

## Sealing Roof Penetrations: Silicon isn't enough!

**Roof penetrations for PV systems are often the most difficult parts of installing a PV system, especially on tile roofs. Installations on tile roofs typically require grinding out the underside of numerous tiles for the mounting feet and then having to drill holes for cable entries, then to properly seal these holes can seem tedious but it is one of the most important stages in the installation process. This article will look at why sealing roof penetrations is of critical importance and will provide some tips on why and how to make your job easier.**

### Why we make penetrations, and why we seal them.

Roof penetrations are essential to the installation of all PV systems. A roof penetration is where the installation process requires a modification to be made to the customer's existing roof structure. The conventional method of drilling a hole in the roof is the obvious example of a roof penetration, but grinding a tile or raising a tile from its original position is also an example of a roof penetration.

To modify a roof structure is an activity that must be undertaken carefully. Roofs are designed to keep the wind and rain out of building for 25+ years and any installation activities on a customer's roof must be done so as not to compromise this assumption of security and longevity. By modifying a customer's roof during the installation process, the system installer is now taking some of the responsibility for the ongoing water-tightness of that roof and can therefore be liable for leaks or degradation of the roof. Ensuring that you have sealed any penetrations in a way that is as secure and as long lasting as possible will help you to meet your requirement to ensure that "Any roof penetrations must be suitably sealed and waterproof for the expected life of the system, refer to roofing manufacturer's guidelines." As stated in the Clean Energy Council Installation Guidelines.

### Types of Penetration

Roof penetrations can be classified into two main categories which both have their own characteristics and sealing requirements.

**Horizontal Penetrations** are those which run through an existing gap between two materials, most commonly between two tiles. Such penetrations require a section of tile to be ground out allowing the conduit or metal tile bracket to be installed. The installer will need to grind out the tile so that the top and bottom tile sit flush against each other before the PV installation and this maintains the integrity of the water proofing and seals the roof.

**Vertical Penetrations** are those which enter the roof space perpendicular to the roofing material.

These are common on both metal and tile roofs and are frequently used for conduit entries into the roof space. Because the penetration is at right angles to the roof, these penetrations are not naturally water tight and have a high risk of leaking if not correctly installed.

The rest of this article will focus on the correct method of sealing vertical roof penetrations.

### Sealing Vertical Penetrations

A good roof penetration should be sealed in a way that will last the life of the PV system. Photovoltaic systems are designed to last for 20 years or more, so this means that the method of sealing used must be durable and able to withstand rain, thermal effects and UV damage. As this is a big demand on any material, it is recommended that the customer's documentation include maintenance of the seal over the life of the system.

#### Method One – Small Flashings

One of the most popular methods of sealing roof penetrations around small entries such as conduits is to use a small rubber or silicon flashing or a gland that is UV stable, heat stable and freeze proof. Although there are a range of these products available on the market, the Dektite brand is a commonly known brand in Australia. These products seal around the conduit entering the roof space, and onto the roof material using a UV stabilised silicon or other sealant.

When installing such a product it is important to ensure that:

- The conduit entering the roof space has sufficient clearance around it to prevent rubbing and damage to the conduit that may result from flexing and thermal expansion of materials;
- The seal between the Dektite or equivalent and the roof material is complete and will be durable;
- The seal between the Dektite or equivalent rubber or silicon and the conduit is complete and will be durable.

The photograph below shows a Dektite installed correctly to maintain a durable seal on a metal roof. Note that Dektite or equivalent can be installed on both metal roofs and tile roofs as long as the correct product is selected.

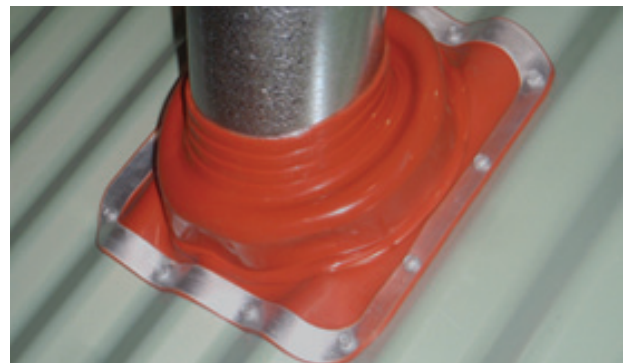


Figure 1 - A silicon Dektite installed on a metal roof. Source DEKS ([www.deks.com.au](http://www.deks.com.au))

## Method Two – Large Flashings and Tile Replacements

Using large flashings for roof penetrations can result in a durable, water tight and fast way to seal roof penetrations. Unlike small flashings which require the installer to drill a hole in a tile before inserting the conduit, a large flashing takes the place of the entire tile with a premade component that replaces the complete tile and significantly reduces installation time.

The image below shows a commercially available large flashing installed on a roof. It can be seen that the flashing consists of a smaller flashing similar to the one shown previously bonded onto a large flexible metal sheet that sits in the same place as the tile that has been replaced and moulds against the roof to form a durable seal. Using this type of flashing reduces the risk and cost associated with tiles that may be broken during installation and can be significantly quicker.

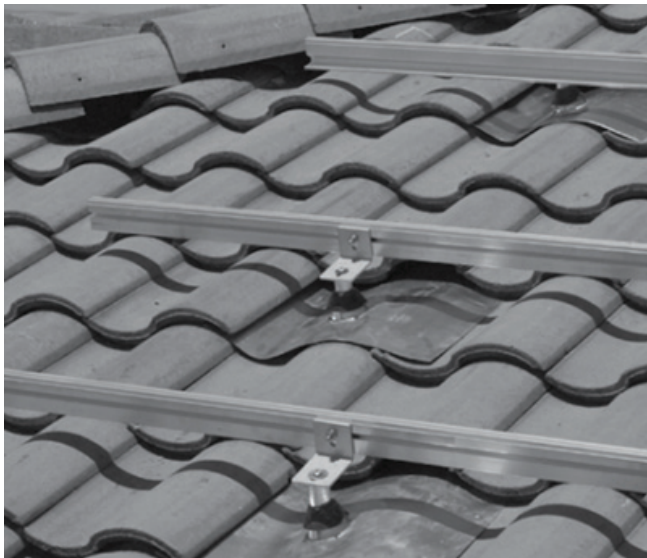


Figure 2: Large area flashing replacing a tile. Source QuickMount PV (<http://www.quickmountpv.com/>)

Like any product it is important to ensure that the flashing is installed according to the manufacturer's requirements. These may include:

- Sealing the interface between the conduit and rubber/silicon gland with UV stabilised silicon;
- Ensuring minimum overlaps between the surrounding tiles and the metal of the flashing;
- Bonding the flashing to the surround tiles to eliminate any movement caused by vibrations, thermal expansion or flexing of the building structure.

## What Not To Do

The durability of roof penetrations is a major concern and it is important to note that simply using silicon around the conduit with UV stabilised silicon is not a sufficient method for sealing roof penetration. Silicon may be easy to apply and may be labelled UV stable, but over the life of a photovoltaic system this material becomes hard and is unlikely to maintain a water tight bond. The reason it is not likely to maintain a secure bond is because the roof changes shape over time and this movement causes the hardened silicon "plug" to flex. As the silicon does not flex with the roof, it can work loose leaving gaps for water to penetrate the roof. This is of particular concern for metal roofs which are subject to thermal expansion due to diurnal temperature differences.