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WATCH THE WASHER

HOW TO IDENTIFY A QUALITY WASHER AND WHY IT MATTERS

BY ROBERT MURRELL

FOR MANY YEARS PEOPLE have accepted that if a screw has a washer, it will do the job. Unfortunately in today's price-driven market, this is no longer always true.

To fully understand why you need to be able to identify and use quality washers, it's important to know how a washer works in a complete roofing and cladding system. A washer must withstand all environmental conditions, including UV degradation, acid rain and extreme temperatures while remaining elastic, intact and watertight.

Unfortunately, washers often are overlooked because of their minor cost per unit compared to fasteners and steel sheet. Washers make up less than one-one-thousandth of 1 percent of the cost of a roof, yet many companies will squabble over this minute amount. However, it's a surprisingly little-known fact that some washers can play a significant part in corrosion of a roof system and can accelerate deterioration, reducing the life span of the structure if incorrect or substandard washers are installed.

BEWARE OF BLENDS

Washers can be made of many different materials, but few are suited to the rigorous conditions to which they are exposed. As seen in the table on page 79, EPDM, which

is a synthetic polymer derived from oil, is the ideal material from which to manufacture washers. Many companies state that they supply EPDM washers; however, because there are no current standards, the percentage of EPDM contained in each washer varies greatly. The number of ingredients in any given EPDM "blend" can range from five to 20 with hugely varying properties, such as UV stability, elasticity, compression performance and resistance to heat aging.

One common washer additive you should be aware of is carbon black. A small amount of carbon black is a necessary additive in EPDM blends because it delivers important performance characteristics at a relatively low cost. These include:

- High UV resistance
- Improved elasticity
- Weathering resistance
- Assistance with manufacturing methods

Carbon black's low cost also makes it effective for binding blends with high-clay contents.

As rising oil prices drive up the cost of EPDM, some manufacturers are increasing the level of fillers within their blends. These low-EPDM, high-carbon blends almost are impossible to separate visually from a high-

quality blend that will have a life span of more than 20 years. A poorly blended formulation can last as little as 18 months before showing signs of breakdown.

CONDUCTIVE CORROSION

It's a surprisingly little-known fact that some washers can play a significant part in corrosion of a roof system and can accelerate deterioration, reducing the life span of the structure if incorrect or substandard washers are installed.

Another concern caused by high levels of carbon black is the incidence of bi-metallic corrosion facilitated by the conductive washer. The quantity of carbon, grade of carbon and its dispersion in the blend can lead to an electrical pathway being developed through the washer itself. This occurs when the high levels of carbon black form a conductive chain through the polymer and create an electrolytic cell between two



These fasteners are exhibiting corrosion caused by a conductive washer.

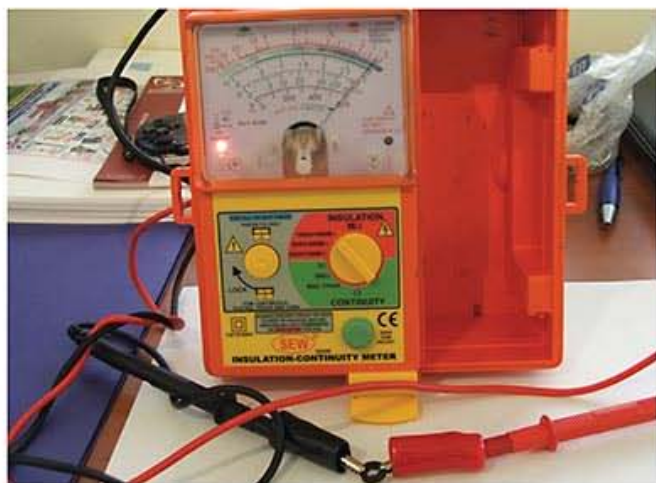
different metals, the screw and roof. This problem often is misinterpreted as a failure of the fastener or roofing/cladding material. This is an inaccurate and costly assumption.

An indication that the washer is contributing to the corrosion can be small blisters of white rust on the surface of the steel sheet close to the base of the screw head. In severe cases, you will see red rust as the coating is removed and the substrate begins to corrode. In addition, where the corrosion has remained unchecked the structural integrity of the construction envelope will have begun failing.

A SIMPLE TEST

Testing the conductivity of a washer can be done simply by applying a resistance meter to the surface of the washer. Applying a charge of 1,000 volts across the washer and reading the resistance will provide a quick indication of whether the washer is conductive. The true measure of a perfect insulator, which is what a washer should be, is a reading of infinite resistance regardless of the voltage applied.

The degree of conductivity is measured according to the amount



By applying a charge of 1,000 volts across the washer and reading the resistance, it was determined that this washer is conductive.

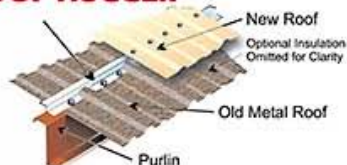


Sparks appear when current is applied to a conductive washer.

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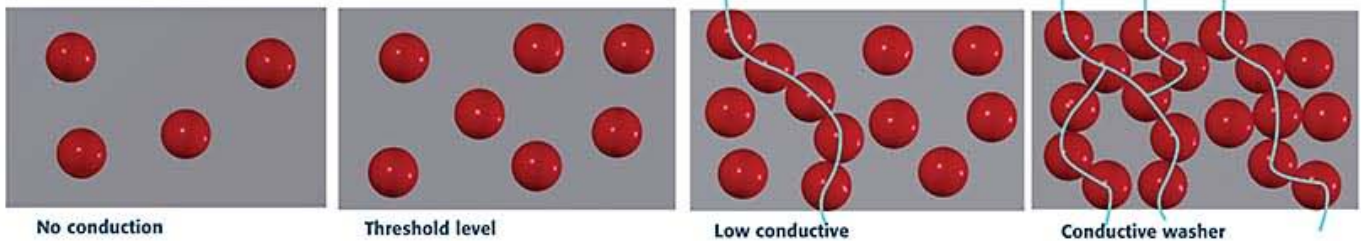
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[FIELD TECHNIQUES]



From left to right: Corrosion on colored steel with a mildly conductive washer, semi-conductive washer and highly conductive washer after 10 months exposure.

of current that will pass through at any given voltage. The relationship between voltage (V), current (I) and resistance (R) is governed by $I = V/R$. The industry benchmark is that a current flow of less

than 0.5×10^{-6} amps is considered acceptable for washers to be deemed nonconductive. This equates to a resistance of no less than 2000M Ohms.

It is advisable to ask for a certificate of

compliance from a screw supplier or a similar statement regarding conductivity. You also can perform the test yourself with a simple multimeter.

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and cladding material in Australasia made the recommendation that all roofing and cladding must be installed with fully non-conductive washers. This conclusion was reached after extensive external real-world testing was carried out that revealed washers with even the slightest conductivity showed an increase in electrolysis compared with fasteners with nonconductive washers. This

recommendation is to be adopted as part of the company's overall roof material warranty this year.

Quality washers are engineered to suit the fastener, roofing and cladding profiles and materials, as well as the final application. The old terminology of "one size fits all" creates false assumptions and can lead to leakages caused by poor design.

When looking for a quality washer always ask your fastener supplier the following questions:

- Does the washer have a warranty?
- Is the washer quality traceable (who made it)?
- Is the technical data and support available to view?
- Has the washer been manufactured to suit the fastener and applications that I am using it for?
- How can I tell I am getting what I am paying for?

By asking these simple questions, you can be assured that your next metal roofing or cladding project will not fail because of the washers. **ii**

Robert Murrell is export business development manager for Deks Industries Pty Ltd, Bayswater, Australia. He can be reached at robertm@deks.com.au or +61 (08) 8983 3418.

WASHER INGREDIENTS

EPDM (Ethylene Propylene Diene-Monomer)

- A blend of materials based on EPDM polymer.
- The blend is critical to sealing, UV resistance, life span and conductivity.

TPE/TPV(Thermoplastic Elastomers)

- *Not suitable for temperatures above 374 F (190 C).

NEOPRENE

- Common sealing material 20 to 30 years ago. Inferior resistance to ozone, UV and common oils.

NR/SBR (Rubber Blends)

- Highly susceptible to UV and ozone.
- Difficult to visually distinguish from EPDM.
- Can begin breaking down in as little as six months.

PVC

- *Low-cost, rigid plastic unsuitable for sealing. Melting point is 302 F (150 C).

**These are important factors to consider because 80 percent or more of screws are now head colored and commonly baked in ovens ranging in temperatures from 392 F (200 C) to 536 F (280 C).*

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