

The devil's in the detail

A review of key metal roof system elements and their associated guarantees leaves the question: Are clients getting the warranties and long-term performance that they are paying for? In this article, Richard Polling addresses the holistic design of metal roof systems and important implications for the long-term performance of insulated roof systems.

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Photographs courtesy of MRC Group.*

Long-term metal roof system failure is all too common in Southern Africa, generally due to poor quality design and construction of perimeter and penetration details, which leads to water ingress resulting in damage within the building. But the implications reach much farther than that.

WATER INGRESS IMPACTS INSULATION GUARANTEE

Water ingress in any form into the building has lasting implications for the guarantee of the performance of your installed bulk insulation blanket system.

A closer look at the guarantee on bulk insulation blanket products clearly shows that the thermal, acoustic and fire performance of the insulation can only be guaranteed if certain conditions are met, such as:

- The product must be stored, handled and installed in accordance with the manufacturer's instructions.
- No physical damage is caused to the product during either installation or during its operational life.
- There is a recorded maintenance plan to show the product has been maintained according to the manufacturer's recommendations.
- There is no water ingress or other liquids present due to leaks or any other manner that will cause loss of insulation properties.

Meeting all the above conditions is vital in order to keep the validity of the installed insulation guarantee, and yet many roofs leak – thereby invalidating this guarantee. The impact on the thermal and acoustic performance of the insulation from water ingress may not be felt for many years; however, the fire performance may be impaired when you most need it.

To ensure the validity of the insulation's guarantee as well as its long-term performance, a recorded maintenance scheme (such as the Guardian™ Maintenance Scheme offered by MRC Group) needs to be in place for the complete roof system.



Failed open end lap, allowing the ingress of wind-driven rain.



Essential recorded maintenance of the roof system.



Breakdown of the end lap from rust under the waterproofing.



Water vapour sealed within the end lap by the waterproofing has accelerated the corrosion process.





Photograph: © MRC Group

The corrosion process between roof sheets without butyl seal type sealants.

HOW BIG A PROBLEM IS WATER INGRESS?

There are many high-quality roof systems on the market, including pierced fix, concealed fix and secret fix systems – all in a myriad of arrangements to provide a large range of solutions. Provided such a quality roof system is specified correctly, constructed correctly with all the various elements and with the correct gauge and girth of the perimeter details, and that the roof system is regularly maintained, the roof should not leak – and therefore the insulation guarantee will remain valid.

MRC Group's knowledge of the manufacturing, installation and maintenance of all types of metal roof systems is extensive, borne from extensive experience in the refurbishment, upgrading and maintenance of industrial, commercial and retail buildings. MRC Group's unique roof auditing and diagnostic services of existing roofs highlight all the water ingress issues and their potential solutions, before any specifications can be written or works undertaken.

MRC Group has completed numerous audits of large-scale roofs, on both newly constructed buildings as well as roofs that had been installed many decades ago. *In most of these cases*, the roofs had not been maintained and have leaked, effectively invalidating any guarantees given at the time of installation.

WHERE DO ROOFS LEAK?

Although incorrect specification does occur, the main reason for water ingress or leaks is a lack of care regarding the details. Roof sheeting from the major manufacturers is generally fit for purpose and, if installed correctly with all the various elements, will not leak; however, the *poor quality of installations* is the biggest factor that leads to water ingress.

Risk areas, or where water ingress or leaks are most likely to occur, include:

- Roof sheet end laps.
- Perimeter details such as ridges, headwalls, barges and sidewalls.
- Penetration details for pipes, flues and other such items.
- Roof light sheeting solutions.
- Exposed fixings loosened through thermal expansion.
- Roofs that are not maintained.

Note: The abovementioned areas of risk are not generally covered in the guarantees from the various manufacturers and contractors. And, if they *are* covered, it's usually only for a few years, thereby passing on the risk of long-term poor performance to the client.

THE RISKS

- **Roof sheet end laps and side laps:** It is considered best practice to install butyl seal type sealants to both the side laps and end laps of pierced fix roof systems, and essential for roof pitches below 7.5 degrees. Should water ingress occur through these joints, it is because it is not common practice to include these sealants. When a leak in the lap is discovered during the operational life of the roof, it is common practice to seal the joint from the exterior with a waterproofing membrane; however, the water vapour now encapsulated within the joint forms a more corrosive environment as it warms up and cools down, thereby speeding up the corrosion process on the end lap of the roof sheet, causing more leaks and now making the roof sheet dangerous to transverse during maintenance.
- **Perimeter detail flashings:** The manufacturers provide an indicative principle of how the detail should be formed, but in no way must a 'one size fits all' solution be applied. In most cases, ridge, barge and changes in angle metal flashings are under-gauged and the girth is undersized, which leads to problems of water ingress by wind-driven rain.

Example: A roof with a low roof pitch should have a larger girth ridge flashing, and therefore a thicker gauge of metal. This is to stop the impact of wind-driven rain, which can be a big contributor to water ingress into low-pitch roofs.

Many of the metal flashings installed around roof details have a girth of 462mm, for no technical reason other than the fact that two flashings can be made from a single 925mm-wide flat sheet, keeping waste and costs to a minimum – with no consideration given to long-term performance.

In most cases, the audits of existing roofs undertaken by MRC Group have exposed the fact that many of the elements that make up the perimeter details were *not* installed correctly or not installed *at all*. These include the important profiled foam fillers or polyclosures, tapes and sealants, all of which should be hidden, if they were installed, once the actual metal flashing is secured.

It is interesting to note that, in general, the manufacturer will provide a long-term guarantee for the material itself, but it is the approved contractor's responsibility to provide the roof systems performance warranty against water ingress. Such warranties are normally less than five years, thereby exposing the client to the risk of long-term poor performance and invalidation of the insulation guarantee.

- **Penetration details:** There are many roof systems that can be installed down to extremely low roof pitches, such as the 'secret' or concealed fix systems that provide the benefit of no exposed fixings and long sheet lengths, removing the requirement for end laps. But, as soon as a penetration such as a vent, pipe or flue is installed, the risk of water ingress is dramatically increased.



Should a building require penetrations through the roof, either an alternative roof system such as a single-ply waterproofing membrane should be considered, or the roof pitch should be increased to mitigate the risk. The lower the roof pitch, the more reliance placed on the tapes and sealants to oppose water ingress from wind-driven rain.

With the use of an aluminium roof system, there is the additional benefit of being able to weld up the flashing detail to ensure no water ingress.

MITIGATING THE RISKS FOR THE BUILDING OWNER

To ensure a high level of construction compliance, it has to be the responsibility of the manufacturer and the contractor to ensure the correct application of the roof system and the installation of all the components that make up the roof system and its associated perimeter and penetration details.

Such compliance should be substantiated with regular photographic reports during installation that show how the roof system has been installed as well as all the components that make up the perimeter and penetration details.

All guarantees provided by both the manufacturer and the approved contractor should be for the same length of term. In other words, if the roof sheet material guarantee is for 15 years, the approved contractor should provide a 15-year guarantee for the performance of the roof system, including his workmanship.

All guarantees should specifically mention the following items:

1. The length of term of material guarantee and the expected operational life of each of the roof system components:
 - a. Roof Sheeting
 - b. Tapes and Sealants
 - c. Fixings and Fasteners
 - d. Insulation
 - e. AshGrid Bar and Bracket Support System (if used)
 - f. Straining Wire or Liner Sheet (if used)
 - g. Perimeter Flashings
 - h. Penetration Flashings
2. Correct application of the roof system.
3. Construction compliance of all the components that make up perimeter details.
4. The length of term of the warranty of the workmanship. (This should match the length of term of the material guarantee.)
5. The length of term of the guarantee of no water ingress from normal weather conditions.

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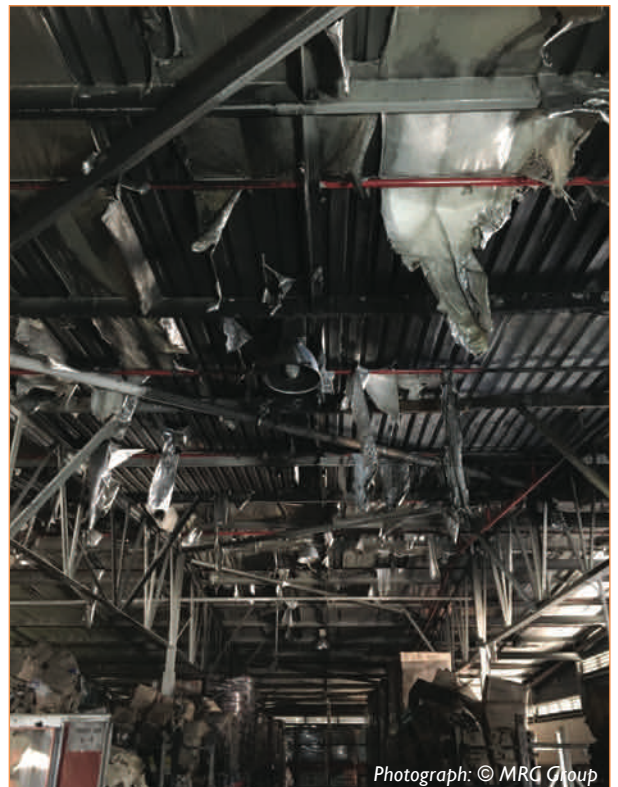
MRC Group offers the Guardian™ Maintenance Scheme, an innovative single-source, transferable building envelope warranty that covers up to 20 years of the building envelope's life, providing coverage not only for materials and workmanship, but also maintenance.



Photograph: © MRC Group
Due to the low roof pitch 925mm girth metal ridge flashing complete with serrated closures, polyclosures, sealants and turn-ups in lieu of the standard 462mm girth metal ridge flashing.



Photograph: © MRC Group
Standard waterproofing solution to water leaking through the end lap.



Photograph: © MRC Group
Fire damaged building. Was the insulation guarantee valid?

