

The devil's in the detail – part 2

In this article, we address the holistic design of metal roof systems and important implications for the long-term performance of insulation systems.

By Richard Polling

All images courtesy of MRC Group



A failed end lap.

In the first part of this article, published in the August 2016 edition of *SA Roofing*, we considered the impact of water ingress on the guarantee of the insulation, highlighting that any insulation guarantee would be invalidated should the nature of the insulation change through water leaks, which would ultimately lead to an invalidation of the thermal, acoustic and fire performance.

We considered the importance of any roof system maintenance to continue validity of any material guarantee, concluding that unless recorded maintenance with a frequency prescribed by the material supplier was undertaken, then most roof system guarantees were in fact invalidated, leaving the client holding the long-term performance bill.

Under the section of 'Where do roofs leak?' we considered three of the key areas of water ingress, which are as follows:

- Roof sheet end laps
- Perimeter details such as ridges, head walls, barges and side walls
- Penetration details for pipes, flues and other such items

To complete the most prominent areas of risk, we will now consider the following:

- Roof light and daylight sheeting solutions
- Exposed fixing loosened through thermal expansion
- Unmaintained roofs



A rusty end lap.

The risks continued

Roof light and daylight sheeting solutions

The amount of daylight allowed to enter the building is carefully considered by specifiers, to mitigate the costs of power for the use of lighting systems and to ensure that the operatives within the building have access to as much natural daylight in their working environment as possible.

The use of inline polycarbonate roof sheeting is considered to be the most economic and widely-used solution and yet, before specification of these products, the following must be taken into account:

- Roof pitch: minimum of 7.5° as the ability to provide a tight seal is reliant on tapes and sealants. Lower roof pitches leads to water ponding and wind driven water ingress.
- Sheet lengths: short lengths up to 5m should be specified to minimise the impact of thermal expansion, as roof light sheeting can thermally expand and contract up to six times more than the roof sheet itself.
- Gauge of the material: minimum of 1.25mm is specified.
- Sealants and tapes: to ensure good contact between the roof light sheeting and to keep water out. Butyl seal type sealants should be used along the side laps and twice on the end laps.
- Installation methodology: due to the thermal expansion of the material the holes for the fixings need to be over-sized to allow for the material to expand and contract.
- Long-term maintenance: over time the polycarbonate material will become brittle, crack and warped by thermal expansion, all of which will lead to water ingress and at this point the roof light sheeting needs to be replaced.
- Health and safety: the use of red headed fixings to ensure that any following maintenance contractor is aware of the danger and additional measures – such as mesh under polycarbonates – are considered to be best practice.

The use of glass-reinforced polyester (GRP) roof light sheeting or multi-skinned solutions provide greater ability to withstand water leaks and a longer term of guarantee, all still subject to regular recorded maintenance and the salient points mentioned above.

Exposed fixing loosened through thermal expansion

With every metal roof system there are tangible benefits and drawbacks and a 'one size fits all' approach to specification will always lead to problems. One such drawback of the pierced fix metal roof system is the exposed fixings at the end laps and side laps.

During the course of the day, as the pierced fix metal roof sheet warms and cools, the metal roof sheeting expands and contracts. The amount of movement is subject to the conditions and the length of the roof sheet itself. Depending on the material and its coating this could be between 1 to 3mm per linear metre of sheeting, which needs to be accommodated within the design of the roof system.

Interesting to note that roof sheeting in the summer can get as hot as 80° C, depending on the material used; zinc aluminium-based sheeting tends to be able to withstand the impact of the sun better than galvanised steel products, which are all dependent on the colour and location.

With such extreme temperatures and thermal movement it is no surprise that over time, the exposed fixings used in a pierced fix metal roof system can work themselves loose, rising up with the washer from the face of the roof sheeting. Although installing the fixings at the crown of the roof sheet mitigates this risk, there is still a risk of water ingress that ultimately makes any insulation guarantee invalid.

Regular recorded maintenance should include correct tightening of the exposed fixings throughout the whole roof ensuring that the washer is in good contact with the roof sheeting therefore ensuring there are no water leaks.

Unmaintained metal roof systems

One of the biggest culprits as to why water leaks into a building, is the lack of regular recorded maintenance. In general, maintenance of the unseen roof is neglected and only generally considered as a reaction to a water leak rather than a long-term preventative measure.

It is interesting to note, that many of the material guarantees offered in the marketplace for metal roof sheeting, have a maintenance clause written into the terms and conditions and without such recorded regular maintenance, any such guarantee is invalidated.

The frequency of the recorded maintenance is determined by the location, the material, its coating and the operation of the building itself. In coastal or high industrial zones, the frequency of maintenance could be up to four visits a year following installation of the roof system.

As maintenance of the unseen roof is generally an afterthought or unbudgeted for. There is also the danger that the client uses a general maintenance contractor, with little or no experience of the design of the roof system or how to safely traverse across it. In the most part general maintenance contractors may not understand all the health and safety certifications and training that are required by law to undertake such works at height, which could leave the client responsible and exposed to a severe fine or even a jail sentence.

All maintenance of metal roof systems should be undertaken following the material supplier and manufacturer of the roof sheeting's recommendations, providing them with a photographic report or the opportunity to ensure that the works have been undertaken correctly. All such maintenance works should be signed and verified by the supplier, manufacturer, contractor and client and kept on file to ensure the validity of the product guarantee.

MRC Group is recognised for its experience and industry knowledge of the design, supply, installation and maintenance of metal roof and waterproofing systems backed with the Guardian™ Maintenance Scheme, which ensures the long term performance of our clients' buildings and the validity of the material guarantees that are used to construct the roof system. 🏠

For more information, contact the author on +27 (0) 79 340 2318 or email richardp@mrc-group.co.za or visit www.mrc-group.co.za.

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.

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Fire damage.



Loose screws, due to thermal expansion.