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April 2011

Kalzip®

Kalzip Ltd

Durability and corrosion testing

WEATHER AND CORROSION RESISTANT • 40 YEARS & COUNTING

Research undertaken by BAM confirms Kalzip's outstanding durability even in aggressive environments

Kalzip® – proven to last, whatever

Kalzip aluminium standing seam roofing and wall cladding has revolutionised the design of building envelopes, making possible some of the world's most dramatic architecture. But perhaps even more important is its inherent durability, delivering virtually maintenance-free performance for decade after decade.

40 years' exposure and still performing.

The latest findings of a long-term project by German technical research body BAM (Federal Institute for Materials Research and Testing) show that, even after 40 years' exposure to potentially corrosive industrial pollutants and atmospheric attack, the base material of a Kalzip roof – and therefore its ability to perform – remains fully functional.

Aluminium is inherently durable and weather-resistant, creating an inert, hard oxide layer that resists most pollutants and 'regenerates if cut or scratched. With Kalzip, an additional weathering layer of bespoke alloy further improves this resistance to corrosion, resulting in a BBA-certified life expectancy in excess of 40 years.

Experience suggests this to be a conservative estimate – Kalzip roofs have already exceeded that life expectancy – and the findings of the BAM report confirm this.

The research undertaken by BAM investigated the condition of roof samples taken from buildings in three locations, selected for their different atmospheric conditions and the threats that these present, e.g. humidity, rainfall, attack by chemical pollution, UV radiation etc.

And the results clearly show that the Kalzip aluminium roofing tested remains in good working order, 40 years or more from the day it was first installed. This document provides a summary of the findings published in BAM-Test Certificate VI.1/14669.

Fig. 1

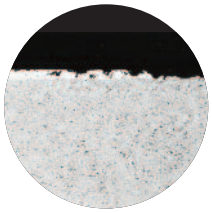


Fig. 2

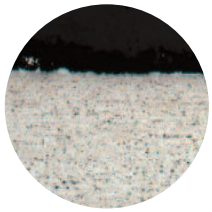


Fig. 3

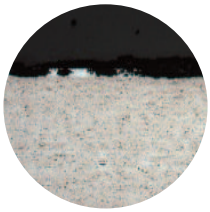


Fig. 4

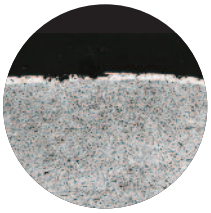
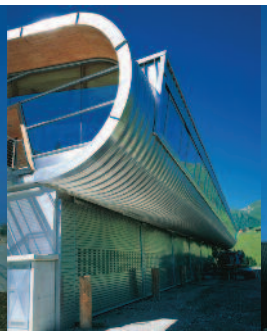
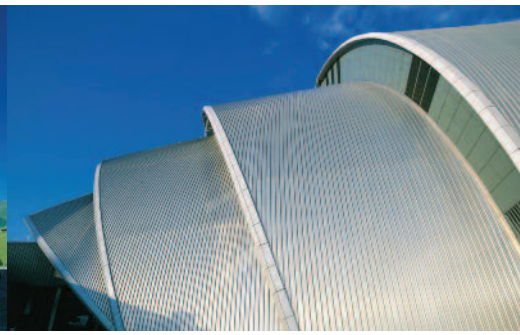


Fig. 5

the conditions



Packing Hall, Hamburg NaCl

This plated aluminium Kalzip roof, at a packing hall in the Freeport of Hamburg, was installed in 1970. While its location is classed as an urban climate, the hall is actually situated in the harbour area, a marine environment where sodium chloride is the major atmospheric pollutant.

Tests carried out on a storage hall at Hamburg's container terminal in 1972 (Fig. 1, after 1 years' exposure), showed early signs of pitting corrosion; similar tests 21 years later (Fig. 2) showed further pitting, but still no damage to the core material.

While the 2009 samples were taken from a different structure, they are still representative in terms of age and atmospheric exposure conditions. The first sample (Fig. 3) was taken from an area of the eaves and shows further increase in corrosion, both on the inner and the outer side. The second (Fig. 4), taken from the middle of the roof, shows similar corrosion to the outer side but limited damage to the inner side.

Again, pitting and corrosion is restricted to the protective layer; the bulk material remains completely unaffected.

BAM expert opinion

After 40 years of exposure, the bulk material is not yet affected… At the present moment the function of the roof is completely in a good condition.

Congress Hall, Nuremberg CO_2 CO

The Kalzip roof on Congress Hall, Nuremberg was installed in 1968. The climate in this location is a mixture of urban and rural and the main pollutants are carbon monoxide and carbon dioxide, neither of which has any major effect on aluminium.

Initial tests carried out in 1993 (Fig. 5) showed that pitting corrosion was restricted to the plating layer and did not extend to the underlying bulk material.

In 2009, three further samples were taken, allowing assessment of the roof after 41 years' exposure. The first two samples (Fig. 6 and Fig. 7) were taken from eaves adjacent to the earlier tests and pitting corrosion remains limited to the plating layer. The third sample (Fig. 8) was taken from a seam and the protected inner side of the sheet shows no sign of corrosion. The freely weathered upper side shows pitting typical for this location, none of which reaches the bulk material.

So, in every sample taken, the weathering layer – designed to protect the purer base material – continues to do its job.

BAM expert opinion

The pitting corrosion effects in the plating layer detected in the cross section stop at the bulk material and thus do not affect the function of the roofing after 41 years of use… long durability can be expected.

Storage Facility, Essen HC1 SO_2

Testing at the third location, Essen, was carried out on a roof at a metal storage facility erected in 1974. The climate at this installation is classified as industrial, where the most frequently encountered pollutants are sulphur dioxide and hydrogen chloride.

Tests in 1972 and 1993 were carried out on a different building, also in Essen, but access was no longer possible. While the Essen location is the same, there is an eight year age difference between the two buildings tested so a direct comparison is not possible.

The first sample (Fig. 9) was taken from the eaves of the storage facility; while pitting to the plating layer is apparent on both sides, the core material remains unaffected; the second sample (Fig. 10), taken from the middle of the roof, shows pitting to the outside but only very limited damage to the inside, neither affecting the bulk material.

BAM expert opinion

The investigations reveal numerous corrosion effects which, however, do not extend to the bulk material.

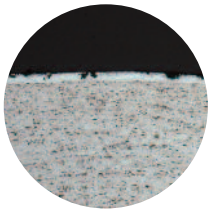


Fig. 6

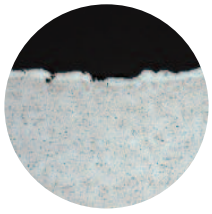


Fig. 7

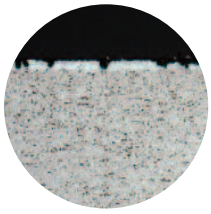


Fig. 8

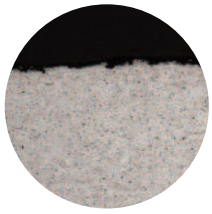


Fig. 9

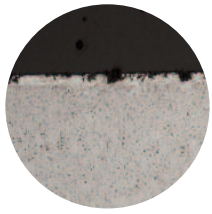


Fig. 10

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Kalzip Alclad alloy

Kalzip's resistance to corrosion is achieved by cladding the base material with a sacrificial layer of AlZn1 (aluminium zinc alloy).

The improved protection comes from the negative potential of AlZn1 of 150 mV towards the base material of AlMn1Mg1. Upon appearance of an aggressive medium, the AlZn1 layer sacrifices itself as anodes, thereby allowing the functioning of the cathode material AlMn1Mg1 to remain intact.

The investigations undertaken by BAM found there was "no significant corrosion progress" on the Kalzip projecting roof installed at the south wing of the Congress Hall in Nuremberg. And while pitting corrosion was detected on the roofs of the packing hall at Hamburg freeport and the metal trade storage facility in Essen, in both cases the damage was restricted to the plating layer.

Overall, the Federal Institute for Materials Research and Testing (BAM) concluded that: "From the corrosion point of view the roofings are still working well after 36 to 41 years' exposure under atmospheric conditions."

Kalzip testing and accreditation

The BAM evaluation and report is just one example of the independent tests to which Kalzip is regularly subjected.

The Kalzip roof system in its entirety has achieved third party certification by the BBA in the UK and is globally recognised by the German Zulassung, French Avis Technique and Factory Mutual quality standards.

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