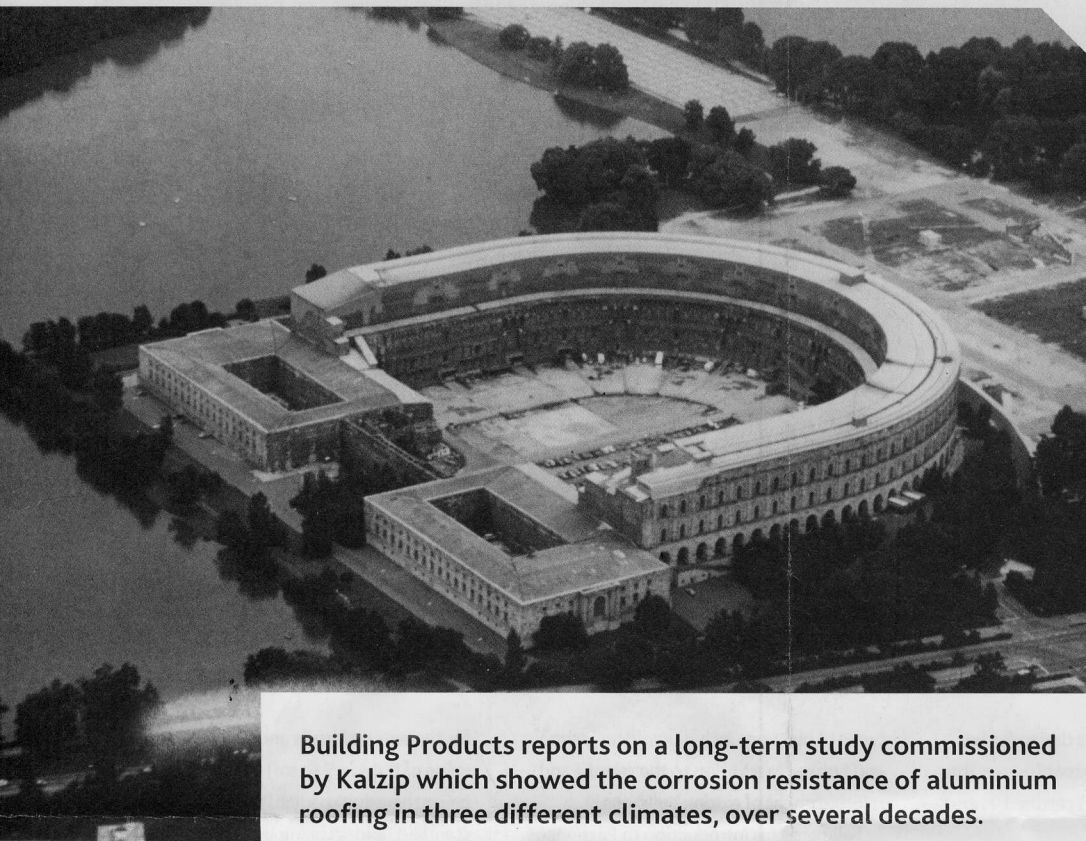


History of resilience



Building Products reports on a long-term study commissioned by Kalzip which showed the corrosion resistance of aluminium roofing in three different climates, over several decades.

The Kalzip roof of the historic Congress Hall in Nuremberg, installed in 1968, was one of the sites tested by the German institute

The durability and stability of aluminium roofing has long been recognised. Kalzip uses aluminium alloys for the additional protection of its roofing products, to provide a weathering layer that delivers further improvements in corrosion resistance. The performance of Kalzip's standard seam roofing has been the subject of independent testing over a 41-year period by The Federal Institute for Material Research and Testing (BAM), whose recent findings prove illuminating.

Kalzip's aluminium profiled sheet offer comprises a comprehensive range of products and associated fixings, enabling complex roof geometries to be produced within a complete, weather-tight, virtually maintenance-free system. The durability and corrosion resistance of aluminium makes it the ideal choice for a wide variety of environmental conditions. In order to formally substantiate this however, BAM has assessed long-term performance of Kalzip systems on corrosion resistance in three different settings – marine, urban and industrial – in Germany. The inherent threats to the systems over the 41-year period have been humidity, rainfall, attack by chemical pollution and UV radiation.

Methodology & case studies

Tests on all three sites have been carried out over the whole period, enabling documentation of progressive corrosion. In each case, BAM examined samples taken from each location and compared them with a sample of new Alclad 3004 profiled sheet. Sections of each are embedded in synthetic resin and cross-sectioned. After grinding and polishing, the specimens are etched with 5% hydrofluoric acid to make the plating layer and bulk material visible with the help of their different microstructure formation.

The Kalzip roof on Congress Hall, Nuremberg, was installed in 1968 and was first tested by BAM in 1993. The climate in this location is a mix of urban and rural. The main pollutants in urban atmospheres are carbon monoxide and carbon dioxide, neither of which has any major effect on aluminium, according to Kalzip. Atmospheric pollution is generally very low in rural environments.

The latest results relate to assessment of the roof after 41 years exposure. Three samples were taken. The first two samples from the eaves, adjacent to the earlier test samples, showed pitting corrosion occurred to the upper side "but is still limited to the plating layer only." The third sample was

taken from a seam and revealed that the protected inner side shows "no sign of corrosion." The freely weathered upper side shows "pitting typical for this location."

Assuming that corrosion of the metallic blank inner side is negligible, and therefore that the thickness of the plating layer is as per the original state, (and also that both layers began with the same plating thickness), the mean difference recorded of 10 μm (inner 45 μm , outer 35 μm) corresponds to a mean corrosion rate of approximately 0.24 $\mu\text{m}/\text{year}$ for this location, says Kalzip.

According to the BAM report: "The pitting corrosion effects in the plating layer detected in the cross section stop at the bulk material do not affect the function of the roofing after 41 years of use... long durability can be expected."

A plated aluminium Kalzip roof was installed at a packing hall in Hamburg in 1970. The hall is situated in the harbour area of the city; being a marine environment sodium chloride is the major atmospheric pollutant. Tests carried out show the difference in this case (between the inner and outer after nearly 40 years exposure), is 7 μm (inner 47 μm , outer 40 μm). BAM stated in its report: "After 40 years exposure, the bulk material is not yet affected. At the present moment the function of the roof is completely in a good condition."

The third roof under assessment was erected in 1974 at a storage facility operated by a metal business in Essen. The climate at this installation is classified as industrial, where the most frequently encountered pollutants are sulphur dioxide and hydrogen chloride.

At this location the first sample was taken from the eaves; and whilst "some pitting to the plating layer is apparent on both sides, the core material remains unaffected;" the second shows "pitting to the outside but only very limited damage to the inside, neither affecting the bulk material." The difference after 36 years is 12 μm , a finding which led the BAM to state: "The investigations reveal numerous corrosion effects which, however, do not extend to the bulk material."

Overall, BAM concluded: "From the corrosion point of view the roofs are still working well after 36 to 41 years' exposure under atmospheric conditions." This reinforces the product's 40-year guarantee.