

November 2021

TO WHOM IT MAY CONCERN

Re: Zinc whiskers

The science behind zinc whiskers has not made much progress since their discovery around 1940. Back in those days it was found that some pure metals (tin, bismuth, cadmium, lead and zinc) could grow hair-shaped crystals from their surface. Much attention was given to tin whiskers, as tin was used for soldering early electronics. It was found that addition of lead to solder could largely prevent the growth of tin whiskers, but mechanisms of inoculation and growth of these tiny filaments are still largely unknown. The use of lead free solders has made the tin whisker issue a modern topic again, but for zinc whiskers not many scientific facts are known.

The known facts regarding zinc whiskers:

- Zinc whiskers are tiny, thin filaments of zinc, growing for instance from metal surfaces that were electroplated with zinc for corrosion protection. (typical length up to a few millimetres, thickness around a few microns)
- The incubation period for the start (inoculation) of their growth is unpredictable and not understood, it could be months or years and may never occur.
- Once they exist, they can grow at rates as high as 1 mm/year, but chances are high that they don't grow that fast.
- The mechanisms behind their inoculation and growth are largely unknown, giving room to all kinds of speculations.

The problem with zinc whiskers:

- Once there, they could break and become airborne in an air flow. Air transport could bring them in contact with electronic equipment at large distances, where they might cause short circuits.
- Due to their tiny dimensions, the whiskers might not survive that short circuit, they will melt and/or evaporate. The killer will not leave any trace...
- Zinc whiskers are so small that they are hardly visible with the naked eye, which makes early detection and even proof of their presence difficult.

Assumptions that are not proven, but are likely:

- Zinc whiskers grow from electroplated zinc
- Hot dip galvanised products carry a thick layer of zinc, and it is likely that a thick layer will reduce whisker growth significantly
- Zinc whiskers do not grow from alloyed zinc layers,
- It is expected that proper surface coating on top of the zinc will prevent inoculation and growth of zinc whiskers.
- Stainless steel products are not sensitive to the growth of whiskers

In its 80 years of being in the business, Walraven has never received any complaint regarding zinc whiskers. Based on the current state of science, it can be concluded that:

- Walraven Stainless Steel products are guaranteed free from whiskers
- It is likely that Walraven Hot Dip Galvanised products and Walraven BUP products are not subject to the risk of zinc whisker growth

- Walraven electro galvanised or zinc plated products – like those of any competitor - might be sensitive to the growth of whiskers, when other factors (like temperature, material tensions, etc) are also supporting this possible growth

We do know that many construction elements in installations are made with less care. Server racks, ventilators, air ducts and even construction elements at large distances can still be vulnerable to the growth of zinc whiskers. Detection of zinc whiskers is difficult, but proof of their source once they are airborne is almost impossible. We therefore recommend to clean installations regularly and to have an active filtration of air. Proper maintenance of your installation could prevent damage!

Zinc whisker literature:

<https://www.er-emergency.com/wp-content/uploads/2011/04/Zinc-Whisker-Awareness.pdf>

Juan Manuel Cabrera-Anaya. Growth of zinc whiskers. Materials. Université de Grenoble, 2014.

English.

J. van Walraven Holding BV



G.A. Sedee,
Legal Counsel

J. VAN WALRAVEN HOLDING B.V.
Industrieweg 5
3641 RK Mijdrecht
Nederland