

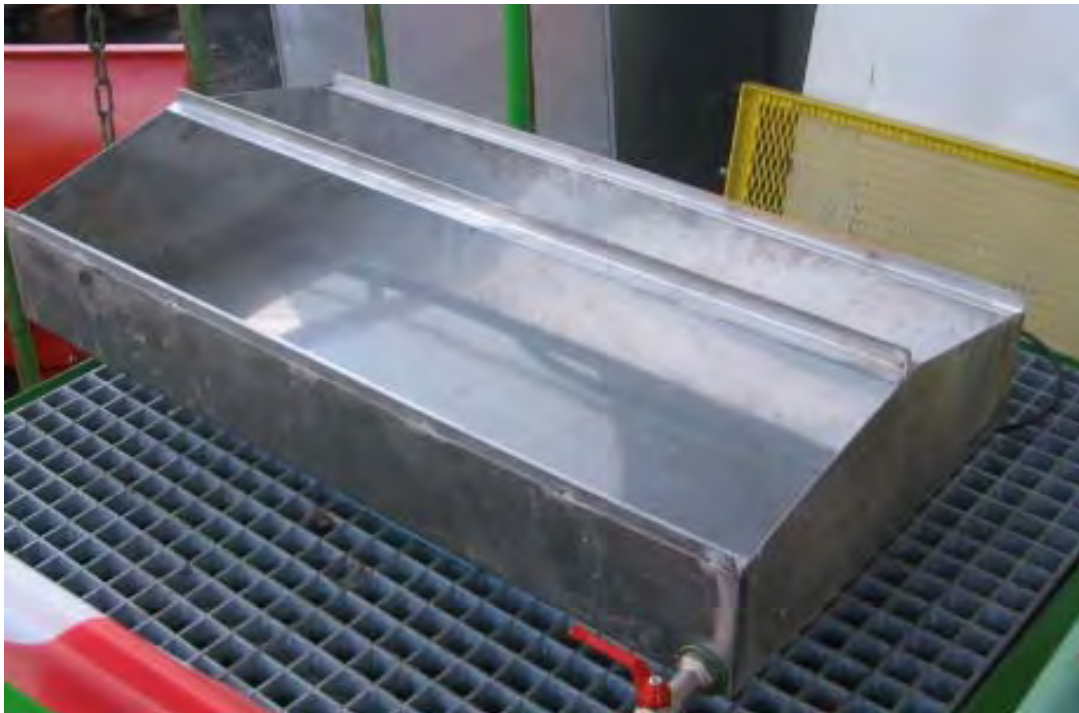
## I.C.C. USE IN LIVESTOCK CONFINEMENT

### 1 Purpose of the test

The purpose of this test was to research how I.C.C. provides **additional protection** to the metal roof panels in buildings used for **livestock confinement**, where corrosion is very likely to occur.

### 2 Testing

As there is no standardized test for corrosion in livestock confinement, the first task was to find the most corrosive tests regularly run on steel panels and see if they could be adapted to livestock confinement. In talks with some of the world's largest steel producers, one test seemed to lend itself well to the need.



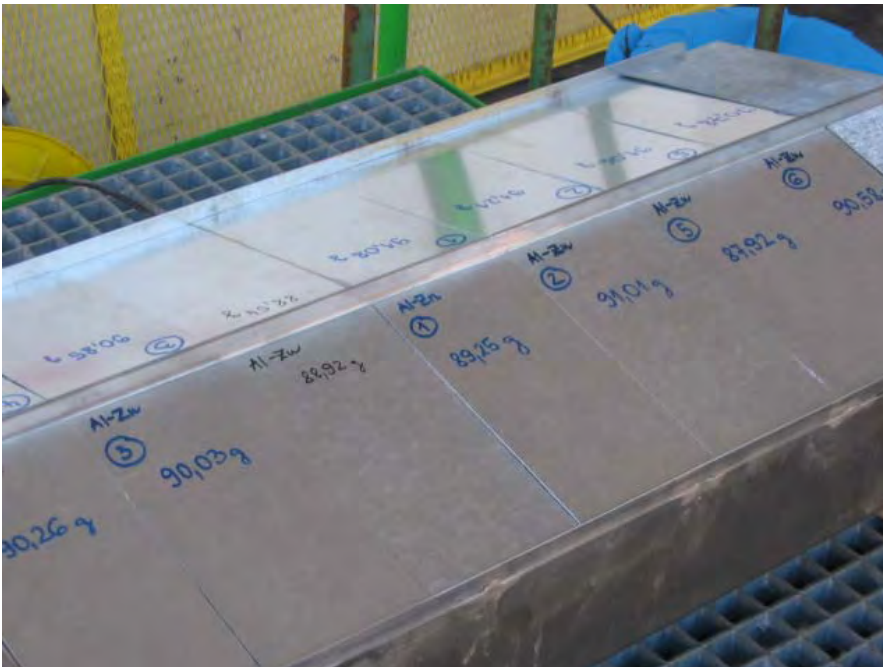
*Testing Chamber similar to a chaffing dish.*

The idea of the test was to loosely copy the **humidity chamber testing** also known as the Cleveland Condensing Test (ASTM-D4584). The test was performed on steel sheets with a protective layer of Zn (galvanized). **Instead of the usual water**, livestock confinement conditions were simulated in a chamber filled with **liquid manure** which was heated from below.



Chamber filled with liquid manure.

By heating the liquid manure, the temperature difference between inside and outside the chamber kept **humidity levels at close to 100%** and left a constant state of condensation on the test panels. Steel sheet test samples with and without I.C.C. were directly exposed to the simulated environment.

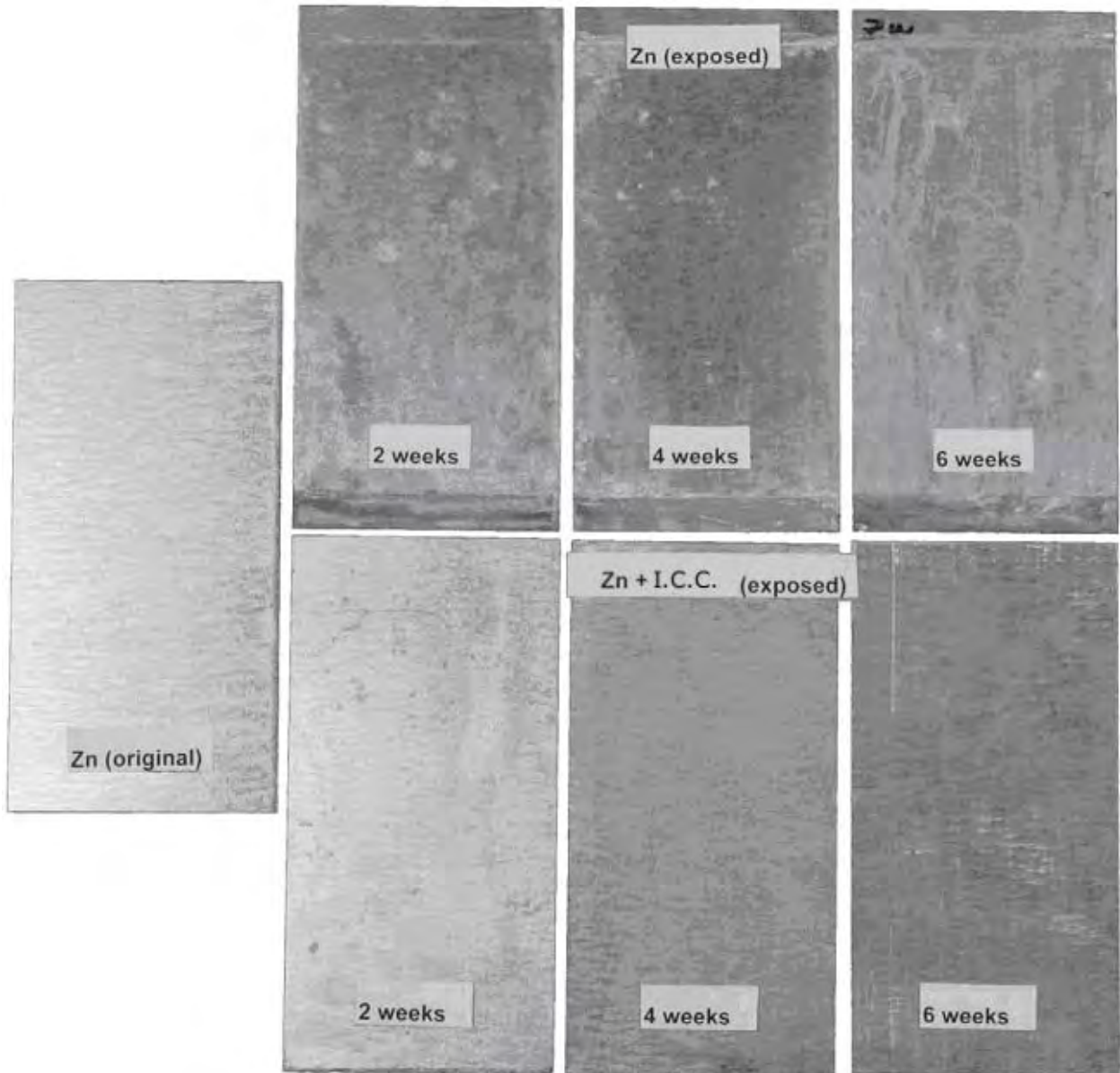


Chamber with steel samples in place.

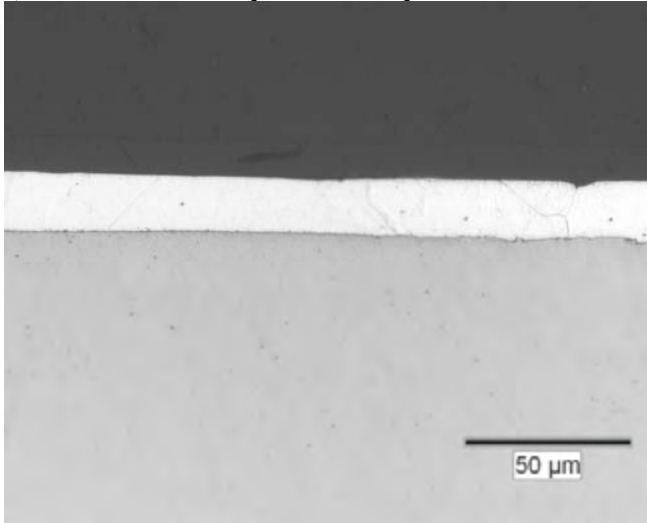
We observed the changes on the surface of each metal sheet after 2, 4 and 6 weeks (1000 hours). Samples were compared with original metal sheets, which had not been exposed to the testing conditions.

Steel test samples and their protective coating

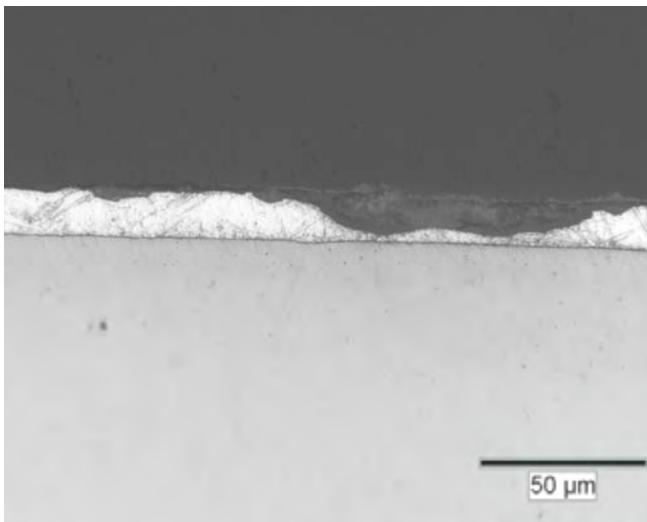
- GALVANIZED; Zn coating (U.S.Steel DX51D, 200g/m<sup>2</sup> Zn)



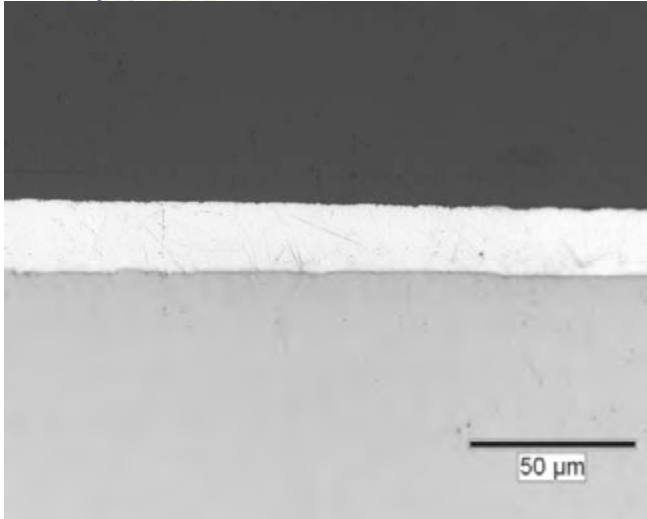
Microscopic Cross Section Analysis (500 Times Magnification)  
(The white stripe is the protective zinc layer.)



*Original*



*After 1000 Hours without I.C.C. Protection*



*After 1000 Hours with I.C.C. Protection*

#### **4 Conclusion**

This test provides significant evidence that I.C.C. protects metal panels exposed to severe conditions in buildings used for livestock confinement. The panels covered with I.C.C. resist corrosion much better.