Euro ZAC

Technical Validation Paper 2
2004

European exposure tests of pre-painted steel panels

10-year Eurodes programme confirms the outstanding comparative performance of substrate in 55% Al-Zn metallic coated steel

55% Al-Zn℠

THE MAGIC FORMULA

FOR PRE-PAINTED SUBSTRATE

- The 10-year Eurodes exposure test programme was carried out by EuroZAC in co-operation with the European Coil Coaters Association (ECCA) to provide specific European performance data for 55% Al-Zn metallic coated steel as the substrate for pre-painted steels in construction applications.

- Commercially pre-painted samples, cut from coil line material and coated with paint systems available at the time, were supplied by EuroZAC member companies, with substrates in:

  Hot-dip galvanised steel
  Zn-5%Al coated steel (Galfan®)*
  55% Al-Zn coated steel (Aluzink® and Aluzinc®)

- ECCA approved and monitored the two Eurodes test sites at Hendaye in France (severe marine environment) and Geleen in The Netherlands (industrial marine environment).

- Three sets of panels were exposed at each site. One set was removed after 2 years, one after 5 years, and the last after 10 years. ECCA assisted in the initial exposure and subsequent removal of panels, which were then sent to an independent laboratory for evaluation.

- The evaluation covered corrosion resistance along flat and formed areas, overlapped joints, along scribes and unprotected sheared edges, and around fasteners. Paint film properties like colour retention, chalking and fading were outside the scope of the study

- Though the paint systems may have contributed to overall performance, the effect was not significant, and did not affect the ranking of the samples.

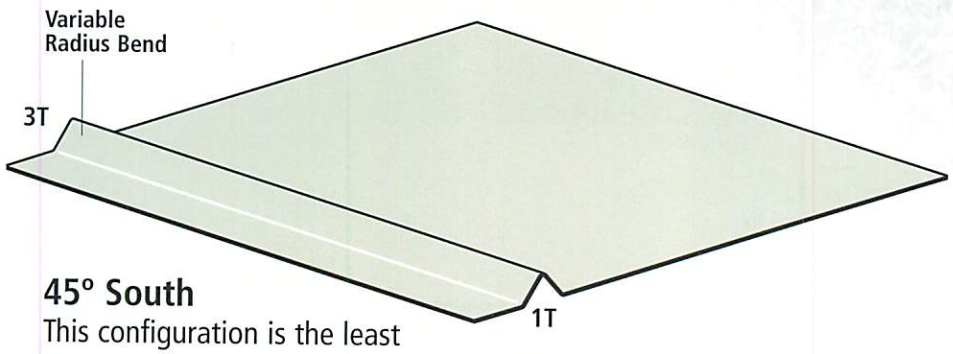
*Galfan® is a registered trademark for Zn-5% Al metallic coated sheet steel. For clarity, the name Galfan has been used throughout this paper to refer to Zn-5% Al coated steel.

PANEL PREPARATION AND EXPOSURE

Panels were prepared and exposed in accordance with ECCA Test Method T-19.

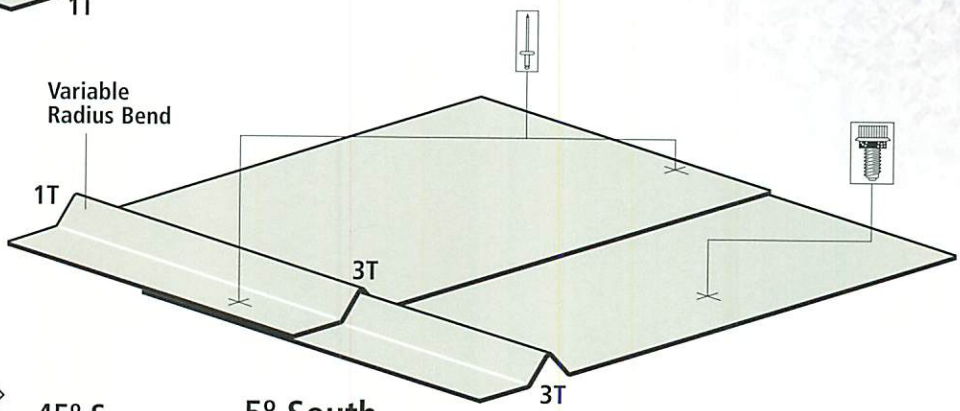
The panels contained unprotected sheared edges, a variable radius bend, reverse impact dimple, scribe marks, overlapped joints, rivets and fasteners. They showed paint damage caused by the normal roll-forming, handling and installation processes.

The panels were exposed under the three configurations required by ECCA T-19.



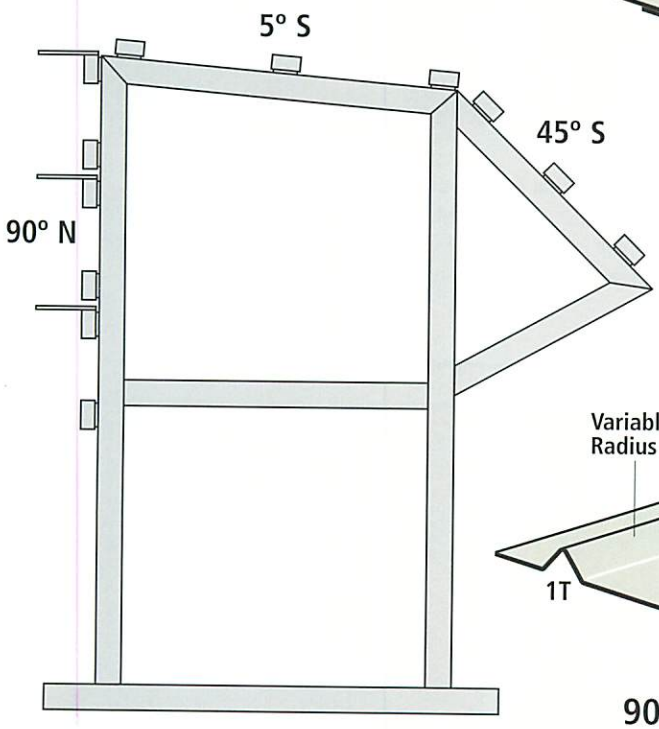
45° South

This configuration is the least severe, and is traditionally used to determine chalk and fade resistance of the paint system.

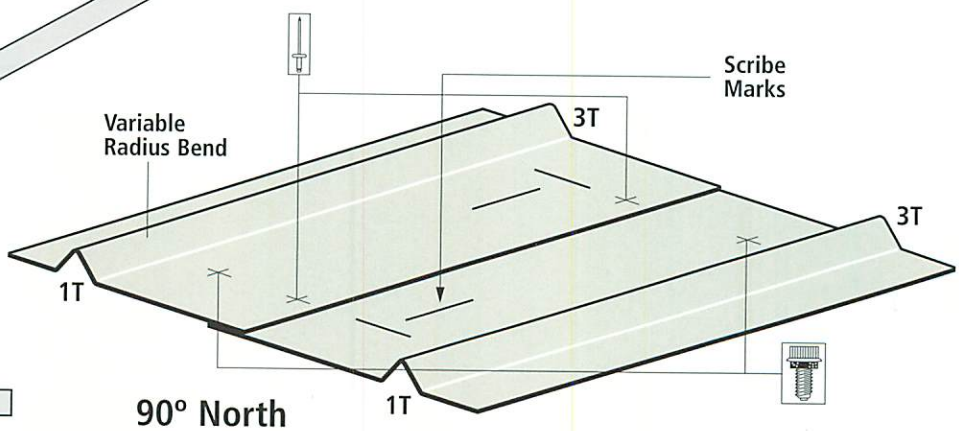


5° South

The severest configuration, representing roof areas.



The exposure rack design.

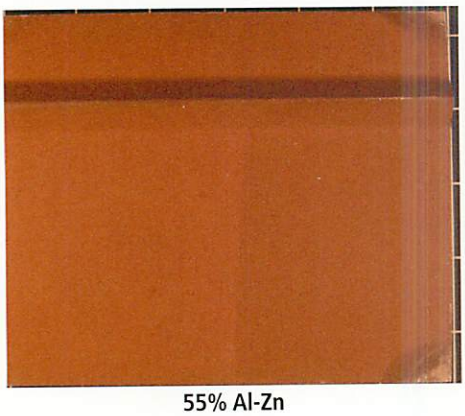


90° North

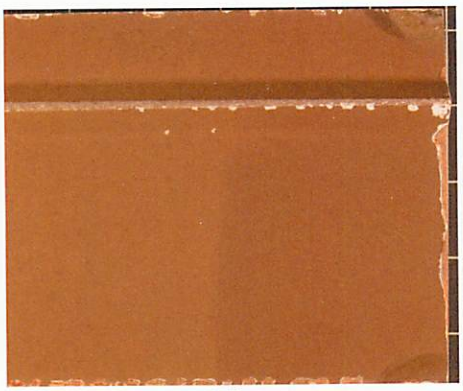
This represents the side wall of a building; the north-facing aspect gives the harshest side wall exposure, with long times of wetness. The top part of each panel is shaded with an overhang to replicate sheltered area conditions.

10 YEARS' EXPOSURE AT HENDAYE, FRANCE

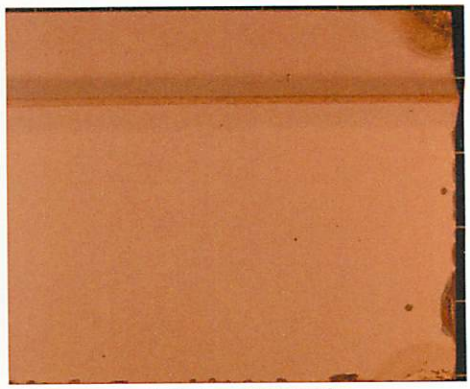
Severe marine environment dramatically confirms the superior performance of the 55% Al-Zn substrate



55% Al-Zn



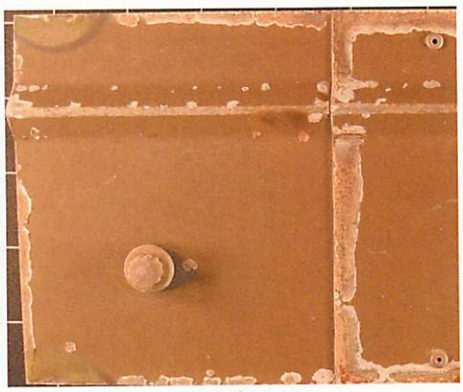
Galfan



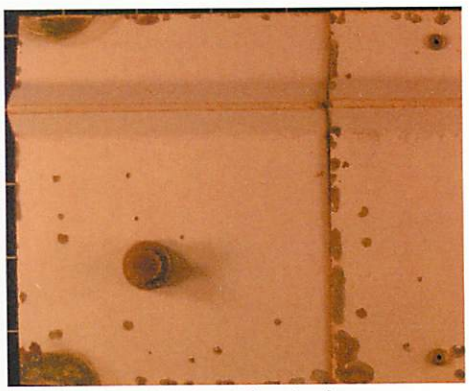
Hot-dip galvanised

45° South: polyester coatings. The Galfan (Zn-5% Al) and hot-dip galvanised panels show paint loss along the edges, white corrosion along the bend, and blistering. The 55% Al-Zn panel remains in excellent condition.

55% Al-Zn

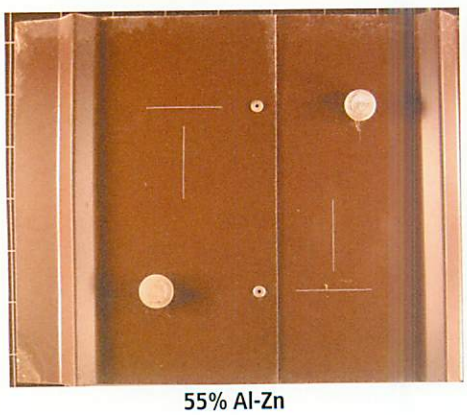


Galfan

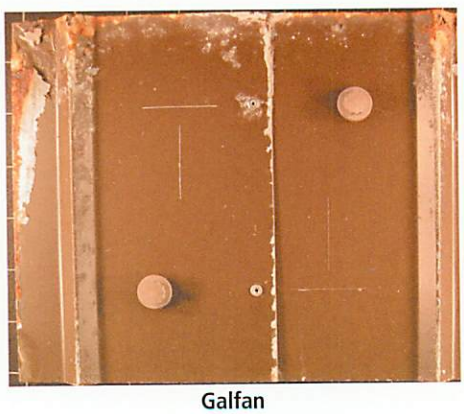


Hot-dip galvanised

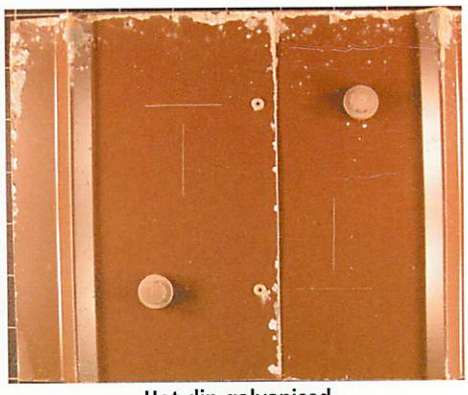
5° South: polyester coatings. Realistically replicating a building roof in this severe marine environment, these panels with 10 years' exposure clearly show the excellent performance of 55% Al-Zn. The 55% Al-Zn panel has no detectable edge creep rusting or blisters and just a little staining on bends and edges. In stark contrast, the Galfan and hot-dip galvanised panels show edge creep that exhibits the total dissolution of the underlying substrate's metallic coating, with paint loss and rust on the bends and flat surfaces. There is severe corrosion along the bend, and severe blistering in flat and formed areas and around fasteners is also obvious.



55% Al-Zn

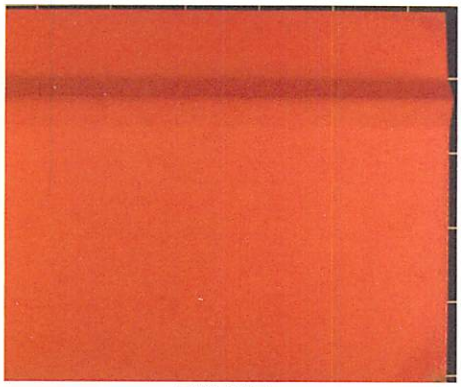


Galfan

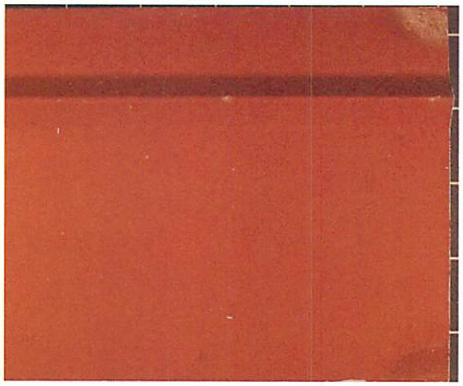


Hot-dip galvanised

90° North: polyester coatings. This area replicates side walls with the longest time of wetness, with an overhang providing a sheltered area. The 55% Al-Zn panel shows virtually no failure, proving the product's excellent sheltered area corrosion resistance. Both the other panels (the hot-dip galvanised shown here is coated with silicon modified polyester) show extensive substrate corrosion and paint loss on edges, bends and flat areas.

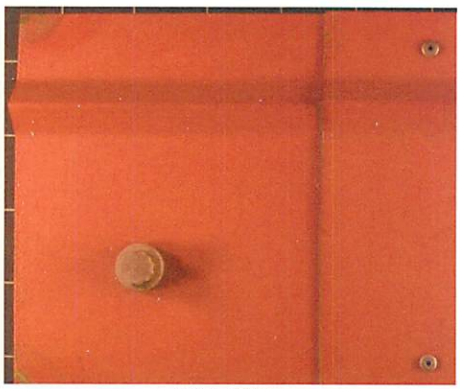


55% Al-Zn

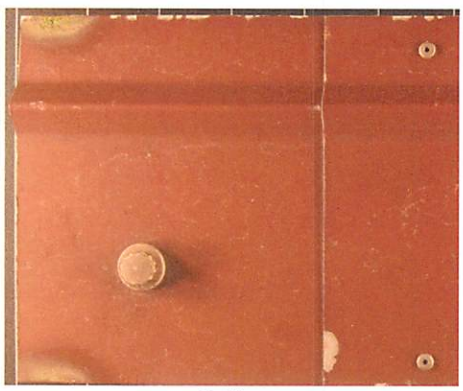


Galfan

45° South: Pvdf coatings. Both these panels, coated with the fluorocarbon paint system, show good performance, although some paint loss is seen along the edges of the Galfan panel, and a few blisters are visible on the bend.

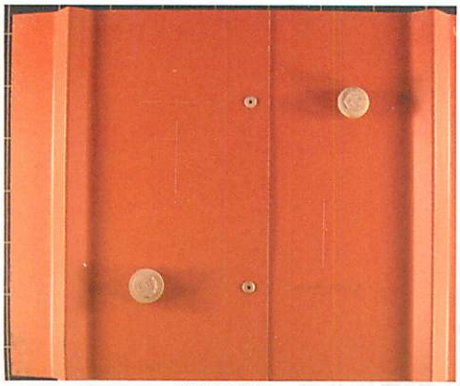


55% Al-Zn

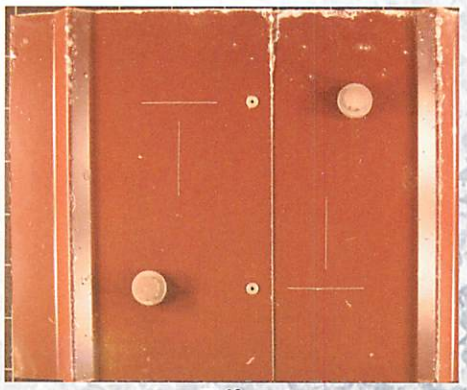


Galfan

5° South: Pvdf coatings. This more aggressive orientation causes problems for the Galfan panel, with loss of paint adhesion along the sheared edges, and blistering on the bend and flat areas. The 55% Al-Zn panel remains free of any significant failure: there are fine blisters along the edge, but they have not developed and the paint still adheres to the substrate.



55% Al-Zn

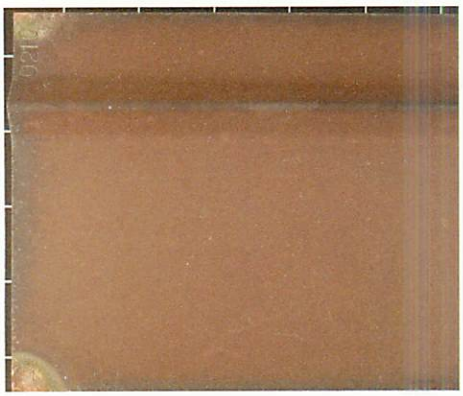


Galfan

90° North: Pvdf coatings. The strong sheltered area corrosion resistance of 55% Al-Zn is again clearly shown, demonstrating its all-round relative superiority.

10 YEARS' EXPOSURE AT GELEEN, THE NETHERLA

Relative performance differences in this industrial marine environment are less dramatic, but still substantial

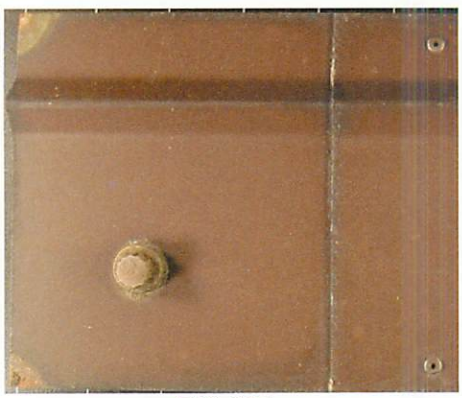


55% Al-Zn

Galfan

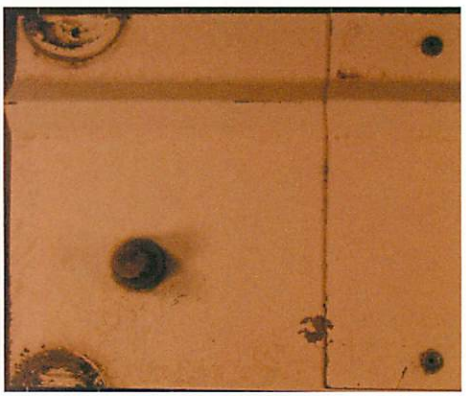
Hot-dip galvanised

45° South: polyester coatings. After 10 years, the 55% Al-Zn and hot-dip galvanised panels show virtually no failure. The Galfan (Zn-5% Al) panel has suffered paint loss on the bend and the edges.



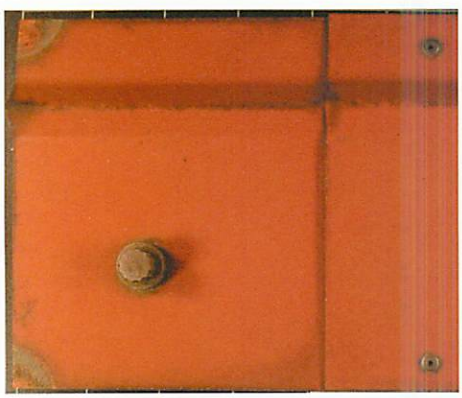
55% Al-Zn

Galfan



Hot-dip galvanised

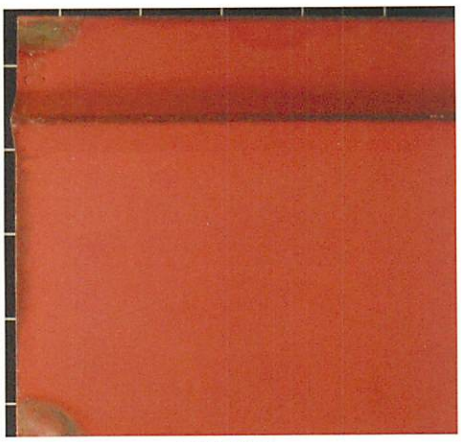
5° South: polyester coatings. This configuration provides a very severe test. None of the panels, however, display appreciable corrosion; but the Galfan and hot-dip galvanised specimens show paint loss along the edges.



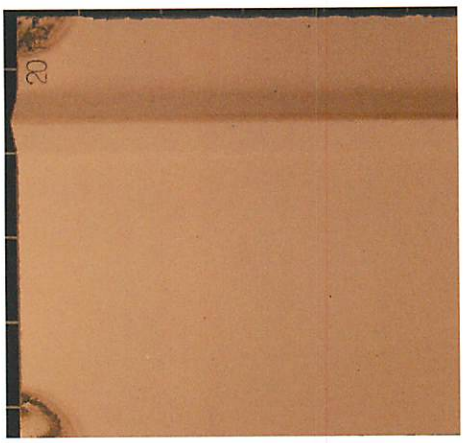
55% Al-Zn

Hot-dip galvanised

5° South: Pvdf coatings. The hot-dip galvanised panel shows appreciable paint delamination on the overlap and at the sheared edges. The 55% Al-Zn panel is in good condition, except for some staining on the bend.



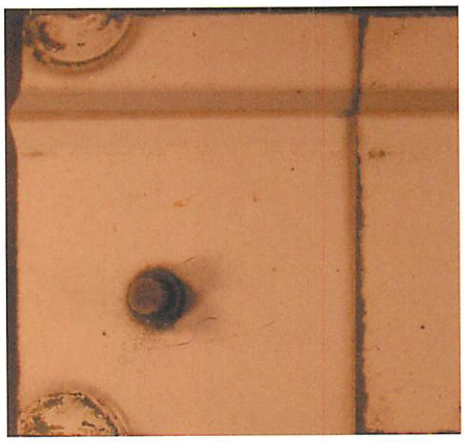
55% Al-Zn



Hot-dip galvanised

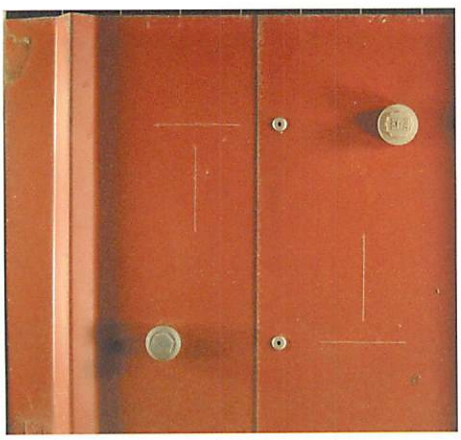
45° South: silicon modified polyester (SMP) coatings.

55% Al-Zn

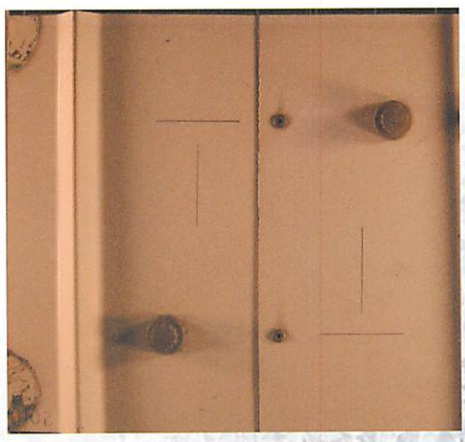


Hot-dip galvanised

5° South: SMP coatings.



55% Al-Zn



Hot-dip galvanised

90° North: SMP coatings.

The SMP topcoat is brittle (less formable) than polyester, and is expected to exhibit more micro-fracturing on bends. This effect is well documented above. Whilst the 55% Al-Zn panels show staining on the variable radius bend for all

55% Al-Zn℠

THE MAGIC FORMULA FOR ROOFS

The Eurodes test programme provides strong independent evidence of the superior performance of 55% Al-Zn metallic coated steel as a substrate for pre-painted sheet in European building applications. In particular, the results of panels exposed at 5° South in a severe marine environment indicate its unequalled durability for roof applications where long trouble-free life is essential. The findings reflect those of similar tests in other world regions.

55% Al-Zn coated sheet in unpainted form also provides an exceptional performance on roofs. A European field inspection survey carried out in 2002/03 indicates a life expectancy of 40+ years without major maintenance for roofs in unpainted 55% Al-Zn – again matching experience in other world regions. Details of this survey have been published in EuroZAC Technical Validation Paper 1, 2004, available from the address on the back cover of this leaflet.

55% Al-Zn℠

THE MAGIC FORMULA

FOR PRE-PAINTED SUBSTRATE

Specific European exposure test data for 55% Al-Zn metallic coated steel as a substrate for pre-painted, coil-coated sheet used in the construction industry is documented in this Technical Validation Paper.

55% Al-Zn steel is marketed in Europe by members of EuroZAC, who co-operated with the European Coil Coaters Association in developing and carrying out the test programme.

The brand names Aluzinc® (Galvalange – Groupe Arcelor), Aluzink® (SSAB Tunnplåt) and Galvalume® (a registered trademark of BIEC International Inc and some of its licensed producers) are all used in Europe for 55% Al-Zn.

EuroZAC

55% Al-Zn Coated Sheet Producers of Europe

For details of manufacturers and sales agencies visit www.roofsteel.com

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