



BRANZ Appraised

Appraisal No.574 [2014]

BRANZ Appraisals

**Technical Assessments of products
for building and construction**

**BRANZ
APPRAISAL
No. 574 (2014)**

This Appraisal replaces BRANZ
Appraisal No. 574 (2008) issued
24 September 2008

**ZINCALUME®
STEEL**

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Product

1.1 Zincalume® steel is an unpainted zinc/aluminium alloy coated steel supplied in coil form.

1.2 Zincalume® steel coil is used as feed-stock in the manufacture of a variety of common building materials, including roofing and wall cladding, guttering, fencing, etc and can be easily formed to create a wide variety of profiles.



Scope

- 2.1 Zincalume® steel coil has been appraised for use within the following scope:
- as a steel sheet product in accordance with AS 1397 for Zn/Al alloy coating specification; and,
 - as a steel sheet product in accordance with AS/NZS 1365 for manufacturing tolerances for flat rolled steel products; and,
 - for durability when used in the manufacture of products to be used in NZS 3604 defined Exposure Zones B and C.
- 2.2 Zincalume® steel coil has been appraised for use as a feed-stock for the manufacture of:
- roll-formed roofing and cladding products and associated accessories; and,
 - spouting, down-pipes and other rain-water goods.

Building Regulations

New Zealand Building Code (NZBC)

3.1 In the opinion of BRANZ, Zinalume® steel coil, when used by specifiers, manufacturers and other users, in accordance with the product information and directions issued by New Zealand Steel Limited will meet or contribute to meeting the following provisions of the NZBC:

Clause B2 DURABILITY: Performance B2.3.1 (b) 15 years and (c), 5 years. Zinalume® steel coil can be used to meet these requirements. See Paragraphs 9.1 to 9.12.

Clause E1 SURFACE WATER: Performance E1.3.2. Zinalume® steel can be used to meet this requirement when manufactured as roof guttering systems. See Paragraph 9.12.

Clause E2 EXTERNAL MOISTURE: Performance E2.3.1 and E2.3.2. Zinalume® steel can be used to meet these requirements when manufactured as roofing and cladding products and accessories. See Paragraphs 13.1 and 13.2

Clause F2 HAZARDOUS BUILDING MATERIALS: Performance F2.3.1. Zinalume® steel meets this requirement and does not present a health hazard to people.

(Note: The NZBC applies to buildings and building elements, and does not apply to a material, such as Zinalume® steel coil to be used in the manufacture of building elements, unless the use and form of the building elements has been defined. The assessment of actual building elements manufactured from Zinalume® steel coil for compliance with the NZBC is outside the scope of this Appraisal although some of the issues relating to elements are commented on in the text.)

Technical Specification

4.1 Zinalume® steel is made from a sheet steel base that is coated with a Zinc/Aluminium alloy on both sides using a continuous hot-dip process. The alloy coating is made up of 43.5% Zinc, 55% Aluminium, and 1.5% Silicon. This process follows the coating specification AZ150, and for sheet products relates to a metallic coating mass of 150 g/m² (75 g/m² on each side of the sheet or approximately 20 µm). The coating specification AZ150 is specified as a minimum requirement in AS 1397.

4.2 Zinalume® steel is also available in the coating specification AZ200 giving a metallic coating thickness of 100 g/m² on each side of the sheet.

4.3 For ease of transport, handling and supply to industry, the sheet is supplied as a strip rolled into a coil. The material is treated with a passivation system, or can be supplied oiled only, for specific applications.

4.4 Zinalume® steel is available in two typical steel grades – G300 with good ductility for tight radius roll-forming for roofing and cladding, and G550 with less ductility more suitable to the fabrication of roll-formed structural profiles. The Zn/Al alloy coating specification is the same for both steel grades. G300 and G550 are available in a range of thicknesses from 0.30 mm to 1 mm and a range of production widths between 940 mm and 1250 mm.

Handling and Storage

5.1 Although supplied with an applied surface passivation system, Zinalume® steel coil, and building products made from it must be handled carefully, and kept clean and dry at all times prior to installation. Zinalume® steel coil must be stored in clean, well ventilated conditions, and protected from moisture. Moisture, including condensation, entrapped between sheets, may damage the coating and promote corrosion. In the event that the formed material should become wet during transportation or storage, it should immediately be separated and dried.

Technical Literature

6.1 Adequate product Technical Literature must be made available by manufacturers of building products that have been fabricated from Zinalume® steel. The literature must include all information relating to the building products and their use within buildings, to ensure that the buildings meet the NZBC. Information must include detailed design, structural, installation and maintenance details. Installation instructions must make specific reference to the New Zealand Steel Technical Literature separately distributed by New Zealand Steel Limited. There are important conditions of use that relate specifically to the methods of use of Zinalume® steel feed-stock in the fabrication of a variety of building products. Manufacturing advice and the Technical Literature are available to manufacturers from New Zealand Steel Limited. This available Technical Literature has not been assessed by BRANZ and is outside the scope of this Appraisal.

Design Information

General

7.1 Although this Appraisal draws attention to certain aspects and considerations in the design and use of Zinalume® steel coil, manufacturers, specifiers, and users must fully inform themselves, and follow the directions and information given in the Technical Literature published by New Zealand Steel Limited.

Forming & Fabrication

7.2 Only the correct tools and equipment, maintained in good condition must be used. The surface treatment is intended to reduce the need for lubricants in most forming operations. In any event, solvent-based lubricants must not be used. Any damaged or defective material must not be used for the manufacture of cladding, or other building elements such as water management systems. Zinalume® steel is suitable for working with conventional manufacturing techniques such as roll-forming, brake-pressing, bending, drilling and punching. Graphite pencils must not be used to mark Zinalume® steel during manufacture or installation of components.

Joining and Sealing

7.3 While lock-seam jointing can be used with Zinalume® steel, in most situations the minimum recommended internal bend diameter is 2T (two times thickness). In general, greater bend diameters will result in a longer serviceable life. Minimum internal bend diameters should be obtained from New Zealand Steel Limited for the different Zinalume® steel grades and manufacturing applications. Zinalume® steel cannot be soldered. A neutral cure silicon sealant should be used in conjunction with mechanical fasteners such as blind aluminium rivets when sealing and joining. Care must be taken not to use stainless steel, carbon steel, or copper containing rivets. Zinalume®

steel can be welded in some circumstances, and advice should be sought from New Zealand Steel Limited regarding workable welding procedures.

Fixings

7.4 Details of suitable fixings including hot-dipped galvanized fasteners, aluminium rivets, and the use of no carbon black washers, can be obtained from New Zealand Steel Limited.

Structure

8.1 Factors affecting the structural properties and performance of products manufactured from Zinalume® steel will include:

- strength (grade) and thickness of the base material specified; and,
- the profile design of the formed element or product; and,
- the performance of the fixing and jointing system used.

Durability

9.1 Zinalume® steel is suitable for the manufacture of:

- roof and wall cladding, meeting the performance requirement of NZBC Clause B2.3.1(b), 15 years;
- spouting, down-pipes, and rainwater goods, to which there is ready access, meeting the performance requirement of NZBC Clause B2.3.1(c), 5 years.

Serviceable Life

9.2 When used in accordance with the provisions of this Appraisal and the instructions of New Zealand Steel Limited, a serviceable life of at least 20 years in moderate corrosion environments, can be reasonably expected for unpainted Zinalume® steel used in the manufacture of roofing and wall cladding products.

9.3 If diligently painted and maintained, Zinalume® material may be made to last the life of the building.

Location

9.4 Corrosion conditions in New Zealand vary according to the local topography and climatic conditions such as strong onshore winds, and can not be precisely defined for every location. The following information must be used in conjunction with local knowledge and experience.

9.5 Exposure Zones given in the manufacturer's Technical Literature are based on the classifications given in ISO 9223. Table 1 shows how the ISO 9223 Exposure Zones relate to those given in NZS 3604 along with durability expectations for exposed elements.

9.6 Roofing and wall cladding products made from unpainted Zinalume® steel coil may be used in Exposure Zones B and C as described in the NZS 3604 classification.

9.7 Roofing and wall cladding products made from unpainted Zinalume® steel must not be used in Zone D as described in NZS 3604, or 'Severe' and 'Very Severe' industrial environments, or localised areas of high geothermal activity. Advice on the corrosivity conditions of particular sites in these areas should be obtained from the relevant Building Consent Authority, who may in turn refer to New Zealand Steel Limited.

Incompatible Materials & Uses

9.8 Zinalume® steel must not be allowed contact with the following:

- lead, copper, or freshly made (green) concrete
- run-off from copper (eg. spoutings and downpipes) or lead.

Table 1. Durability expectations for Zinalume® (non-painted/organically coated).

General guide to the correlation of NZS 3604 Exposure Zones with the corrosion categories published in ISO 9223 may not apply to all locations. In the latter case, derivation of localised corrosivity classification is recommended. Durability is presented as time to sheet perforation as a direct result of corrosive losses.

| NZS 3604 | Zone B | Zone C | Zone D |
|--|-------------------|-------------------|-----------------------------|
| ISO 9223 | C1 & C2 | C3 | C4 & C5 |
| General description | Mild and Moderate | Marine influenced | Severe & very severe marine |
| Durability expectation: Roof and wall cladding ‡ | > 20 years | > 15 years | Not recommended |
| Durability expectation: Rainwater goods ‡ | > 5 years | > 5 years | Not recommended |

‡ All durability expectations are presented for rain-washed and fully exposed components.

9.9 Zinalume® steel must not be used in the following areas:

- in contact with permanently wet materials ("poultices")
- water tanks
- in contact with soil
- as concrete formwork
- in intensive animal shelters or areas of high ammonia/urea concentration
- above swimming pools, or in enclosed areas of high chloride concentration.

Painting

9.10 Zinalume® steel is suitable for painting when this is carried out according to the recommendations of New Zealand Steel Limited, and the paint manufacturer's instructions. Solvent-based primers must not be used.

9.11 Painting Zinalume® steel is recommended as this will extend its life in most environments.

Rainwater Goods

9.12 Rainwater goods are usually subjected to more severe conditions than roofing and cladding and attention is drawn to the following:

- the recommendations of New Zealand Steel Limited for minimum bend radius must be followed; and
- spouting and rainwater goods must be designed to allow complete drainage.

Maintenance

10.1 The level of maintenance required is dependent on the environment. Guidance must be sought from New Zealand Steel Limited regarding levels of maintenance in different environments.

10.2 Spouting and rainwater heads must be kept clear of leaves and dirt.

Prevention of Fire Occurring

11.1 Zinalume® steel is considered a non-combustible material and need not be separated from heat sources such as fire places, heating appliances, flues and chimneys. However, when used in conjunction with, or attached to heat sensitive materials, the heat sensitive material must be separated from fireplaces, heating appliances, flues and chimneys in accordance with the requirements of Part 7 of NZBC Acceptable Solutions C/AS1 – C/AS6 and NZBC Verification Method C/VM1.

Control of External Fire Spread

12.1 Zinalume® steel is a non-combustible material. When Zinalume® steel is finished with a paint coating of not more than 1.0 mm in thickness, the exterior surface finish requirements of NZBC Acceptable Solutions C/AS1 Paragraph 5.4 and C/SA2 – C/AS6 Paragraph 5.8.1 do not apply in accordance with NZBC Acceptable Solutions C/AS1 Paragraph 5.4 and C/AS2 – C/AS6 Paragraph 5.8.2 a), respectively.

External Moisture

13.1 Aluminium-zinc coated steel (Zinalume®) is specified in NZBC Acceptable Solution E2/AS1 Paragraph 4.3.4 for the use of flashings, NZBC Acceptable Solution E2/AS1 Paragraph 8.4.3.2 for the use of roofing and NZBC Acceptable Solution E2/AS1 Paragraph 9.6.3.2 for wall claddings. Zinalume® steel fulfils these E2/AS1 material requirements.

13.2 Factors likely to affect the resistance of buildings clad with Zinalume® steel to external moisture, include the following:

- design and execution of the jointing and fixing systems; and
- design and execution of the junctions with other building elements; and
- roof configuration, including pitch; and
- location of the building or building element, and severity of climatic conditions; and
- level of natural rain washing.

Health and Safety

14.1 Zinalume® steel is non-hazardous. Refer to New Zealand Steel's product safety data sheet for Zinalume® steel for further information regarding processing and handling precautions.

Water Supplies

15.1 Water is not contaminated by Zinalume® steel and complies with the provisions of NZBC G12.3.1. Zinalume® steel has been tested against, and shown to comply with AS/NZS 4020.

15.2 The first 25 mm of rainfall from a newly installed Zinalume® roof must be discarded before drinking water collection starts. This is to remove residues which may have developed during the many processes involved in the production of a Zinalume® steel roof.

15.3 Where a paint or paint system is applied to the roof its suitability for the collection of drinking water must be established.

15.4 Lead-based or lead-edged flashings must not be used.

Note: Though Zinalume® steel itself has been shown to comply with AS/NZS 4020, it must be noted that all water collected off roof surfaces made from any material is considered to be non-potable due to possible contamination from other sources. Water collected in this way can only be considered potable if it has passed through a suitable sterilization system. Sterilization systems such as this have not been assessed and are outside the scope of this Appraisal.

The following is a summary of the technical investigations carried out:

Investigations

16.1 BRANZ experience with roll-formed steel roofing and cladding in New Zealand and overseas over many years has been noted. This includes structural and weathertightness performance, durability and non-hazardous nature.

16.2 Roll-formed steel roofing and wall cladding has been used in New Zealand for over 100 years and its structural performance is well established and extensively documented.

16.3 History of use: Zinalume® (also known as Galvalume®) products have been in use in the U.S.A. since 1972, and both Zinalume® and pre-painted Zinalume® products in Australia since 1976. During that time Zinalume® and Zinalume® based products have proved to have general atmospheric corrosion resistance properties which are superior to those of galvanised (zinc-coated) sheet steel in most respects, and particularly in marine environments.

16.4 A durability opinion has been given by BRANZ technical experts.

16.5 AS/NZS 4020 Test Reports have been examined by BRANZ and found to be satisfactory.

Quality

17.1 The processes, including methods adopted for quality control and details of the quality and composition of the materials, have been examined by BRANZ and found to be satisfactory.

17.2 The quality control systems of New Zealand Steel Limited have been assessed and registered by TELARC SAI as meeting the requirements of ISO 9001: 2008.

17.3 New Zealand Steel Limited is responsible for the quality of the product supplied.

17.4 The manufacturer of formed products made from Zinalume® steel is responsible for the quality of the manufacture of those goods and is outside the scope of this Appraisal.

Sources of Information

- AS 1397: 2011 Continuous hot-dip metallic coated steel sheet and strip - Coatings of zinc and zinc alloyed with aluminium and magnesium.
- AS/NZS 1365: 1996 Manufacturing Tolerances for flat-rolled sheet products
- AS/NZS 4020: 1999 Testing of products for use in contact with drinking water.
- ISO 9223: 1992 Corrosion of metals and alloys. Corrosivity of atmospheres - classification.
- NZS 3604: 2011 Timber-framed buildings.
- NZ Metal Roof and Wall Cladding Code of Practice; NZ Metal Roofing Manufacturers' Inc., March 2012.
- Compliance Document for New Zealand Building Code
- The Building Regulations 1992.
- Zinalume® Steel, Material Safety Data Sheet, New Zealand Steel Limited.



BRANZ

In the opinion of BRANZ, **Zincalume® Steel** is fit for purpose and will comply with the Building Code to the extent specified in this Appraisal provided it is used, designed, installed and maintained as set out in this Appraisal.

The Appraisal is issued only to **New Zealand Steel Limited**, and is valid until further notice, subject to the Conditions of Appraisal.

Conditions of Appraisal

1. This Appraisal:
 - a) relates only to the product as described herein;
 - b) must be read, considered and used in full together with the technical literature;
 - c) does not address any Legislation, Regulations, Codes or Standards, not specifically named herein;
 - d) is copyright of BRANZ.
2. **New Zealand Steel Limited**:
 - a) continues to have the product reviewed by BRANZ;
 - b) shall notify BRANZ of any changes in product specification or quality assurance measures prior to the product being marketed;
 - c) abides by the BRANZ Appraisals Services Terms and Conditions.
3. Warrants that the product and the manufacturing process for the product are maintained at or above the standards, levels and quality assessed and found satisfactory by BRANZ pursuant to BRANZ's Appraisal of the product.
4. BRANZ makes no representation or warranty as to:
 - a) the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship;
 - b) the presence or absence of any patent or similar rights subsisting in the product or any other product;
 - c) any guarantee or warranty offered by **New Zealand Steel Limited**.
5. Any reference in this Appraisal to any other publication shall be read as a reference to the version of the publication specified in this Appraisal.
6. BRANZ provides no certification, guarantee, indemnity or warranty, to **New Zealand Steel Limited** or any third party.

For BRANZ

C Percy
Chief Executive

Date of issue: 12 March 2014