CSSBI 22M-2017:

Standard for Residential Steel Roofing

PREFACE

One of the objectives of the Canadian Sheet Steel Building Institute is the development of product standards to promote safety and sound construction practices. This Standard is intended to assist specifiers, designers, buyers, manufacturers, and erectors of sheet steel cladding by providing information which can be adopted by reference where desired.

The requirements contained herein are in accordance with sound engineering principles, augmented by experience. They include recommended minimum requirements for such factors as grade of steel, thickness, metallic coating designation, loading and deflections, as well as design, fabrication and erection in general. While the material is believed to be technically correct and in accordance with recognized practice at the time of publication it does not obviate the need to determine its suitability for a given situation. Neither the Canadian Sheet Steel Building Institute nor its members warrant or assume liability for the suitability of the material for any general or particular application.

1. SCOPE

1.1 This standard applies to hot dipped metallic coated sheet steel prefinished with colours of proven durability and suitable for exterior exposure on residential houses and small buildings as steel roofing and related components.

2. REFERENCE DOCUMENTS

2.1 **American Society for Testing and Materials**

ASTM A653/A653M, Standard Specification for Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

ASTM A792/A792M, Standard Specification for Steel Sheet, 55% Aluminun-Zinc Alloy-Coated by the Hot-Dip Process

ASTM D523, Standard Test Method for Specular Gloss

ASTM D714,Standard Test Method for Evaluating Degree of Blistering of Paints

ASTM D2244, Standard Test Method for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

ASTM D2247, Standard Test Method for Testing Water Resistance of Coatings in 100% Relative Humidity

ASTM D3363, Standard Test Method for Film Hardness by Pencil Test

ASTM D4145, Standard Test Method for Coating Flexibility of Prepainted Sheet

ASTM D4214, Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films

ASTM D5402, Standard Practice for Assessing the Solvent Resistance of Organic Coatings Using Solvent Rubs

ASTM D5796, Standard Test Method for Measurement of Dry Film Thickness of Thin Film Coil-Coated Systems by Destructive Means Using a Boring Device

ASTM G85, Standard Practice for Modified Salt Spray (Fog) Testing

2.2 **Canadian Standards Association**
CAN/CSA-S136 North American Specification for the Design of Cold-Formed Steel Structural Members

2.3 Where reference is made to another publication, such reference shall be considered to refer to the latest version or edition approved by the organization issuing that publication, unless otherwise noted.

3. DEFINITIONS

3.1 **Design Thickness** means the thickness of the base steel that is used in the calculation of section properties on which the load carrying capacity is based. The **Minimum Thickness** shall not be less than 95% of the Design Thickness as permitted by CAN/CSA-S136.

3.2 **Fasteners** refer to nails, screws, staples and similar devices.

3.3 **Manufacturer** means a manufacturer of sheet steel roofing.

3.4 **Prefinished** refers to material in coil form factory-coated with a paint system, or laminate system, prior to delivery to a manufacturer.

3.5 **Roof** means a surface that is inclined less than 70 degrees from the horizontal.

3.6 **Sheet Steel Roofing** means those components of sheet steel that form the exposed exterior surface of a roof of a building.

4. SHEET STEEL REQUIREMENTS: ROOFING AND FLASHING

4.1 **Materials**

4.1.1 Sheet steel roofing shall be manufactured from one of the following material specifications:

4.1.1.1. Zinc coated sheet steel shall conform to ASTM Standard Specification A653/A653M, minimum Grade 230, minimum zinc coating designation Z275. The base steel design thickness shall be 0.29 mm or greater.

4.1.1.2. 55% aluminum-zinc alloy coated sheet steel shall conform to ASTM Standard Specification A792/A792M, minimum Grade 230, minimum 55% aluminum-zinc alloy coating designation AZM150. The base steel design thickness shall be 0.29 mm or greater.

4.1.2 The prefinish system shall consist of a primer and topcoat continuously applied and cured within the paint manufacturer's specifications on cleaned, pretreated, metallic coated substrate. The pretreatment specified shall be applied in accordance with the pretreatment manufacturer's specifications.The prefinished coating shall meet the quality and performance requirements listed in Section 5.

4.1.3 Alternative prefinish systems may be used provided they meet the quality and performance requirements listed in Section 5.

4.1.4 Fasteners for attaching roofing to structural framing or other structural supports, for attaching flashing to roofing, and for joining roofing components together shall be as recommended by the manufacturer.

4.2 **Minimum Thickness**

4.2.1 The minimum base steel thickness of sheet used for roofing and flashing shall be at least 0.29 mm, but not be less than 95% of the specified design thickness as permitted by CAN/CSA-S136

5. QUALITY AND PERFORMANCE SPECIFICATION FOR PREFINISHED SHEET STEEL

5.1 **Paint Qualification Tests**

A variety of paint systems are available depending on the properties and specific performance requirements of the end user.

Table 1: Performance Specification and Test Methods

Performance Specification/ Test	Standard Paint Systems PVdF*, SMP*, SDPE*	Specialty Paint Systems	
		PU**	PVC**
Paint Film Thickness	22µm min	22µm min	100µm min
Solvent Resistance	100 double MEK rubs	30 min	Not Applicable
Film Hardness	HB min	HB min	Not Applicable
Flexibility (T-Bend)	3T min No Removal	1T min No Removal	0T No Removal
Adhesion (Boiling water test)	Not Applicable	Not Applicable	No Removal
Gloss tolerance	± 5 units	± 5 units	Reference Only

* Polyvinylidene (di)Fluoride, Silicon Modified Polyester, Super Durable Polyester

** Polyurethane, Polyvinyl Chloride

5.1.1 Film Thickness

a) The exposed surface shall have a minimum topcoat dry film thickness as reported in the Table 1

b) The unexposed or reverse side shall have a dry film thickness that can be customized to meet customer requirements (i.e. wash coat only, primer + wash coat, or full coat). Top coat paint systems may require specific reverse side products due to the properties of the top coats systems.

c) Test Method: ASTM D5796.

5.1.2 Solvent Resistance

a) When applicable, the cured topcoat film shall withstand a minimum number of MEK double rubs as specified by the paint system and in accordance with ASTM D5402.

5.1.3 Film Hardness (Pencil Method)

a) The hardness of the paint film may be measured by means of Eagle/Berol turquoise T-2375 or equivalent pencils using a flat cylindrical head applied at a 45° angle to the paint film.

b) Test Method: ASTM D3363.

5.1.4 Flexibility Test (T-Bend)

a) When using a representative sample at 20 ± 1.5°C using #610 Scotch brand cellophane tape, the paint system will show no loss of adhesion when subjected to a 180° bend and tape pull test as specified by the paint system.

b) This requirement does not apply to material which is ordered as ASTM A653 or A792Grade 80, and ASTM A653M orA792M Grade550.

c) Test Method: ASTM D4145.

5.1.5 Adhesion Test (Boil Test – PVC products only)

a) The paint system will show no loss of adhesion on a sample that has been subjected to cross-hatch cutting, Olsen deformation and 30 min submersion in boiling water.

5.1.6 Gloss

a) The specular gloss shall be the standard gloss specified by the paint system and within the Gloss tolerance from Table 1 when measured with a glossmeter at 60°. When other than the standard gloss is ordered, the gloss range shall be mutually agreed upon prior to purchase.

b) Test Method: ASTM D523.

5.2 **Exterior Exposure (Weathering)**

Each proven colour of proven durability shall successfully meet the following weathering standards for applications in Canada (in the absence of aggressive fumes and/or other chemicals not normally encountered in the atmosphere) and shall be tested in North America. Specialty systems are available for end uses exposed to specific aggressive atmospheres.

Table 2: Performance Criteria for Exterior Exposure

Performance Criteria	Standard Paint Systems	Specialty Paint Systems
Film Integrity	40 years minimum	20 years minimum
Chalking	30 years minimum	20 years minimum (Not Applicable to PVC)
Colour Change	30 years minimum	20 years minimum

5.2.1 Film Integrity

No evidence of cracking, chipping, peeling, crazing, spotting or loss of adhesion.

5.2.2 Chalking

Minimum rating limits are specific to the paint system as measured by ASTM D4214 Method A, and shall not be lower than #6

5.2.3 Colour Change

Maximum Delta E colour change limits are specific to the paint system as measured by ASTM D2244, Hunter L, a&b, and shall not be greater than 10 colour variation units.

5.3 **Accelerated Corrosion Tests**

The following accelerated corrosion testing requirements represents the minimum performance for paint systems selected for residential roofing and flashing.

5.3.1 Prohesion (Modified Cyclic Salt Spray)

a) After 800 hours, the surface shall show only a few #8 field blisters, and typical average cut-edge corrosion of production samples shall not exceed 8 mm.

b) Test Method: ASTM G85, Method A5. The Prohesion test is a cyclic test incorporating corrosive sulphates, which has been demonstrated to correlate well with natural exposure testing.

5.3.2 Humidity Resistance

a) The humidity resistance test shall be conducted at 100% relative humidity at a temperature of 38°C.

b) After 1000 hours of exposure, the surface should have no field blisters (per ASTM D714).

c) Test Method: ASTM D2247.

6. COLLATERAL MATERIAL

6.1 **General**

6.1.1 All collateral materials used in roof systems employing sheet steel roofing shall be of a nature, style and form which will not damage or impair the serviceability of, nor in the case of exposed surfaces the appearance of, sheet steel roofing. Collateral material may include, but is not limited to, air barrier, convection barrier, vapour retarder, insulation, and sub-girts.

6.2 **Field Painting**

6.2.1 Metallic coated sheet steel that is supplied unpainted is usually chemically treated (passivated) at the mill to minimize wet storage stain. Passivated material is generally not suitable for painting without special procedures. Where it is intended to field paint sheet steel roofing or other components after erection check with a reputable paint supplier for recommendations.