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Zinc-Coated (Galvanized) Sheet Steel for Structural Building Products

Technical Bulletin No. 3

CANADIAN
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INSTITUTE

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Zinc-Coated Sheet Steel (Structural) UCI 5 Metals & Alloys

The purpose of this Bulletin is to:

1. *Update material specifications.*
2. *Set minimum quality standards.*
3. *Assist in specifying sheet steel structural building products.*

Preface

One of the precepts of the Members of the Canadian Sheet Steel Building Institute is the development of, and adherence to, product standards to promote safety and sound construction practices.

This Bulletin is intended to assist in the specifying of zinc-coated sheet steel structural building products by providing basic technical information on zinc coated sheet steel and by outlining the minimum quality standards which are deemed to be valid for selected end uses.

Reference Publications

This Bulletin makes reference to the following:

American Society for Testing and Materials (ASTM).

A446 — Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Physical (Structural) Quality.

A525 — Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, General Requirements.

CSSBI TECHNICAL BULLETIN No. 3

ZINC-COATED (GALVANIZED) SHEET STEEL FOR STRUCTURAL BUILDING PRODUCTS

1. SCOPE

The following standards apply to zinc-coated (galvanized) sheet steel used by CSSBI members for structural building products such as steel roof deck, cellular steel floor, cladding, insulated panels and components of steel building systems.

2. MATERIAL

Members of the Canadian Sheet Steel Building Institute use material conforming to ASTM A446 (latest revision) "Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Physical (Structural) Quality", Grade A, B, C, D, E or F and in accordance with the provisions of this technical bulletin. Refer to Table 1 for specified mechanical properties.

3. THICKNESS (Refer to Table 2)

3.1 All sheet steel thicknesses are expressed in inches to 3 decimal places.

3.2 Steel core *nominal* thickness is used to establish section properties and for structural design calculations.

3.3 Overall zinc-coated *nominal* thickness is used by a Fabricator when placing an order with a Producer.

3.4 Overall zinc-coated *nominal* thickness is taken as the sum of the steel core *nominal* thickness plus the *calculated* thickness of the designated zinc coating (rounded to the nearest 0.001 inch).

3.5 Overall zinc-coated *actual* thickness may vary from the overall zinc-coated *nominal* thickness within stated tolerances.

3.6 Steel core *actual* thickness is used for determination of material mechanical properties by test. (See also 7.2). Steel core thickness in this case is determined by measurement, and *not* by deducting calculated zinc coating thickness from overall thickness.

4. MINIMUM THICKNESS

For adequacy and safety in design and for aesthetic considerations where applicable, CSSBI has established standards for minimum steel core nominal thickness. Refer to Table 3.

5. ZINC COATING

5.1 Zinc coating applied by the hot-dip method, as required by ASTM A446, is available in a number of weights (ounces per square foot, total both sides of the sheet) each identified by a zinc coating designation in accordance with ASTM A525 (latest revision) "Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements". Refer to Table 4 for zinc coating designations and the calculated thickness of zinc for each designation.

5.2 G90 and heavier coatings are normally furnished with regular spangle. When so specified, G90 coating can be furnished with minimized spangle.

5.3 Wiped Coat sheets, under the trade names "Colourbond" and "Satincoat" are those from which the free zinc is wiped as the sheet leaves the zinc pot, with only a layer of zinc-iron alloy remaining on the steel surface. The coating surface is matte gray in appearance and spangle-free, suitable for painting without special treatment. The minimum coating weight (total both sides by Triple Spot Test) of both Colourbond and Satincoat when ordered in accordance with this technical bulletin is 0.25 ounces per square foot. (Wiped Coat, as defined above, is not the same as ASTM A525 coating designation A01 for which no minimum is specified.) Widely used for steel roof deck, cellular steel floor and

liner sheets of insulated panels, the zinc-iron alloy coating characteristic of Wiped Coat material offers short term protection to the steel core during manufacturing, shipping, site storage, erection and closing in of a building. For long term or severe exposure however, a heavier coating (G90 minimum) should be specified.

5.4 Electrolytic zinc coated steel sheets, covered by ASTM A591 (latest revision) "Electrolytic Zinc-Coated Steel Sheets", are somewhat similar in appearance to Wiped Coat. However, the weight of the electrolytic zinc coating is generally less. Such light coating weights are not intended to withstand even moderate exposure without proper additional chemical treatment and painting. CSSBI therefore does not recommend the use of electrolytic zinc coated steel sheets for structural building products unless the zinc coating is at least equivalent in weight to Wiped Coat. (See 5.3). For long term or severe exposure a heavier coating (at least equivalent to G90) should be specified.

6. MINIMUM ZINC COATING PROTECTION

6.1 Based on the research and experience of its members, CSSBI Standards require zinc coating for all sheet steel structural building products excepting those employing stainless or weathering grades of steel. The minimum coating shall be Wiped Coat. (See 5.3). For exterior use the minimum coating shall be G90. Refer to Table 5.

6.2 The same minimum zinc coating requirements apply also to factory painted or prefinished sheet steel (See CSSBI Technical Bulletin No. 5) since the finish coat may be subject to some abuse during manufacture, shipment and erection. The zinc coating beneath the finish coat guards against immediate rusting as would occur with uncoated carbon steel and provides insurance against unknown corrosive elements.

6.3 For unusual exposure conditions requiring special consideration consult CSSBI or a CSSBI Member Company.

7. INSPECTION AND TESTING

7.1 To quickly check for *thickness* the overall thickness is measured to the nearest 0.001 inch. If the measured thickness is within the tolerance range for the specified overall nominal thickness given in Table 2, the sheet is acceptable. For instance a sheet specified to have a core nominal thickness of 0.030 inch and a coating designation of G90 has an overall nominal thickness of 0.032 inch. Measured overall thickness not less than 0.004 inch under the nominal value would be acceptable since the actual thickness falls within the tolerance permitted on the nominal thickness.

7.2 For determination of *material mechanical properties* by test, it is not acceptable to use nominal thickness in calculations. Mechanical properties (yield strength, tensile strength, etc.) are calculated from the actual base metal thickness after stripping of the coating.

8. GAUGE NUMBERS

The use of gauge numbers to specify thickness of sheet steel structural products has been discontinued. For correlation only with previous practice, the relationship of the steel core nominal thickness in inches and the former core gauge equivalent (Manufacturers' Standard Gauge) is given in Table 6.

9. MATERIAL SPECIFICATIONS

9.1 Designers and specification writers should specify the *type* and *grade* of steel, *minimum core nominal thickness* and the required *zinc coating designation* for the product. The Fabricator will incorporate this information when preparing his material purchase order or when requisitioning material from his existing stock.

9.2 Typical Specification for Steel Roof Deck Material

Steel roof deck shall be fabricated from sheet steel conforming to ASTM A446 (latest revision), minimum Grade A with a minimum steel core nominal thickness of 0.030 inch and a zinc coating designation of Wiped Coat, as prescribed in CSSBI Technical Bulletin No. 3 (latest revision).

9.3 Typical Specification for Steel Wall Panel Materials

The outer element of the wall panel shall be fabricated from sheet steel conforming to ASTM A446 (latest revision) minimum Grade A with a minimum steel core nominal thickness of 0.030 inch and a zinc coating designation of G90, as prescribed in CSSBI Technical Bulletin No. 3 (latest revision). The inner element shall be fabricated from similar material with a minimum steel core nominal thickness of 0.030 inch and a zinc coating designation of Wiped Coat, as prescribed in CSSBI Technical Bulletin No. 3 (latest revision).

TABLE 1 — SPECIFIED MECHANICAL PROPERTIES: ASTM A446 ZINC COATED STEEL SHEETS, COILS AND CUT LENGTHS (Per ASTM A446-72)

Mechanical Property	Grade					
	A†	B†	C	D	E*	F
Tensile Strength min ksi	45	52	55	65	82	70
Yield Point, min ksi	33	37	40	50	80**	50
Elongation in 2 in. min percent	20	18	16	12	—	12

† Grades most frequently used for structural building products.

* Full hard material with minimum formability.

** Yield point approaches the tensile strength. Since there is no halt in the gauge or drop in the beam, the yield point is taken as the stress at 0.5 percent elongation under load.

TABLE 2 — THICKNESS INCREMENTS AND TOLERANCES: ASTM A446 ZINC COATED STEEL SHEETS, COILS AND CUT LENGTHS

Core Nominal Thickness* (Inches)	Overall Zinc-Coated Nominal Thickness** (Inches)				Tolerance on Overall Zinc Coated Nominal Thickness***Over and Under (Inches)
	Zinc Coating Designation				
	Wiped Coat	G90, G115	G140, G165, G185	G210, G235	
0.105	0.105	0.107	0.108	0.109	0.008
.075	.075	.077	.078	.079	.007
.060	.060	.062	.063	.064	.005
.048	.048	.050	.051	.052	.005
.036	.036	.038	.039	.040	.004
.030	.030	.032	.033	.034	.004
.024	.024	.026	.027	.028	.004
.018	.018	.020	.021	.022	.003

* Core nominal thickness is used to establish section properties and for structural design calculations (See 3.2).

** The thickness increment for wiped coat can be disregarded for all practical purpose when specifying to 3 decimal places. Similarly the differential between adjacent zinc coating designations is small enough to allow the groupings shown when overall thickness is expressed in 3 decimals.

*** Includes allowance for variation in both steel core thickness and coating thickness.

TABLE 3 — CSSBI STANDARDS FOR MINIMUM CORE NOMINAL THICKNESS

Product	Minimum Core Nominal Thickness (Inches)
Steel Roof Deck	0.030
Cellular Steel Floor	
— Structural Only	.030*
— With Electrical Raceways and 2½ inches minimum concrete cover	.036*
— With Electrical Raceways and less than 2½ inches concrete cover	.060
Cladding, Panels (inner and outer elements)	.018

* Flat sheet used as the lower element of a two-element section shall have a minimum steel core nominal thickness of 0.048 inch where sprayed fire protection is applied to the underside, or as Specifically listed by Underwriters' Laboratories of Canada.

TABLE 4 — ZINC COATING DESIGNATION, WEIGHT AND NOMINAL THICKNESS
(Per ASTM A525-71)

Zinc Coating Designation	Previous Coating Class	Triple Spot Test Min. Check Limit (oz. per sq. ft. of sheet)	Nominal Zinc Coating Thickness, Total both sides	
			to nearest **0.0001** in.	to nearest **0.001** in.
G235	2.75	2.35	0.0041	0.004
G210	2.50	2.10	.0037	.004
G185	2.25	1.85	.0033	.003
G165	2.00	1.65	.0030	.003
G140	1.75	1.40	.0026	.003
G115	1.50	1.15	.0022	.002
G90	1.25	0.90	.0019	.002
Wiped Coat*	0.30**	0.25	.0004	—

* Refers to sheets with a zinc-iron alloy surface layer and sold under the trade names "Colourbond" and "Satincoat".

** For Wiped Coat, this number represents the nominal coating weight in oz. per sq. ft. of sheet.

TABLE 5 — CSSBI STANDARDS FOR MINIMUM ZINC COATING FOR TYPICAL PRODUCTS AND EXPOSURES

Exposure	Minimum Zinc Coating		Typical Product
	Unpainted	Prefinished, Factory Painted or Field Painted	
Exterior	G90	G90	Cladding, Panels (outer element)
Exposed Interior	G90	Wiped Coat	Panels (inner element), Roof Deck, Cellular Steel Floor
Non-Exposed Interior	Wiped Coat	Wiped Coat	Roof Deck, Cellular Steel Floor (with suspended ceilings)
Heavy Industrial or Corrosive (Exterior & Interior)	G90 or heavier*	G90 or heavier*	Cladding, Panels (inner & outer element) Roof Deck, Cellular Steel Floor

* Consult CSSBI or a CSSBI Member Company on particular condition.

TABLE 6 — CORRELATION OF CORE NOMINAL THICKNESS IN INCHES AND FORMER CORE GAUGE EQUIVALENT

Core Nominal Thickness (Inches)	Former Core Gauge Equivalent (Manufacturers' Standard Gauge)
0.105	12 (.1046 inches)
.075	14 (.0747)
.060	16 (.0598)
.048	18 (.0478)
.036	20 (.0359)
.030	22 (.0299)
.024	24 (.0239)
.018	26 (.0179)