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STANDARDS ZINC-COATED (GALVANIZED) SHEET STEEL for STRUCTURAL BUILDING PRODUCTS

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.

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 Pre-Engineered Buildings.

2. MATERIALS

2.1 General

All members of the Canadian Sheet Steel Building Institute use ASTM A446 (latest revision)—"Specification for Zinc-coated (Galvanized) Steel Sheets of Structural Quality, Coils, and Cut Lengths", covering requirements for both uncoated steel core and zinc coating.

2.2 Uncoated Steel Core

2.2.1 Thickness—Core nominal thickness is used for calculation of structural properties. Refer to Table I.

2.2.2 Mechanical Properties—Refer to Table II. Mill certificates guaranteeing mechanical properties are available when requested on customer's order. Standard industry practice is to use steel to Grade A for roof decks, cellular steel floor, cladding and insulated panels, and Grades A or B for pre-engineered buildings and components.

2.3 Standards by Product for Minimum Core Nominal Thicknesses

For adequacy and safety in design and erection and for proper aesthetics where applicable, the CSSBI has established minimum Core Nominal Thickness Standards as outlined in Table IV.

2.4 Hot Dipped Zinc Coatings

2.4.1 General—The zinc coating specification included as part of ASTM A446 conforms with ASTM A525 (latest revision) "Specification for General Requirements for Delivery of Zinc-Coated (Galvanized) Iron or Steel Sheets,

Coils, and Cut Lengths Coated by the Hot-Dip Method". Both these specifications cover only steel coated by the hot-dip method. Various coating weights are available as outlined below and in Table III.

2.4.2 Commercial (1.25 oz.) and Heavier Coatings (Refer to Table V)—Available with spangled or minimized spangled coatings.

2.4.3 Wiped Coating—"Wiped Coated" galvanized sheets have been manufactured in Canada for over twelve years and has been defined more recently by ASTM A525 as "hot-dipped" sheets on which the zinc is wiped down as it leaves the zinc pot. The surface is matte gray in appearance and is spangle free. The description "Wiped Coated" supersedes the earlier CSSBI terminology of "Light Zinc Coated". The average coating weight is 0.30 oz. per square foot and is guaranteed to be not less than 0.25 oz. by Triple Spot Test as defined by ASTM A-90 when for structural end use, in uncoated core nominal thickness of 0.0299 in. to 0.0747 in. inclusive. This special sheet, under the trade names "Colourbond" and "Satincoat", has been widely used for many years in the manufacture of Steel Roof Deck, Cellular Steel Floor and Liner Sheets of Insulated Panels.

The "Wiped Coated" steel sheet was developed for the purpose of providing protection to the steel core during manufacturing, shipping, site storage, and erection of Structural Sheet Steel Building Products. It also provides protection during the period required for closing in and completing the building. (Refer to Table V).

Finally, it provides a surface which can be readily painted without special pre-treatment.

2.5 Electro Zinc Coatings (Electro-Galvanized)

There is at present no known specification comparable to ASTM A446 covering core mechanical requirements and coating classes for electro-galvanized sheets. While the appearance of the electro-galvanized coatings is somewhat similar to wiped coating the coating weight of the former is generally less. The CSSBI therefore recommends that where electro-galvanized sheets are to be used for structural building products that (a) the core shall be in accordance with ASTM A446, and (b), the coating shall be guaranteed to be not less than 0.25 oz. by Triple Spot Test (as defined in this bulletin under "Wiped Coated"). Refer to paragraph 2.6 below and Table V for application limitations.

2.6 Standards for Minimum Zinc Coating Protection (Refer to Table V)

Based on the research and experience of its members, CSSBI Standard requires Zinc Coating Protection for all Sheet Steel Building Products used structurally. Absolute minimum coating class shall be "Wiped Coated". The "Wiped-Coated" sheet is not recommended by the CSSBI Members for exterior applications, nor for permanent or long term "exposed interior" use. For exterior use, the minimum coating class shall be 1.25 oz.

These zinc coating requirements also apply to factory painted steel (Refer to CSSBI Technical Bulletin No. 5), since prepainted material may be subject to some abuse during manufacturing, shipping and erection. The zinc coating under the paint guards against immediate rusting as would occur with uncoated carbon steel and provides insurance against unknown corrosive elements. For unusual exposure conditions consult a CSSBI Member Company.

3. SHEET STEEL GAUGES—INSPECTION AND TESTING

The following will clarify the use of Gauge Numbers:

3.1 Manufacturers' Standard Gauge (MSG)

This gauge, relating a decimal thickness to each gauge number, is used by the CSSBI Members in reference to all zinc-coated steel utilized in the manufacture of Structural Building Products. It measures the thickness of the uncoated steel core and not the overall thickness of the zinc coated sheet. See paragraph 3.4 following. The National Building Code of Canada refers to this gauge.

3.2 Galvanized Sheet Gauge (GSG)

This gauge is used primarily by trades consuming non-structural galvanized steel. Designers and owners should beware of

material for structural applications being supplied under the Galvanized Sheet Gauge since it is normally not guaranteed as to minimum mechanical properties. This gauge is also used by sheet steel producers as a reference for pricing all zinc-coated steel sheets, whether structural or non-structural.

3.3 United States Standard Gauge (USSG)

This is a weight gauge rather than a thickness gauge and is not used in reference to uncoated carbon nor galvanized sheet steel. It is utilized in connection with stainless sheet steel in lieu of the specific thickness reference.

3.4 Countercheck, Inspection and Testing

To check quickly a specified core thickness, the overall zinc coated sheet thickness must be measured, then reduced by the zinc coating thickness "Coating Correction Factor" in Table III. If the calculated core thickness comes within the tolerance range outlined in Table I, then the sheet is acceptable. If a physical check of the Core Thickness, Mechanical Properties, or Zinc Coating is desired, such counterchecks by an independent Inspection and Testing Agency should be requested.

4. TABLES AND MATERIAL SPECIFICATIONS

4.1 General

Included in this Technical Bulletin are Tables I to V inclusive, outlining various technical and usage standards of the CSSBI. These standards require that the nominal thickness of the uncoated steel core be used in establishing the properties of Sheet Steel Structural Building Products, not the total thickness of the zinc coated sheet. Designer should specify the required minimum core nominal thickness with the Manufacturers' Standard Gauge number in brackets.

4.1.1 Typical Specification for Steel Roof

Deck Materials—The Steel Roof Deck shall be fabricated from steel sheets conforming to ASTM Specification A446 (Latest revision) minimum Grade _____ with a minimum steel core nominal thickness of _____ inches (____MSG) and a zinc coating class of _____ oz.

4.1.2 Typical Specification for Steel Wall

Panel Materials—The exterior sheet of the wall panel shall be fabricated from steel sheets conforming to ASTM A446 (latest revision) minimum Grade _____, with a steel core nominal thickness of _____ inches (____MSG) and a zinc coating class of _____ oz. The inner sheet shall be fabricated of similar material with a steel core nominal thickness of _____ inches (____MSG) and a zinc coating class of _____ oz.

TABLE I — CORE THICKNESS INCREMENTS AND THICKNESS TOLERANCES FOR ZINC COATED SHEETS

(Source, ASTM A525-67, Table A2)

Manufacturers Standard Gauge Number Uncoated	Core Nominal Thickness Inches Uncoated	*Nominal Thickness Zinc-Coated		** Thickness Tolerances Zinc-Coated Over & Under—Inches		
		Wiped Coated (0.0005")	1.25 oz. (0.0019")	Flat Sheet Width		
				Over 15" to 32"	Over 32" to 40"	Over 40" to 60"
10	0.1345	0.1350	0.1364	0.009	0.010	0.011
11	0.1196	0.1201	0.1215	0.009	0.010	0.011
12	0.1046	0.1051	0.1065	0.008	0.009	0.010
13	0.0897	0.0902	0.0916	0.007	0.008	0.008
14	0.0747	0.0752	0.0766	0.007	0.008	0.008
15	0.0673	0.0678	0.0692	0.007	0.007	0.007
16	0.0598	— 0.0603	0.0617 —	0.007 0.006	0.007 0.006	0.007 0.006
17	0.0538	0.0543	0.0557	0.006	0.006	0.006
18	0.0478	0.0483	0.0497	0.006	0.006	0.006
19	0.0418	— 0.0423	0.0437 —	0.006 0.005	0.006 0.005	0.006 0.005
20	0.0359	0.0364	0.0378	0.005	0.005	0.005
21	0.0329	0.0334	0.0348	0.004	0.004	0.004
22	0.0299	0.0304	0.0318	0.004	0.004	0.004
23	0.0269	0.0274	0.0288	0.004	0.004	0.004
24	0.0239	0.0244	0.0258	0.004	0.004	0.004
25	0.0209	0.0214	0.0228	0.003	0.003	0.003
26	0.0179	0.0184	0.0198	0.003	0.003	0.003

* Represents combined nominal thickness of uncoated steel core plus zinc-coating. This is NOT "Galvanized Sheet Gauge" thickness as used for non-structural galvanized sheet applications.

** For inspection purposes apply tolerances to zinc-coated (galvanized) nominal thickness.

TABLE II — MECHANICAL REQUIREMENTS

(Source, ASTM A-446-67 Table 2)

	Sheets for General Structural Applications				Grade E*
	Grade A	Grade B	Grade C	Grade D	
Tensile strength, min, psi	48,000	52,000	55,000	65,000	82,000
Yield point min, psi	33,000	37,000	40,000	50,000	80,000**
Elongation in 2 in. min, percent	20	18	16	12	1.5

* Properties obtained by cold work, for roofing and similar applications.

** Grade E is a full hard product. The yield point approaches the tensile strength and since there is no halt in the gauge or drop in the beam, the yield point shall be taken as the stress at 0.5 percent elongation, under load.

TABLE III — COATING AND THICKNESS

Weight of Coating and Correction Factor for Coating Thickness deducted from the Micrometered Thickness of the Coated Test Specimen

(Source ASTM A446-67 Table 3
ASTM A525-67 Tables 1 & 4)

Coating Class, oz. per sq. ft.	Triple-Spot Test, Minimum Check Limit oz. per sq. ft.	Coating Correction Factor, in.
2.75	2.35	0.0041
2.50	2.10	0.0037
2.25	1.85	0.0033
2.00	1.65	0.0030
1.75	1.40	0.0026
1.50	1.15	0.0022
1.25 Commercial	0.90	0.0019
Wiped Coated	0.25	0.0005

NOTE: Light Commercial not available in Canada.

TABLE IV—STANDARDS FOR MINIMUM CORE NOMINAL THICKNESSES

PRODUCT	MINIMUM	
	Core Nominal Thickness Inches Uncoated	Manufacturers Standard Gauge Number Uncoated
STEEL ROOF DECK	0.0299	22
CELLULAR STEEL FLOOR		
When Used Structurally Only		
Single Element Cellular Section	0.0299	22
Two Element Cellular Section	0.0359	20
When Used as Electrical Raceways		
With 2½" Cover fill		
Upper Element	0.0478	18
Lower Element	0.0598	16
With Less than 2½" cover fill		
Upper and Lower Elements	0.0598	16
CLADDING		
Exterior and/or interior Single Elements	0.0179	26
Exterior and/or interior—Steel Bonded to Hard Rigid Core—(Composite Structural)	0.012	30

TABLE V — STANDARDS FOR MINIMUM ZINC COATING CLASSES FOR TYPICAL PRODUCTS EXPOSURES

EXPOSURE	PAINTED *	UNPAINTED	TYPICAL APPLICATION
Exterior	1.25 oz.	1.25 oz.	Cladding Panel (Outer Face)
Exposed Interior	Wiped Coated or heavier **	1.25 oz. or heavier **	Panel (inner liner) Roof Deck Cellular Steel Floor Structural Components
Non-Exposed Interior	Wiped Coated	Wiped Coated	Roof Deck Cellular Steel Floor (with suspended ceilings)
Heavy Industrial or Corrosive (Interior & Exterior)	1.25 oz. or heavier **	1.25 oz. or heavier **	Cladding Roof Deck Cellular Steel Floor Structural Components Panel (Inner & Outer)

*Factory or Field Painted—See CSSBI Technical Bulletin No. 5 "Standards for Coil Coated Galvanized Sheet Steel for Structural Building Products" for exterior exposure.

**Consult CSSBI Member Companies on particular condition.