

Standard for Steel Floor Deck

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CANADIAN

Sheet Steel Building

INSTITUTE

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The purpose of this Standard is to:

- 1. Define current practice*
- 2. Set minimum quality standards*
- 3. Assist in the design, specification, and use of steel floor deck.*

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 standard is intended to assist Buyers, Fabricators and Erectors of steel floor deck 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, core nominal thickness, zinc coating designation, welding, as well as design, fabrication and erection in general.

This Standard is based on the "inch/pound" system. Conversion to the SI metric system is currently under review for future publication.

Contents

	PAGE
1. SCOPE	1
2. GENERAL	1
3. DEFINITIONS	1
4. SHEET STEEL REQUIREMENTS	2
5. FABRICATION	2
6. COLLATERAL MATERIAL	2
7. SAFETY DURING ERECTION	3
8. GUIDE SPECIFICATION FOR STEEL FLOOR DECK	3

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Reference Publications

This Standard makes reference to the following:

American Society for Testing and Materials (ASTM)

A 446 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

Canadian Sheet Steel Building Institute (CSSBI)

40.3 - Zinc-Coated (Galvanized) Sheet Steel for Structural Building Products - Technical Bulletin No. 3.

Canadian Standards Association (CSA)

C22.2 No. 79 - Cellular Metal and Cellular Concrete Floor Raceways and Fittings

S136 - Cold Formed Steel Structural Members

W55.2 - Resistance Welding Practice

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STANDARD FOR STEEL FLOOR DECK

1. SCOPE

- 1.1 This Standard covers the design, fabrication and erection of non-composite steel floor deck intended for use with concrete cover.
- 1.2 This Standard applies to steel floor deck sections which have:
 - (a) a depth not greater than 3 inches, and
 - (b) a flute spacing not greater than 8 inches, and
 - (c) interlocking side laps to connect adjacent parallel units.
- 1.3 This Standard does not cover steel pans or centering intended for concrete formwork.

2. GENERAL

- 2.1 This Standard is to govern in those cases where the provisions of building codes, architects' and engineers' plans and specifications are not specific. In the event of any conflict between this Standard and any legal regulations, such regulations shall apply and this Standard shall only amplify, as applicable.
- 2.2 Where reference is made to another publication, such reference shall be considered to refer to the latest revision or edition approved by the organization issuing that publication.
- 2.3 When details of design are not clearly specified in the plans and specifications furnished by the Buyer, the Fabricator shall furnish all materials required in accordance with the current specifications and standards of the Canadian Sheet Steel Building Institute (CSSBI).
- 2.4 CSSBI Publication 40.3 *Zinc-Coated (Galvanized) Sheet Steel for Structural*

Building Products - Technical Bulletin No. 3 is a part of this Standard.

- 2.5 For applications not covered herein, such as composite action between steel floor deck and concrete cover slab, diaphragm action to resist in-plane shear forces, etc., this Standard should be supplemented by such additional requirements as current good practice would indicate.

3. DEFINITIONS

- 3.1 **Buyer** means the person, firm or company contracting with the Fabricator or Erector for the supply and installation of steel floor deck.
- 3.2 **Cellular Steel Floor Deck** means a steel floor deck comprised of:
 - (a) a fluted element interconnected with a flat sheet, or
 - (b) two interconnected fluted elements.
- Non-Cellular Steel Floor Deck** means a steel floor deck comprised of a single fluted element.
- 3.3 **Erector** means an erector of steel floor deck, who may also be a Fabricator.
- 3.4 **Fabricator** means a fabricator of steel floor deck.
- 3.5 **Span** of steel floor deck means the lesser of:
 - (a) the distance centre to centre of supports.
 - (b) the clear distance between supports plus the depth of the deck.
- 3.6 **Thickness** of sheet steel used for steel floor deck means the steel core thickness, exclusive of any coating. **Nominal Thickness** means the representative basic Thickness used to establish sec-

tion properties. **Minimum Thickness** means the least Thickness obtained by measurement at any point located at least 3/8 inch from an edge.

4. SHEET STEEL REQUIREMENTS

4.1 Material

Sheet steel used for steel floor deck shall conform to ASTM A446 *Steel Sheet, Zinc-Coated (Galvanized) By The Hot-Dip Process, Structural (Physical) Quality* minimum Grade A. Refer to CSSBI publication 40.3 for thickness tolerances and mechanical properties.

4.2 Nominal Thickness Limitation

The Nominal Thickness of sheet steel used for steel floor deck shall not be less than:

- (a) 0.030 inch for a single-element section
- (b) 0.036 inch for a two-element section, except where a greater Thickness is required by Canadian Standards Association or Underwriters' Laboratories of Canada for the particular application involved.

4.3 Minimum Thickness

The Minimum Thickness of sheet steel used for floor deck shall not be less than the difference between the specified Nominal Thickness and its permissible negative deviation (under-tolerance).

4.4 Zinc Coating

The minimum zinc coating designation shall be Wiped Coat, unless special conditions warrant the use of heavier zinc coating. Refer to CSSBI publication 40.3.

5. FABRICATION

5.1 General

Steel floor deck shall be fabricated in

accordance with the applicable requirements of CSA S136 *Cold Formed Steel Structural Members*. Electrical raceway units shall also conform to CSA C22.2 No. 79 *Cellular Metal and Cellular Concrete Floor Raceways and Fittings*.

5.2 Tolerances

- 5.2.1 Upon completion of fabrication, the depth of steel floor deck shall not be more than 1/32 inch under the design depth.
- 5.2.2 Upon completion of fabrication, the cover width of steel floor deck shall not exceed the design width by more than 1/8 inch per foot of width.

6. COLLATERAL MATERIAL

6.1 General

Although certain collateral material such as formwork, screed flash, concrete shrinkage mesh, reinforcing steel and fire-proofing normally is supplied by parties other than the Fabricator and/or Erector, it is desirable to have certain principles followed in the specifying and furnishing of such materials in order to provide an acceptable floor construction.

This Standard is not intended to encroach upon the standard practices of other suppliers and trades, but is intended only to supplement and amplify such practices.

6.2 Formwork

Suitable formwork or screed flash around openings or perimeters shall be supplied and installed by others prior to placing concrete.

6.3 Concrete

Steel floor deck shall be covered with concrete of the minimum specified depth and surface finish. The concrete shall have a minimum 28 day compressive strength of 2500 psi and the minimum slump consistent with workability. No concrete additives, such as calcium chloride, which may have a deleterious effect on the steel floor deck shall be used.

6.4 Shrinkage Mesh

A minimum 6x6-10/10 shrinkage mesh shall be included in the concrete cover to assist in the control of shrinkage cracks.

7. SAFETY DURING ERECTION

- 7.1 Minimum safety requirements for steel floor deck erection are outlined in 7.2 to 7.7 inclusive. In the event of any conflict between these requirements and any legal regulations, such regulations shall apply and these requirements shall only amplify.
- 7.2 All steel floor deck being hoisted to the working level shall be adequately banded and carefully slung employing steel wire rope and a choker type sling.
- 7.3 All bundles shall be tag lined during the ascent of the hoisting operation. Bundles shall be placed so as to avoid overloading the supporting structure.
- 7.4 Steel floor deck, after being laid and aligned, shall be properly secured in place prior to leaving the jobsite at the end of a working day.
- 7.5 All loose bundles of steel floor deck shall be secured at the completion of each working day.
- 7.6 All steel floor deck cuttings, strappings, packaging material and other debris pertaining to steel floor deck shall be cleaned up on the floor area each working day and disposed of in a suitable manner.
- 7.7 Perimeter safety lines, safety lines at discontinued or incomplete construction and barricading of openings shall be the responsibility of the General Contractor.

8. GUIDE SPECIFICATION FOR STEEL FLOOR DECK

8.1 General

The General Conditions shall be and are hereby made a part of this division.

8.2 Work Included In This Division

- 8.2.1 Furnish all labour, materials and equipment necessary to fabricate and, where shown or called for by the tender documents, hoist into position and erect the steel floor deck.
- 8.2.2 Supply and install accessories where shown or called for by the tender documents e.g. *cover plates, cell closures, flashings*.
- 8.2.3 Cut and reinforce holes and openings up to 12 inches across the flutes, where shown or called for by the tender documents.
- 8.2.5 Field weld steel shear connectors through the low flute of steel floor deck, where shown or called for by the tender documents.

NOTE: The top surface of the flange or chord of the supporting structural member to which shear connectors are to be welded must be free of paint, dirt, heavy rust or mill scale, sand or other materials which will interfere with the welding operation.

8.3 Work Not Included in this Division

- 8.3.1 All collateral materials e.g. *formwork, screed flash, concrete, shrinkage mesh, reinforcing steel, and fireproofing*.
- 8.3.2 Reinforcing or structural framing for openings larger than 12 inches across the flutes.
- 8.3.3 Field painting of steel floor deck.
- 8.3.4 Cutting and drilling of holes for the attachment of suspended ceiling hangers, or for the attachment of any work of other trades.
- 8.3.5 Bearing plates, shelf angles, diagonal supports and other structural steel required to support steel floor deck.
- 8.3.6 Supply and installation of tape for abutting ends.

8.4 Materials

- 8.4.1 Steel floor deck shall be formed of

zinc-coated sheet steel, conforming to ASTM Standard A446 *Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process, Structural (Physical) Quality* minimum Grade A with a steel core Nominal Thickness of 0.030 inch or greater for single-element sections, and 0.036 / 0.036 inch or greater for two-element sections. The minimum zinc coating designation shall be Wiped Coat. The steel core Nominal Thickness may be increased, where necessary, in order to satisfy structural, electrical, specified fire resistance rating, or other requirements as called for by the tender documents.

8.4.2 Cover plates, cell closures, and flashings shall be supplied of similar material and zinc coating designation to that specified for the steel floor deck. The steel core Nominal Thickness shall be 0.030 inch or greater.

8.5 Drawings and Specifications

8.5.1 The Buyer shall provide complete architectural and structural plans, specifications, and approved structural steel erection drawings with floor support spacings correctly dimensioned.

8.5.2 Submit . . . copies of erection drawings for approval. The Buyer shall return one copy with his approval, or with such corrections as he may deem necessary.

8.5.3 Erection drawings shall show clearly the location of various sheet lengths, sheet quantities, thicknesses, and zinc coating designations.

8.5.4 When changes are made by the Buyer the cost of such changes shall be the basis for re-negotiating the contract.

8.6 Design

8.6.1 In the absence of laws, regulations, ordinances and specifications to the contrary, structural design of steel floor deck shall be in accordance with 8.6.2 to 8.6.7 inclusive.

8.6.2 Structural properties shall be calculated in accordance with the current

edition of Canadian Standards Association Standard S136 *Cold Formed Steel Structural Members*.

8.6.3 Wherever structural framing permits, and subject to reasonable limitations for handling, steel floor deck shall be designed and fabricated to span continuously over at least three spans.

8.6.4 Electrical raceway units shall conform to CSA C22.2 No. 79 *Cellular Metal and Cellular Concrete Floor Raceways and Fittings*.

8.6.5 Spot welding used to interconnect top and bottom elements of two-element sections shall be in accordance with ~~CSA~~ *136 Cold Formed Steel Structural Members*. Spot welds shall develop the full horizontal shear at the plane of interconnection and shall have a maximum spacing of 9 inches parallel to the direction of flutes. Spot welding shall be performed in accordance with Class C requirements of CSA W55.2 *Resistance Welding Practice* and equipment shall be approved by the Canadian Welding Bureau.

8.6.6 Maximum uniform live load, based on deflection, shall be calculated as follows:

For single span

$$W_L = \frac{533 EI}{C_d L^3}$$

For two equal spans

$$W_L = \frac{1285 EI}{C_d L^3}$$

For three or more equal spans

$$W_L = \frac{1005 EI}{C_d L^3}$$

Where,

- W_L = maximum uniform live load (psf)
- E = modulus of elasticity of steel = 29.5×10^3 (ksi)

C_d = deflection coefficient
= 360 unless otherwise specified

I = steel deck moment of inertia,
at design stress, with top flange
of the deck in compression
(in ⁴/ft of width)

L = span (ft).

8.6.7 Maximum uniform total load, based on bending stress, shall be calculated as follows:

For single span

$$W_T = 667 FS/L^2$$

For two equal spans, use the lesser of

$$W_T = 1185 FS/L^2 \quad W_T = 667 FS_1/L^2$$

For three or more equal spans, use the lesser of

$$W_T = 1042 FS/L^2 \quad W_T = 833 FS_1/L^2$$

Where,

W_T = allowable uniform total load in Working Stress Design (psf)

= factored uniform total load in Limit States Design (psf)

F = basic design stress as defined in CSA S136 for Working Stress Design (ksi)

= basic design stress as defined in CSA S136 for Limit States Design (ksi)

S = steel deck section modulus, at basic design stress, with top flange of the deck in compression (in ³/ft of width)

S_1 = steel deck section modulus, at basic design stress, with bottom flange of the deck in compression (in ³/ft of width)

L = span (ft).

8.7 Erection

8.7.1 When under a supply and erection contract, all erection work shall be the responsibility of the Fabricator and such erection work shall be carried out by the Fabricator's trained erection crews or Fabricator's approved Erector, all in accordance with the Fabricator's and these specifications.

8.7.2 The steel floor deck shall be placed, and adjusted to final position, on the supporting structure before being permanently fastened thereto. If structural supports are not in proper alignment, the problem shall be reported to the General Contractor in order that the necessary correction be made before proceeding with the work.

8.7.3 Establishment of the datum line for positioning electrified cellular steel floor deck units shall be the responsibility of the General Contractor.

8.7.4 Steel floor deck shall be adequately connected to structural supports. The average spacing of fastenings shall not exceed 16 inches along bearing supports. When arc spot welds are used they shall be a minimum of 5/8 inch diameter. Welders shall be qualified by the Canadian Welding Bureau for deck welding.

8.7.5 Side laps of adjacent units shall be mechanically fastened at intervals not exceeding 24 inches on centre or, alternatively, for thicknesses greater than 0.036 inch, side laps may be welded using one inch long welds at intervals not exceeding 36 inches on centre.

8.7.6 For openings up to 6 inch across the flutes, where not more than two vertical webs are removed, no reinforcement is required.

8.7.7 For openings over 6 inch to 12 inch across the flutes, reinforcing shall be provided as determined by a structural analysis.

8.7.8 If additional openings not shown or called for by the tender documents are required, such openings shall be cut, reinforced and flashed as necessary under the work of this division

but the cost of such extra work shall be charged to the Buyer.

- 8.7.9 Where steel floor deck is welded in place, the deck surface shall be inspected, and all areas where the zinc coating has been burned by welding shall be covered by a suitable primer, applied according to the paint manufacturer's instructions.
- 8.7.10 The Erector shall install all flashings at openings and columns shown or called for by the tender documents.
- 8.7.11 All cellular steel floor deck units intended for electrical raceways shall be properly levelled. Abutting ends shall be in alignment within 1/8 inch both vertically and horizontally.
- 8.7.12 Bottom elements of cellular steel floor deck units shall not be separated from each other at abutting ends by more than 1/2 inch.
- 8.7.13 No holes shall be made in the walls of cells used as raceways, other than those necessary for proper installation of cellular steel floor deck. Such holes shall be adequately covered to prevent entry of concrete.
- 8.7.14 Any internal projection due to welding or other operations that could damage conductor insulation shall be removed or rendered harmless.

8.8 Limitations

- 8.8.1 Any damage or alterations by others to the steel floor deck, including that due to construction loads applied at any time, shall not be the responsibility of the Erector or Fabricator.

8.9 Access

- 8.9.1 Access for unloading bundles of deck onto the structure shall be provided by the General Contractor.

8.10 Storage of Materials on Site

- 8.10.1 Steel floor deck shall normally be delivered to the jobsite as required for erection, but if site storage becomes necessary, the bundles of deck shall be stacked on wood blocking clear of the ground and tilted sufficiently to ensure that no water lies on the material.

NOTE: When stored under certain conditions of humidity and temperature fluctuations, zinc coated steel may exhibit white staining of the coating surface where moisture has accumulated. A nominal amount of white staining is not detrimental to the functioning of the product and is usually considered acceptable.

- 8.10.2 Areas for storage shall be provided by the General Contractor as close to the building as is practicable.
- 8.10.3 Protection against damage shall be provided by the General Contractor.

8.11 Cleanup

- 8.11.1 Remove all debris of this trade and leave work ready for other trades.