

Standards for Cellular Steel Floor

OBSOLETE
HISTORICAL REFERENCE ONLY



CANADIAN

Sheet Steel Building

INSTITUTE

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The purpose of this standard is to:

- 1. Update cellular steel floor standards.*
- 2. Set minimum quality standards.*
- 3. Assist in the design, specification, and application of cellular steel floor.*

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 designed to assist buyers, manufacturers, and erectors of cellular steel floor by providing information which can be adopted by reference where desired.

The practices and customs contained herein are in accordance with good engineering practice and based on experience, and include minimum recommended requirements for such factors as design, grade of steel, nominal core thickness, zinc coating, span, welding practices, etc.

STANDARDS

for

CELLULAR STEEL FLOOR

1. SCOPE

- 1.1 This standard covers the design and erection of non-composite cellular steel floor with cells at a maximum of eight inches on centre and a maximum depth of profile of three inches and intended for use with concrete cover.
- 1.2 This standard does not cover steel pans intended for concrete formwork.
- 1.3 Where reference is made to other publications, such references shall be considered to refer to the latest edition approved by the organization issuing that publication.

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 building regulations, such regulations shall apply and this standard shall only amplify.
- 2.2 When details of design are not clearly specified in the plans and specifications furnished by the Buyer, the Manufacturer shall furnish all materials required in accordance with the current specifications and standards of the Canadian Sheet Steel Building Institute.
- 2.3 CSSBI Technical Bulletin No. 3 "Standards Zinc-Coated (Galvanized) Sheet Steel for Structural Building Products" is a part of this standard.
- 2.4 Supplementary rules or requirements, such as diaphragm action design to resist horizontal wind and seismic forces, or composite design, may be necessary for applications not covered herein.

2.5 Definitions

- 2.5.1 Cellular Steel Floor means a steel floor section comprised of either
 - a. a single fluted element

- b. a two element section including a fluted element in conjunction with a flat sheet
- c. two fluted elements

2.5.2 Manufacturer means a company which fabricates cellular steel floor.

2.5.3 Erector means an installer of cellular steel floor who may also be a Manufacturer.

2.5.4 Buyer means the person, firm, or company contracting with the Manufacturer or the Erector for the supply and installation of cellular steel floor.

2.5.5 Span means the lesser of the distance, centre to centre of supports for cellular steel floor, or the clear distance between support flanges plus the depth of the cellular steel floor.

2.5.6 Gauge means the Manufacturers' Standard Gauge (MSG). (See Technical Bulletin No. 3 for thicknesses, weights, tolerances, etc.)

3. MATERIALS

3.1 General

The steel used for cellular steel floor shall be zinc coated (galvanized) steel to ASTM Specification A446 (latest revision) "Specification for Zinc-Coated (Galvanized) Steel Sheets of Structural Quality, Coils and Cut Lengths", Minimum Grade A.

3.2 Uncoated Steel Core

For single element cellular steel floor, minimum steel core nominal thickness shall be 0.0299 inches. Two-element cellular steel floor shall have a minimum steel core nominal thickness of 0.0359/0.0359 inches unless the requirements of the Canadian Standards Association, or the Underwriters' Laboratories of Canada require a heavier minimum. (Refer to CSSBI Technical Bulletin No. 3 for thickness tolerances, Tables I and IV, and Mechanical Properties, Table II.)

3.3 Zinc Coating

Minimum zinc coating class shall be "Wiped Coated" unless special conditions warrant use of a heavier zinc coating. (Refer to CSSBI Technical Bulletin No. 3, Table V, for standards of minimum zinc coating class for typical product exposures.)

4. COLLATERAL MATERIAL

4.1 Although certain collateral material such as concrete, reinforcing steel, temperature mesh, fireproofing and formwork, is not supplied or erected by the cellular steel floor manufacturer, it is desirable to have certain principles followed in the specifying and furnishing of such materials in order to provide an acceptable cellular steel floor construction.

This standard is not intended to encroach upon the standard practices for concrete, reinforcement, formwork, fireproofing and other suppliers, but is intended only to supplement and amplify such practices.

4.2 Concrete

4.2.1 All cellular steel floor shall be covered with minimum 2,500 p.s.i. compressive strength concrete incorporating a minimum 6 x 6-10/10 temperature mesh to limit shrinkage cracks.

4.2.2 No concrete additives, such as calcium chloride, which may have deleterious effects on cellular steel floor, shall be used.

4.3 Formwork

Suitable formwork around openings shall be supplied and installed by others prior to placing of concrete.

5. SAFETY

5.1 General

The following are minimum safety requirements pertaining to cellular steel floor construction. In the event of any conflict between these requirements and any legal regulations, such regulations shall apply and these requirements shall only amplify.

5.1.1 All cellular steel floor being hoisted to the working level shall be tightly

banded and carefully slung employing steel wire rope and using a choker type sling.

5.1.2 All cellular steel floor units after being laid and aligned, shall be properly secured in place prior to leaving the jobsite at the end of the working day.

5.1.3 All loose bundles of cellular steel floor units shall be secured at the completion of each working day.

5.1.4 All cellular steel floor cuttings, strapings, packaging material, and other debris pertaining to cellular steel floor units shall be cleaned up on the floor area each working day and disposed of in a suitable manner.

5.1.5 Perimeter safety lines and safety lines at discontinued or incomplete construction shall be the responsibility of the General Contractor. Barricading of openings shall also be the responsibility of the General Contractor.

6. SPECIFICATION FOR CELLULAR STEEL FLOOR

6.1 General

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

6.2 Work Included in this Division

6.2.1 Furnishing all labour, materials and equipment necessary to fabricate and, where shown or called for on the tender documents, hoisting into position and erecting the cellular steel floor.

6.2.2 Supplying and installing, where shown or called for on the tender documents, accessories such as cover plates, flashings and cell closures.

6.2.3 Cutting and reinforcing of holes and openings up to 12 inches diameter or square, as shown on the tender documents.

6.2.4 Where steel shear connectors are to be welded through the cellular steel floor, they shall be field welded by the cellular steel floor erector.

6.3 Work Not Included in this Division

6.3.1 All collateral materials.

- 6.3.2 Reinforcing or structural framing of openings larger than 12 inches diameter or square.
- 6.3.3 Field painting of the cellular steel floor.
- 6.3.4 Cutting and drilling of holes for the attachment of suspended ceiling hangers, or for the attachment of any work of other trades.
- 6.3.5 Bearing plates, shelf angles, diagonal supports and other structural steel required to support the cellular steel floor.
- 6.3.6 Supply and installation of tape for abutting ends.

6.4 Materials

- 6.4.1 The cellular steel floor shall be formed of zinc-coated (galvanized) steel to ASTM Specification A446 (latest revision) "Specification for Zinc-Coated (Galvanized) Steel Sheets of Structural Quality, Coils and Cut Lengths", minimum Grade A with a minimum steel core nominal thickness of _____ inches. The minimum Zinc Coating Class shall be 0.25 ounces per square foot total both sides. Cellular steel floor units comprised of two elements shall be of minimum Grade A with a minimum steel core nominal thickness of _____ inches. The minimum Zinc Coating Class shall be 0.25 ounces per square foot total both sides. Above minimum steel core nominal thickness may be increased, where required, to carry the structural loads as indicated on the contract documents.
- 6.4.2 Cover plates, cell closures and flashings shall be supplied of similar material and finish as that specified for the cellular steel floor of minimum steel core nominal thickness of 0.0299 inches.

6.5 Drawings and Specifications

- 6.5.1 The Buyer shall provide complete architectural and structural plans, specifications, and approved structural steel erection diagrams with floor support spacings correctly dimensioned. Should the structural support spacing vary from the original architectural and structural design drawings, this shall be brought to the attention of the Buyer.

- 6.5.2 Erection drawings, furnished by the Manufacturer, shall clearly show the location of various sheet lengths and sheet quantities, gauges and protective coatings. Quantities and lengths of cellular steel floor sheets shall be the responsibility of the Manufacturer.
- 6.5.3 This contractor shall 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. The Manufacturer or Erector shall not start shop work prior to final approval of drawings unless approval is waived by the Buyer.
- 6.5.4 Changes in the contract made by the Buyer subsequent to tendering, affecting quantities and/or installation of the cellular steel floor, shall be the basis of extras or credits to the contract sum.

6.6 Design

- 6.6.1 In the absence of laws, regulations, ordinances and specifications to the contrary, structural design of the cellular steel floor shall be in accordance with the following:
 - 6.6.1.1 Structural properties shall be calculated using the current edition of Canadian Standards Association standard S136 "Design of Light Gauge Steel Structural Members", or the AISI "Specification for the Design of Cold Formed Steel Structural Members".
 - 6.6.1.2 Wherever structural steel layout permits, and subject to reasonable limitations for handling, the cellular steel floor shall be designed and fabricated to span continuously over at least three spans.
 - 6.6.1.3 The electrical raceway units shall conform to the Canadian Standards Association C22.2, No. 79, "Cellular Metal and Cellular Concrete Floor Raceways and Fittings".

6.6.1.4 Shop Welding

When the upper and lower elements of cellular steel floor are assembled by welding to form a cellular unit, the spot welding spacing shall be calculated so as to develop the full horizontal shear at the plane where the upper and lower elements are joined. The design strength per weld

shall be in accordance with CSA Standard S136, Section 6.2 Table IV. Spot welds shall not exceed a maximum 9-inch spacing. Spot welding shall conform to the "Class C" requirements of CSA W55.2 "Specification for Resistance Welding Practice" and equipment shall be approved by the Canadian Welding Bureau.

- 6.6.1.5 The cellular steel floor shall have interlocking male and female side laps to connect adjacent parallel units.
- 6.6.1.6 The allowable live load due to deflection limitations shall be calculated with the following formulae:

For Single Spans:

$$W_L = \frac{384 K E I}{5 \times 144 L^3}$$

For Two Equal Spans:

$$W_L = \frac{384 K E I \times 2.4}{5 \times 144 L^3}$$

For Three or More Equal Spans:

$$W_L = \frac{384 K E I \times 1.89}{5 \times 144 L^3}$$

Where:

W_L = Live Load (Design Load) psf.

E = Modulus of Elasticity
= 29.5×10^6 psi.

K = 1/360 for steel floor.

I = Moment of Inertia at the design stress with top surface in compression, in.⁴/ft. of width.

L = Span, ft.

- 6.6.1.7 The allowable total load due to stress limitations shall be calculated with the following formulae:

For Single Spans:

$$W_T = \frac{Sf}{1.5 L^2}$$

For Two Equal Spans use the lesser of:

$$W_T = \frac{S_1 f}{1.5 L^2} \quad \text{or} \quad W_T = \frac{32 S f}{27 L^2}$$

For Three or More Equal Spans use the lesser of:

$$W_T = \frac{S_1 f}{1.2 L^2} \quad \text{or} \quad W_T = \frac{25 S f}{24 L^2}$$

Where:

W_T = Total load in psf.

S = Section Modulus at design stress with top surface in compression, in.³/ft. of width.

S_1 = Section Modulus at design stress with bottom surface in compression, in.³/ft. of width.

f = Design stress, psi.

= 20,000 psi for Grade A steel.

= 22,400 psi for Grade B steel.

L = Span, ft.

6.7 Erection

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

6.7.2 The cellular steel floor units shall be placed on the supporting steel and brought to proper alignment and level. If the supporting steel is not in proper alignment or at correct levels, the problem shall be reported to the General Contractor in order that the necessary corrections be made before proceeding with the work.

- 6.7.3 Establishment of the datum line for positioning of the electrified cellular steel floor units shall be the responsibility of the General Contractor.
- 6.7.4 All cellular steel floor units shall be fastened to the supporting steel at ends and intermediate supports by $\frac{3}{4}$ " diameter fusion welds at not more than 16 inches on centres.
- 6.7.5 The side laps of adjacent units shall be fastened by clinching at intervals not exceeding 24 inches or as an alternate by one inch welds at 36 inches on centres.
- 6.7.6 For openings up to 6 inches diameter or square, where not more than two vertical webs are removed, no reinforcing is required.
- 6.7.7 For openings 6 to 12 inches diameter or square, reinforcing shall be provided as determined through a structural analysis with the loads involved.
- 6.7.8 If additional openings not shown or called for on 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.
- 6.7.9 Immediately the cellular steel floor is welded in place, the steel floor surface shall be inspected, and all areas where zinc coating has been burned by welding shall be covered by a suitable zinc enriched paint, applied according to the paint manufacturer's instructions.
- 6.7.10 The cellular steel floor erector shall install all flashings at openings and columns shown on tender documents.
- 6.7.11 All cellular steel floor units intended for electrical raceways are to be properly levelled and the abutting ends are to be in alignment within $\frac{1}{8}$ inch both vertically and horizontally.
- 6.7.12 The bottom elements of the cellular steel floor shall not be separated from each other at the ends by more than $\frac{1}{2}$ inch.
- 6.7.13 No holes are to be made in the walls of cells to be used as raceways, other than those necessary for the proper installation of the cellular steel floor units, in which case these holes shall be adequately covered to protect the raceways from concrete.
- 6.7.14 No sharp projections are to be left, from internal welding operations, that could damage conductor insulation.
- 6.8 Limitations**
- 6.8.1 Any damage or alterations by others to the cellular steel floor shall not be the responsibility of the Erector or Manufacturer.
- 6.9 Storage of Materials on Site**
- 6.9.1 Cellular steel floor shall normally be delivered to the job site as required for erection, but if site storage becomes necessary, the bundles of cellular steel floor units shall be stacked on wood blocking clear of the ground and tilted slightly to ensure that no water lies on the material.
- 6.9.2 Areas for storage shall be provided by the General Contractor as close to the building as is practicable.
- 6.9.3 Protection against damage shall be provided by the General Contractor.
- 6.10 Cleanup**
- 6.10.1 Remove all debris of this trade and leave work ready for other trades.