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Standard for Steel Building Systems

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CANADIAN
SHEET STEEL
BUILDING INSTITUTE

HISTORICAL REFERENCE ONLY

The purpose of this Standard is to:

1. Define current practice.
2. State minimum quality standards.
3. Assist in the design, specification and use of Steel Building Systems.

PREFACE

One of the objects of the Canadian Sheet Steel Building Institute is the development of product standards to promote safety and good practices.

This Standard is intended to assist Buyers, Manufacturers, Sellers and Erectors of Steel Building Systems by providing information which can be adopted by reference where desired.

The technical provisions contained herein are in accordance with sound engineering principles, augmented by experience. They include recommended minimum requirements for live loads, materials, design, fabrication and erection. Of necessity, much of the detailed information concerning the above are contained in the various publications to which this Standard makes reference.

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NOTE: This Standard employs SI metric units with comparable imperial units in brackets.

Minimum thickness of steel, where specified, is given in millimetres to two decimal places (inches to 3 decimal places). Designation of sheet thickness by gauge number has been discontinued. For those who may still be accustomed to relate thickness to gauge number, the correlation between the former Manufacturer's Standard Gauge Number for sheet thickness (base steel thickness for coated sheet) and the thickness expressed in millimetres (inches) is as follows:

12 MSG = 2.67 mm (0.105 in.)	14 MSG = 1.91 mm (0.075 in.)	16 MSG = 1.52 mm (0.060 in.)
18 MSG = 1.22 mm (0.048 in.)	20 MSG = 0.91 mm (0.036 in.)	22 MSG = 0.76 mm (0.030 in.)
24 MSG = 0.61 mm (0.024 in.)	26 MSG = 0.46 mm (0.018 in.)	

STANDARD for STEEL BUILDING SYSTEMS

1. SCOPE

- 1.1 This Standard covers the design, fabrication and erection of Steel Building Systems.
- 1.2 This Standard includes only the necessary technical provisions for Steel Building Systems and is not intended to cover other contractual matters.

2. GENERAL

- 2.1 This Standard shall apply in those cases where the provisions of building codes or the Buyer's stated requirements are not specific. In the event of any conflict between the provisions of this Standard and the building regulations, such regulations shall apply and this Standard shall only amplify.
- 2.2 Where reference is made to another publication, such reference shall be considered to apply to the latest edition or revision approved by the organization issuing that publication.
- 2.3 Unless otherwise specified, the Manufacturer shall furnish all required materials in accordance with this Standard.
- 2.4 Unless otherwise specified, the roof slope, eave height, length and width of building and spacing of bays shall be to the Manufacturer's standards.

3. DEFINITIONS

- 3.1 **Manufacturer** means a company which fabricates a Steel Building System.
- 3.2 **Buyer** means the person, firm or organization contracting with the Seller for the supply of a Steel Building System.
- 3.3 **Seller** means the person, firm or organization who sells a Steel Building System, whether a Manufacturer, dealer or erector.
- 3.4 **Steel Building System** means a building system, intended primarily for commercial, industrial or institutional occupancies, featuring steel structural and cladding components in conjunction with applicable Appurtenances. Components are engineered to facilitate mass production and assembly in various combinations.
- 3.5 **Structural Framing** means the steel framework consisting of primary members (rigid frames, beams, girders, trusses, arches, rafters, columns), secondary members (purlins, joists, struts, bracing, tension rods, girts, eave struts, base angle or channel, header, jambs, sills and other structural items) and all necessary hardware.

- 3.6 **Cladding** means the exposed exterior wall and roof skin consisting of steel sheets or panels and including fasteners and attachments, weather sealants, trim, flashing, fascia, and closures, as applicable.
- 3.7 **Appurtenances** means accessory items such as doors, windows, louvers, ventilators, fans, ceilings, insulation, sky and wall lights, partitions, interior liner, gutters and downspouts, as applicable.

4. DESCRIPTION OF TYPES OF STEEL BUILDING SYSTEMS

- 4.1 **Rigid Frame** This type of building, which may be either a single or multi-span structure, utilizes clear span rigid frames consisting of rafters (tapered or uniform depth) rigidly connected to columns (tapered or uniform depth) with either fixed or pinned base details. The rigid frames, spanning the width of the building, are spaced on predetermined bay lengths and support the secondary structural members and Cladding.
- 4.2 **Beam and Column** This type of building utilizes tapered or uniform depth beams or girders supported by columns and may be either a single or multi-span structure. The primary beams or girders, spanning the width of the building, are spaced on predetermined bay lengths and support the secondary structural members and Cladding.
- 4.3 **Truss Frame** This type of building utilizes variable or uniform depth braced trusses supported by columns and may be either a single or multi-span structure. The primary trusses spanning the width of the building, are spaced on pre-determined bay lengths and support the secondary structural members, and Cladding.
- 4.4 **Self-Framing** This type of building utilizes the Cladding as primary load bearing roof and/or wall elements in addition to functioning as a weather barrier, and may be either a single or multi-span structure.

5. CHECKLIST OF ITEMS

- 5.1 A Steel Building System includes the following:
 - 5.1.1 Structural Framing (excluding Self-Framing type) including all necessary hardware.
 - 5.1.2 Cladding, including fasteners, and attachments, weather sealants, flashing, trim, fascia and closures, as applicable.

- 5.1.3 Exterior doors, windows, louvers and ventilators, including framing, fittings and hardware, as applicable.
- 5.1.4 Valley gutters in the case of multi-span buildings.
- 5.2 Unless otherwise specified, a Steel Building System does not include:
 - 5.2.1 Foundations and their design.
 - 5.2.2 Anchor bolts, anchor bolt templates, and leveling plates.
 - 5.2.3 Setting, or supervision of setting, of anchor bolts.
 - 5.2.4 Grouting of any type in the recess around the base of the wall cladding.
 - 5.2.5 Grouting under columns, door jambs and end wall columns.
 - 5.2.6 Electrical installations and wiring.
 - 5.2.7 Plumbing, heating, and air conditioning.
 - 5.2.8 Field painting.
 - 5.2.9 Interior finishing and carpentry work of any kind.
 - 5.2.10 Masonry or masonry anchors.
 - 5.2.11 Step flashing, and flashing to existing buildings.
 - 5.2.12 Valley interior downspouts, and drains (either underfloor or overhead).
 - 5.2.13 Cranes, including beams, rails and hoists.
 - 5.2.14 Glazing for windows and other openings.
 - 5.2.15 Miscellaneous items such as exhaust fans, eave gutters and downspouts.
 - 5.2.16 Openings, flashing, and framing in roof and wall required by other trades and for accessories furnished by others.
 - 5.2.17 Insulation.
 - 5.2.18 Structural fire protection.

6. MATERIAL STANDARDS

- 6.1 **Structural Framing**
 - 6.1.1 Members and components of the Structural Framing shall be fabricated of structural quality steel conforming to CSA or ASTM material standards.
 - 6.1.2 Structural fasteners shall be of a type permitted by CSA Standards S16.1-M or S136.

6.2 Cladding

- 6.2.1 Cladding materials shall be suitable for weather exposure under the anticipated environmental conditions.
- 6.2.2 Sheet steel shall conform to an appropriate CSA, ASTM or other published material standard, and shall be coated with zinc, aluminum, or a zinc-aluminum combination (except stainless and weathering grades).
- 6.2.3 Zinc coated sheet steel shall conform to ASTM A446. Base steel nominal thickness for exterior applications shall be not less than 0.46 mm (0.018 in.) and minimum zinc coating designation shall be Z275 (G90). Refer to CSSBI Pub. No. 40.6.
- 6.2.4 Prefinished sheet steel shall be coated in coil form with colours of proven durability for exterior exposure. Refer to CSSBI Pub. No. 40.7.
- 6.2.5 Fasteners for attaching Cladding to Structural Framing and for attaching flashing, trim, etc. shall be to the Manufacturer's standards. Carbon steel fasteners shall have a minimum coating thickness of 0.008 mm (0.0003 in.) of zinc or cadmium.

6.3 Appurtenances

- 6.3.1 Unless otherwise specified, all Appurtenances included with the Steel Building System shall be to the Manufacturer's standards.

7. DESIGN LOADS AND COMBINATIONS

- 7.1 Unless otherwise specified, the assumed values, dispositions and combinations of live loads, including wind loads and seismic loads shall be as prescribed by the National Building Code of Canada for the locality concerned.
- 7.2 Dead load shall include the weight of all permanent construction and specified stationary equipment.
- 7.3 Live load shall include loads due to use and occupancy, specified movable equipment, snow, rain, impact and any other specified live load. Refer to CSSBI Pub. No. 18.38 for snow load design criteria.
- 7.4 Wind load shall be that due to wind blowing on the building from any horizontal direction.

- 7.5 Seismic load shall be the assumed lateral load acting on the building in any horizontal direction as the result of earthquake motion.

8. DESIGN

- 8.1 The following standards shall apply to design:
- 8.1.1 Structural steel members and parts — CSA Standard S16, or S16.1-M.
 - 8.1.2 Cold-formed steel structural members — CSA Standard S136.
 - 8.1.3 Sheet Steel Cladding — CSSBI Standard, Pub. No. 38.6.
 - 8.1.4 Structural welding (metal arc) — CSA Standard W59.
 - 8.1.5 Resistance welding — CSA Standard S136.
- 8.2 Framed openings for windows, doors and other Appurtenances shall be designed to structurally replace the Cladding or framing members they displace.
- 8.3 Cladding components, including joints, flashing and attachments of Appurtenances shall be designed to be weathertight.

9. FABRICATION

- 9.1 Materials furnished shall be as specified for the Steel Building System.
- 9.2 Components of the Steel Building System shall be fabricated true to dimension so that in erection all parts will fit properly together. Fabrication tolerances for formed and built up structural members are given in Appendix A.
- 9.3 The size and weight of components as packaged for shipment shall be such as to permit transportation by common carrier.
- 9.4 Fabricators of welded structural components shall be fully approved by the Canadian Welding Bureau to the requirements of CSA Standard W47.1 and/or CSA Standard W55.3, as applicable.
- 9.5 All Structural Framing members shall have one coat of factory applied primer or other corrosion resisting coating on suitably prepared surfaces. These coatings are intended for short term temporary protection only.
- 9.6 Dissimilar materials which are incompatible in contact shall be separated by means of suitable coatings, gaskets or other effective means.

10. MARKING AND IDENTIFICATION

- 10.1 Erection part numbers shall be shown clearly on all members or bundles of identical pieces.
- 10.2 Fasteners required for erection shall be packaged and identified by size and type.
- 10.3 A master shipping list containing a description of the material, including erection part numbers, shall accompany the shipment of material.

11. INSPECTION

- 11.1 All finished material shall be inspected by the Manufacturer prior to shipment.

12. ERECTION

- 12.1 Unloading instructions, storage of materials and erection procedures as outlined by the Manufacturer shall be followed as closely as possible.
- 12.2 Erection tolerances for Structural Framing shall be in accordance with CSA Standards S16.1-M. In general, structural framing members are considered plumb, level, and aligned when the variance does not exceed 1:500.

13. DRAWINGS

- 13.1 Proposal drawings, when required, indicating the scope of work covered by the proposal, shall be considered as sufficient information for bidding purposes.
- 13.2 Upon award of contract, erection drawings, foundation loads and anchor bolt setting plans shall be available from the Seller prior to shipment of materials.

14. CERTIFICATION

- 14.1 If requested by the Buyer, the Seller shall submit with the proposal and/or bid the certificate of a professional engineer registered in a province of Canada to the effect that the Steel Building System which is the subject of such proposal and/or bid is in accordance with the stated requirements of the Buyer, the building regulations and this Standard, so far as is applicable.
- 14.2 If requested by the Buyer, upon award of contract the Seller shall submit a structural analysis of the Steel Building System which is the subject of such contract. The analysis shall be signed and sealed by a professional engineer registered in a province of Canada.

REFERENCE PUBLICATIONS

This Standard makes reference to the following:

American Society for Testing and Materials (ASTM)

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

Canadian Sheet Steel Building Institute (CSSBI)

18.38 Snow Load Design Criteria for Steel Building Systems.

38.6 Metric Standard for Sheet Steel Cladding.

40.6 Metric Zinc Coated (Galvanized) Sheet Steel for Structural Building Products.

40.7 Prefinished and Post Painted Galvanized Sheet Steel for Exterior Building Products.

Canadian Standards Association (CSA)

S16 Steel Structures for Buildings.

S16.1-M Steel Structures for Buildings — Limit States Design.*

S136 Cold Formed Steel Structural Members.

W47.1 Certification of Companies for Fusion Welding of Steel Structures.

W55.2 Resistance Welding Practice.

W55.3 Resistance Welding Qualification Code for Fabricators of Structural Members used in Buildings.

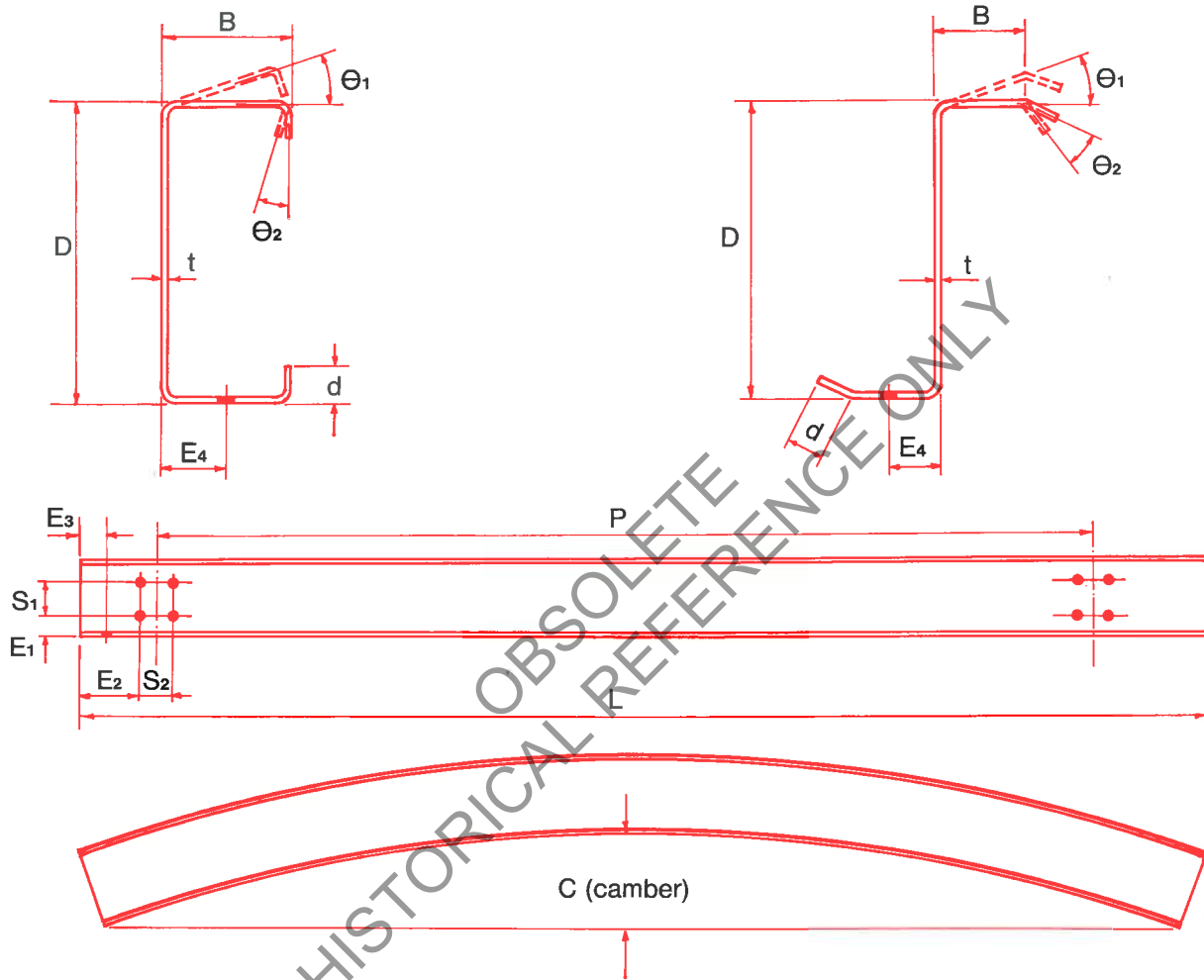
W59 Welded Steel Construction (Metal Arc Welding).

National Research Council of Canada

NRCC 17303 National Building Code of Canada.

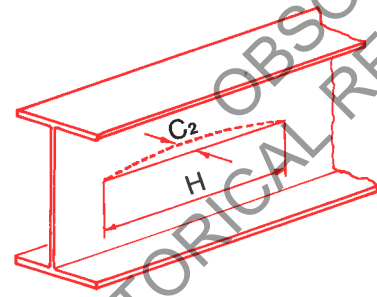
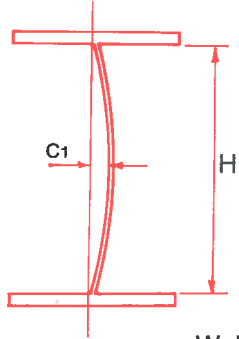
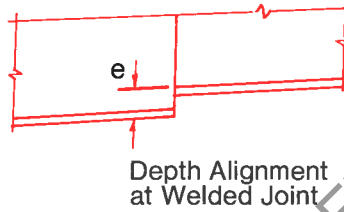
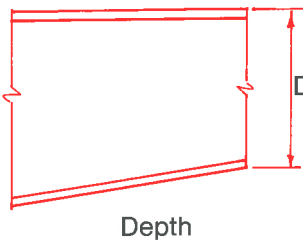
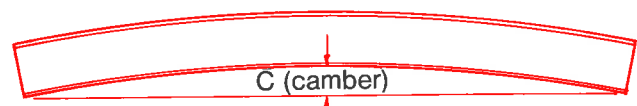
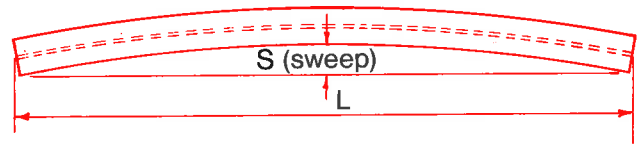
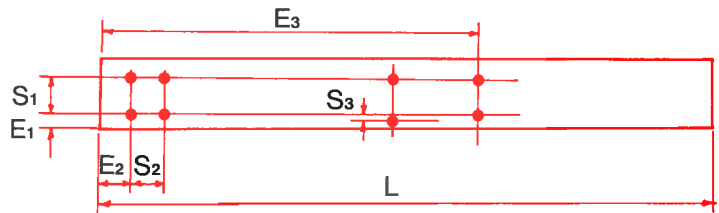
**If imperial units are employed, reference to CSA Std. S16.1-M shall be taken as reference to CSA Std S16.1, the similar standard in the imperial system.*

FABRICATION TOLERANCES FOR FORMED STRUCTURAL MEMBERS

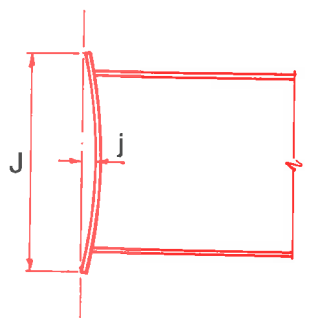
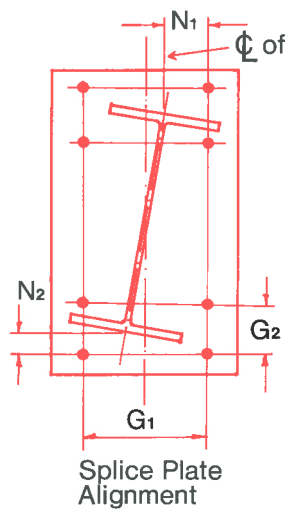


DIMENSION OR ANGLE	FABRICATION TOLERANCE	
	Millimetres	Inches
B, D	±5	± ³ / ₁₆
d	+10 -3	+ ³ / ₈ - ¹ / ₈
Θ ₁	±3°	±3°
Θ ₂	±5°	±5°
P, L	±3	± ¹ / ₈
C	0.002 L	¹ / ₄ (Lft/10)
E ₁ , E ₂ , E ₃ , E ₄	±3	± ¹ / ₈
S ₁ , S ₂	±2	± ¹ / ₁₆
t	t min = 0.95 (t design)	

FABRICATION TOLERANCES FOR BUILT-UP STRUCTURAL MEMBERS

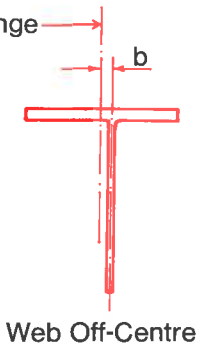
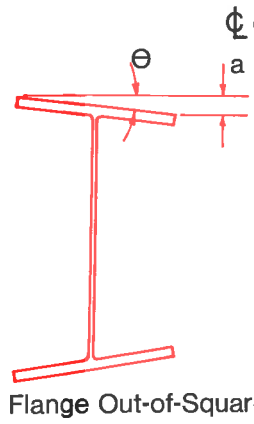


Web Flatness



Flatness of Splice Plate After Welding

DIMENSION	FABRICATION TOLERANCE	
	Millimetres	Inches
a	6 max ($\Theta \leq 3^\circ$)	$\frac{1}{4}$ max ($\Theta \leq 3^\circ$)
b	6	$\frac{1}{4}$
C_1, C_2	0.015 H	H/72
e	3	$\frac{1}{8}$
D	± 5	$\pm \frac{3}{16}$
E_1, E_2, E_3	± 3	$\pm \frac{1}{8}$
S_1, S_2, S_3	± 2	$\pm \frac{1}{16}$
N_1	± 3	$\pm \frac{1}{8}$
N_2	± 5	$\pm \frac{3}{16}$
G_1, G_2	± 2	$\pm \frac{1}{16}$
j	3 ($J \leq 600$)	$\frac{1}{8}$ ($J \leq 24$)
	5 ($600 < J \leq 1200$)	$\frac{3}{16}$ ($24 < J \leq 48$)
	6 ($J > 1200$)	$\frac{1}{4}$ ($J > 48$)
L	± 6	$\pm \frac{1}{4}$
C (camber)	0.002L	$\frac{1}{4}$ (Lft/10)
S (sweep)	0.002L	$\frac{1}{4}$ (Lft/10)



OBSOLETE
HISTORICAL REFERENCE ONLY

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