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Standard for Steel Farm Buildings

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HISTORICAL REFERENCE ONLY



**CANADIAN
SHEET STEEL
BUILDING INSTITUTE**

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)

32.120 Code of Standard Practice for Steel Farm Buildings
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
18.120 Snow Load Design Criteria for Low Human Occupancy Steel Farm Buildings
38.4 Standard for Steel Building Systems

Canadian Standards Association (CSA)

*S16 Steel Structures for Buildings
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 General Specification for Welding of Steel Structures (Metal Arc Welding)

National Research Council of Canada (NRCC)

NRCC17303 National Building Code of Canada, 1980

Standards Council of Canada (SCC)

CAN3-Z234.1 Canadian Metric Practice Guide

**Currently there are two Standards, S16 covering Working Stress Design and S16.1 covering Limit States Design.*

Reference to S16 shall be taken as references to S16.1 where Limit States Design is employed.

In this Standard, minimum thickness of steel, where specified, is given in inches to 3 decimal places with equivalent thickness in millimetres. Indirect 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 zinc coated sheet) and the thickness expressed in inches (millimetres) is as follows:

12 MSG = 0.105 in., (2.67 mm)	20 MSG = 0.036 in., (0.91 mm)
14 MSG = 0.075 in., (1.91 mm)	22 MSG = 0.030 in., (0.76 mm)
16 MSG = 0.060 in., (1.52 mm)	24 MSG = 0.024 in., (0.61 mm)
18 MSG = 0.048 in., (1.22 mm)	26 MSG = 0.018 in., (0.46 mm)
	28 MSG = 0.015 in., (0.34 mm)

Approximate Conversions*

To convert pounds per square foot to kilonewtons per square metre (kilopascals)
psf to kN/m² (kPa), multiply by 0.04788
1 psf = 0.04788 kN/m² = 0.04788 kPa

To convert kilonewtons per square metre (kilopascals) to pounds per square foot
kN/m² (kPa) to psf, multiply by 20.886
1 kN/m² = 1 kPa = 20.886 psf

*For more precise conversions refer to the Canadian Metric Practice Guide, CAN 3-Z234.1

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 Farm Buildings.

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 good practices.

This Standard is intended to assist Buyers, Dealers, Erectors and Manufacturers of Steel Farm Buildings 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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STANDARD for STEEL FARM BUILDINGS intended for LOW HUMAN OCCUPANCY

1. SCOPE

1.1 This Standard covers the design, fabrication and supply of non-residential Steel Farm Buildings to be located on land devoted to the practice of farming and intended for low human occupancy farm use, such as but not limited to, the shelter of livestock, storage of implements or crops, or combinations thereof.

As used in this Standard a low human occupancy Steel Farm Building is a building or major portion thereof having an occupant density no greater than one person per 500 square feet (50 square metres) during normal periods of use of four hours or longer in any one day.

All other buildings including but not limited to, such buildings as processing rooms, workshops, auction or show arenas, or other areas likely to be occupied by groups of persons over extended periods, shall be considered as high human occupancy and shall be designed in accordance with the National Building Code of Canada or applicable provincial regulations for such occupancies and the CSSBI Standard for Steel Building Systems.

1.2 This Standard applies to low human occupancy Steel Farm Buildings intended for equipment and material storage where such storage does not exert internal loading on the structure. Where buildings are intended for uses which will exert internal loading on the structure, the Manufacturer shall be so advised in order that such loading may be incorporated in the design.

1.3 This Standard does not provide all requirements for low human occupancy Steel Farm Buildings intended for the storage of corrosive materials. Where storage of corrosive materials is intended, the Manufacturer shall be so advised in order that the applicability for such use may be reviewed by the Manufacturer.

1.4 This Standard does not provide all requirements for low human occupancy Steel Farm Buildings incorporating special loads including, but not limited to, those due to cranes and roof mounted conveyor systems. Where special loads are to be carried, the Manufacturer shall be so advised in order that such loading may be incorporated in the design.

1.5 This Standard includes only the necessary technical provisions for low human occupancy Steel Farm Buildings and is not intended to cover other contractual matters.

2. GENERAL

2.1 This Standard shall apply in those cases where there is no conflict between the provisions of building regulations and this Standard. In the event of any conflict with a building regulation, such regulation shall apply and this Standard shall only amplify. The Manufacturer shall be advised by the Buyer where such differences exist.

2.2 Unless otherwise specified, where reference is made to another publication, such reference shall refer 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 or curvature, length and width of building, eave height and spacing of bays as applicable, shall be to the Manufacturer's standards.

3. DEFINITIONS

3.1 **Manufacturer** means a company which fabricates a Steel Farm Building.

3.2 **Vendor** means the person, firm or organization who sells a Steel Farm Building, whether a Manufacturer, dealer or erector.

3.3 **Buyer** means the person, firm or organization contracting with the Vendor for the supply of a Steel Farm Building.

3.4 **Structural Framing** means the steel framework consisting of primary members or elements (rigid frames, beams, girders, trusses, arches, rafters, columns, including cladding for self-framing buildings), secondary members (purlins, joists, struts, bracing, tension rods, girts, eave struts, base angle or channel headers, jambs, sills and other structural items) and all necessary hardware.

3.5 **Cladding** means those components of sheet steel which form the exposed exterior of a wall or roof of a building.

3.6 **Thickness** of sheet steel used for cladding means the base steel thickness exclusive of any coating.

Nominal thickness means the representative base steel thickness used to establish section properties.

Minimum thickness means the least thickness obtained by measurement at any point located at least 3/8 in. (10 mm) from an edge or corner bend.

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 FARM BUILDINGS

4.1 **Rigid Frame** This type of building utilizes clear span Structural Framing 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 the primary load bearing roof and/or wall elements in addition to its function as a weather barrier, and may be either a single or multi-span structure.

5. MATERIAL STANDARDS

5.1 Structural Framing

5.1.1 Members and components of the Structural Framing shall be fabricated of structural quality steel conforming to *CSA* or *ASTM* materials standards.

5.1.2 Structural fasteners shall be of a type permitted by *CSA Standards S16* or *S136*.

5.2 Cladding

5.2.1 Sheet steel used for Cladding shall be zinc coated, stainless or weathering steels as described in *Metric Standard for Sheet Steel Cladding, CSSBI Pub. No. 38.6*.

5.2.2 Zinc coated sheet steel used for Cladding shall conform to *ASTM A446*. Base steel nominal thickness shall not be less than 0.015 inch (0.34 mm) for Cladding supported by Structural Framing, and not less than 0.024 inch (0.61 mm) for Self-Framing buildings where the Cladding is not so supported. The minimum zinc coating designation for all Cladding shall be G90 (Z275).

5.2.3 Prefinished or post painted zinc coated sheet steel used for Cladding shall be coated with paint systems and colours of proven durability for exterior exposure. Paint systems shall include, but are not limited to, those listed in *Prefinished and Post-Painted Sheet Steel for Exterior Building Products CSSBI Pub. No. 40.7*.

5.2.4 Fasteners for attaching Cladding to Structural Framing or other Cladding and for attaching flashing, trim, etc. shall be to the Manufacturer's standards. Carbon steel fasteners shall have a minimum coating thickness of 0.0003 inch (0.008 mm) of zinc or cadmium.

5.3 Appurtenances

5.3.1 Unless otherwise specified, all Appurtenances included with the Steel Farm Building shall be to the Manufacturer's standards.

6. DESIGN LOADS AND COMBINATIONS

6.1 Unless otherwise specified below, the assumed values, dispositions and combinations of snow and wind loads shall be as prescribed by the *National Building Code of Canada*.

6.2 Dead load shall include only the weight of all permanent construction supplied by the Manufacturer, unless otherwise specified.

6.3 Live load shall include only the loads due to snow and wind, unless otherwise specified.

6.4 Roof Snow Load

6.4.1 The minimum design roof snow load for buildings covered by this Standard shall be not less than 21 pounds per square foot (1 kN/m²).

6.4.2 Simple gable or single slope roofs with slopes of 20 degrees or less may be designed for a uniform snow load distribution only.

6.4.3 The Manufacturer shall state clearly the maximum uniformly distributed roof snow load which the building is designed to carry at working level (psf or kN/m²). Where non-uniform or unbalanced loading governs the design, the manufacturer shall also state the maximum roof snow load applicable to such unbalanced condition. See Information Bulletin No. 6, *Snow Load Design Criteria for Low Human Occupancy Steel Farm Buildings*, CSSBI Pub. No. 18.120.

6.4.4 When the Manufacturer is advised, prior to design and fabrication, of the intended location of a building covered by this Standard, the components shall be designed for the snow loading applicable to that location. The design snow load shall be not less than 0.6 of the ground snow load for the locality concerned as specified in the Supplement Ch. 1 to the *National Building Code of Canada*. When the design snow load is less than 0.8 of the specified ground snow load the Manufacturer shall advise the Buyer that the design contemplates the following:

- (a) the building is located in an exposed location such as open level terrain with only scattered buildings, trees or other obstructions, so that the roof is exposed to the winds on all sides and is not likely to become shielded in the future by obstructions higher than the roof within a distance from the building equal to 10 times the height of the obstruction above the roof level, and
- (b) the roof does not have any significant projections, which may prevent snow from being blown off the roof, such as parapet walls, which exceed a height in feet of g divided by 25 where g is the ground snow load in pounds per square foot, (which exceed a height in metres of S_0 divided by 4 where S_0 is the ground snow load in kilonewtons per square metre).

6.5 Wind load shall be that due to wind blowing on the building from any horizontal direction. The reference velocity pressure shall be based on a probability of being exceeded in any one year of one in ten unless otherwise specified.

7. DESIGN AND LOAD TESTS

7.1 Except as noted, the following standards shall apply to design.

7.1.1 Structural steel members and parts — *CSA Standard S16*.

7.1.2 Cold formed steel structural members — *CSA Standard S136*.

7.1.3 Sheet steel Cladding — *CSSBI Metric Standard for Sheet Steel Cladding*.

7.1.4 Structural welding (metal arc) — *CSA Standard W59*.

7.1.5 Resistance welding — *CSA Standard W55.2*.

7.2 Where the design of structural components or assemblies for buildings covered by this Standard is based on performance load tests, at least three representative test samples selected at random shall be capable of supporting:

- 7.2.1 one hundred percent of dead and specified live load for one hour without exceeding deflection limitations where applicable, and,

- 7.2.2 one hundred percent of dead load plus two hundred percent of specified live load for twenty-four hours without failure.
- 7.3 Section properties not covered by the design standards referenced in 7.1, shall be determined by rational analysis and tests.
- 7.4 Openings for windows, doors and other Appurtenances shall be designed and installed such that the structural strength of the building, as designed, is maintained.
- 7.5 Cladding components, including joints, flashings and attachments of Appurtenances shall be designed to be weathertight.
- 7.6 For buildings covered by this Standard, the allowable stress may be increased by 25 percent in Working Stress Design or the importance factor (γ) may be taken as 0.80 in Limit States Design.
- 7.7 Provision shall be made to ensure adequate stability of a structure as a whole, and adequate lateral, torsional and local stability of all structural parts.
- 7.8 Structural components shall be proportioned such that deflections are within acceptable limits for the nature of the materials to be supported and the intended use and occupancy.
- 7.9 Foundations and their design are not part of this Standard.
- 7.9.1 The Manufacturer shall furnish the anchor bolt layout and the reactions required for design of the foundations. The Manufacturer does not supply the anchor bolts.

Although the foundations for buildings covered by this Standard are not part of the Standard, the design contemplates that the foundations will be adequate to support safely the loads and forces to which they are subject.

8. FABRICATION

- 8.1 Materials furnished shall be as specified by the Manufacturer.
- 8.2 Components shall be fabricated true to dimension so that in erection all parts will fit properly together.

- 8.3 The size and weight of components as packaged for shipment shall be such as to permit transportation by common carrier.
- 8.4 Manufacturers 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*.
- 8.5 Structural Framing members shall have one coat of factory applied primer or other corrosion resisting coating on suitably prepared surfaces. These coatings are normally intended for short term temporary protection only. (See also 1.3.)
- 8.6 Dissimilar materials which are incompatible in contact shall be separated by means of coatings, gaskets or other effective means.

9. MARKING AND IDENTIFICATION

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

10. INSPECTION

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

11. FOUNDATIONS

- 11.1 Foundation reactions and anchor bolt setting plans shall be furnished by the Manufacturer, prior to or with the shipment of materials.

12. ERECTION

- 12.1 Unloading instructions; advice on storage of materials; erection drawings; and a full description of erection procedures, shall be furnished by the Manufacturer, prior to or with the shipment of materials.

13. CERTIFICATION

- 13.1 If requested, the Manufacturer shall furnish a letter of certification attesting to the design loads and design standards used for the building. The letter shall be signed and sealed by a professional engineer registered in a province or territory of Canada.

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