

Standard for Steel Farm Cladding

CSSBI 21M-84
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HISTORICAL REFERENCE ONLY
OBSOLETE



CANADIAN
SHEET STEEL
BUILDING INSTITUTE

The purpose of this Standard is to:

1. Define current practice.
2. Set minimum quality standards.
3. Assist in the design, manufacture and installation of steel farm cladding.

PREFACE

One of the objects of the Canadian Sheet Steel Building Institute is the development of product standards to promote safety and sound construction practices. This Standard is intended to further this objective by providing to buyers, manufacturers and installers of steel farm cladding, information which can be used or adopted by reference where desired.

The requirements contained herein are in accordance with accepted engineering principles, augmented by experience. They include recommendations covering order thicknesses, minimum grade of steel and metallic coating designations, as well as design, manufacture and installation in general.

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REFERENCE PUBLICATIONS

This Standard makes reference to the following:

Canadian Farm Building Code

American Society for Testing and Materials (ASTM)

- A446/446M Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
- A525/525M Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, General Requirements.
- A792/792M Steel Sheet, Aluminum-Zinc Alloy Coated by the Hot-Dip Process, General Requirements.

Canadian Standards Association (CSA)

- CAN3-S136 Cold Formed Steel Structural Members

HISTORICALLY DERIVED REFERENCE ONLY

STANDARD for STEEL FARM CLADDING

1. SCOPE

- 1.1 This Standard covers the manufacture, load carrying capacity, handling and installation of sheet steel cladding intended for application to the walls (vertical or slanting) and/or roofs (sloped or curved) of farm buildings.
- 1.2 This Standard does not apply to:
 - (a) cladding for use on roofs with a slope less than 4 in 12;
 - (b) roof cladding where built-up roofing or other covering is to be placed on top of the cladding;
 - (c) cladding for use on buildings with sustained high internal humidity; or
 - (d) curved steel sheet arch sections used to construct steel arch structures.

NOTE: For roof slopes less than 4 in 12, the manufacturer should be consulted for advice on the selection of a profile.

2. GENERAL

- 2.1 This Standard is to govern in those cases where the provisions of farm building codes or the stated requirements of the buyer are not specific. In the event of a conflict between this Standard and any legal regulation applying to farm buildings, the regulation shall govern and this Standard shall only supplement.
- 2.2 Unless otherwise stated, 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 materials in accordance with this Standard.
- 2.4 For situations not covered herein (such as the exposure of cladding to corrosive materials or gases; using the cladding as a structural diaphragm to resist in-plane shear forces; or using the cladding to resist loads other than snow and wind loads as stipulated in Section 7) this Standard shall be supplemented by additional requirements based on good practice.
- 2.5 Caution shall be exercised if steel farm cladding is intended for use in buildings such as piggeries and livestock pens. Adequate ventilation is necessary in these buildings to prevent the condensation of internal humidity which can be particularly corrosive.

3. DEFINITIONS

- 3.1 **Buyer** means a buyer of steel farm cladding.
- 3.2 **Farm Building** means a building which does not contain a residential occupancy and which is: (a) associated with and located on land devoted to the practice of farming; and

(b) used essentially for the housing of equipment or livestock, or the production, storage or processing of agricultural and horticultural produce or feeds, such as barns, produce storage buildings, milking centres, piggeries, poultry houses, grain bins, silos, machinery sheds, farm workshops, feed preparation centres, tobacco pack barns, manure storages, greenhouses and garages not attached to the farm residence.

- 3.3 **Installer** means an installer of steel farm cladding.
- 3.4 **Manufacturer** means a manufacturer of steel farm cladding.
- 3.5 **Roof** means a surface which is inclined less than 70 degrees from the horizontal.
- 3.6 **Seller** means a seller of steel farm cladding, whether a manufacturer, retailer or installer.
- 3.7 **Span** means the lesser of: (a) the distance between centres of supports; or (b) the clear distance between supports plus the depth of the cladding profile.
- 3.8 **Steel Farm Cladding** means those components of sheet steel which form the exposed surface of a wall or roof of a farm building.
- 3.9 **Thickness** of sheet steel used for steel farm cladding means the base steel thickness plus the thickness of the metallic coating. **Nominal Thickness** means the thickness on which order thickness is based, and is representative of the actual thickness of the material. **Base Steel Nominal Thickness** means the thickness of the base steel that is used in calculating the structural section properties on which load carrying capacity is based.
- 3.10 **Wall** means a surface which is vertical or inclined not more than 20 degrees from the vertical.

4. SHEET STEEL REQUIREMENTS

- 4.1 **Material**
 - 4.1.1 Zinc coated sheet steel used as farm cladding or flashing shall conform to ASTM A446/446M *Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality*. The minimum zinc coating designation shall be Z275 (G90).
 - 4.1.2 Aluminum-zinc alloy coated sheet steel used as farm cladding shall conform to ASTM A792/792M* *General Requirements for Steel Sheet, Aluminum-Zinc Alloy Coated by the Hot-Dip Process*. The minimum coating designation shall be AZ150. Metric coating designations apply to

sheet produced in Canada and the coating designations specified in ASTM A792 do not apply.

*NOTE: In Canada, the product is currently marketed under the tradename "Galvalume Steel".
ASTM A792M Specification pending.

4.1.3 Prefinished and factory post-painted sheet steel, in addition to meeting the requirements of 4.1.1 or 4.1.2, as applicable, shall have a 2-coat (minimum) baked on paint system using colours of proven durability for exterior exposure that will meet the performance standards of paint systems such as Series 2000 or 5000, Series 24 or 60, or an equivalent.

4.2 Minimum Thickness

The measured minimum thickness of sheet steel used for farm cladding and flashing shall not be less than the specified nominal thickness minus the permissible under-tolerance as given in Table 1. If thickness is measured on prefinished (pre-painted) sheet steel, a deduction of 0.02 mm (0.001 in) should be made for each paint film thickness (i.e. full coat one side deduct 0.02 mm (0.001 in) or full coat two sides deduct 0.04 mm (0.002 in)).

NOTE: In conformance with industry practice, dimensions in this Standard are rounded off to three decimal places for imperial units and two decimal places for metric units.

5. MANUFACTURE

5.1 General

Steel farm cladding shall be formed from sheet steel at ambient temperature to final profile and shall have the full dimensions claimed by the manufacturer, subject to the tolerances given in 5.2.

5.2 Tolerances

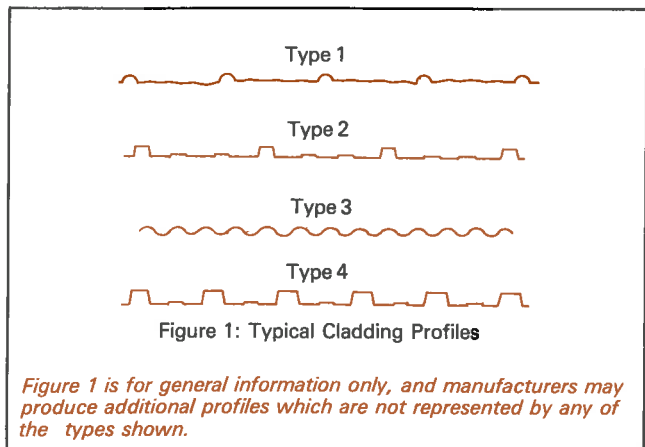
5.2.1 Upon completion of manufacturing, the depth of the cladding profile shall not be more than 1 mm (0.04 in) under the depth claimed by the manufacturer.

5.2.2 Upon completion of manufacturing, the cover width of the cladding sheet shall not deviate from the cover width claimed by the manufacturer by more than 1 percent (10 mm per metre or 1/8 inch per foot).

6. PRODUCT INFORMATION

6.1 Profiles

Steel farm cladding profiles vary somewhat from manufacturer to manufacturer, but in general may be classified into four types as noted below and illustrated in Figure 1. This classification is for general information only. Some manufacturers may produce additional profiles which do not conform to any of the types described.



(a) **Type 1** profiles have a major rib height of 18 mm (11/16 in) or less and a cover width of 1000 mm (39 in) or less with major ribs spaced 150 to 300 mm (6 to 12 in) on centres.

(b) **Type 2** profiles have a major rib height of 19 to 25 mm (3/4 to 1 in) and a cover width of 900 mm (36 in) or less with major ribs spaced 150 to 300 mm (6 to 12 in) on centres.

(c) **Type 3** profiles have a corrugated (wave pattern) profile of 12 mm (1/2 in) minimum amplitude, a 65 to 75 mm (2.5 to 3 in) pitch and a cover width of 750 mm (30 in) or less.

(d) **Type 4** profiles have a major rib height greater than 25 mm (1 in) and a cover width of 900 mm (36 in) or less with the major ribs spaced 150 to 300 mm (6 to 12 in) on centres.

6.2 Sheet Thicknesses

6.2.1 Order Thickness:

Sheet steel farm cladding is typically ordered to one of three thicknesses as shown in Table 1. The actual measured sheet thickness may deviate slightly from the order thickness but will be within the permissible tolerance range. Order thicknesses apply to metallic coated, unpainted sheet steel only, and an allowance for the paint film thickness must be added when measuring prefinished material. (See also 4.2).

TABLE 1

Order Thickness, Z275 and AZ150 Coated Sheet, Unpainted		Tolerance on Order Thickness (over and under)	
mm	in.	mm	in.
0.54	0.021	0.08	0.003
0.46	0.018	0.08	0.003
0.38	0.015	0.08	0.003

6.2.2 Base Steel Thickness

The base steel nominal thickness is the order thickness less an allowance for the metallic coating. The relationship between the order thickness and the base steel nominal thickness is shown in Table 2.

TABLE 2

Order Thickness, Z275 and AZ150 Coated Sheet, Unpainted		Base Steel Nominal Thickness	
mm	in.	mm	in.
0.54	0.021	0.50	0.019
0.46	0.018	0.42	0.016
0.38	0.015	0.34	0.013

6.3 Metallic Coatings

6.3.1 All steel farm cladding produced by CSSBI members has a protective metallic coating on both sides of the base steel. This coating may be of zinc (galvanized) or aluminum-zinc alloy (such as Galvalume) and is applied by the steel producer using a continuous hot-dip process.

6.3.2 Zinc coated sheet is available in a number of coating weights, the most common being Z275 (G90) which has a minimum coating weight (total both sides of the sheet) of 275 g/m² (0.90 oz/ft²) by the triple spot test as defined by ASTM A525M (A525). The Z275 (G90) coating is supplied on all zinc coated sheet steel intended for cladding, unless a heavier coating is specified.

6.3.3 Aluminum-zinc alloy coated sheet is available in two coating weights, AZ150 and AZ180, the numbers referring to the minimum coating in g/m². The AZ150 coating is supplied on aluminum-zinc alloy coated sheet steel intended for cladding, unless otherwise specified.

6.4 Paint Systems

6.4.1 All prefinished steel farm cladding produced by CSSBI members has a factory-applied paint system consisting of a baked-on primer and finish coat. The sheet steel is normally prefinished in coil form by a coil-coater and is subsequently roll formed to the final shape by the cladding manufacturer. Occasionally, the sheet steel may be factory post-painted (i.e. after roll forming) using a process similar to coil coating. However, factory post-painting is not carried out on a large scale due to cost and quality factors which generally favour coil coating.

6.4.2 The paint systems generally applied to coil coated sheet for farm cladding are Series 2000, Series 5000, Series 24 or Series 60 (or an equivalent). Series 2000 and Series 24 are economical prefinish systems for farm building applications in rural locations that are not subjected to aggressive exposure nor in close proximity to industrialized zones. Series 5000 and Series 60 are slightly more expensive prefinish systems developed for commercial and light-to-moderately severe industrial applications.

6.4.3 The service life of any paint system is dependent on many factors particular to the individual application, such as: aggressiveness of the environment; slope of the cladding surface; degree of exposure to the sun; time of surface wetness; and colour. For particularly aggressive environments, there are other coating systems available which provide superior durability at somewhat higher cost.

6.5 Colours

6.5.1 Generally, only colours of proven durability for exterior exposure should be considered. Roof surfaces are subject to more severe exposure conditions than wall surfaces, and a light colour will better resist the more severe exposure to sunlight.

6.5.2 Paint systems of the same colour designation, but of a different series (e.g. 2000 and 5000, or 24 and 60) are not formulated as exact matches; also, colours of the same colour designation may appear different on aluminum-zinc alloy coated sheet than on galvanized sheet due to the different substrate and primer. Therefore, it would be prudent not to mix the two metallic coatings nor the various paint systems where cladding appearance is important.

6.5.3 High pigmentation colours (e.g. *Melchers Green*) are more susceptible to marring during roll forming and handling. Also, high-contrast colours (e.g. *White and Dark Brown*) on opposite sides of a sheet are more susceptible to edge bleeding (transfer of one colour to the other) and curing problems. The manufacturer and buyer should be aware of these constraints.

6.6 Accessories

Accessories to sheet steel cladding (e.g. *flashing and trim*) should be manufactured from the same material and have the same paint system as the adjacent cladding. This will provide for a more consistent service life of both the cladding and the accessories.

7. LOAD CARRYING CAPACITY

7.1 Steel farm cladding on roofs and walls is subjected in service to the effects of rain, snow and wind. The load which a specified steel farm cladding profile may safely carry is determined by the distance between its supports, the geometry of the profile, the base steel thickness, the base steel strength and the adequacy of the fastening. Special consideration must be given to steel farm cladding which is expected to confine materials such as grain or manure which can exert internal pressure on surrounding walls.

7.2 The load carrying capacity of steel farm cladding is provided in load-span tables provided by the manufacturer for each profile type and base steel thickness. The

manufacturers of steel farm cladding who are members of the Canadian Sheet Steel Building Institute use the following design criteria to establish their load-span tables:

- (a) Loads are as specified in the Canadian Farm Building Code.
- (b) The structural properties of the profile are determined in accordance with CSA Standard CAN3-S136 "Cold Formed Steel Structural Members".
- (c) Design is based on strength considerations applicable to a uniformly distributed load. Load-span tables usually assume that a cladding sheet spans continuously over four structural supports (3-span continuous) or more. For 2-span continuous or single span coverage, the load carrying capacity is reduced by 20 percent.
- (d) Deflection under load is not considered as a design determinant.
- (e) The capacity of the fasteners may govern for certain loading cases (e.g. *wind-induced uplift on roof cladding*).

8. HANDLING AND STORAGE RECOMMENDATIONS

8.1 Transportation

- 8.1.1 Steel farm cladding should be securely banded for shipping in bundles of like profiles in accordance with the manufacturer's standard practice. In general, wood crating, wrapping and shrouds are not provided and where so ordered are at the buyer's expense.
- 8.1.2 For protection against salt, rain, dirt, etc. during transport, cladding panels should be properly covered but also well ventilated.
- 8.1.3 Where chains are used to secure or hoist cladding panels, it is necessary to protect the edges of the bundle at the cinch points.

8.2 Site Storage

- 8.2.1 Shipments of bundled cladding panels should be inspected upon delivery.
- 8.2.2 Storage time should be minimized by installing cladding panels as soon as possible after delivery.
- 8.2.3 If cladding must be stored for an extended period, the most desirable storage place is under-roof in a cool, dry, well ventilated area.
- 8.2.4 When outdoor storage is unavoidable, the following is recommended:
 - (a) use good quality covers, other than plastic, loosely shrouded over stacks and firmly anchored to prevent wind blow-off;
 - (b) tilt bundles for drainage;
 - (c) ventilate bundles but do not allow entry of wind-driven precipitation;
 - (d) block bundles off ground for effective ventilation and drainage;
 - (e) block long bundles to prevent sagging;

- (f) store out of direct sunlight if possible;
- (g) store away from chemically aggressive substances (e.g. *salt, cement, fertilizer*), away from materials that could contaminate the surface (e.g. *diesel oil, paint, grease*) and away from site traffic.

- 8.2.5 Moisture can cause wet storage staining of prefinished material and usually occurs as a result of: (1) condensation from high humidity and/or temperature cycling; (2) wet shipping conditions; and/or (3) wind-driven rain penetration (outdoor storage). The usual progression is from water staining to unsightly white staining (dark grey to dull black staining on aluminum-zinc alloy coated sheet) to red rust. On material where wet storage staining has occurred, it should be noted that a nominal amount of staining is not detrimental to the functioning of the product.

9. INSTALLATION RECOMMENDATIONS

9.1 General

- 9.1.1 When using tools in close proximity to prefinished cladding, care should be taken to protect the paint finish. Do not allow the hot filings from power cutting tools to contact the painted surface. Abrasive cutting tools are not recommended for cutting prefinished steel sheets.
- 9.1.2 Rubber soled shoes should be worn if it is necessary to walk on prefinished material.
- 9.1.3 Since scratches or scuff marks will contribute to paint failure, these areas should be touched up carefully with a matching compatible paint.
- 9.1.4 It is essential that nails, fasteners, saw cuttings, etc. be removed from roofs, gutters, etc. as installation progresses.
- 9.1.5 Materials that can trap moisture (e.g. *dirt, wood or rags*) should not be allowed to accumulate on the cladding surface.

9.2 Cutting

- 9.2.1 It is recommended that only reciprocating saws, nibblers or shears be used on prefinished cladding. Any cutting method that generates excessive heat is unsuitable since the heat will damage the painted surface.
- 9.2.2 A high speed disc cutter (hand power saw) is not recommended, but if the tool must be used on material that will be exposed, cut only one sheet at a time, exposed side down, away from other sheets and do not force the cutting disc. Any burrs should be removed with a file or shears and touched up with paint.

9.2.3 Filings, from cutting or drilling, can damage the paint finish and contribute to surface abrasion. These filings should not be allowed to contact the prefinished surface. If this does happen, the filings should be removed as quickly as possible by one of several methods: dry mops, soft bristle brush brooms, soft cloths, magnetic bar collectors, or power water wash. Steel particles should be removed daily since overnight dew is often sufficient to cause these particles to rust. This rusting of filings gives the impression that the coating has deteriorated with apparent failure of the sheet. The rust produces unsightly surface stains that are difficult and costly to remove.

9.3 Fastening

9.3.1 There are a number of fasteners, both nails and screws, that may be used to install steel farm cladding. Fastener selection will depend on the cladding type, the supporting structure and the preference of the installer.

9.3.2 The basic requirements of all fasteners, is a heavy rust protective coating (e.g. *zinc*), proper length to give ample holding power and a suitable seal beneath the head to prevent moisture penetration. For aluminum-zinc alloy coated sheet, a neutral cure sealant which does not contain acetic acid or amines should be used and washers of lead or copper are not recommended.

9.3.3 Proper fastening to girts of steel or well-seasoned wood will overcome the problem of "nail popping".

9.3.4 Caution should be used when fastening cladding through the top of the corrugation; if the fastener is over-driven the corrugation will flatten and the next row of sheets will not overlap properly.

9.3.5 The manufacturer should be consulted for recommended fastening procedures.

9.4 Field Painting and Touch-up

9.4.1 Painting over a new installation is not recommended. All coil coated paint films have internal additives that do not allow good adhesion between field-applied paint and the coil-coated paint layer.

9.4.2 Touch-up paint will not last as long as the original prefinish paint system, therefore, keep any touch-up to a minimum. A small artist's brush or a small air brush should be used. It is often preferable to replace a panel rather than attempt to touch-up large areas.

9.4.3 For repainting, consult a fabricator member of the Institute who will provide recommendations.

9.5 Maintenance

9.5.1 An occasional thorough cleaning of prefinished material can extend the service life and help to maintain the appearance of the finish. Simply washing with plain water using hoses or pressure sprays is often sufficient. Waxing is an additional method of prolonging the service life of prefinished material.

9.5.2 In areas where heavy dirt deposits dull the surface, a solution of water and detergent may be used: 100 ml (1/3 cup) of a typical liquid detergent per 4 litres (1 gallon) of water. A soft bristle brush should be used for scrubbing followed by a clear water rinse.

9.5.3 Mildew may occur in areas subject to high humidity. To remove mildew along with the dirt, the following is suggested:

- (a) mix: (1) 100 ml (1/3 cup) liquid detergent;
 - (2) 200 ml (2/3 cup) trisodium phosphate (TSP);
 - (3) 1 litre (1 quart) 5% sodium hypochlorite solution (laundry bleach);
 - (4) 3 litres (3 quarts) water;
- (b) use in a well ventilated area;
- (c) a clear water rinse should follow.

9.5.4 Solvent and abrasive cleaners should be avoided. Caulking compound, oil, grease, tar, wax and similar substances can be removed with mineral spirits applied only to the areas that are affected. Detergent cleaning and thorough rinsing should follow the use of solvent.

10. THERMAL AND VENTILATION CONSIDERATIONS

10.1 Insulation

10.1.1 Insulation should be installed in agricultural buildings where required to prevent condensation and to establish a heat balance between the heat gain from livestock and other sources and the heat loss through floors and ceilings and through openings and other means of ventilation.

10.1.2 Insulation should be installed between all heated and unheated spaces and around the perimeter of concrete slabs on grade in such a manner that there is reasonably uniform insulating value over the entire face of the insulated area.

10.1.3 Insulation should fill the space between furring or framing members.

10.1.4 Insulation should be protected from exposure to the weather and against mechanical damage.

10.1.5 There are several types of insulating materials available, such as: glass fibre,

mineral wool, vermiculite loose fill, fibreboard, and foamed plastics such as polystyrene and urethane. The selection of insulation will depend on a number of factors such as building type, insulating requirements, and availability of the material.

10.1.6 Foamed plastic insulations such as polystyrene are readily soluble in many organic solvents including oils and fuels and should, therefore, be used only where there is no contact with such substances.

10.2 Vapour Barriers

10.2.1 The installation of a vapour barrier (e.g. *polyethelene sheet*) on the warm side of insulated assemblies is a necessity to prevent moisture condensation within the insulated space. Moisture condensation can cause corrosion of metal components and will reduce the effectiveness of the insulation.

10.2.2 The entire interior surface of the building, including framing members, should be protected with the vapour barrier which should be sealed at all joints so that no leakage paths are present. Any openings should be cut in such a manner that the vapour barrier fits snugly around electrical outlets,

water pipes, etc. and is effectively sealed.

10.3 Ventilation

10.3.1 Proper ventilation is necessary to provide a healthy atmosphere for livestock and poultry. Different types of animals have different rates of heat and moisture production and require different living conditions inside the building (i.e. acceptable ranges of temperatures and humidity). These rates of heat and moisture production can lead to considerable difficulties in selecting a suitable ventilation rate in cold weather. For instance, if sufficient air is circulated within the building to carry away excess moisture, the inside temperature could drop below the desired level. In locations of extreme cold, it may be necessary to heat the incoming ventilation air.

10.3.2 One method of ventilation is to install automatic exhaust fans in the wall near the roof or ceiling and locate fresh air inlets in the walls opposite the fans. Reversible fans that exhaust air during cold weather and bring air into the building during hot weather are most effective in combating humidity and poor ventilation. These fans may also help to control fluctuations in temperature that affect production.

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The Canadian Sheet Steel Building Institute, the national association of the structural sheet steel industry, promotes the use of sheet steel in building construction through engineered design and standards of quality and performance. Activities focus on sheet steel building products and steel building systems for commercial, industrial and institutional applications and similar products and systems for farm applications.

The Institute provides information regarding the standards of design, fabrication and erection, and offers technical assistance in the use of cold formed and pre-engineered steel products. The CSSBI also represents its members in technical matters connected with government, and provides liaison with organizations such as Canadian Standards Association and National Research Council.

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