Guide Specification for Wind Bearing Steel Studs

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CANADIAN
SHEET STEEL
BUILDING INSTITUTE

Guide Specification for Wind Bearing Steel Studs

PART 1 - GENERAL

1.1 Description of System

.1 Wall studs subjected to lateral loads (no axial load other than self weight and the weight of applied finishes).
.2 Steel bridging.
.3 Top and bottom track.
.4 Head and sill members and jamb studs for wall openings.
.5 Stud, bridging and track connections.
.6 Top and bottom track connections to main structure including detailing to accommodate floor deflections.

1.2 Related Work

.1 Sheathing materials.
.2 Insulation.
.3 Accessories (e.g. brick ties, furring channels, metal lath)
.4 Non-load bearing steel stud and sheathing assemblies.

1.3 Referenced Standards

.1 Referenced standards refer to the latest edition or revision except where specified otherwise.
.2 Where referenced standards conflict with this specification, this specification governs.
.3 The following standards are referenced in this specification:

National Building Code of Canada

Canadian Standards Association
CAN/CSA-S136 *Cold Formed Steel Structural Members*
W47.1 *Certification of Companies for Fusion Welding of Steel Structures*
W59 *Welded Steel Construction (Metal Arc Welding)*

American Society for Testing Materials (ASTM)
ASTM A525M *General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process [Metric]*
ASTM A591/591M *Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Mass Applications*
ASTM A792M *Steel Sheet, Aluminum-Zinc Alloy Coated by the Hot-Dip Process, General Requirements [Metric]*

American National Standard Institute/American Welding Society (ANSI/AWS)
ANSI/AWS D1.3 *Structural Welding Code - Sheet Steel*

Canadian General Standards Board (CGSB)
CGSB 1-GP-181M *Standard for: Coating, Zinc Rich, Organic, Ready Mix*

1.4 Design Criteria

.1 Design shall be based on Limit States Design principles using factored loads and resistances.
.2 Loads and load factors shall be in accordance with the National Building Code of Canada.
.3 Resistances and resistance factors shall be determined in accordance with the National Building Code and CAN/CSA-S136.
.4 Conform to the requirements of specified fire rated assemblies.
.5 Design bridging to prevent member rotation and member translation perpendicular to the minor axis. Provide for secondary stress effects due to torsion between lines of bridging. Collateral sheathing may be used to help restrain member rotation and translation perpendicular to the minor axis for wind bearing studs. Provide bridging at 1500 mm o.c. maximum. Closer spacing may be required to satisfy structural requirements.

(Specifier Note: Some sheathing materials such as gypsum drywall may lose their structural integrity when subject to a moist environment or when subjected to a sufficient number of load cycles. Such materials may not be suitable to act as structural bracing. If the sheathing is utilized for bracing, it is

standard practice in the industry to provide sufficient steel bridging to align members during erection and to provide the necessary structural integrity during construction as well as in the completed structure.)

.6 Maximum deflections under specified loads shall conform to the following:

.1 Wall studs supporting masonry veneer, L/720.

.2 Wall studs supporting other finishes, L/360.

(Specifier Note: For masonry veneers the deflection limit is intended to control veneer cracking, not eliminate it. In LSF construction, flexural cracking of the veneer represents a serviceability limit state rather than ultimate structure failure. The width of flexural cracks is controlled through the L/720 deflection criterion for the LSF back-up member. Substantial additional load can be carried before the wall reaches ultimate structural failure. In addition, when the load is removed the flexural cracks tend to close and the wall returns to its unloaded configuration. Reinforced concrete and reinforced masonry design standards also recognize cracking and the need to control crack widths.)

.7 Design components or assemblies to accommodate specified erection tolerances of the structure.

.8 The spacing of members shall not exceed ... mm o.c. (*Specifier select*)

(Specifier Note: The structural performance of the collateral facing materials such as gypsum drywall, plywood subfloors, roof cladding and wall cladding and their associated performance as air barriers, vapour retarders, rain screens, etc. will limit the spacing of supporting members.)

.9 Allow for movement of the structure. Design wind bearing stud end connections to accommodate floor/roof deflections such that the studs are not loaded axially.

.10 Connections between light steel framing members shall be by bolts, welding or sheet metal screws.

1.5 Submittals

.1 Submit (....) certified copies of mill reports covering chemical and mechanical properties, and coating designation of steel used in this work.

.2 Submit (....) representative pieces of all framing component parts including mechanical fasteners if used. The length of pieces submitted need not exceed 300 mm. Tag pieces with the name of the part, the metal thickness exclusive of coating and the manufacturer.

.3 Submit (....) copies of engineering calculations or data verifying the capacity of the members and the ability of the assemblies to meet the design requirements.

.4 Submit (....) copies of shop drawings.

.1 Each shop drawing submitted shall bear the stamp and signature of a qualified Professional Engineer registered in Canada in the Province of (....) (*Specifier select*).

.2 Include all necessary shop details and erection diagrams. Indicate member sizes, locations, thicknesses exclusive of coating, coatings, and materials. Include connection details for attaching framing to itself and for attachment to the structure. Show splice details where permitted. Indicate dimensions, openings, requirements of related work and critical installation procedures. Show temporary bracing required for erection purposes.

.3 Indicate design loads.

.5 Do not fabricate until all submittals in 1.5.4 are reviewed.

.6 Submit (....) copies of field review reports as required in Section 3.7.1.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers

(*Specifier list*)

2.2 Materials

.1 Steel shall have metallic coatings that conform to one of the following ASTM Standards:

A525M *General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process [Metric]*

A591/591M *Steel Sheet, Electrolytic Zinc-Coated, for LightCoating Mass Applications*

A792M *Steel Sheet, Aluminum-Zinc Alloy Coated by the Hot-Dip Process, General Requirements [Metric]*

.2 Steel shall conform to the requirements of CAN/CSA-S136 and shall be identified as to specification, type, grade and mechanical properties.

.3 Roof and wall members forming part of the exterior building envelope shall have a minimum coating of Z180 galvanizing in accordance with A525M. Other coatings (e.g. aluminum-zinc alloy) providing equal or better corrosion protection may be used.

.4 Interior members not forming part of the exterior building envelope shall have a minimum coating of Class C electrogalvanizing in accordance with A591. Other coatings providing equal or better corrosion protection may be used.

.5 Sheet metal screws shall have a minimum coating thickness of .008 mm of zinc or cadmium. Other coatings providing equal or better corrosion protection may be used.

.6 Welding electrodes shall be of the 480 MPa minimum tensile strength series (e.g. E480XX, E480S-X).

.7 Zinc rich paint for touching up welds and damaged metallic coatings shall conform to CGSB 1-GP-181M.

.8 The design thickness, exclusive of coating, shall not be less than ... mm (*Specifier select*). Thicker material shall be used where required to satisfy structural requirements. Material used to fabricate steel framing shall comply with the thickness tolerance requirements of CAN/CSA-S136.

(Specifier Note: The coatings specified in 2.2 are recommended minima. None are intended to provide long-term protection where the light steel framing members are exposed directly to a corrosive environment. The specifier is responsible for the compatibility of the specified coatings. Some materials may require separation.)

PART 3 - EXECUTION

3.1 General

.1 Fabrication and erection shall conform to the approved shop drawings. Modifications required to accommodate as-built conditions (other than minor dimensional changes) shall be submitted for approval.

3.2 Welding

.1 Companies engaged in welding shall be certified by the Canadian Welding Bureau to CSA Standard W47.1. Companies shall have welding procedures approved and welders qualified for the base material types and thicknesses that are to be welded.

.2 Welds shall conform to CSA W59 and/or ANSI/AWS D1.3, whichever is applicable.

.3 For material less than 3 mm thick, shop drawings may show nominal weld leg sizes. For such material, the effective throats of welds shall not be less than the thickness of the thinnest connected part.

.4 Touch-up welds with zinc rich paint.

3.3 Screws

.1 Steel screws shall be of the minimum diameter indicated on the shop drawings.

.2 Penetration beyond joined materials shall be not less than 3 exposed threads.

.3 Thread types and drilling capability shall conform to the manufacturer's recommendations.

.4 Screws covered by sheathing materials shall have low profile heads.

3.4 Fabrication

.1 Where specified, provide cut-outs centred in the webs of members to accommodate services. Unreinforced cut-outs shall be limited to the dimensions in

Table 1. The effect of cut-outs on the strength and stiffness of the member shall be considered.

.2 Fabrication tolerances for members shall conform to Table 2.

.3 The steel thickness exclusive of coating shall be marked on each member by embossing, stamping with indelible ink or by colour coding.

3.5 Storage of Materials

.1 Products shall be protected from conditions that may cause physical damage or corrosion.

3.6 Erection

.1 Methods of construction may be either piece by piece (stick-built) or by fabrication into panels (panelized) either on or off site.

.2 Lightweight steel framing shall be erected true and plumb within the specified tolerances. Temporary bracing shall be employed wherever necessary to withstand all loads to which the structure may be subject during erection and subsequent construction. Temporary bracing shall be left in place as long as required for the safety and integrity of the structure. The Erector shall ensure that during erection a margin of safety consistent with the requirements of the National Building Code and CAN/CSA-S136 exists in the uncompleted structure.

.3 Erection Tolerances

(Specifier Note: These tolerances are intended as minima to insure structural performance only. Architectural considerations such as the visual appearance of a finished surface or joint may require closer tolerances.)

.1 For the purposes of this section, camber is defined as the deviation from straightness of a member or any portion of a member with respect to its major axis, and sweep is defined as the deviation from straightness of a member or any portion of a member with respect to its minor axis.

.2 For wind bearing studs, out of plumbness shall not exceed 1/500th of the member length. Out of straightness (camber and sweep) shall not exceed 1/1000th of the member length.

.3 For track, camber shall not exceed 1/1000th of the member length.

.4 Studs shall seat into top and bottom tracks. The gap between the end of the stud and the web of the track shall not exceed 4 mm for wind bearing studs.

.5 Align adjacent prefabricated panels to provide surface continuity at the interface.

.6 Spacing of studs shall not be more than ±3 mm from the design spacing. The cumulative error in spacing shall not exceed the requirements of the finishing materials.

.4 Make all field measurements necessary to insure the proper fit of all members.

.5 Cutting of members may be by saw or shear. Torch cutting is not permitted.

.6 Holes that are field cut into lightweight steel framing members shall conform to the requirements of Section 3.4.1 and 3.6.5.

.7 Insulation equal to that specified shall be placed in all jamb and header assemblies that will be inaccessible after their installation into the wall. Insure that insulation is kept dry and not compressed.

.8 Handling and lifting of prefabricated panels shall not cause permanent distortion to any member or collateral material.

3.7 Inspection

.1 The lightweight steel framing Design Engineer, responsible for the production of the shop drawings, shall provide periodic field review during construction and shall submit reports in accordance with Section 1.5.6.

.1 The cost of this field review shall be paid for by the Contractor.

.2 Additional inspection and testing of materials and workmanship shall be carried out by a qualified Independent Inspection Agency appointed by the Architect.

.1 The cost of this additional inspection shall be paid for out of the Cash Allowances for Inspection and Testing.

.2 Any testing or inspection required by the Architect because of an

error by the Contractor or due to departure from the contract documents by the Contractor, shall be paid for by the Contractor.

.3 Inspection shall include:

.1 Checking that mill test reports are properly correlated to materials.

.2 Sampling fabrication and erection procedures for general conformity to the requirements of the specification.

.3 Checking that the welding conforms to the requirements of Section 3.2.

.4 Checking fabricated members against specified member shapes.

.5 Visual inspection of all welded connections including sample checking of joint preparation and fit-up.

.6 Sample checking of screwed and bolted joints.

.7 Sample checking that tolerances are not exceeded during fit-up or erection.

.8 Additional inspection and testing of welded connections as required by CSA W59.

.9 General inspection of field cutting and alterations required by other trades.

.10 Submission of reports to the Architect, the Project Engineer, the Contractor and the authorities having jurisdiction covering the work inspected with details of deficiencies discovered.

.4 The Contractor shall provide the necessary cooperation to insure that the inspection can proceed.

.5 The inspection provided in this section does not relieve the Contractor of his responsibility for the performance of the contract. The Contractor is solely responsible for quality control and he shall implement his own supervisory and quality control procedures.

.6 Materials or workmanship not conforming to the requirements of the contract documents may be rejected at any time during the progress of work.

TABLE 1 - ALLOWABLE DIMENSIONS FOR UNREINFORCED CUT-OUTS

Member Depth (mm)	Across the Member Web (mm)	Along the Member Length (mm)	*Centre to Centre Spacing (mm)
92, 102	40 max.	105 max.	600 min.
> 152	65 max.	115 max.	600 min.

* The distance from the centreline of the last unreinforced cut-out to the end of the member shall be not less than 300 mm.

TABLE 2 - FABRICATION TOLERANCES FOR LIGHTWEIGHT STEEL FRAMING MEMBERS

Member Type	Member Depth A (mm)	Flange Width B (mm)	Lip Length C (mm)	Thick-ness t (mm)	Inside Radius r (mm)	Corner Angles
Track or stud,	-1, +2	-1, +2 **	-0, +4	-0	*	±3°

* Only applicable to members subjected to web crippling.
For r≤ 2t +28%
For 2t < r≤ 4t +9%
Where r is the manufacturer's specified inside bend radius and t is the thickness exclusive of coating.

** Where drywall is attached directly to the flange, the minimum flange width shall be 31 mm.

Member Type	Length
Tracks	-
Wind Bearing Studs	±3 mm
Axial Load Bearing Studs	±1.5 mm
Joists and Rafters	±3 mm