CSSBI S5-2000: Guide Specification for Wind Bearing Steel Studs

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Specifier Notes: This specification is written on the assumption that structural design of the framing is the responsibility of the Contractor. It also assumes that division of the work between subcontractors is the responsibility of the Contractor alone, and done without reliance on the specifications.

For use as a contract document:
- *Delete Specifier Notes*
- *Choose appropriate selections in square brackets*
- *Delete selections in square brackets that do not apply*
- *Make any other project specific amendments that are appropriate.*

Part 1 - General

1.1 Description of System

Wind bearing steel studs includes:

.1 Wall studs subjected to lateral loads (no axial loads other than self-weight and the weight of applied finishes)

.2 Steel bridging

.3 Top and bottom track

.4 Head, sill and jamb members for wall openings

.5 Stud, bridging and track connections

.6 Top and bottom connections to the main structure including detailing to accommodate floor and/or roof deflections.

Specifier Note: Non-load bearing interior partition studs are outside the scope of this specification.

1.2 Related Work

Specifier Note: In the applicable related sections, reference this section for the specification of wind bearing steel studs.

.1 Section [01___] Allowances for independent inspection or testing.

.2 Section [03___] Concrete

.3 Section [04___] Masonry

Specifier Note: Reference the section where masonry ties connecting to steel studs are specified.

.4 Section [06___] Wood sheathing

.5 Section [07___] Insulation

Specifier Note: Reference the section(s) where insulation in the stud space and exterior insulation are specified.

.6 Section [____] [_____]

Specifier Note: List section(s) where other exterior cladding or finishes attached to the wind bearing studs are specified.

.7 Section [07___] Air barriers and/or vapour retarders

.8 Section [08___] Doors and windows

.9 Section [09___] Non load-bearing wall framing systems

.10 Section [09___] Gypsum board

Specifier Note: Reference the section(s) where gypsum board finish attached to framing and exterior gypsum sheathing is specified. If the gypsum board/sheathing is to function as an air barrier, insure that screw spacing, board thickness, and orientation required by wind loads have been covered there.

.11 Section [_____] [_____]

1.3 References

Where referenced standards conflict with this specification, this specification governs.

Referenced standards refer to the latest edition.

Specifier Note: As an alternative to specifying the "latest edition", add current dates to the standards listed below.

.1 National Building Code of Canada

.2 [Ontario] [_____] Building Code

.3 [CAN/CSA-S16.1 Limit States Design of Steel Structures]

.4 CSA-S136 Cold Formed Steel Structural Members

.5 [CSA-W47.1 Certification of Companies for Fusion Welding of Steel Structures]

.6 [CSA-W59 Welded Steel Construction (Metal Arc Welding)]

.7 [ANSI/AWS-D1.3 Structural Welding Code – Sheet Steel]

.8 [CSA-A370 Connectors for Masonry]

.9 [CSA-S304.1 Masonry Design for Buildings (Limit States Design)]

.10 [ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength]

.11 [ASTM A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum tensile Strength]

.12 [ASTM A653/A653M Standard Specification for Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process]

.13 [ASTM A792/A792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process]

.14 [CAN/CGSB-1.181 Ready-Mixed Organic Zinc-Rich Coating]

.15 CAN/CGSB-7.1 Lightweight Steel Wall Framing Components

.16 [CAN/ULC-S101 Standard Methods of Fire Endurance Tests of Building Construction and Materials]

.17 [_____]

Specifier Note: List standards referenced elsewhere in this specification.

1.4 Quality Assurance

Retain a Professional Engineer registered in [Canada] [the province of _____] to design the wind bearing steel stud wall system; to prepare, seal and sign all shop drawings; and to perform field review. Shop drawings shall show both design and installation requirements.

1.5 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. For wind load calculations, the reference velocity pressure, q, shall be based on a 1 in 30 probability of being exceeded in any one year for strength design and 1 in 10 for deflection.

.3 Resistances and resistance factors shall be determined in accordance with the National Building Code of Canada and CSA-S136.

.4 Conform to the requirements of fire rated assemblies [specified] [which have been tested in accordance with CAN/ULC-S101 and provide a fire resistance rating of [_____]].

.5 Stud depths are shown on the drawings. Adjust stud material thicknesses and spacings, as required by the design criteria. Use greater or lesser stud and joist depths only if approved by the [Project Engineer] [Architect].

Specifier Note: Note that maximum spacings (Section 1.5.6) and minimum design thicknesses (Section 1.5.7) must also be considered. In addition, to avoid contractual confusion:

- ***Do not show stud and joist thicknesses or spacings on the Architectural or Structural drawings***
- ***Do not use gauge as a thickness designation.***

.6 Space wall studs at [300] [400] [480] [600] [_____] mm maximum. Use lesser stud spacings if required by the design criteria.

Specifier Note: The structural performance of the collateral facing materials such as gypsum drywall, plywood or OSB and their associated performance as air barriers, vapour retarders, etc. will also limit the spacing of supporting members.

.7 For studs, conform to the minimum design thicknesses in Table 1. Use greater stud design thicknesses if required by the design criteria.

TABLE 1 • Minimum Design Thicknesses

Stud Depth (mm)	Minimum Design Thickness Exclusive of Coating (mm)
64	0.84
92	0.84
102	0.84
140	0.84
152	0.84
184	0.91
203	1.12

[For wall studs supporting brick veneer, the minimum design thickness exclusive of coating shall be the greater of the design thicknesses in Table 1 or [1.12 mm] [_____]].

Specifier Note: The minimum design thicknesses in Table 1 satisfy the requirement in S136 for web height to thickness ratio not greater than 200 assuming an inside bend radius of 2t. An additional thickness limit of 1.12 mm for steel

stud/brick veneer is a design recommendation arising out of CMHC sponsored research. This is not a building code requirement, but more to facilitate handling.

.8 The minimum design thickness for bridging channel shall be 1.22 mm. Use greater bridging channel design thickness if required by the design criteria.

.9 The minimum design thickness for clip angles shall be 1.52 mm. Use greater clip angle thickness if required by the design criteria.

.10 Maximum flexural deflections under specified wind loads shall conform to the following:

.1 Wall studs supporting masonry veneer shall meet the requirements of CSA-S304.1 [with veneer deflections limited to L/600] [with stud deflections limited to L/720].

Specifier Note: The deflection of steel studs supporting masonry veneer is controlled by the requirements of the masonry design standard, CSA-S304.1. Two calculation methods are allowed:

a) Veneer deflections are limited to L/600. To meet this limit the stud flexural deflections plus the tie deformations must be less than L/600. In addition, tie stiffness and mechanical play must conform to the requirements of CSA-A370 Connectors for Masonry.

b) Stud flexural deflections are limited to L/720. To use this approach, a stiffer tie than that specified by CSA-A370 is required. The tie deflection due to one half the total mechanical play plus a tension or compression load of 0.45 kN must not exceed 1.0 mm.

While these two design approaches will produce similar results, the L/720 approach is simpler and therefore generally preferred. Refer to CSA-S304.1 for additional detail on the two calculation methods. Insure that the tie specification in the masonry section is consistent with the design assumptions used here. The specifier should ensure that the tie is specified to meet CSA-S304.1

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

.11 Design connections to accommodate vertical deflection movement of the structure, frame shortening and vertical tolerances without imposing axial loads onto the framing. Leave a minimum gap of [12 mm] [____]. Larger gaps may be required to accommodate structural movement. Co-ordinate with the Project Structural Engineer.

.12 Limit free play and movement in connections perpendicular to the plane of the framing to ± [0.5] [____] mm relative to the building structure.

.13 Design components and assemblies to accommodate specified erection tolerances of the structure.

.14 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]. [Do not rely on collateral sheathing to help restrain member rotation and translation perpendicular to the minor axis]. Provide bridging at 1500 mm o.c. maximum. Space bridging at equal intervals over the span length of the member. Closer spacings 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 are generally not suitable to act as structural bracing. If the sheathing is utilized for bracing, it is standard practice in the industry to also 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.

.15 Design anchorage and splice details for bridging.

.16 Design for local loading due to anchorage of cladding and interior wall mounted fixtures where shown.

.17 Connections between wind bearing steel stud members shall be by bolts, welding or sheet metal screws.

.18 Provide head, sill and jamb members and connections to frame openings larger than [100] [____] mm in any dimension.

.19 Anchor top and bottom track to the structure at a maximum spacing of 800 mm o.c. Closer spacings may be required to satisfy structural requirements.

Specifier Note: The 800 mm maximum spacing is based on design recommendations arising out of CMHC sponsored research.

1.6 Submittals

.1 Make submittals in accordance with Section [01 ___] Submittals.

.2 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 _____].

.2 Include all necessary shop details and erection diagrams. Indicate member sizes, locations, thicknesses exclusive of coating, coatings, and material types. 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.

.3 Submit [____] certified copies of mill reports covering chemical and mechanical properties, and coating designation of steel used in this work.

.4 Submit product data for mechanical fasteners indicating sizes, load capacities and type of corrosion protection.

.5 Submit [on request] [_____] representative pieces of all framing component parts including mechanical fasteners if used.

.6 Submit [on request] [____] copies of engineering calculations or data verifying the capacity of the members, including masonry connectors if specified, and the ability of the assemblies to meet the design requirements.

.7 Do not fabricate or construct until submittals other than field review reports are reviewed and approved.

.8 Submit [____] copies of field review reports.

Part 2 - Products

2.1 Acceptable Manufacturers.

.1 Provide wind bearing steel stud framing and accessories manufactured by any of the following: [_____].
Specifier Note: Provide a list of acceptable manufacturers.

2.2 Materials

.1 Wind Bearing Steel Stud Framing Members and Accessories

.1 Steel shall conform to the requirements of CSA-S136 and shall be identified as to specification, grade, mechanical properties and coating type and thickness.

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

ASTM A653/A653M Standard Specification for Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process

ASTM A792/A792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

.3 Wind bearing steel studs shall have a minimum coating of Z180 galvanizing in accordance with ASTM A653/A653M. Other coatings (e.g. aluminum-zinc alloy to ASTM A792/A792M) providing equal or better corrosion protection may be used.

Specifier Notes: 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 CMHC sponsored research on steel stud/brick veneer assemblies recommends a minimum Z275 galvanized coating.

The specifier is responsible for the compatibility of the specified coatings. Some materials may require separation.

As a guide to determining equivalence of zinc versus aluminum-zinc alloy coatings, the Canadian Sheet Steel Building Institute recommends that AZM150 (aluminum-zinc) be considered equivalent to Z275 (zinc).

.2 Fasteners and Welds

.1 Bolts and nuts shall conform to the requirements of ASTM A307 or ASTM A325. Provide washers. [Hot-dip galvanize bolts, nuts and washers].

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

.3 Welding materials shall conform to the requirements of CSA-W59.

.4 Welding electrodes shall be of the 480 MPa minimum tensile strength series (e.g. E480XX, ER480S-X).

.5 Zinc rich paint for touching up welds and damaged metallic coatings shall conform to CAN/CGSB-1.181.

.6 Concrete anchors shall have a minimum coating thickness of .008 mm of zinc. Other coatings providing equal or better corrosion protection may be used.

.7 [Powder actuated/low velocity fasteners are not permitted [for fastening to structural steel] [for fastening to concrete]]. [Powder actuated/low velocity fasteners shall have a minimum coating thickness of .008 mm of zinc. Other coatings providing equal or better corrosion protection may be used].

Specifier Note: Powder actuated/low velocity fasteners may be less reliable than other fastener types.

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 to [Project Engineer] [Architect] for approval.

3.2 Fabrication

.1 Except as noted herein, fabricated wall framing components shall conform to the requirements of CAN/CGSB-7.1.

.2 Where specified, provide cut-outs centred in the webs of members to accommodate services and though-the-knockout style bridging. Unreinforced cut-outs shall be limited to the dimensions in Table 2. The effect of cut-outs on the strength and stiffness of the member shall be considered.

TABLE 2: Allowable Dimensions for Unreinforced Cut-Outs

Member Depth (mm)	Perpendicular to the Length of the Member (mm)	Parallel to the Length of the Member (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.

.3 Length tolerances for members shall conform to Table 3.

TABLE 3: Length Tolerances

Member Type	Length Tolerance
Tracks	none
Wind Bearing Studs	±3 mm

.4 Cross sectional geometry tolerances for members shall conform to Table 4.

TABLE 4: Cross Sectional Geometry Tolerances

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

* *The tolerance on delivered steel thickness shall conform to the requirements of CSA-S136.*

** *Where sheathings are attached directly to the flange, the minimum flange width shall be 31 mm.*

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

3.3 Fasteners and Welds

.1 Insure that connected parts are in contact. Provide clamping before welding or installing screws as required.

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

.3 Welds shall conform to CSA-S136, CSA-W59 and ANSI/AWS-D1.3, whichever is applicable.

.4 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.

.5 Touch-up welds and coatings damaged by welding with zinc rich paint. Prior to touching-up prepare surface in accordance with paint manufacturer's recommendations.

.6 Sheet metal screws shall be of the minimum diameter indicated on the shop drawings but not less than a #8.

.7 Penetration of sheet metal screws beyond joined materials shall be not less than 3 exposed threads.

.8 Sheet metal screw thread types, drilling capability and installation shall conform to the manufacturer's recommendations.

.9 Sheet metal screws covered by sheathing materials shall have low profile heads.

.10 Install concrete anchors in accordance with manufacturer's recommendations.

3.4 Storage of Materials

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

3.5 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 Wind bearing studs shall be erected true and plumb within the specified tolerances. Temporary bracing shall be employed wherever necessary to withstand all loads to which the steel stud wall system 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 wall system. The Erector shall ensure that during erection a margin of safety consistent with the requirements of the National Building Code and 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 tighter 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.

.5 Align adjacent or abutting members in the same plane to within ± 0.5 mm maximum.

.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.

.7 Align web cut-outs in studs and joists as required for the installation of through-the-knockout style bridging and services.

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

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

.10 Reinforce cut-outs where the distance from the centreline of the cut-out to the end of the member is less than 300 mm. Submit the reinforcing detail to the [Project Engineer] [Architect] for approval.

.11 Holes that are field cut into lightweight steel framing members shall conform to the requirements of Section 3.2.

.12 Replace members with localized damage.

.13 Unless a closer spacing is shown on the shop drawings, anchor top and bottom tracks securely to structure at [____] [800 mm] o.c. maximum. Place one additional anchor within 100 mm of the end of each piece of track and additionally as required by the shop drawings.

.14 Install additional studs at abutting walls, openings, terminations against other materials and on each side at corners unless explicitly detailed otherwise on the shop drawings.

.15 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.

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

3.6 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.
[These field reviews shall include review of mill

tests reports, welded and screwed connections, connections to the main structure, member sizes, location and material thickness, coating thickness, erection tolerances, and all field cutting.]

Specifier Note: Use this paragraph for projects where independent inspection is deemed unwarranted.

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

.3 Additional inspection and testing of materials and workmanship shall be carried out by a qualified Independent Inspection Agency appointed by the [Project Engineer] [Architect].

.1 The cost of this additional inspection shall be paid for out of the Cash Allowances for Inspection and Testing except that any testing or inspection required by the [Project Engineer] [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.

.2 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 3.3.

.4 Checking fabricated members against specified member geometries.

.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 co-operation and access 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 The Contract cannot rely on timely discovery and reporting of defective work. Materials or workmanship not conforming to the requirements of the Contract may be rejected at any time during the progress of work at no cost to the Owner even if the Contractor has to destroy and rebuild other work as a result.