



CSSBI S6-2019:

Guide Specification for Lightweight Steel Framing

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SPECIFIER NOTES:

Lightweight steel framing includes wall, floor and roof framing, generally from cold formed C-shaped steel members. 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.

This publication replaces the previous edition dated January 2011.

1. GENERAL

1.1 Description of System

Lightweight Steel Framing includes Wind Bearing Studs, Axial Load Bearing Studs, Floor Joists and Roof Joists.

- .1 Wind Bearing Studs
 - .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.
- .2 Axial Load Bearing Studs
 - .1 Wall studs subject to lateral and axial loads
 - .2 Steel bridging
 - .3 Top and bottom track

- .4 Lintel, sill and jamb members for wall openings
 - .5 Cross bracing for lateral loads
 - .6 Connections
- .3 Joists
 - .1 Floor and roof joists
 - .2 Headers and trimmers for floor or roof openings
 - .3 Bridging
 - .4 Closure channels
 - .5 Connections including web stiffeners

Specifier Note: Roof rafters, roof trusses, ceiling joists and non-load bearing interior partition studs are outside the scope of this specification. Refer to CSSBI S18 for a non-load bearing stud guide specification.

1.2 Related Work

Specifier Note: In the applicable related sections, reference this section for the specification of Lightweight Steel Framing Elements.

- .1 Section [01___] Allowances for independent inspection or testing.
- .2 Section [03___] Concrete
- .3 Section [04___] Masonry
- .4 Section [06___] Wood sheathing
- .5 Section [07___] Insulation

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

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

.6 Section [____] [_____]

Specifier Note: List section(s) where other exterior cladding, finishes or roofing attached to the Lightweight Steel Framing 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, ensure 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 Design of Steel Structures]

.4 [CSA-S136 North American Specification for the Design of Cold Formed Steel Structural Members

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

.6 [CSA W59 Welded Steel Construction]

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

.8 [CSA A370 Connectors for Masonry]

.9 [CSA S304.1 Design of Masonry Structures]

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

.11 [ASTM F3125M, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions]

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

.16 [CSSBI-61 Manufacturer Certification Requirements for Cold Formed Steel Framing Members]

.17 [AISI S240 North American Standard for Cold-Formed Steel Structural Framing]

.18 [____]

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 Lightweight Steel Framing 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 50 probability of being exceeded in any one year.

- .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 and joist depths are shown on the drawings. Adjust stud and joist 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 [305] [406] [610] [_____] mm maximum. Space floor joists at [305] [406] [610] [_____] mm maximum. Space roof joists at [305] [406] [610] [_____] mm maximum. Use lesser stud and joist spacings if required by the design criteria.

Specifier Note: The structural performance of the collateral facing materials such as gypsum drywall, plywood or OSB subfloors, roof cladding and wall cladding and their associated performance as air barriers, vapour retarders, etc. will also limit the spacing of supporting members. In addition, on projects with axial load bearing studs, use the same spacing for joists and wall studs to allow vertical alignment of roof, floor and wall members.

- .7 For studs, track and joists, conform to the design thicknesses in Table 1. Use greater stud, track and joist design thicknesses if required by the design criteria

Specifier Note: The minimum thicknesses in Table 1 are 95% of the design thickness as limited by CSA-S136

[For wall studs supporting brick veneer, the minimum thickness exclusive of coating shall be the greater of the minimum thicknesses in Table 1 or [1.087 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.

- .8 The minimum thickness for bridging channel shall be 1.087 mm for studs and 1.367 mm for joists. Use greater bridging channel design thickness if required by the design criteria.
- .9 The minimum thickness for clip angles shall be 1.367 mm for studs and 1.720 mm for joists. Use greater clip angle thickness if required by the design criteria.
- .10 Maximum flexural deflections under specified live or wind loads shall conform to the following:

- .1 Wall studs supporting masonry veneer shall meet the requirements of CSA S304.1 with stud deflections limited to L/360.

Specifier Note: The deflection of steel studs supporting masonry veneer is controlled by the requirements of the masonry design standard, CSA S304.1.

- .2 Wall studs supporting other finishes, L/360.
- .3 Floor joists, [L/360] [L/480] [_____].

Specifier Note: The L/360 limit has been used historically. More recently, L/480 has been introduced to help control floor vibrations.

- .4 Roof joists, [L/300] [L/360].

Specifier Note: For roofs supporting finishes not susceptible to cracking, use L/300. For roofs supporting finishes that are susceptible to cracking, use L/360. More relaxed deflection limits may be appropriate for industrial type buildings. Refer to CAN/CSA S16 Appendix D for additional guidance.

- .5 Building sway due to all effects, 1/400 of building height or 1/500 of storey height.

Table 1: Minimum Thicknesses

Stud, Track or Joist Depth (mm)	Minimum Base Steel Thickness Exclusive of Coating (mm)	Design Thickness Exclusive of Coating (mm)
92	0.836	0.879
102	0.836	0.879
140	0.836	0.879
152	0.836	0.879
203	1.087	1.146
254	1.367	1.438
305	1.720	1.811
356	1.720	1.811

- .11 For wind bearing studs, 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 For wind bearing studs, limit free play in connections perpendicular to the plane of the framing to \pm [0.5] [____] mm relative to the building structure.
- .16 Design for local loading due to anchorage of cladding and interior wall mounted fixtures where shown.
- .17 Connections between light steel framing members shall be by bolts, welding or sheet metal screws.
- .18 Allow for appropriate end eccentricities in the design of axial load bearing members.
- .19 Design interior axial load bearing walls with a nominal lateral wind load of [0.24] [____] kPa in combination with the required axial loads.

Specifier Note: Free play does not include the deflection under applied load. The provisions in 1.5.12 do not apply to masonry ties covered by CSA-A370.

Specifier Note: It is standard industry practice to apply a nominal 0.24 kPa (5 psf) lateral load on interior axial load bearing stud walls.

- .13 Design Lightweight Steel Framing 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 for [wind bearing studs] [axial load bearing studs] [floor joists] [roof joists]]. [Do not rely on collateral sheathing to help restrain member rotation and translation perpendicular to the minor axis]. Provide bridging at 1524 mm o.c. maximum for wind bearing studs, 1219 mm o.c. maximum for axial load bearing studs and 2134 mm o.c. maximum for joists. Space bridging at equal intervals over the span length of the member. Closer spacings may be required to satisfy structural requirements.
- .20 Design diagonally braced stud walls to act as shear walls. The location of the shear walls and the applied factored lateral loads are indicated on the [Structural] [Architectural] drawings.
- .21 For stud walls, provide head, sill and jamb members and connections to frame openings larger than [100] [____] mm in any dimension. For joists, provide headers and trimmers and connections to frame openings larger than [100] [____] mm in any dimension.
- .22 For stud walls anchor top and bottom track to the structure at a maximum spacing of 813 mm o.c. Closer spacings may be required to satisfy structural requirements.

Specifier Note: It is not the responsibility of the Contractor to do a lateral load analysis on the building. The Architectural or Structural contract drawings must therefore show the location of proposed lateral load resisting elements and the magnitude of the forces acting on them.

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.

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.

2. Products

2.1 Acceptable Manufacturers.

- .1 Manufacturers must be certified to CSSBI-61.
- .2 Provide Lightweight Steel Framing and accessories manufactured by any of the following:
[_____].

Specifier Note: Provide a list of acceptable manufacturers from the list of CSSBI members.

2.2 Materials

- .1 Lightweight Steel 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 Lightweight steel framing members forming part of the exterior building envelope shall have a minimum coating of Z180 galvanizing in accordance with ASTM A653/A653M or AZM150 for 55% aluminum-zinc alloy coated to ASTM A792/A792M.

Specifier Notes: The coatings specified in 2.2 are minima by the CSSBI. 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. 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 F3125M. 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 490 MPa minimum tensile strength series (e.g. E49XX).

- .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].

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 Where specified, provide cut-outs centred in the webs of members to accommodate services and through-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	38 max.	114 max.	610 min.
≥ 152	64 max.	114 max.	610 min.

*The distance from the centreline of the last unreinforced cut-out to the end of the member shall be not less than 305 mm.

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

Table 3: Length Tolerances

Member Type	Length Tolerance (mm)
Tracks	+12.7 / -6.4
Wind Bearing Studs	± 2.38
Axial Load Bearing Studs	± 2.38
Joists	± 2.38

- .3 Cross sectional geometry tolerances for members shall conform to AISI S240.
- .4 The minimum 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 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 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 axial load bearing studs, out of plumbness and out of straightness (camber and sweep) shall not exceed 1/1000th of the member length.

.3 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.

.4 For joists, out of straightness (camber and sweep) shall not exceed 1/1000th of the member length.

.5 For track, camber shall not exceed 1/400th 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 3.2 mm for axial load bearing studs or 6.4 mm for wind bearing studs.

.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 For studs and joists, reinforce cut-outs where the distance from the centreline of the cut-out to the end of the member is less than 305 mm. Submit the reinforcing detail to the [Project Engineer] [Architect] for approval.

.11 All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at roof/wall and floor/wall intersections.

.12 Complete bearing shall be maintained under tracks to provide for load transfer in axially loaded assemblies. Any discrepancy shall be brought to the attention of the [Project Engineer] [Architect].

- .13 Joists, or their end stiffeners, shall be located directly over axial load bearing studs. Alternatively, a load distribution member shall be provided to transfer loads. The use of track as a load distribution member is not permitted.
- .14 Holes that are field cut into Lightweight Steel Framing members shall conform to the requirements of Section 3.2.
- .15 Replace members with localized damage.
- .16 Unless a closer spacing is shown on the shop drawings, anchor top and bottom tracks securely to structure at [____] [813 mm] o.c. maximum. Place one additional anchor within 102 mm of the end of each piece of track and additionally as required by the shop drawings.
- .17 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.
- .18 Splicing of axial load bearing members is not permitted.
- .19 Insulation equal to that specified shall be placed in all jamb and header assemblies that will be inaccessible after their installation into the wall. Ensure that insulation is kept dry and not compressed.
- .20 Handling and lifting of prefabricated panels shall not cause permanent distortion to any member or collateral material.
- .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.

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.

- .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 ensure 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.