SECTION 05 40 00 – cold-formed metal framing

1. GENERAL
   1. SUMMARY
      * + 1. Unless otherwise specified conform to CSA-S16, Steel Structures for Building - Limit States Design and CAN/CSA-S136, Cold Formed Steel Structural Members.
          2. Related Requirements:

Section 04 20 00 – Masonry.

Section 06 10 00 – Rough Carpentry.

Section 07 21 13 – Board Insulation.

Section 07 21 16 – Blanket Insulation.

Section 07 52 16 – SBS Modified Bituminous Membrane Roofing.

Section 07 54 23 – Thermoplastic Polyolefin Roofing (TPO).

Section 08 44 13 – Glazed Aluminum Curtain Wall.

Section 09 29 00 – Gypsum Wallboard.

* 1. REFERENCE STANDARDS
     + - 1. Canadian Institute of Steel Construction (CISC):

CISI - Specification for the Design of Cold‑Formed Steel Structural Members, in accordance with CAN/CSA-S136.

* + - * 1. American Society for Testing and Materials (ASTM):

ASTM A153/A123M-09, Zinc Coating (Hot-Dipped) on Iron and Steel Hardware.

ASTM A568/A568M-11b, General Requirements for Steel Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.

ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

ASTM C955-11c, Standard Specification for Load bearing (Transverse and Axial) Steel Studs, Runners (Track), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases.

* + - * 1. American National Standards Institute/American Welding Society:

ANSI/AWS D1.3, Structural Welding Code - Sheet Steel.

* + - * 1. Canadian Standards Association:

CSA-W47.1, Certification of Companies for Fusion Welding of Steel Structures.

CSA-W59-03 (R2008), Welded Steel Construction (Metal Arc Welding).

CSA-S16-09, Design of Steel Structures.

CAN/CSA-S136-07, North American Specification for the Design of Cold-Formed Steel Structural Members.

* + - * 1. Canadian General Standards Board (CGSB):

CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

* + - * 1. Canadian Sheet Steel Building Institute:

CSSBI 51M-1991, Lightweight Steel Framing Design Manual.

* 1. SYSTEM DESCRIPTION
     + - 1. Design Requirements:

Have Work of this Section designed by a professional engineer licensed to design structures and registered in the place of Work.

Design cold formed metal framing system to resist pressure and suction of wind loads, snow loads, snow load build-up and temperature range, expected in the geographical area for this Project, under the local Building Code, climatic information for 30 year probability without any detrimental effects on appearance and performance.

Design shall be based on Limit States Design principles using factored loads and resistances.

Deflection (inward or outward) shall not be greater than L/720 of the span between points of support.

Resistance strength and resistance factors shall be determined in accordance with applicable building code requirements and CAN/CSA-S136.

Construct Work of this Section to provide for expansion and contraction of components as will be caused by ambient temperature range without causing buckling, failure of joint seals, undue stress on fasteners or other effects detrimental to appearance or performance.

Section properties shall be computed on the basis of the nominal core thickness.

Design bridging to prevent member rotation and member translation perpendicular to the minor axis. Provide for secondary stress affects due to torsion between lines bridging. Sheathing shall not be used to help restrain member rotation and translation perpendicular to the minor axis for wind bearing studs.

Design cold formed metal framing system to support loads and superimposed loads transferred from cladding and include for design of support and attachment components between other assemblies and stud system. Responsibility for design of exterior wall loads transferred from other envelope components is part of Work of this Section.

* 1. SUBMITTALS
     + - 1. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
         2. Shop Drawings:

Prepare and submit shop and erection drawings which conform to the requirements of the CAN/CSA-S16, and as specified herein.

Cold formed metal framing system must have shop drawings prepared by qualified draftsmen, checked by, and bearing the seal of a professional engineer registered to design structures and practice in the place of Work.

Show the size, spacing and location of connections, attachments, reinforcing and anchorage. Include necessary plans, elevations, and details. Indicate size and type of fastening. For weld connections use welding symbols in compliance with AWS and indicate clearly net weld lengths.

Submit typical details of connections, and any special connections for approval before preparation of shop drawings.

Review of shop drawings by the Consultant and Structural Engineer will not absolve the Contractor from his responsibility of providing materials and equipment to complete and finish Work of this Section in accordance with the architectural and structural drawings. Departures or differences from the referenced drawings shall be approved in writing by the Consultant.

* 1. QUALITY ASSURANCE
     + - 1. Conform to requirements of CAN/CSA-S16, Steel Structures for Buildings, and CAN/CSA-S136, Cold Formed Steel Structural Members.
         2. Work to be executed by firm thoroughly conversant with laws, by-laws and regulations which govern, and capable of workmanship of best grade of modern shop and field practice known to recognized manufacturer's specializing in this work.
         3. Work shall be executed by workers especially trained and experienced in this type of work. Have a full time, senior, qualified representative at the site to direct the work.
         4. Install system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
         5. Install system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
  2. INSPECTION AND TESTING
     + - 1. An independent inspection and testing company appointed and paid for by the Owner may carry out inspection and testing of the structural steel stud systems in accordance with Section 01 45 00 – Quality Control.
         2. Provide free access for inspectors to all places where work is being done.
         3. Inspectors are to ensure that materials conform to the requirements of this Section.
         4. Any inspection and/or testing required because of an error by the Contractor, or due to departure from the Contract Documents shall be paid for by the Contractor.
         5. Inspection and testing of structural metal stud systems shall include, but shall not be limited to the following:

Checking that mill test reports are properly correlated to materials.

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

Checking that the welding conforms to the requirements of CSA W47.1, CSA W59 (R2008) and/or ANSI/AWS D1.3, whichever is applicable.

Checking fabricated members against specified member shapes.

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

Sample checking of screwed and bolted joints.

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

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

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

Submission of reports to the Consultant covering the work inspected with details of deficiencies discovered.

* + - * 1. The inspection and testing provided in this Section does not relieve the Contractor of his responsibility for the performance of the Contract. The Contractor shall implement his own supervisory and quality control procedures.
        2. Materials and/or workmanship not conforming to the requirements of the Contract Documents may be rejected at any time during the progress of the work and shall be replaced and/or repaired without cost to the Owner.
  1. DELIVERY, STORAGE, HANDLING AND PROTECTION
     + - 1. Coordinate deliveries to comply with Construction Progress Schedule and arrange ahead for off-the-ground storage location. Do not load any area beyond the design limits.
         2. Adequately protect steel against rust and damage during manufacturing, delivery and storage.
         3. Store material on planks on a dry area and protect from damage. Make good immediately any damage done, clean scratches and the like, touch-up with specified primer.

1. PRODUCTS
   1. MANUFACTURERS
      * + 1. Cold formed metal framing as indicated on drawings and as specified herein shall be by one of the following:

Bailey Metal Products Limited.

Canadian Steel Manufacturing, Division of British Steel Canada Inc.

Lightsteel Inc., Boucherville, Quebec.

Approved equal.

* 1. MATERIALS
     + - 1. Faming materials shall conform to the requirements of CAN/CSA-S136.
         2. Galvanized Sheet Steel:

Conform to ASTM A653/A653M, minimum Grade D, 50 PSI (345 Mpa) yield for 1.5mm (.060") material.

* + - * 1. Structural Metal Studs:

Galvanized sheet steel formed to channel shape, of minimum gauge, sizes, and section properties to meet design requirements, and conforms to ASTM C955.

* + - * 1. Metal Stud Runners/Top and Bottom Tracks:

Galvanized sheet steel formed to channel shape, having same width as studs, with tight fit and solid web, of minimum gauge to meet design requirements, but no less than gauge of metal studs, and conforms to ASTM C955.

* + - * 1. Metal Plates, Bridging, Gussets and Clips:

Formed from galvanized sheet steel, of gauges, shapes and sizes required to meet design requirements determined for conditions encountered, and of same finish as framing members.

* + - * 1. Fastenings:

Self‑drilling, Self‑tapping Screws, Bolts, Nuts and Washers: Hot‑dip galvanized to 1.25 ounce per square foot and conforms to ASTM A153/A153M-09, Class B3, '12-24 x 7/8 HWH #4STLG' by Hilti Canada or approved equal.

Anchorage Devices: Power driven, powder actuated, drilled expansion bolts, or screws with sleeves, as application dictates.

Welding Materials: Conforms to CSA W59.

Electrodes for welding shall have minimum 480 Mpa tensile strength series, (E480XXX, E480S-X).

* + - * 1. Touch-Up Primer:

Ready mixed, zinc-rich primer, and conforms to CAN/CGSB-1.181, 'Sealtight Galvafroid Zinc-Rich Coating' by W.R. Meadows of Canada Limited, or 'Zinc Clad No.7 Organic Zinc Rich Primer' by Sherwin Williams Company of Canada Ltd. or approved equal.

* + - * 1. Dampproof Course:

No. 15 asphalt building paper conforming to CAN/CGSB-51.32-M77.

* 1. FABRICATION
     + - 1. Fit and assemble work in shop where possible. Execute work according to details and reviewed shop drawings.
         2. Take measurements at the building for work which is to fit or be connected to steel, concrete framing, or masonry, before commencing fabrication.
         3. Structural metal studs shall have one unreinforced service cut-out centred in the web of the studs and with the centreline of the cut-out a minimum of 455mm (1'-6") from the bottom of the studs. In addition to the above, provide cut-outs for internal bridging as required. All unreinforced cut-outs shall conform to dimension limitations of Table 1, in the CSSBI M50-1987 Manual.
         4. Provide prepunched cut-outs in inner top track for anchor clearances so that deflection clearances are not reduced.
         5. Fabrication tolerances for cold formed steel framing members shall Table 2 of the CSSBI M50-1987 Manual.
         6. Cutting of cold formed steel framing members shall be by "power saw" or "shear" methods. Cutting by "torch" method shall not be permitted.
         7. Steel thickness, exclusive of coating shall be marked on all cold formed steel framing members by embossing, or by stamping with indelible ink, or by colour coding method.
         8. Gauges and sizes of metal shall be adequate for various conditions.

1. EXECUTION
   1. EXAMINATION
      * + 1. Verify at site that the work to receive the Work of this Section is free of irregularities detrimental to the installation and performance of the work and that it is located correctly and at proper levels before delivery and installation.
          2. Verify that building framing components are ready to receive work.
          3. Beginning of installation means acceptance of existing conditions.
   2. ERECTION OF STUDS
      * + 1. Install components in strict accordance with manufacturer's written instructions.
          2. Methods of construction may be either piece by piece (stick-built), or by fabrication into panels (panelized) either on or off site. Handling and lifting of prefabricated panels shall not cause permanent distortion to any member or collateral material.
          3. Cold formed steel framing shall be erected true and plumb within the tolerances specified herein. 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 Contractor 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.
          4. Erection Tolerances:

For the purposes of erection tolerances, "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.

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.

For runners/tracks, camber shall not exceed 1/1000th of the member length.

Studs shall seat into top and bottom runners/tracks. The gap between the end of the stud and the web of the runner/track shall not exceed 4mm (5/32") for wind bearing studs.

Where cold formed metal framing is made in prefabricated panels, align adjacent prefabricated panels to provide surface continuity at the interface.

Spacing of studs shall not be more than 3mm (1/8") from the design spacing. The cumulative error in spacing shall not exceed the requirements of the finishing materials.

* + - * 1. Align floor and ceiling runners/tracks, locate to wall or partition layout. Secure in place with screws or welding at maximum 610mm (24") O.C. Coordinate installation of sealant with floor and ceiling track.
        2. Place studs to meet design requirements as indicated on approved shop drawings, and not more than 50mm (2") from abutting walls, and at each side of openings. Connect studs to tracks using clips and ties, screws, or welding. Diameter of screws shall be equal to, or exceed the minimum diameter indicated on the reviewed shop drawings. Penetration of screws beyond joined materials shall be not less than three (3) exposed threads. Thread types and drilling capability of screws shall conform to the manufacturer's written recommendations to suit design requirements and conditions. Screws to be covered by sheathing materials shall have "low profile" type heads.
        3. Field cutting of cold formed steel framing members shall be by "power saw" or "shear" methods. Cutting by "torch" method shall not be permitted.
        4. Holes that are field cut into cold formed steel framing members shall conform to the dimensional requirements of Table 1, in the CSSBI M50-1987 Manual.
        5. Brace structural metal studs as required to meet design requirements and as indicated on reviewed shop drawings.
        6. Provide continuous dampproof course to underside of bottom runner/track.
        7. Construct corners using minimum of three studs. Double studs at door, window jambs, and wall openings.
        8. Erect studs one-piece full length. Splicing of studs is not permitted.
        9. Erect load bearing studs, brace, and reinforce to develop full strength to meet design requirements.
        10. Refer to drawings for height of partition framing.
        11. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
        12. Install intermediate studs above and below openings to match wall stud spacing.
        13. Provide deflection allowance in stud bottom runner/track, directly below horizontal building framing for non‑load bearing framing.
        14. Attach cross studs or furring channels to studs for attachment of fixtures anchored to walls. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
        15. Touch-up field welds and damaged galvanized surfaces with two coats of zinc rich touch-up primer.

END OF SECTION