CSSBI S17-2005: Guide Specification for Steel Building Systems

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SPEC NOTE: DESCRIPTION: This Section specifies performance criteria for Steel Building Systems. For some components, materials and finishes other Sections may be added. Avoid conflicts between specified performance criteria and prescriptive statements in other Sections.

Part 1 - General

1.1 RELATED WORK SPECIFIED ELSEWHERE

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

1.1.1 Section [01330 - Submittal Procedures].

1.1.2 Section [01355 - Waste Management and Disposal].

1.1.3 Section [[_____] [_____] Insulation].

1.1.4 Section [08110 - Steel Doors and Frames].

1.1.5 Section [[_____] [Glazing] [Windows]].

1.1.6 [List Other]

1.2 SCOPE OF WORK FOR STEEL BUILDING SYSTEM

1.2.1 The work shall include the following:

.1 Structural design of steel building system primary and secondary framing.

.2 Design of anchor bolts (quantity and diameter only).

.3 Design of metal cladding and roofing.

.4 Preparation of shop drawings.

.5 Supply of steel building system primary and secondary framing.

.6 Reinforcement and framing required by mechanical penetrations and projections, and doors and windows.

.7 Drawings for the steel building system shall bear the seal of a professional engineer registered in the province the work is to take place in.

1.3 REFERENCES

SPEC NOTE: Edit to suit standards specified in project specification.

1.3.1 American Society for Testing and Materials (ASTM)

.1 ASTM A307-04, Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

.2 ASTM A325M-04b, Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength [Metric].

.3 ASTM 490M-04a, Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).

.4 ASTM A529/A529M-04, Specification for High-Strength Carbon-Manganese Steel of Structural Quality.

.5 ASTM A653/A653M-04a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.6 ASTM A792/A792M-03, Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.7 ASTM A1011/A1011M-04a, Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength-Low Alloy and High-Strength Low-Alloy with Improved Formability.

.8 ASTM A992/A992M -04a Standard Specification for Structural Steel Shapes

.9 ASTM A36/A36M-04 Standard Specification for Carbon Structural Steel

.10 ASTM A475, Standard Specification for Zinc Coated Steel Wire Strand

1.3.2 Canadian Institute of Steel Construction/Canadian Paint Manufacturers Association (CSIC/CPMA)

.1 CISC/CPMA 1-73a. Quick Drying, One-Coat Paint for use on Structural Steel.

1.3.3 Canadian Sheet Steel Building Institute (CSSBI)

.1 CSSBI 30M-95, Standard for Steel Building Systems.

.2 CSSBI C1-04, Certification of Design and Manufacturing Conformance (NBCC 1995).

.3 CSSBI S8-2001, Quality & Performance Specification for Prefinished Sheet Steel Used for Building Products.

.4 CSSBI Fact Sheet #3, Care and Maintenance of Prefinished Sheet Steel Building Products.

1.3.4 Canadian Standards Association (CSA)

.1 CSA-A660-04, Certification of Manufacturers of Steel Building Systems.

.2 CAN/CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.3 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.4 CAN/CSA-S16-01, Limit States Design of Steel Structures.

.5 CAN/CSA-S136-01, North American Specification for the Design of Cold-Formed Steel Structural Members.

.6 CSA-W47.1-03, Certification of Companies for Fusion Welding of Steel

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

1.4 SYSTEM DESCRIPTION

1.4.1 Type: [rigid frame] [beam and column] [truss frame] [self-framing] with vertically braced bays as indicated.

1.4.2 Roof slope: minimum [_____].

1.4.3 Wall system: [[through fastened] [concealed fastener] single skin] [sandwich][thermal wall] panels.

1.4.4 Roof system: [standing seam] [lapped seam] [[through fastened] [concealed fastener] single skin] [sandwich] [thermal wall] panels.

SPEC NOTE: Delete 1.4.5 if not applicable.

1.4.5 Self-framing truss type roof system: [lapped seam parallel chord truss] [bow string truss] [pitched truss] consisting of roof and ceiling panels connected with diagonal web members.

1.5 DESIGN

SPEC NOTE: Design to NBCC or relevant codes, also conform to relevant CSSBI standards. Use 1.5.1 for every project, edit following paragraphs to select optional criteria applicable for project conditions.

1.5.1 Standards:

.1 Design to conform to the National Building Code of Canada, [1995] [2005] and applicable Provincial and local Codes.

.2 Design structural steel to CAN/CSA-S16-01.

.3 Design cold formed steel sections to CAN/CSA-S136-01.

.4 Fabricators shall be certified by the Canadian Welding Bureau to the requirements of CSA Standard W47.1, Division 1 or 2.1.

.5 Companies performing field welding shall be certified by the Canadian Welding Bureau to the requirements of CSA Standard W47.1.

.6 Erect to the CISC Code of Standard Practice.

.7 Building manufacturer shall be certified to CAN/CSA-A660-04.

1.5.2 Design Criteria:

.1 Main column spacing shall be as indicated on the plans.

.2 Wind columns on the building ends shall be as indicated on the plans.

.3 The minimum clear internal height of the building shall be as indicated on the drawings.

.4 The main building frames shall be designed as steel moment-resisting frames. The base of the frames shall be assumed to act as pinned. Frames to be designed by the bare frame method and not use composite stiffness.

.5 Provide diagonal bracing perpendicular to main building frames and in building end walls. Locate bracing in bays designated on the drawings where shown.

.6 Design building walls and roof to allow for thermal movement of component materials caused by ambient temperature range of [___] [75] deg C without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.

.7 Ensure total absence of condensation on the interior surfaces under following minimum condition:

i) Interior: 22 deg C, [__] [30] % relative humidity, (RH), still air.

ii) Exterior: [minus [__] [40]] deg C, [__] [25] km/h wind.

.8 Building shall be weather tight.

.9 Provide for positive drainage to exterior of condensation occurring within wall construction and water entering at joints.

.10 Design building enclosure elements to accommodate, by means of expansion joints, any movement in element itself and between elements and building structure caused by structural movements without permanent distortion, damage to infills, racking of joints, breakage of seals, water penetration or glass breakage.

.11 Provide sub-framing for all openings, indicated on the plans.

1.5.3 Loading Definitions:

.1 Dead loads shall include the self-weight of the structure and all permanent materials of the building construction.

.2 Collateral loads shall include mechanical and electrical equipment, sprinkler systems, suspended ceilings and all other removable parts of the structure.

.3 Live loads shall include superimposed loads on the structure due to the following:

i) Use and occupancy loads.

ii) Snow, rain, and ice effects.

iii) Maintenance and construction loads.

iv) Wind loads.

v) Earthquake loads.

vi) Thermal loads.

vii) Differential foundation settlement.

viii) Crane loads.

1.5.4 Climatic Data:

.1 Snow load:
Ground Snow Load S_S ___ kPa
Rain Load S_r ___ kPa

.2 Hourly Wind Pressures:
1/10 year probability ___ kPa
1/30 year probability ___ kPa
1/100 year probability ___ kPa

.3 Seismic Data:
Z_a ___
Zv ___
Zonal velocity ratio, v ___

.4 Specified Rain Load (one day rain) ___ mm

.5 Specified Rain Load (15 min rain) for downspout design ___mm

1.5.5 Design Loads:

.1 Snow load shall be determined in accordance with NBCC 1995. Cb shall be 0.8. The wind exposure factor Cw shall be 1.0 [0.75]. Load combinations shall be applied in accordance with the NBCC.

.2 Wind load shall be in accordance with NBCC 1995. Wind exposure factor Ce shall be 1.0.

.3 Dead load shall be the self-weight of the Steel Building System, and all specified permanent loads from supported floors, walls, and roofs.

.4 Collateral gravity load shall be as follows:

i) Lighting, piping, suspended ceilings, wiring, sprinkler runs and miscellaneous mechanical loads: ____ kPa

ii) Refer to structural drawings for additional requirements.

iii) Crane loads shall be for
a ____ tonne crane.
Wheel load _____kPa
Wheelbase _____ mm
Longitudinal Thrust ____kPa
Lateral Thrust ____ kPa]
Service Class_____

1.5.6 Deflection Limitations:

.1 Building load resisting frames: lateral drift shall not exceed [1/60][1/80] [1/100] [1/300] of the height measured at the eave, under wind loads or applicable lateral cranes loads.

SPEC NOTE: A deflection limit of 1/300 may be required for the proper functioning of cranes or to prevent damage to brittle finishes such as brick and glass.

.2 Roof framing: [1/180] [1/240] of the clear span under full specified roof live load.

.3 Wall Cladding and girts: [1/180] of the clear span under full specified wind effects.

.4 Maintain tolerance for the building structure and enclosure elements as follows or per CAN/CSA-A660 whichever is more restrictive:

i) maximum variation from plane or location shown on shop drawings.

ii) 3 mm/3m of length to 6mm/30m maximum.

1.6 SOURCE QUALITY CONTROL

1.6.1 Provide certification that the steel building system manufacturer is certified to CSA-A660.

1.7 SHOP DRAWINGS

SPEC NOTE: Edit following paragraphs to select optional criteria applicable for project.

1.7.1 Submit shop drawings in accordance with Section [01340 – Shop Drawings, Product Data, Samples and Mock-ups] [01330 – Submittal Procedures].

1.7.2 Submit shop drawings bearing stamp and signature of professional engineer registered in [Canada] [[Province] [Territory] of [_____]] in which work takes place.

1.7.3 Submit the following documents in accordance with CSSBI 30M, para 13: Erection drawings showing foundation loads, anchor bolt setting details part numbers, connections and assembly details.

1.7.4 Indicate plans and grid lines, structural members and connection details, bearing and anchorage details, roof cladding, wall cladding, framed openings, accessories, schedule of materials and finishes, loads and reaction forces, fasteners and field welds, sealant locations and details.

1.7.5 Indicate shop and erection details including cuts, copes, connections, holes, threaded fasteners, rivets and welds. Indicate welds by CSA welding symbols.

1.7.6 Indicate on erection shop drawings related provisions required for mechanical, electrical and other work, when such information can be supplied to building manufacturer at time of initial order.

1.8 CERTIFICATES

1.8.1 Submit CSA-A660 Certificate of Design and Manufacturing Conformance with NBC, 1995 stating design criteria used and loads assumed in design. Certificate shall be signed and sealed by a professional engineer registered in [Canada] [[Province] [Territory] of [_____]] in which work takes place.

1.9 STORAGE AND PROTECTION

1.9.1 Protect prefinished steel sheet during fabrication, transportation, site storage and installation in accordance with CSSBI Fact Sheet #3.

1.9.2 Handle and protect metallic coated materials from damage to metallic coating. During storage space surfaces of metallic coated materials to permit free circulation of air.

1.9.3 Provide protection from weather to all primary and secondary steel components if stored on site by means of properly secured tarps. Components should be prevented from prolonged contact with the ground by means of adequately spaced blocking.

2 PRODUCTS

2.1 MATERIALS

2.1.1 Structural steel: to [CAN/CSA-G40.21] [ASTM A992/A992M], [340 MPa (50 ksi)] minimum yield strength, [shop primed] [hot dipped zinc coated to CAN/CSA-G164 to [____] g/m^2] [unprotected].

2.1.2 Bolts: to [ASTM A307 for secondary structural connections] [ASTM A325M] [ASTM A490M] for primary structural connections, minimum 12mm diameter, [plain] [galvanized] complete with nuts and washers.

2.1.3 Welding materials: to CSA-W59.

2.1.4 Shop primer paint: to [CISC/CPMA 1-73a, [1.5 to 2] mils film thickness].

2.1.5 Anchor [rods] [bolts]: to [ASTM F1554] [ASTM A36]

2.1.6 Purlins & girts: [hot rolled sheet steel conforms to [CSA-G40.21] [ASTM A1011/A1011M], 340 MPa (50 ksi) minimum yield], [high strength ductile steel in conformance with requirements of CAN/CSA-S136, with minimum yield strength of 380 MPa (55 ksi)], [zinc coated (galvanized) to Z275 per ASTM A653M], [55% aluminum-zinc alloy coated to AZM150 per ASTM A792M], [shop primed].

2.1.7 Rod: to [CSA-G40.21] [ASTM A992/A992M], [300MPa(44ksi)] [340MPa (50 ksi)]] [ASTM A36 (36ksi)] minimum yield, shop primed.

2.1.8 Cable: Galvanized strand to [ASTM A475 Class A coating] [CSA G12]. Design strength based on manufacturer's published breaking strengths.

2.1.9 Eye bolts: Forged, [ASTM 1030 carbon steel], [hot-dip galvanized]. Design strengths based on manufacturers published breaking strengths.

2.1.10 Screws: corrosion resistant purpose made, head colour to match attached sheet.

2.1.11 Insulation and tape: as per Section 07213.

2.1.12 Insulation adhesive; purpose made for insulation type and steel liner sheet, incombustible after initial set.

2.1.13 Vapour barrier and sealing tape: as recommended by insulation manufacturer.

2.1.14 Sealants: [in accordance with Section [07900 – Joint Sealers]] [as recommended by sealant manufacturer].

2.2 FABRICATION

2.2.1 Fabricate structural members in accordance with shop drawings and to CAN/CSA-S16. Tolerance not to exceed those specified in CAN/CSA-S16.

2.2.2 Provide holes for attachment of other work, as indicated.

2.2.3 Reinforce openings to maintain design strength.

2.2.4 All structural steel shall be new un-used steel free of loose mill scale, rust, dirt, oil, and other deleterious matter.

2.2.5 All framing members shall be shop fabricated for bolted field assembly. Cutting, drilling, or welding in the field shall be minimized, and when required shall be clearly noted on the shop drawings.

2.2.6 All members and sections shall be closely fitted and finished true to line.

2.3 COMPONENTS

2.3.1 Wall System

.1 Exterior sheet-wall: factory preformed steel sheet, minimum [___] mm base steel thickness, [zinc coated] [55% aluminum-zinc alloy-coated], [prefinished] [unpainted] from manufacturer's standard profiles. Include closures, gaskets, caulking, flashing and fasteners to effect weathertight installation. Cut ends of sheets square and clean.

.2 Exterior corners-wall: of material to match finish, thickness [and profile] of adjacent cladding material, shop cut and brake formed to correct angle.

.3 Accessories to exterior wall cladding: brake or bend to shape, of material and finish to match wall cladding [comprising cap flashings], [drip flashings], [internal corner flashings], [copings and closures for [head] [jamb] [sill] corners].

.4 Interior liner sheet-wall: factory preformed steel sheet, minimum [___] mm base steel thickness, [zinc coated] [55% aluminum-zinc alloy-coated], prefinished of manufacturer's standard profile [indicated], with interlocking side lap. Install sealant material in interlocking lap for vapour barrier applications. Cut ends of sheets square and clean.

.5 Sub-girts and clips: factory preformed steel sheet minimum [___] mm base steel thickness, [zinc coated] [55% aluminum-zinc alloy-coated].

2.3.2 Roof System

.1 Exterior sheet-roof: factory preformed steel sheet, minimum [___] mm base steel thickness,[zinc coated] [55% aluminum-zinc alloy-coated], [prefinished] [unpainted] from manufacturer's standard profiles. Include closures, gaskets, caulking, flashing and fasteners to effect weathertight installation. Cut ends of sheet square and clean.

.2 Accessories to roof cladding: brake or bend to shape, of material and finish to match roof cladding or wall cladding where applicable, comprising [cap flashings], [drip flashings], [coping and closures for [corners], [fascia] and [soffit]].

.3 Sub-purlins and clips: factory preformed steel sheet minimum base steel thickness [___] mm, [zinc coated] [55% aluminum-zinc alloy-coated].

.4 Interior sheet-ceiling: factory preformed steel sheet, minimum [___] mm base steel thickness, [zinc coated] [55% aluminum-zinc alloy-coated], prefinished of manufacturer's standard profile [indicated], with interlocking side lap. Install sealant material in interlocking lap. Cut ends of sheets square and clean.

.5 Diagonal web members: factory preformed steel sheet minimum [___] mm base steel thickness, [zinc coated], [55% aluminum-zinc alloy-coated] shop cut and formed to profile [indicated] from manufacturer's standard.

.6 Gussets, lateral spacers: factory preformed steel sheet, minimum [___] mm base steel thickness, [zinc coated] [55% aluminum-zinc alloy-coated] shop cut and formed to profile from manufacturer's standard.

2.3.3 Gutters & Downspouts

.1 Form gutters and downspouts from minimum [___] mm base steel thickness, material and finish to match wall cladding material to size and profile with outlets as indicated. Provide:

i) Support straps and fastenings,
ii) Flute fillers and sealants,
iii) Leaf screens and dams for outlets.
iv) [Snow guards]

2.4 FINISHES

2.4.1 Clean, prepare surfaces and shop prime structural steel to CISC/CPMA 1-73a [except where members are zinc coated or 55% aluminum-zinc alloy coated or are to be encased in concrete].

2.4.2 Where pre-finished steel is specified, roof panels, wall panels, liner panels and accessories to be pre-finished as per CSSBI S8-2001 specification using the [8000+ series] [10000 series] [___] paint system.

3 EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

3.1.1 Delivery and Handling

.1 Before delivery, mark building pieces clearly with substantial tags indicating the erection drawing number and other information required for identification. Mark long members at each end. All products shall be suitably packaged and adequately braced for shipment.

.2 All items shall be protected and handled so that they will not be over-stressed, bent, broken, deformed or otherwise damaged before and during delivery.

.3 Care shall be taken to avoid damage to protective coating finishes.

.4 All lifting devices and rigging shall conform to the Occupational Health and Safety Regulations and in no case shall have a safety factor less than 4.

.5 All erection bolts shall be shipped with the first delivery of steel in appropriate containers.

.6 One copy of the master shipping list shall be transmitted by the Contractor in a waterproof package with each shipment of steel. One copy shall be mailed to the field office the same day the steel leaves the shop.

3.1.2 Storage

At the site all units shall be stored off the ground on blocking or skids, with identification marks readily visible, so that materials are protected from damage, deterioration, and corrosion.

3.2 ERECTION

3.2.1 Do work in accordance with CSSBI 30M, Standard for Steel Building Systems except where specified otherwise.

3.2.2 Erect structural frame in accordance with shop drawings and to CAN/CSA-S16. Erection tolerances not to exceed those specified in CSSBI 30M.

3.2.3 Structural bolts at connections subject to tension loads to be tightened by turn-of-nut method and bolts are to be marked to indicate completion of procedure

3.2.4 Contractor shall be responsible for the stability of the structure during its erection. Temporary bracing and guys shall be used to maintain structural integrity and to keep the structural members plumb and true during erection.

3.2.5 Prepare galvanized structural steel surfaces for field welding by removing zinc before welding. After welding, chip away flux and prime with [CGSB 1-GP-178-Ma]. Touch up welded areas with a zinc rich primer or similar.

3.2.6 Obtain written permission of [Engineer] [Consultant] prior to field cutting or altering of structural members.

3.2.7 Touch up with shop primer [bolts], welds and burned or scratched surfaces where exposed at completion of erection.

3.2.8 Install wall cladding assemblies ensuring a completed installation.

3.2.9 Secure roof-cladding sheets to structural [purlins] [beams]. Terminate sheet ends over structural supports.

3.2.10 Install roof assemblies ensuring a completed installation.

3.2.11 Install interior [ceiling] [and] [wall liner] panels to ensure continuous [vapour] [air] [dust-proof] barrier.

3.2.12 Install all necessary closures, gaskets, caulking sealants and flashings.

3.2.13 Install insulation and vapour retarder to maintain continuity of thermal and moisture protection to building elements and spaces.

3.2.14 Fit insulation closely around and behind electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

3.2.15 Keep insulation away from hot surfaces, chimneys and gas vents.

3.2.16 Do not compress insulation to fit into spaces.

3.2.17 For roof system, apply insulation in ceiling to form continuous thermal barrier.

3.3 FIELD QUALITY CONTROL

3.3.1 Inspection and testing of materials and workmanship will be carried out by an Inspection and Testing Company designated by the [Engineer] [Architect].

3.3.2 The Inspection and Testing Company will carry out vertical and horizontal alignment checks inspection of bolt installation, and inspection of representative connection welds.

3.3.3 Contractor will pay costs of inspection and testing from the cash allowance as specified in Section 01021 – Allowances. Costs for any re-inspections and/or re-testing as a result of deficient work will be paid for by the contractor.

3.3.4 Prior to inspection & testing by the Inspection and Testing Company the structural steel erection contractor will carry out an inspection of the work and make the inspection results available to the Engineer/Architect and the Inspection and Testing Company. The inspection report will identify the areas or work inspected, deficiencies identified and measures taken to correct the deficiencies.