

PART 1 GENERAL

1.1 Work Included

- .1 Structural steel framing members, beams, columns, structural steel support members and struts, complete with required bracing, welds, washers, nuts, shims, anchor plates and bolts.
- .2 Base plates, connectors and bearing plates, rivets, wall anchors, girts, purlins, attached accessories, shelf angles and brackets.
- .3 Field and shop welded composite studs shall be supplied and installed under this section.
- .4 Erection.
- .5 Painting of material supplied.

1.2 Related Work

- .1 Concrete Form Work Section 031000.
- .2 Cast-in-Place Concrete Section 033000.
- .3 Pre-Engineered Light Gauge Metal Building Section 051220
- .3 Metal Fabrications Section 055000.
- .4 Painting and Finishing Section 099120.

1.3 Work Supplied Only - Installed by Others

- .1 Anchor bolts.
- .2 Embedded plates and assemblies.

1.4 Quality Assurance

- .1 On date of tender and for duration of contract, fabricator shall be certified by the Canadian Welding Bureau to Division 1, or Division 2.1 of CSA W47.1-1983 "Certification of Companies for Fusion Welding of Steel Structures" and to CSA W55.3-1965 "Resistance Welding Qualification Code for Fabricators of Structural Members".
- .2 Design to strictly adhere to all codes and standards as enumerated under Section 1.5. - Reference Standards.
- .3 In the event of conflict between pertinent codes, standards and/or regulations, most stringent shall govern.

1.5 References

- .1 Canadian Standards Association, Latest Edition:
 - .1 CAN/CSA S16.1-94 Limit State Design of Steel Structures.
 - .2 CAN/CSA-G40-20: General Requirements for Rolled or Welded Structural Quality Steel.
 - .3 CAN/CSA-G40.21-M181: Structural Quality Steel.
 - .4 CAN/CSA-S16.1-94: Steel Structures for Buildings (Limited States Design).
 - .5 W47.1-1983: Certification of Companies for Fusion Welding or Steel Structures (25r).
 - .6 W48 Series: Electrodes.
 - .7 W55.3-M1989: Resistance Welding Qualifications Code for Fabricators of Structural Members used in Buildings.
 - .8 W59-M1989: Welded Steel Construction (Metal Arc Welding).
 - .9 ASTM Standard A325M: High Strength Bolts for Structural Steel Joints Including Suitable Nuts and Plane Hardened Washers.
 - .10 CSA Standard W59-M1984 Welded Steel Construction.
 - .11 CSA S136 Cold-Formed Steel Structural Members
 - .12 CSA 940.21 Structural Quality Steel
 - .13 ASTM A61 (ASTM A6M) Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Ring and Bars for Structural Use
- .2 Canadian Institute of Steel Construction/Canadian Paint Manufacturer's Association:

- .1 STD 2-75: A Quick Drying Primer for Use on Structural Steel.
- .3 Steel Structures Painting Council surface preparation specifications.
- .4 American Society for Testing Materials:
 - .1 A307-1976a: Carbon Steel Externally and Internally Threaded Standard Fasteners.
 - .2 A325-1976a: High Strength Bolts for Structural Steel Joints Including Suitable Nuts and Plain hardened Washers.

1.6 Submittals

- .1 Prior to commencement of work, submit shop and erection drawings in accordance with Section 01300, Submittals.
- .2 On shop drawings, show members supplied, material standards, welds, finishes, paint and details of anchors, fasteners and accessories. It is the responsibility of the steel fabricator to provide all structural steel connection designs with the shop drawings and detail all connections on the shop drawings. Shop drawings are to be sealed and signed by a Professional Engineer registered with the Association of Professional Engineers of the Province having jurisdiction within the structural steel contract work. Show the capacity of all connections including moment connections. Structural drawings may show schematically structural steel connections and are **not** to be used for fabrication.
- .3 Upon request by the Departmental Representative, submit mill test reports on steel materials supplied under this Section indicating physical and chemical properties.
- .4 Submit a record drawing survey of that work whose erection tolerance does not meet CAN3-S16.1
- .5 Show all welds, both shop and field, by the currently recommended symbols of the Canadian Welding Bureau.
- .6 Review of shop drawings shall be for size and arrangement of principal and auxiliary members only. Such review will not relieve the Contractor of responsibility for general and detail dimension and fit, or any errors or omissions.
- .7 Substitutions:
 - .1 If at any time after the Contract is let this Contractor wishes to make changes or substitutions for the material required on the drawings or in these specifications, he shall submit all such proposed changes to the General Contractor and to the Departmental Representative for approval before substitution is made.
- .8 At time of bidding /tendering of the work, the structural steel supplier/fabricator is to assess. Connection design requirements and connection configuration (may require input from structural steel fabricator , connection design engineer during tender period for size and configuration of connection details No extra costs will be permitted for connection design fabrication and installation after tender award.

1.7 Testing

- .1 The Departmental Representative, on behalf of the Owner, may retain the services of a material testing agency to inspect and test fabricated members in the shop or field. Cooperate with such agency in its performances of its duties.
- .2 Report failures of material to fit together properly to the Departmental Representative No corrective measures are permitted unless approved the by Departmental Representative in writing.

1.8 Design

- .1 Design system used in proportioning members is "Simple Construction" according to CSA CAN3 S16.1, unless noted.
- .2 Bolted Connections:
 - .1 Friction Type:
 - .1 Connections subject to stress reversals.
 - .2 As noted on drawings.

- .2 Bearing Type:
 - .1 All others.
- .3 Bolts:
 - .1 Minimum size - 20mm, unless noted.
 - .2 Minimum number - (2) unless noted.
- .4 Design connections and assume full responsibility for same.
- .5 Check field conditions to determine exact requirements and dimensions.

PART 2 PRODUCTS

2.1 Materials

- .1 Standard Rolled Sections: New material conforming to CAN3 G40.21-M81, Grade 350W and CAN/CSA-G40.21.
- .2 Hollow Structural Sections: New material conforming to CSA Standard G40.21-M81, Grade 350W, Class C.
- .3 Base and Cap Plates: New material conforming to CSA Standard G40.21-M81, Grade 300W.
- .4 Plates over 40mm: CAN/CSA-G40.21, 230G.
- .5 Beam End Plates: Ledger Angles and Miscellaneous Steel: New material conforming to CSA Standard G40.21-M81, Grade 300W.
- .6 Anchor Bolts: New material conforming to CAN 3 G40.21-M81, Grade 260W. ASTM A307, Grade A (ASTM 568 Property Class 4.6) Carbon Steel Hex-Head Bolts; and Carbon Steel Nuts and Washers.
- .7 High Strength Bolts, Nuts and Washers: ASTM A325 (ASTM A325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts and hardened carbon-steel washers.
 - .1 Finish: Plain, uncoated.
 - .2 Finish: Hot-dip zinc-coating, ASTM A153, Class C at exposed to weather conditions.
 - .3 Direct-Tension Indicators: ASTM F959, Type 325.
 - .1 Finish: Plain, uncoated.
 - .2 Finish: Mechanically deposited zinc-coating, ASTM B695, Class 50 at exposed to weather conditions.
- .8 Non-High Strength Bolts, Nuts and Washers: ASTM A307, Grade A (ASTM F568, Property Class 4.6); carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.
- .9 Pipe: ASTM A53, Grade B.
- .10 Electrodes: CSA W48 Series.
- .11 Shop and Field Studs: Shall be Nelson headed anchors to ASTM A108-58T or approved equal. Sizes as detailed on drawings.

2.2 Primer

- .1 Primer: Fast-curing, lead and chromate-free, universal modified-alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements of FS TT-P-664.
- .2 Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 93% zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

2.3 Fabrication

- .1 Fabricate structural steel members in accordance with building design drawings and all requirements of CAN/CSA S16.1-94 and CSA/CAN3, S16.1. Welding to conform to CSA W59-M1989 "Welded Steel Construction". Verify all dimensions prior to fabrication.
- .2 No cutting or openings in structural members except as shown on structural drawings. Reinforce openings to maintain required design strength.
- .3 Provide 20mm grout weep hole in base plates near centre.
- .4 Provide column base plate assembly with end moment capacity equal to capacity generated by

- anchor bolts.
- .5 Provide full end plates for skew connections.
- .6 Accurately cut and mill column ends to assure full contact of bearing surfaces.
- .7 Camber horizontal members as specified on drawings. Mill camber up where not specifically detailed.
- .8 All bolted connections to be slip-resistant (friction type) connections.
- .9 All structural members to be connected for loads shown on drawings or half the depth of the connected member, whichever is greater.
- .10 Tolerances of all structural steel shall be maintained strictly in accordance with CAN/CSA S16.1-94.

2.4 Painting (See also Section 09900)

- .1 Clean members, remove loose mill scale, rust, oil, dirt and other foreign matter. Prepare surfaces according to SSPC Standard SP2 "Hand Tool Cleaning", and SSPC-SP3 "Power Tool Cleaning".
- .2 Apply one coat of prime paint in the shop to steel surfaces, except:
 - .1 Surfaces to be encased in concrete or mortar: Extend priming of partially embedded members to a depth of 2" (50 mm).
 - .2 Surfaces to receive field installed stud shear connectors.
 - .3 Surfaces and edges to be field welded.
 - .4 Faying surfaces of friction type connections.
 - .5 Surfaces to be high-strength bolted with slip-critical connections.
 - .6 Surfaces to receive sprayed-on fire-proofing.
 - .7 Galvanized surfaces.
 - .8 Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at a rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges and exposed surfaces.
 - .1 Stripe paint corners, crevices, bolts, welds and sharp edges.
 - .2 Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.
 - .9 Painting: Apply a one-coat, non-asphaltic primer complying with SSPC's "Painting System Guide No. 7.00" to provide a dry film thickness of not less than 1.5 mils (0.038 mm).
- .3 All steel exposed ledgers, lintels and connections shall be prepared and painted as follows:
 - .1 Blast clean steel to SSPC Standard SP6 "Commercial Blast Cleaning". Apply one coat of General Paint 06-154-Q.D. Shop Primer.
 - .2 Apply one coat of General Paint 16-Line Q.D. industrial enamel. Color selection by Departmental Representative
- .4 All other structural steel shall be prepared in accordance with SSPC Standard SP2 "Hand Tool Cleaning" and have one coat of specified shop applied primer.
- .5 Apply paint under cover, on dry surfaces only and when surface and air temperatures are above 5° C.
- .6 Maintain dry condition and 5° C minimum temperatures until paint is thoroughly dry.

PART 3 EXECUTION

3.1 Examination

- .1 Prior to commencement of erection, examine bearing and anchors provided or installed under other sections upon which work of this section is dependent. Promptly report to the Engineer errors or omissions that may affect the work.
- .2 Protect survey reference points during construction.

3.2 Erection

- .1 Erect structural steel in accordance with CSA/CAN3 S16.1-94. Assume full responsibility for

- corrective work to trades resulting from work which does not meet erection tolerances of this Section. Minimum erection tolerances of structural steel within CSA S16.1/CSA S136.
- .2 Set column base plates to proper elevations. Shim where necessary. Set all base plates which are shop welded to columns to proper elevation on steel shims. Maximum tolerance from stated elevations to be ± 2 mm. Wooden wedges shall not be used.
- .3 After base plates are grouted, tighten anchor bolts to full capacity.
- .1 Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
- .2 Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
- .4 Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in a permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- .1 Level and plumb individual members of structure.
- .2 Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- .5 Make adequate provision for all erection loads and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection. Leave such bracing in place as long as required for safety.
- .6 Provide temporary cross-bracing to safety support structural steel elements until completion of permanent bracing elements.
- .7 Splice members only where indicated.
- .8 As erection progresses, securely bolt work to take care of full design loads.
- .9 Field Connections:
- .1 Use high tensile bolts for field connections unless otherwise noted on building design drawings.
- .2 Install and tighten high-strength bolts according to CSA S16.1/CSA S136.
- .1 Connection type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.
- .3 Weld Connections: Comply with CSA W59 for procedures, appearance and quality of welds, and methods used in correcting welding work.
- .1 Comply with CSA S16.1/CSA S136 specifications referenced in this Section for bearing, adequacy of temporary connections, alignment and removal of paint on surfaces adjacent to field welds.
- .2 Verify that weld sizes, fabrication sequence and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of backside welding on exposed steel surfaces. Grind smooth exposed fillet welds $\frac{1}{2}$ " and larger. Grind flush butt welds. Dress exposed welds.
- .10 Reinforce and/or replace existing structural steel elements as shown on the drawings.
- .11 After erection, field prime welds, nuts, bolts, washers and touch up abrasions or damage to shop primed surfaces.
- .12 Remove erection bolts on welded, architecturally exposed structural steel. Fill holes with plug welds and grind smooth at exposed surfaces. Do not use thermal cutting during erection. Finish sections thermally cut during erection equal to a sheared appearance. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.
- .13 Install shear connectors to beams and girders as shown, either in the shop or in the field.
- .14 All studs to be installed in strict conformance with the requirements of Clause 5.5.6. of CSA Standard W59 "Welded Steel Construction".
- .15 Obtain written permission of Departmental Representative prior to altering or field-welding of structural members.

- .16 When the base metal temperature is below 0° C, pre-heat the base metal to at least 10° C and maintain this temperature during welding.
- .17 Use only light drifting to draw parts together. Enlarge holes for bolted connections with reamers or twist drill only. Do not burn to form holes, enlarge holes or match unfair holes.
- .18 Make adequate provision for erecting stresses and for sufficient temporary bracing to keep the structural steel frame plumb and in true alignment until completion of erection.
- .19 Prior to field erection, examine the existing work of all other contractors on which this work is in any way dependent and report to the General Contractor any errors or discrepancies that may affect this work.
- .20 Seats may be used where required for web connections not permitted where they interfere with architectural clearance.
- .21 Columns: Where detailed, unless otherwise noted, all column base plates shall be welded to columns. Supply all necessary bolts for anchoring bases and fastening adjacent structure.
- .22 This Contractor shall inspect elevation of trowel surfaces to receive column base plates to ensure setting of steel to a $\pm 2\text{mm}$ (1/8"). In accepting these trowelled surfaces, this Contractor shall assume responsibility for vertical leveling of all steel work.

3.3 Field Quality Control

- .1 The Owner will engage in independent testing agency to perform field inspections and tests and to prepare test reports. The Testing Agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- .2 Correct deficiencies or remove and replace structural steel that inspections and test reports indicated do not comply with specified requirements.
- .3 Additional testing at the Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.
- .4 Field-bolted connections will be tested and inspected according to CSA S16.1/CSA S136.

3.4 Cleaning

- .1 Touch-up Painting: Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils (0.038 mm).
- .2 Galvanized Surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint according to ASTM A780.

END OF SECTION

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PART 1 GENERAL

1.1 Section Includes

- .1 Furnish all design, labour, material, equipment and services necessary for the fabrication and construction of the complete light gauge metal building structure and enclosure, in accordance with this specification and where shown or called for on the drawings. Anchor bolts and "sill" angle included.
- .2 This Contract to include the supply and installation of all door/window/opening headers, jambs, header and X bracing or portal-type bracing, including any additional steel members required for additional support of mechanical / electrical provisions.

1.2 Related Sections

- .1 Cast-in-Place Concrete Section 033000
- .2 Structural Steel Section 051200
- .3 Metal Fabrication Section 055000

1.3 Work Not Included

- .1 The design, material and construction of foundations, floor slabs and concrete work.
- .2 The setting and/or placing of anchor bolts or tie rods.
- .3 Grouting under column base plates.
- .4 Field painting of structural steel or other members, except normal touch-up to either major abrasions or field welded connections.
- .5 Field painting of doors, windows, ventilators and other accessories.
- .6 The cutting and/or reinforcing of openings in the structure required by other trades except as noted on the drawings.
- .7 Mechanical, electrical, heating or plumbing work.

1.4 References

- .1 CSA Standard S-16 (Latest Revision) "Steel Structures for Buildings".
- .2 CSA Standard S-136 (Latest Revision) "Design of Light Gauge Steel Structural Members".
- .3 CSA Standard W-59.1 (latest Revision) "General Specification for Welding of Steel Structures (Metal Arc Welding)".
- .4 CSSBI (Canadian Sheet Steel Building Institute) Technical Bulletin #3 (Latest Revision) "Zinc-Coated (Galvanized) Sheet Steel for Structural Building Products".
- .5 CSSBI Technical Bulletin #5 (Latest Revision) "Coated Galvanized Sheet Steel for Structural Building Products".
- .6 CSSBI Standard for Steel Building Systems (latest Revisions).
- .7 National Building Code of Canada (Latest Revision). Section 4.3.4.3 Steel Building Systems
CSA A660, Certification of Manufacturer of Steel Building System.
- .8 IAS AC 472 Accreditation for Metal Building.

1.5 Submittals

- .1 Examine all drawings forming a part of this Contract and conform to the requirements of all such drawings.
- .2 Prepare shop drawings to supplement the Departmental Representative drawings. Report any discrepancies in the Contract Drawings to the Departmental Representative.
- .3 Shop drawings shall show the position, extent, type and arrangement of the structural framing: Type, size, decimal thickness of material, colour of material, etc., of cladding and accessories, and the relationship of the light gauge metal building structure to other related work.

- .4 The Departmental Representative's approval of the shop drawings will not relieve the Contractor from his responsibility of ensuring that his work is complete, accurate and in accordance with the drawings and specifications.
- .5 Submit shop drawings in accordance with Section 013300. Shop Drawings to bear Professional Registered Engineer's Seal of the Province having jurisdiction (Metal Building's Supplier Engineer assumes responsibility for design/shop drawings and detailing and Supplier is responsible for manufacturing of the building components).

1.6 Coordination

- .1 Coordinate the work of this Section with other work specified elsewhere, as it relates to the light gauge metal building structure, to ensure a continuous erection procedure.
- .2 Coordinate the work of this Section with the work of Section 15 (Mechanical) and Section 16 (Electrical), as it relates to cutting and framing of openings for these trades, as shown on the drawings.

1.7 Design Criteria

- .1 The light gauge metal building structure shall be designed in accordance with the Canadian Sheet Steel Building Institute Standard for Steel Building Systems" (Latest Revision).
 - .1 IAS AC 472 Accreditation for Metal Buildings.
 - .2 CAN/CSA A660 Certification for Manufacturer of Metal Buildings.
 - .3 Metal Building Manufacturer's Association.
- .2 Structural members fabricated from plate and bar stock or hot rolled structural shapes shall be designed in accordance with the Canadian Standards Association's Standard S-16 (Latest Revision) "Steel Structures for Buildings".
- .3 All members fabricated from light gauge cold-formed material shall be designed in accordance with the Canadian Standards Association's Standard S-136 (Latest Revision) "Design of Light Gauge Steel Structural Members".
- .4 All shop connections shall be welded in accordance with the Canadian Standard Association's Standard W-59.1 (Latest Revision) "General Specification for Welding of Steel Structures (Metal Arc Welding)".
- .5 All field connections shall be bolted and bolts shall conform to ASTM Specification A307, A325 or A490, as shown on the Contractor's drawings. Connections using S325 or A490 bolts shall be designed as "bearing type" connections and shall be tightened by the "turn of the nut" method.
- .6 Design loads shall be applied as follows:
 - .1 Snow loads, wind loads and earthquake loads shall be as listed in the National Building Code of Canada (Latest Revision) as a minimum, but shall be increased to suit local building codes as required.
 - .2 Snow loads, wind loads and earthquake loads shall be applied to the structure as outlined in the National Building Code of Canada (Latest Revision).
 - .3 Unless otherwise specified, and in the absence of auxiliary loads a minimum of 3 loading combinations shall be analyzed:
DL + LL DL + WL DL + LL + WL
 - .4 The light gauge metal building structure shall be designed to suit the dimensions and clearances shown on the drawings.

PART 2 PRODUCTS

2.1 Structural Steel Framing System

- .1 Framing system to be frame profile and design configuration, with roof slope as indicated on drawings.

2.2 Primary Framing

- .1 All structural members shall be fabricated from G40.21 Grade 44W steel plate or bar stock and/or hot rolled structural shapes.
- .2 All structural steel members are to be sheared, formed, punched and welded in the plant. All welding to be fully approved by the Canadian Welding Bureau to the requirements of CSA Standard W470-1947 "Welding Qualifications Code".
- .3 All primary building frame connections shall be bolted.
- .4 Prior to shop prime painting, all structural steel shall be power tool cleaned for the removal of oil, dirt, loose scale and foreign matter, to the requirements of the Steel Structures Painting Council - Standard SP3-63.
- .5 All structural steel shall receive one shop coat of red oxide primer.

2.3 Secondary Framing

- .1 Purlins and girts shall be roll-formed 'Z' sections, with stiffening lips at a 45 degree angle. Material shall be coated steel in decimal thickness of .105" (12 ga.), .075" (14 ga.), or .060" (16 ga.) as required. Refer to drawings for any variance to 'Z' section sizing required.
- .2 Wind bracing shall consist of diagonal rod bracing in both the roof and walls of the building. Double purlin struts shall be provided where required to distribute the wind loads into braced bays. This supplier to propose bracing configuration and locations for Departmental Representative's approval.
- .3 Flange bracing shall be provided if required, to restrain the inner flange of the primary framing, when in compression.

2.4 Anchor Bolts

- .1 Anchor bolts shall be sized to resist all shears and uplifts induced by the structure and shall not be less than the sizes shown on the anchor bolt layout drawings. All anchor bolts and reactions shall be furnished as required, in conjunction with layout drawings, to ensure the correct placement of anchor bolts (set by others).

2.5 Roof and Wall Cladding

- .1 Profile/Module: Cladding for wall and roof to be exposed fastener, 36" module, with 1'-0" wide 1 1/4" rib pattern and (2) intermediary 1/2" ribs, 24/26ga.; roof finish to be white/gray. Cladding for walls to be marine blue (closest available manufacturer standard color, non-metallic, to match cladding on existing building).
- .2 Material: Material for cladding shall be fabricated from steel conforming to ASTM Specification A-446 (Latest Revision), Grade 'B' with a zinc coating class of G-90. Decimal thickness of material shall be to suit the loads and spans indicated on the drawings, with a minimum decimal thickness of .024~ (24 ga.) for roofs and .018" (26 ga.) for walls. Prefinished aluminum panels are also acceptable (.32 mm and .40mm, ASTM E1592). Interior liner panels for walls and roof shall have a similar profile and shall be pre-finished in white or off-white.
- .3 Finish:
 - .1 Painted panels shall be provided with a baked-on "durasil" finish, having a film thickness of 1.0 mils. Colour selection shall be from the manufacturer's proven standards. The unexposed or reverse side shall have a treated colour wash coat.
 - .2 Roof and walls to be factory finished.
- .4 Fasteners:
 - .1 Fasteners for roof panels shall be #14x3/4" hex screws, type AB thread, with a conical shaped neoprene bonded washer. The fastener shall have a 1.0 mil rating of Dyko Zinc Chromate, with a baked enamel finish to match roof and wall colours.
 - .2 Fasteners for wall panels shall be #14x3/4" "Colour-Mate" hex head screws, with a nylon head to match wall colour.
- .5 Tape Mastic: All roof joints (side laps and end laps) shall be sealed with a 1/4" diameter butyl-polyisobutylene tape mastic, equivalent to RP566 tape.

- .6 Insulation: Where shown and indicated on the drawings (exterior wall cavity and roof), provide 3' wide blanket type glass fibre insulation having a 3/4 lb. density and shall be 6" foil scrim kraft insulation. Insulation shall have a minimum R value of 28.
- .7 Trim:
 - .1 Corner flashings for wall panels shall be of the same material, thickness and finish as the wall cladding.
 - .2 All wall openings shall be flashed with a colored trim.
 - .3 The juncture of the wall and roof panels at eaves shall be closed by means of a notched colored flashing.
 - .4 The base of all sidewall panels shall be crimped and trimmed so as to be flush with the foundation.
 - .5 The juncture of the wall and roof panels at gables shall be closed with a colored rake fascia.
 - .6 All closures shall be a configuration to match the cladding and shall be fabricated from closed cell material conforming to ASTM Specification D-1056-RE-43, having a density (PCF) of 15-35.
 - .7 Inside "closures" at sill, eaves and opening junctions to be included.
 - .8 All colors shall be specified and approved by the Departmental Representative.

2.6 Accessories

- .1 Eaves, Gutters and Downspouts: Shall be a profile to match the rake fascia. It shall be precision formed. A joint sealant shall be used at all laps and ends to ensure weather tightness. Gutters and downspouts to be oversized and with sufficient capacity to drain roof areas with a maximum rain fall intensity for the site location in a 24 hour period set out by NBC.
- .2 Window, Door and Vent Openings:
 - .1 Openings to be framed out as per drawings, trimmed and flashed with colour equal to panel-profile specified.
- .3 Nameplate: No manufacturer's nameplate on "ridge peak" or elsewhere on the building will be permitted, unless approved by the Owner.

2.7 Manufacturer

- .1 Pre-Qualified Manufacturers:
 - .1 Varco Pruden
 - .2 Armco
 - .3 Butler
 - .4 Stran
 - .5 Robertson
 - .6 Behlen
- .2 Other Manufacturers: Other manufacturers or their authorized builder wishing to bid the work of this section must obtain permission from the Departmental Representative at least 8 days prior to tender closing.
- .3 Tender Submission:
 - .1 All manufacturers or their authorized builder must include the following data in their tender submission:
 - .1 Written certification that the products and manufacturing facilities have been approved by the testing/regulatory agencies (9CWB, CSA, etc.) indicated in this specification.
 - .2 Written certification that the design of their products is in strict accordance with the requirements of Subsection 6 "Design Criteria" of this Specification. In addition, the percent factor of Ground Snowload used as roof liveload is to be clearly indicated.

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- .3 Written certification that the above certifications will be validated by a professional engineer registered in the Province having jurisdiction, in the permanent employ of the manufacturer, within 5 days of tender closing, if requested by the Departmental Representative.
- .2 Tenders that do not have this data included will be automatically rejected.

PART 3 EXECUTION

3.1 Examination:

- .1 Examine and obtain all necessary measurements of previously executed work which may affect the work of this Section.
- .2 Report any undiscovered discrepancies to the Departmental Representative so that instructions may be given for the necessary remedial work.

3.2 Erection

1. Storage and Handling: Exercise care in storing, handling and placing of the components to prevent damage likely to impair the adequacy or appearance of the finished structure.
2. Erection of the light gauge metal building shall be performed by erection forces in the permanent employ of the manufacturer or his authorized builder. Subletting of the erection portion of this specification will not be allowed.
- .3 All erection of the light gauge metal building is to be carried out in accordance with building system standards of prequalified manufacturers.
- .4 The building erector must have a minimum of 5 years' experience in the erection of steel building system.

3.3 Painting: On the structural steel and other members, field paint major abrasions to the shop prime coat and field welded connections. Do not paint bolts and nuts.

3.4 Clean-Up: At the completion of the work of this Section, remove any excess materials, debris and equipment pertaining to the work of this Section from the site.

END OF SECTION

PART 1 GENERAL

1.1 Section Includes

- .1 Shop fabricated ferrous metal items, galvanized and prime painted.

1.2 Products Furnished But Not Installed Under This Section

- .1 Section 033000 – Cast-In-Place Concrete: Placement of metal fabrications in concrete.

1.3 Related Sections

- .1 Examine drawings thoroughly to determine items and quantities required, and for purposes of distinction, read this Section in conjunction with structural steel drawings and specifications under Section 051200.
- .2 Concrete Form Work Section 031000.
- .3 Cast-In-Place concrete Section 033000.
- .4 Section 099120 - Painting: Paint finish.

1.4 References

- .1 ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
- .2 ASTM A325 - High Strength Bolts for Structural Steel Joints.
- .3 ASTM B177 - Chromium Electroplating on Steel for Engineering Use.
- .4 CAN/CGSB-7.1M - Cold Formed Steel Framing.
- .5 CAN/CSA-G40.20M - General Requirements for Rolled or Welded Structural Quality Steel.
- .6 CAN/CSA-G40.21M - Structural Quality Steels.
- .7 CAN/CSA-S136M - Cold Formed Steel Structural Members.
- .8 CGSB 85-GP-0M - Shop Painting Structural Steel.
- .9 CGSB 85-GP-16M -Painting Galvanized Steel.
- .10 CSA G164M - Hot Dip Galvanizing of Irregularly Shaped Articles.
- .11 CSA W47.1 - Certification of Companies for Fusion Welding of Steel Structures.
- .12 CSA W47.2 -Aluminum Welding Qualification Code.
- .13 CSA W55.3 - Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
- .14 CSA W59 - Welded Steel Construction (Metal-Arc Welding).
- .15 CSSBI - Canadian Sheet Steel Building Institute.
- .16 SSPC - Steel Structures Painting Council.

1.5 Submittals

- .1 Submit shop drawings to requirements of Section 01300.
- .2 Indicate on shop drawings, profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Shop drawings to bear stamp and signature of professional engineer registered in the province of the work.
- .3 Indicate welded connections using standard CSA W59 welding symbols. Indicate net weld lengths.

1.6 Quality Assurance

- .1 Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance and with sufficient production capacity to produce required units without delaying the Work.
- .2 Perform Work in accordance with CSA W47.1, CSA W47.2M, CSA W55.3, CSA W59.2 and

CSA W59.

1.7 Field Measurements

- .1 Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 PRODUCTS

2.1 Ferrous Materials

Note: See drawings for locations, i.e. grates/miscellaneous angles, etc.

- .2 Metal Surfaces: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names or roughness.
- .2 Steel Plates, Shapes and Bars: CAN/CSA G40.21-M.
- .3 Rolled Steel Floor Plates: ASTM A786 (ASTM A786M).
- .4 Steel Tubing: Product type (manufacturing method) as follows:
 - .1 Cold-Formed Steel Tubing: ASTM A500.
 - .2 Hot-Formed Steel Tubing: ASTM A501.
- .5 Steel Pipe: ASTM A53, standard weight (schedule 40), unless otherwise indicated or another weight required by structural loads.
 - .1 Black finish unless otherwise indicated.
 - .2 Galvanized finish for exterior installations and where indicated.
- .6 Gray Iron Castings: ASTM A48, Class 30.
- .7 Malleable-Iron Castings: ASTM A47, Grade 32510 (ASTM A47M, Grade 22010).
- .8 Cast-In-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing as per ASTM E488, conducted by a qualified independent testing agency.
- .9 Formed Members: CAN/CGSB-7.1M, CAN/CSA-S136M.
- .10 Bolts, Nuts, and Washers: ASTM, A325, A307, galvanized to CSA G164M for galvanized fabrications.
- .11 Welding Materials: W59; type required for materials being welded.
- .12 Shop and Touch-Up Primer: CGSB 85-GP-10M, Red oxide type.
- .13 Touch-Up Primer for Galvanized Surfaces: CGSB 85-GP-16M, Zinc rich type.
- .14 Stainless steel shall be gauges as indicated, Type 304, with #3 finish.

2.2 Paint (see also Section 099120)

- .1 Shop Primer for Ferrous Metal: Fast-curing, lead and chromate-free, universal modified-alkyd primer complying with performance requirements of CGSB 1-GP-40M, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied top coats despite prolonged exposure.
- .2 Zinc Chromate Primer: To CGSB 1-GP-132M.
- .3 Zinc Rich Galvanized Primer: High zinc dust content paint for re-galvanizing welds in galvanized steel with dry film containing not less than 94% zinc dust by weight, to CGSB 1-GP-181M.

2.3 Fasteners

- .1 General: Provide plated fasteners complying with ASTM B633, Class Fe/Zn 25 for electro-deposited zinc coating for exterior use, or where built into exterior walls. Select fasteners for the type, grade and class required.
- .2 Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F568, Property Class 4.6), with hex nuts.
- .3 Machine Screws: ANSI B18.6.3 (ANSI B18.6.7M).
- .4 Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).
- .5 Wood Screws: Flat head, carbon steel, ANSI B18.6.1.
- .6 Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).
- .7 Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
- .8 Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below, with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete, as determined by testing as per ASTM E488, conducted by a qualified independent testing agency.
- .9 Toggle Bolts: FS FF-B-588, tumble-wing type; class and style as required.

2.4 Grout (See also Section 036000)

- .1 Non-Shrink Metallic Grout: Factory-packaged, ferrous-aggregate grout, complying with ASTM C1107, specifically recommended by manufacturer for heavy duty loading applications.
- .2 Non-Shrink Non-Metallic Grout: Factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C1107. Provide grout specifically recommended by the manufacturer for interior and exterior applications.

2.5 Concrete Fill

- .1 Concrete Materials and Properties: Comply with requirements of Division 3, Section 03300 "Cast-In-Place Concrete" for normal weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 Psi (20 Mpa), unless higher strengths are indicated.

2.6 Fabrication

- .1 Fabricate components in shop where possible, to details shown on drawings and in accordance with approved shop drawings. Accurately fit joints and intersecting members in true planes, with adequate fastening. Verify dimensions on site prior to proceeding with shop fabrication.
- .2 Fit and shop assemble in largest practical sections for delivery to site.
- .3 Build work square, true, straight and accurate to required size, with joints closely fitted and properly secured. Ensure shapes and sizes are true with clean lines and distortion-free surfaces.
- .4 Ease exposed edges to a radius of approximately 1/32" (1 mm), unless otherwise indicated. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- .5 Weld permanent connections wherever possible.
- .6 Provide anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- .7 Fabricate items from steel unless otherwise noted.
- .8 Use self-tapping, shake-proof, countersunk, flat headed screws on items requiring assembly by screws or as indicated. When used, countersink bolted connections in accordance with the Engineer's instructions. Nick threads to prevent loosening. Cut, reinforce, drill and tap metal fabrications as indicated to receive finish hardware, screws and similar items.
- .9 Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use

- connections that maintain structural value of jointed pieces. Clearly mark units for re-assembly and coordinated installation.
- .10 Where possible, fit and shop assemble work, ready for erection.
 - .11 Exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.
 - .12 Indicate bolted connections on shop drawings.
 - .13 Drill or punch holes for bolted connections.

2.6 Finishes

- .1 Prepare surfaces to be primed in accordance with SSPC SP 2.
- .2 Do not prime surfaces in direct contact with concrete or where field welding is required.
- .3 Prime paint items with one coat.
- .4 Galvanize structural steel members in accordance with CSA G164M to minimum 380g/sq m galvanized coating.
- .5 Insulate contact surfaces to prevent electrolysis due to metal to metal contact or contact between metal and masonry or concrete. Use bituminous paint, butyl tape, building paper or other accepted means.
- .6 Thoroughly de-scale steel work for which galvanizing is not specified before delivery to project site. Remove roughness and irregularities, clean with a wire brush, remove oil and grease, and prime with one shop coat of primer to 0.04 to 0.05 mm (1.5 to 2 mil) thickness.
- .7 Steel items located on the exterior or unheated side of air/vapour barrier of the building, or where items are likely to be in contact with moisture, shall be hot dipped galvanized.
- .8 Do not prime the following surfaces:
 - .1 Steel to be encased in concrete.
 - .2 Non-ferrous metals.
 - .3 Surfaces and edges to be field-welded. If painted, remove paint for field-welding for a distance of at least 50 mm (2") on sides of the joint.
- .9 Steel and Iron Finishes
 - .1 Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process complying with the following requirements:
 - .1 ASTM A153 for galvanizing iron and steel hardware.
 - .2 ASTM A123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated, rolled, pressed, and forged shapes, plates, bars and strip 0.0299" (0.76mm) thick or thicker.
 - .2 Preparation for shop Priming: Prepare un-coated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications.
 - .1 Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning".
 - .2 Interiors: (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning".
 - .3 Apply shop primer to un-coated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting. Stripe paint corners, crevices, bolts, welds and sharp edges.

PART 3 EXECUTION

3.1 Examination

- .3 Verify that field conditions are acceptable and are ready to receive work.
- .4 Beginning of installation means erector accepts existing conditions.

3.2 Workmanship

- .1 Fabrication, erection and workmanship: Conform to the requirements of CSA Standard S16.1, Steel Structures for Buildings and S136 Cold Formed Steel Structural Members.

3.3 Preparation

- .1 Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the project site.
- .2 Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.
- .3 Clean and strip primed steel items to bare metal where site welding is required.
- .4 Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate sections.

3.4 Installation

- .1 Install items plumb and level, accurately fitted, free from distortion or defects.
- .2 Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors, as required.
- .3 Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
- .4 Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- .5 Field weld components indicated on shop drawings.
- .6 Perform field welding in accordance with W59. Comply with the following requirements.
 - .1 Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - .2 Obtain fusion without undercut or overlap.
 - .3 Remove welding flux immediately.
 - .4 At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- .7 Cutting, Fitting and Placement: Obtain Departmental Representative approval prior to site cutting or making adjustments not scheduled. Perform cutting, drilling and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment and elevation, with edges and surfaces level, plumb, true and free of rack, and measured from established lines and levels.

3.5 Setting Loose Plates

- .1 Clean concrete bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- .2 Set loose levelling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with

grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.6 Erection Tolerances

- .1 Maximum variation from plumb: 6 mm per storey, non-cumulative.
- .2 Maximum offset from true alignment: 6 mm.

3.7 Schedule

- .1 The Schedule is a list of principal items only. Refer to drawing details for items not specifically scheduled.
- .2 Bollards (if any – coordinate with drawings)
 - .1 Steel pipe, concrete filled, crowned cap, as detailed; prime paint, enamelled finish.
 - .2 Fabricate pipe bollards from Schedule 80 Steel Pipe.
 - .3 Anchor bollards in concrete as detailed on plans.
 - .4 Fill bollards solidly with concrete, mounding top surface.
- .3 Ledge and shelf angles, channels and plates not attached to structural framing: For support of metal decking, masonry; prime paint finish. Provide loose bearing and levelling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.
- .4 Loose Steel Lintels:
 - .1 As detailed; prime paint finish.
 - .2 Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
 - .3 Size loose lintels for equal bearing of 12"/ft. (85 mm/m) of clear span but not less than 8" (200mm) bearing at each side of openings, unless otherwise indicated.
 - .4 Galvanize loose steel lintels located in exterior walls.
- .5 Rough Hardware
 - .1 Furnish bent or otherwise custom-fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items as specified in Division 6.
 - .2 Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts that bear on wood structural connections and furnish steel washers elsewhere.
- .6 Miscellaneous Framing and Supports
 - .1 General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the work.
 - .2 Fabricate units to sizes, shapes and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates and steel bards of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware, hangers and similar items.
 - .3 Galvanize miscellaneous framing and supports in exterior locations.
- .7 Steel Ladders (if any – coordinate with drawings)
 - .1 Fabricate ladders for the location shown with dimensions, spacings, details and anchorages as indicated. Comply with requirements of ANSI A14.3.
 - .2 Side Rails: Continuous, steel ½" x 2-1/2" (12mm x 64mm) flat bars with eased edges spaced 18" (460mm) apart.
 - .1 Bar Rungs: ¾" (19mm) diameter steel bars, spaced 12" (300mm) o.c. Fit rungs in centreline of side rails; plug weld and grind smooth on outer rail faces.

- .2 Support each ladder at top and bottom and at intermediate points spaced not more than 60" (1500mm) o.c. with welded or bolted steel brackets. Size brackets to support design dead and live loads indicated and to hold centreline of ladder rungs clear of the wall surface by not less than 5" (127mm).
- .3 Steel Plate Stair: 1/4" thick steel checkerplate treads, 1-1/4"x1-1/4"x3/16" angle support 10" channel stringers.

3.8 Identification of Parts for Erection

- .1 Identify individual pieces in accordance with identification schedule used on shop and erection drawings to clearly indicate their positions in the work for erection purposes. Apply identification marks, clear and legible, by using paint, stamping or other suitable means which will not become obliterated during shipment and handling.

3.9 Adjusting and Cleaning

- .1 After erection field prime welds, nuts, bolts, washers and touch up abrasions or damage to shop primed surfaces.
- .2 Touch-up Painting: Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA1 requirements for touching up shop-painted surfaces. Apply by brush or spray to provide a 2.0 mil (0.05mm) minimum dry film thickness.
- .3 For galvanized surfaces, clean welds, bolted connections and abraded areas, and apply galvanizing repair paint to comply with ASTM A780.

3.10 Erection

- .1 Erect metal work square, plumb, straight and true, accurately fitted, with tight joints and intersections.
- .2 Provide suitable and acceptable means of anchorage, such as dowels, anchor clips, bar anchors, expansion bolts, shields and toggles.
- .3 Make field connections with high tensile bolts of weld to CSA S16 (Latest Edition) and CSA S16S1 (Latest Edition).
- .4 Hand items over for casting into concrete to appropriate trades together with setting templates.
- .5 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection.
- .6 Touch-up galvanized surfaces with zinc primer where burned by field welding.

END OF SECTION