

PART 1 – GENERAL

1.1 RELATED WORK

- .1 Division 01: General Requirements.
- .2 Section 03 30 00: Cast-in-Place Concrete.
- .3 Section 05 31 00: Steel Deck.
- .4 Section 05 50 00: Metal Fabrications.
- .5 Section 09 91 00: Painting.

1.2 REFERENCE STANDARDS

- .1 American National Standard / National Association of Architectural Metal Manufacturers (ANSI/NAAMM)
 - .1 ANSI/NAAMM MBG531-09. Metal Bar Grating Manual.
 - .2 ANSI/NAAMM MBG533-09. Welding Standards for Fabrication of Steel, Stainless Steel and Aluminum Bar Grating.
 - .3 NAAMM MBG534-12. Metal Bar Grating Engineering Design Manual.
- .2 American Society for Training and Materials (ASTM International).
 - .1 ASTM A36/A36M - 14 Standard Specification for Carbon Structural Steel.
 - .2 ASTM A53/A53M - 12 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - .3 ASTM A307-14 Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
 - .4 ASTM A325-14, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi minimum Tensile Strength.
 - .5 ASTM A500/A500M-13, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - .6 ASTM A510/A510M - 13 Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel
 - .7 ASTM-A563-07a (2014), Standard Specification for Carbon and Alloy Steel Nuts.
 - .8 ASTM A1011/A1011M - 13 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
 - .9 ASTM D2369-10 (2015) Standard Test Method for Volatile Content of Coatings.
 - .10 ASTM F436-11, Standard Specification for Hardened Steel Washers.
- .3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA).
 - .1 CISC/CPMA-2-75-(1975), Quick-Drying, Primer for Use on Structural Steel.
 - .2 CISC Handbook of Steel Construction, Tenth Edition, 2010.
- .4 Canadian Standards Association (CSA International).

- .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA S16-14, Design of Steel Structures.
- .4 CAN/CSA-S136-12, North American Specifications for the Design of Cold Formed Steel Structural Members.
- .5 CSA W47.1-09 (2014), Certification of Companies for Fusion Welding of Steel.
- .6 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
- .7 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
- .8 CSA W178.2-14, Certification of Welding Inspectors.

- .5 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International.

- .1 NACE No. 3/SSPC SP-6-06, Commercial Blast Cleaning

1.3 AS-BUILT DRAWINGS

- .1 Maintain "As-Built" conditions on record drawings in accordance with Division 1.

1.4 SUBMITTALS

- .1 Submit three (3) certified copies of mill test reports covering chemical and physical properties of steel used in this work. Such mill test reports shall be certified by qualified metallurgists confirming that tests conform to requirements of CSA G40.20-13 and CSA G40.21-13.

1.5 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Division 1.
- .2 Each shop drawing shall bear the stamp and signature of a qualified professional Engineer registered or licensed to practice lawfully in the Province of Nova Scotia.
- .3 Clearly indicate shop and erection details including cuts, copes, connections, holes, threaded fasteners, and welds. Indicate welds by AWS welding symbols as defined in CSA W59.
- .4 Anchor rod plan and erection drawings shall be originals prepared by fabricator. Reproduction of contract drawings not permitted.
- .5 All shop drawings and material lists are to contain a blank area measuring 70 mm high by 100 mm long located near the bottom right hand corner of the drawing or page. This area is to be reserved for the Departmental Representative's review stamp.

1.6 CONNECTION DESIGN

- .1 The Fabricator shall be responsible for the design, proportioning and detailing of the steel connections. This shall include the design, proportioning and detailing of reinforcement to the members being connected for adequate resistance and transfer of the applied forces and moments, as applicable.
- .2 Submit all typical and special connection design details and calculations in advance of preparing any shop drawings.
- .3 The Departmental Representative reserves the right to review the detailed drawings of the connections to ensure general compliance with the forces shown on the tender documents.
- .4 This review does not relieve in any way the responsibility of the Fabricator for the connections. However, if the Departmental Representative discovers deficiencies in the connections requiring extensive design checks and/or modifications to the detailed shop drawings submitted by the Fabricator, costs incurred by the Departmental Representative above the normal review process will be backcharged against the Contractor.

1.7 COMPANY CERTIFICATION

- .1 To meet the requirements of the 2010 National Building Code of Canada, all welding on this project is to be done only by companies certified to Division 1 or 2 of CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
- .2 Under CSA W47.1, the Fabricator is required to employ a registered Professional Engineer with an audited background in welding design procedure and practice, as well as welding supervisors and welders, all of whom have had their qualifications audited.
- .3 Only companies certified to CSA W47.1 (Division 1 or 2) at the time of bidding this job will be considered as eligible to bid.
- .4 The Fabricator shall have a certified CISC, ISO9001, Z299 or AISC quality system for fabrication of structural steel in place at time of bid.

PART 2 – PRODUCTS

2.1 MATERIALS

- .1 Channels, plates, angles and rods: to CSA G40.21, 300W.
- .2 Rolled W sections: to CSA G40.21, 350W.
- .3 Hollow structural sections: to CSA G40.21, 350W, Class C or ASTM A500 Grade C.
- .4 Bolts, nuts and washers: to ASTM A325. Provide galvanized bolts, nuts and washers for unheated steel with special paint.
- .5 Welding materials: to CSA W59.

- .6 Steel Primer for exterior (unheated) steel: shall be three component zinc rich epoxy primer 70% solids by weight with zinc portions at least 80% by weight of dried coating. Standard of quality: Ameron Amercoat 68HS or equivalent. Steel primer shall be supplied by the same manufacturer as the topcoat specified below.
- .7 Steel Topcoat for exterior (unheated) steel: to be high-build epoxy coating having not less than 63% solids by weight. Epoxy topcoat shall be recommended by paint manufacturer for exterior applications. Colour selection by Departmental Representative.
- .8 Shop galvanizing: hot dip galvanizing with a minimum coating of 0.6 kg per square metre to CAN/CSA-G164. Touch up must be VOC compliant if used interior.
- .9 Anchor rods: CSA G40.21, 300W. Supply anchor rods to size shown on drawings complete with ASTM-A563 nuts and ASTM F436 circular washers or plate washers as noted on drawings. Provide galvanized anchor rods for steel columns with special paint and for steel columns in the vicinity of the cistern.
- .10 Pipe: In accordance with ASTM A53, Grade B ($F_y = 241 \text{ MPa}$)
- .11 Rods: to CSA G40.21, 300W.
- .12 Welding electrodes: E49XX.
- .13 Anchor rods and embedded steel: structural steel contractor to supply and ship to site all anchor rods and embedded steel to be placed in concrete by concrete contractor.
- .14 Epoxy adhesive for threaded rods embedded into concrete: Chemical adhesive anchors: Hilti HIT HY150 MAX, Epcon Acrylic 7, Powers AC100 + Gold or approved equal.

2.2 FABRICATION

- .1 Do structural steel work to CSA S16 and CAN/CSA-S136 except where specified otherwise.
- .2 Do welding to CSA W59 except where specified otherwise.
- .3 Fabricate structural steel as indicated to CSA S16 and in accordance with reviewed shop drawings.
- .4 Provide punched holes from 11 mm to 27 mm in diameter for attachment of other work. Refer to drawings for details and locations.
- .5 Reinforce openings to maintain required design strength.
- .6 Beam to beam and beam to column connections shall be simple connections proportioned for a minimum of 50% of the total uniformly distributed load for laterally supported beams of the given span as per CISC 350W Handbook of Steel Construction, Tenth Edition, unless noted

otherwise on the drawings. Single angle beam connections will not be permitted for main structural beams and girders.

- .7 In addition to the shear as specified in Item 2.2.4, the beam connections shall be designed for the moments and axial forces indicated on the drawings. These forces shall be considered to act simultaneously.
- .8 Unless noted otherwise, loads shown on the drawings are specified loads and moments, shears and axial forces are factored.
- .9 Steel beams, column and channels shall be cut from full length stock or ordered cut to length. All substitutions shall be subject to the approval of the Departmental Representative.
- .10 No holes shall be punched or cut in beams, columns or beam to column connections.
- .11 All exposed members to be welded or otherwise connected, shall be scribed and cut to the adjoining members in a neat workmanlike manner. All exposed structural steel shall be fabricated to AESS 1, Appendix I of CISC Handbook of Steel Construction.
- .12 All bolted connections are to be detailed as bearing type unless otherwise noted on the drawings. All field connections for exterior (unheated) shall be bolted if possible.
- .13 Supply embedded plates, angles and anchor rods for installation by the Concrete Contractor.
- .14 Provide site survey of anchor rod locations. If base plate repairs are required to suit anchor rod locations, submit proposed repair procedures to Departmental Representative for approval.
- .15 Continuously seal HSS members by continuous welds and grind smooth. All HSS members to be air sealed with drain holes at low points as shown on drawings.

2.3 SHOP PRIMING EXTERIOR (UNHEATED) STRUCTURAL STEEL

- .1 All exterior steel (i.e. unheated) shall be blast cleaned to conform to "The Steel Structures Paintings Council" specification SSPC-SP6-07.
- .2 The zinc epoxy primer shall be mixed, applied to the metal surface immediately after cleaning and cured at the proper temperature in accordance with the manufacturer's recommendations.
- .3 All surfaces shall be completely free of dust and dirt prior to the application of the zinc epoxy.
- .4 The zinc epoxy primer shall be applied to the metal surface with airless spray equipment as recommended by the zinc epoxy manufacturer. All leading edges to be hand stripped prior to spray application.
- .5 The zinc epoxy shall be applied in the shop to obtain a dry film thickness of 3.0 mils (one coat) with a tolerance of -0.25 to +0.5 mils to all surfaces.

2.4 TOP COAT FOR EXTERIOR (UNHEATED) STRUCTURAL STEEL

- .1 Touch-up of damaged areas of the zinc epoxy primer coating shall be carried out in accordance with the above requirements except that brush application may be used in lieu of airless spray equipment.
- .2 Touch-up shall be done with a primer that is recommended by the paint manufacturer and approved by the paint manufacturer for compatibility with the zinc epoxy shop primer.
- .3 The epoxy top coating shall be mixed, applied to the zinc rich primed surfaces and cured at the proper temperature in accordance with the manufacturer's recommendations.
- .4 All surfaces shall be free of dust, dirt, moisture, oil or grease prior to the application of the epoxy coating. Oil and grease shall be removed with a thinner as recommended by the manufacturer of the paint system.
- .5 The zinc epoxy primer is to be applied in the shop and a time period may elapse before applying the final coat of epoxy. Clean all surfaces that are to be top-coated insuring that they are free of all contaminants. The cleaning method must be approved by the coating manufacturer.
- .6 The epoxy coating shall be applied to the steel surface with airless spray equipment as recommended by the manufacturer of the paint. All leading edges to be hand stripped prior to spray application.

2.5 SUBSTITUTIONS

- .1 Estimate the work on the basis of the member sizes shown on the drawings. Substitution of larger sizes shall not be considered as an extra to the contract. Substitutions to be approved by the Departmental Representative.

PART 3 – EXECUTION

3.1 ERECTION

- .1 Erect structural steel as indicated to CSA S16 and in accordance with shop drawings to minimum tolerances. Erect temporary bracing to ensure plumbness and stability.
- .2 Where indicated, continuously seal members by continuous welds and grind smooth.
- .3 Obtain written permission of Departmental Representative prior to field cutting or altering of structural members.
- .4 Touch up shop primer to bolts, welds and burned or scratched surfaces at completion of erection.

3.2 TOUCH-UP PAINTING

- .1 Field touch up shop primer and shop top coats to bolts, welds and burned or scratched surfaces at completion of erection.

3.3 INSTALLATION OF REINFORCING STEEL/ANCHOR RODS USING ADHESIVE ANCHOR SYSTEM

- .1 Install adhesive anchors in concrete at locations shown on plans and/or as required to complete the works. Installation to be in strict accordance with the manufacturer's written instructions.
- .2 Holes shall be drilled with a quality carbide tipped bit using a rotary impact hammer. Bolts to be torqued to manufacturer's recommended torque.

3.4 INSPECTION AND TESTING

- .1 Inspection and testing of materials and workmanship will be carried out by a testing laboratory approved by the Departmental Representative.
- .2 Owner will pay costs of inspection and testing as specified in Division 01.
- .3 Visual welding inspection will be carried out on all welding as outlined in CSA W59 by an inspector certified to CSA W178.2.
- .4 Inspection of connections will be carried out during steel erection. Cooperate with and assist the Testing Company by providing access to all parts of the work as required.
- .5 Inspection of connections will be carried out in accordance with CSA S16.
- .6 Radiographic testing shall be done in the fabrication shop or field in accordance with CSA W59.
- .7 If this testing results in an unacceptable standard, the structural steel contractor will be responsible for reinforcing or repairing all connections and providing a complete radiographic test of the member with the results being made available to the Departmental Representative. Proposed repair methods to be made available to the Departmental Representative for review prior to starting repairs.
- .8 A qualified protective coating inspection firm will verify preparations of structural steel surfaces prior to application of shop primers, review equipment being employed and shall measure dry film thickness of primers and dry film thickness of top coat. Copies of reports shall be submitted to the Departmental Representative.
- .9 If this testing results in an unacceptable standard, the Contractor shall be responsible for the re-cleaning, re-priming of the surfaces until standards are met.
- .10 A technical representative of the primer manufacturer will also review methods of work to ensure manufacturer's recommendations are being strictly adhered to and shall submit a report to the Departmental Representative.

- .11 Additional inspections and testing by the Owner does not relieve the Contractor of any responsibility.

END OF SECTION