

PART 1 - GENERAL

- 1.1 Work Included .1 This Section specifies the requirements for supply, fabricating and erecting all structural steel. This Section also specifies the requirement for the fabricator to design and detail all connections not specifically defined on the Drawings.
- 1.2 Related Sections .1 General Instructions: Section 01 10 00  
.2 Submittal Procedures: Section 01 33 00  
.3 Construction/Demolition Waste Management and Disposal: section 01 74 21  
.4 Sitework, Demolition and Removals: Section 31 11 00
- 1.3 References .1 National Building Code of Canada 2010, Volumes 1 and 2 and Structural Commentaries.  
.2 Canadian Standards Association (CSA)  
.1 CAN/CSA S6-14, Canadian Highway Bridge Design Code (including Supplements and Commentaries).  
.2 CSA G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.  
.3 CSA S16-14, Design of Steel Structures.  
.4 CSA S136-12, North American Specification for the Design of Cold-Formed Steel Structural Members.  
.5 CSA W47.1-09(R2014), Certification of Companies for Fusion Welding of Steel.  
.6 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.  
.7 CSA W55.3-08(R2013), Certification of Companies for Resistance Welding of Steel and Aluminum.  
.8 CSA W59-13, Welded Steel Construction (Metal Arc Welding).  
.3 Canadian General Standards Board (CGSB)  
.1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.  
.2 CAN/CGSB 1.210-2003, Quick Drying Alkyd

- Primer for Structural Steel.
- .3 CAN/CGSB-1.181-99, Ready-Mixed, Organic Zinc-Rich Coating.
- .4 CAN/CGSB 85.10-99, Protective Coatings for Metals.
- .4 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless.
  - .2 ASTM A123-15, Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
  - .3 ASTM A153/A153M-16, Standard Specification for Zinc Coatings (Hot-Dip) on Iron and Steel Hardware.
  - .4 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
  - .5 ASTM F3125/F3125M-15a, Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - .6 ASTM A500/A500M-13, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - .7 ASTM A572/A572M-15, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
  - .8 ASTM A992/A992M-11(R2015), Standard Specification for Structural Steel Shapes.
  - .9 ASTM A1011/A1011M-15, 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.
  - .10 ASTM F593-13AE1, Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
  - .11 ASTM F1554-15E1, Standard Specification for Anchor Bolts, Steel, 36, 55 and 105 - ksi Yield Strength.
- .5 CISC/CPMA:
  - .1 CISC/CPMA 1-73a, Quick-Drying, One-Coat Paint for Use on Structural Steel.
  - .2 CISC/CPMA 2-75, Quick-Drying, Primer for use on Structural Steel.

- .6 Master Painters Institute
  - .1 MPI-INT 5.1-98, Structural Steel and Metal Fabrications.
- .7 The Society for Protective Coatings (SSPC)
  - .1 SSPC-SP1-2004, Solvent Cleaning.
  - .2 SSPC-SP3-2004, Power Tool Cleaning.
  - .3 SSPC-SP6-2007/NACE No. 3, Commercial Blast Cleaning.
  - .4 SSPC-SP10-2007/NAC No. 2, Near-White Blast Cleaning.
- 1.4 Design Requirements
  - .1 Design details and connections in accordance with requirements of CSA S16 to resist axial forces, moments, shears and allow for movements indicated.
  - .2 Shear connections:
    - .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.
    - .2 Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.
  - .3 Where axial bracing forces are not indicated, design and detail the connection based on 75% of the tensile resistance of the bracing members.
  - .4 For non-standard connections, submit sketches and design calculations stamped and signed by a qualified Professional engineer registered or licensed to practice in the Province of New Brunswick.
  - .5 For standard connections, select details from CISC Handbook of Steel Construction to ensure structural adequacy. Submit all standard connections for each structural steel member size. Connections shall be stamped and signed by a qualified Professional engineer registered or licensed to practice in the Province of New Brunswick.
- 1.5 Shop Drawings
  - .1 Submit shop drawings including fabrication and

erection documents and materials list in accordance with Section 01 33 00.

- .2 Erection drawings: indicate details and information necessary for assembly and erection purposes including:
  - .1 Description of methods.
  - .2 Sequence of erection.
  - .3 Type of equipment used in erection.
  - .4 Temporary bracings.
  - .5 Member size and mark number.
  - .6 Elevations and dimensions.
  - .7 Bolt and weld requirements.
  - .8 Details of all standard and non-standard connections.
  - .9 Location of all non-standard connections.
- .3 Ensure Fabricator drawings showing designed assemblies, components and connections are stamped and signed by qualified Professional engineer registered or licensed to practice in the Province of New Brunswick, Canada.
- .4 Indicate welds by welding symbols as defined in CSA W59.

1.6 Samples

- .1 If requested, submit material samples in accordance with 01 33 00.

1.7 Quality Assurance

- .1 If requested, submit four (4) copies of mill test reports two (2) weeks prior to fabrication of structural steel.
  - .1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.
  - .2 Provide mill test reports certified by metallurgists qualified to practice in the Province of New Brunswick, Canada.
- .2 Provide structural steel Fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.
- .3 Fabricator, as practicably as possible (preferably 90% or greater), to maximize amount of recycled content for all structural steel. Provide certification stating breakdown of the pre-consumer, post-industrial and post-consumer

contents percentages of the steel.

- 1.8 Waste Management and Disposal
- .1 Separate and recycle waste materials in accordance with an approved Waste Management and Disposal Plan and in accordance with Section 01 74 21.
  - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
  - .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material for recycling in accordance with the Waste Management and Disposal Plan.
  - .4 Divert unused metal materials from landfill to metal recycling facility approved by the Departmental Representative.
  - .5 Divert unused paint material from landfill to official hazardous material collections site approved by the Departmental Representative.
  - .6 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

## PART 2 - PRODUCTS

- 2.1 Materials
- .1 Structural steel: Hot-rolled structural steel conforming to CSA G40.20/G40.21, Grade 350W (Fy = 350 MPa) or alternatively ASTM A992 (Fy = 345 MPa) for wide flange shapes, channels, plates, and angles. Hollow Structural Sections (HSS) shall be Class C, Grade 350W (Fy = 350 MPa) or alternatively ASTM A500, Grade C (Fy = 345 MPa). Pipe for bollards shall conform to ASTM A53, Grade 240W (Fy = 240 MPa), XS (extra strong)/Sch. 80.
  - .2 Anchor bolts (rods): to ASTM A307, ASTM F1554 (Grade 36ksi/248MPa Yield Strength) and ASTM F593 (AISI Type 316 stainless steel), unless noted otherwise.
  - .3 Bolts, nuts and washers: to ASTM F3125/F3125M.
  - .4 Welding materials: to CSA W59 and certified by

Canadian Welding Bureau; Electrodes: E49XX.

- .5 Shop painting of new structural steel to include surface preparation in accordance with SSPC-SP1 and SSPC-SP10/NACE No. 2 and shall be to one of the following coating systems:
  - .1 System 1:
    - .1 All steel work designated to be painted to receive the following shop applied paint system as manufactured by Devoe High Performance Coatings (Part of International Paint) or an approved equivalent system. Use all products in accordance with the manufacturer's written instructions especially with respect to storage, handling, surface preparation, application, temperature, humidity and curing.
      - .1 Primer: One (1) coat of 4 mils Dry film Thickness (DFT) of Cathacoat 302HB, reinforced inorganic zinc silicate primer.
      - .2 Stripe coat: A stripe coat of contrasting colour from the primer and intermediate coat shall be applied over all sharp and rolled edges, cutouts and welds. One (1) coat of 6 mils DFT of Bar-Rust 236, multipurpose epoxy mastic.
      - .3 Intermediate Coat: One (1) coat of 6 mils DFT of Bar-Rust 236, multipurpose epoxy. Colour to be coordinated with the Departmental Representative and to be contrasting from the primer and stripe coats.
      - .4 Top Coat: One (1) coat of 6 mils DFT of Bar-Rust 236, multipurpose epoxy. Colour to be coordinated with the Departmental Representative and to be contrasting from the intermediate coat.
      - .5 Field Touch-up: Minor damaged coating areas with the same system.
  - .2 System 2:

- .1 All steel work designated to be painted shall receive the following shop applied paint system as manufactured by Carboline Company. Use all products in accordance with the manufacturer's written instructions especially with respect to storage, handling, surface preparation, application, temperature, humidity and curing.
  - .1 Primer: One (1) coat of 4 mils Dry film Thickness (DFT) of Carbozinc 11, inorganic zinc primer.
  - .2 Stripe coat: A stripe coat of contrasting colour from the primer and intermediate coat shall be applied over all sharp and rolled edges, cutouts and welds. One (1) coat of 6mils Carboguard 890 epoxy.
  - .3 Intermediate Coat: One (1) coat of 6 mils DFT of Carboguard 890 epoxy. Colour to be coordinated with the Departmental Representative and to be contrasting from the primer and stripe coats.
  - .4 Top Coat: One (1) coat of 6 mils DFT of Carboguard 890 epoxy. Colour to be coordinated with the Departmental Representative and to be contrasting from the intermediate coat.
  - .5 Field Touch-up: Minor damaged coating areas with the same system.
- .3 An approved equivalent paint system.
- .6 Hot dip galvanizing: galvanize steel, where indicated, to ASTM A123/A123M for all fabricated assemblies, minimum zinc coating of 705 g/m<sup>2</sup>; ASTM A153/A153M for all hardware (average zinc coating of 381g/m<sup>2</sup>).
- .7 Galvanized primer: two component, zinc rich; Colour; gray; Cathacoat 304L by Devoe Coatings or approved equal.
- .8 Adhesive anchor bolts: tube injected system Hilti HIT-HY 150 MAX, complete with HAS SS 316 threaded rods or approved equivalent. Provide adhesive

anchor installation, including drilling of holes, preparation, storage, usage and curing in accordance with the written instructions and training as approved by the manufacturer.

2.2 Fabrication

- .1 Fabricate structural steel in accordance with CSA S16, W47.1 (Division 1 or 2), W59 and in accordance with approved shop drawings.
- .2 Confirm exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush where indicated without compromising design weld profile or size.
- .3 Provide weep holes to suit hot dip galvanizing where required.

2.3 Shop Painting

- .1 Clean, prepare surfaces and shop prime structural steel in accordance with Part 2.1.5 Materials, Shop Painting and to MPI-INT 5.1/EXT 5.1 except where members are to be encased in concrete.
- .2 Clean members, remove loose mill scale, rust, oil, dirt and other foreign matter. Prepare surfaces according to SSPC - SP1 and SP6.
- .3 Apply primer in shop to steel surfaces to achieve the specified minimum dry film thickness for each coat, except:
  - .1 Surfaces to be encased in concrete.
  - .2 Surfaces to receive field installed stud shear connections.
  - .3 Surfaces and edges to be field welded.
  - .4 Faying surfaces of friction-type connections.
  - .5 Below grade surfaces in contact with soil.
- .4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.
- .5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.

PART 3 - EXECUTION

3.1 General

- .1 Do structural steel work in accordance with CSA



S16.

- .2 Do welding in accordance with CSA W59.
- .3 Companies to be certified under Division 1 or 2 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.
- .4 When required by the Departmental Representative, provide certification that all welded joints are qualified by the Canadian Welding Bureau.

3.2 Connection to Existing Work

- .1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to the Departmental Representative for direction before commencing fabrication.

3.3 Marking

- .1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- .2 Match marking: shop mark bearing assemblies and splices for fit and match.

3.4 Erection

- .1 All construction activities including the erection, use, moving and dismantling of approved and certified staging must be by qualified and experienced personnel and shall conform to all safe work practices, procedures and regulations of the applicable regulatory authorities.
- .2 Erect structural steel, as indicated and in accordance with CSA S16 and in accordance with approved erection drawings.
- .3 Obtain written permission and approval of the Departmental Representative prior to field cutting or altering of structural members.
- .4 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .5 Continuously seal members by continuous welds where indicated. Grind smooth.

- .6 Assume full responsibility for the integrity of structure during erection. Make necessary provision for all erection loads and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment until completion of erection and installation of necessary permanent bracing and frames.
- .7 Set base plates and loose bearing plates with steel shims to proper elevation, true and level, ready for grouting-in.
- .8 Restrict drifting during assembly to minimum required to bring parts into position without enlarging or distorting holes and without distorting, kinking or sharply bending metal of any unit. If, in the opinion of the Departmental Representative, holes must be enlarged to admit bolts, they are to be reamed and larger size bolts used. Reamed holes not to exceed size of bolt used by more than 2mm.

- 3.5 Field Quality Control
- .1 If requested, inspection and testing of materials and workmanship will be carried out by testing laboratory designated by the Departmental Representative.
  - .2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by the Departmental Representative.
  - .3 Submit test reports to the Departmental Representative within two (2) weeks of completion of inspection.
  - .4 Testing laboratory may use ultra-sonic testing procedures to verify soundness of some representative shop and field welds. In principal structural members, shop and field welds will be X-rayed. Representative bolted connections will be checked with torque wrench. The Departmental Representative will determine location and extent of all testing.

- 3.6 Field Painting
- .1 Touch-up damaged surfaces and surfaces without shop coat with primer to SSPC-SP6/SP3 as required and to Part 2.1.5 Materials, Shop Painting and Part 2.3 Shop Painting except as specified

otherwise.

- .2 Clean with mechanical brush and touch-up with an approved, compatible zinc rich primer any damage to the galvanized finish to bolts, rivets, welds and burned or scratched surfaces at the completion of erection/field work.

**END OF SECTION**

PART 1 - GENERAL

- 1.1 Reference Standards
- .1 ASTM A123/A123M-15, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2 ASTM A307-14, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
  - .3 CAN/CSA-G40.21-13, Structural Quality Steels.
  - .4 CAN/CGSB-1.181-1999, Ready-Mixed Organic Zinc-Rich Coating.
  - .5 CAN/CSA-S16.1-14, Limit States Design of Steel Structures.
  - .6 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
- 1.2 Related Work
- .1 Refer to other Specification Sections for related information.
  - .2 Refer to Section 01 33 00 for Shop Drawings/Submissions requirements.
- 1.3 Shop Drawings
- .1 Shop Drawings:
    - .1 Clearly indicate the following items:
      - .1 General arrangements, dimensions, clearance locations and directions of assemblies as installed on structures.
      - .2 Locations, sizes and installation tolerances of anchor bolts, eye bolts and embedded parts.
      - .3 Types of materials used, finishes and core thickness.
      - .4 All other pertinent details and accessories.
  - .2 Test Results:
    - .1 Provide test results for the galvanized items.
  - .3 Submissions
    - .1 Provide submissions in accordance with Section 01 33 00.

PART 2 - PRODUCTS

- 2.1 Materials
- .1 Steel Sections: to CAN-G40.21, Grade 350W.
  - .2 Steel rod, plate and angles: to CAN-G40.21, Grade 350W.
  - .3 Welding materials: to CSA W59.
  - .4 Bolts and anchor bolts: to ASTM A3125.
  - .5 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m<sup>2</sup> to ASTM A123/A123M.
  - .6 Zinc primer: Zinc rich, ready mix to CGSB 1-GP-181.
- 2.2 Fabrication
- .1 Build work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
  - .2 Fabricate items from steel unless otherwise noted.
  - .3 Where possible, fit and shop assemble work, ready for installation.
  - .4 Confirm exposed welds are continuous for length.
- 2.3 Miscellaneous Metal Work Items
- .1 Miscellaneous anchors, bolts and inserts:
    - .1 Where size, spacing and the like are not indicated, provide as necessary for the purpose.
    - .2 Galvanize all miscellaneous anchors, bolts and inserts.
  - .2 Miscellaneous Steel:
    - .1 Provide miscellaneous steel as required for guide units and the like to the shape, size and details required.
    - .2 Galvanize all miscellaneous steel.

PART 3 - EXECUTION

3.1 Erection

- .1 Install metalwork square, plumb, straight and true, accurately fitted with tight joints and intersections.
- .2 Make field connections with bolts to CSA S16.1, or weld.
- .3 Touch-up bolts and scratched surfaces after completion of erection with zinc primer.
- .4 Isolate dissimilar materials as noted on drawings.

**END OF SECTION**