

## **PART 1 - GENERAL**

### **1.1 References**

- .1 All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.
- .2 Canadian Standards Association (CSA International):
  - .1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CSA S16, Limit States Design of Steel Structures.
  - .3 CSA W47.1, Certification of Companies for Fusion Welding of Steel.
  - .4 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.
  - .5 CSA W55, Certification of Companies for Resistance Welding of Steel and Aluminum.
  - .6 CSA W59, Welded Steel Construction (Metal Arc Welding).
  - .7 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .3 ASTM International Inc.:
  - .1 ASTM A123/A123M, Standard Specification for Zinc (Hot Dip Galvanized) coating on Iron and Steel Products.
  - .2 ASTM A36/A36M, Standard Specification for Carbon Structural Steel.
  - .3 ASTM F3125/F3125M, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric dimensions
  - .4 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless
  - .5 ASTM A1085/A1085M, Standard Specification for Cold Formed Welded Carbon Steel Hollow Structural Sections (HSS)
  - .6 ASTM A992, Standard Specifications for Structural Steel Shapes.
  - .7 ASTM F1554, Standard Specification for Anchor Bolts, Steel 36, 55 and 105 ksi Yield Strength.
- .4 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA):
  - .1 CISC Handbook of Steel Construction.
- .5 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International:
  - .1 SSPC-SP 1, Solvent Cleaning.
  - .2 NACE No. 3 / SSPC-SP 6, Commercial Blast Cleaning.

- .3 NACE No.4 / SSPC-SP 7, Brush Off Blast Cleaning.
- .4 NACE No.2 / SSPC-SP 10, Near White Blast Cleaning.
- .5 SSPC Technology Guide No.14 – Guide for the Repair of Imperfections in Galvanized, Organic or Inorganic Zinc-Coated Steel Using Organic Zinc Rich Coating.
- .6 SSPC Paint Specification No. 20 – Zinc Rich Coating, Type I – Inorganic and Type II - Organic.

## 1.2 Quality Assurance

- .1 In accordance with Section 01 43 00 – Quality Assurance.
- .2 Qualifications
  - .1 Structural steel fabricator and erector to be certified by the Canadian Welding Bureau under the requirements of CSA W47.1, Division 1 or 2 for fusion welding and/or CSA W55.3 for resistance welding of structural steel components, and to have CWB approved procedure for welding rebar (Grade 400W) to structural steel.
  - .2 Welders to be CWB approved, working under supervision of a CWB approved firm.
  - .3 Engage a Professional Engineer licensed in the place where the project is located to be responsible for design, detailing and installation of all connections related to structural steel work.

## 1.3 Quality Control

- .1 Submit in accordance with Section 01 45 00 – Quality Control.
- .2 Source Quality Control Submittals:
  - .1 Provide all submittals 4 weeks prior to starting fabrication of structural steel.
  - .2 Upon request, provide mill test reports:
    - .1 Mill test reports to include ladle analysis and physical test results, and to show chemical and physical properties and other details of steel to be incorporated in project.
    - .2 The reports to be correlated to the materials or products to which they pertain
  - .3 In addition to mill testing, each batch of structural steel (including bolts) manufactured outside United States, Canada, Great Britain and EU countries must also be tested in Canada by an ISO 17025 certified testing laboratory. In addition to compliance with all the relevant CSA and ASTM requirements, the testing must show that the maximum boron content in structural steel does not exceed 0.0008%.
- .3 Tolerances
  - .1 Conform to the fabrication and erection tolerances of CAN/CSA S16.

#### **1.4 Action and Informational Submittals**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
  - .1 Provide drawings stamped and signed by the Professional Engineer responsible for steel connections.
  - .2 If additional information is required from Departmental Representative, allow a minimum of five working days for review and respond to the request for information.
- .3 Erection drawings:
  - .1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
    - .1 Description of erection methods.
    - .2 Beam sizes (in addition to beam marks).
    - .3 Details of all field welded connections
  - .2 Provide setting drawings showing dimensions and details for placing steel assemblies which are set in concrete,
- .4 Fabrication drawings:
  - .1 Submit fabrication drawings showing designed assemblies, member sizes, components and connections. Show on drawings:
    - .1 Material specifications.
    - .2 Surface preparation.
    - .3 Shop painting / galvanizing.
    - .4 Types of shop and field connections.
    - .5 Net weld lengths.
    - .6 Vent holes required for galvanizing process.

### **PART 2 - PRODUCTS**

#### **2.1 Design and Detailing Requirements**

- .1 Follow conceptual connection details if shown on structural drawings. Do not change without Departmental Representative written approval. If welds are defined on drawings, the sizes shown are minimum requirements which might need to be increased to suit connection design.
- .2 Increase specified section thickness at no extra cost if required for fabrication or galvanizing.
- .3 Moment connections:
  - .1 Where moment connections are called for but values are not indicated, design for moment capacity of the smaller member in the connection.

.4 Holes:

- .1 Where holes for services are required through webs of beams or columns, coordinate size and location with Architectural, Mechanical and Electrical drawings, and show on fabrication drawings.
- .2 Provide 16 mm (5/8") diameter weep holes in base plates of HSS columns which are not made watertight.
- .3 Provide vent holes in HSS sections where required for galvanizing process. Locate so that any water inside HSS will drain away when HSS is in its final position. Maximum size – 16 mm (5/8") diameter. Fill holes with vent hole plugs after galvanizing.
- .5 Do not oversize anchor rod holes for site tolerances. Use hole sizes suggested in the CISC Handbook of Steel Construction.
- .6 Provide closure plates for all exposed and for all exterior tubular members.

**2.2 Materials**

.1 Structural steel:

- .1 Rolled shapes: to CSA G40.21 or ASTM A992, refer to drawings.
  - .2 Hollow structural sections: to ASTM A500, ASTM A1085 or CSA G40.21, refer to drawings.
  - .3 Structural pipe: to ASTM A53.
- .2 Anchor rods: CSA G40.21, or ASTM 1554, refer to drawings.
- .3 Bolts, nuts and washers: to ASTM F3125, grade A325.
- .4 Welding materials: to CSA W48 and CSA W59, certified by Canadian Welding Bureau. For members in seismic force resisting system, refer to additional brittleness requirements in CSA S16.
- .5 Hot dip galvanizing: to ASTM A123/A123M, minimum zinc coating of 600 g/m<sup>2</sup>.
- .6 Galvanizing vent hole plug: Grade 6061 Aluminum circular plug.

**2.3 Fabrication**

- .1 Fabricate structural steel in accordance with CSA S16 and with reviewed shop drawings.
- .2 Continuously seal hollow members exposed to weather by continuous welds.
- .3 Position beams having permissible mill camber so that the camber is up.
- .4 HSS members which require galvanizing to either be per CSA G40.21, grade 350W, Class H, or to be stress relieved prior to galvanizing.
- .5 Complete welded shop connections prior to galvanizing.
- .6 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left unpainted, place marking at locations not visible from exterior.

## **2.4 Shop Painting**

- .1 Clean all members to SSPC-SP 1 – Solvent Cleaning, Remove loose mill scale, rust, oil, dirt and foreign matter using any suitable method.
- .2 Apply galvanizing in the shop to all structural steel including:
  - .1 Exposed anchor rods.
- .3 If galvanized steel is to be painted, use only non passivated galvanizing process (without chromate coating).

## **PART 3 - EXECUTION**

### **3.1 General**

- .1 Structural steel work: in accordance with CSA S16.
- .2 Welding: in accordance with CSA W59.

### **3.2 Erection**

- .1 Erect structural steel in accordance with CSA S16 and reviewed erection drawings.
- .2 Do not field cut or alter any members without Departmental Representative approval.
- .3 Set column base plates to the elevation required for grouting using steel shims or leveling screws attached to sides of base plates. Do not fasten leveling nuts to anchor rods. Alternatively, for base plates equal or smaller than 350 mm x 350 mm (14" x 14"), leveling plates set with grout and level to within 1.5 mm (1/16") across the plate can be used. Do not erect columns upon plates exceeding this tolerance. Lift base plates for inspection when directed.
- .4 Grout under column base plates and beam bearing plates as soon as steelwork is completed.
- .5 Do not make permanent connections until structure has been properly aligned.
- .6 Install bolts which are not pre-tensioned to be snug tight.
- .7 Apply dry lubricant to threads of all galvanized bolts prior to installation.
- .8 Report ill-fitting connections to Departmental Representative before taking corrective measures.
- .9 When welding after galvanizing is in place, grind away galvanizing at areas to be welded.
- .10 Do not weld in an ambient temperature below -17°C. Preheat material adjacent to welding areas when ambient temperature is between -17°C and +4°C.
- .11 Remove slag from all completed welds so that they may be visually inspected.
- .12 Seal members by continuous welds where indicated.
- .13 Remove field connection aids from all surfaces which will be exposed to view and where interfering with clearances required by other trades.

### **3.3 Field Painting**

- .1 Paint in accordance with Section 09 91 00 - Painting
- .2 Touch up damaged surfaces with the same paint as the shop coat.
- .3 Repair any galvanized or zinc rich painted surfaces which have been damaged or field welded in accordance with SSPC Technology Guide No.14.
- .4 Clean and prepare surfaces of bolts, which will receive a finished coat of paint in the same manner as the connected steelwork.

**END OF SECTION 05 12 23**