

**DIVISION 05**

**METALS**

**Part 1 General**

**1.1 DESCRIPTION**

- .1 This section specifies requirements for supply, fabrication and installation of structural steel.
- .2 The work includes design, installation and removal of any bracing or other measures necessary to ensure stability of the steel framework during construction.

**1.2 RELATED WORK**

- .1 Metal Fabrications - Section 05 50 00
- .2 Painting - Section 09 90 00

**1.3 REFERENCE STANDARDS**

- .1 Design of Steel Structures - CSA-S16-14
- .2 Welded Steel Construction (Metal Arc Welding) - CSA-W59-13
- .3 Structural Quality Steel - CSA-G40.21-13

**1.4 DESIGN**

- .1 Design in accordance with Standards in Article 1.3.
- .2 Design all the temporary systems to maintain stability of the work at all phases of construction.
- .3 Design of all members and connections not detailed on the drawings shall be the responsibility of the shop drawing engineer and shall be detailed on a shop drawing bearing the signature and seal of a Professional Engineer registered in the Province of Manitoba.

**1.5 SUBMITTALS**

- .1 Submit certificates for the material supplied as requested by the Contract Administrator.
- .2 Submit erection diagram and shop details for review by the Contract Administrator 10 days in advance of fabrication.
- .3 Complete shop fabrication and erection drawings shall be provided for all work and items.
- .4 Provide separate layout plans and setting details for all bearing and attachment devices supplied under this section.
- .5 Shop drawings shall include details of all temporary bracing systems required for stability during construction and shall show the extent of prior work that is required to be in place for the temporary bracing system.
- .6 Bracing and stability systems as shown on drawings are for stability of the completed structure and shall not be assumed as adequate for the various stages of construction.

- .7 Before the placing of material orders, the Contractor shall submit for review by the Contract Administrator sketch drawings showing the general description of the proposed fabrication scheme. This shall include the general arrangement of plates or shapes, the location of all shop and field splices and such other information as may be required by the Contract Administrator to permit an assessment of the acceptability of the proposal.
- .8 Shop drawings showing all details shall be prepared by the Contractor and submitted for review by the Contract Administrator prior to fabrication. Refer to Section 01 33 00 – Submittal Procedures.
- .9 Fabrication executed before review of the shop drawings shall be at the Contractor's own risk.
- .10 In addition to specific details, the shop drawings must include the following items:
  - .1 Drawings showing details of connections designed by the Contractor.
  - .2 All dimensions shall be correct at 20°C unless otherwise shown.
  - .3 Weld procedure identification shall be shown on the shop details.
  - .4 All material splice locations shall be shown on the drawings.

## **1.6 QUALITY CONTROL**

- .1 Refer to Section 01 45 00 – Quality Control.

## **Part 2 Products**

### **2.1 STRUCTURAL STEEL**

- .1 Unless noted otherwise, steel to conform to the following.
- .2 Wide flange sections: to CSA-G40.21-350 W.
- .3 Hollow Structural Sections: to CSA-G40.21-350W Class C.
- .4 Other Steel Sections and Plate: to CSA-G40.21-300W.

### **2.2 BOLTS**

- .1 Bolts: to ASTM-A325-14.
- .2 Anchor bolts: to ASTM-F1554-15, Grade36
- .3 Nuts: to ASTM A563-07a (2014).
- .4 Washers: to ASTM F436-10.
- .5 Studs: to ASTM A108-13.

### **2.3 WELDING**

- .1 All welding material: to CSA-W59.

### **2.4 PRIMER**

- .1 Shop paint primer to CGSB-1-GP-140 Red Lead, Iron Oxide, Oil Alkyd Type, unless specified in Section 09 90 00 - Painting.

**2.5 HOT DIP GALVANIZING**

- .1 To CSA-G164-M92(R2003).

**Part 3 Execution**

**3.1 INSPECTION**

- .1 Notify the Contract Administrator in advance as required to allow inspection of fabrication (including welding) and erection.
- .2 Provide access to allow inspection of fit, welding, bolting and other aspects of the Work.

**3.2 SURFACE PREPARATION, PRIMING AND PAINTING**

- .1 Blastcleaning: Unless otherwise noted, all steel components shall be sandblast cleaned after fabrication in accordance with the Steel Structures Painting Council Standard (SSPC) No. SP6. Essentially this is a surface from which all oil, grease, dirt, rust, scale and foreign matter have been completely removed except for slight shadows, streaks, or discolorations caused by rust stain or mill scale oxide binder.
- .2 Painting: In accordance with Section 09 90 00.
- .3 Splice areas and areas in contact with concrete shall be blastcleaned but not painted and shall be kept free from overspray.
- .4 Application Conditions: In accordance with Section 09 90 00. Application of primer or paint must be at temperature of not less than 5°C for a period of not less than 12 hours to dry the paint. During primer application and curing, all necessary means shall be provided to assure that the members are protected against the effects of the weather. Primer shall not be applied upon damp or frosted surfaces.

**3.3 FABRICATION**

- .1 Take field measurements as necessary to ensure that items fabricated in the shop will fit the structure.
- .2 Reinforce hanger holes or openings for pipes or ducts with steel plates sized and welded in place to restore member to original design strength.
- .3 Provide holes for attachment of other work only after obtaining Contract Administrator's approval.

**3.4 WELDING**

- .1 Shop Qualifications: The Contractor shall be fully approved by the Canadian Welding Bureau (CWB) as per CSA-W47.1-09(2014). Welding procedures shall be submitted for each type of weld used in the structure. The procedures shall bear the approval of the Canadian Welding bureau and must also be approved by the Contract Administrator prior to use on the structure.
- .2 Welder Qualifications: Only welders, welding operators and tackers approved by the Canadian Welding Bureau in the particular category may be permitted to perform weldments. Their qualifications must be current and be available for examination by the Contract Administrator.

- .3 Welding Code: Except as otherwise noted on the drawings, all welding, cutting and preparation shall be in accordance with the CSA-W59.
- .4 Cleaning: All weld areas must be clean and free of mill scale, dirt, grease, paint, etc., prior to welding.
- .5 Preheat material and enclose heated enclosures as required for all field welding or cutting to maintain the steel at temperatures above 10°C.
- .6 Filler Metals: Low hydrogen filler, fluxes and low hydrogen welding practices are to be used throughout. The low hydrogen covering and flux shall be protected and stored as specified by CSA-W59.
- .7 Automatic Welding Process: All flanges and web butt joints and all stiffener to web fillet welds shall be made by an approved semi or fully automatic submerged arc process. All webs to flange fillet welds shall be made by an approved fully automatic submerged process. These weld areas must be clean, free of mill scale, dirt, grease, etc., and be preheated as required, just prior to welding.
- .8 Tack and Temporary Welds: Tack and temporary welds are not allowed unless they are to be incorporated in the final weld.
- .9 Methods of Weld Repair: Repair procedures for unsatisfactory welds must be submitted for approval by the Contract Administrator prior to work commencing.
- .10 Arc Strikes: Arc strikes shall not be permitted. In the event of accidental arc strikes, the Contractor shall submit to the Contract Administrator for approval his/her proposed repair procedure. The repair procedure shall include the complete grinding out of the crater produced by the arc strike. These areas shall be examined by the Contract Administrator to ensure complete removal of the metal in the affected area.
- .11 Grinding of Welds: Welds at web members to chord members shall be ground flush in all locations exposed to view. All other welds ground to CSA-W59.

### **3.5 MATERIAL SPLICES**

- .1 Additional splices, other than those shown on the details, will require approval of the Contract Administrator. The Contractor shall bear the cost of inspection of these splices.

### **3.6 HANDLING AND STORAGE**

- .1 All lifting and handling shall be done using devices that do not mark damage, or distort the assemblies or members in any way. Girders shall be stored upright, supported on sufficient skids and safely shored to maintain the proper section without buckling, twisting or in any damage or misalign the material.

### **3.7 APPROVAL OF ERECTION SCHEME**

- .1 Before starting the work of erection, the Contractor shall inform the Contract Administrator fully in writing as to the method of erection he/she proposes to follow and the amount and character of equipment he/she proposes to use which shall be subject to the approval of the Contract Administrator. The Contract Administrator's approval shall not be considered as relieving the Contractor of the responsibility for the safety of his/her methods or equipment, nor from carrying out the work in full accordance with the plans

and specifications. No work shall be done until such approval by the Contract Administrator has been obtained.

- .2 Erect to CSA-S16.
- .3 Touch up prime painting for complete coverage including all field connections.
- .4 Provide details of blocking for bearings, where necessary to restrain movements due to horizontal forces and/or gravity effects.
- .5 Provide details of grouting procedures including design mix and aggregate gradation of grout, or specifications for other materials, proposed for setting anchor bolts and/or constructing grout pads. Non-metallic non-shrink grout shall be used.
- .6 Carry out field measurements of the constructed substructure.
- .7 Bearing and Anchorage:
  - .1 Bearing plates shall not be placed upon bearing areas which are improperly finished, deformed, or irregular.
  - .2 Bearing plates shall be set level and in exact position.
  - .3 The Contractor shall accurately set anchor bolts, except where bolts are cast into concrete; he/she shall coordinate correct locations.
  - .4 When bearings are employed in conjunction with grout pockets in the substructure, bearings shall be set accurately on steel shims and grouted as detailed on the drawings after erection has been completed.

**END OF SECTION**

**Part 1 General**

**1.1 DESCRIPTION**

- .1 This section specifies requirements for the supply, fabrication, and installation of miscellaneous metals.
- .2 Metal fabrications include, but are not limited to:
  - .1 Hand holds and accessories
  - .2 Access hatches and support frames
  - .3 Gratings support frames
  - .4 Special pipe braces

**1.2 REFERENCE STANDARDS**

- .1 Materials shall be in accordance with CSA, CGSB and ASTM Standards.
- .2 Submit certificates for the materials supplied, as requested by the Contract Administrator.

**1.3 QUALITY ASSURANCE**

- .1 Employ tradesmen skilled in this trade and proficient in the use of various materials specified.
- .2 Perform work in accordance with material manufacturer's instructions.
- .3 Refer to Section 01 45 00 - Quality Control.

**1.4 SUBMITTALS**

- .1 Submit detailed shop drawings for all miscellaneous metals, showing fabrication and erection details. Design of all connections to be carried out and stamped by a Professional Contract Administrator registered in the Province of Manitoba.
- .2 Submit examples of aluminum plating, handrail and ladders for review by the Contract Administrator.
- .3 Submit details and shop drawings for review by the Contract Administrator, at least 10 days in advance of fabrication.

**1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver items on site in a safe manner.
- .2 Deliver items in sufficient quantity to allow continuity of work.
- .3 Deliver products to the site in the largest practical sections. Tag and mark items for identification.
- .4 Deliver items to be built in adjoining construction at proper time.
- .5 Store items on site under cover in positions to ensure that no bending, warping or marring takes place.
- .6 Prevent staining by concrete, mortar, plaster, oil, grease or other foreign substances.

- .7 Do not paint or place crayon or other markings on exposed surfaces.

**1.6 JOB CONDITIONS**

- .1 Give timely and accurate instructions to other trades for locations, levels, holes, connections of anchors, sleeves and frames.
- .2 Examine site conditions and take site measurements to ensure accurate and proper fitting, clear of obstructions.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Steel - conform to CSA-G40.21-13, Grade 300W. (For members exposed to cold weather conform to CSA-G40.21-13, 300WT)
- .2 Aluminum - alloy 6063-T6; 6351-T6 and 6061-T6 as specified herein.
- .3 Galvanizing - conform to CSA-G164-M92(R2003).
- .4 Fibreglass grating shall be as manufactured by Nemato Composites, Emco Industrial Plastics, or approved alternative in accordance with B7.

**2.2 SCHEDULE OF MATERIALS**

<b>Location</b>	<b>Item</b>	<b>Material</b>	<b>Finish</b>
Pumping Station	Ladder, Hand Hold, Access Hatches, Pipe Support Angles	Aluminum	Machine
	Inserts, Anchors, Supports, Guide Bars	Stainless Steel-13	Machine
	Pipe Supports, Air Vents	Galvanized Steel	Machine
	Intermediate Platform Grating	Fibreglass	Mill

**2.3 FASTENINGS AND ANCHOR BOLTS**

- .1 Nuts, bolts, washers, rivets and screws shall be stainless steel Type 316 ELC to ASTM-A167.
- .2 Anchor bolts to ASTM-A307, unless specified otherwise.
- .3 All lift station base insert pump elbow bolts shall be stainless steel Type 316 ELC and cast-in-place.
- .4 For anchors or fastening required to fix equipment after concrete has been poured, use anchorage in accordance with the equipment manufacturer's recommendations.
- .5 Provide angles, brackets, inserts, bolts, frames and all other items required to fasten metalwork and fibreglass grating to structure.



## **2.4 CORROSION PROTECTION**

- .1 Conform to Division 09 - Finishes, for shop priming.
- .2 Use stainless steel where shown on drawings.
- .3 Hot dip galvanize all ferrous metal fixings and miscellaneous parts, including hangers, bolts, nuts and washers. Galvanize in accordance with CSA-G164.

## **2.5 GROUT**

- .1 Use pre-mixed non shrink, non-metallic grout.

## **2.6 ALUMINUM CHECKERPLATE**

- .1 Covers and frames - clear anodized to CSA HA Series. Checkerplate - raised diamond pattern, framed Alloy 6351-T6. Construct the frames with aluminum structural angles or channels, mitred at the corners, complete with anchor lugs, and flat surround. Fit covers with lifting handles.
- .2 Support a uniform live load of not less than 4.8 kN/M<sup>2</sup> or a point load of 8.0 kN, whichever will produce greater stresses, with maximum deflection not to exceed 1/240 of the span.
- .3 Minimum thickness 6 mm not including raised diamond lugs.

## **2.7 FIBREGLASS LADDER**

- .1 A fibreglass access ladder shall provide safe access to the lift station bottom and intermediate platform.
- .2 Ladder construction and its supports are to be capable of holding two people at one time (200 kg). The design shall meet all safety requirements of the Manitoba Workplace Safety and Health Act and Regulations.
- .3 As manufactured by Canada Composites, Emco Industrial Plastics, or approved equal in accordance with B7

## **2.8 ALUMINUM HAND HOLD**

- .1 A hand hold shall provide safe access into and egress from the station and be aluminum.
- .2 Aluminum welded construction to CSA-S157, Alloy Type 6351-T6 and shall be as detailed on the drawings.
- .3 Hand hold construction and its supports shall meet all safety requirements of the Worker's Compensation Board and safety codes of the local area.

## **2.9 FIBREGLASS REINFORCED PLASTIC (FRP) GRATING**

- .1 Bearing and cross bars: minimum 6 x 40 mm (1/4" x 1 1/2") with 40 mm x 40 mm (1 1/2" x 1 1/2") spaces.
- .2 Grating to be removable in sections not exceeding 22.7kg (50 lbs) in weight.
- .3 Shop drawings shall include fastening details with sizes, gauges, and centres of fastenings.
- .4 Support 100 psf and max deflection L/360.

- .5 Sections shall have the following full section properties:
  - .1 Modulus of Elasticity 1.78 x 10<sup>6</sup> psi
  - .2 In plane shear strength 1600 psi
  - .3 Compressive Strength 31,200 psi
- .6 Sections shall be standard sections as manufactured by Nemato Composites or Emco Industrial Plastics.

## **2.10 LIFTING HOOKS AND RAIL SUPPORTS**

- .1 According to details on drawings.
- .2 Submit shop drawings.

## **2.11 ALL OTHER MISCELLANEOUS**

- .1 All other miscellaneous items as shown on the drawings shall be aluminum unless otherwise specified or shown on the drawings.

## **Part 3 Execution**

### **3.1 INSPECTION**

- .1 Notify the Contract Administrator to allow inspection of fit, welding, bolting and other items.
- .2 Take field measurements as necessary to ensure proper fit of miscellaneous metal items into structures.

### **3.2 FABRICATION**

- .1 Perform Aluminum welding according to CSA-S244.
- .2 Trim and bevel ends and other items to enable satisfactory welding.
- .3 Keep painting back from areas requiring welding after fabrication.

### **3.3 FINISHING**

- .1 Apply touch up paint for galvanized metal.
- .2 Clean and touch up shop primer after installation.
- .3 Refer to Division 09 - Finishes for finishing details.

### **3.4 FASTENING, ANCHORING**

- .1 Cast anchor bolts in concrete as shown on the drawings.
- .2 Do not use self-drilling anchors where cast-in anchor bolts are specified.
- .3 Drilled and epoxied HVA anchors are acceptable in lieu of cast-in-place type.

### **3.5 INSTALLATION**

- .1 Aluminum plates cast into concrete shall be coated with bitumastic to prevent contact between aluminum and concrete.

**3.6 CHECKERPLATE**

- .1 Provide checkerplate covers and frames where shown on the drawings.
- .2 Frames to consist of angle mitred at corners, complete with anchors and packing bars. Covers to be fitted with lifting handles, lock, hasp, and neoprene gaskets.

**3.7 ACCESS LADDERS**

- .1 Position access ladders and ladder anchors as shown on the drawings.
- .2 Access ladders shall comply with the requirements of the Worker's Compensation Board of Manitoba (which utilizes ANSI specification A14.3). In general, the requirements of this specification are as follows:
  - .1 Maximum spacing centre to centre of rungs = 305 mm.
  - .2 Floor to rung and rung to rung spacing shall not vary in any one ladder flight.
  - .3 The top rung in any ladder flight shall be at the same elevation as the landing, floor or curb or parapet.
  - .4 Minimum spacing between rails = 410 mm.
- .3 Position access ladder anchors as shown on the drawings, and anchor in position.

**END OF SECTION**