

**MISCELLANEOUS METALS AND AQUEDUCT SADDLE CONNECTION**

---

**1. GENERAL**

**1.1 Work Included**

- .1 The Work included in this Section generally includes, but is not limited to the following items:
  - .1 Supply and installation of the saddle connection to the existing Aqueduct.
  - .2 Supply and installation of the valve stem support.

**1.2 References**

- .1 City of Winnipeg Standard Construction Specifications
  - .1 Section 02315 – Excavation, Trenching and Backfilling
  - .2 Division 3 – Cast-in-Place Concrete
- .2 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM A36/A36M, Specification for Carbon Structural Steel
  - .2 ASTM A283/A283M Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
- .3 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel.
  - .2 CAN/CSA-S16.1, Limit States Design of Steel Structures.
  - .3 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
  - .4 CSA W59, Welded Steel Construction (Metal Arc Welding) (Imperial Version).
  - .5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

**1.3 Submittals**

- .1 Product Data:
  - .1 Submit Manufacturer's printed product literature, specifications and data sheet in accordance with Section 01300 Submittals.
- .2 Shop Drawings
  - .1 Submit shop drawings in accordance with Section 01300 - Submittals.
  - .2 Drawings for all items shall clearly indicate dimensions, materials, installation procedures and any other pertinent information.
  - .3 Submit shop drawings for shoring and excavation plan around Aqueduct. Shoring and excavation plan shall be designed and stamped by a Professional Engineer experienced in shoring design and licensed to practice in the Province of Manitoba.

---

**MISCELLANEOUS METALS AND AQUEDUCT SADDLE CONNECTION**

---

**2. PRODUCTS**

**2.1 Materials**

- .1 Saddle plate and steel cylinder: 8 mm thick, ASTM A283 or A36 steel.
- .2 Valve stem support: to CAN/CSA-G40.21 steel.
- .3 Chemical anchors: Hilti HVA capsule adhesive anchor or approved equal.
- .4 Epoxy injection resin shall be Kemko 077 epoxy injection resin or approved equal.
- .5 Gasket Material: Neporene Duro 60

**2.2 Fabrication**

- .1 The Contractor shall arrange with the Manufacturer of the saddle plate to have a qualified representative visit the site to examine and take measurements of the Aqueduct at the connection location for the purposes of making an accurate template for the saddle plate.
- .2 The saddle plate shall be welded to the steel cylinder as shown on the Drawings. Backing for the rubber gasket shall be welded onto the saddle plate as shown on the Drawings. The steel cylinder shall extend 300 mm from the concrete encasement.
- .3 The Contractor shall provide the Contract Administrator with seven (7) Calendar Days written notice of his intention to examine the Aqueduct with the Manufacturer's Representative. As the Aqueduct will be in service during the pre-installation inspection, the Contractor shall exercise care and caution when exposing and backfilling the Aqueduct. The work shall be carried out in the presence of the Contract Administrator.
- .4 The Contractor shall coordinate the hole size in the valve stem support to accommodate the valve stem requirements. The valve stem support shall be galvanized.

**2.3 Shop Painting**

- .1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .3 Clean surfaces to be field welded; do not paint.

**3. EXECUTION**

**3.1 Scheduling**

- .1 Dewatering of the Aqueduct will be completed by City forces and will be coordinated by the Contract Administrator. The Contractor shall ensure all of the work described in Stage I below, is completed before the start of the scheduled shutdown in order to enable coring of

---

**MISCELLANEOUS METALS AND AQUEDUCT SADDLE CONNECTION**

---

the opening in the Aqueduct during the shutdown window. All of the work must be completed during the Aqueduct shutdown window of five (5) Calendar Days.

**3.2 Excavation**

- .1 Excavation shall be done in accordance with Section 02315. All excavation and backfill operations shall be done in the presence of the Contract Administrator.
- .2 The Contractor shall exercise extreme care so as not to damage or disturb the Aqueduct. The exposed section of the Aqueduct shall be fully and adequately supported to the satisfaction of the Contract Administrator so as not to allow any shearing action to occur on the pipe at the limit of the excavation or at the joints. At no time will excavation equipment, machinery or vehicular traffic be allowed to be placed on or over the Aqueduct. Adequate bracing, shoring and cribbing of the excavation shall be provided as necessary so as not to lose any ground from under and around the Aqueduct outside of the excavation limits.

**3.3 Access to the Interior of the Aqueduct**

- .1 Access to the Aqueduct interior shall be through the existing 400 millimetre diameter pressure manhole, PMH 160 (Mile 12.87).

**3.4 Connection to the Aqueduct**

- .1 Grout any spalling and cracks of the exterior concrete of the Aqueduct under the saddle connection, if necessary. Install saddle in accordance to the Drawings
- .2 Remove the saddle connection and couplings to facilitate cutting the Aqueduct opening. Once the Aqueduct has been dewatered for the shutdown, anchor the coupon to be cored from inside the Aqueduct, then core the opening from the outside of the Aqueduct. The method of coring shall be subject to the approval of the Contract Administrator.
- .3 Locate existing Aqueduct reinforcing utilizing non-destructive reinforcement location equipment. Drill bolt holes in saddle so as to avoid reinforcing bars in Aqueduct using electric hammer drill (pneumatic drill not permitted). Prepare the surface of the Aqueduct and install the saddle and grout gaskets. Pressure test the annular space between the saddle connection and the Aqueduct exterior wall using the grout injection ports to 15 psi. Inject annular space with approved epoxy resin.
- .4 Clean and roughen the exterior surface of the Aqueduct using high pressure (35 MPa) water blasting where the saddle encasement is to be installed. Install concrete encasement in accordance to Division 3.
- .5 Disinfect the saddle connection, interior of the Aqueduct and supernatant piping to the butterfly valve in the valve chamber, by applying a 200 mg/litre hypochlorite solution to all surfaces in accordance with AWWA C652 Method B.

**3.5 Backfill**

- .1 Backfilled in accordance with Section 02315 and CW 2030 for Class 4 backfill. .

---

**MISCELLANEOUS METALS AND AQUEDUCT SADDLE CONNECTION**

---

**3.6 Testing of Fittings and Connection to the Aqueduct**

- .1 The leakage test will be conducted while the Aqueduct is being returned to service. The supernatant piping connection to the Aqueduct will be considered to have failed the test if water is observed flowing from the connection, or if moisture, other than precipitation or condensation, can be transferred to a dry hand from the exterior surfaces of the drain pipe and Aqueduct.
- .2 The Contractor shall be responsible for repairing any visible leaks.

**3.7 Valve Stem Support**

- .1 Install valve stem support located as shown on the Drawings.
- .2 Ensure that correct operation of the valve stem is maintained; make any required adjustments.

**4. METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

**4.1 Supply and Installation of the Aqueduct Saddle Connection**

- .1 Supply and installation of the Aqueduct saddle connection shall be measured on a lump sum basis, and paid for at the Contract Unit Price for "Supply and Installation of Aqueduct Saddle Connection" in accordance with these specifications. The lump sum price shall include excavation, backfill, cast-in-place concrete works, fabrication of saddle template and saddle, installation of saddle connection, removal and replacement of fence, removal and replacement of utilities, and connection of drain from valve chamber to the Aqueduct underdrain.

**4.2 Supply and Installation of Valve Stem Support**

- .1 Supply and installation of the valve stem support shall not be measured for payment. The supply and installation of valve stem supports shall be included in the price for "Construction of Valve Chamber".

**END OF SECTION**

## ALUMINIUM FABRICATIONS

---

### 1. GENERAL

#### 1.1 Design Requirements

- .1 Comply with CSA S157/A157.1 for strength design in aluminium work.
- .2 Floor covers and platform grating: unless otherwise indicated, minimum uniform loading of  $9.6 \text{ kN/m}^2$  at maximum deflection of  $L/360$  of clear span.

#### 1.2 Quality Assurance

- .1 Retain a Professional Engineer registered in the Province of Manitoba, with experience in work of comparable complexity and scope, to perform the following services as part of the Work of this Section:
  - .1 Design aluminium fabrication items as required to resist live, dead, lateral, wind, and seismic loads.
  - .2 Structural design.
  - .3 Review, stamp, and sign Shop Drawings.
  - .4 Conduct shop and Site inspections.
  - .5 Prepare and submit inspection reports.
- .2 Do aluminium welding to CSA W59.2 by fabricators certified by the Canadian Welding Bureau to CSA W47.2.

#### 1.3 Submittals

- .1 Shop Drawings: bearing professional seal and signature of the Professional Engineer responsible for the engineering design. Show work of this Section including large scale detail of members and materials, of connection and jointing details, and of anchorage devices, dimensions, thicknesses, description of materials, aluminium finishing, as well as other pertinent data and information.

#### 1.4 Measurement and Payment

- .1 No measurement will be made for the Work in this Section.
- .2 Include costs in the unit prices bid for the various structures as listed in the Schedule of Prices.

## **ALUMINIUM FABRICATIONS**

---

### **2. PRODUCTS**

#### **2.1 Materials**

- .1 Aluminium plates, shapes, and extrusions: 6061-T6 alloy, anodizing quality.
- .2 Welding rods, aluminium: 5356 alloy.
- .3 Grating: to style 30-102M as manufactured by Fisher & Ludlow using 6063-T6 aluminum alloy for bearing bars and 6063-T5 aluminum alloy for cross bars, corners and junctions ground smooth. Weld perimeter banding bars, same size as bearing bars, at grating edges and openings.
- .4 Fasteners: stainless steel ASTM 316 bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws, and machine bolts complete with applicable isolation washers.
- .5 Drilled anchors: RAWL by Anchor Construction Industrial Products or HSL by Hilti Inc. heavy-duty anchors, sizes to suit.
- .6 Bituminous Paint: to MPI (Master Paint Institute) EXT 5.5D, without thinner.

#### **2.2 Fabrication**

- .1 Verify dimensions of installed Work before commencing fabrications and report any discrepancies to Contract Administrator.
- .2 Fit and assemble Work in shop where possible. Execute Work in accordance with details and reviewed Shop Drawings. Where shop fabrication is not possible, make trial assembly in shop.
- .3 Unless indicated otherwise, provide welded connection for work of this Section.
- .4 Carefully make and fit details. Take special care with exposed finished Work to produce a neat and correct appearance to Contract Administrator's acceptance.
- .5 Assemble members without twists or open joints.
- .6 Correctly size holes for connecting Work of other Sections where such can be determined prior to fabrication. Where possible, show holes on Shop Drawings. Place holes not to cause appreciable reduction in strength of member.

#### **2.3 Welding**

- .1 Execute welding to avoid damage or distortion to Work. Execute welding in accordance with following standards:
  - .1 CSA W48: for welding materials; if rods are used, only coated rods are allowed.

## **ALUMINIUM FABRICATIONS**

---

- .2 CSA W59.2: for design of connections and workmanship.
- .3 CAN/CSA W117.2: for safety.
- .2 Thoroughly clean welded joints and exposed aluminium surfaces for a sufficient distance to perform welding operations.
- .3 Test welds for conformance and remove work not meeting specified standards and replace to Contract Administrator's acceptance.
- .4 Continuous weld all joints for the full length of each joint. Finish exposed welds smooth and flush, file, or grind as required.

### **2.4 Anchors and Fastening**

- .1 Use weld studs of size not larger than 10 mm for attaching miscellaneous materials and equipment to structure. If weight of item requires larger fasteners use clips or brackets and secure by welding or through bolting.
- .2 Use self-drilling expansion type concrete anchors for attaching to masonry and concrete.

### **2.5 Inserts and Hangers**

- .1 Install inserts, hangers, and supports. Make inserts drilled type.
- .2 Before openings are cut through structure, obtain Contract Administrator's written acceptance for procedures, locations and reinforcements required.

### **2.6 Aluminium Finishes**

- .1 Clear anodic finish: AA-M12C22A41, as fabricated nonspecular mechanical finish, medium matte etched chemical finish, architectural class I clear anodic coating of minimum 18 µm (0.7 mil) thick complying with AAMA 611.

## **3. EXECUTION**

### **3.1 Erection**

- .1 Fit joints and intersecting members accurately. Make Work in true planes with adequate fastenings. Build and erect Work plumb, true, square, straight, level, and accurate to sizes detailed, free from distortion or defects detrimental to appearance or performance.
- .2 Perform drilling of concrete as required to fasten Work of this Section.
- .3 Unless otherwise indicated, grout set work in concrete with non-shrink grout. Trowel surface smooth and flush with adjacent surfaces.

## **ALUMINIUM FABRICATIONS**

---

- .4 Insulate aluminium where necessary to prevent corrosion due to contact between dissimilar metals and between aluminium and masonry, or concrete. Use bituminous paint, butyl tape, building paper, or other accepted means.

### **3.2 Schedule of Aluminium Works**

- .1 General: supply and install work indicated on Drawings and not included in work of other Sections in addition to items listed below. Where items are required to be built into concrete or other work, supply such items to respective Sections with all anchors and accessories for building in.
- .2 Itemized list: supply and install following Work unless specifically designated to be supplied only. List supplied herein is not necessarily complete and shall be augmented by thorough inspection of Drawings and all other requirements to complete Work. Each item shall be as indicated on Drawings and as detailed on reviewed Shop Drawings:
  - .1 Access ladders: construct access ladders of stringers with solid rungs rigidly secured to the stringers. Supply and install angle clips and anchor bolts to secure the ladders in place.
  - .2 Grating: fabricate removable and fixed gratings in sections weighing maximum 75 kg each. Install grating loose laid in place.
  - .3 Checkered plate covers: diamond shaped raised pattern, of nominal thickness shown exclusive of raised pattern.

**END OF SECTION**