

## 1 GENERAL

### 1.1 REFERENCE STANDARDS

- .1 American Association for State Highway and Transportation Officials (AASHTO)
  - .1 AASHTO Standard Specifications for Highway Bridges-17th Edition 2002.
- .2 ASTM International
  - .1 ASTM A 325M-09, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength [Metric].
  - .2 ASTM A 490M-09, Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints.
  - .3 ASTM A 780M-15 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- .3 CSA International
  - .1 CSA G40.20/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 CAN/CSA S6-14, Canadian Highway Bridge Design Code.
  - .4 CSA S16-14, Design of Steel Structures.
  - .5 CSA S269.1-16, Falsework for Construction Purposes.
  - .6 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
  - .7 CSA W59-13, Welded Steel Construction, (Metal Arc Welding).

### 1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 10 General Instructions.
- .2 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario and Quebec, Canada.
  - .2 Indicate shop and erection details including shop splices, cuts, copes, connections, holes, bearing plates, threaded fasteners, rivets and welds. Indicate welds by CSA W59, welding symbols.
  - .3 Proposed welding procedures to be stamped and approved by Canadian Welding Bureau.

### 1.3 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 00 10 General Instructions.
- .2 Provide protective blocking for lifting, transportation and storing.
  - .1 Exercise care during fabrication, transportation and erection so as not to damage to components.
  - .2 Do not notch edges of members.
  - .3 Do not cause excessive stresses.
- .3 Mark mass on members weighing more than 3 tonnes.

- .4 Protect unpainted weathering steel, before erection, with waterproof covering.
- .5 Ensure that no portion of steel comes into contact with ground.

## 2 PRODUCTS

### 2.1 MATERIALS

- .1 Structural steel: to CSA G40.20/G40.21, grade and types 300W, hot dipped galvanized.
- .2 High strength bolts: to ASTM A 325M Type 1, galvanized.
- .3 Nuts to ASTM A563M, galvanized and anti-theft.
- .4 Washers to ASTM F436M, galvanized.
- .5 Steel chain, spring link and anchor shackle, 10 mm minimum thickness, galvanized.
- .6 Touch-up coating: zinc reach primer with 85% or more zinc content in the dried film.
- .7 Hot dip galvanizing: to CAN/CSA G164, minimum zinc coating of 600 g/m<sup>2</sup>.

## 3 EXECUTION

### 3.1 EXAMINATION

- .1 Verification of Conditions: verify existing conditions of substrates are acceptable for installation.
  - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### 3.2 PREPARATION

- .1 Clean steel surfaces as directed by Departmental Representative when staining or defacing occurs.
- .2 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.
  - .1 Enlarge holes if necessary by reaming only after receipt of approval from Departmental Representative
  - .2 Ensure reamed holes are 2 mm maximum larger than bolt size used.

### 3.3 INSTALLATION

- .1 Do fabrication and erection of structural steel in accordance with CAN/CSA S6, Design of Highway Bridges.

- .2 Do welding in accordance with CSA W59, except where specified otherwise.
  - .1 Do welding in shop. Field welding is not permitted
- .3 High strength bolting: in accordance with CAN/CSA S6. Use 'turn-of-nut' tightening method. Drill new bolt holes in existing ladder supports. Torch cutting is not permitted.
- .4 Finish: members true to line, free from twists, bends, open joints, sharp corners and sharp edges.
- .5 Allowable tolerance for bolt holes:
  - .1 Matching holes for bolts to line up so that dowel 2 mm less in diameter than hole passes freely through assembled members at right angles to such members.
  - .2 Finish holes not more than 2 mm in diameter larger than diameter of rivet or bolt unless otherwise specified by Departmental Representative.
  - .3 Centre-to-centre distance between any two holes of group to vary by not more than 2 mm from dimensioned distance between such holes.
  - .4 Correct mispunched or misdrilled members only as directed by Departmental Representative.
- .6 Component length tolerances:
  - .1 plus or minus 2 mm.
- .7 Shop splices:
  - .1 Not permitted.
- .8 Field splices: not permitted
- .9 Touch-up galvanization in areas damaged during installation, new cut ends and around bolt holes to meet ATSM A780.
- .10 Install chains so that slack is between 75 mm and 125 mm.

### 3.4 FIELD QUALITY CONTROL

- .1 Schedule site visits:
  - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
  - .2 Upon completion of the Work, after cleaning is carried out.

### 3.5 CLEANING

- .1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

**END OF SECTION**

## 1 GENERAL

### 1.1 RELATED REQUIREMENTS

- .1 Section 02 83 99 Bridge Cleaning.

### 1.2 REFERENCE STANDARDS

- .1 ASTM International
  - .1 ASTM A 325M-09, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric.
  - .2 ASTM A 307-14 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
  - .3 ASTM1023-15 Standard Specification for Stranded Carbon Steel Wire Ropes for General Purposes.
- .2 CSA International
  - .1 CSA G40.20/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 CAN/CSA S6-14, Canadian Highway Bridge Design Code.
  - .4 CSA S16-14, Design of Steel Structures.
  - .5 CSA S269.1-16, Falsework for Construction Purposes.
  - .6 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
  - .7 CSA W59-13, Welded Steel Construction, (Metal Arc Welding).

### 1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings:
  - .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with Departmental Representative in accordance with Section 01 00 10 General Instructions to:
    - .1 Verify project requirements.
    - .2 Review installation and substrate conditions.
    - .3 Co-ordination with other subtrades.
    - .4 Review manufacturer's written installation instructions and warranty requirements.
  - .2 Ensure key personnel attend.

### 1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 10 General Instructions.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for bird deterrent system and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3 Shop Drawings:

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario and Quebec, Canada.
- .2 Indicate shop and erection details including shop splices, cuts, copes, connections, holes, bearing plates, threaded fasteners, rivets and welds. Indicate welds by CSA W59, welding symbols.
- .3 Proposed welding procedures to be stamped and approved by Canadian Welding Bureau.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 00 10 General Instructions.
- .2 Provide protective blocking for lifting, transportation and storing.
  - .1 Exercise care during fabrication, transportation and erection so as not to damage bird deterrent system.
  - .2 Do not notch edges of members.
  - .3 Do not cause excessive stresses.
- .3 Protect bird deterrent system, before erection, with waterproof covering.
- .4 Ensure that no portion of bird deterrent system comes into contact with ground.

### 1.6 QUALITY ASSURANCE

- .1 Preconstruction Testing:
  - .1 Provide suitable facilities and cooperate with Departmental Representative in carrying out inspection and tests required.

## 2 PRODUCTS

### 2.1 MATERIALS

- .1 Structural steel: to CSA G40.20/G40.21, grade and types 300W, hot dip galvanized.
- .2 Bolts, nuts and washers: to ASTM A 307 galvanized.
- .3 Anchor bolts, washers and nuts: to CSA G40.20/G40.21, grade 300W galvanized.
- .4 Welding electrodes: to CSA W48 series.
- .5 Hot dip galvanizing: to CAN/CSA G164, minimum zinc coating of 600 g/m<sup>2</sup>.
- .6 Bird Netting - minimum requirements: heavy duty, ultra-violet stabilized knotted polyethylene netting with 19.05 mm meshing. The netting shall be flame resistant, rot-proof and stable in cold temperatures. It shall be comprised of 6 mono filaments each 0.305 mm thick with U.V. stabilizers added. Mono filaments shall be intertwined with 160 to 200 twists per 1.0 m of twine. Breaking strength shall be at least 225 N.
- .7 Mounting hardware: supplied by and meeting the requirements of the bird netting manufacturer. All metal hardware shall be galvanized. Eyebolts shall be to ASTM A307 Grade A and shall be M6 minimum size, galvanized.

- .8 Straining wire - minimum requirements: 2.38 mm diameter to ASTM A1023 and galvanized. Ferrules shall be made of aluminium.
- .9 Bird spikes - minimum requirements: fabricated of Grade 316 stainless steel and with 200 mm of coverage consisting of a minimum of 40 spikes per 305 mm. Staggered spikes are not acceptable. System to have a centre spike resulting in no gap. Minimum height of the bird spikes is 120 mm. Spike thickness shall be 1.1 mm. The base strip shall be made of a flexible material allowing 360 degree bends.
- .10 Adhesive: non-silicone based outdoor construction adhesive as specified or supplied by the manufacturer of the bird deterrent system.
- .11 Concrete fasteners: bearing expansion bolts or powder actuated fasteners as specified or supplied by the manufacturer of the bird deterrent system.
- .12 Steel fasteners: bolts, metal screws and powder-actuated fasteners as specified or supplied by the manufacturer of the bird deterrent system.
- .13 Alternate connection methods: girder clamps, permanent magnets and/or epoxy connectors as recommended by the manufacturer. Alternate connection methods to be durable, resistant to environmental conditions (UV, moisture, temperature and of sufficient strength and rigidity to permanently secure the bird deterrent system in place.

### **3 EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify existing conditions of substrates are acceptable for bird deterrent system installation in accordance with manufacturer's written instructions.
  - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

#### **3.2 PREPARATION**

- .1 Clean surfaces as directed by Departmental Representative when staining or defacing occurs.
- .2 Perform surface preparation as per bird deterrent system manufacturer's recommendations.

#### **3.3 INSTALLATION**

- .1 Connection to the existing structure:
  - .1 Connections between the bird deterrent system and the existing structure to be as specified by the manufacturer unless indicated otherwise on the Contract Drawings.
  - .2 Provide corner attachments at the end of each net run (corners) and

at all turns.

- .3 Provide intermediate attachments at 450 mm spacing.
- .4 Do not damage the structural steel elements of the bridge (box girders and associated bracing elements): welding, riveting, drilling, nailing, screwing and/or fire-in-pinning are not permitted. Use alternate connection methods instead.
- .5 Connect the bird deterrent system to the existing concrete elements of the structure (abutments, piers, deck fascia and wingwalls) using concrete fasteners. Powder-actuated fasteners are acceptable for the intermediate attachments only. Locate concrete fasteners a minimum distance of 70 mm away from any concrete edge.
- .6 Connect the bird deterrent system to the existing catwalk structure as specified by the manufacturer of the bird deterrent system.
- .7 Connect the bird spikes to the existing concrete surfaces using an adhesive specified by the manufacturer of the bird deterrent system.
- .8 Limit cable segments for the bird netting to 10.0 m length and equip each segment with a M6 galvanized turnbuckle. Loop each cable segment end with a minimum of two ferrules per loop.
- .9 Install the bird netting as recommended by the manufacturer to accommodate the expansion and contraction indicated on the Contract drawings.
- .10 Limit gaps between the bird netting and structure, and between adjacent segments of bird netting to 20 mm.
- .11 Install the bird spikes using a combination of adhesive and concrete fasteners as specified by the manufacturer.

### 3.5 CLEANING

- .1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**