Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 - Cast-In-Place Concrete.

.2 Section 05 50 00 - Metal Fabrications.

1.2 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit Technical Data Sheets for all products to be used during work.

.3 Indicate materials, finishes, connections and accessories to be used during work.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Transport and store in accordance with manufacturer's instructions. Attention will be paid to product shelf life, storage temperature and protection from moisture.

Part 2 Products

2.1 MATERIALS

.1 Anchors: complete with all accessory parts as specified by manufacturer, and additional accessories indicated on drawings or described in specifications.

.2 Steel Bearing Plates: to ASTM A36/A36M-08.

.3 Clean steel surfaces of all rust and deleterious matter. Remove grease or oils thoroughly. Bars showing pitting will be rejected.

.4 Store bars straight, and protect threads.

.5 Deliver materials in clearly marked, sealed bags.

.6 Store materials in dry, heated enclosure maintained between 2°C and 40°C.

.7 Hot dip galvanize all the anchors unless they are stainless steel anchors.

.8 Provide mill certificate of each type of anchor to the Departmental Representative.

2.2 TYPE A1 AND A2 ANCHORS

.1 Solid concrete anchor.

.2 Threaded unless noted otherwise on the drawings.

.3 Steel plates to ASTM A36/A36M-96.

.4 Diameter:

.1 A1 – 16 mm dia., expansion anchor, manufacturer approved epoxy grout, as per ASTM A325. Use as shown on drawings.

.2 A2 – 22 mm dia. and 25.4 mm dia., adhesive anchor with manufacturer approved epoxy grout, stainless steel as ASTM F 593 (AISI 304/316). Use as shown on drawings.

Part 3 Execution

3.1 INSTALLATION

.1 Drill holes strictly in accordance with the size and depth specified by the manufacturer for the particular anchor bolt to be used.

.2 Care will be taken to prevent damage to the concrete or concrete block. To ensure as little damage as possible, use a rotary impact hammer drill, carbide-tipped masonry drill bits, or equipment otherwise specified by the manufacturer. All damage to concrete and concrete block will be repaired by the Contractor.

.3 Unless otherwise specified, do not drill holes in concrete until concrete, mortar, or grout has achieved full design strength.

3.2 CURING

.1 All anchors will be installed and cured as per the recommendations of the manufacturer.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 05 50 00 - Metal Fabrications.

.3 Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

- .1 CSA-S16-2009 - Limit States Design of Steel Structures.
- .2 CSA G40.20-2009 - General Requirements for Rolled or Welded Structural Quality Steel.
- .3 CSA G40.21-2009 - Structural Quality Steel.
- .4 CSA W47.1-2009 - Certification of Companies for Fusion Welding of Steel.
- .5 CSA W59-2008 - Welded Steel Construction (Metal Arc Welding).
- .6 CSA S136-2012 - Cold Formed Steel Structural Members.
- .7 CSA G164-2003 - Hot Dip Galvanizing of Irregularly Shaped Articles.
- .8 CISC Code of Standard Practice for Structural Steel.

.2 American Society for Testing and Materials (ASTM)

- .1 ASTM A53/A53M-2012 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .2 ASTM A123/A123M-2012 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM A325M-2009 - Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric).
- .4 ASTM A449-2010 - Anchor Bolts.
- .5 ASTM F436M-2011 - Hardened Steel Washers (Metric).
- .6 ASTM A653/A653M-2011 - Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .7 ASTM A500/A500M-2010 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- .8 ASTM A501-2007 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Prior to fabrication, submit the description of all work to be fabricated and the appropriate weld procedures. These procedures are to be in accordance with CSA Standard W49.1, and welders qualified and certified as per W47.1.

.3 Shop Drawings:

.1 Provide drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.

.4 Erection Drawings:

.1 Submit erection drawings indicating 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 Fabrication Drawings:

.1 Submit fabrication drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the Province of Ontario, Canada.

.6 Source Quality Control Submittals:

.1 Submit 4 copies of mill test reports at least 4 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 Province of Ontario, Canada.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver materials in manufacturer’s original, undamaged containers with identification labels intact.

.3 Packaging waste management in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 DESIGN REQUIREMENTS

.1 Design details and connections in accordance with requirements of CAN/CSA-S16 to resist forces, moments and shears, and allow for movements if 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 Submit sketches and design calculations stamped and signed by qualified professional engineer licensed in the Province of Ontario, Canada for nonstandard connections.

2.2 MATERIALS

.1 Structural Steel Shapes and Bars: CSA G40.21 - 350W.

.2 Structural Steel Angles and Channels: CSA G40.21 - 300W.

.3 Structural Steel Plates: CSA G40.21 - 300W.

.4 Structural Steel (Hollow Structural Sections): CSA G40.21 - 350W Class C.

.5 Floor Plates: CSA G40.21.

.6 Steel Pipe: ASTM A53/A53M:

.1 Standard: Schedule 40.

.2 Extra strong: Schedule 80.

.7 Welding Materials: CSA W48.1 to W48.6.

.8 Arc Welding Electrodes: E49XX.

.9 Bolts, Nuts and Washers:

.1 High strength: ASTM A325M.

.2 Washers, hardened: ASTM F436M.

.10 Provide cast-in-place anchor bolts, nuts and washers to ASTM A449 unless noted otherwise on the drawings. Provide the embedment lengths as shown on drawings.

.11 Unless otherwise specified herein or shown on the Drawings, all exposed fastenings to be of the same material, colour and finish as the metal to which they are attached.

2.3 GROUT

.1 Grout to be used under base plates and bearing plates, etc: nonshrink, nonmetallic, cement based, flowable, minimum 28 days compressive strength 30 MPa or pre-packaged equal with the approval of the Departmental Representative.

.2 Adhere to the requirements of CAN/CSA A23.1 and to the grout manufacturers' recommendations regarding handling, mixing, preparing, placing, finishing, and curing of the grout.

.3 Clean all the surfaces receiving grout of all debris in accordance with the manufacturer's instructions.

2.4 FABRICATION

.1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with approved shop drawings. The approval of the shop drawings by the Departmental Representative does not relieve Contractor from the responsibility to perform quality work as per these specifications and all applicable codes.

.2 Galvanize (hot dipped) the structural and miscellaneous steel and accessories as per Section 09 90 00 - Painting and Coating.

Part 3 Execution

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 GENERAL

.1 Structural Steel Work: in accordance with CAN/CSA-S16 and CAN/CSA-S136.

.2 Welding: in accordance with CSA W59.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.3 CONNECTIONS

.1 Verify dimensions of the as-built concrete and report discrepancies and potential problem areas to Departmental Representative for direction before commencing fabrication/erection.

.2 Use connection angles and end plates with lengths of not less than one half of the depth of the connected member.

.3 All the shop connections to be welded and all field connections to be bolted unless noted otherwise or approved by the Departmental Representative.

.4 Unless shown otherwise on the drawings, all bolts to be 20M diameter, high-strength bolts to ASTM A325.

.5 A minimum 5-mm continuous structural fillet weld to be used except as shown otherwise on the drawings.

.6 Follow manufacturer guidelines to install anchor bolts in the concrete.

.7 Any connection designed by the Contractor to be as per latest CSA S16 and be stamped by a professional engineer registered with Professional Engineers of Ontario.

3.4 MARKING

.1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.

.2 Match Marking: shop mark for fit and match.

3.5 ERECTION

.1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with approved erection drawings.

.2 Field cutting or altering structural members: to approval of Departmental Representative.

.3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.

.4 Continuously seal members by continuous welds where indicated. Grind smooth.

.5 Welding:

.1 All welding to conform to the requirements of CSA W59 except as modified herein. Welding to be performed by the arc welding process. Contractor to be fully accepted by the Canadian Welding Bureau in accordance with CSA Standard W47.1 (Division 1 or 2).

.2 Perform welding under the supervision of a welding supervisor qualified under the requirements of CSA W47.1. Welding operators to be certified within 2 years of the date of performing the Work.

.3 All shop welding performed on the Work is subject to inspection by the Departmental Representative.

.4 Plan the welding sequence to control and minimize distortion and where necessary include stress relief to minimize residual stresses.

.5 Exposed welds to be ground smooth and flush with the adjacent metal on all angles, frames, on bearing surfaces where weld projections would prevent proper seating or bearing of contacting members.

.6 The welding of the galvanized sections is not allowed without Departmental Representative permission and properly restoring the damaged galvanized surfaces due to welding.

3.6 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and workmanship to be carried out by testing laboratory designated by Departmental Representative.

.2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Departmental Representative.

.3 Submit test reports to Departmental Representative within 2 weeks of completion of inspection.

3.7 FIELD PAINTING

.1 Paint in accordance with Section 09 90 00 - Painting and Coating.

.1 Touch up the galvanized surfaces damaged during construction with two coats of approved zinc-rich paint as per manufacturer’s recommendations at no additional expense to the Departmental Representative.

3.8 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.2 Waste management in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 03 30 00 - Cast-In-Place Concrete.

.3 Section 05 05 19 - Post-Installed Concrete Anchors.

.4 Section 09 90 00 - Painting and Coating.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA S16-2009 - Limit States Design of Steel Structures.

.2 CSA G40.20-2009 - General Requirements for Rolled or Welded Structural Quality Steel.

.3 CSA G40.21-2009 - Structural Quality Steel.

.4 CSA W47.1-2009 - Certification of Companies for Fusion Welding of Steel.

.5 CSA W59-2008 - Welded Steel Construction (Metal Arc Welding).

.6 CSA S136-2012 - Cold Formed Steel Structural Members.

.7 CSA G164-2003 - Hot Dip Galvanizing of Irregularly Shaped Articles.

.8 CISC Code of Standard Practice for Structural Steel.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A325M 2013 - Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric).

.2 ASTM A490 –2012 - Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.

.3 ASTM A653/A653M-2011 - Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 American Architectural Manufacturers Association (AAMA)

.1 AAMA 2604-2010- Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer’s instructions, printed product literature and data sheets for sections, plates, pipe, tubing, bolts and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

Part 2 Products

2.1 MATERIALS

.1 Structural Steel Shapes and Bars: CSA G40.20/G40.21 - 350W.

.2 Structural Steel Angles and Channels: CSA G40.20/G40.21 - 300W.

.3 Structural Steel Plates: CSA G40.20/G40.21 - 300W.

.4 Structural Steel (Hollow Structural Sections): CSA G40.20/G40.21 - 350W.

.5 Sheet Steel: ASTM A653.

.6 Floor Plates: CSA G40.21.

.7 Cast Iron: ASTM A48 Class 25.

.8 Steel Pipe: ASTM A53/A53M.

.1 Standard: Schedule 40.

.2 Extra strong: Schedule 80.

.9 Chains: ASTM A467/A467M.

.10 Welding Materials: CSA W48.1 to W48.6.

.11 Arc Welding Electrodes: E49XX.

.12 Bolts, Nuts and Washers:

.1 High strength - ASTM A325M or ASTM A490.

.13 Drill-in-place anchor bolts for the handrails will be as per Section 05 05 19 - Post-Installed Concrete Anchors.

2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Where possible, fit and shop assemble work, ready for erection.

.3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

.1 All the handrails, fall arrest system and exterior steel doors of the electrical building will be hot-dipped galvanized and painted (if shown on drawings) as per Section 09 90 00 - Painting and Coating.

.2 Metal siding and steel roofing will be baked enamel finish as per AAMA 2604. Steel roofing to match colour with siding.

2.4 GROUT

.1 Grout to be used under base plates and bearing plates, etc: nonshrink, nonmetallic, cement based, flowable, minimum 28 days compressive strength 30 MPa or pre-packaged equal with the approval of the Departmental Representative.

.2 Adhere to the requirements of CAN/CSA A23.1 and to the grout manufacturers' recommendations regarding handling, mixing, preparing, placing, finishing, and curing of the grout.

.3 Clean all the surfaces receiving grout of all debris in accordance with the manufacturer's instructions.

2.5 SHOP PAINTING

.1 Apply one shop coat of primer to metal items required to be painted as noted on the drawings or directed by the Departmental Representative, with exception of galvanized or concrete-encased items.

.2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale and grease. Do not paint when temperature is lower than 7°C.

.3 Do not paint the clean surfaces to be field welded if permitted by the Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 ERECTION

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight and true, accurately fitted, with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.4 Exposed fastening devices to match finish and be compatible with material through which they pass.

.5 Supply components for work by other trades in accordance with shop drawings and schedule.

.6 Make field connections with bolts to CSA S16.

.7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.

.8 Touch-up rivets, field welds, bolts, and burnt or scratched surfaces with primer after completion.

3.3 HANDRAIL AND FALL ARREST SYSTEM

.1 Install posts to the lines and levels indicated on drawings.

.2 Align posts so that the maximum deviation of any post from a straight line drawn between end posts is less than 4 mm.

.3 Weld steel pipe handrail and fall arrest system posts to base plates as indicated on drawings.

.4 Bolt base plate pipe sleeve assemblies as indicated on drawings.

.5 Weld to CSA W59-03(R2008) and CSA W48-06.

.6 Repair damaged galvanized surfaces on the handrails and fall arrest system. Clean damaged surfaces with wire brush removing loose and cracked spelter coatings. Apply two coats of approved zinc-rich paint to damaged areas.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by metal fabrications installation.

END OF SECTION