

SECTION 05 05 23

WELDING-QUALITY ASSURANCE

PART 1 GENERAL

1.1 REFERENCES

- A. Comply with the latest edition of the following statutes codes and standards and all amendments thereto.
1. Canadian Standard Association CSA:
    - a. G30.18, Carbon Steel Bars for Concrete Reinforcement.
    - b. W59, Welded Steel Construction (Metal Arc Welding).
    - c. W59.2, Welded Aluminum Construction.
    - d. W186, Welding of Reinforcing Bar in Reinforced Concrete Construction.
    - e. W47.1, Certification of Companies for Fusion Welding of Steel.
    - f. W47.2, Certification of Companies for Fusion Welding of Aluminum.
    - g. W117.2, Safety in Welding, Cutting and Allied Processes.
    - h. W178.1 Certification of Welding Inspection Organisations.
    - i. W178.2, Certification of Welding Inspector.
    - j. W55.3, Certification of Companies for Resistance Welding of Steel and Aluminum
  2. ASTM International (ASTM):
    - a. A370, Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
    - b. E10-01, Standard Test Method for Brinell Hardness of Metallic Materials.
    - c. E23-02, Standard Test Methods for Notched Bar Impact Testing of Metallic Materials.
  3. American Welding Society (AWS):
    - a. A2.4, Standard Symbols for Welding, Brazing, and Nondestructive Examination.
    - b. A3.0, Standard Welding Terms and Definitions; Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting and Thermal Spraying.
    - c. D1.1, Structural Welding Code – Steel.
    - d. D1.3, Structural Welding Code - Sheet Steel.
    - e. D1.6, Structural Welding Code – Stainless Steel.
    - f. QC1-96, Specification for AWS Certification of Inspection Personnel.
  4. Canadian General Standards Board (CGSB):
    - a. 48.9712 Non-Destructive Testing – Qualification and Certification of Personnel.
  5. American Society of Mechanical Engineers (ASME):
    - a. BPVC SEC V, Nondestructive Examination.
    - b. BPVC SEC IX, Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.

## 1.2 DEFINITIONS

- A. Class W47.1 welding positions flat (F) horizontal (H); vertical (V) overhead (O).
- B. CJP: Complete Joint Penetration.
- C. CWB: Canadian Welding Bureau.
- D. CWI: Certified Welding Inspector.
- E. GTSM: Gauge to Sound Metal.
- F. MT: Magnetic Particle Testing.
- G. NDE: Nondestructive Examination.
- H. NDT: Nondestructive Testing.
- I. PJP: Partial Joint Penetration.
- J. PQR: Procedure Qualification Record.
- K. PT: Liquid Penetrant Testing.
- L. RT: Radiographic Testing.
- M. UT: Ultrasonic Testing.
- N. VT: Visual Testing.
- O. WPQ: Welding Personnel Performance Qualification.
- P. WPS: Welding Procedure Specification.
- Q. WPDS: Welding Procedure Data Sheets.
- R. WQR: Welder Qualification Record.
- S. Contractor's inspection:
- T. Verification Inspection:

## 1.3 SUBMITTALS

- A. Shop and Field Drawings:
  - 1. Welding Data (Shop and Field):
    - a. Show on a weld map complete information regarding base metal specification designation, location, type, size, and extent of welds with

reference called out for WPS and NDE numbers in tail of welding symbol.

- b. Distinguish between shop and field welds.
  - c. Indicate, by welding symbols or sketches, details of welded joints and preparation of base metal. Provide complete joint welding details showing bevels, groove angles, and root openings for welds.
  - d. Fillet weld symbols shall show fillet size and length.
  - e. Groove weld symbols shall indicate CJP or PJP or GTSM in the tail of the symbol, as applicable.
  - f. For pipe fittings, provide a joint weld beveling diagram.
  - g. Welding and NDE symbols shall be in accordance with AWS A2.4.
  - h. Welding terms and definitions shall be in accordance with AWS A3.0.
  - i. Submit welding data together with shop drawings as a complete package.
- B. Other Submittals:
1. When CAN/CSA applies, WPS's and related WPDS's shall be submitted for all joints prequalified in accordance with W59. Similar documentation is required for non prequalified joints accompanied by PQR's for the non-prequalified joints. All such documentation shall be affixed with the CWB acceptance stamp.
  2. When AWS applies, WPS's standard formats shall be submitted for all prequalified and non prequalified joints. In addition, PQR's shall be submitted for non-prequalified joints.
  3. When the BPVC applies, WPS's and PQR's shall be submitted in accordance with ASME SECT. IX approved by the authority having jurisdiction.
  4. When CAN/CSA W55.3 applies, documentation of resistance welded joint qualification accepted by the CWB shall be submitted.

#### 1.4 QUALIFICATIONS

- A. Structural fabricators and erectors shall be certified in accordance with CAN/CSA W47.1-03 and/or W47.2.
- B. BPVC fabricators shall be qualified in accordance with ASME Section IX.
- C. Welding personnel shall be qualified in accordance with the appropriate codes – CAN/CSA W47.1 or W47.2; AWS D1.1; D1.2; D1.6; ASME Section IX.
- D. CWI shall be qualified in accordance with CAN/CSA W178.2 or AWS QC1 and shall have prior experience with the welding codes specified.
- E. Non-destructive inspection personnel shall be qualified in accordance with the appropriate CAN/CGSB requirements or NDT Level II certified in accordance with ASNT SNT-TC-1A.

#### 1.5 SEQUENCING AND SCHEDULING

- A. Unless otherwise specified, all Submittals required in this Section shall be submitted and approved prior to commencement of welding operations.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 GENERAL

- A. Welding and Fabrication by Welding: Conform to governing welding codes referenced in attached Welding and Nondestructive Testing Table.

3.2 NONDESTRUCTIVE WELD TESTING REQUIREMENTS

- A. Contractor's Inspection Criteria:
  - 1. Selection of Welds to be Tested: Unless 100 percent NDT is specified herein, as agreed upon between Contract Administrator and Contractor.
  - 2. Unless otherwise specified, perform NDT of welds at a frequency as shown in the attached NDT table in accordance with the referenced welding codes. Perform UT on CJP groove welds that cannot be readily radiographed. In case there is a conflict the higher frequency level of NDT shall apply.
- B. Weld Acceptance criteria for Contractor's inspection shall be based on the acceptance criteria as per the governing welding codes listed in the NDT table.

3.3 SOURCE AND FIELD QUALITY CONTROL

- A. Contractor Inspection:
  - 1. The W178.2 (or QC1-96) CWI, employed by the Contractor, shall be present whenever shop or field welding of the Goods is to be performed. The CWI shall perform inspection prior to assembly, during assembly, during welding, and after welding. CWI shall perform inspections as required in referenced welding codes and as follows:
    - a. Verifying conformance of specified job material and proper storage.
    - b. Monitoring conformance with approved WPS.
    - c. Monitoring conformance of WPQ.
    - d. Inspecting weld joint fit-up and in-process inspection.
    - e. Providing 100 percent visual inspection of all welds.
    - f. Supervising nondestructive testing personnel and evaluating test results.
    - g. Maintaining records and preparing report confirming results of inspection and testing comply with the Work.
- B. Verification Inspection:
  - 1. At the City's sole discretion, an independent testing agency may be retained by the City to perform verification inspection and testing of welds.

3.4 WELD DEFECT REPAIR

- A. Repair and retest rejectable weld defects until sound weld metal has been deposited in accordance with appropriate welding codes.

- B. Repair and retest rejected weld defects to meet the design, plans and specifications.
- C. Retesting shall be performed with the same NDT method used for initial tests and to the same frequency of testing.

3.5 SUPPLEMENTS

- A. The supplements listed below, following “End of Section,” are a part of this Specification.
  - 1. Welding and Nondestructive Testing table.

END OF SECTION

SEWPCC UPGRADING/EXPANSION PROJECT  
RFP NO. 873-2013

WELDING AND NONDESTRUCTIVE TESTING						
Specification Section	Governing Welding Codes or Standards	Submit WPS	Submit WPQ	Onsite CWI Req'd	Submit Written NDT Procedure Specifications	NDT Requirements
05 50 00 Metal Fabrications (Basic)	CAN/CSA W59, Welded Steel Construction (Metal Arc Welding)or CAN/CSA W59.2, Welded Aluminum Construction	Yes	Yes	Yes	Yes	05 50 00 100% VT; see Section 05 50 00
46 43 80 High Rate Clarification System	AWS D1.6, Structural Welding Code – Stainless Steel	Yes	Yes	Yes	Yes	100% VT; see Section 05 52 00

SECTION 05 50 00

METAL FABRICATIONS (BASIC)

PART 1 GENERAL

1.1 SUMMARY

- A. Comply with Division 1, General Requirements.
- B. Metal Fabrications (Structural): Refer to Section 05 50 02, Metal Fabrications (Structural).
- C. Welding (Quality Assurance): Refer to Section 05 05 23, Welding-Quality Assurance.

1.2 REFERENCES

- A. Comply with the latest edition of the following statutes codes and standards and all amendments thereto.
  - 1. AISC Design Guide 27: Structural Stainless Steel
  - 2. ASME/ANSI B36.10M Welded and Seamless Wrought Steel Pipe.
  - 3. ASTM A36 Standard Specification for Carbon Structural Steel.
  - 4. ASTM A48 Standard Specification for Gray Iron Castings.
  - 5. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
  - 6. ASTM A108 Standard Specification for Steel Bars, Carbon and Alloy, Cold-Finished.
  - 7. ASTM A123/A, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 8. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 9. ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - 10. ASTM A193 Standard Specification for Alloy-Steel and Stainless Steel Bolting for High-Temperature or High Pressure Service and other Special Purpose Applications.
  - 11. ASTM A194 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
  - 12. ASTM A276 Standard Specification for Stainless Steel Bars and Shapes.
  - 13. ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, and Threaded Rod 60000 psi Tensile Strength.
  - 14. ASTM A312 Standard Specification for Seamless, Welded and Heavily Cold Worked Austenitic Stainless Steel Pipe.
  - 15. ASTM A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - 16. ASTM A490 Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150ksi Minimum Tensile Strength.ASTM A511 Standard Specification for Seamless Stainless Steel Mechanical Tubing.

17. ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts.
18. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron (Galvannealed) by the Hot-Dip Process.
19. ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
20. ASTM A743 Standard Specification for Castings, Iron-Chromium, Iron-Chromium - Nickel, Corrosion-Resistant, for General Application.
21. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
22. ASTM A786 Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.
23. ASTM A793 Standard Specification for Rolled Floor Plate, Stainless Steel.
24. ASTM A992/A992M Standard Specification for Structural Steel Shapes.
25. ASTM A1008 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low Alloy, High-Strength low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
26. ASTM A1011 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
27. ASTM B26 Standard Specification for Aluminum-Alloy Sand Castings.
28. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
29. ASTM B211 Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire.
30. ASTM B221 Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
31. ASTM B241 Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
32. ASTM B308 Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
33. ASTM B316 Standard Specification for Aluminum and Aluminum-Alloy Rivet and Cold-Heading Wire and Rods.
34. ASTM B468 Standard Specification for Welded UNS N08020 Alloy Tubes.
35. ASTM B632 Standard Specification for Aluminum-Alloy Rolled Tread Plate.
36. ASTM B766 Standard Specification for Electrodeposited Coatings of Cadmium.
37. ASTM F436 Standard Specification for Hardened Steel Washers.
38. ASTM F467 Standard Specification for Nonferrous Nuts for General Use.
39. ASTM F468 Standard Specification for Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws and Studs for General Use.
40. ASTM F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
41. ASTM F738 Standard Specification for Stainless Steel Metric Bolts, Screws, and Studs.
42. ASTM F1136 Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners.
43. AWS D1.6/D1.6M Structural Welding Code – Stainless Steel.
44. CAN/CGSB-1.184 Coal Tar-Epoxy Coating.
45. CAN/CSA-S16 Limit States Design of Steel Structures.

46. CAN/CSA G40.20/G40.21 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
47. CGSB 1-GP-181 Ready-Mixed Organic Zinc-Rich Coating.
48. CISC/CPMA 2-75a A Quick-Drying Primer for use on Structural Steel.
49. CISC, Canadian Institute of Steel Construction "Code of Standard Practices".
50. CSA S157/S157.1 Strength Design in Aluminum/Commentary on CSA S157-05, Strength Design in Aluminum.
51. CSA W47.1 Certification of Companies for Fusion Welding of Steel.
52. CSA W47.2-M Certification of Companies for Fusion Welding of Aluminum.
53. CSA W55.3 Certification of Companies for Resistance Welding of Steel and Aluminum CSA W59 Welded Steel Construction (Metal Arc Welding).
54. CSA W59.2-M Welded Aluminum Construction.
55. 2010 National Building Code of Canada with the 2011 Manitoba Amendments (NBC).

### 1.3 SYSTEM DESCRIPTION

- A. Design Requirements
  1. Design miscellaneous metal items in accordance with applicable standards.
  2. Design work of this Section, which will support other items or will be required to support structural loads of any nature, by a professional structural engineer licensed in the Province of Manitoba. Affix professional seal and signature to shop drawings for such items.
  3. Design connections and splices using high-strength bolts or welds. Use bearing type bolts for bolted connections.
  4. Design splices for the full strength of the member in bending, shear and axial load.
  5. Design end connections and/or splices in bracing members for the full axial strength of the member.
  6. Where overlapping or contacting surfaces cannot be avoided, completely seal weld these surfaces. Where there is any evidence of rusting or deterioration of finish in such areas, carry out remedial seal welding and refinishing.
  7. Design aluminum work to CSA S157/S157.1 and CSA W59.2-M.
  8. Design stainless steel work in accordance with AISC Design Guide 27.
  9. Design equipment, anchorage, and support systems for vertical and lateral loading in accordance with NBC.

### 1.4 SUBMITTALS

- A. Shop Drawings: Submit shop drawings before fabrication commences of each metal fabrication item, showing in large scale fabrication details, thickness, anchors, location, dimensions, erection details, connections and jointing details, and finishes.
- B. Submit shop drawings bearing seal and signature of a professional engineer registered in the Province of Manitoba. Shop drawings will be reviewed for general arrangement and material specifications and will not be reviewed for structural adequacy.
- C. Submit welding procedure specification for each type of material.

- D. Samples: Submit two samples of each finish.
- E. Submit written certification from professional engineer licensed in the Province of Manitoba stating that support systems, anchorage, and equipment have been designed for post-disaster structures according to requirements of the 2010 National Building Code of Canada with the 2011 Manitoba Amendments at time of shop drawing submittals.

#### 1.5 QUALITY ASSURANCE

- A. Comply with Section 05 05 23, Welding-Quality Assurance.
- B. Welding Procedure for Steel, Aluminum and Stainless Steel:
  - 1. Comply with Section 05 05 23, Welding-Quality Assurance.

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Provide protective coating on stainless steel and aluminum items.
- B. Handle components with care, and provide protection for surfaces against marring or other damage. Ship and store members with cardboard or other resilient spacers between surfaces.
- C. Use removable coatings or wrappings to protect exposed surfaces of prefinished metal work which does not receive site finishing. Use materials recommended by finishers or manufacturers to ensure that method is sufficiently protective, easily removed, and harmless to the finish.
- D. Contractor's written storage instructions shall include measures to prevent the formation of wet storage stain on galvanized members, such as but not limited to:
  - 1. Stack members or bundle to allow air between the galvanized surfaces during transport from supplier. Load materials in position that continuous drainage could occur.
  - 2. Raise members from the ground and separate with strip spacers to provide free access of air to most parts of the surface. Incline in a manner which will allow continuous drainage. Do not lay galvanized steel on cinders, clinkers, wet soil or decaying vegetation.
  - 3. Handle galvanized members in such a manner as to avoid any mechanical damage and to prevent distortion.

#### 1.7 COORDINATION

- A. Supply materials requiring setting and/or building-in in concrete or other trades. This includes inserts, anchors, frames, sleeves, etc. Verify locations of these materials on site before fabrication and erection.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Where anchors, lifting hooks, screws, bolts, nuts, washers, hangers and other fasteners are not specifically shown or specified, provide such items with at least the strength and corrosion resistance properties of the metal fabrication for which they are required.
- B. Structural Steel:
1. W and H-Shapes:
    - a. CAN/CSA-G40.20/G40.21 Grade 350W.
    - b. ASTM A992, Grade 50 ksi.
  2. Shapes Except W and H-Shapes, Rolled plates and Bars:
    - a. CAN/CSA-G40.20/G40.21 Grade 300W.
  3. Steel Pipe: ASTM A53, Type E or S, Grade B.
  4. Hollow Structural Sections (HSS): CAN/CSA-G40.20/G40.21 Grade 350W Class C.
  5. Cold Formed Sections:
    - a. ASTM A653 Grade 340 (Grade 50),  $F_y = 345$  MPa for coated sections.
    - b. ASTM A1011 Grade 340 (Grade 50),  $F_y = 345$  MPa for uncoated sections.
- C. Welding Electrode: Comply with requirements of applicable welding codes.
- D. Structural Steel Connections:
1. High strength Bolts:
    - a. For structural connections at platforms, support frames and similar items; use ASTM A325 carbon steel high strength bolts with nuts and washers.
    - b. Where such structural connections will be normally exposed to atmospheric conditions use ASTM A325 carbon steel bolts hot-dip galvanized to ASTM A153.
  2. Nuts: ASTM A563 and the recommended nut grade and style listed in Appendix X1, Table X1 thereof. Where connections will be normally exposed to atmospheric conditions use Grade C3 or DH3.
  3. Washers: Bolted connections - hardened steel washers conforming to ASTM F436. Hot-dip galvanized washers with galvanized bolts.
- E. Welded Anchor Studs:
1. Headed anchor studs (HAS) or threaded anchor studs (TAS).
    - a. Carbon Steel: ASTM A108, Standard Quality Grades 1010 through 1020, inclusive either semi-killed or killed aluminum or silicon dioxide, unless indicated otherwise.
    - b. Stainless Steel: ASTM F593, AISI Type 316, Condition CW.
  2. Manufacturers:
    - a. Nelson Stud Welding.
    - b. Stud Welding Associates, Inc.

- F. Cast In Place Anchor Bolts and Anchor Bolt Sleeves:
1. Cast-In-Place Anchor Bolts:
    - a. Headed type, unless otherwise shown on Drawings.
    - b. Material type and protective coating as shown in Fastener Schedule at end of this Section.
  2. Anchor Bolt Sleeves:
    - a. Plastic:
      - 1) Single unit construction with corrugated sleeve.
      - 2) Top of sleeve shall be self-threading to provide adjustment of threaded anchor bolt projection.
      - 3) Material: High density polyethylene.
    - b. Fabricated Steel: ASTM A36/A36M.
- G. Concrete Drilled Anchors:
1. General:
    - a. Material and Protective coating as shown in Fastener Schedule at end of this section.
    - b. Acceptable for use in potable water structures by local health agencies or NSF.
  2. Wedge Anchors:
    - a. Hilti Kwik-Bolt-3 (KB-3) Anchor.
    - b. ITW Construction Products; Ramset/Red Head; Trubolt Wedge Anchor.
  3. Drop in Expansion Anchors:
    - a. Hilti HDI Drop-In Anchor.
    - b. ITW Construction Products; Ramset/Red Head; Multi-Set II Drop-In and Self Drill Anchor.
  4. Undercut Anchors:
    - a. Hilti HDA Undercut Anchor.
    - b. USP Structural Connectors; DUC Undercut Anchor.
  5. Heavy Duty Sleeve Anchors:
    - a. Hilti HSL-3 Heavy Duty Sleeve Anchor.
    - b. ITW Construction Products; Ramset/Red Head; Dynabolt Hex Nut Sleeve Anchor.
  6. Adhesive Anchors:
    - a. Threaded Rod:
      - 1) ASTM F593 stainless steel threaded rod, diameter as shown on Drawings.
      - 2) Length as required, to provide minimum depth of embedment.
      - 3) Clean and free of grease, oil, or other deleterious material.
      - 4) For hollow-unit masonry, provide galvanized or stainless steel wire cloth screen tube to fit threaded rod.
    - b. Adhesive:
      - 1) Two-component, designed to be used in adverse freeze/thaw environments, with gray color after mixing.
      - 2) Cure Temperature, Pot Life, and Workability: Compatible for intended use and environmental conditions.
      - 3) Non sag, with selected viscosity base on installation temperature and overhead application where applicable.

- 4) Manufacturers and Products:  
 a) Hilti HIT HY 200 Adhesive Anchor System.  
 b) ITW Construction Products; Ramset/Red Head; C6 Adhesive Anchor System or A7 Adhesive Anchor System.

7. Adhesive Threaded Inserts:  
 a. Stainless steel, internally threaded insert.  
 b. Manufacturer and Product: Hilti HIS-R Insert with HIT HY 200 adhesive.

- H. Galvanized steel sheet: ASTM A653- Class Z275 zinc coating.  
 I. Hot rolled steel sheet: ASTM A1011.  
 J. Cold rolled steel sheet: ASTM A1008.  
 K. Steel Pipe: ASTM A53 - Type S Grade A or ANSI B36.10.  
 L. Neoprene: Premium grade Durometer A 40.  
 M. Fasteners: ASTM F1136, galvanized, 19 mm diameter minimum.  
 N. Stainless Steel: Alloy 316.

Item	ASTM	UNA Designations
Structural	A666	S31600
Architectural	A666	S31600
Plates, Sheets and Strips	A167	S31600
		<u>Grade</u>
Fasteners	F738, F1136,	B8A
	A193, A194	
Castings	A743	CF-8M
Tubing	A511	MT-316 or
	A511	MT316L

- O. Aluminum:

Item	ASTM	UNA Designations
Extruded Shapes - Structural	B211	A96351-T6
Extruded Shapes - Architectural	B221	A96063-T6
Smooth Plates and Sheets	B209	A93003-H16
Checkered or Tread Plates	B632	A96061-T6

Item	ASTM	UNA Designations
Rivets	B316	A96061-T6
Castings	B26	A03560-T6 or A05350-F
Tubing & Pipe	B241	A96061-T6
Fasteners - Bolts	F468	A96061-T6
- Nuts	F467	A96061-T6

- P. Primer: CISC/CPMA 2-75a unless otherwise required for finish coating under Section 09 90 00, Painting and Coating.
- Q. Isolation coating: CAN/CGSB-1.184, Coal Tar-Epoxy Coating.
- R. Zinc-rich primer: CGSB 1-GP-181M, Sealtight Galvafruid Zinc-Rich Coating by W.R. Meadows Ltd.
- S. Grouting: Set 45 by Master Builders Technologies Ltd. , Sika Grout 212 by Sika Canada Inc.

## 2.2 FINISHES

- A. Rough Edges and Mill Scale:
  - 1. Following completion of fabrication of any item, grind rough edges straight and finish smooth. Remove mill scale and rust.
- B. Electrolytic Corrosion:
  - 1. Back paint metal surfaces in contact with dissimilar metal or concrete, with coal tar-epoxy coating, 1.0 mm (40 mils) DFT minimum.
  - 2. Paint galvanized metal surfaces to be in contact with or encased in concrete with rust inhibitive epoxy coating ICI Devoe Coating: Devran 201. Prepare surfaces to SSPC SP1, apply coating to 125 microns DFT.
- C. Aluminum:
  - 1. Restore aluminum to original mill finish after fabrication. Buff and brighten exposed aluminum surfaces, which have been damaged during construction.
  - 2. Paint the surfaces to be in contact with aluminum with coloured coal tar-epoxy coating where aluminum is intended to be in contact with dissimilar metals, or concrete.
  - 3. Use anodizing quality aluminum where anodizing is required.
- D. Carbon Steel:
  - 1. Hot dip galvanize metal fabrications where carbon steel is intended to be exposed to atmospheric conditions or sewage.
  - 2. Hot dip galvanize the surfaces to be in such contact Where carbon steel is intended to be in contact with either concrete, brick or mortar.

- E. Galvanizing:
1. Hot-dip galvanized items after fabrication. Galvanize steel scheduled for exposure to exterior conditions or corrosive materials.
  2. Clean surfaces to be galvanized of slag and impurities immediately before being galvanized or cadmium plated.
  3. Where specified or detailed, galvanize plates and other structural shapes in accordance with CSA G164M. Where fabrications are too large to be hot-dipped, employ zinc metallizing.
  4. Repair of Damaged Galvanized Surfaces:
    - a. Repair hot-dip galvanized coatings damaged by welding, cutting, rough handling during shipping or erection or otherwise, in accordance with ASTM A780 using organic zinc-rich primer. Dry film thickness on repairs to exceed original coating thickness by 25 percent.
- F. Shop Finishes:
1. Aluminum finish:
    - a. Where shop finishing is specified or indicated, after fabrication or forming, prepare surfaces, shop prime, and factory finish in accordance with PPG specifications for the manufacturer's Duranar two-coat fluoropolymer enamel system for aluminum. Shop finishing: Performed by an accepted applicator. Minimum dry film thickness – 30 microns (1.2 mil).
    - b. Color : To later selection.
    - c. After installation, touch-up shop finished surfaces damaged during construction.
    - d. Anodized finish: Anodizing Architectural Class I Anodic Coating 0.018 mm (0.7 mil) thickness, one-hour coating 215 RI (AA-C22A41 clear) preceded by a caustic etch.
- G. Stainless Steel:
1. Remove rust and postweld discoloration from stainless steel by grinding, using only stainless steel tools.
  2. Passivate stainless steel, which was cleaned by grinding, with a solution of 12-15 percent nitric acid and 3 percent hydrofluoric acid.
  3. During finishing ensure no carbon steel gets into contact with the stainless steel surfaces.
  4. Finishes: No. 4 finish XL Blend S
- H. Steel Finish:
1. Where shop finishing is specified or indicated, after fabrication or forming, prepare surfaces, shop prime, and factory finish in Stelcolor 10000, series.
  2. Shop finishing: Performed by an accepted applicator. Minimum dry film thickness – 30 microns (1.2 mil).
  3. Color: To later selection.
  4. After installation, touch-up shop finished surfaces damaged during construction

## 2.3 FABRICATION - GENERAL

- A. Fit and shop assemble insofar as possible various sections of the Work and deliver to the project site in the largest practical sections.
- B. Assume responsibility for the correctness of the actual detailed dimensions used in fabrication and carefully check the same, by field measurement.
- C. Variations from suggested details are subject to acceptance in writing by the Contract Administrator. Such acceptance does not in any way waive the above mentioned responsibility.
- D. Wherever overlapping or contacting surfaces cannot be avoided, completely seal weld these surfaces. Rusting or deterioration of finish in such areas will require remedial seal welding and refinishing.
- E. Fabricate the Work true to dimensions and square. Accurately fit members with hairline joints, and join using adequate fastening. Assemble members without twists or open joints.
- F. Construct finished work free from distortion and defects detrimental to appearance and performance.
- G. Stainless steel grain direction: One direction throughout.
- H. File or grind exposed welds smooth and flush. Do not leave grinding marks. Construct internal and external corners with sharp lines. Provide continuous welds unless otherwise accepted by the Contract Administrator in writing. Brighten and buff aluminum and stainless steel welds to match appearance of adjacent surface.
  - 1. Remove weld spatter and slag. After finish grinding and smoothing welds, passivate welds with pickling paste.
- I. Fabricate metal work complete with components required for anchoring to concrete; bolting or welding to structural steel frames; standing free; or resting in frames or sockets, in a safe and secure manner.
- J. Countersink exposed fastenings, where such are accepted in writing, and make as inconspicuous as possible with bolts cut off flush with nuts. Construct fastenings of the same material and finish as the base material on which they occur.

## PART 3 EXECUTION

### 3.1 INSTALLATION - GENERAL

- A. By Installation Contractor in accordance with manufacturer's written instructions.
- B. For aluminum and stainless steel items, and exterior locations, use stainless steel anchors.

- C. Where items are specified to be installed by other Sections, fabricate items to the appropriate trade with necessary instructions and templates required for proper installation. Include required fastenings, such as screws, bolts, expansion shields and similar items.
- D. Deliver items to be cast into concrete with instructions for setting.

3.2 INSTALLATION - ANCHORS AND FASTENERS

- A. Furnish anchor bolts of sufficient length to embed into concrete to develop full strength of the anchor or 200 mm minimum, the maximum governs, and project the threaded portion a minimum of 50 mm for the installation of the nuts.
- B. Furnish lock nuts or nuts with lock washer for submerged conditions where bolts are used.

3.3 FASTENER SCHEDULE

- A. Unless indicated otherwise, provide fasteners as follows:

Service Use and Location	Product	Remarks
1. Anchor Bolts Cast Into Concrete for Structural Steel, Metal Fabrications and Castings		
Interior Dry Areas	Hot-dip galvanized steel headed anchor bolts, unless indicated otherwise.	
Exterior and Interior Wet Areas	Stainless steel headed anchor bolts.	
Submerged and Corrosive Areas	Stainless steel headed anchor bolts	
2. Anchor Bolts Cast Into Concrete for Equipment Bases		
Interior Dry Areas	Hot dip galvanized carbon steel headed anchor bolts, unless otherwise specified with equipment	
Submerged, Exterior, Interior Wet, and Corrosive Areas	Stainless steel headed anchor bolts, unless otherwise specified with equipment	
3. Drilled Anchors for Metal Components to Cast-in-Place Concrete (e.g., Ladders, Railing Posts, Electrical Panels, and Equipment)		
Interior Dry Areas	Stainless steel wedge or drop in expansion anchors	Use undercut anchors for overhead and ceiling installations.

Service Use and Location	Product	Remarks
Submerged, Exterior, Interior Wet, and Corrosive Areas	Stainless steel Adhesive anchors or Stainless heavy duty sleeve anchor	Use undercut anchors for overhead and ceiling installations.
4. Connections for Structural Steel Framing		
Exterior and Interior Wet and Dry Areas	High-strength steel bolted connections	Use hot-dipped galvanized high-strength bolted connections for galvanized steel framing members and for Exterior areas
5. Connections for Steel Fabrications		
Exterior and Interior Wet and Dry Areas	Stainless steel bolted connections	
6. Connections of Aluminum Components		
Submerged, Exterior and Interior Wet and Dry Areas	Stainless steel bolted connections, unless otherwise specified with equipment	
7. All Others		
Exterior and Interior Wet and Dry Areas	Stainless steel fasteners	

- B. Anti-seizing Lubricant: Use on all stainless steel threads.
- C. Do not use adhesive anchors to support fire-resistive construction or where ambient temperature will exceed 49 degrees C.

END OF SECTION

SECTION 05 50 02

METAL FABRICATIONS (STRUCTURAL)

PART 1 GENERAL

1.1 SUMMARY

- A. Comply with Section 05 50 00, Metal Fabrications (Basic).

1.2 REFERENCES

- A. Refer to Section 05 50 00, Metal Fabrications (Basic).
- B. 2010 National Building Code of Canada with the 2011 Manitoba Amendments (NBC).

PART 2 PRODUCTS

2.1 EMBEDDED STEEL SUPPORT FRAMES FOR GRATING

- A. Steel angle support frames to be embedded in concrete shall be stainless steel, A276, AISI Type 316, unless indicated otherwise.
- B. Welded anchors for stainless steel support frames shall also be stainless steel.

2.2 STRUCTURAL STEEL FRAMING

- A. Beams, trusses, joists, or other structures required to support equipment or providing access to equipment. Refer to Specification Section 46 43 80, High Rate Clarification System.
- B. Provide stairs as required to access the steel structure from surrounding floor level, if applicable.
- C. Use material matching durability requirements and equipment specified in Specification Section 46 43 80, High Rate Clarification System.
- D. Design Criteria:
  - 1. Comply with the requirements of NBC.
  - 2. Uniform Service Load for access: 5.0 kPa minimum.
  - 3. Maximum Deflection: 6 mm or L/240.
  - 4. Do not use existing building framing as part of lateral load resisting system.
  - 5. Design to accommodate openings for piping, ducting, and electrical services as required.
- E. Design framing and grating so that gaps around perimeter of equipment do not exceed 75 mm clearance.

PART 3 EXECUTION

3.1 INSTALLATION

A. By Installation Contractor.

END OF SECTION