

**Part 1            General****1.1                RELATED SECTIONS**

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

**1.2                REFERENCES**

- .1        National Building Code of Canada 2010.
  - .2        Canadian General Standards Board (CGSB)
    - .1        CAN/CGSB-85.10-99, Protective Coatings for Metals.
  - .3        Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA).
    - .1        CISC/CPMA 1-73a, Quick-Drying, One-Coat Paint for Use on Structural Steel.
    - .2        CISC/CPMA 2-75, Quick-Drying, Primer for use on Structural Steel.
  - .4        American Society for Testing and Materials International, (ASTM)
    - .1        ASTM A 36/A36M-12, Carbon Structural Steel.
    - .2        ASTM A 307-12, Standard Specification for Carbon Steel Bolts and Stud, and Threaded Rods, 60,000 psi Tensile Strength.
    - .3        ASTM A 325M-13, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric).
    - .4        ASTM A 490-12, Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).
    - .5        ASTM A123/A123M-12, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings On Iron and Steel Products.
  - .5        Canadian Standards Association (CSA International)
    - .1        CAN/CSA G40.20/G40.21-04(R2009), 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-S16-09, Limit States Design of Steel Structures.
    - .4        CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding).
    - .5        CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
    - .6        CSA W55.3-08, Certification of companies for resistance welding of steel and aluminum
  - .6        The Society for Protective Coatings (SSPC)
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- .1 SSPC SP-3-04, Power Tool Cleaning.
- .2 SSPC SP-6-07, Commercial Blast Cleaning.
- .7 Master Painters Institute
  - .1 MPI-INT 5.1-08, Structural Steel and Metal Fabrications.
  - .2 MPI-EXT 5.1-08, Structural Steel and Metal Fabrications.

### **1.3 DESIGN REQUIREMENTS**

- .1 Design details and connections to requirements of CAN/CSA-S16-09 to resist forces, moments and shears indicated.
- .2 Design beam connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending.
- .3 Design connections in line with brace frames to resist lateral forces (tension and compression) indicated on the drawings.
- .4 Bolts shall be bearing type, except for connection of members noted as carrying reversing axial load. For connection of members carrying reversing axial load, bolts in shear shall be slip critical, assuming a load factor of 1.5 for determining service loads.
- .5 Design brace frame connections in Code specified locations of seismic activity to requirements of CAN/CSA-S16, Clause 27.

### **1.4 SHOP DRAWINGS**

- .1 Submit shop details, erection drawings and fieldwork drawings in accordance with Section 01 33 00. Shop drawings must be original. Reproduction of Engineer's design drawings is not acceptable. Allow ten working days for shop drawing review.
- .2 Erection drawings shall indicate all information necessary for assembly, including member size, base plate elevation, anchor bolt size and location
- .3 Clearly indicate shop and erection details including cuts, copes, connections, holes, threaded fasteners, rivets and welds. Indicate welds by AWS welding symbols.
- .4 Each drawing submitted shall bear the signature and stamp of a qualified professional engineer registered in the province of Ontario.
- .5 Do not proceed with work until final review of shop drawings.

### **1.5 QUALITY ASSURANCE**

- .1 If requested, submit certified copies of mill reports showing chemical and physical properties of steel used in this Work.
- .2 Welding shall be done by a fabricator fully certified to the conditions of CSA Qualification Code W55.3 or W47.1 respectively. Conform to CAN/CSA-S16.1 where requirements are at variance.
- .3 An inspection and testing company shall be selected to verify that materials and fabrication, including alignment, plumbness, bearing, tolerances, connections, bolts, torque, welds, and painting conform to this specification, to CAN/CSA-S16.1, to CSA-W59, and to other applicable Standards. Welding inspections to be visual, except where

non-destructive testing is deemed necessary by the Testing Agency or Departmental Representative. Submit 4 copies of inspection reports, outlining progress of work, and stating whether or not it conforms to the Contract Documents.

- .4 Advise Departmental Representative of proposed fabrication schedule, at least ten working days prior to starting, to permit the Testing Agency to arrange for inspection of Work in the shop.
- .5 Co-operate with Testing Agency and Departmental Representative in providing access to the work, including scaffolding where necessary. Give minimum 24 hours notice for inspection prior to concealment of Work by fireproofing or finishes.

## **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.
- .5 Divert unused paint material from landfill to official hazardous material collections site approved by Departmental Representative.
- .6 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Structural steel: to CAN/CSA-G40.21, Type 350W.
- .2 HSS Sections: to CAN/CSA-G40.21, Type 350W (Class C).
- .3 Anchor bolts: to ASTM A307 unless otherwise noted.
- .4 Bolts, nuts and washers: to ASTM A325M. Bolts shall be bearing type, unless otherwise noted.
- .5 Welding materials: to CSA W59
- .6 Shop paint primer: to CAN/CGSB-1.40 or CAN/CGSB-1.181, (Refer to Section 2.3 below).
- .7 Shop galvanizing: hot dip galvanizing to CAN/CSA-G164, minimum zinc coating of 600 g/m<sup>2</sup>.

### **2.2 FABRICATION**

- .1 Fabricate structural steel in accordance with CAN/CSA - S16.1 and in accordance with reviewed shop drawings. Mark and match-mark units for field assembly.

- .2 Connections shall be as shown on final shop drawings. In general, use welded connections for shop work, and high strength bolts for all field connections, except as otherwise indicated. Furnish templates for bolt installation by others.
- .3 Provide anchor bolts, bearing assemblies, inserts, wall plates and other hardware (including setting templates) for structural steel beam, joist and deck connections to cast-in-place concrete or masonry, for installation under the Work of Divisions 3 or 4.

## **2.3 SHOP PAINTING**

- .1 Clean, prepare surfaces and shop prime structural steel to CAN3-S16.1.
- .2 Interior Steel
  - .1 Surface preparation shall conform to SSPC SP-3.
  - .2 Primer shall be one coat oil alkyd type to CGSB 1-GP-40.
  - .3 Dry film thickness shall be 1.5 mils minimum.
- .3 Exterior Exposed Steel, Galvanized:
  - .1 Clean, prepare and galvanize to CSA G164 (610g/m<sup>2</sup>, hot dipped).
- .4 Exterior Exposed Steel: Non-Galvanized:
  - .1 Surface preparation: to SSPC SP-6, commercial blast cleaning using mechanical shot blast techniques. Hand cleaning not permitted.
  - .2 Primer: One coat zinc rich type: to CAN/CGSB-1.181-99, minimum 2 mil./maximum 3 mil. dry thickness.
  - .3 Primer to be compatible with finish paint (See Section 09 91 30 & 09 91 23).
- .5 Do not paint:
  - .1 Surfaces and edges to be field welded, or to have field installed stud shear connectors,
  - .2 Surfaces that are in contact at bolted friction type connections or
  - .3 Surfaces that are in contact with concrete or mortar.

## **Part 3 Execution**

### **3.1 GENERAL**

- .1 Erect structural steel as indicated in accordance with CAN/CSA-S16-09, CAN-S136-07, and in accordance with reviewed shop drawings.
- .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.

### **3.2 MARKING**

- .1 Mark materials in accordance with CAN/CSA G40.20/G40.21. Do not use die stamping.

If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.

- .2 Match marking: shop mark bearing assemblies and splices for fit and match.

### **3.3 ERECTION**

- .1 Erect structural steel as indicated in accordance with CAN/CSA-S16.1, CAN-S136, and in accordance with reviewed shop drawings.
- .2 Provide necessary erection equipment, bracing, shoring and temporary flooring as required for erection and for all safety regulations. Brace and support structure during erection to ensure that it is maintained in alignment under construction and other loading and until all other construction elements contributing to stability are in place.
- .3 Check anchor bolt and insert layout before erection. Arrange for correction of discrepancies.
- .4 Set base plates on cleaned bearing surfaces. Solidly pack open spaces between shims with bedding mortar consisting of non-shrink grout as specified in Section 03 30 00.
- .5 Obtain permission of Departmental Representative prior to field cutting or altering of structural members not shown on Drawings.
- .6 Clean field welds, bolted connections and abraded areas. Apply touch up shop primer (or zinc rich paint for galvanized steel) to bolts, welds and burned or scratched surfaces at completion of erection.
- .7 Continuously seal members by continuous welds where indicated. Grind smooth.

### **3.4 FIELD QUALITY CONTROL**

- .1 Inspection and testing of materials and workmanship will 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.

### **3.5 DEFECTIVE WORK**

- .1 Remove and replace, or repair, damaged or defective work, at no cost to the Departmental Representative.
- .2 Contractor shall be responsible for the cost of additional testing and re-inspection made necessary by the occurrence of deficient Work.
- .3 Submit in writing details of proposed method of remedial work, for approval by the Departmental Representative. Details to be signed and sealed by a licensed Professional Engineer retained by the Contractor.
- .4 Correction of misaligned holes or other field modifications by flame-cutting is not permissible.

**END OF SECTION**

**Part 1            General**

**1.1            RELATED SECTIONS**

- .1      Section 05 12 23 - Structural Steel for Buildings
- .2      Section 09 91 23 - Painting

**1.2            REFERENCES**

- .1      American Society for Testing and Materials International, (ASTM)
  - .1          ASTM A 653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .2          ASTM A 792/A792M-10, Standard Specification for Steel Sheet, 55%Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .2      Canadian General Standards Board (CGSB)
  - .1          CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3      Canadian Standards Association (CSA International)
  - .1          CSA C22.2 No.79-1978(R2008), Cellular Metal and Cellular Concrete Floor Raceways and Fittings.
  - .2          CAN/CSA-S16-09, Limit States Design of Steel Structures.
  - .3          CSA-S136-07, North American Specification for the Design of Cold Formed Steel Structural Members.
  - .4          CSA W47.1-09, Certification of Companies for Fusion Welding of Steel.
  - .5          CSA W55.3-08, Certification of Companies for Resistance Welding of Steel and Aluminum.
  - .6          CSA W59-03, Welded Steel Construction, (Metal Arc Welding).
- .4      Canadian Sheet Steel Building Institute (CSSBI)
  - .1          CSSBI 10M-08, Standard for Steel Roof Deck.
  - .2          CSSBI 12M-08, Standard for Composite Steel Deck.
- .5      Conform to National Building Code of Canada 2010

**1.3            DESIGN REQUIREMENTS**

- .1      Design steel deck using limit states design in accordance with CSA S136, CSSBI 10M and CSSBI 12M.
  - .2      Steel decking and all connectors/fasteners shall be designed to safely carry dead, live and diaphragm loads as indicated, including any variable or concentrated loads, wind uplift as required under the Ontario Building Code, and construction loads.
  - .3      Deflection under live loads (including construction loads) shall not exceed:
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- .1 Roof Deck: 1/240th of span, except when plaster or gypsum board ceilings are suspended directly from deck, live load deflection not to exceed 1/360th of span.
- .2 Floor Deck: deflection under sum of live loads, partitions and slab self weight not to exceed 1/360th of span.

#### **1.4 SHOP DRAWINGS**

- .1 Submit shop drawings erection and shoring drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit drawings stamped and signed by qualified Professional Engineer registered and licensed in the Province of Ontario.
- .3 Submit design calculations if requested by Departmental Representative.
- .4 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories. Show welding and connection details for diaphragm action.
- .5 Indicate details of temporary shoring of steel deck, such as location, time and duration of placement and removal of shoring for concrete fill decks.

#### **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Divert unused metal from landfill to metal recycling facility approved by Departmental Representative.
- .3 Dispose of unused paint material at official hazardous material collections site approved by Departmental Representative
- .4 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .5 Dispose of unused caulking material at official hazardous material collections site approved by Departmental Representative.

#### **1.6 QUALITY ASSURANCE**

- .1 Steel deck manufacturers shall be members in good standing of the Canadian Sheet Steel Building Institute.
  - .2 An inspection and testing company shall be selected to inspect and report on compliance with this specification. Submit 4 copies of inspection reports, outlining progress of work, and stating whether or not it conforms to the requirements of CSA-S136, CSA-W59, CSSBI standards and Contract Documents.
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**Part 2 Products**

**2.1 MATERIALS**

- .1 For interior surfaces not exposed to weather:
  - .1 Zinc-Iron Alloy (ZF) coated steel sheet: to ASTM A653/A653M, structural quality, Grade 230, 0.76 mm minimum base steel thickness.
    - .1 For unpainted decks: with ZF75 zinc coating suitable for unpainted finish, and chemically treated (passivated).
    - .2 For painted decks: with ZF75 wiped coat zinc-iron alloy coating suitable for finish painting (not passivated).
- .2 For exterior surfaces exposed to weather:
  - .1 Zinc (Z) coated steel sheet to ASTM A 653/A653M structural quality Grade 230, with ZF75, coating, regular spangle extra smooth surface, chemically treated for unpainted finish, not chemically treated for paint finish, 0.76 mm minimum base steel thickness.
- .3 Perimeter Closures, neoprene.
- .4 Cover plates, cell closures and flashings: steel sheet with minimum base steel thickness 0.76 mm. Metallic coating same as deck material.
- .5 Touch-up Primer: zinc rich, ready mix to CAN/CGSB-1.181, zinc rich type.

**2.2 TYPES OF DECKING**

- .1 Steel roof deck: steel thickness and deck depth as indicated on the drawings, non-cellular, interlocking side laps.
- .2 Composite steel deck where indicated: steel thickness and deck depth as indicated on the drawings, non-cellular upright inverted embossed fluted profile, and interlocking side laps.

**Part 3 Execution**

**3.1 GENERAL**

- .1 Structural steel work: in accordance with CAN/CSA-S136, and CSSBI 10M and CSSBI 12M.
  - .2 Welding: in accordance with CSA W59, except where specified otherwise.
  - .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel and/or CSA W55.3 for resistance welding.
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### **3.2 ERECTION**

- .1 Erect steel deck as indicated to manufacturer's instructions and in accordance with reviewed shop drawings with white side down.
- .2 Weld deck to structural steel. Welds shall be 20mm dia. fusion welds at 300mm centres on bearing supports (transverse welds) and at 600mm centres on side supports (longitudinal welds), or as noted on drawings. Mechanically clinch side joints at 300mm centres, or as noted on drawings.
- .3 Immediately after deck is permanently secured in place, touch up surface with specified primer where burned by welding, or otherwise damaged.
- .4 Supply and install closures, where indicated on drawings.
- .5 Prior to concrete placement, steel deck to be free of soil, debris, standing water, loose mil scale and other foreign matter.
- .6 Temporary shoring, if required, to be designed to support construction loads, wet concrete and other construction equipment. Do not remove temporary shoring until concrete attains 75% of its specified 28 day compression strength.
- .7 Provide anchor plates where deck bears on masonry and/or concrete.

### **3.3 OPENINGS AND AREAS OF CONCENTRATED LOADS**

- .1 No reinforcement required for openings cut in deck which are smaller than 150 mm square.
- .2 Frame deck openings with any one dimension between 150 and 300 mm as recommended by manufacturer, except as otherwise indicated.
- .3 For deck openings with any one dimension greater than 300 mm and for areas of concentrated load, reinforce in accordance with structural framing details.

### **3.4 CONNECTIONS**

- .1 Install connections in accordance with CSSBI recommendations as indicated.

### **3.5 DEFECTIVE WORK**

- .1 Remove and replace, or repair, damaged or defective work, at no cost to the Contract.
- .2 Submit in writing, details of proposed method of remedial work, for approval by the Departmental Representative. Details to be signed and sealed by a licensed Professional Engineer retained by the Contractor.

**END OF SECTION**

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**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 03 30 00 - Cast-in-Place Concrete, for concrete fill to landings and treads
- .2 Section 05 12 23 - Structural Steel for Buildings
- .3 Section 09 91 23 - Interior Painting: field painting

**1.2 REFERENCES**

- .1 ASTM International (ASTM)
  - .1 ASTM A53/A53M-10, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
  - .2 ASTM A307-10, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
  - .3 ASTM A325-10, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer
- .3 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel
  - .2 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel
  - .3 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding
  - .4 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding/Imperial Version)
  - .5 CSA W55.3-1965(R2003), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings
- .4 National Ornamental and Miscellaneous Metals Association (NOMMA)
  - .1 Guideline 1: Joint Finishes
- .5 National Association of Architectural Metal Manufacturers (NAAMM)
  - .1 AMP 510-92, Metal Stair Manual.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination:
    - .1 Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
    - .2 Coordinate installation of anchorages for metal stairs and railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to
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be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

- .3 Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair.

#### **1.4 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Action Submittals:
  - .1 Product Data: Submit manufacturer's printed product literature, specifications and data sheets.
  - .2 Shop Drawings
    - .1 Include plans, elevations, sections, details, and attachments to other work.
    - .2 Indicate construction details, sizes of steel sections and thickness of steel members.
    - .3 Indicate welds by standard CWB symbols. Distinguish between shop and field welds, show size, length, and type of each weld. Identify grinding, finish and profile of welds.
    - .4 Submit shop drawing bearing stamp of a qualified professional engineer registered in Ontario.
  - .3 Samples:
    - .1 Duplicate 300 mm long sample of each type and finish of handrail and bracket, and guardrail.
    - .2 Duplicate 200 by 200 mm sample of each type, colour and sheen of specified finish on specified base metal.
    - .3 Fabrication Sample: of metal handrail connections to each different type of substrate, showing details of anchorage, including countersunk connectors.
  - .4 Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - .5 Welding certificates.
  - .6 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
  - .7 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
  - .8 Qualification data.

#### **1.5 QUALITY ASSURANCE**

- .1 Installer Qualifications: Fabricator of products.
- .2 NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

- .3 Welding Qualifications: Qualify procedures according to the following:
  - .1 CSA W47.1, Certification of Companies for Fusion Welding of Steel
  - .2 CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings
  - .3 ANSI/AWS D1.6/D1.6M: 2007, Structural Welding Code - Stainless Steel

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, handle and store shop-finished clear coated components from damage during shipping and handling.
- .2 Waste management and disposal requirements: Refer to Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

## **Part 2 Products**

### **2.1 DESIGN AND PERFORMANCE REQUIREMENTS**

- .1 Delegated Design: Design stairs, railings, ladders, and safety cages, including comprehensive engineering analysis by qualified professional engineer, using performance requirements, criteria indicated.
- .2 Design Requirements:
  - .1 Detail and fabricate stairs to NAAMM Metal Stairs Manual, NAAMM Commercial quality.
  - .2 Design metal stair, balustrade and landing construction and connections to withstand the effects of gravity loads and NBC vertical and horizontal live load requirements.
  - .3 Design stringers to limit vibration as specified in CAN/CSA-S16.1, Appendix G, Guide for Floor Vibrations
  - .4 Design hand railings, balustrades, guards, all connections to support minimum horizontal live load 0.75 kN/m or a concentrated load of 1.0 kN.
  - .5 Design hand railings, balustrades, guards, all connections to support minimum vertical live load 1.5 kN/m.

- .6 Tolerances: non-cumulative.
  - .1 Maximum variation from plumb in vertical lines: 3.2 mm in 3 m.
  - .2 Maximum variation from level: 3.2 mm in 9 m.
  - .3 Maximum variation from straight: 3.2 mm in 3 m under a 3 m straight edge.
  - .4 Maximum variation from angle indicated: 10 seconds.

## 2.2 MATERIALS

- .1 Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- .2 Steel sections: to CAN/CSA-G40.20/G40.21, Grade 350W.
- .3 Steel plate, angles and channels: to CAN/CSA-G40.20/G40.21, Grade 300W.
- .4 Steel HSS and tubing: to G40.21, Grade 350W Class C, or ASTM A500 Grade C, wall thickness as required to meet specified codes, sizes and dimensions as indicated.
- .5 Steel pipe: to ASTM A53/A53M, standard weight, schedule 40 seamless black.
- .6 Welded Wire Fabric: ASTM A 185M, 152 by 152 mm, W1.4 by W1.4.
- .7 Welding materials: to CSA W59.
  - .1 Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- .8 Bolts: to ASTM A307.
- .9 High strength bolts: to ASTM A325M.
- .10 Post-installed anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- .11 Non-premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 40 MPa at 28 days.
- .12 Isolation Coating: Manufacturer's standard alkali-resistant coating or bituminous paint.

## 2.3 FABRICATION, GENERAL

- .1 Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
  - .1 Join components by welding unless otherwise indicated.
  - .2 Use connections that maintain structural value of joined pieces.
- .2 Fabricate to NAAMM, Metal Stair Manual.
- .3 Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- .4 Weld connections where exposed and to greatest extent possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur. Obtain approval from Departmental Representative for bolted and exposed connections.
- .5 Fabricate balustrades and railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings, except where indicated otherwise.
- .6 Accurately form connections with exposed faces flush; mitres and joints tight. Make risers of equal height.
- .7 Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1 mm unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- .8 Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- .9 Form exposed work with accurate angles and surfaces and straight edges.
- .10 Weld connections to comply with the following:
  - .1 Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - .2 Obtain fusion without undercut or overlap.
  - .3 Remove welding flux immediately.
  - .4 Weld exposed corners and seams continuously unless otherwise indicated.
  - .5 At exposed connections, finish exposed welds to comply with NOMMA's "Guideline 1: Joint Finishes" as follows:
    - .1 NOMMA Type 3 welds with partially dressed welds with spatter removed.
- .11 Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use flat-head

(countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

## **2.4 STEEL-FRAMED STAIRS**

### **.1 Stair Framing:**

- .1 Form stringers from minimum 250 mm structural steel MC channel. Provide outer stringers with 5 mm thick plate fascia welded on.
- .2 Close ends of stringers where exposed.
- .3 Weld stringers to headers; weld framing members to stringers and headers.
- .4 Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

### **.2 Treads:**

- .1 Fabricate with concrete filled closed riser steel pan construction.
  - .1 Form treads and risers from minimum 3 mm thick steel plate, or as required by miscellaneous metal supplier's engineer. Secure treads and risers to horizontal and vertical angles welded to stringers.
  - .2 Provide intermediate landings of configuration indicated or, if not indicated, minimum 3 mm thick steel plate with steel angle framing. Weld intermediate landings to framing.
  - .3 Place welded steel wire fabric reinforcing in treads, and landings, and secure so that reinforcing is maintained with equal concrete coverage above and below reinforcing.

### **.3 Finish:**

- .1 Stringers and risers: Shop primed, field paint.
- .2 Underside of metal pans: Shop prime.

## **2.5 BALUSTRADES**

- .1 Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacing, and anchorage, but not less than that needed to withstand indicated loads.
  - .1 Construct balusters and handrails from steel pipe or steel tubing, where indicated.
  - .2 Cap and weld exposed ends of balusters and handrails.
  - .3 Terminate at abutting wall with end flange.
  - .4 Construct pickets from steel bar: shape, size, and spacing indicated.
  - .5 Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
  - .6 Finish: shop primed, field painted.

## **2.6 FINISHES, GENERAL**

- .1 Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- .2 Finish metal fabrications after assembly.
- .3 Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.
- .4 Provide exposed fasteners with finish matching appearance, including colour and texture, of railings.

## **2.7 STEEL FINISHES**

- .1 Shop coat primer: to CAN/CGSB-1.40, rust-inhibitive, high solids, low VOC, grey.

## **2.8 SHOP FINISHING**

- .1 Clean surfaces in accordance with Steel Structures Painting Council Manual Volume 2.
- .2 Apply one coat of shop primer except interior surfaces of pans, and as indicated.
- .3 Apply two coats of primer of different colours to parts inaccessible after final assembly.
- .4 Use primer as prepared by manufacturer without thinning or adding admixtures. Paint on dry surfaces, free from rust, scale, grease, do not paint when temperature is below 7 degrees C.
- .5 Do not paint surfaces to be field welded.

## **Part 3 Execution**

### **3.1 INSTALLATION, GENERAL**

- .1 Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- .2 Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

### **3.2 INSTALLATION OF STAIRS AND LADDERS**

- .1 Install in accordance with NAAMM, Metal Stair Manual.
- .2 Install plumb and true in exact locations, using welded connections wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting stairs to structure.
- .3 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .4 Do welding work in accordance with CSA W59 unless specified otherwise.



- .5 Touch up shop primer to bolts, welds, and burned or scratched surfaces at completion of erection.

### **3.3 INSTALLATION OF PIPE/TUBING BALUSTRADES AND HANDRAILS**

- .1 Space posts as indicated. Secure posts and rail ends to building construction as follows:
  - .1 Anchor posts to steel by welding directly to steel supporting members.
- .2 Attach handrails to wall with wall brackets. Provide bracket with 50 mm clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:
  - .1 For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  - .2 For hollow masonry anchorage, use toggle bolts.
  - .3 For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.

### **3.4 CLEANING**

- .1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**