

**PART 1 General**

**1.1 REFERENCE STANDARDS**

- .1 ASTM International (ASTM)
  - .1 ASTM A36/A36M-19, Standard Specification for Carbon Structural Steel.
  - .2 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .3 ASTM F3125/F3125M-18, Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
- .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 Manufacturers Association (CPMA).
  - .1 Handbook of the Canadian Institute of Steel Construction.
  - .2 CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel.
- .4 CSA Group (CSA)
  - .1 CSA G40.20/G40.21-13(R2018), 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-S16-14, Limit States Design of Steel Structures.
  - .4 CAN/CSA-S136-12, North American Specifications for the Design of Cold Formed Steel Structural Members.
  - .5 CSA W47.1-19 Certification of Companies for Fusion Welding of Steel.
  - .6 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
  - .7 CSA W55.3-08 (R2018), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
  - .8 CSA W59.2-18, Welded Steel Construction (Metal Arc Welding).
- .5 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.
- .6 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International
  - .1 NACE No. 3/SSPC SP-6-06, Commercial Blast Cleaning.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:

- .1 Provide fabrication and erection documents stamped and signed by the Professional Engineer responsible for steel connections.
  - .2 Before submitting shop drawings, provide a letter signed and sealed by that Engineer stating their engagement to undertake the responsibility for the above. Also submit a copy of that Engineer's Certificate of Authorization, and proof of liability insurance.
  - .3 If additional information is required from Consultant, allow a minimum of five working days for Consultant to review and respond to the request for information.
- .3 Erection drawings:
- .1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
    - .1 Erection procedure
      - .1 Description of erection methods.
      - .2 Sequence of erection.
      - .3 Temporary bracings.
    - .2 Erection diagrams
      - .1 Member sizes (in addition to member marks).
      - .2 Size and finish of field bolts.
      - .3 Connections where threads must be excluded from shear plane.
      - .4 Sliding bearing assemblies.
    - .3 Field work details
      - .1 Details of all field welded connections
  - .2 Provide setting drawings showing dimensions and details for placing steel assemblies which are set in concrete.
- .4 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 Saskatchewan, Canada. Show on drawings:
    - .1 Material specifications.
    - .2 Surface preparation.
    - .3 Shop painting / galvanizing.
    - .4 Section splices.
    - .5 Types of shop and field connections.
    - .6 Net weld lengths.
    - .7 Size and finish of shop bolts.
  - .2 Substitution of alternative sections will only be allowed provided the new members have equal or greater capacity and stiffness and their dimensions are approved by Consultant.
  - .3 When requested, submit sketches and design calculations stamped and signed by the Professional Engineer responsible for connection design.
  - .4 On completion of erection, submit a letter signed and sealed by the Professional Engineer responsible for structural steel connections certifying that the work has been completed in accordance with all contract documents.

### **1.3 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.

## **PART 2 Products**

### **2.1 DESIGN REQUIREMENTS**

- .1 Design details and connections in accordance with requirements of with CSA-S136.1 CAN/CSA-S16 and CAN/CSA-S136 to resist forces, moments, shears and allow for movements indicated.
- .2 Follow conceptual connection details if shown on drawings. Do not change without Consultant approval. If welds are defined on drawings, the sizes shown are minimum requirements which may need to be increased to suit connection design.
- .3 Connection design to include consideration of all pass-through forces, including tension, compression, moment and shear. Provide local reinforcement at connection or joint as required.
- .4 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.
- .5 Increase specified section thickness at no extra cost if required for fabrication (bending) or galvanizing. Alternatively, build up curved sections from plates.
- .6 Assume that bolt threads are intercepted by shear plane, unless special measures are indicated on shop drawings to exclude threads from shear plane.
- .7 Beams:
  - .1 Select beam end connections from CISC "Handbook of Steel Construction" when connection for shear only (standard connection) is required.
  - .2 Typical beam to spandrel beam and beam to column connections to be two sided or end plate connections.
  - .3 Select or design beam end connections for factored shear indicated on plans.
  - .4 When shears are not indicated, select or design non composite beam end connections to resist reaction due to maximum uniformly distributed load capacity of the beam in bending, assuming the flange in compression is fully braced.
  - .5 When shears are not indicated, select or design composite beam end connections to resist one and a half times the reaction due to maximum uniformly distributed load capacity of the non composite beam section in bending.

- .6 Where no axial force is shown for beam to column connection, design to resist horizontal tension / compression equivalent to 2% of the factored axial force in column, in addition to all other loads.
  - .7 Seated beam connections to have top clip angles.
  - .8 End bearing connections of inclined members to have horizontal bearing plane at supported member.
  - .9 Extend beams bearing on walls for the full length of bearing plates.
  - .10 For beams continuous over supports and for beams supporting columns, provide min. 6 mm (1/4") stiffener plates at each side of web at supports / points of concentrated load, unless thicker stiffeners are required by connection design or different details are shown on drawings.
- .8 Columns:
- .1 In addition to all other loads, connect columns to base plates to transfer horizontal load equal to 2% of the column vertical load.
  - .2 In addition to all other loads, connect columns to base plates to transfer tensile load equal to the capacity of all anchor bolts.
  - .3 Unless otherwise noted on drawings, provide 102x102x9.5 seat angles attached to sides of columns to support masonry lintels adjacent to columns. Length of seat angle to equal width of lintel minus 25 mm.
- .9 Bracings:
- .1 Shape and size plates to accommodate required finishes and clearances; refer to Architectural and Mechanical drawings.
  - .2 Detail plate and rod bracing connections to be adjustable and to be able to be prestressed to approximately 15 MPa.
- .10 Provide all wall supporting members (shelf angles, hangers, stubs, back braces, etc.) which are attached to floor beams with adjustable connections capable to compensate for the deflection of the floor beams due to self weight of concrete. Anticipate beam deflection to be equivalent to the camber shown, or 20 mm (whichever is more). Alternatively, fabricate based on actual deflected shape of the beams as measured after concrete is poured.
- .11 Provide slotted holes long enough to allow for deflection indicated on drawings plus construction tolerance, see Typical Detail for bolts' positions in slots. Bolts are to be finger-tight with burred threads to allow for movement during the life of structure without bolts loosening.
- .12 Do not oversize anchor rod holes for site tolerances. Use hole sizes suggested in the CISC Handbook of Steel Construction.
- .13 Connect new steel members to existing concrete using drilled concrete anchors, refer to Post Installed Anchors and Dowels notes on drawings. Do not field weld at connections with adhesive anchors.
- .14 Provide closure plates for all exposed ends and for all exterior tubular members.

## 2.2 MATERIALS

- .1 Structural steel (W, WWF, S, channels, and angles): to G40.21, 350W. Plates and bars: 300W.
- .2 HSS: to G40.21, 350W.

- .3 Anchor rods: to G40.21, 300W.
- .4 Bolts, nuts and washers: to ASTM F3125 Grade A325M
- .5 Welding materials: to CSA W59 and certified by Canadian Welding Bureau.
- .6 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m<sup>2</sup>.
- .7 Shear studs: to CSA W59, Appendix H.
- .8 Maximum percentage of boron in all structural steel elements and fasteners not to exceed 0.0008%.
- .9 Shop paint primer: to CISC/CPMA 2-75, solvent reducible alkyd, red oxide, compatible with specified topcoat.
- .10 Zinc-rich coating: to SSPC Paint Specification No.20, compatible with top coat (where specified).
- .11 Coating of fasteners: to ASTM F2329 (hot dip galvanizing), ASTM B695 (mechanical galvanizing) or ASTM F1136 (Zn/Al coating). All fastening elements (bolts, nuts, washers) to be coated using the same process and to be obtained from a single supplier. Nuts to have visible dye lubricant.
- .12 Epoxy coating: pre-mixed, 2 components, high-solids (volume of solids 87 ±3%), self-priming,

### **2.3 FABRICATION**

- .1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with approved shop drawings.
- .2 Weld in accordance with CSA W59 and CSA W186.
- .3 Complete welded shop connections prior to galvanizing.
- .4 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left unpainted, place marking at locations not visible from exterior.
- .5 Where shop inspection is required, do not ship material to the site before it has been inspected.
- .6 Continuously seal members by intermittent welds and plastic filler unless continuous welds are indicated on drawings.

### **2.4 SHOP PAINTING**

- .1 Clean all members to SSPC-SP 1 – Solvent Cleaning. Remove loose mill scale, rust, oil, dirt and foreign matter using any suitable method.
- .2 In addition for members receiving shop primer paint: Clean steel to SSPC-SP 7 Brush-Off Blast Cleaning.
- .3 In addition for members receiving intumescent coating: Clean steel to SSPC-SP 6 Commercial Blast Cleaning
- .4 In addition for members receiving zinc-rich coating: Clean steel to SSPC-SP 10 Near White Blast Cleaning.

- .5 Apply one coat of shop paint CISC/CPMA 1-73a to steelwork in the shop with the exception of:
  - .1 Members to receive spray fireproofing.
  - .2 Members to receive a finish coat of paint on site for which a CISC/CPMA 2-75 shop primer is required.
  - .3 Members to receive intumescent coating for which a compatible shop primer is required.
  - .4 Members to receive zinc-rich coating.
  - .5 Galvanized members.
  - .6 Shear connectors and top flanges of composite beams with field welded shear connectors.
  - .7 Surfaces encased in or in contact with cast-in-place concrete including top flanges of beams supporting slabs.
  - .8 Surfaces and edges to be field welded for a distance of 50 mm (2") from joints.
  - .9 Faying surfaces of slip-critical connections.
- .6 Apply one coat of compatible primer paint (CISC/CPMA 2-75) in the shop to steelwork to receive a finish coat of paint on site.
- .7 Apply one coat of compatible primer paint in the shop for steel to receive intumescent coating on site, see section 07 81 29 Sprayed Fire Resistive Coating.
- .8 If more than one type of paint is specified, each paint to be visually identifiable after application.
- .9 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5°C.
- .10 Maintain dry condition and 5°C minimum temperature until paint is thoroughly dry.
- .11 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

### **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.
- .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 CONNECTION TO EXISTING WORK**

- .1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Consultant for direction before commencing fabrication.

- .2 Take precautions to protect existing works from damage. Provide temporary shoring as required. Repair damage to adjacent materials caused by structural steel installation

### **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.

### **3.5 MODIFICATION/REMOVAL OF EXISTING STEEL WORK**

- .1 Dismantle and cut existing structural steel as required. Provide temporary shoring and bracing required for these operations. Retain a Professional Engineer to design the temporary shoring and to review this work on site.
- .2 Clean existing structural steel, which is affected by the work and is to remain in place, down to bare metal, prior to its inspection so that its condition may be ascertained. Notify Consultant when members are ready for inspection.
- .3 Remove from site existing steel which is dismantled but not designated for re-use

### **3.6 ERECTION**

- .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S136 and CAN/CSA-S16 and in accordance with approved erection drawings.
- .2 Field cutting or altering structural members: to approval of Consultant.
- .3 Make adequate provision for all loads acting on the structure during erection. Provide erection bracing to keep the structure stable, plumb and in true alignment during construction. Bracing members or connections shown on Structural Drawings are those required for the completed structure, and may not be sufficient for erection purposes. For load bearing masonry construction, maintain bracing until completion of masonry work and floor / roof decks which together provide permanent bracing. Do not remove erection bracings without written approval from the Engineer who designed it.
- .4 Steel framing to be plumb at temperature of 20°C. If erection is carried out at temperatures greatly differing from 20°C, make adequate provisions; some members may need to be erected out of plumb in order to become plumb when the temperature stabilizes at 20°C.
- .5 Set column base plates to the elevation required for grouting using steel shims or leveling screws attached to sides of base plates. Do not fasten leveling nuts to anchor rods. Alternatively, for base plates equal or smaller than 350 mm x 350 mm (14" x 14"), leveling plates set with grout and level to within 1.5 mm (1/16") across the plate can be used. Do not erect columns upon plates exceeding this tolerance. Lift base plates for inspection when directed.
- .6 Grout under column base plates and beam bearing plates as soon as steelwork is completed. Do not add load on steelwork until grouting is completed and grout strength has reached at least 20 MPa.
- .7 Do not make permanent connections until structure has been properly aligned.
- .8 Install bolts which are not pre-tensioned to be snug tight.
- .9 Install bolts in pre-tensioned connections using turn-of-nut method.

- .10 Where slotted connections are shown on structural drawings, finger tighten bolts to a snug fit and burr threads to prevent nuts from working loose.
- .11 Prestress plate and rod bracing connections to approximately 15 MPa. Adjust connections as required for the prestress to be effective when building ambient temperature has stabilized.
- .12 Weld beams to bearing plates unless otherwise noted on drawings.
- .13 Adjust and finalize connections at wall supporting elements affected by floor beam deflections after concrete is poured.
- .14 Provide dissimilar metal separators at connections between aluminum members and structural steel.
- .15 Report ill-fitting connections to Consultant before taking corrective measures.
- .16 When welding after galvanizing is in place, grind away galvanizing at areas to be welded.
- .17 Remove slag from all completed welds so that they may be visually inspected.
- .18 Seal members by continuous welds where indicated.
- .19 Remove field connection aids from all surfaces which will be exposed to view and where interfering with clearances required by other trades.

### **3.7 FIELD QUALITY CONTROL**

- .1 Retain an independent, third party Inspection and Testing Agency (certified to CSA W178.1 & 2) to carry out inspection and testing of all structural steel.
- .2 Do not commence fabrication until details of inspection have been worked out with the Agency.
- .3 Assist the Inspection and Testing Agency in its work. Notify as to the Work Schedule and provide safe access to the work area as required.
- .4 The Inspection Agency will submit reports to Departmental Representative, Contractor and Municipal Authorities covering the Work inspected and provide details of errors or deficiencies observed.
- .5 Work will be inspected in shop and when erected. Store fabricated members in shop so that they are accessible for inspection.
- .6 Provide Inspection and Testing Agency with a copy of reviewed shop drawings.
- .7 Welding inspection:
  - .1 Welding inspection will be conducted in shop and in field.
  - .2 The Inspector will check welders' CWB qualification.
  - .3 The Inspector will review welding procedures for conformance with CWB requirements, manufacturers' requirements and standard practice.
  - .4 Arrange for the Inspector to be present during welding of 10% of moment connections and 10% of butt welds in direct tension.
  - .5 The inspector will visually check 20% of all other welds for:
    - .1 Size, length and profile
    - .2 Joint preparation, including cleaning and removal of any paint.
    - .3 Fit up and alignment.

- .4 Slag removal.
- .5 Distortion.
- .6 Porosity.
- .7 Cracks.
- .6 Test results will be evaluated in accordance with CSA W59.
- .8 Shop inspection will include:
  - .1 Confirming that all materials meet specifications.
  - .2 Reviewing mill test reports for conformance with specified material grades.
  - .3 Checking fabricator's qualification under the requirement of CSA W47.
  - .4 Checking surface preparation for members to be painted.
  - .5 Checking shop painting and galvanizing.
  - .6 General checking:
    - .1 Dimensions and cross sections in relation to specified member sizes.
    - .2 Locations of all holes, cuts and fittings.
    - .3 Reinforcement of openings.
    - .4 Milling of ends for bearing.
    - .5 Base plate orientation.
    - .6 Fabrication tolerances.
    - .7 Splicing (where indicated on drawings).
- .9 Field inspection:
  - .1 Arrange for the Inspector to start field inspection as soon as each section of the Work is completed, plumbed, bolts tightened and field welding finished.
  - .2 The Inspector will sample erection procedures for general conformity with Contract requirements.
  - .3 The Inspector will check general fit-up and tolerances and report any apparent distortions and misalignments.
  - .4 Field inspection will include:
    - .1 Checking individual frame members for twisting, sweep and local damage.
    - .2 Checking levelness of leveling plates.
    - .3 Inspection of grouting under base plates and bearing plates.
    - .4 Checking bearings on steel and masonry.
    - .5 Inspection of bolting and post installed anchors as described below.
    - .6 Checking installation of permanent bracings and nominal tension.
    - .7 Checking that column connections are adjusted to keep the columns plumb after supported structure has deflected due to dead loads applied to floor and roof deck.
    - .8 Checking that all adjustable connections at wall supporting members have been finalized after concrete is poured.
    - .9 Inspection of approved field cutting and reinforcing around openings.
    - .10 Inspection of field painting.
    - .11 Inspection of field touch-up.
  - .5 Bolting inspection:
    - .1 The Inspector will visually check all bolts in bearing connections. Where erection drawings indicate bolts with threads excluded from the shear

plane, remove nuts from 1% of all bearing bolts and check that thread is excluded from the shear planes.

- .6 Post installed anchor inspection:
  - .1 The Inspector will sample check drilled concrete and masonry anchors.
  - .2 The Inspector will provide full time inspection during installation of post installed adhesive anchors subject to sustained tension loads.
  - .3 The Inspector will randomly select and pull test 5% of all types and sizes of post installed anchors installed on a weekly basis, but not less than one anchor of each type, size and orientation. Pull test to twice the allowable tensile load, or 1.5 times the factored resistance of the anchor given by the manufacturer. Chose anchor locations where proximity to concrete edge does not affect anchor capacity, or use reduced anchor loads per manufacturer's recommendation. Submit reports to Consultant within one week of testing. Reports to indicate each anchor location, test load and mode of failure, if applicable. Notify Consultant immediately if any anchor fails the pull test

### **3.8 FIELD PAINTING**

- .1 Paint in accordance with Section 09 91 23 – Interior Painting
- .2 Touch up damaged surfaces with the same paint as the shop coat.
- .3 Repair any galvanized or zinc rich painted surfaces which have been damaged or field welded in accordance with SSPC Technology Guide No.14.
  - .1 Clean and prepare surfaces of bolts, which will receive a finished coat of paint in the same manner as the connected steelwork.
- .4 Clean non galvanized steel surfaces which will be in contact with ground to SSPC SP-3 (Power Tool Cleaning) and apply two coats of epoxy paint to achieve dry film thickness between 0.20 mm and 0.35 mm (8 mils and 14 mils).

**END OF SECTION**

---

**PART 1      General**

**1.1            REFERENCE STANDARDS**

- .1    ASTM International (ASTM)
  - .1    ASTM A653/A653M-19a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .2    ASTM A780-09(2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings.
  - .3    ASTM A792/A792M-10(2015), Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .2    Canadian Sheet Steel Building Institute (CSSBI)
  - .1    CSSBI 12M-18, Standard for Composite Steel Deck.
- .3    CSA Group (CSA)
  - .1    CSA S16-14, Design of Steel Structures.
  - .2    CSA S136-16, North American Specification for the Design of Cold Formed Steel Structural Members including Update No. 1 (2019)
  - .3    CSA W47.1-19, Certification of Companies for Fusion Welding of Steel Structures.
  - .4    CSA W55.3-08 (R2018), Certification of Companies for Resistance Welding of Steel and Aluminum.
  - .5    CSA W59.2-18, Welded Steel Construction, (Metal Arc Welding).

**1.2            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1    Submit manufacturer's data sheets for each deck type.
  - .2    Submit product data confirming capacity of mechanical fasteners to resist uplift, shear and corrosion and compliance with Factory Mutual (FM) requirements.
  - .3    When requested, provide data to substantiate deck load capacity.
- .3    Shop Drawings:
  - .1    Provide drawings stamped and signed by a Professional Engineer responsible for design of steel decking. Drawings to include diaphragm connection design.
  - .2    Submit a copy of the Engineer's Certificate of Authorization, and proof of liability insurance
  - .3    Show on drawings:
    - .1    Deck layout.
    - .2    Deck profile and base steel thickness.
    - .3    Type of deck metallic coating. Indicate deck which is to be painted on site.
    - .4    Gravity loads and deflection requirements the deck is designed for.
    - .5    Type and spacing of connections to supports and between sheets.

- .6 Projections and openings.
- .7 Reinforcement details and accessories.
- .8 FM requirements for type, size and spacing of fasteners for side laps and connection to supports, and statement that deck and its installation are FM compliant.
- .9 Layout, size, type and welding requirements for welded stud shear connectors

### **1.3 QUALITY ASSURANCE**

- .1 Qualifications
  - .1 Deck supplier and erector 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.
  - .2 Welders to be CWB approved for deck welding.
  - .3 Engage a Professional Engineer licensed in the Province of Saskatchewan, Canada, to be responsible for design, detailing and installation of all decking.
  - .4 The Professional Engineer designing steel decking to hold a Certificate of Authorization, and to carry min. \$1,000,000.00 in liability insurance

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer s name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer s recommendations.
  - .2 Store and protect decking from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.t

## **PART 2 Products**

### **2.1 DESIGN AND DETAILING REQUIREMENTS**

- .1 Design loads, deck depths and core nominal thicknesses are shown on Structural Drawings. Chose deck profile, design connections and detail in accordance with CSA S136, CSSBI 10M and CSSBI 12M and to satisfy requirements of any Fire Rated Assembly Design specified for the Project.
- .2 Design floor composite steel deck to CSA S16, CSA136 and CSSBI 12M.
- .3 Steel deck and connections to steel framing to carry dead, live and other loads as indicated.
- .4 Unless otherwise noted on drawings, floor deck to carry weight of wet concrete and appropriate construction load allowance without shoring.
- .5 Deflection limitations for floor deck:
  - .1 1/360 of span under live load.

- .2 1/480 of span long term (under live load, superimposed dead load, shrinkage and creep).

- .6 Design reinforcement for roof deck openings up to 450 mm (18") wide across flutes

## **2.2 MATERIALS**

- .1 Steel Deck: Zinc-iron Alloy (ZF) coated steel sheet to ASTM A653/A653M, structural quality Grade 230, with ZF75 coating, or aluminum-zinc alloy (AZ) coated steel sheet to ASTM A792/A792M, structural quality grade 230 with AZ 150 coating.
- .2 Decks to be painted on site: zinc-iron alloy coated decks suitable for finish painting.
- .3 Fasteners for galvanized deck and prefinished deck: stainless steel, hex head, self-tapping screws with EPDM (ethylene propylene diene monomer) bonded washers.
- .4 Cover plates, closures, pour stops, edge strips, flashings and deck reinforcing: steel sheet with minimum base steel thickness of 0.91 mm. Metallic coating same as deck material.
- .5 Headed studs: to CSA W59, Type B, min.  $F_y=350$  MPa.

## **2.3 TYPES OF DECKING**

- .1 Composite floor deck: embossed fluted profile, interlocking or overlapping side laps. Centre to centre rib spacing to be:
  - .1 150 mm (6") for 38 mm (1.5") deep deck.
- .2 Use only decks with overlapping side joints where side lap connections need to be screwed or where multiple deck layers are specified.

## **2.4 FABRICATION**

- .1 Conform to CSA S136 and CSA W59
- .2 Fabricate sections from steel sheets by rolling. Form integral ribs which will bear on supports and form interlocking male and female side laps.

## **PART 3 Execution**

### **3.1 GENERAL**

- .1 Structural steel work: in accordance with CSA S136, CSSBI 10M and CSSBI 12M.
- .2 Welding: in accordance with CSA W59, except where specified otherwise

### **3.2 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts acceptable for steel decking installation in accordance with manufacturer s written instructions.
  - .1 Visually inspect substrate.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation after unacceptable conditions remedied.

---

**3.3 PREPARATION**

- .1 Locate bundles of deck materials to prevent overloading of supporting members.
- .2 Install temporary shoring before placing deck panels, if required to meet deflection limitations.

**3.4 ERECTION**

- .1 Erect steel deck in accordance with CSA S136, CSSBI 10M, CSSBI 12M, and reviewed shop drawings.
- .2 Do not overload structure during erection. Place deck bundles near columns.
- .3 Align deck end to end for accurate fit with corresponding sections. Sections to be parallel, even and straight.
- .4 Locate deck rib directly over perimeter steel beams spanning parallel to deck and at same elevation as underside of deck.
- .5 For exposed deck end laps, do not extend lower deck sheet past the face of the supports.
- .6 Exercise particular care in erection of exposed deck. Sections which are dented, damaged or perforated by welding will be rejected.
- .7 Connections
  - .1 Use connections specified on reviewed shop drawings, to suite the required corrosion protection, uplift, diaphragm shear, requirements of any Fire Rated Assembly Design.
  - .2 Connect deck to all supporting beams and perimeter beams. Interconnect sheets at side laps.
- .8 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer where burned by welding.
- .9 Prior to concrete placement, steel deck to be free of soil, debris, standing water, loose mill scale and other foreign matter.
- .10 Closures and Accessories
  - .1 Provide all required edge stiffeners, closures, reinforcing sheet steel and flashing.
  - .2 Provide pour stops for concrete slabs over deck. Fasten to deck.
  - .3 Provide flashing at columns and points of discontinuity to prevent leakage when concrete is placed over deck.
- .11 Openings
  - .1 Structural Drawings do not show all openings required. Refer also to Architectural, Mechanical and Electrical drawings.
  - .2 Cut all opening required by other trades.
  - .3 Reinforce roof deck openings up to 450 mm (18") across flutes. Maximum size of unreinforced openings not to exceed 150 mm (6")
- .12 Protect existing works. Repair damage to adjacent materials caused by steel decking installation.
- .13 Protect installed products and components from damage during construction.

- .14 Temporary shoring, if required, not to be removed until concrete attains 75% of its specified 28 day compression strength.

**3.5 FIELD TOUCH-UP PAINTING**

- .1 Upon erection completion, mechanically brush clean bolts, rivets, welds, and burned or scratched surfaces.
- .2 For galvanized steel surface with damage and without shop coat, repair with field touch up primer.

**3.6 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by steel decking installation.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCE STANDARDS**

- .1 American Architectural Manufacturers Association (AAMA)
  - .1 AAMA 611-14, Voluntary Specifications for Anodized Finishes Architectural Aluminum.
- .2 ASTM International (ASTM)
  - .1 ASTM A53/A53M-20, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM A269/A269M-15a(2019), Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .3 ASTM A307-14E1, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .4 ASTM F3125/F3125M-19e2, Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
  - .5 ASTM B221-14, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .3 CSA Group (CSA)
  - .1 CSA G30.18-09 (R2019), Carbon Steel Bars for Concrete Reinforcement, Includes Update No. 1 (2012)
  - .2 CSA G40.20-13 /G40.21-13(R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .3 CSA G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .4 CSA S16-19, Design of Steel Structures.
  - .5 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
  - .6 CSA W59-18, Welded Steel Construction (Metal Arc Welding) Metric
- .4 National Association of Architectural Metal Manufacturers (NAAMM) and Expanded Metal Manufacturers Association (EMMA)
  - .1 NAAMM EMMA 557-15; Standards for Expanded Steel.
- .5 The Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual - current edition

**1.2 ACTION AND INFORMATIONAL 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 tubing, bolts, sections, pipe, plates, mesh, and include product characteristics, performance criteria, physical size, finish, and limitations.
- .3 Shop Drawings:
  - .1 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
- .4 Samples:
  - .1 For steel mesh product specified, provide one sample, minimum size 200 mm x 200 mm, representing actual material and completed with all fastening devices.

### **1.3 QUALITY ASSURANCE**

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Mock-ups:
  - .1 Submit mock-ups in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Mock-up will be used to judge workmanship, substrate preparation, and materials application and detailing.
    - .1 Mock-up size: 1.2m x 1.2m including mesh, rivets, and washers.
    - .2 Locate where directed by Departmental Representative.
  - .3 When accepted, mock-up will demonstrate standard of quality required for this work. Approved mock-up may remain as part of finished work.

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan and Waste Reduction Workplan related to Work of this Section and in accordance with Section 01 74 19 - Waste Management and Disposal.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W or 350W.

- .2 Steel pipe: to ASTM A53/A53M extra strong, galvanized finish.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A307.
- .6 Stainless sheet: to ASTM A269, Type 302 commercial grade
- .7 Steel Mesh: rolled flattened steel mesh, galvanized finish.
- .8 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

## **2.2 FABRICATION**

- .1 Fabricate work square, true, straight, and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Exposed welds continuous for length of each joint. File or grind exposed welds smooth and flush.

## **2.3 FINISHES**

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m<sup>2</sup> to CAN/CSA-G164.
- .2 Chromium plating: chrome on steel with plating sequence of 0.009 mm thickness of copper, 0.010 mm thickness of nickel, and 0.0025 mm thickness of chromium.
- .3 Shop coat primer: to CAN/CGSB-1.40.
- .4 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

## **2.4 ISOLATION COATING**

- .1 Isolate aluminum from following components, by means of bituminous paint:
  - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
  - .2 Concrete, mortar, and masonry.
  - .3 Wood.

## **2.5 SHOP PAINTING**

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

## **2.6 IN-WALL SECURITY MESH**

- .1 To NAAMM EMMA 557; 19mm #9/10, nominal strand thickness of 3.05mm, rolled flattened steel mesh, galvanized, diamond opening of 14.3 x 42.9mm.

- .2 Fasteners: Ultra grip steel rivet complete with 38 mm outside diameter and 4.76 mm inside diameter galvanized fender washers. Spacing as indicated in drawings.

## **2.7 ANGLE LINTELS**

- .1 Steel angles: prime painted, sizes indicated for openings. Provide 200 mm minimum bearing at ends.
- .2 Weld or bolt back-to-back angles to profiles as indicated.
- .3 Finish: shop painted.

## **2.8 ALUMINUM BRAKESHAPE**

- .1 Extruded aluminum to ASTM B221. Aluminum Association alloy AA6063-T anodizing quality.
- .2 Minimum 1.63 mm (14ga) aluminum.
- .3 Finish coatings: conform to AAMA 611 and AA-M12C22A44. To match adjacent curtain wall system
- .4 Architectural Class II, etched matte, clear / coloured anodic coating, 0.4mil minimum thickness.

## **2.9 STEEL VANITY SUPPORT**

- .1 Steel plate, 6 mm thick, shop primed (PT-1).

## **2.10 SECURE DUCT REINFORCING**

- .1 Steel angle, prime painted, sizes indicated in drawings.
- .2 Steel bars: deformed bars of new billet steel conforming to CSA G30.18, Grade 400, galvanized finish.
- .3 Bolts, nuts, and washers: high strength for structural requirements, confirming to ASTM F3125.

## **Part 3 Execution**

### **3.1 EXAMINATION**

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

### **3.2 ERECTION - GENERAL**

- .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 S16.1 or weld field connection.
- .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 of:
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

### **3.3 IN-WALL SECURITY MESH**

- .1 Refer to Wall Types in drawings.
- .2 Refer to drawings and Section 09 22 16 – Non-Structural Metal Framing for installation details.

### **3.4 ANGLE LINTELS**

- .1 Install angle lintels as indicated.

### **3.5 ALUMINUM BRAKESHAPE**

- .1 Install aluminum brakeshape as indicated.

### **3.6 STEEL VANITY SUPPORTS**

- .1 Install counter support arm as indicated in drawings.
- .2 Continuously weld all connections, grind smooth.
- .3 Apply primer to exposed metal.

### **3.7 SECURE DUCT REINFORCING**

- .1 Install secure duct reinforcing as indicated in drawings.

### **3.8 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 00 - Cleaning.

### **3.9 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**