METALS GENERAL REQUIREMENTS

1. GENERAL

1.1 Summary

.1 This Section specifies the metals general requirements.

.2 Design and construction of structural steel, steel deck, and cold-formed steel stud of building elements and systems as required by the Final Design.

1.2 Standards

.1 Association of Wall and Ceiling Contractor's (AWCC) Specification Standards Manual.

.2 Master Painters Institute (MPI).

.3 Canadian Standards Association (CSA).

1.3 Submittals

.1 Provide submittals in accordance with Sections 01300 and the following:

.1 Manufacturer's descriptive literature for materials.

1.4 Quality Assurance

.1 Quality assurance testing and monitoring of workmanship to be carried out by a certified testing laboratory using testing procedures to CSA standards to verify soundness of representative shop and field welds.

.2 The steel stud manufacturer to be certified to CSSBI Standard 30M and all applicable CSA standards. All standards to be latest edition.

.3 The steel stud fabricator and erector to have a minimum of five (5) years of experience in the type of work undertaken.

2. PRODUCTS

2.1 Performance Criteria

.1 Provide structural steel, steel deck, and cold-formed steel stud systems to meet the deflection and vibration requirements set out in the Final Design. Erection tolerances for steel construction are to be to all applicable CSA standards.

.2 Design steel floor and roof systems to meet the deflection limits set out in the Final Design for steel beams, joists, and girders requirements due to the wet weight of concrete topping slabs is to be considered. Topping slab thickness may have to vary to maintain floor levelness tolerances. Design the structure to withstand concrete ponding weight.

.3 Crack control of concrete topping slabs on steel deck is to be used to avoid random surface shrinkage cracking and radial cracking around re-entrant corners. Provide the necessary curing procedures to control cracking for concrete topping slabs on metal deck.

.4 Steel floor/roof decking to be wide rib profile for ease of attachment of current and future services, equipment, and fixtures using insert expansion anchors drilled into the bottom of the deck ribs.

.5 Steel floor and roof decking and concrete topping slab thickness to satisfy the requirements of a ULC rated assembly meeting the fire rating requirements. Spray on or applied fireproofing material is not to be used to achieve required floor deck fire rating.

.6 Components are to accommodate erection tolerances of the structure.

.7 Provide stainless steel surfacing where surfaces require antiseptic or clean characteristics, special maintenance, and resistance to caustic action of chemicals or agents.

2.2 Structural Steel and Steel Joists

.1 Preparation and painting of structural steel components to conform to the Master Painters Institute (MPI) standards.

.2 Metal studs sizing to account for the anchorage of other materials being supported including sub-girts supporting metal cladding, composite panels and soffit finishes and the provision of lateral support at window heads.

.3 Wind-bearing stud end connections to accommodate floor and roof deflections and to ensure that studs are not axially loaded.

.4 Fireproof structural steel floor and roof framing and supporting members to meet fire rating requirements.

.5 Conform to the requirements of the Association of Wall and Ceiling Contractor’s (AWCC) Specification Standards Manual.

.6 Provide material quality testing, including sourcing and welding quality by an independent testing agency.

2.3 Load Bearing Metal Studs

.1 Load bearing metal studs may be considered a component of the exterior wall systems to support exterior wall finishes and form an integral part of the perimeter envelope.

.2 Load bearing metal studs may be part of the structural framing or may be independent of the principle structural system.

3. EXECUTION

3.1 General

.1 Install in accordance with Manufacturer's recommendations and as required by the Final Design.

END OF SECTION

STRUCTURAL STEEL

1. GENERAL

1.1 Summary

.1 This Section specifies supply and installation of structural steel.

.2 Structural steel is to be hot-dip galvanized where required by the Final Design. If not required to be galvanized, then coat structural steel per the Protective Coating Schedules in Section 09905.

1.2 Standards

.1 All codes and standards to be latest edition unless noted otherwise.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A36/A36M - Structural Steel.

.2 ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

.3 ASTM A193/A193M - Alloy-Steel and Stainless-Steel Bolting Materials for High-Temperature Service.

.4 ASTM A123/A123M - Zinc (Hop-Dip Galvanized) Coatings on Iron and Steel Products.

.5 ASTM A153/A153M - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.6 ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile.

.7 ASTM A449 - Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.

.8 ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

.9 ASTM F593 - Stainless Steel Bolts, Hex Cap Screws, and Studs.

.10 ASTM F3125/F3125M - High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

.11 ASTM AA992 - Structural Steel Shapes.

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.171 - Inorganic Zinc Coating.

.4 Canadian Standards Association (CSA):

.1 CSA G40.20/G40.21 - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

.2 CSA S16 - Design of Steel Structures.

.3 CSA S136 - North American Specification for the Design of Cold Formed Steel Structural Members.

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

.5 CSA W55.3 - Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

.6 CSA W59 - Welded Steel Construction (Metal Arc Welding) Metric.

.7 CSA W178.1 - Certification of Welding Inspection Organizations.

.8 CSA W178.2 - Certification of Welding Inspectors.

.9 CSA W186 - Welding of Reinforcing Bars in Reinforced Concrete Construction.

.5 Canadian Institute of Steel Construction/Canadian Paint Manufacturers' Association (CISC/CPMA):

.1 1-73a - A Quick-drying One-coat Paint for Use on Structural Steel.

.2 2-75 - A Quick-drying Primer for Use on Structural Steel.

.6 The Society for Protective Coatings (SSPC):

.1 SSPC.SP1 - Solvent Cleaning.

.2 SSPC SP2 - Hand Tool Cleaning.

.3 SSPC.SP3 - Power Tool Cleaning.

.4 SSPC SP6 - Commercial Blast Cleaning.

.5 SSPC.SP7 - Brush Off Blast Cleaning.

.7 The Steel Construction Institute:

.1 Design Manual for Structural Stainless Steel.

.8 American National Standards Institute (ANSI)/National Association of Architectural Metal Manufacturers (NAAMM) Metal Bar Grating Manual.

1.3 Submittals

.1 Provide submittals in accordance with Section 01300 and the following:

.1 Manufacturer's descriptive literature for materials.

.2 Shop Drawings:

.1 Clearly indicate sizes, spacing, and locations of all structural members, connections and cambers.

.2 Include the following on each Shop Drawing:

.1 Supplier/fabricator name.

.2 Project name.

.3 Contract number.

.4 Material weights and quantities.

.5 Material grade.

.6 Material coating.

.7 Bolt/anchor type.

.3 Use welding symbols defined in CSA W59. Indicate corresponding weld procedure for each weld required for the Final Design. Clearly indicate net weld lengths.

.4 On the Shop Drawings, clearly show method of torquing bolts.

.5 Prepare Shop Drawings of all connections and components designed by the fabricator under the seal and signature of a Professional Engineer registered in the Province of Manitoba.

.3 Provide CWB weld procedure data sheets and CWB fabricator certificates in conjunction with Shop Drawings.

.4 Submit calculations verifying design capacities prior to fabrication.

.5 Submit evidence of ability to weld reinforcing steel to CSA W186.

.6 Upon request provide certified copies of mill test reports to CSA G40.20/G40.21 submitted twenty (20) Business Days prior to fabrication. Submit copies of mill test reports properly indexed to the materials used.

1.4 Quality Assurance

.1 Qualifications:

.1 The organization undertaking to weld under this Section is to be fully approved by the CWB under the requirements of CSA W47.1, Division 1 or 2.1 only. Division 3 qualification is not acceptable.

.2 Weld inspection: the organization undertaking to perform weld inspection under this Section is to be fully approved by the CWB under the requirements of CSA W178.1 and CSA W178.2.

.3 Retain a Professional Engineer, fully qualified and experienced in the design of structural steel, connections, and welded components to be responsible for the design of specified steel components, connections, and welded components.

.2 Quality Control:

.1 The Professionals of Record are responsible for the design of connections and other components. The designers are to inspect the fabrication and erection of these components.

.2 Design builder is to include in the Construction Quality Management Plan the quality control and inspection test plans to meet the Technical Requirements for structural steel material, fabrication, workmanship, and erection.

.3 Perform the following non-destructive examination on welded fabrications. Prepare and submit a written NDT report identifying location of inspected items and summary of corrections as required to meet CSA S16 and CSA W59 acceptance criteria:

.1 Testing of welds to include visual examination of all welding procedures at the plant and in the field, plus magnetic particle, x ray or other means deemed necessary by the testing agency based on the acceptance criteria set out in CSA W59.

.2 Fillet welds: 50 percent visual examination.

.3 Butt joint welds: 100 percent tested by either radiographic or ultrasonic testing.

.4 Supply test coupons upon request by the designer.

.5 Inspect bolts to CSA S16.

.6 Defective connections: Correct and re-inspect defective connections. Retest as necessary to demonstrate compliance of the completed work.

.3 Arrange to inspect the fabrication and installation of Work and certify the Work prior to Substantial Completion.

1.5 Design

.1 Design components and connections to CSA S16 to resist all loads and forces required for the Final Design and as noted herein.

.2 Steelwork detailing and design to be suitable for galvanizing or coating.

2. PRODUCTS

2.1 Materials

.1 Structural steel members and plates:

.1 Wide flanges: CSA G40.20/G40.21, Grade 350W.

.2 Hollow structural shapes: CSA G40.20/G40.21, Grade 350W, Class C.

.3 Miscellaneous shapes: CSA G40.20/G40.21, Grade 300W.

.4 Galvanizing: galvanize steel, where indicated, to ASTM A123/A123M for steel shapes and ASTM A153/A153M for hardware.

.5 Minimum thickness of steel structural member is 6 mm.

.2 Stainless Steel:

.1 Exterior, process areas, and submerged: American Iron and Steel Institute (AISI), Type 316.

.2 Non-process interior areas: AISI, Type 304.

.3 Aluminum:

.1 Structural shapes, handrails, and plates: Alloy 6061-T6 or 6063-T6.

.2 Grating to be to American National Standards Institute (ANSI)/National Association of Architectural Metal Manufacturers (NAAMM) Metal Bar Grating Manual.

.3 Checkered floor plates: Alloy 6061-T6.

.4 Bolted Connections:

.1 Submerged: stainless steel Type 316.

.2 Inside enclosed tanks and channels: stainless steel Type 316.

.3 Splash zone (water level to 600 mm above the water level): stainless steel Type 316.

.4 Aluminum bolted connections are to be stainless steel Type 316 with isolation washers.

.5 Coatings: See Sections 09900 and 09905.

2.2 Configuration Components and Features

.1 Provide connections for the following minimum forces:

.1 Beam end shear connections to resist forces equal to half the maximum uniform load capacity of the laterally supported beam and any concentrated loads.

.2 Moment connections to resist the moment capacity of the beam. Consider shear and bending at critical sections, including members that are coped.

.3 Splices to provide a connection equal to the capacity of the smaller spliced member.

.4 Bracing connections to resist the tensile capacity of the brace.

.2 Use the following minimum dimensions:

.1 Rolled sections, minimum web thickness: 5.0 mm.

.2 Plate, general including checker plate, minimum thickness: 6.0 mm.

.3 Plate stiffeners, gusset plates, minimum thickness: 10.0 mm.

.4 Hollow structural sections, minimum wall thickness: 4.8 mm.

.5 Bolts, minimum diameter: 19.1 mm.

.6 Fillet weld, minimum size: 6.0 mm.

.3 Design connections for all main structural members with symmetrical double angle or end plate beam connections to the design tables of the CISC Handbook of Steel Construction.

.4 Use bearing type bolted connections. Exclude threads from shear plane. Use at least two (2) bolts in connections.

.5 Locate work points at the intersections of members and design connections so that no eccentricities are introduced in the members.

.6 Avoid creating recesses that cannot be painted. Where packing plates and shims are required, provide plates wider than the smaller member in the connection.

.7 If galvanizing is specified, detail components to suit the galvanizing process. Provide adequate venting and drainage holes.

2.3 Assembly and Fabrication

.1 Fabrication:

.1 Notify the designer a minimum of forty-eight (48) hours prior to fabricating any structural steel.

.2 Fabricate structural steel to CSA S16, and as required for the Final Design.

.3 Verify dimensions of existing work prior to commencing fabrication.

.4 Verify all Drawing dimensions and conditions prior to commencing fabrication.

.5 Welding to conform to the requirements of CSA W59. Do not splice materials.

.6 Accurately cut and mill column ends and bearing plates to assure full contact of bearing surfaces prior to welding.

.7 Seal all hollow structural sections with suitable cap plates or by welding all around to adjoining members.

.8 Provide 10 mm plate stiffeners each side of beam where continuous over supports.

.9 Provide 10 mm plate stiffener each side of beam at all bearing connections.

.10 Camber horizontal members to accommodate dead load deflection.

.11 Provide welds smooth and groove welds flush on exposed structural steel; file or grind as required.

.12 Do not place any holes or openings in structural steel members.

.13 Weld reinforcement where required by the Final Design. Weld to applicable requirements of CSA W186. Do not weld reinforcing without written approval of the Professional of Record.

.14 Galvanize all structural steel components to ASTM A123M for shapes and ASTM A153 for hardware.

.15 Steel to be painted to have minimum edge radius of 2 mm.

2.4 Marking

.1 Mark materials to CISC Standard Code of Practice and CSA G40.20.

.2 Shop mark materials for fit and match.

.3 Place markings at locations not visible when erected.

.4 Do not use die stamping.

3. EXECUTION

3.1 General

.1 Install in accordance with Manufacturer's recommendations and as required by the Final Design.

.2 Inspection and Testing:

.1 Materials and workmanship are to be inspected and tested by an inspection and testing firm certified to CSA W178.1.

.2 Inspection and testing firm to submit a final report certifying all welds and connections, including confirmation that required repairs have been completed.

3.2 Erection

.1 Notify the Professional of Record a minimum of forty-eight (48) hours prior to erecting any structural steel to allow for inspection.

.2 Erect structural steel as required to satisfy CISC Standard Code of Practice and CSA S16.

.3 Make adequate provision for all erection loads and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of necessary permanent bracing.

.4 Do not field cut or alter structural members. Report to the Professional of Record every failure of material to fit together properly. Corrective measures to be approved by the Professional of Record.

.5 Set column base plates on steel wedges or shims to accurate elevations. Wooden wedges are not permitted.

.6 Use the turn-of-nut method to pre-tension bolts used in slip critical connections and connections subject to impact or cyclic loads. Snug tighten bolts that are used in other connections.

.7 Repair damaged galvanizing to ASTM A780M with zinc-rich paint equivalent to Galvacon applied in multiple coats to a minimum dry film thickness of 0.20 mm.

.8 Columns:

.1 Roughen concrete surfaces in accordance with the grout Manufacturer's recommendations prior to placing shims.

.2 Set column bases and base plates to the proper elevations on steel shims ready for grouting. Locate shims so they do not protrude past grouted surfaces.

.3 Clean underside of base plates before erection.

END OF SECTION

STEEL JOISTS

1. GENERAL

1.1 Summary

.1 This Section specifies:

.1 All steel joists to be in accordance with dimensions and loads as required by the Final Design.

.2 Standard and custom fabricated type steel joists and bridging.

.3 Bearing plates and angles with anchors.

.4 Joist seats and anchor bolts for joists.

.5 Welding to steel supports.

.6 Joist chord extensions.

.7 Hot dip galvanized steel joists and appurtenances.

.8 Field touch up of damaged galvanized surfaces.

1.2 Standards

.1 All codes and standards to be latest edition unless noted otherwise.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A123/A123M - Zinc (Hop-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A153/A153M - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.3 ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

.1 Canadian Standards Association (CSA):

.1 CSA G40.20-13/G40.21 - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

.2 CSA S16 - Design of Steel Structures.

.3 CSA S136 - North American Specification for the Design of Cold Formed Steel Structural Members.

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

.5 CSA W48 - Electrodes.

.6 CSA W55.3 - Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

.7 CSA W59 - Welded Steel Construction (Metal Arc Welding) Metric.

.2 The Society for Protective Coatings (SSPC):

.1 SSPC.SP1 - Solvent Clean.

.2 SSPC.SP3 - Power Tool Clean.

.3 SSPC SP6 - Commercial Blast Cleaning.

.4 SSPC.SP7 - Brush Off Blast.

1.3 Submittals

.1 Provide submittals in accordance with Section 01300 and the following:

.1 Manufacturer's descriptive literature for materials.

.2 Clearly indicate profiles of rolled sections, sizes, spacing and location of joists, connections, bridging, reinforcing, anchorage, cambers, loads, and accessories.

.3 Include erection drawings, elevations, and details.

.4 Indicate welded connections using welding symbols to CISC Welding Standards. Clearly indicate net weld lengths.

1.4 Quality Assurance

.1 Qualifications:

.1 Joists and all joist connections are to be designed by a Professional Engineer registered in the Province of Manitoba.

.2 All work is to be performed by a firm certified by the CWB to the requirements of CSA W47.1 in Division 1 or 2.1.

.3 All welders employed for erection are to possess valid "S" Classification Class "O" certificates issued by the CWB.

.4 Design Builder is to include in the Construction Quality Management Plan the inspection and testing procedures to verify the Work complies with the Final Design.

.2 Inspection and Testing:

.1 Shop and field inspection and testing are to be performed by a third-party inspection and testing firm.

.2 Upon request submit mill test reports, properly indexed to materials used.

2. PRODUCTS

2.1 Performance Criteria

.1 Provide joists to withstand their own weight and loads required by the Final Design, with not more than the allowable deflection.

2.2 Materials

Type	Material
G	General Construction Steel
W	Weldable Steels
T	Weldable Low Temperature Steels
R	Atmospheric Corrosion Resistant Structural Steel
A	Atmospheric Corrosion Resistant Structural Steel with Improved Low Temperature Properties
Q	Quenched and Tempered Low Alloy Steel Plate

.1 Structural steel: to CSA G50.20/G40.21, type W, with yield strength of 350 MPa for chord sections and 300 MPa for web material.

.2 All steel joists to be hot-dip galvanized after fabrication conforming to ASTM A123/A123M.

.3 Anchor bolts, nuts and washers: to ASTM A325, finishing to be minimum galvanized.

.4 Welding Materials: conforming to CSA W59.

2.3 Fabrication

.1 Fabricate steel joists to CSA S16.

.2 Verify all dimensions prior to commencing fabrication.

.3 Fabricate joists of straight members arranged to form a triangulated truss type structure without joint eccentricities.

.4 Fabricate top and bottom joist chord extensions where required by the Final Design. Extend bottom chords to support top of columns.

.5 Fabricate joist webs to permit passage of mechanical ducts as required by the Final Design. Reinforce joists in accordance with design conditions.

.6 Camber joists for dead load deflection.

2.4 Hot-Dip Galvanizing

.1 Clean all members, remove loose mill scale, rust, oil, dirt, and other foreign matter. Prepare surface to SSPC SP 7 after fabrication.

.2 Hot-dip all steel joists conforming to ASTM A153/A153M with minimum 610 grams per square metre coating.

3. EXECUTION

3.1 General

.1 Install in accordance with Manufacturer's recommendations and as required by the Final Design.

.2 Notify the Professional of Record of any conditions that would prejudice proper installation of this Work.

.3 Replace members damaged during transit or erection, as determined by the Professional of Record, before securing in position.

.4 Erect steel joists to CSA S16.

.5 After erection, touch-up damaged galvanized coating with three (3) coats of zinc-rich paint conforming to ASTM A780M.

END OF SECTION

METAL DECKING

1. GENERAL

1.1 Summary

.1 This Section specifies supply and installation of metal floor and roof decks.

1.2 Standards

.1 All codes and standards to be latest edition unless noted otherwise.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A194/A194M -Carbon Steel, Alloy Steel, and Stainless-Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.

.2 ASTM A563 - Carbon and Alloy Steel Nuts.

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

.4 ASTM A792/A792M - Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.5 ASTM F3125/F3125M - High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

.3 Canadian Standards Association (CSA):

.1 CSA C22.2 No.79 - Cellular Metal and Cellular Concrete Floor Raceways and Fittings.

.2 CSA G40.20-13/G40.21 - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.3 CSA S16 - Design of Steel Structures.

.4 CSA S136 - North American Specification for the Design of Cold Formed Steel Structural Members.

.5 CSA W47.1 - Certification of Companies for Fusion Welding of Steel Structures.

.6 CSA W55.3 - Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

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

.8 CSA W178.1 - Certification of Welding Inspection Organization.

.9 CSA W178.2 - Certification of Welding Inspectors.

.4 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.181 - Ready-Mixed Organic Zinc-Rich Coating.

.5 Canadian Sheet Steel Building Institute (CSSBI):

.1 CSSBI 10M - Standard for Steel Roof Deck.

.2 CSSBI 12M - Standard for Composite Steel Deck.

.3 CSSBI - Standard for Steel Roof Deck and Standard for Steel Floor Deck.

.4 CSSBI 40.6 - Metric Zinc-Coated (Galvanized) Sheet Steel for Structural Building Products Technical Bulletin No. 6.

.5 CSSBI 101M - Zinc-Coated Structural Quality Steel Sheet for Roof and Floor Deck.

1.3 Submittals

.1 Provide submittals in accordance with Section 01300 and the following:

.1 Manufacturer's descriptive literature for materials.

.2 Shop Drawings:

.1 Clearly indicate metal decking plan, deck profile, sheet lengths and quantities, thicknesses, zinc coating designations, anchorage supports, projections, openings and reinforcement, applicable details, and accessories.

.2 Clearly indicate position of temporary shoring of floor metal decking as required by the Final Design.

.3 Prepare Shop Drawings of metal decking under the seal and signature of the Professional Engineer registered in the Province of Manitoba.

.3 Submit calculations verifying design capacities prior to fabrication.

.4 Submit in writing evidence of qualification for welding under CWB.

.5 Prior to commencing Work, file documentation for the designer, fabricator(s), and installer(s) showing evidence of registration in the Province of Manitoba, qualifications, and experience.

1.4 Quality Assurance

.1 Qualifications:

.1 The organization undertaking to weld under this Section is to be fully approved by the CWB under the requirements of CSA W47.1, Division 1 or 2.1 only.

.2 Welders of metal decking are to be approved for deck welding under procedure W610 by the CWB.

.2 The designers are to include in the Construction Quality Management Plan the inspection and testing procedures required to verify this Work complies with DBA.

2. PRODUCTS

2.1 Performance Criteria

.1 Provide steel deck and fasteners.

.2 Steel decking is to be rigid enough and connected sufficiently to provide lateral support for the top chord or flange of the supporting elements.

.3 Design metal decking to function as a lateral load resisting diaphragm as required for the Final Design. Metal decking thickness and connections listed herein are the minimum.

.4 Design steel deck as a diaphragm with a maximum live load deflection to 1/360 of span and total load to 1/240 of span.

.5 Design steel deck to loading indicated by Final Design.

.6 Design steel deck for a minimum wind uplift loading of 1 kPa or as indicated by the Final Design.

2.2 Materials

.1 Roof deck: where it is suitable to CSSBI 101M, minimum Grade A with a minimum base steel nominal thickness of 0.91 mm, a minimum G90 zinc coating, and maximum flute spacing 150 mm.

.2 Bearing plates/angles: to CSA G40.21, Type W weldable steel, minimum yield strength 300 MPa, galvanized to match structural steel.

.3 Bolts and required nuts and washers: high strength type for structural steel joints, conforming to requirements of ASTM F3125. Nuts for galvanized bolts to be ASTM A563 Grade DH or ASTM A194 Grade 2H.

.4 Closures: as recommended by Manufacturer; neoprene closures at exterior walls.

.5 Cover plates, cell closures, and flashings: steel sheet with minimum steel core thickness of 0.76 mm (22 gauge). Metallic coating same as deck material.

.6 Shear studs: to CSA W59.

.7 Primer: zinc-rich ready-mixed primer to CAN/CGSB-1.181.

2.3 Fabrication

.1 Notify the Professional of Record minimum of forty-eight (48) hours prior to fabricating any steel decking to allow for inspection.

.2 Fabricate metal decking in accordance with CSA S136 and as recommended by the CSSBI.

.3 Verify dimensions and conditions of existing work prior to commencing fabrication.

.4 Metal decking to be continuous over three (3) or more spans.

.5 Provide a male and female lip for each section of the metal decking.

3. EXECUTION

3.1 General

.1 Install in accordance with Manufacturer's recommendations and as required by the Final Design.

.2 Notify the Professional of Record a minimum of forty-eight (48) hours prior to installing metal decking.

.3 Erect metal decking required for the Final Design and as recommended by CSSBI.

.4 Align and level metal decking on structural supports.

.5 Inspection and testing: materials and workmanship to be inspected and tested by an inspection and testing firm certified to CSA W178.1.

.6 Do not support any loads, including loads from ceilings, fixtures, mechanical, and other equipment from metal deck.

.7 Allow minimum bearing equal to the depth of metal deck when supported by structural steel and minimum 100 mm bearing when supported by masonry.

.8 Mechanically fasten or weld male/female side lips at maximum 600 mm on centre.

.9 Fastening metal decking:

.1 Powder actuated fasteners: fasten steel deck to top flange or chord sections of steel framing with using minimum support pattern 36/4. Acceptable fasteners: Hilti powder actuated fasteners X-HSN 24 where top flange or chord thickness is between 3 mm to 10 mm or with X-ENP-19 L15 for top flange or chord thickness more than 10 mm.

.2 Welding: fasten metal decking to steel framework at ends and intermediate supports with minimum 20 mm fusion welds at every second valley. Fasten metal decking to perimeter members parallel to flutes with minimum 20 mm diameter fusion welds at 400 mm maximum centres. Weld through minimum 20 mm diameter steel washers unless an approved CWB procedure for welding without washers is provided. A minimum of 75 percent of the perimeter of the weld is to be flush with or above deck.

.10 Form end laps over supports and not less than 50 mm.

.11 Provide deck support for all top edges of unsupported flutes where deck is trimmed parallel to flutes.

.12 Reinforce openings up to 450 mm for roofs and 300 mm for floors with minimum 76 x 76 x 6 steel angles. Place angles perpendicular to flutes, extended minimum three (3) flutes each side of openings, and fasten each flute to angle.

.13 Professional of Record to review and approve all suspended loads from joist panel points or locations on beams.

END OF SECTION

MISCELLANEOUS METAL

1. GENERAL

1.1 Summary

.1 This Section specifies metal fabrication required for this Work and includes, but is not necessarily limited to:

.1 Steel framing for wall openings and closures.

.2 Handrails and posts.

.3 Covers, grating, platforms, stairs and landings, all supports and anchors.

.4 Base and cap plates.

.5 Miscellaneous angle framing.

.6 Pipe bollards.

.7 Stairs, ladder, and safety cage.

.8 Accessories, including all embedded plates.

1.2 Standards

.1 All codes and standards to be latest edition unless noted otherwise.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A193/A193M - Specification for Alloy-Steel and Stainless-Steel Bolting Materials for High-Temperature Service.

.2 ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.

.3 ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.

.4 ASTM A380/A380M - Standard Practice for Cleaning, Descaling, and Passivation of Stainless-Steel Parts, Equipment, and Systems.

.5 ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

.6 ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.

.7 ASTM F594 - Standard Specification for Stainless Steel Nuts.

.8 ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.40 - Primer, Structural Steel, Oil Alkyd Type.

.2 CAN/CGSB-1.171 - Inorganic Zinc Coating.

.4 Canadian Institute of Steel Construction/ Canadian Paint Manufacturers Association (CISC/CPMA):

.1 CISC/CPMA 1-73a - A Quick-drying One-coat Paint for Use on Structural Steel.

.2 CISC/CPMA 2-75 - A Quick-drying Primer for Use on Structural Steel.

.1 Canadian Standards Association (CSA):

.1 CSA G40.20/G40.21 - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

.2 CSA S16 - Design of Steel Structures.

.3 CSA S136 - North American Specification for the Design of Cold Formed Steel Structural Members.

.4 CSA S157/S157.1 - Strength design in aluminum / Commentary on CSA S157-17, Strength design in aluminum.

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

.6 CSA W48 - Filler Metal and Allied Materials for Metal Arc Welding.

.7 CSA W55.3 - Certification of Companies for Resistance Welding of Steel and Aluminum.

.8 CSA W59 - Welded Steel Construction.

.9 CSA W59.2 - Welded Aluminum Construction.

.10 CSA W178.1 - Certification of Welding Inspection Organizations.

.11 CSA W178.2 - Certification of Welding Inspectors.

.2 The Society for Protective Coatings (SSPC):

.1 SSPC.SP1 - Solvent Cleaning.

.2 SSPC SP2 - Hand Tool Cleaning.

.3 SSPC.SP3 - Power Tool Cleaning.

.4 SSPC SP6 - Commercial Blast Cleaning.

.5 SSPC.SP7 - Brush Off Blast Cleaning.

.3 Manitoba Workplace Safety and Health Act and Regulation, Chapter W210, The Workplace Safety and Health Act (MWSHR):

.1 Workplace Safety and Health Regulation 217.

.4 Safe Work Manitoba, division of Workers Compensation Board (WCB) of Manitoba:

.1 Fall Protection Guide.

.5 National Building Code of Canada (NBCC) with Manitoba Building Code amendment.

1.3 Submittals

.1 Provide submittals in accordance with Section 01300 and the following:

.1 Manufacturer's descriptive literature for materials.

.2 Shop Drawings:

.1 Show all shop and erection details including cuts, copes, connections, holes, threaded fasteners, rivets, and welds.

.2 Prepare Shop Drawings of all connections and components designed and signed by the fabricator’s Professional Engineer registered in the Province of Manitoba.

.3 Submit Shop Drawings for all fall arrest anchors, including area/roof location plans and Manufacturer details.

.4 Indicate welds, both shop and field, using CISC standard welding symbols. Clearly indicate net weld lengths.

.3 Submit proof of certification to CSA reference standards.

.4 Indicate the weight of each hatch or cover.

1.4 Quality Assurance

.1 Qualifications:

.1 Structural steel fabricator to be certified as a Division 2 company under CSA W47.1, or CSA W55.3, or both, as applicable. Aluminium fabricator to be certified under CSA W47.2.

.2 Welding of steel: to CSA W59. Welding of aluminium: to CSA W59.2.

2. PRODUCTS

2.1 Materials

.1 Wide flange: conform to CSA G40.20/G40.21, 350W.

.2 Column base and cap plates, beam and plates, ledger angles and miscellaneous steel: conform to CSA G40.20/G40.21, 300W.

.3 Hollow structural sections: conform to CSA G40.20/G40.21, 350W.

.4 Anchors for ledger angles, steel bars: conform to ASTM A36.

.5 Welding materials: conform to CSA W59 and CSA W59.2.

.6 Aluminium: Alloy 6063-T6, 6351-T6, and 6061-T6.

.7 Galvanizing: conform to ASTM A123/A123M for shapes and ASTM A153/A153M for hardware.

.8 Stainless steel: Type 316 conform to ASTM A276M for bars and shapes and ASTM A240M for plates.

.9 High tensile bolts, nuts, and washers as per ASTM F3125. Nut dimensions as per ASA B182 for heavy semi-finished hexagon nuts. Nuts for galvanized bolts to be A563 Grade DH or A194 Grade 2H.

.10 Anchor bolts: Conform to Section 05501.

.11 For fastenings in stainless steel and aluminium, use stainless steel Type 316 per ASTM A193M or ASTM F593.

.12 All fasteners submerged in water or sewage: stainless steel Type 316 per ASTM A193 or ASTM F593.

.13 Shop studs to be Nelson headed type anchors with fluxed ends.

.14 Rust pitted steel not permitted.

2.2 Configuration, Components, and Features

.1 Corrosion protection:

.1 Coatings: in accordance with Section 09900 and 09905.

.2 Use stainless steel, aluminum, or galvanized steel as required by the Final Design.

.3 All aluminum ladders, handrails, and posts to be given an anodic oxide treatment, to Aluminum Association AA-M12 C22 A41 Specification (clear anodized).

.4 All stainless-steel ladders, stairs, handrails, connection assemblies, cover plates, and framing members to be passivated to ASTM A380/A380M.

.2 Aluminum guardrails and handrails:

.1 Type A – general purpose:

.1 Provide aluminum utility railings to MWSHR and WCB requirements for guards and guardrails, mechanically fastened and coupled with posts as per the Standard Details. Limit maximum weight of removable handrail sections to 25 kg.

.2 Type B – exit stairs:

.1 Provide aluminum railings to National Building Code of Canada (NBCC) requirement mechanically fastened and coupled with posts as per the Standard Details with toe boards as required by MWSHR. Rail spacing to conform to NBCC Clause 3.4.6.5. Rails, posts and anchorages to be fabricated to safely support NBCC loads in accordance with Clause 4.1.5.14.

.3 Materials:

.1 Posts: aluminum tubing alloy 6061-T6.

.2 Top rails: aluminum pipe; 6063-T5 alloy 50 mm nominal diameter.

.3 Centre rails: aluminum pipe; 6063-T5 alloy 50 mm nominal diameter.

.4 Join rails with splicing sleeves and seal, without gaps or rough edges:

.1 Set flanges over junctions of rail components and floor and wall surfaces.

.2 Installation to be secure, level, vertical, with all posts evenly spaced.

.3 Tighten all fasteners to ensure completed railing is rigid and completely free of play.

.4 Paint all aluminum surfaces in contact with concrete or masonry with two (2) coats of alkali-resistant bituminous paint.

.5 Use stainless steel fixings for all connections and anchors.

.5 Circular pipe handrailing, aluminum, of welded construction to CSA S157 as required for the Final Design.

.6 Aluminum to be clear anodized prior to fabrication.

.7 Smooth all shop welds and treat with coating to match anodized material, as recommended by the Manufacturer, for the intended use.

.8 Provide movement joints in rails over all structural expansion joints. Joints to allow for 20 mm movement minimum**.** Maximum spacing between expansion joints to be 6000 mm. Match expansion joints over concrete expansion joints.

.9 Do not field weld. All field assembly to be limited to mechanical fastenings.

.10 Bend or couple rails at corners, returns, or other directional changes. Do not mitre cut and weld.

.3 Aluminum grating:

.1 Use Fisher & Ludlow or approved equivalent aluminum grating with gauge to suit load, depth, and span as required by the Final Design. Bearing bars to be Alloy 6061-T6 and serrated to create a non-slip surface.

.2 All grating to be designed to support loads required for the Final Design or a minimum uniform live load of not less than 4.8 kPa or a point load of 4.45 kN, whichever produces greater stresses, with a maximum deflection not exceeding 1/240 of the span.

.3 All grating to be removable and have a maximum weight of 25 kg.

.4 All edges to be banded.

.5 Openings for valves and stems banded with clearance of not less than 25 mm left round.

.6 Obtain grating dimensions at the site before fabricating.

.4 Aluminum checkerplate:

.1 Covers and frames: checkerplate, raised diamond pattern, framed Alloy 6351-T6. Construct the frames with aluminium structural angles or channels, mitred at the corners, complete with anchor lugs and flat surround. Fit covers with stainless steel Type 316 ELC lifting handles.

.2 Design tread plates for loads and limitation of deflection as specified for aluminum grating.

.3 Minimum thickness 10 mm not including raised diamond lugs.

.5 Aluminum access ladders and stairs:

.1 Aluminum access ladders and rungs welded construction to CSA S157, Alloy 6351-T6.

.2 Finish to be clear anodized.

.3 Stair treads: DB aluminum serrated stair treads.

.6 All other miscellaneous:

.1 All other miscellaneous items as required by the Final Design are to be stainless steel.

.7 Stainless steel checkerplate:

.1 Frames and covers: stainless steel Type 316.

.2 Frames: structural (steel) sections with mitred corners, anchor lugs and flat surround.

.3 Covers: raised, frame diamond pattern checkerplate with frame and with stainless steel Type 316lifting handles.

.8 Safety chains:

.1 Removable 5 mm proof chain 13 mm x 29 mm c/c oval shaped stainless steel Type 316 links, snaphooks and eye.

.9 Lifting eyes:

.1 Provide lifting eyes as required for installation.

.2 Type 316 stainless steel.

.10 Open grating stainless steel stairs:

.1 Fabricate stairs with open risers with stainless steel serrated tread gratings.

.2 Secure treads to stringers with stainless steel bolted connections.

.3 Form stringers with minimum C310 x 31 stainless steel Type 316 channels. Weld fascia plates of minimum 5 mm thick stainless steel across channel toes. Grind all welds smooth and slightly radiused.

.4 Form grating landings same as treads. Reinforce underside of landings with stainless steel angles.

.11 Bollards:

.1 Provide bollards as required by the Final Design.

2.3 Fabrication

.1 Fabrication:

.1 Fabricate in strict accordance with the Final Design.

.2 Do not cut or provide holes except as set out in the Final Design.

.3 Provide shop and field connections as required for the Final Design, as specified herein or, in absence of any indication, to CSA S16 and CSA S157.

.4 Make design connections adequate to carry reactions required for the Final Design. No drilling in beam flanges permitted.

.5 All bolted connections to be “friction type” connections.

.6 Perform steel welding to CSA W59.

.7 Perform aluminium welding to CSA W59.2.

.8 Shop installed shear studs to be installed to CSA W59.

.9 Tolerances of all miscellaneous metal to CSA S16.

.10 Stainless steel passivation: stainless steel to be cleaned, de-scaled, and passivated after fabrication to ASTM A380M. Passivation to remove iron compounds from surface of the stainless steel.

.11 Provide stamp on the top of hatches and covers listing the weight (in kilograms) of the hatch or cover.

.12 Provide stamp on the top of hatches and covers listing the load rating (in kilonewtons) of the hatch or cover.

.13 Provide hold-down clips for gratings as required.

3. EXECUTION

3.1 General

.1 Install in accordance with Manufacturer's recommendations and as required by the Final Design.

.2 Erect true and plumb. Use temporary bracing where necessary to take care of all loads to which the structure may be subject, including erection equipment and operation of same. Leave such bracing in place as long as required for safety.

.3 Use bolts for field connections except where welded field connections called for in the Final Design.

3.2 Field Quality Control

.1 Inspection and Testing:

.1 Materials and workmanship are to be subject to inspection and testing by an inspection and testing firm certified to CSA W178.1. Provide access for inspection to all places where work is being done or stockpiled prior to shipment.

.2 Submit a final report for all welds and connections, including confirmation that required repairs have been completed under the seal and signature of a Professional Engineer registered in the Province of Manitoba.

END OF SECTION

ANCHOR BOLTS

1. GENERAL

1.1 Summary

.1 This Section specifies anchor bolts complete with washers and nuts.

1.2 Standards

.1 All codes and standards to be latest edition unless noted otherwise.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A193/A193M - Alloy-Steel and Stainless-Steel Bolting for High Temperature or High-Pressure Service and Other Special Purpose Applications.

.2 ASTM A194/A194M - Carbon Steel, Alloy Steel, and Stainless-Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.

.3 ASTM A320/A320M Alloy-Steel and Stainless-Steel Bolting for Low-Temperature Service.

.4 ASTM A563 - Carbon and Alloy Steel Nuts.

.5 ASTM F593 - Stainless Steel Bolts, Hex Cap Screws, and Studs.

.6 ASTM F844 - Washers, Steel, Plain (Flat), Unhardened for General Use.

.7 ASTM F1554 - Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

.3 Canadian Standards Association (CSA):

.1 CSA A23.3 - Design of Concrete Structures.

1.3 Submittals

.1 Provide submittals in accordance with Section 01300 and the following:

.1 Manufacturer's descriptive literature for materials.

.2 Anchor bolt placement plans.

.3 Anchor rod, nut, and washer material information, including material certifications.

.4 Design calculations and details showing the required diameter, length, embedment, edge distance, confinement, anchor reinforcement, anchor bolt sleeves and other conditions, to be sealed and signed by a Professional Engineer registered in the Province of Manitoba. Calculations to comply with the provisions of CSA A23.3, Annex D. Calculations to be reviewed and certified by the designers.

.5 Product Data:

.1 Data indicating load capacities.

.2 Chemical resistance.

.3 Temperature limitations.

.4 Installation instructions.

2. PRODUCTS

2.1 Performance Criteria

.1 Anchor bolt holes in equipment support frames are not to exceed the bolt diameters by more than 25 percent, up to a maximum oversizing of 6 mm. Minimum anchor bolt diameter is to be 12.7 mm. Provide anchor bolts for equipment mounting and vibration isolation systems as required for the Final Design.

.2 Trim anchor bolt length such that there are three (3) thread lengths left above the nut.

.3 Tapered washers are to be provided where mating surface is not square with the nut.

.4 Expansion, wedge, or adhesive anchors set in holes drilled in the concrete after the concrete is placed are not permitted in substitution for cast-in anchor bolts.

.5 Upset threads are not permitted.

.6 Design requirements: anchor bolts for equipment frames and foundations are to be designed for forces as indicated by the Final Design.

.7 Anchor bolts, nuts, and washers are to be Type 316 stainless steel.

2.2 Materials

Component	Material
Stainless steel anchor bolts	ASTM A193, Grade B8M Class 1, AISI 316 or ASTM A320, Grade B8M Class 1, AISI 316
Stainless steel threaded rods at adhesive anchors	ASTM F593, CW1 (1/4 inch to 5/8 inch rod) ASTM F593, CW2 (3/4 inch to 1 ½ inch rod)
Stainless steel nuts and washers	ASTM A194, Grade 8M, SS316 nuts with Type 316 stainless steel washers (ASTM F594 Group 2, Type 316 stainless steel nuts at adhesive anchors)
Carbon steel anchor bolts	ASTM F1554 (Grade 36), hot dip galvanized
High-strength carbon steel anchor bolts	ASTM F1554 (Grade 55 weldable per Supplementary Requirement S1), hot dip galvanized
Carbon steel nuts and washers	ASTM A563 and ASTM F844
Concrete expansion anchors	Stainless steel HILTI “KWIK BOLT TZ”, or approved equivalent
Concrete adhesive anchoring system	HILTI HIT-HY 200 / HIT-RE 500 V3 or approved equivalent

Component	Material
Masonry expansion anchors (Concrete-filled cores)	Stainless steel HILTI "KWIK BOLT 3", or approved equivalent
Masonry adhesive anchoring system (Concrete-filled cores)	HILTI "HIT-HY 200", or approved equivalent
Masonry adhesive anchoring system	HILTI “HIT-HY 270”, or approved equivalent

2.3 Manufacturers and Products

.1 Concrete expansion anchors acceptable products:

.1 Stainless steel HILTI KWIK BOLT TZ.

.2 Or approved equivalent.

.2 Concrete adhesive anchoring system acceptable products:

.1 HILTI HIT-HY 200 / HIT-RE 500 V3.

.2 Or approved equivalent.

.3 Masonry expansion anchors HILTI "HIT-HY 200" acceptable products:

.1 Stainless steel HILTI KWIK BOLT 3.

.2 Or approved equivalent.

.4 Masonry adhesive anchoring system acceptable products:

.1 HILTI HIT-HY 200. (Concrete-filled cores).

.2 HILTI HIT-HY 270.

.3 Or approved equivalent.

2.4 Stainless Steel Fastener Lubricant (Anti-Seizing)

.1 Anti-seizing lubricant for stainless steel threaded connections:

.1 Resists washout.

.2 Acceptable Manufacturers:

.1 Bostik, Middleton, MA; Never-Seez.

.2 Saf-T-Eze, Lombard, IL; Anti-Seize.

.3 Or approved equivalent.

2.5 Anchor Bolt Sleeves

.1 Provide anchor bolt sleeves for location adjustments.

.2 Anchor bolt sleeve: high density polyethylene plastic.

.1 Single unit construction with deformed sidewalls such that concrete and grout lock in place.

.2 Top of sleeve to be self-threading to provide adjustment of threaded anchor bolt projection.

.3 Material requirements to conform to the following:

.1 Plastic: high-density polyethylene.

.2 Density: ASTM D1505.

.3 Vicat softening point: ASTM D1525.

.4 Brittleness temperature: ASTM D746.

.4 Acceptable Manufacturers:

.1 Wilson Anchor Bolt Sleeve Company.

.2 Or approved equivalent.

3. EXECUTION

3.1 General

.1 Install in accordance with Manufacturer's recommendations and as required by the Final Design.

.2 Undertake commissioning phases as specified in the Schedule 18 Technical Requirements.

.3 Anchor bolts to be cast-in-place.

.4 Grouting of anchor bolts with non-shrink or epoxy grouts to be in accordance with Section 03600.

3.2 Cast-in-Place Anchor Bolts

.1 Anchor bolts to be embedded in concrete to be placed accurately and held in correct position while the concrete is placed. The surfaces of metalwork in contact with concrete are to be thoroughly cleaned.

.2 After anchor bolts have been embedded, their threads to be protected by grease and the nuts run on.

.3 Provide heavy hex headed type.

.4 Provide 19 mm minimum diameter with sufficient length for 250 mm embedment. Design all anchor bolts with adequate diameter sizes and sufficient embedment lengths.

.5 Grout pads not to be included in embedment length.

3.3 Adhesive Anchor Bolts

.1 Adhesive anchors are not to be substituted for cast-in-place anchor bolts. Use of adhesive anchors is subject to each of the following conditions:

.1 Use to be limited to locations where exposure, on an intermittent or continuous basis, to acid concentrations higher than 10 percent, to chlorine gas, or to machine or diesel oils, is extremely unlikely.

.2 Use to be limited to applications where exposure to fire or exposure to concrete or rod temperature above 50°C is extremely unlikely. Overhead applications (such as pipe supports) are not allowed due to temperature and sustained load creep issues.

.2 Anchor diameter and grade of steel as required for the Final Design and per equipment supplier specifications. Anchor to be threaded or deformed full length of embedment and is to be free of rust, scale, grease, and oils.

.3 Embedment depth is to be as required for the Final Design.

.4 All installation recommendations by the anchor system Manufacturer are to be followed carefully, including maximum hole diameter.

.5 Holes are to have rough surfaces created by using a hammer drill and carbide bit. Core drilled holes are not allowed.

.6 Holes are to be blown clean with oil-free compressed air and be free of dust or standing water prior to installation. Follow additional requirements of the adhesive Manufacturer.

.7 Anchor to be left undisturbed and unloaded for full adhesive curing period.

.8 Concrete temperature (not air temperature) to be compatible with curing requirements of adhesives per adhesive Manufacturer. Anchors not to be placed in concrete below minus 4°C.

3.4 Expansion Anchors

.1 Note that expansion anchors not to be substituted for cast-in-place anchor bolts. Use of expansion or wedge type anchors is subject to Subclause 3.3.1 through 3.3.7 specified in Clause 3.3 above. Expansion anchors not to be used in a submerged condition and for mounting equipment subject to vibration or cyclic motion.

3.5 Reinforcing Steel Conflicts with Post-Installed Anchor Installation

.1 When reinforcing steel is encountered in the drill path, slant drill to clear obstruction and provide beveled washer to match angle of anchor. Drill not to be slanted more than 10 degrees.

.2 Abandoned post-installed anchor holes to be filled completely with non-shrink grout and struck off flush with adjacent surface.

END OF SECTION

BOLLARDS

1. GENERAL

1.1 Summary

.1 This Section covers the supply and installation of steel bollards. Bollards to be installed in the following locations and as indicated by the Final Design:

.1 As required to protect equipment adjacent to roadways or parking areas.

.2 On either side of egresses and exits opening towards roadways.

.3 On either side of overhead doors for loading and unloading chemical or equipment of for building access.

.4 To protect building corners adjacent to roadways.

1.2 Standards

.1 All codes and standards to be latest edition unless noted otherwise.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

.2 ASTM A123/A123M - Zinc (Hop-Dip Galvanized) Coatings on Iron and Steel Products.

.3 CW 3310 - City of Winnipeg, Portland Cement Concrete Pavement Works.

.4 The Society for Protective Coatings (SSPC):

.1 SSPC SP 10 - Near-White Blast Cleaning.

.5 The City of Winnipeg Water and Waste Department (WWD):

.1 WWD Painting Colour Standard.

1.3 Submittals

.1 Provide submittals in accordance with Section 01300 and the following:

.1 Manufacturer's descriptive literature for materials.

2. PRODUCTS

2.1 Materials

.1 Bollards: conforming to ASTM A53, DN 150 XS (Schedule 80).

.1 All materials supplied under this Specification shall be subject to inspection and testing by the designer.

.2 The steel bollard shall be 168 mm O.D. (Weight Class XS, 10.97 mm wall thickness) galvanized pipe.

.3 Concrete for setting and filling the steel bollards shall be 30 MPa supplied in accordance with CW 3310.

2.2 Finishes

.1 Galvanizing for bollards: conforming to ASTM A123/A123M.

.2 Touch-up galvanizing with minimum two (2) coats of zinc rich primer. Colour of primer is to match the colour of galvanizing substrate.

.3 Bollard sleeves made of high-density polyethylene and reflective tape.

.4 Stainless steel to be Mill Finish.

3. EXECUTION

3.1 General

.1 Install in accordance with Manufacturer's recommendations and as required by the Final Design.

.2 Undertake commissioning phases as specified in the Schedule 18 Technical Requirements.

3.2 Shop Painting

.1 Clean all members receiving galvanizing material to SSPC SP 10.

.2 Stainless steel members requiring passivation to maintain natural finish prior to passivation.

.3 Paint bollard. Color coating to be:

.1 Type: Polyester powder coat over epoxy primer.

.2 Color to be in accordance with City Standards.

.4 Install two (2) self-adhesive reflective orange bands (each band 50 mm width). Top edge of upper band to be 75 mm below top edge of steel bollard. Lower band to be approximately 300 mm below upper band.

END OF SECTION

ZINC COATINGS

1. GENERAL

1.1 Summary

.1 This Section specifies both hot dip zinc coating and mechanical zinc coating.

.2 Electroplated corrosion protection is not an acceptable substitute for zinc coating.

1.2 Standards

.1 All codes and standards to be latest edition unless noted otherwise.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM A123/A123M - Standard Specification for Zinc (Hop-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A143/A143M - Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.3 ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.4 ASTM A384/A384M - Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.

.5 ASTM A385/A385M - Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).

.6 ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

.7 ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.

.3 MILSPEC DOD-P-21035 - Paint, High Zinc Dust Content, Galvanizing Repair.

1.3 Submittals

.1 Provide submittals in accordance with Section 01300 and the following:

.1 Manufacturer's descriptive literature for materials.

.2 Zinc dust zinc oxide coating Manufacturer's product data showing conformance to the specified product.

.3 Manufacturer's recommendation for application of zinc dust zinc oxide coating.

.4 Coating applicator's written certification that the hot dip galvanized coating meets or exceeds the specified requirements of ASTM A123M and ASTM A153M, as applicable.

1.4 Quality Assurance

.1 Coating applicator to follow the procedures of the American Galvanizers Association Quality Assurance Manual.

2. PRODUCTS

2.1 Materials

Component	Material
Hot Dip Zinc Coating	ASTM A123, ASTM A153
Mechanical Zinc Coating	ASTM B695
Zinc Dust-Zinc Oxide Coating	MILSPEC DOD-P-21035

2.2 Fabrication

.1 Notify the Professional of Record a minimum of forty-eight (48) hours prior to fabrication of any modifications to the Final Design.

.2 Fabricate galvanized products to applicable portions of ASTM A143M, ASTM A384M and ASTM A385M.

.3 Fabricator to consult with the hot-dip galvanizer to confirm components can meet the requirements in this Section.

.4 Provide holes and/or lifting lugs, if necessary, to facilitate handling during galvanizing.

3. EXECUTION

3.1 General

.1 Install in accordance with Manufacturer’s recommendations and as required by the Final Design.

.2 Undertake commissioning phases as specified in the Schedule 18 Technical Requirements.

.3 Where zinc coating has been damaged after installation, clean the substrate surface first, then repair with zinc dust zinc oxide coating to ASTM A780M. Follow application recommended by the zinc dust zinc oxide coating Manufacturer. Apply multiple coats to minimum dry film thickness of 200 µm.

.4 Remove from site and repair by hot dip zinc coating method all items that are not physically damaged but have insufficient or deteriorating zinc coatings from damages in shipment prior to installation.

END OF SECTION