

STRUCTURAL STEEL

1. GENERAL

1.1 Work Included

- .1 Supply and install steel items including, but not limited to, beams, columns, girders, roof framing, bracing, girts, parapet framing, roof hold down assemblies, roof perimeter angles, masonry weld plates and support angles, and loose lintels as indicated on the Drawings.
- .2 Galvanizing of all items exposed to exterior environment.
- .3 Prime painting.
- .4 Bearing plates and anchor bolts (finished to match item).
- .5 Welds, bolts, washers, nuts, and shims (finished to match item).
- .6 Field touch-up of primed and galvanized surfaces including field welding.

1.2 Design Standards, Code Requirements

- .1 Conform to requirements of CSA S16.1, CSA-S136, CISC Code of Standard Practice for Buildings, and Provincial Construction Safety Act.
- .2 Use the loads shown on Drawings and in accordance with the NBC of Canada 1995 with Manitoba Amendments.
- .3 Connections not shown on the Drawings are to be designed by a Professional Engineer registered in the Province of Manitoba. Design connections for loads shown or indicated on the Drawings.
- .4 Perform all welding in accordance with requirements of CSA W59.

1.3 Qualifications

- .1 All work is to be performed by a firm certified by the Canadian Welding Bureau to the requirements of CSA W47.1 in Division 2.
- .2 All welders employed for erection are to possess valid "S" Classification Class "O" certificates issued by the Canadian Welding Bureau.

1.4 Inspection and Testing

- .1 Shop and field inspection and testing is to be performed by an Inspection and Testing Firm appointed and paid by the City.
- .2 Pay all additional costs for inspection and re-inspection due to defective workmanship or materials.

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- .3 If requested by the Contract Administrator, submit four (4) copies of mill test reports, properly correlated to materials actually used.
- .4 Radiographic and magnetic particle inspection of welds is to be performed by the Inspection and Testing Firm, in accordance with CSA W59 and ASTM E109, when required by the Contract Administrator.
- .5 Welds are to be considered defective if they fail to meet quality requirements of CSA W59.
- .6 Additionally, all welds are to be visually inspected.
- .7 High Tensile bolted connections are to be inspected and tested in accordance with CSA S16.1.

1.5 Shop Drawings, Submittals

- .1 Submit Shop Drawings for review in accordance with the Section 01300 – Submittals.
- .2 Provide a fabrication and erection schedule to the Contract Administrator prior to commencement of shop fabrication and field erection, in ample time to allow proper scheduling of inspection and testing.
- .3 Submit details of typical connections and special connections for review prior to preparation of Shop Drawings.
- .4 Shop Drawings and design briefs are to bear the seal and signature of a Professional Engineer registered in the Province of Manitoba.
- .5 Clearly indicate profiles, sizes, spacing, and locations of structural members, connections, attachments, reinforcing, anchorage, size and type of fasteners, cambers and loads, accessories, and setting details.
- .6 Include erection drawings, elevations, and details.
- .7 Indicate welded connections using welding symbols in compliance with CISC Welding Standards. Clearly indicate net weld lengths.
- .8 Shop Drawing review by the Contract Administrator is solely to ascertain conformance to the general design concept.
- .9 Responsibility for approval of detail design inherent in Shop Drawings rests with the Contractor and review by the Contract Administrator shall not imply such approval.
- .10 Review shall not relieve the Contractor of his responsibility for errors or omissions in Shop Drawings or for proper completion of the Work in accordance with the Contract Documents.
- .11 Responsibility for verification and correlation of field dimensions, fabrication processes, techniques of construction, installation, and coordination of all parts of the Work rests with the Contractor.

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2. PRODUCTS

2.1 Materials

- .1 All materials shall be new.
- .2 Beam End Plates, Ledger Angles and Miscellaneous Steel: to CAN/CSA-G40.21, Grade 300W with minimum yield strength of 300 MPa.
- .3 Base and Cap Plates: to CAN/CSA-G40.21, Type 300W with minimum yield strength of 300 MPa.
- .4 Structural steel wide flange sections (W shapes): conforming to CAN/CSA-G40.21, Grade 350W with minimum yield strength of 350 MPa, or conforming to ASTM A992 or A572, Grade 50 with minimum yield strength of 345 MPa.
- .5 Structural Channels (C shapes): conforming to CAN/CSA-G40.21, Grade 300W with minimum yield strength of 300 MPa.
- .6 Hollow Structural Sections: conforming to CAN/CSA-G40.21, Grade 350W Class 'C' with minimum yield strength of 350 MPa. Hollow structural sections conforming to ASTM A500 Grade C shall not be used unless acceptable to the Contract Administrator.
- .7 Bolts, nuts, and washers: conforming to ASTM A325; galvanized or painted to match fastened items.
- .8 Welding Materials: conforming to CSA W59.
- .9 Interior structural steel primer: CISC/CPMA 2-75.
- .10 Stud Shear Connectors: conforming to ASTM A108; Nelson Studs as manufactured by TRW Inc.
- .11 Concrete Anchors: as manufactured by Hilti (Canada) Ltd. where indicated.
- .12 Galvanizing: conforming to CAN/CSA-G164; minimum 610 g/m².
- .13 Touch-up galvanizing with a minimum of two coats of zinc rich primer.

2.2 Fabrication

- .1 Fabricate structural steel members in accordance with CSAS16.1 and CSA S136.
- .2 Verify all drawing dimensions prior to commencing fabrication.
- .3 Provide connections for design loads indicated on the Drawings and to NBC.

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- .4 Provide for field connections to be bolted except where field welded connections are shown on the Drawings. Bolted connections shall be bearing-type connections with the thread excluded from the planes of shear.
- .5 All shop connections are to be welded.
- .6 All exposed welds shall be of smooth neat appearance; grind or file if required.
- .7 Design and detail connections for structural steel so that corrosion potential is minimized.

2.3 Shop Priming

- .1 Structural steel shall be primed at the fabrication shop.
- .2 Clean all members to remove loose mill scale, rust, oil, dirt, and other foreign matter. Prepare surfaces to be primed according to SSPC SP7.
- .3 Apply primer in the shop to all steel surfaces, except:
 - .1 Surfaces to be encased in concrete.
 - .2 Surfaces to receive field installed stud shear connectors.
 - .3 Faying surfaces of friction-type connections.
 - .4 Surfaces and edges to be field welded.
- .4 Apply primer under cover, on dry surfaces only, and when surface and air temperatures are above 5°C.
- .5 Maintain dry condition and 5°C minimum temperature until primer is thoroughly dry.
- .6 Patch prime sharp edges and corners one coat before full coat is applied.
- .7 Apply primer by brush or spray to specified dry film thickness.

3. EXECUTION

3.1 Damaged Members

- .1 Repair or replace members damaged during transit or erection, before securing in position.

3.2 Erection

- .1 Erect structural steel in accordance with CAN/CSA S16.1 and Drawings.
- .2 Field connections are to be bolted wherever possible.

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- .3 Do not field weld wet surfaces or during rain unless under cover.
- .4 Do not weld at temperature below 5°C except with express permission of the Contract Administrator.
- .5 Conform to requirements of CSA W59 for minimum preheat and interpass temperatures.
- .6 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.
- .7 Set column bases and other vertical members to design elevations on levelling nuts or steel wedges. Do not use wood wedges.
- .8 Use only light drifting to draw parts together. Enlarge holes for bolted connections with reamers or twist drill only. Do not burn to form holes, enlarge holes or match unfair holes.
- .9 Erection error is not to exceed requirements of CAN/CSA S16.1.
- .10 Obtain Contract Administrator's written permission prior to field cutting or altering structural members.
- .11 After erection field prime welds, nuts, bolts, washers and touch up abrasions and damage to shop primed surfaces.
- .12 Touch up all damaged shop prime paint and prime paint welds, nuts, bolts, and washers.

END OF SECTION

STEEL JOISTS

1. GENERAL

1.1 Work Included

- .1 Joist design
- .2 Standard type steel joists and bridging
- .3 Bearing plates and angles with anchors
- .4 Joist stools and anchor bolts for joists
- .5 Plate clips for additional roof framing
- .6 Welding to steel supports
- .7 Shop prime paint steel joists and appurtenances
- .8 Field touch up of primed surfaces

1.2 Design Standards, Code Requirements

- .1 Conform to requirements of CAN/CSA-S16.1, CSA S136, CISC "Code of Standard Practice for Buildings" and CISC "Steel Joist Facts".
- .2 Conform to the Provincial Construction Safety Act.
- .3 Use loads, load combinations and stress levels shown on Drawings and in accordance with of the NBC 1995 with Manitoba Amendments.
- .4 Design joists to withstand their own weight and design loads indicated on drawings.
- .5 Live load deflection criteria to L/360 for all intermediate joists and L/400 for joists adjacent and parallel to continuous support walls and for joist supporting crane loadings .
- .6 Joists and connections are to be signed and sealed by a Professional Engineer registered in the Province of Manitoba.
- .7 Perform all welding in accordance with requirements of CSA W59.

1.3 Qualifications

- .1 All Work is to be performed by a firm certified by the Canadian Welding Bureau to the requirements of CSA W47.1 Division 2.

STEEL JOISTS

1.4 Inspection and Testing

- .1 Shop and field inspection and testing is to be performed by an inspection and testing firm appointed and paid by the City.
- .2 Provide free access to all portions of Work in the shop and in the field and cooperate with appointed firm.
- .3 Pay all additional costs for inspection and re-inspection due to defective workmanship or materials.
- .4 If requested by the Contract Administrator, submit four copies of mill test reports, properly correlated to materials actually used.

1.5 Shop Drawings and Submittals

- .1 Provide a fabrication and erection schedule to the Contract Administrator prior to commencement of shop fabrication and field erection, in ample time to allow proper scheduling of inspection and testing.
- .2 Shop Drawings and design briefs are to be signed and sealed by a Professional Engineer registered in the Province of Manitoba.
- .3 Submit Shop Drawings and design briefs in accordance with Section 01300 – Submittals.
- .4 Clearly indicate profiles of rolled sections, sizes, spacing and location of joists, connections, bridging, reinforcing, anchorage, cambers, loads, and accessories.
- .5 Include erection drawings, elevations, and details.
- .6 Indicate welded connections using welding symbols in compliance with CISC Welding Standards. Clearly indicate net weld lengths.
- .7 Shop Drawing review by the Contract Administrator is solely to ascertain conformance to the general design concept.
- .8 Responsibility for approval of detail design inherent in Shop Drawings rests with the Contractor and review by the Contract Administrator shall not imply such approval.
- .9 Review shall not relieve the Contractor of his responsibility for errors or omissions in Shop Drawings or for proper completion of the work in accordance with the Contract Documents.
- .10 Responsibility for verification and correlation of field dimensions, fabrication processes, techniques of construction, installation, and coordination of all parts of the Work rests with the Contractor.

STEEL JOISTS

2. PRODUCTS

2.1 Materials

- .1 All materials are to be new.
- .2 Steel: structural type conforming to CAN/CSA-G40.21, Type W 380 MPa for chord sections and 260 MPa minimum for web material, shop primed.
- .3 Anchor Bolts: fabricated from material conforming to CAN/CSA G40.21, type W, yield strength 300 MPa; nuts and washers to be of equal or greater strength than bolts.
- .4 Welding Materials: conforming to CSA W59
- .5 Primer: CISC/CPMA 2-75 for joists to be finish painted

2.2 Fabrication

- .1 Fabricate steel joists in accordance with CAN/CSA S16.1.
- .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 No splices are allowed in chord members.
- .5 Fabricate bottom joist chord extensions where indicated.
- .6 Fabricate joist webs to permit passage of mechanical ducts as detailed. Reinforce joists in accordance with design conditions.
- .7 Fabricate and weld plate clips to steel joist as indicated on the Drawings for additional channel roof framing. Coordinate with metal fabrication Subcontractor for requirements.
- .8 Camber joists for dead load deflection.

2.3 Shop Painting

- .1 Clean all members, remove loose mill scale, rust, oil, dirt, and other foreign matter. Prepare surface according to SSPC SP 7.
- .2 Apply one coat of prime paint in the shop to all steel surfaces, except:
 - .1 Surfaces to be encased in concrete
 - .2 Surfaces to receive field installed stud shear connectors
 - .3 Surfaces and edges to be field welded

STEEL JOISTS

- .3 Apply paint under cover on dry surfaces only and when surface and air temperatures are above 5°C.
- .4 Maintain dry condition and 5°C minimum temperature until paint is thoroughly dry.
- .5 Patch paint bolts, nuts, sharp edges, and corners one coat before full prime coat is applied.
- .6 Apply paint by brush or spray to a dry film thickness of 0.05 mm minimum.

3. EXECUTION

3.1 Damaged Members

- .1 Repair or replace members damaged during transit or erection, before securing in position.

3.2 Erection

- .1 Erect steel joists in accordance with CAN/CSA-S16.1 and the Drawings.
- .2 Provide minimum 100 mm bearing for joists supported on concrete and masonry. Provide minimum 65 mm bearing for joists supported on steel supports maintain the bearing within the middle third of the steel supports flange.
- .3 Extend bearing chords on supports to reduce eccentricity.
- .4 During erection provide all temporary bracing required for induced loads and stresses.
- .5 Coordinate placement of anchor bolts and bearing plates in masonry construction.
- .6 Field weld joists to bearing plates and steel supports after alignment and positioning.
- .7 Supply and install bridging and bracing.
- .8 Do not weld at temperature below 5°C except with written permission of the Contract Administrator.
- .9 Do not field weld wet surfaces or during rain unless under cover.
- .10 Conform to CSA W59 for minimum preheat and interpass temperatures.
- .11 Do not permit erection of decking until joists are sufficiently braced and bridging is installed.
- .12 Obtain Contract Administrator's written permission prior to field cutting or altering joists or bridging.
- .13 After erection, field prime anchorages, bearing plates, field welds and other appurtenances and abrasions and damage to shop primer.

END OF SECTION

METAL DECK

1. GENERAL

1.1 Work Included

- .1 Metal roof deck complete with cover plates, closures, flashing, fastenings, and installation.
- .2 Angle framing around openings up to 450 mm maximum in any dimension.
- .3 Cut openings through deck.

1.2 Shop Drawings

- .1 Submit Shop Drawings in accordance with Section 01300 – Submittals.
- .2 Clearly indicate decking plan, deck profile dimensions and thicknesses, anchorage, supports, projections, openings and reinforcement, closures, flashings, applicable accessories, and details.
- .3 Shop Drawings and design briefs are to be signed and sealed by a Professional Engineer registered in the Province of Manitoba.

1.3 Design

- .1 Design deck to safely support live and dead loads shown on Drawings and in accordance with CSA S136. If applicable, ensure ponding effects are included.
- .2 Maximum working stress under full live and dead loads shall not exceed 140 MPa.
- .3 Live load deflection shall not exceed 1/240 of span.

2. PRODUCTS

2.1 Materials

- .1 Metal: galvanized sheet steel conforming to ASTM A653M SS Grade 230 with zinc coating of Z275 galvanized.

2.2 Deck and Related Accessories

- .1 Roof deck: minimum 0.76 mm thickness or as indicated on the Drawings, base sheet steel, galvaneal, three (3) equal spans, 38 mm deep profile.
- .2 Roof deck to be style RD938 as manufactured by Vicwest or style P-3615 as manufactured by Canam Group.

METAL DECK

- .3 Floor deck to act in composite with concrete slab and be styles HB 938 and HB308 as manufactured by Vicwest or styles P-3615 and P2432 Composite as manufactured by Canam Group, style and thickness as indicated on the Drawings.
- .4 Closure strips, flashing, and cover plates: minimum 0.76 mm thickness base sheet steel, galvanneal coating, of required profiles and sizes.

2.3 Fabrication

- .1 Fabricate metal deck in accordance with requirements of CSA S136, and CSSBI Standards and Drawings.
- .2 Fabricate deck with interlocking side laps.
- .3 Fabricate to generally span over three (3) or more supports unless shown otherwise on the Drawings.

3. EXECUTION

3.1 Damaged Members

- .1 Repair or replace sections damaged during transit or erection before securing in position.

3.2 Installation

- .1 Erect metal deck in accordance with requirements of CSSBI and the Drawings. Align and level deck on structural supports.
- .2 Locate all end joints over supports.
- .3 Lap all end joints on non-cellular deck 75 mm minimum.
- .4 Maintain minimum end bearing on steel supports of 50 mm for deck up to 45 mm deep.
- .5 Maintain minimum end bearing on masonry supports of 100 mm for deck up to 45 mm deep.
- .6 Lay out lines of supporting steel on top surface of deck to produce accurate welds and prevent burns through deck from improper weld location.
- .7 Welding shall be done by qualified welders who shall make practice welds. Prior to actual job welding, practice welds shall be made on the deck to be used to check adequacy of the welding rod amperage and burn-off rate to produce satisfactory fusion for the various welds required. Both the practice welds and actual job welds shall be inspected by the steel deck erector as to size and spacing and tested by pry tests to assure metal to metal fusion.
- .8 Fasten to all supports with 20 mm diameter fusion welds at 300 mm on center maximum, unless noted otherwise on the Drawings.

METAL DECK

- .9 Mechanically fasten sidelaps at 600 mm on center by button punch, unless noted otherwise on the Drawings.
- .10 Install angle or channel closures full length on all deck openings.
- .11 Install acoustical closures over all walls.
- .12 Cut all holes required in deck for roof hold downs and mechanical and electrical requirements.
- .13 Install closure strips at slab edges of thickness of slab as required to contain cast concrete. Ensure closures are of sufficient strength to maintain in place without distortion.
- .14 Reinforce openings up to 450 mm in any dimension with 55 x 55 x 6 mm steel angles unless noted otherwise on the Drawings. Place reinforcing angles at right angles to ribs, extend out two ribs each side and weld.
- .15 Install deck to provide flat upper surface, with all flange surfaces touching a 1200 mm straight edge over structural supports.
- .16 If two or more adjacent flanges on any deck section are concave or convex so that only edges or crowns touch straight edge, repair or replace deck sections.
- .17 Immediately after installation, touch up welds, burned areas, and damaged areas of zinc coating with minimum two (2) coats of zinc rich primer.

END OF SECTION

METAL FABRICATIONS

1. GENERAL

1.1 Design Requirements

- .1 Design details and connections, where not shown on Drawings, in accordance with CAN/CSA-S16, CSA S136, and CSA S136.1.
- .2 All metal fabrications to be hot dipped galvanized unless noted otherwise on the Drawings or elements fabricated from stainless steel.

1.2 Quality Assurance

- .1 Retain a Professional Engineer registered in the Province of Manitoba, with experience in work of comparable complexity and scope, to perform the following services as part of the Work of this Section:
 - .1 Design metal fabrication items as required to resist live, dead, lateral, wind, and seismic loads.
 - .2 Structural design.
 - .3 Review, stamp, and sign Shop Drawings.
 - .4 Conduct shop and Site inspections.
 - .5 Prepare and submit inspection reports.
- .2 Do steel welding to CSA W59 by fabricators certified by the Canadian Welding Bureau to CSA W47.1.

1.3 Submittals

- .1 Shop Drawings and design briefs are to be signed and sealed by a Professional Engineer registered in the Province of Manitoba.
- .2 Shop Drawings shall show work of this Section including large scale detail of members and materials, of connection and jointing details, and of anchorage devices, dimensions, thicknesses, description of materials, metal finishing, as well as other pertinent data and information.

2. PRODUCTS

2.1 Materials

- .1 Structural Steel: CAN/CSA-G40.21; Type W with minimum yield strength of 300 MPa.
- .2 Hollow Structural Steel Sections: CAN/CSA-G40.20/G40.21-M, Grade 350W, Class C.

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- .3 Galvanized Sheet Steel: ASTM A653/A653M Grade A, Z275 Commercial Quality zinc coating, size and shape as shown.
- .4 Steel grating: to style 30-102M as manufactured by Fisher & Ludlow. Supply and install serrated grating for exterior applications. Stair treads to be welded to stair stringers.
- .5 Steel grating stair treads: to style Type A-Checker Plate Nosing, width 278 mm wide as manufactured by Fisher & Ludlow with style 30-102M grating. Supply and install serrated grating for exterior applications. Stair treads to be welded to stair stringers.
- .6 Fasteners: Bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts hot dipped galvanized to CSA G164. For joining stainless steel components use stainless steel fasteners.
- .7 Primer Paint: CISC/CPMA 2-75.
- .8 Galvanizing: conforming to CAN/CSA-G164; minimum 610 g/m².
- .9 Galvanized Primer Paint: Organic zinc rich primer. For galvanized fabrications where touchup is to remain unpainted in finished work: Inorganic zinc rich primer, Galvafruid by W.R. Meadows of Canada Ltd.
- .10 Grout: Non-shrink, non-metallic, flowable, 1-day 15 MPa (2100 psi) compressive strength, pull-out strength 7.9 MPa (1150 psi).
- .11 Drilled Anchors: HY-150 Adhesive anchors with stainless steel rods by Hilti Inc., sizes to suit.

2.2 Fabrication

- .1 Verify dimensions of installed Work before commencing fabrications and report any discrepancies to Contract Administrator.
- .2 Fit and assemble Work in shop where possible. Execute work in accordance with details and reviewed Shop Drawings. Where shop fabrication is not possible, make trial assembly in shop.
- .3 Seal exterior steel fabrications against corrosion in accordance with CAN/CSA S16.1.
- .4 Unless indicated otherwise, provide welded connection for work of this Section.
- .5 Carefully make and fit details. Take special care with exposed finished Work to produce a neat and correct appearance to Contract Administrator's acceptance.
- .6 Assemble members without twists or open joints.
- .7 Correctly size holes for connecting Work of other Sections where such can be determined prior to fabrication. Where possible, show holes on shop drawings. Place holes not to cause appreciable reduction in strength of member.

METAL FABRICATIONS

2.3 Welding

- .1 Perform welding by electric arc process.
- .2 Execute welding to avoid damage or distortion to Work. Execute welding in accordance with following standards:
 - .1 CSA W48: For welding materials. If rods are used, only coated rods are allowed.
 - .2 CSA W59: For design of connections and workmanship.
 - .3 CAN/CSA W117.2: For safety.
- .3 Thoroughly clean welded joints and expose metals for a sufficient distance to perform welding operations.
- .4 Test welds for conformance and remove work not meeting specified standards and replace to Contract Administrator's acceptance.
- .5 Continuous weld all joints for the full length of each joint. Finish exposed welds smooth and flush, file, or grind as required.

2.4 Anchors and Fastening

- .1 Use weld studs of size not larger than 10 mm for attaching miscellaneous materials and equipment to building steel. If weight of item requires larger fasteners use clips or brackets and secure by welding or through bolting.
- .2 Use self-drilling expansion type concrete anchors for attaching to masonry and concrete.

2.5 Inserts and Hangers

- .1 Install inserts, hangers, and supports. Make inserts drilled type.
- .2 Before openings are cut through structure, obtain Contract Administrator's written acceptance for procedures, locations and reinforcements required.

2.6 Shop Priming

- .1 Clean steel to SSPC SP7 and remove loose mill scale, weld flux, and splatter in preparation for shop priming.
- .2 Shop prime steel with one coat of primer paint to dry film thickness of 0.07 mm. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7°C. Paint items under cover and leave under cover until primer is dry. Follow paint Manufacturer's recommendations regarding application methods, equipment, temperature, and humidity conditions.
- .3 Clean but do not prime surfaces to be field welded.

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- .4 Do not prime surfaces embedded in concrete, clean as if they were to be primed.
- .5 Do not prime machine finished surfaces, but apply an effective anti-rust compound.
- .6 Take precautions to avoid damage to adjacent surfaces.

2.7 Hot Dip Galvanizing

- .1 Hot dip galvanize, after fabrication, steel metal fabrication items. Straighten shapes and assemblies true to line and plane after galvanizing. Repair damaged galvanized surfaces with brush or spray-applied anti-corrosion coating containing 92 to 95% zinc, in accordance with Manufacturer's printed directions.
 - .1 Members exposed to elements when in final location.
 - .2 Members embedded on exterior side of exterior walls.
 - .3 Members imbedded in concrete.
 - .4 Members specified in this Section or indicated on Drawings.
- .2 Hot-dip galvanize members in accordance with CAN/CSA G164 and requirements of the following ASTM standards, with minimum coating weights or thicknesses as follows:
 - .1 Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strips: ASTM A123/A123M; average weight of zinc coating of actual surface
 - .1 4.8 mm ($3/16$ ") and less member thickness: 600 g/m²
 - .2 6 mm ($1/4$ ") and heavier members: 640 g/m²
 - .2 Iron and Steel Hardware: ASTM A153/A153M; minimum weight of zinc coating, in gram per square meter of surface, in accordance with Table 1 for the various classes of materials used in the Work.

3. EXECUTION

3.1 Erection

- .1 Fit joints and intersecting members accurately. Make Work in true planes with adequate fastenings. Build and erect Work plumb, true, square, straight, level and accurate to sizes detailed, free from distortion or defects detrimental to appearance or performance.
- .2 Perform drilling of concrete as required to fasten Work of this Section.
- .3 Unless otherwise indicated, grout set work in concrete with non-shrink grout. Trowel surface smooth and flush with adjacent surfaces.

METAL FABRICATIONS

- .4 Insulate metals where necessary to prevent corrosion due to contact between dissimilar metals and between metals and masonry, concrete or plaster. Use bituminous paint, butyl tape, building paper or other approved means.
- .5 Obtain Contract Administrator's written acceptance prior to field cutting or altering of structural members.

3.2 Field Painting

- .1 Paint bolt heads, washers, nuts, field welds and previously unpainted items. Touch up shop primer damaged during transit and installation, with primer to match shop primer.

3.3 Grating and Stair Tread Installation

- .1 Grating and stair tread products shall be installed in accordance with Manufacturer's Shop Drawings. Lock grating panels securely in place with hold-down fasteners as specified herein.
- .2 Stair treads to be welded to stair stringers.
- .3 Fabricate and install grating panels and stair treads such that adjacent panels have perpendicular bars lining up to present a continuous appearance. Clip panels together to prevent differential panel to panel movement.
- .4 Apply shop applied edge banding around openings in the grating and discontinuous grating panels. Edge banding shall be a minimum of the full profile of the attached grating or larger as required by the Manufacturer.
- .5 The Contractor shall verify measurements in field for work fabricated to field conditions as required by grating Manufacturer. Determine correct size and locations of required holes or cutouts from field dimensions before grating fabrication.
- .6 Each grating section shall be readily removable. Grating supports shall be supplied and installed at openings in the grating by Contractor where necessary to meet load-deflection requirements specified herein.
- .7 Grating openings which fit around protrusions (pipes, tanks, cables, machinery, etc.) shall be discontinuous at approximately the centerline of opening so each section of grating is readily removable.
- .8 Gratings shall be fabricated free from warps, twists, or other defects which affect appearance and serviceability.
- .9 Hold-down clips shall be supplied and installed and spaced at a maximum of 1000 mm apart unless noted otherwise on the Drawings with a minimum of four clips per piece of grating.

END OF SECTION

ALUMINIUM FABRICATIONS

1. GENERAL

1.1 Design Requirements

- .1 Comply with CSA S157/A157.1 for strength design in aluminium work.
- .2 Design railings, balustrade, and landing construction and connections to requirements of the building code and other authorities having jurisdiction. Maximum deflection of L/360 of clear span.

1.2 Quality Assurance

- .1 Retain a Professional Engineer registered in the Province of Manitoba, with experience in work of comparable complexity and scope, to perform the following services as part of the Work of this Section:
 - .1 Structural design
 - .2 Review, stamp, and sign Shop Drawings
 - .3 Conduct shop and Site inspections
 - .4 Prepare and submit inspection reports
- .2 Do welding to CSA W59.2. All Work is to be performed by a firm certified by the Canadian Welding Bureau to the requirements of CSA W47.2 in Division 2.

1.3 Submittals

- .1 Shop Drawings and design briefs are to be signed and sealed by a Professional Engineer registered in the Province of Manitoba.
- .2 Shop Drawings shall show work of this Section including large scale detail of members and materials, of connection and jointing details, and of anchorage devices, dimensions, thicknesses, description of materials, metal finishing, as well as other pertinent data and information.

2. PRODUCTS

2.1 Materials

- .1 Aluminium Plates, Shapes and Extrusions: 6061-T6 alloy, anodizing quality.
- .2 Fasteners: Stainless steel ASTM type 316 for all bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts with appropriate isolation devices.

ALUMINIUM FABRICATIONS

- .3 Grout: Non-shrink, non-metallic, flowable, 1-day 15 MPa (2100 psi) compressive strength, pull-out strength 7.9 MPa (1150 psi).
- .4 Bituminous Paint: to MPI (Master Paint Institute) EXT 5.4D, without thinner.
- .5 Drilled Anchors: HY-150 Adhesive anchors with stainless steel rods by Hilti Inc., sizes to suit.

2.2 Aluminium Finishes

- .1 Clear Anodic Finish: AA-M12C22A41, as fabricated nonspecular mechanical finish, medium matte etched chemical finish, architectural class I clear anodic coating of minimum 18 µm (0.7 mil) thick complying with AAMA 611.

2.3 Fabrication

- .1 Verify dimensions of installed Work before commencing fabrications and report any discrepancies to Contract Administrator.
- .2 Fit and assemble Work in shop where possible. Execute Work in accordance with details and reviewed Shop Drawings. Where shop fabrication is not possible, make trial assembly in shop.
- .3 Supply and install bolted connections wherever possible. Bolted connections shall be bearing-type connections with the thread excluded from the planes of shear. Welded connections will not be permitted unless approved by the Contract Administrator. Inform Contract Administrator if required welding procedures will negatively influence the original yield strength of the members at the compression or tension flange. Adjust welding procedures as required by the Contract Administrator at no additional cost.
- .4 Carefully make and fit details. Take special care with exposed finished Work to produce a neat and correct appearance to Contract Administrator's acceptance.
- .5 Assemble members without twists or open joints.
- .6 Correctly size holes for connecting Work of other Sections where such can be determined prior to fabrication. Where possible, show holes on Shop Drawings. Place holes not to cause appreciable reduction in strength of member.

2.4 Welding

- .1 Execute welding to avoid damage or distortion to Work. Execute welding in accordance with following standards:
 - .1 CSA W48: For welding materials. If rods are used, only coated rods are allowed.
 - .2 CSA W59.2: For design of connections and workmanship.
 - .3 CAN/CSA W117.2: For safety.

ALUMINIUM FABRICATIONS

- .2 Thoroughly clean welded joints and expose aluminium surfaces for a sufficient distance to perform welding operations.
- .3 Test welds for conformance and remove work not meeting specified standards and replace to Contract Administrator's acceptance.
- .4 Continuous weld all joints for the full length of each joint. Finish exposed welds smooth and flush, file, or grind as required.

2.5 Anchors and Fastening

- .1 Use weld studs of size not larger than 10 mm for attaching miscellaneous materials and equipment to building structure. If weight of item requires larger fasteners use clips or brackets and secure by welding or through bolting.

2.6 Inserts and Hangers

- .1 Install inserts, hangers, and supports. Make inserts drilled type.
- .2 Before openings are cut through structure, obtain Contract Administrator's written acceptance for procedures, locations, and reinforcements required.

3. EXECUTION

3.1 Damaged Members

- .1 Repair or replace members damaged during transit or erection, before securing in position.

3.2 Erection

- .1 Erect aluminum in accordance with CSA S157/A157.1 and Drawings.
- .2 Field connections are to be bolted wherever possible. Field welding of aluminum will not be permitted unless approved by the Contract Administrator.
- .3 Perform required field welding. Visible field welds to be smooth, grind or file as required. Touch up galvanizing as required.
- .4 Obtain the Contract Administrator's permission prior to Site cutting or making adjustments which are not part of the scheduled Work.
- .5 Install items plumb, square and level; fit accurately, and maintain free from distortion or defects detrimental to appearance and performance.
- .6 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.

ALUMINIUM FABRICATIONS

- .7 Set column bases and other vertical members to design elevations on levelling nuts or stainless steel wedges. Do not use wood wedges.
- .8 Use only light drifting to draw parts together. Enlarge holes for bolted connections with reamers or twist drill only. Do not burn to form holes, enlarge holes or match unfair holes.
- .9 Obtain Contract Administrator's written permission prior to field cutting or altering structural members.
- .10 After erection field prime welds, nuts, bolts, washers and touch up abrasions and damage to bituminous coatings and galvanizing.
- .11 Supply and Install anchors for setting in concrete with minimum 100 embedment.
- .12 Paint aluminum surfaces in contact with concrete with two (2) coats of alkali-resistant bituminous paint.
- .13 Prevent electrolysis between aluminum and dissimilar metals in contact with appropriate isolation devices.

END OF SECTION