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DIVISION 5

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STRUCTURAL STEEL

1. GENERAL

1.1 Work Included

- .1 Structural framing columns, beams, girders, purlins, hollow sections, channels
- .2 Support channels and angles attached to structural framing
- .3 Baseplates, bearing plates, anchor bolts, vertical and horizontal bracing
- .4 Bearing plates, angles with anchors and anchor bolts for joists
- .5 Plate, angle, and channel door and opening frames attached to structural steel
- .6 Monorails
- .7 Welds, bolts, washers, nuts, and shims
- .8 Shear stud connectors
- .9 Prime and galvanized structural steel members and appurtenances
- .10 Field touch up of primed and galvanized surfaces including field welding

1.2 Design Standards, Code Requirements

- .1 Conform to requirements of CAN/CSA S16.1, CAN/CSA-S136, the Canadian Institute of Steel Construction (CISC) "Code of Standard Practice for Buildings" and the Provincial Construction Safety Act.
- .2 Use loads, load combinations, and stress levels shown on Drawings and in accordance with the National Building Code of Canada 1995.
- .3 Connections are to be designed by a Professional Engineer registered in the Province of Manitoba. Design connections for loads indicated on the Drawings as a minimum.
- .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.

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.

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- .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 (4) copies of mill test reports, properly correlated to materials actually used.
- .5 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.
- .6 Welds are to be considered defective if they fail to meet quality requirements of CSA W59.
- .7 Additionally, all welds are to be visually inspected.

1.5 Shop Drawings, 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 Submit details of typical connections and special connections for review prior to preparation of Shop Drawings.
- .3 Shop drawings and design briefs are to bear the seal of a Professional Engineer, registered in the Province of Manitoba.
- .4 Submit Shop Drawings for review in accordance with Section 01300 - Submittals.
- .5 Clearly indicate profiles, sizes, spacing and locations of structural members, connections, attachments, reinforcing, anchorage, framed openings, size and type of fasteners, cambers and loads, accessories, column anchor bolt locations, 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.

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- .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.

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 monorail sections (S shapes): conforming to ASTM A992 or A572, Grade 50 with minimum yield strength of 345 MPa.
- .6 Structural Channels (C shapes): conforming to CAN/CSA-G40.21, Grade 300W with minimum yield strength of 300 MPa.
- .7 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 will not be acceptable unless accepted by the Contract Administrator.
- .8 Bolts, nuts, and washers: conforming to ASTM A325; galvanized or painted to match fastened items.
- .9 Welding Materials: conforming to CSA W59.
- .10 Interior structural steel primer: CISC/CPMA 2-75.
- .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 minimum two (2) coats of zinc rich primer.
- .14 Provide and install decals for each side the monorails at each blower location reading, "MAXIMUM LOAD XXXX kg AT ANY TIME", in black letters minimum 100 mm in height. Coordinate exact loading designations with Contract Administrator.

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2.2 Fabrication

- .1 Fabricate structural steel members in accordance with CAN/CSAS16.1 and CAN/CSA S136.
- .2 Verify all drawing dimensions prior to commencing fabrication.
- .3 Provide openings and punched holes 10 to 30 mm in diameter in structural members for other building components. Reinforce openings with steel plates sized and welded in place, to restore members to original design strength. Locate holes so as to cause no appreciable reduction in strength of members.
- .4 Provide connections for loads indicated on the Drawings as a minimum.
- .5 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.
- .6 Accurately cut and mill column ends and bearing plates to assure full contact of bearing surfaces prior to welding.
- .7 Close and weatherproof all gaps, butt joints and connections exposed to exterior of building. Grind all exposed welds flush with surface of welded members.
- .8 Weld shear studs in place with stem perpendicular to member, in full fusion weld.
- .9 Design and detail connections for structural steel so that corrosion potential is minimized. Cap and seal weld all exposed ends of HSS sections.
- .10 Weld reinforcing bars, to structural steel, in accordance with CSA W186, where acceptable to the Contract Administrator or as shown on the Drawings.

2.3 Shop Painting

- .1 Clean all members, remove loose mill scale, rust, oil, dirt, and other foreign matter. Prepare surfaces according to SSPC SP SP7 unless indicated otherwise.
- .2 Clean all members receiving galvanizing material to SSPC SP SP-10 "Near-White Blast Cleaning".
- .3 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.
 - .4 Faying surfaces of friction-type connections.

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- .5 Surfaces to receive sprayed fireproofing.
- .6 Structural steel exposed to weather.
- .4 All structural steel exposed to weather shall be hot dipped galvanized.
- .5 Apply paint under cover, on dry surfaces only and when surface and air temperatures are above 5°C.
- .6 Maintain dry condition and 5°C minimum temperature until paint is thoroughly dry.
- .7 Patch paint bolts, nuts, sharp edges and corners one coat before full prime coat is applied.
- .8 Apply paint by brush or spray to a dry film thickness of 0.05 mm minimum.

3. EXECUTION

3.1 Examination

- .1 Before starting erection, take field measurements and examine other Work may affect this Work.
- .2 Notify the Contract Administrator of any conditions which would prejudice proper installation of this Work.
- .3 Commencement of this Work implies acceptance of existing conditions.

3.2 Damaged Members

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

3.3 Erection

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

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- .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, and washers and touch up abrasions and damage to shop primed surfaces.
- .12 Touch up all damaged shop finish paint, prime and finish paint all welds, nuts, bolts and washers.

END OF SECTION

METAL FABRICATIONS

1. GENERAL

1.1 Work Included

- .1 Shop fabricated ferrous metal items, galvanized and prime painted. The following is a list of principal items only. Refer to Drawings for items not specifically listed.
 - .1 Mechanical supports
 - .2 Boot scrapers (galvanized)
 - .3 Steel grating (galvanized)
 - .4 Anchors, plates, bolts, nuts, screws, brackets, etc. required for Work of this Section

1.2 Design Code, Quality Assurance

- .1 Design and fabricate stairs, landings, handrails, and balustrades to conform to requirements of the National Building Code of Canada, 1995
- .2 Perform welding in accordance with requirements of CSA W59
- .3 Welding Work on all load carrying structures and assemblies is to be performed by a firm certified by the Canadian Welding Bureau to the requirements of CSA W47.1 in Division 2.

1.3 Shop Drawings

- .1 Submit Shop Drawings in accordance with Section 01300 - Submittals.
- .2 Clearly indicate profiles, sizes, connections, attachments, reinforcing, anchorage, size and type of fasteners and accessories.
- .3 Include erection drawings, elevations, and details where applicable.
- .4 Indicate welded connections using CISC standard welding symbols. Clearly indicate net weld lengths.
- .5 Shop Drawings and design briefs are to be signed and sealed by a Professional Engineer registered in the Province of Manitoba.

2. PRODUCTS

2.1 Materials

- .1 Steel: conforming to CAN/CSA-G40.21; Type W with minimum yield strength of 300 MPa.
- .2 Welding Materials: conforming to CSA W59

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- .3 Bolts, Nuts, and Washers: conforming to ASTM A325 unless specified otherwise
- .4 Steel grating: style 30M-102M as manufactured by Fisher & Ludlow using steel bearing bars and cross bars. Provide serrated grating for exterior applications.

2.2 Finishes

- .1 Primer: CISC/CPMA 2-75
- .2 Galvanizing: conforming to CAN/CSA-G164; minimum 610 g/m²
- .3 Touch-up damaged galvanizing with minimum two (2) coats of zinc rich primer.

2.3 General Fabrication

- .1 Verify all dimensions on-site prior to shop fabrication.
- .2 Fabricate items of sizes and profiles detailed on Drawings, with joints neatly fitted and properly secured.
- .3 Fit and shop assemble in largest practical sections, for delivery to Site.
- .4 Supply all components required for proper anchorage of miscellaneous metals. Fabricate anchorage and related components of same material and finish as metal fabrications, unless otherwise specified or shown.
- .5 Weld connections where possible, otherwise bolt connections. Counter-sink all exposed fastenings. Cut off bolts flush with nuts.
- .6 Accurately form all connections and joints with exposed faces flush, mitres and joints tight.
- .7 Exposed welds and metal sections shall be smooth and flush; grind or file if required.
- .8 Provide for flush welded or hairline butt field joints.
- .9 Shop fabricate openings in members for other building components. Reinforce openings to restore member to original design strengths.
- .10 Provide lugs, clips, brackets, hangers and struts as required for attaching miscellaneous metal items securely to building structure.
- .11 Thoroughly clean all surfaces of rust, scale, grease and foreign matter prior to prime painting or galvanizing.
- .12 Galvanize and prime paint items as shown. Do not shop prime surfaces in contact with or embedded in concrete or requiring field welding.

METAL FABRICATIONS

3. EXECUTION

3.1 Examination

- .1 Before starting erection, examine other Work which may affect this Work.
- .2 Notify the Contract Administrator of any conditions which would prejudice proper installation of the Work.
- .3 Commencement of erection Work implies acceptance of existing conditions.

3.2 Erection

- .1 Obtain Contract Administrator's permission prior to Site cutting or making adjustments which are not part of scheduled Work.
- .2 Install items plumb, square and level, fit accurately, and maintain free from distortion or defects detrimental to appearance and performance.
- .3 Make provision for erection stresses and temporary bracing. Keep Work in alignment at all times.
- .4 Replace items damaged in course of installation.
- .5 Perform required field welding. Exposed welds shall be smooth and flush; grind or file if required.
- .6 Perform necessary cutting and altering for the installation of Work of other Sections, and as indicated on Drawings. No additional cutting is to be done without the permission of the Contract Administrator.
- .7 Perform all field assembly bolting and welding to match standard of shop bolting and welding. Bolts and screws are to be concealed whenever possible.
- .8 After installation, touch up field bolts, nuts, welds, and scratched and damaged prime painted surfaces. Field touch-up primer to be same as shop primer. Touch up galvanized surfaces with two (2) coats of zinc rich primer.
- .9 Supply, to appropriate sections, items required to be cast into concrete and built into masonry, complete with necessary setting templates.

END OF SECTION

ALUMINUM FABRICATIONS

1. GENERAL

1.1 Work Included

- .1 Stairs, handrails, and guardrails
- .2 Grating
- .3 Ladders
- .4 Stainless steel bolts for bolted connections
- .5 Stainless steel anchor bolts and anchorages for all aluminum equipment supplied

1.2 Design Standards, Code Requirements

- .1 CSA/CAN 3-S157-M83 Strength Design in Aluminum
- .2 CSA W59.2, Welded Aluminum Construction
- .3 CSA S244, Welded Aluminum Design and Workmanship
- .4 CSA W47.2 Certification of Companies for Fusion Welding of Aluminum
- .5 ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile
- .6 ASTM A 325M, Specification for High-Strength Bolts for Structural Steel Joints
- .7 ASTM F 593 Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
- .8 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles
- .9 Aluminum Association Standard SSA-46
- .10 Use loads, load combinations, and stress levels accordance with the National Building Code of Canada 1995.
- .11 Connections are to be designed by a Professional Engineer registered in the Province of Manitoba. Design connections for loads indicated on the Drawings as a minimum.

1.3 Qualifications

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

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.

ALUMINUM FABRICATIONS

- .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.
- .5 Welds are to be considered defective if they fail to meet quality requirements of CSA W59.2 and CSA S244.
- .6 Additionally, all welds are to be visually inspected.

1.5 Shop Drawings, 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 Submit details of typical connections and special connections for review prior to preparation of Shop Drawings.
- .3 Shop Drawings and design briefs are to bear the seal of a Professional Engineer, registered in the Province of Manitoba.
- .4 Submit Shop Drawings for review in accordance with Section 01300 - Submittals.
- .5 Clearly indicate profiles, sizes, spacing, and locations of structural members, connections, attachments, reinforcing, anchorage, framed openings, size and type of fasteners, cambers and loads, accessories, column anchor bolt locations, 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.

ALUMINUM FABRICATIONS

1.6 Maintenance Data

- .1 Provide maintenance data for cleaning of aluminum fabrications complete with pertinent details, and warnings against harmful maintenance materials and practices for incorporation into maintenance manual.

2. PRODUCTS

2.1 Materials

- .1 All materials shall be new.
- .2 Aluminum to CSA/CAN 3-S157-M83, 6061-T6 aluminum alloy. All aluminum shapes to be anodized in accordance with Aluminum Association Standard SSA-46, designation A41, clear (natural) coating, Architectural Class 1, 18 uM (0.007 mils). Structural design based on Alcan structural shapes.
- .3 Aluminum grating: to style 30-102M as manufactured by Fisher & Ludlow using 6063-T6 aluminum alloy for bearing bars and 6063-T5 aluminum alloy for cross bars. Provide serrated grating for exterior applications.
- .4 Aluminum stair treads: to style Type A-Checker Plate Nosing, width 278 mm wide as manufactured by Fisher & Ludlow using 6063-T6 aluminum alloy for bearing bars and 6063-T5 aluminum alloy for cross bars. Provide serrated grating for exterior applications.
- .5 Nuts, bolts, and fastening devices connecting aluminum parts to aluminum, concrete, or other materials: Stainless steel to Series 300 as specified in AISI Steel Products manual No. 12, with appropriate isolation devices.
- .6 Welding materials: conforming to CSA W59.2
- .7 Bituminous Paint: to MPI (Master Paint Institute) EXT 5.5D, without thinner
- .8 Concrete Anchors: Stainless Steel Hilti Kwik Bolts, manufactured by Hilti (Canada) Ltd. where indicated.

2.2 Fabrication

- .1 Fabricate aluminum members in accordance with CSA/CAN 3-S157 Strength Design in Aluminum using Alcan structural shapes.
- .2 Conform to requirements of CSA W59.2 for recommended filler alloy and welding.
- .3 Verify all Drawing dimensions prior to commencing fabrication.
- .4 Provide connections for loads indicated on the Drawings as a minimum.

ALUMINUM FABRICATIONS

- .5 Provide 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 acceptable to 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.
- .6 Accurately cut and mill column ends and bearing plates to assure full contact of bearing surfaces prior to welding.
- .7 Close and weatherproof all gaps, butt joints and connections exposed to exterior of building. Grind all exposed welds flush with surface of welded members.
- .8 Design and detail connections for aluminum so that corrosion potential is minimized. Cap and seal weld all exposed ends of HSS and Pipe sections.
- .9 Provide perimeter banding of same size as bearing bars for grating.
- .10 Provide banding of same size as bearing bars for all required openings through grating as required unless noted. Contractor to coordinate location of openings prior to Shop Drawing submission.
- .11 Match position of bearing bars and cross bars in adjacent panels to preserve a continuous appearance.
- .12 Provide removable hold down clip style Type D complete with appurtenances for all grating. At locations where Type D clip is impractical, provide Type C clip. All clips as manufactured by Fisher & Ludlow.
- .13 Provide two (2) hold-down clips at each end of the panels if not detailed on the Drawings.
- .14 Clip adjacent grating panels edges together at 1500 mm spacing to prevent differential vertical movement.
- .15 Provide checker plate nosing along grating sections within areas of stairs for width of stair opening.

3. EXECUTION

3.1 Examination

- .1 Before starting erection, take field measurements and examine other Work may affect this Work.
- .2 Notify the Contract Administrator of any conditions which would prejudice proper installation of this Work.
- .3 Commencement of this Work implies acceptance of existing conditions.

ALUMINUM FABRICATIONS

3.2 Damaged Members

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

3.3 Erection

- .1 Erect aluminum in accordance with CSA/CAN 3-S157-M83 and Drawings.
- .2 Field connections are to be bolted wherever possible. Field welding of aluminum will not be permitted unless acceptable to 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.
- .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, and washers and touch up abrasions and damage to bituminous coatings and galvanizing.
- .11 Provide 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