PART 1 GENERAL

1.1 Related Sections

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

1.2 Description Of Work Included

.1 Provide all labour, materials, equipment and services to supply and erect structural steel and open web steel joists required and/or indicated on the drawings or specified herein, including the supply of embedded steel parts which will form the connection between the structural steel and poured-in-place concrete and reinforcement of steel deck openings larger than 18 inches. Report any discrepancies between structural, mechanical, electrical and architectural drawings to the Contract Administrator immediately.

1.3 Quality Assurance

.1 Structural steel work shall conform to the following standards:

.1 Provincial Building Code - current Edition.

.2 CSA Standard CAN/CSA-S16.1-01 (Limit States Design Of Steel Structures).

.3 CSA Standards CAN/CSA-W47.1-03 (Certification Of Companies For Fusion Welding Of Steel Structures).

.4 CSA Standards W59-03 (Welded Steel Construction) (Metal Arc Welding).

.2 Copies of the above publications shall be available from the Contractor at the job site at all times.

1.4 Qualifications of Contractor

.1 Structural steel fabricator shall have not less than five (5) years experience in the fabrication of structural steel.

.2 Erector shall have not less than five (5) years experience in erection of structural steel.

.3 The steel fabricators and erectors must be certified under the requirements of CAN/CSA W47.1 as required by CAN/CSA-S16-01.

.4 Welding procedures, welders and welding operations shall be qualified in accordance with Canadian Welding Bureau Standards.

1.5 Submittals & Shop Drawings

.1 Submit detailed erection and shop drawings prepared under the supervision of a Registered Professional Engineer in accordance with the General Conditions. Where pre-engineered or fabricator designed elements are part of the shop drawings, the shop drawings shall be stamped by a professional engineer licensed to practice in the applicable province.

.2 The shop drawings shall clearly show all shop and erection details, including cuts, copes, connections, holes, threaded fasteners, splices and welds. All welds, both shop and field, shall be indicated by AWS Welding Symbols as specified in CSA Standard W59 Appendix D and E.

.3 Provide setting drawings, templates and directions for the installation of anchor bolts plates and other devices.

.4 Prior to starting erection work, submit a description of the methods, sequence of erection and type of equipment proposed for in erecting structural steel.

.5 Joist drawings shall show joist eccentricity limits at maximum fabrication tolerances as described in the Open-Web Steel Joist Clause of CAN3-S16.1-04.

1.6 Product Handling

.1 Storage of Materials:

.1 Structural steel members shall be stored at the site above ground on platforms, skids or other devices.

.2 Steel shall be protected from corrosion.

.3 Other materials shall be stored in a weather tight and dry place until ready for use in the Work.

.4 Packaged materials shall be stored in their original unbroken packages or containers.

1.7 Supply Of Alternate Products

.1 Should the rolled sections shown on the drawings not be procurable from Canadian Mills, or should substitution for those sections be desired, sections of equivalent strength, may be substituted if approved by the Contract Administrator. In such case full particulars thereof must be submitted prior to the closing of Bid. Material substitutions after the closing of Bid, if accepted, will be at the Contractor's cost.

1.8 Testing and Inspection

.1 A testing agency will be selected and paid as specified in the General Conditions.

.2 Prior to the commencement of Work, provide shop fabrication and erection schedules.

.3 On request, submit certified mill tests in accordance with the standards.

.4 The Contractor shall advise the testing agency of the scheduling of all shop and field work pertaining to this Project. The Contractor shall permit the testing agency full access to the fabrication shop and the site for the purpose of carrying out his work and he shall provide assistance required to aid in the performance of the inspection and testing.

.5 Testing of all connections and splices not indicated on the design drawings shall be undertaken by the City's Testing Agency and shall be at the Contractor's expense.

PART 2 PRODUCTS

2.1 Materials

.1 Structural Steel shall be in accordance with CSA Standard G40.21. Wide Flanges shall be Grade 350W, hollow structural sections shall be Grade 350W Class C, and steel plates and miscellaneous sections shall be 300W.

.2 Welding materials shall be in accordance with CSA Standard W59.

.3 Threaded fasteners to ASTM Specification A325 or A490.

.4 Anchor bolts to ASTM Specification A307 or better.

.5 Embedment anchors shall be Nelson headed anchors with fluxed ends or approved equal conforming to ASTM. A.108-73.

.6 Bar anchors shall be Nelson deformed bar anchors or approved equal conforming to ASTM.A-496.

.7 Brick support angles and related framing materials exposed to weather, shall be galvanized Z275 G90 designation.

.8 Primers for interior exposure not to receive a shop or field paint finish shall be CISC/CPMA Standard 1-73a Primer or other pre-approved.

.9 Primers for exterior exposure not to receive a shop or field paint finish shall be zinc chromate Type - 1, conforming to CGSB 1-GP-40d.

.10 Primers used in a multi-coat system where a final shop or field paint finish is to be applied shall be selected and pre-approved based on surface preparation, exposure conditions and compatibility with subsequent coatings.

2.2 Fabrication

.1 Unless otherwise indicated, fabrication of structural steel shall be in accordance with CSA Standard CAN/CSA-S16-01.

.2 Verify all dimensions and take necessary field measurements before fabrication.

.3 Provide punched holes for the convenience of other trades in attaching wood blocking or other materials. Coordinate with drawings of other disciplines for locations and details.

.4 Obtain Contract Administrator's approval for holes required through structural steel that are not shown on the drawings.

2.3 Welding

.1 Appearance, quality of welds made, methods of correcting defective work shall be in accordance with CSA Standard W59.

.2 Prepare surfaces for welding either by leaving unpainted or remove paint.

.3 Embedment anchors, shear studs and deformed bar anchors shall be automatically end welded with suitable stud welding equipment in accordance to the manufacturer's recommendations. Fillet welding of anchors will be rejected.

2.4 Shop Painting

.1 Steel shall be painted with shop primer meeting the requirements of CSA Standard CAN/CSA-S16.1 unless noted otherwise.

.2 Architecturally Exposed Steel:

.1 Cleaning, preparation of steel and the paint product shall be compatible with requirements of finish painting.

.2 Use paint as prepared by manufacturer without thinning or adding admixtures. Execute painting on dry surfaces, free from rust, scale, and grease. Do not paint in temperatures lower than 8 deg. C.

.3 Interior structural steel - steel surfaces to be encased in concrete, welded, fireproofed, zinc coated, galvanized or to receive shear connector studs or embedment anchors shall not be painted.

.4 Clean contact surfaces by effective means before assembly, but do not paint.

.5 Where shop painting is required give two coats of paint (preferably of different colours) to parts inaccessible after final assembly.

.6 Touch-up welds, bolts, and burnt or scratched surfaces of painted steel after completion of erection.

2.5 Columns and Bases

.1 All flame cut steel columns shall have their ends milled. Steel base plates supporting columns shall be flat.

.2 Base plates and cap plates are to be seal welded to HSS columns.

2.6 Connections

.1 Use connections of the type and detail shown on the drawings. Modifications to the specified connection types and details will not be permitted without prior approval from the Contract Administrator.

.2 Connections designed by the fabricator shall be in accordance with CSA Standard CAN/CSA-S16.1 and stamped and sealed by a Professional Engineer registered in the applicable province.

.3 All connections shall be designed to carry the loads specified on the drawings. If loads are not given, the connection shall have a capacity not less than the members being connected.

.4 Column to beam and girder connections shall allow for a horizontal stability force in all directions equal to 2% of the design column axial load in addition to all other loads.

.5 Structural steel members spliced for ease of fabrication or transportation shall have splices designed to develop the full strength and stiffness of the member. Splices shall be subject to non-destructive testing as directed by the Contract Administrator. The cost for such testing shall be borne by the Contractor.

.6 Use standard connection types where possible.

.7 Provide stiffeners in beam webs at all locations of beam continuity. Unless noted otherwise web stiffeners shall be 12mm minimum.

.8 All bolted connections may be snug tight except connections for:

.1 Bracing, trusses and drag struts.

.2 Elements resisting crane loads.

.3 Supports for running machines or loads that produce impact or cyclic load.

.4 These shall be designed as slip resistant connections and pretensioned.

.9 Connections for lateral load resisting elements, bolts in tension, and elements connected with oversize or slotted holes unless designed to accommodate movement may be bearing connections but shall be pretensioned.

2.7 Separators And Miscellaneous Supports

.1 Provide separators for all double members in accordance with CSA Standard CAN/CSA-S16.1.

.2 Provide plates and/or angles for support of masonry where required.

2.8 Erection

.1 The erector is fully responsible for erection methods, equipment, workmanship and safety precautions.

.2 Erect structural steel plumb, true and with all necessary precautions against damage of any kind to the material and to the structure. Report every failure of members to come

properly together and any measures taken for correction shall be submitted to the Contract Administrator for review.

.3 Confirm the setting of anchor bolts and bearing plates and make an instrument survey to verify the setting prior to erection of steel members.

.4 Cutting or burning of base plates to accommodate misplaced anchor bolts is not permitted.

.5 Provide and install temporary bracing as required to keep the structure plumb and in true alignment during construction. Assume complete responsibility for the extent and timing of the removal of such bracing. The bracing members indicated on the drawings are required for the finished structure and shall not be considered as adequate for temporary bracing. Any failure to make proper and adequate provision for stresses occurring during the erection from any causes whatsoever shall be entirely the responsibility of the Contractor.

.6 Structural steel frames shall be accurately assembled to the lines and elevations indicated within the specified tolerances.

.7 The various members forming parts of complete frame structure after being assembled shall be aligned and adjusted accurately before being fastened.

.8 Bearing surfaces and surfaces which will be in permanent contact shall be cleaned before the members are assembled.

.9 Temporary bolts, clips and angles etc., used to facilitate erection shall be removed unless noted otherwise on the drawings.

2.9 Temporary Flooring

.1 Provide all temporary flooring, planking and scaffolding necessary in connection with erection of structural steel, or support of erection machinery in accordance with governing regulations or by-laws.

PART 3 EXECUTION

3.1 Completion

.1 The Registered Professional Engineer responsible for the sealed shop drawings, or his representative shall visit the site to review in place connections and components designed by that Registered Professional Engineer as required to substantiate compliance with his sealed shop drawings. He shall then submit a letter of compliance provide a sealed and signed letter to the Contract Administrator.

.2 On completion of the Work of this section, all protection erected in conjunction with the structural steel work shall be removed, all damage to this work and adjoining work shall be made good and all surplus materials and debris and all tools, plant and equipment shall be removed from the site.

3.2 Field Quality Control

.1 Structural steel work (material and workmanship) shall be subject to review and tests by a testing agency retained by the City.

.2 Construction review by the testing agency or the Contract Administrator does not relieve the Contractor of his responsibility to furnish materials and workmanship in accordance with the drawings and specifications.

PART 1 GENERAL

1.1 Related Sections

.1 Cast- in-Place Concrete: Installation of Anchors — Section 03 30 00

.2 Painting — Section 09 91 10

1.2 References

.1 American Society for Testing and Materials (ASTM)

.1 ASTM A53/A53M-99b, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A269-98, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.3 ASTM A307-97, Specification for Carbon Steel Bolts and Studs, 600,000 PSI Tensile Strength.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.

.2 CAN/CGSB-1.1.08-M89, Bituminous Solvent Type Paint.

.3 CAN/CGSB-1.181-92, Ready-Mixed, Organic Zinc-Rich Coating.

.3 Canadian Standards Association. (CSA)

.1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel.

.2 CAN/CSA-G164-M92 (R1998), Hot-Dip Galvanizing of Irregularly Shaped Articles.

.3 CAN/CSA-S16.1-94, Limit States Design of Steel Structures.

.4 CSA W48.1-M1991 (R1998), Carbon Steel Covered Electrodes for Shielded Metal Arc Welding.

.5 CSA W48.2-M1992 (R1998), Chromium-Nickel Steel Covered Electrodes for Shielded Metal Arc Welding.

.6 CSA W48.3-M1993 (R1998), Low Alloy Steel Covered Electrodes for Shielded Metal Arc Welding.

.7 CSA W48.4-95, Solid Carbon Steel Filler Metals for Gas Shielded Arc Welding.

.8 CSA W48.5-M1990 (R1996), Carbon Steel Electrodes for Flux- and Metal – Cored Arc Welding.

.9 CSA W48.6-96, Fluxes and Carbon Steel Electrodes for Submerged Arc Welding.

.10 CSA W59-M1998, Welded Steel Construction (Metal Arc Welding).

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate materials, core thickness, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

.3 Shop drawings must be sealed and signed by a structural engineer registered in the province of the Work.

1.4 Protection

.1 Deliver, store, handle and protect materials in accordance with Basic Product Requirements.

.2 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.

.3 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

PART 2 PRODUCTS

2.1 Materials

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

.2 Steel pipe: to ASTM A53/A53M standard weight black finish.

.3 Welding materials: to CSA W59.

.4 Welding electrodes: to CSA W 48 Series.

.5 Bolts and anchor bolts: to ASTM A307.

.6 Grout: non-shrink, non-metallic, flowable, 15Mpa at 24 hours.

2.2 Fabrication

.1 Fabricate Work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Use self-tapping shake-proof round-headed screws on items requiring assembly by screws or as indicated.

.3 Where possible, fit and shop assemble Work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 Finishes

.1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m2 to CAN/CSA-G164.

.2 Shop coat primer: to CAN/CGSB-1.40.

.3 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

.4 Bituminous paint: to CAN/CGSB-1.108.

2.4 Isolation Coating

.1 Isolate Aluminum from following components, by means of bituminous paint.

.1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.

.2 Concrete, mortar and masonry.

.3 Wood.

2.5 Shop Painting

.1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

.2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale and grease. Do not paint when the temperature is lower than 7°C.

.3 Clean surfaces to be field welded; do not paint.

2.6 Angle Lintels

.1 Steel angles: galvanized, sizes indicated for openings. Provide 150 mm minimum bearing at ends.

.2 Weld or bold back-to-back angles to profiles as indicated.

.3 Finish: shop painted.

2.7 Pipe Railings

.1 Steel pipe: 40 mm nominal outside diameter, formed to shapes and sizes as indicated.

2.8 Bench Supports

.1 Support: dimensions as detailed, steel angle. Prime paint for interior.

2.9 Shelf Brackets

.1 Fabricate frames from steel, sizes as shown on drawings.

2.10 10’ work bench top

.1 Fabricate - 20 ga steel.

PART 3 EXECUTION

3.1 Erection

.1 Do welding Work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight, and true, accurately fitted with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Contract Administrator such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.4 Exposed fastening devices to match finish and be compatible with material through which they pass.

.5 Supply components for building into Work by other sections in accordance with shop drawings and schedule.

.6 Make field connections with bolts to CAN/CSA-S16.1, or weld.

.7 Hand items over for casting into concrete or building into masonry to appropriate trades, together with setting templates.

.8 Touch-up rivets, field welds, bolts and burnt of scratched surfaces after completion of erection with primer.

.9 Touch-up galvanized surfaces with zinc-rich primer where burned by field welding.

3.2 Pipe Railings

.1 Install all pipe railings to stairs as drawn.

3.3 Galvanized Steel Grates

.1 Provide steel galvanized grates for concrete area well: grating to be welded bar grating, mechanically secured.

3.4 Steel Counter Top

.1 Provide 20 GA Steel counter top on workbench in apparatus room.

PART 1 GENERAL

1.1 Related Sections

.1	Cast-in-Place Concrete	Section 03 30 00
.2	Structural Steel	Section 05 12 23
.3	Metal Fabrications	Section 05 50 00
.4	Paints and Coatings	Section 09 90 00

1.2 References

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel

.2 CAN/CSA-G164-M92 (R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CSA-W59-M1989 (R1998), Welded Steel Construction (Metal Arc Welding).

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.40-M89, Primer, Structural Steel, Oil Alkyd Type.

.2 CAN/CGSB-1.181-92, Ready-Mixed Organic Zinc-Rich Coating.

.3 American Society for Testing and Materials (ASTM)

.1 ASTM A53/A53M-99b, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

.2 ASTM A307-00, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A325M-00, Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric).

.4 The National Association of Architectural Metal Manufacturers (NAAMM), Metal Stair Manual, 1989.

1.3 System Description

.1 Design Criteria

.1 Design metal stair stringers, balustrade and landing construction and connections to NBC vertical and horizontal live load requirements.

.2 Detail and fabricate stairs to NAAMM Metal Stairs Manual.

1.4 Submittals

.1 Submit shop drawings in accordance with General Requirements.

.2 Indicate construction details, sizes of steel sections and thickness of steel sheet.

.3 All fabricator designed assemblies, components and connections, and drawings to be stamped and signed by a qualified Professional Engineer licensed in the jurisdiction at the Place of Work.

.4 Notify the Paint Inspection Agency on award of Contract and provide a written confirmation of preparation procedures and of primers used for all steel items supplied.

PART 2 PRODUCTS

2.1 Materials

.1 Steel sections: to CAN/CSA-G40.21, Grade 300W minimum.

.2 Steel plate: to CAN/CSA-G40.21, Grade 300W.

.3 Steel pipe: to ASTM A35/A35M standard weight, schedule 40, seamless black.

.4 Steel tubing: to CAN/CSA-G40.21, Grade 350W, sizes and dimensions as indicated; large diameter tube to ASTM A500, Grade C.

.5 Welding materials: to CSA W59.

.6 Bolts: to ASTM A307.

.7 High strength bolts: to ASTM A325M.

.8 Shop coat primer: to CAN/CGSB 1.40.

.9 Galvanizing: hot dipped galvanizing with minimum zinc coating of 600 g/m2 to CAN/CSA G164.

.10 Zinc primer: zinc rich, ready mix to CAN/CGSB 1.181.

2.2 Fabrication

.1 Fabricate to NAAMM, Metal Stair Manual.

.2 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.

.3 Accurately form connections with exposed faces flush; mitres and joints tight. Make risers of equal height.

.4 Grind or file exposed welds and steel sections smooth.

.5 Shop fabricate stairs in sections as large and complete as practical.

2.3 Steel Pan Stairs

.1 Fabricate stairs with closed riser steel pan construction.

.2 Form treads and risers from 3 mm thick steel plate. Secure treads and risers to 35 x 35 x 5 mm horizontal and vertical angles welded to stringers.

.3 Outer stringers to have 5 mm thick plate fascia welded on.

.4 Form landings from 3 mm thick steel plate, reinforced by 55 x 55 x 6 mm angles spaced at 400 mm on centre.

.5 Provide clip angles for fastening of furring channels, where applied finish is indicated for underside of stairs and landings.

.6 Extend stringers around mid landings to form steel base.

.7 Close ends of stringers where exposed.

.8 Provide tread reinforcing as indicated.

2.4 Plate Stairs

.1 Form treads from 6 mm thick steel plate to profile indicated, and secure to stringers with L 35 x 35 x 5 supports. Form landings from 6 mm thick steel plate, reinforced by L 55 x 55 x 6 spaced at 600 mm on centre.

.2 Provide serrated safety grating stair treads and landings, diamond grip channel, to profile indicated and secure to stringers and supports as indicated. Reinforce landings as required.

2.5 Handrails and Pipe Balustrades

.1 Construct handrails and pipe balustrades from 38 mm o.d. x 3.25 mm wall thickness steel pipe unless otherwise indicated on drawings.

.2 Fabricate wall handrails and brackets as indicated.

.3 Cap and weld exposed ends of balusters and handrails.

.4 Terminate at abutting wall with end flange.

2.6 Wire Mesh

.1 5 x 5 mm 10 ga.

.2 Fabricate as indicated on drawing.

2.7 Finishes

.1 Shop Primer

.1 Clean surfaces in accordance with Steel Structures Painting Council SSPC – SP2.

.2 Apply shop primer to all members except interior surfaces of pans.

.3 Apply two coats of primer in different colours to parts inaccessible after final assembly.

.4 Use primer as prepared by manufacturer without thinning or adding admixtures. Paint on dry surfaces, free from rust, scale, grease, do not paint when temperature is below 7°C.

.5 Shop primers for all exterior and interior painted steel work shall be of types specified in the painting specification section. Where non-complying primers are used by the steel fabricator, the fabricator shall completely remove same from all surfaces and prepare and prime surfaces in accordance with the requirements of

Section 09 91 10 for painted steel work at no additional cost to the City or the painter.

.6 Do not paint surfaces to be field welded.

2.8 Source Quality Control

.1 A third party independent inspection agency may periodically inspect all exterior and interior steel work to be painted for finish, surface preparation and application of required primers.

PART 3 EXECUTION

3.1 Installation

.1 Install in accordance with NAAMM, Metal Stair Manual.

.2 Install plumb and true in exact locations, using welded connections wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting stairs to structure.

.3 Hand items over for casting into concrete or building into masonry to appropriate trades together with templates.

.4 Do welding work in accordance with CSA W59 unless specified otherwise.

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