

1 General

1.1 **SUMMARY**

.1 Section Includes

- .1 Labour, Products, equipment and services necessary to complete the Work of this section.

1.2 **REFERENCES**

.1 Conform to the latest edition of the following:

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| .1 | ASTM A53 | - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless |
| .2 | ASTM F1554 | - Standard Specifications for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength |
| .3 | ASTM A325M | - High-Strength Bolts for Structural Steel Joints [Metric] |
| .4 | ASTM A500 | - Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes |
| .5 | ASTM A653/A653M | - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process |
| .6 | ASTM B209M | - Specification for Aluminum and Aluminum-Alloy Sheet and Plate |
| .7 | ASTM B210M | - Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes |
| .8 | ASTM B221M | - Specification for Aluminum-Alloy Extruded Bars, Rods, Profiles and Tubes |
| .9 | ASTM B241/B241M | - Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube |
| .10 | ASTM B308/B308M | - Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles |
| .11 | ASTM D635 | - Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position |
| .12 | ASTM E84 | - Test Method for Surface Burning Characteristics of Building Materials |
| .13 | ASTM F436 | - Hardened Steel Washers (for Use with High Strength Bolts) |
| .14 | CAN3-S157-M | - Strength Design in Aluminum |
| .15 | CSA-G40.20/G40.21-M | - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel |
| .16 | CAN/CSA-S16.1 | - Limit States Design of Steel Structures |

- .17 CAN/CGSB-1.181 - Ready Mixed Organic Zinc Rich Coating
- .18 CGSB 85-GP-16M - Painting Galvanized Steel
- .19 CAN/CSA G164-M - Hot-Dip Galvanizing of Irregularly Shaped Articles
- .20 CSA W47.1 - Certification of Companies for Fusion Welding of Steel Structures
- .21 CSA W47.2 - Certification of Companies for Fusion Welding of Aluminum
- .22 CSA W48 Series - Electrodes
- .23 CSA W59-M - Welded Steel Construction (Metal Arc Welding)
- .24 CSA-W117.2 - Safety in Welding, Cutting and Allied Processes
- .25 CISC/CPMA 2.75 - Canadian Institute of Steel Construction/Canadian Paint Manufacturers Association "A Quick-Drying Primer for Use on Structural Steel"
- .26 CISC - Canadian Institute of Steel Construction, "Code of Standard Practice"
- .27 OPSS - Ontario Provincial Standard Specifications
- .28 SSPC - Steel Structures Painting Council, "Steel Structures Painting Manual, Vol. 2"

1.3 SUBMITTALS

- .1 Shop Drawings
 - .1 Submit Shop Drawings for fabrication and erection of miscellaneous metals in accordance with Section 01 33 00.
 - .2 Clearly show and describe all items; sections, dimensions, erection details, anchors and fastenings, connection and jointing details.
 - .3 Shop Drawings for stairs and handrails and support members shall bear the seal and signature of a licenced Ontario Professional Structural Engineer responsible for their design.

1.4 QUALITY ASSURANCE

- .1 Retain a firm certified in accordance with CSA W47.1 Division 1 or 2.1 to perform welding. (For aluminum Work, retain a firm certified in accordance with CSA W47.2-M to perform welding.
- .2 Employ welding operators licensed per CSA W47.1 for types of welding required by the Work.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for strategic off-the-ground, covered storage locations. Do not load areas beyond the designed limits.
- .2 Handle and store metal materials at job Site in a manner to prevent damage to other materials, (to existing buildings) or property.

- .3 Handle components with care, and Provide protection for surfaces against marring or other damage. Ship and store members with cardboard or other resilient spacers between surfaces. Use lifting chokers of material which will not damage surface of steel members.
- .4 Use strippable coatings or wrappings to protect exposed surfaces of prefinished metal Work which does not receive Site finishing. Use materials recommended by finishers or manufacturers of metals, to ensure that method is sufficiently protective, easily removed, and harmless to the finish.
- .5 Prevent the formation of wet storage stain on galvanized articles by complying with the following measures:
 - .1 Stack articles or bundle to allow air between the galvanized surfaces during transport from Supplier. Load materials in such a manner that continuous drainage could occur.
 - .2 Raise articles from the ground and separate with strip spacers to provide free access of air to most parts of the surface. Incline in a manner which will allow continuous drainage. Do not lay galvanized steel on cinders, clinkers, wet soil or decaying vegetation.
 - .3 Handle galvanized articles in such a manner as to avoid any mechanical damage and to prevent distortion.
- .6 Tag metal fabrications, including associated anchor bolts, sleeves, and bases, or otherwise mark for ease of identification at Project site.

1.6 **COORDINATION**

- .1 Supply to concrete, masonry and/or other sections, materials requiring setting and/or building-in in concrete, masonry or other trades. This includes inserts, anchors, frames, sleeves, etc. Verify locations of said materials.

1.7 **PROJECT CONDITIONS**

- .1 Field measurements: Take measurements at the building to assure proper fitting, fabrication, and erection of the Work. Check dimensions in the field, whether or not shown, upon which the accurate fitting together and building-in of the metal fabrication Work may depend or which affects the proper installation of the Work of others.

2 **Products**

2.1 **MATERIALS**

- .1 General: Metals shall be free from defects which impair strength or durability, or which are visible. Metals shall be new, of best quality and free from rust, waves or buckles, and clean, straight throughout entire length, sharply defined profiles and true in web and flange.
- .2 Structural shapes, plates, etc.: New material conforming to CSA-G40.20/G40.21-M, Grade 350W for W and H shapes, and Grade 300W for other shapes, and plates.
- .3 Hollow structural sections: New material conforming to CSA-G40.20/G40.21-M Grade 350W, Class H.
- .4 Welding materials: Conforming to CSA W48.1-M and CSA W59-M.

- .5 High strength bolts, nuts and washers: Conforming to ASTM A325M, with each type and size of bolt and nut of same manufacture and of same lot.
 - .1 Bolts: Heavy, hexagon head high strength structural bolts, of standard size, of lengths required for thickness of members joined and for type of connection.
 - .2 Nuts: Heavy hexagon semi-finished nuts per ASTM A563M.
 - .3 Washers: Flat and smooth hardened washers, quenched and tempered.
- .6 Machine bolts and anchor rods: As specified below, complete with hexagon heads and nuts:
 - .1 Common bolts: Conforming to ASTM A307, Grade A, of lengths required to suit thickness of material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.
 - .2 Anchor rods: Conforming to ASTM F1554, Grade 36, of lengths noted, but projecting not less than 13 mm beyond nut unless otherwise noted.
 - .3 Nuts: per ASTM A563M.
- .7 Primer paint: Solvent reducible alkyd, light grey, in fast drying, lead and zinc-chromate free formulation conforming to CISC/CPMA 2.75. Use one brand of primer paint throughout the Work, in any of the following, tinted to the specified colour:
 - .1 "97-680" by PPG Canada Inc.
 - .2 Selectone "MR-05-3" by Selectone Paints Ltd.
 - .3 "Kem Bond HS-B50WZ4" by Sherwin-Williams
- .8 Primer paint: Solvent reducible alkyd, white, in fast drying, lead and zinc-chromate free formulation conforming to CISC/CPMA 2.75. Use one brand of primer paint throughout the Work, in any of the following:
 - .1 "97-680" by PPG Canada Inc.
 - .2 Selectone "MR-05-5" by Selectone Paints Ltd.
 - .3 "Kem Bond HS-B50WZ4" by Sherwin-Williams
- .9 Primer paint: Solvent reducible alkyd, red oxide, in fast drying, lead and zinc-chromate free formulation conforming to CISC/CPMA 2.75. Use one brand of primer throughout the Work, in any of the following:
 - .1 PPG "97-900"
 - .2 Selectone "J-82"
 - .3 ICI Devoe "27454"
 - .4 Sherwin-Williams "Kem Bond HS B50NZ3"
- .10 Galvanizing: Hot-dip galvanizing with minimum zinc coating of 600 g/m² to CAN/CSA G164-M.
- .11 Galvanized primer: Zinc rich conforming to CAN/CGSB-1.181 for new galvanized metal in compliance with CGSB 85-GP-16M. For galvanized fabrications touchup to remain unpainted in finished Work, use W.R. Meadows of Canada Ltd. "Galvafrid" or Kerry Industries "Z.R.C." or Niagara Paint Inc. "PL052898" zinc rich coating.

- .12 Handrails
 - .1 Steel pipe handrails: Conforming to ASTM A53, Type "S", Grade B steel pipe, powder coat finish. Colour to be selected by Consultant from manufacturer's standard colour range. Secure handrail to bracket with 2#10 FHMS through two countersunk holes in bracket.
 - .1 Handrail brackets: Julius Blum cast steel model 378 (377 -flat handrail), powder coat finish, and with flanges tapped for bolting. Colour to match steel pipe handrails. Secure bracket to post with 2#10 FHMS through countersunk holes into threaded insets in the post.
- .13 Steel pipe bumpers: Conforming to ASTM A500, cold rolled, bare, seamless steel pipe of sizes shown.
- .14 Stainless steel pipe: To ASTM A312, Type 304, 180-grit finish.
- .15 Pass Through Trays / Metal Liner: minimum 18 gauge stainless steel sheet to ASTM A167, type 304 to AISI No. 4 finish. Sheet to be levelled, free of buckles, warps and imperfections. Size and thickness as indicated on Drawings.
- .16 Galvanized sheet steel: 0.0897 mm (13 ga) core thickness commercial quality to ASTM A653/A653M, Grade A, with Z275 zinc coating designation.
- .17 Checkered plate: To ASTM A36, 6 mm thick, with raised diamond floor surface pattern.
- .18 Aluminum and steel bar grating: As manufactured by Fisher & Ludlow, Armco Irving, Borden Metal Products or Ohio Gratings Inc.
- .19 Grating treads and landings: As manufactured by Borden Metal Products, Armco Irving, Fisher & Ludlow or Ohio Gratings Inc. Furnish treads with 32 mm x 5 mm bearing bars incorporating 32 mm crosshatch abrasive nosing.
- .20 Fiber reinforced plastic (FRP) grating: Manufactured from premium grade (isophthalic) (vinylester) resin, conforming to ASTM E-84, Class 1 and flame rating and self-extinguishing requirements of ASTM D635. Patterns shall be (rectangular) (square), covered with baked on safety non-skid epoxy grit. Colour; (grey) (yellow) (custom). Fabricate grating to carry uniform distributed load of ____ lbs. ft² as manufactured by Fisher & Ludlow, Seasafe Inc., or MAK Enterprises Inc.
- .21 Ladder rungs (on steel rails): "Algrip" by Safe Walk Inc., "Mebac" by IKG Industries, "Slipnot" by W.S. Molnar Co. or Safety-Tread by Amico.
- .22 Ladder rungs (cast in concrete): 20 mm rectangular solid aluminum, alloy 6051T4 with non-slip surface, No. 2916 by Stepcon Industries Inc. or approved alternative.
- .23 Highway type beam guardrails: Single rail (double rail) manufactured by Armtec Limited, Canadian Metal Rolling Mills, or Canada Culvert and Metal Products, OPSS Type DD-909-A complete with standard terminal sections, splicers, galvanized steel nuts and bolts and 125 mm diameter concrete filled standard pipe posts.
- .24 Plastic handrail: Extruded high quality virgin PVC in colour to Consultant's selection: Rehau "Art. 70039RAU - PVC9505", Micro Plastics Canada Ltd., or VPI Rail "103A", verify models to handrail and railing steel plate size. Furnish covers with protective strippable covering to protect PVC from scratches and marring during construction process.

- .25 Drilled inserts: Ramset "Mega" or Hilti "HSL" heavy-duty anchors installed in accordance with manufacturer's directions, to sizes shown. Load capacity when embedded in 25 MPa concrete shall not be less than:

Diameter	Pullout kN	Shear kN
8 mm	30.0	36.0
10 mm	43.6	57.2
12 mm	53.6	82.8
16 mm	83.6	149.6
20 mm	119.6	205.6

- .26 Epoxy capsule type anchors: Hilti "HVA Adhesive Anchor", two-part, threaded steel stud and epoxy adhesive filled capsule anchoring system. Install per manufacturer's recommendations.

- .27 Stainless steel curbing for gas pump islands: Waggs Petroleum Equipment Island Forms or Pomeco/OPW Island Forms & Protective Curbing.

- .28 Bollards

~~.1 Interior Steel Pipe Bollards~~

~~.1 Surface mounted, bolted down bollards with base plate, conforming to ASTM A500, Schedule 40 standard weight steel pipe cleaned to SSPC SP3 and shop primed with primer conforming to CISC/CPMA 2.75 (hot dip galvanized to CAN/GSA G164 M).~~

~~.2 Dimensions of bollard as indicated on Drawings.~~

~~.3 Base plate: 200 mm x 200 mm x 12.5 mm thick and 4 corner holes.~~

~~.4 For Plastic Bollard Covers:~~

~~.1 Cover with reflective stripe, plastic cover, safety yellow, 6 mm thick.~~

~~.2 Finish: Schedule 40, safety yellow powder coat finish.~~

- .2 Exterior Pipe Bollards:

.1 Cast aluminum alloy and iron bollard:

.1 TFMC Style #318B by Toronto Fabrication & MFG. CO.

~~.2 Concrete fille:~~

~~.1 Hot dipped galvanized steel bollards. Fabricated in HSS in accordance with GSA G40.20/G40.21, Grade 350W, Class H or Schedule 40 steel pipe, grade B, in accordance with ASTM A53/53M~~

~~.2 Sizes of bollard as indicated on Drawings.~~

~~.3 Pipe Finish: ICI Devco 201 or approved equivalent two-part polyamide epoxy tie coat, and exterior alkyd enamel topcoat conforming to CAN/CGSB 1.59 M.~~

~~.3 Surface mounted, bolted down bollards with square base plate, hot dipped galvanized steel bollards. Fabricated in accordance with GSA~~

~~G40.20/G40.21, Grade 350W, Class H or Schedule 40 steel pipe, grade B, in accordance with ASTM A53/53M.~~

~~.4 Bollard Cover with reflective stripe, plastic cover, 6 mm thick.~~

~~.1 Finish: safety yellow finish.~~

2.2 BASIC MATERIALS - ALUMINUM

- .1 Aluminum rolled or extruded shapes: Structural quality to ASTM B308/B308M, Alloy 6061-T6.
- .2 Aluminum bar, rod, wire: To ASTM B221M.
- .3 Aluminum sheet or plate: To ASTM B209M.
- .4 Aluminum checkered plate: To ASTM B209M, Alloy 5086.
- .5 Aluminum drawn tubes: To ASTM B210M.
- .6 Aluminum pipe: To ASTM B241/B241M, Schedule 40, 6061 alloy.
- .7 Stainless steel bolts: Expansion bolts using high strength stainless steel conforming to ASTM A193, Grade B8, Type 316.
- .8 Aluminum finish: (plain mill finish) (clear anodic finish, designation AA-M12C22A41)
- .9 Accessories
 - .1 Steel bolts: To (ASTM F1554 grade 36) (ASTM A325M), hot-dip galvanized to CAN/CSA-G164-M, minimum zinc coating of 600 g/m².
 - .2 Bituminous paint: Henry "410-02" Bituminous paint.

2.3 BASIC MATERIALS - STAINLESS STEEL

- .1 Stainless steel sheet: To ASTM A167, type 304 to AISI No. 4 (2B) finish.
- .2 Stainless steel plate: To ASTM A167, type 304 to AISI No. 4 (2B) finish.
- .3 Stainless steel shapes: To ASTM A276, type 304 to AISI No. 4 (2B) finish.
- .4 Stainless steel fasteners: Type 304, (316).
- .5 Stainless steel pipe: To ASTM 312, type 316, 180 grit finish.
- .6 Stainless steel bolts: Expansion bolts using high strength stainless steel conforming to ASTM A193, Grade B8, Type 316.

2.4 SHOP FABRICATION

- .1 Fabricate items that are to be built into masonry or concrete and deliver to Project site for setting; furnish items complete with bolts, anchors, clips, etc., ready to set. Furnish, completely install and connect other items. Erect items to proper lines and levels, plumb and true, and in correct relation to adjoining Work. Secure parts in a rigid and substantial manner using concealed connections where practicable.
- .2 Where necessary to secure Work to the structure by means of expansion bolts, cinch anchors, and similar connections, lay out the Work and install such connections, install the Work and bolt up, unless otherwise noted.

- .3 Provide bolts, shims, blocks, nuts, washers, wedging pieces, etc., required for complete installation, unless otherwise noted.
- .4 Drill field holes for bolts or rivets. Do not burn holes.
- .5 Furnish fitting-up bolts, drift pins, other tools and equipment and do necessary reaming of unfair holes found in field connections. New holes or enlargement of unfair holes by use of cutting torch is cause for rejection of the entire member. Replacement shall be made at Contractor's expense.
- .6 Mill joints to a tight, hairline fit; cope or miter corners. Form joints exposed to weather to exclude water.
- .7 Remove burrs from all exposed cut edges.
- .8 Execute shop welding conforming with welding requirements specified under "Quality Assurance" and "Welding" herein. (Fabricate structural aluminum in accordance with CAN3-S157 and in accordance with reviewed Shop Drawings).
- .9 Accurately cut, machine and fit joints so that finished Work presents a neat appearance.
- .10 Assemble members without twists or open joints.
- .11 Drill properly sized holes for connecting the Work of other trades where such can be determined prior to fabrication. Where possible, show such holes on Shop Drawings. Place holes so not to cause an appreciable reduction in strength of member.
- .12 Certain miscellaneous metal elements are listed with a corresponding description below. Such listing is intended to provide clarity or to specify requirements for the given elements, and not to represent the scope of metal fabrications work.
- .13 Stairs – General
 - .1 Fabricate stairs with necessary components and in sizes and manner to enable installation directly to structure. Provide cast-in anchor assemblies supporting pickets, balustrades and other stair railing members. Provide bracing and hangers including necessary adjustment capability. Where possible, fit and shop assemble various sections of Work and deliver to Site in largest practicable sections.
 - .2 Forming and bending of exposed materials for treads shall be crisp, smooth, and of smallest possible radii.
 - .3 Fabricate items that are to be built into masonry or concrete and deliver to Project site for setting; furnish items complete with bolts, anchors, clips, etc., ready to set. Furnish, completely install and connect other items. Erect items to proper lines and levels, plumb and true, and in correct relation to adjoining Work. Parts shall be secured in a rigid and substantial manner using concealed connections where practicable.
 - .4 Where necessary to secure Work to the structure by means of expansion bolts, cinch anchors, and similar connections, do the Work of laying out and installing such connections, installing the Work and bolting up, unless otherwise noted. Drill or core holes in concrete and masonry Work.
- .14 Metal Pan Stairs
 - .1 Steel channel stringer: Of size, construction and attachment to structure as shown. Close exposed ends of stringers with 3 mm thick steel closure plates welded to edges of exposed flange edges and ground smooth.

- .2 Sub-treads, risers and landing permanent metal forms: Steel sheet formed as shown; treads to be concrete filled, with bare metal riser incorporating 19 mm dust cove.
- .3 Supports: As detailed on Drawings.
- .15 Bar Grating
 - .1 Of pressure resistance welded construction. No notching of bearing or cross bars permissible.
 - .2 Band openings cut in grating and grating edges, using welded connections.
- .16 FRP Grating
 - .1 Fabricate FRP gratings so that a regular pattern is presented in the finished Work with all members lined up or evenly spaced, and pattern is unbroken.
- .17 Steel Ladders and Cages
 - .1 Assembly: Welded construction, complete with steel stiffeners, rungs, safety cage, angle rails, bent plate straps or angle brackets.
 - .2 Cage bars: Of 50 mm x 3 mm thick steel bent to form rings, located at maximum 1200 mm centres, with first hoop located 2.1 m from floor level.
- .18 Steel Pipe Handrails
 - .1 Close open ends of steel pipe handrail with 1.9 mm (14 gauge) closure neatly welded and ground smooth.
 - .2 Pipe railing to consist of top rail and intermediate rail, and with matching vertical standards.
 - .3 Form changes in direction of railing members by mitering or inserting prefabricated flush elbow fittings.
 - .1 Form curves by bending in jigs to produce uniform curvature without buckling, flattening, twisting, cracking, or otherwise deforming exposed surfaces.
 - .4 Perform all welding and joining in shop prior to finishing.
 - .5 Assemble end-to-end connections and splice joints by using internal sleeves, bonded by epoxy adhesive or by field welding. Do not field weld.
- .19 Pipe Railings
 - .1 Fabricate the same as steel pipe handrails.
 - .2 Where railings are permanently inserted into concrete floors, Provide steel pipe sleeve of adequate size to be cast into concrete with a 3 mm thick steel plate welded to bottom and required anchor rods to ensure a securely set sleeve.
 - .3 Fabricate removable railings in sections to permit for easy removal. Provide steel sleeves into which railing uprights will be inserted. Fabricate sleeves to sliding fit over uprights and to provide adequate support.

- .20 Stainless Steel Pipe
 - .1 Thoroughly clean welds and surrounding substrate area of weld spatter, flux or scale by wire brushing, grinding and polishing.
 - .2 Remove excess weld by grinding to provide for continuous weld line. Grind, polish, and buff welds exposed to view to match finish of parent material.
- .21 Flat Bar Handrails, Pickets
 - .1 Handrails: Continuous top and bottom flat bars supporting both ends of pickets.
 - .2 Pickets: Welded to top and bottom flat bar handrails.
 - .3 Connection to stairs: Weld both sides of bottom rail continuously to top flange of stringer.
 - .4 Wall brackets: Provide for railings supported from walls.
 - .5 Handrail cap: Cover top flat bar full length with extruded plastic handrail cover. Weld all joints in vinyl.
- .22 Channel Door Frames
 - .1 Structural channel sections, selected for trueness of web and flange, with joints welded and ground smooth. Furnish (bar stop) and bent bar anchors for anchorage to masonry or concrete as required.
 - .2 Fit frames with temporary spreaders to prevent frame from springing out of shape.
- .23 Steel Frames for Miscellaneous Openings
 - .1 Connections: Connect built-up members of frames by means of plug welding. Miter or cope and join members with continuous welding beads.
 - .2 Top of frames embedded in concrete: Fabricate frames so top of frames are flush with finish floor elevation.
- .24 Pipe Bumpers and Sleeves, Pipe Guardrails
 - .1 (Removable), constructed of steel pipe sizes shown, complete with lifting hole where bumper is to be removable, and 6 mm thick plate closure welded to bottom of guard post sleeves.
 - .2 Provide properly sized steel pipe sleeves to allow easy removal of pipe bumper.
- .25 Lintels
 - .1 Weld pairs of members back to back together and in no case shall lintels be more than 25 mm less in width than wall they support.
 - .2 Extend lengths to allow 150 mm minimum end bearing on masonry. Unless otherwise shown, lintels in block walls shall be of steel furnished under this section.

.26 Toilet Partition Support Framing

- .1 Fabricate for ceiling-hung toilet partitions in washrooms with suspended ceilings. Align steel framing member with, and directly above the ceiling, over the pilasters of partitions to provide a fastening point for the pilaster. Hang the framing member from building framing above and brace the assembly against movement. Provide supplementary, concealed steel framing as required to secure the hangers and bracing in place.

.27 Lateral Supports For Masonry Walls

- .1 Minimum size 100 x 100 x 150 x 6 mm thick, steel angles along top of concrete block walls as shown. Fasten angles to structure above and space at not over 1800 mm o.c. on both sides of the walls, staggering the angles, that when combined, angles are not over 900 mm o.c.

.28 Millwork Supports and Brackets

- .1 Design, fabricate, and supply metal framing and connections in accordance with Contract Drawings for support of the following: Millwork, washroom vanities, counters, and similar items. Supply stainless steel mounting hardware, brackets, bolts, sleeves, and the like for metal supports as required. Size of members and hardware.

.29 Mechanical Equipment Fabricated Supports

- .1 Design, fabricate, and Provide supplementary steel framing to support mechanical equipment at locations and elevations in accordance with Contract Drawings.
- .2 Coordinate Work with appropriate mechanical technical Sections. Obtain dimensions and weights of equipment from reviewed Shop Drawings.

.30 Checkered plate covers: Diamond shaped raised pattern, of nominal thickness shown exclusive of raised pattern.

.31 Floor plate: Shearing, cutting, or punching shall leave clean, true lines and surfaces. Drill countersunk holes in plate where it will be bolted in place.

.32 Kickplates: Continuous, 150 mm high x 6 mm thick.

2.5 **WELDING**

- .1 Execute welding to avoid damage or distortion to the Work. Should there be, in the opinion of Consultant or inspection and testing company, doubt as to adequacy of welds, such welds shall be tested for efficiency and any Work not meeting specified standards shall be removed and replaced with new Work satisfactory to Consultant. Execute welding in accordance with the following standards:

- .1 CSA W48-M: For electrodes. If rods are used, only coated rods are allowed.
- .2 CSA W59-M: For design of connections and workmanship.
- .3 CAN/CSA-W117.2-M: For safety.

- .2 Thoroughly clean welded joints and expose steel for a sufficient space to perform welding operations. Neatly finish welds. Where exposed to view and finish painted, apply weld continuously and grind to a uniformly smooth finish.

2.6 **CLEANING, SHOP PRIMING**

- .1 Omit prime painting of miscellaneous metals that will be painted with epoxy as specified in Division 9.
- .2 Clean steel to SSPC SP3 (SP6) and remove loose mill scale, weld flux and splatter.
- .3 Shop prime with one coat of primer paint to dry film thickness of 0.025 mm. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7°C (45°F). 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.
- .4 Clean but do not paint surfaces being welded in field.
- .5 Do not paint surfaces embedded in concrete.
- .6 Do not paint surfaces in friction connections.
- .7 Treat surface of aluminum in contact with or embedded in dissimilar materials in accordance with CAN3-S157-M. Treat as if material is installed in the presence of moisture.

2.7 **HOT-DIP GALVANIZING**

- .1 Galvanize members exposed to exterior elements when in final location; members embedded on the exterior side of exterior walls; members embedded in concrete; members specified in this section or noted on Drawings.
- .2 Perform hot-dip galvanizing after fabrication. Plug relief vents air tight. After galvanizing, remove plugs, ream holes to proper size and re-tap threads. Straighten shapes and assemblies true to line and plane after galvanizing. Repair damaged galvanized surfaces with galvanize primer in accordance with manufacturer's printed directions.
- .3 Wet storage stain: Remove wet storage stain that may have developed in the coating before installation so that premature failure of the coating does not occur. Remove wet storage stain in accordance with galvanizer's recommendations.
- .4 Repair of galvanized items: Repair coatings damaged by welding, cutting, or during handling, transport or erection using cold galvanizing compound specified, and as follows:
 - .1 Ensure surface is clean, dry, and free of oil, grease and corrosion.
 - .2 Power clean surface to near white metal condition, extending into undamaged galvanized coating.
 - .3 Apply touch up material to a dry film thickness of 0.203 mm (8 mils) minimum. If touched up Work is to remain exposed in the finished Work, apply a finish coat of aluminum paint to provide a colour blend with the surrounding galvanizing.
 - .4 Coating shall be continuous, adherent, smooth and evenly distributed.

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 Stairs, Rails and Handrails
 - .1 Erect rigid and free from whip.
 - .2 Continuously weld connections for railings attached directly to steel stringers. Where rails return to wall Provide end returns and wall brackets.
 - .3 Provide temporary supports and bracing required to position stairs and landings.
 - .4 Adjust railings prior to securing in place to ensure proper matching at butting joints and correct alignment throughout their length.
 - .5 Continuously weld connections between handrails and balusters and in lengths of handrails.
 - .6 Secure wall brackets to walls with through bolts and plate where these can be concealed, otherwise use bolts and expansion shields to achieve maximum rigidity of rail. Wood plugs for fixing to walls will not be permitted. Use metal anchoring devices.
- .3 Fit door frames and jambs with temporary steel spreaders to prevent springing frames and jambs out of shape.
- .4 Weld as specified herein.
- .5 Take adequate care to prevent damage to any material such as weld burns, etc.
- .6 Include all cutting and patching of masonry walls where necessary. Obtain Contractor's approval of cutouts in advance.
- .7 Insulate where necessary to prevent electrolysis due to dissimilar metal to metal contact, or metal to masonry and concrete. Use bituminous paint, butyl tape, building paper or other approved means.
- .8 Install materials in a good and workmanlike manner, cleaning and grinding all welding laitance and touching up primer where necessary.
- .9 Erect fibre reinforced plastic (FRP) grating plumb, true, square, straight, level and accurate to size detailed, in accordance with manufacturer's printed instructions.

3.2 **CONNECTIONS**

- .1 Weld or high strength bolt main member connections. Use CISC double angle header connections wherever possible. High strength bolted connections shall be bearing type using 19 mm diameter bolts conforming to ASTM A325M. Secondary members may be bolted with machine bolts.
- .2 Perform high tensile bolted connections in accordance with CSA-S16.1. Accurately space holes of size 1.6 mm larger than the nominal diameter of the bolt. Install bearing type high tensile bolted connections unless shown otherwise on Drawings. Provide compressor or electrical equipment capable of supplying and maintaining required pressure at the wrench. Make connections without the use of erection bolts; some high tensile bolts will serve that purpose. Prevent nuts on bolts, except high tensile bolts, from becoming loose by burring bolt thread, by welding or by lock washers or lock nuts.
- .3 Execute welding as specified under shop welding in Part 2 and as follows:
 - .1 Provide continuous welds on exterior Work to provide proper weathering.

- .2 Take necessary safety precautions in accordance with CSA standards when welding is carried out in cold weather.

3.3 **FIELD TOUCH-UP**

- .1 Paint bolt heads, washers, nuts, field welds and previously unprimed items. Touch up shop primer (and galvanizing) damaged during transit and installation with material to match shop primer or galvanize coating.
- .2 Clean off dirt on installed miscellaneous metal surfaces.
- .3 Touch up all damaged surfaces of aluminum Work with one coat of zinc chromate primer.

End of Section