SECTION 05 50 00 – metal fabrications

1. GENERAL
   1. summary
      1. Supply and install all metal fabrications work indicated on drawings and not included in the work of other Sections in addition to items listed in this Section.
   2. reference standards
      1. ASTM International (ASTM):
         1. ASTM A 53/A 53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
         2. ASTM A325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
         3. ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
         4. ASTM C939, Standard Test Method for Flow of Grout for Preplaced Aggregate Concrete (Flow Cone Method).
         5. ASTM A1011/A1011M, Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with improved Formability, and Ultra-High Strength.
         6. ASTM C1107/C1107M, Standard Specification for Packaged Dry, Hydraulic Cement Grout (Non-shrink).
         7. ASTM E488 Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
      2. Canadian Standards Association (CSA):
         1. CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.
         2. CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
         3. CSA S16, Design of Steel Structures.
         4. CSA A23.1, Concrete Materials and Methods of Concrete Construction.
         5. CSA-S136, North American Specification for the Design of Cold Formed Steel Structural Members.
         6. CSA W47.1, Certification of Companies for Fusion Welding of Steel.
         7. CSA W48, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
         8. CSA W55.3, Certification of Companies for Resistance Welding of Steel and Aluminum.
         9. CSA W59, Welded Steel Construction (Metal Arc Welding) Metric.
         10. CAN/CSA-A3001, Cementitious Materials for Use in Concrete.
      3. Canadian General Standards Board (CGSB):
         1. CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.
         2. CGSB 31-GP-105Ma, Zinc Phosphate Conversion Coatings for Paint Base.
      4. Association for Materials Protection and Performance (AMPP) (formally The Society for Protective Coatings SSPC):
         1. SSPC-1 Solvent Cleaning.
         2. SSPC-2 Hand Tool Cleaning.
         3. SSPC-3 Power Tool Cleaning.
         4. SSPC-6 Commercial Blast Cleaning.
   3. SUBMITTALS
      1. Provide submittals in accordance with Section 01 33 00 – Submittal Procedures, bearing stamp or seal and signature of the Professional Engineer responsible for the design of the work of this Section.
      2. Product Data:
         1. Submit product data for grout products.
      3. Shop Drawings:
         1. Make thorough examination of drawings and details, determine the intent, extent, and materials, and be fully cognizant of requirements when preparing shop drawings.
         2. Submit shop drawings showing and describing in detail all work of this Section including large scale detail of members and materials, of connection and interfacing with work of other Sections, jointing details, and of anchorage devices, dimension, gauges, thicknesses, description of materials, metal finishing, as well as other pertinent data and information.
         3. Submit, for information only, copies of structural calculations indicating complete compliance with the specified performance requirements.

The shop drawings shall be prepared by qualified draftsmen, checked by and bearing the seal and signature of a professional engineer registered to design structures and practice in Ontario, Canada.

* + - 1. Digital files of design drawings shall not be used in the preparation of shop drawings.
      2. Review of shop drawings by the Consultant and Structural Engineer will not absolve the Contractor from his responsibility of providing materials and equipment to complete and finish Work of this Section in accordance with the architectural and structural drawings. Departures or differences from the referenced drawings shall be approved in writing by the Consultant.
  1. QUALITY ASSURANCE
     1. All Codes and Standards referred to in this Specification shall be current editions including all latest revisions and addenda.
     2. Conform to requirements of CSA-S16, Design of Steel Structures and CAN/CSA-S136, Cold Formed Steel Structural Members.
     3. Work of this Section to be executed by firm thoroughly conversant with laws, by-laws and regulations which govern, and capable of workmanship of best grade of modern shop and field practice known to recognized manufacturer's specializing in this work.
     4. The firm shall have completed metal fabrications on a minimum of three projects similar in material, design, and extent to that indicated for this Project in the last 5 years that have a record of successful in-service performance.
     5. Work of this Section shall be executed by workers especially trained and experienced in this type of work. Have a full time, senior, qualified representative at the site to direct the work of this Section.
     6. The work of this Section shall be designed by a professional engineer licensed to design structures and registered in Ontario, Canada.
     7. Structural Performance:
        1. Counter Tops and Vanities: Provide countertop and vanity framing capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections, or of exhibiting excessive deflections in any of the components making up the countertops and vanities:
        2. All deadloads.

500-pound live load placed on the countertop and vanity.

Deflection at Midspan:

Solid Surfacing: L/360 times span or 1/4 inch, whichever is less.

* + - 1. Shelf angle deflection shall be sized and anchored to carry the imposed loads such that total deflection is limited to the lesser of 1/600 or 0.3 inch and rotations are less than 1/16 inch.
      2. Tube Framing for Partial Height Walls: Provide tube framing for partial height walls capable of withstanding a deflection not to exceed L/720 of the wall height when subjected to a positive and negative pressure of 5 psf.
      3. Ceiling-Hung Toilet Compartments Overhead Coiling Doors: Fabricate and install support framing capable of supporting all deadloads and withstanding live loads imposed from functioning operations.
      4. Other Overhead Anchored Fabrications: Fabricate and install framing as required to sustain imposed loads and to limit deflections to L/720 between hangers.
      5. Support Framing for decorative items: Provide framing for partial height items, full height items, floor to ceiling anchored items, and other items within 48 inches of the floor should be capable of withstanding a deflection not to exceed L/720 of the height when subjected to a positive and negative pressure of 5 psf (239 Pa.)
    1. Exterior Metal Fabrications: All exterior metal fabrications shall be fabricated and installed to prevent buckling, opening up of joints and overstressing of welds and fasteners under the following temperature conditions:
       1. Base fabrication on a temperature of +70 deg F at time of installation with allowance made for an exposed metal surface temperature range of -20 deg F to +180 deg F. Make all necessary adjustments and provisions for concealed expansion.
    2. Architectural metals work shall be of the highest architectural quality, free of scratches, pitting, roughness, marring, discolouration, staining and other imperfections.
  1. DELIVERY, STORAGE AND HANDLING
     1. Coordinate deliveries to comply with construction schedule and arrange ahead for strategic off the ground, under cover storage locations. Do not load any area beyond the design limits.
     2. Adequately protect and crate all components against damage, dirt, disfigurement and weather during delivery and storage. Damaged materials shall not be used and shall be replaced by approved material.
     3. Cover and protect the work of other Sections in the area of work from damage. Make good all damage to the satisfaction of the Consultant.
     4. Protect the installed work of this Section and on completion the work shall be examined, and damage shall be remedied to the complete satisfaction of the Consultant.

1. products
   1. metals, general
      1. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
   2. FERROUS METALS
      1. Structural Steel Sections and Steel Plate: New stock (not weathered or rusted); to conform to CAN/CSA-G40.21, Grade 300W (44W) and Grade 350W (50W) for wide flange shapes.
      2. Hollow Structural Sections (HSS): New stock; to conform to CAN/CSA-G40.21, Grade 350W (50W), Class C, stress relieved.
      3. Sheet Steel (Structural Quality): Conforms to ASTM A1011/A1011M.
      4. Sheet Steel (Commercial Quality): Conforms to ASTM A653/A653M, stretcher levelled, or temper rolled.
      5. Galvanized Sheet Steel (Commercial Quality): Galvanized coating G90 (Z275) in accordance with ASTM A653/A653M, minimized spangle, stretch levelled or temper rolled. Specially treat by phosphate conversion process conforming to CGSB 31-GP-105Ma ready to receive prime paint finish.
      6. Steel tubing: to CAN/CSA G40.20-04/G40.21, [square] [rectangular] [round] wall thickness, sizes and dimensions as indicated.
      7. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) minimum, unless otherwise indicated or required to satisfy the performance requirements; finish as follows:
      8. Black finish, unless otherwise indicated.
      9. Galvanized finish for exterior installations and where indicated.
      10. Slotted Channel Framing: Cold-formed metal channels with continuous slot and with flanged edges returned toward web complying with MFMA-4 and fabricated from steel complying with ASTM A 1011/A 1011M. Width, depth, and metal thickness as required to suit performance requirements.
      11. Welding materials: to CSA W59.
      12. Welding electrodes: to CSA W48 Series.
      13. Metal Filler: Polyester based type.
   3. paint
      1. Shop Applied Structural Steel Primer: Steel Spec Universal Primer (B50RV6227 Red), by Sherwin Williams Company of Canada Ltd., or approved equal. Apply a minimum of 2 mils dft./coat. Grey coloured primer is acceptable.
      2. Refer to Section 09 91 23 – Interior Painting, and coordinate with the above.
      3. Touch-up Primer (On Site): Procryl Universal Acrylic Primer by Sherwin Williams Company of Canada Ltd. or approved equal. Touch-up primer shall be no less than 3 mil dft.
      4. Refer to Section 09 91 23, and coordinate with the above.
      5. Zinc Rich Paint For Touch-up of Galvanized Metals: Ready mixed, zinc-rich primer conforming to CAN/CGSB-1.181-99, Sealtight Galvafroid Zinc-Rich Coating by W.R. Meadows of Canada Limited or Zinc Clad No. 5 Organic Zinc Rich Primer by Sherwin Williams Company of Canada Ltd. or approved equal.
      6. Isolation Coatings and Tapes:
      7. Isolation Coating: Acid and alkali resistant bituminous paint complying with ASTM D 1187 or CAN/CGSB-1.108, Type 2.
         1. Butyl Tape: Extruded, high grade, macro-polyisobutylene tape of size, width, and shore hardness to suit conditions.
   4. fasteners
      1. Bolts: Complying to ASTM A307 zinc plated with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 for interior use and Class Fe/Zn 12 for exterior use. Select fasteners for type, grade, and class required.
      2. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
      3. Interior Expansion Anchor Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
         1. Exterior Expansion Anchor Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).
   5. grout
      1. Non-Shrink Grout: Premixed, high strength, maximum bearing, impact resistant, non-shrink non-metallic aggregate grout having minimum 76 Mpa 28-day compressive strength and conforms to ASTM C939 and ASTM C1107/C1107M, 'Embeco Premixed Grout' by Master Builders Technologies Ltd., or 'Tartan Grout Iron' by Webster & Sons Ltd., or 'Sika Grout 212 HP' by Sika Canada Inc.
   6. CONCRETE FILL
      1. Concrete Materials and Properties: Comply with CAN/CSA-A3001 and composed of Type GU (General Use) Normal Portland cement, sand and coarse aggregates complying with CSA A23.1 and potable water to produce a low slump mix suitable for placement. Grade coarse aggregate from 1/8-inch (3 mm) with at least 95 percent passing a 3/8 inch (10 mm) sieve and not more than 10 percent passing a No. 8 sieve. Fill shall be proportioned to provide a minimum 28-day compressive strength of 3000 psi (20 MPa).
   7. FABRICATION, GENERAL
      1. Fit and assemble work in shop where possible. Execute work according to details and reviewed shop drawings.
      2. Take measurements at the building for work which is to fit or be connected to steel or concrete before commencing fabrication.
      3. Where shop fabrication is not possible, make trial assembly in shop.
      4. Do all welding in accordance with requirements of CSA W59, CSA W55.3 and CSA W47.1 including all supplements. Grind welds smooth and flush with surface of parent metal, where exposed to view and where specifically indicated on drawings. Welds shall be continuous seam welds unless specified otherwise. Maintain sharp arises.
      5. Fit joints and intersecting members accurately in true planes, square, plumb, straight with tight joints and intersections.
      6. Provide adequate reinforcing, fastenings, anchors, accessories required for fabrication and erection of work of this Section. Such items occurring on or in an exterior wall or slab shall be hot dip galvanized. Make thread dimensions such that nuts and bolts will fit without rethreading or chasing threads.
      7. Fabricate, drill, and tap members to accommodate attachments, anchorage and work of other Sections where located and directed by them.
         1. Shear and punch metals cleanly and accurately. Remove burrs.
      8. Fabricate joints that will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.
      9. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
      10. Exposed steel surfaces shall be smooth and free from imperfections such as warping, buckling, weld marks, burrs, rust, and scale.
      11. Make exposed metal fastenings and accessories of same material, texture, colour, and finish as base metal on which they occur unless otherwise shown or specified. Keep exposed fastenings to an absolute minimum evenly spaced and neatly laid out. Make fastenings of permanent type unless otherwise indicated.
      12. Hot dip galvanizes all exterior ferrous metal fabrications embedded in concrete. Hot dip galvanizes all other items where specified or shown.
          1. Exterior ferrous metal fabrications are defined as those items which are indicated to be installed in areas exposed to conditions which are not controlled by the building heating and cooling systems.
          2. Interior ferrous metal fabrications are defined as those items which are indicated to be installed in areas exposed to conditions which are controlled by the building heating and cooling systems.
   8. LOOSE BEARING AND LEVELING PLATES
      1. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
      2. Galvanize exterior plates after fabrication, prime paint interior plates after fabrication.
   9. LOOSE STEEL LINTELS
      1. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Furnish a minimum of 1 angle for each masonry wythe; provide two (2) angles at all openings in 8-, 10- and 12-inch masonry walls and partitions. Unless otherwise indicated on the structural drawings furnish loose steel lintels as follows:

**Masonry Wall and Partition Thickness (inches)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Max. Opening | 4 | 6 | 8 | 10 and 12 |
| Width (Feet) | 3-1/2 x 3-1/2 x 1/4 | 5 x 5 x 5/16 | 3-1/2 x 3-1/2 x1/4 | 8 x 4 x 1/2 |
| 2 | 3-1/2 x 3-1/2 x 1/4 | 5 x 5 x 5/16 | 3-1/2 x 3-1/2 x1/4 | 8 x 4 x 1/2 |
| 3 | 3-1/2 x 3-1/2 x 1/4 | 5 x 5 x 5/16 | 3-1/2 x 3-1/2 x1/4 | 8 x 4 x 1/2 |
| 4 | 3-1/2 x 3-1/2 x 1/4 | 5 x 5 x 5/16 | 3-1/2 x 3-1/2 x1/4 | 8 x 4 x 1/2 |
| 5 | 3-1/2 x 3-1/2 x 1/4 | 5 x 5 x 5/16 | 3-1/2 x 3-1/2 x1/4 | 8 x 4 x 1/2 |
| 6 | 3-1/2 x 3-1/2 x 1/4 | 5 x 5 x 5/16 | 3-1/2 x 3-1/2 x1/4 | 8 x 4 x 1/2 |
| 7 | 3-1/2 x 3-1/2 x 1/4 | 5 x 5 x 5/16 | 3-1/2 x 3-1/2 x1/4 | 8 x 4 x 1/2 |
| 8 | 4 x 3-1/2 x 1/4 | 5 x 5 x 5/16 | 4 x 3-1/2 x1/4 | 8 x 4 x 5/8 |

* + 1. Weld adjoining members together to form a single unit where indicated.
       1. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches (200 mm), unless otherwise indicated.
       2. Galvanize loose steel lintels located in exterior walls. Prime paint loose steel lintels located in interior walls.
  1. steel ladders
     1. General: Fabricate ladders for locations shown, with dimensions, spacings, details, and anchorages as indicated.
        1. Comply with the following standards:

ANSI A14.3, unless otherwise indicated.

For elevator pit ladders, comply with ASME A17.1.

OSHA 1910 Series Walking-Working Surfaces and Fall Protection Standards.

OSHA 1910.66 for fall protection.

OSHA 1910.28 for fixed ladders.

* + 1. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges, spaced 16 inches apart.
    2. Bar Rungs: 3/4-inch diameter steel bars, spaced 12 inches o.c.
    3. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
    4. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets. Size brackets to support design loads specified in ANSI A14.3.
    5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
    6. Fixed Ladder Safety System: Flexible cable system consisting of a top and bottom bracket acting as anchors for steel cable running the length of the climbing area, automatically following user during climb, and locking on cable in the event of a fall; welded to ladder.
       1. Manufacturer: Subject to compliance with requirements, provide LadSaf by DIA-SALA or comparable by one of the following:

Guardian Fall Protection.

Honeywell Miller, Honeywell Industrial Safety.

* + - 1. Ladder Style: Straight.
    1. Galvanize exterior ladders; prime paint interior ladders.
  1. ladder safety cages
     1. General: Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or riveting.
     2. Primary Hoops: 5/16 by 4-inch steel flat bar hoops. Provide at tops and bottoms of cages and spaced not more than 20 feet o.c.
     3. Secondary Intermediate Hoops: 5/16 by 2-inch steel flat bar hoops, spaced not more than 48 inches o.c. between primary hoops.
     4. Vertical Bars: 5/16 by 2-inch steel flat bars secured to each hoop, spaced approximately 9 inches o.c.
     5. Fasten assembled safety cage to ladder rails and adjacent construction by welding or riveting, unless otherwise indicated.
     6. Galvanize exterior ladder safety cages, prime paint interior ladder safety cages.
  2. SHELF ANGLES
     1. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide machined horizontally slotted holes to receive 3/4-inch (19 mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
     2. Provide joint gaps in angles where control and expansion joints in exterior cladding skin are shown or required. Size joint gaps to match width of the masonry joints in the location of use. Provide joints in other locations, as required for fabrication only, with tight joints.
     3. Provide units at corners and other transitions fabricated into one piece.
     4. Galvanize shelf angles to be installed in exterior walls.
  3. MISCELLANEOUS FRAMING AND SUPPORTS
     1. General: Provide steel framing and supports indicated and as necessary to complete the Work and which are not a part of the structural framework, including but not limited to framing and supports for overhead rolling doors, countertop and vanities, ceiling hung toilet compartments, ceiling hung televisions and cameras, tube framing for partial height walls, and mechanical and electrical equipment.
     2. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
     3. Framing for Ceiling Hung Toilet Compartments: Provide framing for ceiling hung toilet compartments, coordinated with the partitions, and including provisions for partition anchorage as required to sustain imposed loads and to limit deflections to L/360 between hangers, fabricated from the following.
     4. Structural Steel Shapes, Plates and Bars: ASTM A 36/A 36M.
        1. Modular Structural Framing System: Modular, structural quality steel pre-formed "U" channel framing system with continuous open slot prepared to receive attachment nuts, bolts, straps, threaded rods, beam clamps, hanger rods support brackets and other accessories. Provide manufacturer's standard corrosion resistant finish.
        2. Provide steel rods, 1/2 inch diameter, spaced not more than 36 inches o.c. Thread rods to receive anchor and stop nuts. Fit hangers with wedge shape washers for full bearing on sloping flanges of support beam.
        3. Coordinate installation with toilet compartment manufacturer's written instructions and recommendations.
     5. Countertop and Vanity Framing: Custom fabricate countertop and vanity framing, using steel shapes and plates, and cold finished mild steel bars at exposed conditions, for support framing and plywood, to the thicknesses, sizes and shapes shown, and as required to produce work of adequate strength and durability, without objectionable deflections. Use proven details of fabrication, as required, to achieve proper assembly and alignment of the various components of the work.
     6. Galvanize miscellaneous framing and supports at exterior locations; prime paint miscellaneous framing and supports at interior locations.
  4. MISCELLANEOUS STEEL TRIM
     1. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.
     2. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c., unless otherwise indicated.
     3. Surface Applied Corner Guards: Provide corner guards fabricated from angles of sizes shown, or if not shown, of minimum 4-1/2 inch by 4-1/2 inch by 1/4-inch-thick equal leg angles. Drill and countersink legs of angles, for fastening to substrates indicated, with holes spaced 24 inches on center. Provide corner guard lengths of 42 inches, if not otherwise indicated.
     4. Cast-In Pit Angles and Edge Angles: Provide edge angles at exterior platforms and elsewhere where indicated, and pit angles where indicated, fabricated from angles of size as shown, or required, with welded-on stud anchors spaced 24 inches on center. Provide pit and edge angles in as long lengths as possible. Miter and weld corners and provide splice plates for alignment between sections.
     5. Galvanize exterior miscellaneous steel trim, prime paint interior miscellaneous steel trim.
  5. STRUCTURAL-STEEL DOOR FRAMES FOR OVERHEAD COILING DOOR OPENINGS
     1. Fabricate steel door frames from structural channel shapes of size and to dimensions indicated (16 by 38 mm). Continuously weld exposed joints. (250 mm)
     2. Provide steel anchors, (3 by 50 mm) with a minimum 6 inch (150 mm) embedment (50 mm)unless otherwise indicated, for securing door frames into adjoining new masonry. Weld anchors to frame jambs no more than 12 inches (300 mm) from both bottom and head of frame, and space anchors not more than 30 inches (750 mm) apart.
     3. At existing concrete or masonry construction, set frames and secure in place with machine screws and expansion anchorage devices. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
     4. Door frames at sound control partitions shall be fully grouted at masonry walls and packed with mineral fiber insulation at steel stud framed partitions.
     5. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.
     6. Galvanize exterior frames, prime paint interior frames.
  6. EXTRUDED NOSINGS
     1. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions. For poured in place concrete stairs nosings shall terminate not more than 3 inches (75 mm) from ends of steps. Provide extruded-aluminum units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder.
     2. Provide solid-abrasive-type units without ribs.
     3. Configurations: Provide units in the following configurations, unless otherwise indicated:
        1. Nosings: One -piece units, 3/4 inches (75 mm) wide, for casting into concrete steps.
        2. Provide integral anchors for embedding units in concrete.
     4. Apply clear lacquer to concealed bottoms, sides, and edges of units set into concrete.
     5. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        1. American Safety Tread Co., Inc.
        2. Basis of Design: CT-22/34A; KN Crowder Mfg. Inc.
        3. Schluter Systems.
  7. PIPE BOLLARDS
     1. Fabricate pipe bollards from 200 mm diameter Schedule 80 steel pipe.
     2. Fabricate bollards with 3/8 inch (10 mm) thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch (19 mm) anchor bolts.
        1. Galvanize bollards after fabrication.
  8. SHOP PAINTING
     1. Galvanizing: Hot dip galvanize items as indicated to comply with applicable standard listed below:
        1. ASTM A 123/A 123M, for galvanizing steel and iron products.
        2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
     2. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces by removing oil, grease, and similar contaminants in accordance with SSPC-SP 1 "Solvent Cleaning," followed with the SSPC surface-preparation specifications listed below and environmental exposure conditions of installed metal fabrications. Surface preparation shall be done after fabrication and immediately prior to shop painting. Apply shop coat of paint within 4 hours after cleaning and before rust bloom occurs.
        1. As per SSPC 2 Hand Tool Clean and SSPC1 Solvent Clean, clean welds by wire brushing and wash down with clean water, to remove the chemical residues left by the electrodes, prior to painting.
        2. Prepare steel as per SSPC 3 Power Tool Cleaning for Interior or SSPC 6 Commercial Blast Cleaning for exterior members. Remove rust, mill scale, oil, dirt, and other foreign matter before commencing shop painting.
     3. Apply shop coat of primer to all surfaces except those with galvanized finishes and areas requiring field welding. Apply by brush, working paint well into surfaces, interstices and cavities. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.
        1. Primer is to be free of runs, sags, or other collections of primer due to dipping of members into primer.
        2. Steel work shall be painted under cover, and shall remain under cover, until the paint protection is dry.
        3. Prime steel with two full coats of paint, each with a minimum 2.0 dry film thickness (DFT) in strict accordance with paint manufacturer's directions. Apply paint thoroughly and evenly to dry surfaces, free from holidays and pinholes, in accordance with manufacturer's directions.
        4. Give the parts which are inaccessible after assembly two coats of primer coat paint of different colours, when members are noted to be painted.

1. execution
   1. general
      1. Verify at site that the Work to receive the work of this Section is free of irregularities detrimental to the installation and performance of the work and that it is located correctly and at proper levels before delivery and installation.
      2. Erection: To meet specified requirements of CAN/CSA-S16.
      3. Anchors: Anchors to structural concrete shall be approved inserts set into concrete or approved self-drilling expansion insets drilled and placed afterwards.
   2. INSTALLATION, general
      1. Assemble and erect work plumb, true, square, straight, level and accurate to sizes detailed, to reviewed shop drawings, free from distortion and defects detrimental to appearance and performance.
      2. Isolate metals where necessary to prevent corrosion due to contact between dissimilar metals and between metals and masonry, concrete or plaster. Use bituminous paint or butyl tape.
      3. Supply adequate instructions, templates, and if necessary, supervise installation of the fastenings or accessories requiring to be built-in by other Sections of the Work.
   3. ERECTION - GENERAL
      1. Do welding work in accordance with CSA W59 unless specified otherwise.
      2. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
      3. Provide suitable means of anchorage acceptable to Consultant such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles. Drill holes for bolts to the exact diameter of the bolt. Provide screws threaded full length to the screw head.
      4. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
      5. Supply components for work by other trades in accordance with shop drawings and schedule.
      6. Make field connections with bolts to CSA S16 or field weld in accordance with CSA W59.
         1. Quality of Weld Workmanship:

At concealed connections: No improvement from mill finishes, except preparation necessary for priming is required. Welds are not required to be ground.

At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness, pits, mill marks, nicks, or scratches shows after finishing and contour of welded surface matches that of adjacent surface. Defects and distortions shall not be visible to the eye nor show through painted or polished surfaces.

* + 1. Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.
    2. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
  1. SETTING BEARING AND LEVELING PLATES
     1. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.
     2. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
     3. Use non-shrink grout, either metallic or non-metallic, in concealed locations where not exposed to moisture; use non-shrink, non-metallic grout in exposed locations, unless otherwise indicated.
     4. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
  2. INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS
     1. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.
     2. Ceiling Hung Toilet Partitions: Anchor supports securely to, and rigidly brace from, overhead building structure.
     3. CMU Partition Head Supports: Unless otherwise indicated place partition head supports on alternate faces of CMU partitions every 6'-0" o.c. and expansion bolt to underside of structure. Do not bolt to CMU partitions.
  3. INSTALLING NOSINGS
     1. Install with anchorage system indicated to comply with manufacturer's written instructions.
     2. Center nosings on tread widths.
     3. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.
  4. INSTALLING PIPE BOLLARDS
     1. Anchor bollards to existing construction with post-installed anchors and bolts. Provide four 3/4-inch (19 mm) anchors at each bollard, unless otherwise indicated. Embed anchors at least 4 inches (100 mm) in existing concrete.
     2. Fill bollards solidly with concrete, mounding top surface.
  5. ADJUSTING
     1. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
     2. Apply by brush or spray to provide a minimum 2.0 mil (0.05 mm) dry film thickness.
     3. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
  6. PROTECTION
     1. Protect installed products and components from damage during construction.
     2. Repair damage to adjacent materials caused by metal fabrications installation.

end of section