

METAL FABRICATIONS

Part 1 General

1.1 SECTION INCLUDES

- .1 Supply and installation of materials and components for metal fabrications, including the following:
 - .1 Steel platform benches.
 - .2 Galvanized steel components for feature art wall.
 - .3 Galvanized steel metal paver edge.
 - .4 Finishes and shop applied coatings.
 - .5 Miscellaneous metal components indicated on drawings and specified herein.

1.2 RELATED WORK

- .1 Section 01 33 00 – Submittals
- .2 Section 01 45 00 – Construction Quality Control
- .3 Section 03 10 00 – Concrete Formwork
- .4 Section 03 30 00 – Cast-in-Place Concrete
- .5 Section 06 15 01 – Timber and Woodwork
- .6 Section 32 14 40 – Landscape Stone
- .7 Section 32 33 00 – Exterior Site Furnishings
- .8 Refer to structural drawings and notes

1.3 REFERENCES

- .1 All referenced standards shall be the current edition or edition referenced by the Ontario Building Code currently in force.
- .2 Ontario Provincial Standard Specifications (OPSS)
 - .1 [OPSS.MUNI 904](#), Construction Specification for Concrete Structures
- .3 CSA Group (CSA):
 - .1 [CSA G40.20/G40.21-13](#), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
 - .2 [CSA G164-18](#), Hot Dip Galvanizing of Irregularly Shaped Articles
 - .3 [CSA S16-19](#), Design of Steel Structures
 - .4 [CSA W47.1-19](#), Certification of companies for fusion welding of steel
 - .5 [CSA W48-23](#), Filler Metals and Allied Materials for Metal Arc Welding
 - .6 [CSA W55.3-08](#), Certification of companies for resistance welding of steel and aluminum

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- .7 [CSA W59-18](#), Welded Steel Construction
- .4 Canadian General Standards Board (CGSB)
 - .1 [CAN/CGSB-1.181-99](#), Ready-Mixed Organic Zinc-Rich Coating.
- .5 American Society for Testing and Materials International (ASTM)
 - .1 [ASTM A53/A53M-22](#), Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - .2 [ASTM A90/A90M-21](#), Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
 - .3 [ASTM A123/A123M-17](#), Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - .4 [ASTM A153/A153M-16a](#), Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - .5 [ASTM A240/A240M-23](#), Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - .6 [ASTM A269/A269M-15a](#), Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
 - .7 [ASTM A276-13a](#), Standard Specification for Stainless Steel Bars and Shapes
 - .8 [ASTM A307-21](#), Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
 - .9 [ASTM A314-23](#), Standard Specification for Stainless Steel Billets and Bars for Forging
 - .10 [ASTM A380/A380M-17](#), Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems
 - .11 [ASTM A480/A480M-23](#), Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
 - .12 [ASTM A500/A500M-20](#), Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Round Shapes
 - .13 [ASTM A554-21](#), Standard Specification for Welded Stainless Steel Mechanical Tubing
 - .14 [ASTM A555/A555M-22](#), Standard Specification for General Requirements for Stainless Steel Wire and Wire Rods
 - .15 [ASTM A641/A641M-09a](#), Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
 - .16 [ASTM A653/A653M-22](#), Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .17 [ASTM A780/A780M-20](#), Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

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- .18 [ASTM A787/A787M-20a](#) – Standard Specification for Electric-Resistance-Welded Metallic-Coated Carbon Steel Mechanical Tubing
- .19 [ASTM F3125/F3125M-22](#), Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength
- .6 Nickel Institute, Tel. 416-591-7999, Contact: Jack McGurn, Email jmcgurn@nidi.org.
- .7 American Iron and Steel Institute (AISI)
 - .1 Steel Product Manual; Stainless and Heat Resisting Steel, current edition
- .8 International Organization for Standardization (ISO):
 - .1 ISO 12944, Corrosion Protection of Steel Structures by protective paint system
- .9 The Master Painters Institute (MPI):
 - .1 Architectural Painting Specification Manual (ASM), current edition
 - .2 Approved Products List (APL), current edition
- .10 Reference Documents:
 - .1 Appendix A - Arborist Report, Macpherson Avenue Park, Urban Forest Innovations Inc., April 23, 2025
 - .2 Appendix B - Soil and Groundwater Management Plan – Davenport Lands (Parcel 28B, 29 and 30, WSP, July 2024
 - .3 Appendix C - Contaminant Health and Safety Plan – 28B, 29 and 30 Green Line Trail, WSP, July 2024
 - .4 Appendix D - City of Toronto Tree Protection Policy and Specifications for Construction Near Trees, July 2016
 - .5 Appendix E – Geotechnical Investigation for Macpherson Avenue Park, October 31, 2022
 - .6 Appendix F – Hydro One General Conditions for Secondary Land Uses, Hydro One, January 2023
 - .7 Appendix G -General Requirements for Construction Work by External Parties in the Vicinity of Hydro One 115,000 and 230,000 Volt Underground Plant, Hydro One, January 2024

1.4 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Action Submittals: Submit the following before starting work of this Section:
 - .1 Product Data: Submit product data for each type of manufactured material and product indicated. Include product characteristics, performance criteria, physical size, finish and limitations in use,
 - .2 Submit manufacturer's available range of colours for specified powdercoating finish.

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- .3 Shop Drawings: Submit electronic shop drawings for Contract Administrator review, prior to fabrication.
 - .1 Shop drawings shall include plans, sections and large-scale details, and shall indicate components and methods of assembly, materials and their characteristics, fastenings, metal finishes, welds, and their structural characteristics relative to their purpose, and other fabrication information required.
 - .1 Digital artwork file for platform bench graphics and feature art wall street tag plaques to be provided by the Contract Administrator for the preparation of shop drawings and mock-ups.
 - .2 Shop Drawings shall be coordinated with other appropriate Sections of the specifications to ensure proper scheduling for fabrication and installation of the work specified herein.
 - .3 Indicate proposed site connections and methods.
 - .4 Indicate metal finishes.
 - .5 Indicate grain direction for stainless steel work.
 - .6 Shop drawings for work of this Section shall bear seal of qualified Professional Engineer licensed to practice in the Province of Ontario.
 - .7 Alternative details may be considered by the Contract Administrator. Full details of any alternatives to be shown on shop drawings.
 - .8 Submit design calculations for work of this Section bearing the seal of qualified Professional Engineer licensed to practice in the Province of Ontario.
- .4 Samples for initial selection:
 - .1 Submit samples of powdercoated metal for platform bench with specified colour.
 - ~~.1 Allow up to 3 additional colour variations for Contract Administrator's initial selection.~~
 - .1 Samples shall be 50mm x 50mm or manufacturer's standard colour chip.
 - .2 Submit a sample of metal for feature art wall street tag plaque demonstrating each specified finish and paint colours.
 - .1 Allow up to 3 additional colour variations for Contract Administrator's initial selection.
 - .2 Samples shall be 50mm x 50mm or manufacturer's standard colour chip.
 - .3 Submit a 300 x 300 section of galvanized welded wire mesh for feature art wall.
 - .1 Submit sample concurrently with submission of feature art wall stone and glass samples required under Section 32 14 40 – Landscape Stone.
- .5 Samples
 - .1 Submit a 300x300mm section of powdercoated steel demonstrating green colour with painted white lettering. Sample to capture letters 'GRE' for review of size, finish and colour.



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- .2 Submit one street tag plaque demonstrating metal finish, paint colour, welds and laser etched text.
- .3 Submit a 300mm section showing welds and material finishes for the following:
 - .1 HSS structural frame for the Wood Platform Bench
 - .2 Galvanized Steel Metal Paver Edger
- .3 Informational Submittals: Submit the following submittals during the course of the Work:
 - .1 Mock-ups:
 - .1 Construct a full-size mock-up of the wood platform bench demonstrating the metal frame, front panel and supports and wood slats and fasteners as well as all other metal components.
 - .1 Coordinate the mock-up with requirements of Section 06 15 01 – Timber and Woodwork.
 - .2 Construct mock-up at Metal Fabricators shop. Accepted Mock-ups may be retained as part of final installation work at the discretion of the Contract Administrator. Acceptance of workmanship shall establish a basis for acceptance of remainder of work.
 - .2 Construct a full-size mock-up of one panel of the feature art wall, including posts, frame, mesh, internal panels, street tag plaques as well as all other metal components.
 - .1 Construct mock-up at Metal Fabricators shop. Accepted Mock-ups may be retained as part of final installation work at the discretion of the Contract Administrator. Acceptance of workmanship shall establish a basis for acceptance of remainder of work.
 - .3 The purpose of the mock-ups is to evaluate the proposed details and to assess the fabricator's workmanship.
 - .4 Mock-ups shall be modified as many times as necessary to obtain acceptance by the Contract Administrator. Proceed with fabrication work only upon acceptance of Contract Administrator.
 - .5 When accepted, mock-ups shall demonstrate the minimum standard for the Work.

1.5 QUALITY ASSURANCE

- .1 Execute Work only by company with adequate plant, equipment, and skilled workers to perform Work expeditiously, having been responsible for a high standard of workmanship in similar installation to that specified using architectural metals during a period of at least the immediate past 5 years. Specialized experience and capabilities are mandatory for work indicated herein. Capability in managing fine detailing will be required with respect to the following:
 - .1 Accuracy of metalwork
 - .2 Neatness of workmanship
 - .3 Hairline joinery
 - .4 Possessing proper equipment and know-how for the work

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- .5 Possessing keen understanding of cleanliness of shop, tools, methods, cleaning, blasting, and brushing work, so as to finish work with clean, consistent finishes free of staining.
- .2 All materials, components and workmanship to conform to building and local by-laws. Contractor to obtain all necessary permits and approvals.
- .3 Weld structural components in steel, to conform to requirements of CSA Standard W59-M, and by a fabricator fully certified by the Canadian Welding Bureau to conditions of CSA Standard W47.1 and W55.3, and other current applicable standards.
- .4 Manufacturer's Qualification: Powdercoating manufacturer shall regularly engage, for at least 10 years in manufacturing shop-applied coating systems of similar type and for similar projects to that specified
- .4.5 Verify proposed grading conditions and coordinate for accuracy prior to fabrications of all metal components



1.6 DESIGN REQUIREMENTS

- .1 Design Work of this Section by qualified Professional Engineer registered in the Province of Ontario and covered by a minimum \$1,000,000 professional liability insurance.
- .2 Design, fabricate, and install in accordance with the building code and requirements of all other governing authorities.
- .3 Exterior metal fabrication items shall be designed to withstand expansion and contraction of the component parts at an ambient temperature range of 80°C without causing harmful buckling, opening of joints, overstressing of fasteners, or other harmful effects.
- .4 Design, fabricate, and install in accordance with the building code and requirements of all other governing authorities.
- .5 Design assemblies and connections to withstand own dead load, super-imposed dead loads, and fabrication forces, without permanent distortions or deformation.
- .6 Design assemblies and connections to withstand own dead load, super-imposed dead loads, and fabrication forces, without permanent distortions or deformation, to maximum allowable deflection of L/360, within the following construction tolerances.
 - .1 Maximum variation from plumb in vertical lines: 3.2 mm (1/8") in 3 m (10 ft).
 - .2 Maximum variation from level: 3.2 mm (1/8") in 9 m (30 ft).
 - .3 Maximum variation from straight: 3.2 mm (1/8") in 3 m (10 ft.) under a 3 m (10 ft.) straight edge.
 - .4 Maximum variation from angle indicated: 10 seconds.

1.7 COORDINATION

- .1 Coordinate the work in this Section with other appropriate Sections of the specifications to ensure proper scheduling for fabrication and installation of the work specified herein.
- .2 Field measurements:
 - .1 Verify dimensions in the field prior to fabrication to assure proper fit. Perform Work to suit site dimensions and conditions.

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- .2 Detailed field measurements of structure dimensions and anchorage locations shall be undertaken prior to any fabrication. The Contractor shall adjust any dimensions on the drawings as necessary to ensure proper fit.
- .3 Provide cut-outs, templates, anchors, inserts, and other accessories which are required for coordination of work of other trades including, but not limited to, precast concrete, and as indicated on Drawings.
- .4 Be responsible for extra Work caused by, and time lost as a result of failure to provide necessary cooperation, information or items to be fixed to or built in, in adequate tune as determined by the project.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Store products in manufacturer's unopened packaging until ready for installation.
- .2 Label, tag or otherwise mark Work supplied for installation by other Sections to indicate its function, location in project and shop drawing designation.
- .3 Protect Work from damage during delivery, storage and handling. Handle with fabric slings, store and transport on non-staining wood blocking. Protect against scuffing during shipment.
- .4 Store products according to manufacturer's recommendations. Leave products wrapped or otherwise protected and under clean and dry storage conditions until required for installation.
- .5 Deliver Work to location designated by the Contractor and to meet requirements of construction schedule.
- .6 Exercise care not to scratch, mark, dent, or bend metal components during delivery, storage, and installation.

1.9 PROJECT CONDITIONS

- .1 Verify actual site dimensions by field measurements before fabrication; show recorded measurements on shop drawings.
- .2 Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.10 WASTE MANAGEMENT

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Divert unused metal materials from landfill to metal recycling facility.

1.11 SITE REVIEW

- .1 Professional Engineer responsible for the production of the shop drawings and design calculations shall provide periodic site review during fabrication and installation and shall submit periodic site review reports.
- .2 Include cost of shop and field review.

1.12 WARRANTY

- .1 Warrant labour, materials and workmanship against defects and deficiencies for a period of 2 years from date of Substantial Performance of the Work.

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Part 2 Products**2.1 MATERIALS - GENERAL**

- .1 Include materials, products, accessories, and supplementary parts necessary to complete assembly and installation of Work of this Section.
- .2 Incorporate only metals that are free from defects which impair strength or durability, or which are visible. Install only new metals, and free from scratches, surface contaminants, rust, waves, buckles, and that are clean, straight, and with sharply defined profiles.
- .3 Be responsible for structural design, member sizes, arrangement, supports, connections, and anchoring of Work of this Section. Coordinate and maintain materials, dimensions, layout and appearance.

2.2 STEEL

- .1 Steel, structural shapes, plate, bars: hot-rolled, to meet specified requirements of CAN/CSA-G40.21, Steel plates to be Universal Mill Plates Grade 300 W.
- .2 Steel, hollow structural sections: hot-formed, seamless, to meet specified requirements of CAN/CSA-G40.21, Grade 350W, Class H.
- .3 Steel, sheet: cold rolled, stretcher levelled, fully pickled, to meet specified requirements of ASTM A366 or SAE Specification 1010.
- .4 Steel Pipe: ASTM A53, Type E or S, Grade A or B, standard weight, Schedule 40 seamless black or AISI MT 1010/1015, or acceptable alternative.

2.3 GALVANIZED STEEL

- .1 Hot Dip Galvanizing: to ASTM A123/A123M-17, minimum zinc coating of 600 g/m², Coating Grade 85.
- .2 Fabricate steel to be galvanized in accordance with ASTM A123/A123M-17. Avoid fabrication techniques that could cause distortion or embrittlement of steel.
- .3 Remove welding slag, splatter, burrs, grease, oil, paint, lacquer, and other deleterious material prior to galvanizing.
- .4 Remove by blast cleaning or other methods surface contaminants and coatings not removable by normal chemical cleaning process in the galvanizing operation.
- .5 Hot dip galvanize steel members, fabrications, and assemblies after fabrication and all welding is complete, in accordance with ASTM A123/A123M-17. Use air cooling method (no water or chromate dipping treatment permitted).
- .6 Hot dip galvanize A325 and A490 bolts, nuts, washers, and hardware components in accordance with ASTM A123/A123M-17. Oversize holes to allow for zinc alloy growth. Shop assemble bolts, nuts and washers with special lubricant and test in accordance with ASTM A123/A123M-17.
- .7 Galvanize components of bolted assemblies separately before assembly.
- .8 Welding on galvanized surfaces is not permitted.

2.4 STAINLESS STEEL

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- .1 Stainless steel sheet and plate: ASTM A167, Type 316, Type 316L at welded fabrications.
- .2 Stainless steel sheet: AISI Type 316, Type 316L at welded fabrications).
- .3 Stainless steel bar and angle: ASTM A276, Type 316, Type 316L at welded fabrications.

2.5 WELDING MATERIALS

- .1 Steel: to CAN/CSA W59.





2.6 FASTENERS

- .1 Metal fasteners shall be uniform to metal materials and components being anchored or of a metal which will not set-up a galvanic action causing damage to the fastening or metal component under moist conditions.
- .2 Fasteners for pre-finished materials shall be of concealed type unless otherwise indicated, and when exposed finish is required, of matching pre-finishing materials.
- .3 Metal fastenings and accessories shall be of same texture, colour, and finish as material on which they occur, as selected by the Contract Administrator.
- .4 Bolts, nuts, washers, screws: Type 304 stainless steel to ASTM A314-23.
- .5 High strength bolts: to ASTM F3125/F3125M-23.
- .6 All exposed fasteners to be tamper-proof.
- .7 Where noted, anti-seize paste will be applied to fasteners

2.7 FINISHES

- .1 Galvanizing; hot dip after fabrication metal work: for irregular sections, zinc coating to meet specified requirements of CAN/CSA-G164. Use air cooling method (no water or chromate dipping treatment permitted).
- .2 Stainless steel: AISI No. 4 brushed finish, grain direction as indicated on drawings. Where grain direction is not indicated, verify with Contract Administrator prior to fabrication.

2.8 SHOP-APPLIED COATINGS

- .1 Powdercoat for Platform Bench: ~~Polyester TGIC-Free super durable powder coating with excellent weather resistance properties for high performance architectural exterior applications, as supplied by Tiger-drylac Canada (www.tiger-coatings.com/ca-en/), or approved equivalent.~~ 
- .1 Colour: Kelly Green 138/50017 RAL 6017 smooth / glossy, White RAL - 9003 smooth / glossy 
- .2 Powdercoat finish shall be free of all defects.
- .3 Digital artwork file for text laser cut lettering to be provided by the Contract Administrator. 
- ~~.2 'The Green Line' text painting applied to the powder coated steel to adhere to the powder coated finish. Colour to be selected by Contract Administrator.~~ 

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Part 3 Execution

3.1 GENERAL

- .1 Coordinate installation with work of other appropriate Sections to ensure proper scheduling for fabrication and installation of the work specified herein.
- .2 Assemble items in the shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- .3 Incorporate means for fastenings of other Work secured to Work of this Section.
- .4 Make templates for cast in anchorages.
- .5 Joints shall be milled to a close fit. Corner joints shall be coped or mitred, well formed, and in true alignment.
- .6 Protection against galvanic action shall be provided wherever dissimilar metals are in contact. Protection shall be by application of an appropriate gasket, neoprene spacer or other approved galvanic isolator.

3.2 EXAMINATION

- .1 Verify condition and dimensions of previously installed work, related work, and conditions under which this work is to be performed.
- .2 Notify the Contract Administrator in writing of all deficiencies and conditions detrimental to the proper completion of this work.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work means Installer accepts substrate, previously installed work, and existing conditions.

3.3 PREPARATION

- .1 Thoroughly clean and suitably pre-treat steel prior to finishing.
- .2 Remove loose mill scales, rust, oil grease, dirt and other foreign matter by solvent cleaning, wire brushing, power wire brushing, or abrasive blasting.
- .3 Grind sharp projections until smooth.

3.4 FABRICATION - FEATURE ART WALL

- .1 All steel fabrication for the feature art wall to be supplied by Monte Metals inc. (<https://www.montemetals.com/>), or approved equal.
- .2 Refer to drawings and notes for feature art fence fabrication requirements and installation sequence.

3.5 FABRICATION – WOOD PLATFORM BENCH

- .1 All steel fabrication for the wood platform bench to be supplied by Allsteel Fabricators Inc.. (<https://www.allsteelfab.ca/>), or approved equal.
- .2 Refer to drawings and notes for requirements.



3.5.6 FABRICATION

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- .1 Take site measurements to ensure that Work is fabricated to fit surrounding construction, around obstructions and projections in place.
- .2 Construction:
 - .1 Fabricate metal components with machinery and tools specifically designed for the intended manufacturing processes and by skilled tradesmen.
 - .2 Shop fabricate to designs indicated on Drawings and to meet performance requirements specified.
 - .3 Shop fabricate fittings, interfacing parts and assemblies so that field cutting adjustments are not necessary.
 - .4 Fabricate Work with materials, component sizes, metal gauges, reinforcing, anchors, and fasteners of adequate strength to withstand intended use..
 - .5 Ensure that Work will remain free of warping, buckling, opening of joints and seams, distortion, and permanent deformation.
 - .6 Drill drainage holes at metal fabrications to permit drainage of trapped moisture.
- .3 Welding:
 - .1 Do welding work in accordance with CSA W59 and CSA W59.2, as applicable, unless specified otherwise.
 - .2 Welding shall be done by qualified welders. No welding will be permitted on site.
 - .3 Provide continuous welds, where exposed to view unless otherwise indicated. Weld and grind welds to provide flat flush and finish to match adjacent finish, where exposed to view
- .4 Bolting:
 - .1 Bolt holes in 10mm or thinner material may be drilled or punched to finished size. In material thicker than 10mm, the holes shall be drilled to finished size or sub-punched smaller than the nominal diameter of the fastener and reamed to size. The finished diameter of holes shall not be more than seven percent greater than the nominal diameter of the fastener except:
 - .1 Slotted holes for expansion purposes shall be provided as required on the plans.
 - .2 Holes for anchor bolts shall have a diameter of not less than the nominal diameter plus 5mm and not greater than the nominal bolt diameter plus 10mm.
 - .2 Holes shall not be drilled in such a manner as to distort the metal, but holes only slightly misaligned may be reamed to render a reasonable fit.
 - .3 In all bolts the finished shank shall be long enough to provide full bearing and washers shall be used under the nuts to give full grip when the nuts are tightened.
- .5 Cutting:
 - .1 Material 10mm thick or less may be sheared, sawn or cut with a router. Materials more than 10mm thick shall be sawn or routed.
 - .2 Cut edges shall be true and smooth, and free from excessive burrs or ragged breaks.

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- .3 Re-entrant cuts shall be avoided wherever possible. If used, they shall be filleted by drilling prior to cutting.
- .6 Assembly
 - .1 Fit and assemble metal fabrications in shop. When this is not possible, make a trial shop assembly.
 - .2 Accurately cut, machine and fit joints, corners, copes and miters so that junctions between components fit together tightly and in true planes.
 - .3 Fasten Work with concealed methods unless otherwise indicated on Drawings.
 - .4 Weld connections where possible, bolt where not possible, and cut off bolts flush with nuts. Countersink bolt heads, and incorporate method to prevent loosening of nuts. Ream holes drilled for fastenings.
 - .5 Provide continuous welds, where exposed to view unless otherwise indicated. Weld and grind welds to provide flat flush and finish to match adjacent finish, where exposed to view.
 - .6 Provide for differential movements within assemblies and at junctions of assemblies with surrounding Work.
 - .7 Drainage
 - .1 Provide 6 mm drainage holes at bottom of all vertical hollow members and on underside of horizontal hollow members (min 600 mm o.c.) to ensure complete drainage of all
- .7 Finish work:
 - .1 Prefinish work at the factory, except where specified or indicated otherwise
 - .2 Incorporate holes and connections for work installed under other sections.
 - .3 Cleanly and smoothly finish exposed edges of materials including holes. Ease 90° corners of exposed metals.
 - .4 Cap open ends of sections exposed to view, such as pipes, channels, angles, and other similar work. End caps shall be fitted to all exposed ends of rails or posts.
 - .5 Mill joints to a tight, hairline fit. Cope or mitre corner joints. Form joints exposed to weather to exclude water penetration.
 - .6 Finish exposed surfaces to smooth, sharp, well-defined lines and arises.
 - .7 For welded stainless steel fabrications continuous weld, grind welds smooth and flat where exposed to view and polish to match metal finish.
 - .8 For galvanized steel, remove all grind smooth all sharp edges prior to galvanizing.
 - .9 Galvanizing:
 - .1 Galvanize metal fabrications following fabrication.
 - .10 Powdercoating:
 - .1 Apply powdercoating following fabrication.

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- .2 Follow powdercoating manufacturer's specifications for cleaning and preparation prior to powdercoating.
- .11 Painting:
 - .1 Prepare metal surfaces to receive paint finishes in accordance with MPI ASM.
 - .2 Apply paint following fabrication and powdercoating.
 - .3 Apply paint following manufacturer's specifications for cleaning and preparation of powdercoated surface, prior to painting.

3.63.7 INSTALLATION

- .1 Install metal fabrications in accordance with reviewed shop drawings and to accommodate work of others.
- .2 Verify alignment, support dimensions, and tolerances are correct.
- .3 Inventory components to ensure all required items are available for installation. Inspect components for damage. Remove damaged components from site and replace.
- .4 Anchorage devices, such as concrete inserts, anchor bolts, and metal items having integral anchors that are to be embedded in cast-in-place concrete construction, shall be delivered to the project site in time to be installed before the start of cast-in-place concrete operations. Setting drawings, templates, instructions, and directions for the installation of the anchorage items shall be provided.
- .5 Install metal fabrications plumb, true, square, straight, level, and accurately and tightly fitted together and fit to surrounding work.
- .6 Make field connections with bolts or weld as indicated to CAN/CSA-S16.1.
- .7 Do welding work in accordance with CAN/CSA-S16.1.
- .8 Provide suitable means of anchorage acceptable to Contract Administrator such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .9 Attach work to site concrete and masonry with epoxy injected adhesive and threaded inserts, to support load with a safety factor of three (3).
- .10 Insulate between dissimilar metals, or between metal and masonry or concrete, with bituminous paint, or as otherwise noted on Drawings, to prevent electrolytic action.
- .11 Grout metal posts, pickets, balusters, and the like, in metal sleeves into concrete, with non-shrink quick setting epoxy anchor cement, unless detail otherwise.
- .12 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .13 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .14 Minimize on-site welding of galvanized steel. Welding of galvanized steel only permitted where accepted by Contract Administrator on accepted shop drawings.
- .15 Repair galvanized surfaces as per ASTM A-780.

3.73.8 ADJUSTMENT AND CLEANING

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- .1 Touch-up, repair or replace damaged products as directed by Contract Administrator.
- .2 Repair damaged factory-applied finish as directed by Contract Administrator.
- .3 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new.
- .4 Clean and polish acrylic and metal surfaces after installation is complete. Use only materials that won't scratch, or mar finished surfaces and as approved by material manufacturers.
- .5 Do not use abrasive cleaners.

3.83.9 PROTECTION

- .1 Maintain protection of Work of this Section from time of installation until final finishes are applied or to final cleanup.
- .2 Protect finished surfaces from damage.

END OF SECTION