

Architectural Metal Fabrications

Section revised and reissued by Addendum 01
Section revised and reissued by Addendum 03

PART 1 - GENERAL

1.1 Summary

.1 Section includes:

- .1 Work of this section includes architectural metal fabrications and related metals identified on the drawings and on the Miscellaneous Metals Legend and as indicated including, but not limited to the following:
 - .1 Perimeter heater cabinet covers.
 - .2 Brass stair nosing strips and floor transition strips (ML6).
 - .3 Handrails and brackets.
 - ~~.3.4~~ Sliding door HSS and/or steel angle bracing at headers and jamb for stabilization in accordance with Sections 08 42 29 and 08 42 43 door manufacturer's recommendations.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings.
 - .2 Submit a list of fabrications to be provided as part of the work of this section.
 - .3 Include plans, sections and large scale details, exposed-to-view edge conditions.
 - .4 Indicate materials, including material characteristics, profiles of each metal fabrication member, methods of assembly and joinery, fittings, fastenings, finishes, anchorages, welds, solders, brazing, and their structural characteristics relative to their purpose, accessory items, and other fabrication information required.
 - .5 Indicate proposed *Place of the Work* connections and methods.
 - .6 Submit coordination drawings indicating locations of concealed grounds, cutouts, plates, and other required fabrications.
 - .7 Show relation to adjoining construction, details of outside and inside corners and door openings.
 - ~~.7.8~~ Indicate seismic design, connections and restraint.
- .4 Samples:

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- .1 Submit 3 sets of samples of architectural metals and shop finished materials, show each type of finish and colour, 200 mm x 200 mm (8" x 8") size.
- .2 Provide samples of welded joints showing quality of workmanship.
- .3 Provide fastener samples for each type required.
- .5 Certificates: mill certificates signed by manufacturers of stainless steel certifying that products furnished comply with requirements.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 78 00.
- .2 Operation and maintenance data:
 - .1 Manual shall include detailed maintenance and cleaning procedure for materials and finishes requiring specific care, noting particularly those procedures or materials which will cause damage to finished surfaces.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Installers / applicators / erectors:
 - .1 *Subcontractor*, shop foreperson, and *Place of the Work* installation foreperson:
 - .1 Have adequate plant, equipment, and skilled tradespersons to perform work expeditiously.
 - .2 Has successfully completed installations similar to that specified during a period of at least the immediate past 10 years.
 - .3 Fabricators shall have experience working with all metal types specified in this section.
 - .2 Provide separation of stainless steel or non-ferrous metals fabrication areas from mild steel fabrication areas.
 - .3 Grinders, wire brushes, and tools used on stainless steel or non-ferrous metals shall be free of materials which will leave or produce dissimilar material or metal oxides deposits. Tools previously used on mild steel shall not be used on stainless steel or non-ferrous metal work.
 - .4 Do not bring iron or mild steel surfaces into contact with stainless steel or non-ferrous metals, including lifting tools, steel tables, storage racks, and other storage and handling equipment.
 - .5 Cutting or grinding debris from iron or mild steel materials shall not be permitted to settle on stainless steel or non-ferrous materials and fabrications.
 - .6 Perform water-wetting and drying tests during finishing indicating free iron on finished stainless work in accordance with ASTM A380-06.
 - .2 Mock-ups:
 - .1 Provide mock-ups, per the following list:

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- .1 One typical heater cabinet cover fabricated to match existing.
- .2 One transition strip.
- .3 One stair nosing strip.

1.6 Delivery, Storage, and Handling

- .1 For aluminum fabrications comply with AAMA CW-10 – Care and Handling of Architectural Aluminum from Shop to Site.
- .2 Label, tag or otherwise mark work supplied for installation by other sections to indicate its function, location in building and shop drawing designation.
- .3 Metals subject to corrosion during handling and storage shall be protected from exterior and adverse conditions to preserve finish.
- .4 Deliver work to location at the *Place of the Work* designated by *Contractor* and to meet requirements of construction schedule.
- .5 For metalwork items which are susceptible to damage from construction activities provide strippable temporary protective film on factory finished or prefinished surfaces before shipping.

1.7 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranty:
 - .1 Labour, materials, and workmanship for work of this section.
 - .2 Duration: 2 years.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Design, fabricate, and install work of this section in accordance with the building code and requirements of authorities having jurisdiction.
- .2 Welding:
 - .1 Steel: Weld components to conform to requirements of CSA W59-18, and by a fabricator fully certified by the Canadian Welding Bureau to conditions of CSA W47.1-19 and CSA W55.3-08 (R2018) as applicable.
 - .2 Stainless steel: Weld components to conform to requirements of CSA W59-13 and ANSI/AWS D1.6/D1.6M-2007 as applicable, and by a fabricator fully certified by the Canadian Welding Bureau to conditions of CSA W47.1-09(R2014).
- .3 Design assemblies and connections to withstand own dead load, super-imposed dead loads, live load, and fabrication forces, without permanent distortions or deformation, to maximum allowable deflection of L/360, within the following construction tolerances:
 - .1 Edges and surfaces shall be uniform for like metalwork.

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- .2 Limit inconsistencies in edge and surfaces to those which can be identified when viewed from distance of not greater than 300 mm (12").
- .3 Surfaces of panels shall be flat and free of distortion when viewed from any distance or angle from surface.
- .4 Finish shall be uniform when viewed from any distance from surface or from like surfaces which are viewed from within the same viewing area.
- .5 Limit variations from plumb and level:
 - .1 3.2 mm in 6096 mm (1/8" in 20'-0") vertically and horizontally.
 - .2 6.4 mm in 12192 mm (1/4" in 40'-0") either direction.
- .6 Limit offsets in theoretical end-to-end and edge-to-edge alignment:
 - .1 1.6 mm (1/16") where surfaces are flush or less than 12.7 mm (1/2") out of flush and separated by not more than 50 mm (2").
 - .2 3.2 mm (1/8") for surfaces separated by more than 50 mm (2").
- .7 Step in face: 1.6 mm (1/16") maximum.
- .8 Jog in alignment: 1.6 mm (1/16") maximum.
- .9 Location: 6.4 mm (1/4") maximum deviation of any member at any location.
- .10 Tolerances are not cumulative.
- .4 Comply with NAAMM AMP 555-92 – Standard Practice for the Architectural Metal Industry (Including Miscellaneous Iron).

2.2 Materials

- .1 General:
 - .1 Unless detailed or specified otherwise, standard *Products* will be acceptable if construction details and installation meet requirements of the *Contract Documents*.
 - .2 Include materials, *Products*, accessories, and supplementary parts necessary to complete assembly and installation of work of Section 05 50 10.
 - .3 Incorporate only metals that are free from defects that are visible, or that impair strength or durability. Install only new metals that are of best quality, free from rust or waves and buckles, clean, straight, with sharply defined profiles.
- .2 Steel:
 - .1 Structural shapes, plate, bars: hot-rolled, in accordance with CSA G40.21-13, Grade 300W.
 - .2 Hollow structural sections: hot-formed, seamless, in accordance with CSA G40.21-13, Grade 350W, Class H.
 - .3 Mild steel sheet and strip: hot rolled, in accordance with ASTM A1011/A1011M-14, Commercial.

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- .4 Cold rolled sheet: stretcher levelled, fully pickled, in accordance with ASTM A1008/A1008M-13, Grade CS Type A exposed, matte finish, oiled, unless otherwise indicated.
- .5 Steel pipe: in accordance with ASTM A53/A53M-12, Type E or S, Grade A or B, standard weight, Schedule 40 seamless black or AISI MT 1010/1015.

~~.3 Bronze (M6):~~

- ~~.1 Interior architectural bronze; Alloy 38500 and 28000, and as follows:~~
 - ~~.1 Plate and sheet: in accordance with ASTM B36/B36M-18, temper M31.~~
- ~~.2 Finish: In accordance with Finish Schedule.~~

~~.4.3 Handrail brackets:~~

- .1 Post mounted, stainless steel, hand rail bracket for round posts, designed for 38 mm (1 1/2") diameter handrail tubing.
 - .1 Fasteners: Bracket manufacturer's standard.
 - .2 Adaptors: Bracket manufacturer's standard coped adaptors as required to complete installation.
 - .3 Finish: ~~To later selection by Consultant from manufacturer's full product range~~
Brushed stainless.
- .2 Acceptable *Products*:
 - .1 C.R. Laurence 'HR2EP'.
 - .2 Substitutions in accordance with Section 01 25 00.

.4 Stainless steel:

- .1 Type 316 unless otherwise indicated.
- .2 Stainless steel tubing: in accordance with ASTM A269/A269M-15a, Commercial Grade, seamless welded.
- .3 Stainless steel sheet and plate: in accordance with ASTM A167-99(2009).
- .4 Stainless steel bar and angle: in accordance with ASTM A276/A276M-17.
- ~~.3.5~~ .5 Stainless steel seamless pipe: in accordance with ASTM A312/A312M-18a.

2.3 Accessories

- .1 Fasteners:
 - .1 Exposed fasteners to match the material surface on which they occur.
 - .2 For fastening steel: Zinc plated screws and bolts, and in accordance with ASTM A307-21, Type 304 stainless steel where exposed to exterior.
 - .3 For fastening stainless steel: same metal as that being fastened. Match finish of exposed heads with material being fastened.
 - .4 For fastening aluminum: Stainless steel 300 Series, stainless steel 400 Series, cadmium plated or aluminum.

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- .5 High strength bolts: in accordance with ASTM A325-14.
- .6 Other types of fasteners as appropriate to meet design requirements.
- .7 Fasteners shall be tamperproof where exposed.
- .2 Welding materials:
 - .1 Steel: in accordance with CSA W59-18.
 - ~~.2 Bronze:~~
 - ~~.1 Solder: in accordance with ASTM B32-08, composition 50/50 tin/lead except 60/40 tin/lead for lead coated metal.~~
 - ~~Flux: muriatic acid neutralized with zinc or manufacturer's approved brand of soldering flux.~~
 - .3.2 Stainless steel: in accordance with ANSI/AWS D1.6/D1.6M-2017.
- .3 Grout:
 - .1 Epoxy grout; non-shrink, non-expanding.
 - .1 Acceptable *Products*:
 - .1 Hilti 'HY-200'.
 - .2 Sika 'Sika AnchorFix 3001'.
 - .3 W.R. Meadows 'REZI-WELD 3/2 EPOXY GROUT/PATCH'.
 - .2 Cementitious grout: non-shrink, non-expanding to ASTM C1107/C1107M-20:
 - .1 Acceptable *Products*:
 - .1 Sika 'Sika Grout 212' or 'Sika M-Bed Standard'.
 - .2 W.R. Meadows 'Sealtight CG-86 Construction Grout'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .4 Dielectric separator: Best grade, quick drying non-staining alkali resistant bituminous paint in accordance with CAN/CGSB 1.108-M89, or membrane type to acceptance of *Consultant*.

2.4 Finishes

- .1 Shop primer; premium quality:
 - .1 Acceptable *Product*:
 - .1 Sherwin Williams 'Pro Industrial Pro-Cryl Universal Primer', 0.0076 mm (3 mils) DFT.
- .2 Zinc rich paint; steel: Two-component zinc-rich coating, zinc powder to ASTM D520-00(2019) Type III, SSPC-Paint 20, Type 1 Inorganic or single-component zinc-rich coating to SSPC-Paint, Type 2 Organic, CAN/CGSB 1.181-M99, VOC content <100 g/l to ASTM-D1475.
 - .1 Acceptable *Products*:

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- .1 Aervoe Industries, Inc. 'Low VOC Cold Galvanize Coating 93% Zinc'.
- .2 ZRC Worldwide 'ZRC Zero-VOC Galvanizing Compound'.
- .3 Substitutions: in accordance with Section 01 25 00.
- .3 Hot dip galvanizing: for irregular sections, in accordance with ASTM A123/A123M-13, minimum zinc coating of 600 g/m². Use air cooling method (no water or chromate dipping treatment permitted).
- .4 Powder paint:
 - .1 Acceptable *Products*:
 - .1 Tiger Drylac series 58 (epoxy TGIC free), in accordance with AAMA 2604-22.
 - .2 Colour:
 - .1 Refer to Interior Finish Schedule.
- .5 Field painting: in accordance with Section 09 91 00.
- ~~.6 Bronze:~~
 - ~~Patina in accordance with Finish Schedule.~~
- .6 Stainless steel:
 - .1 AISI No. 4 brushed finish.

2.5 Fabrication

- .1 General:
 - .1 Fabricate architectural metal fabrications with machinery and tools specifically designed for the intended manufacturing processes and by skilled tradesmen.
 - .2 Fit and assemble architectural metal fabrications in shop. When this is not possible, make a trial shop assembly.
 - .3 Incorporate means for fastenings of other work secured to work of this section.
- .2 Construction:
 - .1 Fabricate with materials, component sizes, metal thicknesses (gauges), reinforcing, anchors, and fasteners of adequate strength to withstand intended use, and within allowable design factors imposed by jurisdictional authorities. Fabricate items from steel unless otherwise noted.
 - .2 Architectural metal fabrications shall remain free of warping, buckling, opening of joints and seams, distortion, and permanent deformation to expansion and contraction forces and loads.
 - .3 Construct items that are part of floor construction, such as gratings and trench covers, to support the same live loads for which surrounding construction is designed.
- .3 Assembly:

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- .1 Accurately cut, machine and fit joints, corners, copes and mitres so that junctions between components fit together tightly and in true planes.
- .2 Corners shall be mitred unless otherwise noted.
- .3 Fasten work with concealed methods unless otherwise indicated.
- .4 Weld connections where possible, bolt where not possible, and cut off bolts flush with nuts. Countersink bolt heads, and provide method to prevent loosening of nuts. Ream holes drilled for fastenings.
 - .1 Except where exposed to view:
 - .1 Finish welds shall comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #4 - Good quality, uniform undressed weld with minimal splatter as shown in NAAMM AMP 521.
 - .2 Where exposed to view:
 - .1 Weld behind finished surfaces without distorting or discolouring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces. Where welding cannot be concealed behind finished surfaces, finish joints to comply with NOMMA's "Joint Finish Guidelines", for "Finish #1 - no evidence of a welded joint".
- .5 Allow for differential movements within assemblies and at junctions of assemblies with surrounding work.
- .6 Field welding of hot dipped galvanized members permitted only when other fastening methods are not possible. Locations of field welds to be clearly identified on shop drawings.
- .7 Incorporate holes and connections for work installed under other sections.
- .8 Cleanly and smoothly finish exposed edges of materials including holes.
- .9 Cap open ends of sections exposed to view, such as pipes, channels, angles, and other similar work.
- .4 Shop prime painting; premium quality:
 - .1 Clean loose mill scale, rust, dirt, weld flux and spatter from work after fabrication.
 - .2 Clean and prepare surfaces to meet specified requirements of SSPC SP-6 and paint manufacturer's installation requirements.
 - .3 Apply primer in accordance with paint manufacturer's installation requirements.
- .5 Powder painting:
 - .1 Apply powder paint in accordance with the manufacturer's requirements and recommendations and as follows.
 - .2 Clean surfaces to be coated as follows:
 - .1 Remove dust, dirt, and other surface debris by vacuuming, wiping dry with clean cloths or compressed air.

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- .2 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
- .3 Allow surfaces to drain completely and allow to thoroughly dry.
- .3 If the above procedures do not clean the substrate surfaces, clean the surfaces with high pressure water washing.
- .4 Apply pretreatment as soon as possible after cleaning and before surface deterioration occurs.
- .5 Pre-treat iron phosphate for steel, zinc phosphate for galvanized or steel structures, and yellow or green chromating, or approved chrome-free for aluminum substrates.
- .6 Spray application:
 - .1 Apply coating to requirements of coating manufacturer's written application requirements.
 - .2 Method of application: as recommended by paint system manufacturer.
 - .3 Spray application.
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly fluidizing powder coating to be applied.
 - .2 Apply coating materials to clean surfaces to minimum 2.5 - 3.5 mil dry film thickness or as specified by manufacturer.
 - .3 Coating shall adhere to internal corners and recessed areas.
 - .4 Allow surfaces to cure for minimum time period as required by manufacturer.
 - .5 Cure in accordance with manufacturer's cure curves.
- .6 Galvanizing:
 - .1 Galvanize metal fabrications following fabrication.
 - .2 Paint damaged galvanized surfaces with zinc rich paint, immediately following damage to galvanized protection. Prepare substrate to remove oil and grease to SSPC-SP1-16, rust scale to SSPC-SP3-18, mill scale to SSPC-SP6/NACE No. 3-07.
 - .3 At interior locations, fill vent and drain holes exposed in the finished *Work*, by plugging with zinc solder and filing off smooth.
- .7 Fabrications exposed to view:
 - .1 Fabrications exposed to view shall be of the highest architectural quality, free of scratches, pitting, roughness, marring, discolouration, seams, staining and other imperfections with the quality of workmanship conforming to the workmanship classifications of Class 1 as defined in NAAMM-AMP 555-92, paragraph 8.3 of Section 8, Quality Control or Assurance and as follows:
 - .1 Exposed surfaces are finished smooth with pits, mill marks, nicks and scratches filled or ground off. Defects shall not show when painted or polished. Remove sharp corners and edges.

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- .2 Conceal welds where possible. Where exposed, grind welds to small radius with uniform sized cove. Welds shall appear continuous in appearance. When painted or polished welds shall be undetectable.
- .3 Use only flat head countersunk bolts in exposed locations unless indicated otherwise.
- .4 Distortions shall not be visible to the eye.
- .5 Exposed joints shall be fitted to hairline finish.
- .2 Assemble items in the shop to 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 Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.
- .4 Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the work.
- .5 Form simple and compound curves in bars, pipe, tubing, and extruded shapes by bending members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces.
- .6 Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1 mm (0.040") unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- .7 Mill joints to a tight, hairline fit. Cope or mitre corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.
- .8 Surface preparation; non-ferrous metals: Remove tool and die marks and stretch lines, or blend into finish. Grind and polish surfaces to produce uniform finish, free of cross scratches. Run grain of directional finishes with long dimension of each piece.

PART 3 - EXECUTION

3.1 Examination

- .1 Take measurements at the *Place of the Work* to verify that architectural metal fabrications fit surrounding construction, around obstructions and projections in place, or as indicated, and to suit service locations.
- .2 Inspect surfaces on which work of this section is dependent for any irregularities detrimental to installation and performance of the work of this section. Confirm conditions are satisfactory before proceeding.

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3.2 Installation

- .1 Install work plumb, true, square, straight, level, and accurately and tightly fitted together and to surrounding Work and as required for proper performance.
- .2 Supply and install anchor bolts, high tensile bolts, washers and nuts, expansion bolts, toggles, straps, sleeves, brackets, clips, and other items necessary for secure installation as required by loading and jurisdictional authorities.
- .3 Countersink holes at wood screws where wood is attached to work of this section.
- .4 Attach metal fabrications to interior concrete and masonry with corrosion resistant expansion bolts to support load with a safety factor of 3.
- .5 Insulate between dissimilar metals, between metal and masonry, and between metal and concrete with bituminous paint to prevent electrolytic action.
- .6 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .7 Erect members and component parts plumb, level and true to building lines, in correct relation to work of other sections and established lines, curves and levels indicated.
- .8 Securely anchor metal framing to concrete by means of anchor rods with epoxy adhesive, shim and pack to true straight lines and levels.
- .9 Field welding:
 - .1 Comply with applicable specification for procedures of manual shielded metal arc welding and requirements for welding and for finishing welded connections given above in this section.
 - .2 Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
- .10 Field painting: in accordance with Section 09 91 00.

3.3 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
 - .1 Inspection and testing:
 - .1 Ferroxyl test for free iron in accordance with ASTM A380-06 in the fabrication shop and on site.
 - .2 If test results or inspections show stainless steel work to be contaminated with free iron or other impurity which can lead to discolouration of stainless steel work when exposed to moisture, remove and replace or repair the stainless steel work in accordance with recommendation of Nickel Development Institute and as required to provide stainless steel which meets the requirements of this section.

3.4 Adjusting and Cleaning

- .1 After erection, touch up primed surfaces that are burned, scratched or otherwise damaged with prime paint to match shop paint.

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- .2 Repair areas of bare metal and welds on galvanized surfaces with zinc rich paint.
- .3 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new.
- .4 Clean and polish surfaces after installation is complete. Use only materials that will not scratch or mar finished surfaces and as approved by material manufacturers.

END OF SECTION