

**SECTION 057000 ORNAMENTAL METALS**

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the ornamental metals, including heavy gauge stainless steel and non-ferrous metal products which are used in building construction for functional, architectural, and decorative effects, and which are not a part of other metal systems specified in other Sections. The extent of these items is indicated on the drawings and/or specified herein, including, but not limited to, the following:
  - 1. Decorative aluminum railings.
  - 2. Stainless steel items.

1.3 RELATED SECTIONS

- A. Miscellaneous Metals - Section 055000.
- B. Elevator entrances - Division 14.

1.4 QUALITY ASSURANCE

- A. General: Work of this section shall be fabricated and installed by an experienced fabricator or manufacturer who has been engaged in work of equivalent scope and fabrication standards for at least five (5) years. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection shall be in accordance with drawings, specifications, and approved shop drawings, and be of highest quality practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected. All work shall be accurately and neatly fabricated, assembled, and erected.
- B. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work. However, do not delay job progress; allow for adjustments and fitting where taking of field measurements before fabrication might delay the work.
- C. Shop Assembly: Insofar as practicable, fitting and assembly of work shall be done in shop. Work that cannot be permanently shop assembled, shall be completely assembled, marked and disassembled in shop before shipment to insure proper assembly in field. Shop assemble work in largest practical sizes to minimize field work. It is the responsibility of the Contractor for this work to assure himself that the shop fabricated items will properly fit the field condition. In the event that shop fabricated items do not fit the field condition, the item shall be returned to the shop for correction.

**1.5 SUBMITTALS**

- A. Shop Drawings: Submit for all items of work of this Section, as enumerated under paragraph 1.2, showing locations, layouts, materials, thicknesses, finishes, dimensions, construction, relation to adjoining construction, erection details, profiles, jointing and all other details to fully illustrate the work of this Section.
- B. Samples: Submit fabricated samples (of sufficient size to fully show construction, materials and finishes) of all items of work as enumerated under paragraph 1.2 herein.
- C. Product Data: Submit manufacturer's, fabricator's and finisher's specifications and installation instructions for products used in ornamental metal work, including finishing materials and methods.
- D. Samples for Verification: For each type of exposed finish required, prepared on 12" x 12" samples of metal of same thickness and material indicated for the Work.
- E. Contractor Licensed Engineer Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Coordination Drawings: For decorative formed metal elements that house items specified in other Sections. Show dimensions of housed items, including locations of housing penetrations and attachments and necessary clearances.

**1.6 COORDINATION**

- A. Coordinate installation of anchorages for decorative formed metal items. Furnish setting drawings, templates and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts and items with integral anchors, that are to be embedded in concrete to masonry. Deliver such items to Project site in time for installation.
- B. Coordinate installation of decorative formed metal with adjacent construction to ensure that wall assemblies, flashings, trim and joint sealants, are protected against damage from the effects of weather, age, corrosion and other causes.

**1.7 PRODUCT HANDLING**

- A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

**1.8 PERFORMANCE STANDARDS FOR RAILINGS (UNLESS GREATER REQUIRED BY CODE)**

- A. Railing assemblies shall be designed and installed to resist the simultaneous application of a lateral force of 50 PLF and a vertical load of 100 PLF, both applied to the top of the railing. Railings shall resist a total lateral force and total vertical load of at least 200 lbs. each.
- B. Submit calculations and drawings signed and sealed by a Professional Engineer licensed in the State of New Jersey indicating that railing system can meet these performance criteria.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Provide materials which have been selected for their surface flatness, smoothness and freedom from surface blemishes where exposed to view in the finished unit. Surfaces exposed to view surfaces that exhibit pitting, seam marks, roller marks, oil-canning, stains, discolorations, or other imperfections on the finished units will not be acceptable.
- B. Aluminum: Comply with the following standards for the forms and types of aluminum for the required items of work.
  - 1. Alloy and Temper: Provide alloy and temper as indicated or as otherwise recommended by the aluminum producer or finisher.
    - a. Aluminum Extrusions, Bars and Shapes: Alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T6.
    - b. Extruded Pipe and Tube: ASTM B 429, alloy 6063-T6.
    - c. Aluminum Plate and Sheet: Alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209, alloy 6061-T6.
    - d. Bars, Rods and Wire: ASTM B 211.
    - e. Drawn Seamless Tube: ASTM B 483, alloy 6063-T832.
    - f. Castings: ASTM B 26; alloy A356-T6.
    - g. Forgings: ASTM B 247, alloy 6061-T6.
- C. Stainless Steel: Comply with the following standards for the forms and types of stainless steel for the required items of work.
  - 1. Tubing: ASTM A 554, Grade MT 304.
  - 2. Pipe: ASTM A 312, Grade TP 304.
  - 3. Castings: ASTM A 743, Grade CF 8 or CF 20.
  - 4. Sheet, Strip, Flat Bar and Plate: ASTM A 666, Type 304.
  - 5. Bars and Shapes: ASTM A 276, Type 304.
- D. Steel (Carbon) for Concealed Supports Only
  - 1. Structural Shapes: ASTM A 36.
  - 2. Plates (for forming or bending cold): ASTM A 283, Grade C.
  - 3. Steel Sheets: ASTM A 366, Grade 1.
  - 4. Shop prime with rust inhibitive primer equal to Series 88 Azerox made by Tnemec, or approved equal made by Benjamin Moore or Sherwin Williams.
- E. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of the metal to be welded, and as required for color match, strength and compatibility in the fabricated items.
- F. Fasteners: Furnish basic metal and alloy, matching finished color and texture as the metal being fastened, unless otherwise indicated. Provide Phillips flat-head screws for exposed fasteners, unless otherwise indicated.

- G. Anchors and Inserts: Either furnish inserts to be set in concrete or masonry work, or provide other anchoring devices as required for the installation of ornamental metal items. Provide toothed steel or lead shield expansion bolt devices for drilled-in-place anchors. Provide galvanized or cadmium-coated anchors and inserts for exterior installations.
  - 1. Provide units with exposed surfaces matching the texture and finish of the metal item anchored.
- H. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).
- I. Cast-in-Place and Preinstalled Anchors: Anchors fabricated from corrosion-resistant materials 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.
- J. Sealants, Interior: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834; of type and grade required to seal joints in decorative formed metal; and as recommended in writing by decorative formed metal manufacturer.
  - 1. Sealants shall have a VOC content of not more than 250 g/l when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- K. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as necessary for strength, corrosion resistance, and compatibility in fabricated items.
  - 1. Use filler metals that will match the color of metal being joined and will not cause discoloration.

## 2.2 FABRICATION

- A. Cutting: Cut metal by sawing, shearing or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp, square and free of burrs, without deforming adjacent surfaces or metals.
- B. Holes: Drill or cleanly punch holes (do not burn), so that holes will be accurate, clean, neat and sharp without deforming adjacent surfaces or metals.
- C. Connections
  - 1. Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to water. Locate joints where indicated on drawings. Provide connections to allow for thermal movement of metal at locations and by methods approved by Architect. For work exposed to view, use concealed fasteners (unless welded or other connections indicated) with joints accurately fitted, flush and rigidly secured with hairline contacts. All edges within public reach shall be eased.
  - 2. Welding: Welding shall be in accordance with recommendations of the American Welding Society and shall be done with electrodes and/or methods recommended by the manufacturers of the metals being welded. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match finish of adjoining surfaces so that joint will not be visible; undercut metal edges where welds are required to be ground flush and dressed smooth. All welds on or behind surfaces which will be exposed to view shall be done so that finished surface will be free of imperfections such as pits, runs, splatter, cracks,

warping, dimpling, depressions or other forms of distortion or discoloration. Remove weld splatter and welding oxides from all welded surfaces.

3. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads, where shown to be exposed to view, shall be flat and countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts of adjacent metal.
- D. Operating Mechanism: Operating devices, mechanism and hardware used in connection with this work shall be fabricated, assembled, installed and adjusted after installation so that they will operate smoothly, freely, noiselessly and without excessive friction.
  - E. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items for architectural metal work to be built into concrete, masonry, or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.
  - F. Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.
  - G. Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.
  - H. Exposed Work: In addition to requirements specified herein or shown on drawings, all surfaces exposed to view shall be clean, and free from dirt, stains, grease, scratches, distortions, waves, dents, buckles, tool marks, burrs and other defects which mar appearance of finished work. Ornamental metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.
  - I. Materials used shall be of such strength, thickness and alloy that they are capable of meeting all standards and descriptions specified herein and as detailed on drawings.
  - J. Bending: Bend sheet metal to the required shape. Bent items shall be free of grain separation, oil canning or other distortion.
    1. Square Bends: Back-cut sheets to attain maximum square bend possible, with maximum radius of 1/16 in.
    2. Knife Edge Bends: Back-cut and back bevel sheets to attain sharpest bend possible, with maximum radius of 1/32 in.
- 2.3 SHOP FINISHING
- A. General
    1. Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated.
    2. Provide colors or color matches as indicated on selected samples.
    3. Protect mechanical finishes on exposed surfaces from damage by application of strippable temporary protective covering prior to shipment.

4. Corrosion Protection: Coat concealed surfaces which will be in contact with concrete, masonry, wood or dissimilar metals, in exterior work and work to be built into exterior and below grade walls and decks, with a heavy coat of bituminous paint. Do not extend coating onto exposed surfaces.

**B. Aluminum**

1. Class II Clear Anodized Finish: AA-M12C22A31, medium satin directional textured mechanical finish; inhibited chemical cleaning; 0.4 mil minimum thick anodic coating conforming to AAMA Spec. 607.1.
2. Class I Color Anodized Finish: AA-M12C22A42/A44, Smooth non-specular buffed mechanical finish; chemical etch, medium matte; 0.18 mil minimum thick integrally colored or electrolytically deposited coating conforming to AAMA 608.1 or 606.1.
  - a. Match color range of Architect's samples.
3. Baked Enamel Finish: AA-C21C42R1x, cleaned with inhibited chemicals, corrosion coated with an acid-chromate-fluoride-phosphate treatment, and painted with organic coating specified below. Apply baked enamel finish in strict compliance with paint manufacturer's specifications for cleaning, conversion coating and painting.
  - a. Organic Coating: Thermosetting modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with minimum dry film thickness of 1.5 mils; medium gloss.
4. High Performance Coating: AA-C12C42R1x, cleaned with inhibited chemicals, conversion coated with an acid-chromate-fluoride-phosphate treatment, and painted with organic coating specified below. Apply finish in strict compliance with paint manufacturer's instructions using a licensed applicator.
  - a. Fluorocarbon Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
  - b. Custom color and gloss as selected by the Architect.

**C. Stainless Steel**

1. Remove or blend tool and die marks and stretch lines into finish.
2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
  - a. Bright, Directional Polish: No. 4 finish.
  - b. Satin, Directional Polish: No. 6 finish.
  - c. Satin Reflective, Directional Polish: No. 7 finish.
  - d. Mirror-Like Reflective, Non-Directional Polish: No. 8 finish.
3. When polishing is complete, passivate and rinse surfaces. Remove foreign matter and leave surface chemically dry.

**2.4 PROTECTION**

- A. Provide necessary protection to all exposed surfaces of architectural metal work, so as to prevent damage, staining, discoloration, abrasion, etc., to these surfaces from time of shipment

from factory to acceptance of work of this project. Protection shall be provided by wrappings, strippable coatings, or other means. After installation, remove protective paper or strippable coating and clean exposed surfaces, and then provide additional temporary protection to protect architectural metal work from damage during subsequent construction activities. Surfaces which are damaged, stained, discolored, abraded etc., shall be rejected and replaced with new materials, at no cost to the Owner.

## 2.5 STEEL FRAMING, BRACING, SUPPORTS AND REINFORCEMENTS

- A. Steel framing, plate reinforcing, supplementary steel framing or reinforcing, bracket assemblies, and the like required for the support, framing, reinforcing, bracing, etc., of work of this Section shall be of such sizes and shapes as indicated on the drawings, or as required to suit the conditions, and shall be provided with all necessary supports and accessory items such as inserts, hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly and rigidly fasten, anchor or attach work of this Section in place and to the concrete, masonry and other connecting and adjoining work.

## 2.6 ORNAMENTAL RAILINGS

- A. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove flux immediately.
  4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
  5. Form changes in direction of railing members by radius bends.
  6. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, or otherwise deforming exposed surfaces of handrail and railing components.
  7. Provide wall returns at ends of wall-mounted handrails, close ends of returns.
  8. Close exposed ends of handrail and railing members with prefabricated end fittings.
  9. Brackets, Flanges, Fittings, and Anchors: Provide brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.
    - a. Furnish inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
    - b. For railing posts set in concrete, provide preset sleeves of steel, not less than 6 inches long and inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.

**PART 3 - EXECUTION**

**3.1 INSPECTION**

- A. Examine the areas and conditions where ornamental metal work is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

**3.2 INSTALLATION**

- A. General: Install work of this Section square, plumb, straight, true to line or radius, accurately fitted and located, with flush, tight hairline joints (except as otherwise indicated or to allow for thermal movement), with provisions for other trades, with provisions to allow for thermal movement, with provisions to exclude water where exposed to weather, and with attachment devices as required for secure and rigid installation. It is the responsibility of the Contractor to assure himself that shop fabricated architectural metal items will properly fit the field condition. In cases where the shop fabricated architectural metal items do not fit the field condition, the item shall be returned to the shop for correction.

**B. Attachments**

- 1. Unless otherwise indicated, work to be built into concrete or masonry shall be anchored with shop welded on galvanized steel strap anchors; work to be attached to concrete or masonry shall be anchored by bolts into embedded inserts or expansion shields; work attached to structural steel shall be anchored by welds or bolts; work attached to metals other than structural steel shall be anchored by bolts or screws. Power actuated fasteners not permitted unless approved by Architect. Provide all supplementary parts necessary to complete each item of work of this Section.
- 2. All attachment devices shall be of type, size and spacing to suit condition and as approved by Architect. Provide shims, slotted holes, or other means necessary for leveling, plumbing and other required adjustments. Attachment devices for work exposed to view shall be concealed, unless indicated otherwise. Where bolts or screws are permitted in work exposed to view, they shall be oval head and counter sunk, unless otherwise noted, with projecting end cut off flush with nuts or adjacent material, and shall match adjacent surfaces.
- 3. Do all necessary drilling, tapping, cutting or other preparations of surrounding construction in the field accurately, neatly and as necessary for the attachment and support of work of this Section, but obtain Architect's approval prior to such preparation to work of others.

**C. Tolerances: All work of this Section shall be plumb, square, level, true to radius and correctly aligned within the following limitations:**

- 1. Offset from true horizontal, vertical and design location shall not exceed 1/16" per ten (10) feet of length for any component, not cumulative.
- 2. Maximum offset from true alignment between abutting components shall not exceed 1/32".

- D. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units at Contractor's option.

- E. Install concealed gaskets and joint fillers as the work progresses, so as to make the work soundproof or lightproof as required.
- F. Restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location.
- G. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform oxidation and discoloration.
- H. Field Welding: Comply with AWS Code for the procedures of manual shielded metal- arc welding, the appearance and quality of welds made, and the methods used in correcting welding work.

### 3.3 CLEANING AND PROTECTION

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Protect finishes of ornamental metal from damage during construction period with temporary protective coverings approved by ornamental metal fabricator. Remove protective covering at the time of Substantial Completion.
- C. Restore finishes damaged during construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057000