

## **SECTION 05 50 00 METAL FABRICATIONS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

##### **A. Section Includes**

1. Weld plates, bearing plates, lintels, shelf- and relieving angles, angle- and pipe-frames, area-way grating cover, railings and other steel shapes and fabrications unless expressly noted as structural steel or sized on Structural Drawings.
2. Include sleeves, anchors, bolts and related accessories.
3. Ships' Ladders.

##### **B. Products Furnished, but Installed under another Section**

1. Construction Waste Management and Disposal- Section 01 74 19
2. Sleeves, anchors, bolts etc., Sections 03 10 00, 03 30 00, 04 20 00 and 05 40 00
3. Elevator pit ladders, Section 14 21 00

##### **C. Related Items**

1. Cast-in-place concrete, Sections 03 10 00, 03 20 00 and 03 30 00
2. Unit masonry, Section 04 20 00
3. Metal Primers: Section 05 03 00.
4. Structural, light-gage metal framing, Section 05 40 00
5. Pre-engineered metal stairs, Section 05 51 00
6. Aluminum Railings, Section 05 52 10
7. Steel Railings, Section 05 72 10.
8. Field applied paints, Section 09 96 00 High Performance Coating System

#### **1.2 SUBMITTALS**

##### **A. Submit for the Architect's review.**

1. Product Data for manufactured components.
2. Shop Drawings
  - a. Indicate complete fabrication and installation details, including at least the following.
    - 1) sizes and profiles of metal sections
    - 2) thicknesses or gages, as applicable, of metals
    - 3) attachments
    - 4) locations of field joints,
    - 5) method of support from structure,
    - 6) finishes, and
    - 7) work to be built-in or provided under other Sections
  - b. Indicate welded connections, both shop and field, using standard AWS welding symbols. Indicate net weld lengths.

##### **B. Submit for the Owner's use / records.**

1. Statements of Qualifications from manufacturers.
2. Statements of Qualifications from installers.
3. Certificates of Compliance regarding manufacturer designed and engineered components and connections

##### **C. Submit for LEED Credit documentation.**

1. Refer to Section 018113 "Sustainable Design Requirements" for additional LEED submittal requirements.

2. Product Data for Credit MR 4.1 and Credit MR4.2: For products having recycled content, provide documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating material costs for each product having recycled content.
3. Product data for Credit MR 5.1 and Credit 5.2: For products having regional content::
  - a. Provide documentation indicating location of manufacturer of product. If only a fraction of the material is manufactured regionally, indicate fraction as a percentage product's total weight.
  - b. Provide documentation indicating location of extraction, harvest or recovery of raw material in product. If only a fraction of the material is extracted, harvested or recovered regionally, indicated fraction as a percentage of product's total weight.
  - c. Include statement indicating material costs for each product having regional content.
4. Product Data for Credit EQ 4.1: Provide documentation indicating VOC content of product for all adhesives, sealants and mastics applied on-site and interior of the building's weatherproofing system.
5. Product Data for Credit EQ4.2: Provide documentation indicating VOC content of product for all paints, primers and coatings applied on-site and interior of the building's weatherproofing system.
6. Product Data for Credit EQ 4.4: Provide documentation for all composite-wood and agrifiber products installed interior of building's weatherproofing system indicating that product contains no urea formaldehyde. Provide documentation for all laminating adhesives used for on-site or off-site fabrication of composite wood and agrifiber assemblies installed interior of the building's weatherproofing system indicating that product contains no added urea formaldehyde.

### 1.3 QUALITY ASSURANCE

#### A. Manufacturer's Qualifications

1. Firm with at least 5-years' experience producing the specified products.
2. Manufacturer/fabricator shall have staff experienced in the design, engineering, and detailing of metal components and connections.

#### B. Installer's Qualifications

1. Firm with at least 3-years' experience installing projects similar in scale and complexity to those required for this Project, including specific requirements indicated.
2. Successfully completed at least 5 similar projects using this system; submit list with the names and telephone numbers of knowledgeable client contacts.

C. **Welders:** qualified under AWS D1.1 and AWS D1.3 for each type of weld required

### 1.4 DELIVERY, STORAGE, AND HANDLING

#### A. Storage and Protection

1. Store and handle materials using methods that will prevent damage to finished surfaces.
2. Protect steel surfaces from corrosion.
3. Protect painted and galvanized surfaces from abrasion and abuse.
4. Protect from damage caused by the elements and construction procedures.

### 1.5 MOCK-UPS

- A. Provide a full scale mock-up of pre-fabricated metal panels at sloped glazed curtain wall base (ref. A1/A-405.2 and E1/A-403.2), as indicated on Drawings. Mock-up shall include a minimum of two curtain wall segments. Include all clips, anchors, fasteners, substructure and finishes for completed sample assembly. Accepted mock-up may be integrated into final installation.

## PART 2 - PRODUCTS

### 2.1 LEED REQUIREMENTS

#### A. LEED Requirements:

1. Refer to Section 01 81 13 for "Sustainable Design Requirements" for additional LEED product requirements.
2. Product compliance for Credit MR7: Forest Certification: For all wood products and wood containing products, provide materials produced from wood obtained from forests certified by and FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship".

3. Product Compliance for Credit EQ 4.1: All adhesives, sealants and mastics applied on-site and interior of the buildings' weatherproofing system shall comply with the VOC requirements of Section 01 81 13 "Sustainable Design Requirements".
4. Product Compliance for Credit EQ4.2: All paints, primers and coatings applied on-site and interior of the building's weatherproofing system shall comply with the VOC requirements of Section 01 81 13 "Sustainable Design Requirements".
5. Product Compliance for Credit EQ 4.4: All composite-wood and agrifiber products installed interior of the building's weatherproofing system shall contain no added urea formaldehyde. All laminating adhesives used for on-site or off-site fabrication of composite wood and agrifiber assemblies installed interior of the building's weatherproofing system shall contain no added urea formaldehyde.

## 2.2 MATERIALS

- A. **Stainless Steel:** Austenitic, Type 302/304, chromium nickel stainless steel meeting AISI specification and containing 8 percent nickel and 18 percent chromium
  1. Bar stock: ASTM A276
  2. Plate: ASTM A167
  3. Tubing: ASTM A269
  4. Castings: ASTM A297, iron-chromium-nickel alloy
- B. **Steel Shapes, Bars, and Plates:** ASTM A6, ASTM A36
- C. **Steel Plates, Bent and Cold-formed:** ASTM A283
- D. **Steel Tubing:** ASTM A500 and ASTM A513, Type 5
- E. **Steel Sheet:** ASTM A653, SS, Grade 40
- F. **Checkered Steel Floor Plate:** ASTM A786, Pattern No. 4
- G. **Steel Pipe:** ASTM A53, Type S, grade A, standard weight black finish pipe; Schedule as indicated

## 2.3 COMPONENTS

- A. **Handrail Wall Brackets:** malleable iron, 2-1/2 or 2-3/4 inch diameter wall plate, center of rail 2 inches from face of wall.
  1. Acceptable products
    - a. Julius Blum and Company, Inc., No. 382
    - b. J. G. Braun Company No. 4596
    - c. R and B Wagner, Inc., No. 1765
- B. **Under-counter Support Brackets:** fabricated from steel and pre-drilled for fasteners.
  1. Furnish prime painted for field finish as specified in Section 09 9600.
  2. Acceptable Products: selected to be approximately 6-inches less than depth of top.
    - a. Rakks, Nos. EH-1818, -1824, and -2430
    - b. A and M Hardware, Work Station Brackets 15x21, 18x24, and 24x29
- C. **Ornamental Sheet Metal (OM-1):** perforated hot dipped galvanized steel sheet, 0.024-inch thick
  1. Perforation Pattern
    - a. 0.098" Diameter
    - b. 0.216" Straight (grid) Centers
    - c. 16% open area
- D. **Metal Ships' Ladders:**
  1. Provide metal ships' ladders where indicated. Fabricate open type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.
    - a. Fabricate ships' ladders including railings from steel.
    - b. Fabricate treads from welded or pressure -locked steel bar grating. Limit openings in gratings to no more than 1/2 inch in least dimension.
    - c. Comply with Division 5 "Steel Railings".
    - d. Finish to match pre-engineered metal stairs, Section 05 5100.

**E. Wire Mesh (West Lobby Stair-Re: A4/A651.2 in Drawings)**

1. Square weave wire mesh, stainless steel Type 304, 4 inch square opening, 0.2500 inch wire diameter, Lockcrimp weave.
2. Open area: 89 percent.
3. Manufacturer and product:
  - a. McNichols: Item No. 3804250051.
  - b. Comparable product of other manufacturer.

**2.4 ACCESSORIES**

- A. **Fasteners:** selected by fabricator for each condition, unless fastener type / size is expressly indicated.
1. Anchor bolts: ASTM A307, Grade A; unfinished
  2. High strength bolts: ASTM A325
- B. **Shop Primers**
1. **Unless indicated otherwise:** Prime per section 05 03 00.
  2. **For Steel with Exterior Exposure:** Prime per section 05 0300 and finish per 09 9600. Use the same manufacturer as selected for the finish coat specified in Section 09 9600 or provide Certificate of Compatibility from both manufacturers.
- C. **Galvanize Repair Compound:** metal fabrication manufacturer's standard product.
- D. **Bituminous Coating:** cold-applied asphalt mastic meeting SSPC-Paint 12, compounded for 30 mil thickness per coat.
- E. **Non-metallic, Shrinkage Resistant Grout:** pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sand, portland cement, shrinkage compensating agents, plasticizing, and water reducing agents.

**2.5 GENERAL FABRICATION**

- A. When cutting, shearing, punching and forming, leave clean, true, uniform lines and surfaces, free from buckles and twists. Remove burrs.
- B. **Welding:** comply with AWS D1.1 and D1.3 including current revisions, with 0.02 inch tolerance.
1. Where weld will be exposed to view in the finished Work, grind smooth and flush with adjacent surfaces.
  2. Paint welds and surrounding areas with primer to match adjacent surfaces.
- C. **Mechanical Fastening:** bolts and screws, except where welded connections or other connections are indicated.
1. Provide mechanical fasteners for field connections.
  2. The fabricator shall design connections unless they are expressly detailed on Drawings.
  3. Hide mechanical fasteners whenever possible. Where not hidden, use flush countersunk type unless indicated otherwise.
- D. Make exposed mechanically fastened joints flush butt type, hairline-tight joints.
- E. Supply components required for proper anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, unless otherwise specified in Schedule herein.
- F. When finishing is required, completely assemble, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- G. Shop assemble in largest practical sizes that can be easily handled through building openings and accessibility routes.

**2.6 FABRICATION OF MISCELLANEOUS ITEMS**

- A. **Steel Ladders. (Elevator, General Use, and Mechanical Access)** Unless indicated otherwise fabricate steel ladders as follows, coordinate with elevator supplier.

1. Stringers (side rails): 3- by 3/8-inch steel bars with eased edges.
  2. Clear Width: 18-inches between stringers.
  3. Rungs: 3/4-inch diameter smooth steel rods at 12-inches on-center.
  4. Brackets: 3- by 3/8-inch by 11-inches bent steel plate fabricated so that the center line of rungs falls 7 inches from wall. Furnish for maximum 4-feet on-center spacing.
  5. Extend stringers 3'-6" above top rung and return to wall
  6. Comply with applicable OSHA requirements for steel ladders.
- B. Miscellaneous Framing and Supports**
1. Provide miscellaneous framing and supports, not a part of structural steel framework, which are necessary to complete Project Work.
  2. Fabricate miscellaneous units to sizes, shapes, and profiles indicated or if not indicated, to required dimensions to receive adjacent other work to be retained by framing. Unless otherwise indicated, fabricate from steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware and similar items.
  3. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish insert if units must be installed after concrete is placed. Unless otherwise indicated space anchors 24 inches on center and provide anchor units not less than 10-1/4 inch by 1/4 inch by 8 inch steel straps.
- C. Pipe Railings.** Fabricate using Schedule 40 Steel Pipe, and rod-, and bar-stock as indicated.
1. Space vertical posts as required to meet the specified performance requirements.
  2. Top Rail. Design and fabricate integral railings and their connections to resist the following loads with 1/2-inch, maximum, deflection at the top-rail, with no permanent set, and to meet OSHA requirements. The two loads shall not be considered cumulative.
    - a. Design and fabricate railings and component connections to resist a 250-lb concentrated load applied in any direction at any point on the top rail.
    - b. Design and fabricate railings and component connections to resist a vertical and horizontal thrust of 50 lbs-per-lin.ft applied to the top railing without permanent set or damage.
  3. In-Fill Areas. Design and fabricate in-fill areas of railing to resist a concentrated load of 200-lbs applied on a 1-sq.ft area at any point in the system including intermediate rails or other components serving this purpose. This loading shall not be applied simultaneously with other loading conditions.
- D. Shelf and Relieving Angles.** Fabricate from steel angles of sizes indicated and for attachment to framing. Provide slotted holes to receive 3/4 inch bolts, spaced not more than 6 inches from ends and not more than 24 inches on center. Provide angles in lengths not more than 10 feet and length not less than 3 feet.
1. At building expansion joints, provide expansion joint in relieving angle of same dimension as building expansion joint. At expansion/contraction joints in brick veneer, provide expansion joint of 3/16 inch between angles.
- E. Loose Bearing and Leveling Plates.** Provide for steel items bearing on masonry or concrete construction, fabricate flat, free from warps or twists, and required thickness and bearing area. Drill plates to receive anchor bolts and for grouting.
- F. Miscellaneous Steel Trim and Brackets.** Provide shapes and sizes for profiles indicated. Fabricate with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work.
- G. Loose Lintels.** Provide above openings in masonry unit walls, including openings for mechanical and electrical work. Loose angle lintels and lintel beams shall be detailed for bearing of not less than 1 inch per foot of span, but not less than 8 inches, unless otherwise indicated.
- H. Steel Backing**
1. Plates for wall-mounted casework, equipment and appliances: as indicated; if not shown provide minimum 8-gage, galvanized steel sheet; coordinate with Sections 06 4000 and 11 7010.
  2. Steel Sheet Reinforcing for wall mounted building accessories: as indicated; if not shown provide minimum 18-gage, galvanized steel sheet; coordinate with Sections 08 7110, 10 1100, 10 2600 and 10 2800.

- I. **Steel Pipe Bollards.** Fabricate from 8 inch diameter, schedule 80 steel pipe to set bollards in 16 inch diameter 4-foot deep hole filled with concrete.
- J. **Rebounding Bollard**-6.63-inch diameter, 36-inch high rebounding bollard, as manufactured by Impact Recovery Systems, or comparable product.
- K. **Stainless Steel Window Sill:** 0.050-inch, Austenitic, Type 302/304, chromium nickel stainless steel meeting AISI specification and containing 8 percent nickel and 18 percent chromium. Fabricate as 2-1/2- by 2-1/2-inch, equal-leg angle.
- L. **Stainless Steel Counters and Tops**
  - 1. Fabricate from 0.060-in., minimum, Stainless Steel Sheet.
  - 2. Exposed surfaces and edges shall have No. 4 (satin) finish.
  - 3. To the extent practicable, fabricate tops in a single piece for each run of casework. Do not locate needed joints within 30-inches of a sink or integral drain board.
    - a. Factory joints: electrically welded, ground smooth and finished to match exposed top surface.
    - b. Field joints: not permitted
  - 4. Fabricate tops to be installed without field cutting or drilling. Take measurements at the Site and coordinate fabrication with related casework specified in Sections 06 4100, and 12 #####.
  - 5. Overall thickness of counter tops shall be 1-1/2-inch thick unless otherwise noted.
  - 6. Fabricate tops with seamless, die-formed 1/4-inch high raised marine edge at front surface and drip groove or bevel in underside of return.
  - 7. Back- and end splashes shall be 4-inches high, unless expressly indicated otherwise, and shall meet horizontal surface of top with integral, coved joint. Form tops and backsplashes from single sheet of metal.
  - 8. Reinforce tops with continuous stainless steel channels welded to the underside along length to prevent twisting, oil canning, or buckling of surface. Reinforce tops at the perimeter of sinks.
  - 9. Drainboards: two-way pitched to bowl to provide drainage without channeling or grooving.
  - 10. Where sinks are shown, they shall be integral and of the size(s) indicated with vertical and horizontal corners rounded or coved to 5/8-inch radius. Slope bottom of sink to outlet. If sink dimensions are not indicated provide 22 inches by 16 inches by 11 inches deep. Seams and joints shall be electrically welded, ground smooth and finished to match tops.
  - 11. Coat concealed surfaces of tops, including sides and bottoms of sinks, where provided, with sound deadening material.
- M. **Corner Guards (CG-1) ( at Truck Dock and Event Level Marshaling)** Provide bent 1/8" thick x 4 foot high steel checker plate attached to substrate with epoxy grout. Width variable dependent on size of concrete column 4 plates assembled to wrap column 360 degrees.

## 2.7 FINISHING

- A. **Painting.** Surfaces shall be clean, dry and free of deleterious substances that would impair the work.
  - 1. Extents of Work. Apply shop primer to metal fabrications, except the following.
    - a. Surfaces that will be embedded in or in contact with concrete.
    - b. Surfaces within 2 inches of field welds.
    - c. Surfaces scheduled for galvanizing.
    - d. Non-ferrous metals not scheduled for painting.
    - e. Surfaces to receive fireproofing.
  - 2. Clean surfaces as recommended by the coating manufacturer and as follows.
    - a. After shop fabrication and inspection, clean steel to be shop painted in compliance with SSPC No. 6 Commercial Blast Cleaning (SSPC-SP6), and to achieve a blast profile of 1.0 to 2.0 mils.
    - b. Preparation rust inhibitive acrylic primer. After shop fabrication and inspection, clean steel to be shop painted in compliance with SSPC SP-3. Remove loose rust, loose mill scale and spatter, slag, flux deposits, coatings, oil, grease, and dirt.
  - 3. Painting. After preparation and before leaving shop apply one coat of paint of the specified type. Apply paint, following the manufacturer's instructions, to obtain a uniform coating with the DFT specified in Sections 05 0300 and 09 9600.
    - a. Use methods that will result in full coverage of joints, corners and all open spaces.
    - b. Do not apply primer when the surface temperature of the steel is below the dew point of the atmosphere.

- B. **Galvanizing.** Shop galvanize to comply with ASTM A123 and to provide the coating thickness specified, if not specified provide G90 (minimum 1.5-ounces per square foot) coating.
  - 1. Galvanize supports and anchors for brick and pre-cast concrete at exterior locations, including but not limited to relief angles, brackets, hangers, lintels, plates, bolts, shims, and bracing.
- C. **Electrolytic Isolation**
  - 1. Apply 1 coat of bituminous paint or other isolating material to surfaces of aluminum materials that will be in contact with dissimilar metals.
  - 2. Apply 1 coat of bituminous paint or other isolating material to surfaces of aluminum materials that will be in contact with materials such as concrete, masonry, or lime mortar.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. **Verify Working Conditions.** Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion. Do not proceed until unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Comply with manufacturer's recommendations.
- B. Install fabricated metal items complying with manufacturer's instructions.
  - 1. Install plumb and level.
  - 2. Securely anchor in place.
  - 3. Provide suitable temporary braces and stays to hold items in position until permanently secured.
- C. **Field Welding:** as specified under General Fabrication in this Section.
  - 1. Touch up welds in shop prime painted work with same primer.
  - 2. Touch up welds in galvanized work with galvanize repair compound.
- D. **Anchor Devices.** Attach to withstand a load of at least 250-pounds applied in any direction without dislodging the device.
- E. **Items Embedded in Concrete**
  - 1. Position accurately and support against displacement.
  - 2. Temporarily fill voids with removable material where such voids are not to be filled with concrete.
  - 3. Attach and locate anchors for proper embedment.
- F. **Bolt Tightening**
  - 1. A307 Bolts (ASTM A307) Tighten to snug, tight fit. Insure parts are in contact. Use self-locking type nut or upset bolt threads to prevent nut from coming off.
  - 2. A325 Bolts (ASTM A325) Install washer and tighten bolt to comply with ASTM A325.
- G. Whenever dissimilar metals come in contact with each other, or aluminum in contact with concrete or masonry, apply a protective coating to the contacting metal surfaces.
- H. **Steel Pipe Bollards**
  - 1. Locate as indicated on Drawings.
  - 2. Fill with 3000 psi, air entrained concrete, round-off tops of concrete fill.
- I. **Field Finishing.** After installation, finish bare metal and repair damage to shop finishes.
  - 1. For painted surfaces, clean bare metal and apply primer to field welds, bolt connections, and abraded areas. Use same primer as fabricator; blend to smooth inconspicuous repair.
  - 2. For galvanized surfaces, clean bare metal and apply galvanic repair compound to field welds, bolt connections and abraded areas. Apply 2-coats following coating manufacturer's instructions; blend to inconspicuous repair.

**END OF SECTION 05 50 00**

