

**SECTION 057300
DECORATIVE METAL GUARDRAILS AND RAILINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Stair and Balcony Guardrails.
- B. Flush Balcony Railings

1.02 RELATED REQUIREMENTS

- A. Section 017419 - Construction Waste Management and Disposal: Additional requirements for cleaning.
- B. Section 055913 - Metal Balconies: Supports.
- C. Section 055100 - Metal Stairs: Handrails other than those specified in this section.
- D. Section 057100 - Decorative Metal Stairs.
- E. Section 062000 - Finish Carpentry: Wood handrail.
- F. Section 092116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).
- B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels, current standard.
- C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels, current standard.
- D. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- E. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications 2020.
- F. ASTM A242/A242M - Standard Specification for High-Strength Low-Alloy Structural Steel 2013.
- G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2014, with Editorial Revision (2017).
- H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2020.
- I. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing 2016.
- J. ASTM A555/A555M - Standard Specification for General Requirements for Stainless Steel Wire and Wire Rods 2020.
- K. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- L. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings 2009 (Reapproved 2015).
- M. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus 2019.
- N. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable 2018.
- O. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2014.
- P. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2013.

- Q. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink) 2017.
- R. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements 2018.
- S. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings 2013, with Editorial Revision.
- T. ASTM F3125/F3125M - 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 2019.
- U. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015, with Errata (2016).
- V. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel 2017.
- W. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).
- X. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Schedule and conduct a pre-installation meeting one week before starting work of this section. Attendees shall include, but are not limited to:
 - 1. Contractor.
 - 2. Manufacturer's representative.
 - 3. Architect.
 - 4. Owner's representative.
 - 5. Other subcontractors of adjacent work.

1.05 SUBMITTALS

- A. [See Section 013000 - Administrative Requirements for submittal procedures.] **OR** [See Division 01, Administrative Requirements for submittal procedures.]
- B. Product Data: Submit manufacturer's product data, including description of materials, components, finishes, fabrication details, anchors and accessories.
- C. Shop Drawings: Indicate railing system elevations and sections, finishes, details of profile, details of attachment of metal panels to supports, dimensions, sizes, tolerances, connection attachments, anchorage, size and type of fasteners, accessories and installation methods. Indicate anchor and joint locations, connections, transitions, and terminations.
- D. Samples: Submit two (2) of each item below for each type and condition shown.
 - 1. If requested, provide up to six different powder coat samples for submittal review.
 - 2. [3 inch by 6 inch samples of powder coat.] **OR** [2 inch by 2 inch Kynar color chips or anodized aluminum samples
 - 3. Pattern Sample: [Submit 12 inch by 12 inch flat panel, without finish] **OR** [Submit **[Insert number of panels]** full size panel samples]. Pattern scaling may vary depending on selection.
 - 4. Railing: 12 inch (305 mm) long section of handrail illustrating color, finish and connection detail.
- E. Test Reports: If required, submit test reports from an independent testing agency showing compliance with specified design and performance requirements.
- F. Manufacturer's Installation Instructions.
- G. Manufacturers storage and handling instructions.
- H. Sustainable Design Submittals:
 - 1. In accordance with Division 01 sustainable design requirements.

OR

2. Submit Product Data for Credits [**Insert Sustainable Design program credits here**]
 3. For products having recycled content, documentation indicating percentages by weight of post consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
- I. Maintenance Data: Manufacturer's instructions for care and cleaning.
 - J. Manufacturer's Qualification Statement.
 - K. Installer's Qualification Statement.
 - L. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Verification and Coordination:
 1. Verify actual locations of walls and other construction contiguous with the work of this Section using field measurements before fabrication. Indicate measurements on Shop Drawings.
 2. Embedded Anchor Plates and Structural Connections: Coordinate support sizes and locations.
- B. Engineering:
 1. System to be engineered by manufacturer for standard loading criteria and geometry layout.
 2. Custom Systems: Structural design to be performed by the manufacturer or a Registered Structural Engineer licensed in the State in which the Project is located.
 3. Engineering for panels and panel assembly will be provided by manufacturer. Structural attachment or connections to be engineered by the Engineer of Record for the Project.
- C. Installer to supply manufacturer with existing field dimensions of structure, bracket locations, and any other conditions that affect the location of work.
- D. Installer Qualifications: Company specializing in installation of decorative railing systems and guardrails with a minimum of five years of documented experience and certified or approved by manufacturer.
- E. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than ten years of documented experience.
- F. Fabricator Qualifications: Company specializing in fabrication of products of the type specified in this Section with a minimum of 8 years of documented experience and sufficient production capacity to produce the required units within the Project schedule..

1.07 MOCK-UP

- A. Provide mock-up of railing system and guardrail illustrating each type of material, cladding, and finish.
- B. See Section 014000 - Quality Requirements for additional requirements.
- C. Locate where directed.
- D. Mock-up [may] or [may not] remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original protective coverings and packaging with corresponding labels and identifying information.
- B. Protect materials against damage during transit, delivery, storage, and installation at site. Protect against bending, warping, twisting or surface damage. Store in accordance with manufacturers written instructions and in a dry location.
- C. Inspect materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.

- D. Store in accordance with manufacturers written instructions. Do not stack panels. Store prefinished material off ground and protected from weather; prevent twisting, bending, or abrasion, and provide ventilation to stored materials; slope metal sheets to ensure drainage. Provide protection between panels.
- E. Prevent contact with materials that may cause discoloration or staining of products.

1.09 WARRANTY

- A. Warranty: Manufacturer's standard one year warranty against defects in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion.
- B. Correct defective work within a five year period after Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
- C. Warranty: Manufacturer's standard five year warranty against defects in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion.
- D. Warranty on FEVE and PVDF Finishes: Provide **[manufacturer's standard 10 year warranty] OR [manufacturer's extended 20 year warranty]** on finish. Not all colors are available with extended warranties. If extended warranty is required, confirm color selection with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. BOK Modern, Inc.: **[Insert product style name here]**; www.bokmodern.com
- B. Substitutions: [See Section 016000 - Product Requirements.] **OR** [See Division 01, Administrative Requirements for substitution procedures] **OR** [Not permitted].

2.02 RAILING SYSTEMS PERFORMANCE REQUIREMENTS

- A. Railing Systems - General: Factory- or shop-fabricated in design style indicated to suit specific project conditions and for proper connection to building structure in largest practical sizes for delivery to site.
 - 1. Performance Requirements: Design and fabricate railings and anchorages to resist the following loads without failure, damage, or permanent set; loads do not need to be applied simultaneously.
 - a. Lateral Force: [] lb ([] N) minimum, at any point, when tested in accordance with ASTM E935.
 - b. Distributed Load: [] lbs/ft ([] kN per m) minimum, applied in any direction at the top of the handrail, when tested in accordance with ASTM E935.
 - c. Top Rail of Guards:
 - 1) Concentrated load of 200 lbf (0.89kN) applied at any point and in any direction.
 - 2) Uniform load of 50 lbf-ft. (0.07kN-m) applied horizontally and concurrently with uniform load of 100 lbf-ft. (0.14kN-m) applied vertically downward.
 - 3) Concentrated and uniform loads above need not be assumed to act concurrently.
 - d. Handrails not Serving as Top Rails:
 - 1) Concentrated load of 200 lbf (0.89 kN) applied at any point and in any direction.
 - 2) Uniform load of 50 lbf-ft. (0.07kN-m) applied in any direction.
 - 3) Concentrated and uniform loads above need not be assumed to act concurrently.
 - e. Guard Infill Area:
 - 1) Concentrated horizontal load of 200 lbf (0.89 kN) applied to 1 sq ft at any point in system including panels, intermediate rails, balusters, or other elements composing infill area. Loads need not be assumed to act concurrently with loads on top rails in determining stress on guard.
 - 2) Thermal Movements: Panels to allow for movements resulting from 120 Degrees F (49 Degrees C) changes in ambient temperatures and 180 Degrees F (82 Degrees C) surface temperatures and base engineering calculation on surface

temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

- 3) Corrosion Resistance: Separate incompatible materials to prevent galvanic corrosion.
2. Assembly: Join lengths, seal open ends, flanges, escutcheons and wall brackets.
3. Joints: Per manufacturers recommendation for seismic movement or thermal expansion and contraction.
4. Field Connections: Provide sleeves to accommodate site assembly and installation.
5. Welded Joints: Make visible joints butt tight, flush and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
 - a. Ease exposed edges to a small uniform radius.
 - b. Welded Joints:
 - 1) Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.
 - 2) Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.
 - 3) Corten: Perform welding in accordance with AWS D1.1 and D1.5. For A606 and A588 steel AWSA5.29 and E81T1-Ni1C wire shall be used.
 - 4) Aluminum: Perform welding in accordance with AWS D1.2 / D1.2M. Welding shall use alloy 5356 filler required for anodizing.

2.03 ORNAMENTAL PERFORATED METAL PANELS

- A. Metal Surfaces: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations or blemishes; unless allowed for specific metal types and finishes.
- B. Perforated Aluminum Sheet: AA5052-H32, [**0.125-inch (3.17 mm)**] [**0.1875-inch (4.76 mm)**] [**Insert custom thickness**] thick.
- C. Perforated Stainless Steel Sheet: ASTM A240/A240M, [**Type 304**] [**Type 316L**], [**0.062- inch (1.57 mm)**] [**Insert custom thickness**] thick.
- D. Perforated Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel Type B, [**0.074-inch (1.88 mm)**] [**Insert custom thickness**] thick.
- E. Perforated Corten Steel Sheet: ASTM A242/A242M, [**0.074-inch (1.88 mm)**] [**Insert custom thickness**] thick.
- F. Material: Corten Weathering Steel, [] gauge, [] inch ([] mm) minimum thickness.
- G. Material: Hot Rolled Steel, [] gauge, [] inch ([] mm) minimum thickness.
- H. Laser Cut Proprietary Pattern: [**As selected by the Architect from manufacturer's full library**] OR [**Insert name of custom design and pattern scale here**].

2.04 FABRICATION

- A. Fabricate metal panel assemblies to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish and anchorage, but not less than required to support structural loads.
- B. Fabricate systems in accordance with approved shop drawings and manufacturers written instructions. Form work true to line and level with accurate angles and surfaces.
- C. Assemble metal panels in the shop to greatest extent possible to minimize field splicing and assembly.
- D. Cut, drill and laser cut metals cleanly and accurately. Remove burrs and ease edges; unless allowed for specific metal types and finishes. Remove sharp or rough areas on exposed surfaces.
- E. Cut, reinforce, drill and tap as indicated to receive finish hardware, screws and similar items.
- F. Use grommets, bushings and washers or methods as recommended by the manufacturer for separation of dissimilar metals.

2.05 FINISHES

- A. Comply with NAAMM's MFM for recommendations for applying and designating finishes.
 - 1. Appearance of Finished Work:
 - a. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved samples.
 - b. Noticeable variations in same piece are not acceptable except for steel and anodized aluminum.
 - c. Variations in appearance of other components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.
- B. Finishes for Aluminum; Anodized :
 - 1. Clear Anodic Finish: AAMA 611, AA-M10C22A41 CLASS I, Architectural Class 1, 0.7 to 1.2 mil coating thickness.
 - 2. Color Anodic Finish: AAMA 611, AA-M10C22A44 CLASS II, Architectural Class 1, 0.7 to 1.2 mil coating thickness.
 - a. Color: As selected by Architect from manufacturers full range
 - b. Color [_____].

Finishes for Aluminum; Powder Coating to meet AAMA 2604:

- 3. Pretreat according to manufacturers instructions and AAMA 2604 to withstand a minimum of 2000 hours (ASTM B117) or 1500 hours (ASTM G85) salt spray testing.
- 4. Apply Architectural Grade AAMA 2604 compliant topcoat at a minimum of 2.5 mils and process according to manufacturer's recommendations.
- 5. Color and Gloss: [As selected by Architect from manufacturer's full range of choices]

Finishes for Aluminum; Fluoropolymer Coating to meet AAMA 2605:

- 6. Pretreat according to manufacturer's instructions and AAMA 2605 to withstand a minimum of 3000 hours (ASTM B117) or 2000 hours (ASTM G85) salt spray testing.
- 7. Apply standard available colors, high volume RAL, or high volume custom color matches in single coat powder finish containing no less than 100% FEVE (fluorinated ethylene vinyl ether) at a minimum of 2.0 mils and process according to manufacturer's recommendations.
- 8. Apply custom color matches for low volume as a 2-coat 70% min. PVDF (poly vinylidene fluoride) resin fluoropolymer powder or liquid system including specially formulated inhibitive primer where required by manufacturer and top color coat to total dry film thickness of 2-3 mils.
- 9. Apply specifically available pallet colors only as a 3-coat system including clear fluorocarbon topcoat using 70% min. PVDF (poly vinylidene fluoride) resin fluoropolymer liquid to total dry film thickness of 2-3 mils.

- C. Finishes for Steel:
 - 1. Mill finish.
 - 2. Powder Coating:
 - a. Pretreat according to AAMA 2604 to withstand a minimum of 2000 hours (ASTM B117) or 1500 hours (ASTM G85 Annex A2).
 - b. Apply zinc rich primer for steel at minimum of 2.0 mils 50 percent or less cure to ensure proper inter coat adhesion to topcoat.
 - c. Apply AAMA 2604 compliant topcoat at a minimum of 2.0 mils and process according to manufacturer's written recommendations.
 - d. Color and Gloss: As selected by Architect from manufacturers standard range.
- D. Stainless Steel:
 - 1. Polished Finishes:
 - a. Grind and polish surfaces to produce uniform finish free of cross scratches.
 - 2. Mill finish with no additional treatment to surfaces.
 - 3. Orbital sanding

- E. Pre-grained #4 finish on available gauge material.
- F. Cor-ten or weathering steel unfinished mill material with no significant scratches or gouges.

2.06 ACCESSORIES

- A. Non-Weld Mechanical Fittings for Stainless Steel Railings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
- B. Non-Weld Mechanical Fittings for Aluminum Railings: In-line aluminum fittings, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
- C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; joints and seams ground smooth.
- D. Universal Bracket:
 - 1. Stainless steel 2-part bracket. Installed per manufacturer's instructions.
 - 2. Finish: Powder coat.
 - 3. Color: As selected by Architect from manufacturer's standard range.
 - 4. Manufacturer: BOK Modern, Inc.; www.bokmodern.com.
- E. Anchors and Fasteners:
 - 1. Fasteners: **[Stainless Steel fasteners] OR [Corten fasteners]**.
 - 2. Select fasteners of type, grade and class required to product connections for anchoring metal panels to other types of construction indicated and capable of withstanding design loads.
 - 3. Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
 - 4. Do not use metals that are corrosive or non-compatible with materials joined. Avoid fastening dissimilar materials and separate with isolating hardware where necessary.
 - a. For anchorage to concrete, provide inserts to be cast into concrete for bolt anchors.
 - b. For anchorage to masonry, provide brackets to be embedded in masonry for bolt anchors.
 - c. For anchorage to stud walls, provide backing plates for bolt anchors.
 - d. Posts: Provide adjustable flanged brackets.
 - 5. Exposed Fasteners: No exposed bolts or screws.
- F. Carbon Steel Bolts and Nuts: ASTM A307.
- G. Hydraulic Expansion Cement: ASTM C1107/C1107M.
- H. Bituminous Coating: Cold-applied asphalt mastic, noncorrosive compound free of asbestos, sulfur, and other deleterious impurities; 0.015 inch (0.4 mm) dry film thickness per coat complying with ASTM D1187.
- I. Sealant: Silicone; black.
- J. Finish Touch-Up Materials: As recommended by manufacturer for field application.
- K. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- L. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Prior to commencement of work, verify that substrate and site conditions are acceptable and ready to receive work.
- B. Verify field dimensions and measurements are acceptable to suit assembly tolerances.
- C. Verify supports and anchors are correctly positioned and set.

- D. Notify Architect immediately of conditions that would prevent satisfactory installation.
- E. Do not proceed with work until detrimental conditions have been corrected.
- F. Furnish components to be installed in other work to installer of that other work, including but not limited to blocking, sleeves, inserts, anchor bolts, embedded plates, and supports for attachment of anchors.

3.02 PREPARATION

- A. Protect existing work.
- B. Install in accordance with manufacturer's written instructions.
- C. Review installation drawings before beginning installation. Coordinate diagrams, templates, instructions, and directions for installation of anchorages and fasteners.
- D. Provide items required to be cast into concrete or embedded in masonry with setting templates.
- E. Take field measurements after permanent end terminations are in place and prior to preparation of shop drawings and commencement of fabrication to ensure fitting of work.
- F. Prepare surfaces using methods recommended by the manufacturer for achieving the best result for the substrate under Project conditions.

3.03 INSTALLATION

- A. Comply with Drawings and manufacturer's written instructions.
- B. Install metal panels plumb, level, square, true to line and rigid. Fit exposed connections together to form tight, hairline joints per manufacturers recommendation for seismic movement or thermal expansion and contraction
- C. Adjust metal panels before anchoring to ensure alignment at abutting joints.
- D. Install components plumb and level, accurately fitted, free from distortion or defects, and with tight joints, except where necessary for expansion.
- E. Anchor securely to structure.
- F. Use manufacturer's hardware for panel-to-panel connections.
- G. Attach metal panels securely in place using anchorage devices and fasteners as approved by Engineer of Record.
- H. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- I. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood or dissimilar metals, with a heavy coat of bituminous paint.
- J. Universal Bracket: Install per manufacturers printed instructions.
- K. Weld connections that cannot be shop welded due to size limitations.
 - 1. Weld in accordance with AWS D1.1/D1.1M.
 - 2. Match shop welding and bolting.
 - 3. Clean welds, bolted connections, and abraded areas.
 - 4. Touch up shop primer and factory-applied finishes.
 - 5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.
- L. Isolate dissimilar materials with bituminous coating, bushings, grommets, or washers to prevent electrolytic corrosion.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

3.05 FIELD QUALITY CONTROL

- A. Field Services: Provide the services of the manufacturer for field observation of installation of railings.

3.06 CLEANING

- A. Remove protective film from exposed metal surfaces.
- B. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents, or other substances that may damage the material or finish.

3.07 ADJUSTING AND PROTECTION

- A. Touch-up and repair damage to exposed finishes to be indistinguishable from undamaged areas.
 - 1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.
 - 2. Obtain approved coating for repainting surfaces from manufacturer.
- B. Return and replace items that cannot be repaired or refinished in field.
- C. Protect installed components and finishes from damage after installation.

END OF SECTION