

SECTION 057300 DECORATIVE METAL RAILING

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 decorative metal railing as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Stainless steel post and wire rope infill railing system (Base Bid).
 - 2. Stainless steel wire mesh guardrail (Alternate).

1.3 RELATED SECTIONS

- A. Steel Pan Stairs - Section 055113.

1.4 QUALITY ASSURANCE

- A. The contractor or subcontractor performing the work of this section must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope and type to the required work. 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.

1.5 SUBMITTALS

- A. Shop Drawings: Submit for all items of work, at full scale as far as practical, showing metal thicknesses, arrangement of components, of joining, of jointing, details of all field connections and anchorages, diagrams and details explaining provisions for thermal movement, fastening and sealing methods, and support methods, metal finishes and all other pertinent information.
- B. Samples for Verification: For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the work.
 - 1. 6" long sections of each different linear railing member, including handrails, top rails and posts.
 - 2. Fittings and brackets.
 - 3. Welded connections.
 - 4. Assembled samples of railings, made from full size components, including top rail, post and handrail. Show method of finishing members at intersections. Samples need not be full height.

- C. Provide signed and sealed calculations by a Professional Engineer licensed in the State of New Jersey, demonstrating compliance with structural performance for railing system per Building Code.

1.6 PRODUCT HANDLING

- A. Finished Materials: Protect finishes against soiling, staining or damage from scratches and abrasion. Maintain protection during construction until project completion or as otherwise directed by Architect.
 - 1. Provide wrappings, strippable coatings or other means approved by Architect.
 - 2. During construction, remove protection for visual observation of finish as directed by Architect and replace to maintain protection.

1.7 PERFORMANCE STANDARDS

- A. Structural Performance of Handrails and Railings: Provide handrails and railings complying with requirements per New Jersey Code and ADA requirements.
- B. Thermal Movements: Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in engineering, fabricating, and installing handrails and railing systems to prevent buckling, opening of joints, overstressing of components and connections, damage to adjoining construction, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.
 - 1. Temperature Change (Range): 120 deg F ambient, 180 deg F material surfaces.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel Wire Rope and Fittings (Base Bid)
 - 1. Where stainless wire rope and fittings are indicated, provide products of Jakob Rope Systems' "INOX Line," as scheduled and detailed on drawings or approved equal, AISI Type 316L, conforming to ASTM A 492 and ASTM A 555. Provide thickness of wire rope indicated on drawings, located as shown.
 - 2. Fittings
 - a. Provide fittings required for attachment and connection of stainless steel wire rope and infill to support framework and substrates.
 - b. Minimum Breaking Strength of Fitting: 10% of wire rope minimum breaking strength.
 - c. Types: Fabricate from AISI Type 316L stainless steel complying with ASTM F 1145; INOX Line Fittings as manufactured by Jakob, Inc. Provide sizes and types as required to meet project design conditions specified and indicated on Drawings and reviewed shop drawings including:

- Shop-Applied Swaged Rope Ends: Threaded external and internal swivel ends, turnbuckles, tensioning screws, end stops, clevis ends, eye ends, loop ends, and end cones.
 - Screwed Rope Ends for On-site Assembly: Threaded external and internal swivel ends, turnbuckles, tensioning screws, end stops, clevis ends, eye ends, loop ends, and end cones.
 - Clamps: Ring clamps, cross clamps, wire rope clamping cones, and connecting wire rope clamps.
 - Post Fittings: Straight, angled, and spherical.
 - Anchoring Systems: Studs, clevis, eye end, eye bolt, slotted, spacer baskets, radial clevis holder, cross clamp with support disk, slotted rope deflector, ball cage.
- d. Accessories: Provide threaded couplings, tensioning screws, cover disks, eye bolts, eye nuts, carabiners, shackles, clips, welded rings, screws, washers, lock nuts, hexagonal nuts, dome nuts, wall anchors, screws, and wire endcaps as required to complete the installation.
3. Provide Jacob Inox Line tensioning screws with swaged internal thread ends at ends of tensioning cables, sized to accommodate thicknesses of wire rope indicated.
4. Make up wire-rope assemblies in the shop to field-measured dimensions with fittings machine swaged. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning wire ropes. Tag wire-rope assemblies and fittings to identify installation locations and orientations for coordinated installation.
- a. Provide optimum adjustment in both directions by calculating final tendon lengths with allowance for tensioning fittings with 2/3 open and with 1/3 of thread length engaged.
 - b. Measure tendon length from center of pin to center of pin, or center of eye to center of eye.
5. Finish: After fabrication, clean and de-scale stainless steel wire rope, fittings, and other components in accordance with ASTM A 380. Finish components with AISI No. 6 satin finish in accordance with ASTM B 912.
- B. Wire Mesh Guard Infill (Alternate): Webnet by Jakob Inox or approved equal.
- 1. Material: ASTM A 492 Type 316 stainless steel 7 x 7 wire rope joined with seamless ferrules.
 - 2. Cable Diameter: 2.0mm.
 - 3. Mesh Aperture Dimensions: As indicated on drawings.
 - 4. Mesh Perimeter Finishes: Closed loop with loose ferrules. Refer to Finish Schedule for color.
 - 5. Direction (Grain) of Mesh: As indicated on drawings.
 - 6. Seamless AISI 316L stainless steel ferrule.
- C. Stainless Steel: Comply with the following standards for the forms and types of stainless steel for the required items of work.
- 1. Pipe: ASTM A 312, Grade TP 316L.
 - 2. Sheet, Strip, Flat Bar and Plate: ASTM A 666, Type 316L.
 - 3. Tubing: ASTM A 554, Grade MT 316L.
 - 4. Castings: ASTM A 743, Grade CF 8 or CF 20.
 - 5. Bars and Shapes: ASTM A 276, Type 316L.

- D. Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.
- 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 for Interconnecting Handrails and Railing Components: Furnish of basic metal and alloy, matching finished color and texture as the metal being fastened, unless otherwise indicated. Unless otherwise shown, provide Phillips flat-head screws for exposed fasteners.
- G. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads. Fasteners shall be fabricated from Type 316 stainless steel.
- H. Erosion-Resistant Anchoring Cement: Factory packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.2 FABRICATION

- A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacings, and anchorage, but not less than those required to support structural loads.
- B. Assemble handrails and railings in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- C. Form changes in direction of members as detailed or, if not detailed, by either of the following methods:
 - 1. By radius bends of radius indicated.
 - 2. By flush radius bends.
 - 3. By bending.
 - 4. By insertion of prefabricated flush elbow fittings.
- D. Welded Connections: Fabricate stainless steel handrails and railing systems for connection of members by welding, except as otherwise indicated. Limit non-welded connections to connections that cannot be made in the factory due to size or handling limitations and similar considerations. For connections made during fabrication, weld corners and seams 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 welding flux immediately.

4. At tee and cross intersections, cope ends of intersecting members to fit contour of pipe or tube to which end is joined, and weld all around.
 5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- E. Brackets, Flanges, Fittings and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing system members to other construction.
 - F. Provide inserts and other anchorage devices to connect handrails and railing systems to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.
 - G. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
 - H. Ease exposed edges to a radius of approximately 1/32", unless otherwise indicated. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing work.
 - I. Cut, reinforce, drill and tap components, as indicated, to receive finish hardware, screws, and similar items.
 - J. Provide weep holes, or another means to evacuate entrapped water, in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources.
 - K. Fabricate joints that will be exposed to weather in a manner to exclude water.
 - L. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.
 - M. Close exposed ends of pipe by welding 3/16" thick stainless steel plate in place or with prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4" or less.
 - N. Fillers: Provide stainless steel sheet or plate fillers, of thickness and size indicated or required to support structural loads of handrails, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses to produce adequate bearing to prevent bracket rotation and overstressing substrate.
- 2.3 STAINLESS STEEL FINISHES
- A. Remove or blend tool and die marks and stretch lines into finish.
 - B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
 - C. Finish: No. 4 brushed, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where decorative metal railings are 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 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions and directions for installing anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.
 - 1. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16" in 3 feet.
 - 3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4" in 12 feet.
- C. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

3.4 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2" beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6" of post.

3.5 ANCHORING POSTS

- A. Unless otherwise shown on the drawings, use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space

between post and sleeve with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:

- B. Where indicated on the drawings, form or core-drill holes not less than 5" deep and 3/4" larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:
 - 1. Non-shrink, non-metallic grout or anchoring cement.
- C. Cover anchorage joint with flange of same metal as post, attached to post as follows:
 - 1. Welded to post after placing anchoring material.
- D. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

3.6 ANCHORING RAILING ENDS

- A. Anchor railing ends into concrete and masonry with round flanges connected to railing ends and anchored into wall construction with post installed anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.
 - 1. Weld flanges to railing ends.

3.7 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2" clearance from inside face of handrail and finished wall surface.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.

3.8 INSTALLING WIRE ROPE INFILL

- A. Install wire rope infill system in accordance with manufacturer's instructions and the approved shop drawings.
- B. Provide anchorage devices and fittings to secure to in-place construction; including threaded fittings for concrete inserts, toggle bolts and through-bolts.
- C. Install wire rope infill system plumb, level, square, and rigid without kinks or sags.
- D. Anchor wire rope railing system to mounting surfaces as indicated on the drawings.

- E. Separate dissimilar materials with bushings, grommets or washers to prevent electrolytic corrosion.
- F. Use manufacturer's supplied cable hardware.
- G. Ensure cables are clean, parallel to each other, and without kinks or sags.
- H. Tension cable with hand or hydraulic equipment so that no slack is visible.
- I. After final adjustment provide tamper resistant locktight materials on all fittings.

3.9 ADJUSTING AND CLEANING

- A. Adjust wire rope tension and connecting hardware.
- B. Remove temporary coverings and protection of adjacent work areas. Clean installed products in accordance with manufacturer's instructions before Owner's acceptance.
- C. Do not use abrasive cleaners.
- D. Remove from project site and legally dispose of construction debris associated with this work.

3.10 PROTECTION

- A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.
- B. Restore finishes damaged during installation and 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 057300