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SECTION 05720 Aluminum Handrails and Railings: Sample Specifications

1.01 GENERAL

A. RELATED DOCUMENTS

- i. Architectural Drawings, Site Plans, Landscape Drawings and/or Interior Design Drawings.

B. SUMMARY

- i. This section includes furnishing and installing Aluminum Handrails and Guardrails as indicated on drawings and includes Miscellaneous Aluminum Handrails and Guardrails not included in other sections of these specifications, such as Aluminum Pipe Railing Systems, Ornamental Railing Systems and Glass Railing Systems.

1.02 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Engineering handrail and railing systems to withstand structural loads indicated and to determine allowable design working stresses of railing materials based on the following:

- a. For Aluminum: The Aluminum Association's "Aluminum Design Manual"

- B. Structural Performance of Handrails and Railing Systems:

- i. Engineer, fabricate and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.
 - a. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:
 - i. Concentrated load of 200 lbs applied at any point and in any direction.
 - ii. Uniform load of 50 lb. per lineal ft. applied horizontally and concurrently with uniform load of 100 lb. per lineal ft. applied vertically downward.
 - iii. Concentrated load need not be assumed to act concurrently with uniform loads.
 - b. Handrails Not Serving as Top rails: Capable of withstanding the following loads applied as indicated:
 - i. Concentrated load of 200 lb. applied at any point and in any direction.
 - ii. Uniform load of 50 lb. per linear ft. applied in any direction.
 - iii. Concentrated and uniform loads need not be assumed to act concurrently.
 - c. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lb. applied to one sq. ft. at any point in the system.
 - i. Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress on guard.
 - d. Glass Guardrails: Designated live loads above do not apply within glass guardrail systems. Wind loads with applicable safety factors shall apply.
- ii. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - a. Aluminum contacting metals not considered as compatible should be protected as follows:
 - a. Painting the dissimilar metal with a prime coat of zinc-chromate primer or other suitable primer, followed by one or two coats of aluminum and masonry paint or other suitable protective coating, excluding those containing lead pigmentation.

2.02 METALS

- A.** Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required.
 - i.** Structural extrusions such as posts shall be 6061-T6 or 6005-T5 Alloy/Temper.
 - ii.** All other extrusions such as Caps, Pickets, Mid and Bottom Rails shall be at least 6063-T5.
 - iii.** Castings: To be high quality prime material or materials re-melted from prime extrusion.
 - a.** For projects located within coastal regions, castings shall be designated to be "Marine Grade".

2.03 GROUT AND ANCHORING CEMENT

- A.** Non-shrink, Nonmetallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout complying with CE CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.
- B.** Erosion-Resistant Anchoring Cement: Factory-prepackaged, non-shrink, non-staining high strength 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 or provide a sealer or waterproof coating recommended for exterior use by manufacturer to be applied by the installer or other qualified contractor or subcontractor.

2.04 WELDING MATERIALS, FASTENERS AND ANCHORS

- A.** Welding Electrodes and Filler/Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B.** Fasteners for Anchoring Railings to Other Construction: Select fasteners of the type, grade, and class required to produce connections that are suitable for anchoring railing to other types of construction indicated and capable of withstanding design loadings.
 - i.** For aluminum railings in coastal environments provide fasteners fabricated from stainless steel or aluminum only.
- C.** Fasteners for Interconnecting Railing Components: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

2.05 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.** Preassemble railing systems in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for field assembly and coordinated installation. Use connections that maintain structural value of joined pieces.
 - i.** No mechanical, field assembled railing systems shall be permitted for use.
 - a.** The nature of field assembled, mechanical railing systems require components to be of pre-painted extrusions. Following shop assembly, individual panel sections are sent to jobsite for installation, and due to railing systems assembly, top rails are "cut-to-size" creating mill finish edges. These cut edges serve as passageway for premature paint failure.
- C.** Assembly shall be in a neat workmanlike manner using M.I.G. or T.I.G. Welding Processes as required. Horizontal Channels shall be punched to receive pickets and welds in this application shall be concealed from view.
 - i.** Channels to receive a snap cover only when specifically required and noted on drawings.
 - ii.** All Posts shall be structurally welded to top rail and mid and lower horizontal members to assure fixed fastening for the life of the rail.
 - iii.** Segmented railing sections and Corners shall be hairline fitted by mitre and further welded as required to obtain maximum assurance of strength through the railing's useful life.
 - a.** Exposed welded surfaces shall be ground smooth (when applicable). Finish to be no less than National Association of Architectural Metal Manufacturers (NAAMM): Finish Type 2 or National Ornamental & Miscellaneous Metals Association (NOMMA): Finish #2.
 - iv.** All splices shall be accomplished by butting one top rail to the next with a structural sleeve insert extending from one top rail to the next and further secured by means of a stainless steel, aluminum or other proper screw or pop-rivet.

- a. Butt splices to be either hairline fitted or properly gapped to provide for proper expansion and contraction movement. For expansion joints be sure that only one side of the sleeve insert is fastened to the top tail.
- v. End connections required to fasten to the building structure require either a welded end clip or a separate side clip.
- vi. Provide weep holes when necessary to drain closed sections from pretreatment immersion and sprays.

2.06 ALUMINUM FINISHES

- A. E.S.P. applied (1) coat Super-durable Polyester thermosetting resin over pre-treatment bond coating. Aluminum shall be cleaned using a (6) stage non-chrome conversion pre-treatment process. 1.) Product shall be pre-treated utilizing a concentrated heated acidic cleaner to clean, degrease, de-smut, deoxidize and etch the surface. 2.) Product shall then be sprayed with a less concentrated acidic cleaner to further de-smut and etch the surface. 3.) Product shall then be sprayed and rinsed with water treated through a reverse osmosis, ultraviolet, multi-stage filtration process. 4.) Product will continue to be rinsed of impurities with water treated through a reverse osmosis, ultraviolet, multi-stage filtration process. 5.) En-route to the final non-chrome sealer, the product shall be misted with pure water treated through a reverse osmosis, ultraviolet, multi-stage filtration process to prevent from drying prior to application of seal coat. 6.) Product shall then be treated with a non-chrome (titanium & zirconium) conversion coating to seal and eliminate oxidation. Paint to be 1.5 - 3 mils. Paint shall be baked on at 392 degrees for a minimum duration of 15 minutes. Paint to be Tiger Drylac "Series 38" Super-durable Polyester thermosetting resin or equal.
 - i. Powder coatings available in POMA CONSTRUCTION CORP. standard colors and manufacturers standard colors.
 - ii. Tiger Drylac "Series 38" system or equal meet **AAMA 2604** specifications and have a 5 year durability rating for projects located (5) miles or more from coastal regions. Projects located within (5) miles from coastlines shall carry a (1) yr durability rating.

- B. E.S.P. applied (2) coat Super-durable Polyester thermosetting resin over pre-treatment bond coating and base prime coat. Aluminum shall be cleaned using a (6) stage non-chrome conversion pre-treatment process. 1.) Product shall be pre-treated utilizing a concentrated heated acidic cleaner to clean, degrease, de-smut, deoxidize and etch the surface. 2.) Product shall then be sprayed with a less concentrated acidic cleaner to further de-smut and etch the surface. 3.) Product shall then be sprayed and rinsed with water treated through a reverse osmosis, ultraviolet, multi-stage filtration process. 4.) Product will continue to be rinsed of impurities with water treated through a reverse osmosis, ultraviolet, multi-stage filtration process. 5.) En-route to the final non-chrome sealer, the product shall be misted with pure water treated through a reverse osmosis, ultraviolet, multi-stage filtration process to prevent from drying prior to application of seal coat. 6.) Product shall then be treated with a non-chrome (titanium & zirconium) conversion coating to seal and eliminate oxidation. Prime coat to be applied between 1.5-3 mils and Paint between 1.5-3 mils. Prime coat to be Tiger Drylac "Dryprotector 69/7000" or equal. Prime coat shall be half cured prior to application of top coat. Paint shall be baked on at 392 degrees for a minimum duration of 15 minutes. Paint to be Tiger Drylac "Series 38" Superdurable Polyester thermosetting resin with or equal.
 - i. Powder coatings available in POMA CONSTRUCTION CORP. standard colors and manufacturers standard colors.
 - ii. Tiger Drylac "Series 38" system with "Dryprotector 69/7000" or equal meet **AAMA 2604/05** specifications and have a 10 year durability rating for projects located (5) miles or more from coastal regions. Projects located within (5) miles from coastlines shall carry a (5) yr durability rating.

- C. E.S.P. applied High Performance Fluoropolymer Polyvinylidene Fluoride (pvdf) "Kynar" finish. Aluminum railings shall be cleaned with inhibited chemicals and the surface shall be chemically converted to amorphous chromium phosphate to conform with ASTM d 1730. Type b, method 5, prior to coating. Apply manufacturers 2-coat thermocured system composed of specially formulated inhibited primer and fluoropolymer color coat with color coat containing not less than 70% (pvdf) resin by weight. Paint to have 1.0 -1.2 mils dry film thickness. Paint shall be baked on at 475 degrees for a duration of 10 minutes. Substrate temperature shall reach 450 degrees for a duration of 5 minutes. Paint to be "PPG'S" Duranar High Performance (pvdf) system or equal.

- i. High Performance Fluoropolymer (pvdf) "kynar" finishes are available in POMA CONSTRUCTION CORP. standard colors and manufacturers standard colors. Paint to be "PPG'S" Duranar High Performance (pvdf) system or equal which meet **AAMA 2604/05** specifications and have a 5 year durability rating.
- D.** E.S.P. applied High Performance Fluoropolymer Polyvinylidene Fluoride (pvdf) "Kynar" finish with XL coating. Aluminum railings shall be cleaned with inhibited chemicals and the surface shall be chemically converted to amorphous chromium phosphate to conform with ASTM d 1730. Type b, method 5, prior to coating. Apply manufacturer's standard 3-coat thermocured system composed of specially formulated inhibited primer, fluoropolymer color coat and fluoropolymer top coat with color coat and top coat containing not less than 70% (pvdf) resin by weight. Paint to have 1.6 -1.8 mils dry film thickness. Paint shall be baked on at 475 degrees for duration of 10 minutes. Substrate temperature shall reach 450 degrees for duration of 5 minutes. Paint to be "PPG'S" Duranar High Performance (pvdf) system with XL coating or equal.
- i. High Performance Fluoropolymer (pvdf) "Kynar" with XL coating are available in POMA CONSTRUCTION CORP. standard colors and manufacturers standard colors. Paint to be "PPG'S" Duranar High Performance (pvdf) system with XL coating or equal which meet & exceed **AAMA 2605** specifications and have a 10 year durability rating.
- E.** Upon request five, ten and (in certain geographical locations) 15 year warranties are obtainable at additional costs. Additionally, custom colors are obtainable at additional costs.

3.00 EXECUTION

3.01 PREPARATION

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

3.02 INSTALLATION GENERAL

- A.** Fit exposed connections accurately together to form tight, hairline joints, except as required for expansion.
- B.** Minimize field cutting and assembly to the greatest extent possible. Perform any cutting, drilling, and fitting required for installation of handrails and railings. Set handrails and railings accurately in location, alignment and elevation measured from established lines and levels and free from rack.
 - i.** Set posts plumb within a tolerance of 1/16" to 12".
 - ii.** Align rails so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/32" in 12".
 - iii.** Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood or dissimilar metals with a heavy bodied bituminous coating or epoxy.
 - a.** Powder-coating or painted finishes shall not be considered as adequate protection against contact with grout, concrete, masonry, wood or dissimilar metals.
 - b.** Drill weep-hole slightly above (1/16") concrete surface and post interface. Utilizing weep-hole created, fill inside of post (up to bottom of weep-hole) with Vulkem 45 or equal.
 - iv.** Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing handrails and railings to in-place construction.

3.03 ANCHORING POSTS

- A.** Anchor post in concrete by means of preset sleeves into concrete. After posts have been inserted into sleeves, fill space between post and sleeve solid with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.
 - i.** Non-shrink, nonmetallic grout or anchoring cement specifically formulated for railing installation.
- B.** Anchor posts in concrete by core drilling holes not less than 3" deep and 1" greater than outside diameter of post. Clean holes of all loose material, insert posts and fill space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.
 - i.** Non-shrink, nonmetallic grout or anchoring cement specifically formulated for railing installation.
- C.** Leave anchoring material down approximately 1/2" to allow for final topping with a water-proof material matching the surrounding areas by others. Whenever possible fill hole with waterproof topping slightly higher than the adjacent surfaces and taper away from the post.

- i. Drill weep-hole slightly above (1/16") concrete surface and post interface. Utilizing weep-hole created, fill inside of post (up to bottom of weep-hole) with Vulkem 45 or equal.
 - a. Recommended procedures for the proper installation standard post mount systems.
- D. Anchoring by means of **POMA'S S.S. INSERT** in concrete by means of hammer drilling or core drilling a 1 ½"-2" diameter hole, not less than 3" deep (unless under special circumstances). Clean holes of any loose material, place aluminum handrail with s.s. anchor rod in hole and fill space with high strength epoxy, mixed and placed to comply with anchoring material manufacturer's directions.
 - i. **Note: Use of POMA'S S.S. INSERT is the recommended method of installation for all railing systems to be used on any high rise structure, and more importantly, all structures located near or within a corrosive environment.**

3.04 **CLEANING, PROTECTION AND TOUCH-UP PAINTING**

- A. On delivery all railing will have protective cover over cap only. Immediately upon completion of installation the installer shall remove protective wrapping from the top rail cap cover and clean all work for inspection and approval.
- B. After installation the General Contractor or Owner shall be responsible for protecting the railings during the balance of construction.
- C. Painted aluminum surfaces shall be cleaned with plain water containing a mild soap or detergent. No abrasive agents or harsh chemicals are to be used.
 - i. **Note:** All railings require periodic maintenance. All railing surfaces require periodic washings especially those subject to ocean salt air or harmful chemical environments. Application of a UV protection product and/or waxing after washing is recommended.