Part 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 06 10 00 – Rough Carpentry

.2 Section 07 46 46 – Mineral Fibre Cement Siding.

1.2 PERFORMANCE REQUIREMENTS

.1 General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of materials based on the following:
.1 Aluminum: AA 30, "Specification for Aluminum Structures."
.2 Cold-Formed Structural Steel: AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members."
.3 For fully tempered glass in glass-supported handrails and railings, use a safety factor of 3 applied to the applicable modulus of rapture listed in "Mechanical Properties" in AAMA Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass."

.2 Structural Performance of Handrails and Railings. Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stress of materials for handrails, railings, anchors, and connections:

.3 Top Rail of Guards: Capable of withstanding the following loads applied as indicated:
.1 Concentrated load of 200 lbf applied at any point and in any direction.
.2 Uniform load of 50 lb. per linear foot applied horizontally and concurrently with uniform load of 50 lb. per linear foot applied vertically downward.
.3 Concentrated and uniform loads above need not be assumed to act concurrently.

.4 Handrails Not Servicing As Top Rails: Capable of withstanding the following loads applied as indicated:
.1 Concentrated load of 200 lbf applied at any point and in any direction.
.2 Uniform load of 50 lbf/ft. applied in any direction.
.3 Concentrated and uniform loads above need not be assumed to act concurrently.

.5 Infill area of Guards: Capable of withstanding a horizontal concentrated load of 50 lb. applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.

.1 Load above need not be assumed to act concurrently with loads on top rails in determining stress on guard.

.6 Thermal Movements: Provide handrails and railings that allow for thermal movements resulting form the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, over stressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
.1 Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F
(100 deg C), material surfaces.

.7 Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 SUBMITTALS

.1 Product Data: For manufacturers product lines of handrails and railings assembled from standard components.
1. Include Product Data for grout, anchoring cement, and paint products.

.2 Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, details, and attachments to other work.

.3 Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for products with factory-applied color finishes.

.4 Samples for Initial selection: Short sections of railing or flat sheet metal Samples showing available mechanical finishes.

.5 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. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
.1 6-inch-(150-mm-) long sections of each different linear railing member, including handrails, and top rails.
.2 Fittings and brackets.
.3 Assembled Samples of railings, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.

.6 Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and

addresses of architects and owners, and other information specified.

.7 Product Test Reports: Indicating products comply with requirements, based on comprehensive testing of current products.

1.4 QUALITY ASSURANCE

.1 Source Limitations: Obtain each type of railing through one source form a single manufacturer.

1.5 STORAGE

.1 Store handrails and railings in a dry, well-ventilated, weather tight place.

1.6 PROJECT CONDITIONS

.1 Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

.1 Established Dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

.1 Coordinate installation of anchorage for handrails and railings. 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 or masonry. Deliver such items to project site in time for installation.

Part 2 PRODUCTS

2.1 METALS

.1 General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.

.2 Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of alloy and temper designated below for each aluminum form required.
.1 Extruded Bar and Tube: ASTM B 221 (ASTM B 221M), alloy 6063-T5/T52.
.2 Extruded Structural Pipe and Tube: ASTM B 429, alloy 6063-T6.
.3 Drawn Seamless Tube: ASTM B 210 (ASTM B 210M), alloy 6063-T832.
.4 Plate and Sheet: ASTM B 209 (ASTM B 209M), alloy 6061-T6.
.5 Die and Hand Forgings: ASTM B 247 (ASTM B 247M), alloy 6061-T6.
.6 Castings: ASTM B 26/B 26M, alloy A356-T6.

.3 Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.
.1 Provide cast brackets with flange tapped for concealed anchorage to threaded hanger bolt.
.2 Provide formed or cast brackets with predrilled hole for exposed bolt anchorage.
.3 Provide formed steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.
.4 Provide brackets with interlocking pieces that conceal anchorage. Locate screws on bottom of bracket.

2.2 GLASS PRODUCTS AND GLAZING MATERIALS

.1 Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent glass, flat). Quality q3 (glazing select). Provide products complying with requirements indicated below for class, thickness, and manufacturing process that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to 16 CFR, Part 1201 for Category II materials.
.1 Clear glass: Class I (clear).
.2 Thickness: ¼" unless otherwise noted.
.3 Manufacturing Process: Manufacture fully tempered glass as follows:
.1 By vertical (tong-held) or horizontal (roller-hearth) process, at manufacturers option, except provide horizontal process tongless and free of tong marks.
.4 Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council or another certification agency, acceptable to authorities having jurisdiction.

.2 Glazing Cement and Accessories: Provide glazing cement and related accessories recommended, or supplied by railing manufacturer for bonding glass to metal subrails.

2.3 FASTENERS

.1 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.

.2 Fasteners for Interconnecting Handrail and Railing Components: Use fasteners fabricated from same basic metal as fastened metal, unless other wise indicated. Do not use metal that are corrosive or incompatible with material joined.

.1 Provide concealed fasteners for interconnecting railing components and for attaching them to other Work, unless exposed fasteners are unavoidable or are standard fastening method for handrail and railing indicated.
.2 Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

.3 Cast-in-Place and Post installed Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by qualified independent testing agency.

.1 Cast-in-place anchors.
.2 Chemical anchors.
.3 Expansion anchors.

2.4 GROUT AND ANCHORING CEMENT

.1 Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

.2 Interior Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for missing with water at Project site to create pourable anchoring, patching, and grouting compound. Use for interior applications only.

2.5 FABRICATION

.1 Assemble handrails and railing 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 reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

.2 Form changes in direction of railing members as follows:
.1 As detailed.

.3 Mechanical Connections: Fabricate handrails and railings by connecting members with railing manufacturer's standard concealed mechanical fasteners and fittings, unless other wise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

.4 Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.

.5 Provide inserts and other anchorage devices to connect handrails and railing to concrete or masonry. Fabricate anchorage device capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.

.6 Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

.7 Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

.8 Close exposed ends of railing members with prefabricated end fittings.

.9 Provide wall returns at ends of wall-mounted handrails, unless other wise indicated. Close ends of returns, unless clearance between end of railing and wall is ¼ inch (6 ram) or less.

2.6 GLAZING PANEL FABRICATION

.1 Glass Panels: Cut tempered glass to final size and shape before heat treatment; provide for proper edge clearance and bit on glass. Provide thickness indicated, but not less than that required to support structural loads.

.2 Straight Panels: provide tempered glass panels for straight sections.

2.7 FINISHES, GENERAL

.1 Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

.2 Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. 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.

2.8 ALUMINUM FINISHES

.1 Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

.2 High Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals, Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Powder Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with manufacturer's written instructions.

1. Tiger Drylac, Series 39, Polyester Powder Coating, 3 mil. Average film thickness complying with AAMA 2604-98.
   .1 Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss, including custom colors. Selections might include up to four different selections for color.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Examine substrates, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

.1 Fit exposed connections together to form tight, hairline joints.

.2 Cutting, Fitting, and Placement: Perform Cutting, drilling, and fitting required for installing handrails and railings. Set handrails and railing 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 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 Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed ¼ inch in 12 feet (5 mm in 3 m).

.3 Corrosion Protection: Coat concealed surfaces of aluminum and copper alloys that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

.4 Adjust handrails and railings before anchoring to ensure alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

.5 Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railing and for properly transferring loads to in-place construction.

3.3 RAILINGS CONNECTIONS

.1 Nonwelded Connections: Use mechanical joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings.

3.4 INSTALLING GLASS PANELS

.1 Glass, Handrails and Railings: Install assembly to comply with railing manufacturer's written instructions. Attach base channel to building structure, then insert and connect factory-fabricated and assembled glass panels.

.2 Erect Glass handrails and railings under direct supervision of manufacturer's authorized technical personnel.

3.5 CLEANING

.1 Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.

3.6 PROTECTION

.1. 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.

.2 Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION