SECTION 05 73 00

ORNAMENTAL HANDRAILS AND RAILINGS

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\*\* NOTE TO SPECIFIER \*\* Fortress Railing Products, prefabricated metal, aluminum, cable and glass railing systems and decorative lighting systems.
This section is based on the products of Fortress Railing Products, which is located at:1720 N. First St.Garland, TX 75040Tel: 844-909-2999Fax: 972-372-0924Email:  todds@fortressbp.com
Web: <https://fortressbp.com/railing>
 [ Click here ] for additional information
Fortress Railing Products is committed to developing innovative, quality products specifically for the railing industry. It is very proud of its vast distribution network, commitment to code testing, innovative product design and the strength of the Fortress Railing Products brand. As a respected category creator and industry leader, Fortress Railing Products offers a complete line of railing solutions that encompasses categories such as Steel, Aluminum, Cable and Glass.

1. GENERAL
	1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for the Project.

* + 1. Glass Baluster Railing System. (Pure View Baluster Railing System)
		2. Glass Panel Railing System. (Pure View Full Glass Panel Railing System)
		3. Ornamental Welded Aluminum Railing System. (Al13 PLUS) (Al13 HOME)
		4. Ornamental Welded Steel Railing System. (Fe26 Residential) (Fe26 PLUS Commercial)
		5. Pre-Assembled Steel Cable Railing System. (Stainless Steel Cable)
		6. Pre-Assembled Aluminum Cable Railing System. (Stainless Steel Cable)
		7. Handrail System. (Round Handrail)
	1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this Project; add others as required.

* + 1. Section 03 30 00 - Cast-in-Place Concrete.
		2. Section 03 50 00 - Cast Decks and Underlayment.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Fe26, Fe26 PLUS, Cable Railing and AI13 PLUS only. Delete if not required.

* + 1. Section 05 52 17 - Roof Fall Protection.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Pure View railings only. Delete if not required.

* + 1. Section 05 75 00 - Decorative Formed Metal.

\*\* NOTE TO SPECIFIER \*\* The following paragraph applies to Cable Railing only. Delete if not required.

* + 1. Section 05 75 00 - Decorative Formed Metal.
		2. Section 06 10 00 - Rough Carpentry.
		3. Section 09 01 20.91 - Plaster Restoration.
	1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. American National Standards Institute (ANSI):
			1. ANSI Z97.1 Safety Performance Specifications and Methods of Test for Safety Glazing Materials in Buildings.
			2. ANSI 1264.1 Safety Requirements for Workplace Floor and Wall Openings, Stairs, and Railing Systems.
		2. American Welding Society (AWS):
			1. AWS D1.1/D1.1M: 2010 Structural Welding Code- Steel.
		3. American Society for Testing and Materials (ASTM):
			1. ASTM A123/A123M-13 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
			2. ASTM A 307-14 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rods 60,000 psi Tensile Strength.
			3. ASTM A500/A500M-13 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
			4. ASTM A555/A555M-05(2014) - Specifications for General Requirements for Stainless Steel Wire and Wire Rods.
			5. ASTM A580/A580M-14 Standards Specifications for Stainless Steel Wire.
			6. ASTM A751-14a Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products.
			7. ASTM B117-11 Standard Practice for Operating Salt Spray (Fog) Apparatus.
			8. ASTM B221-14 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
			9. ASTM B921-08 (2013) Standard Specification for Non-hexavalent Chromium Conversion Coatings on Aluminum and Aluminum Alloys.
			10. ASTM C1048-12e1 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
			11. ASTM D1730-09 (2014) Standard Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting.
			12. ASTM E8/8M-13a Standard Test Methods for Tension Testing of Metallic Materials.
			13. ASTM E488/E488M-10 Standard Test Method for Strength of Anchors in Concrete Elements.
			14. ASTM E894-88 (2010) Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.
			15. ASTM E935-13e1 Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
			16. ASTM E1481-00a(2014)e1 - Standard Terminology of Railing Systems and Rails for Buildings.
			17. ASTM E2349-12 Standard Practice for Safety Requirements in Metal Casting Operations and Sand Preparation; Molding and Core Making; Melting and Pouring; and Cleaning and Finishing.
			18. ASTM E2353-14 Standard Test Methods for Performance of Glazing in Permanent Railing Systems, Guards and Balustrades.
			19. ASTM E2358-04 (2010) Standard Specifications for the Performance of Glass in Permanent Glass Railing Systems, Guards and Balustrades.
			20. ASTM F593-13a Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
			21. ASTM F594-09e1 Standard Specifications for Stainless Steel Nuts.
			22. ASTM F606/F606M-14a Standard Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators and Rivets.
			23. ASTM F879-12 Standard Specification for Stainless Steel Socket Button and Flat Countersunk head Cap Screws.
		4. American Architectural Manufacturer's Association (AAMA):
			1. AAMA 2604 Voluntary Specification, Performance Requirements and Test Procedure for High Performance Organic Coatings on Aluminum Extrusions and Panels.
		5. Code of Federal Regulations (CFR):
			1. 16 CFR Part 1201 Safety Standard for Architectural Glazing Material (Consumer Products Safety Commission).
			2. 28 CFR Part 36 American with Disabilities Act - hereinafter referred to as ADA.
		6. International Code Council (ICC):
			1. ICC-ES AC174 - Deck Board Span Ratings and Guardrail Systems (Guards and Handrails).
			2. ICC-ES AC273 - Handrails and Guards.
			3. International Building Code (IBC).
			4. International Residential Code (IRC).
		7. International Conference of Building Officials (ICBO):
			1. ICBO UBC - Uniform Building Code.
		8. Military Specification:
			1. MIL-DTL-53084B: Primer, Cathodic Electrodeposition, Chemical Agent Resistant.
	1. DEFINITIONS
		1. Railings: Guards, Handrails, and similar devices used for protection of occupants at open-sided floor areas, pedestrian guidance and support, visual separation, or wall protection.
	2. PERFORMANCE REQUIREMENTS
		1. General: Railings to withstand structural loads indicated. Determine allowable design working stresses of railing materials.

\*\* NOTE TO SPECIFIER \*\* ICC-ES AC273 does not apply to Al13 HOME.

* + 1. Structural Performance: Railings capable of withstanding test loads in accordance with ICC-ES AC273.
			1. Structural Performance of Top Rails and Supports:
				1. Concentrated Load Test: Section 4.23 of AC273. Two separate tests on each specimen shall be conducted, where a test load of 500 lbf/ft (2.22 kN) is applied at the midspan of the top rail and at the top of a single post is an outward direction. In both cases the load shall be continuously applied horizontally and normal to the top rail at the maximum guard and handrail system height.
				2. Uniform Load Test: Section 4.2.3 of AC273. The top rail of the guard and handrail test specimens shall be subjected to a single test where a maximum uniform load of 125 lbf/ft (1.82 kN/m) is applied vertically and in an outward direction at an angle of 45 degrees from horizontal.
				3. Need not provide for concentrated and uniform loads to be applied concurrently.
			2. Structural Performance of Guardrail Infill:
				1. In-Fill Load Test: Section 4.2.2 of AC273. The test specimens shall be tested and shall be capable of satisfactorily resisting a load of 125 lbf (556 N) applied over a 1 sq ft (0.1 sq m) area normal to the in-fill. In-Fill is defined to include panels, intermediate rails, balusters and other elements.
				2. Need not provide for infill loads to be applied concurrently with top rail loads.
	1. SUBMITTALS
		1. General: Submit under provisions of Section 01 30 00 - Administrative Requirements.
		2. Product Data: Manufacturer's printed product information indicating material compliance and specified options are to be submitted prior to installation. Submit manufacturer's data sheets on each product to be used, including:
			1. Manufacturer's product lines of railings assembled from standard components.
			2. Rail finish.
		3. Shop Drawings: Layout of railings components with dimensions, details, and finishes shall be submitted for approval and shall be approved prior to installation. Include plans, elevations, sections, details, and attachments to other work.

\*\* NOTE TO SPECIFIER \*\* Delete if LEED submittals not required.

* + 1. Design Data: Submit design data to verify compliance design loads specified in Performance Requirements Article. Design data shall be signed and sealed by the qualified professional engineer responsible for their preparation.

\*\* NOTE TO SPECIFIER \*\* Delete sample submittal for initial selection below if colors have been preselected and are specified or scheduled.

* + 1. Samples:
			1. Submit Samples for initial color selection. Submit samples of each specific finish. Submit Samples in form of Manufacturer's color charts showing full range of colors and finishes available. Where finishes involve normal color variations, include samples showing the full range of variations expected.
			2. Submit Samples for verifications purposes. Samples shall be submitted prior to removal. Submit samples for the following:
				1. For each type of exposed finish required.
				2. Of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.

Each type of railing panel required.

Each type of glass required.

Fittings and Brackets.

Welded Connections.

Assembled Samples of railing systems, 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.

* + 1. Qualification Data: For Professional Engineer.
		2. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified inspecting and testing agency; according to ASTM E894-88 (2010) and ASTM E935-13e1 and in accordance with testing standards set forth in ICC-ES AC273 Guidelines.
		3. Closeout Submittals: Operation and Maintenance Data.
	1. QUALITY ASSURANCE
		1. Qualifications:
			1. Manufacturer Qualifications: Company engineering and fabrication of custom railing systems for a minimum of 10 years.
			2. Installer Qualifications: Company experienced in manufacturer�s products for a minimum of 5 years. Contractor to provide laborers with prior experience in type of construction involved and experienced installing materials with techniques specified.
			3. Qualified Professional Engineer: Licensed in state of the Project location and who is qualified to design the portion of the work described in this Section.
		2. Regulatory Requirements: Completed installations to meet ICC standards, applicable ADA Accessibility Guidelines along with local amendments and/or modifications. Completed installations to conform to state, regional, and local codes and regulations.
		3. Source Limitations: Obtain each type of railing through one source from a single manufacturer.
		4. Product Options: Drawings indicating size, profiles and dimensional requirements of railings and are based on specific system indicated. Refer to Section 01 60 00 - Product Requirements.
		5. Modifications: Do not modify intended aesthetic effects as judged solely by the Architect, except with the Architects' approval. If modifications are proposed, submit comprehensive explanatory data to the Architect for review.
		6. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M:2010.

\*\* NOTE TO SPECIFIER \*\* Include a mock-up if the Project size and/or quality warrant taking such a precaution. The following is one example of how a mock-up on a large project might be specified. When deciding on the extent of the mock-up, consider all the major different types of work on the Project.

* + 1. Mock-Ups: Build mock-ups to verify selections made under samples submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation. Build mock-ups for each form and finishes of railing consisting of two posts, top rail, infill area, and anchorage systems components that are full height and area not less than 24 inches (610 mm) in length.
	1. DELIVERY, STORAGE, AND HANDLING
		1. Store products in manufacturer's unopened packaging until ready for installation.
		2. Store components in a dry, sheltered location away from uncured concrete, masonry, mortar, and stucco; and a safe distance away from any sanding, blasting, welding and/or painting operations.
		3. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
		4. Glass components are fragile and subject to shattering. Handle and store as such.
	2. PROJECT CONDITIONS
		1. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on shop drawings. Provide allowance for trimming and fitting as site.
	3. COORDINATION AND SCHEDULING
		1. Coordinate installation of anchorages for railings. Furnish setting drawings, templates and directions for installing anchorages, including sleeves, concrete inserts, anchor bolds and items with integral anchors that are to be embedded in concrete and masonry. Deliver such items to the project site in time for installation.
		2. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by means that do not satisfy structural performance requirements.
	4. WARRANTY
		1. Manufacturer's Warranty: Manufacturer's standard limited warranty from the date of purchase, for defects, in material and workmanship, including protection against cracking, peeling, blistering, and corrosion (rusting) of metal parts supplied by the manufacturer.

\*\* NOTE TO SPECIFIER \*\* Delete types not required.

* + - 1. Pure View Glass Baluster Railing System:
				1. Steel Pre-Slotted Rails: 15 years.
				2. Aluminum Pre-Slotted Rails: Limited lifetime.
			2. Pure View Full Glass Panel Railing System: Limited lifetime.
			3. Ornamental Welded Aluminum Railing System (Al13 PLUS)(Al13 HOME): Limited lifetime.
			4. Ornamental Welded Steel Railing System:
				1. Fe26 Residential: 15 years.
				2. Fe26 PLUS Commercial: 10 years.
			5. Pre-Assembled Steel Cable Railing System (Stainless Steel Cable): 15 years.
			6. Pre-Assembled Aluminum Cable Railing System. (Stainless Steel Cable): Limited lifetime.
			7. Handrail System (Round Handrail): Limited lifetime.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: Fortress Railing Products, which is located at:1720 N. First St.Garland, TX 75040Tel: 844-909-2999Fax: 972-372-0924Email:  todds@fortressbp.com;Web: <https://fortressbp.com/railing>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions

* + 1. Substitutions: Not permitted.
		2. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. PURE VIEW GLASS RAILING
		1. Prefabricated Glass Baluster Railing System:
			1. Product: Pure View Glass Railing System as manufactured by Fortress Railing Products.
			2. Materials:

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + - * 1. Steel Pre-Slotted Rails:

Materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

Brackets, Flanges, and Anchors: Same metal and finish as supported rails, unless otherwise indicated.

Metal Rails and Posts: Formed and welded Grade A cold-rolled steel tubing manufactured in accordance with ASTM A 500/A500M-13, with G60 zinc coating, 0.60 ounce/sq ft (0.27 kg/sq m) on both inside and outside surfaces in accordance with ASTM A 123/A123M-13 hot-dip galvanized process.

Molded Nylon 66 Type Material Inserts: Pre-installed into slotted rail at factory holds glass balusters in pre-slotted rail sections.

Materials to conform to ASTM E935-13e1 testing (Methods A, B, C, and D) and load testing in accordance with ICC-ES AC273 (Sections 4.2.2, 4.2.3, and 4.2.4), ASTM E2353-14 and ASTM E 2358-04(2010).

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + - * 1. Aluminum Pre-Slotted Rails:

Materials with smooth surfaces, without seam marks, roller marks, roller trade names, stains, discolorations, or blemishes.

Brackets, Flanges, and Anchors: Same metal and finish as supported rails, unless otherwise indicated.

Rails: 6063-T6 extruded aluminum alloy tubing manufactured in accordance with ASTM B221-14.

Molded Nylon 66 Type Material Inserts: Pre-installed into slotted rail at factory holds glass balusters in pre-slotted rail sections.

\*\* NOTE TO SPECIFIER \*\* ICC-ES AC273 does not apply to Al13 HOME. Delete options not required.

Materials to conform to ASTM E935-13e1 testing (Methods A, B, C, and D) and load testing in accordance with ICC-ES AC273 (Sections 4.2.2, 4.2.3, and 4.2.4), ASTM E2353-14 and ASTM E 2358-04(2010).

* + - 1. Glass and Glazing:
				1. Tempered Glass: ASTM C 1048, Kind FT, fully tempered, Condition A uncoated, Type 1 transparent flat glass, Quality Q3, tested for surface and edge compression according to ASTM C 1048-12e1 and for impact strength according to 16 CFR Part 1201 for Category II materials. Meet requirements of ANSI Z97.1 and 16 CFR Part 1201 to qualify as safety glass.

Clear Glass: Class 1.

Thickness for Structural Glass Balusters: As required by structural loads.

Thickness for Glass Infill Panels: As required by structural loads, but not less than 0.3125 inch (8 mm) with chamfered edges.

Marking: Safety glass permanently marked with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction (AHJ).

\*\* NOTE TO SPECIFIER \*\* Delete components not required.

* + - 1. Components:
				1. Glass: Tempered safety glass balusters 5/16 inch (8 mm) thick, conforming to standards set forth elsewhere in this Section.

\*\* NOTE TO SPECIFIER \*\* Delete rail and post types not required.

* + - * 1. Steel Rails: 16 gauge formed and welded galvanized G60 steel tubing, 1.25 inches (32 mm) square with powder-coated factory finish.

\*\* NOTE TO SPECIFIER \*\* Aluminum rails are for Al13 PLUS. Delete if not required.

* + - * 1. Aluminum Rails: 6063-T6 Extruded Aluminum Tube 0.126 inch (3.2 mm) formed and welded rectangular Aluminum tubing 1.61 x 1.10 inches (41 x 28 mm) with powder-coated factory finish.

\*\* NOTE TO SPECIFIER \*\* Aluminum rails are for Al13 HOME. Delete if not required.

* + - * 1. Aluminum Rails: 6063-T6 Extruded Aluminum Tube 0.126 inch (3.2 mm) formed and welded rectangular Aluminum tubing 1.10 x 1.10 inches (28 x 28 mm) with powder-coated factory finish.
				2. Steel Posts: 13 gauge, 2 inches (51 mm) or 15 gauge, 3 inch (76 mm) square formed and welded galvanized G60 steel tubing. Powder coated factory finish.
				3. Aluminum Posts: 6063-T6 Extruded Aluminum 0.160 inch (4 mm) square formed and welded aluminum tubing with powder-coated factory finish.
				4. Wood Posts: 4 inches (102 mm) square, by Others.
				5. Wood Rails: 2 x 4 inches (51 x 102 mm), or 1 x 4 inches (25 x 102 mm); by others.
				6. Fasteners: Nuts, bolts, washers, sheet metal/wood screws: Stainless steel.
				7. Fittings: Brackets, clips, and other similar components shall come from same manufacturer as railings and posts or from manufacturer's approved suppliers. Brackets to have powder-coated factory finish.
			1. Style:

\*\* NOTE TO SPECIFIER \*\* Delete mounting methods not required.

* + - * 1. Mounting Method: Pure View Steel Pre-Slotted Rail.
				2. Mounting Method: Pure View Aluminum Pre-Slotted Rail.
				3. Mounting Method: Pure View Shoe.
				4. Mounting Method: Pure View Polished Mounting Clip.
				5. Mounting Method: Pure View Stainless Steel Screw and Washer.

\*\* NOTE TO SPECIFIER \*\* Delete installation style not required.

* + - * 1. Installation Style: Level application.
				2. Installation Style: Stair application.

\*\* NOTE TO SPECIFIER \*\* Delete heights not required. All sizes apply for FE26 and Al13 PLUS.

* + - * 1. Glass Panel Height: 26 inches (660 mm).
				2. Glass Panel Height: 34 inches (864 mm).
				3. Glass Panel Height: 40 inches (1010 mm).

\*\* NOTE TO SPECIFIER \*\* The following height options apply to Al13 HOME.

* + - * 1. Glass Panel Height: 31.85 (809 mm).
				2. Glass Panel Height: 39.35 (999 mm).

\*\* NOTE TO SPECIFIER \*\* Clear applies to all products. Delete options not required.

* + - * 1. Glass Panel Color: Clear.
			1. Fabrication:
				1. Rail sections to comply with all requirements indicated for materials, thickness, design, and details of construction.
				2. Welded connections to comply with AWS D1.1/D1.1M:2010 standards for recommended practice in shop welding.
				3. Welds behind finished surfaces to be without distortion or discoloration of exposed side.
				4. Components to be accurately cut, drilled and/or tapped to receive hardware, fasteners, and accessories.
				5. Glass panels shall be fabricated with appropriate pre-drilled holes to accommodate mounting hardware.
			2. Finish:

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + - * 1. Steel Railing Components Finish:

Metal Parts: Assembled and finished individually prior to shipment.

Individual Parts and Welded Assemblies: Made from G60 pre-galvanized material.

Galvanized Steel Railing Components: Cleaned with a non-petroleum solvent followed by the application of a sealing zinc phosphate coating.

Following Cleaning and Pretreatment Parts: Welded assemblies to be electro-coated.

Electro Coating of Parts and Welded Assemblies: Two-component cathodic electrodeposition primer with high corrosion protection followed by a sealing and drying process.

Immediately After Sealing: Apply a two-step powder finish coating by an electrophoresis and electrostatic spray process.

Electro Coating and Powder Coating of Parts and Welded Assemblies: By a certified powder coater.

Color: As selected by Architect from manufacturer's range of colors.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + - * 1. Aluminum Railing Components Finish:

Metal Parts: Assembled and finished individually prior to shipment.

Chromated Aluminum Railing Components: Cleaned with a non-petroleum solvent.

After Chromating: A one-step powder finish coating applied by an electrostatic spray process consisting of a thermosetting carboxyl polyester resin topcoat.

Color: As selected by Architect from manufacturer's range of colors.

* + - * 1. Fasteners:

For Mounting Metal Parts and Welded Assemblies: Stainless steel as supplied by recommended railing supplier.

Hexalobular Internal Drive, Flat Head Stainless Steel Thread Cutting Screw.

Immediately after cleaning and drying, a two-step coating is to be applied by an electrophoresis and electrostatic spray process. This consists of a thermosetting carboxyl polyester resin top coat with a minimum dry film thickness of 60 to 80 microns.

\*\* NOTE TO SPECIFIER \*\* Delete if no wood components.

Hexalobular Internal Drive, Flat Head Stainless Steel Wood Screw.

Immediately after cleaning and drying, a one-step coating is to be applied by the electrophoresis process. This consists of a thermosetting epoxy with a minimum dry film thickness of 10 to 25 microns.

\*\* NOTE TO SPECIFIER \*\* Delete if no metal rail.

* + - * 1. Metal Rail Color: As selected by Architect from manufacturer's range of colors.

\*\* NOTE TO SPECIFIER \*\* Delete if no wood components.

* + - * 1. Wood Components: Furnished by supplier prior to installation.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. GLASS PANEL RAILING SYSTEM
		1. Prefabricated Glass Panel Railing System:
			1. Product: Pure View Full Glass Panel Railing System as manufactured by Fortress Railing Products.
			2. Materials:
				1. Materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, and blemishes.
				2. Brackets, Flanges, and Anchors: Same metal and finish as supported rails, unless otherwise indicated.
				3. Rails: Formed and welded 6063-T6 extruded aluminum alloy tubing manufactured in accordance with ASTM B 221-14.
				4. Materials to conform to ASTM E935-13e1 testing (Methods A, B, C, and D) and load testing in accordance with ICC-ES AC273 (Sections 4.2.2, 4.2.3, and 4.2.4), ASTM E2353-14 and ASTM E 2358-04(2010).
			3. Glass and Glazing:
				1. Tempered Glass: ASTM C 1048-12e1, Kind FT, fully tempered, Condition A uncoated, Type 1 transparent flat glass, Quality Q3, tested for surface and edge compression according to ASTM C 1048-12e1 and for impact strength according to 16 CFR Part 1201 for Category II materials. Products are to be tested to ASTM E 2353-14 and ASTM E2358-04(2010) standards. Meet requirements of ANSI Z97.1 and 16 CFR Part 1201 to qualify as safety glass.

Clear Glass: Class 1.

Thickness for Infill Panels: 0.25 inch (6 mm).

Marking: Safety glass permanently marked with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction (AHJ).

\*\* NOTE TO SPECIFIER \*\* Delete components not required.

* + - 1. Components:
				1. Glass: Tempered Safety Glass panel 0.25 inch (6 mm) thick, conforming to the standards set forth elsewhere in this Section.

\*\* NOTE TO SPECIFIER \*\* Aluminum rails are for Al13 PLUS. Delete if not required.

* + - * 1. Aluminum Rails: 6063-T6 Extruded Aluminum Tube 0.126 inch (3.2 mm) formed and welded rectangular Aluminum tubing 1.61 x 1.10 inches (41 x 28 mm) with powder-coated factory finish.

\*\* NOTE TO SPECIFIER \*\* Aluminum rails are for Al13 HOME. Delete if not required.

* + - * 1. Aluminum Rails: 6063-T6 Extruded Aluminum Tube 0.126 inch (3.2 mm) formed and welded rectangular Aluminum tubing 1.10 x 1.10 inches (28 x 28 mm) with powder-coated factory finish.
				2. Glazing Gasketing: Co-Extruded, dual durometer polyvinyl chloride (PVC) extrusion 0.43 inches (10.79 mm) wide by 0.53 inches (13.54 mm) high.

\*\* NOTE TO SPECIFIER \*\* (Al13 PLUS and Al13 HOME) Delete options not required.

* + - * 1. Aluminum Posts: 6063-T6 Extruded Aluminum 0.160 inch (4 mm) thick by 3 inches (76 mm) square formed and welded aluminum tubing with powder-coated factory finish.

\*\* NOTE TO SPECIFIER \*\* (Al13 HOME) Delete options not required.

* + - * 1. Aluminum Posts: 6063-T6 Extruded Aluminum 0.160 inch (4 mm) thick by 2 inches (51 mm) square formed and welded aluminum tubing with powder-coated factory finish.
				2. Fasteners: Nuts, bolts, washers, sheet metal/wood screws: Stainless steel.
				3. Brackets: Die-cast aluminum and come from same manufacturer as railings and posts. Brackets to have powder-coated factory finish.
			1. Style:
				1. Mounting Method: Pure View Full Glass Panel Aluminum Rails with Dual Extruded Glazing gasket.
				2. Installation Style: Level.

\*\* NOTE TO SPECIFIER \*\* 33 and 39 inches (838 and 991 mm) apply to Al13 PLUS only. 31.5 and 39 inches (800 and 991 mm) apply to Al13 HOME only. Delete heights not required.

* + - * 1. Glass Panel Height: 31.5 inches (800 mm).
				2. Glass Panel Height: 33 inches (838 mm).
				3. Glass Panel Height: 39 inches (991 mm).

\*\* NOTE TO SPECIFIER \*\* Delete widths not required.

* + - * 1. Glass Panel Width: 12.25 inches (311 mm).
				2. Glass Panel Width: 18.25 inches (464 mm).
				3. Glass Panel Width: 24.25 inches (616 mm).
				4. Glass Panel Width: 31.25 inches (794 mm).
				5. Glass Panel Width: 36.25 inches (921 mm).
				6. Glass Panel Width: 41.25 inches (1048 mm).
				7. Glass Panel Width: 46.25 inches (1175 mm).
				8. Glass Panel Width: 51.25 inches (1302 mm).
				9. Glass Panel Width: 56.25 inches (1429 mm).
				10. Glass Panel Width: 61.25 inches (1556 mm).
				11. Glass Panel Color: Clear.
				12. Pure View Glass Panel Aluminum Rail Mounting Bracket: Evolve External Bracket.
			1. Fabrication:
				1. Rail Panels: Comply with all requirements indicated for materials, thickness, design, and details for construction.
				2. Welds behind finished surfaces to be without distortion or discoloration of exposed side.
				3. Components to be accurately cut, drilled, and/or tapped to receive hardware, fasteners, and accessories.
			2. Finish:
				1. Metal Parts: Assembled and finished individually prior to shipment.
				2. Chromated Aluminum Railing Components: Cleaned with a non-petroleum solvent.
				3. After Chromating: A one-step powder finish coating applied by an electrostatic spray process consisting of a thermosetting carboxyl polyester resin topcoat.

Dry Film Thickness: 60 to 80 microns minimum.

* + - * 1. Fasteners:

For Mounting Metal Parts and Welded Assemblies: Stainless steel as supplied by recommended railing supplier.

Hexalobular Internal Drive, Flat Head Stainless Steel Thread Cutting Screw.

Immediately after cleaning and drying, a two-step coating is to be applied by an electrophoresis and electrostatic spray process. This consists of a thermosetting carboxyl polyester resin topcoat with a minimum dry film thickness of 60 to 80 microns.

\*\* NOTE TO SPECIFIER \*\* Delete if no wood components.

Hexalobular Internal Drive, Flat Head Stainless Steel Wood Screw.

Immediately after cleaning and drying, a one-step coating is to be applied by the electrophoresis process. This consists of a thermosetting epoxy with a minimum dry film thickness of 10 to 25 microns.

* + - * 1. Metal Rail Color: As selected by Architect from manufacturer�s range of colors.
				2. Glass Color: Clear.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. ORNAMENTAL WELDED ALUMINUM RAILING SYSTEM
		1. Ornamental Welded Aluminum Railings

\*\* NOTE TO SPECIFIER \*\* Delete product option not required.

* + - 1. Product: Al13 PLUS Aluminum Railing as manufactured by Fortress Railing Products.
				1. Materials: Pre-welded Aluminum, 100 percent recyclable.
				2. Components:

Aluminum Rails: 6063-T6 Extruded Aluminum Tube 0.126 inch (3.2 mm) formed and welded rectangular Aluminum tubing 1.61 x 1.10 inches (41 x 28 mm) with powder-coated factory finish.

Pickets: 0.0625 inch (3.2 mm) wall thickness, 6063-T6 extruded aluminum tubing 0.75 inch (19 mm) square. Powder-coated factory finish.

Posts: 6063-T6 extruded aluminum, 0.160 inch (4 mm) wall thickness, 3 inch (76.2 mm) square tubing welded to 0.375 inch (10 mm) thick, 5.55 inch (141 mm) square base plate with powder-coated factory finish.

Brackets: Die-cast aluminum materials. Powder-coated factory finish.

Fasteners: Nuts, bolts, washers, sheet metal/wood screws: Stainless steel.

* + - * 1. Style:

Mounting Method: Pre-Welded Aluminum Railing Panel.

\*\* NOTE TO SPECIFIER \*\* Delete mounting method not required.

Al13 PLUS Traditional Railing Panel; Level Railing.

Al13 PLUS Traditional Adjustable Railing Panel; Stair Railing.

\*\* NOTE TO SPECIFIER \*\* Delete installation style not required.

Installation Style: Level Application.

Installation Style: Stair Application.

\*\* NOTE TO SPECIFIER \*\* Delete heights not required.

Railing Height: 32 inches (813 mm).

Railing Height: 34 inches (854 mm).

Railing Height: 38 inches (965 mm).

Railing Height: 40 inches (1016 mm).

\*\* NOTE TO SPECIFIER \*\* Delete lengths not required.

Railing Length: 69 inches (1753 mm).

Railing Length: 90.5 inches (2299 mm) Aluminum Stair Railing Panel.

Railing Length: 93 inches (2363 mm).

* + - * 1. Fabrication:

Rail Panels: Comply with all requirements indicated for materials, thickness, design, and details for construction.

Welds behind finished surfaces to be without distortion or discoloration of exposed side.

Components to be accurately cut, drilled, and/or tapped to receive hardware, fasteners, and accessories.

* + - * 1. Finish:

Metal Parts: Assembled and finished individually prior to shipment.

Chromated Aluminum Railing Components: Cleaned with a non-petroleum solvent.

After Chromating: A one-step powder finish coating applied by an electrostatic spray process consisting of a thermosetting carboxyl polyester resin topcoat.

Dry Film Thickness: 60 to 80 microns minimum.

Fasteners:

For Mounting Metal Parts and Welded Assemblies: Stainless steel as supplied by recommended railing supplier.

Hexalobular Internal Drive, Flat Head Stainless Steel Thread Cutting Screw.

Immediately after cleaning and drying, a two-step coating is to be applied by an electrophoresis and electrostatic spray process. This consists of a thermosetting carboxyl polyester resin top coat with a minimum dry film thickness of 60 to 80 microns.

\*\* NOTE TO SPECIFIER \*\* Delete if no wood components.

Hexalobular Internal Drive, Flat Head Stainless Steel Wood Screw.

Immediately after cleaning and drying, a one-step coating is to be applied by the electrophoresis process. This consists of a thermosetting epoxy with a minimum dry film thickness of 10 to 25 microns.

Metal Rail Color: As selected by Architect from manufacturer�s range of colors.

* + - 1. Product: Al13 HOME Aluminum Railing as manufactured by Fortress Railing Products.

\*\* NOTE TO SPECIFIER \*\* Delete style option not required.

* + - * 1. Styles: Over the post.
				2. Styles: Proud post.
				3. Materials: Pre-welded Aluminum, 100 percent recyclable.
				4. Components:

Aluminum Rails: 6063-T6 Extruded Aluminum Tube 0.126 inch (3.2 mm) formed and welded rectangular Aluminum tubing 1.10 x 1.10 inches (28 x 28 mm) with powder-coated factory finish.

Balusters: 0.0625 inch (3.2 mm) wall thickness, 6063-T6 extruded aluminum tubing 0.625 inch (16 mm) square with powder-coated factory finish.

Posts: 6063-T6 extruded aluminum, 0.118 inch (3 mm) wall thickness,

\*\* NOTE TO SPECIFIER \*\* 2 inches (51 mm) square posts are available for Over the Top and Proud Post styles. 3 inch (76 mm) square posts are available for Proud Post style only. Delete tubing not required.

Tubing: 2 inch (51 mm) square welded to 4.75 inch (121 mm) square base plate with powder-coated factory finish.

Tubing: 3 inch (76 mm) square welded to 5.75 inch (146 mm) square base plate with powder-coated factory finish.

Brackets: Die-cast aluminum materials. Powder-coated factory finish.

Fasteners: Nuts, bolts, washers, sheet metal/wood screws: Stainless steel.

Mounting Method: Pre-Welded Aluminum Railing Panel.

\*\* NOTE TO SPECIFIER \*\* Delete panel and panel options not required.

Panels: Traditional Railing.

Level Panel Length: 69.5 inches (1765 mm)

Level Panel Length: 93.5 inches (2375 mm).

Level Panel Height: 32.5 inches (826 mm).

Level Panel Height: 40 inches (1016 mm).

Stair Panel Length: 69.5 inches (1765 mm)

Stair Panel Length: 93.5 inches (2375 mm).

Stair Panel Height: 32.5 inches (826 mm).

Stair Panel Height: 40 inches (1016 mm).

Panels: Pure View Glass Panel:

Top and Bottom Rail: Slotted.

Horizontal Rail Length: 68.5 inch (1740 mm) length.

\*\* NOTE TO SPECIFIER \*\* 31.50 inch (800 mm) glass height creates a 36 inch ( mm) installed height panel. A 39 inch (991 mm) glass height creates a 42 inch (1067 mm) installed height panel. Delete rail height and length options not required.

Horizontal Glass Height: 31.50 inch (800 mm).

Horizontal Glass Height: 39.00 inch (991 mm).

Horizontal Glass Length: 12.25 inch (311 mm).

Horizontal Glass Length: 18.25 inch (464 mm).

Horizontal Glass Length: 24.25 inch (616 mm).

Horizontal Glass Length: 31.25 inch (794 mm).

Horizontal Glass Length: 36.25 inch (921 mm).

Horizontal Glass Length: 41.25 inch (1048 mm).

Horizontal Glass Length: 46.25 inch (1175 mm).

Horizontal Glass Length: 51.25 inch (1302 mm).

Horizontal Glass Length: 56.25 inch (1429 mm).

Horizontal Glass Length: 61.25 inch (1556 mm).

Panels: Pure View Glass Balusters: 5/16 inch (8 mm) x 3.75 inch (95 mm).

Horizontal Baluster Height: 31.85 inch (809 mm).

Horizontal Baluster Height: 39.35 inch (999 mm).

Horizontal Rail Length: 69 inch (1753 mm).

Panels: Vertical Cable. Comes with I-supports.

Cable Spacing: 3.35 inch (85 mm)

Pre-Assembled Traditional:

Width: 69.5 inch (1765 mm). 15 cables, 4 mid-spans.

Width: 93.5 inch (2375 mm). 21 cables, 6 mid-spans

Height: 32.5 inch (826 mm).

Height 40 inch (1016 mm).

Pre-Assembled Adjustable: Uses low profile stair bracket. Adjustable up to 38 degrees.

Width: 65.5 inch (1664 mm).

Width: 92 inch (2350 mm).

Height: 32.5 inch (826 mm).

Height 40 inch (1016 mm).

\*\* NOTE TO SPECIFIER \*\* Delete top rail options not required.

Top Rail: Round accent.

Top Rail: Flat accent.

Top Rail: Drink rail.

\*\* NOTE TO SPECIFIER \*\* The gate kit is optional. Delete gate kit option not required or delete both. Maximum Gate Width: 48 inches (1219 mm).

Gate Kit: Width: As detailed on the drawings.

Gate Kit: Width: \_\_\_\_ inches (\_\_\_\_ mm).

Trim: Post caps, cap rail clips, post base covers,

\*\* NOTE TO SPECIFIER \*\* Delete installation styles options not required.

* + - * 1. Installation Style: Level application.
				2. Installation Style: Stair application.
				3. Installation Style: Level and stair application.

\*\* NOTE TO SPECIFIER \*\* The following 4 railing heights are for 2 inch (51 mm) railing posts. Delete railing height options not required.

* + - * 1. Railing Height: 36 inches (914 mm). Includes base plate.
				2. Railing Height: 42 inches (1067 mm). Includes base plate.
				3. Railing Height: 51 inches (1295 mm). Includes base plate.
				4. Railing Height: 49 inches (1245 mm). Facia mount.

\*\* NOTE TO SPECIFIER \*\* The following 4 railing heights are for 3 inch (76 mm) railing posts. Delete railing height options not required.

* + - * 1. Railing Height: 39.5 inches (1003 mm). Includes base plate.
				2. Railing Height: 45.5 inches (1156 mm). Includes base plate.
				3. Railing Height: 49 inches (1245 mm). Facia mount.
				4. Railing Height: 55 inches (1397 mm). Facia mount.
				5. Fabrication:

Railing panels shall comply with all requirements indicated for materials, thickness, design, and details of construction.

Welds behind finished surfaces shall be without distortion or discoloration of exposed side.

Components shall be accurately cut, drilled, and/or tapped to receive hardware, fasteners, and accessories.

* + - * 1. Finish:

Metal parts shall be assembled and finished individually prior to shipment.

Individual aluminum parts and welded aluminum assemblies will be cleaned and pretreated per ASTM standard practices for aluminum using a chromium phosphate solution.

Chromated aluminum railing components shall be cleaned with a non-petroleum solvent.

After Chromating: A one-step powder finish coating applied by an electrostatic spray process consisting of a thermosetting carboxyl polyester resin topcoat.

Fasteners:

Fasteners used for mounting metal parts and welded assemblies shall be stainless steel as supplied by recommended railing supplier.

Hexalobular Internal Drive, Flat Head Stainless Steel Thread Cutting Screw.

Immediately after cleaning and drying, a two-step coating shall be applied by the electrophoresis and electrostatic spray process. This consists of a thermosetting carboxyl polyester resin top coat with a minimum dry film thickness of 60 to 80 microns.

\*\* NOTE TO SPECIFIER \*\* Delete if no wood components.

Hexalobular Internal Drive, Flat Head Stainless Steel Wood Screw.

Immediately after cleaning and drying, a one-step coating shall be applied by the electrophoresis process. This consists of a thermosetting epoxy with a minimum dry film thickness of 10 to 25 microns.

Color: As selected by Architect from manufacturer's full range of colors.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* 1. ORNAMENTAL WELDED STEEL RAILING SYSTEM

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + 1. Residential Ornamental Welded Steel Railings:
			1. Product: Fe26 Residential Steel Railing as manufactured by Fortress Railing Products.
			2. Materials: Pre-welded Steel railing panels.
				1. Rails and Pickets: Grade A cold rolled steel formed and welded tubing conforming to ASTM A500/A500M-13 with G-60 zinc coating (0.60 oz/sq ft or 0.27 kf/sq m) on both inside and outside surfaces in accordance with ASTM A123/A123M-13 hot dipped electroplating process.
				2. Tests: ASTM E935-13e1 testing (Methods A, B, C, and D) and loading testing in accordance with ICC-ES AC273.
			3. Components:
				1. Rails: 17 gauge (1.4 mm) wall thickness by 1 inch (25 mm) square galvanized welded steel tubing with powder-coated factory finish.
				2. Pickets: 19 gauge (1.1 mm) wall thickness by 0.625 inch (1.6 mm) square galvanized steel tubing with powder-coated factory finish.
				3. Posts: 13 gauge (2.5 mm) 2 inch (51 mm) or 15 gauge (1.8 mm) 3 inch (76 mm) square formed and welded galvanized steel tubing with welded base and powder-coated factory finish.

\*\* NOTE TO SPECIFIER \*\* Delete stair stringer post if not required or delete width option not required.

* + - * 1. Stair Stringer Posts: Color: Black sand only.

Welded Post and bracket assembly.

Attached horizontal pivot rod.

Pivot rod mount.

Standoff support.

Screws for mounting to C-Channel.

* + - * 1. Width: 2 inches (51 mm).
				2. Width: 3 inches (76 mm).
				3. Height: 49 inches (1245 mm); 52 inches (1321 mm) when including the bracket.

Height is 47 inches (1194 mm) from the bottom of the pivot rod.

* + - * 1. Brackets: From same manufacturer as railings and posts. Powder-coated factory finish.
				2. Fasteners: Nuts, bolts, washers, sheet metal/wood screws: Stainless steel.
			1. Style:
				1. Fe26 Residential Steel Railing Panels:

\*\* NOTE TO SPECIFIER \*\* Delete type not required.

Fe26 Traditional Steel Railing Panels; Level Railing.

Fe26 Traditional Adjustable Steel Railing Panels; Stair Railing.

\*\* NOTE TO SPECIFIER \*\* Delete installation style not required.

* + - * 1. Installation Style: Level Application.
				2. Installation Style: Stair Application.

\*\* NOTE TO SPECIFIER \*\* Delete heights not required.

* + - * 1. Railing Panel Height: 28 inches (711 mm).
				2. Railing Panel Height: 32 inches (813 mm).
				3. Railing Panel Height: 34 inches (864 mm).
				4. Railing Panel Height: 38 inches (965 mm).
				5. Railing Panel Height: 40 inches (1016 mm).

\*\* NOTE TO SPECIFIER \*\* Delete width not required.

* + - * 1. Railing Panel Width: 69.5 inches (1765 mm).
				2. Railing Panel Width: 93.5 inches (2375 mm).
			1. Fabrication:
				1. Metal Rail Sections: Comply with all requirements indicated for materials, thickness, design, and details for construction.
				2. Welded Connections: Comply with AWS D1.1/D1.1M:2010 standards for recommended practice in shop welding. Welds behind finished surfaces shall be without distortion or discoloration of exposed side.
				3. Components to be accurately cut, drilled, and/or tapped to receive hardware, fasteners, and accessories.
			2. Finish:
				1. Fe26 Residential Steel Railing Panels:

Metal Parts: Assembled and finished individually prior to shipment.

Individual Parts and Welded Assemblies: Made from G60 pre-galvanized material.

Galvanized Steel Railing Components: Cleaned with a non-petroleum solvent followed by the application of a sealing zinc phosphate coating.

Following Cleaning and Pretreatment: Parts and welded assemblies to be electro-coated.

Electro Coating: A two-component cathodic electrodeposition primer with high corrosion protection followed by a sealing and drying process.

Immediately After Sealing: Apply a two-step powder finish coating by the electrophoresis and electrostatic spray process.

Electro Coating and Powder Coating: To be done by a certified powder coater.

* + - * 1. Fasteners:

Fasteners for Mounting Metal Parts and Welded Assemblies: Stainless steel as supplied by recommended railing supplier.

Hexalobular Internal Drive, Flat Head Stainless Steel Thread Cutting Screw.

Immediately after cleaning and drying, a two-step coating shall be applied by the electrophoresis and electrostatic spray process. This consists of a thermosetting carboxyl polyester resin top coat with a minimum dry film thickness of 60 to 80 microns.

\*\* NOTE TO SPECIFIER \*\* Delete if no wood components.

Hexalobular Internal Drive, Flat Head Stainless Steel Wood Screw.

Immediately after cleaning and drying, a one-step coating shall be applied by the electrophoresis process. This consists of a thermosetting epoxy with a minimum dry film thickness of 10 to 25 microns.

* + - * 1. Color: As selected by Architect from manufacturer's full range of colors.

\*\* NOTE TO SPECIFIER \*\* Delete type if not required.

* + 1. Commercial Ornamental Welded Steel Railings:
			1. Product: Fe26 PLUS Commercial Steel Railing as manufactured by Fortress Railing Products.
			2. Materials: Pre-welded Steel railing panels.
				1. Rails and Pickets: Grade A cold rolled steel formed and welded tubing conforming to ASTM A500/A500M-13 with G-60 zinc coating (0.60 oz/sq ft or 0.27 kf/sq m) on both inside and outside surfaces in accordance with ASTM A123/A123M-13 hot dipped electroplating process.
				2. Tests: ASTM E935-13e1 testing (Methods A, B, C, and D) and loading testing in accordance with ICC-ES AC273.
			3. Components:
				1. Rails: 16 gauge (1.6 mm) wall thickness by 1.25 inch (31.7 mm) square galvanized welded steel tubing with factory applied powder-coated finish.
				2. Pickets: 19 gauge (1.1 mm) wall thickness by 0.75 inch (19 mm) square galvanized welded steel tubing with powder-coated factory finish.
				3. Posts: 13 gauge (2.5 mm) 2 inch (51 mm) or 15 gauge (1.8 mm) 3 inch (76 mm) square formed and welded galvanized steel tubing with welded base and powder-coated factory finish.

\*\* NOTE TO SPECIFIER \*\* Delete stair stringer post if not required or delete width option not required.

* + - * 1. Stair Stringer Posts: Color: Black sand only.

Welded Post and bracket assembly.

Attached horizontal pivot rod.

Pivot rod mount.

Standoff support.

Screws for mounting to C-Channel.

* + - * 1. Width: 2 inches (51 mm).
				2. Width: 3 inches (76 mm).
				3. Height: 49 inches (1245 mm); 52 inches (1321 mm) when including the bracket.

Height is 47 inches (1194 mm) from the bottom of the pivot rod.

* + - * 1. Brackets: From same manufacturer as railings and posts. Powder-coated factory finish.
				2. Fasteners: Nuts, bolts, washers, sheet metal/wood screws: Stainless steel.
			1. Style:
				1. Fe26 PLUS Commercial Steel Railing Panels:

\*\* NOTE TO SPECIFIER \*\* Delete type not required.

Fe26 Traditional Steel Railing Panels; Level Railing.

Fe26 Traditional Adjustable Steel Railing Panels; Stair Railing.

\*\* NOTE TO SPECIFIER \*\* Delete installation style not required.

* + - * 1. Installation Style: Level Application.
				2. Installation Style: Stair Application.

\*\* NOTE TO SPECIFIER \*\* Delete heights not required.

* + - * 1. Railing Panel Height: 32 inches (813 mm).
				2. Railing Panel Height: 34 inches (864 mm).
				3. Railing Panel Height: 36 inches (914 mm).
				4. Railing Panel Height: 40 inches (1016 mm).

\*\* NOTE TO SPECIFIER \*\* Delete width not required.

* + - * 1. Railing Panel Width: 69.5 inches (1765 mm).
				2. Railing Panel Width: 93.5 inches (2375 mm).
			1. Fabrication:
				1. Metal Rail Sections: Comply with all requirements indicated for materials, thickness, design, and details for construction.
				2. Welded Connections: Comply with AWS D1.1/D1.1M:2010 standards for recommended practice in shop welding. Welds behind finished surfaces shall be without distortion or discoloration of exposed side.
				3. Components to be accurately cut, drilled, and/or tapped to receive hardware, fasteners, and accessories.
			2. Finish:
				1. Fe26 Residential Steel Railing Panels:

Metal Parts: Assembled and finished individually prior to shipment.

Individual Parts and Welded Assemblies: Made from G60 pre-galvanized material.

Galvanized Steel Railing Components: Cleaned with a non-petroleum solvent followed by the application of a sealing zinc phosphate coating.

Following Cleaning and Pretreatment: Parts and welded assemblies to be electro-coated.

Electro Coating: A two-component cathodic electrodeposition primer with high corrosion protection followed by a sealing and drying process.

Immediately After Sealing: Apply a two-step powder finish coating by the electrophoresis and electrostatic spray process.

Electro Coating and Powder Coating: To be done by a certified powder coater.

* + - * 1. Fasteners:

Fasteners for Mounting Metal Parts and Welded Assemblies: Stainless steel as supplied by recommended railing supplier.

Hexalobular Internal Drive, Flat Head Stainless Steel Thread Cutting Screw.

Immediately after cleaning and drying, a two-step coating shall be applied by the electrophoresis and electrostatic spray process. This consists of a thermosetting carboxyl polyester resin top coat with a minimum dry film thickness of 60 to 80 microns.

\*\* NOTE TO SPECIFIER \*\* Delete if no wood components.

Hexalobular Internal Drive, Flat Head Stainless Steel Wood Screw.

Immediately after cleaning and drying, a one-step coating shall be applied by the electrophoresis process. This consists of a thermosetting epoxy with a minimum dry film thickness of 10 to 25 microns.

* + - * 1. Color: As selected by Architect from manufacturer's full range of colors.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* 1. PRE-ASSEMBLED STEEL CABLE RAILING SYSTEM
		1. Cable Railing.
			1. Product: Vertical Cable Railing as manufactured by Fortress Railing Products.
			2. Materials:
				1. Rails and Reinforcement Channel: Grade A cold-rolled steel formed and welded tubing conforming to ASTM A500/ A500M-13 with G-60 zinc coating (0.60 oz/sq ft or 0.27 kf/sq m) on both inside and outside surfaces in accordance with ASTM A123/A123M-13 hot dipped electroplating process.
				2. Cable Infill: Type 316 grade stainless steel wire with factory assembled and installed connectors in accordance with ASTM A492-95(2013), A580/A580M-14, and F594-09e1.
				3. Tests: Tested in accordance with ASTM E935-13e1 (Methods A, B, C, and D) and load testing in accordance with ICC-ES AC273.
			3. Components:
				1. Rails: 1.22 x 1.22 inch (31 x 31 mm). 9 gauge (4 mm), formed and welded galvanized steel channel, Powder-coated factory finish.
				2. Reinforcement Channel (WxH): 0.91 x 0.47 inch (23 x 12 mm). 14 gauge (2 mm), formed and welded galvanized steel channel. Powder-coated factory finish.
				3. Cable: 0.125 inch (3.2 mm) diameter, 1x19 strand construction, type 316 grade stainless steel, polished finish, dry grade cable with fitting factory installed as specified.

Cable Fittings:

Ball Swage Fitting: 1.26 inch (32 mm), type 316 grade stainless steel factory-installed fitting pressed fit to bottom of cable.

Threaded Swage Fitting: 1.20 inch (31 mm), type 316 grade stainless steel factory-installed fitting pressed fit to top of cable.

Nut: 0.51 inch (13 mm), type 316 grade stainless steel hex nut with nylon insert installed onto threaded swage cable fitting.

* + - * 1. Cable Panel Support: 0.625 inch (16 mm) round galvanized steel rod, 31.50 inches (800 mm) or 37.50 inches (952.50 mm), with factory applied powder-coated finish.
				2. Bolt: M8 by 1.25 inch (31.7 mm) thread by 1.18 inch (30 mm), type 316 grade stainless steel bolt.
				3. Washer: M8 by 0.63 inch (16 mm) by 0.055 inch (1.4 mm), type 316 grade stainless steel washer.
				4. Split Washer: M8 by 0.25 inch (6 mm) radius by 0.075 inch (1.90 mm), type 316 grade stainless steel split washer.
				5. Posts: 13 gauge (2.5 mm) 2 inch (51 mm) or 15 gauge (1.8 mm) 3 inch (76 mm) square formed and welded galvanized steel tubing with welded base and powder-coated factory finish.
				6. Brackets: From same manufacturer as railings and posts. Powder-coated factory finish.
				7. Fasteners: Nuts, bolts, washers, sheet metal/wood screws: Stainless steel.
			1. Style:

\*\* NOTE TO SPECIFIER \*\* Delete railing panel not required.

* + - * 1. Vertical Cable Railing panels; level.
				2. Vertical Stair Cable Railing panels.

\*\* NOTE TO SPECIFIER \*\* Delete installation style not required.

* + - * 1. Installation Style: Level Application.
				2. Installation Style: Stair Application.

\*\* NOTE TO SPECIFIER \*\* Delete heights not required.

* + - * 1. Railing Panel Height: 34 inches (864 mm).
				2. Railing Panel Height: 40 inches (1016 mm).

\*\* NOTE TO SPECIFIER \*\* Delete width not required.

* + - * 1. Railing Panel Width: 69.5 inches (1765 mm).
				2. Railing Panel Width: 93.5 inches (2375 mm).
			1. Fabrication:
				1. Metal Rail Sections: Comply with all requirements indicated for materials, thickness, design, and details for construction.
				2. Welded Connections: Comply with AWS D1.1/D1.1M:2010 standards for recommended practice in shop welding. Welds behind finished surfaces shall be without distortion or discoloration of exposed side.
				3. Components to be accurately cut, drilled, and/or tapped to receive hardware, fasteners, and accessories.
			2. Finish:
				1. Vertical Cable Railing:

Metal Parts: Assembled and finished individually prior to shipment.

Individual Parts and Welded Assemblies: Made from G60 pre-galvanized material.

Galvanized Steel Railing Components: Cleaned with a non-petroleum solvent followed by the application of a sealing zinc phosphate coating.

Following Cleaning and Pretreatment: Parts and welded assemblies to be electro-coated.

Electro Coating: A two-component cathodic electrodeposition primer with high corrosion protection followed by a sealing and drying process.

Immediately After Sealing: Apply a two-step powder finish coating by the electrophoresis and electrostatic spray process.

Electro Coating and Powder Coating: To be done by a certified powder coater.

* + - * 1. Fasteners:

Fasteners used for mounting metal parts and welded assemblies shall be stainless steel as supplied by recommended railing supplier.

Hexalobular Internal Drive, Flat Head Stainless Steel Thread Cutting Screw.

Immediately after cleaning and drying, a two-step coating shall be applied by the electrophoresis and electrostatic spray process. This consists of a thermosetting carboxyl polyester resin top coat with a minimum dry film thickness of 60 to 80 microns.

\*\* NOTE TO SPECIFIER \*\* Delete if no wood components.

Hexalobular Internal Drive, Flat Head Stainless Steel Wood Screw.

Immediately after cleaning and drying, a one-step coating shall be applied by the electrophoresis process. This consists of a thermosetting epoxy with a minimum dry film thickness of 10 to 25 microns.

* + - * 1. Color: As selected by Architect from manufacturer's full range of colors.
	1. PRE-ASSEMBLED ALUMINUM AND STAINLESS STEEL CABLE RAILING SYSTEM
		1. Cable Railing.
			1. Product: Vertical Cable Railing as manufactured by Fortress Railing Products.
			2. Materials:
				1. Rails and Reinforcement Channel: Grade A cold-rolled steel formed and welded tubing conforming to ASTM A500/ A500M-13 with G-60 zinc coating (0.60 oz/sq ft or 0.27 kf/sq m) on both inside and outside surfaces in accordance with ASTM A123/A123M-13 hot dipped electroplating process.
				2. Cable Infill: Type 316 grade stainless steel wire with factory assembled and installed connectors in accordance with ASTM A492-95 (2013), A580/A580M-14, and F594-09e1.
				3. Tests: Tested in accordance with ASTM E935-13e1 (Methods A, B, C, and D) and load testing in accordance with ICC-ES AC273.
			3. Components:
				1. Aluminum Rails: 1.10 x 1.10 inches (28 x 28 mm). 6063-T6 Extruded and welded rectangular aluminum tubing 0.126 inch (3.2 mm) wall thickness. Powder-coated factory finish.
				2. Reinforcement Channel (WxH): 0.91 x 0.47 inch (23 x 12 mm). 14 gauge (2 mm), formed and welded galvanized steel channel. Powder-coated factory finish.
				3. Cable: 0.125 inch (3.2 mm) diameter, 1x19 strand construction, type 316 grade stainless steel, polished finish, dry grade cable with fitting factory installed as specified.

Cable Fittings:

Ball Swage Fitting: 1.26 inch (32 mm), type 316 grade stainless steel factory-installed fitting pressed fit to bottom of cable.

Threaded Swage Fitting: 1.20 inch (31 mm), type 316 grade stainless steel factory-installed fitting pressed fit to top of cable.

Nut: 0.51 inch (13 mm), type 316 grade stainless steel hex nut with nylon insert installed onto threaded swage cable fitting.

* + - * 1. Cable Panel Support: 0.625 inch (16 mm) round galvanized steel rod, 31.50 inches (800 mm) or 37.50 inches (952.50 mm), with factory applied powder-coated finish.
				2. Bolt: M8 by 1.25 inch (31.7 mm) thread by 1.18 inch (30 mm), type 316 grade stainless steel bolt.
				3. Washer: M8 by 0.63 inch (16 mm) by 0.055 inch (1.4 mm), type 316 grade stainless steel washer.
				4. Split Washer: M8 by 0.25 inch (6 mm) radius by 0.075 inch (1.90 mm), type 316 grade stainless steel split washer.
				5. Posts: 6063-T6 extruded aluminum, 0.160 inch (4 mm) wall thickness,

\*\* NOTE TO SPECIFIER \*\* Delete tubing option not required.

Tubing: 2 inch (51 mm) square welded to 4.75 inch (121 mm) square base plate with powder-coated factory finish.

Tubing: 3 inch (76 mm) square welded to 5.75 inch (146 mm) square base plate with powder-coated factory finish.

* + - * 1. Brackets: From same manufacturer as railings and posts. Powder-coated factory finish.
				2. Fasteners: Nuts, bolts, washers, sheet metal/wood screws: Stainless steel.
			1. Style:

\*\* NOTE TO SPECIFIER \*\* Delete railing panel not required.

* + - * 1. Vertical Cable Railing panels; level.
				2. Vertical Stair Cable Railing panels.

\*\* NOTE TO SPECIFIER \*\* Delete installation style not required.

* + - * 1. Installation Style: Level Application.
				2. Installation Style: Stair Application.

\*\* NOTE TO SPECIFIER \*\* Delete height not required.

* + - * 1. Railing Panel Height: 32.5 inches (825 mm).
				2. Railing Panel Height: 40 inches (1016 mm).

\*\* NOTE TO SPECIFIER \*\* Delete width not required.

* + - * 1. Railing Panel Width: 69.5 inches (1765 mm).
				2. Railing Panel Width: 93.5 inches (2375 mm).
			1. Fabrication:
				1. Metal Rail Sections: Comply with all requirements indicated for materials, thickness, design, and details for construction.
				2. Welded Connections: Comply with AWS D1.1/D1.1M:2010 standards for recommended practice in shop welding. Welds behind finished surfaces shall be without distortion or discoloration of exposed side.
				3. Components to be accurately cut, drilled, and/or tapped to receive hardware, fasteners, and accessories.
			2. Finish:
				1. Metal Parts: Assembled and finished individually prior to shipment.
				2. Individual Aluminum Parts and elded Assemblies: Cleaned and pretreated per ASTM standard practices for aluminum using a chromium phosphate solution.
				3. Chromated Aluminum Railing Components: Cleaned with a non-petroleum solvent.
				4. After Chromating: A one-step powder finish coating applied by an electrostatic spray process consisting of a thermosetting carboxyl polyester resin top coat.

Dry Film Thickness: 60 to 80 microns minimum.

* + - * 1. Fasteners:

Fasteners used for mounting metal parts and welded assemblies shall be stainless steel as supplied by recommended railing supplier.

Hexalobular Internal Drive, Flat Head Stainless Steel Thread Cutting Screw.

Immediately after cleaning and drying, a two-step coating shall be applied by the electrophoresis and electrostatic spray process. This consists of a thermosetting carboxyl polyester resin top coat with a minimum dry film thickness of 60 to 80 microns.

\*\* NOTE TO SPECIFIER \*\* Delete if no wood components.

Hexalobular Internal Drive, Flat Head Stainless Steel Wood Screw.

Immediately after cleaning and drying, a one-step coating shall be applied by the electrophoresis process. This consists of a thermosetting epoxy with a minimum dry film thickness of 10 to 25 microns.

* + - * 1. Color: As selected by Architect from manufacturer�s full range of colors.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. ROUND HANDRAIL SYSTEM
		1. Product: Round Handrail system as manufactured by Fortress Railing Products.
			1. Components:
				1. Handrail and Posts: 0.10 inch (2.5 mm) wall, 6063-T6 extruded aluminum tubing 1.5 inch (38 mm) diameter. Length: 97 inches (2464 mm). Powder-coated factory finish.
				2. Brackets and Assembly Components: Aluminum Die-Cast extrusions. From same manufacturer as handrail, and posts. Powder-coated factory finish.
				3. Fasteners: Nuts, bolts, washers, sheet metal/wood screws: Stainless steel.
			2. Installation Style: Level.
			3. Installation Style: Stair.
			4. Installation Style: Ramp.
			5. Fabrication:
				1. Handrail, Brackets, and Assembly Components: Manufactured to meet ADA guidelines.
				2. Metal Handrail Sections: Comply with requirements indicated for materials, thickness, design, and details for construction.
				3. Components to be accurately cut, drilled, and/or tapped to receive hardware, fasteners, and accessories.
			6. Finish:
				1. Metal Parts: Assembled and finished individually prior to shipment.
				2. Individual Aluminum Parts and elded Assemblies: Cleaned and pretreated per ASTM standard practices for aluminum using a chromium phosphate solution.
			7. Chromated Aluminum Railing Components: Cleaned with a non-petroleum solvent.
				1. After Chromating: A one-step powder finish coating applied by an electrostatic spray process consisting of a thermosetting carboxyl polyester resin top coat.

Dry Film Thickness: 60 to 80 microns minimum.

* + - * 1. Fasteners:

Fasteners used for mounting metal parts and welded assemblies shall be stainless steel as supplied by recommended railing supplier.

Hexalobular Internal Drive, Flat Head Stainless Steel Thread Cutting Screw.

Immediately after cleaning and drying, a two-step coating shall be applied by the electrophoresis and electrostatic spray process. This consists of a thermosetting carboxyl polyester resin top coat with a minimum dry film thickness of 60 to 80 microns.

\*\* NOTE TO SPECIFIER \*\* Delete if no wood components.

Hexalobular Internal Drive, Flat Head Stainless Steel Wood Screw.

Immediately after cleaning and drying, a one-step coating shall be applied by the electrophoresis process. This consists of a thermosetting epoxy with a minimum dry film thickness of 10 to 25 microns.

* + - * 1. Color: As selected by Architect from manufacturer�s full range of colors.
1. EXECUTION
	1. EXAMINATION
		1. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
			1. Examine gypsum board assemblies, where in forced 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.
			2. Verify areas to receive railings are completed to previously established conditions as detailed in other sections.
			3. Coordinate post setting diagrams, plans, templates, and drawings and verify the proper installation of any necessary anchorages as detailed in the Drawings.
			4. Coordinate with appropriate entity to correct unsatisfactory conditions if any exist.
			5. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.
	2. PREPARATION
		1. Stake Layout showing locations of posts as well as any gates.
		2. Note location of any affected underground utility lines, irrigation lines, or other subsurface structures, if applicable.
		3. Railings that require wall mounting, wood blocking shall be provided.
	3. INSTALLATION

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* + 1. Railing assemblies shall consist of the following systems (assembly shall be designed in accordance with all standards established elsewhere in this Section):

\*\* NOTE TO SPECIFIER \*\* Delete types of post not required.

* + - 1. Metal posts anchored to floor supporting top and bottom metal rails.
			2. Wood posts anchored to floor supporting top and bottom metal rails.
			3. Wood posts anchored to floor supporting top and bottom wood rails.
		1. Assemblies shall be installed based on manufacturer's written installation instructions and in accordance with authorities having jurisdiction.
		2. Mount posts in accordance with post mounting applications per manufacturer's written installation instructions and in accordance with authorities having jurisdiction.
		3. Install manufacturer-supplied brackets and mounting clips onto railing section and posts per manufacturer�s printed instructions for specific railing material. Attach railing sections to brackets with approved fasteners and techniques ensuring sections are horizontal and parallel to grade/slab or rake to within 0.25 inches (6 mm) in 12 feet (3658 mm).
		4. Glass panels shall be non-structural and attached to posts and rails with manufacturer's connectors to infill space between posts.
		5. Verify rails, posts, and other surfaces receiving glass panels are clean and obstruction free.
		6. Joints to accommodate expansion and contraction of metal components without causing undue stress, buckling, joint fatigue, and/or distortion. Follow manufacturer's written installation instructions.
	1. CLEANING
		1. Repair scratches and other installation-incurred damage on rails and posts. If damage is visible from a distance of 5 feet (1524 mm), component shall be replaced.
		2. Clean up debris and unused material, and remove from site.
		3. Clean glass immediately after installation. Replace Scratched, chipped, or cracked glass.
	2. PROTECTION
		1. Protect railing finishes from damage during construction with temporary protective coverings approved by railing manufacturer. Remove coverings at 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; make required alterations and refinish entire unit, or provide new units.

END OF SECTION