SECTION 05 73 00

ARCHITECTURAL RAILING SYSTEMS

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\*\* NOTE TO SPECIFIER \*\* Hollaender Manufacturing Company, architectural railing systems.
This section is based on the products of Hollaender Manufacturing Company, which is located at:
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[ HYPERLINK "http://www.arcat.com/arcatcos/cos33/arc33096.html" Click Here ] for additional information.
The Hollaender Manufacturing Company produces a wide array of architectural railing systems, from non-welded aluminum rails to stainless steel and structural glass. Some of our most recognized railing designs include Interna-Rail®, Speed-Rail® and Newman by Hollaender™ (formerly known as Newman Brothers Railing), as well as VUE, KLEAR, and VISION.
These hand and guard railing systems meet IBC and ADA codes. Hollaender engineering staff can provide delegated design services to demonstrate our compliance, if needed and can also assist in developing fully engineered and code compliant anchoring/mounting systems, regardless of substrate..

1. GENERAL
	1. SECTION INCLUDES

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

* + 1. Aluminum Handrail System with in line metal or glass or resin infill. (Interna-Rail).
		2. Aluminum Handrail System with offset glass infill. (VUE).
		3. Aluminum Handrail System with offset glass infill, glass as top rail. (KLEAR).
		4. Slip-on Pipe Fitting Railing System with in line metal or glass infill. (Speed-Rail).
		5. Structural Glass Railing with shoe mount glass. (Newman by Hollaender).
		6. Button Glass Railing. (Newman by Hollaender).
		7. Stainless Steel Panel Clip Railing System with in line glass or metal infill. (VISION).
		8. ADA Compliant Aluminum Handrail System. (ADA Railing).
		9. ADA Compliant Stainless Steel Handrail System. (ADA Railing).
	1. RELATED SECTIONS

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

* + 1. Section 08 81 13 - Decorative Glass Glazing.
	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 Architectural Manufacturers Association (AAMA):
			1. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
			2. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
		2. Americans with Disabilities Act Accessibility Guidelines (ADAAG).
		3. American Society of Mechanical Engineers (ASME).
		4. American National Standards Institute (ANSI):
			1. ANSI/ASME B 18.6.4 - Mechanical and Quality Requirements for Tapping Screws.
		5. ASTM International (ASTM):
			1. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
			2. ASTM A 67 - Standard Specification for Steel Tie Plates, Low-Carbon and High-Carbon-Hot-Worked.
			3. ASTM A 167 - Stainless and heat resisting Chromium-Nickel steel plate, sheet and strip
			4. ASTM A 269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
			5. ASTM A 312 - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
			6. ASTM A 1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
			7. ASTM B 26 - Standard Specification for Aluminum-Alloy Sand Castings.
			8. ASTM B 29 - Standard Specification for Refined Lead.
			9. ASTM B 179 - Standard Specification for Aluminum Alloys in Ingot and Molten Forms for Castings from All Casting Processes.
			10. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
			11. ASTM B 210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
			12. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
			13. ASTM B 247 - Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings.
			14. ASTM B 429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
			15. ASTM C 1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
			16. ASTM E 935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
		6. Code of Federal Regulations (CFR):
			1. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
		7. International Building code (IBC).
		8. Occupational Safety and health Administration (OSHA).
	1. PERFORMANCE REQUIREMENTS
		1. Railing must conform to apply to pertinent sections of the following codes:
			1. Applicable state and local building codes, including IBC.

\*\* NOTE TO SPECIFIER \*\* Retain the next paragraph only if ADA Rail is specified.

* + - 1. ADAAG - Americans with Disabilities Act Accessibility Guidelines.
			2. OSHA as applicable to non public access.
		1. Handrail for Ramps and Stairs:
			1. Ramps with a rise greater than 6 inch (152 mm) shall have handrails on both sides.
			2. Handrail Height: Installed height of 34 to 38 inch (864 to 965 mm) above ramp surface.
			3. A curb, rail, wall, or barrier shall be provided to serve as edge protection.
				1. Curb: 4 inch (102 mm) minimum height.
				2. Barrier: Constructed to prevent the passage of a 4 inch (102 mm) diameter sphere above ramp grade level.
			4. Circular Cross Section Handrails: Gripping surface diameter between 1-1/2 inch (38 mm) and 2 inch (51 mm).
			5. Clearance between Wall or Post Surface and Handrail: 1-1/2 inch (38 mm) minimum.
			6. At the top and bottoms of handrail sections that stop at a landing, handrail shall extend 12 inch (305 mm) horizontally beyond the top riser and 12 inch (305 mm) horizontally beyond the bottom tread.
			7. Ramps with 30 inch (762 mm) or more drop off to grade shall require guards.
			8. Handrail shall be continuous, without interruption by newel posts or other obstructions.
			9. Handrails shall return to a wall, guard or walking surface.
		2. Structural Performance: Railings capable of withstanding effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
			1. Handrails:
				1. Uniform load of 50 lbf per ft (729.7 N per m) applied in any direction.
				2. Concentrated load of 200 lbf (889.6 N) applied in any direction.
				3. Uniform and concentrated loads need not be assumed to act concurrently.
			2. Top Rails of Guards:
				1. Uniform load of 50 lbf per ft (729.7 N per m) applied in any direction.
				2. Concentrated load of 200 lbf (889.6 N) applied in any direction.
				3. Uniform and concentrated loads need not be assumed to act concurrently.
			3. Infill Area of Guards:
				1. Horizontal concentrated load of 50 lbf per sq ft (2394 N per sq m)
				2. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area. Load on infill area need not be assumed to act concurrently with loads on top rails.
				3. Glass infill panels shall have a safety factor of 4 included in the calculation.
		3. Thermal Movement: Exterior railings shall allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing 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 degrees F (48.9 degrees C), ambient; 180 degrees F (82.2 degrees C), material surfaces.
		4. Corrosion Control: Prevent galvanic action and other corrosion types. Insulate metals and other materials from direct contact with incompatible materials.
	1. SUBMITTALS
		1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
		2. Product Data: Manufacturer's data sheets on each product to be used, including:
			1. Railing, grout, anchoring cement and paint products.
			2. Preparation instructions and recommendations.
			3. Storage and handling requirements and recommendations.
			4. Installation methods.
		3. Shop Drawings: Prior to fabrication submitted which include the following:
			1. Plan views showing location of handrail required for the project with all necessary dimensions.
			2. Detail drawings which show standard handrail elevations, typical railing connections, anchoring systems and expansion joints.
			3. Drawings shall be signed and sealed by a structural engineer indicating compliance with design loads specified.
		4. Qualification Data: For professional engineer.
		5. Product Test Reports: Supplier shall submit calculations and test reports for complete system. Test Data per ASTM E 935.
		6. Verification Samples: For each finish product specified, two samples, minimum size 6 inch (152 mm) square, representing actual product, color, and patterns.
	2. QUALITY ASSURANCE
		1. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten year experience.
		2. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.

\*\* 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-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship. Unless indicated otherwise on the Drawings, approximate size of mockup shall be 25 % to 50% of full size required, using full size components.
			1. Finish areas designated by Architect.
			2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
			3. Remodel mock-up area as required to produce acceptable work.
	1. DELIVERY, STORAGE, AND HANDLING
		1. Store products in manufacturer's unopened packaging until ready for installation.
	2. PROJECT CONDITIONS
		1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
		2. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.
		3. Coordinate installation of anchorages for 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.
	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 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.
		2. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.
	4. WARRANTY
		1. At project closeout, provide an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: Hollaender Mfg. Co., which is located at: 10285 Wayne Ave. P. O. Box 156399; Cincinnati, OH 45215-6399; Toll Free Tel: 800-772-8800; Tel: 513-772-8800; Fax: 800-772-8806; Email: [request info (sales@hollaender.com)](https://admin.arcat.com/users.pl?action=UserEmail&company=Hollaender+Mfg.+Co.&coid=33096&rep=&fax=800-772-8806&message=RE:%20Spec%20Question%20(05720hol):%20%20&mf=); Web: <https://architecturalhandrail.hollaender.com>

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

* + 1. Substitutions: Not permitted.
		2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.
	1. RAILING SYSTEM GENERAL
		1. Metal Surfaces: Smooth, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
		2. Brackets, Flanges, and Anchors: Cast or formed metal of same material type and finish as supported rails, unless otherwise indicated.
		3. Provide ADA handrail systems at all locations scheduled or required in the Contract Documents.

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

* 1. ALUMINUM HANDRAIL SYSTEM WITH IN LINE METAL, GLASS, OR RESIN INFILL - INTERNA-RAIL
		1. Basis of Design: Interna-Rail aluminum component railing as manufactured and assembled by Hollaender Manufacturing or an approved equivalent.
			1. Single source manufacturer is required.
			2. Welded Railing: Not acceptable.
		2. Posts and Rails:

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

* + - 1. Material: Extruded bars and tubing per ASTM B 221, Alloy 6063-T5/T52, 6005-T5 aluminum.
			2. Material: Extruded structural pipe and round tubing per ASTM B 429, Alloy 6061-T6 aluminum.
			3. Drawn Seamless Tubing per ASTM B 210: Alloy 6063-T832 aluminum.
			4. Post Size: 1-1/2 inch (38 mm) schedule 80.
				1. Outside Diameter: 1.900 inch (48 mm).
				2. Wall: 0.200 inch (5.1 mm).
			5. Rail Size: 1-1/2 inch schedule 40:
				1. Outside Diameter: 1.900 inch (48 mm).
				2. Wall: 0.145 inch (3.7 mm).
			6. Plate and Sheet per ASTM B 209: Alloy 6061-T6 aluminum.
			7. Die and Hand Forgings per ASTM B 247: Alloy 6061-T6 aluminum.
			8. Base Flange Castings per ASTM B 26/B 26M: Alloy Almag 535.
			9. Panel Clips and Structural Fasteners: Alloy 6063-T6 aluminum.
		1. Rail Attachment Fittings:
			1. Externally connected to the post with anodized aluminum, tubular rivet nuts, and an austenitic 302 alloy stainless steel, hexagon socket, button head, cap screw.
			2. Internally connected to the pipe with an internal double tang which is expanded by an austenitic 302 alloy stainless steel, internal and external, reverse knurl, cup point, hexagon socket set screw.
			3. Handrail brackets are connected to the underside of the rail with 2 stainless steel, flat countersunk, Type F self-tapping screws conforming to ANSI/ASME - B18.6.4.
			4. Pop rivets, sheet metal screws, and adhesives are not acceptable fastening methods.

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

* + 1. Pickets:
			1. Picket Infill: 3/4 inch (19 mm) IPS, Schedule 10, 6063-T6 aluminum pickets, attached to top and bottom rails by 156-85 aluminum component tees.
			2. Spacing: 4 inch (102 mm) on centers.
			3. Picket Tees: Attached to top and bottom rails with threaded self-tapping machine screws, size 1/4-20 UNC x 1 inch (25 mm). Picket tees shall be attached to pickets by friction fit through the use of mechanical or hydraulic pressure.
				1. Individual picket tees to have notches allowing escape of any water build up in the pickets.
			4. Top and Bottom Rail: 1-1/2 inch (38 mm) IPS, Schedule 40, 6063-T6 aluminum.
			5. Installed such that no welding or tool marks will be needed or visible, and firmly fixed with no movement allowed.

\*\* NOTE TO SPECIFIER \*\* Select infill type. Architect may specify another pattern, however infill specified must meet minimum gauge and open area requirements needed to meet structural loading of 50 lbf per sq ft (2394 N per sq m) area. In addition, for exterior steel applications, it is strongly recommended to have e-coating and powder coating. Delete infill panels not required.

* + 1. Infill Panels:

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

* + - 1. Resin Panels: 3/8 inch (10 mm) thick acrylic, Lumicor or equal acceptable to the Architect.
			2. Supported Glass: Tempered Glass per ASTM C 1048: Fully Tempered, Condition A, Type 1 (Transparent Flat Glass), Quality Q3.
				1. Comply with properties indicated for class, thickness, and manufacturing process that have been tested for surface and edge compression according to ASTM C1048 and for impact strength according to 16 CFR 1201 for category 2 materials.

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

* + - * 1. Glass Type: 3/8 inch (10 mm) tempered.
				2. Glass Type: 7/16 inch (11 mm) tempered and laminated.

\*\* NOTE TO SPECIFIER \*\* Delete lamination material not required.

* + - * 1. Lamination: PVG interlayer; for interior work.
				2. Lamination: SGP interlayer; for exterior work.

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

* + - * 1. Color: Clear.
				2. Color: Architect to specify if not clear.
				3. Color and Pattern: As scheduled in the Contract Documents.
				4. Coordinate glazing for infill panel with Section 08 81 13 - Decorative Glass Glazing.
				5. Attachment: Glass panels secured to top and bottom rails using Hollaender 144-8 two piece glass panel clips. 144-8 clips will be secured to rails using anodized aluminum tubular rivet nuts, and 5/16-18 UNC stainless steel socket head cap screws.
			1. Metal Wire Mesh Infill Panels:
				1. Railing Attachment: Hollaender model 145 panel retainers and 1/4-20 UNC screws, with appropriate slot width for panel thickness, and set screw for final tightening of panel within retainer slot.

Panel retainer: 6061 - T6 aluminum alloy.

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

* + - * 1. Welded Steel Wire Mesh: 0.118 inch (3 mm) diameter steel wire.

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

Pattern: 2 inch (51 mm) by 2 inch (51 mm) square.

Pattern: 4 inch (102 mm) by 4 inch (102 mm) square.

Pattern: 1 inch (25 mm) by 4 inch (102 mm) rectangle.

Pattern: 2 inch (51 mm) by 1 inch (25 mm) rectangle.

Pattern: 2 inch (51 mm) by 2 inch (51 mm) diamond.

Pattern: Custom pattern as specified in Contract Documents.

Frame: Steel U-channel, 11 gage (2.29 mm), x 1 inch (25 mm), welded corners, ground smooth.

Bottom Frame Channel: Open channel to ensure water evacuation

* + - * 1. Aluminum Wire Mesh.

.250 inch (6 mm) diameter woven aluminum mesh.

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

Pattern: 2 inch (51 mm) by 2 inch (51 mm) square.

Pattern: 4 inch (102 mm) by 4 inch (102 mm) square.

Pattern: 1 inch (25 mm) by 4 inch (102 mm) rectangle.

Pattern: 2 inch (51 mm) by 1 inch (25 mm) rectangle.

Pattern: 2 inch (51 mm) by 2 inch (51 mm) diamond.

Pattern: Custom pattern as specified in Contract Documents.

Frame: Aluminum U-channel, 11 gage (2.29 mm), x 1 inch (25 mm), welded corners, ground smooth.

Bottom Frame Channel: Open channel to ensure water evacuation

* + - * 1. Woven Wire Mesh: 0.162 inch (3 mm) diameter carbon steel wire.

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

Pattern: Techna 3150.

Pattern: 2 inch (51 mm) Lockcrimp.

Frame: steel U-channel, minimum 11 ga (2.29 mm), x 1 inch (25 mm), welded corners, ground smooth.

Bottom Frame Channel:

Open channel to ensure water evacuation

* + - * 1. Woven Wire Mesh: 0.162 inch (3 mm) diameter stainless steel wire.

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

Pattern: Techna 3150.

Pattern: 2 inch (51 mm) Lockcrimp.

Frame: steel U-channel, minimum 11 ga (2.29 mm), x 1 inch (25 mm), welded corners, ground smooth.

Bottom Frame Channel

Open channel to ensure water evacuation

* + - 1. Perforated Metal Infill Panels:
				1. Minimum 1 inch (25 mm) margins on all edges.

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

* + - * 1. Material: Steel, gauge as necessary to withstand loads indicated, but in no case less than 14 gauge (1.90 mm), ASTM A1008.
				2. Material: Stainless Steel, gauge as necessary to withstand loads indicated, but in no case less than 14 gauge (1.90 mm), ASTM A1008. Grade 304 for interior applications. Grade 316 for exterior applications.
				3. Material: Aluminum sheet of gage required to withstand loads indicated, minimum 0.125 inch (3 mm), aluminum alloy 3003-H14.

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

* + - * 1. Pattern: 1/2 inch (13 mm) round holes, spaced on 11/16 inch (17 mm) staggered centers.
				2. Pattern: 1/4 inch (6 mm) round holes, spaced on 11/16 inch (17 mm) staggered centers.
				3. Pattern: 3/4 inch (19 mm) round holes, spaced on 1 inch (25 mm) staggered centers.
				4. Pattern: 1/2 inch (13 mm) square holes, spaced on 11/16 inch (17 mm) straight centers.
				5. Frame: U-channe in same material as infilll, minimum 11 ga (2.29 mm). thick, x 1 inch (25 mm), welded corners, ground smooth.

Bottom Frame Channel: Open to maximize water drainage assuring minimum maintenance and maximum corrosion protection.

* + 1. Finishes:

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

* + - 1. Posts and Rails: Anodized per AA-M10C22A41; Architectural Class I, .7 mil (0.018 mm) thickness or greater.

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

* + - * 1. Color: Clear.
				2. Color: Dark Bronze.
				3. Color: Black.
			1. Posts and Rails: TGIC polyester powder coat per AAMA 2603 minimum.

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

* + - * 1. Color: To be selected from the manufacturer's available color palette.
				2. Color: As specified in the finish schedules of the Contract Documents.
			1. Posts and Rails: Kynar 500 Fluoropolymer coating per AAMA 2605 minimum.

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

* + - * 1. Color: To be selected from the manufacturer's available color palette.
				2. Color: As specified in the finish schedules of the Contract Documents.

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

* + - 1. Fittings: Anodized.

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

* + - * 1. Color: Clear.
				2. Color: Dark Bronze.
				3. Color: Black.

\*\* NOTE TO SPECIFIER \*\* Delete fitting finish not required.

* + - 1. Fittings: TGIC polyester powder coat per AAMA 2603 minimum.

\*\* NOTE TO SPECIFIER \*\* Delete color not required

* + - * 1. Color: To be selected from the manufacturer's available color palette.
				2. Color: As specified in the finish schedules of the Contract Documents.
			1. Fittings: Kynar 500 Fluoropolymer coating per AAMA 2605 minimum.

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

* + - * 1. Color: To be selected from the manufacturer's available color palette.
				2. Color: As specified in the finish schedules of the Contract Documents.

\*\* NOTE TO SPECIFIER \*\* Delete all infill panel finish if glass infill panels are being used, or no infill panels are specified. Otherwise delete infill panel not required.

* + - 1. Infill Panels: Stainless steel shall have the following finish:

\*\* NOTE TO SPECIFIER \*\* If a very shiny, almost chrome finish is acceptable, "electropolish finish" shall be specified. Delete finish not required.

* + - * 1. Electropolish finish.

\*\* NOTE TO SPECIFIER \*\* If a more "satin" finish is desired, finish shall be No. 4 polish. Corners will be welded and ground, brushed to match No. 4 polish. Passivizing electro chemical polish shall be used on all areas that are ground.

* + - * 1. No. 4 Polish: Corners welded and ground, brushed to match No.4 polish. Passivizing electro chemical polish shall be used on all areas that are ground.
			1. Infill Panels: Steel panels to have standard ecoat and powder coat.
				1. Primer and Corrosion Protection: PPG Powercron 8000 or approved equivalent, applied in four-step process.
				2. Color: Silver Stardust, to match clear anodized railing.
			2. Infill Panels: Standard ecoat and TGIC polyester powder coat per AAMA 2603 minimum.
				1. Primer and Corrosion Protection: PPG Powercron 8000 or approved equal, applied in four-step process.

\*\* NOTE TO SPECIFIER \*\* Delete the color not required.

* + - * 1. Color: To be selected from the manufacturer's available color palette.
				2. Color: As specified in the Finish Schedules of the Contract Documents.

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

* 1. ALUMINUM HANDRAIL SYSTEM WITH OFFSET GLASS OR RESIN INFILL - VUE
		1. Basis of Design: Interna-Rail VUE Glass Panel and Aluminum Railing System as manufactured and assembled by Hollaender Manufacturing.
		2. Posts and Rails:

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

* + - 1. Material: Extruded bars and tubing per ASTM B 221, Alloy 6063-T5/T52, 6005-T5 aluminum.
			2. Material: Extruded structural pipe and round tubing per ASTM B 429, Alloy 6061-T6 aluminum.
			3. Drawn Seamless Tubing per ASTM B 210: Alloy 6063-T832 aluminum.
			4. Post Size: 1-1/2 inch (38 mm) schedule 80.
				1. Outside Diameter: 1.900 inch (48 mm).
				2. Inside Diameter: 1.500 inch (38 mm).
				3. Wall: 0.200 inch (5.1 mm).
			5. Rail Size: 1 1/2 inch schedule 40:
				1. Outside Diameter: 1.900 inch (48 mm).
				2. Inside Diameter: 1.610 inch (41 mm).
				3. Wall: 0.145 inch (3.7 mm).
			6. Plate and Sheet per ASTM B 209: Alloy 6061-T6 aluminum.
			7. Die and Hand Forgings per ASTM B 247: Alloy 6061-T6 aluminum.
			8. Base Flange Castings per ASTM B 26/B 26M: Alloy Almag 535.
			9. Panel Clips and Structural Fasteners: Alloy 6063-T6 aluminum.
		1. Rail Fittings Attachment:
			1. The top rail shall be connected to the main body of the post with Hollaender 255-8 EXT tees. Tee fittings shall be manufactured from 6063-T6 aluminum alloy and shall be internally connected to the rail by means of a 5/16 inch (14 mm) socket head set screw. This combination shall prevent any loosening of the system due to changes in temperature or vibration. Systems using pop rivets or adhesives will not be accepted.
			2. Handrail brackets are connected to the underside of the rail with 2 stainless steel, flat countersunk, Type F self-tapping screws conforming to ANSI/ASME - B18.6.4.
			3. Pop rivets, sheet metal screws, and adhesives are not acceptable fastening methods and are considered to be inferior, defective work, subject to rejection by the Architect.
		2. Flanges and Anchors:
			1. Anchors: Concrete adhesive anchors where indicated or necessary.

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

* + - 1. Flanges For Level Railing: Hollaender 142-8 internal cast flanges with 4 holes. Capped with Hollaender 242-8 anodized aluminum escutcheon plate.
			2. Flanges for Raked Railing on Steel Stringers: Hollaender 146I-8 internal spud with integral cover plate.
			3. Flanges for Side Mount: Hollaender 52E-8 flange.
		1. Infill Panels:

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

* + - 1. Resin Panels: 3/8 inch (10 mm) thick acrylic, Lumicor or equal acceptable to the Architect.
			2. Supported Glass: Tempered Glass per ASTM C 1048: Fully Tempered, Condition A, Type 1 (Transparent Flat Glass), Quality Q3.
				1. Comply with properties indicated for class, thickness, and manufacturing process that have been tested for surface and edge compression according to ASTM C1048 and for impact strength according to 16 CFR 1201 for category 2 materials.

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

* + - * 1. Glass Type: 3/8 inch (10 mm) tempered.
				2. Glass Type: 7/16 inch (11 mm) tempered and laminated.
				3. Lamination: PVG interlayer; for interior work.
				4. Lamination: SGP interlayer; for exterior work.

\*\* NOTE TO SPECIFIER \*\* Delete glass color not required.

* + - * 1. Color: Clear.
				2. Color and Pattern: As specified in the Contract Documents.
				3. Coordinate glazing for infill panel with Section 08 81 13 - Decorative Glass Glazing.
				4. Attachment: Glass panels secured to posts using Hollaender 244-8 two piece glass panel clips. Panel clips are secured to rails using anodized aluminum tubular rivet nuts and stainless steel socket head cap screws, size 5/16-18 UNC. Support bottom of glass using Hollaender 24B4-8 glass clips.

No holes will be drilled in glass except at corner or end post conditions.

Glass Panel Clips, No. 244-8: 6063-T6 aluminum alloy.

* + 1. Finishes:

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

* + - 1. Post and Rail Finish: Anodized AA-M10C22A41 (Architectural class, .7 mil thickness or greater).

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

* + - * 1. Color: Clear.
				2. Color: Dark Bronze.
			1. Post and Rail Finish: TGIC Polyester Powder Coat per AAMA 2603 minimum.

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

* + - * 1. Color: Selected from manufacturer's available color palette.
				2. Color: As specified in finish schedules of the Contract Documents.
			1. Post and Rail Finish: Kynar 500 Fluoropolymer coating per AAMA 2605 minimum.

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

* + - * 1. Color: Selected from manufacturer's available color palette.
				2. Color: As specified in finish schedules of the Contract Documents.

\*\* NOTE TO SPECIFIER \*\* Delete fitting finish not required.

* + - 1. Fittings: Anodized.

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

* + - * 1. Color: Clear.
				2. Color: Dark Bronze.
			1. Fittings: TGIC Polyester Powder Coat per AAMA 2603 minimum.

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

* + - * 1. Color: Selected from manufacturer's available color palette.
				2. Color: As specified in finish schedules of the Contract Documents.

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

* 1. ALUMINUM HANDRAIL SYSTEM WITH OFFSET GLASS INFILL, GLASS AS TOP RAIL - KLEAR
		1. Basis of Design: KLEAR Glass Panel and Aluminum Railing System as manufactured and assembled by Hollaender Manufacturing.
		2. Interconnecting Railing Components:
			1. Post, Handrail/Grabrail Connection: Hollaender 87-8 post brackets using anodized aluminum tubular rivet nuts and stainless steel socket head cap screws, size 5/16-18 UNC. This combination prevents loosening of system due to temperature change or vibration.
			2. Hollaender 87-8 Post Brackets: 6063-T6 aluminum alloy.
			3. Systems that are welded, or use pop rivets or adhesives are not acceptable.
			4. Post Spacing: 48 inch (1219 mm) maximum.
		3. Glass Panel Attachment: Secured to rails using Hollaender 244-8 two piece glass panel clips using anodized aluminum tubular rivet nuts and stainless steel socket head cap screws, size 5/16-18 UNC. Support bottom of glass using Hollaender 244B-8 glass support clips.
			1. No holes will be drilled in the glass except at corner or end post conditions.
			2. Glass Panel Clips, No. 244-8: 6063-T6 aluminum alloy.
		4. Flanges and Anchors:
			1. Anchors: Concrete adhesive anchors where indicated or necessary.

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

* + - 1. Flanges For Level Railing: Hollaender 142-8 internal cast flanges with 4 holes. Capped with Hollaender 242-8 anodized aluminum escutcheon plate.
			2. Flanges for Raked Railing on Steel Stringers: Hollaender 146I-8 internal spud with integral cover plate.
			3. Flanges for Side Mount: Hollaender 52E-8 flange.
		1. Glass or Resin Infill Panels for Railings:
			1. Tempered Glass: ASTM C 1048, Fully Tempered, Condition A, Type 1 (Transparent Flat Glass), Quality Q3.
				1. Comply with properties indicated for class, thickness, and manufacturing process that have been tested for surface and edge compression according to ASTM C1048 and for impact strength according to 16 CFR 1201 for category 2 materials.

\*\* NOTE TO SPECIFIER \*\* Delete glass thickness not required.

* + - * 1. Glass Type: 3/8 inch (10 mm) tempered.
				2. Glass Type: 7/16 inch (11 mm) tempered and laminated.

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

* + - * 1. Lamination: PVG interlayer; for interior work.
				2. Lamination: SGP interlayer; for exterior work.
				3. If Frosted Glass is Required: "Velour" frosted glass (frosted one side only) by Oldcastle, or approved equivalent.
		1. Finishes:

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

* + - 1. Posts and Rails: Anodized per AA-M10C22A41; Architectural Class I, .7 mil (0.018 mm) thickness or greater.

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

* + - * 1. Color: Clear.
				2. Color: Dark Bronze.
			1. Posts and Rails: TGIC polyester powder coat per AAMA 2603 minimum.

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

* + - * 1. Color: To be selected from the manufacturer's available color palette.
				2. Color: As specified in the finish schedules of the Contract Documents.
			1. Posts and Rails: Kynar 500 Fluoropolymer coating per AAMA 2605 minimum.

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

* + - * 1. Color: To be selected from the manufacturer's available color palette.
				2. Color: As specified in the finish schedules of the Contract Documents.

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

* + - 1. Fittings: Anodized.

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

* + - * 1. Color: Clear.
				2. Color: Dark Bronze.
			1. Fittings: TGIC polyester powder coat per AAMA 2603 minimum.

\*\* NOTE TO SPECIFIER \*\* Delete color not required

* + - * 1. Color: To be selected from the manufacturer's available color palette.
				2. Color: As specified in the finish schedules of the Contract Documents.

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

* 1. SLIP-ON PIPE FITTING RAILING SYSTEM WITH IN LINE METAL OR GLASS INFILL - SPEED-RAIL
		1. Basis of Design: Speed-Rail for glass as manufactured and assembled by Hollaender Manufacturing.
		2. Posts and Rails:

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

* + - 1. Material: Extruded bars and tubing per ASTM B 221, Alloy 6063-T5/T52, 6005-T5 aluminum.
			2. Material: Extruded structural pipe and round tubing per ASTM B 429, Alloy 6061-T6 aluminum.
			3. Drawn Seamless Tubing per ASTM B 210: Alloy 6063-T832 aluminum.
			4. Post Size: 1-1/2 inch (38 mm) schedule 80.
				1. Outside Diameter: 1.900 inch (48 mm).
				2. Inside Diameter: 1.500 inch (38 mm).
				3. Wall: 0.200 inch (5.1 mm).
			5. Rail Size: 1 1/2 inch schedule 40:
				1. Outside Diameter: 1.900 inch (48 mm).
				2. Inside Diameter: 1.610 inch (41 mm).
				3. Wall: 0.145 inch (3.7 mm).
			6. Plate and Sheet per ASTM B 209: Alloy 6061-T6 aluminum.
			7. Die and Hand Forgings per ASTM B 247: Alloy 6061-T6 aluminum.
			8. Base Flange Castings per ASTM B 26/B 26M: Alloy Almag 535.
			9. Panel Clips and Structural Fasteners: Alloy 6063-T6 aluminum.
		1. Slip-On Fittings: High-tensile aluminum-magnesium alloy 535.0 manufactured in compliance with ASTM B 26, cast from high-purity ingot 535.2 conforming to ASTM B 179.
			1. Attachment:
				1. Secured to pipe with internal and external, reverse knurl, cup point hex socket set screws.
				2. Connected to the underside of rail with 2 stainless steel, flat countersunk, Type F self-tapping screws conforming to ANSI/ASME - B18.6.4.
				3. Pop rivets, sheet metal screws, and adhesives are not acceptable fastening methods.
		2. Infill Panels:

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

* + - 1. Supported Glass: Tempered Glass per ASTM C 1048: Fully Tempered, Condition A, Type 1 (Transparent Flat Glass), Quality Q3.
				1. Comply with properties indicated for class, thickness, and manufacturing process that have been tested for surface and edge compression according to ASTM C1048 and for impact strength according to 16 CFR 1201 for category 2 materials.

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

* + - * 1. Glass Type: 3/8 inch (10 mm) tempered.
				2. Glass Type: 7/16 inch (11 mm) tempered and laminated.

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

Lamination: PVG interlayer; for interior work.

Lamination: SGP interlayer; for exterior work.

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

* + - * 1. Color: Clear.
				2. Color and Pattern: As scheduled in the Contract Documents.
				3. Coordinate glazing for infill panel with Section 08 81 13 - Decorative Glass Glazing.
				4. Attachment: Glass panels secured to top and bottom rails using Hollaender 144-8 two piece glass panel clips. 144-8 clips will be secured to rails using anodized aluminum tubular rivet nuts, and 5/16-18 UNC stainless steel socket head cap screws.
			1. Metal Wire Mesh Infill Panels:
				1. Railing Attachment: Hollaender 145-8 single piece panel clips.

\*\* NOTE TO SPECIFIER \*\* Delete metal infill panels not required.

* + - * 1. Welded Steel Wire Mesh: 0.120 inch (3mm) diameter steel wire.

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

Pattern: 2 inch (51 mm) by 2 inch (51 mm) square.

Pattern: 4 inch (102 mm) by 4 inch (102 mm) square.

Pattern: 1 inch (25 mm) by 4 inch (102 mm) rectangle.

Pattern: 2 inch (51 mm) by 1 inch (25 mm) rectangle.

Pattern: 2 inch (51 mm) by 2 inch (51 mm) diamond.

Pattern: Custom pattern as specified in Contract Documents.

Frame: Steel U-channel, 11 gage (2.29 mm), x 1 inch (25 mm), welded corners, ground smooth.

Bottom Frame Channel: Open channel to ensure water evacuation

* + - * 1. Aluminum Wire Mesh.

.250 inch (6 mm) diameter woven aluminum mesh.

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

Pattern: 2 inch (51 mm) by 2 inch (51 mm) square.

Pattern: 4 inch (102 mm) by 4 inch (102 mm) square.

Pattern: 1 inch (25 mm) by 4 inch (102 mm) rectangle.

Pattern: 2 inch (51 mm) by 1 inch (25 mm) rectangle.

Pattern: 2 inch (51 mm) by 2 inch (51 mm) diamond.

Pattern: Custom pattern as specified in Contract Documents.

Frame: Aluminum U-channel, 11 gage (2.29 mm), x 1 inch (25 mm), welded corners, ground smooth.

Bottom Frame Channel: Open channel to ensure water evacuation

* + - * 1. Woven Wire Mesh: 0.162 inch (3mm) diameter steel wire.

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

Pattern: Techna 3150.

Pattern: 2 inch (51 mm) Lockcrimp.

Frame: Steel U-channel, minimum 11 ga (2.29 mm), x 1 inch (25 mm), welded corners, ground smooth.

Bottom Frame Channel: Open channel

* + - * 1. Woven Wire Mesh: 0.162 inch (3mm) diameter stainless steel wire.

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

Pattern: Techna 3150.

Pattern: 2 inch (51 mm) Lockcrimp.

Frame: Stainless Steel U-channel, minimum 11 ga (2.29 mm), x 1 inch (25 mm), welded corners, ground smooth.

Bottom Frame Channel: Open channel

* + - 1. Perforated Metal Infill Panels:

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

* + - * 1. Material: Steel, gauge as necessary to withstand loads indicated, but in no case less than 14 gauge (1.90 mm), ASTM A1008.
				2. Material: Stainless Steel, gauge as necessary to withstand loads indicated, but in no case less than 14 gauge (1.90 mm), ASTM A1008.
				3. Material: Aluminum sheet of gage required to withstand loads indicated, minimum 0.125 inch (3 mm), aluminum alloy 3003-H14 with hem.

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

* + - * 1. Pattern: 1/2 inch (13 mm) round holes, spaced on 11/16 inch (17 mm) staggered centers.
				2. Pattern: 1/4 inch (6 mm) round holes, spaced on 11/16 inch (17 mm) staggered centers.
				3. Pattern: 3/4 inch (19 mm) round holes, spaced on 1 inch (25 mm) staggered centers.
				4. Pattern: 1/2 inch (13 mm) square holes, spaced on 11/16 inch (17 mm) straight centers.
				5. Frame: U-channel in same material as infill, minimum 11 ga (2.29 mm). thick, x 1 inch (25 mm), welded corners, ground smooth.

Bottom Frame Channel: Open channel

* + 1. Finishes:

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

* + - 1. Posts and Rails: Anodized per AA-M10C22A41; Architectural Class I, .7 mil (0.018 mm) thickness or greater.

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

* + - * 1. Color: Clear.
				2. Color: Dark Bronze.
			1. Posts and Rails: TGIC polyester powder coat per AAMA 2603 minimum.

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

* + - * 1. Color: To be selected from the manufacturer's available color palette.
				2. Color: As specified in the finish schedules of the Contract Documents.

\*\* NOTE TO SPECIFIER \*\* Delete fitting finish not required..

* + - 1. Fittings: Architectural tumbled mill finish.
			2. Fittings: Anodized, clear.
			3. Fittings: TGIC Polyester owder coat per AAMA 2603 minimum

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

* + - * 1. Color: To be selected from the manufacturer's available color palette.
				2. Color: As specified in the Finish Schedules of the Contract Documents.

\*\* NOTE TO SPECIFIER \*\* Delete infill panel finish not required..

* + - 1. Infill Panels: Standard ecoat and powder coat.
				1. Color: Silver Stardust, to match clear anodized railing.
			2. Infill Panels: Standard ecoat and TGIC polyester powder coat per 2603 minimum.

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

* + - * 1. Color: To be selected from the manufacturer's available color palette.
				2. Color: As specified in the Finish Schedules of the Contract Documents.

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

* 1. STRUCTURAL GLASS RAILING WITH SHOE MOUNT GLASS - NEWMAN BY HOLLAENDER
		1. Basis of Design: Newman by Hollaender Structural Glass Railing with Shoe Mount as manufactured and assembled by Hollaender Manufacturing.
		2. Stainless Steel Finishes:
			1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
			2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
				1. Run grain of directional finishes with long dimension of each piece.
				2. Satin Finish: No 4 (standard).
				3. Mirrorlike Finish: No 8.
		3. Aluminum Finishes:
			1. Anodized: AA-M10C22A41; Architectural class, .7 mil thickness minimum.
				1. Finish designations prefixed by AA comply with Aluminum Association's aluminum finishes designations.
			2. Power Coating: Provide color specifying appropriate RAL number in AAMA 2604 finish.
		4. Base Shoe: Newman by Hollaender - aluminum base shoe for wet glazing; 6063-T6 alloy cladding per specification.
			1. NBH400: Up to 3/4 inch (19 mm) thick glass.
			2. Alternative for base shoe: Newman by Hollaender Panel Grip 2 dry glaze shoe.
		5. Cladding:
			1. Stainless Steel Sheet: 304 stainless steel, .050 (1.27 mm) thick.
				1. Finish: No 4 brushed satin finish (standard).
				2. Finish: No 8 polished (mirror finish).
			2. Aluminum sheet, .050 inch (1.27 mm) thick, 3003 alloy.
				1. Finish: Powder coated to match aluminum top rail/cap.
				2. Standard is to match clear anodized/silver.
		6. Top Cap or Rail:

\*\* NOTE TO SPECIFIER \*\* The first paragraph below is standard. Delete material not required.

* + - 1. Stainless Steel Tubing: 1.66 inch (42.2 mm) OD, 0.059 inch (1.5 mm) wall, No. 4 brushed satin finish.
			2. Stainless Steel Tubing: 2 inch (50.8 mm) OD, 0.059 inch (1.5 mm) wall, No. 4 brushed satin finish.
			3. Stainless Steel Tubing: 2.5 inch (63.5 mm) OD, 0.062 inch (1.6 mm) wall, No. 4 brushed satin finish.
			4. Stainless Steel Tubing: 3 inch (76.2 mm) OD, 0.062 inch (1.6 mm) wall No. 4 brushed satin finish.
			5. Aluminum Pipe: 1.9 inch (48.3 mm) diameter, 0.109 inch (2.77 mm) wall, 6063-T52 alloy. Powder coat to match architect selected finish.
			6. U Channel: Stainless steel. No. 4 brushed satin finish.
			7. U Channel: Aluminum. Powder coat to match architect selected finish.
		1. Assist Rail:

\*\* NOTE TO SPECIFIER \*\* Delete rail material not required.

* + - 1. Stainless Steel Tubing: 1.5 inch (38.1 mm) OD, 0.059 inch (1.5 mm) wall, No. 4 brushed satin finish.
			2. Aluminum Pipe: 1.9 inch (48.3 mm) diameter, 0.109 inch (2.77 mm) wall, 6063-T52 alloy. Powder coat to match architect selected finish.

\*\* NOTE TO SPECIFIER \*\* Delete the assist rail brackets not required. The first paragraph below is standard.

* + - 1. Assist Rail Brackets: Stainless Steel, 304, Model 687-8/304
			2. Assist Rail Brackets: Stainless Steel, 316, Model 787-8/316- 316.
		1. Glass Infill Panels for Railing:
			1. Tempered Glass per ASTM C 1048: Fully Tempered, Condition A, Type 1 (Transparent Flat Glass), Quality Q3.
				1. Comply with properties indicated for class, thickness, and manufacturing process that have been tested for surface and edge compression according to ASTM C1048 and for impact strength according to 16 CFR 1201 for category 2 materials.

\*\* NOTE TO SPECIFIER \*\* Delete glass infill panel not required.

* + - 1. Glass Infill Panel: 1/2 inch (13 mm) tempered monolithic (standard)
			2. Glass Infill Panel: 3/4 inch (19 mm) tempered monolithic
			3. Glass Infill Panel: 13/16 inch (20.64 mm) laminated with PVG interlayer; for interior work.
			4. Glass Infill Panel: 13/16 inch (20.64 mm) laminated with SGP interlayer; for exterior work.

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

* + - 1. Tint: Clear
			2. Tint: Bronze
			3. Tint: Grey

\*\* NOTE TO SPECIFIER \*\* Delete laminated not required or delete both if lamination is not required.

* + - 1. Laminated: one lite.
			2. Laminated: Two lites.

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

* 1. BUTTON GLASS RAILING - NEWMAN BY HOLLAENDER
		1. Basis of Design: Newman by Hollaender Button Glass Railing as manufactured and assembled by Hollaender Manufacturing or an approved equivalent.
		2. Mounting Buttons: Model 600-8, 4 per lite minimum. Buttons placed at 6 inch (152 mm) in from horizontal edge, on 36 inch (914 mm) centers.
			1. Material: 304 SS standard (Interior)
			2. Material: 316 SS optional (exterior)
			3. Mounting surface provided so bottom button will be 2 inch (51 mm) minimum from mounting surface edge, and 7 inch (178 mm) vertical spacing between bottom and top buttons. 9 inch (229 mm) minimum vertical mounting surface available.
		3. Top Cap or Rail:

\*\* NOTE TO SPECIFIER \*\* The first paragraph below is standard. Delete material not required.

* + - 1. Stainless Steel Tubing: 1.66 inch (42.2 mm) OD, 0.059 inch (1.5 mm) wall, No. 4 brushed satin finish.
			2. Stainless Steel Tubing: 2 inch (50.8 mm) OD, 0.059 inch (1.5 mm) wall, No. 4 brushed satin finish.
			3. Stainless Steel Tubing: 2.5 inch (63.5 mm) OD, 0.062 inch (1.6 mm) wall, No. 4 brushed satin finish.
			4. Stainless Steel Tubing: 3 inch (76.2 mm) OD, 0.062 inch (1.6 mm) wall No. 4 brushed satin finish.
			5. Aluminum Pipe: 1.9 inch (48.3 mm) diameter, 0.109 inch (2.77 mm) wall, 6063-T52 alloy. Powder coat to match architect selected finish.
			6. U Channel: Stainless steel. No. 4 brushed satin finish.
			7. U Channel: Aluminum. Powder coat to match architect selected finish.
		1. Assist Rail:

\*\* NOTE TO SPECIFIER \*\* Delete one of the two following paragraphs.

* + - 1. Stainless Steel Tubing: 1.5 inch (38.1 mm) OD, 0.059 1.5 mm) wall, No. 4 brushed satin finish.
			2. Aluminum Pipe: 1.9 inch (48.3 mm) diameter, 0.109 inch (2.77 mm) wall, 6063-T52 alloy. Powder coat to match architect selected finish.

\*\* NOTE TO SPECIFIER \*\* Delete the assist rail brackets not required. The first paragraph below is standard.

* + - 1. Assist Rail Brackets: Stainless Steel, 304, Model Q 0117 - 304.
			2. Assist Rail Brackets: Stainless Steel, 316, Model Q 0117 - 316.
		1. Glass Infill Panels for Railing:
			1. Tempered Glass per ASTM C 1048: Fully Tempered, Condition A, Type 1 (Transparent Flat Glass), Quality Q3.
				1. Comply with properties indicated for class, thickness, and manufacturing process that have been tested for surface and edge compression according to ASTM C1048 and for impact strength according to 16 CFR 1201 for category 2 materials.

\*\* NOTE TO SPECIFIER \*\* Delete glass infill panel not required.

* + - 1. Glass Infill Panel: 3/4 inch ( mm) tempered monolithic
			2. Glass Infill Panel: 13/16 inch (20.64 mm) laminated with PVG interlayer; for interior work.
			3. Glass Infill Panel: 13/16 inch (20.64 mm) laminated withSGP interlayer; for exterior work.

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

* + - 1. Tint: Clear.
			2. Tint: Bronze.
			3. Tint: Grey.

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

* 1. STAINLESS STEEL PANEL CLIP RAILING SYSTEM WITH IN LINE GLASS OR METAL INFILL - VISION
		1. Basis of Design: VISION Stainless Steel Railing for Glass as manufactured and assembled by Hollaender Manufacturing.

\*\* NOTE TO SPECIFIER \*\* Type 316 is higher cost alternative for coastal, highly corrosive environments and difficult exterior applications in general. Delete stainless steel not required.

* + - 1. Stainless Steel: Type 304.
			2. Stainless Steel: Type 316
			3. Posts: Stainless steel tubing, 1.9 in. (48.26 mm) OD 0.120 in. (3.05 mm) wall.
			4. Rails: Stainless steel tubing, 1.9 in. (48.26 mm) OD 0.080 in. (2.03 mm) wall.
			5. Assist Rail (Handrail/Grabrail): 1.5 inch (38.10 mm) OD, 0.062 inch (1.57 mm) wall.
			6. Structural Fasteners for Interconnecting Railing Components:
				1. Top Rail: Connected to main body of post with Hollaender 655-8 tees.

Internally connected to rail by means of 5/16 inch (8 mm) set screw that engages a lug on the 655-8 tee through the wall of the 0.120 (3 mm) thick post. Set screw shall have an internal/external, reverse knurl, cup point preventing loosening of the system due to changes in temperature or vibration.

Use of pop rivets or adhesives is not acceptable.

* + - * 1. Tee Fittings: 304 Stainless steel alloy.
			1. Glass or Resin Panel Attachment: Secured to posts with two piece stainless steel, glass panel clips, No. 644-8 from Hollaender using anodized aluminum tubular rivet nuts, and stainless steel socket head cap screws, size 5/16- 18 UNC.

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

* + - 1. Flanges For Level Railing: Hollaender 642-8 internal cast flanges with 4 holes. Capped with Hollaender 642-8 stainless steel escutcheon plate.
			2. Flanges for Raked Railing on Steel Stringers: Hollaender 646I-8 internal spud with integral cover plate.
			3. Flanges for Side Mount: Hollaender 652E-8 flange.
		1. Glass or Resin Infill Panels for Railing:
			1. Tempered Glass per ASTM C 1048: Fully Tempered, Condition A, Type 1 (Transparent Flat Glass), Quality Q3.
				1. Comply with properties indicated for class, thickness, and manufacturing process that have been tested for surface and edge compression according to ASTM C1048 and for impact strength according to 16 CFR 1201 for category 2 materials.
			2. Monolithic Glass: 3/8 inch (19 mm) thick.
				1. Spacing Between Posts: 48 inch (1219 mm).
			3. Laminated Glass if Required by 2015 IBC: 7/16 inch (11 mm) thick minimum. Individual lites: 3/16 (5 mm) thick fully tempered.
				1. Comply with ASTM C 1172.

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

* + - * 1. Lamination: PVG interlayer; for interior work.
				2. Lamination: SGP interlayer; for exterior work.
			1. If Frosted Glass is Required: "Velour" frosted glass (frosted one side only) by Oldcastle, or approved equivalent.
			2. Resin Panels: Acrylic, 3/8 inch (9 mm) thick, from Lumicor or approved equivalent.
		1. Metal Wire Mesh Infill Panels:
			1. Railing Attachment: Hollaender 644-8 stainless steel panel clips.

\*\* NOTE TO SPECIFIER \*\* Delete metal infill panels not required.

* + - 1. Welded Steel Wire Mesh: 0.120 inch (3mm) diameter stainless steel wire.

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

* + - * 1. Pattern: 2 inch (51 mm) by 2 inch (51 mm) square.
				2. Pattern: 4 inch (102 mm) by 4 inch (102 mm) square.
				3. Pattern: 1 inch (25 mm) by 4 inch (102 mm) rectangle.
				4. Pattern: 2 inch (51 mm) by 1 inch (25 mm) rectangle.
				5. Pattern: 2 inch (51 mm) by 2 inch (51 mm) diamond.
				6. Pattern: Custom pattern as specified in Contract Documents.
				7. Frame: Stainless Steel U-channel, 11 gage (2.29 mm), x 1 inch (25 mm), welded corners, ground smooth.

Bottom Frame Channel: Open channel to ensure water evacuation

* + 1. Perforated Metal Infill Panels:

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

* + - 1. Material: Stainless Steel, gauge as necessary to withstand loads indicated, but in no case less than 14 gauge (1.90 mm), ASTM A1008.

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

* + - 1. Pattern: 1/2 inch (13 mm) round holes, spaced on 11/16 inch (17 mm) staggered centers.
			2. Pattern: 1/4 inch (6 mm) round holes, spaced on 11/16 inch (17 mm) staggered centers.
			3. Pattern: 3/4 inch (19 mm) round holes, spaced on 1 inch (25 mm) staggered centers.
			4. Pattern: 1/2 inch (13 mm) square holes, spaced on 11/16 inch (17 mm) straight centers.
			5. Frame: U-channel in same material as infill, minimum 11 ga (2.29 mm). thick, x 1 inch (25 mm), welded corners, ground smooth.
				1. Bottom Frame Channel: Open channel

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

* 1. ADA COMPLIANT ALUMINUM HANDRAIL SYSTEM - OFFSET POST MOUNTED ADA RAILING
		1. Basis of Design: ADA Rail ALUMINUM component railing as manufactured and assembled by Hollaender Manufacturing.
			1. Single source manufacturer is required.
			2. Welded Railing: Not acceptable.
		2. Posts and Rails:
			1. Post Size: 1-1/2 inch (38 mm) Schedule 40:
				1. Outside Diameter: 1.900 inch (48 mm).
				2. Inside Diameter: 1.500 inch (38 mm).
				3. Wall: 0.200 inch (5.1mm).
			2. Rail Size: 1-1/2 inch (38 mm) Schedule 40:
				1. Outside Diameter: 1.900 inch (48 mm).
				2. Inside Diameter: 1.610 inch (41mm).
				3. Wall: 0.145 inch (3.7mm).
			3. Post and Handrail Connections: Hollaender Model 85 adjustable brackets and 5/16-18 aluminum rivet nuts and stainless steel socket head cap screws.
			4. Handrail Splicing: Hollaender Model 70ES-8 internal locking splices.
			5. Top Mounted to Ramp: Flanges shall be Hollaender 45 SBCS angled flanges.
			6. Core Mounting: Drill core holes 6 inch (152 mm) deep x 3 inch (76 mm) diameter, fill with non-shrink grout.
			7. End Loops: Upper and lower, shall extend horizontally beyond the post and be attached to the handrail using 70 ES-8 Hollaender locking splices.
		3. Finishes:

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

* + - 1. Post and Rail Finish: Anodized AA-M10C22A41 (Architectural class, .7 mil thickness or greater).

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

* + - * 1. Color: Clear.
				2. Color: Dark Bronze.
			1. Post and Rail Finish: TGIC Polyester Powder Coat per AAMA 2604 minimum.

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

* + - * 1. Color: Selected from manufacturer's available color palette.
				2. Color: As specified in finish schedules of the Contract Documents.
			1. Post and Rail Finish: Kynar 500 Fluoropolymer coating per AAMA 2605 minimum.

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

* + - * 1. Color: Selected from manufacturer's available color palette.
				2. Color: As specified in finish schedules of the Contract Documents.

\*\* NOTE TO SPECIFIER \*\* Delete fitting finish not required.

* + - 1. Fittings: Anodized.

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

* + - * 1. Color: Clear.
				2. Color: Dark Bronze.
			1. Fittings: TGIC Polyester Powder Coat per AAMA 2604 minimum.

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

* + - * 1. Color: Selected from manufacturer's available color palette.
				2. Color: As specified in finish schedules of the Contract Documents.
			1. Fittings: Kynar 500 Fluoropolymer coating per AAMA 2605 minimum.

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

* + - * 1. Color: Selected from manufacturer's available color palette.
				2. Color: As specified in finish schedules of the Contract Documents.

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

* 1. ADA COMPLIANT ALUMINUM HANDRAIL SYSTEM - IN LINE POST MOUNTED RAILING
		1. Basis of Design: Interna-Rail Aluminum Handrail, non welded component railing as manufactured and assembled by Hollaender Manufacturing.
			1. Single source manufacturer is required.
			2. Welded railing will not be accepted.
		2. Posts and Rails:
			1. Post Size: 1-1/2 inch (38 mm) Schedule 40:
				1. Outside Diameter: 1.900 inch (48 mm).
				2. Inside Diameter: 1.500 inch (38 mm).
				3. Wall: 0.200 inch (5.1mm).
			2. Rail Size: 1-1/2 inch (38 mm) Schedule 40:
				1. Outside Diameter: 1.900 inch (48 mm).
				2. Inside Diameter: 1.610 inch (41mm).
				3. Wall: 0.145 inch (3.7mm).
		3. Post and Handrail Attachment:

\*\* NOTE TO SPECIFIER \*\* Delete handrail attachment not required.

* + - 1. Hollaender model 155-8 aluminum level tee fittings.
			2. Hollaender model 173-8 aluminum angled tee fittings.
			3. Hollaender model 255-8-8 two piece adjustable tees.
		1. Stair Tread or Stringer Mounting: Use Hollaender mounting flanges appropriate to size and angle of mounting surface.
		2. Core Mounting: Drill core holes 6 inch (152 mm) deep x 3 inch (76 mm) diameter. Fill with non-shrink grout.
		3. End Loops: Upper and lower, shall extend horizontally beyond the post.

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

* 1. ADA COMPLIANT STAINLESS STEEL HANDRAIL SYSTEM - IN LINE POST MOUNTED RAILING
		1. Basis of Design: Interna-Rail Stainless Steel Handrail, non welded component railing as manufactured and assembled by Hollaender Manufacturing.
			1. Single source manufacturer is required.
			2. Welded railing will not be accepted.
			3. Posts: Stainless steel 304, 1-1/2 IPS, 1.90 in. (48 mm) OD, 0.120 inch (3.05 mm) wall.
			4. Rail and Handrail: Stainless steel 304, 1-1/2 IPS, 1.90 in. (48 mm) OD, 0.080 inch (2.03 mm) wall.

\*\* NOTE TO SPECIFIER \*\* Delete post and handrail not required. 316 stainless steel is for highly corrosive environments.

* + 1. Post and Handrail Attachment: 304 stainless steel.
			1. Hollaender model 655-8 non welded stainless steel tees for level section, and Hollaender model 673-8 stainless steel angled tee fittings.
			2. Hollaender model 655S-8 two piece adjustable tees.
		2. Post and Handrail Attachment: 316 stainless steel.
			1. Hollaender model 755-8 stainless steel 316 for level, and 773-8 stainless steel 316 for sloping.
			2. Hollaender model 755S-8 stainless steel 316 two piece adjustable tees.
		3. Stair Tread or Stringer Mounting: Use Hollaender mounting flanges appropriate to size and angle of mounting surface.
		4. Core Mounting: Drill core holes 6 inch (152 mm)deep x 3 inch (76 mm) diameter. Fill with non-shrink grout.
		5. End Loops: Upper and lower, shall extend horizontally beyond the post.
		6. Wall Mounted Handrail:
			1. Wall Rail: Stainless steel 304, 1-1/2 IPS, 1.90 in. (48 mm) OD, 0.080 inch (2.03 mm) wall.
				1. Wall Attachment: 60 inch (1524 mm) spacing maximum

\*\* NOTE TO SPECIFIER \*\* Delete attachment bracket not required. The 304 stainless steel option is standard. The 316 stainless steel option is for highly corrosive environments.

* + - * 1. Attachment Brackets: Hollaender 688-8, 304 stainless steel.
				2. Attachment Brackets: Hollaender 688-8, 316 stainless steel.
				3. Attachment Brackets: Hollaender 788-8, 316 stainless steel shall be used to attach wall rail to support material.
			1. Continuous between flights, or shall return to the wall at top or bottom of flight, as appropriate.
			2. Bent at the end that returns to the wall.
	1. FABRICATION
		1. Railing Fabrication: Comply with requirements for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
			1. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (0.8 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
			2. Form work true to line and level with accurate angles and surfaces.
			3. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
			4. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
			5. Connections: Fabricate railings with non-welded connections, unless otherwise indicated.
			6. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
			7. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
			8. Fabricate anchorage devices capable of withstanding loads imposed by railings.
			9. Coordinate anchorage devices with supporting structure.
		2. Railing Assembly: Shop assemble to greatest extent possible minimizing field splicing and assembly.
			1. Disassemble only as necessary for shipping and handling.
			2. Clearly mark units for reassembly and coordinated installation.
			3. Use connections that maintain structural value of joined pieces.
			4. Non-welded Connections: Connect members with concealed mechanical fasteners and fittings.
				1. Fittings to be internal double tang type activated by a reverse knurl cup point set screw ensuring screw does not come loose under vibration.

Plain cup point screws will not be accepted.

* + - * 1. Fittings fastened to pipe using 5/16-18 UNC inch tubular rivet nuts and stainless steel socket head cap screws.
			1. Form Changes in Direction: Use flush bends or prefabricated flush-elbow fittings.
			2. Form Simple and Compound Curves: Bend members in jigs producing uniform curvature for each repetitive configuration required.
				1. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
			3. Exposed Ends of Railing Members: Close using prefabricated end fittings.
			4. Wall Returns: Provide at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
			5. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
				1. External Flanges: Sand cast aluminum alloy 535 with anodized finish fastened directly to posts by two reverse knurl cup point set screws.
				2. Internal Flanges: Sand cast aluminum alloy 535. Cover flanges with escutcheon plates.
			6. Railing Toe Plates: Provide when adjacent to or above and open to stair system, floor or grade below and in accordance with the following:
				1. Size: 4 inch (102 mm) high extruded section.
				2. Toe Plate Bottom Clearance Above Top of Walking Surface: 1/8 inch (3 mm) minimum and 1/4 inch (6 mm) maximum. Notch plates as required at railing posts and post base plates.
				3. Attach to each rail post with clamps; allowing for temperature expansion and contraction between posts.
				4. Expansion Joints: Provide toeboard at railing expansion joints.
				5. Provide pre-manufactured corners for field installation.
	1. FASTENERS
		1. Aluminum and Stainless Steel Railings: Type 304 stainless-steel fasteners.
		2. Fasteners Anchoring Railings to Other Construction: Select type, grade, and class required to produce connections suitable for anchoring railings to construction types indicated and capable of withstanding design loads.
			+ 1. Pop rivets or adhesives are not acceptable.
		3. Anchors: Provide concrete adhesive anchors where indicated or necessary.
	2. FINISHES
		1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
		2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
		3. Appearance of Finished Work:
			1. Acceptable Variations: Appearance of abutting or adjacent pieces must be within one-half of the range of approved samples.
				1. 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. Noticeable Variations: In same piece is not acceptable.
			3. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

\*\* NOTE TO SPECIFIER \*\* Delete finish types not required on this project.

* + 1. Aluminum:
			1. Finish designations prefixed by AA comply with system established by Aluminum Association for designating aluminum finishes.
			2. Aluminum Pipe Finish: Anodize to AA-M10C22A41 (Architectural class, .7 mil thickness or greater) unless indicated otherwise.
		2. Steel:
			1. Primer: E-coat, electrostatically-applied.
			2. Finish: Powdercoat. Color as selected by Architect from manufacturer's selection.
		3. Stainless Steel

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

* + - 1. #4 Satin Polish - standard.
			2. #8 Mirror Polish - optional.
1. EXECUTION
	1. EXAMINATION
		1. Examine plaster and gypsum board assemblies, 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.
		2. Do not begin installation until substrates have been properly prepared.
		3. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
	2. PREPARATION
		1. Clean surfaces thoroughly prior to installation.
		2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
	3. INSTALLATION
		1. Fit exposed connections together to form tight, hairline joints.
			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. Set posts plumb within a tolerance of 1/16 inch in 3 feet (1.6 mm in 1 m).
			3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.6 m).
		2. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.
		3. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2 inch (38 mm) clearance from inside face of handrail and finished wall surface.
		4. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.
		5. Once installed, all handrails must be in compliance with the requirements of applicable federal, state and local building codes.
	4. CLEANING AND PROTECTION
		1. Protect installed products until completion of project.
		2. Remove all stains, dirt, grease, or other substances by washing all railings thoroughly using clean water and soap; rinse with clean water.
		3. Do not use acid solutions, steel wool, and other harsh abrasives.
		4. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION