SECTION 05 73 13 - GLAZED DECORATIVE METAL RAILINGS, GUARDS, AND PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the Work of this Section in accordance with requirements of the Contract Documents.

B. This Section includes:

1. Interior glazed metal shoe and top channel railings/guards **RLG-02** with **GL-22**
2. Glazed metal posts partial height partition **RLG-05** with **GL-22**

C. Related Requirements:

1. Division 05, Section 05 12 00 "Structural Steel Framing" for structural steel supports
2. Division 05, Section 05 51 13 "Metal Pan Stairs" for commercial metal stairs to receive railings in this Section.
3. Division 09, Sections 09 21 00 "Gypsum Board Assemblies" for metal backing for anchoring railings.

1.2 COORDINATION AND SCHEDULING

A. Do not install enclosing or concealing construction until after welds have been inspected, and tested and corrections have been made to defective applications.

B. Coordinate installation of anchorages for work of this section. 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 items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not suit structural performance requirements.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Glass products.
2. Sealant and accessories for structural glass railings.
3. Fasteners.
4. Bituminous paint.
5. Nonshrink, nonmetallic grout.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details. Provide dimensioned drawings of assemblies, indicating hardware locations, transitions, and terminations to adjacent railings.
2. Include details of provisions for assembly expansion and contraction.
3. Indicate glass panel fabrication plans and elevations with dimensions, holes and finishes.

C. Samples for Verification:

1. Submit samples for each type of exposed finish required.
2. Sections of each distinctly different linear metal member, including top u-channels base shoe and, posts.
3. Base channel.
4. Each type of glass and glass edge required.
5. Fittings and brackets.
6. Finishes.

D. Fabrication Engineering and Design: For installed products indicated to comply with performance requirements and criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization – Sourcing of Raw Materials:

a. Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.

b. Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.

1) Include statement indicating costs for each product having recycled content.

c. Regional Materials: For products that are required to comply with requirements for regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.

2. Indoor Environmental Quality, Low Emitting Materials: Building Products must be tested and compliant with the California Department of Public-Health (CDPH) Standard Method V1.1-2010 or v1.2 2017, using the applicable exposure scenario.

a. For paints, and coatings, wet applied, include printed statement of VOC content, showing compliance with the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure for Architectural Coatings or the South Coast Air Quality Management District (SCAQMD) Rule 1113-2011.

b. Adhesives and Sealants: For wet applied on-site products, submit printed statement showing compliance with the applicable chemical content requirements of SCAQMD Rule 1168, effective July 1, 2005, and rule amendment date of January 7, 2005.

1.4 INFORMATIONAL SUBMITTALS

A. Fabrication Engineering and Design: For installed products indicated to comply with performance requirements and criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Mill Certificates: Signed by manufacturers of stainless steel products, certifying that products furnished comply with requirements.

C. Welding Certificates and Procedures: Submit for record written data on the materials, welding procedures and qualifications of welders in accordance with requirements of AWS D1.1 and the Building Code. For stainless steel welds or bimetallic welds between stainless and carbon

steels, submit for review welding procedures and processes per AWS D1.6 requirements. Submit all welding and qualification procedures to the Special Inspection Agency for approval before submitting to the Design Professionals.

D. Shop and field quality-control reports and inspection reports.

E. Evaluation Reports: From ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1. For glazed decorative metal railings and guards.
2. For post-installed anchors.

F. Sustainable Design Submittals:

1. Building Product Disclosure and Optimization - Environmental Product Declarations

a. Submit product specific type III EPDs or Industry wide (generic) EPDs, USGBC approved program declaration or products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Building Product Disclosure and Optimization - Material Ingredients

a. Material Ingredient Reporting: Submit documentation confirming chemical inventory of products to at least 0.1 % (1000pm) with at least one of the following:

1) Submit published manufacturer inventory of ingredients identified by name and Chemical Abstract Service Registration Number (CASRN)
2) Submit documentation that product has been certified as Cradle-to-Cradle v3 at the Bronze Level or better
3) Submit Declare product label indicating that all ingredients have been disclosed down to 1000 ppm or designated as Red List Free or Declared
4) Living Product Challenge
5) Product Lens Certification
6) USGBC approved program.

b. Material Ingredient Optimization: Submit documentation confirming chemical inventory of products to at least 0.01 % (100pm) and/or that has a compliant material ingredient optimization report with at least one of the following:

1) Submit GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.
2) Submit third-party verified documentation that product has been certified as Cradle-to-Cradle v3 at the Bronze Level or better
3) Submit third-party verified Cradle to Cradle v3 Material Health certificate at the Bronze Level or better
4) Submit third-party verified Declare product label indicating that all ingredients have been disclosed down to 100 ppm
5) Submit third-party verified documentation that product is Living Product Challenge certified with a Red List Free or LBC Red List Free Declare label.
6) Submit documentation that product has a manufacturer prepared action plan with material inventory to at least 1000 ppm.

1.5 QUALITY ASSURANCE

A. Professional Engineer, Qualifications: A professional engineer who is li licensed to practice in the jurisdiction where project is located who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of

glazed decorative metal railings that are similar to those indicated for this Project in material, design and extent.

B. Welding Qualifications: Qualify the welding procedures and personnel including shop welders, field welders, welding operators and tackers for the following periods of effectiveness according to the following:

1. Welding Reference Standards:

a. AWS D1.1, "Structural Welding Code--Steel."

b. AWS D1.2, "Structural Welding Code - Aluminum."

c. AWS D1.6, "Structural Welding Code - Stainless Steel."

2. Certification and qualification, including period of effectiveness of welding personnel shall be as specified by AWS D1.1. Certification shall remain in effect for duration of work provided welders are continuously engaged in performing the type of welding for which they are certified, unless welders fail to perform acceptable welding, as determined by the Independent Special Inspection Agency. Certification and re-certification of welding personnel is subject to verification by the Testing Agency. Re-testing for re-certification will be the Subcontractor's responsibility.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups for each form and finish of structural glass railing consisting of top rail, structural glass, base channel, and anchorage system components that are full height and are not less than 24 inches (600 mm) in length.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer’s written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLAZED DECORATIVE METAL RAILINGS

A. Source Limitations for Laminated Glass: Obtain from single source from single manufacturer.

B. Source Limitations for Decorative Metal Railing Components: Obtain from single source from single manufacturer for each component and installation method.

C. Product Options: Information on Drawings and in the Specifications establishes requirements for railing system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

2.2 PERFORMANCE REQUIREMENTS

A. Fabrication Engineering and Design: Engage a qualified professional engineer, licensed to practice in the State of the Project to engineer glazed decorative metal railings, including attachment to building construction.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Aluminum: The lesser of minimum yield strength divided by 1.65, or minimum ultimate tensile strength divided by 1.95.
2. Stainless Steel: 60 percent of minimum yield strength.
3. Steel: 72 percent of minimum yield strength.
4. Glass: 25 percent of mean modulus of rupture (50 percent probability of breakage), as listed in "Mechanical Properties" in AAMA CW-12, "Structural Properties of Glass."

C. Structural Performance: Railings, Guards, and Partitions, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Top Rails of Guards:
    a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
    b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
    c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Structural Glass Railings, Guards:
    a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
    b. Infill load and other loads need not be assumed to act concurrently.
    c. Support each section of top rail by a minimum of three glass panels or by other means so railings will remain in place if any one glass panel fails.
        1) Support top rail ends such that railings remains in place if end glass panel fails.
3. Structural Glass Partial Height Partitions:
    a. Lateral loading: Provide partial height partition assemblies engineered to resist guard loads.
    b. Deflection Normal to Glazing Plane: Limited to 1/175 of clear span or 3/4 inch whichever is smaller.

c. Glass thicknesses specified are minimum estimates used for detailing purposes only.

1) Confirm glass thicknesses by analyzing Project loads and in-service conditions.
2) Provide glazing materials, complying with ASTM E1300, in the nominal thicknesses indicated for each opening size, but not less than the thicknesses and strength required to meet or to exceed the specified performance requirements.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

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

F. Low-Emitting Materials:

1. Architectural paints and coatings wet-applied inside the weather-proofing system must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
2. All paints and coatings wet-applied inside the weather-proofing system must have VOC content in compliance with the applicable VOC limits (g/L) found in tables in Division 01, Section 01 81 13 "Sustainable Design Requirements - LEED v4 BD+C."
3. Adhesives and Sealants wet-applied inside the weather-proofing system must meet the VOC general emissions testing criteria of CDPH Standard Method v1.2.
4. All adhesives and sealants wet-applied inside the weather-proofing system must have VOC content in compliance with the applicable VOC limits (g/L) found in tables in Division 01, Section 01 81 13.14 "Sustainable Design Requirements - LEED v4 BD+C."

2.3 MANUFACTURERS

A. Glazed Metal Posts Partial Height Partition: CRL Metropolis Post Windscreen System by C.R. Laurence Co., Inc.

2.4 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

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

2.5 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.

B. Extruded Bars and Shapes: ASTM B221 (ASTM B221M), Alloy 6063-T5/T52.

2.6 STAINLESS STEEL

A. Tubing: ASTM A554, Grade MT 304.

B. Sheet, Strip, Plate, and Flat Bar: ASTM A666 or ASTM A240/A240M, Type 304.

C. Bars and Shapes: ASTM A276, Type 304.

2.7 STEEL AND IRON

A. Bars: Hot-rolled, carbon steel complying with ASTM A29/A29M, Grade 1010.

2.8 GLASS AND GLAZING PRODUCTS, GENERAL

A. Glazing Publications: Comply with written instructions of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. NGA/GANA Publications: "GANA Laminated Glazing Reference Manual" and "GANA Glazing Manual."

B. Sealant and Accessories for Structural Glass Railings: Sealant, gaskets, setting blocks, shims, and related accessories as recommended or supplied by railing manufacturer for installing structural glazing in metal base channels.

2.9 GLASS

A. Laminated Glass **GL-22**: ASTM C1172, Type II with two plies of glass bonded together by an interlayer.

1. Construction: Laminate glass with ionoplast polymer interlayer to comply with interlayer manufacturer's written instructions.
2. Interlayer Thickness: 0.090 inch (2.29 mm).
3. Kind: LT (laminated tempered).
4. Glass Color: clear.
5. Interlayer Color: Clear.
6. Glass Plies for Structural Glass Balusters: Thickness required by structural loads, but not less than 6.0 mm thick each.

2.10 FASTENERS

A. Fastener Materials: Use fasteners of same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined. Unless otherwise indicated, provide the following:

1. Aluminum Components: Type 304 stainless steel fasteners.
2. Stainless Steel Components: Type 304 stainless steel fasteners.
3. Dissimilar Metals: Type 304 stainless steel fasteners.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated].

C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless exposed fasteners are unavoidable.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/ASTM F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.11 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Brackets: Stainless steel**.**

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M, type I or II.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.12 FABRICATION OF METAL

A. General: Fabricate metal components to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble metal components in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

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

F. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.

4. At exposed connections, finish exposed welds to comply with NAAMM's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.

G. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

H. Form changes in direction as detailed by bending to smallest radius that will not result in distortion of metal member.

I. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

J. Close exposed ends of hollow railing, guards, or partition members with prefabricated end fittings.

K. Close ends of channels, unless clearance between end of channel and wall is 1/4 inch or less.

L. Brackets, Flanges, Fittings, and Anchors: Provide brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work where indicated.

1. At brackets and fittings fastened to gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.13 FABRICATION OF GLASS PANELS

A. General: Fabricate glass to sizes and shapes required; provide for proper edge clearance and bite on glazing panels.

B. Structural Glass Panel; Exposed to View Edges:

1. Edge Finish: Grind smooth and flat polish exposed edges of glass, including those at open joints, to produce smooth, square edges with glass edge finishes. Edges of glass indicated to be exposed in the finish work, shall be in full alignments, with zero mismatch.
2. Fabricate structural glass panels to maintain equal length glass widths and uniform spacing between glass panels to the acceptance of the Architect.

2.14 METAL FINISH REQUIREMENTS, GENERAL

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

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

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

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.15 ALUMINUM FINISHES

A. Mill finished with aluminum surfaces concealed from view or clad with stainless steel finishes where exposed to view.

2.16 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. 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. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

C. Stainless Steel Tubing Finishes:

1. 180-Grit Polished Finish: Uniform, directionally textured finish.

D. Stainless Steel Sheet, Strip, Plate, and Bar Finishes:

1. Directional Satin Finish: ASTM A480/A480M, No. 4.

2.1 SOURCE QUALITY CONTROL

A. Pending receipt of welding procedures in Paragraph "Information Submittals", provide periodic shop inspection including but not limited to alignment and straightness of members, preparation for connections, dimensional checks, witnessing of welding procedures, examination and testing of completed welds, cleaning, painting and storage of material. All shop fabrication shall be inspected in the shop.

1. Welding:

a. Full penetration welds: Test all full penetration welds for soundness by means of either radiographic or ultrasonic testing in accordance with AWS D1.1 and ASTM E164 procedures. Repair all flaws in plate or flange material revealed during such tests.

b. Partial penetration welds: Test all partial penetration welds for soundness by means of visual and magnetic particle inspection, unless other methods are specified in the Contract Documents. Repair all flaws in plate or flange material revealed during such tests.

c. Fillet welds: Visually inspect all fillet welds by AWS certified welding inspector. In addition, test ten percent (10%) of all fillet welds using a non-destructive method, such as dye penetrant or magnetic particle. Select test locations randomly

throughout the structure, but test at least one weld in each location with 6 or more welds per connection. If, in the opinion of the independent Inspector this testing discloses a large ratio (10% or more) of unacceptable welds, the required percentage of tested welds may be increased to 100%, all at the contractor's expense. All defects found visually in fillet welds shall be non-destructively tested by magnetic particle or dye-penetrant methods

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

A. Comply with Drawings and manufacturer's written instructions for installing glazed decorative metal, accessories, and other components.

B. Perform cutting, drilling, and fitting required for installing metal.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
4. Do not weld, cut, or abrade surfaces of metal 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.
5. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
6. 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 (5 mm in 3 m).

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

1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with bituminous paint.

D. Adjust metal components before anchoring to ensure matching alignment at abutting joints.

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

3.3 METAL RAILING CONNECTIONS

A. Nonwelded Connections:

1. Use mechanical or adhesive joints for permanently connecting metal components.
2. Use wood blocks and padding to prevent damage to metal members and fittings.
3. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of exposed metal.

B. Expansion Joints: Install expansion joints at locations indicated, but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 INSTALLATION OF GLASS BALUSTERS AND GLASS PARTITIONS

A. Structural Glass Balusters and Partitions:

1. Install assembly to comply with product manufacturer's written instructions.
2. Attach base channel to building structure, then insert and connect factory-fabricated and -assembled glass balusters.
3. For field-assembled balusters, attach base channel to building structure, insert glass in base channel, and bond with sealant.
    a. Support glass panels in base channel at quarter points with channel-shaped setting blocks that also act as shims to maintain uniform space for glazing cement.
    b. Fill remaining space in base channel with sealant for uniform support of glass.
4. Adjust spacing of glass panels so gaps between panels are equal before securing in position.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made by Owner.

1. Inspection Agency: Engage a qualified independent inspection and testing agency to perform shop and on-site tests and inspections according to requirements of the Building Code Special Inspection requirements.
2. Inspect the structural steel fabrication, welding, bolting and erection as Work progresses, in accordance with, but not limited to the Building Code Special Inspection requirements. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Design Professional for final acceptance.
    a. Field inspection of steel shall include connections, levelness, plumbness and alignment of the stair and railing systems in conformance with AWS welding methods, examination of surface before welding, examination and testing of completed welds.
    b. Where testing is required for less than 100% of locations, select test locations at random and throughout the project.
3. If testing finds welds are not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.
4. Welds will be considered defective if they do not pass tests and inspections.
    a. Remove and replace welds that does not pass tests and inspections, and retest.
    b. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

B. Remove and replace railings, guards where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and comply with specified requirements.

C. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports

3.6 CLEANING

A. Clean finished metal surfaces by washing thoroughly with water and soap, rinsing with clean water, and wiping dry.

B. Clean and polish glass as recommended in writing by manufacturer. Wash both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion.

3.7 PROTECTION

A. Protect finishes of exposed metal from damage during construction period with temporary protective coverings approved by product manufacturer. Remove protective coverings at time of Substantial Completion.

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

END OF SECTION