SECTION 05510

MONUMENTAL STAIR

PART 1 - GENERAL

1.1 SUMMARY

A. Description: This Section, includes the following:

1. Straight run, stainless steel framed stair, with field-placed stone treads.
2. Tempered glass guardrail system attached to stainless steel stair stringers.
3. Tempered glass guardrail system at second floor connected to stair.
4. Stainless steel handrails attached to tempered glass guardrails.

B. Related Sections:

1. Division 5 Section “Metal Fabrications” includes ship ladders and other steel tread stairs.
2. Division 5 Section “Pipe and Tube Railings” includes pipe handrails and railing systems, not attached to metal stairs or to walls adjacent to metal stairs.
3. Section 09385 - Dimension Stone Tiles

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer, fabricate, and install steel stairs to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of steel stairs.

1. Treads of Stair: Capable of withstanding a uniform load of 100 lbf. per sq. ft. (4.8 kN/sq. m) or a concentrated load of 300 lbf. (1.35 kN) on an area of 4 sq. inches (26 sq. cm) located in the center of the tread, whichever produces the greater stress.
2. Landings of Stair: Capable of withstanding a uniform load of 100 lbf. per sq. ft. (4.8 kN/sq. m).
3. Stair Framing: Capable of withstanding stresses resulting from loads specified above as well as stresses resulting from railing system loads.

B. Structural Performance of Handrails and Railing Systems: Engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each of the respective components of each metal fabrication.

1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:
   a. Concentrated load of 200 lbf. (890 N) applied at any point and in any direction.
   b. Uniform load of 50 lbf. per linear foot (730 N/m) applied horizontally and concurrently with uniform load of 100 lbf. per linear foot (1460 N/m) applied vertically downward.
   c. Concentrated and uniform loads above need not to be assumed to act concurrently.
2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:

a. Concentrated load of 200 lbf. (890 N) applied at any point and in any direction.
b. Uniform load of 50 lbf. per linear foot (730 N/m) applied in any direction.
c. Concentrated and uniform loads above need not to be assumed to act concurrently.

3. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lbf. (890 N) applied to one sq. ft. (0.09 sq. m) at any point in the system including panels, intermediate rails, balusters, or other elements composing the infill area.
   a. Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress on guard.

C. Test Reports: For record purposes, provide certified test results from a recognized testing laboratory or agency indicating performance of proposed handrail and railing systems when tested for conformance with specified performance requirements.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Section 01300.

B. Product Data: Manufacturer's product specifications for metal stairs, handrails, guardrails, nonslip aggregates and nonslip aggregate surface finishes, paint products, and grout.

C. Shop Drawings: Dimensioned, detailed drawings detailing fabrication and installation of steel stairs, handrails and guardrails. Include plans, elevations, sections, and details of steel stairs, rails, and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

1. For steel stairs, handrails and guardrails, include structural analysis date sealed and signed by the qualified professional engineer who was responsible for their preparation.

1.4 QUALITY ASSURANCE

A. Workmanship: Quality of workmanship expected for each fabrication shall be Class 1 (Architectural Metals), NAAMM AMP 555-92, as follows:

1. Class 1 (Architectural Metals):
   a. Exposed surfaces are finished smooth with pits, mill marks, nicks and scratches filled or ground off. Defects should not show when painted or polished.
   b. Welds should be concealed where possible. Exposed welds are ground to small radius with uniform sized cove unless otherwise noted.
   c. Distortions should not be visible to the eye.
   d. Exposed joints are fitted to a hairline finish.

B. Fabricator Qualifications: Firm experienced in producing steel stairs and rails similar to those indicated for this Project with a record of successful in-service performance and with sufficient production capacity to produce required units without delaying the Work.

C. Engineer Qualifications: A professional engineer legally authorized to practice in Louisiana and experienced in providing engineering services that have resulted in the installation of metal stairs (including handrails and railing systems) similar to this Project and that have a record of successful in-service performance.

D. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

E. Mock-Ups: Before installing monumental stair and glass railing system, build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Obtain Architect's approval of mockups before starting fabrication.
4. In presence of Architect, damage part of an exposed face for each finish, color, and texture, and demonstrate materials and techniques proposed for repairs to match adjacent undamaged surfaces.
5. Approval of mockups is also for other material and construction qualities.
6. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
7. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed Work.

1.5 PROJECT 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.

1.6 COORDINATION AND SCHEDULING

A. 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: Couturier Iron Craft, Inc., 5050 West River Drive, P. O. Box 308, Comstock Park, MI 49321-0308. ASD. Toll Free Tel: (800) 670-6123. Tel: (616) 784-6780. Fax: (616)784-5077. Web: www.couturierironcraft.com.

B. The following manufacturers are approved provided they can provide stair as drawn and specified:

1. Manufab, Inc., Kenner, LA 70062; (504) 466-2368.
2. Big D Metalworks, Dallas, TX 75212; (800) 299-9767.

C. Other Manufacturer: Products of other manufacturers require pre-bid approval in accordance with the Instructions to Bidders.

2.2 STAINLESS STEEL

A. Metal Surfaces, General: For surfaces exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, roughness, or, for steel sheet, variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

B. Tubing: ASTM A 554, Grade MT 304.

C. Pipe: ASTM A 312/A 312M, Grade TP 304.

D. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.

E. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.

F. Bars and Shapes: ASTM A 276, Type 304.

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

2.3 STAINLESS STEEL FINISHES

A. General:

1. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
   a. All exposed work shall be Class 1 (Architectural Metals)
2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering prior to shipment.
3. Remove or blend tool and die marks and stretch lines into finish.
4. Grind and polish surfaces to produce uniform directional, textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

B. Exposed Surfaces: Provide the following finish for all exposed surfaces.

1. Bright, Directional Polish: Match AISI No. 4 finish.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.4 RELATED MATERIALS

A. Bolts and Nuts: Type 304 stainless steel, with hex nuts, and, where indicated, flat washers.

B. Plain Washers: Round, Type 304 stainless steel.

C. Lock Washers: Helical, spring type, Type 304 stainless steel.

D. Expansion Anchors: Anchor bolt and sleeve assemblies of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2.5 GROUT

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

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. B-6 Construction Grout; W. R. Bonsal Co.
2. Euco N-S Grout; Euclid Chemical Co.
3. Five Star Grout; Five Star Products.
4. Crystex; L & M Construction Chemicals, Inc.
5. Masterflow 928 and 713; Master Builders Technologies, Inc.
6. Sikagrout 212; Sika Corporation.
7. Sonogrout 14; Sonneborn Building Products – ChemRex, Inc.

2.6 GLASS PRODUCTS AND GLAZING MATERIALS

A. Safety Glass Standard: Shall meet current requirements of ASTM C 1172 "Standard Specification for Laminated Architectural Flat Glass"; and for safety glazing applications, comply with the Consumers Product Safety Commission 16 CFR 1201 and Safety Glass Requirements of ANSI I97.1.

B. Laminated Safety Glass (Landings and Treads): Provide 2 thick frosted laminated safety glass (traffic bearing) as indicated on drawings and conforming to performance requirements specified.

1. Sup Resistance of treads and landings shall conform to ASTM F 1637, standard practice for safe walking surfaces.
2. Structural silicone sealant for setting of landings and treads shall be "Dow Corning 995 Silicone Structural Sealant" or an approved equal; color as selected by Architect.
3. Acceptable manufacturers; subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
   a. Circle Redmont, Melbourne, FL 32940; telephone (800) 358-3888.
   b. Guardian Industries, Corsicana, TX 75110; telephone (800) 527-2511.
   c. Vision Products, Houston, TX 77661; telephone (800) 515-2197.
4. Other Manufacturers: Products of other manufacturers require pre-bid approval in accordance with the Instructions to Bidders.

C. Tempered Glass (Guardrails): Provide fully tempered safety glass complying with ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent glass, flat), Quality q^3 (glazing sealant), class, thickness and manufacturing process as indicated below:

1. Clear Glass: Class 1 (clear).
2. Nominal Thickness: 1/2" (minimum).
3. Manufacturing Process: Manufacturer fully tempered GL by horizontal (roller hearth) process with roll wave distortion parallel with bottom edge of glass as installed, unless otherwise indicated.
4. Guardrails shall comply with performance requirements specified.
5. Acceptable Manufacturers: Subject to requirements manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

a. Bumcraft of Pittsburgh.
b. Clearail, Inc.
c. Livers Bronze Co., Inc.

6. Other Manufacturers: Products of other require pre-bid approval in accordance with the Instructions to Bidders.
7. Related Accessories and Materials: Provide accessories or materials recommended or supplied by railing manufacturer for the installation of guardrails and handrails as indicated on drawings and below.
   a. Handrails: 1.50" o.d. stainless steel pipe, Type 304, No. 4 satin finish, curved to radii, as manufactured by Acceptable manufacturers above or an approved equal.
   b. Handrail Brackets: Stainless steel glass mount bracket #993-2 with adapter kit including (2) gaskets, nylon bushing, backing disk and machine bolt as manufactured by J. G. Braun Company or an approved equal.
   c. Glass Mount: Stainless steel glass mount including (2) disks, (2) gaskets, nylon bushing and machine bolt as indicated. Disks diameter to match handrail bracket disk.

2.7 FABRICATION REQUIREMENTS

A. General: Form steel stairs handrails, and guardrails from materials of size, thickness, and shapes indicated, but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Shear and punch metals cleanly and accurately.

B. Exposed Work:

1. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
2. Remove sharp or rough areas on exposed surfaces.
3. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
4. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

C. Welding: Weld corners and seams continuously to comply with the following:

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 welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and welded surface matches contours of adjoining surfaces.

D. Shop Assembly: Preassemble in shop to greatest extent possible to minimize field splicing and assembly. Use connections that maintain structural value of joined pieces. Clearly mark units for field assembly and coordinated installation.

2.8 STEEL-FRAMED STAIRS

A. General: Construct stairs to conform to sizes and arrangements indicated. Join by welding, unless otherwise indicated. Provide complete stair assemblies, including metal framing, hangers, columns, handrails, railing systems, struts, clips, brackets, bearing plates, or other components necessary for the support of stairs and platforms, and as required to anchor the stairs on the supporting structure.

B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM "Metal Stair Manual" for Architectural class, except where more stringent requirements are indicated.

C. Stair Framing: Fabricate stringers of structural stainless steel tubes, plates, or a combination thereof, as indicated. Provide closures for exposed ends of stringers. Construct platforms of framed stainless steel headers and miscellaneous framing members as indicated. Bolt or weld headers and framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finish surfaces.

D. Metal Formed Risers: Shape metal for risers to conform to configuration shown. Provide thickness of structural steel sheet for metal indicated, but not less than that required, to support total design loading.

1. Form metal risers of stainless steel as indicated.
2. Attach risers by direct welding to stringers.
3. Provide subplatforms of framing and construction indicated, of same metal as risers, in thicknesses required to support design loading. Attach subplatform framing to stringer framing members by direct welding.

2.9 HANDRAILS AND RAILING SYSTEMS

A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness, post spacings, and anchorage, but not less than that required to support structural loads.

1. Provide outside diameter members for handrails as indicated.

B. Joints: Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

1. At tee and cross intersections, cope ends of intersecting members to fit contour of pipe to which end is joined, and weld all around.

C. Radius Bends: Form changes in direction of handrails and rails by bending in jigs to produce uniform curvature; maintain cylindrical cross section throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces.

D. Wall Returns: Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

E. Exposed Ends: Close exposed ends of members by welding 3/16-inch- (4.8-mm.-) thick steel plate in place or with prefabricated fittings, except where clearance to adjoining wall surface is ¼ inch (6 mm.) or less.

F. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of handrails and railing systems to other work. Furnish inserts and other anchorage devices for connecting handrails and railing systems to concrete or masonry work.

1. For stainless steel handrails and glass railing systems, provide stainless steel fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in interior concrete construction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Coordination: Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, weld plates, and anchor bolts. Coordinate delivery of such items to Project site.

B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing steel stairs, handrails, and guardrails to in-place construction; include threaded fasteners for concrete and masonry inserts, through-bolts, and other connectors as required.

C. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing steel stairs, handrails, and guardrails. Set units accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

1. Install steel stairs by welding stair framing to steel structure or to weld plates cast into concrete, except where otherwise indicated.
2. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
3. Fit exposed connections accurately to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted field connections.

D. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercoat or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

E. Grouted Base Plates:

1. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base plates.
2. Set steel stair base plates on wedges or other adjustable devices. After the stairs have been positioned and aligned, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
3. Use nonmetallic, nonshrink grout, unless otherwise indicated.
4. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

F. Tread and Platform: Provide non-slip laminated glass treads and platforms set in structural sealant as indicated and specified.

3.2 INSTALLING RAILINGS AND HANDRAILS

A. General: Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space glass mounts at spacing indicated or, if not indicated, as required by design loadings. Provide railings in each direction. Secure railing ends to building construction as follows:

1. Anchor glass railing to steel stringers as indicated.
2. Anchor handrail ends into concrete with round flanges welded to rail ends and anchored into wall or floor construction with drilled-in expansion anchors.

B. Wall Handrails: Secure handrails to glass railing with wall brackets and end fittings. Provide bracket with 1½-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:

1. Use type of bracket as specified anchorage to glass railing.

3.3 ADJUSTING AND CLEANING

A. Touchup: Immediately after erection, clean field welds, bolted connections, and abraded areas of stainless steel; grind and polish to match stainless finish.

B. Completion:

1. Completed stair work including handrails and guardrails, shall be securely anchored, free from rattles and excessive vibration during use. Items shall be plumb, level, straight and properly aligned. Exposed grouting shall be neat, uniform, and without holes and gaps.
2. Joints shall be snug-fitting and uniform; exposed welds shall be ground smooth and touched-up, and free of crevices, spatter and flux. Bolts, screws, nuts and other threaded fasteners shall occur only where permitted, and shall be drawn up tightly but not over-tightened; exposed heads and nuts shall be undamaged.
3. Remove, adjust and re-install, or remove and replace with new material, items which are not in compliance due to improper installation and materials, and items which are defective and damaged.
4. Clean finished surfaces which are soiled and marked by metal work installation. Remove and replace other materials which cannot be cleaned and those which are damaged by metal work installation.

END OF SECTION