SECTION 05 5150

MONUMENTAL STAIR

PART 1 GENERAL

1.1 SUMMARY

A. Work of this Section includes custom-fabricated monumental stairs as indicated on Drawings, including woven mesh panel railings.

B. Related Documents and Sections: Examine Contract Documents for requirements that directly affect or are affected by Work of this Section. Other Documents and Sections that directly relate to work of this Section include, but are not limited to:

1. General provisions of the Contract, including General and Supplementary Conditions, and Division 01 General Requirements Specification Sections.
2. Section 03 3000 - CAST-IN-PLACE CONCRETE.
3. Section 09 2116 - GYPSUM BOARD ASSEMBLIES.

1.2 SUBMITTALS

A. Action Submittals:

1. Range Samples: Architect shall visit fabricator's shop and select mill finish steel for use on the stairs. Fabricator shall use steel color as selected by the Architect for complete fabrication.
2. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.
3. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of the work. Provide plans, elevations, details of anchorages, connections and accessory items. Provide installation templates for Work installed by others. Show all interfaces and relationships to Work of other trades.
    a. Include locations of exposed connections requiring mechanical fasteners for Architect’s review.
4. Field Measurements: Take all necessary field measurements before preparation of shop drawings and fabrication. Do not delay progress of the job. If field measurements are not possible prior to fabrication, allow for field cutting and fitting.
5. Calculations: Provide professionally prepared calculations and certification of the performance of this work. Indicate how design requirements for loading and other performance criteria have been satisfied.

B. Informational Submittals:

1. Welding Certificates: Signed by Contractor certifying that welders comply with requirements specified herein.

1.3 QUALITY ASSURANCE

A. Welding Standards: Comply with applicable provisions of AWS D1.1, "Structural Welding Code - Steel."

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

B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

1. Preassembled Stairs: Commercial class.

C. Mockup: Furnish an in-situ mock-up of monumental stair construction including four stair treads and handrails as indicated on Drawings and as directed by Architect. Mockup shall demonstrate quality of welds, interface details, method of inserting railing into stringer, method of attachment of treads to stringers, and all other visual characteristics required by the Architect.

1. Coordinate with related Sections.

1.4 COORDINATION

A. Coordinate installation of anchorages for monumental stairs. Furnish setting drawings, templates, and directions for installing anchorages, including concrete inserts, weld plates, and anchor bolts, that are to be embedded in concrete or masonry construction. Deliver such items to Project site in time for installation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Uniform Load: 100 lbf/sq. ft.
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
3. Imposed loads: Stairs, intermediate stair landings, stair transfers shall be designed to accommodate pipe loads from the standpipe/sprinkler system
4. Uniform and concentrated loads need not be assumed to act concurrently.
5. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to fire standpipes and related piping attached to stairs, and loads specified above.
6. Limit deflection of treads, platforms, and framing members to the following:
    a. Stairs with gypsum board soffits: L/360 or 1/4 inch, whichever is less.
    b. Other stairs: L/240 or 1/4 inch, whichever is less.

B. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Handrails and Top Rails of Guards:
    a. Uniform load of 50 lbf/ ft. applied in any direction.
    b. Concentrated load of 200 lbf applied in any direction.
    c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Infill of Guards:
    a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
    b. Infill load and other loads need not be assumed to act concurrently.

C. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7-10, “Minimum Design Loads for Buildings and Other Structures”: Section11, "Seismic Design Criteria," and the building code.

2.2 MATERIALS, GENERAL

A. Metals: For exposed surfaces, 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, or roughness.

B. Fasteners: For connecting stair components and for anchoring stairs to other construction, select fasteners of the type, grade, and class required to produce connections capable of withstanding design loadings.

1. For steel and cast iron, use plated fasteners complying with ASTM B633, Class Fe/Zn 25 for electrodeposited zinc coating.

C. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure; complying with performance requirements of FS TT-P-664.

D. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

E. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

F. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

G. Architectural Woven Metal Mesh: Provide flat panels for all applications. Rolled panels are not acceptable.

1. Acceptable Manufacturer: Banker Wire (C.I. Banker Wire + Iron Works, Inc.), Mukwonago, WI.
2. Architectural Mesh Pattern: As selected by the Architect.
   a. Material: Steel.
   b. Overall Thickness 0.126

2.3 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

B. Interlocking, low-profile, counter-sunk, sex bolts and barrel nuts with socket hex drive, ASTM A 307, Grade A.

C. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

D. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
3. Provide tamper-resistant square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.

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.

2.4 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, steel plate stringers, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs and railings in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

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

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections 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. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes okay.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use flat-head (countersunk) hex screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.5 STEEL-FRAMED STAIRS

A. Metal Stairs, General: Form stairs to configurations shown from steel plate of thickness needed to comply with performance requirements but not less than shown on the Drawings.

1. Fabricate stringers of structural steel plates with clips for mounting treads.
2. Treads, Risers and Cladding: Provide precast terrazzo treads, perforated metal risers and metal cladding as indicated on the Drawings.
   a. Refer to Section 09 6600 for terrazzo treads.

2.6 STEEL AND IRON FINISHES

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

B. Stairs and railings shall be fabricated and finished to AESS 4 standards, meeting tolerances and

fabrication requirements as specified in ANSI/AISC 303, Section 10, Table 10.1: AESS Category Matrix.

C. Blackened Steel: Permanent, chemically oxidized and sealed blackened finish matching Architect's reference sample, suitable to base metal and exposure conditions indicated. Blackening includes metal preparation, chemical oxidizing, and sealing.

1. Preparation: Prepare and clean metal according to blackening agent manufacturer's written recommendations and consistent with appearance of accepted samples and mockups.
2. Blackening: Use chemical blackening agents capable of matching architect's reference sample and recommended by manufacturer for applications and exposures indicated. Perform blackening according to manufacturer's written recommendations.
3. Sealing: Seal as soon as possible after blackening. Clean blackened surface. Wipe surface with seal coat manufacturer's recommended solvent just prior to sealing.
    a. Sealer: As standard with fabricator.
    b. Apply additional coats as recommended by seal coat manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing monumental stairs to in-place construction; include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Do not cut, alter or drill stair components in the field that do not fit properly. Return components that do not fit to the manufacturer for adjustment.

C. Install monumental stairs accurately in location, alignment, and elevation; level and plumb; and according to manufacturer's written instructions.

D. Install monumental stairs by welding to steel structure or to weld plates cast into concrete, unless otherwise indicated.

E. 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 undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
5. Upon completion, where stair structural members are exposed and finished, no evidence of welded connections shall be visible.

3.2 CLEANING AND PROTECTING

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

B. Protect finished tread surfaces during construction by covering with 1/2 inch thick plywood secured with plastic strapping or another non-marring fastening method.

END OF SECTION

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