SECTION 05 50 00 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. Work included:

1. Aluminum stairs.
2. Alternating tread aluminum stairs.
3. Steel pipe supports.
4. Steel hoist systems.

B. Products furnished, but not installed, under this Section:

1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related work:

1. MASS Division 30 – Portland Concrete
2. Mass Division 80 Art. 4.2 Cast-in-Place Concrete for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
3. Section 09 90 00 – Painting and Coating

1.2 REFERENCES

A. NAAMM, STANDARD AMP 510-92 Metal Stairs Manual 5th Edition

B. Aluminum standards and data, latest Edition

1.3 SUBBMITTALS

A. Dimensional prints: shall be submitted for approval prior to fabrication.

1.4 PRODUCT DELIVERY STORAGE AND HANDLING

A. Deliver materials to the jobsite in good condition and properly protected against damage to finished surfaces.

B. Store material in a location and manner to avoid damage. Do not stack components. Lay out components on firm foundation material such that bending cannot occur.

C. Store metal components in a clean dry location, away from uncured concrete, cement, or masonry products, acids, oxidizers, rain water, or any other chemical or substance that might damage the material or finish.

D. Plan work and storage locations to keep on-site handling to a minimum.

E. Exercise particular care to avoid damage to material finishes or unprotected surfaces when handling.

1.5 JOB CONDITIONS

A. Verify that other trades with related work are complete before installing vault access door(s).

B. Mounting surfaces shall be straight and secure; substrates shall be of proper width.

C. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.

D. Observe all appropriate OSHA safety guidelines for this work.

1.6 WARRANTY/GUARANTEE

A. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of (25) twenty five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge. Electrical motors, special finishes, and other special equipment (if applicable) shall be warranted separately by the manufacturers of those products.

B. Manufacturer's Quality System: Registered to ISO 9001:2008 Quality Standards including in-house engineering for product design activities.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of stair, accessory, and product indicated.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.9 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.10 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers.

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanized or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Eyebolts: ASTM A 489.

G. Machine Screws: ASME B18.6.3.

H. Lag Screws: ASME B18.2.1.

I. Wood Screws: Flat head, ASME B18.6.1.

J. Plain Washers: Round, ASME B18.22.1.

K. Lock Washers: Helical, spring type, ASME B18.21.1.

L. Anchors, General: 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 E 488, conducted by a qualified independent testing agency.

M. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

2.3 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. 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.

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

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

E. 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 no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

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

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

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

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.4 ALUMINUM STAIRS

A. Fabricate and install aluminum stair assemblies in accordance with the requirements set forth in this subsection. Provide brackets and fittings for installation.

1. Manufacturer:

a. Lapeyre Stair, Inc., 5117 Toler St., Harahan, LA 70123; Phone: (800) 535-7631.

b. Substitutions will not be considered.

2. Performance requirements:

a. Meet all requirements of OSHA Standard 1910.24 Fixed Industrial Stairs.

b. Stair treads and stringers shall be designed for a uniform live load of 100 PSF and a concentrated vertical load of 300 pounds over 4 square inches.

c. Handrails shall be designed to resist a concentrated load of 200 pounds applied at any point and in any direction at the top of the rail.

d. Design of aluminum members shall conform to Aluminum Association Specifications and Guidelines for Aluminum Structures.

e. Provide letter of Design Certification signed and sealed by qualified professional engineer licensed by the State of Alaska and including:

1) Name and location of project.

2) Order Number.

3) Name of manufacturer.

4) Name of contractor.

5) Governing building code and year of edition.

6) Design Loads.

3. Dimensions

a. Dimensions shall be as shown on the Drawings.

b. Dimensional prints shall be submitted for approval prior to fabrication.

4. Materials

a. Stair treads, stringers, and risers: Aluminum Alloy 6061-T6 for primary structural components.

b. Stair treads: I Bar grating stair treads with corrugated aluminum nosing are safe, self-cleaning, and skid-resistant.

c. Handrails:

1) Designed for roof hatch application.

2) Aluminum Alloy 6061-T6 and 6063-T5

3) 1-1/2-inch x 1/8-inch Tube

5. Finish: Natural finish

6. Fabrication:

a. Aluminum welding in accordance with ANSI/AWS D1.2-97 GMAW process performed by experienced operators.

b. All exposed surfaces smooth and free of sharp or jagged edges.

2.5 ALTERNATING TREAD ALUMINUM STAIRS

A. Fabricate and install alternating tread aluminum stair assemblies in accordance with the requirements set forth in this subsection. Provide brackets and fittings for installation.

1. Manufacturer:

a. Lapeyre Stair, Inc., 5117 Toler St., Harahan, LA 70123; Phone: (800) 535-7631.

2. Performance requirements:

    a. Alternating tread stair treads: shall be capable of withstanding a single concentrated 1000 pound load without permanent deformation; or 100 pounds per square foot or 300 pounds on an area of 4 square inches without exceeding the allowable working stress of the material.

    b. Alternating tread stair guard and handrail: shall be capable of withstanding a single concentrated load of 200 pounds or a uniform load of 50 pounds per linear foot applied in any direction at any point on the rail without exceeding the allowable working stress of the material.

    c. Alternating tread stair stringers: shall be capable of withstanding a single concentrated load of 1000 pounds at any point on the stair without permanent deformation; or a uniform live loading of 100 pounds per square foot applied in a downward direction to all tread surfaces or a 300 pound load on an area of 4 square inches without exceeding the allowable working stress of the material.

3. Construction requirements:

    a. Cast aluminum treads, landings, and mounting base: shall be shielded metal arc welded to a single extruded box-like stringer.

    b. Tread castings: shall have integrally cast handrail support arms which are precision machined and welded to continuous aluminum handrails.

    c. Pedestrian surfaces: shall be cast with skid resistant surfaces and all treads shall have upturned integrally cast skid barriers.

    d. Riser spacing: shall be equally spaced to within 3/16" for adjacent and to within 3/8" for any two non-adjacent risers on a stair.

    e. Guards and handrails: shall be spaced for body guidance and underarm support, and shall have offset handrail supports for free sliding of the hands.

    f. Cast aluminum foot divider: shall be an integral part of the landing and shall form a support for a rubber bumper strip.

4. Dimensions:

    a. Alternating tread stair angle: 68 degrees from horizontal as specified in the drawings.

    b. Vertical drop: to be determined by Contractor.

5. Materials:

    a. Landings, treads, and foot castings: Aluminum alloy F356F.

    b. Guards/Handrails:

        1) Aluminum alloy 6063-T4.

        2) 1-1/2” Ø x 1/8” Tube.

    c. Central Stringer:

        1) Aluminum alloy 6063-T52.

        2) 1-3/4” x 4” x 1/8” Box shape.

d. Miscellaneous materials:

1) Rubber spine: Hollow neoprene strip.

2) Bolts: Landing to structure, ASTM A307, 1/2” diameter.

3) Nuts: ASTM A563.

4) Washers: ASTM F844.

6. Finish: Natural finish.

7. Fabrication:

a. General: Fabricate alternating tread aluminum stairs to conform with performance and construction requirements, and in accordance with approved shop drawings or dimensional prints. Fabricate and shop-assemble to greatest extent possible.

b. Fabricate gas metal arc welded and/or gas tungsten arc welded alternating tread aluminum stairs using the specified materials.

2.6 STEEL PIPE SUPPORTS

A. Fabricate and install steel pipe support assemblies in accordance with the requirements set forth in this subsection. Provide brackets and fittings for installation.

1. Manufacturer:

a. Material Resources, Inc., PO Box 247, Forest Grove, OR, Phone: (503) 533-5256, Fax: (503) 533-5501, Web: www.standon.net.

b. Supports shall be Standon Model S92.

c. Substitutions will not be considered.

2. Performance requirements:

a. Support design shall have been tested to withstand a minimum of 10,000 pounds compressive load. Test certification must be available.

3. Dimensions:

a. Base plate: 8” x 8” x 1/4”.

b. Saddle: shall encompass 170 degrees of circumference for pipe sizes up to 24”, and 120 degrees for larger diameters.

4. Materials:

a. Saddle strap: ASTM A36.

b. Collar/base cups: ASTM A53 D.O.M tubing.

c. Thread stud: ASTM A36, rolled thread, grade ASTM A307.

d. Base plate: ASTM A36 sheet steel.

5. Finish: All supports shall have corrosion resistant, electro-galvanized finish. Hot-dip galvanizing is acceptable.

6. Fabrication:

    a. All welds: 100% MIG welding, electrode E70XX.

    b. Saddle: formed to ductile iron pipe radius.

    c. A neoprene liner is required when supporting steel or PVC pipe.

2.7 STEEL HOIST SYSTEMS

A. Fabricate and install jib crane assemblies in accordance with the requirements set forth in this subsection. Provide brackets and fittings for installation.

1. Manufacturer:

    a. Gorbel, Inc., 600 Fishers Run, PO Box 593, Fishers, NY 14453, Phone: (800) 821-0086, Fax: (585) 924-6262, Web: www.gorbel.com.

2. Performance requirements:

    a. All jib cranes shall be structurally designed in accordance with AISC Steel Construction Manual.

    b. All jib cranes shall be in accordance with OSHA Specification 1910.179 and ANSI Specification B30.11.

    c. All jib cranes shall have a design factor of 15% of the allowable capacity for hoist weight and 25% of the allowable capacity for impact.

    d. Deflection guidelines: shall be L/320 for wall mounted and L/150 for wall cantilever.

    e. 1,000-pound lifting capacity (WC200) or 2,500-pound lifting capacity (AJ200).

3. Dimensions:

    a. 7-foot total span or 12-foot span.

4. Materials:

    a. Structural shapes: shall be a minimum of ASTM A36 designation.

    b. Pipes: shall be structural grade ASTM A53.

    c. Tubing: shall be ASTM A500.

    d. Plates and round bars: shall have minimum yield strength of 36 KSI.

5. Finish: All structural components shall be shot blasted and/or washed utilizing a high pressure/high temperature iron phosphate solution prior to painting. A conventional air-assisted airless paint system shall be used to apply high solids industrial baking enamel which shall be cured at elevated temperatures inside an industrial oven. Some pre-assembled components, such as hoist trolleys, may have powder-coated finish.

6. Fabrication:

    a. All welds: shall be in accordance with AWS D14.1 and shall be performed by certified welders.

b. All holes: shall be punched or drilled. Flame cut holes are not permitted.

2.8 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.9 FINISHES, GENERAL

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

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.10 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless indicated.

2.11 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 PREPARATIONS

A. Coordination: Coordinate start and installation of metal fabrications with performance and construction requirements, and in accordance with approved shop drawings or dimensional prints. Fabricate and shop-assemble to greatest extent possible.

B. Verification: Verify that dimensions and angles are correct and that substrate is in proper condition for metal fabrications installation. Do not proceed with installation until all necessary corrections have been made.

3.2 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together 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 surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. 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 contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.

2. Extruded Aluminum: Two coats of clear lacquer.

3.3 INSTALLATION ALUMINUM STAIRS AND ALTERNATING TREAD STAIRS

A. Prepare mounting holes.

B. Position stairs with top tread at same elevation as upper finished floor or roof surface.

C. Secure stairs with not less than 2 bolts or studs at top and with not less than 2 at bottom of stairs.

3.4 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.5 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.6 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 90 00 Painting and Coating.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

3.7 CLEAN-UP

A. Leave work areas clean and free of debris.

END OF SECTION 05 50 00