UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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USACE / NAVFAC / AFCEC / NASA	**UFGS-05 51 00 (February 2017)** **Change 1 - 05/17**

Preparing Activity: NASA	**Superseding** **UFGS-05 51 00 (February 2012)**

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SECTION 05 51 00

METAL STAIRS
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NOTE: This guide specification covers the requirements for steel stair systems which are not a part of any other metals system of the specification.

Associated work found in Division 5, "Metals," includes:

Structural steel

Miscellaneous metal

Handrails and railings

Ornamental railings

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

****

PART 1 GENERAL

****

NOTE: If Section 05 05 23.16 STRUCTURAL WELDING is not included in the project specification, applicable requirements therefrom should be inserted and the following paragraph deleted.

****

[Section 05 05 23.16 STRUCTURAL WELDING applies to work specified in this section.
]

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 314	(1990; R 2013) Standard Specification for Steel Anchor Bolts

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 360	(2016) Specification for Structural Steel Buildings

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISC/AISI 121	(2007) Standard Definitions for Use in the Design of Steel Structures

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.6.1	(2016) Wood Screws (Inch Series)
ASME B18.6.3	(2013; R 2017) Machine Screws, Tapping Screws, and Machine Drive Screws (Inch Series)

ASME B18.6.5M	(2000; R 2010) Standard Specification for Metric Thread-Forming and Thread-Cutting Tapping Screws
ASME B18.6.7M	(1999; R 2010) Metric Machine Screws
ASME B18.21.1	(2009; R 2016) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)
ASME B18.22M	(1981; R 2017) Metric Plain Washers

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A6/A6M	(2017a) Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A27/A27M	(2020) Standard Specification for Steel Castings, Carbon, for General Application
ASTM A29/A29M	(2020) Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought
ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings
ASTM A48/A48M	(2003; R 2016) Standard Specification for Gray Iron Castings
ASTM A53/A53M	(2020) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A108	(2013) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A283/A283M	(2013) Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A307	(2014; E 2017) Standard Specification for

	Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A325	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A325M	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength (Metric)
ASTM A449	(2014) Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
ASTM A500/A500M	(2020) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A512	(2006; R 2012) Standard Specification for Cold-Drawn Buttweld Carbon Steel Mechanical Tubing
ASTM A568/A568M	(2019a) Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for
ASTM A575	(2020) Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A924/A924M	(2020) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM A1008/A1008M	(2020) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM A1011/A1011M	(2018a) Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209M	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

ASTM C514	(2004; R 2020) Standard Specification for Nails for the Application of Gypsum Board
ASTM C636/C636M	(2013) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM E488/E488M	(2015) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
ASTM F568M	(2007) Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners
ASTM F1679	(2004e1) Standard Test Method for Using a Variable Incidence Tribometer

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 898-1	(2013) Mechanical Properties of Fasteners Made of Carbon Steel and Alloy Steel – Part 1: Bolts, Screws and Studs with Specified Property Classes – Coarse Thread and Fine Pitch Thread

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM MBG 531	(2017) Metal Bar Grating Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2021) Life Safety Code

1.2 SUBMITTALS

****

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes

following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Iron and Steel Hardware; G[, [____]]

Steel Shapes, Plates, Bars, and Strips; G[, [____]]

Metal Stair System; G[, [____]]

SD-03 Product Data

Structural Steel Plates, Shapes, and Bars; G[, [____]]

Structural Steel Tubing; G[, [____]]

Hot-Rolled Carbon Steel Sheets and Strips; G[, [____]]

Cold-Finished Steel Bars; G[, [____]]

Hot-Rolled Carbon Steel Bars; G[, [____]]

Cold-Rolled Carbon Steel Sheets; G[, [____]]

Galvanized Carbon Steel Sheets; G[, [____]]

Cold-Drawn Steel Tubing; G[, [____]]

Gray Iron Castings; G[, [____]]

Malleable Iron Castings; G[, [____]]

Concrete Inserts; G[, [____]]

Masonry Anchorage Devices; G[, [____]]

Protective Coating; G[, [____]]

Steel Pan Stairs; G[, [____]]

Steel Stairs; G[, [____]]

Steel Stairs, Circular; G[, [____]]

SD-07 Certificates

[Welding Procedures; G[, [____]]

][Welder Qualification; G[, [____]]

] SD-08 Manufacturer's Instructions

Structural Steel Plates, Shapes, and Bars; G[, [____]]

Structural Steel Tubing; G[, [____]]

Hot-Rolled Carbon Steel Sheets and Strips; G[, [____]]

Cold-Finished Steel Bars; G[, [____]]

Hot-Rolled Carbon Steel Bars; G[, [____]]

Cold-Rolled Carbon Steel Sheets; G[, [____]]

Galvanized Carbon Steel Sheets; G[, [____]]

Cold-Drawn Steel Tubing; G[, [____]]

Gray Iron Castings; G[, [____]]

Malleable Iron Castings; G[, [____]]

Protective Coating; G[, [____]]

Masonry Anchorage Devices; G[, [____]]

1.3 QUALITY CONTROL

1.3.1 Qualifications for Welding Work

[Submit welding procedures in accordance with AWS D1.1/D1.1M. Make test specimens in the presence of the Contracting Officer, and have the specimens tested by an approved testing laboratory at the Contractor's expense.

][Certify welder qualification by tests in accordance with AWS D1.1/D1.1M, or under an equivalent approved qualification test. In addition, perform tests on test pieces in positions and with clearances equivalent to those actually encountered. If a test weld fails to meet requirements, ensure that two test welds are retested immediately and that each test weld is made and passes. Failure in the immediate retest requires that the welder be retested after further practice or training and a complete set of test welds be made.

]PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Submit complete and detailed fabrication drawings for all iron and steel

hardware, and for all steel shapes, plates, bars, and strips used in accordance with the design specifications referenced in this section.

2.2 FABRICATION

Preassemble items in the shop to the greatest extent possible. Disassemble units only to the extent necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

For the fabrication of work exposed to view, use only materials that are smooth and free of surface blemishes, including pitting, seam marks, roller marks, rolled trade names, and roughness. Remove blemishes by grinding, or by welding and grinding, before cleaning and treating surfaces and applying surface finishes, including zinc coatings.

2.2.1 General Fabrication

Prepare and submit metal stair system shop drawings with detailed plans and elevations at scales not less than 1 to 12 scale 1 inch to 1 foot and with details of sections and connections at scales not less than 1 to 4 scale 3 inches to 1 foot. Also detail the placement drawings, diagrams, and templates for installation of anchorages, including concrete inserts, anchor bolts, and miscellaneous metal items having integral anchorage devices.

Use materials of size and thicknesses indicated or, if not indicated, of the size and thickness necessary to produce a finished product that is strong enough and durable enough for its intended use. Work the materials to the dimensions indicated on approved detail drawings, using proven methods of fabrication and support. Use the type of materials indicated or specified for the various components of work.

Form exposed work true to line and level, with accurate angles and surfaces and with straight sharp edges. Ease exposed edges to a radius of approximately 0.8 millimeter 1/32 inch, and bend metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.

Continuously weld corners and seams in accordance with the recommendations of AWS D1.1/D1.1M. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

Form exposed connections with hairline joints that are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type indicated or, if not indicated, use Phillips flat-head (countersunk) screws or bolts.

Provide and coordinate anchorage of the type indicated for the supporting structure. Fabricate anchoring devices, and space them as indicated and as necessary to provide adequate support for the intended use of the work.

Use hot-rolled steel bars for work fabricated from bar stock unless work is indicated or specified as fabricated from cold-finished or cold-rolled stock.

2.2.2 Steel Pan Stairs

2.2.2.1 General

Joining pieces by welding. Fabricate units so that bolts and other fastenings do not appear on finished surfaces. Make joints true and tight, and connections between parts lighttight. Grind continuous welds smooth where exposed.

Construct metal stair units to sizes and arrangements indicated to support a minimum live load of 500 kilogram per square meter 100 pounds per square foot. Provide framing, hangers, columns, struts, clips, brackets, bearing plates, and other components as required for the support of stairs and platforms.

2.2.2.2 Stair Framing

Fabricate stringers of structural steel channels, or plates, or a combination thereof as indicated. Provide closures for exposed ends of strings.

Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. Bolt headers to stringers and newels, and bolt framing members to stringers and headers.

2.2.2.3 Riser, Subtread, and Subplatform Metal Pans

[Form metal pans of 2.8 millimeter 0.1084-inch (12-gage) structural steel sheets, conforming to ASTM A1011/A1011M, Grade 36. Shape the pans to the configuration indicated.

][Form metal pans of 2.8 millimeter 0.1084-inch (12-gage) galvanized structural steel sheets, conforming to ASTM A653/A653M, Grade A, with zinc coating conforming to ASTM A653/A653M and ASTM A924/A924M. Shape the pans to the configuration indicated.

] Construct risers and subtread metal pans with steel angle supporting brackets, of the size indicated, welded to stringers. Secure metal pans to brackets with rivets or welds. Secure subplatform metal pans to platform frames with welds.

2.2.2.4 Metal Safety Nosings

Between stringers, provide abrasive cast metal safety nosings, 4 inches wide by the full length of the step. Fabricate nosings to the thickness, profile, and surface pattern indicated. Equip each nosing with integral anchors for embedding in the pan fill material, and space the anchors not more than 100 millimeter 4 inches from each end and not more than 380 millimeter 15 inches on center.

2.2.2.5 Steel Floor Plate Treads and Platforms

Provide raised-pattern steel floor plate fabricated from steel complying with ASTM A36/A36M. Provide the pattern indicated or, if not indicated, as selected from the manufacturer's standard patterns.

Form treads of 6 millimeter 1/4-inch thick steel floor plate with integral nosing and back-edge stiffener. Weld steel supporting brackets to strings, and weld treads to brackets.

[Fabricate platforms of steel floor plate to the thickness indicated. Provide nosing that match treads at landings. Secure floor plates to platform framing members with welds.

]2.2.2.6 Safety Nosings for Concrete Treads

****
NOTE: Cast iron nosings may be specified where heavy use is anticipated. They should not be used where appearance is important since they tend to discolor or rust. Check for availability. Cast aluminum nosings may cost more than cast iron nosings, but may be more readily available. Specify where appearance is important.
****

[Provide safety nosings of [cast aluminum] [cast iron] with [cross-hatched] [plain] abrasive surfaces, or extruded aluminum with abrasive inserts, at least 100 mm 4 inches wide and 6 mm 1/4 inch thick [and terminating at not more than 150 mm 6 inches from the ends of treads] [for metal-pan cement-filled treads extending the full length of the tread] for stairs and [as indicated] for platforms and landings. Provide safety nosings with anchors embedded a minimum of 20 mm 3/4 inch in the concrete and with tops flush with the top of the traffic surface.

]2.2.2.7 Safety Treads

****
NOTE: Select and indicate tread type. Delete remaining tread types.

NAAMM MBG 531:

W - welded (steel)
P - pressure locked (steel or aluminum)
R - riveted (steel or aluminum)

ASTM A653/A653M W welded (steel) or ASTM B209M ASTM B209 B bolted (steel or aluminum); or for concrete-filled metal pan-treads ASTM A1011/A1011M, ASTM A568/A568M, steel.

****

****
NOTE: Each tread and the top landing of a stairway where vertical risers are used should have a nose that extends 12 to 25 mm 1/2 inch to 1 inch beyond the face of the lower riser. Include large-scale details of stairs and safety nosings on the drawings.
****

[NAAMM MBG 531 [aluminum] [steel], Type [_____]] [Plank grating ASTM A653/A653M, Z275 G-90] [aluminum ASTM B209M, ASTM B209] [ASTM A1011/A1011M, steel pan for concrete tread.

]2.2.2.8 Steel Framing for Concrete Stairs

When necessary, modify fabricated units to fit actual dimensions of the supporting structure. Join steel components by welding. Provide 2 millimeter 14-gage steel risers unless otherwise indicated. Arrange components to receive finish materials as indicated.

2.2.3 Floor Grating Treads and Platforms

****
NOTE: Use galvanized treads and platforms for exterior stairs.
****

Provide floor grating treads and platforms conforming to ASTM A6/A6M, ASTM A29/A29M and NAAMM MBG 531, "Metal Bar Grating Manual." Provide the pattern, spacing, and bar sizes as indicated:

[a. Galvanized finish, conforming to ASTM A123/A123M.

][b. Manufacturer's baked-on primer for painted finishes.

] Fabricate grating treads with steel plate nosings on one edge and with steel angle or steel plate carriers at each end for string connections. Secure treads to strings with bolts.

Match the nosings of grating platforms with the nosing of grating treads at landings. Provide toeplates where the open-sided edges of floor grating meet platform framing members.

2.2.4 Protective Coating

[Shop-prime steelwork as indicated in accordance with [AISC/AISI 121] [Section 09 97 13.00 40 STEEL COATINGS], except surfaces of steel encased in concrete; welded surfaces; high-strength, bolt-connected surfaces; and surfaces of crane rails.

][Hot-dip galvanize steelwork as indicated in accordance with ASTM A123/A123M. Touch up abraded surfaces and cut ends of galvanized members with zinc-dust, zinc-oxide primer, or an approved galvanizing repair compound.

]2.3 COMPONENTS

2.3.1 Steel Stairs

****
NOTE: Design fire escapes of the type and arrangement to conform to Fire Escape Stairs, Section 5, of NFPA 101, Code for Safety to Life.
****

****
NOTE: Consider the footwear typically worn by personnel using grating treads and landings with openings through the surface.
****

Provide steel stairs complete with stringers, [steel-plate treads and risers,] [metal-pan concrete-filled treads,] [grating treads,] [nonskid

metallic treads,] [precast concrete treads,] landings, columns, handrails, and necessary bolts and other fastenings. [Hot-dip-galvanize] [Shop-paint] steel stairs and accessories.

2.3.1.1 Design Loads

****
NOTE: For industrial or heavy-duty stairs use a live load of five times the expected load and a concentrated load of 2 kN 1000 lb. For standard applications, use a live load of 500 kg per square m 100 psf and a concentrated load of 1.3 kN 300 lb.
****

Design stairs to sustain a live load of not less than [_____] kg per square meter pounds per square foot, or a concentrated load of [_____] applied where it is most critical. Except for a commercial product, design and fabricate steel stairs to conform to AISC 360. [Design fire stairs to conform to NFPA 101.]

2.3.1.2 Materials

****
NOTE: Provide each tread, and the top landing of a stairway where vertical risers are used, with a nose that extends 12 to 25 mm 1/2 inch to 1 inch beyond the face of the lower riser. Include large-scale details of stairs and safety nosings on the drawings.
****

****
NOTE: Select and indicate tread types.
****

Provide steel stairs of welded construction except that bolts may be used where welding is not practicable. Do not use screw or screw-type connections.

a. Structural Steel: ASTM A36/A36M.

b. Gratings for Treads and Landings: [NAAMM MBG 531] [or] [Plank grating; ASTM A653/A653M, Z275 G-90 for steel; ASTM B209M ASTM B209 for aluminum.] [Provide gratings with nonslip nosings.] [with slip resistance exceeding a static coefficient of friction, both wet and dry, of [0.5] [0.6] as tested in accordance with ASTM F1679.]

c. Support [steel floor plate] [metal pan for concrete fill] [steel grating] on angle cleats welded to stringers or treads with integral cleats, welded or bolted to the stringer. [Provide sheet-steel landings with angle stiffeners welded on.] Close exposed ends. [For exterior stairs, form all exposed joints to exclude water.]

[d. Ensure that precast concrete treads are factory-built as specified in Section 03 45 33 PRECAST[PRESTRESSED] STRUCTURAL CONCRETE.

] e. Before fabrication, obtain necessary field measurements and verify drawing dimensions.

f. Clean metal surfaces free of mill scale, flake rust, and rust pitting

before shop finishing. Weld permanent connections. Finish welds flush and smooth on surfaces that will be exposed after installation.

2.3.2 Steel Stairs, Circular

Provide standard open riser constructed of steel, with a minimum outside diameter of 1800 mm 6 feet and with 12 treads to the circle. Construct the center pole from one continuous length of circular, cold-drawn, seamless tube with a minimum outside diameter of 90 mm 3 1/2 inches and with caps at the top plate and base plate having countersunk machine screws and expansion shields for fastening to the concrete floor slab. Construct treads and platforms from steel grating conforming to NAAMM MBG 531. [Provide nonslip nosings for gratings.] [Design slip-resistant gratings to exceed a static coefficient of friction of 0.5 [0.6] as tested in accordance with ASTM F1679.]

2.3.3 Soffit Clips

Provide clips with holes for attaching metal furring for plastered soffits. Space the clips not more than 300 millimeter 12 inches on center, and weld them to stair treads and platforms as required.

2.3.4 Concrete Inserts

****

NOTE: Use inserts for fastening steel stair items to cast-in-place concrete construction subjected to direct pullout loadings such as shelf angles and supports attached to concrete slab ceilings. Indicate locations of inserts.

****

[Threaded-type concrete inserts consisting of galvanized ferrous castings, internally threaded to receive M20 3/4-inch diameter machine bolts; either malleable iron conforming to ASTM A47/A47M or cast steel conforming to ASTM A27/A27M, and hot-dip-galvanized in accordance with ASTM A153/A153M.

][Wedge-type concrete inserts consisting of galvanized box-type ferrous castings designed to accept M20 3/4-inch diameter bolts having special wedge-shaped heads; either malleable iron conforming to ASTM A47/A47M or cast steel conforming to ASTM A27/A27M and hot-dip-galvanized in accordance with ASTM A153/A153M.

][Carbon steel bolts having special wedge-shaped heads, nuts, washers, and shims and galvanized in accordance with ASTM A153/A153M. Provide slotted-type concrete inserts consisting of galvanized 3 millimeter 1/8-inch thick pressed steel plate conforming to ASTM A283/A283M; of box-type welded construction with slot designed to receive M20 3/4-inch diameter square-head bolt with knockout cover; and be hot-dip-galvanized in accordance with ASTM A123/A123M.

]2.3.5 Masonry Anchorage Devices

****

NOTE: Use only masonry anchorage devices for fastening steel stair items to solid masonry and concrete when the anchor is not subjected to pullout loads or vibration in shear loads.

****

Provide masonry anchorage devices consisting of expansion shields complying with AASHTO M 314, ASTM E488/E488M and ASTM C514 as follows:

[a. Lead expansion shields for machine screws and bolts 6 millimeter 1/4 inch and smaller; head-out embedded-nut type, single unit class, Group I, Type 1, Class 1.

][b. Lead expansion shields for machine screws and bolts larger than 6 millimeter 1/4 inch in size; head-out embedded-nut type, multiple unit class, Group I, Type 1, Class 2.

][c. Bolt anchor expansion shields for lag bolts; zinc-alloy, long-shield anchors class, Group II, Type 1, Class 1.

][d. Bolt anchor expansion shields for bolts; closed-end bottom-bearing class, Group II, Type 2, Class 1.
]

****
NOTE: Use toggle bolts for anchoring steel stair items to hollow masonry and stud partitions.
****

Use toggle bolts of the tumble-wing type, conforming to ASTM A325M ASTM A325, ASTM A449, and ASTM C636/C636M, type, class, and style as required.

2.3.6 Fasteners

****
NOTE: Select the fasteners that are consistent with the stair system design.
****

Select galvanized zinc-coated fasteners conforming to ASTM A153/A153M for exterior applications or where the fasteners are built into exterior walls or floor systems. Select the fasteners for the type, grade, and class required for the installation of steel stair items:

a. Standard/regular hexagon-head bolts and nuts, conforming to ASTM F568M, ASTM A307, Grade A.

b. Square-head lag bolts conforming to ISO 898-1, ASME B18.2.1.

c. Cadmium-plated steel machine screws, conforming to ASME B18.6.7M, ASME B18.6.3.

d. Flat-head carbon steel wood screws, conforming to ASME B18.6.5M, ASME B18.6.1.

e. Plain, round, general-assembly-grade, carbon steel washers, conforming to ASME B18.22M ASME B18.21.1.

f. Helical-spring, carbon steel lockwashers, conforming to ISO 898-1 ASME B18.2.1.

2.4 MATERIALS

2.4.1 Structural Steel Plates, Shapes and Bars

Structural size shapes and plates, conforming to ASTM A36/A36M, unless otherwise noted, except bent or cold-formed plates.

Steel plates - bent or cold-formed, conforming to ASTM A283/A283M, Grade C.

Steel bars and bar-size shapes, conforming to ASTM A36/A36M, unless otherwise noted for steel bars and bar-size shapes.

2.4.2 Structural Steel Tubing

****
NOTE: Includes square, rectangular, round, and specially shaped structural steel tubing.
****

Provide the following:

[a. Structural steel tubing, hot-formed, welded or seamless, conforming to ASTM A500/A500M, Grade B, unless otherwise noted.

][Structural steel tubing, hot-formed, welded or seamless, conforming to [_____] Grade [_____].

]2.4.3 Hot-Rolled Carbon Steel Bars

Provide the following:

[a. Hot-rolled carbon steel bars and bar-size shapes, conforming to ASTM A575, grade as selected by the fabricator.

][b. Hot-rolled carbon steel bars and bar-size shapes, conforming to [_____], grade as selected by the fabricator.

]2.4.4 Cold-Finished Steel Bars

Provide the following:

[a. Cold-finished steel bars conforming to ASTM A108, grade as selected by the fabricator.

][b. Cold-finished steel bars conforming to [_____], grade as selected by the fabricator.

]2.4.5 Hot-Rolled Carbon Steel Sheets and Strips

Provide the following:

[a. Hot-rolled carbon sheets and strips conforming to ASTM A568/A568M and ASTM A1011/A1011M, pickled and oiled.

][b. Hot-rolled carbon sheets and strips conforming to [_____].

]2.4.6 Cold-Rolled Carbon Steel Sheets

Provide the following:

[a. Cold-rolled carbon steel sheets conforming to ASTM A1008/A1008M.

][b. Cold-rolled carbon steel sheets conforming to [_____].

]2.4.7 Galvanized Carbon Steel Sheets

Provide the following:

[a. Galvanized carbon steel sheets conforming to ASTM A653/A653M, with galvanizing conforming to ASTM A653/A653M and ASTM A924/A924M.

][b. Galvanized carbon steel sheets conforming to [_____], with galvanizing conforming to [_____].

]2.4.8 Cold-Drawn Steel Tubing

Provide the following:

[a. Cold-drawn steel tubing conforming to ASTM A512, sunk drawn, butt-welded, cold-finished, and stress-relieved.

][b. Cold-drawn steel tubing conforming to [_____], [_____].

]2.4.9 Gray Iron Castings

Provide the following:

[a. Gray iron castings conforming to ASTM A48/A48M, Class 30.

][b. Gray iron castings conforming to [_____], Class [_____].

]2.4.10 Malleable Iron Castings

Provide the following:

[a. Malleable iron castings conforming to ASTM A47/A47M, grade as selected.

][b. Malleable iron castings conforming to [_____], grade as selected.

]2.4.11 Steel Pipe

Provide the following:

[a. Steel pipe conforming to ASTM A53/A53M, type as selected, Grade B; primed finish, unless galvanizing is required; standard weight (Schedule 40).

][b. Steel pipe conforming to [_____], type as selected, Grade [_____]; primed finish, unless galvanizing is required; [standard weight (Schedule 40)] [_____].

]PART 3 EXECUTION

3.1 PREPARATION

Clean surfaces thoroughly before installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions. Examine materials upon

arrival at site. Notify the carrier and manufacturer of any damage.

Protect installed products until completion of project. Touch up, repair or replace, damaged products before substantial completion

3.2 INSTALLATION

Install in accordance with the manufacturer's instructions and approved submittals. Install in proper relationship with adjacent construction.

Install items at locations indicated, according to the manufacturer's instructions. Verify all measurements and take all field measurements necessary before fabrication. Ensure that exposed fastenings are compatible with generally match the color and finish of, and harmonize with the material to which they are applied. Include materials and parts necessary to complete each item, even though such work is not definitely shown or specified. Poor matching of holes for fasteners is cause for rejection. Conceal fastenings where practicable. Select thickness of metal and details of assembly and supports that adequately strengthen and stiffen the construction. Form joints exposed to the weather to exclude water.

3.2.1 Field Preparation

Remove rust-preventive coating just before field erection, using a remover approved by the coating manufacturer. Provide surfaces, when assembled, free of rust, grease, dirt and other foreign matter.

3.2.2 Field Welding

Comply with AWS D1.1/D1.1M in executing manual shielded-metal arc welding, (for appearance and quality of new welds) and in correcting existing welding.

3.2.3 Safety Nosings

Completely embed nosing in concrete before the initial set of the concrete occurs and finish flush with the top of the concrete surface.

3.2.4 Touchup Painting

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NOTE: Delete the paragraph and heading if touchup painting is excluded from the steel stair erector's work.

****

Immediately after installation, clean all field welds, bolted connections, and abraded areas of the shop-painted material, and repaint exposed areas with the same paint used for shop painting. Apply paint by brush or spray to provide a minimum dry-film thickness of 0.051 millimeter 2 mils.

-- End of Section --