

SECTION 05 51 13  
METAL PAN STAIR ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preassembled steel stairs with concrete filled treads.
2. Steel tube railings attached to metal stairs.
3. Steel tube handrails attached to walls adjacent to metal stairs.
4. Railing gates at the level of exit discharge.

1.2 ACTION SUBMITTALS

A. Product Data: Technical data for metal pan stairs including:

1. Prefilled metal pan stair treads.
2. Abrasive nosings.
3. Welded wire mesh.
4. Paint products.

B. Shop Drawings: Submit plans, elevations, sections, details, and attachments to other work.

1. Show detailed construction, metal thickness, jointing, methods of installation, fastening and supports location and sizes of welds, anchoring, hangers and other pertinent data.
2. Submit plans and section of steel stairs, drawn to scale at not less than 1/4 inch (6 mm) per foot (3005 mm). Where conditions in three or more consecutive stories are exactly alike, drawings may be broken and noted to include duplicate runs
3. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
4. Include plan at each level.
5. Indicate locations of anchors, weld plates, and blocking for attachment of wall mounted handrails.
6. Indicate profile and dimensions of precast terrazzo treads.
7. Indicate profile and dimensions of epoxy resin filled treads.
8. Indicate profile and dimensions of stone treads.

C. Samples: Submit samples for each type and finish of nosing.

D. Delegated Design Submittal: Submit data for stair assembly railings and guards, [precast treads and connections] indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Submit professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that engineer is licensed in the State in which Project is located.
- B. Welding certificates.
- C. Paint Compatibility Certificates: Certification from manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M Structural Welding Code - Steel.
  - 2. AWS D1.3/D1.3M Structural Welding Code - Sheet Steel.
- C. Preinstallation Conference: Conduct conference at site.

### 1.5 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs. 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. Ensure delivery to site in time for installation.
- C. Coordinate locations of hanger rods and struts with other work so that they do not encroach on required stair width and are within the fire resistance rated stair enclosure.
- D. Schedule installation of railings and guards so wall attachments are made to completed walls.
  - 1. Do not support railings and guards temporarily by means that do not satisfy structural performance requirements.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification.
  - 1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
  - 2. Protect steel members and packaged materials from corrosion and deterioration.
  - 3. Do not store materials on structure that contributes to distortion, damage, or overload to members or supporting structures.

- a. Repair or replace damaged materials or structures as directed.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design stair assemblies, railings and guards, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated:
  1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
  2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
  3. Uniform and concentrated loads need not be assumed to act concurrently.
  4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
  5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.
- C. 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. (0.73 kN/m) applied in any direction.
    - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
  2. Infill of Guards:
    - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
    - b. Infill load and other loads need not be assumed to act concurrently.
  3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
    - a. Temperature Change: 120 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C), material surfaces.
- D. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  1. Component Importance Factor: 1.5.

### 2.2 MATERIALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Alfab, Inc.

2. American Stair, Inc.
  3. Lapeyre Stair Inc.
  4. Pacific Stair Corporation.
  5. Sharon Stair, Duvinage, LLC.
- B. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.
1. Provide galvanized finish for exterior installations and where indicated.
- E. Steel Pipe for Railings and Guards: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
1. Provide galvanized finish for exterior installations and where indicated.
- F. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- G. Uncoated, Cold Rolled Steel Sheet: ASTM A 1008/A 1008M, structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.
- H. Uncoated, Hot Rolled Steel Sheet: ASTM A 1011/A 1011M, structural steel, Grade 30 (Grade 205), unless another grade is required by design loads.
- I. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating, structural steel, Grade 33 (Grade 230), unless another grade is required by design loads.
- J. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- K. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- L. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).
- M. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semi-red brass).
- N. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).
- O. Fasteners: Provide zinc plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
1. Bolts and Nuts: Regular hexagon head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

2. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
    - a. Provide hot dip, zinc coated anchor bolts for exterior stairs indicated to be galvanized and stairs indicated to be shop primed with zinc rich primer.
  3. Post Installed Anchors: 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, determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
    - a. Material for Interior Locations: Carbon steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
    - b. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).
- P. Accessories:
1. Handrail Wall Brackets: Cast stainless steel, center of rail 2-1/2 inches (63.5 mm) from face of wall.
  2. Welding Electrodes: Comply with AWS requirements.
- Q. Miscellaneous Materials:
1. Universal Shop Primer for Ferrous Metal: Fast curing, lead free and chromate free universal modified alkyd primer, organic zinc rich primer, complying with SSPC-Paint 20 and compatible with topcoat. Use primer containing pigments that make it easily distinguishable from zinc rich primer.
    - a. Product: Provide 10-99 (red) or 10-09 (gray) by Tnemec Company.
  2. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc coated metal and compatible with finish paint systems indicated.
  3. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
    - a. Product: Provide Tneme-Zinc 90-97 by Tnemec Company.
  4. Bituminous Paint: Cold applied asphalt emulsion complying with SSPC-Paint 12, containing no asbestos fibers, or cold applied asphalt emulsion complying with ASTM D 1187 ASTM D 1187/D 1187M.
  5. Concrete Materials and Properties: Comply with requirements in Section 03 30 00 for normal weight, air entrained, ready mix concrete with a minimum 28 day compressive strength of 3000 psi (20 MPa) unless otherwise indicated.
  6. Welded Wire Reinforcement: ASTM A 185/A 185M, 6 inches by 6 inches (152 mm by 152 mm), W1.4 by W1.4, unless otherwise indicated.
  7. Reinforcement Supports: Bolsters, chairs, spacers, and devices for spacing, supporting, and fastening welded wire reinforcement in place.
    - a. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI Manual of Standard Practice of greater compressive strength than concrete.

- R. For galvanized reinforcement, use galvanized wire or dielectric polymer coated wire bar supports.

## 2.3 ABRASIVE NOSINGS

- A. Extruded Units: Aluminum units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Style 3511 by American Safety Tread Inc.
    - b. Type S25-C by Armstrong Products Inc.
    - c. Type 231BF by Wooster Products, Inc.
  - 2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above aluminum extrusion.
  - 3. Nosings: Square back units, 3 inches (75 mm) wide full length integrally extruded 3/4 inch anchor for casting in place.
- B. Apply bituminous paint to concealed surfaces of cast aluminum units set into concrete to guard against corrosion.

## 2.4 FABRICATION

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, 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. Assembled Stairs: Shop assemble stairs greatest extent possible. Disassemble units 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 (1 mm) 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. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 1. Obtain fusion without undercut or overlap.
  - 2. Remove welding flux immediately.
  - 3. Weld exposed corners and seams continuously unless otherwise indicated.

4. At exposed connections, finish exposed welds to comply with NOMMA Voluntary Joint Finish Standards for Type 4 welds: good quality, uniform undressed weld with minimal splatter.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

## 2.5 STEEL FRAMED STAIR FABRICATION

- A. NAAMM Stair Standard: Comply with Recommended Voluntary Minimum Standards for Fixed Metal Stairs in NAAMM AMP 510 Metal Stairs Manual, Commercial Class, unless more stringent requirements are indicated.
- B. Stair Framing:
  1. Fabricate stringers steel channels as indicated on Drawings.
    - a. Stringer Size: Indicated on Drawings.
    - b. Provide closures for exposed ends of channel and rectangular tube stringers.
    - c. Finish: Shop primed Painted.
  2. Construct platforms of steel channel headers and miscellaneous framing members as indicated on Drawings.
    - a. Provide closures for exposed ends of channel and rectangular tube framing.
    - b. Finish: Shop primed Painted.
  3. Weld stringers to headers; weld framing members to stringers and headers.
  4. Where stairs are enclosed by gypsum board shaft wall assemblies, provide hanger rods or struts to support landings from floor construction above or below.
    - a. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire resistance rated stair enclosure.
  5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness necessary to comply with performance requirements, but not less than 0.067 inch (1.7 mm).
  1. Fabricate treads and landing subplatforms of exterior stairs so finished walking surfaces slope to drain.
  2. Steel Sheet: Uncoated cold rolled steel sheet unless otherwise indicated.
  3. Steel Sheet: Galvanized steel sheet, where indicated.
  4. Directly weld metal pans to stringers; locate welds on top of subtreads where they are concealed by concrete fill. Do not weld risers to stringers.
  5. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
  6. Shape metal pans to include nosing integral with riser.
  7. Attach abrasive nosings to risers.

8. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete during fabrication.
  9. Provide epoxy resin filled treads, reinforced with glass fibers, with slip resistant, abrasive surface.
  10. Provide subplatforms of configuration indicated or the same as subtreads. Weld subplatforms to platform framing.
    - a. Smooth Soffit Construction: Construct subplatforms with flat metal under surfaces to produce smooth soffits.
- D. Abrasive Coating Finished, Formed Metal Stairs: Form risers, treads, and platforms to configurations shown from steel sheet of thickness necessary to comply with performance requirements, but not less than 0.097 inch (2.5 mm).
1. Steel Sheet: Uncoated hot rolled steel sheet unless otherwise indicated.
  2. Directly weld risers and treads to stringers; locate welds on underside of stairs.
  3. Provide platforms of configuration indicated or, if not indicated, the same as treads. Weld platforms to platform framing.
  4. Finish tread and platform surfaces with epoxy bonded abrasive finish.

## 2.6 STAIR RAILINGS AND GUARDS

- A. Steel Tube Railings: Fabricate railings and guards to comply with requirements indicated for type, design, orientation, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.
1. Rails and Posts: 1-5/8 inch (41 mm) diameter top and bottom rails and 1-1/2 inch (38 mm) square posts.
  2. Vertical Picket Infill: 3/4 inch (19 mm) round pickets spaced to prohibit the passage of a 4 inch (100 mm) diameter sphere.
  1. Intermediate Rails Infill: 1-5/8 inch (41 mm) diameter intermediate rails spaced less than indicated on the Drawings.
  2. Gates: Form gates from steel tube of same size and shape as top rails, with infill to match guards. Provide with cam type, self closing hinges for fastening to wall and overlapping stop with rubber bumper to prevent gate from opening in direction opposite egress.
- B. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
1. Fabricate connections exposed to weather to exclude water. Provide weep holes where water may accumulate internally.
  2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  3. Obtain fusion without undercut or overlap.
  4. Remove flux immediately.

5. Finish welds to comply with NOMMA Voluntary Joint Finish Standards for Type 2 welds: completely sanded joint, some undercutting and pinholes are okay shown in NAAMM AMP 521.
- C. Form changes in direction of railings:
  1. As detailed.
  2. By flush bends.
- D. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
  1. Rails may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
- E. Close exposed ends of railing members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- G. Connect posts to stair framing by direct welding unless otherwise indicated.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
  1. For galvanized railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous metal components.
  2. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
  3. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2 inch (38 mm) clearance from inside face of handrail to finished wall surface.
- I. Filler: Provide fillers made from steel plate, or suitably crush resistant material, where necessary to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thickness to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

## 2.7 FINISHES

- A. Unless otherwise noted all cast in place concrete shall have a nonslip broomed concrete finish perpendicular to the direction of travel.
- B. Finish metal stairs after assembly.
- C. Galvanizing: Hot dip galvanize components to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
  2. Fill vent and drain holes that are exposed in the finished work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- D. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with SSPC-SP 3 Power Tool Cleaning.
- E. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel, for shop painting.
- F. Field Finish: Refer to finish schedule and Section 09 91 23 and 09 91 13 for field applied paints and coatings.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
1. For wall mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.
- B. Proceed with installation after correcting unsatisfactory conditions.

### 3.2 INSTALLING METAL PAN STAIR ASSEMBLY

- A. Fastening to In Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in place construction. Include threaded fasteners for concrete and masonry inserts, through bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond reducing materials and roughen surfaces prior to setting plates.
    - a. Clean bottom surface of plates.
    - b. Set plates for structural members on wedges, shims, or setting nuts.
    - c. Tighten anchor bolts after supported members have been positioned and plumbed.
    - d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

- e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.
  - 1) Neatly finish exposed surfaces; protect grout and allow to cure.
  - 2) Comply with manufacturer's written installation instructions for shrinkage resistant grouts.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. 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.
- F. Field Welding: Comply with requirements for welding.
- G. Place and finish concrete fill for treads and platforms to comply with Section 03 30 00.
  - 1. Install abrasive nosings with anchors fully embedded in concrete. Center nosings on tread width.

### 3.3 INSTALLATION OF RAILINGS AND GUARDS

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or required by design loads. Plumb posts in each direction within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
  - 1. Align rails and guards so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).
  - 2. Secure posts, rail ends, and guards to building construction:
    - a. Anchor posts to steel by welding to steel supporting members.
    - b. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.
- B. Install railing gates level, plumb, and secure for full opening without interference.
  - 1. Attach hardware using tamper resistant or concealed means.
  - 2. Adjust hardware for smooth operation.
- C. Attach handrails to wall with wall brackets. Locate brackets at spacing required to support structural loads. Secure wall brackets to building construction as required to comply with performance requirements.
  - 1. For concrete and solid masonry anchorage, use drilled in expansion shields and hanger or lag bolts.
  - 2. For hollow masonry anchorage, use toggle bolts.
  - 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.

4. For steel framed partitions, use hanger or lag bolts set into fire retardant treated wood backing between studs. Coordinate with stud installation to locate backing members.
5. For steel framed partitions, use self tapping screws fastened to steel framing or to concealed steel reinforcements.
6. For steel framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

### 3.4 CONCRETE PLACEMENT

- A. Comply with ACI 301 (ACI 301M) and the Contract Documents for placing concrete.
- B. Do not add water to concrete during delivery, at site, or during placement.
- C. Consolidate concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
  - A. Slip Resistive Broom Finish: Apply a slip resistive finish to tread surfaces platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber bristle broom perpendicular to main traffic route.
  - B. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
  - C. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
    1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      - a. Water.
      - b. Continuous water fog spray.
      - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12 inch (300 mm) lap over adjacent absorptive covers.
    2. Moisture Retaining Cover Curing: Cover concrete surfaces with moisture retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
    3. Curing Compound: Refer to Section 03 39 00 Concrete Sealer for cure and seal agent permitted. Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
  - D. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold weather protection and with ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.

3.5 REPAIR, ADJUSTING, AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with 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 (0.05 mm) dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION

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