1. **GENERAL**
   1. **SECTION INCLUDES**
      1. Steel tubing railings, handrails, balusters and posts.
      2. Brackets and fittings.
   2. **REFERENCES**
      1. CAS/CAR - California Accessibility Statutes and California Accessibility Regulation, January 2019 and current/latest CBC.
      2. ASTM A 53 - Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless.
      3. ASTM A 153 - Zinc coating (Hot-Dip) on Iron and Steel Hardware.
      4. ASTM A 500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
      5. ASTM A 123 ‑ Zinc (Hot‑Dip Galvanized) Coatings on Iron and Steel Products.
      6. ASTM C 1107 - Packaged Dry, Hydraulic - Cement Grout (Non-Shrink).
      7. AWS D1.1 – American Welding Society, Structural Welding Code - Steel.
      8. Chapters 10 and 11B, current/latest California Building Code.
      9. ASTM A 780 - Repair of Damage and Uncoated Areas of Hot-Dip Galvanized Coatings.
   3. **DESIGN REQUIREMENTS**
      1. Railing assembly, wall rails and attachments to resist a load of 50 pounds per lineal foot and 200 pounds applied in any direction at any point on the rail, without damage or permanent set, in accordance with CAS/CAR and California Building Code.
   4. **SUBMITTALS**
      1. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners and accessories.
      2. Samples: Submit three samples of handrail and each component.
      3. Submit structural calculations signed and stamped by Structural Engineer currently licensed in California for railings where walking surface or floor levels exceeding 48 inches from adjacent ground or level.
   5. **FIELD MEASUREMENTS**
      1. Verify that field measurements are as indicated on shop drawings.
2. **PRODUCTS**
   1. **STEEL RAILING SYSTEM**
      1. Fasteners, Brackets, Flanges and Bases: Manufactured by:

1. Craneveyor Corp., South El Monte, CA.

2. R & B Wagner Inc., Milwaukee, WI.

3. McNichols Co. South Gate, CA.

or equal as approved in accordance with Division 1, General Requirements for Substitutions.

* + 1. Railings, Handrails, Guardrails, Balusters, Posts:
       1. Steel Tubing, ASTM A500, 1-1/4 inch nominal size, Pipe Size ERW, Standard size. (shown on drawings as 1-1/2 inch), 1.660 inch outside diameter, wall thickness of 0.1400 inches, Grade B, welded joints.
    2. Fittings: Elbows, T‑shapes, wall brackets, escutcheons: Cast steel. Brackets: Round top to accept tube rail, size to allow 1-1/2 inch clearance from rail to wall.
    3. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
    4. Nonshrink Grout: ASTM C 1107, premixed compound consisting of non‑metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 5,000 psi in 24 hours and 8,000 psi in 7 days; of consistency for application and a 30 minute working time.

**Manufacturers:**

1. 1107 Advantage Grout by Dayton Superior, Miamisburg, OH.

2. Sonogrout 10K by Sonneborn, Shakopee, MN.

3. Super Por-Rok Anchoring Cement by Novex Systems International, Clifton NJ, or equal.

* + 1. Touch-Up Primer for Galvanized Surfaces: Ready mixed Zinc rich cold galvanizing compound.

**Manufacturers:**

1. DEVCON Z, by Devcon Corp., Danvers, MA.

2. GALVICON by Southern Coatings, Sumter, SC.

or equal as approved in accordance with Division 1, General Requirements for Substitutions.

* + 1. Structural Plates, shapes and bars: ASTM A36.
  1. **FABRICATION**
     1. Fabricate handrails of specified pipe or tubing only in conformance with requirements of CAS/CAR and Chapters 10 and 11B CBC.
     2. Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
     3. Assemble handrails and railings in shop to greatest extent possible to minimize field splicing and assembly.
     4. Fabricate components with joints tightly fitted and secured.
     5. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
     6. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
     7. Seal joined pieces by continuous welds in accordance with AWS D1.1.
     8. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush and hairline. Ease exposed edges to small uniform radius.
     9. Accurately form components to each other and to building structure.
     10. Hot-dip Galvanized
         1. In accordance with ASTM A 123 Grade 75, minimum 1.7 oz. per square foot for steel and iron products; ASTM A 153 for steel and iron hardware.
         2. One piece in greatest extent possible for fabricated assemblies in accordance with ASTM A 123. Field welding of galvanized main components not permitted.
         3. Surfaces shall be free of icicles, spangles and puddling. Provide venting holes at all enclosed sections, “V" notch and drilled holes are acceptable. Locate to prevent rainwater from entering section at exterior galvanized items. See drawings and schedules for extent of steel items to be provided with a galvanized finish.
     11. Finish
         1. Galvanized coating thickness in accordance with ASTM A 123.
         2. Final Exposed Finish: Gloss Polyurethane Special Coatings as specified in Section 09 90 00 Painting. Color as selected in Section 09 05 00.

1. **EXECUTION**
   1. **EXAMINATION**
      1. Verify that field conditions are acceptable and are ready to receive Work.
      2. Beginning of installation means erector accepts existing conditions.
   2. **PREPARATION**
      1. Clean and strip steel items to bare metal where site welding is required.
   3. **INSTALLATION**
      1. Set vertical supports in sleeves with the specified non-shrink grout. Slope to drain at each post.
      2. Install components plumb and level, accurately fitted, free from distortion or defects.
      3. Provide anchors, plates or angles required for connecting railings to structure. Anchor railing to structure. Mount railings 1-1/2 inches clearance from side walls or columns.
      4. Field weld anchors as indicated on shop drawings. Grind welds smooth.
      5. Conceal bolts and screws. Where not concealed, use flush countersunk fastenings.
      6. Touch up welds and chipped surfaces with specified galvanizing compound prior to painting, minimum thickness 5 mils.
   4. **ERECTION TOLERANCES**
      1. Maximum Variation From Plumb: 1/4 inch in 10 feet.
   5. **SCHEDULE**
      1. As detailed and located in drawings.
      2. Stair and ramp handrails.
      3. Wall handrails.
      4. Guardrails.
      5. Guardrails at level difference of 30 inches and above.
      6. Guardrails on 3 sides at floor and roof openings, including roof railings.
      7. Rails at drinking fountains.

**END OF SECTION**