

SECTION 05 51 50
STEEL LADDER AND SAFETY CAGE ASSEMBLIES

PART 1 GENERAL

1.1 WORK INCLUDED:

- A. This work includes furnishing and installing of the coated steel ladder and safety cage assemblies, including materials, fabrications, and installation in accordance with the Drawings and applicable local state, and federal safety regulations.
- B. It is the intent of this specification that the ladder and safety cage assembly conform to the Code of Federal Regulations (CFR) Section 29, Chapter XVII, Part 1910.27, Fixed Ladders. In the event a conflict occurs between this specification and the CFR, the CFR specification shall in all cases prevail.

1.2 QUALITY STANDARDS:

- A. American Welding Society (AWS)
 - 1. ANSI/AWS D1.1 – Structural Welding Code
 - 2. Welding Handbook – Materials and Applications – Part 1
- B. American Society for Testing Materials
 - 1. ASTM A 6 – Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes and Sheet Piling
 - 2. ASTM A 36 - Specifications for Structural Steel
 - 3. ASTM A 276 – Specification for Stainless Steel Bars and Shapes
 - 4. ASTM E 488 – Test Methods for Strength of Anchors in Concrete and Masonry Elements
 - 5. ASTM A 615 - Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - 6. ASTM F 593 – Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
- C. American Institute for Steel Construction (AISC)
 - 1. Steel Construction Manual
- D. Code of Federal Regulations (CFR)
 - 1. Section 29, Chapter XVII, Part 1910.27, Fixed Ladders

- E. Society for Protective Coatings (SSPC)
 - 1. SP 8 – Pickling
 - 2. SP 10 – Near White Blast Cleaning

1.3 SUBMITTALS.

- A. Shop drawings shall conform to the requirements of SECTION 01300 – SUBMITTALS.
- B. Shop drawings detailing fabrication including plan and elevation views, sections, details and connections. Indicate welded connections using standard AWS welding symbols. Clearly indicate net weld lengths, sizes and welding sequences.
- C. Submit copies of welder certifications
- D. Submit copies of coating system certification

1.4 DELIVERY, STORAGE AND HANDLING

- A. See SECTION 01610 – DELIVERY, STORAGE AND HANDLING
- B. Handle the fabrication using nylon slings in such a manner to avoid damaging or permanently bending the fabrication.
- C. Store the fabrication in a safe location on wood pallets and protect from damage due to any construction operations.
- D. Remove dirt from the ladder prior to lifting and installing.

1.5 QUALITY ASSURANCE

- A. All welding shall conform to referenced AWS standards
- B. Materials shall conform to referenced AISC – Steel Construction Manual and ASTM standards
- C. Qualify welding processes and welders in accordance with AWS D1.1.
- D. Field Measurements: Take field measurements prior to fabrication and after structure deflections have occurred to ensure proper fitting of the work. Allow for trimming and fitting whenever the taking of field measurements before fabrication might delay the work

PART 2 MATERIALS

2.1 GENERAL

- A. Materials used in the work shall conform and meet the requirements for the class of the material named.
- B. The as-fabricated straightness tolerances of members shall be less than or equal to one-half of the tolerances in ASTM A 6.

2.2 BAR AND PLATE STEEL

- A. The steel used for fabricating ladder and safety cage assemblies shall conform to the requirements of ASTM A 36.

2.3 DEFORMED REINFORCING BAR STEEL

- A. Deformed reinforcing bar steel used for ladder rungs shall conform to ASTM A 615, Grade 40 or 60.

2.4 COATINGS

A. Interior Ladder

- 1. The interior ladder and safety cage assembly shall be coated with Tnemec Poto-Pox Series 20, Epoxy-Polyamide coating, as described in SECTION 09 91 00 – Painting and Protective Coatings – System 2, for potable water tank systems after fabrication.
- 2. The color shall be 20-AA90, White.

B. Exterior Ladder

- 1. The exterior ladder shall be coated with Tnemec Aliphatic Acrylic Polyurethane Series 27, Epoxy-Polyamide coating, as described in SECTION 09 91 00 – Painting and Protective Coatings – System 14.
- 2. The color shall be Desert Sand.

2.5 CONCRETE ANCHOR BOLTS

- A. Stainless steel wedge style anchor bolts shall be used for anchoring ladder and safety cage assemblies to the floor of concrete structures.

B. Ramset / Red Head WW-5860 (5/8-inch dia. by 3 1/2-inch long) stainless steel anchor bolts, or equal, shall be used.

1. Bolt body shall conform to Type 316 stainless steel
2. Expansion clip shall conform to Type 302 stainless steel
3. Washer shall conform to Type 316 stainless steel
4. Nut shall conform to Type 316 stainless steel

2.6 SACRIFICIAL MAGNESIUM ANODE STUDS

A. Studs shall be stainless steel conforming to ASTM F 593.

PART 3 EXECUTION

3.1 GENERAL

A. Fabrication shall conform to the appropriate sections of the AWS and AISC Standards.

3.2 WELDING

A. All welding shall conform to the Structural Welding Code of the AWS.

B. The ladder and safety shall be fabricated using prequalified fillet welds provided that they conform to the requirements of the AWS Code and the AISC Specifications.

C. All fillet welds shall have a 1/4-inch root thickness.

3.3 FABRICATION

A. Flame cutting of steel may be by hand or mechanically guided means.

B. Surfaces shall have a maximum ANSI roughness height value of 500. Any fabricating technique, such as friction sawing, cold sawing, milling, etc., that produces such a finish may be used.

C. Members which are to be framed to other parts of the steel ladder or safety cage may have a variation from the detailed length not greater than 1/16-inch.

D. Completed members shall be free from twists, bends, and open joints.

E. Sharp kinks, bends, or burrs are cause for rejection of the ladder and safety cage.

3.4 SURFACE PREPARATION:

- A. Surfaces shall be cleaned after fabrication of the assembly by SSPC-SP10, Near White Metal Blast Cleaning or SSPC-SP8, Pickling.
- B. SSPC-SP10 requires the removal of 95% of all visible rust, mill scale, paint and other foreign material from each square inch of surface by compressed air nozzle blasting, centrifugal wheels or other means of abrasive blast cleaning.

3.5 SHIPMENT

- A. Allow a minimum of seven (7) days curing after the application of the finish coat prior to shipment and installation.

3.6 INSTALLATION

- A. Concrete Structures
 - 1. All wedge style anchor boltholes shall be drilled when the ladder is temporarily set in place as a template. Re-drilling of holes or enlarging of holes is not permitted.
 - 2. The stainless steel wedge anchors shall be installed in accordance with the manufacturer's recommended procedures.
- B. Repair
 - 1. All areas where the coating has been damaged during installation shall be cleaned again and primed with the same primer, intermediate and finish coats applied to the same dry film thicknesses.
- C. Install studs and anodes where shown in the Drawings and in accordance with SECTION 05 80 00 – SACRIFICIAL MAGNESIUM ANODES.
- E. Apply a final coat of Tnemec Series 20.

END OF SECTION

SECTION 05 52 00
STEEL HANDRAILS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. The work shall include, but is not necessarily limited to the fabrication, furnishing and installation of steel handrails and fittings.

1.2 QUALITY STANDARDS

- A. ASTM A 53 - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
- B. ASTM A 500 - Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- C. ASTM A 501 - Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
- D. ASTM E 935 - Test Methods for Performance of Permanent Metal Railing Systems and Rails for Building
- E. ASTM E 985 - Specification for Permanent Metal Railing Systems and Rails for Buildings
- F. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual

1.3 SUBMITTALS

- A. Submit shop drawings which indicate the profiles, sizes, connection attachments, anchorages, sizes and types of fasteners, and accessories.

1.4 DESIGN REQUIREMENTS

- A. General
 - 1. Railing assembly, wall rails, and attachments shall conform to ASTM E 985.
 - 2. Posts shall be spaced at a maximum of six feet on center unless otherwise shown on the Drawings.

3. Expansion bolts shall be stainless steel type 316 wedge bolts and shall be furnished by the handrail manufacturer. A factor of safety of four shall be used on expansion bolt pullout values published by the manufacturer. Expansion bolts shall be spaced at 10 bolt diameters apart with a 5 bolt diameter edge distance for no reduction in pullout strength.

B. Lateral Load

1. Safety railing assembly, wall rails, and attachments shall resist a lateral 200 pound concentrated load applied in any direction to the top rail. The height of the top rail shall be 42 inches.

PART 2 MATERIALS

2.1 STEEL RAILING SYSTEM

A. Rails and Posts

1. Rails and posts shall be 1-1/2 inch diameter Schedule 40 steel pipe.

B. Fittings

1. Elbows, T-shapes, wall brackets, and other fittings shall be of cast or machined steel.

C. Mounting

1. Mounting shall consist of brackets and flanges with steel inserts for casting into the concrete. Prepare a backing plate for mounting into walls.

D. Splice Connectors

1. Steel splice connectors may be of the concealed spigot, collar with locking set screws, or welding collar type.

E. Exposed Fasteners

1. Exposed fasteners shall be countersunk screws or bolts, consistent with the design of the railing.

F. Painting

1. Provide one 3.0 mil coat of a rust-inhibitive, oil-based primer (Tnemec Series 4 or equivalent), and two 3.0 mil coats of a semi-gloss alkyd enamel

(Tnemec Series 23 or equivalent). Color shall be Desert Sand unless otherwise indicated on the Drawings.

2.2 FABRICATION

1. Fit and shop assemble components in largest practical sizes for delivery to the site. Shop-assembled components shall not to exceed 24 feet in length.
2. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
3. Provide the anchors, plates, angles or other fasteners for connecting railings to the structure. Fasteners shall be of the same material and finish as the railing. Exposed mechanical fasteners shall be flush countersunk screws or bolts, unobtrusively located and consistent with the design of the component.
4. Joined railing pieces shall be continuously sealed. For railings exposed to weather, drill condensate drainage holes at the bottom of members at locations that will not encourage water intrusion.
5. 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.
6. Accurately form components to each other and the structure to which they are attached.
7. Railing shall accommodate expansion and contraction of structures to which they are attached without damage to the connections or structures.

PART 3 EXECUTION

3.1 EXAMINATION

1. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

1. Clean and strip metal surfaces where site welding is required.
2. Supply items required to be cast into the concrete with setting templates to appropriate sections.

3.3 INSTALLATION

1. Install railing in accordance with manufacturer's recommendations.
2. Install components plumb and level, accurately fitted, free from distortion or defects.
3. Anchor railing to structure with anchors, plates, or angles as required.
4. Field weld anchors where required. Touch-up welds with primer and grind smooth.
5. Conceal bolts and screws wherever possible. Where not concealed, use flush countersunk fastenings.
6. Assemble with spigots and sleeves to accommodate tight joints and secure installation.

END OF SECTION

**SECTION 05 80 00
SACRIFICIAL MAGNESIUM ANODES**

PART 1 GENERAL

1.1 WORK INCLUDED

- A. The CONTRACTOR shall furnish and install magnesium anodes on metal appurtenances as shown in the Drawings. The work includes furnish and installing sacrificial magnesium anodes.

1.2 QUALITY ASSURANCE

- A. Garfield Alloys magnesium PVC coated Type 2R-5 anodes or equivalent, with a 1/2 inch diameter by 1 inch deep drilled and tapped core, or equal shall be used.
- B. The anodes are available from Farwest Corrosion Control Company 3825 Paris, Denver, Colorado 80239, Telephone (303) 307-1447

1.3 QUALITY STANDARDS

- A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - 1. ASTM B 843, Specification for Magnesium Alloy Anodes for Cathodic Protection

1.3 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original, tightly sealed containers or unopened packages with the manufacturer's name, labels and product identification.
- B. Materials shall be stored in a secure, dry area until installed.

PART 2 PRODUCTS

2.1 ALLOY SPECIFICATIONS

- A. The magnesium anode shall conform to the following alloy specification:

Al	0.01% max.
Mn	0.80 – 1.1%
Cu	0.002% max.
Si	0.04% max.
Fe	0.03% Max.

Ni	0.001% max.
Other	0.05% each or 0.3% max. total
Magnesium	Remainder

- B. The above shall be in conformance with ASTM B843 for M1C high potential magnesium anodes.

2.2 ANODE DIMENSIONS

- A. The anode shall be approximately 4 1/4 inches in diameter, 2 1/4 inches thick and weigh 2 pounds and drilled and tapped for a 1/2 dia. SS stud.
- B. Anodes which are cracked or chipped shall be rejected.

2.3 STUD

- A. The stud used to attach the anode to appurtenances, such as the overflow weir and pipe, shall be 304 or 316 stainless steel and threaded to match the threads of the anode.

PART 3 EXECUTION

- A. Prior to installation of the anode the metal stud shall be wire brushed to remove any coating or rust, for a positive electrical contact.
- B. Anodes that are cracked or chipped during the installation process shall be replaced.
- C. The anodes shall be threaded onto the 1/2 inch diameter stainless steel studs on metal ladders, ladder safety cages and piping as shown in the Drawings after the final storage tank cleaning, prior to water tightness testing.

END OF SECTION