SECTION 05120
STRUCTURAL STEEL

PART 1 – GENERAL

1.01 DESCRIPTION
A. This Section includes specifications for structural steel.

1.02 REFERENCE STANDARDS
A. American Railway Engineering and Maintenance-of Way Association (AREMA),
B. American Welding Society (AWS):
   1. D1.1 Structural Welding Code Steel
   2. D1.5 Bridge Welding Code
C. State of California, Department of Transportation (Caltrans), Standard Specifications
   1. Section 55 Steel Structures.
D. Steel Structures Painting Council (SSPC):
   1. SP 1 Solvent Cleaning
   2. SP 3 Power Tool Cleaning
   2. SP 10 Near-White Blast Cleaning
   3. SP 11 Power Tool Cleaning to Bare Metal
   4. PA 1 Shop, Field & Maintenance Painting
   5. Paint 20 Zinc-Rich Primers (Type I – Inorganic & Type II – Organic)
   6. Paint 22 Epoxy-Polyamide Paints (Primers, Intermediate & Topcoats)

1.03 SUBMITTALS
A. Submit shop drawings conforming to Caltrans Standard Specifications, Section 55-1.02 Drawings, second paragraph, and AREMA Manual, Section 1.1 of Chapter 15. Shop drawings shall also show the following:
   1. Profiles, sizes, spacing, and locations of structural members, openings, and attachments.
   2. Details of connections: bolted and welded.
3. Details of welded connections with symbols conforming to AWS standards. Indicate net weld lengths.

B. Product data for primer.

1.04 DELIVERABLES

A. Quality Control Deliverables:

1. Certified Mill Test Reports: Submit certified mill test reports indicating structural strength, and destructive and non-destructive test analyses.

2. Certificates of Compliance: Submit Certificates of Compliance to certify that products meet or exceed specified requirements.

3. Welders' Certificates: Submit certification of personnel employed on the work to satisfy the requirements of Part 4 of AWS D1.1.

1.05 QUALITY ASSURANCE

A. Refer to Section 01400, Quality Control and Assurance. Contractor’s Quality Control Plan shall include listing of methods and personnel to satisfy AWS D1.5, if applicable.

B. Calculations substantiating camber, which are submitted with shop drawings in accordance with Caltrans Standard Specifications, Section 55-1.02, shall be prepared, sealed, and signed by a Professional Engineer hired by the Contractor who is currently registered in the State of California.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Unless otherwise noted in the Contract Documents, the following shall be used for structural steel members:


B. Section 05500, Metal Fabrications: Steel items required in construction of Shelters.
2.02 FABRICATION

A. Fabricate structural steel in accordance with Caltrans Standard Specifications, Section 55-3, Fabrication, and as specified herein.

B. Fabricate structural steel for railroad bridges in accordance with AREMA Manual, Chapter 15.

C. Shop Assembly: Continuously seal joined members by continuous welds. Grind exposed welds smooth.

2.03 SHOP FINISHING

A. Interior, Non-Corrosive Applications:

1. After fabrication and immediately before shop painting, wash structural steel materials with solvent to remove dust and residue in accordance with SSPC-SP 1.
   a. Structural Steel Materials not Exposed to the Public: Power-tool cleaned in accordance with SSPC-SP 3 to remove mill scale, rust, grease, oil, and any other foreign matter.
   b. Structural Steel Materials Exposed to Public View: Blast cleaned in accordance with SSPC-SP 10 or power-tool cleaned in accordance with SSPC-SP 11 to remove all visible mill scale, rust, grease, oil, and any other foreign matter.

2. If materials are not painted immediately after cleaning then those materials shall be washed with solvent to remove dust and residue in accordance with SSPC SP 1.

3. After preparation, shop paint steel materials with one coat of corrosion-inhibitive metal primer in accordance with SSPC-PA 1. Materials and application shall conform to SSPC-Paint 20 or SSPC-Paint 22.

B. Exterior Applications:

1. Steelwork to be Exposed to Weather: Blast cleaned in accordance with SSPC-SP 10, Near White Blast Cleaning, or power-tool cleaned in accordance with SSPC-SP 11, Power Tool Cleaning to Bare Metal.

2. After cleaning, solvent wash in accordance with SSPC-SP 1, and shop paint steelwork in accordance with SSPC-PA 1. Materials and application shall conform to SSPC-Paint 20.
PART 3 - EXECUTION

3.01 INSTALLATION

A. Erection:

1. Allow for erection loads, and for sufficient temporary bracing to maintain the structure safely plumb and in true alignment until completion of erection and installation of permanent bracing.

2. Do not field cut or alter structural members without prior approval of the Engineer.

3. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

4. Coordinate the installation of structural steel with the installation of miscellaneous metals to minimize the requirement for field cutting, alteration, temporary bracing, and redundant operations during erection.

B. Erection Tolerances: Maximum offset from true alignment shall be 1/4 inch.

3.02 FIELD FINISH

A. Refer to Section 09900, Paints and Coatings, for field finish for work of this Section.

END OF SECTION
SECTION 05500
METAL FABRICATION

PART 1 - GENERAL

1.01 DESCRIPTION
A. This Section includes specifications for metal fabrication, including galvanizing.

1.02 REFERENCE STANDARDS
A. ASTM International (ASTM):
   1. A27 Specification for Steel Castings, Carbon, for General Application
   2. A36 Specification for Carbon Structural Steel
   3. A48 Specification for Gray Iron Castings
   4. A53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   5. A109 Specification for Steel, Strip, Carbon (0.25 Maximum Percent), Cold-Rolled
   7. A307 Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile
   8. A325 Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
   10. A536 Specifications for Ductile Iron Castings
   11. A653 Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
   12. A780 Practice for Repair of Damaged Hot-Dip Galvanized Coatings
B. American Welding Society (AWS):
   1. D1.1 Structural Welding Code Steel
C. Department of Defense (DOD):
   1. DOD-P-15328 Primer (Wash), Pretreatment (Formula No. 117 For Metals) (Metric)
D. Federal Specifications (FS)
   1. QQ-F-461 Floor Plate, Steel, Rolled.

E. Steel Structures Painting Council (SSPC):
   1. SSPC-SP 1 Solvent Cleaning
   2. SSPC-SP 3 Power Tool Cleaning
   3. SSPC-PA 1 Shop, Field & Maintenance Painting
   4. SSPC-Paint 20 Zinc-Rich Primers (Type I – Inorganic & Type II – Organic)
   5. SSPC-Paint 22 Epoxy-Polyamide Paints (Primers, Intermediate & Topcoats)

1.03 SUBMITTALS

A. Submit shop drawings showing the following:
   1. Sizes, details of fabrication and construction, methods of assembly, locations of hardware, anchors, and accessories, and installation details.
   2. Details for manufacturer’s items or fabricated metalwork.
   3. Field erection details showing cuts, copes, connections, holes, threaded fasteners and welds, both shop and field, by symbols conforming to AWS standards. Indicate net weld lengths.

B. Submit manufacturers’ product data. Include application instructions for for galvanizing repair product.

1.04 DELIVERABLES

A. Welders' Certificates: Submit certification of personnel employed on the work to satisfy the requirements of Part 4 of AWS D1.1.

1.05 QUALITY ASSURANCE

A. Welding including shielded arc process shall conform to the requirements in AWS D1.1 Structural Welding Code

PART 2 - PRODUCTS

2.01 STEEL

A. Plates, Shapes and Bars: ASTM A36, unless otherwise noted.

B. Sheet, Commercial Quality, Galvanized: ASTM A653, G90.

C. Strip: ASTM A109
D. Pipe: ASTM A53, Grade B, Schedule 40, black or galvanized, as indicated.
E. Castings: ASTM A27 or A48, as indicated.
F. Ductile Iron: ASTM A536

2.02 FASTENERS
A. Steel Bolts, Nuts, Shear Studs and Threaded Rods: ASTM A307, unless otherwise noted.
B. High Strength Steel Bolts and Nuts: ASTM A325, unless otherwise noted.
C. Threaded Inserts: ASTM A488, unless otherwise noted

2.03 MISCELLANEOUS MATERIALS
A. Use E7018 low hydrogen electrodes for A36 steel.
B. Primer Pretreatment: DOD-P-15328.
C. Corrosion-Inhibitive Metal Primer: SSPC-Paint 20 or SSPC-Paint 22. Verify compatibility of shop primer and finish coats specified in Section 09900, Paints and Coatings.
D. Hot Process Field Galvanizing (for repairs): Galv, Galvalloy, Galvweldalloy, or equal.

2.04 CHECKERED SAFETY PLATE
A. FS QQ-F-461, Class 1, flat black, standard 4-way raised pattern.

2.05 IRON CASTINGS
A. Gray: ASTM A48, Class 35B, unless otherwise noted.

2.06 FABRICATION - GENERAL
A. Fabricate miscellaneous metal items with light structural angles, tees, bars, channels, plates, rods, pipes and other rolled steel shapes, as indicated in the Contract Documents and specified herein.
B. Fabricate work true to shape, size and tolerances as indicated on the Contract Drawings and approved shop drawings; with straight lines, square corners or smooth bends; free from twists, kinks, warps, dents, and other imperfections. Straighten work bent by shearing or punching.
C. Utilize metal of sufficient thickness and detail assembly and support to provide strength and stiffness sufficient to resist distortion during shipment, handling, installation, and severe service conditions. Exposed edges and ends of metal shall be ground smooth with no sharp edges and with corners slightly rounded. Connections and joints exposed to weather shall be watertight.
D. Form curved work to radii indicated. Furnish bolts, nuts, washers, and other fastening devices required for securing work.

E. For pipe sleeves in concrete construction, provide standard weight, black steel pipe with anchors welded to exterior. Provide sizes as required to accommodate passage of conduits, pipes, ducts and similar items with proper clearance.

F. Fabricate flanges for posts from 3/8-inch minimum thickness plate, and for standoffs from not less than 3/16-inch thickness plate.

G. Grind off excess metal and make smooth surface welds which will be exposed to view.

2.07 GALVANIZING

A. Where galvanizing is required, fabricate units complete or in largest practical sections before galvanizing. Thoroughly clean welded areas prior to galvanizing. Remove weld spatter, burrs, oil, grease and any other deleterious matter that would interfere with the adherence of the zinc.

B. Hot dip galvanize products after fabrication (including shearing, punching, bending, forming, or welding) in accordance with ASTM A 123.

C. The weight of zinc coating shall be not less than 2.0 ounces per square foot of surface area.

2.08 SHOP FINISHING

A. Nongalvanized Metalwork: Shop paint ferrous metal which is not indicated to be galvanized.

1. After fabrication and immediately before shop painting, power-tool clean ferrous metalwork in accordance with SSPC-SP 3 to remove mill scale, rust, grease, oil, and any other foreign matter. Wire brush welds thoroughly.

2. After power-tool cleaning and just before shop painting, wash ferrous metalwork with solvent to remove dust and residue in accordance with SSPC-SP 1.

3. After cleaning and solvent washing, shop paint ferrous metalwork with one coat of corrosion-inhibitive metal primer in accordance with SSPC-PA 1. Material and application shall conform to SSPC-Paint 20 or SSPC-Paint 22.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install metal fabrications with installation accessories furnished by fabricator as required for complete installation.
B. Install in accordance with approved shop drawings, true and horizontal, perpendicular, or at required angle, as the case may be, level and square with angles and edges parallel with related lines of structure.

C. Install threaded rods used as dowels as specified in Section 03200, Concrete Reinforcing.

D. Keep field joints to a minimum and concealed. Make field joints strong, rigid, watertight and flush with hairline fit. Grind sharp corners smooth.

E. Grind off excess metal and make smooth surface welds which will be exposed to view.

F. Securely grout posts set in sleeves in conformance to grout manufacturer's instructions. Attach posts not set in sleeves with appropriate fasteners.

G. After installation, retouch damaged primed surfaces; leave ready for field painting. Touch up galvanized surfaces using hot process field galvanizing product.

END OF SECTION
SECTION 05521
PIPE HANDRAILS AND PEDESTRIAN EXIT GATES

PART 1 - GENERAL

1.01 DESCRIPTION
A. This Section includes specifications for pipe handrail and pedestrian exit gates, including galvanizing.

1.02 REFERENCE STANDARDS
A. ASTM International (ASTM):
   1. A36 Specification for Carbon Structural Steel
   2. A53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   3. A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   4. A780 Practice for Repair of Damaged Hot-Dip Galvanized Coatings
B. American Welding Society (AWS):
   1. D1.1 Structural Welding Code Steel

1.03 SUBMITTALS
A. Submit shop drawings showing member sizes, details of fabrication and construction, methods of assembly, and installation details.
B. Submit manufacturers’ product data. Include application instructions for galvanizing repair product.

1.04 DELIVERABLES
A. Welders’ Certificates: Submit certification of personnel employed on the work to satisfy the requirements of Part 4 of AWS D1.1.

1.05 QUALITY ASSURANCE
A. Welding including shielded arc process shall conform to the requirements in AWS D1.1 Structural Welding Code

PART 2 - PRODUCTS

2.01 MATERIALS
A. Steel Plate and Miscellaneous Items: ASTM A36, except as otherwise indicated on the Contract Drawings.
B. Steel Pipe: Pipe for Handrail and Gates: Seamless steel pipe, conforming to ASTM A53, Type S, Grade A, standard weight, nominal size as shown on the Contract Drawings.

C. Brackets, Bolts, Threaded Studs, Nuts, Washers and Other Fittings: Commercial quality structural steel, except that standard steel pipe fittings may be used where shown on the Contract Drawings.

D. Mechanical expansion anchors for attaching the railing to supporting concrete members: Concrete anchorage devices as specified in Section 75-1.03, "Miscellaneous Bridge Metal."


F. Hot Process Field Galvanizing (for repairs): Galv, Galvalloy, Galvweldalloy, or equal.

2.02 FABRICATION

A. Weld railings, continuous as detailed. Fabricate welded pipe items with flush welded construction throughout, except where sleeve joints or other mechanical joints for field connection or job requirements are necessary. Fabricate railings and gates neat, rigid, and in accordance with the details shown on the Contract Drawings. Fabricate railings in shop to greatest practical extent.

B. Heat railing and make radius bends to produce uniform curvature without distortion. Shape curved sections on true radius without buckle, dent, kinks or flattened sections. Cope intersections; continuously weld and grind welds smooth. Return rail ends to 1/4 inch clearance and weld plug over open end.

C. Furnish bolts, nuts, washers, and other fastening devices required for anchoring and securing work.

D. Sleeves for Anchoring Railing Posts in Concrete: Galvanized standard pipe sleeves with welded-on bottom plates or 24 gage galvanized sheet metal sleeves with bottoms.

E. Pedestrian Exit Gate Posts: Provide steel sleeves with locking mechanism and padlock. Sleeve and locking mechanism shall be configured to facilitate removal and reinstallation of the gates and posts by authorized personnel for emergency or maintenance use as a vehicular crossing. Bottom of gate post sleeve shall provide drainage of sleeve and positive support of gate post.

F. Grind off excess metal and make smooth surface welds which will be exposed to view.

2.03 WELDING

A. Use electric shielded arc process conforming to the requirements of AWS D1.1.

1. Use E7018 low hydrogen electrodes for A36 steel.
2.04 GALVANIZING

A. Where galvanizing is required, fabricate units complete or in largest practical sections before galvanizing. Thoroughly clean welded areas prior to galvanizing. Remove weld spatter, burrs, oil, grease and any other deleterious matter that would interfere with the adherence of the zinc.

B. Hot dip galvanize exterior railing, gates, and attached metal components after fabrication (including shearing, punching, bending, forming, or welding) in accordance with ASTM A123.

C. The weight of zinc coating shall be not less than 2.0 ounces per square foot of surface area.

D. After galvanizing, all elements of the railing shall be free of fins, abrasions, rough or sharp edges and other surface defects and shall not be kinked, twisted or bent. If straightening is necessary, straighten using methods approved by the Engineer. Kinks, twists, or bends in railing elements may be cause for rejection of the railing elements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install work straight and plumb with members anchored, secure and fasten together in accurate position, neat, rigid, level, square, straight and plumb.

B. Keep field joints to a minimum and concealed to greatest practical extent. Make field joints strong, rigid, watertight and flush with hairline fit. Ease sharp corners.

C. Securely posts set in sleeves with non-shrink grout in accordance with grout manufacturer's instructions.

D. Where posts are not set in sleeves, mechanically secure posts to wood or steel surfaces with fasteners as shown on the Contract Drawings or in accordance with approved shop drawings.

E. Secure wall brackets to solid construction with concealed anchorage at 4 feet 6 inches maximum on center. Provide floor flanges where shown; snug fit over posts and in contact with floor; secure in place.

F. Repair abraded or damaged galvanized surfaces with hot process field galvanizing in accordance with ASTM A780 and manufacturer's published instructions.

3.02 SITE TOLERANCES

A. Install posts vertical within a tolerance not to exceed 0.02-foot in 10 feet.

3.03 FIELD PAINTING

A. Field paint steel pipe and attached metal components in accordance with Section 09900, Paints and Coatings. Color shall match Sherman Williams
Colonial Yellow, SW0030.

END OF SECTION