

SECTION 0501

METALS

0501.0100 GENERAL

0501.0101 Description of the Work. The work under this section shall consist of furnishing and installing materials including but not limited to the following:

- Aluminum and miscellaneous nonferrous metals
- Anchors and anchor bolts
- Bolts
- Grating and frames
- Hatches
- Ladders
- Manhole frames and covers
- Metal roof decking
- Miscellaneous aluminum
- Miscellaneous cast iron
- Miscellaneous metal items shown on the Plans or specified
- Miscellaneous structural steel
- Pipe handrails, pipe sleeves, inserts, and gates
- Shade structures
- Sheet metalwork
- Stairs and treads
- Structural steel
- Supports for mechanical equipment
- Tread plates and frames

0501.0103 Submittals. Before moving any materials to the site or commencing any work in the section the contractor must submit five (5) copies for the Engineer's approval. No materials will be allowed on site without this approval.

Unless otherwise specified or indicated on the Plans or Typical Details, structural and miscellaneous metals shall conform to the standards of the American Society for Testing and Materials (ASTM), latest revision, including but not limited to the following:

SECTION 0501

Item	ASTM Standard #	Class, Grade, Type or Alloy No.
Steel		
Galvanized sheet iron or steel	A 446 A 525 A 526	Coating G90 (min.)
Structural steel	A 36	
Standard bolts, nuts, & washers	A 307	
High strength bolts, nuts, & washers	A 325	
Tubing, cold-formed	A 500	
Tubing, hot-formed	A 501	
Black steel, sheet or strip	A 569 A 570	
Coil (plate)	A 635	
Steel pipe	A 53	Grade B
Stainless Steel		
Plate, sheet and strip	A 167	Type 304 or 316
Bars and shapes	A 276	Type 304 or 316
Aluminum		
Sheet aluminum-flashing	B 209	Alloy 5005-H14, 0.032 inches min thickness
Sheet aluminum-structural	B 209	Alloy 6061-T6
Structural aluminum	B 308	Alloy 6061-T6 B 209
Extruded aluminum	B 221	Alloy 6063-T42
Cast Iron		
Cast iron	A 48	Class 40 B

Other structural and miscellaneous metal items shall be as indicated on the Plans, typical details, or as specified.

0501.0105 Fabrication and Erection. All fabrication and erection of steel items shall conform to AISC “Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings” wherever applicable, except as may be modified by applicable building codes and specifications, of which this is a part.

Where anchors, connections, or other details of miscellaneous metalwork are not definitely indicated or specified, their material, size, form, attachment, and location shall be equivalent in quality and workmanship to items as specified herein.

Galvanized structural steel or iron shall be “hot dipped” galvanized after fabrication in accordance with ASTM A 123. Electro-galvanizing shall not be used unless specified. Galvanized items that bend or twist during galvanizing shall be re-straightened to ASTM A6 dimensional tolerances.

All bolts shall be provided with washers and self-locking nuts, or lock washers and plain nut. Bolts, including anchor bolts, nuts, washers, and similar fasteners specified to be galvanized, shall be galvanized after cleaning in accordance with ASTM A 153. All bolts, including anchor bolts and

SECTION 0501

concrete anchors, shall project beyond the attached nut or nuts a minimum of two threads and a maximum of one-half-inch.

All cut or otherwise damaged galvanized surfaces shall be field repaired to equivalent original condition using Galvinox, Galvo-Weld, or equal.

The Contractor shall take all measurements necessary to properly fit its work in the field. The Contractor shall be governed by and be responsible for these measurements and the proper working out of all details. The Contractor shall be responsible for the correct fitting of all metalwork in the field. Sharp or hazardous projections shall be rounded off and ground smooth. the Contractor shall paint steel and miscellaneous ferrous metal items in accordance with these Specifications.

Where aluminum comes in contact with dissimilar metals, it shall be bolted with stainless steel bolts and separated or isolated from the dissimilar metals, as well as the stainless steel bolts and nuts, with neoprene gaskets, sleeves, and washers. Those parts of aluminum which will be cast into concrete or come into contact with concrete, masonry, or wood shall be coated in accordance with these Specifications.

All stainless steel bolt and screw surfaces shall be coated with Never-Seez by Never Seez Compound Corp., WLR No. 111 by Oil Research Inc., or equal.

0501.0106 Structural Metal. All structural or foundry items shall be carefully fabricated to true dimensions without warp or twist. Welded closures shall be neatly made. Where weld material interferes with fit or is unsightly in appearance, it shall be ground off smooth.

Each structural item shall be installed accurately and securely true to level, plumb, alignment, and grade with all parts bearing or fitting the structure or equipment for which it is intended. Cocking out of alignment, redrilling, reshaping, or forcing to fit any fabricated item will not be permitted. It is the Contractor's responsibility to place anchor bolts or other anchoring devices accurately and to make any surfaces which bear against structural items smooth and true to level to preclude the necessity of any springing, redrilling, or reshaping.

Structural items needing a special alignment to preserve straight, level, even, smooth lines shall be rigidly supported and braced and kept braced until concrete, grout, or dry pack cement mortar has hardened for a period of not less than 48 hours.

Certified copies, in duplicate, of mill tests or reports from a recognized commercial laboratory shall be furnished as to the chemical, tensile, and bending properties of each shipment of structural metal or part thereof having common properties. All tests and analyses shall be made in accordance with the applicable ASTM Specification.

All welding under this section shall be done by welders who have a current American Welding Society (AWS) certificate for the type of welding to be done by the welder. The Contractor shall notify the Engineer at least 24 hours before starting shop or field welding. A welding inspector may check the materials, the equipment, and the qualifications of the welders. Welders doing unsatisfactory work shall be removed from work on this project or may be required to requalify.

The inspector may use gamma ray, magnetic particle, dye penetrant, trepanning, or any other aid to visual inspection which is deemed necessary on any part or all welds to insure adequacy of the welds.

SECTION 0501

The cost of any tests and all retests on defective welds shall be borne by the Contractor. Cost in connection with qualifying welders shall also be borne by the Contractor.

0501.0107 Structural Steel. The Contractor shall furnish and install all structural steel items in accordance with the Plans and Typical Details, and as specified herein. The Contractor shall provide all supplementary parts necessary to complete each item even though such work is not definitely covered by the Plans and Specifications.

All structural steel shall be delivered free from mill scale, rust, or pitting. Items not galvanized or protected by a shop coat of paint shall be protected from the weather until erection and painting.

Welding steel shall conform to AWS D1.1, Structural Welding Code – Steel.

All welds shall be full penetration welds, unless specified otherwise.

All welding of structural steel Type ASTM A 36 shall be done using electrodes conforming to AWS A 5.1, Specification for Mild Steel Covered Arc Welding Electrodes, or using electrodes and fluxes conforming to AWS A 5.17, Specification for Bare Mild Steel Electrodes and Fluxes for Submerged Arc Welding using an F7XX-EXXX electrode-flux combination. Welding of stainless steels shall be done with electrodes and techniques as recommended in Welded Austenitic Chromium – Nickel Stainless Steel – Techniques and Properties as published by the International Nickel Company, Inc., New York, New York.

0501.0108 Anchor Bolts and Inserts. Anchor bolts shall be cast in place when concrete is placed, wherever feasible. Anchor bolts, concrete anchors, and flush shells embedded in concrete shall be accurately spaced with bolts truly normal to the surfaces from which they project.

Anchor bolts and nuts shall be Type 316 stainless steel when:

- They will be submerged in water
- They are located below the tops of the walls, as in structures customarily containing water, even if above water level
- In ceilings or overheads
- In the dry side of water bearing walls
- Securing aluminum to steel or concrete equipment

Other anchor bolts not required to be of stainless steel shall be stainless steel or galvanized carbon steel conforming to ASTM A 307 or ASTM A 36, at the Contractor's option.

Anchor bolts shall not touch reinforcing steel. Where anchor bolts are within 1/4-inch of reinforcing steel, anchor bolts shall be insulated with not less than three wraps of 10-mil PVC tape in the area adjacent to the reinforcing steel.

In anchoring machinery bases subject to heavy vibration, two nuts shall be used, one serving as a locknut. All bolts, when indicated for future use, shall be first coated thoroughly with nonoxidizing wax, followed by turning nuts down to the full depth of thread. Exposed thread shall then be neatly wrapped with waterproof polyvinyl tape.

SECTION 0501

0501.0108 A Installation. Unless indicated otherwise on the Plans, anchor bolts shall be embedded not less than twelve diameters and shall have a head or a hook not less than four diameters in length. Where indicated on the Plans, anchor bolts shall be set in metal sleeves having an inside diameter approximately two-inches greater than the bolt diameter and not less than twelve bolt diameters in length. Sleeves shall be filled with grout when the machine or other equipment is grouted in place.

0501.0109 Concrete Anchors. Concrete anchors, where indicated on the Plans or specified, shall mean drilled in place anchors with integral anchor bolts. Concrete anchors shall be ITT-Philips Red Head "Wedge Anchors" with integral anchor bolts; Expansion Products Company "Wej-It" concrete anchors with integral anchor bolts; or equal.

The material of each concrete anchor, including its integral anchor bolt, washer, and nut, shall be stainless steel Type 304 or Type 316.

Concrete anchors shall be not less than 1/2 inch diameter and shall have the following minimum embedment lengths:

Size Inches	Embedment Length, Inches
1/2	2 1/4
5/8	2 3/4
3/4	3 1/4

Prior to installation or use of concrete anchors, the Contractor shall perform the following test with the test results subject to review and acceptance by the Engineer. The Contractor shall do the following tasks:

- (1) Furnish not less than four Type 304 or Type 316 stainless steel concrete anchors, 5/8-inch size of the type proposed to be used.
- (2) Install the concrete anchors in a test block of concrete to the specified embedment length.
- (3) Furnish and install one 5/8-inch nut on each concrete anchor. Tighten each nut with an applied torque of ten-foot pounds.
- (4) Loosen each nut, then retightened with an applied torque load of ten-foot pounds.

Any visible evidence of turning of any of the concrete anchors shall be cause for rejection of the concrete anchors by the Engineer.

Anchor bolts may be cast in the concrete in lieu of using concrete anchors.

Cast iron, lead cinch, or slug-in anchors will not be accepted as substitutes for concrete anchors.