

DIVISION 5 - METALS

The following section specifies all items fabricated from metal shapes, plates, sheets, rods, bars, or castings, and all other wrought or cast metal items. Fabricated metal items that are detailed in the contract documents but not mentioned specifically herein shall be fabricated in accordance the applicable requirements of this section.

05010 – METAL MATERIALS

All materials shall be new and undamaged and shall conform to pertinent ASTM or other industry standard specifications including the following:

STEEL

Shapes, Plates, and Bars

(including concrete imbedded items
other than reinforcing steel)

ASTM A588 or ASTM A242 (weathering)

Structural Tubing

ASTM A847 or ASTM A606, Type 4 (weathering)

Grating

ASTM A606, Type 4 (weathering)

Bolts and Nuts

ASTM F593 and F594, (stainless steel grade 18.8 or 316) or ASTM A325, Type 3 (weathering) and A563, grade C3 or DH3 (weathering)

Flat Washers

ANSI B27.2, of the same material as bolts and nuts

Bat closures shall be fabricated from high strength ($F_y=50,000$ psi), self-weathering, low alloy, atmospheric corrosion resistant steel as specified above.

05030 - METAL FINISHES

Specified hereunder are shop-applied coatings. It is the intent of these specifications to utilize atmospheric corrosion resistant structural steel, grating and appurtenances to the fullest extent practicable. This section specifies the required shop coatings for metal services where it is not practicable to use a corrosion resistant material.

05031 - SHOP COATING**I. Materials**

Unless otherwise authorized, shop applied prime coatings shall be:

Zinc-rich Urethane Primer Tnemec "90-97 Tneme-Zinc" or DuPont "Imron 62 ZF"

For repair of hot-dip galvanized surfaces and to rustproof welds, field applied coatings shall be:

Cold Galvanizing Compound Z.R.C. Cold Galvanizing Compound

II. Cleaning

Surfaces shall be dry and of a proper temperature when coated, and free of grease, oil, dirt, dust, grit, rust, loose mill scale, weld flux, slag, weld spatter, or other objectionable substances. Articles to be galvanized shall be pickled before galvanizing. All other ferrous metal surfaces shall be cleaned by high power wire brushing or blasting. Welds shall be scraped, chipped, and brushed as necessary to remove all weld spatter.

III. Galvanizing

All galvanizing shall be done after fabrication by the hot-dip process in conformity with requirements of ASTM A123, A153 and A385.

IV. Steel

Unless otherwise specified, all ungalvanized structural and miscellaneous steel shall be given an anticorrosion prime coat in the shop after fabrication. Steel surfaces shall be prime coated as soon as practicable after cleaning. All painting shall be done in a heated structure if the outside air temperature is below 50 degrees Fahrenheit. Steel shall not be moved or handled until the shop coat is dry and hard.

Plates, shapes, and bars of ASTM A588 or A618 weathering steel shall not be shop or field primed or painted, except as noted.

V. Aluminum

All surfaces of aluminum that will be in contact with concrete, mortar, or dissimilar metals shall be given a heavy coat of coal tar paint.

VI. Other Surfaces

No shop coating will be required for zincoated steel, stainless steel, or bronze surfaces.

VII. Film Thickness

The dry film thickness of the shop coating shall be at least 2.5 mils for the zinc-rich urethane primer.

05500 – METAL FABRICATIONS

Structural steel members shall be fabricated in accordance with drawings that are a part of the contract documents. The Contractor shall verify all dimensions prior to fabrication. All bolt holes shall be drilled.

Non-corrosion resistant structural steel members shall be cleaned, prepared, and shop primed, unless otherwise specified. Surfaces to be field welded or in contact with concrete shall not be primed.

05501 - FIELD ERECTION

Structural steel and miscellaneous metals shall be erected in accordance with drawings that are a part of the contract documents.

Structural steel and miscellaneous metal shall be stored on blocking so that no metal touches the ground and water cannot collect thereon. The material shall be protected against bending under its own weight or superimposed loads. Care shall be taken in handling steel and miscellaneous metals to avoid unsightly gouges and scrapes.

The Contractor shall make adequate provisions for all erection loads and for sufficient temporary bracing to maintain the structure safe, plumb and in true alignment until completion of erection and installation of necessary permanent bracing.

Before assembly, surfaces to be in contact with each other shall be thoroughly cleaned. All parts shall be assembled accurately as shown on the drawings. Light drifting will be permitted to draw parts together, but drifting to match unfair holes will not be permitted. Any enlargement of holes necessary to make connections in the field shall be done by reaming with twist drills. Enlarging holes by burning is absolutely prohibited.

After erection, all welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete, shall be primed, unless the steel is weathering steel. The primer shall be consistent with the shop prime coat.

Weathering steel shall be kept as clean and free as possible from mud, grease, oil, paint, concrete or mortar splatter, and other foreign substances to minimize on-the-job cleaning. Paint or crayon identification marks shall be made in locations not visible on the finished structure; otherwise, these marks must be removed from the visible surfaces during the final cleaning operation. Objectionable substances on weathering steel, especially on highly visible exterior surfaces and including mill scale on the surfaces visible from the mine opening, shall be removed by solvents, high-speed power brushing, scraping, sand or grit blast cleaning, or other suitable methods. Surfaces of welds shall be given special treatment by scraping and wire brushing as necessary to remove all slag and weld spatter. Tools that produce excessive roughness shall not be used.

Welders certified in accordance with AWS specifications for the intended work shall do all field welding. A copy of certifications shall be furnished to the Project Manager. All welding shall be consistent with the requirements of AWS D1.1, "Structural Welding Code," including adequate edge preparation and preheating and the selection of proper flux (when applicable).

For weathering steel, the use of properly dried, low-hydrogen electrodes and fluxes are specified by the AWS and shall be used. The capping runs of multi-run fillet and butt welds shall have strength, corrosion resistance, and weathered appearance similar to that of the base metal by use of appropriate alloy electrodes for the final two exposed top layers with the weld composition for weathering steel matching the base metal. Conventional electrodes may be used for the body of such welds. Conventional electrodes may also be used for butt welds with a single run each side and for single run fillet welds of up to 5/16-inch leg length.

All joints shall be welded unless otherwise indicated. Weathering steel fabrications shall be welded to eliminate surfaces on which moisture accumulation can occur and joints shall be tight to so that moisture cannot enter between plies of material. All joints in weathering steel, including fillet welds, shall be continuously welded to avoid moisture and corrosion traps such as crevices.

An oxygen meter shall be used to test air before and during field erection and welding of metal fabrications or any other work inside mine openings. The oxygen meter shall be a National Mine Service (NMS) OX231 oxygen meter or equivalent. The oxygen meter shall continuously monitor oxygen levels and have an audible warning. If the oxygen level falls below 19 percent, all personnel shall withdraw from the working area in the mine until the oxygen content increases to safe levels.

Any remedy for increasing oxygen content of the working area or providing ventilation from the surface shall be determined in consultation with the Project Manager.

05530 – GRATING

Specified hereunder is all steel grating, including accessories.

05531 - FABRICATION

The Contractor shall verify all dimensions that affect grating prior to fabrication. Serrated grating shall be provided for all exterior applications and plain grating for all interior applications, unless otherwise noted on the drawings.

Unless otherwise noted on the drawings, grating shall be of the welded or pressure locked steel type with bearing bars at 13/16 inches on center and cross bars spaced at 4 inches on center. Bearing bars shall be at least 3/16 inch thick. Bearing bar depth shall be as noted on the drawings. Where noted, grating shall be full depth banded, and bands shall be 3/16 inch thick. Bands shall be welded to first, last, and every fourth intermediate bar. All grating shall be fabricated from weathering, “Corten,” steel.

Cross bars and edge bars of adjacent grating panels shall align. Grating shall be fabricated to fit with no more than 1/4-inch clearance between panels. All bearing bars shall be parallel. All grating shall be fabricated to lie flat with no tendency to rock. Poorly fitting or damaged grating will be rejected.

05532 - INSTALLATION

Metal grating units and accessories shall be installed in accordance with specifications, drawings that are a part of the contract documents and shop drawings reviewed by the Project Engineer.

Grating shall be positioned on supports and the final positions adjusted and accurately aligned before being permanently fastened by welding. Grating units shall be placed flat and square and secured to supports without warp or deflection or tendency to rock after installation. No more than 1/4-inch clearance between panels will be permitted. The first, last, and every fourth bearing bar shall be welded to the supports with a 3/16-inch fillet weld 3/4-inch long. All field welds and repairs to hot-dip galvanized surfaces shall be painted with a minimum of two coats of cold galvanizing compound. Slag shall be chipped or wire brushed and completely removed prior to paint application.

ASTM A36 steel frames bolted to or cast in concrete to support grating shall be hot-dipped galvanized in accordance with ASTM A123 after fabrication. Weathering steel frames shall not be galvanized but shall be cleaned as specified above for weathering steel.

05540 – EXPANDED METAL

The expanded metal shall have the following characteristics:

| | |
|----------------|--|
| Base Material | ASTM F1267 (Stainless Steel, grade 304 or 316) |
| Style | ¾" - #16 |
| Sheet Size: | |
| LWD | 2' |
| SWD | 12' or as required |
| Type | Standard |
| Quantity | As required |
| Pattern | Reverse |
| Edge Condition | Bonded Edges (Closed) |

The locations where the expanded metal is tack welded to the culvert shall be coated with a zinc-rich paint.

05990 – SUBMITTALS

Complete data, detailed drawings, and setting or erection drawings covering all structural and miscellaneous metal items, including security bolts and nuts, shall be submitted in accordance with the procedure set forth in Section 01340.

END OF DIVISION 5