



**SECTION 903**

**HIGHWAY SIGNING**

**903.1 Description.** This work shall consist of furnishing and installing highway signs as shown on the plans. All signs shall be in accordance with the MUTCD. Any signs not detailed on the plans shall be in accordance with *Standard Highway Signs* by the U.S. Department of Transportation, Federal Highway Administration.

**903.2 Material.** All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

<b>Item</b>	<b>Section</b>
Reinforcing Steel for Concrete	1036
Highway Sign Material	1042
Delineators, Mile and Marker Posts	1044
Paints for Structural Steel	1045
Electrical Conduit	1060
Expansive Mortars	1066
Low-Carbon Steel Bolts, Nuts and Washers	1080
Structural Carbon Steel	1080
Structural Low Alloy Steel	1080
Low-Carbon Steel Anchor Bolts	1080
High-Strength Bolts, Nuts and Washers	1080
Galvanized Coating of Structural Steel, Tubular Steel Sign Supports, Sign Trusses and Appurtenances	1081

**903.2.1 Sign Posts and Tubular Steel Sign Supports.**

<b>Item</b>	<b>Section/Specification</b>
Wood Posts	1050
Steel Pipe Posts	ASTM A 53, Grade B, or ASTM A 500, Grade B
Galvanizing of Steel Pipe Posts	ASTM A 53
Structural Steel Welding Electrodes	AWS A5.1 or AWS A5.5
Structural Steel Posts	AASHTO M270 Grade 50 or 50w
U-Channel Posts	ASTM A 499, Grade 60

### 903.2.2 Overhead Sign Trusses.

Item	Specification
Aluminum Extruded Tube	ASTM B 221, 6061-T6
Aluminum Permanent Mold Castings	ASTM B 108, A 356.0-T61
Aluminum Sand Castings	ASTM B 26, 356.0-T6
Aluminum Plate	ASTM B 209, 6061-T6
Aluminum Structural Shapes	ASTM B 308, 6061-T6
Aluminum Pipe Handrail	ASTM B 241, 6061-T6 or 6063-T6
Aluminum Pipe Fittings for Schedule 10 Pipe	ASTM B 26, 356.0-T6 or ASTM B 108, A 356.0-T61
Aluminum Grating Bearing Bars	ASTM B 211, 6061-T6 or ASTM B 221, 6061-T6 or 6063-T6
Cross Bars	ASTM B 211, 6061-T6 or ASTM B 221, 6061-T6 or 6063-T5 or T6
Aluminum Washers	ASTM B 209, 2024-T4 or Alclad 2024T4
Aluminum Beveled Washers	ASTM B 221, 2024-T4
Filler Wire for Welding Aluminum	AWS A 5.10 ER5356, ER5556
Stainless Steel U-Bolts	ASTM A 276 Chromium-Nickel Grade, min. yield 30,000 psi
Stainless Steel Bolts, Nuts, Screws and Washers	ASTM A 320 or SAE J405D, Austenitic Steel, min. yield 30,000 psi
Structural Steel Welding Electrodes	AWS A 5.1 or AWS A 5.5

**903.2.3 Hardware.** Bolts, nuts and washers specified to be galvanized shall be galvanized in accordance with [Sec 1081](#). Except for anchor bolts, galvanizing thickness shall not exceed 6 mils. For high strength bolts, the contractor shall furnish to the engineer a copy of the manufacturer's inspection test report for each production lot or shipping lot furnished, and shall certify the bolts furnished are in accordance with [Sec 1080](#).

**903.2.4 Concrete.** Concrete shall be of the class specified in the contract. Material, proportioning, mixing, slump and transporting of concrete shall be in accordance with [Sec 501](#) for the specific class specified. Concrete shall be placed, finished and cured in accordance with [Sec 703](#). The entire exposed concrete surface, including sides and top, shall be surface sealed in accordance with [Sec 703](#).

**903.2.5 Equipment and Material.** Equipment and material shall be of new stock unless the contract provides for relocation of existing units or use of units furnished by others. New equipment and material shall meet the approval of the engineer.

### 903.3 Construction Requirements.

#### 903.3.1 Footings for Trusses and Posts.

**903.3.1.1 Bolt-Down Installations.** Class B concrete shall be used to construct all footings and end supports for overhead sign trusses, tubular steel sign supports and posts with bolt-down bases. Footings shall be formed, unless in the judgment of the engineer, soil conditions permit excavation to be made to the neat lines of the footings and the footings cast against the undisturbed vertical soil face. In all cases, the top 12 inches below finished ground line shall be formed. Footings shall be placed on firm, stable, undisturbed soil to the minimum depth shown on the plans. Backfill shall be thoroughly compacted, and care taken to prevent damage to finished concrete. Backfill shall be brought up level with the finished ground line.

Anchor bolts shall be firmly held in proper position, supported at the top, during placement of concrete.

**903.3.1.2 Embedded Installations.** Class B or B-1 concrete, or concrete of a commercial mixture meeting the requirements of [Sec 501](#) shall be used for the footings for embedded-type sign posts. The contractor may use a quick-setting polyurethane foam for footings in lieu of concrete. The foam shall have a minimum compressive strength of 80 psi, in the direction of rise, when tested in accordance with ASTM D 1621, and shall have a minimum density of 4 pounds per cubic foot when tested in accordance with ASTM D 1622. Foam shall not be placed in water. Polyurethane foam shall be mixed in accordance with manufacturer's recommendations. Posts shall be supported in proper position until the concrete or foam has set. Excavation and backfill shall be in accordance with [Sec 903.3.1.1](#), except forming will not be required unless soil conditions warrant forming. Polyurethane foam will not be permitted if forming is necessary. Tops of footings shall be finished flush with the slope of the ground to the satisfaction of the engineer.

**903.3.1.3 Optional Footings.** Substructures for butterfly and cantilever overhead sign trusses and posts may be either drilled shafts or spread footings.

**903.3.1.3.1** The quantities shown on the plans reflect the total cubic yards of substructure, based upon drilled shaft quantities.

**903.3.1.3.2** No adjustment in payment will be made for providing the equivalent spread footing design that differs in area from the specified drilled shaft design.

**903.3.1.3.3** If rock is encountered and the depth of drilled shafts are adjusted accordingly, cubic yard quantities will be recalculated for those locations and payment will be adjusted accordingly. Cubic yard quantities will not be recalculated for spread footings if rock is encountered, unless it is considered differing site conditions in accordance with [Sec 104.2](#) of the standard specifications.

### **903.3.2 Posts for Ground Mounted Signs.**

**903.3.2.1 Post Lengths.** Post lengths shown on the plans for ground-mounted signs are for bidding purposes only. The contractor shall be responsible for determining post lengths to provide the vertical clearance shown on the plans. Field cutting of posts will be permitted.

**903.3.2.2 Post Alignment.** Sign posts shall be vertical. Any post bent or otherwise damaged to the extent that the post is considered unfit for use shall be removed and replaced with an acceptable post at the contractor's expense.

**903.3.2.2.1 Structural Steel Posts.** Structural steel sign posts for ground mounting of signs shall be fabricated and erected as shown on the plans. Welds shall be of full section and sound throughout. Posts with dimensional defects and structural discontinuities will be rejected. Posts built up by welding two lengths together will be permitted, provided the welds are ground smooth and flush with the base metal. Posts and appurtenances shall be hot-dip galvanized after fabrication. Posts with breakaway assemblies shall be cut at the hinge prior to galvanizing, except for field cutting. Hinge plates shall not be attached to the posts at the time of galvanizing. All welds shall be cleaned before galvanizing. All exposed steel areas and damaged galvanizing shall be repaired in accordance with [Sec 1081](#).

**903.3.2.2.2 Pipe Posts.** Pipe posts shall be fabricated as shown on the plans and shall be hot-dip galvanized after fabrication. Welds shall be of full section and sound throughout. Posts with dimensional defects and structural discontinuities will be rejected. All welds shall be cleaned before galvanizing. Exposed steel areas and damaged galvanizing shall be repaired in

accordance with [Sec 1081](#). Friction caps for pipe posts shall be of the dimensions shown on the plans and may be galvanized steel or aluminum alloy.

**903.3.2.2.3 Perforated Square Steel Tube Posts.** Perforated square steel tube posts shall be installed at locations shown on the plans. Exposed steel areas and damaged galvanizing shall be repaired in accordance with [Sec 1081](#).

**903.3.2.2.4 U-Channel Posts.** U-Channel posts shall be installed at locations shown on the plans. Exposed steel areas and damaged galvanizing shall be repaired in accordance with [Sec 1081](#).

**903.3.2.2.5 Wood Posts.** Wood posts shall be installed at locations shown on the plans.

**903.3.2.3 Certification.** The contractor shall furnish to the engineer three copies of the fabricator's certification that the material supplied is in accordance with the requirements specified.

**903.3.3 Tubular Steel Sign Supports.** Tubular sign supports for overhead mounting of signs shall include span, cantilever and butterfly types, complete with poles, beams, mast arms, sign bracket assemblies and other specified appurtenances. All steel shall be hot-dip galvanized after fabrication in accordance with [Sec 1081](#). All welds shall be cleaned before galvanizing. Shop drawings will not be required for these supports.

**903.3.3.1 Tapered Steel Poles and Beams.** Tapered steel poles and beams shall be a continuous taper tube, fabricated from one length of open hearth sheet steel with one continuous welded longitudinal seam. After fabrication, the material shall have a minimum yield strength of 48,000 psi. Straight steel arms shall be standard or extra heavy pipe, of the dimensions and grades shown on the plans. Bolts, nuts, washers, clamps and sign bracket assemblies shall be hot-dip galvanized or of stainless steel. Clamps shall be fabricated of low alloy steel.

**903.3.3.2 Certification.** The contractor shall furnish to the engineer three copies of the manufacturer's certification that the tubular steel sign supports are in accordance with the requirements specified.

**903.3.3.3 Surfaces.** Galvanized material shall be handled to avoid damage to the surfaces. Any material on which the galvanizing has been bruised or broken will be rejected or may, with approval from the engineer, be repaired in accordance with [Sec 1081](#).

**903.3.4 Overhead Sign Trusses.** Overhead sign trusses shall be steel or aluminum, and shall include all structural steel, structural aluminum, aluminum castings, pipe railing, gratings, supports and appurtenances above the top surface of the concrete footings. Shop drawings in accordance with [Sec 1080](#) shall be furnished to the engineer for approval.

**903.3.4.1 Testing and Certification.** The contractor shall furnish to the engineer a copy of certified mill test reports on all material furnished, providing the actual chemical analysis and the actual results of physical tests. In lieu of mill test reports for secondary members, the contractor may furnish a certification from the fabricator certifying the material supplied is in accordance with the requirements of these specifications. All test reports and certifications shall be furnished to the engineer before any requests for shop inspection are made.

**903.3.4.2 Steel Fabrication and Erection.** Structural steel fabrication and erection shall be in accordance with [Secs 712](#) and [1080](#), except as hereinafter specified.

**903.3.4.3 Welder Qualifications.** Before starting fabrication of structural aluminum, all welders shall be qualified in accordance with the latest edition of ANSI/AWS D1.2 – Structural Welding Code, Aluminum. The test specimens shall be made using a base metal of aluminum alloy 6061-T6 using filler metal acceptable for welding this alloy and inert gas shield arc. Requalification may be required any time there is specific reason to question the welder's ability.

**903.3.4.4 Welding Inspection.** All aluminum welds shall be inspected by the fabricator to verify the reliability of production as follows:

(a) Visual inspection of all welds, proof testing of welds, and sufficient destructive testing of weld samples fabricated during the production welding.

(b) Poor welding workmanship noted by visual inspection will be sufficient cause for rejection.

**903.3.4.5 Contact Surfaces.** Contact surfaces of aluminum flange castings shall be finished to provide at least 50 percent contact after assembly, as indicated by the Standard Machinist's Blue Test.

**903.3.4.6 Fabrication of Aluminum Alloy.** Fabrication of aluminum alloy material shall be in accordance with the manufacturer's recommendations and the following requirements. Flame cutting will not be permitted. All holes in castings shall be machined for final fit. Welding shall be done by the inert gas shielded arc method, and flux shall not be used. Precautions shall be taken to avoid scoring or marring of aluminum surfaces. The engineer will reject any scoring or marring that gives an objectionable appearance. Cast parts shall have all casting irregularities removed. Tubing shall be seamless, and exterior and interior surfaces shall be clean, smooth and free from slivers, laminations, grooves, cracks or other defects.

**903.3.4.7 Shop Inspection.** Shop inspection will be in accordance with [Sec 1080](#).

**903.3.4.8 Wind Testing.** Simulated wind-shop test loading for aluminum trusses will be required as shown on the plans. The load in kips and location of the point of application shall be indicated on the shop drawings.

**903.3.4.9 Handling and Storage.** Handling and storage of material shall be in accordance with [Sec 712](#). If specified, galvanized high strength bolts and washers shall be in accordance with [Sec 903.2.2](#). Bolts shall be snugly tightened. Connections in which steel and aluminum are in contact shall be protected as shown on the plans.

**903.3.4.10 Surfaces.** Galvanized and aluminum material shall be handled to avoid damage to the surfaces. Any material on which the galvanizing has been bruised or broken will be rejected or may, with approval from the engineer, be repaired in accordance with [Sec 1081](#).

**903.3.5 Sign Storage, Certification and Erection.**

**903.3.5.1 Storage of Signs.** Signs delivered for use on a project shall be stored in a manner meeting the approval of the engineer. Any sign damaged, discolored or defaced during transportation, storage or erection may be rejected.

**903.3.5.2 Fabricator's Certification.** The contractor shall furnish to the engineer, prior to sign erection, the fabricator's certification stating, "I hereby certify that only material and manufacturing processes in full compliance with the Missouri Department of Transportation

job specification requirements were used in the fabrication of signs for Job \_\_\_\_\_, Route \_\_\_\_\_, County \_\_\_\_\_."

**903.3.5.3 Erection of Signs.** Sign posts shall be set vertically true to line such that the signs will be level, at the proper angle with the roadway, and with the minimum clearances shown on the plans. Mounted signs shall present a smooth flat surface varying no more than 3/8 inch from a 4-foot straightedge placed in any position on the face of the sign after erection. Signs on traffic signal posts shall be mounted with strap or clamp type sign supports as shown on the plans or as approved by the engineer. Signs shall not be mounted on light poles.

**903.3.6 Delineators.** Delineators shall be installed vertically and any delineator considered unfit for use by the engineer shall be removed and replaced at the contractor's expense.

**903.4 Final Clean Up.** Final clean up of right of way shall be in accordance with [Sec 104.11](#).

**903.5 Method of Measurement.** Final measurement will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity. The revision or correction will be computed and added to or deducted from the contract quantity. Where required, measurements will be made in the following manner.

**903.5.1** Measurement of concrete for footings, including all concrete, excavation, backfilling, reinforcing steel, anchor bolts and nuts, grout and other incidental items shown on the plans, will be made to the nearest 0.1 cubic yard.

**903.5.2** Measurement of the weight of structural steel and pipe posts will be made to the nearest pound for each post and to the nearest 10 pounds for the total, as shown on the plans. Weights will be computed using the theoretical weight of the various sections.

**903.5.3** Measurement of sign areas will be made to the nearest 1/10 square foot for each sign and to the nearest square foot for the total. The area of each sign will be that of the smallest rectangular, triangular or trapezoidal shape that will encompass the sign panel.

**903.5.4** Measurement of perforated square steel tube, u-channel and wood posts will be made to the nearest linear foot for each post, as shown on the plans.

**903.5.5** Measurement of delineators will be made per each.

**903.6 Basis of Payment.**

**903.6.1** Breakaway assemblies, including the base connection, hinge plate and all other fabrication, complete in place, will be paid for at the contract unit price each, regardless of the post size or shape.

**903.6.2** Highway signing will be paid for at the contract unit price for each of the items included in the contract. No direct payment will be made for incidental items necessary to complete the work, unless specifically provided as a pay item in the contract.

**903.6.3** Delineator posts will be paid for at the contract unit price. No direct payment will be made for reflective sheeting or post anchors.

**903.6.4** Perforate square steel tube, u-channel and wood posts will be paid for at the contract unit price for each of the items included in the contract.

**903.6.5** Concrete footings will be paid for at the contract unit price.

**903.6.6** Structural steel and pipe posts will be paid for at the contract unit price for each of the items included in the contract.