

802-T-188 OVERHEAD SIGN STRUCTURES

(Revised 02-21-13)

The Standard Specifications are revised as follows:

SECTION 802, BEGIN LINE 67, DELETE AND INSERT AS FOLLOWS:

802.06 Placing Concrete

Placing concrete shall be in accordance with 702, except that foundations incorporated into sections of concrete barrier wall shall receive a finish in accordance with 702.21. Exposed concrete shall have a smooth surface and beveled edges.

Anchor bolt alignment shall be maintained during concrete placement. Temporary positioning plate and associated nuts shall be removed upon completion of the foundation. The threads shall be protected during concrete placement. Any damage to galvanized coating shall be repaired prior to assembly.

Conduit and grounding shall be in accordance with 807.

802.07 Installing Supports

(a) Posts

Posts shall be vertical after installation. All damaged posts shall be removed and replaced with an acceptable post.

Square sign post foundations shall be reinforced anchor base or unreinforced anchor base as shown on the plans. If sign post type A or sign post type B is specified, square sign posts may be used. Splicing of square steel sign posts will not be permitted.

In locations where class X excavation is encountered, the Engineer will determine the design for the installation of foundations. If the total length of the anchor bolts cannot be used, they shall be cut off. A steel plate measuring 6 by 6 by 1/2 in. (~~150 by 150 by 13 mm~~), shall be welded to the bottom of the bolts. The plate shall have a hole cut which allows the bolt to pass through it and the plate and bolt shall be completely welded together around the circumference of the bolt on both sides of the plate. No butt welding is allowed. The length of the bolts shall allow the plate to be covered by 3 to 4 in. (~~75 to 100 mm~~) of concrete at the bottom of the foundation.

(b) ~~Structural Frames~~ Overhead Sign Structures

When erection of the structure has been started, it shall be completed the same day. The structure shall be loaded, to prevent vibration, by attaching signs or lighting supports the same day.

An oxidation inhibitor in accordance with 802.07(b)4 shall be applied to all surfaces that mate with a dissimilar material.

Fasteners for chord splice connections shall be high-strength bolts conforming to ASTM A 325 with matching lock nuts having steel inserts. Installation shall be in accordance with 711.65. Other bolts and hardware shall conform to the requirements of 910.19.

Fasteners shall be tightened by turn-of-nut tightening, calibrated wrench tightening, or direct tension indicator tightening. The calibrated wrench shall be calibrated by an acceptable tension measuring device such as a Skidmore-Wilhelm.

The base plate bolt tightening shall be as follows:

- a. Lower nuts and washers shall be in full contact with the base plate,
- b. The top nuts shall be tightened to 1/6 turn beyond snug fit,
- c. The lower nuts shall be retightened to assure that full contact with the base plate has been maintained.

Damage that is detrimental to the structural integrity of the frame or aesthetic appearance shall be repaired.

~~Field welding of aluminum shall be in accordance with 803. Field welding of steel shall be in accordance with 711.32. No field welding will be allowed.~~

The grounding connection shall be located 12 in. ~~(300 mm)~~ from the bottom of the support and shall be easily accessible from the structure manhole.

Traffic shall be maintained in accordance with 801.16 during installation.

1. Trusses

When placed on blocks to produce the required camber, the truss sections shall fit together at the flange connections with a minimum gap of 1/16 in. ~~(1.5 mm)~~ on any flange assembly. The total of the gaps in any one connection shall not exceed 1/8 in. ~~(3 mm)~~. Gaps shall be shimmed with tapered shims before tightening the flange bolts.

Vertical truss members and vertical diagonals shall be machined to provide a snug tube-to-tube fit to the chord along the entire edge before welding. Horizontal truss members and horizontal diagonals shall be slotted for the dimensions shown on the plans and welded to the gusset plates. They shall be sealed against water penetration.

Chord ~~plates~~flanges shall be machined from solid rounds. Mating surfaces shall be flat within 1/64 in. ~~(0.4 mm)~~. Flanges shall be given an additional finish if necessary to ensure contact between plates.

The cap bolts used to attach the top caps of end-support columns shall be located so as to miss the J hook.

The camber shown on the plans is for fabrication only. It shall be measured with the truss fully supported. The allowable camber tolerance is 25% of the specified camber value.

All signs and walkway brackets shall be placed as close to the brace points as possible. The Contractor shall verify that the dimensions are suitable for the type of fixture to be supplied.

2. Monotube

The required camber shall be achieved in accordance with the manufacturer's recommendations as detailed on the working drawings.

3. Cantilever Arms

Cantilever arms shall fit together at the flange connections between sections with a minimum gap of 1/16 in. ~~(1.5 mm)~~ on any flange assembly. The total of the gaps in any one connection shall not exceed 1/8 in. ~~(3 mm)~~. *Double arm chords are octagonal tubular shape with 0.14 in./ft taper. Quadri-chord arms are circular shape with constant diameter.*

4. Bridge Brackets

The location of the sign bracket may be shifted to avoid joints or stiffeners on the bridge. Before placing aluminum in contact with concrete, both the concrete and aluminum surfaces shall be coated with an aluminum-impregnated caulking compound. Where aluminum surfaces are to be placed in contact with steel, the steel surface shall be given 1 coat of zinc chromate paint and the aluminum surfaces shall be coated with an aluminum-impregnated caulking compound before placement. After the bolts have been tightened, the excess caulking compound shall be removed. All openings around the flanges shall be fully painted and shall be flush with the caulking compound.

802.08 Installing Signs

If new signs are to be installed on existing ~~structural frames~~ *overhead sign structures*, the existing mounting hardware, if applicable, may be reused. Bolts, nuts, and washers shall not be reused. Additional new hardware may be required to complete the mounting. All such sign hangers protruding above the new signs shall be cut off flush to the top of the signs. Splicing or overlapping of sign hangers will not be permitted. All unused sign hangers and hardware shall be removed.

SECTION 802, BEGIN LINE 234, DELETE AND INSERT AS FOLLOWS:

802.11 Method of Measurement

Sheet signs and panel signs will be measured by the square foot ~~(square meter)~~. Sheet signs will be measured as the smallest dimensions of a square or rectangle large enough to make the sign. However, triangular or trapezoidal signs will be measured as the smallest triangle or trapezoid required to make the sign.

If the pay unit for sheet signs is shown in the Schedule of Pay Items as each, the number of sheet signs specified, including posts, hardware, and erection, will be measured by the number of units installed.

Sign posts will be measured by the linear foot ~~(meter)~~. Square sign posts will be measured from the top of the post to the termination of the post in the anchor base.

Traffic sign support foundations will be measured by the number of units of each type installed. No reduction will be made in a unit if class X material is encountered during foundation excavation.

If class X material is encountered during foundation excavation, the quantity to be measured will be that authorized and removed and in accordance with 206.10.

Structural steel, breakaway, will be measured by the pound ~~(kilogram)~~. Such measurement will include the weight ~~(mass)~~ of breakaway sections such as stubs, stiffeners, base plates, and fuse plates. For rigid sections, the weight ~~(mass)~~ of the base plate will be included.

Reference posts, including post, sign, and hardware, will be measured by the number of units installed.

Backfill of traffic sign support foundations will be measured in accordance with 211.09.

Overhead sign structures ~~and bridge bracket assemblies~~ will be measured by the number of units of each type installed.

Overhead sign structures to be removed will be measured by the number of structures removed.

802.12 Basis of Payment

The accepted quantities of sheet signs and panel signs will be paid for at the contract unit price per square feet ~~(square meter)~~, of the type and thickness specified, with legend, complete in place.

Sign post will be paid for at the contract unit price per linear foot ~~(meter)~~ for the type specified.

Structural steel, breakaway, will be paid for at the contract unit price per pound ~~(kilogram)~~.

Ground mounted sign support foundations will be paid for at the contract unit price per each type specified.

Reference posts will be paid for at the contract unit price per each, complete in place.

Payment for class X material encountered during a foundation excavation will be made in accordance with 206.11.

Payment for backfill of support foundations will be made in accordance with 211.10.

The removal of signs, overhead structures, and sign assemblies, will be paid for at the contract unit price per each.

Payment will be made under:

Pay Item	Pay Unit Symbol
Box Truss Sign Structure Foundation, _____ type	EACH
Bridge Bracket Assembly	EACH
Cable Span Sign Structure Foundation, _____ type	EACH
Cantilever Sign Support Foundation, _____ type	EACH
Overhead Balanced Cantilever Sign Structure Foundation, _____ type	EACH
Overhead Sign Structure, <i>Box Truss</i> _____ type	EACH
<i>Overhead Sign Structure, Bridge Bracket Assembly</i>	<i>EACH</i>
<i>Overhead Sign Structure, Butterfly Cantilever</i>	<i>EACH</i>
<i>Overhead Sign Structure, Cantilever</i> _____ type	<i>EACH</i>
<i>Overhead Sign Structure, Monotube</i>	<i>EACH</i>
Overhead Sign Structure, _____, Remove	EACH
type	
<i>Overhead Sign Structure, Tri-chord</i> _____ type	<i>EACH</i>
Reference Post	EACH
Sign and Supports, Wide Flange, Remove	EACH
Sign Post, _____ type	LFT-(m)
Sign Post, Square, _____, Reinforced Anchor Base	LFT-(m)
type	
Sign Post, Square, _____, Unreinforced Anchor Base	LFT-(m)
type	
Sign, Double Faced, Sheet, With Legend, _____ thickness	SFT-(m2)
Sign, Overhead, Remove	EACH
Sign, Panel, Relocate	EACH
Sign, Panel, Remove	EACH
Sign, Panel, With Legend	SFT-(m2)
Sign, Sheet Assembly, Relocate	EACH
Sign, Sheet, and Supports, Remove	EACH
Sign, Sheet, Relocate	EACH
Sign, Sheet, Remove	EACH
Sign, Sheet, With Legend	EACH
Sign, Sheet, With Legend, _____ thickness	SFT-(m2)

Structural Steel, Breakaway	LBS (kg)
Tri-chord Sign Structure Foundation, _____ type	EACH
Wide Flange Sign Post Support Foundation, _____ type	EACH

The cost of staking sign and sign structure locations, including materials and labor, shall be included in the cost of the pay items in this section.

The cost of all hardware necessary to assemble and attach the sign to its structural supports, all legend, and adjustments necessary to eliminate specular reflection shall be included in the cost of sheet sign or panel sign.

The cost of all hardware to attach the sign to its structural supports, the reflective sheeting on both faces, and all legend shall be included in the cost of double-faced sheet signs.

The cost of all necessary hardware including sign hangers, clips, and U bolts required for the mounting of signs to existing or new overhead sign structures shall be included in the cost of the sign.

The cost of modifying existing hardware to mount a new sign shall be included in the cost of the new sign.

The cost of the reinforced anchor base or unreinforced anchor base, angle bolts, and rivets shall be included in the cost of sign post, square.

The cost of identification markings for signs shall be included in the cost of the sign.

The cost of sign removal, existing post removal, and all mounting hardware necessary to attach the existing sign to new posts, shall be included in the cost of the sign relocation.

The cost of roadway and bridge reference signs and posts to be removed, stored, and reinstalled shall be included in the cost of other pay items, unless otherwise specified. Roadway and bridge reference signs which are damaged by the Contractor shall be replaced with no additional payment.

The cost of furnishing and applying aluminum-impregnated caulking compound and zinc chromate paint as required in 802.07, shall be included in the cost of the pay items in this section.

The cost of removal of signs, sign assemblies, sign lighting circuitry, supports, concrete foundations, backfill material, sodding, seeding, and necessary incidentals shall be included in the cost of overhead sign structure, remove.

The replacement of posts damaged by the Contractor's activities shall be without additional payment.

The cost of concrete, reinforcement, stub, anchor bolts, conduit, and all necessary hardware shall be included in the cost of the support foundation.

The cost of cutting the reinforcing bars and anchor bolts, furnishing the steel plate and welding the plate to the ends of the anchor bolts when class X excavation is encountered shall be included in the cost of the pay items in this section.

No additional payment will be made if square sign posts are used in lieu of type A or type B posts.

The cost of excavation, except for class X material, and necessary incidentals shall be included in the cost of the pay items in this section.

The cost of walkway assembly where applicable shall be included in the cost of overhead sign structure.

SECTION 910, BEGIN LINE 1266, DELETE AND INSERT AS FOLLOWS:

910.19 Overhead Sign Structures

The complete structure with signs in place shall be able to withstand wind pressure in accordance with AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals. The structure shall be designed to resist fatigue of the material in accordance with the AASHTO specifications.

All prefabricated structural units shall be packed so that there is no injury or defacement during transportation to the point of destination.

All bolts, nuts, and washers for bridge bracket assemblies shall be stainless steel in accordance with ASTM F 738M.

Strain poles for cable span signs shall be in accordance with 922.05(a). Each strain pole shall include 3 band type attachments for span wire clamps. Such attachments shall be galvanized in accordance with ASTM A 153. Cable shall be in accordance with 922.06(b). Each cable shall include 3 wire rope clips at each end. Anchor bolts shall be in accordance with 922.05(c)6. All sign mounting hardware except for the extruded aluminum bar shall be galvanized in accordance with ASTM A 153.

Gratings for the walkway shall be of aluminum in accordance with ASTM B 221, alloy 6061-T6 or 6063-T6. Cross bars and bent connecting bars shall be of aluminum in accordance with ASTM B 221, alloy 6061, 6063, or 3003 conforming to ASTM B 210.

Material furnished under this specification shall be covered by a type C certification in accordance with 916.

(a) Aluminum Trusses for Overhead Sign Structures, Box Truss and Bridge Attached Dynamic Message Sign Structure Truss

Extruded tubes *and other shapes* shall be of aluminum in accordance with ASTM B 221 ~~(B-221M)~~, B 241 ~~(B-241M)~~, or B 429, alloy 6061-T6. All other castings shall be of aluminum in accordance with ASTM B 26 ~~(B-26M)~~, alloy 356.0-T6. *Gusset, flange and stiffener* ~~P~~plates shall be of aluminum in accordance with ASTM B 209 ~~(B-209M)~~, alloy 6061-T6. Plates shall be free of sharp edges and irregularities.

~~Welding material and procedures shall be in accordance with 803 and applicable AWS provisions.~~

Bolts, nuts, screws, and flat washers shall be passivated type 304 stainless steel. Bolts and screws shall be in accordance with ASTM A 193 ~~(A-193M)~~, grade B8. Hexagon nuts and washers shall be in accordance with ASTM A 194 ~~(A-194M)~~, grade 8. High strength bolts, nuts and washers for chord splice connections, *with matching lock nuts having steel inserts*, shall be in accordance with 910.02(g) and shall be galvanized in accordance with AASHTO M 232, *class C or D*.

~~The J hook shall consist of one 3/8 in. (10 mm) steel bar in accordance with ASTM A 307. It shall be spot welded to the inside of the end support member. The J hook shall be hot dip galvanized prior to welding or in the final assembly with the support column.~~

Neoprene pads shall be ultraviolet rated *and shall conform to the requirements in 915.04*.

~~The safety cable shall be in accordance with 922.06(b).~~

~~Anchor bolts, nuts and washers shall be in accordance with ASTM F 1554, Grade 36. A hexagon nut, leveling nut, and flat washer shall be furnished with each anchor bolt. Top ends of anchor bolts and associated hardware as shown on the plans, shall be coated in accordance with ASTM A 153 or be mechanically galvanized and conform to the coating thickness, adherence, and quality requirements of ASTM A 153, class C.~~

~~Welding material and procedures shall be in accordance with 803 and applicable AWS provisions.~~

Certified proof of the qualifications for a minimum of 2 welders shall be presented after the contract is awarded and before fabrication is started. This certification shall be from a commercial or public testing laboratory and qualifications shall be based on welding of aluminum alloy, 6061-T6 with consumable electrode type welding using aluminum alloy ER5356 filler material. Welders shall qualify by passing the requirements of "Procedure and Performance Tests of Qualification Standard for Welding Procedures, Welders, and Welding Operations", latest edition, formulated by the Boiler and Pressure Vessel Committee of the American Society of Mechanical Engineers.

Welding shall be checked ~~carefully~~ by visual inspection. Poor welding workmanship ~~as noted by visual inspection~~ shall be ~~sufficient cause for rejection~~.

Each complete structure shall be warranted that it is free from any misfits or structural deficiencies prior to shipment.

(b) Steel Overhead Sign Structures, ~~Box Truss~~, Cantilever, Monotube, Tri-Chord, and Bridge Attached, and End Supports for Box Truss and Dynamic Message Sign Structure

End-support members for box truss and dynamic message sign structure shall be fabricated from constant cross-section tubular steel or extruded steel shapes as indicated on the drawings. Sections used for end-support columns, diagonal and horizontal members shall be constant cross-section tubular members in accordance with ASTM A 53, type E or S, grade B, minimum yield strength of 35,000 psi. Constant cross-section tubular steel with greater yield strength may be used with written approval, however, structural dimensions must remain as shown on the plans. Sections used for cross support beams shall be constant cross-section extruded W-shapes in accordance with ASTM A 709, grade 36. Base plates shall be in accordance with ASTM A 36. Base plates for columns shall develop the full strength of the columns. Structures shall be galvanized after fabrication in accordance with ASTM A 123.

Support columns for the cantilever structure shall be fabricated from constant cross-section tubular steel as indicated on the drawings. Column sections shall be in accordance with ASTM A 53, type E or S, grade B as shown on the plans. Members shall have minimum yield strength of 35,000 psi. Constant cross-section tubular steel with greater yield strength may be used, with written approval, however, structural dimensions must remain as shown on the plans. Base plates shall be in accordance with ASTM A 36. Base plates shall develop the full strength of the columns.

Cantilever arms shall be either double arms or quadri-chord trusses as shown on the plans.

Cantilever arms shall be fabricated from octagonal tubular member with 0.14 in./ft taper and in accordance with ASTM A 595 or ASTM A 572, grade 50. Quadri-chord arms shall be of constant cross-section tubular members in accordance with ASTM A 53, type E or S, grade B as shown on the plans. Members shall have minimum yield strength of 35,000 psi. Steel with greater yield strength may be used, with written approval, however, structural dimensions must remain as shown on the plans. Structures shall be galvanized after fabrication in accordance with ASTM A 123. Plates shall be free of sharp edges and irregularities.

High strength bolts, nuts and washers for chord to column connections, with matching lock nuts having steel inserts, shall be in accordance with 910.02(g) and shall be galvanized in accordance with AASHTO M 232, class C or D.

Bolts, U-bolts, nuts, screws, and flat washers shall be passivated type 304 stainless steel. Bolts and screws shall be in accordance with ASTM A 193, grade B8. Hexagon nuts and washers shall be in accordance with ASTM A 194, grade 8.

~~Steel sections used for upright members, cross beams, or horizontal members shall be either tapered or constant cross section tubular members as specified herein. The tubular members may be either circular or multi-sided.~~

~~Box truss and b~~Bridge attached structures shall be fabricated from constant cross section tubular steel in accordance with ASTM A 53, type E or S, grade B (minimum yield strength of 35,000 psi). Constant cross section tubular steel with greater yield strength may be used, with written approval. However, structural dimensions must remain as shown on the plans. Structures shall be galvanized after fabrication in accordance with ASTM A 123.

~~Tri-chord truss, cantilever, and monotube structures shall be made of tapered tubular members in accordance with either ASTM A 595 or ASTM A 572, grade 50 (A 572M, grade 345), or of constant cross section tubular members in accordance with API High Test Line Pipe, grade X 52. Members shall have a minimum yield strength of 50,000 psi (345 MPa). Monotube structures shall be made of tapered tubular members in accordance with either ASTM A 595 or ASTM A 573, grade 50. Structures shall be galvanized after fabrication in accordance with ASTM A 123.~~

The J hook shall consist of one 3/8-in. steel bar in accordance with ASTM A 307. It shall be spot welded to the inside of the end-support member. The J hook shall be hot-dip galvanized prior to welding or in the final assembly with the support column.

Anchor bolts, nuts, and washers shall be in accordance with ASTM F 1554, grade 36. A hexagon nut, leveling nut, and flat washer shall be furnished with each anchor bolt. Top ends of anchor bolts and associated hardware as shown on the plans, shall be coated in accordance with ASTM A 153 or be mechanically galvanized and conform to the coating thickness, adherence, and quality requirements of ASTM A 153, class C.

Base plate skirts shall be 10 gage galvanized steel.

Welding material and procedures shall be in accordance with 711.32 and applicable AWS provisions.

Welding shall be checked by visual inspection. Poor welding workmanship shall be rejected.

Each complete structure shall be free from any misfits or structural deficiencies prior to shipment.

Strain poles shall be anchor bolt type complete with hand-holes and pole top or cap. They shall meet the requirements set out above for cantilever sign structures. Each pole is to include 3 band type attachments for span wire clamps. The band shall be from material in accordance with ASTM A 572, grade 50 (~~A 572M, grade 345~~); ASTM A 606; or approved equal. The bands shall not be of the U-bolt type. The poles shall have maximum deflections as shown below when loaded 18 in. (~~450 mm~~) from the top with a 100 lb (~~445 N~~) load.

Pole Size**Deflection**

15 in. by 30 in. (~~380 mm by 910 mm~~)0.16 in. (~~4.1 mm~~)

14 in. by 26 in. (~~356 mm by 790 mm~~)0.12 in. (~~3.0 mm~~)

The steel flanges at the center of the cross beam and at the ends of the horizontal arms shall be fastened to the tapered or straight sections by means of 2 circumferential welds. One of the circumferential welds shall weld the outside of the flange firmly to the tube. The flange connection shall develop fully the strength of the tubular sections being joined together by means of the flange connections.

Gusset, flange, and base plates shall be in accordance with ASTM A 36 (~~A 36M~~) and shall be galvanized after fabrication in accordance with ASTM A 123. Base plates for upright poles shall develop the full strength of the poles. Castings for the vertical pole top and horizontal arm and cap shall be in accordance with ASTM A 126 and shall be galvanized with a minimum coating of 2 oz/sq ft (~~610 g/m²~~). Bolts and nuts, except anchor bolts, shall be in accordance with ASTM A 325, Type 1. Two nuts for use in plumbing upright poles shall be furnished with each anchor bolt. Anchor bolts for overhead steel structures shall be in accordance with 910.19(a). Steel bolts, nuts, washers, and the top ends of anchor bolts shall be coated in accordance with ASTM A 153 or be mechanically galvanized and conform to the coating thickness, adherence, and quality requirements of ASTM A 153, class C. Welding shall be in accordance with 711.32.

Beam clamp details and sign support assemblies shall be galvanized in accordance with ASTM A 153. Clamps shall be fabricated of high strength, low alloy steel in accordance with ASTM A 242 (~~A 242M~~), ASTM A 606, or approved equal. Stainless steel U-bolts may be used in lieu of the clamps for the attachment of the sign hangers to the arms of double arm cantilevers. The U-bolts shall be in accordance with 910.19(a) for stainless steel hardware.
