

ALABAMA DEPARTMENT OF TRANSPORTATION

DATE: June 3, 2016

Special Provision No. 12-0798(2)

EFFECTIVE DATE: September 1, 2016

SUBJECT: Structural Materials for Traffic Control Devices and Highway Lighting.

Alabama Standard Specifications, 2012 Edition, SECTION 891 shall be replaced by the following:

SECTION 891 STRUCTURAL MATERIALS FOR TRAFFIC CONTROL DEVICES AND HIGHWAY LIGHTING

891.01 General.

All materials used in the fabrication of overhead roadway sign, traffic signal, luminaire and traffic surveillance structural supports shall meet the requirements of the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 2009 Edition* (hereinafter referred to as the AASHTO Sign Specifications). AASHTO material specifications shall govern in lieu of ASTM material specifications when an AASHTO equivalent specification exists for all references within any referenced specification.

891.02 Steel.

(a) General.

All grades of steel listed in the AASHTO *Standard Specifications for Highway Bridges* are applicable for welded structural supports for overhead roadway signs, luminaries, traffic signals and traffic surveillance and shall have a specified yield strength not less than 35 ksi {241 MPa}, unless otherwise specified on the contract plans, or within this Section. The specifications for steels other than ASTM and AASHTO shall be submitted to the Bridge Engineer for approval, prior to design. The contractor shall supply the Bridge Engineer with a copy of the steel specification corresponding to the steel that is being used if the steel is not covered by ASTM or AASHTO specifications.

(b) Fabrication.

Within 30 days after the award of the contract, the Contractor shall notify the Bridge Engineer in writing of the name and address of the fabricator of the structural steel. The notification shall include the fabricator's proposed fabrication schedule. Evidence of the fabricator's qualifications and experience shall be furnished if requested by the Bridge Engineer.

No material shall be fabricated before the Department has been notified where the fabrication order has been placed and the shop drawings have been reviewed and approved for distribution. The Fabricator is responsible for notifying the Bridge Engineer of any fabrication work to be done outside of their facility, the name and address of the outside fabricator, and the proposed fabrication schedule.

The Fabricator of the structures shall give the Bridge Engineer at least 30 days' notice by submittal of a BBF-11 Form (Notice of Intent to Begin Fabrication) prior to the beginning of fabrication to allow time for arrangements to be made for an ALDOT inspector to be present during fabrication.

All steel structures shall be fabricated in a plant certified by the American Institute for Steel Construction for "Standard for Bridge and Highway Metal Component Manufactures (CPT)".

Welding of steel members shall be in accordance with the AWS D1.1/D1.1M: **2015 Structural Welding Code—Steel 23rd Edition** (hereinafter referred to as the AWS **Structural Welding Code**).

Welders shall be certified in accordance with the AWS **Structural Welding** Code. All welds shall be visually inspected and be free of cracking and undercutting. High Mast lighting assembly pole to base plate welds shall be magnetic particle or ultrasonically tested. Circumferential butt welds shall not be allowed on overhead roadway sign structure uprights. All circumferential welds on steel poles shall be tested by ultrasonic for wall thickness of 5/16 inch {8 mm} or greater, or radiographic testing for wall thickness less than of 5/16 inch {8 mm}. All requirements of Section 1.4.2 of the AASHTO Sign Specifications shall be observed when welding and testing the poles. The longitudinal weld on the female section of lap splices shall be either one hundred percent full penetration, with quality assurance by ultrasonic inspection per the AWS **Structural Welding** Code, or shall be reinforced externally to ensure the development the full yield stress of the pole.

The handling and storing of materials, during and after fabrication, shall be done in such a manner that the metal or galvanized finish is not damaged. Material that is damaged may be rejected. Material shall be stored off the ground and properly drained. Loose members and fasteners shall be stored in boxes, crates, kegs or barrels.

Support structures shall be free from sharp edges and irregularities, and any misfits or structural deficiencies. All members must fit together well and make for an easy and quick erection. All components shall be protected from damage during fabrication, handling and transportation to the site. Unless approved by the Engineer, none of the components shall be delivered to the site until such time as the entire structure (less sign faces) can be erected.

(c) Overhead Roadway Sign Structures.

Material for overhead roadway steel sign structures shall be structural carbon steel or structural low alloy steel meeting the requirements of the AASHTO *Specifications for Highway Bridges*, latest edition. Steel pipe shall be in accordance with ASTM A 53, Grade B, Schedule 40 or stronger. Nuts, bolts, and washers used in structural joints shall be in accordance with ASTM A 325 and shall be installed in accordance with Item 508.03(d)6. Nuts and bolts used in non-structural joints shall be in accordance with ASTM A 307. Washers used in non-structural joints shall comply with the requirements of ASTM F 844.

All components of the structure assembly shall be galvanized with zinc after fabrication in accordance with AASHTO M 111 and AASHTO M 232, for fasteners. Hollow sections shall be galvanized on both exterior and interior surfaces. Closed hollow sections shall have appropriate sized galvanizing vent holes at each end of a member. Damage to galvanization or any bare areas developed before or during erection shall be painted with two coats of approved galvanizing coating in accordance with **Article 855.15**.

A uniform camber, in accordance with Section 9 of the AASHTO Sign Specification, shall be provided for all horizontal members of the sign structure. The minimum camber shall be equal to the dead load deflection + L/1000 (L in inches {millimeters}). The maximum permissible camber shall be L/240 (L in inches {millimeters}).

1. Facilities for Inspection.

The **Contractor/Fabricator** shall provide ALDOT with adequate, suitable **office facilities and equipment** when required for the inspection of materials and workmanship in the fabrication plant. This office shall be conveniently located near the fabrication plant or work site, shall be private and not shared with any other agency and shall be equipped so that it may be locked. It shall be climate controlled, water tight and include necessary office furnishings such as desk/table, chairs and file cabinet. (Telephone is optional).

2. Quality Control and Non-Destructive Testing.

A current written copy of the fabricator's quality control manual, along with a listing of qualifications of personnel qualified to perform inspections and/or non-destructive testing shall be submitted prior to any fabrication work. All nondestructive testing personnel shall meet the requirements set forth in ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel (ANSI/ASNT CP-105-2011).

No materials or members will be accepted by the Bridge Engineer's representative, or partial payments made, until the Department's BBF-1 form, the supporting mill test reports and galvanization certificates for the materials have been furnished and approved by

the Department. This information shall be submitted for approval. The BBF-1 form shall be signed by a company official and notarized.

The contractor shall furnish certified copies of mill test reports covering steel materials. These reports shall include chemical determinations and physical characteristics.

The fabrication shop shall have and maintain a master tape, calibrated by the National Institute of Science and Technology. All tapes shall be calibrated with the master tape before being used on the project. Any master tape found damaged or with a certification over two years old shall be replaced or recalibrated.

A Certified Welding Inspector (CWI) shall be present on all shifts where welding is ongoing.

3. Handling, Transportation and Storage Of Materials

The handling and storing of materials, during and after fabrication, shall be done in such a manner that the metal or galvanized finish is not damaged. Damaged material may be a cause for rejection. Material shall be stored off the ground and properly drained. Loose members and fasteners shall be stored in boxes, crates, kegs or barrels and kept dry.

4. Workmanship, Finish and Detailing.

All work shall be performed in a neat workmanlike manner.

A buffer and/or shield shall be utilized during fitting operations to protect base metals from damage caused by fitting tools or devices. Any damage incurred may be cause for rejection of the material.

Heat straightening or hot bending is allowable provided the metal is not heated above 1100 °F {590 °C}. The maximum heat applied shall be controlled by the use of heat crayons or other approved means. After straightening or bending, the metal shall not be artificially cooled until the temperature of the metal reaches 600 °F {315 °C} or less. Water or spray misting shall not be used as a means of artificial cooling. Heat cambering will only be permitted when making minor adjustments to the actual camber in a member.

Steel may be thermal cut, provided a smooth surface is secured by the use of a mechanical guide. Thermal cutting by hand shall be done only when approved. The surface shall be smoothed by planing, chipping or grinding. Other methods of cutting steel may be considered for use.

Sheared edges of plates more than 5/8 inch {16 mm} in thickness shall be planed to a depth of 1/4 inch {6 mm}. Plates 5/8 inch {16 mm} in thickness, or less, shall be ground to remove sharp corners and edges.

Vent holes, if required, shall be cylindrical, without ragged or torn edges or corners. If vent holes are installed with a thermal cutting process, they shall be reamed.

5. Accuracy of Reamed or Drilled Holes.

Reamed or drilled holes shall be cylindrical and perpendicular to the member.

Holes may be punched with a full-size die provided the thickness of the material is not greater than the nominal diameter of the fasteners being used nor greater than 3/4 inch {20 mm} for carbon steel, 5/8 inch {16 mm} for high strength steel, nor 1/2 inch {12 mm} for quenched and tempered alloy steel. Holes shall be clean cut and free of torn or ragged edges. Plug welding of any holes that are too large or slightly off location is prohibited. Completed holes shall be 1/16 inch {1.6 mm} larger than the nominal diameter of the fastener being used.

All holes may be oversized or slotted by 1/32 inch {0.8 mm}, maximum. In any connection, no more than ten percent of all holes may be oversized or slotted 1/16 inch {1.6 mm}.

Edge distances of fasteners shall be as shown below.

- The minimum distance from the center of any fastener to a sheared or flame cut edge shall be: 1" Fastener: 1-3/4" {45 mm}; 7/8" Fastener: 1-1/2" {38 mm}; 3/4" Fastener: 1-1/4" {32 mm}; 5/8" Fastener: 1-1/8" {29 mm}.
- The minimum distance from the center of any fastener to a rolled or planed edge, except in flanges of beams and channels, shall be: 1" Fastener: 1-1/2" {38 mm}; 7/8" Fastener: 1-1/4" {32 mm}; 3/4" Fastener: 1-1/8" {29 mm}; 5/8" Fastener: 1" {25 mm}.

- In the flanges of beams and channels the minimum distance from the center of the fastener to a edge shall be: 1" Fastener: 1-1/4" {32 mm}; 7/8" Fastener: 1-1/8" {29 mm}; 3/4" Fastener: 1" {25 mm}; 5/8" Fastener: 7/8" {22 mm}.

The distance between the edges of adjacent holes that are enlarged or slotted shall not be less than three times the diameter of the fastener minus the nominal diameter of the hole. The edge distance shall not be less than that given for Minimum Edge Distance minus one half the nominal diameter of the hole.

6. Welding.

- a. All welding shall be inspected for defects in accordance with the requirements stated herein. Any worker, welder or weld inspector who, in the opinion of the Engineer, produces inferior work, may, under the provision of Article 108.06, be disqualified from performing ALDOT work.
- b. All shop welding shall be performed under cover of a permanent structure and/or building capable of protecting the material and welding operation from inclement weather.
- c. Intersecting welds, unless shown on the plans or approved shop drawings, are prohibited.
- d. Tack welds, not incorporated in the final weld, shall not be used. Cracked tack welds shall be removed and the area of base material examined by MT or PT.
- e. Complete penetration, circumferential welded splices, in any component of an upright member is prohibited within overhead sign structures.
- f. Undercut is limited to 1/32" {0.8 mm} on secondary members and to 0.01" {0.25 mm} on main members.
- g. Excessive arc strikes and/or gouges will be assessed by the ALDOT representative to determine if repairs are required or if the material should be rejected.
- h. Carbon arc or thermal cut boundaries and back gouged surfaces for groove welds shall be ground to a smooth, bright surface, before welding.
- i. Drying and storage ovens shall be electric and of sufficient size to accommodate a one day supply of electrodes. Drying ovens shall be equipped with a recording thermometer. Storage ovens shall have a visible thermometer.
- j. Each welding machine shall have its approved welding procedure posted in a conspicuous area on or near the machine
- k. The Contractor shall furnish a written welding procedure specification (WPS) for each process and joint to be used in shop welding. The WPS number shall appear in the tail of the weld symbol on the shop drawings.
- l. All shop welds shall be temporarily marked in such a manner that allows identification of the welder.
- m. A complete list of qualified welders and copies of the qualification records shall be provided by the fabricator. Welders that do not have satisfactory pre-qualification, may be required to qualify in the presence of an ALDOT representative or a third party Certified Welding Inspector (C.W.I.).

(d) Steel Poles for Traffic Signal, Luminaire and Traffic Surveillance Support Structures.

The shafts shall be fabricated from basic oxygen or open hearth sheet steel, of a single ply, and having only one longitudinal seam weld. Circumferential welded splices may be used, provided none of the spliced pieces, except for the top piece, are less than ten feet in length. All circumferential welds shall be ground flush with the material surfaces. In lieu of circumferential welds, a two piece section, slip joint shaft pole (for poles without horizontal welds) will be permitted when the plans or approved shop drawings require poles longer than the manufactured length capability.

Steel poles shall be anchored with a one piece cast steel anchor base or a welded steel plate anchor base that is of sufficient strength to develop the yield strength of the pole. When the anchor

base is attached to the shaft it shall develop the full strength of the shaft section to resist bending action. The base shall be provided with four slotted holes for attachment to the foundation with four anchor bolts. The complete pole assembly shall be hot-dipped galvanized after fabrication in accordance with AASHTO M 111. Each assembly must be completely coated in a single dip. All miscellaneous hardware shall be galvanized per AASHTO M 232. Mill certifications shall be supplied.

891.03 Glass Fiber Reinforced Polymers (GFRP).

GFRP poles shall be heavy duty class, conforming to the American National Standard for Roadway Lighting-Fiber-Reinforced Plastic (FRP) Lighting Pole (ANSI C136.20 - latest edition). GRFP poles shall be manufactured by using a thermosetting polyester resin containing a minimum of 65% fiberglass by weight. The resin shall be ultraviolet resistant and pigmented the same color as the final coating to be applied. The resin shall not contain clay fillers. The pole color shall be uniform throughout the entire wall thickness of the pole. The finish of the pole shall be smooth. A 1-1/2 mil dry film thickness of weather resistant polyurethane shall be coated to the surface of the pole for additional ultra-violet protection.

Direct burial poles shall have a 4 inch by 6 inch {102 mm by 153 mm} hand hole with a non-aluminum cover provided at 18 inches {458 mm} above the ground line. The conductor entrance shall be two each 2 inch by 6 inch {51 mm by 51 mm} entrance holes located 2 feet {610 mm} below the ground line and one hundred and eighty degrees apart.

The poles shall be delivered pre-drilled to accommodate luminaires and lowering devices. Pole top tenons shall be permanently bonded to the shaft and shall be aluminum or hot dipped galvanized steel.

891.04 Aluminum.

Aluminum material shall meet the requirements of the AASHTO Sign Specifications, Section 5.

Welding shall be in accordance with the provisions of Section 5 of the AASHTO Sign Specifications.

The shaft of aluminum poles shall be one piece seamless round tapered tube full length heat-treated after welding on the base flange to produce the T6 temper. The base shall be one-piece cast aluminum. All nuts, bolts and washers used shall be stainless steel Grade 18-8 or stronger, and shall meet the requirements of ASTM F 593. Each pole will have an internal grounding lug. A pole vibration damper shall be provided.

The contractor shall furnish copies of certified mill test reports attesting to the fact that the aluminum material submitted for approval meets the contract requirements. These reports shall include chemical determinations and physical characteristics.

891.05 Prestressed Concrete Poles.

Concrete, reinforcing steel and prestressing steel for prestressed concrete poles shall meet the requirements given in Section 513. The concrete shall have a minimum 28 day compressive strength of 5000 psi {35 MPa} or as shown on the plans.

The prestressed concrete pole manufacturing plant shall follow the applicable requirements in ALDOT-367, Section 2, except that plant certification by the Precast/Prestressed Concrete Institute Plant Certification Program will not be required.

Within 30 days after the award of the contract, the Contractor shall notify the Materials and Tests Engineer in writing of the name and address of the fabricator of the poles.

Fabrication will not be allowed to begin until two weeks after the Materials and Tests Engineer has all of the approved details and submittals that are required for a representative of the Department to adequately inspect the fabrication of the poles. The Contractor shall arrange for a representative of the Department to conduct an inspection of the plant facilities and review the plant's Quality Control/Quality Assurance manual during this two week time period.

891.06 Breakaway Supports.

A Federal Highway Administration approved breakaway support shall be installed on each luminaire assembly when indicated on the plans. The pole shall meet the 1985 AASHTO breakaway requirements and FHWA certification of testing must be submitted. The Contractor shall assure the compatibility of the pole base, breakaway support and foundation.

Transformer bases shall be used only as a replacement of a like item on an existing installation unless specifically shown otherwise on the plans.

891.07 Mast Arms.

Mast arms shall be fabricated from steel tubes (except for aluminum poles, which shall have aluminum mast arms) to the lengths specified on the plans and approved shop drawings. Mast arm shafts shall be of one continuous piece without intermediate splices or couplings, provided with rain-tight connections to the shaft of the pole and designed to rotate three hundred and sixty degrees in the horizontal plane.

A two piece section, slip joint shaft mast arm will be permitted when plans or proposal require mast arms longer than the manufacturer's length capability.

All hardware, except split pole clamps, shall be stainless steel or anodized aluminum. The end of the arm shall be furnished with the type of fitting required by the plans.

All connecting joints for attachments for mast arms, shaft extensions and luminaire arms shall be of the design indicated by plan details or approved by the Engineer and shall develop full strength of the joint.

891.08 Anchor Bolt Assemblies.

Anchor bolt assemblies (anchor bolts, nuts, and washers) shall be in accordance with AASHTO M 314, Grade 36 or Grade 55, except maximum tensile strength on all grades is waived, and capable of transferring the load safely from the structure base plate to the foundation. The exposed end of the anchor bolts shall be threaded (rolled or cut type) and provided with appropriate nuts, including lock nuts and flat washers. The anchor bolts, nuts, and washers shall be hot-dipped galvanized in accordance with AASHTO M 232, however, galvanization of the bolt below 6 inches {152 mm} from the top of the embedment line will not be required. The nuts shall be lubricated with a lubricant containing a visible dye so that a visual check can be made for proper lubrication prior to installation. Special care shall be taken when storing galvanized bolts with a water soluble lubricant.

Anchor bolts for overhead roadway sign structures and high mast lighting assembly poles only, shall meet the requirements provided in AASHTO T 244 for Charpy V-Notch testing. Notch toughness tests on specimens shall be performed in accordance with Test Frequency P (Piece Testing) of AASHTO T 243 with a minimum average value of 15 ft-lb. at 40 °F {20 J at 4.4 °C} and the notch shall be oriented perpendicular to the longitudinal axes of the anchor bolt. In order to meet the Charpy V-Notch impact requirements, the steel may require heat treatment. The Charpy V-Notch testing equipment shall be calibrated once each year using a National Institute of Standards and Technology check sample. Certification of the annual calibration shall be available to the Department when requested.

891.09 Pedestals.

If specified by the plans, pedestals shall be furnished for steel and aluminum poles according to the overall length (including cap and base) shown on the plans. Pedestal shafts shall be a one piece, continuous taper or parallel wall, circular shaft. Steel shafts shall be of not less than 1/8 inch {3 mm} wall thickness and of a size at the top designed to fit a standard 4 inch {102 mm} slip-fitter attachment. Steel shafts shall have a polished or galvanized finish, which shall be protected during storage and shipment by a suitable protective covering. The covering shall remain on the shaft until installation begins. A one piece base shall be provided which, when attached to the shaft, will develop the full strength of the shaft to resist bending action. The base shall be provided with four slotted holes for attachment to the base of the foundation. The anchor bolts shall be recessed and ornamental covers provided. A handhole with cover, approximately 4 inches by 6 inches {102 mm by 153 mm} in dimension, shall be provided in the base of the pedestal shaft. A cap for any exposed open end of a pedestal shaft shall be provided. The cap shall be of cast aluminum and of the nipple or tenon mounting type.