

MEYER

UTILITY STRUCTURES

TECHNICAL SPECIFICATION

PREFACE

This document is a general specification for the design and fabrication of tubular steel transmission structures by Meyer Utility Structures, LLC (referred to herein as the “fabricator”). It may also be used by utility engineers and consulting engineers to develop project specifications for design and fabrication of tubular steel transmission structures.

This specification is incorporated by reference as specifically noted in applicable Meyer Utility Structures, LLC quotations, proposals, and responses to invitations to bid and requests for proposals. Non-applicable sections should be disregarded. Supplemental drawings and documents provided by the purchaser, as referenced in this document, are required to complete the specification.

1.0 General

1.1 Scope – This specification covers the design, drawings, material, fabrication, welding, inspection, protective coating, and shipping of welded tubular steel structures for use to support overhead transmission lines. Standards and specifications of organizations (such as ASTM) referenced in this specification, together with any drawings and loading diagrams furnished by the purchaser, shall be considered part of the specification. Referenced standards and specifications shall be the latest edition, unless specifically stated otherwise.

1.2 General Design and Fabrication Considerations – Structures shall be designed to the factored static design loads selected by and provided by the purchaser. The static design loads provided by the purchaser will take into account all additional loading conditions that may be applicable to structures while in service, including but not limited to, effects of conductor galloping, wind-induced vibration, seismic events and other dynamic loading conditions. Correction, repair, and replacement of structures and components with errors in fabrication or design will be in accordance with the terms of the fabricator’s published warranties or warranties agreed between fabricator and purchaser.

2.0 Material

2.1 General – All primary structural plate material shall meet ASTM A6 “General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use” except as modified herein. All

structural plate material furnished shall be mill-certified to meet an impact property of 15 ft/lbs @ - 20°F in the longitudinal direction using the Charpy V-Notch Test. This shall be based on an average of three (3) tests with no one (1) test below 10 ft/lbs. The location of the test sample shall be as prescribed in ASTM A673. The criteria of 15 ft/lbs at -20°F is based on full size test specimens. For subsize specimens, the dimensions and values to be used shall be in accordance with ASTM A673. Heat lot testing (Frequency "H") is acceptable.

2.2 Poles, Arms, Arm Attachment Plates and Conductor Brackets

2.2.1 (Weathering)

Material shall conform to ASTM A871 or A588 to provide a minimum yield strength of 50 ksi and meet the requirements of 2.1.

2.2.2 (Painted)

Material shall conform to ASTM A572, A588 or A871, to provide a minimum yield strength of 50 ksi and meet the requirements of 2.1.

2.2.3 (Galvanized)

Material shall conform to ASTM A572, to provide a minimum yield strength of 50 ksi with a silicon content limited to 0.06%. Material must also meet the requirements of 2.1.

2.3 Base Plates

2.3.1 (Weathering)

Material shall conform to ASTM A871 or A588 to provide a minimum yield strength of 50 ksi, and meet the requirements of 2.1. Equivalent forged ring material may be used.

2.3.2 (Painted or Galvanized)

Material shall conform to ASTM A572, A588, A871, or A633 Grade 50 minimum, and meet the requirements of 2.1. Equivalent forged ring material may be used.

- 2.4 Anchor Bolts** – Material shall conform to ASTM A615 modified “Standard Specification for Deformed Billet Steel Bars for Concrete Reinforcement”, with minimum yield strength of 75 ksi. This material furnished shall be mill-certified to meet an impact property of 15 ft/lbs @ - 20°F in the longitudinal direction using the Charpy V-Notch Test. Reinforcing bars shall be normalized, holding at temperature long enough to ensure uniform heat distribution throughout its mass, and then cooling in still air in a uniform manner. Material shall meet the requirements of 2.1, and shall have a corrosion resistance at least four times that of carbon steel. Anchor bolt threads may be cut or rolled. The thread area of the bolts along with an additional area up to 24 inches beyond the thread area shall be hot dipped galvanized according to ASTM A123, or metallized according to AWS C2.2-67T.
- 2.5 Fasteners** – All bolts shall conform to ASTM A325 or ASTM A354 Grade BC. Bolt material shall have corrosion and atmospheric resistant properties comparable to ASTM A871. Bolts shall either be coated with zinc-rich primer, or hot dipped galvanized to ASTM A153 (for galvanized structures). Nuts shall conform to ASTM A563 Grade DH, galvanized and tapped oversize in accordance with ASTM A563 or ASTM A563 Grade C3.
- 2.6 Reports and Test Samples** – Material, workmanship, inspection travelers and material certified mill test reports shall be maintained on file by the fabricator for a minimum of 6 years.

3.0 DESIGN

- 3.1 General** – Structure loads provided by the purchaser include all overload factors. Stress calculations shall be based on elastic analysis with maximum stresses in main members being limited to the specified yield strength of the steel being used. Any increase in allowable stress due to cold working of the material is not to be considered in the design.

Stability shall be provided for the structure as a whole and for each structural element. The nonlinear effects of the structure in its deflected position shall be considered.

Structures shall be designed to meet the project load requirements.

3.2 Minimum Thickness and Local Buckling

3.2.1 The thickness of any structural member shall not be less than 3/16”

3.2.2 As a minimum, designs shall conform to the requirements in the latest version of ASCE 48 "Design of Steel Transmission Pole Structures"

3.3 Design Calculations and Data – The design calculations shall be the responsibility of the fabricator. The design calculations and data shall include:

3.3.1 General dimensions of all structural components and anchor bolts.

3.3.2 The actual moments, moment of inertia furnished, and the w/t for polygonal cross sections at all splices and at least every 20 feet along the pole.

3.3.3 Structure and anchor bolt weight.

3.4 Final Design Calculations – Final design calculations shall be submitted to the purchaser before fabrication commences, and shall include, in addition to the previously mentioned items:

3.4.1 The bending moments, moments of inertia, and stress at the connections of the arms.

3.4.2 Computation of stresses in base plates and anchor bolts.

3.4.3 Maximum deflection at top of the structure and all load points for specified loading cases.

3.5 Cross Section – The cross section of welded steel tubular members shall be regular polygonal, or elliptical. If elliptical, the ratio of the minor axis to the major axis shall be .75 or greater. The minimum top diameter for any structure shall be 9 inches.

3.6 Anchor Bolts – Anchor bolt design is the responsibility of the supplier. The minimum embedment length (L) shall be calculated in accordance with the latest version of ASCE 48 "Design of Steel Transmission Pole Structures".

3.7 Arms – All engineered arm bracket to arm shaft connections shall be designed and fabricated with a 100% complete penetration weld.

3.8 Climbing – Provisions for removable ladders, step bolts, and other climbing provisions (if any) shall be as detailed on the drawings provided by the purchaser. Compliance of the design of such provisions with OSHA regulations and other applicable safety regulations and standards shall be the responsibility of purchaser.

3.9 Camber – Steel poles designed for eccentric loading or line angles shall be shop cambered if the deflection exceeds the pole top diameter under the normal service loads shown on the loading drawings provided by the purchaser.

4.0 FABRICATION

4.1 General

4.1.1 Except as modified herein, fabrication shall be in accordance with latest version of ASCE 48 "Design of Steel Transmission Pole Structures".

4.1.2 Punching of holes is acceptable for plate thickness up and including 3/4".

4.1.3 Pole sections and Arms shall have the approximate center of gravity identified by welding a plus "+" sign.

4.2 Tolerances – Tolerances shall be in accordance with the fabricator's latest version for manufacturing tolerances. The fabricator shall supply a list of fabrication tolerances to the purchaser upon request.

4.3 Welding – General

4.3.1 Welding shall be performed by qualified operators using qualified procedures in accordance with AWS D1.1, Structural Welding Code – Steel.

4.3.2 Records of welding procedure and welding operator test results shall be kept for 6 years by the fabricator and shall be available for review by the purchaser.

4.3.3 All welding electrodes used for primary joints shall meet, as a minimum, an impact value of 15 ft/lbs at -20°F as measured by the standard Charpy V-notch test. They shall equal or exceed the specified physical properties of the base metal being welded when tested with the applicable AWS specification for welding electrodes.

4.4 Processes

4.4.1 Welding may be done by the shielded metal-arc, gas shielded flux core, gas metal-arc, or submerged-arc processes.

4.4.2 The gas metal-arc process, using the short-circuited transfer shall be not be used.

4.4.3 Personnel and procedures shall be qualified to AWS D1.3, Structural Welding Code – Sheet Steel.

4.4.4 Shielded metal-arc welding shall be done with appropriate strength low hydrogen electrodes, which have been conditioned in accordance with the requirements of AWS D1.1.

4.4.5 Preheating shall be in accordance with the steel producer's minimum recommendation and AWS D1.1, Table 3.3, Table 4.9, or, as verified by testing for suitability for structural application in accordance with AWS D1.1, Annex H. Preheat and interpass temperature requirements shall be specified in the applicable Welding Procedure Specification (WPS).

4.5 Weld Joint Details

4.5.1 Circumferential seams and longitudinal seams in the female slip-joint (nominal) area + 6 inches shall be complete joint penetration welds.

4.5.2 Longitudinal welds in pole sections (except as noted in 4.5.1) shall have a minimum weld joint penetration of 80%.

4.5.3 Base plate, flange plate, and arm bracket joints shall be complete joint penetration welds.

4.5.4 Weld joints, other than described in 4.5.1 through 4.5.3, shall be detailed by the fabricator.

4.6 Weld Quality and Inspection

4.6.1 Except for penetration requirements stated in Section 4.5.2, weld quality shall, as a minimum, conform to AWS D1.1, Clause 6, Part C, regardless of the method of welding.

4.6.2 The fabricator may use any combination of inspection methods to satisfy the weld quality requirements of Section 4.6.1. Visual inspection is required on all completed welds. Ultrasonic inspection shall be performed on all complete joint penetration welds.

4.6.3 In accordance with ASCE 48-11, all base plate to shaft and flange plate to shaft full penetration welds on all galvanized structures shall be inspected for toe cracks after galvanizing. All identified toe cracks must be repaired and recoated prior to shipping finished product. Reports of inspections and repairs shall be provided upon request.

4.6.4 The fabricator shall maintain a "Traveler" on all major components. The "Traveler" shall list material identification, welder identity, inspection results and inspector identity. The fabricator shall furnish the purchaser with data from certified inspection reports upon request.

4.7 Marking – Each separate part of the structure shall be marked according to the purchaser's requirements. In addition, the fabricator's pole number shall be marked on the pole. Marking shall be made by the addition of weld metal, or by stamping, and shall be clearly legible after finishing.

5.0 PROTECTIVE COATINGS

5.1 Painted – The fabricator shall recommend a specific paint system and submit cleaning and application procedures for the purchaser's review and approval.

5.1.1 The recommended system shall be the fabricator's standard. Documentation of previous applications shall be made available to the purchaser upon request.

5.1.2 The fabricator shall have documented test data which verifies the adequacy of the corrosion protection system (primer and topcoat) and make this information available to the purchaser upon request.

5.1.3 The recommended paint system shall provide cathodic corrosion protection. A zinc rich coating (ZRC) is to be used on galvanized surfaces.

- 5.1.4** Tubular sections shall be sealed to eliminate the need for internal protection.
- 5.2 Metallizing** – The fabricator shall provide procedures which detail the metallizing process upon request.
- 5.2.1** Surface preparation is a key element in metallizing. The procedure shall define the cleaning and blasting process. All contaminants, especially petroleum products, must be removed. The steel shall be roughened by the use of a blasting medium with adequate hardness to develop a proper anchor profile.
- 5.2.2** Metallizing application shall be detailed to define the type of equipment to be used, coating to be applied, and thickness of coating.
- 5.2.3** Tubular sections shall be sealed to eliminate the need for internal corrosion protection.
- 5.3 Galvanizing** – The fabricator shall provide detailed galvanizing procedures upon request.
- 5.3.1** The inside of a tubular member shall be readily visible and accessible for post galvanizing cleaning and repair as needed.
- 5.3.2** The galvanizing shall meet the requirements of ASTM A123.
- 5.3.3** The coating quality shall be determined as described in the American Galvanizer’s Association bulletin “Inspection of Products Hot Dip Galvanized After Fabrication”.
- 5.3.4** The fabricator shall provide a detailed inspection procedure and evidence that ultrasonic inspections are performed on base plate and flange plate welds after galvanizing.
- 5.4 Weathering Steel** – The structure shall be designed to eliminate water and refuse traps. The base sections of tubular steel structures shall be sealed (top and bottom) to eliminate any entry points for moisture.

5.5 Coatings for Embedded Steel – The fabricator shall provide procedures which detail the coating system and its effectiveness in various soil conditions upon request. The coating shall include an aliphatic component to prolong the coating life relative to the effects of UV exposure. In addition, the coating must be dielectric and 99.5% minimum solids content in order to create a proper barrier coating.

5.5.1 Minimum coating thickness shall be 20 mils.

5.5.2 All sharp corners and edges shall be pre-stripped with coating thickness prior to the application of the full coating.

5.5.3 All contaminants must be removed from the structure surface prior to coating. The steel shall be roughened by the use of a blasting medium with appropriate hardness to develop a proper anchor profile.

Note: The purchaser should perform an initial evaluation of the installation site conditions. This evaluation may include soil electrical resistivity tests in accordance with ASTM G-57, Method for Field Measurement of Soil Resistivity, using the Wenner Four-Electrode Method.

6.0 DRAWINGS

6.1 Submittals – After receipt of a purchase order, the fabricator shall prepare detailed assembly drawings and submit electronically to the purchaser. Within one week of receipt of drawings, the purchaser shall return the drawings electronically marked “Approved” or “Approved as Noted”. After resolution of all comments from the purchaser, updated assembly drawings shall be sent electronically to the purchaser. Drawings shall be approved by the purchaser before proceeding with fabrication

6.2 Ownership of Drawings – Fabricator shall retain all intellectual property rights in designs and drawings furnished by fabricator. Designs and drawings furnished by the fabricator may be used and reproduced by the purchaser for purchaser’s own use in the installation, erection, operation, and maintenance of the structures depicted in such designs and/or drawings.

7.0 SHIPPING

7.1 General – Each shipment and each invoice shall be accompanied by a packing list of all parts on that particular shipment. Bolts, nuts and other hardware shall be either boxed or bundled. All bolts, nuts and

miscellaneous hardware shall be identified by the packing list to enable efficient match-up with their respective poles shafts.

7.2 Anchor Bolts

7.2.1 Anchor bolts shall either be shipped caged and assembled as one unit, or shipped unassembled with a top and bottom template for each pole as defined elsewhere in the bid documents.

7.2.2 Welding on anchor bolts for clustering purposes is permitted only in the bottom 6" of the bolt's length. Structural welds according to AWS D1.4 Structural Welding Code-Reinforcing Steel and 4.3.1 are permissible.

7.3 Destination – Unless otherwise agreed to by the purchaser, the shipment shall be forwarded according to the shipping instructions shown on the inquiry. The purchaser shall be notified when each shipment is made.

7.4 Source Inspection and Testing – Upon sufficient notification by the purchaser, the purchaser will have the right to inspect work specific to their job during the course of the fabrication process. An inspection and/or test plan must be provided and agreed to by the fabricator before access will be given.