

1. SCOPE

This specification covers the minimum performance requirements for design, material, welding, fabrication, testing and shipping requirements to supply tubular steel transmission poles, arms, base plates, caissons, anchor bolts, ground pads, and associated hardware. A special provisions sheet accomodates this specification with project specific information.

3. REFERENCE STANDARDS

Unless otherwise stated in this specification, steel poles shall comply with the latest revisions of the following standards:

Industry Standards

ANSI B18	Standardization of Bolts, Nuts, Rivets, Screws, Washers, and Similar Fasteners
ANSI C2	National Electrical Safety Code
ASCE/SEI 48	Design of Steel Transmission Pole Structures
ASTM A6	Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A36	Standard Specification for Structural Steel
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A143	Standard Specification for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A370	Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A384	Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
ASTM A385	Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
ASTM A388	Standard Practice for Ultrasonic Examination of Steel Forgings
ASTM A435	Standard Specification for Straight-Beam Ultrasonic Examination of Steel Plates
ASTM A500	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A572	Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A588	Standard Specification for High-Strength Low-Alloy Structural Steel, with Atmospheric Corrosion Resistance
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A633	Standard Specification for Normalized High-Strength Low-Alloy Structural Steel Plates
ASTM A673	Standard Specification for Sampling Procedure for Impact Testing of Structural Steel
ASTM A780	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A847	Standard Specification for Cold-Formed Welded and Seamless High-Strength, Low-Alloy Structural Tubing with Improved Atmospheric Corrosion Resistance
ASTM A871	Standard Specification for High-Strength Low-Alloy Structural Steel Plate With Atmospheric Corrosion Resistance
ASTM D2197	Standard Test Method for Adhesion of Organic Coatings by Scrape Adhesion
ASTM D3451	Standard Guide for Testing Coating Powders and Powder Coatings
ASTM D7803	Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating
ASTM E94	Standard Guide for Radiographic Examination Using Industrial Radiographic Film
ASTM E114	Standard Practice for Ultrasonic Pulse-Echo Straight-Beam Contact Testing
ASTM E164	Standard Practice for Contact Ultrasonic Testing of Weldments
ASTM E587	Standard Practice for Ultrasonic Angle-Beam Contact Testing
ASTM E709	Standard Guide for Magnetic Particle Testing
ASTM F3125 Grade A325	Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength
AWS D1.1	Structural Welding Code

ISO 12944	Corrosion protection of steel structures by protective paint systems
SSPC-PA-2	Procedure for Determining Conformance to Dry Coating Thickness Requirements
SSPC-SP-6/NACE No. 3	Commercial Blast Cleaning
SSPC-SP-7/NACE No. 4	Brush-Off Blast Cleaning
SSPC-SP-8/NACE No. 5	Near White Blast Cleaning

In the event of a conflict between this specification and referenced document the more stringent requirement will be followed.

4. POLE DESIGN

4.1 General

All pole sections, arms and hardware shall be designed for installation either on the ground or in the air.

The shaft joints to be made in the field shall be slip joints, or flange plate connections.

Poles shall be furnished complete with all appropriate hardware, fittings and devices, including but not limited to bolts, nuts, washers, lockwashers, arms, base plates, anchor bolts, nameplates and pole cap.

Poles, arms and associated hardware shall be designed to present a clean aesthetically pleasing appearance while maintaining all strength and durability requirements in this standard.

In general a minimal pole diameter and minimum number of joints is desired. See special provisions sheet for any additional requirements.

Poles shall have a uniform taper throughout their length unless otherwise approved by the District.

- Minimum taper shall be no less than 0.14 in. of diameter per ft. of length;
- Maximum taper shall be no more than 0.45 in. of diameter per ft. of length.

Conditions, limitations and data for design in addition to that shown on the loading schedules, shall be according to the applicable sections of the National Electrical Safety Code (ANSI C2), and Design of Steel Transmission Pole Structures (ASCE 48).

In the event of conflict between this specification and referenced documents or between several referenced documents, the more stringent requirement will be followed.

4.2 Loading

The poles shall satisfy all of the conditions imposed by the appropriate loading schedules shown on the District's design drawings. The following information is to be used in connection with the loading schedules.

- The loads shall be applied in the directions indicated on the loading schedules.
- The poles must not fail at the combination of loads specified in the loading schedules. Failure is defined as a permanent deformation or stress beyond the elastic limit of any pole part or the limit at which the pole will no longer sustain the applied load.
- The structure outline is diagrammatic only and not to be considered restrictive beyond given dimensions. Geometric shapes given in the details are also not restrictive.
- All double circuit structure types shall be designed to support either one or both circuits installed in a vertical configuration (one circuit on each side of structure) at a given time.

4.3 Rotation and Deflection

Rotation and deflection shall be separate design considerations.

The design of all structures shall allow for one (1) degree of foundation rotation, including all "p-delta" effects from vertical load associated with such rotation.

Deflection shall be calculated from the assumed point of fixity for direct embedded poles or the groundline for poles mounted on a caisson.

The steel poles shall be cambered or raked if the deflection is more than 1 percent of the pole height under normal operating conditions (60°F, FINAL, no wind, no ice) indicated on the structure loading schedule. Under all loading cases the deflection shall be limited to:

- Strain and Dead End Structures - 5 percent of the pole height.
- Suspension Angle Structures - deflection shall not infringe on the electrical clearances and shall not be more than 5 percent of the pole height.
- Tangent Structures - deflection shall not infringe on the electrical clearances and shall not be more than 8 percent of the pole height.
- Additional stresses from vertical loads applied in the final deflected position must be analyzed and included within the design.
- When a broken conductor condition is present in the Loading Schedule on the bid drawings, the deflection of all types of structures shall not exceed 10 percent of the pole height.

4.4 Strength at Attachment Bolts

Metal poles shall support the simultaneous application of a 3,000 lb horizontal and 5,000 lb vertical load on a 5/8 inch through bolt reinforced with 3 inch washers (curved washers for tubular or flat for multi-sided poles) without damage to the pole or permanent deformation of the bolt hole. Steel poles shall be designed for a nominal through bolt installation torque of 50 ft-lb, but must withstand an installation torque of 100 ft-lb without damage.

4.5 Field-drilled Holes

Manufacturer shall provide correct procedures for field drilling additional holes. Poles shall maintain strength ratings if drilled accordingly.

4.6 Pole Drawings

All parts forming the structure shall be fabricated in accordance with drawings provided by the manufacturer and approved in writing by the District. Manufacturer shall provide drawings in the form specified by the District in the special provisions sheet and according to Section 8 of this specification.

4.7 Forged Rings

The use of forged ring material will generally be acceptable by the District once the vendor's forge ring supplier has been vetted to ensure proper mechanical and CVN testing of the material has been performed and approved in writing by the District.

For galvanized material, the forged rings will be required to meet the requirements of ASTM A350. Following post-fabrication heat treatment (tempering) all forged ring material used for base plates or flange plates shall undergo a surface "milling" process (approximately 3 mils minimum) to remove any hardened layers of steel formed during the forging operation as well as ensure a flat surface for the anchor bolts nuts to bear on. As with any material used in a welded joint, proper Weld Procedure Specifications (WPS) with the requisite Procedure Qualification Record (PQR) are required per the requirements of AWS D1.1. prior to welding the material.

These tests shall include the requirement for CVN testing of the deposited weld. All forged rings materials shall be tested for potential laminar defects in accordance with the requirements of ASTM A388 Ultrasonic Examination of Steel Forgings.

5. MATERIAL

5.1 Structural Steel

All structural steel shall meet or exceed requirements in ASTM A6, A572, A588 or A871 unless approved in writing by the District. All grounding/bonding pads shall conform to AISI 304L unless approved in writing by the District.

Material for poles, caissons, attachment plates and brackets shall conform to ASTM A572 Grade 50, 55, 60 or 65.

Material used from Coil, must be re-certified to conform to the A572 specification following decoiling per the requirements of A6 and A572. Material for base plates shall conform to ASTM A572, A588, A871, A633 Grade 60, 65 or A852 Grade 70.

Structural plate material 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 tests using full size test specimens with no one test below 15 ft/lbs. If full size test specimens cannot be used, a reduction in the minimum acceptance energy values shall be in conformance to Table 9 of ASTM A370 and a CVN test temperature reduction Table 4.15 of AWS D1.1 shall be used. For subsize specimens the dimensions and values to be used shall be in accordance with ASTM A673. Heat joint testing (Frequency "H") is acceptable.

Manufacturers shall submit all certified mill test reports and ASTM standards prior to shipment.

Steel having a specified minimum tensile strength of less than 70 ksi [485 MPa] shall not exceed the minimum specified tensile strength by more than 30 ksi [205 MPa]. Steel having a minimum specified tensile strength of 70 ksi [485 MPa] or higher shall not exceed the minimum specified tensile strength by more than 25 ksi [170 MPa].

For galvanized steel structures, structural plate or coil used for base plates, flanges, pole shafts, through vangs, and brackets shall not exceed a carbon equivalency (CE) of 0.45. Supplier shall notify the District on the bid if this value is exceeded.

The minimum thickness of all structural steel shall be 1/4" regardless of yield strength.

5.2 Anchor Bolts

The vendor shall select and specify an anchor bolt pattern that will provide the most economical arrangement, based on full length anchor bolts, for the specific pole loading and diameter. The embedment length shall be determined by using the anchor bolt's ultimate capacity in tension and the ultimate bond stress values (for concrete having FC-3000PSI) as determined using the formulas provided in ASCE 48.

Two templates, adequate to hold the anchor bolts in a rigid cluster while concrete is being poured, shall be furnished for each set of anchor bolts.

Templates shall have an unobstructed opening through the center to allow the placing of concrete for the caisson.

When the bolt circle will permit, this opening shall be a minimum of twenty-four (24) inches in diameter. In no case shall an opening of smaller than sixteen (16) inches in diameter be provided.

The top template shall have orientation 'V' notches on the bisector of the line angle to aid in alignment. Holes 1/4 inch in diameter shall be drilled in the top template 90 degrees off the bisector to aid in field alignment.

Anchor bolts shall be a minimum of 24 inches long with a 2-1/4 inch diameter, deformed, straight reinforcing rods in compliance with the latest revision of ASTM Specification A-615, 75,000 psi yield strength, and with impact requirements in accordance with Section 5.1 of this specification. Each nut and bolt shall be hot-dip galvanized per Section 6.12. At a minimum the threaded length shall allow for three (3) nuts, the baseplate plus six inches. Each bolt shall be supplied with three (3) galvanized nuts installed on the threaded end prior to shipment. Anchor bolt nuts shall fit snugly after galvanizing, but be sufficiently loose to be tightened by hand as identified by a Class 2 fit.

5.3 Bolts, Nuts and Lockwashers

All bolts, nuts and lockwashers shall be supplied with the pole and comply with the latest revision of ASTM Specification F3125 Grade A325.

Bolts must be of such length to pass entirely through the standard nut, with a minimum projection of three (3) full threads and a maximum projection of 3/4 inches. Bolts used in assembling poles in the field shall not be less than 5/8 inches in diameter.

All bolts shall be galvanized and supplied with galvanized nuts and lockwashers. The nuts shall fit the bolts snugly, but be sufficiently loose to be tightened by hand. Bolts having diameters of 5/8 inches and larger shall have heavy lockwashers, as specified in the latest edition of ANSI B18.21.1.

The vendor shall furnish extra bolts, nuts, and lockwashers, in the quantity of five percent of the number of each size (with a minimum of one (1) extra set per pole).

6. FABRICATION

6.1 General

All materials shall be new and of the highest quality. Any subcontracting by the Vendor of the fabrication of major components/assemblies (pole shafts, arms, anchor bolts, etc.) shall be approved in writing by the District.

6.2 Attachments

Attachments for insulators, arms, and hardware shall be sized and located as shown on the District's design drawings.

6.3 Climbing Devices

Mounting clips for removable ladders shall be provided on the pole from the pole top to the ground level or as specified on the District's design drawings. Clips shall be designed and tested to support sustained vertical load of 750 lb applied 6 inches away from the pole surface on permanent pole steps per Figures 1-3.

6.4 Through Holes

Through holes shall be drilled horizontally through the center of the pole at locations shown on the District's design drawings. Through holes shall be sleeved with the inside diameter equal to the diameters shown on the District's design drawings. Through holes shall be drilled and sleeved prior to galvanizing.

6.5 Slip Joints

Slip joint length shall be at least 1.5 times the maximum shaft diameter. Slip joints shall have a 3/8" hole in the female section at the minimum splice dimension in order to verify minimum overlap when the slip splice is fully assembled in the field.

6.6 Grounding Attachments

Grounding connections shall be supplied as detailed on the District's design drawings.

Grounds shall meet the requirements of NESC 094 and shall be electrically connected to the pole per NESC 095.

6.7 Rigging and Lifting

A minimum of two lifting ears shall be attached near the top of each pole section to allow for lifting in the field with a either 10-ton shackles or ground release shackles. Lifting ears shall have holes with a minimum diameter of 1.5", be a maximum of 3" deep and be strong enough to lift the weight of the pole section with a safety factor of 5:1.

6.8 Base or Bearing Plate

A bearing plate shall be welded to the bottom of directly embedded poles. The bearing plate shall be designed for a maximum allowable soil bearing pressure of 10,000 pounds per square foot. Actual soil bearing values will be provided to the vendor after the bid award. Bearing plate shall have a diameter not more than two inches greater than the maximum pole diameter.

Unless hermetically sealed, poles shall have a drain hole through the base plate or bearing plate. There shall be no pockets or depressions that allow water to pool.

6.9 Caisson

A caisson shall be supplied when specified by the District. Caisson shall have a minimum thickness of 3/8 inch for caissons from 36 inch diameter to 47.9 inch diameter; a minimum thickness of 7/16 inch for caissons from 48 inch diameter to 53.9

inch diameter; a minimum thickness of 1/2 inch for caissons of 54 inch or greater diameter.

The caisson shall be designed for a maximum allowable soil bearing pressure of 10,000 pounds per square foot.

Actual soil bearing values will be provided to the vendor after the bid award.

6.10 Welding

All welding shall be done in the factory and conform to the requirements the AWS D1.1.

Visual weld inspection shall be performed for one hundred percent (100%) of all welds. The acceptance-rejection criteria for visual weld inspection shall be that provided in AWS D1.1 Table 6.1.

In addition to visual inspection, all complete joint penetration welds shall be volumetrically inspected by either ultrasonic testing (UT) or radiographic testing (RT). The acceptance-rejection criteria for welds inspected with UT shall be the requirements shown in AWS D1.1 Table 6.2. The acceptance rejection criteria for welds tested by RT shall be as shown in AWS D1.1 Figures 6.1.

All circumferential welds, including base/flange plate and arm bracket to pole/arm shaft welds shall be complete joint penetration (CJP) welds.

All longitudinal welds in the following areas shall also be 100% penetration welds:

1. The overlapping lengths of slip splice on the female section calculated as 1.5 times the O.D. of the female end plus 12 inches of added length to account for any slip splice under-slip tolerance.
2. Six (6) inches on either side of a circumferential weld.
3. Six (6) inches above a base plate to pole shaft weld.
4. Six (6) inches above a flange plate to pole shaft weld.
5. Six (6) inches at the top end of the male section in a slip splice.
6. Three (3) inches in either side of a through vang that penetrates through the long seam.

Longitudinal welds in all other areas shall have a minimum weld penetration of 80%. The 80% penetration requirement shall be verified by ultrasonic testing (UT), on a minimum of 10% of the total length of the longitudinal weld that is 80% penetration.

In addition to the weld testing during fabrication, the requirements in ASCE 48 to provide post-galvanizing UT inspection for "toe cracks" on all large CJP "T-Joints" (flange plates, base plates) shall be followed.

The Vendor shall furnish the District test results in writing for all the welds tested on all poles. The cost of the weld tests made by the Vendor shall be included in the lump sum price as stated in the proposal.

6.11 Nameplate and Section Markings

Each pole structure shall be distinctly marked with a nameplate to identify the manufacturer, serial number, purchase order number, structure number, height and weight of the pole, ground line moment and the month and year of manufacture. The nameplate shall be made of a noncorrosive metal and shall be securely attached to each pole five (5) feet up from the base plate for poles on caissons or (5) feet from ground line on direct buried poles.

Characters for the purchase order number shall be 3/16" high by 1/8" wide. All other characters shall be at least 1/4" high by 3/16" wide.

Each part or piece of the structure shall be marked with an identification mark and a designated center of gravity. All marks shall be a minimum of 1/4 inch high. All parts with identical identification marks shall be interchangeable.

For multi-piece poles, the minimum overlap shall be permanently marked on the male section. Poles shall include provisions for jacking & bolting the pole sections.

6.12 Galvanizing

The method of SSPC surface preparation specification that precedes galvanizing shall be submitted to the District for approval. The parts to be galvanized shall be blast cleaned if necessary before pickling. The necessary precautions shall be taken to avoid embrittlement as specified by ASTM A143. Precautions shall also be taken as necessary to ensure that iron-zinc alloys do not reach the surface.

Any machining, bending or working of these parts in any manner shall be done before the parts are galvanized.

All galvanized coatings shall be of a uniform thickness per ASTM A123. No "overlap", "splice" or "double dip" in "wet-kettle" galvanizing shall be allowed.

Galvanizing shall be over the entire surface area of all hardware, both internally and externally in accordance with the AGA "Quality Control Manual".

Galvanizing of anchor bolts, bolts, nuts, and lockwashers shall be of a uniform thickness per ASTM A153. All other galvanizing including pole shafts, arms, plates and structural shapes, shall be performed in accordance with ASTM Specifications A123 and A384.

Galvanizing shall cover the entire surface area, both inside and outside surfaces.

All anchor bolts shall be galvanized a minimum of 6" below the top of the caisson to the top of the bolt.

Galvanizing repairs shall be made per ASTM A780 Annex A2 (Repair Using Paints Containing Zinc Dust) or Annex A3 (Repair Using Sprayed Zinc Metallizing). Repairs using Zinc Base Alloys or Solders shall not be allowed.

Galvanized sections shall not be water quenched after galvanizing.

6.13 Painting

All surfaces of the pole and arms shall be painted or powder coated after galvanizing above and below the groundline coating according to ISO 12944 for high durability (>15 years) under corrosivity category: C4-IM1/IM3. The top coat shall lose no more than 5% from flaking under an adhesion test per ASTM D2197 Class 4B.

Primer coat from pole base to 8' above ground line shall be a minimum dry film thickness of 5 mils. Coating from 8' above ground line to the pole top shall be a minimum of 3 mils.

Top coat shall be a minimum dry film thickness of 3 mils.

If powder coating, the surface shall be prepared per ASTM D7803 and tested per ASTM D3451.

Bidders shall furnish appropriate technical data on the paint.

The Vendor shall make available sufficient paint of the color specified but of brushing consistency, to touch-up any paint surfaces damaged by shipping and handling. Touch up paint shall have the District's purchase order number clearly and permanently identified on the container.

The manufacturer shall note on their bid if any pole will be shipped to another facility for painting after galvanization, provide distance between facilities and procedures to ensure adhesion to surface.

Paint color shall be RAL 7030 "stone gray" or District approved equivalent unless otherwise specified in the special provisions sheet.

6.14 Groundline Coating

Direct embedded steel poles and caissons shall be coated with TarGuard, Chemthane 2260, CorroCote II Classic, Ultra or District approved equivalent. Hard edges are not acceptable at the top termination of the coating. There should be no overspray at the top of the coating and a clean chamfered transitional termination edge should be the end result.

Galvanized surfaces to be top coated shall be brush blasted in accordance with SSPC-SP 7/NACE No. 4 – BrushOff Blast Cleaning. A fine grain abrasive shall be used so that excessive zinc removal or micro-fracturing of the zinc does not occur. Steel surface temperature, humidity, and dew point shall all be measured and recorded prior to coating application. Coating shall not occur if the steel surface temperature is below 50°F and at least 5°F above the dew point.

For direct embedded poles, the base of the pole shall be coated from four feet below groundline to two feet above unless otherwise specified. The dry film thickness shall be a minimum of 20 mils and be applied to the exterior and interior of the pole.

For caisson mounted poles, the caisson shall be coated from the caisson plate to 15 feet below the caisson plate on the exterior and interior of the caisson. The caisson plate shall not be coated. The dry film thickness shall be a minimum of 32 mils and be applied to the exterior and interior of the caisson.

An ultraviolet light protective top coating shall be applied over the TarGuard, Chemthane 2260, CorroCote II Classic, Ultra or District approved equivalent system. The minimum dry film thickness for this additional UV protective coat shall be 3 mils.

Aliphatic, UV stable formulations may be used as a single 20 mil coating if approved in writing by the District.

7. QUALITY ASSURANCE

The chemical compositions and appropriate mechanical properties of structural steel used shall be verified either by providing the District with the manufacturer's certificates of compliance or with laboratory testing results.

The vendor shall bear all costs of chemical analysis, physical tests and furnishing of all certified reports required hereunder.

Upon request, sample coupons of steel used shall be furnished for independent testing by a laboratory selected by and at the expense of the District. Manufacturer shall make these available for up to 7 years after receipt of order.

All plates over 1-1/2 inches thick shall be ultrasonically tested per the requirements of ASTM A435 to determine if defects are present which could cause laminar tearing.

Materials and workmanship shall at all times be open to inspection by the District and acceptance or rejection by the District may occur either at the Vendor's plant or at the point of delivery. Any omission or failure on the part of the District to dis-

approve or reject any workmanship or materials at the time of inspection shall not be construed as an acceptance of any defective workmanship or materials.

All nondestructive testing shall be performed by an ASNT Level II Inspector in the specific method that he/she is performing inspections. The inspector shall meet all of the requirements recommended in ASNT SNT-TC-1A.

The District or the District's contracted 3rd party representative shall have free entry, at all times while work is in progress, to all parts of the Vendor's plant involved in the fabrication of the structures furnished pursuant to these specifications. Such accessibility for quality inspections shall also apply to any sub-contractors used by the Vendor.

The Vendor shall afford the District or the District's representatives reasonable facilities, without charge, to allow them to verify that the finished products and materials being furnished are in accordance with the requirements of these specifications.

8. DRAWINGS

8.1 General

The manufacturer shall provide a lead time for erection and shop drawings as detailed below in the form of "After Receipt of Order" (ARO). When the drawings need confirmation or correction the District shall have two weeks to have corrections returned to the Manufacturer. If additional time is taken by the District to make corrections, the lead time for pole delivery may be moved out no more than two weeks for every one week the District takes to make corrections.

Unless specified otherwise drawings shall be 22 inches by 34 inches overall in size, have a one inch binding margin and be provided in a digital format approved by the District and by hard copy at the option of the District's Engineer.

No drawing shall contain details for more than one pole type.

All calculations, stresses, weights, and dimensions shall be shown in US customary units. In addition, metric units may also be shown.

8.2 Drawings Furnished with Bids

All Bidder's shall submit with their proposal, one (1) set of prints of the Bidder's design drawings and design calculations for each pole per section 8.4. Design calculations shall be submitted digitally and in a form approved by the District.

8.3 Drawings for District's Approval

Following award of the bid, the Vendor shall furnish the District with design and erection drawings for approval within the amount of time specified in the bid. The District may make minor design changes at its sole discretion after award of contract and prior to the District's approval of the Vendor's design and erection drawings with no change to the total contract price.

Within two weeks of revised prints, the District will return markups which will either set forth proposed revisions or be marked "Approved for Construction." If revisions are required, the District will either approve the prints or return for further revisions within one week of receipt of each set of revised prints. Fabrication started before receiving District's approval shall be at the Vendor's risk. Approval of the drawings by the District does not relieve the Vendor of responsibility for the proper fitting of the parts or the meeting of the specifications. Approval of the drawings by the District shall not be construed as a complete check but will indicate only that the general method of fabrication and detailing is satisfactory.

After the District approves the drawings, the Vendor shall supply drawings marked "Approved for Construction" in the following formats: (1) set in pdf, (1) set in dxf and 11" x 17" paper copies on request.

A complete set of drawings in PLS-POLE or District approved format shall be supplied for each structure.

Each drawing supplied, whether for approval or as "Approved for Construction", shall bear identification showing the District's Purchase Order Number, and the date of drawing release.

The drawings described in this section shall be sent at least two weeks prior to shipment.

In the event any errors in detailing are found during the course of erecting the structures, the Vendor shall correct and revise and furnish new copies of the drawings without cost to the District.

8.4 Drawing Types

The Bidder's design drawings shall show the following:

- Material grades for pole shaft, caissons, base plates, attachment plates and brackets.
- Pole and arm dimensions including pole diameter, joints and metal thickness.
- The number, spacing, and minimum length and bolt pattern of anchor bolts.

The Manufacturer's design calculations shall include the following:

- The total shears and axial forces, moments, stresses, deflections, section moduli, cross-sectional areas, safety factors (allowable stress/actual combined stress), and w/t's ratio at five foot intervals along the structure as well as at points of load application for all load cases.
- The total shears and axial forces, moments, stresses, section modules, cross sectional area, and safety factor at the arm connections for the critical loading case. Deflection at end of arm shall also be included.
- Computation of stresses in base plates, connections and attachments.
- Calculated weight of each structure including all attachments.
- Anchor bolt design including bolt pattern, size and length of anchor bolt and quantity per pole.
- All reactions and groundline moment with and without overload factors for all load cases.

The Manufacturer's erection drawings shall show:

- Complete pole oriented from the top down, including position of each component, pre-drilled holes and base plate.
- Size and number of bolts required for each connection.
- Assembly instructions including best practices, order of operations, arm joining and connecting of multipiece poles.
- Directions for setting poles if precambered or raked.
- A bill of materials showing:
 - Number of parts required.
 - Description of parts including size and weight.
 - Mark used for each part.
- Complete bolt list showing size and length.
- Cross reference to appropriate shop detail drawings.

The Vendor's shop detail drawings shall show:

- All Parts or pieces with identification marks.
- All information required for fabrication including weld symbols indicating weld sizes required by design.
- Location, size and orientation of all holes.

- Enlarged details where necessary to provide clarity.
- A Bill of Materials for all material shown on the drawing including:
- The mark designating the part or piece.
- A description of each part.
- Number of pieces required.
- Separate shop detail drawings are not required when the above information is included in the erection drawings.

The District reserves the right to revise details on the shop detail drawings to accommodate attachment of distribution equipment.

9. PACKING AND SHIPPING

9.1 General

The Vendor shall pack, crate, load, protect, and brace each item as appropriate for shipment in a workmanlike manner in accordance with applicable standard trade practice. Painted parts shall be wrapped or otherwise suitably protected to prevent damage during shipment.

Poles shall be shipped on an open flatbed trailer in a bundle that may be handled and easily unloaded by forklift without damage to the poles. The butts and tops of each row shall be alternated. Pole bundles shall be secured by cushioned 4 inch x 4 inch minimum support braces and banding straps. Positions of the bracing and banding shall be approximately 36 inches to 48 inches from each end, and then evenly divided along the length with no more than 15 feet between support braces. These cushioned braces shall be located in between each layer of poles at each bracing/banding strap location to prevent poles from rubbing together during shipment.

All packages, bundles, boxes, or kegs shall be plainly marked indicating purchase order number, structure number, pole height, type of material, size, length and number of pieces.

Each pole shipment shall arrive with a full set of erection drawings as described in Section 8.4 secured to the pole base in weatherproof packaging and shall include an outline drawing of each section including all dimensions, weights, center of gravity and pick points. A digital copy shall be sent to the District in advance of any shipment of material.

Unless otherwise directed all poles, caisson and associated hardware shall be delivered in one shipment to:

1802 75th Street SW
Everett, WA 98203

9.2 Poles and Accessories

All poles and accessories shall be shipped as one shipment within the time period stated on the purchase order.

If the accessories are loaded separately from the pole bodies, they shall be packaged or bundled and marked to identify them with their corresponding pole bodies. Anchor bolt cages shall be shipped preclustered within the time period dated on the purchase order.

9.3 Bolts, Nuts, Washers and Lockwashers

All bolts, nuts, and washers, except anchor bolts and nuts shall be packed in serviceable wooden boxes, UVresistant plastic pails or kegs with wooden ends for each pole. All packages shall be plainly marked indicating type of material, sizes, lengths,

number of pieces and pole number.

10. WARRANTY

The Vendor shall promptly repair or replace any of the goods provided to the District which do not conform with the warranty provisions set forth in the General Bidding Conditions, including any necessary transportation and related costs including but not limited to costs of removal and reinstallation.

The failure of any pole due to defective design, material and/or workmanship within 12 months after being set or 18 months after delivery, whichever comes first, shall be repaired or replaced without cost to the District.

Any defect in design, material and/or construction discovered within this period shall be corrected at the manufacturer's expense, either by repair or by replacement.

11. BID AWARD

Bid proposals shall be evaluated based on:

- The Bidder meeting the minimum requirements outlined by this specification
- Price
- Delivery
- Quality of product
- Past performance
- Warranty
- Any other elements or factors which could affect the final cost to and the benefits to be derived by the District.

The District reserves the right to award any bid item or items to one or more Bidders, in accordance with the best interests of the District.

12. FINAL ACCEPTANCE

Prior to final acceptance the Vendor shall provide the District with the following:

- Certified Mill Test Reports (MTR) for all structural materials (including hardware) used on the project; for coiled material this should also include the documentation for the re-certification after decoiling including retesting for CVN properties. If accomplished independently of the MTR, provide documentation of all testing for CVN properties.
- All weld inspection documentation including formal reports of results for UT including UT for postgalvanizing "toe-crack" inspection.
- Documentation for testing of galvanizing, paint and groundline coating thicknesses.