Attachment A
SPECIFICATIONS

SECTION I - NON-ORNAMENTAL MAST ARM POLES

Current Standards: 62-01 Non-Ornamental Pole

1. GENERAL

1.1. This section describes minimum acceptable design and installation standards for poles and arms for traffic signals.

1.2. The Contractor/Manufacturer shall provide to Arlington County a written warranty against any defects in materials and workmanship for a period of one year from the time of delivery to the Arlington County.

1.3. For warranty repairs, all costs of labor, parts and transportation to and from the Contractor/Manufacturer shall be borne by the Contractor/Manufacturer**.**

2. DESIGN

2.1. Design shall be in accordance with "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, 6th Edition (LTS-6), 2013 with 2015 Interims" and the VDOT Instructional and Informational Memorandum S&B 90.2.

All welding shall be in accordance with Sections 1 through 8 of the American Welding Society (AWS) D1.1 Structural Welding Code. Tackers and welders shall be qualified in accordance with the code.

2.2. Design and calculations shall include mast arm, luminaire arm, pole, baseplate, and anchor bolt analysis. Maximum arm and pole loads, stresses and combined stress ratios shall be provided for each group load, as well as maximum pole dead load rotation.

For anchor bolt forces, pole forces shall be positioned in such a manner to maximize the force on any individual bolt regardless of the actual bolt orientation with the pole. The design of anchor bolts shall result in a ductile steel failure prior to any sudden brittle failure of the concrete.

Calculations shall be sealed by a professional engineer licensed in the Commonwealth of Virginia. Include shop drawings detailing the poles as designed. Shop drawings shall contain all component drawings necessary to fabricate the structure. Drawings shall at a minimum specify the pole height, arm length(s), pole and arm diameters at the base and tip, splice locations, bolt circle diameter, bolt diameters, and detailed drawings showing the hand hole cover assemblies. The drawings shall also show the width, depth, length and thickness of all material and list pertinent ASTM specification designations together with the tensile strength of metallic members.

Design Loading Requirements:

2.2.1. Structure components and their connections shall be designed to resist the worst-case loading, upon evaluation of all applicable cases acting separately.

2.2.2. Design Attachment Loading:

2.2.2.1. Attachment Data:

ATTACHMENT	SURFACE AREA (SF)	DEAD LOAD (LBS)
ALUMINUM 3-SECTION HEAD*	8	68
ALUMINUM 4 SECTION HEAD*	11	89
8'x2' STREET NAME SIGN	16	48
10'x2' STREET NAME SIGN	20	60
30"x36" REGULATORY SIGN	7.5	22.5
36"x36" REGULATORY SIGN	9	27
CCTV CAMERA	1	22
VIDEO DETECTION CAMERA	1	22
OPTICOM DEVICE	1	22
LUMINAIRE	2	40
LED BLANK-OUT SIGN (only included on arm lengths above 40')	10	50
*All Signal Heads shall include High Visibility Signal Backplates (HVSB)		

2.2.2.2. 20' Compact Pole Mast Arm Length:

(2) Aluminum 3-section heads spaced every 8.5'
(1) 8'x2' street name sign mounted between pole upright and 3-section head
(1) 30"x36" regulatory sign halfway on the arm
(1) 30"x36" regulatory sign 1' from the end of the arm

2.2.2.3. 20' to 40' Mast Arm Lengths:

(3) Aluminum 3-section heads spaced every 10'
(1) Aluminum 4-section head at the end of the arm (1' in from the end)
(1) 10'x2' street name sign mounted between the inside two signals
(1) 30"x36" regulatory sign (next to the middle signal head)
(1) 36"x36" regulatory sign (next to the last signal head)
(1) CCTV camera halfway on the arm
(1) Video detection camera over the outside lane
(1) Opticom device located 2' in from the end of the arm

2.2.2.4. 42’ to 48’ Mast Arm Lengths:

(4) Aluminum 3-section heads spaced every 10’
(1) Aluminum 4-section head at the end of the arm (1’ in from the end)
(1) 10’x2’ street name sign mounted between the inside two signals
(2) 30“x36” regulatory signs (next to the middle two signal heads)
(1) 36“x36” regulatory sign (next to the last signal head)
(1) CCTV camera halfway on the arm
(1) Video detection camera over the outside lane
(1) Opticom device located 2’ in from the end of the arm
(1) LED Blankout sign 8’ from the end of the arm

2.2.2.5. 50’ to 60’ Mast Arm Lengths:

(4) Aluminum 3-section heads spaced every 10’
(2) Aluminum 4-section head at the end of the arm (1’ and 5’ in from the end)
(1) 10’x2’ street name sign mounted between the inside two signals
(3) 30“x36” regulatory signs (next to the inner three signal heads)
(1) 36“x36” regulatory sign (next to the last signal head)
(1) CCTV camera halfway on the arm
(2) Video detection camera (over the outside lane, and over the middle of the remaining length)
(1) Opticom device located 2’ in from the end of the arm
(1) LED Blankout sign 8’ from the end of the arm

2.2.2.6. 62’ to 66’ Mast Arm Lengths:

(5) Aluminum 3-section heads spaced every 10’
(2) Aluminum 4-section head at the end of the arm (1’ and 5’ in from the end)
(1) 10’x2’ street name sign mounted between the inside two signals
(4) 30“x36” regulatory signs (next to the inner four signal heads)
(1) 36“x36” regulatory sign (next to the last signal head)
(1) CCTV camera halfway on the arm
(2) Video detection camera (over the outside lane, and over the middle of the remaining length)
(1) LED Blankout sign 8’ from the end of the arm
(1) Opticom device located 2’ in from the end of the arm

2.2.2.7. All poles shall also be designed for (1) 12’ luminaire arm and (1) luminaire at the end of the luminaire arm. This allows for longer luminaire arms to be installed in the future.

2.2.3. Wind Loading:

The entire assembly shall be designed to meet the wind loading requirements of VDOT IIM-S&B-90.2.

2.2.4. Fatigue Loading:

The entire assembly shall be designed to meet the fatigue loading requirements of VDOT IIM-S&B-90.2.

2.2.5. **Special Designs:**

Mast arm signal pole systems with a larger loading than specified above shall require a special design. Special designs shall be submitted to the County with sealed shop drawings and a letter from a Professional Engineer in the Commonwealth of Virginia certifying that the design meets the requirements of this specification.

Design shall include mast arm(s), luminaire arm, pole, baseplate, and anchor bolt analysis. Maximum arm and pole loads, stresses and combined stress ratios shall be provided for each group load, as well as maximum pole dead load rotation.

For anchor bolt forces, pole forces shall be positioned in such a manner to maximize the force on any individual bolt regardless of the actual bolt orientation with the pole. The design of anchor bolts shall result in a ductile steel failure prior to any sudden brittle failure of the concrete.

Provide to the County, shop drawings detailing the poles as designed. Shop drawings shall contain all component drawings necessary to fabricate the structure. Drawings shall at a minimum specify the pole height, arm length(s), pole and arm diameters at the base and tip, splice locations, bolt circle diameter, bolt diameters, and detailed drawings showing the hand hole cover assemblies. The drawings shall also show the width, depth, length and thickness of all material and list pertinent ASTM specification designations together with the tensile strength of metallic members.

3. MATERIALS

3.1. **The materials used for construction shall meet the following requirements:**

COMPONENT	ASTM DESIGNATION	MINIMUM YIELD (KSI)
POLE SHAFT	A595 or A572	55
POLE BASE	A36	36
GALVANIZING-STRUCTURE	A123	
GALVANIZING-HARDWARE	A153	
ARM SHAFT	A595 or A572	55
ARM CONNECTION	A36	36
ARM CONNECTION BOLTS	F3125 GALVD. TO A153	
DTI WASHERS	ASTM F959	
LUMINAIRE ARM SHAFT	PER MANUFACTURER	35
LUMINAIRE ARM CASTING	A27GR.65-35	35
LUMINAIRE ARM CONNECTION BOLTS	SAE GR.5 or ASTM F3125	
PLATE AND CHANNEL	A36	36
ANCHOR BOLTS	F1554	55

3.2. The manufacturer shall provide mill certifications for steel materials.

3.3. All poles, arms, transformer bases, and hardware shall be galvanized with powder coating or painted as specified on the plans or by the ENGINEER prior to installation.

3.4. Non-Ornamental poles shall have a rust resistant coating applied to the inside of the pole. The color of the outside of the pole will be specified at time of order. All poles, arms, ornamental bases, and hardware shall use one of the following coating systems:

3.4.1. **Option 1:**

Primer = Dupont 25P Primer

Top Coat = Dupont 333 Imron

3.4.2. **Option 2:**

Triglycidyl Isocyanurate (TGIC) polyester powder at a minimum thickness of 2.0 mils

4. POLE SHAFTS

4.1. There shall be five size categories of single arm mast arm poles:

- 20 ft Compact
- 20-40 ft
- 42-48 ft
- 50-60 ft
- 62-66 ft

To achieve interchangeability between poles and foundations, all the poles in a size category shall have the same base plate size and bolt pattern.

4.2. There shall be four size categories of twin arm mast arm poles:

- 20-40 ft
- 42-48 ft
- 50-60 ft
- 62-66 ft

The lengths listed are the longest arm. To achieve interchangeability between poles and foundations, all the poles in a size category shall have the same base plate size and bolt pattern.

4.3. All base plates shall be circular.

4.4. Mast arm poles shall be 30 feet tall. The mast arm connection shall be located 20 feet above the base of the pole. The luminaire arm connection shall be located 29'-6" above the base of the pole

4.3.1 Truncated pole shafts (poles without extra height for luminaires) shall be 2' taller than the top of the connection plate. The design of the pole should assume conditions for a pole with luminaire arm.

4.3.2 Pole shafts for a "20 ft Compact" mast arm shall be 2' taller than the top of the connection plate. A luminaire arm and luminaire are not expected for this specific pole design.

4.5. Mast arm poles shall be round. Multi-sided pole shafts are unacceptable. The shaft shall be one piece and contain no circumferential weld butt splices. The shaft shall have a constant linear taper of 0.14in/ft. The minimum thickness of steel shall be 7 gauge.

4.6. Pole diameters at the connection to the base plate shall not exceed the diameters listed below.

Pole Design Shaft Diameter			
Single Mast Arm Poles		**Dual Mast Arm Poles**	
Arm Length (ft)	Max Dia (in)	Arm Length (largest)(ft)	Max Dia. (in)
20 Compact	11	<50	20
<40	18	50+	26
40-48	20		
50+	25		

4.7. **Identification Tag**

4.7.1. Provide an identification tag affixed to the pole with the following information:

Arlington County, VA
Manufacturer
Date of Manufacture (MM/YY)
Pole Height and Gage
Arm Length and Gage
Anchor Bolt Diameter and Length
Bolt Circle Diameter (on center of bolts)
Serial Number

The tag shall be attached between 4'-5' above the base of the pole.

4.8. **Hand holes**

4.8.1. An access hole and J-hook shall be provided on the opposite side of the pole shaft from the mast arm at the same elevation as the center of the mast arm. The access hole at the mast arm height shall have an outside dimension of 4" x 6.5" exclusive of reinforcement. The hand hole cover shall be attached to the inside of the pole with a chain to prevent dropping the hand hole cover.

A second access hole shall be provided 2'-0" above the pole base to the bottom of the access hole. The lower access hole shall be provided on the opposite side from the attachment of the longest mast arm. The lower access hole shall have an outside dimension of 6" x 10" exclusive of reinforcement. Provide a grounding L-clip welded directly opposite the access hole on the inside wall of the pole. The hand hole cover shall be attached to the inside of the pole with a chain to prevent dropping the hand hole cover.

Access holes for a "20 ft Compact" pole shall include the same details as described above except for the hand hole sizes. The hand hole opposite of the pole shaft shall be 3" x 5" and the hand hole 2'-0" above the pole base shall be 4" x 8".

All hand holes shall have a neoprene rubber gasket that is permanently secured to the hand hole frame to insure weather-tight protection. Hand holes shall be provided with a bolt-on galvanized steel cover painted to match the pole. The hand hole cover shall be removable from the frame.

4.9. **Connection Plate**

4.9.1. The mast arm connection plate shall be located 20 feet above the base of the pole. The connection plate shall have an upward angle 3 degrees from the horizontal plane.

4.10. **Pole Top**

4.10.1. Each pole shall be provided with an end cap secured in place with set screws.

4.11. **Luminaire Arm**

4.11.1. Each pole shall be provided with a luminaire arm where specified. The orientation will vary based on the plan. Refer to County Traffic Signal Specifications and Standards.

5. MAST ARMS

5.1. There shall be **five size categories of mast arms:**

- 20 ft Compact
- 20-40 ft
- 42-48 ft
- 50-60 ft
- 62-66 ft

To achieve interchangeability between arms and poles, all of the arms in a size category shall have the same connection plate size and bolt pattern.

5.2. Mast arms shall be round. Multi-sided and fluted mast arms are unacceptable. Mast arms shall have a constant linear taper of 0.14in/ft. The minimum thickness of steel shall be 7 gauge.

5.3. Mast arms up to 50 feet in length shall be manufactured and shipped in one piece. Mast arms 50 feet and greater in length shall be manufactured and shipped in two pieces with no piece having a length greater than 40 feet. Circumferential welded tube butt splices and laminated tubes are not permitted.

5.4. Wire entrance holes 1-3/8 inches in diameter shall be drilled into the bottom of the arm every 11 feet starting at a point approximately 9 inches from the free end of the arm. Rubber grommets shall be installed in all wire entrance holes.

5.5. Mast Arm Cap

5.5.1 Each mast arm shall be provided with an end cap secured in place with set screws.

6. ANCHOR BOLTS

6.1. A minimum of six (6) fully galvanized anchor bolts shall be supplied for all single arm mast arm poles; however, Compact Poles shall have a minimum of four (4) anchor bolts. There shall be two steel templates provided per pole. All templates shall be fully galvanized.

A minimum of eight (8) fully galvanized anchor bolts shall be supplied for all dual arm mast arm poles. There shall be two steel templates provided per pole. All templates shall be fully galvanized.

6.2. Provide galvanized nuts compatible with the anchor bolts as needed to complete the installation. Nut covers shall be provided for all nuts.

6.3. Furnish 2 flat washers with each bolt/nut/washer assembly. Furnish galvanized direct tension indicating (DTI) washers. Use the size, number, type, and configuration of hardened flat washers the DTI manufacturer recommends for the anchor bolt diameter.

6.4. The following notes shall be included on all plans and/or shop drawings in reference to anchor bolts:

Pre-tensioning of all anchor bolts is required and shall be accomplished with the use of DTI washers. Nuts shall be tightened until proper pre-tensioning is indicated by the DTI washer.

The maximum clearance between the bottom of the leveling nuts and the top of the concrete is critical and shall not exceed the amount specified on the drawing.

7. HIGH STRENGTH BOLTS

7.1. Provide galvanized high strength bolts for connections. Provide galvanized nuts compatible with the bolts as needed to complete the installation.

7.2. Furnish 2 flat washers with each bolt/nut/washer assembly. Furnish galvanized direct tension indicating (DTI) washers. Use the size, number, type, and configuration of hardened flat washers the DTI manufacturer recommends for the bolt diameter.

8. MEASUREMENT AND PAYMENT

8.1. Signal Pole Shafts shall be measured and paid for at the contract unit price per each. This shall include flange plates, anchor plates, bolts, bases, nut covers, access hole covers, pole tops, painting, welding, labor, and all other associated equipment and hardware required for installation.

8.1.1. There shall be no additional charge for dual mast arm poles with differing arm lengths (one arm shorter than the other). The flanges shall fit the size tube as specified in the order. For shorter arms, the flange shall be designed to accommodate the smaller tube size at the shaft rather than cutting a longer arm down to size.

8.2. Mast arms shall be measured and paid for at the contract unit price per each. This shall include the arm, end cap, bolts, and any other equipment required for installation

8.3. Replacement hand hole covers shall be measured and paid for at the contract unit price per each and shall include hardware for installation.

8.4. Replacement endcaps shall be measured and paid for at the contract unit price per each.

8.5. Replacement nut covers shall be measured and paid for at the contract unit price per each.

8.6. Replacement luminaire arms shall be measured and paid for at the contract unit price per each. This shall include mounting hardware required for installation.

SECTION II – STANDARD FOUNDATION DESIGN DEVELOPMENT

1. GENERAL

1.1. The Contractor/Manufacturer shall develop a set of standard foundation drawings for the pole designs supplied in the pricing schedule. All mast arm poles shall have a standard foundation design developed. The Contractor may utilize foundation designs for ranges of poles sizes such as those foundation designs included in the previous County standards.

1.2. Typical soil conditions will be provided by the County to utilize for standard drawing development.

1.3. The foundation designs shall minimize diameter while still providing an overall feasible design.

1.4. The drawings shall specify the requirements for all materials used in the foundation such as reinforcing steel and concrete. The arrangement of the reinforcing and spacing of the bars shall be detailed in the standard designs.

1.5. The drawings shall also list any specific installation guidelines required for structural integrity which are beyond those found in the County specifications for foundation installation.

2. DELIVERABLE

2.1. The foundation detailed drawings shall be provided in both PDF and AutoCAD format. The PDF drawings shall be stamped by a PE licensed in the State of Virginia. The soil assumptions shall be listed for each type of foundation design.

2.2. The design calculations used to develop the designs shall be provided to the County and sealed by a professional engineer licensed in the State of Virginia.

3. PAYMENT

3.1. Payment shall be measured and paid for on a lump sum basis. A one-time lump sum payment will be made upon receipt of all required designs. No partial payment will be made for this line item.

I. STATEMENT OF WORK

1) General

a) The Contractor shall supply Arlington County (County) with traffic signal poles, mast arms, and appurtenances. Additionally, the County's existing traffic signal pole designs need to be updated to incorporate the latest AASHTO and VDOT specifications. **The new poles should resemble the appearance and style of the County's existing standards included in Attachment C as closely as possible while complying with the updated design requirements included in Attachment A.** The Contractor shall develop new standard designs to replace the County's existing signal pole standards and shall provide pricing to manufacture and deliver the newly designed poles and mast arms per the attached pricing schedule.

2) Design Drawings

a) **Drawing Requirements**

i) The apparent low bidder shall submit, within 14 business days of notification from the County, standard drawings in AutoCAD and PDF format. Drawings must verify that each item is compliant with specifications listed in this solicitation. The drawings shall notate:
   (1) The designs comply with the design specifications (AASHTO, VDOT, etc.)
   (2) The designs comply with the assumed loadings provided in the specifications

ii) These drawings will be reviewed by the County to verify compliance with the intent of the requirements and for conformance with the existing pole styles and aesthetics.

iii) The PDF versions of the drawings shall be sealed by a licensed Professional Engineer in Virginia.

iv) The County's previous standard drawings are included as **Attachment C** of this ITB as an example for the level of effort required and the expected contents.

3) Delivery

a) The bid prices shall include all charges for delivery and unloading of the equipment and materials. Shipments shall be delivered to the County's Transportation Engineering and Operations Bureau Trades Center.

i) The County's Trades Center is located at:
   Transportation Engineering and Operations
   Traffic Signal Section
   4300 29th Street South
   Arlington, VA 22206

b) The Contractor shall notify the County Project Officer of all deliveries at least three (3) business days in advance of the delivery. The notification shall consist of an email notification and phone confirmation.

i) Arlington County reserves the right to refuse an entire shipment if the advance notice is not received.

c) Delivery time shall not be included in the required lead time.

4) Lead Time

a) The lead time for materials with standard designs shall be **no more than 75 (seventy-five) calendar days** from the placement of the order. Standard pole designs shall require no shop drawing submittals or additional design work. Upon shipment of the materials, written shipping notification shall be provided to the County Project Officer. This shipment notification shall serve as the completion date for the lead time.

b) The Contractor shall provide submittals (shop drawings sealed by a PE licensed in Virginia) for orders which require additional/special design. The Contractor shall provide the submittals within 2 weeks of receipt of the order. Upon approval of the submittal by the County and placement of the order, the Contractor shall supply the materials within 75 (seventy-five) calendar days.

c) The Contractor may request a variance to the required lead time by notifying the project officer prior to placing an order. With written (e-mail) approval from the project officer, the lead time may be adjusted for individual orders.

5) Miscellaneous and Replacement Parts

a) The lead time for replacement and miscellaneous parts shall be no more than 45 **(forty-five) calendar days** from the placement of the order.

b) Replacement parts shall be fully compatible with those shipped with the poles and mast arms listed in the specifications. The colors and materials shall also match.

c) Replacement parts shall be shipped with all required hardware for installation.

6) Optional Services

a) **Special Design Pole or Mast Arm**

(1) On a case by case basis, the County may request that the Contractor design a mast arm pole with different loading, geometric, or aesthetic requirements from those listed in the specifications included in this invitation.
(2) The County will provide the Contractor with all required parameters for the development of the design.
(3) Examples of work that may be performed under this task include but are not limited to design of Variable Message Sign poles, light pole design, modification of a standard design for situations such as overhead utility conflicts, etc.
(4) The Contractor will supply PE sealed PDFs of the design drawings for the County's records along with the design calculations. The PDF drawings shall be stamped by a PE licensed in the State of Virginia.
(5) The Contractor shall also provide the pricing to accompany the designs.
(6) The special design services will be paid for on an hourly basis. The hourly rate should reflect that of a professional engineer.

b) **Special Design Foundation**

(1) The County may request the design of foundations using parameters different from those outlined in the standard specifications.
(2) Examples of this work may include but are not limited to the development of spread foundations, foundation designs for special design mast arm poles, atypical soil conditions, etc.
(3) Design contents shall follow that outlined in section 5a above.
(4) The foundation detailed drawings shall be provided in both PDF and AutoCAD format. The PDF drawings shall be stamped by a PE licensed in the State of Virginia.
(5) The design calculations used to develop the designs shall be provided to the County and also sealed by a professional engineer licensed in the State of Virginia.
(6) Payment shall be measured and paid for per each foundation design.