SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

SEMINOLE COUNTY
2013
STANDARD MAST ARM DRAWINGS

SEMINOLE COUNTY TRAFFIC ENGINEER: CHARLES WETZEL II, P.E., P.T.O.E.

Prepared For: Seminole County Traffic Engineering
140 Bush Loop
Sanford, FL 32773
407- 665-5677

Prepared By: Pegasus ENGINEERING

Pegasus Engineering, LLC
301 West State Road 434 - Suite 309
Winter Springs, FL 32708
407-992-9160

Project Manager: Fursan S. Munjed, P.E.

INDEX OF DRAWINGS

PEGASUS ENGINEERING, LLC
301 West State Road 434 - Suite 309
Winter Springs, FL 32708
Certificate of Authorization No. 27770

PEGASUS ENGINEERING
PROJECT NO.
SMC-12015

DATE
FEBRUARY 2013

SHEET
1 OF 14

GENERAL NOTES

1. These Standards are intended solely for use by Seminole County, Florida for mast arm installations in Seminole County.

2. These Standards address only the structural details of the mast arm and the foundation. The user of these Standards remains responsible for verifying that the complete mast arm assembly (structure, foundation, signal heads, and sign panels) meets all of the requirements of the appropriate governing agencies, including, but not limited to, providing adequate vertical and horizontal clearances, adequate sight distance, appropriate signalization and signal placement, and adequate sign panel size/positioning.

3. Utilities: Adequate provision must be made for the protection and/or relocation of existing utilities. Users of these standards are cautioned to verify that there will be no interference between the utilities and the mast arm foundation.

4. Construction shall be in accordance with the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction" (2013 Edition) except for method of payment.

STRUCTURAL DESIGN CRITERIA

1. Mast Arm Structure Design shall comply with:
   A. American Society of State Highway and Transportation Officials "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals" (2012 Edition)
   B. Florida Department of Transportation Structures Design Manual (January 2013 Edition).

2. Basic Wind Speed: 130 mph

3. Multiple plies shall not be used.

4. The diameter of the Anchor Rod Circle shall not exceed 28 inches.

5. In accordance with FDOT District 5 policy, a grout pad is not permitted.

6. The mast arm structure details shown herein are not complete details. Instead, the details indicate the desired appearance of the mast arm structure and the desired connection styles. The fabricator shall be responsible for the complete design and detailing of the mast arm structure. Calculations and Shop Drawings shall be signed and sealed by a professional engineer registered in the State of Florida in compliance with Florida laws and regulations.

ATTACHMENT OF TRAFFIC SIGNAL HEADS & ILLUMINATED SIGNS

1. The attachment details shall be included with the mast arm shop drawings.

2. Signal and power cables shall be completely encased in hollow tubes and hollow brackets between the head and the signal head/sign.

3. The support brackets shall attach to the arm using metal bands. Fastening to and/or welding to the arm is prohibited.

4. Field drill entry holes for signal cables and power cables. Fit holes with rubber grommet.

5. Illuminated Signs shall be attached below the arm using a free-swinging bracket. No other attachment position or method is permitted.

MAST ARM STRUCTURE REQUIREMENTS

1. Materials:

Arm & Poles:	ASTM A1011 Grade 50, 55, or 60 (less than 1/4") or ASTM A572 Grade 50, 55, 60, or 65" (1/4" and over) or ASTM A595 Grade A (55 ksi yield) or Grade B (60 ksi yield)
Steel Plates:	ASTM A36
Weld Metal:	E70XX
Bolts:	ASTM A325 Type 1
Anchor Rods:	ASTM F1554 Grade 55
Nuts for Anchor Rods:	ASTM A563 Grade a Heave Hex
Washers for Anchor Rods:	ASTM F436, Type 1
Handhole Frame:	ASTM A709 Grade 36 or ASTM A36
Handhole Cover:	ASTM A1011 Grade 50, 55, 60, or 65
Caps:	ASTM A1011 Grade 50, 55, 60, or 65 or ASTM B209
Nut Covers:	ASTM B26 (319-F)
Stainless Steel Screws:	AISI Type 316
Threaded Bars/Studs:	ASTM A36 or ASTM A307

2. All welding shall conform to American Welding Society Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Fillet weld socket connections with unequal leg welds with the long weld leg along the shaft. Terminate the long weld leg along the shaft at approximately 30 degrees.

3. All steel items shall be galvanized:
   Nuts, Bolts, Washers, Anchor Rods, and Threaded Bars/Studs: ASTM F2329
   All other items (including Pole & Mast Arm): ASTM A123

4. Bolt hole diameters shall be equal to the bolt diameter plus 1/16" prior to galvanizing. Hole diameters for Anchor Rods shall not execed the bolt diameter plus 1/2" prior to galvanzing.

5. Arms and Pole shall be tapered with a diameter changing at a rate of 0.14 inch per foot.

6. Provide "J", "S", or "C" hook at top of Pole for signal cable support.

7. One hundred percent of full penetration groove welds and a random 25 percent of partial penetration groove welds shall be inspected. Full-penetration groove weld inspection shall be performed by nondestructive mehtods of radiography or ultrasonics.

8. The diameter of wire access holes for Signals and Signs shall not exceed 1.5 inches.

9. The Pole shall not be erected until the foundation concrete has cured for a minimum of seven days.

10. The Pole shall be installed vertically. Camber shall be accounted for in the arm onnection.

11. If the traffic signals or sign panels are not in place within two working days after the arm is erected, then a 3.0 feet by 2.0 feet blank 1/8" thick aluminum sign panel shall be attached to the bottom of the arm within six feet of the arm tip and shall remain in place until the signals and signs are installed.

12. Locate the handhole 180 degrees from the arm on single arm poles. Locate the handhole 180 degrees from the first arm on double arm poles.

13. Shop drawings are required and fabrication shall not begin until the Shop Drawings are approved. Shop Drawings shall inlcude the anchor rod orientation with respect to the arms and the direction of traffic.

14. Paint the entire structure after galvanizing. Painting shall be in acoordance with the FDOT Specifications.

SPECIFYING STANDARD MAST ARMS

The designer shall include the applicable standard sheets from this set, including the pole schedule data sheet, in the construction plans.

SUBMITTAL REQUIREMENTS

1. The following information shall be provided for every structure:
   Mast Arm Design Calculations & Shop Drawings
   Soils Data Letter (with Soil Boring Log)

2. The mast arm design calculations shall clearly state the foundation reactions.

3. A Soils Data Letter shall be prepared by a Goetechnical Engineer and shall be submitted with the mast arm structure calculations and drawings. The Soils Data Letter shall be based upon a soil boring (SPT) not less than 30' in depth.

   The Soils Data Letter shall clearly state the following:
   Applicable Standard Soil Type (see Sheet 14)
   Internal Angle of Friction (Phi Angle)
   Recommended Water Table Elevation for Design
   Soil Dry Unit Weight
   Soil Saturated Unit Weight
   Soil Effective Unit Weight (Saturated Unit Weight minus Water Unit Weight)
   SPT Blow Count
   Special Conditions Encountered (Loose Soils, Hardpan, Voids, etc.)

   The Geotechnial Engineer is advised that the foundation capacities have been determined assuming a single soil layer for the entire embedded length of the drilled shaft. The Geotechnical Engineer shall exercise appropriate engineering judgement when using weighted-average and/or other measures to determine the single-layer soil properties that will accurately model the actual existing mulit-layer soil conditions.

4. For locations where a standard soil type applies, the standard foundation details shall be used. A special foundation design is not required for these structure(s).

5. For locations where no standard soil type is applicable, a special foundation design is required. The special foundation shall be designed and detailed using the actual mast arm base reactions and the specific soils parameters provided in the Soils Data Letter. The special foundation shall be designed by a professional engineer registered in the State of Florida. Signed and sealed design calculations and foundation details shall be submitted concurrently with the mast arm calculations and shop drawings.

REVISIONS		
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SEMINOLE COUNTY TRAFFIC ENGINEERING
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NOTES

SPECIFICATION OF MAST ARMS

Mast Arm Structures constructed in accordance with these standards shall be specified as follows:

POLE I.D.	POLE TYPE	POLE STYLE	ARM STYLE*	COLOR	LUMINAIRE	BASE	BANNER	FIRST ARM LENGTH	SECOND ARM LENGTH	ANGLE BETWEEN ARMS
POLE A										
POLE B										
POLE C										
POLE D										

AVAILABLE OPTIONS

POLE TYPE	POLE STYLE	ARM STYLE*	COLOR	LUMINAIRE	BASE	BANNER
POLE TYPE 1	ROUND	CURVED	HUNTER GREEN	SHOE BOX	NUT COVERS	TYPE 1
POLE TYPE 2	FLUTED	STRAIGHT	BLACK	ACORN	DECORATIVE	TYPE 2
POLE TYPE 3				NONE	NONE	NONE
POLE TYPE 4						
POLE TYPE 5						
POLE TYPE 6						

* NOTE: ARM STYLE SHALL BE CONSISTANT AT EACH INTERSECTION. EITHER ALL CURVED OR ALL STRAIGHT ARMS SHALL BE USED AT AN INTERSECTION.

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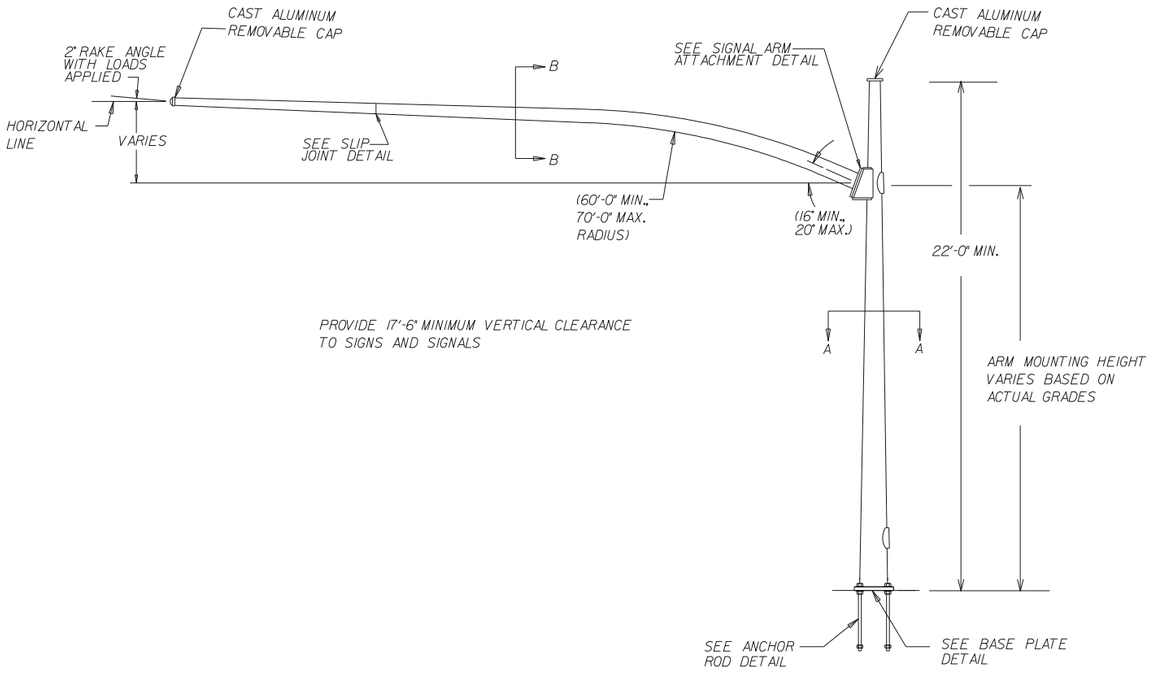
POLE SCHEDULE DATA SHEET

NOTE: ARM LENGTH SHALL NOT EXCEED 60'-0".
ARMS LONGER THAN 60'-0" SHALL BE STRAIGHT (SEE SHEET 5 OF 13)



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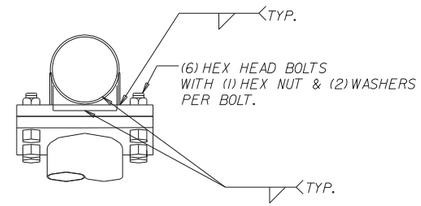
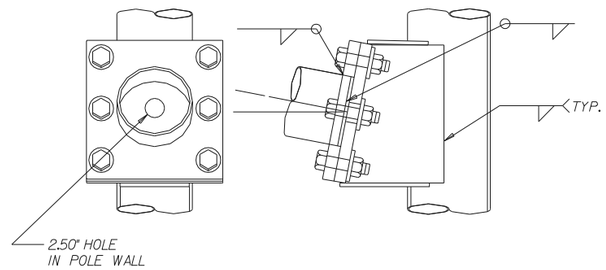
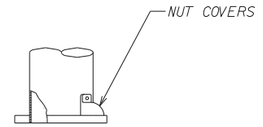




SIGNAL ARM ATTACHMENT



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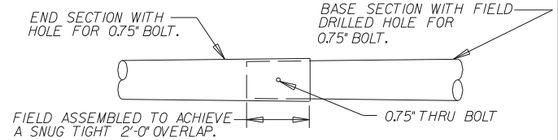
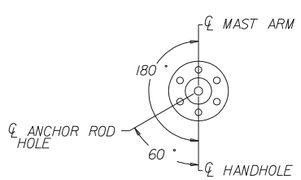
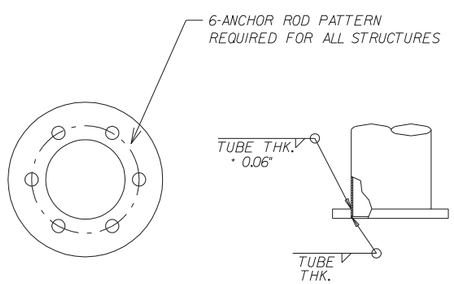


SIGNAL ARM SLIP JOINT



ALL ANGLES MEASURED CLOCKWISE FROM HAND-HOLE AS VIEWED FROM SMALL END OF POLE

6-BOLT RADIAL INDEX



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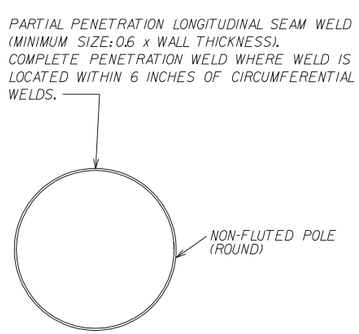
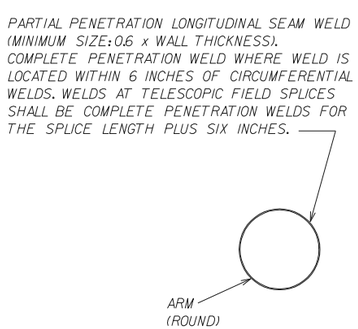


SECTION A-A



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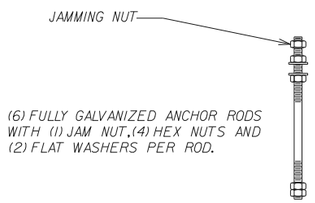

ANCHOR ROD

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140 BUSH LOOP SANFORD, FL 32773
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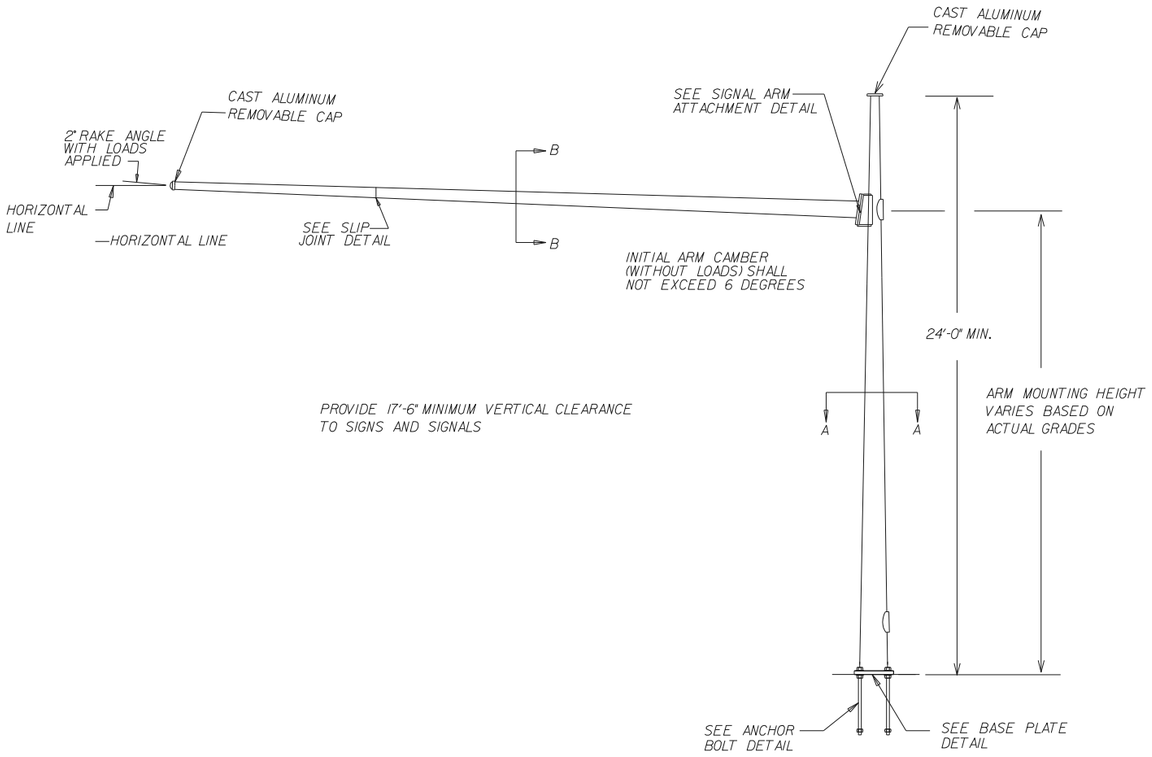
POLE TYPE I

NON-FLUTED POLE WITHOUT LUMINAIRE
CURVED ARM



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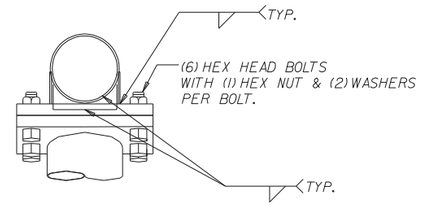
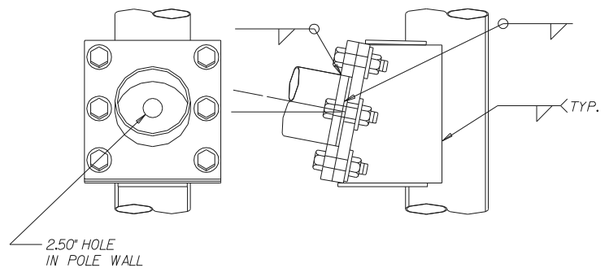
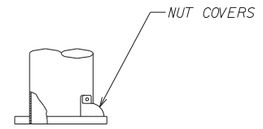




SIGNAL ARM ATTACHMENT



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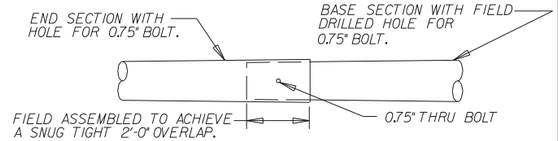
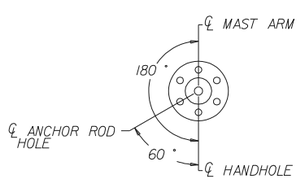
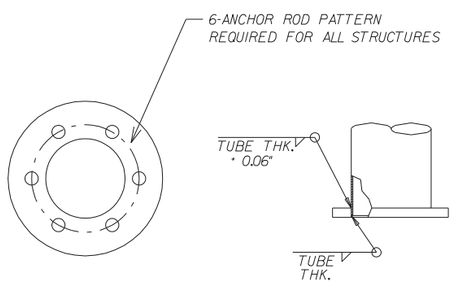


SIGNAL ARM SLIP JOINT



ALL ANGLES MEASURED CLOCKWISE FROM HAND-HOLE AS VIEWED FROM SMALL END OF POLE

6-BOLT RADIAL INDEX



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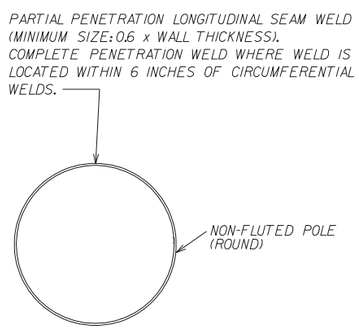
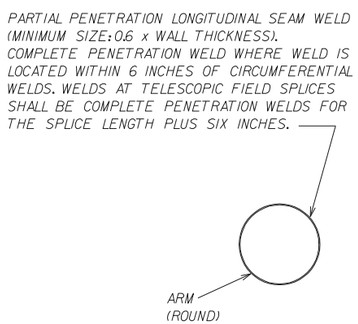


SECTION A-A



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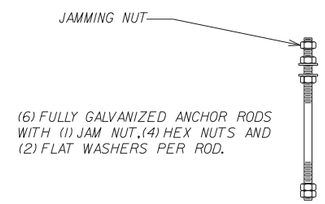

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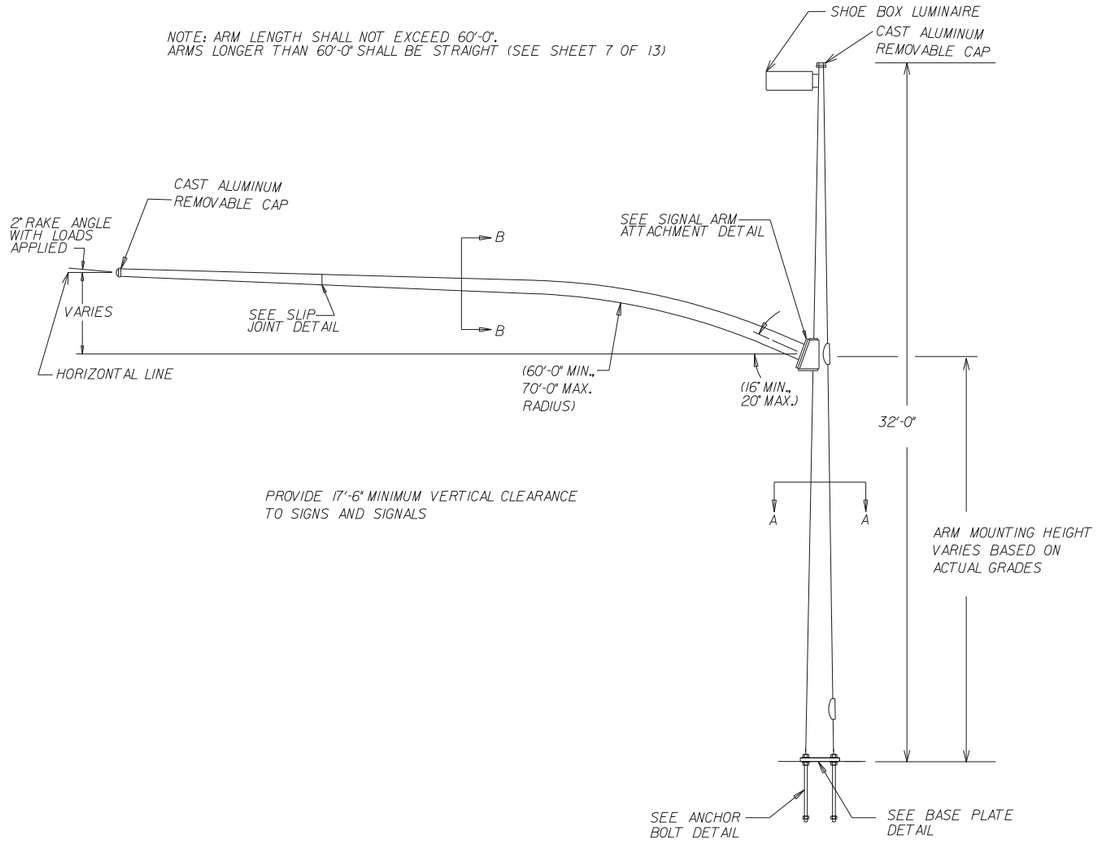
POLE TYPE 2

NON-FLUTED POLE WITHOUT LUMINAIRE
STRAIGHT ARM



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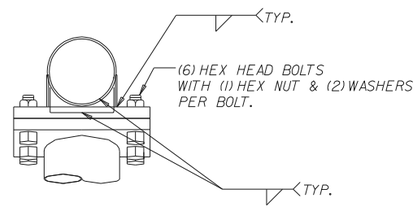

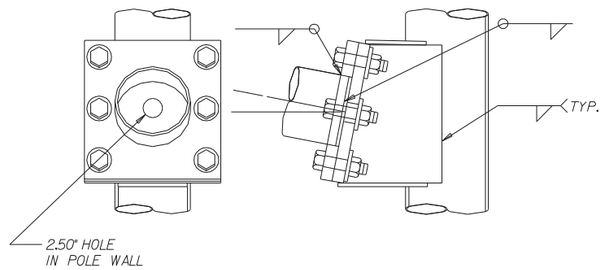

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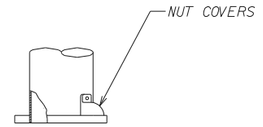

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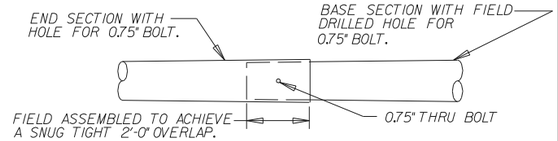
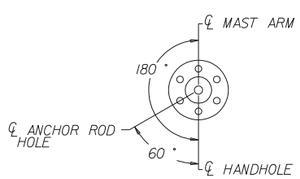
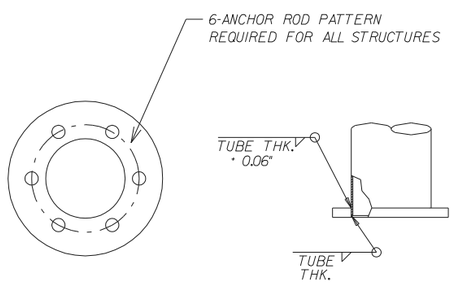


SIGNAL ARM SLIP JOINT



ALL ANGLES MEASURED CLOCKWISE FROM HAND-HOLE AS VIEWED FROM SMALL END OF POLE

6-BOLT RADIAL INDEX



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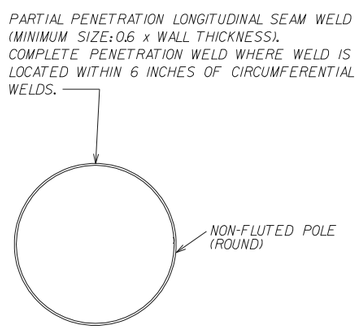
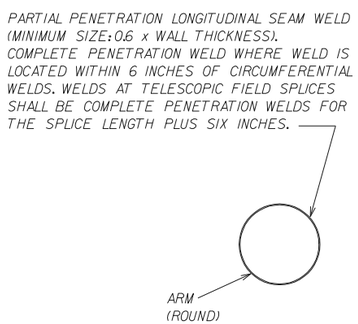


SECTION A-A



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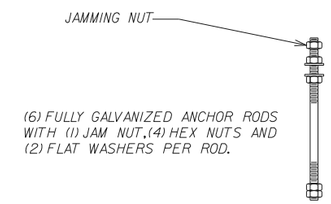

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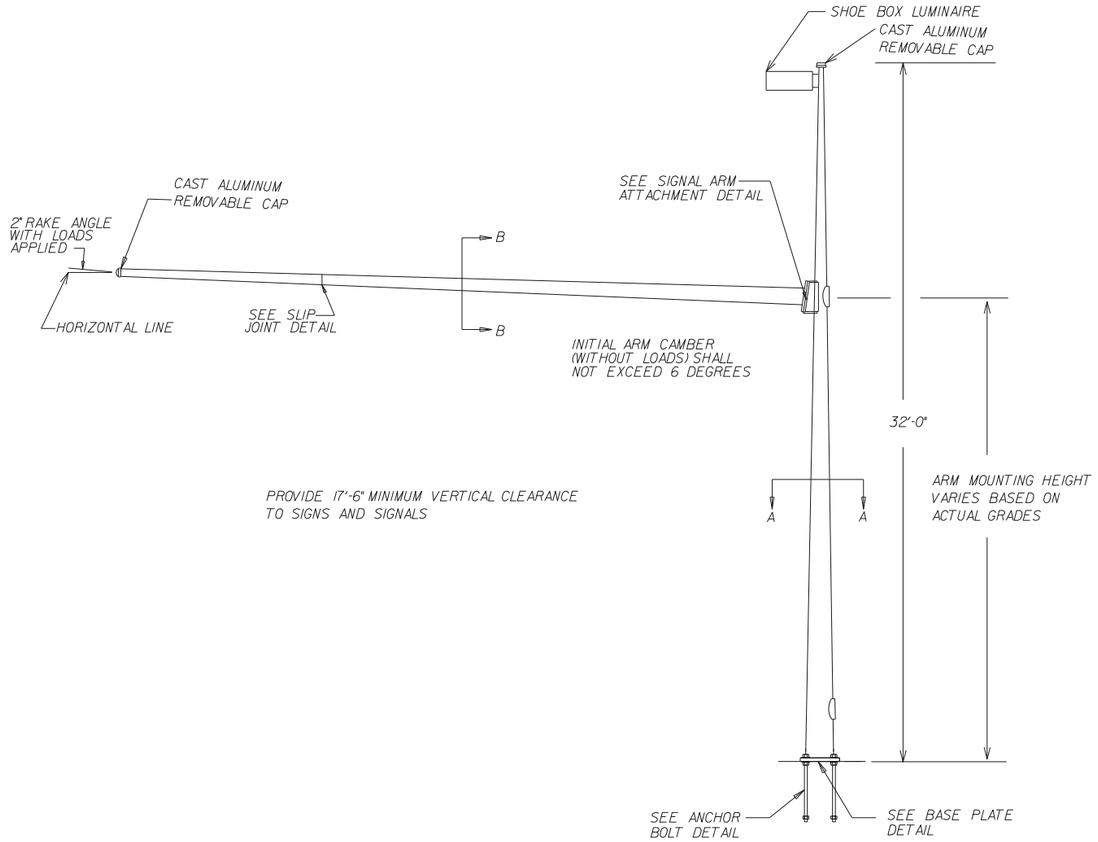
POLE TYPE 3

NON-FLUTED POLE WITH LUMINAIRE CURVED ARM



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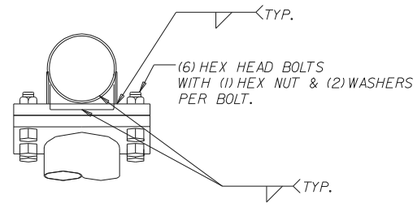
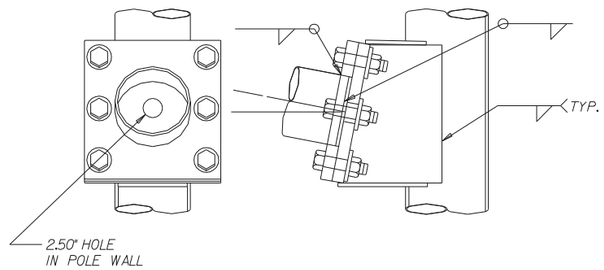
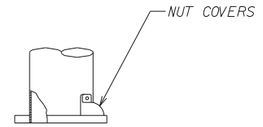




SIGNAL ARM ATTACHMENT



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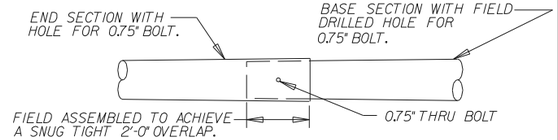
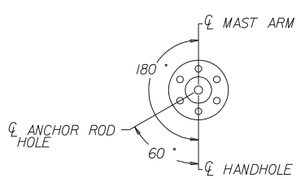
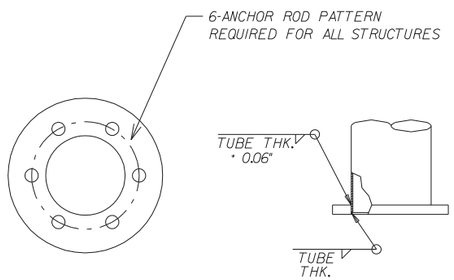


SIGNAL ARM SLIP JOINT

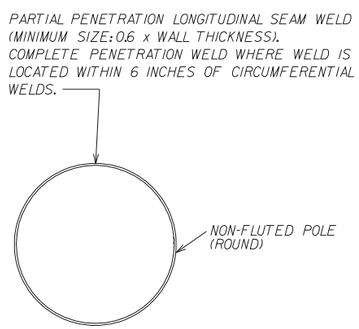


ALL ANGLES MEASURED CLOCKWISE FROM HAND-HOLE AS VIEWED FROM SMALL END OF POLE

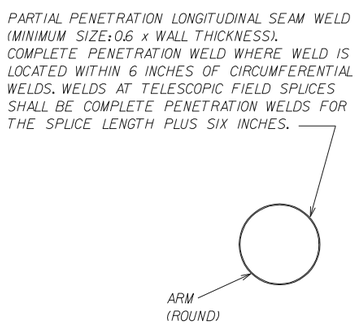
6-BOLT RADIAL INDEX



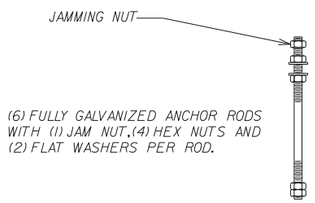
BASE PLATE



SECTION A-A



SECTION B-B



ANCHOR ROD

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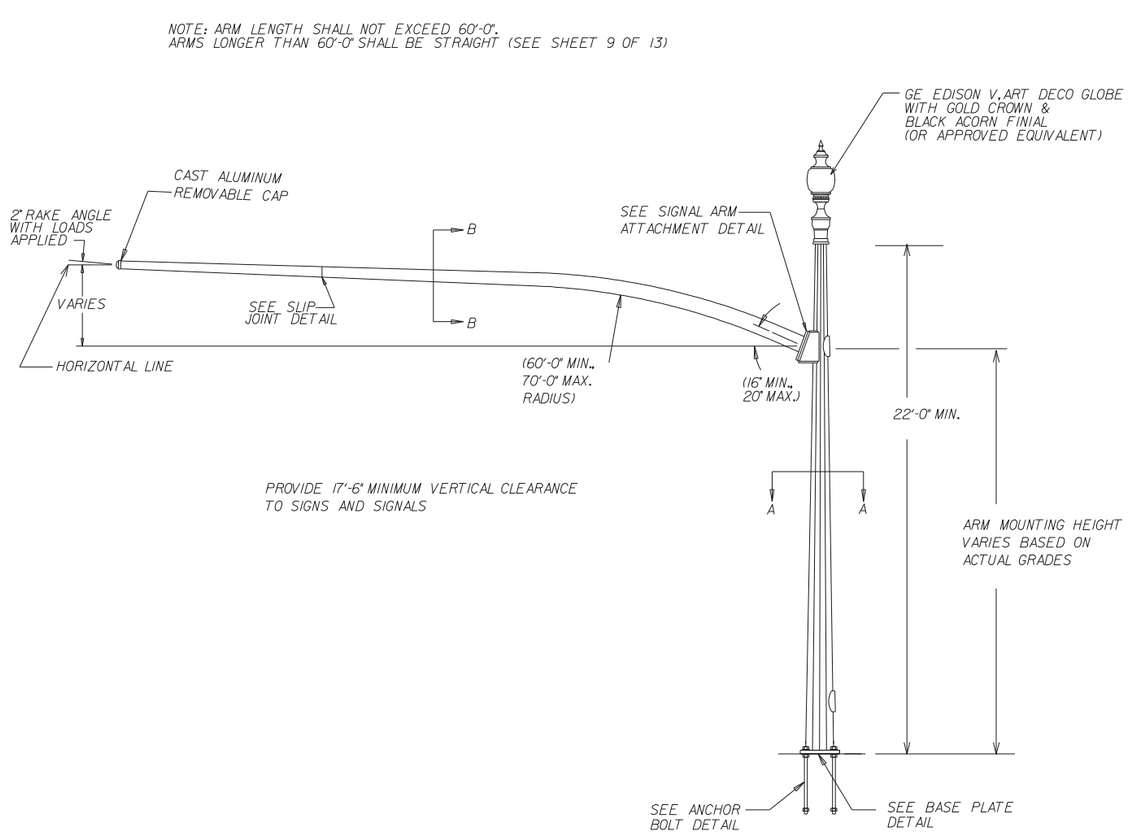
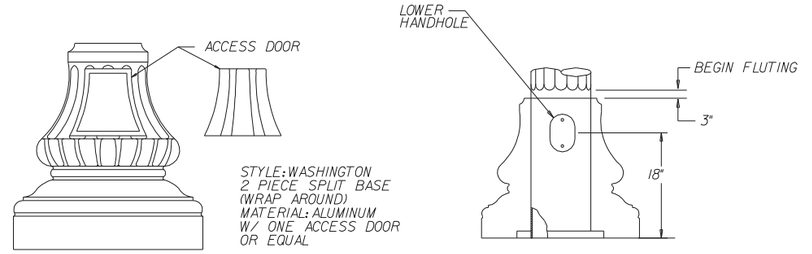
POLE TYPE 4

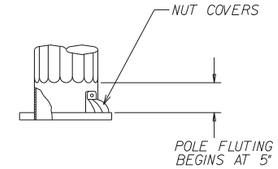
NON-FLUTED POLE WITH LUMINAIRE STRAIGHT ARM



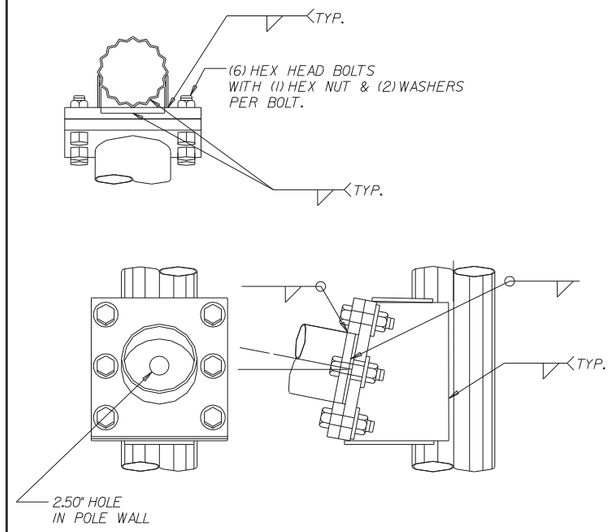
ELEVATION



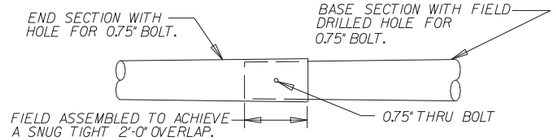
ALUMINUM DECORATIVE BASE
(OPTIONAL)



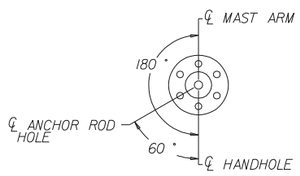
NUT COVERS
(OPTIONAL)



SIGNAL ARM ATTACHMENT

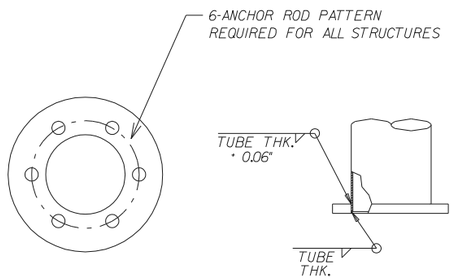


SIGNAL ARM SLIP JOINT

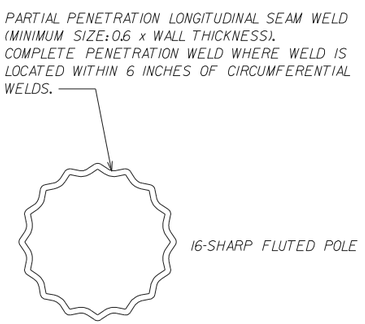


ALL ANGLES MEASURED CLOCKWISE FROM HAND-HOLE AS VIEWED FROM SMALL END OF POLE

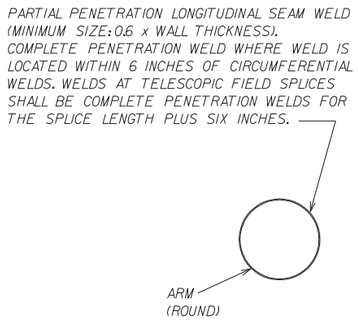
6-BOLT RADIAL INDEX



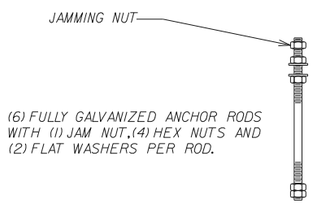
BASE PLATE



SECTION A-A



SECTION B-B



ANCHOR ROD

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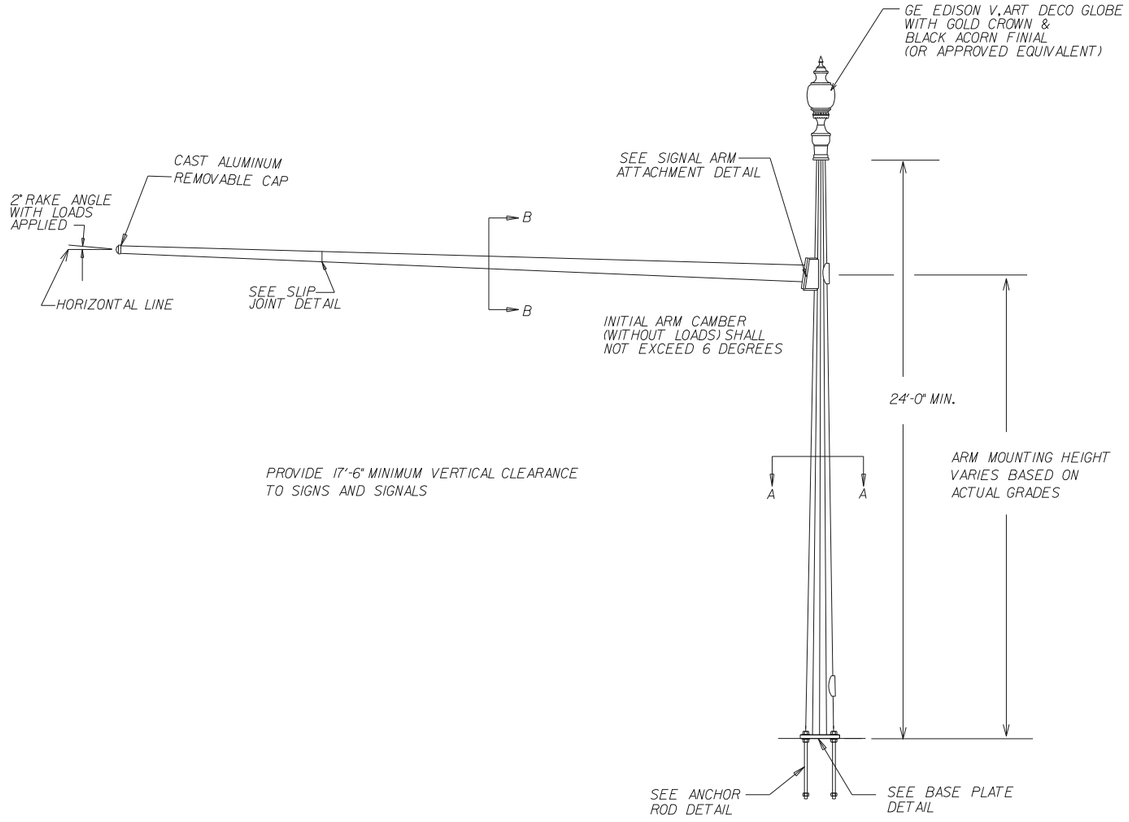
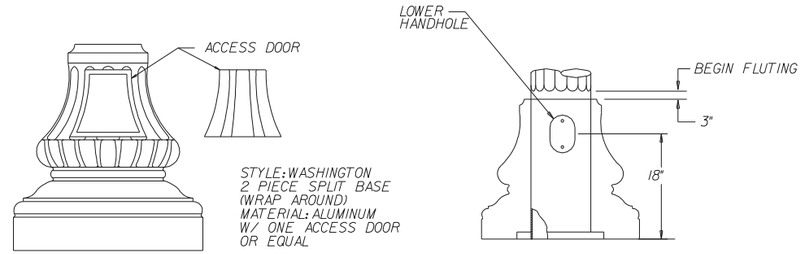
POLE TYPE 5

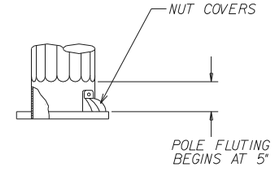
FLUTED POLE
CURVED ARM



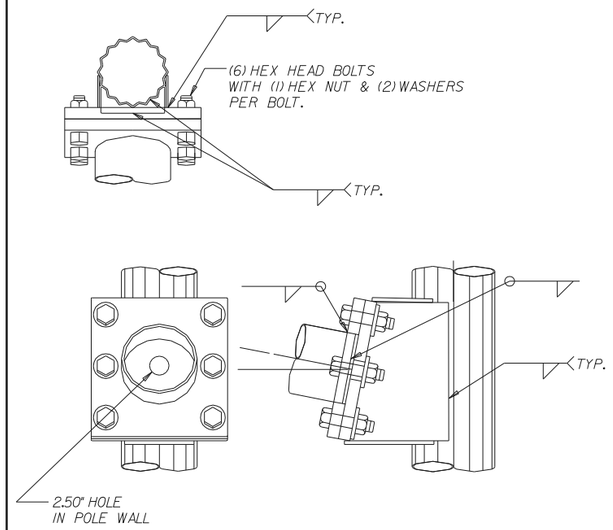
ELEVATION



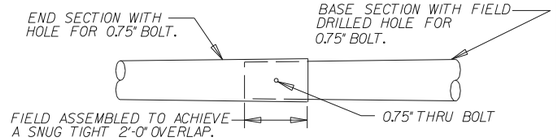
ALUMINUM DECORATIVE BASE
(OPTIONAL)



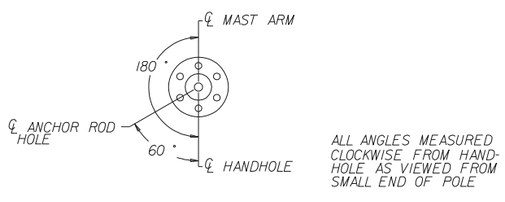
NUT COVERS
(OPTIONAL)



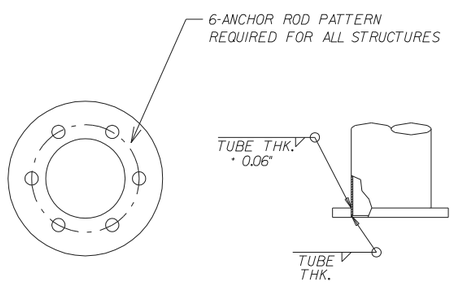
SIGNAL ARM ATTACHMENT



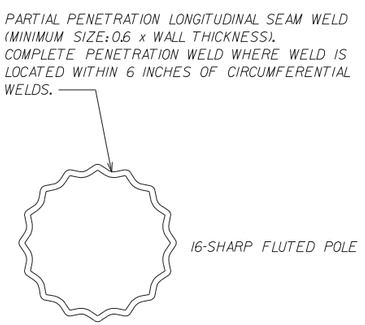
SIGNAL ARM SLIP JOINT



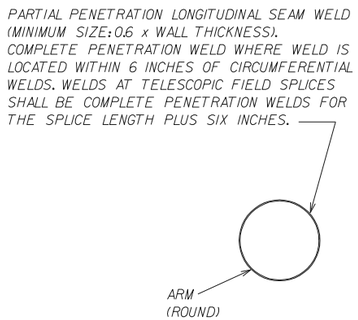
6-BOLT RADIAL INDEX



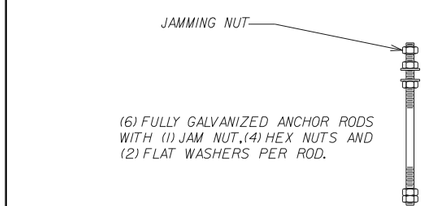
BASE PLATE



SECTION A-A



SECTION B-B



ANCHOR ROD

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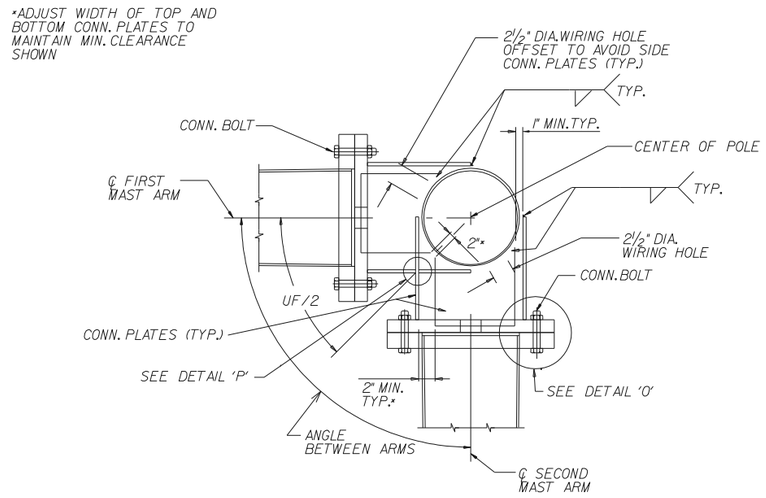
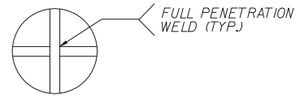
POLE TYPE 6

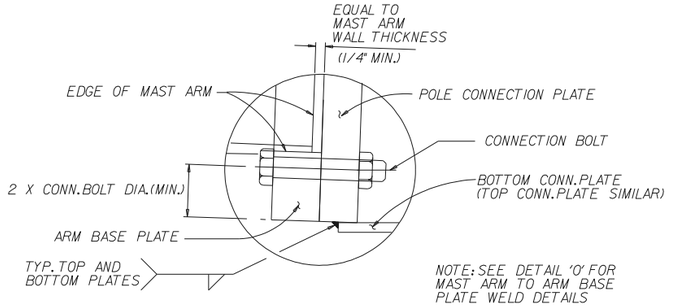
FLUTED POLE
STRAIGHT ARM



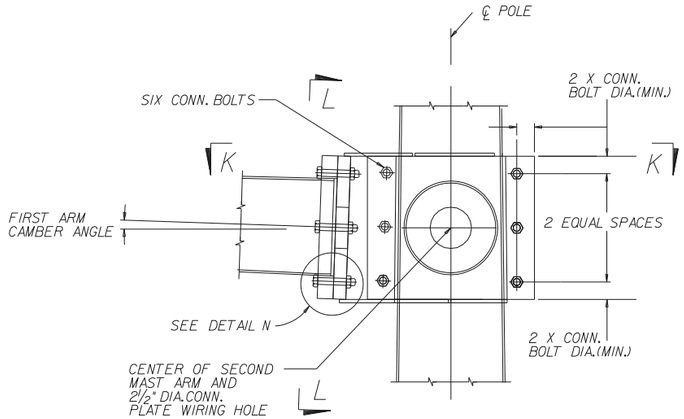
SECTION K-K



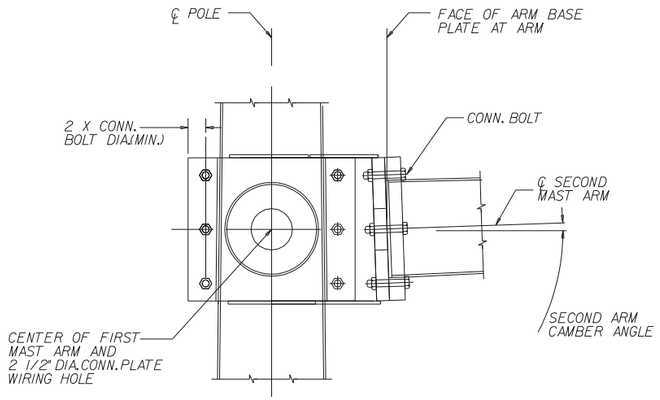
DETAIL 'P'



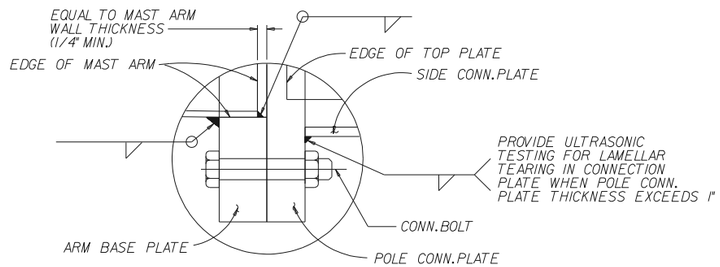
DETAIL 'N'



ELEVATION



SECTION L-L



DETAIL 'O'

NOTE: DETAILS SHOWN ARE FOR ROUND POLE.
DETAILS FOR FLUTTED POLE ARE SIMILAR.

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DOUBLE ARM CONNECTION DETAILS

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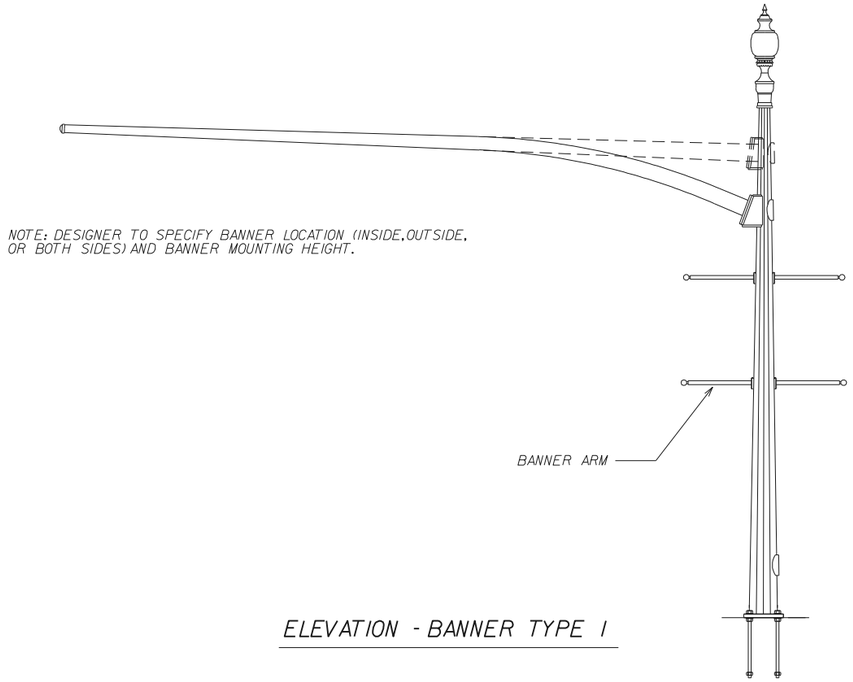
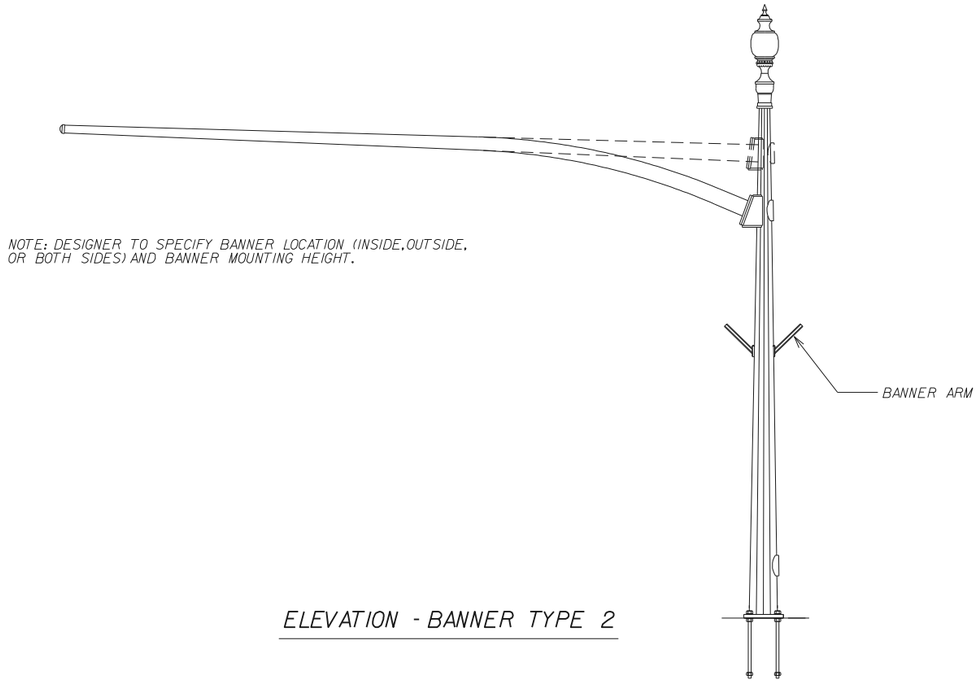
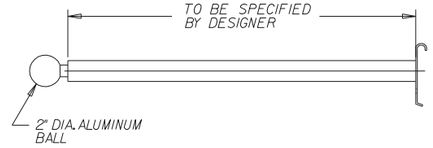


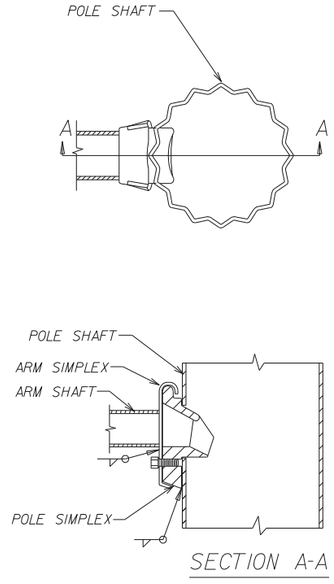
ELEVATION - BANNER TYPE 1



ELEVATION - BANNER TYPE 2



BANNER ARM



SECTION A-A

BANNER ARM ATTACHMENT

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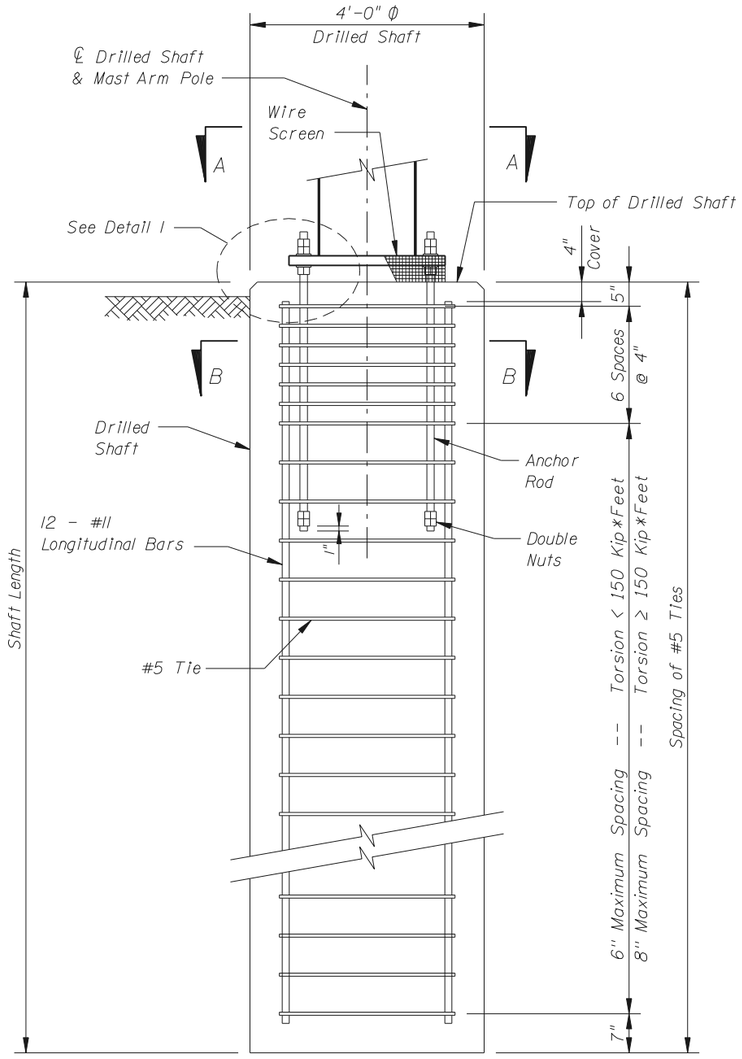
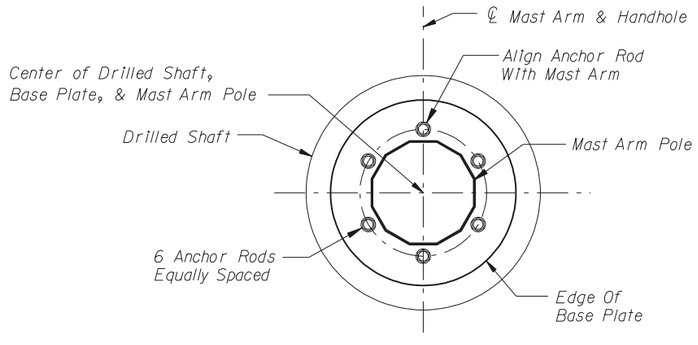
BANNER DETAILS

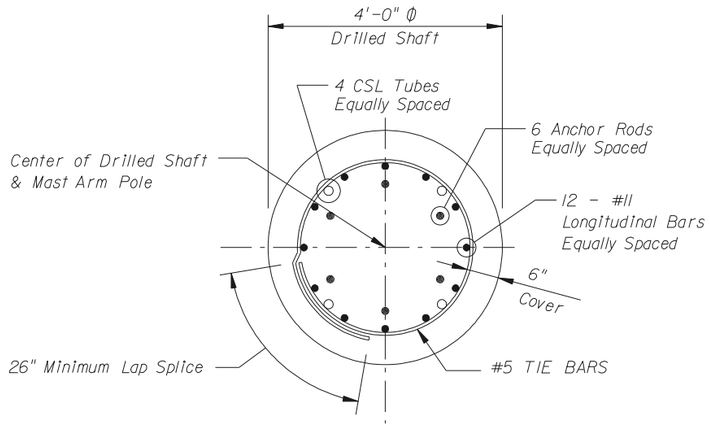
Note:
The Top of the Drilled Shaft shall extend at least 1" but not more than 6" above the adjacent finish grade. Where the Drilled Shaft is located within a sidewalk, or abuts a sidewalk, the Top of the Drilled Shaft shall match the top of the Sidewalk unless otherwise shown in the Mast Arm Designer's Plans.



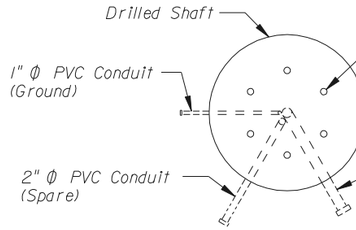
ELEVATION - DRILLED SHAFT & MAST ARM
(CSL Tubes & Conduits Not Shown)



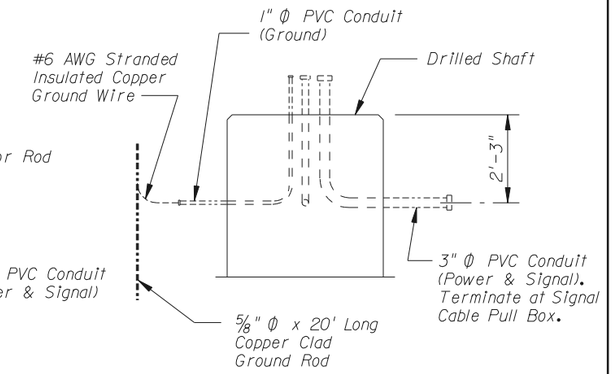
SECTION A-A
(Drilled Shaft Reinforcing, CSL Tubes, & Conduits Not Shown)



SECTION B-B
(Conduits Not Shown)



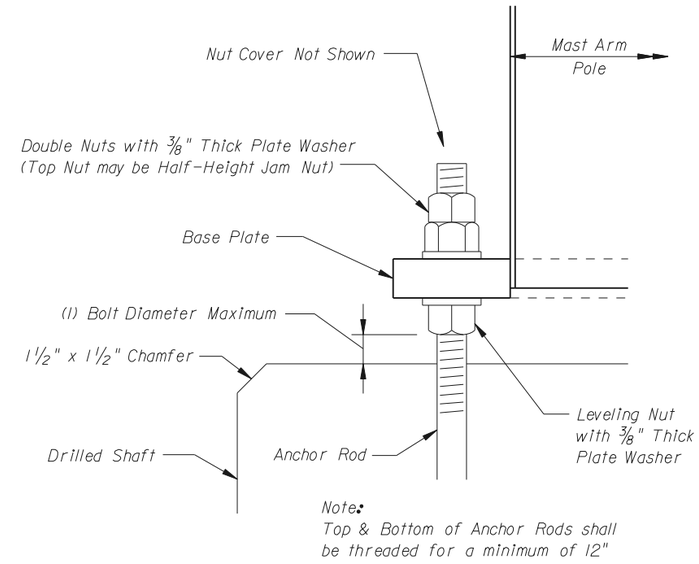
PLAN VIEW



ELEVATION

FOUNDATION CONDUIT DETAIL

Conduit Notes:
1. Details shown are schematic.
2. Adjust Conduit Orientation as required to clear Anchor Rods, Drilled Shaft Reinforcing, and CSL tubes.
3. Extend Conduits to 1" below bottom of Mast Arm Handhole.



Note:
Top & Bottom of Anchor Rods shall be threaded for a minimum of 12"

DETAIL 1
(Drilled Shaft Reinforcing, CSL Tubes, Conduits & Wire Screen Not Shown)

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FOUNDATION DETAILS

FOUNDATION CONSTRUCTION NOTES

1. Drilled Shaft Foundations shall be constructed in accordance with FDOT Specification 455.

2. Natural Slurry shall not be relied upon to prevent the caving of soils and/or to maintain an open hole. Other measures shall be implemented.

3. Contractor shall be prepared to use temporary casing and/or other methods as needed to control Artesian Water Conditions.

4. Where needed, Contractor shall reinforce temporary casing by using a thicker casing wall and/or using a reinforced casing tip to prevent deformation of the temporary casing.

5. Permanent Casing is Prohibited.

6. Verify CSL Access Tubes will not interfere with Anchor Rod installation prior to excavating the shaft. Where CSL Access Tubes conflict with the Anchor Rods, move the CSL Access Tubes 2" maximum along the inner circumference of the Reinforcing Cage. Notify the Engineer before excavating the shaft if the CSL Access Tube locations cannot be moved out of conflict with the Anchor Rods.

7. The Top of the Drilled Shaft Foundation shall extend a minimum of 1" above but not more than 6" above the adjacent finish ground line. The Top of Drilled Shaft Foundations located within a sidewalk or abutting a sidewalk shall match the sidewalk elevation otherwise otherwise noted in the mast arm designer's plans.

FOUNDATION MATERIALS

1. Concrete shall be FDOT Class IV (Drilled Shaft).
   Minimum 28-Day Compressive Strength = 4,000 psi.

2. Reinforcing Steel: ASTM A615, Grade 60.

3. Special Requirements apply for FDOT District 5 Submittals.
   Contact FDOT District 5 Geotechnical Department for Environmental Classification based upon the FDOT District 5 Corrosion Maps.

CLAY LAYER NOTE

At the discretion of the Geotechnical Engineer, the following procedure may be used for a soil profile that contains a single clay less than 3'-0" feet in thickness, but that otherwise fully meets the parameters of one of the soil types listed in the Table of Foundation Capacities:

A. The drilled shaft foundation capacities shall be based upon the soil type and foundation length shown in the Table of Foundation Capacities.

B. The constructed shaft length shall be increased 3 feet beyond the length shown in the Table of Foundation Capacities.

This procedure shall not be used if the clay layer is at the bottom of the shaft.

The Geotechnical Engineer shall specifically approve of the use of this procedure in the Soils Data Letter.

FOUNDATION TABLE NOTES

1. The Drilled Shaft Moment and Torsion Capacities were determined in accordance with the FDOT Structures Manual (January 2013 Edition).

2. The Moment and Torsion Capacities are Service Load (Unfactored) Capacities. The values in the Table of Foundation Capacities are limited to:
   Overturning Moment: 225 kip*ft
   Torsion: 225 kip*ft

3. The foundation information and details shown are for foundations meeting specific soil properties:
   Internal Angle of Friction (Phi Angle)
   Soil Effective Unit Weight (saturated unit weight minus water unit weight)
   SPT Blow Counts (blows per foot)
   These parameters are assumed to exist for the entire embedded depth of the drilled shaft.

4. The following parameters were used to determine the Drilled Shaft Foundation Moment and Torsion Capacities:
   Factor of Safety Against Overturning: 2.0
   Factor of Safety Against Torsion: 1.0
   Horizontal Shear (Applied at Top of Drilled Shaft): 7.0
   Coefficient of Friction (Concrete Against Soil): 67% x tan(Ø)
   Top of Foundation extends no more than 6" above grade
   Top 18" of soil offers no contribution (assumed loose or disturbed)

5. The information provided in the Table of Foundation Capacities is only valid if all of the following conditions are met:

   A. The existing soil conditions meet all of the parameters listed for the standard soil type (see Clay Layer Notes this sheet for exception).

   B. The ground surface slope is 4:1 (Horizontal to Vertical) or flatter for a minimum of 6 feet from the center of the foundation in all directions.

   C. The foundations are constructed in accordance with these standards.

   If any of these conditions are not met, then the foundation information and details shown herein do not apply and a special foundation must be designed. See Sheet 2 for foundation design and submittal requirements.

6. If the Base Moment or Base Torsion exceed the values shown in the Table of Foundation Capacities, then a special foundation must be designed. See Sheet 2 for foundation design and submittal requirements.

7. A Soils Data Letter is required for each Mast Arm. See Sheet 2 for Soils Data Letter Requirements.

8. See Sheet 2 for additional notes.

TABLE OF FOUNDATION CAPACITIES LEGEND

Ø: Soil Internal Angle of Friction (Phi Angle)
γ: Soil Effective Unit Weight
N: SPT Blow Count (Blows per Foot)

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FOUNDATION NOTES

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TABLE OF FOUNDATION CAPACITIES

SEE "FOUNDATION NOTES" DRAWING FOR NOTES & LEGEND

SOIL TYPE: 28-40-06 Ø: 28 DEGREES γ: 40 PCF N: 9 > N ≥ 6	LENGTH (FEET)	12	13	14	15	16	17	18	19	20
	MOMENT (KIP*FEET)	26	55	92	136	188	225	225	225	225
	TORSION (KIP*FEET)	35	42	50	58	66	76	86	96	107
SOIL TYPE: 28-40-09 Ø: 28 DEGREES γ: 40 PCF N: 12 > N ≥ 9	LENGTH (FEET)	12	13	14	15	16	17	18	19	20
	MOMENT (KIP*FEET)	26	55	92	136	188	225	225	225	225
	TORSION (KIP*FEET)	50	60	71	83	96	110	124	140	156
SOIL TYPE: 28-40-12 Ø: 28 DEGREES γ: 40 PCF N: 15 > N ≥ 12	LENGTH (FEET)	12	13	14	15	16	17	18	19	20
	MOMENT (KIP*FEET)	26	55	92	136	188	225	225	225	225
	TORSION (KIP*FEET)	66	79	93	109	126	144	163	183	205
SOIL TYPE: 28-40-15 Ø: 28 DEGREES γ: 40 PCF N: N ≥ 15	LENGTH (FEET)	12	13	14	15	16	17	18	19	
	MOMENT (KIP*FEET)	26	55	92	136	188	225	225	225	
	TORSION (KIP*FEET)	81	97	115	134	155	177	201	225	
SOIL TYPE: 28-50-06 Ø: 28 DEGREES γ: 50 PCF N: 9 > N ≥ 6	LENGTH (FEET)	12	13	14	15	16	17	18	19	20
	MOMENT (KIP*FEET)	53	91	138	195	225	225	225	225	225
	TORSION (KIP*FEET)	43	51	61	70	81	93	105	118	132
SOIL TYPE: 28-50-09 Ø: 28 DEGREES γ: 50 PCF N: 12 > N ≥ 9	LENGTH (FEET)	12	13	14	15	16	17	18	19	20
	MOMENT (KIP*FEET)	53	91	138	195	225	225	225	225	225
	TORSION (KIP*FEET)	62	74	88	102	118	135	153	172	193
SOIL TYPE: 28-50-12 Ø: 28 DEGREES γ: 50 PCF N: 15 > N ≥ 12	LENGTH (FEET)	12	13	14	15	16	17	18	19	
	MOMENT (KIP*FEET)	53	91	138	195	225	225	225	225	
	TORSION (KIP*FEET)	81	97	115	134	155	177	201	225	
SOIL TYPE: 28-50-15 Ø: 28 DEGREES γ: 50 PCF N: N ≥ 15	LENGTH (FEET)	12	13	14	15	16	17	18		
	MOMENT (KIP*FEET)	53	91	138	195	225	225	225		
	TORSION (KIP*FEET)	99	120	142	166	192	220	225		
SOIL TYPE: 28-60-06 Ø: 28 DEGREES γ: 60 PCF N: 9 > N ≥ 6	LENGTH (FEET)	12	13	14	15	16	17	18	19	20
	MOMENT (KIP*FEET)	81	128	185	225	225	225	225	225	225
	TORSION (KIP*FEET)	50	60	71	83	96	110	124	140	156
SOIL TYPE: 28-60-09 Ø: 28 DEGREES γ: 60 PCF N: 12 > N ≥ 9	LENGTH (FEET)	12	13	14	15	16	17	18	19	20
	MOMENT (KIP*FEET)	81	128	185	225	225	225	225	225	225
	TORSION (KIP*FEET)	73	88	104	121	140	160	182	205	225
SOIL TYPE: 28-60-12 Ø: 28 DEGREES γ: 60 PCF N: 15 > N ≥ 12	LENGTH (FEET)	12	13	14	15	16	17	18		
	MOMENT (KIP*FEET)	81	128	185	225	225	225	225		
	TORSION (KIP*FEET)	96	115	137	160	185	211	225		
SOIL TYPE: 28-60-15 Ø: 28 DEGREES γ: 60 PCF N: N ≥ 15	LENGTH (FEET)	12	13	14	15	16				
	MOMENT (KIP*FEET)	81	128	185	225	225				
	TORSION (KIP*FEET)	118	143	169	198	225				

SOIL TYPE: 30-40-06 Ø: 30 DEGREES γ: 40 PCF N: 9 > N ≥ 6	LENGTH (FEET)	12	13	14	15	16	17	18	19	20
	MOMENT (KIP*FEET)	35	67	107	155	213	225	225	225	225
	TORSION (KIP*FEET)	36	43	50	58	67	76	86	97	108
SOIL TYPE: 30-40-09 Ø: 30 DEGREES γ: 40 PCF N: 12 > N ≥ 9	LENGTH (FEET)	12	13	14	15	16	17	18	19	20
	MOMENT (KIP*FEET)	35	67	107	155	213	225	225	225	225
	TORSION (KIP*FEET)	51	61	72	84	97	110	125	140	157
SOIL TYPE: 30-40-12 Ø: 30 DEGREES γ: 40 PCF N: 15 > N ≥ 12	LENGTH (FEET)	12	13	14	15	16	17	18	19	20
	MOMENT (KIP*FEET)	35	67	107	155	213	225	225	225	225
	TORSION (KIP*FEET)	66	79	94	109	126	144	163	184	206
SOIL TYPE: 30-40-15 Ø: 30 DEGREES γ: 40 PCF N: N ≥ 15	LENGTH (FEET)	12	13	14	15	16	17	18	19	
	MOMENT (KIP*FEET)	35	67	107	155	213	225	225	225	
	TORSION (KIP*FEET)	81	97	115	135	156	178	202	225	
SOIL TYPE: 30-50-06 Ø: 30 DEGREES γ: 50 PCF N: 9 > N ≥ 6	LENGTH (FEET)	12	13	14	15	16	17	18	19	20
	MOMENT (KIP*FEET)	65	106	158	220	225	225	225	225	225
	TORSION (KIP*FEET)	43	52	61	71	82	93	106	119	132
SOIL TYPE: 30-50-09 Ø: 30 DEGREES γ: 50 PCF N: 12 > N ≥ 9	LENGTH (FEET)	12	13	14	15	16	17	18	19	20
	MOMENT (KIP*FEET)	65	106	158	220	225	225	225	225	225
	TORSION (KIP*FEET)	62	75	88	103	119	136	154	173	193
SOIL TYPE: 30-50-12 Ø: 30 DEGREES γ: 50 PCF N: 15 > N ≥ 12	LENGTH (FEET)	12	13	14	15	16	17	18	19	
	MOMENT (KIP*FEET)	65	106	158	220	225	225	225	225	
	TORSION (KIP*FEET)	81	97	115	135	156	178	202	225	
SOIL TYPE: 30-50-15 Ø: 30 DEGREES γ: 50 PCF N: N ≥ 15	LENGTH (FEET)	12	13	14	15	16	17	18		
	MOMENT (KIP*FEET)	65	106	158	220	225	225	225		
	TORSION (KIP*FEET)	100	120	142	167	193	221	225		
SOIL TYPE: 30-60-06 Ø: 30 DEGREES γ: 60 PCF N: 9 > N ≥ 6	LENGTH (FEET)	12	13	14	15	16	17	18	19	20
	MOMENT (KIP*FEET)	94	146	209	225	225	225	225	225	225
	TORSION (KIP*FEET)	51	61	72	84	97	110	125	140	157
SOIL TYPE: 30-60-09 Ø: 30 DEGREES γ: 60 PCF N: 12 > N ≥ 9	LENGTH (FEET)	12	13	14	15	16	17	18	19	20
	MOMENT (KIP*FEET)	94	146	209	225	225	225	225	225	225
	TORSION (KIP*FEET)	74	88	104	122	141	161	183	206	225
SOIL TYPE: 30-60-12 Ø: 30 DEGREES γ: 60 PCF N: 15 > N ≥ 12	LENGTH (FEET)	12	13	14	15	16	17	18		
	MOMENT (KIP*FEET)	94	146	209	225	225	225	225		
	TORSION (KIP*FEET)	96	116	137	160	185	212	225		
SOIL TYPE: 30-60-15 Ø: 30 DEGREES γ: 60 PCF N: N ≥ 15	LENGTH (FEET)	12	13	14	15	16				
	MOMENT (KIP*FEET)	94	146	209	225	225				
	TORSION (KIP*FEET)	119	143	170	198	225				

REVISIONS		
DATE	BY	DESCRIPTION

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

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TABLE OF FOUNDATION CAPACITIES