



**FINAL SUBMITTAL
NOVEMBER 28, 2011**

SEMINOLE COUNTY 2011 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.

Engineer of Record: M. David Finley, P.E.
Florida P.E. No. 40119

INDEX OF DRAWINGS	
SHEET	DESCRIPTION
1	COVER SHEET AND INDEX OF DRAWINGS
2	NOTES
3	POLE SCHEDULE DATA SHEET
4	POLE TYPE 1 - NON-FLUTED POLE WITHOUT LUMINAIRE - CURVED ARM
5	POLE TYPE 2 - NON-FLUTED POLE WITHOUT LUMINAIRE - STRAIGHT ARM
6	POLE TYPE 3 - NON-FLUTED POLE WITH LUMINAIRE - CURVED ARM
7	POLE TYPE 4 - NON-FLUTED POLE WITH LUMINAIRE - STRAIGHT ARM
8	POLE TYPE 5 - FLUTED POLE - CURVED ARM
9	POLE TYPE 6 - FLUTED POLE - STRAIGHT ARM
10	DOUBLE ARM CONNECTION DETAILS
11	BANNER DETAILS
12	FOUNDATION DETAILS
13	TABLE OF FOUNDATION CAPACITIES

PEGASUS ENGINEERING, LLC
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 Certificate of Authorization No. 27770



PEGASUS
ENGINEERING
PROJECT NO.
SMC-011

DATE
NOVEMBER 2011

SHEET
1 OF 13

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" (Current 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" (2009 Edition with Interims through 2010)
 - b. Florida Department of Transportation FDOT January 2011 Modifications to LTS-5.
- 2) Basic Wind Speed: 130 mph
- 3) Multiple piles shall not be used.
- 4) The diameter of the Anchor Rod Circle shall not exceed 38 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 cables. 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.

STRUCTURE REQUIREMENTS

- I) 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 Heavy 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 exceed the bolt diameter plus 1/2" prior to galvanizing.
- 5) Arms and Pole shall be tapered with a diameter changing at a rate of 0.4 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 methods of radiography or ultrasonics.
- 8) Field drill wire access holes for Signs and Signals. The hole diameter shall not exceed 1.50 inches. Provide 1.00 inch internal diameter rubber grommet at each hole.
- 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 connection.
 - i) 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 include 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 accordance 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 must 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 Geotechnical Engineer and shall be submitted with the mast arm structure calculations and drawings. The Soils Data Letter shall be based upon a soil boring not less than 30' in depth. The Soils Data Letter shall state which, if any, standard soil type is applicable. For locations where the existing soils do not meet the requirements of one of the standard soil types, the Soils Data Letter shall provide the specific soils parameters for the location.
- 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 structures.
- 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.

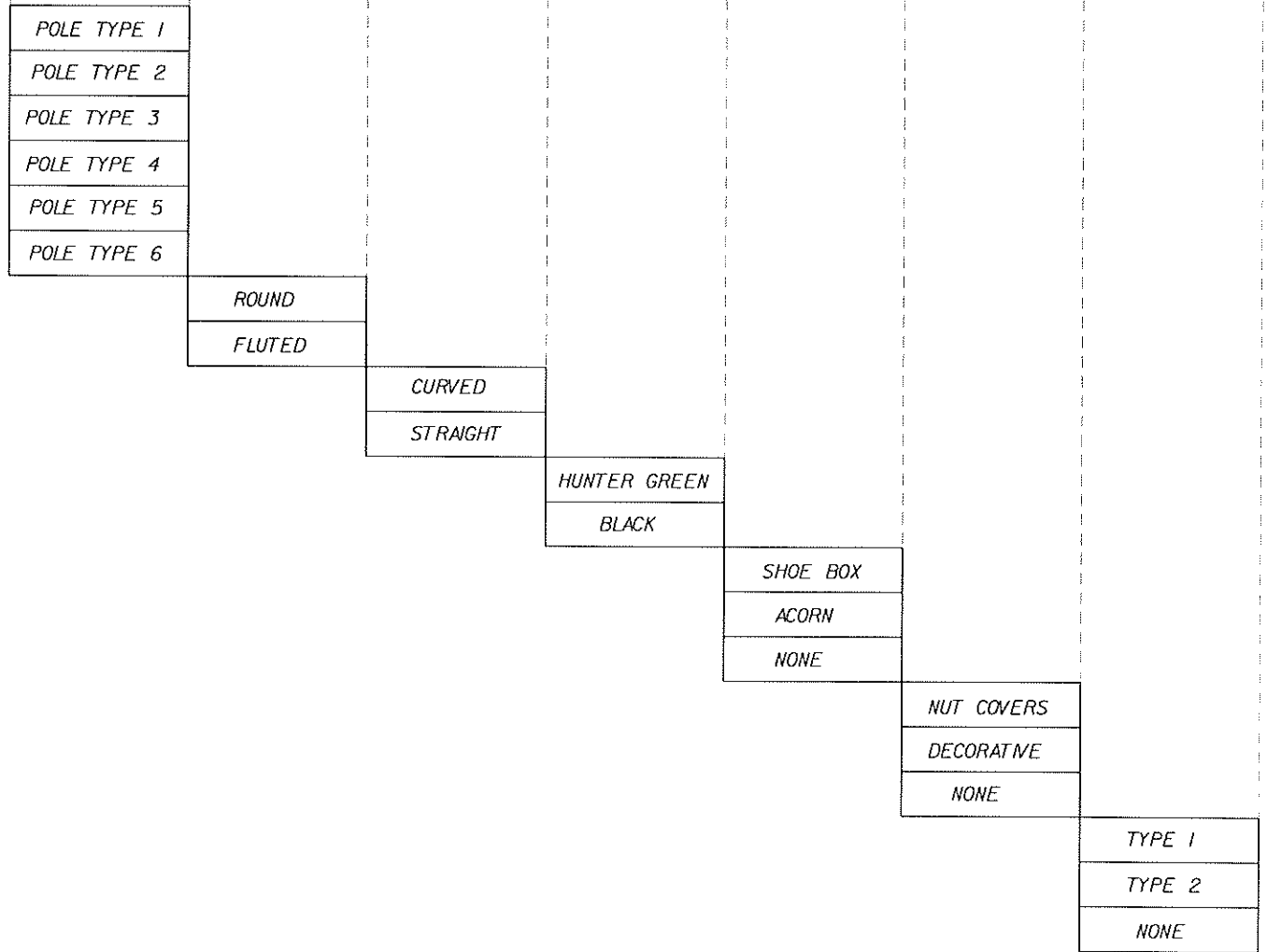
REVISIONS			ENGINEER OF RECORD: M. DAVID FINLEY, P.E. LICENSE # 40119 M. DAVID FINLEY, P.E., P.A. 2086 SW MAIN BOULEVARD, SUITE 111 LAKE CITY, FLORIDA 32025 CERTIFICATE OF AUTHORIZATION NO. 25972			2011 STANDARD MAST ARM DRAWINGS SEMINOLE COUNTY TRAFFIC ENGINEERING 140 BUSH LOOP SANFORD, FL 32773 PHONE (407) 665-5677	NOTES	2 OF 13
DATE	BY	DESCRIPTION						

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										

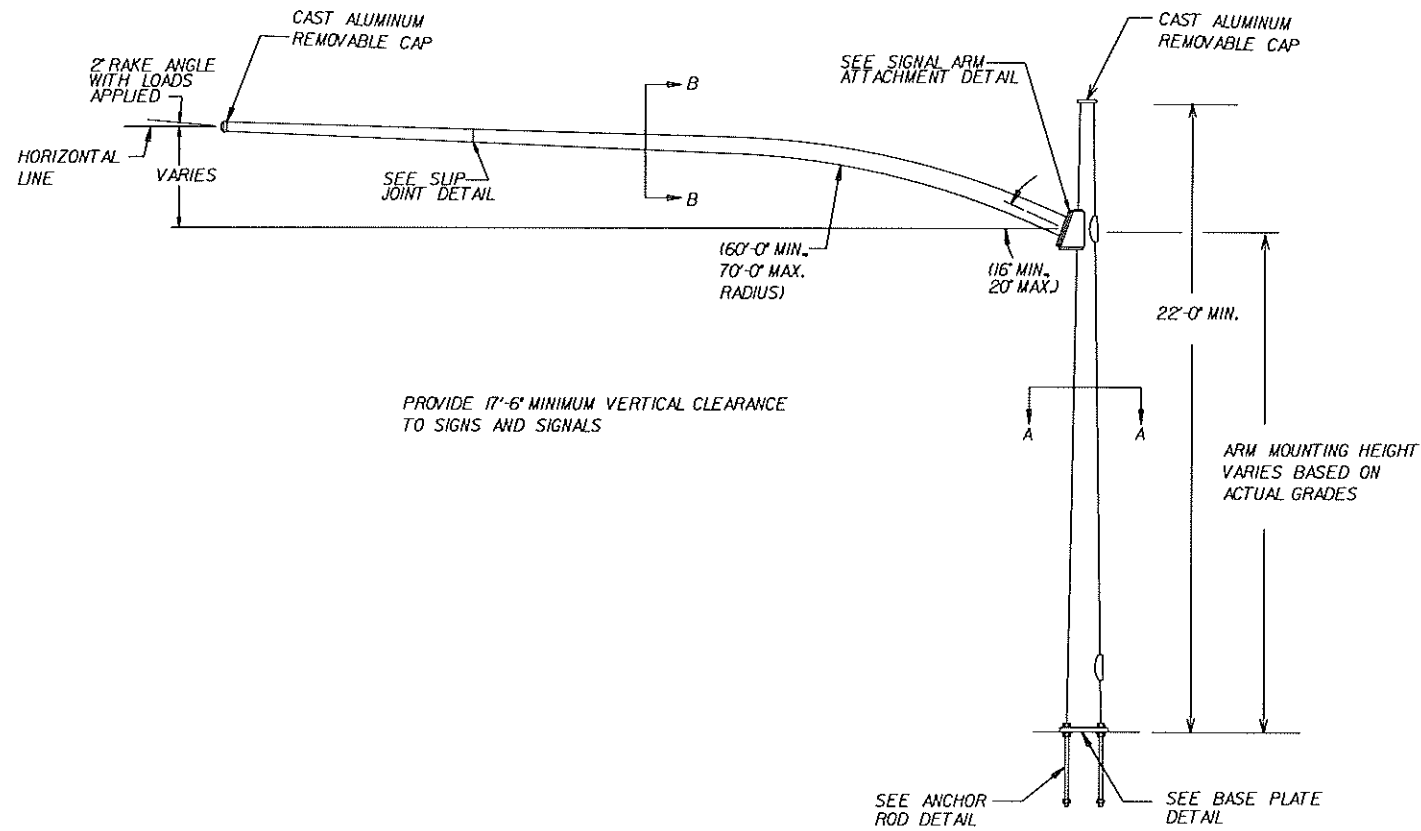
AVAILABLE OPTIONS



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

REVISIONS			ENGINEER OF RECORD: M. DAVID FINLEY, P.E. LICENSE # 40119 M. DAVID FINLEY, P.E., P.A. 2086 SW MAIN BOULEVARD, SUITE 111 LAKE CITY, FLORIDA 32025 CERTIFICATE OF AUTHORIZATION NO. 25972			2011 STANDARD MAST ARM DRAWINGS SEMINOLE COUNTY TRAFFIC ENGINEERING 140 BUSH LOOP SANFORD, FL 32773 PHONE (407) 665-5677	POLE SCHEDULE DATA SHEET	3 OF 13
DATE	BY	DESCRIPTION						

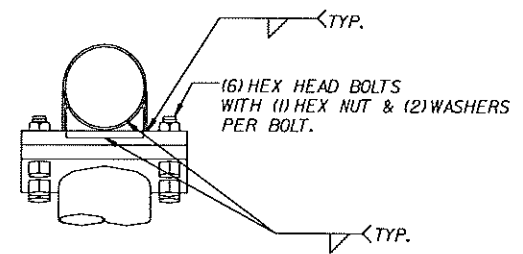
NOTE: ARM LENGTH SHALL NOT EXCEED 60'-0".
ARMS LONGER THAN 60'-0" SHALL BE STRAIGHT (SEE SHEET 5 OF 13)



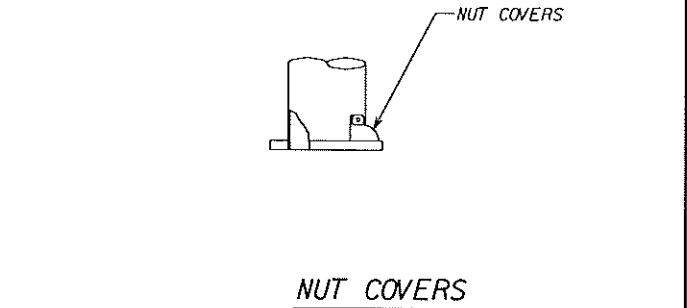
PROVIDE 17'-6" MINIMUM VERTICAL CLEARANCE TO SIGNS AND SIGNALS

ARM MOUNTING HEIGHT VARIES BASED ON ACTUAL GRADES

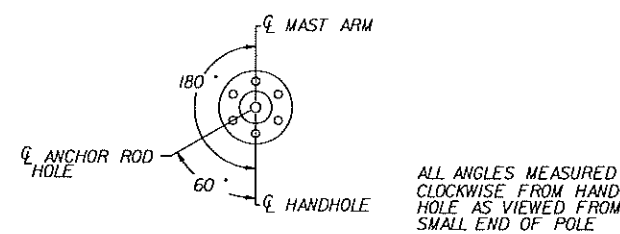
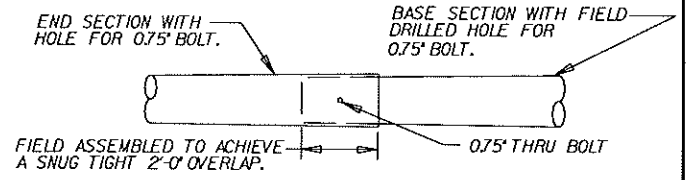
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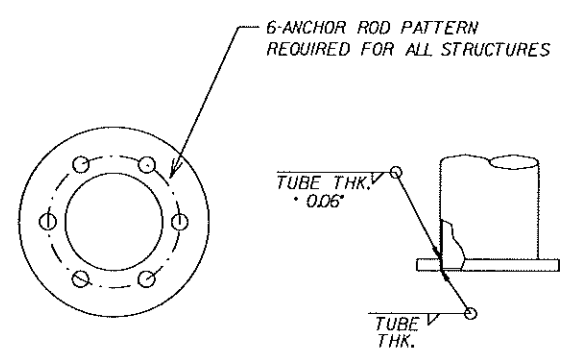
SIGNAL ARM ATTACHMENT



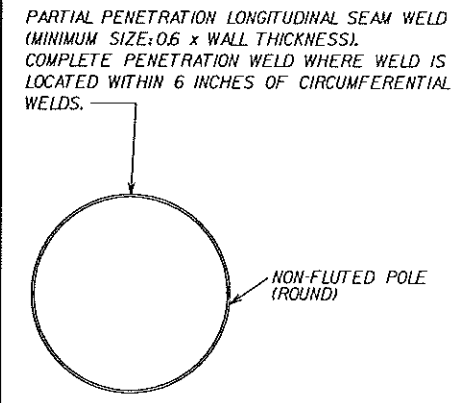
SIGNAL ARM SLIP JOINT



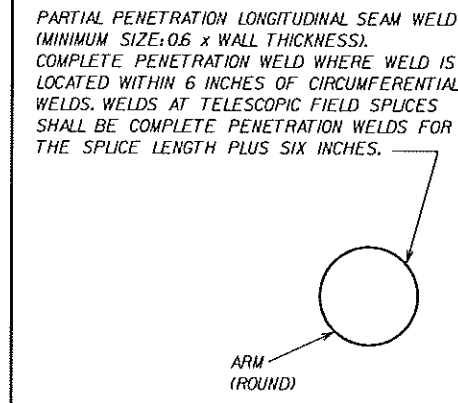
6-BOLT RADIAL INDEX



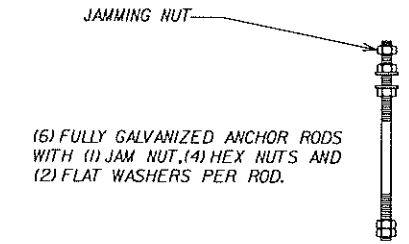
BASE PLATE



SECTION A-A



SECTION B-B



ANCHOR ROD

NOTE: 'J-BOLTS' ARE NOT PERMITTED

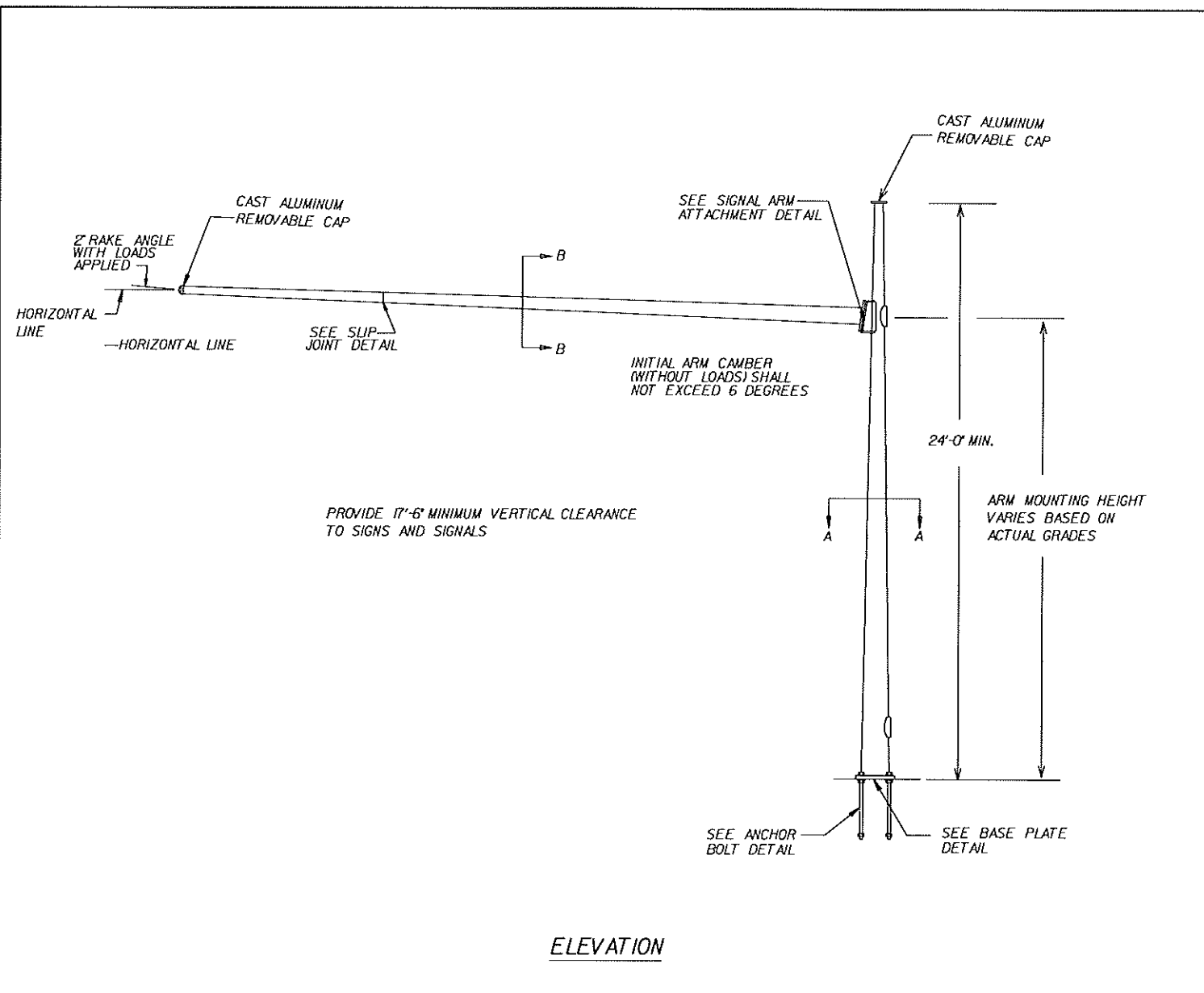
REVISIONS		
DATE	BY	DESCRIPTION

ENGINEER OF RECORD:
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2086 SW MAIN BOULEVARD, SUITE 111
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CERTIFICATE OF AUTHORIZATION NO. 25972

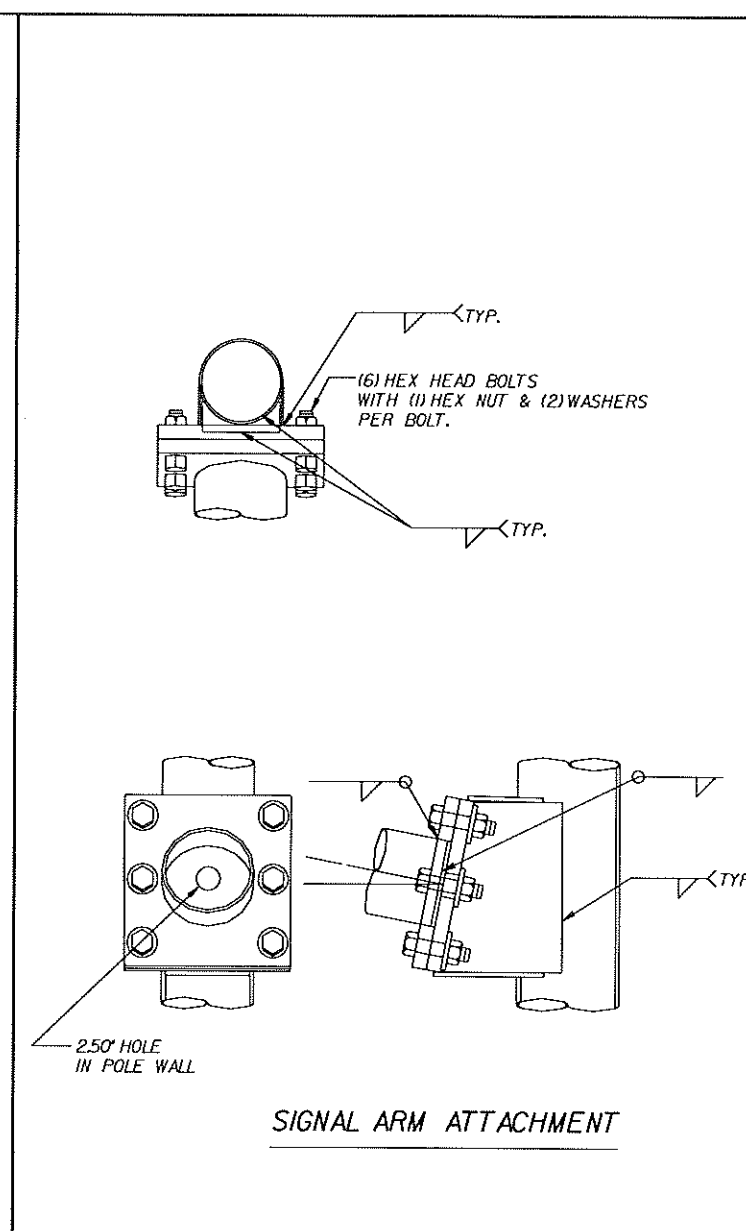


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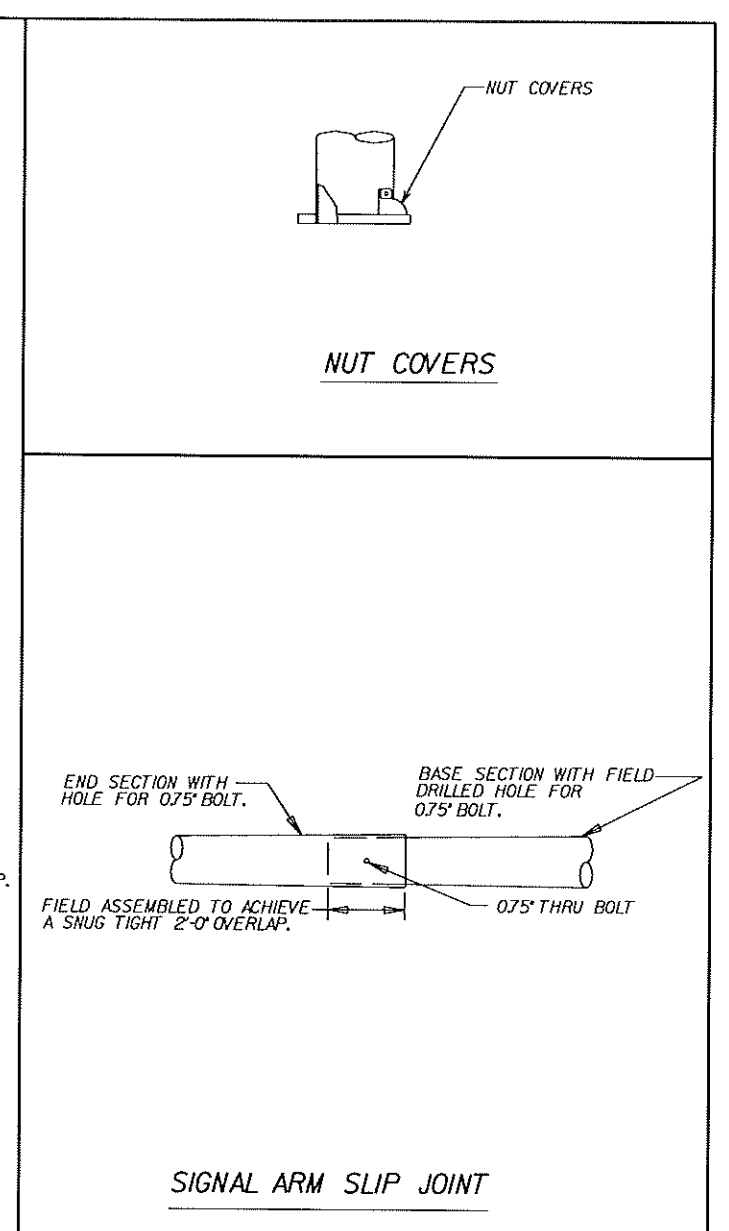
POLE TYPE 1
NON-FLUTED POLE WITHOUT LUMINAIRE
CURVED ARM



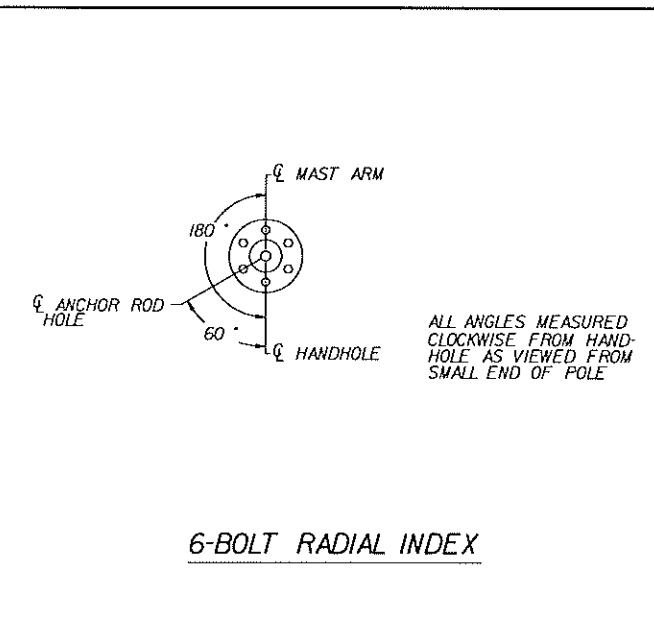
ELEVATION



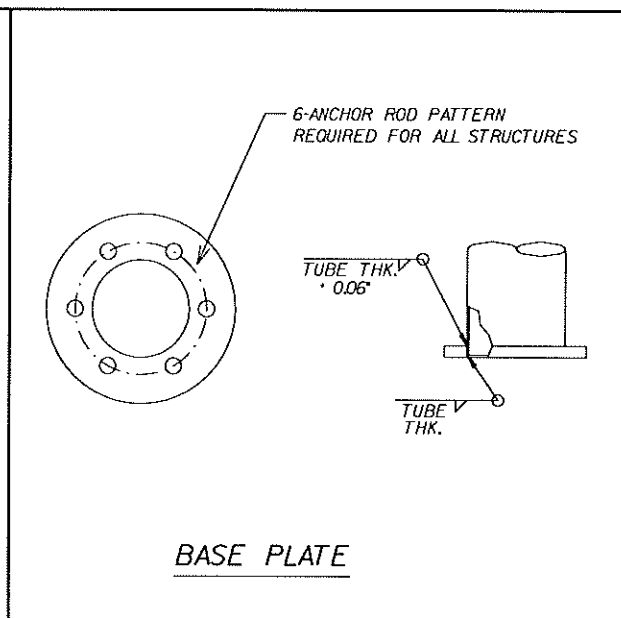
SIGNAL ARM ATTACHMENT



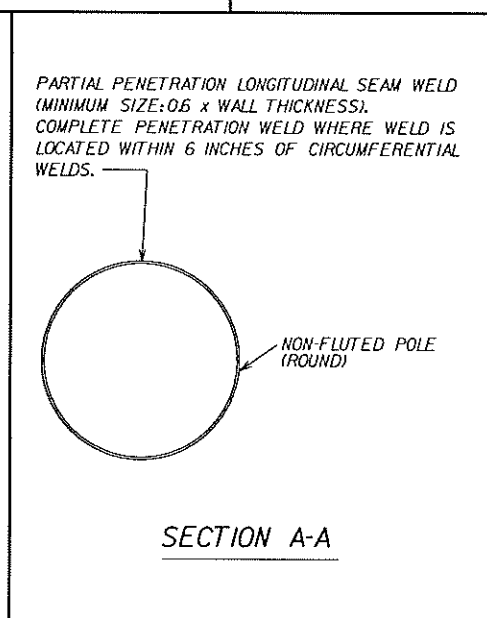
SIGNAL ARM SLIP JOINT



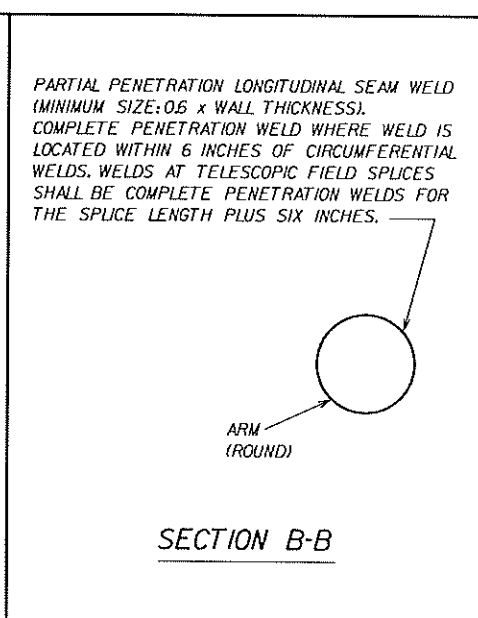
6-BOLT RADIAL INDEX



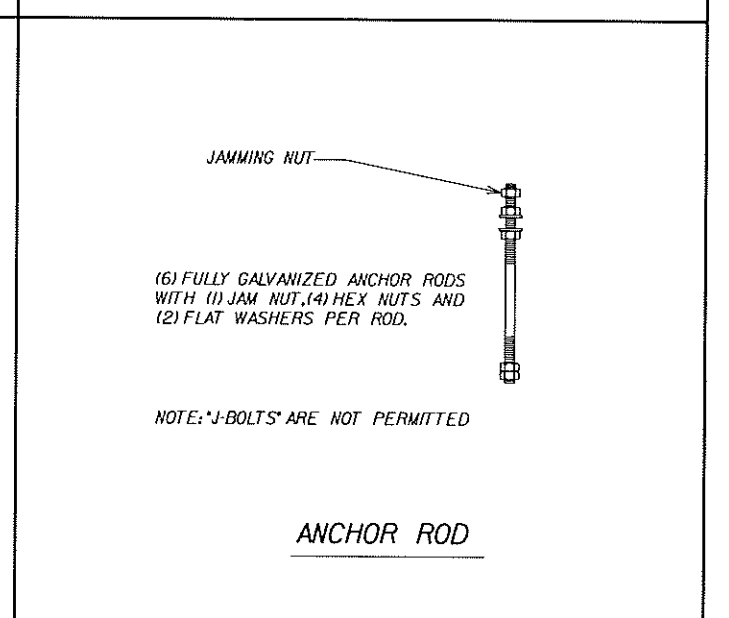
BASE PLATE



SECTION A-A



SECTION B-B



ANCHOR ROD

REVISIONS		
DATE	BY	DESCRIPTION

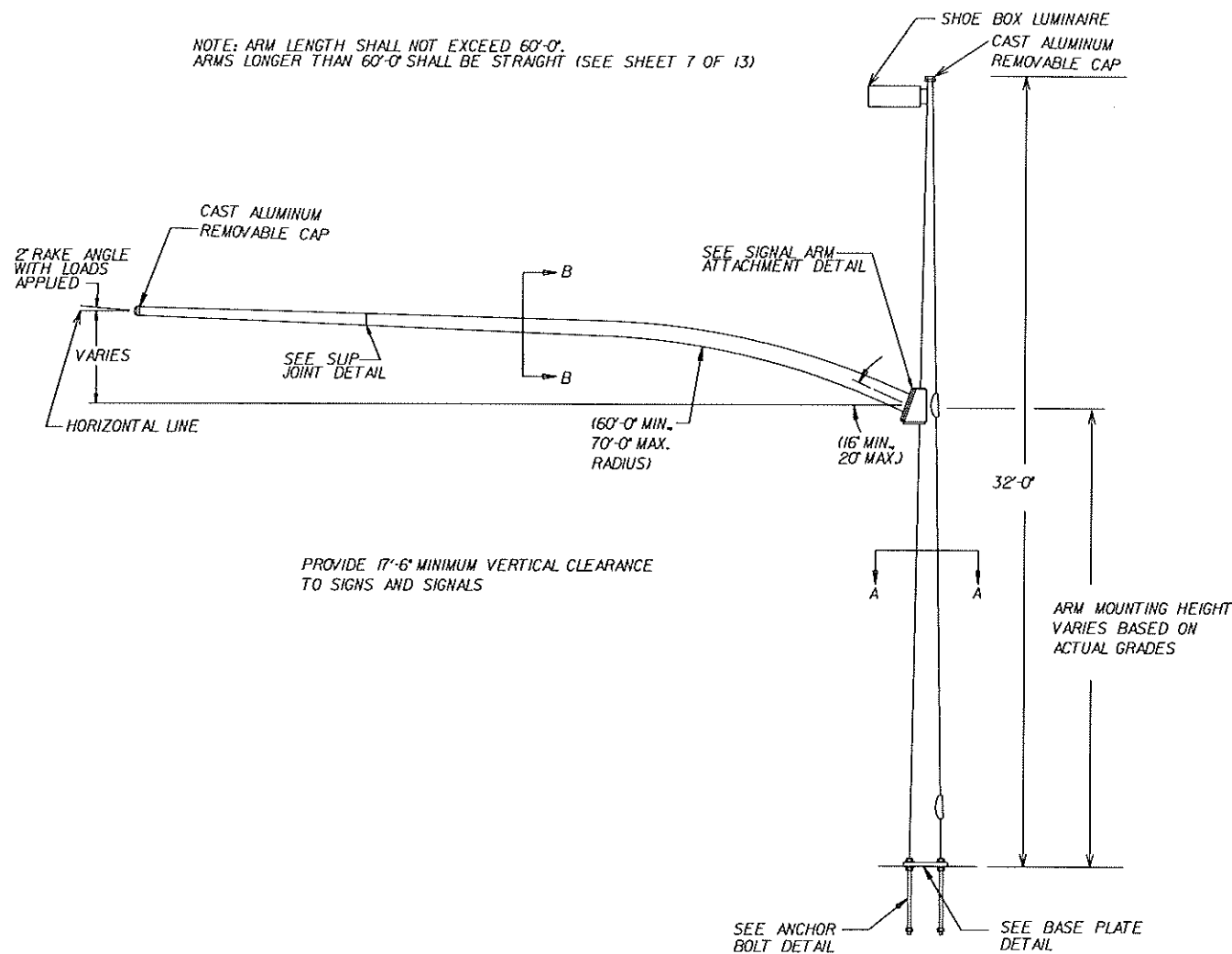
ENGINEER OF RECORD:
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POLE TYPE 2
NON-FLUTED POLE WITHOUT LUMINAIRE
STRAIGHT ARM

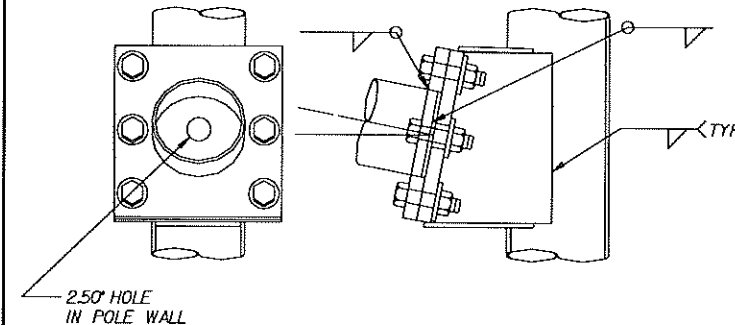
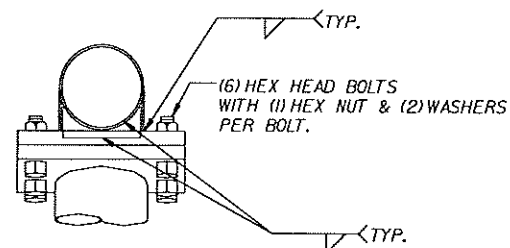
NOTE: ARM LENGTH SHALL NOT EXCEED 60'-0".
ARMS LONGER THAN 60'-0" SHALL BE STRAIGHT (SEE SHEET 7 OF 13)



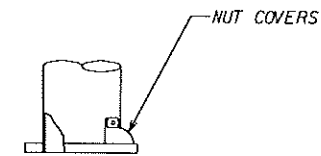
PROVIDE 17'-6" MINIMUM VERTICAL CLEARANCE TO SIGNS AND SIGNALS

ARM MOUNTING HEIGHT VARIES BASED ON ACTUAL GRADES

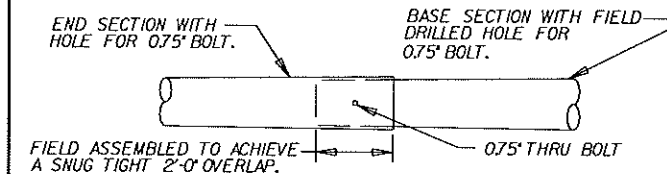
ELEVATION



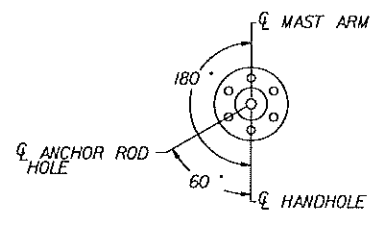
SIGNAL ARM ATTACHMENT



NUT COVERS

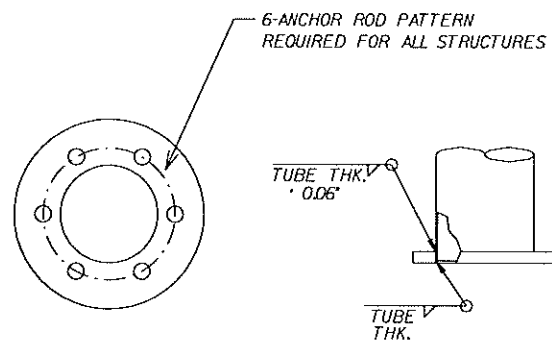


SIGNAL ARM SLIP JOINT



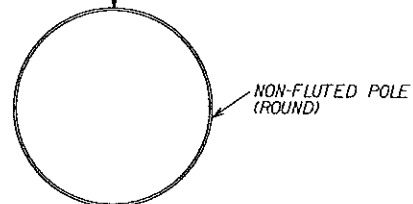
ALL ANGLES MEASURED CLOCKWISE FROM HANDHOLE AS VIEWED FROM SMALL END OF POLE

6-BOLT RADIAL INDEX



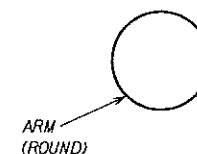
BASE PLATE

PARTIAL PENETRATION LONGITUDINAL SEAM WELD (MINIMUM SIZE: 0.6 x WALL THICKNESS). COMPLETE PENETRATION WELD WHERE WELD IS LOCATED WITHIN 6 INCHES OF CIRCUMFERENTIAL WELDS.

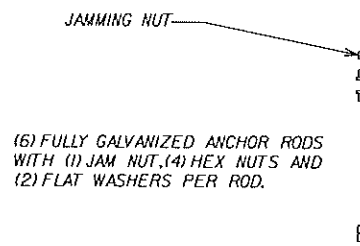


SECTION A-A

PARTIAL PENETRATION LONGITUDINAL SEAM WELD (MINIMUM SIZE: 0.6 x WALL THICKNESS). COMPLETE PENETRATION WELD WHERE WELD IS LOCATED WITHIN 6 INCHES OF CIRCUMFERENTIAL WELDS. WELDS AT TELESCOPIC FIELD SPLICES SHALL BE COMPLETE PENETRATION WELDS FOR THE SPLICE LENGTH PLUS SIX INCHES.



SECTION B-B



(6) FULLY GALVANIZED ANCHOR RODS WITH (1) JAM NUT, (4) HEX NUTS AND (2) FLAT WASHERS PER ROD.

NOTE: "J-BOLTS" ARE NOT PERMITTED

ANCHOR ROD

REVISIONS

DATE	BY	DESCRIPTION

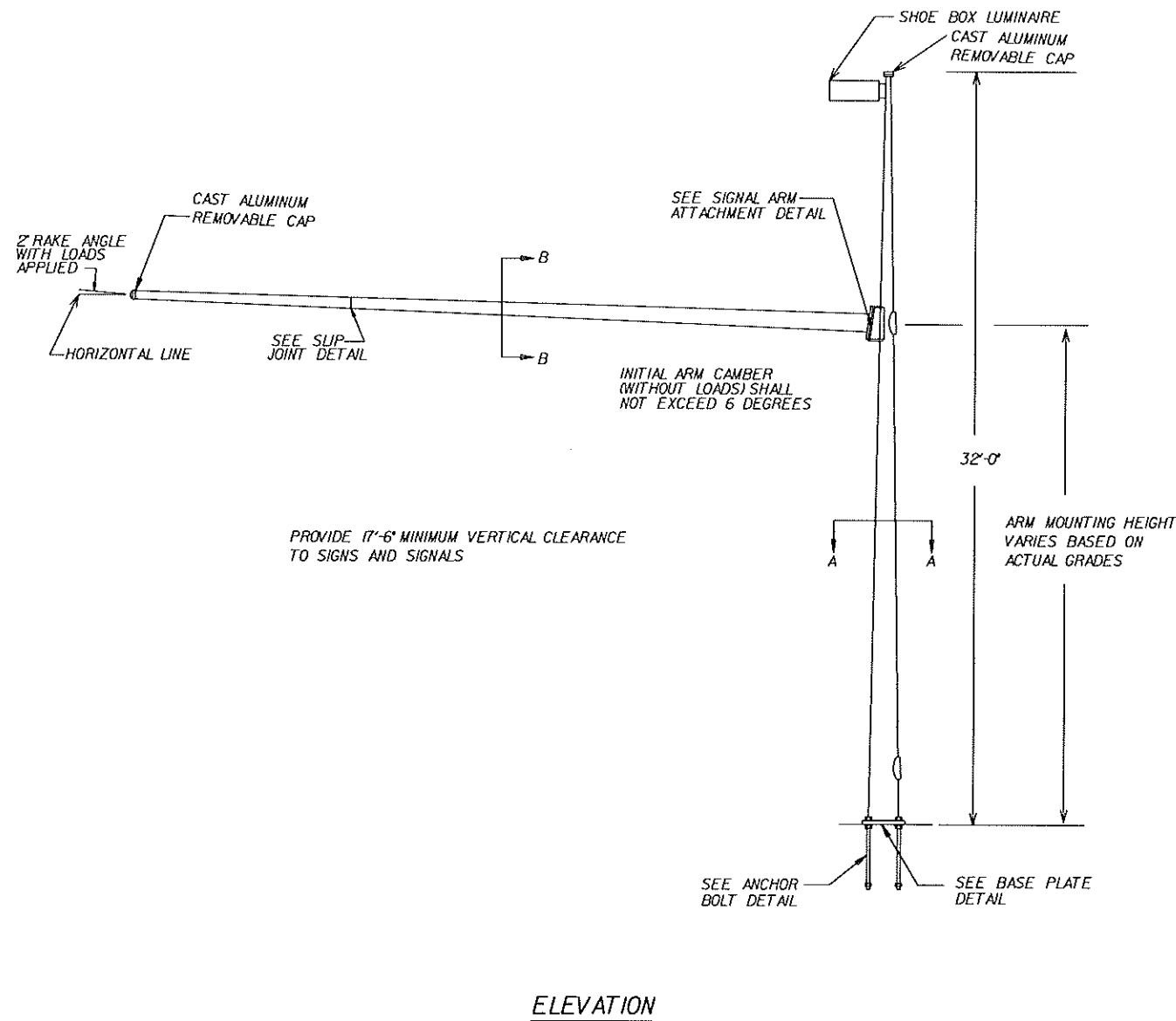
ENGINEER OF RECORD:
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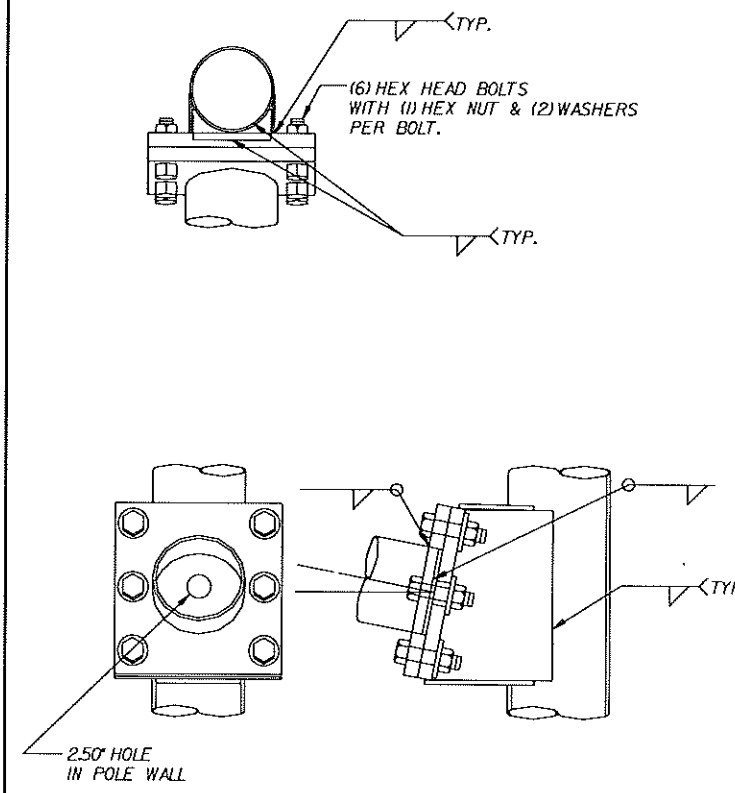
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PHONE (407) 665-5677

POLE TYPE 3
NON-FLUTED POLE WITH LUMINAIRE
CURVED ARM

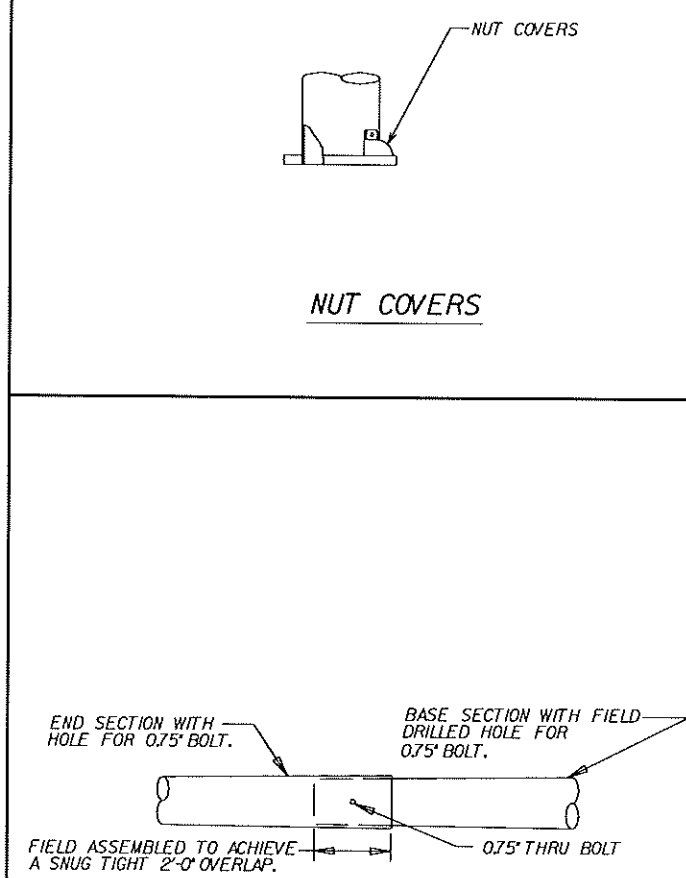
6
OF
13



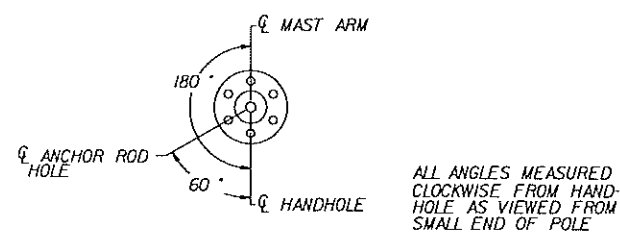
ELEVATION



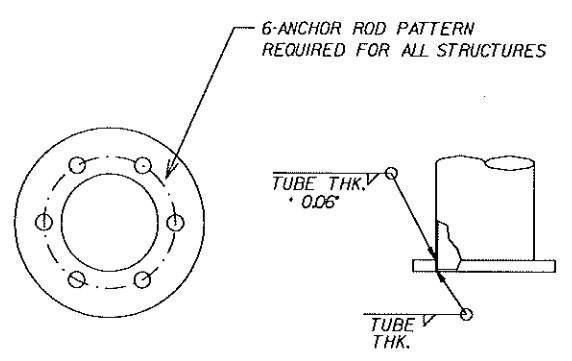
SIGNAL ARM ATTACHMENT



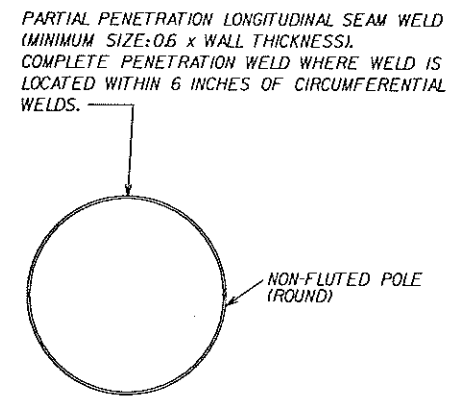
SIGNAL ARM SLIP JOINT



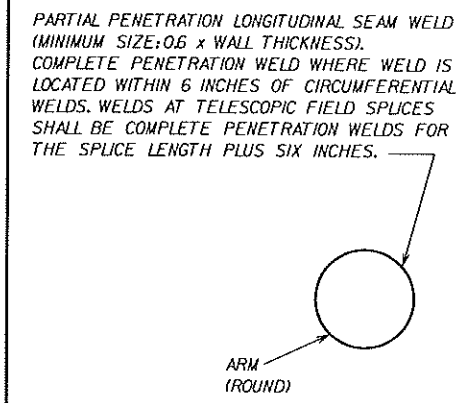
6-BOLT RADIAL INDEX



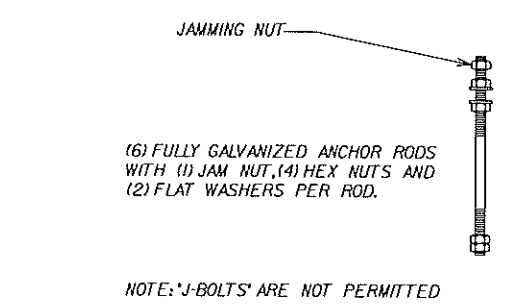
BASE PLATE



SECTION A-A



SECTION B-B



ANCHOR ROD

REVISIONS		
DATE	BY	DESCRIPTION

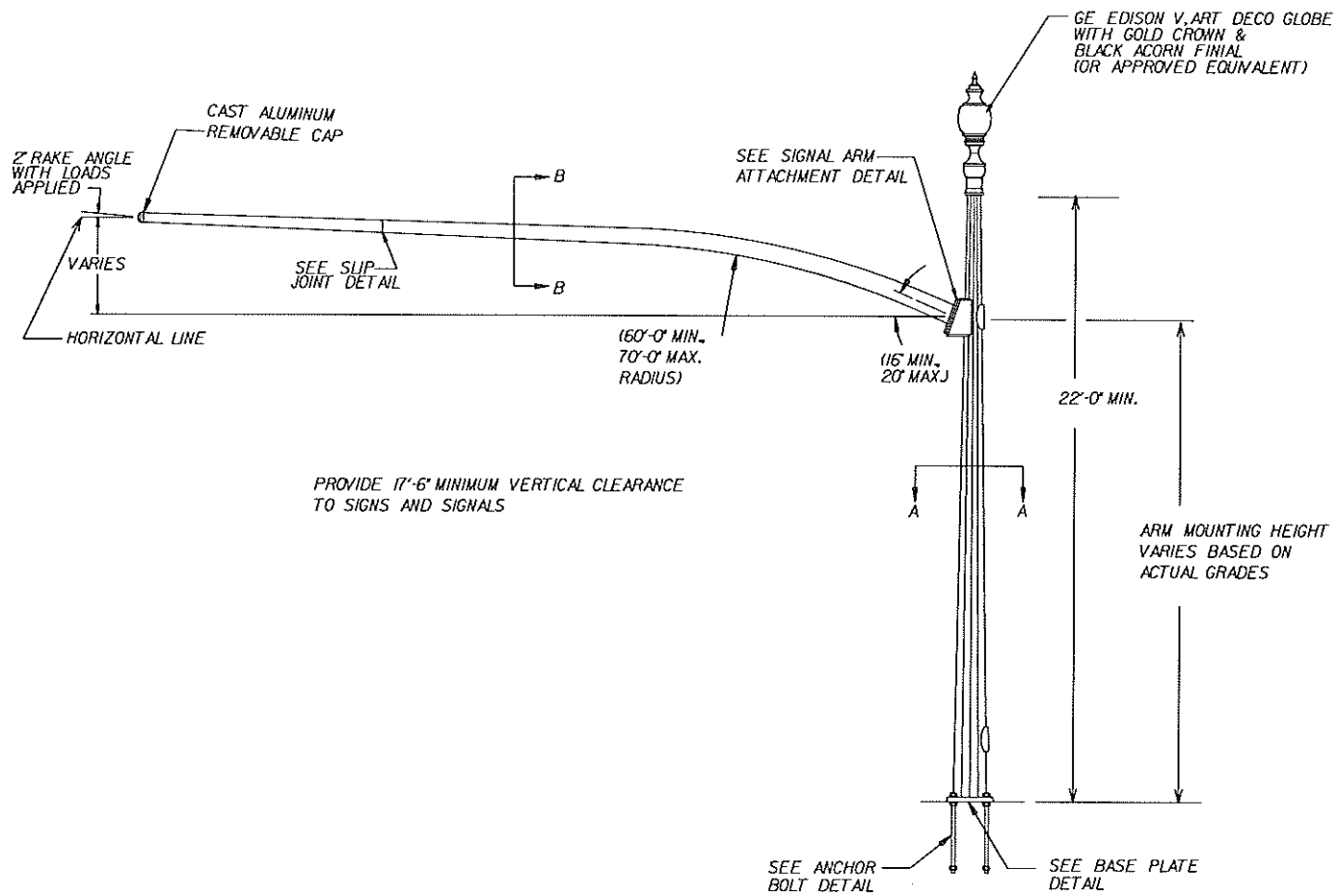
ENGINEER OF RECORD:
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LAKE CITY, FLORIDA 32025
CERTIFICATE OF AUTHORIZATION NO. 25972



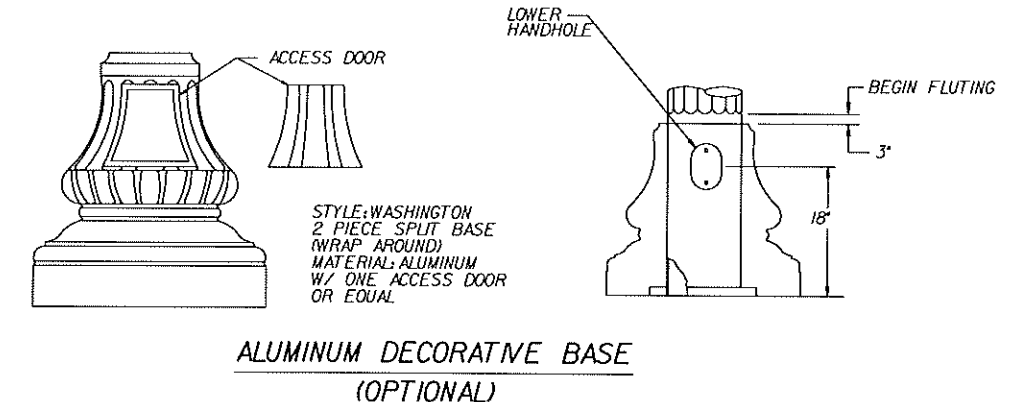
2011 STANDARD MAST ARM DRAWINGS
SEMINOLE COUNTY TRAFFIC ENGINEERING
140 BUSH LOOP SANFORD, FL 32773
PHONE (407) 665-5677

POLE TYPE 4
NON-FLUTED POLE WITH LUMINAIRE
STRAIGHT ARM

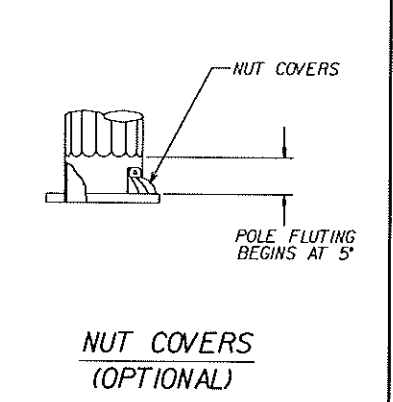
NOTE: ARM LENGTH SHALL NOT EXCEED 60'-0".
ARMS LONGER THAN 60'-0" SHALL BE STRAIGHT (SEE SHEET 9 OF 13)



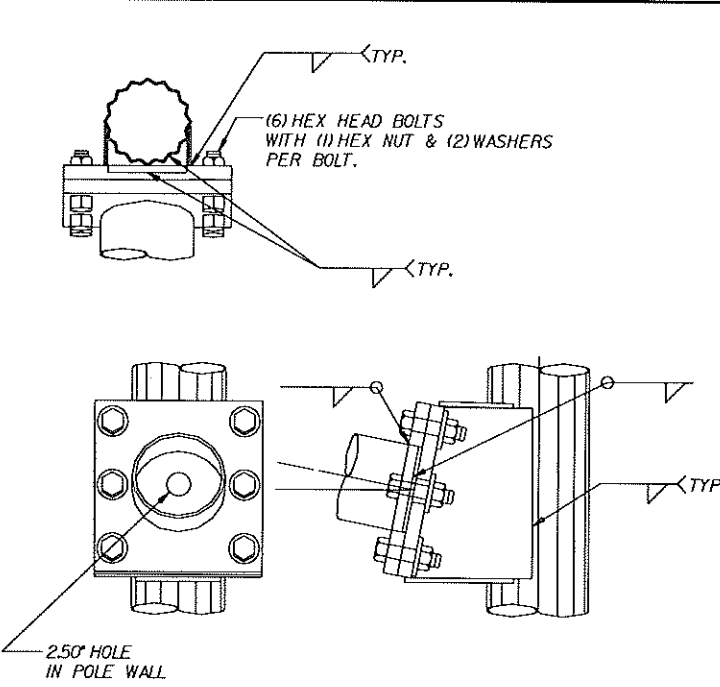
ELEVATION



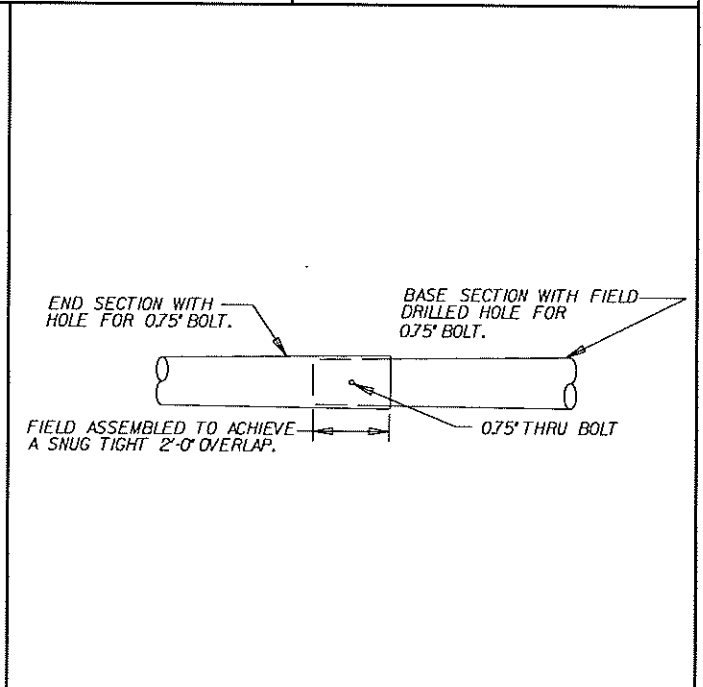
ALUMINUM DECORATIVE BASE (OPTIONAL)



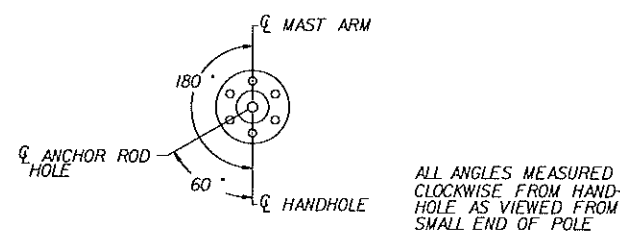
NUT COVERS (OPTIONAL)



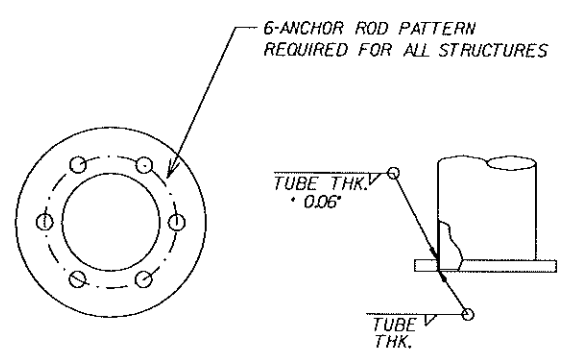
SIGNAL ARM ATTACHMENT



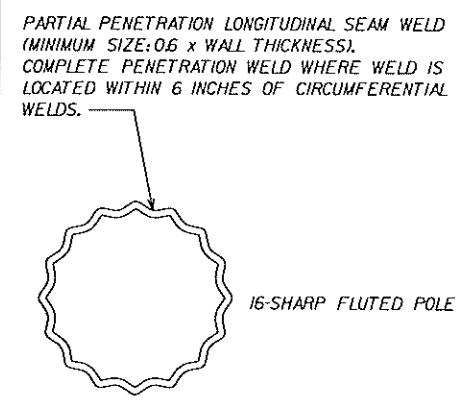
SIGNAL ARM SLIP JOINT



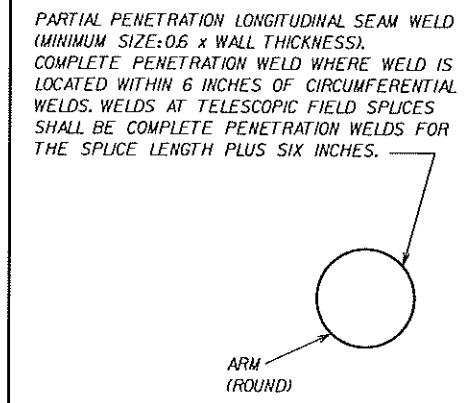
6-BOLT RADIAL INDEX



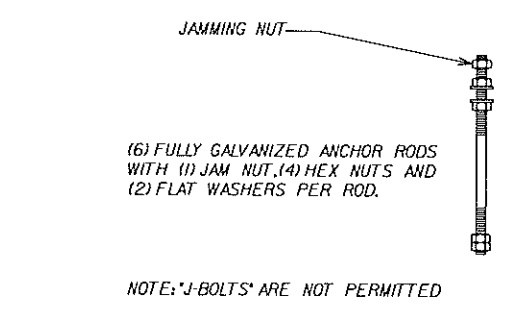
BASE PLATE



SECTION A-A



SECTION B-B



ANCHOR ROD

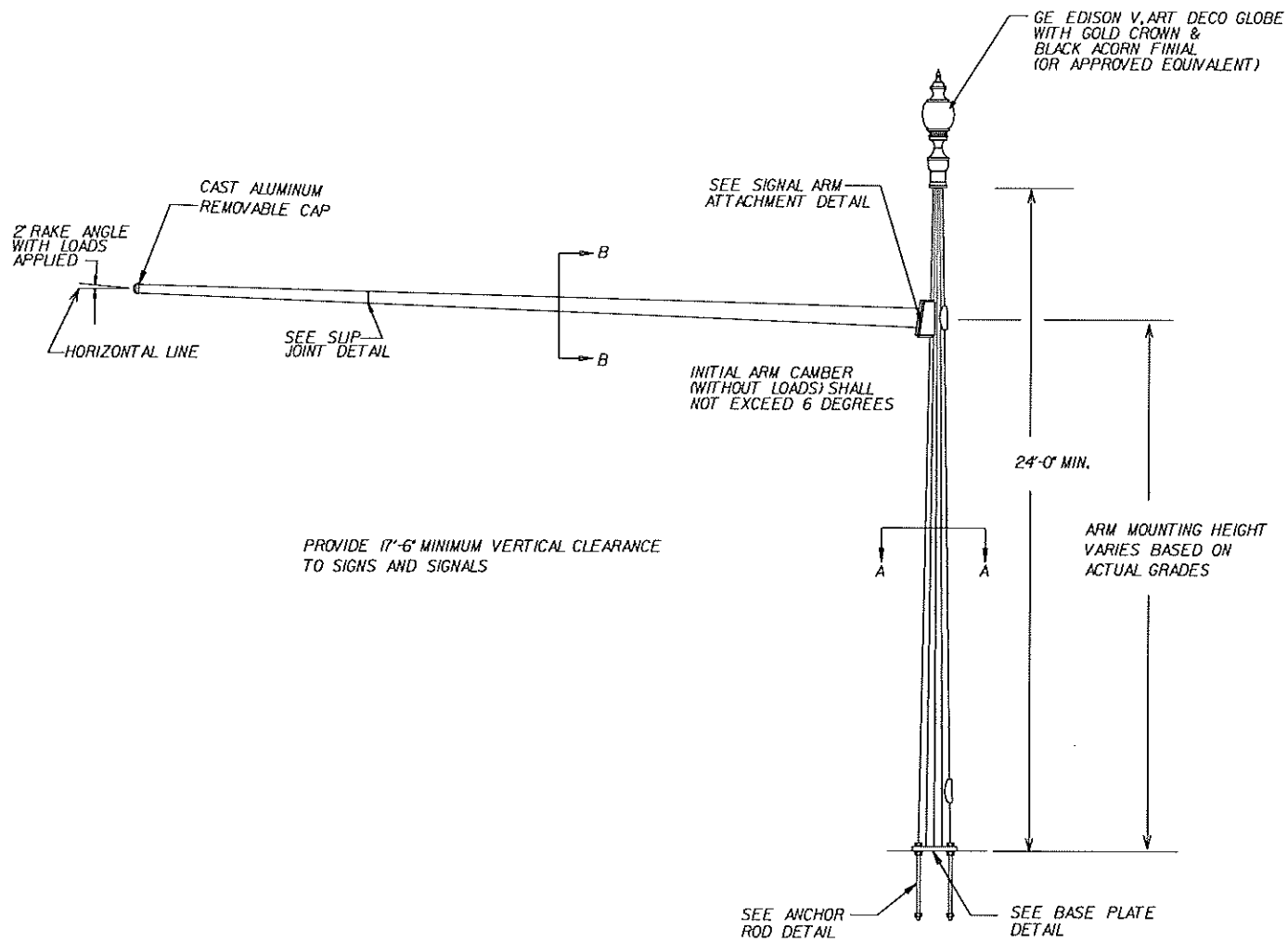
REVISIONS		
DATE	BY	DESCRIPTION

ENGINEER OF RECORD:
M. DAVID FINLEY, P.E.
LICENSE # 40119
M. DAVID FINLEY, P.E., P.A.
2086 SW MAIN BOULEVARD, SUITE 111
LAKE CITY, FLORIDA 32025
CERTIFICATE OF AUTHORIZATION NO. 25972

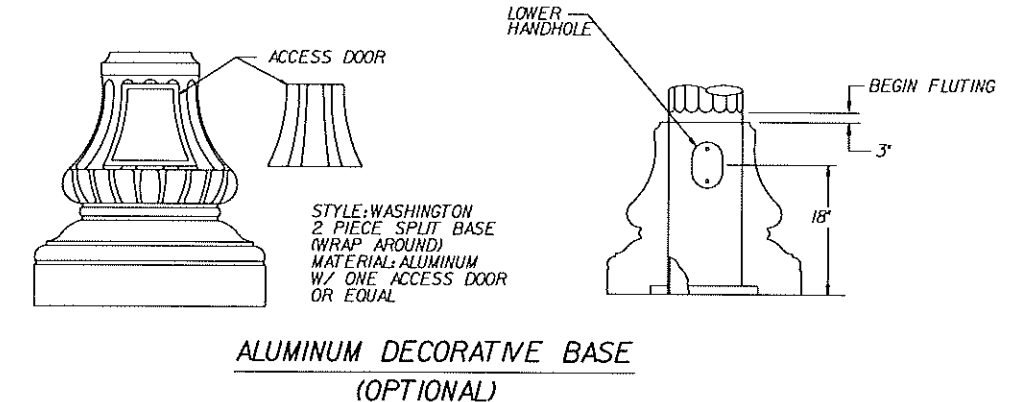


2011 STANDARD MAST ARM DRAWINGS
SEMINOLE COUNTY TRAFFIC ENGINEERING
140 BUSH LOOP SANFORD, FL 32773
PHONE (407) 665-5677

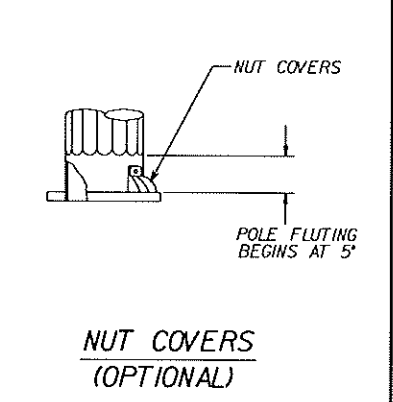
POLE TYPE 5
FLUTED POLE
CURVED ARM



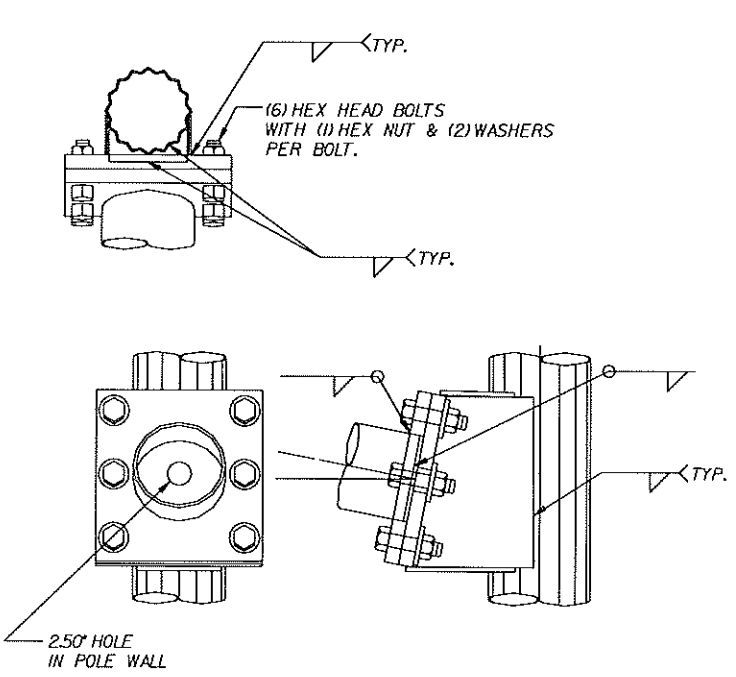
ELEVATION



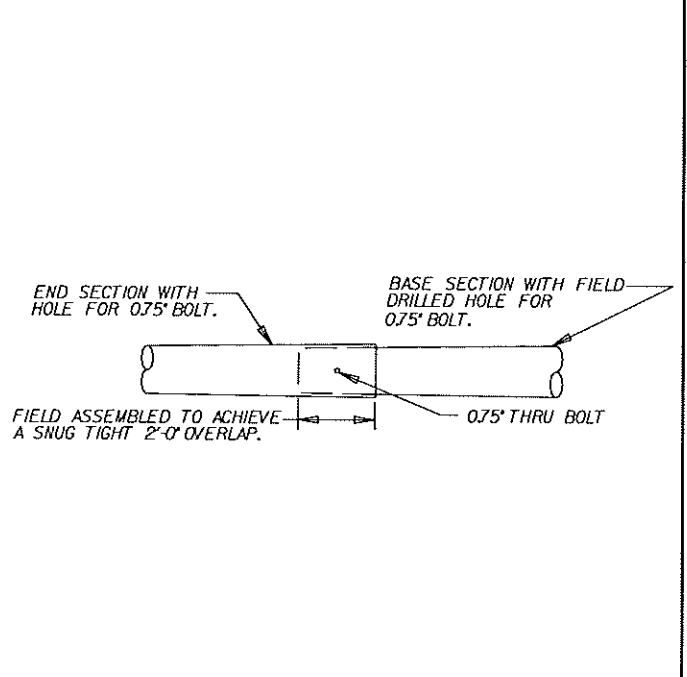
ALUMINUM DECORATIVE BASE (OPTIONAL)



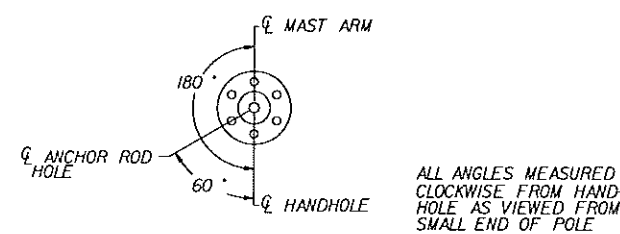
NUT COVERS (OPTIONAL)



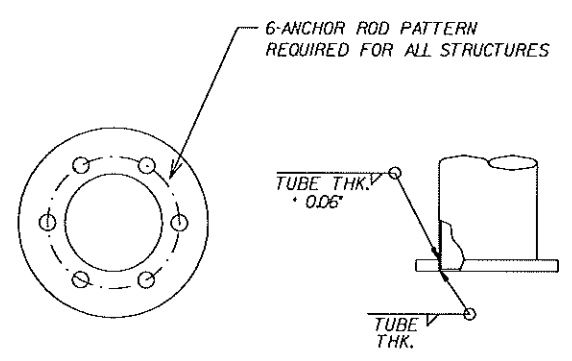
SIGNAL ARM ATTACHMENT



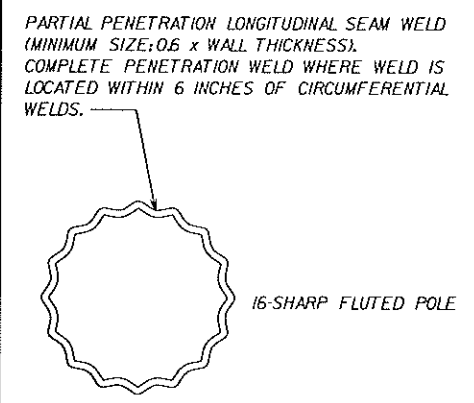
SIGNAL ARM SLIP JOINT



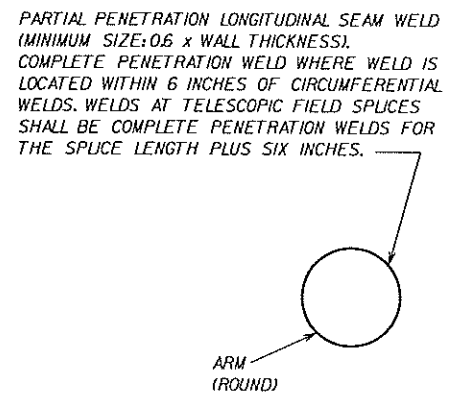
6-BOLT RADIAL INDEX



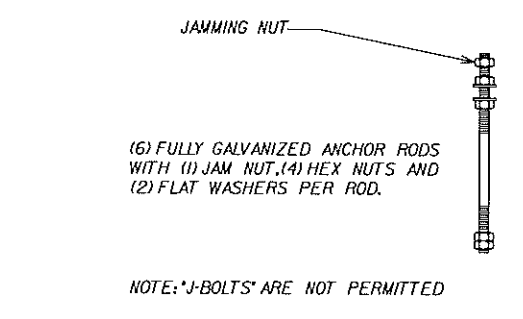
BASE PLATE



SECTION A-A



SECTION B-B



ANCHOR ROD

REVISIONS		
DATE	BY	DESCRIPTION

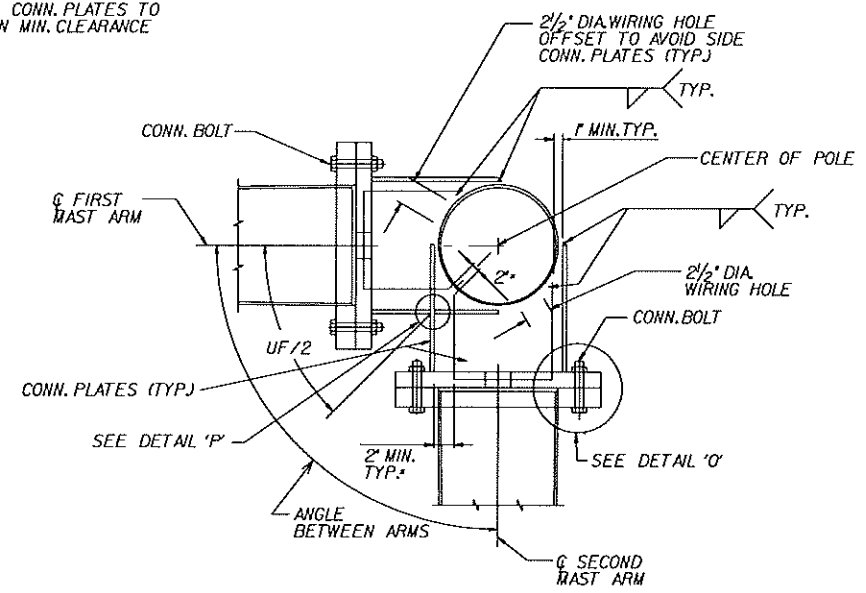
ENGINEER OF RECORD:
 M. DAVID FINLEY, P.E.
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 M. DAVID FINLEY, P.E., P.A.
 2086 SW MAIN BOULEVARD, SUITE 111
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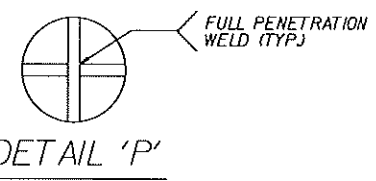
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 140 BUSH LOOP SANFORD, FL 32773
 PHONE (407) 665-5677

POLE TYPE 6
 FLUTED POLE
 STRAIGHT ARM

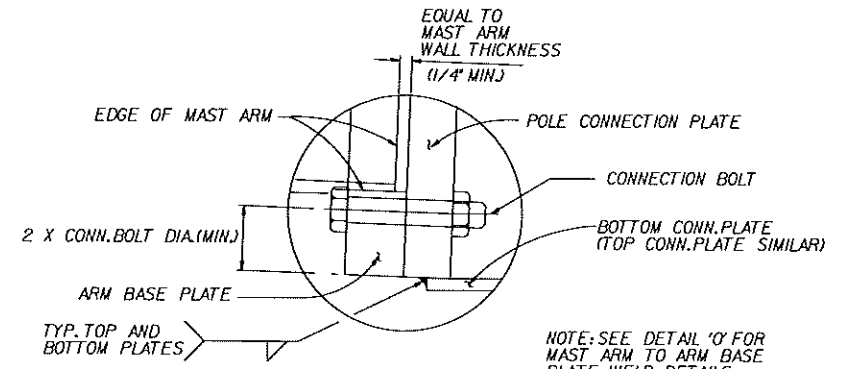
*ADJUST WIDTH OF TOP AND BOTTOM CONN. PLATES TO MAINTAIN MIN. CLEARANCE SHOWN



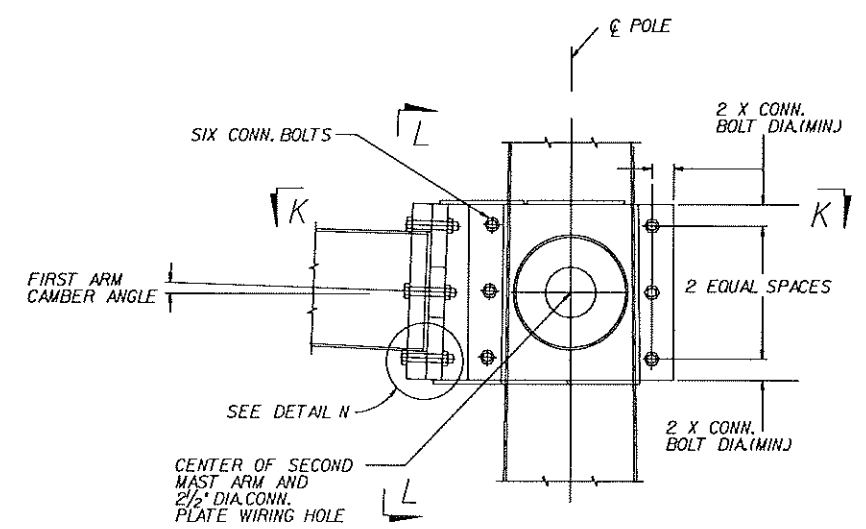
SECTION K-K



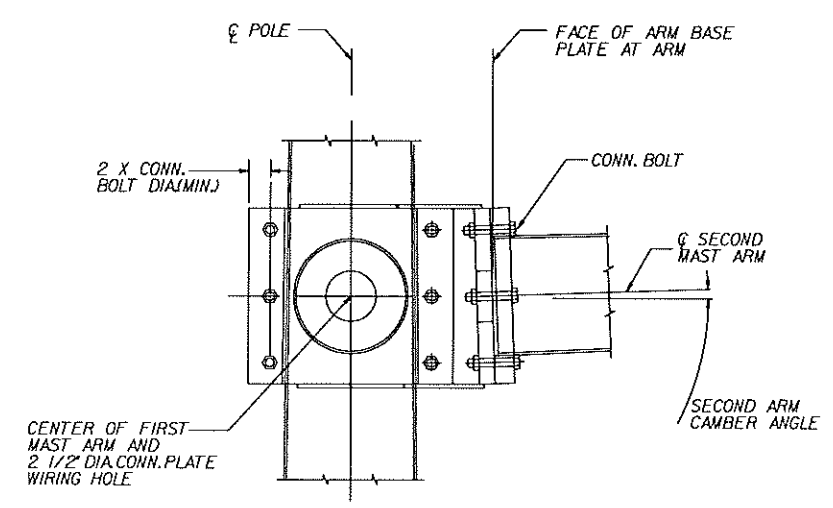
DETAIL 'P'



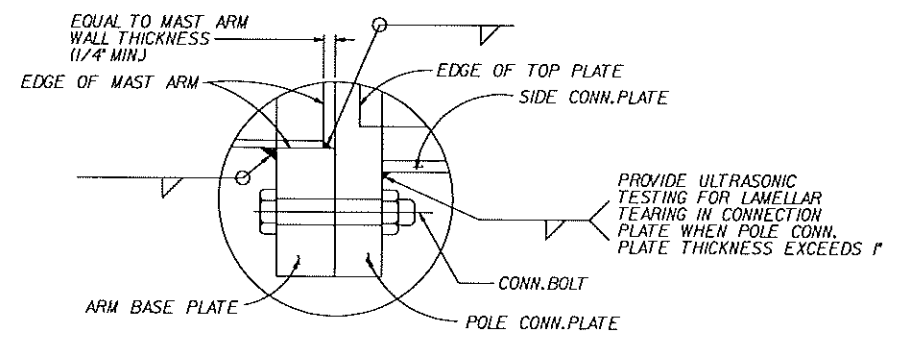
DETAIL 'N'



ELEVATION



SECTION L-L

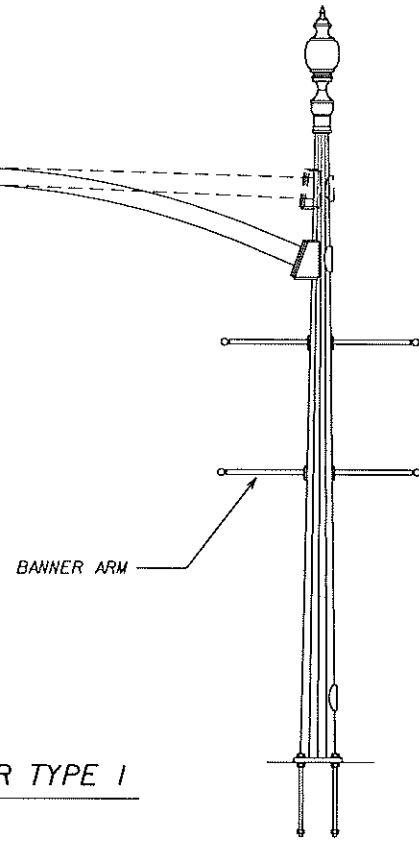


DETAIL 'O'

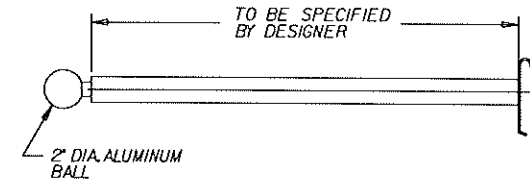
NOTE: DETAILS SHOWN ARE FOR ROUND POLE. DETAILS FOR FLUTTED POLE ARE SIMILAR.

REVISIONS			ENGINEER OF RECORD: M. DAVID FINLEY, P.E. LICENSE # 40119 M. DAVID FINLEY, P.E., P.A. 2086 SW MAIN BOULEVARD, SUITE 111 LAKE CITY, FLORIDA 32025 CERTIFICATE OF AUTHORIZATION NO. 25972			2011 STANDARD MAST ARM DRAWINGS SEMINOLE COUNTY TRAFFIC ENGINEERING 140 BUSH LOOP SANFORD, FL 32773 PHONE (407) 665-5677	DOUBLE ARM CONNECTION DETAILS	10 OF 13
DATE	BY	DESCRIPTION						

NOTE: DESIGNER TO SPECIFY BANNER LOCATION (INSIDE, OUTSIDE, OR BOTH SIDES) AND BANNER MOUNTING HEIGHT.

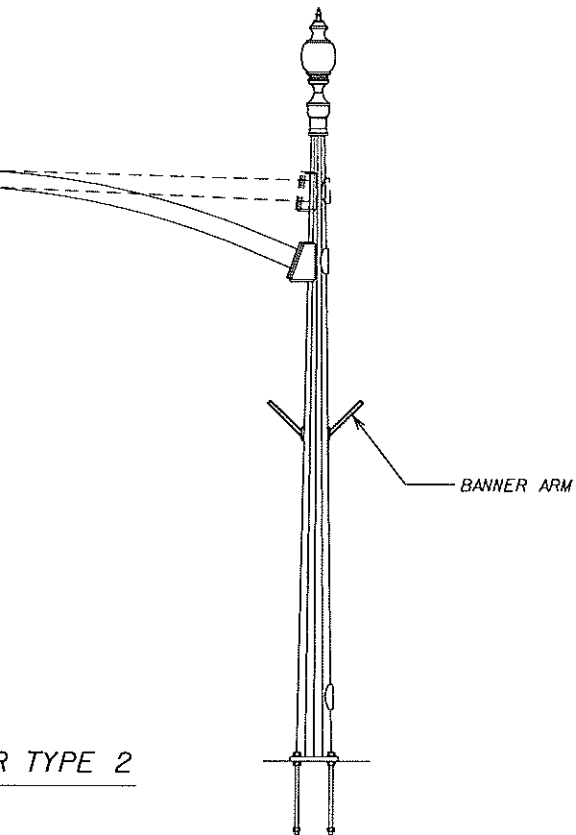


ELEVATION - BANNER TYPE 1

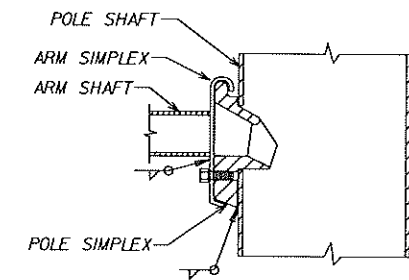
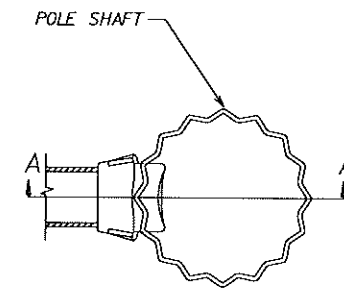


BANNER ARM

NOTE: DESIGNER TO SPECIFY BANNER LOCATION (INSIDE, OUTSIDE, OR BOTH SIDES) AND BANNER MOUNTING HEIGHT.



ELEVATION - BANNER TYPE 2



SECTION A-A

BANNER ARM ATTACHMENT

REVISIONS		
DATE	BY	DESCRIPTION

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LICENSE # 40119
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2086 SW MAIN BOULEVARD, SUITE 111
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SEMINOLE COUNTY TRAFFIC ENGINEERING
140 BUSH LOOP SANFORD, FL 32773
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BANNER DETAILS

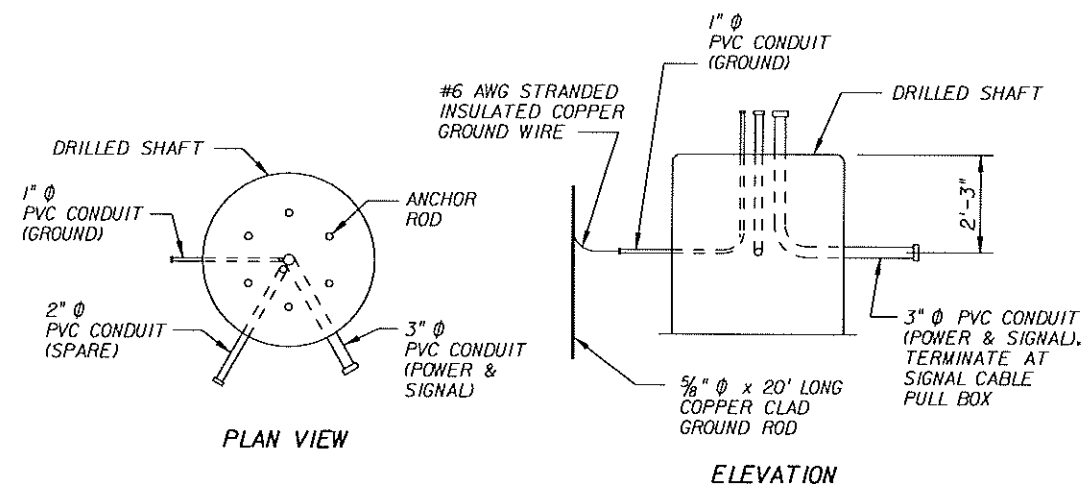
11
OF
13

FOUNDATION CONSTRUCTION NOTES

1. DRILLED SHAFTS 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.
3. CONTRACTOR SHALL BE PREPARED TO USE TEMPORARY CASING OR OTHER METHODS AS NEEDED TO CONTROL ARETESTIAN WATER CONDITIONS.
4. VERIFY CSL ACCESS TUBES WILL NOT INTERFERE WITH ANCHOR ROD INSTALLATION BEFORE EXCAVATING THE SHAFT. WHEN CSL ACCESS TUBE LOCATIONS CONFLICT WITH ANCHOR ROD LOCATIONS, MOVE THE CSL ACCESS TUBE LOCATION 2" 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 ROD LOCATION

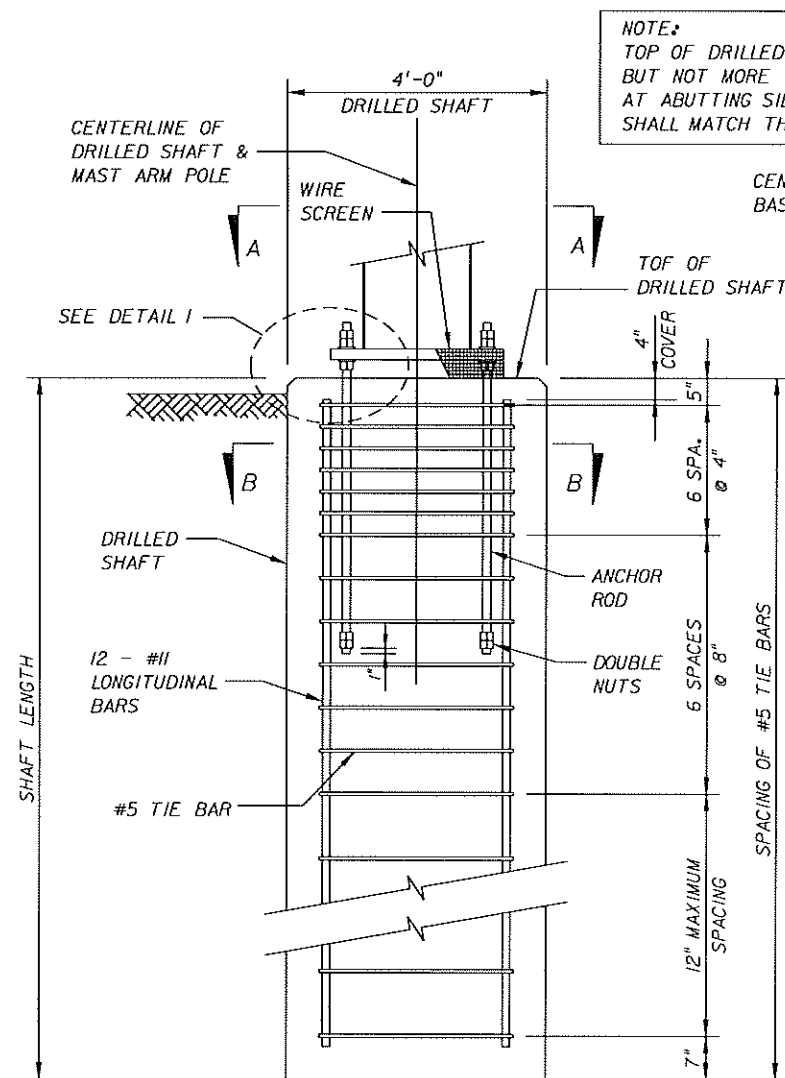
FOUNDATION MATERIALS

1. REINFORCING STEEL SHALL BE ASTM A615, GRADE 60.
2. CONCRETE SHALL BE FDOT CLASS IV (DRILLED SHAFT), MINIMUM 28-DAY COMPRESSIVE STRENGTH = 4,000 PSI.
3. SPECIAL REQUIREMENTS APPLY FOR FDOT DISTRICT 5 SUBMITTALS: CONTACT FDOT DISTRICT 5 GEOTECHNICAL DEPARTMENT FOR ENVIRONMENTAL CLASSIFICATION BASED ON THE FDOT DISTRICT 5 CORROSION MAPS.



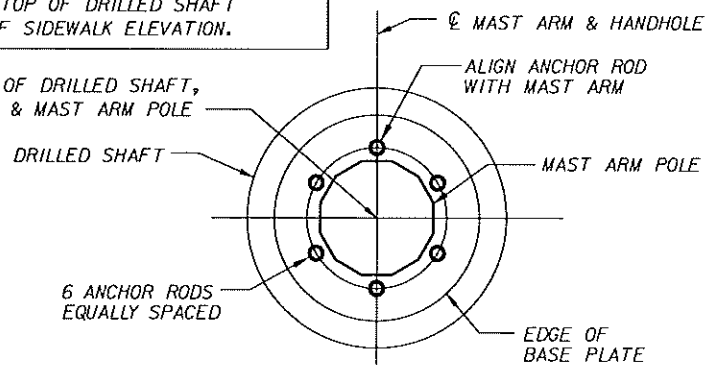
FOUNDATION CONDUIT DETAIL

- CONDUIT NOTES:
1. DETAILS SHOWN ARE SCHEMATIC. ADJUST CONDUIT ORIENTATION TO CLEAR ANCHOR RODS, SHAFT REINFORCING, AND CSL TUBES.
 2. EXTEND CONDUITS TO 1" BELOW BOTTOM OF MAST ARM HANDHOLE.

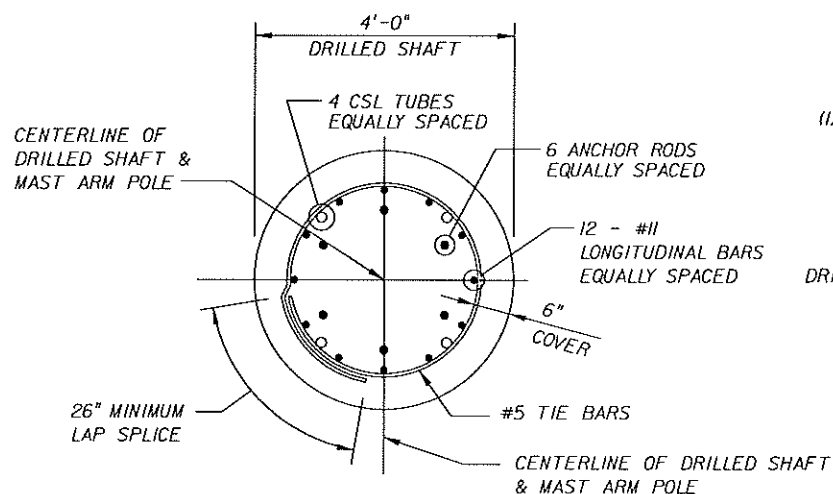


ELEVATION - DRILLED SHAFT & MAST ARM
CSL TUBES & CONDUITS NOT SHOWN

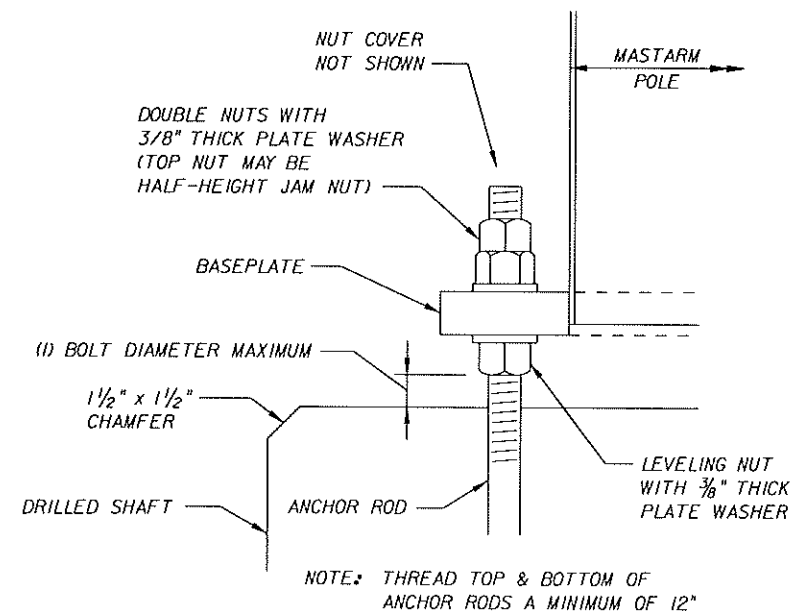
NOTE:
TOP OF DRILLED SHAFT SHALL EXTEND AT LEAST 1" BUT NOT MORE THAN 6" ABOVE ADJACENT FINISH GRADE. AT ABUTTING SIDEWALKS, TOP OF DRILLED SHAFT SHALL MATCH THE TOP OF SIDEWALK ELEVATION.



SECTION A-A
SHAFT REINFORCING, CSL TUBES, & CONDUITS NOT SHOWN



SECTION B-B
CONDUITS NOT SHOWN



DETAIL I
SHAFT REINFORCING, CSL TUBES, CONDUITS, & WIRE SCREEN NOT SHOWN

REVISIONS		
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2011 STANDARD MAST ARM DRAWINGS
SEMINOLE COUNTY TRAFFIC ENGINEERING
140 BUSH LOOP SANFORD, FL 32773
PHONE (407) 665-5677

FOUNDATION DETAILS

GENERAL FOUNDATION NOTES

- 1) The foundation information and details shown are for foundations that were designed using specific soil properties including internal angle of friction, average effective soil unit weight, and the coefficient of friction between soil and foundation.
- 2) 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 of 13 for foundation design and submittal requirements.
- 3) 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 of 13 for foundation design and submittal requirements.
- 4) A Soils Data Letter is required for each Mast Arm. See Sheet 2 of 13 for Soils Data Letter Requirements.
- 5) See Sheet 2 of 13 for additional notes.

CLAY LAYER NOTE

At the discretion of the Geotechnical Engineer, the following procedure may be used for soil profiles meeting the parameters of one of the soil types listed herein except for having a single clay layer less than 3 feet thick:

1. The shaft capacities shall be based upon the soil type and foundation length shown in the Table of Foundation Capacities.
2. 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 permit the use of this procedure in the Soils Data Letter.

TABLE OF FOUNDATION CAPACITIES

SOIL	SHAFT LENGTH (FEET)	TORSION CAPACITY (KIP*FEET)	MOMENT CAPACITY (KIP*FEET)	SOIL	SHAFT LENGTH (FEET)	TORSION CAPACITY (KIP*FEET)	MOMENT CAPACITY (KIP*FEET)	SOIL	SHAFT LENGTH (FEET)	TORSION CAPACITY (KIP*FEET)	MOMENT CAPACITY (KIP*FEET)
SOIL TYPE S-1 φ - 28 DEGREES γ - 60 PCF	12	140	150	SOIL TYPE S-5 φ - 30 DEGREES γ - 60 PCF	12	140	170	SOIL TYPE S-9 φ - 32 DEGREES γ - 60 PCF	12	140	190
	14	200	280		14	200	310		14	200	350
	16	260	460		16	260	510		16	270	560
	18	340	710		18	340	780		18	340	850
	20	420	1000		20	420	1100		20	420	1200
	22	510	1400		22	510	1550		22	510	1700
	24	610	1900		24	610	2000		24	620	2200
	26	720	2400		26	720	2700		26	730	2900
	28	840	3100		28	840	3400		28	840	3700
SOIL TYPE S-2 φ - 28 DEGREES γ - 75 PCF	30	970	3900	SOIL TYPE S-6 φ - 30 DEGREES γ - 75 PCF	30	970	4200	SOIL TYPE S-10 φ - 32 DEGREES γ - 75 PCF	30	970	4600
	12	180	200		12	180	230		12	180	250
	14	250	370		14	250	410		14	250	450
	16	330	610		16	330	660		16	330	730
	18	420	910		18	420	1000		18	420	1100
	20	520	1300		20	530	1400		20	530	1550
	22	640	1800		22	640	1950		22	640	2100
	24	770	2400		24	770	2600		24	770	2800
	26	900	3100		26	900	3400		26	910	3700
SOIL TYPE S-3 φ - 28 DEGREES γ - 90 PCF	28	1050	3900	SOIL TYPE S-7 φ - 30 DEGREES γ - 90 PCF	28	1050	4300	SOIL TYPE S-11 φ - 32 DEGREES γ - 90 PCF	28	1050	4600
	12	220	260		12	220	290		12	220	320
	14	300	460		14	300	510		14	300	560
	16	400	750		16	400	820		16	400	890
	18	510	1100		18	510	1200		18	510	1350
	20	630	1600		20	630	1750		20	630	1900
	22	770	2200		22	770	2400		22	770	2600
	24	920	2900		24	920	3100		24	920	3400
	26	1100	3700		26	1100	4100		26	1100	4400
SOIL TYPE S-4 φ - 28 DEGREES γ - 105 PCF	12	250	320	SOIL TYPE S-8 φ - 30 DEGREES γ - 105 PCF	12	250	350	SOIL TYPE S-12 φ - 32 DEGREES γ - 105 PCF	12	250	380
	14	350	550		14	350	610		14	350	670
	16	460	890		16	460	970		16	460	1050
	18	590	1300		18	590	1450		18	590	1550
	20	740	1850		20	740	2000		20	740	2200
	22	900	2600		22	900	2800		22	900	3000
24	1050	3400	24	1050	3700	24	1100	4000			

LEGEND
 φ - SOIL INTERNAL ANGLE OF FRICTION (PHI)
 γ - SOIL AVERAGE EFFECTIVE UNIT WEIGHT

FOUNDATION DESIGN PARAMETERS
 FOUNDATION DESIGNS ARE BASED UPON:
 FACTOR OF SAFETY AGAINST OVERTURNING: 2.0
 FACTOR OF SAFETY AGAINST TORSION: 1.0
 HORIZONTAL SHEAR (APPLIED AT TOP OF SHAFT): 6.0 KIPS
 COEFFICIENT OF FRICTION BETWEEN SHAFT & CONCRETE: 85% x tan(φ)
 LOAD TRANSFER RATIO: 1.5

<p>REVISIONS</p> <table border="1"> <thead> <tr> <th>DATE</th> <th>BY</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>			DATE	BY	DESCRIPTION				<p>ENGINEER OF RECORD: M. DAVID FINLEY, P.E. LICENSE # 40119 M. DAVID FINLEY, P.E., P.A. 2086 SW MAIN BOULEVARD, SUITE 111 LAKE CITY, FLORIDA 32025 CERTIFICATE OF AUTHORIZATION NO. 25972</p>			<p>2011 STANDARD MAST ARM DRAWINGS SEMINOLE COUNTY TRAFFIC ENGINEERING 140 BUSH LOOP SANFORD, FL 32773 PHONE (407) 665-5677</p>	<p>TABLE OF FOUNDATION CAPACITIES</p>	<p>13 OF 13</p>
DATE	BY	DESCRIPTION												