GENERAL NOTES

1. These Standards are 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 Drilled Shaft Foundation. Users of these Standards remain responsible for verifying that the complete Mast Arm assembly (structure, foundation, signal heads, sign panels, and luminaries) meets all of the criteria and requirements of the appropriate governing agencies, including, but not limited to, providing adequate vertical and horizontal clearance, adequate sight distance, appropriate signalization, appropriate signal placement, and adequate sign panel size positioning.

3. Utilities: Adequate provision shall 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.

GEOTECHNICAL REQUIREMENTS & SOILS DATA LETTER

1. Site-specific Geotechnical Data is required for all Mast Arms.

2. A Soils Data Letter shall be prepared by a Geotechnical Engineer and shall be submitted with the Mast Arm Structure Design Calculations and Shop Drawings. The Soils Data Letter shall be based upon a Soil Boring Log not less than 20 feet in depth. Use of methods other than SPT is not permitted.

3. The Soils Data Letter shall clearly state the following:

   - Applicable Standard Soil Type(s)
   - 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 (Uncorrected)
   - Minimum Tip Elevation (if applicable)
   - Shaft Length Extension due to Clay Layer (if applicable)

4. The Geotechnical Engineer is advised that the Foundation Capacities have been determined assuming a single soil layer for the entire embedded length of the Drilled Shaft Foundation. The Geotechnical Engineer shall exercise appropriate engineering judgment when using weighted-average and/or other measures that will accurately model the actual existing multi-layer soil conditions.

5. Standard Soil Type may be applicable for a Drilled Shaft Foundation longer than 16'-0". In all cases, the provided Standard Soil Type(s) shall be applicable for the entire length of the Drilled Shaft Foundation. I.e., do not provide a Standard Soil Type for the upper soil layers and a different soil type for the lower soil layers.

6. Drilled Shaft Foundations shall not terminate in a soil layer with an uncorrected SPT Blow Count of 4 or less. The Soils Data Letter shall specifically note all such layers and shall provide a Minimum Tip Elevation. Where the Ground Elevation is not known, the Minimum Tip Elevation shall be expressed as a Minimum Tip Depth Below Grade.

7. The following criteria must be met in order to qualify as a Standard Soil Type:

   A. The average soils parameters must meet all of the minimum values of the Standard Soil Type.
   B. Within the limits of the Drilled Shaft Foundation, there can be no more than 3'-0" of soils with an uncorrected SPT Blow Count (N) of 4 or less. The Drilled Shaft Foundation shall contain a clay layer not exceeding 3'-0" thick (see Note #6).

ATTACHMENT OF TRAFFIC SIGNAL HEADS & ILLUMINATED SIGNS

1. Mast arm shop drawings shall include the attachment details.

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

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

4. Field drill entry holes for signal cables and power cables.

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

SUBMITTAL REQUIREMENTS

The following information shall be provided for every Mast Arm structure:

1. Mast Arm Design Calculations
2. Mast Arm Shop Drawings
3. Soils Data Letter (with Soil Boring Log)
4. Special Foundation Design (required only for non-standard soils)

SPECIAL CONSTRUCTION REQUIREMENTS

1. All Construction shall comply with the Florida Department of Transportation and Standard Specifications for Road and Bridge Construction except for methods of payment.

2. Mast Arm Shop Drawings are required and fabrication shall not begin until the Shop Drawings are approved. Mast Arm Shop Drawings shall include the anchor rod orientation with respect to the arm(s) and the direction of traffic.

3. Foundation Materials:
   - A. Concrete: FDOT Class IV (Drilled Shafts)
   - B. Reinforcing Steel: ASTM A615, Grade 60

4. Drilled Shaft Foundations shall not terminate in a soil layer with an uncorrected SPT Blow Count (N) of 4 or less. The Soils Data Letter shall specifically note all such layers and shall provide a Minimum Tip Elevation. Where the Ground Elevation is not known, the Minimum Tip Elevation shall be expressed as a Minimum Tip Depth Below Grade.

5. The top of the Drilled Shaft Foundation shall extend a minimum of one inch (1") but not more than six inches (6") above the adjacent finish ground line. The top of Drilled Shaft Foundations located within or abutting a sidewalk shall match the top of sidewalk elevation unless otherwise noted in the Mast Arm Designer's plans.

6. Natural Scurrly shall not be relied upon to prevent caving of the soils and/or to maintain an open hole. Adequate measures shall be taken to control high Water Conditions where encountered. Temporary Casing or other measures may be used. Permanent Casing is prohibited.

7. The Pole shall not be erected until the foundation concrete has achieved the specified 28-day compressive strength.

8. If the traffic signals or sign panels are not in place within two working days after the arm is erected, a 30 foot by 2.0 foot blank 1/4" 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.

CONTACT INFORMATION:

SEMINOLE COUNTY TRAFFIC ENGINEERING
140 BUSH LOOP  -  SANFORD, FL  32773
407-648-8677

12/6/2017
2:17:00 PM
1. Mast Arm Structure Design shall comply with:
   B. Florida Department of Transportation Structures Manual (January 2017 Edition)
   C. Fatigue shall be considered in accordance with the requirements of the Florida Department of Transportation Structures Manual (January 2017 Edition)

2. Basic Wind Speed: 150 mph

3. The Mast Arm Design Calculations shall clearly state the Foundation Reactions.

4. To ensure constructability of the drilled shaft foundations, the Mast Arm Anchor Rod Bolt Circle shall not exceed 24" without prior approval of Seminole County Traffic Engineering. An Anchor Rod Bolt Circle larger than 24" will require more stringent construction tolerances for the Drilled Shaft Construction than those in the FDOT Specifications, including more precise fabrication/placement of the reinforcing bar cage and more precise placement of the anchor rods.

5. A grout pad is required.

6. The mast arm structure details shown herein are not complete details. The details only indicate the appearance of the mast arm structure and the 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.

1. Materials:
   A. Poles, Mast Arms & Backing Rings:
      1) Less than 3/8":
      2) Greater than or equal to 3/8":
      3) All thicknesses:
   B. Steel Plates:
   C. Weld Metal:
   D. Bolts, Nuts, and Washers:
      1) High Strength Bolts:
      2) Nuts:
      3) Washers:
   E. Anchor Rods, Nuts, & Washers:
      1) Anchor Rods:
      2) Nuts for Anchor Rods:
      3) Plate Washers:
   F. Threaded Bars/Studs:
   G. Handhole Frame:
   H. Handhole Cover:
   I. Aluminum Pole Caps and Nut Covers:
   J. Stainless Steel Straps:

2. Fabrication:
   A. Pole and Mast Arm Taper: Change diameter at a uniform rate of 0.14 inches per foot
   B. Upright (Pole) Splices: are not allowed. Transverse welds in pole are only permitted at the base.
   C. Arm Camber: shall comply with requirements shown on these Standards.
   D. Provide bolt hole diameters as follows:
      3. Washers:
   E. Unless specifically shown otherwise in the Signalization Plans, face the handhole:
      1) Single Arm Structures:
      2) Double Arm Structures: Perpendicular to first arm
      3) Perpendicular to arm
   F. Seam weld on bottom side of arm. Seam weld under Arm 1 side of pole.
   G. Provide "F" or "C" hook at the top of the pole for signal wiring support.
   H. Perform all welding in accordance with Specification Article 460-6.4.
   I. Hot Dip Galvanize and Paint after fabrication.

3. Coatings:
   A. All Nuts, Bolts, Washers, and Threaded Bars/Studs: ASTM F3329
   B. All other steel items: ASTM A123
   C. Paint the entire structure after fabrication in accordance with Specification Article 649-4. Surfaces that will not be exposed after erection need not be painted.

4. Construction:
   B. Install Pole vertically:
   C. Place structural grout pad with drain between the top of the foundation and the bottom of the baseplate in accordance with Specification Article 649-7.
   D. Attach Sign Panels and Signals centered on the elevation of the Mast Arm.
   E. Wire Access holes shall be 1/2" or less in diameter.
**SPECIFICATION OF MAST ARMS**

The information shown in this table shall be specified for Mast Arm Structures constructed using these standards. Provide additional information and requirements, as required and appropriate.

<table>
<thead>
<tr>
<th>POLE I.D.</th>
<th>POLE TYPE</th>
<th>POLE STYLE</th>
<th>ARM STYLE</th>
<th>COLOR</th>
<th>LUMINAIRE</th>
<th>BASE</th>
<th>BANNER</th>
<th>FIRST ARM LENGTH</th>
<th>SECOND ARM LENGTH</th>
<th>ANGLE BETWEEN ARMS</th>
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**AVAILABLE OPTIONS**

- **POLE SCHEDULE**
  - **SEMINOLE COUNTY TRAFFIC ENGINEERING**
  - **140 BUSH LOOP - SANFORD, FL 32773**
  - **407-665-5677**

**NOTE:** MAST ARM STYLE SHALL BE CONSISTENT WITHIN EACH INTERSECTION.

FOR EACH INTERSECTION,
USE EITHER ALL ROUND POLES OR ALL FLUTED POLES,
USE EITHER ALL STRAIGHT ARMS OR ALL CURVED ARMS.

A MIXTURE OF POLES WITH LUMINAIRES AND WITHOUT LUMINAIRES IS PERMITTED.
**TYPICAL SECTION THROUGH ARM**

- **Arm Radius**: 60' Minimum, 70' Maximum
- **Connection Angle**: 16° Min., 20° Max.
- **Slip Joint**: Handhole
- **Connection Angle**: 0° (Level) Minimum to 2° Maximum Upward Slope at Arm Tip under Load
- **Cast Aluminum Cap**: (Removeable)

**TYPICAL SECTION THROUGH POLE**

- **0.6 x Wall Thickness**: Round Tapered Arm
- **Seam Weld**: Round Tapered Pole

**ELEVATION - POLE TYPE 3**

- **60'-0" Maximum Arm Length**
- **Shoe Box Luminaire**: (Arm 1 for Double Arm Poles)
- **Detail shown without Decorative Base or Nut Covers**
- **NOTE**: Provide 17'-6" minimum, 19'-0" maximum vertical clearance to all signals and signs

**NOTE:**
Designer shall detail orientation of luminaire with respect to Signal Arm (Arm 1 for Double Arm Poles)

**SEMINOLE COUNTY TRAFFIC ENGINEERING**
140 BUSH LOOP  -  SANFORD, FL  32773
407-665-5677

**DATE**
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N:\Projects\SMC-17038 2017-2018 Seminole County Standard Mast Arm Drawings\MAST ARM STANDARDS 12-1-2017\SCSMA 2017-2018 05-10 Pole Types.dgn
A Mounting Height
(Varies according to actual grades)

Pole Height

TYPICAL SECTION THROUGH ARM

0.6 x Wall Thickness
Round Tapered Arm

TYPICAL SECTION THROUGH POLE

0.6 x Wall Thickness
Round Tapered Arm

NOTE:
Designer shall detail orientation of
luminaire with respect to Signal Arm
(Arm 1 for Double Arm Poles)

78'-0" Maximum Arm Length

Initial Arm Camber (No Load)
Shall not exceed 6 degrees

Tapered Pole
Round

NOTE:
Provide 17'-6" minimum, 19'-0" maximum
vertical clearance to all signals and signs

Detail shown without
Decorative Base or Nut Covers

2° Maximum Upward Slope
at Arm Tip under Load

Round Tapered Arm

Cast Aluminum Cap
(Removable)

Cast Aluminum Cap
(Removable)

Slip Joint
(2-Piece Arms Only)

Round Tapered Arm

NOTE:
Shall not exceed 6 degrees

SEMINOLE COUNTY TRAFFIC ENGINEERING
1300 S. State Road 434 - Sanford, FL 32773
407-665-5677

SHEET 12/4/2017 11:35:39 AM

STANDARD MAST ARM DRAWINGS
2017-18 SEMINOLE COUNTY TRAFFIC ENGINEERING
1300 S. State Road 434 - Sanford, FL 32773
407-665-5677

POLE TYPE 4
ROUND POLE WITH LUMINAIRE
STRAIGHT ARM

ELEVATION - POLE TYPE 4

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**TYPICAL SECTION THROUGH ARM**

- 0.6 x Wall Thickness
- Round Tapered Arm

**TYPICAL SECTION THROUGH POLE**

- 0.6 x Wall Thickness
- Fluted Tapered Pole (16 Sharp)

**ELEVATION - POLE TYPE 5**

- 6" Arm Mounting Height (Varies according to actual grades)
- 22'-0" Minimum Pole Height
- 60'-0" Maximum Arm Length
- GE Edison V Art Deco Globe with Gold Crown & Black Acorn Finial (or approved equivalent)

**NOTE:**

- Provide 17'-6" minimum, 19'-0" maximum vertical clearance to all signals and signs

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**SEMINOLE COUNTY TRAFFIC ENGINEERING**

140 Bush Loop - Sanford, FL 32773

407-665-5677

**DATE**

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**STANDARD MAST ARM DRAWINGS**

2017-18

**POLE TYPE 5**

FLUTED POLE CURVED ARM

**SHEET**

9 of 17
Designer shall specify Banner Arm Length

Banner Arm Simplex

2" Diameter Aluminum Ball at End of Arm

BANNER ARM

Pole Shaft

Banner Arm Simplex

Mast Arm Upright

BANNER ARM ATTACHMENT DETAILS

NOTE:
Designer must specify complete Banner Arm Details including:
- Banner Arm Type (Type 1, Type 2, or None)
- Banner Arm Location (inside, outside, or both sides)
- Banner Arm Mounting Height & Banner Arm Spacing
- Banner Arm Length,
- Banner Arm Angle (Type 2 Banners only),
and all special requirements
Designer shall include appropriate notes & details as required

PLAN SECTION THROUGH CONNECTION

SECTION A-A

ELEVATION - BANNER TYPE 1

ELEVATION - BANNER TYPE 2

NOTE:
Designer shall include appropriate notes & details as required.
2017-18
STANDARD MAST ARM DRAWINGS
SEMINOLE COUNTY TRAFFIC ENGINEERING
140 BUSH LOOP  -  SANFORD, FL  32773
407-665-5677

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SECTION D-D

SECTION E-E

* Adjust width of top & bottom Connection Plates to maintain clearance shown

NOTE:
Details drawn for round pole.
Details for fluted pole similar.
**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.

---

**BASE PLATE & ANCHORAGE ELEVATION**

*The Structural Grout Pad diameter may be reduced where the footprint of the Grout Pad does not provide adequate clearance for the sidewalk and/or accessibility considerations.*

*Note: See MAST ARM STRUCTURAL DESIGN CRITERIA, Note #4 on Sheet #3 for restriction on diameter of Anchor Rod Bolt Circle.*

---

**SECTION G-G**

(CSL Tubes & Conduits Not Shown)

**SECTION F-F**

(Cables Not Shown)

---

**DETAIL '6'**

PARTIAL SECTION THROUGH BASE PLATE AT CENTER OF BASE PLATE

(Shaft Reinforcing, CSL Tubes, & Conduits Not Shown)
4. The base Moment or Base Torsion exceed the values shown in the Table of Foundation Capacities, then a special foundation must be designed. 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.

2. Design Parameters:
   - Resistance Factor – Overturning: 0.60
   - Resistance Factor – Torsion: 0.90
   - Horizontal Shear (Applied at Top of Drilled Shaft): 100 Kips

3. Foundation capacity assumes that:
   a. The top of the foundation extends 6” above grade
   b. The top 2’-0” of the shaft length is considered to provide no contribution to the overturning or torsion resistance and therefore the soil within that limit is totally neglected.
   c. Torsion resistance is computed solely for skin friction.

4. Torsion resistance is computed solely for skin friction. No contribution from bottom friction is considered.

### Table of Foundation Capacities

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Length (Feet)</th>
<th>Moment (Kip*ft)</th>
<th>Torsion (Kip*feet)</th>
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<tr>
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<tr>
<td>28-50-15</td>
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</tbody>
</table>

### Table Legend

- φ: Soil Internal Angle of Friction (PhI Angle)
- γ: Soil Effective Unit Weight
- N: SPT Blow Count (Blows per Foot) (Uncorrected)
- R = # N ≥ 6

### Table Notes
1. The Moment and Torsion Capacities are LRFD Capacities.
2. The values in the Table of Foundation Capacities are limited to:
   - Overturning Moment: 300 kip*ft
   - Torsion: 375 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 Count (Blows per Foot) (Uncorrected)

These parameters are assumed to exist for the entire embedded depth of the drilled shaft.

4. The top of the foundation extends 6” above grade

5. See Sheet 2 for additional notes.

### Foundation Capacity Criteria

1. The Drilled Shaft Moment and Torsion Capacities are determined in accordance with the FDOT Structures Manual (January 2017 Edition) with parameters and modifications as listed herein.

2. Design Parameters:
   - Resistance Factor – Overturning: 0.60
   - Resistance Factor – Torsion: 0.90
   - Horizontal Shear (Applied at Top of Drilled Shaft): 100 Kips

3. The foundation capacity assumes that:
   a. The top of the foundation extends 6” above grade
   b. The top 2’-0” of the shaft length is considered to provide no contribution to the overturning or torsion resistance and therefore the soil within that limit is totally neglected.
   c. Torsion resistance is computed solely for skin friction.

No contribution from bottom friction is considered.

### Foundation Capacities

- Standard Mast Arm Drawings
- Seminole County Traffic Engineering
- The Mendel Building
- 1550 South Lake Mary Blvd
- Lake Mary, FL 32746
- 407-939-8877

2017-18

16 of 17
## Table of Foundation Capacities

### Soil Type: 30-40-06
- **φ**: 30 Degrees
- **γ**: 40 kcf
- **N**: N > N ≥ 6

<table>
<thead>
<tr>
<th>Length (Feet)</th>
<th>Moment (Kip*Feet)</th>
<th>Torsion (Kip*Feet)</th>
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</tbody>
</table>

### Soil Type: 30-40-09
- **φ**: 30 Degrees
- **γ**: 40 kcf
- **N**: N > N ≥ 9

<table>
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<tr>
<th>Length (Feet)</th>
<th>Moment (Kip*Feet)</th>
<th>Torsion (Kip*Feet)</th>
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### Soil Type: 30-40-12
- **φ**: 30 Degrees
- **γ**: 40 kcf
- **N**: N > N ≥ 12

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<th>Length (Feet)</th>
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<th>Torsion (Kip*Feet)</th>
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### Soil Type: 30-40-15
- **φ**: 30 Degrees
- **γ**: 40 kcf
- **N**: N > N ≥ 15

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<th>Torsion (Kip*Feet)</th>
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### Soil Type: 30-40-06
- **φ**: 30 Degrees
- **γ**: 50 kcf
- **N**: N > N ≥ 6

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<th>Length (Feet)</th>
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### Soil Type: 30-40-09
- **φ**: 30 Degrees
- **γ**: 50 kcf
- **N**: N > N ≥ 9

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<th>Length (Feet)</th>
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### Soil Type: 30-40-12
- **φ**: 30 Degrees
- **γ**: 50 kcf
- **N**: N > N ≥ 12

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<th>Length (Feet)</th>
<th>Moment (Kip*Feet)</th>
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### Soil Type: 30-50-06
- **φ**: 30 Degrees
- **γ**: 40 kcf
- **N**: N > N ≥ 6

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### Soil Type: 30-50-09
- **φ**: 30 Degrees
- **γ**: 40 kcf
- **N**: N > N ≥ 9

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### Soil Type: 30-50-12
- **φ**: 30 Degrees
- **γ**: 40 kcf
- **N**: N > N ≥ 12

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### Soil Type: 30-50-15
- **φ**: 30 Degrees
- **γ**: 40 kcf
- **N**: N > N ≥ 15

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### Soil Type: 30-50-06
- **φ**: 30 Degrees
- **γ**: 50 kcf
- **N**: N > N ≥ 6

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### Soil Type: 30-50-09
- **φ**: 30 Degrees
- **γ**: 50 kcf
- **N**: N > N ≥ 9

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**Table Legend**
- φ: Soil Internal Angle of Friction (°)
- γ: Soil Effective Unit Weight
- N: SPT Blow Count (Blows per Foot) (Uncorrected)

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**Notes:** See Sheet 16 for Table Notes & Criteria used for Foundation Capacities.