

FLORIDA DEPARTMENT OF TRANSPORTATION



**FDOT MODIFICATIONS TO STANDARD
SPECIFICATIONS FOR STRUCTURAL SUPPORTS
FOR HIGHWAY SIGNS, LUMINAIRES
AND TRAFFIC SIGNALS (LTS-5)**

**FDOT STRUCTURES MANUAL
VOLUME 9
JANUARY 2011**



Table of Contents

Table of Contents. **i**

1 Introduction **1**

 1.1 Scope (Rev. 01/11) 1

2 General Features of Design **1**

 2.1 Scope (Rev. 01/11) 1

 2.4 Functional Requirements 1

 2.4.2 Structural Supports for Signs and Traffic Signals (Rev. 01/11) 1

 2.4.2.2 Size, Height and Location of Signs (Rev. 01/11) 1

 Figure 1 Example: actual signs 2

 Figure 2 Example: signs used in design 2

 2.4.2.4 Variable Message Signs (Rev. 01/11) 3

 2.4.2.5 Horizontal Span and Cantilever Limits (Rev. 01/11) 3

3 Loads **3**

 3.8 Wind Load 3

 3.8.2 Basic Wind Speed (Rev. 01/11) 3

 3.8.3 Wind Importance Factor I_r (Rev. 01/11) 4

 FDOT Table 3-3 Minimum Design Life 4

 3.8.6 Drag Coefficients C_d 4

 3.8.7 Lift Coefficient for Traffic Signals C_l 5

 3.9 Design Wind Loads On Structures 5

 3.9.1 Load Application (Rev. 01/11) 5

 3.9.3 Design Loads for Vertical Supports (Rev. 01/11) 5

 3.10 References 6

5 Steel Design **6**

 5.4 Material - Structural Steel (Rev. 01/11) 6

 5.13 Cables And Connections (Rev. 01/11) 6

 5.15 Welded Connections 6

 5.15.1 Circumferential Welded Splices (Rev. 01/11) 6

 5.16 Bolted Connections (Rev. 01/11) 7

 5.17 Anchor Bolt Connections (Rev. 01/11) 7

 5.17.1 Anchor Bolt Types (Rev. 01/11) 7

 5.17.2 Anchor Bolt Materials (Rev. 01/11) 7

 5.17.3 Design Basis (Rev. 01/11) 8

 5.17.3.3 Use of Grout 8

 5.17.4 Anchor Bolt Design (Rev. 01/11) 8

 5.17.4.3 Bending Stress in Anchor Bolts (Rev. 01/11) 8

6 Aluminum Design **8**

 6.1 Scope (Rev. 01/11) 8

7 Prestressed Concrete Design. **9**

 7.5 Design 9

 7.5.1 Method of Design (Rev. 01/11) 9

 7.5.2 Concrete Strength (Rev. 01/11) 9

 7.10 Durability 9

 7.10.2 Concrete Cover (Rev. 01/11) 9

| | |
|---|-------------|
| 10 Serviceability Requirements | 10 |
| 10.5 Camber (Rev. 01/11) | 10 |
| 11 Fatigue Design (Rev. 01/11) | 10 |
| 11.6 Fatigue Importance Factors (Rev. 01/11)..... | 10 |
| 11.7 Fatigue Design Loads | 11 |
| 11.7.1 Galloping (Rev. 01/11) | 11 |
| 11.8 Deflection (Rev. 01/11)..... | 11 |
| 13 Foundation Design | 11 |
| 13.6 Drilled Shafts (Rev. 01/11) | 11 |
| 13.6.1 Geotechnical Design | 12 |
| 13.6.1.1 Embedment (Rev. 01/11)..... | 12 |
| 13.6.2 Structural Design (Rev. 01/11)..... | 13 |
| 13.6.2.1 Details (Rev. 01/11) | 13 |
| 13.10 Embedment of Lightly Loaded Small Poles and Posts | 13 |
| 13.11 References (Rev. 01/11)..... | 13 |
| Appendix C | 14 |
| 1 Alternate Method (Rev. 01/11)..... | 14 |
| 2 Wind Load (Rev. 01/11)..... | 14 |
| FDOT Table C.2-1 Wind Speed by County | 15 |
| Volume 9 - Revision History | R9-1 |

1 INTRODUCTION

1.1 Scope (Rev. 01/11)

Add the following:

Conform to the date specific AASHTO Publications listed in [Structures Manual Introduction](#) I.6 References.

C 1.1

Add the following:

Structures Manual Introduction I.6 is updated annually to reflect the specific specifications editions and interims adopted by the FDOT.

2 GENERAL FEATURES OF DESIGN

2.1 Scope (Rev. 01/11)

Add the following:

See Chapter 7 and 29 of the FDOT **Plans Preparation Manual** regarding the use of FDOT Design Standards and other plans preparation requirements.

C 2.1

Add the following:

The FDOT **Plans Preparation Manual** contains additional FDOT requirements.

2.4 Functional Requirements

2.4.2 Structural Supports for Signs and Traffic Signals (Rev. 01/11)

2.4.2.2 Size, Height and Location of Signs (Rev. 01/11)

Add the following:

Span type overhead sign structures in urban locations shall be designed either for the actual signs shown on the signing plans or for a minimum sign area of 120 sq. ft. (12 ft. W x 10 ft. H) per lane, whichever is the greater. If the signing plans require signs for only one traffic direction, the minimum sign area per lane requirement applies to the traffic lanes in this direction only.

Cantilever type overhead sign structures in urban locations shall be designed either for the actual signs shown on the signing plans or for a minimum sign area of 80 sq. ft. (8 ft. W x 10 ft. H) located at the end of the cantilever, whichever provides the more stringent load or stress at the location under consideration.

C 2.4.2.2

Add the following:

Minimum sign areas provide a reasonable allowance for future sign panel installations without the need for a new support structure.

Minimum sign areas for overhead variable message sign supports are normally not required.

See the FDOT **Plans Preparation Manual**, Volume 1, Introduction for a link to the Urban Area Boundary Maps

Figures 1 and 2 show how to apply the above minimum sign areas for span type overhead sign structures in urban locations.

Overhead signs in rural locations should be designed for the actual sign shown on the signing plans.

Figure 1 Example: actual signs

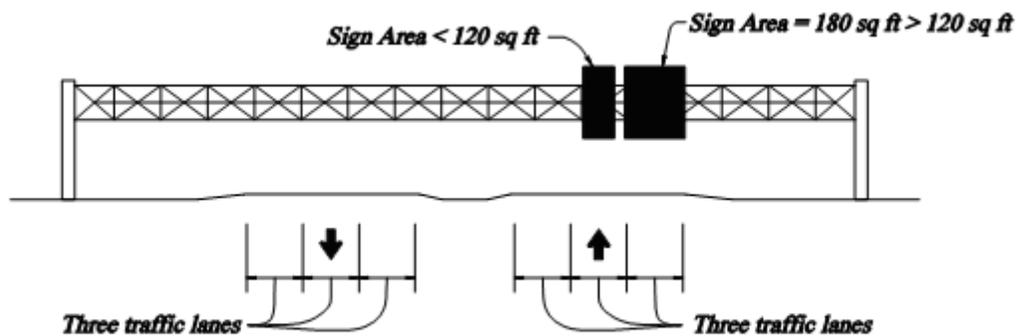
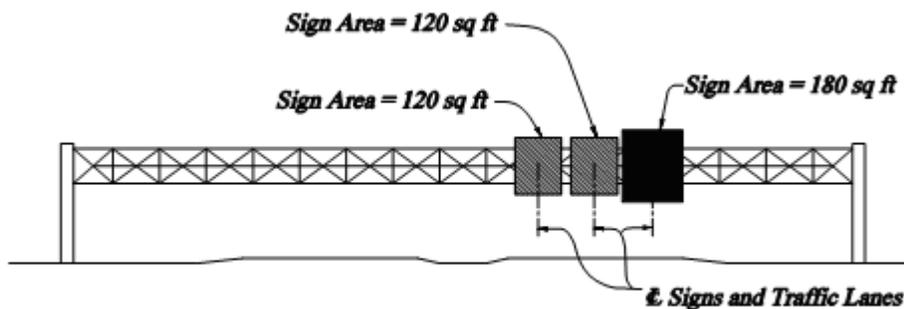


Figure 2 Example: signs used in design



**2.4.2.4 Variable Message Signs
(Rev. 01/11)**

Replace the first sentence with the following:

For all overhead Variable Message Sign (VMS) structures, the horizontal member shall consist of a truss with a minimum of two chords with a minimum center-to-center distance between the chords of 3'-0". See FDOT section 11.8 for VMS maximum span-to-depth ratios.

C 2.4.2.4

Add the following:

The minimum requirements given provide additional measures to limit the possibility of galloping.

Since cantilever overhead Variable Message Sign (VMS) structures are more susceptible to fatigue than span overhead VMS structures, span structures should be used whenever possible.

In Florida, overhead VMS structures are typically referred to as Dynamic Message Sign (DMS) structures.

2.4.2.5 Horizontal Span and Cantilever Limits (Rev. 01/11)

New Section, add the following:

Sign and signal structures shall be limited to the following maximum horizontal lengths:

| Structure Type | Max Length |
|--------------------------|------------|
| Span Overhead Sign | 250 feet |
| Cantilever Overhead Sign | 50 feet |
| Mast Arm | 78 feet |
| Span Wire Assembly | 250 feet |

C 2.4.2.5

Add the following:

These limits were chosen based on past practice and practical experience.

A FDOT Design Variation is required when sign or signal structure limits are exceeded. The design variation documentation shall include the type of structure, height, length, discussion of alternatives, and costs.

3 LOADS

3.8 Wind Load

Delete the last paragraph and add the following:

The use of Appendix C is only permitted for the evaluation of existing structures.

3.8.2 Basic Wind Speed (Rev. 01/11)

Delete the entire paragraph including Figure 3-2, and add the following:

The wind loads shall be based on the wind speeds (mph) shown in FDOT [SDG Table 2.4.1-2](#)

C 3.8

FDOT [Plans Preparation Manual](#), Volume 1, Section 25.4.27 defines the structures where evaluation is necessary.

C 3.8.2

Add the following:

FDOT [SDG Table 2.4.1-2](#) was derived from the ASCE 7-05 wind speed map.

To simplify the design process, FDOT has designated one wind speed per county.

3.8.3 Wind Importance Factor I_r
(Rev. 01/11)

Add the following Wind Importance Factor to Table 3-2:

| Recurrence Interval Years | V = 85-100 mph | V > 100 mph | Alaska |
|---------------------------|----------------|-------------|--------|
| 1.5 | 0.45 | 0.2 | --- |

Delete Table 3-3 and add the following FDOT Table 3-3:

FDOT Table 3-3 Minimum Design Life

| Design Life | Structure Type |
|-------------|---|
| 50-year | Overhead sign structures |
| | Luminaire support structures >50' in height. |
| | Mast Arms |
| | Monotubes |
| | Steel Strain Poles |
| | ITS Camera Poles |
| 25-year | Luminaire support structures ≤ 50' in height. |
| | Concrete Strain Poles |
| 10-year | Roadside sign structures |
| 1.5-year | Temporary construction signs |

A 1.5-year design life ($I_r = 0.2$) for temporary construction signs shall only be used with a 150 mph design wind speed.

3.8.6 Drag Coefficients C_d

Replace the coefficient of drag for Traffic Signals in Table 3-6 with the following:

Traffic Signals - no ability to swing - 1.2

Traffic Signals - installed with the ability to swing on span wire systems under full wind load - 0.7

C 3.8.3

Add the following:

A 1.5-year design life has been added for temporary construction signs. The importance factor is calculated based on "Wind Speed for Design of Temporary Structures" by D.W. Boggs and J.A. Peterka, Structures Congress, 1992, Compact Papers, ASCE, 1992.

Florida has traditionally designed Luminaire support structures, 50 feet in height and less, and strain poles for a 25 year design life.

Concrete strain poles are designed for zero tension stress, therefore a twenty-five year design life is appropriate.

C 3.8.6

Add the following to note 2 at the bottom of Table 3-6:

A drag coefficient for traffic signal installed with the ability to swing has been established through research (Cook 2007). On span wire systems where signal and signs are allowed to swing, varying C_d as a function of swing angle is allowed (Hoit and Cook 1997).

3.8.7 Lift Coefficient for Traffic Signals C_l

New Section, add the following:

For traffic signals installed with the ability to swing on span wire systems under full design wind speed (Group II loading), use a coefficient of lift C_l equal to 0.4. To compute the lift pressure, use Eq. 3-1 substituting C_l for C_d . Using a reduced signal area based on the swing angle, compute the lift force and apply in a vertical direction opposite dead load.

3.9 Design Wind Loads On Structures

3.9.1 Load Application (Rev. 01/11)

Add the following:

Use the following areas for traffic signals:

| Item | Projected Area |
|---------------------|----------------|
| 12" Signal | 1.36 sf |
| 8" Signal | 0.70 sf |
| 3 Section Backplate | 5.67 sf |
| 4 Section Backplate | 6.83 sf |
| 5 Section Backplate | 8.00 sf |

When the full design wind speed is used for Group II loading on span wire systems, use a reduced signal and sign area based on the following swing angles:

| Wind Speed | Swing Angle |
|------------|-------------|
| 110 mph | 45 degrees |
| 130 mph | 55 degrees |
| 150 mph | 60 degrees |

3.9.3 Design Loads for Vertical Supports (Rev. 01/11)

Add the following:

When 3 or 4 span wire pole structures are connected, analyze the system with wind directions of 0, 45, and 90 degrees. If other angles are used, document the angles in the analysis report.

C 3.8.7

Add the following:

A lift coefficient of 0.4 on traffic signals installed on span wire systems has been established through research (Cook 2007). On span wire systems where signal and signs are allowed to swing, varying C_l as a function of swing angle is allowed (Hoit and Cook 1997).

C 3.9.1

Add the following:

Swing angles for traffic signals and signs installed on span wire systems have been established through research (Cook 2007).

Areas given are for standard signals in Florida.

C 3.9.3

Add the following:

More refined analysis is typically not required due to the number of approximate assumptions made in the analysis. Other angles may be analyzed and substituted if program results are not consistent at the specified angles.

3.10 References

Add the following:

Cook, R.A. (2007). **Development of Hurricane Resistant Cable Supported Traffic Signals** (FDOT Report# BD545 RPWO #57). Gainesville, Florida: University of Florida.

Hoit, M.I., Cook, R.A. (1997). **Computer Aided Design Program for Signal Pole and Span Wire Assemblies With Two Point Connection System** (FDOT Report# 0510653). Gainesville, Florida: University of Florida.

5 STEEL DESIGN

5.4 Material - Structural Steel
(Rev. 01/11)

Add the following:

Do not specify ASTM A588 (rustic, Corten, "self-oxidizing", or "self-weathering") steel in sign, signal, or lighting structures.

C 5.4

Add the following:

In some environmental conditions in Florida, A588 steel has deteriorated significantly faster than expected.

5.13 Cables And Connections
(Rev. 01/11)

Add the following:

Use the cable breaking strength values specified in FDOT Specification 634.

C 5.13

Add the following

Cables used in the construction of span-wire pole structures are listed in FDOT Specification 634.

5.15 Welded Connections

5.15.1 Circumferential Welded Splices
(Rev. 01/11)

Delete the last sentence and add the following:

On steel sign and signal structures, no circumferential welds are permitted on the uprights, arms or chords with the exceptions of the base plate socket weld, the flange plate connections on tubular truss members, and the mitered arm-to-upright angle weld on monotubes.

C 5.15.1

Add the following:

The Department's intent is to avoid any unnecessary welds on sign, signal or lighting structures.

5.16 Bolted Connections (Rev. 01/11)

Add the following:

Design all pole to arm connections on Mast Arm structures as "through bolted". Tapped connections are not permitted.

C 5.16

Add the following:

Through bolted connections provide fully tensioned A325 bolts.

5.17 Anchor Bolt Connections (Rev. 01/11)

Add the following:

All sign, signal, and lighting structures designed for a minimum service life of 50 years (wind speed based on a 50-year mean recurrence interval) shall use a minimum of six, Grade 55, ASTM F1554 anchor bolts at the pole to foundation connection.

C 5.17

Add the following:

A minimum of six anchor bolts provides redundancy and better distribution of forces through the base plate.

5.17.1 Anchor Bolt Types (Rev. 01/11)

Delete anchor bolts types listed in the second and third bullet and add the following:

Both Adhesive anchors and threaded post-tensioning bars are not permitted.

C 5.17.1

Add the following:

FDOT only allows straight headed anchor bolts.

Adhesive anchor and threaded post-tensioning bars have undesirable creep and ductility behavior respectively.

5.17.2 Anchor Bolt Materials (Rev. 01/11)

Add the following:

Only use ASTM F 1554 anchor bolts with 55 ksi yield strength.

C 5.17.2

Add the following:

ASTM F 1554 Grade 55 anchor bolts provide sufficient ductility after yield to engage all the anchor bolts on the tension side of the base plate.

5.17.3 Design Basis (Rev. 01/11)

5.17.3.3 Use of Grout

Add the following:

Grout pads underneath the baseplates in double-nut moment joints of miscellaneous highway structures (i.e. mast arms, overhead sign structures, high mast lights, steel strain poles and monotube structures) are not required.

C 5.17.3.3

Add the following:

Inspections have shown that a poorly functioning grout pad is worse than no grout pad at all. For poles without a grout pad beneath the base plate, the double-nut moment joint requires adequate tensioning of the anchor bolts. It is critical that the nuts beneath the base plate, typically referred to as leveling nuts, are firmly tightened and locked to prevent loosening. This locking mechanism is accomplished through the turn of the nut method specified in FDOT Specification 649 or a properly placed grout pad.

5.17.4 Anchor Bolt Design (Rev. 01/11)

5.17.4.3 Bending Stress in Anchor Bolts (Rev. 01/11)

Change "should" to "shall" in the first sentence.

C 5.17.4.3

Add the following:

Testing has shown significant reduction in anchor bolt capacity when the standoff distance is greater than one bolt diameter.

6 ALUMINUM DESIGN

6.1 Scope (Rev. 01/11)

Add the following:

Do not specify aluminum overhead sign structure supports with the exception of the vertical sign panel hangers, which may be aluminum or steel.

C 6.1

Add the following:

Aluminum overhead sign structures have been prone to unacceptable levels of vibration and fatigue cracking.

7 PRESTRESSED CONCRETE DESIGN

7.5 Design

7.5.1 Method of Design (Rev. 01/11)

Add the following:

For Standard Prestressed Concrete Strain Pole Design, see Index 17725, Sheet 2 of 2, Table 1 for the Service Moment Capacity provided and Table 2 for the Ultimate Moment Capacity provided. Actual capacities are calculated by the manufacturer and included with their QPL application. An increased percentage of Allowable Stress for Group 2 loading (LTS Table 3-1) is not applicable for Prestressed Concrete Poles, since Group 2 loading is an ultimate moment capacity calculation.

7.5.2 Concrete Strength (Rev. 01/11)

Replace this section with the following:

The minimum compressive concrete strength shall be 6 ksi.

7.10 Durability

7.10.2 Concrete Cover (Rev. 01/11)

Replace this section with the following:

The minimum clear concrete cover for all prestressed and non-prestressed poles is 1 inch.

C 7.5.1

Add the following:

FDOT uses Standard Prestressed Concrete Poles in accordance with Index 17725, Specification 641 and the Qualified Products List. QPL listed pole manufacturers have submitted design drawings and calculations that exceed the service and strength moment requirements listed in Design Standard 17725, Sheet 2 of 2. After analysis of the proposed span-wire pole structure, the Designer selects the appropriate pole using the design moment values given in Index 17725 Tables 1 and 2.

C 7.5.2

Add the following:

FDOT uses Class V Special, 6 ksi or Class VI 8.5 ksi concrete in accordance with Specification 346.

C 7.10.2

Add the following:

FDOT requires a minimum 1 inch cover on all concrete poles in all environments.

10 SERVICEABILITY REQUIREMENTS

10.5 Camber (Rev. 01/11)

Replace this section with the following:

Provide permanent camber equal to 1.5 times the dead load deflection for overhead sign structures. For span overhead sign structures, arch the horizontal member upwards and for cantilever overhead sign structures rake the vertical support backwards. For mast arm signal structures, provide a two degree upward angle at the arm/upright connection.

C 10.5

Add the following:

Permanent camber equal to 1.5 times the dead load deflection provides for a better appearance than the relatively small L/1000 given in AASHTO. For mast arms, a two degree upward angle at the arm/upright connection is standard industry practice.

11 FATIGUE DESIGN (Rev. 01/11)

11.6 Fatigue Importance Factors (Rev. 01/11)

Add the following:

Use Fatigue Category II for all sign, traffic signal, and lighting support structures meeting the limits in 2.4.2.5 and designed using FDOT Design Standards and Programs. Use Fatigue Category I for all other sign, traffic signal, and lighting support structure designs including all VMS support structures.

C 11.6

Add the following:

Research performed at the University of Texas (Report 0-4178) concluded increasing "the end plate thickness for a 10-inch mast arm from 1.5 inches to 2 inches increased the fatigue life from category E' to category D."

Since FDOT Design Standards and programs for Mast Arm signal structures, overhead tri-chord sign trusses, and High-mast light poles use relatively thick base plates, Fatigue Category II is appropriate. In addition, there have been no reports of fatigue damage to sign, signal and lighting structure designed using FDOT programs and built using FDOT Design Standards.

11.7 Fatigue Design Loads

11.7.1 Galloping (Rev. 01/11)

Replace the 2nd and 3rd paragraph with the following:

Vibration Mitigation devices are not allowed in lieu of designing for galloping.

C 11.7.1

Add the following:

Vibration mitigation devices are seldom necessary and installed only after excessive vibration has been observed and the device is approved by the Department.

11.8 Deflection (Rev. 01/11)

Add the following:

In addition, VMS structures shall also meet the following maximum span-to-depth ratios:

C 11.8

Add the following:

The minimum requirements given provide additional measures to limit the possibility of galloping

| VMS Structure Type | Max. Span-to-Depth Ratio |
|-------------------------------|--------------------------|
| Overhead Span Structure | 25 |
| Overhead Cantilever Structure | 9 |

13 FOUNDATION DESIGN

13.6 Drilled Shafts (Rev. 01/11)

Add the following:

Drilled shafts are the standard foundation type on high mast light poles, span overhead signs, mast arms, monotubes, and steel strain poles.

C 13.6

Add the following:

For standard drilled shaft details, see Design Standard Indexes 11320, 17502, 17723 and 17745 for span overhead sign structures, high mast light poles, steel strain poles, and mast arms respectively.

13.6.1 Geotechnical Design

13.6.1.1 Embedment (Rev. 01/11)

Add the following:

Use a safety factor against overturning of 2 when using the Broms method.

For torsion resistance in drilled shafts supporting Mast Arm signal and cantilever overhead sign structures, use the following equations:

$$T_u \leq \frac{T_n}{SF_{tor}}$$

Where

$$T_n = \pi D L F_s \left(\frac{D}{2}\right) + \pi \left(\frac{D}{2}\right)^2 L \gamma_{conc} \left(\frac{D}{3}\right) \mu$$

$$F_s = \sigma_v \omega_{fdot}$$

$$\sigma_v = \gamma_{soil} \left(\frac{L}{2}\right)$$

$$\mu = \tan(\phi_{soil})$$

T_u = Torsion force on the drilled shaft

T_n = Nominal torsion resistance of the drilled shaft

SF_{tor} = Safety Factor against torsion
 = 1.0 for Mast Arm signal structures
 = 1.3 for overhead cantilever sign structures

D = diameter of the drilled shaft

L = length of the drilled shaft

F_s = unit skin friction

σ_v = effective vertical stress at mid-layer

ω_{fdot} = load transfer ratio
 = 1.5 for granular soils where the allowable shaft rotation may exceed 10 degrees

γ_{conc} = unit weight of concrete

γ_{soil} = unit weight of soil

μ = Coefficient of friction between the shaft and soil

ϕ_{soil} = soil friction angle

C 13.6.1.1

Add the following:

FDOT experience has established a safety factor of 2 produces conservative designs.

The torsion resistance equation is based on the theory for the Beta Method (O'Neill and Reese, 1999). A single ω_{fdot} factor of 1.5 is used to adjust for the concurrent overturning and torsional forces and to compare with past FDOT practice. Since the consequence of a torsion soil-structure failure is usually small, some rotation is typically allowable from the design wind.

Since cantilever overhead sign structures can have significantly more torsion than a Mast Arm, a higher safety factor of 1.3 is appropriate.

13.6.2 Structural Design (Rev. 01/11)

Add the following:

Longitudinally reinforce drilled shaft foundations with a minimum of 1% steel. At a minimum, place #5 stirrups at 4 inch spacing in the top two feet of shaft. In cantilever structures, design for shear resulting from the torsion loading on the anchor bolt group.

13.6.2.1 Details (Rev. 01/11)

Replace the second sentence with the following:

A minimum concrete cover of six inches over steel reinforcement is required.

Add the following:

A minimum main reinforcement clear spacing of six inches is required for proper concrete consolidation. Stirrups in drilled shafts for sign, signal and lighting structures are exempt from this requirement.

13.10 Embedment of Lightly Loaded Small Poles and Posts

Add the following:

When using the Broms method for ground sign foundation design, use a safety factor against overturning of 1.3. When using the Broms method for direct burial concrete pole foundation design, use a safe factor against overturning of 1.5.

13.11 References (Rev. 01/11)

Add the following:

Cook, R.A. (2007). **Anchor Embedment Requirements for Signal/Sign Structures** (FDOT Report# BD545 RPWO #54). Gainesville, Florida: University of Florida.

C 13.6.2

Add the following:

Using 1% steel is conservative for flexural design in most cases. Additional stirrups in the top of the shaft provides resistance against shear failure in the top of the shaft. Due to torsion, additional stirrups may be required in cantilever structures.

C 13.6.2.1

Add the following:

FDOT requires six inches of cover to ensure durability in drilled shafts.

Concrete consolidation becomes more difficult with clear spacing less than six inches.

APPENDIX C

C.1 Alternate Method (Rev. 01/11)

Add the following:

When evaluating existing structures in accordance with *PPM* 25.4.27, the following design assumptions are permitted:

- an allowable overstress of 1.4 is allowed for Group II loading.
- allowances for future loads is not required
- evaluation using Section 11, Fatigue Design, is not required.
- evaluation of the foundation capacity is not required.

C.2 Wind Load (Rev. 01/11)

Delete the 2nd and 3rd sentence and add the following:

The design wind pressures shall be computed using the wind pressure formula, Eq. C-1, with the appropriate wind speed shown in FDOT Table C.2-1, Wind Speed by County.

C C.1

Add the following:

By allowing an overstress factor of 1.4, consistent with previous editions of LTS, properly designed existing structures will be allowed to remain in place in accordance with the *PPM*.

C C.2

Add the following:

To simplify the design process, FDOT has designated one wind speed per county.

FDOT Table C.2-1 Wind Speed by County

| County (Dist) | 10 year | 25 year | 50 year | County (Dist) | 10 year | 25 year | 50 year |
|----------------------|----------------|----------------|----------------|----------------------|----------------|----------------|----------------|
| Alachua (2) | 60 | 80 | 90 | Lee (1) | 80 | 90 | 100 |
| Baker (2) | 60 | 80 | 90 | Leon (3) | 60 | 70 | 80 |
| Bay (3) | 70 | 80 | 90 | Levy (2) | 70 | 80 | 90 |
| Bradford (2) | 60 | 80 | 90 | Liberty (3) | 60 | 80 | 90 |
| Brevard (5) | 80 | 90 | 100 | Madison (2) | 60 | 70 | 80 |
| Broward (4) | 90 | 100 | 110 | Manatee (1) | 80 | 90 | 100 |
| Calhoun (3) | 60 | 80 | 90 | Marion (5) | 60 | 80 | 90 |
| Charlotte (1) | 80 | 90 | 100 | Martin (4) | 80 | 90 | 100 |
| Citrus (7) | 70 | 80 | 90 | Miami-Dade (6) | 90 | 100 | 110 |
| Clay (2) | 60 | 80 | 90 | Monroe (6) | 90 | 100 | 110 |
| Collier (1) | 80 | 90 | 100 | Nassau (2) | 70 | 80 | 90 |
| Columbia (2) | 60 | 70 | 80 | Okaloosa (3) | 70 | 90 | 100 |
| DeSoto (1) | 70 | 80 | 90 | Okeechobee (1) | 70 | 80 | 90 |
| Dixie (2) | 70 | 80 | 90 | Orange (5) | 70 | 80 | 90 |
| Duval (2) | 70 | 80 | 90 | Osceola (5) | 70 | 80 | 90 |
| Escambia (3) | 70 | 90 | 100 | Palm Beach (4) | 80 | 100 | 110 |
| Flagler (5) | 70 | 80 | 90 | Pasco (7) | 70 | 90 | 100 |
| Franklin (3) | 70 | 90 | 100 | Pinellas (7) | 70 | 90 | 100 |
| Gadsden (3) | 60 | 70 | 80 | Polk (1) | 70 | 80 | 90 |
| Gilchrist (2) | 60 | 80 | 90 | Putnam (2) | 60 | 80 | 90 |
| Glades (1) | 70 | 80 | 90 | St. Johns (2) | 70 | 80 | 90 |
| Gulf (3) | 70 | 90 | 100 | St. Lucie (4) | 80 | 90 | 100 |
| Hamilton (2) | 60 | 70 | 80 | Santa Rosa (3) | 70 | 90 | 100 |
| Hardee (1) | 70 | 80 | 90 | Sarasota (1) | 80 | 90 | 100 |
| Hendry (1) | 70 | 80 | 90 | Seminole (5) | 70 | 80 | 90 |
| Hernando (7) | 70 | 90 | 100 | Sumter (5) | 60 | 80 | 90 |
| Highlands (1) | 70 | 80 | 90 | Suwannee (2) | 60 | 70 | 80 |
| Hillsborough (7) | 70 | 80 | 90 | Taylor (2) | 70 | 80 | 90 |
| Holmes (3) | 60 | 70 | 80 | Union (2) | 60 | 80 | 90 |
| Indian River (4) | 80 | 90 | 100 | Volusia (5) | 80 | 90 | 100 |
| Jackson (3) | 60 | 70 | 80 | Wakulla (3) | 70 | 80 | 90 |
| Jefferson (3) | 60 | 70 | 80 | Walton (3) | 70 | 80 | 90 |
| Lafayette (2) | 60 | 80 | 90 | Washington (3) | 60 | 80 | 90 |
| Lake (5) | 60 | 80 | 90 | | | | |

VOLUME 9 - REVISION HISTORY

- 1.1Added new Commentary.
- 2.1New Section and Commentary.
- 2.4.2Deleted Commentary.
- 2.4.2.2Added new first and last Paragraphs to Commentary.
- 2.4.2.4Replaced Section content. Added new Commentary.
- 2.4.2.5New Section and Commentary.
- 3.8.2Added second Paragraph to Commentary.
- 3.8.3Corrected Title for consistency with LTS-5.
- 3.9.1Added new first Paragraph and Table to Section. Added second Paragraph to Commentary.
- 3.9.3New Section and Commentary.
- 5.4New Section and Commentary.
- 5.13New Section and Commentary.
- 5.15.1Clarified locations that circumferential welds are not permitted. Added Commentary.
- 5.16Added Commentary.
- 5.17Revised Title for consistency with LTS-5. Added Commentary.
- 5.17.1Removed proprietary information and replaced with non-proprietary description. Added Commentary.
- 5.17.2New Section and Commentary.
- 5.17.3Revised Title and numbering for consistency with LTS-5.
- 5.17.4Revised Title and numbering for consistency with LTS-5.
- 5.17.4.3Added Commentary.
- 6.1New Section and Commentary.
- 7.5.1New Section and Commentary.
- 7.5.2New Section and Commentary.
- 7.10.2New Section and Commentary.
- 10.5New Section and Commentary.
- 11Deleted Section 11.1 and C 11.1.
- 11.6New Section and Commentary.

- 11.7.1**New Section and Commentary.
- 11.8**New Section and Commentary.
- 13.6**Replaced "preferred" with "standard". Added Commentary.
- 13.6.1.1**Added new content after first sentence of Section. Added Commentary.
- 13.6.2**Clarified reinforcing requirements and addressed cantilever structures.
Added Commentary.
- 13.6.2.1**Corrected format in first sentence. Added second sentence to second
Paragraph. Added Commentary.
- 13.11**New Section.
- C.1**Added additional permitted design assumptions. Included "Add the
following:" in Commentary for consistency.
- C.2**Added Commentary.