Chapter 24

Signalization Plans

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Chapter 24

Signalization Plans

24.1 General

Signalization Plans are usually a component set of plans. Projects with minor signalization may include these features on sheets in the roadway plans set or on the roadway sheets (or in another component plans set or on that component's sheets when appropriate). When prepared as component plans they shall be assembled as a separate plans set complete with a key sheet, tabulation of quantities and all other relevant signal sheets. When prepared as component plans, the sheets shall be numbered consecutively with the sheet numbers prefixed by the letter "T".

The signalization plans show the construction details, electrical circuits, signal phasing and other relevant data.

A complete set of signalization plans shall include the following sheets:

1. Key Sheet
2. Tabulation of Quantities
3. Plan Sheets
4. Mast Arm Details (if required)
5. Foundation Details - Mast Arms (if required)
6. Boring Data Sheets - Mast Arms (if required)

In addition, the signalization plans may contain sheets which were prepared separately (perhaps by a sub-consultant) and incorporated into the signalization plans early in the design process (prior to the establishment of sheet numbering). As an option, these may be identified with the following prefixes and placed at the end of the numbered sequence of the signalization plans:

GT-# Soil Survey and Report of Core Borings normally associated with the signalization plans set

PTM-# Portable Traffic Monitoring Site Sheets

24.2 Key Sheet

The key sheet is the first sheet in the component plans set and shall be prepared as described in ***Chapter 3*** of this volume. The location map, length of project box and contract plans set information are not required on this sheet when shown on the lead key sheet. The index of signalization plans shall be shown on the left of the sheet. Other data, including name, consultant contract number, vendor number, and certificate of authorization number of the firm (when plans are prepared by a consultant), shall be shown as described in ***Chapter 3*** of this volume.

If shop drawings are anticipated, the name(s) and address(es) of the Delegated Engineer(s) for shop drawing review(s) shall be shown on the right side of the sheet.

24.3 Tabulation of Quantities and Standard Notes

The tabulation of quantities sheet lists the item numbers, description and quantity of materials. This sheet shall be placed behind the key sheet in plans assembly.

Pay item numbers shall be listed in numerical order. Provisions shall be made to show the original and final quantities per sheet or by station. Pay item notes and general notes that refer to item numbers, description of work to be performed and quantity estimates shall also be shown on this sheet. If space is limited, notes may be shown on a General Notes Sheet.

On contracts with multiple Financial Project ID's, or Federal Aid and non-Federal Aid quantities, provisions shall be made to tabulate and summarize their respective quantities.

24.4 General Notes

The general notes sheet lists special signal design information such as controller operations, loop installations, signal heads, interconnect cable, and computer interface that is generally not covered in the FDOT Standard Specifications, Supplement or Special Provisions. This sheet shall be placed behind the tabulation of quantities in the plans assembly. On minor projects, general notes may be combined with the tabulation of quantities sheet.

24.5 Plan Sheets

24.5.1 Format and Scale

Signalization Plans shall be prepared on standard plan format at a scale large enough to show all details clearly and legibly. The recommended scale is 1" = 40' or 1" = 50'. Usually, the complete intersection shall be shown on one plan sheet. However, for large intersections more sheets may be used with appropriate match lines. A north arrow and scale shall be shown at a point of maximum visibility on the sheet.

24.5.2 Required Information

The basic information requirements include roadway geometrics, street names, construction stationing or milepost, curb and gutter, drainage inlets, sidewalks and right of way lines as similarly required on the plan portion of the roadway plan-profile sheets. Those underground and overhead utilities, signing structures, and lighting structures that may cause construction conflicts with signal components shall be shown. All locations, including existing trees, should be checked for potential conflicts.

The plan sheet shall also show:

1. Signal head locations with directional arrows and movements (movements 2 and 6 shall be the major streets).
2. Details of signal heads in tabular form with pay item numbers.
3. Phasing diagram/signal operating plan (NOTE: If the SOP conforms to the ***Index No. 17870*** of the ***Design Standards***, then the reference to the index is all that is required. For all other operating plans, the plan shall be shown).
4. Signal controller timing chart.
5. Loop detectors.
6. Electrical service location.
7. Location of signal poles and span wires (ground elevation and elevation of roadway crown).
8. Signal wire signs.
9. Pedestrian signals.
10. Turning radii.

11. Median nose locations.
12. Location of "stop bars" and pedestrian crosswalks.
13. Coordination unit-timing chart.
14. Lane lines with directional arrows.

All equipment shown on the plan shall be clearly labeled and their respective pay item numbers and quantity indicated.

A separate signalization plan shall be prepared for each signalized intersection included in the construction project.

Any span wire or mast arm mounted signs shall be coordinated with the appropriate signing and pavement marking plans to avoid duplication.

The sign details for signs must be included on the signalization plans, if signing and pavement markings are not included in the plans package.

24.6 Interconnect/Communication Plan

The interconnect/communication plan is required when signal equipment is being coordinated with other signal installations or with a computerized system. The interconnect/communication plan shows pictorially the placement of interconnect/communication cable, either underground or aerial, and tabulates all related interconnect quantities. The interconnect/communication plan sheet shall indicate all signal poles, service poles, and/or joint-use poles to which interconnect/communication cable will be attached.

The interconnect/communication plan shall be prepared on standard plan format. Unless otherwise approved, the preferred scale of the interconnect/communication plan shall be 1" = 100' for underground cable, and 1" = 200' for aerial cable. For simple projects, or sections of a project, "stacking" two plans on one sheet is generally permitted if clarity and legibility are maintained. Stationing shall progress from left to right and multiple plan views shall be stacked from top to bottom.

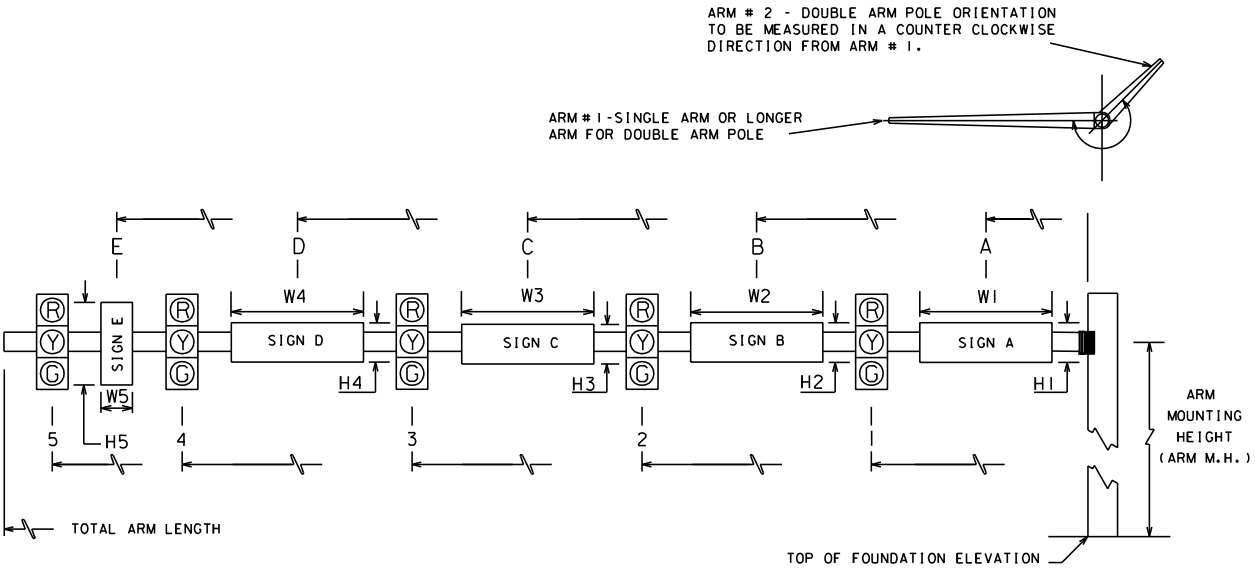
A north arrow and scale shall be shown at a point of maximum visibility on the sheet. If two plans are "stacked" on one sheet, each plan portion shall contain a north arrow and scale.

The basic plan information requirements include roadway schematic, showing cross streets and driveways, cable information, pole location, pole number, utility pole identification number, pay item number and quantity.

24.7 Mast Arm Sheets

The Mast Arm Tabulation Sheet, completed by the signal designer, and the “Standard Mast Arm Assemblies Data Table”, and the Structures CADD cell table completed by the structures designer, will be included in the plans. These are the only plan sheets required for mast arm assemblies which meet the Department's Standard and are included on the Qualified Products List. The structures data table may be placed on a signal plan sheet, if space permits. Mast arm assemblies that do not meet the mast arm standard will require a special design. The completed “Special Mast Arm Assemblies Data Table” will be included in the plans for special designs.

The following instructions are for use with the Mast Arm Tabulation Sheet:



1. Each mast arm assembly is identified by a unique ID number.
2. Dimensions 1-5 are for signals and dimensions A-E are for signs. Record the distance from the edge of the pole, at ground level, to the center of the signal or sign.
3. Signals may be mounted vertically or horizontally. Indicate the mounting in the appropriate column in the table.
4. The entire line for arm #2 and the space for the angle between dual arms are left blank for single arm assemblies.
5. All arms and poles will be galvanized. If a color is required, indicate the color in the table, otherwise leave blank.
6. Starting at the pole, select the signals and/or signs that match the configuration you are tabulating. The spaces representing the signs or signals not used will be blank. Example 1: If no sign is located between the pole and signal 1, the spaces for Sign A would be blank. Example 2: A configuration for three signals and one sign between signal 1 and signal 2 - Only the spaces for signals 1, 2, 3 and sign B would be completed; the others will be blank.
7. Record the number of sections in each signal head in the space following the distance to that head.
8. Record the height and width of each sign in the space following the distance to the sign.

9. When double arm poles are used for a skewed intersection, the standard design should be used whenever possible. The standard orientation for arm #2 is 90 or 270 degrees measured in a counter clockwise direction from arm #1. The normal orientation of the mast arm is perpendicular to the roadway. Adjustments in mounting hardware can compensate for a skew angle of approximately 15 degrees or more from the normal, depending upon the attachment method. The designer should verify the mounting hardware capability before specifying an arm with a skew greater than 15 degrees.

10. The arm mounting height should be calculated to provide a minimum vertical clearance of 17'-6" from the roadway crown elevation to the lowest sign or signal. A standard signal section is approximately 14" square. Therefore the length of a 3-section head is about 42" and a 5-section is about 70". The use of back plates will add about 6" to each side of the signal head. Additionally, approximately 3" should be added to the end of the signal head to compensate for the attachment hardware. This information may be used to determine the arm mounting height.

11. The standard handhole location is 180 degrees from arm #1. Other handhole locations must be noted in the Special Instructions.

12. A free swinging internally illuminated street name sign may be attached to the pole by an independent bracket arm if the sign area does not exceed 12 square feet and weigh more than 75 pounds. The Structures Design Engineer must review other signs attached to the pole or any size sign of this type attached to the signal mast arm.

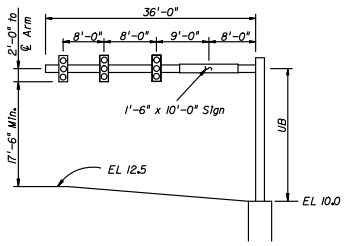
SPECIAL INSTRUCTIONS					
ID NO.	PED. BUTTON		PED. SIGNALS		HANDHOLE LOCATION

13. The "Special Instructions" Table is used to tabulate pedestrian buttons and pedestrian signal locations and handhole locations when the handholes are not in the standard location. Tabulate the ID No. and the orientation of the pedestrian buttons and signals in degrees measured counter clockwise from arm #1. The handhole location should be left blank if the handhole is in the standard location (see note 11).

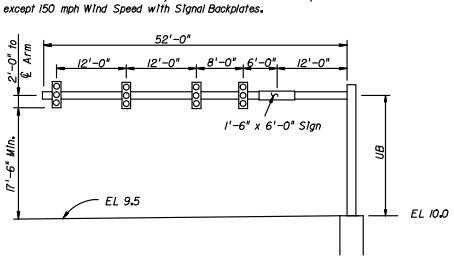
14. Arm #1 is the arm for a single arm assembly or the longer arm for a double arm assembly. If the arms are equal length, arm #1 is over the project roadway.

Following are examples for use with the Standard Mast Arm Assemblies Data Table:

EXAMPLE 1
Single Arm Structure as shown,
110 mph Wind Speed with Signal Backplates.



EXAMPLE 2
First Arm Structure as shown, Second Arm same as Example 1
except 150 mph Wind Speed with Signal Backplates.



STANDARD MAST ARM ASSEMBLIES DATA TABLE

STRUCTURE ID NUMBERS	ASSEMBLY (1) NUMBERS	FIRST ARM			SECOND ARM			UF (deg)	LL (deg)	POLE				SPECIAL DRILLED SHAFT DATA (4)			
		ARM TYPE	FAA (2) (ft.)	FBA (2) (in.)	ARM TYPE	FAA (2) (ft.)	FBA (2) (in.)			POLE TYPE	UAA (3) (ft.)	UB (ft.)	UCA (3) (in.)	DA (ft.)	DB (ft.)	RA	RB
Example 1	F1 – W1	F1								W1		22					
Example 2	D5 – D2 – S3	D5	28	9.08	D2			270		S3	22	20	17.92				

TABLE NOTES:
(1) Assembly Number Legend

Single Arm:
Arm Type – Pole Type = D# – S#
= E# – T#
= F# – W#

Double Arm:
First Arm Type – Second Arm Type – Pole Type = D# – D# – S#
= E# – E# – T#
= F# – F# – W#

(2) If an entry appears in columns "FAA" and "FBA", a shorter arm is required. This is obtained by removing length from the arm tip. For these cases the mast arm length shall be shortened from "FA" to "FAA" and the tip diameter shall be increased from "FB" to "FBA".

(3) If an entry appears in columns "UAA" and "UCA", a shorter pole is required. This is obtained by removing length from the pole tip. For these cases the pole height shall be shortened from "UA" to "UAA" and the pole tip diameter shall be increased from "UC" to "UCA".

(4) The foundations for Standard Mast Arm Assemblies are pre-designed and are based upon the following conservative soil criteria which covers the great majority of soil types found in Florida. Only complete the "Special Drilled Shaft Data" information if site conditions dictate drilled shafts with additional foundation capacity.

Classification = Cohesionless (Fine Sand)
Friction Angle = 30 Degrees (30°)
Unit Weight = 50 lbs./cu. ft. (assumed saturated)

EXAMPLE 1

1. Select Arm Type.

   Investigate Arm F1. Compare attachment sizes and locations with design loading tree in ***Figure 29.2*** of ***Volume 1***. All signals and signs are no further from the pole than shown in the Arm F1 design loading tree. Select Arm Type F1.

2. Select Pole Type.
   Use Pole Selection Tables in ***Index 17743*** of the ***Design Standards***. Select Pole Type W1.

3. Determine Arm Mounting Height.
   UB + 10’ = 12.5’ + 17.5’min. + 2’
   UB = 22’min. Use 22’

EXAMPLE 2

1. Select First Arm Type.

   Designate longest arm as First Arm. For 52’ arm, investigate Arm D5. Compare attachment sizes and locations with design loading tree. All signals and signs are no larger than and are no further from the pole than shown in the Arm D5 design loading tree. Select Arm Type D5.

2. Specify shorter arm.
   Enter 28’ under FAA.
   FAA + FE – Splice = 28’ + 26’ - 2’ = 52’
   Determine actual tip diameter.
   FBA = FB + (60’ – 52’) x taper = 7.96” + 8’ (0.14”/ft) = 9.08”

3. Select Second Arm Type.
   Select Arm Type D2.

4. Enter angle between arms.
   Angle UF is measured counter-clockwise from the First Arm and must be either 90° or 270°.

5. Select Pole Type.
   Use Pole Selection Tables. Select Pole Type S3.

6. Determine Arm Mounting Height.
   UB + 10’ = 9.5’ + 17.5’min. + 2’
   UB = 19’ min. Use 20’

7. Specify shorter pole.
   Enter 22’ under UAA.
   Determine actual tip diameter.
   UCA = UC + (24’ – 22’) x taper = 17.64” + 2’ (0.14”/ft) = 17.92”

24.8 Monotube Sheets

Monotube assemblies require a special design. The Structures Design Engineer will provide all design details for a special design to be included in the plans. For a special design, place a note in the plans stating “Shop drawings will be required.”

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