STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
TRAFFIC OPERATIONS DIVISION
SUITE 1800, JAMES K. POLK BUILDING
505 DEADERICK STREET
NASHVILLE, TENNESSEE 37243-1402
(615) 253-1122

HOWARD H. ELEY
COMMISSIONER

BILL LEE
GOVERNOR

TRAFFIC OPERATIONS MEMORANDUM NO. 2303

Regarding Traffic Design Division Standard Drawings

Effective February 9, 2024 Letting (November 29, 2023 Turn-in), the following Standard Drawings are revised.

Revised Standard Drawings:

DRAWING NUMBER	CURRENT REVISION DATE	DESCRIPTION
T-L-1	9-12-23	STANDARD LIGHTING FOUNDATION DETAILS
T-SG-7D	9-12-23	TYPICAL SIGNAL HEAD PLACEMENT – TWO-LANE APPROACHES
T-SG-10	9-12-23	MAST ARM POLE AND STRAIN POLE FOUNDATION DETAILS

To accompany Standard Drawing T-SG-10, the following footnote shall be used for all traffic signal pole pay item numbers:

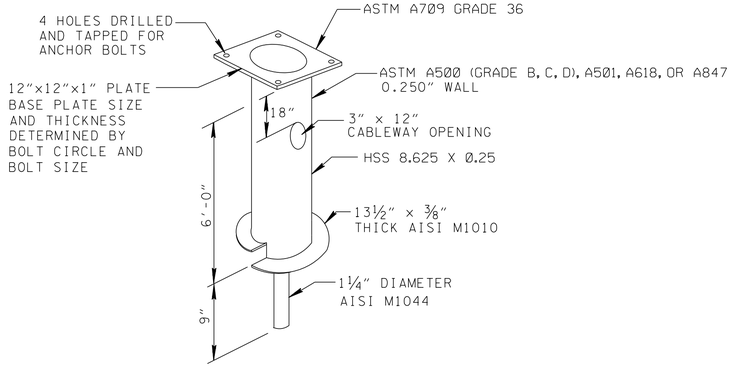
SEE SPECIAL PROVISION 700SIG FOR POLE DESIGN REQUIREMENTS. BID ITEM SHALL INCLUDE THE COST OF ALL MATERIALS AND LABOR NECESSARY FOR COMPLETE INSTALLATION OF THE POLE FOUNDATION. SELECT THE APPROPRIATE FOUNDATION DESIGN FROM STANDARD DRAWING T-SG-10.

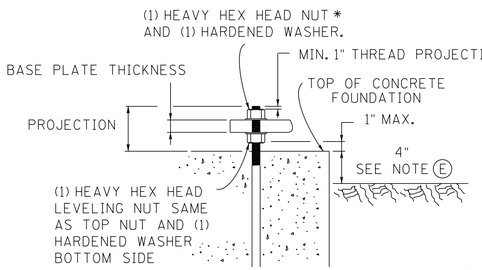
Andrew Barlow (Sep 19, 2023 09:47 CDT)

Andy Barlow, PE
Director
Traffic Design Division

AB:skb

30'-50' STANDARD LIGHTING ALTERNATE METAL FOUNDATION DETAIL





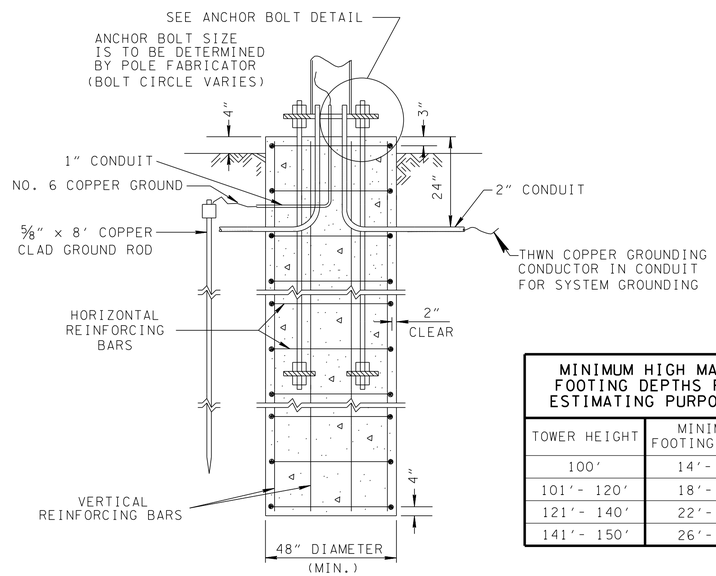
REQUIRED BEARING AREA FOR ANCHOR BOLT	
ANCHOR BOLT DIA(IN)	HEAD OR NUT AREA (SQ IN)
1"	1.800
1¼"	2.812
1½"	4.050
1¾"	5.512
2"	7.199
2¼"	9.122
2½"	11.249

* NOTE: TOP NUT TO BE TORQUED TO PRODUCE 60% YIELD STRESS OF ANCHOR BOLT.

NOTE: DO NOT GROUT BETWEEN BOTTOM OF BASE PLATE AND TOP OF CONCRETE FOUNDATION.

ANCHOR BOLT DETAIL

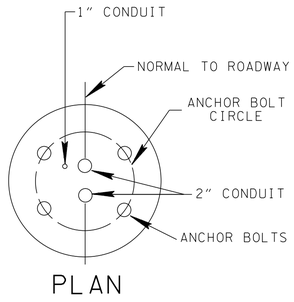
UNDER NO CONDITIONS WILL DRILLED AND GROUTED ANCHOR BOLTS BE ALLOWED)



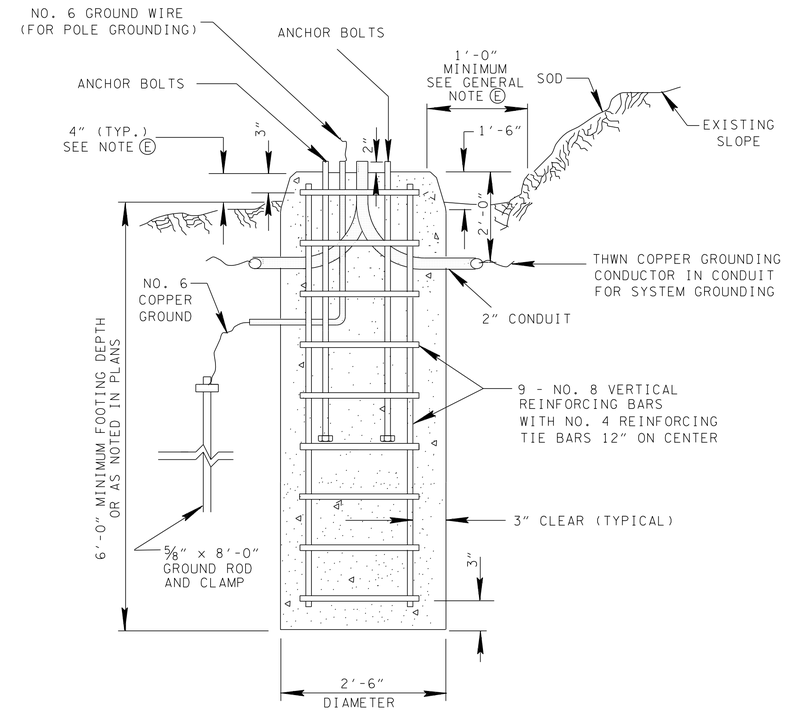
MINIMUM HIGH MAST FOOTING DEPTHS FOR ESTIMATING PURPOSES	
TOWER HEIGHT	MINIMUM FOOTING DEPTH
100'	14'- 0"
101'- 120'	18'- 0"
121'- 140'	22'- 0"
141'- 150'	26'- 0"

HIGH MAST FOUNDATION DETAIL

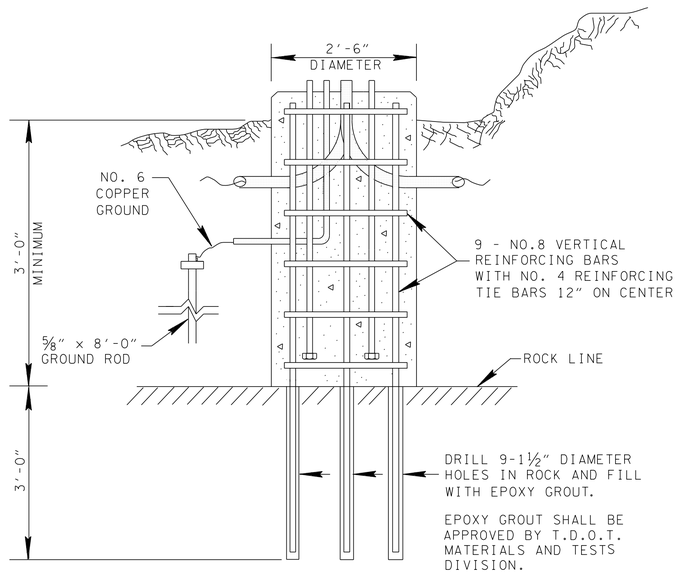
TO BE DESIGNED BY CONTRACTOR



PLAN



30'-50' STANDARD LIGHT FOUNDATION DETAIL



30'-50' STANDARD LIGHT FOUNDATION DETAIL IN ROCK

GENERAL NOTES

Ⓐ ANCHOR BOLT CIRCLE DIAMETER SHALL COMPLY WITH POLE MANUFACTURER'S ANCHOR BOLT PATTERN FOR THE SPECIFIC POLE AND BREAKAWAY BASE.

Ⓑ THE TOP 1'-0" OF THE FOUNDATION MAY BE FORMED SQUARE.

Ⓒ WHEN NECESSARY DUE TO ROCK, THE GROUND ROD MAY BE PLACED HORIZONTALLY IN THE CONDUIT TRENCH, A 3 INCH MINIMUM SEPARATION FROM CONDUIT SHALL BE MAINTAINED.

Ⓓ FOUNDATION SHALL BE PLACED AGAINST UNDISTURBED SOIL. IF ROCK OR WATER IS ENCOUNTERED DURING EXCAVATION FOR FOUNDATION, THE CONTRACTOR MAY PROPOSE MODIFICATIONS TO THE FOUNDATION DESIGN, SUBJECT TO THE REVIEW AND APPROVAL OF THE ENGINEER.

Ⓔ GROUND PROFILE SHOULD DRAIN WATER AWAY FROM FOUNDATION.

Ⓕ SEE STRUCTURES STD. DWG. STD-8-4 FOR ADDITIONAL DESIGN AND MATERIAL SPECIFICATIONS.

- ◎ REV. 11-12-93: NEW SHEET TRANSFERRED INFORMATION FROM T-L-1. ADDED METAL FOUNDATION DETAIL ALTERNATE.
- ◎ REV. 5-27-94: ADDED TABLE FOR HIGH MAST FOOTING AND GROUNDING CONDUCTOR SIZE.
- ◎ REV. 10-26-95: MODIFIED DESCRIPTION OF REINFORCING STEEL. CHANGED SIZE OF GROUND ROD ON HIGH MAST FOUNDATION DETAIL.

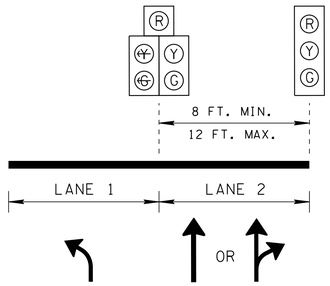
  REV. 12-16-03: DELETED GROUNDING CONDUCTOR CHART. ADDED NOTE E.
- ◎ REV. 7-29-04: CHANGED DRAWING NO. FROM T-L-1A TO T-L-1. ADDED GENERAL NOTE Ⓔ. DELETED GROUNDING CONDUCTOR SIZE TABLE.
- ◎ REV. 02-15-07: ADDED ANCHOR BOLT DETAIL. NOTES AND NOTE Ⓔ AND Ⓕ ADDED.
- □ REV. 12-4-13: CHANGED ANCHOR BOLTS TO THREADED. ADDED BEARING AREA TABLE.
- □ REV. 12-20-19: UPDATED ASTM STANDARDS ALTERNATE METAL FOUNDATION DETAIL.
- □ REV. 11-17-20: CORRECTED MISPELLED WORDS.
- □ REV. 9-12-23: CHANGED FONT FOR ANCHOR BOLT DETAIL. LABELED HORIZONTAL AND VERTICAL REINFORCING BARS, ADDED SPACING DIMENSIONS FROM TOP OF FOOTING TO GROUND LINE, ADDED MINIMUM DIAMETER, ADDED "TO BE DESIGNED BY CONTRACTOR", AND DELETED LABELS NOTING SIZE OF VERTICAL AND HORIZONTAL REINFORCING BARS ON HIGH MAST FOUNDATION DETAIL. UPDATED QUANTITY AND SIZE OF VERTICAL REINFORCING BARS ON 30' -50' STANDARD LIGHT FOUNDATION DETAIL. UPDATED QUANTITY AND SIZE OF VERTICAL REINFORCING BARS AND UPDATED QUANTITY OF HOLES TO BE DRILLED IN ROCK ON 30' -50' STANDARD LIGHT FOUNDATION DETAIL IN ROCK. REORGANIZED SHEET.

◎ MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

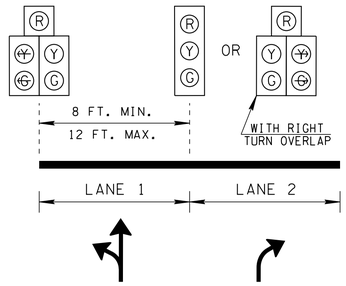
STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

STANDARD LIGHTING FOUNDATION DETAILS

11-12-93 | T-L-1



PROTECTED/PERMISSIVE LEFT TURN PHASING



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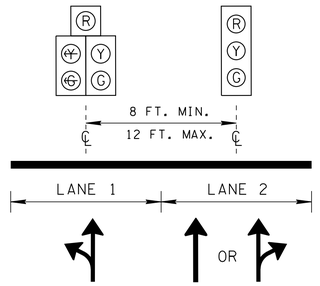

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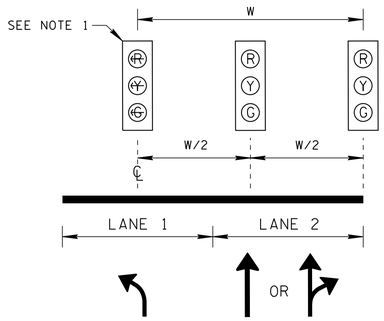
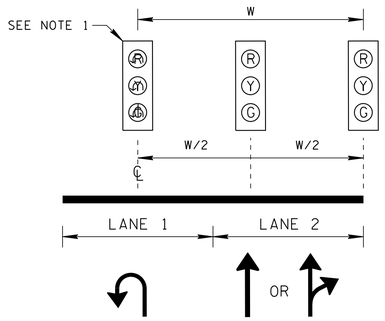
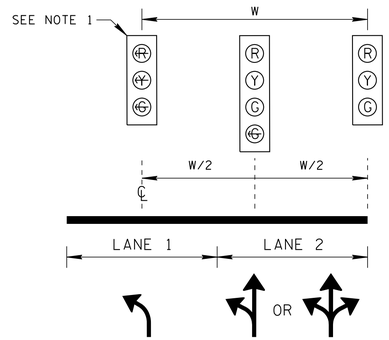


PROTECTED LEFT TURN OR SPLIT PHASING



PROTECTED U-TURN OR SPLIT PHASING



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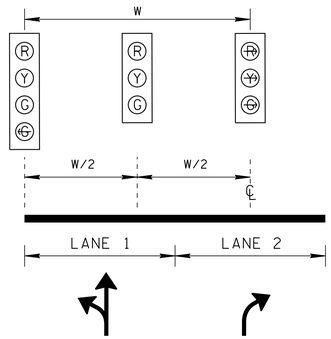
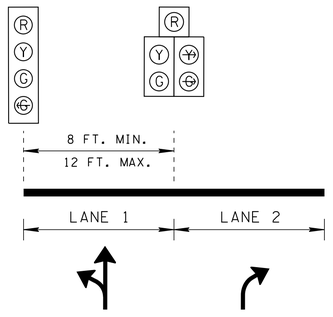
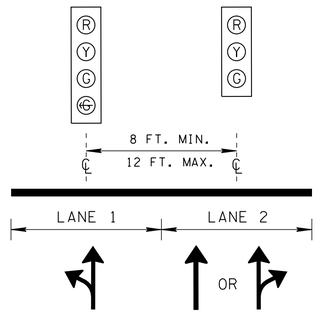


PROTECTED LEFT TURN OR SPLIT PHASING



PROTECTED LEFT TURN OR SPLIT PHASING WITH RIGHT TURN OVERLAP



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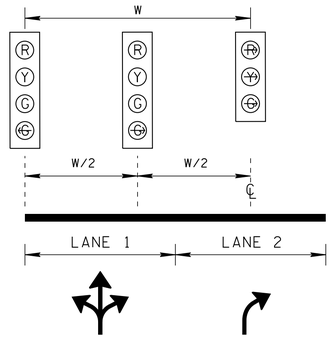
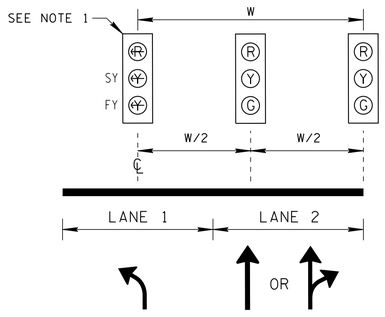
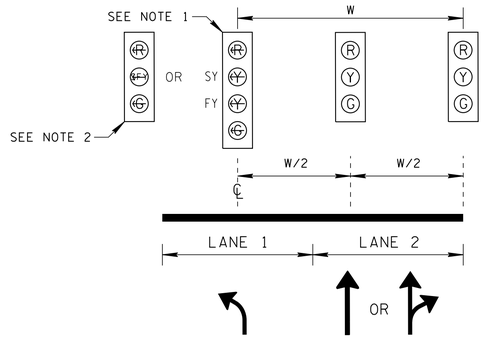


PROTECTED LEFT TURN OR SPLIT PHASING



FLASHING YELLOW ARROW PERMISSIVE LEFT TURN PHASING



FLASHING YELLOW ARROW PROTECTIVE/PERMISSIVE LEFT TURN PHASING

- REV. 10-21-19: RENAMED NOTE 2 TO NOTE 3. ADDED NOTE 2 AND "SEE NOTE 2" LABELS.
- REV. 09-12-23: ADDED A SIGNAL HEAD AND ADJUSTED LAYOUT FOR SIGNAL PLACEMENT ON ROW 2 COLUMN 3.

LEGEND
SY = STEADY YELLOW ARROW
FY = FLASHING YELLOW ARROW
SFY = STEADY AND FLASHING YELLOW ARROW

- MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

NOTE 1: WHERE THERE IS AN OPPOSITE LEFT TURN LANE APPROACH IN THE SAME ALIGNMENT AS THE LEFT TURN LANE, THE LEFT TURN SIGNAL HEAD IS OFFSET TWO FEET (MIN.) CLOSER TO THE THROUGH LANE IN ORDER TO INCREASE THE APPROACH'S SIGNAL HEAD VISIBILITY.

NOTE 2: THIS TRAFFIC SIGNAL HEAD CAN ONLY BE USED THROUGH INTERIM APPROVAL 17 (1A-17) OPTIONAL USE OF THREE -SECTION FLASHING YELLOW ARROW SIGNAL FACE. CONTACT TDOT'S STATE TRAFFIC ENGINEER TO REQUEST PERMISSION AND OBTAIN APPROVALTO UTILIZE THIS TRAFFIC SIGNAL HEAD.

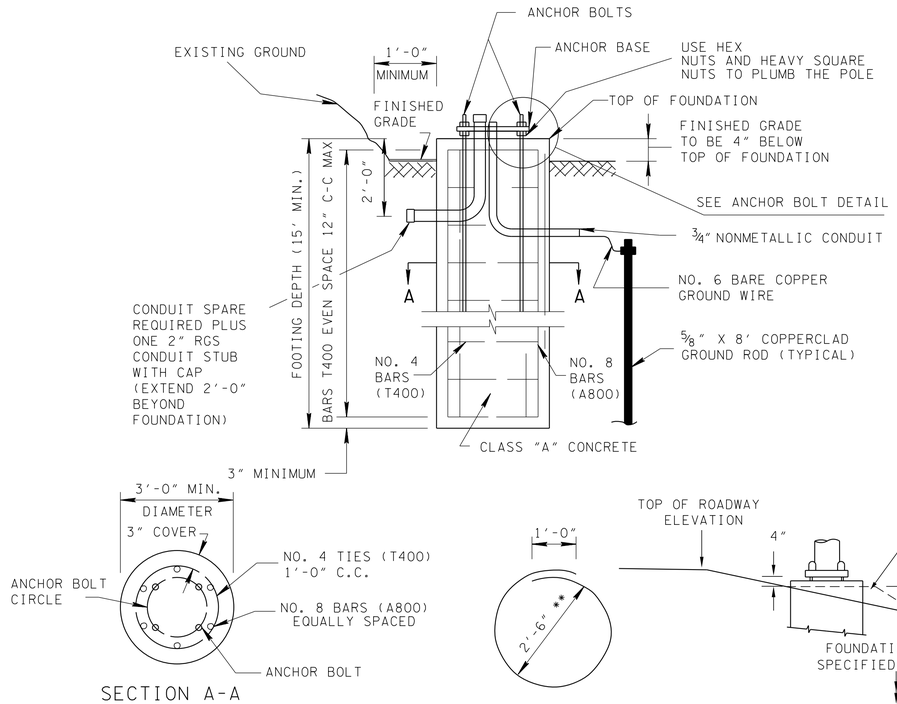
NOTE 3: SEE THE CURRENT EDITION OF THE MUTCD FOR ADDITIONAL INFORMATION REGARDING SIGNAL HEAD PLACEMENTS.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

TYPICAL SIGNAL HEAD PLACEMENT

TWO-LANE APPROACHES

6-27-16 | T-SG-7D



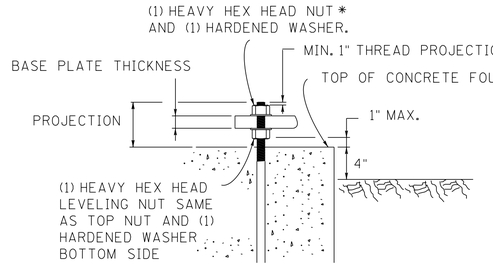
SECTION A-A

FOUNDATION DETAIL FOR STRAIN OR MAST ARM POLE

T400 BARS SHALL LAP 1'-0"

** FOR 3'-0" DIAMETER FOOTING. USE 3'-6" FOR 4'-0" DIAMETER FOOTING.

LOW SHOULDER FOUNDATION DETAIL



ANCHOR BOLT DETAIL

UNDER NO CONDITIONS WILL DRILLED AND GROUTED ANCHOR BOLTS BE ALLOWED

* NOTE: TOP NUT TO BE TORQUED TO PRODUCE 60% YIELD STRESS OF ANCHOR BOLT.
NOTE: DO NOT GROUT BETWEEN BOTTOM OF BASE PLATE AND TOP OF CONCRETE FOUNDATION.

REQUIRED BEARING AREA FOR ANCHOR BOLT

ANCHOR BOLT DIA (IN)	HEAD OR NUT AREA (SQ IN)
1"	1.800
1¼"	2.812
1½"	4.050
1¾"	5.512
2"	7.199
2¼"	9.122
2½"	11.249

POLE FOUNDATIONS WITH REINFORCEMENT AND QUANTITIES

FOOTING DIAMETER	FOOTING DEPTH	T400 REINFORCING BARS			A800 REINFORCING BARS			CONCRETE (CUBIC YARDS)	MAXIMUM DESIGN MOMENT (FT-KIP) SERVICE LOAD
		NUMBER OF BARS	LENGTH OF EACH BAR	TOTAL WEIGHT IN POUNDS	NUMBER OF BARS	LENGTH OF EACH BAR	TOTAL WEIGHT IN POUNDS		
3'-0"	15'-0"	15	8'-10"	89	14	14'-6"	542	3.9	134
3'-0"	16'-0"	16	8'-10"	95	14	15'-6"	579	4.2	150
3'-0"	17'-0"	17	8'-10"	101	14	16'-6"	617	4.5	167
3'-0"	18'-0"	18	8'-10"	107	14	17'-6"	654	4.7	184
3'-0"	19'-0"	19	8'-10"	113	14	18'-6"	692	5.0	202
3'-0"	20'-0"	20	8'-10"	119	14	19'-6"	729	5.2	221
3'-0"	21'-0"	21	8'-10"	125	14	20'-6"	766	5.5	240
3'-0"	22'-0"	22	8'-10"	130	14	21'-6"	804	5.8	260
3'-0"	23'-0"	23	8'-10"	136	14	22'-6"	841	6.0	280
3'-0"	24'-0"	24	8'-10"	142	14	23'-6"	878	6.3	300
4'-0"	15'-0"	15	12'-0"	121	24	14'-6"	929	7.0	179
4'-0"	16'-0"	16	12'-0"	128	24	15'-6"	993	7.4	200
4'-0"	17'-0"	17	12'-0"	136	24	16'-6"	1057	7.9	223
4'-0"	18'-0"	18	12'-0"	145	24	17'-6"	1121	8.4	246
4'-0"	19'-0"	19	12'-0"	153	24	18'-6"	1185	8.8	270
4'-0"	20'-0"	20	12'-0"	161	24	19'-6"	1250	9.3	295
4'-0"	21'-0"	21	12'-0"	169	24	20'-6"	1314	9.8	320
4'-0"	22'-0"	22	12'-0"	177	24	21'-6"	1378	10.2	346
4'-0"	23'-0"	23	12'-0"	185	24	22'-6"	1442	10.7	373
4'-0"	24'-0"	24	12'-0"	193	24	23'-6"	1506	11.2	401
4'-0"	25'-0"	25	12'-0"	201	24	24'-6"	1570	11.7	429
4'-0"	26'-0"	26	12'-0"	209	24	25'-6"	1634	12.1	458
4'-0"	27'-0"	27	12'-0"	217	24	26'-6"	1698	12.6	487
4'-0"	28'-0"	28	12'-0"	224	24	27'-6"	1762	13.0	517
4'-0"	29'-0"	29	12'-0"	233	24	28'-6"	1826	13.5	547
4'-0"	30'-0"	30	12'-0"	241	24	29'-6"	1890	14.0	578
4'-0"	31'-0"	31	12'-0"	248	24	30'-6"	1954	14.4	609
4'-0"	32'-0"	32	12'-0"	257	24	31'-6"	2019	14.9	641
2'-0"	6'-0"	7	5'-9"	27	6	5'-6"	88	0.7	(N)

GENERAL NOTES

(A) ALL STEEL STRAIN POLES AND MAST ARM SIGNAL POLES SHALL CONFORM TO "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION, SECTION 730 - TRAFFIC SIGNALS.

(B) STRAIN POLES AND MAST ARM POLES SHALL BE DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS (2015, FIRST EDITION).

(C) THE CONTRACTOR SHALL FURNISH POLES DESIGNED FOR A BASIC WIND SPEED OF 120 MPH (EXTREME I LIMIT STATE).

(D) ANCHOR BOLTS SHALL BE DESIGNED BY THE POLE FABRICATOR. THEY SHALL BE CAPABLE OF RESISTING THE FULL BENDING MOMENT OF THE SHAFT AT ITS YIELD STRENGTH STRESS.

MATERIAL SPECIFICATIONS - BOLTS:

1.) ANCHOR BOLTS SHALL BE ASTM F1554 GRADE 55 KSI WITH THREADS CONFORMING TO THE REQUIREMENTS OF ASTM A563.

2.) NUTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A563.

3.) ALL HARDWARE, EXCEPT STAINLESS STEEL, SHALL BE HOT DIPPED GALVANIZED ACCORDING TO ASTM A153 OR MECHANICALLY GALVANIZED ACCORDING TO ASTM B695.

(E) THE COST OF ALL FOOTING MATERIALS AND INSTALLATION SHALL BE INCLUDED IN THE PRICE BID FOR STEEL POLES.

(F) THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND DESIGN CALCULATIONS TO THE ENGINEER OF STRUCTURES FOR APPROVAL PRIOR TO FABRICATION.

(G) THE MAXIMUM MOMENT CAPACITY OF THE STRAIN POLES AND MAST ARM POLES SHALL BE AS SPECIFIED ON THE POLE SHOP DRAWINGS. CHOOSE A LARGER MAXIMUM DESIGN MOMENT FROM THE TABLE TO THE LEFT TO DETERMINE THE REQUIRED FOOTING DIAMETER AND DEPTH.

(H) CANTILEVER SIGNAL SUPPORTS SHALL BE DESIGNED BY THE POLE FABRICATOR.

(I) TOP OF FOOTING SHALL BE FLUSH IN SIDEWALK OR PAVED ISLANDS. TOP OF FOOTING SHALL NOT EXTEND MORE THAN 4" ABOVE THE GROUND LINE IN OTHER AREAS.

(J) IF ROCK IS ENCOUNTERED WHILE DRILLING FOR FOOTING, AND CORE AND THE DRILLING INDICATES ROCK IS SOLID, THE CONTRACTOR SHALL PROVIDE A ROCK SOCKET TWO TIMES THE DIAMETER OF THE POLE FOUNDATION.

(K) ALL STRAIN POLES AND MAST ARM POLES TO HAVE SPARE 2" RGS CONDUIT STUB EXTENDING 24" BEYOND POLE FOUNDATION.

(L) ALL CONDUIT BENDS IN POLE FOUNDATION TO BE 6" RADIUS.

(M) BASE OF POLE SHALL REMAIN OPEN TO PERMIT DRAINAGE AND AIR CIRCULATION. FINISHED GROUND PROFILE SHOULD DRAIN WATER AWAY FROM FOUNDATION.

(N) 2' DIAMETER FOUNDATION ONLY TO BE USED WITH PEDESTAL POLE A (SEE T-SG-6).

(O) FOR POLES WITH A BOLT CIRCLE GREATER THAN 24 INCHES, A 4'-0" DIAMETER FOUNDATION MUST BE SELECTED.

- ☐ REV. 9-18-89: ADDED NOTE (J) AND GRADE DETAILS TO FOOTING DETAIL.
- ☐ REV. 1-18-91: REDREW AND REORGANIZED SHEET. ADDED GENERAL NOTE (K) REGARDING FOOTINGS IN ROCK.
- ☐ REV. 1-19-96: CHANGED GENERAL NOTE (A).
- ☐ REV. 2-14-99: REVISED GENERAL NOTE (K).

  REV. 12-16-03: REVISED SHEET TITLE. DELETED ESTIMATED QUANTITY FOR FOUNDATIONS LESS THAN 10', ADDED SPARE CONDUIT TO STRAIN OR MAST ARM FOUNDATION DETAIL, ADDED LOW SHOULDER FOUNDATION DETAIL, DELETED NOTE G, RE LETTERED REMAINING NOTES AND ADDED NOTES (L) TO (N).

  REV. 7-29-04: MODIFIED ESTIMATED FOOTING QUANTITIES FOR STRAIN POLE TABLE. ADDED LOWER SHOULDER FOUNDATION DETAIL.
- ☐ REV. 02-15-07: ADDED ANCHOR BOLT DETAIL. REVISED GENERAL NOTES (D),(G) & (N) AND CHANGED TITLE.
- ☐ REV. 1-5-10: MODIFIED ESTIMATED FOUNDATION QUANTITIES TABLE.

  REV. 5-6-13: MODIFIED ESTIMATED FOUNDATION QUANTITIES, T400 BARS, GENERAL NOTES AND FOUNDATION DETAILS.
- ☐ REV. 12-4-13: CHANGED ANCHOR BOLTS TO THREADED. ADDED BEARING AREA TABLE.
- ☐ REV. 6-11-14: ADDED 2' DIA FOUNDATION FOR PEDESTAL POLES. ADDED NOTES (N).

  REV. 6-27-16: CORRECTED SPELLING ERRORS IN GENERAL NOTES AND REVISED NOTE (N). REVISED FOOTING DETAIL FOR STEEL PEDESTAL POLE A AND MOVED IT TO T-SG-6. ADDED NOTE TO SECTION A-A FOR SPACING OF NO. 7 BARS.
- ☐ REV. 7-11-17: ADDED "(FOR BID PURPOSES ONLY)" TO ESTIMATED FOUNDATION QUANTITIES TABLE. SPECIFIED POLE "A" IN NOTE (N).
- ☐ REV. 9-12-23: RENAMED TABLE TO "POLE FOUNDATIONS WITH REINFORCEMENT AND QUANTITES". CHANGED NO. 7 BARS (A700) TO NO. 8 BARS (A800) AND UPDATED TABLE. REMOVED "SEE NOTES (N) AND (O)". REMOVED NOTE REGARDING 4' FOOTING MAX SPACING FROM FOUNDATION DETAIL FOR STRAIN OR MAST ARM POLE. REMOVED NOTE REGARDING CANTILEVER AND BUTTERFLY SIGN BASES FROM ANCHOR BOLT DETAIL. REVISED GENERAL NOTES (A), (B), (C), (F), (G), AND (J). ADDED GENERAL NOTE (O). CHANGED "STRAIN POLES" TO "STRAIN POLE" IN SHEET TITLE BLOCK.

☐ MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

MAST ARM POLE AND STRAIN POLE FOUNDATION DETAILS

BEFORE 9-18-89 | T-SG-10

9/14/2023 8:2h:24 AM
C:\Users\JJ0223\Documents\Documents\STD DWG\Drawings\TSD10_09122023.DGN