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US 311 (S. MAIN ST.) AT NC 65 [NORTH INTERSECTION]

STANDARD DRAWINGS FOR METAL POLES

SIG. 2.0-2.6

M1-M8

09-0360

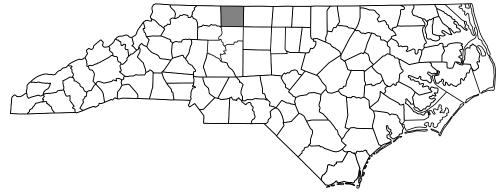
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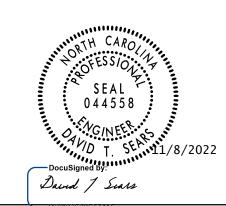
Legend

(XX-XXXX) - SIGNAL INVENTORY NUMBER

Project No. Sheet No.

R-5768 Sig. 1.0





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Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.

Prepared for the Office of:

DIVISION OF HIGHWAYS

TRANSPORTATION MOBILITY AND SAFETY

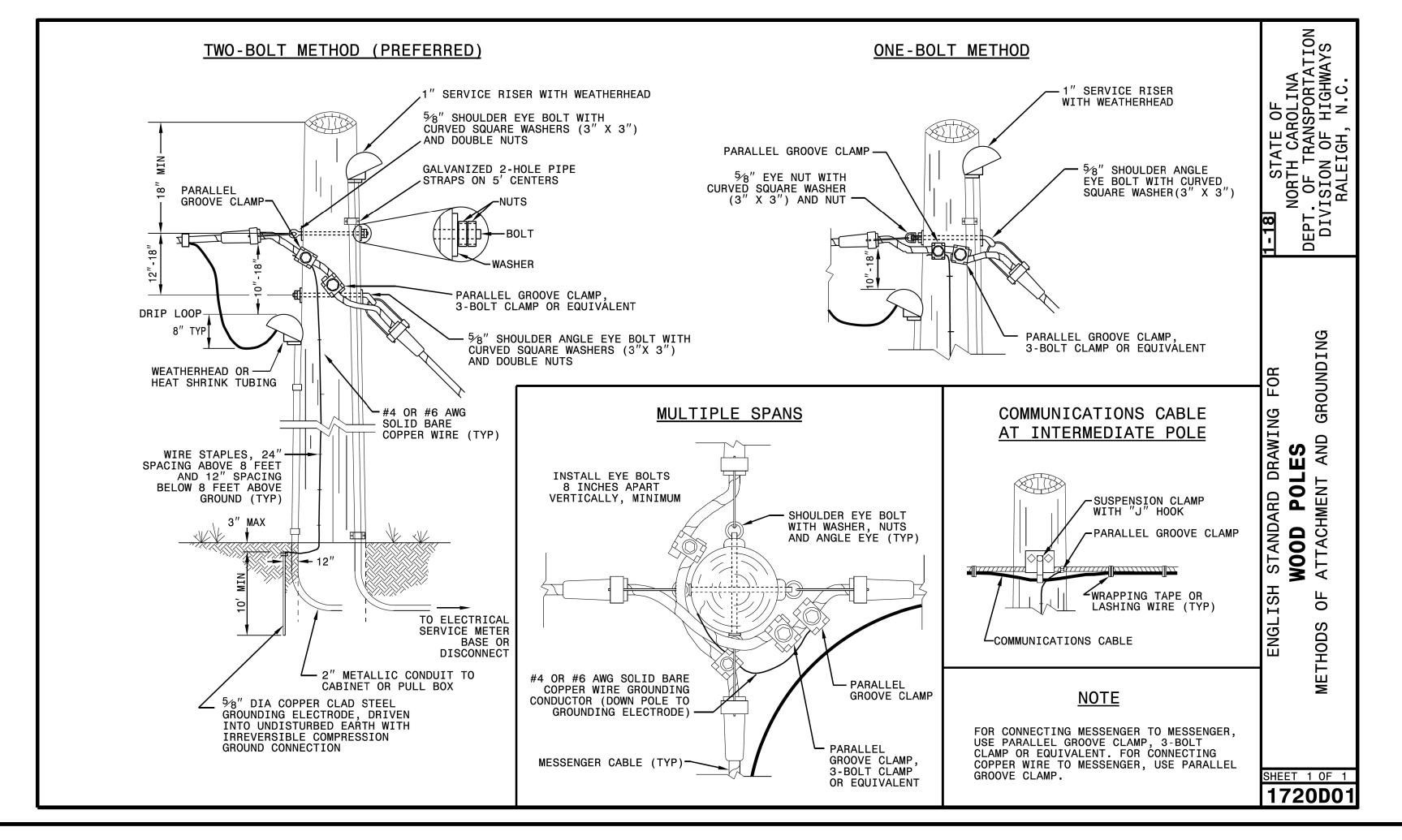
Robert J. Ziemba, P.E. - Central Region Signals Engineer
D. Todd Joyce, P.E. - Signal Equipment Design Engineer

DIVISION

Mobility one Sold Report No. 100 No.

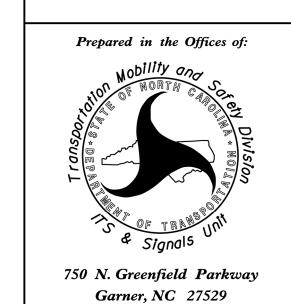
750 N. Greenfield Parkway, Garner, NC 27529

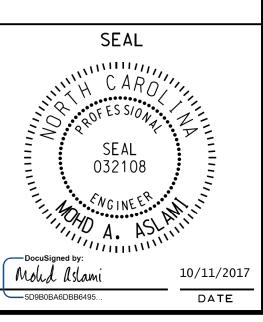
1-18 STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTAT
DIVISION OF HIGHWAY
RALEIGH, N.C. CONDUCTOR TO POWER MESSENGER CABLE\_ GROUNDING CONNECTION SYSTEM POLE GROUND METER BASE CONNECTION LOCK NUT #8 AWG MIN #8 AWG MIN STRANDED COPPER (BLACK) STRANDED COPPER (WHITE) SERVICE DISCONNECT 120 V SINGLE POLE BREAKER - NEUTRAL BUS MAIN BONDING SCREW #8 AWG MIN\_ STRANDED COPPER (WHITE) #6 AWG MIN GROUNDING GREEN INSULATED #8 AWG MIN STRANDED COPPER (BLACK) STRANDED COPPER WIRE GROUNDING/BONDING BUSHING-#4 AWG SOLID BARE - COPPER WIRE TO GROUNDING ELECTRODE LOCK NUTS -FOR JOINT USE POLES ONLY, #6 AWG MIN SOLID BARE COPPER WITH SPLIT BOLT CONNECTORS OR SYSTEM PARALLEL GROOVE CLAMPS ON EACH END (CONNECTION TO BE MADE ABOVE SPECIAL ROUTING SHOWN BELOW) TRICAL SERVICE GROUNDING AND BO WIRE STAPLES, 24" SPACING ABOVE 8 FEET AND 12" SPACING BELOW 8 FEET ABOVE GROUND (TYP) PROVIDE WIRING ROUTING AND STAPLING SO THAT STAPLES MAY BE TEMPORARILY REMOVED AND GROUNDING WIRES CAN BE PULLED MIN 1.5" OFF POLE & SPACED MAX 0.75" APART TO ENABLE TESTING OF GROUNDING → ELECTRICAL SERVICE ELECTRODE RESISTANCE BY CLAMP ON TESTER TO CABINET C Ш 5/8" DIA COPPER CLAD STEEL GROUNDING ELECTRODES, WITH 딥 IRREVERSIBLE COMPRESSION GROUND CONNECTOR SHEET 1 OF 1 1700D01



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# See Plate for Title

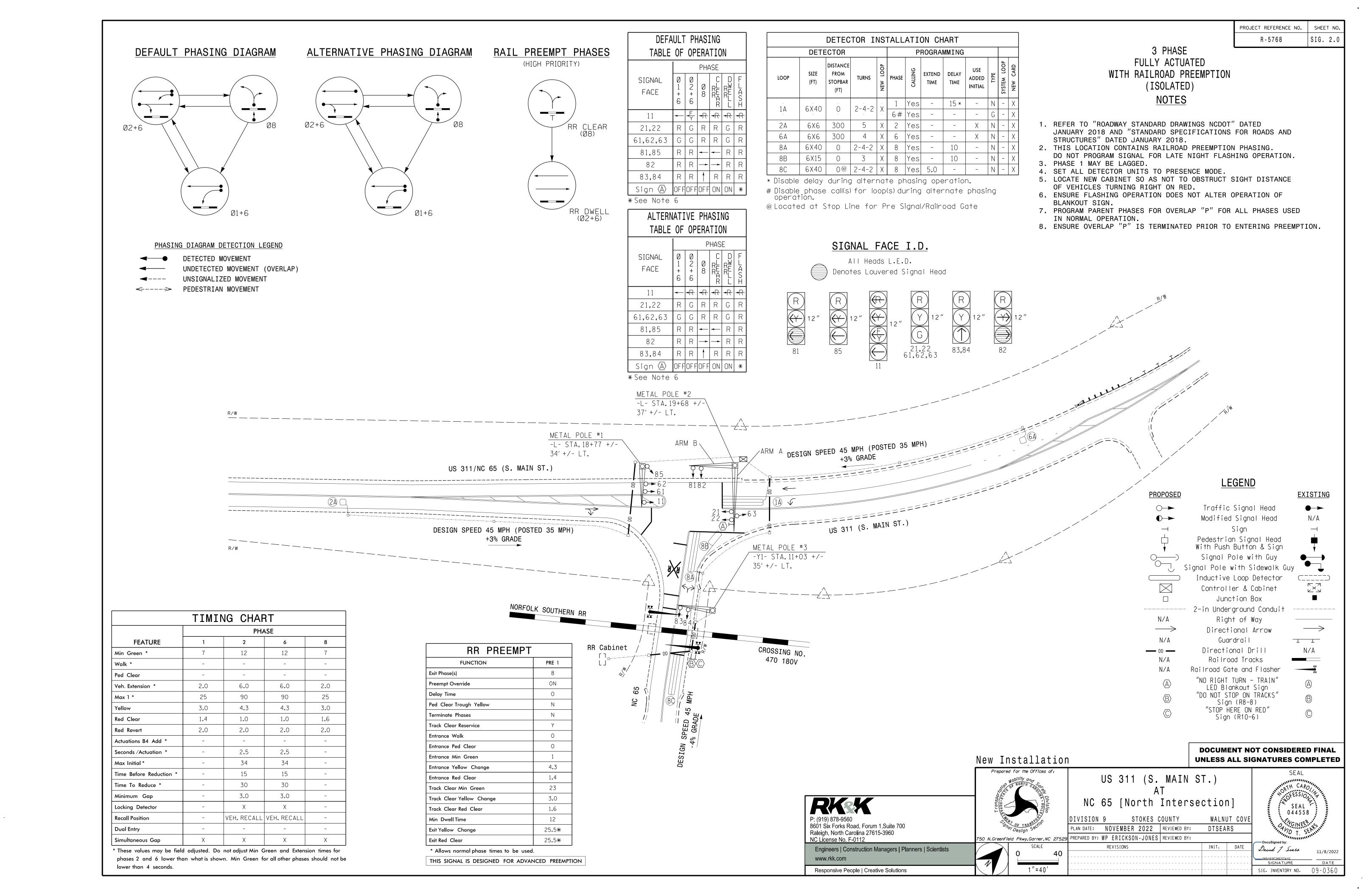




PROJECT NO.

R-5768

SHEET NO



#### NOTES

- 1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- 2. Program controller to start up in phase 2 Green and 6 Green.
- 3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.

#### **EQUIPMENT INFORMATION**

\* See Overlap Programming Detail on sheet 2

CONTROLLER2070LX
CABINET
SOFTWAREECONOLITE ASC/3-2070
CABINET MOUNTBASE
OUTPUT FILE POSITIONS18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USEDS1,S2,S8,S11,AUX S1,AUX S5
PHASES USED
OVERLAP "A"*
OVERLAP "B"NOT USED
OVERLAP "C"NOT USED
OVERLAP "D"8
OVERLAP "P"1+2+6+8

SIGNAL HEAD HOOK-UP CHART | S2 | S3 | S4 | S5 | S6 | CMU CHANNEL NO. 6 | 15 | 7 | 8 | 16 | 9 | 10 | 17 | 11 2 | 13 | 3 | 8 8 OLA OLB SPARE OLC OLD SPARE PHASE NU 61,62, NU NU 81,82, NU 11 NU NU NU 83,84 NU SIGNAL HEAD NO. 128 134 107 RED **\*** 129 135 A102 YELLOW 136 GREEN 130 RED A121 ARROW YELLOW 108 ARROW FLASHING YELLOW ARROW A123 GREEN ARROW 109

NU = Not Used

- \* Denotes install load resistor. See load resistor installation detail this sheet.
- ★ See pictorial of head wiring in detail this sheet.

#### INPUT FILE POSITION LAYOUT

							(front	view)						
ſ	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE U	Ø 1 1A	ø 2 2A	S L O T	SLOT	S LOT	S LOT	SLOT I	SLOT	S LOT	SLOT	S LOT	S LOT	S LOT	FS DC ISOLATOR
"I" L	NOT USED	NOT USED	E M P T Y	E MPTY	E M P T Y	EMPTY	E MPTY	E M P T Y	E MPTY	E M P T Y	E M P T Y	E M P T Y	E M P T Y	ST DC ISOLATOR
FILE U	S L O T	ø 6 6A	S L OT	WIRED &	S L O T	Ø 8 8A	ø 8 8C	S L OT	S L O T	S L O T	S L O T	S L O T	S L O T	PRE1  AC ISOLATOR
"J" L	E M P T Y	NOT USED	E M P T Y	I Z P U T	E M P T Y	ø 8 8B	NOT USED	E M P T Y	E MPTY	E M P T Y	E M P T Y	E M P T Y	E M P T Y	NOT USED

EX.: 1A, 2A, ETC. = LOOP NO.'S

of any jumper allows its channels to run concurrently.

2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.

4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

3. Ensure that Red Enable is active at all times during normal operation.

FS = FLASH SENSE ST = STOP TIME  $^{igotimes}$  Wired Input - Do not populate slot with detector card PRF1 = RR PRFFMPT

#### INPUT FILE CONNECTION & PROGRAMMING CHART

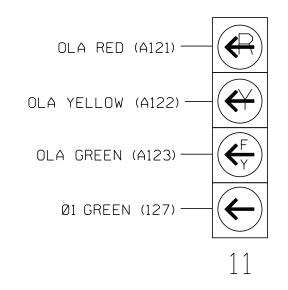
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND TIME	DELAY TIME	ADDED INITIAL	DETECTOR TYPE
1A 1	TB2-1,2	I1U	56	<b>★</b> 1	1	YES		15		N
I H	-	J4U	48	<b>★</b> 26	6	YES				G
2A	TB2-5,6	I2U	39	2	2	YES			Χ	N
6A	TB3-5,6	J2U	40	6	6	YES			Χ	N
8A	TB5-9,10	J6U	42	8	8	YES		10		N
8B	TB5-11,12	J6L	46	18	8	YES		10		N
8C	TB7-1,2	J7U	66	38	8	YES	5.0			N

¹Add jumper from I1-W to J4-W, on rear of input file.

★For the detectors to work as shown on the signal design plan, see the Vehicle Setup Programming Detail for Alternate Phasing on Sheet 2.

#### FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-0360 DESIGNED: November 2022 SEALED: November 8,2022 REVISED:

PROJECT REFERENCE NO.

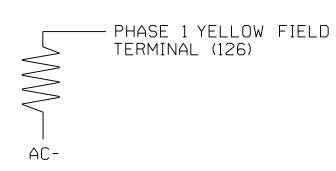
R-5768

Sig 2

# LOAD RESISTOR INSTALLATION DETAIL

(install resistor as shown below)

ACCEPTABLE VALUES VALUE (ohms) | WATTAGE 1.5K - 1.9K 25W (min) 2.ØK - 3.ØK | 1ØW (min)



# INPUT FILE POSITION LEGEND: J2L SLOT 2-LOWER-

= DENOTES POSITION OF SWITCH

| Electrical Detail - Sheet 1 of 4

ELECTRICAL AND PROGRAMMING

US 311 (S.Main St.) DETAILS FOR: Prepared for the Offices of: NC 65 [North Intersection]

PLAN DATE: November 2022 REVIEWED BY: J O Deaton PREPARED BY: M W Yalch REVIEWED BY: REVISIONS

James O. Deaton 11/8/2022

SIG. INVENTORY NO. 09-0360

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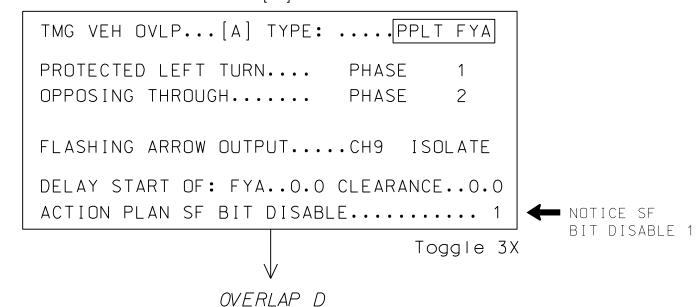
# ECONOLITE ASC/3-2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

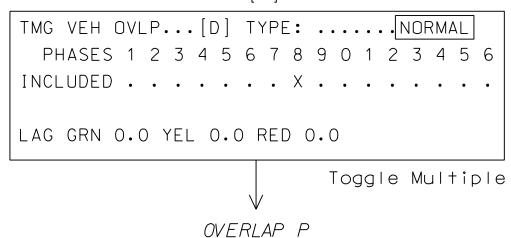
1. From Main Menu select | 2. CONTROLLER 2. From CONTROLLER Submenu select | 2. VEHICLE OVERLAPS

#### OVERLAP A

Select TMG VEH OVLP [A] and 'PPLT FYA'



Select TMG VEH OVLP [D] and 'NORMAL'



Select TMG VEH OVLP [P] and 'NORMAL'

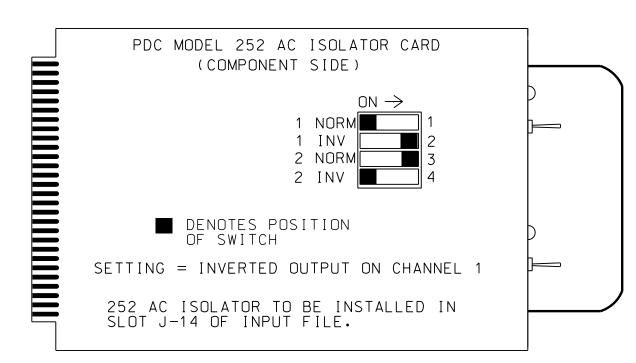
TMG VEH OVLP...[P] TYPE: ......NORMAL PHASES 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 LAG GRN 0.0 YEL 0.0 RED 0.0

END PROGRAMMING

The utilization of Overlap P ensures consistent clearance timing during transition to preemption

### PREEMPT 1 AC ISOLATOR (MODEL 252) OUTPUT PROGRAMMING DETAIL

(set DIP switches as shown below)



NOTE: IF ANOTHER MANUFACTURER TYPE OF AC ISOLATOR IS USED, OUTPUT PROGRAMMING IS LIKELY NOT TO EQUATE TO THAT SHOWN ABOVE.

# ECONOLITE ASC/3-2070 VEHICLE DETECTOR SETUP PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOP 1A

(program controller as shown)

Program detectors per the input file connection and programming chart shown on sheet 1 before proceeding.

- 1. From Main Menu select | 8. UTILITIES |
- 2. From UTILITIES Submenu select | 1. COPY/CLEAR
- 3. Copy from DETECTOR PLAN "1" to DETECTOR PLAN "2".

COPY / CLEAR UTILITY FROM PHASE TIMING.... > PHASE TIMING.... TIMING PLAN..... > TIMING PLAN..... PH DET OPT PLAN. . > PH DET OPT PLAN. . DETECTOR PLAN... 1 > DETECTOR PLAN... 2 TOGGLE TO SELECT A "FROM" AND A "TO" THEN PRESS ENTER

- 4. From Main Menu select 6. DETECTORS
- 5. From DETECTOR Submenu select | 2. VEHICLE DETECTOR SETUP
- 6. Place cursor in VEH DET PLAN [ ] position and enter "2".
  - Place cursor in VEH DETECTOR [ ] position and enter "1". - Set delay time to "0".

VEH DETECTOR [ 1] VEH DET PLAN [ 2] TYPE: S-STANDARD TS2 DETECTOR..... ECPI LOG..... NO DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 EXTEND TIME... O.O DELAY TIME... O.O USE ADDED INITIAL . CROSS SWITCH PH.. 0 LOCK IN..... NONE NTCIP VOL . OR OCC PMT QUEUE DELAY. NO

- Place cursor in VEH DETECTOR [ ] position and enter "26".
- Set assigned phase to "0".

VEH DETECTOR [26] VEH DET PLAN [2] DET PLAN 2 TYPE: G-GREEN EXTENSION/DELAY TS2 DETECTOR..... ECPI LOG..... NO DET PH - 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 IS SET TO "O" EXTEND TIME... O.O DELAY TIME... O.O USE ADDED INITIAL . CROSS SWITCH PH.. 0 LOCK IN..... NONE NTCIP VOL . OR OCC PMT QUEUE DELAY. NO

END PROGRAMMING

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-0360 DESIGNED: November 2022 SEALED: November 8, 2022 REVISED:

#### Electrical Detail - Sheet 2 of 4

ELECTRICAL AND PROGRAMMING Prepared for the Offices of:

US 311 (S.Main St.) NC 65 [North Intersection]

Stokes County REVIEWED BY:

PLAN DATE: November 2022 REVIEWED BY: J O Deaton PREPARED BY: M W Yalch REVISIONS

SEAL 07438 James O. Deaton 11/8/2022

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SIG. INVENTORY NO. 09-0360

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UNLESS ALL SIGNATURES COMPLETED

# ECONOLITE ASC/3-2070 RAILROAD PREEMPT PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select | 4. PREEMPTOR/TSP

2. From PREEMPTOR/TSP/SCP Submenu select | 1. PREEMPT PLAN 1-10 |

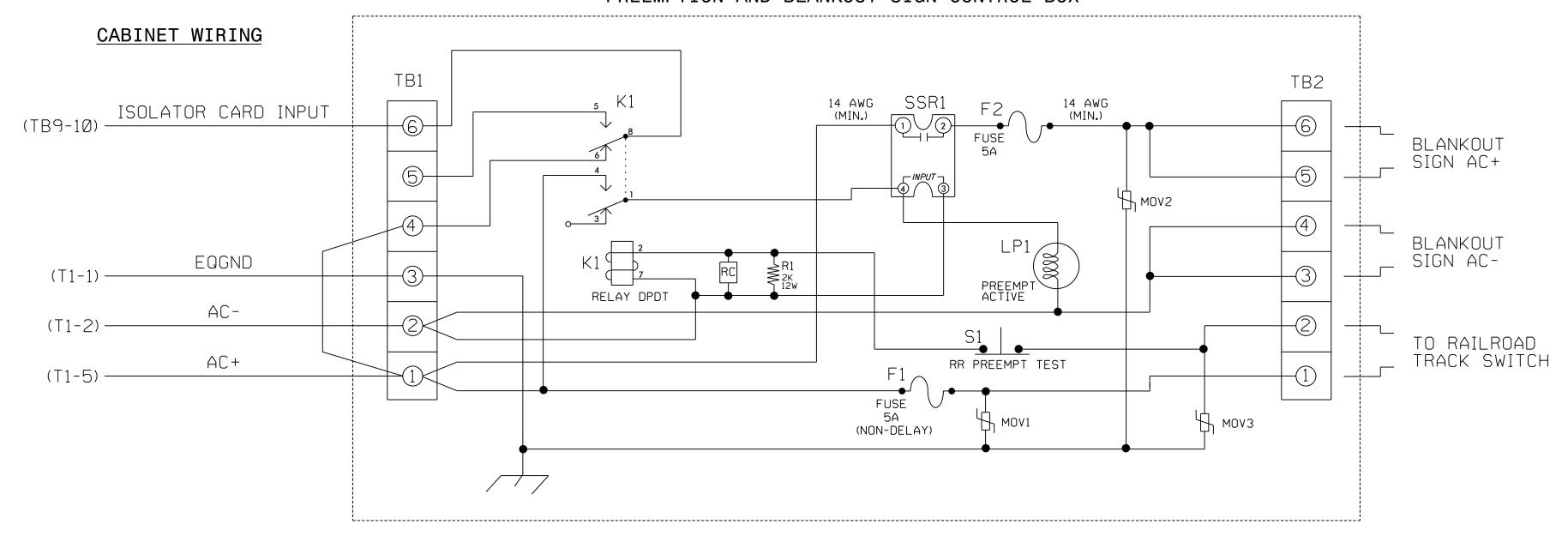
Place cursor in [ ] next to Preempt Plan and press 1. Then press the right cursor arrow and toggle the controller to YES. Next cursor down. This will select Railroad Preempt #1.

PREEMPT PLAN [ 1] ENABLE....YES VEH/PED 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 OVERLAP A B C D E F G H I J K L M N O P ENABLE... YESIPMT OVRIDE.XIINTERLOCK. NO DET LOCK... XIDELAY.. OIINHIBIT... O OVERIDE FL. . IDURATION OICLR-GRN... NO TERM OLP. NOIPC>YEL NOITERM PH NO PED DARK.. NOITC RESRV YESIDWELL FL OFF LINK PMT....OIX FLCOLR REDIEXIT OPT. OFF X TMG PLN...OIRE-SERV.. OIFLT TYPE.HARD FREE DUR PMTIR1 NOIR2 NOIR3 NOIR4 NO --TIMING----WALKIPED CLIMN GRI YELI RED ENTRANCE TM. 2551 2551 11 4.31 1.4 ----MIN GRIEXT GRIMX GRI YELI RED TRACK CLEAR 231 01 01 3.01 1.6 ----MIN DLIPMTEXTIMX TMI YELI RED DWL/CYC-EXIT 121 0.01 0125.5125.5 PMT ACTIVE OUT..ON PMT ACT DWELL...NO OTHER - PRI PMT.OFF NON-PRI PMT....OFF INH EXT TIME... O.O PED PR RETURN...OFF PRIORITY RETURN.OFF QUEUE DELAY.... OFF COND DELAY....OFF 1 2 3 4 5 6 7 8 PR RTN% 0 0 0 0 0 0 0 PHASES 9 10 11 12 13 14 15 16 PR RTN% 0 0 0 0 0 0 0

#### RAILROAD PREEMPTION WIRING DETAIL

(wire as shown below)

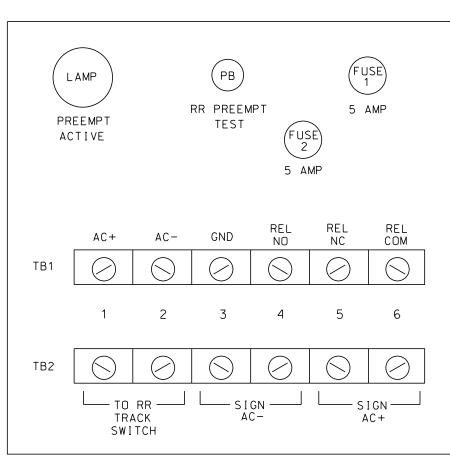
#### PREEMPTION AND BLANKOUT SIGN CONTROL BOX



#### NOTES

- 1. Relay K1 is shown in the energized (Preempt <u>not</u> active) normal operation state.
- 2. Relay K1 is a DPDT with 120VAC coil with octal base.
- 3. Relay SSR1 is a SPST (normally open) Solid State Relay with AC input and AC (25 amp) output.
- 4. AC Isolator Card shall activate preemption upon removal of AC+ from the input (as shown above). To accomplish this set invert dip switch on AC Isolator Card.
- 5. IMPORTANT!! A jumper must be added between input file terminals J14-E and J14-K if not already present. Also, terminal TB9-12 (on input panel) shall be connected to AC neutral (jumper may have to be added).

#### FRONT VIEW



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-0360 DESIGNED: November 2022 SEALED: November 8,2022 REVISED:

#### Electrical Detail - Sheet 3 of 4

ELECTRICAL AND PROGRAMMING Prepared for the Offices of:

NC 65 [North Intersection]

US 311 (S.Main St.)

PLAN DATE: November 2022 REVIEWED BY: J O Deaton PREPARED BY: M W Yalch REVIEWED BY: REVISIONS

SEAL 07438

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James O. Deaton 11/8/2022 SIG. INVENTORY NO. 09-0360

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2. From TIME BASE Submenu select | 2. ACTION PLAN

ACTION PLAN...[ \*] PATTERN..... AUTO SYS OVERRIDE.... NO TIMING PLAN..... O SEQUENCE.... O VEH DETECTOR PLAN.. 2 DET LOG.....NONE FLASH..... -- RED REST.... NO VEH DET DIAG PLN... O PED DET DIAG PLN... DIMMING ENABLE.. NO PRIORITY RETURN, NO PED PR RETURN.. NO QUEUE DELAY.... NO PMT COND DELAY NO PHASE 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 PHASE 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 SPC FCT X . . . . . (1-8) AUX FCT . . (1-3) 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 

\* The Action Plan number(s) are to be determined by the Division and/or City Traffic Engineer.

## ECONOLITE ASC/3-2070 PREEMPT FILTERING PROGRAMMING DETAIL

(program controller as shown)

1. From Main Menu select | 4. PREEMPTOR/TSP

2. From PREEMPT/TSP/SCP Submenu select | 2. ENABLE PREEMPT FILTERING & TSP/SCP

ENABLE PREEMPT FILTERING & TSP/SCP FILTERED SOLID PULSING INPUT 1 ... PREEMPT 1. ... BYPASSED.. 2 ...BYPASSED.. ...BYPASSED.. 3 ...BYPASSED.. ...BYPASSED.. 4 ...BYPASSED.. ...BYPASSED.. 5 ...BYPASSED.. ...BYPASSED.. 6 ...BYPASSED.. ...BYPASSED.. 7 ...BYPASSED.. ...BYPASSED.. 8 ...BYPASSED.. ...BYPASSED.. 9 ...BYPASSED.. ...BYPASSED.. 10 ...BYPASSED.. ...BYPASSED..

PROJECT REFERENCE NO.

## ALTERNATE PHASING ACTIVATION DETAIL

TO RUN ALT, PHASING DURING <u>COORDINATION</u> — SELECT THE TIME BASED ACTION PLAN THAT IS PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BIT 1.

TO RUN ALT. PHASING DURING <u>FREE RUN</u> - PROGRAM CHANGES (SHOWN BELOW) IN A TIME-BASED ACTION PLAN. SCHEDULE A DAY PLAN THAT INCLUDES THE ACTION PLAN PROGRAMMED TO SELECT VEH DET PLAN 2 AND ENABLE SF BIT 1.

PHAS I NG	VEH DET PLAN	SF BITS ENABLED
ACTIVE PAGES REQUIRED TO RUN <u>DEFAULT PHASIN</u> G	1	NONE
ACTIVE PAGES REQUIRED TO RUN <u>ALTERNATE PHASING</u>	2	1

IMPORTANT: IF ALT, PHASING IS USED DURING FREE RUN AND COORDINATION, DO NOT OPERATE TIME OF DAY EVENTS CONCURRENTLY WITH COORDINATION PLAN EVENTS IN THE EVENT SCHEDULER. (EX. FREE RUN EVENT SHOULD END BEFORE COORDINATION PLAN EVENT STARTS AND VICE-VERSA).

#### ALTERNATE PHASING PAGE CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OF WHAT TAKES PLACE WHEN THESE OVERLAP/INPUT PAGE CHANGES ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAPS PAGE 2: Modifies overlap parent phases for head 11 to run protected

turns only.

INPUTS PAGE 2: Disables phase 6 call on loop 1A and reduces delay time for phase 1

call on loop 1A to 0 seconds.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 09-0360 DESIGNED: November 2022 SEALED: November 8,2022 REVISED:

Electrical Detail - Sheet 4 of 4

ELECTRICAL AND PROGRAMMING

Prepared for the Offices of:

US 311 (S.Main St.) NC 65 [North Intersection]

Stokes County PLAN DATE: November 2022 REVIEWED BY: J O Deaton PREPARED BY: M W Yalch REVIEWED BY:

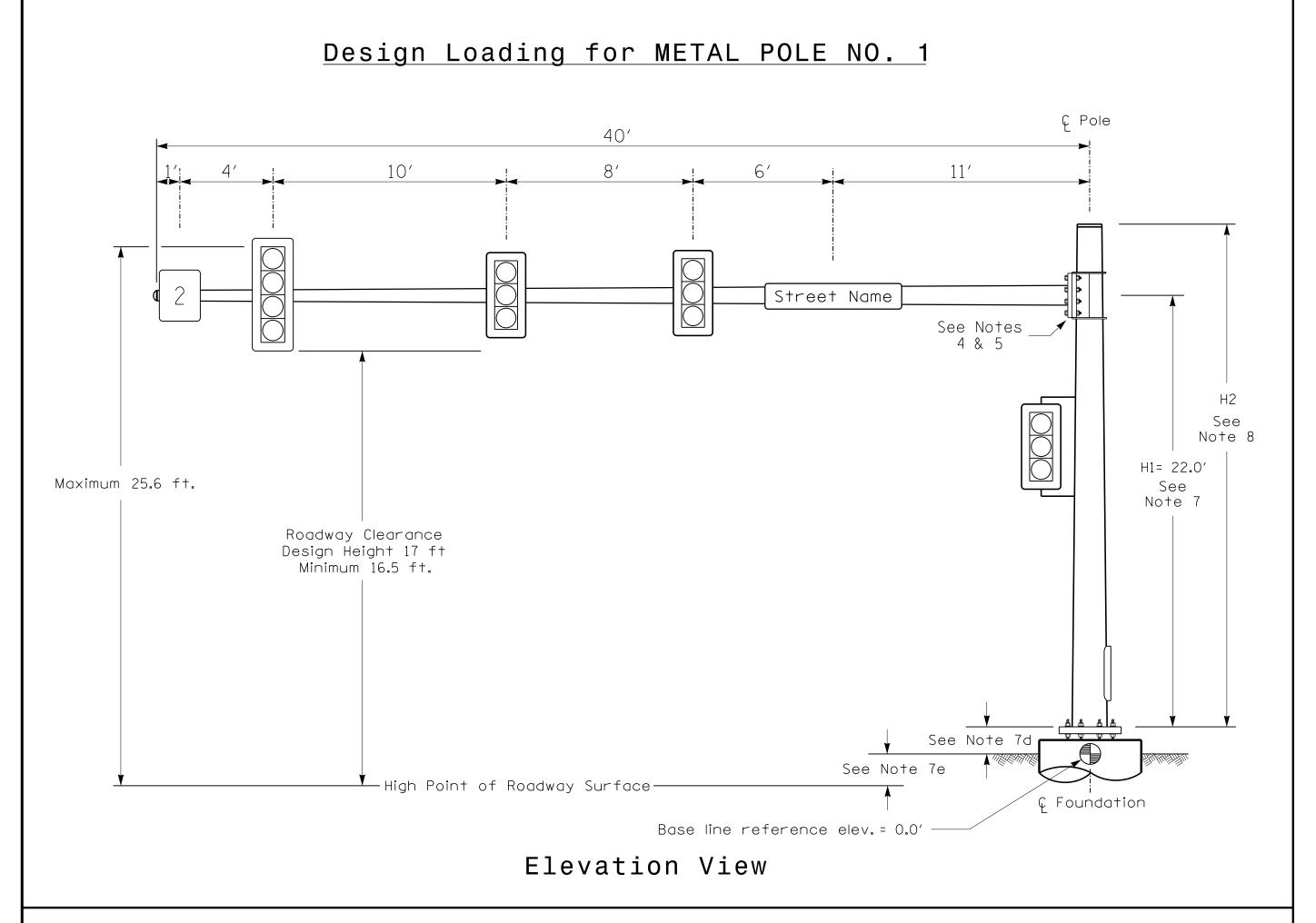
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REVISIONS

James O. Deaton 11/8/2022 SIG. INVENTORY NO. 09-0360

SEAL 07438



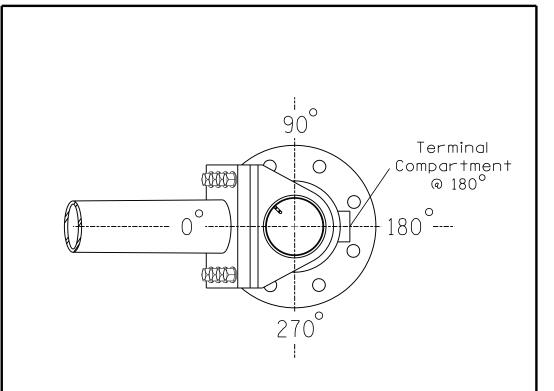
# Design Loading for METAL POLE NO. 3 Ç Pole 20′ See Notes \_ 4 & 5 See Note 8 H1= 22.5′ Maximum 25.6 ft. Note 7 Roadway Clearance Design Height 17 ft Minimum 16.5 ft. See Note 7d r — High Point of Roadway Surface— © Foundation Base line reference elev. = 0.0' Elevation View

#### SPECIAL NOTE

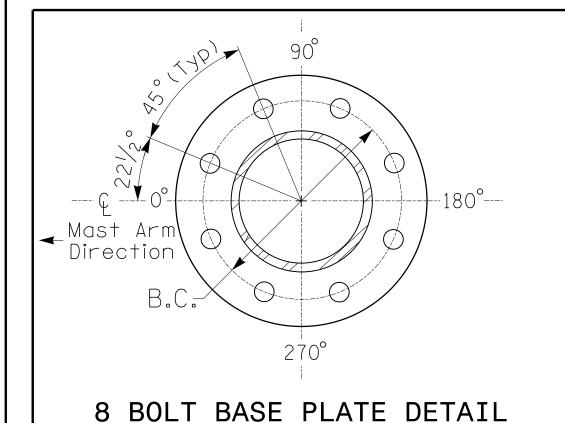
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

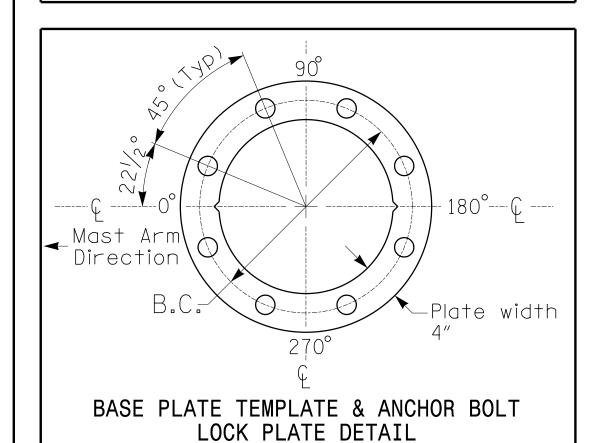
#### Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	Pole 3
Baseline reference point at © Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+3.0 ft.	+3.6 ft.
Elevation difference at Edge of travelway or face of curb	+2.5 ft.	+3.1 ft.



#### POLE RADIAL ORIENTATION





For 8 Bolt Base Plate

See Note 6

#### METAL POLES No. 1 AND No. 3

0	<u> </u>		R - 576	8	SIG.
SC	HEDU	LE			
	A DE A	CI7E	WEIGHT		

PROJECT REFERENCE NO.

	MAST ARM LOADING SC	HEDU	LE	
LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5″W X 66.0″L	74 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5″W X 52.5″L	60 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0"W X 36.0"L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0"W X 96.0"L	36 LBS

**NOTES** 

#### DESIGN REFERENCE MATERIAL

- 1. Design the traffic signal structure and foundation in accordance with: • The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
- The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
- The 2018 NCDOT Roadway Standard Drawings.
- The traffic signal project plans and special provisions.
- The NCDOT "MetalPole Standards" located at the following NCDOT website:
- https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

#### DESIGN REQUIREMENTS

- 2. Design the traffic signalstructure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signalplans for the actualloads that will be applied at the time of the installation.
- 3. Design all signal supports using stress ratios that do not exceed 0.9.
- 4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
- 5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
- 6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- 7. The mast arm attachment height (H1) shown is based on the following design assumptions: a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
- b. Signalheads are rigidly mounted and vertically centered on the mast arm.
- c. The roadway clearance height for design is as shown in the elevation views.
- d. The top of the pole base plate is 0.75 feet above the ground elevation.
- e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground leveland the high point of the roadway.
- 8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
- Mast arm attachment height (H1) plus 2 feet, or
- H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot. 9. If pole location adjustments are required, the contractor must gain approval from the
- Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
- 10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signalheads over the roadway.
- 11. The contractor is responsible for providing soilpenetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.



RKX 8601 Six Forks Road, Forum 1, Suite 700 Raleigh, North Carolina 27615-3960 NC License No. F-0112

Engineers | Construction Managers | Planners | Scientists

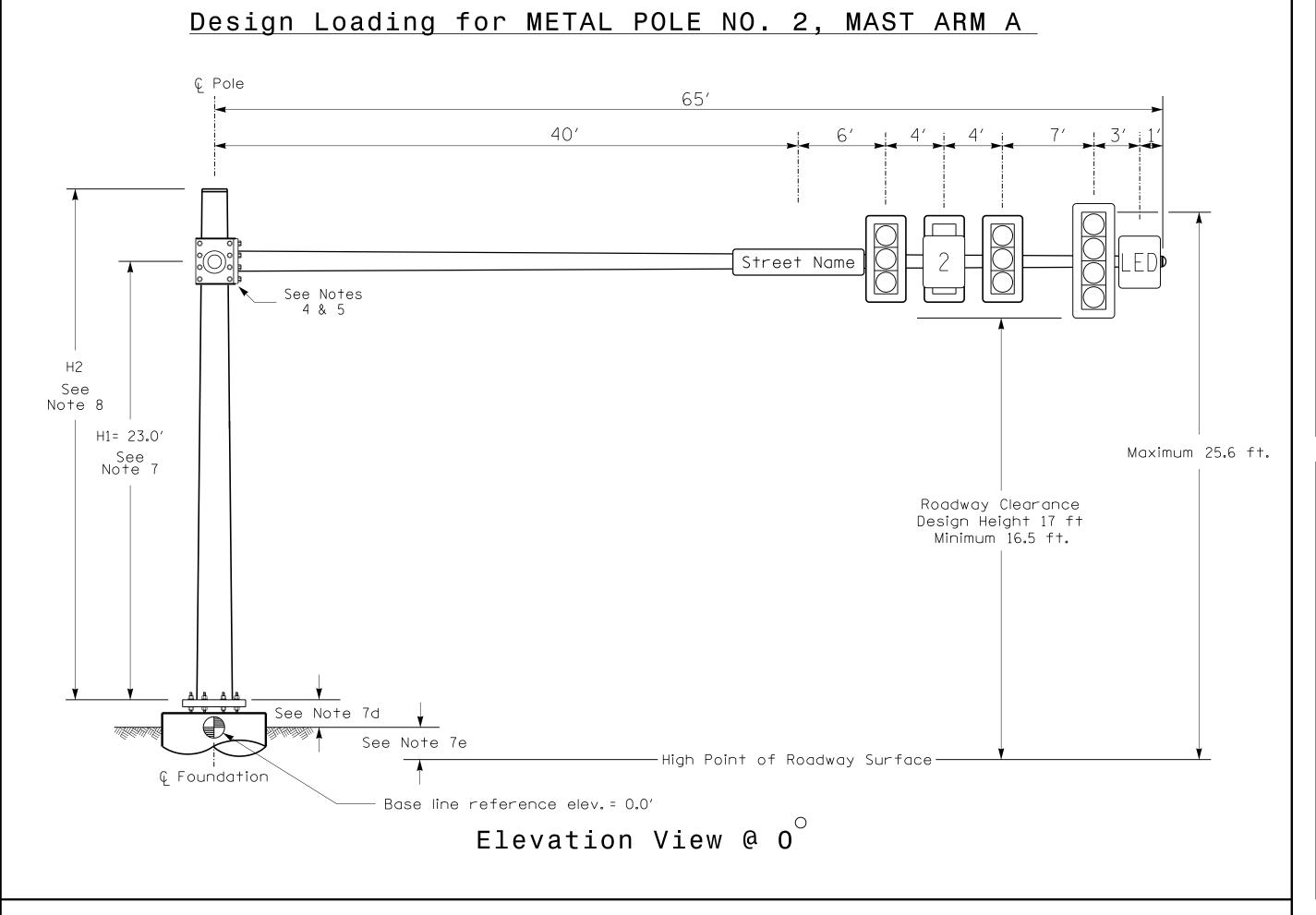
N/A

NCDOT Wind Zone 4 (90 mph) Responsive People | Creative Solutions US 311 (S. MAIN ST.) NC 65 [North Intersection] DIVISION 9 STOKES CO. WALNUT COVE PLAN DATE: NOVEMBER 2022 REVIEWED BY: DTSEARS 50 N.Greenfield Pkwy.Garner.NC 27529 PREPARED BY:WP ERICKSON-JONES REVIEWED BY:

REVISIONS

044558 INIT. DATE David / Scars

SIG. INVENTORY NO. 09-0360



# Ç Pole 27′ Street Name See Notes 4 & 5 See Note 8 H1= 23.0' Maximum 25.6 ft. Note 7 Roadway Clearance Design Height 17 ft Minimum 16.5 ft. See Note 7d r — High Point of Roadway Surface— © Foundation

Elevation View @  $270^{\circ}$ 

Base line reference elev. = 0.0'

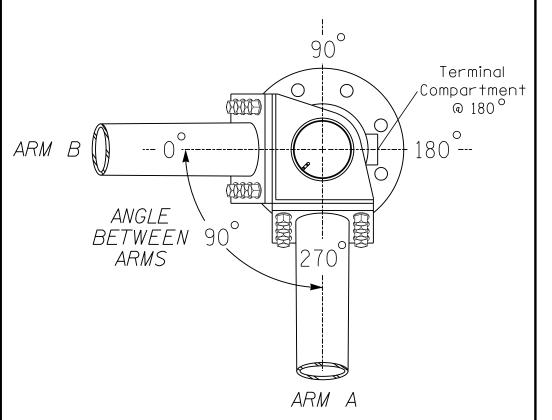
Design Loading for METAL POLE NO. 2, MAST ARM B

#### SPECIAL NOTE

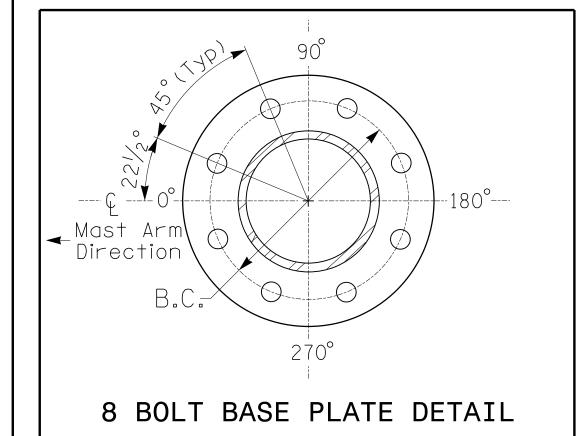
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

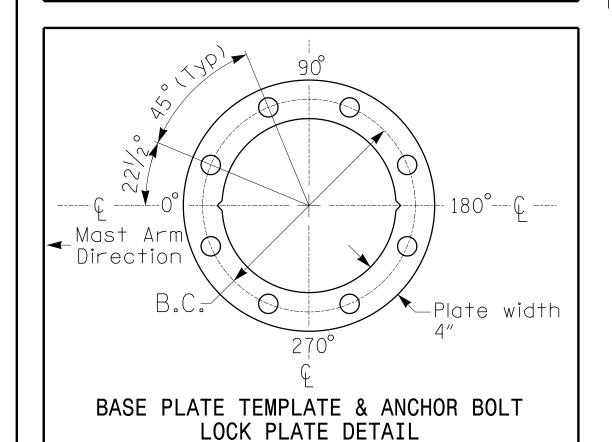
#### Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm A	Arm B
Baseline reference point at © Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+4.0 ft.	N/A
Elevation difference at Edge of travelway or face of curb	+2.8 ft.	N/A



POLE RADIAL ORIENTATION





For 8 Bolt Base Plate

See Note 6

METAL POLE No. 2

PROJECT REFERENCE NO.	SHEET N
R - 5768	SIG. 2.

	MAST ARM LOADING SC	HEDU	LE	
loading Symbol	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE	11.5 S.F.	25.5″W X 66.0″L	74 LBS
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5″W X 52.5″L	60 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0"W X 36.0"L	14 LBS
LED	L.E.D. BLANKOUT SIGN RIGID MOUNTED	5.0 S.F.	24.0"W X 36.0"L	110 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0″W X 96.0″L	36 LBS

#### <u>NOTES</u>

#### DESIGN REFERENCE MATERIAL

- 1. Design the traffic signal structure and foundation in accordance with:
- The 6th Edition 2013 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
- The 2018 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
- The 2018 NCDOT Roadway Standard Drawings.
- The traffic signal project plans and special provisions.
- The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

#### DESIGN REQUIREMENTS

- 2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
- 3. Design all signal supports using stress ratios that do not exceed 0.9.
- 4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
- 5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate arm connection points.
- 6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- 7. The mast arm attachment height (H1) shown is based on the following design assumptions: a. Mast arm slope and deflection are not considered in determining the arm attachment
- height as they are assumed to offset each other. b. Signal heads are rigidly mounted and vertically centered on the mast arm.
- c. The roadway clearance height for design is as shown in the elevation views.
- d. The top of the pole base plate is 0.75 feet above the ground elevation.
- e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
- 8. The pole manufacturer will determine the total height (H2) of each pole using the greater of
- Mast arm attachment height (H1) plus 2 feet, or
- H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
- 9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
- 10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- 11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

**DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED** 

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Engineers | Construction Managers | Planners | Scientists

NCDOT Wind Zone 4 (90 mph)

Responsive People | Creative Solutions US 311 (S. MAIN ST.) NC 65 [North Intersection] DIVISION 9 STOKES CO. WALNUT COVE PLAN DATE: NOVEMBER 2022 REVIEWED BY: DTSEARS 50 N.Greenfield Pkwy.Garner.NC 27529 PREPARED BY:WP ERICKSON-JONES REVIEWED BY:

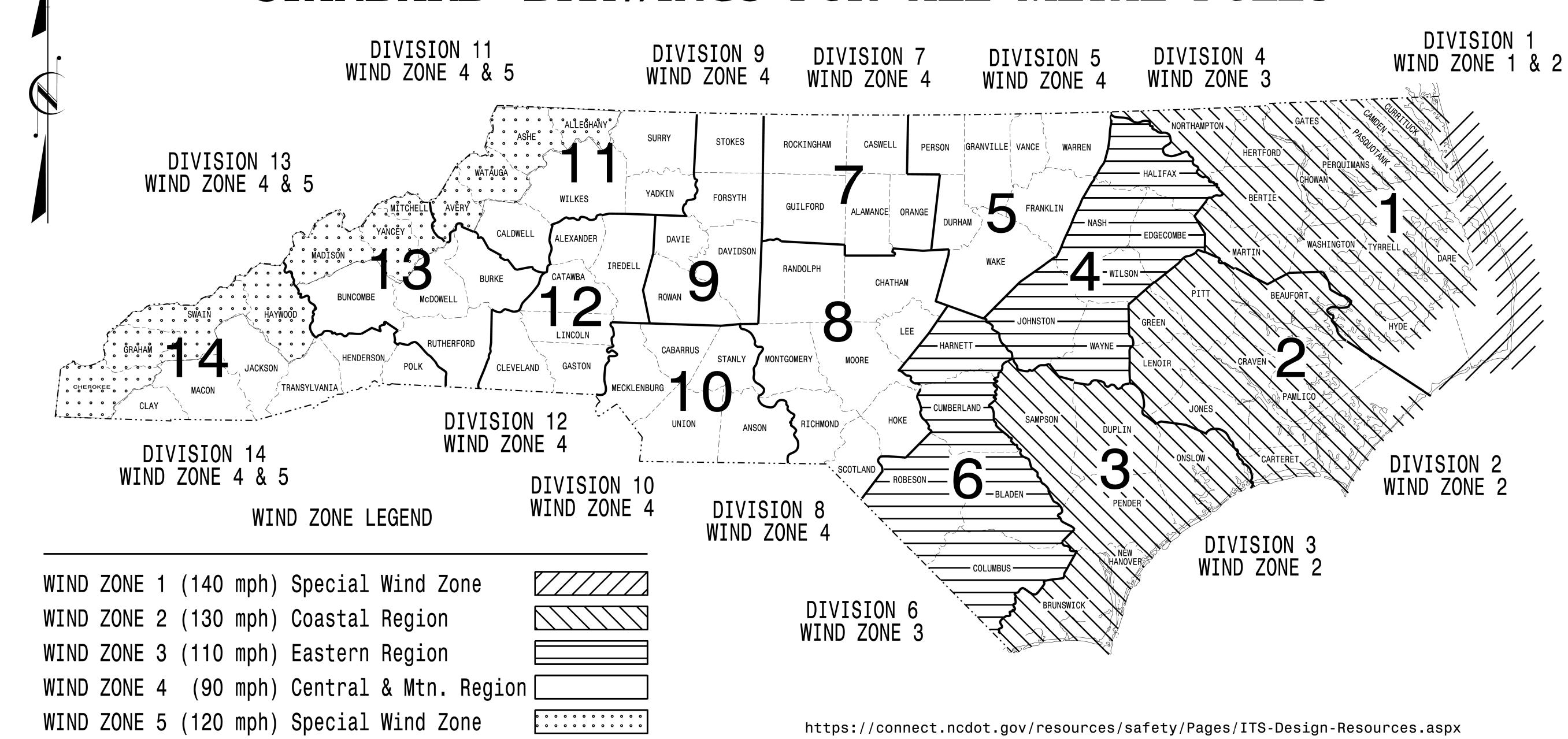
044558 David / Scars

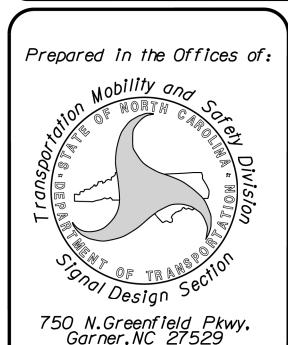
INIT. DATE REVISIONS N/ASIG. INVENTORY NO. 09-0360

# STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

PROJECT I.D. NO. SHEET NO R-5768 Sig.M1

# STANDARD DRAWINGS FOR ALL METAL POLES





Designed in conformance with the latest 2015 Interim to the 6th Edition 2013

# **AASHTO**

Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

**Sig.** *M* 7

Sig. M 8

# INDEX OF PLANS

#### **DRAWING DESCRIPTION NUMBER**

Sig. M	1	Statewide Wind Zone Map
Sig. M	2	Typical Fabrication Details-All Metal Poles
Sig. M	3	Typical Fabrication Details-Strain Poles
Sig. M	4	Typical Fabrication Details-Mast Arm Poles
Sig. M	5	Typical Fabrication Details-Mast Arm Connection
Sig. M	6	Typical Fabrication Details-Strain Pole Attachments

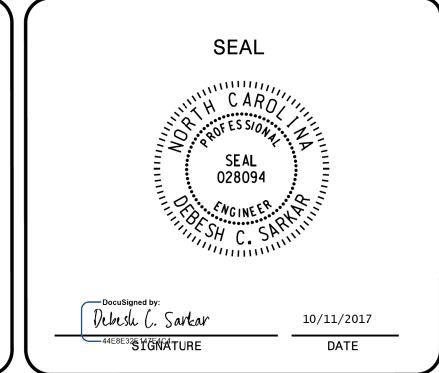
Construction Details-Foundations

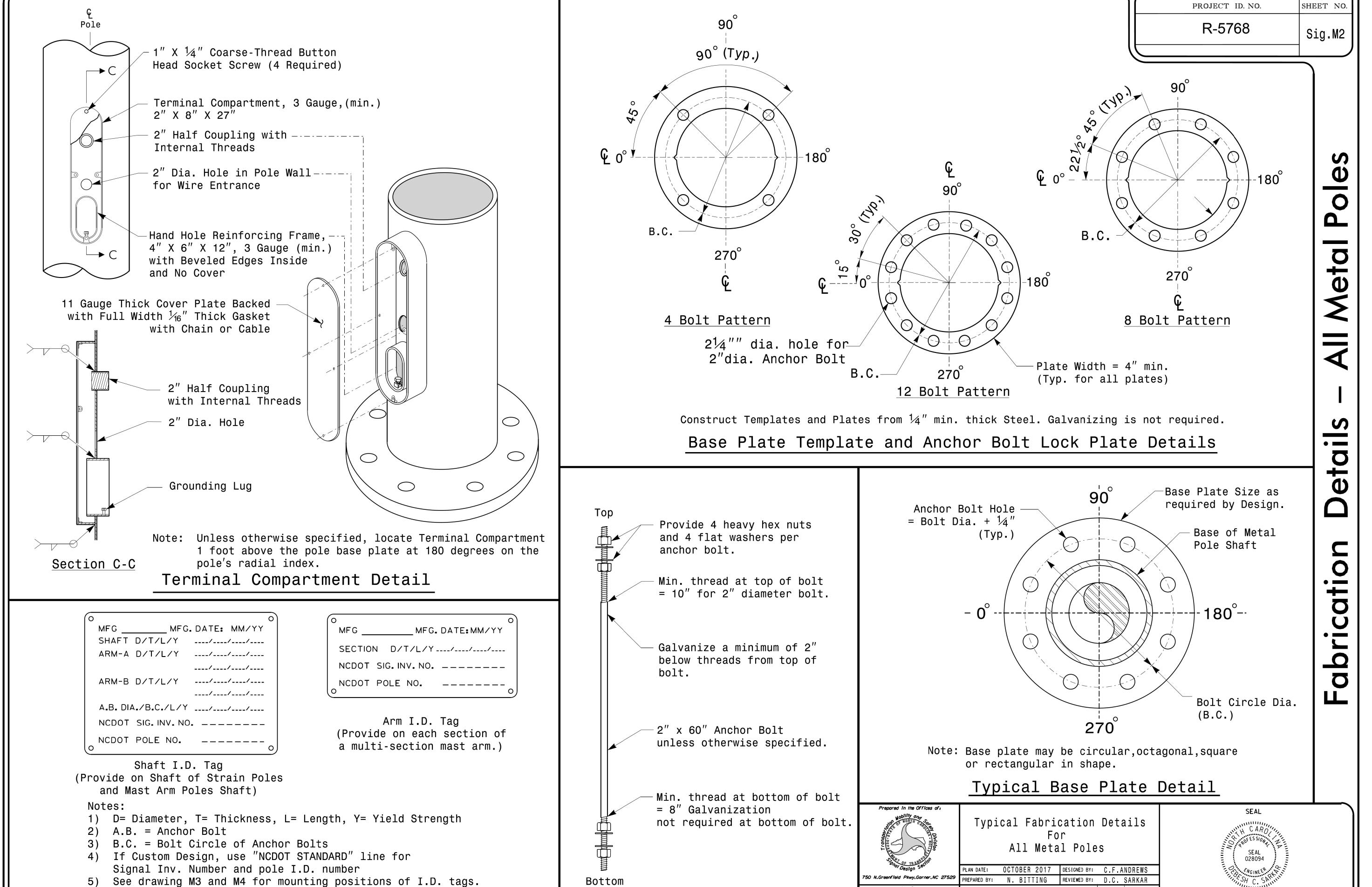
Standard Strain Pole Foundation-All Soil Conditions

# **NCDOT CONTACTS:**

MOBILITY AND SAFETY DIVISION - ITS AND SIGNALS UNIT

M.M. MCDIARMID, P.E. - STATE ITS AND SIGNALS ENGINEER J. P. GALLOWAY, P.E. - STATE SIGNALS ENGINEER D.C. SARKAR, P.E. – ITS AND SIGNALS SENIOR STRUCTURAL ENGINEER





Anchor Bolt Detail

NONE

Debesh C. Sarkar

10/11/2017

S:\*ITS&SU\*ITS Signals\*Signal Design Section\*Eastern Region\*M Sheets\*2016\*2014 Sig.M2 Std. Fabrication Details—All Poles..dgn rnzinser

Identification Tag Details

OCTOBER 2017 DESIGNED BY: K.C.DURIGON
N. BITTING REVIEWED BY: D.C. SARKAR

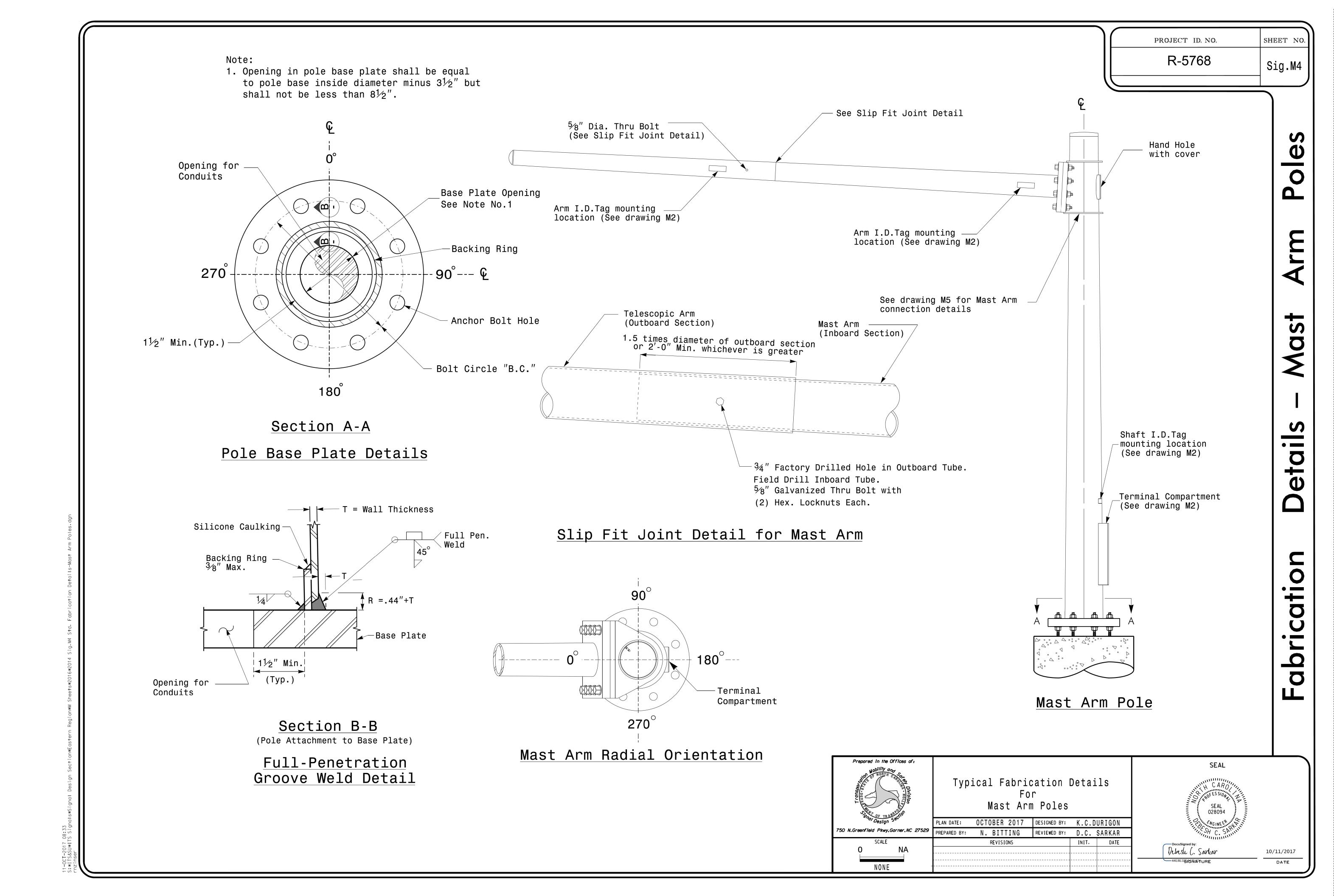
Debesh C. Sarkar

10/11/2017

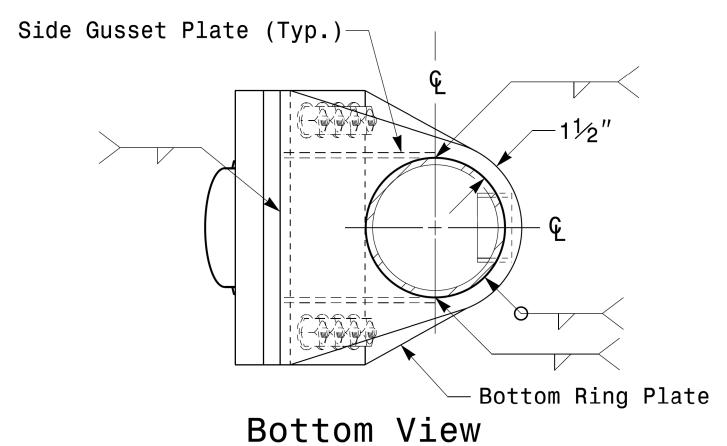
PREPARED BY:

NONE

S:\*ITS&SU\*ITS Signals\*Signal Design Section\*Eastern Region\*M Sheets\*2016\*2014 Sig. rnzinser







Top Ring Plate 4" Diameter Hole for Wire Entrance Flange Angle into Pole, Deburred or Grumetted 3'' X 5'' Hand Hole with cover min. See Note 5 Bottom Ring Plate Mast Arm Att. Plate Thickness Side Gusset Plate Flange Plate Notes: Thickness

# Side Elevation View

Edge Distance 4" Diameter Hole for Wire Entrance  $-\!\!-\!\!$  Plate Width $-\!\!\!-\!\!\!$ into Pole, Deburred or Grumetted See Note 4 ├──Bolt Sp.-See Note 1 Backing Ring 3/8" max. Mast Arm Wall **B** 0 8 B Bolt Hole Diameter = Bolt Dia.+  $\frac{1}{16}$ " Edge Distance – See Note 4

Full-Penetration Groove Weld Detail (See Section B-B)

(Typ.)

High Strength Bolt

+ hardened flat washer

 $-1\frac{1}{2}''$ 

Ring Plate

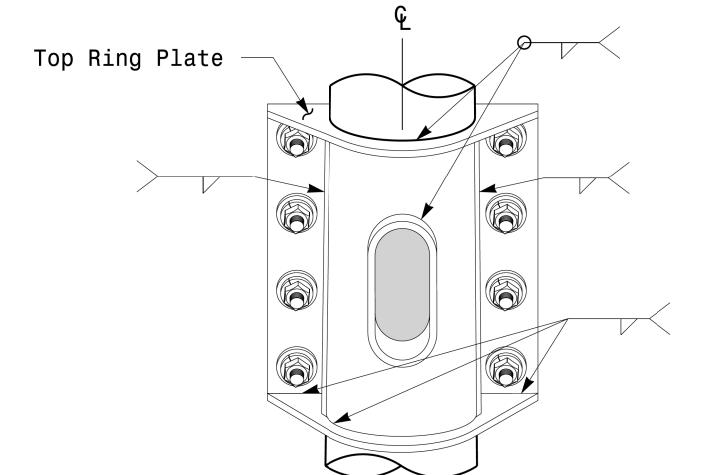
Front Elevation View

Plan View

Side Gusset \_

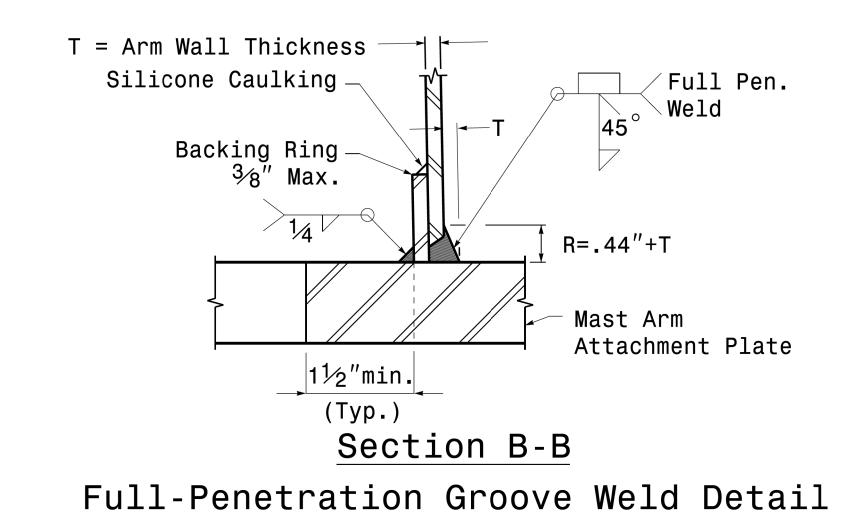
Plate (Typ)

Backing Ring



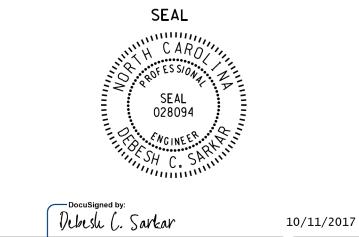
Back Elevation View

# Section A-A Mast Arm Attachment Plate



Typical Fabrication Details Mast Arm Connection To Pole

OCTOBER 2017 DESIGNED BY: C.F.ANDREWS REVIEWED BY: D.C. SARKAR N. BITTING NONE



1. Provide a permanent means of identification above the mast arm to indicate proper attachment orientation of the mast arm.

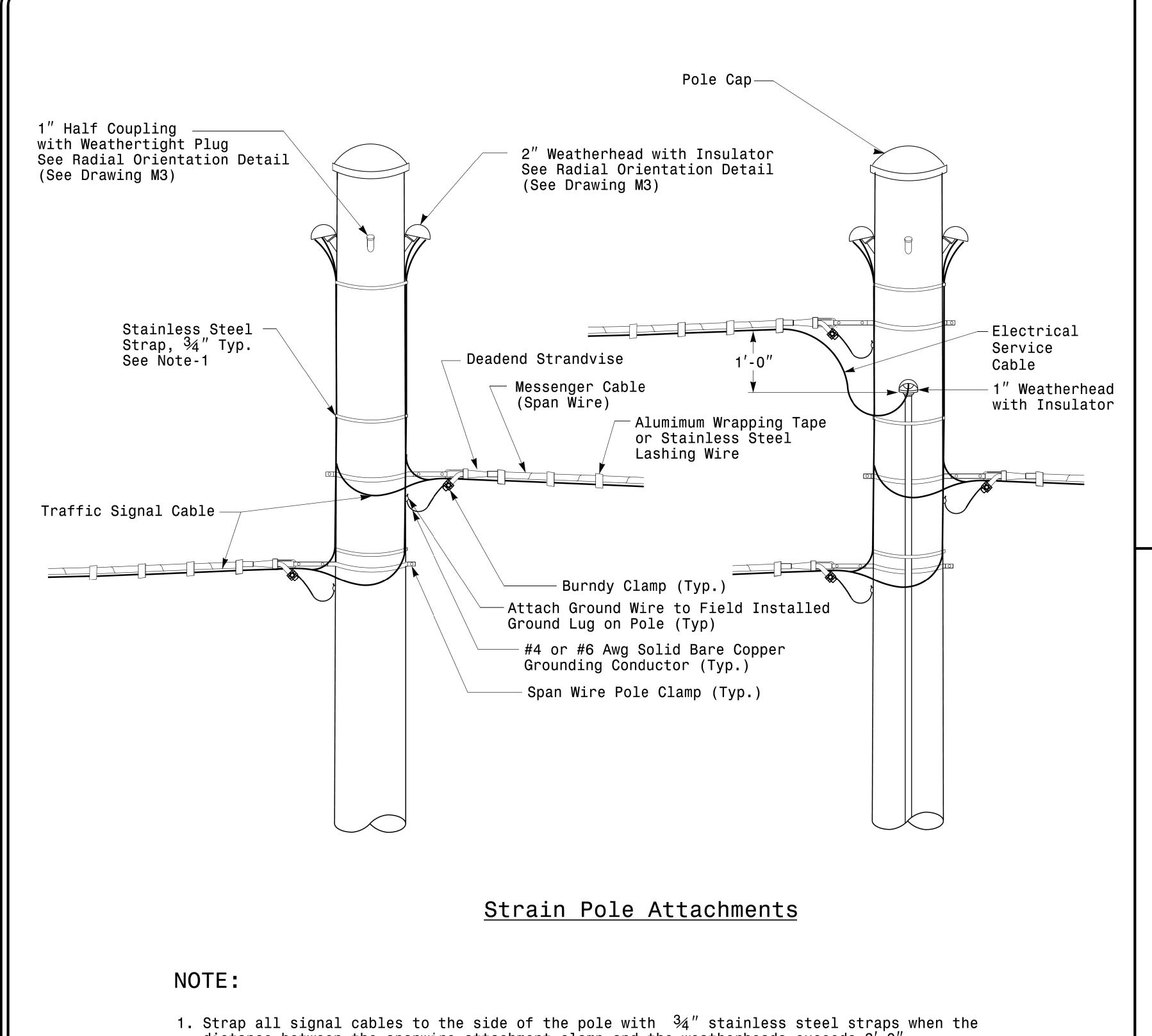
2. Designer will determine the size of all structural components, plates, fasteners, and welds shown unless they are already specified.

3. Fabricator is responsible for providing appropriate holes at drainage points to drain galvanizing materials.

4. For minimum edge distance follow AISC Table J3.4 and J3.5. For nominal bolt hole size use Table J3.3.

5. Provide upper handhole as necessary when shaft extensions are reguired for luminaire arms or camera. For poles without luminaires/camera, wiring can be done through the top of pole.

6. Allowable range of flange tilt angle will vary from  $0^{\circ}$  to as required.

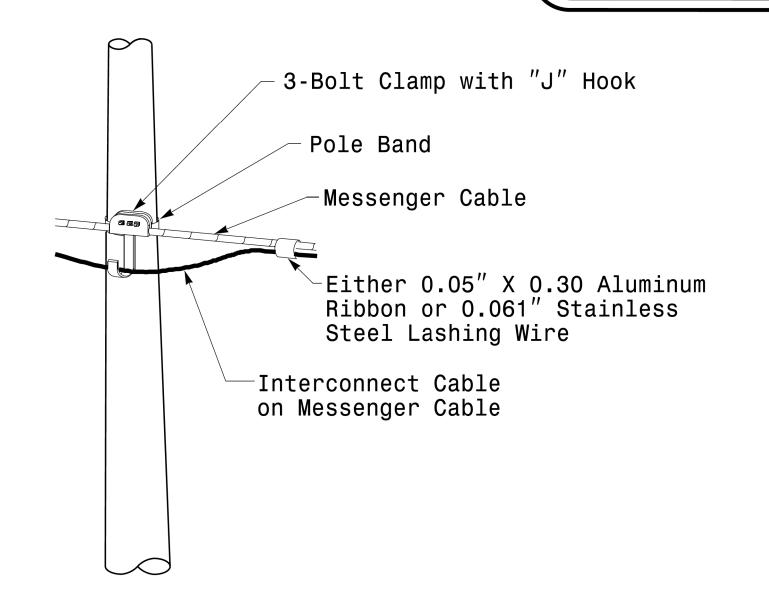


- 1. Strap all signal cables to the side of the pole with  $34^{\prime\prime}$  stainless steel straps when the distance between the spanwire attachment clamp and the weatherheads exceeds  $3^{\prime}$ - $0^{\prime\prime}$ .
- 2. Provide minimum two spanwire pole clamps per pole.
- 3. It is prohibited to attach two span wires at one pole clamp.
- 4. For general requirements refer to NCDOT Standard Specifications for Roadway and Structures, January 2018.

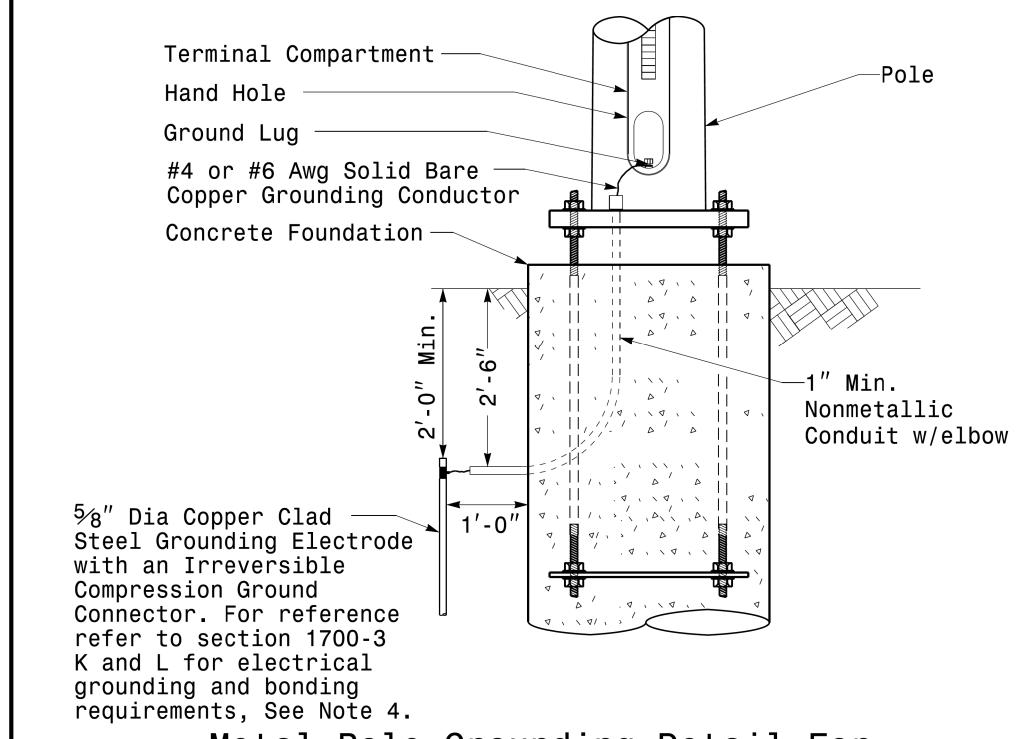
PROJECT ID. NO. SHEET NO. R-5768 Sig.M6

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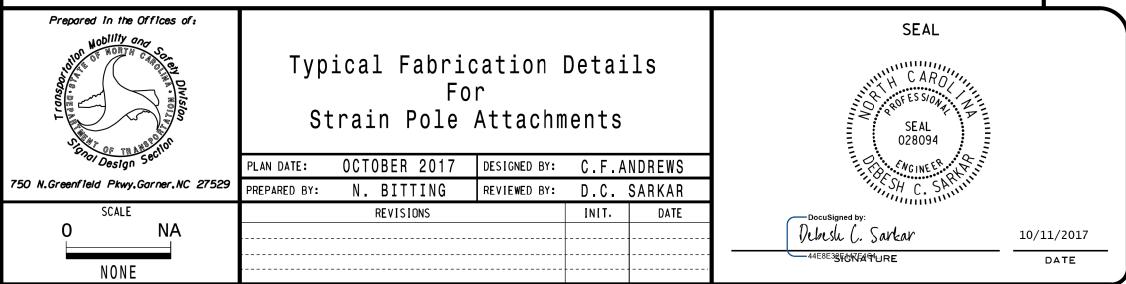
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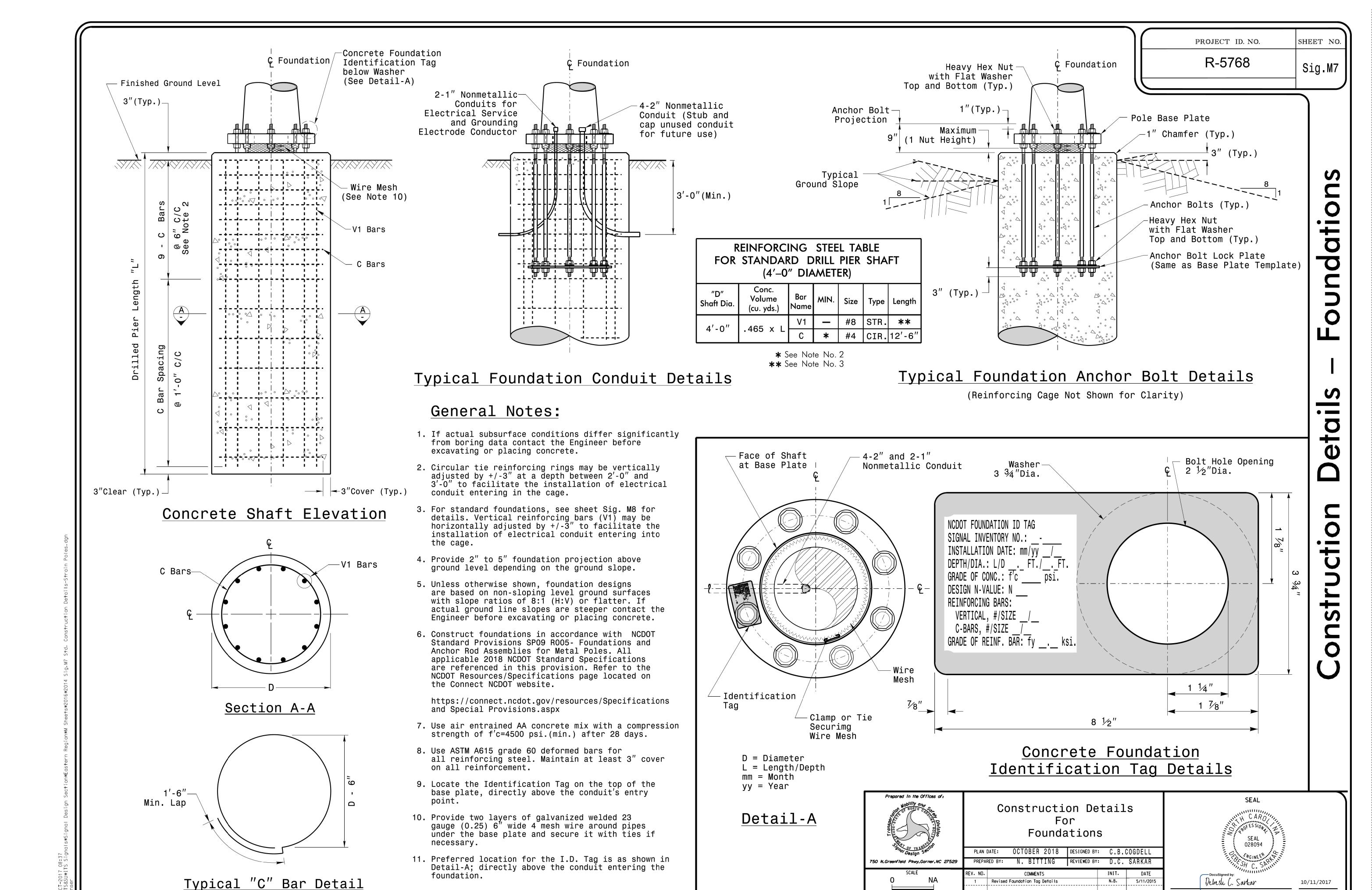


# Attachment of Cable to <u>Intermediate Metal Pole</u>



# Metal Pole Grounding Detail For Strain Pole and Mast Arm





Debesh C. Sarkar

10/11/2017 DATE

Revised Foundation Tag Details

NONE

PROJECT ID. NO.	SHEET
R-5768	Sig

g.M8

Condition

Soil

Foundation-All

<u>o</u>

<u>\_</u>

Standard

									<u> </u>			<u> </u>						
	!	STANDARD STRAIN POLES						STANDARD FOUNDATIONS 48" Diameter Drilled Pier Length (L) – Feet							Reinforcement			
	!	Pole Pl		Base Plate	Reactions at the Pole E			Clay			<del></del>	Sand						rups
		Case No.	Height (Ft.)		Axial (kip)	Shear (kip)	Moment (ft–kip)	Medium N–Value 4–8	Stiff N–Value 9–15	Very Stiff N–Value 16–30	Hard N-Value >30	Loose N–Value 4–10	Medium N–Value 11–30	Dense N–Value >30	Bar Size (#)	Quantity (ea.)	Bar Size (#)	Spacing (in.)
W I N D Z O	Ļ	S26L3	26	25	2	11	270	19	13	10	8	17	14.5	12.5	8	12	4	12
	G H	S30L3	30	25	2	11	300	19.5	13.5	10	8	17.5	15	13	8	14	4	12
	'+'	S35L3	35	25	3	11	320	20	13.5	10.5	8	17.5	15	13	8	14	4	12
N E	HE	S30H3	30	29	3	16	450	24.5	16	12	9	21	17.5	15	8	16	4	6
1 WIND	A V Y	S35H3	35	29	4	16	515	26	17	12.5	9.5	22	18.5	16	8	16	4	6
	Ļ	S26L2	26	23	2	10	245	18	12.5	9.5	8	16.5	14	12	8	12	4	12
	I G	S30L2	30	23	2	10	270	18.5	12.5	10	8	16.5	14	12.5	8	12	4	12
	H	S35L2	35	23	3	10	300	19.5	13	10	8	17	14.5	13	8	12	4	12
ZONE 2 WT	H	S30H2	30	29	3	15	415	23	15.5	11.5	9	20	17	14.5	8	16	4	6
	V Y	S35H2	35	29	4	15	475	25	16.5	12	9.5	21	17.5	15.5	8	16	4	6
	Ļ	S26L2	26	23	2	10	245	18	12.5	9.5	8	16.5	14	12	8	12	4	12
I N D	I G	S30L2	30	23	2	10	270	18.5	12.5	10	8	16.5	14	12.5	8	12	4	12
	H	S35L2	35	23	3	10	300	19.5	13	10	8	17	14.5	13	8	12	4	12
Z O N E	H	S30H2	30	29	3	15	415	23	15.5	11.5	9	20	17	14.5	8	16	4	6
3	A V Y	S35H2	35	29	4	15	475	25	16.5	12	9.5	21	17.5	15.5	8	16	4	6
W	Ļ	S26L1	26	22	2	8	190	16	11.5	8.5	8	15	12.5	11	8	12	4	12
I N D	I G J	S30L1	30	22	2	8	205	16.5	11.5	9	8	15	13	11.5	8	12	4	12
Z	H	S35L1	35	22	3	8	230	17	12	9	8	15.5	13.5	11.5	8	12	4	12
O N E	HE	S30H1	30	25	3	12	320	20.5	13.5	10.5	8	18	15	13.5	8	16	4	6
4	A V Y	S35H1	35	25	4	12	350	21	14	10.5	8.5	18.5	15.5	13.5	8	16	4	6
W	Ļ	S26L2	26	23	2	10	245	18	12.5	9.5	8	16.5	14	12	8	12	4	12
Ŋ	I G	S30L2	30	23	2	10	270	18.5	12.5	10	8	16.5	14	12.5	8	12	4	12
Z O	H	S35L2	35	23	3	10	300	19.5	13	10	8	17	14.5	13	8	12	4	12
N E	H	S30H2	30	29	3	15	415	23	15.5	11.5	9	20	17	14.5	8	16	4	6
5	A V	S35H2	35	29	4	15	475	25	16.5	12	9.5	21	17.5	15.5	8	16	4	6

## General Notes:

- 1. Values shown in the "Reactions at the Pole Base" column represent the minimum acceptable capacity allowed for design using a design CSR of 1.00.
- 2. Use chairs and spacers to maintain proper clearance.
- 3. For foundation, always use air-entrain concrete mix.

## Foundation Selection:

- 1. Perform a standard penetration test at each proposed foundation site to determine "N" value.
- 2. Select the appropriate wind zone from M 1 drawing.
- 3. Select the soil type (Clay or Sand) that best describes the soil characteristics.
- 4. Get the appropriate standard pole case number from the plans or from the Engineer.
- 5. Select the appropriate column under "Standard Foundations" based on soil type and  $"{\sf N}"$  value. Select the appropriate row based on the pole load case.
- 6. The foundation depth is the value shown in the "Standard Foundations" category where the column and the row intersect.
- 7. Use Construction Procedures and Design Methods prescribed by FHWA-NHI-10-016 for Reference Drilled Shafts.

Standard Strain Pole Foundation for All Soil Conditions

Debesh C. Sarkar

10/11/2017

48" Dia. Foundations Concrete Volume (cubic yards) = (0.465) x Drilled Pier Length