

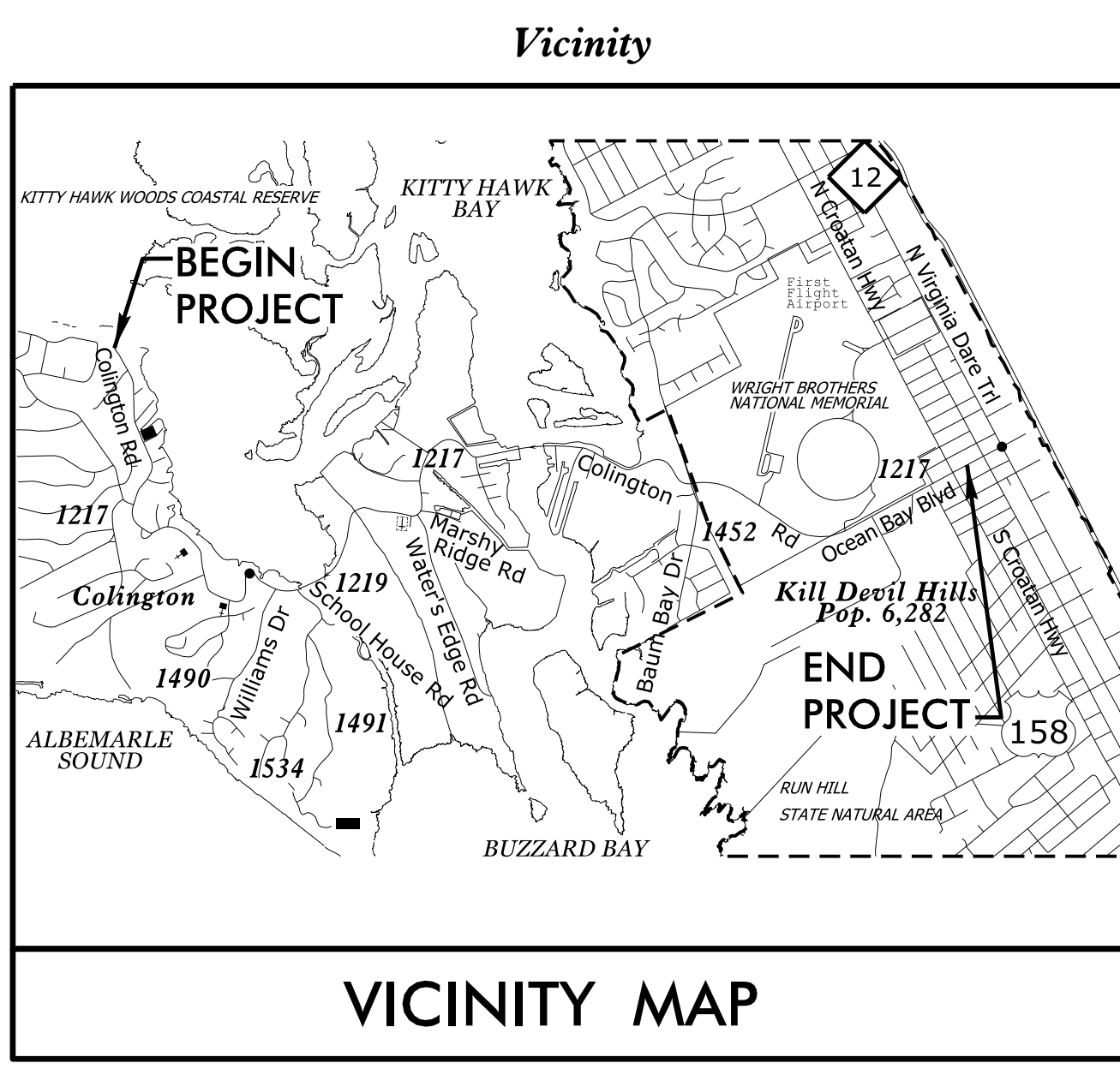
STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

# DARE COUNTY

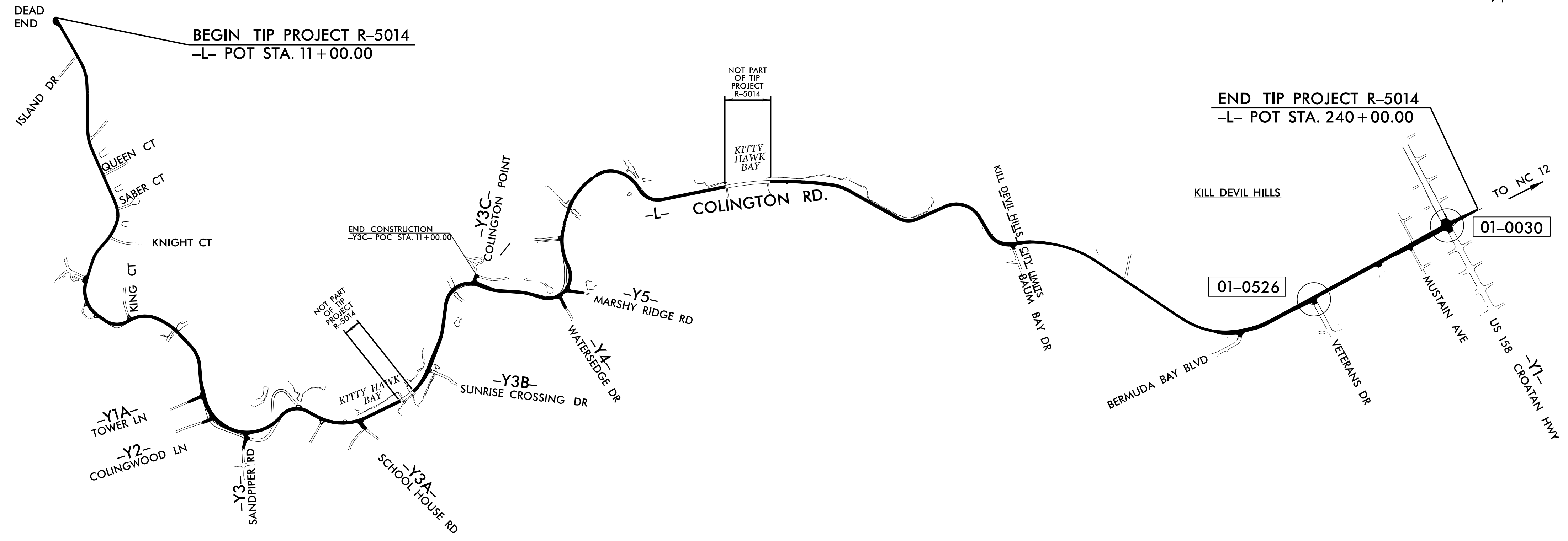
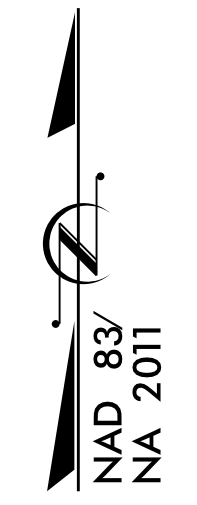
**LOCATION: SR 1217 (COLINGTON RD) FROM DEAD END TO US 158  
CROATON HIGHWAY IN KILL DEVIL HILLS**

**TYPE OF WORK: TRAFFIC SIGNALS**

**Project: R-5014**



VICINITY MAP



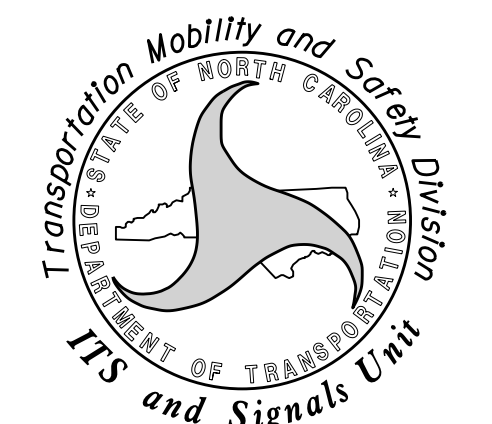
Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.

Sheet #	Reference #	Index of Plans	Location/Description
Sig. 1.0	01-0526	Title Sheet	SR 1217 (Ocean Bay Boulevard) at Veterans Drive
Sig. 2.0-2.4	01-0030	Standard Plate Sheets	US 158 (Croatan Highway) at SR 1217 (Ocean Bay Boulevard / Colington Road)
Sig. 3.0-3.6		Metal Pole Standards	
Sig. 4.0-4.1			
Sig. M1-M8			

**INTELLIGENT TRANSPORTATION AND SIGNALS UNIT**

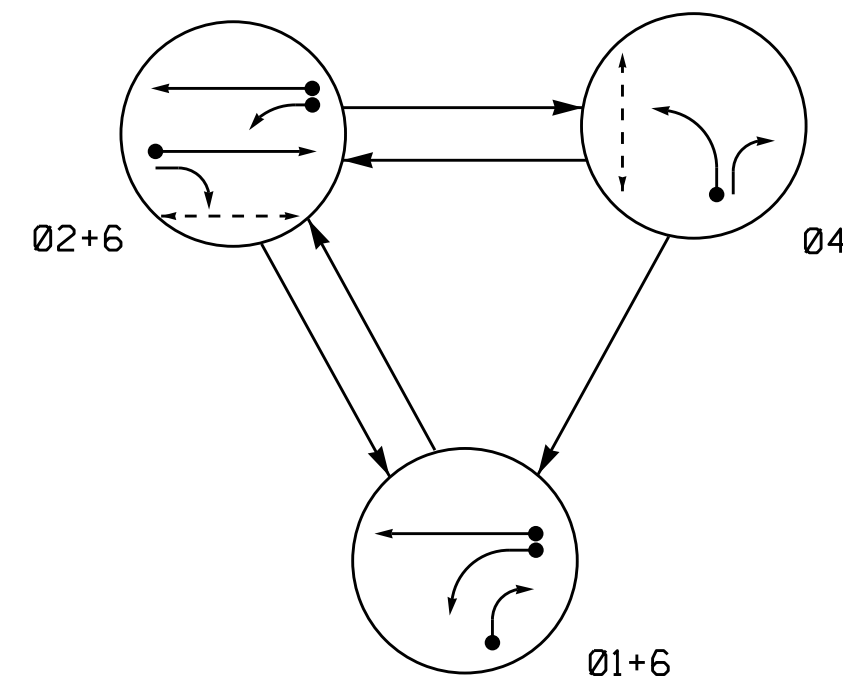
Contacts:  
**Meredith McDiarmid, PE., CPM** - ITS and Signals Engineer  
**Meghan E. LeBlanc, PE** - Eastern Region Signals Project Engineer  
**Keith M. Mims, PE** - Signal Equipment Design Engineer

Prepared in the Office of:  
 DIVISION OF HIGHWAYS  
 TRANSPORTATION MOBILITY AND SAFETY  
 DIVISION



I:\MHS\_2021\4-31-21\Projects\R-5014\Traffic\SIGNALS\Design\Traffic\Sheet\PS014\_TSH.dgn  
 10/11/2021 10:43:31 AM  
 mhabib@ncdot.gov

PHASING DIAGRAM



SIGNAL FACE	PHASE			
	01+6	02+6	04	FLASH
11	Y	R	Y	
21,22,24	R	G	R	Y
41	R	R	G	R
42	R	R	G	R
61,62,64	G	G	R	Y
P21,P22	DW	W	DW	DRK
P41,P42	DW	DW	W	DRK

INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	-
1B	6X40	0	2-4-2	Y	6	Y	Y	-	-	3	-	-
2A	6X6	300	5	Y	2	Y	Y	-	-	-	-	-
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	-	-	-
6A	6X6	300	5	Y	6	Y	Y	-	-	-	-	-

3 Phase Fully Actuated Isolated

NOTES

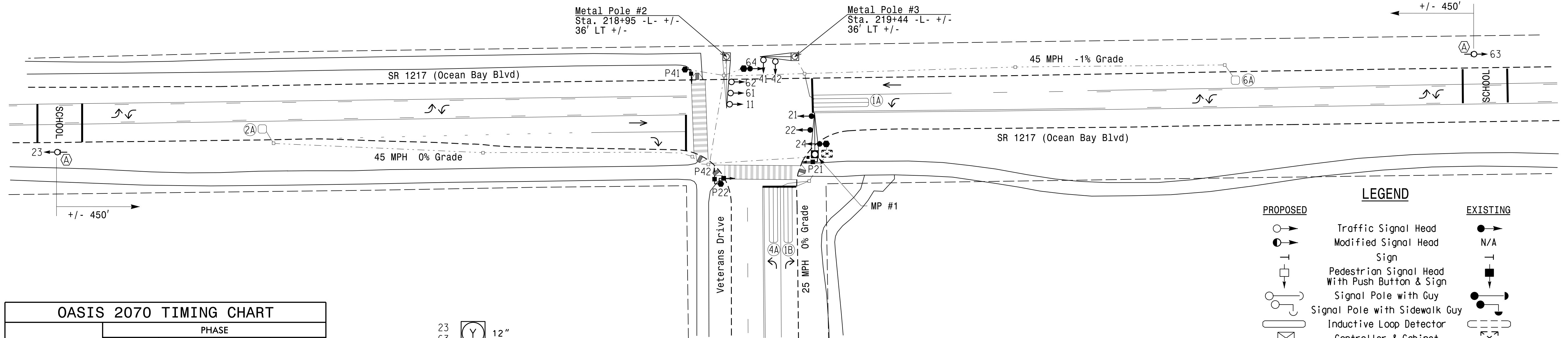
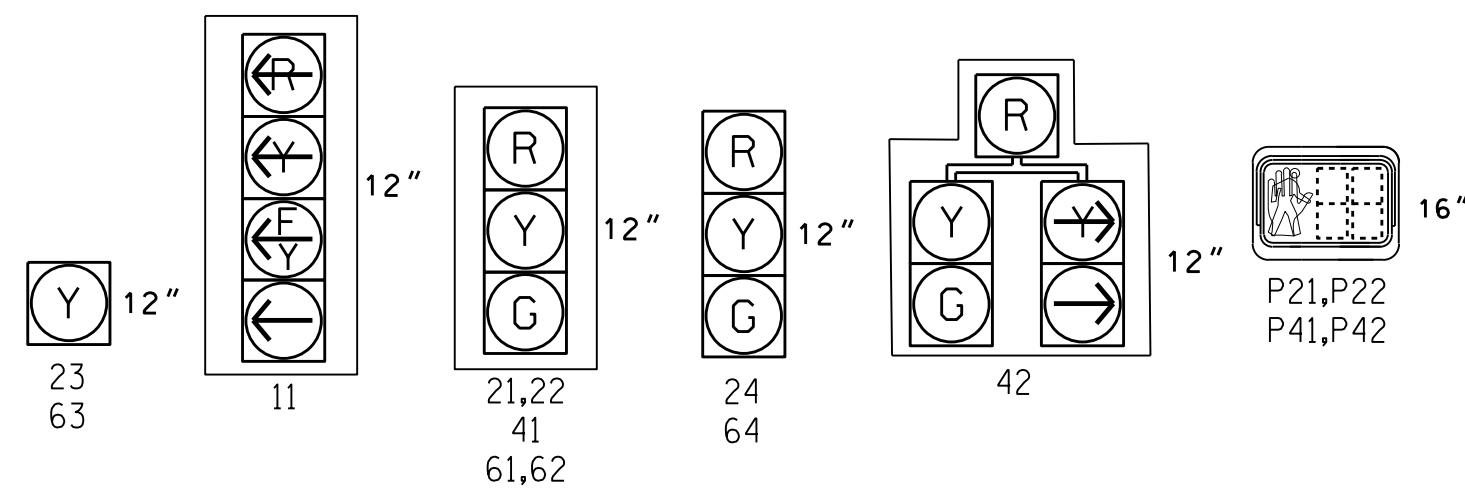
1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 may be lagged.
4. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
5. Program pedestrian heads to countdown the flashing "Don't Walk" time only.

PHASING DIAGRAM DETECTION LEGEND

- ● → DETECTED MOVEMENT
- ○ → UNDETECTED MOVEMENT (OVERLAP)
- ○ → UNSIGNALIZED MOVEMENT
- ○ → PEDESTRIAN MOVEMENT

SIGNAL FACE I.D.

All Heads L.E.D.



OASIS 2070 TIMING CHART

FEATURE	PHASE			
	1	2	4	6
Min Green 1 *	7	14	7	14
Extension 1 *	2.0	6.0	2.0	6.0
Max Green 1 *	20	110	30	110
Yellow Clearance	3.0	4.6	3.0	4.6
Red Clearance	2.3	1.3	2.9	1.3
Walk 1 *	-	7	7	-
Don't Walk 1	-	12	13	-
Seconds Per Actuation *	-	2.0	-	2.0
Max Variable Initial *	-	34	-	34
Time Before Reduction *	-	20	-	20
Time To Reduce *	-	40	-	40
Minimum Gap	-	3.0	-	3.0
Recall Mode	-	MIN RECALL	-	MIN RECALL
Vehicle Call Memory	-	YELLOW	-	YELLOW
Dual Entry	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON

\* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

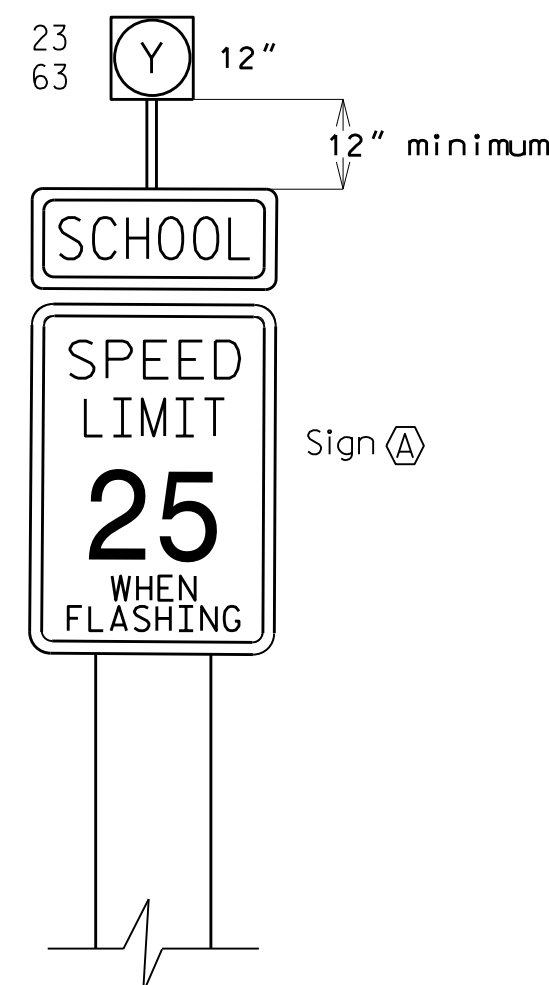


FIGURE A

FLASHER TABLE OF OPERATION

SIGNAL FACE	INTERVAL	
	1	2
23	ON	OFF
63	OFF	ON

LEGEND

- | PROPOSED                                | EXISTING |
|---|----------|
| ○ → Traffic Signal Head                 | ● → N/A  |
| ○ → Modified Signal Head                | ○ → N/A  |
| ○ → Pedestrian Signal Head              | ○ → N/A  |
| ○ → Signal Pole with Push Button & Sign | ○ → N/A  |
| ○ → Signal Pole with Guy                | ○ → N/A  |
| ○ → Signal Pole with Sidewalk Guy       | ○ → N/A  |
| ○ → Inductive Loop Detector             | ○ → N/A  |
| ○ → Controller & Cabinet                | ○ → N/A  |
| ○ → Junction Box                        | ○ → N/A  |
| ○ → 2-in Underground Conduit            | ○ → N/A  |
| ○ → Right of Way                        | ○ → N/A  |
| ○ → Directional Arrow                   | ○ → N/A  |
| ○ → Metal Pole with Mastarm             | ○ → N/A  |
| ○ → Type II Signal Pedestal             | ○ → N/A  |
| ○ → School Zone Sign (See Figure A)     | ○ → N/A  |

Signal Upgrade

Prepared in the Offices of:  
 Transportation Mobility and Safety Solutions  
 NORTH CAROLINA PROFESSIONAL ENGINEERS  
 Signal Design Section

750 N. Greenfield Pkwy, Garner, NC 27529

SR 1217 (Ocean Bay Boulevard) at Veterans Drive  
 Division 1 Dare County Kill Devil Hills

PLAN DATE: August 2018 REVIEWED BY: MEL  
 PREPARED BY: Jeff Spence REVIEWED BY:

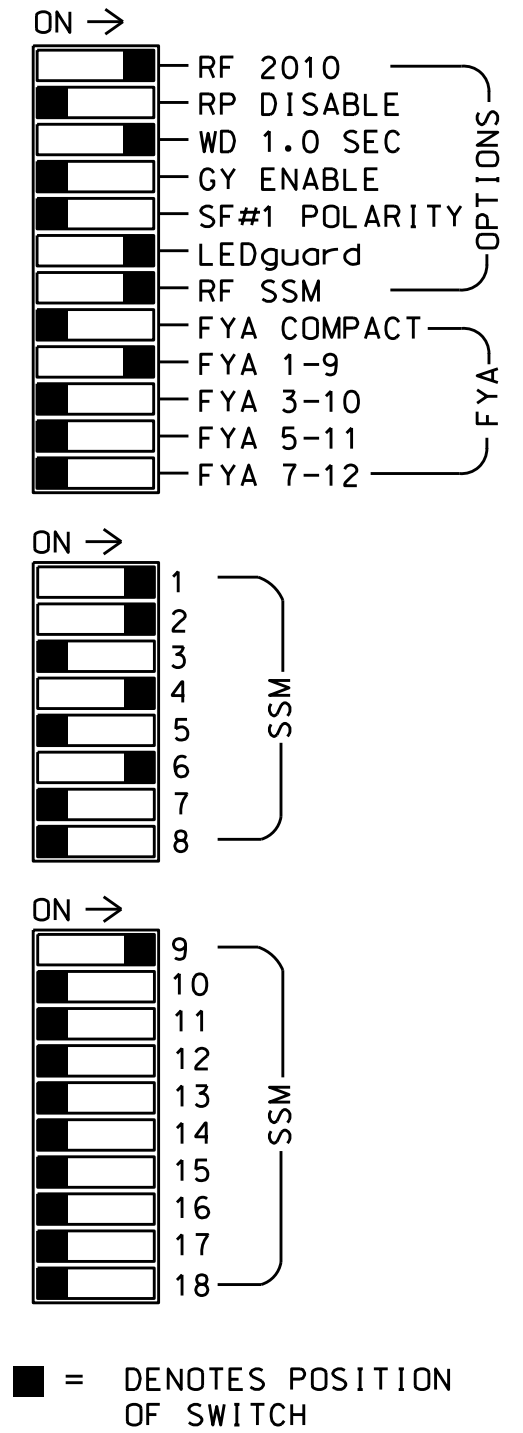
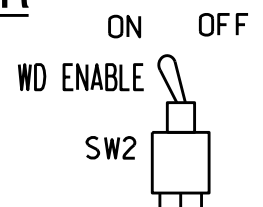
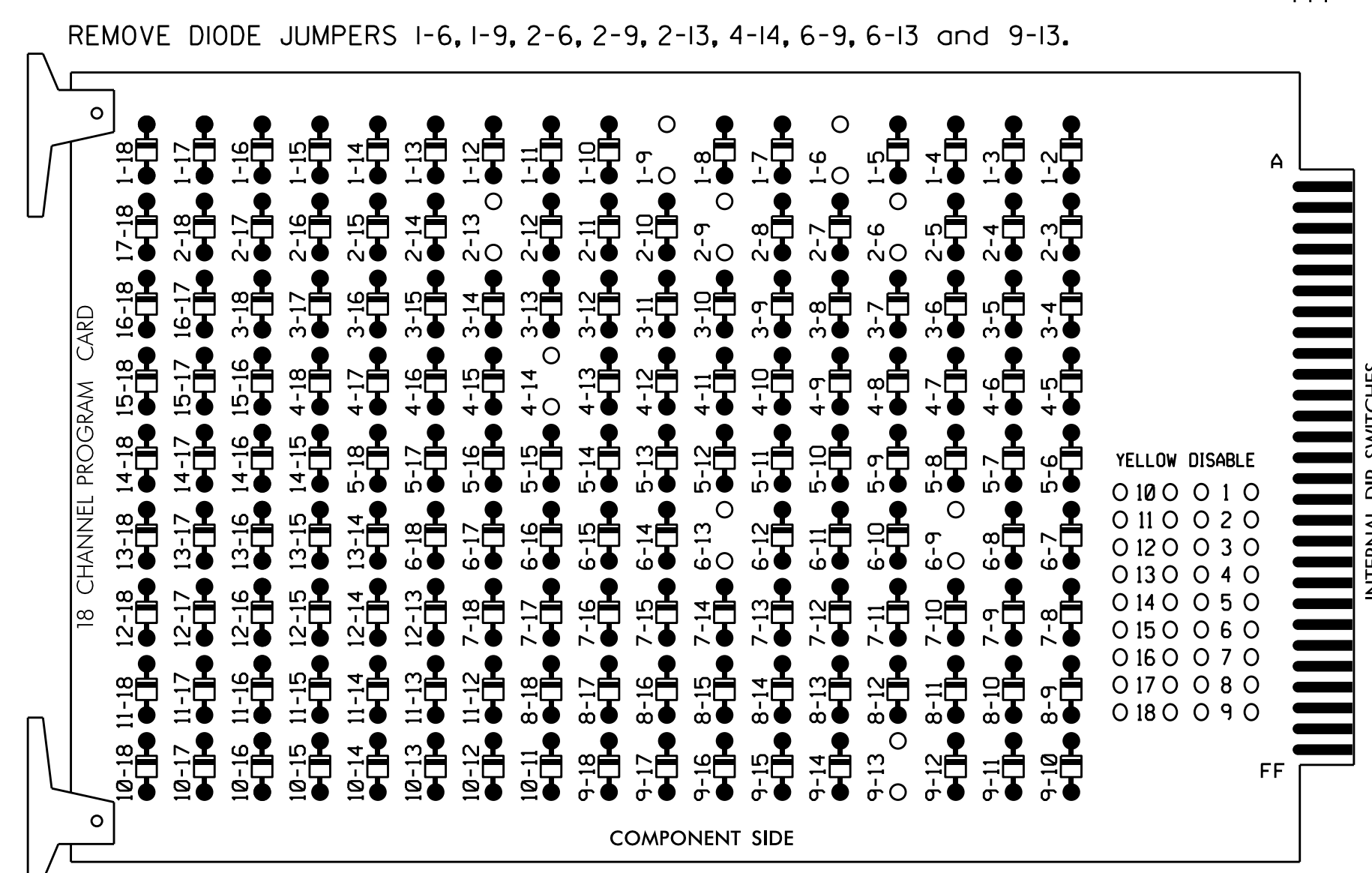
REVISIONS: INIT. DATE

SEAL: MEGHAN E. LEBLANC, ENGINEER, SEAL 042608, 11/20/2018

SIG. INVENTORY NO. 01-0526

20-NOV-2018 1:43:36 R:\Traffic\cans\signal\0526\010526...s\sig\_dsn\2018madd.dgn

**EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL**  
(remove jumpers and set switches as shown)



- NOTES:**
- Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
  - Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
  - Ensure that Red Enable is active at all times during normal operation.
  - Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

**NOTES**

- 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.
- Enable Simultaneous Gap-Out for all phases.
- Program phases 2 and 6 for Variable Initial and Gap Reduction.
- Program phases 2 and 6 for Start Up In Green.
- Program phases 2 and 4 for 'STARTUP PED CALL'.
- Program phases 2 and 6 for Yellow Flash, and overlap 1 as Wag Overlaps.

**EQUIPMENT INFORMATION**

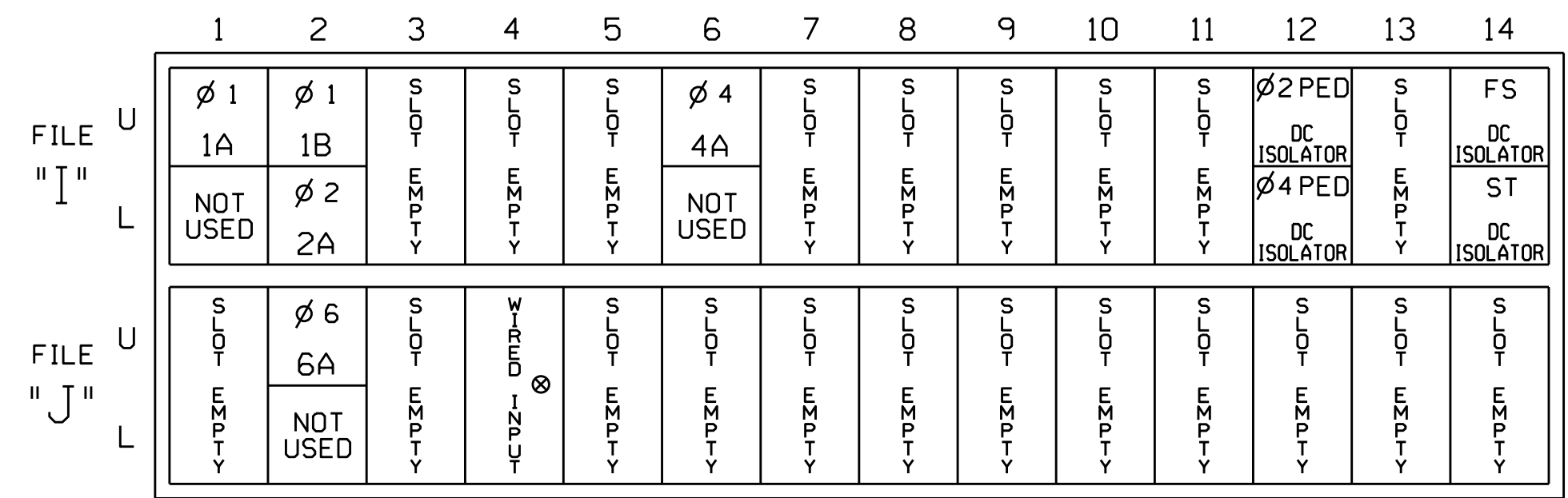
CONTROLLER.....2070  
 CABINET.....332 w/ AUX  
 SOFTWARE.....ECONOLITE OASIS  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE  
 LOAD SWITCHES USED.....S1,S2,S3,S5,S6,S8,AUX S1  
 PHASES USED.....1,2,2 PED,4,4 PED,6  
 OVERLAP 'A'.....1+2  
 OVERLAP 'B'.....NOT USED  
 OVERLAP 'C'.....NOT USED  
 OVERLAP 'D'.....NOT USED

**SIGNAL HEAD HOOK-UP CHART**

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6	
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18	
PHASE	1	2	2 SCHOOL FLASHER	3	4	4 PED SCHOOL FLASHER	5	6	6 PED	7	8	8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE	
SIGNAL HEAD NO.	11	42	21, 22, 24	P21, P22	23	NU	41, 42	P41, P42	63	NU	61, 62, 64	NU	NU	NU	NU	11	NU	NU	
RED	*	128				101					134								
YELLOW		129				102					135								
GREEN		130				103					136								
RED ARROW																		A121	
YELLOW ARROW		126																	A122
FLASHING YELLOW ARROW																			A123
GREEN ARROW	127	127																	
PED YELLOW							113				104								
PED GREEN							** 114				** 105								
PED RED																			
PED BLUE																			
PED PURPLE																			
PED BROWN																			
PED PINK																			
PED GREY																			
PED BLACK																			

NU = Not Used  
 \* Denotes install load resistor. See load resistor installation detail this sheet.  
 \*\* S3-Y and S6-Y are used for the School Flasher. See sheet 3 for wiring and programming details.  
 ★ See pictorial of head wiring in detail below.

**INPUT FILE POSITION LAYOUT**  
(front view)

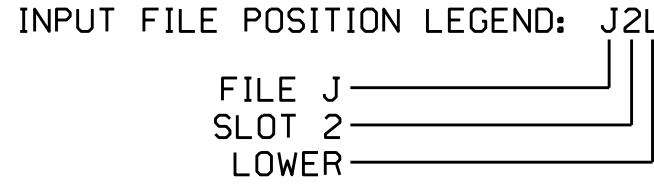


EX.: 1A, 2A, ETC. = LOOP NO.'S  
 FS = FLASH SENSE  
 ST = STOP TIME  
 ⊗ Wired Input - Do not populate slot with detector card

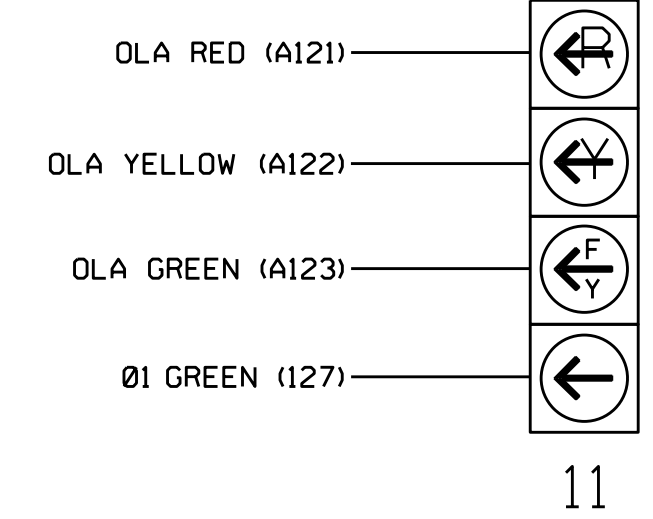
**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A <sup>1</sup>	TB2-1,2	I1U	56	18	1	1	Y	Y			15
	-	J4U	48	10	26	6	Y	Y	Y		3
1B	TB2-5,6	I2U	39	1	2	1	Y	Y			15
2A	TB2-7,8	I2L	43	5	12	2	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			
6A	TB3-5,6	J2U	40	2	6	6	Y	Y			
PED PUSH BUTTONS											
P21,P22	TB8-4,6	I12U	67	29		PED 2		2 PED			
P41,P42	TB8-5,6	I12L	69	31		PED 4		4 PED			

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



**4 SECTION FYA PPLT SIGNAL WIRING DETAIL**  
(wire signal head as shown)

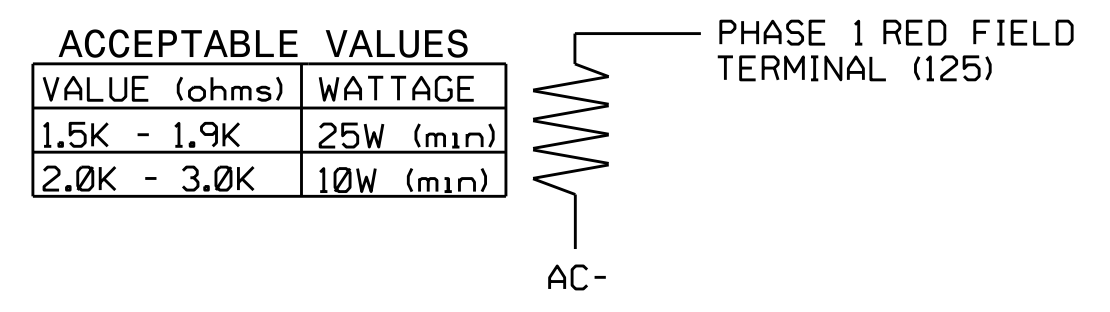


**NOTE**  
 1. The sequence display for this signal requires special logic programming. See sheet 2 for programming instructions.

**COUNTDOWN PEDESTRIAN SIGNAL OPERATION**

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

**LOAD RESISTOR INSTALLATION DETAIL**  
(install resistor as shown)



VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 01-0526  
 DESIGNED: August 2018  
 SEALED: 11/20/2018  
 REVISED:

Electrical Detail - Sheet 1 of 3

Electrical and Programming Details for: SR 1217 (Ocean Bay Boulevard) at Veteran's Drive

Prepared in the Offices of: *Transitional Mobility and Safety Division*

Division 1 Dare County Kill Devil Hills

PLAN DATE: November 2018 REVIEWED BY: T. Joyce

PREPARED BY: C. Strickland REVIEWED BY:

REVISIONS INIT. DATE

DocuSigned by: *D. Todd Joyce* 11/20/2018

SIG. INVENTORY NO. 01-0526

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL: PROFESSIONAL ENGINEER SEAL 031001

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 C:\P\2018\11\15\Sig. 2.1\Signal\work\hgr\edp\sig. 2.1\edp\0026.sm.ele.xxx.dgn

**LOGICAL I/O PROCESSOR PROGRAMMING DETAIL  
TO PRODUCE SPECIAL FYA-PPLT SIGNAL SEQUENCE**

*(program controller as shown below)*

- FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMANDS 1, 2, AND 3.
- FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).

```

LOGICAL I/O COMMAND #1 (+/-COMMAND#)
IF ACTIVE PHASE #1 IS ON
AND RED CLEAR ON PHASE #1 IS ON
↓
SCROLL DOWN
↓
THEN:
SET OUTPUT ASSIGNMENT #50 ON
SET OUTPUT ASSIGNMENT #51 OFF
↓
PRESS '+'
  
```

NOTE: LOGIC FOR PHASE 1 RED CLEAR WHEN TRANSITIONING FROM PHASE 1 TO PHASE 2 (HEAD 11).

```

LOGICAL I/O COMMAND #2 (+/-COMMAND#)
IF ACTIVE PHASE #1 IS ON
↓
SCROLL DOWN
↓
THEN:
SET OUTPUT ASSIGNMENT #52 OFF
↓
PRESS '+'
  
```

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 1 (HEAD 11).

```

LOGICAL I/O COMMAND #3 (+/-COMMAND#)
IF YELLOW ON PHASE #1 IS ON
↓
SCROLL DOWN
↓
THEN:
SET OUTPUT ASSIGNMENT #51 ON
  
```

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 1 (HEAD 11).

LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

**OUTPUT REFERENCE SCHEDULE**

OUTPUT 50 = Overlap A Red  
 OUTPUT 51 = Overlap A Yellow  
 OUTPUT 52 = Overlap A Green

**OVERLAP PROGRAMMING DETAIL**

*(program controller as shown below)*

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

```

PAGE 1: VEHICLE OVERLAP 'A' SETTINGS
PHASE: ;12345678910111213141516
VEH OVL PARENTS:;XX
VEH OVL NOT VEH:;
VEH OVL NOT PED:;
VEH OVL GRN EXT:;
STARTUP COLOR: _ RED _ YELLOW _ GREEN
FLASH COLORS: _ RED _ YELLOW X GREEN
SELECT VEHICLE OVERLAP OPTIONS: (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...Y
GREEN EXTENSION (0=255 SEC)...0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)...0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)...0
  
```

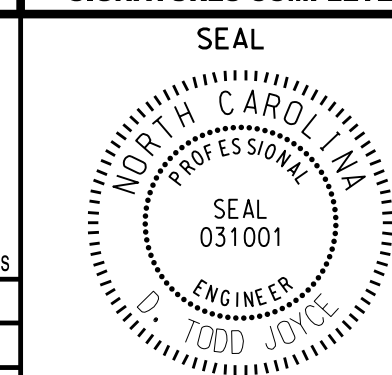
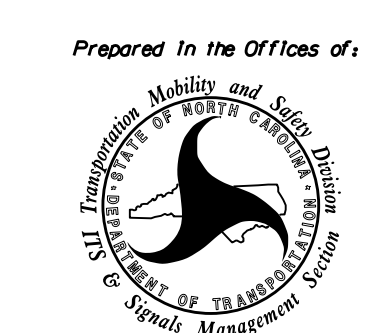

← NOTICE GREEN FLASH

OVERLAP PROGRAMMING COMPLETE

20-Nov-2018 09:59  
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 ceast1ckland

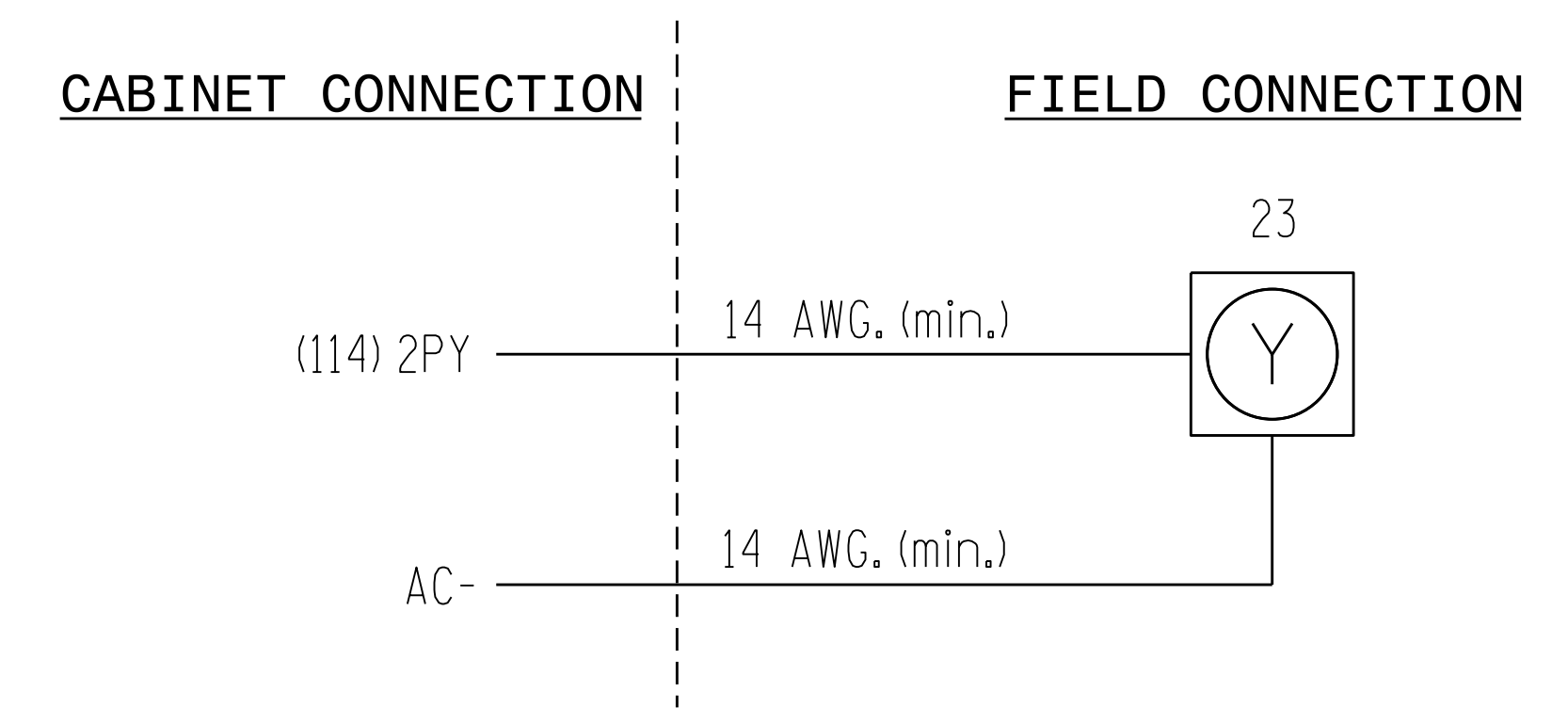
THIS ELECTRICAL DETAIL IS FOR  
 THE SIGNAL DESIGN: 01-0526  
 DESIGNED: August 2018  
 SEALED: 11/20/2018  
 REVISED:

Electrical Detail - Sheet 2 of 3

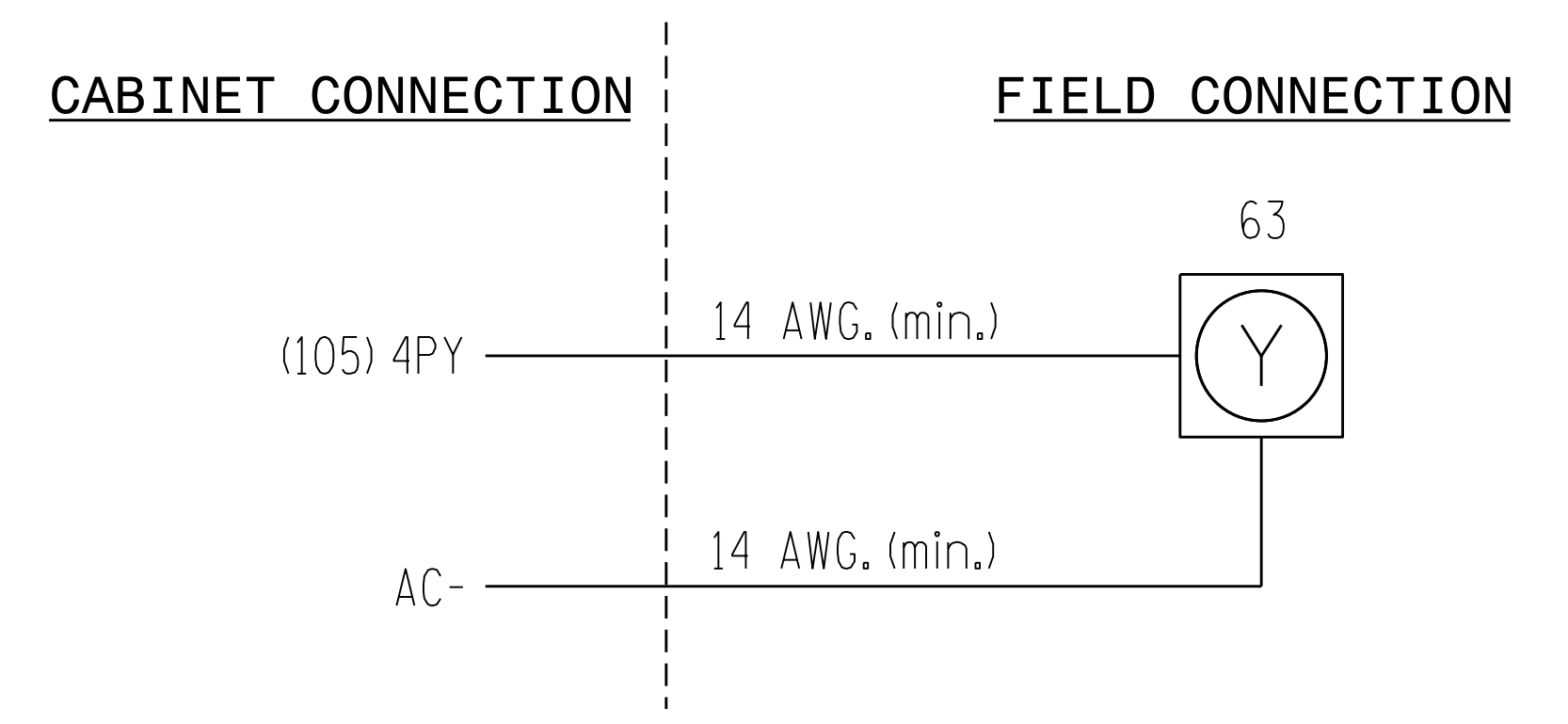
ELECTRICAL AND PROGRAMMING DETAILS FOR:	<b>SR 1217 (Ocean Bay Boulevard)          at          Veteran's Drive</b>	<b>SEAL</b> 
	Prepared In the Offices of: Division 1 Dare County Kill Devil Hills PLAN DATE: November 2018 REVIEWED BY: T. Joyce PREPARED BY: C. Strickland REVIEWED BY:	DocuSigned by:  11/20/2018 DATE
REVISIONS		SIG. INVENTORY NO. 01-0526

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

**SCHOOL FLASHER (23)**  
(wire flasher as shown below)



**SCHOOL FLASHER (63)**  
(wire flasher as shown below)



**IMPORTANT**

1. Ensure that the white keyed plug located behind rear panel of output file labeled 2PY-4PY-6PY-8PY is disconnected. This will disconnect conflict monitor wires from field signal terminals 114 and 105 shown on flasher wiring detail above.
2. To activate school zone flasher operation as indicated on the signal plan, program outputs 33 and 35 as shown on this sheet.
3. Operational times and dates are determined by the DTE. See this sheet for the scheduling programming detail.

**EVENT #1 SCHEDULING (AM)**  
**SCHOOL FLASHER PROGRAMMING DETAIL**  
(program controller as shown below)

FROM MAIN MENU PRESS 'B' (SCHEDULING).

```

SCHEDULED EVENT #1      NOT ASSIGNED*
START DATE (MM/DD).....**/**
END DATE (MM/DD).....**/**
START TIME (HH:MM).....**/**
STOP TIME (HH:MM).....**/**
DOW   1SUN MON TUE WED THR FRI SAT
ENABLED 1  X  X  X  X  X  X
EVENT GROUPS 12345678910111213141516
ASSIGNED

DELETE EVENT WHEN COMPLETED?.....N
CONTINUOUS EVENT?.....N
INVERT EVENT?.....N
SELECT 1 EVENT TYPE:
EVENT GROUP (1-16).....
PLAN (65=FLSH,66=FREE).. OFFSET#...
PLAN PRIORITY: LOW.. MED.. HIGH..
CAHNGE PHASE SEQUENCE PAGE (1-12)...
CHANGE PHASE TIMING PAGE (1-4).....
CHANGE PHASE CONTROL PAGE (1-4)....
CHANGE OVERLAP CONTROL PAGE (1-4)...
CHANGE INPUT PAGE (1-4).....
CHANGE OUTPUT PAGE (1-4).....
SET OUTPUT ON (1-64).....33
SET OUTPUT OFF (1-64).....
SET INPUT ON (1-64).....
SET INPUT OFF (1-64).....
ENABLE FAILURES LOG?.....
ENABLE EVENTS LOG?.....
ENABLE DATA ENTRIES LOG?.....
ENABLE COORDINATION PLANS LOG?.....
ENABLE SPECIAL FUNCTIONS LOG?.....
ENABLE SPLIT MONITOR LOG?.....
ENABLE DETECTOR DATA LOG?.....
ENABLE DETECTOR (1-64).....
ENABLE DETECTOR DIAGNOSTICS (1-64)...
ENABLE DET STRETCH / DELAY (1-64)...
ENABLE DET STOP BAR MODE (1-64)....
SET LOGIC FLAG ON (1-16).....
SET LOGIC FLAG OFF (1-64).....
OVERRIDE PHASE CONTROL FUNCTIONS?...
    
```

**EVENT #2 SCHEDULING (PM)**  
**SCHOOL FLASHER PROGRAMMING DETAIL**  
(program controller as shown below)

FROM MAIN MENU PRESS 'B' (SCHEDULING).

```

SCHEDULED EVENT #2      NOT ASSIGNED*
START DATE (MM/DD).....**/**
END DATE (MM/DD).....**/**
START TIME (HH:MM).....**/**
STOP TIME (HH:MM).....**/**
DOW   1SUN MON TUE WED THR FRI SAT
ENABLED 1  X  X  X  X  X  X
EVENT GROUPS 12345678910111213141516
ASSIGNED

DELETE EVENT WHEN COMPLETED?.....N
CONTINUOUS EVENT?.....N
INVERT EVENT?.....N
SELECT 1 EVENT TYPE:
EVENT GROUP (1-16).....
PLAN (65=FLSH,66=FREE).. OFFSET#...
PLAN PRIORITY: LOW.. MED.. HIGH..
CAHNGE PHASE SEQUENCE PAGE (1-12)...
CHANGE PHASE TIMING PAGE (1-4).....
CHANGE PHASE CONTROL PAGE (1-4)....
CHANGE OVERLAP CONTROL PAGE (1-4)...
CHANGE INPUT PAGE (1-4).....
CHANGE OUTPUT PAGE (1-4).....
SET OUTPUT ON (1-64).....33
SET OUTPUT OFF (1-64).....
SET INPUT ON (1-64).....
SET INPUT OFF (1-64).....
ENABLE FAILURES LOG?.....
ENABLE EVENTS LOG?.....
ENABLE DATA ENTRIES LOG?.....
ENABLE COORDINATION PLANS LOG?.....
ENABLE SPECIAL FUNCTIONS LOG?.....
ENABLE SPLIT MONITOR LOG?.....
ENABLE DETECTOR DATA LOG?.....
ENABLE DETECTOR (1-64).....
ENABLE DETECTOR DIAGNOSTICS (1-64)...
ENABLE DET STRETCH / DELAY (1-64)...
ENABLE DET STOP BAR MODE (1-64)....
SET LOGIC FLAG ON (1-16).....
SET LOGIC FLAG OFF (1-64).....
OVERRIDE PHASE CONTROL FUNCTIONS?...
    
```

\* AFTER PROGRAMMING, THIS SPACE WILL READ 'OUTPUT OVERRIDE'.  
\*\*/\*\* TIMES AND DATES DETERMINED BY THE DTE.

**SCHOOL FLASHER**  
**OUTPUT ASSIGNMENT PROGRAMMING DETAIL**  
(program controller as shown below)

1. FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '1' (OUTPUT ASSIGNMENTS).
2. WITH CURSOR IN "OUTPUT ASSIGNMENT #" FIELD, USE '+' KEY TO FIND THE OUTPUT ASSIGNMENT NUMBER 33, AS SHOWN BELOW.
3. PROGRAM CONTROLLER AS SHOWN:

```

PAGE:1 C1 PIN:35 NOT ENABLED
OUTPUT ASSIGNMENT #.....33
FREQUENCY (0=DEFAULT) (0-25.5 HZ)...1.0
DUTY CYCLE (0=DEFAULT) (0 - 100%)...50
MODE (0=SOLID, 1=FLASH).....1
SELECT ASSIGNMENT:
NOT ENABLED.....Y
VEHICLE PHASE.....
PEDESTRIAN PHASE.....
VEHICLE OVERLAP.....
PEDESTRIAN OVERLAP.....
WATCHDOG.....
DETECTOR RESET.....
ADVANCE BEACON.....
OUT OF PHASE FLASHER.....
CONTROLLER FLASH.....
RUN FREE.....
RESERVED.....
PREEMPT.....
SOFT PREEMPT.....
ANY PREEMPT.....
COORDINATION PLAN.....
PHASE CHECK.....
PHASE ON.....
PHASE NEXT.....
    
```

PRESS '+' KEY FOR OUTPUT ASSIGNMENT 35 (C1 PIN 37)

```

PAGE:1 C1 PIN:37 NOT ENABLED
OUTPUT ASSIGNMENT #.....35
FREQUENCY (0=DEFAULT) (0-25.5 HZ)...0.0
DUTY CYCLE (0=DEFAULT) (0 - 100%)...0
MODE (0=SOLID, 1=FLASH).....0
SELECT ASSIGNMENT:
NOT ENABLED.....Y
VEHICLE PHASE.....
PEDESTRIAN PHASE.....
VEHICLE OVERLAP.....
PEDESTRIAN OVERLAP.....
WATCHDOG.....
DETECTOR RESET.....
ADVANCE BEACON.....
OUT OF PHASE FLASHER.....
CONTROLLER FLASH.....
RUN FREE.....
RESERVED.....
PREEMPT.....
SOFT PREEMPT.....
ANY PREEMPT.....
COORDINATION PLAN.....
PHASE CHECK.....
PHASE ON.....
PHASE NEXT.....
    
```

SCROLL DOWN TO VIEW ALL DATA

```

PAGE:1 C1:37 NOT ENABLED
SELECT OUTPUT ASSIGNMENT (1-64).....33
    
```

WHEN A "Y" IS ENTERED FOR "OUT OF PHASE FLASHER" THE SCREEN SHOWN ABOVE WILL APPEAR. ENTER DATA AS SHOWN. PRESS ENTER AFTER ENTERING DATA, THEN ESC.

DISPLAY WILL NOW SHOW THE SPECIFIED OUTPUT ASSIGNED AS "OUT OF PHASE FLASHER" AS SHOWN BELOW:

```

PAGE:1 C1 PIN:37 OUT OF PHASE FLASHER
OUTPUT ASSIGNMENT #.....35
FREQUENCY (0=DEFAULT) (0-25.5 HZ)...0.0
DUTY CYCLE (0=DEFAULT) (0 - 100%)...0
MODE (0=SOLID, 1=FLASH).....0
SELECT ASSIGNMENT:
NOT ENABLED.....
VEHICLE PHASE.....
PEDESTRIAN PHASE.....
VEHICLE OVERLAP.....
PEDESTRIAN OVERLAP.....
WATCHDOG.....
DETECTOR RESET.....
ADVANCE BEACON.....
OUT OF PHASE FLASHER.....Y
CONTROLLER FLASH.....
RUN FREE.....
RESERVED.....
PREEMPT.....
SOFT PREEMPT.....
ANY PREEMPT.....
COORDINATION PLAN.....
OFFSET.....
PHASE CHECK.....
PHASE ON.....
PHASE NEXT.....
    
```

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 01-0526  
DESIGNED: August 2018  
SEALED: 11/20/2018  
REVISED:

Electrical Detail - Sheet 3 of 3

Electrical and Programming Details For: SR 1217 (Ocean Bay Boulevard) at Veteran's Drive

Prepared In the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

Division 1 Dare County Kill Devil Hills  
PLAN DATE: November 2018 REVIEWED BY: T. Joyce  
PREPARED BY: C. Strickland REVIEWED BY:

REVISIONS INIT. DATE

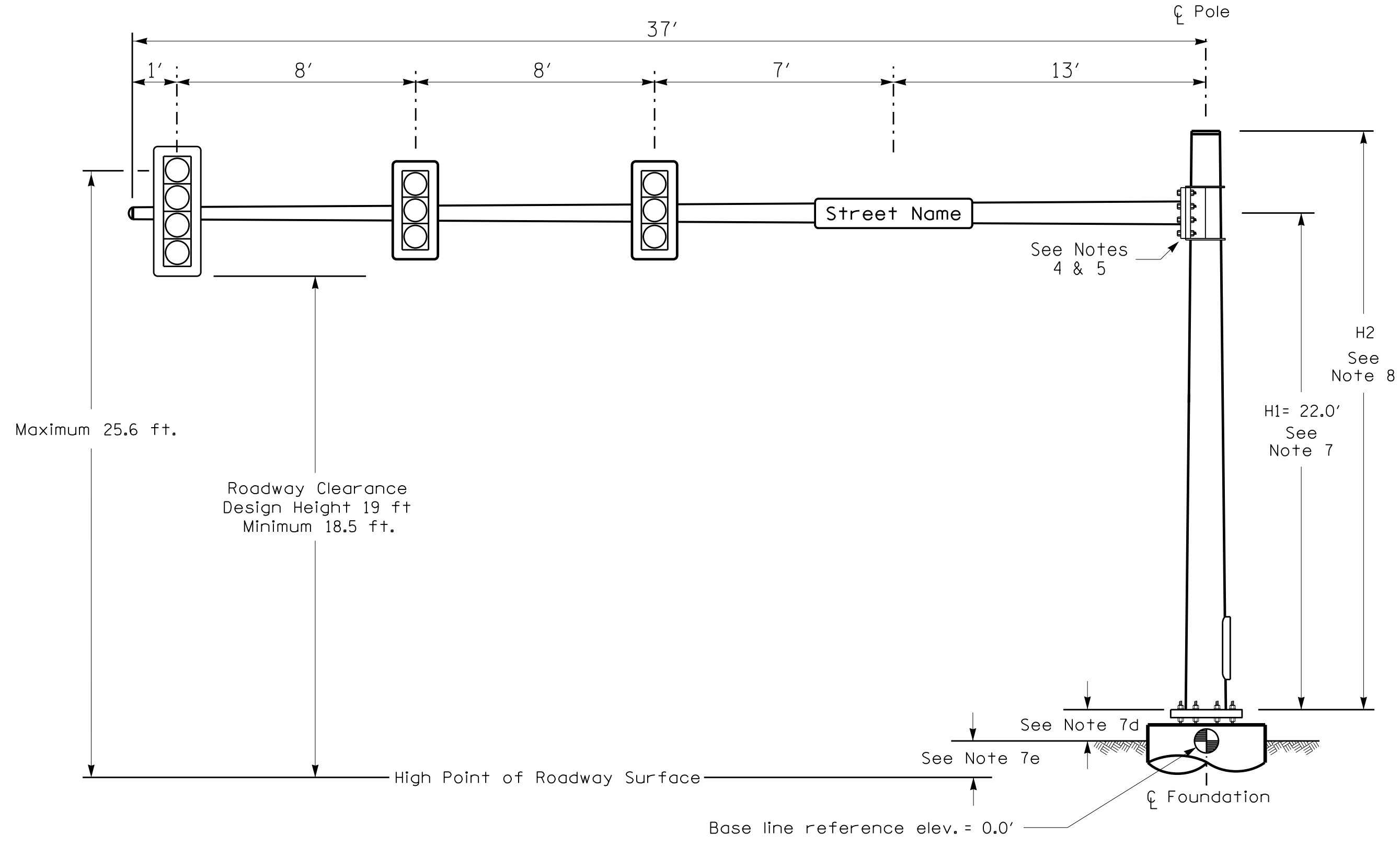
DocuSigned by: 11/20/2018  
SIC. INVENTORY NO. 01-0526

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL  
D. TODD JOYCE  
ENGINEER  
031001

20-Nov-2018 11:55  
S:\ITS\ASST\ITS\_157\_0-SIGNAL\work\hgr\output\sig\_Manual\11-16-18\0026\_sml\_e\_xxx.dgn  
cbsr\ckland

Design Loading for METAL POLE NO. 2



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 2	Pole 3
Baseline reference point at $\zeta$ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.63 ft.	+0.03 ft.
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	+/-0.0 ft.

MAST ARM LOADING SCHEDULE

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
	RIGID MOUNTED SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE	16.3 S.F.	42.0"W X 56.0"L	103 LBS
	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0"W X 96.0"L	36 LBS

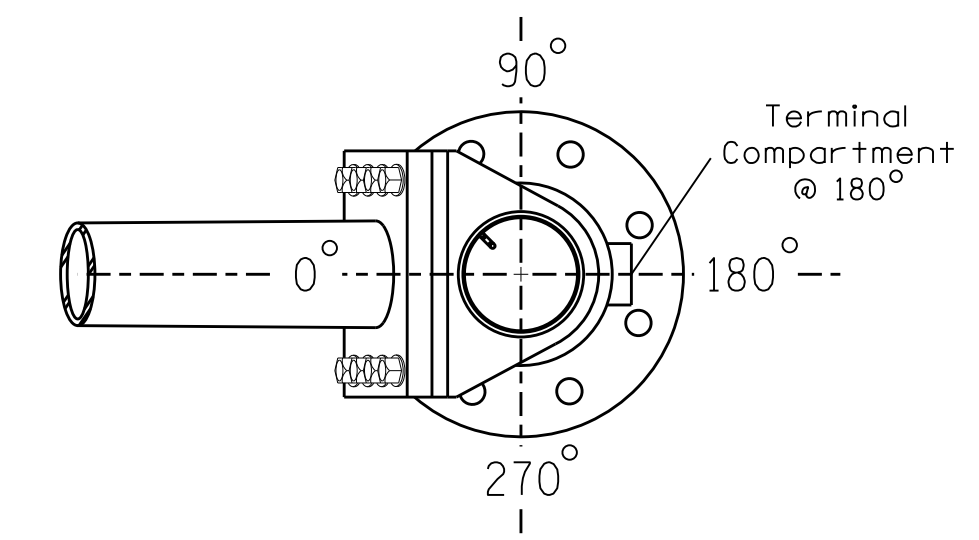
NOTES

DESIGN REFERENCE MATERIAL

- 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>

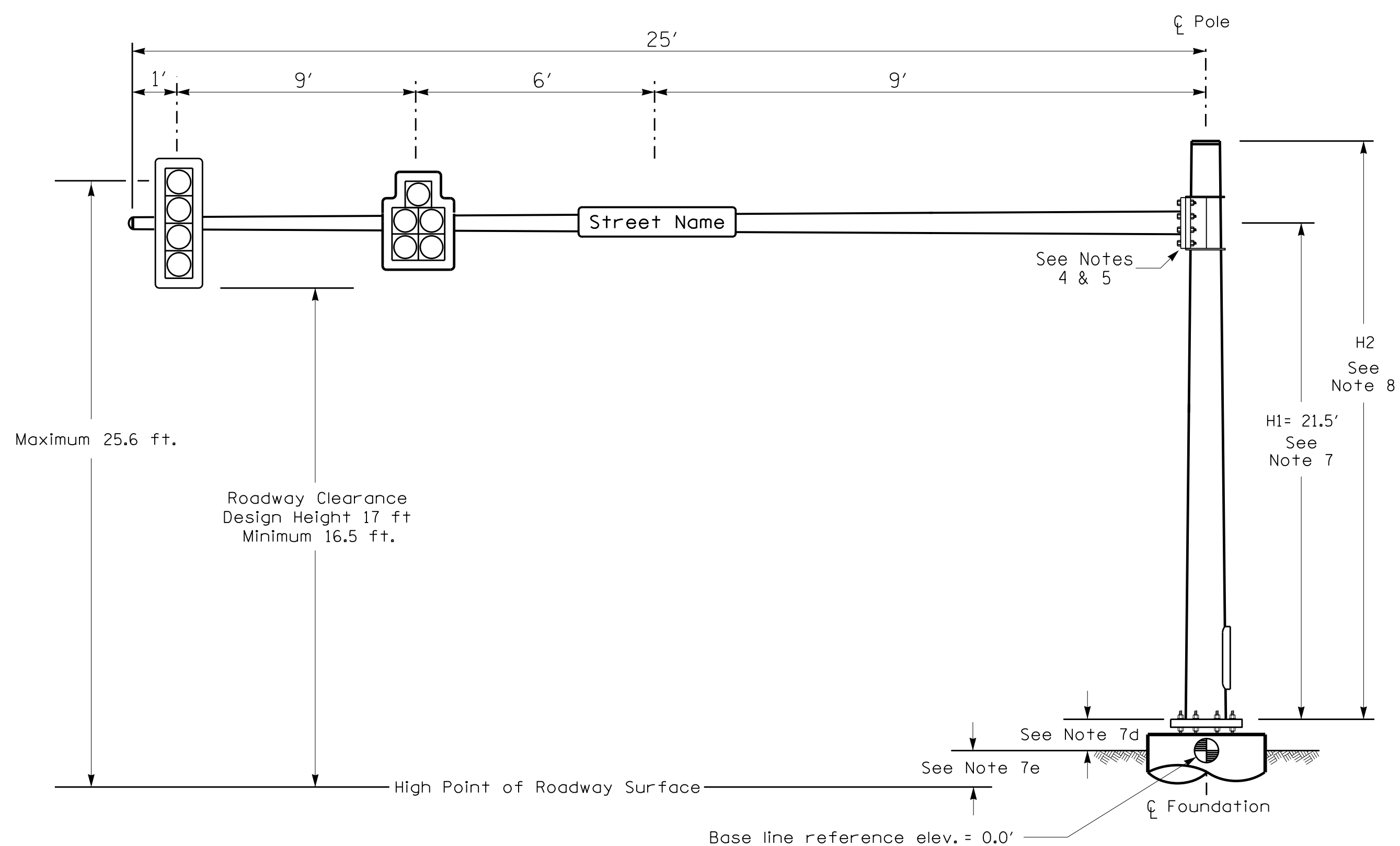
DESIGN REQUIREMENTS

- 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.
- Design all signal supports using stress ratios that do not exceed 0.9.
- 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.
- 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.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
  - Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
  - Signal heads are rigidly mounted and vertically centered on the mast arm.
  - The roadway clearance height for design is as shown in the elevation views.
  - The top of the pole base plate is 0.75 feet above the ground elevation.
  - Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
- 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.
- 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.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

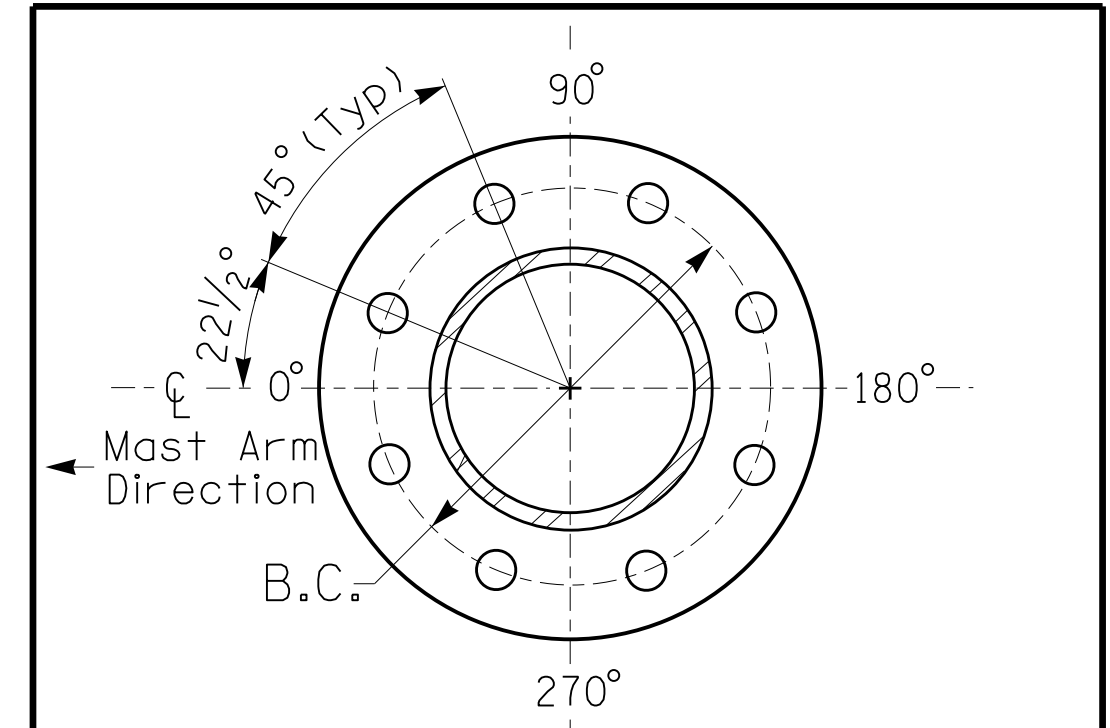


POLE RADIAL ORIENTATION

Design Loading for METAL POLE NO. 3

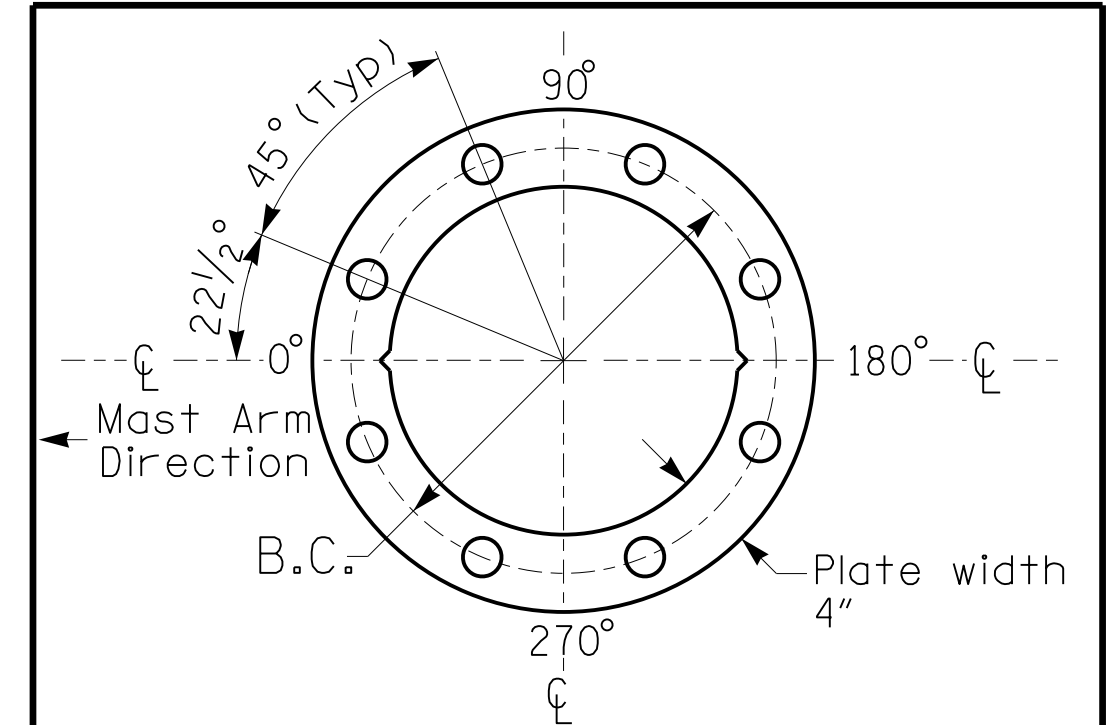


Elevation View



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL For 8 Bolt Base Plate

NCDOT Wind Zone 1 (140 mph)

Prepared in the Offices of:

SR 1217 (Ocean Bay Boulevard) at Veterans Drive

Division 1 Dare County Kill Devil Hills

PLAN DATE: May 2019 REVIEWED BY: ZML

PREPARED BY: Jeff Spence REVIEWED BY:

REVISIONS INIT. DATE

SCALE: 0 N/A

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL

SEAL 042608

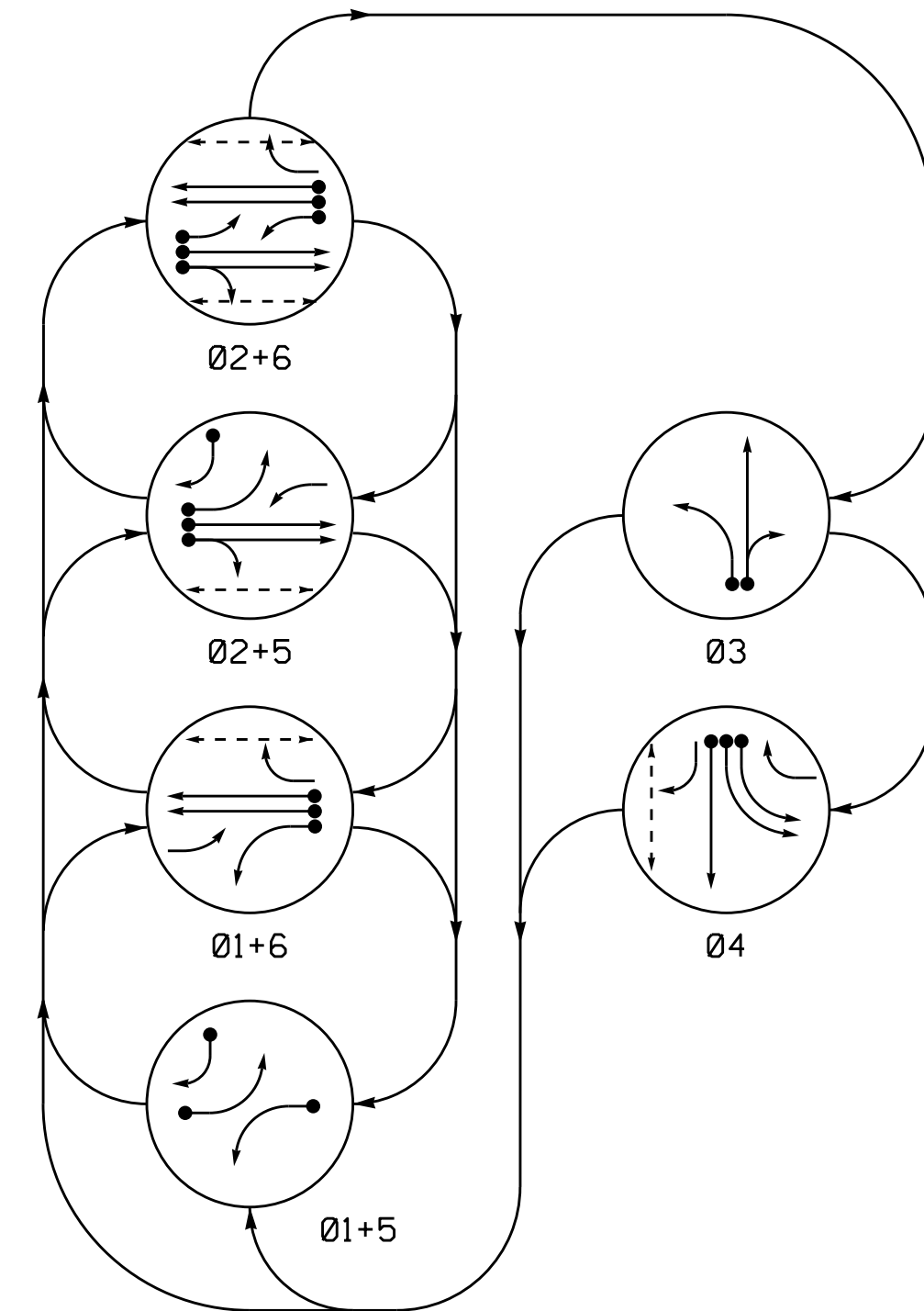
MECHAN E. LEBLANC

3/18/2021

SIG. INVENTORY NO. 01-0526

18-MAR-2021 15:15  
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me/ab/lanc

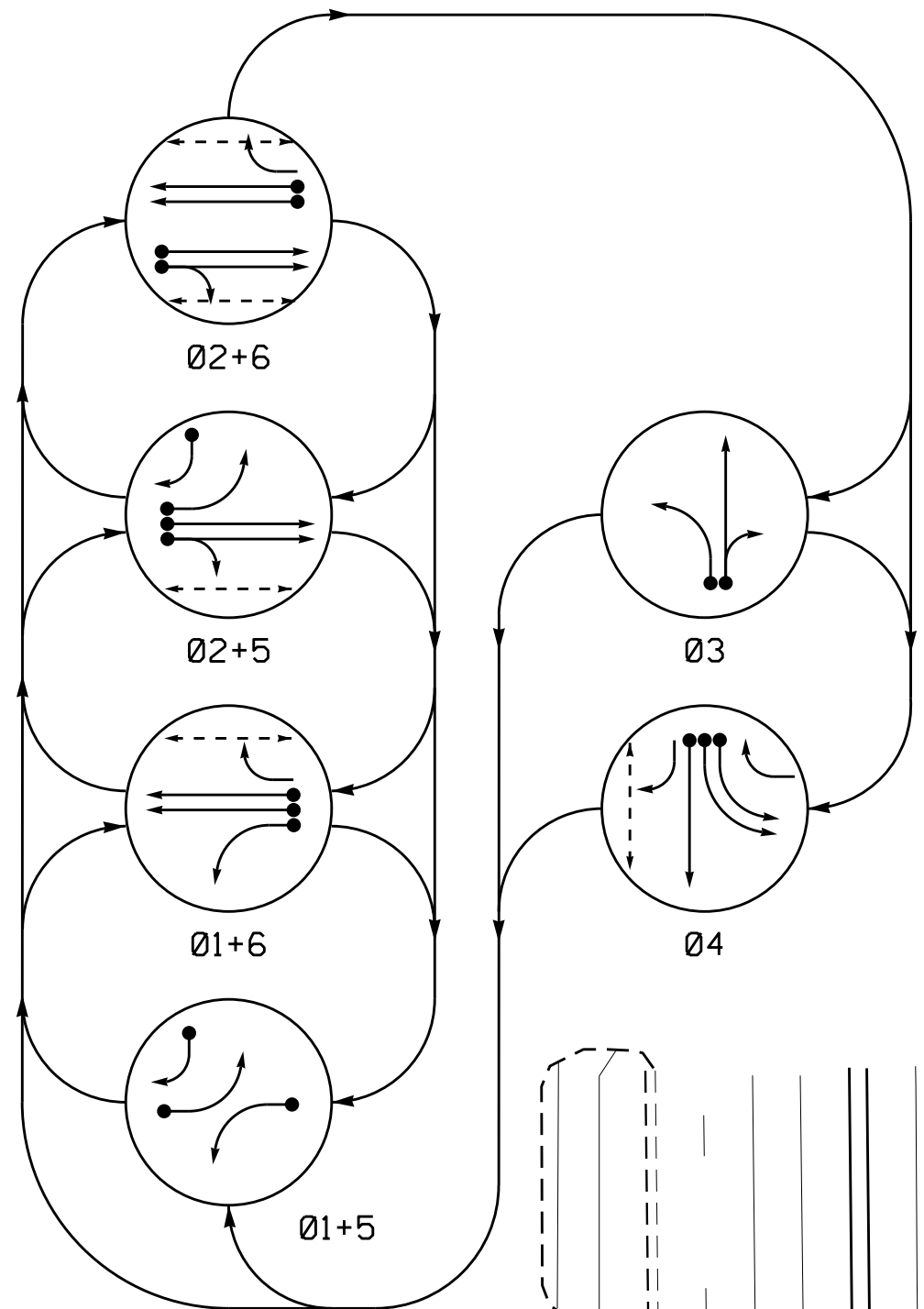
**DEFAULT PHASING DIAGRAM**



**DEFAULT TABLE OF OPERATION**

SIGNAL FACE	PHASE						FLASH	HOLD	STOP
	01+5	01+6	02+5	02+6	03	04			
11	-	-	-	-	-	-	-	-	-
21,22	R	R	G	G	R	R	Y	-	-
31	R	R	R	R	G	R	R	-	-
32	R	R	R	R	G	R	R	-	-
41,42	R	R	R	R	R	-	-	-	-
43	R	R	R	R	G	R	-	-	-
44	R	R	R	R	G	R	-	-	-
51	-	-	-	-	-	-	-	-	-
61	R	G	R	G	R	R	Y	-	-
62	R	G	R	G	R	R	Y	-	-
P21,P22	DW	DW	W	W	DW	DW	DRK	-	-
P41,P42	DW	DW	DW	DW	DW	W	DRK	-	-
P61,P62	DW	W	DW	W	DW	DRK	-	-	-

**ALTERNATE PHASING DIAGRAM**



**ALTERNATE TABLE OF OPERATION**

SIGNAL FACE	PHASE						FLASH	HOLD	STOP
	01+5	01+6	02+5	02+6	03	04			
11	-	-	-	-	-	-	-	-	-
21,22	R	R	G	G	R	R	Y	-	-
31	R	R	R	R	G	R	R	-	-
32	R	R	R	R	G	R	R	-	-
41,42	R	R	R	R	R	-	-	-	-
43	R	R	R	R	G	R	-	-	-
44	R	R	R	R	G	R	-	-	-
51	-	-	-	-	-	-	-	-	-
61	R	G	R	G	R	R	Y	-	-
62	R	G	R	G	R	R	Y	-	-
P21,P22	DW	DW	W	W	DW	DW	DRK	-	-
P41,P42	DW	DW	DW	DW	DW	W	DRK	-	-
P61,P62	DW	W	DW	W	DW	DRK	-	-	-

**OASIS 2070 LOOP & DETECTOR INSTALLATION CHART**

LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	DETECTOR PROGRAMMING				SYSTEM LOOP	NEW CARD	
					PHASE	CALLING	EXTENSION	STRETCH TIME			DELAY TIME
1A	6X40	+5	2-4-2	Y	1	Y	Y	-	*15	-	Y
2A	6X6	355	5	Y	2	Y	Y	-	-	-	Y
2B	6X6	355	5	Y	2	Y	Y	-	-	-	Y
3A	6X40	0	2-4-2	Y	3	Y	Y	-	-	3	Y
3B	6X40	0	2-4-2	Y	3	Y	Y	-	-	10	Y
3C	6X15	0	2-4-2	Y	3	Y	Y	-	-	15	Y
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	3	Y
4B	6X40	0	2-4-2	Y	4	Y	Y	-	-	-	Y
4C	6X40	0	2-4-2	Y	4	Y	Y	-	-	-	Y
5A	6X40	+5	2-4-2	Y	5	Y	Y	-	*15	-	Y
5B	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	Y
6A	6X6	355	5	Y	6	Y	Y	-	-	-	Y
6B	6X6	355	5	Y	6	Y	Y	-	-	-	Y
S07	6X6	+250	4	Y	-	-	-	-	-	-	Y
S08	6X6	+250	4	Y	-	-	-	-	-	-	Y
S09	6X6	+250	4	Y	-	-	-	-	-	-	Y
S10	6X6	+250	4	Y	-	-	-	-	-	-	Y

\* Disable Delay during Alternate Phasing Operation.  
 \*\* Disable Phase 2+6 call for loops 1A and 5A during Alternate Phasing Operation

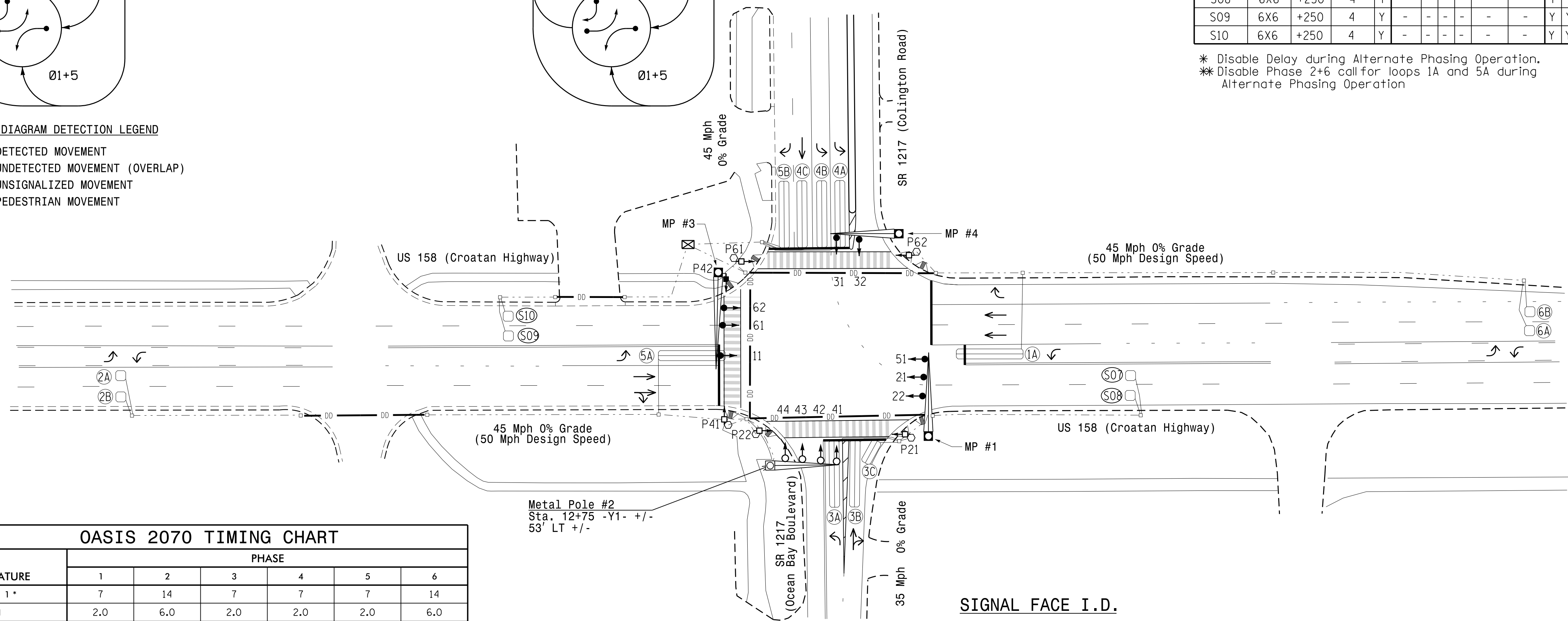
**6 Phase Fully Actuated US 158 (Croatan Hwy) South CLS Signal System #10107**

**NOTES**

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Set all detector units to presence mode.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
8. The Division Traffic Engineer will determine the hours of use for each phasing plan.
9. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
10. Closed loop system data: Controller Asset # 0030.

**PHASING DIAGRAM DETECTION LEGEND**

- ● DETECTED MOVEMENT
- ○ UNDETECTED MOVEMENT (OVERLAP)
- ○ UNSIGNALIZED MOVEMENT
- ○ PEDESTRIAN MOVEMENT



FEATURE	PHASE					
	1	2	3	4	5	6
Min Green 1 *	7	14	7	7	7	14
Extension 1	2.0	6.0	2.0	2.0	2.0	6.0
Max Green 1 *	20	90	30	30	20	90
Yellow Clearance	3.0	4.8	3.8	4.5	3.0	4.8
Red Clearance	3.3	1.6	2.1	1.7	3.3	1.6
Walk 1 *	-	7	-	7	-	7
Don't Walk 1	-	18	-	17	-	21
Walk Advance Time	-	7	-	7	-	7
Seconds Per Actuation *	-	1.8	-	-	-	1.8
Max Variable Initial *	-	40	-	-	-	40
Time Before Reduction *	-	15	-	-	-	15
Time To Reduce *	-	45	-	-	-	45
Minimum Gap	-	3.1	-	-	-	3.1
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL
Vehicle Call Memory	-	YELLOW	-	-	-	YELLOW
Dual Entry	-	-	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON	ON	ON

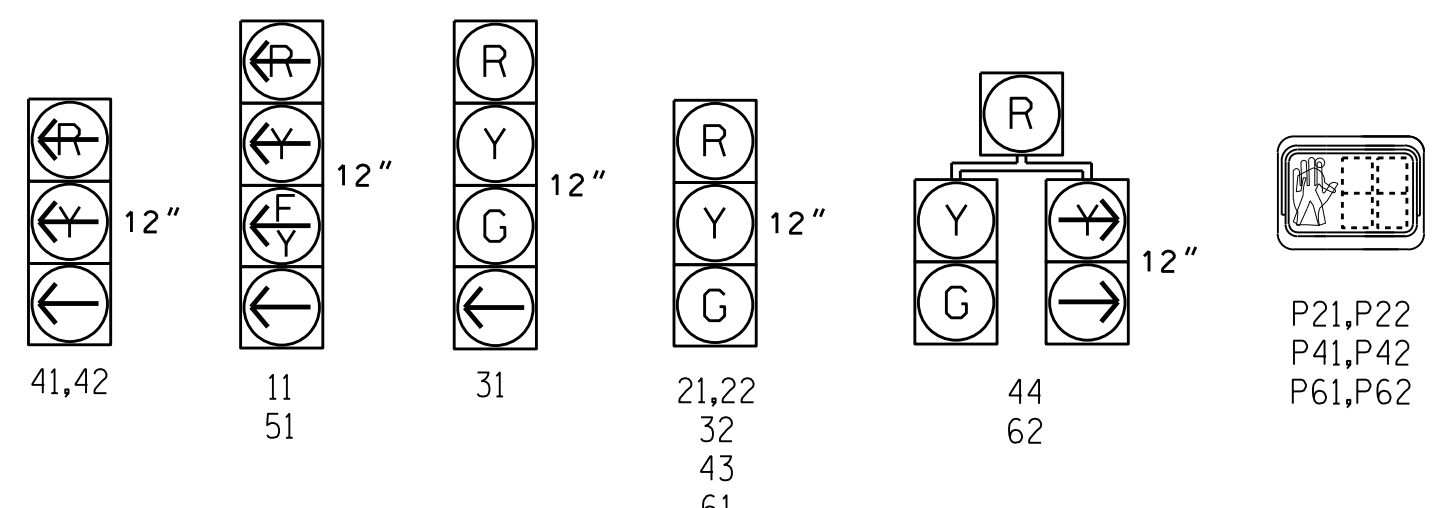
\* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

**SIGNAL FACE I.D.**

All Heads L.E.D.

\* Install Backplates on heads 31,32,41,42, 43 and 44.

\* Do not Install Backplates on Metal Poles #1 and #3.



**LEGEND**

- | PROPOSED   | EXISTING                         |
|--|----------------------------------|
| ○ Traffic Signal Head                            | ● Traffic Signal Head            |
| ○ Modified Signal Head                           | N/A                              |
| ○ Sign   | ○ Sign                           |
| ○ Pedestrian Signal Head With Push Button & Sign | ○ Pedestrian Signal Head         |
| ○ Signal Pole with Guy                           | ○ Signal Pole with Guy           |
| ○ Signal Pole with Sidewalk Guy                  | ○ Signal Pole with Sidewalk Guy  |
| ○ Inductive Loop Detector                        | ○ Inductive Loop Detector        |
| ○ Controller & Cabinet                           | ○ Controller & Cabinet           |
| ○ Junction Box                                   | ○ Junction Box                   |
| ○ 2-in Underground Conduit                       | ○ 2-in Underground Conduit       |
| N/A Right of Way                                 | ○ Right of Way                   |
| → Directional Arrow                              | → Directional Arrow              |
| ○ Metal Pole with Mastarm                        | ○ Metal Pole with Mastarm        |
| N/A Wheelchair Ramp                              | ○ Wheelchair Ramp                |
| ○ Type II Signal Pedestal                        | ○ Type II Signal Pedestal        |
| ○ Left Arrow "ONLY" Sign (R3-5L)                 | ○ Left Arrow "ONLY" Sign (R3-5L) |

**Signal Upgrade**

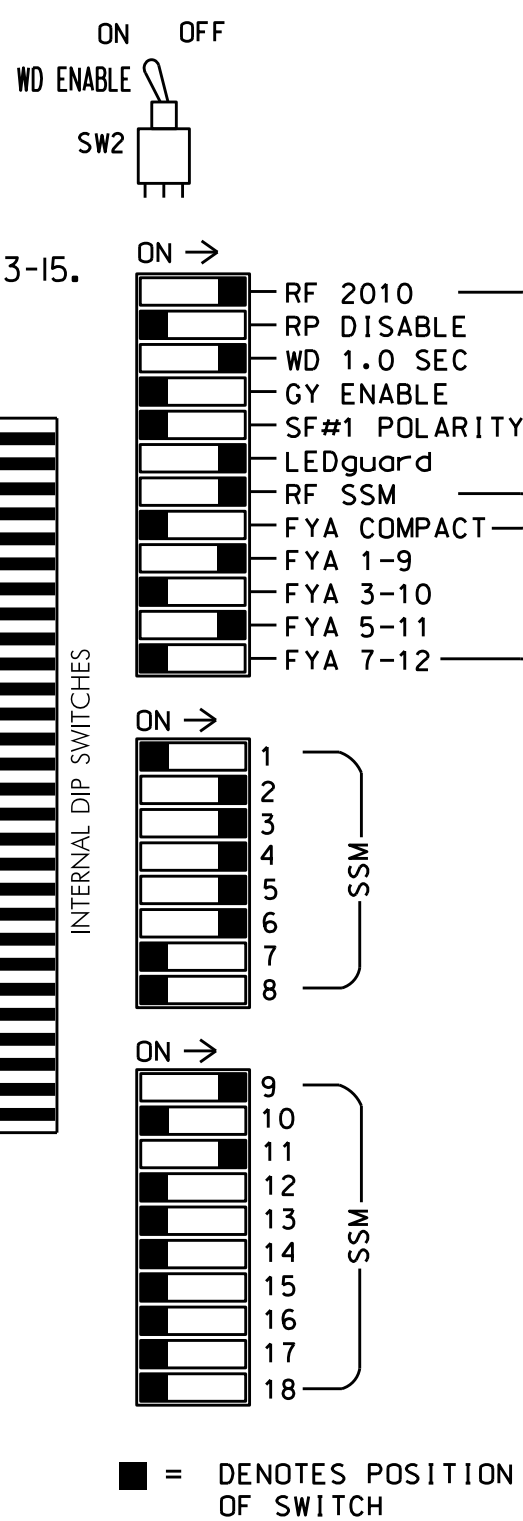
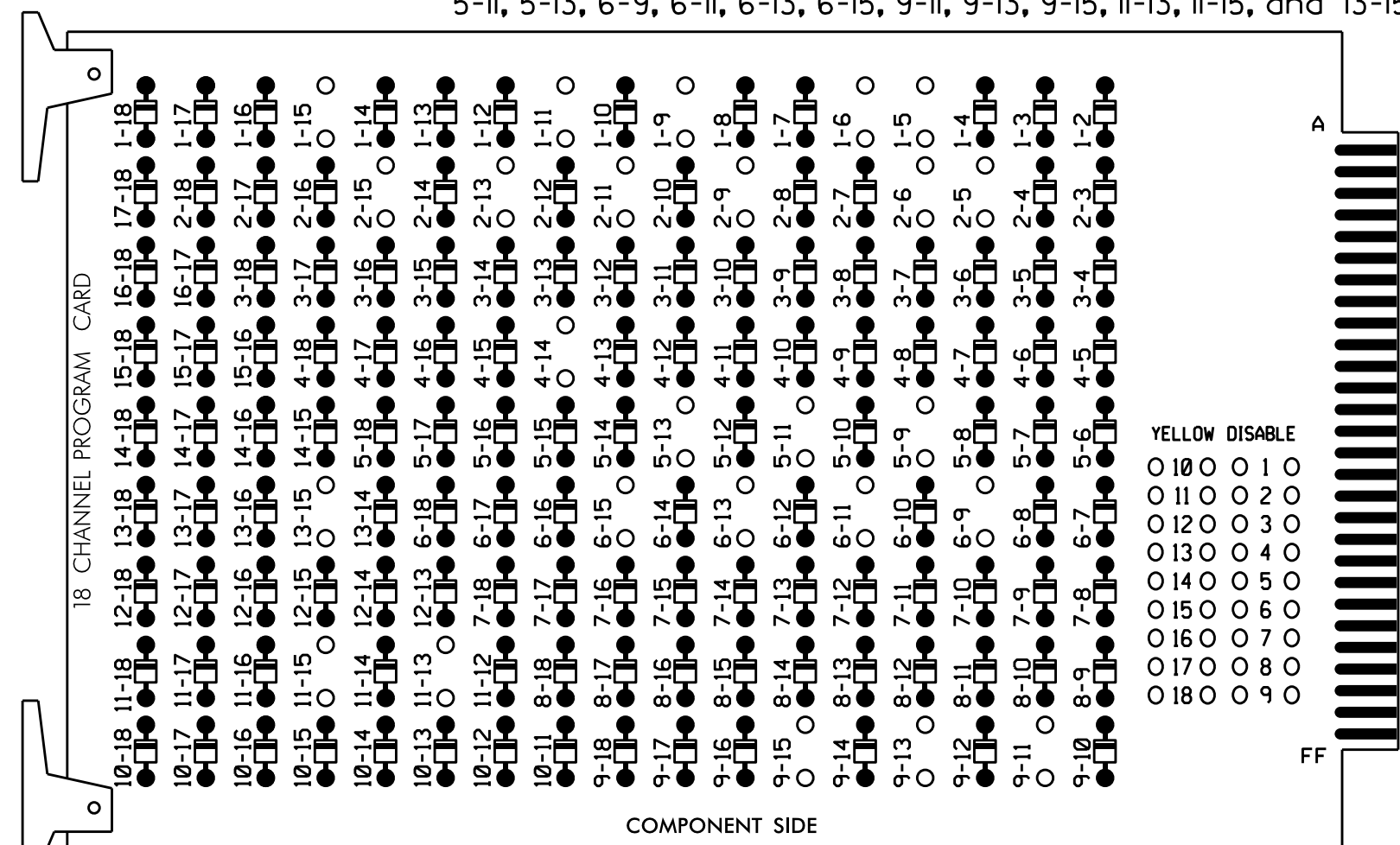
	Prepared in the Offices of: 		DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	
	US 158 (Croatan Highway) at SR 1217 (Ocean Bay Boulevard / Colington Road)		SEAL NATHAN E. LEBLANC PROFESSIONAL ENGINEER 042608	
	Division 1 Dare County Kill Devil Hills		SEAL MICHAN E. LEBLANC PROFESSIONAL ENGINEER 042608	
	PLAN DATE: January 2020 PREPARED BY: Jeff Spence	REVIEWED BY: MEL REVIEWED BY:	DATE:	DATE:

REVISIONS	INIT.	DATE

### EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 1-15, 2-5, 2-6, 2-9, 2-11, 2-13, 2-15, 4-14, 5-9, 5-11, 5-13, 6-9, 6-11, 6-13, 6-15, 9-11, 9-13, 9-15, 11-13, 11-15, and 13-15.



REMOVE JUMPERS AS SHOWN

**NOTES:**

- Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
- Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
- Ensure that Red Enable is active at all times during normal operation.
- Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

### NOTES

- 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.
- Enable Simultaneous Gap-Out for all Phases.
- Program phases 2 and 6 for Variable Initial and Gap Reduction.
- Program phases 2 and 6 for Startup In Green.
- Program phase 4 for Startup Ped Call.
- Program phases 2 and 6 for Yellow Flash, and overlap 1 as Wag Overlaps.
- If this signal will be managed by an ATMS software, enable controller and detector logging for all enabled detectors.
- The cabinet and controller are part of the US 158 (Croatan Hwy) South CLS, Signal System #10107.

### EQUIPMENT INFORMATION

CONTROLLER.....2070  
 CABINET.....332  
 SOFTWARE.....ECONOLITE OASIS  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE  
 LOAD SWITCHES USED.....S1,S2,S3,S4,S5,S6,S7,S8,S9,  
 AUX S1,AUX S4  
 PHASES USED.....1,2,2 PED,3,4,4 PED,5,6,6 PED  
 OVERLAP "A".....1+2  
 OVERLAP "B".....NOT USED  
 OVERLAP "C".....5+6  
 OVERLAP "D".....NOT USED

### SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6			
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18			
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE			
SIGNAL HEAD NO.	11	21,22	P21, P22	31	32	41,42	43,44	62	P41, P42	44	51	61,62	P61, P62	NU	NU	NU	11	51	NU		
RED		128		116	116		101			*		134									
YELLOW	*	129		117	117		102					135									
GREEN		130		118	118		103					136									
RED ARROW							101												A121	A114	
YELLOW ARROW							102		102	132										A122	A115
FLASHING YELLOW ARROW																				A123	A116
GREEN ARROW	127			118		103		103		133	133										
Hand				113						104											119
Walking				115						106											121

NU = Not Used  
 \* Denotes install load resistor. See load resistor installation detail on sheet 2.  
 ★ See pictorial of head wiring in detail this sheet.

### INPUT FILE POSITION LAYOUT

(front view)

FILE	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	∅ 1	∅ 2	∅ 3	∅ 3	∅ 4	∅ 4	S	SYS. DET. S07	S	S	S	∅ 2 PED	∅ 6 PED	FS
I	1A	2A	3A	3C	4A	4C	S	SYS. DET. S08	S	S	S	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR
L	NOT USED	∅ 2	∅ 3	NOT USED	∅ 4	NOT USED	S	SYS. DET. S09	S	S	S	∅ 4 PED	NOT USED	ST
U	∅ 5	∅ 5	∅ 6	∅ 6	∅ 6	∅ 6	S	SYS. DET. S10	S	S	S	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR
J	5A	5B	6A	6B	6B	6B	S	SYS. DET. S10	S	S	S	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR
L	NOT USED	NOT USED	∅ 6	∅ 6	∅ 6	∅ 6	S	SYS. DET. S10	S	S	S	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR

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

FS = FLASH SENSE  
 ST = STOP TIME

⊗ Wired Input - Do not populate slot with detector card

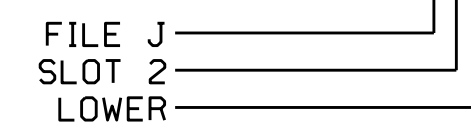
### INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A <sup>1</sup>	TB2-1,2	I1U	56	18	1	1	Y	Y			15
	-	J4U	48	10 ★	26	6	Y	Y	Y		3
	-	I1U	56	18 ★	51	1	Y	Y			3
2A	TB2-5,6	I2U	39	1	2	2	Y	Y			
2B	TB2-7,8	I2L	43	5	12	2	Y	Y			
3A	TB2-9,10	I3U	63	25	32	3	Y	Y			3
3B	TB2-11,12	I3L	76	38	42	3	Y	Y			10
3C	TB4-5,6	I5U	58	20	3	3	Y	Y			15
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			3
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			
4C	TB6-1,2	I7U	65	27	34	4	Y	Y			
5A <sup>2</sup>	TB3-1,2	J1U	55	17	5	5	Y	Y			15
	-	I4U	47	9 ★	22	2	Y	Y	Y		3
	-	J1U	55	17 ★	55	5	Y	Y			3
5B	TB3-5,6	J2U	40	2	6	5	Y	Y			15
6A	TB3-9,10	J3U	64	26	36	6	Y	Y			
6B	TB3-11,12	J3L	77	39	46	6	Y	Y			
*S07	TB6-9,10	I9U	60	22	11	SYS					
*S08	TB6-11,12	I9L	62	24	13	SYS					
*S09	TB7-9,10	J9U	59	21	15	SYS					
*S10	TB7-11,12	J9L	61	23	17	SYS					
PED PUSH BUTTONS											
P21,P22	TB8-4,6	I12U	67	29	PED 2	2 PED					
P41,P42	TB8-5,6	I12L	69	31	PED 4	4 PED					
P61,P62	TB8-7,9	I13U	68	30	PED 6	6 PED					

NOTE:  
 INSTALL DC ISOLATORS IN INPUT FILE SLOTS 112 AND 113.

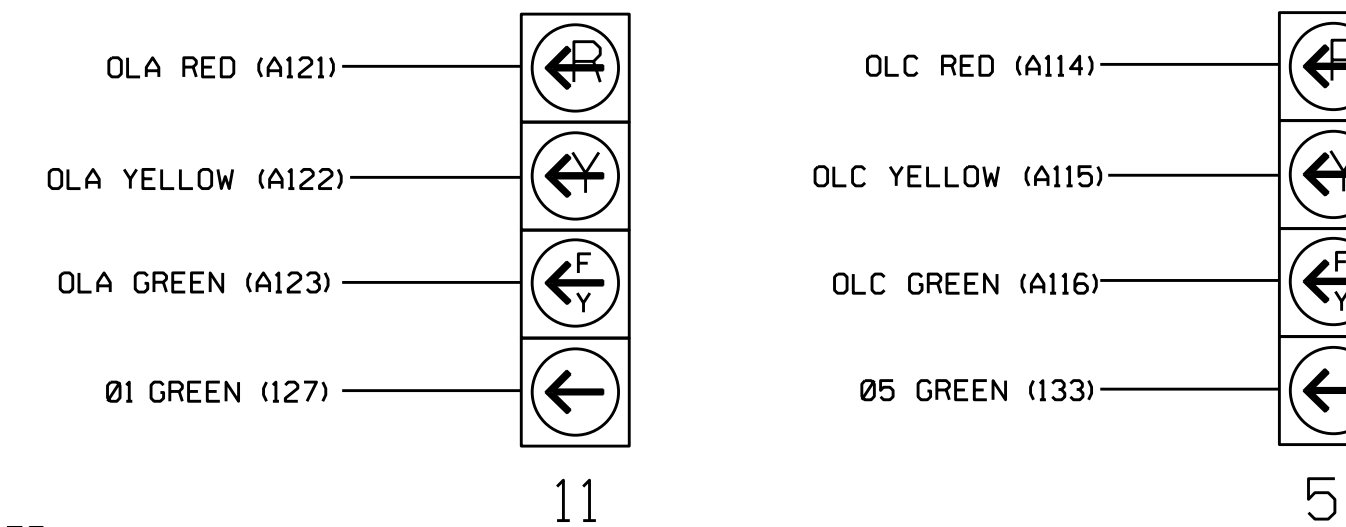
- Add jumper from I1-W to J4-W, on rear of input file.
- Add jumper from J1-W to I4-W, on rear of input file.
- See Input Page Assignment programming details on sheets 3 and 4.
- System detector only. Remove the vehicle phase assigned to this detector in the default programming.

### INPUT FILE POSITION LEGEND: J2L



### FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



**NOTE**

The sequence display for signal signal heads 11 and 51 requires special logic programming. See sheet 2 for programming instructions.

### COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

### ADVANCE WALK NOTE

(program controller as shown below)

From Main Menu press '2' (Phase Control), then '1' (Phase Control Functions). Program phases 2, 4, and 6 for 'Advanced Walk'. Make sure the Walk Advance Time shown on the Signal Design plans are programmed in the 'Phase Timing' menu.

Electrical Detail - Sheet 1 of 5

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared In the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529	US 158 (Croatan Highway) at SR 1217 (Collington Road/ Ocean Bay Boulevard)		DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED SEAL  Ryan W. Hough ENGINEER No. 036833	
	Division 1 PLAN DATE: January 2020 PREPARED BY: S. Armstrong	Dare County Kill Devil Hills REVIEWED BY: REVIEWED BY:		SEAL Ryan W. Hough 2/17/2020 DATE
	REVISIONS INIT. DATE	REVISIONS INIT. DATE		SIG. INVENTORY NO. 01-0030
	750 N. Greenfield Pkwy, Garner, NC 27529			SIG. INVENTORY NO. 01-0030

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 01-0030  
 DESIGNED: January 2020  
 SEALED: 2/12/2020  
 REVISED: N/A



# LOGICAL I/O PROCESSOR PROGRAMMING DETAIL TO PRODUCE SPECIAL FYA-PPLT SIGNAL SEQUENCE

(program controller as shown below)

- FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE ACT LOGIC COMMANDS 1, 2, 3, 4, 5, 6, 7, AND 8.
- FROM MAIN MENU PRESS '6' (OUTPUTS), THEN '3' (LOGICAL I/O PROCESSOR).

LOGICAL I/O COMMAND #1 (+/-COMMAND#)  
IF ACTIVE PHASE #1 IS ON  
AND RED CLEAR ON PHASE #1 IS ON

↓  
SCROLL DOWN

THEN:  
SET OUTPUT ASSIGNMENT #50 ON  
SET OUTPUT ASSIGNMENT #51 OFF

PRESS '+'

NOTE: LOGIC FOR PHASE 1 RED CLEAR WHEN TRANSITIONING FROM PHASE 1 TO PHASE 2 (HEAD 11).

LOGICAL I/O COMMAND #2 (+/-COMMAND#)  
IF ACTIVE PHASE #1 IS ON

↓  
SCROLL DOWN

THEN:  
SET OUTPUT ASSIGNMENT #52 OFF

PRESS '+'

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 1 (HEAD 11).

LOGICAL I/O COMMAND #3 (+/-COMMAND#)  
IF YELLOW ON PHASE #1 IS ON

↓  
SCROLL DOWN

THEN:  
SET OUTPUT ASSIGNMENT #51 ON

PRESS '+'

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 1 (HEAD 11).

LOGICAL I/O COMMAND #4 (+/-COMMAND#)  
IF OUTPUT ASSIGNMENT #10 IS ON  
AND OUTPUT ASSIGNMENT #13 IS OFF

↓  
SCROLL DOWN

THEN:  
SET OUTPUT ASSIGNMENT #52 OFF  
SET OUTPUT ASSIGNMENT #51 OFF  
SET OUTPUT ASSIGNMENT #50 ON

PRESS '+'

← LOGIC STATEMENT FOR ADVANCE WALK WITH FYA'S. TURN FYA HEAD 11 OFF DURING PED 2 ADVANCE WALK.

LOGICAL I/O COMMAND #5 (+/-COMMAND#)  
IF ACTIVE PHASE #5 IS ON  
AND RED CLEAR ON PHASE #5 IS ON

↓  
SCROLL DOWN

THEN:  
SET OUTPUT ASSIGNMENT #42 ON  
SET OUTPUT ASSIGNMENT #43 OFF

PRESS '+'

NOTE: LOGIC FOR PHASE 5 RED CLEAR WHEN TRANSITIONING FROM PHASE 5 TO PHASE 6 (HEAD 51).

LOGICAL I/O COMMAND #6 (+/-COMMAND#)  
IF ACTIVE PHASE #5 IS ON

↓  
SCROLL DOWN

THEN:  
SET OUTPUT ASSIGNMENT #44 OFF

PRESS '+'

NOTE: LOGIC FOR SWITCHING FLASHING YELLOW ARROW "OFF" DURING PHASE 5 (HEAD 51).

LOGICAL I/O COMMAND #7 (+/-COMMAND#)  
IF YELLOW ON PHASE #5 IS ON

↓  
SCROLL DOWN

THEN:  
SET OUTPUT ASSIGNMENT #43 ON

PRESS '+'

NOTE: LOGIC FOR YELLOW ARROW CLEARANCE FROM PHASE 5 (HEAD 51).

LOGICAL I/O COMMAND #8 (+/-COMMAND#)  
IF OUTPUT ASSIGNMENT #26 IS ON  
AND OUTPUT ASSIGNMENT #29 IS OFF

↓  
SCROLL DOWN

THEN:  
SET OUTPUT ASSIGNMENT #44 OFF  
SET OUTPUT ASSIGNMENT #43 OFF  
SET OUTPUT ASSIGNMENT #42 ON

PRESS '+'

← LOGIC STATEMENT FOR ADVANCE WALK WITH FYA'S. TURN FYA HEAD 51 OFF DURING PED 6 ADVANCE WALK.

LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

### OUTPUT REFERENCE SCHEDULE

OUTPUT 10 = 2 PED Walk  
OUTPUT 13 = Vehicle 2 Green  
OUTPUT 26 = 6 PED Walk  
OUTPUT 29 = Vehicle 6 Green  
OUTPUT 42 = Overlap C Red  
OUTPUT 43 = Overlap C Yellow  
OUTPUT 44 = Overlap C Green  
OUTPUT 50 = Overlap A Red  
OUTPUT 51 = Overlap A Yellow  
OUTPUT 52 = Overlap A Green

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## OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

PAGE 1: VEHICLE OVERLAP 'A' SETTINGS  
PHASE: 12345678910111213141516  
VEH OVL PARENTS: XX  
VEH OVL NOT VEH:  
VEH OVL NOT PED:  
VEH OVL GRN EXT:  
STARTUP COLOR: \_ RED \_ YELLOW \_ GREEN  
FLASH COLORS: \_ RED \_ YELLOW X GREEN  
SELECT VEHICLE OVERLAP OPTIONS: (Y/N)  
FLASH YELLOW IN CONTROLLER FLASH?...Y  
GREEN EXTENSION (0-255 SEC)...0.0  
YELLOW CLEAR (0=PARENT,3-25.5 SEC)...0.0  
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0  
OUTPUT AS PHASE # (0=NONE, 1-16)...0.0

← NOTICE GREEN FLASH

PRESS '+' TWICE

PAGE 1: VEHICLE OVERLAP 'C' SETTINGS  
PHASE: 12345678910111213141516  
VEH OVL PARENTS: XX  
VEH OVL NOT VEH:  
VEH OVL NOT PED:  
VEH OVL GRN EXT:  
STARTUP COLOR: \_ RED \_ YELLOW \_ GREEN  
FLASH COLORS: \_ RED \_ YELLOW X GREEN  
SELECT VEHICLE OVERLAP OPTIONS: (Y/N)  
FLASH YELLOW IN CONTROLLER FLASH?...Y  
GREEN EXTENSION (0-255 SEC)...0.0  
YELLOW CLEAR (0=PARENT,3-25.5 SEC)...0.0  
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0  
OUTPUT AS PHASE # (0=NONE, 1-16)...0.0

← NOTICE GREEN FLASH

OVERLAP PROGRAMMING COMPLETE

## OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS). PRESS 'NEXT' TO ADVANCE TO PAGE 2.

NOTICE  
PAGE 2 →

PAGE 2: VEHICLE OVERLAP 'A' SETTINGS  
PHASE: 12345678910111213141516  
VEH OVL PARENTS: X  
VEH OVL NOT VEH:  
VEH OVL NOT PED:  
VEH OVL GRN EXT:  
STARTUP COLOR: \_ RED \_ YELLOW \_ GREEN  
FLASH COLORS: \_ RED \_ YELLOW \_ GREEN  
SELECT VEHICLE OVERLAP OPTIONS: (Y/N)  
FLASH YELLOW IN CONTROLLER FLASH?...Y  
GREEN EXTENSION (0-255 SEC)...0.0  
YELLOW CLEAR (0=PARENT,3-25.5 SEC)...0.0  
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0  
OUTPUT AS PHASE # (0=NONE, 1-16)...0.0

PRESS '+' TWICE

NOTICE  
PAGE 2 →

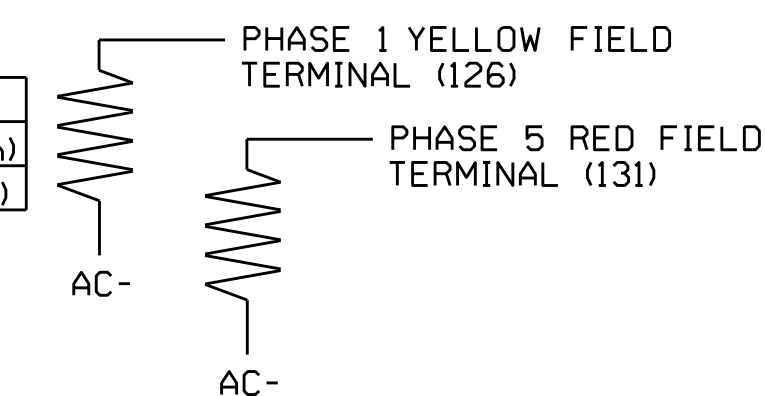
PAGE 2: VEHICLE OVERLAP 'C' SETTINGS  
PHASE: 12345678910111213141516  
VEH OVL PARENTS: X  
VEH OVL NOT VEH:  
VEH OVL NOT PED:  
VEH OVL GRN EXT:  
STARTUP COLOR: \_ RED \_ YELLOW \_ GREEN  
FLASH COLORS: \_ RED \_ YELLOW \_ GREEN  
SELECT VEHICLE OVERLAP OPTIONS: (Y/N)  
FLASH YELLOW IN CONTROLLER FLASH?...Y  
GREEN EXTENSION (0-255 SEC)...0.0  
YELLOW CLEAR (0=PARENT,3-25.5 SEC)...0.0  
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0  
OUTPUT AS PHASE # (0=NONE, 1-16)...0.0

OVERLAP PROGRAMMING COMPLETE

## LOAD RESISTOR INSTALLATION DETAIL

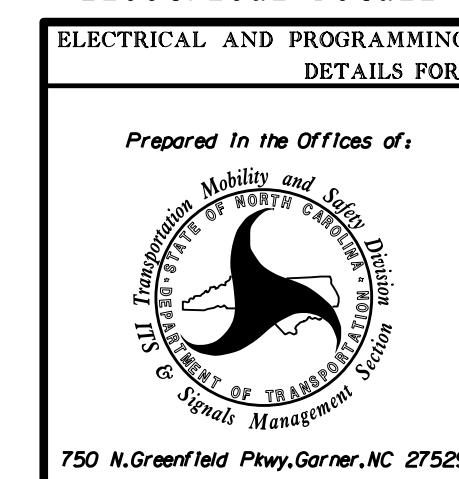
(install resistors as shown below)

ACCEPTABLE VALUES	
VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 01-0030  
DESIGNED: January 2020  
SEALED: 2/12/2020  
REVISED: N/A

Electrical Detail - Sheet 2 of 5



US 158 (Croatan Highway)  
at  
SR 1217 (Collington Road/  
Ocean Bay Boulevard)

Division 1	Dare County	Kill Devil Hills
PLAN DATE: January 2020	REVIEWED BY:	
PREPARED BY: S. Armstrong	REVIEWED BY:	
REVISIONS	INIT.	DATE

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SEAL  
RYAN W. HOUGH  
ENGINEER  
036833  
2/17/2020  
DATE  
SIC. INVENTORY NO. 01-0030

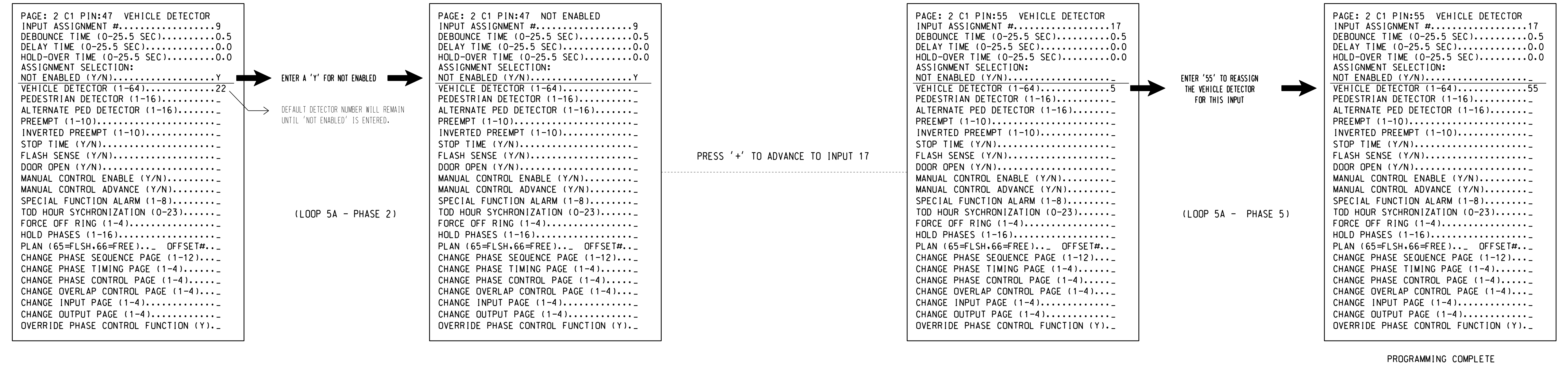


INPUT PAGE 2 ASSIGNMENT PROGRAMMING DETAIL FOR ALTERNATE PHASING - LOOP 5A

(program controller as shown below)

- NOTES: 1. THIS PROGRAMMING APPLIES FOR INPUT PAGE 2 ONLY. INPUT PAGE 1 WILL USE STANDARD DEFAULT SETTINGS. THIS PROGRAMMING IS NECESSARY FOR PROPER DETECTOR OPERATION DURING ALTERNATE PHASING OPERATION.
2. THE FIRST TASK THIS PROGRAMMING ACCOMPLISHES IS THE DISABLING OF INPUT #9 (DETECTOR 22) SO THAT A VEHICLE CALL WILL NOT BE PLACED TO PHASE 2 DURING ALTERNATE PHASING OPERATION. THE SECOND TASK THIS PROGRAMMING ACCOMPLISHES IS THAT IT REASSIGNS DETECTOR 55 TO INPUT #17 SO THAT THE DELAY ON LOOP 5A CAN BE REDUCED FROM 15 SECONDS TO 3 SECONDS.

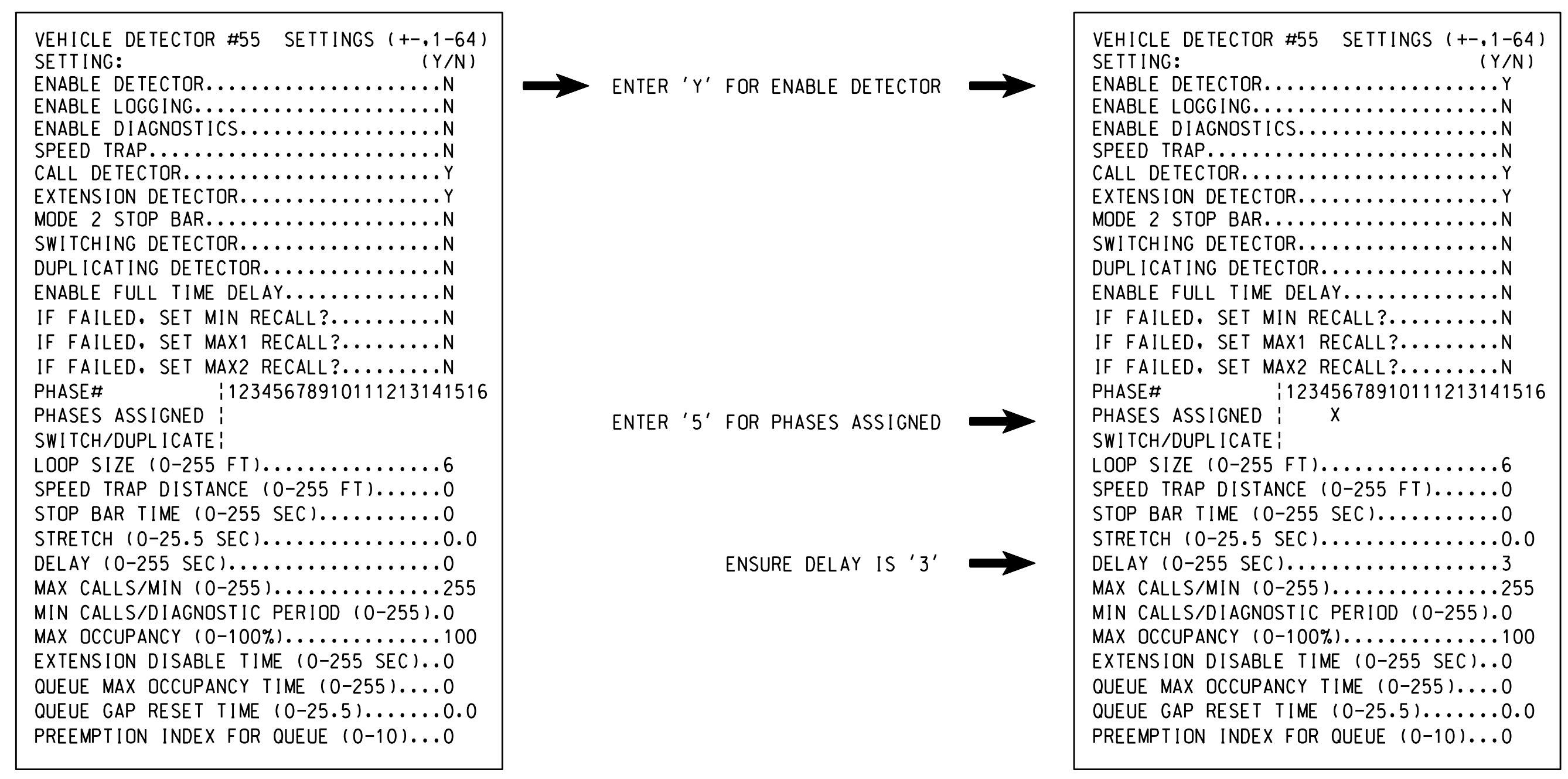
FROM MAIN MENU PRESS '5' (INPUTS), THEN PRESS 'NEXT' TO GET TO INPUT PAGE '2'. PRESS THE '+' KEY UNTIL INPUT 9 IS REACHED.



SPECIAL DETECTOR PROGRAMMING DETAIL - LOOP 5A (ALT.)

(program controller as shown below)

FROM MAIN MENU PRESS '7' (DETECTORS), THEN PRESS '1' FOR VEHICLE DETECTORS. PRESS THE '-' KEY TO GET TO VEHICLE DETECTOR #55.



NOTE: DETECTOR IS PROGRAMMED PER THE INPUT FILE CONNECTION AND PROGRAMMING CHART SHOWN ON SHEET 1.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 01-0030  
DESIGNED: January 2020  
SEALED: 2/12/2020  
REVISED: N/A

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Electrical Detail - Sheet 4 of 5

US 158 (Croatan Highway) at SR 1217 (Collington Road/Ocean Bay Boulevard)

Division 1 Dare County Kill Devil Hills

PLAN DATE: January 2020 REVIEWED BY:

PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS INIT. DATE

DocuSigned by: Ryan W. Hough 2/17/2020

SIG. INVENTORY NO. 01-0030

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## ALTERNATE PHASING ACTIVATION DETAIL

TO RUN ALT. PHASING DURING COORDINATION - SELECT ALL PAGE CHANGES (AS SHOWN BELOW) WITHIN COORDINATION PLAN PROGRAMMING.

TO RUN ALT. PHASING DURING FREE RUN - PROGRAM PAGE CHANGES (SHOWN BELOW) IN SEPARATE TIME OF DAY EVENTS. IF PAGE 1 IS USED, NO EVENT PROGRAMMING IS NECESSARY FOR THAT PARTICULAR PAGE.

<u>PHASING</u>	<u>INPUTS PAGE</u>	<u>OVERLAPS PAGE</u>
ACTIVE PAGES REQUIRED TO RUN <u>DEFAULT PHASING</u>	1	1
ACTIVE PAGES REQUIRED TO RUN <u>ALTERNATE PHASING</u>	2	2

NOTE: PAGES NOT SHOWN (i.e. sequence, phase control, etc.) SHOULD REMAIN AS '1', OR AS DEFINED BY TIMING ENGINEER.

IMPORTANT: IF ALT. PHASING IS USED DURING FREE RUN AND COORDINATION, DO NOT OPERATE TIME OF DAY PAGE CHANGE EVENTS CONCURRENTLY WITH COORDINATION PLAN EVENTS IN THE EVENT SCHEDULER. (EX. FREE RUN PAGE CHANGE 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":


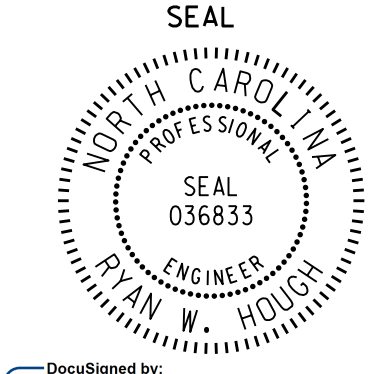
OVERLAPS PAGE 2: Modifies overlap parent phases for heads 11 and 51 to run protected turns only.

INPUTS PAGE 2: Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 3 seconds.

Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 3 seconds.

THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 01-0030  
DESIGNED: January 2020  
SEALED: 2/12/2020  
REVISED: N/A

Electrical Detail - Sheet 5 of 5

<p>ELECTRICAL AND PROGRAMMING DETAILS FOR:</p> <p style="text-align: center; font-size: small;">Prepared In the Offices of:</p>  <p style="font-size: x-small;">750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p style="text-align: center;"><b>US 158 (Croatan Highway)</b> at <b>SR 1217 (Collington Road/ Ocean Bay Boulevard)</b></p> <p style="font-size: x-small;">Division 1    Dare County    Kill Devil Hills</p> <p>PLAN DATE: January 2020    REVIEWED BY:</p> <p>PREPARED BY: S. Armstrong    REVIEWED BY:</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <thead> <tr> <th>REVISIONS</th> <th>INIT.</th> <th>DATE</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </tbody> </table>	REVISIONS	INIT.	DATE										<p style="text-align: center; font-size: x-small;"><b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b></p> <div style="text-align: center;">  <p style="font-size: x-small;">SEAL 036833 ENGINEER RYAN W. HOUGH</p> </div> <p style="font-size: x-small;">DocuSigned by: <b>Ryan W. Hough</b>    2/17/2020 DATE</p> <p style="font-size: x-small;">SIG. INVENTORY NO. 01-0030</p>
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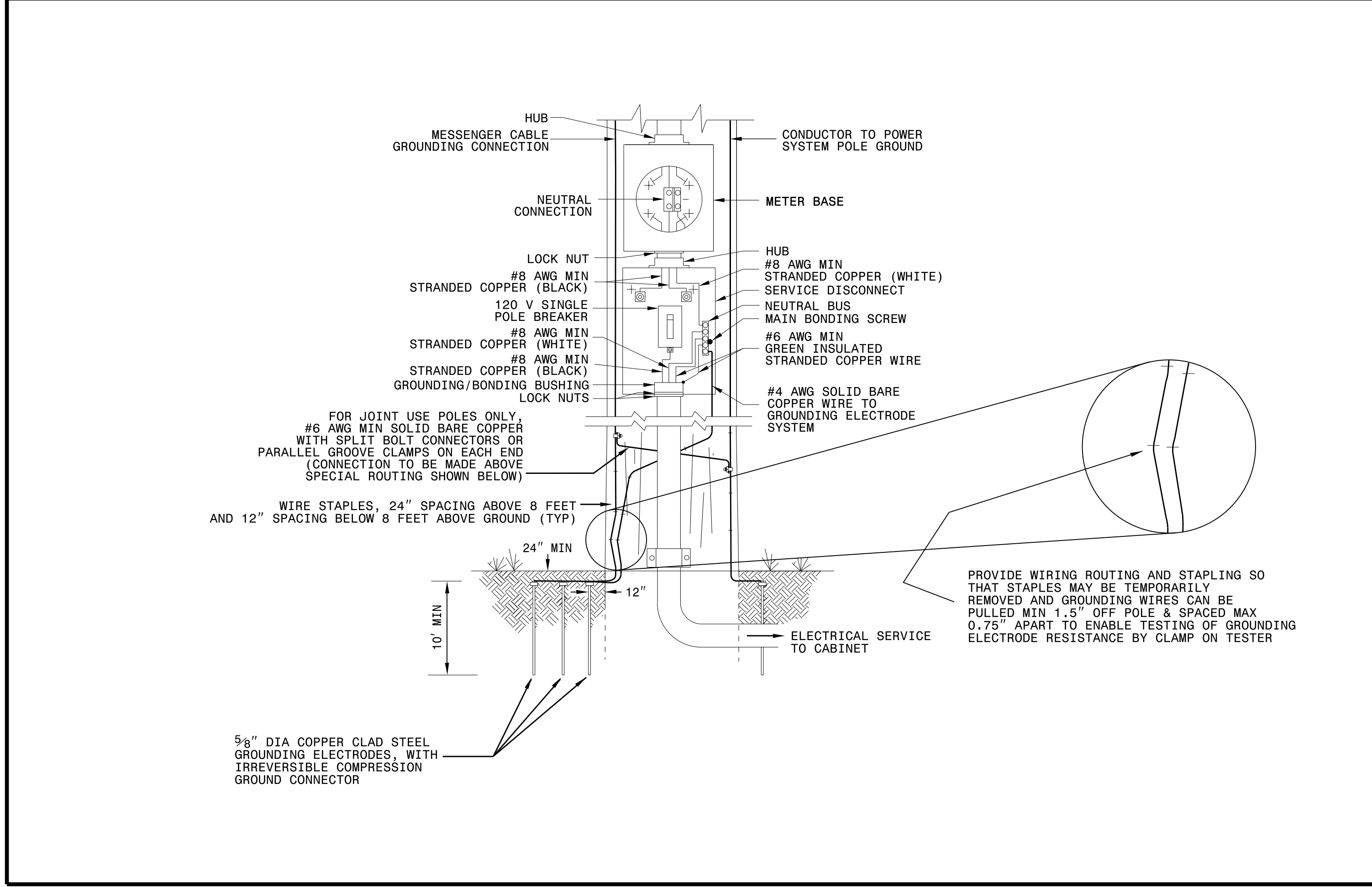
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sarmstrong



1-18 STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

ENGLISH STANDARD DRAWING FOR  
**ELECTRICAL SERVICE GROUNDING**  
GROUNDING AND BONDING

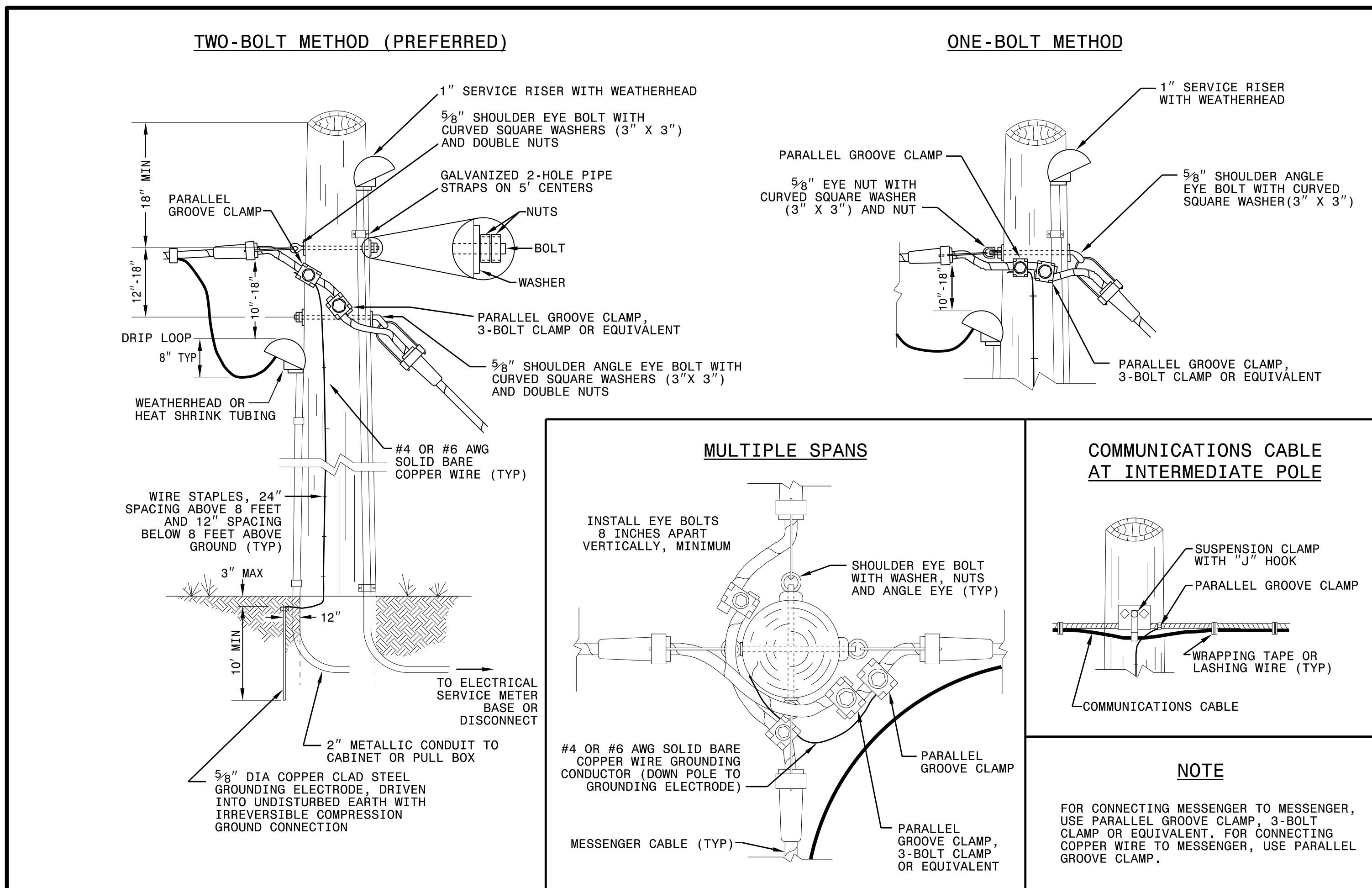
SHEET 1 OF 1  
**1700D01**



1-18 STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

ENGLISH STANDARD DRAWING FOR  
**WOOD POLES**  
METHODS OF ATTACHMENT AND GROUNDING

SHEET 1 OF 1  
**1720D01**

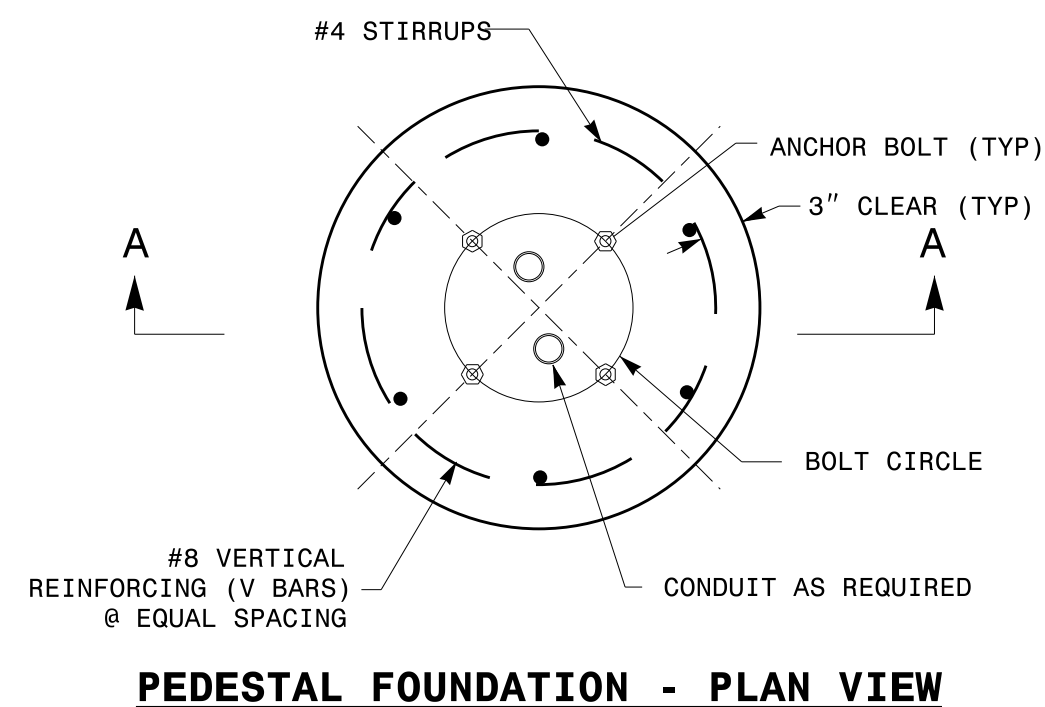


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SIGNATURES COMPLETED

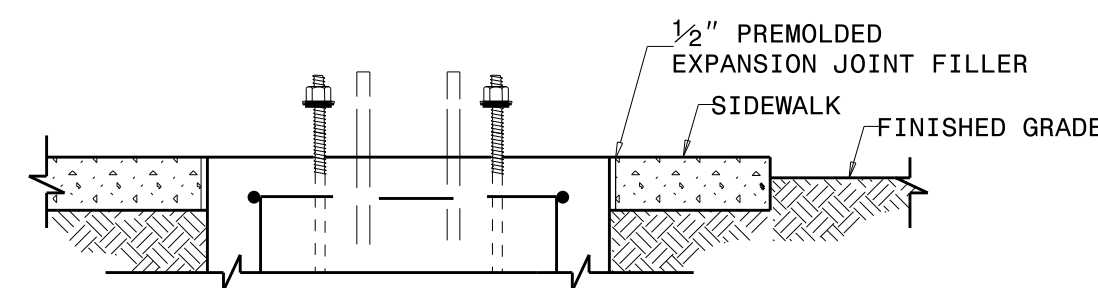
See Plate for Title

<p>Prepared in the Offices of:</p>	<p>SEAL</p>
<p>750 N. Greenfield Parkway Garner, NC 27529</p>	<p>DocuSigned by: <i>Mohd Aslami</i> 10/11/2017 DATE</p>

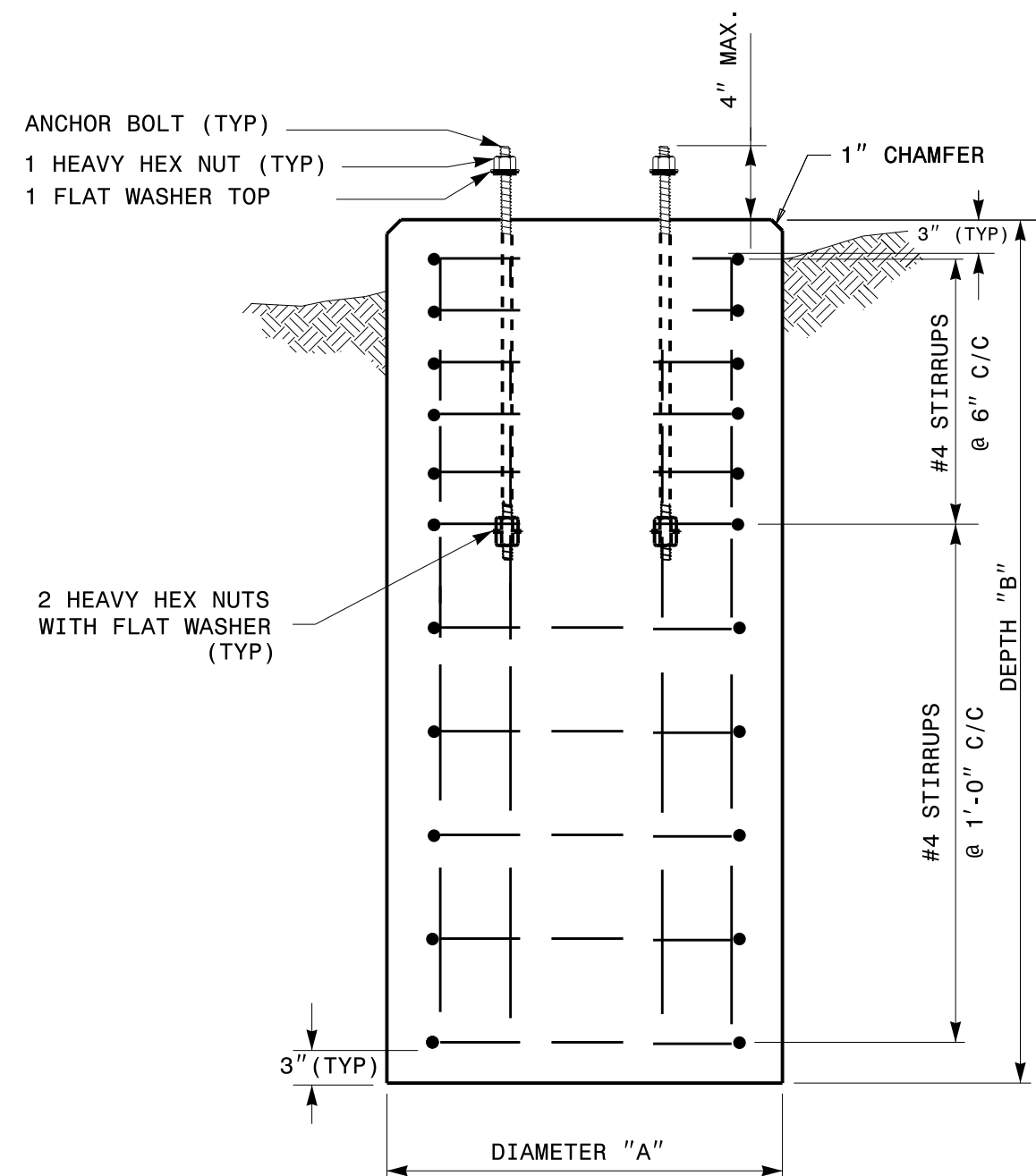
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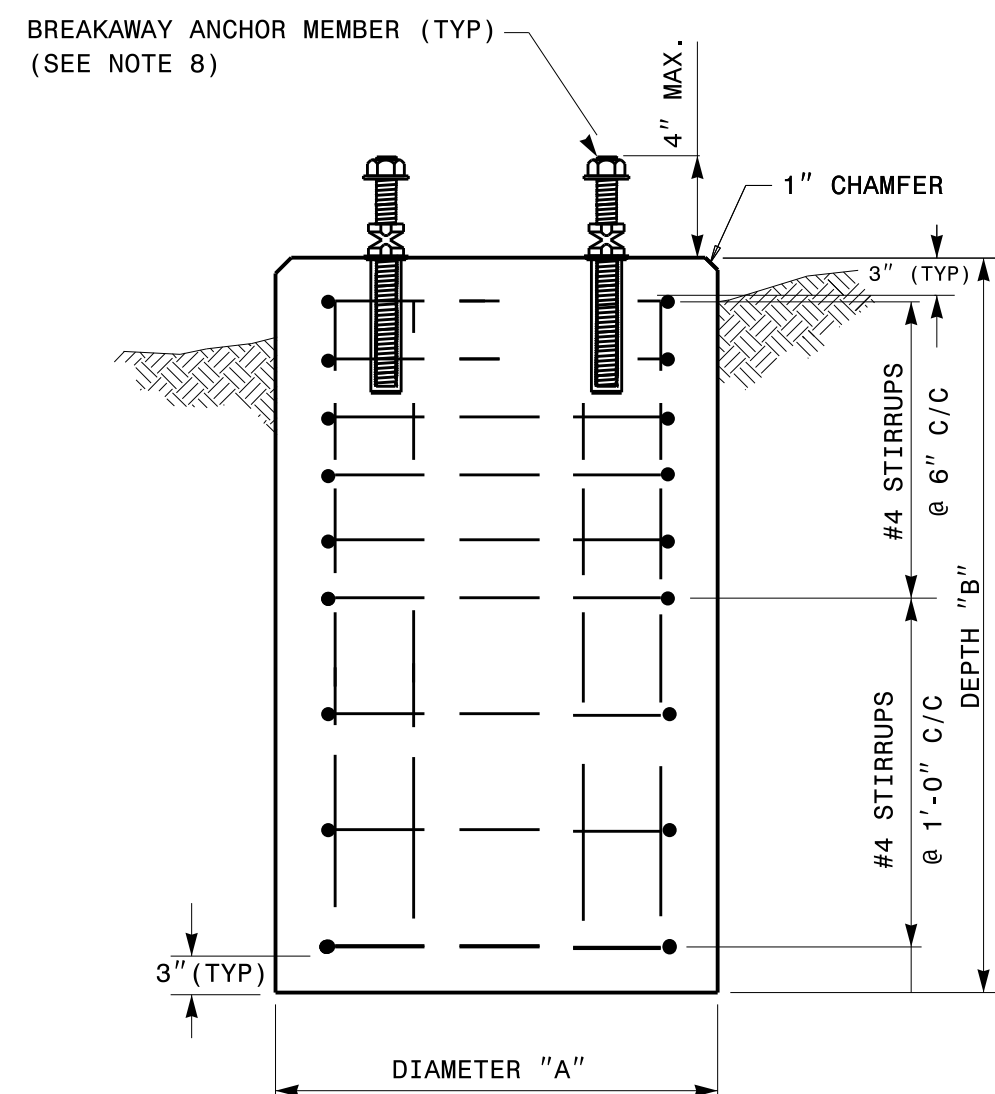
PEDESTAL FOUNDATION - PLAN VIEW



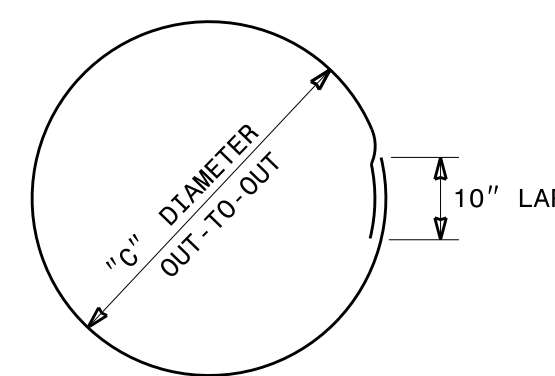
PEDESTAL FOUNDATION DETAILS FOR SIDEWALK



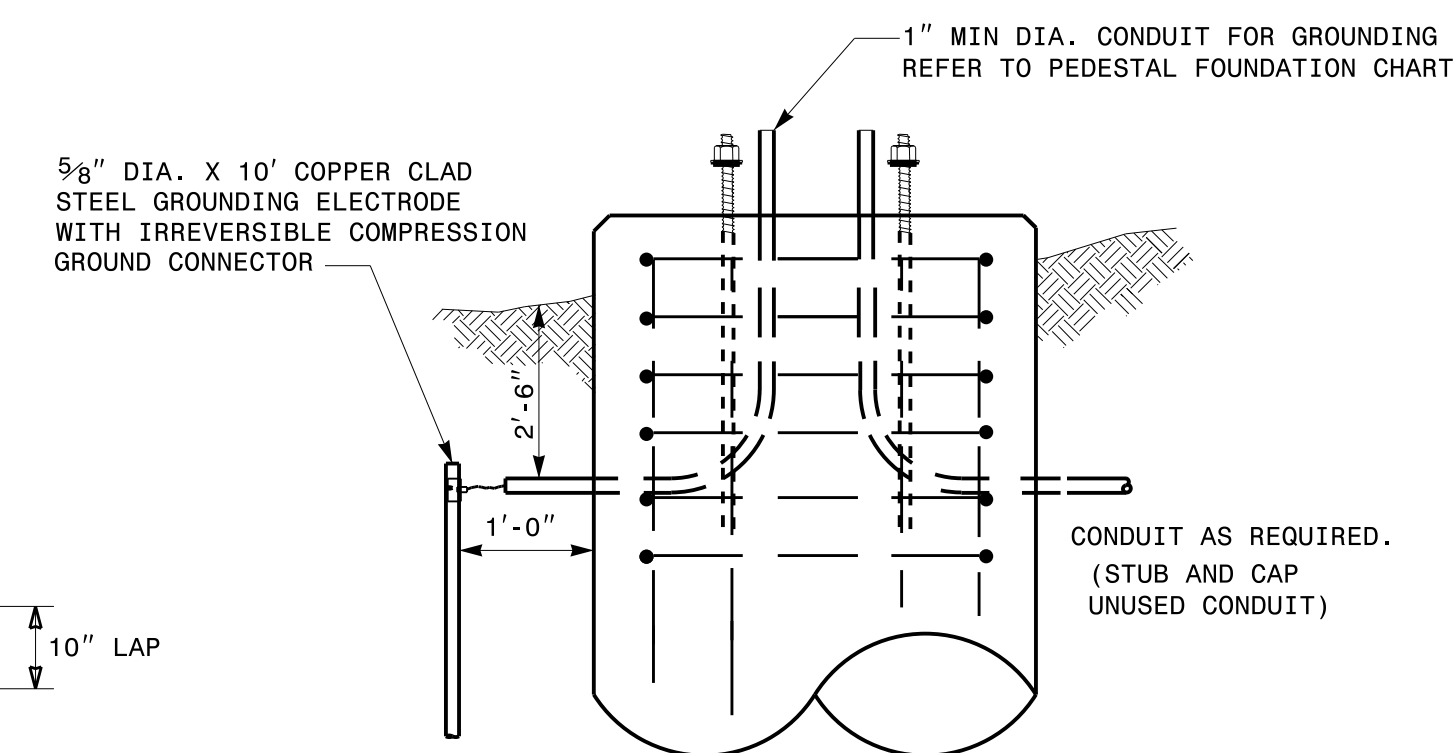
TYPES I, II & III  
SECTION A-A



TYPES I & II ONLY  
SECTION A-A



CLOSED HOOPS



GROUNDING & CONDUIT DETAIL

**NOTES:**

- CAST FOUNDATION AGAINST UNDISTURBED SOIL WHEREVER CONDITIONS PERMIT. IN UNSTABLE SOIL, CAST-IN-PLACE TUBE FORMS ARE ALLOWED WITH APPROVAL.
- COMPLY WITH APPLICABLE PROVISIONS OF SECTION 825 FOR CONCRETE CONSTRUCTION.
- USE CLASS "A" CONCRETE THAT MEETS THE REQUIREMENTS OF SECTION 1000 WITH A COMPRESSION STRENGTH AT 28 DAYS OF  $F'c = 3000$  PSI (MIN.).
- USE ASTM GRADE 60 DEFORMED BARS FOR ALL REINFORCING STEEL.
- GRADE IS ASSUMED TO BE (8H:1V) OR FLATTER. FOUNDATION SIZE AND DEPTHS ARE BASED ON THE FOLLOWING SOIL DESIGN PARAMETERS:
  - SANDY TYPE SOIL
  - NO GROUND WATER WITHIN 5'-0" OF SURFACE ELEVATION
  - WIND SPEED NOT TO EXCEED 140 MPH
 IF ACTUAL CONDITIONS VARY SUBSTANTIALLY FROM THOSE ASSUMED, THE FOUNDATION DEPTH MAY BE ADJUSTED. IN THIS CASE, CONTACT THE ENGINEER.
- MAINTAIN AT LEAST 3" COVER ON ALL REINFORCEMENT.
- ORIENT CONDUIT AS REQUIRED BY THE DESIGN OR AS DICTATED BY FIELD CONDITIONS.
- USE ADHESIVE ANCHOR FOR THREADED COUPLING INSERT. FOR TYPE I MINIMUM DEPTH NECESSARY IS 0'-4 1/2" AND FOR TYPE II MINIMUM DEPTH NECESSARY IS 0'-6 5/8". FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS.

PEDESTAL FOUNDATION TYPE AND SIZE							
TYPE	PEDESTAL DESCRIPTION	SIZE			ANCHOR BOLT		INSTALL GROUNDING SYSTEM (YES/NO)
		DIAMETER "A" FT	DEPTH "B" FT	CONCRETE VOLUME CY	DIAMETER (MIN.) IN	LENGTH FT-IN	
I	PEDESTRIAN PUSHBUTTON	2'-0"	3'-6"	.41	1/2	1'-6"	NO
II	NORMAL-DUTY	2'-0"	5'-0"	.58	3/4	2'-0"	YES
III	HEAVY-DUTY	2'-6"	7'-0"	1.27	1	4'-0"	YES

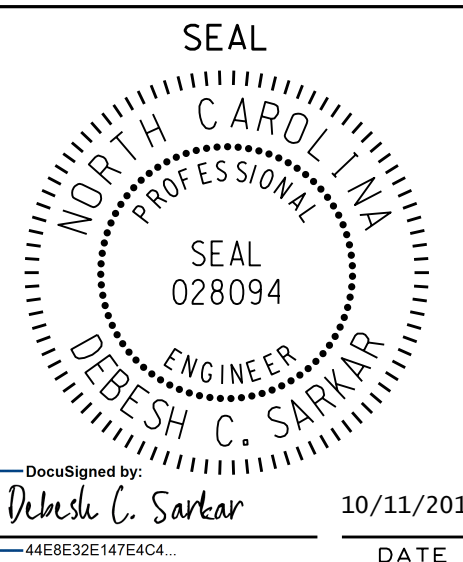
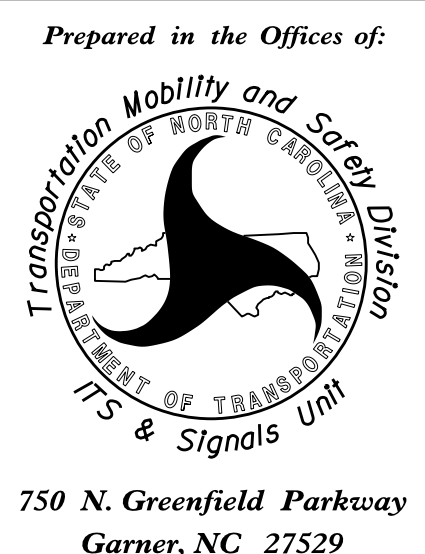
REINFORCING STEEL SCHEDULE													
TYPE	V-BAR				STIRRUP								
	SIZE #	QTY	LENGTH	WEIGHT LBS	SIZE #	QUANTITY			LENGTH	DIAMETER "C" FT	OVERLAP MIN.	WEIGHT LBS	TOTAL STEEL WEIGHT LBS
						VERTICAL ON 6" CENTERS	ON 12" CENTERS	TOTAL					
I	8	6	3'-0"	56	4	0	4	4	5'-7"	1'-6"	0'-10"	15	71
II	8	6	4'-6"	86	4	5	3	8	5'-7"	1'-6"	0'-10"	30	116
III	8	6	6'-6"	122	4	7	4	11	7'-2"	2'-0"	0'-10"	53	175

STATE OF NORTH CAROLINA  
DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
RALEIGH, N.C.

ENGLISH STANDARD DRAWING FOR  
**PEDESTALS**  
FOUNDATIONS

SHEET 1 OF 1  
**1743D01**

See Plate for Title

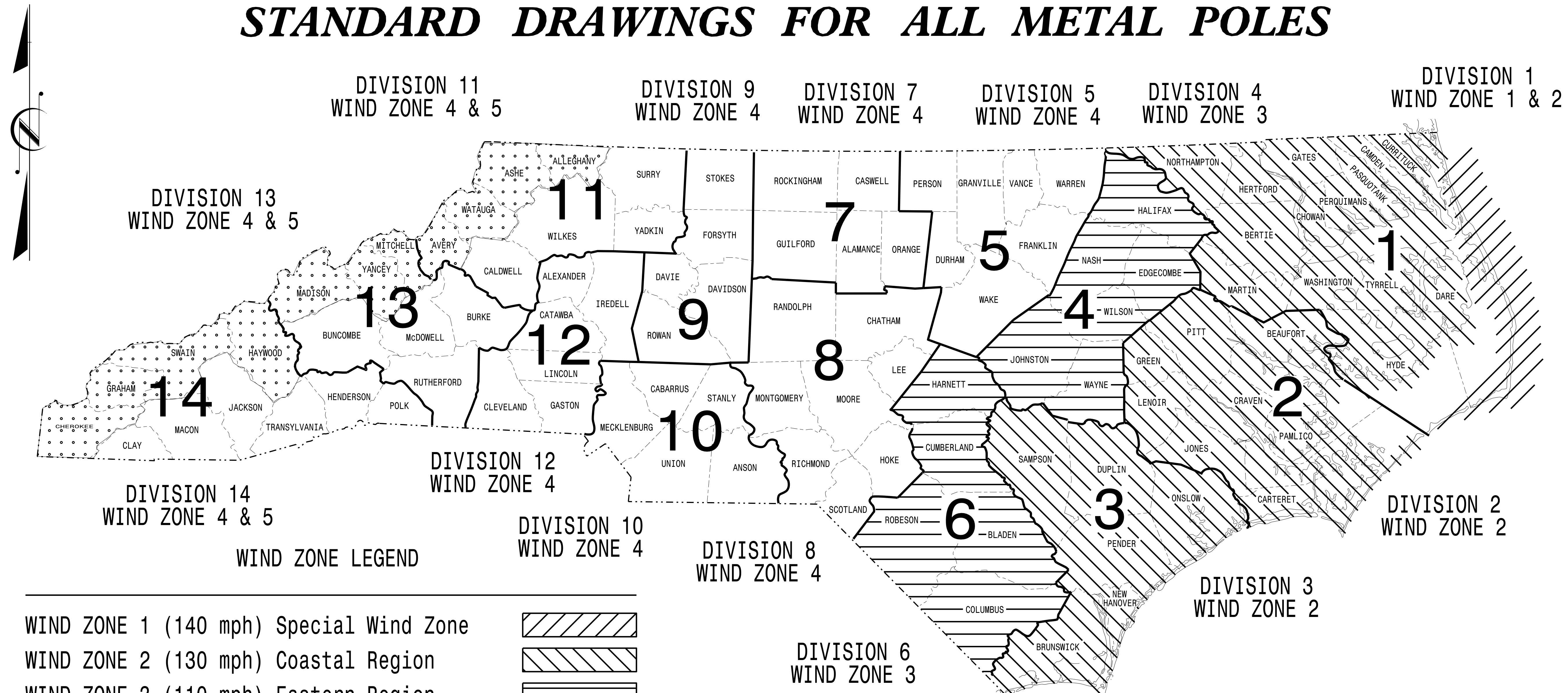


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FINAL UNLESS ALL  
SIGNATURES COMPLETED

# STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

PROJECT I.D. NO. <b>R-5014</b>	SHEET NO. <b>Sig.M1</b>
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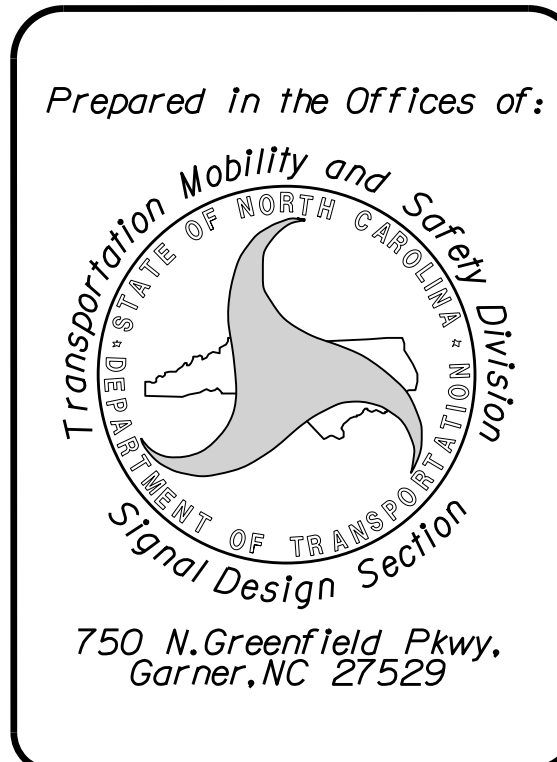
## STANDARD DRAWINGS FOR ALL METAL POLES



WIND ZONE LEGEND

WIND ZONE 1 (140 mph) Special Wind Zone	
WIND ZONE 2 (130 mph) Coastal Region	
WIND ZONE 3 (110 mph) Eastern Region	
WIND ZONE 4 (90 mph) Central & Mtn. Region	
WIND ZONE 5 (120 mph) Special Wind Zone	

<https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx>



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

DRAWING NUMBER	DESCRIPTION
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
Sig. M 7	Construction Details-Foundations
Sig. M 8	Standard Strain Pole Foundation-All Soil Conditions

**NC DOT CONTACTS:**

**MOBILITY AND SAFETY DIVISION - ITS AND SIGNALS UNIT**

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**M.M. MC DIARMID, P.E. - STATE ITS AND SIGNALS ENGINEER**

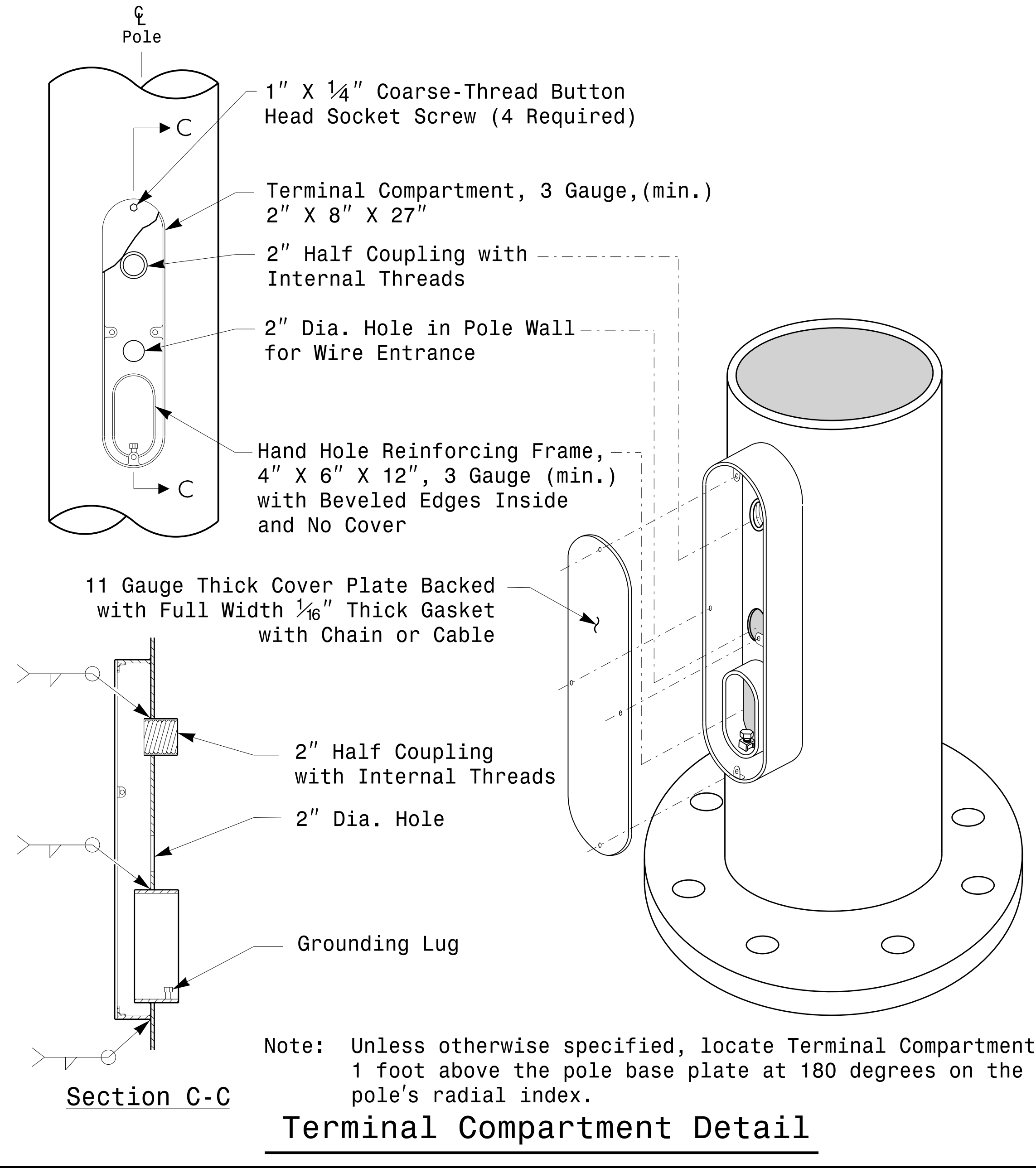
**J.P. GALLOWAY, P.E. - STATE SIGNALS ENGINEER**

**D.C. SARKAR, P.E. - ITS AND SIGNALS SENIOR STRUCTURAL ENGINEER**

SEAL

DocuSigned by:  
*Debesh C. Sarkar*  
DATE: 10/11/2017





MFG _____	MFG. DATE: MM/YY _____
SHAFT D/T/L/Y _____	_____
ARM-A D/T/L/Y _____	_____
ARM-B D/T/L/Y _____	_____
A.B. DIA./B.C./L/Y _____	_____
NCDOT SIG. INV. NO. _____	_____
NCDOT POLE NO. _____	_____

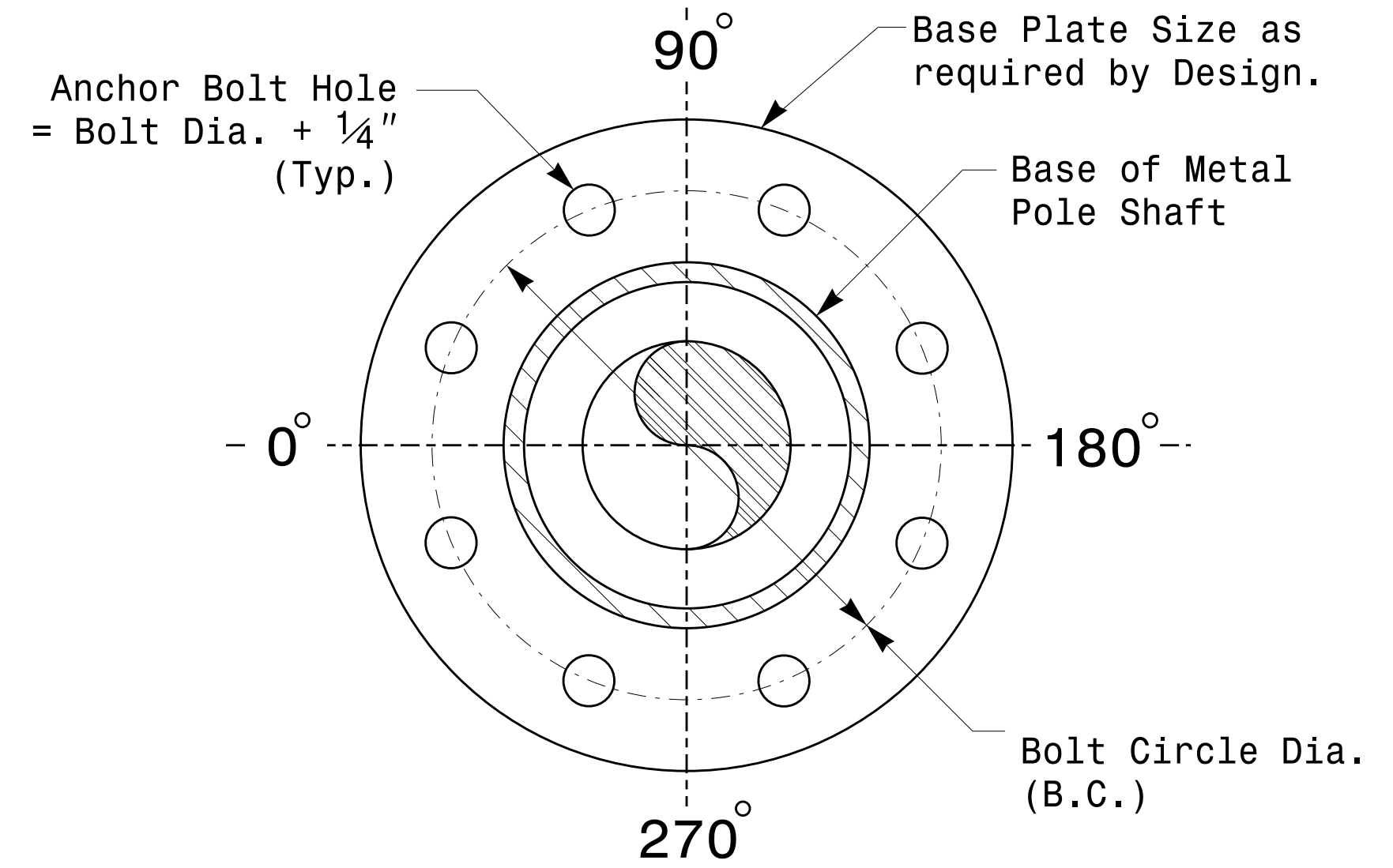
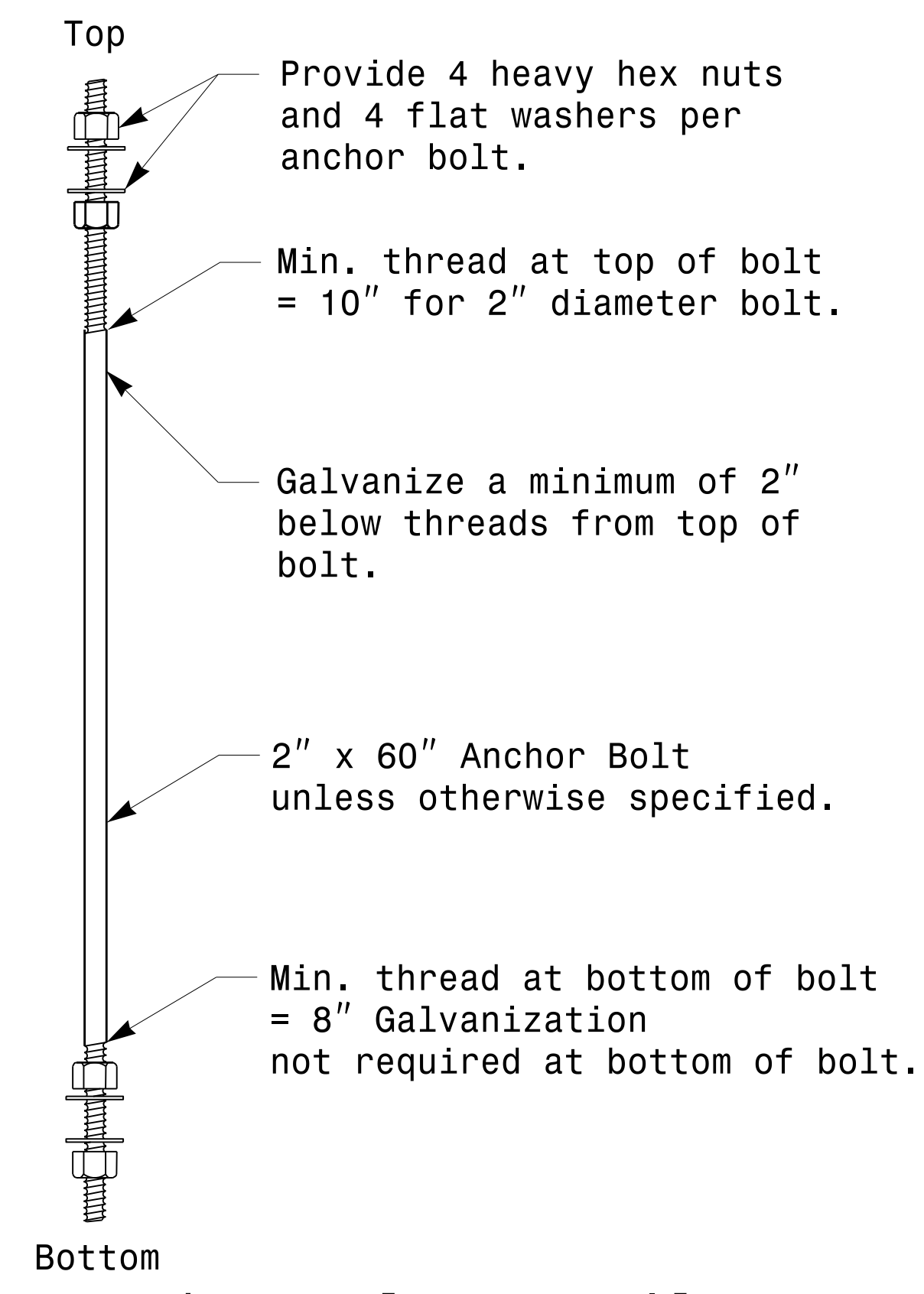
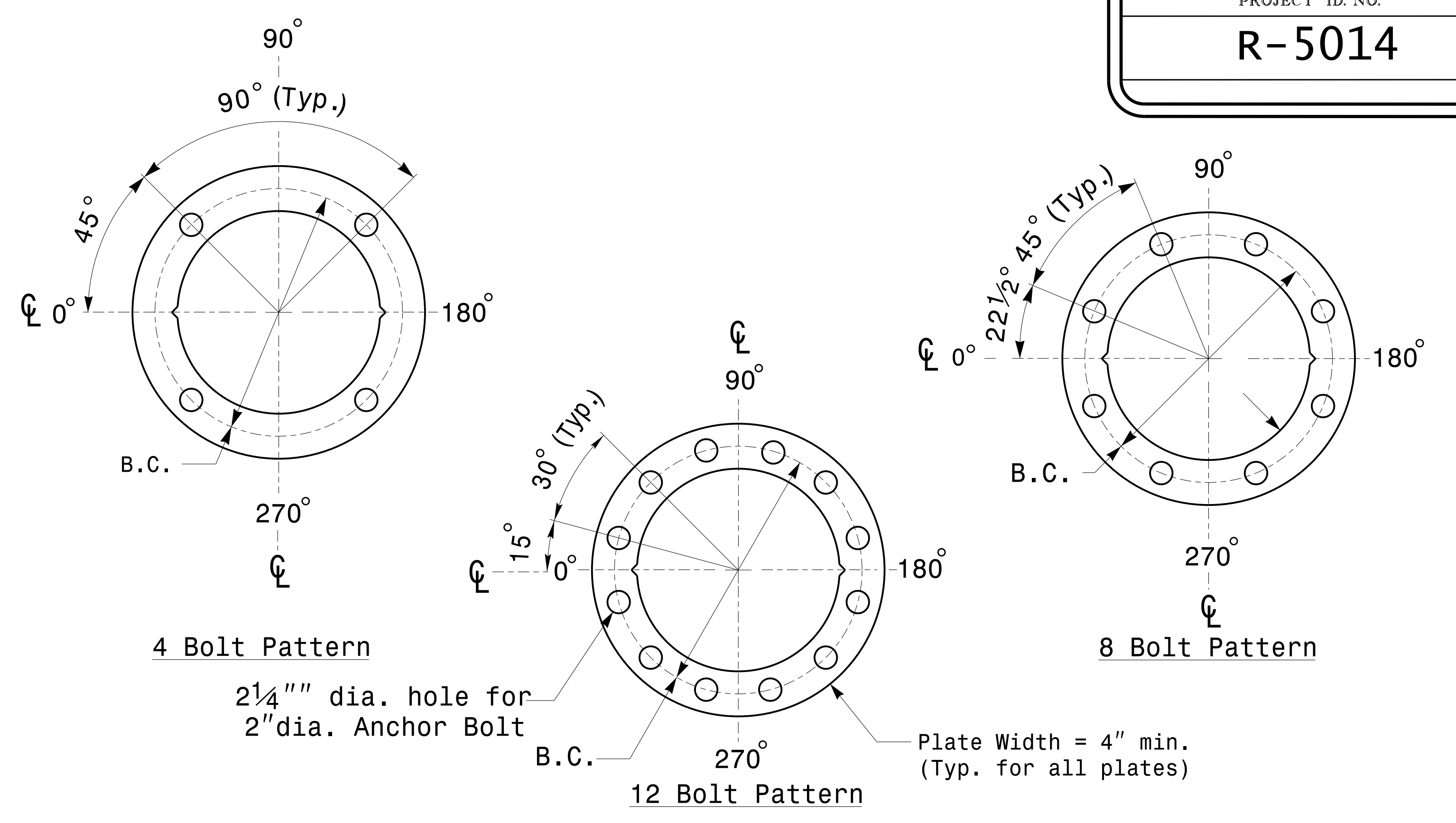
MFG _____	MFG. DATE:MM/YY _____
SECTION D/T/L/Y _____	_____
NCDOT SIG. INV. NO. _____	_____
NCDOT POLE NO. _____	_____

**Shaft I.D. Tag**  
(Provide on Shaft of Strain Poles and Mast Arm Poles Shaft)

**Arm I.D. Tag**  
(Provide on each section of a multi-section mast arm.)

- Notes:**
- 1) D= Diameter, T= Thickness, L= Length, Y= Yield Strength
  - 2) A.B. = Anchor Bolt
  - 3) B.C. = Bolt Circle of Anchor Bolts
  - 4) If Custom Design, use "NCDOT STANDARD" line for Signal Inv. Number and pole I.D. number
  - 5) See drawing M3 and M4 for mounting positions of I.D. tags.

**Identification Tag Details**



Note: Base plate may be circular, octagonal, square or rectangular in shape.

**Typical Base Plate Detail**

Prepared In the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

Typical Fabrication Details For All Metal Poles	
PLAN DATE: OCTOBER 2017	DESIGNED BY: C.F. ANDREWS
PREPARED BY: N. BITTING	REVIEWED BY: D.C. SARKAR
REVISIONS	INIT. DATE

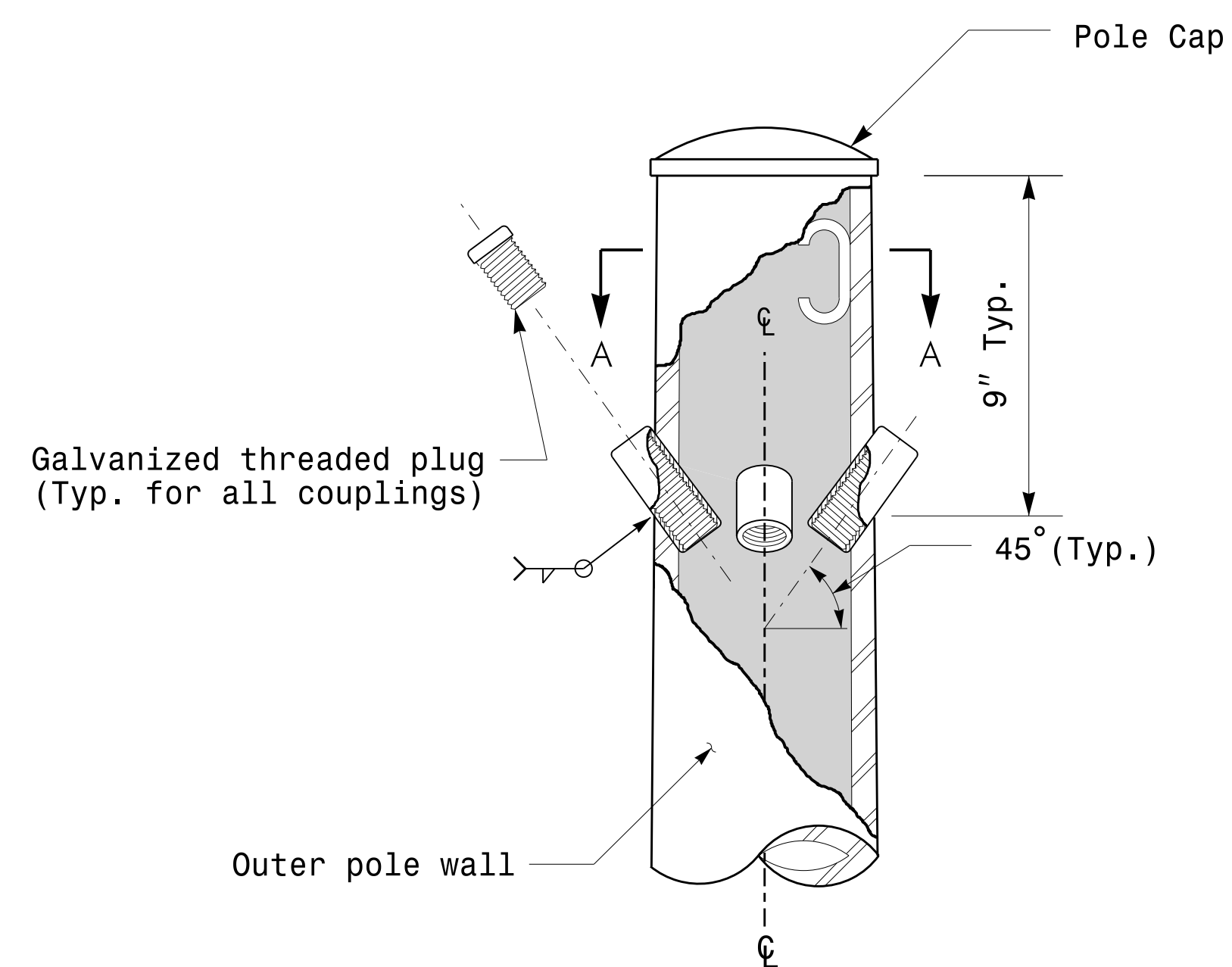
SEAL

DocuSign by: *D. C. Sarkar*

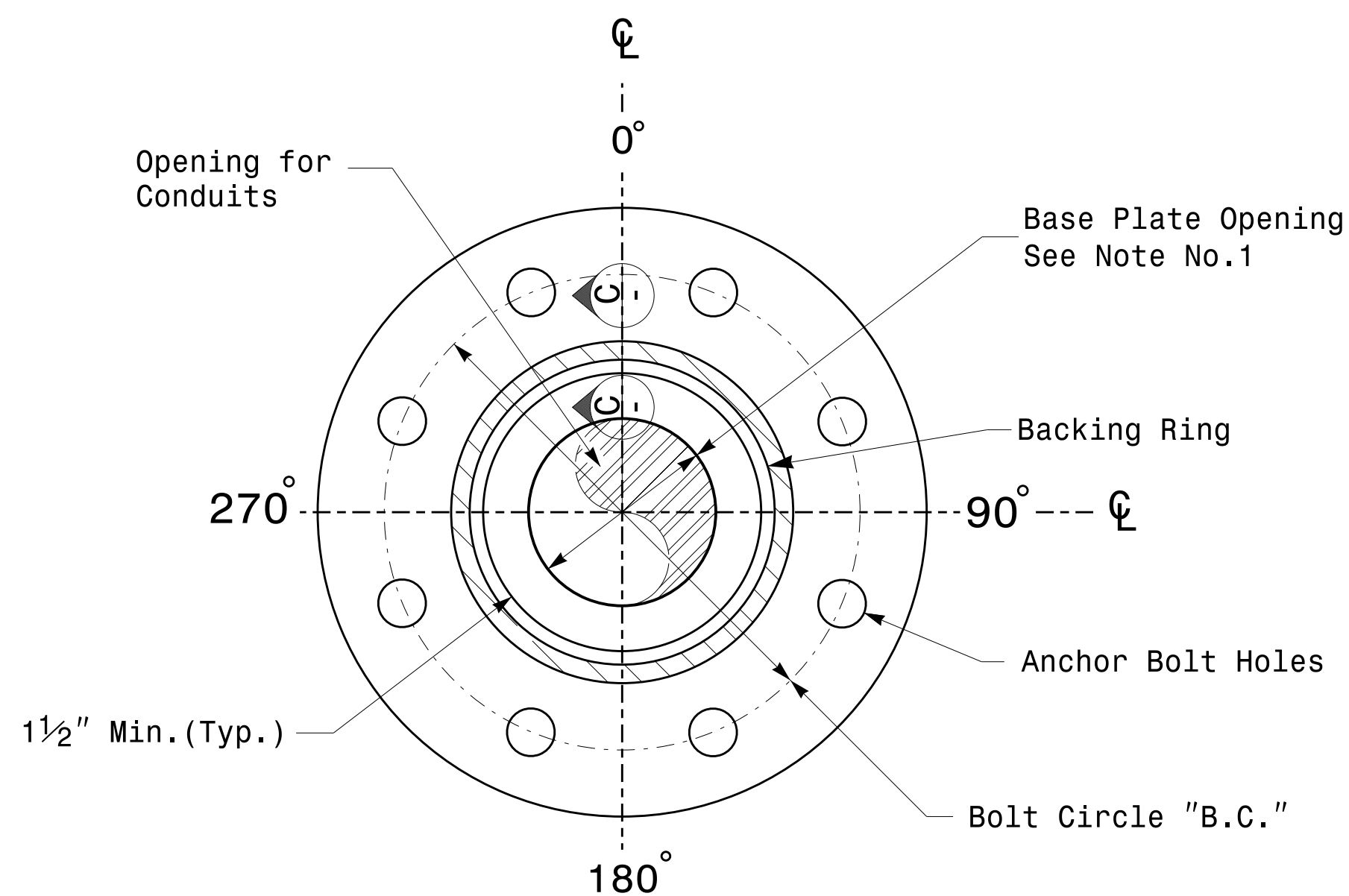
10/11/2017 DATE

11-001-2017-08:30 136504115 Signal&Sigs Design Section Eastern RegionM Sheets20162014 Sig.M2 Std. Fabrication Detail:ls-411 Poles.dgn

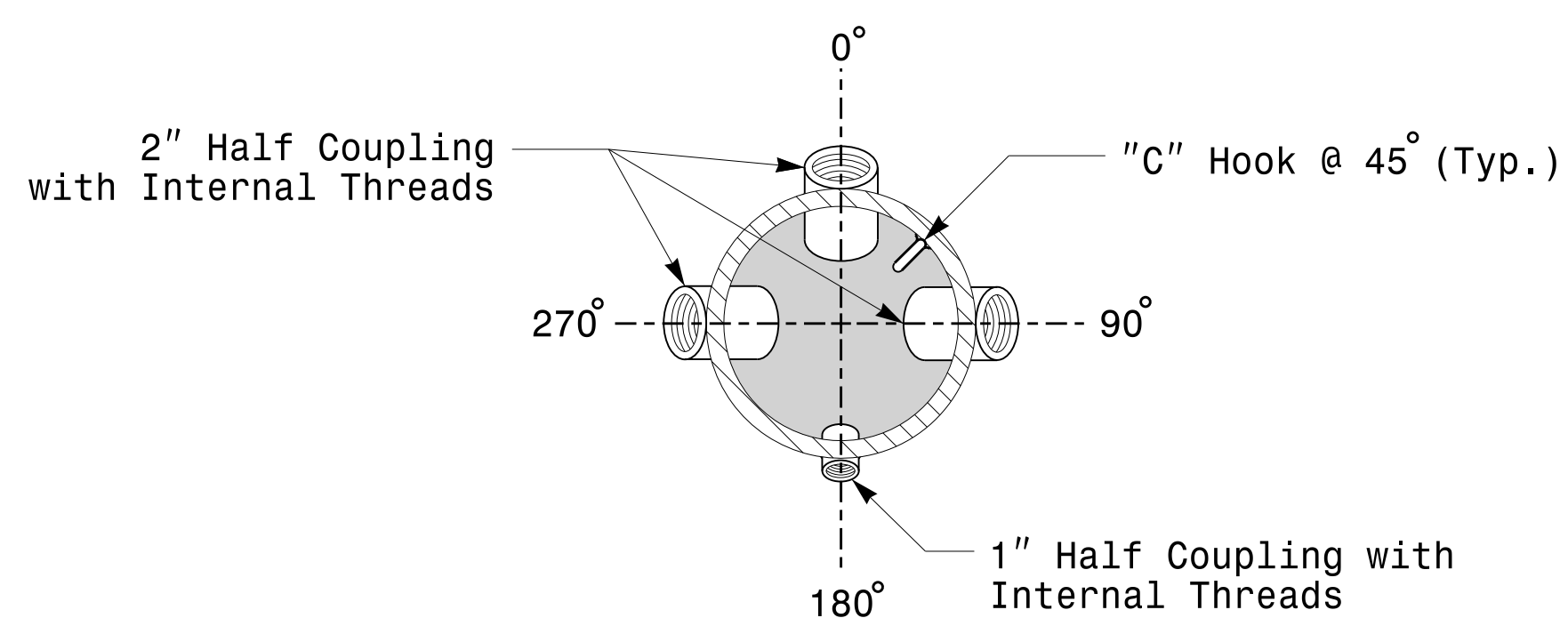
Note:  
 1. Opening in pole base plate shall be equal to pole base inside diameter minus 3 1/2" but shall not be less than 8 1/2".



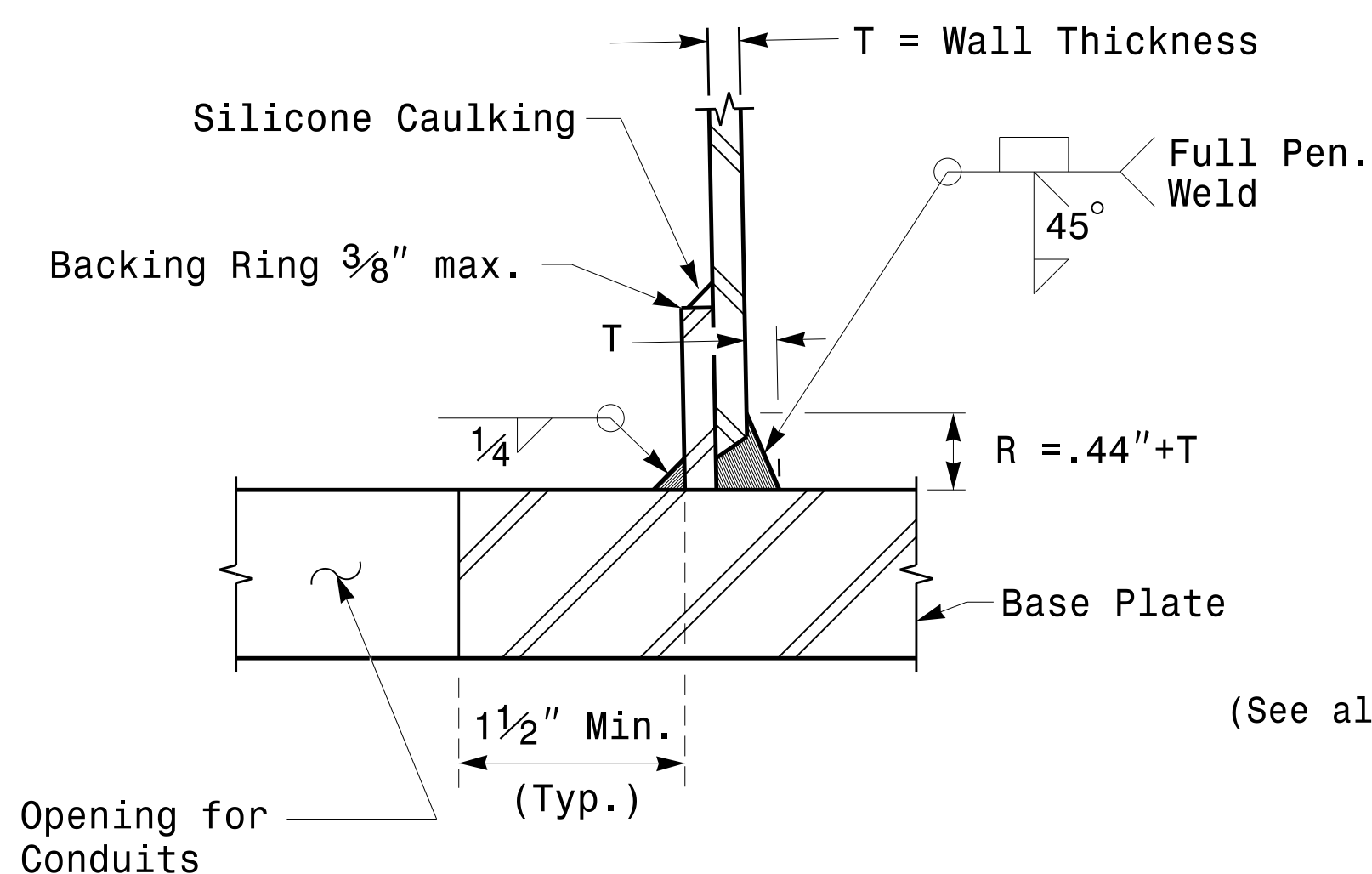
Cable Entrances at Top of Pole



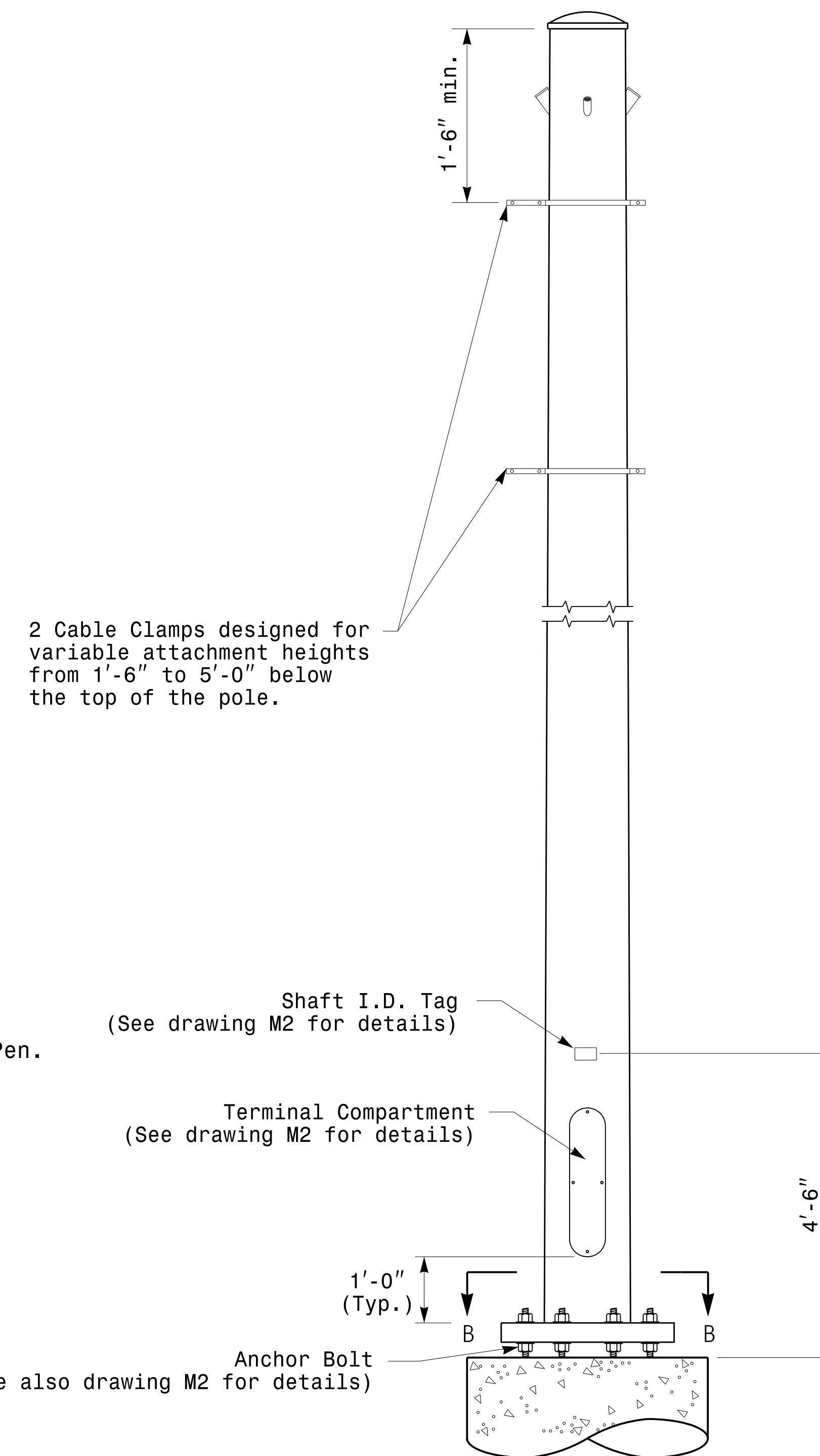
Section B-B Pole Base Plate Details (8 and 12 Bolt Pattern)



Section A-A Radial Orientation for Factory Installed Accessories at Top of Pole



Section C-C Full-Penetration Groove Weld Detail (Pole Attachment to Base Plate)

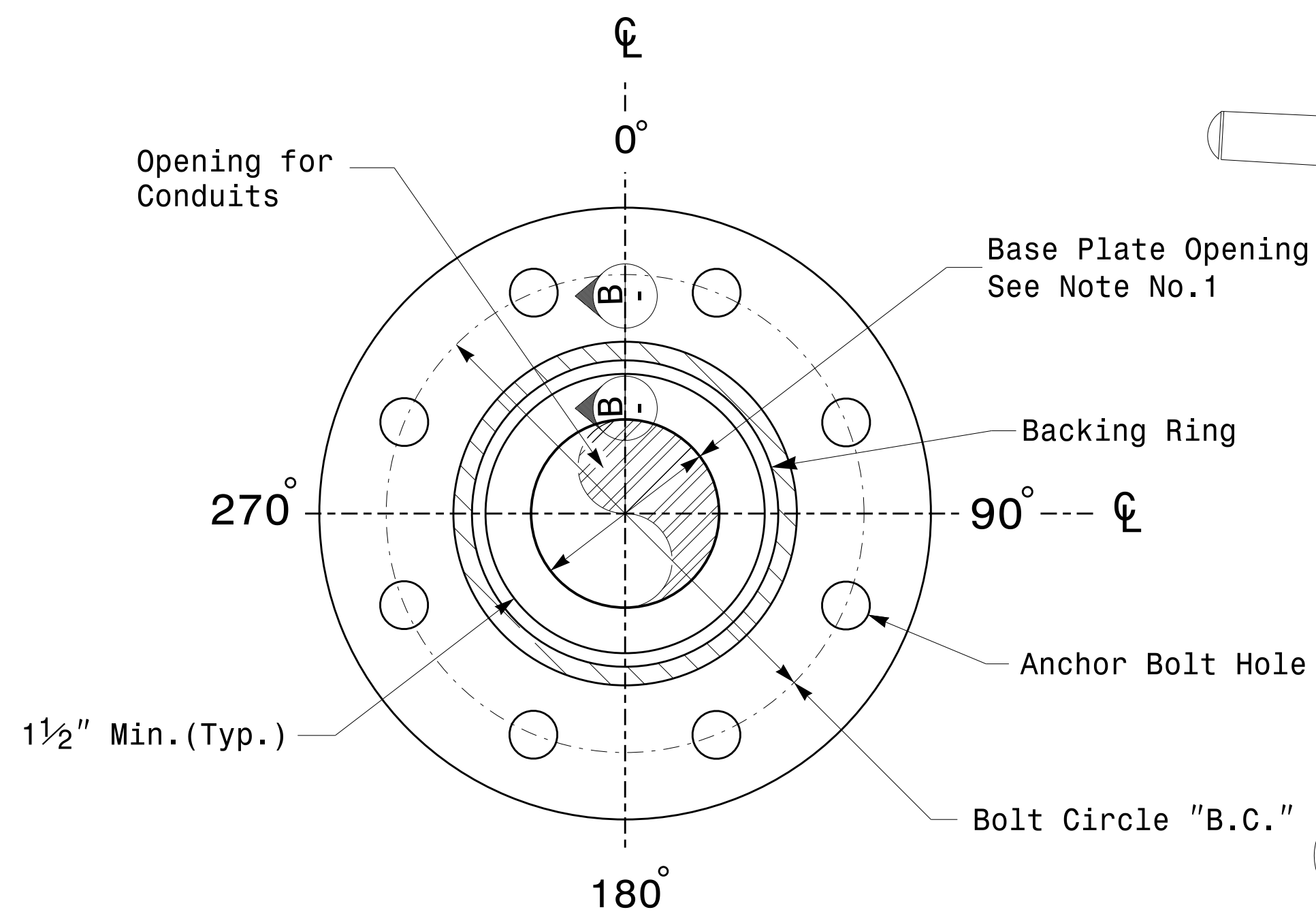


Monotube Strain Pole

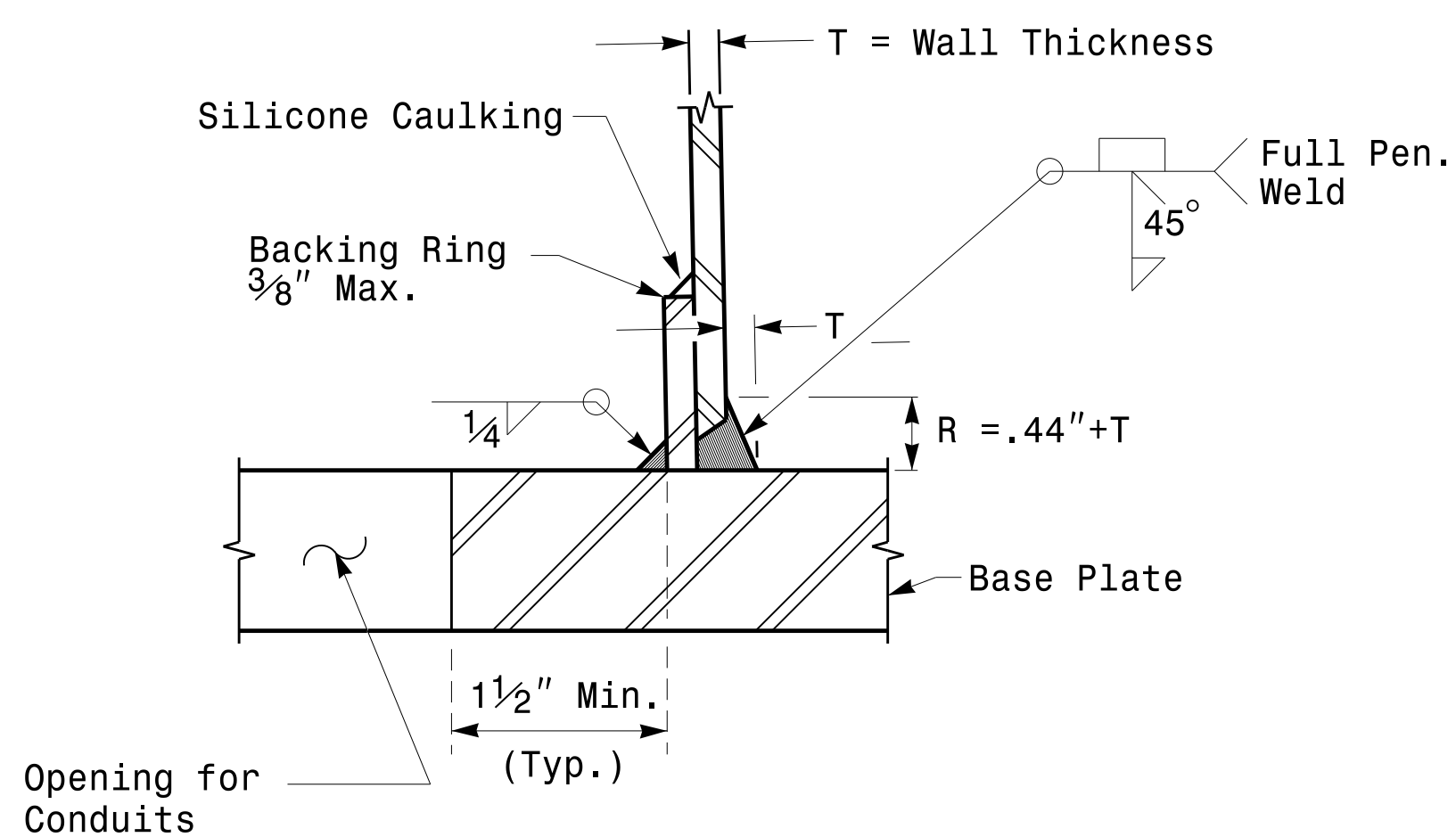
<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>Typical Fabrication Details For Strain Poles</p>		<p>SEAL</p> <p>DocuSigned by: Debesh C. Sarkar</p>
	<p>PLAN DATE: OCTOBER 2017</p> <p>PREPARED BY: N. BITTING</p>	<p>DESIGNED BY: K.C. DURIGON</p> <p>REVIEWED BY: D.C. SARKAR</p>	
<p>SCALE: NONE</p>	<p>REVISIONS</p>	<p>INIT. DATE</p>	<p>DATE</p>

Fabrication Details - Strain Poles

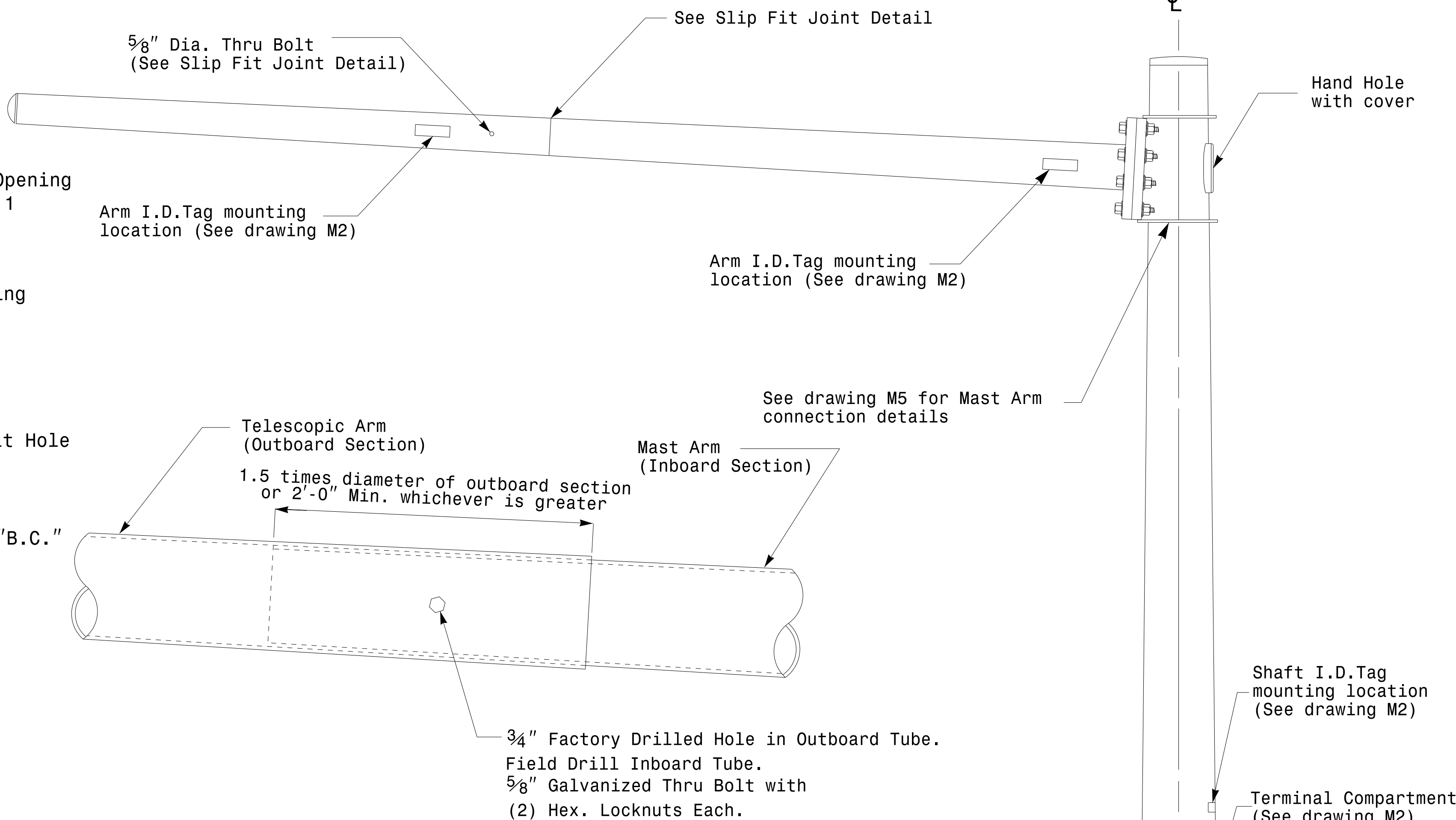
Note:  
 1. Opening in pole base plate shall be equal to pole base inside diameter minus 3 1/2" but shall not be less than 8 1/2".



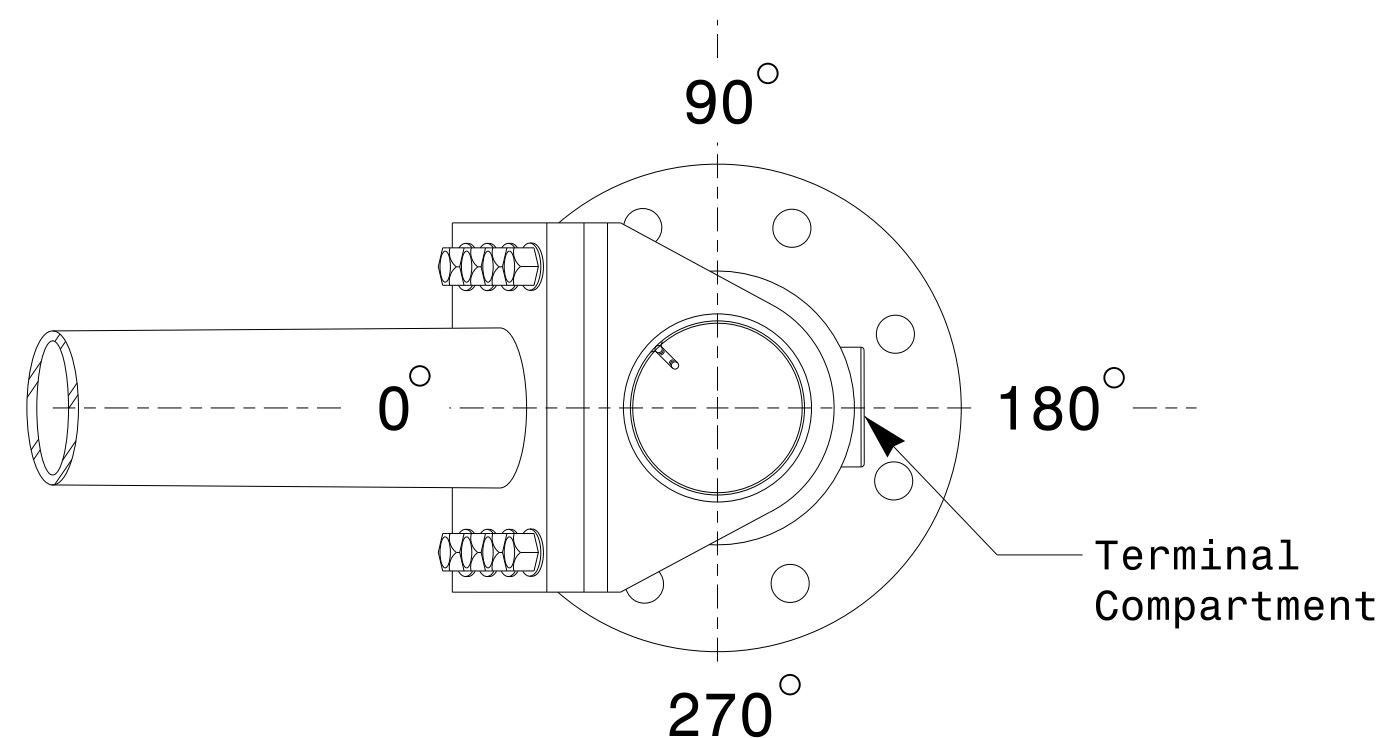
Section A-A  
 Pole Base Plate Details



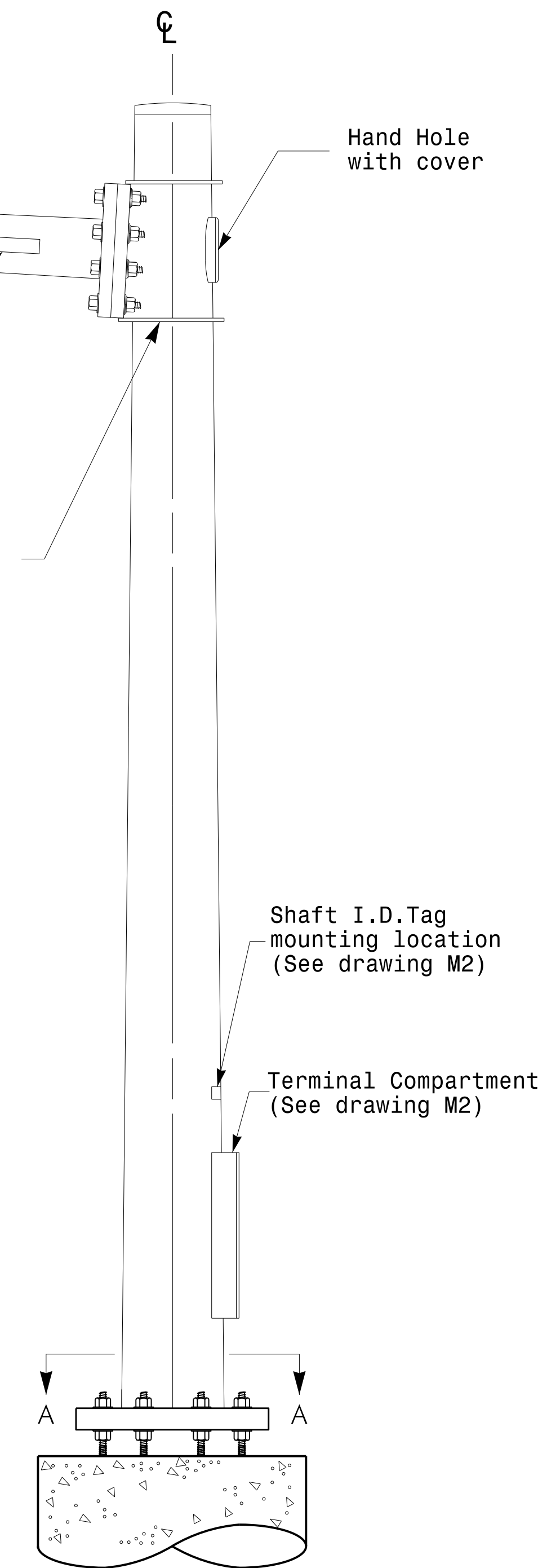
Section B-B  
 (Pole Attachment to Base Plate)  
 Full-Penetration Groove Weld Detail



Slip Fit Joint Detail for Mast Arm



Mast Arm Radial Orientation



Mast Arm Pole

	<b>Typical Fabrication Details For Mast Arm Poles</b>		SEAL 
	PLAN DATE: OCTOBER 2017 PREPARED BY: N. BITTING	DESIGNED BY: K.C. DURIGON REVIEWED BY: D.C. SARKAR	
SCALE: 0 NA NONE	DocuSigned by: <i>Dinesh C. Sarkar</i> 10/11/2017		DATE

Fabrication Details – Mast Arm Poles

11-OCT-2017 08:33 136504115 SignalDesign Section Design Section Eastern RegionM4 Sheets20162014 Sig.M4 Std. Fabrication Detail-Mast Arm Poles.dgn

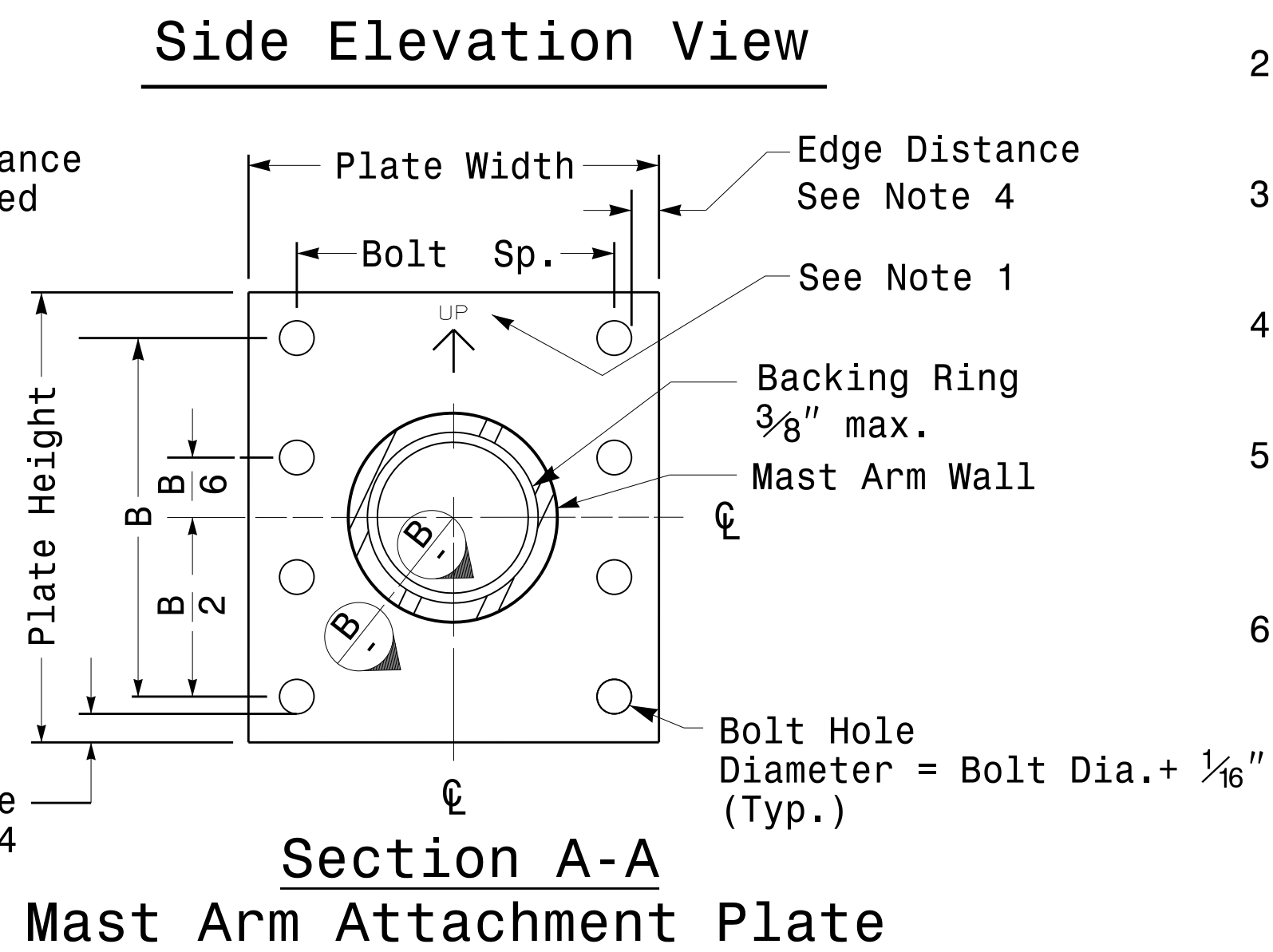
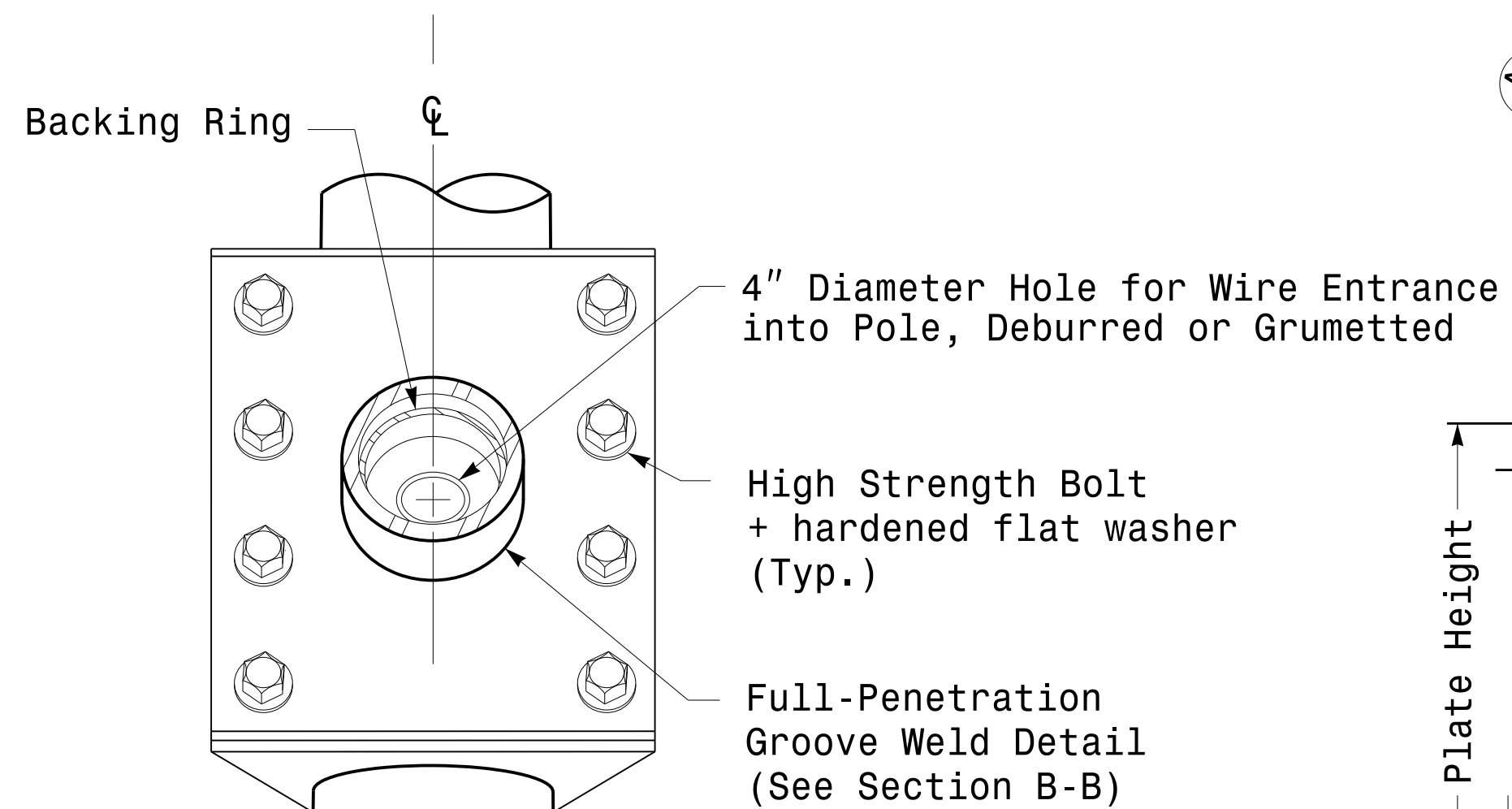
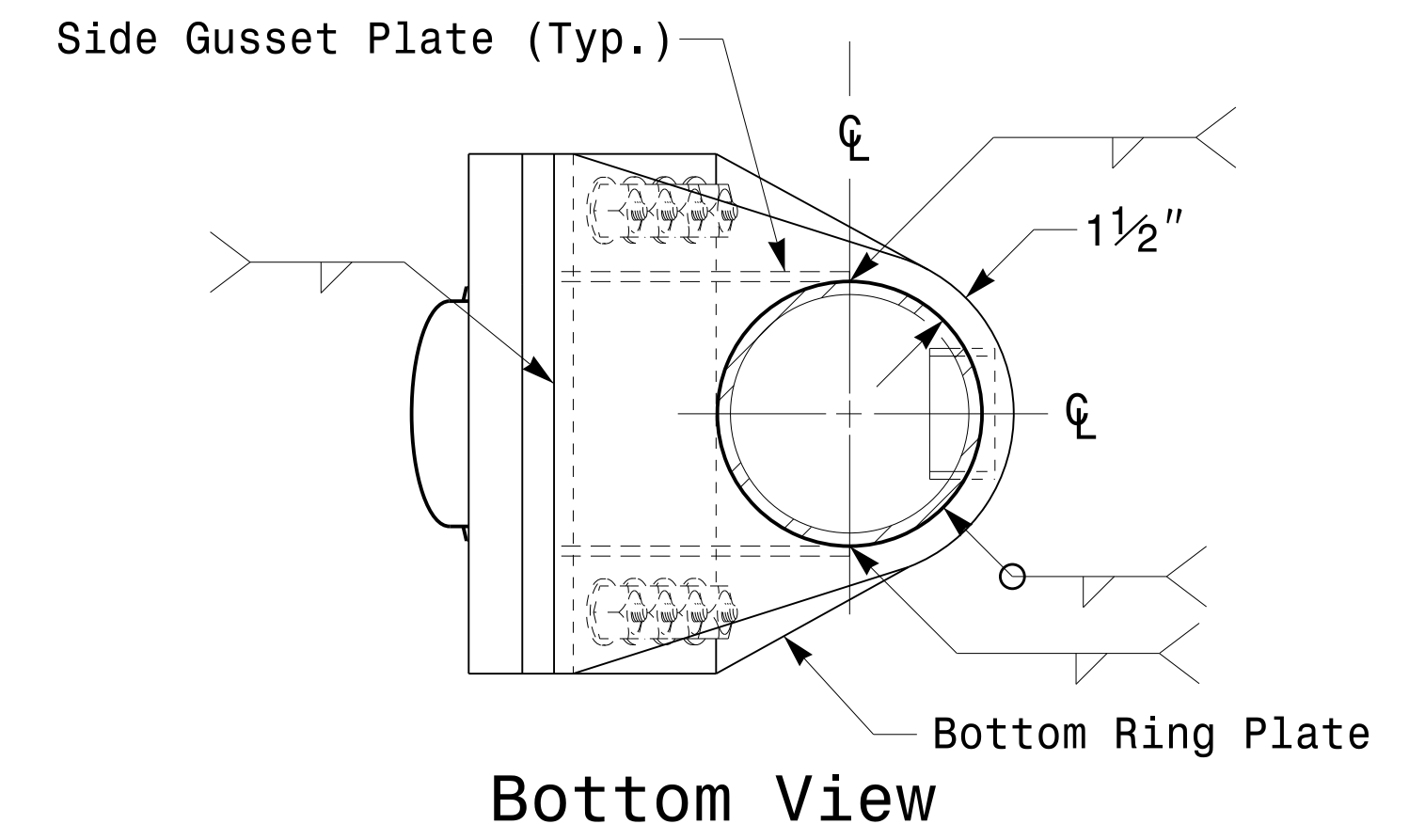
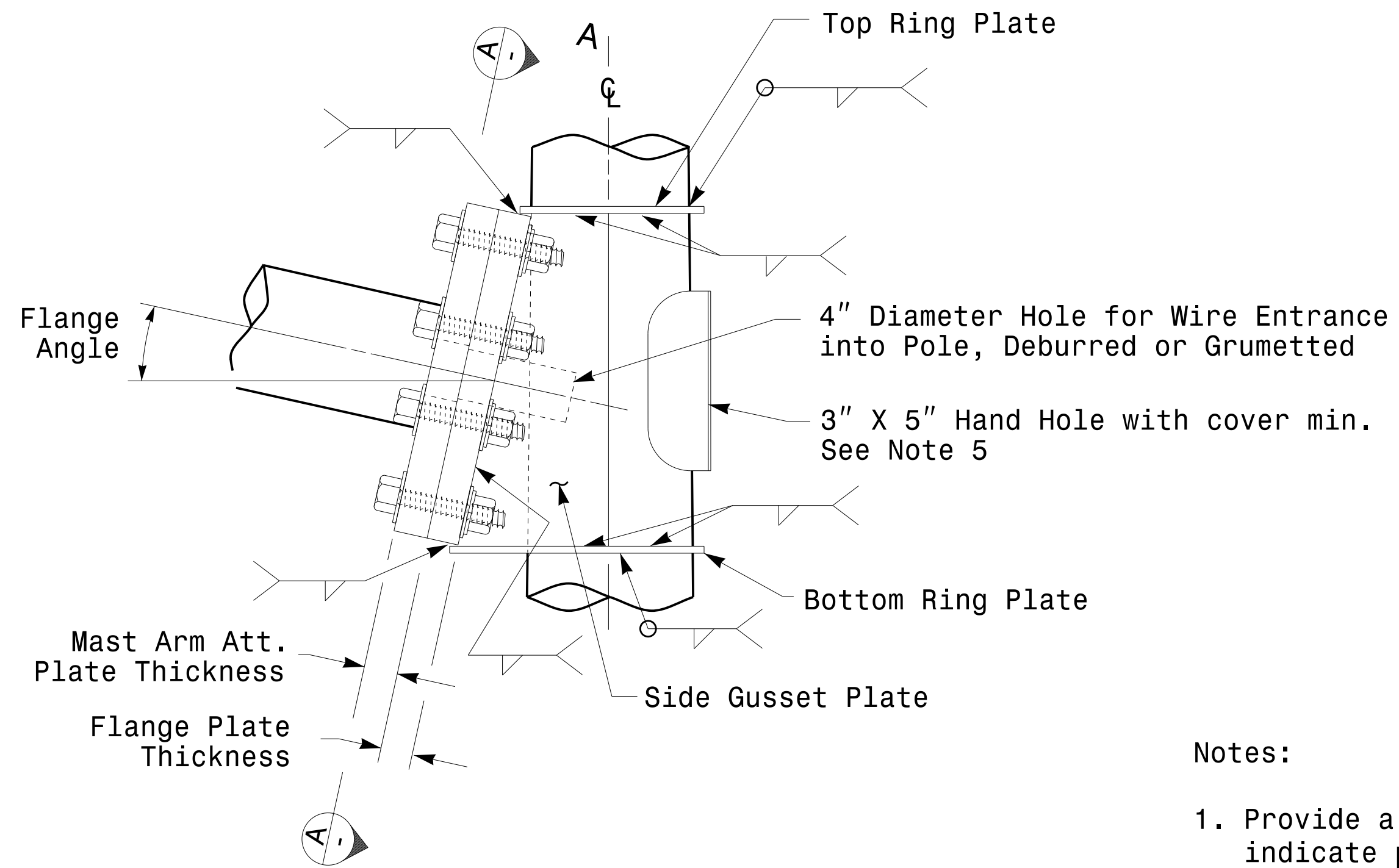
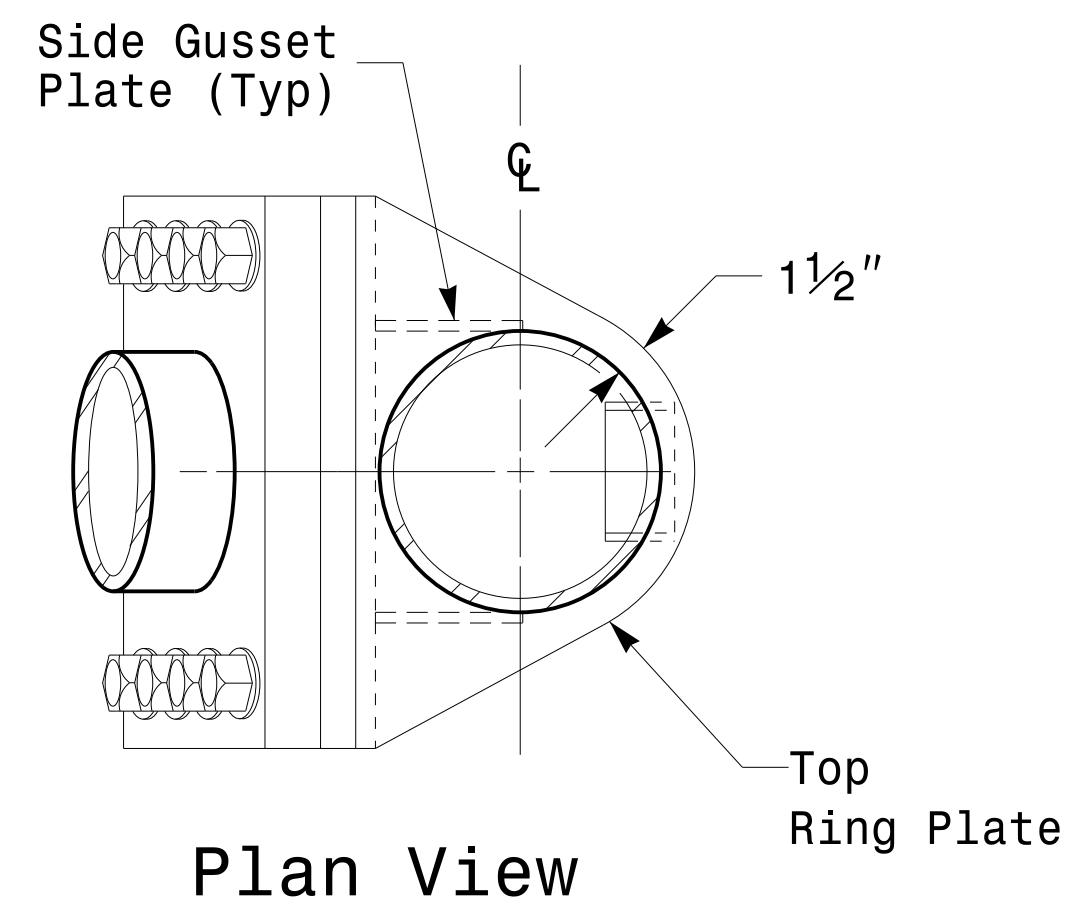
# Welded Ring Stiffened Mast Arm Connection

PROJECT ID. NO.

SHEET NO.

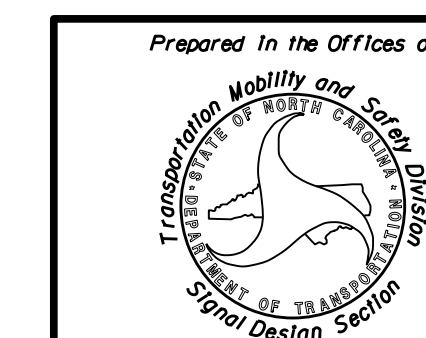
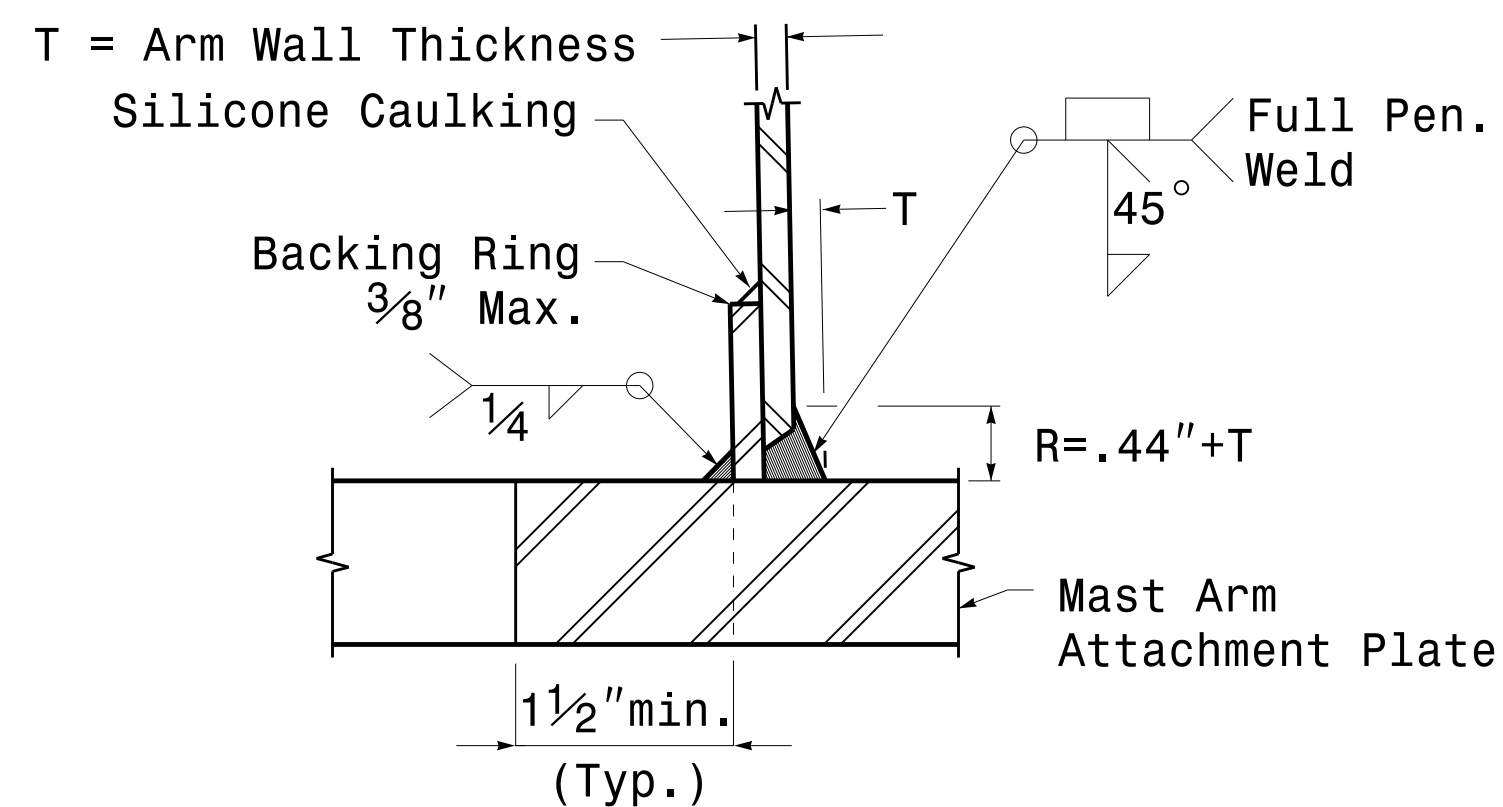
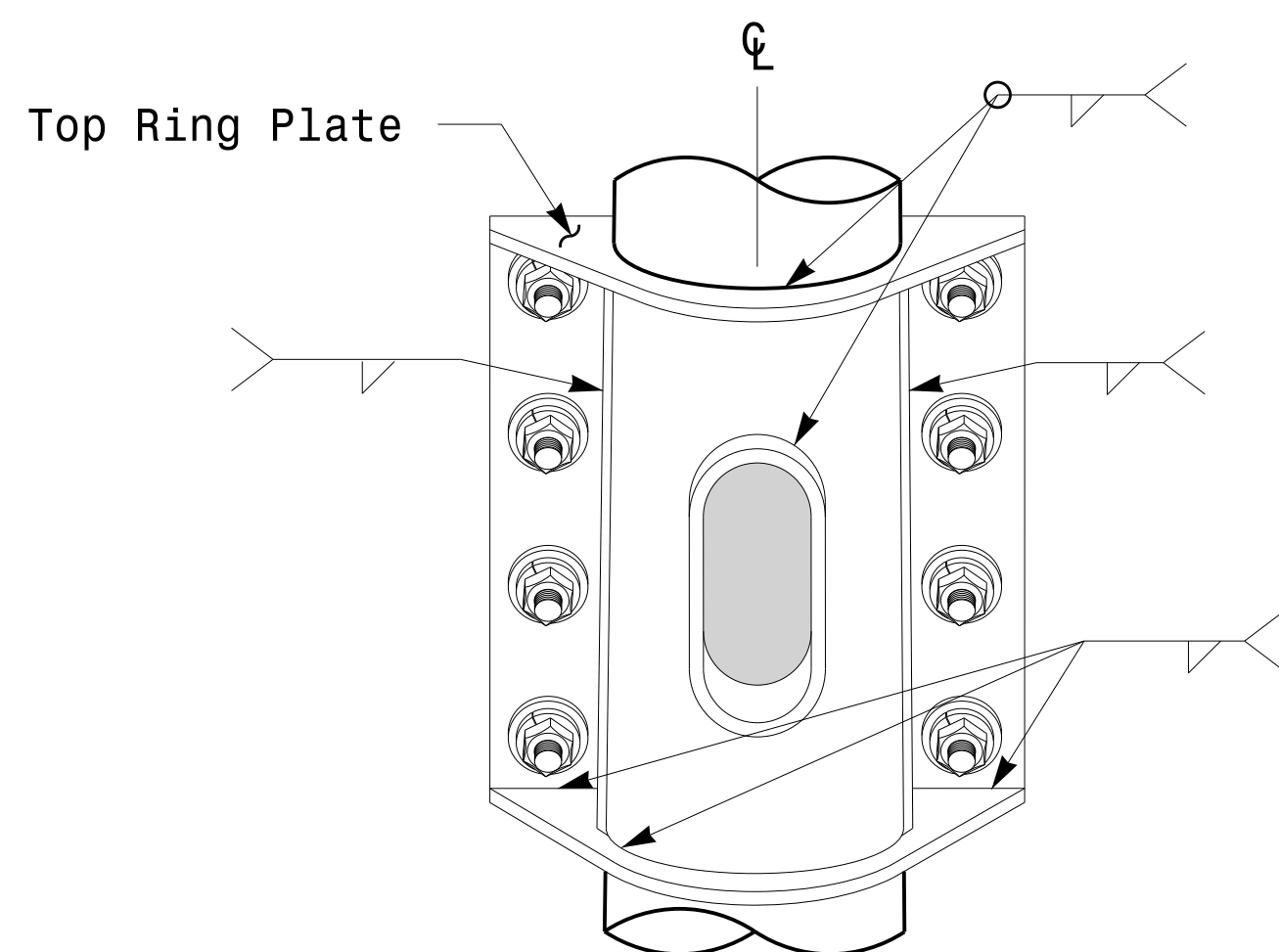
**R-5014**

Sig.M5



**Notes:**

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 required 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° to as required.

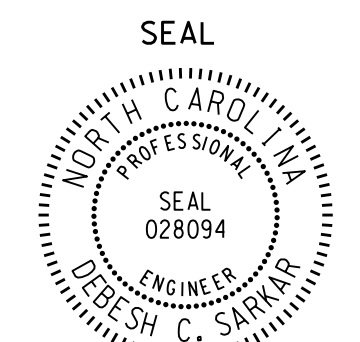


**Typical Fabrication Details  
For  
Mast Arm Connection To Pole**

PLAN DATE: OCTOBER 2017    DESIGNED BY: C.F. ANDREWS  
PREPARED BY: N. BITTING    REVIEWED BY: D.C. SARKAR

750 N. Greenfield Pkwy, Garner, NC 27529  
SCALE: 0 NA NONE

REVISIONS	INIT.	DATE

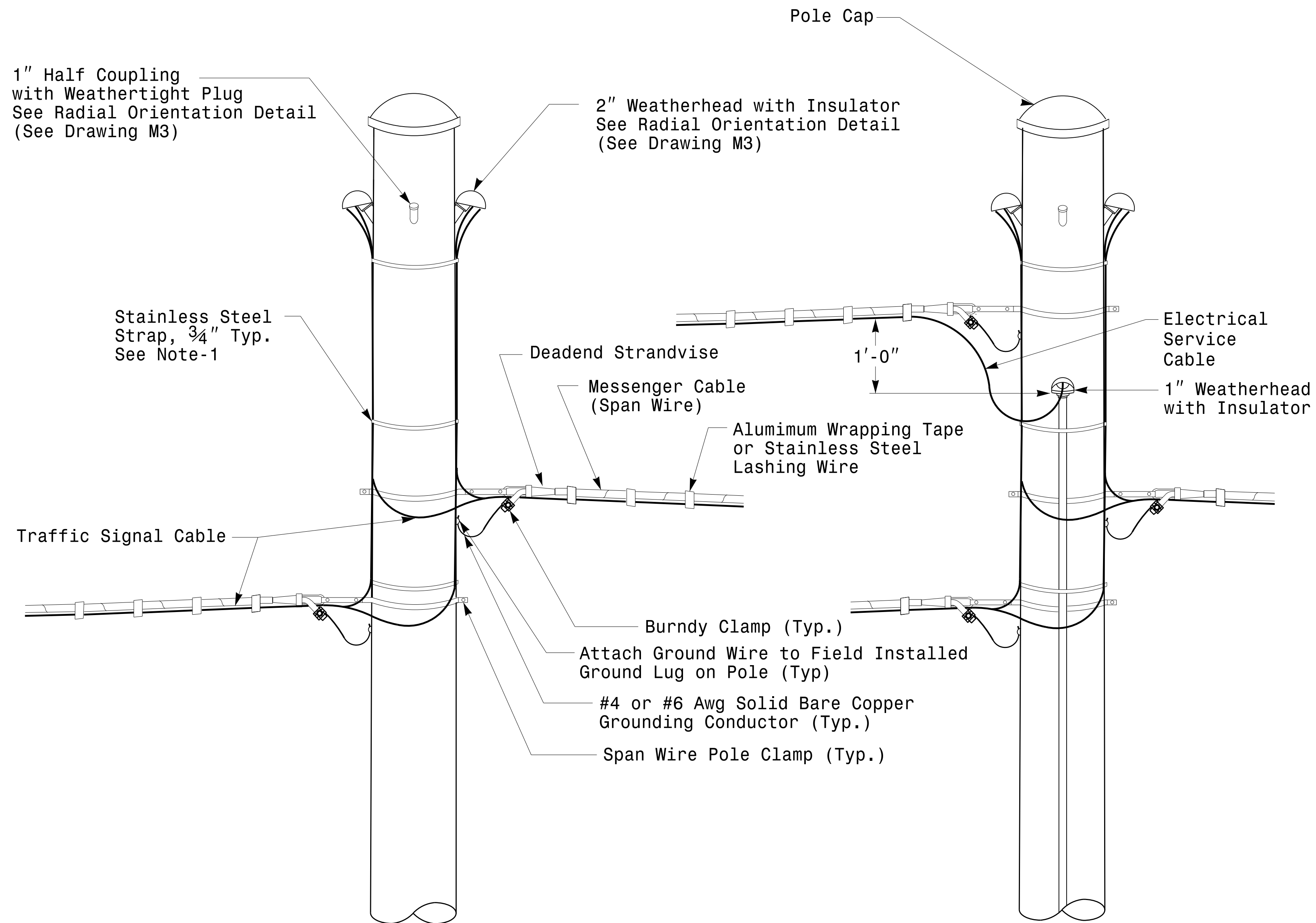


Designed by:  
*Debesh C. Sarkar*  
SIGNATURE

10/11/2017  
DATE

11-OCT-2017 08:35:13 135604115 5101a1s461gnol Design Section Eastern RegionM5 Sheets20162014 Sig.M5 51d. Connection Fabrication Detail s-Mast Arm Poles.dgn P21/28

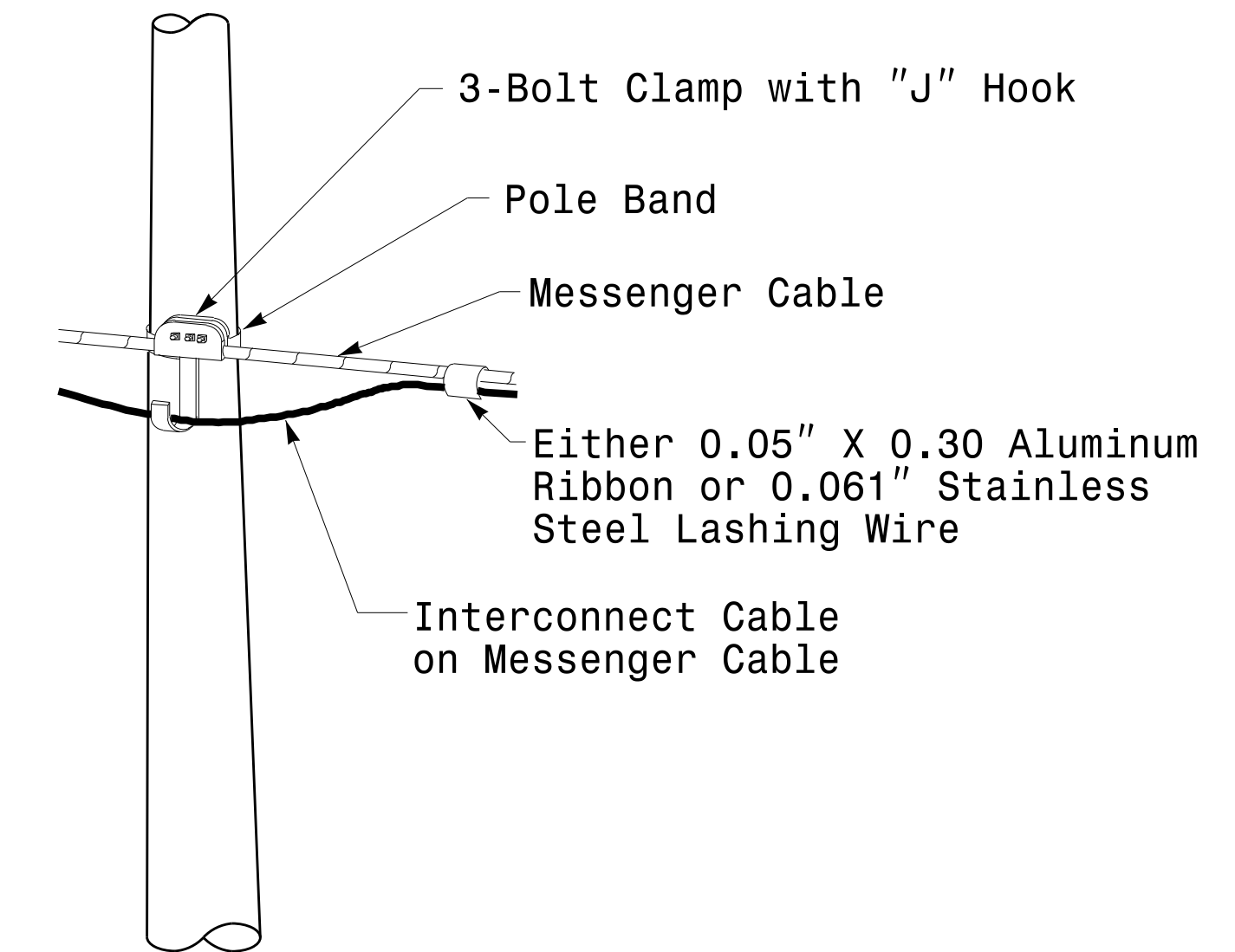
**Fabrication Details – Mast Arm Connection**



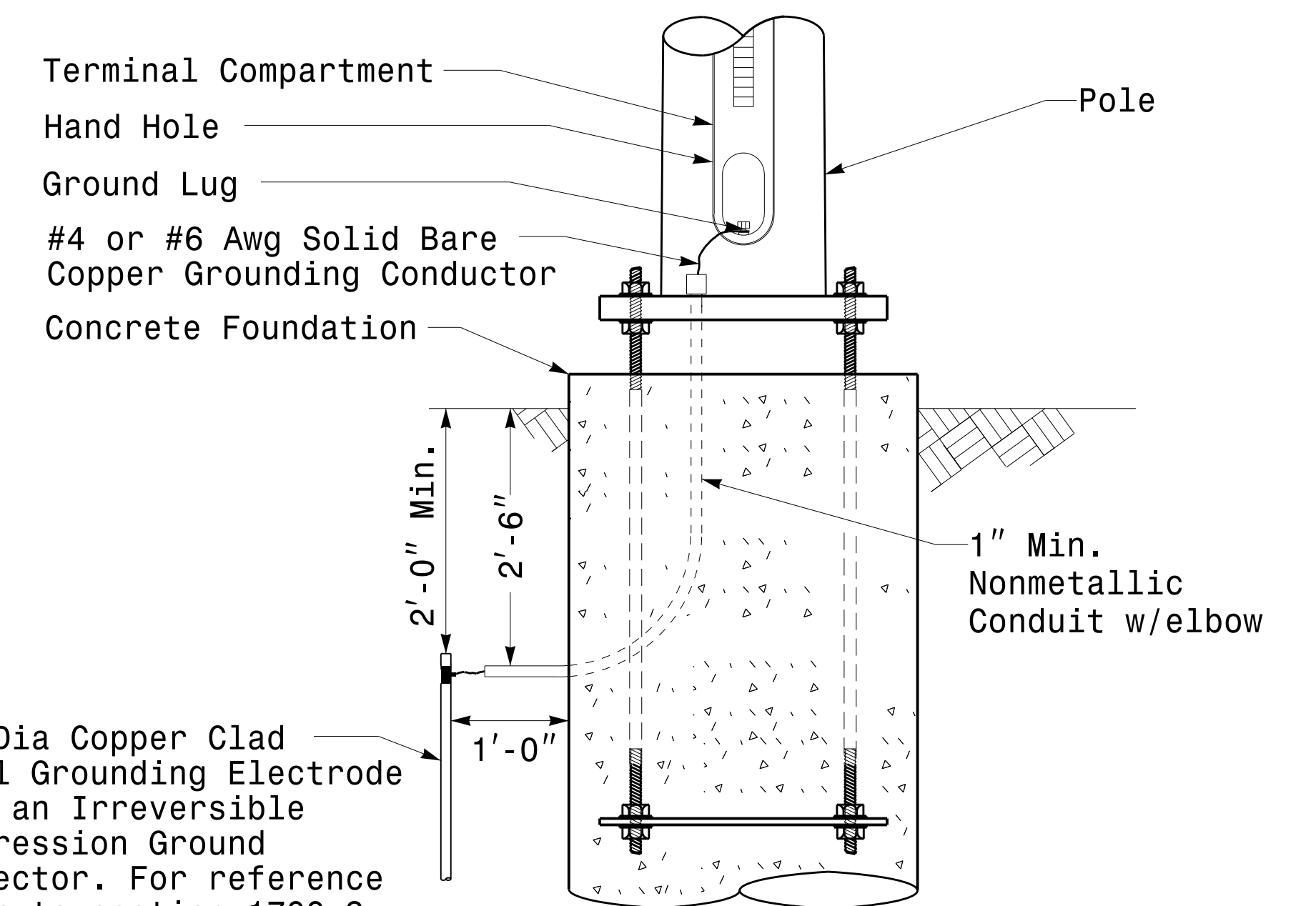
**Strain Pole Attachments**

**NOTE:**

1. Strap all signal cables to the side of the pole with 3/4" stainless steel straps when the distance between the spanwire attachment clamp and the weatherheads exceeds 3'-0".
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.

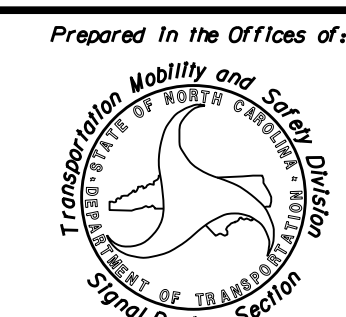


**Attachment of Cable to Intermediate Metal Pole**



5/8" Dia Copper Clad Steel Grounding Electrode with an Irreversible Compression Ground Connector. For reference refer to section 1700-3 K and L for electrical grounding and bonding requirements, See Note 4.

**Metal Pole Grounding Detail For Strain Pole and Mast Arm**



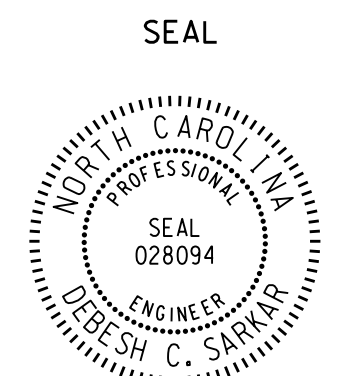
750 N. Greenfield Pkwy, Garner, NC 27529



**Typical Fabrication Details For Strain Pole Attachments**

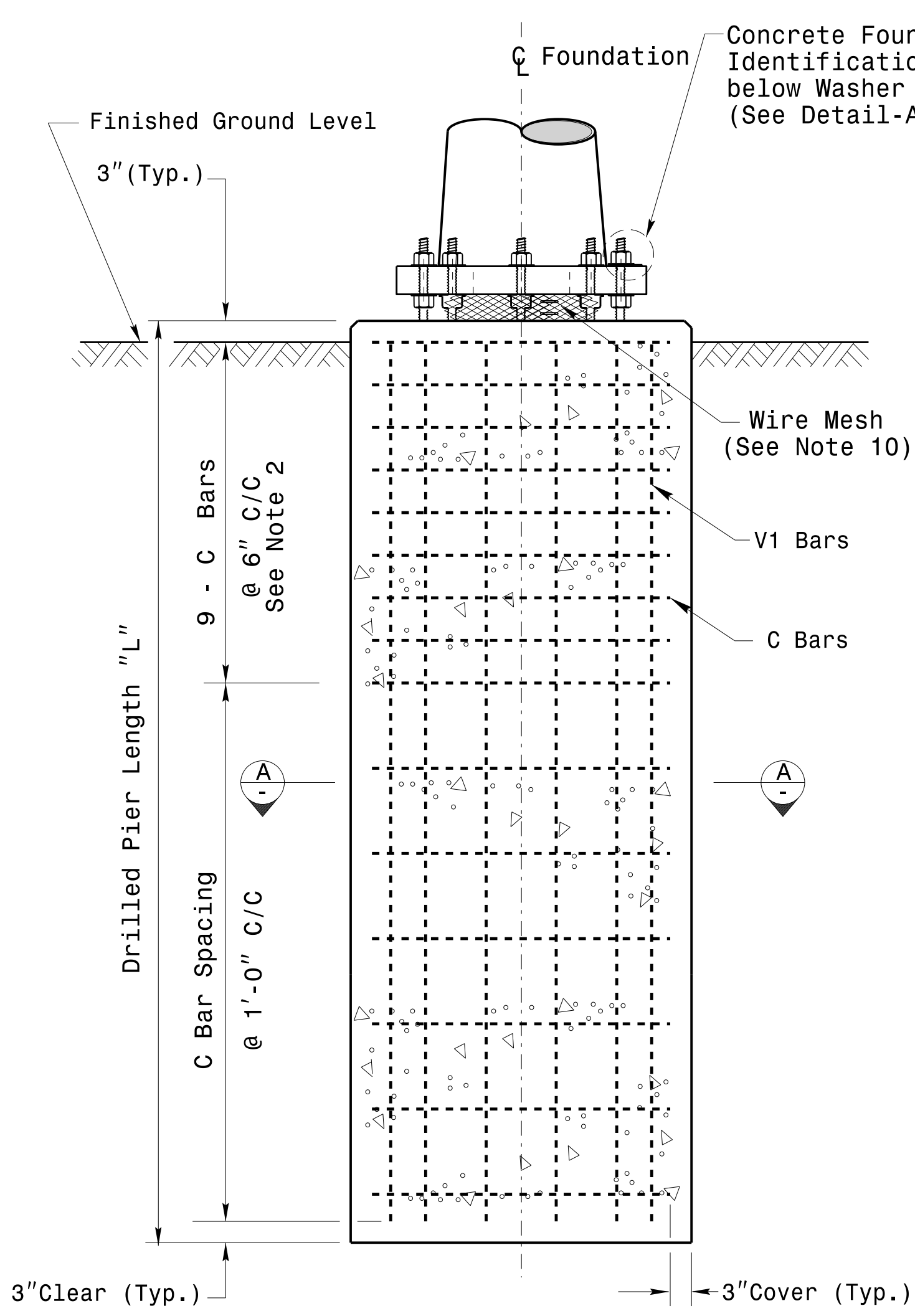
PLAN DATE: OCTOBER 2017 DESIGNED BY: C.F. ANDREWS  
 PREPARED BY: N. BITTING REVIEWED BY: D.C. SARKAR

REVISIONS	INIT.	DATE

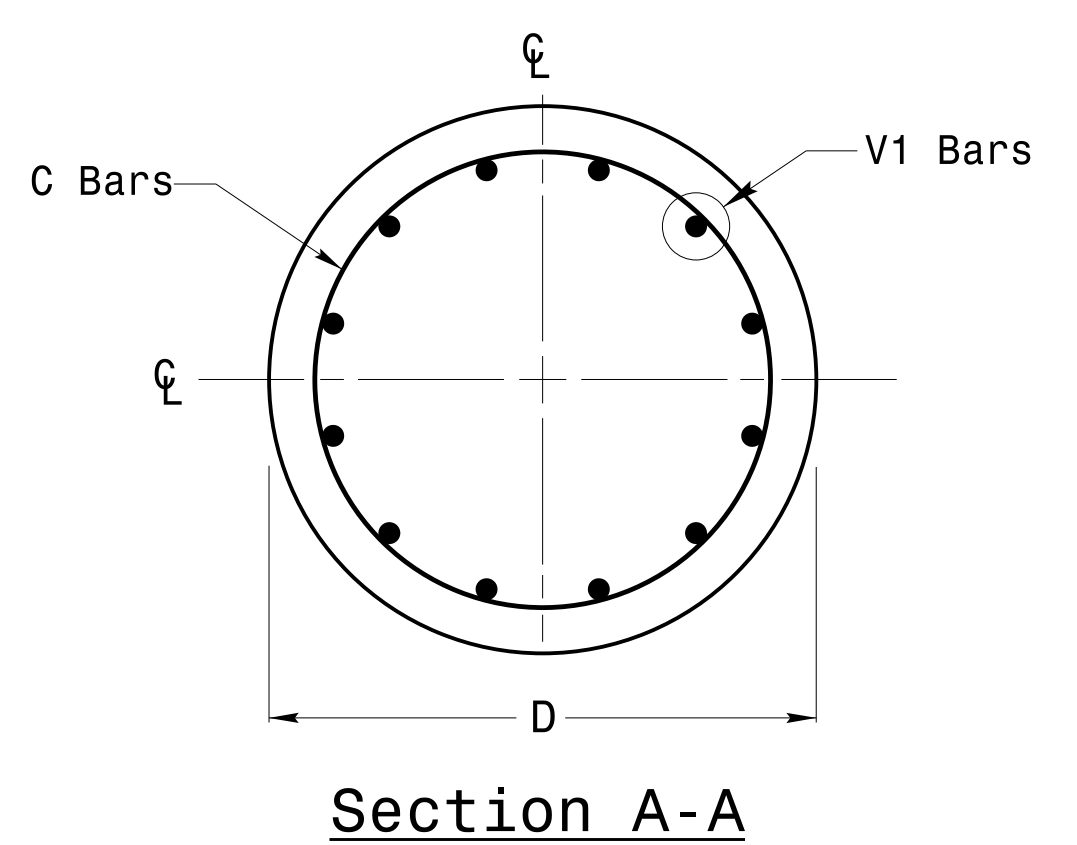


DocuSigned by: D.C. Sarkar

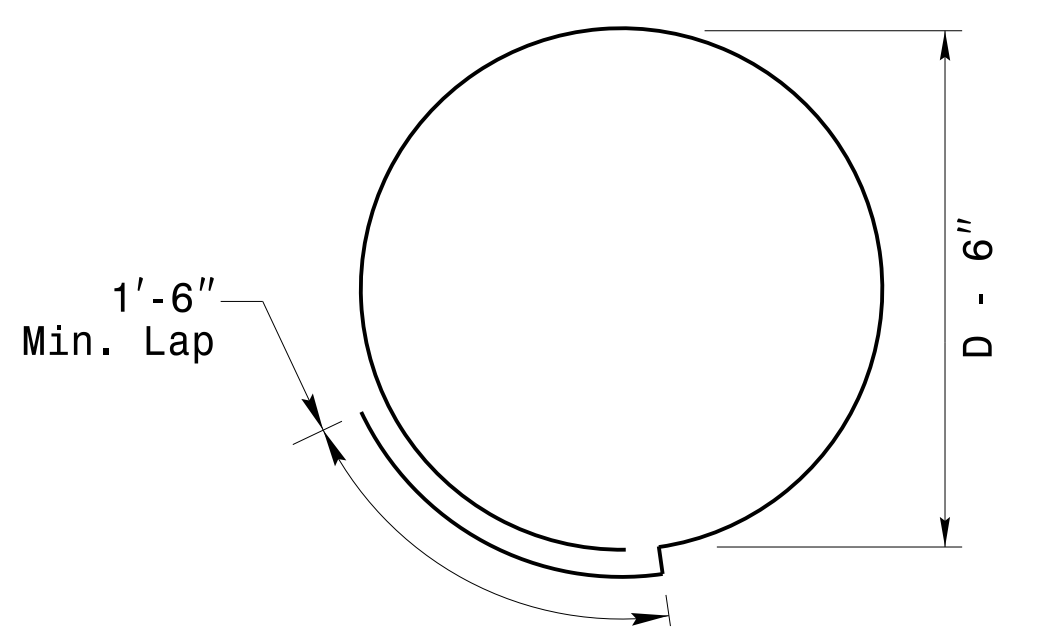
10/11/2017  
DATE



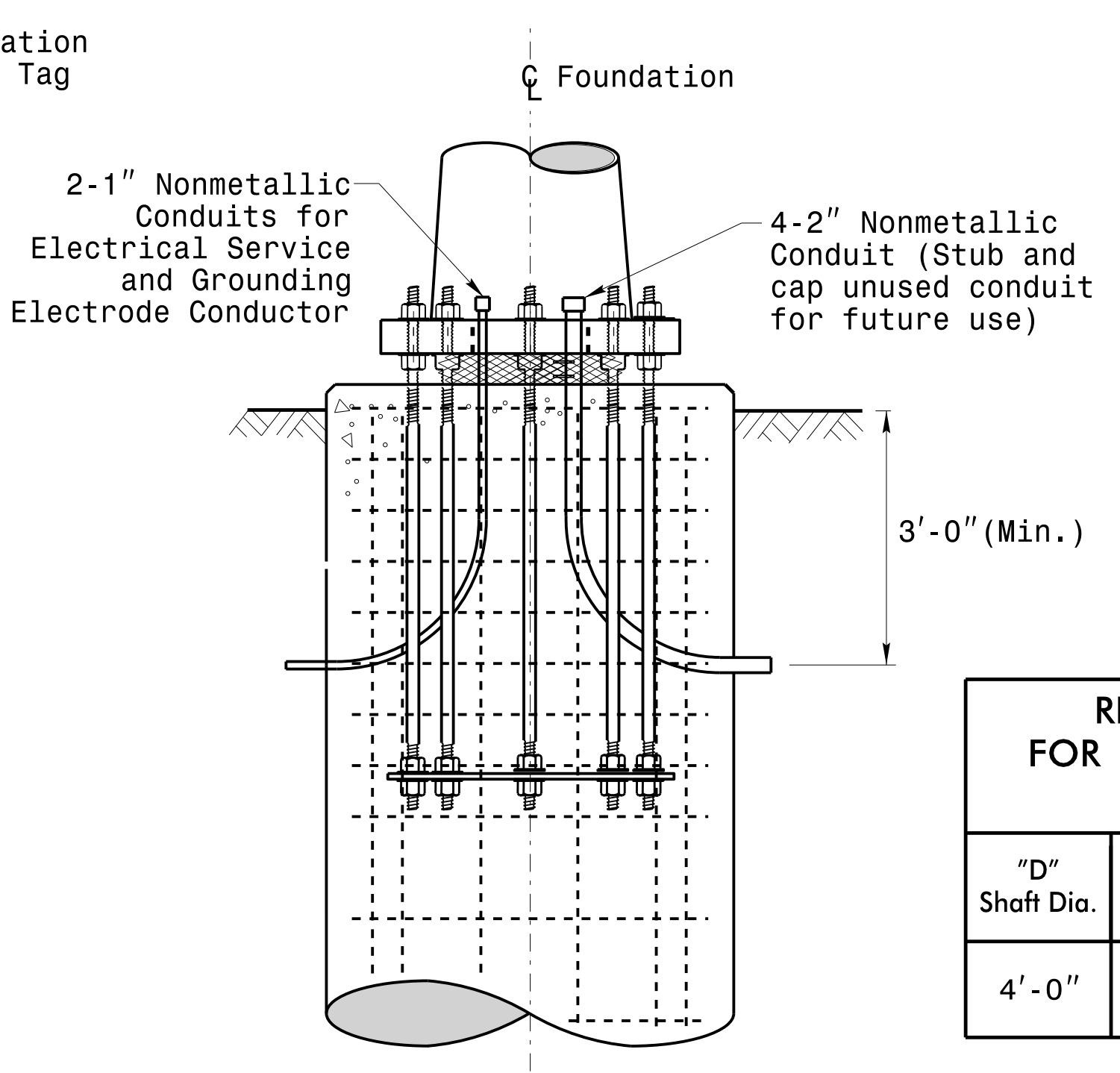
**Concrete Shaft Elevation**



**Section A-A**



**Typical "C" Bar Detail**

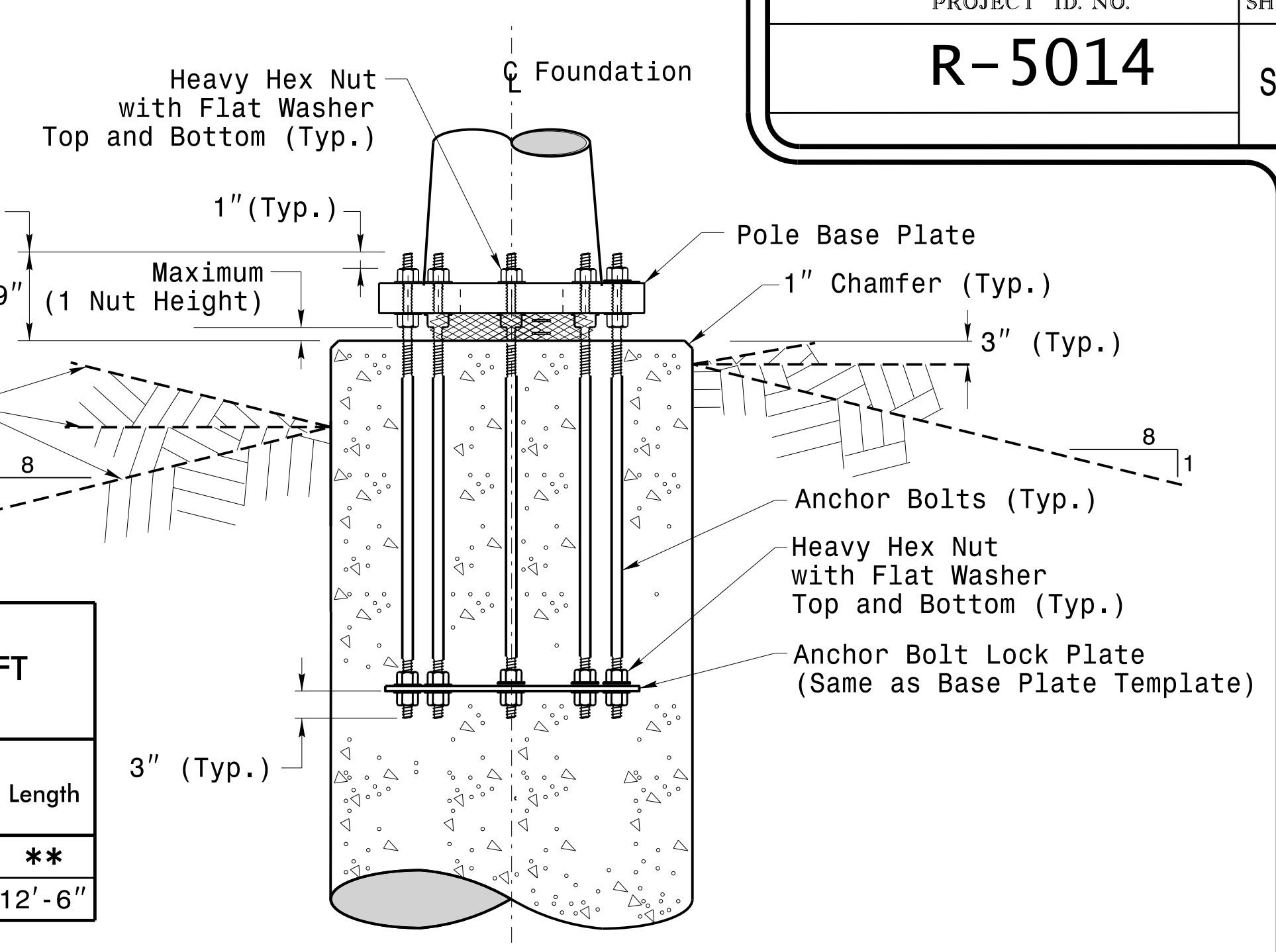


**Typical Foundation Conduit Details**

**REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (4'-0" DIAMETER)**

"D" Shaft Dia.	Conc. Volume (cu. yds.)	Bar Name	MIN.	Size	Type	Length
4'-0"	.465 x L	V1	-	#8	STR.	**
		C	*	#4	CIR.	12'-6"

\* See Note No. 2  
 \*\* See Note No. 3

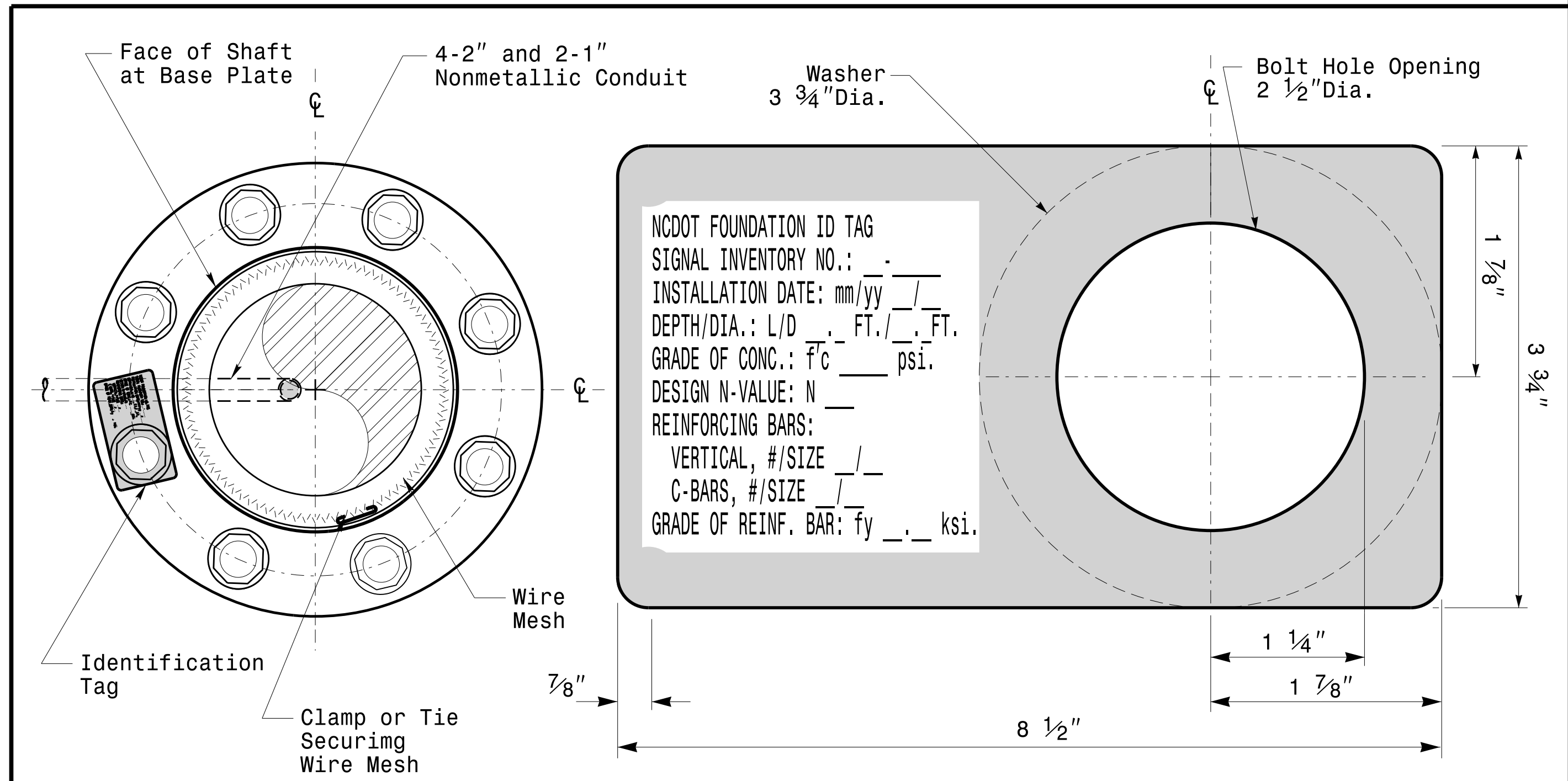


**Typical Foundation Anchor Bolt Details**

(Reinforcing Cage Not Shown for Clarity)

**General Notes:**

- If actual subsurface conditions differ significantly from boring data contact the Engineer before excavating or placing concrete.
- Circular tie reinforcing rings may be vertically adjusted by +/-3" at a depth between 2'-0" and 3'-0" to facilitate the installation of electrical conduit entering in the cage.
- For standard foundations, see sheet Sig. M8 for details. Vertical reinforcing bars (V1) may be horizontally adjusted by +/-3" to facilitate the installation of electrical conduit entering into the cage.
- Provide 2" to 5" foundation projection above ground level depending on the ground slope.
- Unless otherwise shown, foundation designs are based on non-sloping level ground surfaces with slope ratios of 8:1 (H:V) or flatter. If actual ground line slopes are steeper contact the Engineer before excavating or placing concrete.
- Construct foundations in accordance with NCDOT Standard Provisions SP09 R005- Foundations and Anchor Rod Assemblies for Metal Poles. All applicable 2018 NCDOT Standard Specifications are referenced in this provision. Refer to the NCDOT Resources/Specifications page located on the Connect NCDOT website.  
[https://connect.ncdot.gov/resources/Specifications and Special Provisions.aspx](https://connect.ncdot.gov/resources/Specifications%20and%20Special%20Provisions.aspx)
- Use air entrained AA concrete mix with a compression strength of f'c=4500 psi.(min.) after 28 days.
- Use ASTM A615 grade 60 deformed bars for all reinforcing steel. Maintain at least 3" cover on all reinforcement.
- Locate the Identification Tag on the top of the base plate, directly above the conduit's entry point.
- Provide two layers of galvanized welded 23 gauge (0.25) 6" wide 4 mesh wire around pipes under the base plate and secure it with ties if necessary.
- Preferred location for the I.D. Tag is as shown in Detail-A; directly above the conduit entering the foundation.



**Concrete Foundation Identification Tag Details**

**Detail-A**

D = Diameter  
 L = Length/Depth  
 mm = Month  
 yy = Year

<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p><b>Construction Details For Foundations</b></p>		
	<p>PLAN DATE: OCTOBER 2018</p> <p>DESIGNED BY: C.B. COGDILL</p> <p>PREPARED BY: N. BITTING</p> <p>REVIEWED BY: D.C. SARKAR</p>	<p>REV. NO. 1</p> <p>COMMENTS: Revised Foundation Tag Details</p>	

SCALE: 0 NONE

DocuSigned by: *Debesha C. Sarkar* 10/11/2017

**Construction Details - Foundations**

11-001-2017-08:37  
 13560W115-Stipolis:gnal Design Section:Eastern Region:Sheet:2016:2014-Sig.M7-Std.-Construction-Detail:ls-Strain-Poles.dgn  
 PLOT:10/11/2017 10:58:57

# SOIL CONDITION

		STANDARD STRAIN POLES					STANDARD FOUNDATIONS 48" Diameter Drilled Pier Length (L) - Feet							Reinforcement				
		Case No.	Pole Height (Ft.)	Base Plate BC (In.)	Reactions at the Pole Base			Clay				Sand			Longitudinal		Stirrups	
					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.)
WIND ZONE 1	LIGHT	S26L3	26	25	2	11	270	19	13	10	8	17	14.5	12.5	8	12	4	12
		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
	HEAVY	S30H3	30	29	3	16	450	24.5	16	12	9	21	17.5	15	8	16	4	6
		S35H3	35	29	4	16	515	26	17	12.5	9.5	22	18.5	16	8	16	4	6
WIND ZONE 2	LIGHT	S26L2	26	23	2	10	245	18	12.5	9.5	8	16.5	14	12	8	12	4	12
		S30L2	30	23	2	10	270	18.5	12.5	10	8	16.5	14	12.5	8	12	4	12
		S35L2	35	23	3	10	300	19.5	13	10	8	17	14.5	13	8	12	4	12
	HEAVY	S30H2	30	29	3	15	415	23	15.5	11.5	9	20	17	14.5	8	16	4	6
		S35H2	35	29	4	15	475	25	16.5	12	9.5	21	17.5	15.5	8	16	4	6
WIND ZONE 3	LIGHT	S26L2	26	23	2	10	245	18	12.5	9.5	8	16.5	14	12	8	12	4	12
		S30L2	30	23	2	10	270	18.5	12.5	10	8	16.5	14	12.5	8	12	4	12
		S35L2	35	23	3	10	300	19.5	13	10	8	17	14.5	13	8	12	4	12
	HEAVY	S30H2	30	29	3	15	415	23	15.5	11.5	9	20	17	14.5	8	16	4	6
		S35H2	35	29	4	15	475	25	16.5	12	9.5	21	17.5	15.5	8	16	4	6
WIND ZONE 4	LIGHT	S26L1	26	22	2	8	190	16	11.5	8.5	8	15	12.5	11	8	12	4	12
		S30L1	30	22	2	8	205	16.5	11.5	9	8	15	13	11.5	8	12	4	12
		S35L1	35	22	3	8	230	17	12	9	8	15.5	13.5	11.5	8	12	4	12
	HEAVY	S30H1	30	25	3	12	320	20.5	13.5	10.5	8	18	15	13.5	8	16	4	6
		S35H1	35	25	4	12	350	21	14	10.5	8.5	18.5	15.5	13.5	8	16	4	6
WIND ZONE 5	LIGHT	S26L2	26	23	2	10	245	18	12.5	9.5	8	16.5	14	12	8	12	4	12
		S30L2	30	23	2	10	270	18.5	12.5	10	8	16.5	14	12.5	8	12	4	12
		S35L2	35	23	3	10	300	19.5	13	10	8	17	14.5	13	8	12	4	12
	HEAVY	S30H2	30	29	3	15	415	23	15.5	11.5	9	20	17	14.5	8	16	4	6
		S35H2	35	29	4	15	475	25	16.5	12	9.5	21	17.5	15.5	8	16	4	6

**General Notes:**

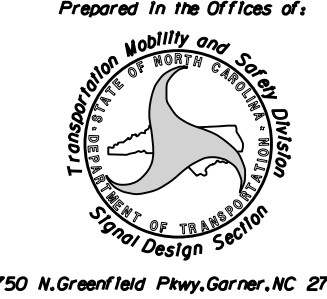
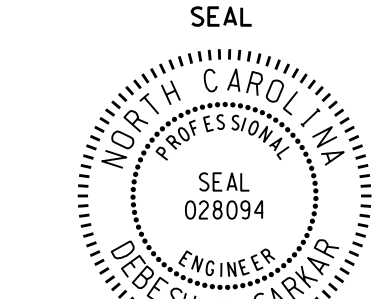
- Values shown in the "Reactions at the Pole Base" column represent the minimum acceptable capacity allowed for design using a design CSR of 1.00.
- Use chairs and spacers to maintain proper clearance.
- For foundation, always use air-entrain concrete mix.

**Foundation Selection:**

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

**Standard Strain Pole Foundation-All Soil Condition**

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

	<p><b>Standard Strain Pole Foundation for All Soil Conditions</b></p> <p>PLAN DATE: OCTOBER 2017    DESIGNED BY: C.B. COGDILL                  PREPARED BY: N. BITTING    REVIEWED BY: D.C. SARKAR</p>	
SCALE: 0 NA NONE	REVISIONS: Changed "Foundation Depth" to "Drilled Pier Length" in Conc. Egn. N.B. 7/12/2015	DATE: 10/11/2017

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