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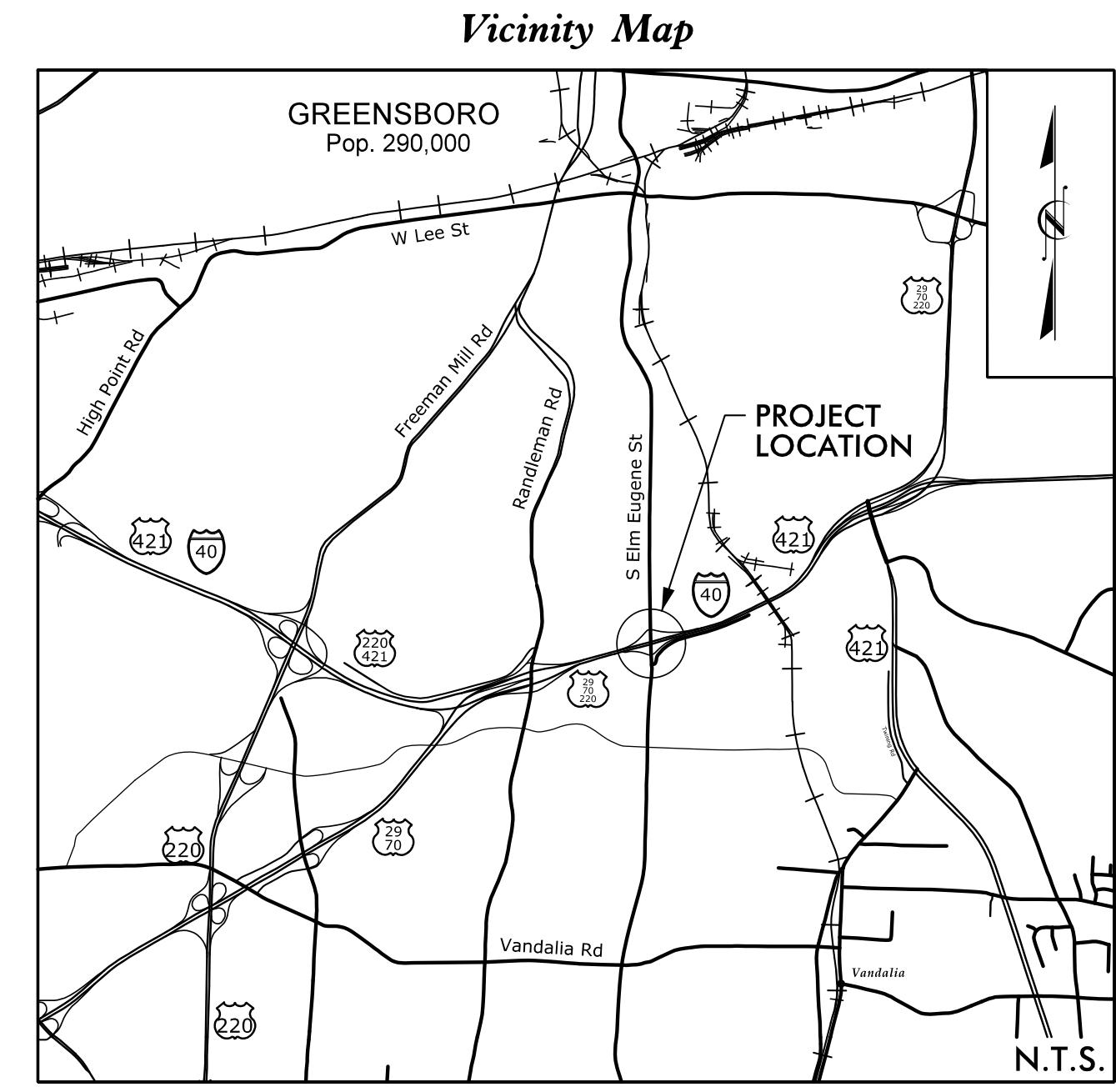
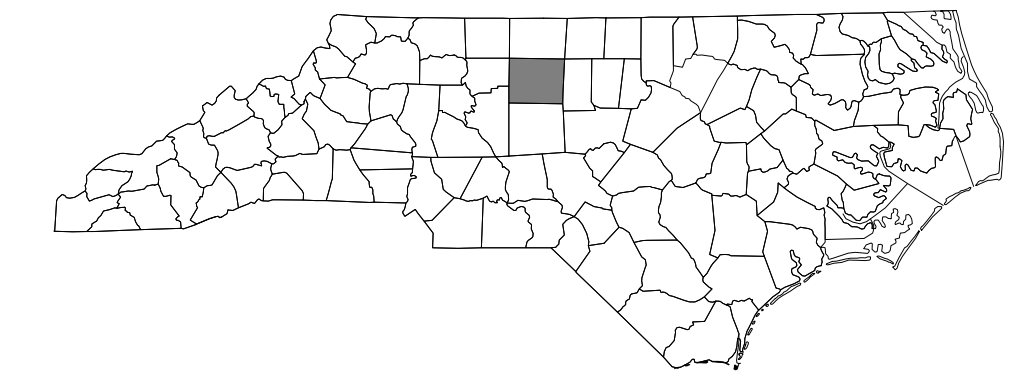
Project: I-5964

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

GUILFORD COUNTY

Project No. I-5964	Sheet No. Sig. 1.0
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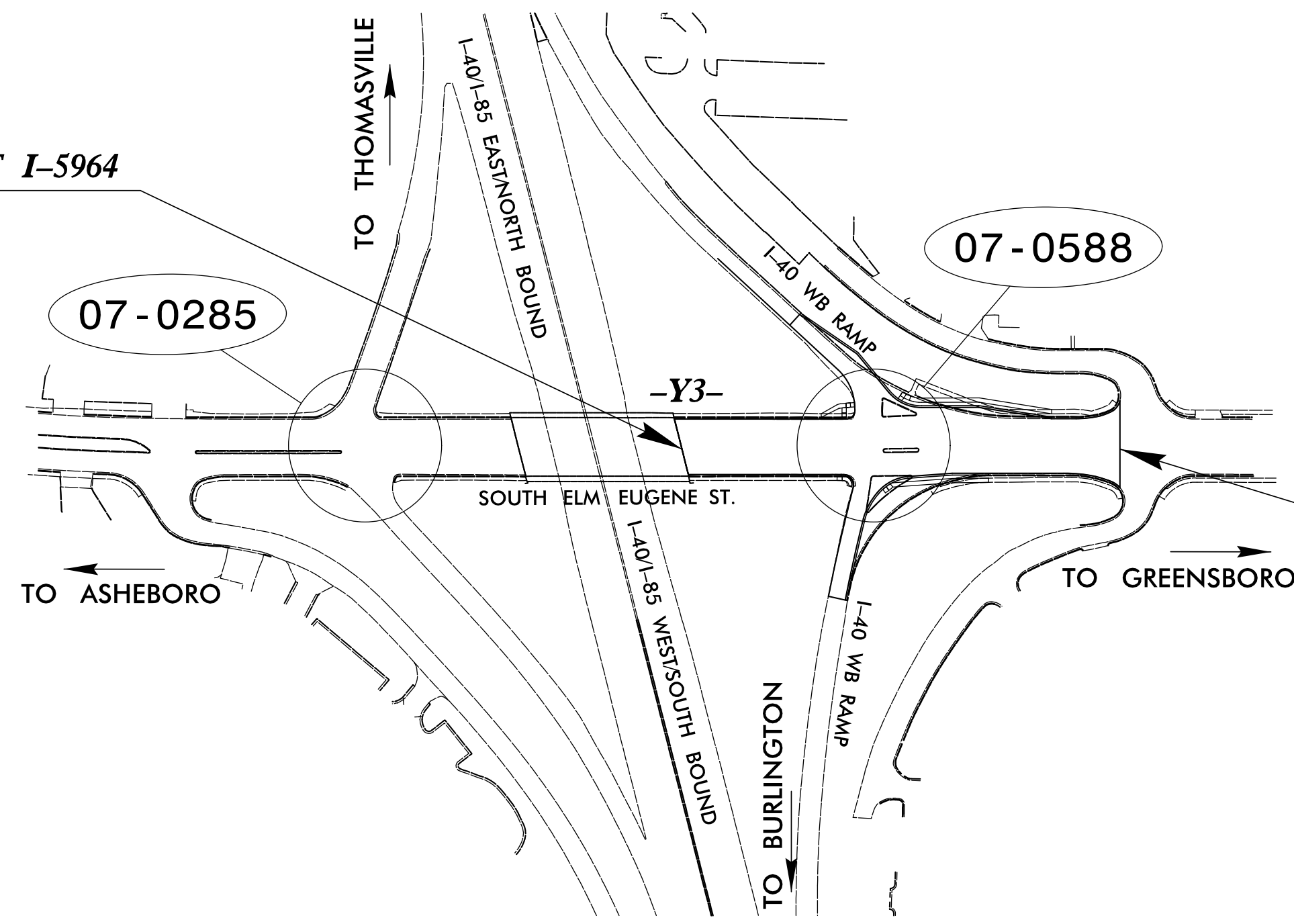
LOCATION: I-40 / SOUTH ELM-EUGENE INTERCHANGE IMPROVEMENTS

TYPE OF WORK: SIGNALS

XX-XXXX SIGNAL ID NUMBER



BEGIN TIP PROJECT I-5964
-Y3- STA. 13 + 90.40



END TIP PROJECT I-5964
-Y3- STA. 19 + 00.00

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

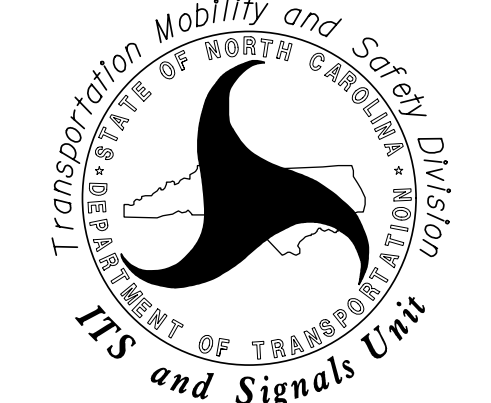
Sheet #	Reference #	Index of Plans Location/Description
Sig. 1.0	-----	Title Sheet
Sig. 2.0-2.5	07-0285	S. Elm-Eugene Street at I-40-US 70 EB /I-85 Business-US 29-220 NB Ramps
Sig. 3.0-4.5	07-0588	S. Elm-Eugene Street at I-40-US 70 WB /I-85 Business-US 29-220 SB Ramps
Sig. 5.0-5.1	-----	Standard Plate Sheets
Sig. M1-M8	-----	Standard Metal Pole Detail Sheets

INTELLIGENT TRANSPORTATION AND SIGNALS UNIT

Contacts:

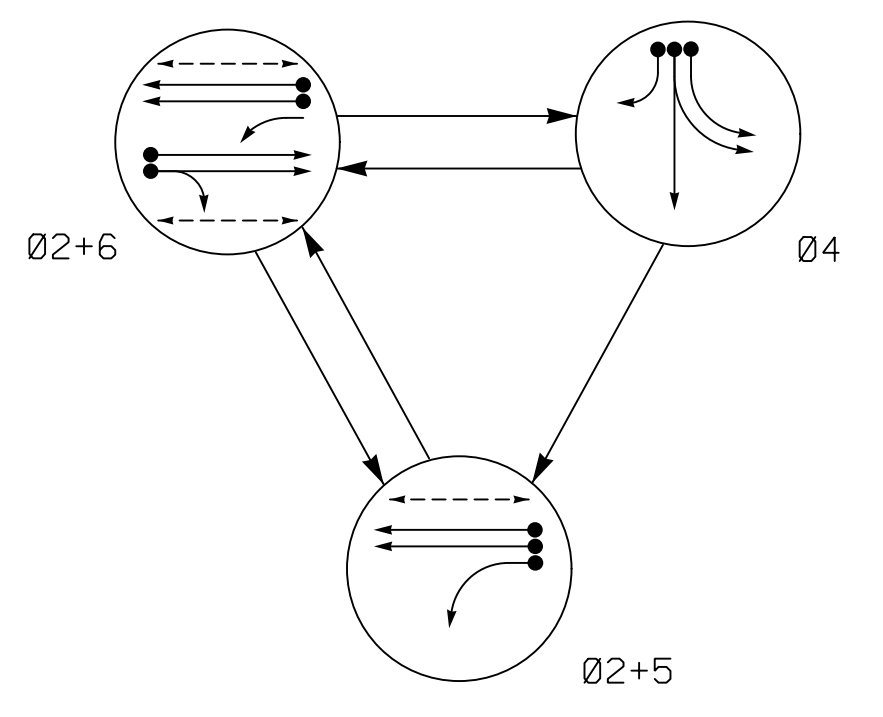
Robert J. Ziemba, PE, CPM - Central Region Signals Engineer
D. Todd Joyce, P.E. - Signal Equipment Design Review Engineer

DIVISION OF HIGHWAYS
TRANSPORTATION MOBILITY AND SAFETY
DIVISION



750 N. Greenfield Parkway, Garner, NC 27529
(919) 773-2800

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV PREEMPT PHASES (Medium Priority)

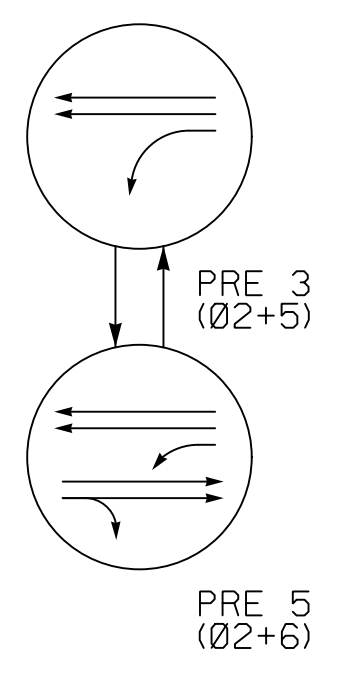
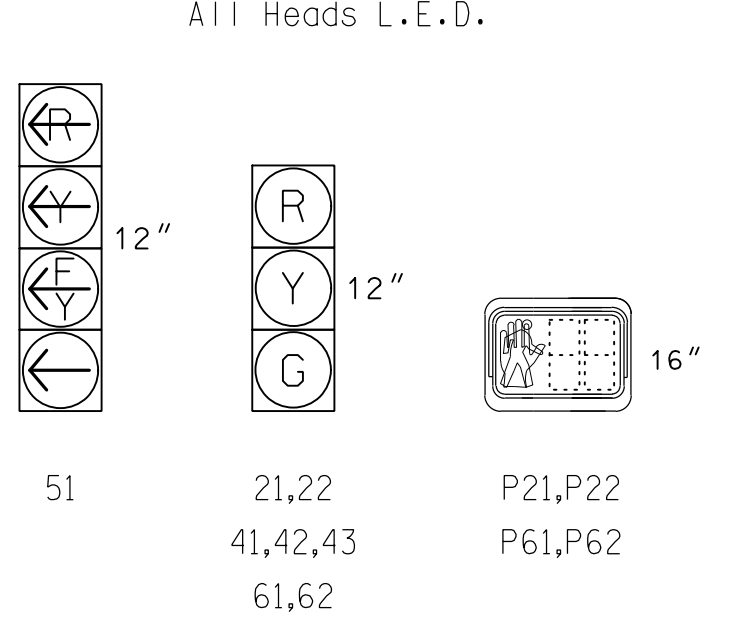


TABLE OF OPERATION

SIGNAL FACE	PHASE					
	Ø2+5	Ø2+6	Ø4	PRE 3	PRE 5	FL
21,22	G	G	R	G	G	Y
41,42,43	R	R	G	R	R	R
51	-	F	R	-	F	Y
61,62	R	G	R	R	G	Y
P21,P22	W	W	DW	DW	DRK	
P61,P62	DW	W	DW	DW	DRK	

SIGNAL FACE I.D.



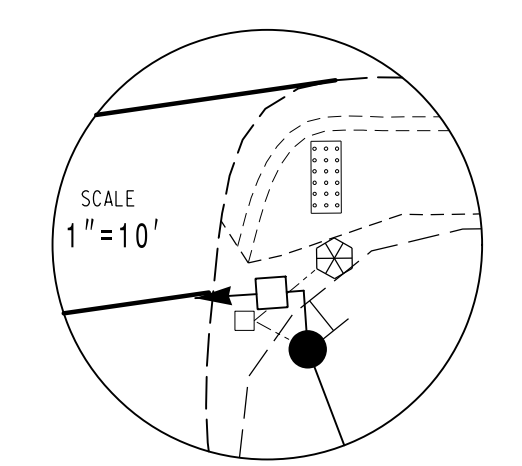
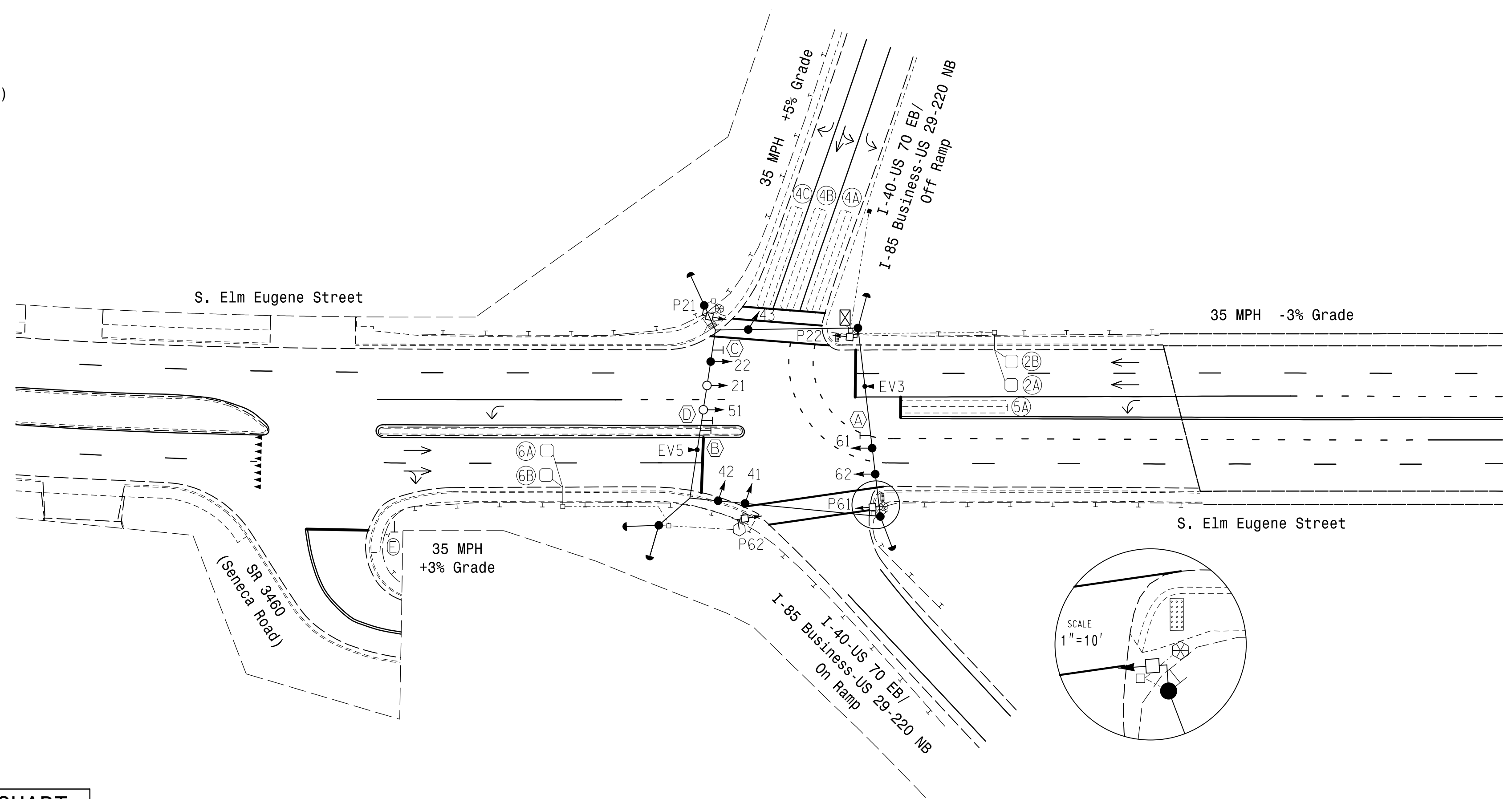
LOOP & DETECTOR UNIT INSTALLATION CHART
NAZTEC APOGEE SOFTWARE 2070 CONTROLLER

LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	DETECTOR PROGRAMMING							
					PHASE	SWITCH (PHASE)	DELAY TIME	STRETCH TIME	CALLING	EXTENSION ADDED INIT.	SYSTEM LOOP	NEW CARD
2A,2B	6X6	70	3	X	2	-	-	-	X	X	-	X
4A	6X50	0	2-4-2	-	4	-	-	-	X	X	-	X
4B	6X50	0	2-4-2	-	4	-	-	-	X	X	-	X
4C	6X50	0	2-4-2	-	4	-	15	-	X	X	-	X
5A	6X50	0	2-4-2	-	5	-	15	-	X	X	-	X
6A,6B	6X6	70	4	X	6	-	-	-	X	X	-	X

3 Phase Fully Actuated (Greensboro Signal System)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 5 may be lagged.
- Reposition existing signal head numbered 22.
- Set all detector units to presence mode.
- In the event of loop replacement, refer to the current ITS and Signals Design Manual and submit a Plan of Record to the Signal Design Section.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Pavement markings are existing unless otherwise shown.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED	EXISTING
○ Traffic Signal Head	● N/A
○ Modified Signal Head	○ N/A
○ Pedestrian Signal Head	○ N/A
○ Signal Pole with Guy	○ N/A
○ Inductive Loop Detector	○ N/A
○ Controller & Cabinet	○ N/A
○ Junction Box	○ N/A
○ 2-in Underground Conduit	○ N/A
N/A Right of Way	○ N/A
N/A Directional Arrow	○ N/A
N/A Guardrail	○ N/A
⊗ Type I Pushbutton Post	⊗ N/A
○ Type II Signal Pedestal	○ N/A
○ EV Preempt Detector	○ N/A
Ⓐ No U-Turn/No Left Turn Sign (R3-18)	Ⓐ N/A
Ⓑ "TURNING TRAFFIC MUST YIELD TO PEDESTRIANS" Sign (R10-15)	Ⓑ N/A
Ⓒ No Right Turn Sign (R3-1)	Ⓒ N/A
Ⓓ Left Arrow "ONLY" Sign (R3-5L)	Ⓓ N/A
Ⓔ "STOP" Sign (R1-1)	Ⓔ N/A

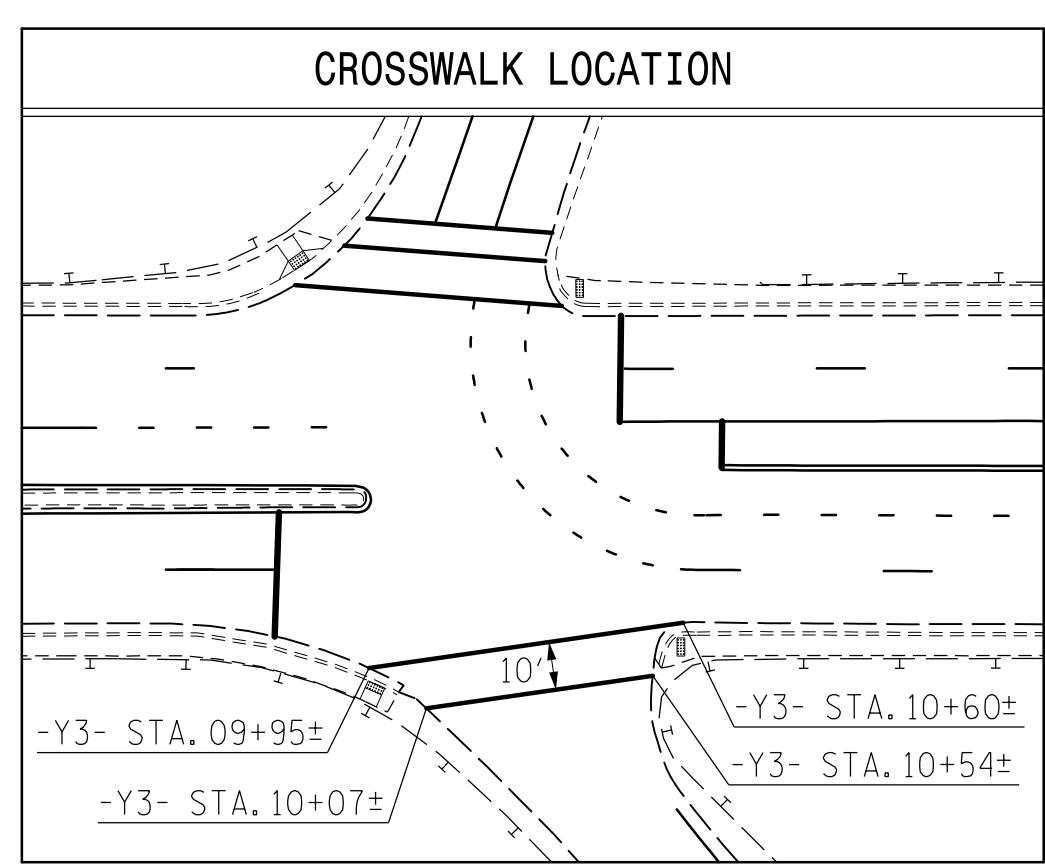
NAZTEC APOGEE 2070 TIMING CHART

FEATURE	PHASE			
	2	4	5	6
Min Green *	10	7	7	10
Gap, Extension *	3.0	2.0	2.0	3.0
Maximum Green 1 *	60	30	20	60
Maximum Green 2 *	-	-	-	-
Yellow Clear	4.1	3.6	3.0	4.1
Red Clear	1.5	2.3	1.9	1.5
Walk *	7	-	-	7
Pedestrian Clear	11	-	-	13
Added Initial *	-	-	-	-
Maximum Initial *	-	-	-	-
Time Before Reduction *	-	-	-	-
Time To Reduce *	-	-	-	-
Minimum Gap	-	-	-	-
Recall Mode	MIN RECALL	-	-	MIN RECALL
Lock Calls	YES	NO	NO	YES
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.

EMERGENCY VEHICLE PREEMPTION

FUNCTION	PRE 3	PRE 5
DELAY BEFORE PREEMPT	0	0
MINIMUM DURATION	16	16
MIN GREEN BEFORE PREEMPT	1	1
MIN WALK BEFORE PREEMPT	1	1
PED CLEAR BEFORE PREEMPT	7	7
MINIMUM DWELL	7	7
EXIT PED CLEAR	0	0
EXIT YELLOW CHANGE	25.5	25.5
EXIT RED CLEAR	25.5	25.5
ENTER YELLOW CHANGE	25.5	25.5
ENTER RED CLEAR	25.5	25.5
ALL-RED B4 DWELL	OFF	OFF
LOCK INPUT	ON	ON
OVERRIDE HIGHER # PREEMPT	OFF	OFF
EXIT PREEMPT TO	Ø2+6	Ø2+6



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Signal Upgrade

Prepared for: **S. Elm Eugene Street at I-40-US 70 EB/ I-85 Business-US 29-220 NB Ramps**

Division 7 Guilford County Greensboro

PLAN DATE: October 2018 REVIEWED BY: R Dubnicka

PREPARED BY: J Trueblood REVIEWED BY: J Carroll

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: 1"=40'

REVISIONS: _____ INIT. DATE

SIGNATURE: _____ DATE: 2/4/2020

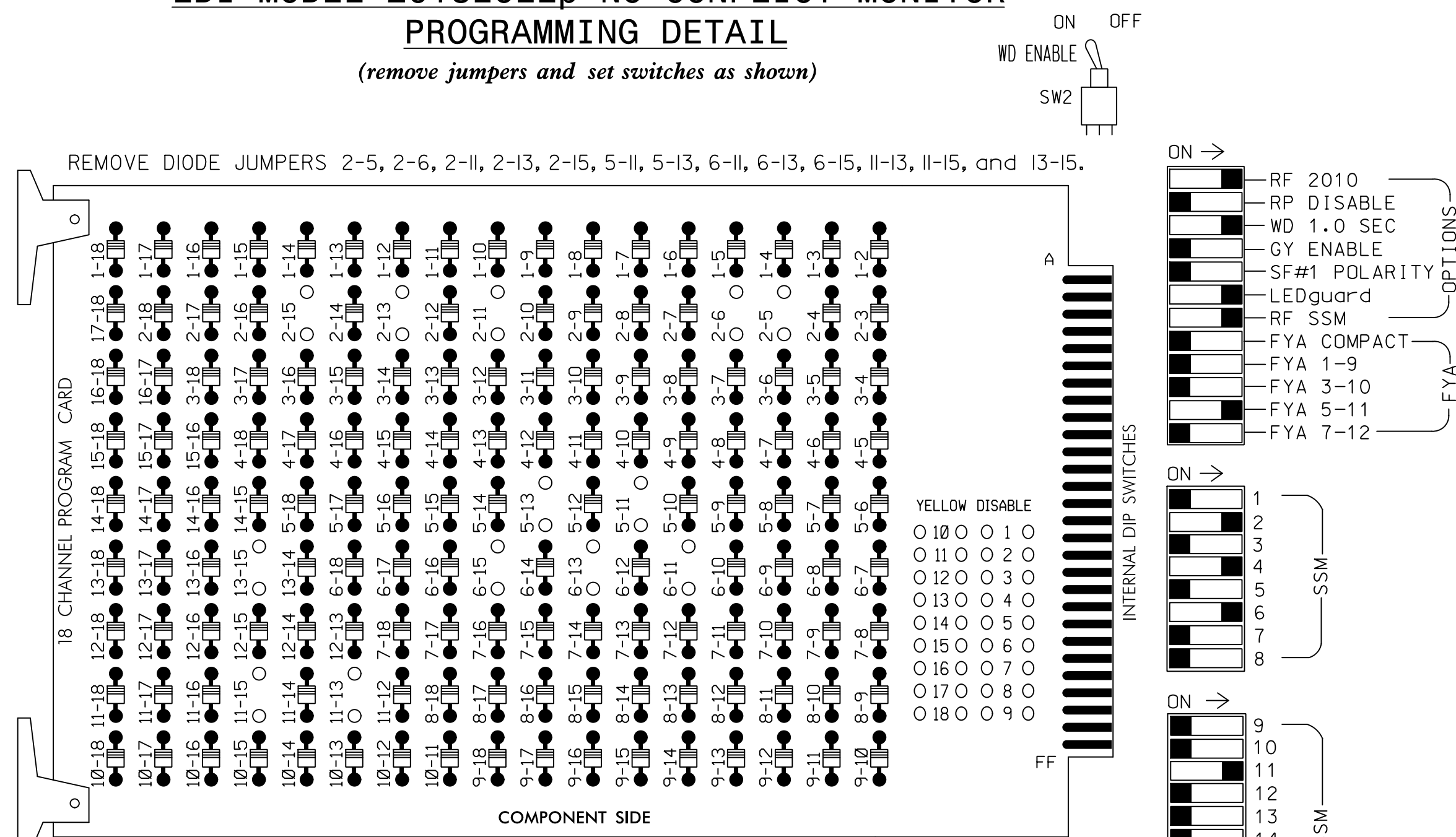
SIG. INVENTORY NO. 07-0285

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NORTH CAROLINA PROFESSIONAL ENGINEER
J. CARROLL
030005

EDI MODEL 2018ECLIP-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.
- Ensure Conflict Monitor Ethernet port is connected to a Switch port located within the cabinet.

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.
- Initialize database in Naztec 2070 local software (Apogee) as FULL-CALTRANS. This initialization should be done prior to programming controller.
- Initialize I/O "C1-C11-ABC IO Mode" to USER (MM 1-8-6). Then set "Init 2A" to MODE 5 (MM 1-8-9-3).
- Program phases 2 and 6 for Start Up In Walk.
- Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
- Program controller "Local Flash Start" feature to "DRK".
- Ensure "InhFYARedSt" feature is set to "ON".
- Program controller to provide a 1 second delay on the Flash Sense/Local Flash input. Use the following logic statement to provide this functionality:

```
FROM MAIN MENU->1->8->7 (I/O LOGIC) Result Src.Fcn TimeOp Time
1208 = 01208 DLY 1
```
- The cabinet and controller are part of the Greensboro Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
 CABINET.....332 W/ AUX
 SOFTWARE.....NAZTEC APOGEE
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
 LOAD SWITCHES USED.....S2,S3,S5,S7,S8,S9,AUX S4
 PHASES USED.....2,2PED,4,5,6,6PED
 OVERLAP A.....NOT USED
 OVERLAP B.....NOT USED
 OVERLAP C.....*
 OVERLAP D.....NOT USED

* See Sheet 2 of 5 for Overlap Programming Detail.

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.	NU	21,22	P21, P22	NU	41,42, 43	NU	51	61,62	P61, P62	NU	NU	NU	NU	NU	NU	51	NU	NU	
RED		128			101			134											
YELLOW		129			102		*	135											
GREEN		130			103			136											
RED ARROW																		A114	
YELLOW ARROW																			A115
FLASHING YELLOW ARROW																			A116
GREEN ARROW									133										
Hand							113						119						
Walking																			121

NU = Not Used

* Denotes install load resistor. See load resistor installation detail this sheet.

★ See pictorial of head wiring in detail below.

INPUT FILE POSITION LAYOUT

(front view)

FILE	U	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE U	U	∅ 2 2A,2B	∅ 3	∅ 4	∅ 4 4A	∅ 4 4C	∅ 4 4B	∅ 5	∅ 6 6A,6B	∅ 7	∅ 8	∅ 9	∅ 10	∅ 11	∅ 12
FILE U	U	∅ 5 5A	∅ 6 6A,6B	∅ 7	∅ 8	∅ 9	∅ 10	∅ 11	∅ 12	∅ 13	∅ 14	∅ 15	∅ 16	∅ 17	∅ 18

EX.: 1A, 2A, ETC. = LOOP NO.'S
 *See Opticom Field Wire Detail this sheet.

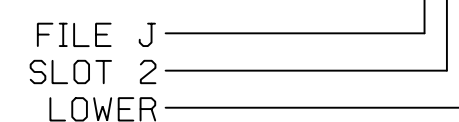
FS = FLASH SENSE
 ST = STOP TIME
 PRE3,5 = EV PREEMPTS

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
2A,2B	TB2-5,6	I2U	39	2	2				X	X	
4A	TB4-9,10	I6U	41	8	4				X	X	
4B	TB4-11,12	I6L	45	9	4				X	X	
4C	TB6-1,2	I7U	65	10	4		15		X	X	
5A	TB3-1,2	J1U	55	15	5		15		X	X	
6A,6B	TB3-5,6	J2U	40	16	6				X	X	
PED PUSH BUTTONS											
P21,P22	TB8-4,6	I12U	67	PED 2	2 PED						
P61,P62	TB8-7,9	I13U	68	PED 6	6 PED						

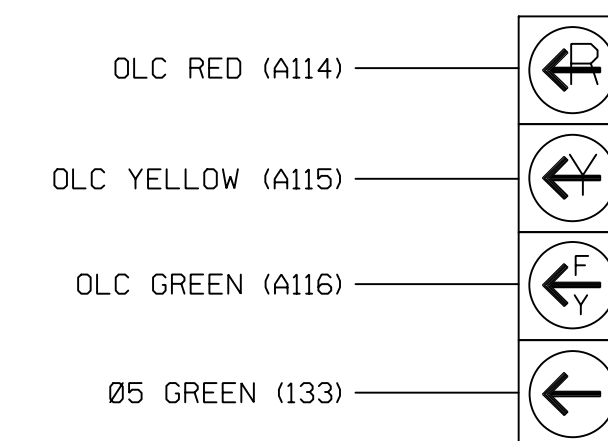
NOTE:
 INSTALL DC ISOLATORS
 IN INPUT FILE SLOTS
 112 AND 113.

INPUT FILE POSITION LEGEND: J2L



4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



51

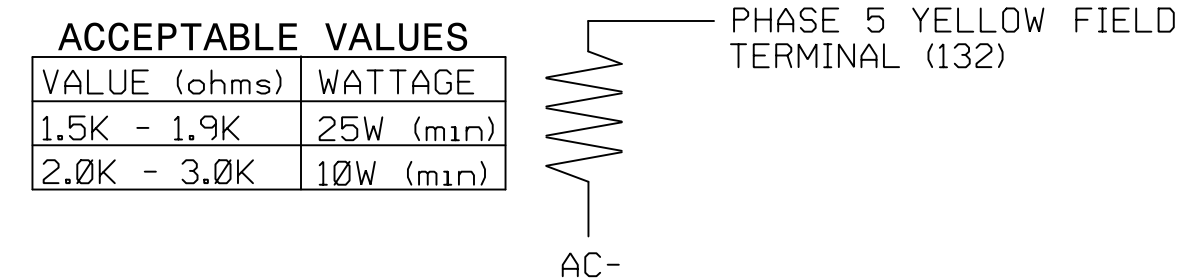
COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 07-0285
 DESIGNED: NOV 2018
 SEALED: 2/4/2020
 REVISED: N/A

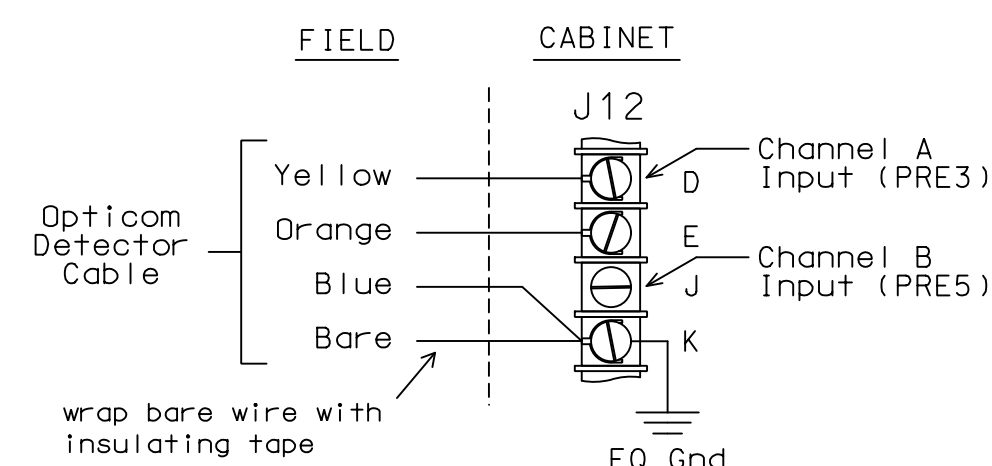
LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)



TYPICAL OPTICOM FIELD WIRE DETAIL

(input file, rear view)



Electrical Detail - Sheet 1 of 5

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North Carolina Professional Engineer Seal 030005

Division 7 Guilford County Greensboro

PLAN DATE: November 2018 REVIEWED BY: R. Dubnicka

PREPARED BY: J. Trueblood REVIEWED BY: J. Carroll

REVISIONS INIT. DATE

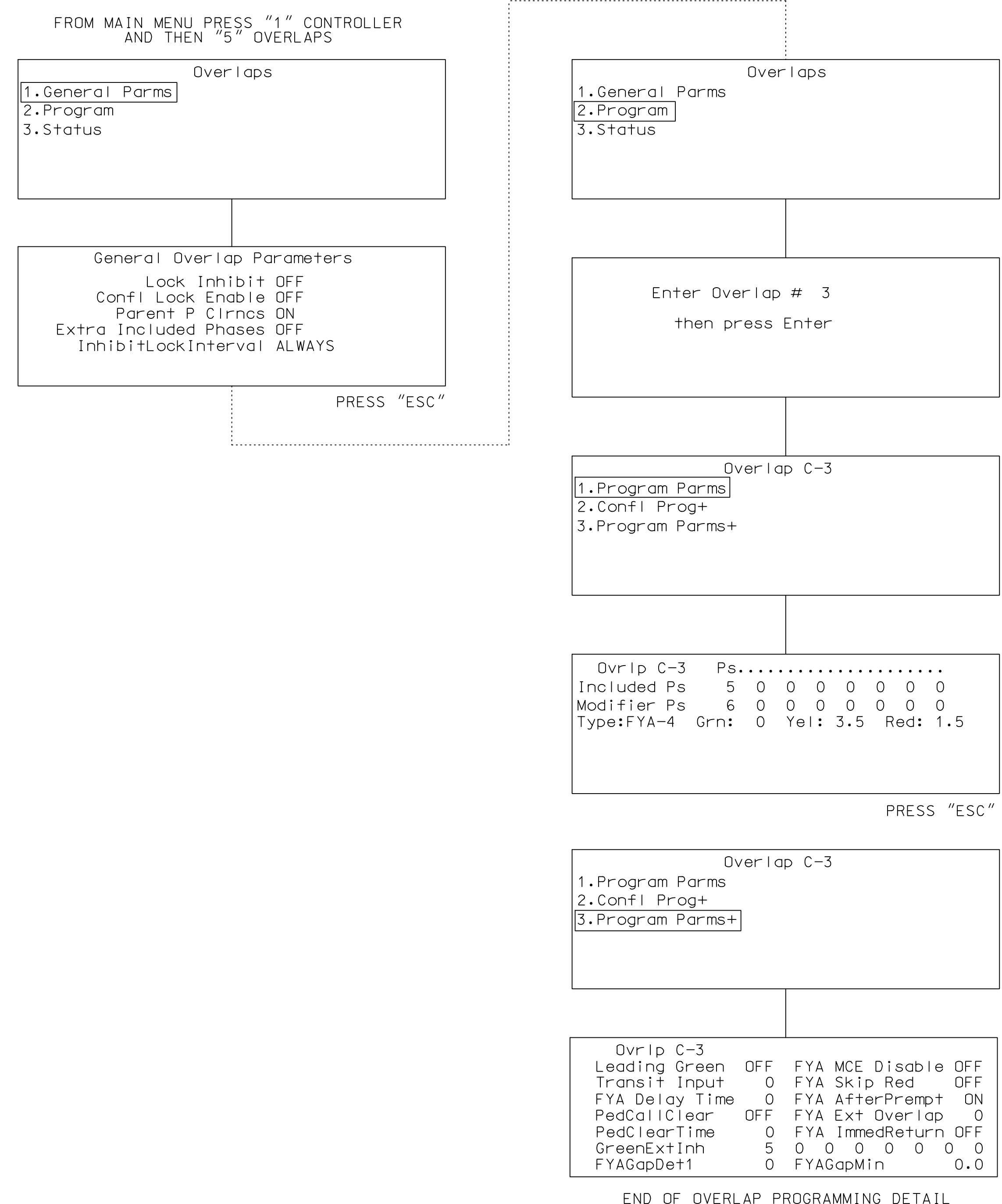
DATE

2/4/2020

SIG. INVENTORY NO. 07-0285

OVERLAP PROGRAMMING DETAIL

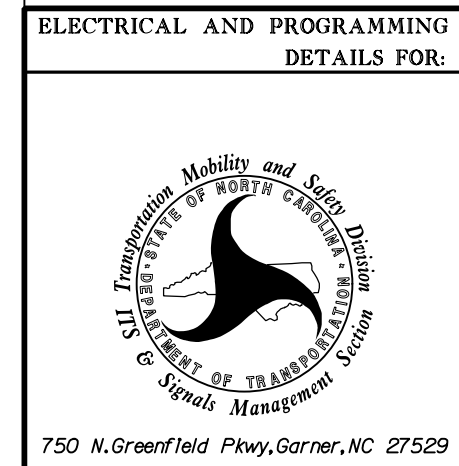
(program controller as shown below)



END OF OVERLAP PROGRAMMING DETAIL

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-0285
DESIGNED: NOV 2018
SEALED: 2/4/2020
REVISED: N/A

Electrical Detail - Sheet 2 of 5



**S. Elm Eugene Street
at
I-40-US 70 EB/
I-85 Business-US 29-220 NB Ramps**

Division 7 Guilford County Greensboro

PLAN DATE: November 2018 REVIEWED BY: R. Dubnicka
PREPARED BY: J. Trueblood REVIEWED BY: J. Carroll

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Justin T. Carroll
ENGINEER

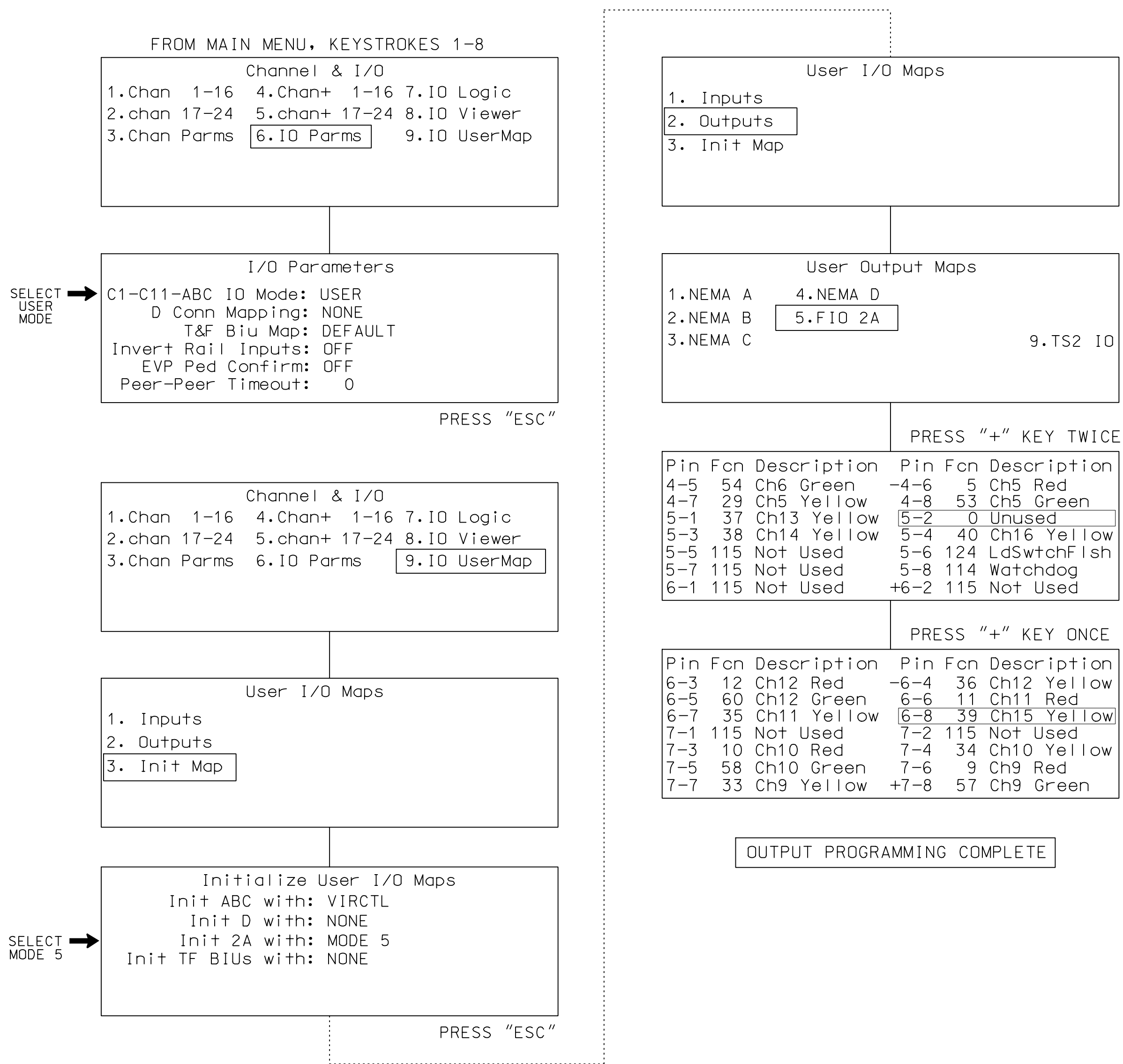
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Justin T. Carroll
3346ACSDHE18486
2/4/2020
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4-SECTION PPLT FYA OUTPUT PROGRAMMING DETAIL

(program controller as shown below)

- Before proceeding with output programming, be sure to switch the "RUN ENABLE STATUS" to "OFF". The "RUN ENABLE STATUS" setting is located from Main Menu, key strokes 1-7.
- The Flashing Yellow Arrow in a 4-section PPLT FYA head is controlled by a normally unused PED Yellow output. This programming takes a specific PED Yellow output and remaps it to the appropriate Overlap Green output.



Pin 5-2 (C1 pin 36) = Load Switch S9-Y
Pin 6-8 (C1 pin 90) = Load Switch AUX S4-G

! Press the "*" key to return to Main Menu. Now go back to "RUN-ENABLE STATUS" and switch to "ON".

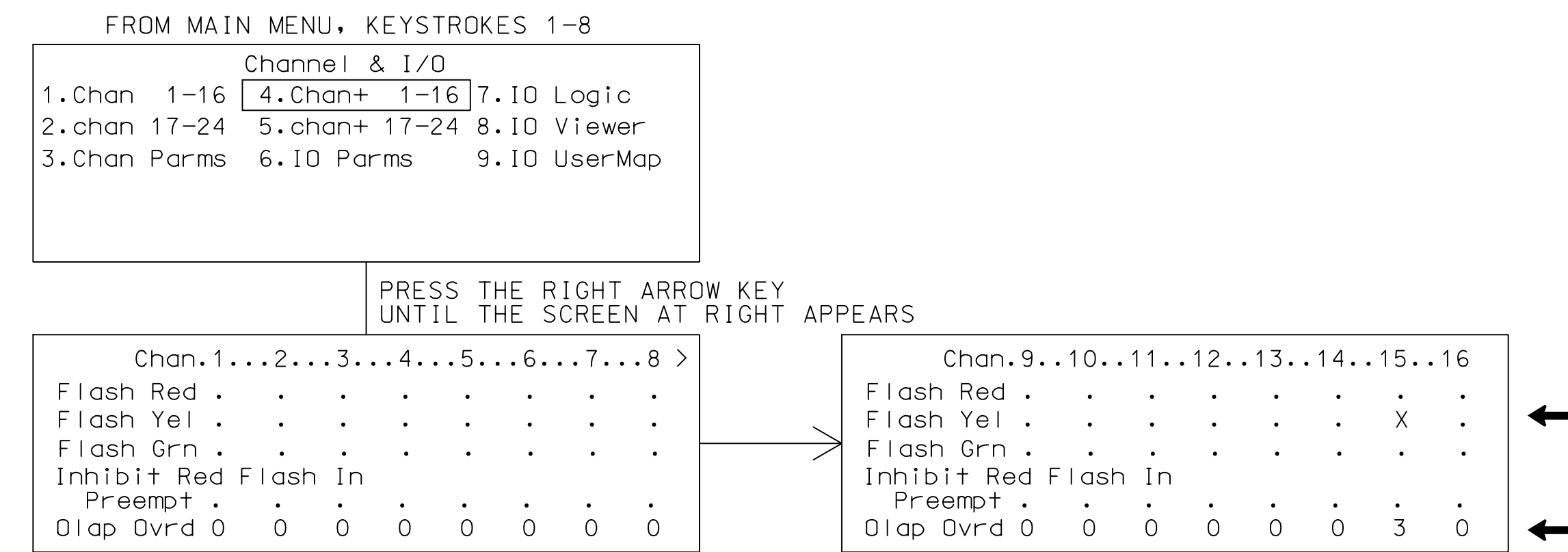
NOTE

I/O re-programming is necessary for proper FYA operation. See Channel & I/O Programming Detail For FYA Operation on this sheet.

CHANNEL & I/O PROGRAMMING DETAIL FOR FYA OPERATION

(program controller as shown below)

This programming takes the output that drives a Flashing Yellow Arrow and makes it flash. It also specifies which overlap is to be overridden for the FYA to display properly.



Programming notes:

Pin	Default Fcn Description	Change To: Fcn Description
5-2	39 Ch15 Yellow	0 Unused

Programming notes:

Pin	Default Fcn Description	Change To: Fcn Description
6-8	59 Ch11 Green	39 Ch15 Yellow

Program the controller as shown above.

CHANNEL & I/O PROGRAMMING COMPLETE

NOTE

Output re-mapping is necessary for proper FYA operation. See the 4-Section PPLT FYA Output Programming Detail on this sheet.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 07-0285
DESIGNED: NOV 2018
SEALED: 2/4/2020
REVISED: N/A

Electrical Detail - Sheet 3 of 5

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(704) 372-1885
NC License Number F-0991

S. Elm Eugene Street
at
I-40-US 70 EB/
I-85 Business-US 29-220 NB Ramps

Division 7 Guilford County Greensboro

PLAN DATE: November 2018 REVIEWED BY: R. Dubnicka
PREPARED BY: J. Trueblood REVIEWED BY: J. Carroll

REVISIONS	INIT.	DATE

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Justin T. Carroll
ENGINEER
2/4/2020
DATE

SIG. INVENTORY NO. 07-0285

EMERGENCY VEHICLE PREEMPTION PROGRAMMING DETAIL FOR 'PRE 3'
(program controller as shown below)

FROM MAIN MENU PRESS "3" PREEMPTS

```

Preemption Menu
1.HiPriority 4.LowPriority
2.Events
3.Sequences
    
```

ENTER PREEMPT #3

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 Times : Begin : Other
Delay 0 MinGrn 1 Track Grn 0
MinDura 16 MinWlk 1 Min Dwell 7
MaxPres 0 PedClr 7
    
```

PRESS "ESC"

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 ---- Preempt Phases ----
Track Veh 0 0 0 0
DwellCyc Veh 2 5 0 0 0 0 0
DwellCyc(more) 0 0 0 0
DwellCyc (Ped) 0 0 0 0 0 0 0
Exit 2 6 0 0
    
```

PRESS "ESC"

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 Preempt Options
Lock input ON
Override Auto Flash OFF
Override higher # preempt OFF
Flash in dwell OFF
Link to preempt # 0
    
```

PRESS "ESC"

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 Preempt Times+ --- Exit --
Ped Clr 0
Extend Dwell 0 Yel 0.0
Return Max 0 Red 0.0
    
```

PRESS "ESC"

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 -- Preempt Overlaps+ --
Track 0 0 0 0 0 0 0
(more) 0 0 0 0 0
DwellCyc 3 0 0 0 0 0 0
(more) 0 0 0 0
    
```

PRESS "ESC"

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 Preempt Options +
Enable ON Pattern 0
Type EMERG Skip Track if Override OFF
Output DELAY Coord+Preempt OFF
Volt Mon Flash OFF
Return Max/Min MAX
    
```

PRESS "ESC"

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 AdvTimes
AllRedB4Prmp+ OFF EnterYelChg 25.5
ResetExtDwell OFF EnterRedClr 25.5
ReservicePremp+ OFF TrackYelChg 25.5
EndDwell OFF TrackRedClr 25.5
DynExitThresh 0 1111111
DsbldwellCalls OFF 12345678 90123456
+ ExitVehCall .....
    
```

PRESS "ESC"

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

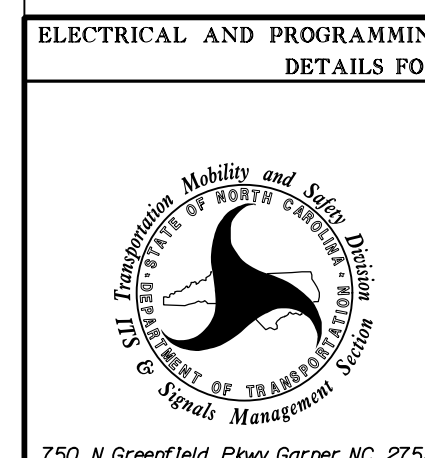
```

# 3 -- Initial Dwell --
Phases 0 0 0 0
Peds 0 0 0 0
Overlaps 0 0 0 0 0 0 0
(more) 0 0 0 0 0 0 0
    
```

PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-0285
DESIGNED: NOV 2018
SEALED: 2/4/2020
REVISED: N/A

Electrical Detail - Sheet 4 of 5



**S. Elm Eugene Street
at
I-40-US 70 EB/
I-85 Business-US 29-220 NB Ramps**

Division 7 Guilford County Greensboro

PLAN DATE: November 2018 REVIEWED BY: R. Dubnicka

PREPARED BY: J. Trueblood REVIEWED BY: J. Carroll

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA
PROFESSIONAL
ENGINEER
SEAL
030005
J. CARROLL
DATE
2/4/2020
SIG. INVENTORY NO. 07-0285

EMERGENCY VEHICLE PREEMPTION PROGRAMMING DETAIL FOR 'PRE 5'

(program controller as shown below)

FROM MAIN MENU PRESS "3" PREEMPTS

```

Preemption Menu
1.HiPriority 4.LowPriority
2.Events
3.Sequences
    
```

ENTER PREEMPT #5

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 5 Times : Begin : Other
Delay 0 MinGrn 1 Track Grn 0
MinDura 16 MinWlk 1 Min Dwell 7
MaxPres 0 PedClr 7
    
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 5 ---- Preempt Phases ----
Track Veh 0 0 0 0
DwellCyc Veh 2 6 0 0 0 0 0
DwellCyc(more) 0 0 0 0
DwellCyc (Ped) 0 0 0 0 0 0 0
Exit 2 6 0 0
    
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 5 Preempt Options
Lock input ON
Override Auto Flash OFF
Override higher # preempt OFF
Flash in dwell OFF
Link to preempt # 0
    
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 5 Preempt Times+ --- Exit ---
Extend Dwell 0 Ped Clr 0
Return Max 0 Red 0.0
    
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 5 -- Preempt Overlaps+ --
Track 0 0 0 0 0 0 0 0
(more) 0 0 0 0
DwellCyc 3 0 0 0 0 0 0 0
(more) 0 0 0 0
    
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 5 Preempt Options +
Enable ON Pattern 0
Type EMERG Skip Track if Override OFF
Output DELAY Coord+Preempt OFF
Volt Mon Flash OFF
Return Max/Min MAX
    
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 5 AdvTimes
AllRedB4Prmp+ OFF EnterYelChg 25.5
ResetExtDwell OFF EnterRedClr 25.5
ReservicePreempt OFF TrackYelChg 25.5
EndDwell OFF TrackRedClr 25.5
DynExitThresh 0 1111111
DsbIDwellCalls OFF 12345678 90123456
+ ExitVehCall .....
    
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```


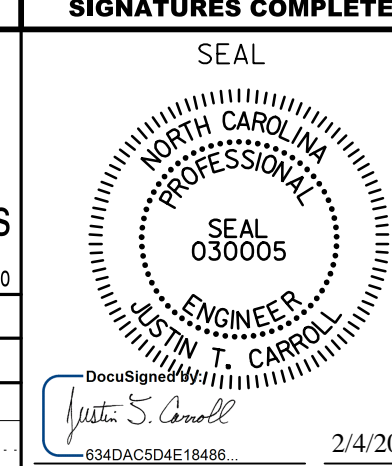
```

# 5 -- Initial Dwell --
Phases 0 0 0 0
Peds 0 0 0 0
Overlaps 0 0 0 0 0 0 0 0
(more) 0 0 0 0 0 0 0 0
    
```

PROGRAMMING COMPLETE

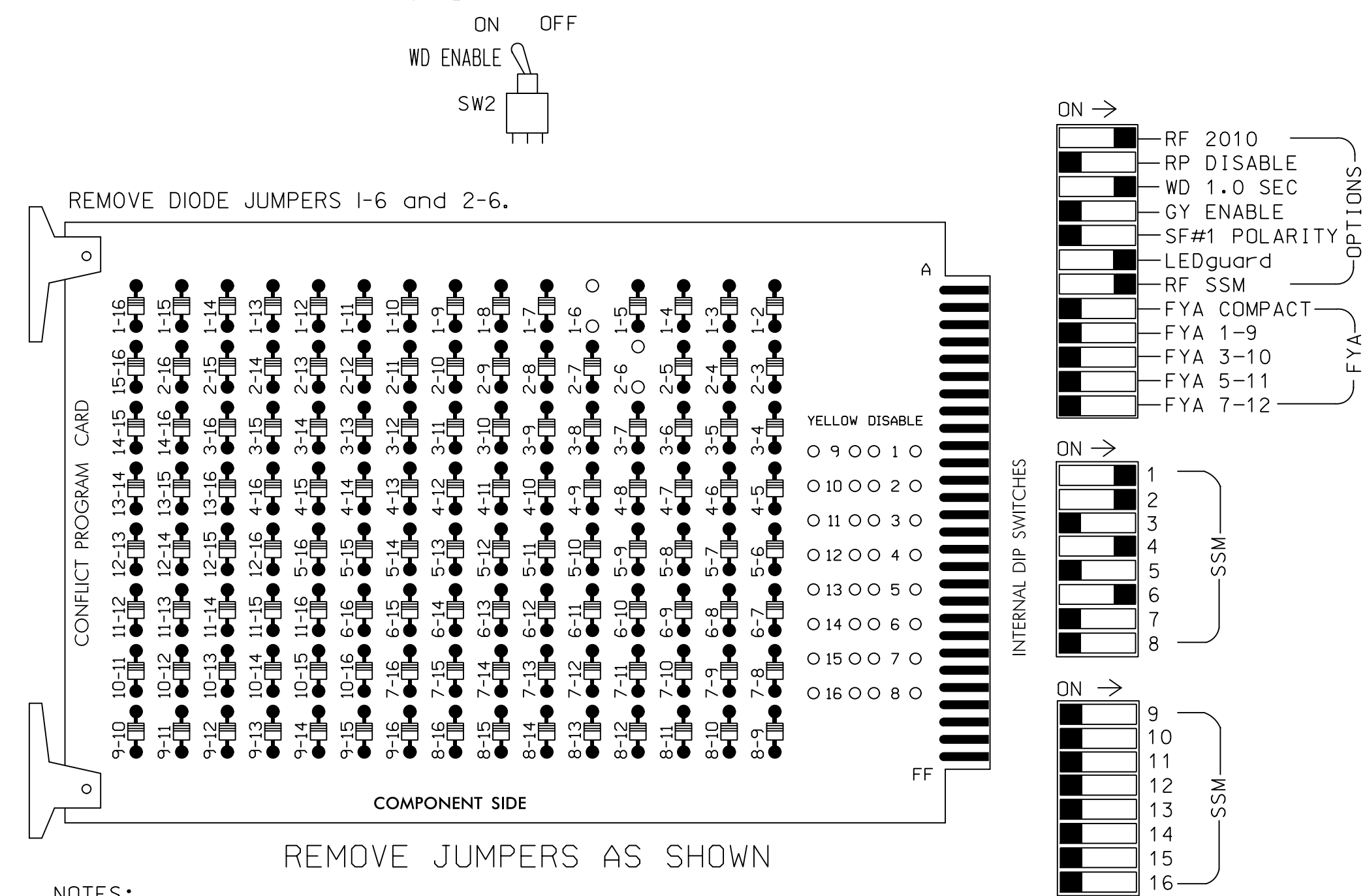
THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-0285
DESIGNED: NOV 2018
SEALED: 2/4/2020
REVISED: N/A

Electrical Detail - Sheet 5 of 5

 <p>STV 100 Years STV Engineers, Inc. 900 West Trade St., Suite 715 Charlotte, NC 28202 (704) 372-1885 NC License Number F-0991</p>	<p>Electrical AND PROGRAMMING DETAILS FOR:</p> <p>S. Elm Eugene Street at I-40-US 70 EB/ I-85 Business-US 29-220 NB Ramps</p> <p>Division 7 Guilford County Greensboro</p> <p>PLAN DATE: November 2018 REVIEWED BY: R. Dubnicka PREPARED BY: J. Trueblood REVIEWED BY: J. Carroll</p> <table border="1" style="width: 100%;"> <tr> <th>REVISIONS</th> <th>INIT.</th> <th>DATE</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>	REVISIONS	INIT.	DATE				<p>SEAL</p>  <p>Justin T. Carroll Professional Engineer SEAL 030005</p>	<p>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</p> <p>DocuSign 2/4/2020 DATE SIGNATURE SIG. INVENTORY NO. 07-0285</p>
REVISIONS	INIT.	DATE							

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



INPUT FILE POSITION LAYOUT

(front view)

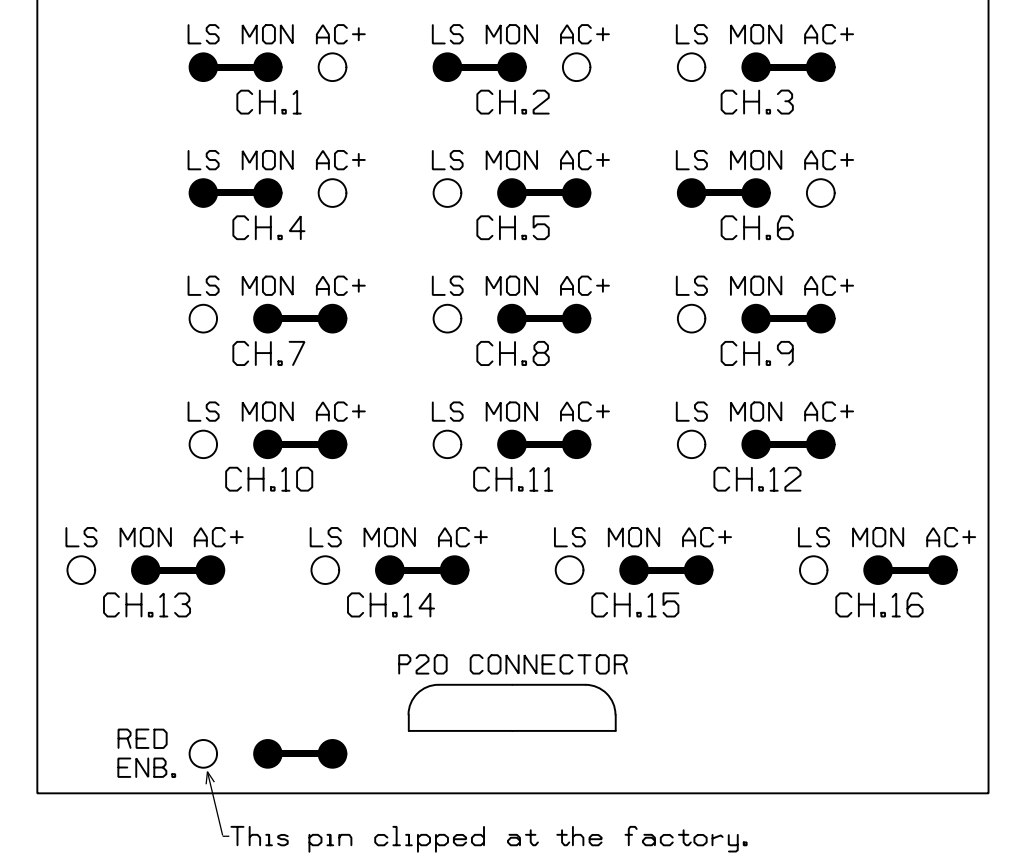
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	∅ 1 1A	∅ 2 2A,2B,2C	∅ 3 NOT USED	∅ 4 4A	∅ 5 NOT USED	∅ 6 6A,6B	∅ 7 NOT USED	∅ 8 NOT USED	∅ 9 NOT USED	∅ 10 NOT USED	∅ 11 NOT USED	∅ 12 NOT USED	∅ 13 NOT USED	∅ 14 NOT USED
FILE "J"	∅ 15 NOT USED	∅ 16 NOT USED	∅ 17 NOT USED	∅ 18 NOT USED	∅ 19 NOT USED	∅ 20 NOT USED	∅ 21 NOT USED	∅ 22 NOT USED	∅ 23 NOT USED	∅ 24 NOT USED	∅ 25 NOT USED	∅ 26 NOT USED	∅ 27 NOT USED	∅ 28 NOT USED

EX.: 1A, 2A, ETC. = LOOP NO.'S
*See Opticom Field Wire Detail this sheet.

FS = FLASH SENSE
ST = STOP TIME
PRE3,5 = EV PREEMPTS

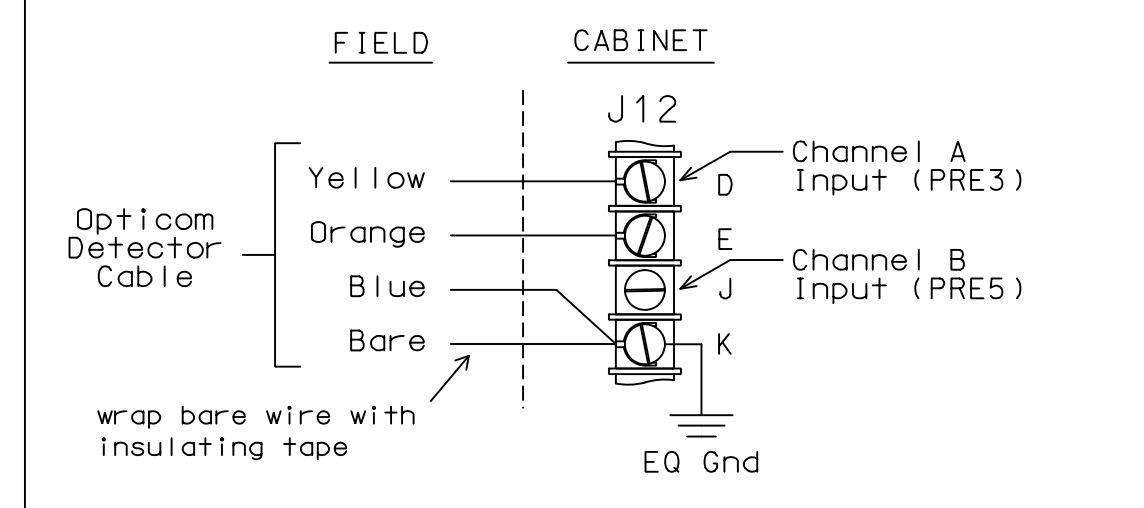
RED MONITOR BOARD PROGRAMMING

(position jumpers as shown below)



TYPICAL OPTICOM FIELD WIRE DETAIL

(input file, rear view)



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.
- To prevent red failures on unused monitor channels, see Red Monitor Board Programming Detail this sheet.
- Initialize database in Naztec 2070 local software (Apogee) as FULL-CALTRANS. This initialization should be done prior to programming controller.
- Initialize I/O "C1-C11-ABC IO Mode" to USER (MM 1-8-6). Then set "Init 2A" to MODE 5 (MM 1-8-9-3).
- Program phases 2 and 6 for Start Up In Green.
- Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
- Ensure "Local Flash Start" feature is set to "DRK".
- Ensure "InhFYARedSt" feature is set to "ON".
- Program controller to provide a 1 second delay on the Flash Sense/Local Flash input. Use the following logic statement to provide this functionality:

```
FROM MAIN MENU->1->8->7 (I/O LOGIC)
Result Src.Fcn  TimeOp Time
I208 = 0I208    DLY      1
```
- The cabinet and controller are part of the Greensboro Signal System.

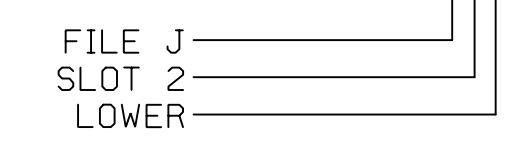
EQUIPMENT INFORMATION

CONTROLLER.....NAZTEC 2070L
 CABINET.....McCAIN/CONTROL TECHNOLOGIES
 (DWG.NO.9500-332-NC DOT)
 SOFTWARE.....NAZTEC APOGEE
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S1,S2,S4,S6
 PHASES USED.....1,2,4,6
 OVERLAPS USED.....NONE

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
1A	TB2-1,2	I1U	56	1	1		5		X	X	
2A,2B,2C	TB2-5,6	I2U	39	2	2				X	X	
4A	TB4-9,10	I6U	41	8	4				X	X	
6A,6B	TB3-5,6	J2U	40	16	6				X	X	

INPUT FILE POSITION LEGEND: J2L



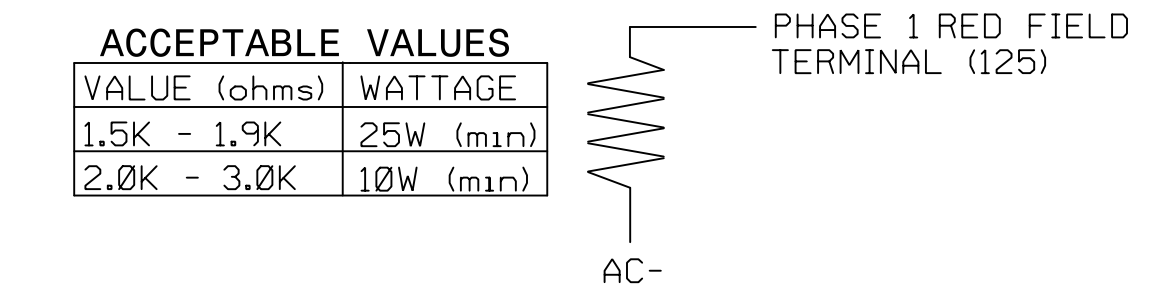
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	61	21,22,23	NU	NU	41,42	NU	NU	61,62	NU	NU	NU	NU
RED	*	128			101			134				
YELLOW		129			102			135				
GREEN		130			103			136				
RED ARROW												
YELLOW ARROW	126											
GREEN ARROW	127											

NU = Not Used
 * Denotes install load resistor. See load resistor installation detail this sheet.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)



NOTE: The purpose of these resistors is to load the channel red monitor inputs in order for the Signal Sequence Monitor to use the full signal sequence monitoring capability on channels that do not use the red display in the field.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 07-0588T
 DESIGNED: NOV 2018
 SEALED: 2/4/2020
 REVISED: N/A

Temporary Electrical Detail - Sheet 1 of 3

 STV Engineers, Inc. 900 West Trade St., Suite 715 Charlotte, NC 28202 (704) 372-1885 NC License Number F-0991	S. Elm Eugene Street at I-40-US 70 WB/ I-85 Business-US 29-220 SB Ramps Division 7 Guilford County Greensboro PLAN DATE: November 2018 REVIEWED BY: R. Dubnicka PREPARED BY: J. Trueblood REVIEWED BY: J. Carroll	DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED SEAL ENGINEER JUSTIN T. CARROLL 2/4/2020 DATE SIG. INVENTORY NO. 07-0588T
--	--	---

EMERGENCY VEHICLE PREEMPTION PROGRAMMING DETAIL FOR 'PRE 3'
(program controller as shown below)

FROM MAIN MENU PRESS "3" PREEMPTS
Preemption Menu
1.HiPriority 4.LowPriority
2.Events
3.Sequences
ENTER PREEMPT #3

3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell

3 Times : Begin : Other
Delay 0 MinGrn 1 Track Grn 0
MinDura 16 MinWlk 0 Min Dwell 7
MaxPres 0 PedClr 0
PRESS "ESC"

3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell

3 ---- Preempt Phases ----
Track Veh 0 0 0 0
DwellCyc Veh 2 6 0 0 0 0 0 0
DwellCyc(more) 0 0 0 0
DwellCyc (Ped) 0 0 0 0 0 0 0 0
Exit 2 6 0 0
PRESS "ESC"

3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell

3 Preempt Options
Lock input ON
Override Auto Flash OFF
Override higher # preempt OFF
Flash in dwell OFF
Link to preempt # 0
PRESS "ESC"

3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell

3 Preempt Times+ --- Exit ---
Ped Clr 0
Extend Dwell 0 Yel 0.0
Return Max 0 Red 0.0
PRESS "ESC"

3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell

3 -- Preempt Overlaps+ --
Track 0 0 0 0 0 0 0 0
(more) 0 0 0 0
DwellCyc 0 0 0 0 0 0 0 0
(more) 0 0 0 0
PRESS "ESC"

3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell

3 Preempt Options +
Enable ON Pattern 0
Type EMERG Skip Track if Override OFF
Output DELAY Coord+Preempt OFF
Volt Mon Flash OFF
Return Max/Min MAX
PRESS "ESC"

3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell

3 AdvTimes
AllRedB4Prmp OFF EnterYelChg 25.5
ResetExtDwell OFF EnterRedClr 25.5
ReservicePremp OFF TrackYelChg 25.5
EndDwell OFF TrackRedClr 25.5
DynExitThresh 0 1111111
DsbIDwellCalls OFF 12345678 90123456
+ ExitVehCall
PRESS "ESC"

3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell

3 -- Initial Dwell --
Phases 0 0 0 0
Peds 0 0 0 0
Overlaps 0 0 0 0 0 0 0 0
(more) 0 0 0 0 0 0 0 0
PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-0588T
DESIGNED: NOV 2018
SEALED: 2/4/2020
REVISED: N/A

Temporary Electrical Detail - Sheet 2 of 3
ELECTRICAL AND PROGRAMMING DETAILS FOR:
S. Elm Eugene Street at I-40-US 70 WB/ I-85 Business-US 29-220 SB Ramps
Division 7 Guilford County Greensboro
PLAN DATE: November 2018 REVIEWED BY: R. Dubnicka
PREPARED BY: J. Trueblood REVIEWED BY: J. Carroll
SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 030005
J. CARROLL
2/4/2020
SIG. INVENTORY NO. 07-0588T



EMERGENCY VEHICLE PREEMPTION PROGRAMMING DETAIL FOR 'PRE 5'
(program controller as shown below)

FROM MAIN MENU PRESS "3" PREEMPTS

```

Preemption Menu
1.HiPriority 4.LowPriority
2.Events
3.Sequences
  
```

ENTER PREEMPT #5

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
  
```

```

# 5 Times : Begin : Other
Delay 0 MinGrn 1 Track Grn 0
MinDura 16 MinWlk 0 Min Dwell 7
MaxPres 0 PedClr 0
  
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
  
```

```

# 5 ---- Preempt Phases ----
Track Veh 0 0 0 0
DwellCyc Veh 1 6 0 0 0 0 0 0
DwellCyc(more) 0 0 0 0
DwellCyc (Ped) 0 0 0 0 0 0 0 0
Exit 2 6 0 0
  
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
  
```

```

# 5 Preempt Options
Lock input ON
Override Auto Flash OFF
Override higher # preempt OFF
Flash in dwell OFF
Link to preempt # 0
  
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
  
```

```

# 5 Preempt Times+ --- Exit ---
Ped Clr 0
Extend Dwell 0 Yel 0.0
Return Max 0 Red 0.0
  
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
  
```

```

# 5 -- Preempt Overlaps+ --
Track 0 0 0 0 0 0 0 0
(more) 0 0 0 0
DwellCyc 0 0 0 0 0 0 0 0
(more) 0 0 0 0
  
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
  
```

```

# 5 Preempt Options +
Enable ON Pattern 0
Type EMERG Skip Track if Override OFF
Output DELAY Coord+Preempt OFF
Volt Mon Flash OFF
Return Max/Min MAX
  
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
  
```

```

# 5 AdvTimes
AllRedB4Prmp OFF EnterYelChg 25.5
ResetExtDwell OFF EnterRedClr 25.5
ReservicePremp OFF TrackYelChg 25.5
EndDwell OFF TrackRedClr 25.5
DynExitThresh 0 1111111
DsbIDwellCalls OFF 12345678 90123456
+ ExitVehCall .....
  
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
  
```

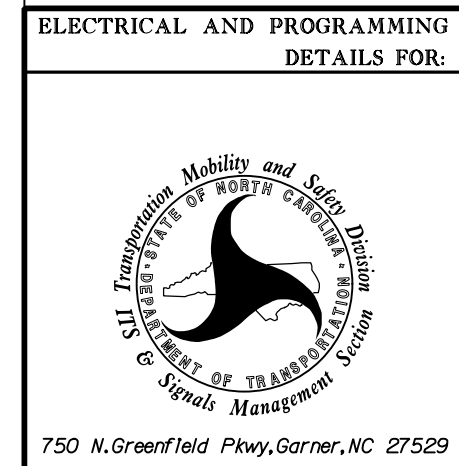
```

# 5 -- Initial Dwell --
Phases 0 0 0 0
Peds 0 0 0 0
Overlaps 0 0 0 0 0 0 0 0
(more) 0 0 0 0 0 0 0 0
  
```

PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-0588T
DESIGNED: NOV 2018
SEALED: 2/4/2020
REVISED: N/A

Temporary Electrical Detail - Sheet 3 of 3



**S. Elm Eugene Street
at
I-40-US 70 WB/
I-85 Business-US 29-220 SB Ramps**

Division 7 Guilford County Greensboro

PLAN DATE: November 2018 REVIEWED BY: R. Dubnicka

PREPARED BY: J. Trueblood REVIEWED BY: J. Carroll

REVISIONS	INIT.	DATE

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SEAL 030005

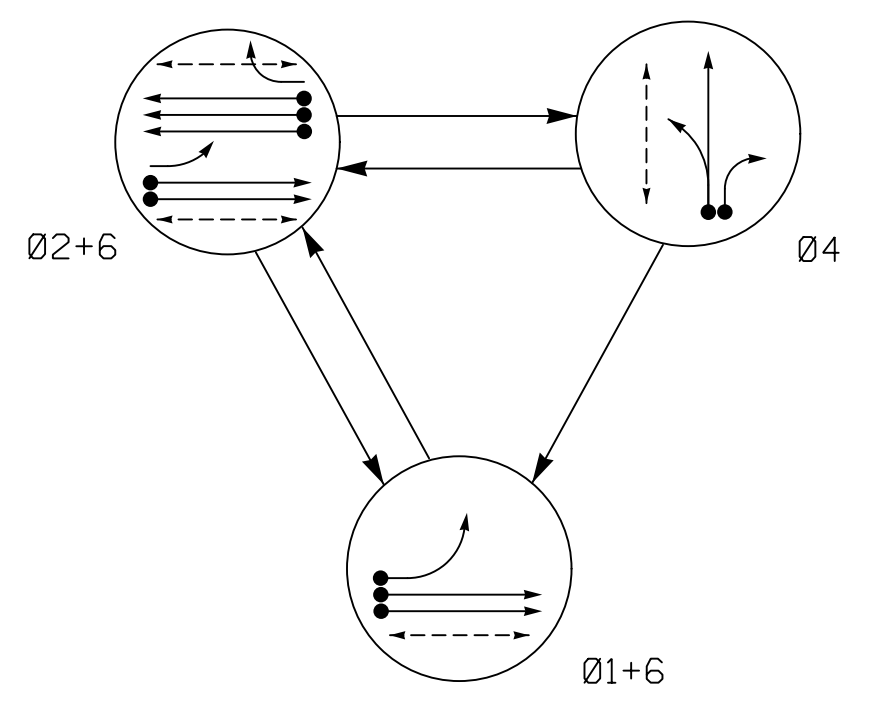
J. CARROLL

2/4/2020

DATE

SIG. INVENTORY NO. 07-0588T

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

EV PREEMPT PHASES (Medium Priority)

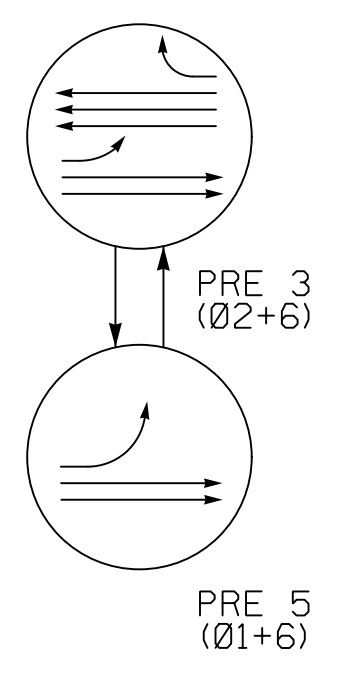
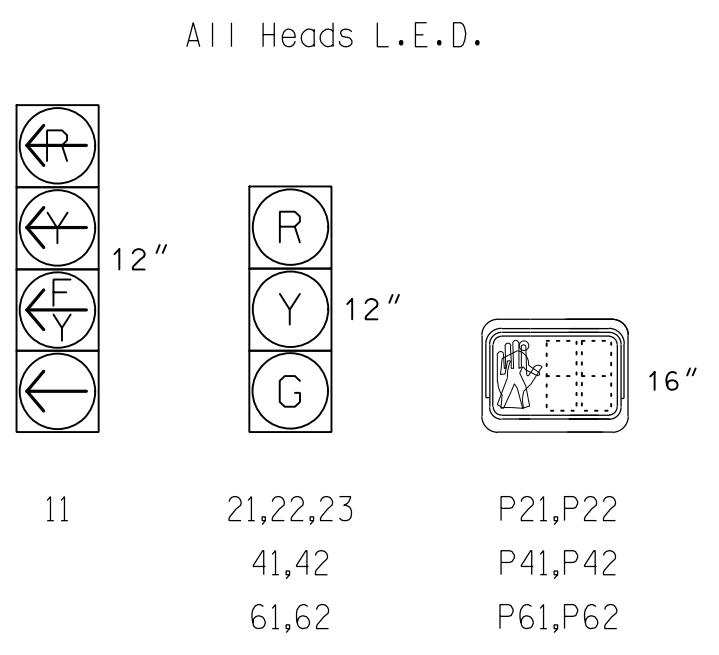


TABLE OF OPERATION

SIGNAL FACE	PHASE							
	Ø1+6	Ø2+6	Ø4	PRE 3	PRE 5	P1	P2	P3
11	←	←	←	←	←	←	←	←
21,22,23	R	G	R	G	R	Y		
41,42	R	R	G	R	R	R	Y	
61,62	G	G	R	G	G	Y		
P21,P22	DW	W	DW	DW	DRK			
P41,P42	DW	DW	W	DW	DRK			
P61,P62	W	W	DW	DW	DRK			

SIGNAL FACE I.D.



LOOP & DETECTOR UNIT INSTALLATION CHART
NAZTEC APOGEE SOFTWARE 2070 CONTROLLER

LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	DETECTOR PROGRAMMING							
					PHASE	SWITCH (PHASE)	DELAY TIME	STRETCH TIME	CALLING	EXTENSION ADDED INIT.	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	X	1	-	15	-	X	X	-	X
2A,2B,2C	6X6	70	4	X	2	-	-	-	X	X	-	X
4A	6X40	0	2-4-2	X	4	-	-	-	X	X	-	X
4B	6X40	0	2-4-2	X	4	-	15	-	X	X	-	X
6A,6B	6X6	70	4	X	6	-	-	-	X	X	-	X

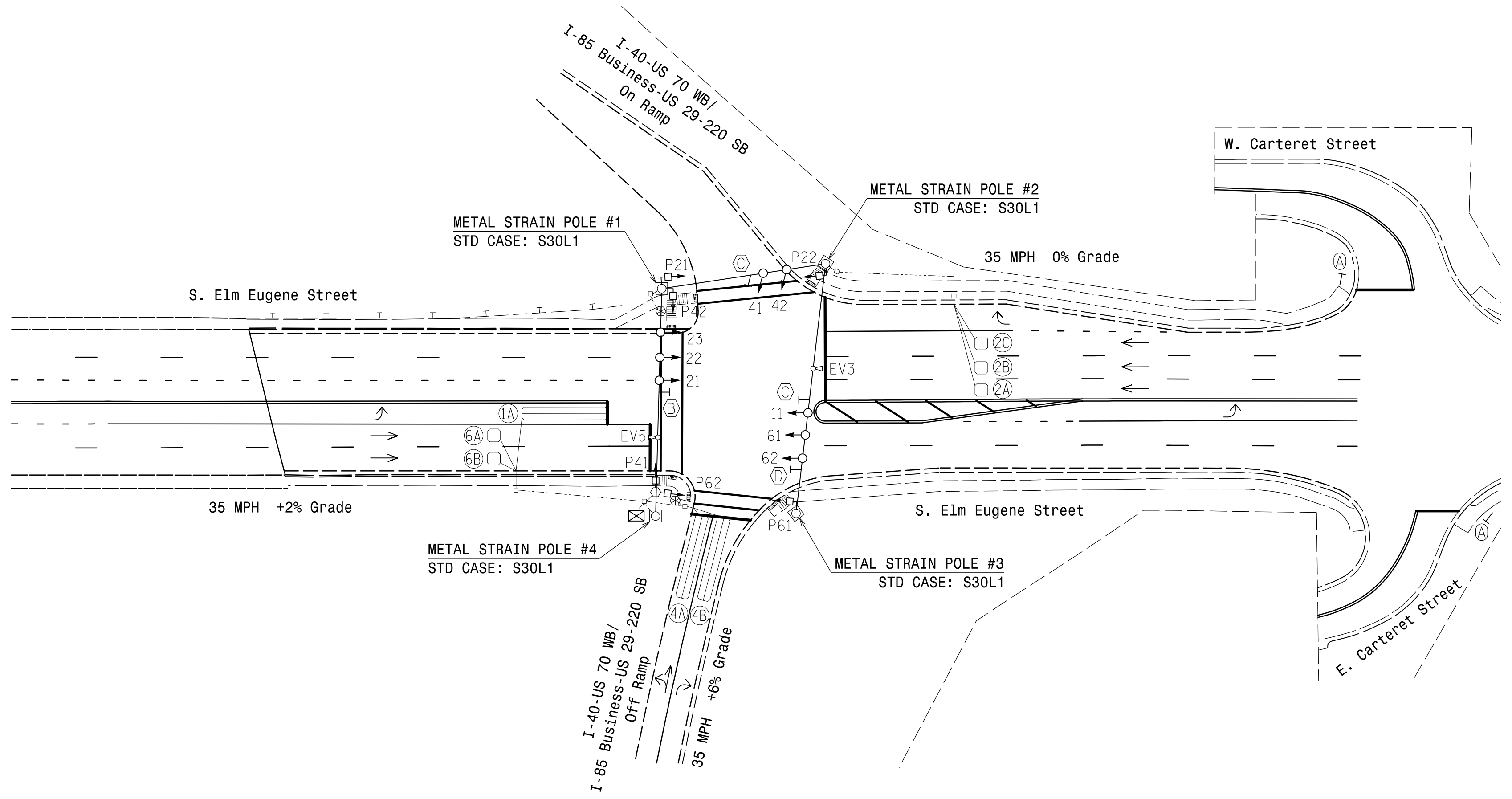
3 Phase Fully Actuated (Greensboro Signal System)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 may be lagged.
- Set all detector units to presence mode.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- EVP equipment to be provided by local municipality for contractor installation.

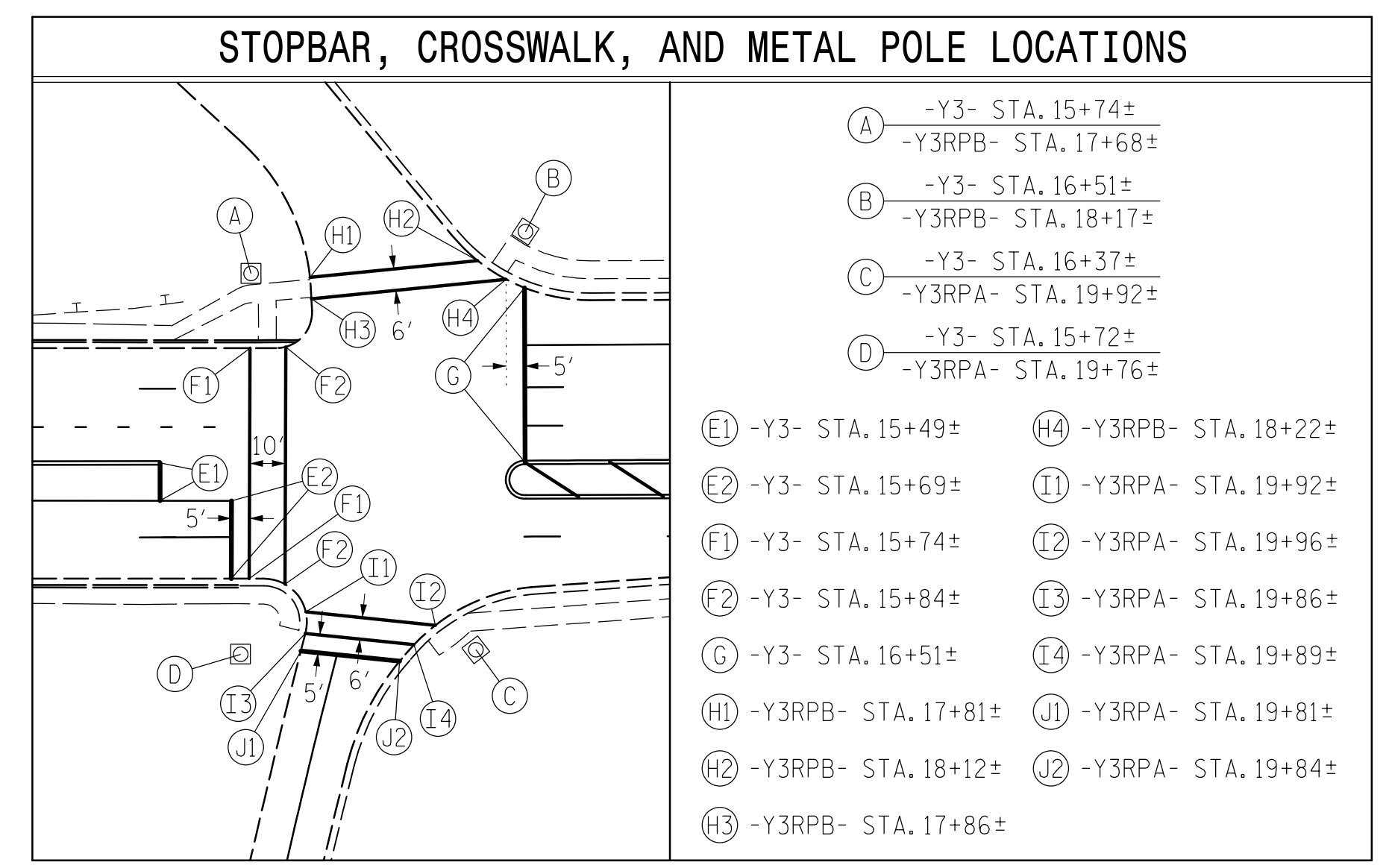
EMERGENCY VEHICLE PREEMPTION

FUNCTION	PRE 3	PRE 5
DELAY BEFORE PREEMPT	0	0
MINIMUM DURATION	16	16
MIN GREEN BEFORE PREEMPT	1	1
MIN WALK BEFORE PREEMPT	1	1
PED CLEAR BEFORE PREEMPT	8	8
MINIMUM DWELL	7	7
EXIT PED CLEAR	0	0
EXIT YELLOW CHANGE	25.5	25.5
EXIT RED CLEAR	25.5	25.5
ENTER YELLOW CHANGE	25.5	25.5
ENTER RED CLEAR	25.5	25.5
ALL-RED B4 DWELL	OFF	OFF
LOCK INPUT	ON	ON
OVERRIDE HIGHER # PREEMPT	OFF	OFF
EXIT PREEMPT TO	Ø2+6	Ø2+6



NAZTEC APOGEE 2070 TIMING CHART

FEATURE	PHASE			
	1	2	4	6
Min Green *	7	10	7	10
Gap, Extension *	2.0	3.0	2.0	3.0
Maximum Green 1 *	20	60	30	60
Maximum Green 2 *	-	-	-	-
Yellow Clear	3.0	3.8	3.5	3.8
Red Clear	3.2	2.5	2.0	2.5
Walk *	-	7	7	7
Pedestrian Clear	-	11	16	7
Added Initial *	-	-	-	-
Maximum Initial *	-	-	-	-
Time Before Reduction *	-	-	-	-
Time To Reduce *	-	-	-	-
Minimum Gap	-	-	-	-
Recall Mode	-	MIN RECALL	-	MIN RECALL
Lock Calls	NO	YES	NO	YES
Dual Entry	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON



LEGEND

PROPOSED	EXISTING
○ Traffic Signal Head	● N/A
○ Modified Signal Head Sign	○ N/A
○ Pedestrian Signal Head	○ N/A
○ Metal Strain Pole	○ 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
→ Guardrail	→ N/A
⊗ Type I Pushbutton Post	⊗ N/A
○ Type II Signal Pedestal	○ N/A
○ EV Preemption Detector	○ N/A
(A) "STOP" Sign (R1-1)	(A) N/A
(B) No U-Turn/No Left Turn Sign (R3-18)	(B) N/A
(C) "TURNING TRAFFIC MUST YIELD TO PEDESTRIANS" Sign (R10-15)	(C) N/A
(D) No Right Turn Sign (R3-1)	(D) N/A

Signal Upgrade - Final Design

STV Engineers, Inc.
900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

750 N. Greenfield Pkwy, Garner, NC 27529
SCALE: 0 to 40
1" = 40'

S. Elm Eugene Street at I-40-US 70 WB/ I-85 Business-US 29-220 SB Ramps

Division 7 Guilford County Greensboro

PLAN DATE: October 2018 REVIEWED BY: R Dubnicka

PREPARED BY: J Trueblood REVIEWED BY: J Carroll

REVISIONS	INIT.	DATE

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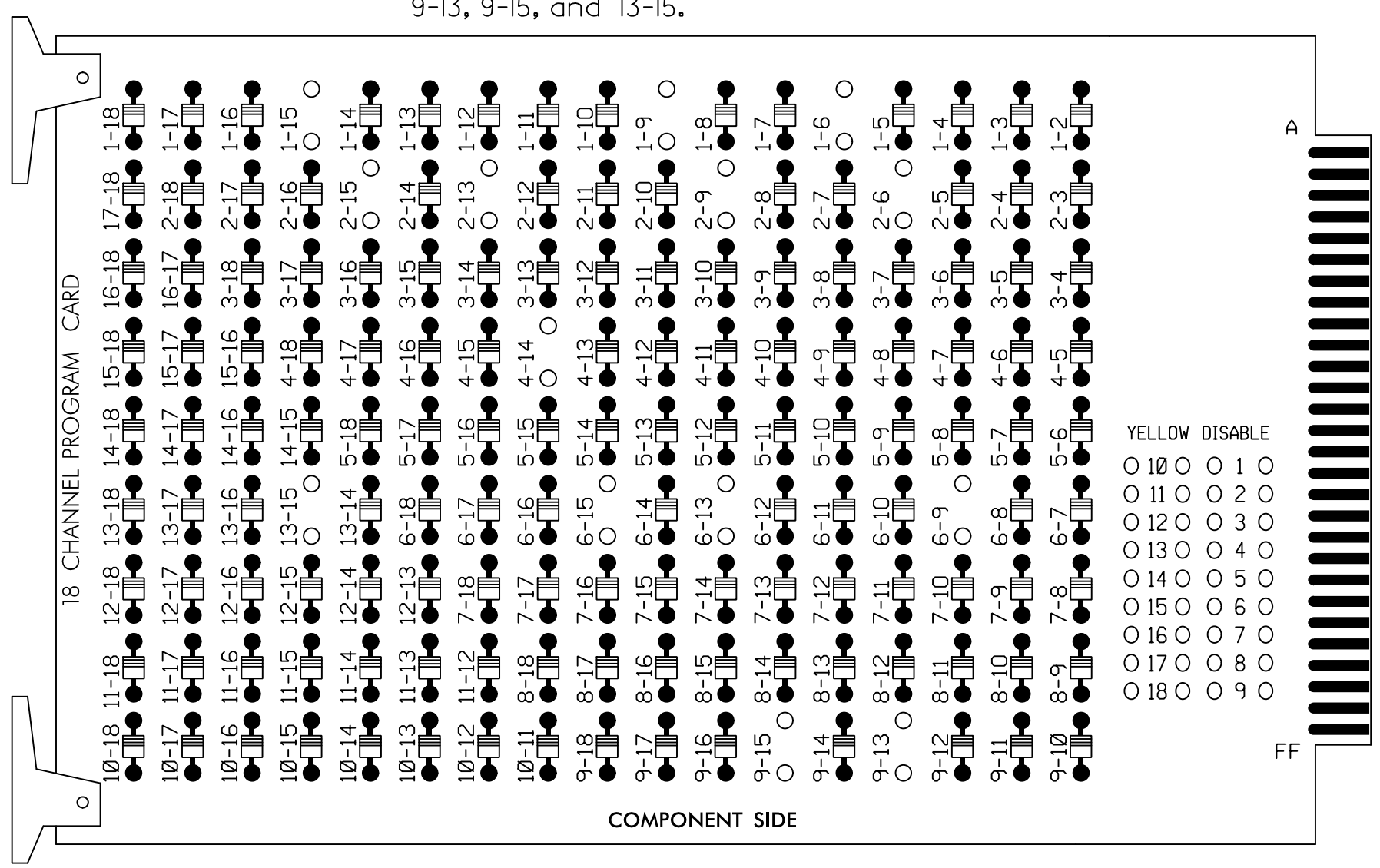
DATE: 2/4/2020
SIGNATURE: J. Carroll
SIG. INVENTORY NO. 07-0588

EDI MODEL 2018ECLIP-NC CONFLICT MONITOR

PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-6, 1-9, 1-15, 2-6, 2-9, 2-13, 2-15, 4-14, 6-9, 6-13, 6-15, 9-13, 9-15, 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.
- Ensure Conflict Monitor Ethernet port is connected to a Switch port located within the cabinet.

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.
- Initialize database in Naztec 2070 local software (Apogee) as FULL-CALTRANS. This initialization should be done prior to programming controller.
- Initialize I/O "C1-C11-ABC IO Mode" to USER (MM 1-8-6). Then set "Init 2A" to MODE 5 (MM 1-8-9-3).
- Program phases 2 and 6 for Start Up In Walk.
- Program "Start Up Flash" for 0 sec. The conflict monitor will govern start-up flash time.
- Program controller "Local Flash Start" feature to "DRK".
- Ensure "InhFYARedSt" feature is set to "ON".
- Program controller to provide a 1 second delay on the Flash Sense/Local Flash input. Use the following logic statement to provide this functionality:
FROM MAIN MENU->1->8->7 (I/O LOGIC)

Result Src.Fcn	TimeOp Time
I208 = 01208	DLY 1
- The cabinet and controller are part of the Greensboro Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
 CABINET.....332 W/ AUX
 SOFTWARE.....NAZTEC APOGEE
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)
 LOAD SWITCHES USED.....S1,S2,S3,S5,S6,S8,S9,AUX S1
 PHASES USED.....1,2,2PED,4,4PED,6,6PED
 OVERLAP A.....*
 OVERLAP B.....NOT USED
 OVERLAP C.....NOT USED
 OVERLAP D.....NOT USED

* See Sheet 2 of 5 for Overlap Programming Detail.

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	21,22,23	P21, P22	NU	41,42	P41, P42	NU	61,62	P61, P62	NU	NU	NU	11	NU	NU	NU	NU	NU
RED		128			101			134										
YELLOW	*	129			102			135										
GREEN		130			103			136										
RED ARROW													A121					
YELLOW ARROW													A122					
FLASHING YELLOW ARROW													A123					
GREEN ARROW	127																	
Hand				113			104			119								
Walking Person				115			106			121								

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

INPUT FILE POSITION LAYOUT

(front view)

FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	∅ 1	∅ 2	∅ 3	∅ 4	∅ 5	∅ 6	∅ 7	∅ 8	∅ 9	∅ 10	∅ 11	∅ 12	∅ 13	∅ 14
L	1A	2A,2B,2C	∅ 3	4A	∅ 5	∅ 6	∅ 7	∅ 8	∅ 9	∅ 10	∅ 11	∅ 12	∅ 13	∅ 14
U	NOT USED	NOT USED	∅ 3	4B	∅ 5	∅ 6	∅ 7	∅ 8	∅ 9	∅ 10	∅ 11	∅ 12	∅ 13	∅ 14
L	NOT USED	NOT USED	∅ 3	4B	∅ 5	∅ 6	∅ 7	∅ 8	∅ 9	∅ 10	∅ 11	∅ 12	∅ 13	∅ 14

EX.: 1A, 2A, ETC. = LOOP NO.'S
 *See Opticom Field Wire Detail this sheet.

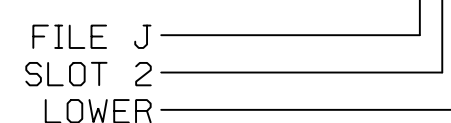
FS = FLASH SENSE
 ST = STOP TIME
 PRE3,5 = EV PREEMPTS

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	CALL PHASE	SWITCH	DELAY TIME	EXTEND TIME	CALL	EXTEND	ADDED INIT.
1A	TB2-1,2	I1U	56	1	1		15		X	X	
2A,2B,2C	TB2-5,6	I2U	39	2	2				X	X	
4A	TB4-9,10	I6U	41	8	4				X	X	
4B	TB4-11,12	I6L	45	9	4		15		X	X	
6A,6B	TB3-5,6	J2U	40	16	6				X	X	
PED PUSH BUTTONS											
P21,P22	TB8-4,6	I12U	67	PED 2	2 PED						
P41,P42	TB8-5,6	I12L	69	PED 4	4 PED						
P61,P62	TB8-7,9	I13U	68	PED 6	6 PED						

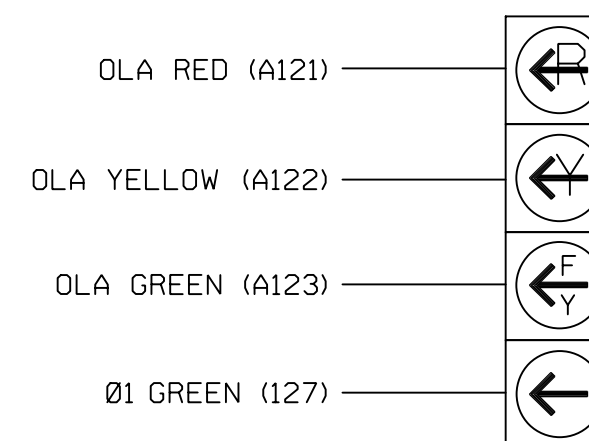
NOTE:
 INSTALL DC ISOLATORS IN INPUT FILE SLOTS I12 AND I13.

INPUT FILE POSITION LEGEND: J2L



4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



11

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

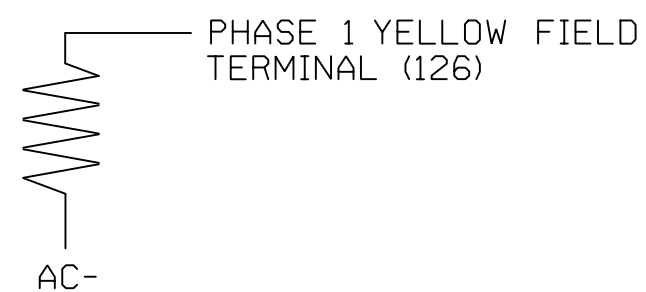
Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 07-0588
 DESIGNED: NOV 2018
 SEALED: 2/4/2020
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LOAD RESISTOR INSTALLATION DETAIL

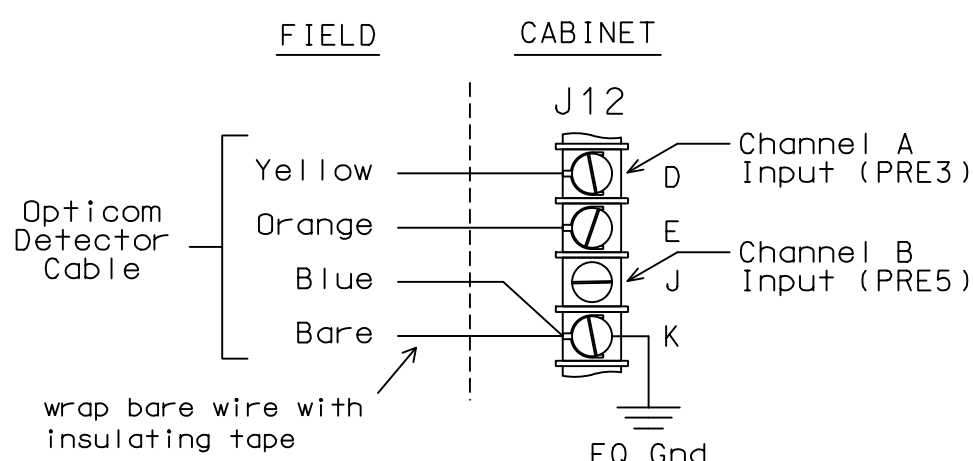
(install resistors as shown below)

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



TYPICAL OPTICOM FIELD WIRE DETAIL

(input file, rear view)



Electrical Detail - Sheet 1 of 5

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 Charlotte, NC 28202
 (704) 372-1885
 NC License Number F-0991

S. Elm Eugene Street at I-85 Business-US 29-220 SB Ramps

Division 7 Guilford County Greensboro

PLAN DATE: November 2018 REVIEWED BY: R. Dubnicka

PREPARED BY: J. Trueblood REVIEWED BY: J. Carroll

REVISIONS INIT. DATE

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2/4/2020

SIG. INVENTORY NO. 07-0588


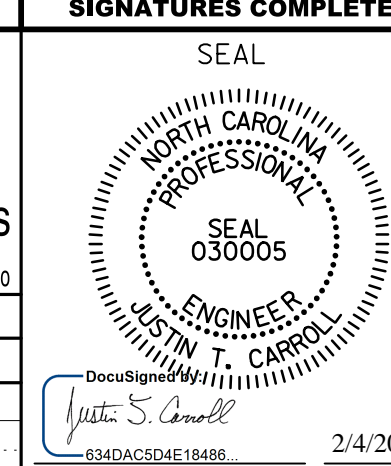
OVERLAP PROGRAMMING DETAIL

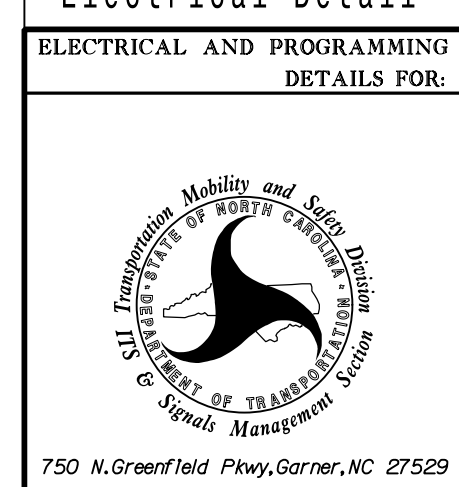
(program controller as shown below)



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THE SIGNAL DESIGN: 07-0588
DESIGNED: NOV 2018
SEALED: 2/4/2020
REVISED: N/A

Electrical Detail - Sheet 2 of 5

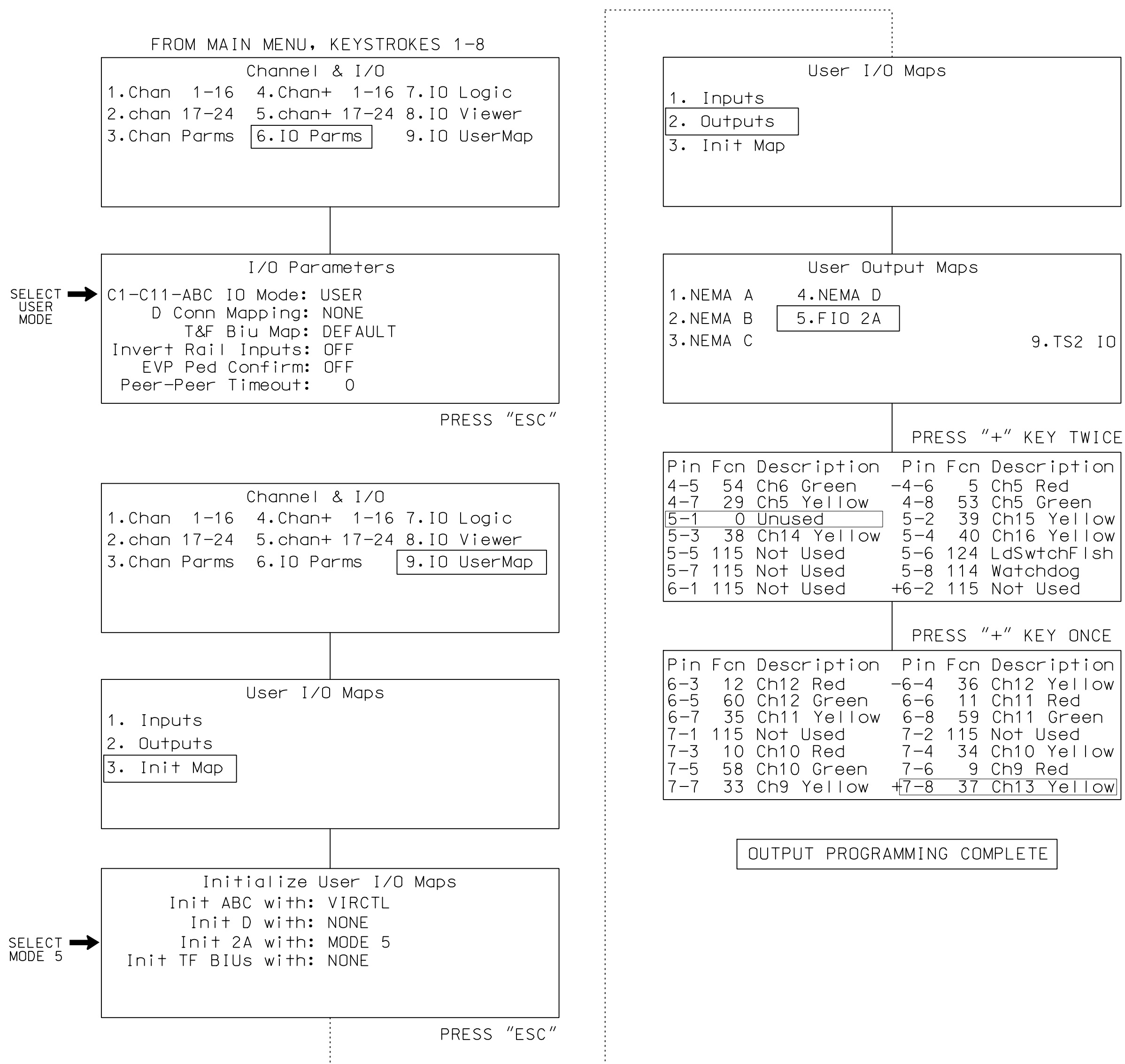
 <p>STV 100 Years STV Engineers, Inc. 900 West Trade St., Suite 715 Charlotte, NC 28202 (704) 372-1885 NC License Number F-0991</p>	<p>S. Elm Eugene Street at I-85 Business-US 29-220 SB Ramps</p> <p>Division 7 Guilford County Greensboro</p> <p>PLAN DATE: November 2018 REVIEWED BY: R. Dubnicka</p> <p>PREPARED BY: J. Trueblood REVIEWED BY: J. Carroll</p>	<p>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</p> <p>SEAL</p>  <p>Justin T. Carroll Professional Engineer SEAL 030005</p>									
<table border="1" style="width: 100%; border-collapse: collapse;"> <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> </tbody> </table>		REVISIONS	INIT.	DATE							<p>2/4/2020</p> <p>SIGNATURE DATE</p> <p>SIG. INVENTORY NO. 07-0588</p>
REVISIONS	INIT.	DATE									



4-SECTION PPLT FYA OUTPUT PROGRAMMING DETAIL

(program controller as shown below)

- Before proceeding with output programming, be sure to switch the "RUN ENABLE STATUS" to "OFF". The "RUN ENABLE STATUS" setting is located from Main Menu, key strokes 1-7.
- The Flashing Yellow Arrow in a 4-section PPLT FYA head is controlled by a normally unused PED Yellow output. This programming takes a specific PED Yellow output and remaps it to the appropriate Overlap Green output.



Pin 5-1 (C1 pin 35) = Load Switch S3-Y
Pin 7-8 (C1 pin 99) = Load Switch AUX S1-G

! Press the "*" key to return to Main Menu. Now go back to "RUN-ENABLE STATUS" and switch to "ON".

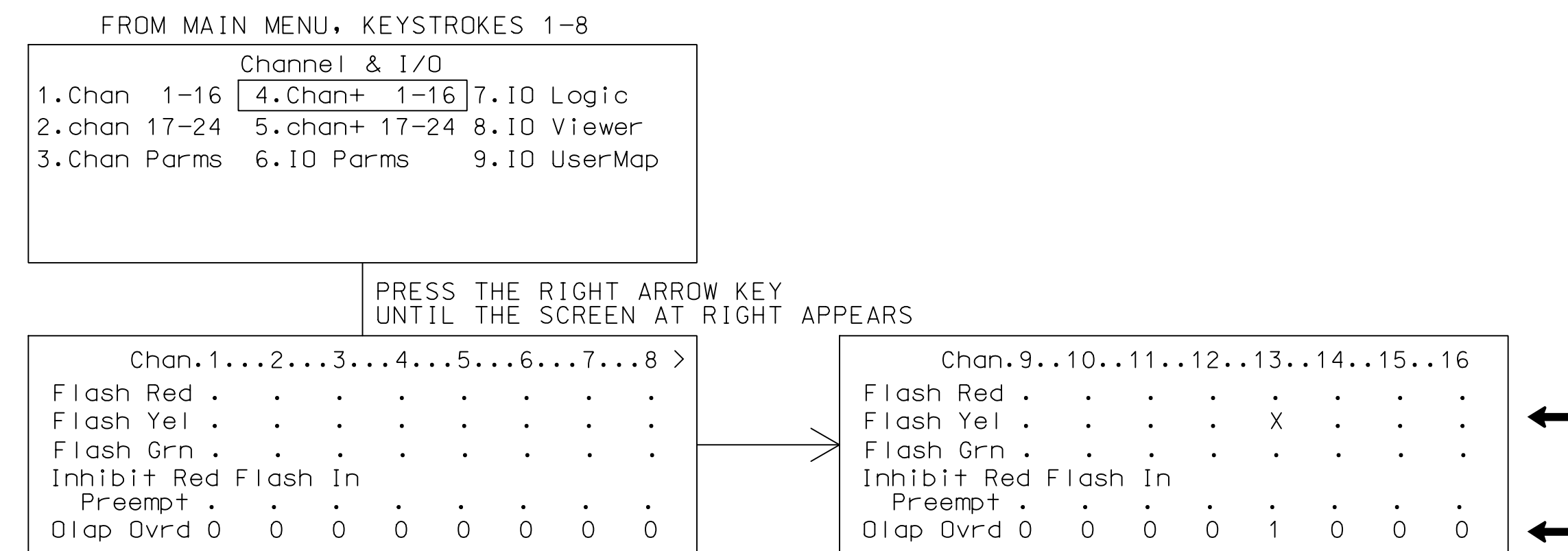
NOTE

I/O re-programming is necessary for proper FYA operation. See Channel & I/O Programming Detail For FYA Operation on this sheet.

CHANNEL & I/O PROGRAMMING DETAIL FOR FYA OPERATION

(program controller as shown below)

This programming takes the output that drives a Flashing Yellow Arrow and makes it flash. It also specifies which overlap is to be overridden for the FYA to display properly.



Programming notes:

Pin	Default Fcn Description	Change To: Fcn Description
5-1	37 Ch13 Yellow	0 Unused

Programming notes:

Pin	Default Fcn Description	Change To: Fcn Description
7-8	57 Ch9 Green	37 Ch13 Yellow

Program the controller as shown above.

CHANNEL & I/O PROGRAMMING COMPLETE

NOTE

Output re-mapping is necessary for proper FYA operation. See the 4-Section PPLT FYA Output Programming Detail on this sheet.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 07-0588
DESIGNED: NOV 2018
SEALED: 2/4/2020
REVISED: N/A

Electrical Detail - Sheet 3 of 5

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900 West Trade St., Suite 715
Charlotte, NC 28202
(704) 372-1885
NC License Number F-0991

S. Elm Eugene Street
at
I-40-US 70 WB/
I-85 Business-US 29-220 SB Ramps

Division 7 Guilford County Greensboro

PLAN DATE: November 2018 REVIEWED BY: R. Dubnicka
PREPARED BY: J. Trueblood REVIEWED BY: J. Carroll

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SEAL 030005
J. CARROLL
2/4/2020
SIG. INVENTORY NO. 07-0588

EMERGENCY VEHICLE PREEMPTION PROGRAMMING DETAIL FOR 'PRE 3'

(program controller as shown below)

FROM MAIN MENU PRESS "3" PREEMPTS

```

Preemption Menu
1.HiPriority 4.LowPriority
2.Events
3.Sequences
    
```

ENTER PREEMPT #3

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 Times : Begin : Other
Delay 0 MinGrn 1 Track Grn 0
MinDura 16 MinWlk 1 Min Dwell 7
MaxPres 0 PedClr 8
    
```

PRESS "ESC"

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 ---- Preempt Phases ----
Track Veh 0 0 0 0
DwellCyc Veh 2 6 0 0 0 0 0 0
DwellCyc(more) 0 0 0 0
DwellCyc (Ped) 0 0 0 0 0 0 0 0
Exit 2 6 0 0
    
```

PRESS "ESC"

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 Preempt Options
Lock input ON
Override Auto Flash OFF
Override higher # preempt OFF
Flash in dwell OFF
Link to preempt # 0
    
```

PRESS "ESC"

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 Preempt Times+ --- Exit ---
Extend Dwell 0 Ped Clr 0
Return Max 0 Red 0.0
    
```

PRESS "ESC"

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 -- Preempt Overlaps+ --
Track 0 0 0 0 0 0 0 0
(more) 0 0 0 0
DwellCyc 1 0 0 0 0 0 0 0
(more) 0 0 0 0
    
```

PRESS "ESC"

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 Preempt Options +
Enable ON Pattern 0
Type EMERG Skip Track if Override OFF
Output DELAY Coord+Preempt OFF
Volt Mon Flash OFF
Return Max/Min MAX
    
```

PRESS "ESC"

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 AdvTimes
AllRedB4Prmpt OFF EnterYelChg 25.5
ResetExtDwell OFF EnterRedClr 25.5
ReservicePreempt OFF TrackYelChg 25.5
EndDwell OFF TrackRedClr 25.5
DynExitThresh 0 1111111
DsbldwellCalls OFF 12345678 90123456
+ ExitVehCall .....
    
```

PRESS "ESC"

```

# 3 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 3 -- Initial Dwell --
Phases 0 0 0 0
Peds 0 0 0 0
Overlaps 0 0 0 0 0 0 0 0
(more) 0 0 0 0 0 0 0 0
    
```

PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 07-0588
DESIGNED: NOV 2018
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REVISED: N/A

Electrical Detail - Sheet 4 of 5



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S. Elm Eugene Street
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I-85 Business-US 29-220 SB Ramps

Division 7 Guilford County Greensboro

PLAN DATE: November 2018 REVIEWED BY: R. Dubnicka

PREPARED BY: J. Trueblood REVIEWED BY: J. Carroll

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DATE
SIG. INVENTORY NO. 07-0588



EMERGENCY VEHICLE PREEMPTION PROGRAMMING DETAIL FOR 'PRE 5'

(program controller as shown below)

FROM MAIN MENU PRESS "3" PREEMPTS

```

Preemption Menu
1.HiPriority 4.LowPriority
2.Events
3.Sequences
    
```

ENTER PREEMPT #5

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 5 Times : Begin : Other
Delay 0 MinGrn 1 Track Grn 0
MinDura 16 MinWlk 1 Min Dwell 7
MaxPres 0 PedClr 8
    
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 5 ---- Preempt Phases ----
Track Veh 0 0 0 0
DwellCyc Veh 1 6 0 0 0 0 0 0
DwellCyc(more) 0 0 0 0
DwellCyc (Ped) 0 0 0 0 0 0 0 0
Exit 2 6 0 0
    
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 5 Preempt Options
Lock input ON
Override Auto Flash OFF
Override higher # preempt OFF
Flash in dwell OFF
Link to preempt # 0
    
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 5 Preempt Times+ --- Exit ---
Extend Dwell 0 Ped Clr 0
Return Max 0 Red 0.0
    
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 5 -- Preempt Overlaps+ --
Track 0 0 0 0 0 0 0 0
(more) 0 0 0 0
DwellCyc 1 0 0 0 0 0 0 0
(more) 0 0 0 0
    
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 5 Preempt Options +
Enable ON Pattern 0
Type EMERG Skip Track if Override OFF
Output DELAY Coord+Preempt OFF
Volt Mon Flash OFF
Return Max/Min MAX
    
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```

```

# 5 AdvTimes
AllRedB4Prmpt OFF EnterYelChg 25.5
ResetExtDwell OFF EnterRedClr 25.5
ReservicePreempt OFF TrackYelChg 25.5
EndDwell OFF TrackRedClr 25.5
DynExitThresh 0 1111111
DsbldwellCalls OFF 12345678 90123456
+ ExitVehCall .....
    
```

PRESS "ESC"

```

# 5 Preemption
1.Times 4.Times+
2.Phases 5.Overlaps+ 8.AdvTimes
3.Options 6.Options+ 9.Init'Dwell
    
```


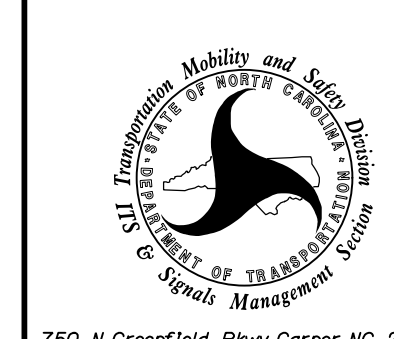
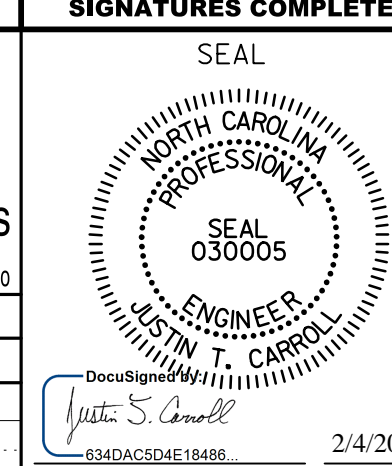
```

# 5 -- Initial Dwell --
Phases 0 0 0 0
Peds 0 0 0 0
Overlaps 0 0 0 0 0 0 0 0
(more) 0 0 0 0 0 0 0 0
    
```

PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR
 THE SIGNAL DESIGN: 07-0588
 DESIGNED: NOV 2018
 SEALED: 2/4/2020
 REVISED: N/A

Electrical Detail - Sheet 5 of 5

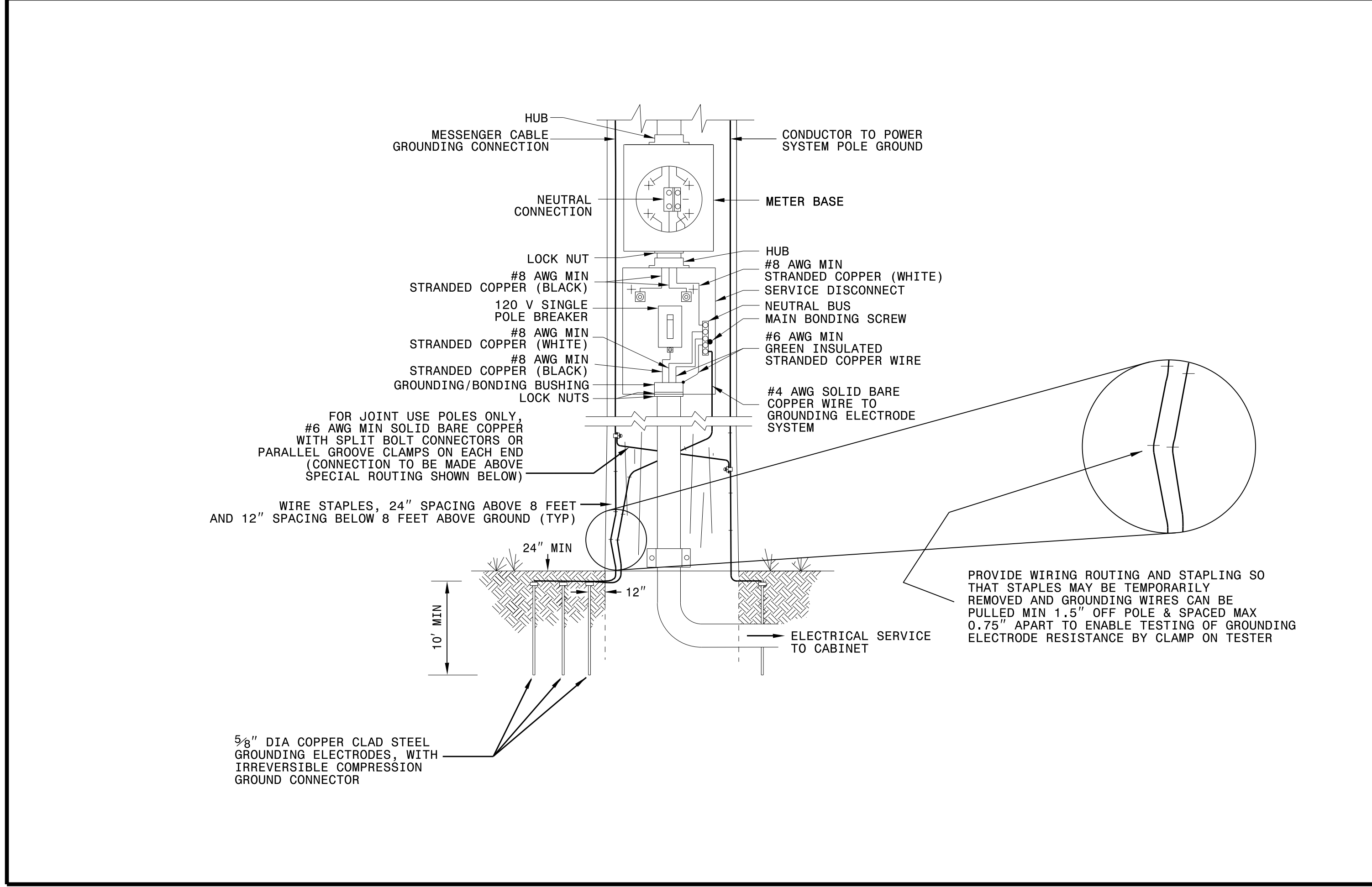
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REVISIONS	INIT.	DATE										

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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

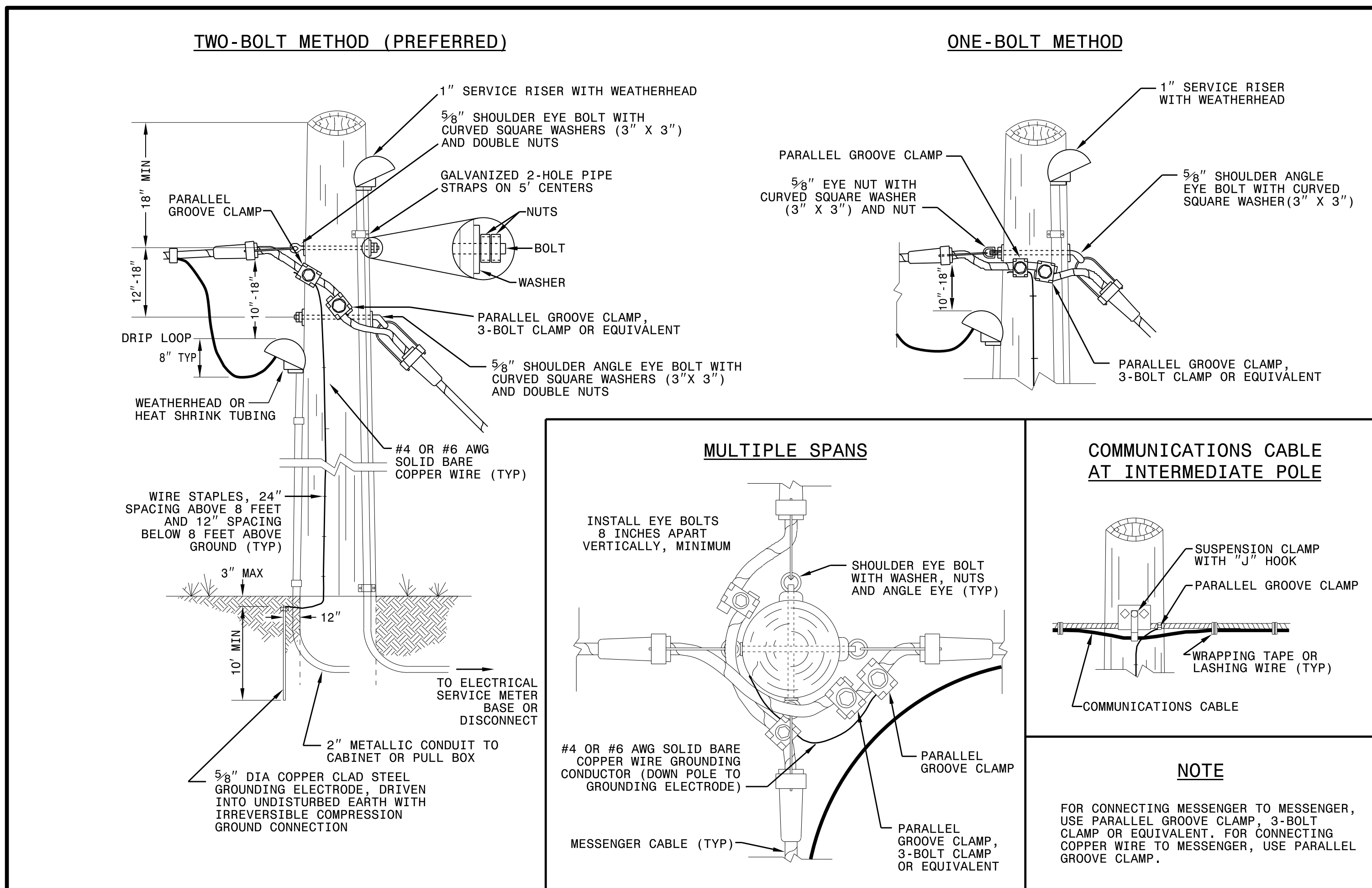
SHEET 1 OF 1
1700D01



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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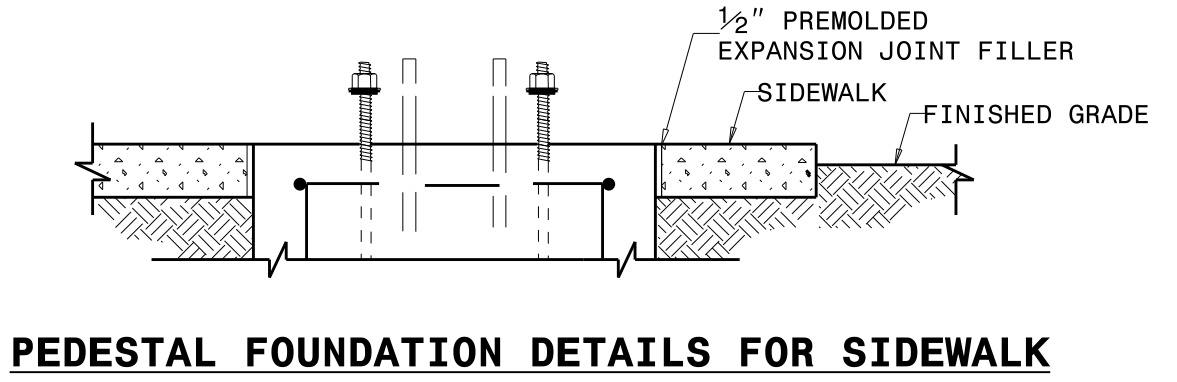
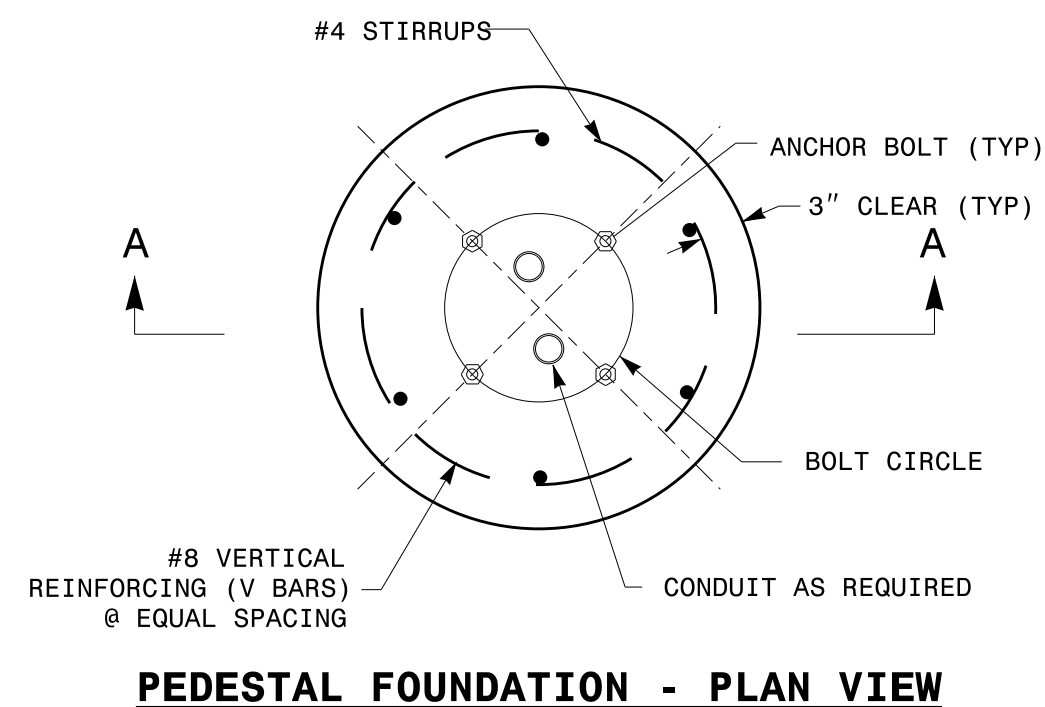
DocuSigned by:
Mohd Aslami

10/11/2017

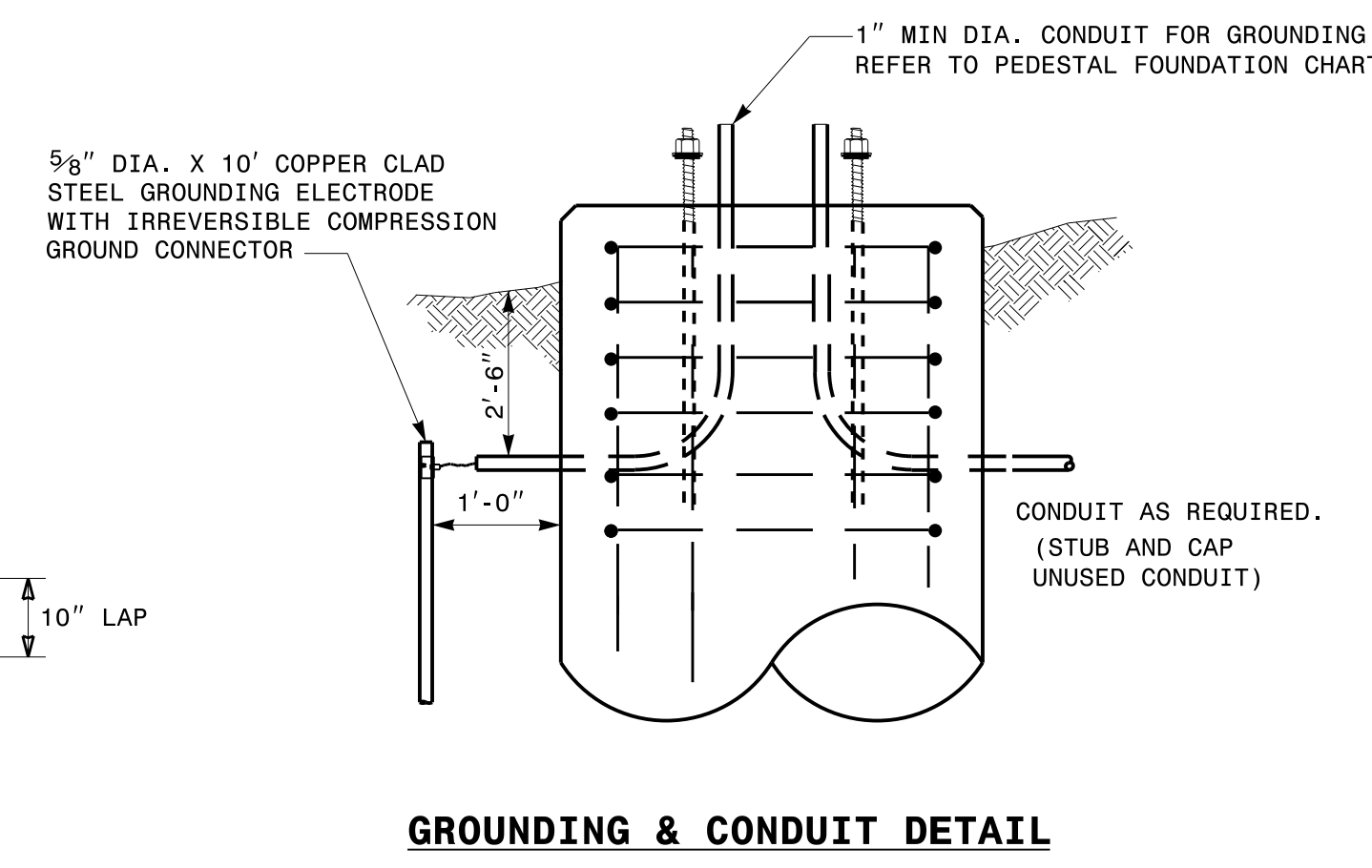
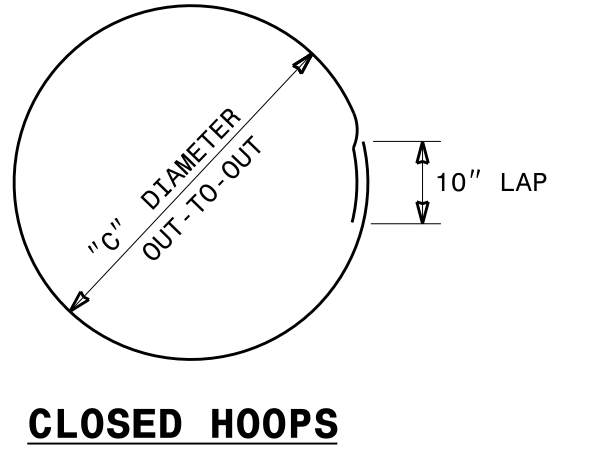
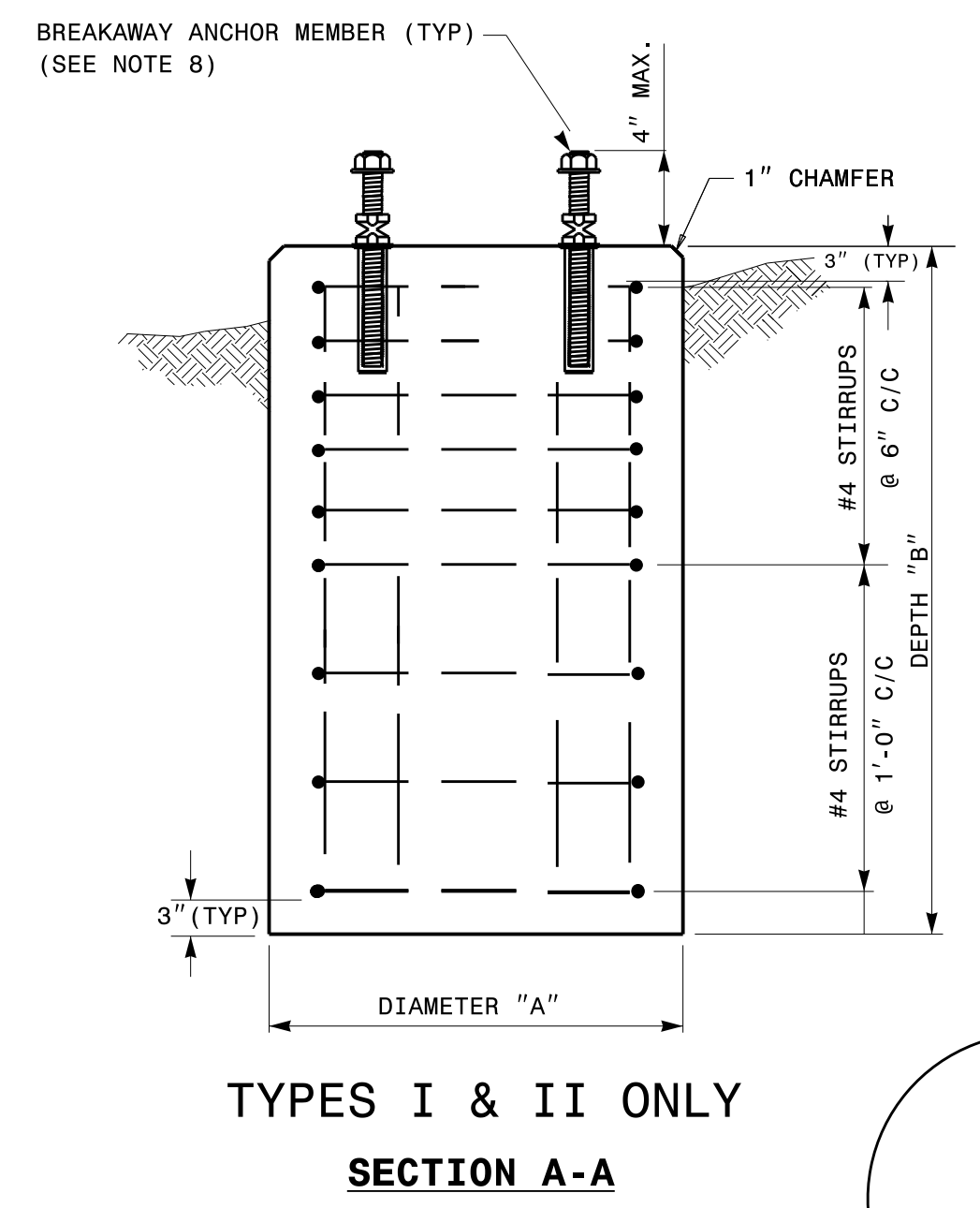
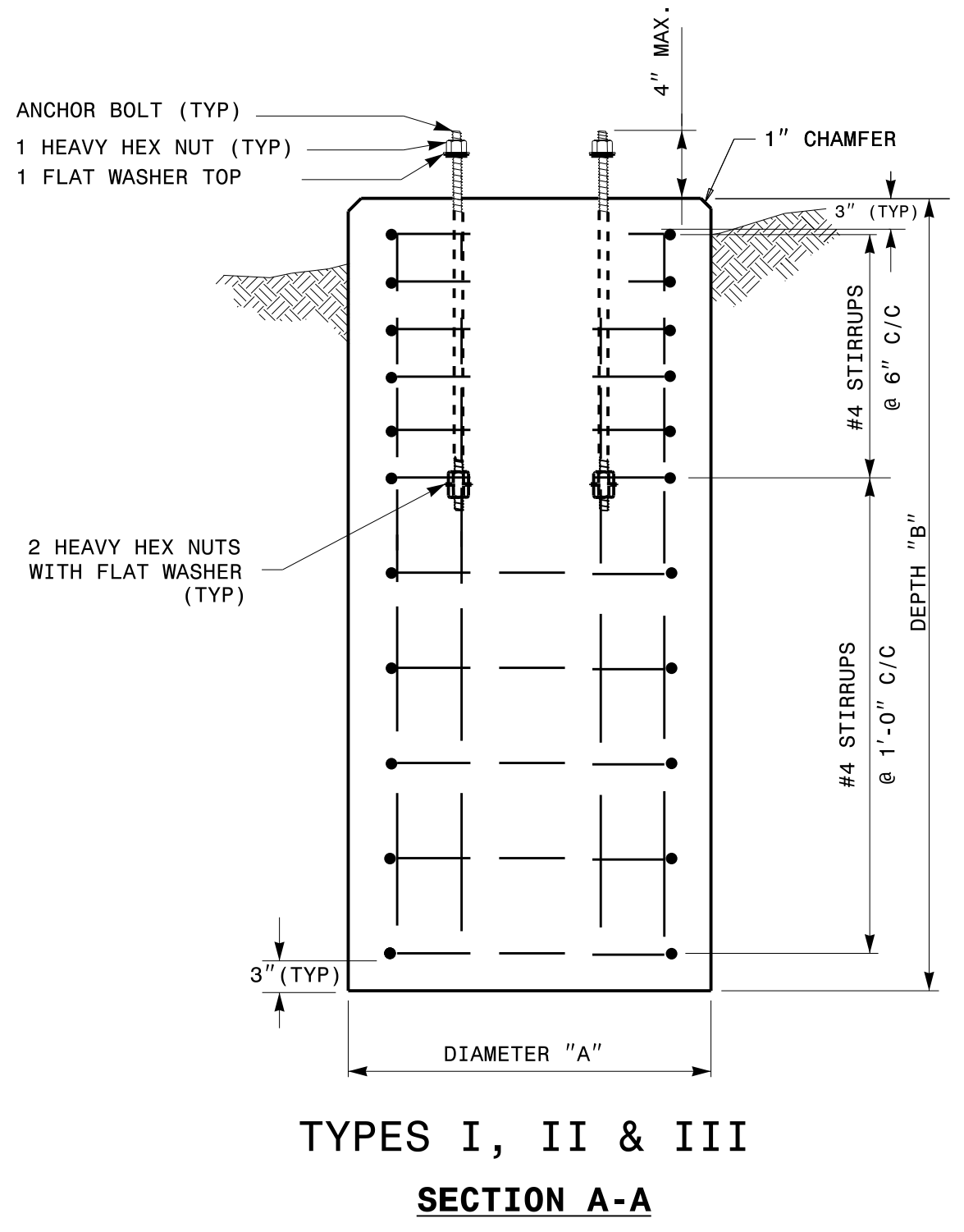
750 N. Greenfield Parkway
Garner, NC 27529

DATE

11-001-2017_08-56
11-2018_S14_DrawingPlate_Sheets2018_Plate_Sheet.dgn
r:\rough



- 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

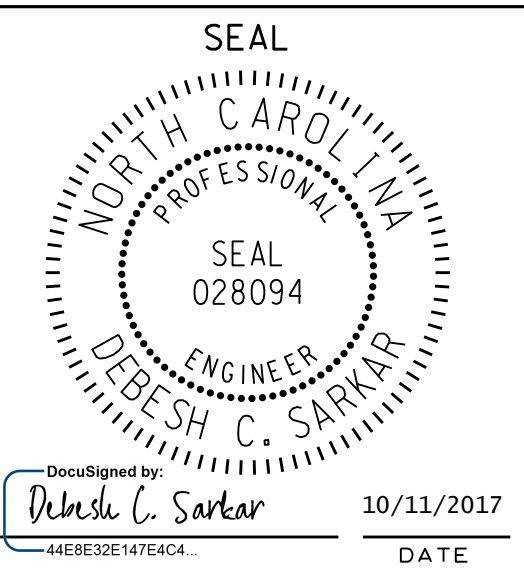
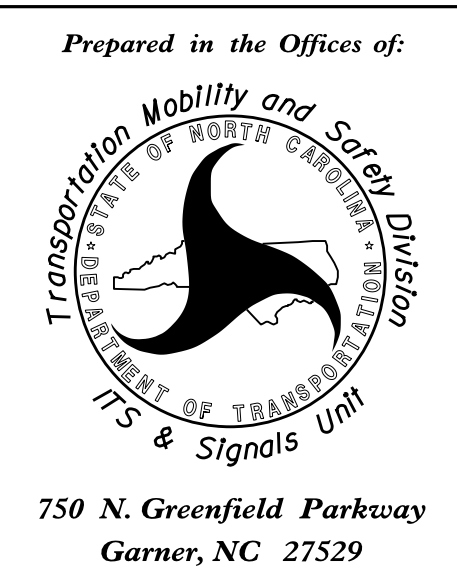
REINFORCING STEEL SCHEDULE												
TYPE	V-BAR				STIRRUP							
	SIZE #	QTY	LENGTH	WEIGHT LBS	QUANTITY			LENGTH	DIAMETER "C" FT	OVERLAP MIN.	WEIGHT LBS	TOTAL STEEL WEIGHT LBS
					VERTICAL ON 6" CENTERS	ON 12" CENTERS	TOTAL					
I	8	6	3'-0"	56	4	0	4	5'-7"	1'-6"	0'-10"	15	71
II	8	6	4'-6"	86	4	5	3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

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

ENGLISH STANDARD DRAWING FOR
PEDESTALS
FOUNDATIONS

SHEET 1 OF 1
1743D01

See Plate for Title



DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

750 N. Greenfield Parkway
Garner, NC 27529

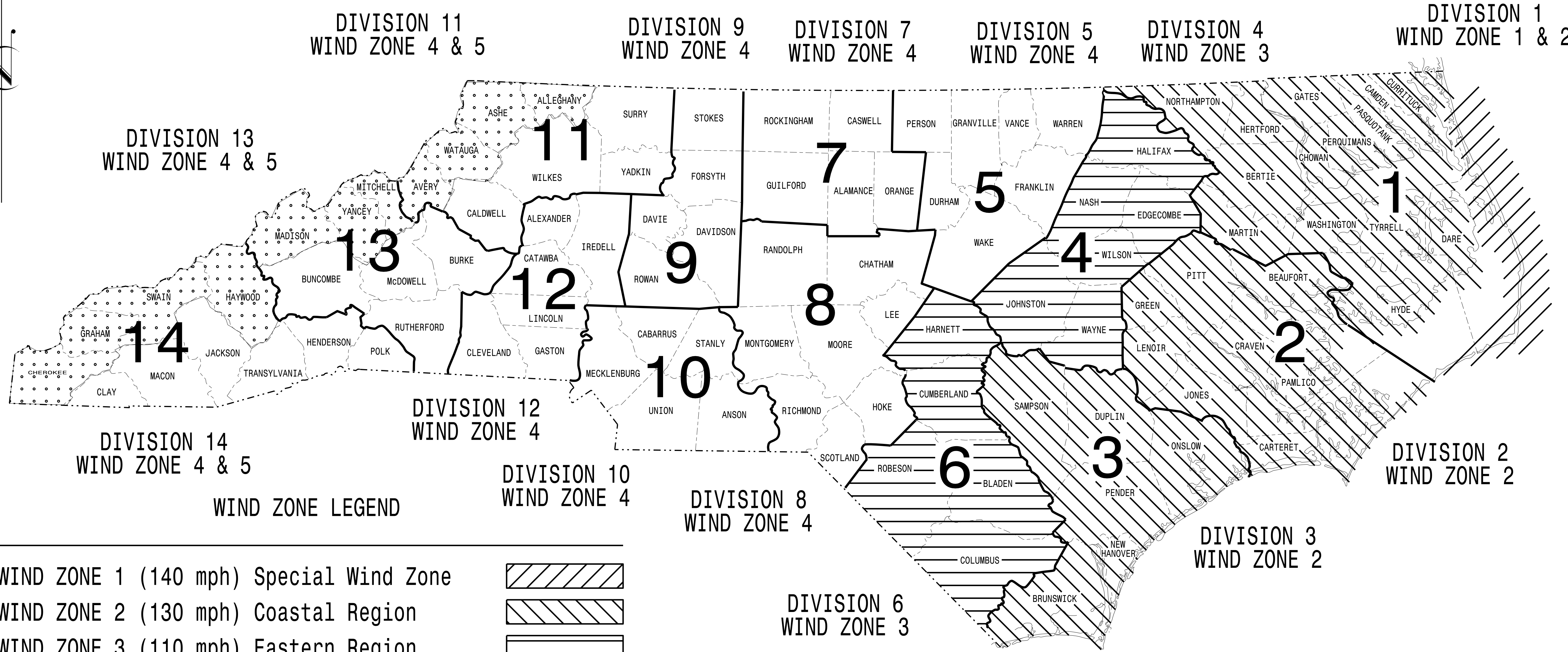
Disc Signed by: *Debesh C. Sarkar*
10/11/2017
DATE

11-10CT-2017_08x03
11-2018_S14 Drawings#Plate_Sheets#2018_Plate_Sheet - .dgn
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STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

PROJECT I.D. NO. I - 5964	SHEET NO. Sig.M1
-------------------------------------	----------------------------

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>

Prepared In the Offices of:

750 N. Greenfield Pkwy.
Garner, NC 27529

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

M.M. MCDIARMID, P.E. - STATE ITS AND SIGNALS ENGINEER

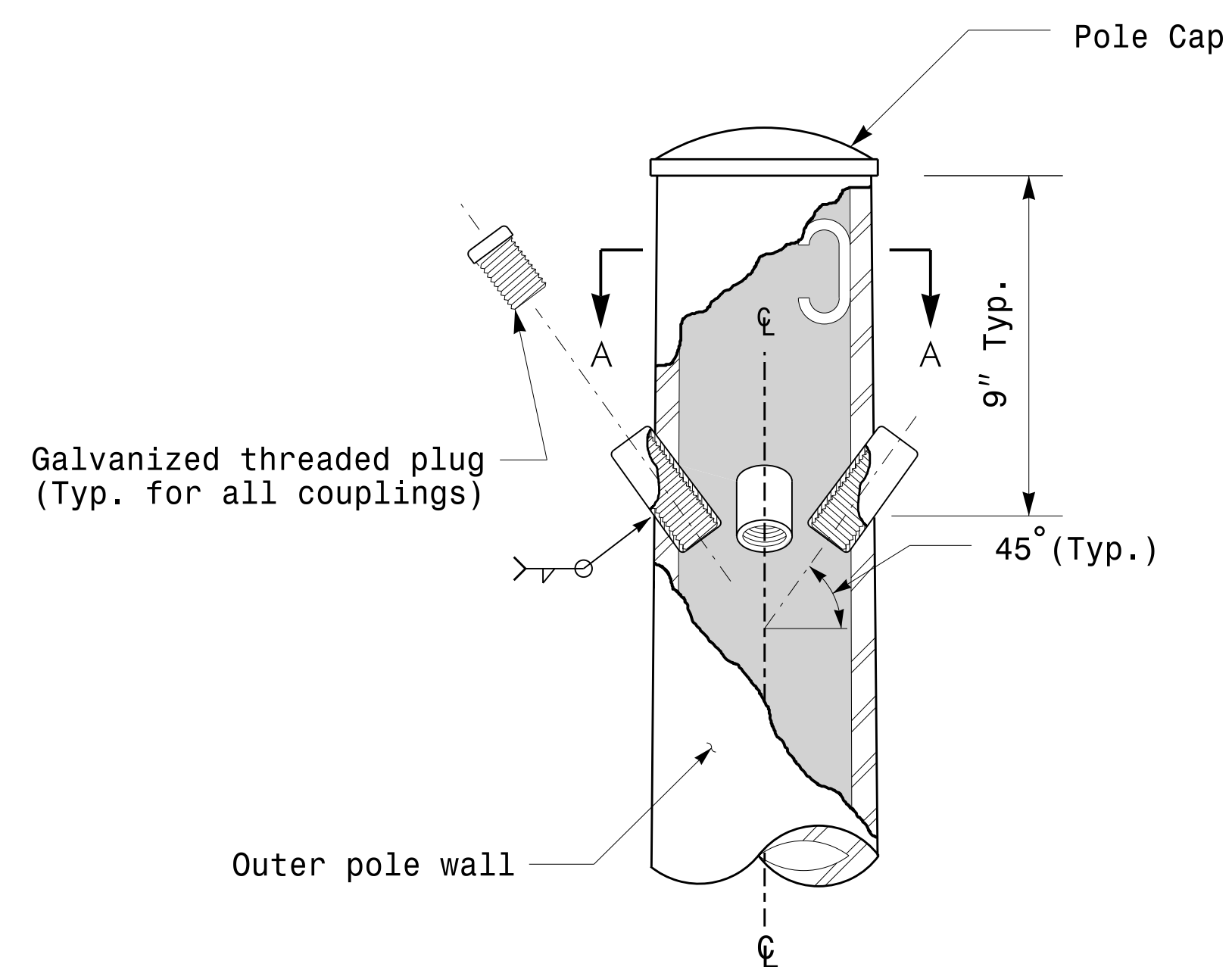
J.P. GALLOWAY, P.E. - STATE SIGNALS ENGINEER

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

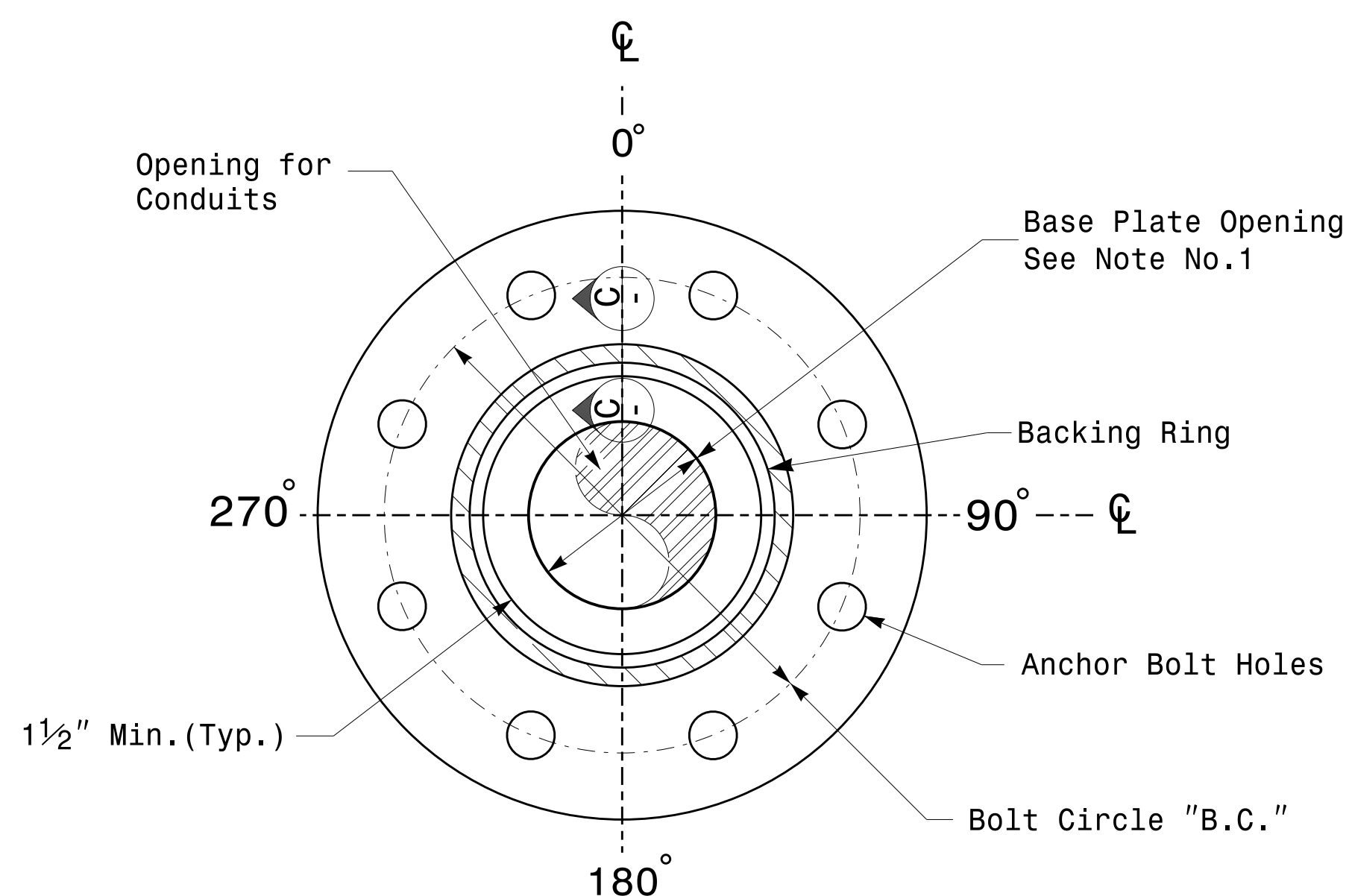
SEAL

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

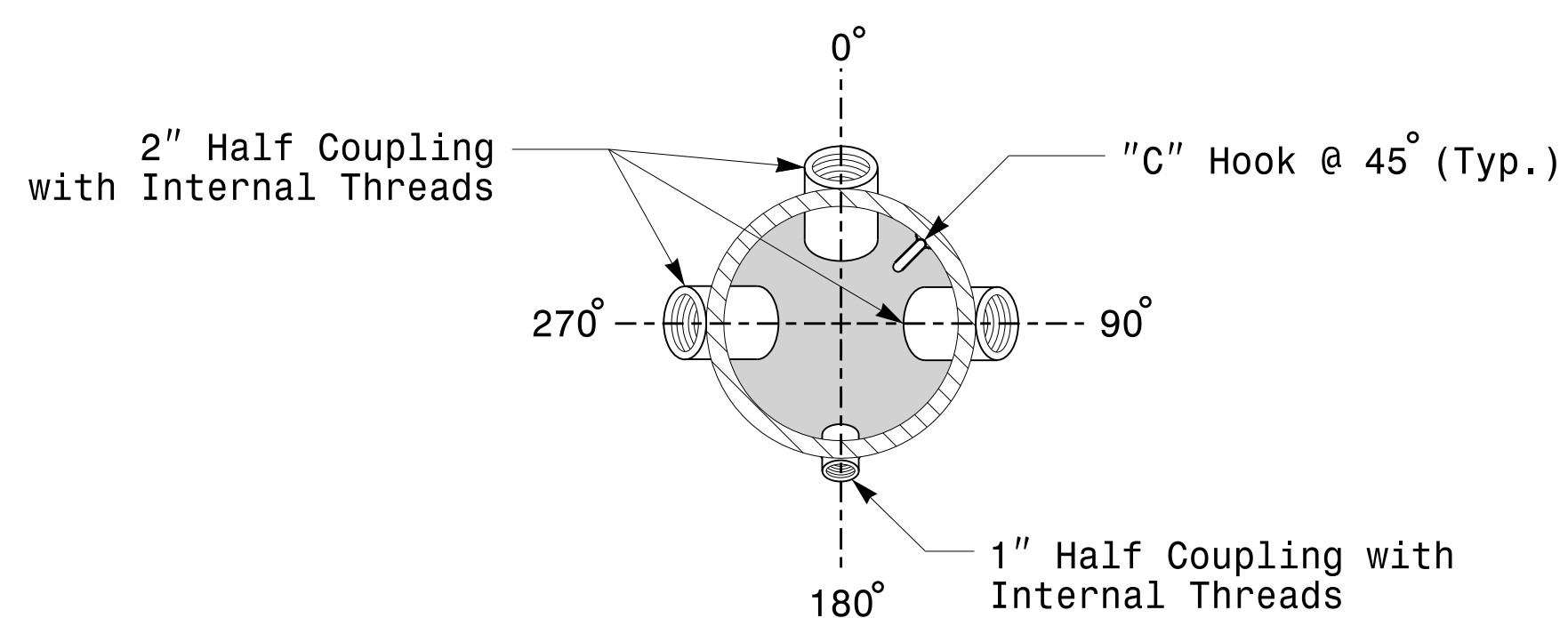
Note:
 1. Opening in pole base plate shall be equal to pole base inside diameter minus 3 1/2" but shall not be less than 8 1/2".



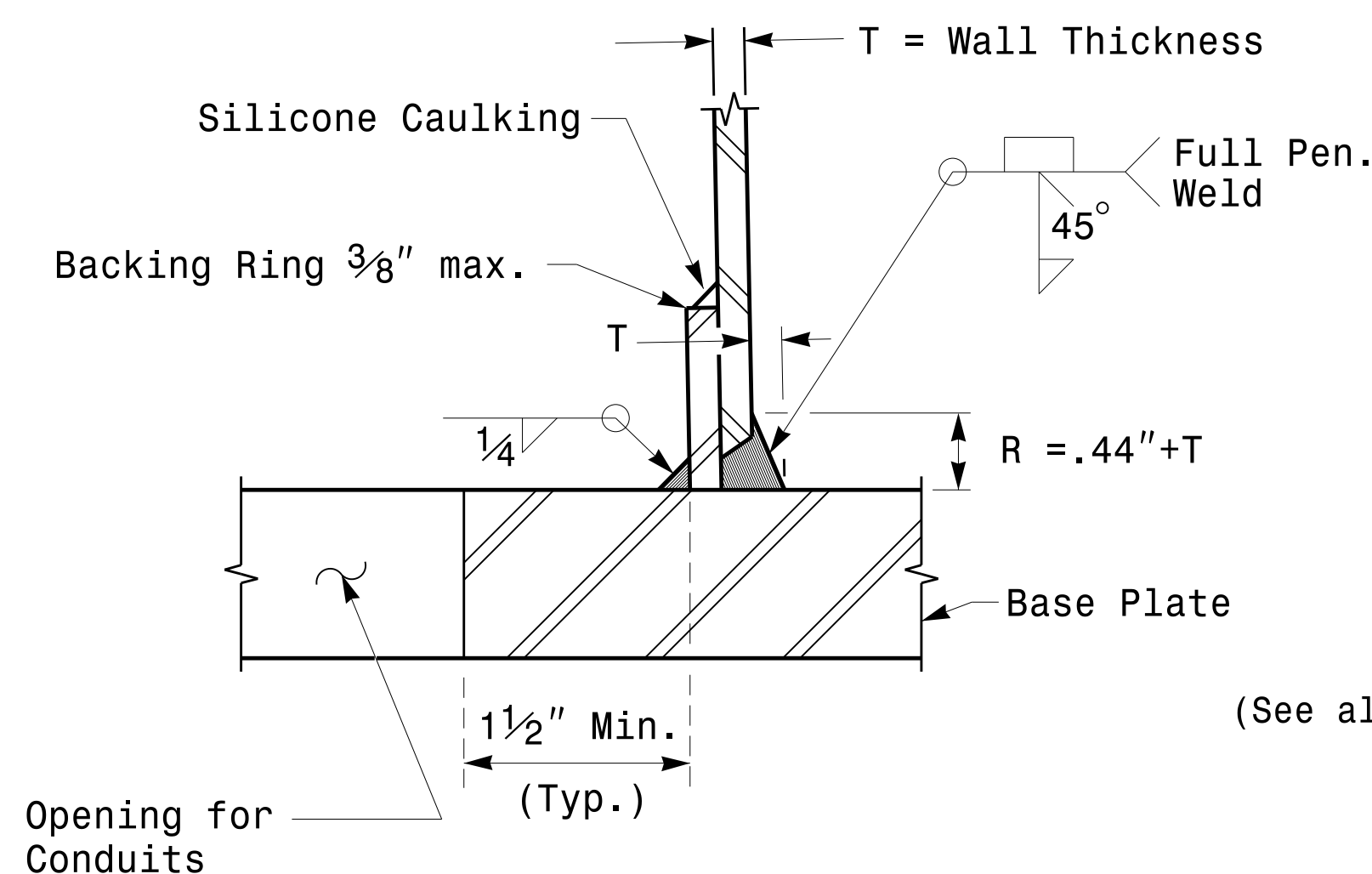
Cable Entrances at Top of Pole



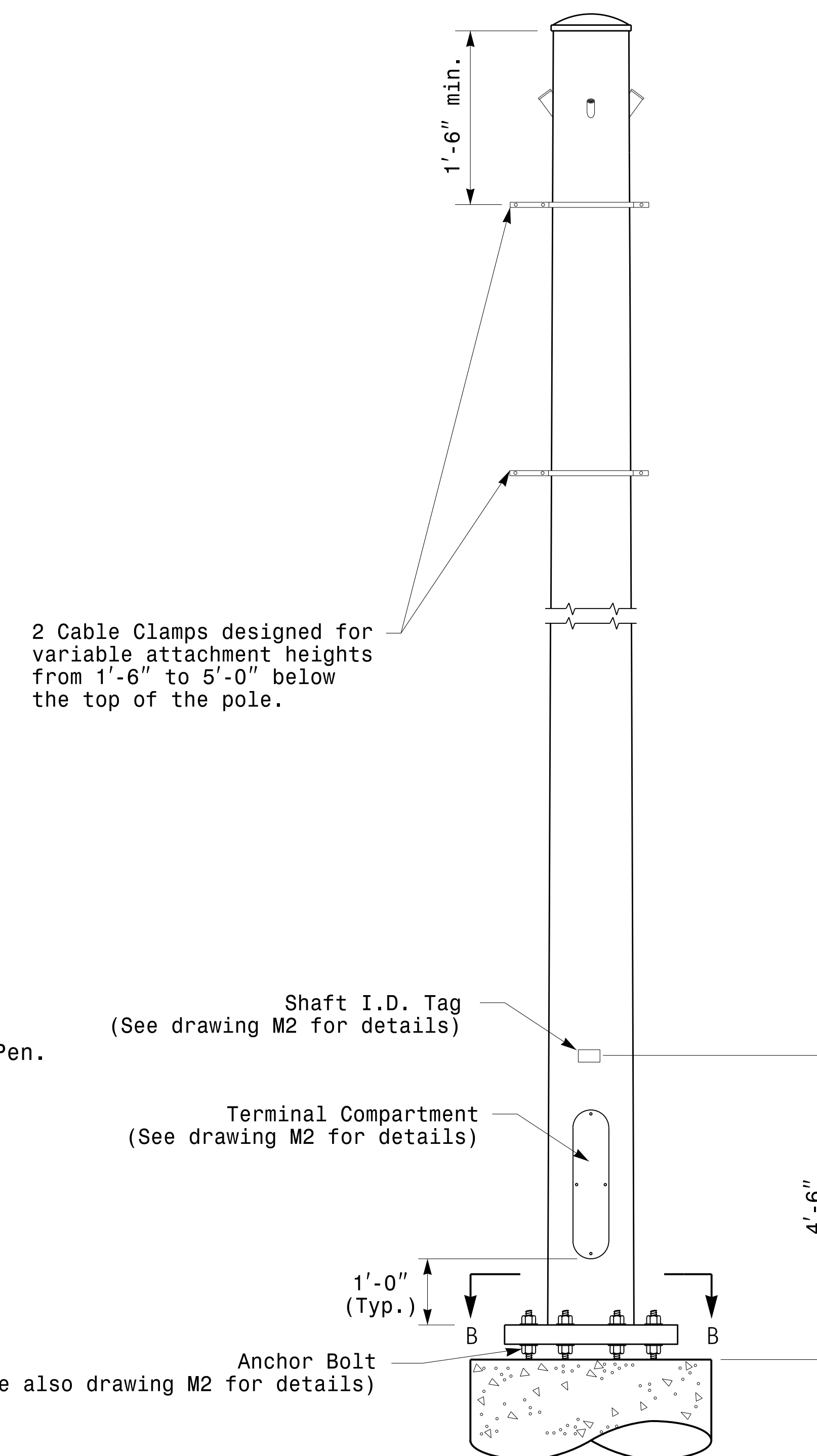
Section B-B
Pole Base Plate Details
(8 and 12 Bolt Pattern)



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



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

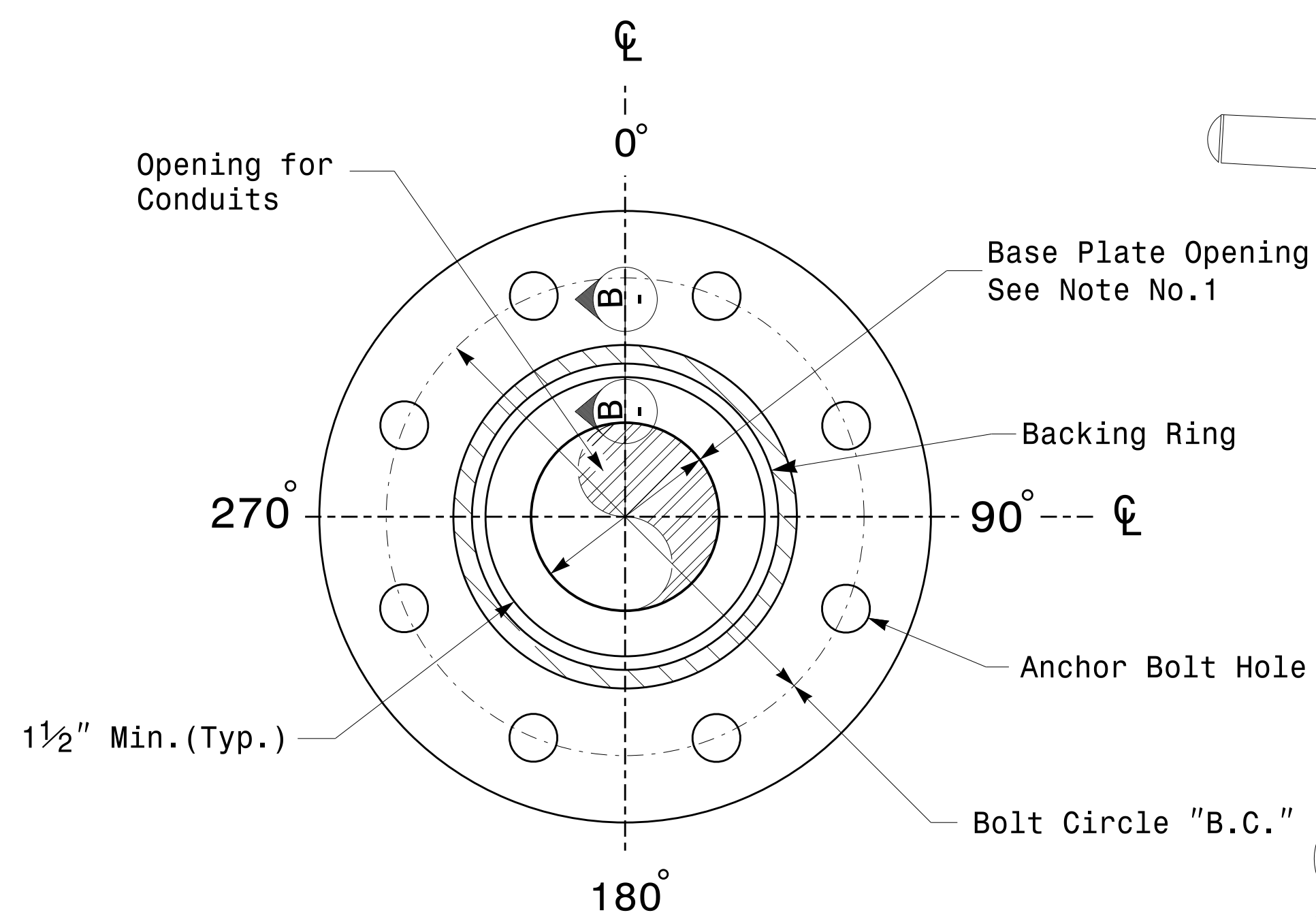


Monotube Strain Pole

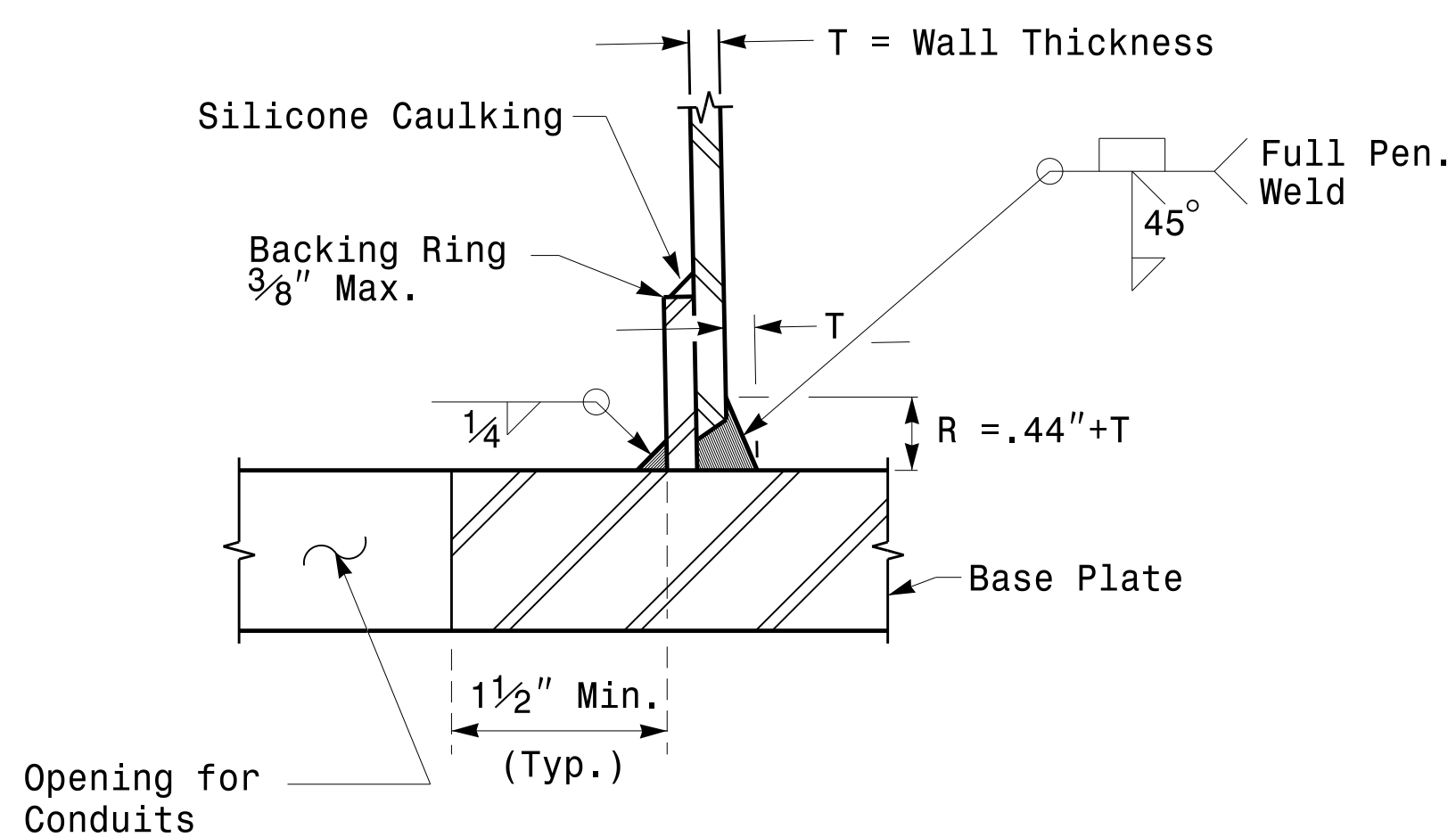
<p>Prepared In the Offices of:</p> <p>750 N. Greenleaf Pkwy, Garner, NC 27529</p>	<p>Typical Fabrication Details For Strain Poles</p>		<p>SEAL</p> <p>DocuSigned by: <i>Dibesh C. Sarkar</i> 44EB87816FA4F49E</p>
	<p>PLAN DATE: OCTOBER 2017</p>	<p>DESIGNED BY: K.C. DURIGON</p>	
<p>SCALE: NONE</p>	<p>PREPARED BY: N. BITTING</p>	<p>REVIEWED BY: D.C. SARKAR</p>	<p>DATE: 10/11/2017</p>

Fabrication Details – Strain Poles

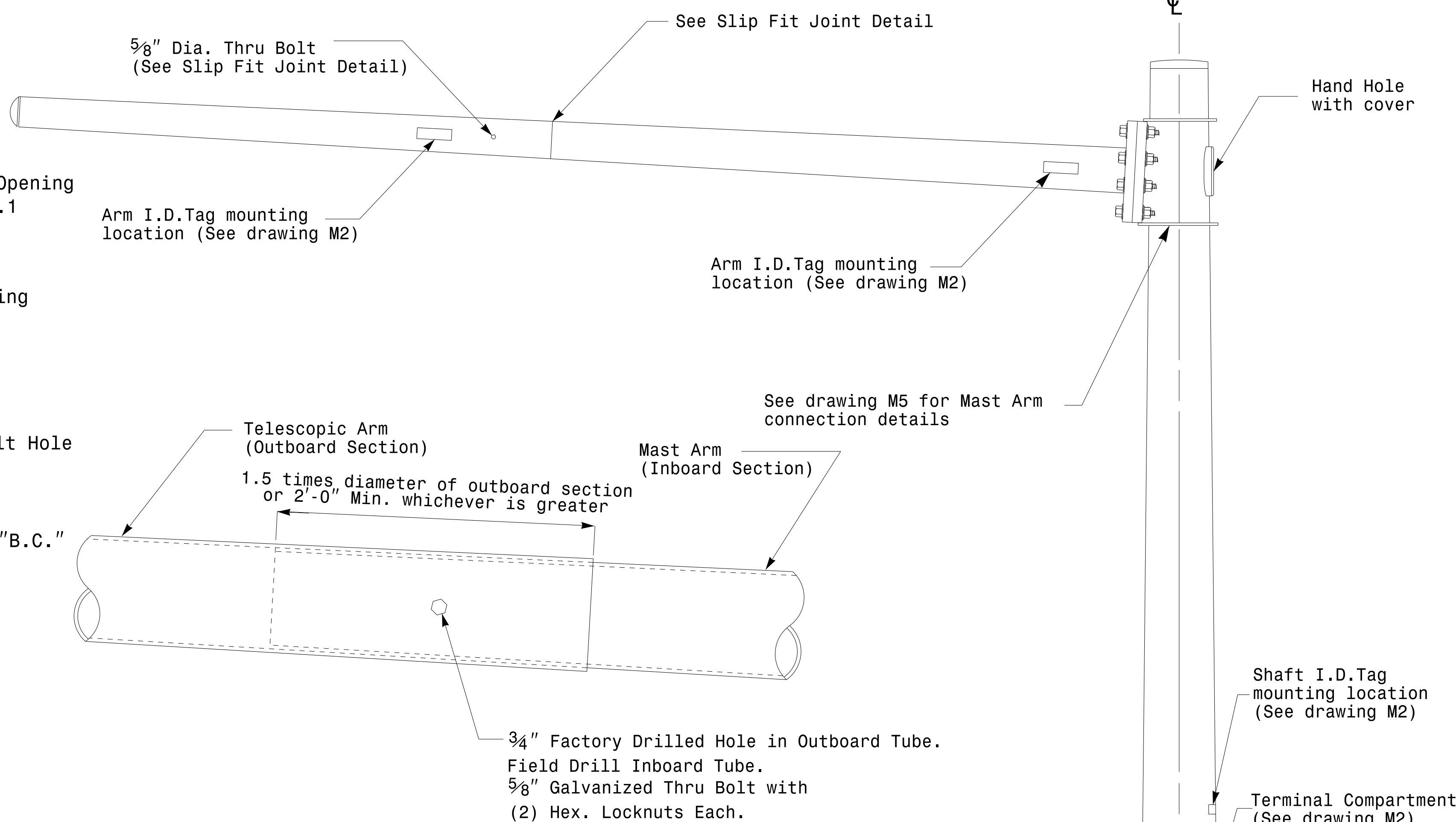
Note:
 1. Opening in pole base plate shall be equal to pole base inside diameter minus 3 1/2" but shall not be less than 8 1/2".



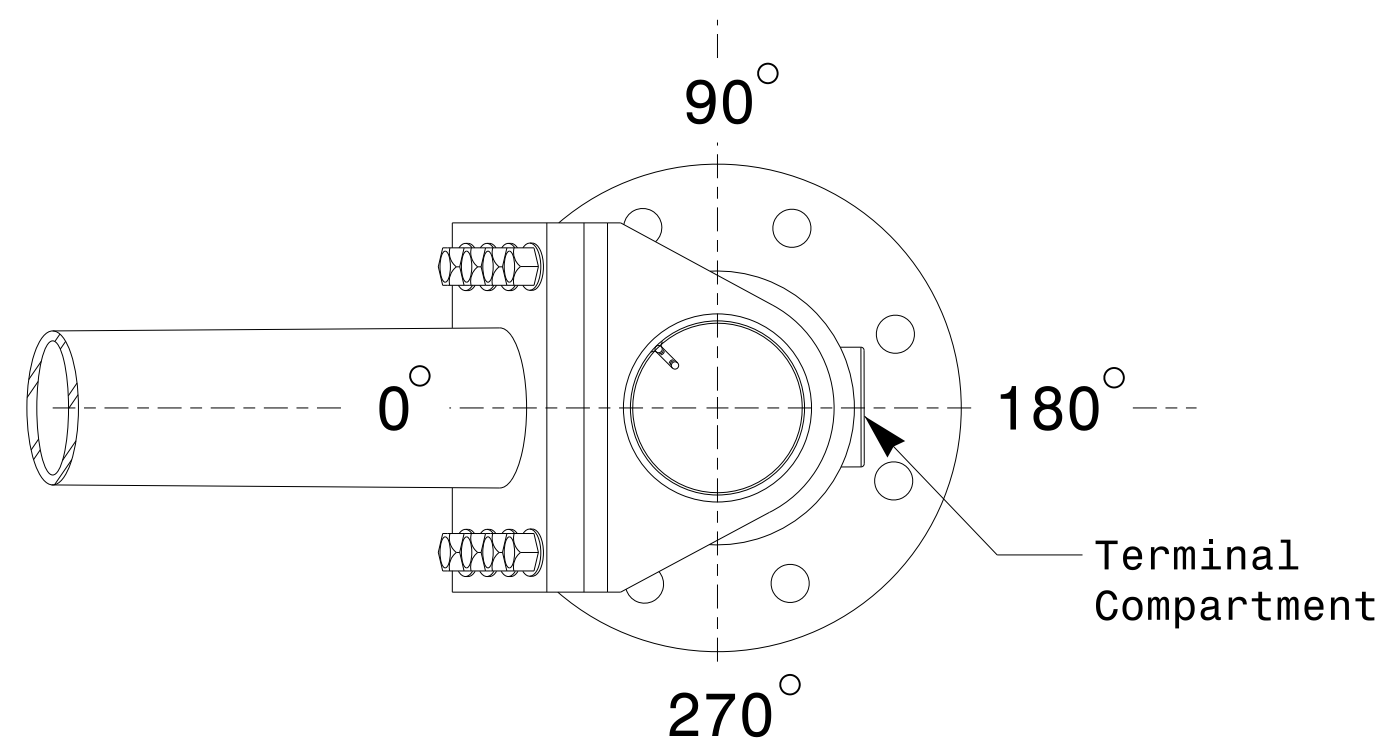
Section A-A
Pole Base Plate Details



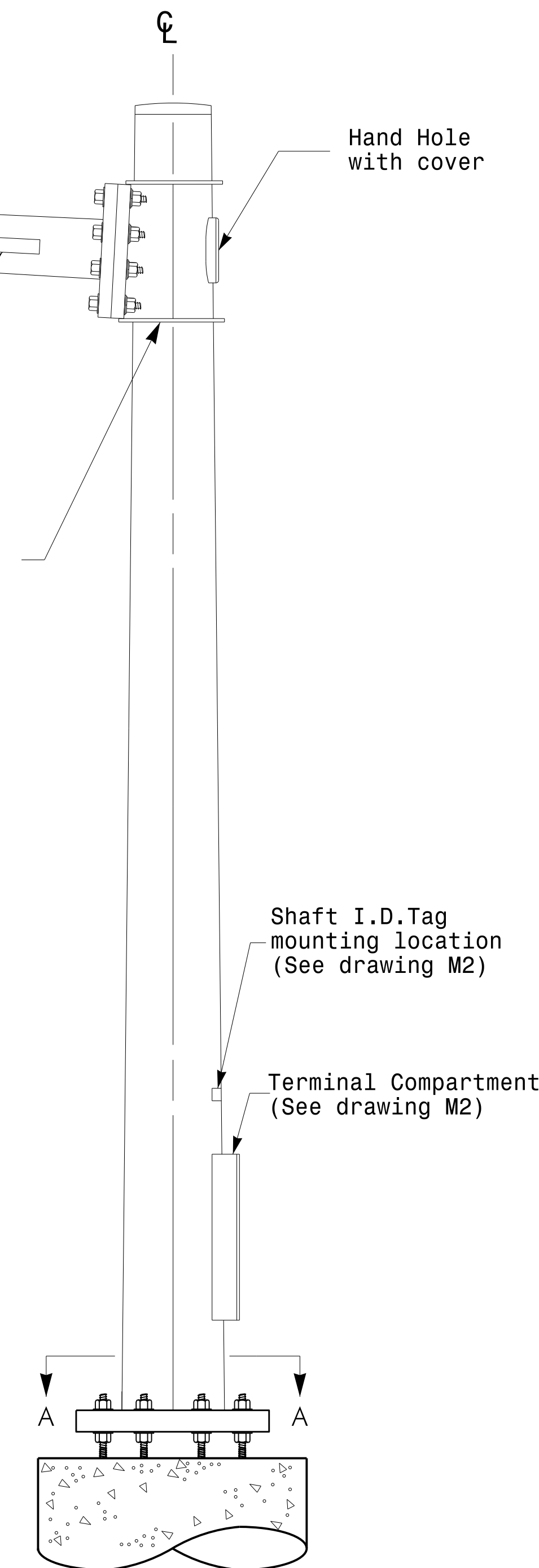
Section B-B
 (Pole Attachment to Base Plate)
Full-Penetration Groove Weld Detail



Slip Fit Joint Detail for Mast Arm



Mast Arm Radial Orientation



Mast Arm Pole

Fabrication Details - Mast Arm Poles

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

11-OCT-2017 08:33 136560115 Signal Design Section Eastern Region\MSD\2016\2014 Sig.M4 Std. Fabrication Detail-Mast Arm Poles.dgn

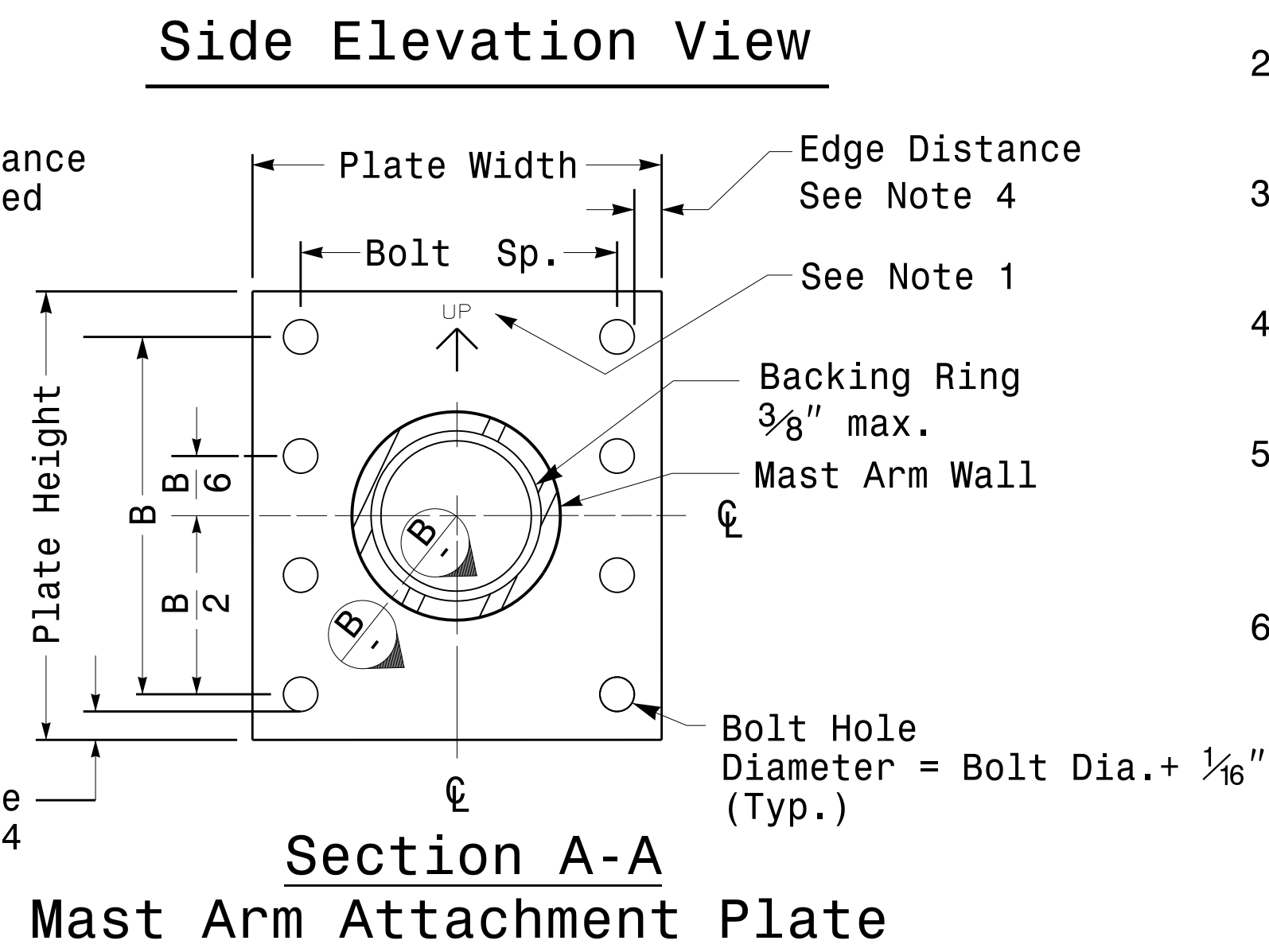
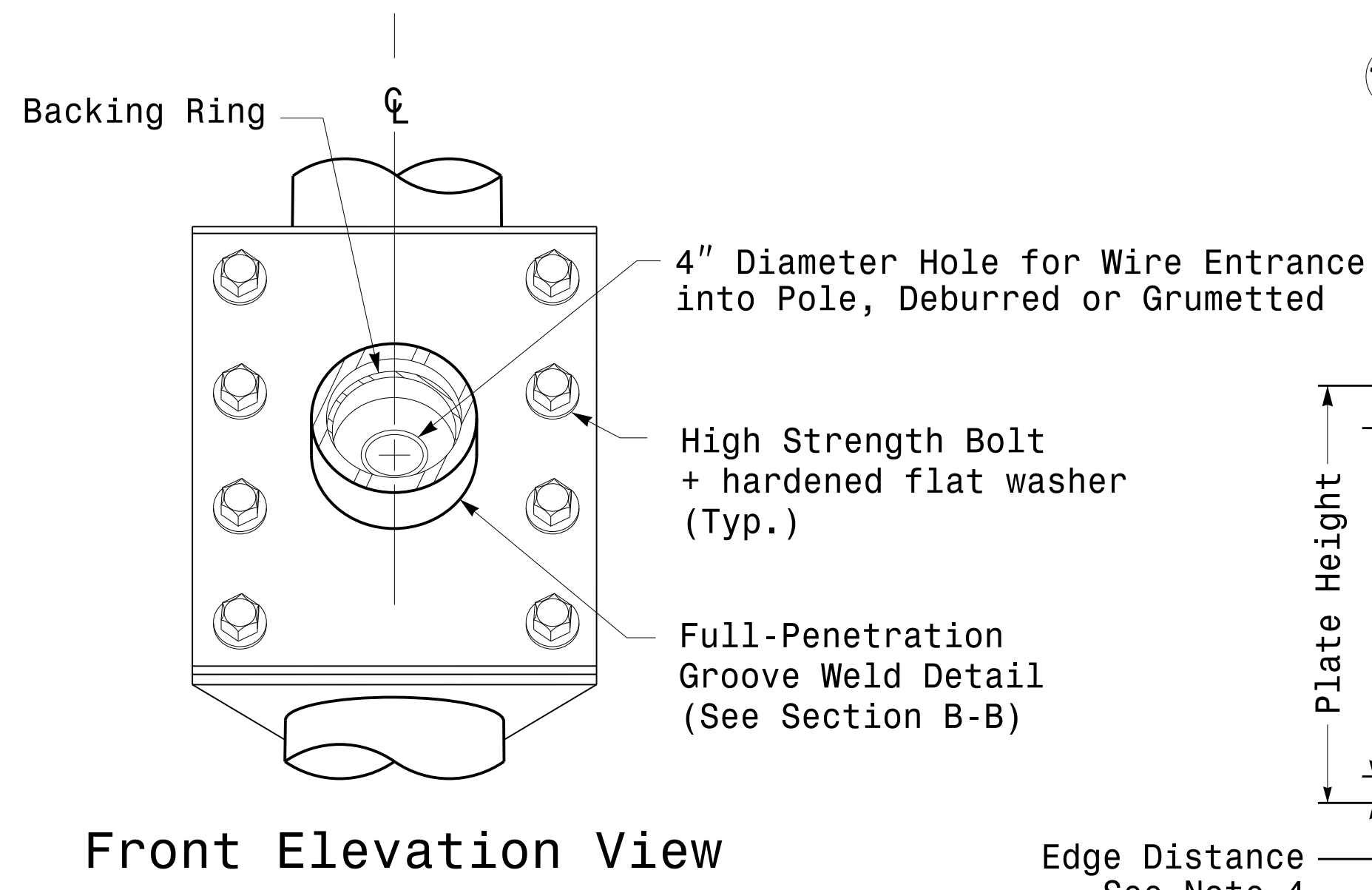
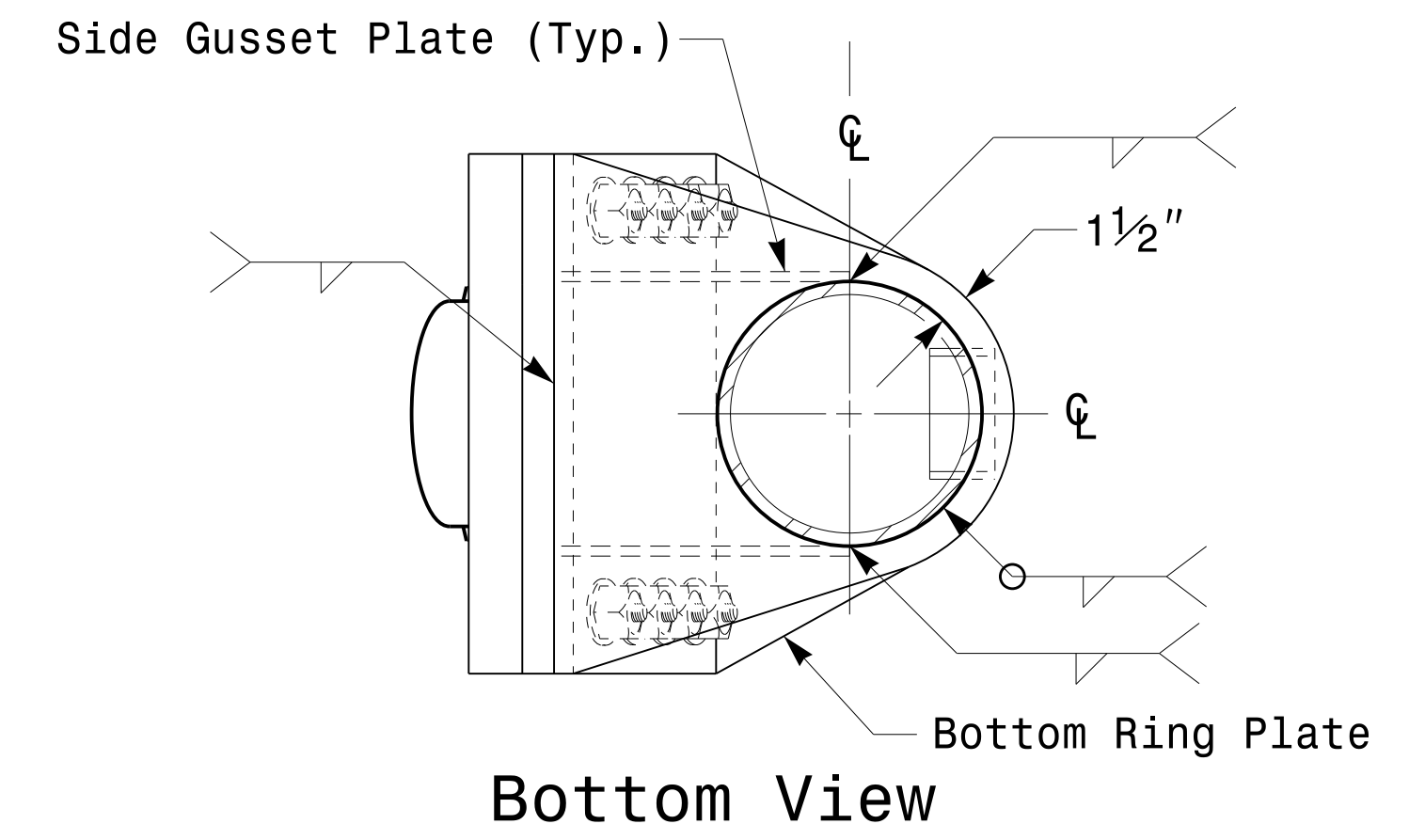
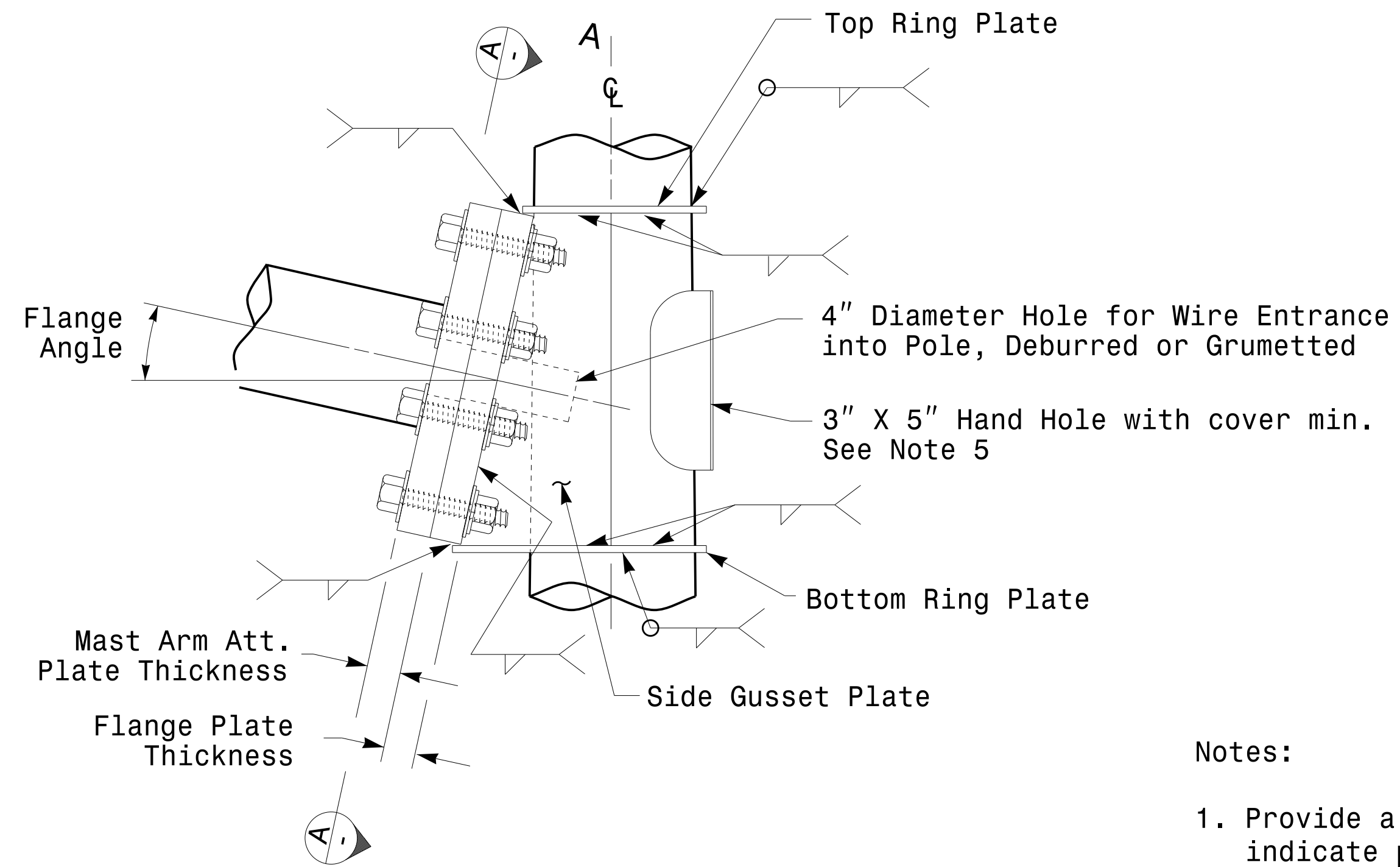
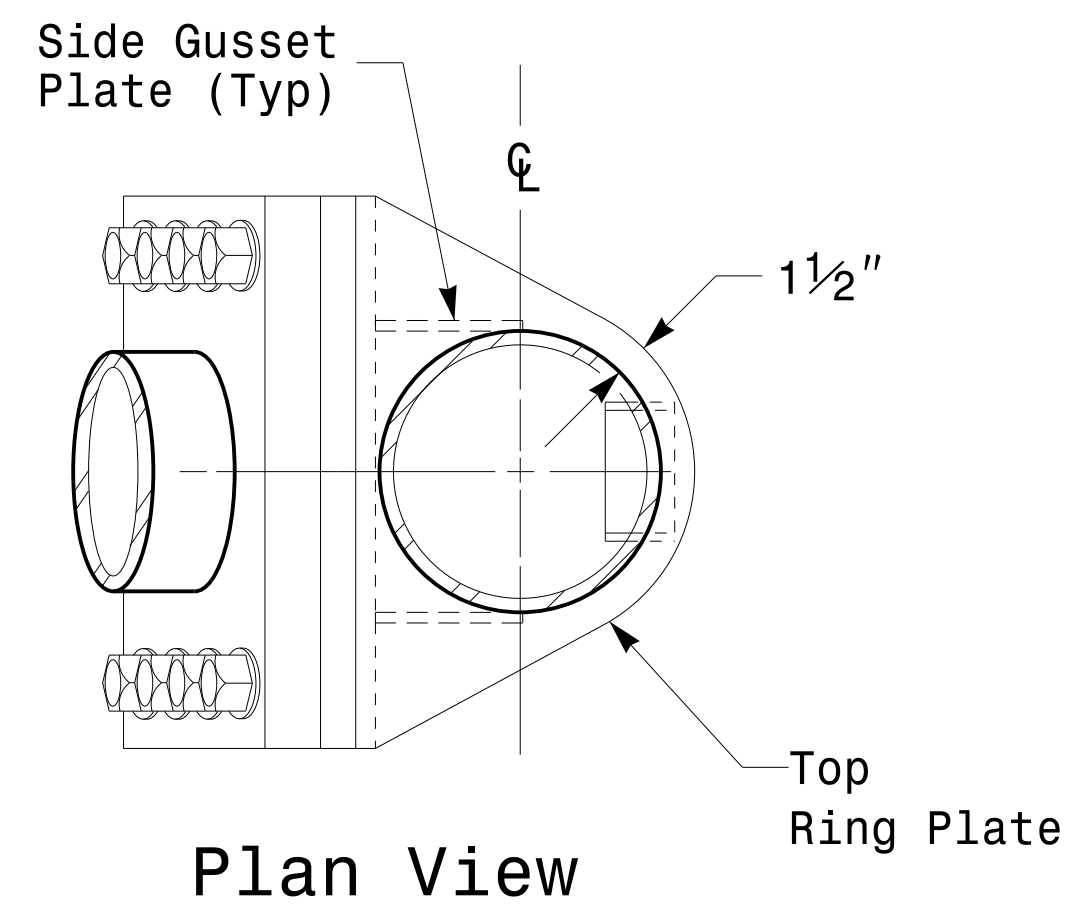
Welded Ring Stiffened Mast Arm Connection

PROJECT ID. NO.

SHEET NO.

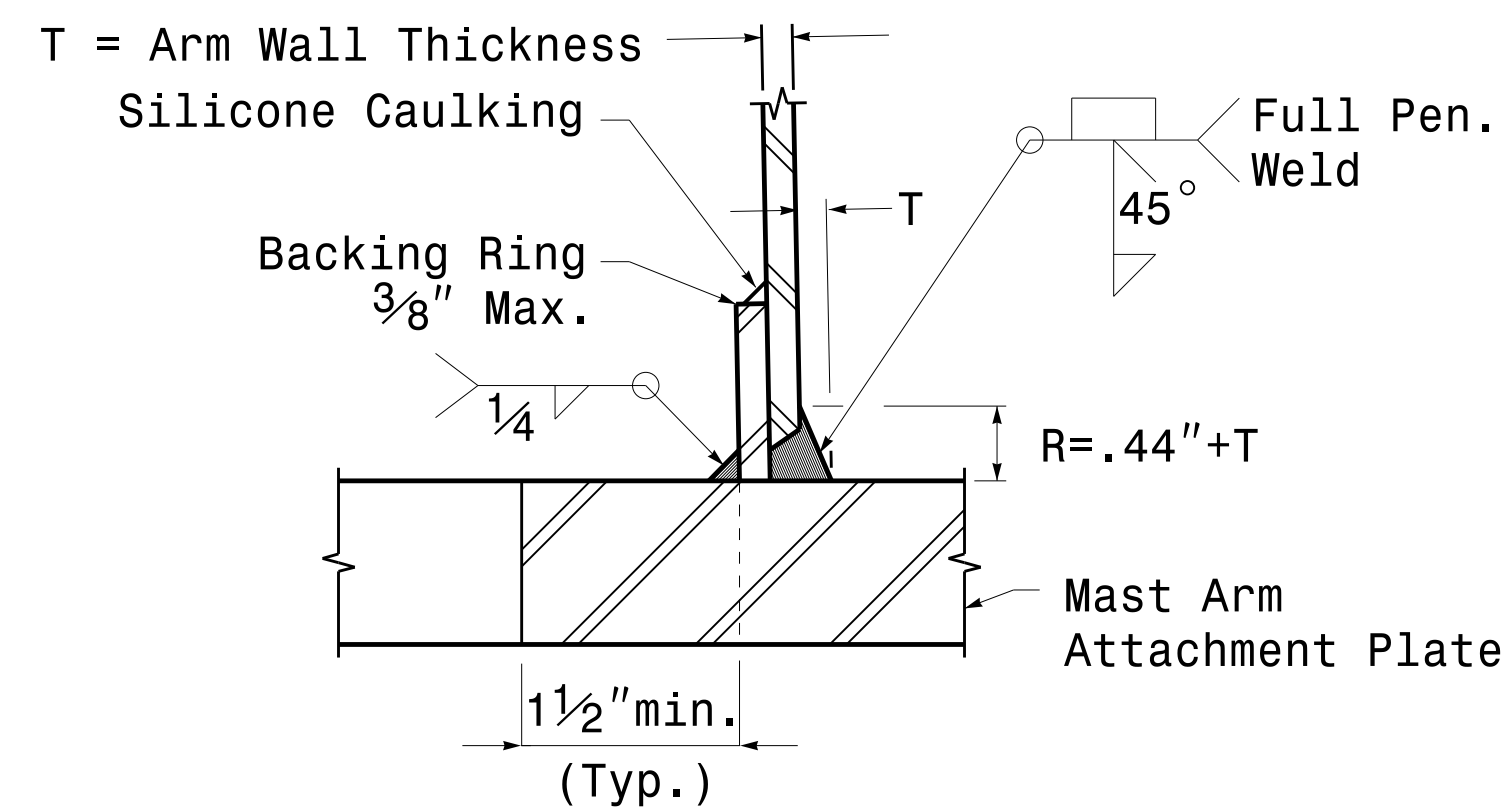
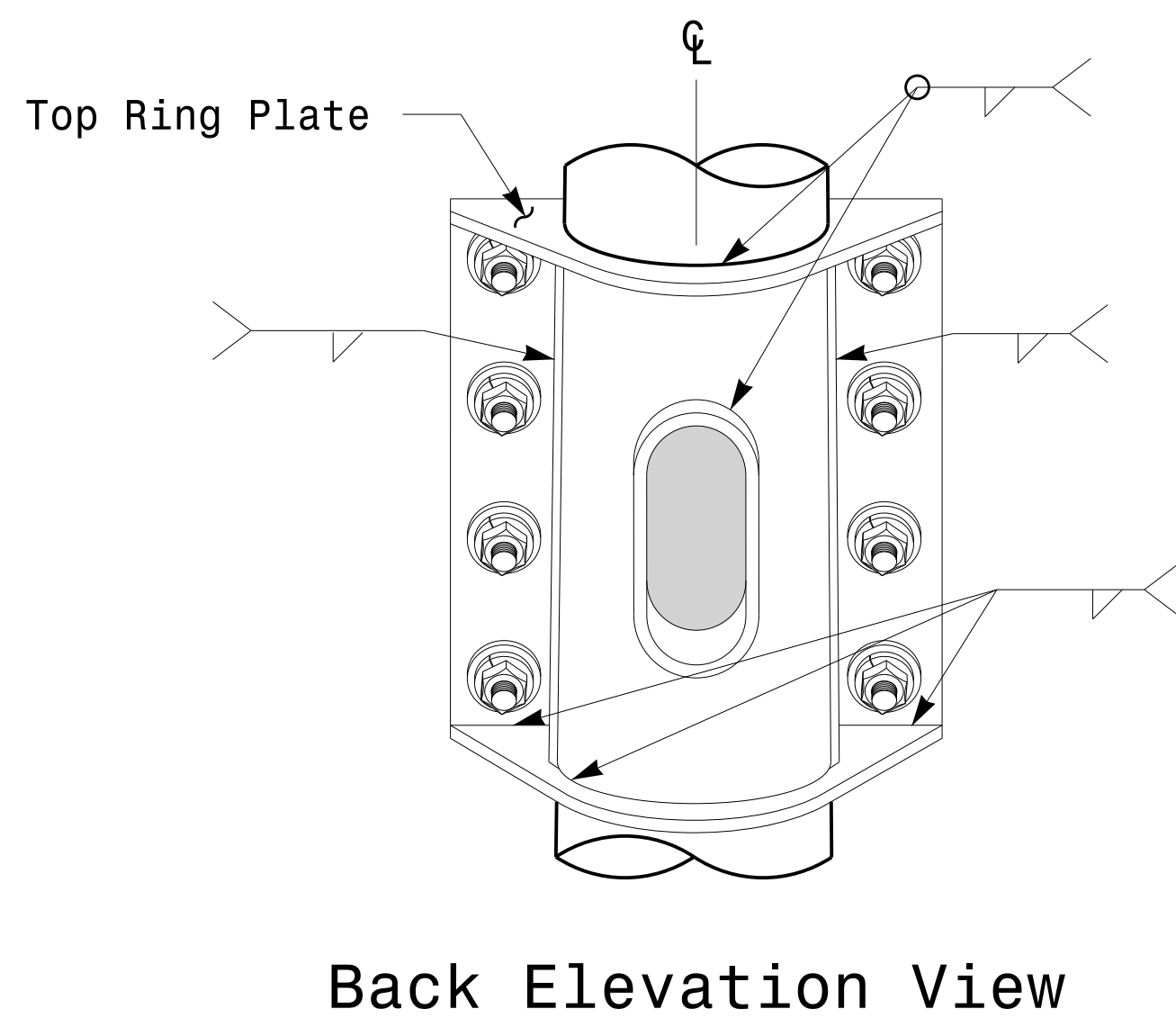
I - 5964

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.



Prepared in the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: 0 NA NONE

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
REVISIONS	INIT. DATE

SEAL

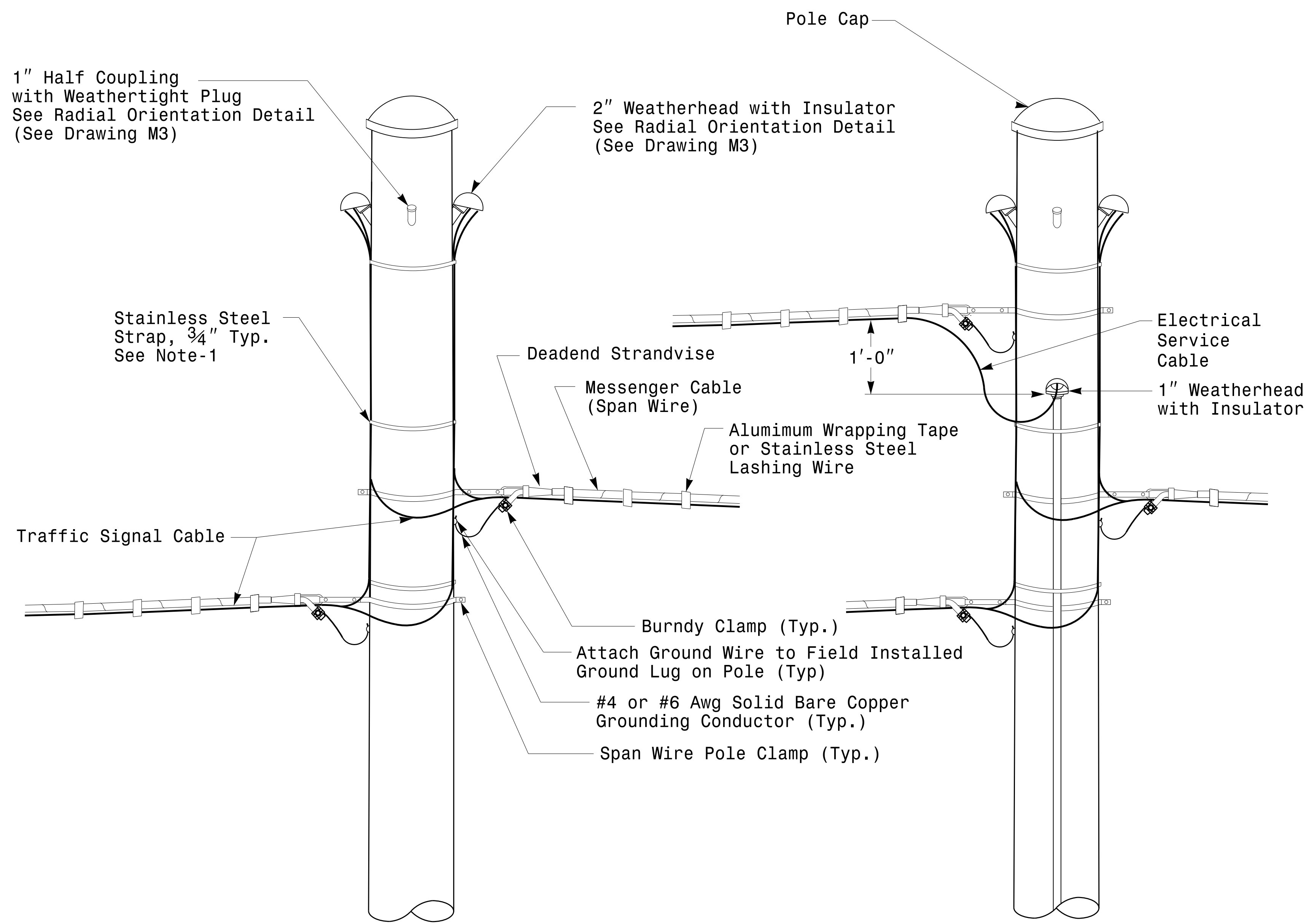
Debesh C. Sarkar

10/11/2017

DATE

Fabrication Details - Mast Arm Connection

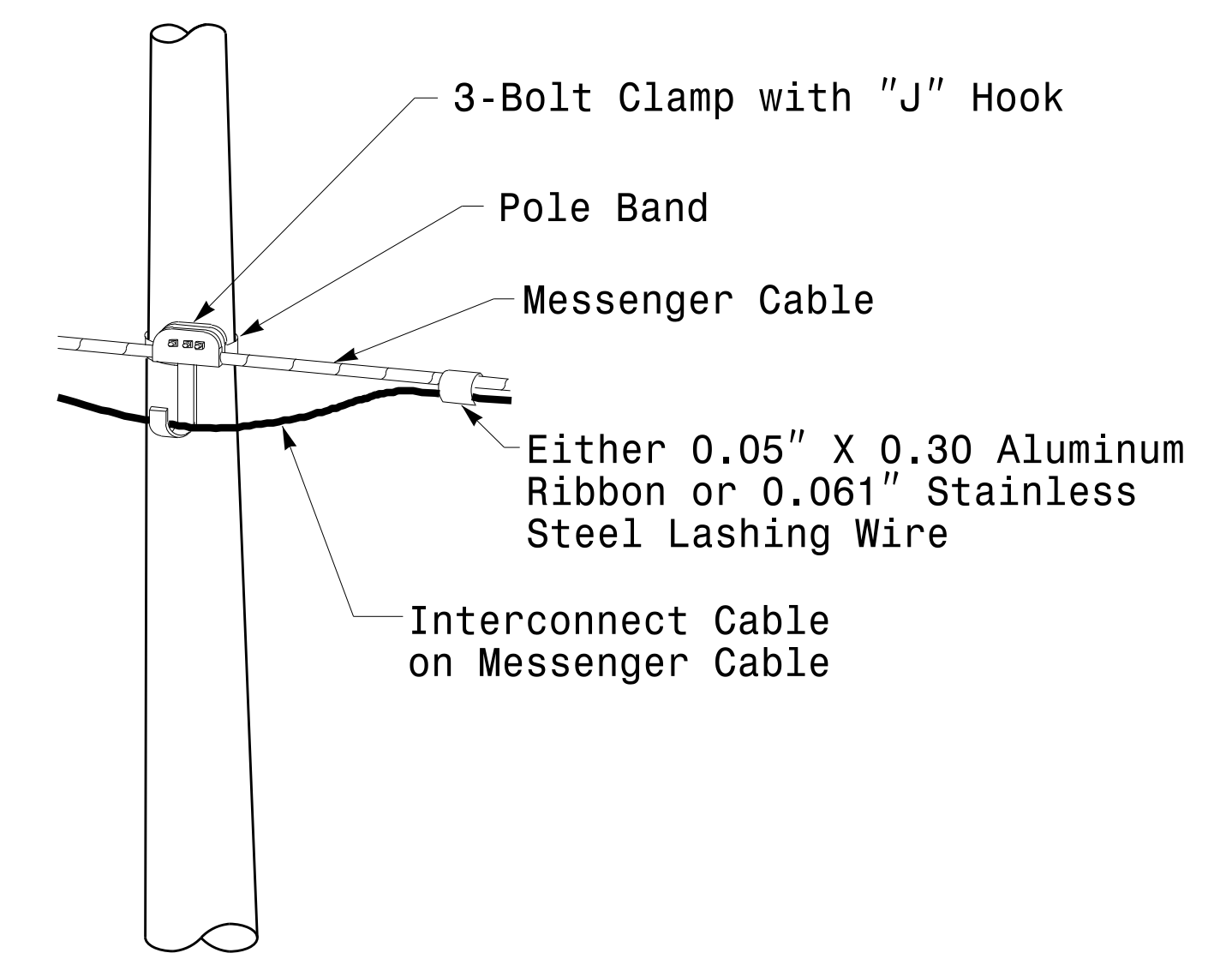
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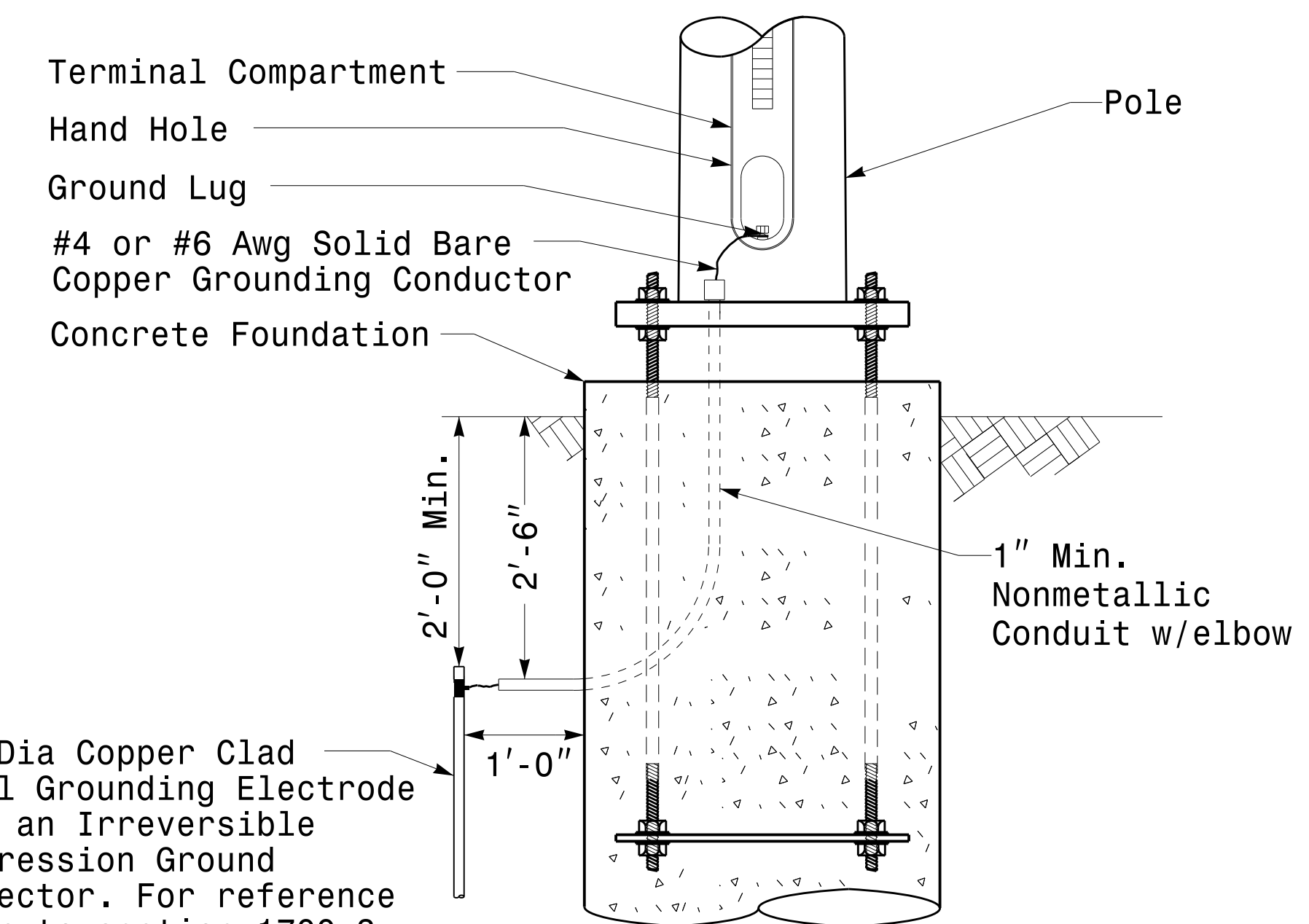
Strain Pole Attachments

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

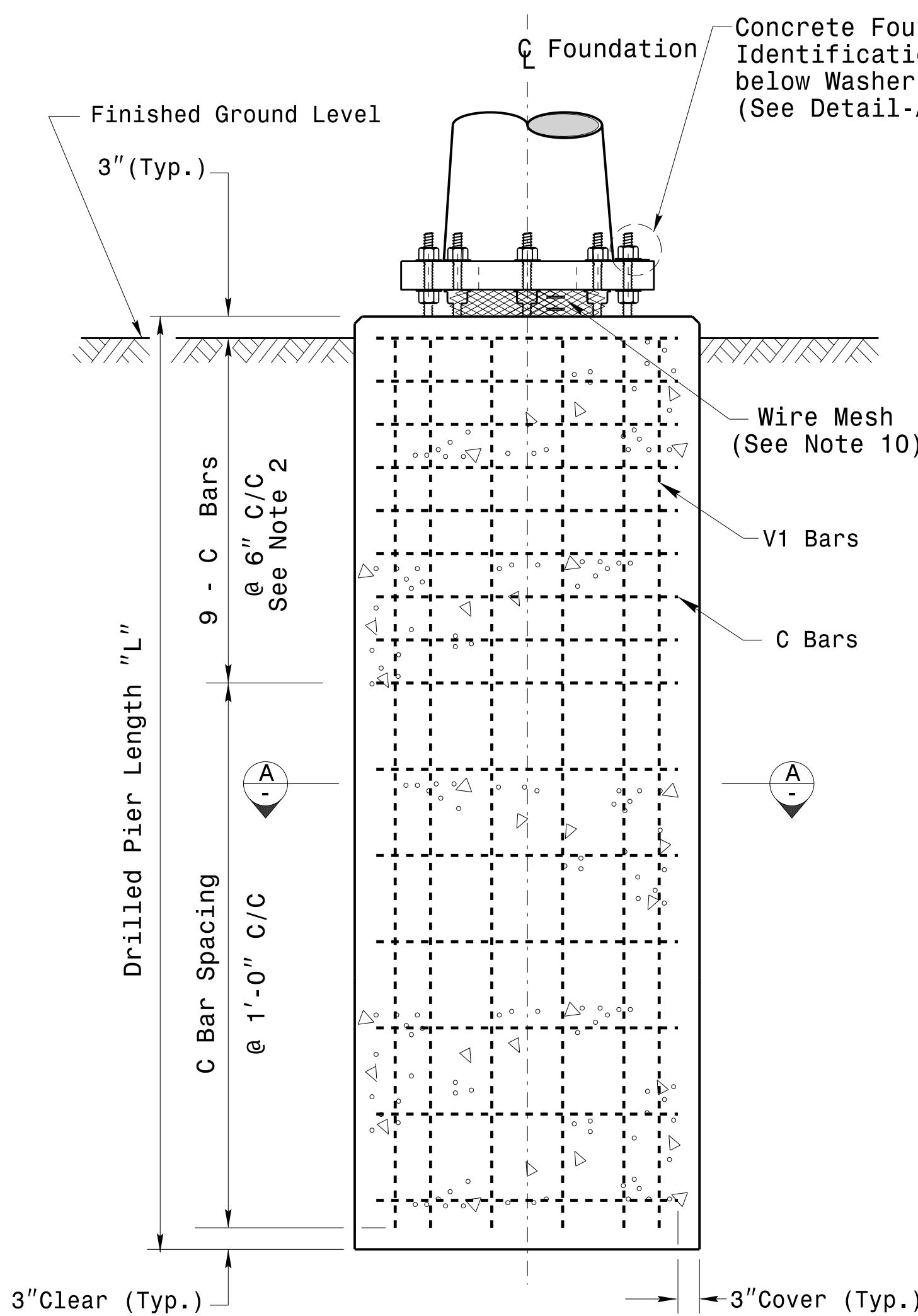


5/8" Dia Copper Clad Steel Grounding Electrode with an Irreversible Compression Ground Connector. For reference refer to section 1700-3 K and L for electrical grounding and bonding requirements, See Note 4.

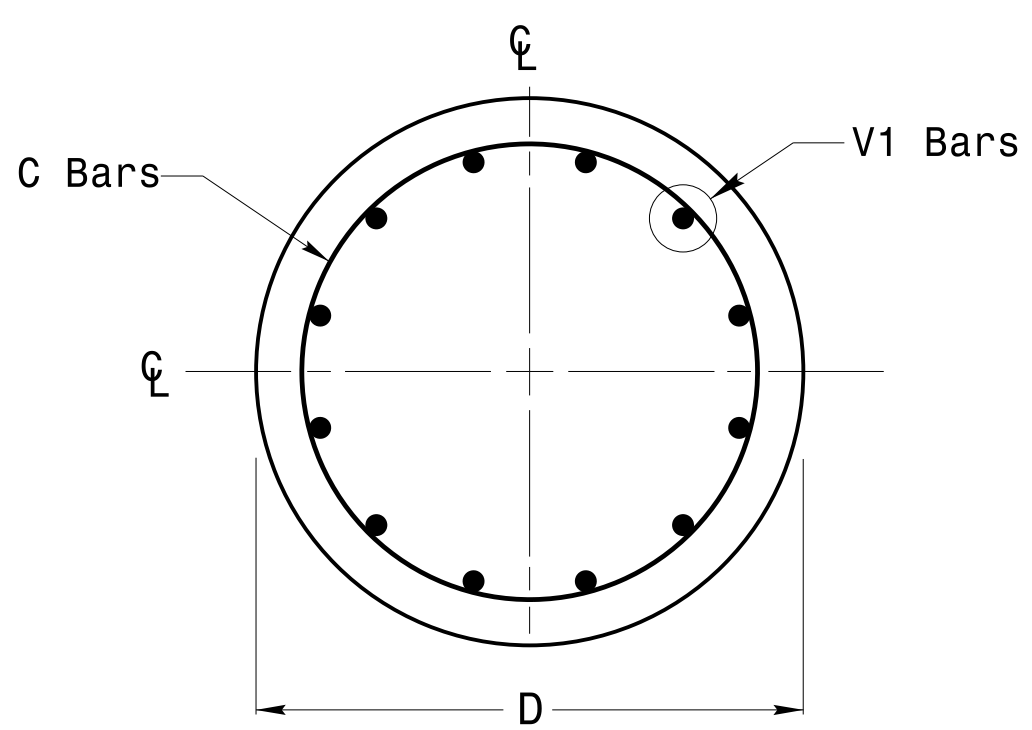
Metal Pole Grounding Detail For Strain Pole and Mast Arm

11-DEC-2017 08:36 136504115 StrainPole.dgn Design Section Eastern Region\m\ Sheets\2016\2014 Sig.M6 Std. Fabrication Detail-Strain Poles.dgn

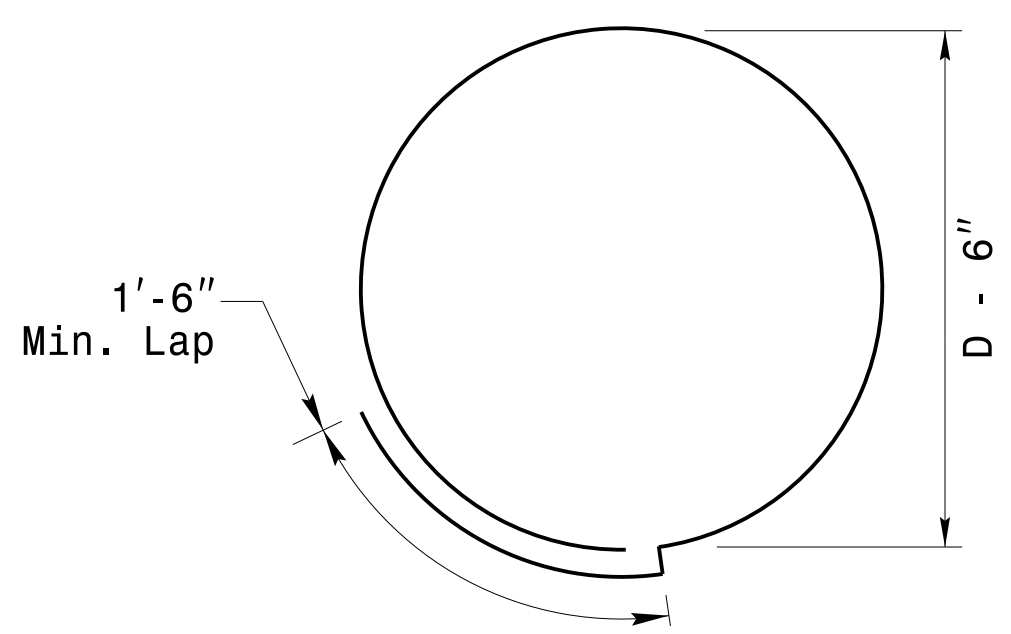
<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>Typical Fabrication Details For Strain Pole Attachments</p>		<p>SEAL</p> <p>DocuSigned by: D. C. Sarkar DATE</p>					
	<p>PLAN DATE: OCTOBER 2017</p> <p>DESIGNED BY: C.F. ANDREWS</p> <p>PREPARED BY: N. BITTING</p> <p>REVIEWED BY: D.C. SARKAR</p>	<table border="1"> <tr> <th>REVISIONS</th> <th>INIT.</th> <th>DATE</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>		REVISIONS	INIT.	DATE		
REVISIONS	INIT.	DATE						



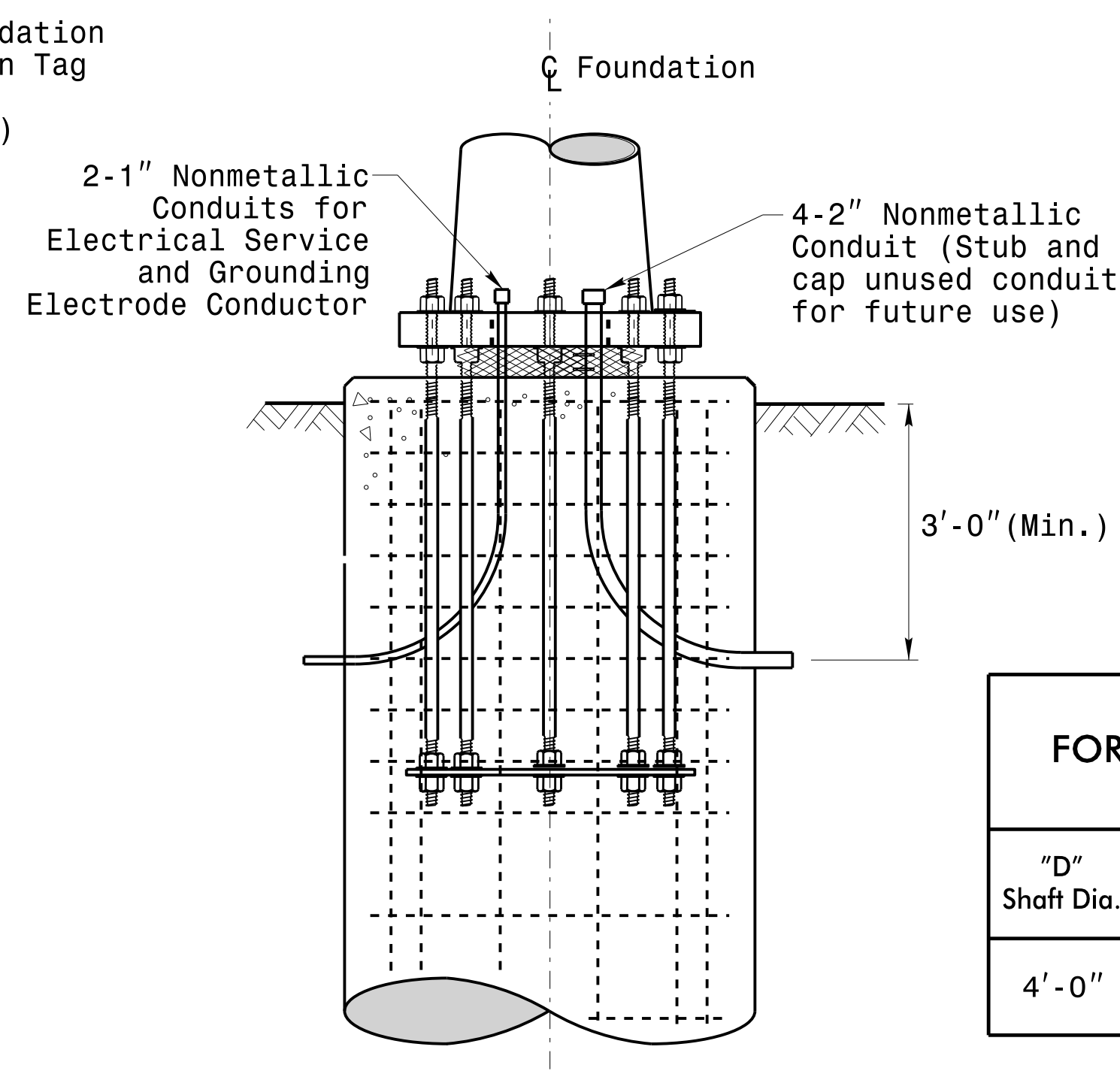
Concrete Shaft Elevation



Section A-A



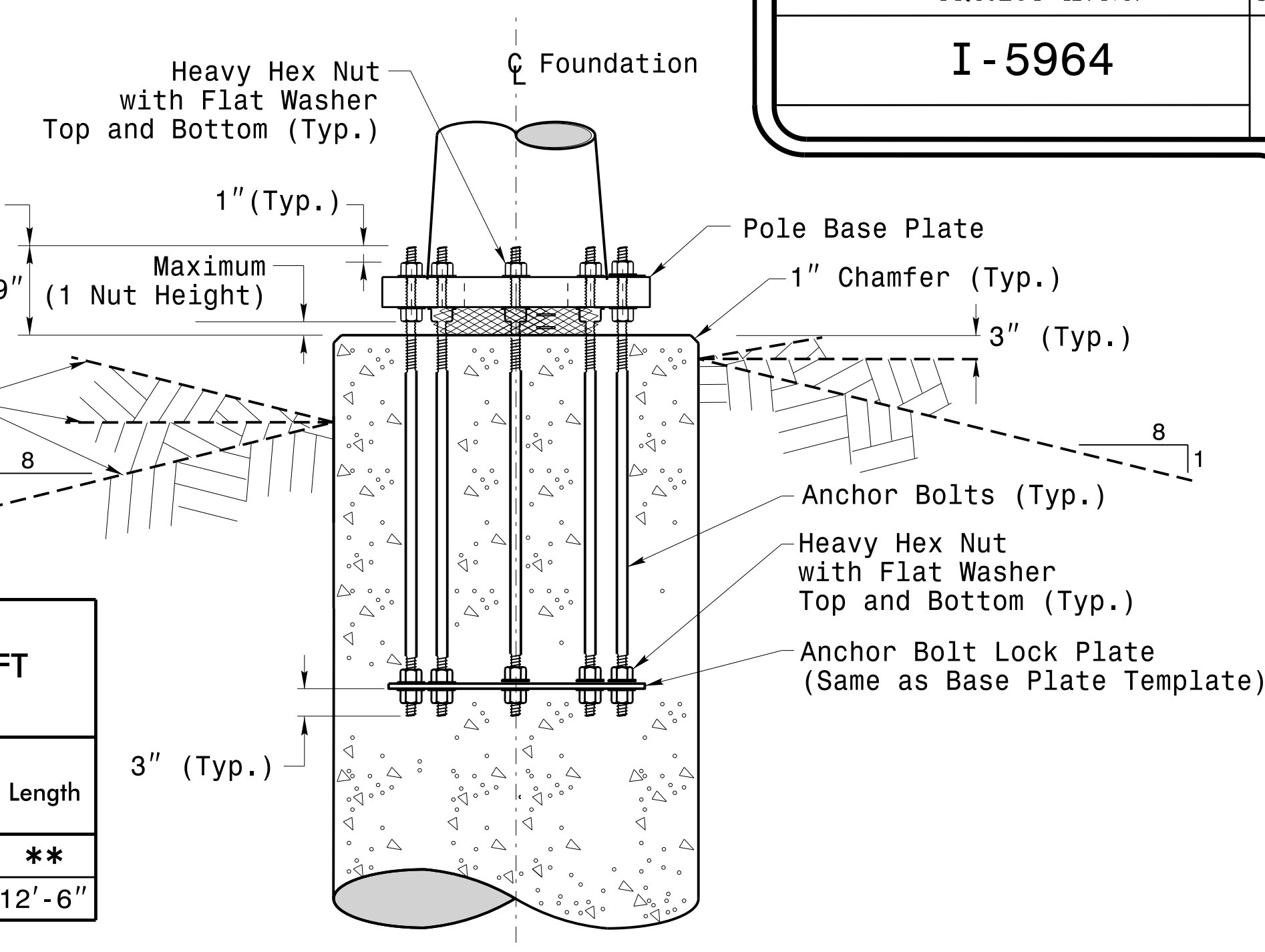
Typical "C" Bar Detail



Typical Foundation Conduit Details

"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

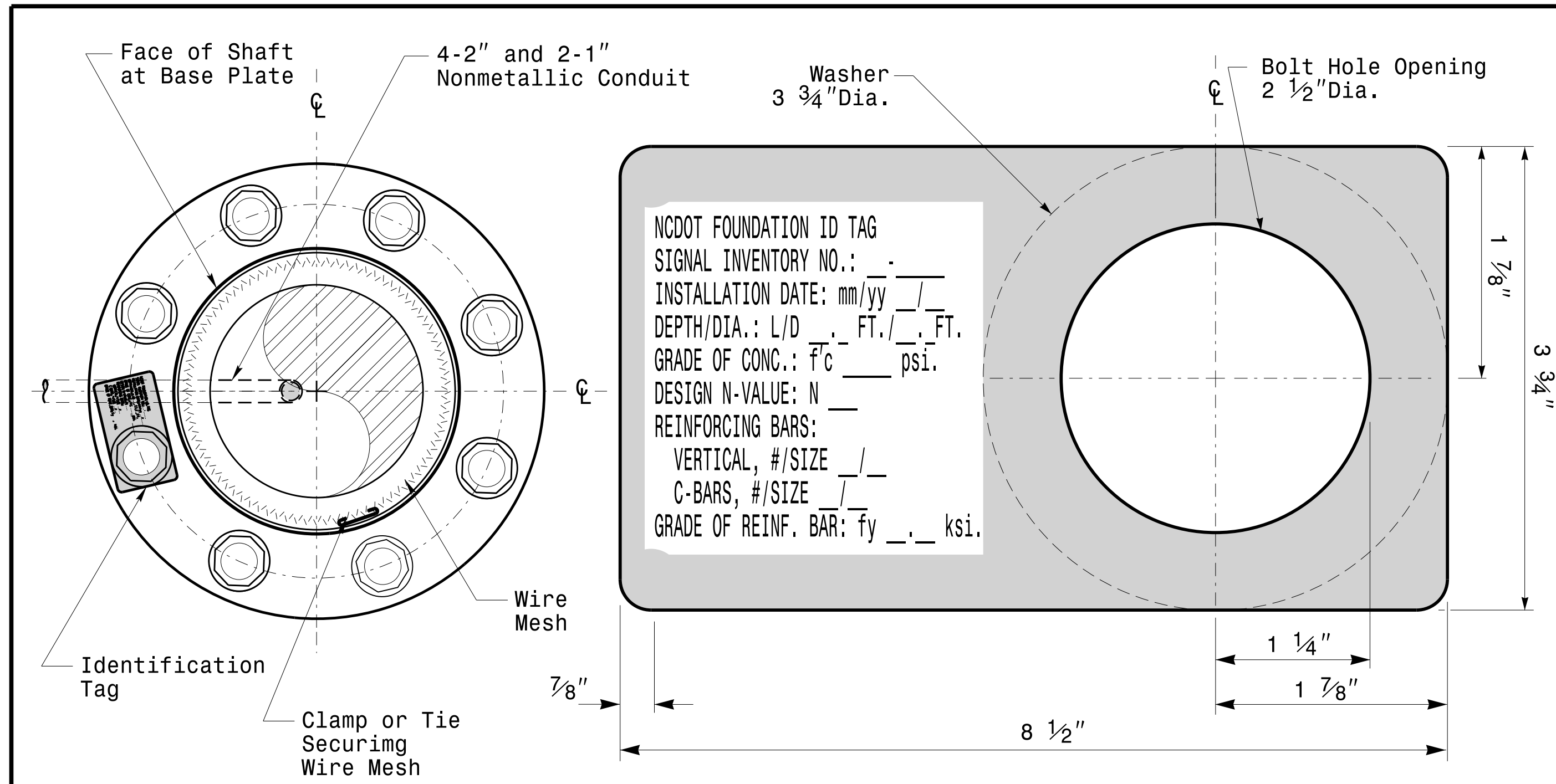


Typical Foundation Anchor Bolt Details

(Reinforcing Cage Not Shown for Clarity)

General Notes:

1. If actual subsurface conditions differ significantly from boring data contact the Engineer before excavating or placing concrete.
2. 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.
3. 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.
4. Provide 2" to 5" foundation projection above ground level depending on the ground slope.
5. 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.
6. 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>
7. Use air entrained AA concrete mix with a compression strength of f'c=4500 psi.(min.) after 28 days.
8. Use ASTM A615 grade 60 deformed bars for all reinforcing steel. Maintain at least 3" cover on all reinforcement.
9. Locate the Identification Tag on the top of the base plate, directly above the conduit's entry point.
10. 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.
11. 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

	<p>Construction Details For Foundations</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>
<p>INIT: N.B.</p>	<p>DATE: 5/11/2015</p>	<p>DATE: 10/11/2017</p>	<p>DATE</p>

11-001-2017-08:33T
 I:\SSD\W115-Stipolis\sigal Design Section\Eastern Region\44-Sheets\2016\2014_Sig.M7_S1d_Construction_Detail\Is-Strain_Poles.dgn
 PLOT: 10/11/2017 10:58:58 AM

Construction Details - Foundations

SOIL CONDITION

PROJECT ID. NO.	SHEET NO.
I - 5964	Sig.M8

		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.

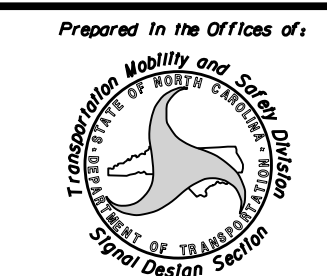
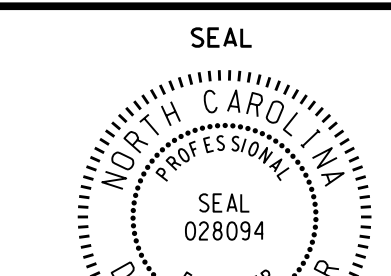
Foundation Selection:

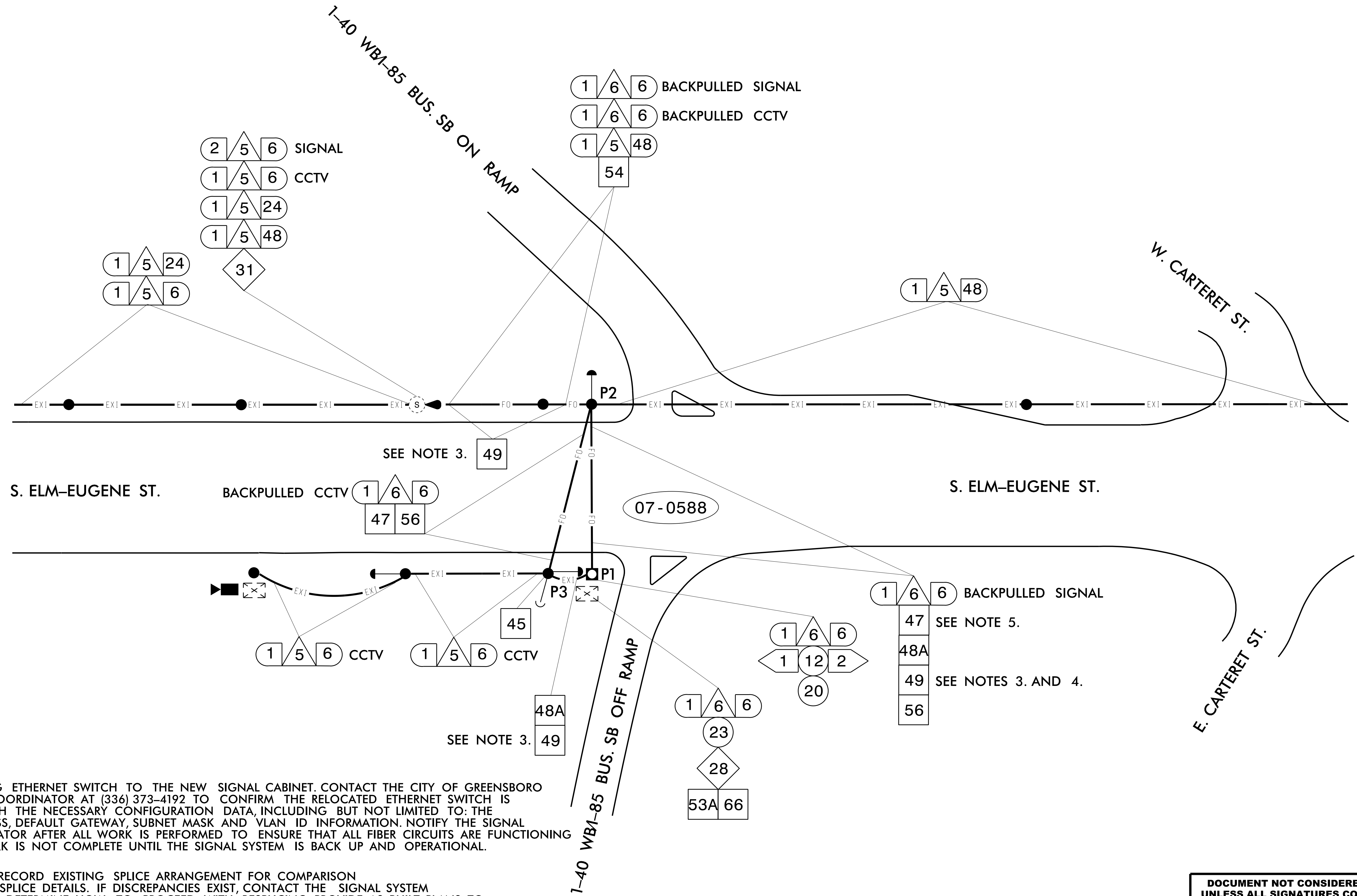
- Perform a standard penetration test at each proposed foundation site to determine "N" value.
- Select the appropriate wind zone from M 1 drawing.
- Select the soil type (Clay or Sand) that best describes the soil characteristics.
- Get the appropriate standard pole case number from the plans or from 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.

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

Standard Strain Pole Foundation-All Soil Condition

I:\Projects\2017_08-10_Signals\2017_08-10_Signals\Design\Section\Eastern Region\MM_Sheets\2016\2014_Sig.M8_Std_Strain_Pole_Found_Saturated_Soil_Condition.dgn
 rnz:insgr

	<p>Standard Strain Pole Foundation for All Soil Conditions</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: <table border="1" style="font-size: small;"> <tr> <th>NO.</th> <th>DATE</th> <th>INIT.</th> <th>DESCRIPTION</th> </tr> <tr> <td>1</td> <td>7/12/2015</td> <td>N.B.</td> <td>Changed "Foundation Depth" to "Drilled Pier Length" in Conc. Egn.</td> </tr> </table>	NO.	DATE	INIT.	DESCRIPTION	1	7/12/2015	N.B.	Changed "Foundation Depth" to "Drilled Pier Length" in Conc. Egn.	Documented by: <i>D. C. SARKAR</i> DATE: 10/11/2017
NO.	DATE	INIT.	DESCRIPTION							
1	7/12/2015	N.B.	Changed "Foundation Depth" to "Drilled Pier Length" in Conc. Egn.							



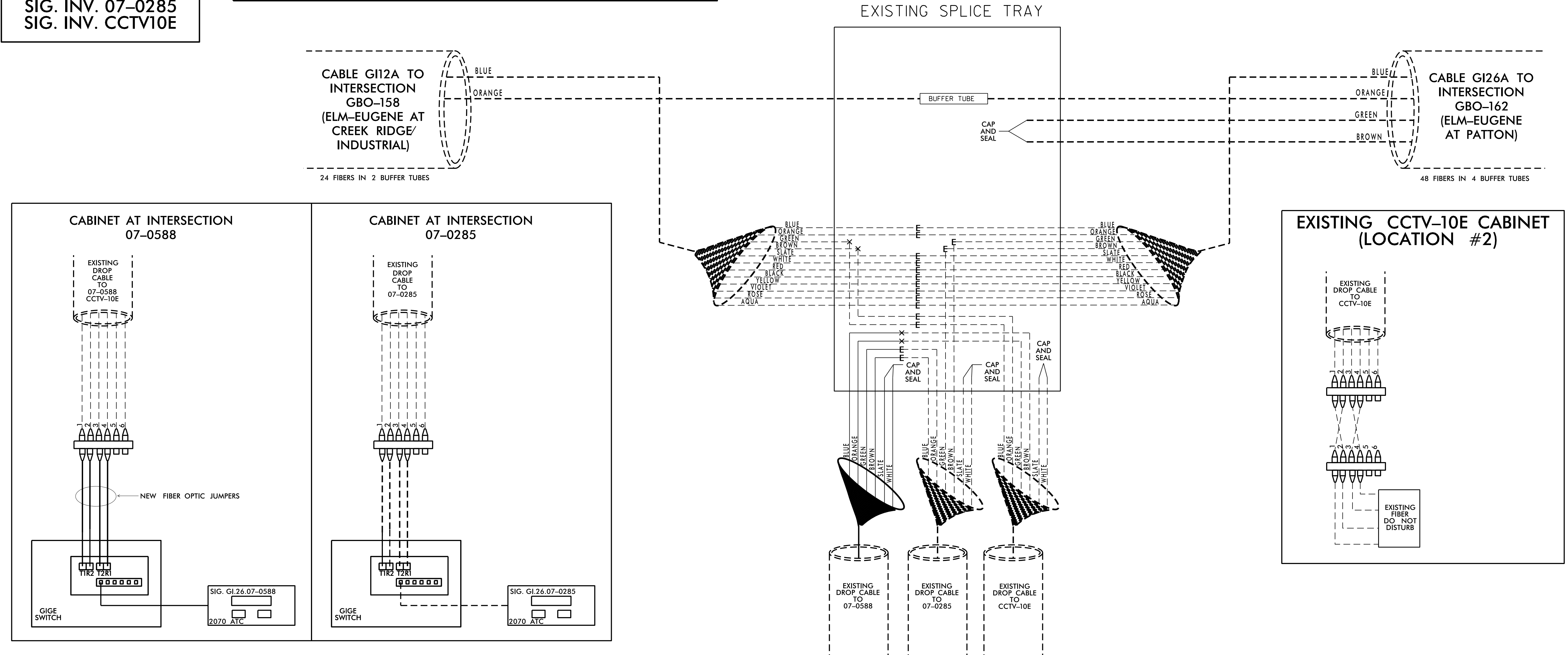
1. RELOCATE EXISTING ETHERNET SWITCH TO THE NEW SIGNAL CABINET. CONTACT THE CITY OF GREENSBORO SIGNAL SYSTEM COORDINATOR AT (336) 373-4192 TO CONFIRM THE RELOCATED ETHERNET SWITCH IS PROGRAMMED WITH THE NECESSARY CONFIGURATION DATA, INCLUDING BUT NOT LIMITED TO: THE PROJECT IP ADDRESS, DEFAULT GATEWAY, SUBNET MASK AND VLAN ID INFORMATION. NOTIFY THE SIGNAL SYSTEM COORDINATOR AFTER ALL WORK IS PERFORMED TO ENSURE THAT ALL FIBER CIRCUITS ARE FUNCTIONING PROPERLY. ALL WORK IS NOT COMPLETE UNTIL THE SIGNAL SYSTEM IS BACK UP AND OPERATIONAL.
2. CONTRACTOR TO RECORD EXISTING SPLICE ARRANGEMENT FOR COMPARISON TO THE SUPPLIED SPLICE DETAILS. IF DISCREPANCIES EXIST, CONTACT THE SIGNAL SYSTEM COORDINATOR TO DETERMINE HOW TO PROCEED WITH RESPLICING. PROVIDE AS-BUILT PLANS TO THE SIGNAL SYSTEM COORDINATOR IF FINAL SPLICE ARRANGEMENT DIFFERS FROM THE SUPPLIED SPLICE DETAILS.
3. BACKPULL EXISTING CCTV FIBER OPTIC DROP CABLE FROM THE EXISTING SPLICE ENCLOSURE TO POLE P3. INSTALL NEW MESSENGER CABLE BETWEEN POLES P2 AND P3. REROUTE EXISTING CCTV FIBER OPTIC DROP CABLE TO THE EXISTING SPLICE ENCLOSURE AND RESPLICE INTO THE TRUNK LINE.
4. BACKPULL EXISTING SIGNAL FIBER OPTIC DROP CABLE FROM THE EXISTING SIGNAL CABINET TO POLE P2. INSTALL NEW MESSENGER CABLE BETWEEN POLES P2 AND P1 AND REROUTE EXISTING SIGNAL FIBER OPTIC DROP CABLE TO THE NEW SIGNAL CABINET.
5. ATTACH NEW MESSENGER AT EXISTING ATTACHMENT POINT ON POLE P2 AND P3. ATTACH NEW MESSENGER 12" ABOVE SIGNAL CABLE AT POLE P1.

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

<p>Prepared in the Offices of: The University of North Carolina Department of Transportation 250 N. Greenfield Place, Garner, NC 27529</p>	<p>S. ELM-EUGENE STREET AT I-40-US 70 WB/I-85 BUSINESS/ US 29-220 SB RAMPS</p>		<p>SEAL THOMAS M. WOODWARD REGISTERED PROFESSIONAL ENGINEER SEAL 025895 DATE 5/28/2021</p>
	<p>DIVISION 7 GUILFORD CO GREENSBORO</p> <p>PLAN DATE: MAY 2021 REVIEWED BY: <i>Greg Gruen</i></p> <p>PREPARED BY: D.J. SONDERFAN</p>	<p>INITIALS DATE</p>	
<p>SCALE 0</p>	<p>REVISIONS</p>		<p>CADD File name:</p>

GROUP GI26
EXISTING SE ELM-EUGENE AT I-85 SB RAMP
SIG. INV. 07-0588
SIG. INV. 07-0285
SIG. INV. CCTV10E

COLOR CODE TIA/EIA 598-A		LEGEND	
(1) BLUE	(7) RED	X	FUSION SPLICE INDIVIDUAL FIBER
(2) ORANGE	(8) BLACK	E	EXISTING SPLICE
(3) GREEN	(9) YELLOW	BUFFER TUBE	SPLICE OR EXPRESS ENTIRE BUFFER TUBE AS NOTED
(4) BROWN	(10) VIOLET		
(5) SLATE	(11) ROSE		
(6) WHITE	(12) AQUA		



1. RELOCATE EXISTING ETHERNET SWITCH TO THE NEW SIGNAL CABINET. CONTACT THE CITY OF GREENSBORO SIGNAL SYSTEM COORDINATOR AT (336) 373-4192 TO CONFIRM THE RELOCATED ETHERNET SWITCH IS PROGRAMMED WITH THE NECESSARY CONFIGURATION DATA, INCLUDING BUT NOT LIMITED TO: THE PROJECT IP ADDRESS, DEFAULT GATEWAY, SUBNET MASK AND VLAN ID INFORMATION. NOTIFY THE SIGNAL SYSTEM COORDINATOR AFTER ALL WORK IS PERFORMED TO ENSURE THAT ALL FIBER CIRCUITS ARE FUNCTIONING PROPERLY. ALL WORK IS NOT COMPLETE UNTIL THE SIGNAL SYSTEM IS BACK UP AND OPERATIONAL.
2. CONTRACTOR TO RECORD EXISTING SPLICE ARRANGEMENT FOR COMPARISON TO THE SUPPLIED SPLICE DETAILS. IF DISCREPANCIES EXIST, CONTACT THE SIGNAL SYSTEM COORDINATOR TO DETERMINE HOW TO PROCEED WITH RESPLICING. PROVIDE AS-BUILT PLANS TO THE SIGNAL SYSTEM COORDINATOR IF FINAL SPLICE ARRANGEMENT DIFFERS FROM THE SUPPLIED SPLICE DETAILS.
3. ETHERNET SWITCH TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING \ ENSURING PROPER TERMINATIONS.
4. INCLUDE ON THE COVER OF EACH SPLICE TRAY THE FOLLOWING: REFERENCE SECTION 1731 "FIBER OPTIC SPLICE ENCLOSURE"
 - 1) SPLICE LOCATION
 - 2) DATE
 - 3) COMPANY NAME
 - 4) NAME OF INDIVIDUAL PERFORMING THE SPLICING

PRIOR TO INSTALLING THE COVER ON THE SPLICE TRAY TAKE A DIGITAL PHOTOGRAPH SHOWING THE SPLICE TRAY AND INFORMATION SHOWN ABOVE (1-4) AND SUBMIT PHOTOGRAPH ALONG WITH OTDR TEST RESULTS.

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

<p>250 N. Greenfield Pkwy., Garner, NC 27529</p>	<p>SPLICE DETAIL</p>		
	<p>DIVISION 7 GUILFORD CO GREENSBORO</p> <p>PLAN DATE: MAY 2021 REVIEWED BY: <i>Gary Gruen</i></p> <p>PREPARED BY: D.J. SONDERFAN</p>	<p>SCALE: 0</p>	