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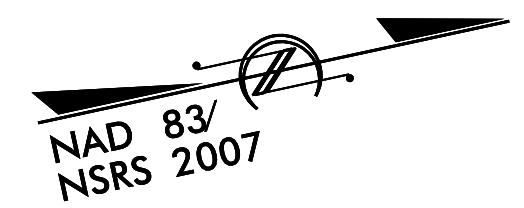
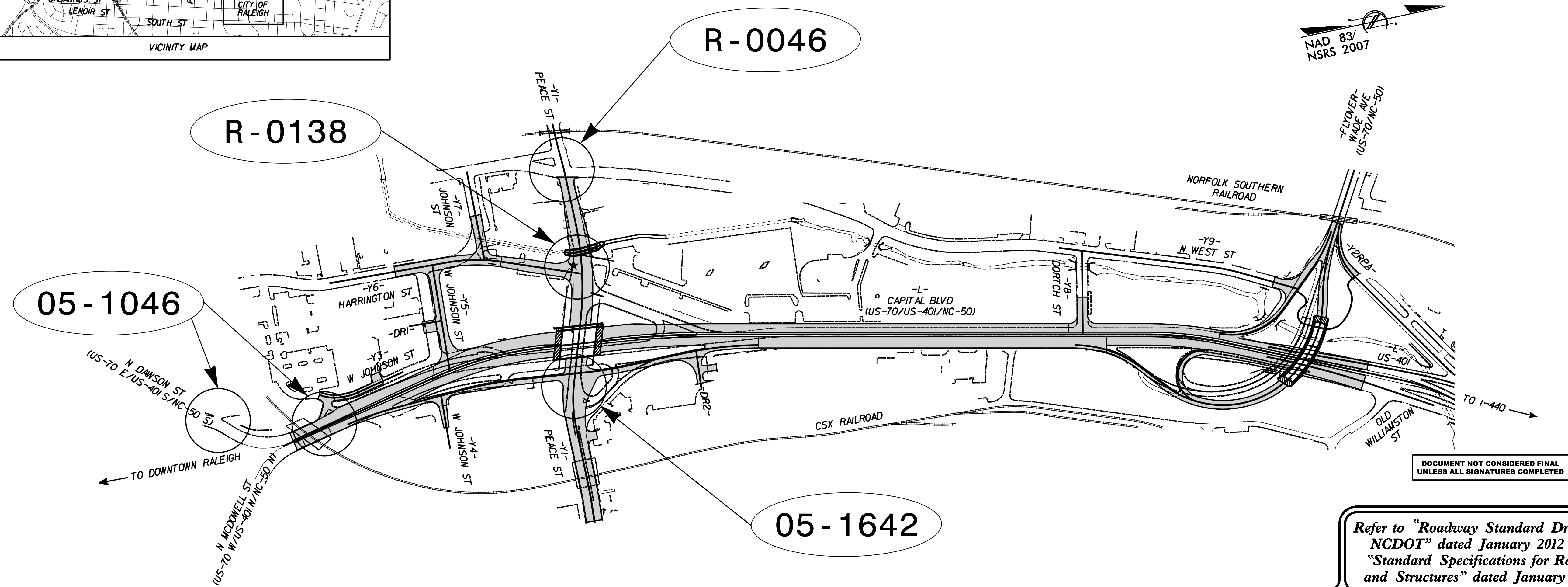
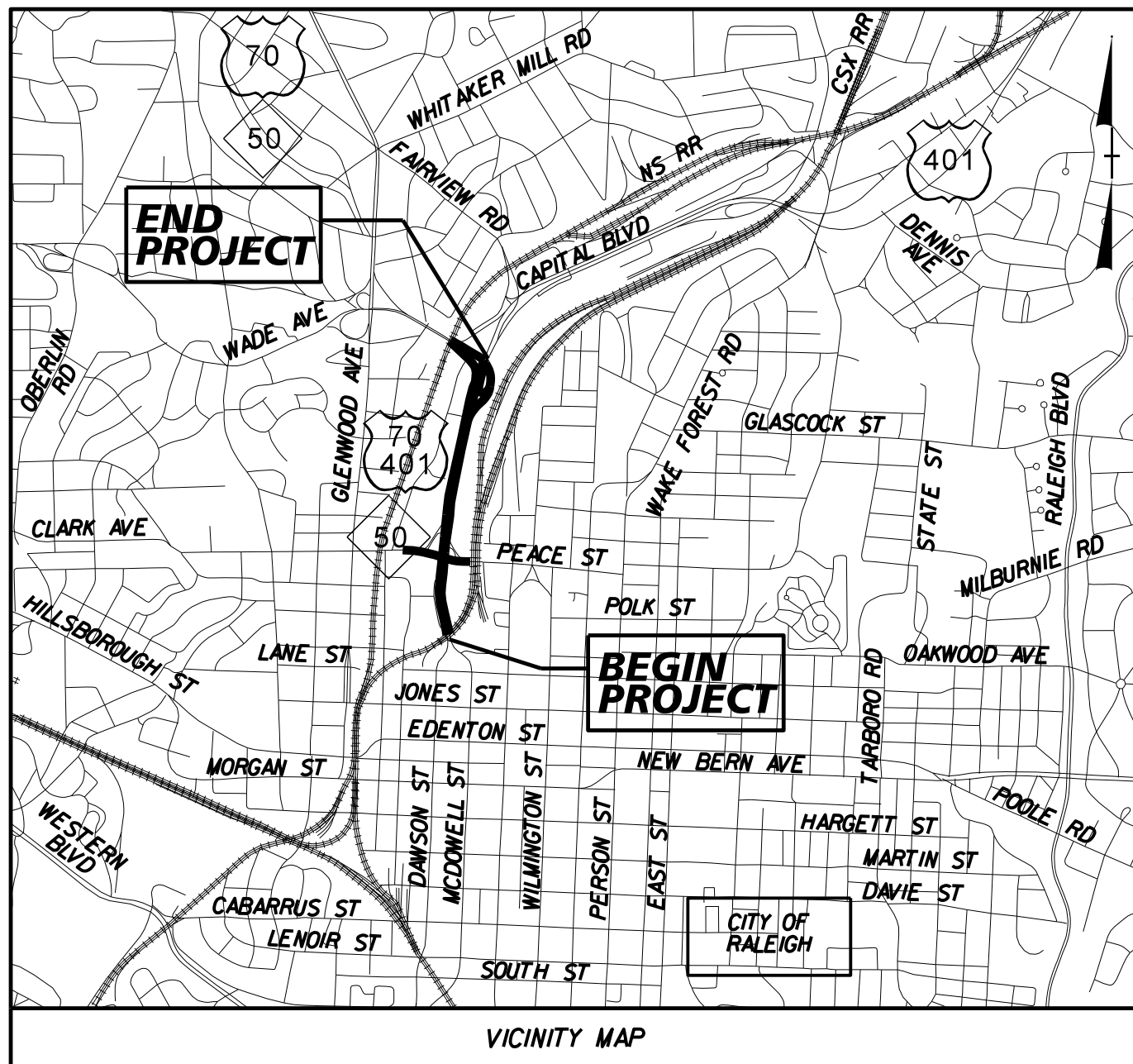
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STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

**WAKE COUNTY**

**LOCATION: BRIDGE NO. 227 ON US-70/US-401/NC-50 (CAPITAL BOULEVARD) OVER PEACE STREET AND BRIDGE NO. 213 ON US-70/NC-50 (WADE AVENUE) OVER US 401 (CAPITAL BOULEVARD)**  
**TYPE OF WORK: TRAFFIC SIGNALS AND SIGNAL COMMUNICATIONS**

**CONTRACT: C203751 TIP PROJECT: B-5121 / B-5317**



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UNLESS ALL SIGNATURES COMPLETED

Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.

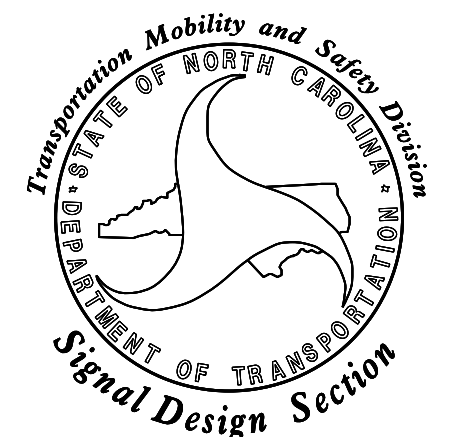
**Index of Plans**

Sheet #	Reference #	Location/Description
Sig. 1.0	-----	Title Sheet
Sig. 2.0-2.5	05-1046	US 70 EB-401 SB/NC 50 SB (N. Dawson Street) at W. Lane Street
Sig. 3.0-5.4	R-0046	W. Peace Street at N. West Street
Sig. 6.0-6.4	R-0138	W. Peace Street at N. Harrington Street
Sig. 7.0-12.4	05-1642	W. Peace Street at US 70 WB - 401/NC 50 NB (Capital Blvd.) Ramps
M1-M9	-----	Standard Drawing For Metal Poles
P1-P3	-----	Pedestrian Pushbutton Location Details
SCP 1-11	-----	Signal Communications Plans

**INTELLIGENT TRANSPORTATION AND SIGNALS UNIT**

Robert J. Ziemba, PE - Central Region Signals Engineer  
Keith M. Mims, PE - Signal Equipment Design Engineer  
I. Neil Avery - Signal Communication Project Engineer

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

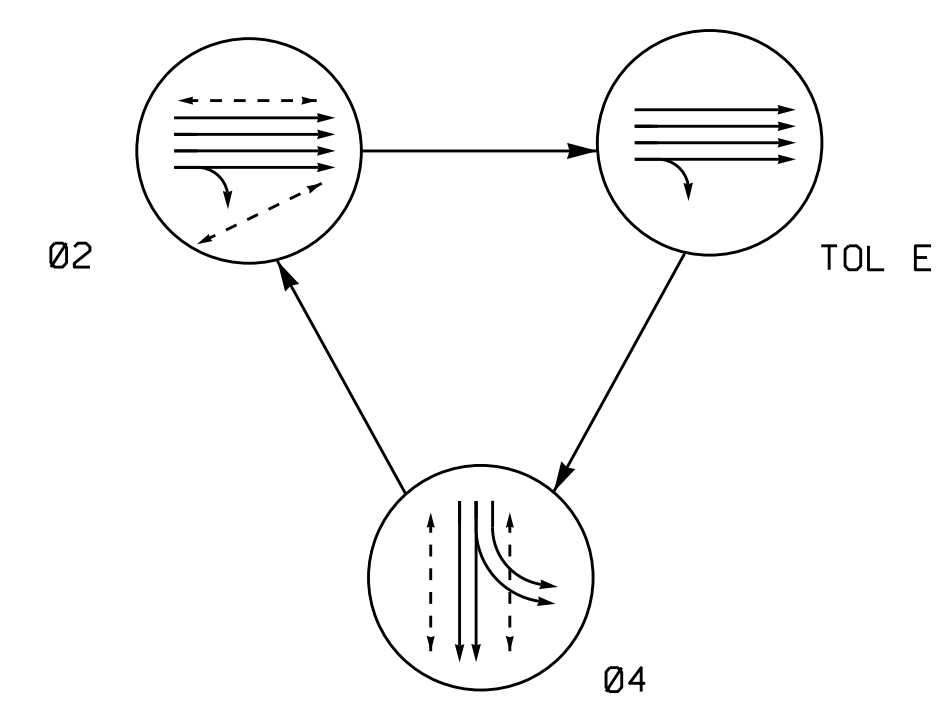


750 N. Greenfield Parkway, Garner, NC 27529

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PHASING DIAGRAM



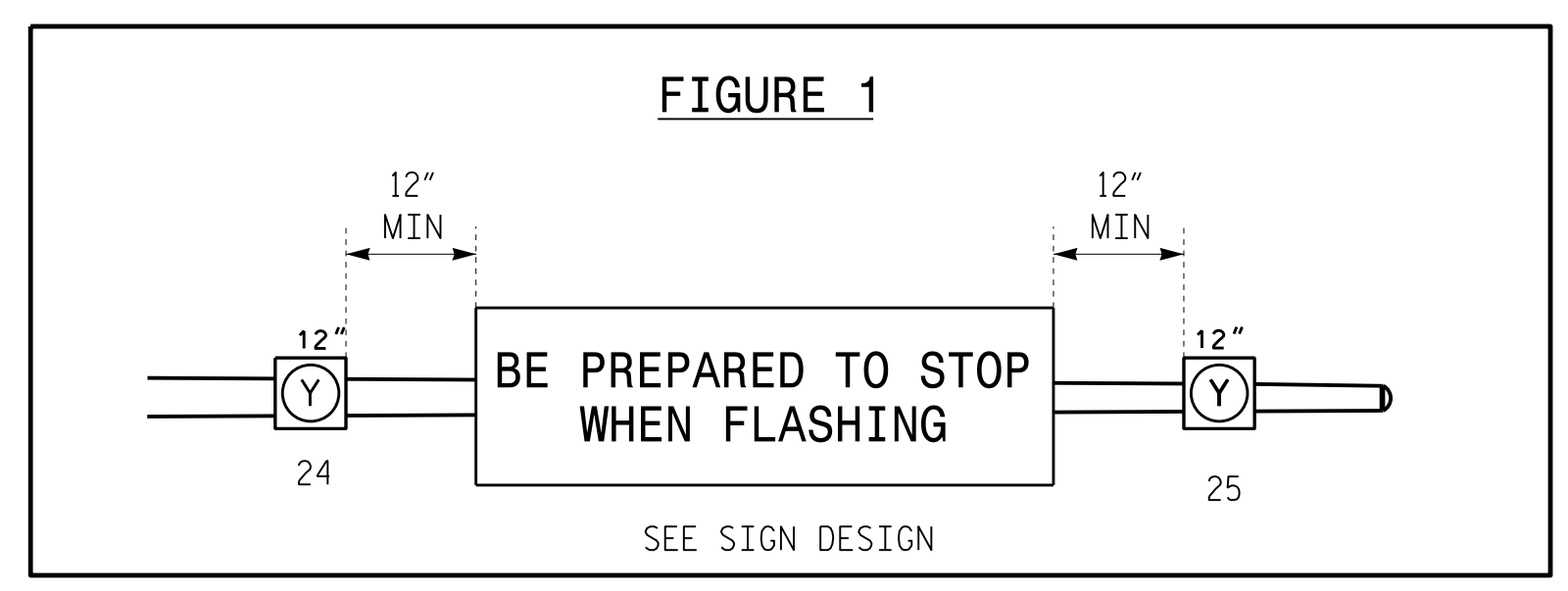
PHASING DIAGRAM DETECTION LEGEND

- ◄●► DETECTED MOVEMENT
- ◄---► UNDETECTED MOVEMENT (OVERLAP)
- ◄- - -► UNSIGNALIZED MOVEMENT
- ◄- - -> PEDESTRIAN MOVEMENT

SIGNAL FACE	PHASE			
	Ø 2	TOL E	Ø 4	FLASH
21, 22, 23	G	G	R	Y
24, 25	OFF	ON	ON	OFF
41, 42	R	R	G	R
P21, P22	W	DW	DW	DRK
P23, P24	W	DW	DW	DRK
P41, P42	DW	DW	W	DRK
P43, P44	DW	DW	W	DRK

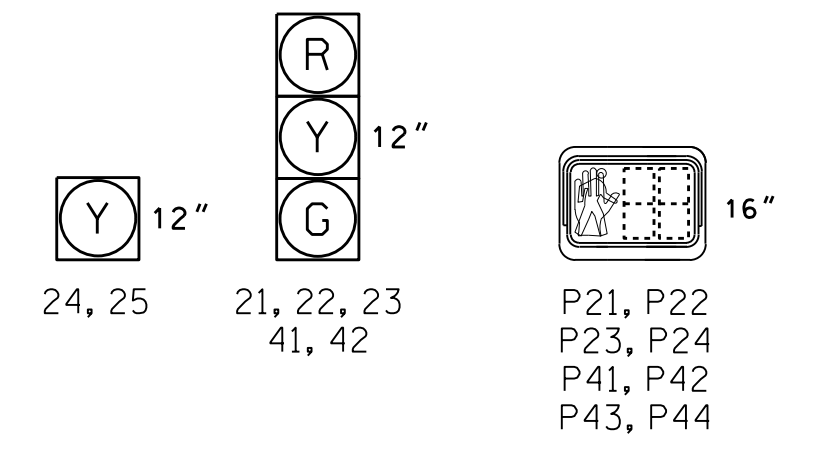
W - Walk  
DW - Don't Walk  
DRK - Dark

SIGNAL FACE	INTERVAL	
	1	2
24, 25	ON	OFF



SIGNAL FACE I.D.

All Heads L.E.D.

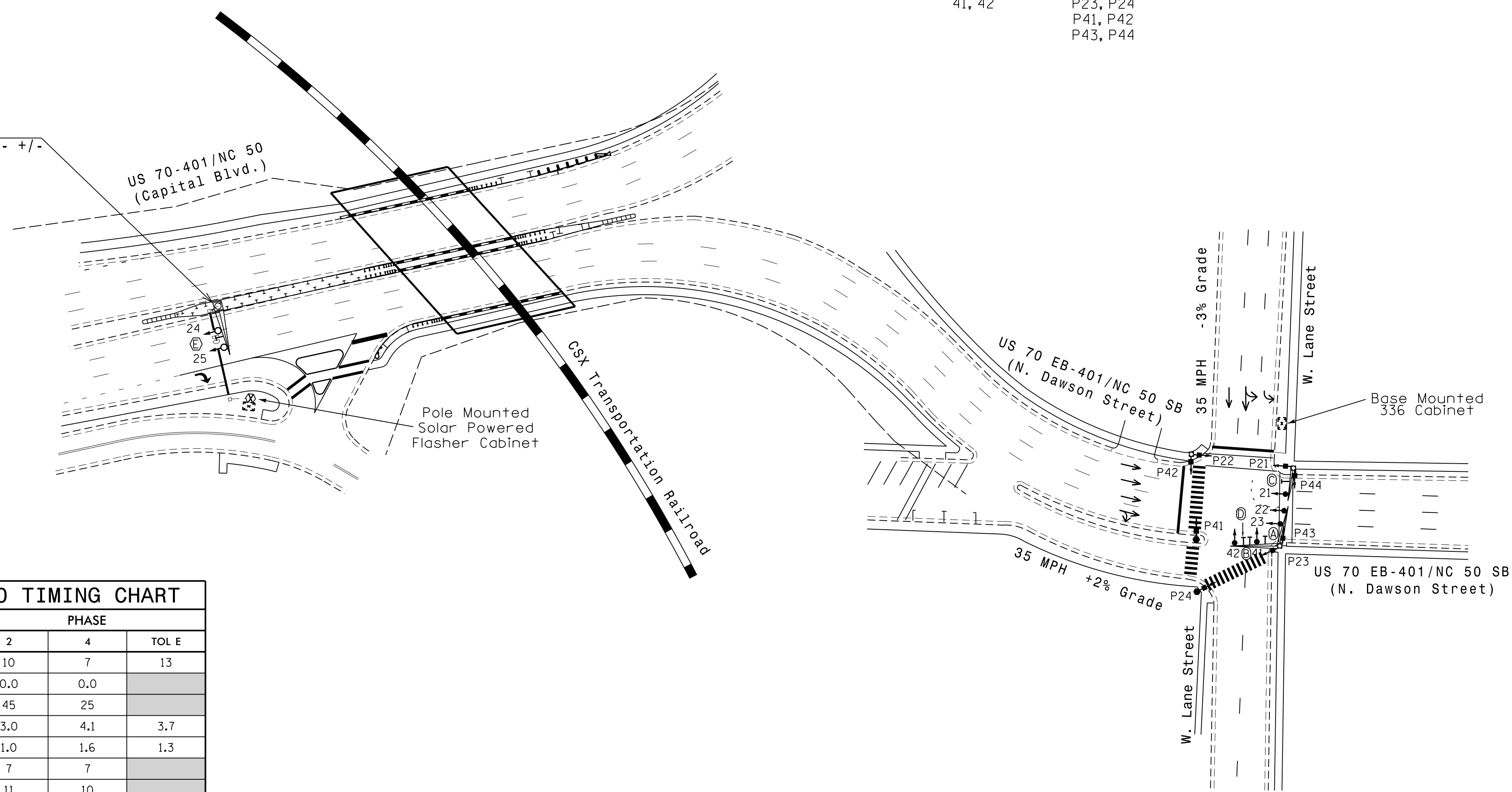


2 Phase  
w/ Timed Overlap  
Pre-Timed  
(Raleigh Signal System)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Beacons 24 and 25 are solar powered.
- Flash beacons 24 and 25 at the beginning of TOL E. They shall flash until the beginning of phase 2 green.
- 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.
- Utilize Wireless Radio for communication between signal cabinet and remote cabinet for solar powered flasher.

Metal Pole #8  
Sta. 12+50 -L- +/-  
0' LT +/-



FEATURE	PHASE		
	2	4	TOL E
Min Green *	10	7	13
Passage Gap *	0.0	0.0	
Maximum Green *	45	25	
Yellow Change	3.0	4.1	3.7
Red Clear	1.0	1.6	1.3
Walk *	7	7	
Pedestrian Clear	11	10	
Added Initial *	-	-	
Maximum Initial *	-	-	
Time Before Reduction *	-	-	
Time To Reduce *	-	-	
Minimum Gap	-	-	
Recall Mode	MAX/PED RECALL	MAX/PED RECALL	
Vehicle Call Memory	-	-	
Dual Entry	-	-	
Simultaneous Gap	ON	ON	

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

LEGEND

- | PROPOSED  | EXISTING  |
|---|---|
| ○ → Traffic Signal Head                                   | ● → N/A   |
| ● → 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 Guardrail   | ⊥ Guardrail   |
| ○ Directional Drill                                       | N/A   |
| ○ Type II Signal Pedestal                                 | ● Type II Signal Pedestal                                 |
| ⊗ Type III Signal Pedestal                                | ⊗ Type III Signal Pedestal                                |
| N/A Railroad Tracks                                       | — Railroad Tracks   |
| ⊠ Left Arrow "ONLY" Sign (R3-5L)                          | ⊠ Left Arrow "ONLY" Sign (R3-5L)                          |
| ⊠ Combined Through and Left Arrow Sign (R3-6L)            | ⊠ Combined Through and Left Arrow Sign (R3-6L)            |
| ⊠ No Left Turn Sign (R3-2)                                | ⊠ No Left Turn Sign (R3-2)                                |
| ⊠ No Right Turn Sign (R3-1)                               | ⊠ No Right Turn Sign (R3-1)                               |
| ⊠ "BE PREPARED TO STOP WHEN FLASHING" Sign - See Figure 1 | ⊠ "BE PREPARED TO STOP WHEN FLASHING" Sign - See Figure 1 |

Signal Upgrade

Prepared In the Offices of:

Transparency Mobility and Safety Solutions  
A DIVISION OF NORTH CAROLINA TRANSPORTATION CONSULTANTS  
Signal Design Section

US 70 EB-401 SB/NC 50 SB  
(N. Dawson Street)  
at  
W. Lane Street  
Wake County Raleigh

Division 5

PLAN DATE: December 2015 REVIEWED BY:

PREPARED BY: I. O. Umozurike REVIEWED BY:

REVISIONS INIT. DATE

SCALE 0 50  
1"=50'

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SEAL  
NORTH CAROLINA  
PROFESSIONAL ENGINEER  
ROBERT J. ZIEGLER  
026486

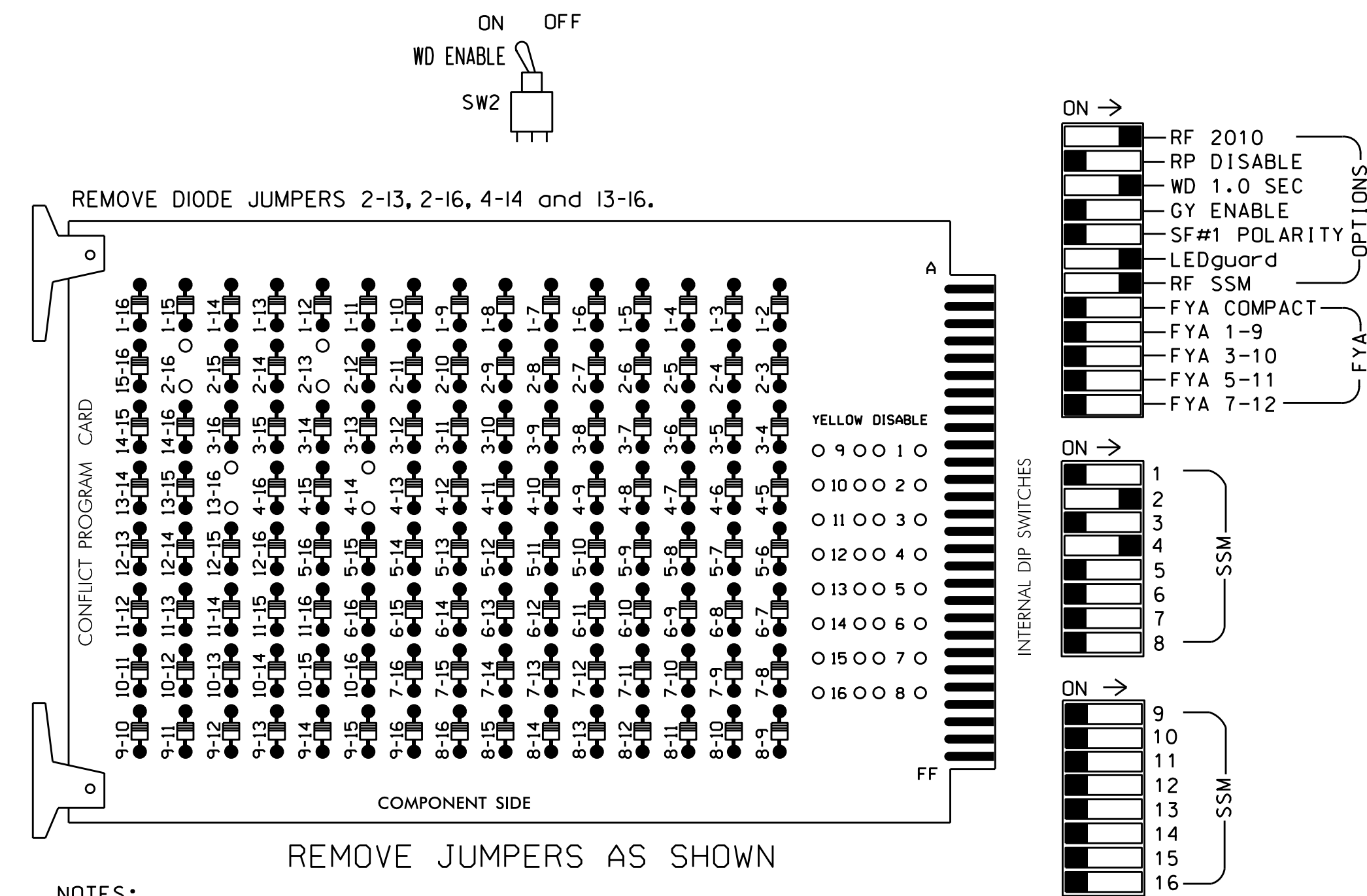
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DATE

SIG. INVENTORY NO. 05-1046

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**EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL**

(remove jumpers and set switches as shown)



**NOTES:**

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Make sure jumpers SEL2-SEL5 are present on the monitor board.

**NOTES**

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3,5, 6,7,8,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program controller to start up in phase 2 green.
4. Enable simultaneous gap-out feature, on controller unit, for all phases.
5. The cabinet and controller are part of the Raleigh City Signal System.

**EQUIPMENT INFORMATION**

CONTROLLER.....2070L  
 CABINET.....336  
 SOFTWARE.....SE-PAC2070  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S2,S2P,S4,S4P,S8P  
 PHASES USED.....2,2 PED,4,4 PED  
 OVERLAP A.....NOT USED  
 OVERLAP B.....NOT USED  
 OVERLAP C.....NOT USED  
 OVERLAP D.....NOT USED  
 OVERLAP E.....2  
 \*OVERLAP F.....2  
 \*Used for Advance Beacon control.

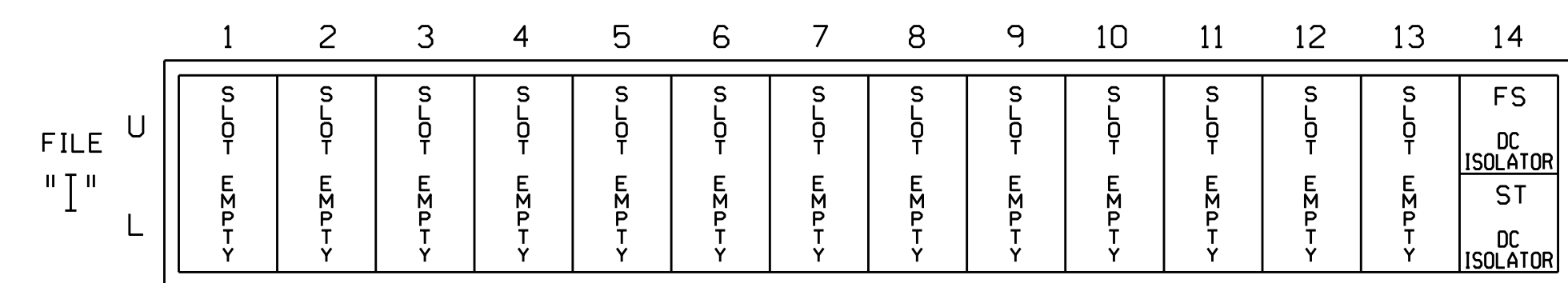
**SIGNAL HEAD HOOK-UP CHART**

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	OLE	2 PED	3	4	4 PED	5	6	6 PED	7	8	OLF
SIGNAL HEAD NO.	NU	21, 22,23	P21,P22, P23,P24	NU	41,42	P41,P42, P43,P44	NU	NU	NU	NU	NU	★
RED		128			101							
YELLOW		129			102							
GREEN		130			103							
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
Hand icon			113			104						
PED YELLOW												*
Person icon			115			106						

NU = Not Used  
 \* Denotes install load resistor. See load resistor installation detail this sheet.  
 ★ Used for Advance Beacon control. See sheets 2 and 3 for programming and wiring details.

**INPUT FILE POSITION LAYOUT**

(front view)



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

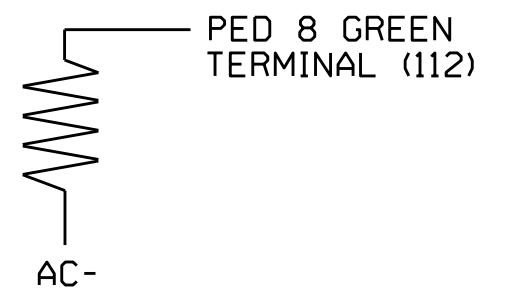
FS = FLASH SENSE  
 ST = STOP TIME

**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**

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



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THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1046  
 DESIGNED: December 2015  
 SEALED: 1/25/2016  
 REVISED: N/A

Electrical Detail - Sheet 1 of 3

Electrical and Programming Details for: **US 70 EB-401 SB/NC 50 SB (N. Dawson Street) at W. Lane Street**

Prepared in the Offices of: **Public Utilities and Safety Services, City of Wake County, North Carolina**

Division 5 Wake County Raleigh

PLAN DATE: December 2015 REVIEWED BY:

PREPARED BY: C. Strickland REVIEWED BY:

REVISIONS INIT. DATE

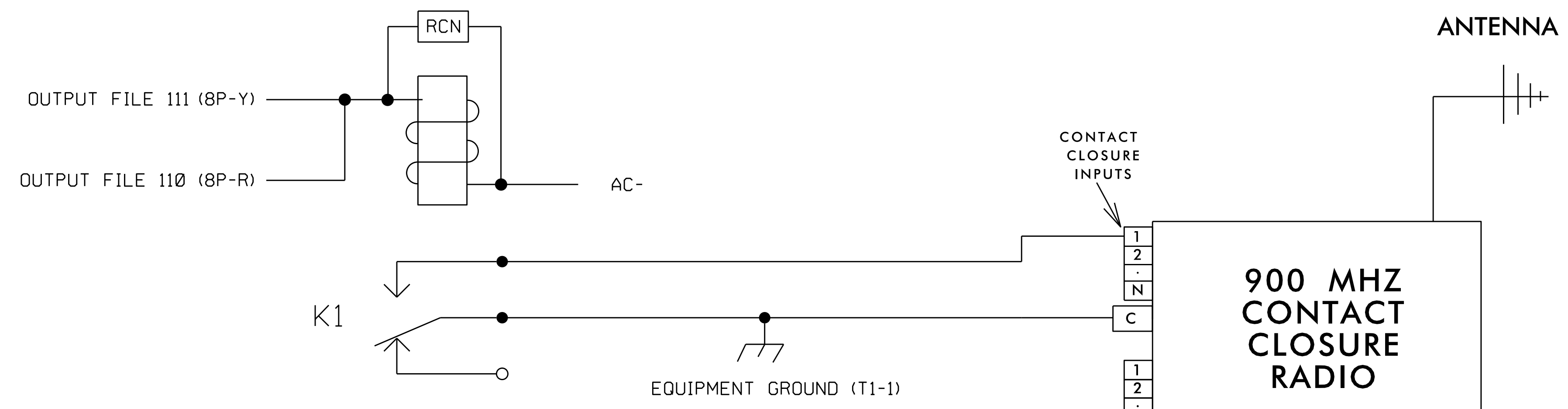
DocuSigned by: **Keith M. Mims** 2/4/2016

SEAL: 036880 ENGINEER: KEITH M. MIMS

SIG. INVENTORY NO. 05-1046



## ADVANCE BEACON RELAY CONTROL DETAIL AT SIGNAL CABINET



### NOTES

1. RELAY SHOWN IN THE DE-ENERGIZED STATE (PHASE 2 ACTIVE AND ADVANCE BEACONS OFF).
2. RELAY K1 IS A SPDT WITH 120VAC COIL WITH AN OCTAL BASE OR APPROVED EQUIVALENT.

## ADVANCE BEACON CONTROL OVERLAP PROGRAMMING DETAIL

### SE-PAC2070 CONTROLLER OVERLAP PROGRAMMING

(program controller as shown below)

FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1-STARTUP & MISC	6-ALT SEQUENCES
2-REMOTE FLASH	7-PORT 1 DATA
<b>3-OVERLAP STANDARD</b>	8-I/O MISC
4-OVERLAP SPECIAL	9-SIG DRV OUT
5-RING STRUCTURE	

F-PRIOR MENU

PRESS 'B' FOUR TIMES

SE-PAC OVERLAP - E	(0-NO/1-YES)
OVL PHASES:	010000000 0000000
PHS/CHN:	123456789 0123456789 01234
OVL CHN(S):	010000000 0000000000 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

PRESS 'B' ONE TIME

SE-PAC OVERLAP - F	(0-NO/1-YES)
OVL PHASES:	010000000 0000000
PHS/CHN:	123456789 0123456789 01234
OVL CHN(S):	000000000 0010000000 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

PRESS 'F' TO RETURN TO UNIT DATA

SE-EPAC UNIT DATA	PRESS # DESIRED
1-STARTUP & MISC	6-ALT SEQUENCES
2-REMOTE FLASH	7-PORT 1 DATA
<b>3-OVERLAP STANDARD</b>	8-I/O MISC
<b>4-OVERLAP SPECIAL</b>	9-SIG DRV OUT
5-RING STRUCTURE	

F-PRIOR MENU

SE-PAC QVLP.A...B...C...D...E...F...G...H.	
TR GRN	0 0 0 0 13 0 0 0
YEL/10	00 00 00 00 37 00 00 00
RED/10	00 00 00 00 13 00 00 00
-G/Y	0 0 0 0 0 0 0 0
+GRN	0 0 0 0 0 0 0 0

(-) #-PH G/Y KILLS QVLP= (=) #-PH G STRT

A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

OVERLAP PROGRAMMING COMPLETE

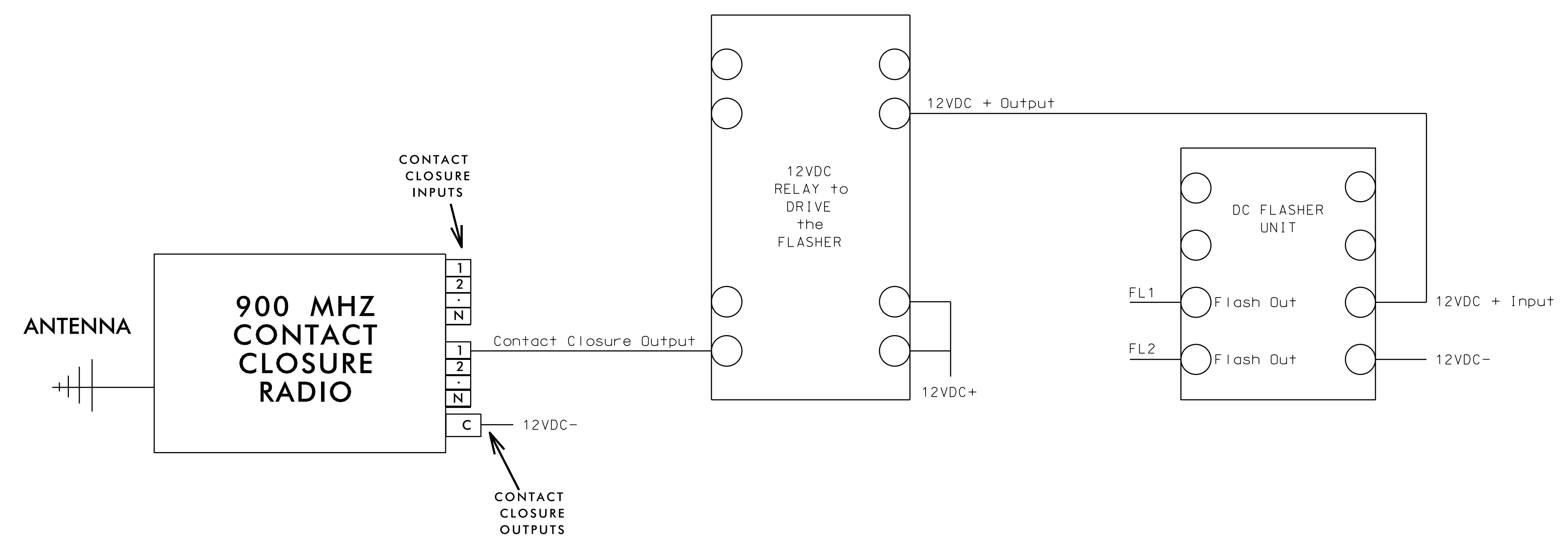
NOTE: OVERLAP TIMING USED TO ALLOW ADVANCE BEACONS TO FLASH 13 SECONDS PRIOR TO THE END OF PHASE 2 GREEN.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1046  
 DESIGNED: December 2015  
 SEALED: 1/25/2016  
 REVISED: N/A

Electrical Detail - Sheet 2 of 3		<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>
ELECTRICAL AND PROGRAMMING DETAILS FOR:	<b>US 70 EB-401 SB/NC 50 SB</b> (N. Dawson Street) at W. Lane Street	SEAL 
Prepared in the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529	Division 5 Wake County Raleigh PLAN DATE: December 2015 REVIEWED BY: PREPARED BY: C. Strickland REVIEWED BY:	REVISIONS INIT. DATE DocuSigned by: Keith M. Mims 2/4/2016 2F80786EBCD344S DATE SIG. INVENTORY NO. 05-1046

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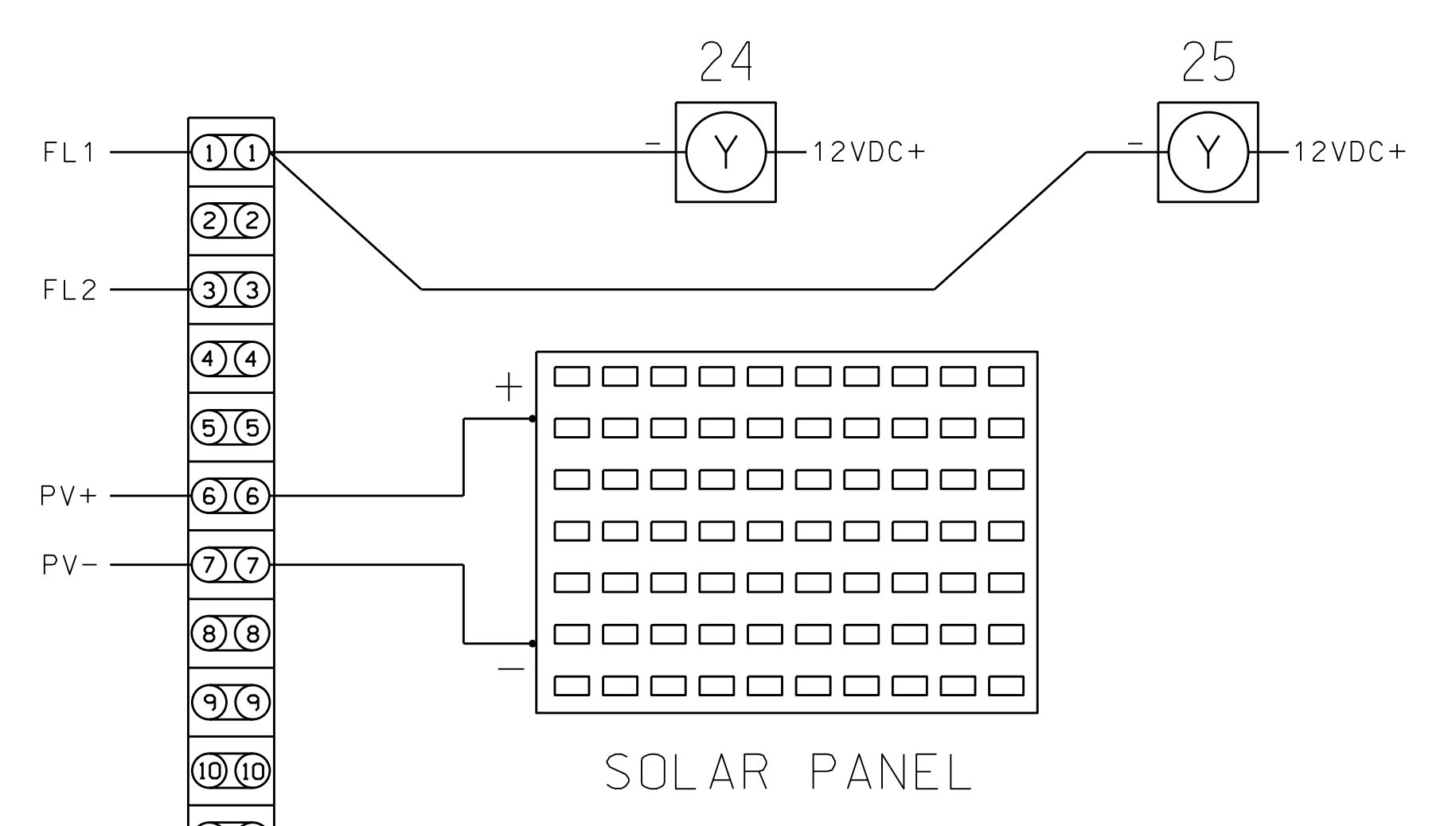
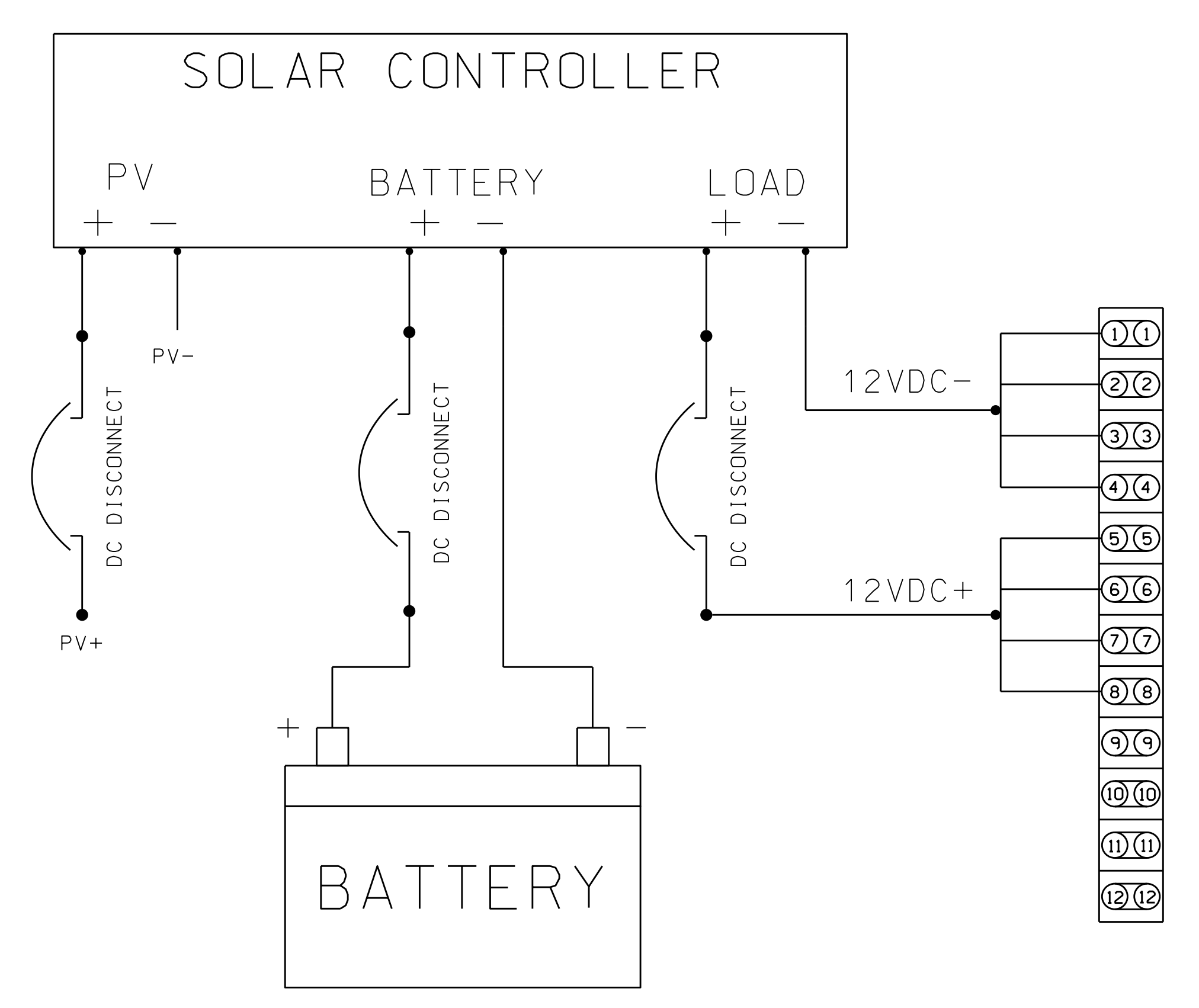
## ADVANCE BEACON RELAY CONTROL AND SIGN WIRING DETAIL AT REMOTE CABINET



### CABINET NOTES

1. ALL EQUIPMENT SHALL BE LOCATED WITHIN POLE MOUNTED TYPE 3R CABINET.
2. DC FLASHER UNIT SWITCHES THE NEGATIVE SIDE OF THE LOAD.
3. POWER FOR ALL COMPONENTS LOCATED AT REMOTE SITE SHALL BE SOURCED BY SOLAR POWER SYSTEM.
4. ALL WIRES ARE 16 AWG.

### REMOTE CABINET SOLAR POWER



THIS ELECTRICAL DETAIL IS FOR  
 THE SIGNAL DESIGN: 05-1046  
 DESIGNED: December 2015  
 SEALED: 1/25/2016  
 REVISED: N/A

Electrical Detail - Sheet 3 of 3

Prepared in the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529	<b>US 70 EB-401 SB/NC 50 SB</b> (N. Dawson Street) at W. Lane Street	SEAL 						
	Division 5      Wake County      Raleigh							
PLAN DATE: December 2015      REVIEWED BY:	PREPARED BY: C. Strickland      REVIEWED BY:							
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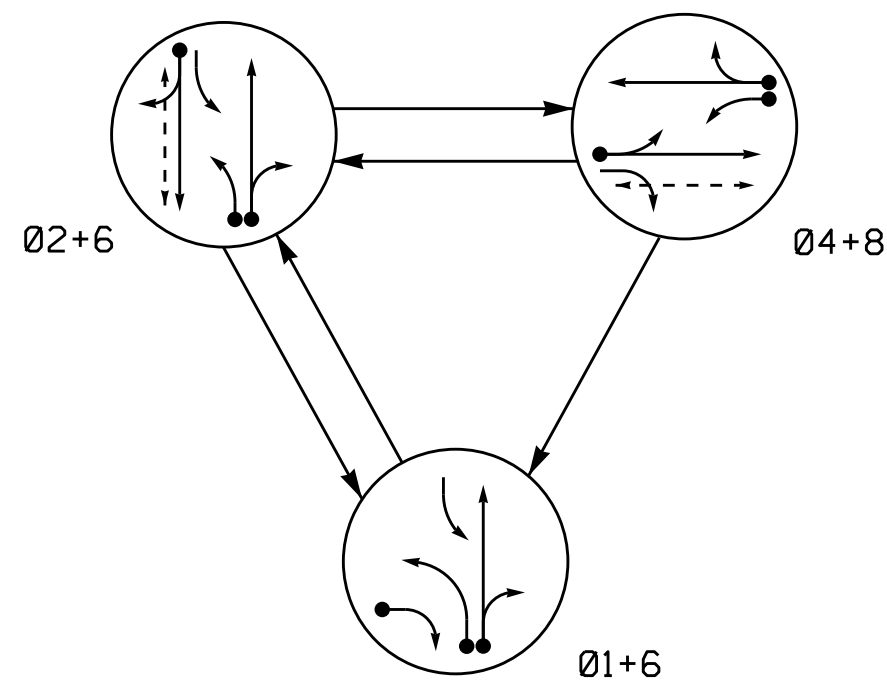








PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE				
	Ø1+6	Ø2+6	Ø4+8	F	FL
11	—	—	—	—	—
21, 22, 24	R	G	R	Y	
23	—	—	—	—	—
41, 42	R	R	G	R	
61, 62	G	G	R	Y	
81	R	R	G	R	
82	—	—	—	—	—
P21, P22	DW	W	DW	DRK	
P81, P82	DW	DW	W	DRK	

W - Walk  
 DW - Don't Walk  
 DRK - Dark

SE-PAC 2070 LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW EXISTING	ASSIGNED PHASE	DETECTOR PROGRAMMING												
						TIMING		OPERATION MODE							SYSTEM LOOPS		STATUS	
						DELAY	EXTEND (STRETCH)	VEHICLE	PEDESTRIAN	1 CALL	STOP A	STOP B	PROTIFER	LEFT THROUGH	AND	SWITCH	NEW	EXISTING
1A	6X40	2-4-2	0	X	1	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-
1B	6X40	2-4-2	0	X	1	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-
2A	6X6	4	70	X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-
4A	6X40	2-4-2	0	X	4	3 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-
4B	6X40	2-4-2	0	X	4	10 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-
6A	6X6	4	70	X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-
8A	6X40	2-4-2	0	X	8	3 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	X	-

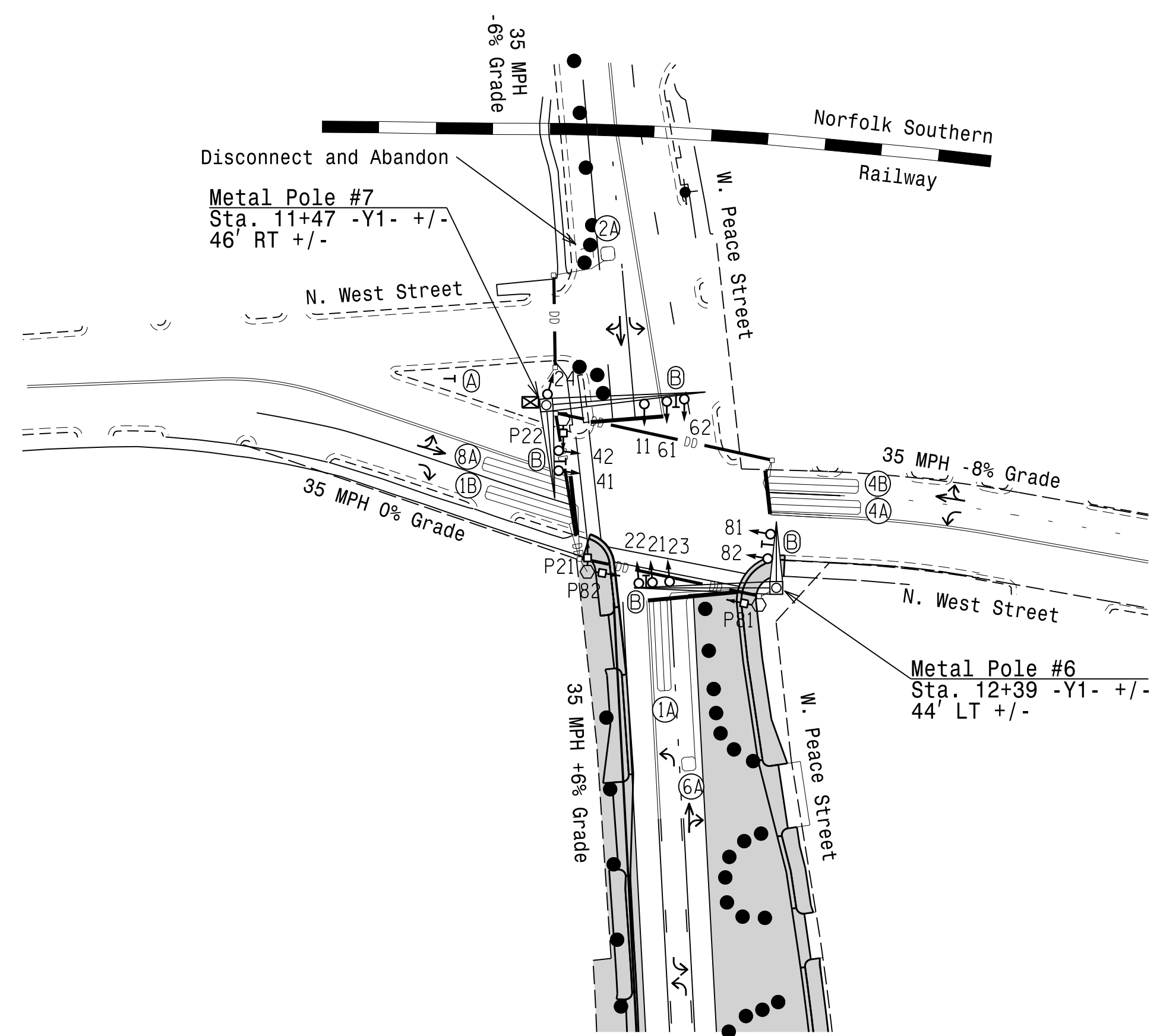
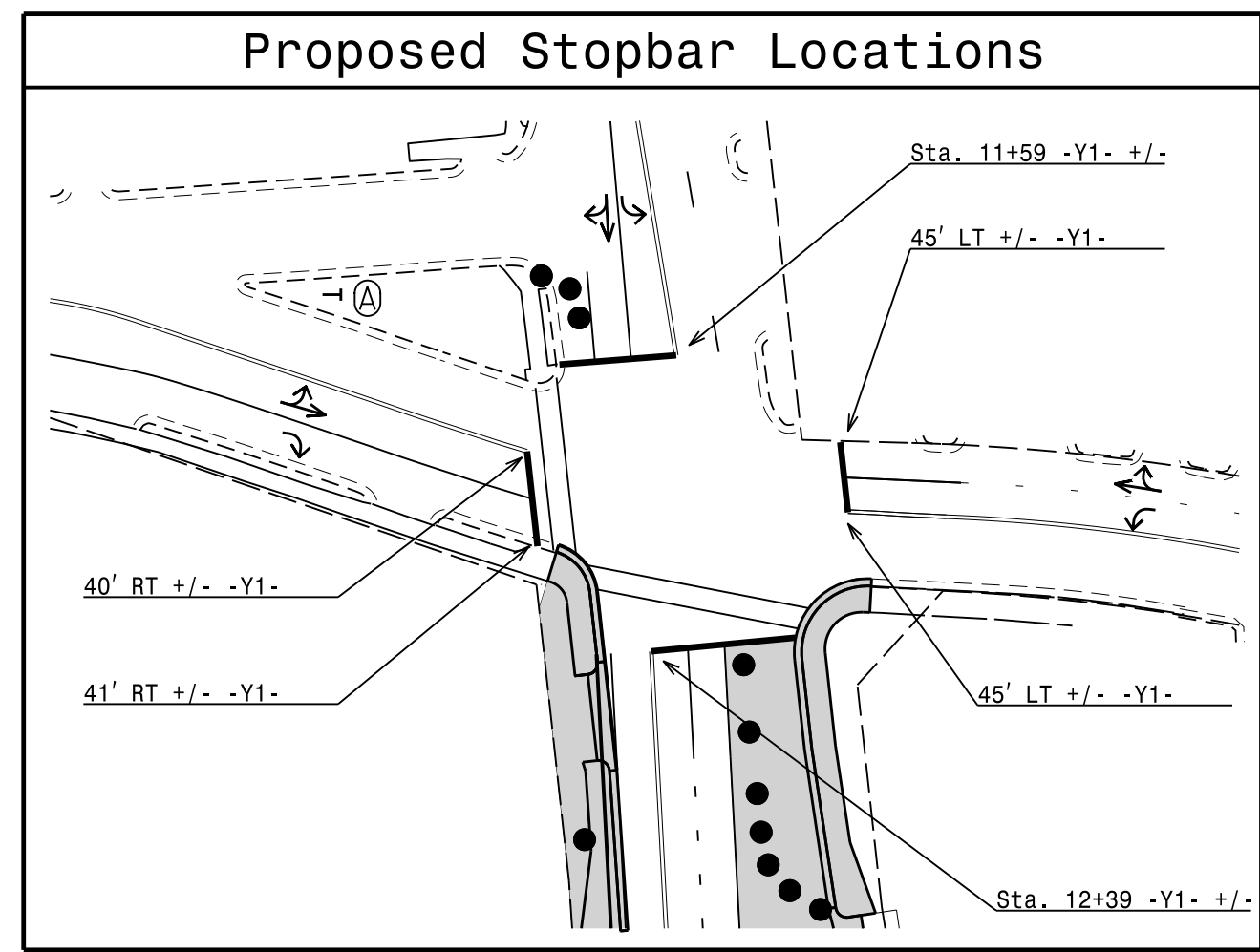
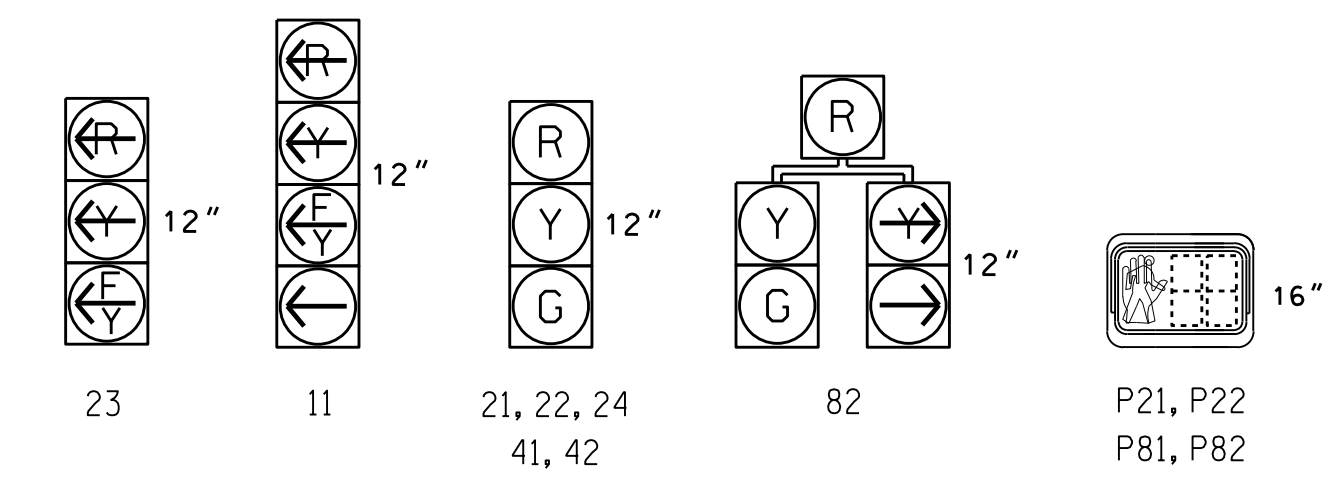
3 Phase Fully Actuated (Raleigh Signal System)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 may be lagged.
- Disconnect and abandon existing loop 2B.
- 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.
- Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for pushbutton location details.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Relocate existing street signs or install new signs as provided by the city of Raleigh.

SIGNAL FACE I.D.

All Heads L.E.D.



SE-PAC 2070 TIMING CHART

FEATURE	PHASE				
	1	2	4	6	8
Min Green *	7	10	7	10	7
Passage Gap *	2.0	3.0	1.0	3.0	2.0
Maximum Green *	15	30	20	30	20
Yellow Change	3.0	4.3	4.5	4.3	3.8
Red Clear	2.1	1.6	1.6	1.6	1.5
Walk *	-	7	-	-	4
Pedestrian Clear	-	9	-	-	13
Added Initial *	-	-	-	-	-
Maximum Initial *	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-
Time To Reduce *	-	-	-	-	-
Minimum Gap	-	-	-	-	-
Recall Mode	-	MIN RECALL	-	MIN RECALL	-
Vehicle Call Memory	NON-LOCK	LOCK	NON-LOCK	LOCK	NON-LOCK
Dual Entry	-	ON	-	-	ON
Simultaneous Gap	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.

LEGEND

PROPOSED	EXISTING
	N/A
	N/A

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Signal Upgrade - Temp. Design 1 (TMP Area II, Phase I, Stage I)

**W. Peace Street at N. West Street**

Division 5 Wake County Raleigh

PLAN DATE: December 2015 REVIEWED BY:

PREPARED BY: I. O. Umozurike REVIEWED BY:

REVISIONS: \_\_\_\_\_ INIT. DATE

SCALE 0 50

1"=50'

1/29/2016

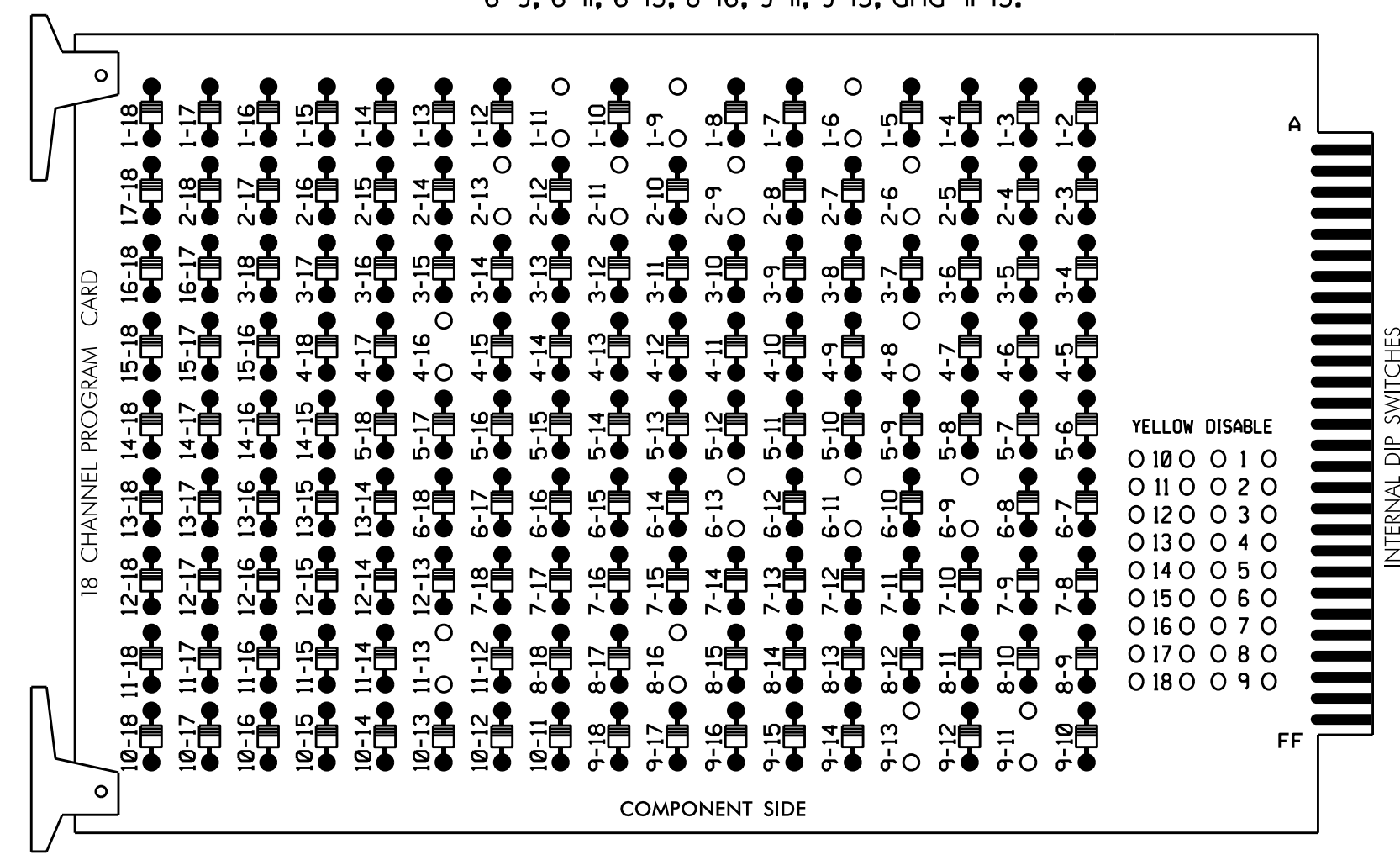
SIG. INVENTORY NO. R-0046T1

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

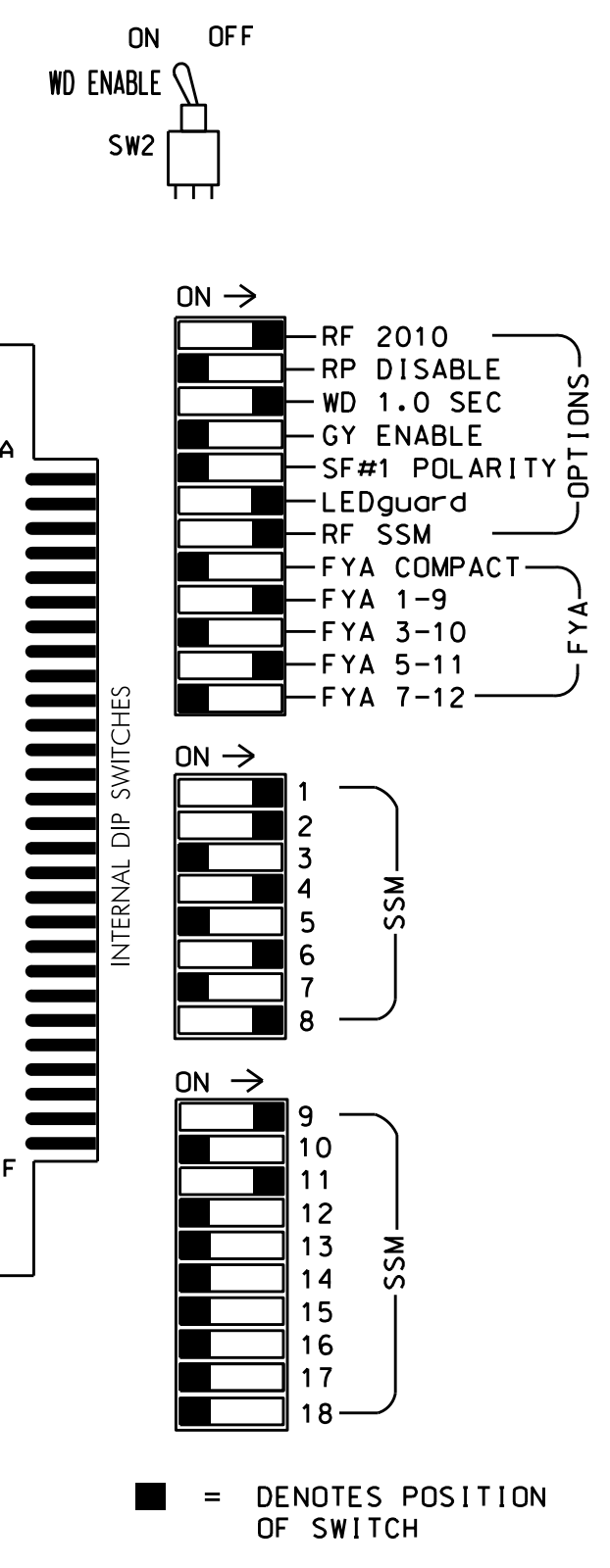
REMOVE DIODE JUMPERS 1-6, 1-9, 1-11, 2-6, 2-9, 2-11, 2-13, 4-8, 4-16, 6-9, 6-11, 6-13, 8-16, 9-11, 9-13, and 11-13.



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.
- Program controller to start up in phases 2 and 6 green.
- Enable simultaneous gap-out feature, on controller unit, for all phases.
- Program phases 4 and 8, on controller unit, for dual entry.
- The cabinet and controller are part of the Raleigh Signal System.

**EQUIPMENT INFORMATION**

CONTROLLER.....2070  
 CABINET.....332 W/ AUX  
 SOFTWARE.....SE-PAC2070  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...18 WITH AUX FILE  
 LOAD SWITCHES USED.....S1,S2,S3,S5,S8,S11,S12,  
 AUX S1,AUX S4  
 PHASES USED.....1,2,2PED,4,6,8,8PED  
 OVERLAP A.....\*  
 OVERLAP B.....NOT USED  
 OVERLAP C.....\*  
 OVERLAP D.....NOT USED  
 \* SEE SHEET 2 FOR OVERLAP PROGRAMMING

**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*	82	21,22 24	P21, P22	NU	41,42	NU	NU	61,62	NU	NU	81,82	P81, P82	11*	NU	NU	23*	NU
RED	*	128			101			134			107							
YELLOW		129			102			135			108							
GREEN		130			103			136			109							
RED ARROW														A121				A114
YELLOW ARROW		126												A122				A115
FLASHING YELLOW ARROW														A123				A116
GREEN ARROW	127	127																
Hand icon						113												110
Walking person icon						115												112

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)

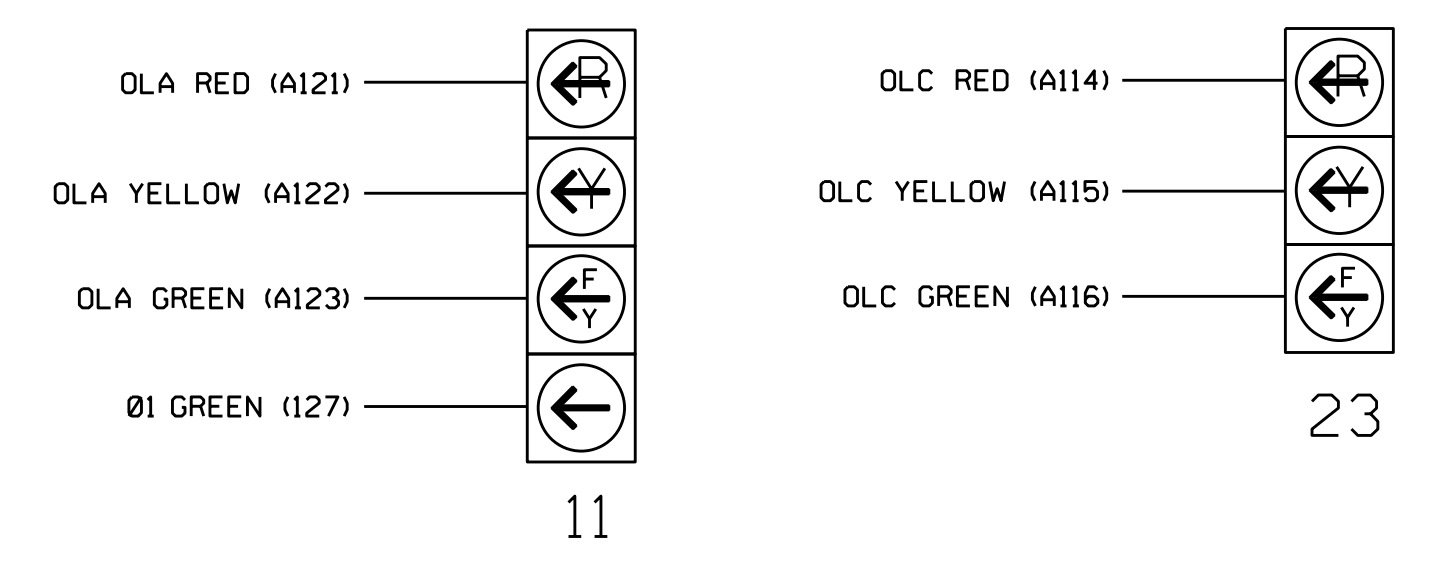
FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	∅ 1 1A	∅ 1 1B	∅ FS	∅ FS	∅ FS	∅ 4 4A	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ 2 PED DC ISOLATOR	NOT USED	FS DC ISOLATOR
L	NOT USED	∅ 2 2A	∅ FS	∅ FS	∅ FS	∅ 4 4B	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ 8 PED DC ISOLATOR	ST DC ISOLATOR
U	∅ S	∅ 6 6A	∅ FS	∅ FS	∅ FS	∅ 8 8A	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS
L	∅ FS	NOT USED	∅ FS	∅ FS	∅ FS	NOT USED	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS

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

**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.

**FYA SIGNAL WIRING DETAIL**  
(wire signal heads as shown)

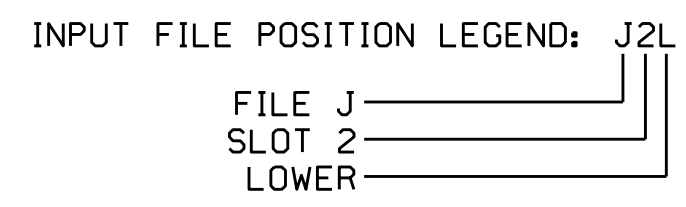


**INPUT FILE CONNECTION & PROGRAMMING CHART**

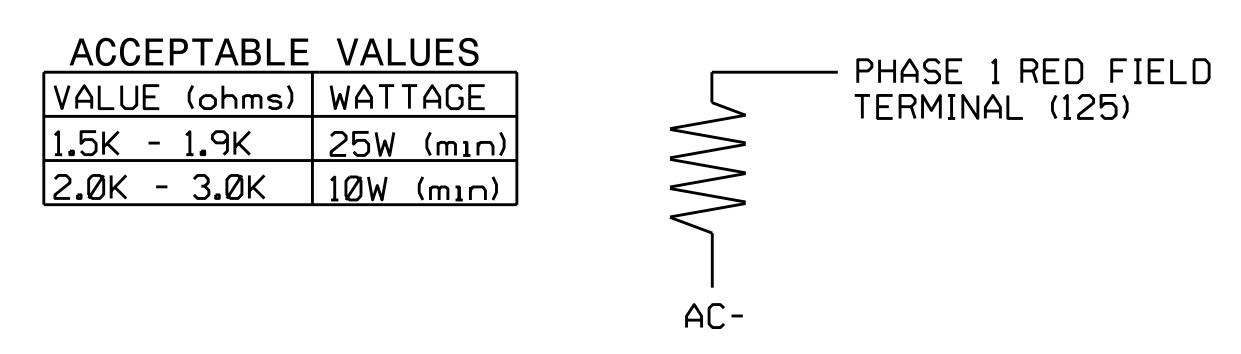
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
1A <sup>1</sup>	TB2-1,2	I1U	56	1	1	15	
	-	J4U	48	25	6		
1B	TB2-5,6	I2U	39	3	1	15	
2A	TB2-7,8	I2L	43	4	2		
4A	TB4-9,10	I6U	41	11	4	3	
4B	TB4-11,12	I6L	45	12	4	10	
6A	TB3-5,6	J2U	40	21	6		
8A	TB5-9,10	J6U	42	31	8	3	
PED PUSH BUTTONS							
P21,P22	TB8-4,6	I12U	67	PED 2	2 PED		
P81,P82	TB8-8,9	I13L	70	PED 8	8 PED		

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

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



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



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

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: R-0046T1  
 DESIGNED: December 2015  
 SEALED: 1/29/2016  
 REVISED: N/A

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Electrical Detail - Temp Design 1 (TMP Area II, Phase I, Stage I) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared In the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529	W. Peace Street at N. West Street		SEAL 
	Division 5 Wake County Raleigh PLAN DATE: January 2016 REVIEWED BY: T. Joyce PREPARED BY: S. Armstrong REVIEWED BY:	REVISIONS INIT. DATE	



## PROTECTED AND PERMISSIVE PHASES FOR FLASHING YELLOW ARROW

(program controller as shown below)  
FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1-STARTUP & MISC	6-ALT SEQUENCES
2-REMOTE FLASH	7-PORT 1 DATA
3-OVERLAP STANDARD	8-I/O MISC
4-OVERLAP SPECIAL	9-SIG DRV OUT
5-RING STRUCTURE	
F-PRIOR MENU	

SE-PAC OVL P.	A...	B...	C...	D...	E...	F...	G...	H.
TR GRN	0	0	0	0	0	0	0	0
YEL/10	40	40	40	40	40	40	40	40
RED/10	20	20	20	20	20	20	20	20
-G/Y	1	0	5	0	0	0	0	0
+GRN	2	0	6	0	0	0	0	0

NOTE: THIS PROGRAMMING IS REQUIRED FOR SIGNAL HEADS 11 AND 23 SO THAT THE SOLID GREEN ARROW TURNS ON EXCLUSIVELY DURING PROTECTED GREEN PHASE 1, AND THE FLASHING YELLOW ARROWS TURN ON EXCLUSIVELY DURING PERMITTED GREEN PHASES 2 & 6.

PROTECTED PHASES →  
PERMISSIVE PHASES →

PPLT DEFINITION PROGRAMMING COMPLETE  
PRESS 'F' TO RETURN TO UNIT DATA

## SE-PAC2070 CONTROLLER OVERLAP PROGRAMMING

(program controller as shown below)  
FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1-STARTUP & MISC	6-ALT SEQUENCES
2-REMOTE FLASH	7-PORT 1 DATA
3-OVERLAP STANDARD	8-I/O MISC
4-OVERLAP SPECIAL	9-SIG DRV OUT
5-RING STRUCTURE	
F-PRIOR MENU	

DO NOT enter any OVL PHASES! →

SE-PAC OVERLAP - A	(0-NO/1-YES)
OVL PHASES:	00000000 0000000
PHS/CHN:	123456789 0123456789 01234
OVL CHN(S):	00000000 00010000 00000
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU	

DO NOT enter any OVL PHASES! →

SE-PAC OVERLAP - C	(0-NO/1-YES)
OVL PHASES:	00000000 0000000
PHS/CHN:	123456789 0123456789 01234
OVL CHN(S):	00000000 000001000 00000
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU	

OVERLAP PROGRAMMING COMPLETE  
PRESS 'F' TO RETURN TO UNIT DATA

## INIT & N.A. RESP PROGRAMMING DETAIL

(program controller as shown below)  
From Main Menu, press '3' (Phase Data)

SE-PAC PHASE DATA	PRESS # DESIRED
1-VEHICLE TIMES	6-N.LOCK & MISC
2-DENSITY TIMES	7-SPEC. SEQUENCE
3-PEDEST. TIMES	8-SPEC. DETECTOR
4-INIT & N.A. RESP	9-PHASE COPY
5-V & P RECALLS	0-MISC PED OPTIONS
F-PRIOR MENU	

Phases 3, 5, & 7 NOT used!

PHASE.....	1...	2...	3...	4...	5...	6...	7...	8...	9
INITIAL	1	4	0	1	0	4	0	1	0
NA RESP	0	1	0	2	0	1	0	2	0


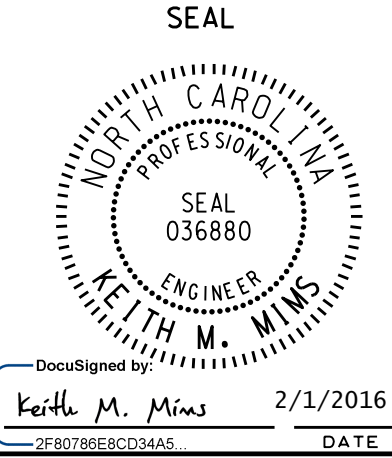
CODES.....	0....	1....	2....	3....	4....	5
INITIAL	NONE	INACT	RED	YEL	GRN	DRK
NA RESP	NONE	NA1	NA2	BOTH	---	---

INIT & N.A. RESP programming complete.

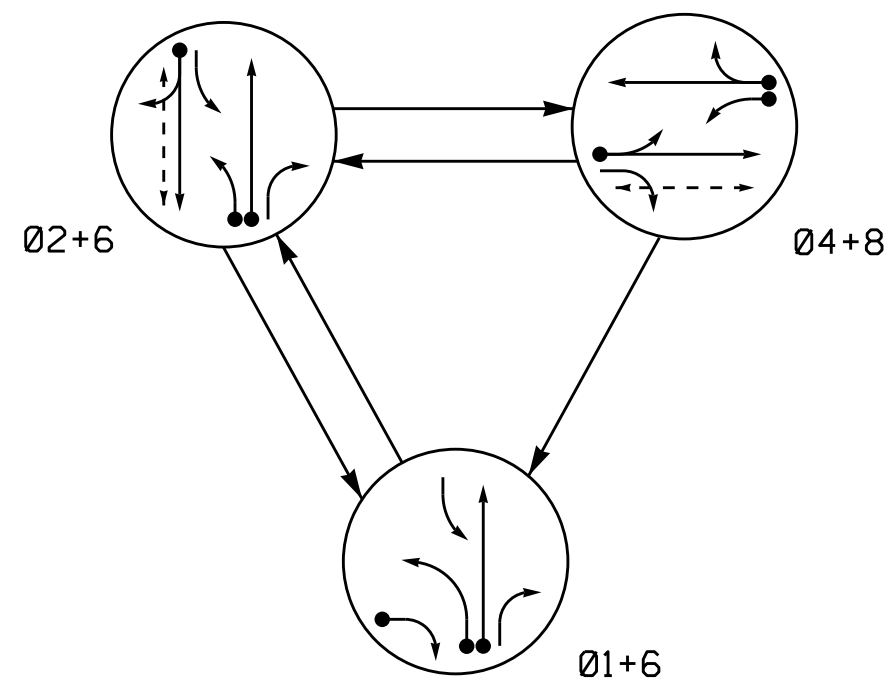
DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

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THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: R-0046T1  
DESIGNED: December 2015  
SEALED: 1/29/2016  
REVISED: N/A

ELECTRICAL AND PROGRAMMING DETAILS FOR:  Prepared In the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529	<b>W. Peace Street at N. West Street</b>		SEAL 
	Division 5 Wake County Raleigh PLAN DATE: January 2016 REVIEWED BY: T. Joyce PREPARED BY: S. Armstrong REVIEWED BY:	DocuSigned by: Keith M. Mins 2/1/2016 2F8078E6CD3445 DATE	
	REVISIONS _____ INIT. DATE _____ _____	SIG. INVENTORY NO. R-0046T1	

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE			
	Ø1+6	Ø2+6	Ø4+8	F
11	←	←	←	←
21, 22, 24	R	G	R	Y
23	←	←	←	←
41, 42	R	R	G	R
61, 62	G	G	R	Y
81	R	R	G	R
82	←	←	←	←
P21, P22	DW	W	DW	DRK
P81, P82	DW	DW	W	DRK

W - Walk  
DW - Don't Walk  
DRK - Dark

SE-PAC 2070 LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW EXISTING	ASSIGNED PHASE	DETECTOR PROGRAMMING															
						TIMING		OPERATION MODE										SYSTEM LOOPS		STATUS	
						DELAY	EXTEND (STRETCH)	VEHICLE	PEDESTRIAN	1 CALL	STOP A	STOP B	PROTIFER	LEFT TURN THROUGH	AND	SWITCH	NEW	EXISTING			
1A	6X40	2-4-2	0	X	1	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X	
1B	6X40	2-4-2	0	- X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X	
2A	6X6	4	70	- X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X	
4A	6X40	2-4-2	0	- X	4	3 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X	
4B	6X40	2-4-2	0	- X	4	10 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X	
6A	6X6	4	70	X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X	
8A	6X40	2-4-2	0	- X	8	3 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	-	X	

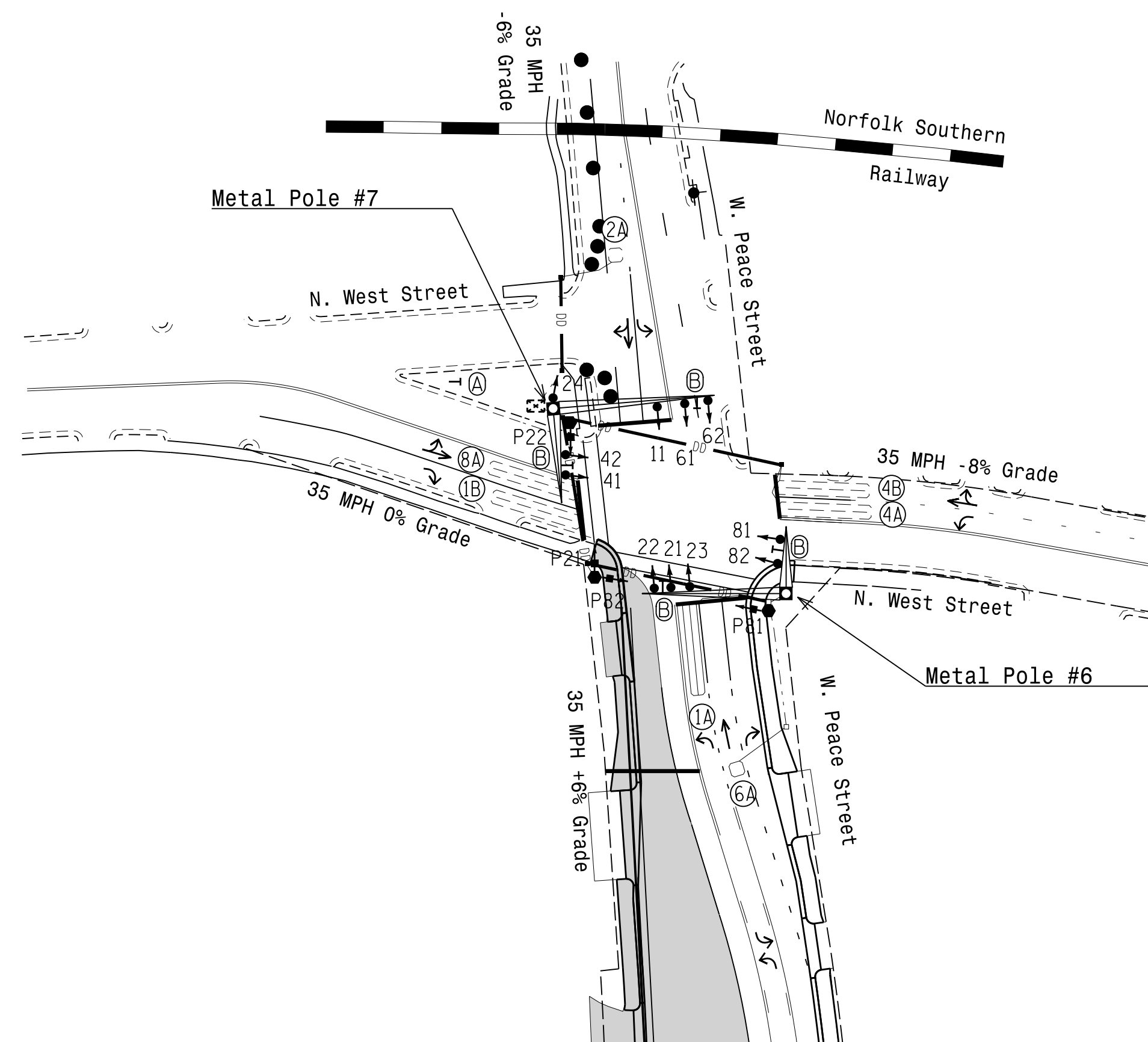
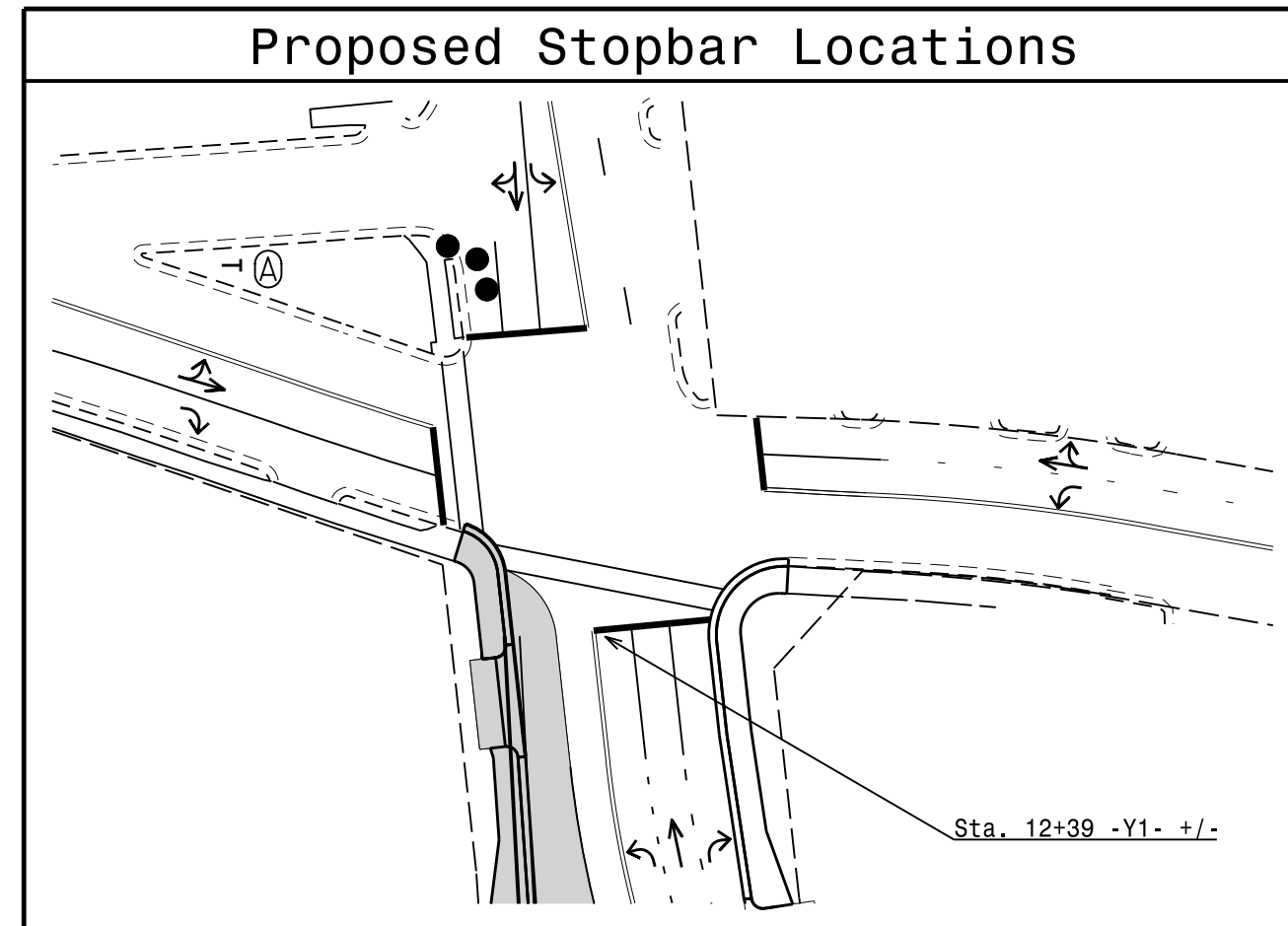
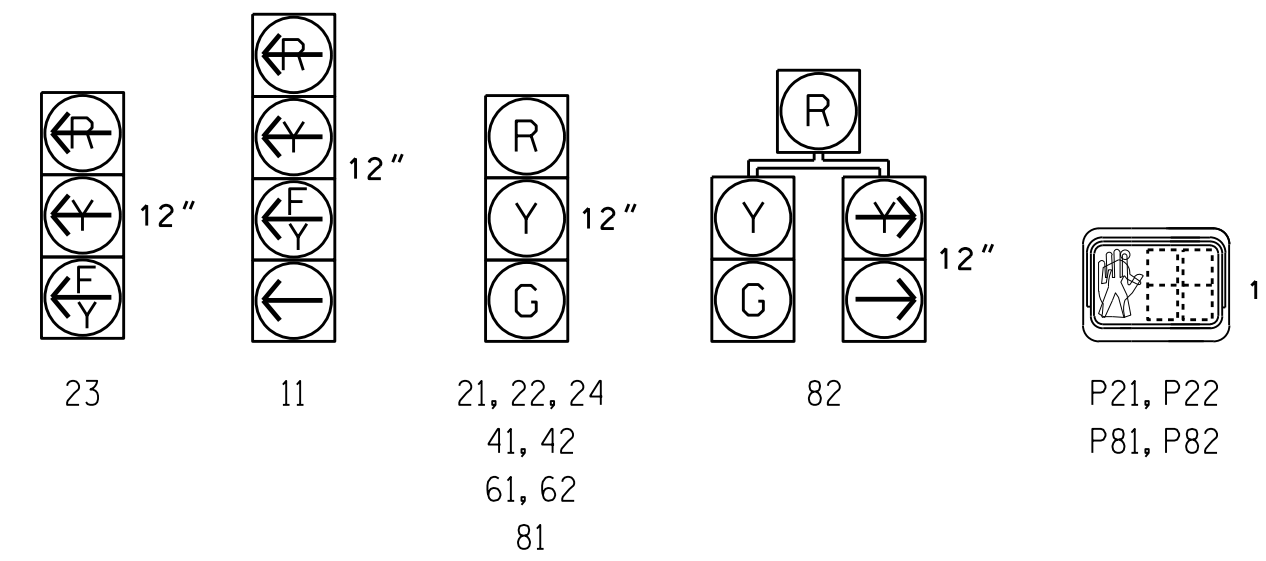
3 Phase Fully Actuated (Raleigh Signal System)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 may be lagged.
- Reposition existing signal heads numbered 11, 21, 22, 23, 61 and 62.
- Set all detector units to presence mode.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for pushbutton location details.
- 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.

SIGNAL FACE I.D.

All Heads L.E.D.



SE-PAC 2070 TIMING CHART

FEATURE	PHASE				
	1	2	4	6	8
Min Green *	7	10	7	10	7
Passage Gap *	2.0	3.0	1.0	3.0	2.0
Maximum Green *	15	30	20	30	20
Yellow Change	3.0	4.3	4.5	4.3	3.8
Red Clear	2.1	1.6	1.6	1.6	1.5
Walk *	-	7	-	-	4
Pedestrian Clear	-	9	-	-	13
Added Initial *	-	-	-	-	-
Maximum Initial *	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-
Time To Reduce *	-	-	-	-	-
Minimum Gap	-	-	-	-	-
Recall Mode	-	MIN RECALL	-	MIN RECALL	-
Vehicle Call Memory	NON-LOCK	LOCK	NON-LOCK	LOCK	NON-LOCK
Dual Entry	-	-	ON	-	ON
Simultaneous Gap	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.

LEGEND

PROPOSED	EXISTING

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Signal Upgrade - Temp. Design 2 (TMP Area II, Phase I Stage II)

W. Peace Street at N. West Street

Division 5 Wake County Raleigh

PLAN DATE: December 2015 REVIEWED BY:

PREPARED BY: I. O. Umozurike REVIEWED BY:

REVISIONS: \_\_\_\_\_ INIT. DATE

SCALE: 0 50 1"=50'

SEAL

PROFESSIONAL ENGINEER

ROBERT J. ZIEMBA

1/29/2016

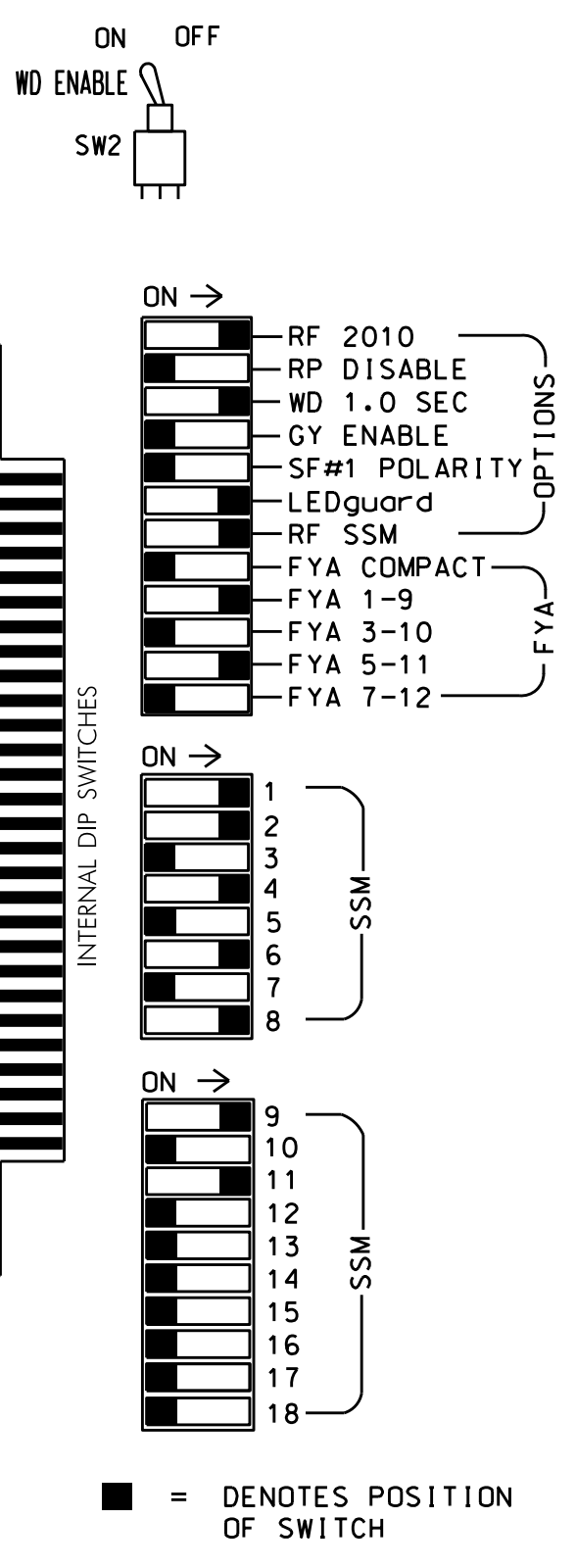
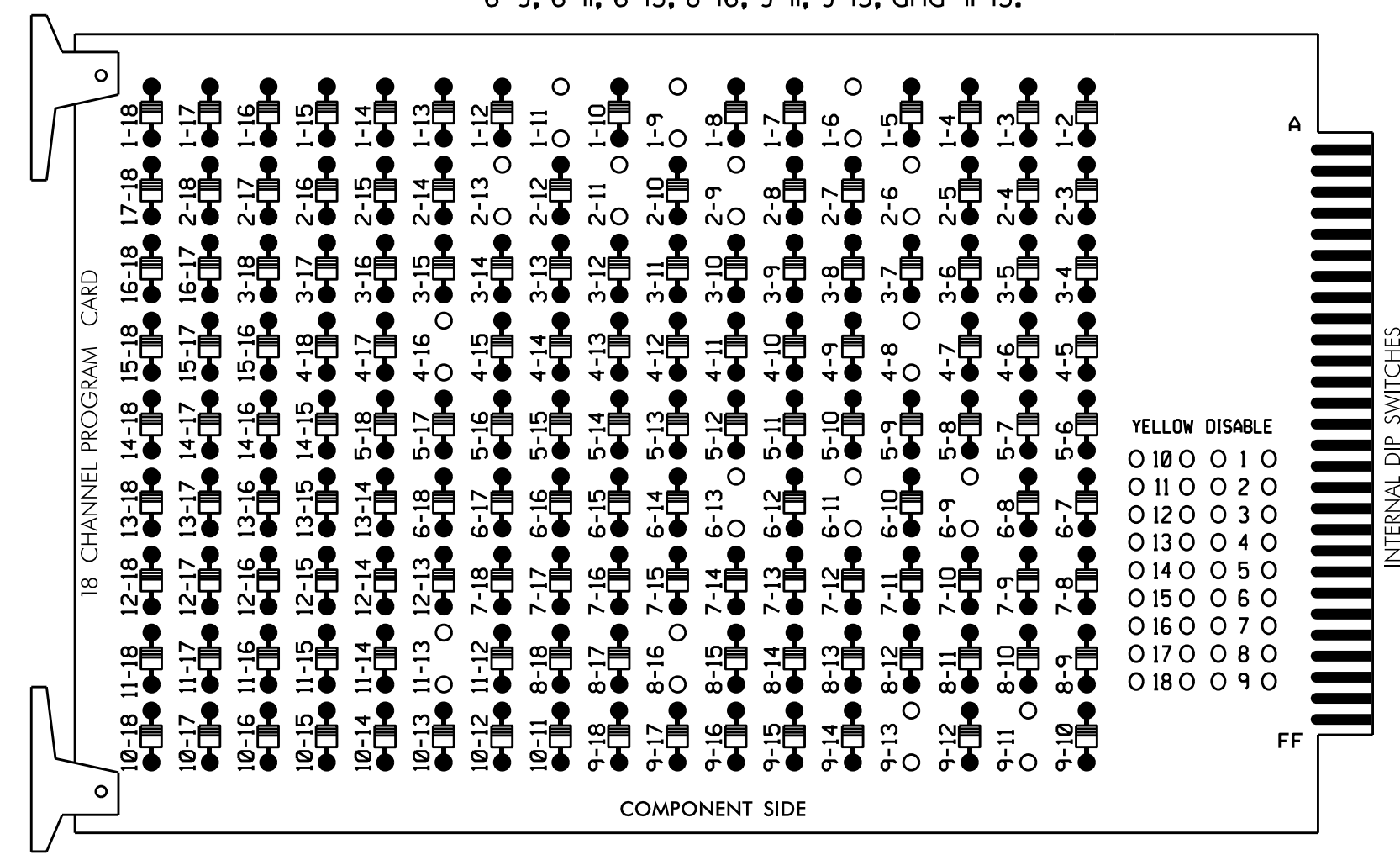
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**EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL**  
(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-6, 1-9, 1-11, 2-6, 2-9, 2-11, 2-13, 4-8, 4-16, 6-9, 6-11, 6-13, 8-16, 9-11, 9-13, and 11-13.



- 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.

REMOVE JUMPERS AS SHOWN

**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.
- Program controller to start up in phases 2 and 6 green.
- Enable simultaneous gap-out feature, on controller unit, for all phases.
- Program phases 4 and 8, on controller unit, for dual entry.
- The cabinet and controller are part of the Raleigh Signal System.

**EQUIPMENT INFORMATION**

CONTROLLER.....2070  
 CABINET.....332 W/ AUX  
 SOFTWARE.....SE-PAC2070  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...18 WITH AUX FILE  
 LOAD SWITCHES USED.....S1,S2,S3,S5,S8,S11,S12,  
 AUX S1,AUX S4  
 PHASES USED.....1,2,2PED,4,6,8,8PED  
 OVERLAP A.....\*  
 OVERLAP B.....NOT USED  
 OVERLAP C.....\*  
 OVERLAP D.....NOT USED  
 \* SEE SHEET 2 FOR OVERLAP PROGRAMMING

**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*	82	21,22 24	P21, P22	NU	41,42	NU	NU	61,62	NU	NU	81,82	P81, P82	11*	NU	NU	23*	NU
RED	*	128			101			134				107						
YELLOW		129			102			135				108						
GREEN		130			103			136				109						
RED ARROW														A121				A114
YELLOW ARROW		126												A122				A115
FLASHING YELLOW ARROW														A123				A116
GREEN ARROW	127	127																
Hand						113												110
Walking						115												112

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

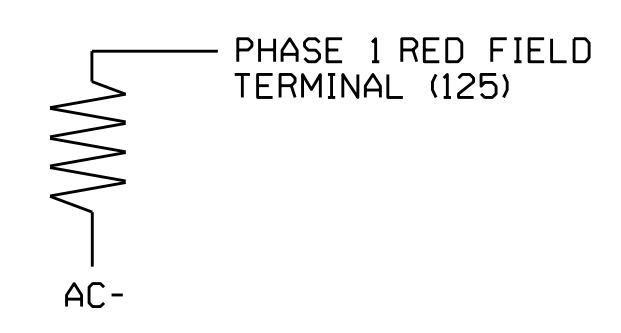
**INPUT FILE POSITION LAYOUT**  
(front view)

FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	∅ 1 1A	∅ 1 1B	∅ FS	∅ FS	∅ FS	∅ 4 4A	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ 2 PED DC ISOLATOR	NOT USED	FS DC ISOLATOR
L	NOT USED	∅ 2 2A	∅ FS	∅ FS	∅ FS	∅ 4 4B	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ 8 PED DC ISOLATOR	ST DC ISOLATOR
U	∅ S	∅ 6 6A	∅ FS	∅ FS	∅ FS	∅ 8 8A	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS
L	∅ FS	NOT USED	∅ FS	∅ FS	∅ FS	NOT USED	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS	∅ FS

EX.: 1A, 2A, ETC. = LOOP NO.'S  
 FS = FLASH SENSE  
 ST = STOP TIME

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

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



**COUNTDOWN PEDESTRIAN SIGNAL OPERATION**

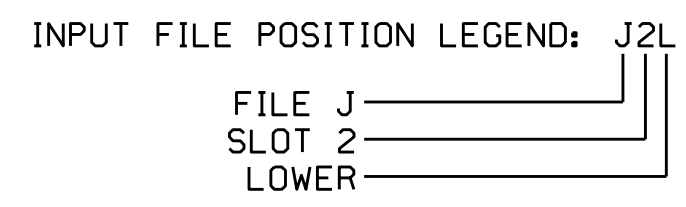
Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

**INPUT FILE CONNECTION & PROGRAMMING CHART**

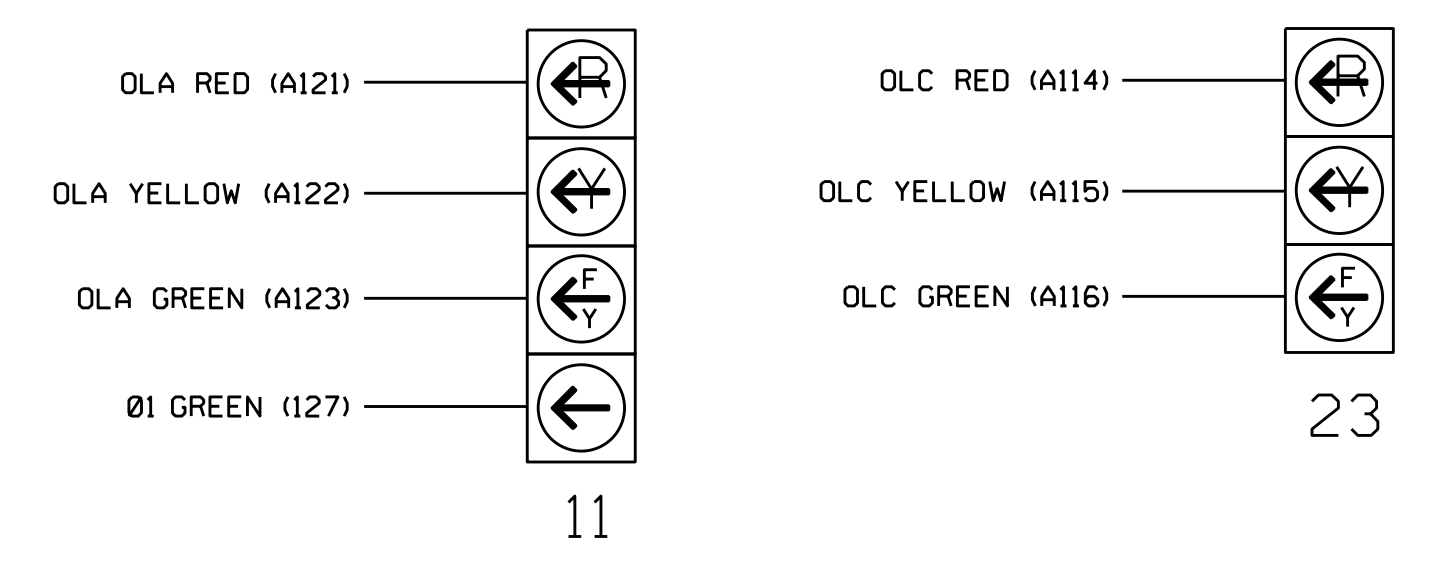
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
1A <sup>1</sup>	TB2-1,2	I1U	56	1	1	15	
	-	J4U	48	25	6		
1B	TB2-5,6	I2U	39	3	1	15	
2A	TB2-7,8	I2L	43	4	2		
4A	TB4-9,10	I6U	41	11	4	3	
4B	TB4-11,12	I6L	45	12	4	10	
6A	TB3-5,6	J2U	40	21	6		
8A	TB5-9,10	J6U	42	31	8	3	
PED PUSH BUTTONS							
P21,P22	TB8-4,6	I12U	67	PED 2	2 PED		
P81,P82	TB8-8,9	I13L	70	PED 8	8 PED		

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

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



**FYA SIGNAL WIRING DETAIL**  
(wire signal heads as shown)



NOTE: See sheet 2 for Protected & Permitted Phases programming.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: R-0046T2  
 DESIGNED: December 2015  
 SEALED: 1/29/2016  
 REVISED: N/A

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Electrical Detail - Temp Design 2 (TMP Area II, Phase I, Stage II) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared In the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529	W. Peace Street at N. West Street		SEAL 
	Division 5 Wake County Raleigh PLAN DATE: January 2016 REVIEWED BY: T. Joyce PREPARED BY: S. Armstrong REVIEWED BY:	REVISIONS INIT. DATE	

01-EEB-2016-13-52  
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 S:\IT\SAS\15\Sig\01\work\hgr\0046\sig\_elec\xxx.dgn  
 S:\IT\SAS\15\Sig\01\work\hgr\0046\sig\_elec\xxx.dgn

### PROTECTED AND PERMISSIVE PHASES FOR FLASHING YELLOW ARROW

(program controller as shown below)  
FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA		PRESS # DESIRED
1-STARTUP & MISC	6-ALT SEQUENCES	
2-REMOTE FLASH	7-PORT 1 DATA	
3-OVERLAP STANDARD	8-I/O MISC	
4-OVERLAP SPECIAL	9-SIG DRV OUT	
5-RING STRUCTURE		F-PRIOR MENU

SE-PAC OVL P.A...B...C...D...E...F...G...H.	
TR GRN	0 0 0 0 0 0 0 0
YEL/10	40 40 40 40 40 40 40 40
RED/10	20 20 20 20 20 20 20 20
-G/Y	1 0 5 0 0 0 0 0
+GRN	2 0 6 0 0 0 0 0

(-) #-PH G/Y KILLS OVL P= (+) #-PH G STRT  
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

NOTE: THIS PROGRAMMING IS REQUIRED FOR SIGNAL HEADS 11 AND 23 SO THAT THE SOLID GREEN ARROW TURNS ON EXCLUSIVELY DURING PROTECTED GREEN PHASE 1, AND THE FLASHING YELLOW ARROWS TURN ON EXCLUSIVELY DURING PERMITTED GREEN PHASES 2 & 6.

PROTECTED PHASES →  
PERMISSIVE PHASES →

PPLT DEFINITION PROGRAMMING COMPLETE  
PRESS 'F' TO RETURN TO UNIT DATA

### SE-PAC2070 CONTROLLER OVERLAP PROGRAMMING

(program controller as shown below)  
FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA		PRESS # DESIRED
1-STARTUP & MISC	6-ALT SEQUENCES	
2-REMOTE FLASH	7-PORT 1 DATA	
3-OVERLAP STANDARD	8-I/O MISC	
4-OVERLAP SPECIAL	9-SIG DRV OUT	
5-RING STRUCTURE		F-PRIOR MENU

DO NOT enter any OVL PHASES! →

SE-PAC OVERLAP - A		(0-NO/1-YES)
OVL PHASES: 00000000 0000000		
PHS/CHN: 123456789 0123456789 01234		
OVL CHN(S): 00000000 00010000 00000		
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU		

DO NOT enter any OVL PHASES! →

SE-PAC OVERLAP - C		(0-NO/1-YES)
OVL PHASES: 00000000 0000000		
PHS/CHN: 123456789 0123456789 01234		
OVL CHN(S): 00000000 000001000 00000		
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU		

OVERLAP PROGRAMMING COMPLETE  
PRESS 'F' TO RETURN TO UNIT DATA

### INIT & N.A. RESP PROGRAMMING DETAIL

(program controller as shown below)  
From Main Menu, press '3' (Phase Data)

SE-PAC PHASE DATA		PRESS # DESIRED
1-VEHICLE TIMES	6-N.LOCK & MISC	
2-DENSITY TIMES	7-SPEC. SEQUENCE	
3-PEDEST. TIMES	8-SPEC. DETECTOR	
4-INIT & N.A. RESP	9-PHASE COPY	
5-V & P RECALLS	0-MISC PED OPTIONS	
		F-PRIOR MENU

Phases 3, 5, & 7 NOT used!


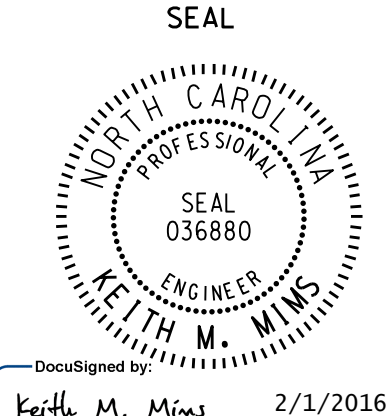
PHASE.....	1...2...3...4...5...6...7...8...9
INITIAL	1 4 0 1 0 4 0 1 0
NA RESP	0 1 0 2 0 1 0 2 0
CODES.....	0...1...2...3...4...5
INITIAL	NONE INACT RED YEL GRN DRK
NA RESP	NONE NA1 NA2 BOTH --- ---
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU	

INIT & N.A. RESP programming complete.

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

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THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: R-0046T2  
DESIGNED: December 2015  
SEALED: 1/29/2016  
REVISED: N/A

Electrical Detail - Temp Design 2 (TMP Area II, Phase I, Stage II) - Sheet 2 of 2																			
<p style="font-size: small;">ELECTRICAL AND PROGRAMMING DETAILS FOR:</p> <p style="text-align: center;">Prepared In the Offices of:</p>  <p style="font-size: x-small; text-align: center;">750 N. Greenfield Pkwy, Garner, NC 27529</p>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center;"><b>W. Peace Street at N. West Street</b></td> </tr> <tr> <td style="font-size: x-small;">Division 5</td> <td style="font-size: x-small;">Wake County</td> </tr> <tr> <td style="font-size: x-small;">Raleigh</td> <td style="font-size: x-small;">Raleigh</td> </tr> <tr> <td style="font-size: x-small;">PLAN DATE: January 2016</td> <td style="font-size: x-small;">REVIEWED BY: T. Joyce</td> </tr> <tr> <td style="font-size: x-small;">PREPARED BY: S. Armstrong</td> <td style="font-size: x-small;">REVIEWED BY:</td> </tr> <tr> <td style="font-size: x-small;">REVISIONS</td> <td style="font-size: x-small;">INIT. DATE</td> </tr> <tr> <td style="font-size: x-small;"> </td> <td style="font-size: x-small;"> </td> </tr> <tr> <td style="font-size: x-small;"> </td> <td style="font-size: x-small;"> </td> </tr> <tr> <td style="font-size: x-small;"> </td> <td style="font-size: x-small;"> </td> </tr> </table>	<b>W. Peace Street at N. West Street</b>		Division 5	Wake County	Raleigh	Raleigh	PLAN DATE: January 2016	REVIEWED BY: T. Joyce	PREPARED BY: S. Armstrong	REVIEWED BY:	REVISIONS	INIT. DATE						
<b>W. Peace Street at N. West Street</b>																			
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PLAN DATE: January 2016	REVIEWED BY: T. Joyce																		
PREPARED BY: S. Armstrong	REVIEWED BY:																		
REVISIONS	INIT. DATE																		
	<p style="font-size: x-small;">DocuSigned by:</p> <p style="font-size: x-small;">Keith M. Mins 2/1/2016</p> <p style="font-size: x-small;">2F8079E8C03445 DATE</p> <p style="font-size: x-small;">SIG. INVENTORY NO. R-0046T2</p>																		

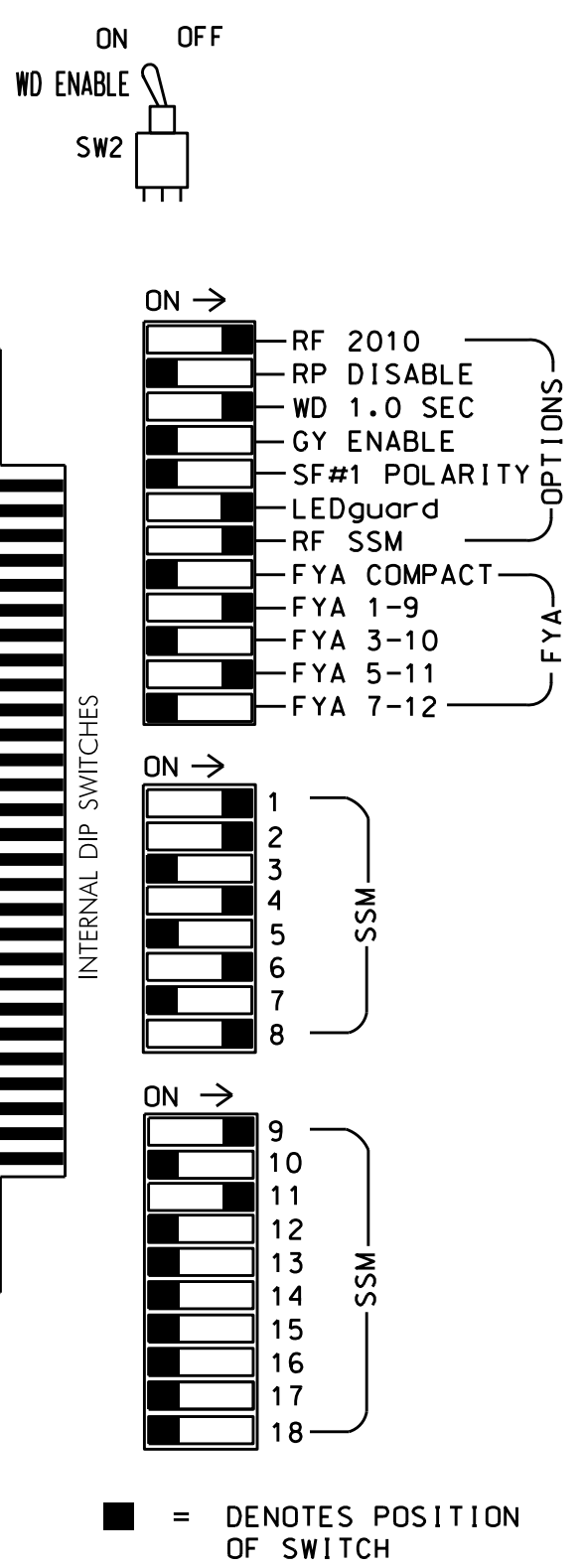
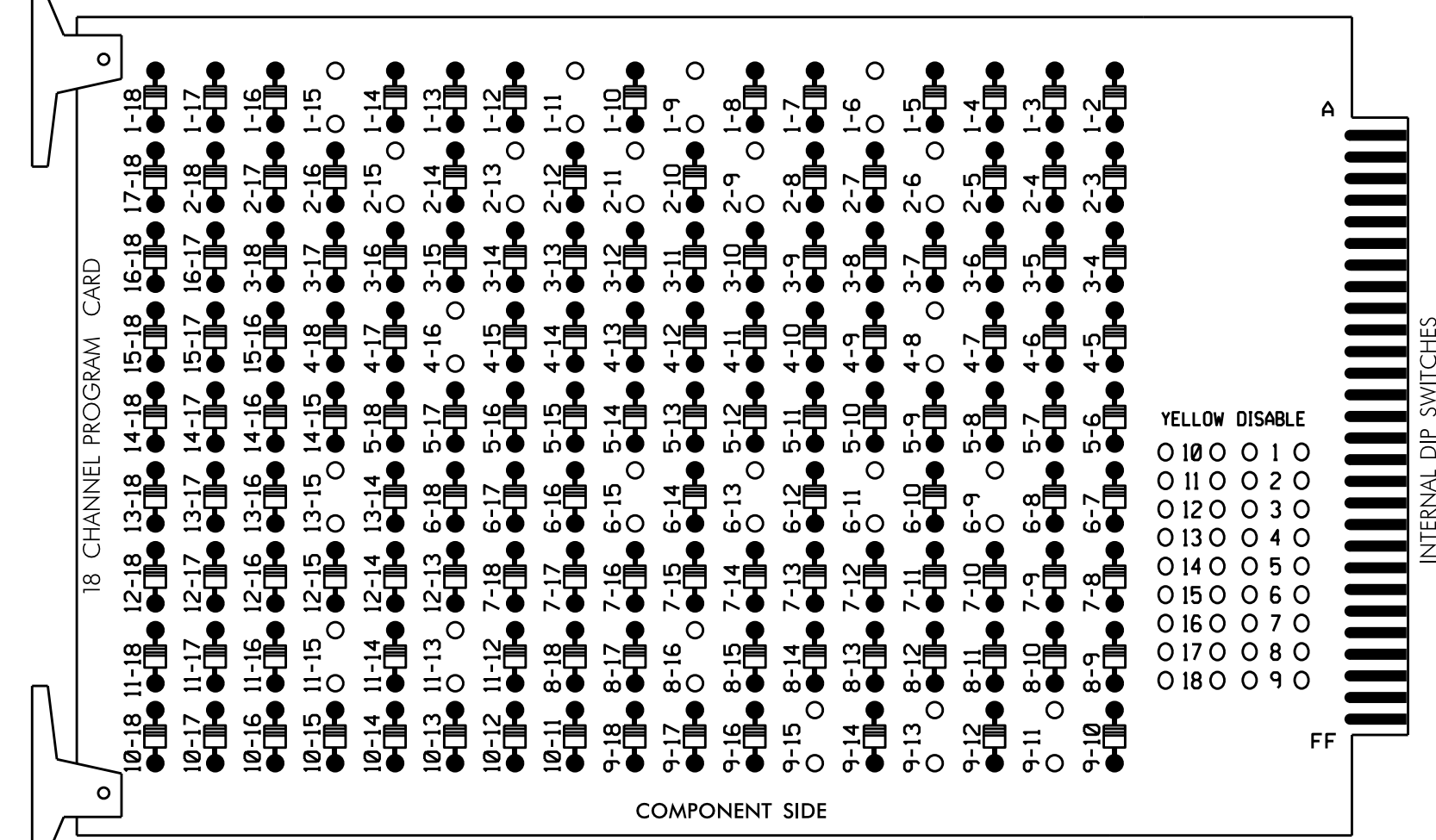






**EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL**  
(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-6, 1-9, 1-11, 1-15, 2-6, 2-9, 2-11, 2-13, 2-15, 4-8, 4-16, 6-9, 6-11, 6-13, 6-15, 8-16, 9-11, 9-13, 9-15, 11-13, 11-15, and 13-15.



- 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.

REMOVE JUMPERS AS SHOWN

**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.
- Program controller to start up in phases 2 and 6 green.
- Enable simultaneous gap-out feature, on controller unit, for all phases.
- Program phases 4 and 8, on controller unit, for dual entry.
- The cabinet and controller are part of the Raleigh Signal System.

**EQUIPMENT INFORMATION**

CONTROLLER.....2070  
 CABINET.....332 W/ AUX  
 SOFTWARE.....SE-PAC2070  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...18 WITH AUX FILE  
 LOAD SWITCHES USED.....S1,S2,S3,S5,S8,S9,S11,S12,  
 AUX S1,AUX S4  
 PHASES USED.....1,2,2PED,4,6,6PED,8,8PED  
 OVERLAP A.....\*  
 OVERLAP B.....NOT USED  
 OVERLAP C.....\*  
 OVERLAP D.....NOT USED  
 \* SEE SHEET 2 FOR OVERLAP PROGRAMMING

**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*	82	21,22 24	P21, P22	NU	41,42	NU	NU	61,62	P61, P62	NU	81,82	P81, P82	11*	NU	NU	23*	NU
RED	*	128			101			134				107						
YELLOW		129			102			135				108						
GREEN		130			103			136				109						
RED ARROW														A121				A114
YELLOW ARROW		126												A122				A115
FLASHING YELLOW ARROW														A123				A116
GREEN ARROW	127	127																
Hand icon																		
Walking person icon																		

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

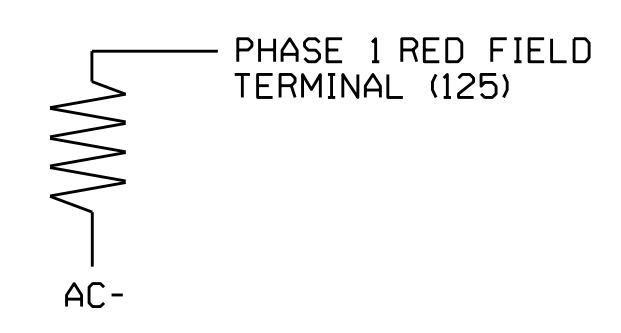
**INPUT FILE POSITION LAYOUT**  
(front view)

FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	∅ 1 1A	∅ 1 1B	∅ 2 2B	∅ S -O-S	∅ S -O-S	∅ 4 4A	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ 2 PED DC ISOLATOR	∅ 6 PED DC ISOLATOR	FS DC ISOLATOR
L	NOT USED	∅ 2 2A	∅ 2 2C	∅ S -O-S	∅ S -O-S	∅ 4 4B	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ S -O-S	NOT USED	∅ 8 PED DC ISOLATOR	ST DC ISOLATOR
U	∅ S -O-S	∅ 6 6A	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ 8 8A	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ S -O-S
L	∅ S -O-S	∅ 6 6B	∅ S -O-S	∅ S -O-S	∅ S -O-S	NOT USED	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ S -O-S	∅ S -O-S

EX.: 1A, 2A, ETC. = LOOP NO.'S  
 FS = FLASH SENSE  
 ST = STOP TIME

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

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



**COUNTDOWN PEDESTRIAN SIGNAL OPERATION**

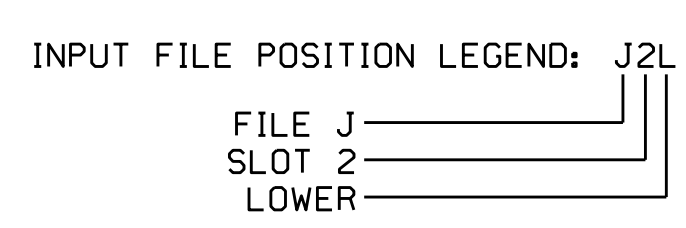
Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

**INPUT FILE CONNECTION & PROGRAMMING CHART**

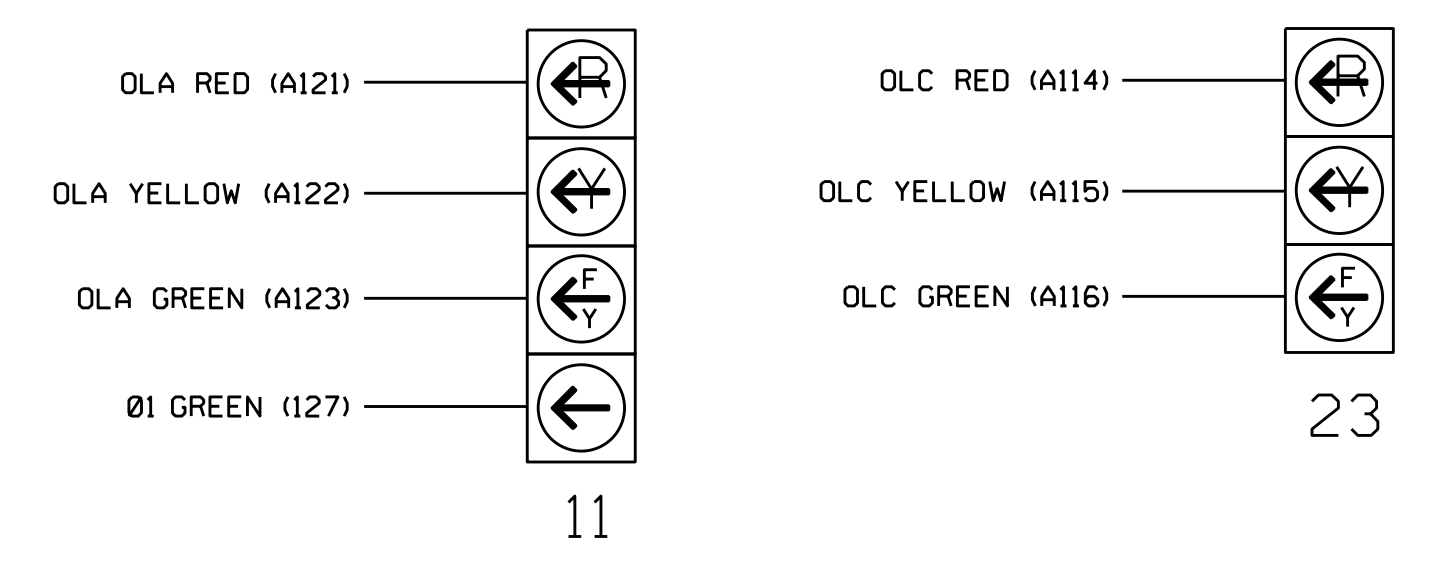
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
1A <sup>1</sup>	TB2-1,2	I1U	56	1	1	15	
	-	J4U	48	25	6		
1B	TB2-5,6	I2U	39	3	1	15	
2A	TB2-7,8	I2L	43	4	2		
2B	TB2-9,10	I3U	63	5	2		
2C	TB2-11,12	I3L	76	6	2		
4A	TB4-9,10	I6U	41	11	4	3	
4B	TB4-11,12	I6L	45	12	4	10	
6A	TB3-5,6	J2U	40	21	6		
6B	TB3-7,8	J2L	44	22	6		
8A	TB5-9,10	J6U	42	31	8	3	
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		
P81,P82	TB8-8,9	I13L	70	PED 8	8 PED		

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

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



**FYA SIGNAL WIRING DETAIL**  
(wire signal heads as shown)



NOTE: See sheet 2 for Protected & Permitted Phases programming.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: R-0046  
 DESIGNED: December 2015  
 SEALED: 1/29/2016  
 REVISED: N/A

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Electrical Detail - Final Design (TMP Area II, Phase II) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared In the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529	W. Peace Street at N. West Street	SEAL  Keith M. Mims 2/1/2016
Division 5 Wake County Raleigh PLAN DATE: January 2016 REVIEWED BY: T. Joyce PREPARED BY: S. Armstrong REVIEWED BY:	REVISIONS INIT. DATE	SIG. INVENTORY NO. R-0046



## SE-PAC2070 CONTROLLER OVERLAP PROGRAMMING

(program controller as shown below)  
FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1-STARTUP & MISC	6-ALT SEQUENCES
2-REMOTE FLASH	7-PORT 1 DATA
<b>3-OVERLAP STANDARD</b>	8-I/O MISC
4-OVERLAP SPECIAL	9-SIG DRV OUT
5-RING STRUCTURE	
F-PRIOR MENU	

DO NOT enter any OVL PHASES! →

SE-PAC OVERLAP - A	(0-NO/1-YES)
OVL PHASES: 00000000 0000000	
PHS/CHN: 123456789 0123456789 01234	
OVL CHN(S): 00000000 00010000 00000	
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU	
PRESS "B" TWICE	

DO NOT enter any OVL PHASES! →

SE-PAC OVERLAP - C	(0-NO/1-YES)
OVL PHASES: 00000000 0000000	
PHS/CHN: 123456789 0123456789 01234	
OVL CHN(S): 00000000 000001000 00000	
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU	

OVERLAP PROGRAMMING COMPLETE  
PRESS 'F' TO RETURN TO UNIT DATA

## PROTECTED AND PERMISSIVE PHASES FOR FLASHING YELLOW ARROW

(program controller as shown below)  
FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1-STARTUP & MISC	6-ALT SEQUENCES
2-REMOTE FLASH	7-PORT 1 DATA
3-OVERLAP STANDARD	8-I/O MISC
<b>4-OVERLAP SPECIAL</b>	9-SIG DRV OUT
5-RING STRUCTURE	
F-PRIOR MENU	

PROTECTED PHASES →  
PERMISSIVE PHASES →

SE-PAC OVL P.A...B...C...D...E...F...G...H.	TR GRN	YEL/10	RED/10	-G/Y	+GRN
0 0 0 0 0 0 0 0	0 0 0 0 0 0	40 40 40 40 40 40	20 20 20 20 20 20	1 0 5 0 0 0	2 0 6 0 0 0
(-) #-PH G/Y KILLS OVL P= (+) #-PH G STRT					
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU					

PPLT DEFINITION PROGRAMMING COMPLETE  
PRESS 'F' TO RETURN TO UNIT DATA

NOTE: THIS PROGRAMMING IS REQUIRED FOR SIGNAL HEADS 11 AND 23 SO THAT THE SOLID GREEN ARROW TURNS ON EXCLUSIVELY DURING PROTECTED GREEN PHASE 1, AND THE FLASHING YELLOW ARROWS TURN ON EXCLUSIVELY DURING PERMITTED GREEN PHASES 2 & 6.

## INIT & N.A. RESP PROGRAMMING DETAIL

(program controller as shown below)  
From Main Menu, press '3' (Phase Data)

SE-PAC PHASE DATA	PRESS # DESIRED
1-VEHICLE TIMES	6-N.LOCK & MISC
2-DENSITY TIMES	7-SPEC. SEQUENCE
3-PEDEST. TIMES	8-SPEC. DETECTOR
<b>4-INIT &amp; N.A. RESP</b>	9-PHASE COPY
5-V & P RECALLS	0-MISC PED OPTIONS
F-PRIOR MENU	

Phases 3, 5, & 7 NOT used!

PHASE.....	1...2...3...4...5...6...7...8...9
INITIAL	1 4 0 1 0 4 0 1 0
NA RESP	0 1 0 2 0 1 0 2 0
CODES.....0...1...2...3...4...5	
INITIAL	NONE INACT RED YEL GRN DRK
NA RESP	NONE NA1 NA2 BOTH --- ---
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU	

INIT & N.A. RESP programming complete.

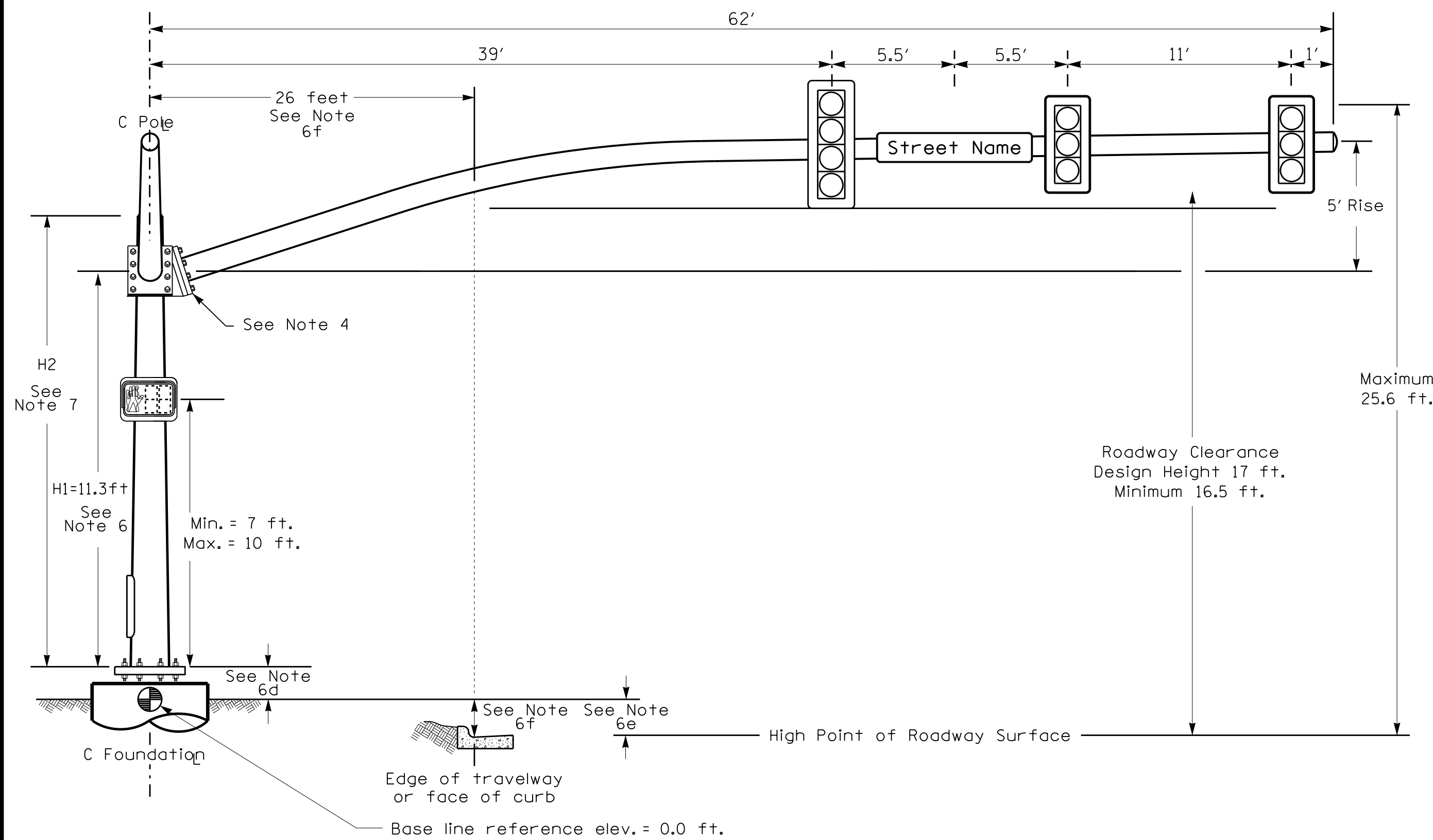
DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: R-0046  
DESIGNED: December 2015  
SEALED: 1/29/2016  
REVISED: N/A

<p>Electrical Detail - Final Design (TMP Area II, Phase II) - Sheet 2 of 2</p> <p>Prepared In the Offices of: <b>TRANSPO-MOBILITY AND SAFETY SOLUTIONS</b> Signal Management Solutions 750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p><b>W. Peace Street at N. West Street</b></p> <p>Division 5 Wake County Raleigh</p> <p>PLAN DATE: January 2016 REVIEWED BY: T. Joyce</p> <p>PREPARED BY: S. Armstrong REVIEWED BY:</p>	<p>SEAL</p> <p style="text-align: center;">NORTH CAROLINA PROFESSIONAL ENGINEER KEITH M. MINS 036880</p> <p>DocuSigned by: Keith M. Mins 2/1/2016</p> <p>SIG. INVENTORY NO. R-0046</p>
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**Design Loading for METAL POLE NO. 6, MAST ARM A**



Elevation View @ 270°

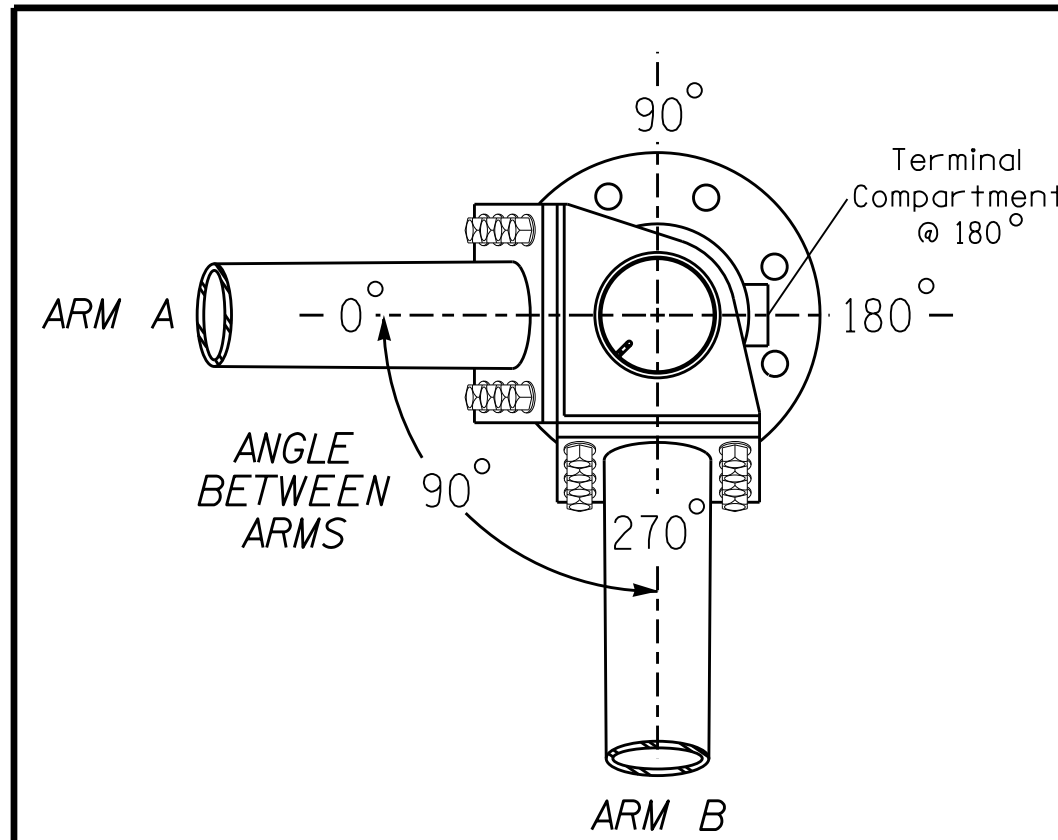
**SPECIAL NOTE**  
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available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

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

Elevation Differences for:	Pole A	Pole B
Baseline reference point at C Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-2.7 ft.	-2.7 ft.
Elevation difference at Edge of travelway or face of curb	-2.7 ft.	-2.7 ft.

**MAST ARM LOADING SCHEDULE**

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	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
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS
	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0" W X 96.0" L	36 LBS



POLE RADIAL ORIENTATION

**NOTES**

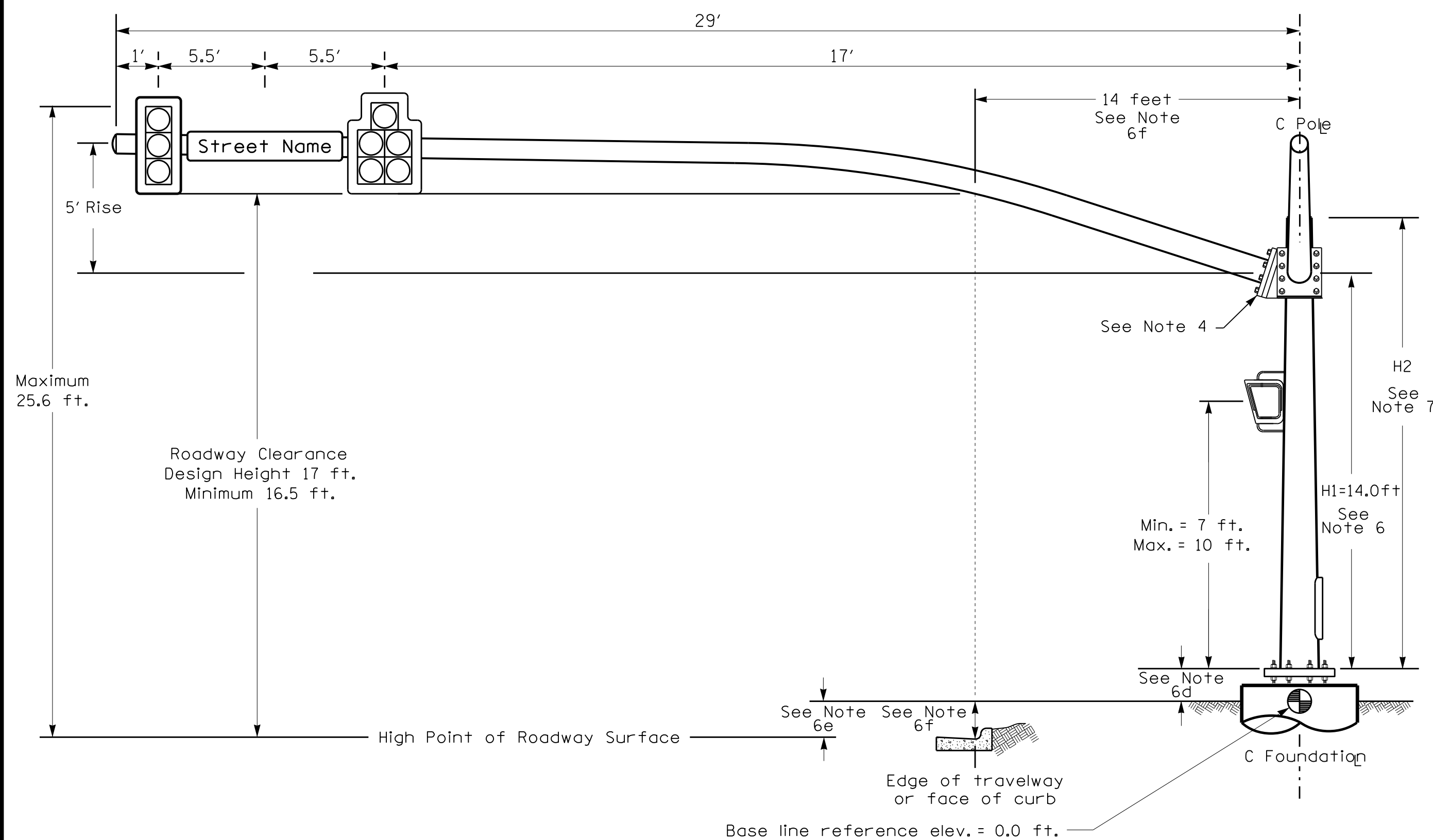
**DESIGN REFERENCE MATERIAL**

- 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 2012 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
  - The 2012 NCDOT Roadway Standard Drawings.

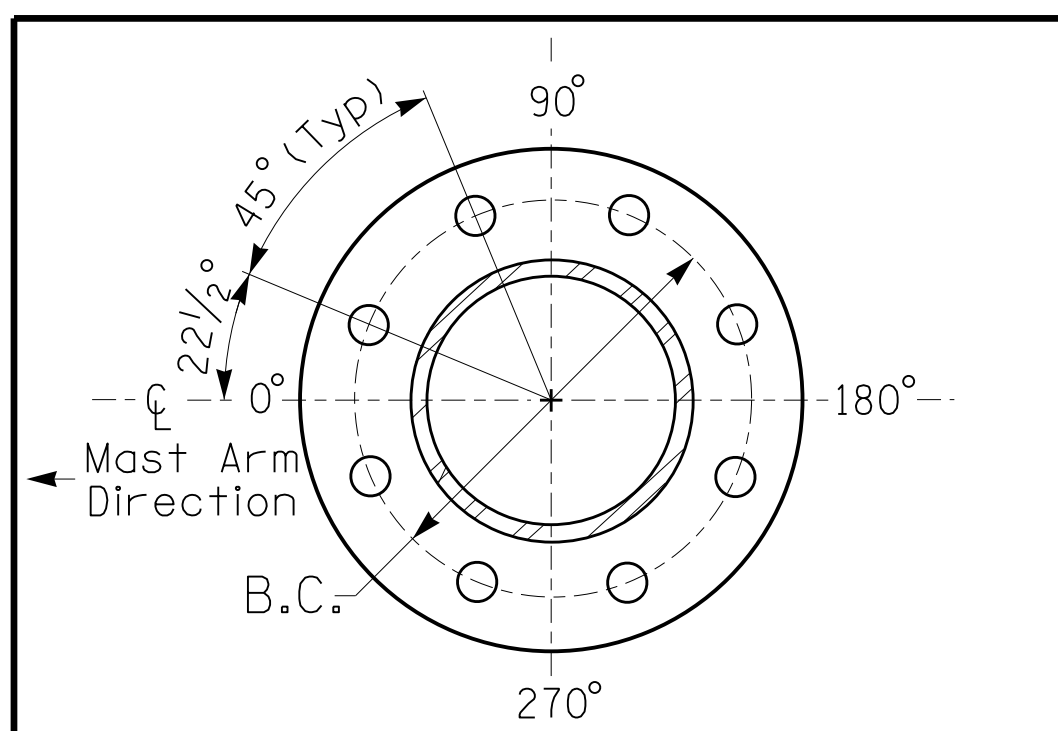
**DESIGN REQUIREMENTS**

- 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.
- A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate connection points.
- 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:
  - Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
  - 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.
  - Provide horizontal distance from the proposed centerline of the foundation to the edge of travelway. Refer to the Elevation Data Chart for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary to ensure that the roadway clearance is maintained at the edge of the travelway and to aid in the camber design of the arm.
- 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) 773-2800.
- 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.

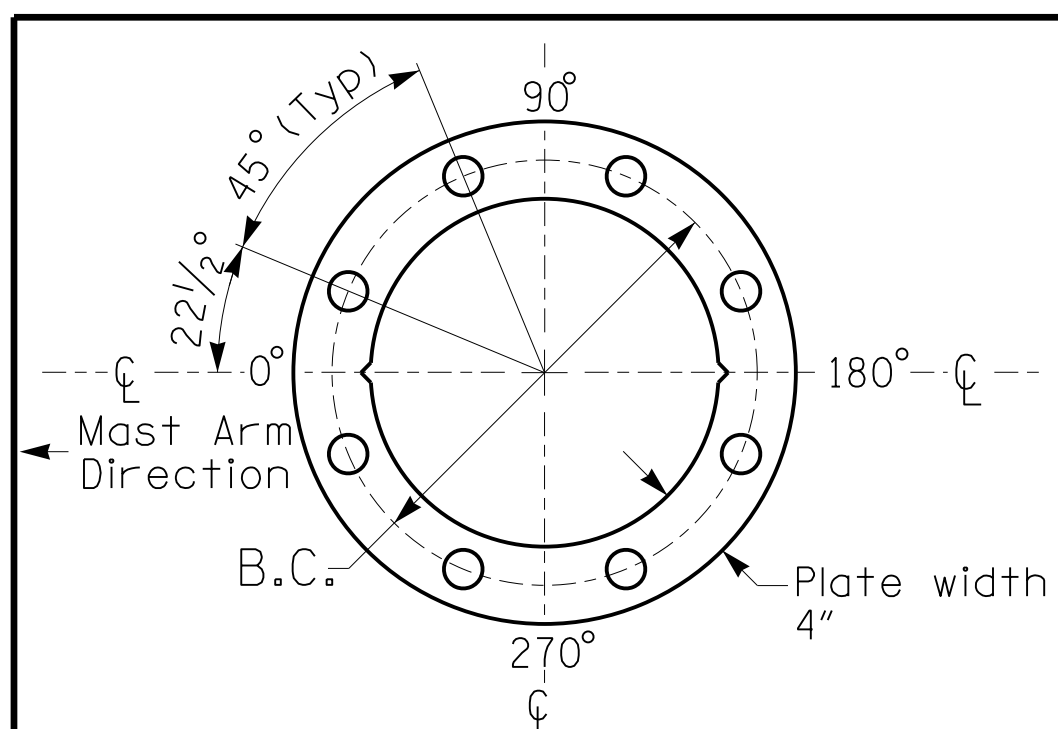
**Design Loading for METAL POLE NO. 6, MAST ARM B**



Elevation View @ 0°



8 BOLT BASE PLATE DETAIL



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

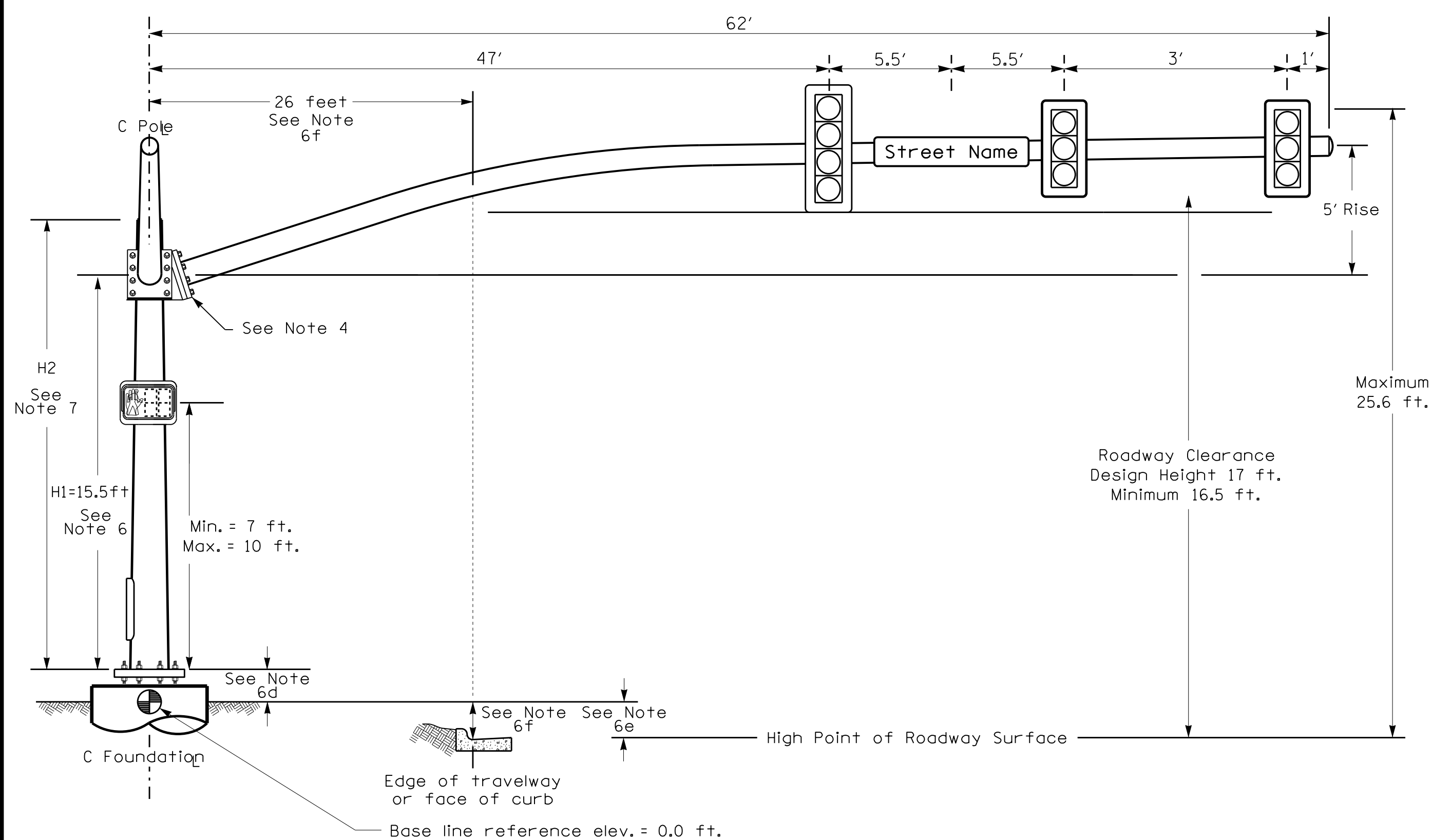
NCDOT Wind Zone 4 (90 MPH)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

<p>Prepared in the Offices of: TRANSPORTATION MOBILITY AND SAFETY DIVISION SIGNAL DESIGN SECTION 750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>W. Peace Street at N. West Street</p> <p>Division 5 Wake County Raleigh</p> <p>PLAN DATE: December 2015 REVIEWED BY: _____</p> <p>PREPARED BY: I. O. Umozurike REVIEWED BY: _____</p>		<p>SEAL ENGINEER ROBERT J. ZIEBA 026486</p>			
	<p>SCALE 0 N/A N/A</p>	<p>REVISIONS</p> <table border="1"> <tr> <th>INIT.</th> <th>DATE</th> </tr> <tr> <td> </td> <td> </td> </tr> </table>		INIT.	DATE	
INIT.	DATE					

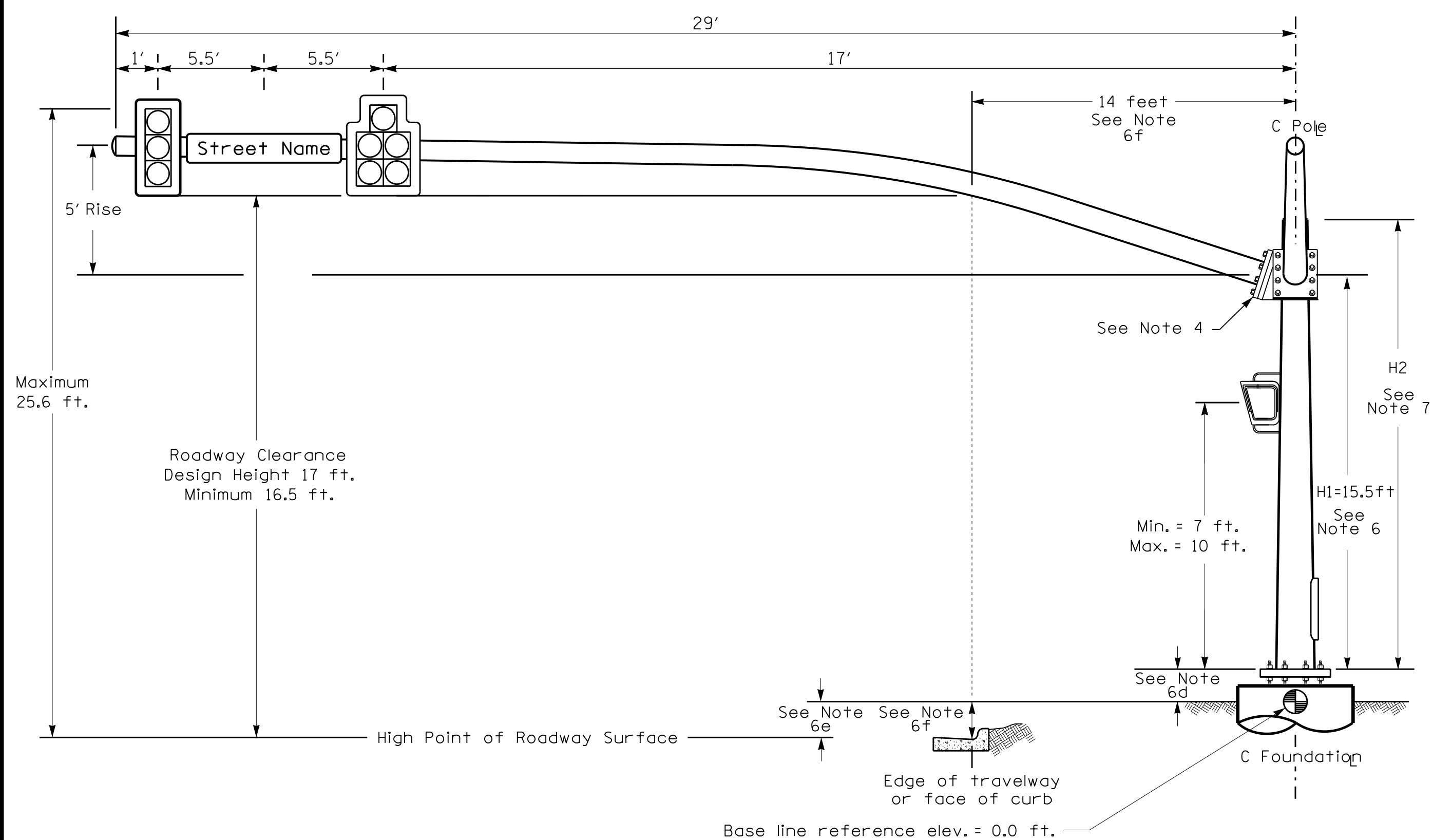


Design Loading for METAL POLE NO. 7 MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 7 MAST ARM B



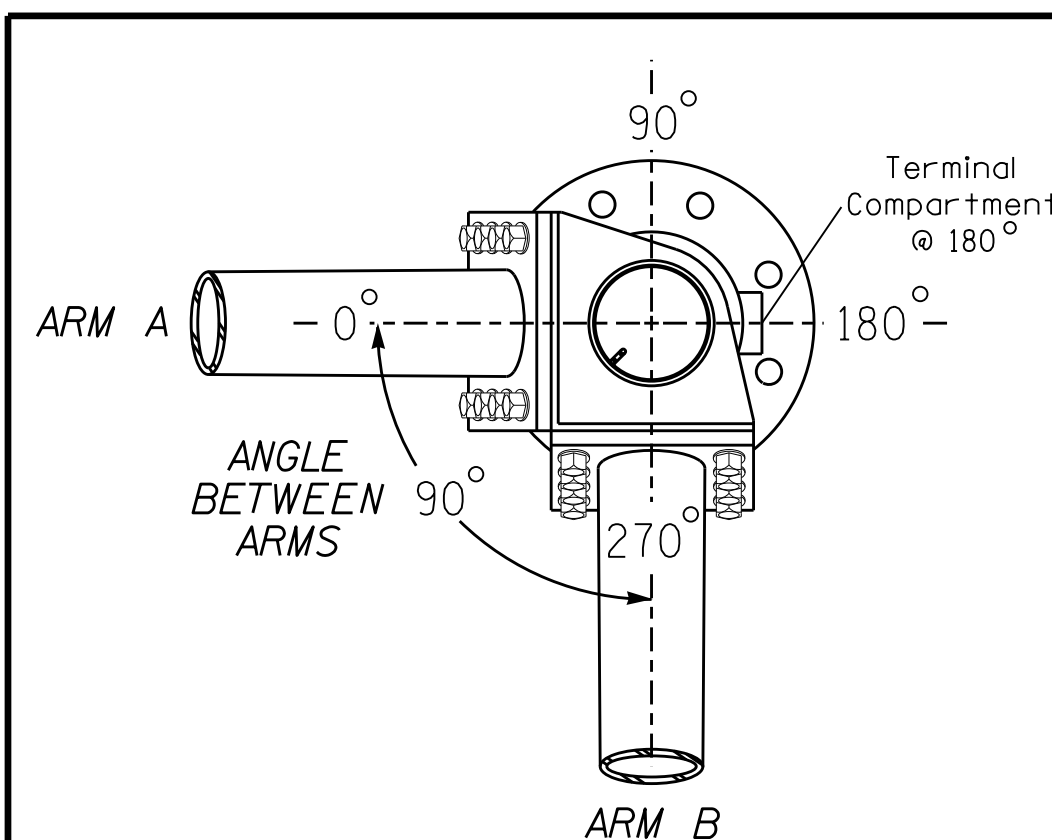
Elevation View @ 0°

SPECIAL NOTE

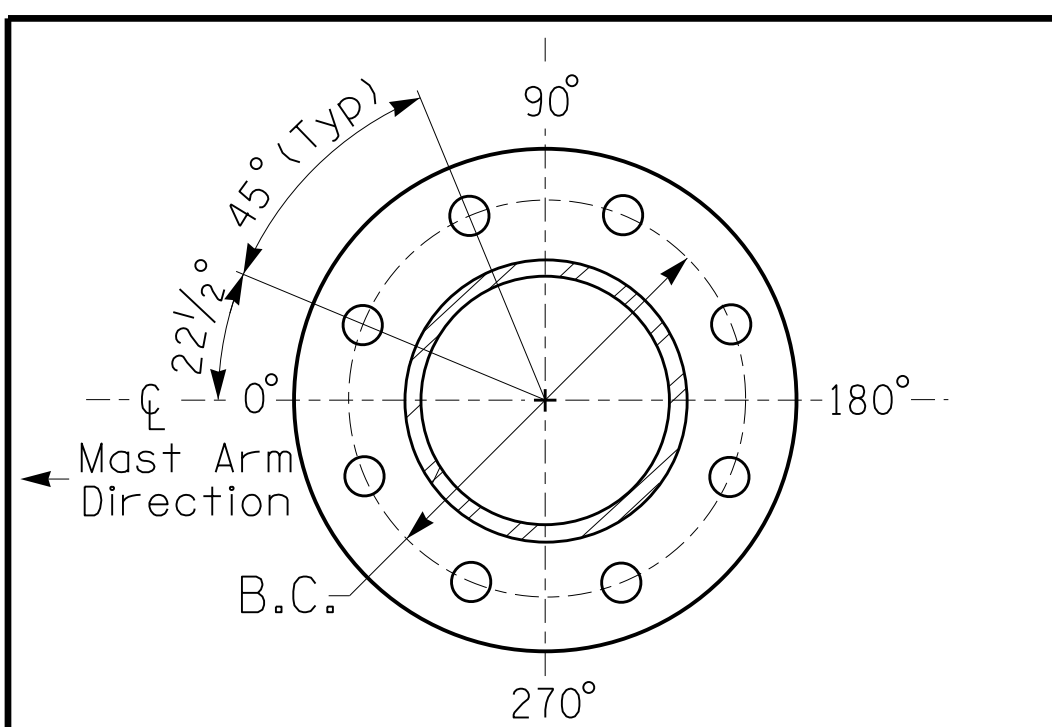
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

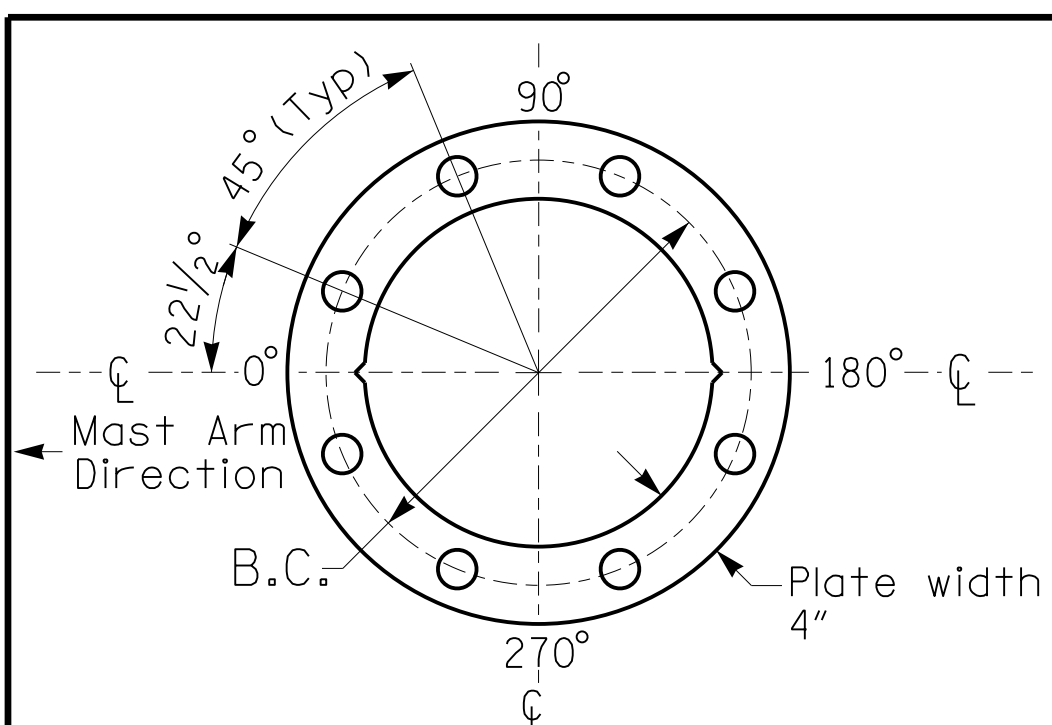
Elevation Differences for:	Pole A	Pole B
Baseline reference point at C Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-2.7 ft.	-2.7 ft.
Elevation difference at Edge of travelway or face of curb	-2.7 ft.	-2.7 ft.



POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL



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

METAL POLE No. 7

PROJECT REFERENCE NO. B-5121/B-5317 SHEET NO. Sig. 5.4

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	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
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 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 2012 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
  - The 2012 NCDOT Roadway Standard Drawings.

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.
- A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate connection points.
- 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:
  - Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
  - 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.
  - Provide horizontal distance from the proposed centerline of the foundation to the edge of travelway. Refer to the Elevation Data Chart for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary to ensure that the roadway clearance is maintained at the edge of the travelway and to aid in the camber design of the arm.
- 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) 773-2800.
- 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.

NCDOT Wind Zone 4 (90 MPH)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

<p>Prepared In the Offices of: TRANSPORTATION MOBILITY AND SAFETY DIVISION DIVISION OF TRANSPORTATION Signal Design Section 750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>W. Peace Street at N. West Street</p> <p>Division 5 Wake County Raleigh</p> <p>PLAN DATE: December 2015 REVIEWED BY:</p> <p>PREPARED BY: I. O. Umozurike REVIEWED BY:</p>		<p>SEAL ROBERT J. ZIEBA ENGINEER 026486</p>
	<p>SCALE: 0 N/A</p>	<p>REVISIONS</p>	
<p>2/8/2016</p>		<p>SIG. INVENTORY NO. R-0046</p>	

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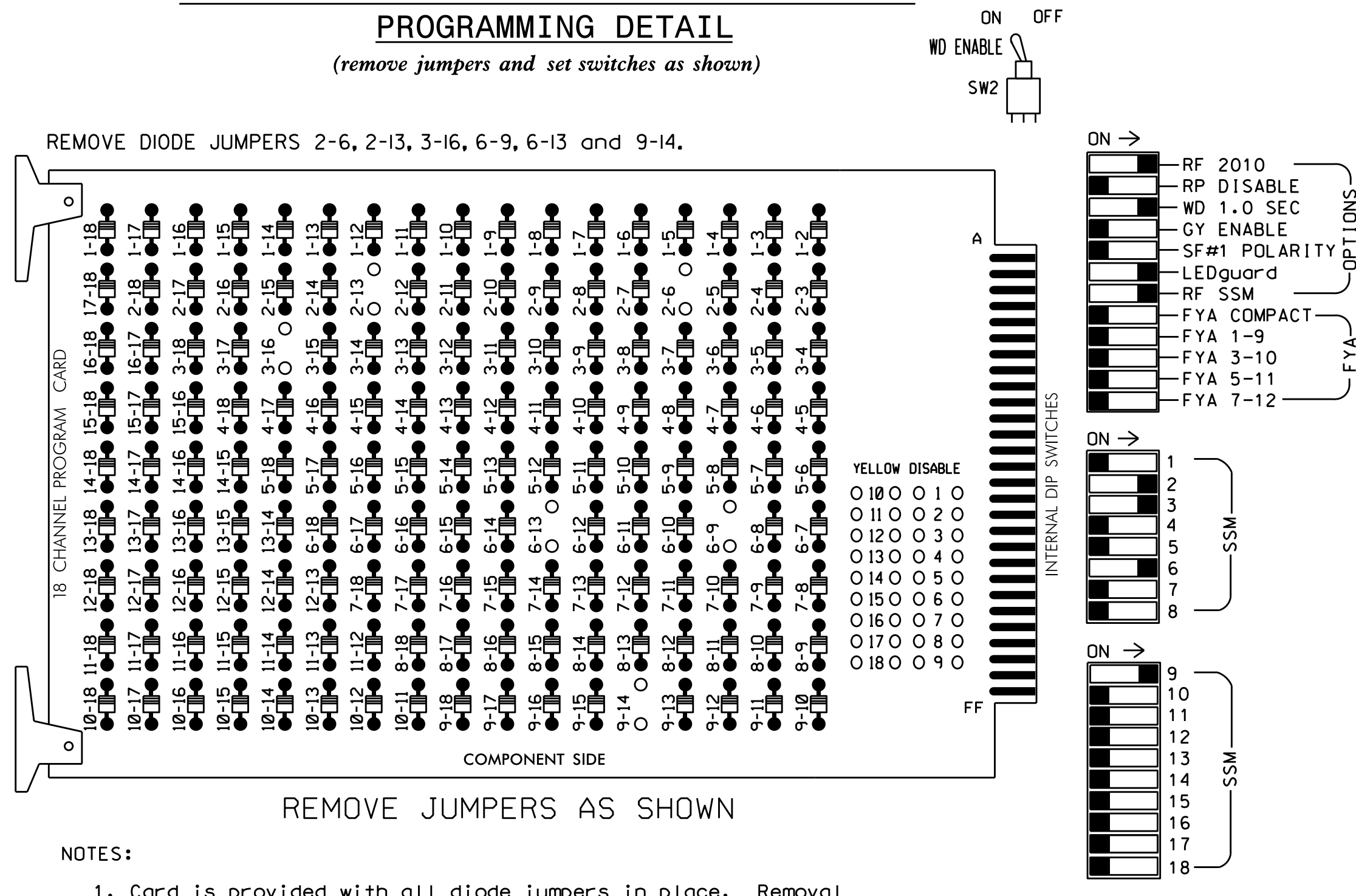






**EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL**

(remove jumpers and set switches as shown)



**NOTES:**

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

**NOTES**

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. Program controller to start up in phases 2 and 6 green.
3. Enable simultaneous gap-out feature, on controller unit, for all phases.
4. The cabinet and controller are part of the Raleigh Signal System.

**EQUIPMENT INFORMATION**

CONTROLLER.....2070L  
 CABINET.....332 /W/ AUX  
 SOFTWARE.....SE-PAC2070  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE LOAD SWITCHES USED.....S2,S3,S4,S6,S8,S12,AUX S1  
 PHASES USED.....\*1,2,2 PED,3,3 PED,\*4,4 PED,6 OVERLAP A.....1+4  
 \* Phase used for timing purposes

**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	3 PED	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	NC	21,22	P21, P22	31,32	NC	P41, P42	NU	61,62	NU	NU	NU	P31, P32	32,61	NU	NU	NU	NU	NU
RED		128		116				134					*					
YELLOW		129		117				135										
GREEN		130		118				136										
RED ARROW																		
YELLOW ARROW													A122					
GREEN ARROW													A123					
Hand				113			104					110						
Walker				115			106					112						

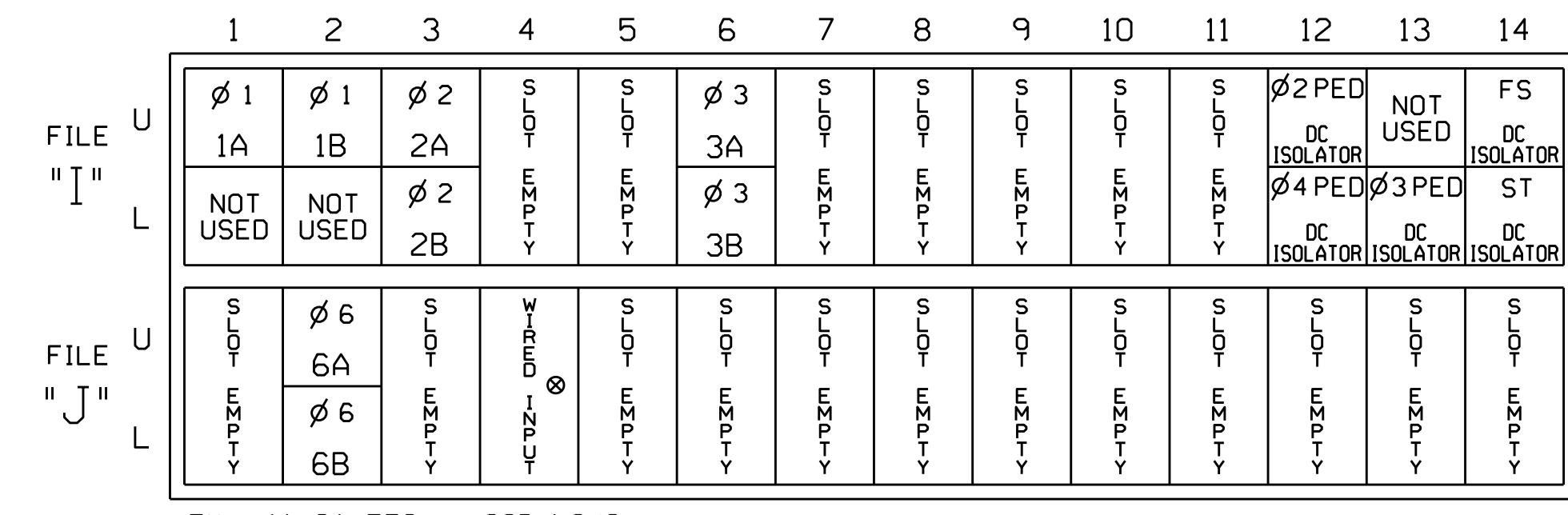
NU = Not Used  
 NC = No Connection, phase used for timing purposes.  
 \* Denotes install load resistor. See load resistor installation detail this sheet.

**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.

**INPUT FILE POSITION LAYOUT**

(front view)



EX.: 1A, 2A, ETC. = LOOP NO.'S FS = FLASH SENSE ST = STOP TIME

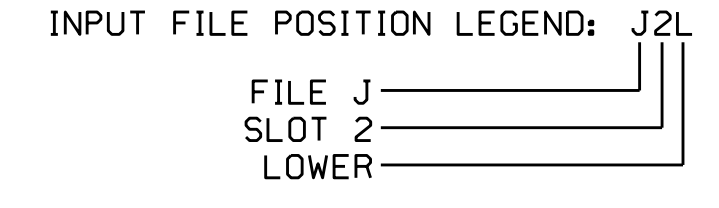
⊗ Wired Input - Do not populate slot with detector card

**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
1A <sup>1</sup>	TB2-1,2	I1U	56	1	1	15	
	-	J4U	48	25	6		
1B	TB2-5,6	I2U	39	3	1	15	
2A	TB2-9,10	I3U	63	5	2		
2B	TB2-11,12	I3L	76	6	2		
3A	TB4-9,10	I6U	41	11	3	3	
3B	TB4-11,12	I6L	45	12	3		
6A	TB3-5,6	J2U	40	21	6		
6B	TB3-7,8	J2L	44	22	6		
PED PUSH BUTTONS							
P21,P22	TB8-4,6	I12U	67	PED 2	2	PED	
P31,P32	TB8-8,9	I13L	70	PED 8	3	PED	
P41,P42	TB8-5,6	I12L	69	PED 4	4	PED	

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

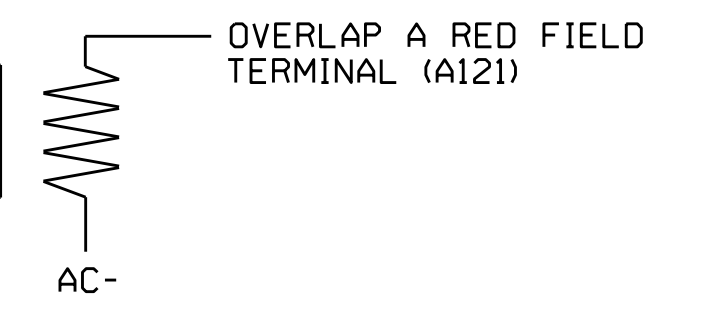
<sup>1</sup>Add jumper from I1-W to J4-W, on rear of input file.



**LOAD RESISTOR INSTALLATION DETAIL**

(install resistor 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: R-0138  
 DESIGNED: December 2015  
 SEALED: 1/25/2016  
 REVISED: N/A

Electrical and Programming Details for: **W. Peace Street at N. Harrington Street**

Division 5 Wake County Raleigh

PLAN DATE: January 2016 REVIEWED BY:

PREPARED BY: C. Strickland REVIEWED BY:

REVISIONS INIT. DATE

750 N. Greenfield Pkwy, Garner, NC 27529

Seal: KEITH M. MIMS, Professional Engineer, No. 036880

DocuSigned by: Keith M. Mims 2/1/2016

SIG. INVENTORY NO. R-0138

01-1-2016 09:03 C:\Users\stricklan\Documents\Signal\Work\Projects\0138\_Sig\_6.1\0138\_Sig\_6.1.dgn

### VEHICLE OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1- STARTUP & MISC	6- ALT SEQUENCES
2- REMOTE FLASH	7- PORT 1 DATA
3- OVERLAP STANDARD	8- I/O MISC
4- OVERLAP SPECIAL	9- SIG DRV OUT
5- RING STRUCTURE	F- PRIOR MENU

SE-PAC OVERLAP - A	(0-NO / 1-YES)
OVL PHASES: 100100000 0000000	
PHS/CHN: 123456789 0123456789 01234	
OVL CHN(S): 000000000 0001000000 00000	

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

PRESS "F" TO RETURN TO UNIT DATA

### BACK-UP PROTECTION PROGRAMMING DETAIL

(program controller as shown below)

From Main Menu, press '3' (Phase Data)

SE-PAC PHASE DATA	PRESS # DESIRED
1-VEHICLE TIMES	6-N.LOCK & MISC
2-DENSITY TIMES	7-SPEC. SEQUENCE
3-PEDEST. TIMES	8-SPEC. DETECTOR
4-INIT & N.A. RESP	9-PHASE COPY
5-V & P RECALLS	0-MISC PED OPTIONS
	F-PRIOR MENU

PHASE.....	1..	2...	3...	4...	5...	6...	7...	8
OMIT	4	0	0	0	0	0	0	0
-YEL	0	0	0	0	0	0	0	0
OCAL	0	0	0	0	0	0	0	0

OMIT:## PHS ON OMITS THIS PHASE  
 -YEL:### PHS YEL OMITS THIS PHS YEL  
 OCAL: WHEN OMIT, DETS CALL## PHS

A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

Special Sequence programming complete.

### SIGNAL DRIVER OUTPUT PROGRAMMING DETAIL FOR PHASE 3 PED

From Main Menu press 4 (Unit Data)

SE-PAC UNIT DATA	PRESS # DESIRED
1- STARTUP & MISC	6- ALT SEQUENCES
2- REMOTE FLASH	7- PORT 1 DATA
3- OVERLAP STANDARD	8- I/O MISC
4- OVERLAP SPECIAL	9- SIG DRV OUT
5- RING STRUCTURE	A- 224E STATUS
	F- PRIOR MENU

SE-PAC SIGNAL DRIVER OUTPUTS			
SIG DRV GRP CHN	HDWE	OUTPUT PIN..	SET
Ph 1 Vehicle..1	Ph 1	Red/Yel/Grn...	1
Ph 2 Vehicle..2	Ph 2	Red/Yel/Grn...	2
Scroll Down to Ph 3 Pedest			
Ph 3 Pedest ..18	Ph 3	DW/PC/WK.....	11

← Default Value

For "Ph 3 Pedest" change "HDWE OUTPUT PIN SET"  
 FROM: 11  
 TO: 16

This will reassign loadswitch S8P to Ph 3 Pedest

Display will now echo  
 HDWE OUTPUT PIN SET "Ph 8"

SIG DRV GRP CHN	HDWE	OUTPUT PIN..	SET
Ph 3 Pedest ..18	Ph 8	DW/PC/WK .....	16

← Modified Value

Press "F" to return to Unit Data

### CONTROLLER PED DETECTOR ASSIGNMENT PROGRAMMING

From the Main Menu press '3' (Phase Data), then from Phase Menu press '8' (Spec. Detector), then from Detector Control Data Menu press '9' (Ped 1-8):

PED DET CONTROL	.1..	2..	3..	4..	5..	6..	7..	8
ASSIGNED PHASE	1	2	3	4	0	6	0	3
OPERATION MODE	1	1	1	1	0	1	0	1
SWITCHED PHASE	0	0	0	0	0	0	0	0

MODE: 0-VEH 1-PED 2-ONE 3-SBA  
 4-SBB 5-PPL 6-PPT 7-AND  
 SWITCHED: TO PH # (AP=Y/R & SP=GRN)

A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU

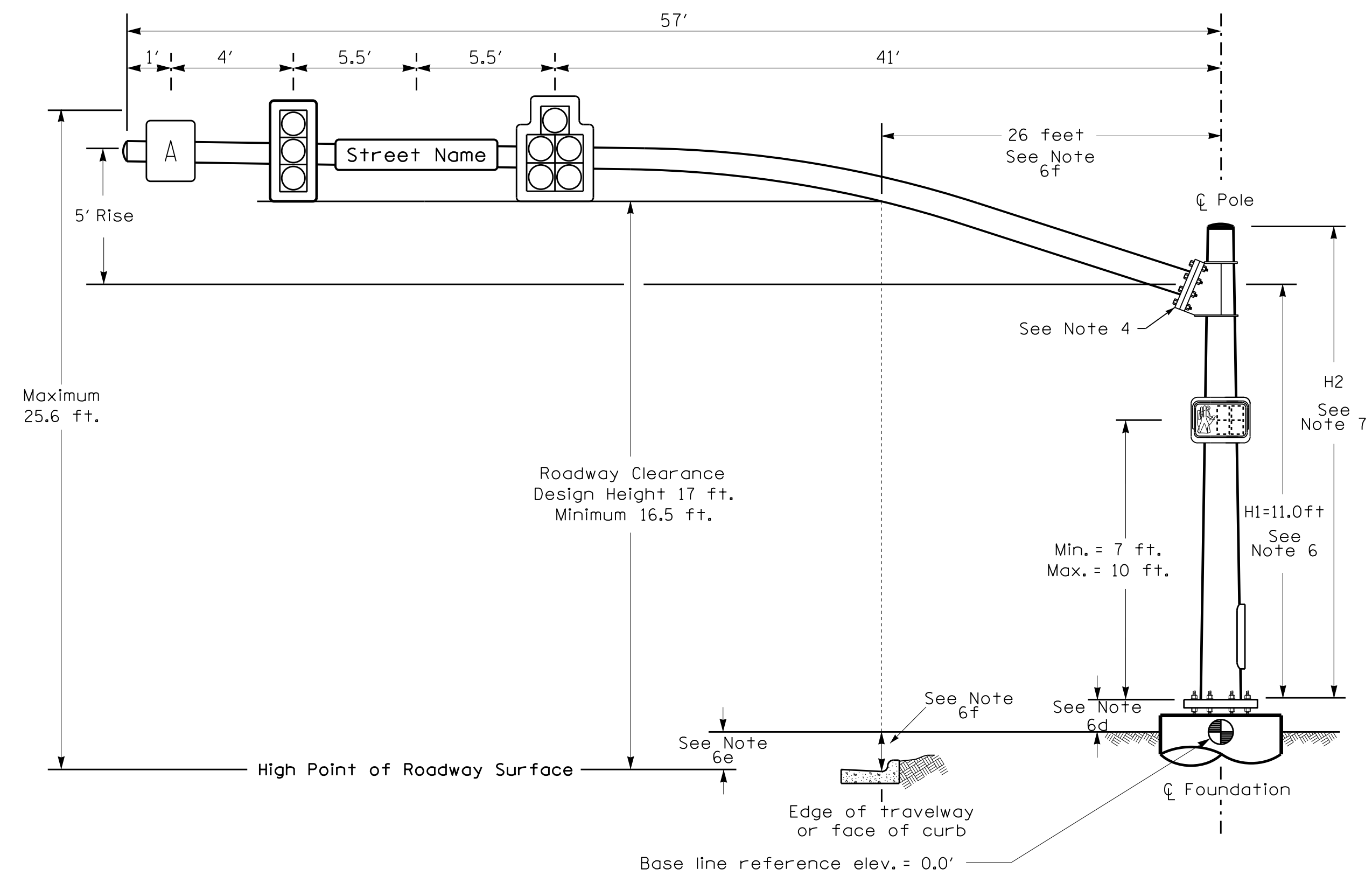
Press "F" to return to Detector Control Data

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 ceast\ckl\and

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: R-0138 DESIGNED: December 2015 SEALED: 1/25/2016 REVISED: N/A		W. Peace Street at N. Harrington Street	
		Division 5 PLAN DATE: January 2016 PREPARED BY: C. Strickland	Wake County REVIEWED BY: REVIEWED BY:
Prepared In the Offices of: 750 N. Greenfield Pkwy, Garner, NC 27529		Raleigh	SEAL KEITH M. MIMS ENGINEER 2/1/2016 DATE



Design Loading for METAL POLE NO. 3

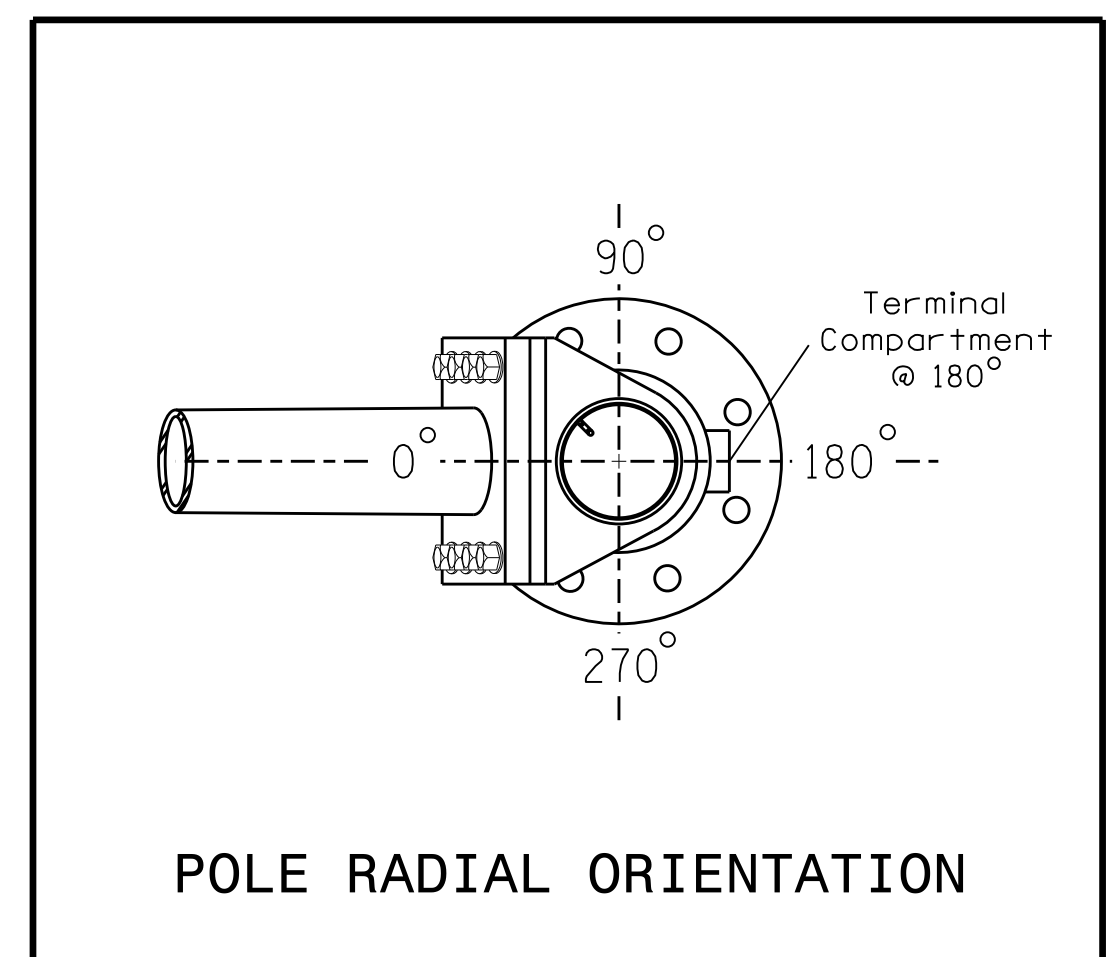


Elevation View

**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.

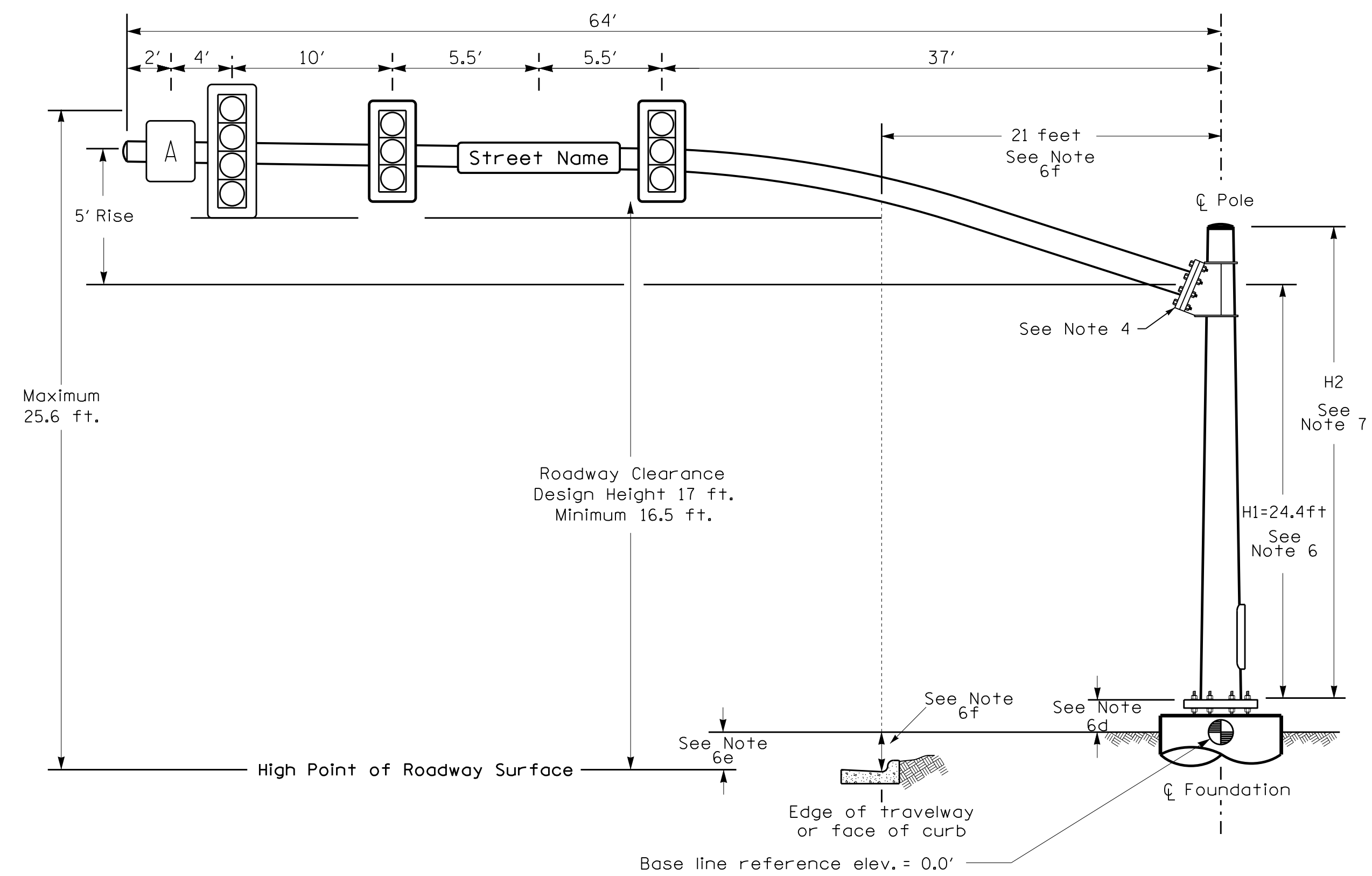
**Elevation Data for Mast Arm Attachment (H1)**

Elevation Differences for:	Pole 3	Pole 4
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-3.0 ft.	+3.4 ft.
Elevation difference at Edge of travelway or face of curb	-2.0 ft.	+2.4 ft.

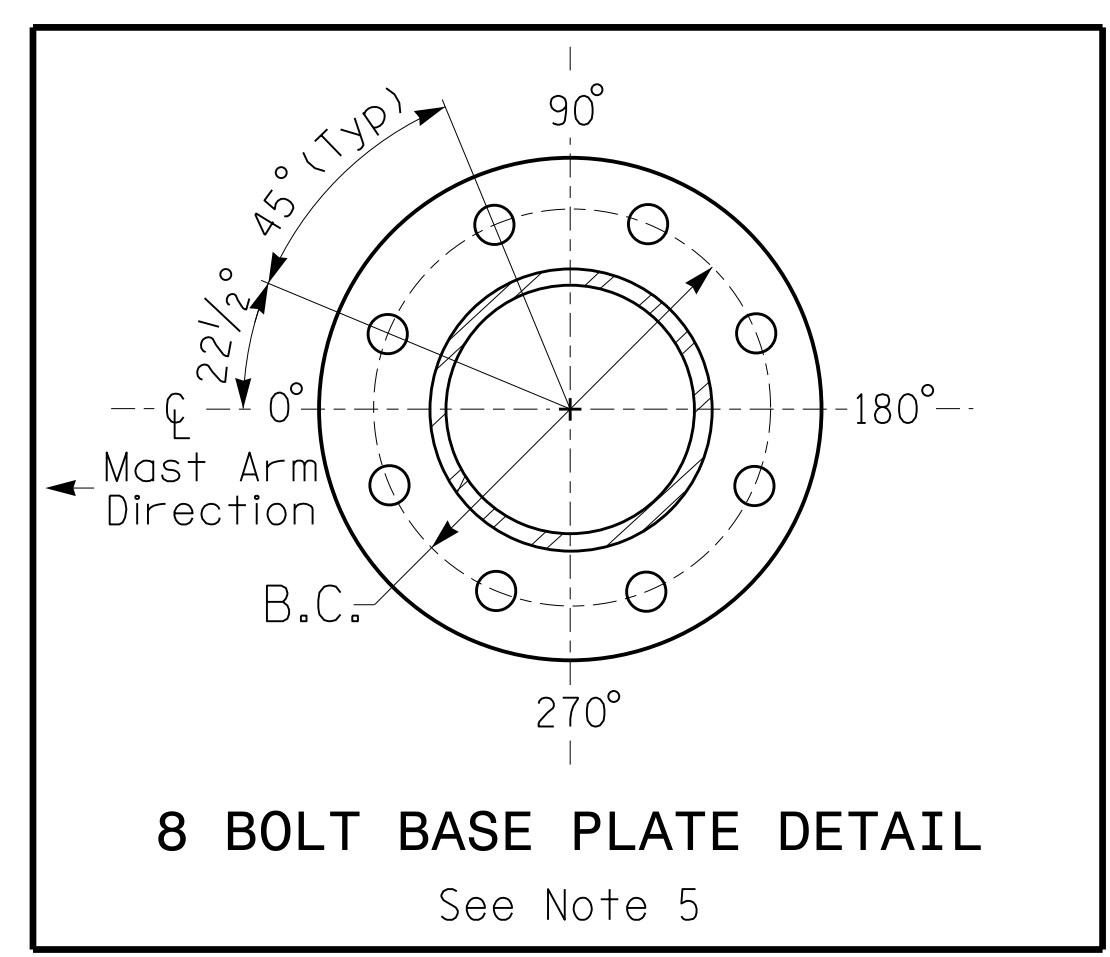


POLE RADIAL ORIENTATION

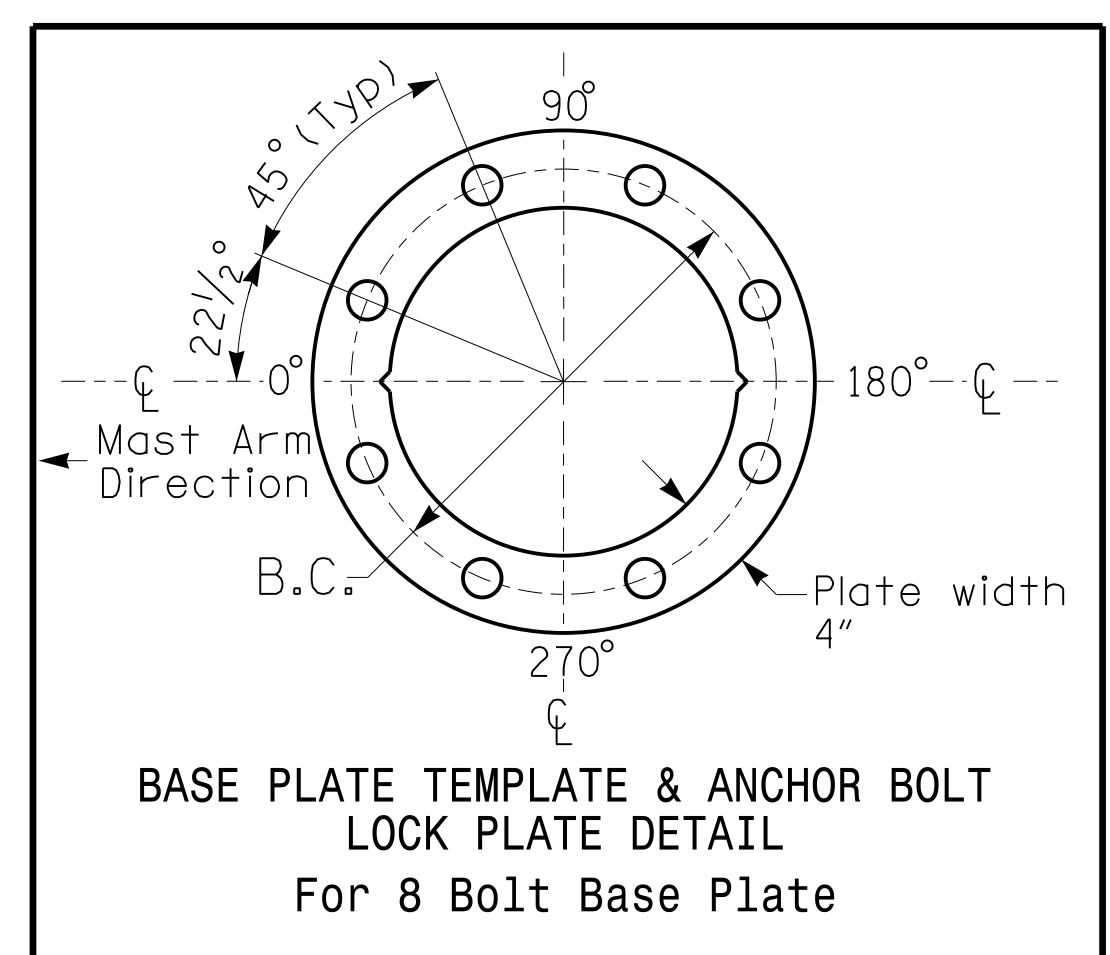
Design Loading for METAL POLE NO. 4



Elevation View



8 BOLT BASE PLATE DETAIL



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

**MAST ARM LOADING SCHEDULE**

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	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
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS
A	SIGN RIGID MOUNTED	5.0 S.F.	24.0" W X 30.0" L	11 LBS
B	SIGN RIGID MOUNTED	7.5 S.F.	30.0" W X 36.0" L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0" W X 96.0" L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

- 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 2012 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
  - The 2012 NCDOT Roadway Standard Drawings.

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.
- 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:
  - Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
  - 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.
  - Provide horizontal distance from the proposed centerline of the foundation to the edge of travelway. Refer to the Elevation Data Chart for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary to ensure that the roadway clearance is maintained at the edge of the travelway and to aid in the camber design of the arm.
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- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 4 (90 MPH)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>W. Peace Street at N. Harrington Street</p> <p>Division 5 Wake County Raleigh</p> <p>PLAN DATE: December 2015 REVIEWED BY:</p> <p>PREPARED BY: I. O. Umozurike REVIEWED BY:</p>		<p>2/8/2016</p>
	<p>SCALE: 0 N/A</p>	<p>REVISIONS</p> <p>INIT. DATE</p>	

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**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.

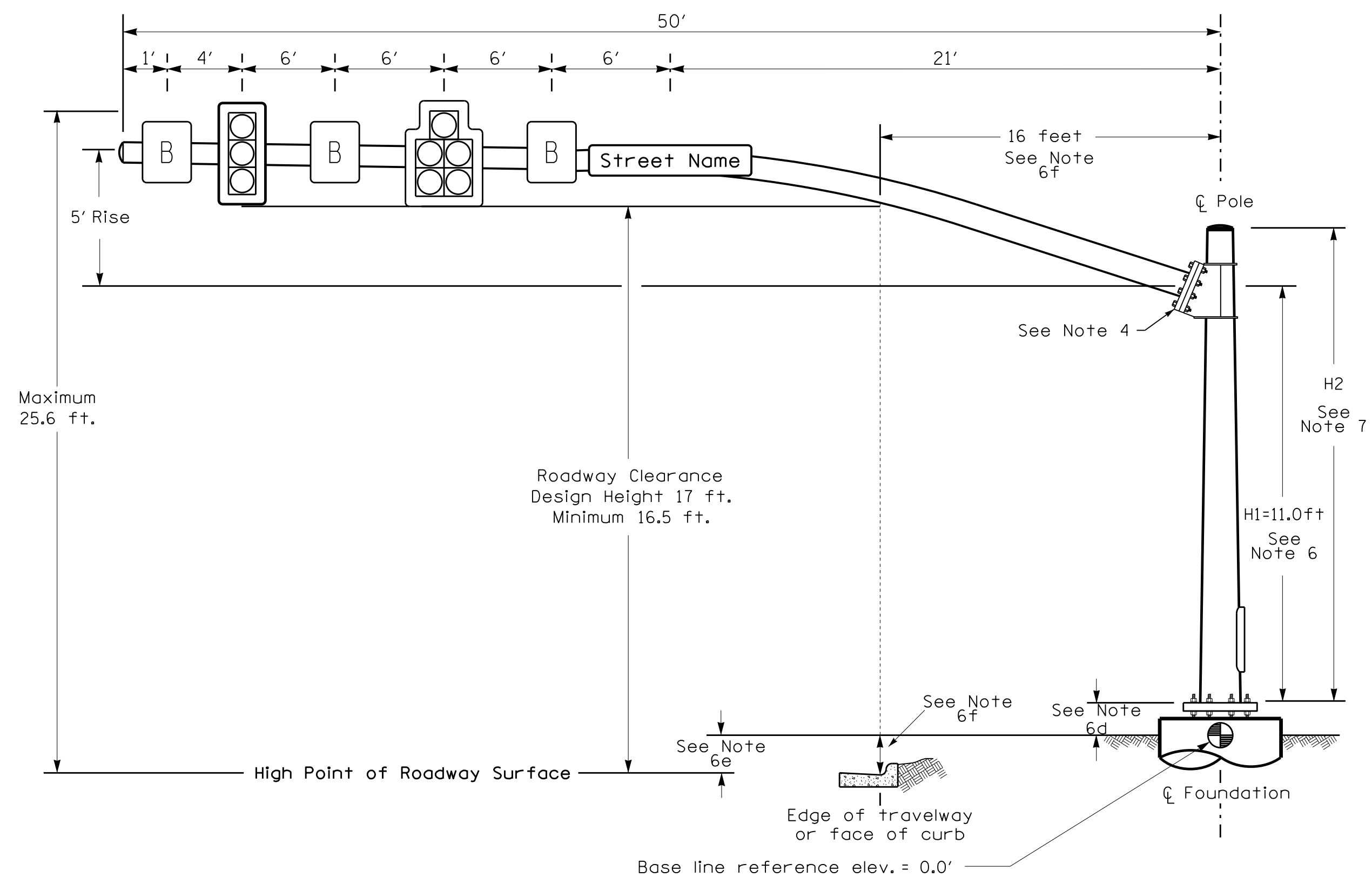
**Elevation Data for Mast Arm Attachment (H1)**

Elevation Differences for:	Pole 3
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.
Elevation difference at High point of roadway surface	+1.0 ft.
Elevation difference at Edge of travelway or face of curb	+1.0 ft.

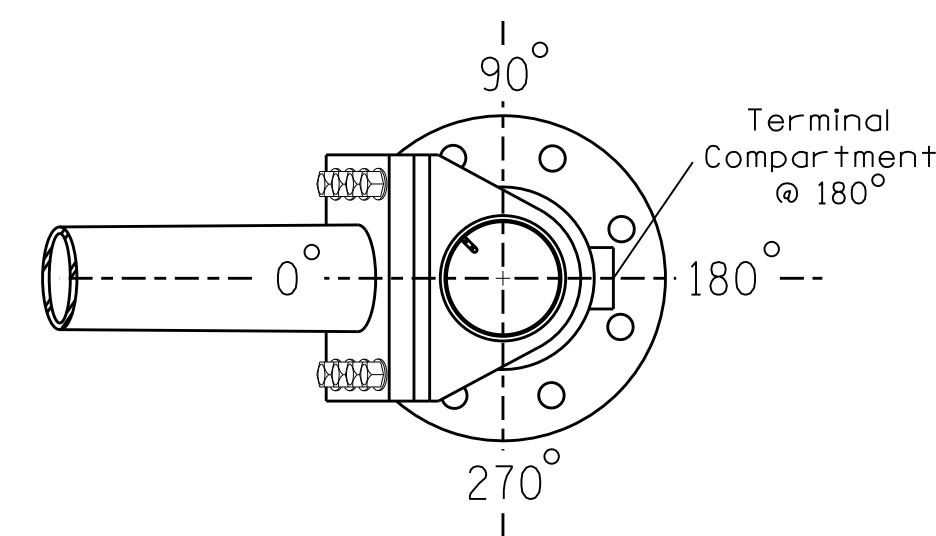
**MAST ARM LOADING SCHEDULE**

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	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
	SIGN RIGID MOUNTED	7.5 S.F.	30.0" W X 36.0" L	14 LBS
	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0" W X 96.0" L	36 LBS

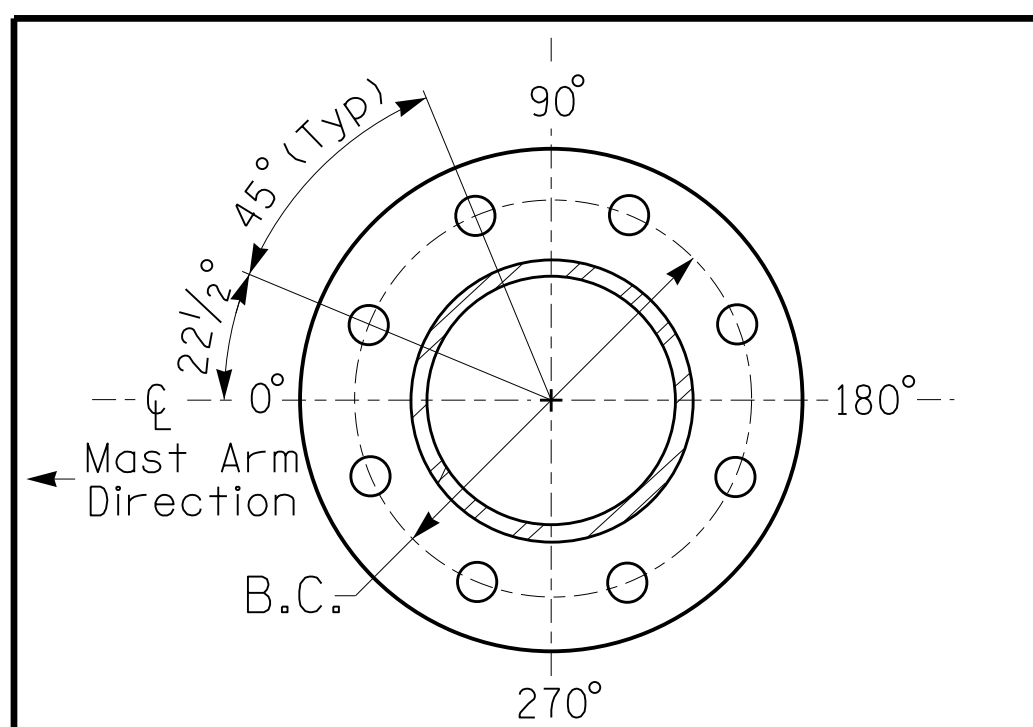
**Design Loading for METAL POLE NO. 5**



**Elevation View**

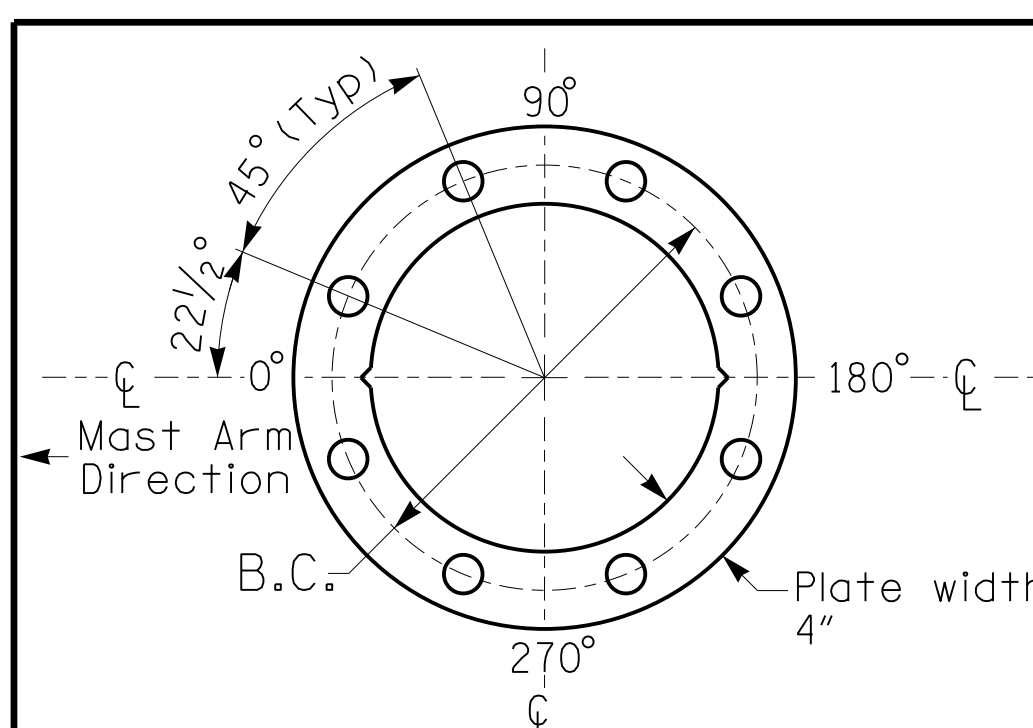


**POLE RADIAL ORIENTATION**



**8 BOLT BASE PLATE DETAIL**

See Note 5



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

**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 2012 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
  - The 2012 NCDOT Roadway Standard Drawings.

**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.
- 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:
  - Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
  - 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.
  - Provide horizontal distance from the proposed centerline of the foundation to the edge of travelway. Refer to the Elevation Data Chart for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary to ensure that the roadway clearance is maintained at the edge of the travelway and to aid in the camber design of the arm.
- 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) 773-2800.
- 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.

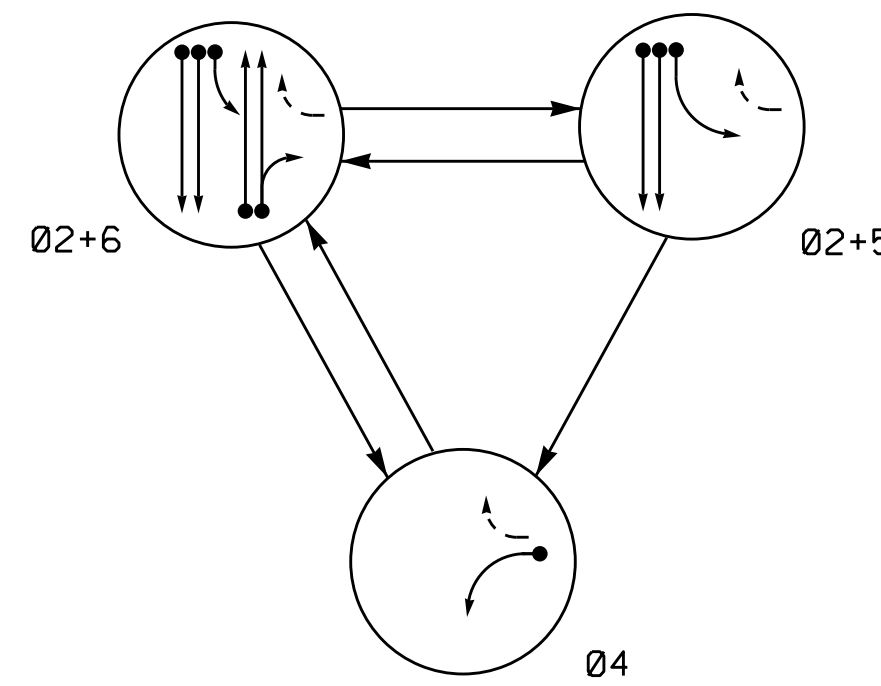
NCDOT Wind Zone 4 (90 MPH)

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

<p>Prepared in the Offices of:                  TRANSPORTATION MOBILITY AND SAFETY DIVISION                  NORTH CAROLINA DEPARTMENT OF TRANSPORTATION                  Signal Design Section                  750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>W. Peace Street                  at                  N. Harrington Street</p>		
	Division 5 Wake County Raleigh PLAN DATE: December 2015 REVIEWED BY: PREPARED BY: I. O. Umzurike REVIEWED BY:	REVISIONS INIT. DATE	
SIG. INVENTORY NO. R-0138			DATE 2/8/2016



### PHASING DIAGRAM



#### PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION. Table with columns: SIGNAL FACE, PHASE (Ø 2+5, Ø 2+6, Ø 4, FLASH), and values for signal faces 21, 22, 23, 24, 41, 42, 61, 62.

WARNING BEACON TABLE OF OPERATION. Table with columns: SIGNAL FACE, INTERVAL (1, 2), and values for signal faces 23 and 24.

LOOP & DETECTOR UNIT INSTALLATION CHART. Table with columns: INDUCTIVE LOOPS (LOOP NO., SIZE, TURNS, DIST. FROM STOPBAR, NEW, EXISTING), DETECTOR PROGRAMMING (TIMING, OPERATION MODE), and STATUS (NEW, EXISTING).

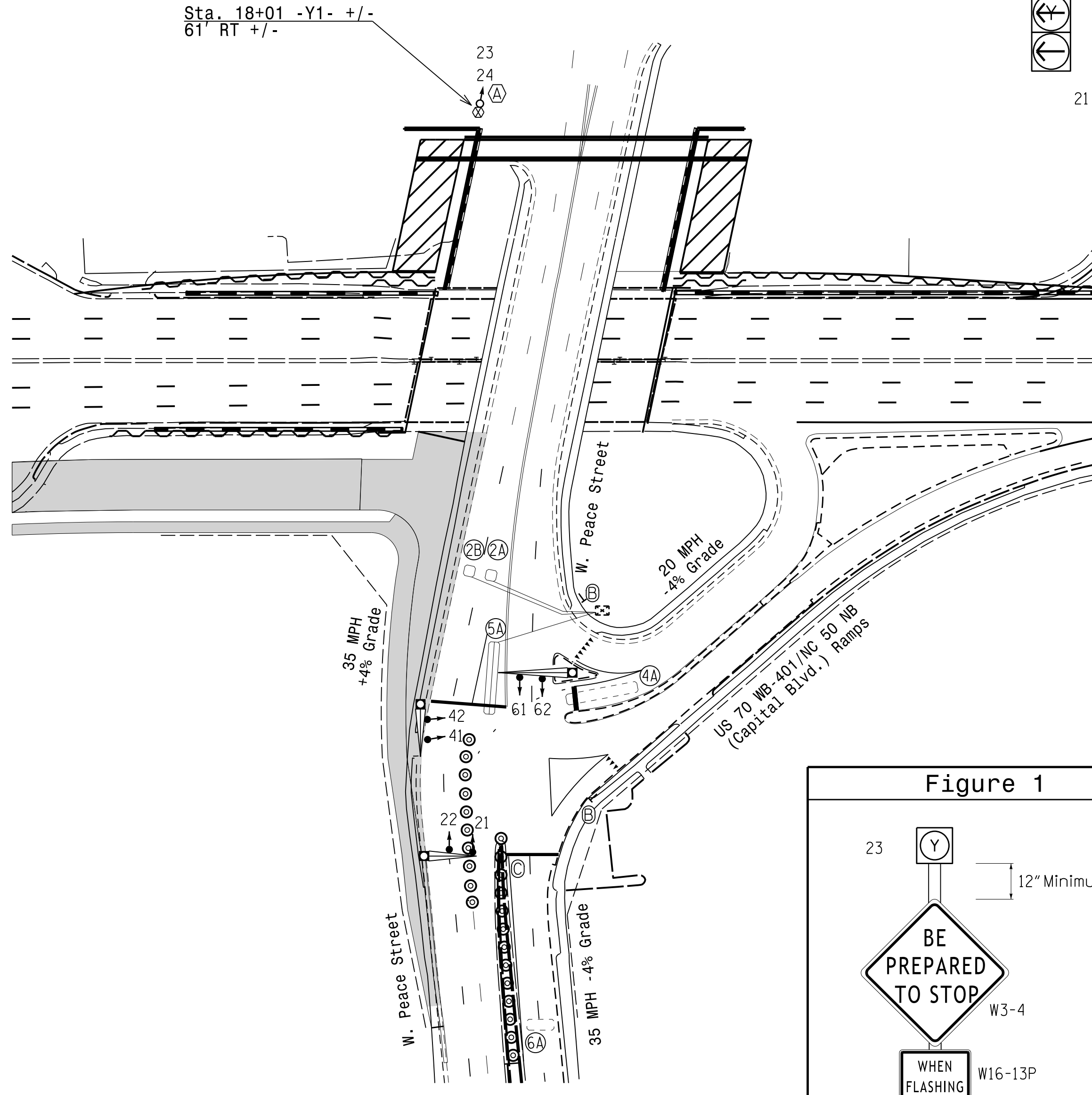
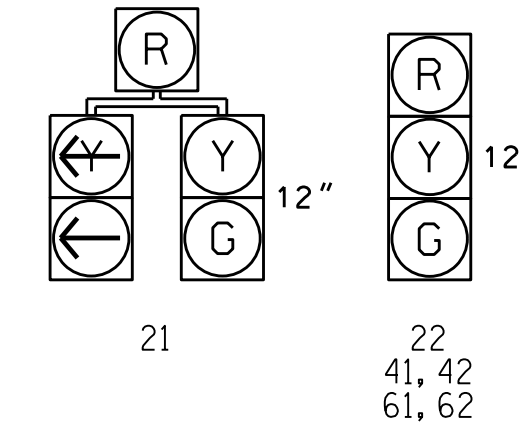
3 Phase Fully Actuated (Raleigh Signal System)

#### NOTES

- 1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012...
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 5 may be lagged.
4. Set all detector units to presence mode.
5. Pavement markings are existing unless otherwise shown.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

#### SIGNAL FACE I.D.

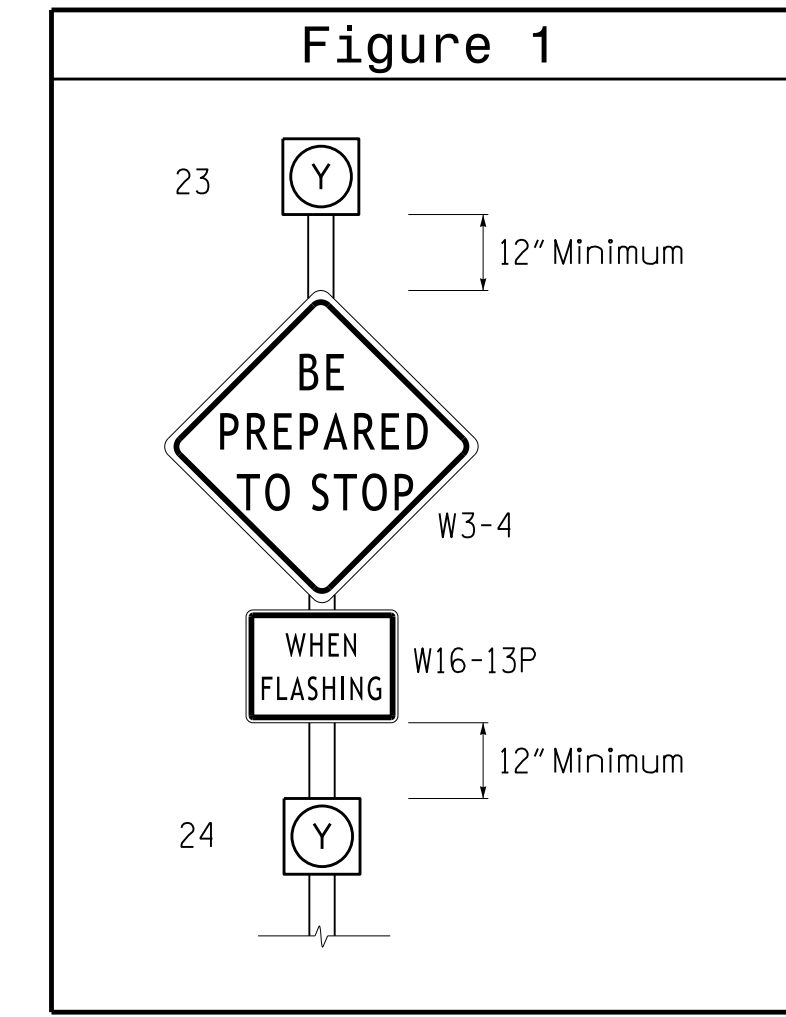
All Heads L.E.D.



#### LEGEND

- PROPOSED: Traffic Signal Head, Modified Signal Head, Sign, Pedestrian Signal Head...
EXISTING: Right of Way, Directional Arrow, Metal Pole with Mastarm, Construction Zone Drums, Type III Signal Pedestal.

SE-PAC 2070 TIMING CHART. Table with columns: FEATURE, PHASE (2, 4, 5, 6), and timing values for various features like Min Green, Passage Gap, etc.



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

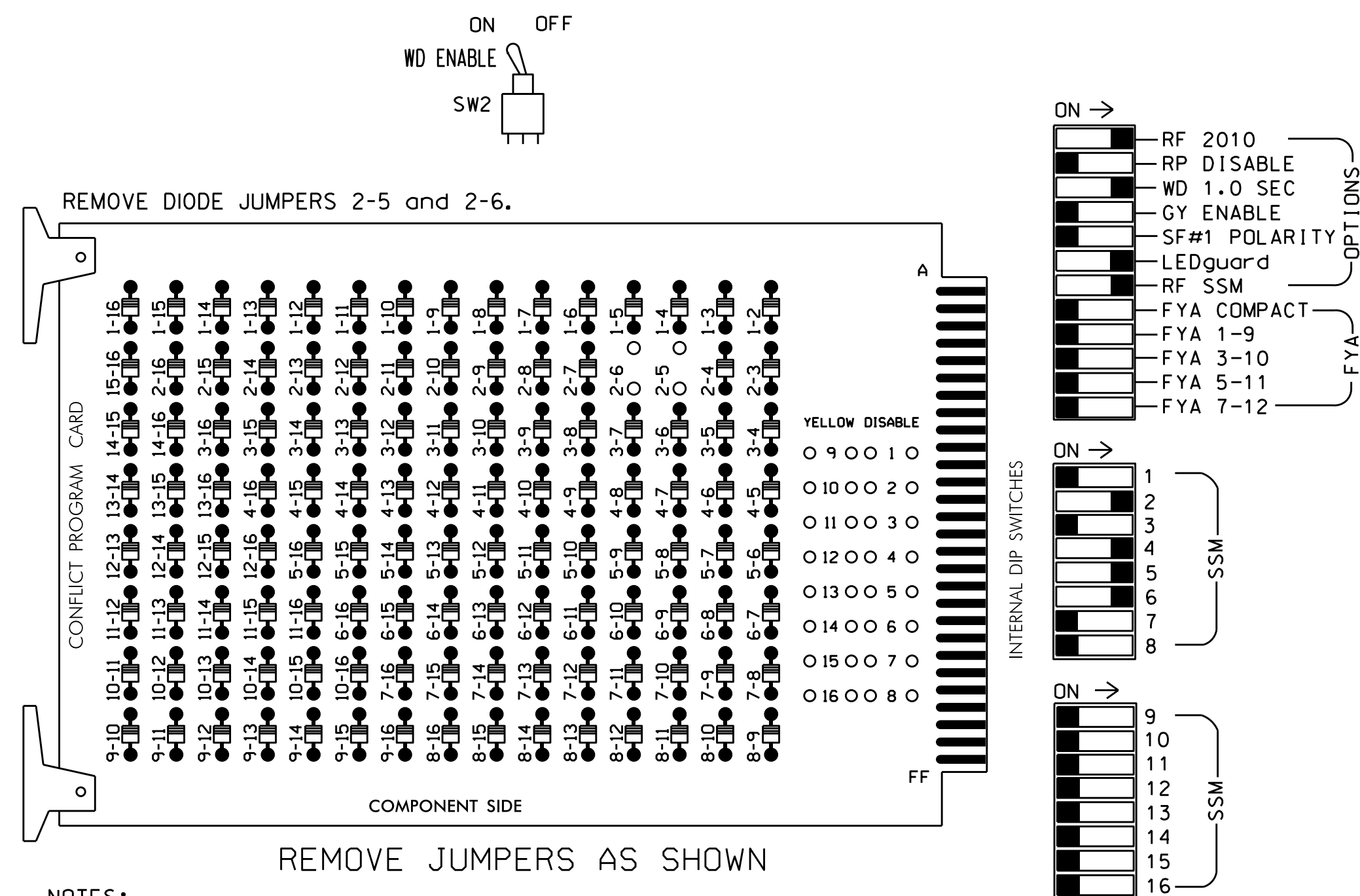
Signal Upgrade - Temporary Design 1 (TMP Area II, Phase I & III). Includes project title, location (W. Peace Street at US 70 WB-401/NC 50 NB), plan date (December 2015), and professional seals.

03-FEB-2016 15:53 P:\TTP\Projects\B-5121\TTP\caddesign\signal\signal.spl s:\dms\1602405164211\_spl.dgn 2/16/2016 2:10:00 PM



**EDI MODEL 2010ECL-NC CONFLICT MONITOR  
PROGRAMMING DETAIL**

(remove jumpers and set switches as shown)



**NOTES:**

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Make sure jumpers SEL2-SEL5 are present on the monitor board.

**NOTES**

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3,7, 8,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program controller to start up in phases 2 and 6 green.
4. Enable simultaneous gap-out feature, on controller unit, for all phases.
5. The cabinet and controller are part of the Raleigh City Signal System.

**EQUIPMENT INFORMATION**

CONTROLLER.....2070  
 CABINET.....332  
 SOFTWARE.....SE-PAC2070  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S2,S2P\*,S4,S5,S6  
 PHASES USED.....2,4,5,6  
 OVERLAP "E".....2

\* Used for Advance Beacons. See sheet 3 for details.

**SIGNAL HEAD HOOK-UP CHART**

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	OLE	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	ADVANCE BEACON	NU	41,42	NU	21	61,62	NU	NU	NU	NU
RED		128			101		*	134				
YELLOW		129			102			135				
GREEN		130			103			136				
RED ARROW												
YELLOW ARROW							132					
GREEN ARROW							133					
HAND			**				113					
PED YELLOW			**				114					
WALKER			*									

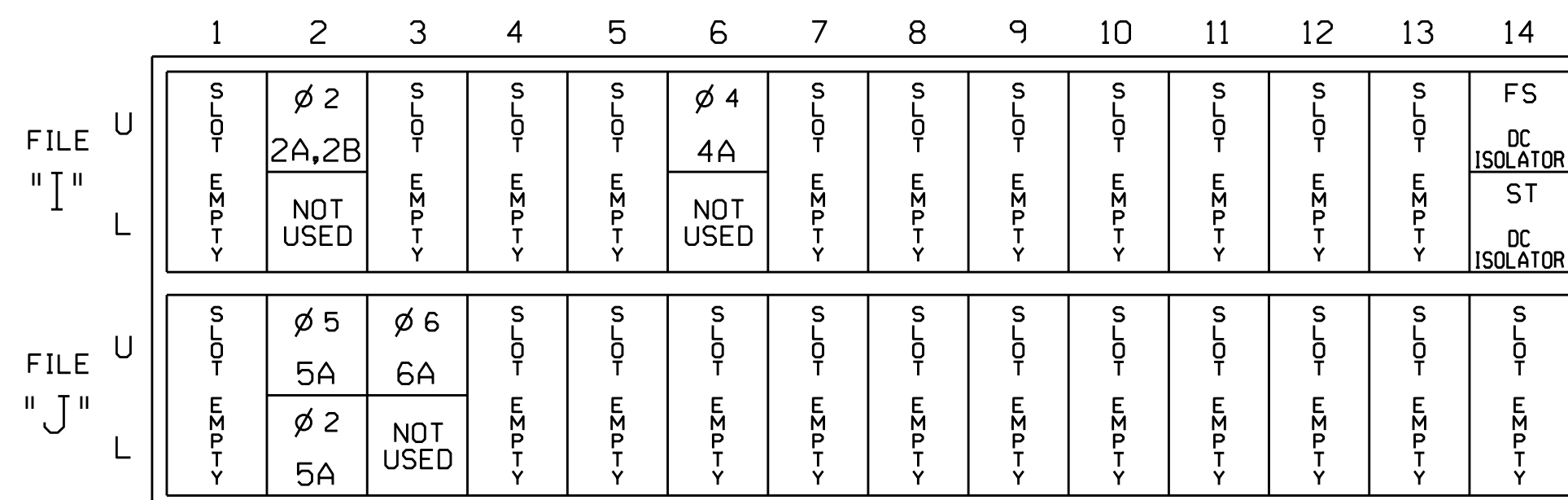
NU = Not Used

\* Denotes install load resistor. See load resistor installation detail below.

\*\* Used for Advance Beacon control. See sheet 3 for Advance Beacon Relay Control and Sign Wiring Detail.

**INPUT FILE POSITION LAYOUT**

(front view)



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

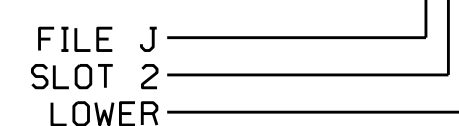
FS = FLASH SENSE  
 ST = STOP TIME

**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
2A,2B	TB2-5,6	I2U	39	3	2		
4A	TB4-9,10	I6U	41	11	4		
5A'	TB3-5,6	J2U	40	21	5	15	
	TB3-7,8	J2L	44	22	2		
6A	TB3-9,10	J3U	64	23	6		

'Add jumpers from TB3-5 to TB3-7, and from TB3-6 to TB3-8.

INPUT FILE POSITION LEGEND: J2L



**SE-PAC2070 CONTROLLER  
OVERLAP PROGRAMMING**

(program controller as shown below)

FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1-STARTUP & MISC	6-ALT SEQUENCES
2-REMOTE FLASH	7-PORT 1 DATA
3-OVERLAP STANDARD	8-I/O MISC
4-OVERLAP SPECIAL	9-SIG DRV OUT
5-RING STRUCTURE	

F-PRIOR MENU

PRESS 'B' FOUR TIMES

SE-PAC OVERLAP - E (0-NO/1-YES)

OVL PHASES: 010000000 0000000  
 PHS/CHN: 123456789 0123456789 01234  
 OVL CHN(S): 000000001 0000000000 00000

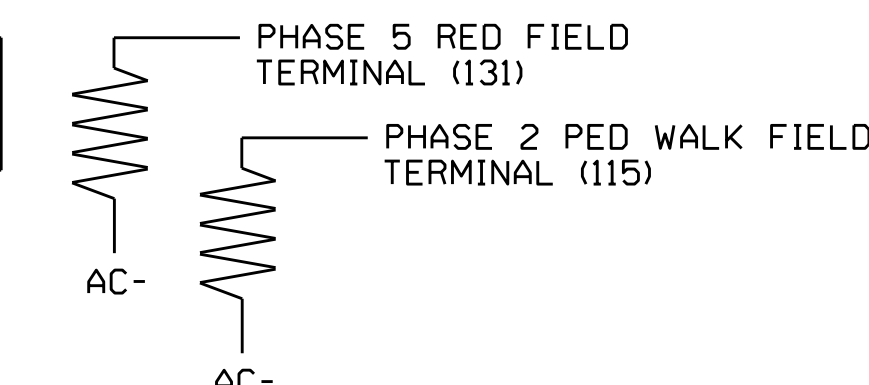
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

PRESS 'F' TO RETURN TO UNIT DATA

**LOAD RESISTOR INSTALLATION DETAIL**

(install resistors as shown below)

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



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1642T1  
 DESIGNED: December 2015  
 SEALED: 2/1/2016  
 REVISED: N/A

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Electrical Detail - Temp Design 1 (TMP Area II Phase I & III) - Sheet 1 of 3

Prepared in the Office of: STATE OF NORTH CAROLINA Department of Transportation Signal Management Section 750 Greenfield Parkway, Garner, NC 27529	W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps		SEAL KEITH M. MIMS ENGINEER
	Division 5 PLAN DATE: January 2016 PREPARED BY: S. Armstrong	Wake County Raleigh REVIEWED BY: T. Joyce REVIEWED BY:	

09-SEP-2016 09:53  
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 s0rmstron



# SE-PAC2070 CONTROLLER RING CONFIGURATION DETAIL

(program controller as shown below)

**NOTE:**  
BEFORE PROGRAMMING CONTROLLER, BE SURE TO LOAD DEFAULT PARAMETERS.

SELECT ④ FROM MAIN MENU

SE-PAC UNIT DATA      PRESS # DESIRED

1- STARTUP & MISC	6- ALT SEQUENCES
2- REMOTE FLASH	7- PORT 1 DATA
3- OVERLAP STANDARD	8- I/O MISC
4- OVERLAP SPECIAL	9- SIG DRV OUT
5- RING STRUCTURE	

F- PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 1    RING: 1    NXT PHS: 2    .....

CONCUR PHS: 100011000 0000000

PHS/CHN: 123456789 0123456789 01234

VEH CHN(S): 100000000 0000000000 00000

PED CHN(S): 000000000 0000000100 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 2    RING: 1    NXT PHS: 3    .....

CONCUR PHS: 010011000 0000000

PHS/CHN: 123456789 0123456789 01234

VEH CHN(S): 010000000 0000000000 00000

PED CHN(S): 000000001 0000000000 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 3    RING: 1    NXT PHS: 4    .....

CONCUR PHS: 001000110 0000000

PHS/CHN: 123456789 0123456789 01234

VEH CHN(S): 001000000 0000000000 00000

PED CHN(S): 000000000 0000000010 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 4    RING: 1    NXT PHS: 1    .....

CONCUR PHS: 000100110 0000000

PHS/CHN: 123456789 0123456789 01234

VEH CHN(S): 000100000 0000000000 00000

PED CHN(S): 000000000 1000000000 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 5    RING: 2    NXT PHS: 7    .....

CONCUR PHS: 110010000 0000000

PHS/CHN: 123456789 0123456789 01234

VEH CHN(S): 000010000 0000000000 00000

PED CHN(S): 000000000 0000000001 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 6    RING: 2    NXT PHS: 5    .....

CONCUR PHS: 110001000 0000000

PHS/CHN: 123456789 0123456789 01234

VEH CHN(S): 000001000 0000000000 00000

PED CHN(S): 000000000 0100000000 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 7    RING: 2    NXT PHS: 8    .....

CONCUR PHS: 001100100 0000000

PHS/CHN: 123456789 0123456789 01234

VEH CHN(S): 000000100 0000000000 00000

PED CHN(S): 000000000 0000000000 10000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 8    RING: 2    NXT PHS: 6    .....

CONCUR PHS: 001100010 0000000

PHS/CHN: 123456789 0123456789 01234

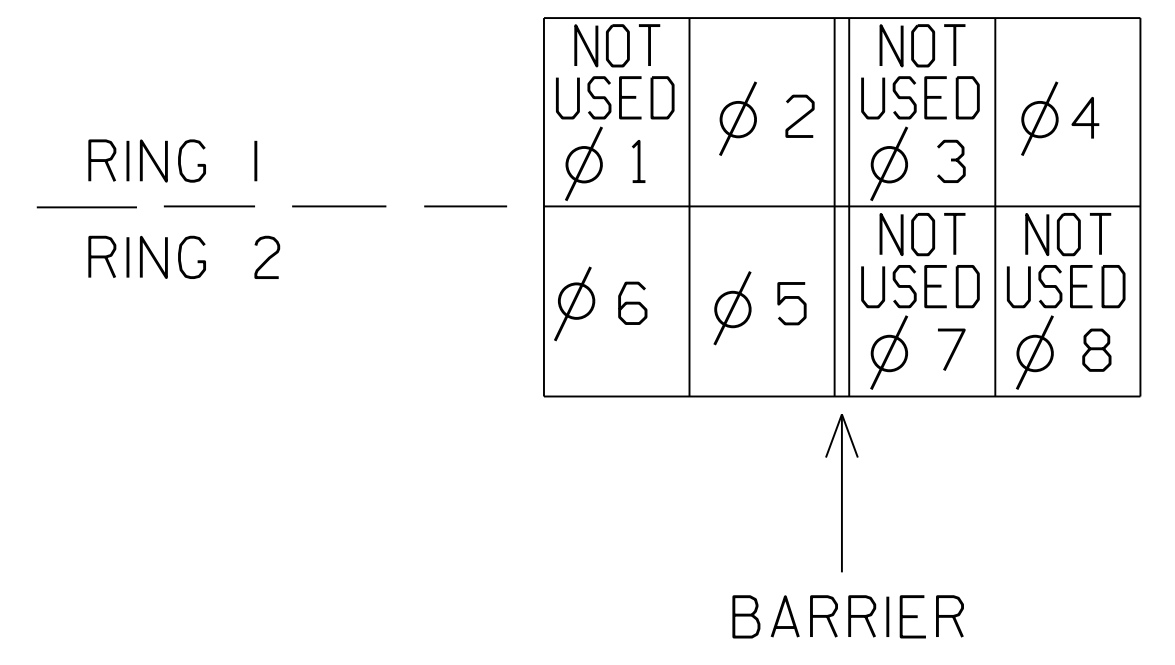
VEH CHN(S): 000000010 0000000000 00000

PED CHN(S): 000000000 0010000000 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

*end of programming*

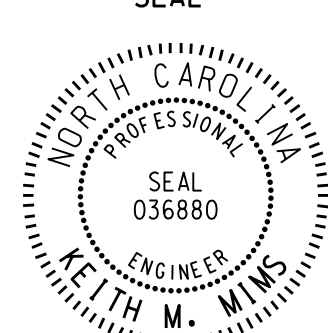
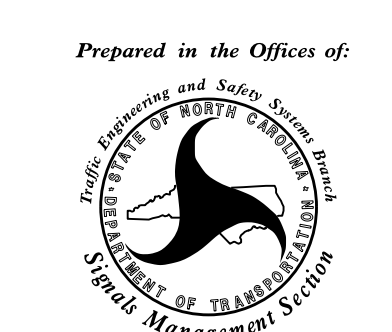
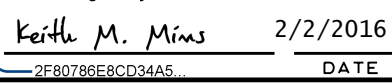
DUAL-QUAD WITH  
PHASES 5 & 6 ROTATED



THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-1642T1  
DESIGNED: December 2015  
SEALED: 2/1/2016  
REVISED: N/A

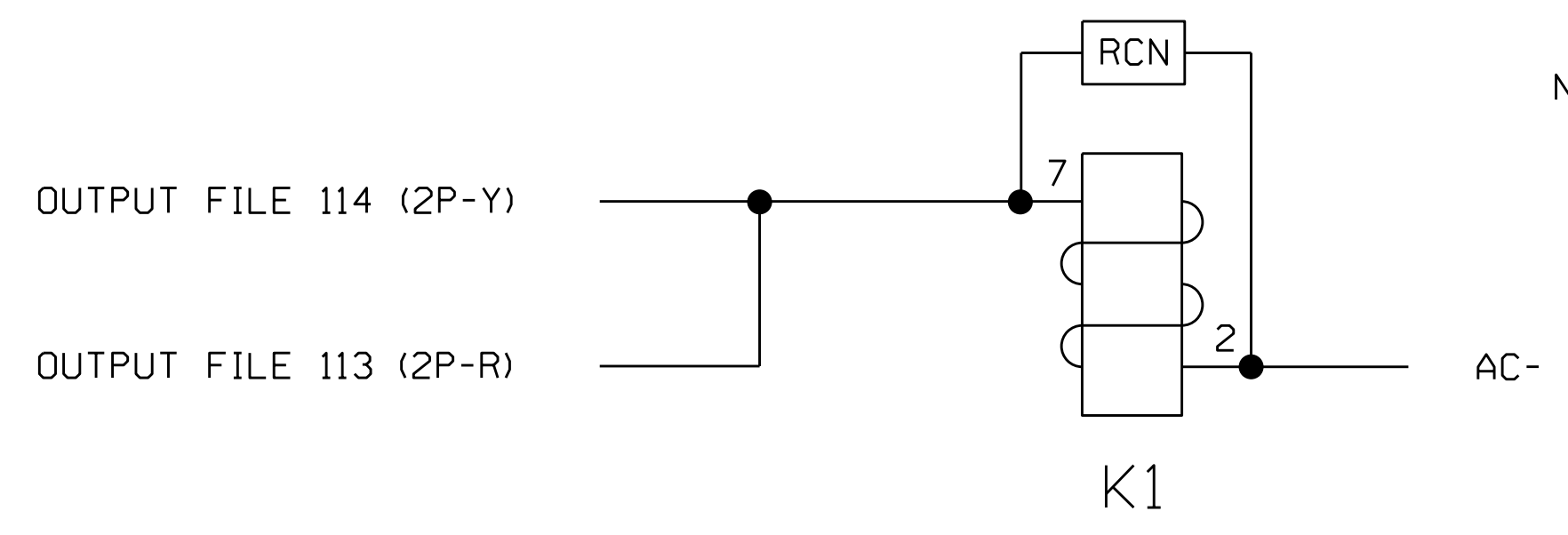
DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

Electrical Detail - Temp Design 1 (TMP Area II Phase I & III) - Sheet 2 of 3

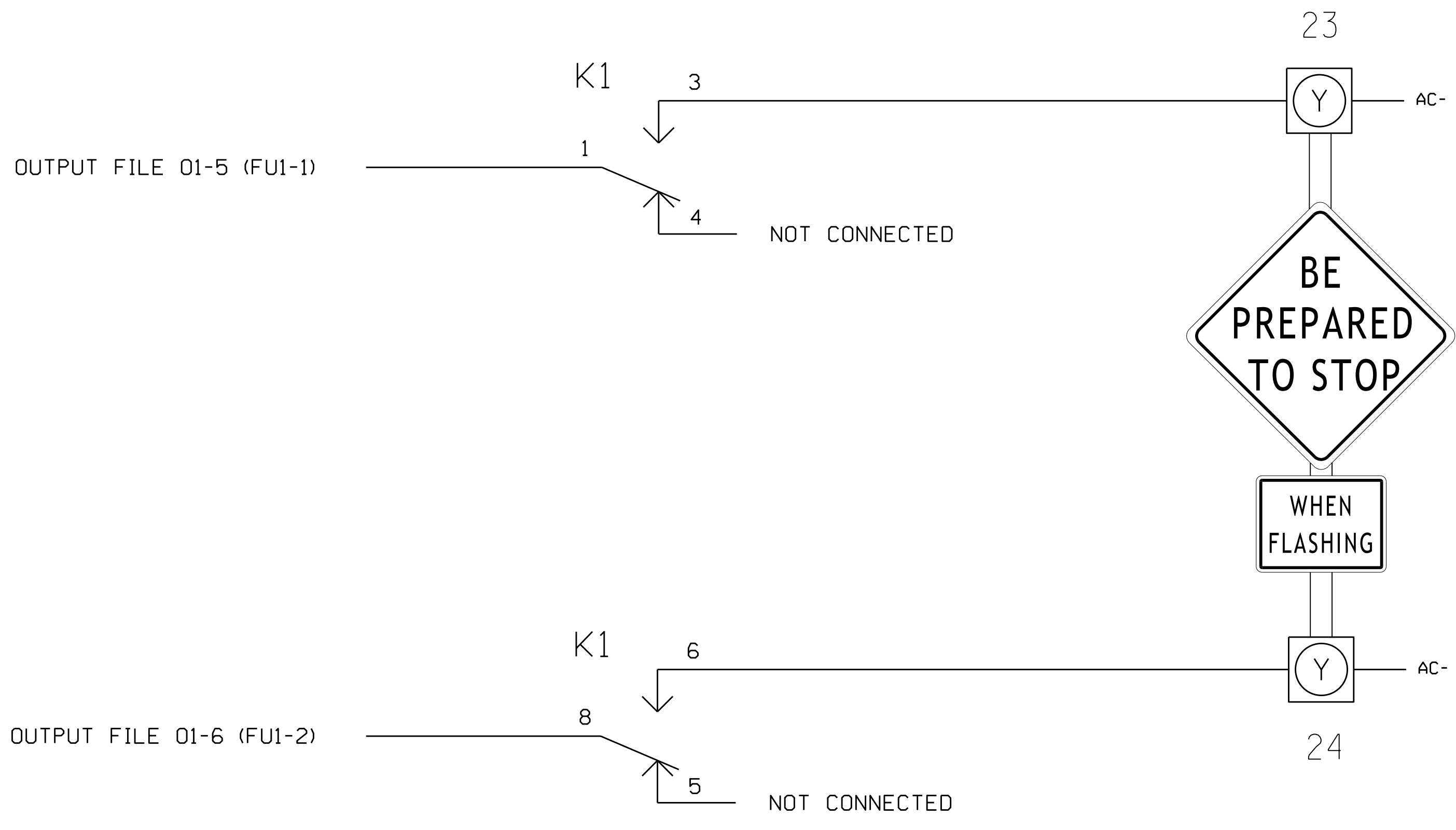
ELECTRICAL AND PROGRAMMING DETAILS FOR:	<b>W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps</b>	SEAL 
Prepared in the Offices of: 	Division 5      Wake County      Raleigh	DocuSigned by: 
PLAN DATE: January 2016      REVIEWED BY: T. Joyce	PREPARED BY: S. Armstrong      REVIEWED BY:	2/2/2016 DATE
REVISIONS      INIT.      DATE		SIG. INVENTORY NO. 05-1642T1

05-PEB-2016-09-14  
S:\MITS\SSM\TS\Sig\m\lework\hgr\051642\_sm.ele.xxx.dgn  
sarmstrong

## ADVANCE BEACON RELAY CONTROL AND SIGN WIRING DETAIL



NOTE: RELAY SHOWN IN THE DE-ENERGIZED STATE  
(PHASE 2 ACTIVE AND ADVANCE BEACONS OFF).

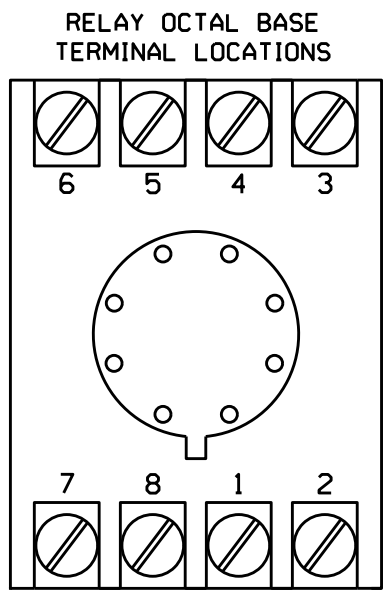


THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-1642T1  
DESIGNED: December 2015  
SEALED: 2/1/2016  
REVISED: N/A

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

### NOTES

- RELAY K1 IS A DPDT WITH A 120VAC COIL, CONTACT RATING 120VAC, 5 AMPS.
- THE RC NETWORK ACROSS THE COIL OF K1 IS VALUED AT .1 MICRO FARAD, 100 OHM.



Electrical Detail - Temp Design 1 (TMP Area II Phase I & III) - Sheet 3 of 3

Prepared in the Offices of:  PUBLIC UTILITIES AND SAFETY SERVICES, INC. Signal Management Systems 750 Greenfield Parkway, Garner, NC 27529	<b>DETAILS FOR:</b> W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps	SEAL 						
	Division 5 Wake County Raleigh							
	PLAN DATE: January 2016 PREPARED BY: S. Armstrong	REVIEWED BY: T. Joyce REVIEWED BY:						
<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> </tbody> </table>		REVISIONS	INIT.	DATE				DocuSigned by: Keith M. Mims 2/2/2016 2F8078E8C03445 DATE
REVISIONS	INIT.	DATE						
SIG. INVENTORY NO. 05-1642T1		DATE						

05-1642T1.dgn 05/14/16  
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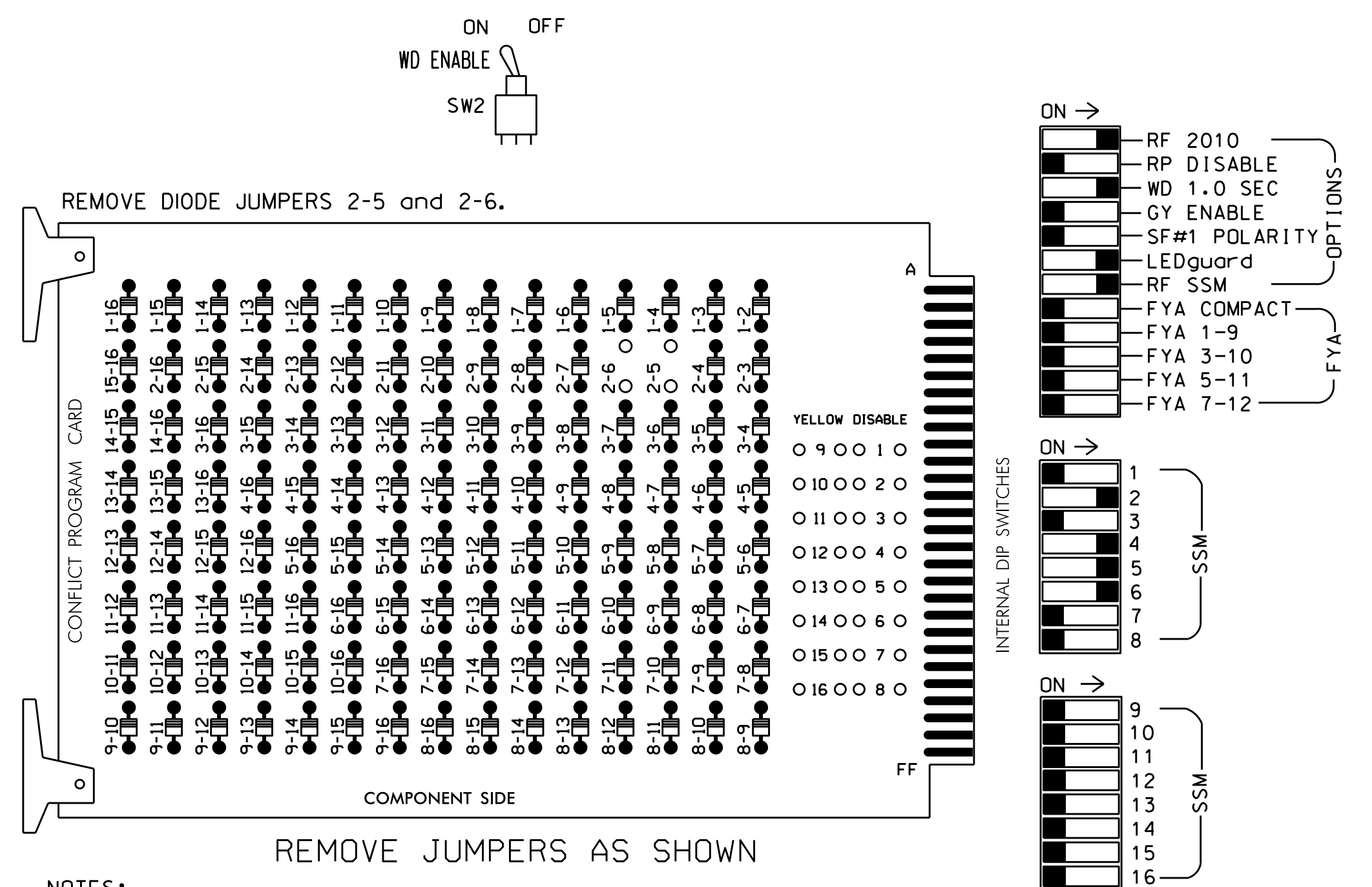






### EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(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.
- Make sure jumpers SEL2-SEL5 are present on the monitor board.

### 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.
- Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3,7, 8,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
- Program controller to start up in phases 2 and 6 green.
- Enable simultaneous gap-out feature, on controller unit, for all phases.
- The cabinet and controller are part of the Raleigh City Signal System.

### EQUIPMENT INFORMATION

CONTROLLER.....2070  
 CABINET.....332  
 SOFTWARE.....SE-PAC2070  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S2,S2P\*,S4,S5,S6  
 PHASES USED.....2,4,5,6  
 OVERLAP "E".....2

\* Used for Advance Beacons. See sheet 3 for details.

### SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	OLE	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	ADVANCE BEACON	NU	41,42	NU	21	61,62	NU	NU	NU	NU
RED		128			101		*	134				
YELLOW		129			102			135				
GREEN		130			103			136				
RED ARROW												
YELLOW ARROW							132					
GREEN ARROW							133					
Hand icon			**				113					
PED YELLOW			**				114					
Walking person icon			*									

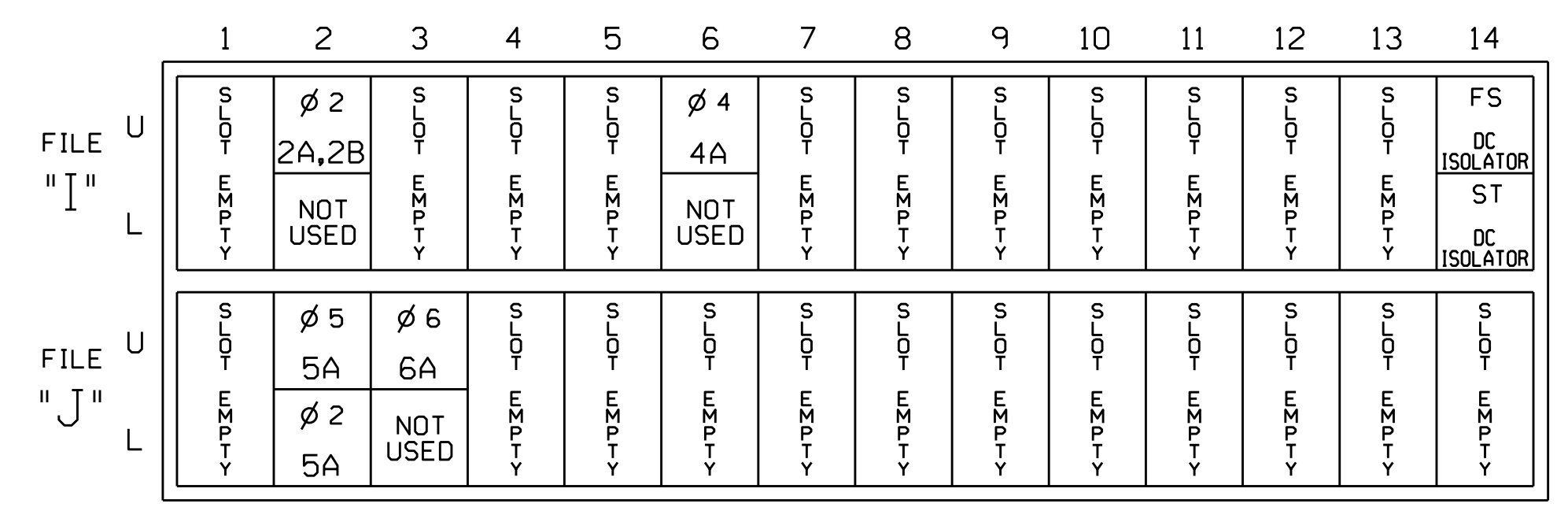
NU = Not Used

\* Denotes install load resistor. See load resistor installation detail below.

\*\* Used for Advance Beacon control. See sheet 3 for Advance Beacon Relay Control and Sign Wiring Detail.

### INPUT FILE POSITION LAYOUT

(front view)



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

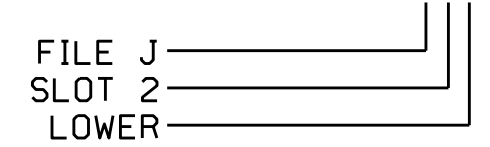
FS = FLASH SENSE  
 ST = STOP TIME

### INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
2A,2B	TB2-5,6	I2U	39	3	2		
4A	TB4-9,10	I6U	41	11	4		
5A'	TB3-5,6	J2U	40	21	5	15	
	TB3-7,8	J2L	44	22	2		
6A	TB3-9,10	J3U	64	23	6		

1 Add jumpers from TB3-5 to TB3-7, and from TB3-6 to TB3-8.

#### INPUT FILE POSITION LEGEND: J2L



### SE-PAC2070 CONTROLLER OVERLAP PROGRAMMING

(program controller as shown below)

FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1-STARTUP & MISC	6-ALT SEQUENCES
2-REMOTE FLASH	7-PORT 1 DATA
3-OVERLAP STANDARD	8-I/O MISC
4-OVERLAP SPECIAL	9-SIG DRV OUT
5-RING STRUCTURE	

F-PRIOR MENU

PRESS 'B' FOUR TIMES

SE-PAC OVERLAP - E	(0-NO/1-YES)
OVL PHASES:	010000000 0000000
PHS/CHN:	123456789 0123456789 01234
OVL CHN(S):	000000001 0000000000 00000

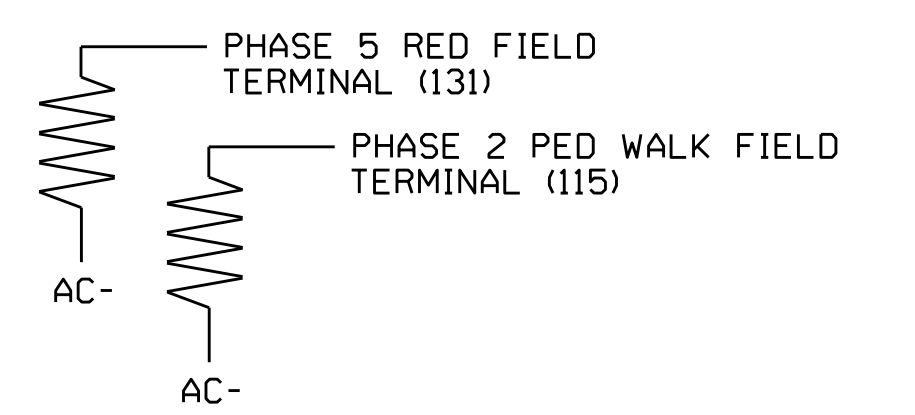
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

PRESS 'F' TO RETURN TO UNIT DATA

### LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)

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



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1642T2  
 DESIGNED: December 2015  
 SEALED: 2/1/2016  
 REVISED: N/A

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Electrical Detail - Temp Design 2 (TMP Area II Phase I, Stage II) - Sheet 1 of 3

Prepared in the Offices of: 	W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps		SEAL 
	Division 5 PLAN DATE: January 2016 PREPARED BY: S. Armstrong	Wake County Raleigh REVIEWED BY: T. Joyce REVIEWED BY:	

750 Greenfield Parkway, Garner, NC 27529

SIG. INVENTORY NO. 05-1642T2

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 sarmstrong



# SE-PAC2070 CONTROLLER RING CONFIGURATION DETAIL

(program controller as shown below)

**NOTE:**  
BEFORE PROGRAMMING CONTROLLER, BE SURE TO LOAD DEFAULT PARAMETERS.

SELECT ④ FROM MAIN MENU

SE-PAC UNIT DATA      PRESS # DESIRED

1- STARTUP & MISC	6- ALT SEQUENCES
2- REMOTE FLASH	7- PORT 1 DATA
3- OVERLAP STANDARD	8- I/O MISC
4- OVERLAP SPECIAL	9- SIG DRV OUT
5- RING STRUCTURE	

F- PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 1    RING: 1    NXT PHS: 2    .....

CONCUR PHS: 100011000 0000000

PHS/CHN: 123456789 0123456789 01234

VEH CHN(S): 100000000 0000000000 00000

PED CHN(S): 000000000 0000000100 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 2    RING: 1    NXT PHS: 3    .....

CONCUR PHS: 010011000 0000000

PHS/CHN: 123456789 0123456789 01234

VEH CHN(S): 010000000 0000000000 00000

PED CHN(S): 000000001 0000000000 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 3    RING: 1    NXT PHS: 4    .....

CONCUR PHS: 001000110 0000000

PHS/CHN: 123456789 0123456789 01234

VEH CHN(S): 001000000 0000000000 00000

PED CHN(S): 000000000 0000000010 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 4    RING: 1    NXT PHS: 1    .....

CONCUR PHS: 000100110 0000000

PHS/CHN: 123456789 0123456789 01234

VEH CHN(S): 000100000 0000000000 00000

PED CHN(S): 000000000 1000000000 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 5    RING: 2    NXT PHS: 7    .....

CONCUR PHS: 110010000 0000000

PHS/CHN: 123456789 0123456789 01234

VEH CHN(S): 000010000 0000000000 00000

PED CHN(S): 000000000 0000000001 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 6    RING: 2    NXT PHS: 5    .....

CONCUR PHS: 110001000 0000000

PHS/CHN: 123456789 0123456789 01234

VEH CHN(S): 000001000 0000000000 00000

PED CHN(S): 000000000 0100000000 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 7    RING: 2    NXT PHS: 8    .....

CONCUR PHS: 001100100 0000000

PHS/CHN: 123456789 0123456789 01234

VEH CHN(S): 000000100 0000000000 00000

PED CHN(S): 000000000 0000000000 10000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

SE-PAC RING STRUCTURE      (0-NO / 1-YES)

PHASE: 8    RING: 2    NXT PHS: 6    .....

CONCUR PHS: 001100010 0000000

PHS/CHN: 123456789 0123456789 01234

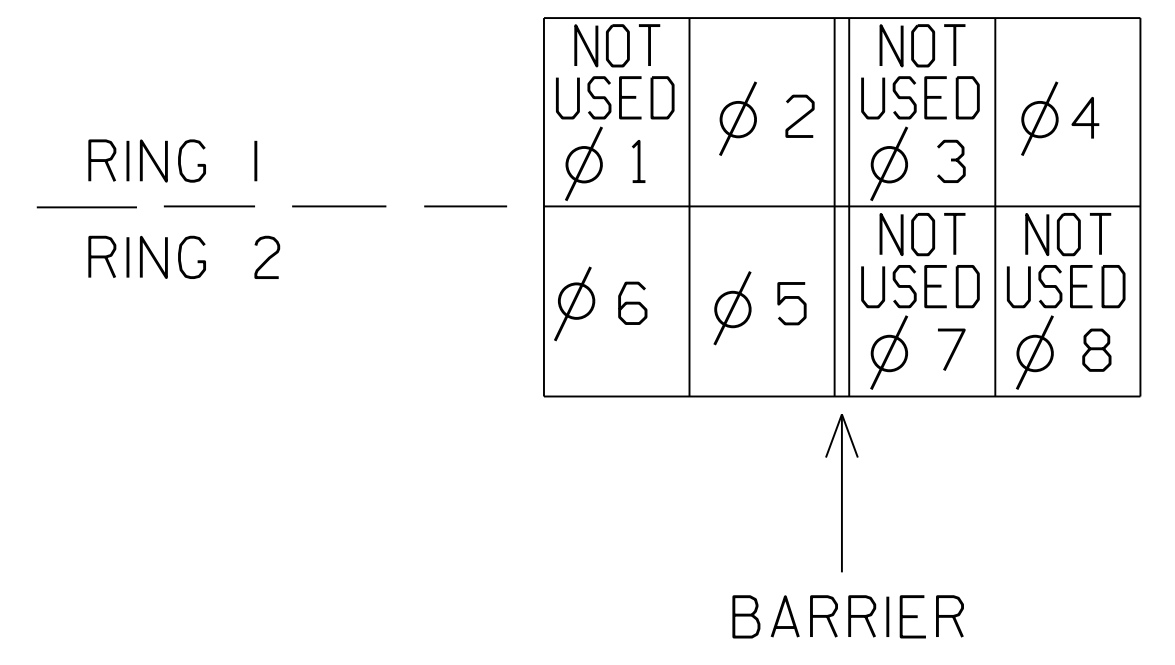
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PED CHN(S): 000000000 0010000000 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

*end of programming*

DUAL-QUAD WITH  
PHASES 5 & 6 ROTATED



THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-1642T2  
DESIGNED: December 2015  
SEALED: 2/1/2016  
REVISED: N/A

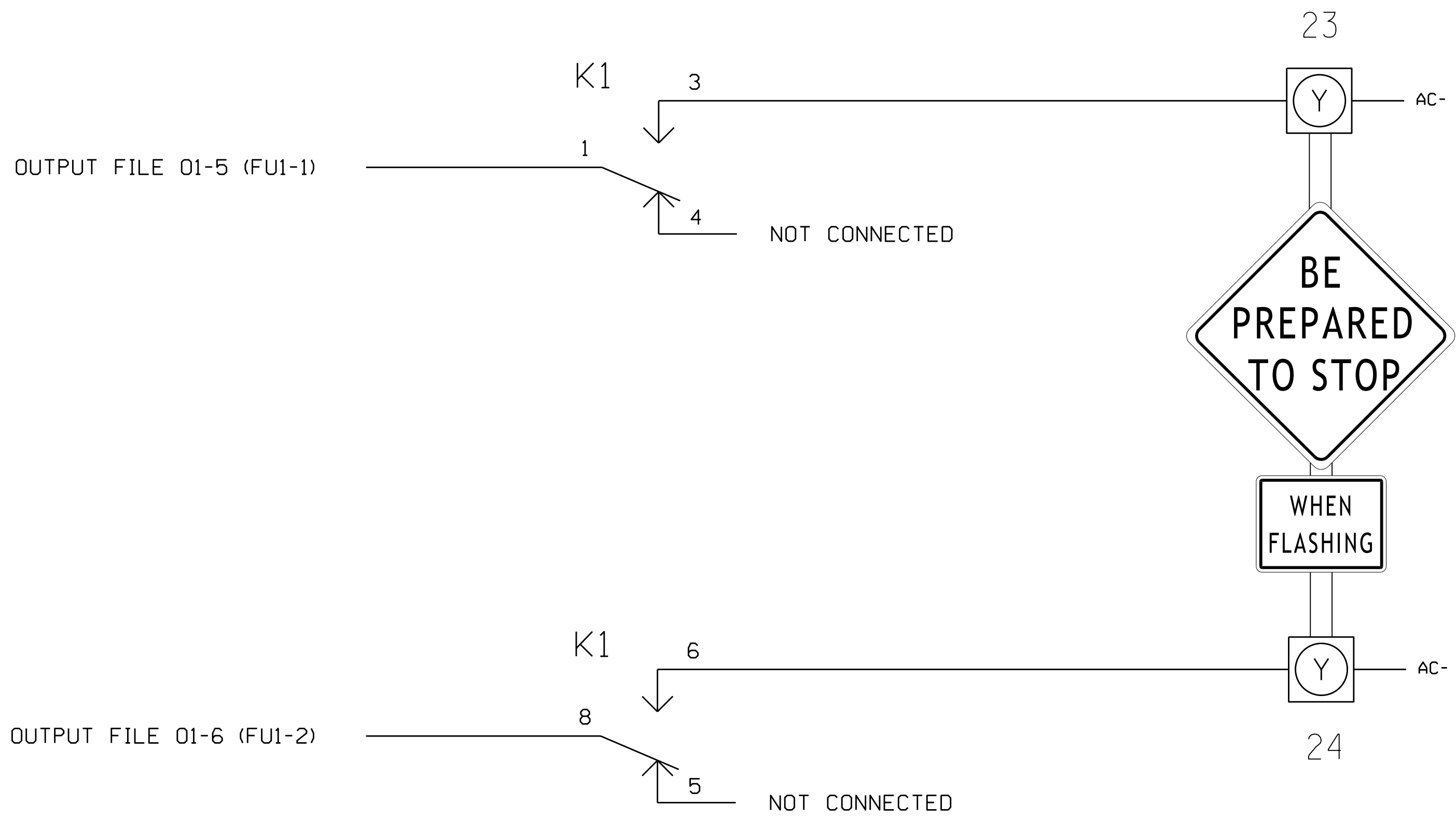
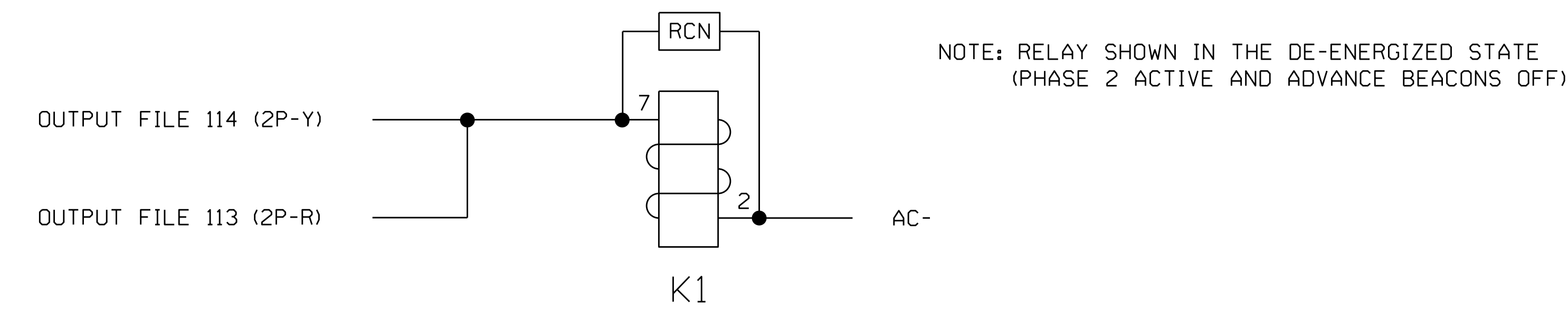
DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

Electrical Detail - Temp Design 2 (TMP Area II Phase I, Stage II) - Sheet 2 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:	<b>W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps</b>	SEAL 
Prepared in the Offices of: 	Division 5      Wake County      Raleigh	SEAL KEITH M. MINS ENGINEER
	PLAN DATE: January 2016      REVIEWED BY: T. Joyce	DocuSigned by: Keith M. Mins      2/2/2016
	PREPARED BY: S. Armstrong      REVIEWED BY:	250 Greenfield Parkway, Garner, NC 27529
	REVISIONS      INIT.      DATE	SIG. INVENTORY NO. 05-1642T2

05-1642-2016\_05-16  
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sarmstrong

## ADVANCE BEACON RELAY CONTROL AND SIGN WIRING DETAIL

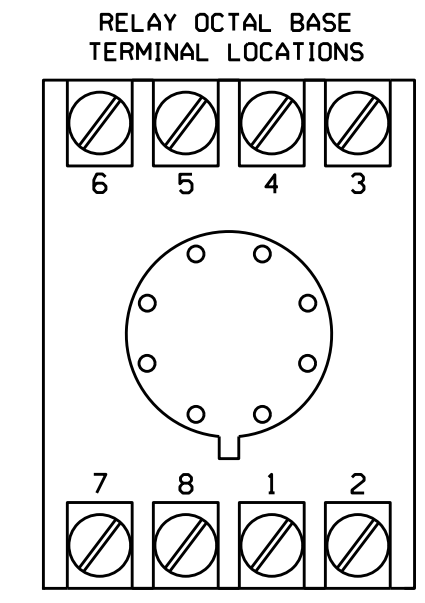


THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-1642T2  
DESIGNED: December 2015  
SEALED: 2/1/2016  
REVISED: N/A

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

### NOTES

1. RELAY K1 IS A DPDT WITH A 120VAC COIL, CONTACT RATING 120VAC, 5 AMPS.
2. THE RC NETWORK ACROSS THE COIL OF K1 IS VALUED AT .1 MICRO FARAD, 100 OHM.



Electrical Detail - Temp Design 2 (TMP Area II Phase I, Stage II) - Sheet 3 of 3

<p style="font-size: small;">ELECTRICAL AND PROGRAMMING DETAILS FOR:</p> <p style="font-size: x-small;">Prepared in the Offices of: Public Utilities and Safety Services DIVISION OF TRANSPORTATION Signal Management Systems 750 Greenfield Parkway, Garner, NC 27529</p>	<p><b>W. Peace Street</b> at <b>US 70 WB-401/NC 50 NB</b> (Capital Blvd.) Ramps</p> <p style="font-size: x-small;">Division 5    Wake County    Raleigh</p> <p style="font-size: x-small;">PLAN DATE: January 2016    REVIEWED BY: T. Joyce</p> <p style="font-size: x-small;">PREPARED BY: S. Armstrong    REVIEWED BY:</p>	<p>SEAL</p> <p style="font-size: x-small;">DocuSigned by: Keith M. Mims    2/2/2016 2F8078EBCD3445    DATE</p> <p style="font-size: x-small;">SIG. INVENTORY NO. 05-1642T2</p>									
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REVISIONS	INIT.	DATE									

05-1642-2016-08-16  
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sarmstrong











**SE-PAC2070 CONTROLLER  
OVERLAP PROGRAMMING**

*(program controller as shown below)*

FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1-STARTUP & MISC	6-ALT SEQUENCES
2-REMOTE FLASH	7-PORT 1 DATA
3-OVERLAP STANDARD	8-I/O MISC
4-OVERLAP SPECIAL	9-SIG DRV OUT
5-RING STRUCTURE	
	F-PRIOR MENU

PRESS 'B' FIVE TIMES

SE-PAC OVERLAP - F	(0-NO/1-YES)
OVL PHASES: 010111000 0000000	
PHS/CHN: 123456789 0123456789 01234	
OVL CHN(S): 000000100 0000000000 00000	
A-UP B-DN D-DspChn	E-EDIT F-PRIOR MENU

PRESS 'B' ONE TIME

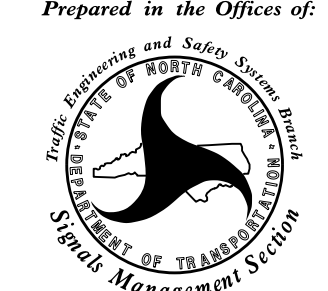
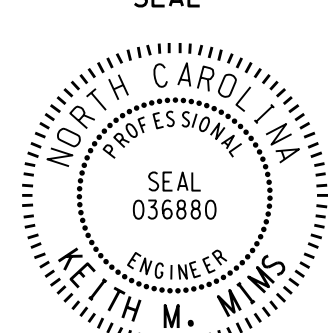
SE-PAC OVERLAP - G	(0-NO/1-YES)
OVL PHASES: 010000000 0000000	
PHS/CHN: 123456789 0123456789 01234	
OVL CHN(S): 000000000 0010000000 00000	
A-UP B-DN D-DspChn	E-EDIT F-PRIOR MENU

PRESS 'F' TO RETURN TO UNIT DATA

THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-1642T3  
DESIGNED: December 2015  
SEALED: 2/1/2016  
REVISED: N/A

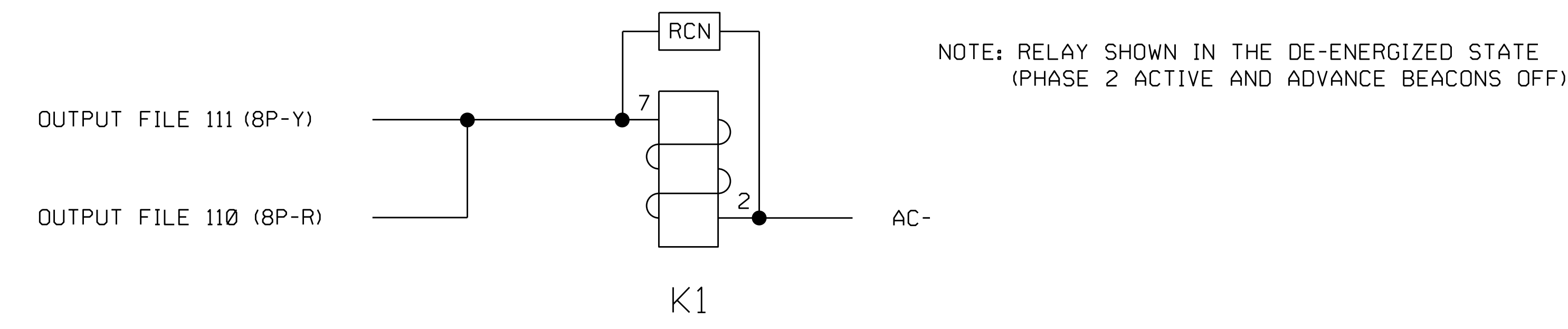
**DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED**

Electrical Detail - Temp Design 3 (TMP Area II Phase III-IV) - Sheet 2 of 3

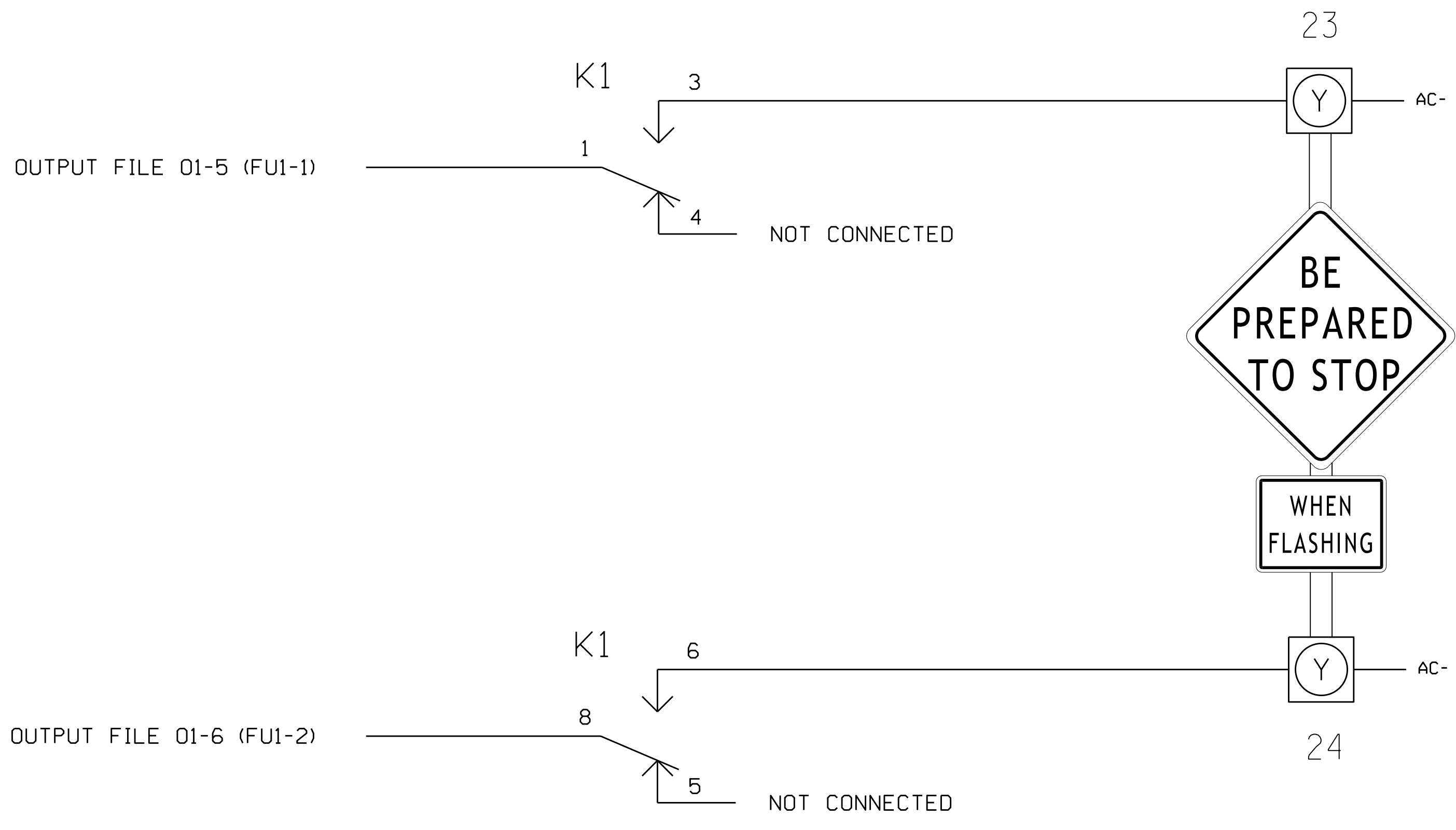
ELECTRICAL AND PROGRAMMING DETAILS FOR:  Prepared in the Offices of:  750 Greenfield Parkway, Garner, NC 27529	<b>W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps</b>		SEAL 
	Division 5 PLAN DATE: January 2016 PREPARED BY: S. Armstrong	Wake County REVIEWED BY: T. Joyce REVIEWED BY:	Raleigh DATE: 2/2/2016 DATE:

05-1642-2016\_10027  
 S:\MITS\SS\15\_Sig\01\work\hgr\051642\_sm.ele.xxx.dgn  
 sarmstrong

## ADVANCE BEACON RELAY CONTROL AND SIGN WIRING DETAIL



NOTE: RELAY SHOWN IN THE DE-ENERGIZED STATE  
(PHASE 2 ACTIVE AND ADVANCE BEACONS OFF).

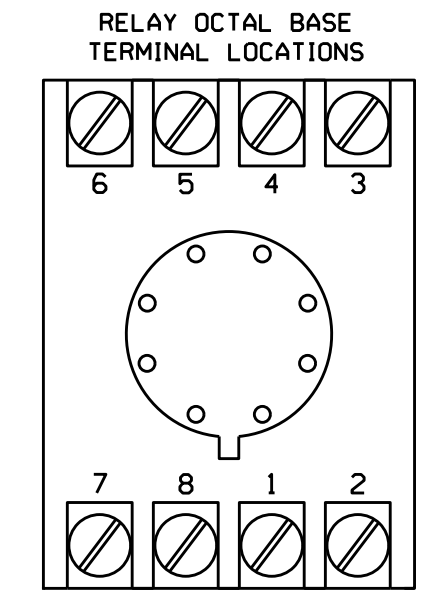


THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-1642T3  
DESIGNED: December 2015  
SEALED: 2/1/2016  
REVISED: N/A

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

### NOTES

- RELAY K1 IS A DPDT WITH A 120VAC COIL, CONTACT RATING 120VAC, 5 AMPS.
- THE RC NETWORK ACROSS THE COIL OF K1 IS VALUED AT .1 MICRO FARAD, 100 OHM.



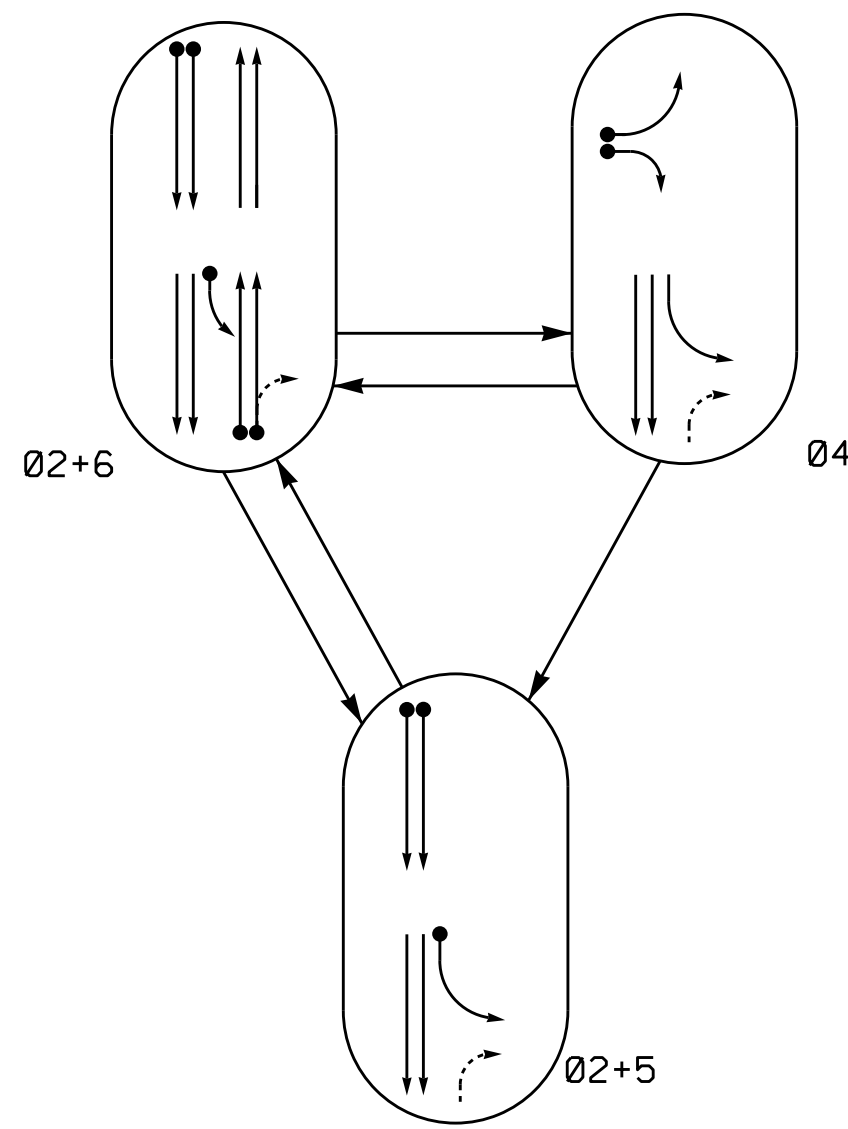
Electrical Detail - Temp Design 3 (TMP Area II Phase III-IV) - Sheet 3 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:  Prepared in the Offices of:  PUBLIC UTILITIES AND SAFETY SERVICES, INC. STATE OF NORTH CAROLINA Signal Management Systems 750 Greenfield Parkway, Garner, NC 27529	<b>W. Peace Street</b> at <b>US 70 WB-401/NC 50 NB</b> (Capital Blvd.) Ramps	SEAL  KEITH M. MINIS ENGINEER
	Division 5 Wake County Raleigh PLAN DATE: January 2016 REVIEWED BY: T. Joyce PREPARED BY: S. Armstrong REVIEWED BY:	REVISIONS INIT. DATE

05-1642T3.dwg 1/2/2016 10:57 AM S:\Projects\05-1642T3\Sigs\05-1642T3\_Sig\_Minis\armstrong051612.dgn.ele xxx.dgn sarminis



PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- ←● DETECTED MOVEMENT
- ← UNDETECTED MOVEMENT (OVERLAP)
- ←- UN SIGNALIZED MOVEMENT
- ←- PEDESTRIAN MOVEMENT

SIGNAL FACE	PHASE			
	02+5	02+6	04	02+5
21, 22, 25	G	G	R	Y
23, 24	OFF	OFF	ON	OFF
41, 42	R	R	G	R
51	G	G	G	Y
52	G	G	G	Y
61, 62, 63, 64	R	G	R	Y

WARNING BEACON TABLE OF OPERATION		
SIGNAL FACE	INTERVAL	
	1	2
23	ON	OFF
24	OFF	ON

LOOP & DETECTOR UNIT INSTALLATION CHART																			
SE-PAC 2070 CONTROLLER WITH 170 CABINET																			
INDUCTIVE LOOPS					DETECTOR PROGRAMMING														
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	ASSIGNED PHASE	TIMING		OPERATION MODE							STATUS			
							DELAY	EXTEND (STRETCH)	VEHICLE	PEDESTRIAN	1 CALL	2	3	4	5	6	7	SWITCH	SYSTEM
2A, 2B	6X6	4	70	-	X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X
4A	6X40	2-4-2	0	-	X	4	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X
4B	6X40	2-4-2	0	-	X	4	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X
5A	6X40	2-4-2	+5	-	X	5	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X
										2	- SEC.	- SEC.	X	-	-	-	-	-	-
6A, 6B	6X6	4	70	-	X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X

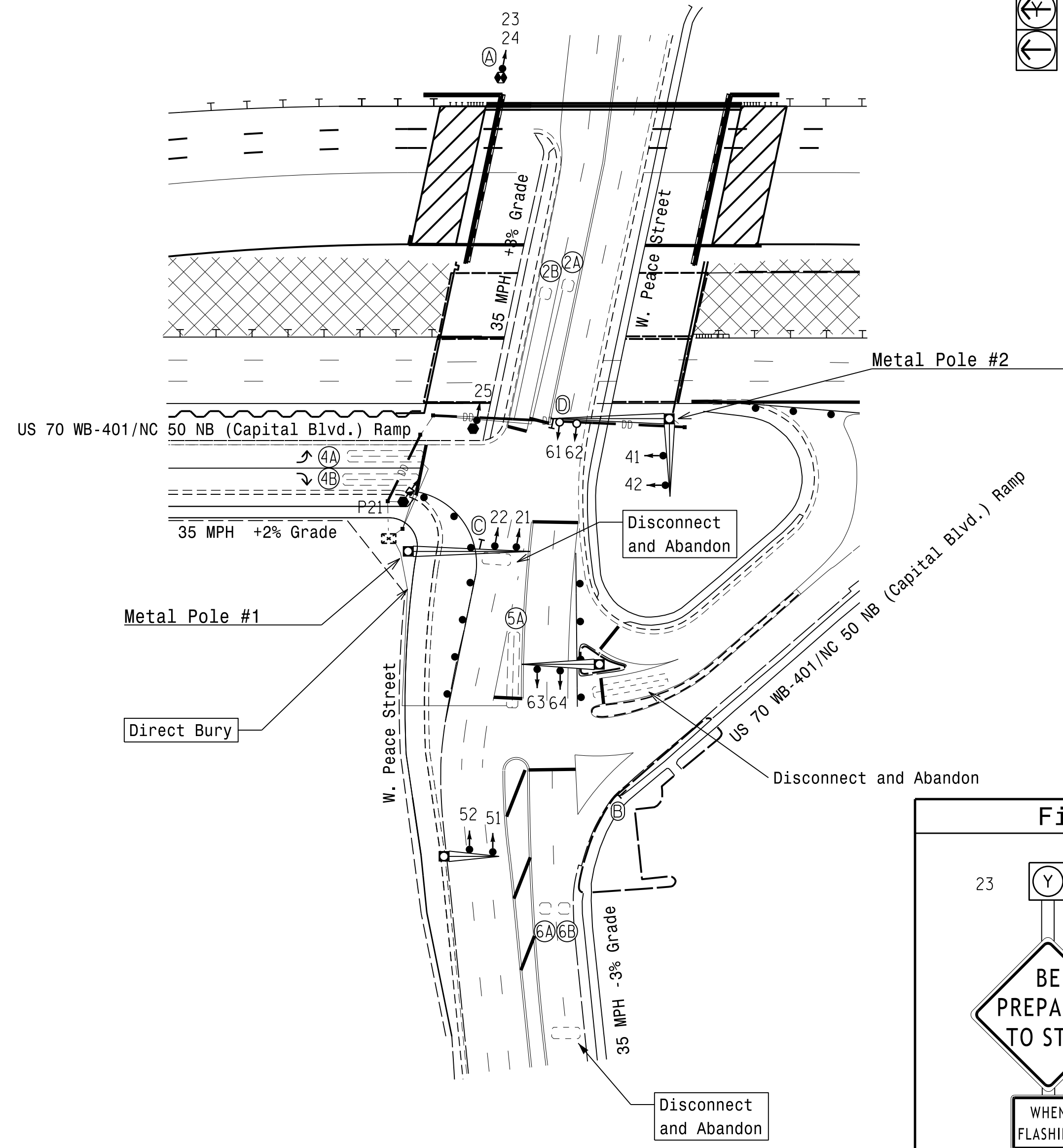
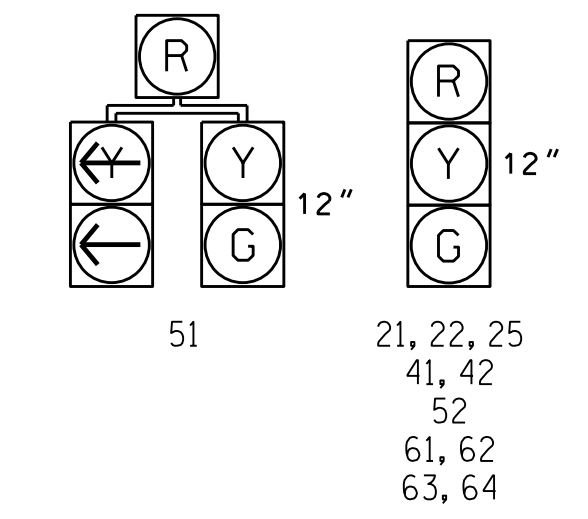
3 Phase Fully Actuated (Raleigh Signal System)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 5 may be lagged.
- Disconnect and bag existing signal head P21.
- Set all detector units to presence mode.
- 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.

SIGNAL FACE I.D.

All Heads L.E.D.

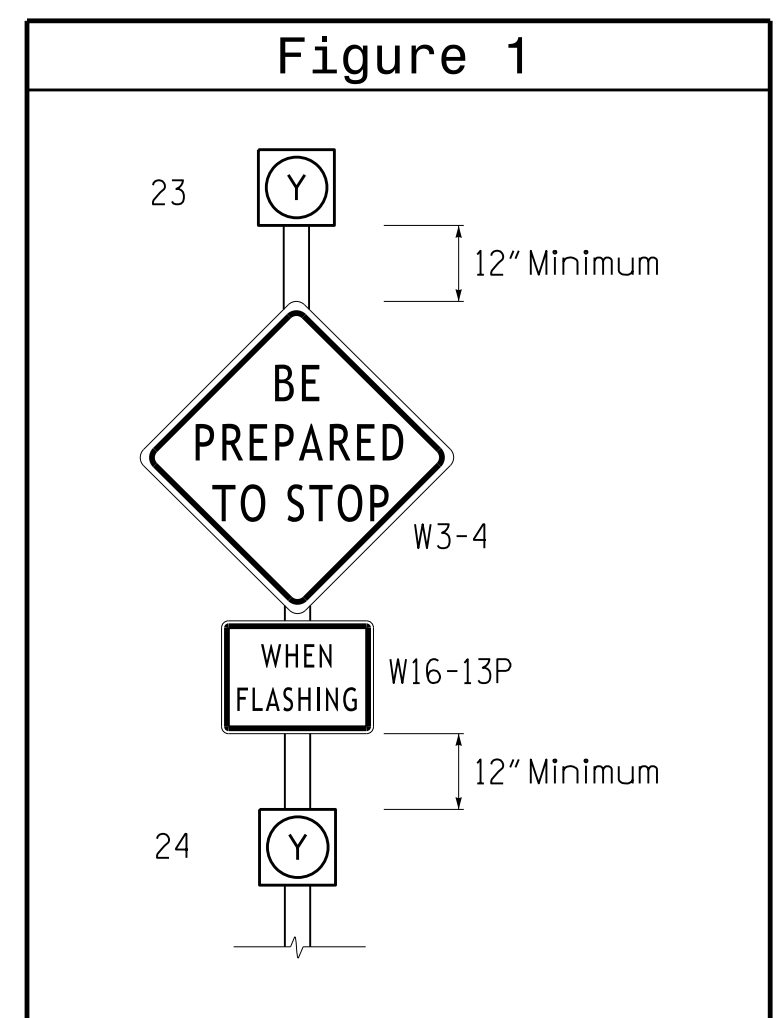


SE-PAC 2070 TIMING CHART				
FEATURE	PHASE			
	2	4	5	6
Min Green *	10	7	7	10
Passage Gap *	3.0	2.0	2.0	3.0
Maximum Green *	60	15	20	60
Yellow Change	3.6	3.0	3.0	4.1
Red Clear	1.2	2.4	1.8	1.0
Walk *	-	-	-	-
Pedestrian Clear	-	-	-	-
Added Initial *	-	-	-	-
Maximum Initial *	-	-	-	-
Time Before Reduction *	-	-	-	-
Time To Reduce *	-	-	-	-
Minimum Gap	-	-	-	-
Recall Made	MIN RECALL	-	-	MIN RECALL
Vehicle Call Memory	LOCK	NON-LOCK	NON-LOCK	LOCK
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.

LEGEND

- | PROPOSED   | EXISTING   |
|--|--|
| ○ → Traffic Signal Head  | ● → Traffic Signal Head  |
| ○ → Modified Signal Head   | N/A  |
| ○ → Sign   | N/A  |
| ○ → Pedestrian Signal Head With Push Button & Sign                           | N/A  |
| ○ → 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   |
| ○ → Directional Arrow  | ○ → Directional Arrow  |
| ○ → Metal Pole with Mastarm  | ○ → Metal Pole with Mastarm  |
| N/A  | ○ → Directional Drill  |
| ○ → Construction Zone Drums  | ○ → Construction Zone Drums  |
| N/A  | ○ → Guardrail  |
| ○ → Type II Signal Pedestal  | ○ → Type II Signal Pedestal  |
| ○ → Type III Signal Pedestal   | ○ → Type III Signal Pedestal   |
| ○ → "BE PREPARED TO STOP" (W3-4) Sign  | ○ → "BE PREPARED TO STOP" (W3-4) Sign  |
| ○ → and "WHEN FLASHING" (W16-13p) Plaque with Warning Beacons (See Figure 1) | ○ → and "WHEN FLASHING" (W16-13p) Plaque with Warning Beacons (See Figure 1) |
| ○ → "YIELD" Sign (R1-2)  | ○ → "YIELD" Sign (R1-2)  |
| ○ → No Right Turn Sign (R3-1)  | ○ → No Right Turn Sign (R3-1)  |
| ○ → No Left Turn Sign (R3-2)   | ○ → No Left Turn Sign (R3-2)   |



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Signal Upgrade - Temp. Design 4 (TMP Area II, Phase IV Step 2)

Prepared In the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps

Wake County Raleigh

Division 5

PLAN DATE: December 2015 REVIEWED BY:

PREPARED BY: I. O. Umozurike REVIEWED BY:

REVISIONS

INIT. DATE

SCALE 0 50 1"=50'

SEAL

PROFESSIONAL ENGINEER

ROBERT J. ZIEBBA

026486

2/1/2016

SIG. INVENTORY NO. 05-164214

03-165-2016-11-13  
 P2-111P-01-164214-11-13  
 P2-111P-01-164214-11-13  
 P2-111P-01-164214-11-13

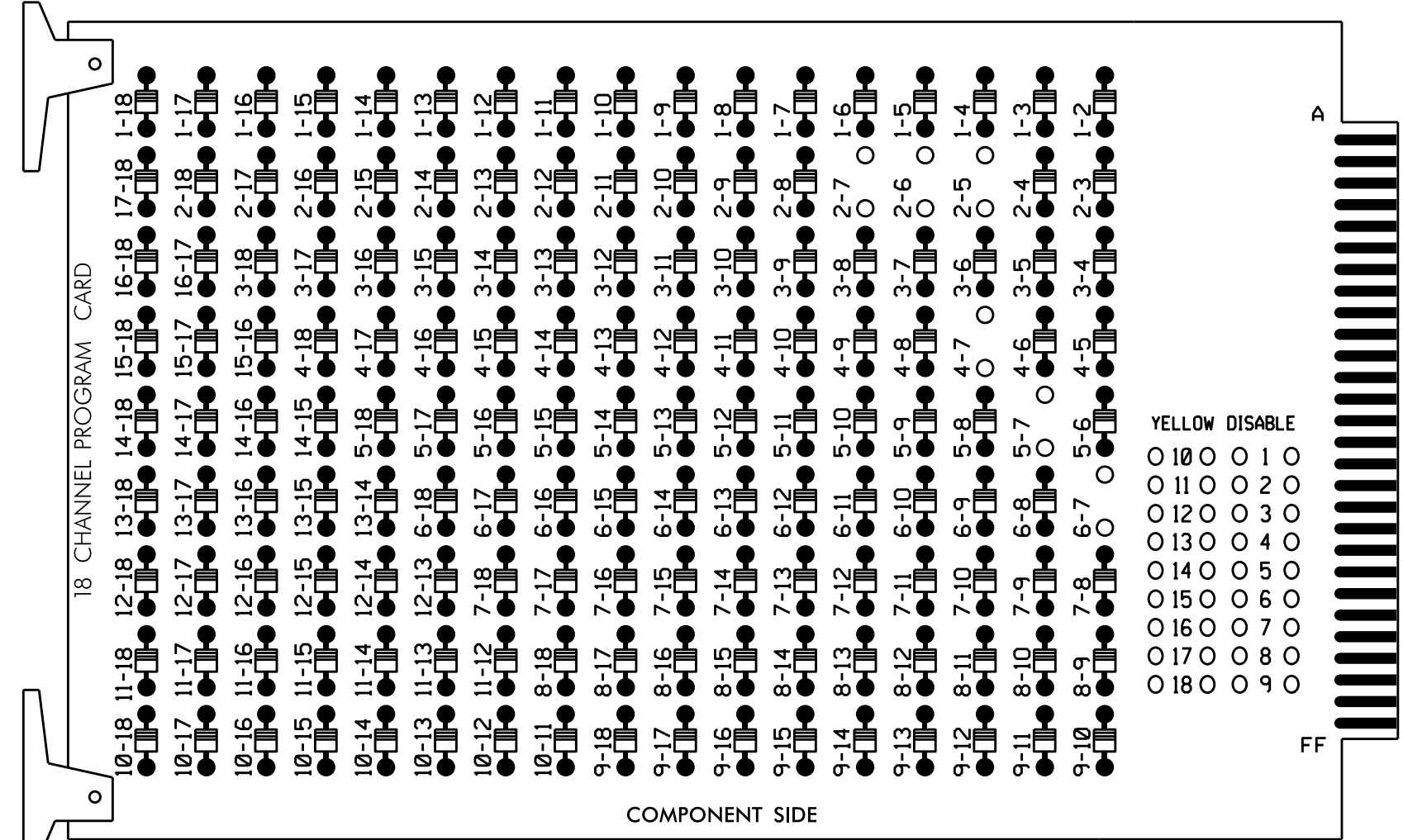


**EDI MODEL 2018ECL-NC CONFLICT MONITOR**

**PROGRAMMING DETAIL**

(remove jumpers and set switches as shown)

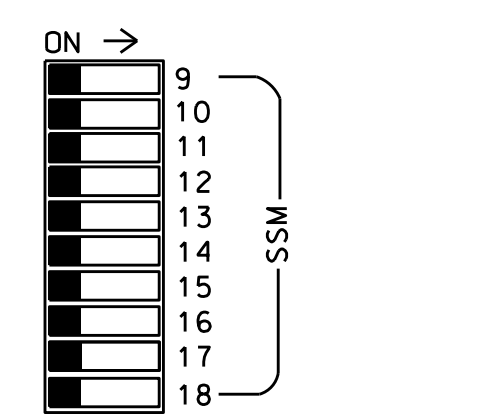
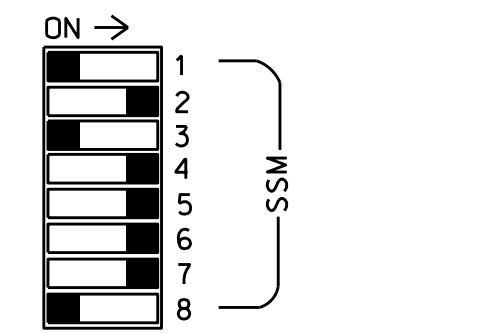
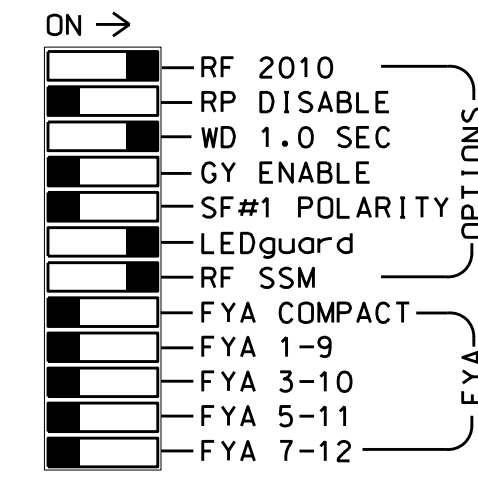
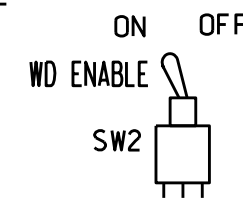
REMOVE DIODE JUMPERS 2-5, 2-6, 2-7, 4-7, 5-7, and 6-7.



REMOVE JUMPERS AS SHOWN

**NOTES:**

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



■ = DENOTES POSITION OF SWITCH

**NOTES**

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. Program controller to start up in phases 2 and 6 green.
3. Enable simultaneous gap-out feature, on controller unit, for all phases.
4. The cabinet and controller are part of the Raleigh Signal System.

**EQUIPMENT INFORMATION**

CONTROLLER.....2070  
 CABINET.....332  
 SOFTWARE.....SE-PAC2070  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S2,S5,S7,S8,S10,S12\*  
 PHASES USED.....2,4,5,6  
 OVERLAP "F".....2+4+5+6  
 OVERLAP "G".....2

\* Used for Advance Beacons. See sheet 3 for details.

**SIGNAL HEAD HOOK-UP CHART**

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	OLF	8	OLG
SIGNAL HEAD NO.	NU	21,22 25	NU	NU	41,42	NU	51	61,62 63,64	NU	51,52	NU	ADVANCE BEACON
RED		128			101		*	134		122		
YELLOW		129			102			135		123		
GREEN		130			103			136		124		
RED ARROW												
YELLOW ARROW								132				
GREEN ARROW								133				
Hand icon												** 110
PED YELLOW												** 111
Person icon												*

NU = Not Used

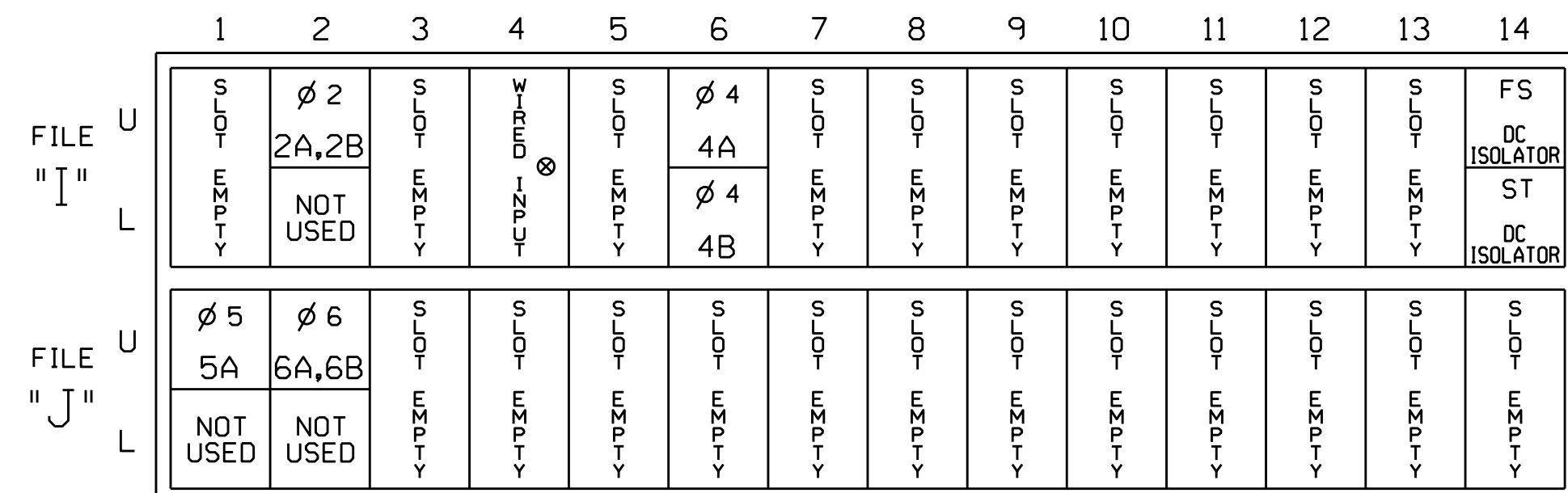
\* Denotes install load resistor. See load resistor installation detail this sheet.

\*\* Used for Advance Beacon control. See sheet 3 for Advance Beacon Relay Control and Sign Wiring Detail.

NOTE: PED 2 heads have been disconnected and bagged for this construction phase.

**INPUT FILE POSITION LAYOUT**

(front view)



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

FS = FLASH SENSE  
 ST = STOP TIME

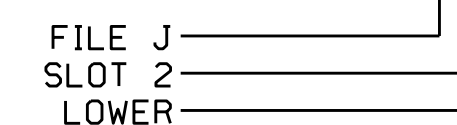
⊗ Wired Input - Do not populate slot with detector card

**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
2A,2B	TB2-5,6	I2U	39	3	2		
4A	TB4-9,10	I6U	41	11	4		
4B	TB4-11,12	I6L	45	12	4	15	
5A <sup>1</sup>	TB3-1,2	J1U	55	19	5	15	
	-	I4U	47	7	2		
6A,6B	TB3-5,6	J2U	40	21	6		

<sup>1</sup>Add jumper from J1-W to I4-W, on rear of input file.

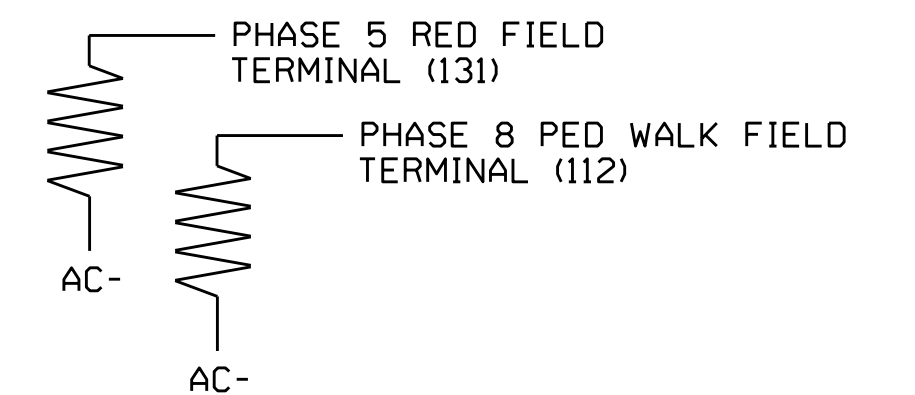
INPUT FILE POSITION LEGEND: J2L



**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: 05-1642T4  
 DESIGNED: December 2015  
 SEALED: 2/1/2016  
 REVISED: N/A

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Electrical Detail - Temp Design 4 (TMP Area II Phase IV, Step 2) - Sheet 1 of 3

Prepared in the Offices of: 	W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps		SEAL 
	Division 5 Wake County Raleigh	REVIEWED BY: T. Joyce	
PLAN DATE: January 2016 PREPARED BY: S. Armstrong	REVIEWED BY:		DATE: 2/2/2016
REVISIONS	INIT.	DATE	DATE:

09-1-2016 10:28  
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 S:\ARMSTRONG



**SE-PAC2070 CONTROLLER  
OVERLAP PROGRAMMING**

*(program controller as shown below)*

FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1-STARTUP & MISC	6-ALT SEQUENCES
2-REMOTE FLASH	7-PORT 1 DATA
3-OVERLAP STANDARD	8-I/O MISC
4-OVERLAP SPECIAL	9-SIG DRV OUT
5-RING STRUCTURE	
	F-PRIOR MENU

PRESS 'B' FIVE TIMES

SE-PAC OVERLAP - F	(0-NO/1-YES)
OVL PHASES:	010111000 0000000
PHS/CHN:	123456789 0123456789 01234
OVL CHN(S):	000000100 0000000000 00000
A-UP B-DN D-DspChn	E-EDIT F-PRIOR MENU

PRESS 'B' ONE TIME

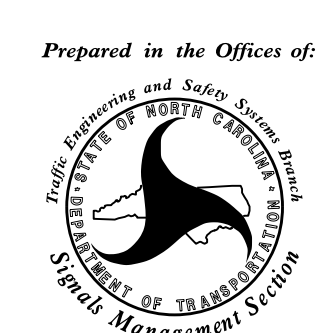
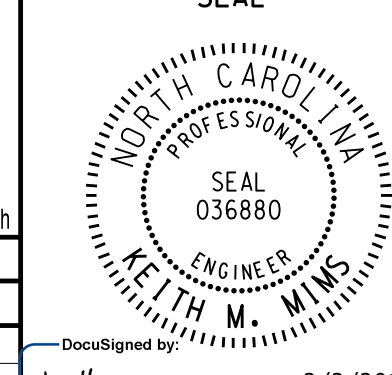
SE-PAC OVERLAP - G	(0-NO/1-YES)
OVL PHASES:	010000000 0000000
PHS/CHN:	123456789 0123456789 01234
OVL CHN(S):	000000000 0010000000 00000
A-UP B-DN D-DspChn	E-EDIT F-PRIOR MENU

PRESS 'F' TO RETURN TO UNIT DATA

THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-1642T4  
DESIGNED: December 2015  
SEALED: 2/1/2016  
REVISED: N/A

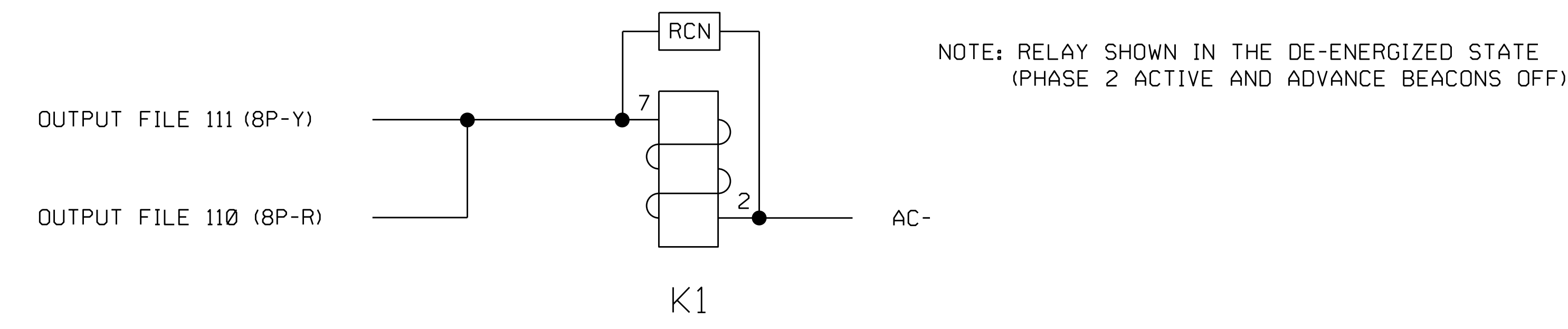
**DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED**

Electrical Detail - Temp Design 4 (TMP Area II Phase IV, Step 2) - Sheet 2 of 3

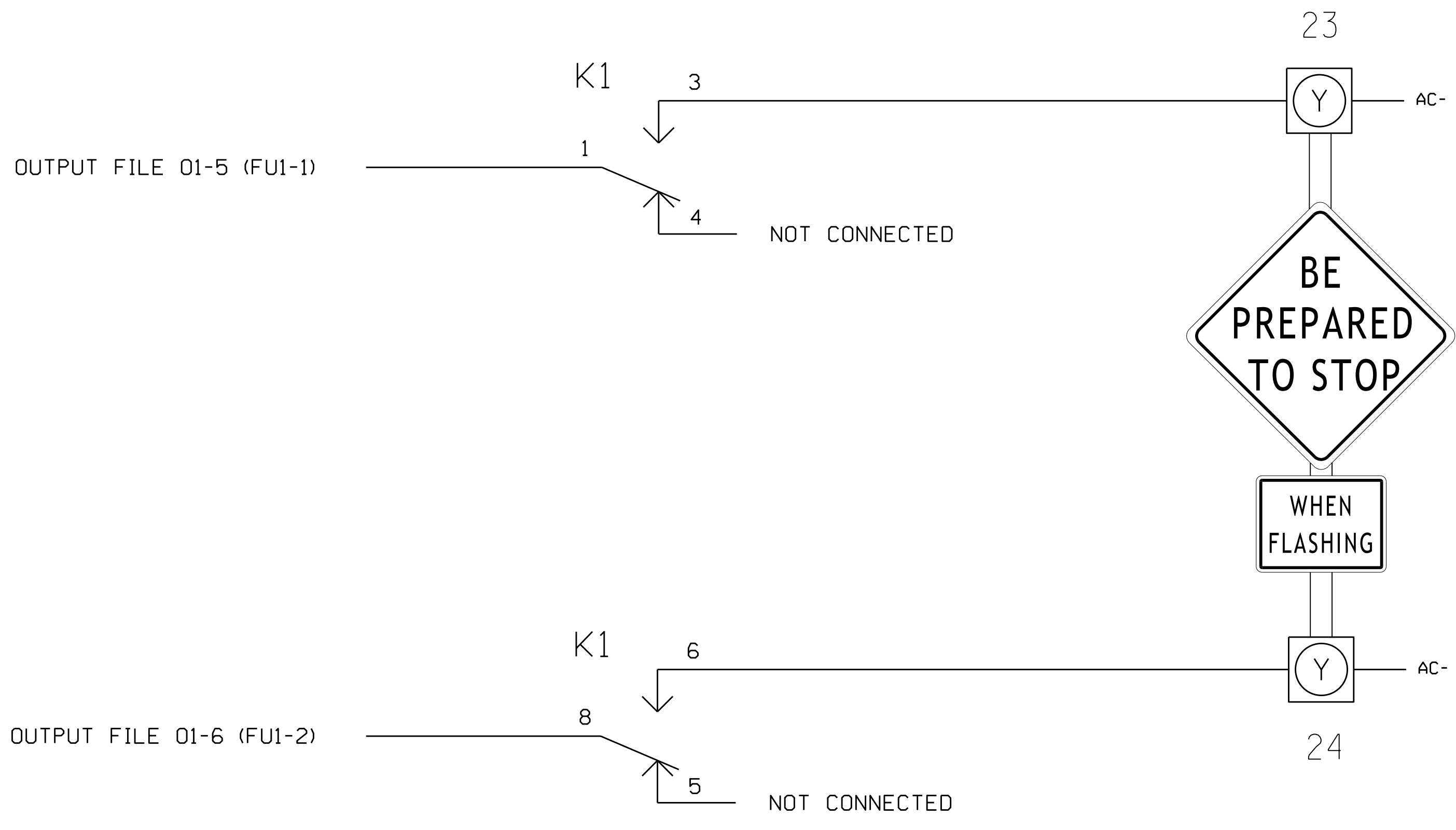
ELECTRICAL AND PROGRAMMING DETAILS FOR:  Prepared in the Offices of:  750 Greenfield Parkway, Garner, NC 27529	<b>W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps</b>		SEAL 
	Division 5 PLAN DATE: January 2016 PREPARED BY: S. Armstrong	Wake County REVIEWED BY: T. Joyce REVIEWED BY:	Raleigh DATE: 2/2/2016 DATE:

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 sarmstrm

## ADVANCE BEACON RELAY CONTROL AND SIGN WIRING DETAIL



NOTE: RELAY SHOWN IN THE DE-ENERGIZED STATE  
(PHASE 2 ACTIVE AND ADVANCE BEACONS OFF).

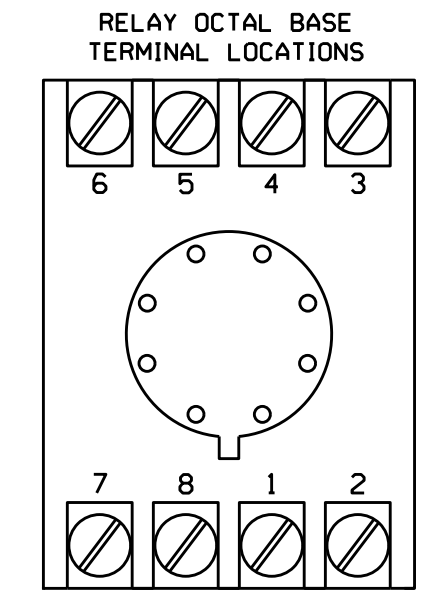


THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-1642T4  
DESIGNED: December 2015  
SEALED: 2/1/2016  
REVISED: N/A

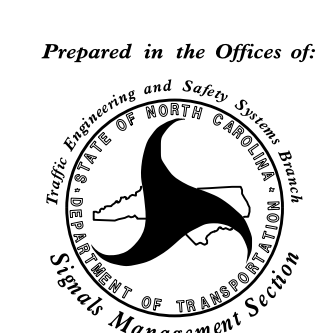
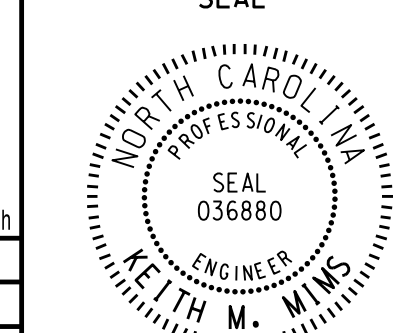
DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

### NOTES

- RELAY K1 IS A DPDT WITH A 120VAC COIL, CONTACT RATING 120VAC, 5 AMPS.
- THE RC NETWORK ACROSS THE COIL OF K1 IS VALUED AT .1 MICRO FARAD, 100 OHM.



Electrical Detail - Temp Design 4 (TMP Area II Phase IV, Step 2) - Sheet 3 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:  Prepared in the Offices of:  750 Greenfield Parkway, Garner, NC 27529	<b>W. Peace Street</b> at <b>US 70 WB-401/NC 50 NB</b> (Capital Blvd.) Ramps	SEAL  KEITH M. MIMS ENGINEER
	Division 5 Wake County Raleigh PLAN DATE: January 2016 REVIEWED BY: T. Joyce PREPARED BY: S. Armstrong REVIEWED BY:	REVISIONS INIT. DATE

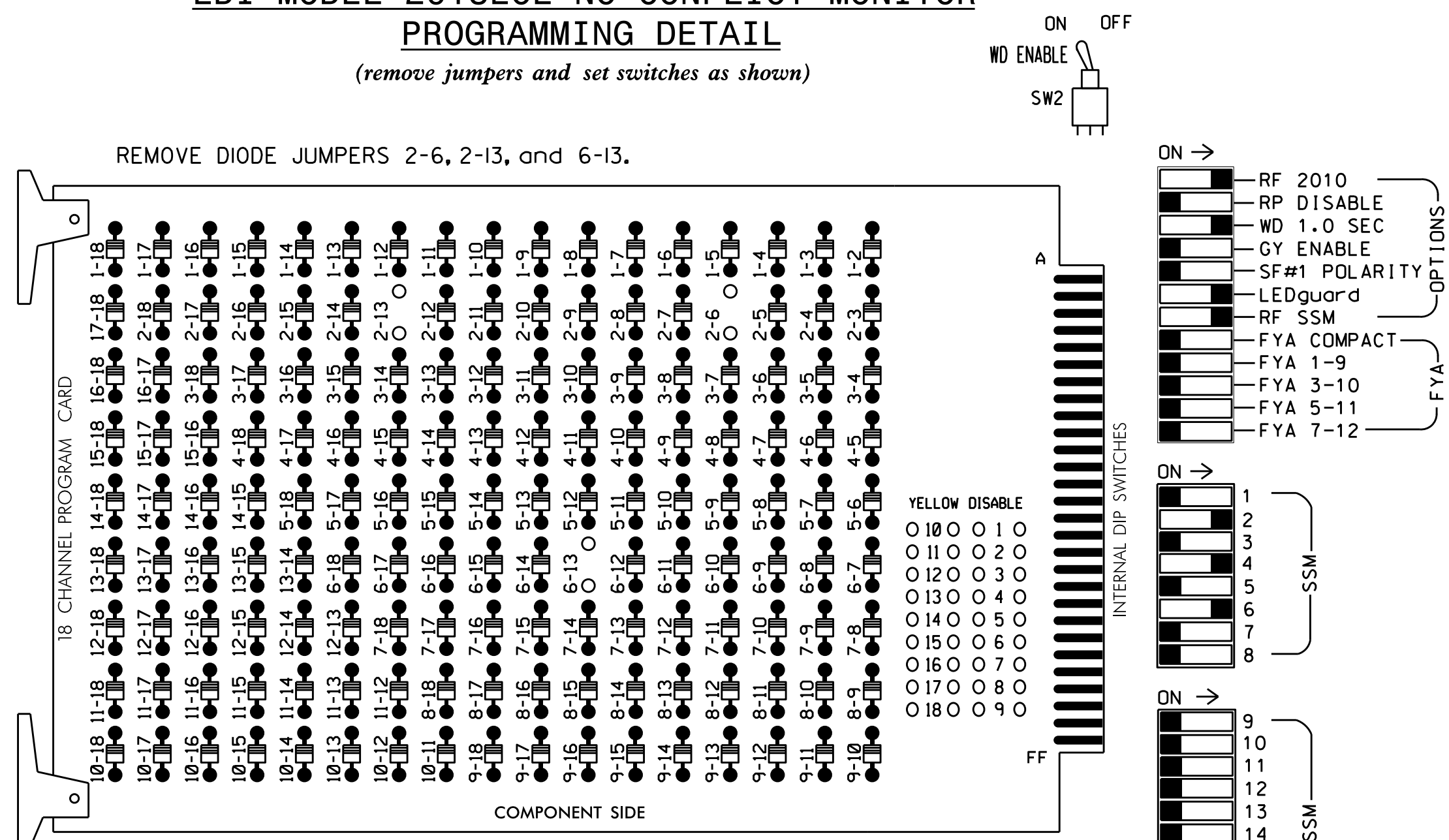
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sarmstrong







**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.
- Program controller to start up in phases 2 and 6 green.
- Enable simultaneous gap-out feature, on controller unit, for all phases.
- The cabinet and controller are part of the Raleigh Signal System.

**EQUIPMENT INFORMATION**

CONTROLLER.....2070  
 CABINET.....332  
 SOFTWARE.....SE-PAC2070  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S2,S3,S5,S8,S12\*  
 PHASES USED.....2,2PED,4,6  
 OVERLAP "G".....2

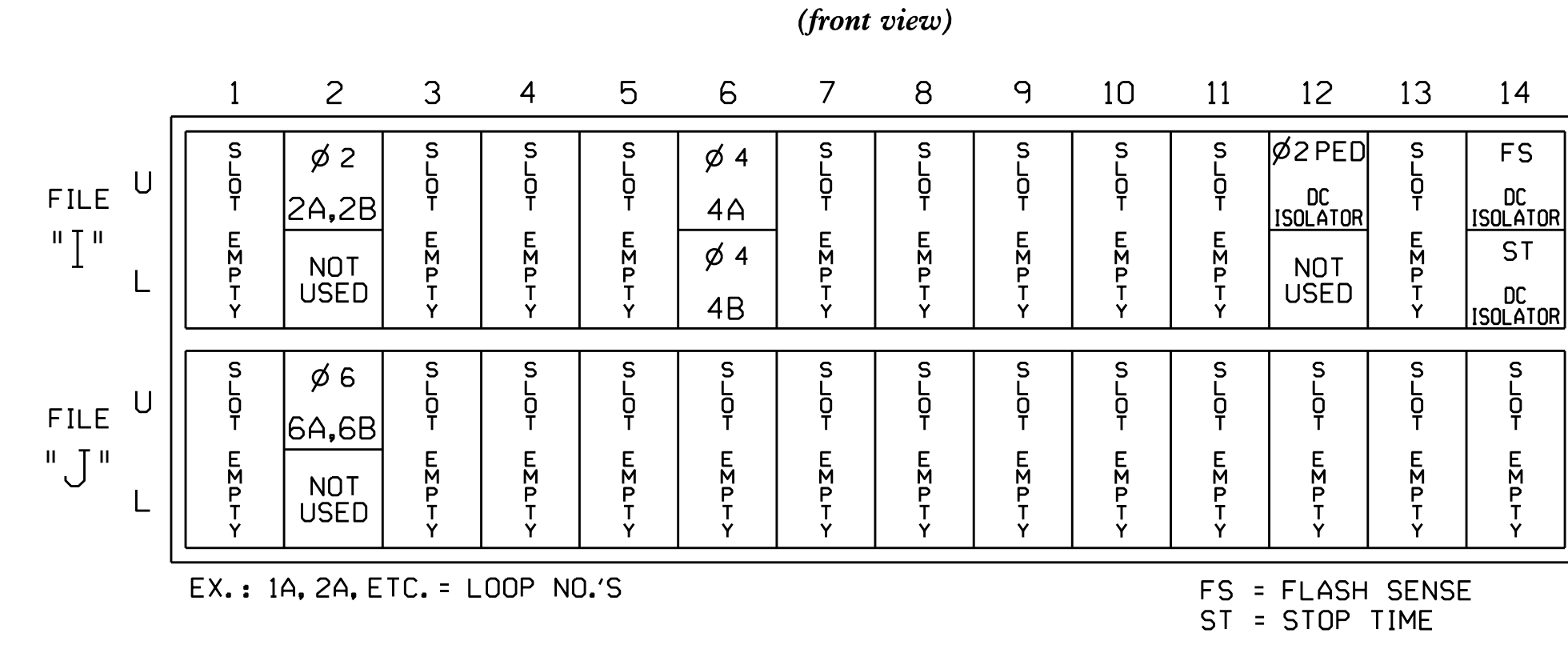
\* Used for Advance Beacons. See sheet 3 for details.

**SIGNAL HEAD HOOK-UP CHART**

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	OLG
SIGNAL HEAD NO.	NU	21,22 25	P21, P22	NU	41,42	NU	NU	61,62	NU	NU	NU	ADVANCE BEACON
RED		128			101			134				
YELLOW		129			102			135				
GREEN		130			103			136				
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
Hand icon			113									** 110
PED YELLOW												** 111
Walking person icon			115									*

NU = Not Used  
 \* Denotes install load resistor. See load resistor installation detail this sheet.  
 \*\* Used for Advance Beacon control. See sheet 3 for Advance Beacon Relay Control and Sign Wiring Detail.

**INPUT FILE POSITION LAYOUT**

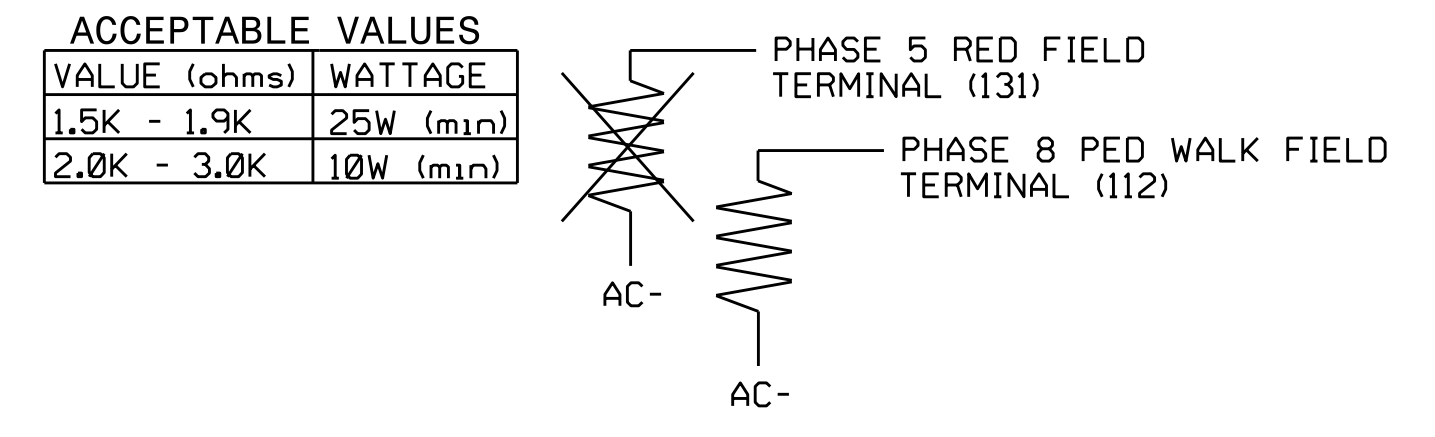


EX.: 1A, 2A, ETC. = LOOP NO.'S  
 FS = FLASH SENSE  
 ST = STOP TIME

**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**



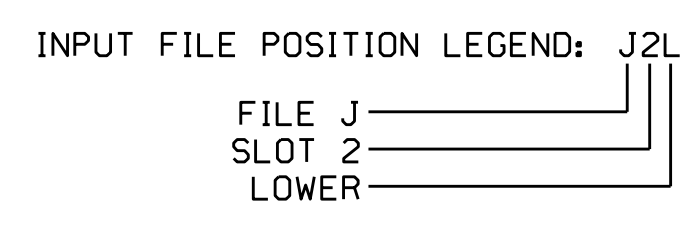
**IMPORTANT!** Remove load resistor from OLF Red field terminal, if present, as shown above.

**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
2A,2B	TB2-5,6	I2U	39	3	2		
4A	TB4-9,10	I6U	41	11	4		
4B	TB4-11,12	I6L	45	12	4	15	
6A,6B	TB3-5,6	J2U	40	21	6		
PED PUSH BUTTONS							
P21,P22	TB8-4,6	I12U	67	PED 2	2 PED		

NOTE:  
 INSTALL DC ISOLATOR IN INPUT FILE SLOT I12.

**IMPORTANT!** Remove the following jumper, if currently installed: from J1-W to I4-W on rear of Input File.



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1642T5  
 DESIGNED: December 2015  
 SEALED: 2/1/2016  
 REVISED: N/A

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

Electrical Detail - Temp Design 5 (TMP Area II Phase IV, Step 3) - Sheet 1 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:  Prepared in the Offices of: Signal Management Systems, Inc. 750 Greenfield Parkway, Garner, NC 27529	W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps		SEAL KEITH M. MIMS ENGINEER
	Division 5 Wake County Raleigh PLAN DATE: January 2016 REVIEWED BY: T. Joyce PREPARED BY: S. Armstrong REVIEWED BY:	REVISIONS INIT. DATE	

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 sarmstrong



**SE-PAC2070 CONTROLLER  
OVERLAP PROGRAMMING**

*(program controller as shown below)*

FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA	PRESS # DESIRED
1-STARTUP & MISC	6-ALT SEQUENCES
2-REMOTE FLASH	7-PORT 1 DATA
3-OVERLAP STANDARD	8-I/O MISC
4-OVERLAP SPECIAL	9-SIG DRV OUT
5-RING STRUCTURE	
	F-PRIOR MENU

PRESS 'B' FIVE TIMES

SE-PAC OVERLAP - F	(0-NO/1-YES)
OVL PHASES: 010111000 0000000	
PHS/CHN: 123456789 0123456789 01234	
OVL CHN(S): 000000100 0000000000 00000	
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU	

PRESS 'B' ONE TIME

SE-PAC OVERLAP - G	(0-NO/1-YES)
OVL PHASES: 010000000 0000000	
PHS/CHN: 123456789 0123456789 01234	
OVL CHN(S): 000000000 0010000000 00000	
A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU	

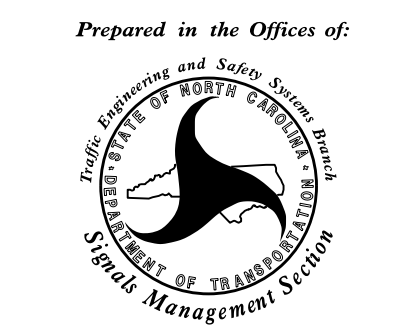
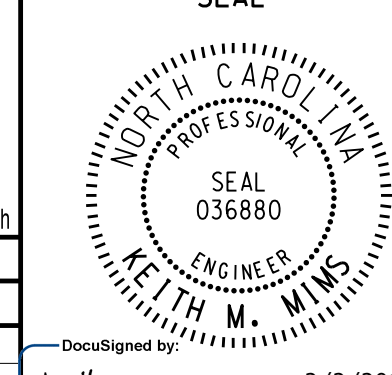
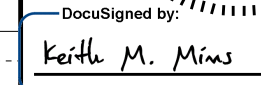
PRESS 'F' TO RETURN TO UNIT DATA

REMOVE OVERLAP 'F'  
PROGRAMMING SHOWN AT RIGHT

THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-1642T5  
DESIGNED: December 2015  
SEALED: 2/1/2016  
REVISED: N/A

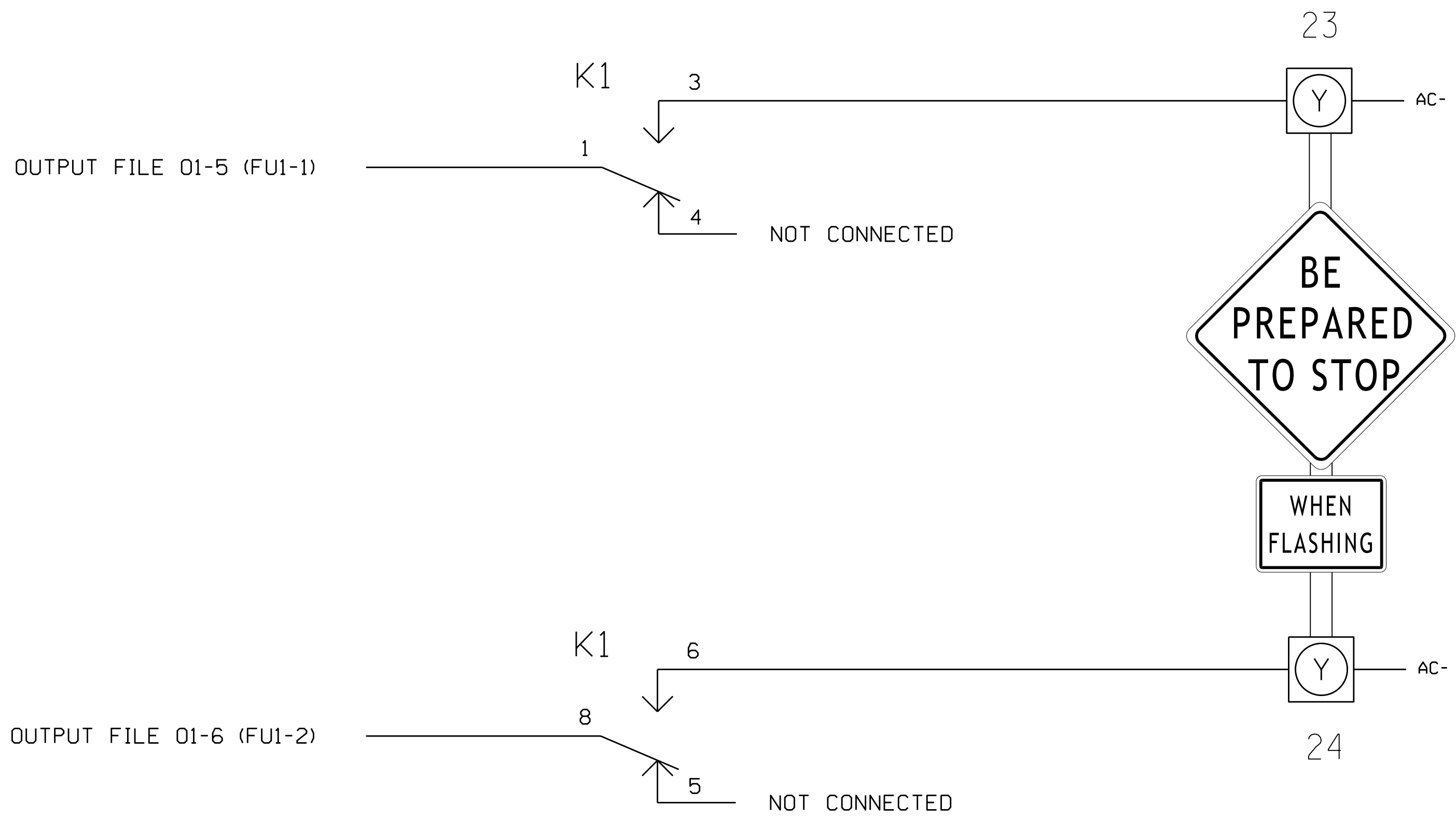
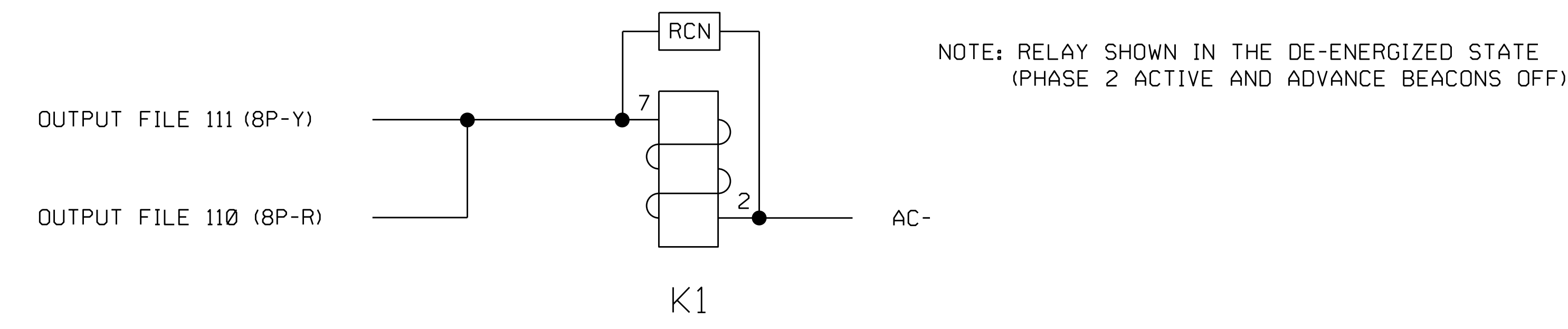
**DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED**

Electrical Detail - Temp Design 5 (TMP Area II Phase IV, Step 3) - Sheet 2 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:  Prepared in the Offices of:  750 Greenfield Parkway, Garner, NC 27529	<b>W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps</b>		SEAL 								
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 sarmstrong

## ADVANCE BEACON RELAY CONTROL AND SIGN WIRING DETAIL

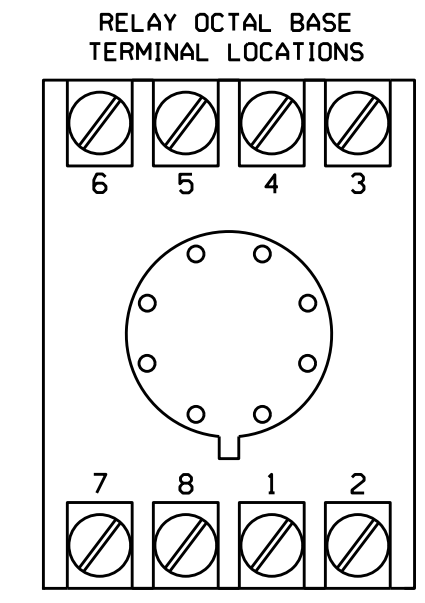


THIS ELECTRICAL DETAIL IS FOR  
 THE SIGNAL DESIGN: 05-1642T5  
 DESIGNED: December 2015  
 SEALED: 2/1/2016  
 REVISED: N/A

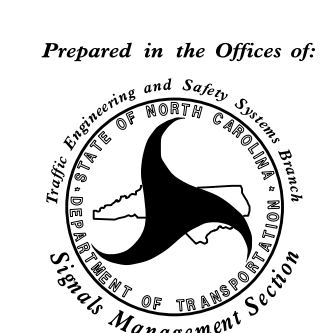
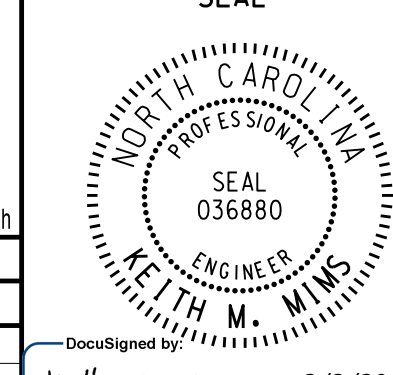
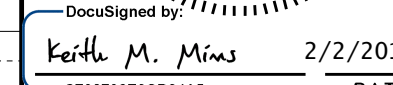
DOCUMENT NOT CONSIDERED FINAL  
 UNLESS ALL SIGNATURES COMPLETED

### NOTES

1. RELAY K1 IS A DPDT WITH A 120VAC COIL, CONTACT RATING 120VAC, 5 AMPS.
2. THE RC NETWORK ACROSS THE COIL OF K1 IS VALUED AT .1 MICRO FARAD, 100 OHM.



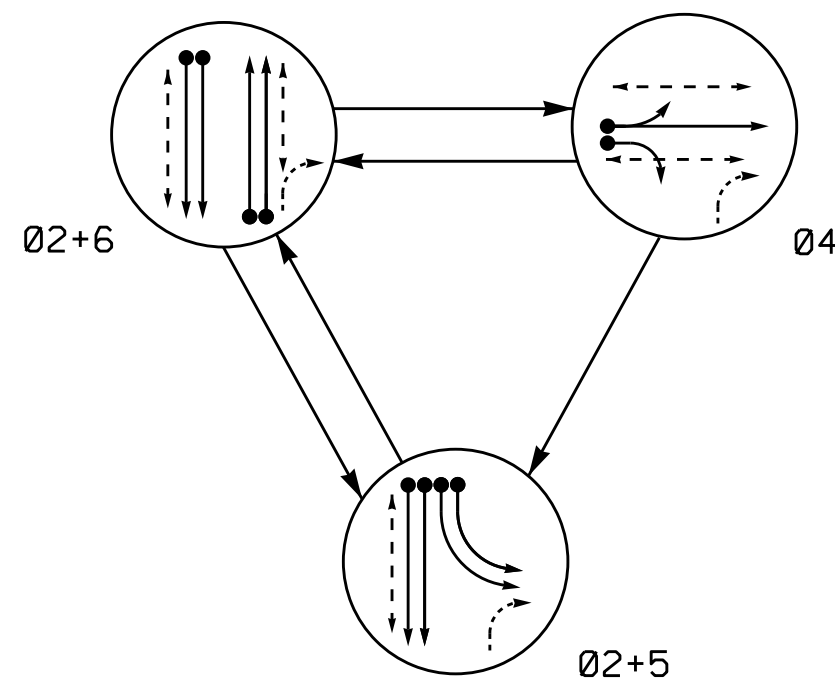
Electrical Detail - Temp Design 5 (TMP Area II Phase IV, Step 3) - Sheet 3 of 3

<p>ELECTRICAL AND PROGRAMMING DETAILS FOR:</p> <p>Prepared in the Offices of:                    PUBLIC UTILITIES AND SAFETY DIVISION                  STATE MANAGEMENT SYSTEMS                  750 Greenfield Parkway, Garner, NC 27529</p>	<p><b>W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps</b></p> <p>Division 5 Wake County Raleigh</p> <p>PLAN DATE: January 2016 REVIEWED BY: T. Joyce</p> <p>PREPARED BY: S. Armstrong REVIEWED BY:</p>	<p>SEAL</p> <p>                  KEITH M. MINS                  ENGINEER                  036880</p>									
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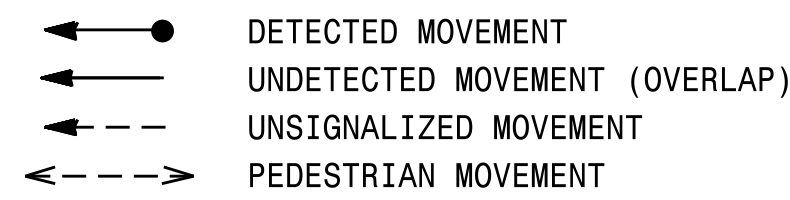
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PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND



SIGNAL FACE	PHASE			
	02+5	02+6	04	FLASH
21, 22, 25	G	R	G	Y
23, 24	OFF	OFF	DN	OFF
41, 42	R	R	G	R
51, 52, 53	←	←	←	←
61, 62	R	G	R	Y
P21, P22	W	W	DW	DRK
P41, P42	DW	DW	W	DRK
P43, P44	DW	DW	W	DRK
P61, P62	DW	W	DW	DRK

W - Walk  
DW - Don't Walk  
DRK - Dark

SIGNAL FACE	INTERVAL	
	1	2
23	ON	OFF
24	OFF	DN

LOOP & DETECTOR UNIT INSTALLATION CHART																			
SE-PAC 2070 CONTROLLER WITH 170 CABINET																			
INDUCTIVE LOOPS					DETECTOR PROGRAMMING														
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW EXISTING	ASSIGNED PHASE	TIMING		OPERATION MODE							STATUS				
						DELAY	EXTEND (STRETCH)	VEHICLE	PEDESTRIAN	1 CALL	2	3	4	5	6	7	AND	SWITCH	SYSTEM LOOPS
2A	6X6	4	70	X	-	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X
2B	6X6	4	70	X	-	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X
4A	6X40	2-4-2	0	-	X	4	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X
4B	6X40	2-4-2	0	-	X	4	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X
5A	6X40	2-4-2	0	X	-	5	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X
5B	6X6	2-4-2	0	X	-	5	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X
6A	6X6	4	70	X	-	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X
6B	6X6	4	70	X	-	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X

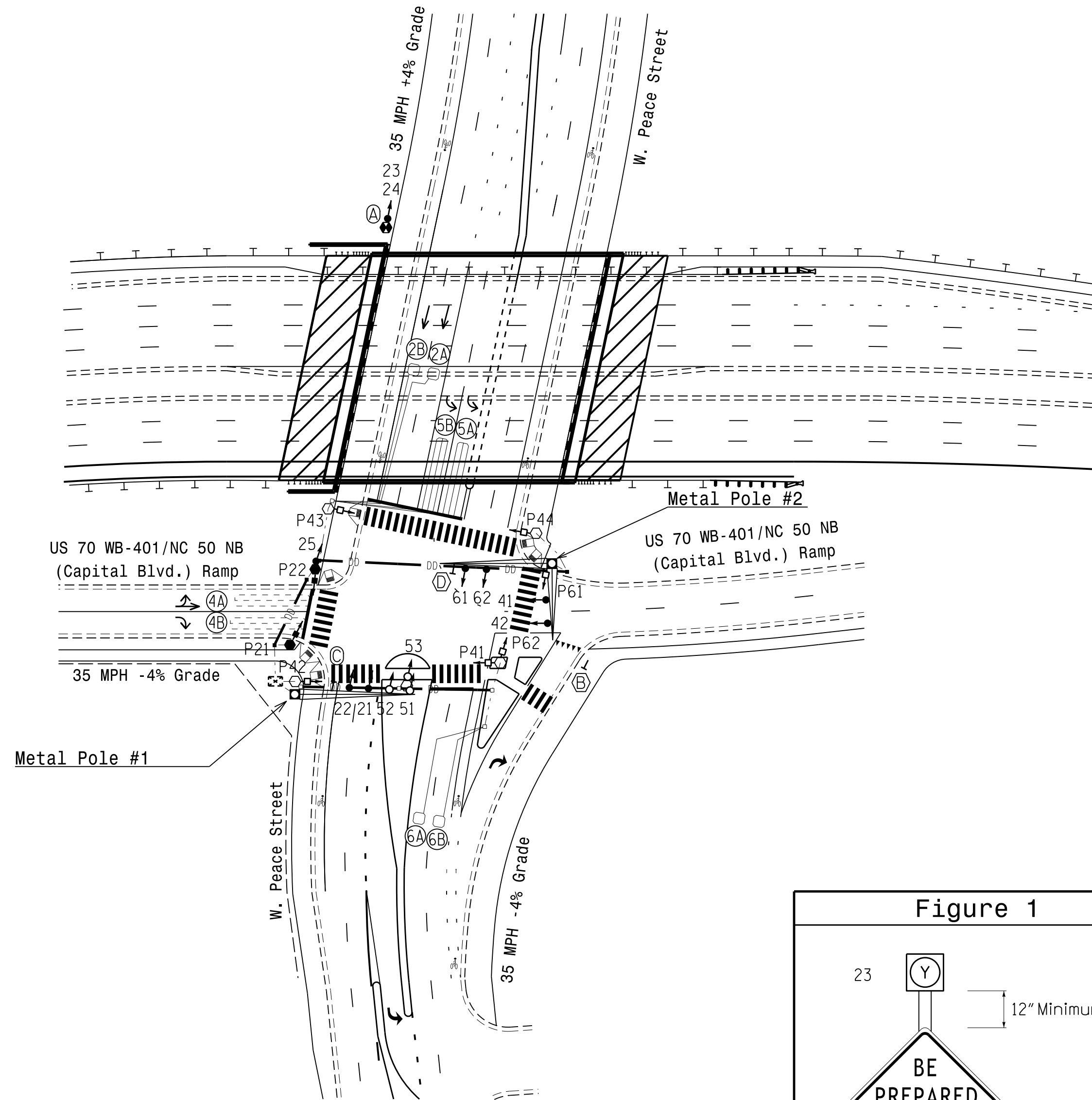
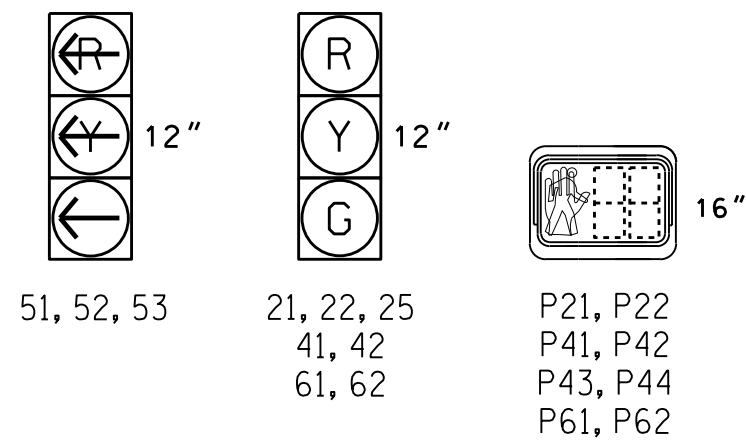
3 Phase Fully Actuated (Raleigh Signal System)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 5 may be lagged.
- Reposition existing signal heads numbered 21, 22, 61, and 62.
- Set all detector units to presence mode.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Pedestrian pedestals are conceptual and shown for reference only. See sheets P1-P3 for pushbutton location details.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

SIGNAL FACE I.D.

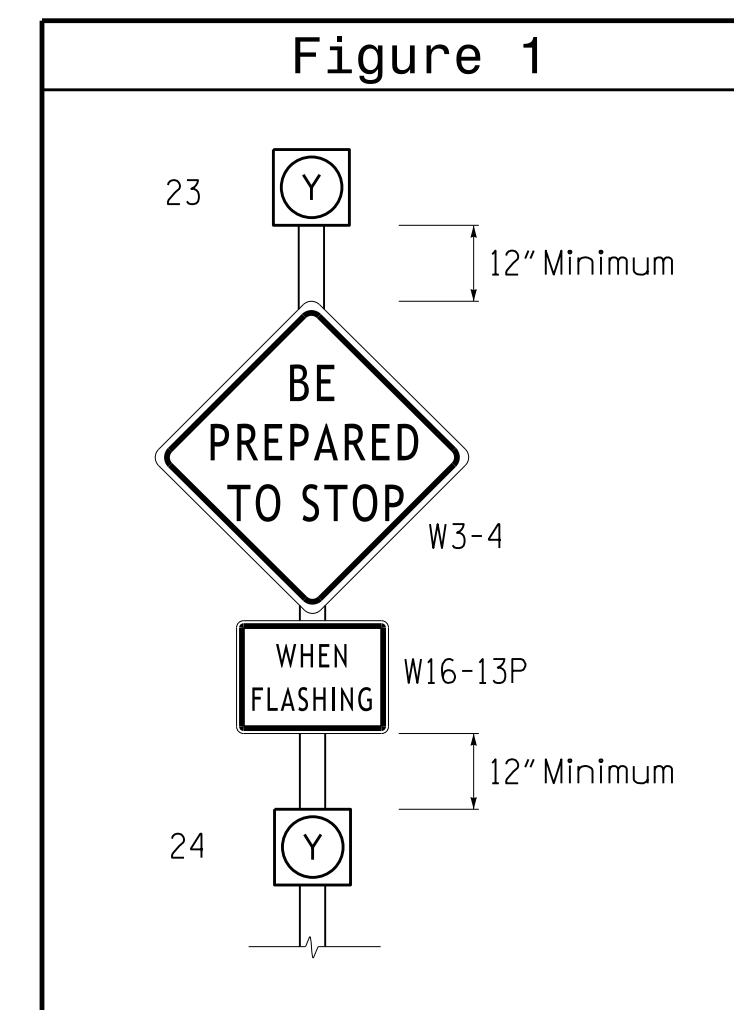
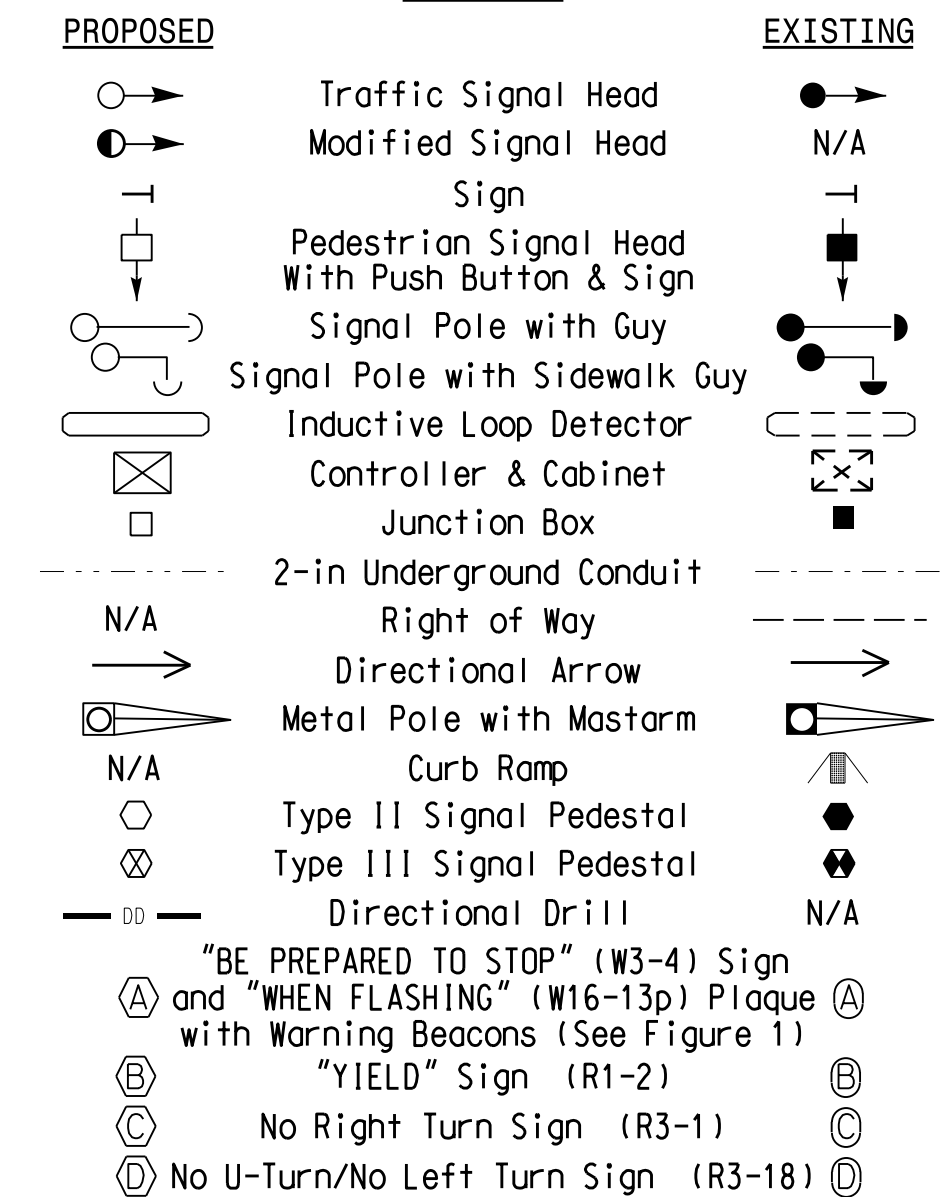
All Heads L.E.D.



FEATURE	SE-PAC 2070 TIMING CHART			
	2	4	5	6
Min Green *	10	7	7	10
Passage Gap *	3.0	2.0	2.0	3.0
Maximum Green *	60	15	30	60
Yellow Change	3.6	4.1	3.0	4.1
Red Clear	1.8	2.2	2.8	1.5
Walk *	7	7	-	7
Pedestrian Clear	5	21	-	7
Added Initial *	-	-	-	-
Maximum Initial *	-	-	-	-
Time Before Reduction *	-	-	-	-
Time To Reduce *	-	-	-	-
Minimum Gap	-	-	-	-
Recall Mode	MIN RECALL	-	-	MIN RECALL
Vehicle Call Memory	LOCK	NON-LOCK	NON-LOCK	LOCK
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.

LEGEND



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Signal Upgrade - Final Design

Prepared In the Offices of:  
  
 W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps  
 Division 5 Wake County Raleigh  
 PLAN DATE: December 2015 REVIEWED BY:  
 PREPARED BY: I. O. Umozurike REVIEWED BY:  
 REVISIONS INIT. DATE  
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 SEAL  
  
 750 N. Greenfield Pkwy, Garner, NC 27529  
 2/1/2016  
 SIG. INVENTORY NO. 05-1642

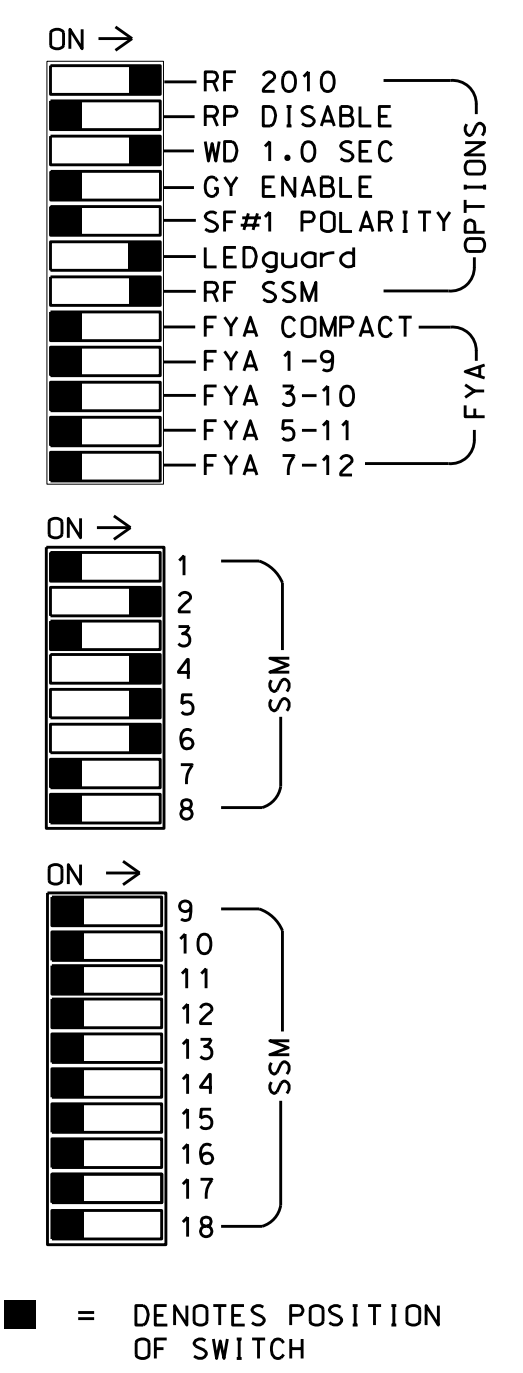
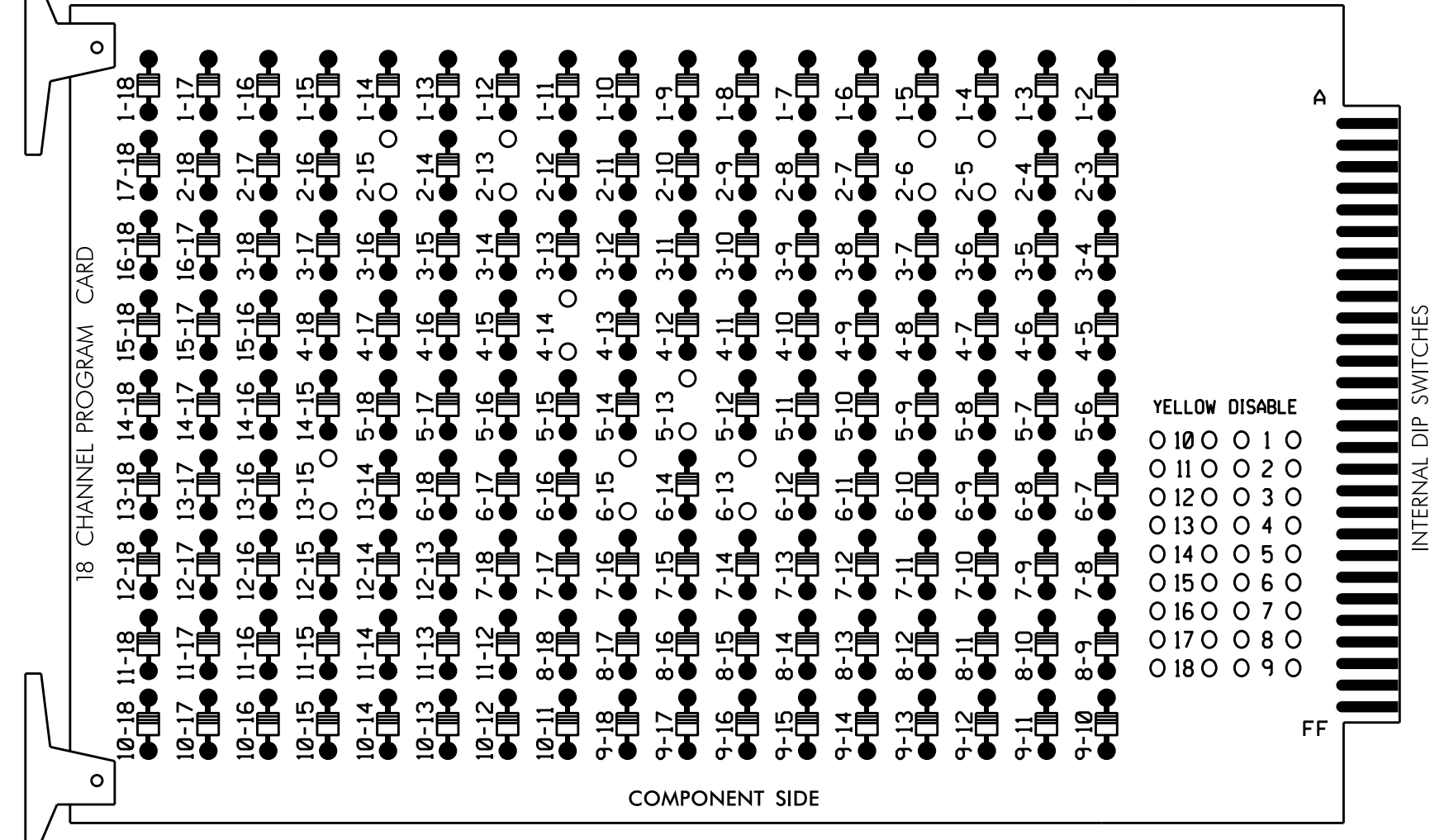
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 RZ:16800



**EDI MODEL 2018ECL-NC CONFLICT MONITOR**

**PROGRAMMING DETAIL**  
(remove jumpers and set switches as shown)

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



**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.
- Program controller to start up in phases 2 and 6 green.
- Enable simultaneous gap-out feature, on controller unit, for all phases.
- The cabinet and controller are part of the Raleigh Signal System.

**EQUIPMENT INFORMATION**

CONTROLLER.....2070  
 CABINET.....332  
 SOFTWARE.....SE-PAC2070  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S2,S3,S5,S6,S7,S8,S9,S12\*  
 PHASES USED.....2,2PED,4,4PED,5,6,6PED  
 OVERLAP "G".....2

\* Used for Advance Beacons. See sheet 3 for details.

**SIGNAL HEAD HOOK-UP CHART**

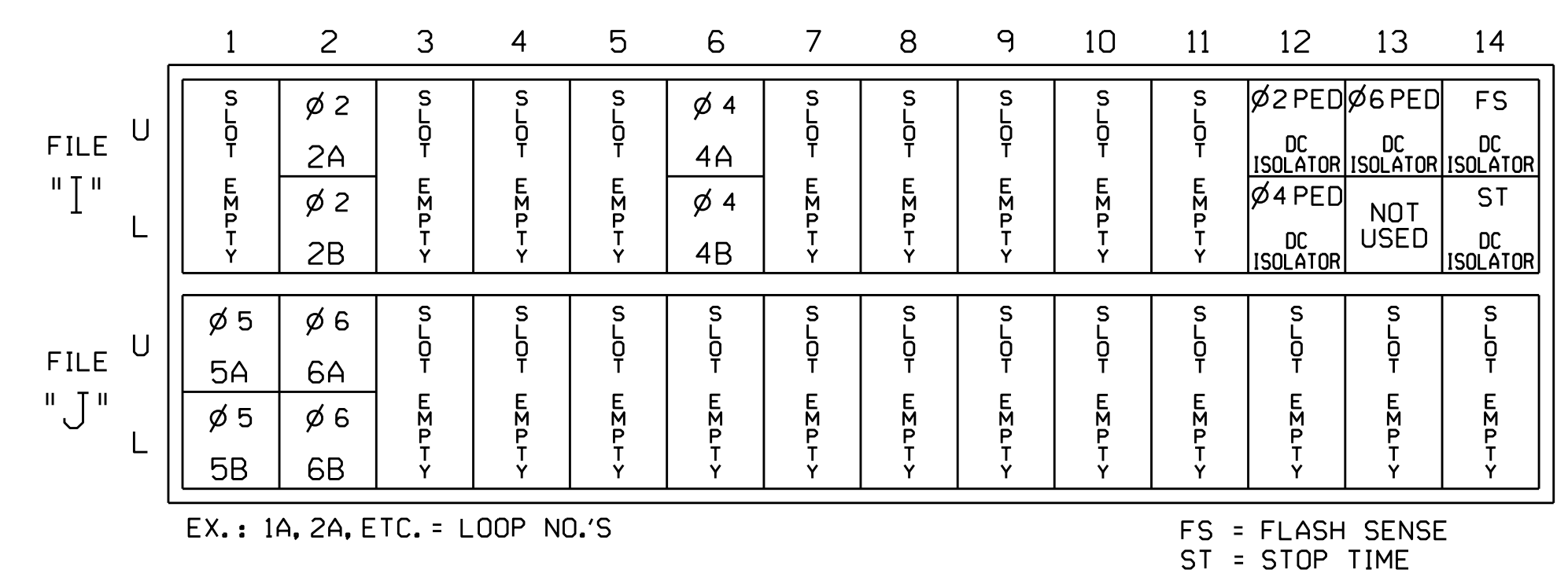
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	OLG
SIGNAL HEAD NO.	NU	21,22 25	P21, P22	NU	41,42	P41,P42 P43,P44	51,52 53	61,62	P61, P62	NU	NU	ADVANCE BEACON
RED		128			101			134				
YELLOW		129			102			135				
GREEN		130			103			136				
RED ARROW								131				
YELLOW ARROW								132				
GREEN ARROW								133				
Hand icon			113			104			119			** 110
PED YELLOW												** 111
Person icon			115			106			121			*

NU = Not Used

- \* Denotes install load resistor. See load resistor installation detail this sheet.
- \*\* Used for Advance Beacon control. See sheet 3 for Advance Beacon Relay Control and Sign Wiring Detail.

**INPUT FILE POSITION LAYOUT**

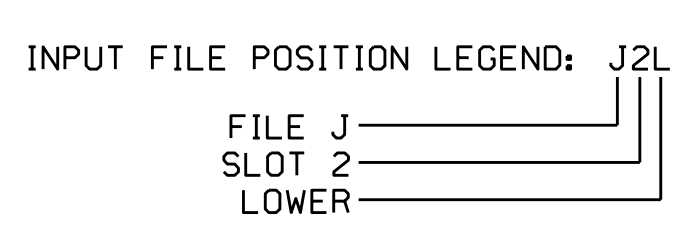
(front view)



**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
2A	TB2-5,6	I2U	39	3	2		
2B	TB2-7,8	I2L	43	4	2		
4A	TB4-9,10	I6U	41	11	4		
4B	TB4-11,12	I6L	45	12	4	15	
5A	TB3-1,2	J1U	55	19	5		
5B	TB3-3,4	J1L	55	19	5		
6A	TB3-5,6	J2U	40	21	6		
6B	TB3-7,8	J2L	44	22	6		
PED PUSH BUTTONS							
P21,P22	TB8-4,6	I12U	67	PED 2	2 PED		
P41,P42,P43,P44	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.



**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.

**SE-PAC2070 CONTROLLER OVERLAP PROGRAMMING**

(program controller as shown below)  
 FROM MAIN MENU PRESS 4 (UNIT DATA)

SE-PAC UNIT DATA PRESS # DESIRED

1-STARTUP & MISC	6-ALT SEQUENCES
2-REMOTE FLASH	7-PORT 1 DATA
3-OVERLAP STANDARD	8-I/O MISC
4-OVERLAP SPECIAL	9-SIG DRV OUT
5-RING STRUCTURE	

F-PRIOR MENU

SE-PAC OVERLAP - G (0-NO/1-YES)

OVL PHASES: 01000000 0000000  
 PHS/CHN: 123456789 0123456789 01234  
 OVL CHN(S): 00000000 0010000000 00000

A-UP B-DN D-DspChn E-EDIT F-PRIOR MENU

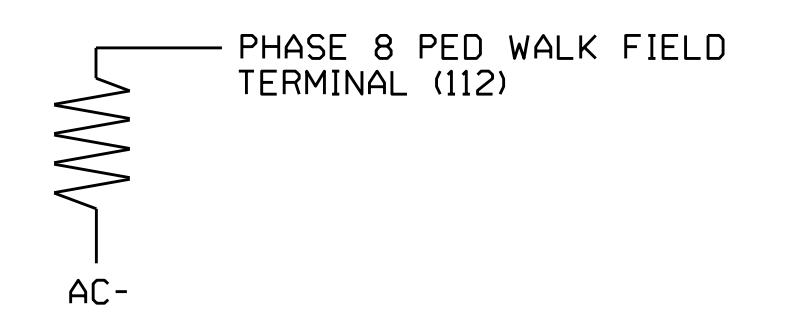
PRESS 'F' TO RETURN TO UNIT DATA

**LOAD RESISTOR INSTALLATION DETAIL**

(install resistor 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: 05-1642  
 DESIGNED: December 2015  
 SEALED: 2/1/2016  
 REVISED: N/A

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

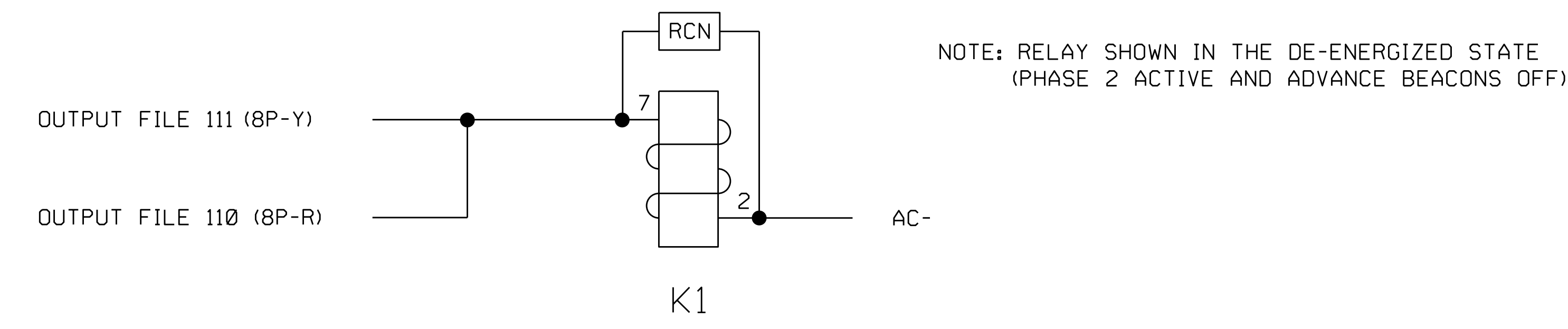
Electrical Detail - Final Design - Sheet 1 of 2

<p>Prepared in the Offices of:</p> <p>750 Greenfield Parkway, Garner, NC 27529</p>	<p>W. Peace Street                  at                  US 70 WB-401/NC 50 NB                  (Capital Blvd.) Ramps</p> <p>Division 5 Wake County Raleigh</p> <p>PLAN DATE: January 2016 REVIEWED BY: T. Joyce</p> <p>PREPARED BY: S. Armstrong REVIEWED BY:</p> <p>REVISIONS INIT. DATE</p>	<p>SEAL</p> <p>DocuSigned by:                  Keith M. Mims                  2/2/2016</p> <p>SIG. INVENTORY NO. 05-1642</p>
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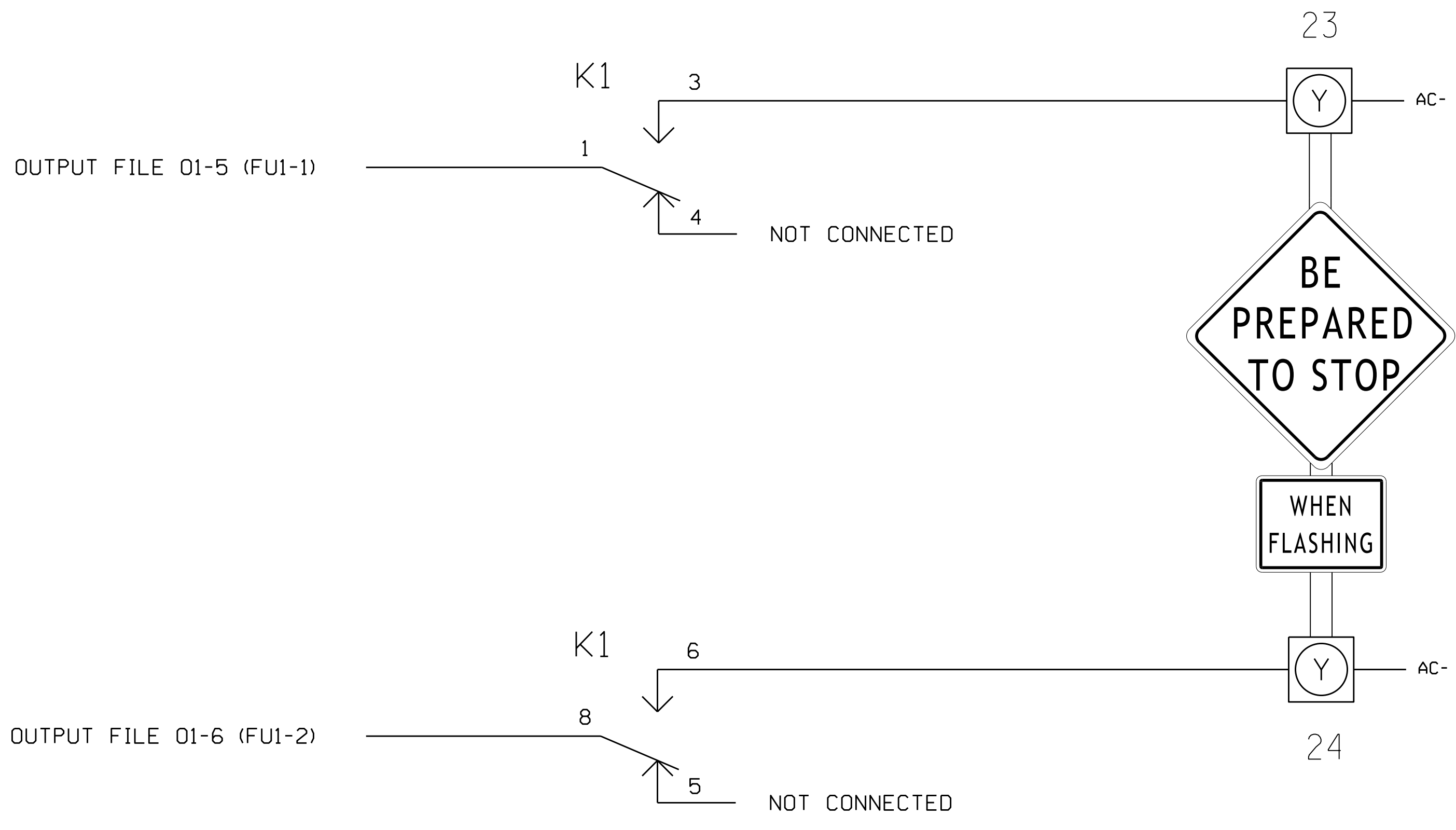
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## ADVANCE BEACON RELAY CONTROL AND SIGN WIRING DETAIL



NOTE: RELAY SHOWN IN THE DE-ENERGIZED STATE  
(PHASE 2 ACTIVE AND ADVANCE BEACONS OFF).

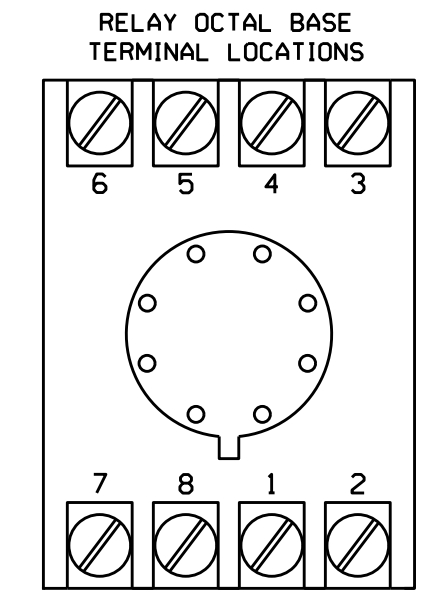


THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-1642  
DESIGNED: December 2015  
SEALED: 2/1/2016  
REVISED: N/A

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

### NOTES

1. RELAY K1 IS A DPDT WITH A 120VAC COIL, CONTACT RATING 120VAC, 5 AMPS.
2. THE RC NETWORK ACROSS THE COIL OF K1 IS VALUED AT .1 MICRO FARAD, 100 OHM.



Electrical Detail - Final Design - Sheet 2 of 2

Prepared in the Offices of:  750 Greenfield Parkway, Garner, NC 27529	<b>DETAILS FOR:</b> <b>W. Peace Street</b> <b>at</b> <b>US 70 WB-401/NC 50 NB</b> <b>(Capital Blvd.) Ramps</b>	SEAL  KEITH M. MINS ENGINEER
	Division 5 Wake County Raleigh PLAN DATE: January 2016 REVIEWED BY: T. Joyce PREPARED BY: S. Armstrong REVIEWED BY:	REVISIONS      INIT.      DATE _____ _____ _____

05-1642-2016-1449  
S:\MITS\SIG\T5\Sig\01\work\groups\Sig\_Minh\armstrong\051642\_sm.elec.xxx.dgn  
sarmstrong

**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 X
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.
Elevation difference at High point of roadway surface	-3.0 ft.
Elevation difference at Edge of travelway or face of curb	-2.0 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
A	SIGN RIGID MOUNTED	5.0 S.F.	24.0" W X 30.0" L	11 LBS
	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0" W X 96.0" L	36 LBS

**NOTES**

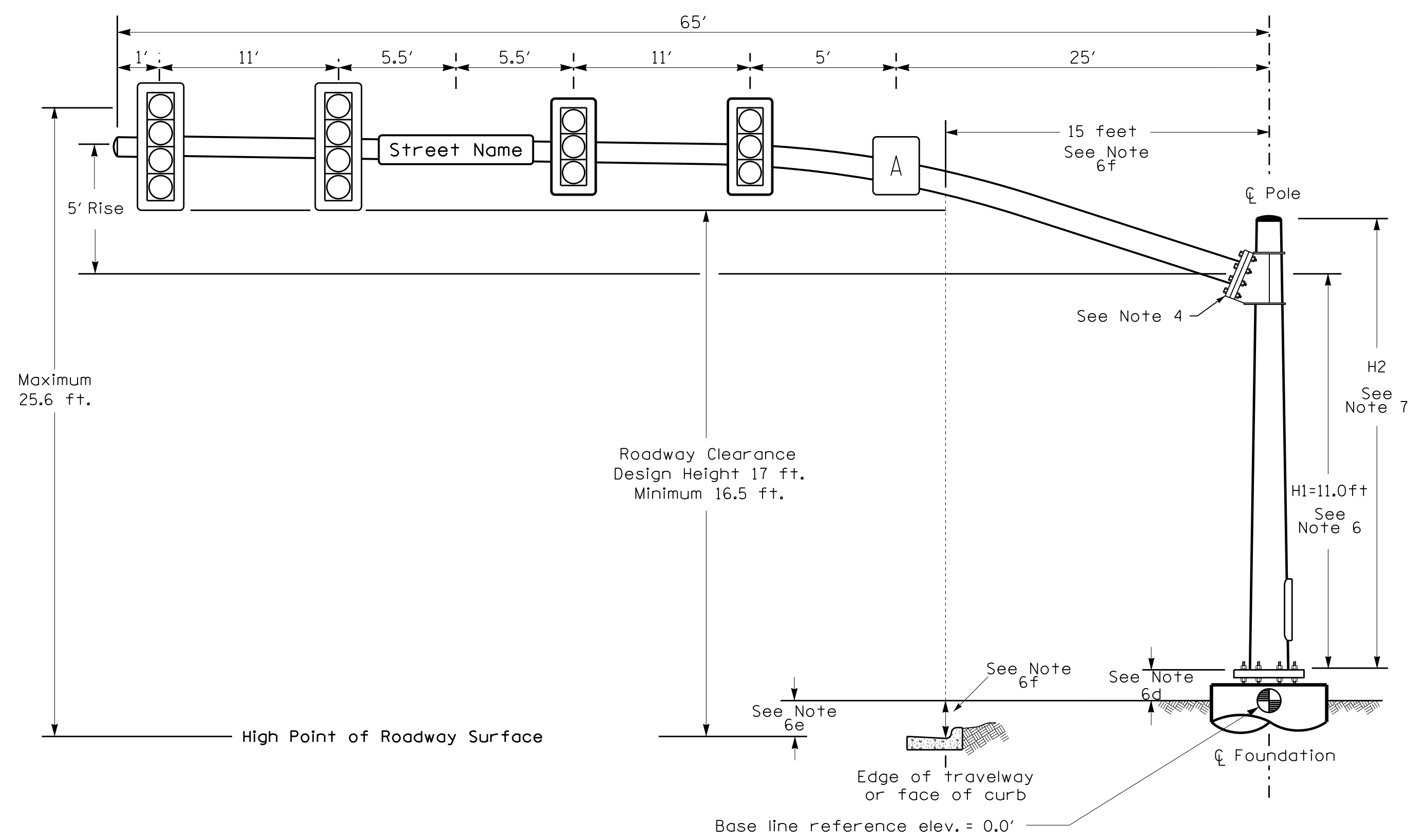
**DESIGN REFERENCE MATERIAL**

- 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 2012 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
  - The 2012 NCDOT Roadway Standard Drawings.

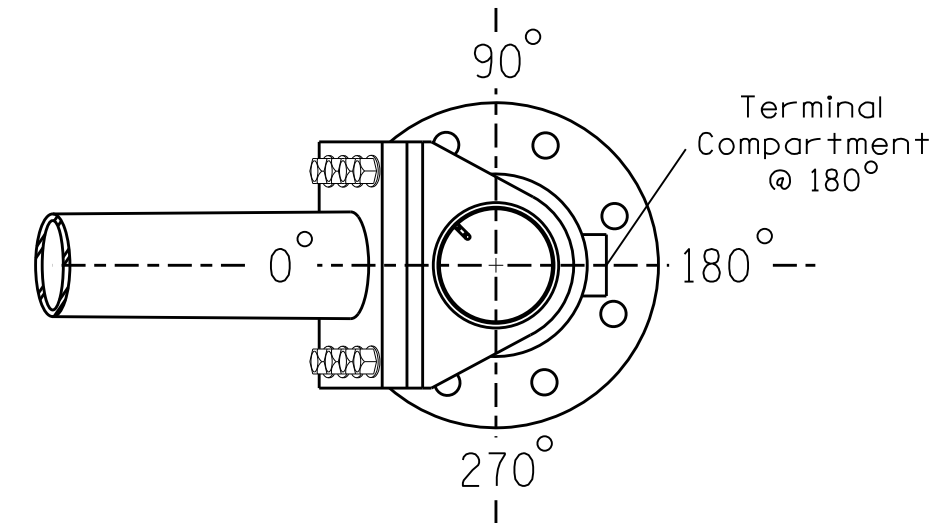
**DESIGN REQUIREMENTS**

- 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.
- 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:
  - Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
  - 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.
  - Provide horizontal distance from the proposed centerline of the foundation to the edge of travelway. Refer to the Elevation Data Chart for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary to ensure that the roadway clearance is maintained at the edge of the travelway and to aid in the camber design of the arm.
- 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) 773-2800.
- 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.

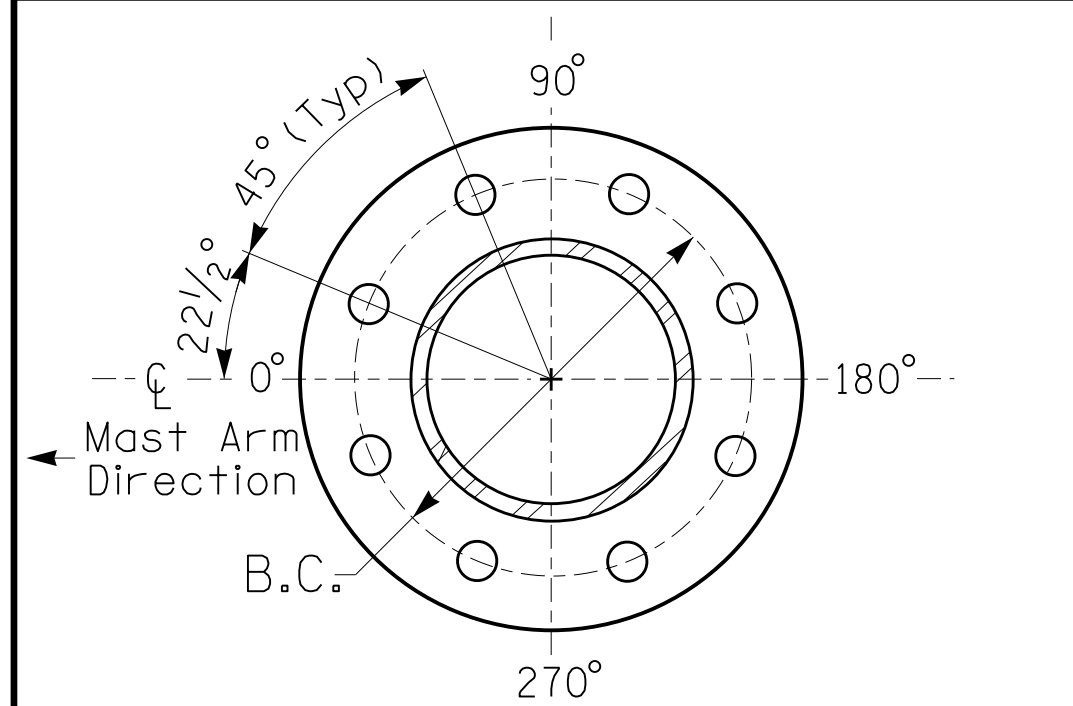
**Design Loading for METAL POLE NO. 1**



**Elevation View**

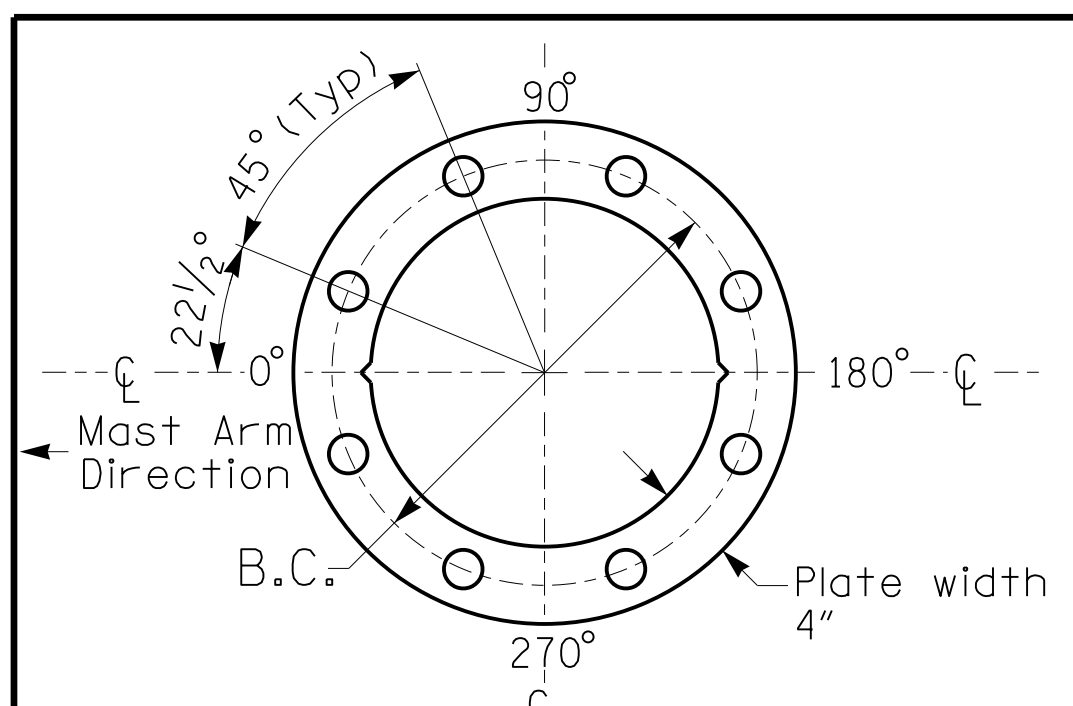


**POLE RADIAL ORIENTATION**



**8 BOLT BASE PLATE DETAIL**

See Note 5



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

NCDOT Wind Zone 4 (90 MPH)

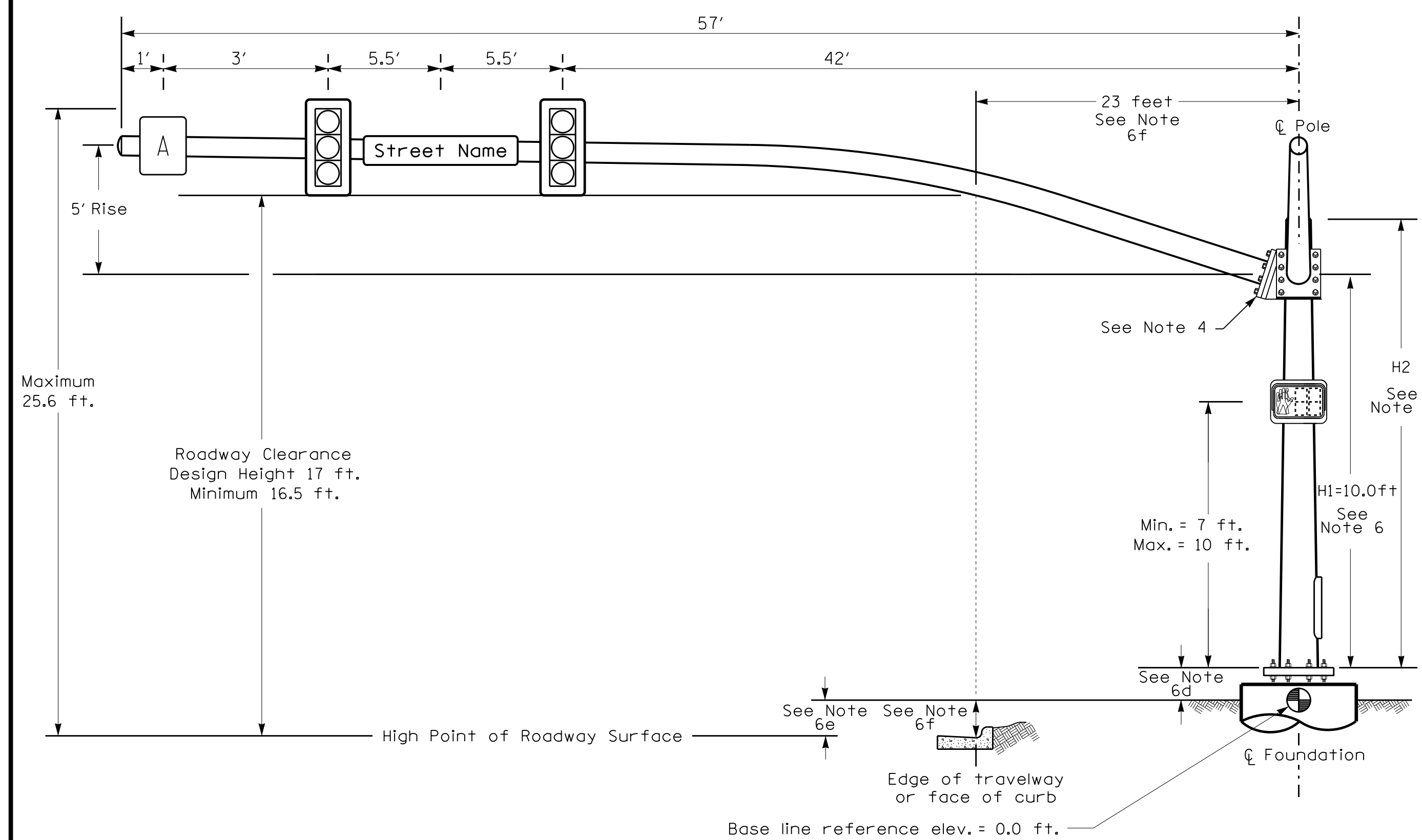
**DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED**

	W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps Wake County Raleigh	
	Division 5 PLAN DATE: December 2015 PREPARED BY: I. O. Umzurike	REVIEWED BY: REVISIONS INIT. DATE
750 N. Greenfield Pkwy, Garner, NC 27529		2/8/2016 DATE SIG. INVENTORY NO. 05-1642

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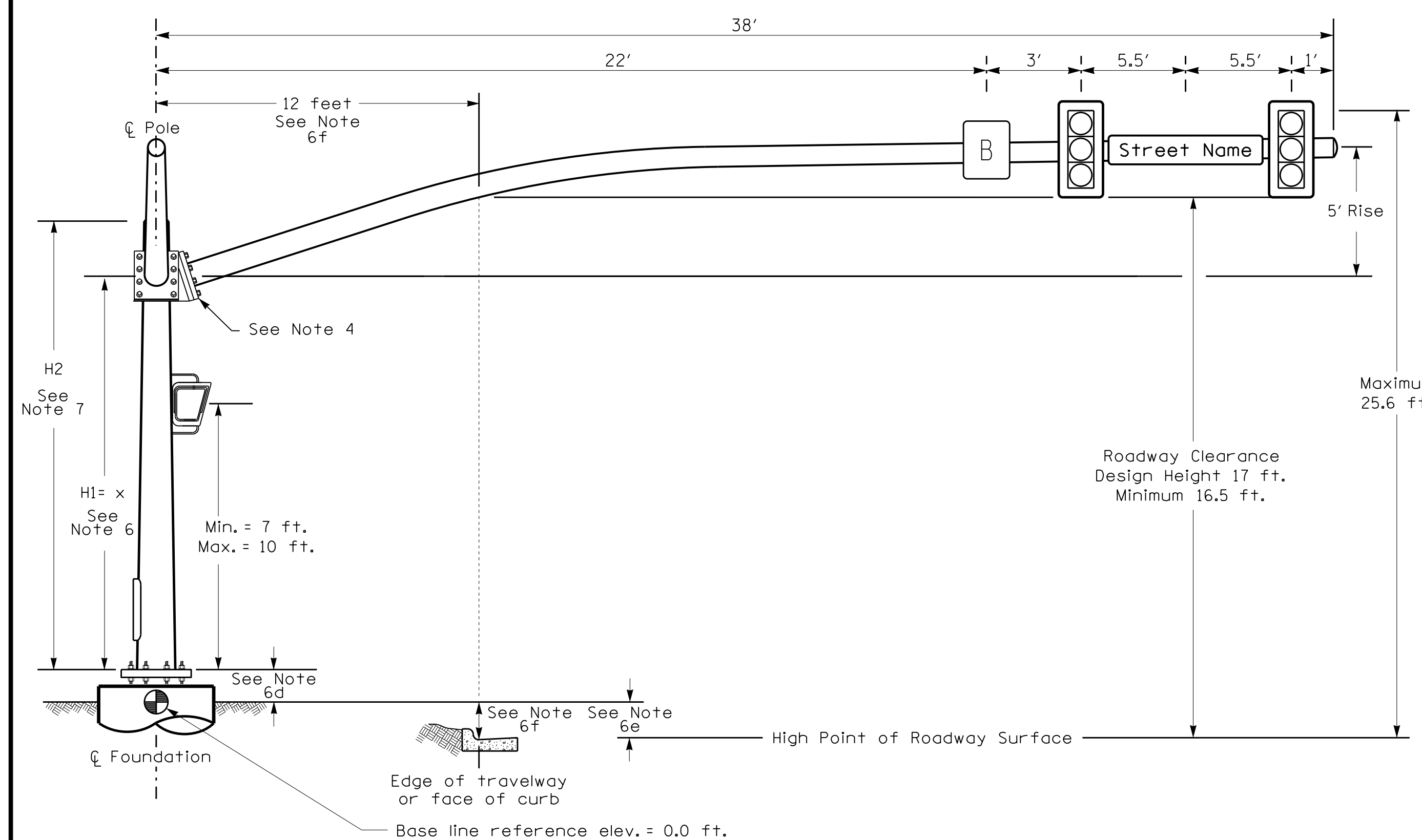


Design Loading for METAL POLE NO. 2, MAST ARM A



Elevation View @ 270°

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



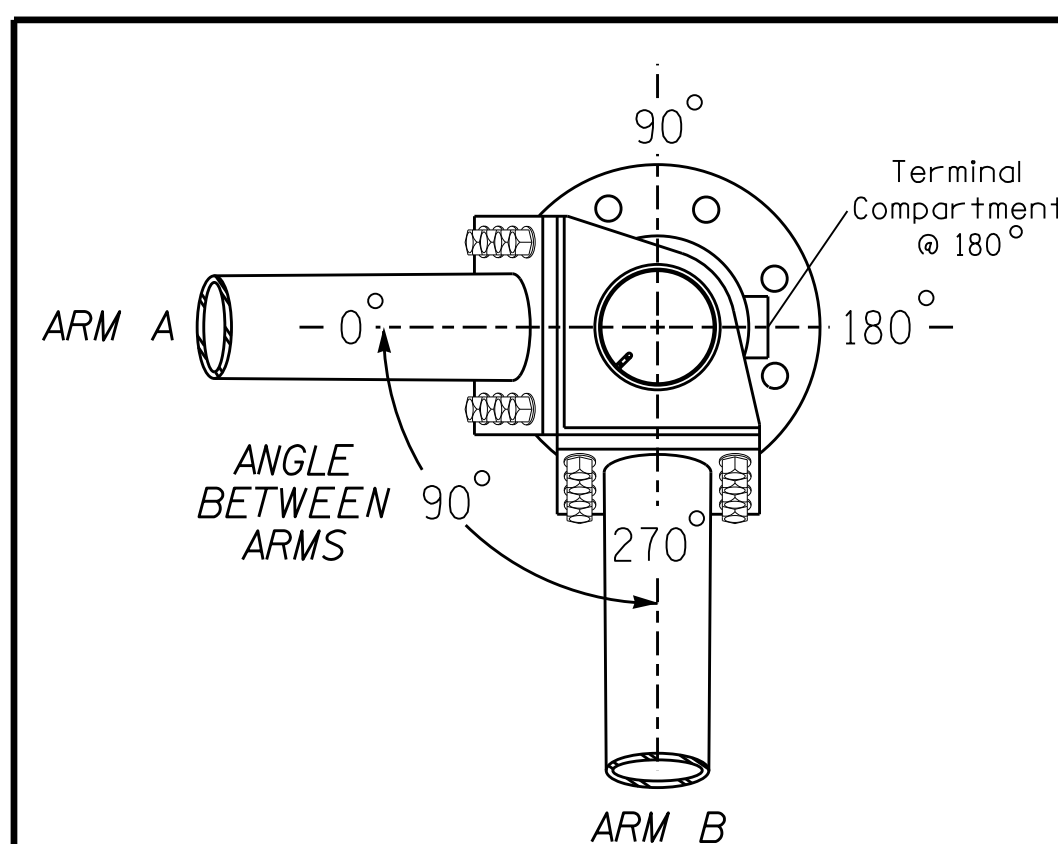
Elevation View @ 0°

SPECIAL NOTE

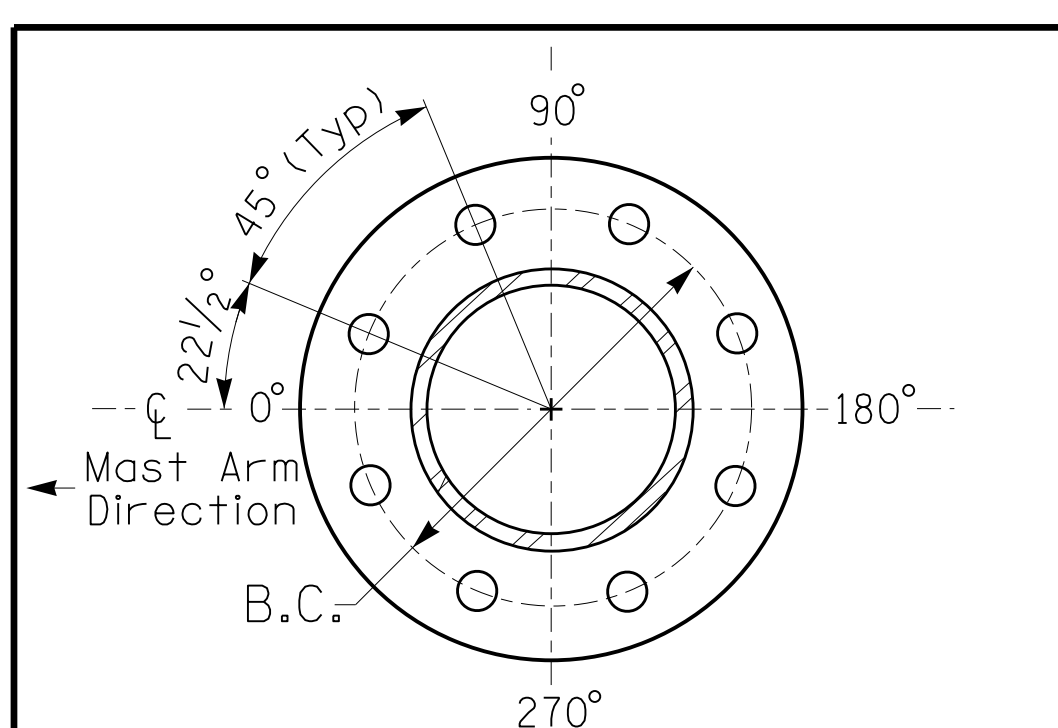
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole A	Pole B
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-4.0 ft.	-1.0 ft.
Elevation difference at Edge of travelway or face of curb	-4.0 ft.	-1.0 ft.

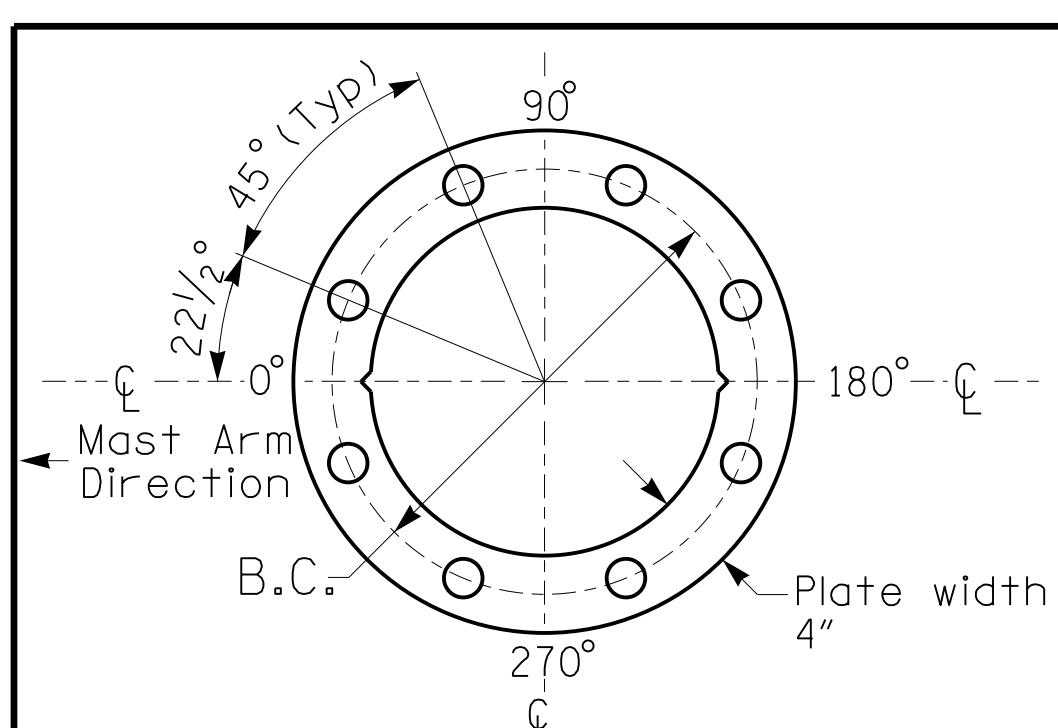


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



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

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS
A	SIGN RIGID MOUNTED	5.0 S.F.	24.0" W X 30.0" L	11 LBS
B	SIGN RIGID MOUNTED	7.5 S.F.	30.0" W X 36.0" L	14 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 2012 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
  - The 2012 NCDOT Roadway Standard Drawings.

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.
- A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate connection points.
- 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:
  - Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
  - 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.
  - Provide horizontal distance from the proposed centerline of the foundation to the edge of travelway. Refer to the Elevation Data Chart for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary to ensure that the roadway clearance is maintained at the edge of the travelway and to aid in the camber design of the arm.
- 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) 773-2800.
- 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.

NCDOT Wind Zone 4 (90 MPH)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

<p>Prepared In the Offices of:                  Transportation Mobility and Safety Division                  DIVISION OF TRANSPORTATION                  Signal Design Section                  750 N. Greenfield Pkwy, Garner, NC 27529</p>	W. Peace Street at US 70 WB-401/NC 50 NB (Capital Blvd.) Ramps Wake County Raleigh		
	Division 5 PLAN DATE: December 2015 PREPARED BY: I. O. Umozurike	REVIEWED BY: REVIEWED BY:	
SCALE 0 N/A N/A	REVISIONS INIT. DATE	DATE 2/8/2016	SIG. INVENTORY NO. 05-1642

08-FEB-2016 11:27  
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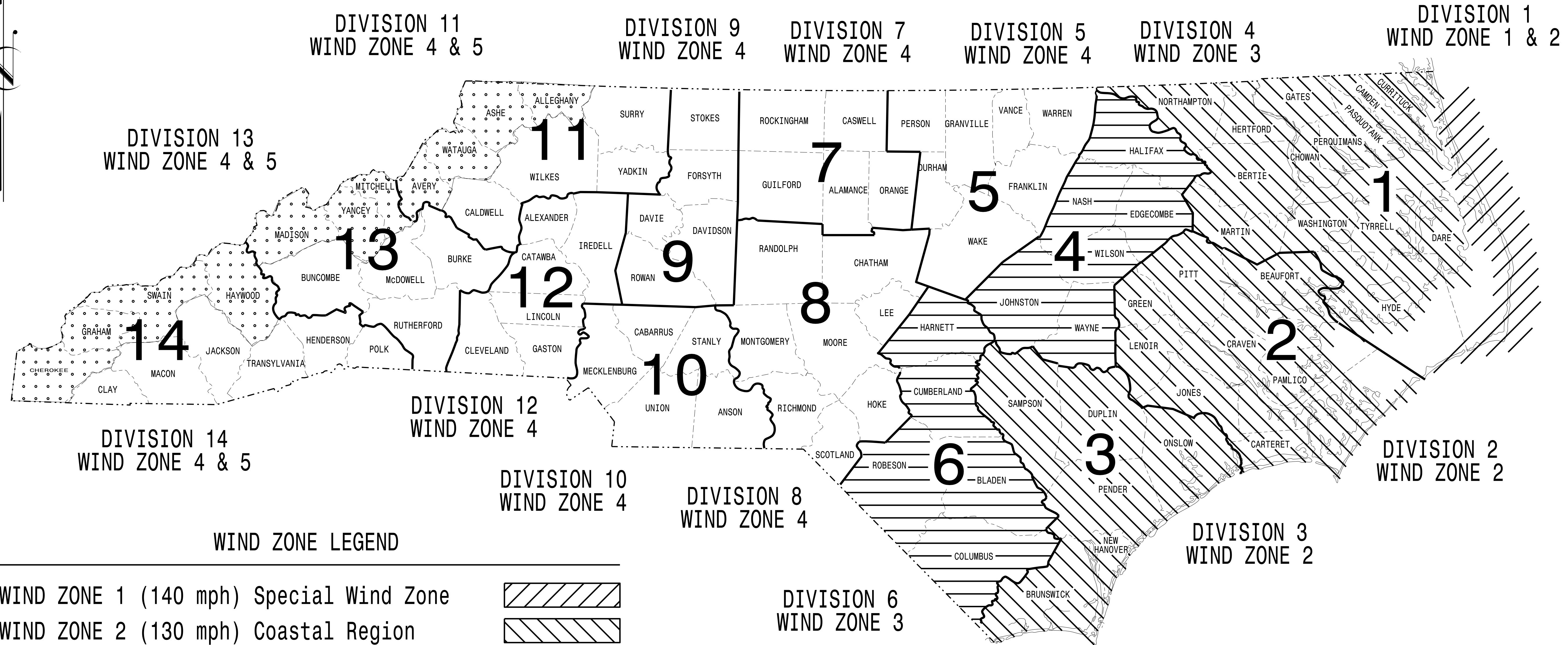


# NCDOT METAL POLE STANDARDS

## STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

PROJECT NO. B-5121/B-5317	SHEET NO. Sig. M1
------------------------------	----------------------

### STANDARD DRAWINGS FOR 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  
 2012 Interim to the  
 5th Edition 2009  
**AASHTO**  
 Standard Specifications for  
 Structural Supports for  
 Highway Signs, Luminaires,  
 and Traffic Signals

DRAWING NUMBER	DESCRIPTION
M 1	Title Sheet
M 2	Fabrication Details - All Poles
M 3	Fabrication Details - Strain Poles
M 4,5	Fabrication Details - Mast Arm Poles
M 6	Construction Details - Strain Poles
M 7	Construction Details - Foundations
M 8,9	Standard Strain Pole Foundations

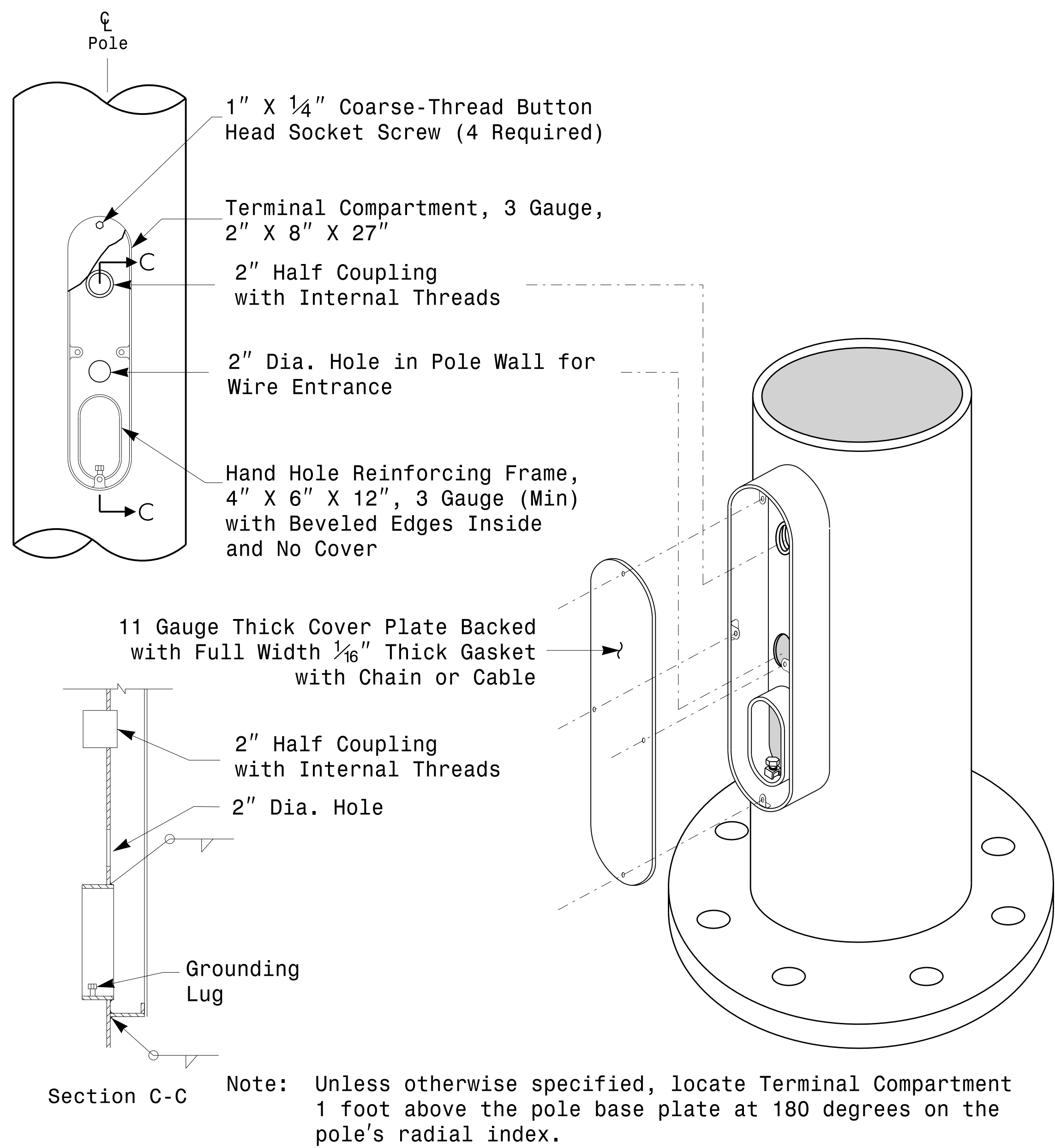
**NCDOT CONTACTS:**  
**MOBILITY AND SAFETY DIVISION - ITS AND SIGNALS UNIT**

**G. A. FULLER, P.E. - STATE ITS AND SIGNALS ENGINEER**  
**G. G. MURR, JR., P.E. - STATE SIGNALS ENGINEER**  
**D.C. SARKAR, P.E. - ITS AND SIGNALS SENIOR STRUCTURAL ENGINEER**  
**C.F. ANDREWS - ITS AND SIGNALS JOURNEY STRUCTURAL ENGINEER**

SEAL

Drawn by: Debesha C. Sarkar  
 DATE: 8/26/2014





**Terminal Compartment Detail**

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 STANDARD _____	

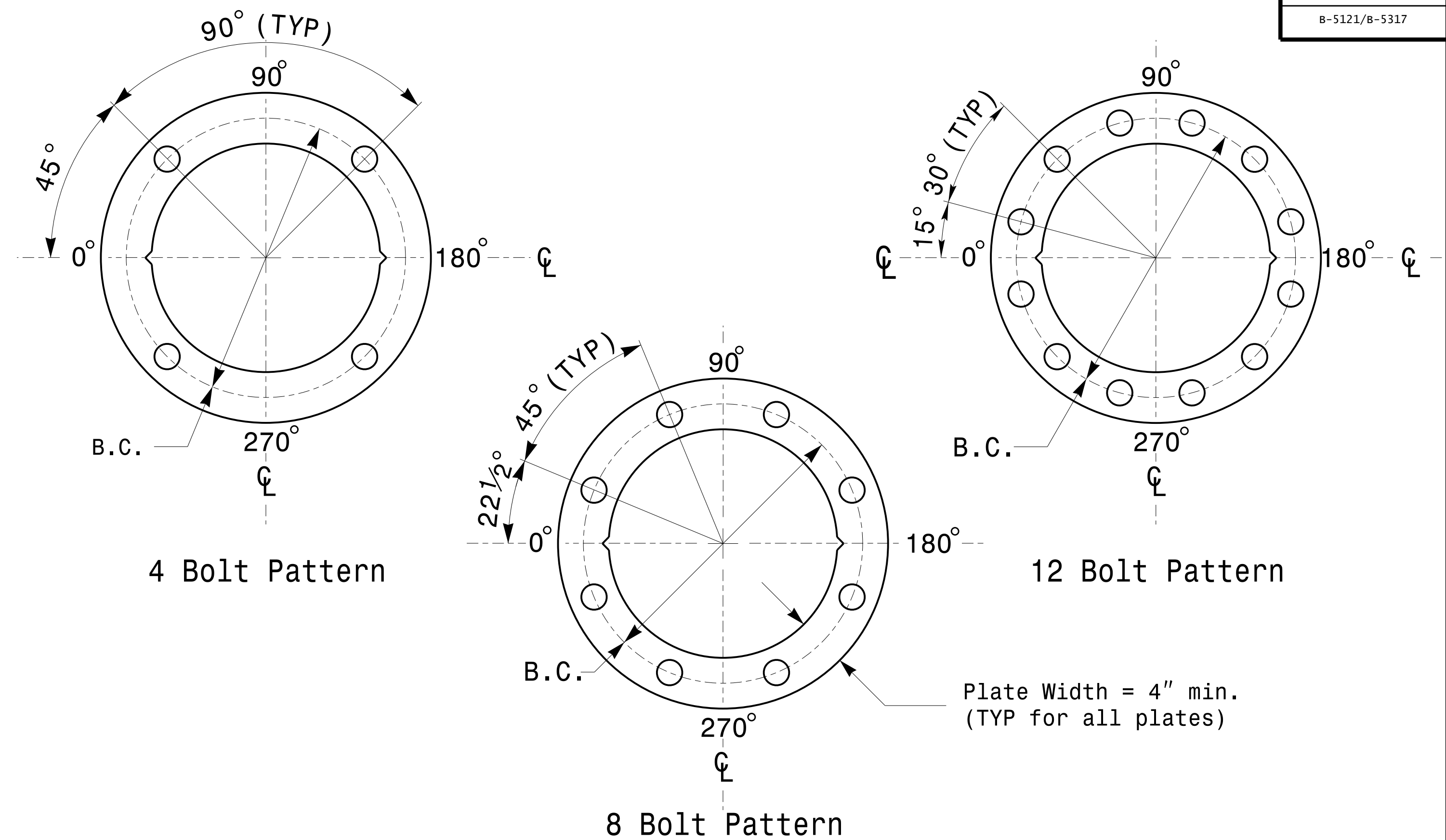
**Shaft I.D. Tag**  
(Provide on Strain Poles and Mast Arm Poles)

MFG _____	MFG. DATE: MM/YY _____
SECTION D/T/L/Y _____	
NCDOT STANDARD _____	

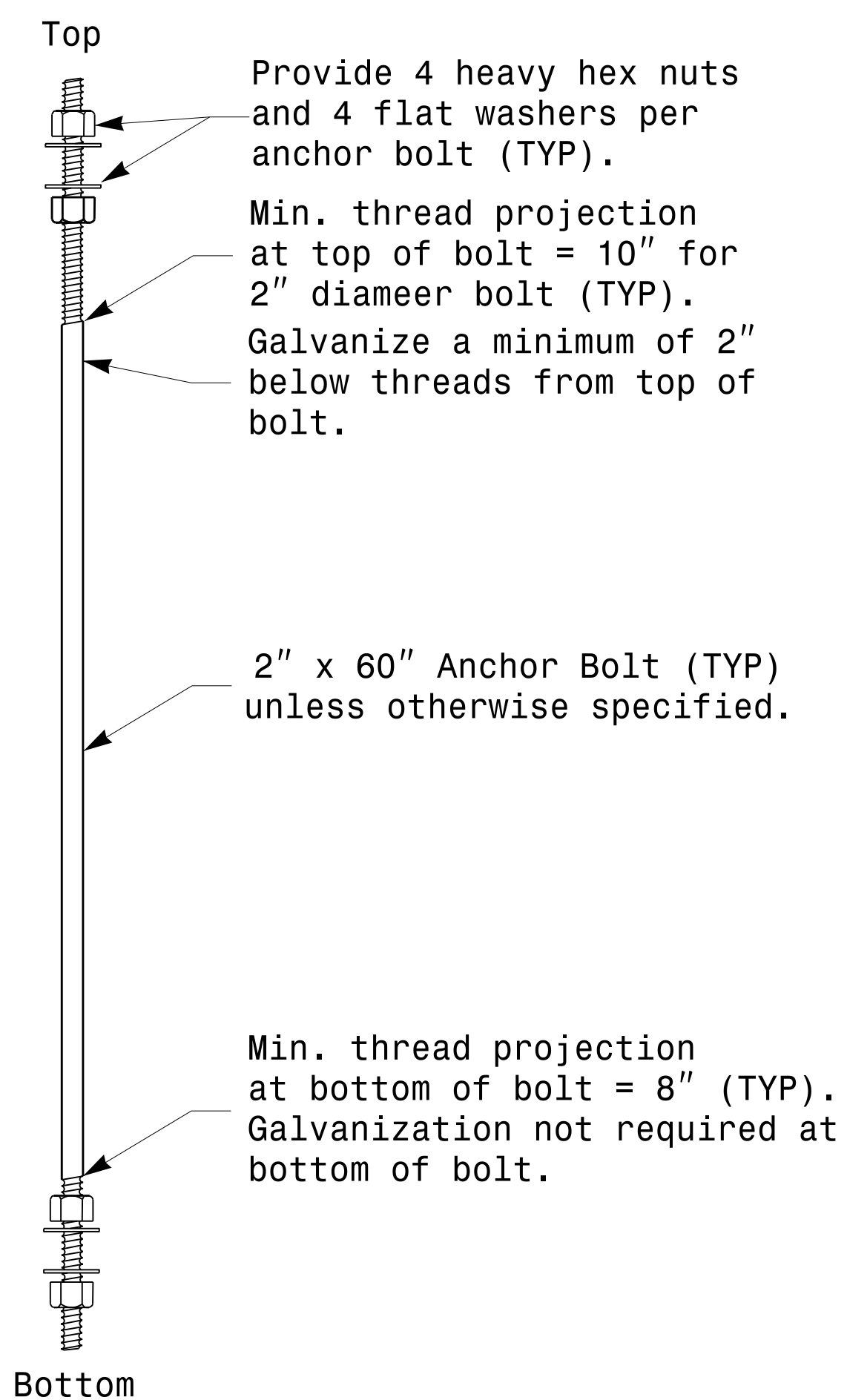
**Arm I.D. Tag**  
(Provide on each section of a multi-section mast arm)

- 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 pole I.D. number and Signal Inv. Number.
  - 5) See drawing M4 for mounting positions of I.D. tags.

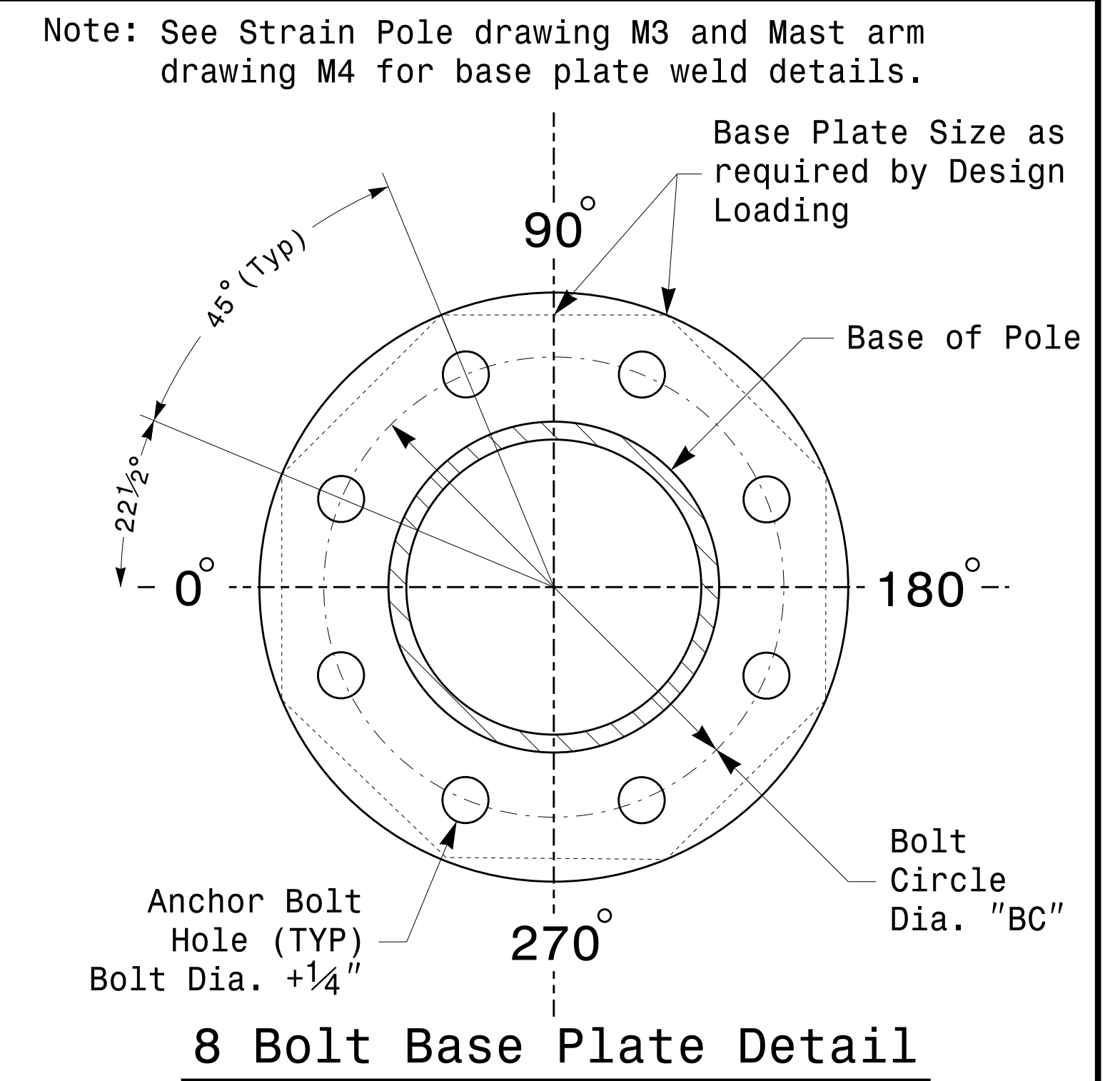
**Identification Tag Details**



Construct Templates and Plates from 1/4" min. thick Steel. Galvanizing is not required.  
**Base Plate Template and Anchor Bolt Lock Plate Details**



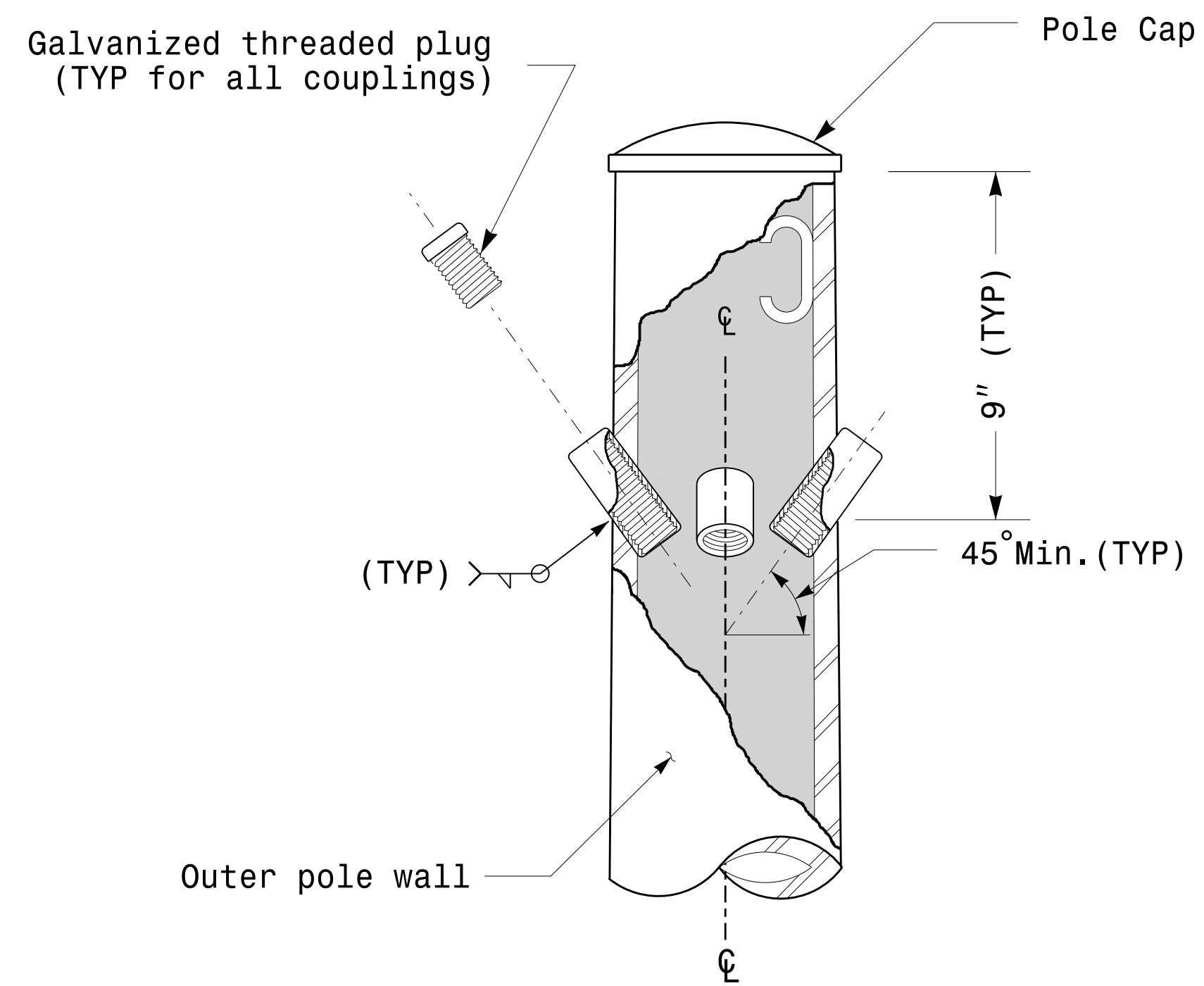
**Anchor Bolt Detail**



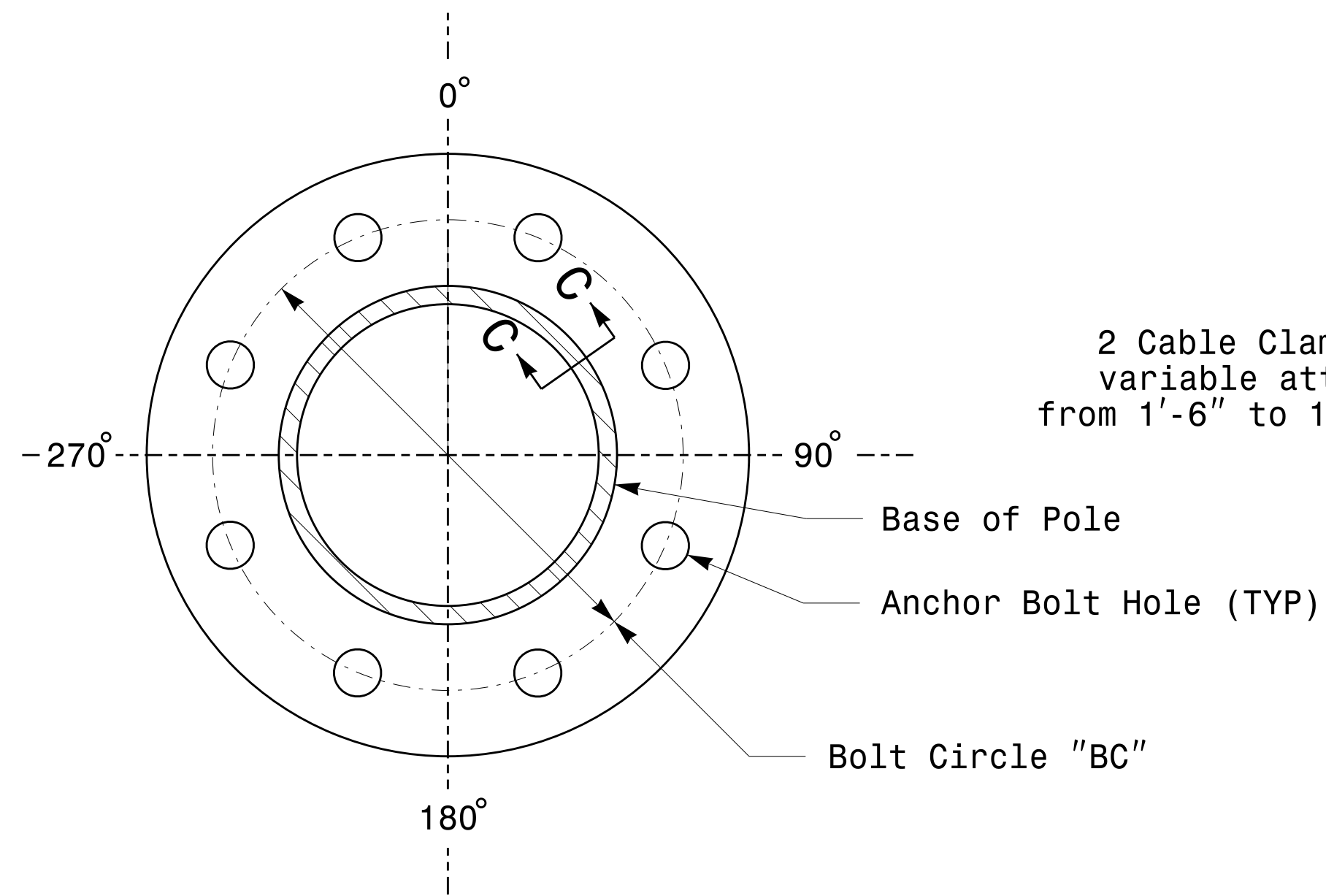
<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>Typical Fabrication Details Common To All Metal Poles</p>		
	<p>PLAN DATE: AUGUST 2013</p> <p>DESIGNED BY: C.F. ANDREWS</p> <p>PREPARED BY: N. BITTING</p> <p>REVIEWED BY: D.C. SARKAR</p>	<p>REVISIONS</p> <p>INIT. DATE</p>	

**Fabrication Details – All Poles**

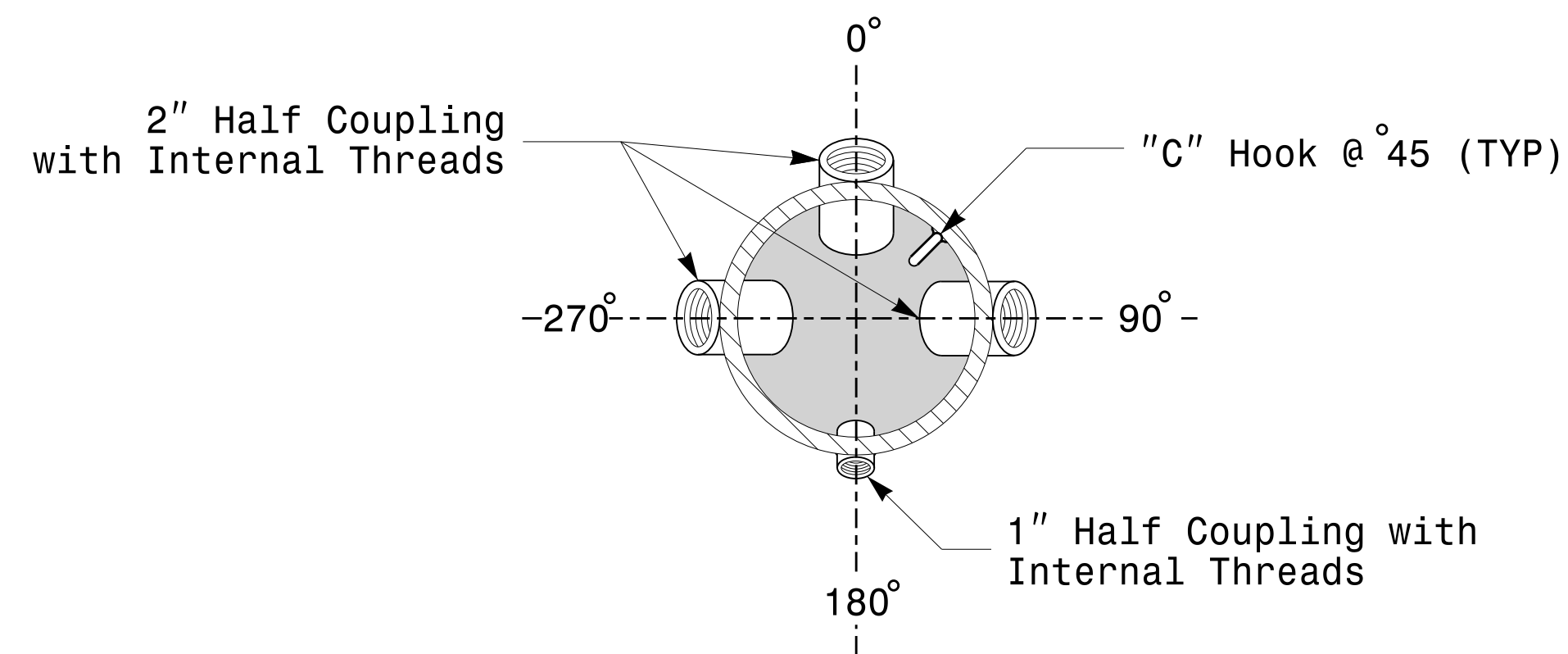
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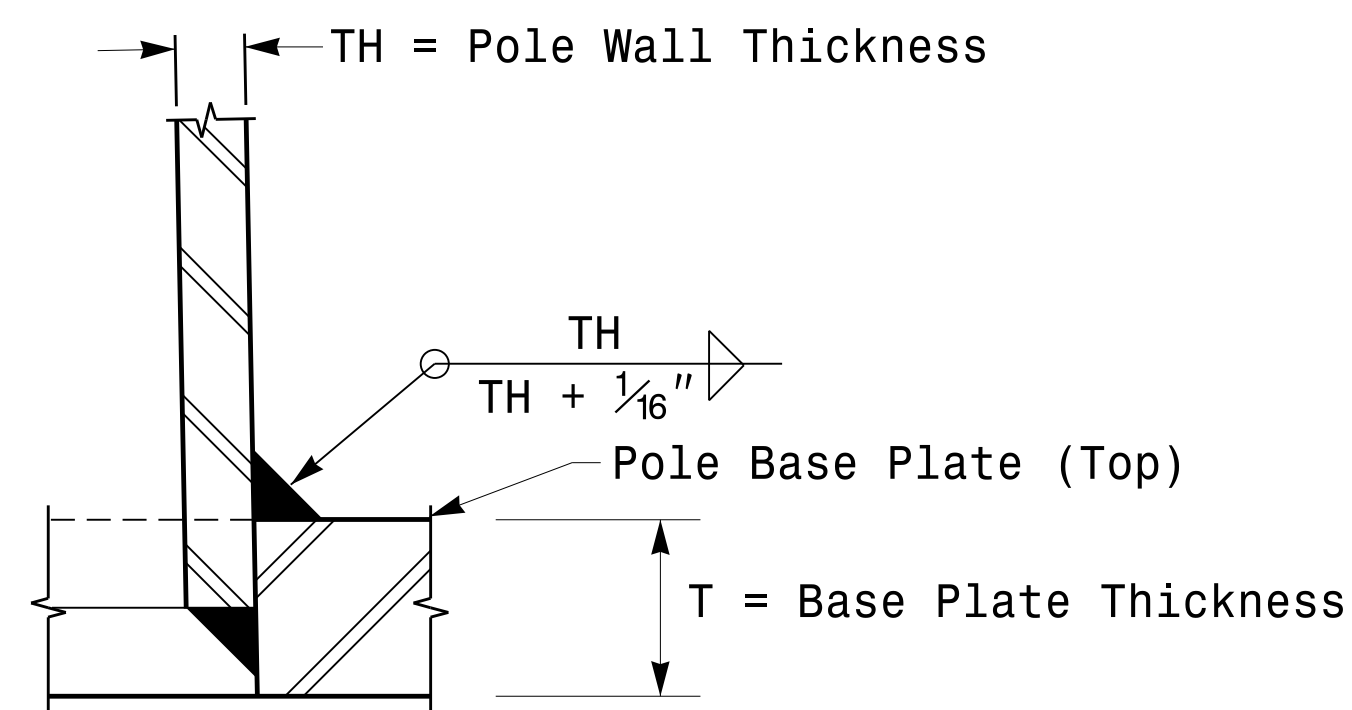
Cable Entrances at Top of Pole



Section B-B  
Pole Base Plate  
(See drawing M2)

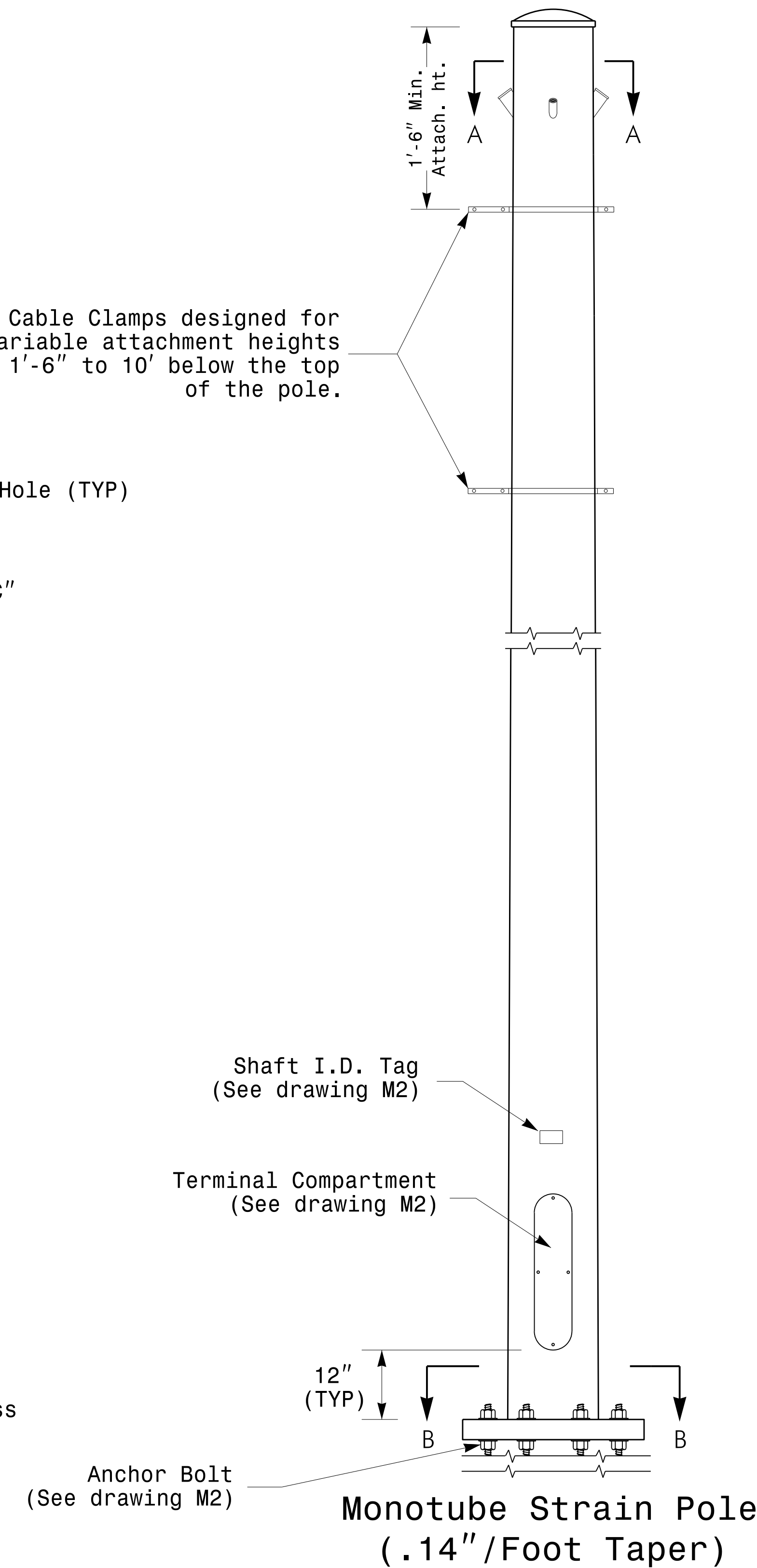


Radial Orientation for Factory Installed  
Accessories at Top of Pole



Socket Connection Weld Detail

2 Cable Clamps designed for variable attachment heights from 1'-6" to 10' below the top of the pole.



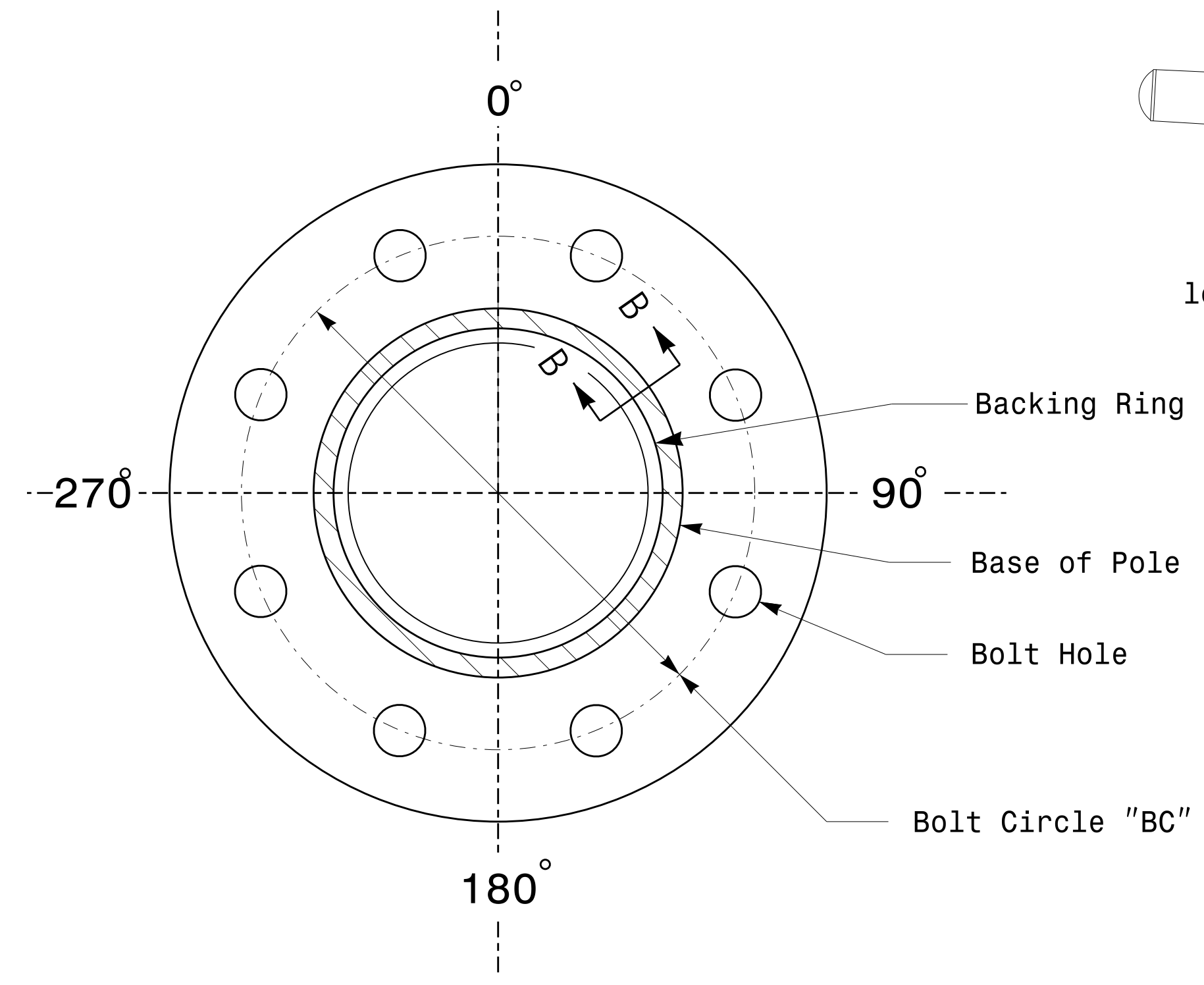
Monotube Strain Pole  
(.14"/Foot Taper)

	Typical Fabrication Details For Strain Poles		
	PLAN DATE: AUGUST 2013 PREPARED BY: N. BITTING	DESIGNED BY: C.F. ANDREWS REVIEWED BY: D.C. SARKAR	
SCALE: 0 NA NONE	REVISIONS:	INIT. DATE:	SIG. INVENTORY NO.:

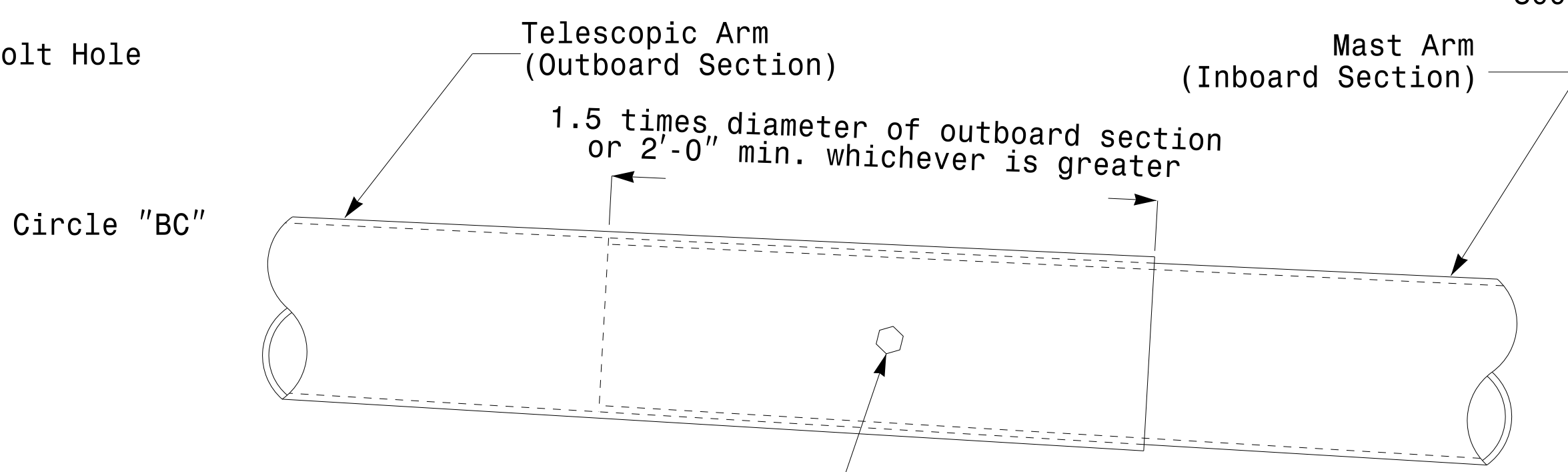
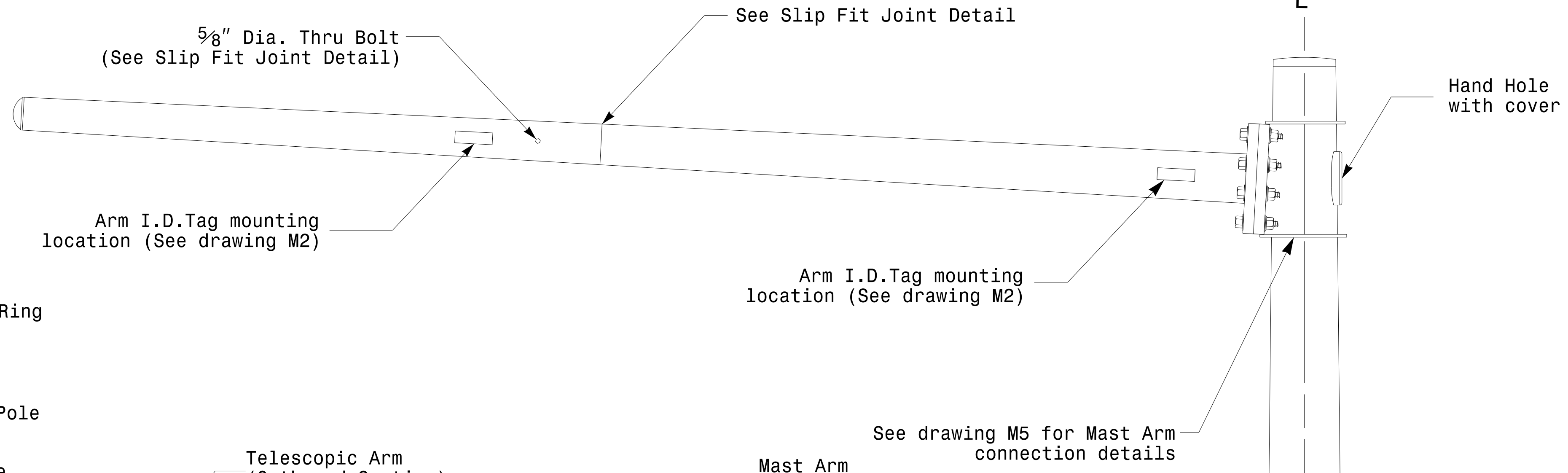
08-26-2014 08:51  
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 Top of Pole

**Fabrication Details – Strain Poles**



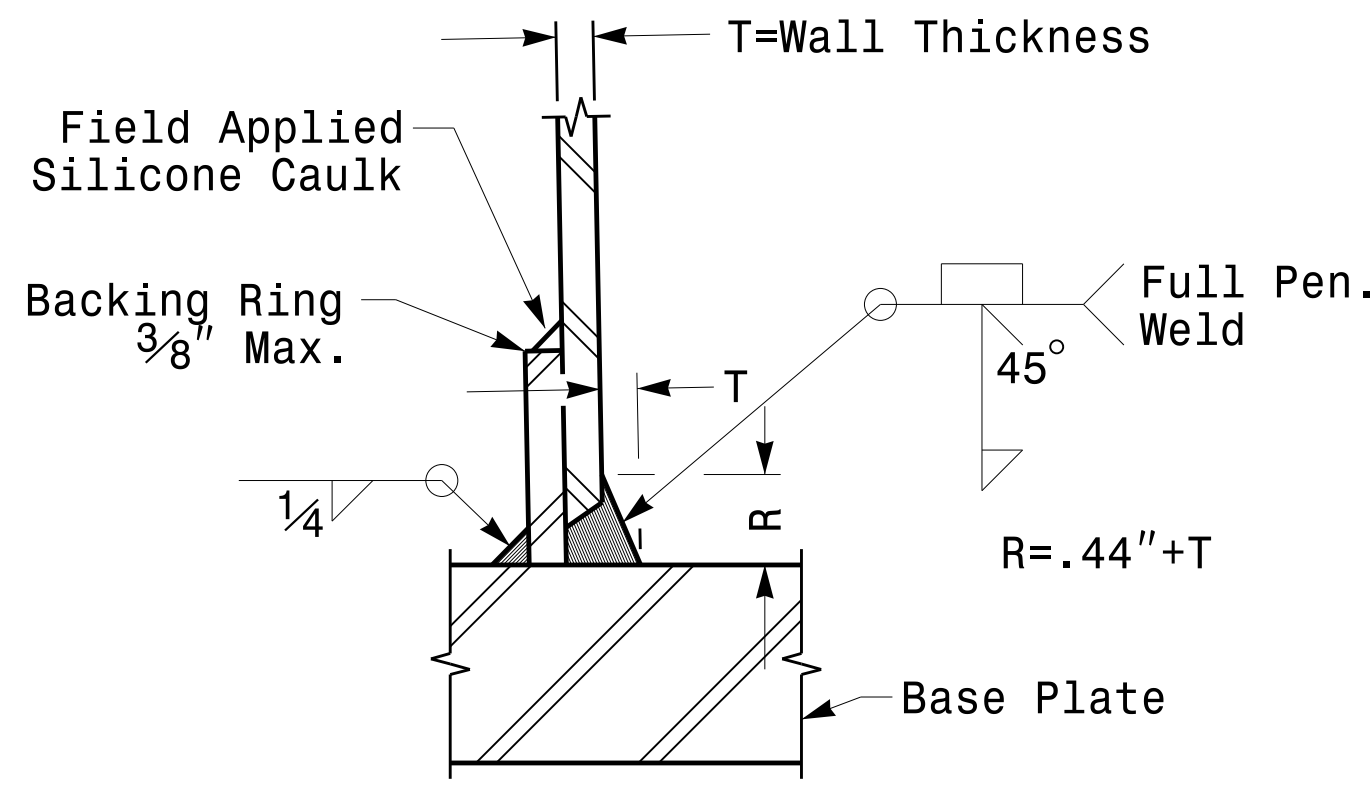


Section A-A  
(See drawing M 2)  
**Pole Base Plate**

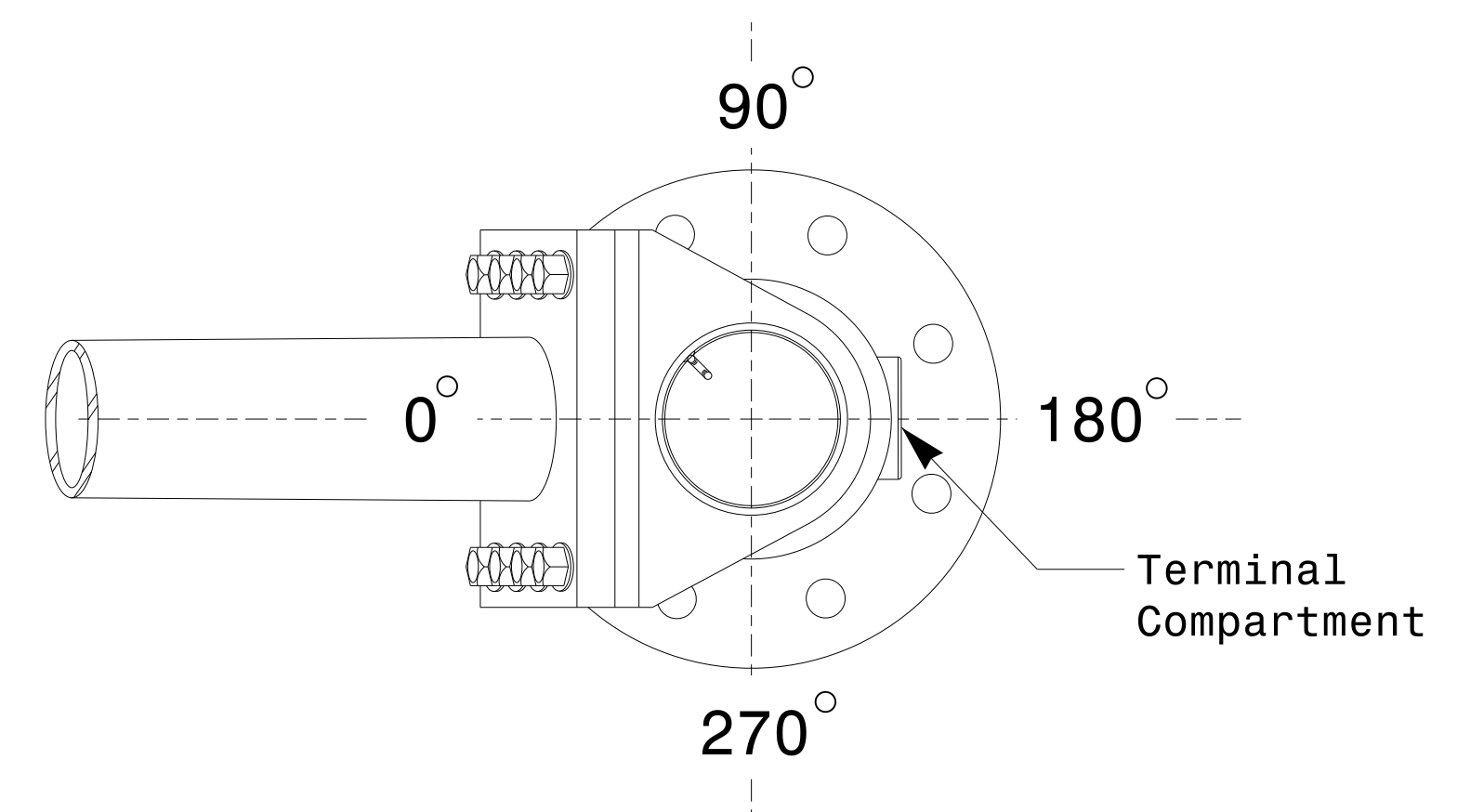


3/4" Factory Drilled Hole in Outboard Tube.  
Field Drill Inboard Tube.  
5/8" Galvanized Thru Stud with  
(2) Hex. Locknuts Each.

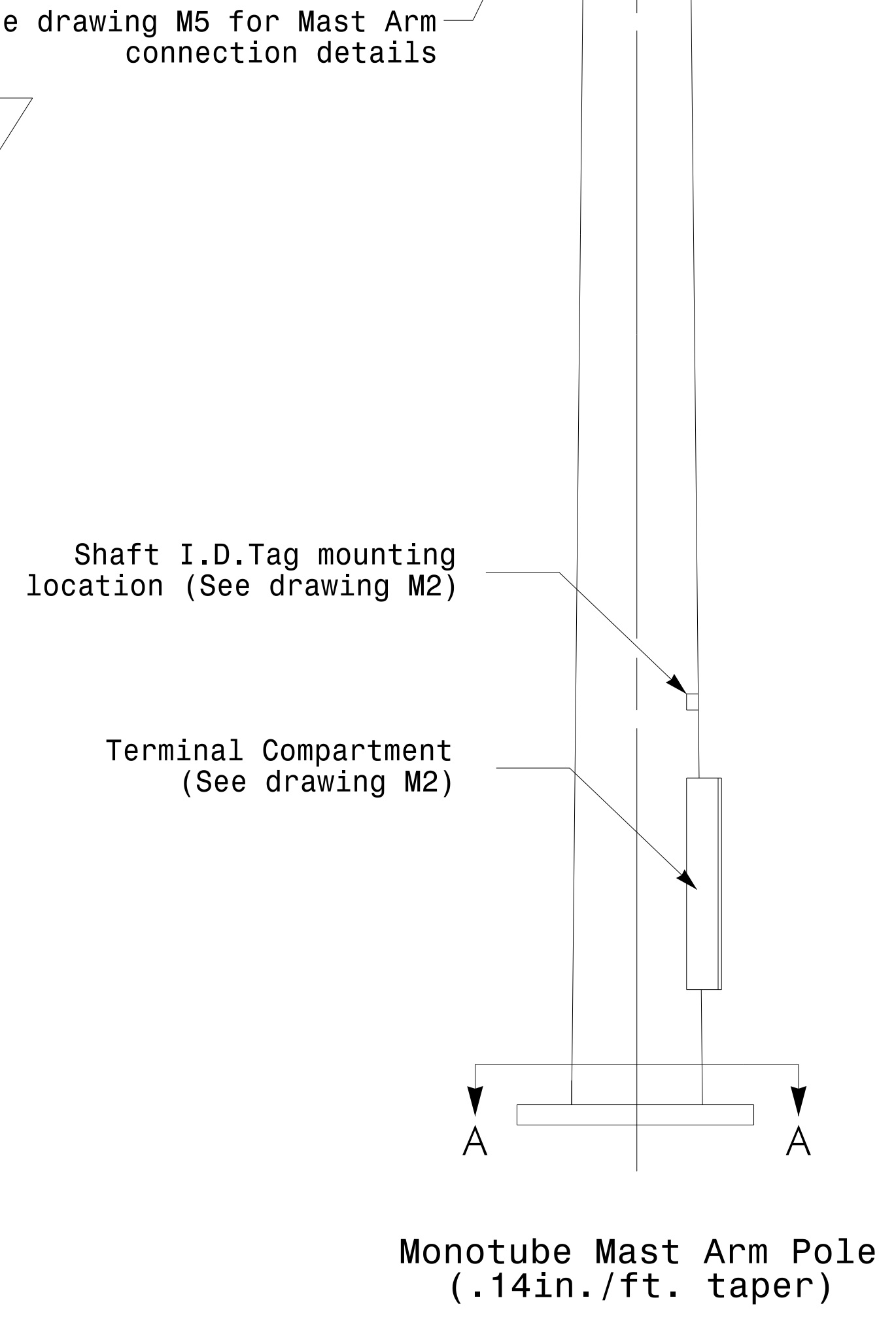
**Slip Fit Joint Detail for Mast Arm**



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



**Mast Arm Radial Orientation**



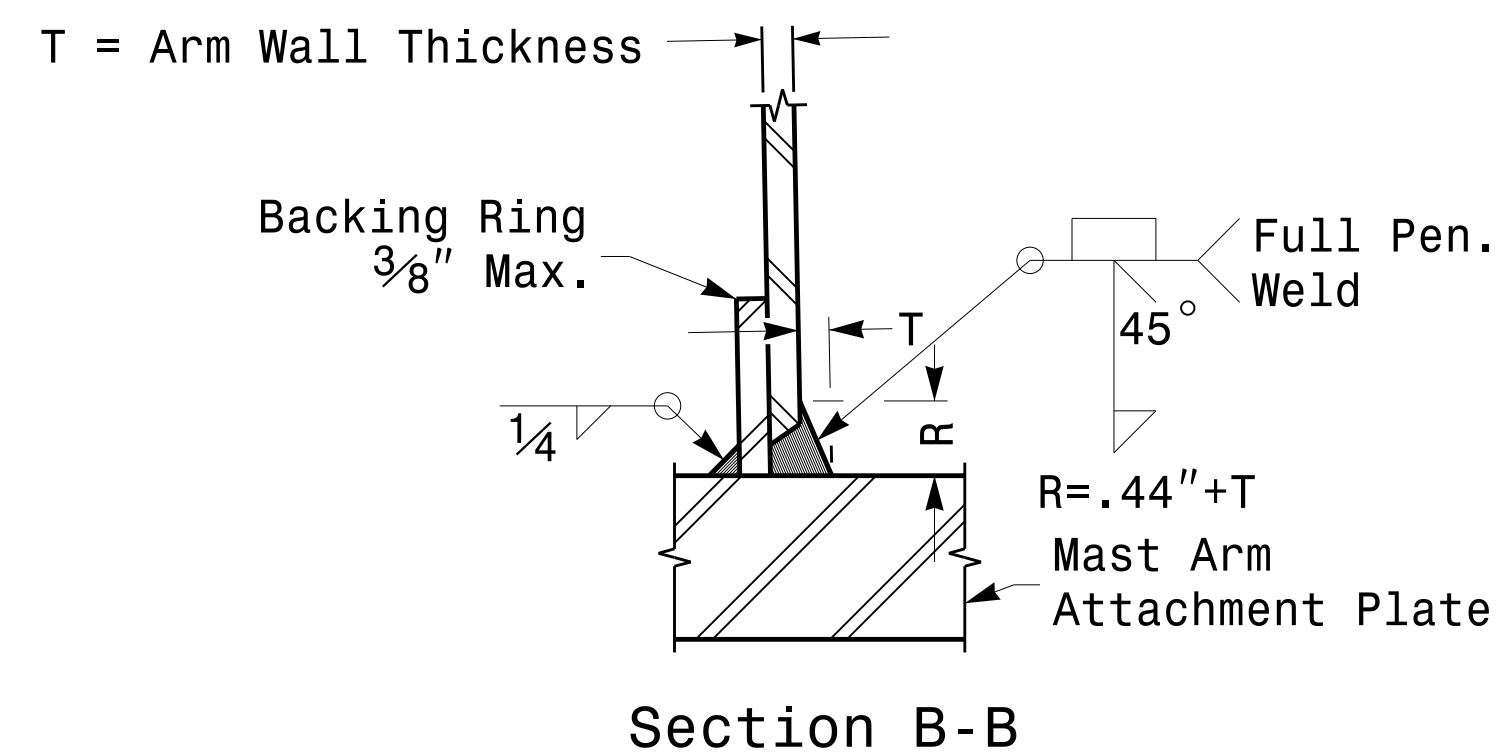
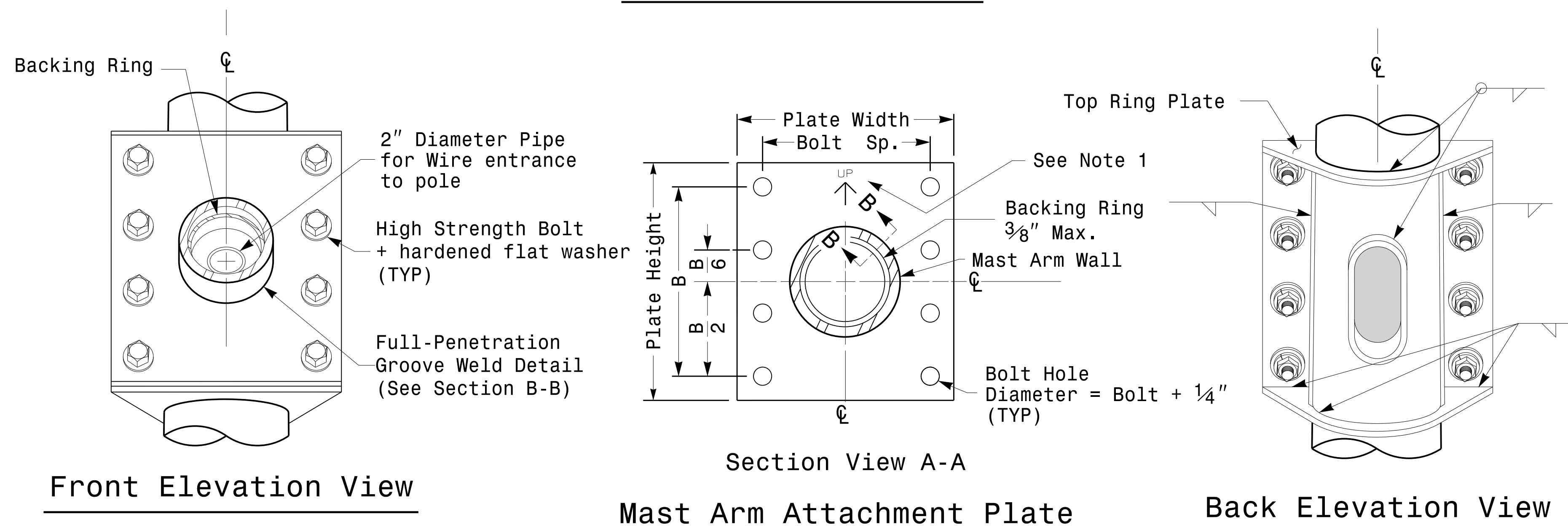
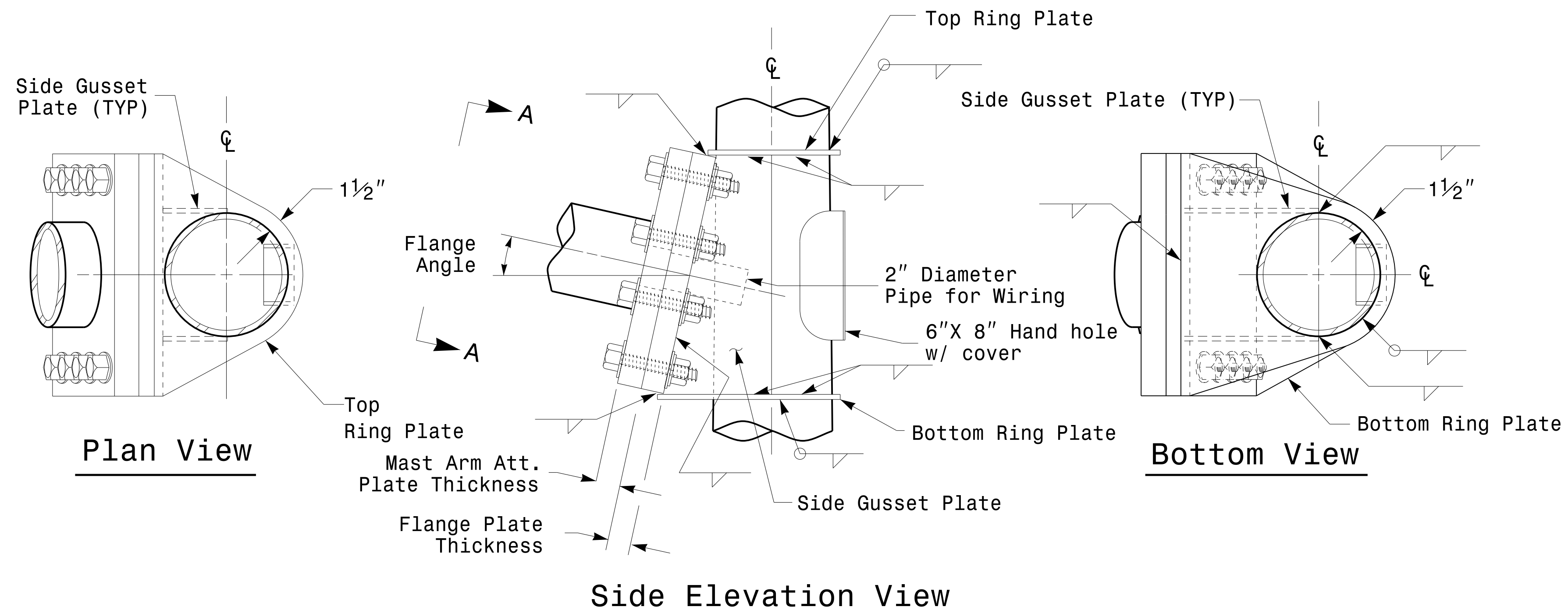
Monotube Mast Arm Pole  
(.14in./ft. taper)

	Typical Fabrication Details for Mast Arm Poles		
	PLAN DATE: AUGUST 2013 PREPARED BY: N. BITTING	DESIGNED BY: C.F. ANDREWS REVIEWED BY: D.C. SARKAR	
SCALE: 0 NA NONE	REVISIONS:	INIT. DATE:	SIG. INVENTORY NO.:

26-AUG-2014 08:50  
 C:\Users\sigal\Documents\Signal Design\Section\Eastern Region\MM Sheets\2012\_M4\_Fab\_Details\MastArms.dgn  
 7:00:11 am

**Fabrication Details – Mast Arm Poles**

# Welded Ring Stiffened Mast Arm Connection

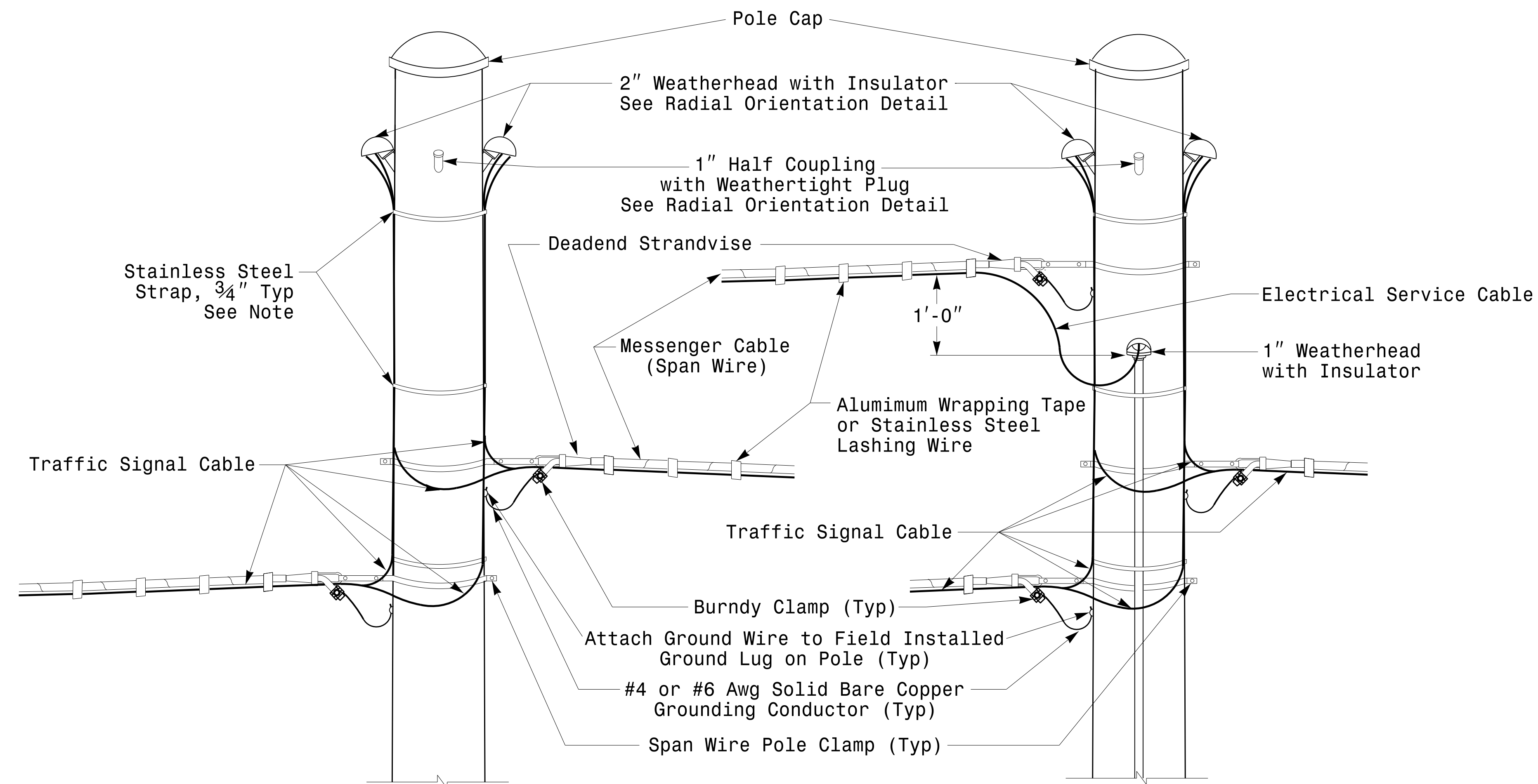


Notes:

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. Designer is responsible for providing appropriate drainage points.

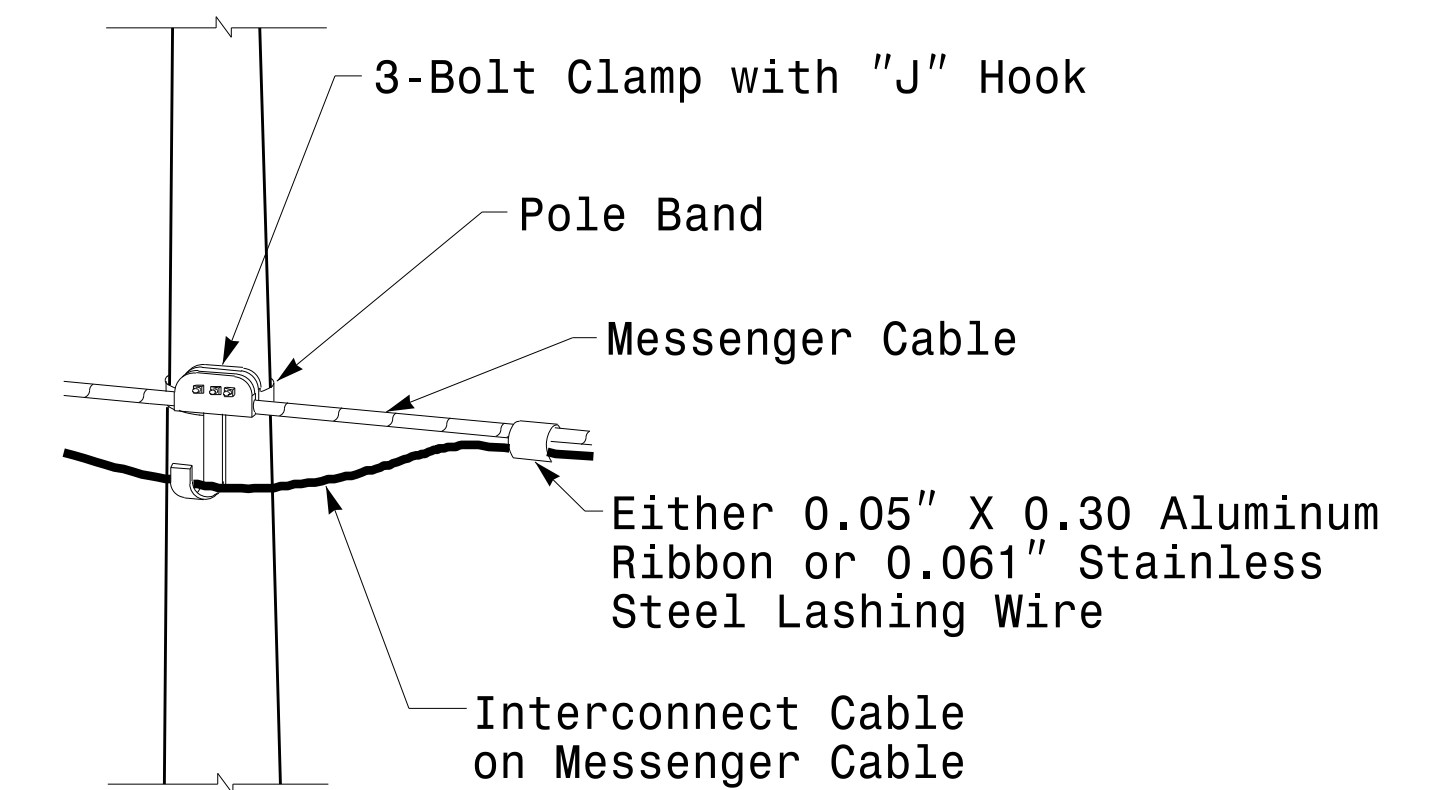
	Fabrication Details For Mast Arm Connection To Pole		
	PLAN DATE: AUGUST 2013 PREPARED BY: N. BITTING	DESIGNED BY: C.F. ANDREWS REVIEWED BY: D.C. SARKAR	
SCALE: 0 NA NONE		DocuSign by: D. C. SARKAR 8/26/2014 44E8E32E147E4C4 DATE SIG. INVENTORY NO.	



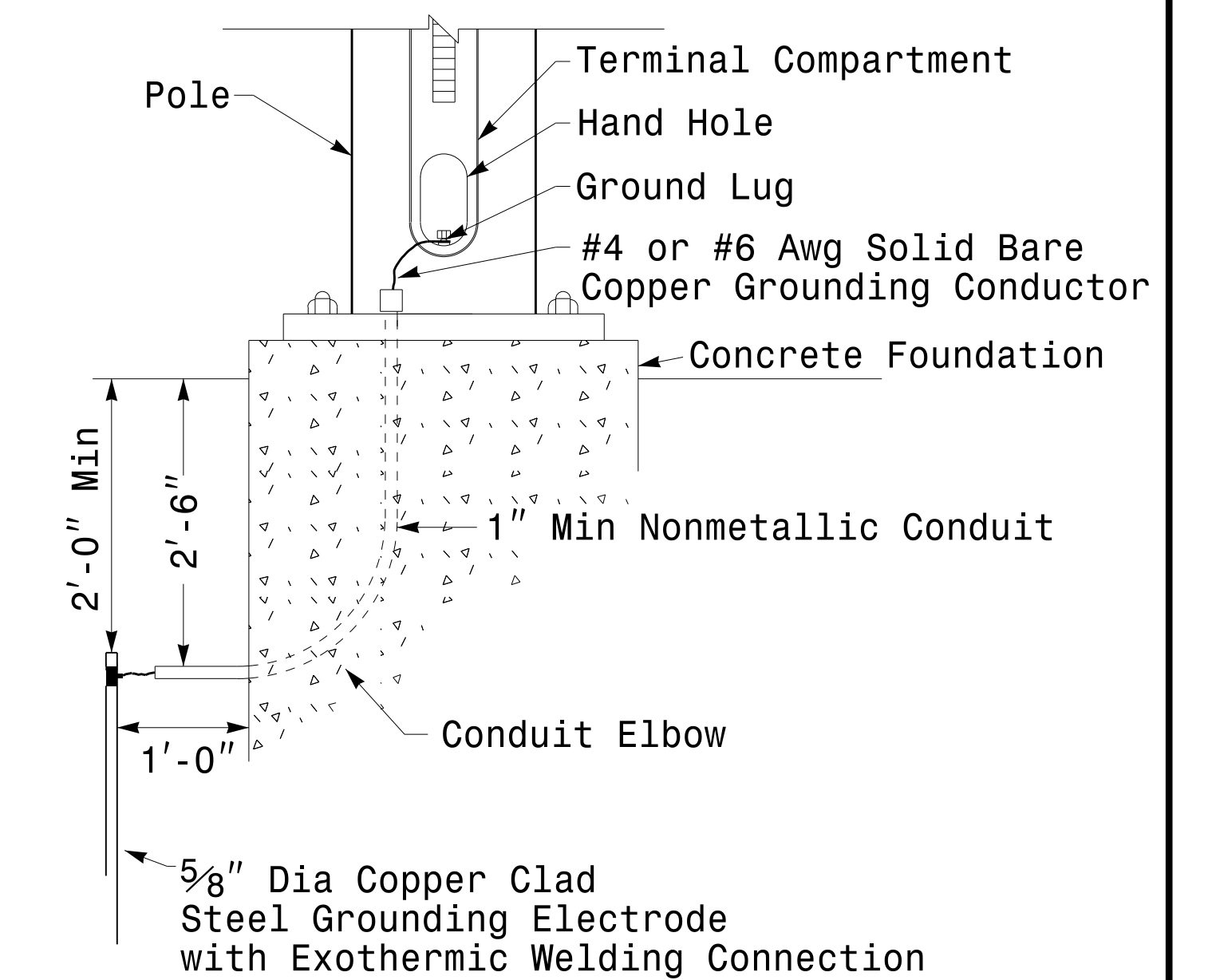


**Strain Pole Attachments**

Note: 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 36"



**Attachment of Cable to Intermediate Metal Pole**



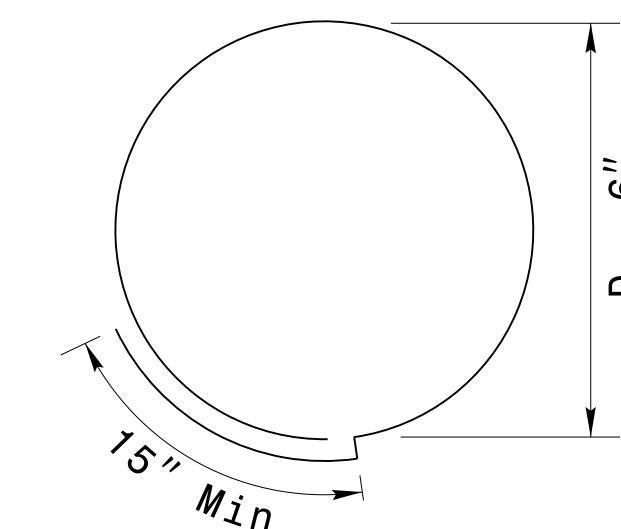
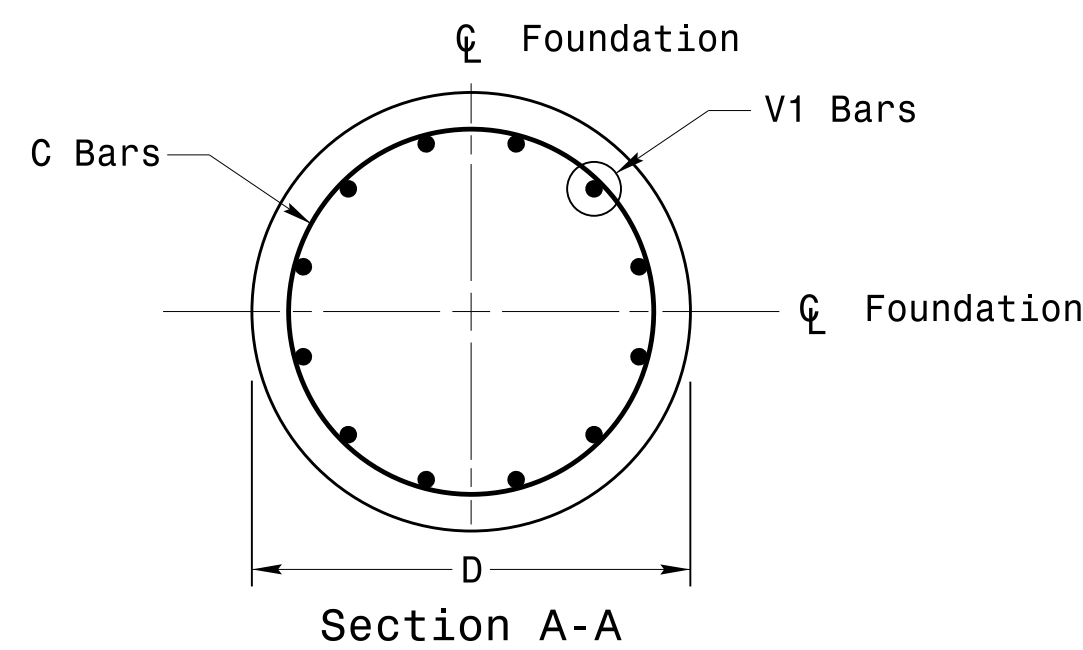
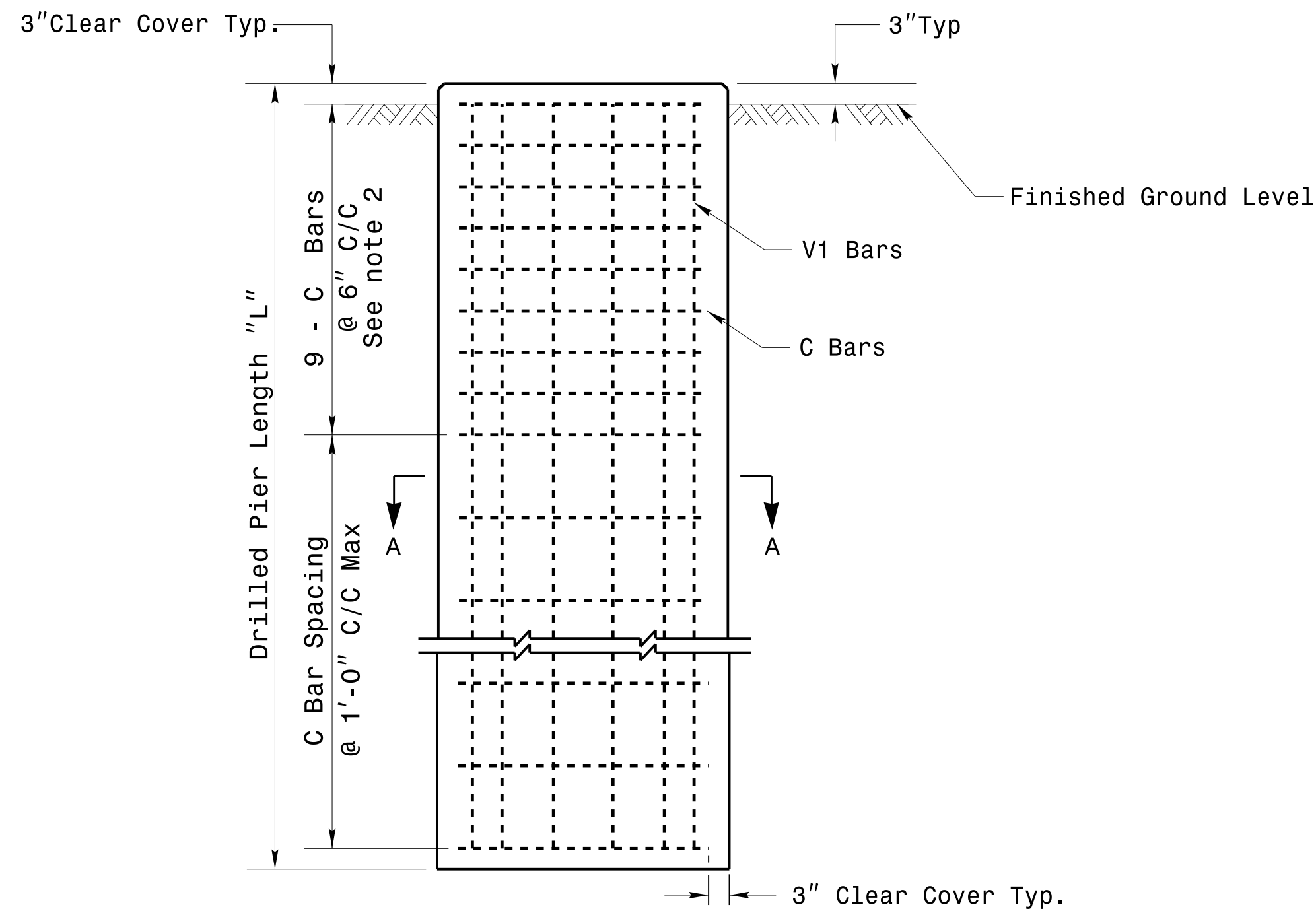
**Metal Pole Grounding Detail**

	<b>Construction Details Strain Poles</b>		
	PLAN DATE: AUGUST 2013 PREPARED BY: N. BITTING	REVIEWED BY: C.F. ANDREWS REVIEWED BY: D.C. SARKAR	
SCALE: 0 NA NONE	REVISIONS:	INIT. DATE:	SIG. INVENTORY NO.:

08-14-2014 08:45  
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 Topiloway

**Construction Details – Strain Poles**

### Reinforcing Steel Bars



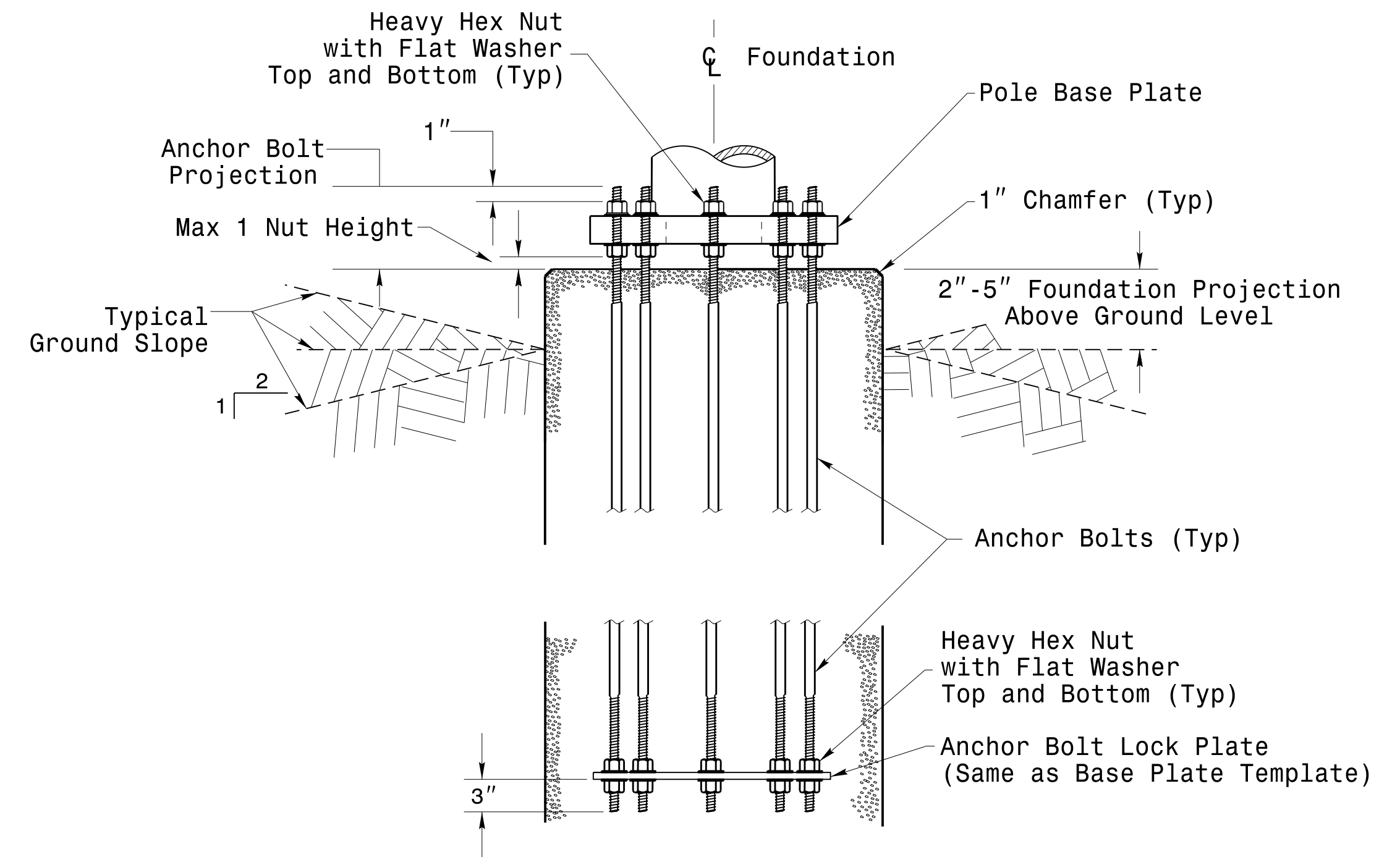
Typical "C" Bars

REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (4'-0" DIAMETER)						
Shaft Dia (in.)	Conc. Volume (cu. yds.)	Bar Name	MIN.	Size	Type	Length
48"	.465 x L	V1	***	#8	STR.	**
		C	*	#4	CIR.	12'-6"

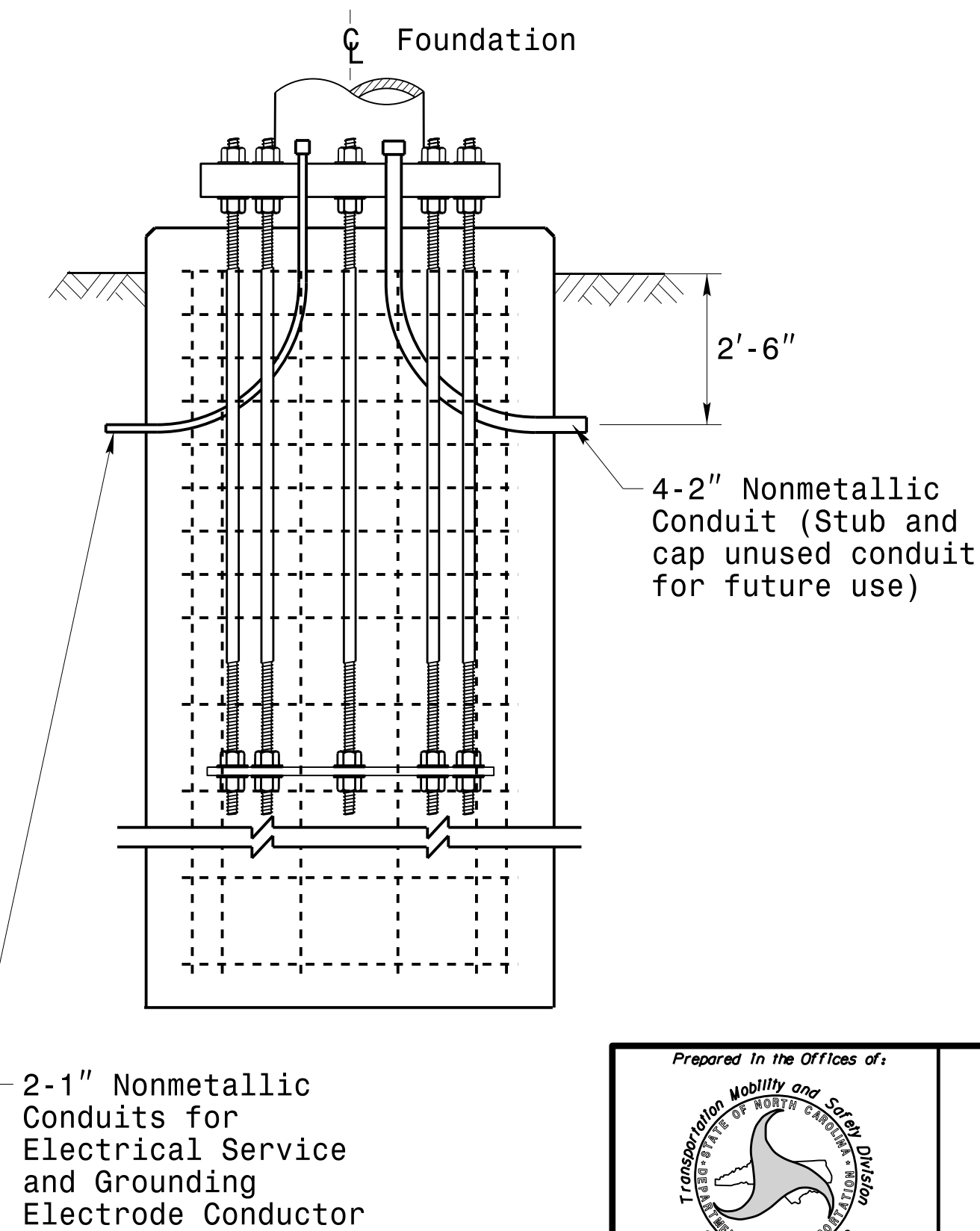
\* See Note No. 1  
 \*\* See Note No. 3  
 \*\*\* See Note No. 4

### Typical Foundation Anchor Bolt Details

(Reinforcing Cage Not Shown for Clarity)



### Typical Foundation Conduit Details



### Notes

- The number of C-bars is based on foundation depth and/or as required. For standard foundations, see sheets M 8 and M 9 for details.
- 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.
- The length of V1-bars is based on foundation depth. For standard foundations, see sheets M 8 and M 9 for details. Vertical reinforcing bars (V1) may be horizontally adjusted by +/- 3" to facilitate the installation of electrical conduit entering into the cage.
- Provide vertical reinforcement as required per design. See sheets M 8 and M9 for details.

	<b>Construction Details Foundations</b>		
	PLAN DATE: AUGUST 2013 PREPARED BY: N. BITTING	DESIGNED BY: K.C. DURIGON REVIEWED BY: D.C. SARKAR	
SCALE: 0 NA NONE	REVISIONS:	INIT. DATE:	SIG. INVENTORY NO.:



# SATURATED 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	Bar Size (#)	Spacing (in.)
WIND ZONE 1	LIGHT	S26L3	26	25	2	11	270	19	13	9	8	17	14.5	12.5	8	13	4	12
		S30L3	30	25	2	11	300	20	13.5	9	8	17.5	15	13	8	14	4	12
		S35L3	35	25	3	11	320	20	13.5	9.5	8	17.5	15	13	8	15	4	12
	HEAVY	S30H3	30	29	3	16	450	24.5	17	13	11	21	17.5	15	8	18	4	12
		S35H3	35	29	4	16	515	26	17.5	12	8.5	22	18.5	16	8	20	4	12
WIND ZONE 2	LIGHT	S26L2	26	23	2	10	245	18	12.5	8.5	8	16.5	14	12	8	13	4	12
		S30L2	30	23	2	10	270	19	12.5	9	8	16.5	14	12.5	8	13	4	12
		S35L2	35	23	3	10	300	19.5	13	9	8	17	14.5	13	8	14	4	12
	HEAVY	S30H2	30	29	3	15	415	25.5	15.5	11	8	20	17	14.5	8	17	4	12
		S35H2	35	29	4	15	475	25	16.5	11.5	8	21	17.5	15.5	8	19	4	12
WIND ZONE 3	LIGHT	S26L2	26	23	2	10	245	18	12.5	8.5	8	16.5	14	12	8	13	4	12
		S30L2	30	23	2	10	270	19	12.5	9	8	16.5	14	12.5	8	13	4	12
		S35L2	35	23	3	10	300	19.5	13	9	8	17	14.5	13	8	14	4	12
	HEAVY	S30H2	30	29	3	15	415	25.5	15.5	11	8	20	17	14.5	8	17	4	12
		S35H2	35	29	4	15	475	25	16.5	11.5	8	21	17.5	15.5	8	19	4	12
WIND ZONE 4	LIGHT	S26L1	26	22	2	8	190	16	11	8	8	15	12.5	11	8	12	4	12
		S30L1	30	22	2	8	205	16.5	11.5	8	8	15	13	11.5	8	12	4	12
		S35L1	35	22	3	8	230	17	12	8	8	15.5	13.5	11.5	8	12	4	12
	HEAVY	S30H1	30	25	3	12	320	20.5	14	9.5	8	18	15	13.5	8	15	4	12
		S35H1	35	25	4	12	350	21	14.5	10	8	18.5	15.5	13.5	8	16	4	12
WIND ZONE 5	LIGHT	S26L2	26	23	2	10	245	18	12.5	8.5	8	16.5	14	12	8	13	4	12
		S30L2	30	23	2	10	270	19	12.5	9	8	16.5	14	12.5	8	13	4	12
		S35L2	35	23	3	10	300	19.5	13	9	8	17	14.5	13	8	14	4	12
	HEAVY	S30H2	30	29	3	15	415	25.5	15.5	11	8	20	17	14.5	8	17	4	12
		S35H2	35	29	4	15	475	25	16.5	11.5	8	21	17.5	15.5	8	19	4	12

**Fabrication Design Notes:**

1. Values shown in the "Reactions at the Pole Base" column represent the minimum acceptable capacity allowed for design using a design CSR of 1.00.
2. Min. base plate thickness (T) is 2.0 inches.

**Foundation Selection:**

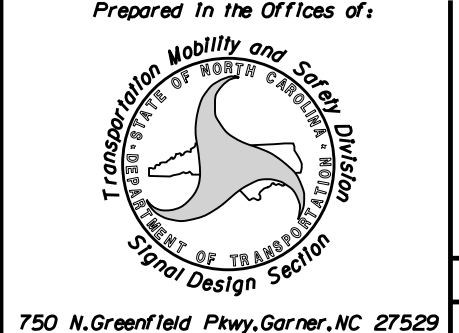
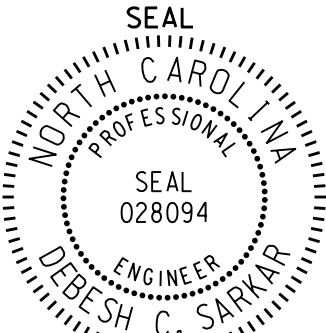
1. Perform a standard penetration test at each proposed foundation site to determine "N" value.
2. Select the appropriate wind zone from M 1 drawing.
3. Select the soil type (Clay or Sand) that best describes the soil characteristics.
4. Get the appropriate standard pole case number from the plans or from the Engineer.
5. Select the appropriate column in the chart based on soil type and "N" value. Select the appropriate row based on the pole load case.  
The foundation depth is the value where the column and the row intersect.
6. Reference Drilled Shafts: Construction Procedures and Design Methods, FHWA -IF-99-025

- S30H1 - Hard Clay-Stirrup Spacing: 6 in. c/c
- S30H2 - Hard Clay-Stirrup Spacing: 6 in. c/c
- S30H3 - Hard Clay-Stirrup Spacing: 6 in. c/c
- Dense Sand-Stirrup Spacing: 6 in. c/c
- S35H1 - Hard Clay - Stirrup Spacing: 6 in. c/c
- S35H2 - Very Stiff Clay-Stirrup Spacing: 6 in. c/c
- Hard Clay- Stirrup Spacing: 6 in. c/c
- Dense Sand- Stirrup Spacing: 6 in. c/c
- S35H3 - Very Stiff Clay-Stirrup Spacing: 6 in. c/c
- Dense Sand-Stirrup Spacing: 6 in. c/c

48" Dia. Foundations Concrete Volume (cubic yards) = (0.465) x Foundation Depth

26-MAR-2014 08:42 S:\TCS\115\Sig\Design\Section\Eastern Region\MM\_Sheets\2012\_MM\_Standard Foundations\_Wet.dgn J:\JL\JL

Standard Strain Pole Foundation-Saturated Soil Condition

	<p><b>Standard Strain Pole Foundation for Saturated Soil Condition</b></p> <p>PLAN DATE: SEPTEMBER 2013    DESIGNED BY: C.B. COGDILL                  PREPARED BY: N. BITTING    REVIEWED BY: D. SARKAR</p>	
SCALE: 0 NA None	REVISIONS:    INIT.    DATE	DocuSigned by: Deborah C. Sarkar 3/26/2014 44EBE32E147E4C4...    DATE







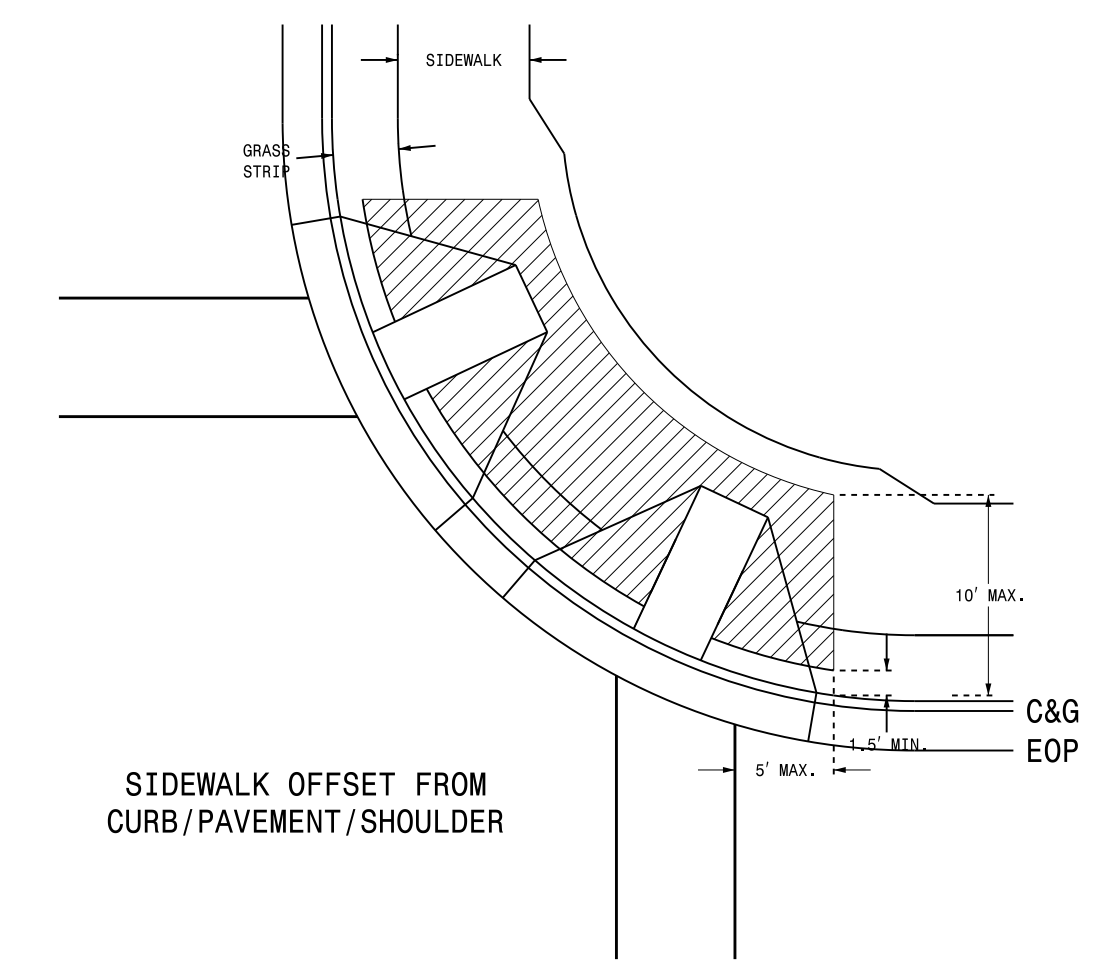
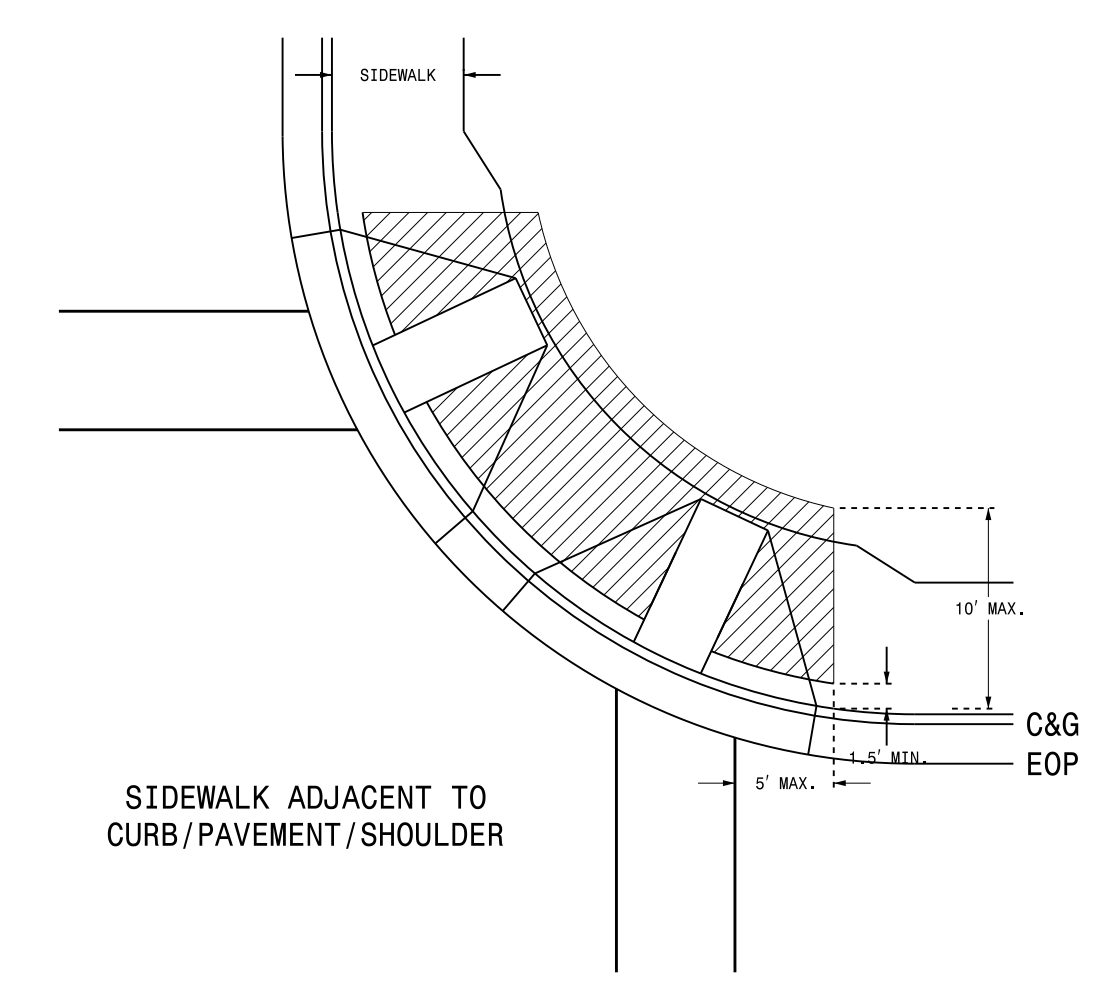
STATE OF NORTH CAROLINA  
DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
RALEIGH, N.C.

06-14

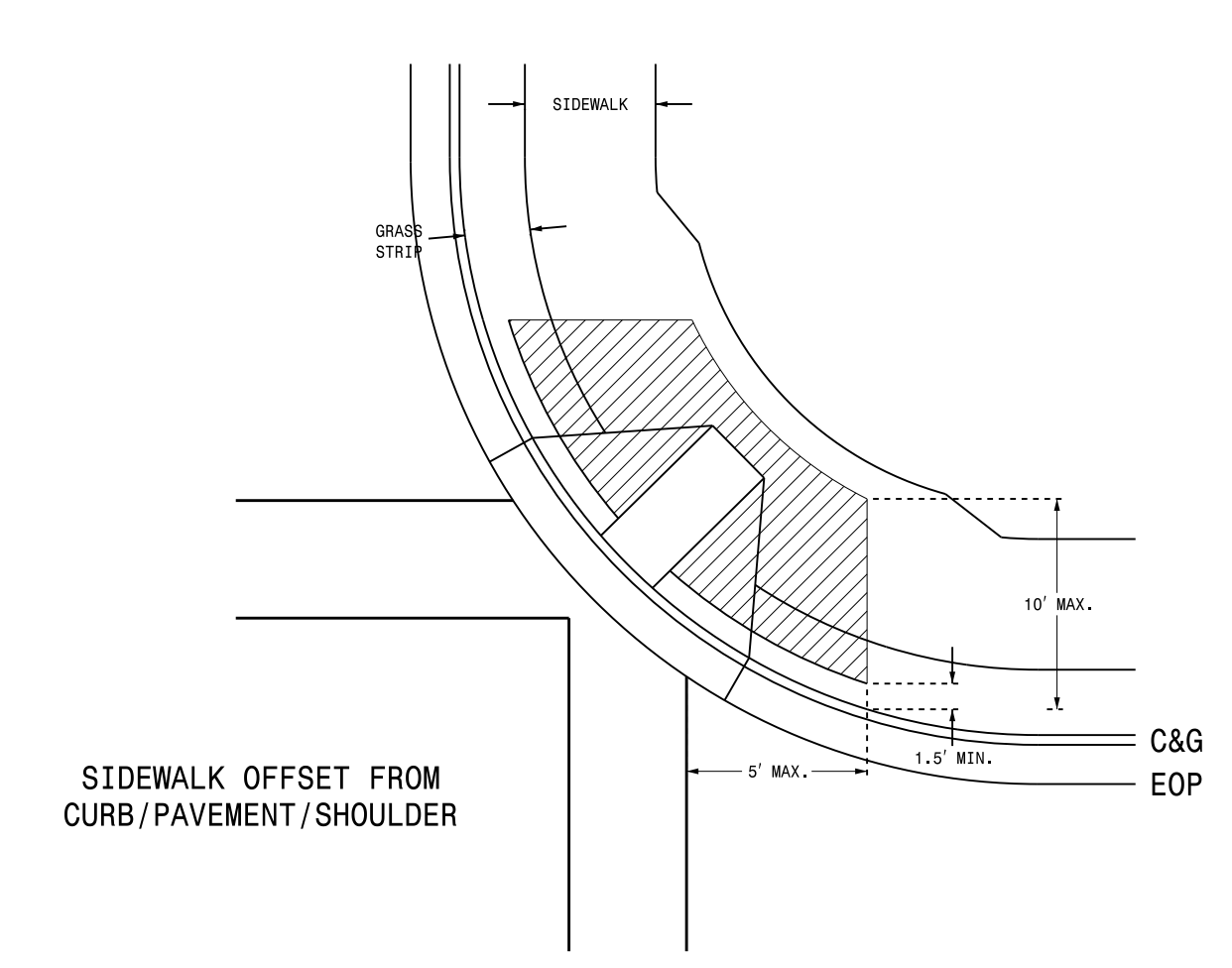
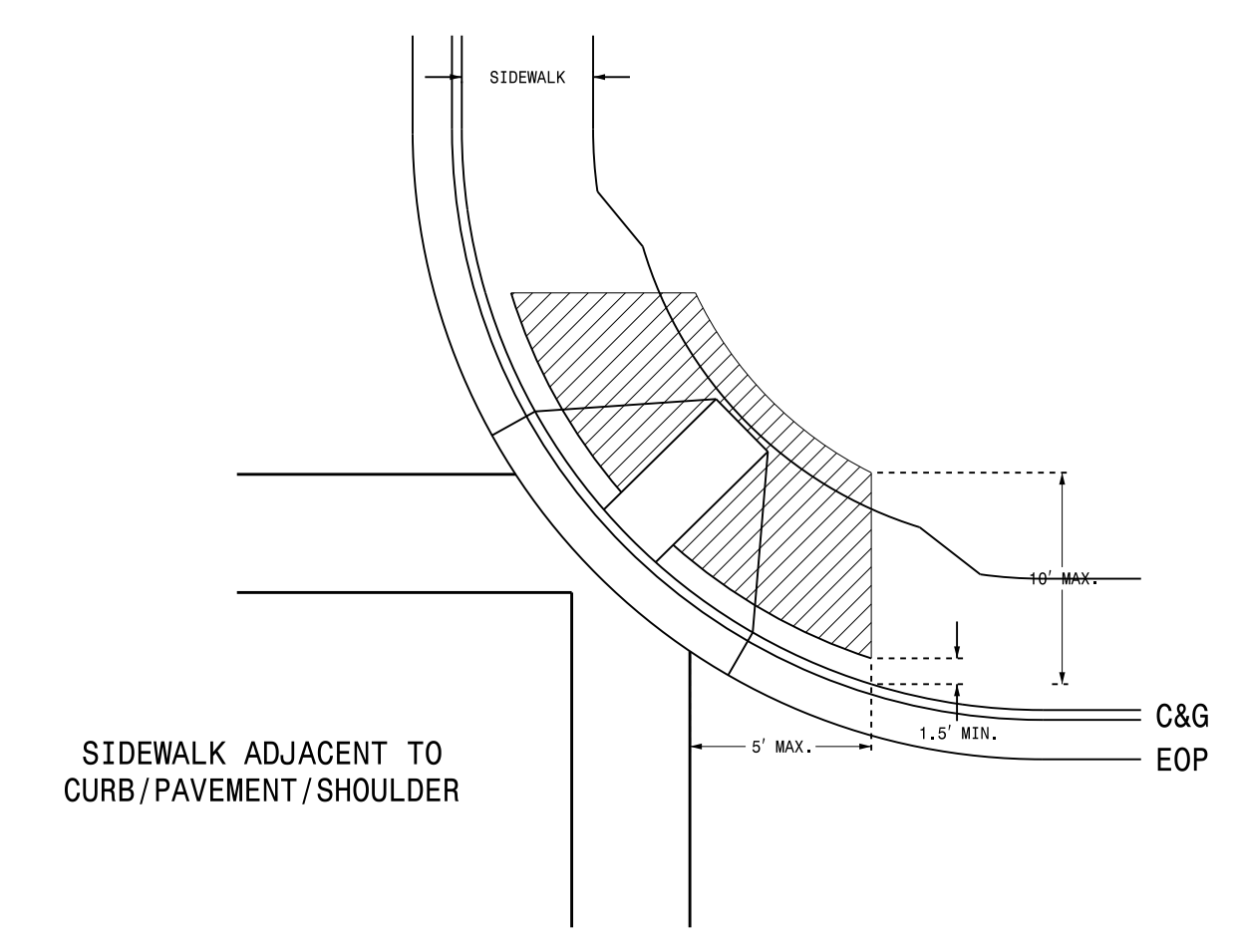
ENGLISH DETAIL DRAWING FOR  
**PEDESTRIAN PUSHBUTTON LOCATIONS**  
PLACEMENT DETAIL

SHEET 1 OF 3  
**1705D01**

**PUSHBUTTON PLACEMENT**  
SEPARATE CURB RAMPS



**PUSHBUTTON PLACEMENT**  
SHARED CURB RAMP



- NOTES**
1. Pushbutton pedestals should not be located further than 10 feet from the edge of curb, shoulder, or pavement.
  2. The face of the pushbutton should be parallel to the applicable crosswalk.
  3. Separate pushbuttons used on the same corner should be separated by a distance of at least 10 feet.
  4. Pushbuttons shall be installed adjacent to a level surface with a maximum reach distance of 10 inches.
  5. Maintain 4 feet of clearance around pedestal if located in sidewalk.
  6. Refer to section 1705 of the 2012 NCDOT Roadway Standard Drawings for Pushbutton Assembly details.
  7. Refer to section 1743 of the 2012 NCDOT Roadway Standard Drawings for Pedestal details.
  8. Contact Division Traffic Engineer for pushbutton location approval prior to installation.
  9. Curb ramps are for symbolic use only and may not reflect actual design or field conditions.

PROPOSED	LEGEND
	Signal Pole
	Type I Pushbutton Post
	Type II Signal Pedestal
	Pushbutton & Sign
	Pedestrian Signal Head
	Curb Ramp
	Pushbutton Location Area

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

06-14

ENGLISH DETAIL DRAWING FOR  
**PEDESTRIAN PUSHBUTTON LOCATIONS**  
PLACEMENT DETAIL

SHEET 1 OF 3  
**1705D01**

See Plate for Title

Prepared in the Offices of:

750 N. Greenfield Parkway  
Garner, NC 27529

SEAL

DocuSigned by:  
*Robert J. Ziemba*  
18084828744604

SIGNATURE DATE

6/17/2014

06-AUG-2014 16:37  
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 rz1emba

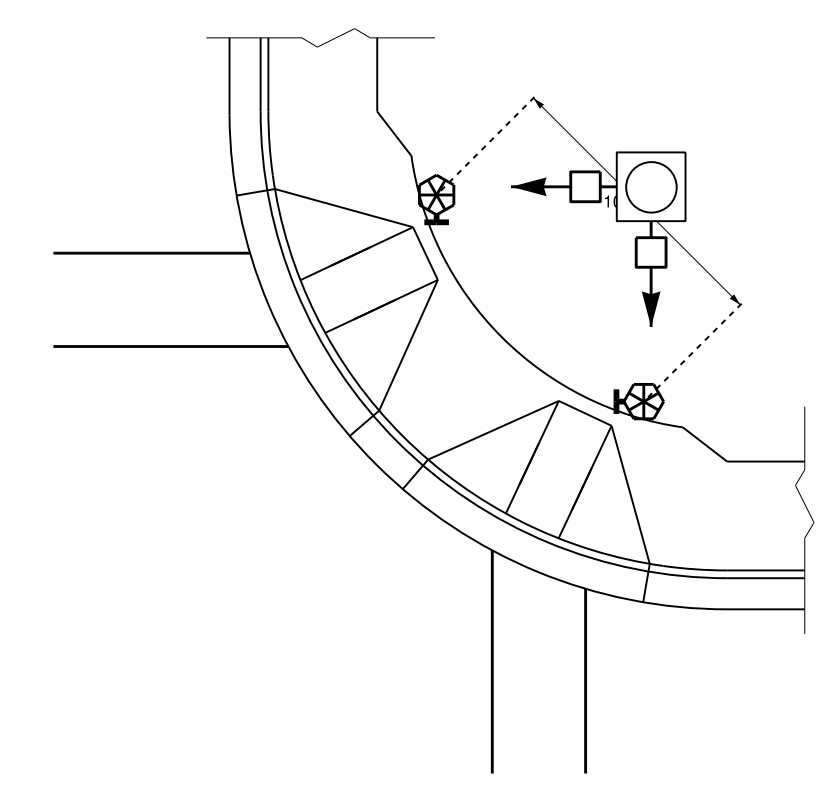
STATE OF NORTH CAROLINA  
DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
RALEIGH, N.C.

06-14

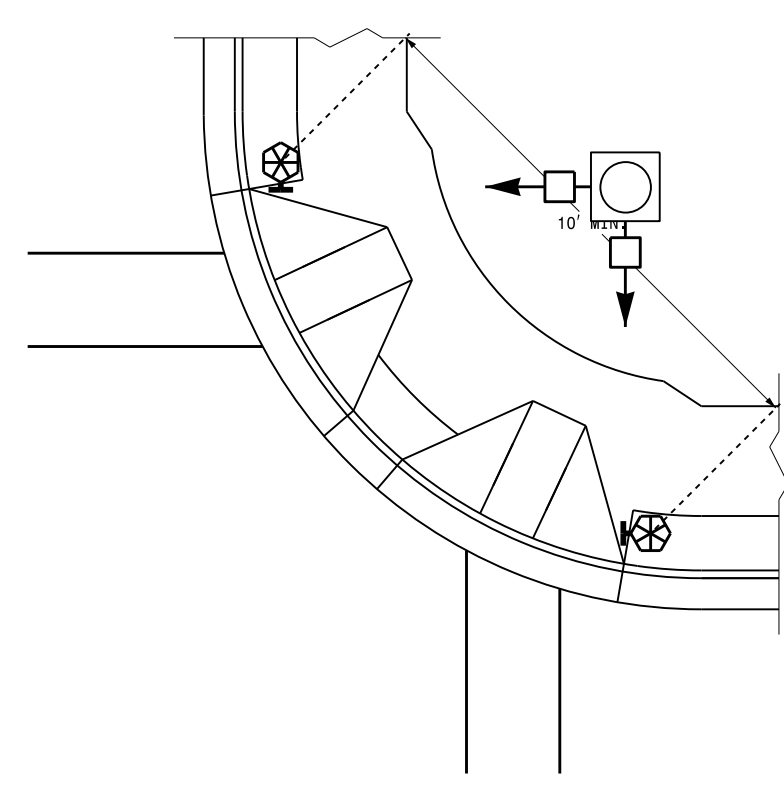
ENGLISH DETAIL DRAWING FOR  
**PEDESTRIAN PUSHBUTTON LOCATIONS**  
PLACEMENT DETAIL

SHEET 2 OF 3  
**1705D01**

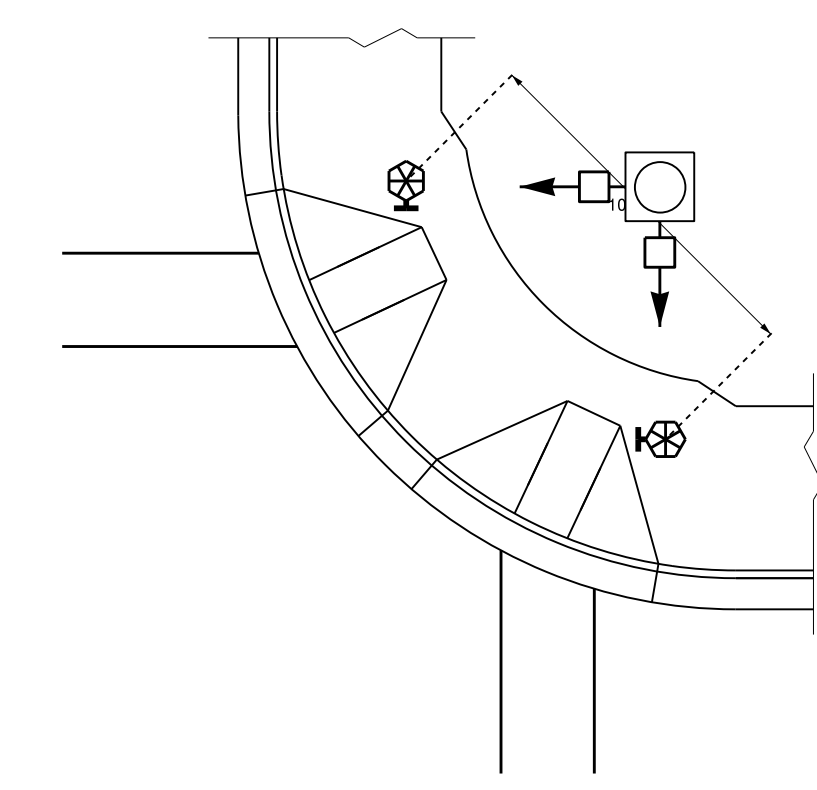
TYPICAL PUSHBUTTON LOCATIONS (CASE I)  
SEPARATE CURB RAMPS W/ TYPE I PEDESTALS



BACK OF SIDEWALK IS WITHIN 10'  
OF CURB OR PAVEMENT/SHOULDER



GRASS STRIP PLACEMENT IF BACK  
OF SIDEWALK EXCEEDS 10' FROM  
CURB OR PAVEMENT/SHOULDER



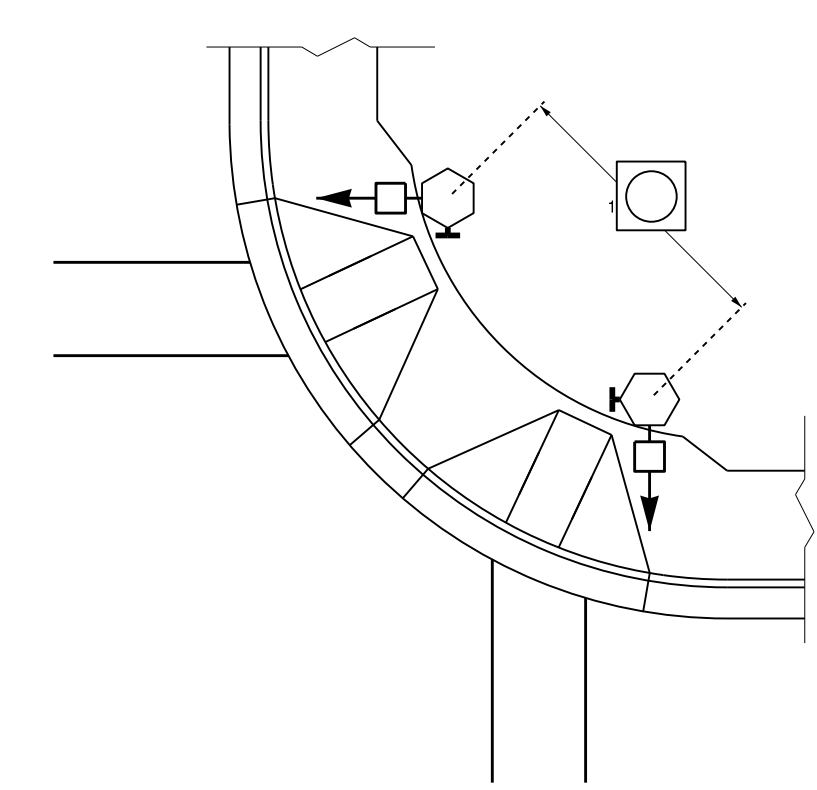
PUSHBUTTON PLACEMENT  
IN WIDE SIDEWALK

**PROPOSED**

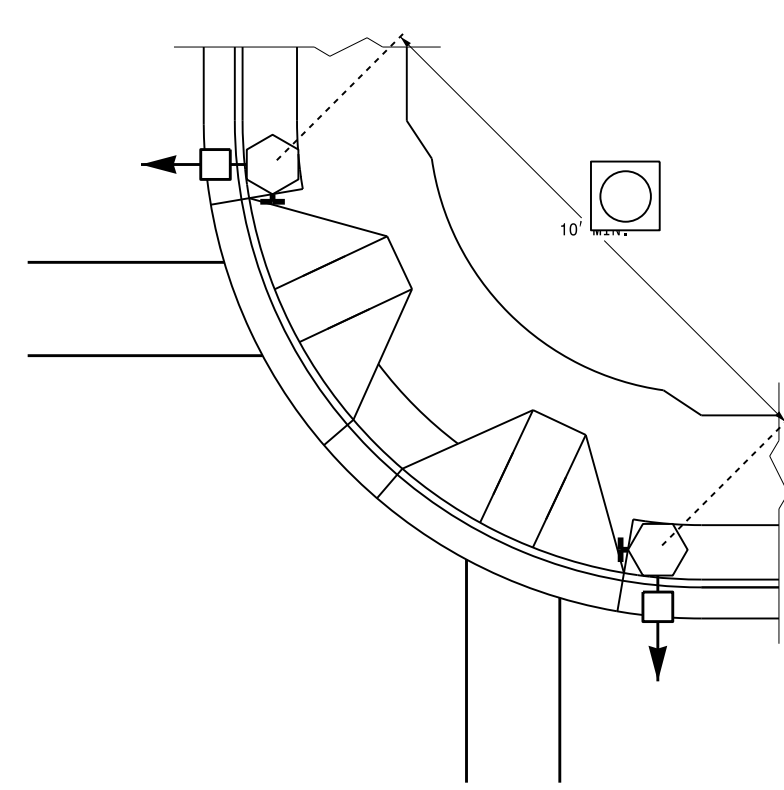
- Signal Pole
- Type I Pushbutton Post
- Type II Signal Pedestal
- Pushbutton & Sign
- Pedestrian Signal Head
- Curb Ramp
- Pushbutton Location Area

**LEGEND**

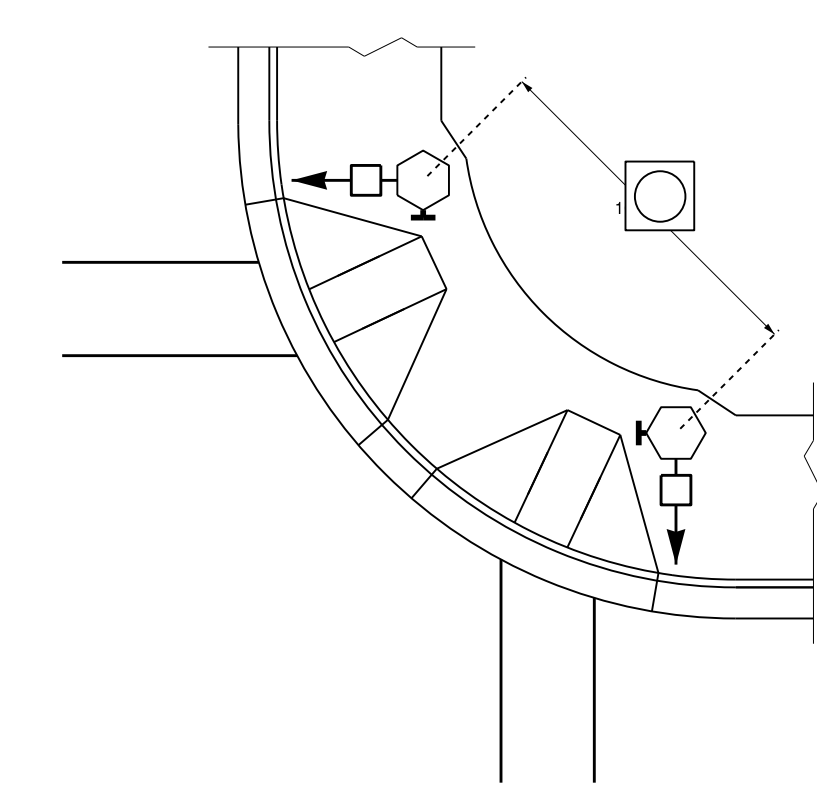
TYPICAL PUSHBUTTON LOCATIONS (CASE II)  
SEPARATE CURB RAMPS W/ TYPE II PEDESTALS



BACK OF SIDEWALK IS WITHIN 10'  
OF CURB OR PAVEMENT/SHOULDER

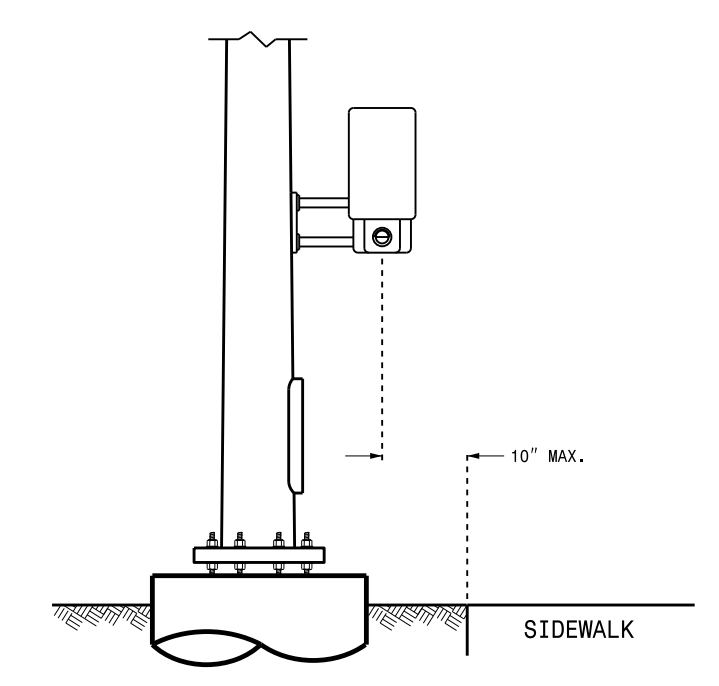


GRASS STRIP PLACEMENT IF BACK  
OF SIDEWALK EXCEEDS 10' FROM  
CURB OR PAVEMENT/SHOULDER



PUSHBUTTON PLACEMENT  
IN WIDE SIDEWALK

OPTIONAL PUSHBUTTON EXTENSION  
FACE OF PUSHBUTTON PARALLEL TO  
APPLICABLE CROSSWALK



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

06-14

ENGLISH DETAIL DRAWING FOR  
**PEDESTRIAN PUSHBUTTON LOCATIONS**  
PLACEMENT DETAIL

SHEET 2 OF 3  
**1705D01**

See Plate for Title

Prepared in the Offices of:

750 N. Greenfield Parkway  
Garner, NC 27529

SEAL

DocuSigned by:  
*Robert J. Ziemba*  
1888488274464

SIGNATURE

6/17/2014  
DATE

06-1406-2014.r16.s38  
 S:\1705D01\SIG\Signal Design Section\Central Region\Rob's Files\Red State\Pushbutton Drawings\Pushbutton Place Drawings\20140617.dgn  
 rz1emba



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

06-14

ENGLISH DETAIL DRAWING FOR  
**PEDESTRIAN PUSHBUTTON LOCATIONS**  
PLACEMENT DETAIL

SHEET 3 OF 3  
**1705D01**

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

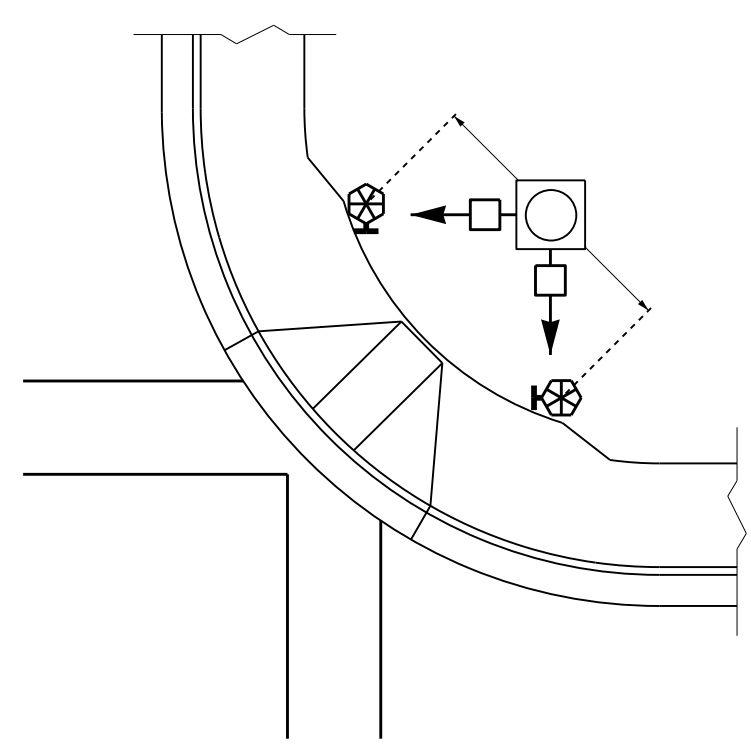
06-14

ENGLISH DETAIL DRAWING FOR  
**PEDESTRIAN PUSHBUTTON LOCATIONS**  
PLACEMENT DETAIL

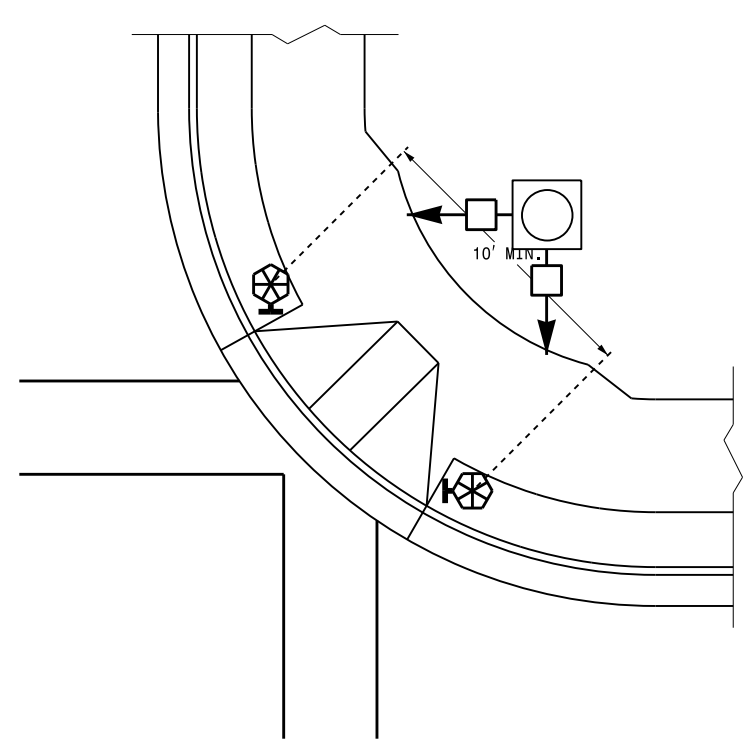
SHEET 3 OF 3  
**1705D01**

**TYPICAL PUSHBUTTON LOCATIONS (CASE III)**

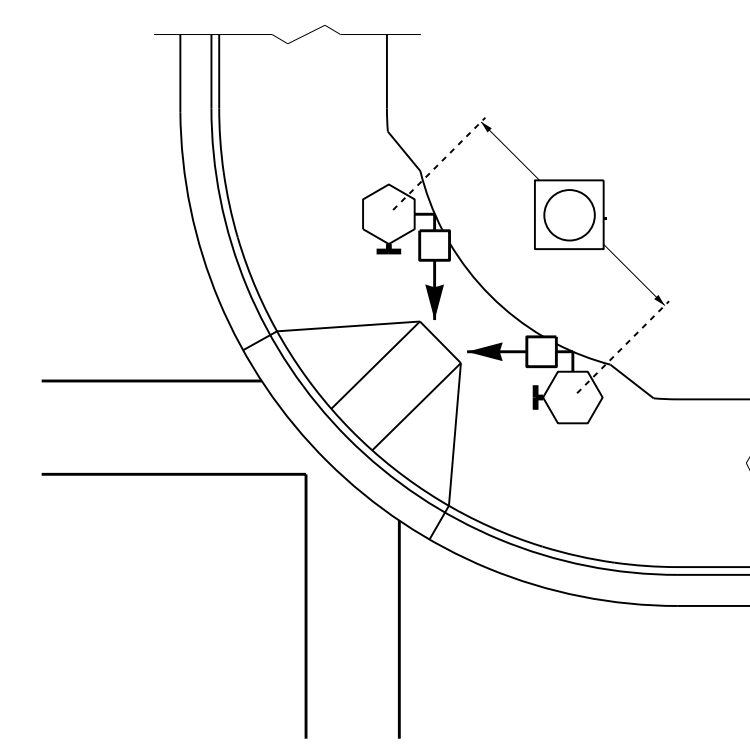
SHARED CURB RAMPS



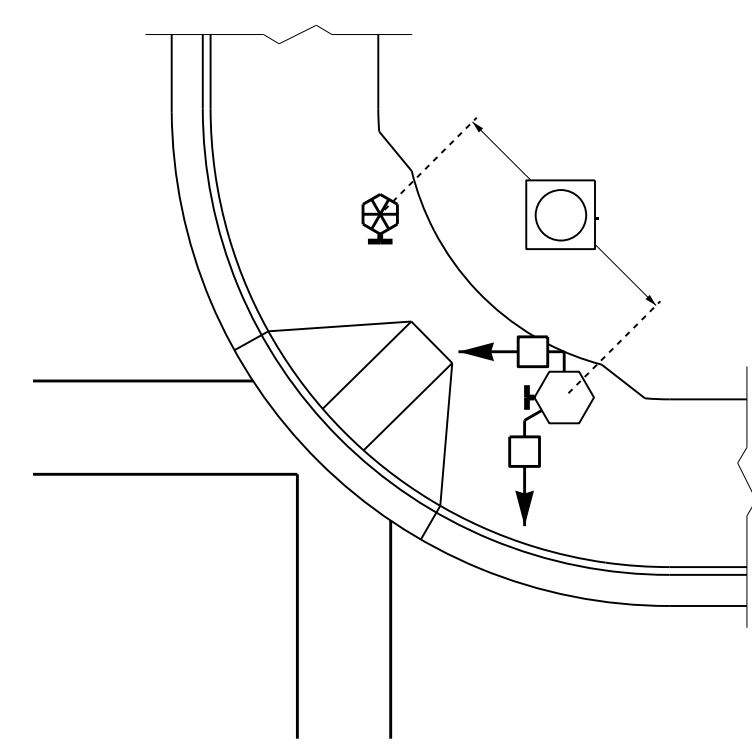
BACK OF SIDEWALK IS WITHIN 10' OF CURB OR PAVEMENT/SHOULDER



GRASS STRIP PLACEMENT IF BACK OF SIDEWALK EXCEEDS 10' FROM CURB OR PAVEMENT/SHOULDER

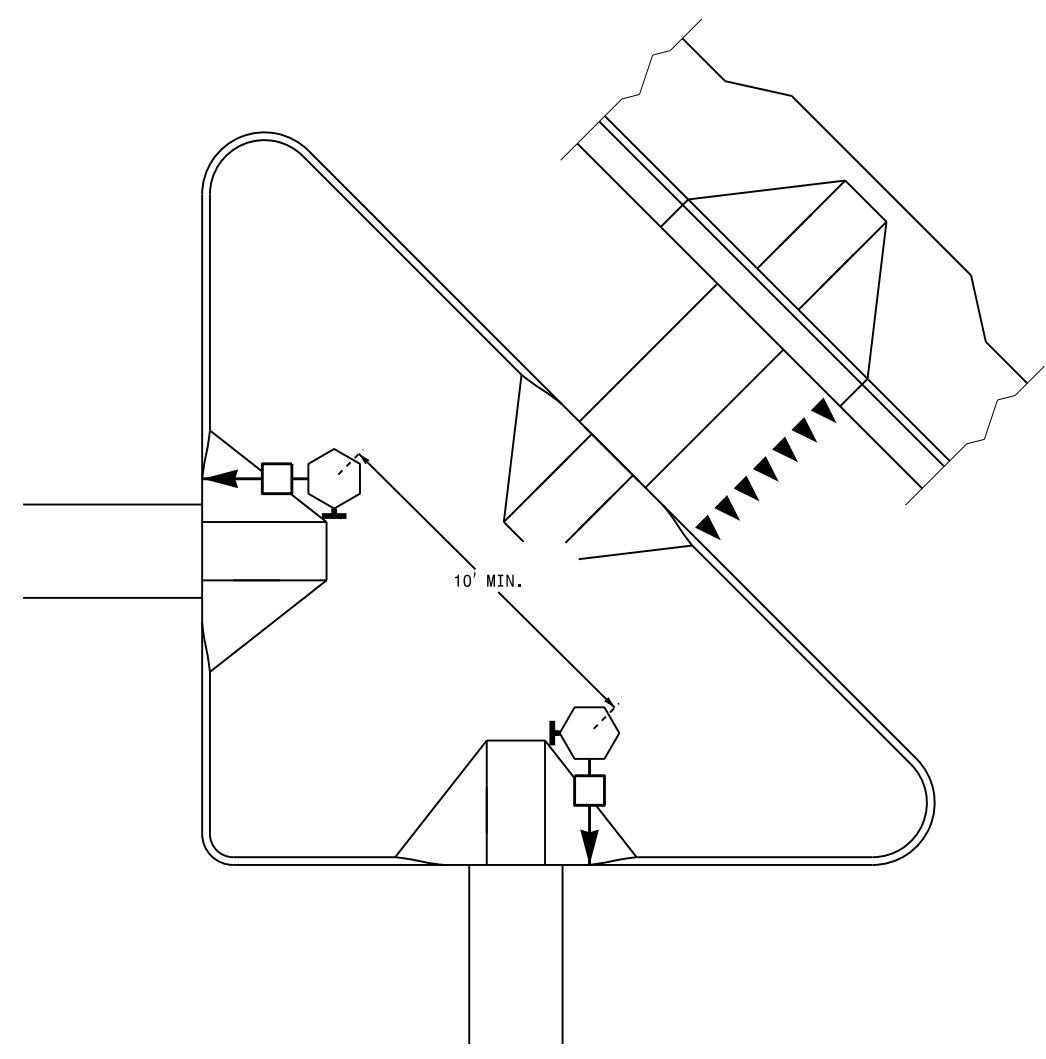


PUSHBUTTON PLACEMENT IN WIDE SIDEWALK (CORRESPONDING PUSHBUTTONS AND SIGNAL HEADS ON DIFFERENT PEDESTALS)

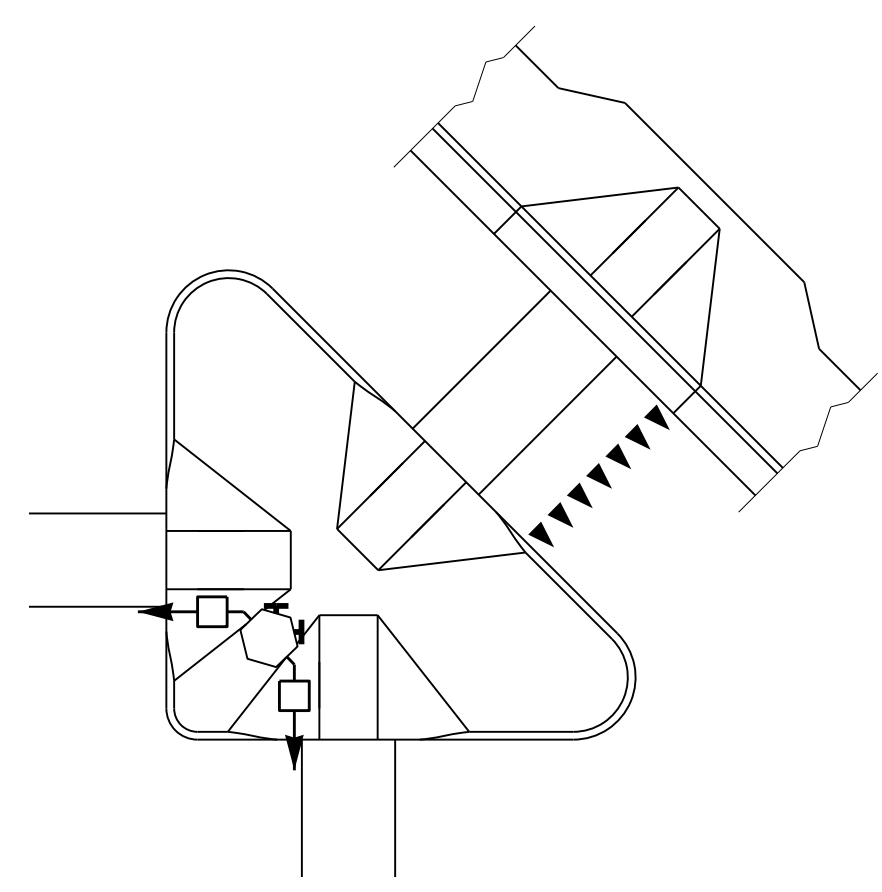


PUSHBUTTON PLACEMENT WITH SHARED TYPE II SIGNAL PEDESTAL AND TYPE I PUSHBUTTON POST

**TRAFFIC ISLAND PUSHBUTTON LOCATIONS**



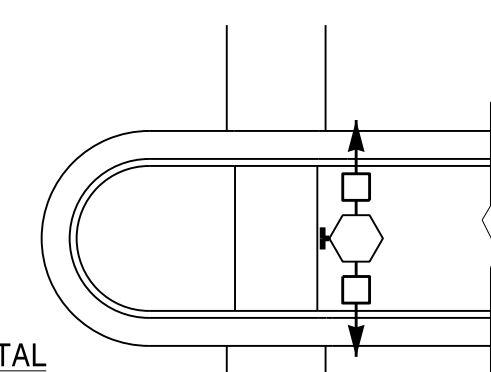
PUSHBUTTON PLACEMENT IN LARGE "PORK CHOP ISLAND" WITH SEPARATE PEDESTALS



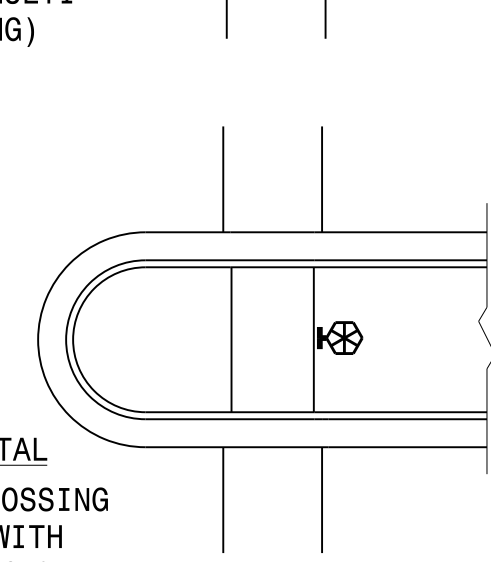
PUSHBUTTON PLACEMENT IN SMALL "PORK CHOP ISLAND" WITH SHARED PEDESTAL

**PUSHBUTTON PLACEMENT IN MEDIAN**

TYPE II PEDESTAL (FOR STAGED OR MULTI-PHASE CROSSING)



TYPE I PEDESTAL (FOR COMPLETE CROSSING CURB TO CURB WITH OPTIONAL REFUGE)



**PROPOSED**

	Signal Pole
	Type I Pushbutton Post
	Type II Signal Pedestal
	Pushbutton & Sign
	Pedestrian Signal Head
	Curb Ramp
	Pushbutton Location Area

**LEGEND**

C:\Users\p3174\_16339\Documents\Signal Design\Section\Central\_Region\Rob's Files\Red Stds\Signal Design\Drawings\Pushbutton Place Drawings\20140617.dgn  
 S:\ITS\ASU\ITS\_Signal\Signal Design\Section\Central\_Region\Rob's Files\Red Stds\Signal Design\Drawings\Pushbutton Place Drawings\20140617.dgn  
 rz1emba

See Plate for Title

Prepared in the Offices of:

750 N. Greenfield Parkway  
Garner, NC 27529

SEAL

DocuSigned by:  
*Robert J. Ziemba*  
18084982744404

SIGNATURE

6/17/2014  
DATE

- 1 INSTALL REA, PE – 22, SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
- 2 INSTALL REA, PE – 38, (FIGURE 8) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
- 3 INSTALL REA, PE – 39, (UNDERGROUND) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
- 4 INSTALL SMFO CABLE
- 5 INSTALL MMFO CABLE
- 6 INSTALL FIBER OPTIC DROP CABLE
- 7 INSTALL TRACER WIRE
- 8 TRENCH
- 9 INSTALL PVC CONDUIT
- 10 INSTALL RIGID, GALVANIZED STEEL CONDUIT
- 11 INSTALL RIGID, GALVANIZED STEEL RISER WITH WEATHERHEAD
- 12 INSTALL RIGID, GALVANIZED STEEL RISER WITH FIBER OPTIC CABLE SEAL
- 13 INSTALL OUTER-DUCT POLYETHYLENE CONDUIT
- 14 INSTALL POLYETHYLENE CONDUIT
- 15 DIRECTIONAL DRILL CONDUIT
- 16 BORE AND JACK CONDUIT
- 17 INSTALL CABLE(S) IN EXISTING CONDUIT
- 18 INSTALL CABLE(S) IN NEW CONDUIT
- 19 INSTALL CABLE(S) IN EXISTING RISER
- 20 INSTALL CABLE(S) IN NEW RISER
- 21 INSTALL CABLE(S) IN EXISTING CONDUIT STUB-OUTS
- 22 INSTALL NEW CONDUIT INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB-OUTS WHEN AVAILABLE)
- 23 INSTALL NEW RISER INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB-OUTS WHEN AVAILABLE)
- 24 INSTALL NEW CONDUIT INTO EXISTING POLE MOUNTED CABINET
- 25 INSTALL NEW RISER INTO EXISTING POLE MOUNTED CABINET
- 26 TERMINATE COMMUNICATIONS CABLE ON EXISTING TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
- 27 INSTALL NEW TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
- 28 INSTALL INTERCONNECT CENTER, PATCH PANEL, JUMPERS AND FUSION SPLICE CABLE IN CABINET
- 29 INSTALL UNDERGROUND SPLICE ENCLOSURE
- 30 INSTALL AERIAL SPLICE ENCLOSURE
- 31 INSTALL POLE MOUNTED SPLICE CABINET
- 32 INSTALL BASE MOUNTED SPLICE CABINET
- 33 REMOVE EXISTING SPLICE CABINET

- 34 INSTALL CABINET FOUNDATION
- 35 REMOVE EXISTING CABINET FOUNDATION
- 36 INSTALL CCTV CAMERA ASSEMBLY
- 37 INSTALL CCTV CAMERA WOOD POLE
- 38 INSTALL CCTV CAMERA METAL POLE AND FOUNDATION
- 39 INSTALL JUNCTION BOX
- 40 INSTALL OVERSIZED JUNCTION BOX
- 41 REMOVE EXISTING JUNCTION BOX
- 42 INSTALL WOOD POLE
- 43 REMOVE EXISTING WOOD POLE
- 44 INSTALL AERIAL GUY ASSEMBLY
- 45 INSTALL STANDARD GUY ASSEMBLY
- 46 INSTALL SIDEWALK GUY ASSEMBLY
- 47 INSTALL MESSENGER CABLE
- 48 REMOVE EXISTING COMMUNICATIONS AND MESSENGER CABLE
- 49 REMOVE EXISTING COMMUNICATIONS CABLE AND ABANDON CONDUIT SYSTEM
- 50 INSTALL TELEPHONE SERVICE
- 51 INSTALL CABLE STORAGE RACKS (SNOW SHOES) AND STORE 100 FEET OF CABLE
- 52 INSTALL DELINEATOR MARKER
- 53 STORE 20 FEET OF COMMUNICATIONS CABLE
- 54 LASH CABLE(S) TO EXISTING SIGNAL/COMMUNICATIONS CABLE
- 55 LASH CABLE(S) TO EXISTING MESSENGER CABLE
- 56 LASH CABLE(S) TO NEW MESSENGER CABLE
- 57 MODIFY EXISTING ELECTRICAL SERVICE
- 58 INSTALL NEW ELECTRICAL SERVICE

**NOTES FOR WIRELESS COMMUNICATIONS:**

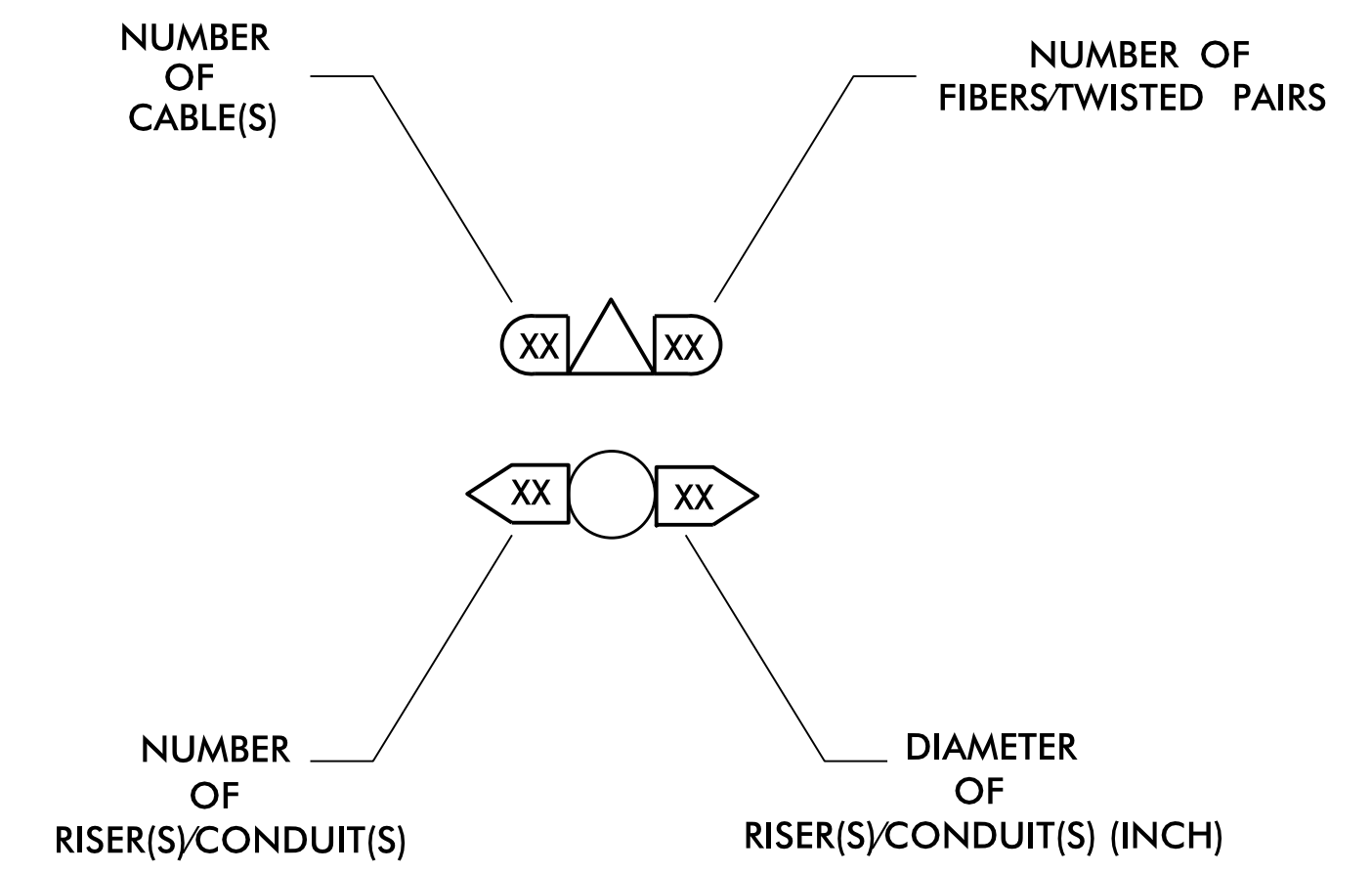
- INSTALL COAXIAL CABLE:
  - ON WOOD POLES, REQUIRING A NEW RIGID GALVANIZED STEEL RISER, INSTALL A 2" RISER WITH WEATHERHEAD AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
  - ON METAL POLES WITH MAST ARMS, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE MAST ARM; FIELD DRILL A 1/2" HOLE UP THROUGH THE BOTTOM OF MAST ARM FOR INSTALLATION OF THE COAXIAL CABLE TO THE ANTENNA.
  - ON METAL STRAIN POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE WEATHERHEAD AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
  - BETWEEN THE POINT OF EXITING THE RISER, METAL POLE OR MAST ARM AND THE ANTENNA, SECURE THE COAXIAL CABLE TO THE STRUCTURE USING 3/4" STAINLESS STEEL STRAPS EVERY 12".
- IF AN EXISTING 2" SPARE RIGID GALVANIZED STEEL RISER IS AVAILABLE, INSTALL THE COAXIAL CABLE IN THE SPARE RISER.
- INSTALL WIRELESS ANTENNA ON POLE WITH RF WARNING SIGN.  
(NOTE: RF WARNING SIGN NOT REQUIRED WHEN ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
- MAINTAIN PROPER CLEARANCE FROM ALL UTILITIES PER THE NATIONAL ELECTRICAL SAFETY CODE.
- INSTALL WIRELESS SERIAL RADIO MODEM WITH EXTERIOR DISCONNECT SWITCH LOCATED ON CABINET.  
(NOTE: RF ANTENNA DISCONNECT SWITCH AND DECAL ARE NOT REQUIRED WHEN THE ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
- REFERENCE "WIRELESS RADIO ANTENNA TYPICAL DETAILS."

**LEGEND**

	NEW FIBER OPTIC COMMUNICATIONS CABLE
	NEW TWISTED PAIR COMMUNICATIONS CABLE
	EXISTING COMMUNICATIONS CABLE
	EXISTING COMMUNICATIONS CABLE TO BE REMOVED
	NEW AERIAL GUY ASSEMBLY
	NEW CONDUIT
	EXISTING CONDUIT
	NEW DIRECTIONAL DRILLED CONDUIT
	NEW BORED AND JACKED CONDUIT
	NEW JUNCTION BOX
	EXISTING JUNCTION BOX
	NEW WOOD POLE
	EXISTING WOOD POLE
	AERIAL SPLICE ENCLOSURE
	NEW METAL POLE
	EXISTING METAL POLE
	NEW CCTV ASSEMBLY
	NEW STANDARD GUY ASSEMBLY
	NEW SIDEWALK GUY ASSEMBLY
	NEW CABLE STORAGE RACKS (SNOW SHOES)
	EXISTING CONTROLLER AND CABINET
	EXISTING SPLICE CABINET
	NEW SPLICE CABINET
	SIGNAL POLE
	SIGNAL INVENTORY NUMBER

**CONSTRUCTION NOTE SYMBOLOGY KEY**

- INDICATES NUMBER OF CABLES, LOOPS, ETC.
- INDICATES NUMBER OF FIBERS PER CABLE, TWISTED PAIRS PER CABLE, ETC.
- INDICATES NUMBER OF RISER(S)/CONDUIT(S)
- INDICATES DIAMETER OF RISER(S)/CONDUIT(S) (INCH)



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

	<b>CONSTRUCTION NOTES</b>		
	DIVISION 05 WAKE CO. PLAN DATE: FEBRUARY 2016 PREPARED BY: B.A. STOUCHKO	DocuSigned by: RALEIGH REVIEWED BY: <i>Michael Avery</i> 09F5D94CBED3443...	
REVISIONS		INIT.	DATE
CADD Filename:			



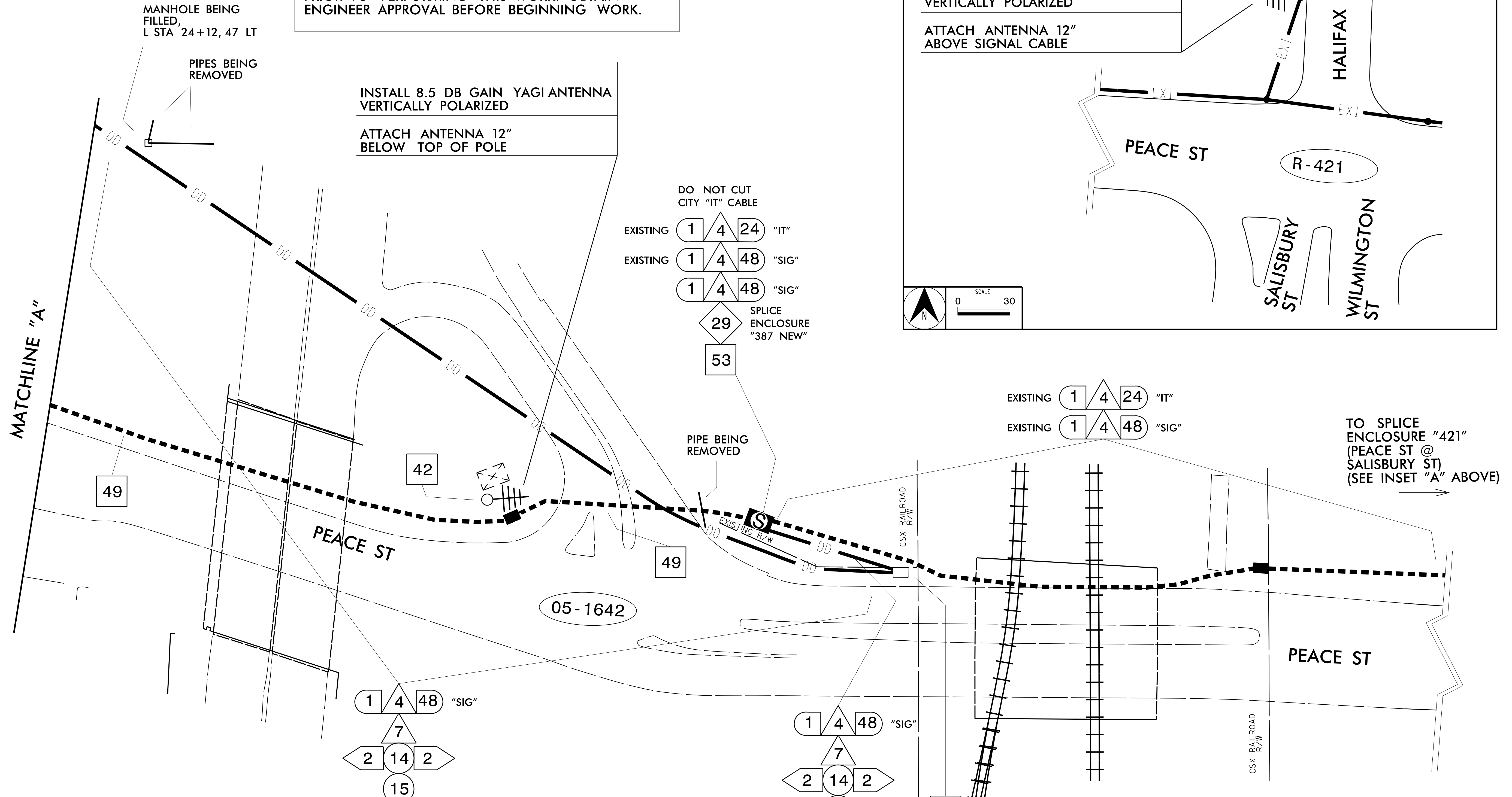
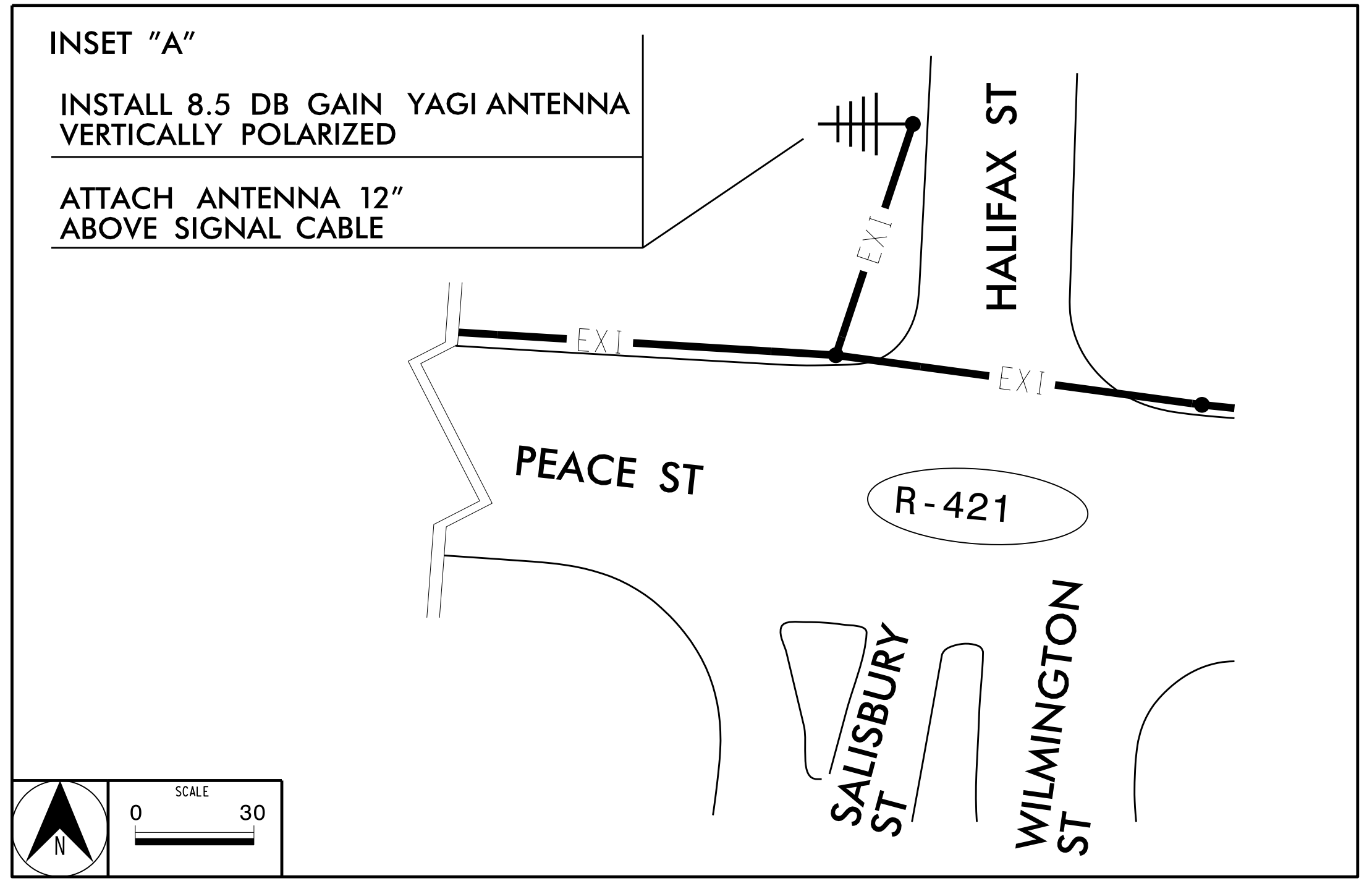




**GENERAL NOTE:**

INSTALL COMMUNICATION CABLE ID MARKERS ON "SIG" CABLES AT POLES AND IN JUNCTION BOXES. MARK ID MARKER WITH CABLE DESIGNATION "SIG".

ALL UTILITIES MAY NOT HAVE BEEN RELOCATED PRIOR TO PERFORMING THIS WORK. OBTAIN ENGINEER APPROVAL BEFORE BEGINNING WORK.



**NOTES:**

1. SURVEY AND RECORD FINAL DRILL DEPTHS EVERY 10' AND PROVIDE TO THE ENGINEER.

PHASE I STAGE I

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Prepared in the Offices of:

**COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS**

DIVISION 05 WAKE CO. DocuSigned by: RALEIGH

PLAN DATE: FEBRUARY 2016 REVIEWED BY: Greg Fuller

PREPARED BY: B.A. STOUCHKO DocuSigned by: Gregory A. Fuller

750 N. Greenfield Pkwy., Garner, NC 27529

SCALE 0 30

REVISIONS

INIT. DATE

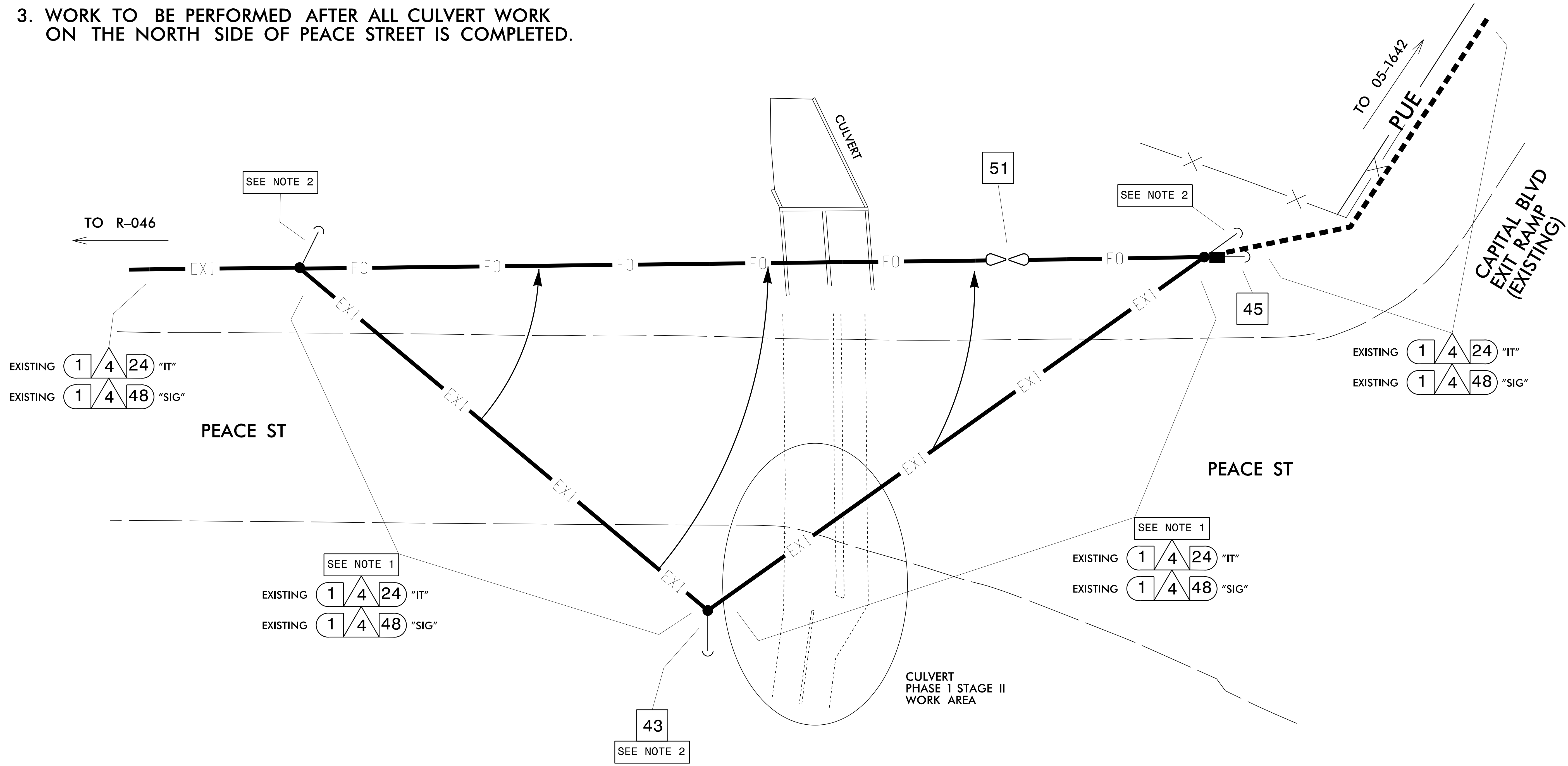
DocuSigned by: G. H. Fuller 2/9/2016

CADD Filename:



**NOTES:**

1. PULL CABLE BACK TO NORTH SIDE OF PEACE ST AND COIL ALL SLACK CABLE ON PROPOSED SNOWSHOE.
2. REMOVE EXISTING GUY ASSEMBLY.
3. WORK TO BE PERFORMED AFTER ALL CULVERT WORK ON THE NORTH SIDE OF PEACE STREET IS COMPLETED.

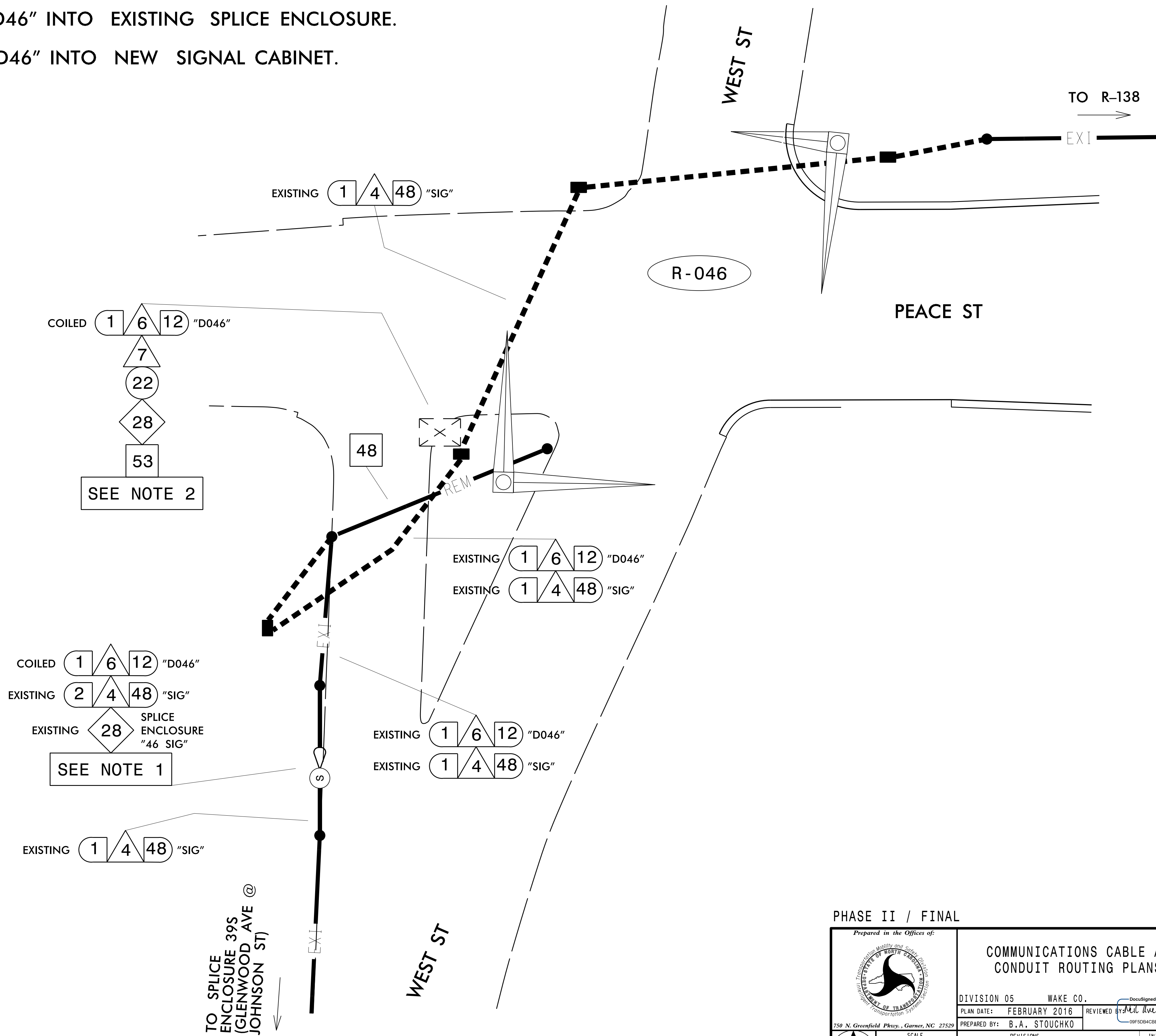


REFERENCE TO CITY "IT" CABLE IS BASED ON THE ASSUMPTION THAT THIS CABLE HAS BEEN INSTALLED BY OTHERS PRIOR TO THIS POINT.

PHASE I STAGE II		DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	
	<b>COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS</b>		
	DIVISION 05 WAKE CO. <span style="float: right;">DocuSigned by: RALEIGH</span> PLAN DATE: FEBRUARY 2016 <span style="float: right;">REVIEWED BY: <i>Michael Avery</i></span> PREPARED BY: B. A. STOUCHKO <span style="float: right;">09F5D94CBED3443...</span>		
	REVISIONS _____ _____	INIT. DATE _____ _____	DocuSigned by: <i>G. H. Fuller</i> 2/9/2016 DATE _____ CADD Filename:

NOTES:

1. SPLICE COILED CABLE "D46" INTO EXISTING SPLICE ENCLOSURE.
2. SPLICE COILED CABLE "D46" INTO NEW SIGNAL CABINET.

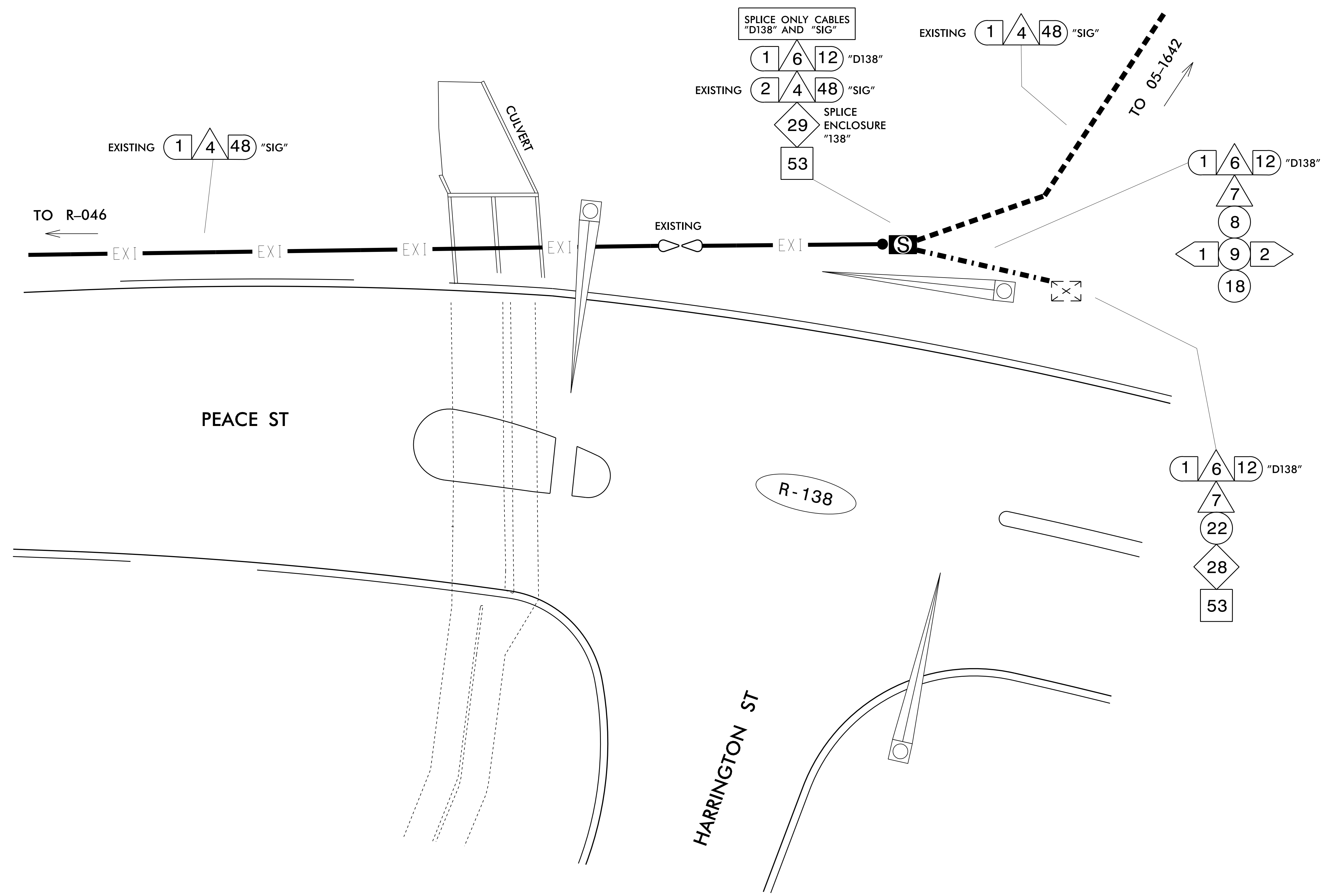


PHASE II / FINAL

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

	<p>COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS</p>		
	<p>DIVISION 05 WAKE CO.</p> <p>PLAN DATE: FEBRUARY 2016</p> <p>PREPARED BY: B.A. STOUCHKO</p>	<p>DocuSigned by: RALEIGH</p> <p>REVIEWED BY: <i>Gregory A. Fuller</i></p> <p>DATE: 2/9/2016</p>	





PHASE II / FINAL

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

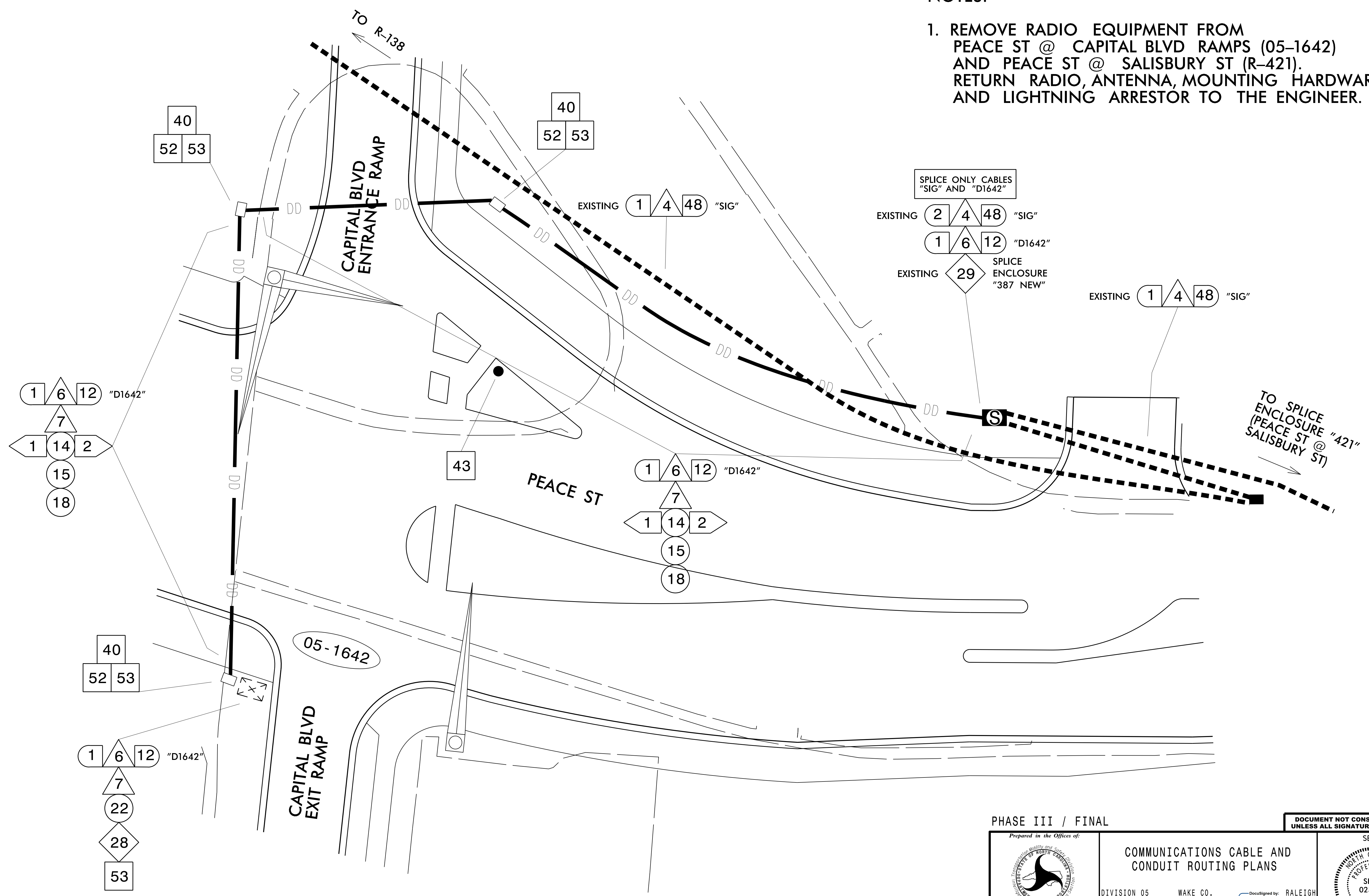
<p>750 N. Greenfield Pkwy., Garner, NC 27529</p>	<p>COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS</p>		
	<p>DIVISION 05 WAKE CO.</p> <p>PLAN DATE: FEBRUARY 2016</p> <p>PREPARED BY: B.A. STOUCHKO</p>	<p>DocuSigned by: RALEIGH</p> <p>REVIEWED BY: <i>Gregory A. Fuller</i></p> <p>09F5D94CBED3443...</p>	

SCALE 0 15

CADD Filename:

NOTES:

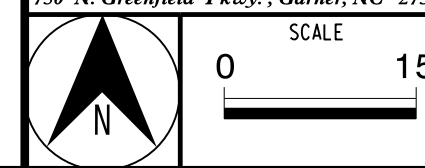
1. REMOVE RADIO EQUIPMENT FROM PEACE ST @ CAPITAL BLVD RAMPS (05-1642) AND PEACE ST @ SALISBURY ST (R-421). RETURN RADIO, ANTENNA, MOUNTING HARDWARE AND LIGHTNING ARRESTOR TO THE ENGINEER.



PHASE III / FINAL

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

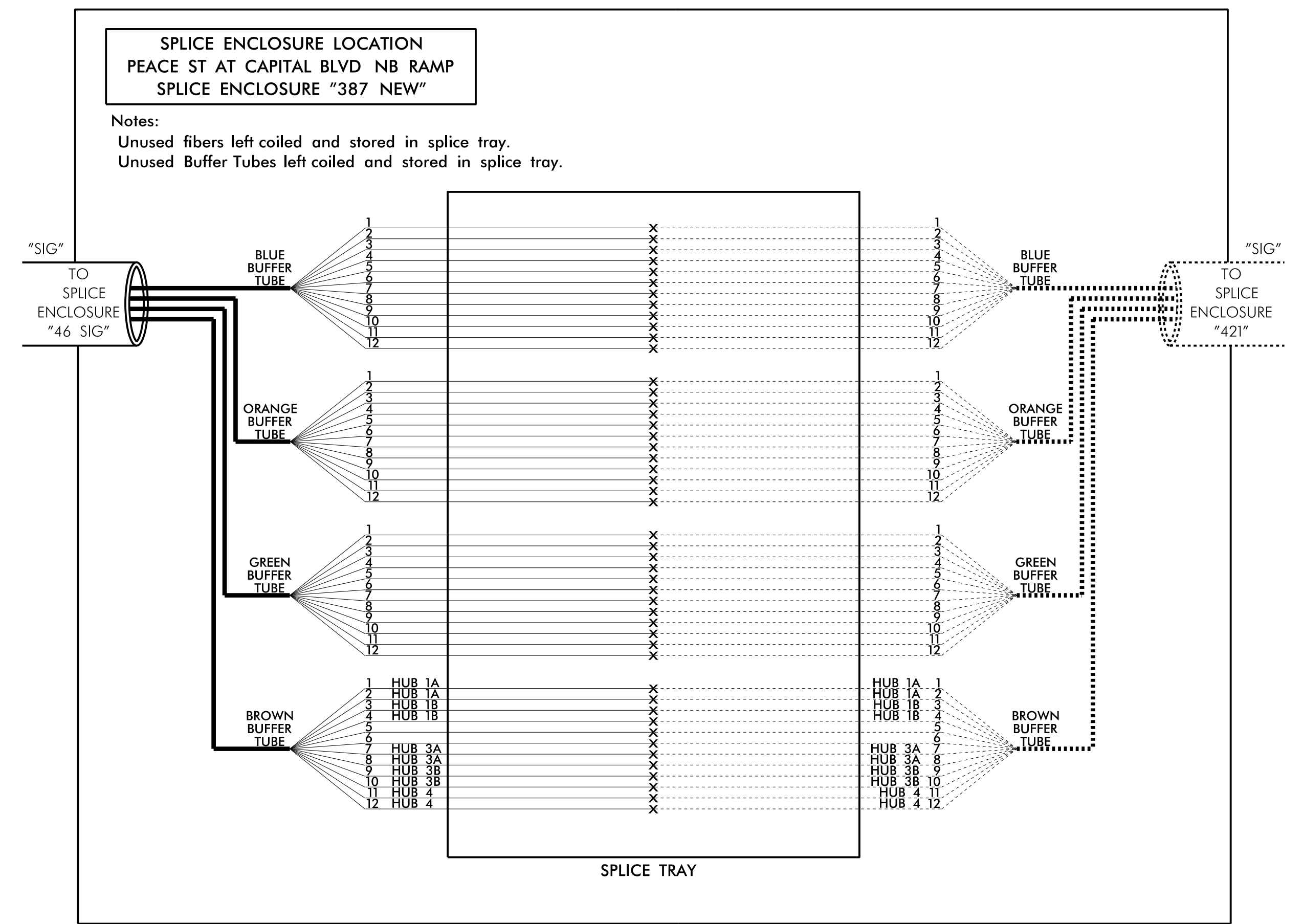
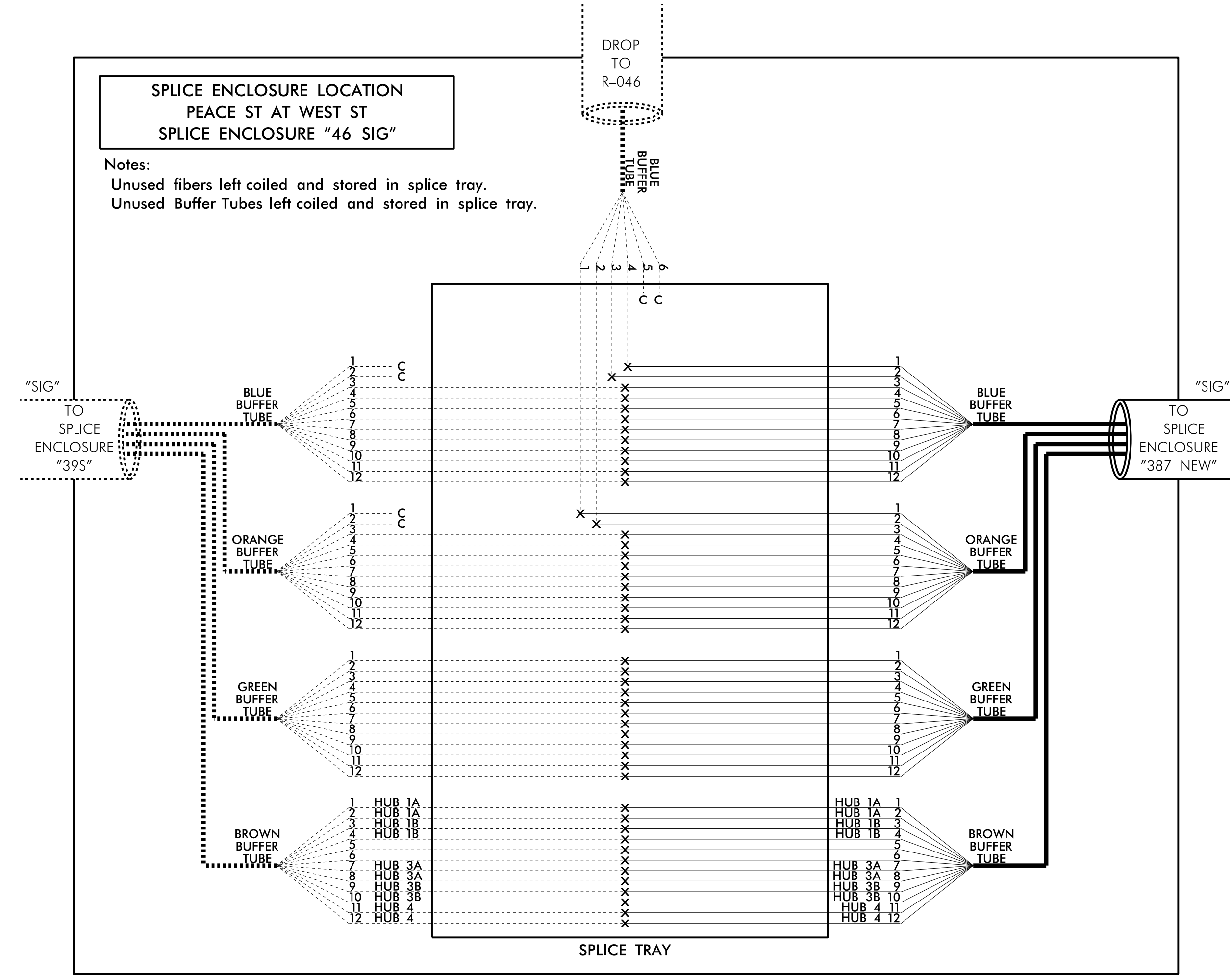
	<p>COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS</p>		<p>SEAL 023919 ENGINEER GREGORY A. FULLER</p>
	<p>DIVISION 05 WAKE CO.</p> <p>PLAN DATE: FEBRUARY 2016</p> <p>PREPARED BY: B. A. STOUCHKO</p>	<p>DocuSigned by: RALEIGH</p> <p>REVIEWED BY: <i>Michael Avery</i></p> <p>09F5D94CBED3443...</p>	





**LEGEND**  
 X = FUSION SPLICE  
 C = CAP IN TRAY

COLOR CODE TIA/EIA 598-A	
(1) BLUE	(7) RED
(2) ORANGE	(8) BLACK
(3) GREEN	(9) YELLOW
(4) BROWN	(10) VIOLET
(5) SLATE	(11) ROSE
(6) WHITE	(12) AQUA



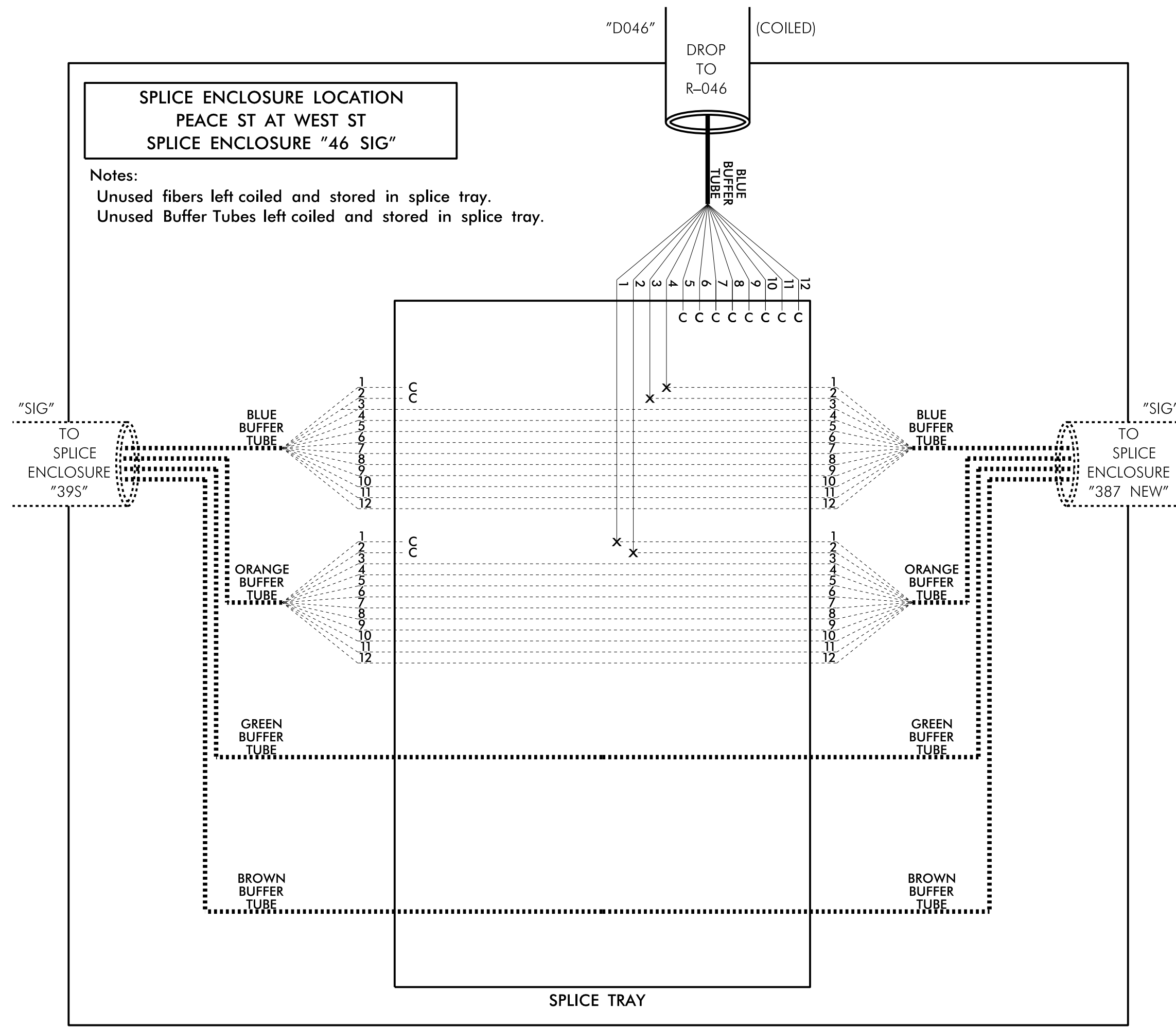
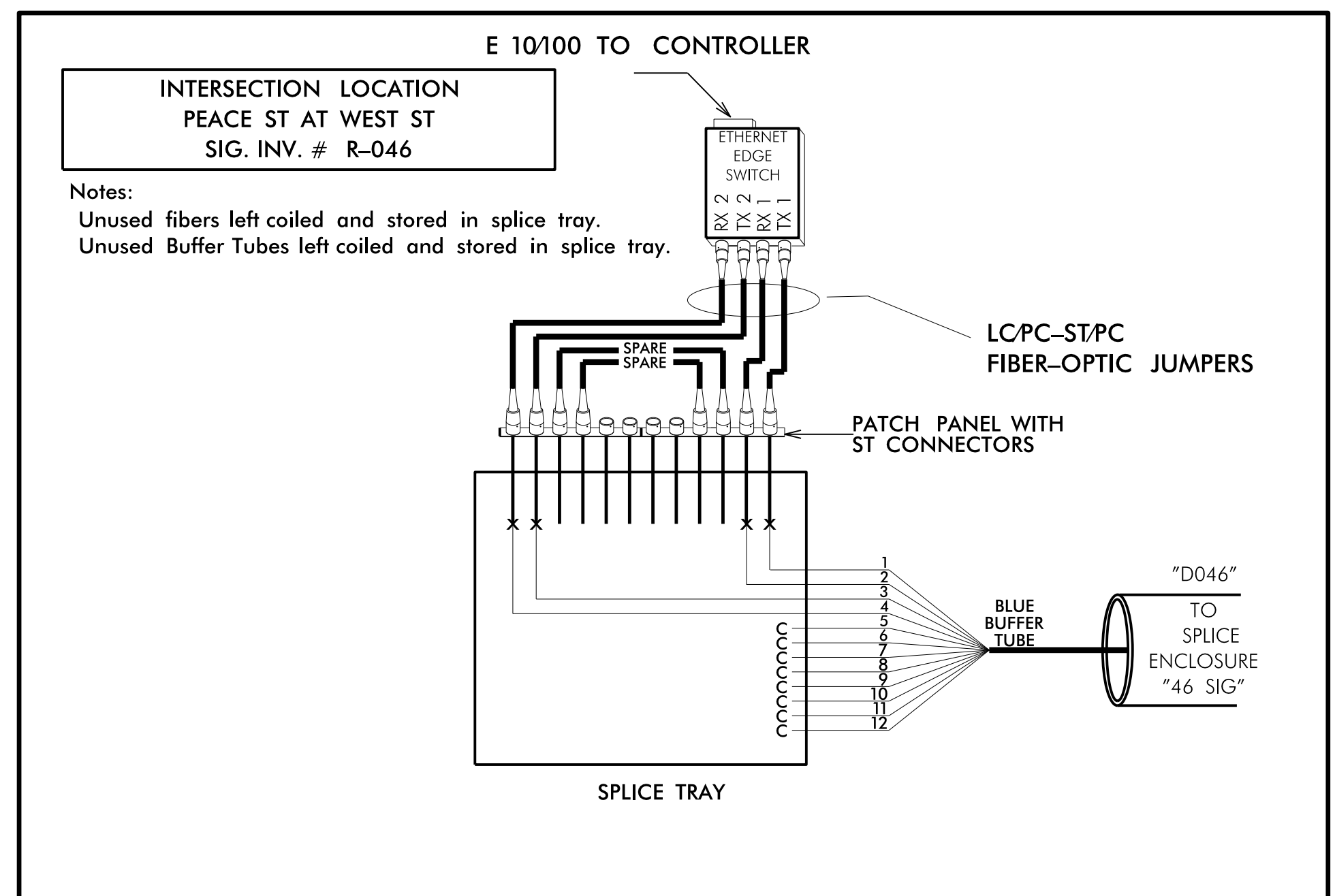
CONTRACTOR TO RECORD EXISTING SPLICE ARRANGEMENT FOR COMPARISON TO THE SUPPLIED SPLICE PLANS. IF DISCREPANCIES EXIST, CONTACT THE ENGINEER TO DETERMINE HOW TO PROCEED WITH RESPLICING.

ALL WORK IS NOT COMPLETE UNTIL THE SIGNAL SYSTEM IS BACK UP AND OPERATIONAL.

PHASE I STAGE I		DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	
	<b>SPLICE DETAIL</b>		
	DIVISION 05 WAKE CO. DocuSigned by: RALEIGH PLAN DATE: FEBRUARY 2016 REVIEWED BY: <i>Michael Avery</i> PREPARED BY: B.A. STOUCHKO 09F5D94CBED3443...		
REVISIONS _____ INIT. DATE		DocuSigned by: <i>G. H. Fuller</i> 2/9/2016 7332C46A5E874FF DATE CADD Filename:	

**LEGEND**  
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(3) GREEN	(9) YELLOW
(4) BROWN	(10) VIOLET
(5) SLATE	(11) ROSE
(6) WHITE	(12) AQUA



**NOTES:**

- 1) ETHERNET EDGE SWITCH TO BE PROVIDED BY THE CITY OF RALEIGH. CONTACT JED NIFFENEGGER, SENIOR TRANSPORTATION ENGINEER, AT 919-996-4039 TO OBTAIN EDGE SWITCH. PROVIDE 5 WORKING DAYS NOTICE.
- 2) THE CITY WILL PROVIDE THE ETHERNET EDGE SWITCH PRE-PROGRAMMED WITH REQUIRED NETWORK CONFIGURATION DATA (INCLUDING BUT NOT LIMITED TO PROJECT IP ADDRESS, DEFAULT GATEWAY, SUBNET MASK, AND VLAN ID INFORMATION).

**CONTRACTOR TO RECORD EXISTING SPLICE ARRANGEMENT FOR COMPARISON TO THE SUPPLIED SPLICE PLANS. IF DISCREPANCIES EXIST, CONTACT THE ENGINEER TO DETERMINE HOW TO PROCEED WITH RESPLICING.**

**ALL WORK IS NOT COMPLETE UNTIL THE SIGNAL SYSTEM IS BACK UP AND OPERATIONAL.**

PHASE II / FINAL

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

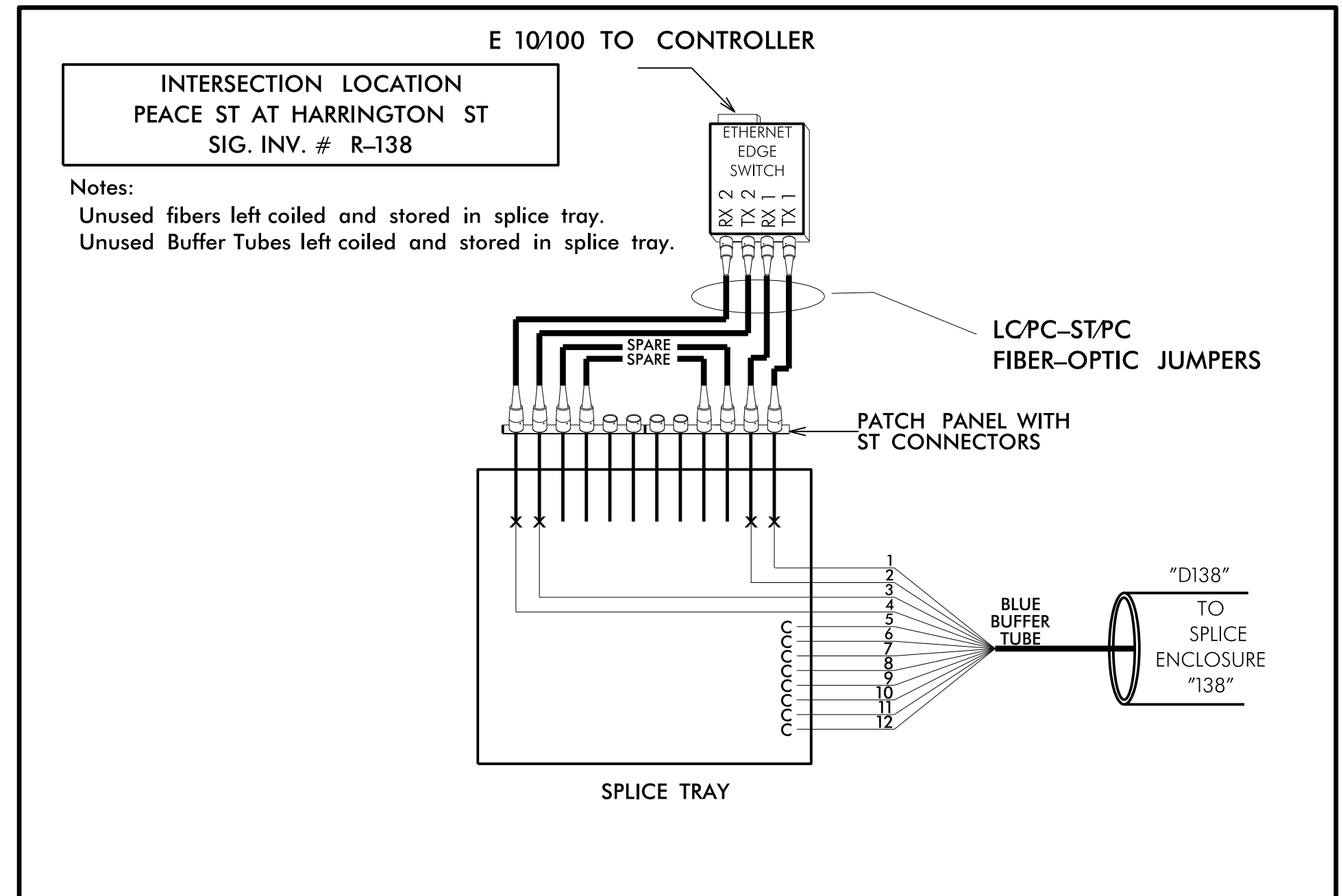
<p>750 N. Greenfield Pkwy., Garner, NC 27529</p>	<p><b>SPLICE DETAIL</b></p> <p>DIVISION 05 WAKE CO.</p> <p>PLAN DATE: FEBRUARY 2016</p> <p>PREPARED BY: B. A. STOUCHKO</p>	<p>SEAL</p> <p>NORTH CAROLINA PROFESSIONAL ENGINEER</p> <p>SEAL 023919</p> <p>GREGORY A. FULLER</p>
	<p>DocuSigned by: RALEIGH</p> <p>REVIEWED BY: <i>Michael Avery</i></p> <p>DocuSigned by: G. H. Fuller</p> <p>DATE: 2/9/2016</p>	<p>DATE</p>

CADD Filename:



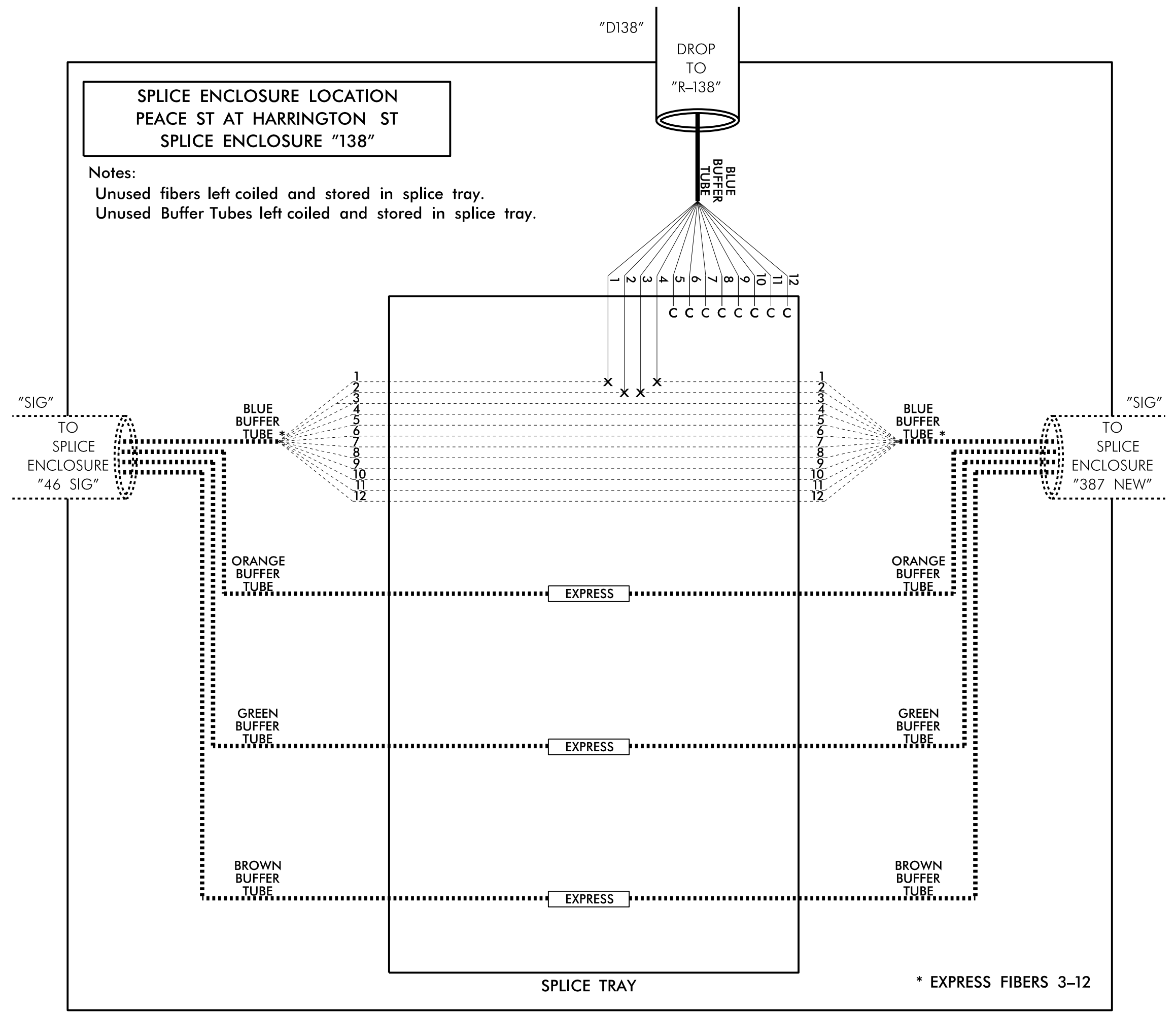
**LEGEND**  
 X = FUSION SPLICE  
 C = CAP IN TRAY

COLOR CODE TIA/EIA 598-A	
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(2) ORANGE	(8) BLACK
(3) GREEN	(9) YELLOW
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(5) SLATE	(11) ROSE
(6) WHITE	(12) AQUA



INTERSECTION LOCATION  
 PEACE ST AT HARRINGTON ST  
 SIG. INV. # R-138

Notes:  
 Unused fibers left coiled and stored in splice tray.  
 Unused Buffer Tubes left coiled and stored in splice tray.



SPLICE ENCLOSURE LOCATION  
 PEACE ST AT HARRINGTON ST  
 SPLICE ENCLOSURE "138"

Notes:  
 Unused fibers left coiled and stored in splice tray.  
 Unused Buffer Tubes left coiled and stored in splice tray.

**NOTES:**

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- 2) THE CITY WILL PROVIDE THE ETHERNET EDGE SWITCH PRE-PROGRAMMED WITH REQUIRED NETWORK CONFIGURATION DATA (INCLUDING BUT NOT LIMITED TO PROJECT IP ADDRESS, DEFAULT GATEWAY, SUBNET MASK, AND VLAN ID INFORMATION).

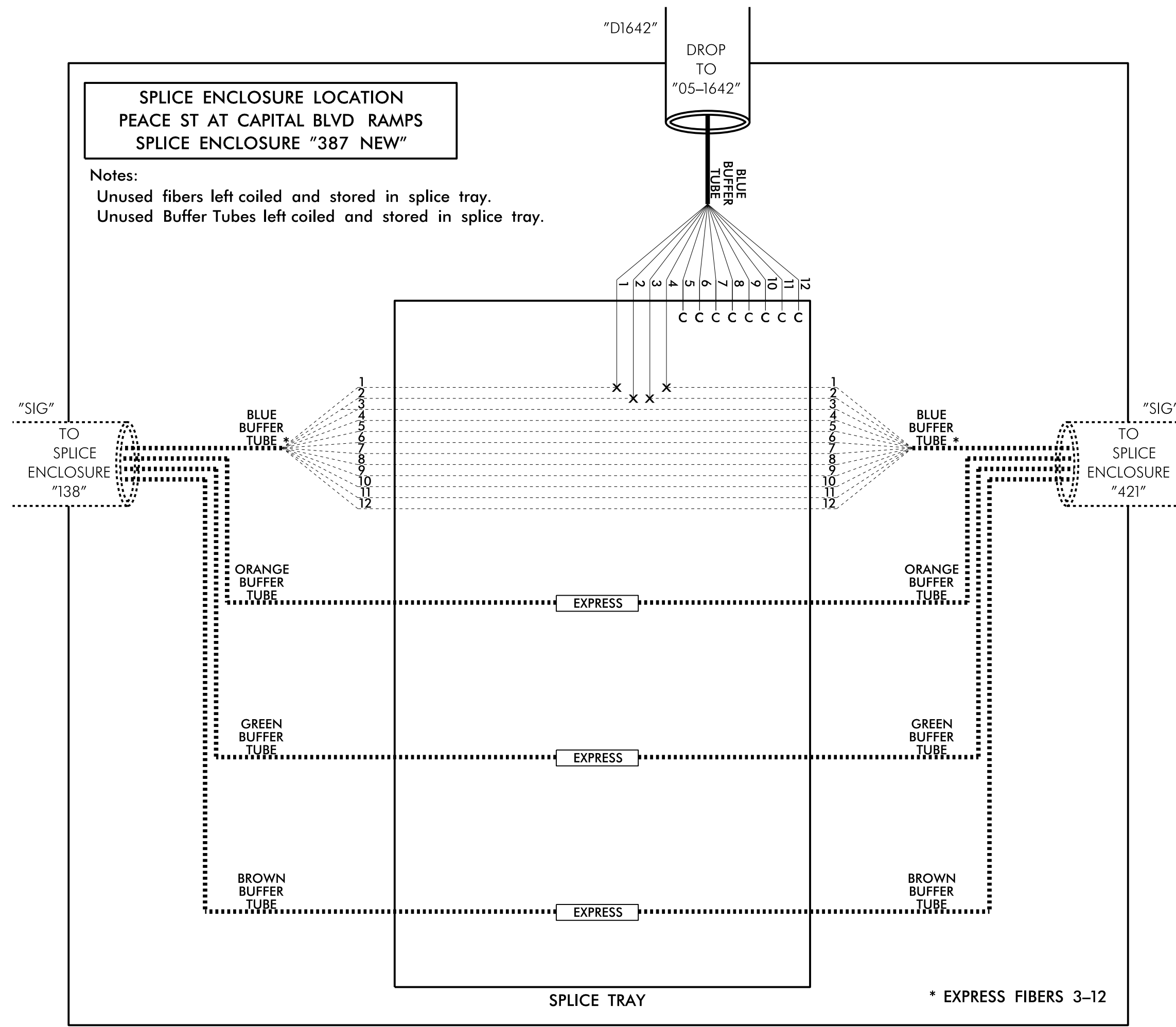
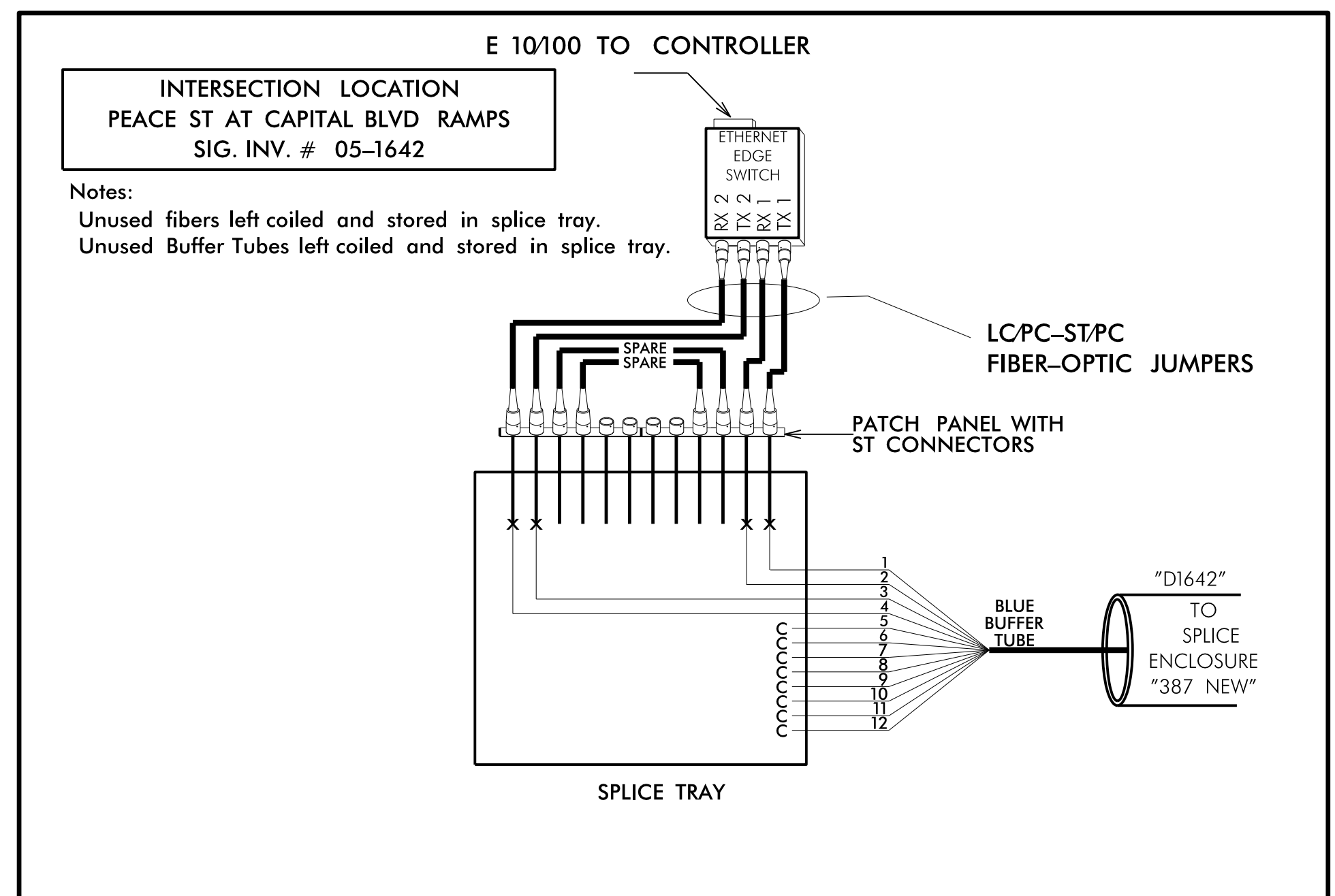
CONTRACTOR TO RECORD EXISTING SPLICE ARRANGEMENT FOR COMPARISON TO THE SUPPLIED SPLICE PLANS. IF DISCREPANCIES EXIST, CONTACT THE ENGINEER TO DETERMINE HOW TO PROCEED WITH RESPLICING.

ALL WORK IS NOT COMPLETE UNTIL THE SIGNAL SYSTEM IS BACK UP AND OPERATIONAL.

PHASE II / FINAL		DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED						
	<p align="center"><b>SPLICE DETAIL</b></p>							
	<p>DIVISION 05 WAKE CO. DocuSigned by: RALEIGH</p> <p>PLAN DATE: FEBRUARY 2016 REVIEWED BY: <i>Michael Berry</i></p> <p>PREPARED BY: B.A. STOUCHKO DocuSigned by: <i>Gregory A. Fuller</i></p>							
<p>750 N. Greenfield Pkwy., Garner, NC 27529</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				<p>DocuSigned by: <i>G. H. Fuller</i> 2/9/2016</p> <p>7332C6A5E874FF DATE</p> <p>CADD Filename:</p>
REVISIONS	INIT.	DATE						

**LEGEND**  
 X = FUSION SPLICE  
 C = CAP IN TRAY

COLOR CODE TIA/EIA 598-A	
(1) BLUE	(7) RED
(2) ORANGE	(8) BLACK
(3) GREEN	(9) YELLOW
(4) BROWN	(10) VIOLET
(5) SLATE	(11) ROSE
(6) WHITE	(12) AQUA



**NOTES:**

- 1) ETHERNET EDGE SWITCH TO BE PROVIDED BY THE CITY OF RALEIGH. CONTACT JED NIFFENEGGER, SENIOR TRANSPORTATION ENGINEER, AT 919-996-4039 TO OBTAIN EDGE SWITCH. PROVIDE 5 WORKING DAYS NOTICE.
- 2) THE CITY WILL PROVIDE THE ETHERNET EDGE SWITCH PRE-PROGRAMMED WITH REQUIRED NETWORK CONFIGURATION DATA (INCLUDING BUT NOT LIMITED TO PROJECT IP ADDRESS, DEFAULT GATEWAY, SUBNET MASK, AND VLAN ID INFORMATION).

**CONTRACTOR TO RECORD EXISTING SPLICE ARRANGEMENT FOR COMPARISON TO THE SUPPLIED SPLICE PLANS. IF DISCREPANCIES EXIST, CONTACT THE ENGINEER TO DETERMINE HOW TO PROCEED WITH RESPLICING.**

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PHASE III / FINAL		DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED						
	<p align="center"><b>SPLICE DETAIL</b></p>							
	<p>DIVISION 05 WAKE CO. <small>DocuSigned by: RALEIGH</small></p> <p>PLAN DATE: FEBRUARY 2016 REVIEWED BY: <i>Michael Berry</i></p> <p>PREPARED BY: B.A. STOUCHKO <small>09F5094C8ED3443...</small></p>							
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REVISIONS	INIT.	DATE						