

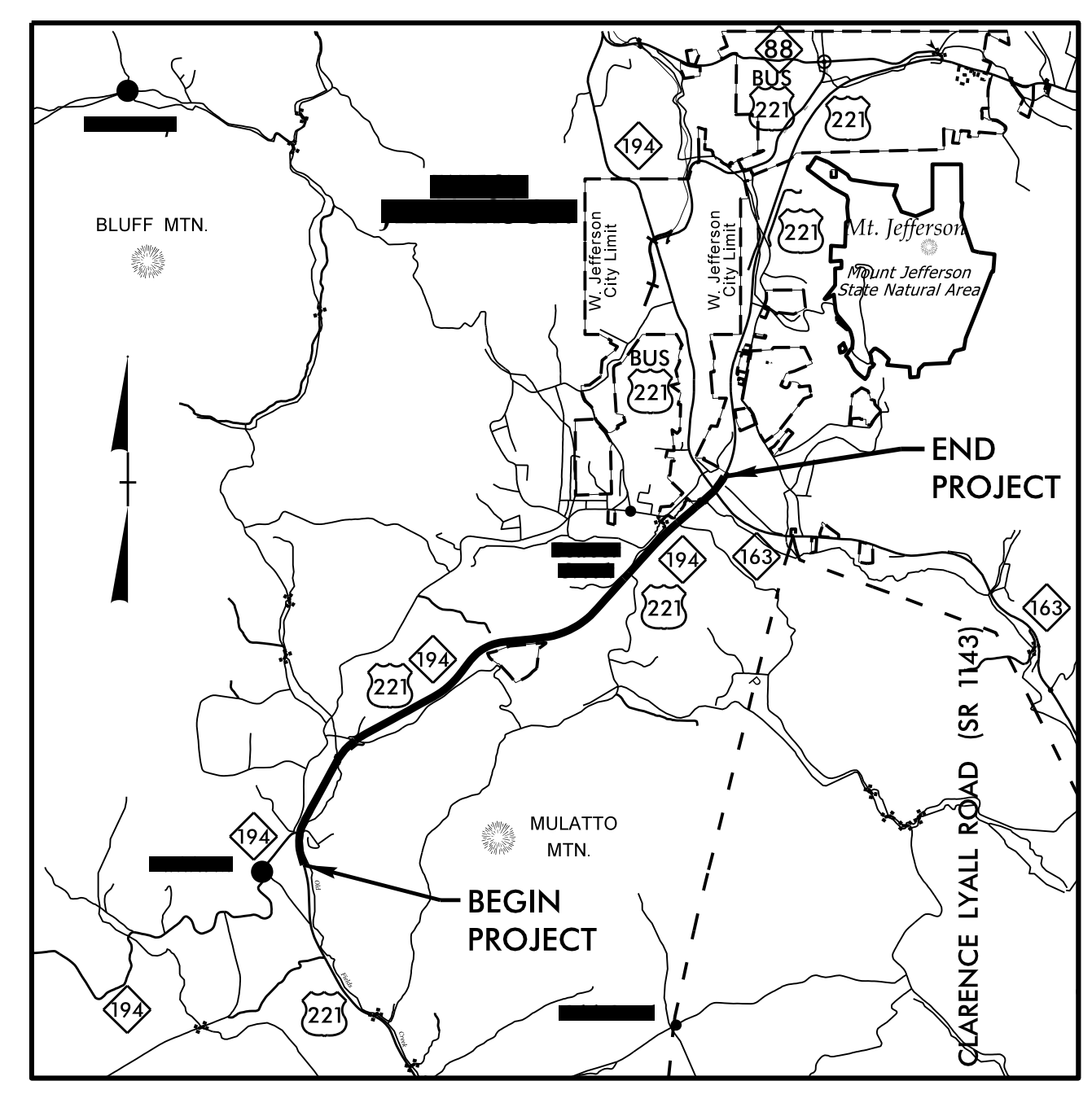
STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

# ASHE COUNTY

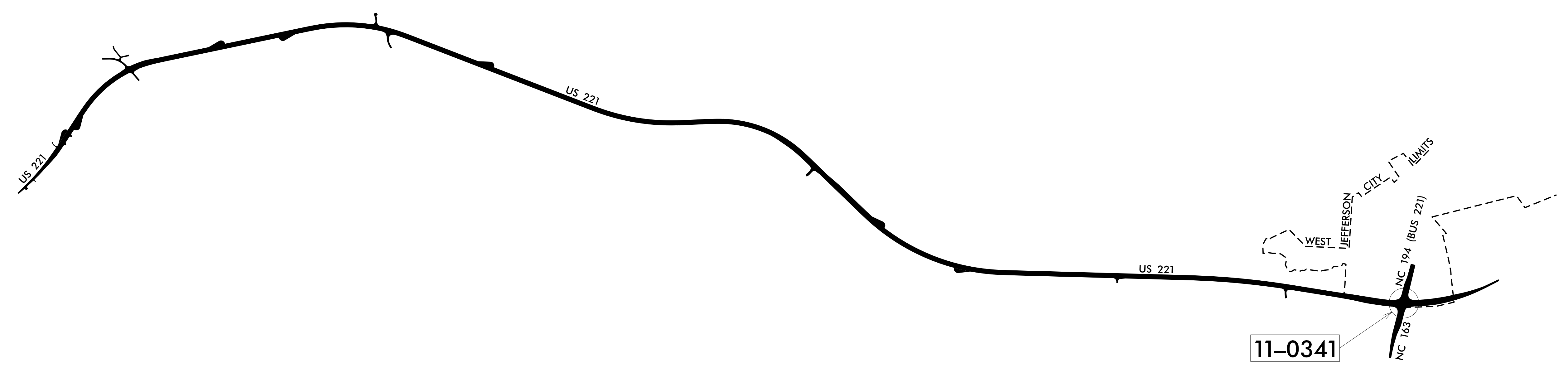
**LOCATION: US 221 FROM SOUTH OF NC 194 TO US 221 BYPASS**

**TYPE OF WORK: TRAFFIC SIGNALS**

**Project: R-2915D**



**VICINITY MAP**



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

<b>Index of Plans</b>		
Sheet #	Reference #	Location/Description
Sig. 1.0	-----	Title Sheet
Sig. 2.0-6.2	11-0341	US 221-NC 194 at US 221 Business-NC 194 / NC 163
Sig. M1-M9	N/A	Metal Pole Standard Drawings

**INTELLIGENT TRANSPORTATION AND SIGNALS UNIT**

Contacts:

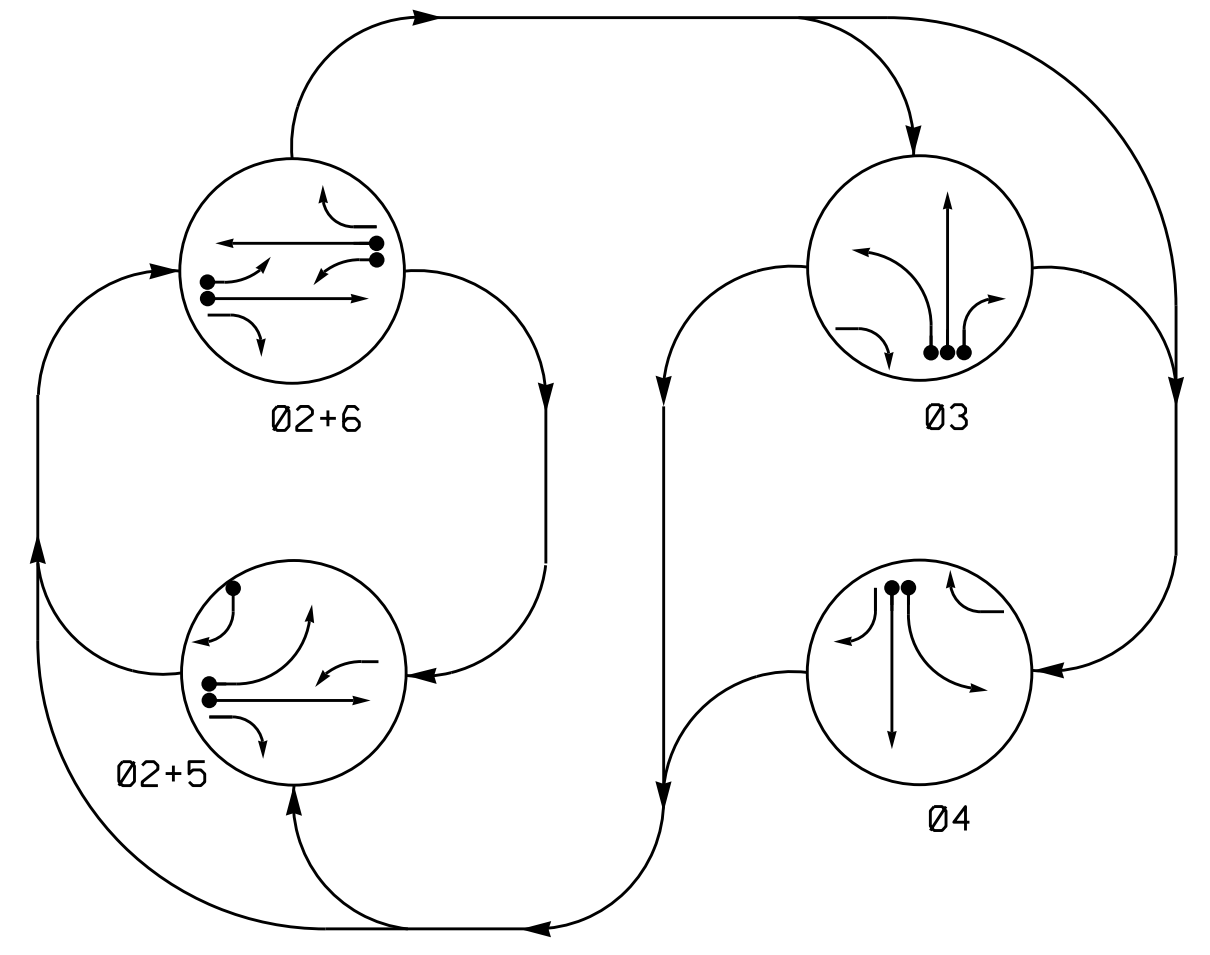
**Zachary M. Little, PE** - Western Region Signals Project Engineer  
**George C. Brown, PE** - Signal Equipment Design Engineer

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

750 N. Greenfield Parkway, Garner, NC 27529

02-NOV-2014 11:30 AM \\f:\p1\signals\Design\TitleSheet\R-2915D Title Sheet.dgn

PHASING DIAGRAM

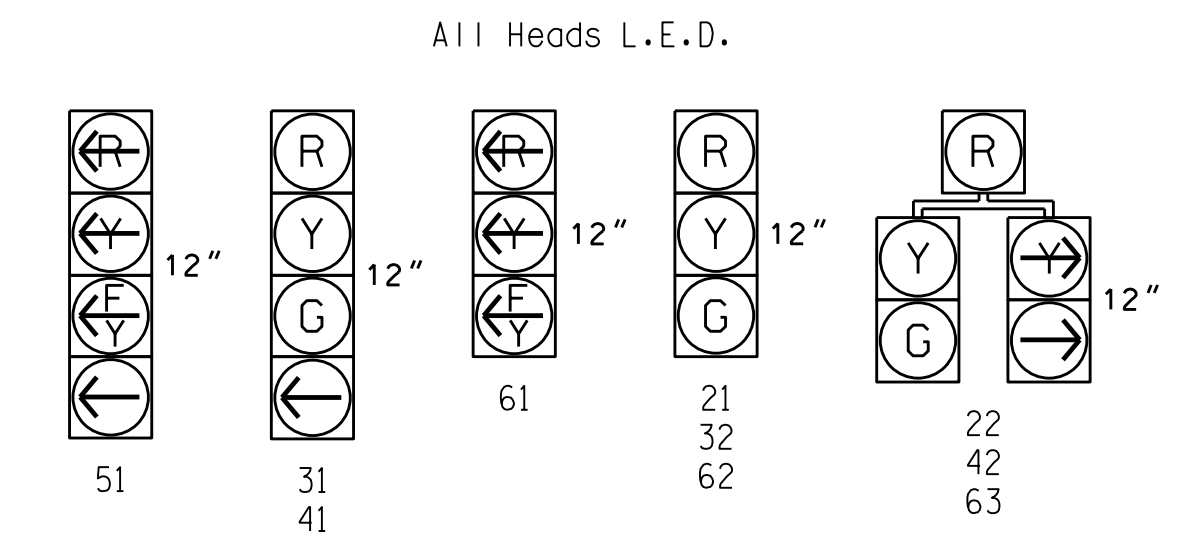


SIGNAL FACE	PHASE				
	02+5	02+6	03	04	FLASH
21	G	G	R	R	Y
22	G	G	R	R	Y
31	R	R	G	R	R
32	R	R	G	R	R
41	R	R	R	G	R
42	R	R	R	G	R
51	-	-	-	-	-
61	-	-	-	-	-
62	R	G	R	R	Y
63	R	G	R	R	Y

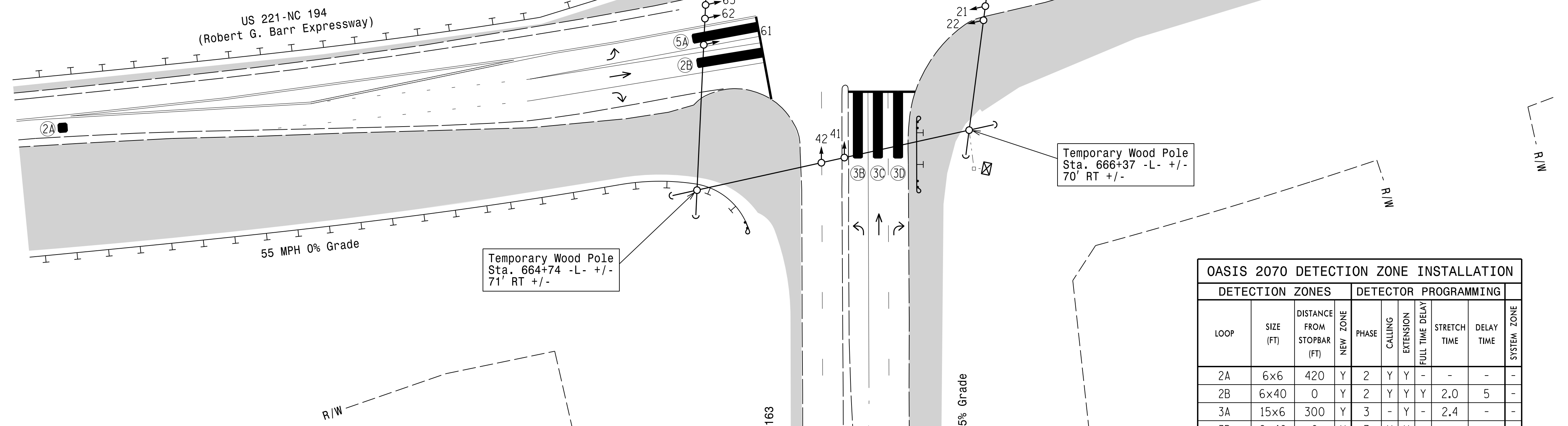
PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.



4 Phase Fully Actuated Isolated



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.
- Set all detector units to presence mode.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.

OASIS 2070 TIMING CHART

FEATURE	PHASE				
	2	3	4	5	6
Min Green 1 *	14	7	7	7	14
Extension 1 *	6.0	2.0	2.0	2.0	6.0
Max Green 1 *	100	30	30	20	100
Yellow Clearance	5.5	4.1	3.8	3.0	5.5
Red Clearance	1.4	1.5	1.6	2.9	1.4
Red Revert	2.0	2.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-	-
Don't Walk 1	-	-	-	-	-
Seconds Per Actuation *	-	-	-	-	-
Max Variable Initial *	-	-	-	-	-
Time Before Reduction *	15	-	-	-	15
Time To Reduce *	45	-	-	-	45
Minimum Gap	3.4	-	-	-	3.4
Recall Mode	MIN RECALL	-	-	-	MIN RECALL
Vehicle Call Memory	YELLOW	-	-	-	YELLOW
Dual Entry	-	-	-	-	-
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.

OASIS 2070 DETECTION ZONE INSTALLATION

LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	NEW ZONE	PHASE	DETECTOR PROGRAMMING			STRETCH TIME	DELAY TIME	SYSTEM ZONE
					CALLING	EXTENSION	FULL TIME DELAY			
2A	6x6	420	Y	2	Y	Y	-	-	-	-
2B	6x40	0	Y	2	Y	Y	-	2.0	5	-
3A	15x6	300	Y	3	-	Y	-	2.4	-	-
3B	6x40	0	Y	3	Y	Y	-	-	-	-
3C	6x40	0	Y	3	Y	Y	-	-	-	-
3D	6x40	0	Y	3	Y	Y	-	-	15	-
4A	6x40	0	Y	4	Y	Y	-	-	-	-
4B	6x40	0	Y	4	Y	Y	-	-	-	-
5A	6x40	0	Y	5	Y	Y	-	-	15	-
5B	6x40	0	Y	5	Y	Y	-	-	15	-
6A	6x6	420	Y	6	Y	Y	-	-	-	-
6B	6x40	0	Y	6	Y	Y	-	-	3	-
6C	6x40	0	Y	6	Y	Y	-	2.0	5	-

LEGEND

- |  |   |  |  |
|--|---|--|--|
|  | PROPOSED Traffic Signal Head                            |  | EXISTING Traffic Signal Head           |
|  | PROPOSED Modified Signal Head                           |  | EXISTING Modified Signal Head          |
|  | PROPOSED Pedestrian Signal Head With Push Button & Sign |  | EXISTING Pedestrian Signal Head        |
|  | PROPOSED Signal Pole with Guy                           |  | EXISTING Signal Pole with Guy          |
|  | PROPOSED Signal Pole with Sidewalk Guy                  |  | EXISTING Signal Pole with Sidewalk Guy |
|  | PROPOSED Inductive Loop Detector                        |  | EXISTING Inductive Loop Detector       |
|  | PROPOSED Controller & Cabinet                           |  | EXISTING Controller & Cabinet          |
|  | PROPOSED Junction Box                                   |  | EXISTING Junction Box                  |
|  | PROPOSED 2-in Underground Conduit                       |  | EXISTING 2-in Underground Conduit      |
|  | PROPOSED Right of Way                                   |  | EXISTING Right of Way                  |
|  | PROPOSED Directional Arrow                              |  | EXISTING Directional Arrow             |
|  | PROPOSED Construction Zone                              |  | EXISTING Construction Zone             |
|  | PROPOSED Video Detection Zone                           |  | EXISTING Video Detection Zone          |

Signal Upgrade - Temporary Design 1 - TCP Phase I

US 221-NC 194 at US 221 Business-NC 194/NC 163

Division 11 Ashe County near West Jefferson

PLAN DATE: September 2014 REVIEWED BY: Z.M. Little

PREPARED BY: C.L. Sweeney REVIEWED BY:

DocuSigned by: *Zachary M. Little*

10/14/2014

DATE

SIG. INVENTORY NO. II-0341 TI

750 N. Greenfield Pkwy, Garner, NC 27529

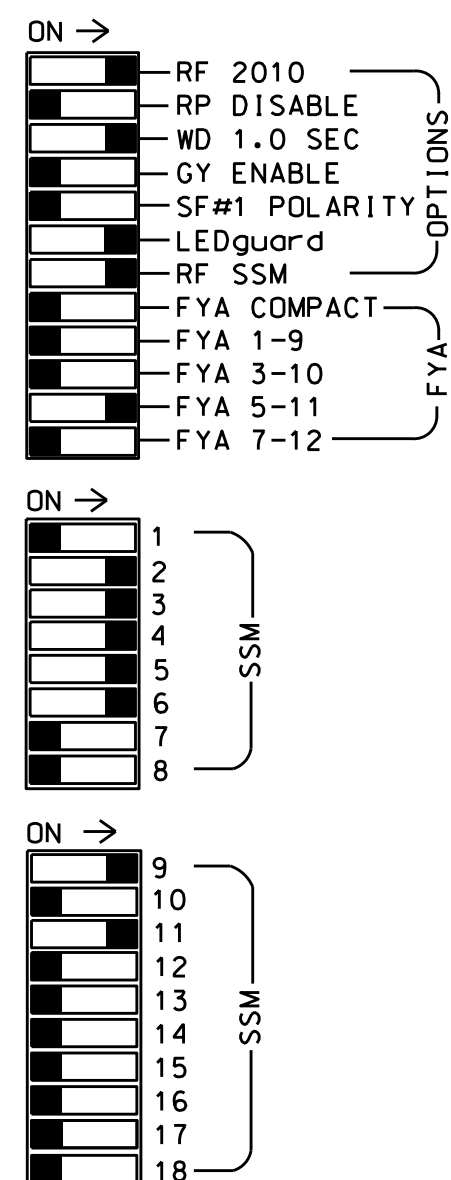
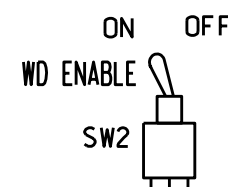
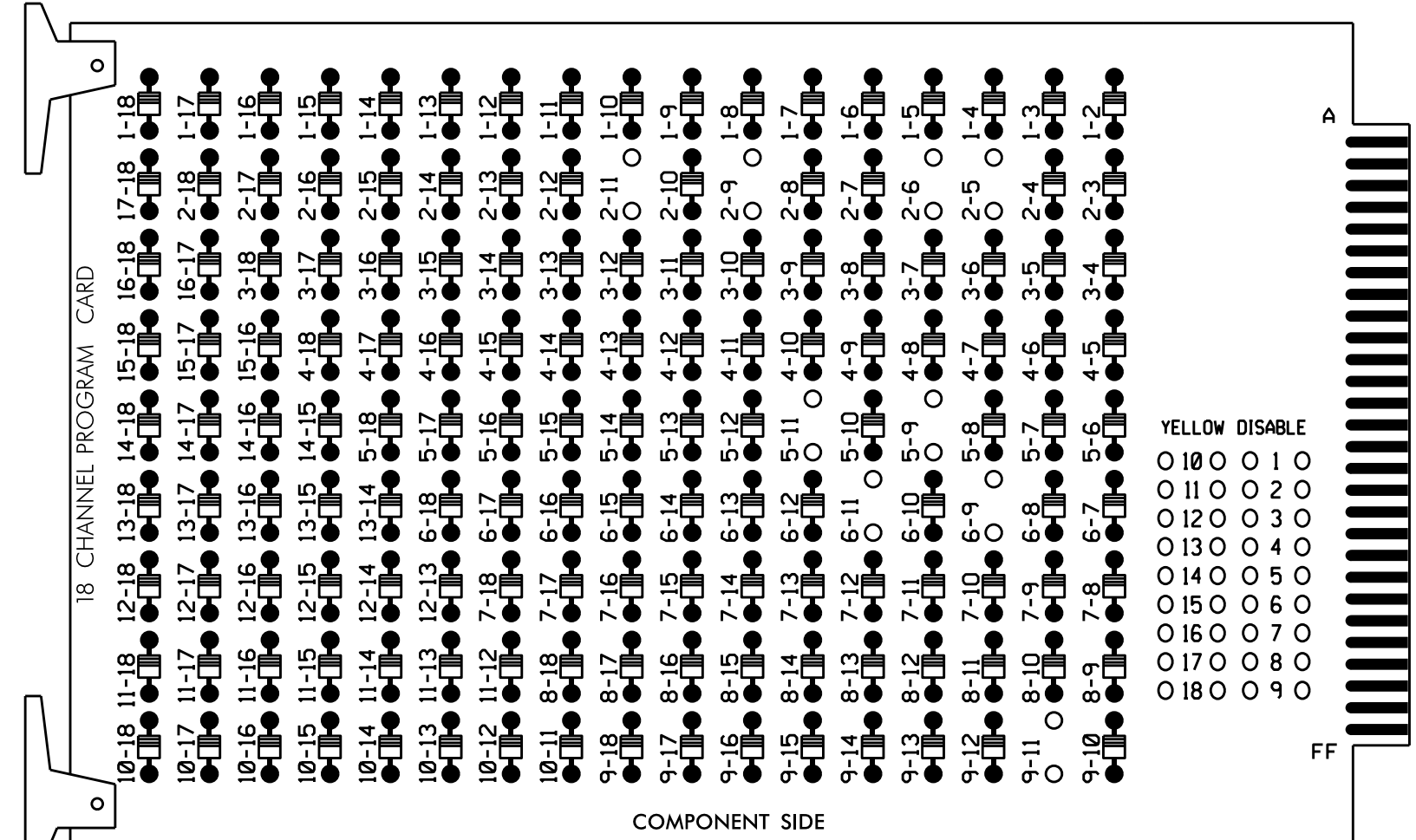
SCALE 0 40

1"=40'

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

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-5, 2-6, 2-9, 2-11, 5-9, 5-11, 6-9, 6-11, and 9-11.



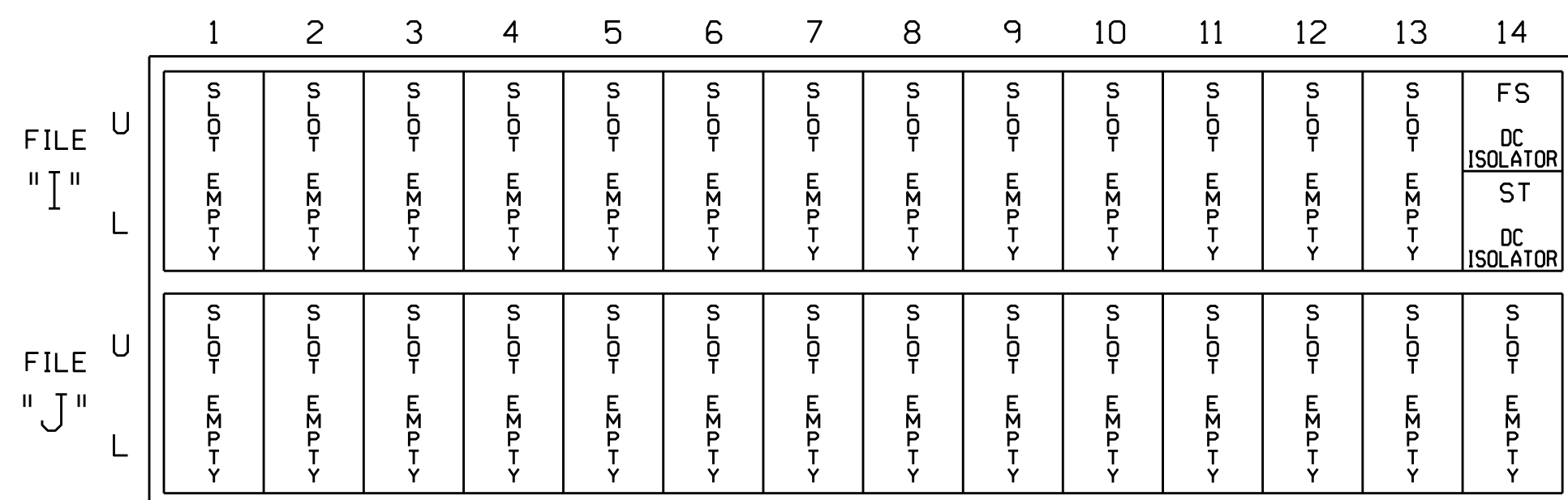
REMOVE JUMPERS AS SHOWN

**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.

**INPUT FILE POSITION LAYOUT**

(front view)



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

FS = FLASH SENSE  
ST = STOP TIME

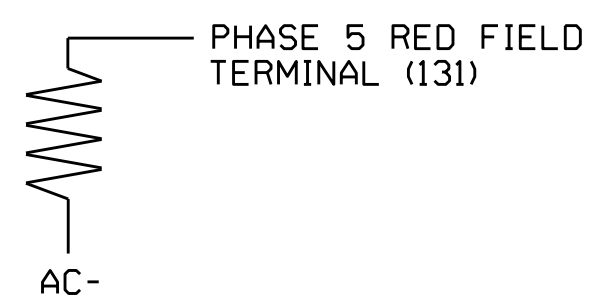
**SPECIAL DETECTOR NOTE**

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

**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)



**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.	NU	21,22	NU	22	31	32	41	42	63	NU	42	51	61	62,63	NU	51	NU	NU
RED		128		116	116	101	101			*				134				
YELLOW		129		117	117	102	102							135				
GREEN		130		118	118	103	103							136				
RED ARROW																A121		A114
YELLOW ARROW																		A115
FLASHING YELLOW ARROW																		A116
GREEN ARROW																		

NU = Not Used

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

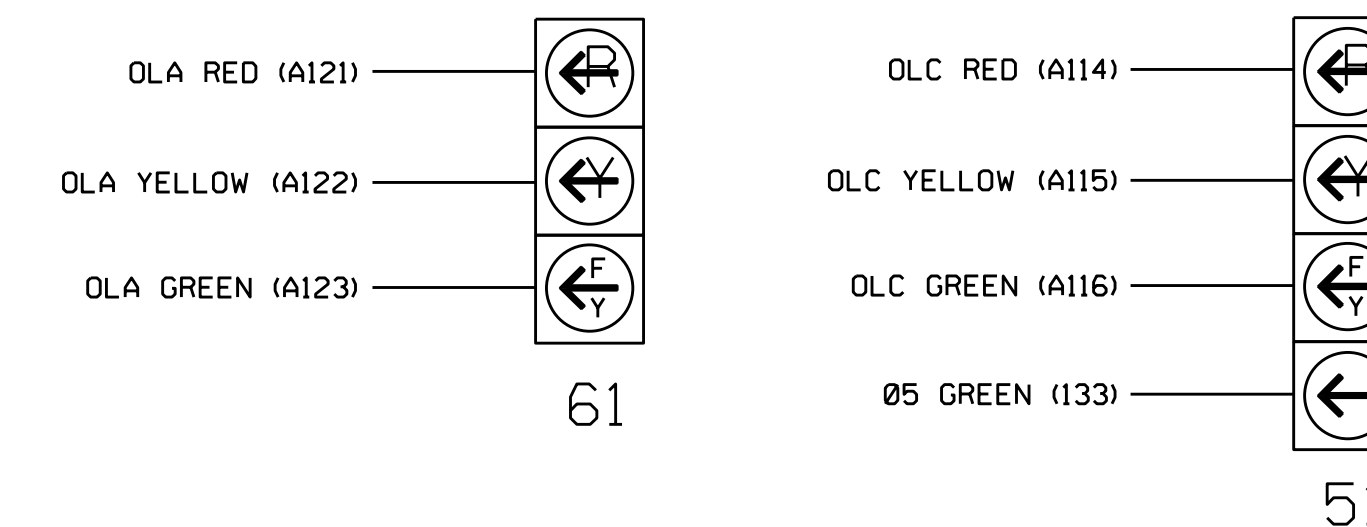
★ See pictorial of head wiring in detail below.

**NOTES**

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Enable Simultaneous Gap-Out for all phases.
- Program phases 2 and 6 for Gap Reduction.
- Program phases 2 and 6 for Start Up In Green.
- Program phases 2 and 6 for Yellow Flash, and overlap 1 as Wag Overlaps.

**FYA SIGNAL WIRING DETAIL**

(wire signal heads as shown)



**NOTE**

The sequence display for signal head 51 requires special logic programming. See sheet 2 for programming instructions.

**EQUIPMENT INFORMATION**

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

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-0341T1  
 DESIGNED: September 2014  
 SEALED: 10/14/2014  
 REVISED: N/A

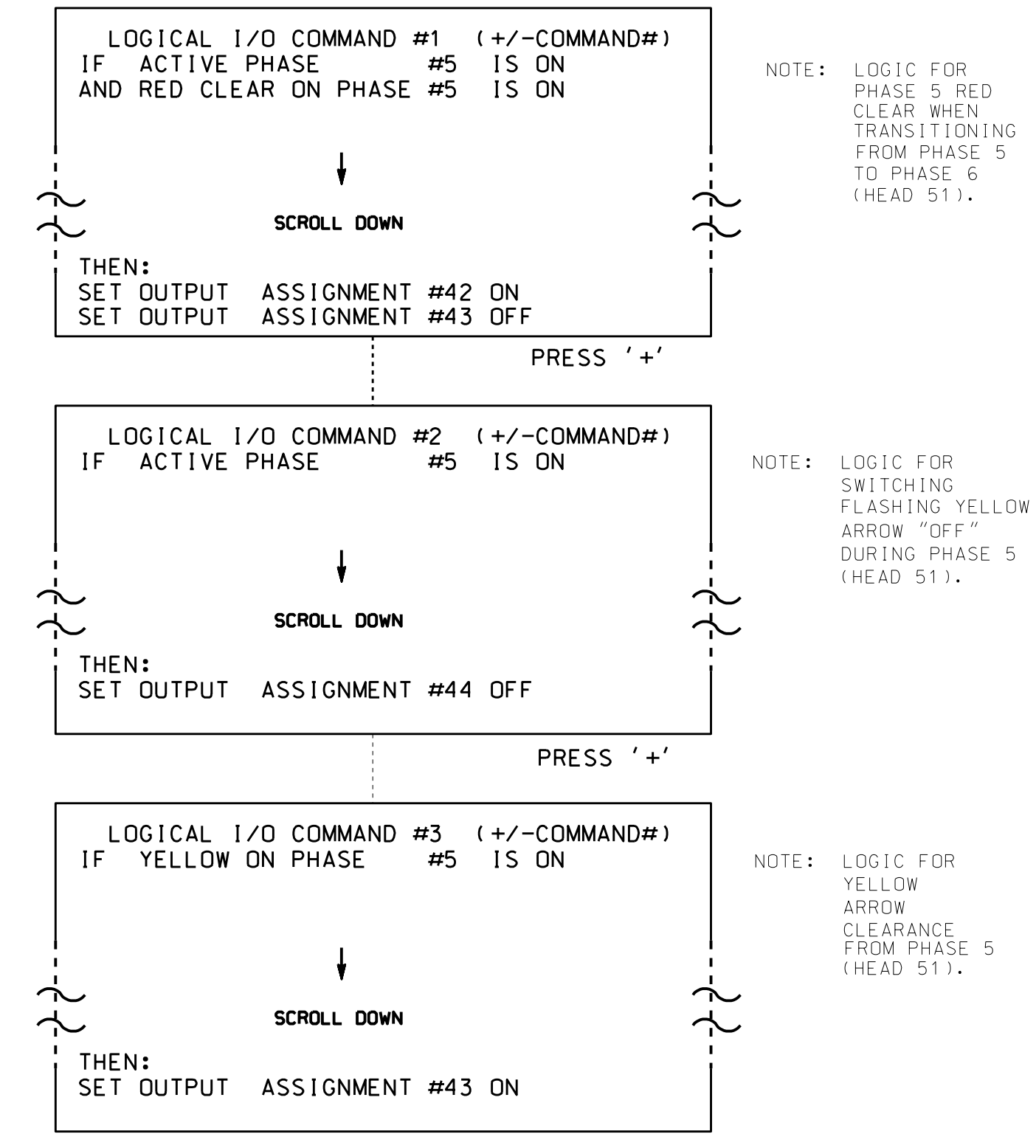
Electrical Detail - Temporary Design 1 - TCP Phase I - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared in the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529	<b>US 221-NC 194</b> at <b>US 221 Business-NC 194/NC 163</b>		SEAL  JOHN T. ROWE, JR. ENGINEER
	Division 11 PLAN DATE: October 2014 PREPARED BY: S. Armstrong	Ashe County near West Jefferson REVIEWED BY: JTR	

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

(program controller as shown below)

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



LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

<b>OUTPUT REFERENCE SCHEDULE</b>	
OUTPUT 42 =	Overlap C Red
OUTPUT 43 =	Overlap C Yellow
OUTPUT 44 =	Overlap C Green

## OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

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

```

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

← NOTICE GREEN FLASH

PRESS '+' TWICE

```

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

← NOTICE GREEN FLASH

OVERLAP PROGRAMMING COMPLETE

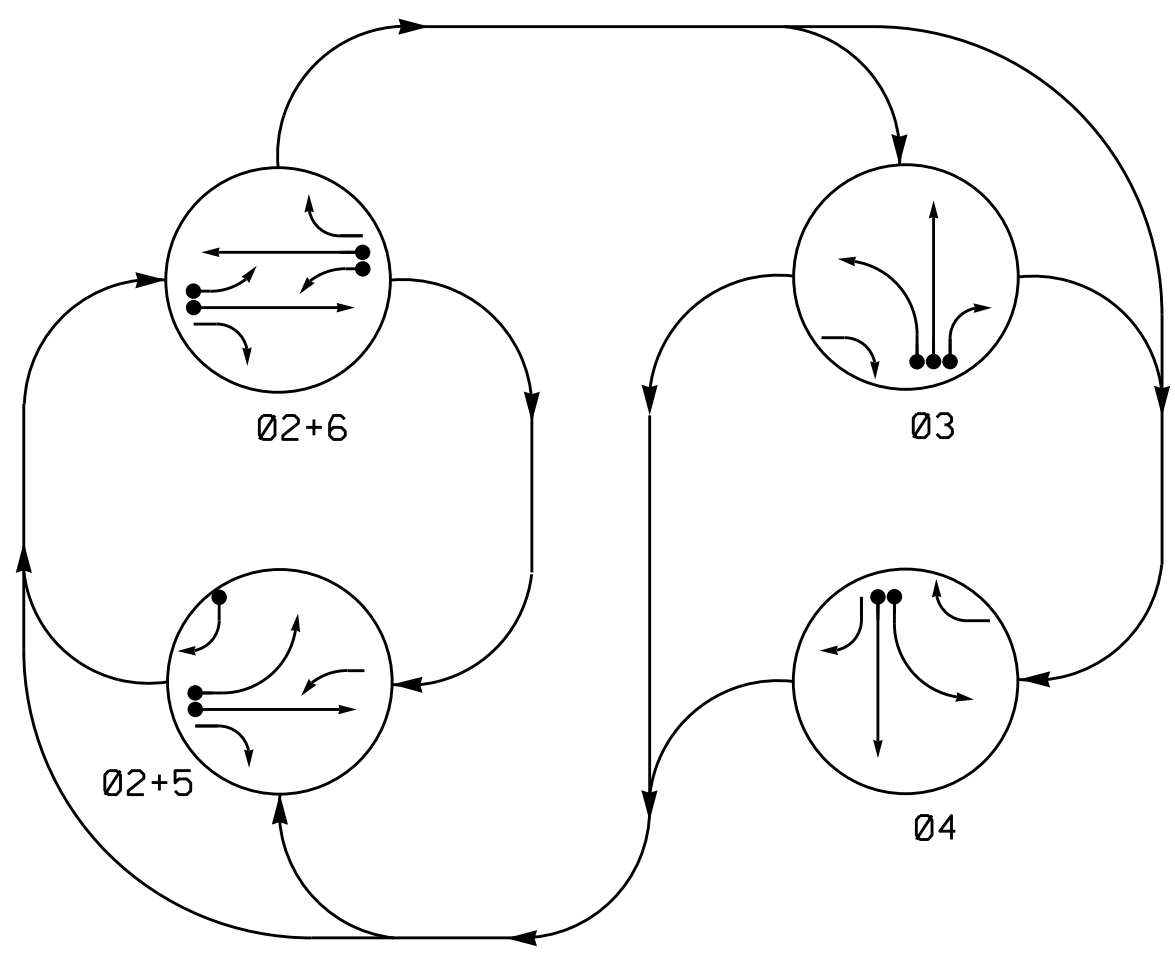
THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 11-0341T1  
DESIGNED: September 2014  
SEALED: 10/14/2014  
REVISED: N/A

Electrical Detail - Temporary Design 1 - TCP Phase I - Sheet 2 of 2

	<b>US 221-NC 194</b> at <b>US 221 Business-NC 194/NC 163</b>	SEAL 
	Division 11      Ashe County      near West Jefferson PLAN DATE: October 2014      REVIEWED BY: JTR PREPARED BY: S. Armstrong      REVIEWED BY:	REVISIONS      INIT.      DATE _____ _____
Prepared in the Offices of: Transportation Mobility and Safety Institute, Inc. 750 N. Greenfield Pkwy, Garner, NC 27529		DocuSigned by: <b>John T. Rowe, Jr.</b> 10/17/2014 SEAL 008453 JOHN T. ROWE, JR. ENGINEER STATE OF NORTH CAROLINA SIG. INVENTORY NO. 11-0341T1

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PHASING DIAGRAM

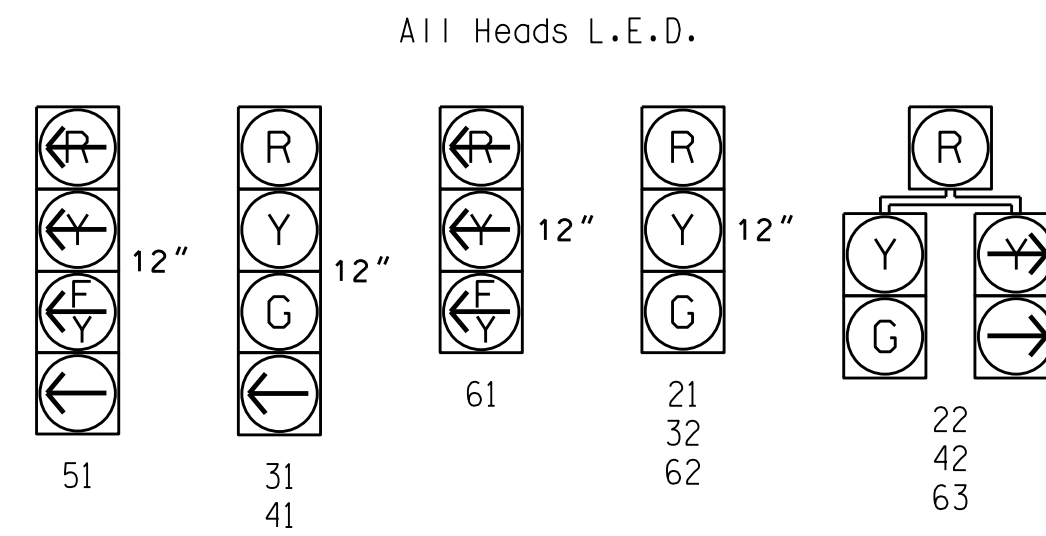


PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT (solid arrow)
- UNDETECTED MOVEMENT (OVERLAP) (dashed arrow)
- UNSIGNALIZED MOVEMENT (dotted arrow)
- PEDESTRIAN MOVEMENT (arrow with walking figure)

SIGNAL FACE	PHASE				
	02+5	02+6	03	04	FLASH
21	G	G	R	R	Y
22	G	G	R	R	Y
31	R	R	G	G	R
32	R	R	G	G	R
41	R	R	G	G	R
42	R	R	G	G	R
51	F	F	R	R	Y
61	F	F	R	R	Y
62	R	G	R	R	Y
63	R	G	R	R	Y

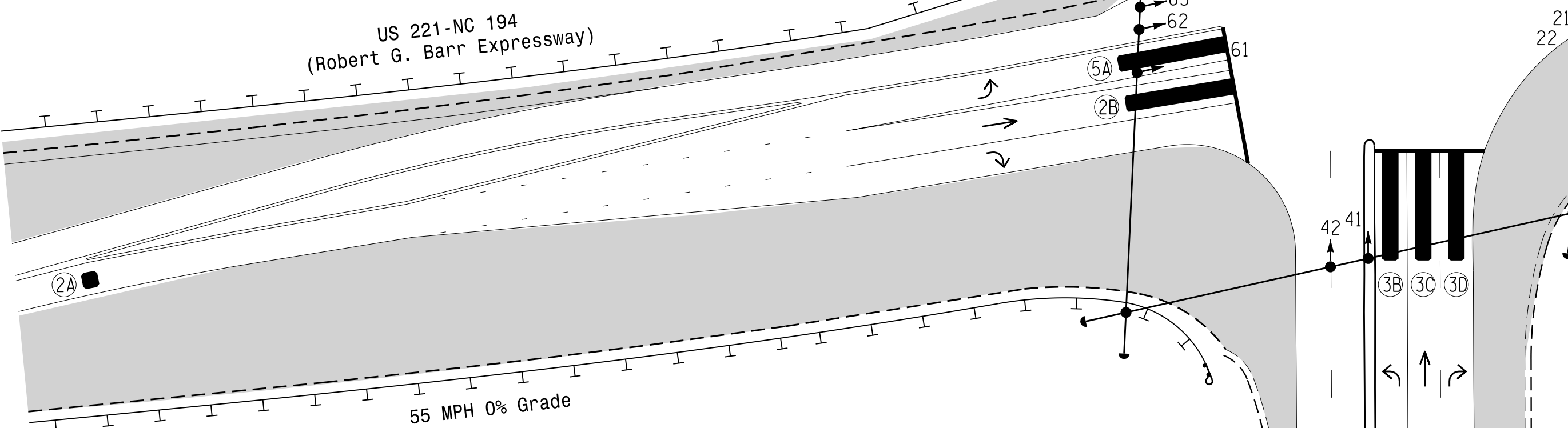
SIGNAL FACE I.D.



4 Phase Fully Actuated Isolated

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.
- Set all detector units to presence mode.



OASIS 2070 DETECTION ZONE INSTALLATION									
DETECTION ZONES					DETECTOR PROGRAMMING				
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	NEW ZONE	PHASE	CALLING	EXTENSION	STRETCH FULL TIME DELAY	DELAY TIME	SYSTEM ZONE
2A	6x6	420	Y	2	Y	Y	-	-	-
2B	6x40	0	-	2	Y	Y	2.0	5	-
3A	15x6	300	-	3	-	Y	2.4	-	-
3B	6x40	0	-	3	Y	Y	-	-	-
3C	6x40	0	-	3	Y	Y	-	-	-
3D	6x40	0	-	3	Y	Y	-	15	-
4A	6x40	0	-	4	Y	Y	-	-	-
4B	6x40	0	-	4	Y	Y	-	-	-
5A	6x40	0	-	5	Y	Y	-	15	-
5B	6x40	0	-	5	Y	Y	-	15	-
6A	6x6	420	-	6	Y	Y	-	-	-
6B	6x40	0	-	6	Y	Y	-	3	-
6C	6x40	0	-	6	Y	Y	2.0	5	-

OASIS 2070 TIMING CHART					
FEATURE	PHASE				
	2	3	4	5	6
Min Green 1 *	14	7	7	7	14
Extension 1 *	6.0	2.0	2.0	2.0	6.0
Max Green 1 *	100	30	30	20	100
Yellow Clearance	5.5	4.1	3.8	3.0	5.5
Red Clearance	1.4	1.5	1.6	2.9	1.4
Red Revert	2.0	2.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-	-
Don't Walk 1	-	-	-	-	-
Seconds Per Actuation *	-	-	-	-	-
Max Variable Initial *	-	-	-	-	-
Time Before Reduction *	15	-	-	-	15
Time To Reduce *	45	-	-	-	45
Minimum Gap	3.4	-	-	-	3.4
Recall Mode	MIN RECALL	-	-	-	MIN RECALL
Vehicle Call Memory	YELLOW	-	-	-	YELLOW
Dual Entry	-	-	-	-	-
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 Traffic Signal Head           |  | EXISTING Traffic Signal Head           |
|  | PROPOSED Modified Signal Head          |  | EXISTING Modified Signal Head          |
|  | PROPOSED Pedestrian Signal Head        |  | EXISTING Pedestrian Signal Head        |
|  | PROPOSED Signal Pole with Guy          |  | EXISTING Signal Pole with Guy          |
|  | PROPOSED Signal Pole with Sidewalk Guy |  | EXISTING Signal Pole with Sidewalk Guy |
|  | PROPOSED Inductive Loop Detector       |  | EXISTING Inductive Loop Detector       |
|  | PROPOSED Controller & Cabinet          |  | EXISTING Controller & Cabinet          |
|  | PROPOSED Junction Box                  |  | EXISTING Junction Box                  |
|  | PROPOSED 2-in Underground Conduit      |  | EXISTING 2-in Underground Conduit      |
|  | PROPOSED Right of Way                  |  | EXISTING Right of Way                  |
|  | PROPOSED Directional Arrow             |  | EXISTING Directional Arrow             |
|  | PROPOSED Construction Zone             |  | EXISTING Construction Zone             |
|  | PROPOSED Video Detection Zone          |  | EXISTING Video Detection Zone          |

Signal Upgrade - Temporary Design 2 - TCP Phase II

Prepared In the Offices of:

US 221-NC 194 at US 221 Business-NC 194/NC 163

Division 11 Ashe County near West Jefferson

PLAN DATE: September 2014 REVIEWED BY: Z.M. Little

PREPARED BY: C.L. Sweeney REVIEWED BY:

750 N. Greenfield Pkwy, Garner, NC 27529

Scale 0 40 1"=40'

DocuSigned by: *Zachary M. Little* 10/14/2014

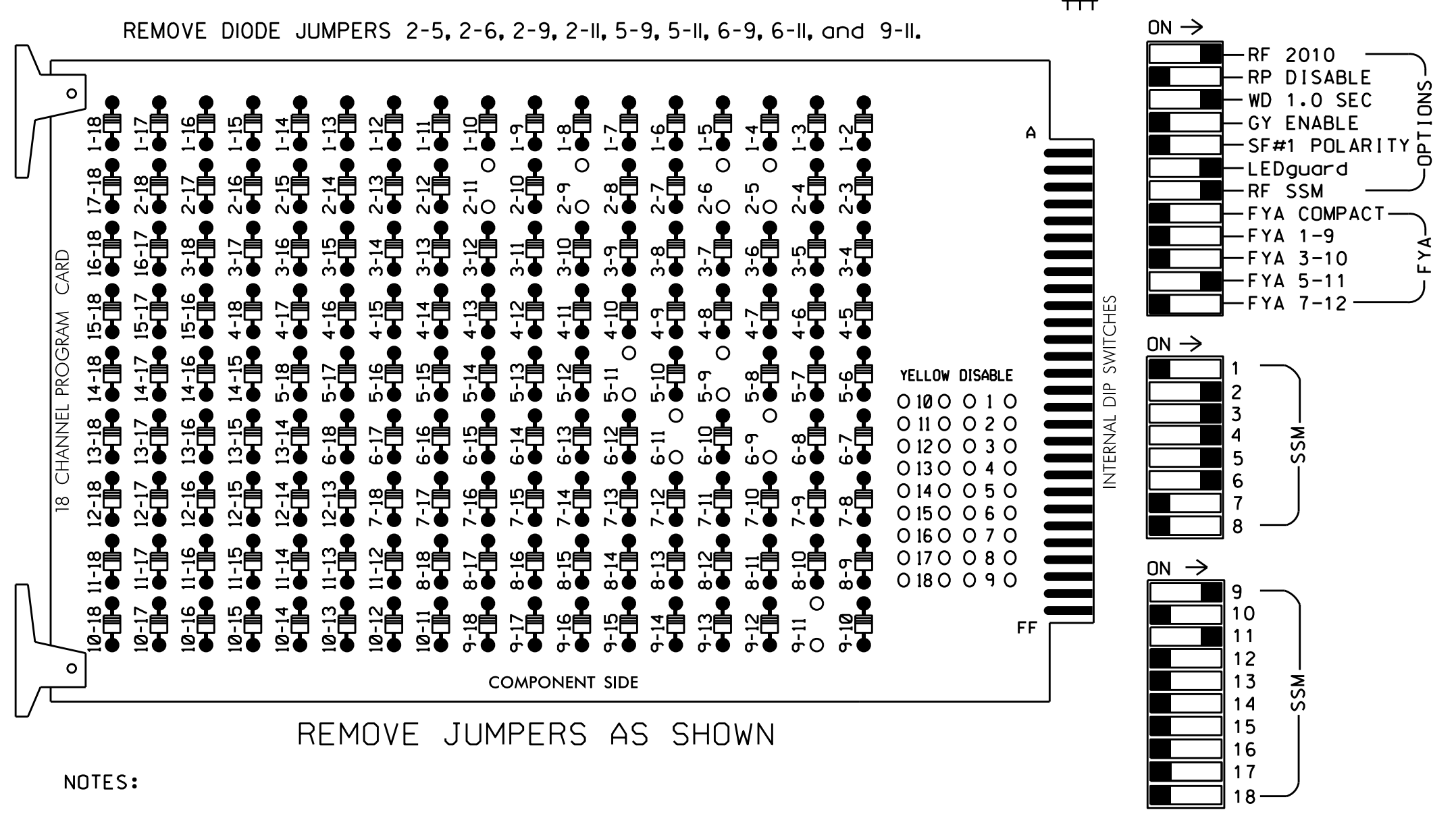
SIG. INVENTORY NO. II-0341 T2

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

**PROGRAMMING DETAIL**

(remove jumpers and set switches as shown)



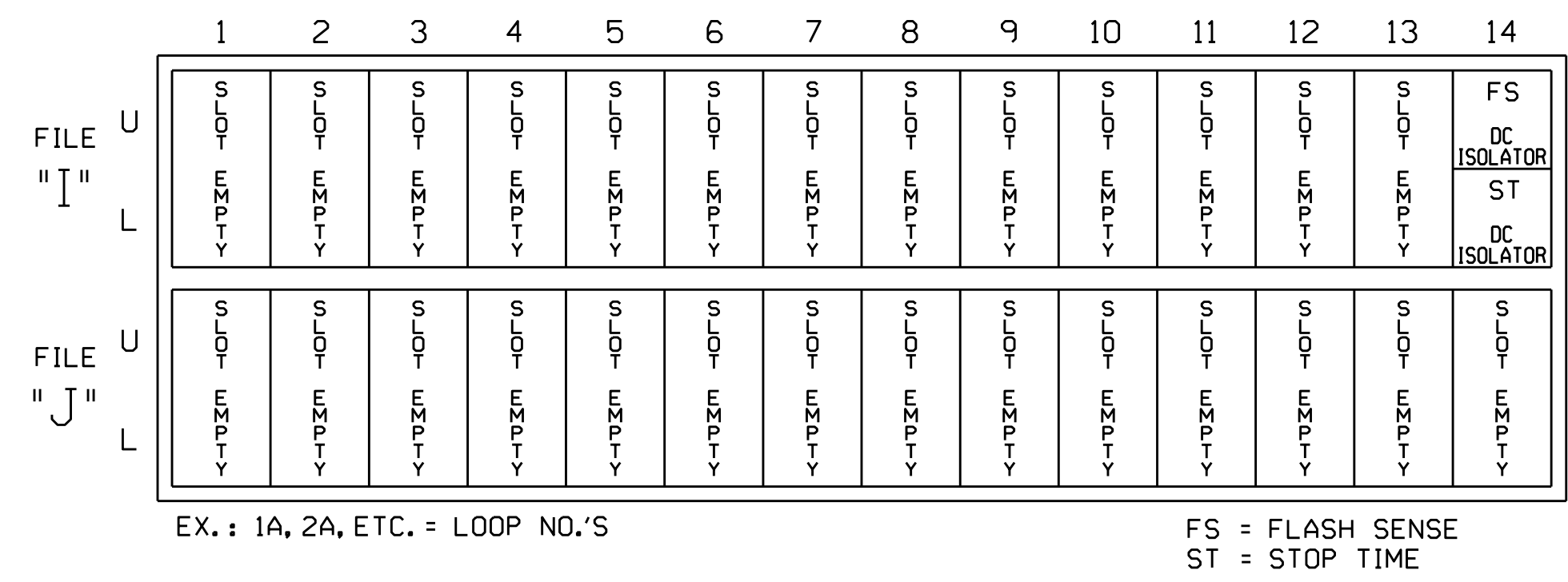
**SIGNAL HEAD HOOK-UP CHART**

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.	NU	21,22	NU	22	31	32	41	42	63	NU	42	51	61	62,63	NU	51	NU	NU
RED		128		116	116	101	101			*				134				
YELLOW		129		117	117	102	102							135				
GREEN		130		118	118	103	103							136				
RED ARROW																A121		A114
YELLOW ARROW				117				102		132						A122		A115
FLASHING YELLOW ARROW																A123		A116
GREEN ARROW				118	118	103	103	133	133									

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)



**SPECIAL DETECTOR NOTE**

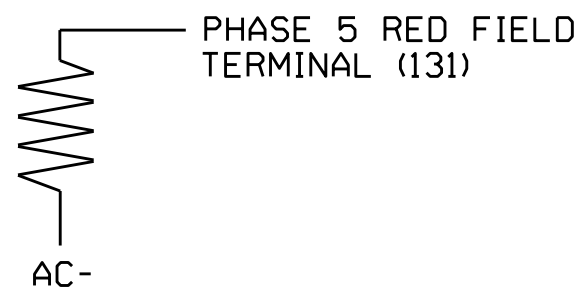
Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

**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)

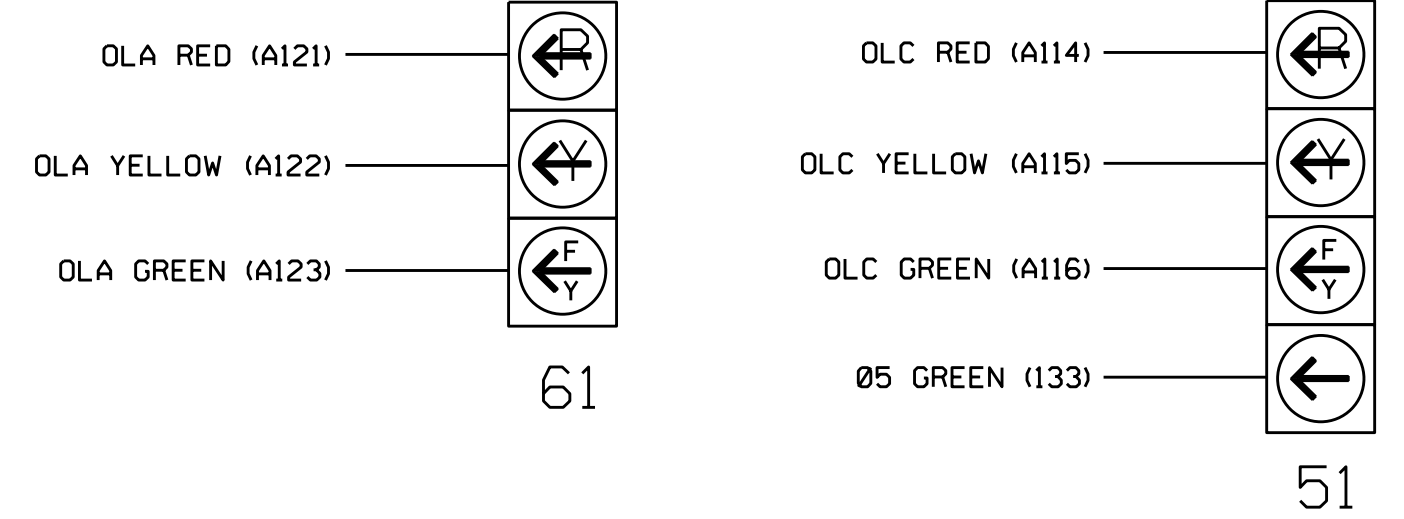


**NOTES**

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Enable Simultaneous Gap-Out for all phases.
- Program phases 2 and 6 for Gap Reduction.
- Program phases 2 and 6 for Start Up In Green.
- Program phases 2 and 6 for Yellow Flash, and overlap 1 as Wag Overlaps.

**FYA SIGNAL WIRING DETAIL**

(wire signal heads as shown)



NOTE  
 The sequence display for signal head 51 requires special logic programming. See sheet 2 for programming instructions.

**EQUIPMENT INFORMATION**

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

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-0341T2  
 DESIGNED: September 2014  
 SEALED: 10/14/2014  
 REVISED: N/A

Electrical Detail - Temporary Design 2 - TCP Phase II - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared in the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529	<b>US 221-NC 194</b> at <b>US 221 Business-NC 194/NC 163</b>		SEAL  JOHN T. ROWE, JR. ENGINEER 008453
	Division 11 PLAN DATE: October 2014 PREPARED BY: S. Armstrong	Ashe County REVIEWED BY: JTR REVIEWED BY:	

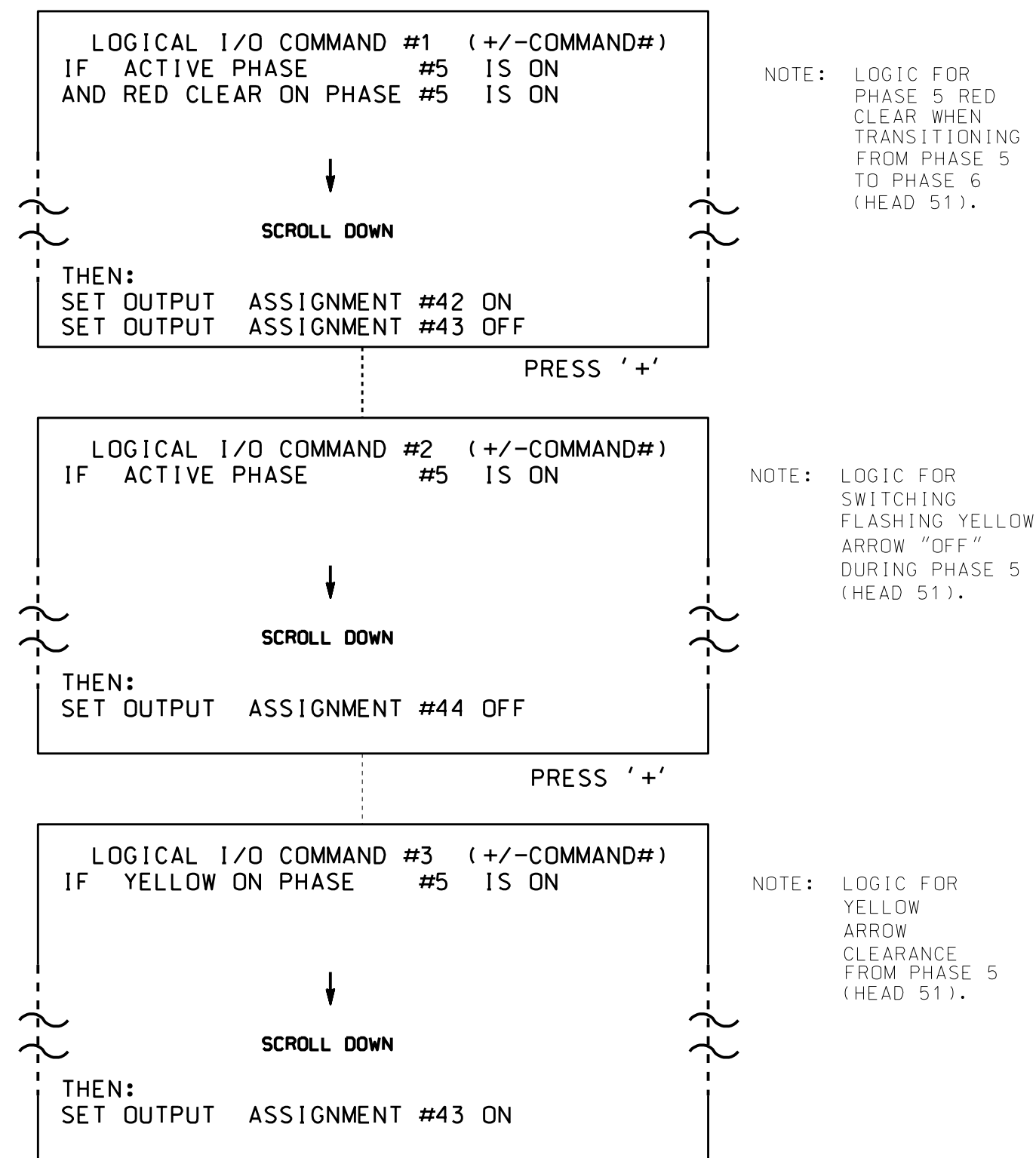
SIG. INVENTORY NO. 11-0341T2

15-0015-2014 15-016  
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 somstron

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

(program controller as shown below)

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



LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

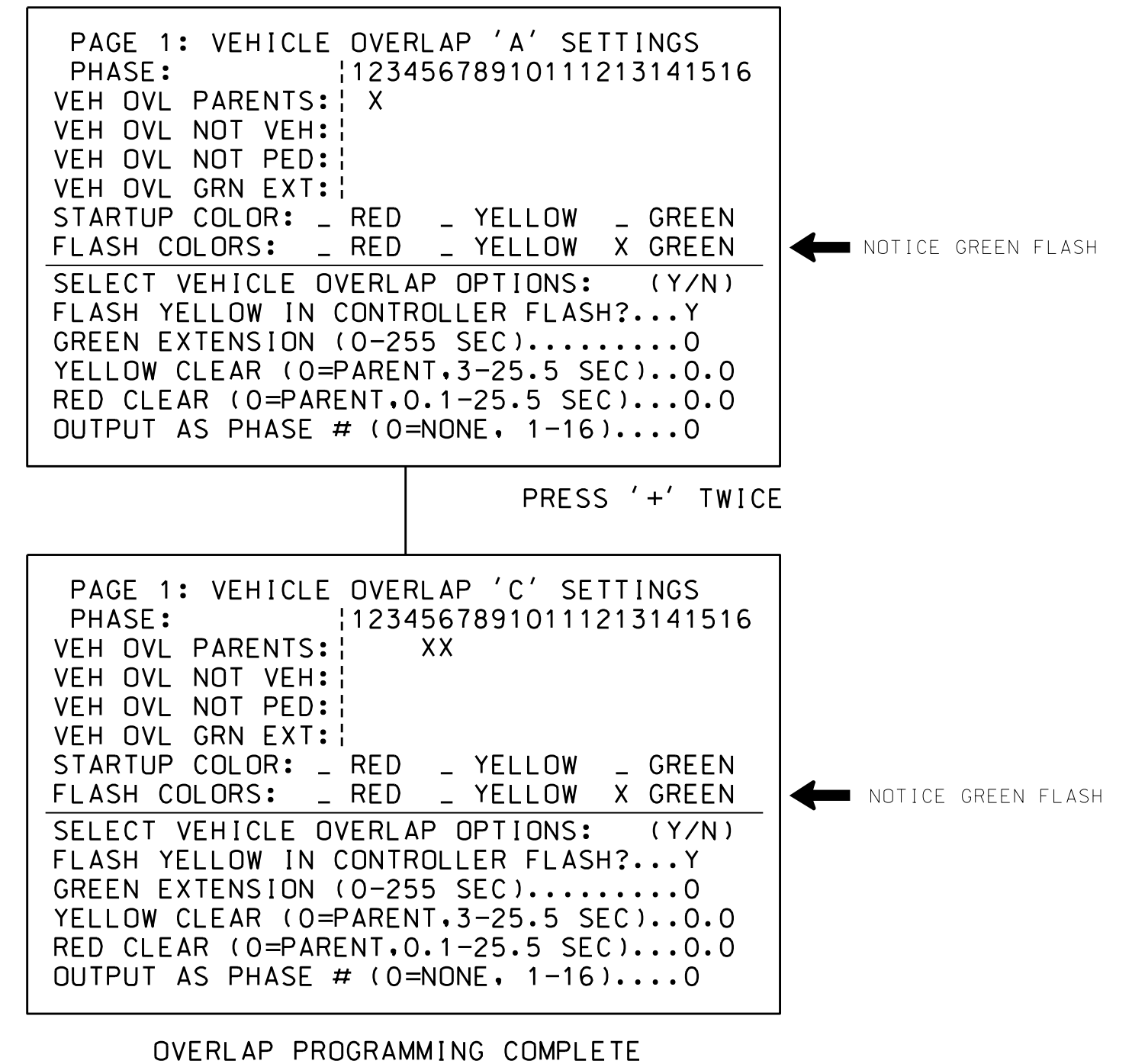
### OUTPUT REFERENCE SCHEDULE

OUTPUT 42 = Overlap C Red  
OUTPUT 43 = Overlap C Yellow  
OUTPUT 44 = Overlap C Green

## OVERLAP PROGRAMMING DETAIL

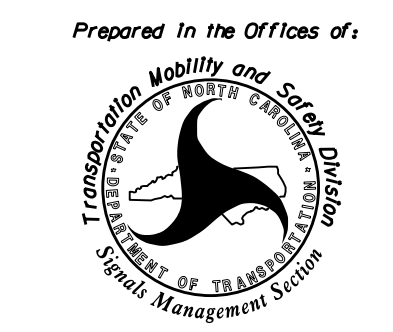
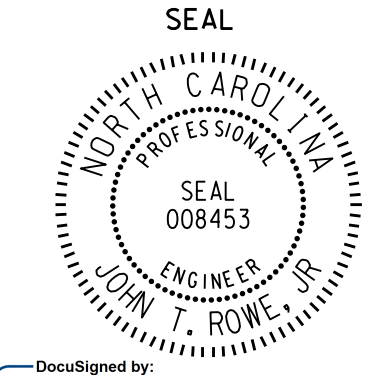
(program controller as shown below)

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

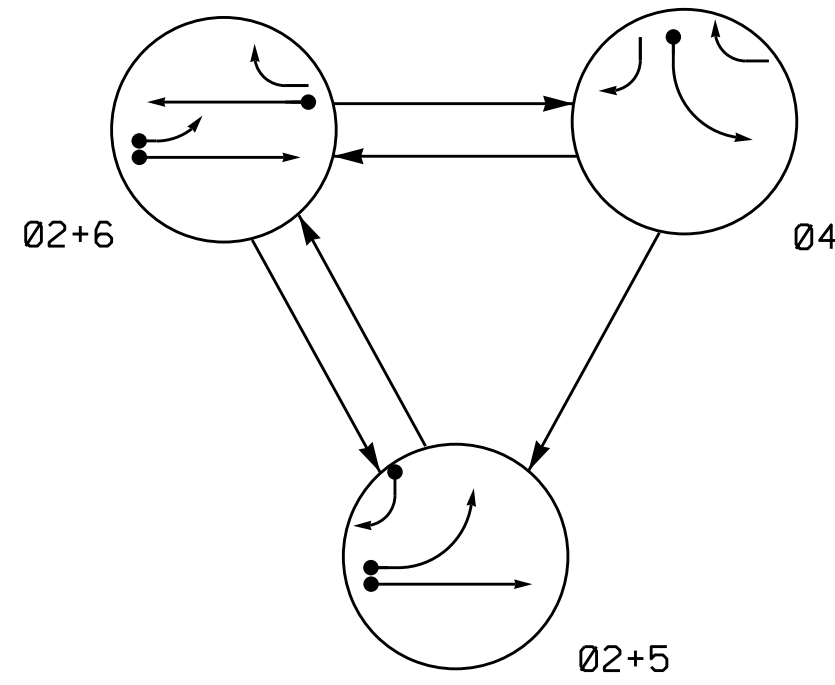


THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 11-0341T2  
DESIGNED: September 2014  
SEALED: 10/14/2014  
REVISED: N/A

Electrical Detail - Temporary Design 2 - TCP Phase II - Sheet 2 of 2

<p>Prepared In the Offices of:</p>  <p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p><b>US 221-NC 194</b> at <b>US 221 Business-NC 194/NC 163</b></p> <p>Division 11    Ashe County    near West Jefferson</p> <p>PLAN DATE: October 2014    REVIEWED BY: JTR</p> <p>PREPARED BY: S. Armstrong    REVIEWED BY:</p>	<p>SEAL</p>  <p>SEAL 008453 ENGINEER JOHN T. ROWE, JR.</p>									
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>REVISIONS</th> <th>INIT.</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>		REVISIONS	INIT.	DATE							<p>DocuSigned by: <b>John T. Rowe, Jr.</b>    10/17/2014</p> <p style="font-size: small;">841D60C148EE4F3    DATE</p>
REVISIONS	INIT.	DATE									
<p>SIG. INVENTORY NO. 11-0341T2</p>											

PHASING DIAGRAM

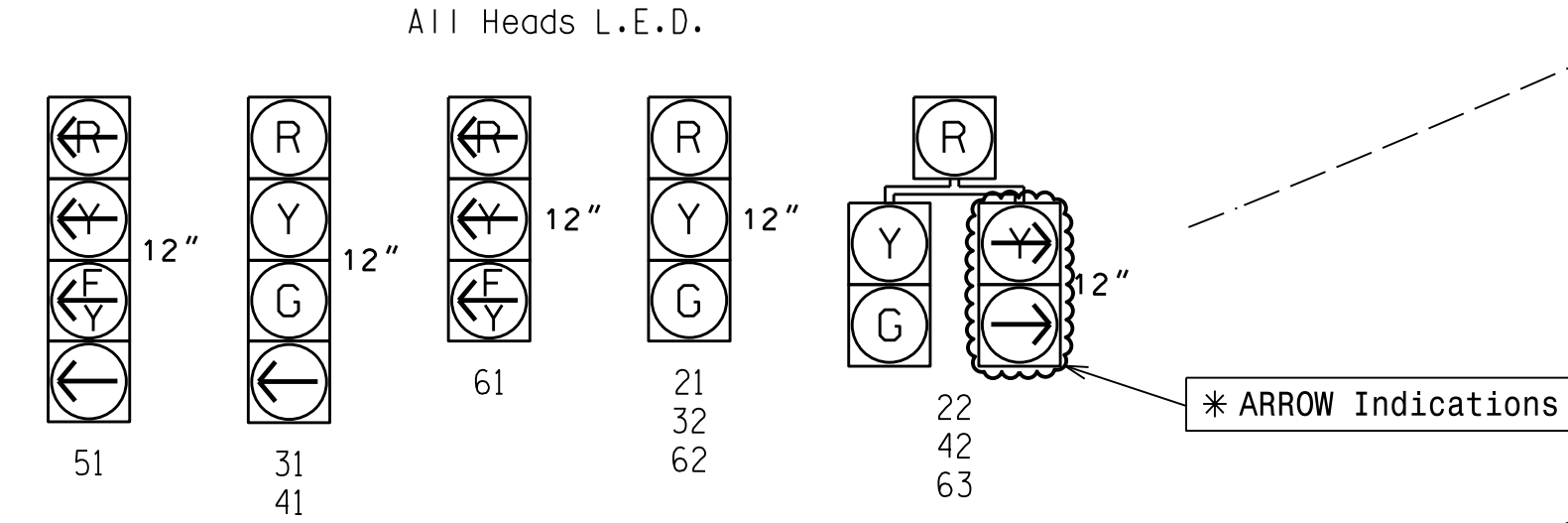


SIGNAL FACE	PHASE			
	Ø 2+5	Ø 2+6	Ø 4	FLASH
21	G	G	R	Y
22	G	G	R	Y
41	R	R	G	R
42	R	R	G	R
51	-	F	R	Y
62	R	G	R	Y
63	R	G	R	Y

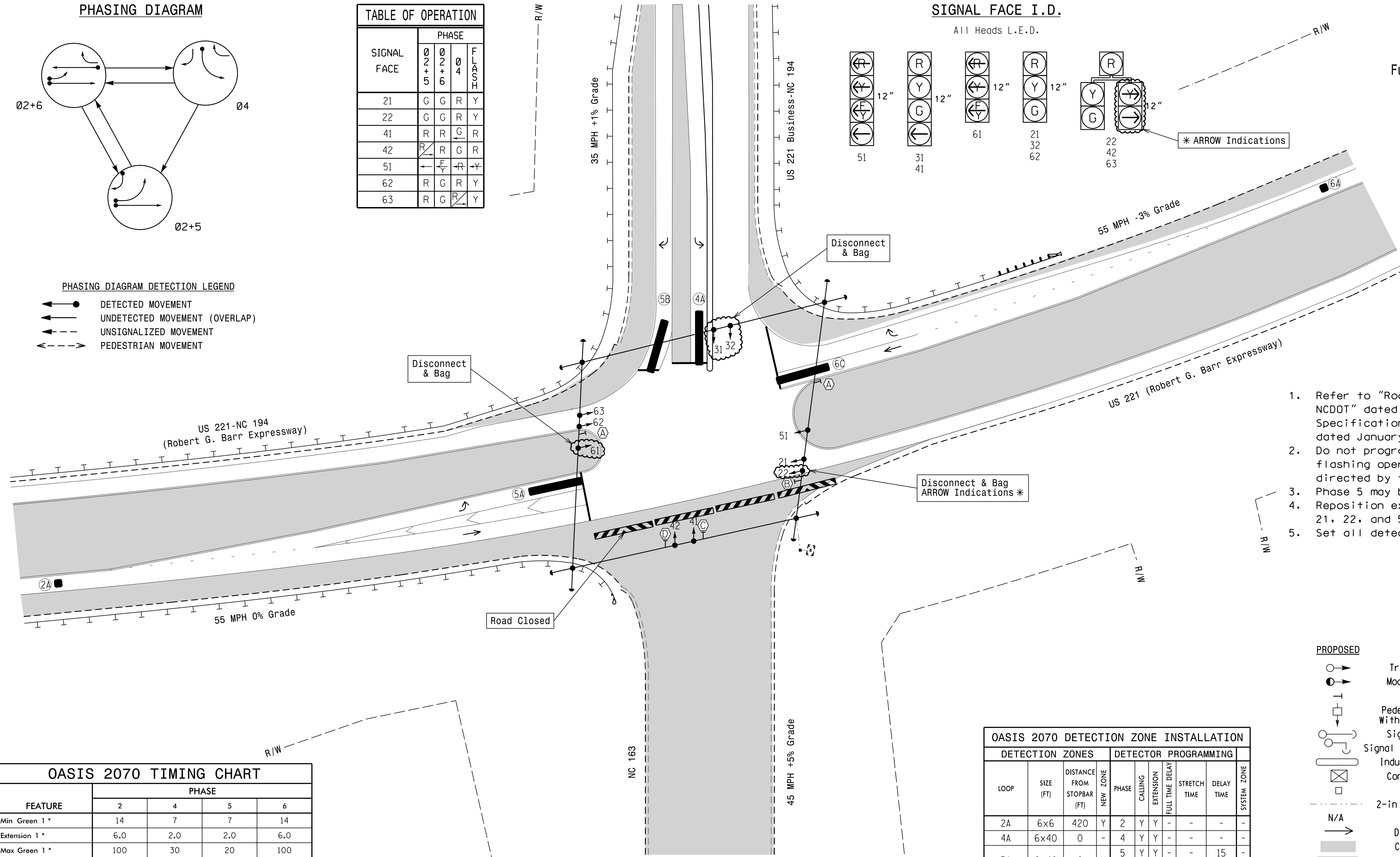
PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.



3 Phase Fully Actuated Isolated



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, and 51.
- Set all detector units to presence mode.

LEGEND

- | PROPOSED | EXISTING |
|----------|----------|
|          |          |
|          |          |
|          |          |
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|          |          |
|          |          |

FEATURE	PHASE			
	2	4	5	6
Min Green 1 *	14	7	7	14
Extension 1 *	6.0	2.0	2.0	6.0
Max Green 1 *	100	30	20	100
Yellow Clearance	5.5	3.0	3.0	5.5
Red Clearance	1.8	3.2	3.8	1.8
Red Revert	2.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	15	-	-	15
Time To Reduce *	45	-	-	45
Minimum Gap	3.4	-	-	3.4
Recall Mode	MIN RECALL	-	-	MIN RECALL
Vehicle Call Memory	YELLOW	-	-	YELLOW
Dual Entry	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON

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

OASIS 2070 DETECTION ZONE INSTALLATION									
DETECTION ZONES				DETECTOR PROGRAMMING					
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	NEW ZONE	PHASE	CALLING	EXTENSION	STRETCH TIME	DELAY TIME	SYSTEM ZONE
2A	6x6	420	Y	2	Y	Y	-	-	-
4A	6x40	0	-	4	Y	Y	-	-	-
5A	6x40	0	Y	2	Y	Y	-	3	-
5B	6x40	0	-	5	Y	Y	-	15	-
6A	6x6	420	-	6	Y	Y	-	-	-
6C	6x40	0	-	6	Y	Y	2.0	5	-

Signal Upgrade - Temporary Design 3 - TCP Phase III (Step 1)

	<p>US 221-NC 194 at US 221 Business-NC 194/NC 163</p>	
	<p>Division 11 Ashe County near West Jefferson</p>	<p>PLANNED BY: C.L. Sweeney</p>
<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>REVISIONS</p>	<p>DATE</p>
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<p>DocuSigned by: Zachary M. Little</p>	<p>10/14/2014</p>	<p>DATE</p>
<p>SIG. INVENTORY NO. II-0341 T3</p>	<p>DATE</p>	<p>DATE</p>

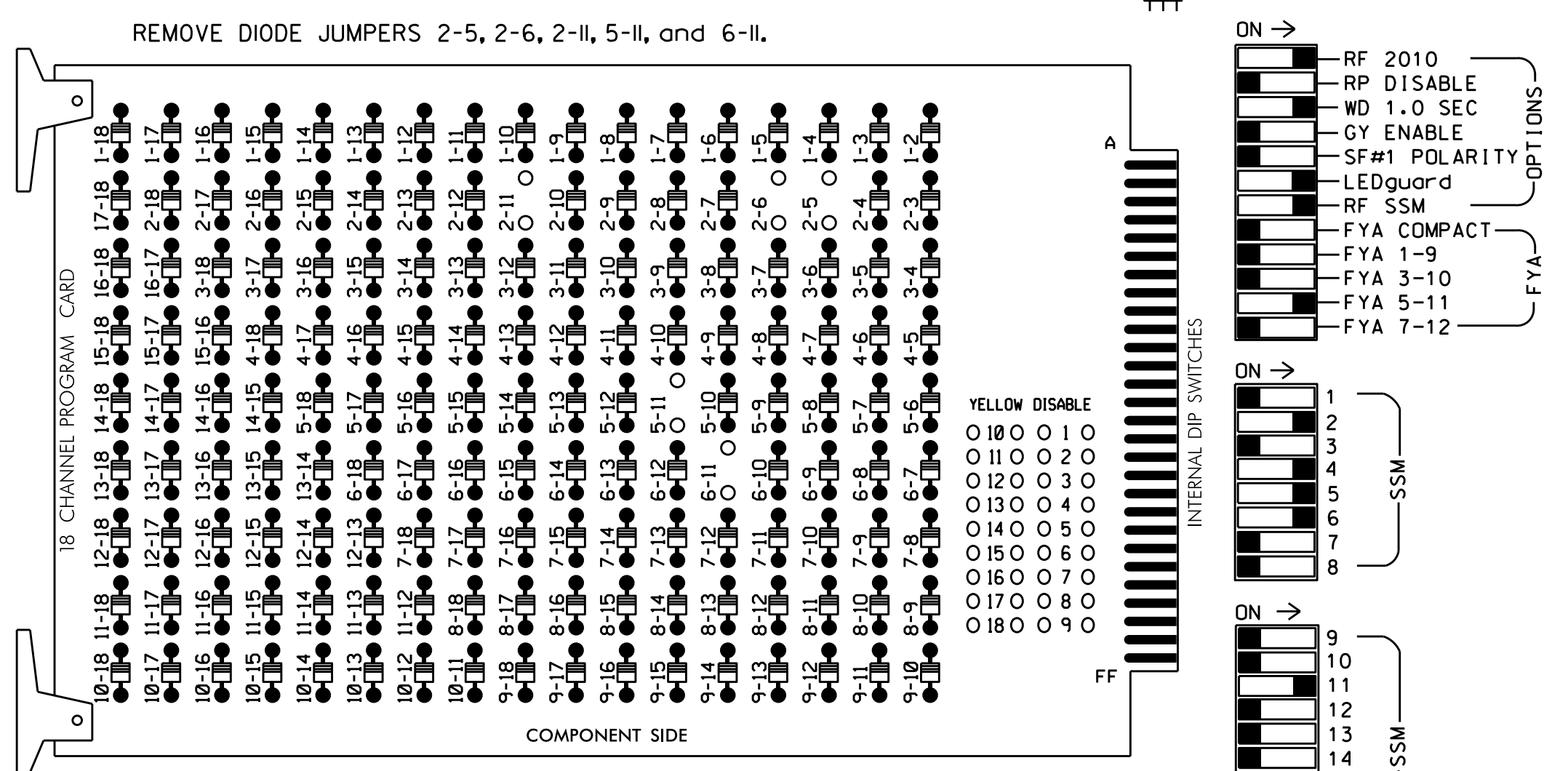
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EDI MODEL 2018ECL-NC CONFLICT MONITOR

PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

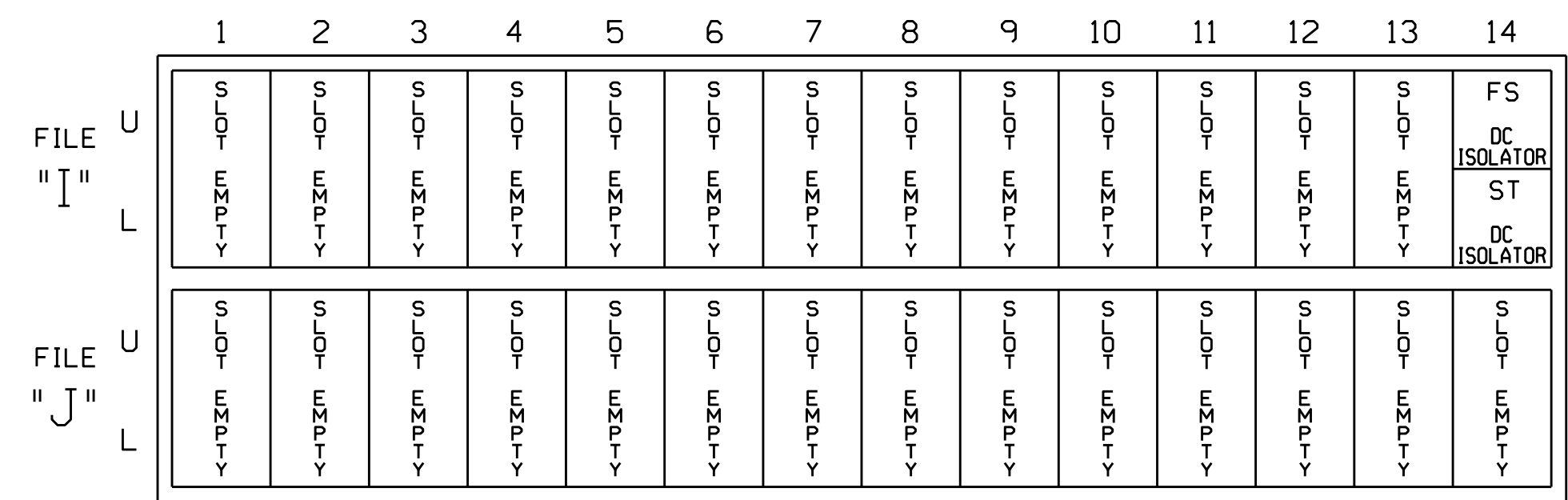


NOTES:

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.

INPUT FILE POSITION LAYOUT

(front view)



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

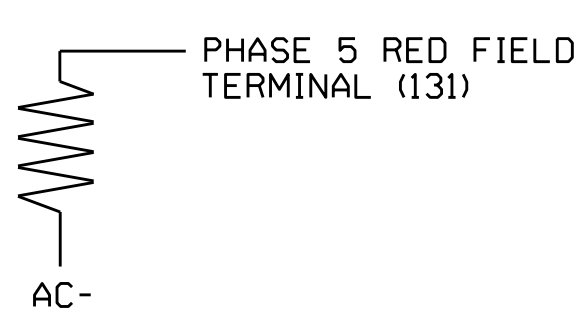
SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

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)



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.	NU	21,22	NU	NU	41	42	63	NU	42	51*	62,63	NU	NU	NU	NU	51*	NU	NU	
RED		128			101	101			*		134								
YELLOW		129			102	102					135								
GREEN		130			103	103					136								
RED ARROW																		A114	
YELLOW ARROW								102		132									A115
FLASHING YELLOW ARROW																			A116
GREEN ARROW					103	103			133	133									

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

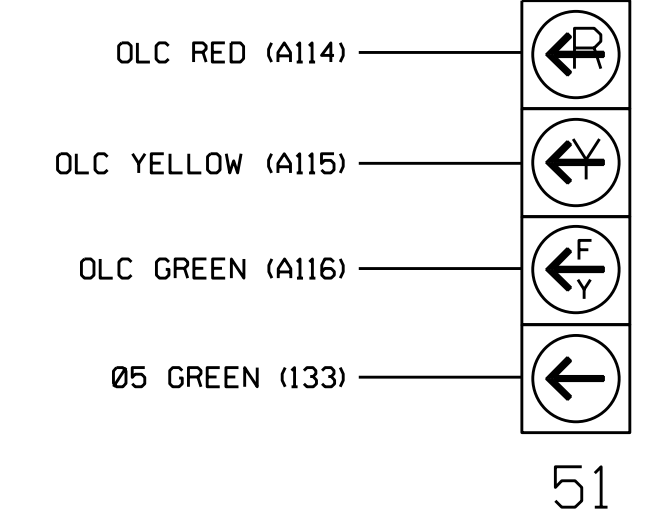
NOTE: disconnect and bag signal heads 31, 32, 61, and the right turn indicators of five-section head 22. Remove loadswitches S4 and AUX S1 from Output File and Aux Output File respectively.

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. Enable Simultaneous Gap-Out for all phases.
3. Program phases 2 and 6 for Gap Reduction.
4. Program phases 2 and 6 for Start Up In Green.
5. Program phases 2 and 6 for Yellow Flash. ~~and overlap as Wag Overlaps.~~

FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



NOTE: The sequence display for signal head 51 requires special logic programming. See sheet 2 for programming instructions.

EQUIPMENT INFORMATION

CONTROLLER.....2070L  
 CABINET.....332 W/ AUX  
 SOFTWARE.....ECONOLITE OASIS  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE  
 LOAD SWITCHES USED.....S2,S5,S7,S8,AUX S4  
 PHASES USED.....2,X,4,5,6  
 OVERLAP "A".....X NOT USED  
 OVERLAP "B".....NOT USED  
 OVERLAP "C".....5+6  
 OVERLAP "D".....NOT USED

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-0341T3  
 DESIGNED: September 2014  
 SEALED: 10/14/2014  
 REVISED: N/A

Electrical Detail - Temporary Design 3 - TCP Phase III (Step 1) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared In the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529	US 221-NC 194 at US 221 Business-NC 194/NC 163		SEAL  JOHN T. ROWE, JR. ENGINEER
	Division 11 PLAN DATE: October 2014 PREPARED BY: S. Armstrong	Ashe County near West Jefferson REVIEWED BY: JTR REVIEWED BY:	

DocuSigned by: John T. Rowe, Jr. 10/17/2014  
 041000145EE4F5  
 DATE: 10/17/2014  
 SIG. INVENTORY NO. 11-0341T3

15-0015-2014 15-08  
 S:\IT\ASIS\ITS\_Signals\work\grouse\51g\_Mon\armstrong\10341\_5m\_e16\_xxx.dgn  
 somstr009

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

(program controller as shown below)

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

LOGICAL I/O COMMAND #1 (+/-COMMAND#)  
IF ACTIVE PHASE #5 IS ON  
AND RED CLEAR ON PHASE #5 IS ON

↓  
SCROLL DOWN

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

PRESS '+'

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

LOGICAL I/O COMMAND #2 (+/-COMMAND#)  
IF ACTIVE PHASE #5 IS ON

↓  
SCROLL DOWN

THEN:  
SET OUTPUT ASSIGNMENT #44 OFF

PRESS '+'

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

LOGICAL I/O COMMAND #3 (+/-COMMAND#)  
IF YELLOW ON PHASE #5 IS ON

↓  
SCROLL DOWN

THEN:  
SET OUTPUT ASSIGNMENT #43 ON

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

LOGIC I/O PROCESSOR PROGRAMMING COMPLETE

**OUTPUT REFERENCE SCHEDULE**

OUTPUT 42 = Overlap C Red  
OUTPUT 43 = Overlap C Yellow  
OUTPUT 44 = Overlap C Green

### OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

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

PAGE 1: VEHICLE OVERLAP 'A' SETTINGS

PHASE: |12345678910111213141516

VEH OVL PARENTS: | X

VEH OVL NOT VEH: |

VEH OVL NOT PED: |

VEH OVL GRN EXT: |

STARTUP COLOR: | RED | YELLOW | GREEN

FLASH COLORS: | RED | YELLOW | X GREEN

SELECT VEHICLE OVERLAP OPTIONS: (Y/N)

FLASH YELLOW IN CONTROLLER FLASH?...Y

GREEN EXTENSION (0-255 SEC)...0.0

YELLOW CLEAR (0=PARENT,3-25.5 SEC)...0.0

RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0

OUTPUT AS PHASE # (0=NONE, 1-16)...0

← NOTICE GREEN FLASH

PRESS '+' TWICE

PAGE 1: VEHICLE OVERLAP 'C' SETTINGS

PHASE: |12345678910111213141516

VEH OVL PARENTS: | XX

VEH OVL NOT VEH: |

VEH OVL NOT PED: |

VEH OVL GRN EXT: |

STARTUP COLOR: | RED | YELLOW | GREEN

FLASH COLORS: | RED | YELLOW | X GREEN

SELECT VEHICLE OVERLAP OPTIONS: (Y/N)

FLASH YELLOW IN CONTROLLER FLASH?...Y

GREEN EXTENSION (0-255 SEC)...0.0

YELLOW CLEAR (0=PARENT,3-25.5 SEC)...0.0

RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0

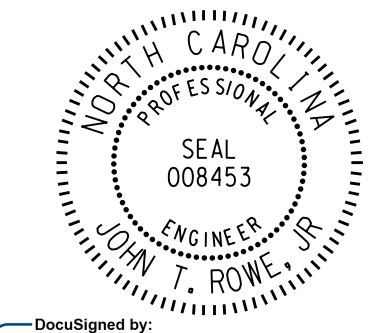

OUTPUT AS PHASE # (0=NONE, 1-16)...0

← NOTICE GREEN FLASH

OVERLAP PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 11-0341T3  
DESIGNED: September 2014  
SEALED: 10/14/2014  
REVISED: N/A

Electrical Detail - Temporary Design 3 - TCP Phase III (Step 1) - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:	<b>US 221-NC 194</b> at <b>US 221 Business-NC 194/NC 163</b>	SEAL 
	Prepared In the Offices of: S. Armstrong 750 N. Greenfield Pkwy, Garner, NC 27529	Division 11 PLAN DATE: October 2014 PREPARED BY: S. Armstrong REVIEWED BY: JTR ASHE COUNTY near West Jefferson
REVISIONS	INIT.	DATE
DocuSigned by: <b>John T. Rowe, Jr.</b> 10/17/2014 <small>0410600145EE4F3</small>		
SIG. INVENTORY NO. 11-0341T3		

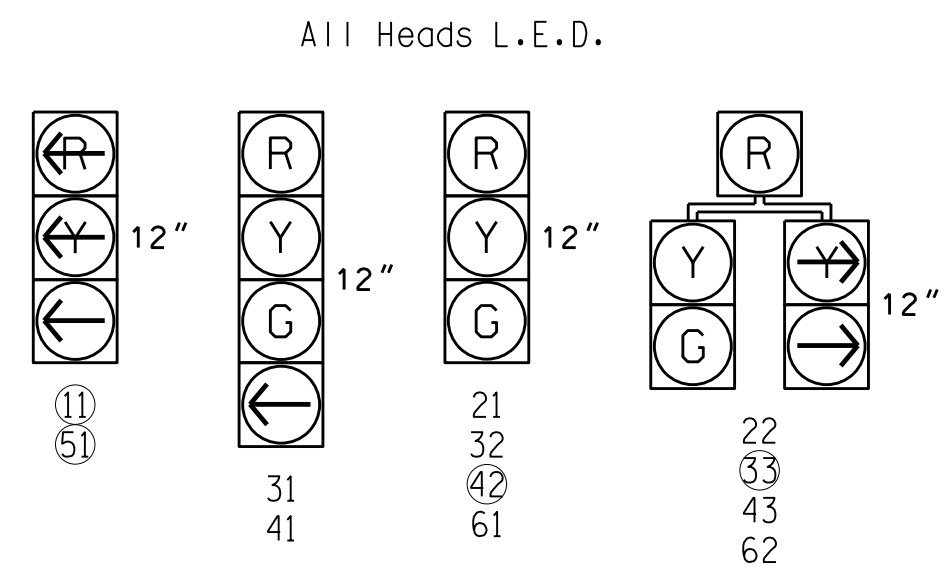
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Signal Cable

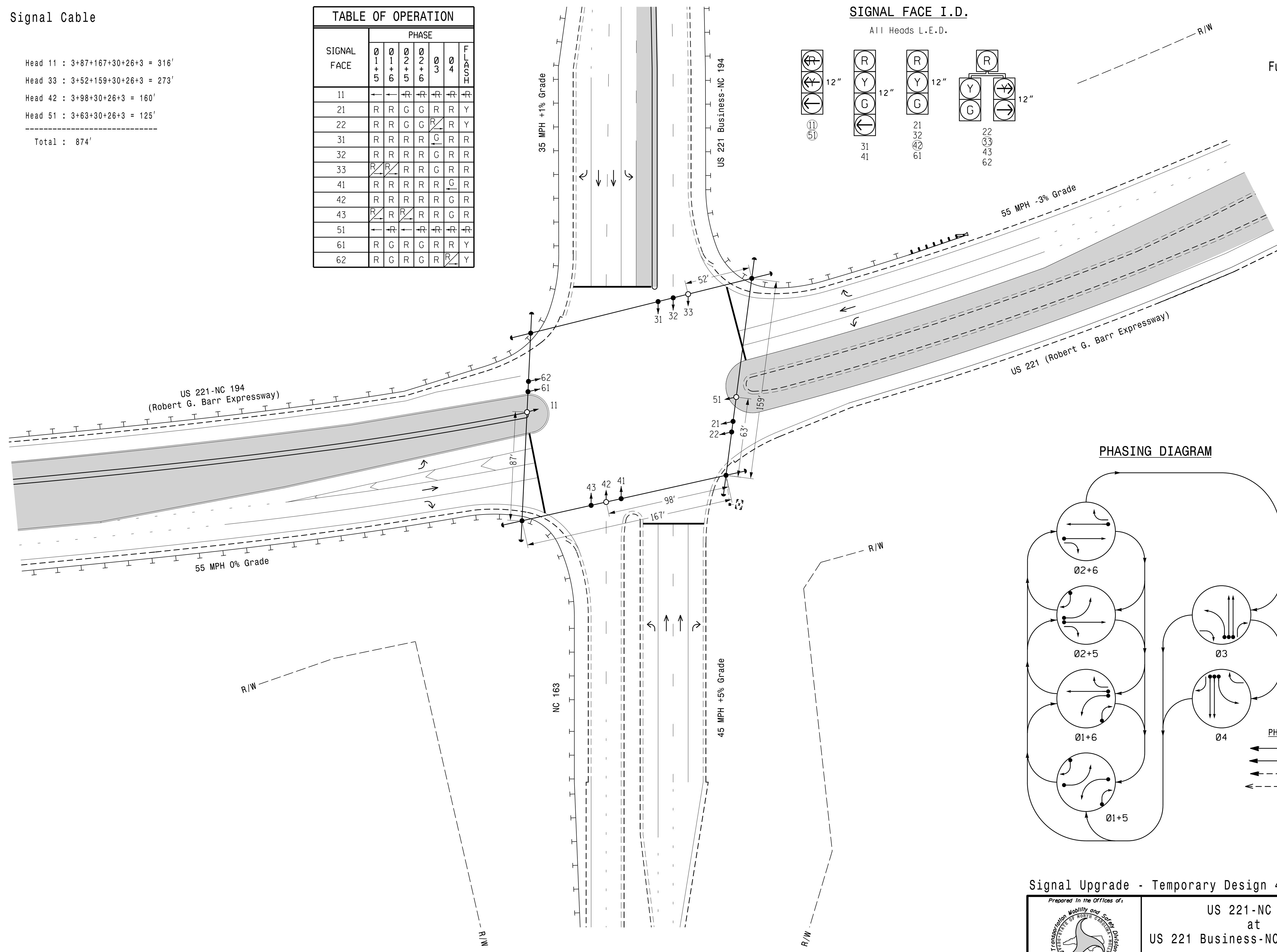
Head 11 : 3+87+167+30+26+3 = 316'  
 Head 33 : 3+52+159+30+26+3 = 273'  
 Head 42 : 3+98+30+26+3 = 160'  
 Head 51 : 3+63+30+26+3 = 125'  
 -----  
 Total : 874'

SIGNAL FACE	PHASE					FLASH
	Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3	
11	-	-	R	R	R	R
21	R	R	G	G	R	Y
22	R	R	G	G	R	Y
31	R	R	R	R	G	R
32	R	R	R	R	G	R
33	R	R	R	R	G	R
41	R	R	R	R	G	R
42	R	R	R	R	G	R
43	R	R	R	R	G	R
51	-	-	R	R	R	R
61	R	G	R	G	R	Y
62	R	G	R	G	R	Y

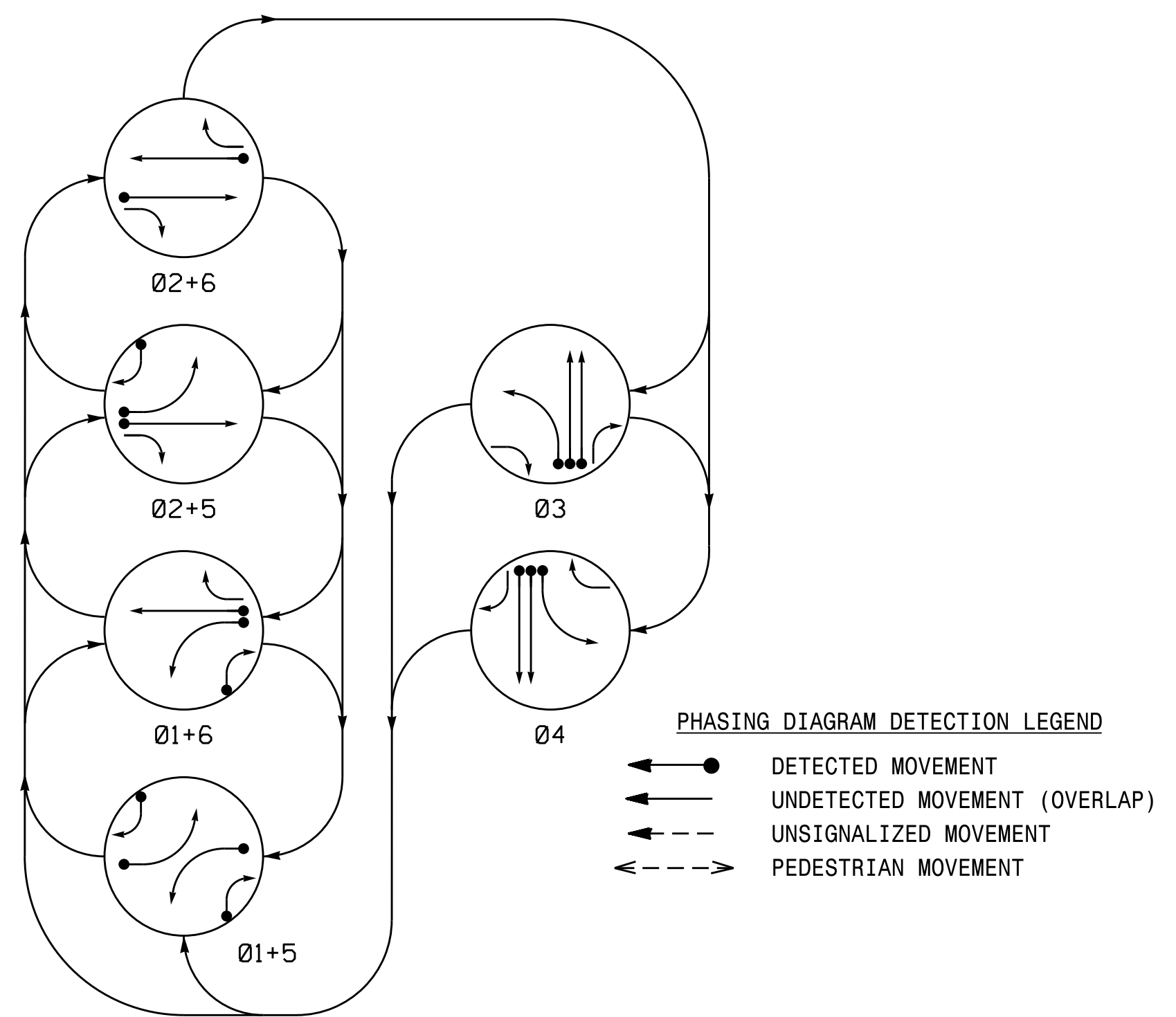
SIGNAL FACE I.D.



6 Phase Fully Actuated Isolated



PHASING DIAGRAM



Signal Upgrade - Temporary Design 4 - TCP Phase III (Step 5)

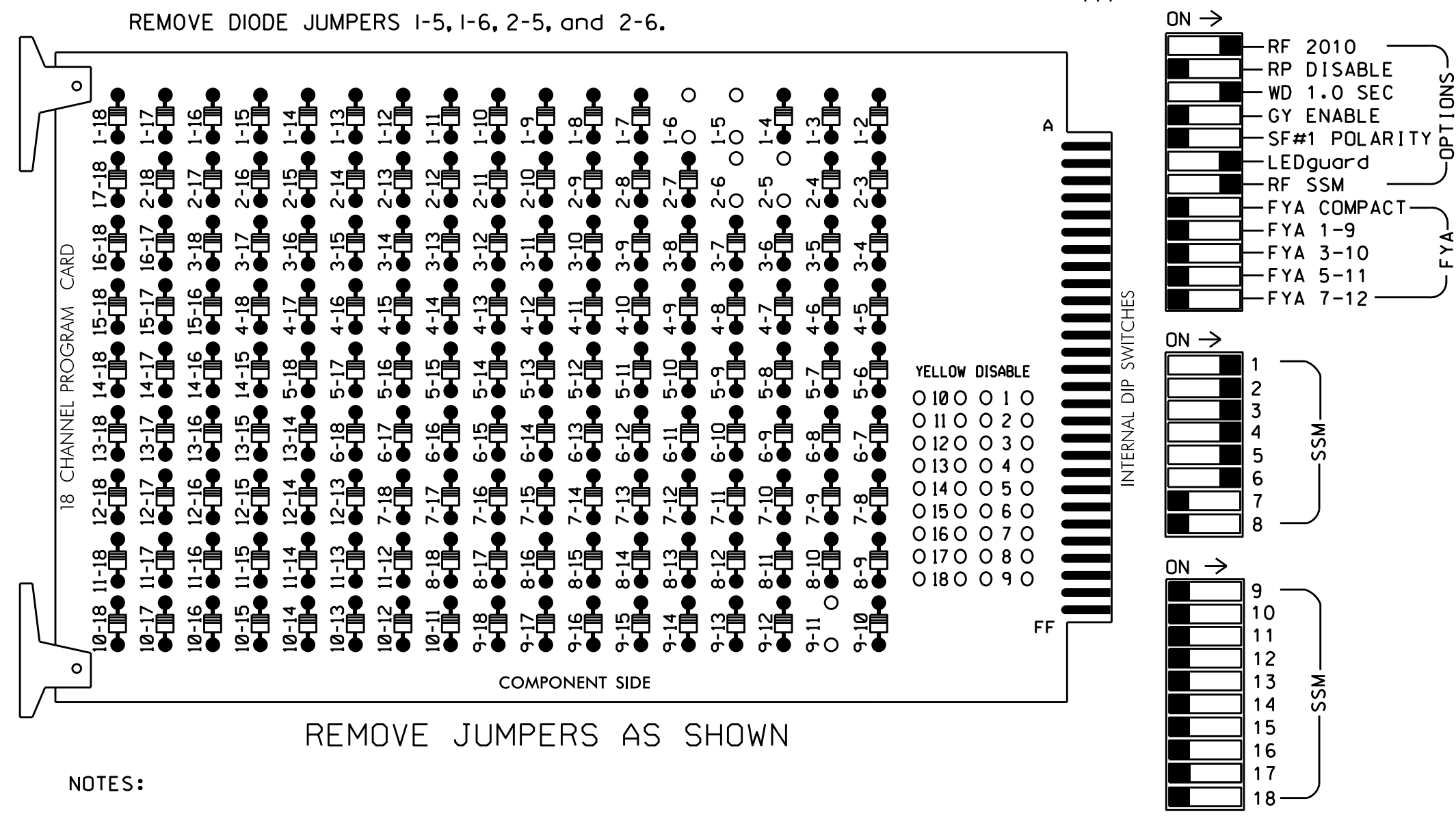
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	Division 11 Ashe County near West Jefferson							
	PLAN DATE: September 2014	REVIEWED BY: Z.M. Little						
	PREPARED BY: C.L. Sweeney	REVIEWED BY:						
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28-Oct-2014 11:23  
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EDI MODEL 2018ECL-NC CONFLICT MONITOR

PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

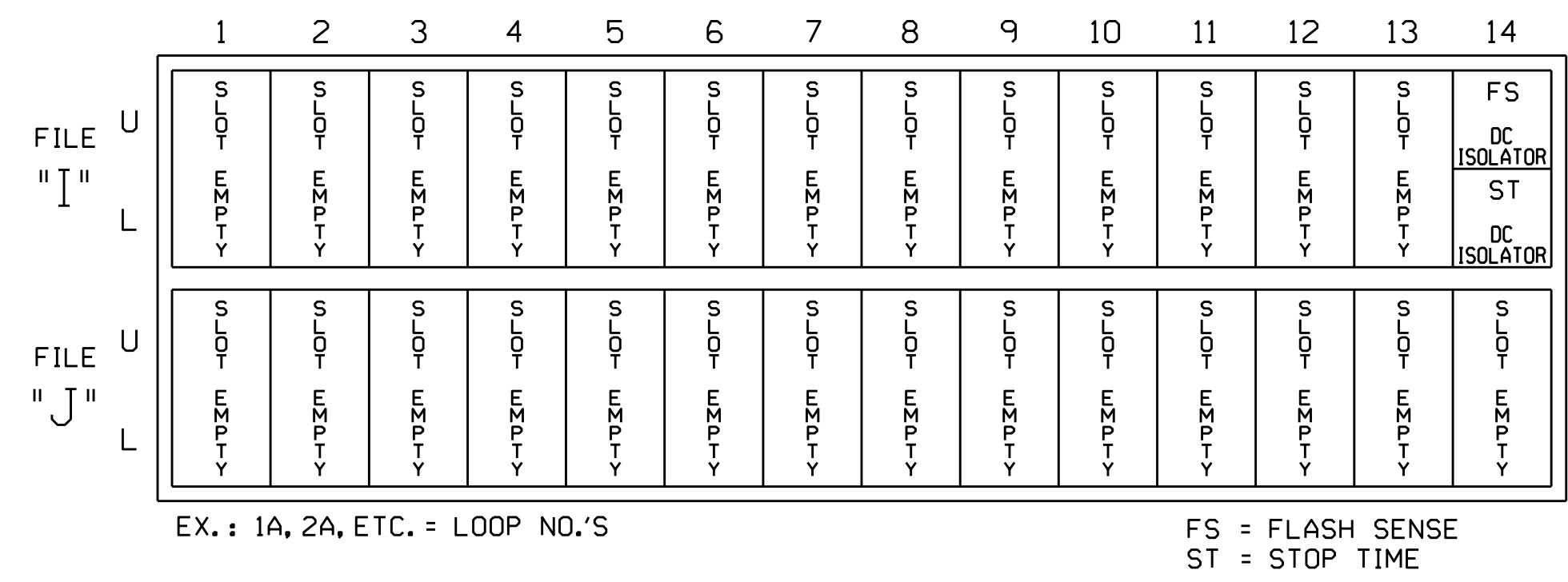


NOTES:

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.

INPUT FILE POSITION LAYOUT

(front view)



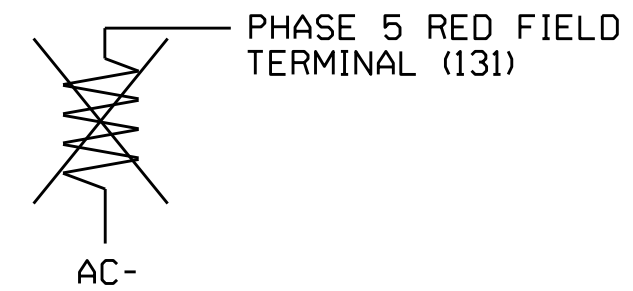
SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

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)



Remove load resistor as shown above.

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	33	21,22	NU	22	31	32,33	41	42,43	62	NU	43	51	61,62	NU	NU	NU	NU
RED			128		116	116	101	101					134					
YELLOW			129		117	117	102	102					135					
GREEN			130		118	118	103	103					136					
RED ARROW	125											131						
YELLOW ARROW	126	126			117				102		132	132						
FLASHING YELLOW ARROW																		
GREEN ARROW	127	127			118	118	103	103	133	133								

NU = Not Used

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. Enable Simultaneous Gap-Out for all phases.
3. Program phases 2 and 6 for Gap Reduction.
4. Program phases 2 and 6 for Start Up In Green.
5. Program phases 2 and 6 for Yellow Flash.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 11-0341T4  
DESIGNED: September 2014  
SEALED: 10/14/2014  
REVISED: N/A

EQUIPMENT INFORMATION

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

Electrical Detail - Temporary Design 4 - TCP Phase III (Step 5) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared in the Offices of: 750 N. Greenfield Pkwy, Garner, NC 27529	US 221-NC 194 at US 221 Business-NC 194/NC 163		SEAL 
	Division 11 PLAN DATE: October 2014 PREPARED BY: S. Armstrong	Ashe County near West Jefferson REVIEWED BY: JTR REVIEWED BY:	

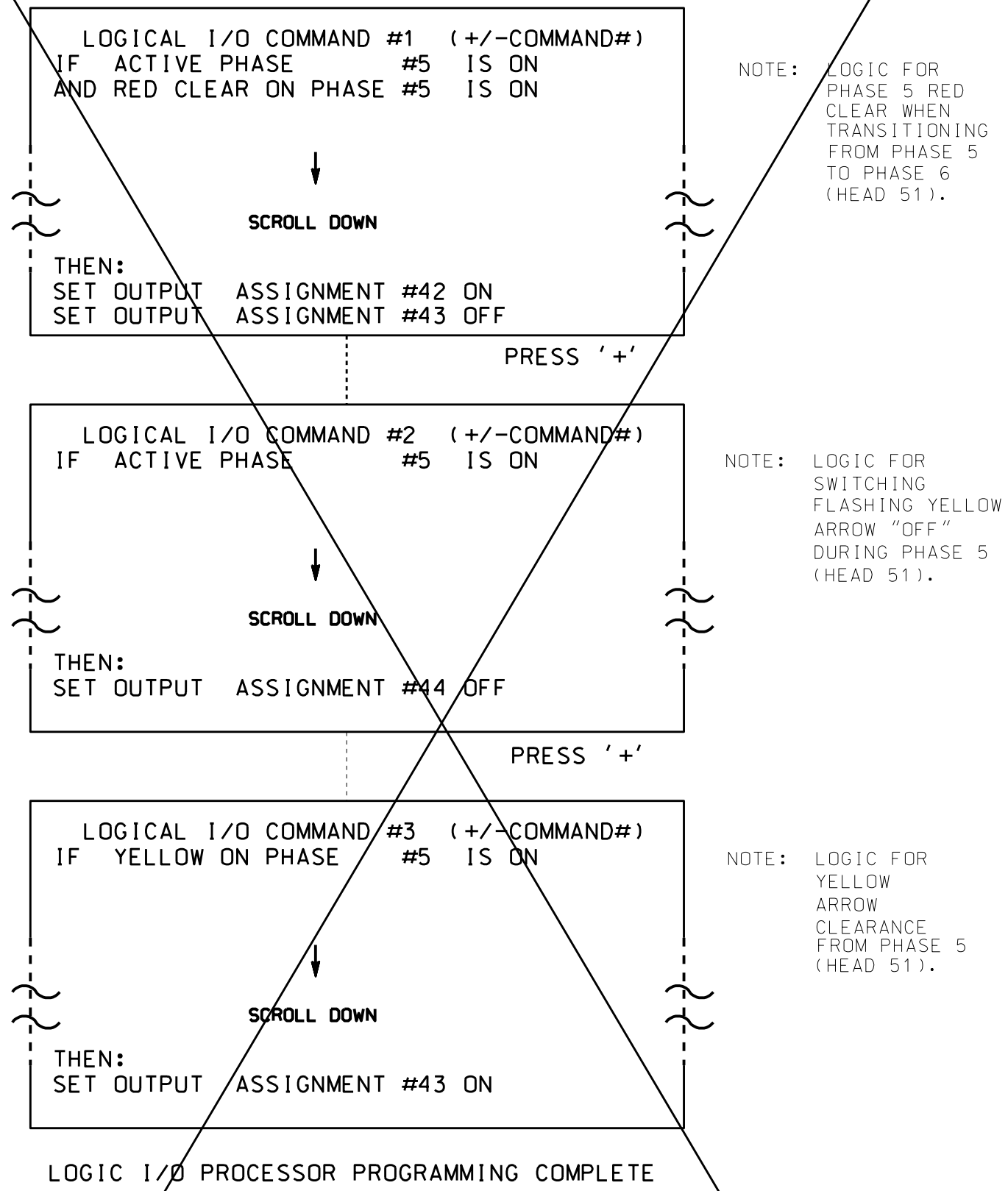
DocuSigned by:  
**John T. Rowe, Jr.** 10/17/2014  
941D600145EE4F5  
SIC. INVENTORY NO. 11-0341T4

15-0075-2014 15-10 S:\TCS\5041T5\Sigma\work\grouse\51g\_MonMstr\mstr\cong\110341\_5m\_e1b\_xxx.dgn somstr009

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

*(program controller as shown below)*

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

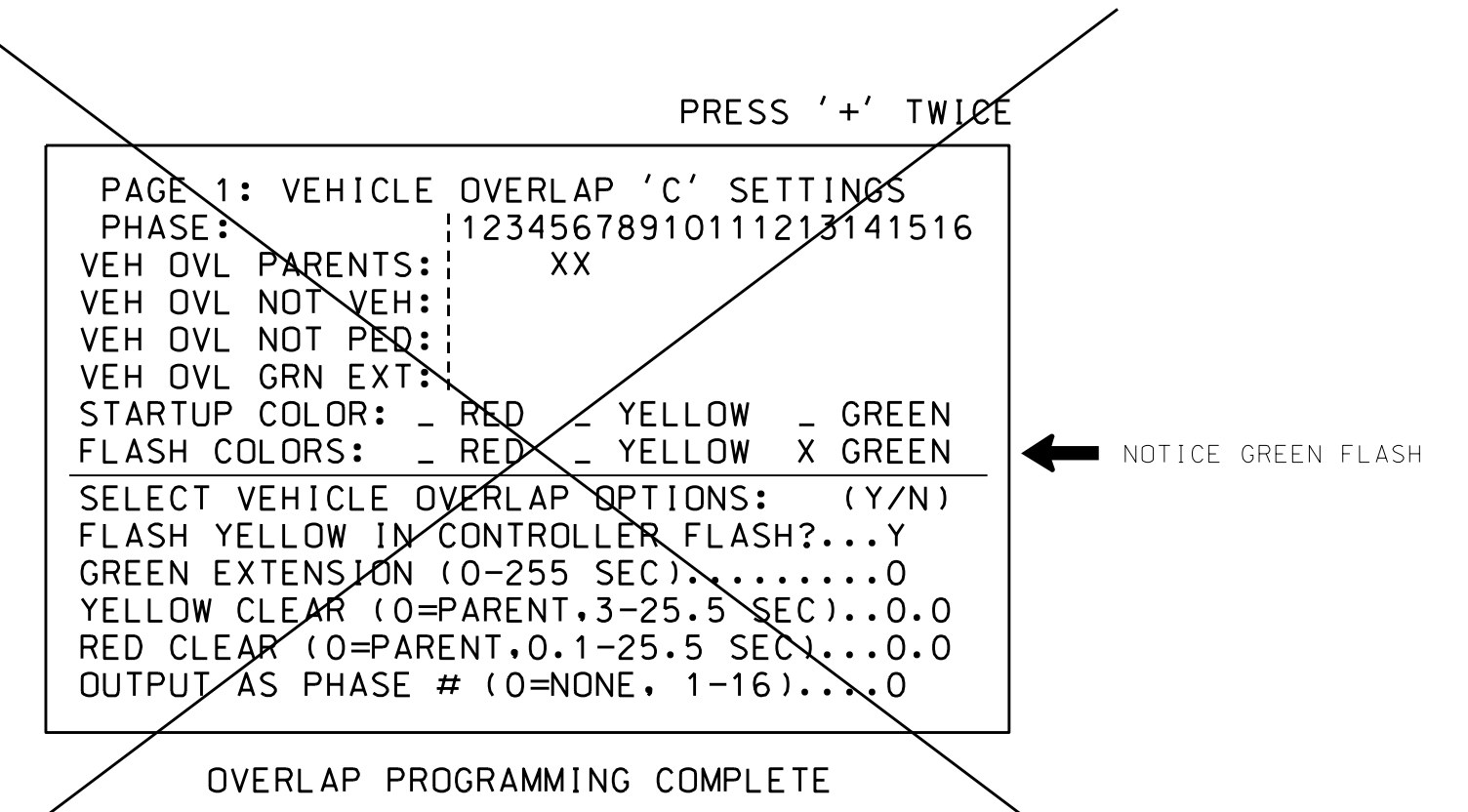


<b>OUTPUT REFERENCE SCHEDULE</b>	
OUTPUT 42	= Overlap C Red
OUTPUT 43	= Overlap C Yellow
OUTPUT 44	= Overlap C Green

**OVERLAP PROGRAMMING DETAIL**

*(program controller as shown below)*

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



THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 11-0341T4  
DESIGNED: September 2014  
SEALED: 10/14/2014  
REVISED: N/A

Electrical Detail - Temporary Design 4 - TCP Phase III (Step 5) - Sheet 2 of 2

	<b>US 221-NC 194</b> at <b>US 221 Business-NC 194/NC 163</b>		<b>SEAL</b> 
	Division 11 PLAN DATE: October 2014 PREPARED BY: S. Armstrong	Ashe County REVIEWED BY: JTR REVIEWED BY:	near West Jefferson
REVISIONS		INIT.	DATE
SIG. INVENTORY NO. 11-0341T4			

15-0075-2014\_15-11  
S:\TDS\15-0075\Sig\Work\mstr\cong\10341\_5m\_e\15\_0075\_001  
sarmstr.dgn

PHASING DIAGRAM

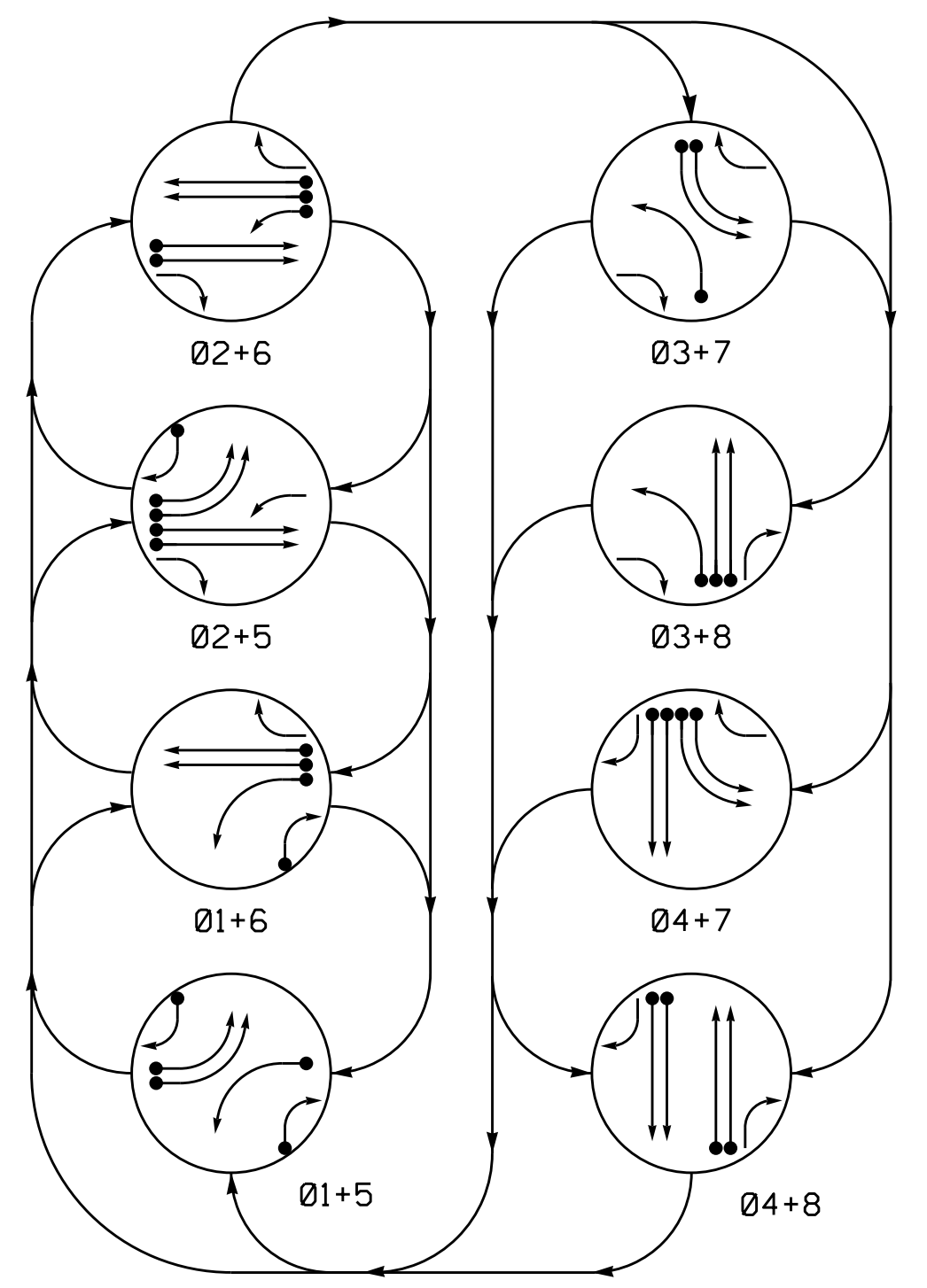


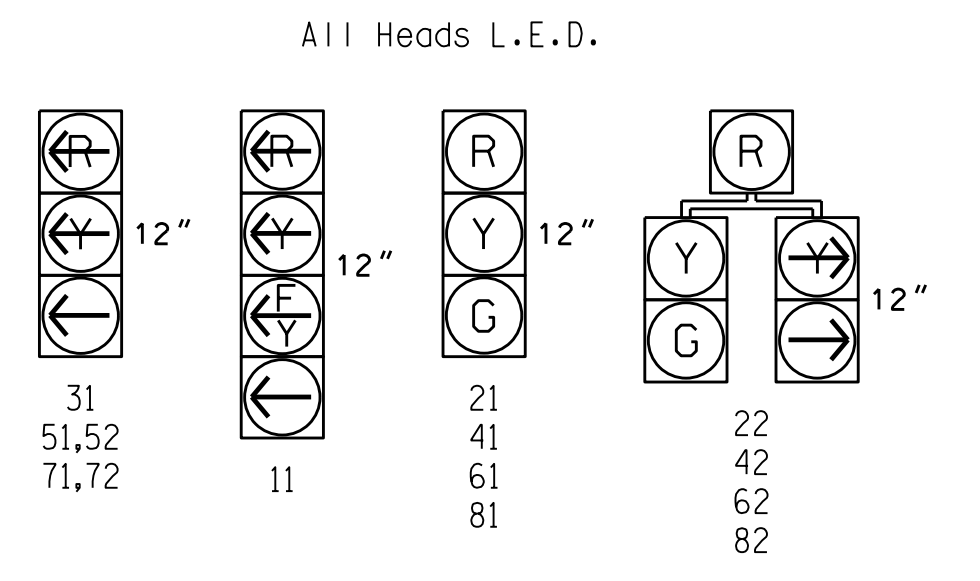
TABLE OF OPERATION

SIGNAL FACE	PHASE								
	01+5	01+6	02+5	02+6	03+7	03+8	04+7	04+8	FLASH
11	←	←	←	←	←	←	←	←	Y
21	R	R	G	G	R	R	R	R	Y
22	R	R	G	G	R	R	R	R	Y
31	←	←	←	←	←	←	←	←	Y
41	R	R	R	R	R	R	G	G	R
42	R	R	R	R	R	R	G	G	R
51,52	←	←	←	←	←	←	←	←	Y
61	R	G	R	G	R	R	R	R	Y
62	R	G	R	G	R	R	R	R	Y
71,72	←	←	←	←	←	←	←	←	Y
81	R	R	R	R	R	G	G	R	Y
82	R	R	R	R	R	G	G	R	Y

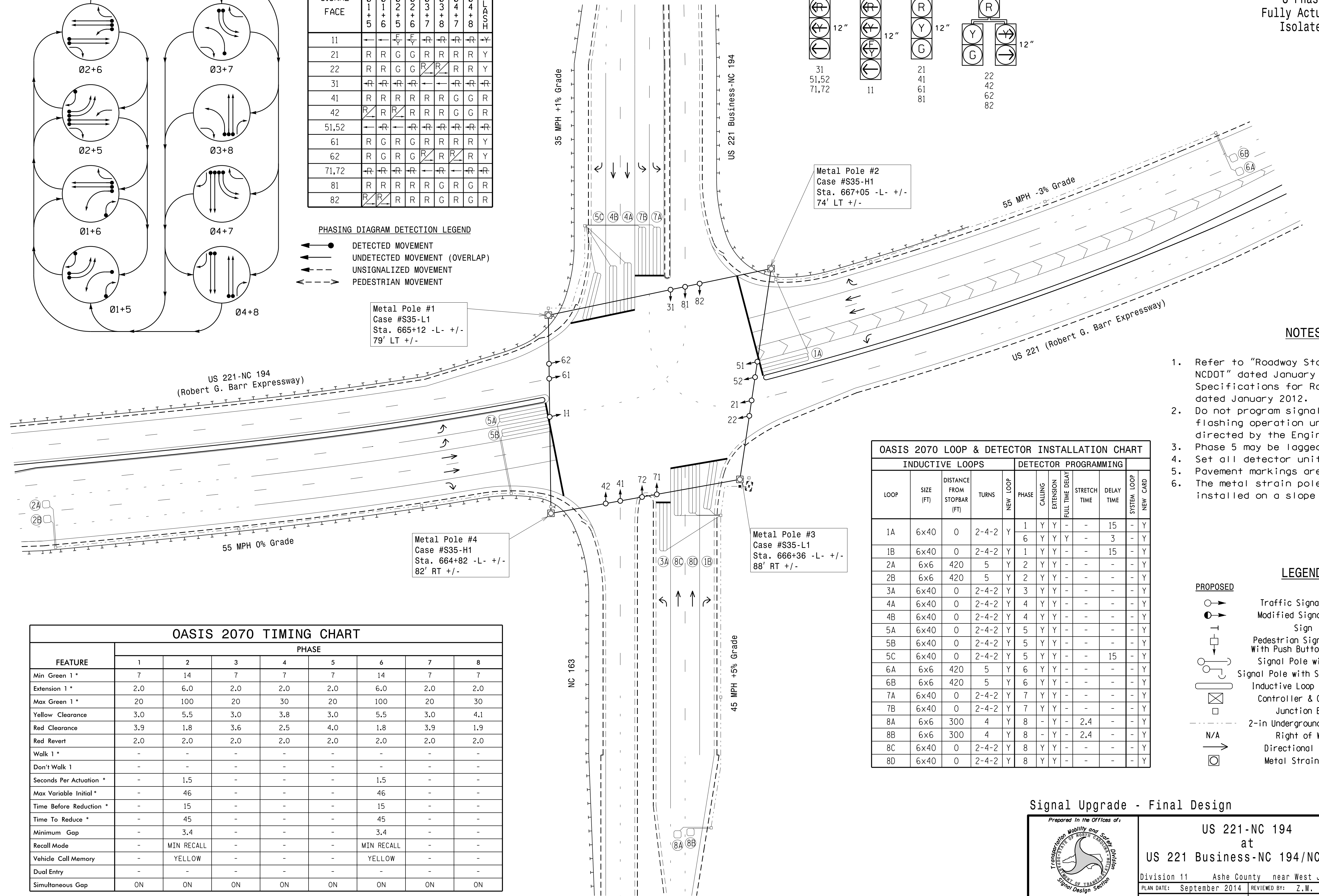
PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.



8 Phase Fully Actuated Isolated



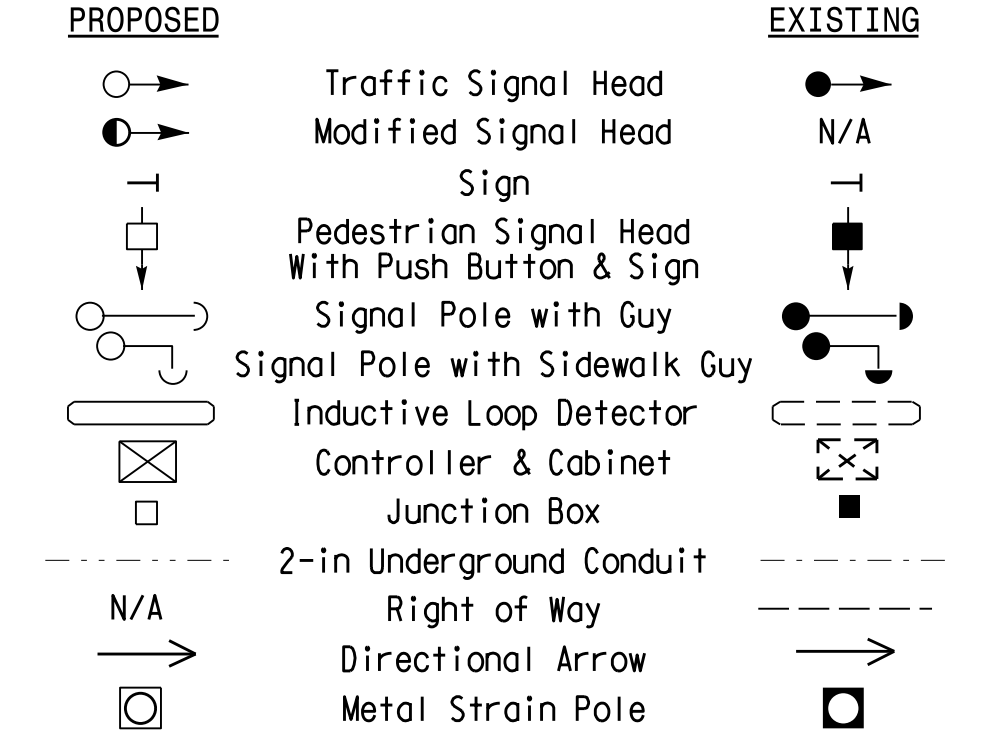
NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" 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.
6. The metal strain pole foundation will be installed on a slope steeper than 8H:1V.

OASIS 2070 LOOP & DETECTOR INSTALLATION CHART

LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	DETECTOR PROGRAMMING					SYSTEM LOOP	NEW CARD	
					PHASE	CALLING	EXTENSION	STRETCH TIME	DELAY TIME			
1A	6x40	0	2-4-2	Y	1	Y	Y	-	-	15	-	Y
1B	6x40	0	2-4-2	Y	6	Y	Y	-	-	3	-	Y
2A	6x6	420	5	Y	2	Y	Y	-	-	-	-	Y
2B	6x6	420	5	Y	2	Y	Y	-	-	-	-	Y
3A	6x40	0	2-4-2	Y	3	Y	Y	-	-	-	-	Y
4A	6x40	0	2-4-2	Y	4	Y	Y	-	-	-	-	Y
4B	6x40	0	2-4-2	Y	4	Y	Y	-	-	-	-	Y
5A	6x40	0	2-4-2	Y	5	Y	Y	-	-	-	-	Y
5B	6x40	0	2-4-2	Y	5	Y	Y	-	-	-	-	Y
5C	6x40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
6A	6x6	420	5	Y	6	Y	Y	-	-	-	-	Y
6B	6x6	420	5	Y	6	Y	Y	-	-	-	-	Y
7A	6x40	0	2-4-2	Y	7	Y	Y	-	-	-	-	Y
7B	6x40	0	2-4-2	Y	7	Y	Y	-	-	-	-	Y
8A	6x6	300	4	Y	8	-	Y	-	-	2.4	-	Y
8B	6x6	300	4	Y	8	-	Y	-	-	2.4	-	Y
8C	6x40	0	2-4-2	Y	8	Y	Y	-	-	-	-	Y
8D	6x40	0	2-4-2	Y	8	Y	Y	-	-	-	-	Y

LEGEND



OASIS 2070 TIMING CHART

FEATURE	PHASE							
	1	2	3	4	5	6	7	8
Min Green 1 *	7	14	7	7	7	14	7	7
Extension 1 *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Max Green 1 *	20	100	20	30	20	100	20	30
Yellow Clearance	3.0	5.5	3.0	3.8	3.0	5.5	3.0	4.1
Red Clearance	3.9	1.8	3.6	2.5	4.0	1.8	3.9	1.9
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-	-	-
Seconds Per Actuation *	-	1.5	-	-	-	1.5	-	-
Max Variable Initial *	-	46	-	-	-	46	-	-
Time Before Reduction *	-	15	-	-	-	15	-	-
Time To Reduce *	-	45	-	-	-	45	-	-
Minimum Gap	-	3.4	-	-	-	3.4	-	-
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Vehicle Call Memory	-	YELLOW	-	-	-	YELLOW	-	-
Dual Entry	-	-	-	-	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON	ON	ON	ON	ON

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

Signal Upgrade - Final Design

US 221-NC 194  
at  
US 221 Business-NC 194/NC 163

Division 11 Ashe County near West Jefferson

PLAN DATE: September 2014 REVIEWED BY: Z.M. Little

PREPARED BY: C.L. Sweeney REVIEWED BY:

DocuSigned by:  
Z. M. Little  
10/14/2014  
DATE

SIG. INVENTORY NO. II-0341

750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 40  
1"=40'

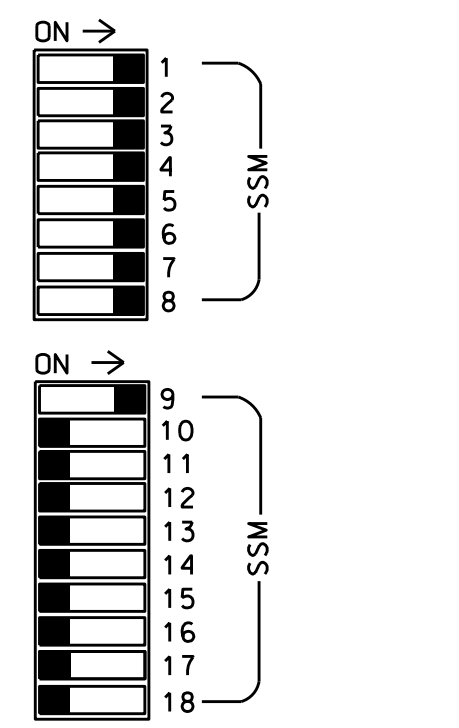
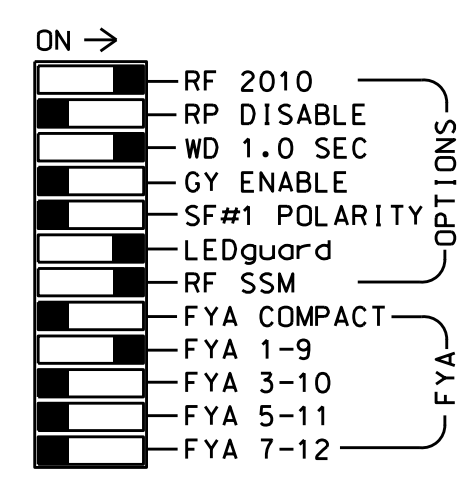
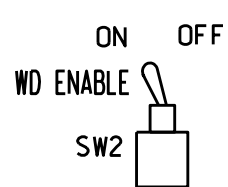
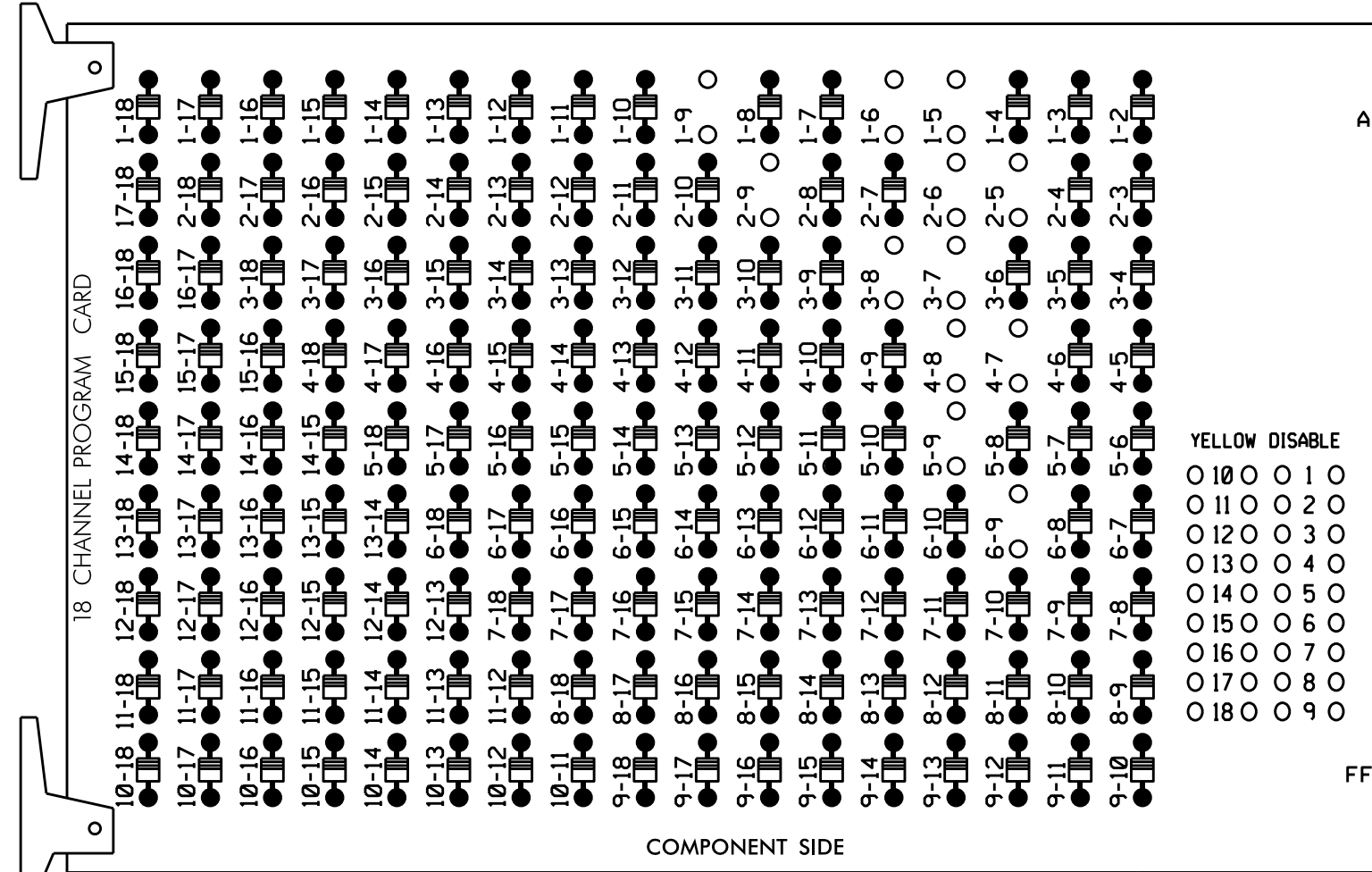
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EDI MODEL 2018ECL-NC CONFLICT MONITOR

PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 2-5, 2-6, 2-9, 3-7, 3-8, 4-7, 4-8, 5-9, and 6-9.



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.

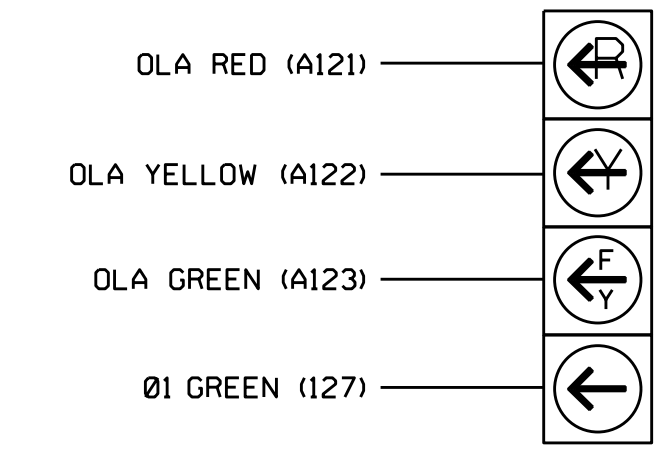
SIGNAL HEAD HOOK-UP CHART

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	NU	22	31	41,42	NU	42	51,52	61,62	NU	62	71,72	81,82	NU	11	NU	NU	NU	NU	
RED		*	128			101				134			107									
YELLOW			129			102				135			108									
GREEN			130			103				136			109									
RED ARROW					116			131				122								A121		
YELLOW ARROW		126		117	117			132	132			123	123							A122		
FLASHING YELLOW ARROW																				A123		
GREEN ARROW	127	127		118	118			133	133			124	124									

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

FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



NOTE

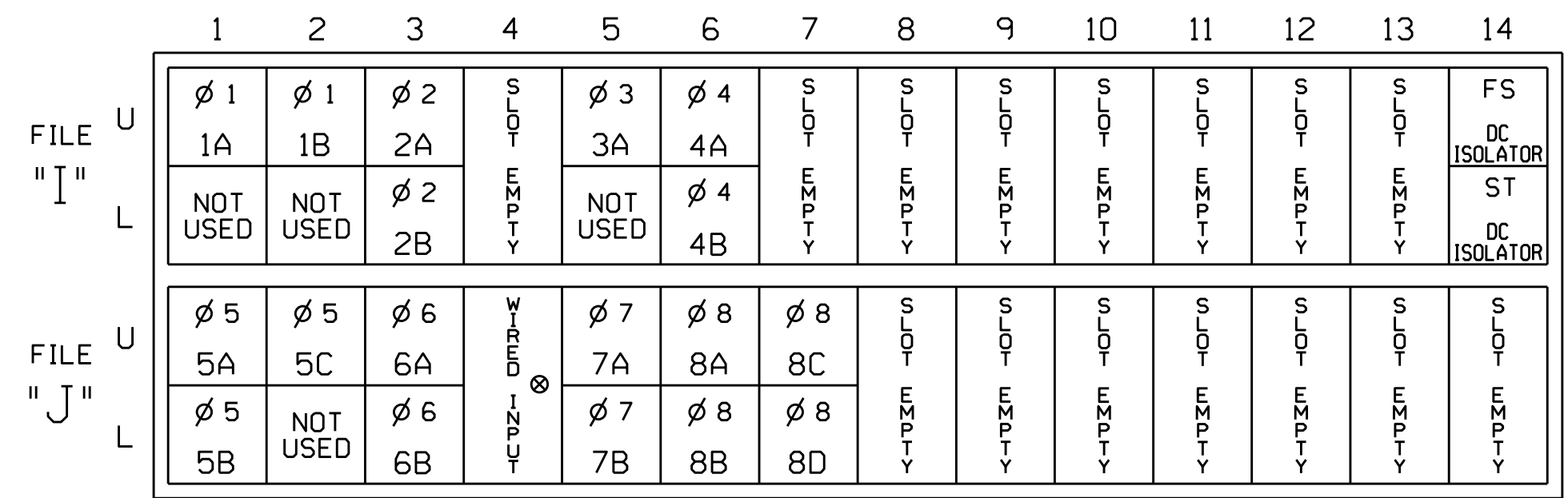
The sequence display for signal head 11 requires special logic programming. See sheet 2 for programming instructions.

NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Enable Simultaneous Gap-Out for all phases.
- Program phases 2 and 6 for Variable Initial and Gap Reduction.
- Program phases 2 and 6 for Start Up In Green.
- Program phases 2 and 6 for Yellow Flash, and overlap 1 as Wag Overlaps.

INPUT FILE POSITION LAYOUT

(front view)



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

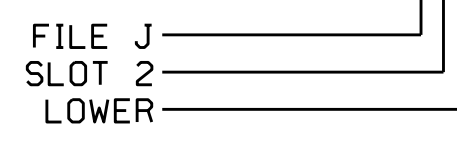
Wired Input - Do not populate slot with detector card

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A <sup>1</sup>	TB2-1,2	I1U	56	18	1	1	Y	Y			15
1B	TB2-5,6	J4U	48	10	26	6	Y	Y	Y		3
2A	TB2-9,10	I3U	63	25	32	2	Y	Y			15
2B	TB2-11,12	I3L	76	38	42	2	Y	Y			
3A	TB4-5,6	I5U	58	20	3	3	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			
5A	TB3-1,2	J1U	55	17	5	5	Y	Y			
5B	TB3-3,4	J1L	55	17	5	5	Y	Y			
5C	TB3-5,6	J2U	40	2	5	5	Y	Y			15
6A	TB3-9,10	J3U	64	26	36	6	Y	Y			
6B	TB3-11,12	J3L	77	39	46	6	Y	Y			
7A	TB5-5,6	J5U	57	19	7	7	Y	Y			
7B	TB5-7,8	J5L	57	19	7	7	Y	Y			
8A	TB5-9,10	J6U	42	4	8	8		Y		2.4	
8B	TB5-11,12	J6L	46	8	18	8		Y		2.4	
8C	TB7-1,2	J7U	66	28	38	8	Y	Y			
8D	TB7-3,4	J7L	79	41	48	8	Y	Y			

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

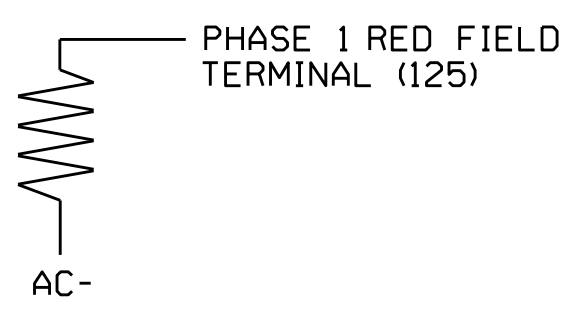
INPUT FILE POSITION LEGEND: J2L



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: 11-0341  
 DESIGNED: September 2014  
 SEALED: 10/14/2014  
 REVISED: N/A

EQUIPMENT INFORMATION

CONTROLLER.....2070L  
 CABINET.....332 W/ AUX  
 SOFTWARE.....ECONOLITE OASIS  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE  
 LOAD SWITCHES USED.....S1,S2,S4,S5,S7,S8,S10,S11,AUX S1  
 PHASES USED.....1,2,3,4,5,6,7,8  
 OVERLAP "A".....1+2  
 OVERLAP "B".....NOT USED  
 OVERLAP "C".....NOT USED  
 OVERLAP "D".....NOT USED

Electrical Detail - Final Design - Sheet 1 of 2

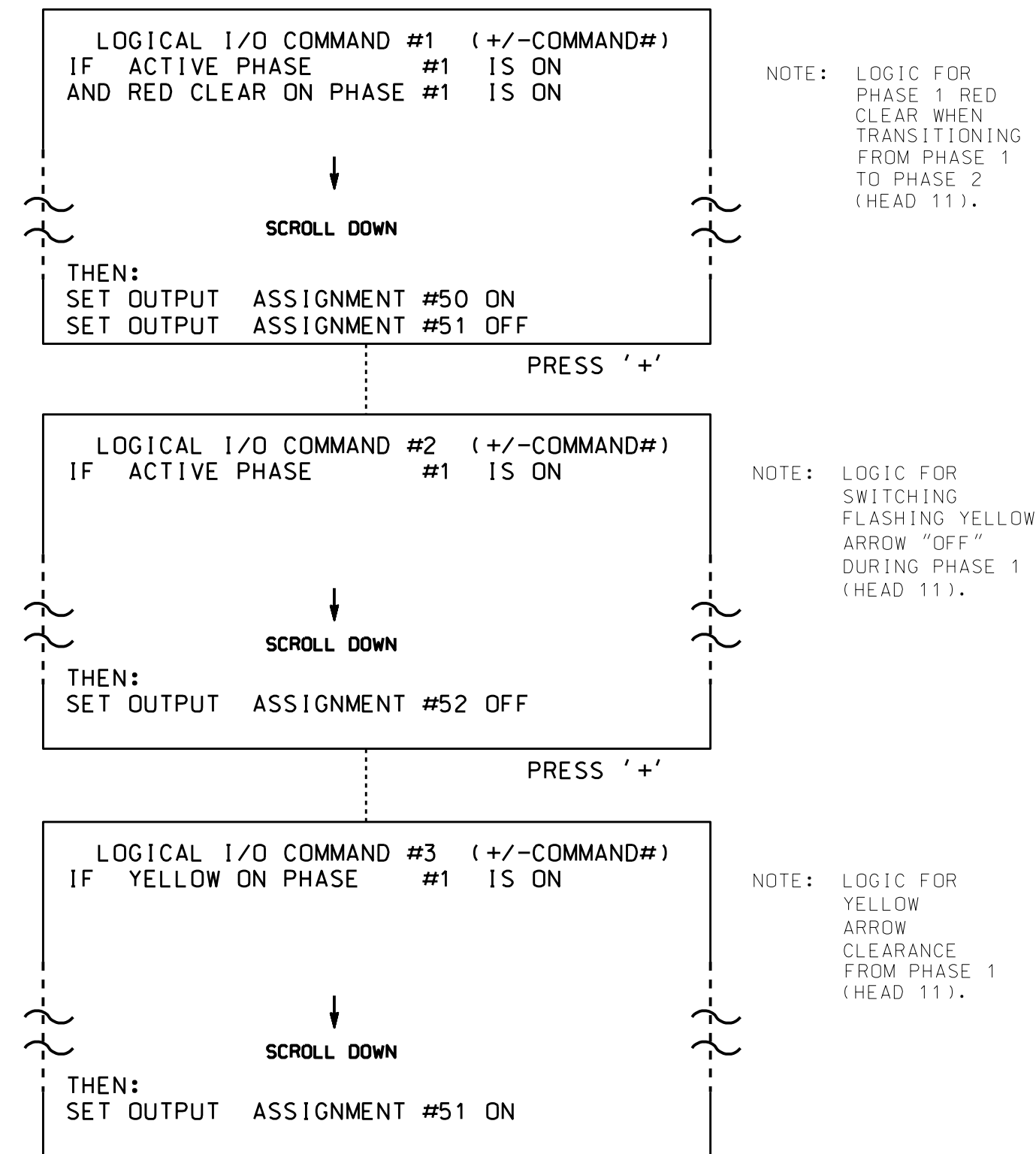
ELECTRICAL AND PROGRAMMING DETAILS FOR: 	US 221-NC 194 at US 221 Business-NC 194/NC 163		SEAL 
	Division 11 PLAN DATE: October 2014 PREPARED BY: S. Armstrong	Ashe County REVIEWED BY: JTR REVIEWED BY:	
REVISIONS			INIT. DATE
750 N. Greenfield Pkwy, Garner, NC 27529			DocuSigned by: John T. Rowe, Jr. 041D600145EE4F3 DATE: 10/17/2014 SIG. INVENTORY NO. 11-0341

15-001-2014 15-12  
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 somstr009

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

(program controller as shown below)

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



#### OUTPUT REFERENCE SCHEDULE

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

### OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

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

PAGE 1: VEHICLE OVERLAP 'A' SETTINGS

PHASE: :12345678910111213141516

VEH OVL PARENTS: :XX

VEH OVL NOT VEH: ::

VEH OVL NOT PED: ::

VEH OVL GRN EXT: ::

STARTUP COLOR: - RED - YELLOW - GREEN

FLASH COLORS: - RED - YELLOW X GREEN

SELECT VEHICLE OVERLAP OPTIONS: (Y/N)

FLASH YELLOW IN CONTROLLER FLASH?...Y

GREEN EXTENSION (0-255 SEC)...0.0

YELLOW CLEAR (0=PARENT,3-25.5 SEC)...0.0

RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0

OUTPUT AS PHASE # (0=NONE, 1-16)...0

← NOTICE GREEN FLASH

OVERLAP PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 11-0341  
DESIGNED: September 2014  
SEALED: 10/14/2014  
REVISED: N/A

Electrical Detail - Final Design - Sheet 2 of 2		
	<p>US 221-NC 194 at US 221 Business-NC 194/NC 163</p>	
ELECTRICAL AND PROGRAMMING DETAILS FOR:	Division 11    Ashe County    near West Jefferson	SEAL
Prepared In the Offices of:	PLAN DATE: October 2014    REVIEWED BY: JTR	SEAL 008453
750 N. Greenfield Pkwy, Garner, NC 27529	PREPARED BY: S. Armstrong    REVIEWED BY:	ENGINEER JOHN T. ROWE, JR.
	REVISIONS    INIT.    DATE	DocuSigned by: John T. Rowe, Jr.    10/17/2014
		DATE
		SIG. INVENTORY NO. 11-0341

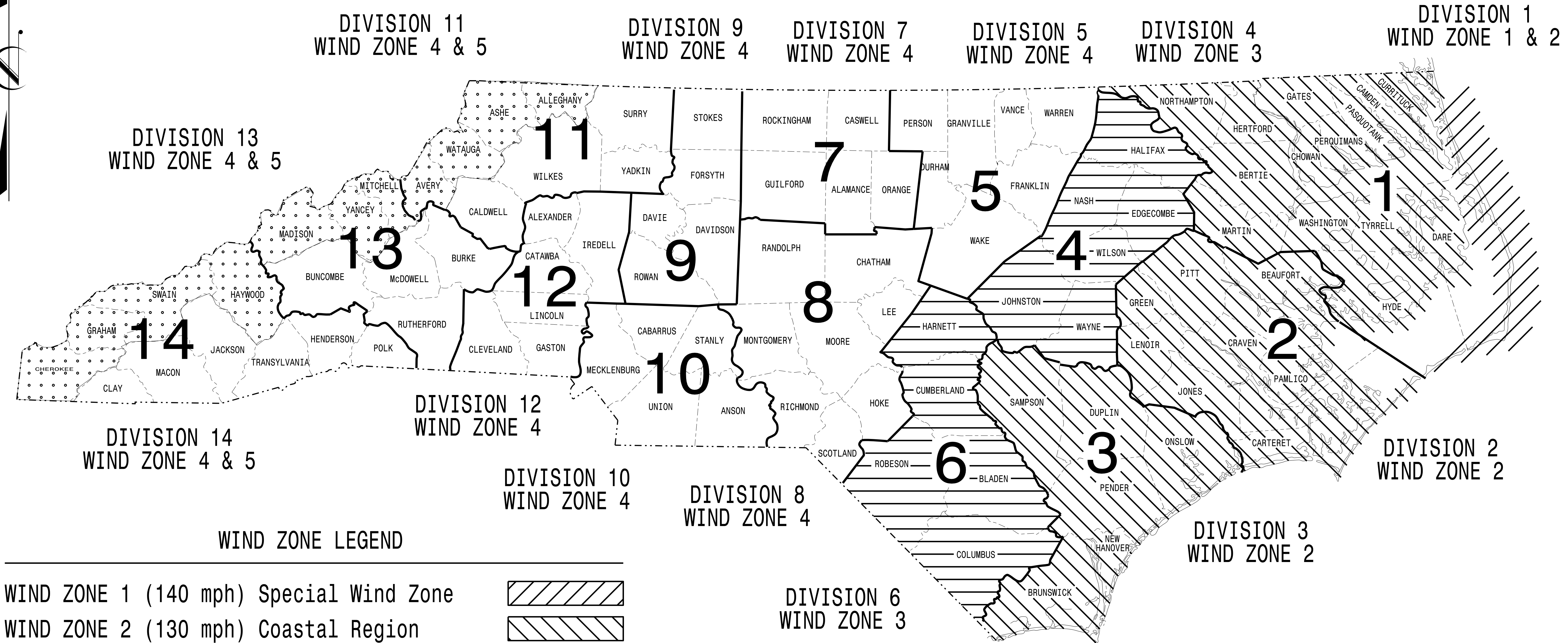
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# STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

## STANDARD DRAWINGS FOR METAL POLES

**NCDOT METAL POLE STANDARDS**



**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

**INDEX OF PLANS**

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**

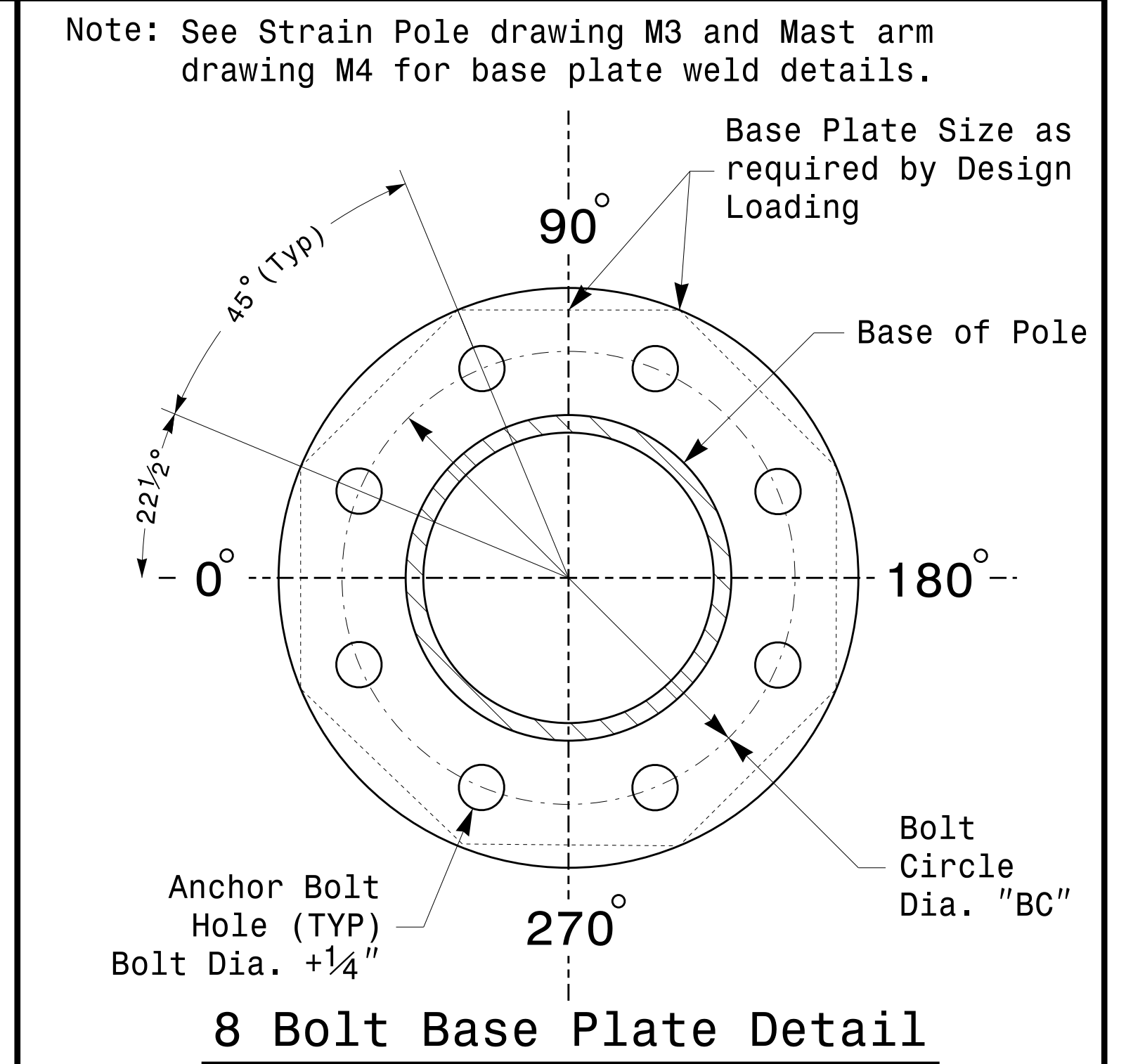
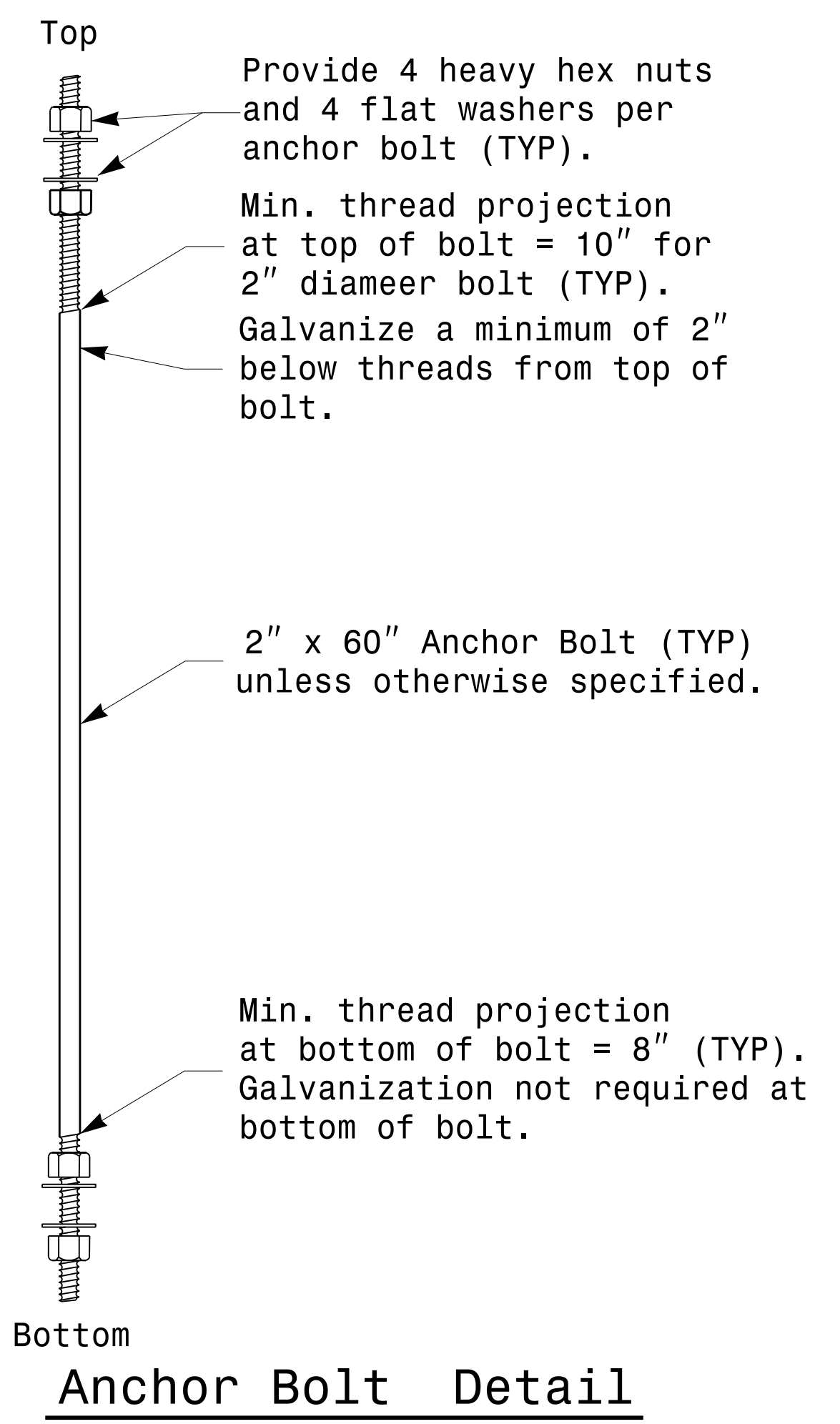
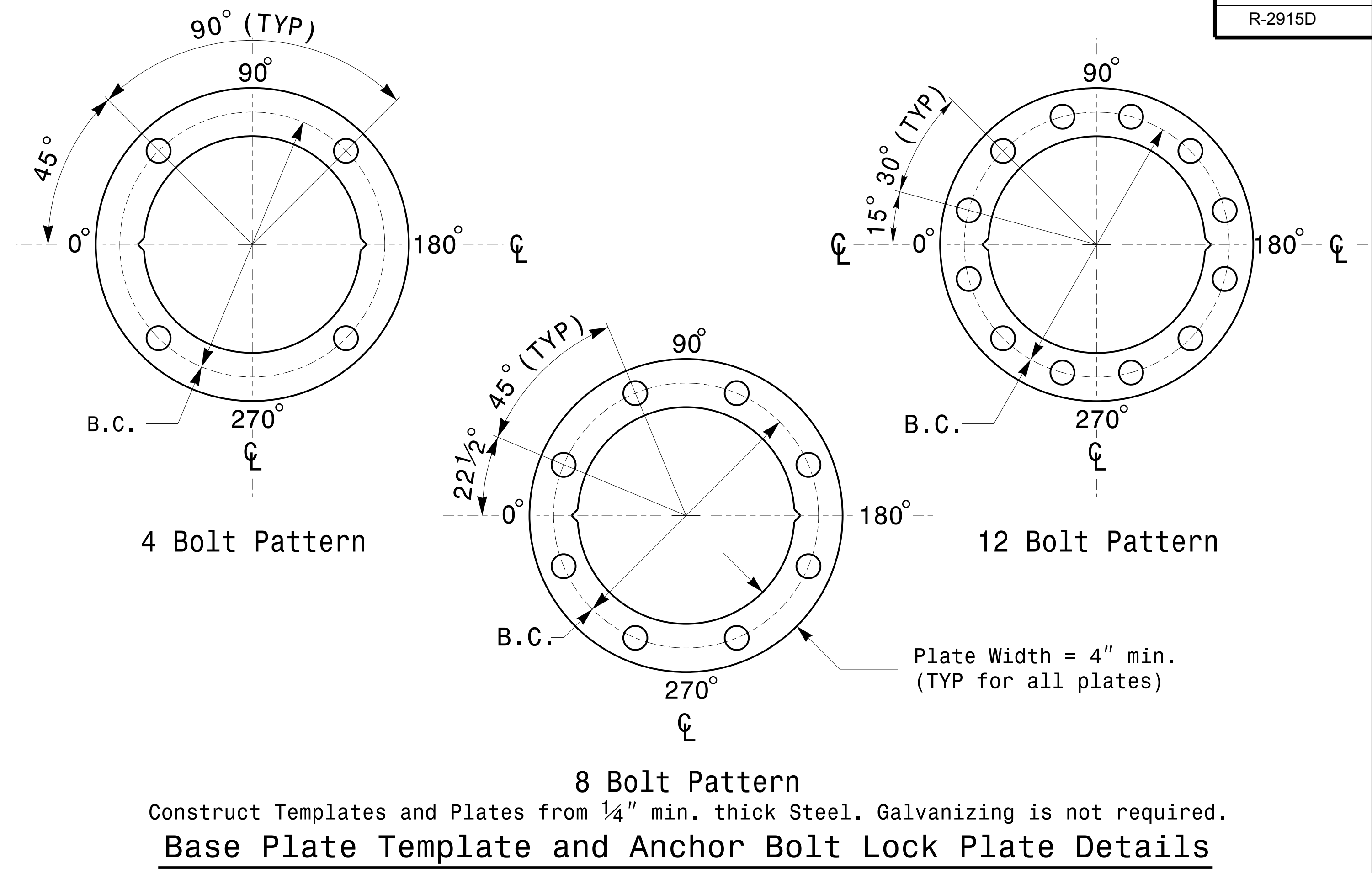
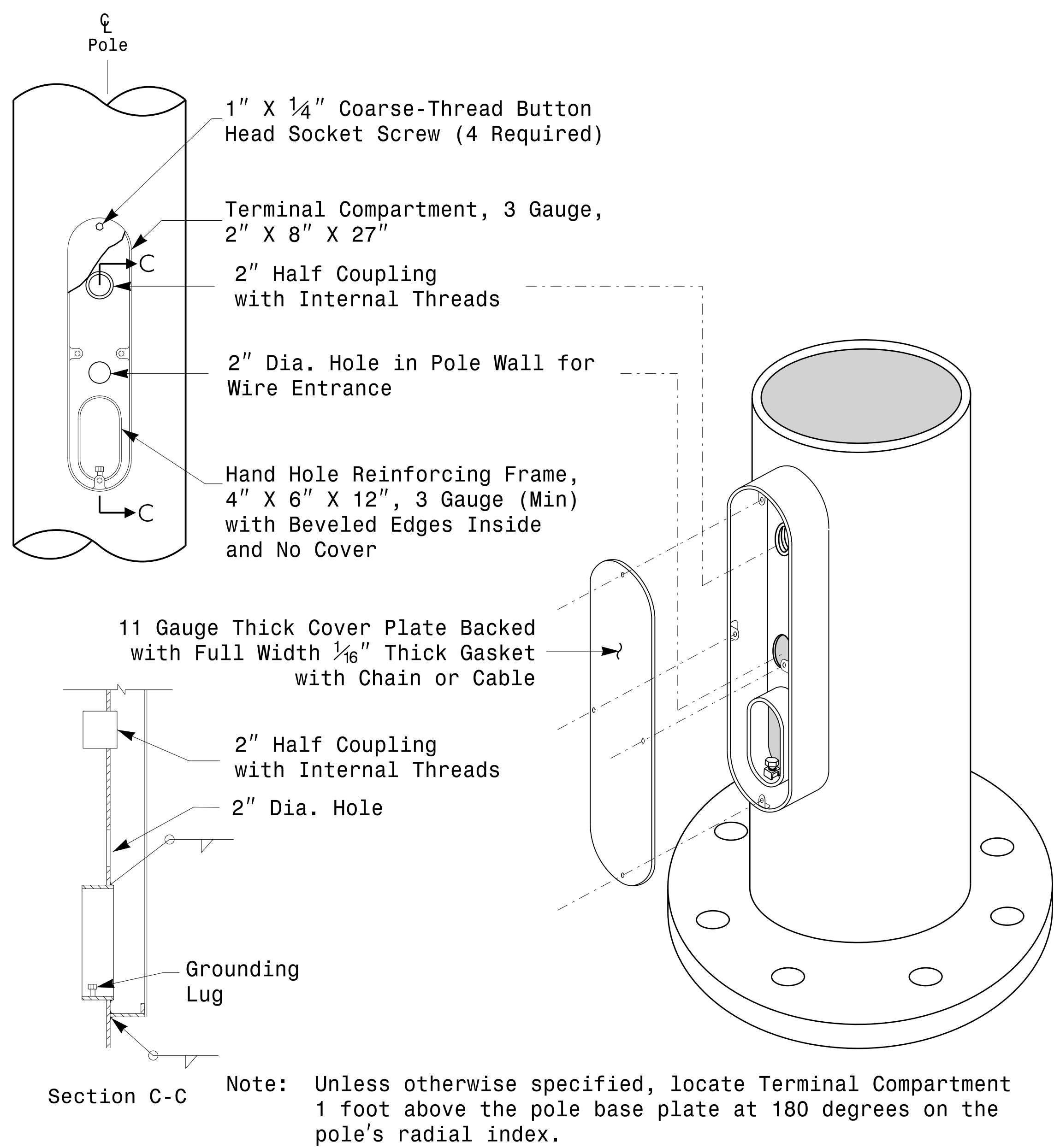
**G. G. MURR, JR., P.E. - STATE SIGNALS ENGINEER**

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

**C.F. ANDREWS - ITS AND SIGNALS JOURNEY STRUCTURAL ENGINEER**

SEAL

Debsu C. Sarkar  
8/26/2014  
DATE



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 _____

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)

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

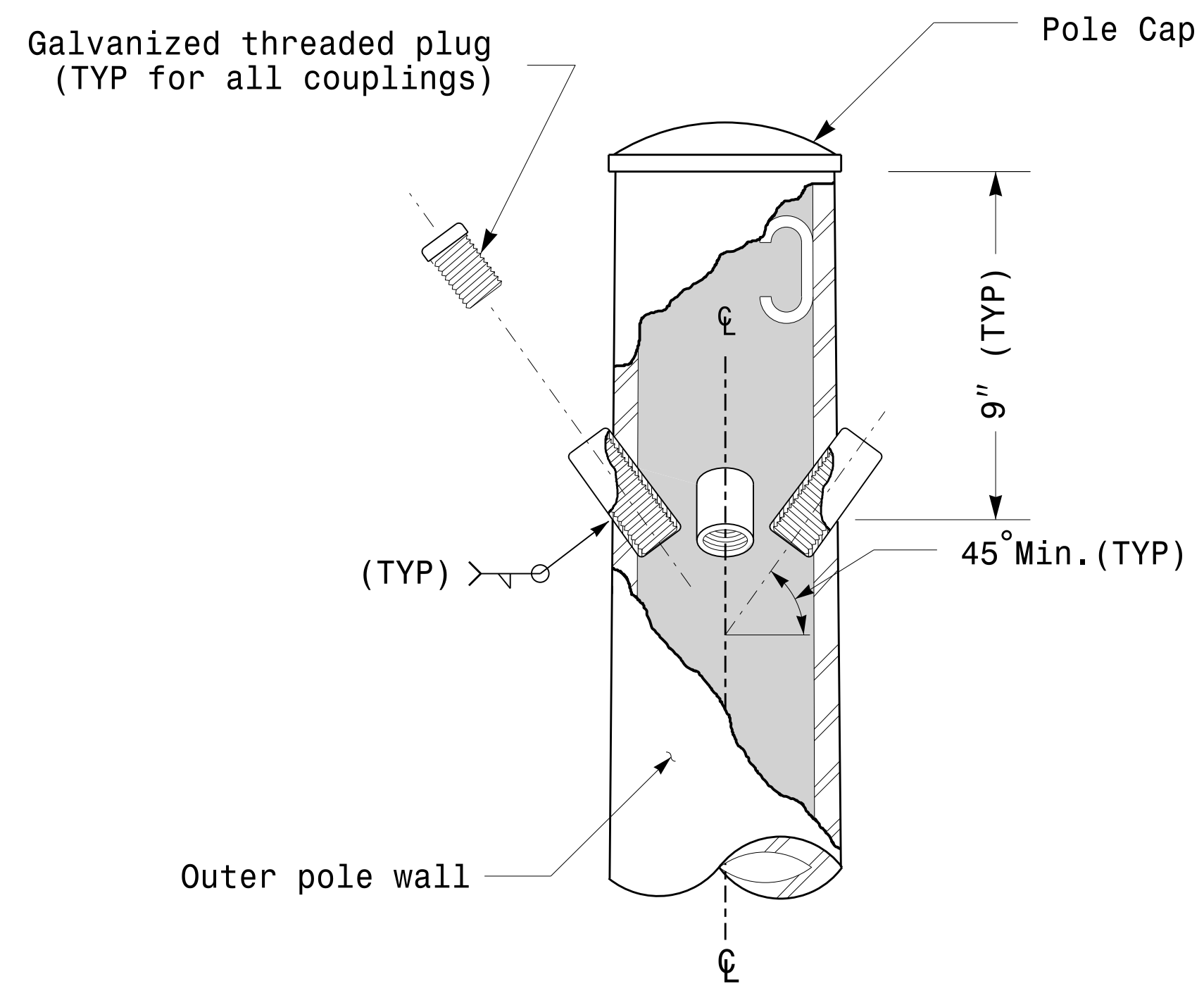
- Notes:
- 1) D= Diameter, T= Thickness, L= Length, Y= Yield Strength
  - 2) A.B. = Anchor Bolt
  - 3) B.C. = Bolt Circle of Anchor Bolts
  - 4) If Custom Design, use "NCDOT STANDARD" line for pole I.D. number and Signal Inv. Number.
  - 5) See drawing M4 for mounting positions of I.D. tags.

**Identification Tag Details**

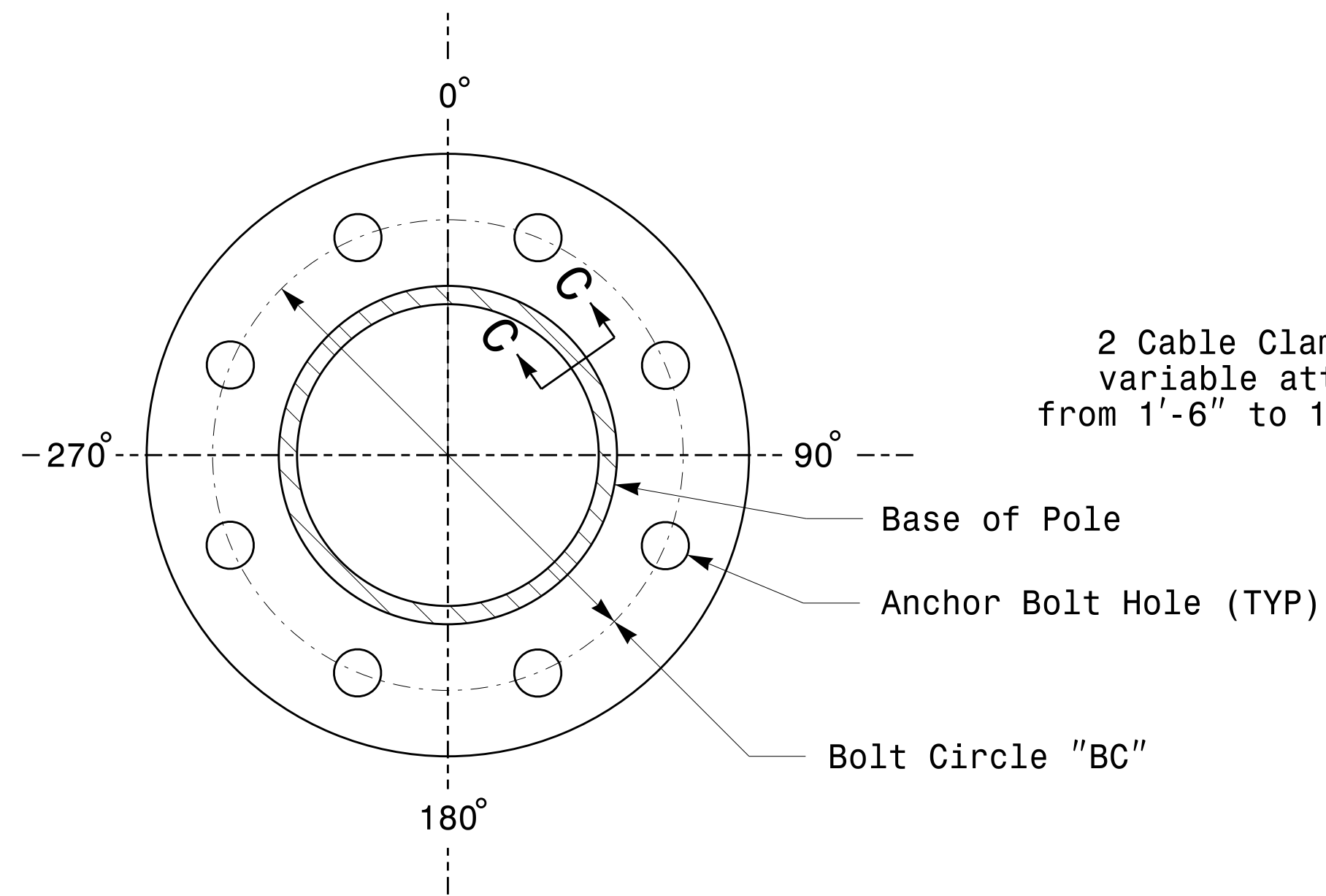
<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>Typical Fabrication Details Common To All Metal Poles</p>		
	<p>PLAN DATE: AUGUST 2013</p> <p>PREPARED BY: N. BITTING</p>	<p>DESIGNED BY: C.F. ANDREWS</p> <p>REVIEWED BY: D.C. SARKAR</p>	
<p>SCALE: NONE</p>	<p>REVISIONS</p>	<p>INIT. DATE</p>	<p>DocuSigned by: Dinesh C. Sarkar</p> <p>8/26/2014</p> <p>DATE</p> <p>SIG. INVENTORY NO.</p>

06-AUG-2014 08:55  
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 Top | Lowy

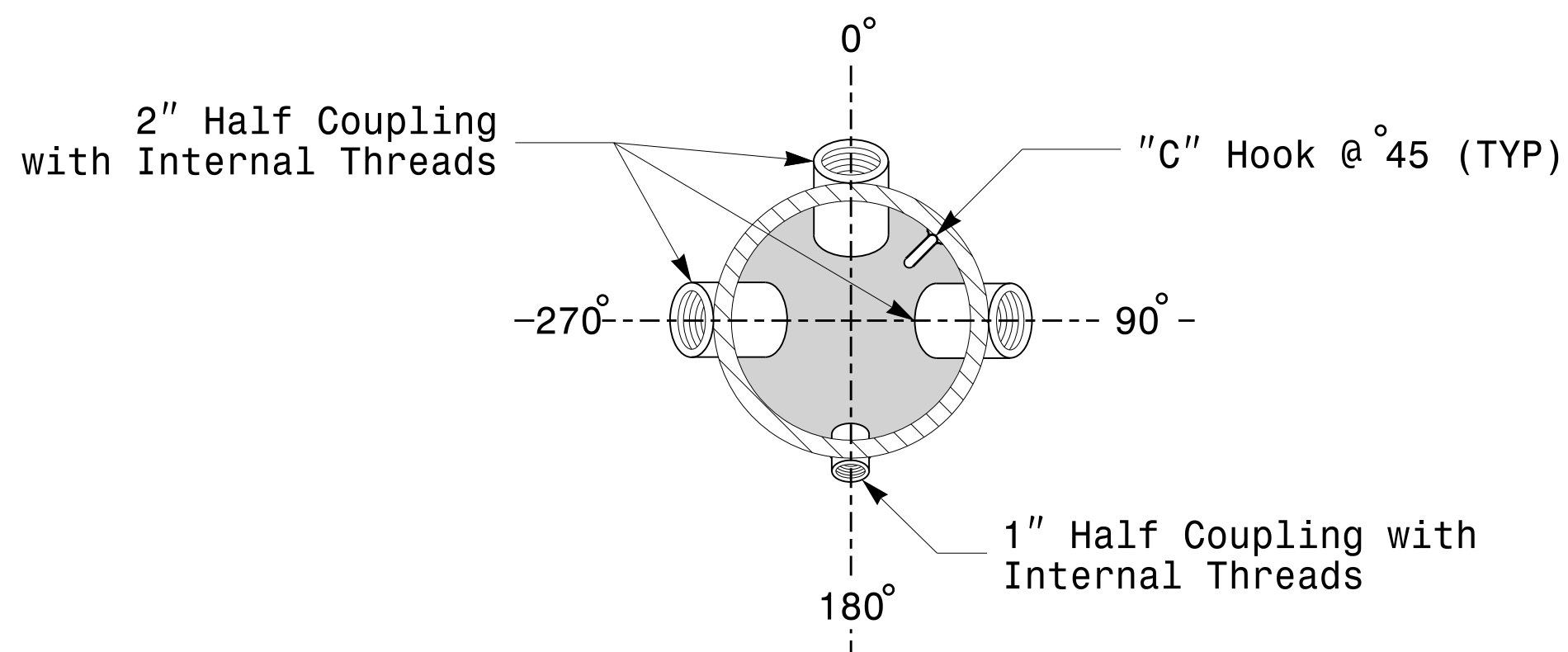
**Fabrication Details – All Poles**



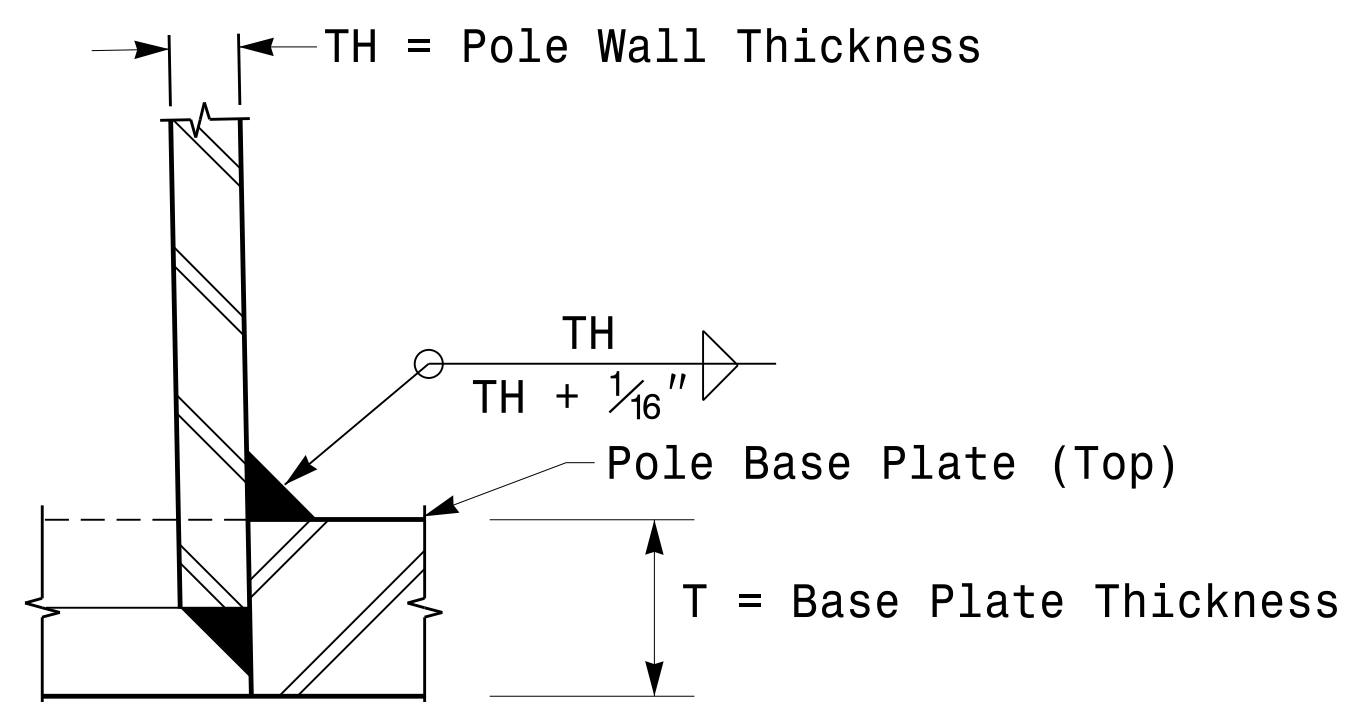
Cable Entrances at Top of Pole



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

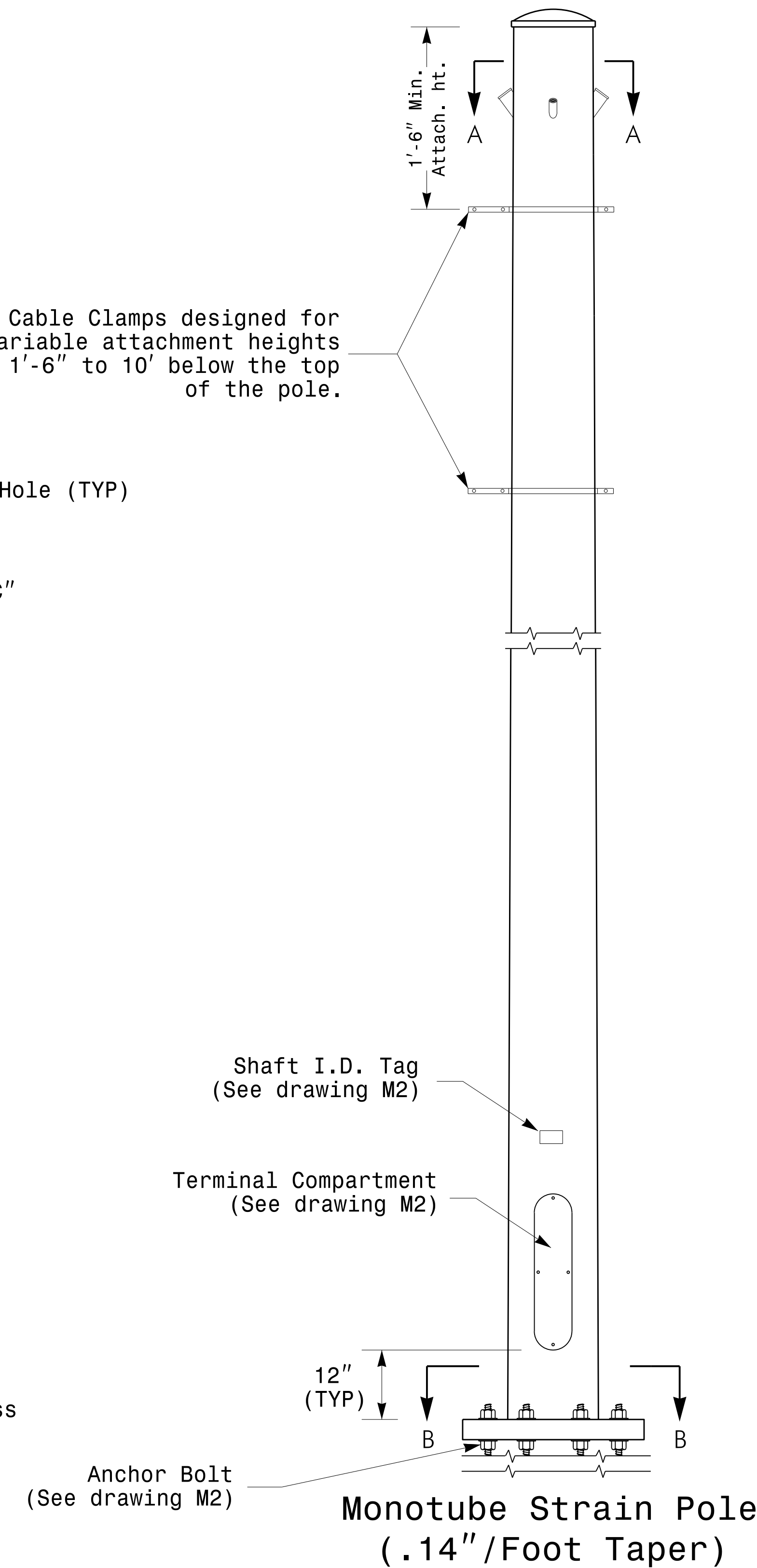


Radial Orientation for Factory Installed Accessories at Top of Pole



Socket Connection Weld Detail

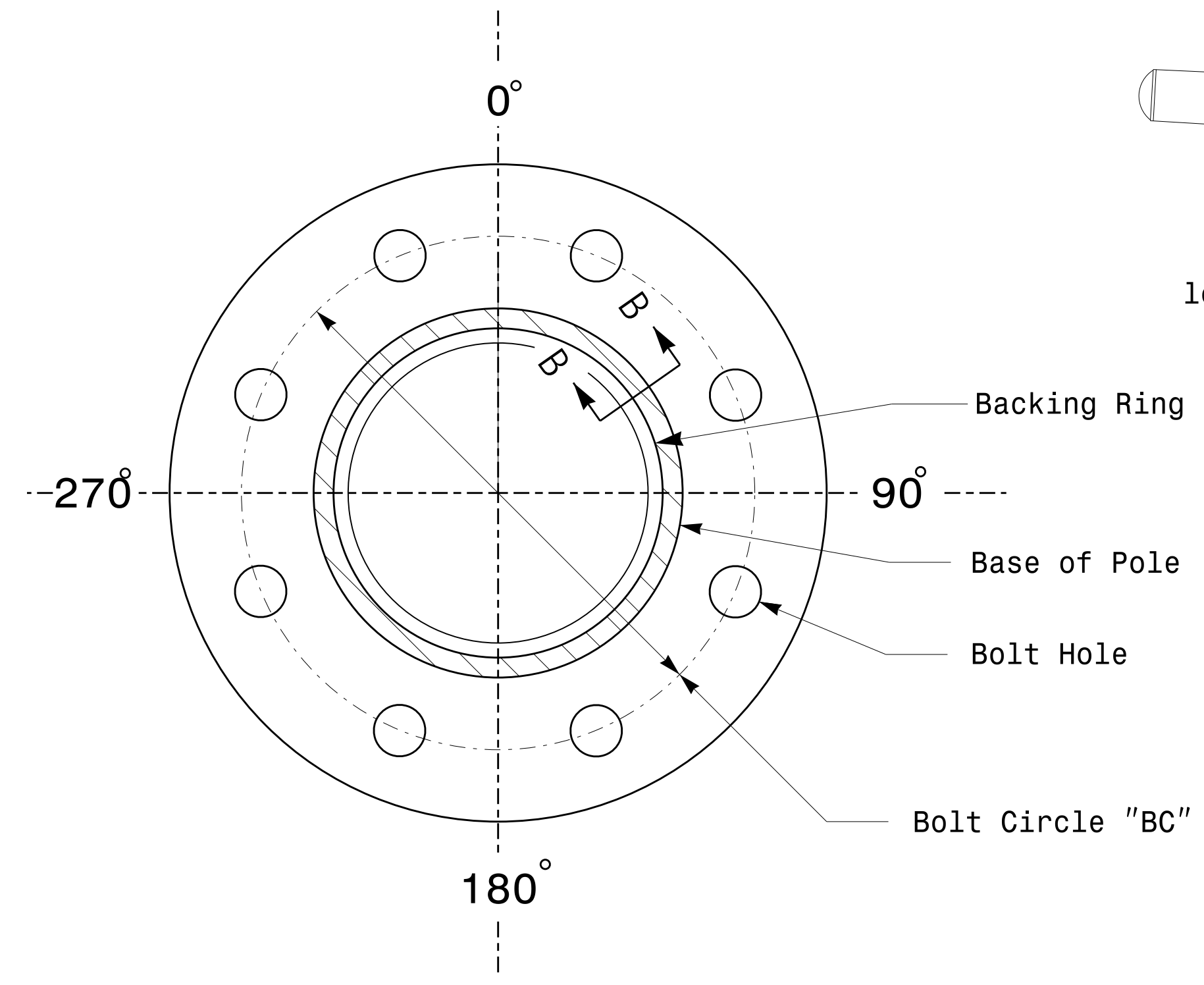
2 Cable Clamps designed for variable attachment heights from 1'-6" to 10' below the top of the pole.



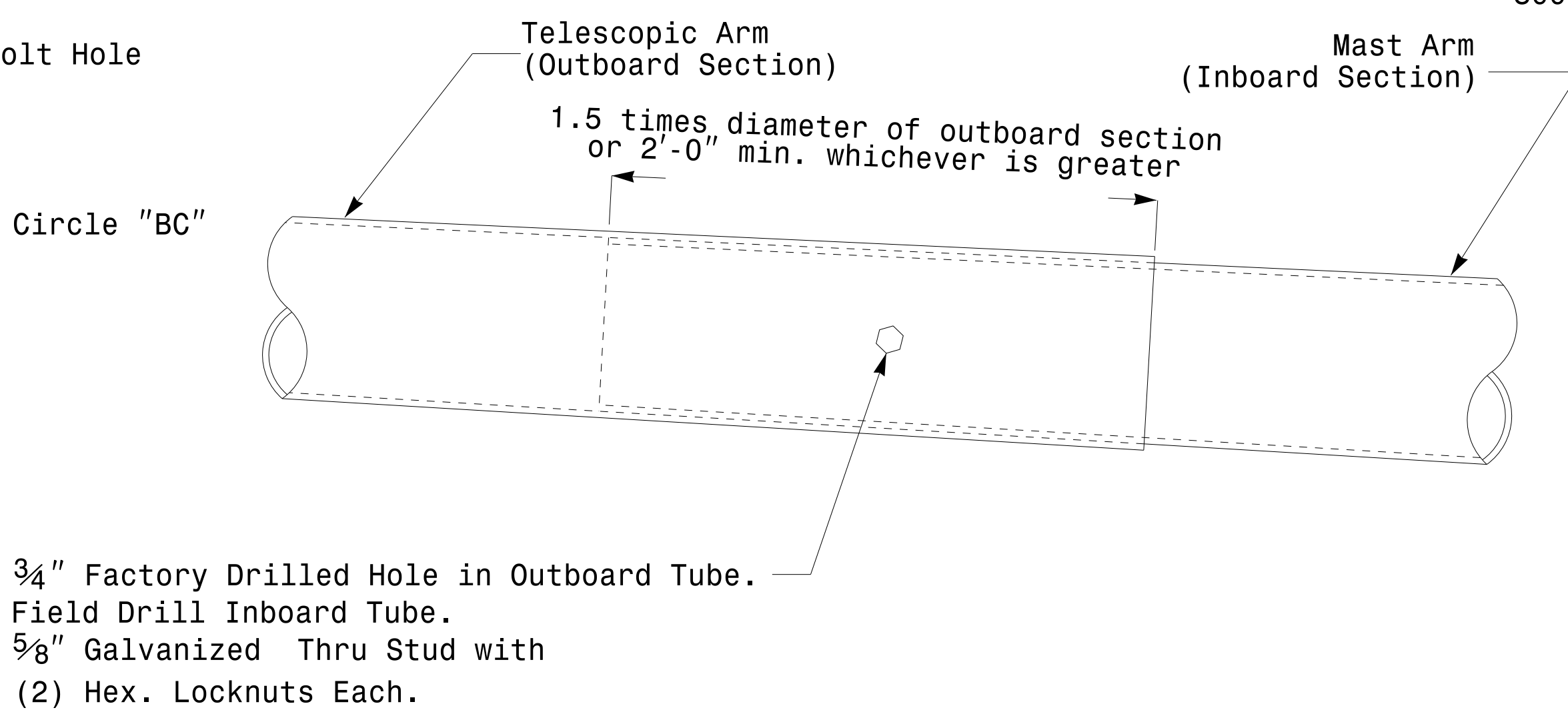
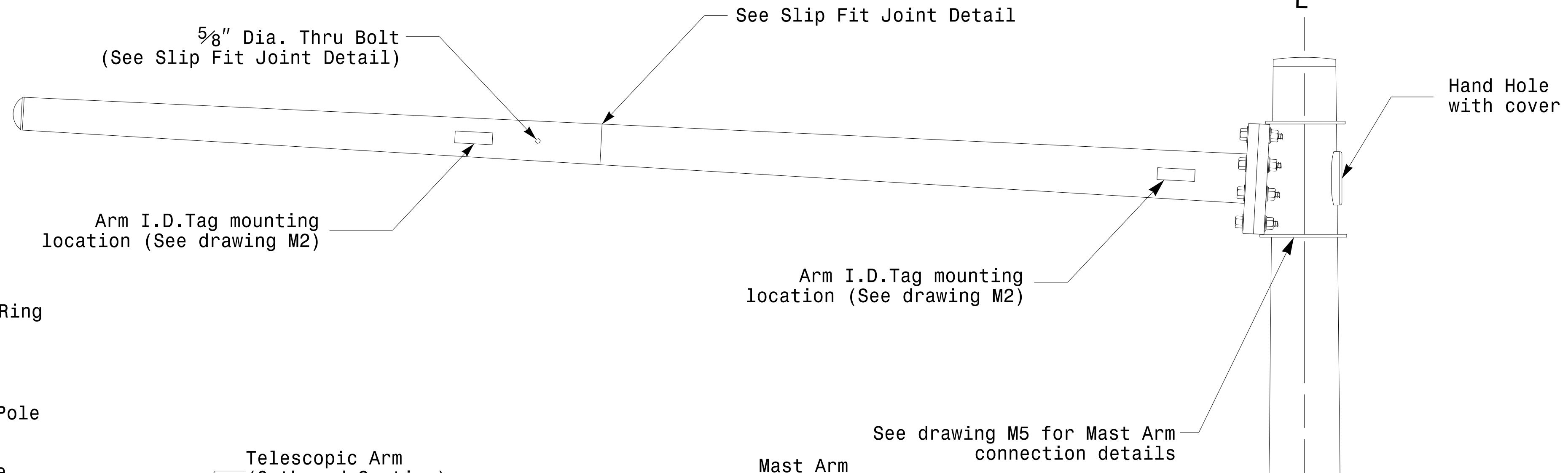
	Typical Fabrication Details For Strain Poles		
	PLAN DATE: AUGUST 2013 PREPARED BY: N. BITTING	DESIGNED BY: C.F. ANDREWS REVIEWED BY: D.C. SARKAR	
SCALE: 0 NA NONE	REVISIONS:	INIT. DATE:	SIG. INVENTORY NO.

06-AUG-2014 09:51  
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 Top of Pole

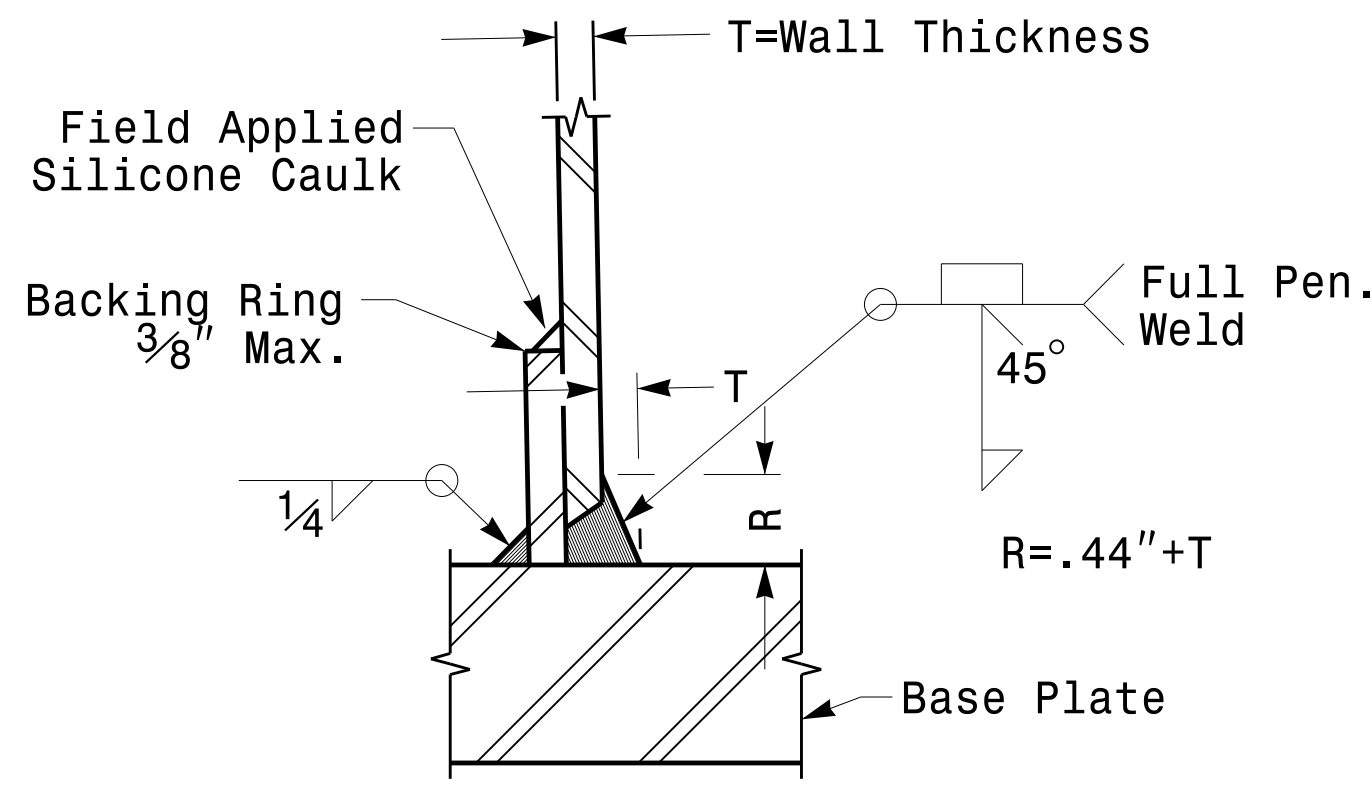
**Fabrication Details – Strain Poles**



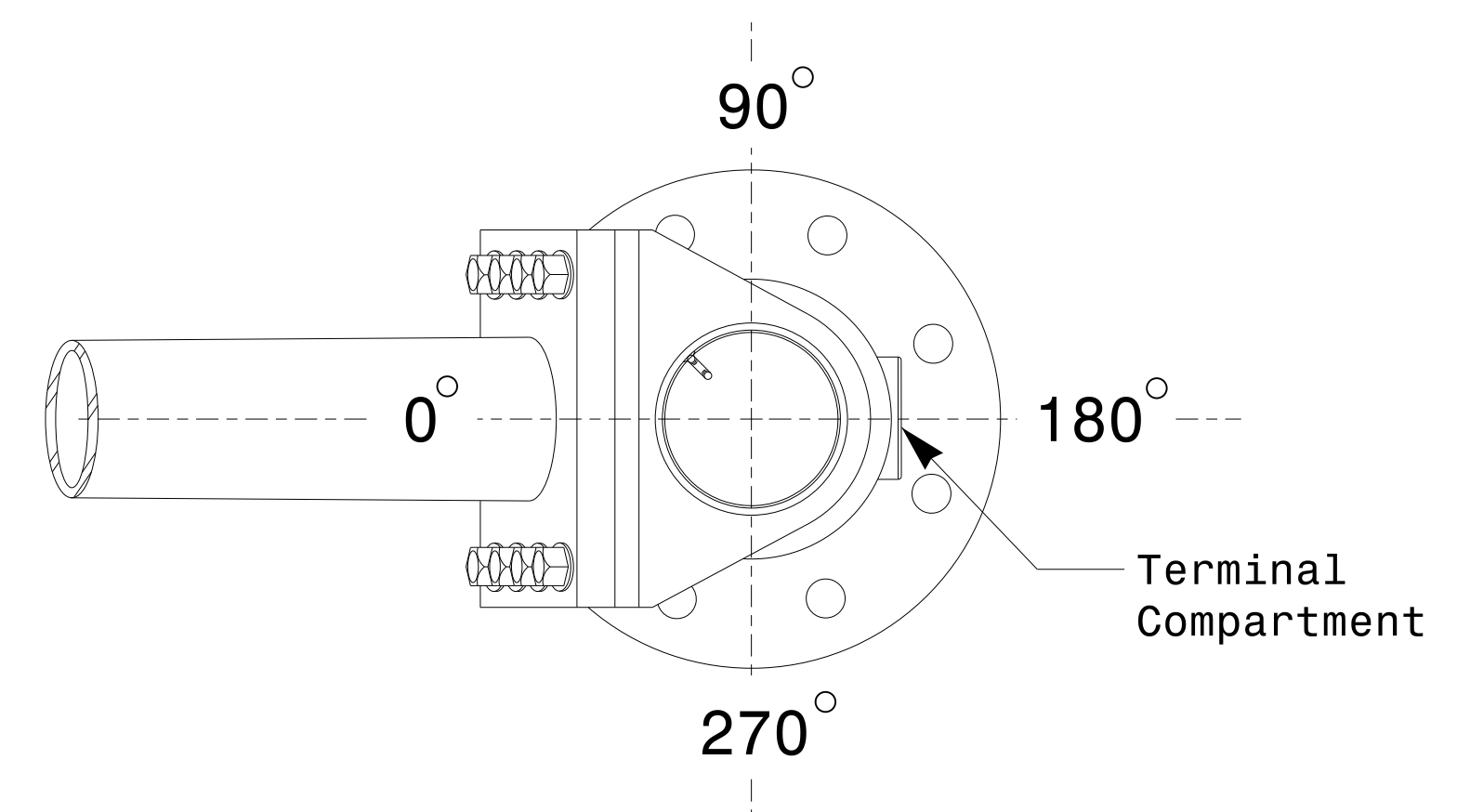
Section A-A  
(See drawing M 2)  
**Pole Base Plate**



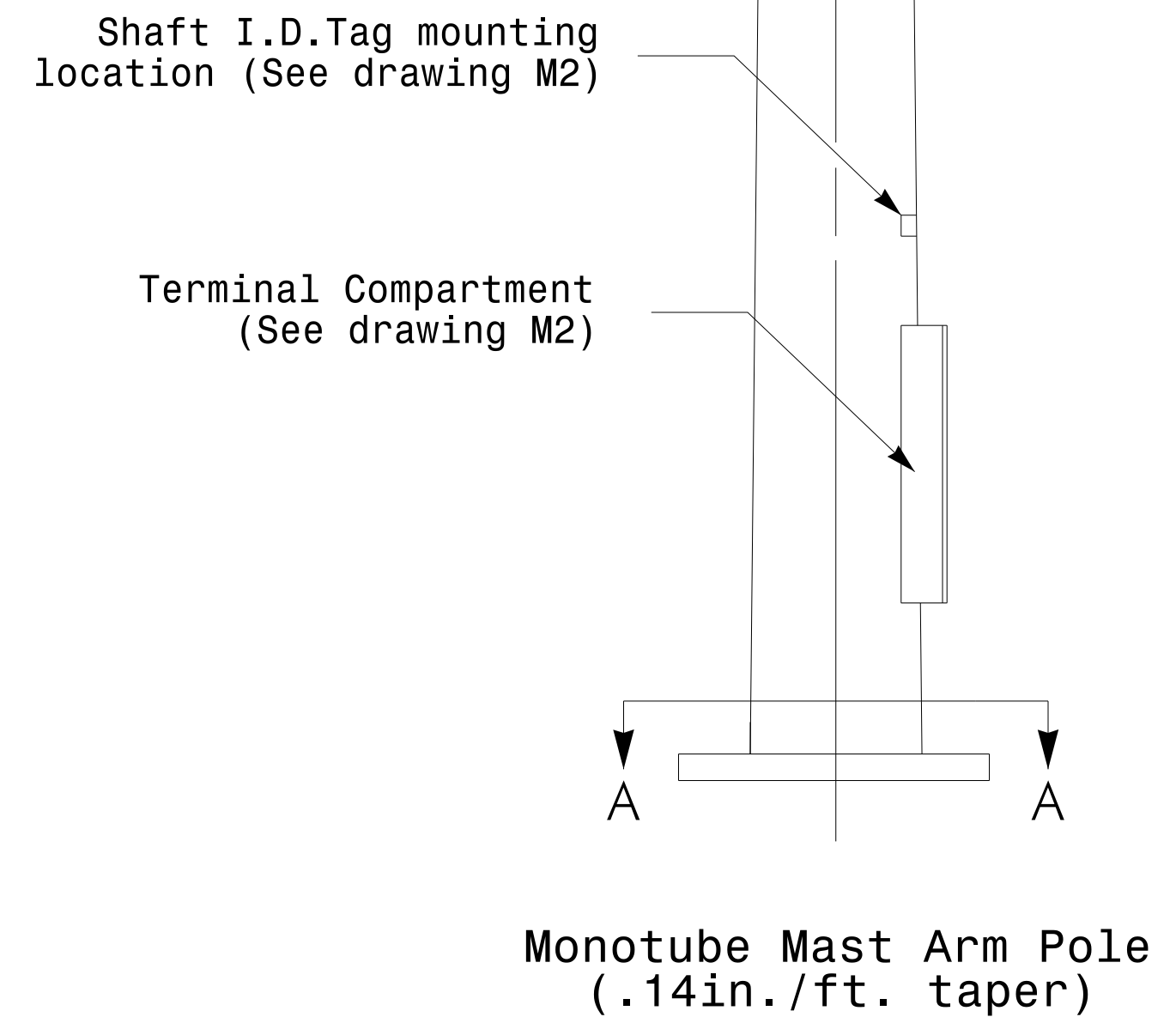
**Slip Fit Joint Detail for Mast Arm**



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



**Mast Arm Radial Orientation**

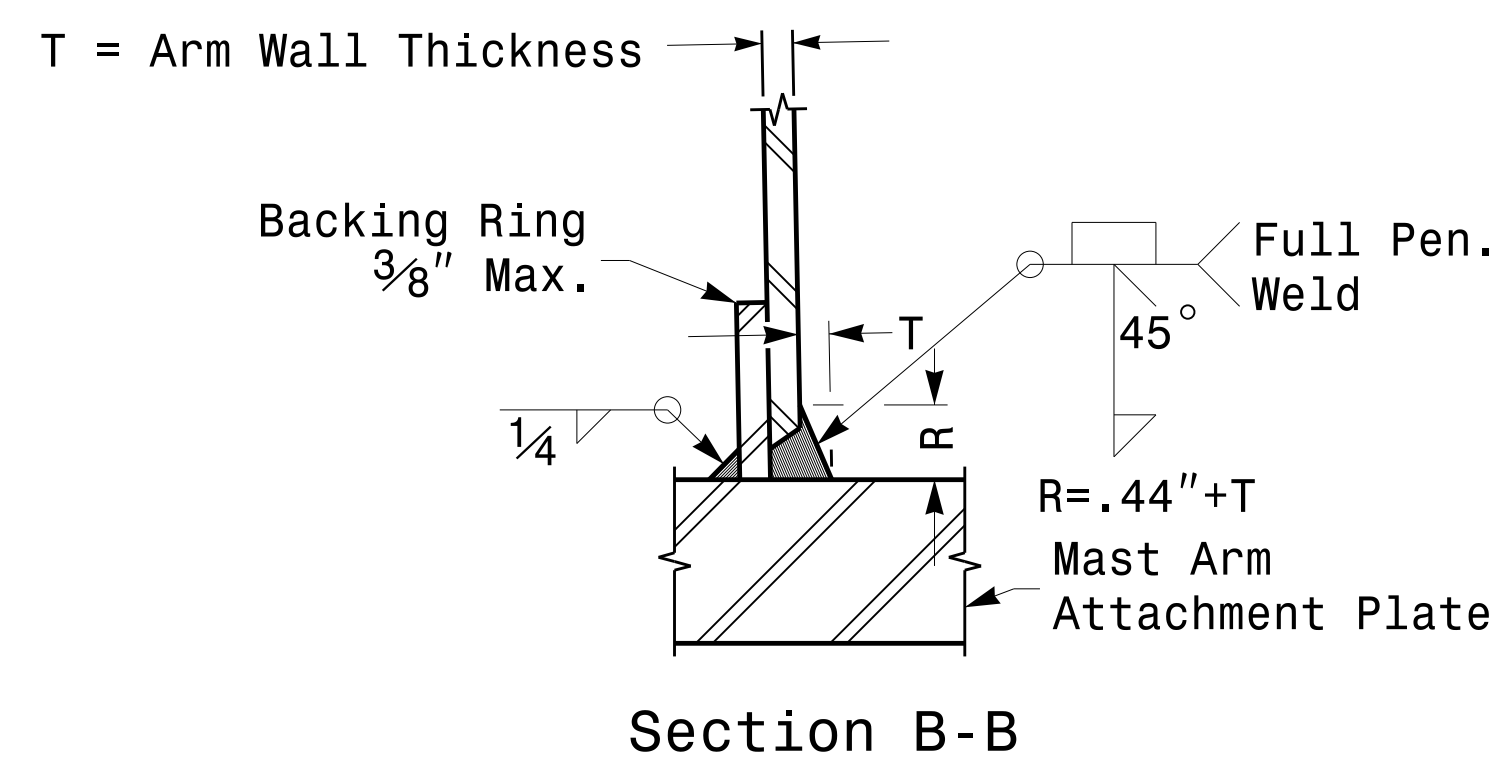
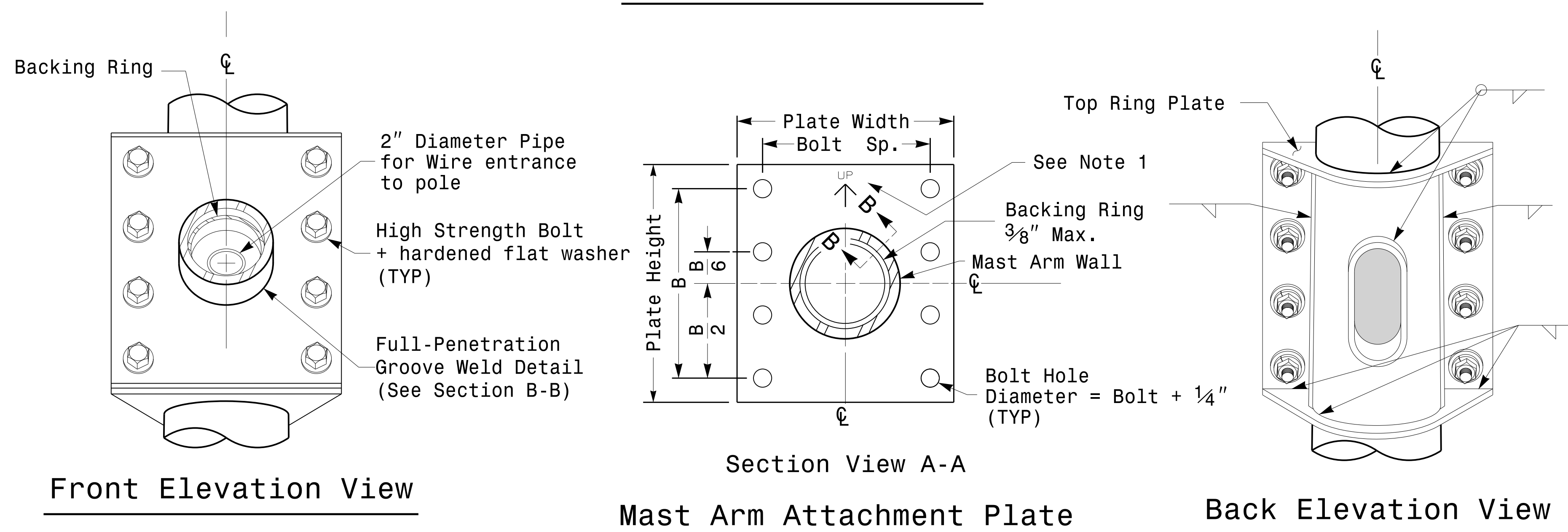
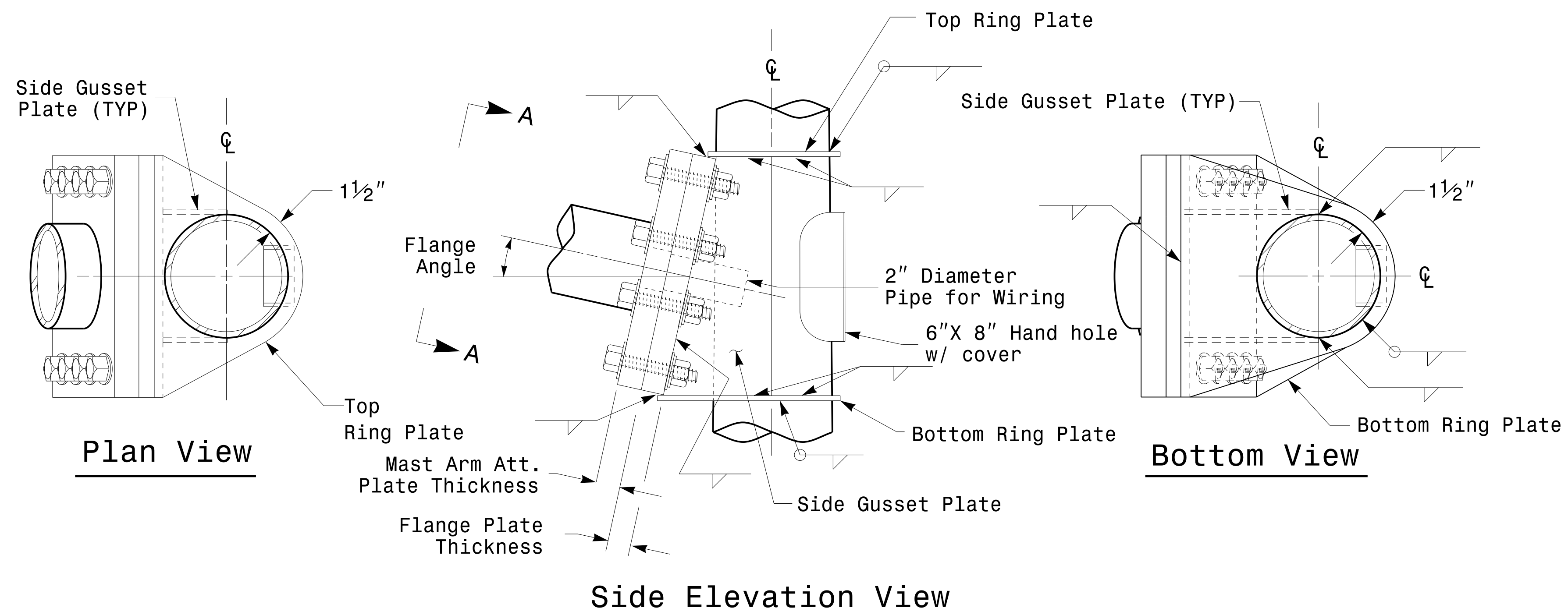


**Fabrication Details – Mast Arm Poles**

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<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>Typical Fabrication Details for Mast Arm Poles</p>		
	<p>PLAN DATE: AUGUST 2013</p> <p>PREPARED BY: N. BITTING</p> <p>SCALE: 0 NA NONE</p>	<p>DESIGNED BY: C.F. ANDREWS</p> <p>REVIEWED BY: D.C. SARKAR</p> <p>INIT. DATE</p>	

# Welded Ring Stiffened Mast Arm Connection



**Full-Penetration Groove Weld Detail**

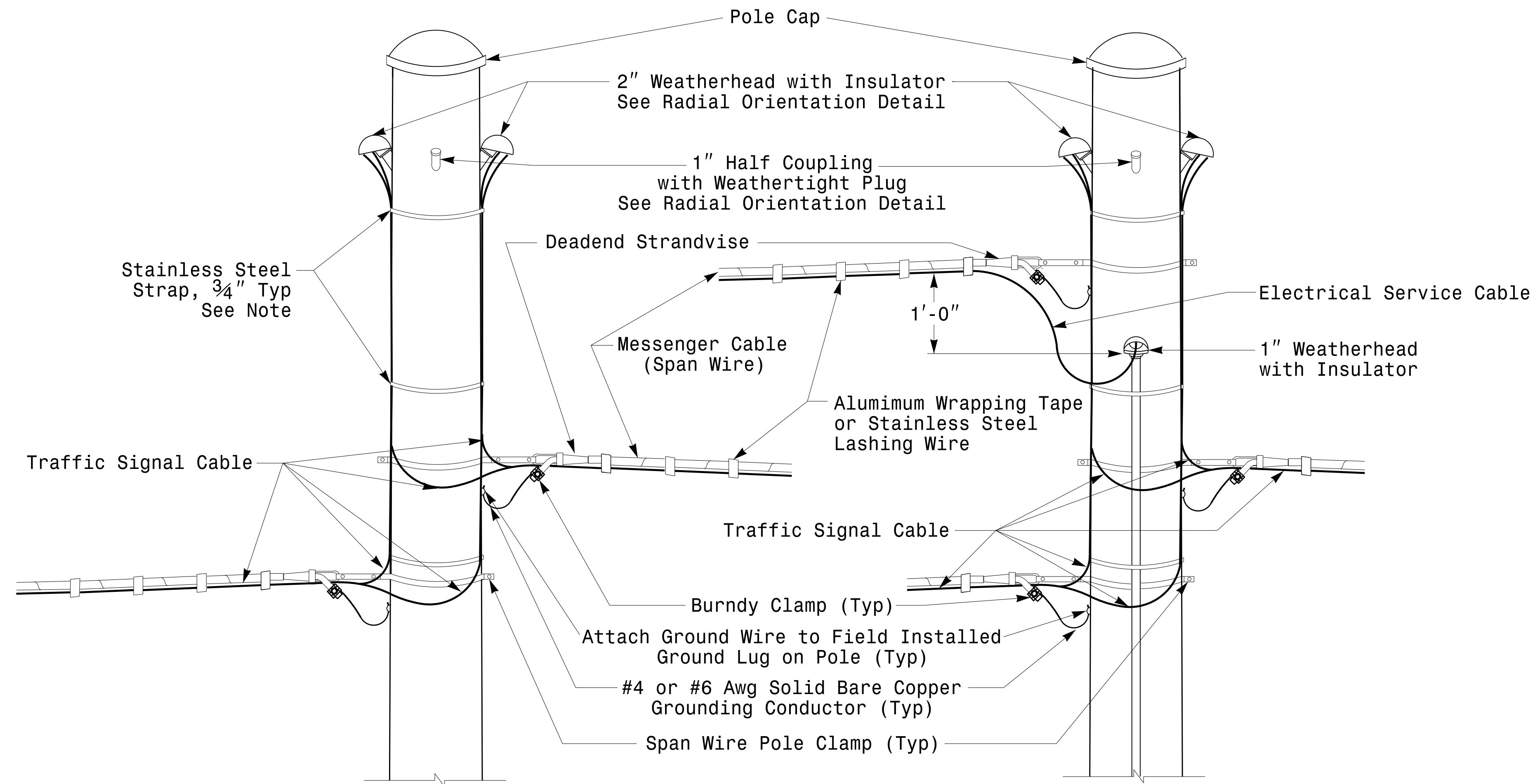
**Notes:**

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.

	<p>Fabrication Details For Mast Arm Connection To Pole</p>		
	<p>PLAN DATE: AUGUST 2013</p>	<p>DESIGNED BY: C.F. ANDREWS</p>	
<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>PREPARED BY: N. BITTING</p>	<p>REVIEWED BY: D.C. SARKAR</p>	<p>INIT. DATE</p>
<p>SCALE: 0 NA NONE</p>	<p>DocuSign by: D. C. SARKAR</p>		<p>8/26/2014</p>
<p>SIG. INVENTORY NO.</p>			<p>DATE</p>

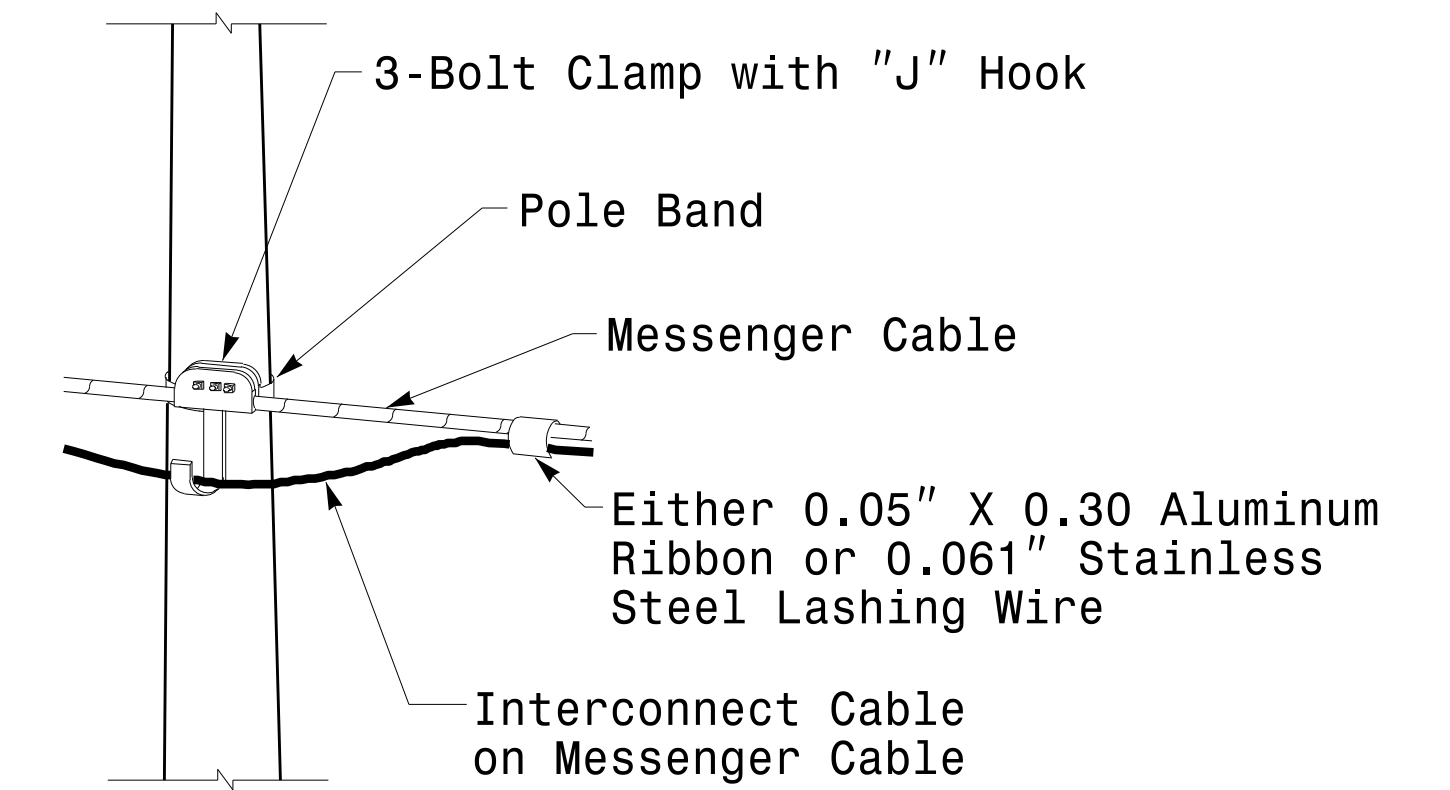
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**Fabrication Details – Mast Arm Poles**

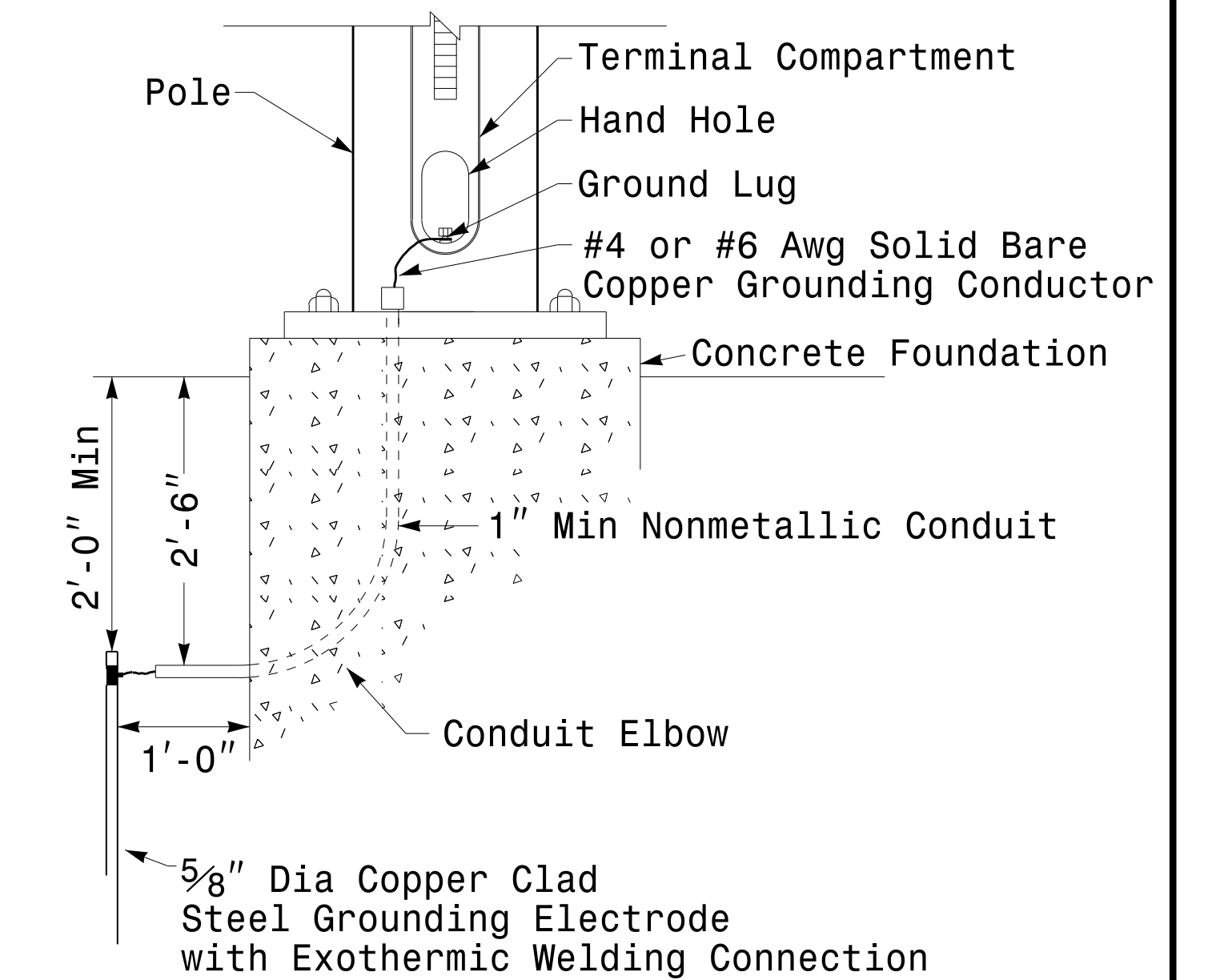


### Strain Pole Attachments

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"



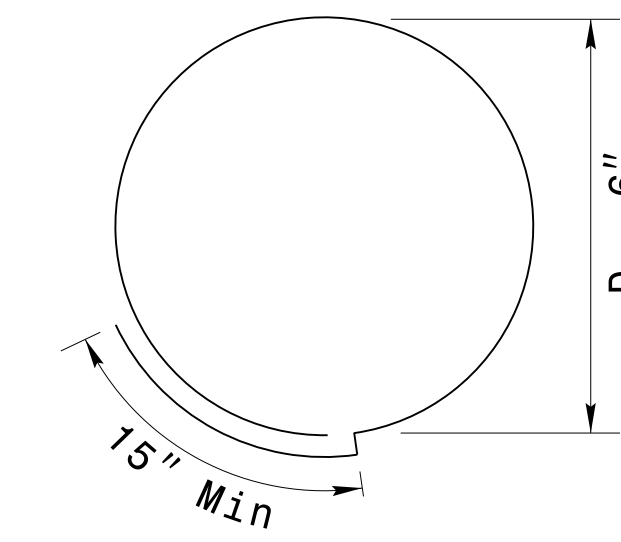
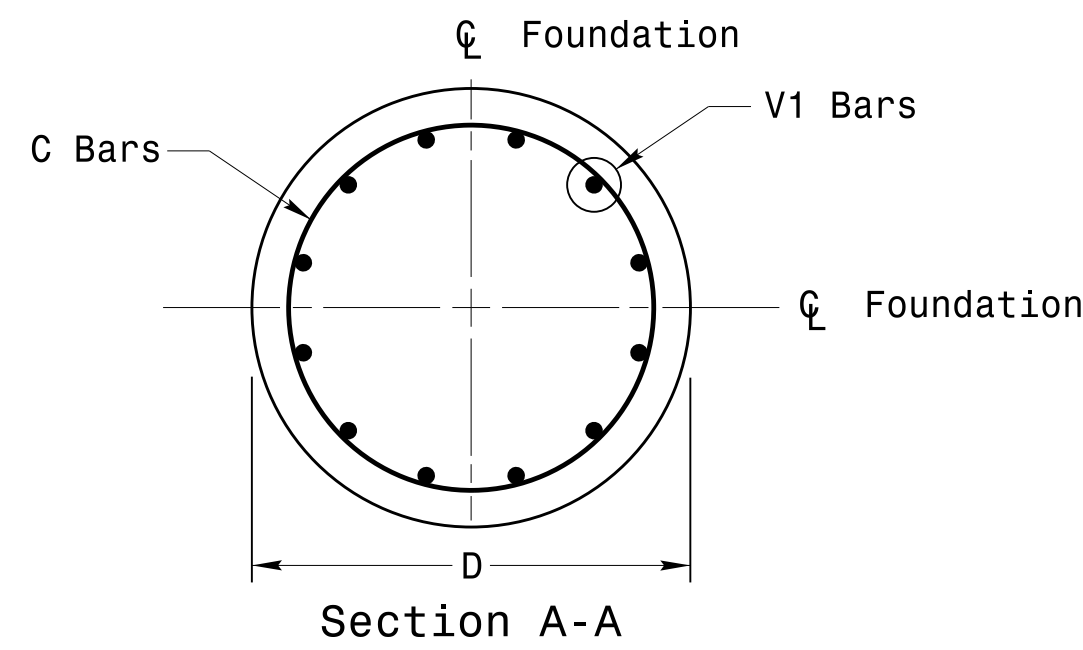
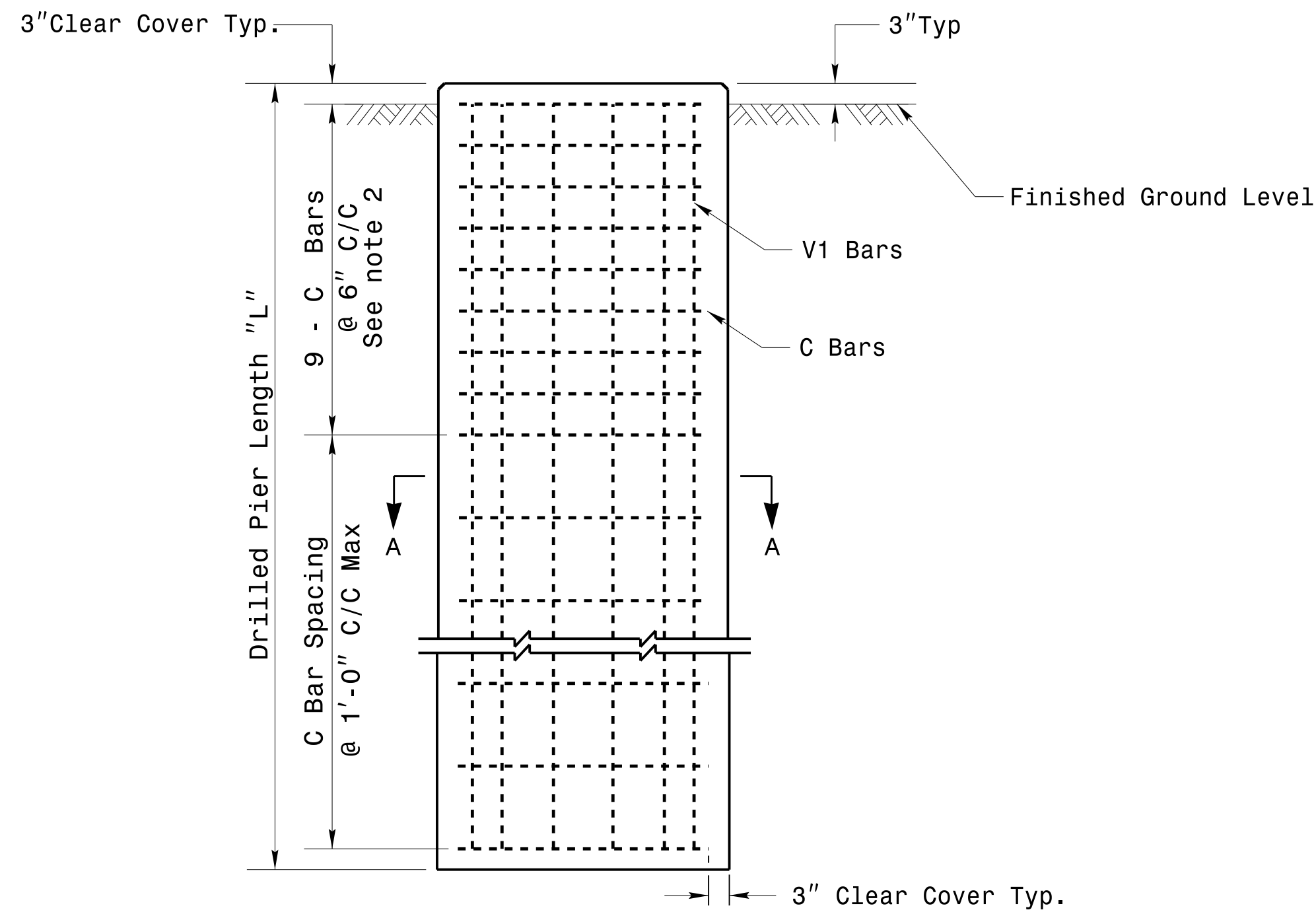
### Attachment of Cable to Intermediate Metal Pole



### 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.:

### Reinforcing Steel Bars



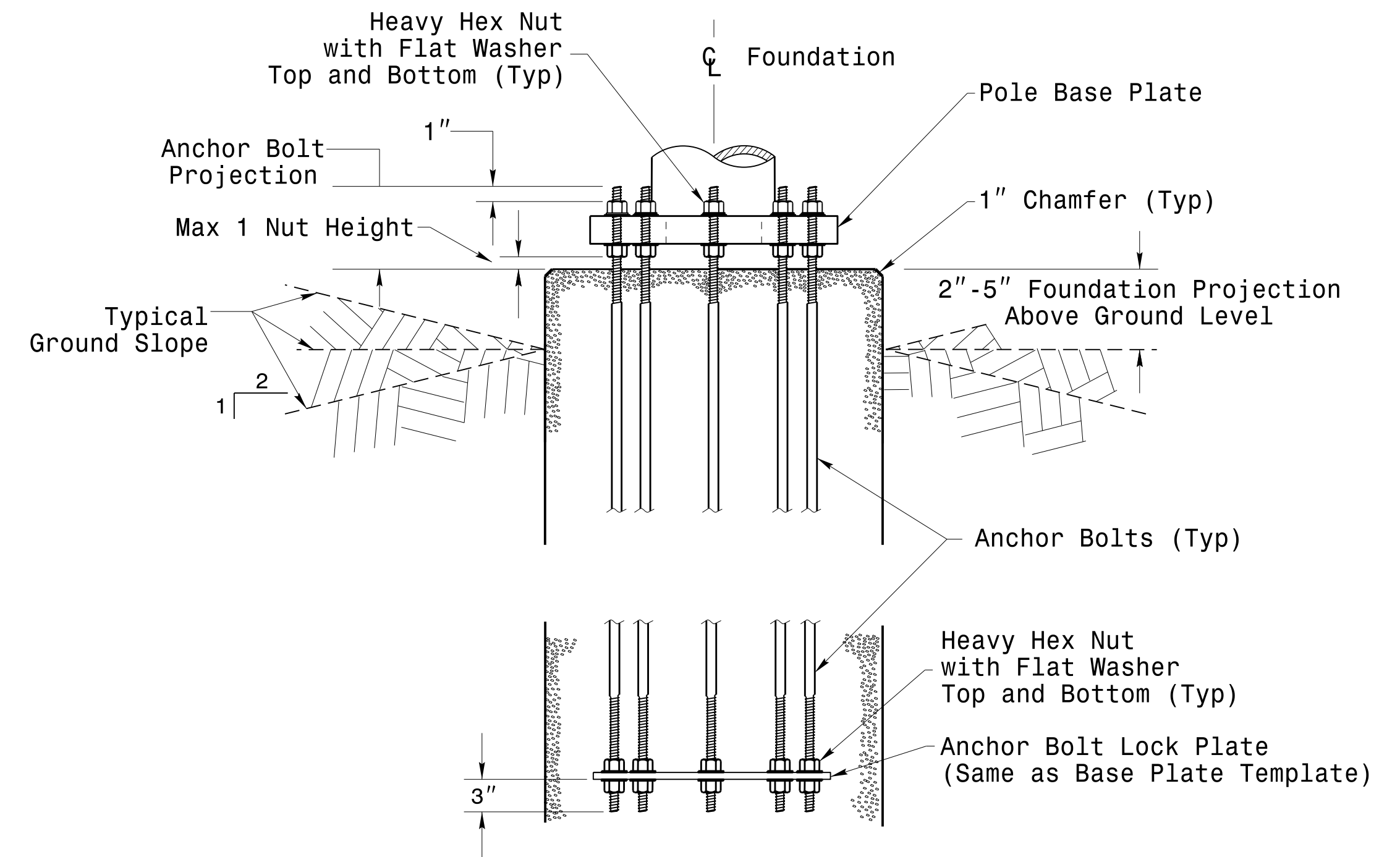
Typical "C" Bars

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"

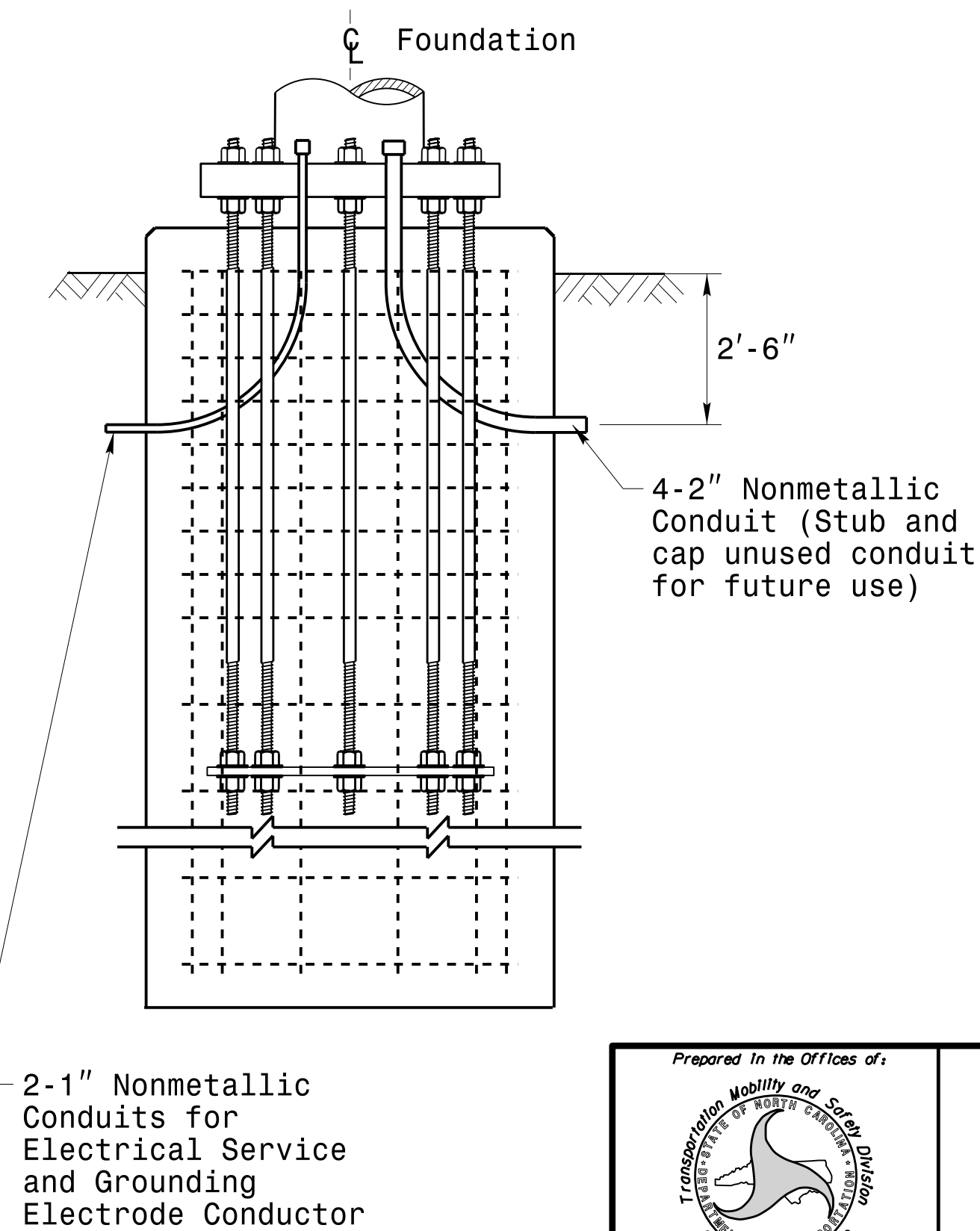
\* See Note No. 1  
 \*\* See Note No. 3  
 \*\*\* See Note No. 4

### 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.

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Construction Details – Foundations

	<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:**

- 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.
- Min. base plate thickness (T) is 2.0 inches.


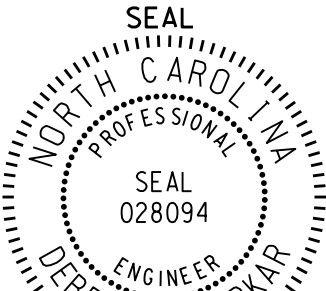
**Foundation Selection:**

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

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	<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>							
<p>SCALE: 0 NA</p> <p>None</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <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>Deborah C. Sarkar</i> 3/26/2014</p> <p>44EBE32E147E4C4... DATE</p>
REVISIONS	INIT.	DATE						

Standard Strain Pole Foundation - Saturated Soil Condition



# DRY 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	18	12.5	9	8	14.5	11	10	8	13	4	12
		S30L3	30	25	2	11	300	18.5	13	9	8	15	11.5	10	8	14	4	12
		S35L3	35	25	3	11	320	19	13.5	9.5	8	15	11.5	10.5	8	15	4	12
	HEAVY	S30H3	30	29	3	16	450	23	16	11	8	17.5	13.5	11.5	8	18	4	12
		S35H3	35	29	4	16	515	24.5	16.5	12	8.5	18.5	14	12	8	20	4	12
WIND ZONE 2	LIGHT	S26L2	26	23	2	10	245	17	12	8.5	8	14	11	9.5	8	13	4	12
		S30L2	30	23	2	10	270	18	12.5	8.5	8	14.5	11	10	8	13	4	12
		S35L2	35	23	3	10	300	18.5	13	9	8	14.5	11.5	10	8	14	4	12
	HEAVY	S30H2	30	29	3	15	415	22	15	10.5	8	17	13	11.5	8	17	4	12
		S35H2	35	29	4	15	475	23.5	16	11.5	8	18	13.5	12	8	19	4	12
WIND ZONE 3	LIGHT	S26L2	26	23	2	10	245	17	12	8.5	8	14	11	9.5	8	13	4	12
		S30L2	30	23	2	10	270	18	12.5	8.5	8	14.5	11	10	8	13	4	12
		S35L2	35	23	3	10	300	18.5	13	9	8	14.5	11.5	10	8	14	4	12
	HEAVY	S30H2	30	29	3	15	415	22	15	10.5	8	17	13	11.5	8	17	4	12
		S35H2	35	29	4	15	475	23.5	16	11.5	8	18	13.5	12	8	19	4	12
WIND ZONE 4	LIGHT	S26L1	26	22	2	8	190	15.5	10.5	8	8	13	10	9	8	12	4	12
		S30L1	30	22	2	8	205	15.5	11	8	8	13	10	9	8	12	4	12
		S35L1	35	22	3	8	230	16.5	11.5	8	8	13.5	10.5	9	8	12	4	12
	HEAVY	S30H1	30	25	3	12	320	19.5	13.5	9.5	8	15	12	10.5	8	15	4	12
		S35H1	35	25	4	12	350	20	14	10	8	15.5	12	10.5	8	15	4	12
WIND ZONE 5	LIGHT	S26L2	26	23	2	10	245	17	12	8.5	8	14	11	9.5	8	13	4	12
		S30L2	30	23	2	10	270	18	12.5	8.5	8	14.5	11	10	8	13	4	12
		S35L2	35	23	3	10	300	18.5	13	9	8	14.5	11.5	10	8	14	4	12
	HEAVY	S30H2	30	29	3	15	415	22	15	10.5	8	17	13	11.5	8	17	4	12
		S35H2	35	29	4	15	475	23.5	16	11.5	8	18	13.5	12	8	19	4	12

### Fabrication Design Notes:


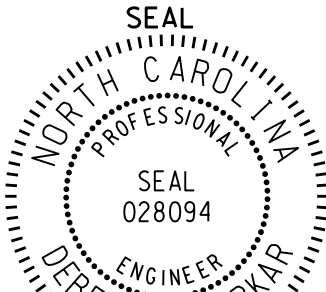
- Values shown in the "Reactions at the Pole Base" column represent the minimum acceptable capacity allowed for design using a design CSR of 1.00.
- Min. base plate thickness (T) is 2.0 inches.

### Foundation Selection:

- Perform a standard penetration test at each proposed foundation site to determine "N" value.
- Select the appropriate wind zone from M 1 drawing.
- Select the soil type (Clay or Sand) that best describes the soil characteristics.
- Get the appropriate standard pole case number from the plans or from the Engineer.
- Select the appropriate column 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.
- Reference Drilled Shafts: Construction Procedures and Design Methods, FHWA -IF-99-025

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

	<b>Standard Strain Pole Foundation for Dry Soil Condition</b>	
750 N. Greenfield Pkwy, Garner, NC 27529	PLAN DATE: SEPTEMBER 2013    DESIGNED BY: C.B. COGDRELL PREPARED BY: N. BITTING    REVIEWED BY: D. SARKAR	REVISIONS:    INIT.    DATE
SCALE: 0 NA None		DocuSigned by: Debesh C. Sarkar 2/26/2014 44EBE32E147E4C4...

Standard Strain Pole Foundation - Dry Soil Condition