

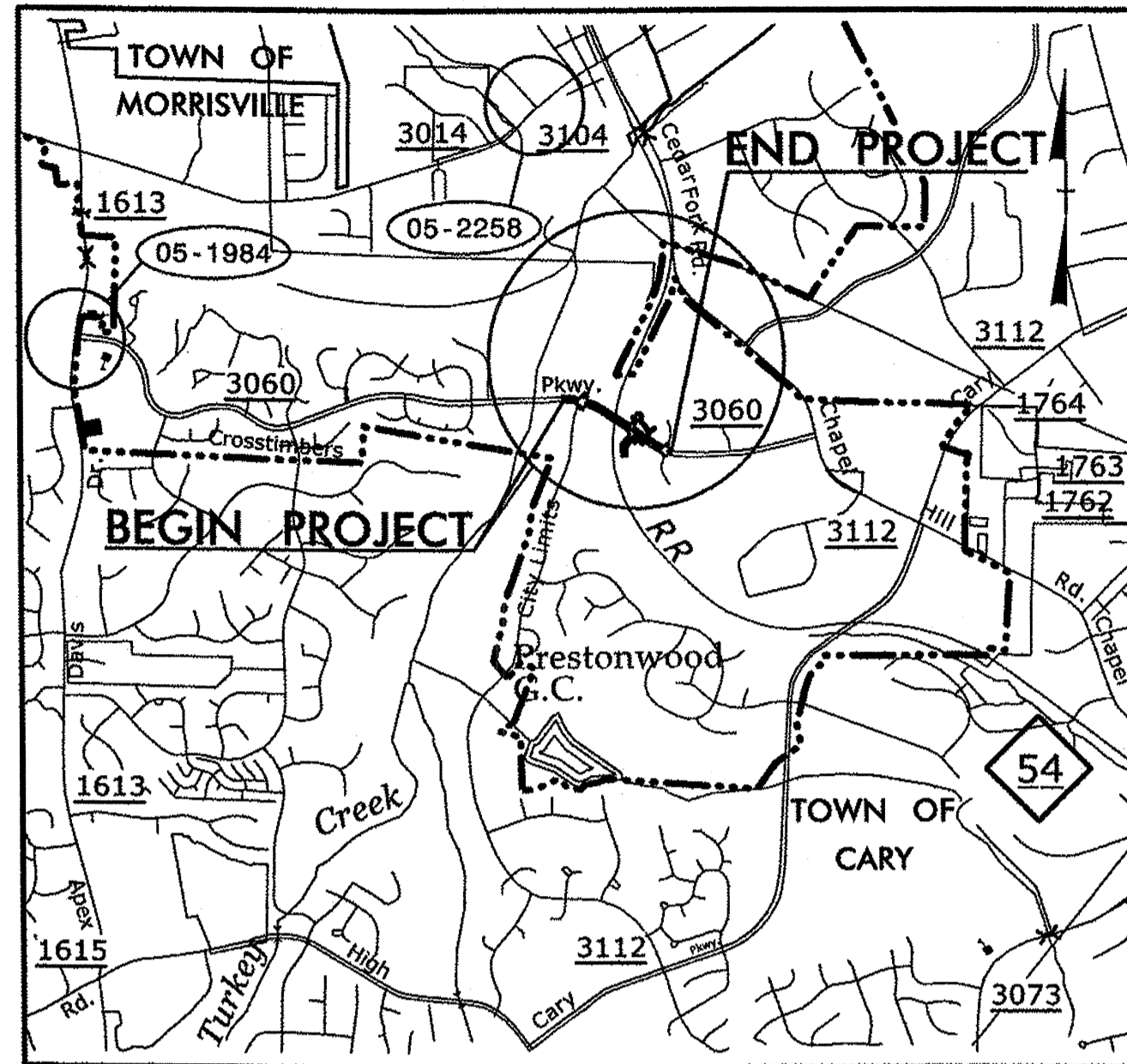
0422DEL\_P19

Project: TIP PROJECT: P-5201

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

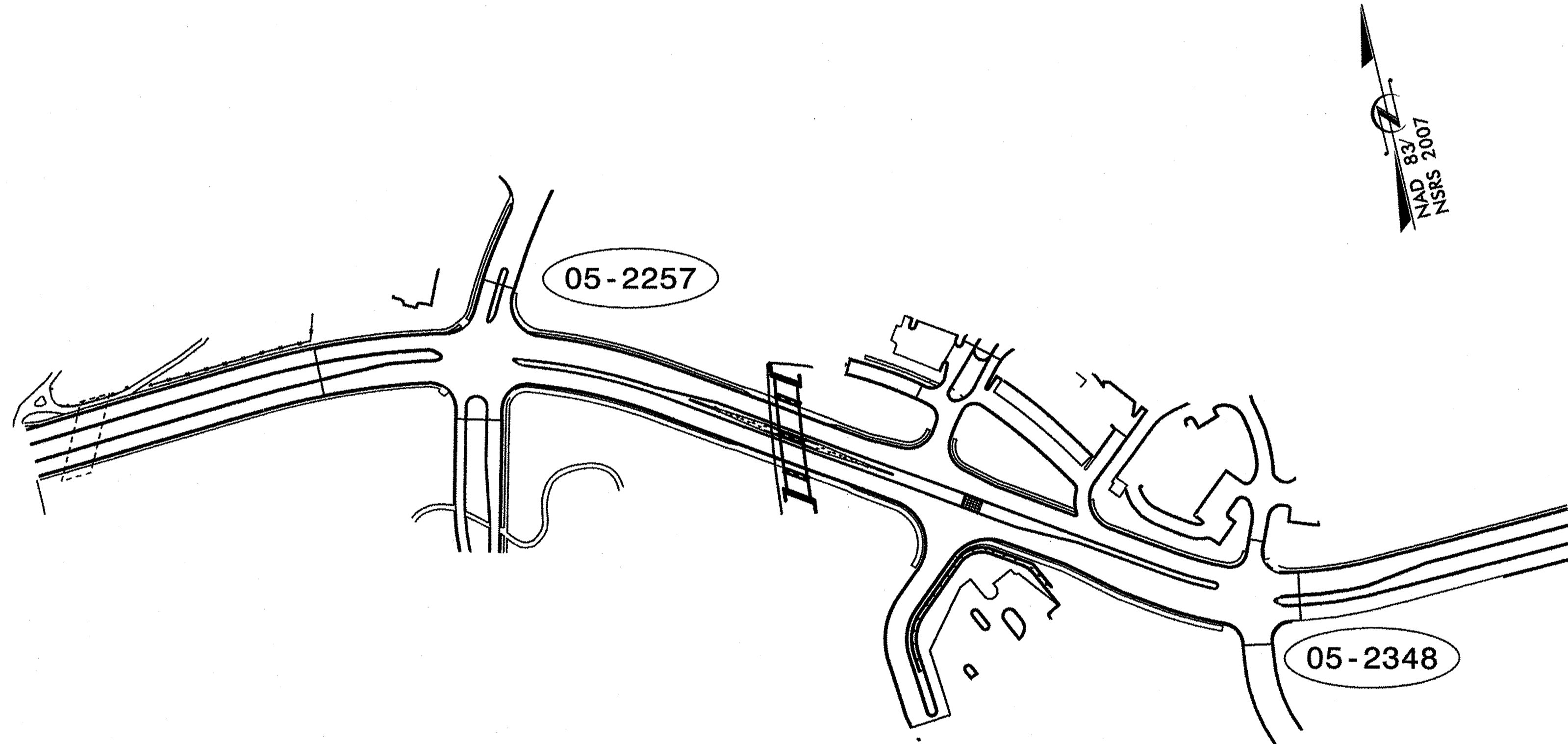
Project No. P-5201  
Sheet No. SIG-1

WAKE COUNTY



LOCATION: MORRISVILLE PARKWAY (SR 3060)  
GRADE SEPARATION UNDER NSNCRR RAILROAD  
FROM WEST OF CRABTREE CROSSING PARKWAY  
TO EAST OF BRISTOL CREEK DRIVE

TYPE OF WORK: TRAFFIC SIGNALS AND COMMUNICATIONS CABLE



**AECOM**

NC Firm License No.: F-0342  
701 Corporate Center Drive  
Suite 475 Raleigh, NC 27607  
Phone: 919-854-6200

Sheet #	Reference #
SIG-1	
SIG-2 to SIG-11	05-2348
SIG-12 to SIG-19	05-1984
SIG-20 to SIG-30	05-2257
SIG-31 to SIG-36	05-2258
SIG-37 to SIG-41	
ITS-1 to ITS-12	

Index of Plans

Location/Description
Title Sheet
SR 3060 (Morrisville Parkway) at Bristol Creek Drive / Quail Fields Court
SR 1613 (Davis Drive) at SR 3060 (Morrisville Parkway)
SR 3060 (Morrisville Parkway) at Crabtree Crossing
SR 3014 (Morrisville-Carpenter Road) at Town Hall Drive
Standard Metal Pole Details / Drawings
Communication Cable and Conduit Routing and CCTV Camera Plans

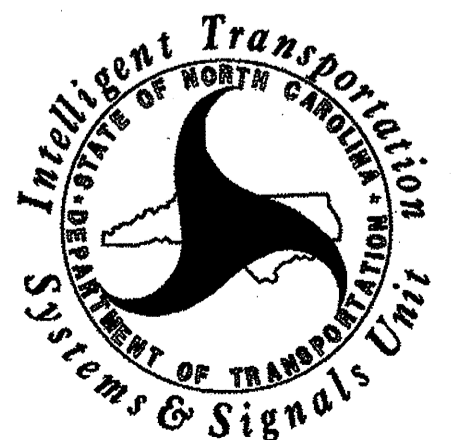
INTELLIGENT TRANSPORTATION AND SIGNALS UNIT

Contacts:

R. J. Ziemba, PE - Central Region Signals Engineer  
G. C. Brown, PE - Signal Equipment Design Engineer  
I. Neil Avery - Signals Communications Project Engineer

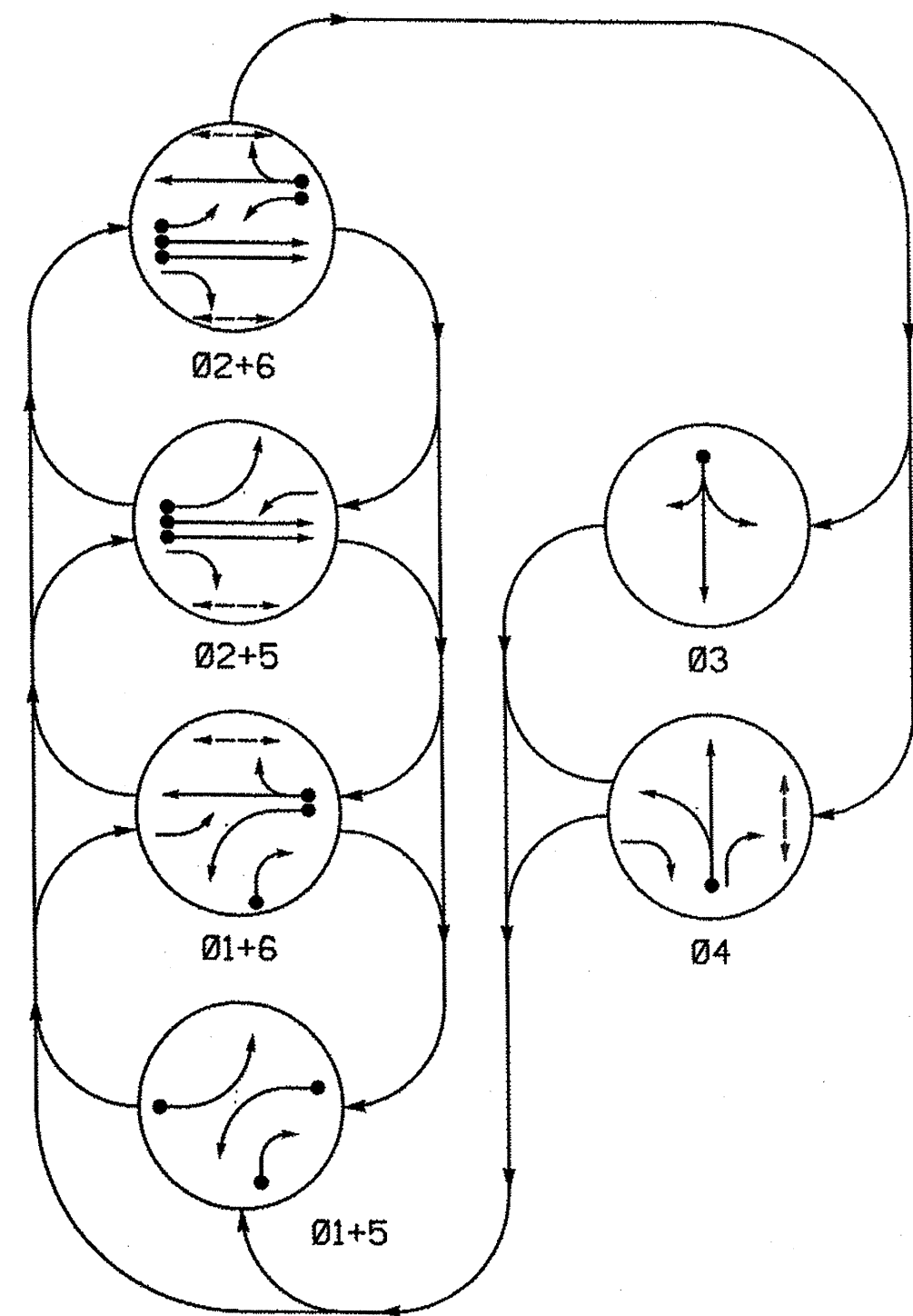
Refer to "Roadway Standard Drawings  
NCDOT" dated January 2012 and  
"Standard Specifications for Roads  
and Structures" dated January 2012.

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

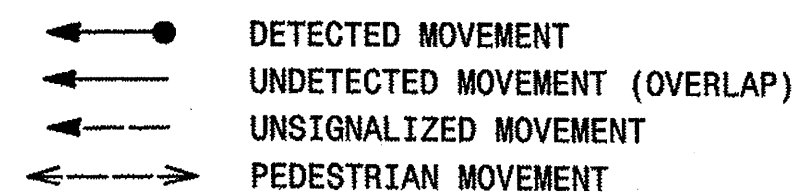


750 N. Greenfield Parkway, Garner, NC 27529

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND



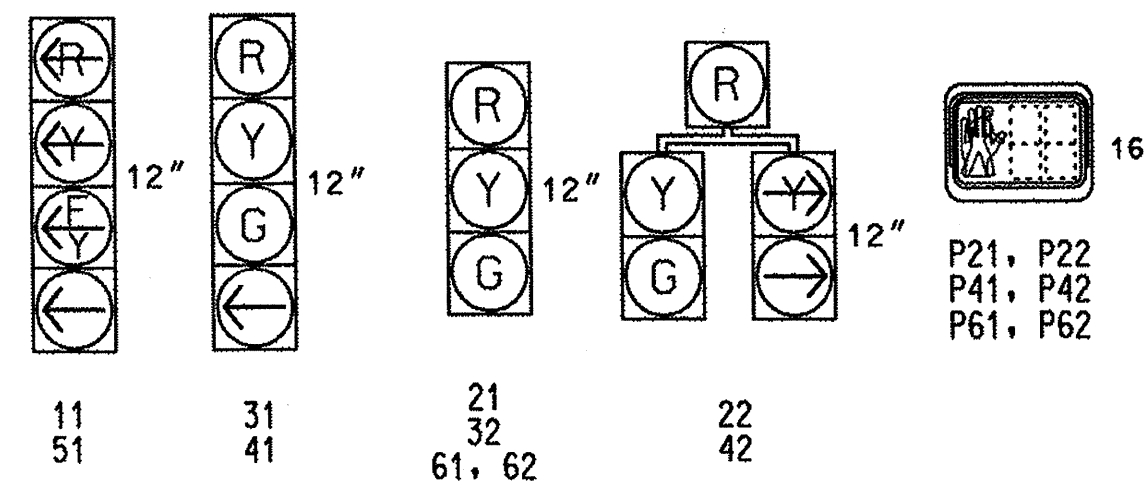
SIGNAL FACE	PHASE						E/O/D/F/T
	01+5	01+6	02+5	02+6	03	04	
11							Y
21	R	R	G	G	R	R	Y
22	R	R	G	G	R	R	Y
31	R	R	R	R	G	R	R
32	R	R	R	R	G	R	R
41	R	R	R	R	R	G	R
42	R	R	R	R	R	G	R
51							Y
61,62	R	G	R	G	R	R	Y
P21, P22	DW	DW	W	W	DW	DW	DRK
P41, P42	DW	DW	DW	DW	DW	W	DRK
P61, P62	DW	W	DW	W	DW	DW	DRK

FLASHING YELLOW ARROW

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

SIGNAL FACE I.D.

All Heads L.E.D.



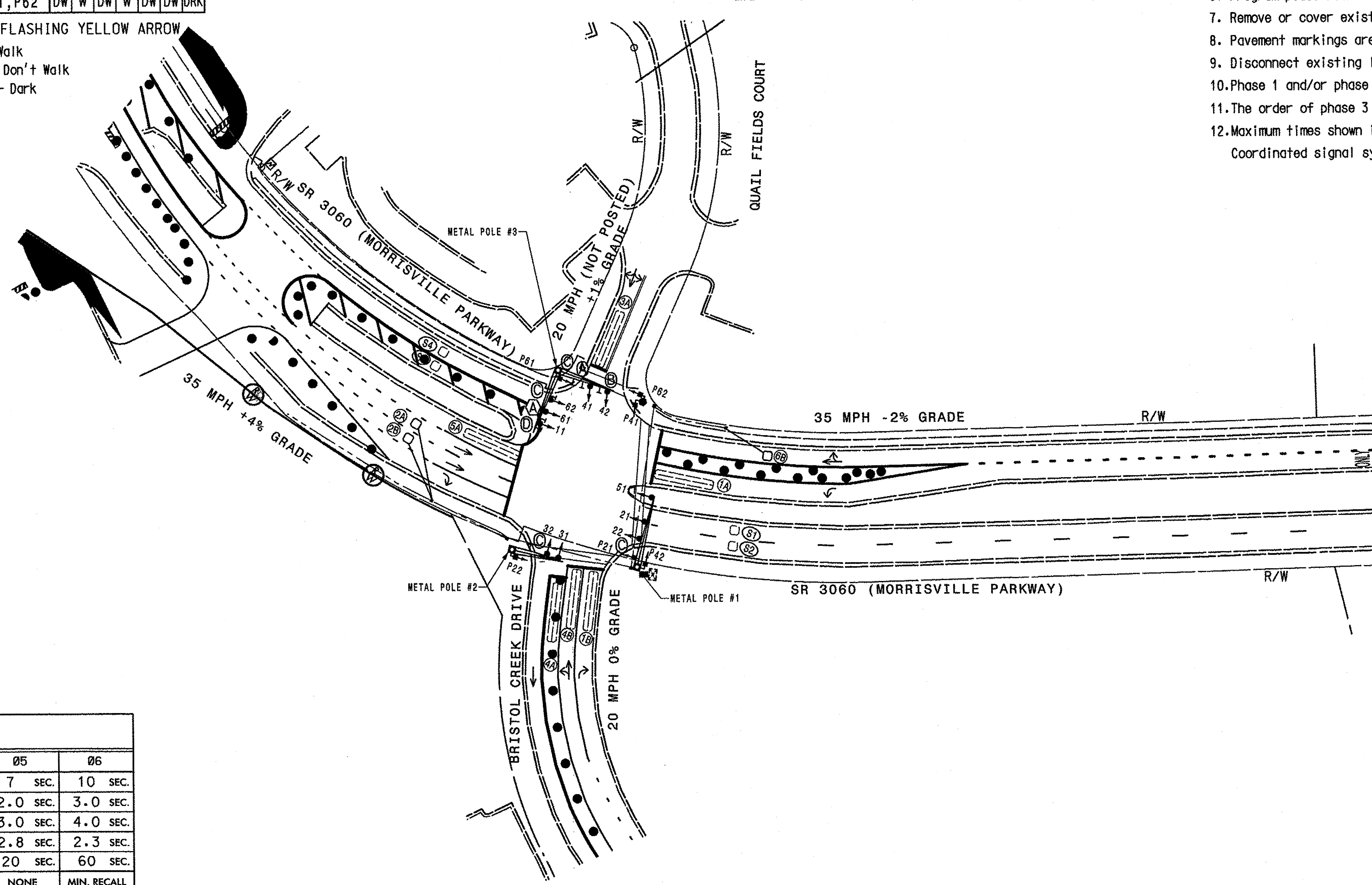
NEMA LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	INDUCTIVE LOOPS		DETECTOR UNITS				
				NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING	
									FEATURE	TIME
1A	6X40	0	2-4-2	-	X	1	X	DELAY	15	YES
1B	6X40	0	2-4-2	-	X	1	X	DELAY	15	YES
2A, 2B	6X6	70	4	X	-	2	X	-	-	NO
3A	6X40	0	2-4-2	-	X	3	X	DELAY	5	YES
4A	6X40	0	2-4-2	-	X	DISCONNECTED				
4B	6X40	0	2-4-2	-	X	4	X	-	-	NO
5A	6X40	0	2-4-2	-	X	5	X	DELAY	15	YES
6B	6X6	70	4	X	-	6	X	-	-	NO
S1	6X6	+150	EXIST	-	X	SYSTEM DETECTOR				
S2	6X6	+150	EXIST	-	X	SYSTEM DETECTOR				
S3	6X6	+150	EXIST	-	X	SYSTEM DETECTOR				
S4	6X6	+150	EXIST	-	X	SYSTEM DETECTOR				

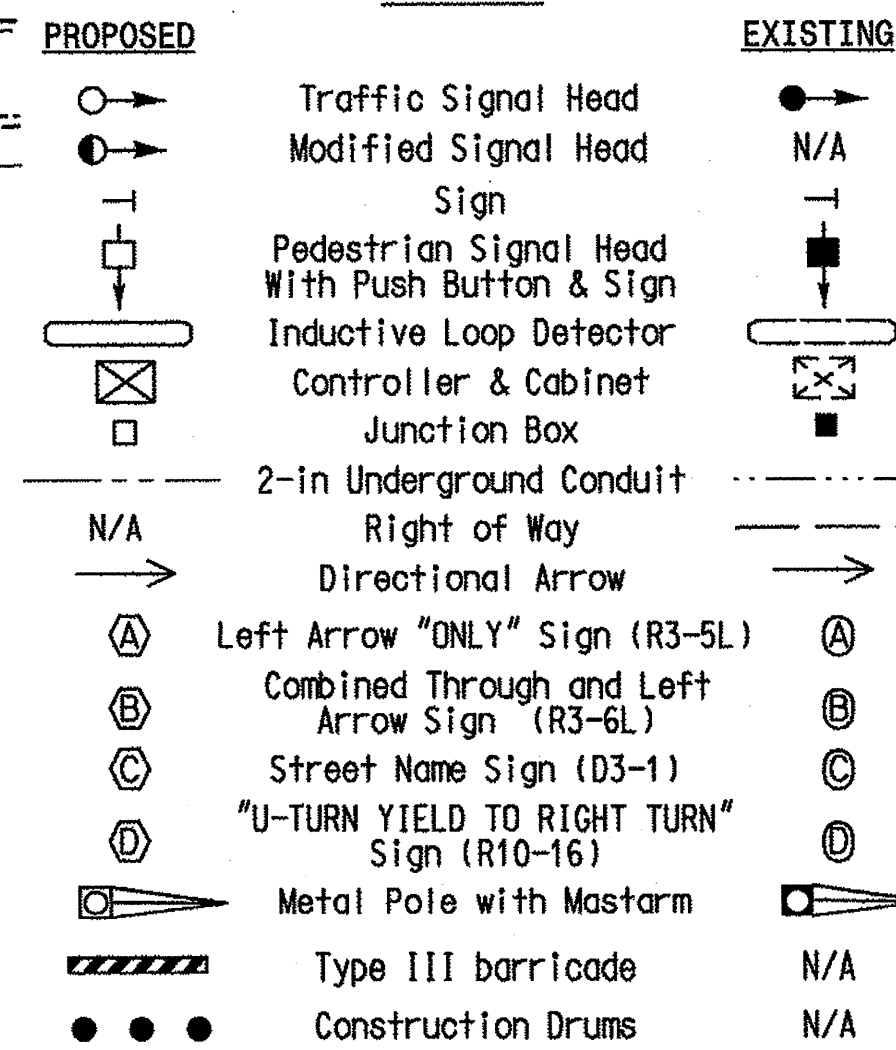
6 PHASE FULLY ACTUATED (CARY SIGNAL SYSTEM)

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.
- Reposition existing signal heads numbered 41, 61 and 62.
- Set all detectors 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.
- Remove or cover existing sign A (R3-5L).
- Pavement markings are existing.
- Disconnect existing loop 4A.
- Phase 1 and/or phase 5 may be lagged.
- The order of phase 3 and phase 4 may be reversed.
- Maximum times shown in the timing chart are for free-run operation only. Coordinated signal system values supersede these values.



LEGEND



NEMA TIMING CHART						
2070LN2 CONTROLLER WITH TS-2 CABINET						
PHASE	01	02	03	04	05	06
MINIMUM GREEN*	7 SEC.	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.
PASSAGE GAP*	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.0 SEC.	3.0 SEC.	3.0 SEC.	3.0 SEC.	4.0 SEC.
RED CLEARANCE	3.3 SEC.	2.3 SEC.	3.6 SEC.	3.7 SEC.	2.8 SEC.	2.3 SEC.
MAX. I*	30 SEC.	60 SEC.	20 SEC.	20 SEC.	20 SEC.	60 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	NONE	MIN. RECALL
VEH. CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	NONLOCK	LOCK
WALK*	- SEC.	7 SEC.	- SEC.	7 SEC.	- SEC.	7 SEC.
FLASHING DON'T WALK	- SEC.	11 SEC.	- SEC.	20 SEC.	- SEC.	5 SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD*	- VEH.	- VEH.	- VEH.	- VEH.	- VEH.	- VEH.
SEC. PER ACTUATION*	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MAX. INITIAL*	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
TIME B4 REDUCTION*	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
TIME TO REDUCE*	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.

\* 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.

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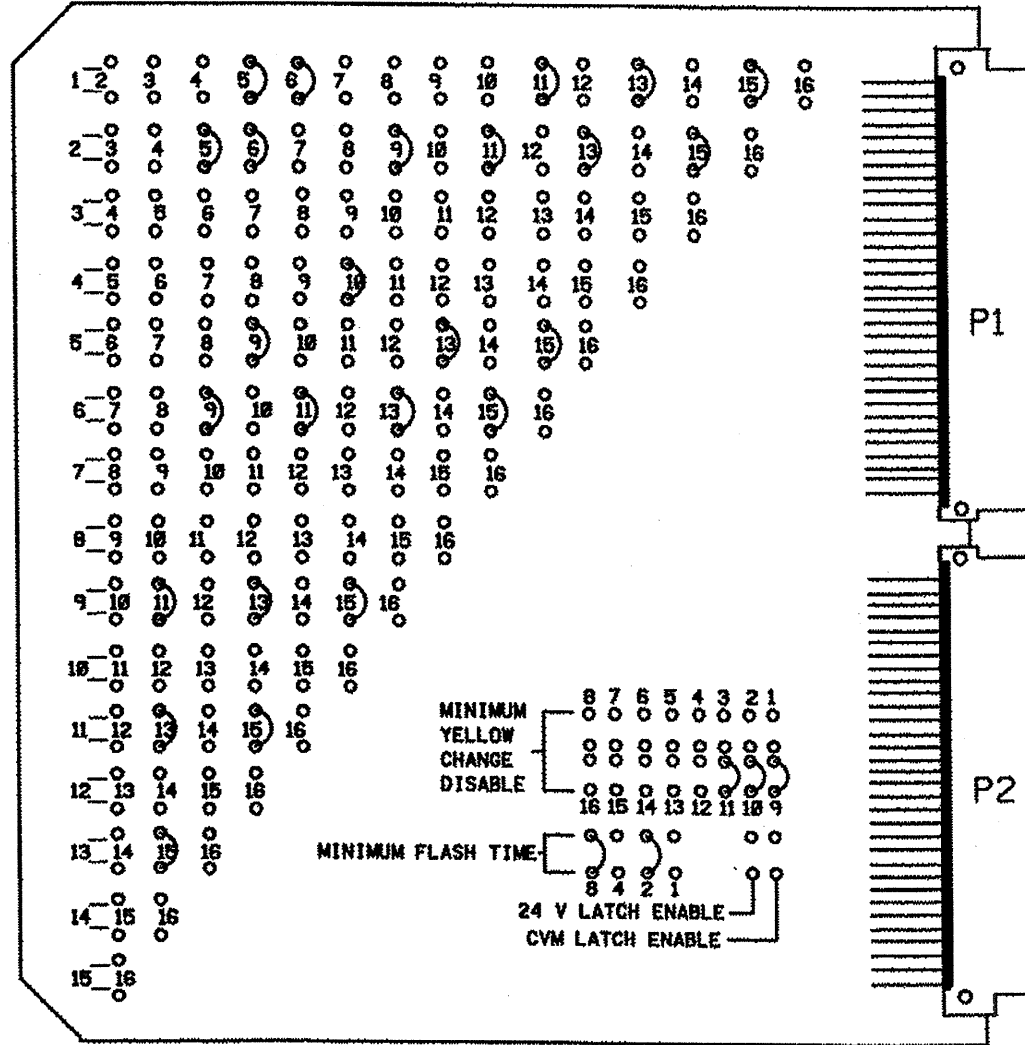
SIGNAL UPGRADE - TEMPORARY DESIGN 1 - (TMP PHASE II & III)

Prepared in the Office of:  
 Transportation Mobility and Safety Division  
 SEAL  
 SR 3060 (Morrisville Parkway) at Bristol Creek Drive / Quail Fields Court  
 Division 5 Wake County Morrisville  
 PLAN DATE: May 2013 REVIEWED BY: A. Demers  
 PREPARED BY: S. W. Cox REVIEWED BY: S. Nandagiri  
 SCALE: 1" = 50'  
 SEAL  
 NORTH CAROLINA PROFESSIONAL ENGINEER  
 SEAL 37856  
 SIGNATURE DATE  
 SIG. INVENTORY NO. 05-234811

11:57:08 PM C:\p2380394001\_1\Information\10\_DWG\F1\2013\5201\0422DEL\_P19.dgn

### EDI MODEL MMU-16LE MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown below)



MMU PROGRAMMING CARD

CHANNEL NUMBER	ENABLE/DISABLE
1	ENABLE
2	ENABLE
3	ENABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	ENABLE
10	ENABLE
11	ENABLE
12	DISABLE
13	ENABLE
14	DISABLE
15	ENABLE
16	DISABLE

OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2-12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 1B	OFF
TYPE12-SOLC	OFF

CH. GROUP FOR PROTECTED GREEN ARROWS	CH. 1,3,5,7
ENABLE CHANNEL PAIR, FYA	
CH 1-13	ON
CH 3-14	OFF
CH 5-15	ON
CH 7-16	OFF

1. ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

### DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	DETECTOR RACK #1						DETECTOR RACK #2						
	CHI L3 Ø1	CHI L1 Ø1	CHI L7 Ø3	CHI L5 Ø2	SLOT NOT USED	NOT USED	CHI L19 SYSTEM DETECTOR	CHI L17 SYSTEM DETECTOR	SLOT NOT USED	SLOT NOT USED	SLOT NOT USED	SLOT NOT USED	SLOT NOT USED
	NOT USED	CHI L2 Ø6	NOT USED	NOT USED	EMPTY	CHI L10 Ø4	CHI L16 Ø6	CHI L14 Ø2	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
1A	L1A, L1B L2A, L2B
1B	L3A, L3B L4A, L4B
2A, 2B	L5A, L5B L6A, L6B
3A	L7A, L7B L8A, L8B
4B	L9A, L9B L10A, L10B
5A	L11A, L11B L12A, L12B L13A, L13B L14A, L14B
6B	L15A, L15B L16A, L16B
S1	L17A, L17B
S2	L18A, L18B
S3	L19A, L19B
S4	L20A, L20B
NU	L21A, L21B
NU	L22A, L22B
NU	L23A, L23B
NU	L24A, L24B
NU	L25A, L25B
NU	L26A, L26B
NU	L27A, L27B
NU	L28A, L28B
NU	L29A, L29B
NU	L30A, L30B
NU	L31A, L31B
NU	L32A, L32B

NOTE  
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

NU = NOT USED

\* THIS DETECTOR IS EQUIPPED WITH DELAY AND EXTEND TIMERS. PROGRAM THE TIMING REQUIRED FOR THIS DETECTOR CHANNEL ON THE DETECTOR UNIT. NOT THE CONTROLLER.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	Ø1	DELAY	15
2	Ø6		
3	Ø1	DELAY	15
4			
5	Ø2		
6			
7	Ø3	DELAY	5
8			
9			
10	Ø4		
11			
12			
13	Ø5	DELAY	15
14	Ø2		
15			
16	Ø6		
17	SYSTEM		
18	SYSTEM		
19	SYSTEM		
20	SYSTEM		
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

### NOTES

- To prevent "Flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
- To prevent red failures on unused monitor channels, tie unused load switch red outputs 7,8,12,14 and 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (red out). Make sure all flash transfer relays are in place.
- Program controller to start up in phases 2 and 6 green.
- Set power-up flash time to 10 seconds and implement on the Malfunction Management Unit. Set controller power-up flash time to 0 seconds.
- Enable simultaneous gap-out feature, on controller unit, for all phases.
- Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
- Program detector call delay and extension timing on the controller, unless otherwise specified.
- Set all detector card unit channels to "presence" mode.
- This controller and cabinet are part of the Cary Signal System.

### EQUIPMENT INFORMATION

CONTROLLER.....ECONOLITE 2070LN2  
 CABINET .....ECONOLITE [TS2-1] NC-8  
 SOFTWARE.....ECONOLITE ASC/2070  
 CABINET MOUNT.....BASE  
 LOADBAY POSITIONS.....16  
 LOAD SWITCHES USED.....1,2,3,4,5,6,9,10,11,13,15  
 PHASES USED.....1,2,3,4,5,6,2PED,4PED,6PED  
 OLA.....\*  
 OLB.....NOT USED  
 OLC.....\*  
 OLD.....NOT USED

\* See Sheet 2 of 2 Econolite ASC/2070 Overlap Programming Detail.

### LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	Ø1
2	Ø2
3	Ø3
4	Ø4
5	Ø5
6	Ø6
7	Ø7
8	Ø8
9	Ø2 PED
10	Ø4 PED
11	Ø6 PED
12	Ø8 PED
13	OLA
14	OLB
15	OLC
16	OLD

### FIELD CONNECTION HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	11*	42	21,22	31	32	22	41	42	51*	61,62	NU	NU	NU	NU	51*	NU
RED	*	2R	3R	3R		4R	4R	*	6R							
YELLOW		2Y	3Y	3Y		4Y	4Y	*	6Y							
GREEN		2G	3G	3G		4G	4G		6G							
RED ARROW													13R		15R	
YELLOW ARROW		1Y			4Y								13Y		15Y	
FLASHING YELLOW ARROW													13G		15G	
GREEN ARROW	1G	1G		3G	4G	4G		5G								
Hand icon									9R	10R	11R					
Hand icon									9G	10G	11G					

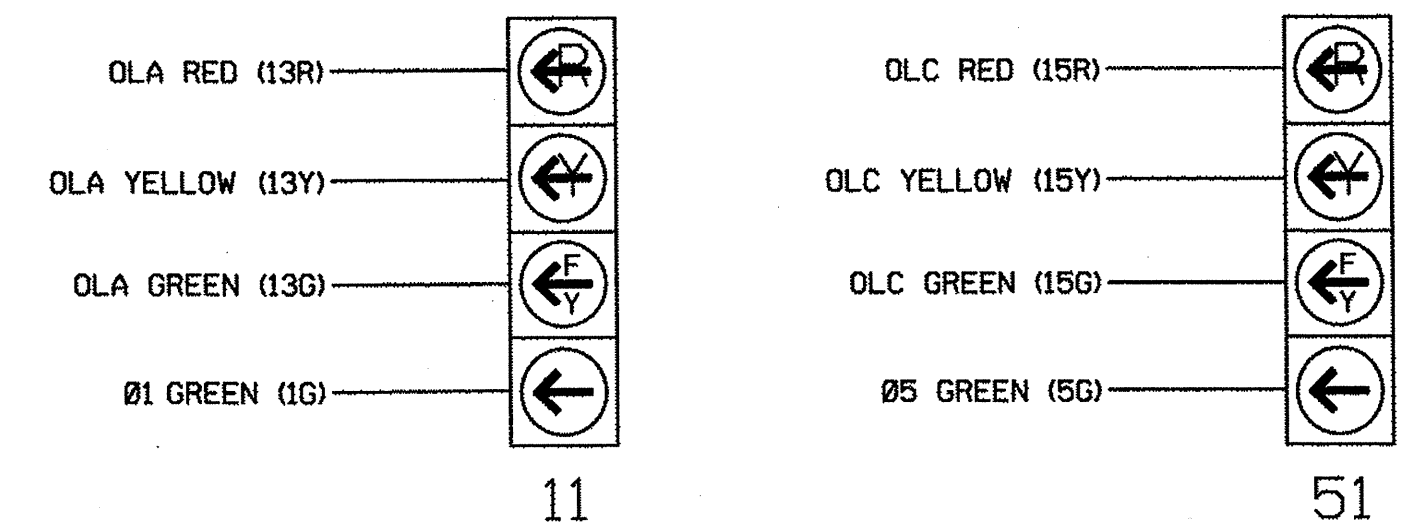
NU = Not Used

\* Denotes install Load Resistor, see Load Resistor installation detail this sheet.

\* See pictorial of head wiring detail this sheet.

### 4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)

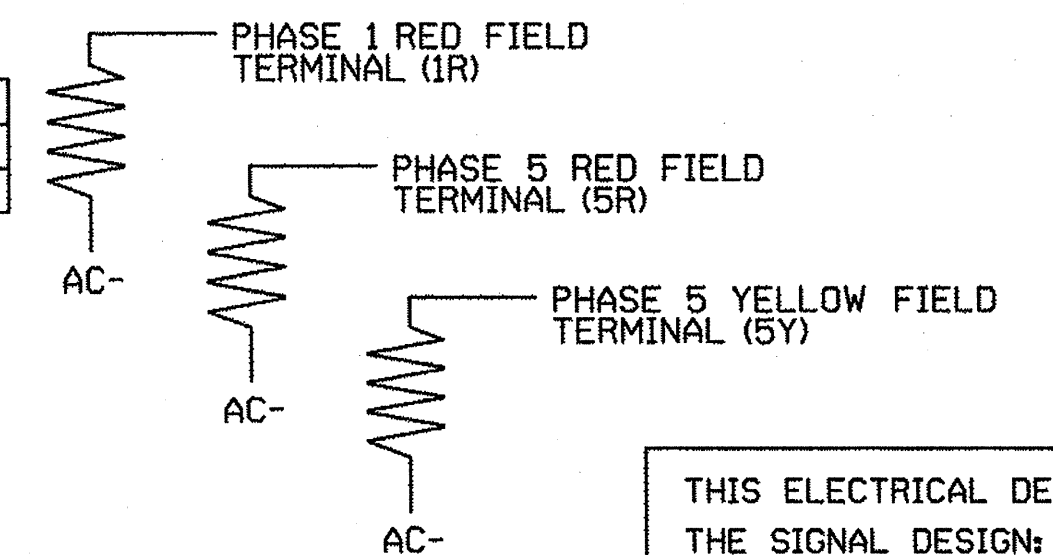


NOTE

1. See overlap programming instructions sheet 2 of 2.

### LOAD RESISTOR INSTALLATION DETAIL

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



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2348T1  
 DESIGNED: May 2013  
 SEALED: September 30, 2013  
 REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 1 - (TMP PHASE II & III)

Sheet 1 of 2

	<b>SR 3060 (Morrisville Parkway)</b> at <b>Bristol Creek Drive / Quail Fields Court</b> Wake County, Morrisville
	Division 5 PLAN DATE: May 2013 PREPARED BY: M W Yalch REVIEWED BY: J O Deaton
REVISIONS INIT. DATE	SIGNATURE DATE SIG. INVENTORY NO. 05-2348T1

**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

**ECONOLITE ASC/2070 OVERLAP PROGRAMMING DETAIL**

(program controller as shown)

FROM MAIN MENU SELECT 2 (CONTROLLER) AND THEN 5 (OVERLAP DATA)

**OVERLAP A**

CONTROLLER OVERLAP DATA

OVERLAP A . . . . .	1	2	3	4	5	6	7	8	9	0	1	1	2
STANDARD . . . . .	X	.	.	.	.	.	.	.	.	.	.	.	.
PROTECTED . . . . .	X	.	.	.	.	.	.	.	.	.	.	.	.
PERMITTED . . . . .	.	X	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
SPARE . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.

ADVANCE GREEN TIMER 0.0  
LAG/LEAD GREEN TIMER 0.0  
LAG/LEAD YELLOW TIMER 0.0  
LAG/LEAD RED TIMER 0.0

ADDITIONAL PAGE(S)

**OVERLAP B**

CONTROLLER OVERLAP DATA

OVERLAP B . . . . .	1	2	3	4	5	6	7	8	9	0	1	1	2
STANDARD . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
PROTECTED . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
PERMITTED . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
SPARE . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.

ADVANCE GREEN TIMER 0.0  
LAG/LEAD GREEN TIMER 0.0  
LAG/LEAD YELLOW TIMER 0.0  
LAG/LEAD RED TIMER 0.0

ADDITIONAL PAGE(S)

**OVERLAP C**

CONTROLLER OVERLAP DATA

OVERLAP C . . . . .	1	2	3	4	5	6	7	8	9	0	1	1	2
STANDARD . . . . .	.	.	.	.	X	.	.	.	.	.	.	.	.
PROTECTED . . . . .	.	.	.	.	X	.	.	.	.	.	.	.	.
PERMITTED . . . . .	.	.	.	.	.	X	.	.	.	.	.	.	.
ENABLE LAG . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
SPARE . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.

ADVANCE GREEN TIMER 0.0  
LAG/LEAD GREEN TIMER 0.0  
LAG/LEAD YELLOW TIMER 0.0  
LAG/LEAD RED TIMER 0.0

ADDITIONAL PAGE(S)

**OVERLAP D**

CONTROLLER OVERLAP DATA

OVERLAP D . . . . .	1	2	3	4	5	6	7	8	9	0	1	1	2
STANDARD . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
PROTECTED . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
PERMITTED . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.
SPARE . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.

ADVANCE GREEN TIMER 0.0  
LAG/LEAD GREEN TIMER 0.0  
LAG/LEAD YELLOW TIMER 0.0  
LAG/LEAD RED TIMER 0.0

ADDITIONAL PAGE(S)

**PED OVERLAP**

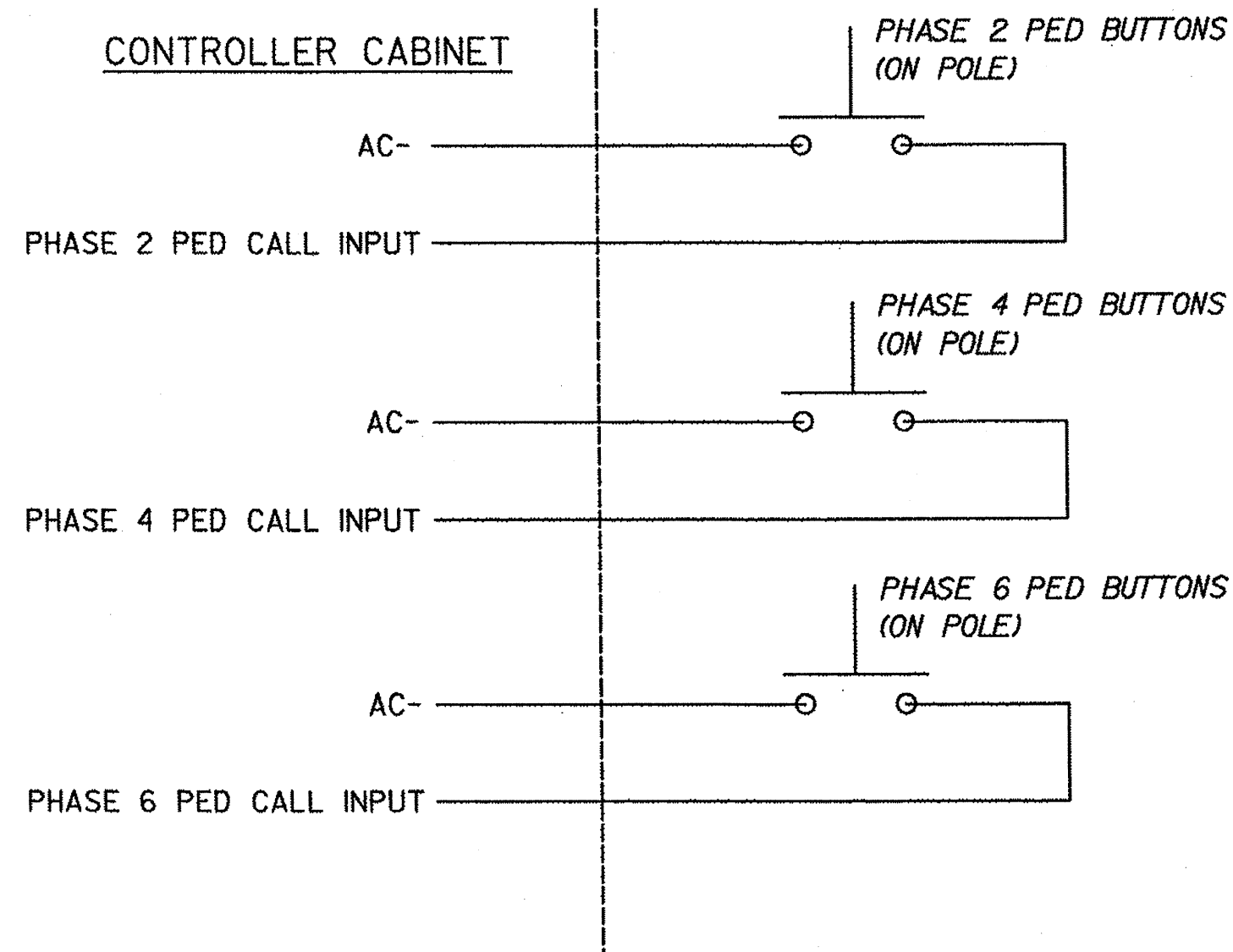
PED OVERLAP ASSIGNMENTS

OVERLAP CONSISTS OF PHASES:	1	2	3	4	5	6	7	8	9	0	1	1	2
OVLP PHASE	1	2	3	4	5	6	7	8	9	0	1	2	1
1	.	.	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.	.	.

END OF SUBMENU

**PEDESTRIAN PUSH-BUTTON WIRING DETAIL**

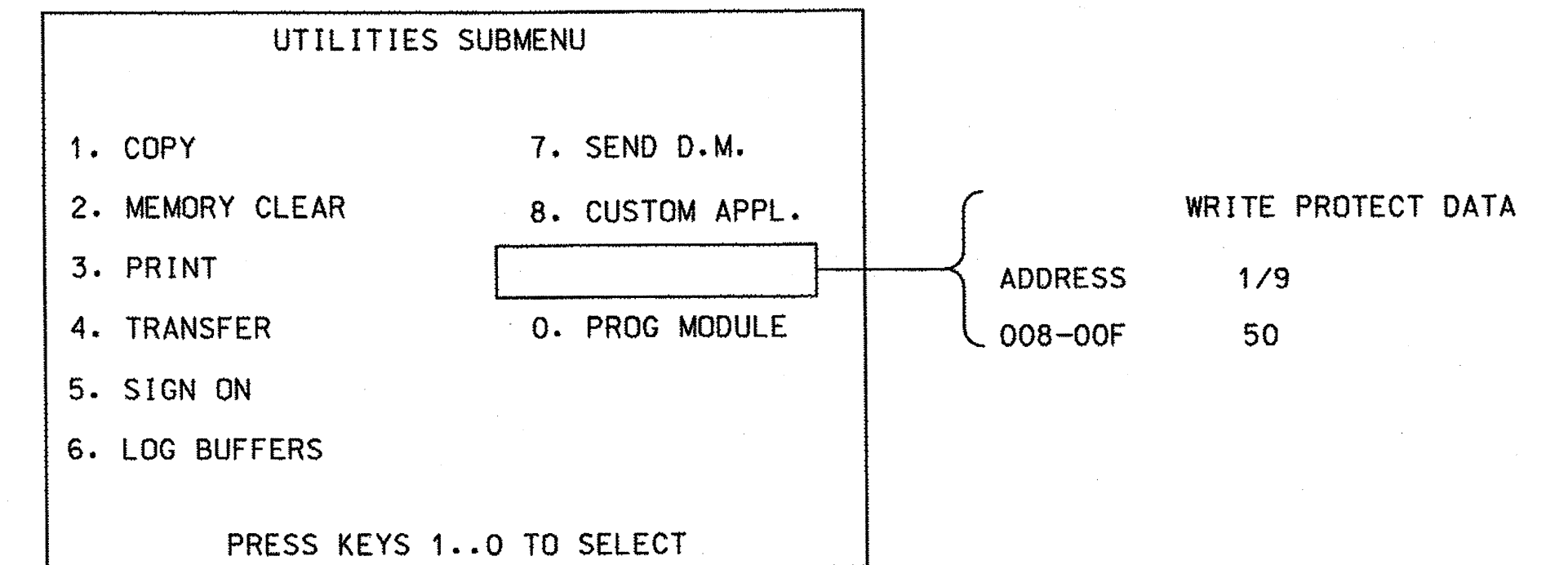
(wire push-buttons as shown below)



**WRITE-PROTECT FOR FLASHING YELLOW ARROWS DETAIL**

(program controller as shown below)

FROM MAIN MENU SELECT 8 (UTILITIES) AND THEN 9 (WRITE PROTECT DATA)

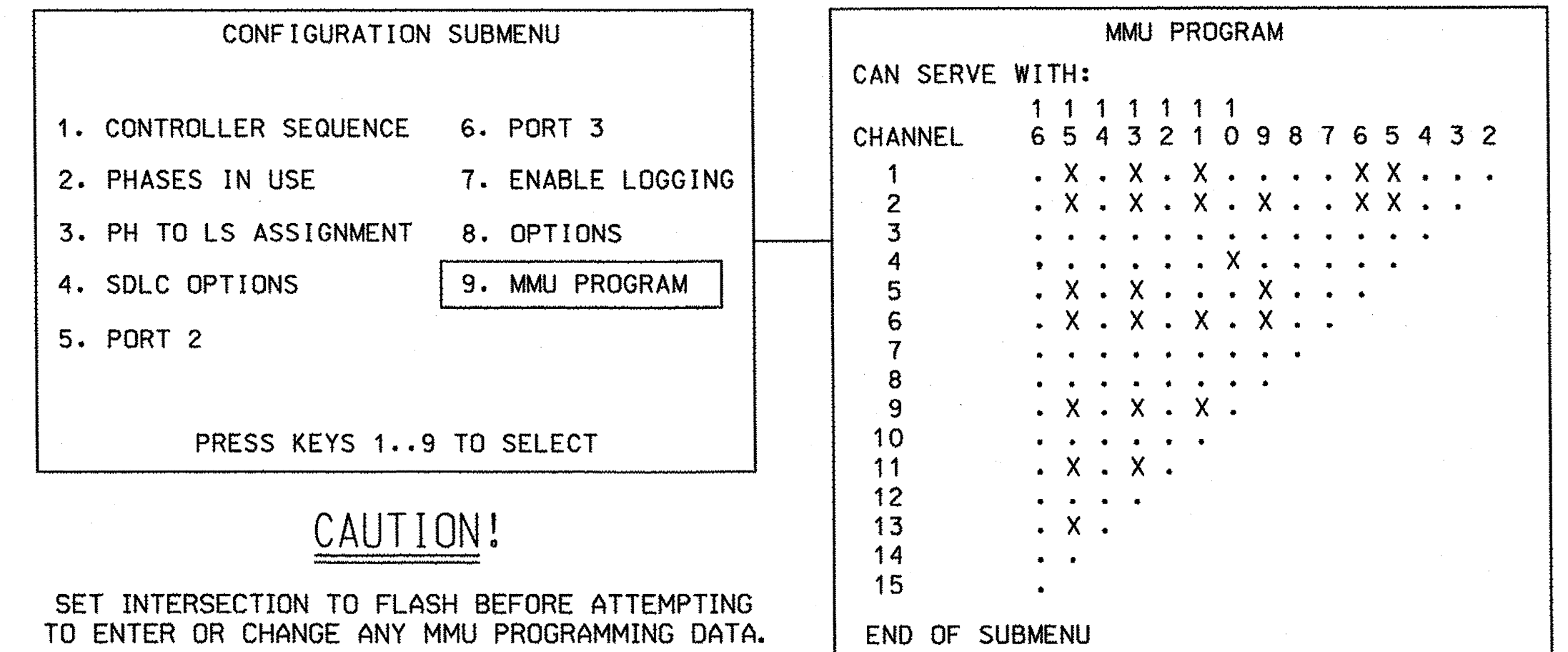


**COUNTDOWN PEDESTRIAN SIGNAL OPERATION**

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.

**ECONOLITE ASC/2070 SPECIAL MMU PROGRAMMING**

(program controller as shown below)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2348T1  
DESIGNED: May 2013  
SEALED: September 30, 2013  
REVISED: N/A

**AECOM**  
NC Firm License No.: F-0342  
701 Corporate Center Drive  
Suite 475 Raleigh, NC 27607  
Phone: 919-854-6200

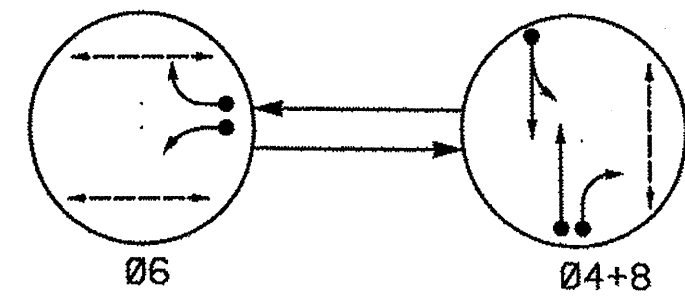
SIGNAL UPGRADE - TEMPORARY DESIGN 1 - (TMP PHASE II & III) Sheet 2 of 2

 Prepared in the Offices of: TRANSPORTATION MOBILITY AND LOGISTICS DIVISION NORTH CAROLINA DEPARTMENT OF TRANSPORTATION Signal Management Section 750 N. Greenfield Pkwy, Garner, NC 27529	SR 3060 (Morrisville Parkway) at Bristol Creek Drive/ Quail Fields Court		SEAL  ENGINEER JAMES O. DEATON 9/20/13
	Division 5 PLAN DATE: May 2013 PREPARED BY: M W Yalch	Wake County REVIEWED BY: J O Deaton REVIEWED BY:	

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

SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_  
SIG. INVENTORY NO. 05-2348T1

PHASING DIAGRAM



**PHASING DIAGRAM DETECTION LEGEND**

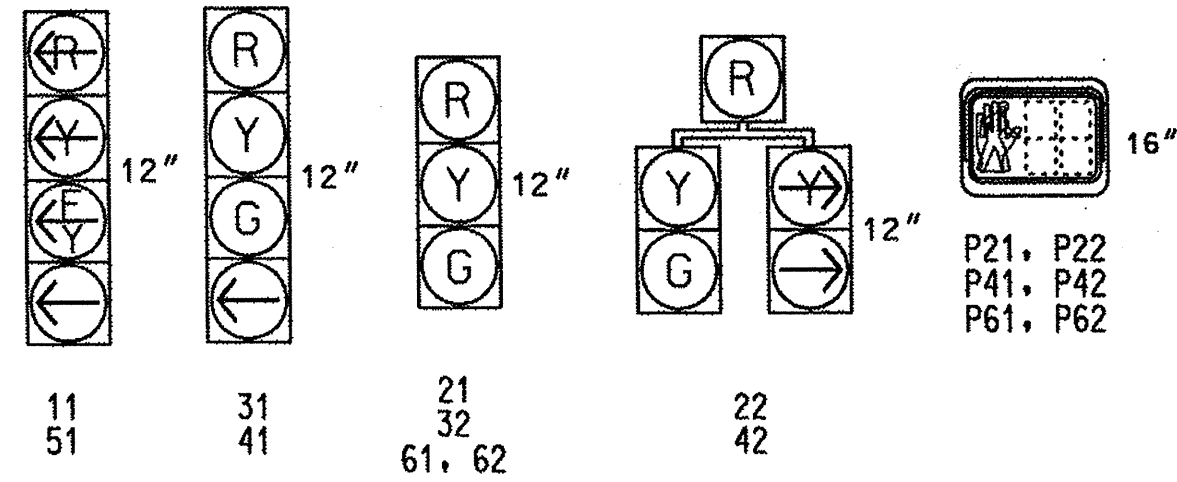
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

SIGNAL FACE	PHASE		
	Ø6	Ø4+8	FLASH
11	Y	R	R
31	R	G	R
32	R	G	R
41	R	G	R
42	R	G	R
61, 62	G	R	R
P21, P22	W	DW	DRK
P41, P42	DW	W	DRK
P61, P62	W	DW	DRK

⚡ FLASHING YELLOW ARROW  
 W - Walk  
 DW - Don't Walk  
 DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.

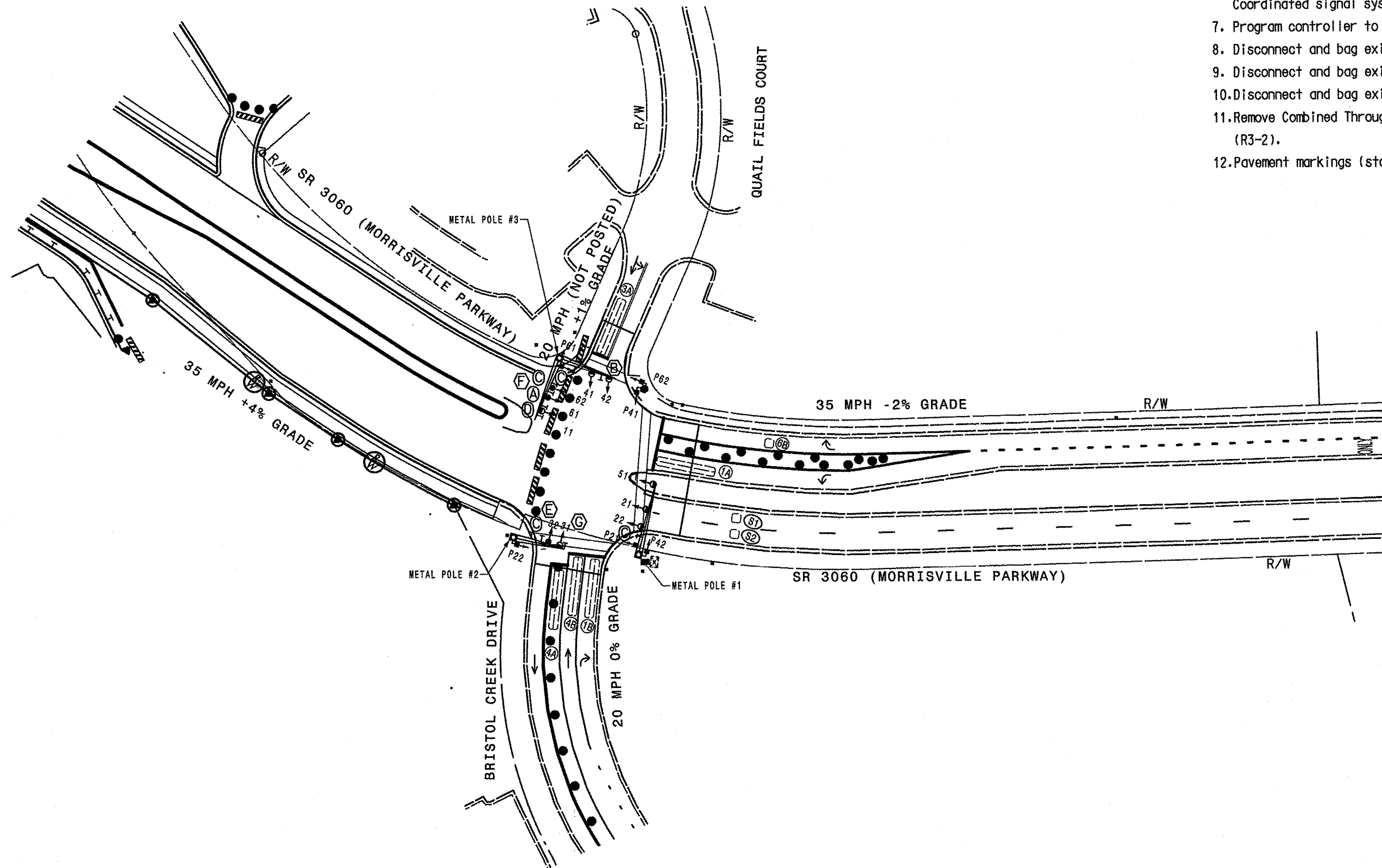


NEMA LOOP & DETECTOR UNIT INSTALLATION CHART									
INDUCTIVE LOOPS					DETECTOR UNITS				
LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW EXISTING	NEMA PHASE	NEW EXISTING	TIMING FEATURE	TIME	INHIBIT DELAY DURING GREEN?
1A	6X40	0	2-4-2	- X	6	- X	-	-	NO
1B	6X40	0	2-4-2	- X	4	- X	DELAY	15	YES
3A	6X40	0	2-4-2	- X	8	- X	-	-	NO
4A	6X40	0	2-4-2	- X	-	-	DISCONNECTED		
4B	6X40	0	2-4-2	- X	4	- X	-	-	NO
6B	6X6	70	4	- X	6	- X	-	-	NO
S1	6X6	+150	EXIST	- X	-	-	SYSTEM DETECTOR		
S2	6X6	+150	EXIST	- X	-	-	SYSTEM DETECTOR		

2 PHASE FULLY ACTUATED (CARY 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.
- Set all detectors 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.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Program controller to start up in phase 4+8 red.
- Disconnect and bag existing head #s 21, 22 and 51.
- Disconnect and bag existing green arrow in signal head #s 11, 31 and 41.
- Disconnect and bag existing right arrows on signal head # 42.
- Remove Combined Through and Left Arrow sign and replace with sign B (R3-2).
- Pavement markings (stopbars) are existing unless otherwise shown.



NEMA TIMING CHART			
2070LN2 CONTROLLER WITH TS-2 CABINET			
PHASE	Ø4	Ø6	Ø8
MINIMUM GREEN*	7 SEC.	10 SEC.	7 SEC.
PASSAGE GAP *	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	3.0 SEC.	3.0 SEC.
RED CLEARANCE	3.7 SEC.	3.3 SEC.	3.7 SEC.
MAX. I*	30 SEC.	60 SEC.	30 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE
VEHI. CALL MEMORY	NONLOCK	LOCK	NONLOCK
WALK *	7 SEC.	7 SEC.	- SEC.
FLASHING DON'T WALK	20 SEC.	12 SEC.	- SEC.
VOLUME DENSITY	OFF	OFF	OFF
ACTUATION B4 ADD *	- VEHI.	- VEHI.	- VEHI.
SEC. PER ACTUATION *	- SEC.	- SEC.	- SEC.
MAX. INITIAL *	- SEC.	- SEC.	- SEC.
TIME B4 REDUCTION*	- SEC.	- SEC.	- SEC.
TIME TO REDUCE*	- SEC.	- SEC.	- SEC.
MINIMUM GAP	- SEC.	- SEC.	- SEC.

\* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 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	● → N/A
○ → Modified Signal Head	○ → N/A
○ → Sign	○ → N/A
○ → Pedestrian Signal Head With Push Button & Sign	○ → N/A
○ → Inductive Loop Detector	○ → N/A
□ → Controller & Cabinet	□ → N/A
□ → Junction Box	□ → N/A
○ → 2-in Underground Conduit	○ → N/A
N/A → Right of Way	N/A → N/A
→ → Directional Arrow	→ → N/A
Ⓐ → Left Arrow "ONLY" Sign (R3-5L)	Ⓐ → N/A
Ⓑ → No Left Turn Sign (R3-2) With Orange Flags	Ⓑ → N/A
Ⓒ → Street Name Sign (D3-1)	Ⓒ → N/A
Ⓓ → "U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	Ⓓ → N/A
Ⓔ → No Right Turn Sign (R3-1) With Orange Flags	Ⓔ → N/A
Ⓕ → Right Arrow "ONLY" Sign (R3-5R) With Orange Flags	Ⓕ → N/A
Ⓖ → Left Turn on Green Ball Sign (R10-12) With Orange Flags	Ⓖ → N/A
Ⓗ → Metal Pole with Mastarm	Ⓗ → N/A
▨ → Type III Barricade	▨ → N/A
● ● ● → Construction Drums	● ● ● → N/A

**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

SIGNAL UPGRADE - TEMPORARY DESIGN 2 (TMP PHASE III)

SR 3060 (Morrissville Parkway)  
 at  
 Bristol Creek Drive /  
 Quail Fields Court

Division 5 Wake County Morrisville

PLAN DATE: May 2013 REVIEWED BY: A. Demers

PREPARED BY: S. W. Cox REVIEWED BY: S. Handagiri

SCALE: 1" = 50'

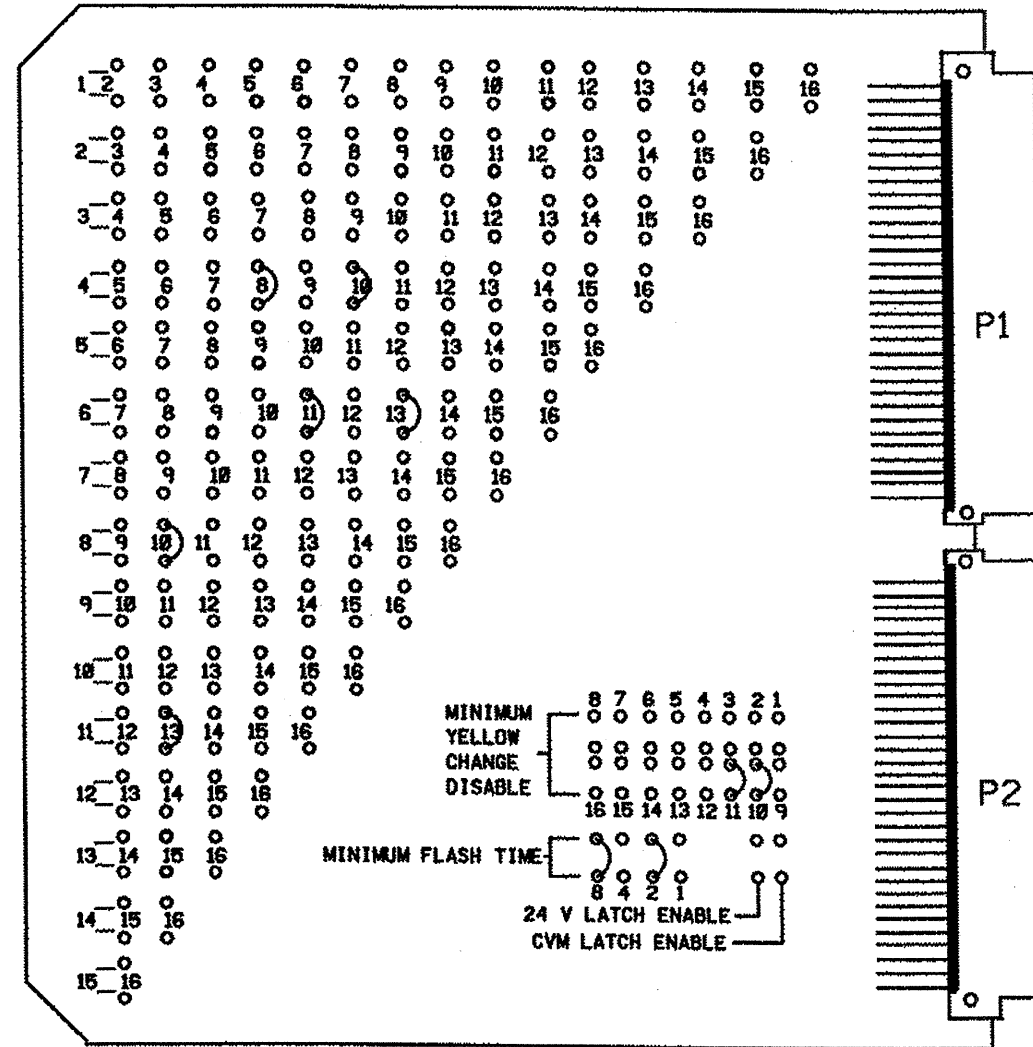
SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 37856

DATE: 9-30-13

SIG. INVENTORY NO. 05-2348T2

**EDI MODEL MMU-16LE  
MALFUNCTION MANAGEMENT UNIT  
PROGRAMMING DETAIL**

(program card and tables as shown below)



CHANNEL NUMBER	ENABLE/DISABLE
1	DISABLE
2	DISABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	ENABLE
9	DISABLE
10	ENABLE
11	ENABLE
12	DISABLE
13	ENABLE
14	DISABLE
15	DISABLE
16	DISABLE

OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF

CH. GROUP FOR PROTECTED GREEN ARROWS	CH. 1,3,5,7
ENABLE CHANNEL PAIR, FYA	
CH 1-13	OFF
CH 3-14	OFF
CH 5-15	OFF
CH 7-16	OFF

**MMU PROGRAMMING NOTE**

1. ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

**MMU PROGRAMMING CARD**

**DETECTOR RACK SET-UP DETAIL**

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	DETECTOR RACK #1				DETECTOR RACK #2			
	CHI L3 Ø4	CHI L1 Ø6	CHI L7 Ø8	SLOT	SLOT	NOT USED	NOT USED	SLOT
	NOT USED	NOT USED	NOT USED	EMPTY	EMPTY	Ø4	Ø6	EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
1A	L1A, L1B
NU	L2A, L2B
1B	L3A, L3B
NU	L4A, L4B
NU	L5A, L5B
NU	L6A, L6B
3A	L7A, L7B
NU	L8A, L8B
NU	L9A, L9B
4B	L10A, L10B
NU	L11A, L11B
NU	L12A, L12B
NU	L13A, L13B
NU	L14A, L14B
NU	L15A, L15B
6B	L16A, L16B
S1	L17A, L17B
S2	L18A, L18B
NU	L19A, L19B
NU	L20A, L20B
NU	L21A, L21B
NU	L22A, L22B
NU	L23A, L23B
NU	L24A, L24B
NU	L25A, L25B
NU	L26A, L26B
NU	L27A, L27B
NU	L28A, L28B
NU	L29A, L29B
NU	L30A, L30B
NU	L31A, L31B
NU	L32A, L32B

**NOTE**  
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

NU = NOT USED

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME(SEC)
1	Ø6		
2	---	---	---
3	Ø4	DELAY	15
4	---	---	---
5	---	---	---
6	---	---	---
7	Ø8		
8	---	---	---
9	---	---	---
10	Ø4		
11	---	---	---
12	---	---	---
13	---	---	---
14	---	---	---
15	---	---	---
16	Ø6		
17	SYSTEM		
18	SYSTEM		
19	---	---	---
20	---	---	---
21	---	---	---
22	---	---	---
23	---	---	---
24	---	---	---
25	---	---	---
26	---	---	---
27	---	---	---
28	---	---	---
29	---	---	---
30	---	---	---
31	---	---	---
32	---	---	---

**NOTES**

- To prevent "Flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
- To prevent red failures on unused monitor channels, tie unused load switch red outputs 1,2,3,5,7,9,12,14,15 and 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (red out). Make sure all flash transfer relays are in place.
- Program controller to start up in phases 4 and 8 red.
- Set power-up flash time to 10 seconds and implement on the Malfunction Management Unit. Set controller power-up flash time to 0 seconds.
- Enable simultaneous gap-out feature, on controller unit, for all phases.
- Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
- Program detector call delay and extension timing on the controller, unless otherwise specified.
- Set all detector card unit channels to "presence" mode.
- This controller and cabinet are part of the Cary Signal System.

**FIELD CONNECTION HOOK-UP CHART**

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	NU	NU	NU	41,42	NU	61,62	NU	31,32	NU	P41, P42	P21,P22, P61,P62	NU	11*	NU	NU	NU
RED				4R		6R		8R								
YELLOW				4Y		6Y		8Y								
GREEN				4G		6G		8G								
RED ARROW																13R
YELLOW ARROW																13Y
FLASHING YELLOW ARROW																13G
GREEN ARROW																
Hand icon																
Person icon																

NU = Not Used

\* See pictorial of head wiring detail this sheet.

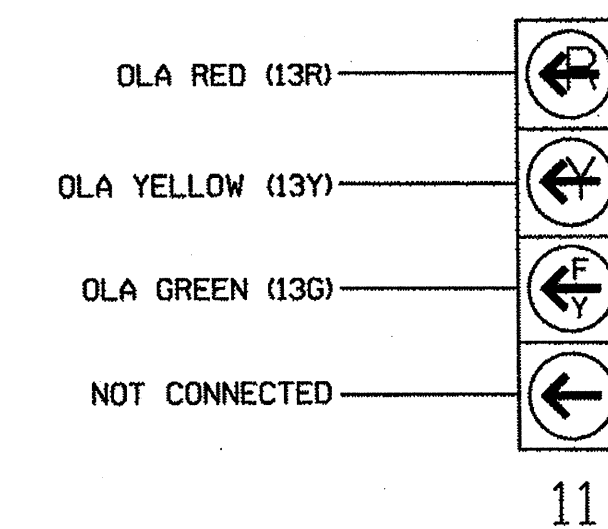
**EQUIPMENT INFORMATION**

CONTROLLER.....ECONOLITE 2070LN2  
 CABINET.....ECONOLITE TS2-1 NC-8  
 SOFTWARE.....ECONOLITE ASC/2070  
 CABINET MOUNT.....BASE  
 LOADBAY POSITIONS.....16  
 LOAD SWITCHES USED.....4,6,8,10,11,13  
 PHASES USED.....4,6,8,4PED,6PED  
 OLA.....\*  
 OLB.....NOT USED  
 OLC.....NOT USED  
 OLD.....NOT USED

\*See Sheet 2 of 2 Econolite ASC/2070 Overlap Programming Detail.

**4 SECTION FYA PPLT SIGNAL WIRING DETAIL**

(wire signal head as shown)



NOTE

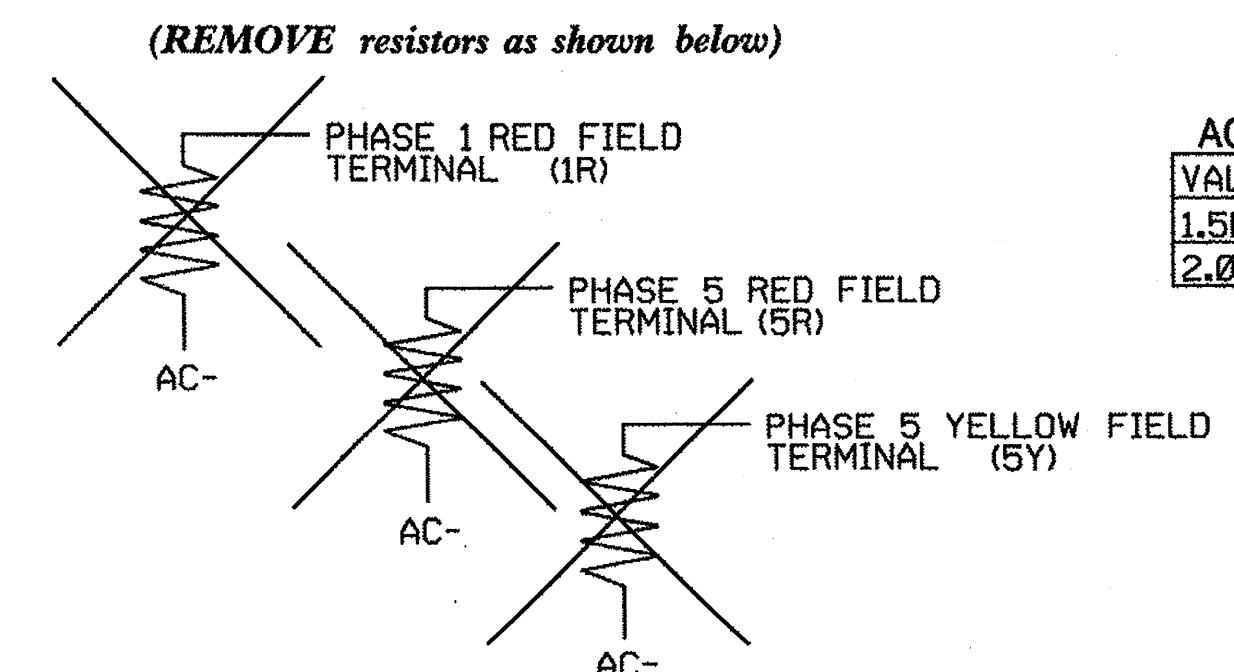
1. See overlap programming instructions sheet 2 of 2.

**LOAD SWITCH ASSIGNMENT DETAIL**

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	Ø1
2	Ø2
3	Ø3
4	Ø4
5	Ø5
6	Ø6
7	Ø7
8	Ø8
9	Ø2 PED
10	Ø4 PED
11	Ø6 PED
12	Ø8 PED
13	OLA
14	OLB
15	OLC
16	OLD

**LOAD RESISTOR INSTALLATION DETAIL**



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

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2348T2  
 DESIGNED: May 2013  
 SEALED: September 30, 2013  
 REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 2 (TMP PHASE III)

Sheet 1 of 2

**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

Electrical and Programming Details for SR 3060 (Morrisville Parkway) at Bristol Creek Drive / Quail Fields Court

Division 5, Wake County, Morrisville

PLAN DATE: May 2013, REVIEWED BY: J O Deaton

PREPARED BY: M W Yalch, REVIEWED BY:

REVISIONS: INIT. DATE

750 N. Greenfield Pkwy, Garner, NC 27529

Signature: [Signature], Date: 9/30/13

SIG. INVENTORY NO. 05-2348T2

**ECONOLITE ASC/2070 OVERLAP PROGRAMMING DETAIL**

(program controller as shown)

FROM MAIN MENU SELECT 2 (CONTROLLER) AND THEN 5 (OVERLAP DATA)

**OVERLAP A**

CONTROLLER OVERLAP DATA											
OVERLAP A	1	2	3	4	5	6	7	8	9	0	1 1 1
STANDARD	.	.	.	.	.	.	.	.	.	.	.
PROTECTED	.	.	.	.	.	X	.	.	.	.	.
PERMITTED	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD	.	.	.	.	.	.	.	.	.	.	.
SPARE	.	.	.	.	.	.	.	.	.	.	.
ADVANCE GREEN TIMER 0.0 LAG/LEAD GREEN TIMER 0.0 LAG/LEAD YELLOW TIMER 0.0 LAG/LEAD RED TIMER 0.0 ADDITIONAL PAGE(S)											

**OVERLAP B**

CONTROLLER OVERLAP DATA											
OVERLAP B	1	2	3	4	5	6	7	8	9	0	1 1 1
STANDARD	.	.	.	.	.	.	.	.	.	.	.
PROTECTED	.	.	.	.	.	.	.	.	.	.	.
PERMITTED	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD	.	.	.	.	.	.	.	.	.	.	.
SPARE	.	.	.	.	.	.	.	.	.	.	.
ADVANCE GREEN TIMER 0.0 LAG/LEAD GREEN TIMER 0.0 LAG/LEAD YELLOW TIMER 0.0 LAG/LEAD RED TIMER 0.0 ADDITIONAL PAGE(S)											

**OVERLAP C**

CONTROLLER OVERLAP DATA											
OVERLAP C	1	2	3	4	5	6	7	8	9	0	1 1 1
STANDARD	.	.	.	.	.	.	.	.	.	.	.
PROTECTED	.	.	.	.	.	.	.	.	.	.	.
PERMITTED	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD	.	.	.	.	.	.	.	.	.	.	.
SPARE	.	.	.	.	.	.	.	.	.	.	.
ADVANCE GREEN TIMER 0.0 LAG/LEAD GREEN TIMER 0.0 LAG/LEAD YELLOW TIMER 0.0 LAG/LEAD RED TIMER 0.0 ADDITIONAL PAGE(S)											

**OVERLAP D**

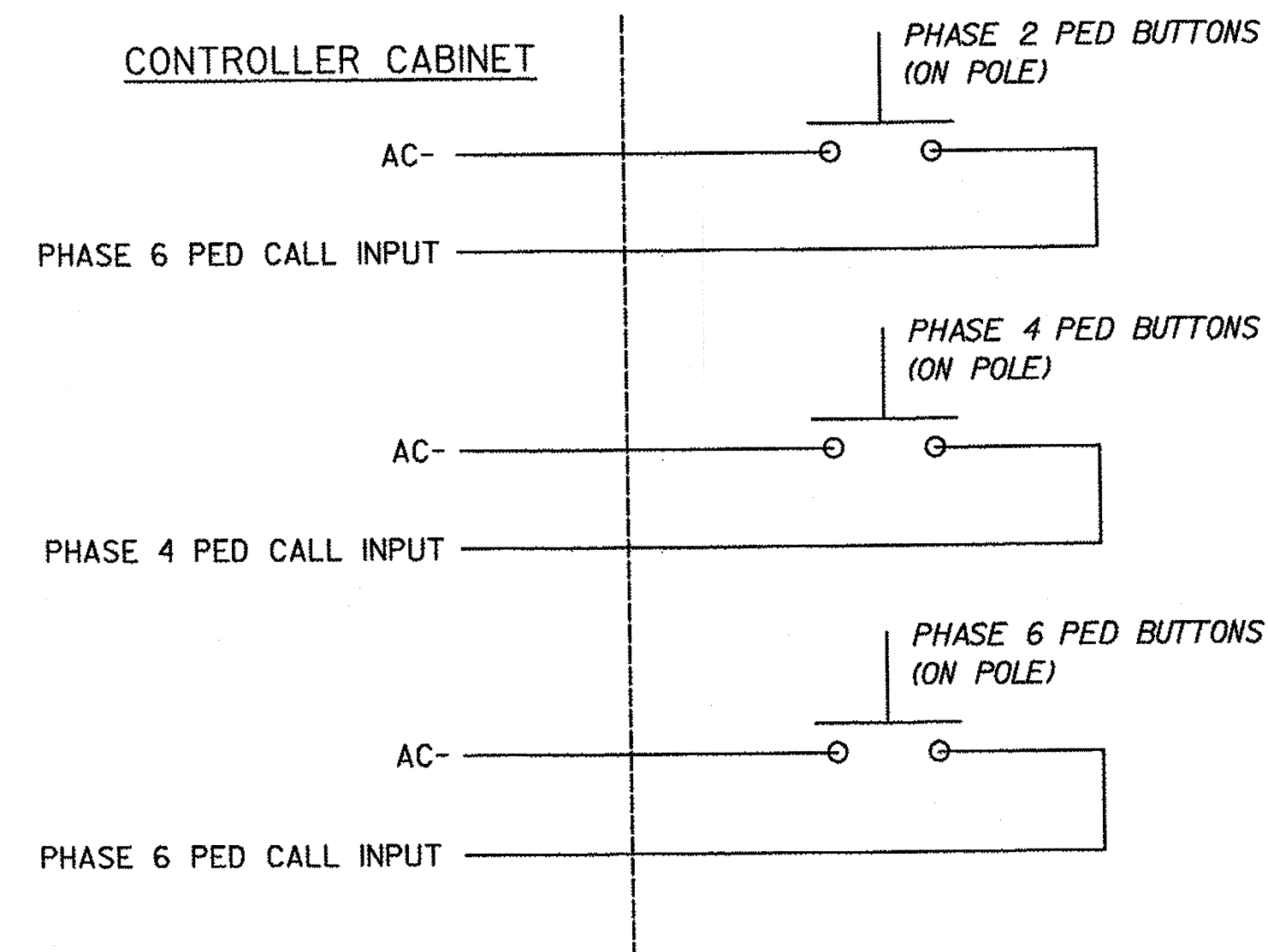
CONTROLLER OVERLAP DATA											
OVERLAP D	1	2	3	4	5	6	7	8	9	0	1 1 1
STANDARD	.	.	.	.	.	.	.	.	.	.	.
PROTECTED	.	.	.	.	.	.	.	.	.	.	.
PERMITTED	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD	.	.	.	.	.	.	.	.	.	.	.
SPARE	.	.	.	.	.	.	.	.	.	.	.
ADVANCE GREEN TIMER 0.0 LAG/LEAD GREEN TIMER 0.0 LAG/LEAD YELLOW TIMER 0.0 LAG/LEAD RED TIMER 0.0 ADDITIONAL PAGE(S)											

**PED OVERLAP**

PED OVERLAP ASSIGNMENTS											
OVERLAP CONSISTS OF PHASES:	1	2	3	4	5	6	7	8	9	0	1 1 1
DVLP PHASE	1	2	3	4	5	6	7	8	9	0	1 1 1
1	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.
END OF SUBMENU											

**PEDESTRIAN PUSH-BUTTON WIRING DETAIL**

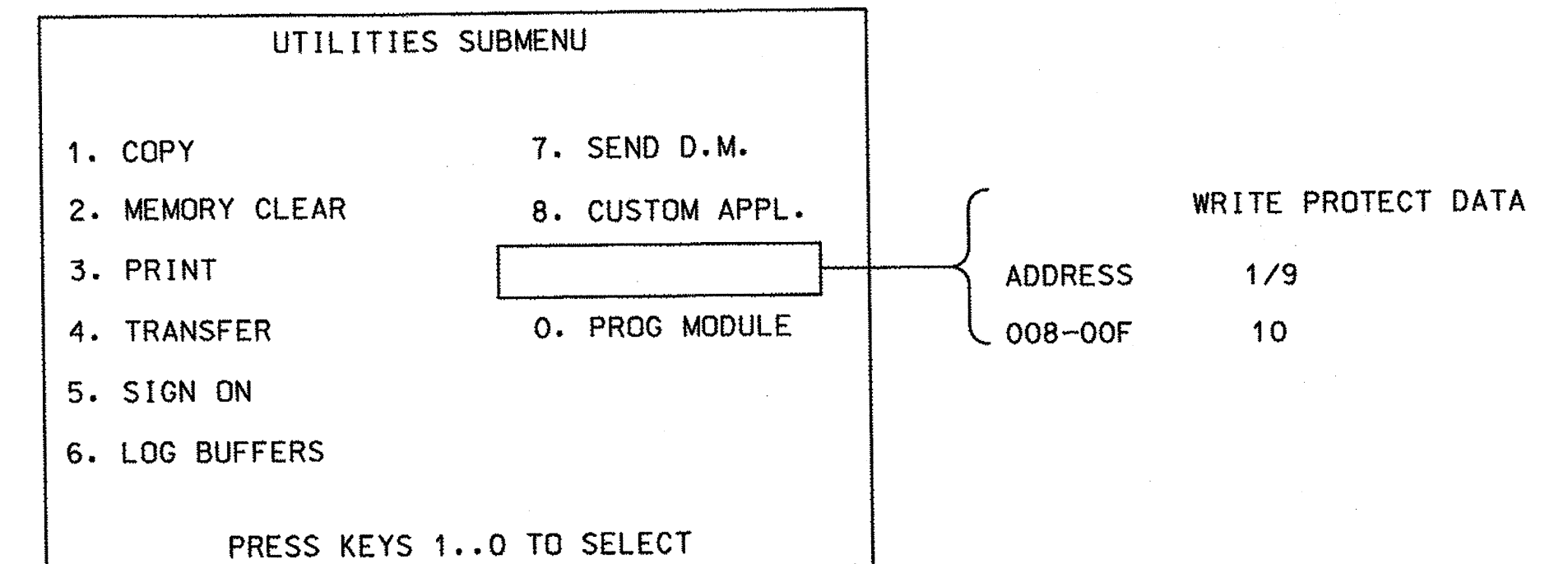
(wire push-buttons as shown below)



**WRITE-PROTECT FOR FLASHING YELLOW ARROWS DETAIL**

(program controller as shown below)

FROM MAIN MENU SELECT 8 (UTILITIES) AND THEN 9 (WRITE PROTECT DATA)

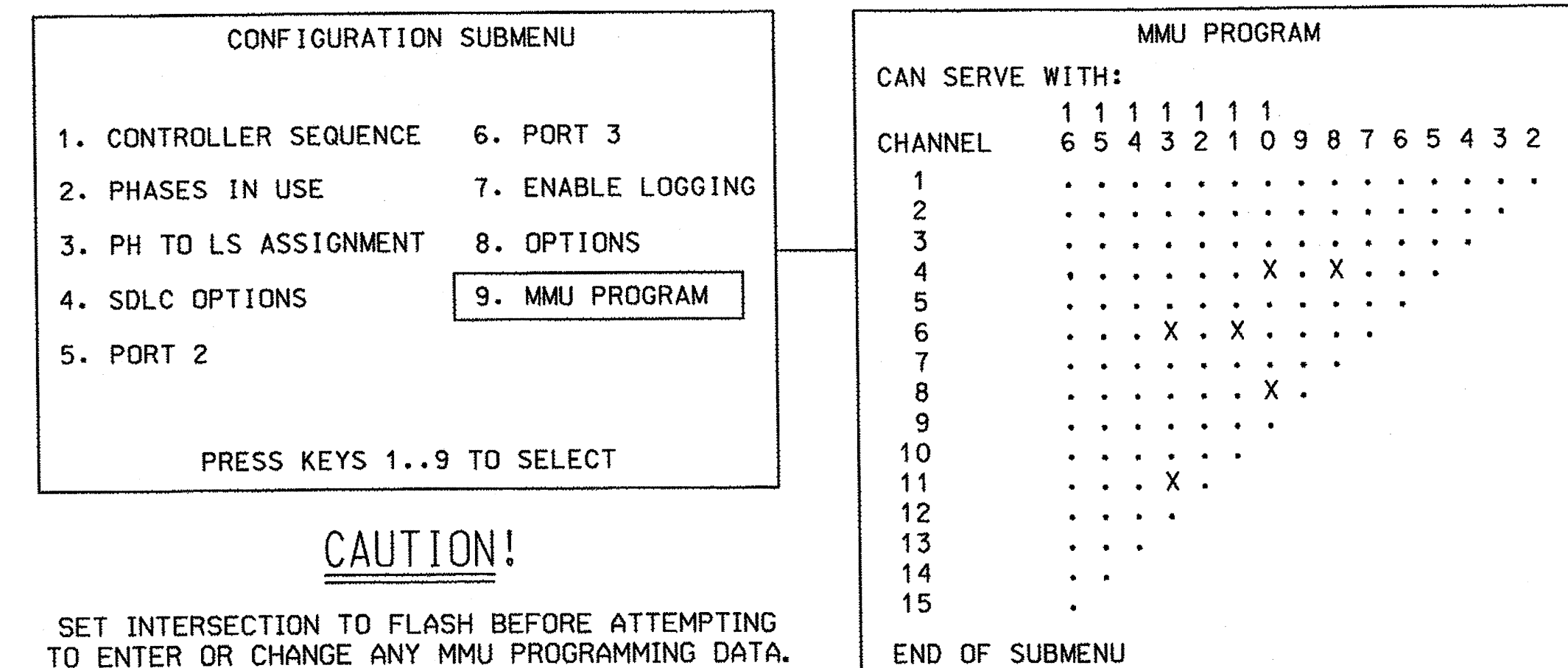


**COUNTDOWN PEDESTRIAN SIGNAL OPERATION**

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.

**ECONOLITE ASC/2070 SPECIAL MMU PROGRAMMING**

(program controller as shown below)



**CAUTION!**

SET INTERSECTION TO FLASH BEFORE ATTEMPTING TO ENTER OR CHANGE ANY MMU PROGRAMMING DATA. THIS PROGRAMMING AND THAT OF THE MMU PROGRAMMING CARD MUST MATCH EXACTLY. IF THEY DO NOT, THE INTERSECTION WILL BE PLACED INTO FLASH.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2348T2  
 DESIGNED: May 2013  
 SEALED: September 30, 2013  
 REVISED: N/A

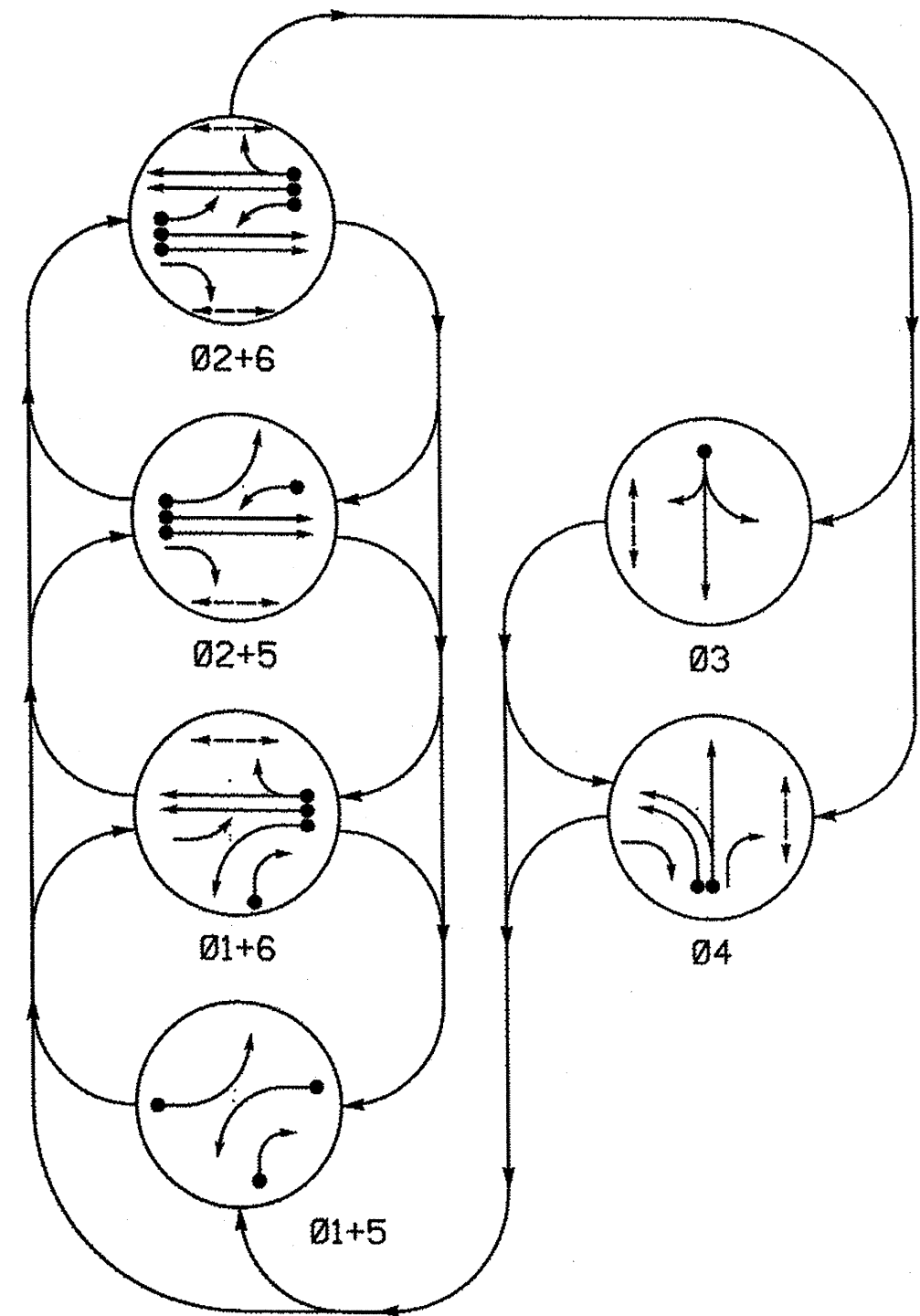
**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

SIGNAL UPGRADE - TEMPORARY DESIGN 2 (TMP PHASE III) Sheet 2 of 2

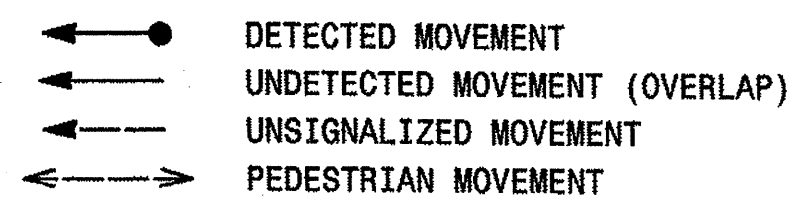
ELECTRICAL AND PROGRAMMING DETAILS FOR:	SR 3060 (Morrisville Parkway)		SEAL NORTH CAROLINA PROFESSIONAL ENGINEER JAMES O. DEATON 07438 9/30/13
	at Bristol Creek Drive/ Quail Fields Court		
Prepared In the Office of: Transportation Mobility and Safety Division STATE OF NORTH CAROLINA Signal Management Section 750 N. Greenfield Pkwy, Garner, NC 27529	Division 5 PLAN DATE: May 2013 PREPARED BY: M W Valch	Wake County REVIEWED BY: J O Deaton REVIEWED BY:	REVISIONS INIT. DATE
SIGNATURE		DATE	

SIG. INVENTORY NO. 05-2348T2

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

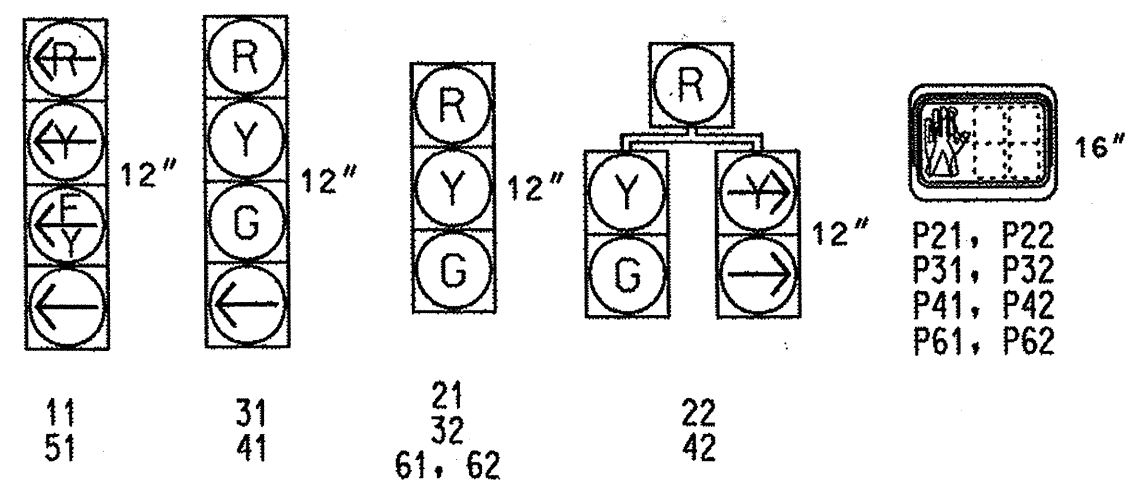


SIGNAL FACE	PHASE					
	01+5	01+6	02+5	02+6	03	04
11						
21	R	R	G	G	R	Y
22	R	R	G	G	R	Y
31	R	R	R	R	G	R
32	R	R	R	R	G	R
41	R	R	R	R	G	R
42	R	R	R	R	G	R
51						
61, 62	R	G	R	G	R	Y
P21, P22	DW	DW	W	W	DW	DRK
P31, P32	DW	DW	DW	DW	W	DRK
P41, P42	DW	DW	DW	DW	W	DRK
P61, P62	DW	W	DW	W	DW	DRK

FLASHING YELLOW ARROW  
W - Walk  
DW - Don't Walk  
DRK - Dark

SIGNAL FACE I.D.

All Heads L.E.D.



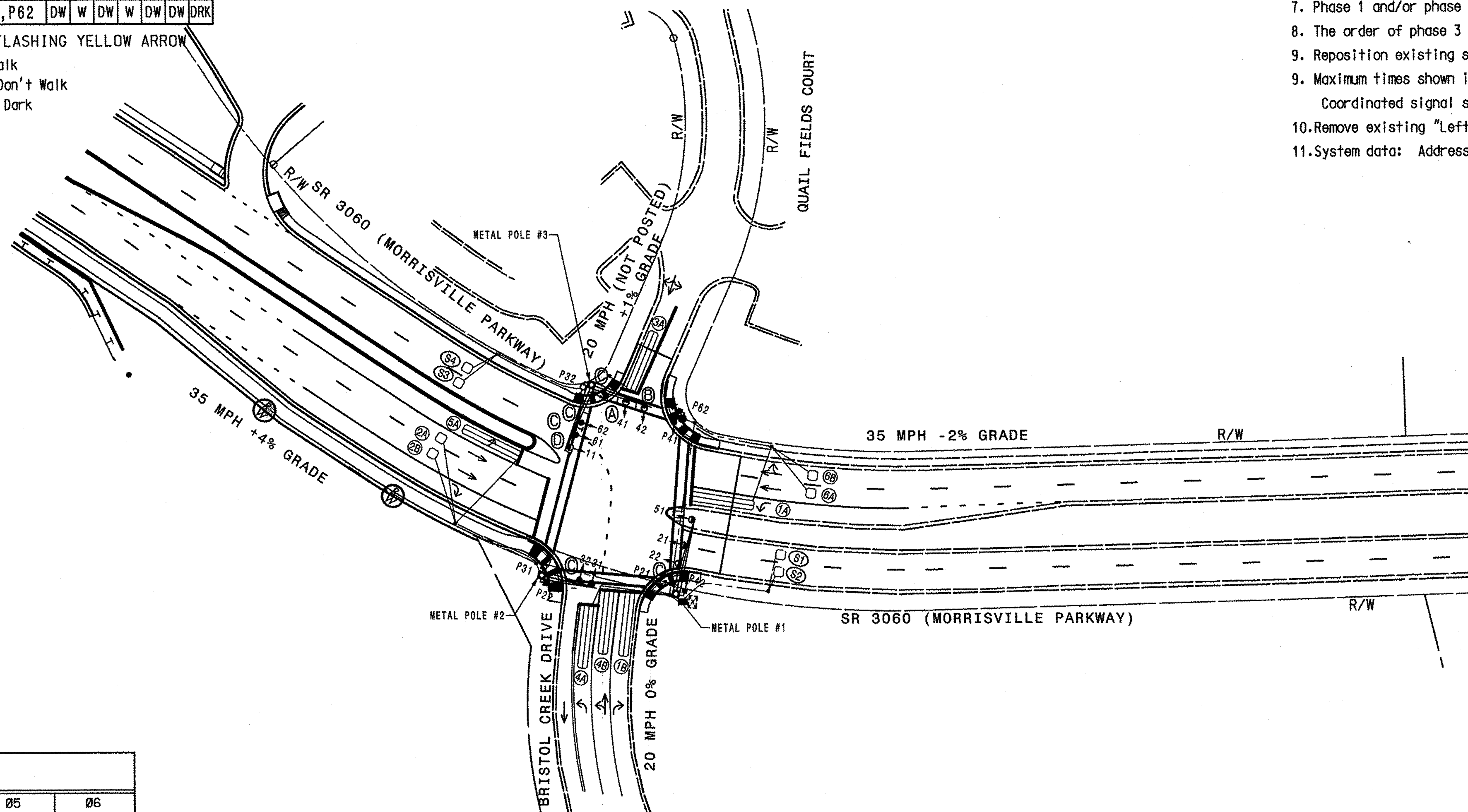
NEMA LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW EXISTING	DETECTOR UNITS			
					NEMA PHASE	NEW EXISTING	TIMING	
1A	6X40	0	2-4-2	X	1	X	DELAY 15	YES
1B	6X40	0	2-4-2	X	6	X	DELAY 15	YES
2A, 2B	6X6	70	4	X	2	X	-	NO
3A	6X40	0	2-4-2	X	3	X	DELAY 5	YES
4A	6X40	0	2-4-2	X	4	X	DELAY 3	YES
4B	6X40	0	2-4-2	X	4	X	-	NO
5A	6X40	0	2-4-2	X	5	X	DELAY 15	YES
6A, 6B	6X6	70	4	X	6	X	-	NO
S1	6X6	+150	EXIST	X			SYSTEM DETECTOR	
S2	6X6	+150	EXIST	X			SYSTEM DETECTOR	
S3	6X6	+150	5	X			SYSTEM DETECTOR	
S4	6X6	+150	5	X			SYSTEM DETECTOR	

6 PHASE FULLY ACTUATED (CARY 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.
- Set all detectors 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.
- Pavement markings are existing unless otherwise shown.
- Phase 1 and/or phase 5 may be lagged.
- The order of phase 3 and phase 4 may be reversed.
- Reposition existing signal heads numbered 41, 61 and 62.
- Maximum times shown in the timing chart are for free-run operation only. Coordinated signal system values supersede these values.
- Remove existing "Left turn on green ball" sign (R10-12).
- System data: Address number 7, Channel number 17.

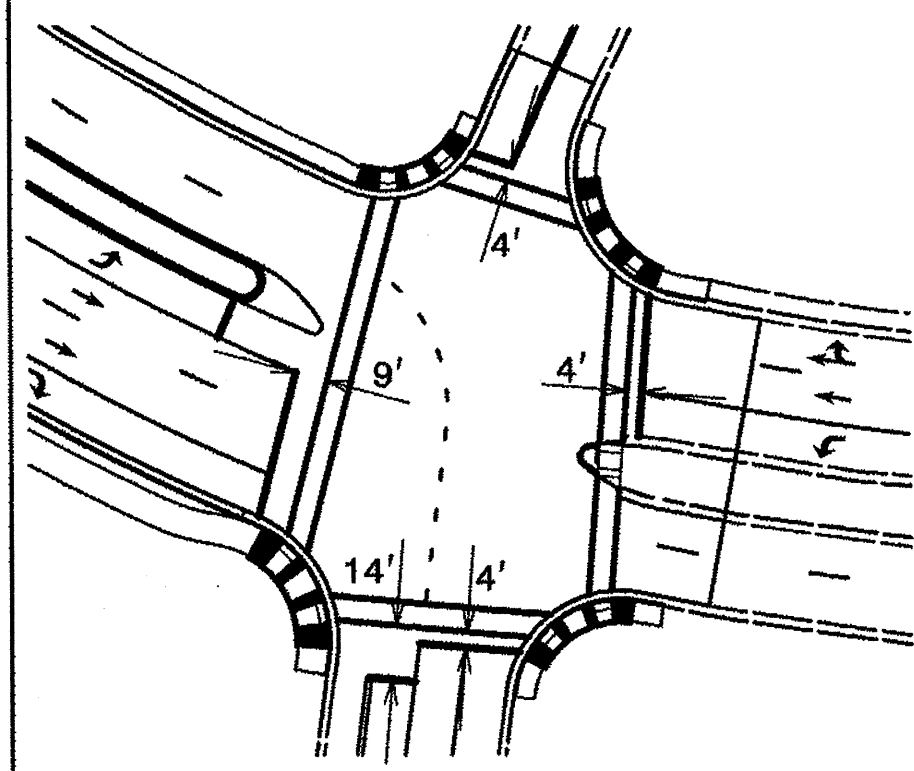


PROPOSED	EXISTING
	N/A

PHASE	NEMA TIMING CHART					
	01	02	03	04	05	06
MINIMUM GREEN*	7 SEC.	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.
PASSAGE GAP*	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.0 SEC.	3.0 SEC.	3.0 SEC.	3.0 SEC.	4.0 SEC.
RED CLEARANCE	3.2 SEC.	2.6 SEC.	3.5 SEC.	3.6 SEC.	3.2 SEC.	2.6 SEC.
MAX. I*	30 SEC.	60 SEC.	20 SEC.	20 SEC.	20 SEC.	60 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	NONE	MIN. RECALL
VEHI. CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	NONLOCK	LOCK
WALK*	- SEC.	7 SEC.	7 SEC.	7 SEC.	- SEC.	7 SEC.
FLASHING DON'T WALK	- SEC.	13 SEC.	20 SEC.	25 SEC.	- SEC.	6 SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD*	- VEH.	- VEH.	- VEH.	- VEH.	- VEH.	- VEH.
SEC. PER ACTUATION*	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MAX. INITIAL*	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
TIME B4 REDUCTION*	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
TIME TO REDUCE*	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.

\* 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.

STOPBAR LOCATION DIAGRAM



**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

SIGNAL UPGRADE - FINAL DESIGN

Prepared in the Offices of:  
 STATE OF NORTH CAROLINA  
 PROFESSIONAL ENGINEER  
 SEVEN W. COX  
 37856

SR 3060 (Morrisville Parkway)  
 at  
 Bristol Creek Drive /  
 Quail Fields Court

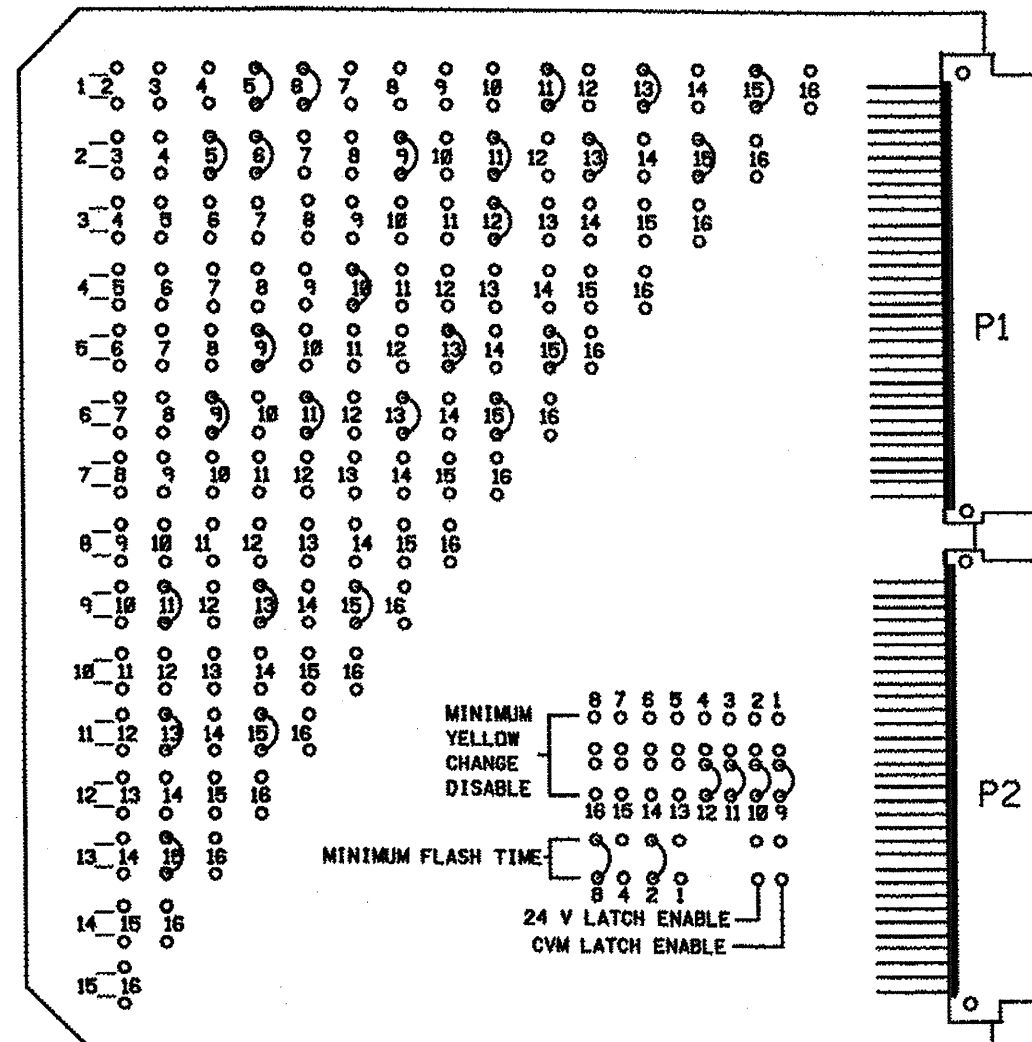
Division 5 Wake County Morrisville  
 PLAN DATE: May 2013 REVIEWED BY: A. Demers  
 PREPARED BY: S. W. Cox REVIEWED BY: S. Nandagiri

REVISIONS: INIT. DATE  
 SCALE: 1" = 50'  
 Sigs. INVENTORY NO. 05-2348



EDI MODEL MMU-16LE MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown below)



MMU PROGRAMMING CARD

Table with 2 columns: CHANNEL NUMBER, ENABLE/DISABLE. Lists channels 1-16 and their enable/disable status.

Table with 2 columns: OPTION, SETTING. Lists unit options like RECURRENT PULSE, WALK DISABLE, etc.

Table with 2 columns: CH. GROUP FOR PROTECTED GREEN ARROWS, CH. 1,3,5,7. Lists channel group settings.

MMU PROGRAMMING NOTE 1. ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

- 1. To prevent "Flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 7,8,14 and 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (red out).
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the Malfunction Management Unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. This controller and cabinet are part of the Cary Signal System.

FIELD CONNECTION HOOK-UP CHART

Large table mapping PHASE (1-8) to SIGNAL HEAD NO. (RED, YELLOW, GREEN, RED ARROW, YELLOW ARROW, FLASHING YELLOW ARROW, GREEN ARROW) and terminal assignments (e.g., 11, 42, 21, 22, 31, 32, etc.).

NU = Not Used
\* Denotes install Load Resistor, see Load Resistor installation detail this sheet.
★ See pictorial of head wiring detail this sheet.
+ See Phase to Load Switch Assignment Programming on Sheet 2.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

Tables showing BIU (BIU #1, BIU #2) and DETECTOR RACK #1, #2 configurations with columns for CH1, CH2, SYSTEM, DETECTOR, S, L, O, T.

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

Table with 2 columns: LOOP NO., LOOP PANEL TERMINALS. Lists loop numbers (1A, 1B, 2A, 2B, etc.) and their corresponding terminal connections.

NOTE BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

Table with 3 columns: CONTROLLER DETECTOR NO., FUNCTION, TIMING. Lists detector numbers (1-32) and their functions (DELAY, SYSTEM, etc.).

EQUIPMENT INFORMATION

CONTROLLER.....ECONOLITE 2070LN2
CABINET.....ECONOLITE [TS2-1] NC-8
SOFTWARE.....ECONOLITE ASC/2070
CABINET MOUNT.....BASE
LOADSWAY POSITIONS.....16
LOAD SWITCHES USED.....1,2,3,4,5,6,9,10,11,12,13,15
PHASES USED.....1,2,3,4,5,6,2PED,4PED,6PED,3PED
OLA.....\*
OLB.....NOT USED
OLC.....\*
OLD.....NOT USED

\* See Sheet 3 of 3 Econolite ASC/2070 Overlap Programming Detail.

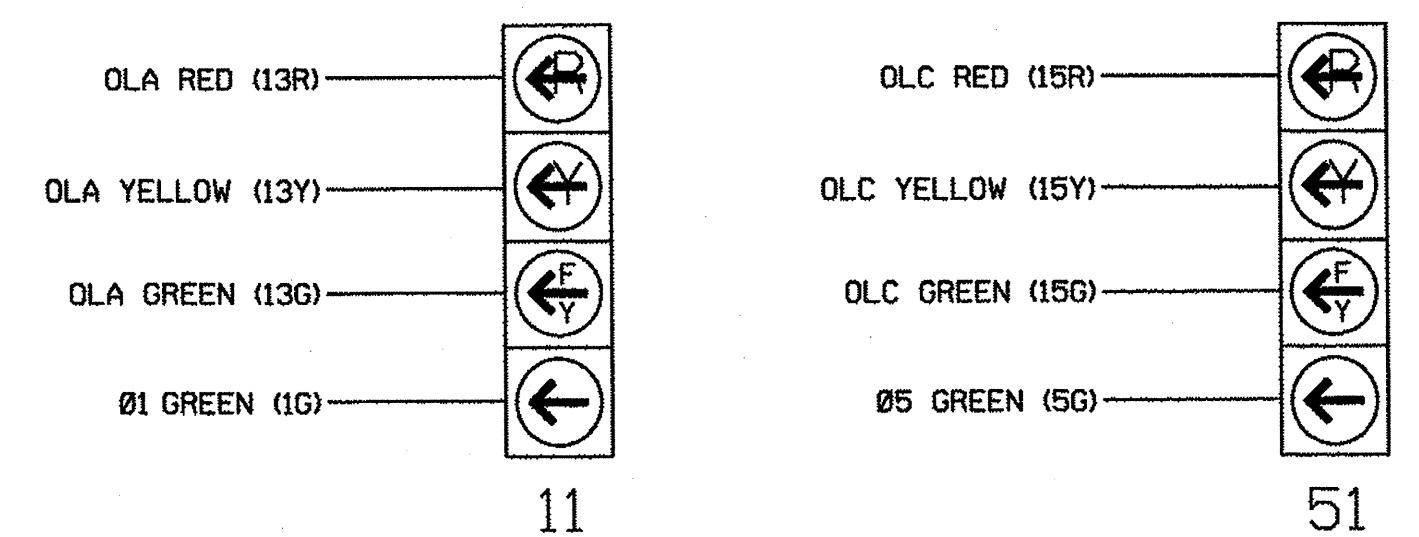
LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

Table with 2 columns: LOAD SWITCH NUMBER, FUNCTION. Lists load switch numbers (1-16) and their functions (Ø1, Ø2, DELAY, etc.).

4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)

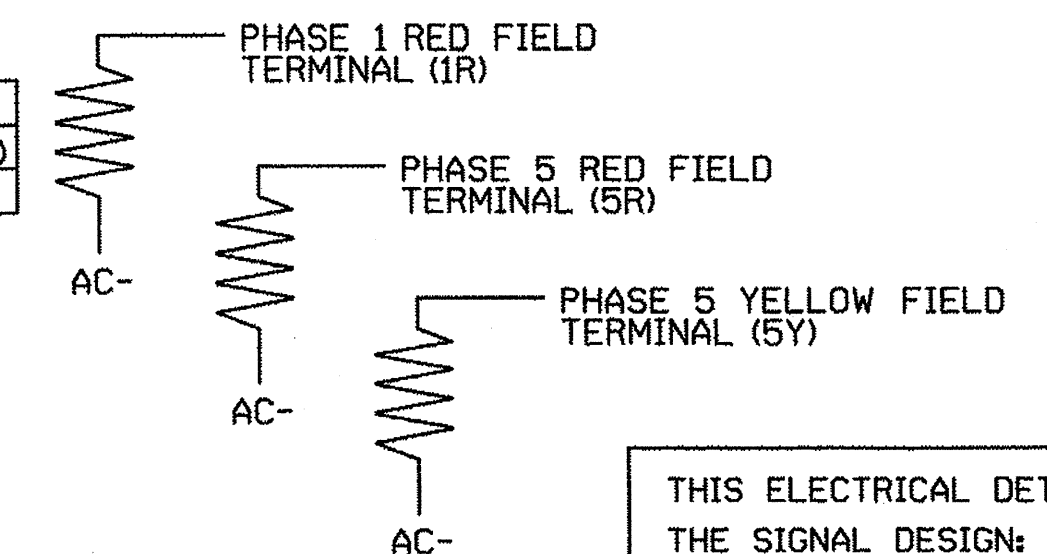


NOTE

1. See overlap programming instructions sheet 3 of 3.

LOAD RESISTOR INSTALLATION DETAIL

Table with 2 columns: VALUE (ohms), WATTAGE. Lists acceptable values (1.5K - 1.9K, 2.0K - 3.0K) and wattages (25W (min), 10W (min)).



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2348
DESIGNED: May 2013
SEALED: September 30, 2013
REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN

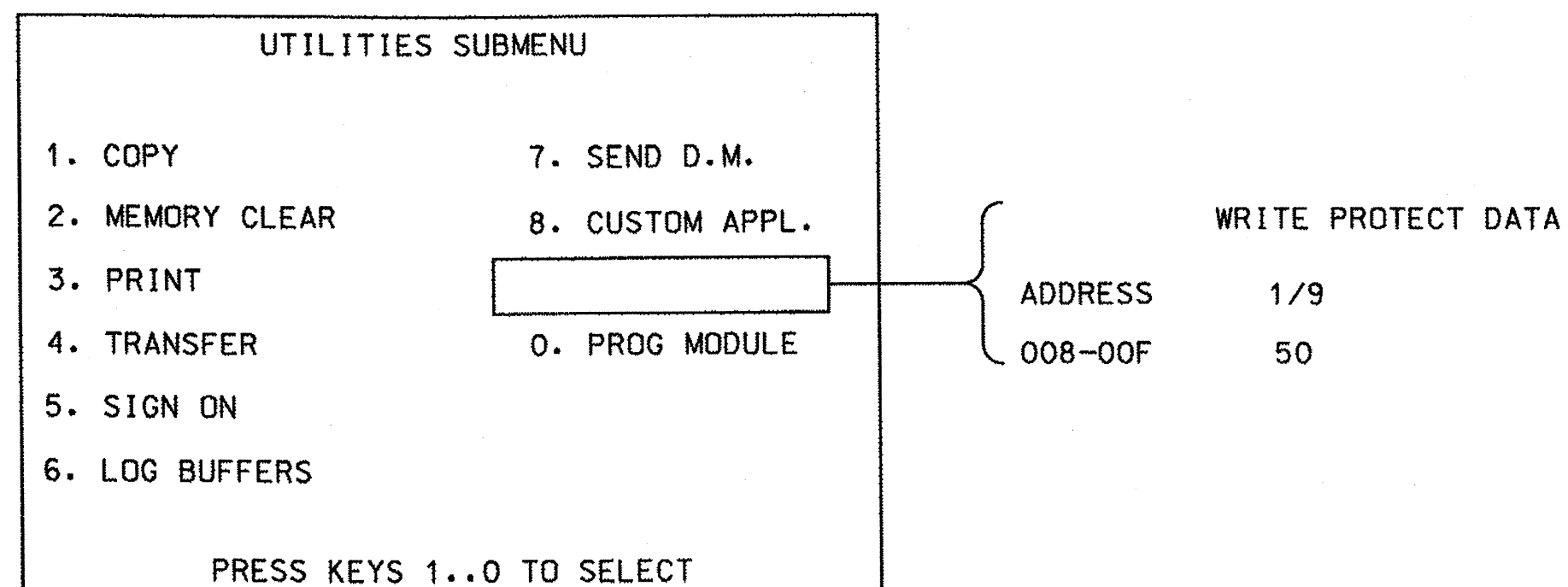
Sheet 1 of 3

AECOM
NC Firm License No.: F-0342
701 Corporate Center Drive
Suite 475 Raleigh, NC 27607
Phone: 919-854-6200

Professional seal and project information for SR 3060 (Morrisville Parkway) at Bristol Creek Drive / Quail Fields Court. Includes dates, names, and a signature.

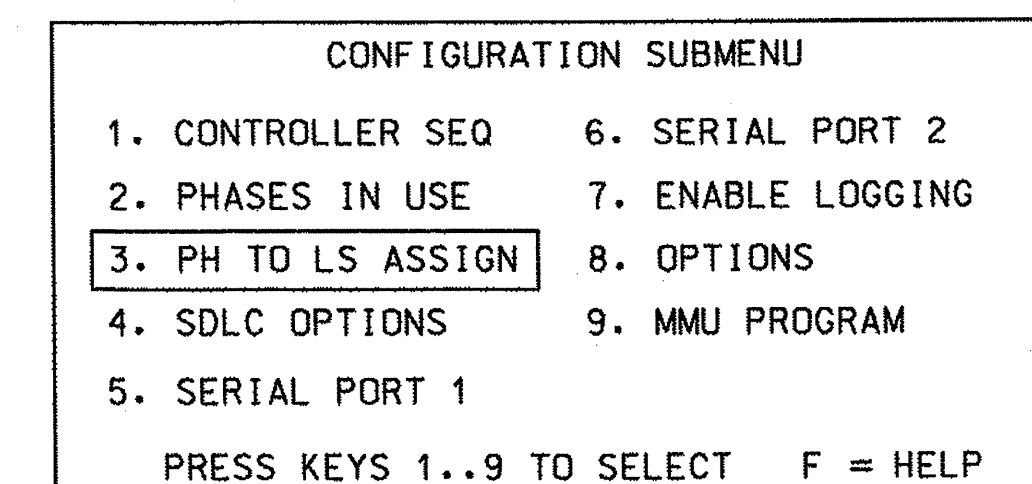
**WRITE-PROTECT FOR FLASHING YELLOW ARROWS DETAIL**  
*(program controller as shown below)*

FROM MAIN MENU SELECT 8 (UTILITIES) AND THEN 9 (WRITE PROTECT DATA)



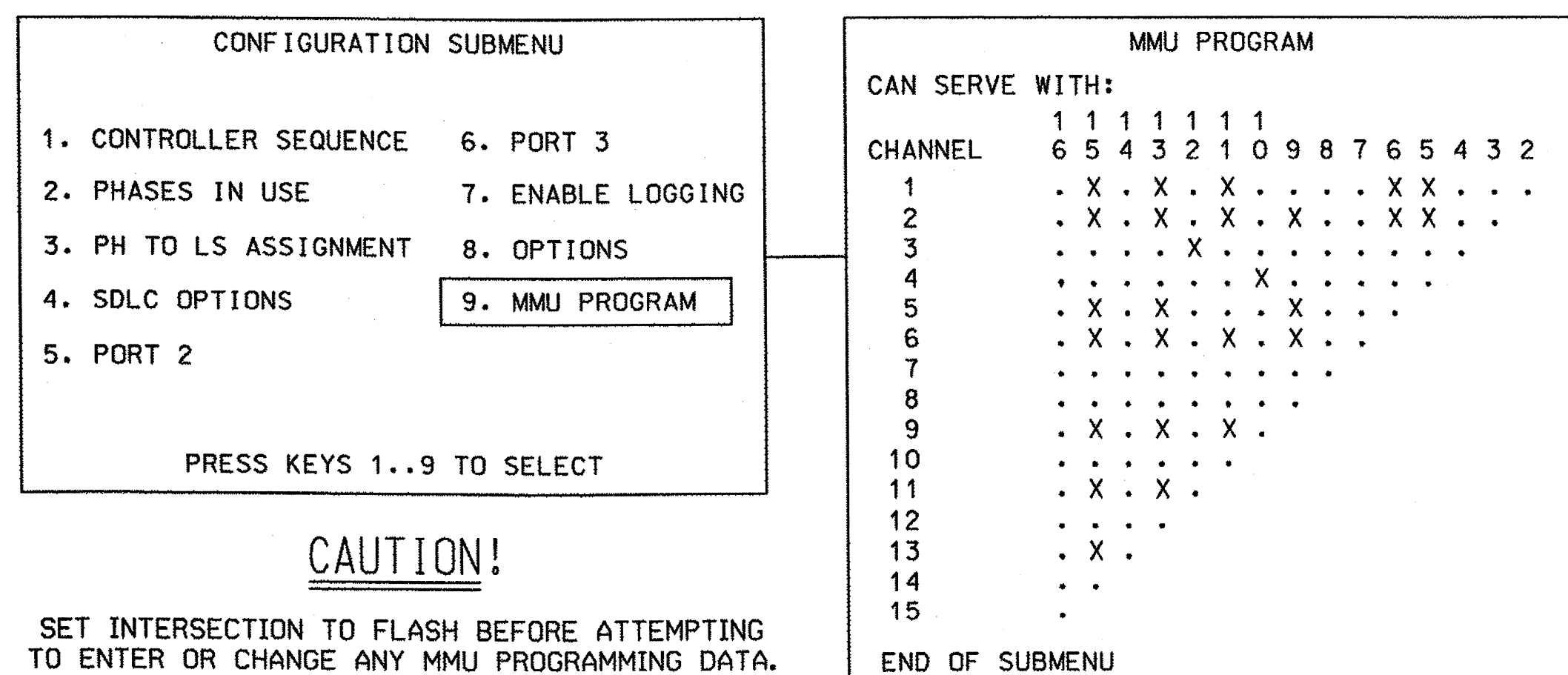
**ECONOLITE ASC/2070 CONTROLLER**  
**PHASE TO LOAD SWITCH ASSIGNMENT PROGRAMMING**  
*(program controller as shown below)*

FROM MAIN MENU PRESS '1' (CONFIGURATION):



PHASE TO LOAD SWITCH (MMU) ASSIGNMENT				
LOAD SWITCH (MMU) CHANNEL	SIGNAL DRIVER GROUP PH/OLAP PED	LOAD SWITCH (MMU) CHANNEL	SIGNAL DRIVER GROUP PH/OLAP PED	
1	1 .	9	2 X	
2	2 .	10	4 X	
3	3 .	11	6 X	
4	4 .	12	3 X	
5	5 .	13	13 .	
6	6 .	14	14 .	
7	7 .	15	15 .	
8	8 .	16	16 .	
ENTER 13-16 FOR OVERLAPS A-D				
END OF SUBMENU				

**ECONOLITE ASC/2070 SPECIAL MMU PROGRAMMING**  
*(program controller as shown below)*


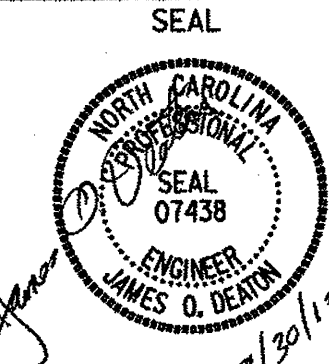
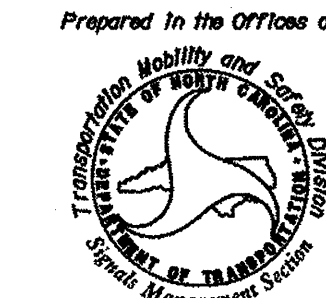


**CAUTION!**

SET INTERSECTION TO FLASH BEFORE ATTEMPTING TO ENTER OR CHANGE ANY MMU PROGRAMMING DATA.  
 THIS PROGRAMMING AND THAT OF THE MMU PROGRAMMING CARD MUST MATCH EXACTLY. IF THEY DO NOT, THE INTERSECTION WILL BE PLACED INTO FLASH.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2348  
 DESIGNED: May 2013  
 SEALED: September 30, 2013  
 REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN Sheet 2 of 3

 NC Firm License No.: F-0342 701 Corporate Center Drive Suite 475 Raleigh, NC 27607 Phone: 919-854-6200	ELECTRICAL AND PROGRAMMING DETAILS FOR: SR 3060 (Morrisville Parkway) at Bristol Creek Drive/Quail Fields Court	SEAL  ENGINEER JAMES O. DEATON 07438 9/30/13
	Prepared In the Office of:  TRANSPORTATION Signal Management Section 750 N. Greenfield Pkwy, Garner, NC 27529	

**ECONOLITE ASC/2070 OVERLAP PROGRAMMING DETAIL**

(program controller as shown)

FROM MAIN MENU SELECT 2 (CONTROLLER) AND THEN 5 (OVERLAP DATA)

**OVERLAP A**

CONTROLLER OVERLAP DATA												
OVERLAP A	1	2	3	4	5	6	7	8	9	0	1	2
STANDARD	X											
PROTECTED	X											
PERMITTED		X										
ENABLE LAG												
ENABLE LEAD												
SPARE												
ADVANCE GREEN TIMER	0.0											
LAG/LEAD GREEN TIMER	0.0											
LAG/LEAD YELLOW TIMER	0.0											
LAG/LEAD RED TIMER	0.0											

ADDITIONAL PAGE(S)

**OVERLAP B**

CONTROLLER OVERLAP DATA												
OVERLAP B	1	2	3	4	5	6	7	8	9	0	1	2
STANDARD												
PROTECTED												
PERMITTED												
ENABLE LAG												
ENABLE LEAD												
SPARE												
ADVANCE GREEN TIMER	0.0											
LAG/LEAD GREEN TIMER	0.0											
LAG/LEAD YELLOW TIMER	0.0											
LAG/LEAD RED TIMER	0.0											

ADDITIONAL PAGE(S)

**OVERLAP C**

CONTROLLER OVERLAP DATA												
OVERLAP C	1	2	3	4	5	6	7	8	9	0	1	2
STANDARD					X							
PROTECTED						X						
PERMITTED							X					
ENABLE LAG												
ENABLE LEAD												
SPARE												
ADVANCE GREEN TIMER	0.0											
LAG/LEAD GREEN TIMER	0.0											
LAG/LEAD YELLOW TIMER	0.0											
LAG/LEAD RED TIMER	0.0											

ADDITIONAL PAGE(S)

**OVERLAP D**

CONTROLLER OVERLAP DATA												
OVERLAP D	1	2	3	4	5	6	7	8	9	0	1	2
STANDARD												
PROTECTED												
PERMITTED												
ENABLE LAG												
ENABLE LEAD												
SPARE												
ADVANCE GREEN TIMER	0.0											
LAG/LEAD GREEN TIMER	0.0											
LAG/LEAD YELLOW TIMER	0.0											
LAG/LEAD RED TIMER	0.0											

ADDITIONAL PAGE(S)

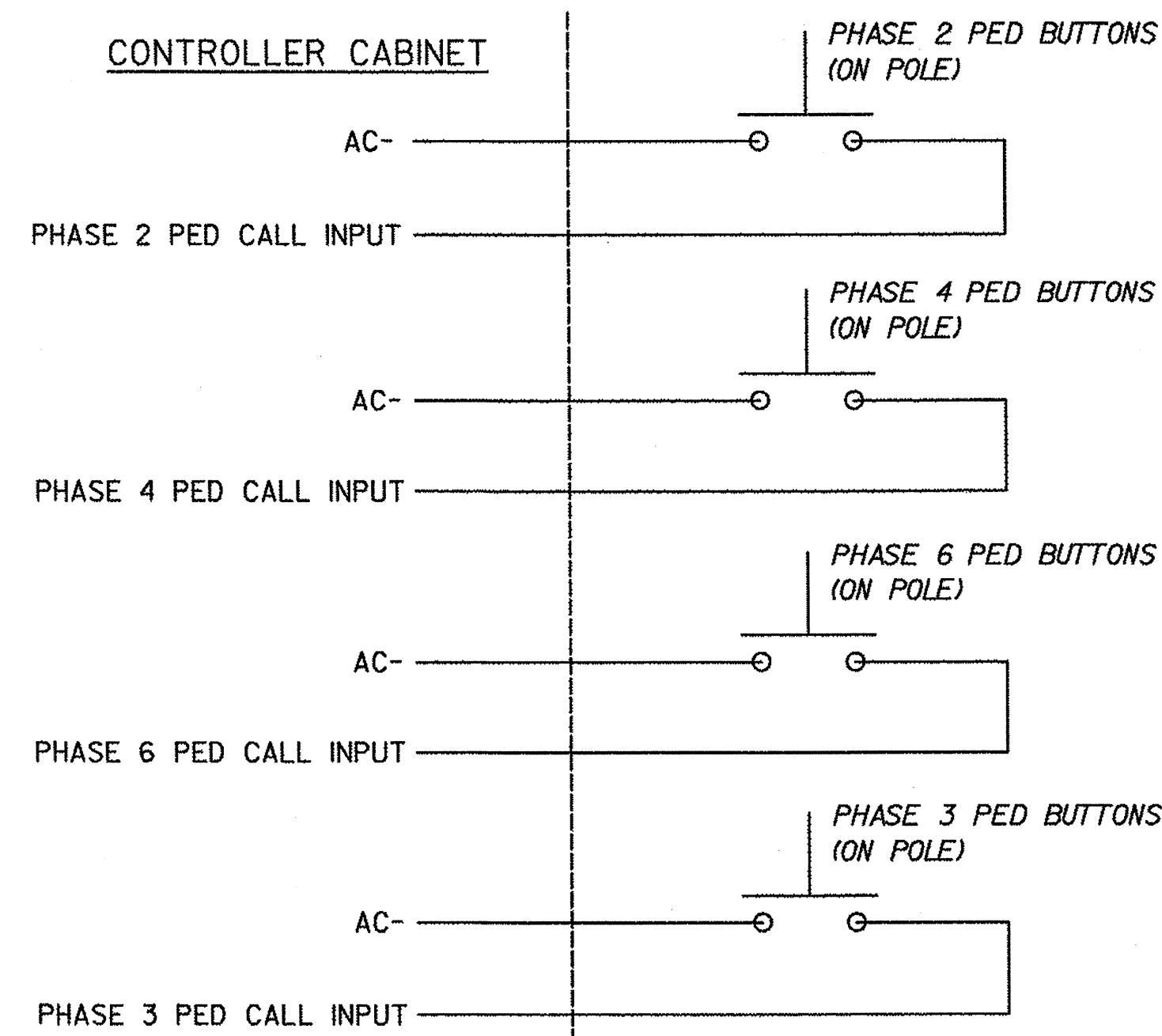
**PED OVERLAP**

PED OVERLAP ASSIGNMENTS												
OVERLAP CONSISTS OF PHASES:	1	2	3	4	5	6	7	8	9	0	1	2
OVLP PHASE												
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

END OF SUBMENU

**PEDESTRIAN PUSH-BUTTON WIRING DETAIL**

(wire push-buttons as shown below)



**ECONOLITE ASC/2070 FAMILY PED DETECTOR**

**PROGRAMMING INSTRUCTIONS**

(program controller as shown below)

NOTE: From MAIN MENU, select "6" (DETECTORS). Then select "3" (PEDESTRIAN DETECTOR SETUP). Assign DET 8 for phase 3.

**COUNTDOWN PEDESTRIAN SIGNAL OPERATION**

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

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2348  
 DESIGNED: May 2013  
 SEALED: September 30, 2013  
 REVISED: N/A

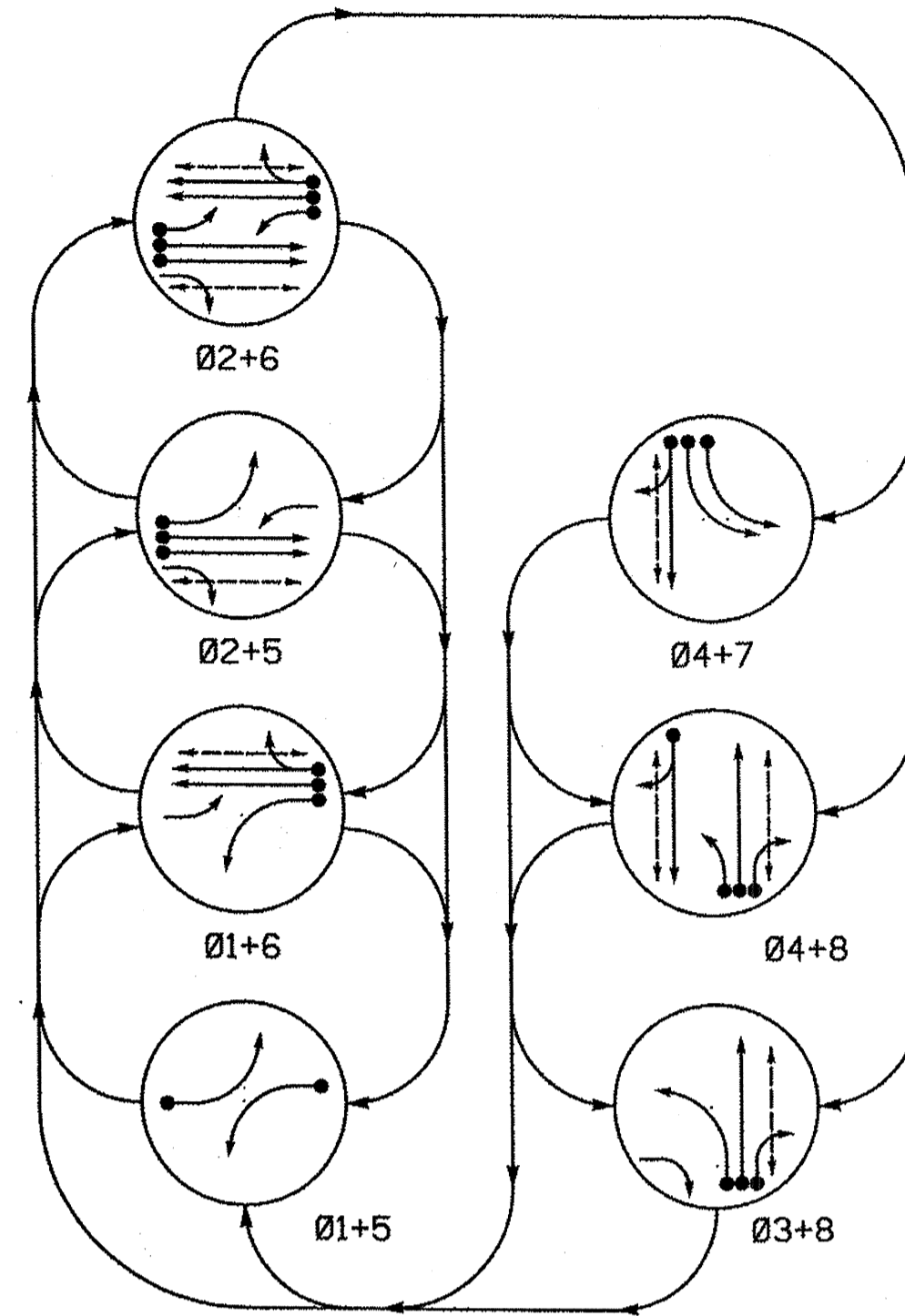
SIGNAL UPGRADE - FINAL DESIGN

Sheet 3 of 3

**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared in the Office of: 750 N. Greenfield Pkwy, Garner, NC 27529	SR 3060 (Morrisville Parkway) at Bristol Creek Drive/ Quail Fields Court		SEAL 9/30/13
	Division 5 PLAN DATE: May 2013 PREPARED BY: M W Yalch	Wake County REVIEWED BY: J O Deaton REVIEWED BY:	
SIGNATURE _____ DATE _____ SIG. INVENTORY NO. 05-2348			

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

Table with columns: SIGNAL FACE, PHASE (01-08), and signal status (R, G, Y, F, W, DW, DRK).

F = Flashing Yellow Arrow
W - Walk
DW - Don't Walk
DRK - Dark

NEMA LOOP & DETECTOR INSTALLATION CHART

Chart with columns: LOOP NO., SIZE (#), DIST. FROM STOPBAR (ft), TURNS, NEMA PHASE, NEW/EXISTING, TIMING (FEATURE, TIME), and INHIBIT DELAY DURING GREEN?

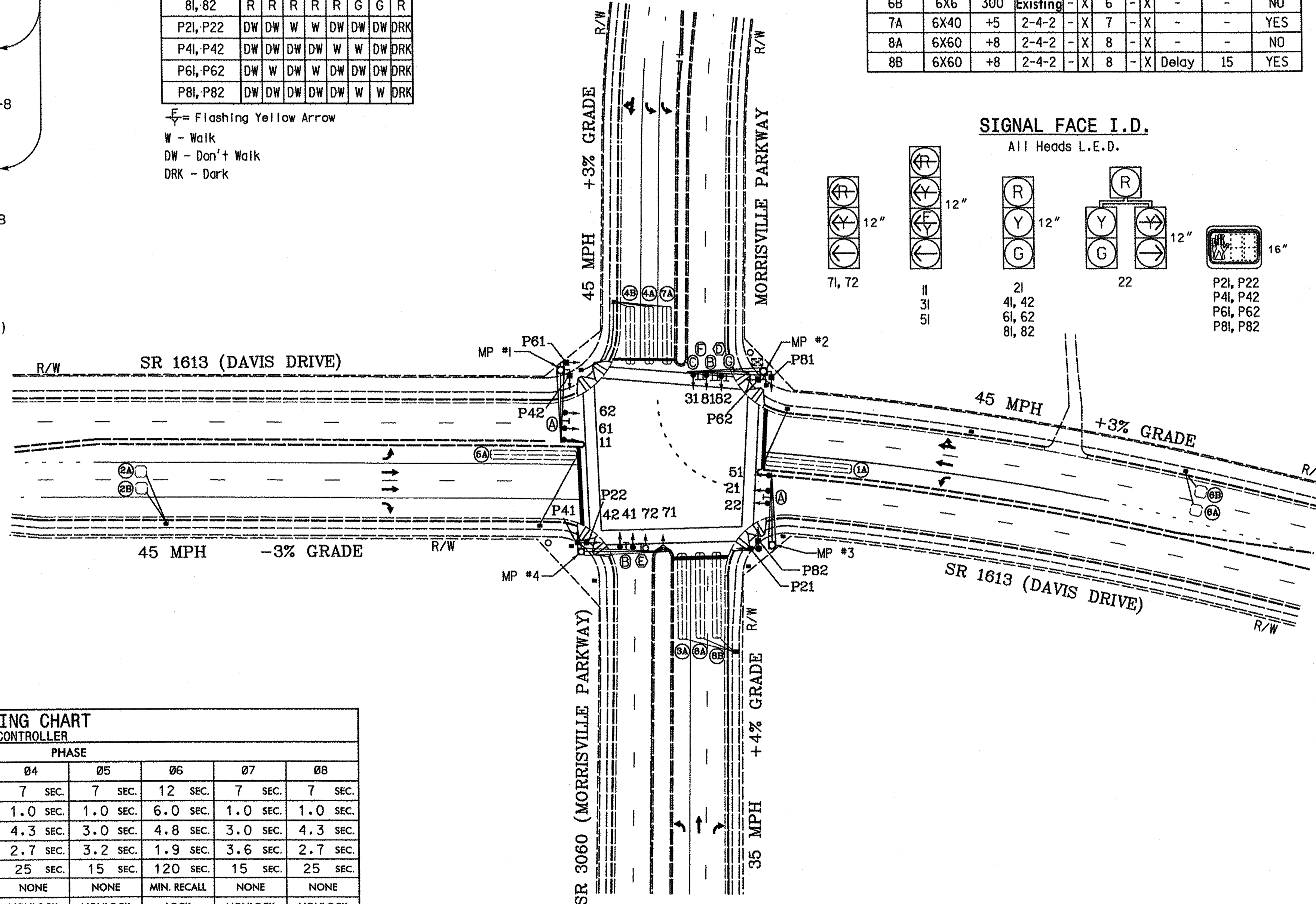
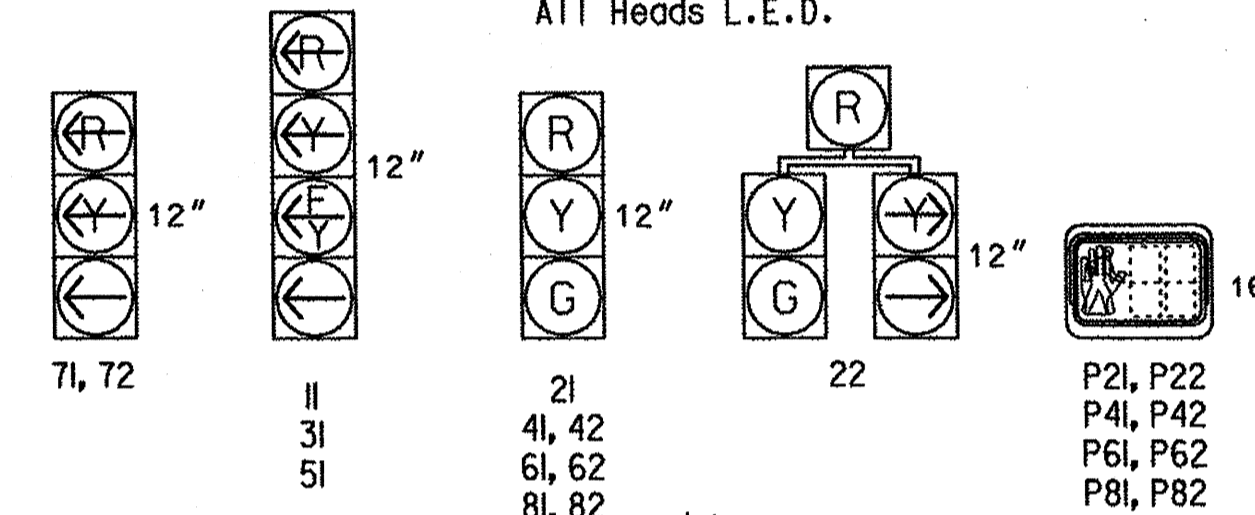
7 Phase Fully Actuated (Cary Signal System)

NOTES

- 1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012...
2. Do not program signal for late night flashing operation...
3. Phase 1 and/or phase 5 may be lagged.
4. Program phase 4 for dual entry.
5. Reposition existing signal heads numbered 41 and 42.
6. Set all detector units to presence mode.
7. In the event of loop replacement, refer to the current ITS and Signals Design Manual...
8. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
9. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
10. Maximum times shown in timing chart are for free-run operation only.
11. Pavement markings are existing unless otherwise shown.
12. Phase 3 and phase 7 shall not be run concurrently.

SIGNAL FACE I.D.

All Heads L.E.D.



LEGEND

- PROPOSED: Traffic Signal Head, Modified Signal Head, Pedestrian Signal Head, Metal Pole with Mastarm, Inductive Loop Detector, Controller & Cabinet, Junction Box, 2-in Underground Conduit, Right of Way, Directional Arrow.
EXISTING: N/A, Sign, Sign (R10-16), Sign (R3-5R), Sign (R3-5), Sign (R3-5a), Sign (R10-30).

NEMA TIMING CHART

Timing chart table with columns: FEATURE, PHASE (01-08), and timing values in seconds.

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



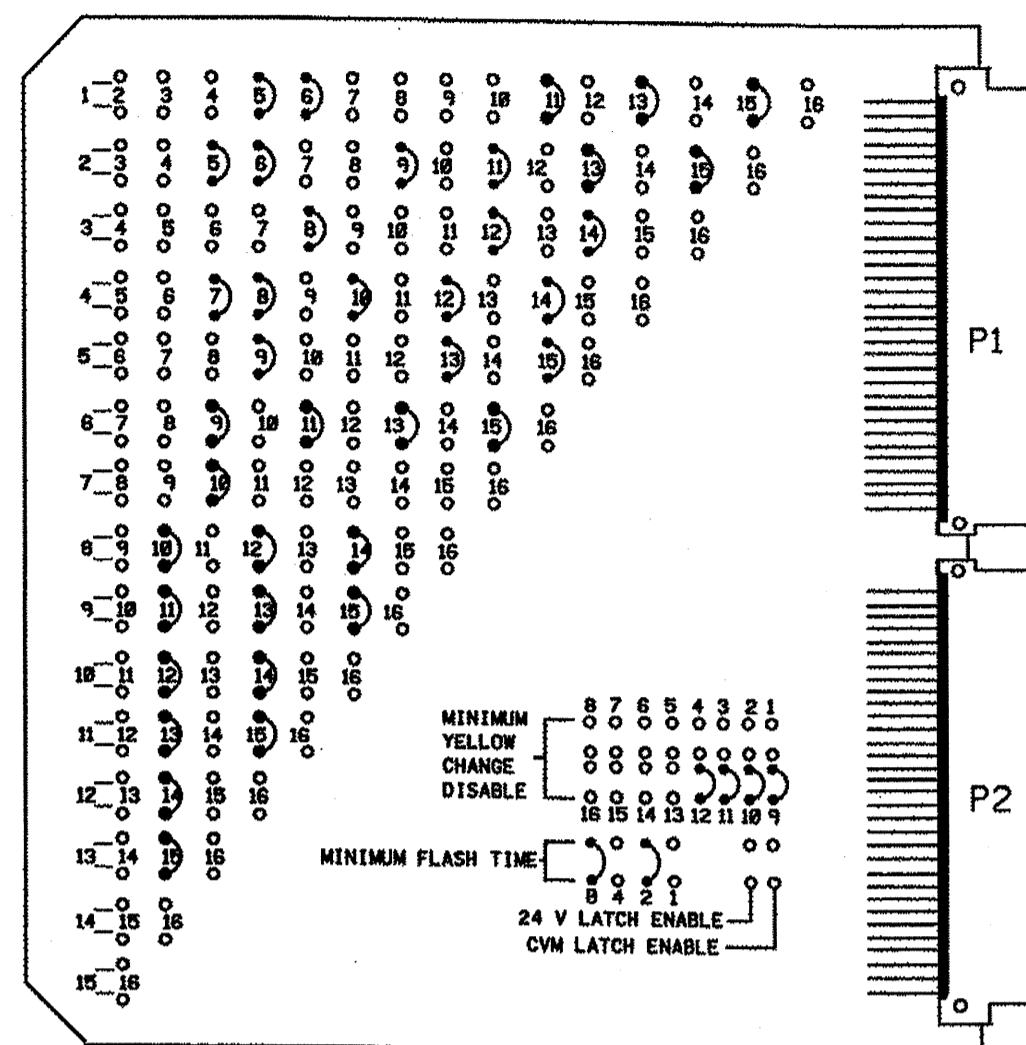
NC Firm License No.: F-0342
701 Corporate Center Drive
Suite 475 Raleigh, NC 27607
Phone: 919-854-6200

Signal Upgrade - Temporary Design

Project information block including plan date (May 2013), reviewed by (A. Demers, S. Nandagiri), scale (1"=50'), and signature/seal area.

**EDI MODEL MMU-16LE  
MALFUNCTION MANAGEMENT UNIT  
PROGRAMMING DETAIL**

(program card and tables as shown below)



MMU PROGRAMMING CARD

CHANNEL NUMBER	ENABLE/DISABLE
1	DISABLE
2	ENABLE
3	ENABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	ENABLE
8	ENABLE
9	ENABLE
10	ENABLE
11	ENABLE
12	ENABLE
13	ENABLE
14	ENABLE
15	ENABLE
16	DISABLE

OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF

CH. GROUP FOR PROTECTED GREEN ARROWS	CH. 1,3,5,7
ENABLE CHANNEL PAIR, FYA	
CH 1-13	ON
CH 3-14	ON
CH 5-15	ON
CH 7-16	OFF

**MMU PROGRAMMING NOTE**

1. ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

**NOTES**

- To prevent "Flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
- To prevent red failures on unused monitor channels, tie unused load switch red output 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (red out). Make sure all flash transfer relays are in place.
- Program controller to start up in phases 2 and 6 green.
- Set power-up flash time to 10 seconds and implement on the Malfunction Management Unit. Set controller power-up flash time to 0 seconds.
- Enable simultaneous gap-out feature, on controller unit, for all phases.
- Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
- Program detector call delay and extension timing on the controller, unless otherwise specified.
- Set all detector card unit channels to "presence" mode.
- Program phases 2 and 6, on controller unit, for volume density operation.
- Program phase 4, on controller unit, for dual entry.
- This controller and cabinet are part of the Cary Signal System.

**SIGNAL HEAD HOOK-UP CHART**

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD	
SIGNAL HEAD NO.	11*	21,22	22	31*	41,42	51*	61,62	71,72	81,82	P21, P22	P41, P42	P61, P62	P81, P82	11*	31*	51*	NU
RED	*	2R	*	4R	*	6R		8R									
YELLOW	*	2Y		4Y	*	6Y		8Y									
GREEN		2G		4G		6G		8G									
RED ARROW								7R						13R	14R	15R	
YELLOW ARROW				3Y				7Y						13Y	14Y	15Y	
FLASHING YELLOW ARROW														13G	14G	15G	
GREEN ARROW	1G		3G	3G		5G		7G									
										9R	10R	11R	12R				
											9G	10G	11G	12G			

NU = Not Used

\* Denotes install Load Resistor, see Load Resistor installation detail on sheet 3.

\* See pictorial of head wiring detail this sheet.

**DETECTOR RACK SET-UP DETAIL**

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1	CH1	CH1	CH1	CH1	CH1	CH1	CH1	SLOT	SLOT	SLOT
	L3	L1	L7	L5	L11	L9	L15	L13			
	Ø 2	Ø 1	Ø 7	Ø 3	Ø 6	Ø 5	Ø 8	Ø 7			
									EMPTY	EMPTY	EMPTY
	CH2	CH2	CH2	CH2	CH2	CH2	CH2	NOT USED			
	L4	L2	L8	L6	L12	L10	L16				
	Ø 2	Ø 6	Ø 4	Ø 8	Ø 6	Ø 2	Ø 8				
		*			*						

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
1A	L1A, L1B
2A	L2A, L2B
2B	L3A, L3B
	L4A, L4B
3A	L5A, L5B
	L6A, L6B
4A	L7A, L7B
4B	L8A, L8B
5A	L9A, L9B
	L10A, L10B
6A	L11A, L11B
6B	L12A, L12B
7A	L13A, L13B
NU	L14A, L14B
8A	L15A, L15B
8B	L16A, L16B

**NOTE**  
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	Ø 1	DELAY	15
* 2	Ø 6	DELAY	3
3	Ø 2		
4	Ø 2		
5	Ø 3	DELAY	15
6	Ø 8		
7	Ø 7		
8	Ø 4	DELAY	10
9	Ø 5	DELAY	15
* 10	Ø 2	DELAY	3
11	Ø 6		
12	Ø 6		
13	Ø 7		
14	---	---	---
15	Ø 8		
16	Ø 8	DELAY	15

\* THIS DETECTOR IS EQUIPPED WITH DELAY AND EXTEND TIMERS. PROGRAM THE TIMING REQUIRED FOR THIS DETECTOR CHANNEL ON THE DETECTOR UNIT, NOT THE CONTROLLER.

**EQUIPMENT INFORMATION**

CONTROLLER.....ECONOLITE 2070L  
 CABINET .....NC-8A TS-2  
 SOFTWARE .....ASC/2070  
 CABINET MOUNT.....BASE  
 LOADBAY POSITIONS.....16  
 LOAD SWITCHES USED.....1,2,3,4,5,6,7,8,9,10,11,12,13,14,15  
 PHASES USED.....1,2,3,4,5,6,7,8,2PED,4PED,6PED,8PED  
 OLA.....\*  
 OLB.....\*  
 OLC.....\*  
 OLD.....NOT USED

\* See Sheet 3 of 3 Econolite ASC/2070 Overlap Programming Detail.

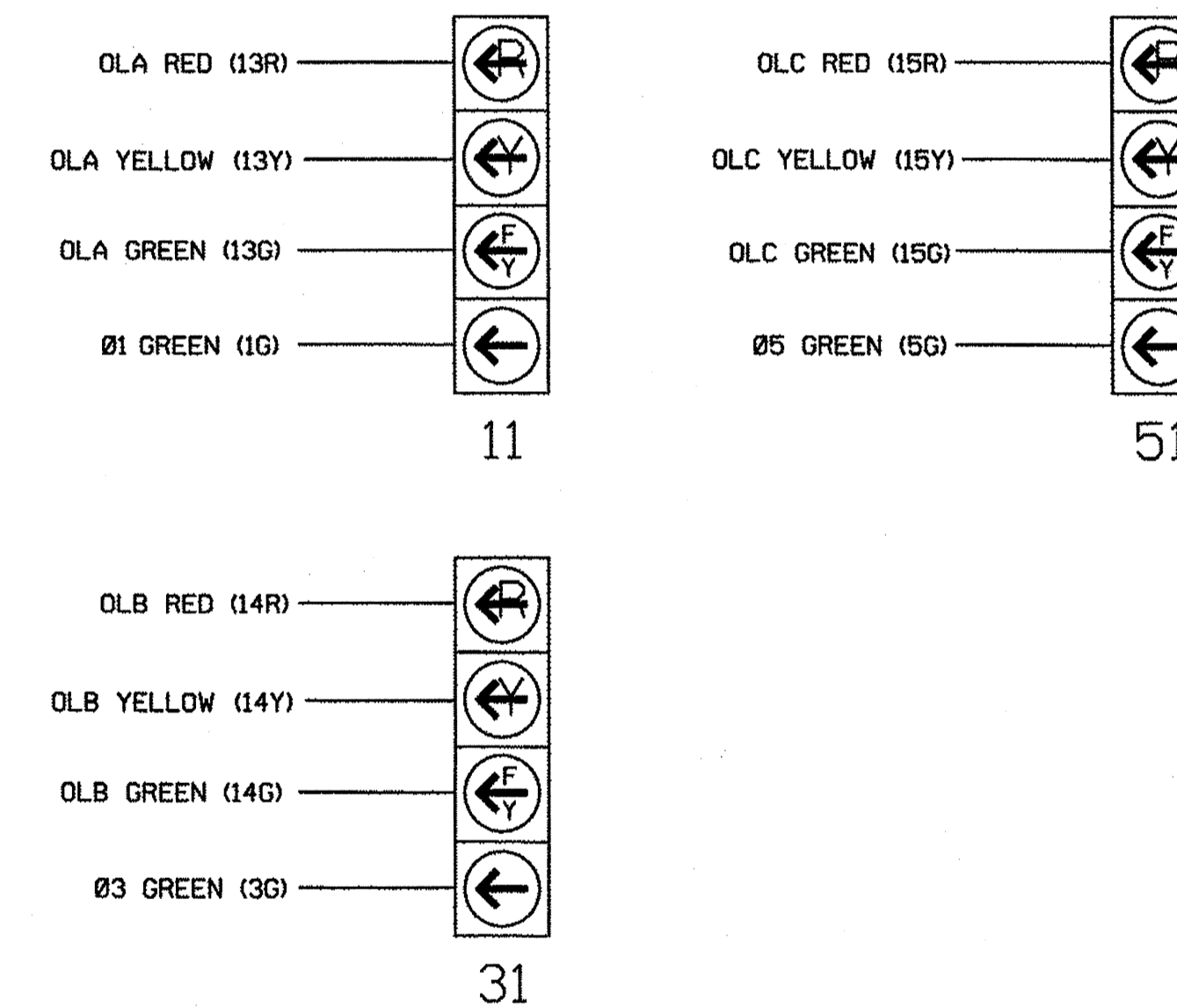
**LOAD SWITCH ASSIGNMENT DETAIL**

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	Ø 1
2	Ø 2
3	Ø 3
4	Ø 4
5	Ø 5
6	Ø 6
7	Ø 7
8	Ø 8
9	Ø 2 PED
10	Ø 4 PED
11	Ø 6 PED
12	Ø 8 PED
13	OLA
14	OLB
15	OLC
16	OLD

**4 SECTION FYA PPLT SIGNAL WIRING DETAIL**

(wire signal heads as shown)



**NOTE**

1. See overlap programming instructions sheet 3 of 3.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1984T  
 DESIGNED: May 2013  
 SEALED: September 30, 2013  
 REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN

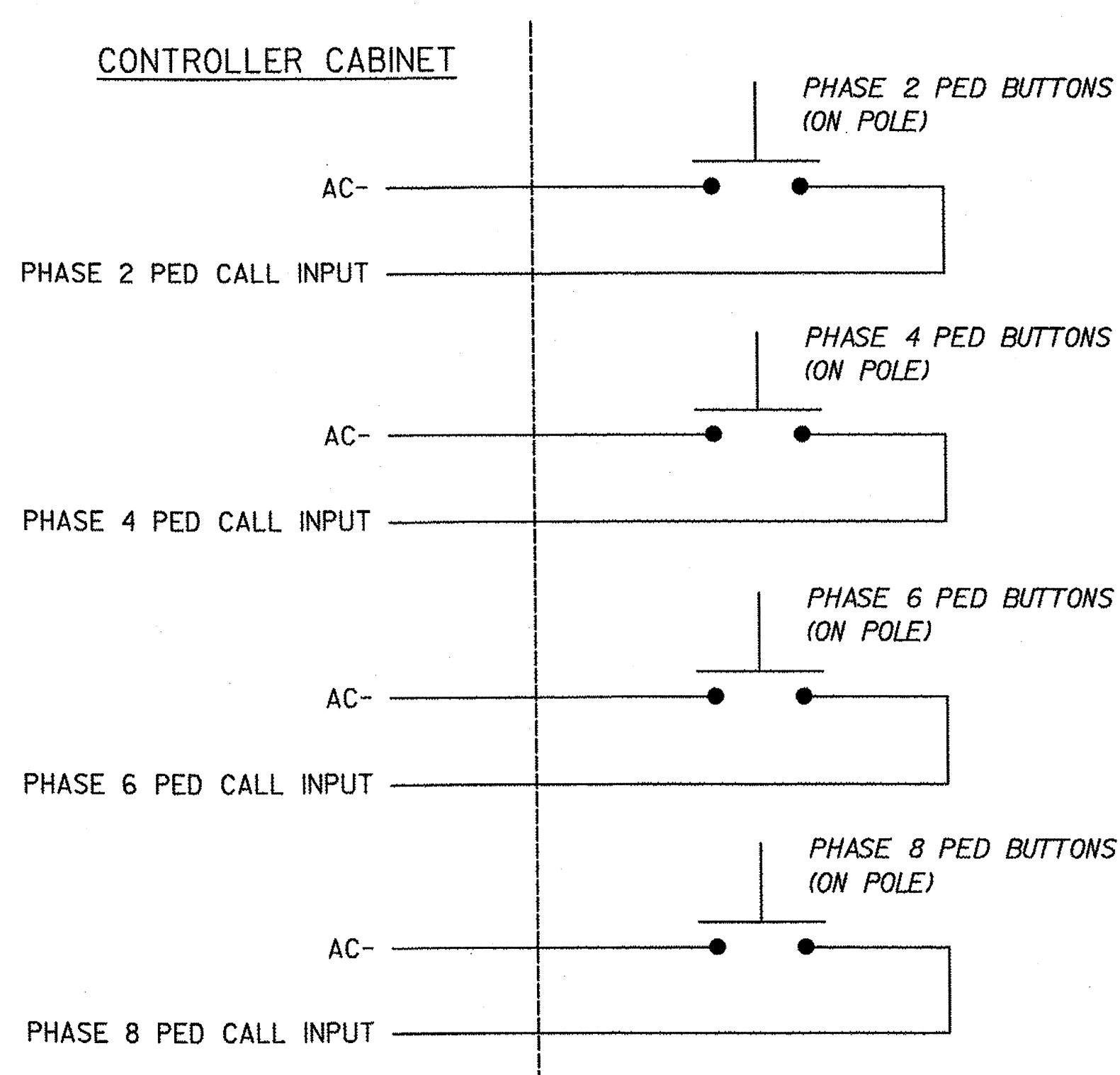
Sheet 1 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared in the Office of: 	SR 1613 (Davis Drive) at SR 3060 (Morrisville Parkway)		SEAL 
	Division 5 Wake County Cary PLAN DATE: May 2013 REVIEWED BY: J O Deaton PREPARED BY: M W Yaich REVIEWED BY:	REVISIONS INIT. DATE	
750 N. Greenfield Pkwy, Garner, NC 27529			SIGNATURE DATE SIG. INVENTORY NO. 05-1984T

**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

1:50:36 PM C:\p23803\00\_Technical\_Information\on\_Disc\_FT1\as450\_NCDOT\ST\rd\ech\us\grf1\asR\ref\com\sig\mal\ech\con\eng-5201\_Final\_Elec\_Detail.s 2013091505-1984T-02-160.dgn

**PEDESTRIAN PUSH-BUTTON WIRING DETAIL**  
*(wire push-buttons as shown below)*



**ECONOLITE ASC/2070 SPECIAL MMU PROGRAMMING**

*(program controller as shown below)*

CONFIGURATION SUBMENU		MMU PROGRAM																																																																																																																																																																																																																																																																																																																																			
1. CONTROLLER SEQUENCE 2. PHASES IN USE 3. PH TO LS ASSIGN 4. SDLC OPTIONS 5. SERIAL PORT 1 6. SERIAL PORT 2 7. ENABLE LOGGING 8. OPTIONS <b>9. MMU PROGRAM</b>		CAN SERVE WITH: <table border="1"> <tr> <td>CHANNEL</td> <td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td> </tr> <tr> <td></td> <td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td><td>9</td> </tr> <tr> <td>1</td> <td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>X</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>2</td> <td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>X</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>3</td> <td>.</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>4</td> <td>.</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>X</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>5</td> <td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>6</td> <td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>7</td> <td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>8</td> <td>.</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>9</td> <td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>10</td> <td>.</td><td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>11</td> <td>.</td><td>X</td><td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>12</td> <td>.</td><td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>13</td> <td>.</td><td>X</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>14</td> <td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> <tr> <td>15</td> <td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td><td>.</td> </tr> </table>	CHANNEL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0	9	1	.	X	.	X	.	X	.	.	.	.	.	X	X	.	.	.	.	.	2	.	X	.	X	.	X	.	X	.	X	.	X	X	.	.	.	.	.	3	.	.	X	.	X	.	.	.	.	X	.	X	.	.	.	.	.	.	4	.	.	X	.	X	.	X	.	X	.	X	X	.	.	.	.	.	.	5	.	X	.	X	.	.	.	.	.	X	.	X	.	.	.	.	.	.	6	.	X	.	X	.	.	.	.	.	X	.	X	.	.	.	.	.	.	7	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.	8	.	.	X	.	X	.	.	.	.	X	.	X	.	.	.	.	.	.	9	.	X	.	X	.	X	.	.	.	.	.	.	.	.	.	.	.	.	10	.	.	X	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	11	.	X	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	12	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	13	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	14	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	15	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
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PRESS KEYS 1..9 TO SELECT

**CAUTION!**

SET INTERSECTION TO FLASH BEFORE ATTEMPTING TO ENTER OR CHANGE ANY MMU PROGRAMMING DATA. THIS PROGRAMMING AND THAT OF THE MMU PROGRAMMING CARD MUST MATCH EXACTLY. IF THEY DO NOT, THE INTERSECTION WILL BE PLACED INTO FLASH.

**WRITE-PROTECT FOR FLASHING YELLOW ARROWS DETAIL**  
*(program controller as shown below)*

FROM MAIN MENU SELECT 8 (UTILITIES) AND THEN 9 (WRITE PROTECT DATA)

UTILITIES SUBMENU		WRITE PROTECT DATA	
1. COPY	5. SIGN ON	ADDRESS	1/9
2. MEMORY CLEAR	6. LOG BUFFERS	008-00F	70
3. RESERVED	7. SEND D.M.		
4. RESERVED	8. D.M. UTILS		

PRESS KEYS 1..0 TO SELECT

**COUNTDOWN PEDESTRIAN SIGNAL OPERATION**

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

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1984T  
DESIGNED: May 2013  
SEALED: September 30, 2013  
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN

Sheet 2 of 3

**AECOM**  
NC Firm License No.: F-0342  
701 Corporate Center Drive  
Suite 475 Raleigh, NC 27607  
Phone: 919-854-6200

Division 5	Wake County	Cary
PLAN DATE: May 2013	REVIEWED BY: J O Deaton	
PREPARED BY: M W Yaich	REVIEWED BY:	
REVISIONS	INIT.	DATE

SR 1613 (Davis Drive) at SR 3060 (Morrissville Parkway)

SEAL  
NORTH CAROLINA PROFESSIONAL ENGINEER  
JAMES O. DEATON  
9/30/13

SIGNATURE DATE  
SIG. INVENTORY NO. 05-1984T

I:\5045\_P19\05-1984T\_Sig-14\05-1984T\_Sig-14.dgn 20130915 08:55:19 1984T-02-160.dgn

**ECONOLITE ASC/2070 OVERLAP PROGRAMMING DETAIL**

(program controller as shown)  
FROM MAIN MENU SELECT 2 (CONTROLLER) AND THEN 5 (OVERLAP DATA)

**OVERLAP A**

CONTROLLER OVERLAP DATA

OVERLAP A .....	1	2	3	4	5	6	7	8	9	0	1	1	1
STANDARD .....	X	.	.	.	.	.	.	.	.	.	.	.	.
PROTECTED .....	X	.	.	.	.	.	.	.	.	.	.	.	.
PERMITTED .....	.	X	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG .....	.	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD .....	.	.	.	.	.	.	.	.	.	.	.	.	.
SPARE .....	.	.	.	.	.	.	.	.	.	.	.	.	.

ADVANCE GREEN TIMER 0.0  
LAG/LEAD GREEN TIMER 0.0  
LAG/LEAD YELLOW TIMER 0.0  
LAG/LEAD RED TIMER 0.0

ADDITIONAL PAGE(S)

**OVERLAP B**

CONTROLLER OVERLAP DATA

OVERLAP B .....	1	2	3	4	5	6	7	8	9	0	1	1	1
STANDARD .....	.	X	.	.	.	.	.	.	.	.	.	.	.
PROTECTED .....	.	X	.	.	.	.	.	.	.	.	.	.	.
PERMITTED .....	.	.	.	.	.	.	X	.	.	.	.	.	.
ENABLE LAG .....	.	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD .....	.	.	.	.	.	.	.	.	.	.	.	.	.
SPARE .....	.	.	.	.	.	.	.	.	.	.	.	.	.

ADVANCE GREEN TIMER 0.0  
LAG/LEAD GREEN TIMER 0.0  
LAG/LEAD YELLOW TIMER 0.0  
LAG/LEAD RED TIMER 0.0

ADDITIONAL PAGE(S)

**OVERLAP C**

CONTROLLER OVERLAP DATA

OVERLAP C .....	1	2	3	4	5	6	7	8	9	0	1	1	1
STANDARD .....	.	.	.	X	.	.	.	.	.	.	.	.	.
PROTECTED .....	.	.	X	.	.	.	.	.	.	.	.	.	.
PERMITTED .....	.	.	.	.	X	.	.	.	.	.	.	.	.
ENABLE LAG .....	.	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD .....	.	.	.	.	.	.	.	.	.	.	.	.	.
SPARE .....	.	.	.	.	.	.	.	.	.	.	.	.	.

ADVANCE GREEN TIMER 0.0  
LAG/LEAD GREEN TIMER 0.0  
LAG/LEAD YELLOW TIMER 0.0  
LAG/LEAD RED TIMER 0.0

ADDITIONAL PAGE(S)

**OVERLAP D**

CONTROLLER OVERLAP DATA

OVERLAP D .....	1	2	3	4	5	6	7	8	9	0	1	1	1
STANDARD .....	.	.	.	.	.	.	.	.	.	.	.	.	.
PROTECTED .....	.	.	.	.	.	.	.	.	.	.	.	.	.
PERMITTED .....	.	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG .....	.	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD .....	.	.	.	.	.	.	.	.	.	.	.	.	.
SPARE .....	.	.	.	.	.	.	.	.	.	.	.	.	.

ADVANCE GREEN TIMER 0.0  
LAG/LEAD GREEN TIMER 0.0  
LAG/LEAD YELLOW TIMER 0.0  
LAG/LEAD RED TIMER 0.0

ADDITIONAL PAGE(S)

**PED OVERLAP**

PED OVERLAP ASSIGNMENTS

OVERLAP CONSISTS OF PHASES:	1	2	3	4	5	6	7	8	9	0	1	1	1
OVLP PHASE	1	2	3	4	5	6	7	8	9	0	1	1	1
1	.	.	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.	.	.
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10	.	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.	.	.

END OF SUBMENU

**ECONOLITE ASC/2070 PHASE PROGRAMMING DETAIL**

(program controller as shown)

FROM MAIN MENU, SELECT "1" (CONFIGURATION), THEN "1" (CONTROLLER SEQUENCE):

**CONFIGURATION SUBMENU**

1. CONTROLLER SEQUENCE	5. TELEMETRY
2. PHASES IN USE	6. TERMINAL PORT
3. PH TO LS ASSIGNMENT	7. ENABLE LOGGING
4. SDLC OPTIONS	8. OPTIONS

PRESS KEYS 1..8 TO SELECT

**CONTROLLER SEQUENCE**

----- PRIORITY -----

	1	1	1										
	1	2	3	4	5	6	7	8	9	0	1	2	
R1	1	2	4	3	0	0	0	0	0	0	0	0	0
R2	5	6	7	8	0	0	0	0	0	0	0	0	0
CG	.	.	.	.	.	.	.	.	.	.	.	.	.

END OF SUBMENU

FROM MAIN MENU, SELECT "2" CONTROLLER, THEN "7" (NO SERVE PHASES):

**CONTROLLER SUBMENU**

1. TIMING DATA	6. START/FLASH DATA
2. PH OVLP ASSIGN	7. NO SERVE PHASES
3. PED CARRYOVER	8. DIMMING
4. RECALL DATA	9. OPTION DATA
5. OVERLAP DATA	

PRESS KEYS 1..9 TO SELECT

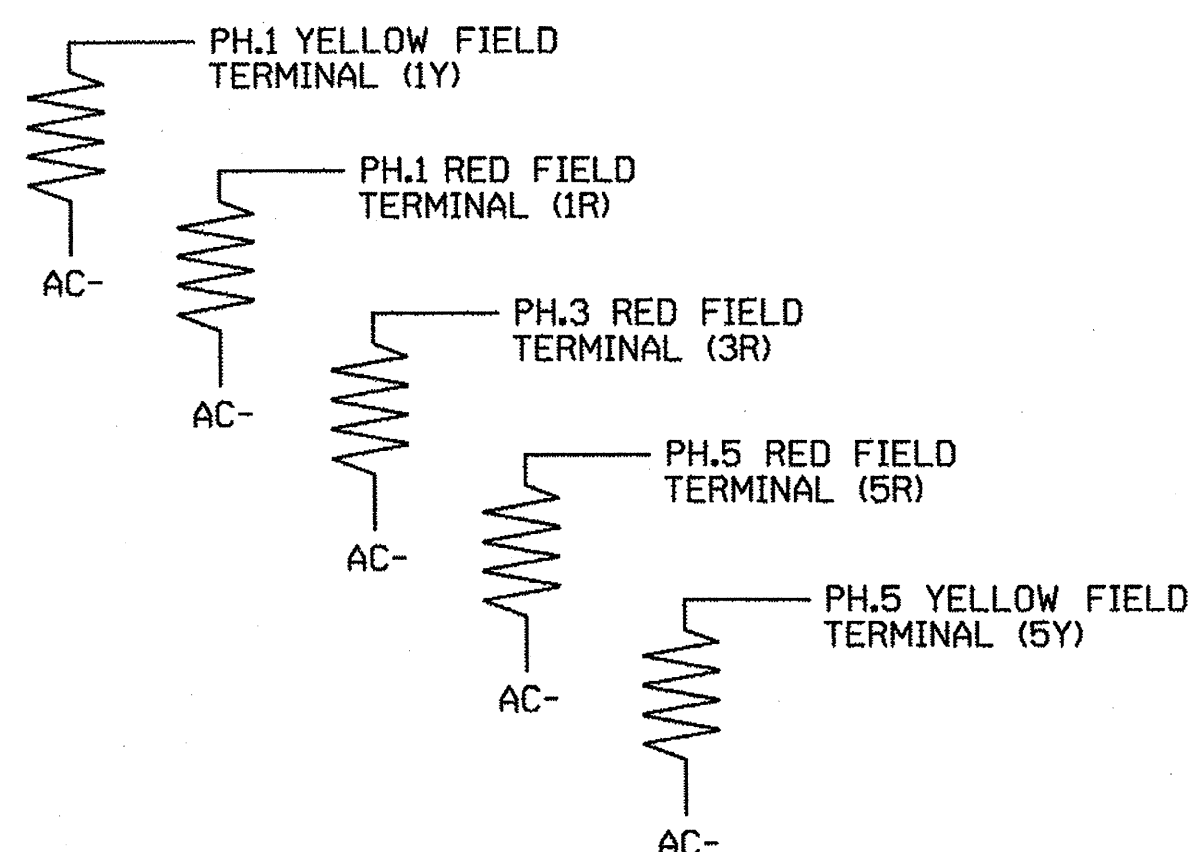
**NO SERVE PHASES**

CANNOT SERVE WITH:	1	1	1										
PHASE	2	1	0	9	8	7	6	5	4	3	2		
1	.	.	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	X	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.	.	.
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8	.	.	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.	.

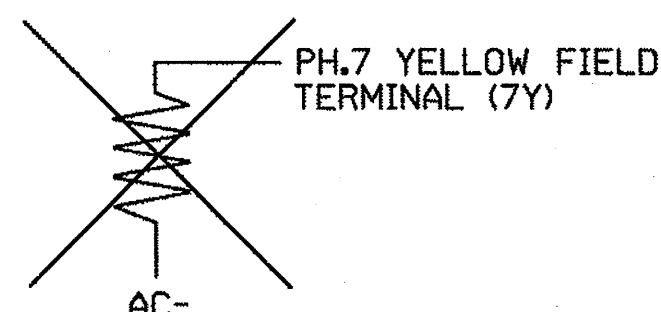
END OF SUBMENU

**LOAD RESISTOR INSTALLATION DETAIL**

(RETAIN/ADD resistors shown below)



(REMOVE 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: 05-1984T  
DESIGNED: May 2013  
SEALED: September 30, 2013  
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN

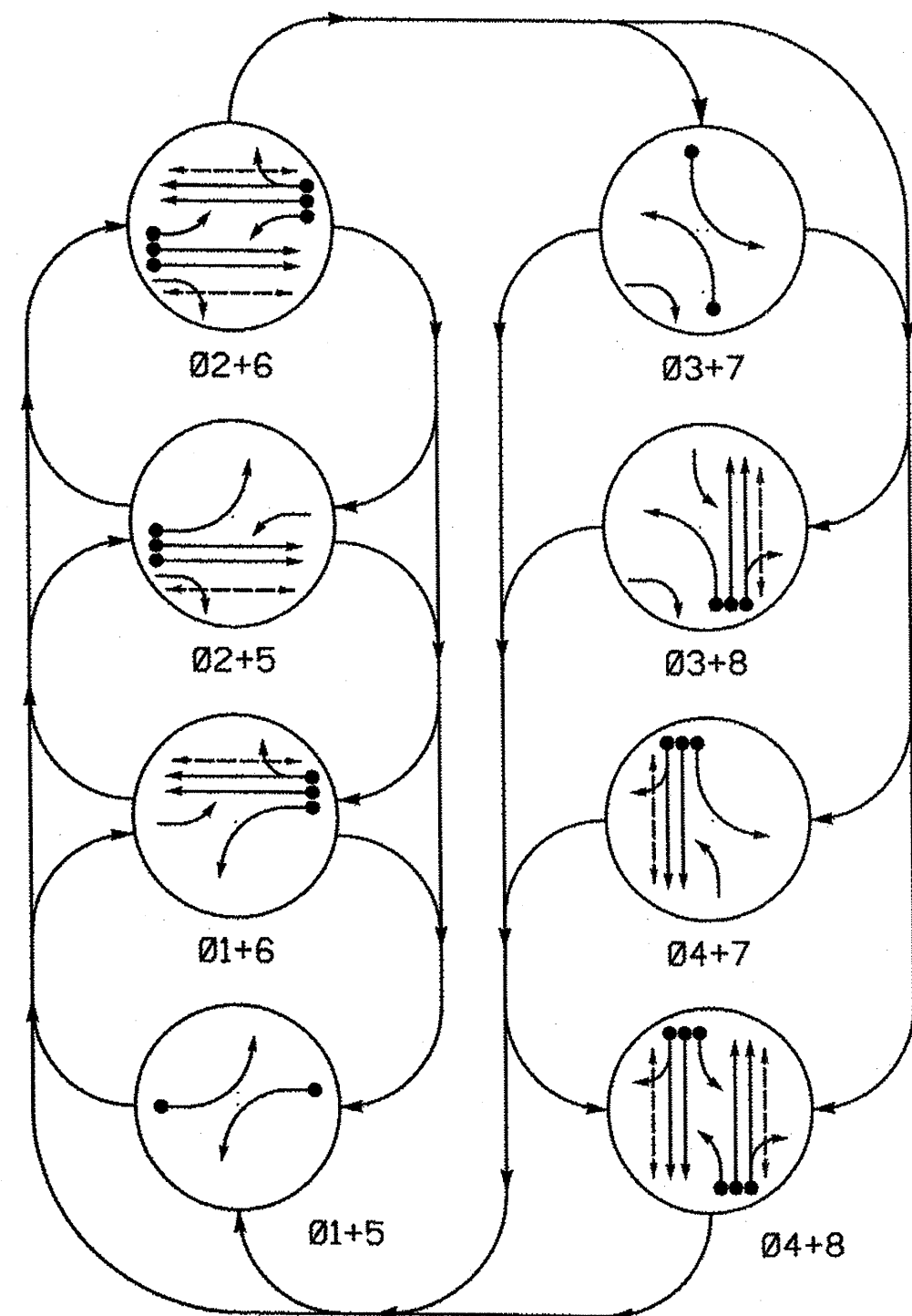
Sheet 3 of 3

<p><b>AECOM</b></p> <p>NC Firm License No.: F-0342 701 Corporate Center Drive Suite 475 Raleigh, NC 27607 Phone: 919-854-6200</p>	<p>ELECTRICAL AND PROGRAMMING DETAILS FOR:</p> <p>SR 1613 (Davis Drive) at SR 3060 (Morrisville Parkway)</p>	<p>SEAL</p>						
	<p>Division 5 Wake County Cary</p> <p>PLAN DATE: May 2013 REVIEWED BY: J O Deaton</p>	<p>REVISIONS</p> <table border="1"> <tr> <th>NO.</th> <th>INIT.</th> <th>DATE</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>	NO.	INIT.	DATE			
	NO.	INIT.	DATE					
	<p>PREPARED BY: M W Yalch</p>	<p>REVIEWED BY:</p>	<p>SIGNATURE DATE</p>					
<p>750 N. Grandfield Pkwy, Garner, NC 27529</p>	<p>SIG. INVENTORY NO. 05-1984T</p>							

1511-01 PM 05:40:23 03/04/2013 Technical Information on the F1 user interface... 05/2013

0422DEL\_P19

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE							
	01	02	03	04	05	06	07	08
II	---	---	---	---	---	---	---	---
21	R	R	G	G	R	R	R	Y
22	R	R	G	G	R	R	R	Y
31	---	---	---	---	---	---	---	---
41, 42	R	R	R	R	R	G	G	R
51	---	---	---	---	---	---	---	---
61, 62	R	G	R	G	R	R	R	Y
71	---	---	---	---	---	---	---	---
81, 82	R	R	R	R	G	R	G	R
P21, P22	DW	DW	W	W	DW	DW	DW	DRK
P41, P42	DW	DW	DW	DW	DW	DW	W	DRK
P61, P62	DW	W	DW	W	DW	DW	DW	DRK
P81, P82	DW	DW	DW	DW	DW	W	W	DRK

⚡ = Flashing Yellow Arrow  
 W - Walk  
 DW - Don't Walk  
 DRK - Dark

NEMA LOOP & DETECTOR INSTALLATION CHART  
 2070N CONTROLLER with TS-2 CABINET

LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	INDUCTIVE LOOPS		DETECTOR UNITS					
				NEW	EXISTING	NEMA PHASE	NEW	EXISTING	TIMING	INHIBIT DELAY DURING GREEN?	
IA	6X60	0	2-4-2	-	X	1	-	X	Delay	15	YES
2A	6X6	300	Existing	-	X	2	-	X	-	-	NO
2B	6X6	300	Existing	-	X	2	-	X	-	-	NO
3A	6X60	+8	2-4-2	-	X	3	-	X	Delay	15	YES
4A	6X40	+5	2-4-2	-	X	4	-	X	-	-	NO
4B	6X40	+5	2-4-2	-	X	4	-	X	Delay	10	YES
5A	6X60	0	2-4-2	-	X	5	-	X	Delay	15	YES
6A	6X6	300	Existing	-	X	6	-	X	-	-	NO
6B	6X6	300	Existing	-	X	6	-	X	-	-	NO
7A	6X40	+5	2-4-2	-	X	7	-	X	Delay	15	YES
8A	6X60	+8	2-4-2	-	X	8	-	X	-	-	NO
8B	6X60	+8	2-4-2	-	X	8	-	X	Delay	10	YES

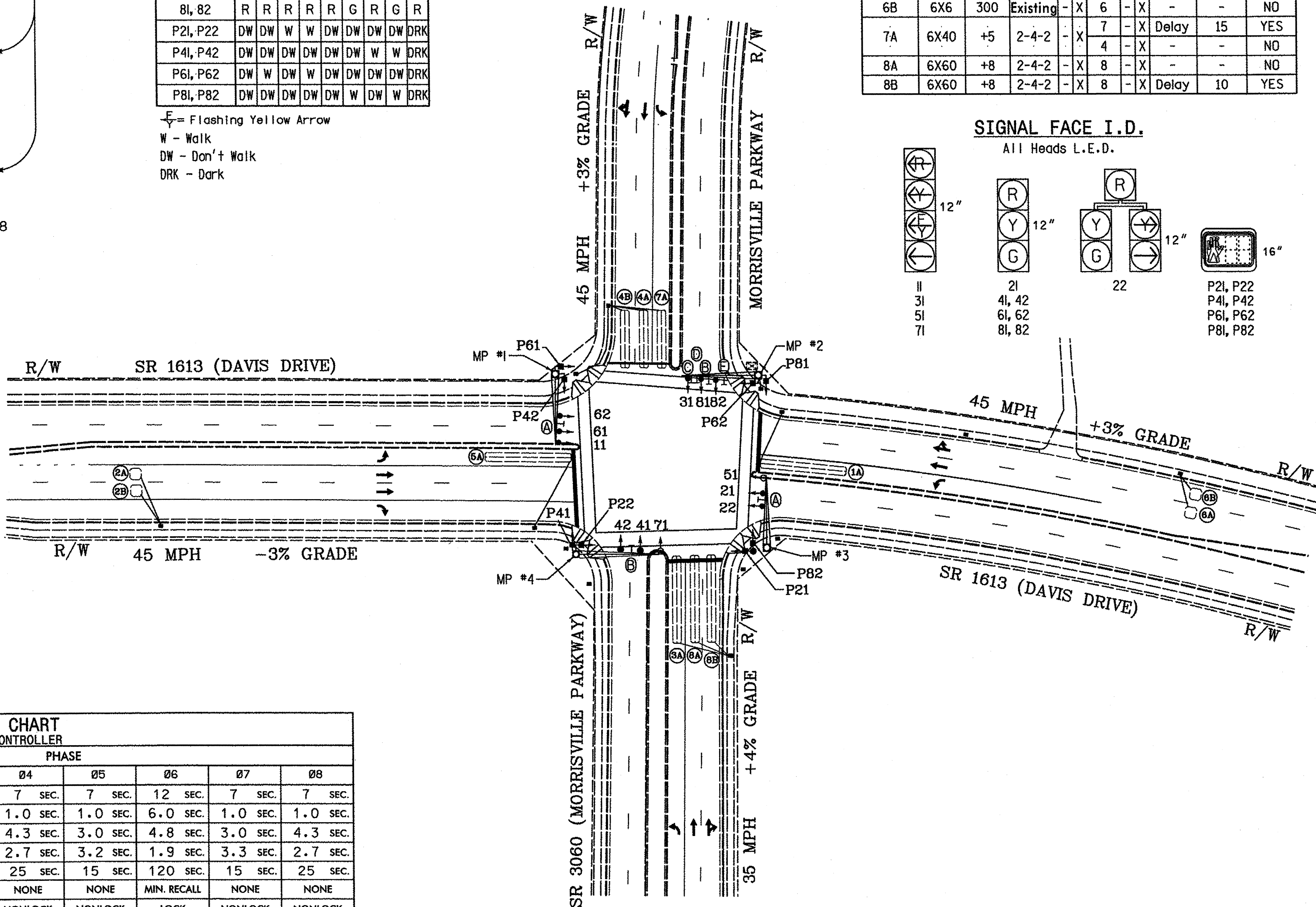
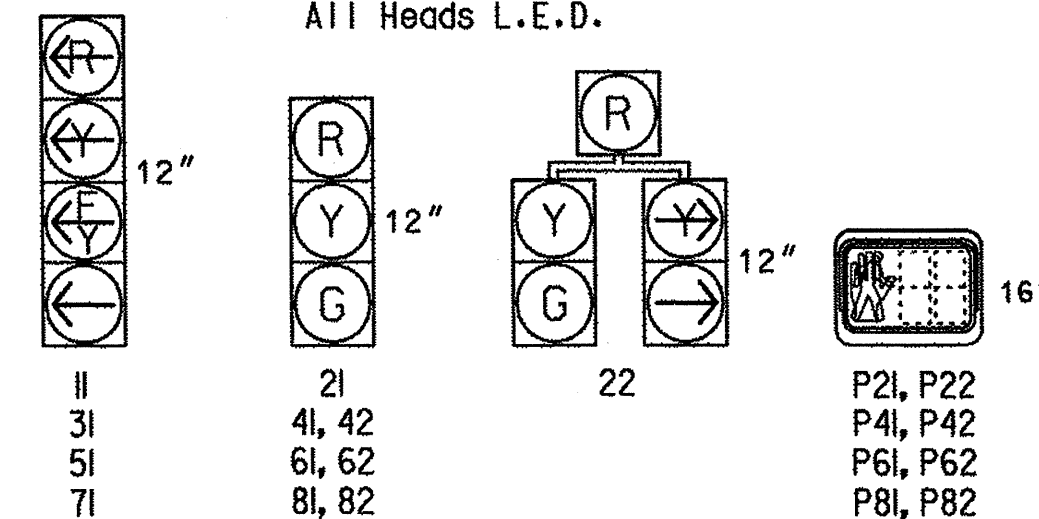
8 Phase Fully Actuated (Cary Signal System)

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 and/or phase 5 may be lagged.
- Phase 3 and/or phase 7 may be lagged.
- Program phase 4 and phase 8 for dual entry.
- Reposition existing signal heads numbered 41 and 42.
- Set all detector units to presence mode.
- In the event of loop replacement, refer to the current ITS and Signals Design Manual and submit a Plan of Record to the Signal Design Section.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Remove existing "Left Arrow Only" sign (R3-5) and existing "Right Arrow Only" sign (R3-5R).
- Existing "Through Only" sign (R3-5A) may be removed.
- 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.



LEGEND

- |     |   |     |   |
|-----|---|-----|---|
| ○ → | PROPOSED Traffic Signal Head                                    | ● → | EXISTING Traffic Signal Head                                    |
| ○ → | PROPOSED Modified Signal Head                                   | N/A | EXISTING Modified Signal Head                                   |
| ○ → | PROPOSED Pedestrian Signal Head                                 | ○ → | EXISTING Pedestrian Signal Head                                 |
| ○ → | PROPOSED Metal Pole with Mastarm                                | ○ → | EXISTING Metal Pole with Mastarm                                |
| ○ → | PROPOSED Inductive Loop Detector                                | ○ → | EXISTING Inductive Loop Detector                                |
| □   | PROPOSED Controller & Cabinet                                   | □   | EXISTING Controller & Cabinet                                   |
| □   | PROPOSED Junction Box   | □   | EXISTING Junction Box   |
| N/A | PROPOSED Right of Way   | --- | EXISTING Right of Way   |
| Ⓐ   | PROPOSED "Morrisville Parkway" Sign (D3-1)                      | Ⓐ   | EXISTING "Morrisville Parkway" Sign (D3-1)                      |
| Ⓑ   | PROPOSED "Davis Drive" Sign (D3-1)                              | Ⓑ   | EXISTING "Davis Drive" Sign (D3-1)                              |
| Ⓒ   | PROPOSED "U-TURN YIELD TO RIGHT TURN" Sign (R10-16)             | Ⓒ   | EXISTING "U-TURN YIELD TO RIGHT TURN" Sign (R10-16)             |
| Ⓓ   | PROPOSED Through Only Sign (R3-5A)                              | Ⓓ   | EXISTING Through Only Sign (R3-5A)                              |
| Ⓔ   | PROPOSED "RIGHT TURN ON RED MUST YIELD TO U-TURN" Sign (R10-30) | Ⓔ   | EXISTING "RIGHT TURN ON RED MUST YIELD TO U-TURN" Sign (R10-30) |

TIMING CHART  
 2070LN2 CONTROLLER

FEATURE	PHASE							
	01	02	03	04	05	06	07	08
MINIMUM GREEN *	7 SEC.	12 SEC.	7 SEC.	7 SEC.	7 SEC.	12 SEC.	7 SEC.	7 SEC.
PASSAGE GAP *	1.0 SEC.	6.0 SEC.	1.0 SEC.	1.0 SEC.	1.0 SEC.	6.0 SEC.	1.0 SEC.	1.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.8 SEC.	3.0 SEC.	4.3 SEC.	3.0 SEC.	4.8 SEC.	3.0 SEC.	4.3 SEC.
RED CLEARANCE	3.2 SEC.	1.9 SEC.	3.3 SEC.	2.7 SEC.	3.2 SEC.	1.9 SEC.	3.3 SEC.	2.7 SEC.
MAX. I *	15 SEC.	120 SEC.	15 SEC.	25 SEC.	15 SEC.	120 SEC.	15 SEC.	25 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	NONE	MIN. RECALL	NONE	NONE
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	NONLOCK	LOCK	NONLOCK	NONLOCK
WALK *	- SEC.	4 SEC.	- SEC.	4 SEC.	- SEC.	4 SEC.	- SEC.	4 SEC.
FLASHING DON'T WALK	- SEC.	25 SEC.	- SEC.	24 SEC.	- SEC.	23 SEC.	- SEC.	22 SEC.
VOLUME DENSITY	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
ACTUATION B4 ADD *	- VEH.	0 VEH.	- VEH.	- VEH.	- VEH.	0 VEH.	- VEH.	- VEH.
SEC. PER ACTUATION *	- SEC.	1.8 SEC.	- SEC.	- SEC.	- SEC.	1.8 SEC.	- SEC.	- SEC.
MAX. INITIAL *	- SEC.	34 SEC.	- SEC.	- SEC.	- SEC.	34 SEC.	- SEC.	- SEC.
TIME B4 REDUCTION *	- SEC.	15 SEC.	- SEC.	- SEC.	- SEC.	15 SEC.	- SEC.	- SEC.
TIME TO REDUCE *	- SEC.	30 SEC.	- SEC.	- SEC.	- SEC.	30 SEC.	- SEC.	- SEC.
MINIMUM GAP	- SEC.	3.0 SEC.	- SEC.	- SEC.	- SEC.	3.0 SEC.	- SEC.	- SEC.

\* 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.

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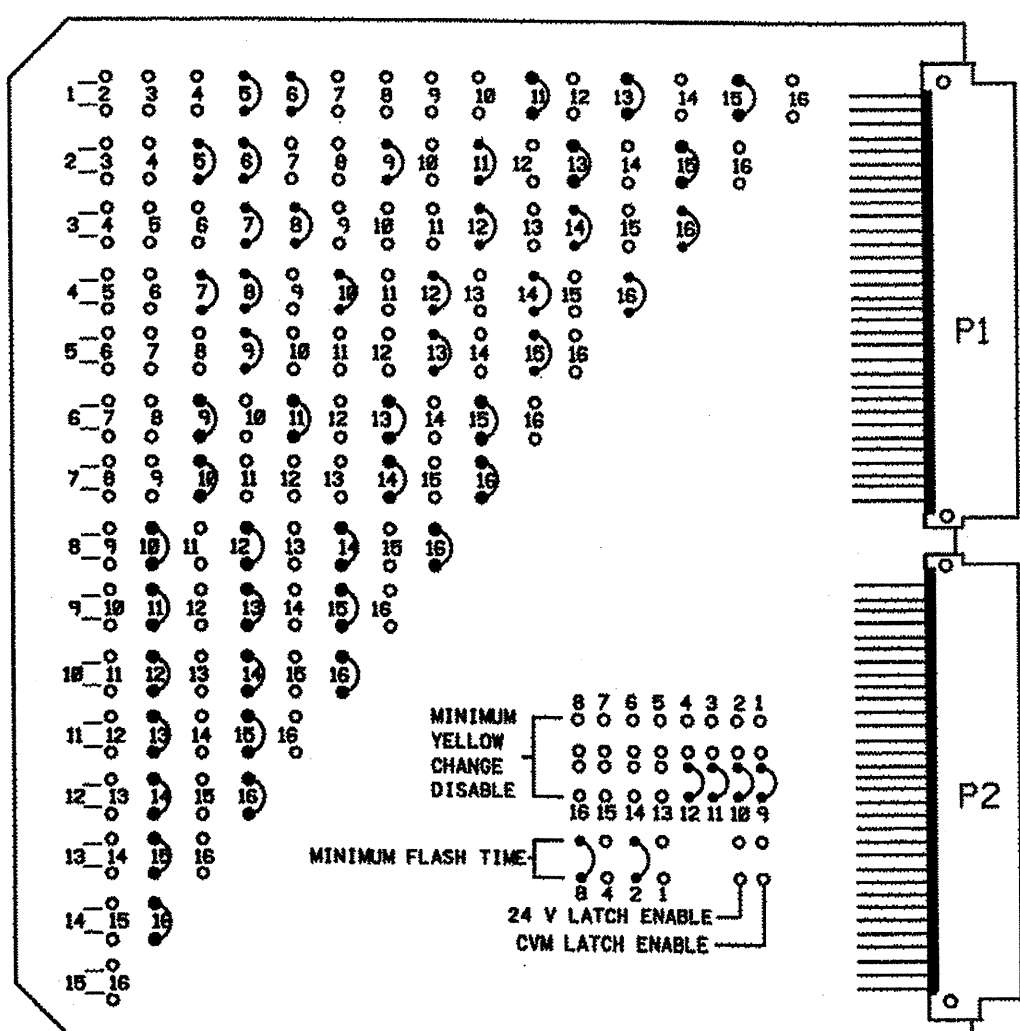
Signal Upgrade - Final Design

	SR 1613 (Davis Drive) at SR 3060 (Morrisville Parkway)	
	Division 5 Wake County Cary	PREPARED BY: S. W. Cox REVIEWED BY: S. Handagiri
PLAN DATE: July 2013 SCALE: 1"=50' REVISIONS:	REVIEWED BY: A. Doners REVIEWED BY: S. Handagiri	SEAL PROFESSIONAL ENGINEER STEVEN W. COX 2013-07-30-13 SIG. INVENTORY NO. 05-1984



### EDI MODEL MMU-16LE MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown below)



MMU PROGRAMMING CARD

CHANNEL NUMBER	ENABLE/DISABLE
1	DISABLE
2	ENABLE
3	ENABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	ENABLE
9	ENABLE
10	ENABLE
11	ENABLE
12	ENABLE
13	ENABLE
14	ENABLE
15	ENABLE
16	ENABLE

OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CYM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PGM CARD MEMORY	ON
LEDgaur-d	ON
FORCE TYPE 16	OFF
TYPE12-SOLC	OFF

FLASHING YELLOW ARROW	
CH. GROUP FOR PROTECTED GREEN ARROWS	CH. 1,3,5,7
ENABLE CHANNEL PAIR, FYA	
CH 1-13	ON
CH 3-14	ON
CH 5-15	ON
CH 7-16	ON

**MMU PROGRAMMING NOTE**

1. ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

### DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1	CH1	CH1	CH1	CH1	CH1	CH1	CH1	SLOT	SLOT	SLOT
	L3	L1	L7	L5	L11	L9	L15	L13			
	ø 2	ø 1	ø 4	ø 3	ø 6	ø 5	ø 8	ø 7			
CH2	CH2	CH2	CH2	CH2	CH2	CH2	CH2	EMPTY	EMPTY	EMPTY	
L4	L2	L8	L6	L12	L10	L16	L14				
ø 2	ø 6	ø 4	ø 8	ø 6	ø 2	ø 8	ø 4				
	*				*						

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
1A	L1A,L1B
2A	L2A,L2B
2B	L3A,L3B
3A	L4A,L4B
4A	L5A,L5B
4B	L6A,L6B
5A	L7A,L7B
6A	L8A,L8B
6B	L9A,L9B
7A	L10A,L10B
7B	L11A,L11B
8A	L12A,L12B
8B	L13A,L13B
	L14A,L14B
	L15A,L15B
	L16A,L16B

**NOTE**  
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	ø 1	DELAY	15
* 2	ø 6	DELAY	3
3	ø 2		
4	ø 2		
5	ø 3	DELAY	15
6	ø 8		
7	ø 4		
8	ø 4	DELAY	10
9	ø 5	DELAY	15
* 10	ø 2	DELAY	3
11	ø 6		
12	ø 6		
13	ø 7	DELAY	15
14	ø 4		
15	ø 8		
16	ø 8	DELAY	10

\* THIS DETECTOR IS EQUIPPED WITH DELAY AND EXTEND TIMERS. PROGRAM THE TIMING REQUIRED FOR THIS DETECTOR CHANNEL ON THE DETECTOR UNIT, NOT THE CONTROLLER.

### NOTES

1. To prevent "Flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the Malfunction Management Unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 2 and 6, on controller unit, for volume density operation.
10. Program phases 4 and 8, on controller unit, for dual entry.
11. This controller and cabinet are part of the Cary Signal System.

### EQUIPMENT INFORMATION

CONTROLLER.....ECONOLITE 2070L  
 CABINET .....NC-8A TS-2  
 SOFTWARE .....ASC/2070  
 CABINET MOUNT.....BASE  
 LOADBAY POSITIONS.....16  
 LOAD SWITCHES USED.....1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16  
 PHASES USED.....1,2,3,4,5,6,7,8,2PED,4PED,6PED,8PED  
 OLA.....\*  
 OLB.....\*  
 OLC.....\*  
 OLD.....\*

\*See Sheet 3 of 3 Econolite ASC/2070 Overlap Programming Detail.

### LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	ø 1
2	ø 2
3	ø 3
4	ø 4
5	ø 5
6	ø 6
7	ø 7
8	ø 8
9	ø 2 PED
10	ø 4 PED
11	ø 6 PED
12	ø 8 PED
13	OLA
14	OLB
15	OLC
16	OLD

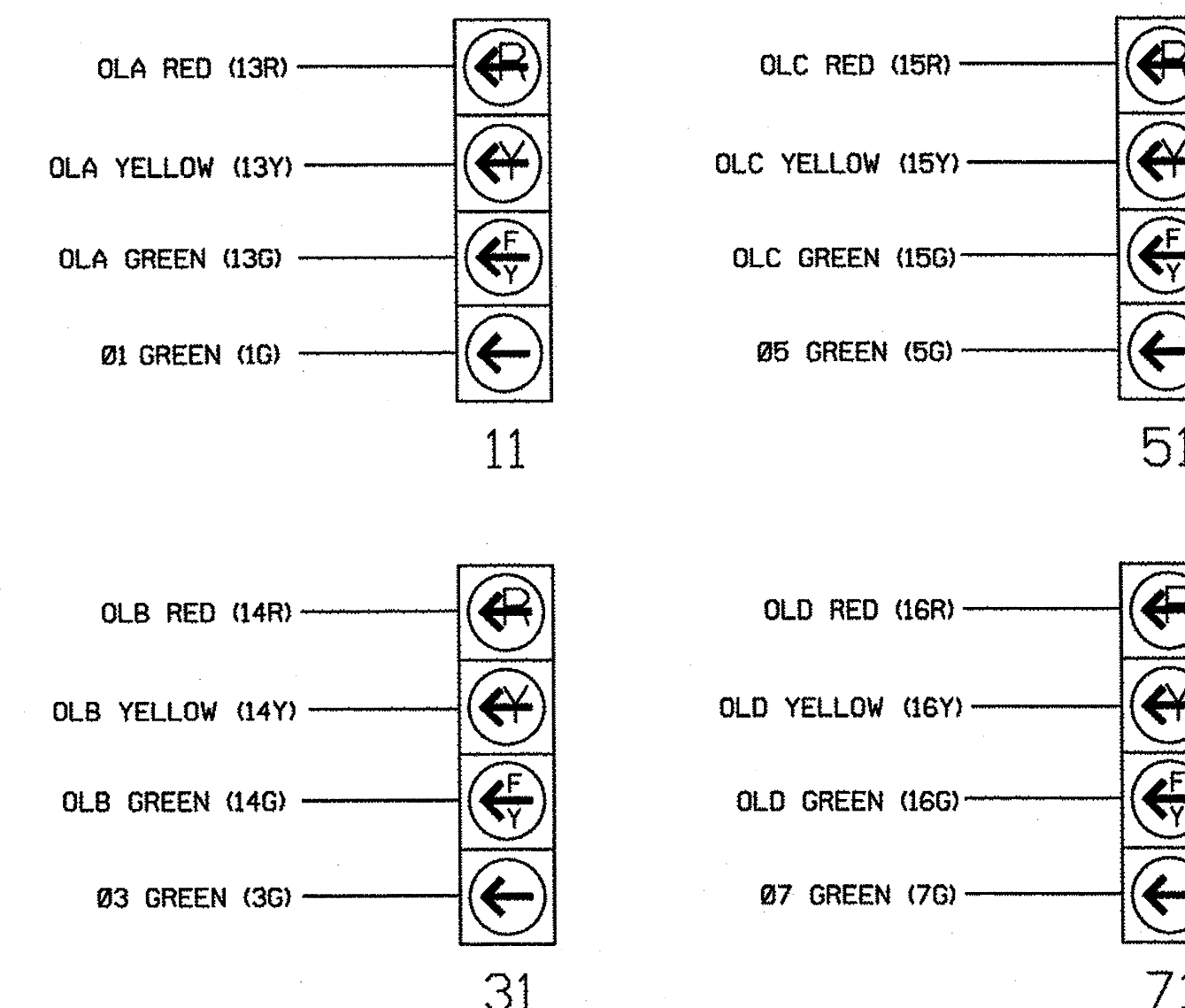
### SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD	
SIGNAL HEAD NO.	11*	21,22	22	31*	41,42	51*	61,62	71*	81,82	P21, P22	P41, P42	P61, P62	P81, P82	11*	31*	51*	71*
RED	*	2R	*	4R	*	6R	*	8R									
YELLOW	*	2Y		4Y	*	6Y	*	8Y									
GREEN		2G		4G		6G		8G									
RED ARROW														13R	14R	15R	16R
YELLOW ARROW			3Y											13Y	14Y	15Y	16Y
FLASHING YELLOW ARROW														13G	14G	15G	16G
GREEN ARROW	1G		3G	3G		5G		7G									
Hand										9R	10R	11R	12R				
Foot										9G	10G	11G	12G				

\* Denotes install Load Resistor, see Load Resistor installation detail on sheet 3.  
 \* See pictorial of head wiring detail this sheet.

### 4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



**NOTE**

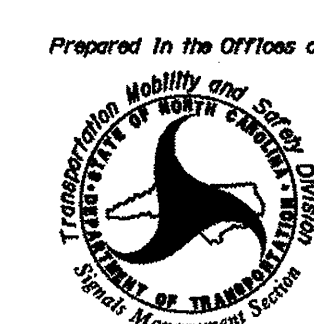
1. See overlap programming instructions sheet 3 of 3.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1984  
 DESIGNED: July 2013  
 SEALED: September 30, 2013  
 REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN

Sheet 1 of 3

ELECTRICAL AND PROGRAMMING DETAILS FOR:



SR 1613 (Davis Drive)  
 at  
 SR 3060 (Morrisville Parkway)

Division 5 Wake County Cary  
 PLAN DATE: July 2013 REVIEWED BY: J O Deaton  
 PREPARED BY: M W Yaich REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL  
 NORTH CAROLINA  
 PROFESSIONAL ENGINEER  
 JAMES O. DEATON  
 07438  
 7/20/13

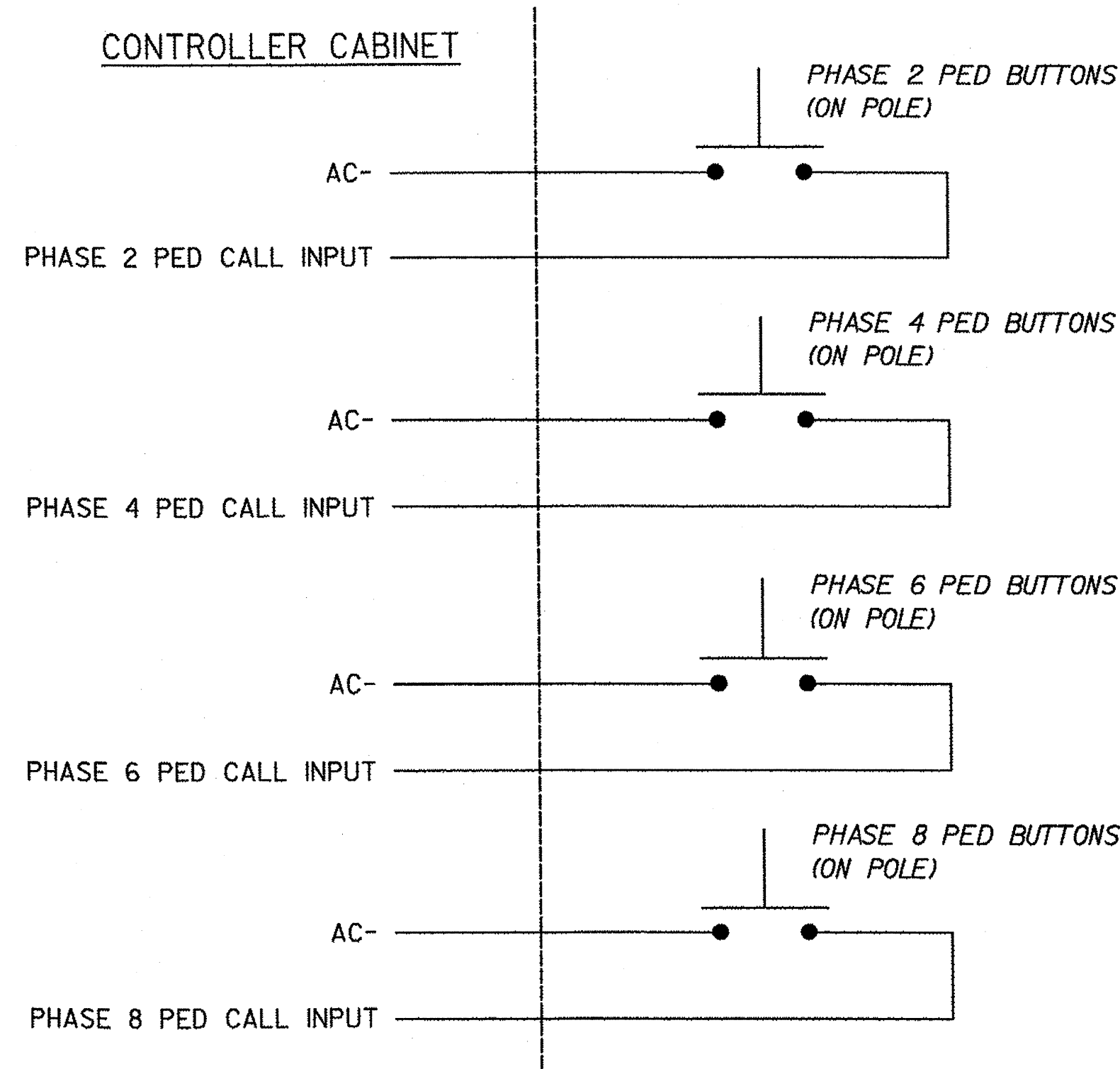
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 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

**ECONOLITE ASC/2070 SPECIAL MMU PROGRAMMING**

(program controller as shown below)

**PEDESTRIAN PUSH-BUTTON WIRING DETAIL**

(wire push-buttons as shown below)



CONFIGURATION SUBMENU

1. CONTROLLER SEQUENCE	6. SERIAL PORT 2
2. PHASES IN USE	7. ENABLE LOGGING
3. PH TO LS ASSIGN	8. OPTIONS
4. SDLC OPTIONS	<b>9. MMU PROGRAM</b>
5. SERIAL PORT 1	

PRESS KEYS 1..9 TO SELECT

MMU PROGRAM

CAN SERVE WITH:

CHANNEL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0	9	8
1	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.
2	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.
3	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X
4	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X
5	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.
6	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.
7	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X
8	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X
9	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.
10	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X
11	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.
12	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X
13	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.
14	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X
15	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.	X	.

END OF SUBMENU

**CAUTION!**

SET INTERSECTION TO FLASH BEFORE ATTEMPTING TO ENTER OR CHANGE ANY MMU PROGRAMMING DATA. THIS PROGRAMMING AND THAT OF THE MMU PROGRAMMING CARD MUST MATCH EXACTLY. IF THEY DO NOT, THE INTERSECTION WILL BE PLACED INTO FLASH.

**WRITE-PROTECT FOR FLASHING YELLOW ARROWS DETAIL**

(program controller as shown below)

FROM MAIN MENU SELECT 8 (UTILITIES) AND THEN 9 (WRITE PROTECT DATA)

UTILITIES SUBMENU

1. COPY	5. SIGN ON
2. MEMORY CLEAR	6. LOG BUFFERS
3. RESERVED	7. SEND D.M.
4. RESERVED	8. D.M. UTILS

PRESS KEYS 1..0 TO SELECT

WRITE PROTECT DATA

ADDRESS	1/9
008-00F	F0

TO INPUT DATA "F0" (HEX) INTO ADDRESS "009" DO THE FOLLOWING:

\* . 6 . 0 . USE CURSOR TO SCROLL OFF OF DATA FIELD

**COUNTDOWN PEDESTRIAN SIGNAL OPERATION**

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

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1984  
 DESIGNED: July 2013  
 SEALED: September 30, 2013  
 REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN

Sheet 2 of 3

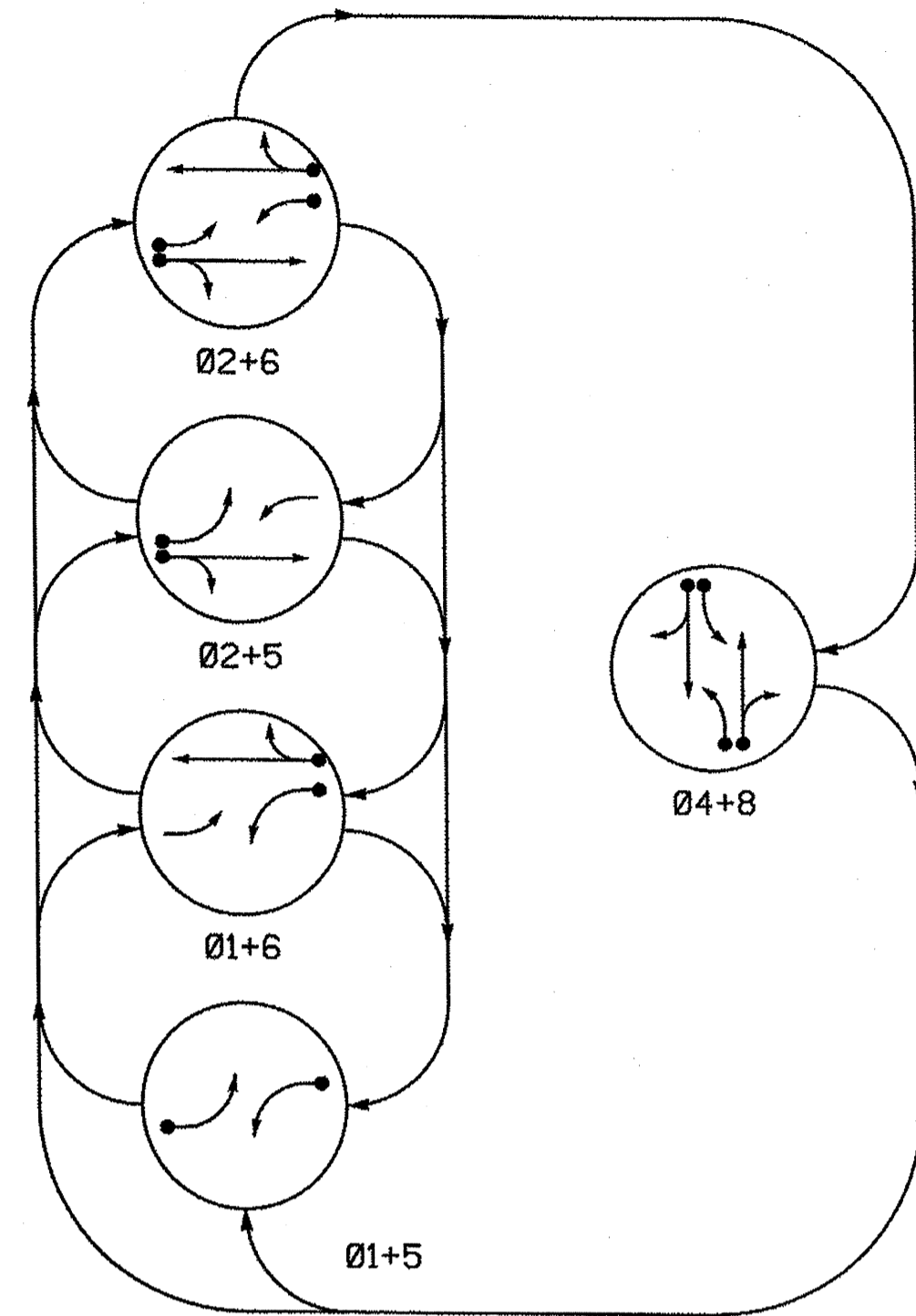
**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared in the Offices of:  TRANSPORTATION, MOBILITY AND SAFETY DIVISION STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION Signal Management Section 750 N. Greenfield Pkwy, Garner, NC 27529	SR 1613 (Davis Drive) at SR 3060 (Morrisville Parkway)		SEAL  JAMES O. DEATON ENGINEER 9/30/13
	Division 5 PLAN DATE: July 2013 PREPARED BY: M W Yalch	Wake County Cary REVIEWED BY: J O Deaton REVIEWED BY:	

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PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

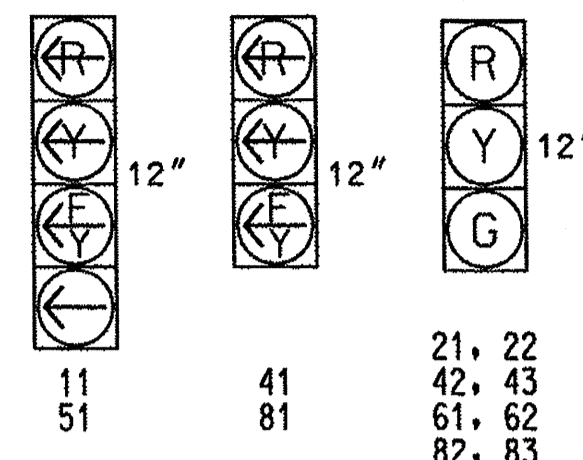
TABLE OF OPERATION

SIGNAL FACE	PHASE					
	01+5	01+6	02+5	02+6	04+8	LEGEND
11	—	—	F	F	R	Y
21, 22	R	R	G	G	R	Y
41	R	R	R	R	F	R
42, 43	R	R	R	R	G	R
51	—	—	F	F	R	Y
61, 62	R	G	R	G	R	Y
81	R	R	R	R	F	R
82, 83	R	R	R	R	G	R

F = Flashing Yellow Arrow

SIGNAL FACE I.D.

All Heads L.E.D.



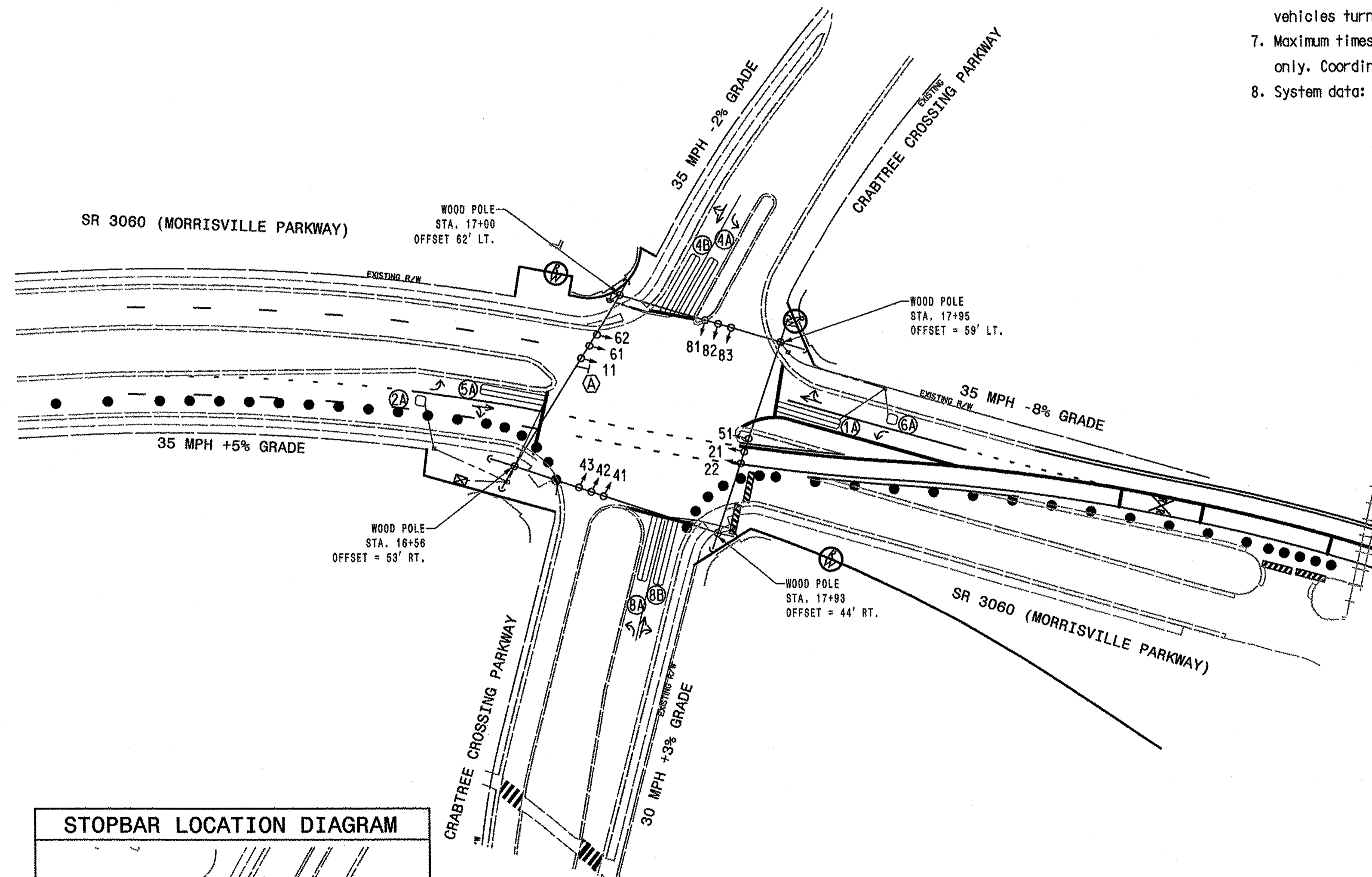
NEMA LOOP & DETECTOR INSTALLATION CHART with TS-2 CABINET

LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	NEW EXISTING	NEMA PHASE		TIMING		INHIBIT DELAY DURING GREEN?
					NEW	EXISTING	FEATURE	TIME	
1A	6X40	0	2-4-2	X	—	1	X	DELAY 15	YES
2A	6X6	70	3	X	—	6	X	—	NO
4A	6X40	0	2-4-2	X	—	2	X	—	NO
4B	6X40	0	2-4-2	X	—	4	X	DELAY 10	YES
5A	6X40	0	2-4-2	X	—	5	X	DELAY 15	YES
6A	6X6	70	5	X	—	2	X	—	NO
8A	6X40	0	2-4-2	X	—	8	X	—	NO
8B	6X40	0	2-4-2	X	—	8	X	DELAY 10	YES

5 Phase Fully Actuated (Cary 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 and/or phase 5 may be lagged.
- Program phase 4 and phase 8 for dual entry.
- Set all detector units to presence mode.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- Maximum times shown in the timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- System data: Address number 8, Channel number 17.

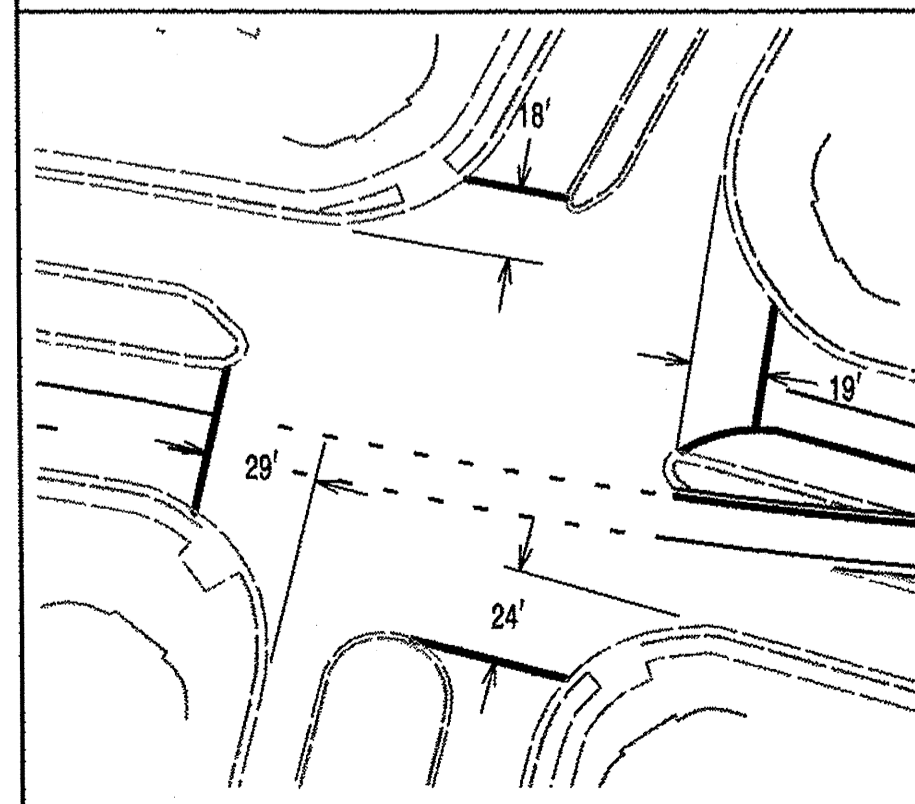


NEMA TIMING CHART 2070LN2 CONTROLLER

FEATURE	PHASE					
	01	02	04	05	06	08
MINIMUM GREEN *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
PASSAGE GAP *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.3 SEC.	4.5 SEC.	4.0 SEC.	3.0 SEC.	4.5 SEC.	4.0 SEC.
RED CLEARANCE	3.7 SEC.	2.7 SEC.	2.8 SEC.	3.3 SEC.	2.7 SEC.	2.8 SEC.
MAX. I *	20 SEC.	90 SEC.	30 SEC.	20 SEC.	90 SEC.	30 SEC.
RECALL POSITION	NONE	MIN. RECALL	NONE	NONE	MIN. RECALL	NONE
VEHICLE CALL MEMORY	NONLOCK	LOCK	NONLOCK	NONLOCK	LOCK	NONLOCK
WALK *	— SEC.	— SEC.	— SEC.	— SEC.	— SEC.	— SEC.
FLASHING DON'T WALK	— SEC.	— SEC.	— SEC.	— SEC.	— SEC.	— SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	— VEH.	— VEH.	— VEH.	— VEH.	— VEH.	— VEH.
SEC. PER ACTUATION *	— SEC.	— SEC.	— SEC.	— SEC.	— SEC.	— SEC.
MAX. INITIAL *	— SEC.	— SEC.	— SEC.	— SEC.	— SEC.	— SEC.
TIME B4 REDUCTION *	— SEC.	— SEC.	— SEC.	— SEC.	— SEC.	— SEC.
TIME TO REDUCE *	— SEC.	— SEC.	— SEC.	— SEC.	— SEC.	— SEC.
MINIMUM GAP	— SEC.	— SEC.	— SEC.	— SEC.	— SEC.	— SEC.

\* 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.

STOPBAR LOCATION DIAGRAM



PROPOSED	EXISTING
○ → Traffic Signal Head	● → N/A
○ → Modified Signal Head	○ → N/A
○ → Sign	○ → N/A
○ → Pedestrian Signal Head With Push Button & Sign	○ → N/A
□ → Inductive Loop Detector	□ → N/A
□ → Controller & Cabinet	□ → N/A
□ → Junction Box	□ → N/A
— 2-in Underground Conduit	— 2-in Underground Conduit
— Right of Way	— Right of Way
○ → Directional Arrow	○ → N/A
○ → Signal Pole with Guy	○ → N/A
○ → Signal Pole with Sidewalk Guy	○ → N/A
● → Construction Drums	● → N/A
— Type III Barricade	— Type III Barricade
⊙ → Left Arrow Only Sign (R3-5)	⊙ → N/A

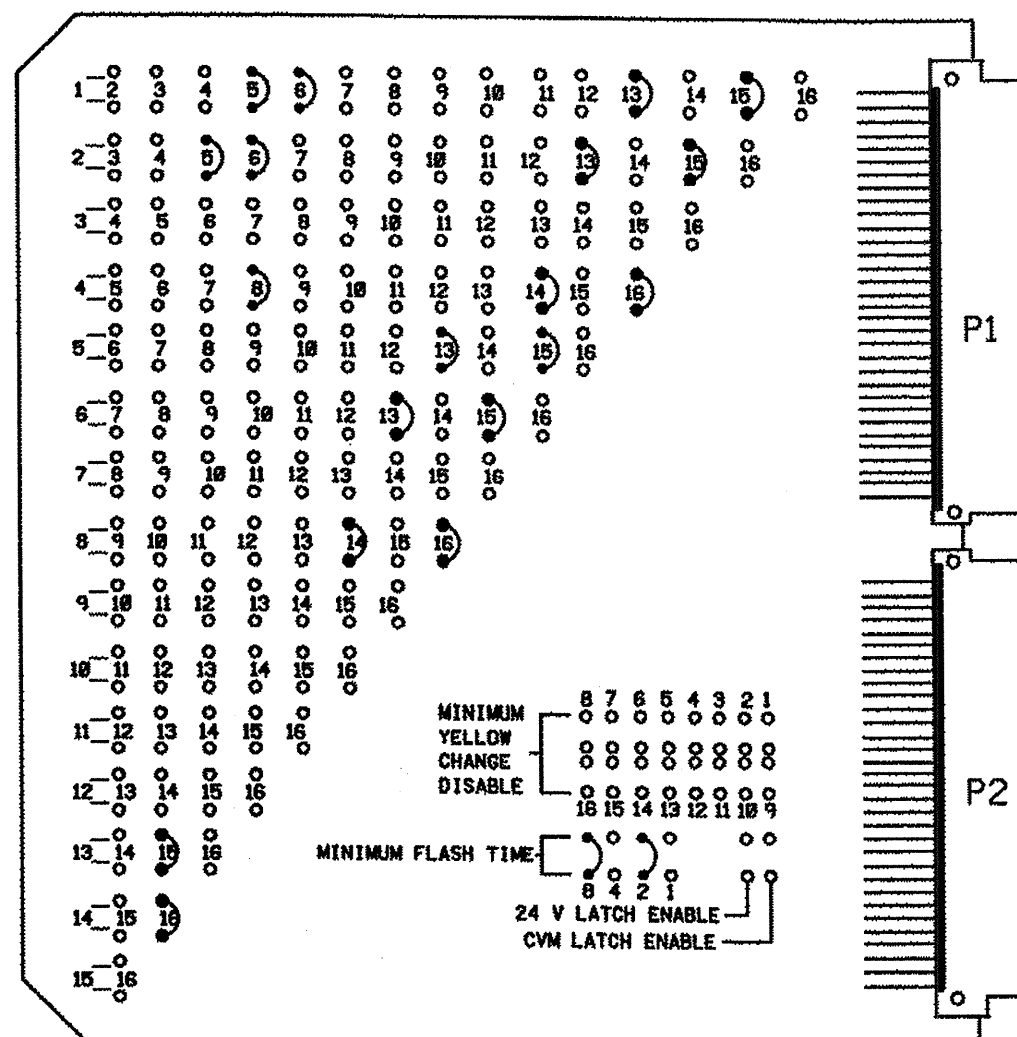
**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

NEW INSTALLATION - TEMPORARY DESIGN 1 (TMP PHASE II & III)

Prepared in the Offices of:  
  
 SR 3060 (Morrisville Pkwy) at Crabtree Crossing Parkway  
 Division 5 Wake County Morrisville  
 PLAN DATE: May 2013 REVIEWED BY: A. Demers  
 PREPARED BY: S. W. Cox REVIEWED BY: S. Nandagiri  
 SCALE: 1" = 50'  
 SIGNATURE: [Signature] DATE: 9-30-13  
 STG. INVENTORY NO. 05-22571

EDI MODEL MMU-16LE  
MALFUNCTION MANAGEMENT UNIT  
PROGRAMMING DETAIL

(program card and tables as shown below)



MMU PROGRAMMING CARD

CHANNEL NUMBER	ENABLE/DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	ENABLE
7	DISABLE
8	ENABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	ENABLE
14	ENABLE
15	ENABLE
16	ENABLE

UNIT OPTIONS	
OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
RSM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF

FLASHING YELLOW ARROW	
CH. GROUP FOR PROTECTED GREEN ARROWS	CH. 1,3,5,7
ENABLE CHANNEL PAIR, FYA	
CH 1-13	ON
CH 3-14	OFF
CH 5-15	ON
CH 7-16	OFF

MMU PROGRAMMING NOTE

1. ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

- To prevent "Flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
- To prevent red failures on unused monitor channels, tie unused load switch red outputs 3,7,9,10,11 and 12 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (red out). Make sure all flash transfer relays are in place.
- Program controller to start up in phases 2 and 6 green.
- Set power-up flash time to 10 seconds and implement on the Malfunction Management Unit. Set controller power-up flash time to 0 seconds.
- Enable simultaneous gap-out feature, on controller unit, for all phases.
- Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
- Program detector call delay and extension timing on the controller, unless otherwise specified.
- Set all detector card unit channels to "presence" mode.
- Program phases 4 and 8, on controller unit, for dual entry.
- This controller and cabinet are part of the Cary Signal System.

SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	11*	21,22	NU	42,43	51*	61,62	NU	82,83	NU	NU	NU	NU	11*	81*	51*	41*
RED	*	2R		4R	*	6R		8R								
YELLOW	*	2Y		4Y	*	6Y		8Y								
GREEN		2G		4G		6G		8G								
RED ARROW													13R	14R	15R	16R
YELLOW ARROW													13Y	14Y	15Y	16Y
FLASHING YELLOW ARROW													13G	14G	15G	16G
GREEN ARROW	1G					5G										

\* Denotes install Load Resistor, see Load Resistor installation detail on sheet 2.  
 ★ See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1	CH1	CH1	CH1	CH1	CH1	SLOT	SLOT	SLOT	SLOT	SLOT
	L3	L1	L7	L5	L11	L9					
	∅ 2	∅ 1	∅ 5	∅ 4	∅ 8	∅ 6					
	CH2	CH2	CH2	CH2	CH2	CH2	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY
	NOT USED	L2	L8	L6	L12	NOT USED					

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
1A	L1A,L1B L2A,L2B
2A	L3A,L3B
4A	L4A,L4B
4B	L5A,L5B
4B	L6A,L6B
5A	L7A,L7B L8A,L8B
6A	L9A,L9B
NU	L10A,L10B
8A	L11A,L11B
8B	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

NOTE  
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME (SEC)
1	∅ 1	DELAY	15
2	∅ 6		
3	∅ 2		
4	---	---	---
5	∅ 4		
6	∅ 4	DELAY	10
7	∅ 5	DELAY	15
8	∅ 2		
9	∅ 6		
10	---	---	---
11	∅ 8		
12	∅ 8	DELAY	10
13	---	---	---
14	---	---	---
15	---	---	---
16	---	---	---

EQUIPMENT INFORMATION

CONTROLLER.....2070L  
 CABINET .....NC-8A [TS-2]  
 SOFTWARE .....ASC/2070  
 CABINET MOUNT.....BASE  
 LOADBAY POSITIONS.....16  
 LOAD SWITCHES USED.....1,2,4,5,6,8,13,14,15,16  
 PHASES USED.....1,2,4,5,6,8  
 OLA.....\*  
 OLB.....\*  
 OLC.....\*  
 OLD.....\*

\*See Sheet 2 of 2 Econolite ASC/2070 Overlap Programming Detail.

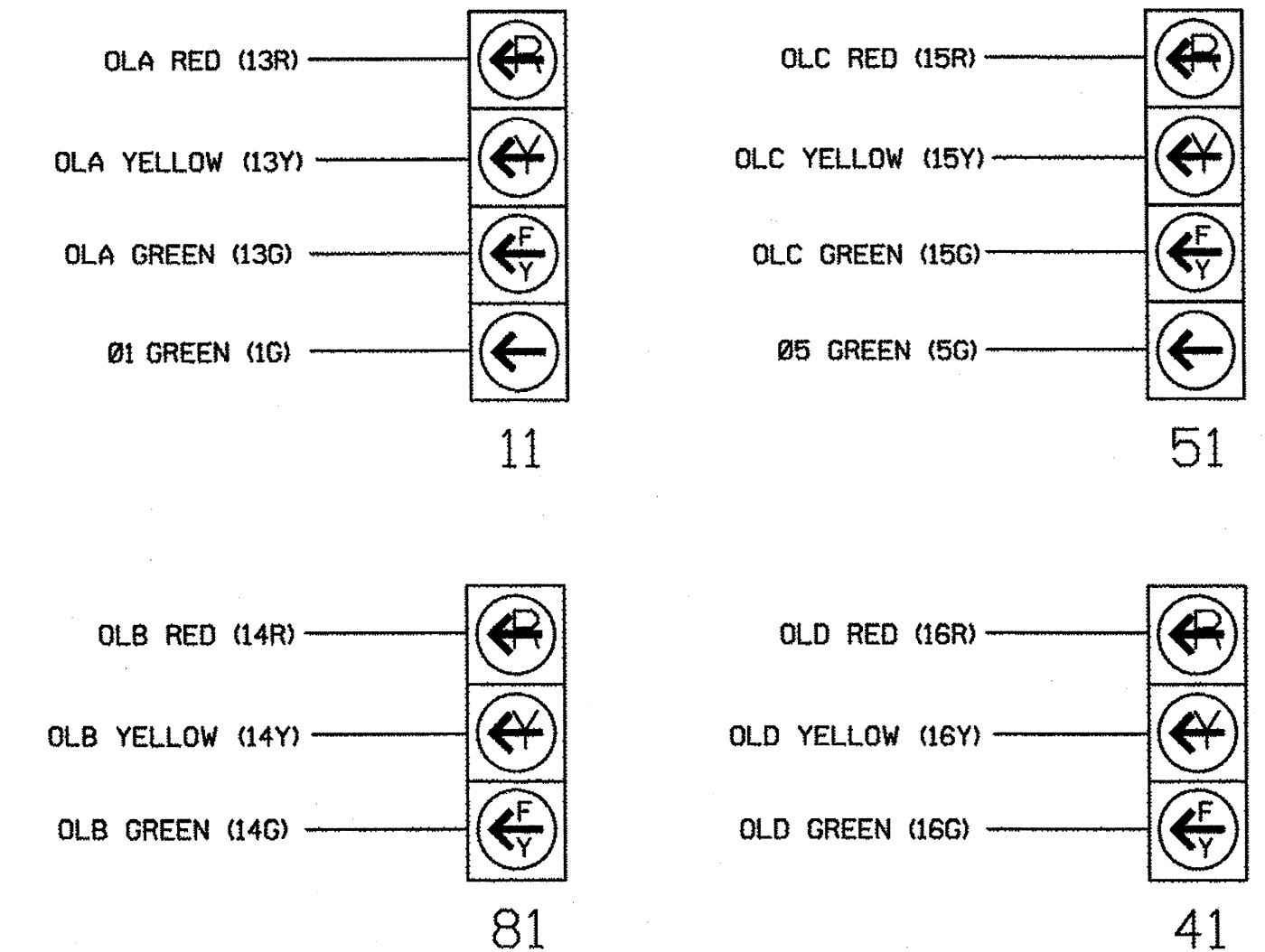
LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	∅ 1
2	∅ 2
3	∅ 3
4	∅ 4
5	∅ 5
6	∅ 6
7	∅ 7
8	∅ 8
9	∅ 2 PED
10	∅ 4 PED
11	∅ 6 PED
12	∅ 8 PED
13	OLA
14	OLB
15	OLC
16	OLD

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

1. See overlap programming instructions sheet 2 of 2.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2257T1  
 DESIGNED: May 2013  
 SEALED: September 30, 2013  
 REVISED: N/A

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 3060 (Morrisville Pkwy) at Crabtree Crossing Parkway

Division 5 Wake County Morrisville

PLAN DATE: May 2013 REVIEWED BY: J O Deaton

PREPARED BY: M W Valch REVIEWED BY:

REVISIONS INIT. DATE

750 N. Greenfield Pkwy, Garner, NC 27529

SEAL NORTH CAROLINA PROFESSIONAL ENGINEER JAMES O. DEATON 07438

SIGNATURE DATE

SIG. INVENTORY NO. 05-2257T1

**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

I:\2257\_T1\05-2257T1\05-2257T1\05-2257T1\_Information\01\_Information\01\_Technical\01\_EDI Model MMU-16LE\EDI Model MMU-16LE\EDI Model MMU-16LE.dgn  
 05-2257\_T1\_05-2257T1.dwg  
 05/03/2013

**ECONOLITE ASC/2070 OVERLAP PROGRAMMING DETAIL**

(program controller as shown)

FROM MAIN MENU SELECT 2 (CONTROLLER) AND THEN 5 (OVERLAP DATA)

**OVERLAP A**

CONTROLLER OVERLAP DATA											
OVERLAP A. . . . .	1	2	3	4	5	6	7	8	9	0	1 1 2
STANDARD. . . . .	X	.	.	.	.	.	.	.	.	.	.
PROTECTED. . . . .	X	.	.	.	.	.	.	.	.	.	.
PERMITTED. . . . .	.	X	.	.	.	.	.	.	.	.	.
ENABLE LAG. . . . .	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD. . . . .	.	.	.	.	.	.	.	.	.	.	.
SPARE. . . . .	.	.	.	.	.	.	.	.	.	.	.
ADVANCE GREEN TIMER 0.0 LAG/LEAD GREEN TIMER 0.0 LAG/LEAD YELLOW TIMER 0.0 LAG/LEAD RED TIMER 0.0 ADDITIONAL PAGE(S)											

**OVERLAP B**

CONTROLLER OVERLAP DATA											
OVERLAP B. . . . .	1	2	3	4	5	6	7	8	9	0	1 1 2
STANDARD. . . . .	.	.	.	.	.	.	.	X	.	.	.
PROTECTED. . . . .	.	.	.	.	.	.	.	.	.	.	.
PERMITTED. . . . .	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG. . . . .	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD. . . . .	.	.	.	.	.	.	.	.	.	.	.
SPARE. . . . .	.	.	.	.	.	.	.	.	.	.	.
ADVANCE GREEN TIMER 0.0 LAG/LEAD GREEN TIMER 0.0 LAG/LEAD YELLOW TIMER 0.0 LAG/LEAD RED TIMER 0.0 ADDITIONAL PAGE(S)											

**OVERLAP C**

CONTROLLER OVERLAP DATA											
OVERLAP C. . . . .	1	2	3	4	5	6	7	8	9	0	1 1 2
STANDARD. . . . .	.	.	.	X	.	.	.	.	.	.	.
PROTECTED. . . . .	.	.	X	.	.	.	.	.	.	.	.
PERMITTED. . . . .	.	.	.	.	X	.	.	.	.	.	.
ENABLE LAG. . . . .	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD. . . . .	.	.	.	.	.	.	.	.	.	.	.
SPARE. . . . .	.	.	.	.	.	.	.	.	.	.	.
ADVANCE GREEN TIMER 0.0 LAG/LEAD GREEN TIMER 0.0 LAG/LEAD YELLOW TIMER 0.0 LAG/LEAD RED TIMER 0.0 ADDITIONAL PAGE(S)											

**OVERLAP D**

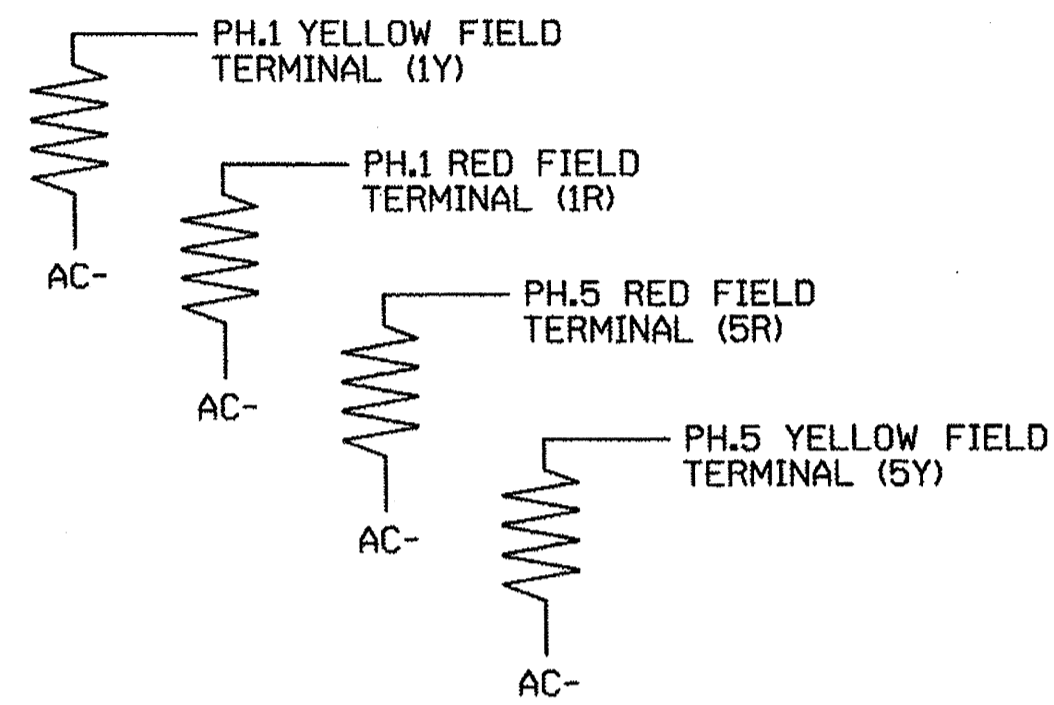
CONTROLLER OVERLAP DATA											
OVERLAP D. . . . .	1	2	3	4	5	6	7	8	9	0	1 1 2
STANDARD. . . . .	.	.	X	.	.	.	.	.	.	.	.
PROTECTED. . . . .	.	.	.	.	.	.	.	.	.	.	.
PERMITTED. . . . .	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG. . . . .	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD. . . . .	.	.	.	.	.	.	.	.	.	.	.
SPARE. . . . .	.	.	.	.	.	.	.	.	.	.	.
ADVANCE GREEN TIMER 0.0 LAG/LEAD GREEN TIMER 0.0 LAG/LEAD YELLOW TIMER 0.0 LAG/LEAD RED TIMER 0.0 ADDITIONAL PAGE(S)											

**PED OVERLAP**

PED OVERLAP ASSIGNMENTS											
OVERLAP CONSISTS OF PHASES:	1	2	3	4	5	6	7	8	9	0	1 1 2
OVLP PHASE	1	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.
END OF SUBMENU											

**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)

**ECONOLITE ASC/2070 SPECIAL MMU PROGRAMMING**

(program controller as shown below)

**CONFIGURATION SUBMENU**

1. CONTROLLER SEQUENCE	6. SERIAL PORT 2
2. PHASES IN USE	7. ENABLE LOGGING
3. PH TO LS ASSIGN	8. OPTIONS
4. SDLC OPTIONS	<b>9. MMU PROGRAM</b>
5. SERIAL PORT 1	

PRESS KEYS 1..9 TO SELECT

**MMU PROGRAM**

CAN SERVE WITH:

CHANNEL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2
1	.	X	.	X	.	.	.	.	.	.	X	X	.	.	.
2	.	X	.	X	.	.	.	.	.	.	X	X	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4	X	.	X	.	.	.	.	.	.	X	.	.	.	.	.
5	.	X	.	X	.	.	.	.	.	.	.	.	.	.	.
6	.	X	.	X	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8	X	.	X	.	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
13	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.
14	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.
15	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

END OF SUBMENU

**CAUTION!**

SET INTERSECTION TO FLASH BEFORE ATTEMPTING TO ENTER OR CHANGE ANY MMU PROGRAMMING DATA. THIS PROGRAMMING AND THAT OF THE MMU PROGRAMMING CARD MUST MATCH EXACTLY. IF THEY DO NOT, THE INTERSECTION WILL BE PLACED INTO FLASH.

**WRITE-PROTECT FOR FLASHING YELLOW ARROWS DETAIL**

(program controller as shown below)

FROM MAIN MENU SELECT 8 (UTILITIES) AND THEN 9 (WRITE PROTECT DATA)

**UTILITIES SUBMENU**

1. COPY	5. SIGN ON
2. MEMORY CLEAR	6. LOG BUFFERS
3. RESERVED	7. SEND D.M.
4. RESERVED	8. D.M. UTILS

PRESS KEYS 1..0 TO SELECT

**WRITE PROTECT DATA**

ADDRESS	1/9
008-00F	F0

TO INPUT DATA "F0" (HEX) INTO ADDRESS "009" DO THE FOLLOWING:

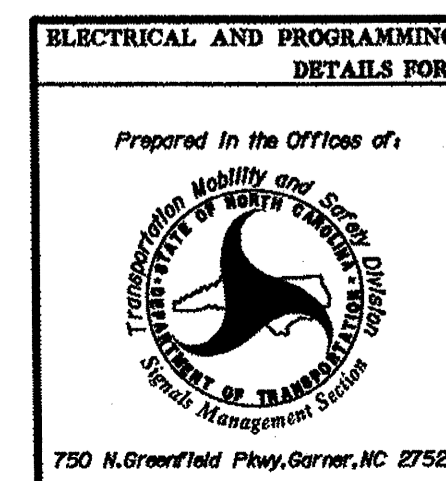
\* . 6 . 0 . USE CURSOR TO SCROLL OFF OF DATA FIELD

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2257T1  
DESIGNED: May 2013  
SEALED: September 30, 2013  
REVISED: N/A

NEW INSTALLATION - TEMPORARY DESIGN 1 - (TMP PHASE II & III)

Sheet 2 of 2

**AECOM**  
NC Firm License No.: F-0342  
701 Corporate Center Drive  
Suite 475 Raleigh, NC 27607  
Phone: 919-854-6200



**ELECTRICAL AND PROGRAMMING DETAILS FOR:**

SR 3060 (Morrisville Pkwy) at Crabtree Crossing Parkway

Division 5	Wake County	Morrisville
PLAN DATE: May 2013	REVIEWED BY: J O Deaton	
PREPARED BY: M W Yalch	REVIEWED BY:	
REVISIONS	INIT.	DATE

**SEAL**

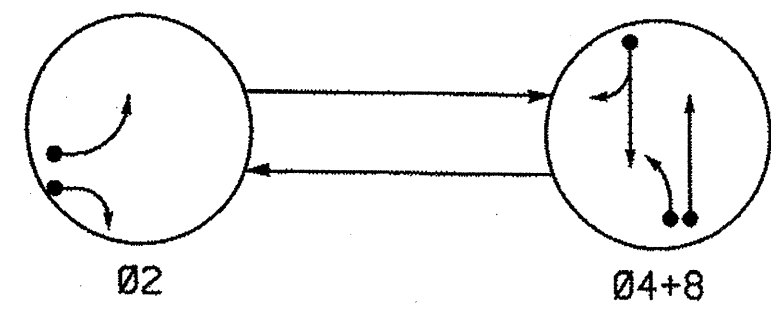
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 07438  
JAMES O. DEATON  
9/30/13

SIGNATURE	DATE

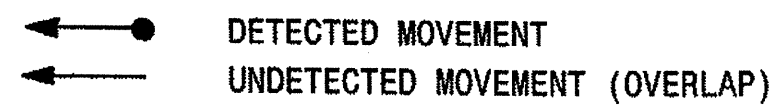
SIG. INVENTORY NO. 05-2257T1

1:53:08 PM 01:46:0236923400... Technical... Information... 2013091515405-2257T1e-02-160-dgn

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

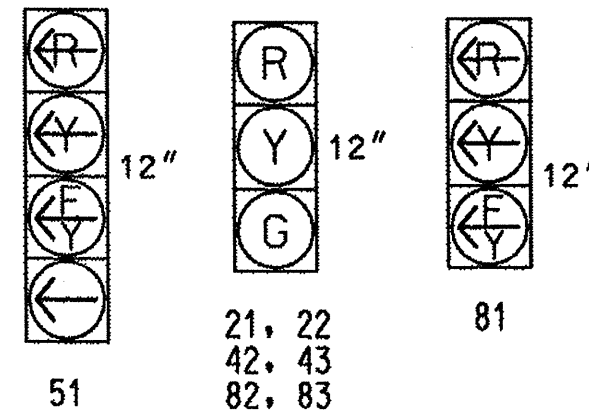


SIGNAL FACE	PHASE		
	Ø 2	Ø 4 + 8	FLASHER
21, 22	G	R	R
42, 43	R	G	Y
51	—	—	—
81	—	—	—
82, 83	R	G	Y

F = Flashing Yellow Arrow

SIGNAL FACE I.D.

All Heads L.E.D.



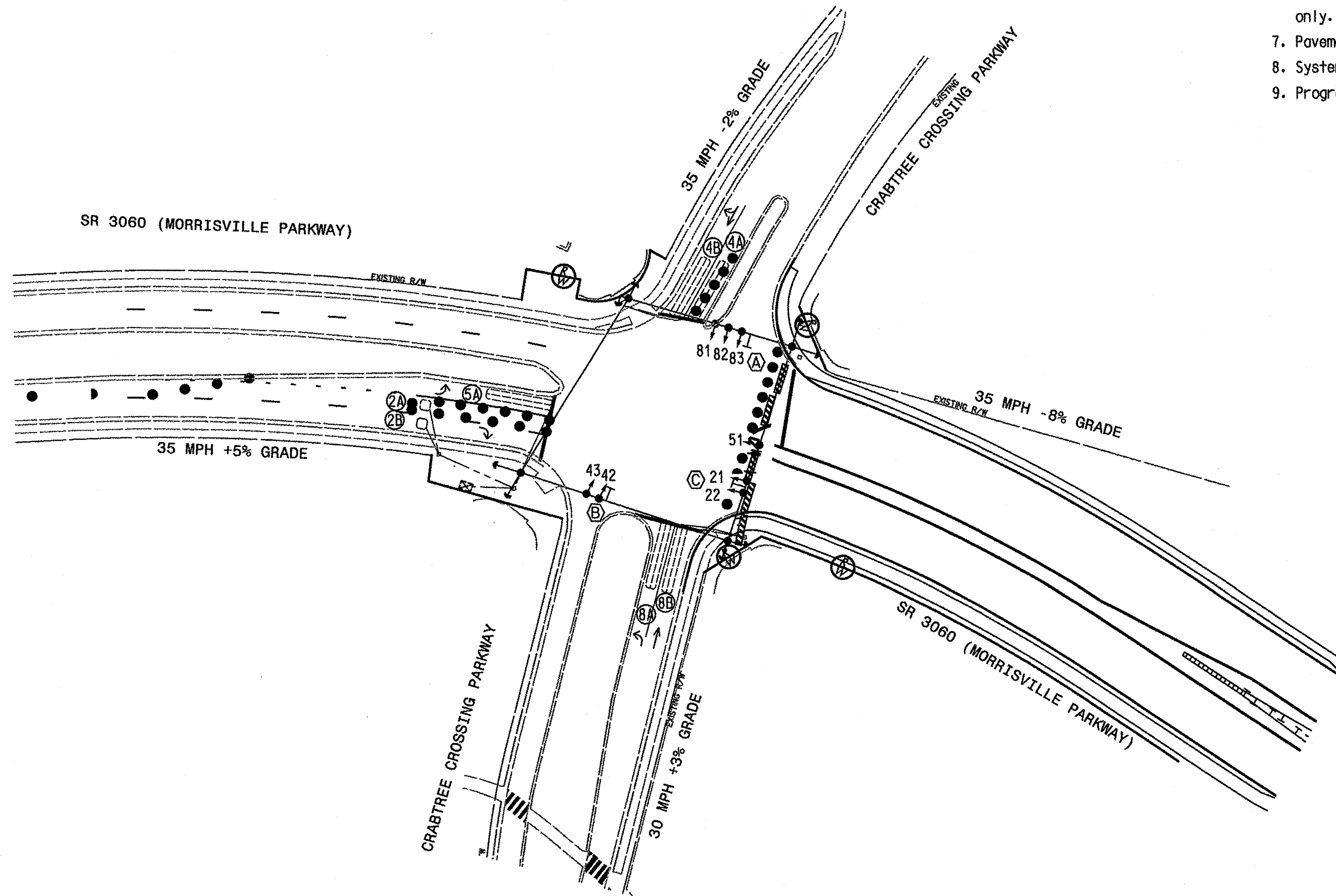
NEMA LOOP & DETECTOR INSTALLATION CHART with TS-2 CABINET

LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	INDUCTIVE LOOPS		DETECTOR UNITS				INHIBIT DELAY DURING GREEN?	
			TURNS	NEW EXISTING	NEMA PHASE	NEW EXISTING	TIMING FEATURE	TIME		
2A	6X6	70	3	-	X	-	-	-	DISCONNECTED	
2B	6X6	70	3	X	-	2	-	X	-	NO
4A	6X40	0	2-4-2	-	X	-	-	-	DISCONNECTED	
4B	6X40	0	2-4-2	-	X	4	-	X	DELAY 10	YES
5A	6X40	0	2-4-2	-	X	2	-	X	-	NO
8A	6X40	0	2-4-2	-	X	8	-	X	-	NO
8B	6X40	0	2-4-2	-	X	8	-	X	-	NO

2 Phase Fully Actuated (Cary 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 phase 4 and phase 8 for dual entry.
- Reposition existing signal heads numbered 21 and 22.
- Set all detector units to presence mode.
- Maximum times shown in the timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Pavement markings are existing.
- System data: Address number 8, Channel number 17.
- Program Controller to start up in phase 4+8 green.



FEATURE	PHASE		
	Ø2	Ø4	Ø8
MINIMUM GREEN *	10 SEC.	7 SEC.	7 SEC.
PASSAGE GAP *	2.0 SEC.	2.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.0 SEC.	4.0 SEC.
RED CLEARANCE	3.3 SEC.	2.8 SEC.	2.8 SEC.
MAX. I *	50 SEC.	20 SEC.	20 SEC.
RECALL POSITION	MIN RECALL	NONE	NONE
VEHICLE CALL MEMORY	NONLOCK	NONLOCK	NONLOCK
WALK *	— SEC.	— SEC.	— SEC.
FLASHING DON'T WALK	— SEC.	— SEC.	— SEC.
VOLUME DENSITY	OFF	OFF	OFF
ACTUATION B4 ADD *	— VEH.	— VEH.	— VEH.
SEC. PER ACTUATION *	— SEC.	— SEC.	— SEC.
MAX. INITIAL *	— SEC.	— SEC.	— SEC.
TIME B4 REDUCTION *	— SEC.	— SEC.	— SEC.
TIME TO REDUCE *	— SEC.	— SEC.	— SEC.
MINIMUM GAP	— SEC.	— SEC.	— SEC.

\* 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.

PROPOSED	EXISTING

**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

SIGNAL UPGRADE - TEMPORARY DESIGN 2 (TMP PHASE III)

Prepared in the Offices of:

SR 3060 (Morrisville Pkwy) at Crabtree Crossing Parkway  
 Division 5 Wake County Morrisville

PLAN DATE: May 2013 REVIEWED BY: A. Demers  
 PREPARED BY: S. W. Cox REVIEWED BY: S. Nandagiri

750 N. Greenfield Pkwy, Carrboro, NC 27520  
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 1" = 50'

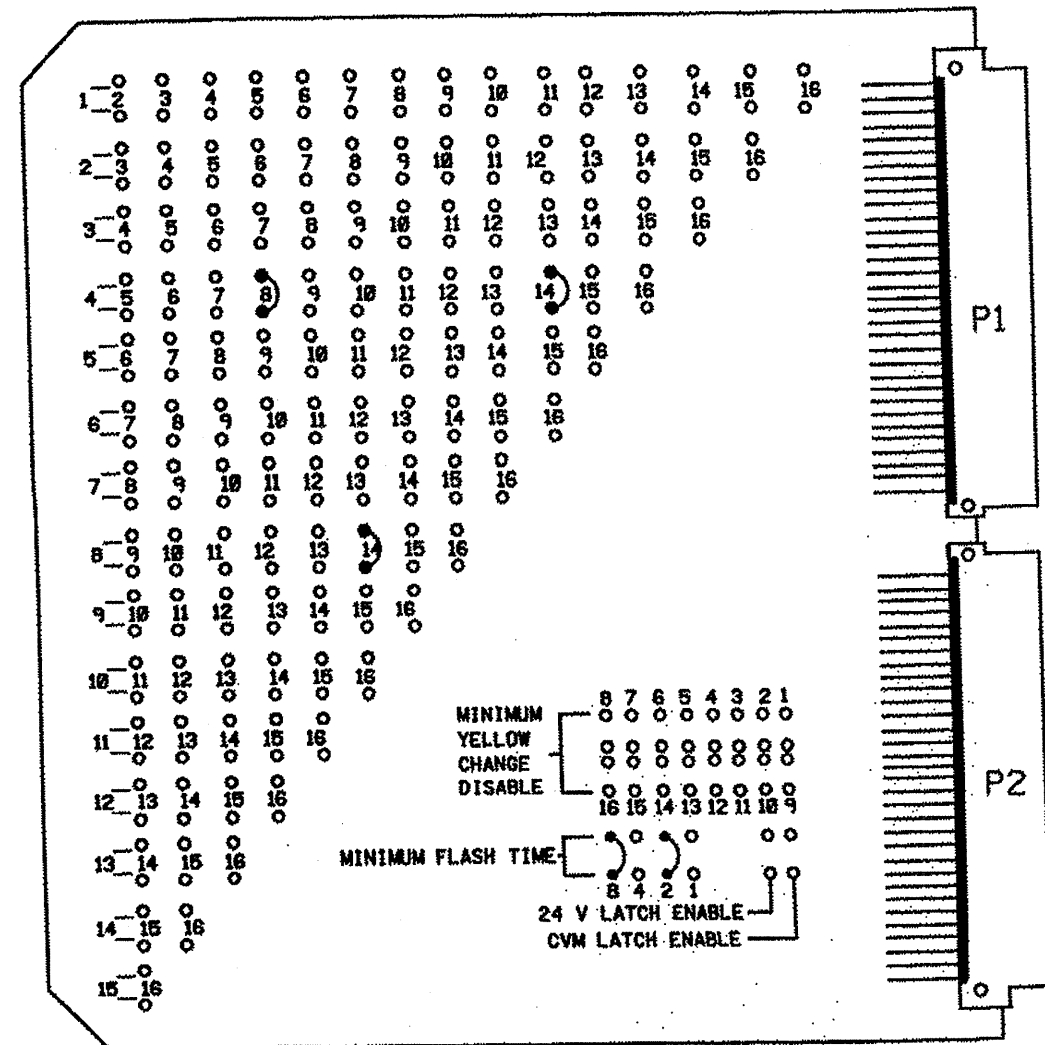
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0422DEL\_P19

### EDI MODEL MMU-16LE MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown below)



MMU PROGRAMMING CARD

CHANNEL NUMBER	ENABLE/DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	DISABLE
6	DISABLE
7	DISABLE
8	ENABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	DISABLE
14	ENABLE
15	DISABLE
16	DISABLE

OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2-12VDC	OFF
PGM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF

FLASHING YELLOW ARROW	
CH. GROUP FOR PROTECTED GREEN ARROWS	CH. 1,3,5,7
ENABLE CHANNEL PAIR, FYA	
CH 1-13	OFF
CH 3-14	OFF
CH 5-15	OFF
CH 7-16	OFF

MMU PROGRAMMING NOTE

1. ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

### NOTES

- To prevent "Flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
- To prevent red failures on unused monitor channels, tie unused load switch red outputs 1,3,5,6,7,9,10,11,12, 13,15 and 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (red out). Make sure all flash transfer relays are in place.
- Program controller to start up in phases 4 and 8 green.
- Set power-up flash time to 10 seconds and implement on the Malfunction Management Unit. Set controller power-up flash time to 0 seconds.
- Enable simultaneous gap-out feature, on controller unit, for all phases.
- Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
- Program detector call delay and extension timing on the controller, unless otherwise specified.
- Set all detector card unit channels to "presence" mode.
- Program phases 4 and 8, on controller unit, for dual entry.
- This controller and cabinet are part of the Cary Signal System.

### SIGNAL HEAD HOOK-UP CHART

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	NU	21,22	51	NU	42,43	NU	NU	NU	82,83	NU	NU	NU	NU	81*	NU	NU
RED		2R		4R				8R								
YELLOW		2Y		4Y				8Y								
GREEN		2G		4G				8G								
RED ARROW														14R		
YELLOW ARROW														14Y		
FLASHING YELLOW ARROW														14G		
GREEN ARROW																
Hand icon																
Person icon																

NU = Not Used

\* See pictorial of head wiring detail this sheet.

### DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU	CH1	SLOT	CH1	CH1	CH1	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L3	∅ 2	L7	NOT USED	L11	∅ 8					
	NOT USED		NOT USED	CH2 L6	CH2 L12	∅ 4	∅ 8				
		EMPTY				EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
NU	L1A,L1B
NU	L2A,L2B
2B	L3A,L3B
NU	L4A,L4B
NU	L5A,L5B
4B	L6A,L6B
5A	L7A,L7B
NU	L8A,L8B
NU	L9A,L9B
NU	L10A,L10B
8A	L11A,L11B
8B	L12A,L12B
NU	L13A,L13B
NU	L14A,L14B
NU	L15A,L15B
NU	L16A,L16B

**NOTE**  
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING FEATURE	TIMING TIME(SEC)
1	---	---	---
2	---	---	---
3	∅ 2	---	---
4	---	---	---
5	---	---	---
6	∅ 4	DELAY	10
7	∅ 2	---	---
8	---	---	---
9	---	---	---
10	---	---	---
11	∅ 8	---	---
12	∅ 8	---	---
13	---	---	---
14	---	---	---
15	---	---	---
16	---	---	---

### EQUIPMENT INFORMATION

CONTROLLER.....2070L  
 CABINET .....NC-8A TS-2  
 SOFTWARE .....ASC/2070  
 CABINET MOUNT.....BASE  
 LOADBAY POSITIONS.....16  
 LOAD SWITCHES USED.....2,4,8,14  
 PHASES USED.....2,4,8  
 OLA.....NOT USED\*\*  
 OLB.....\*  
 OLC.....NOT USED\*\*  
 OLD.....NOT USED\*\*

\*See Sheet 2 of 2 Econolite ASC/2070 Overlap Programming Detail.  
 \*\*Overlaps not employed in this temporary.  
 See Sheet 2 of 2 Econolite ASC/2070 Overlap Programming Detail to remove overlap programming from OLA,OLC and OLD.

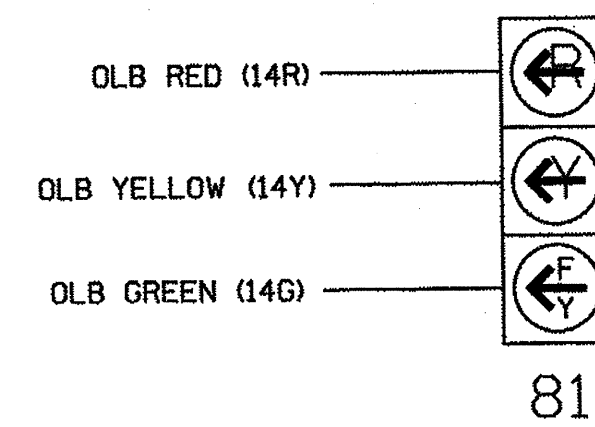
### LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	∅ 1
2	∅ 2
3	∅ 3
4	∅ 4
5	∅ 5
6	∅ 6
7	∅ 7
8	∅ 8
9	∅ 2 PED
10	∅ 4 PED
11	∅ 6 PED
12	∅ 8 PED
13	OLA
14	OLB
15	OLC
16	OLD

### 3 SECTION FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

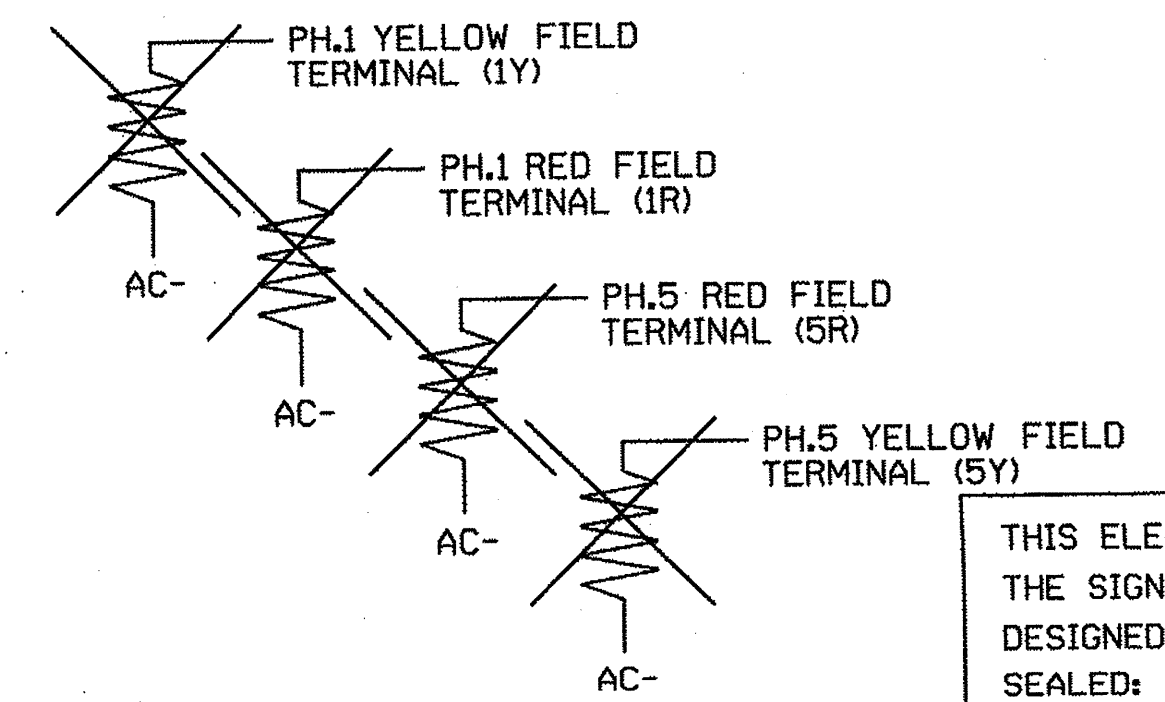


**NOTE**

1. See overlap programming instructions sheet 2 of 2.

### LOAD RESISTOR INSTALLATION DETAIL

(REMOVE resistors as shown below)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2257T2  
 DESIGNED: May 2013  
 SEALED: September 30, 2013  
 REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - (TMP PHASE III) Sheet 1 of 2

 Prepared in the office of:  750 N. Greenfield Pkwy, Garner, NC 27529	SR 3060 (Morrisville Pkwy) at Crabtree Crossing Parkway		SEAL  9/30/13					
	Division 5 Wake County Morrisville PLAN DATE: May 2013 REVIEWED BY: J O Deaton PREPARED BY: M W Yalch REVIEWED BY:	REVISIONS <table border="1"> <tr> <th>INIT.</th> <th>DATE</th> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> </table>		INIT.	DATE			
INIT.	DATE							

**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

1:53:47 PM 01/06/2013 03:40:00 Technical Information... 20130915M05-2257T2e-03-160.dgn



### ECONOLITE ASC/2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

FROM MAIN MENU SELECT 2 (CONTROLLER) AND THEN 5 (OVERLAP DATA)

**OVERLAP A**

CONTROLLER OVERLAP DATA

OVERLAP A. . . . .	1	2	3	4	5	6	7	8	9	1	1	1
STANDARD. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
PROTECTED. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
PERMITTED. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
SPARE. . . . .	.	.	.	.	.	.	.	.	.	.	.	.

ADVANCE GREEN TIMER 0.0  
LAG/LEAD GREEN TIMER 0.0  
LAG/LEAD YELLOW TIMER 0.0  
LAG/LEAD RED TIMER 0.0

ADDITIONAL PAGE(S)

**OVERLAP B**

CONTROLLER OVERLAP DATA

OVERLAP B. . . . .	1	2	3	4	5	6	7	8	9	1	1	1
STANDARD. . . . .	.	.	.	.	.	.	.	.	X	.	.	.
PROTECTED. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
PERMITTED. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
SPARE. . . . .	.	.	.	.	.	.	.	.	.	.	.	.

ADVANCE GREEN TIMER 0.0  
LAG/LEAD GREEN TIMER 0.0  
LAG/LEAD YELLOW TIMER 0.0  
LAG/LEAD RED TIMER 0.0

ADDITIONAL PAGE(S)

**OVERLAP C**

CONTROLLER OVERLAP DATA

OVERLAP C. . . . .	1	2	3	4	5	6	7	8	9	1	1	1
STANDARD. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
PROTECTED. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
PERMITTED. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
SPARE. . . . .	.	.	.	.	.	.	.	.	.	.	.	.

ADVANCE GREEN TIMER 0.0  
LAG/LEAD GREEN TIMER 0.0  
LAG/LEAD YELLOW TIMER 0.0  
LAG/LEAD RED TIMER 0.0

ADDITIONAL PAGE(S)

**OVERLAP D**

CONTROLLER OVERLAP DATA

OVERLAP D. . . . .	1	2	3	4	5	6	7	8	9	1	1	1
STANDARD. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
PROTECTED. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
PERMITTED. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LAG. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
ENABLE LEAD. . . . .	.	.	.	.	.	.	.	.	.	.	.	.
SPARE. . . . .	.	.	.	.	.	.	.	.	.	.	.	.

ADVANCE GREEN TIMER 0.0  
LAG/LEAD GREEN TIMER 0.0  
LAG/LEAD YELLOW TIMER 0.0  
LAG/LEAD RED TIMER 0.0

ADDITIONAL PAGE(S)

**PED OVERLAP**

PED OVERLAP ASSIGNMENTS

OVERLAP CONSISTS OF PHASES:	1	2	3	4	5	6	7	8	9	1	1	1
OVLP PHASE	1	2	3	4	5	6	7	8	9	0	1	2
1	.	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.	.
4	.	.	.	.	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.	.

END OF SUBMENU

### ECONOLITE ASC/2070 SPECIAL MMU PROGRAMMING

(program controller as shown below)

**CONFIGURATION SUBMENU**

1. CONTROLLER SEQUENCE
2. PHASES IN USE
3. PH TO LS ASSIGN
4. SDLC OPTIONS
5. SERIAL PORT 1
6. SERIAL PORT 2
7. ENABLE LOGGING
8. OPTIONS
9. MMU PROGRAM

PRESS KEYS 1..9 TO SELECT

**MMU PROGRAM**

CAN SERVE WITH:

CHANNEL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2
1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4	.	X	.	.	.	.	.	.	.	X	.	.	.	.	.
5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
13	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
14	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
15	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

END OF SUBMENU

#### CAUTION!

SET INTERSECTION TO FLASH BEFORE ATTEMPTING TO ENTER OR CHANGE ANY MMU PROGRAMMING DATA. THIS PROGRAMMING AND THAT OF THE MMU PROGRAMMING CARD MUST MATCH EXACTLY. IF THEY DO NOT, THE INTERSECTION WILL BE PLACED INTO FLASH.

### WRITE-PROTECT FOR FLASHING YELLOW ARROWS DETAIL

(program controller as shown below)

FROM MAIN MENU SELECT 8 (UTILITIES) AND THEN 9 (WRITE PROTECT DATA)

**UTILITIES SUBMENU**

1. COPY
2. MEMORY CLEAR
3. RESERVED
4. RESERVED
5. SIGN ON
6. LOG BUFFERS
7. SEND D.M.
8. D.M. UTILS

PRESS KEYS 1..0 TO SELECT

**WRITE PROTECT DATA**

ADDRESS	1/9
008-00F	20

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2257T2  
DESIGNED: May 2013  
SEALED: September 30, 2013  
REVISED: N/A

SIGNAL UPGRADE - TEMPORARY DESIGN 2 - (TMP PHASE III)

Sheet 2 of 2

**AECOM**  
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701 Corporate Center Drive  
Suite 475 Raleigh, NC 27607  
Phone: 919-854-6200

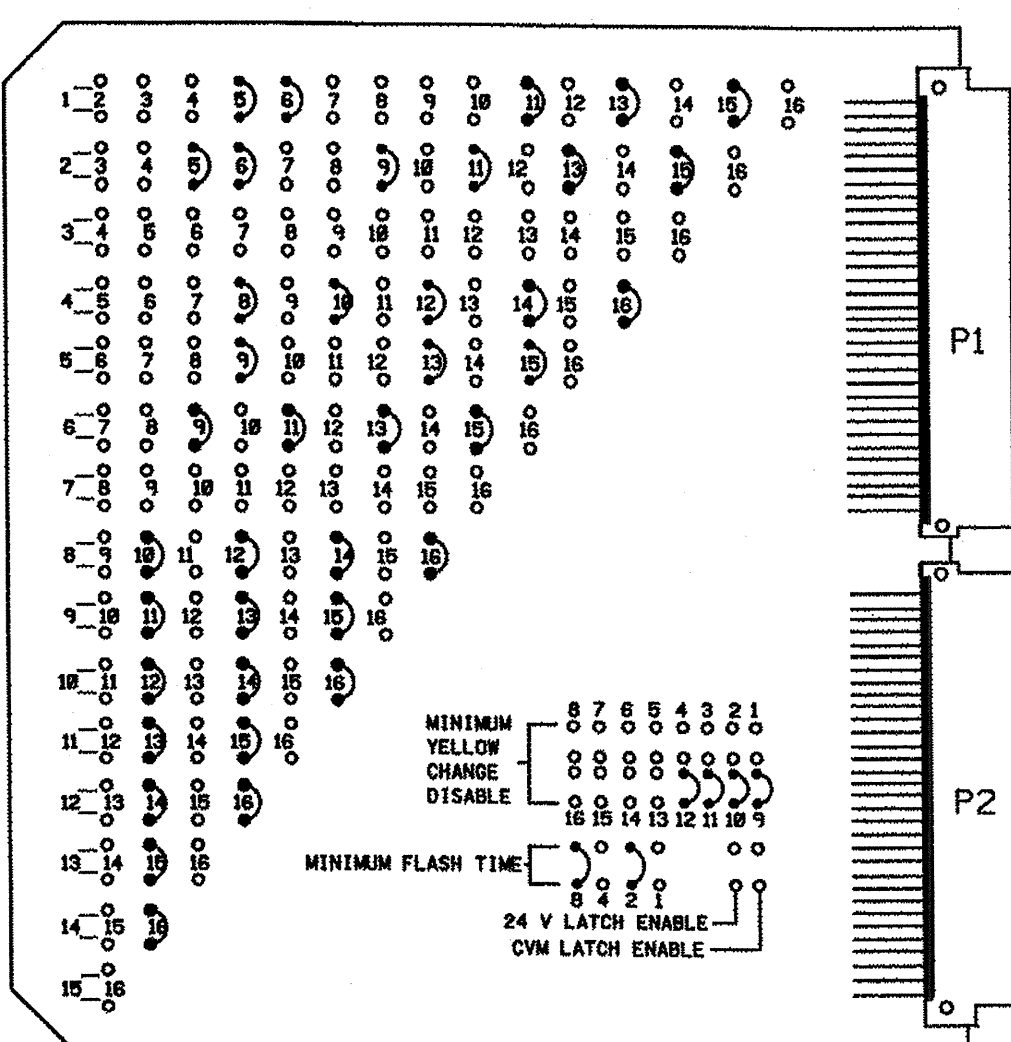
	<b>SR 3060 (Morrisville Pkwy) at Crabtree Crossing Parkway</b>	
	Division 5 PLAN DATE: May 2013 PREPARED BY: M W Yalch	Wake County REVIEWED BY: J O Deaton REVIEWED BY:
REVISIONS	INIT.	DATE
SIGNATURE		DATE
SIG. INVENTORY NO. 05-2257T2		

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EDI MODEL MMU-16LE MALFUNCTION MANAGEMENT UNIT PROGRAMMING DETAIL

(program card and tables as shown below)



MMU PROGRAMMING CARD

Table with columns: CHANNEL NUMBER, ENABLE/DISABLE. Lists channels 1-16 and their enable/disable status.

Table with columns: OPTION, SETTING. Lists unit options like RECURRENT PULSE, WALK DISABLE, etc.

Table with columns: CH. GROUP FOR PROTECTED GREEN ARROWS, ENABLE CHANNEL PAIR, FYA. Lists channel groups and FYA settings.

MMU PROGRAMMING NOTE

1. ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

NOTES

- 1. To prevent "Flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
2. To prevent red failures on unused monitor channels, tie unused load switch red outputs 3 and 7 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (red out). Make sure all flash transfer relays are in place.
3. Program controller to start up in phases 2 and 6 green.
4. Set power-up flash time to 10 seconds and implement on the Malfunction Management Unit. Set controller power-up flash time to 0 seconds.
5. Enable simultaneous gap-out feature, on controller unit, for all phases.
6. Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
7. Program detector call delay and extension timing on the controller, unless otherwise specified.
8. Set all detector card unit channels to "presence" mode.
9. Program phases 4 and 8, on controller unit, for dual entry.
10. This controller and cabinet are part of the Cary Signal System.

SIGNAL HEAD HOOK-UP CHART

Signal Head Hook-Up Chart table with columns for PHASE, SIGNAL HEAD NO., and columns 1-16. Includes rows for RED, YELLOW, GREEN, RED ARROW, YELLOW ARROW, FLASHING YELLOW ARROW, GREEN ARROW, and pedestrian signals.

\* Denotes install Load Resistor, see Load Resistor installation detail on sheet 2.
\* See pictorial of head wiring detail this sheet.

DETECTOR RACK SET-UP DETAIL

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

BIU rack setup table with columns for CH1, CH2, and SLOT. Shows channel assignments for slots 1-5.

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

Loop panel wiring table with columns: LOOP NO., LOOP PANEL TERMINALS. Shows wiring for loops 1A through 16A.

NOTE: BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

Controller detector schedule table with columns: CONTROLLER DETECTOR NO., FUNCTION, FEATURE, TIMING. Lists detector settings for channels 1-16.

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET .....NC-8A TS-2
SOFTWARE .....ASC/2070
CABINET MOUNT.....BASE
LOADBAY POSITIONS.....16
LOAD SWITCHES USED.....1,2,4,5,6,8,9,10,11,12,13,14,15,16
PHASES USED.....1,2,4,5,6,8,2PED,4PED,6PED,8PED
OLA.....\*
OLB.....\*
OLC.....\*
OLD.....\*

\*See Sheet 2 of 2 Econolite ASC/2070 Overlap Programming Detail.

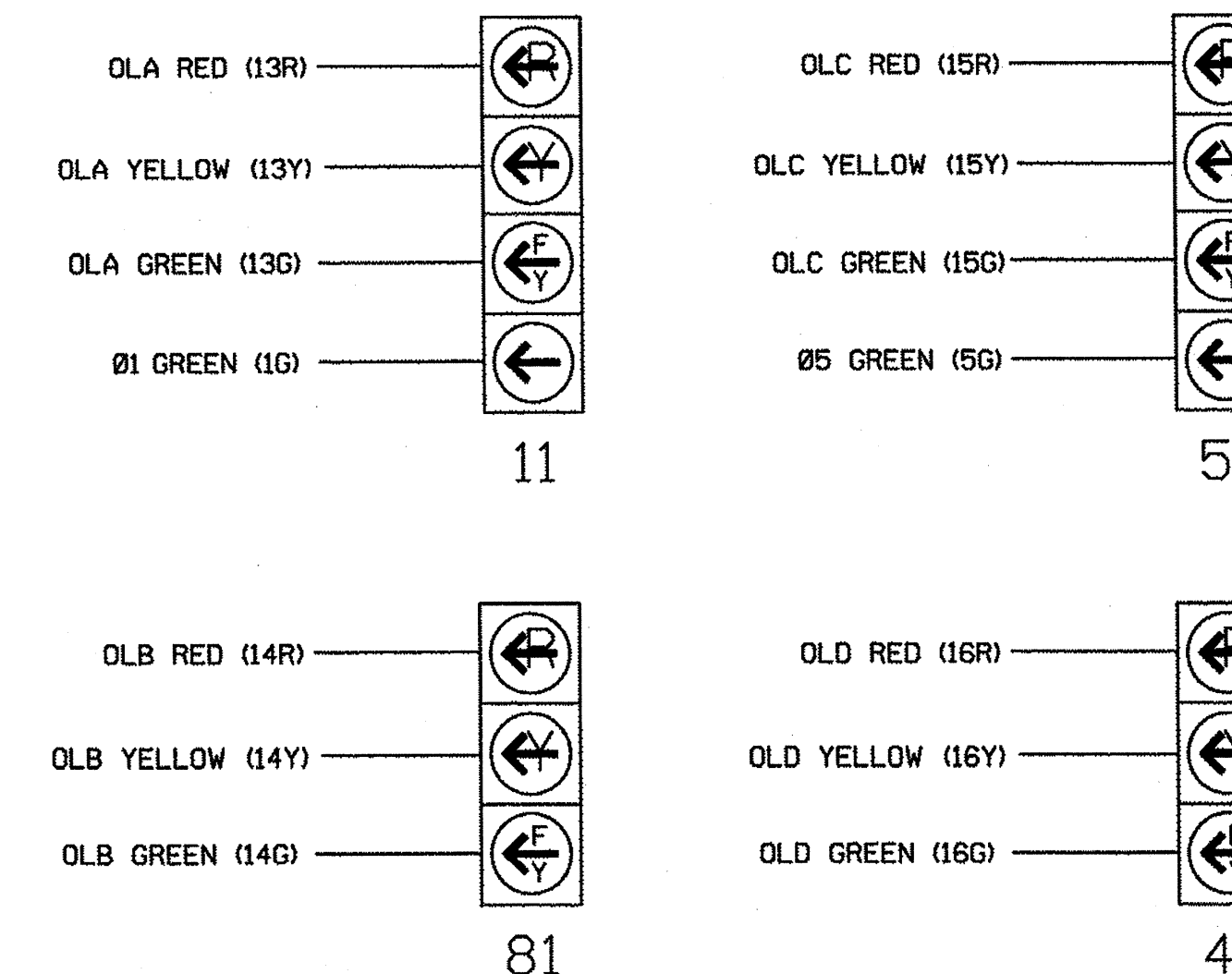
LOAD SWITCH ASSIGNMENT DETAIL

(program controller according to schedule in chart below)

Load Switch Assignment table with columns: LOAD SWITCH NUMBER, FUNCTION. Lists load switches 1-16 and their functions.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

1. See overlap programming instructions sheet 2 of 2.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2257
DESIGNED: May 2013
SEALED: September 30, 2013
REVISED: N/A

SIGNAL UPGRADE - FINAL DESIGN

Sheet 1 of 2

AECOM logo and contact information: NC Firm License No.: F-0342, 701 Corporate Center Drive, Suite 475 Raleigh, NC 27607, Phone: 919-854-6200

Project information and approvals: SR 3060 (Morrisville Pkwy) at Crabtree Crossing Parkway, Division 5 Wake County, Morrisville. Includes plan date, preparer, reviewer, and signature blocks.

**ECONOLITE ASC/2070 OVERLAP PROGRAMMING DETAIL**

(program controller as shown)

FROM MAIN MENU SELECT 2 (CONTROLLER) AND THEN 5 (OVERLAP DATA)

OVERLAP A

CONTROLLER OVERLAP DATA											
OVERLAP A	1	2	3	4	5	6	7	8	9	10	11
STANDARD	X										
PROTECTED	X										
PERMITTED	X										
ENABLE LAG											
ENABLE LEAD											
SPARE											
ADVANCE GREEN TIMER											0.0
LAG/LEAD GREEN TIMER											0.0
LAG/LEAD YELLOW TIMER											0.0
LAG/LEAD RED TIMER											0.0

ADDITIONAL PAGE(S)

OVERLAP B

CONTROLLER OVERLAP DATA											
OVERLAP B	1	2	3	4	5	6	7	8	9	10	11
STANDARD								X			
PROTECTED								X			
PERMITTED								X			
ENABLE LAG											
ENABLE LEAD											
SPARE											
ADVANCE GREEN TIMER											0.0
LAG/LEAD GREEN TIMER											0.0
LAG/LEAD YELLOW TIMER											0.0
LAG/LEAD RED TIMER											0.0

ADDITIONAL PAGE(S)

OVERLAP C

CONTROLLER OVERLAP DATA											
OVERLAP C	1	2	3	4	5	6	7	8	9	10	11
STANDARD					X						
PROTECTED					X						
PERMITTED					X						
ENABLE LAG											
ENABLE LEAD											
SPARE											
ADVANCE GREEN TIMER											0.0
LAG/LEAD GREEN TIMER											0.0
LAG/LEAD YELLOW TIMER											0.0
LAG/LEAD RED TIMER											0.0

ADDITIONAL PAGE(S)

OVERLAP D

CONTROLLER OVERLAP DATA											
OVERLAP D	1	2	3	4	5	6	7	8	9	10	11
STANDARD				X							
PROTECTED				X							
PERMITTED				X							
ENABLE LAG											
ENABLE LEAD											
SPARE											
ADVANCE GREEN TIMER											0.0
LAG/LEAD GREEN TIMER											0.0
LAG/LEAD YELLOW TIMER											0.0
LAG/LEAD RED TIMER											0.0

ADDITIONAL PAGE(S)

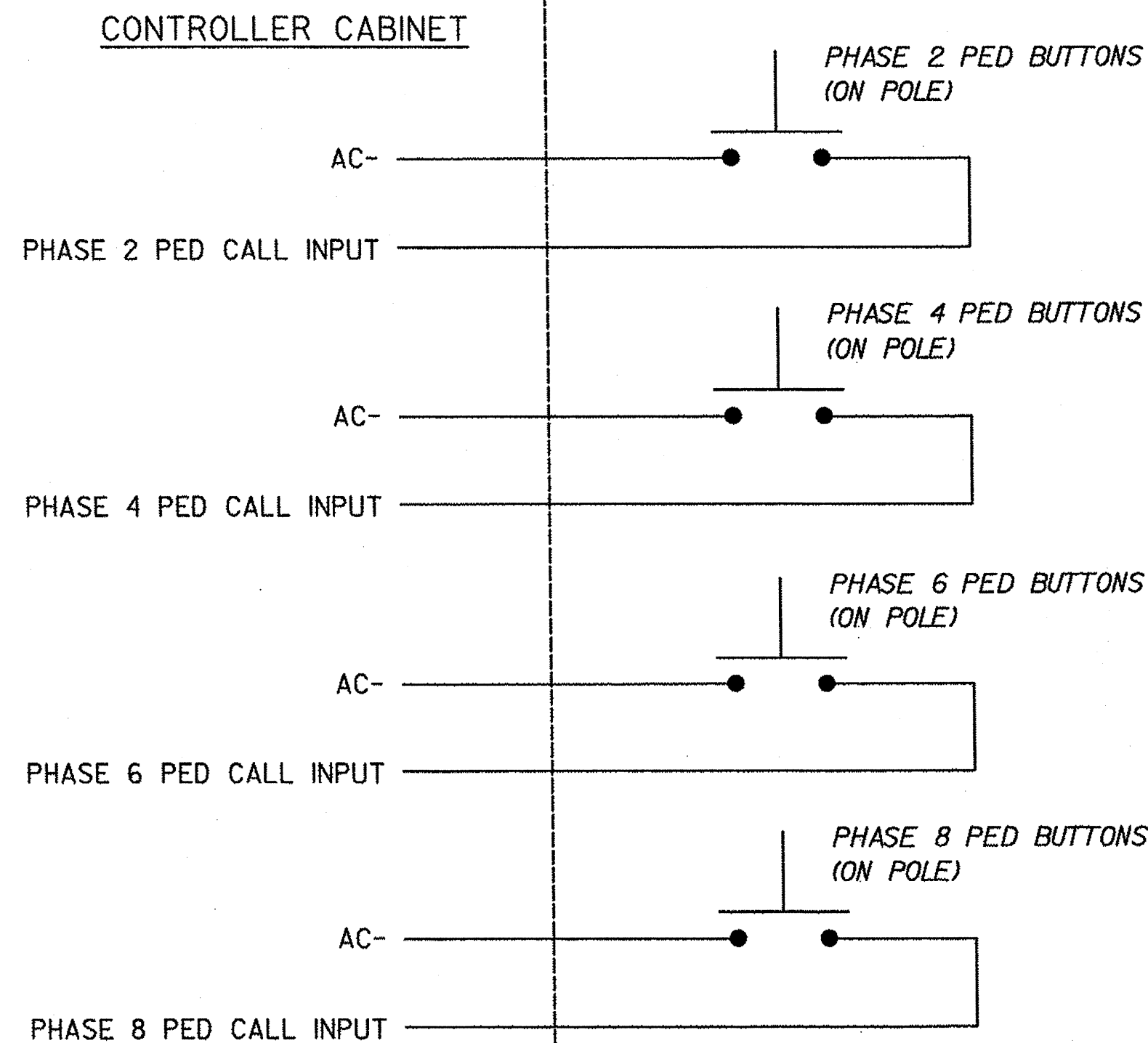
PED OVERLAP

PED OVERLAP ASSIGNMENTS											
OVERLAP CONSISTS OF PHASES:	1	2	3	4	5	6	7	8	9	10	11
OVLP PHASE	1	2	3	4	5	6	7	8	9	10	11
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

END OF SUBMENU

**PEDESTRIAN PUSH-BUTTON WIRING DETAIL**

(wire push-buttons as shown below)

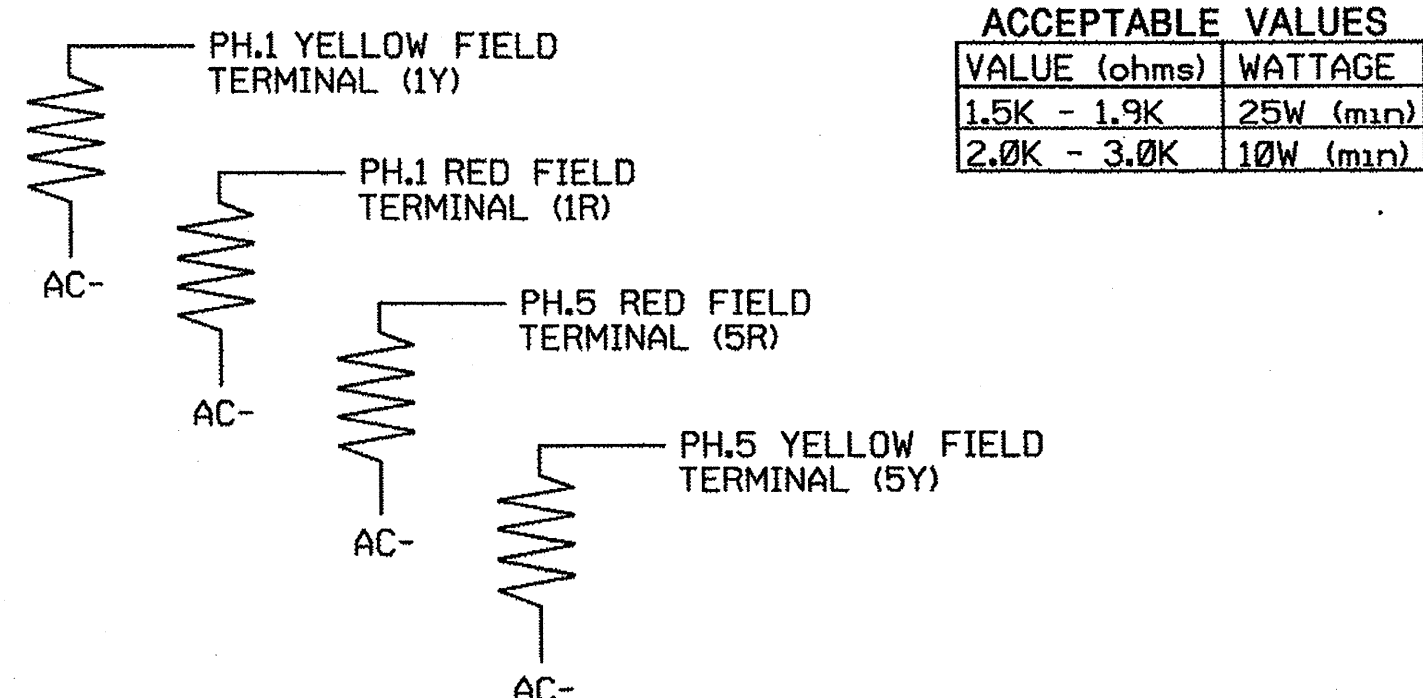


**COUNTDOWN PEDESTRIAN SIGNAL OPERATION**

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

**LOAD RESISTOR INSTALLATION DETAIL**

(install resistors as shown below)



**ECONOLITE ASC/2070 SPECIAL MMU PROGRAMMING**

(program controller as shown below)

CONFIGURATION SUBMENU

- CONTROLLER SEQUENCE
- PHASES IN USE
- PH TO LS ASSIGN
- SDLC OPTIONS
- SERIAL PORT 1
- SERIAL PORT 2
- ENABLE LOGGING
- OPTIONS
- MMU PROGRAM**

PRESS KEYS 1..9 TO SELECT

**CAUTION!**  
SET INTERSECTION TO FLASH BEFORE ATTEMPTING TO ENTER OR CHANGE ANY MMU PROGRAMMING DATA. THIS PROGRAMMING AND THAT OF THE MMU PROGRAMMING CARD MUST MATCH EXACTLY. IF THEY DO NOT, THE INTERSECTION WILL BE PLACED INTO FLASH.

MMU PROGRAM

CAN SERVE WITH:

CHANNEL	1	1	1	1	1	1	1	1	1	1	1
1	. X . X . X . X . X . X . . . X X . . .										
2	. X . X . X . X . X . X . . . X X . . .										
3	. .										
4	. X . X . X . X . X . X . . . . . . . . .										
5	. X . X . . . X . . . . . . . . . . . . .										
6	. X . X . X . X . . . . . . . . . . . . .										
7	. .										
8	. X . X . X . X . X . . . . . . . . . . . .										
9	. X . X . X . . . . . . . . . . . . . . . .										
10	. X . X . X . . . . . . . . . . . . . . . .										
11	. X . X . . . . . . . . . . . . . . . . . .										
12	. X . X . . . . . . . . . . . . . . . . . .										
13	. X .										
14	. X .										
15	. .										

END OF SUBMENU

**WRITE-PROTECT FOR FLASHING YELLOW ARROWS DETAIL**

(program controller as shown below)

FROM MAIN MENU SELECT 8 (UTILITIES) AND THEN 9 (WRITE PROTECT DATA)

UTILITIES SUBMENU

- COPY
- MEMORY CLEAR
- RESERVED
- RESERVED
- SIGN ON
- LOG BUFFERS
- SEND D.M.
- D.M. UTILS

PRESS KEYS 1..0 TO SELECT

WRITE PROTECT DATA

ADDRESS 1/9  
008-00F F0

TO INPUT DATA "F0" (HEX) INTO ADDRESS "009" DO THE FOLLOWING:

\* . 6 . 0 . USE CURSOR TO SCROLL OFF OF DATA FIELD

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2257  
DESIGNED: May 2013  
SEALED: September 30, 2013  
REVISED: N/A

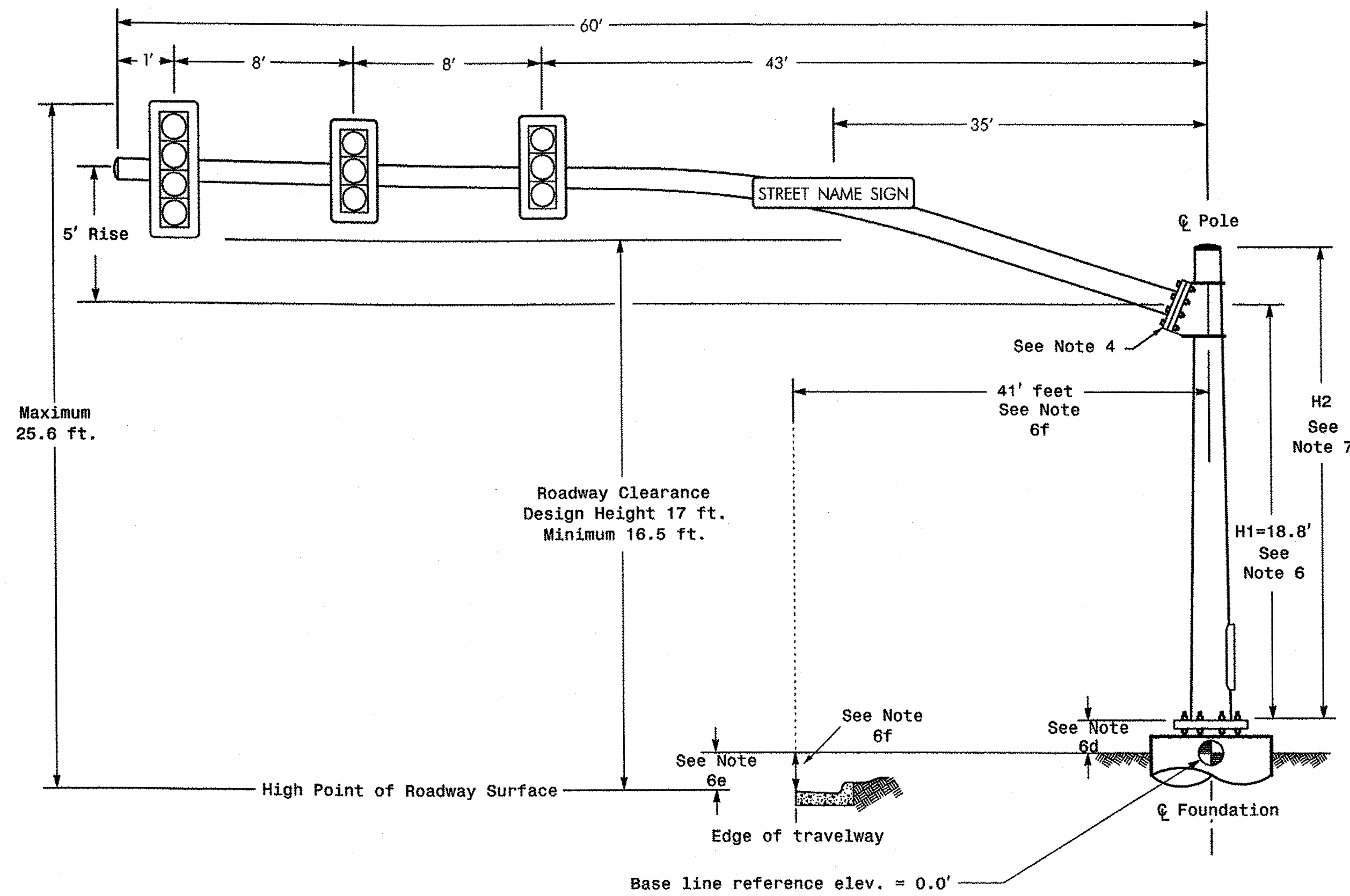
SIGNAL UPGRADE - FINAL DESIGN

Sheet 2 of 2

NC Firm License No.: F-0342  
701 Corporate Center Drive  
Suite 475 Raleigh, NC 27607  
Phone: 919-854-6200

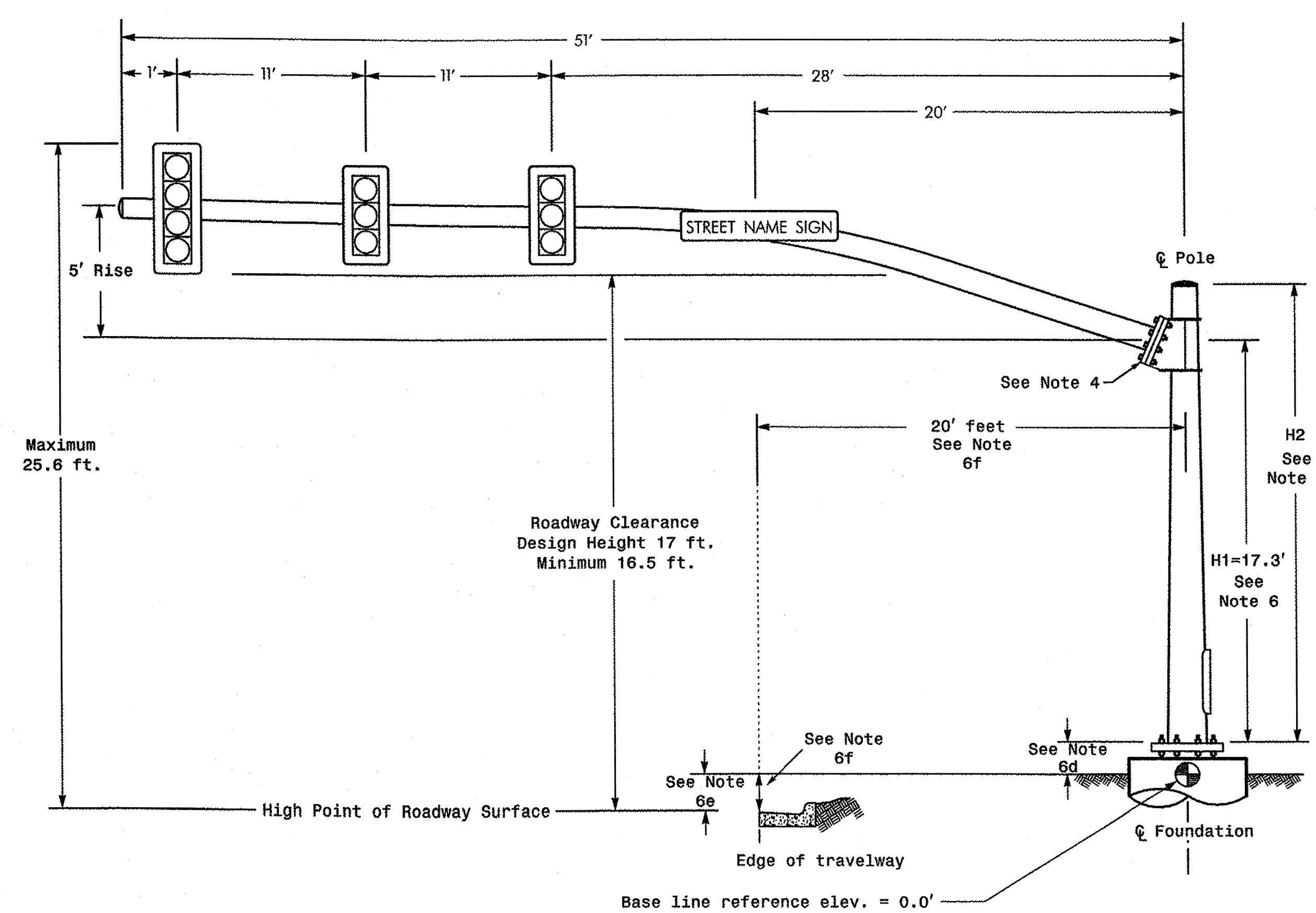
ELECTRICAL AND PROGRAMMING DETAILS FOR:		SR 3060 (Morrisville Pkwy) at Crabtree Crossing Parkway
Prepared In the Office of:		
Prepared By: M W Yalch	Reviewed By: J O Deaton	
Reviewed By:	INIT. DATE	

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



**Elevation View**

**Design Loading for METAL POLE NO. 2**



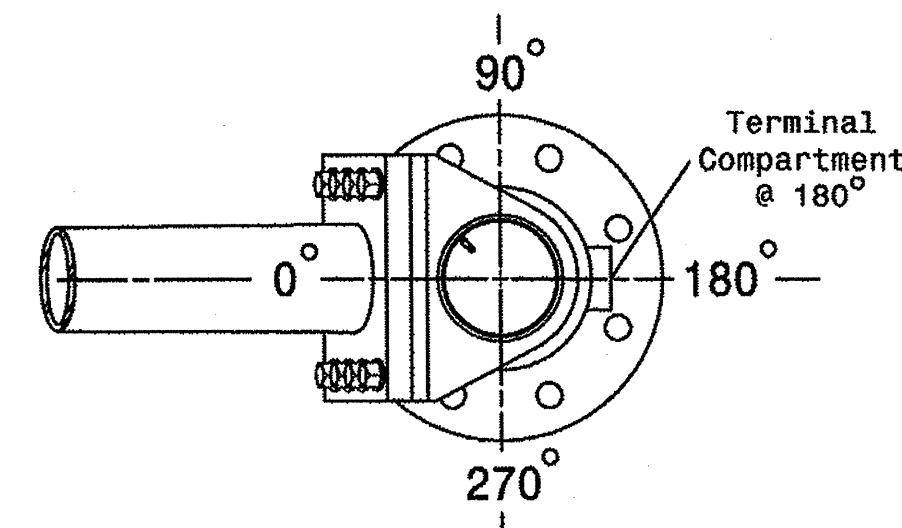
**Elevation View**

**SPECIAL NOTE**

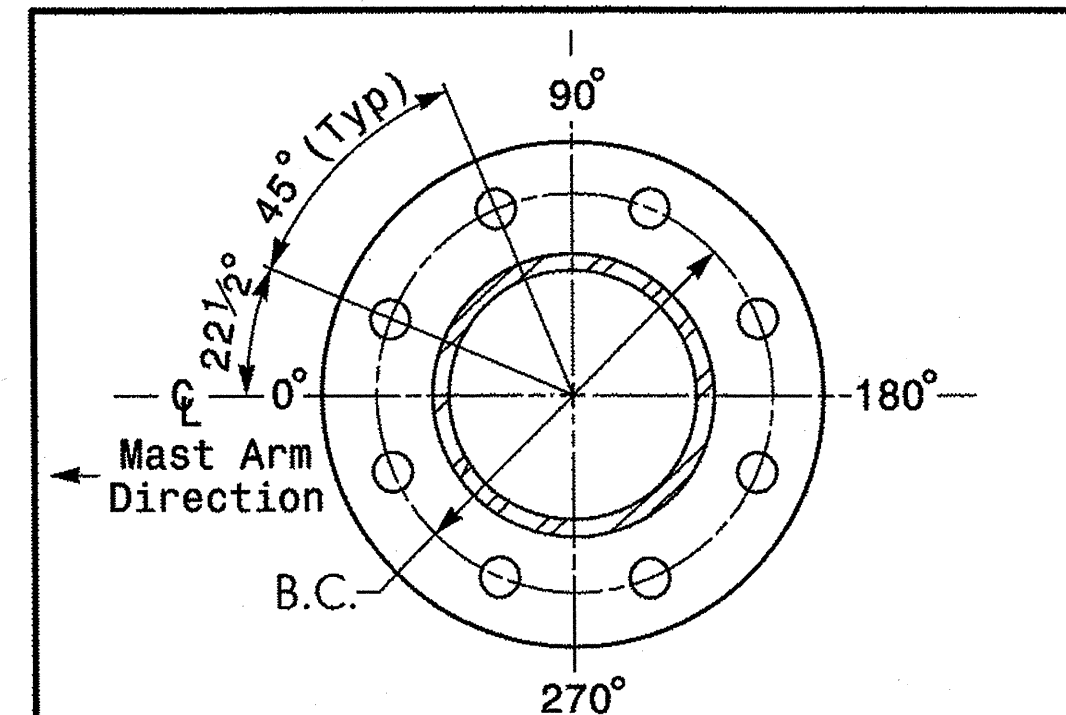
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

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

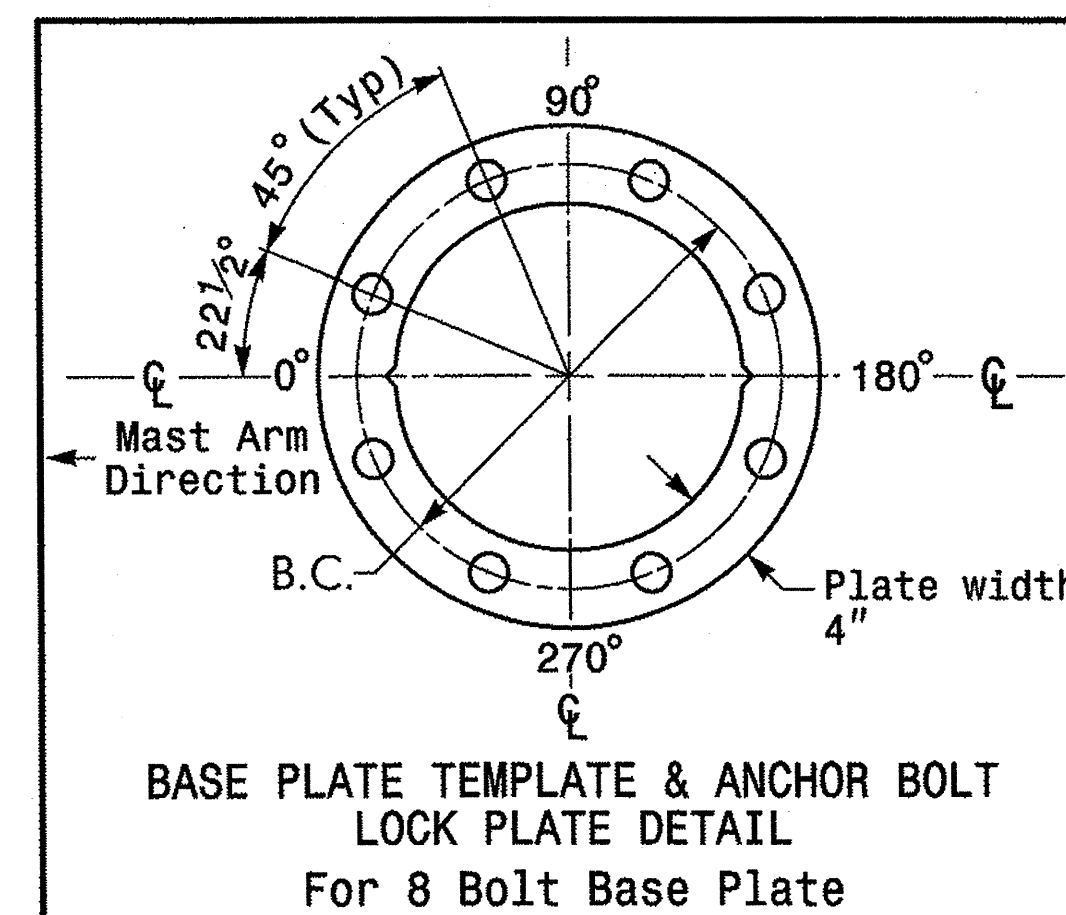
Elevation Differences for:	Pole 1	Pole 2
Baseline reference point at $\odot$ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+2.0 ft.	+0.5 ft.
Elevation difference at Edge of travelway	N/A ft.	N/A ft.



**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
	SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE AND ASTRO-BRAC	11.7 S.F.	25.5" W X 66.0" L	74 LBS
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS

**NOTES**

**Design Reference Material**

- Design the traffic signal structure and foundation in accordance with:
  - The 5th Edition 2009 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 these specifications can be found in the traffic signal project special provisions.
  - The 2012 NCDOT Roadway Standard Drawings.
  - The traffic signal project plans and special provisions.
  - The NCDOT "Metal Pole Standards" located at the following NCDOT website: <http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html>

**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 attached to the mast arm are rigid mounted and vertically centered on the arm.
  - The roadway clearance height for design is as shown in the elevation views.
  - The top of the pole base plate is .75 feet above the ground elevation.
  - Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
  - Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast 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 Signals Design 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 head 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.

**AECOM**

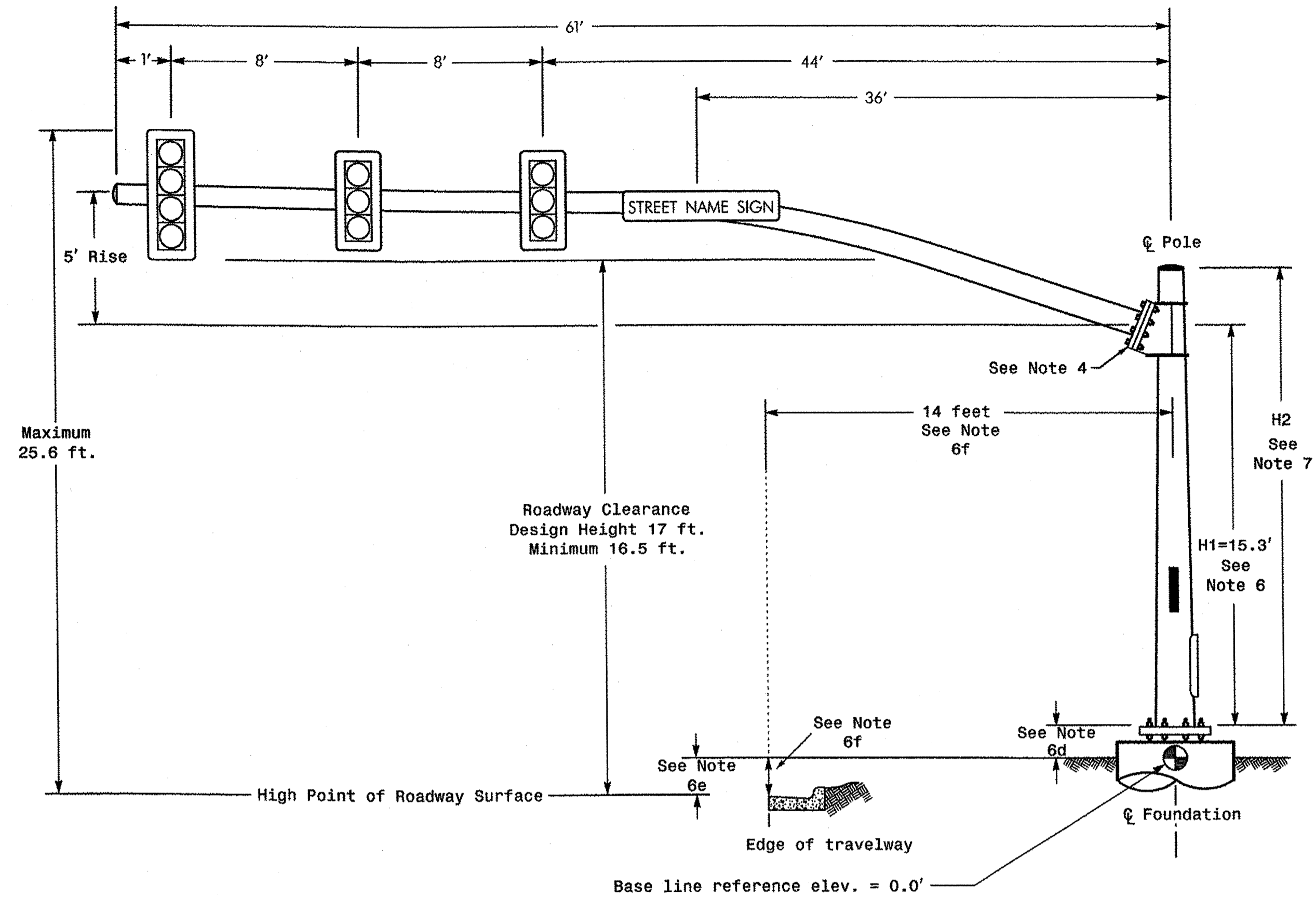
NC Firm License No.: F-0342  
701 Corporate Center Drive  
Suite 475 Raleigh, NC 27607  
Phone: 919-854-6200

**METAL POLE LOADING DETAIL**

	SR 3060 (Morrisville Pkwy) at Crabtree Crossing Parkway	SEAL
	Division 5 Wake County Morrisville	SEAL
PLAN DATE: May 2013	REVIEWED BY: A. Demers	
PREPARED BY: S. W. Cox	REVIEWED BY: S. Nandagiri	
REVISIONS	INIT.	DATE
SIGNATURE		DATE
		9-30-13
SIG. INVENTORY NO.		05-2257

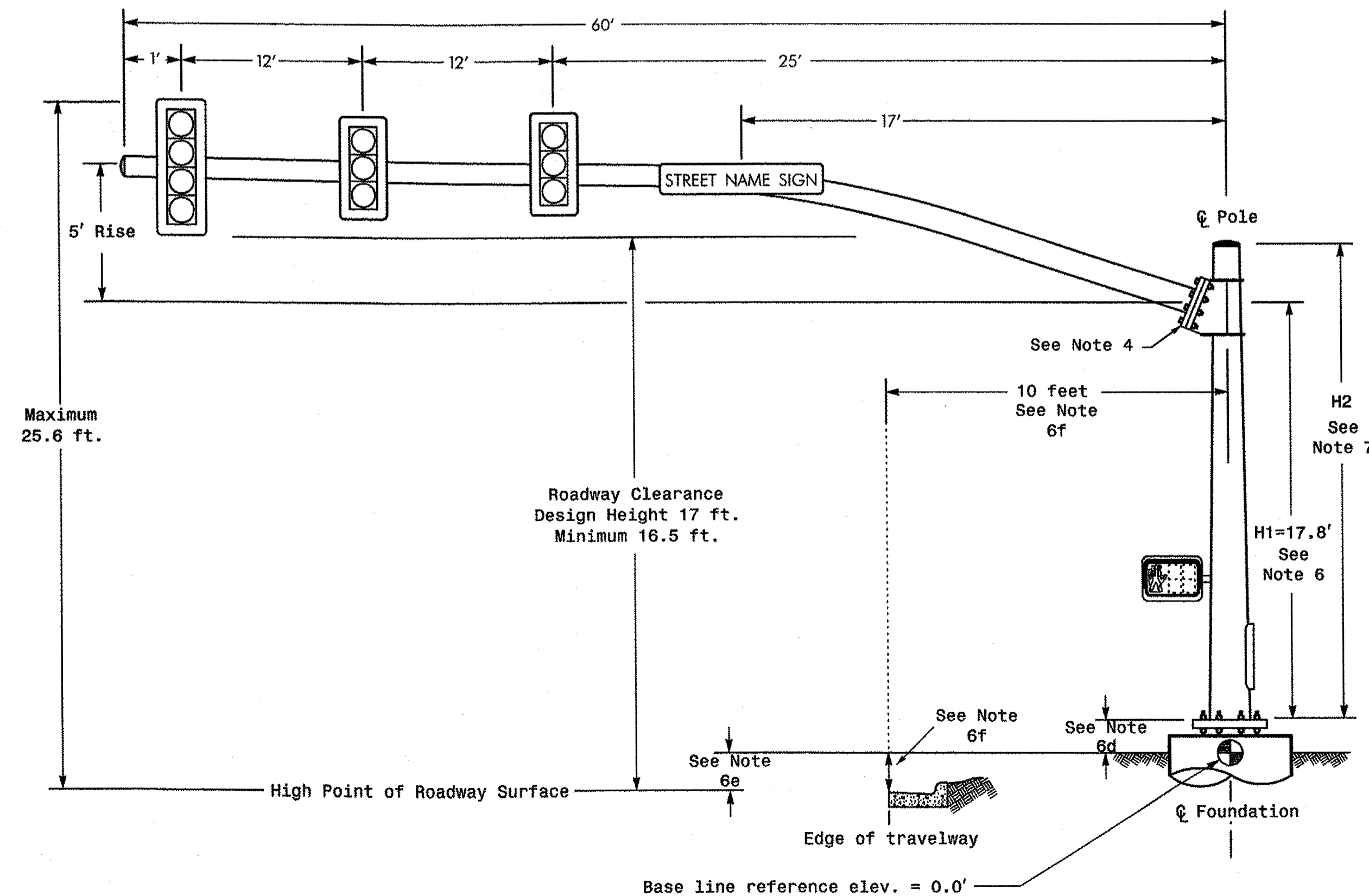
2:05:21 PM C:\Users\jcooper\Documents\0422DEL\_P19\0422DEL\_P19.dgn

**Design Loading for METAL POLE NO. 3**



**Elevation View**

**Design Loading for METAL POLE NO. 4**



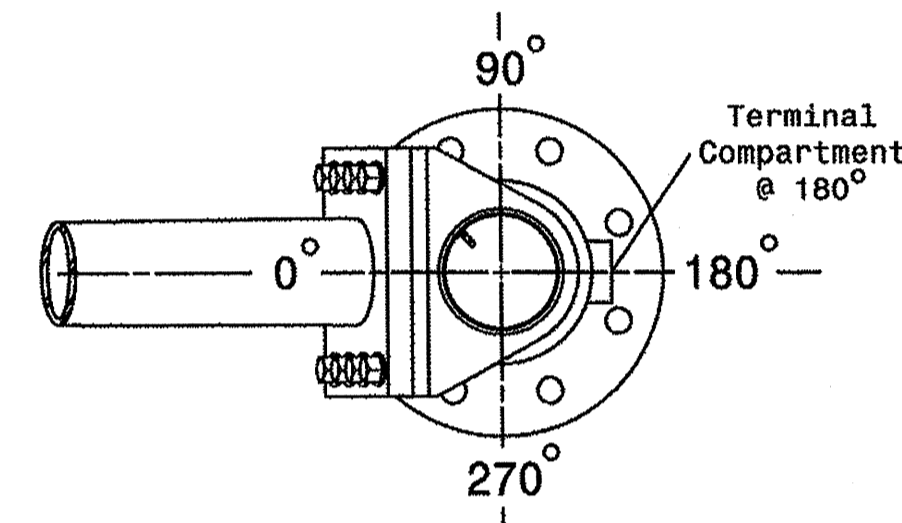
**Elevation View**

**SPECIAL NOTE**

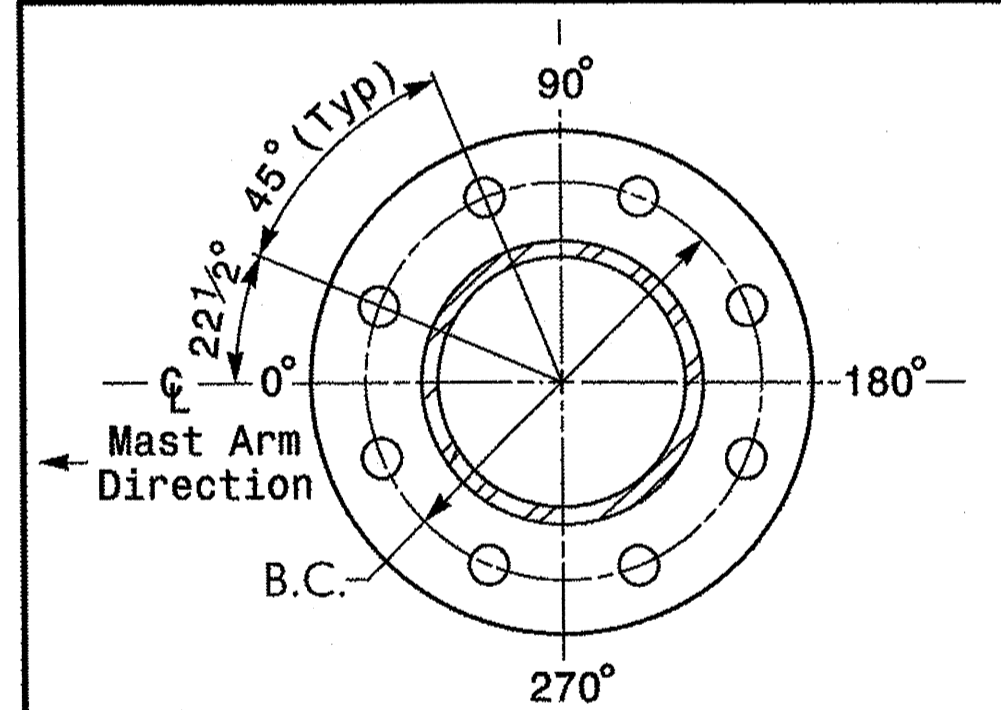
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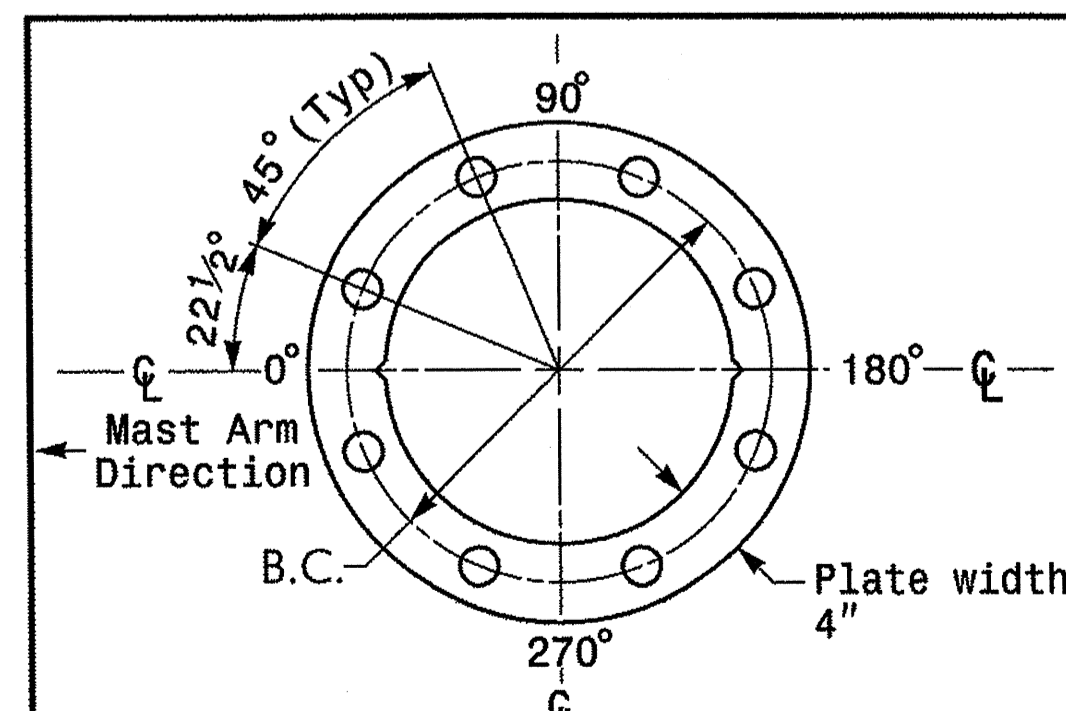
Elevation Differences for:	Pole 3	Pole 4
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-1.5 ft.	+1.0 ft.
Elevation difference at Edge of travelway	N/A	N/A



**POLE RADIAL ORIENTATION**



**8 BOLT BASE PLATE DETAIL**  
See Note 5



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

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**NOTES**

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  - The traffic signal project plans and special provisions.
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  - Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
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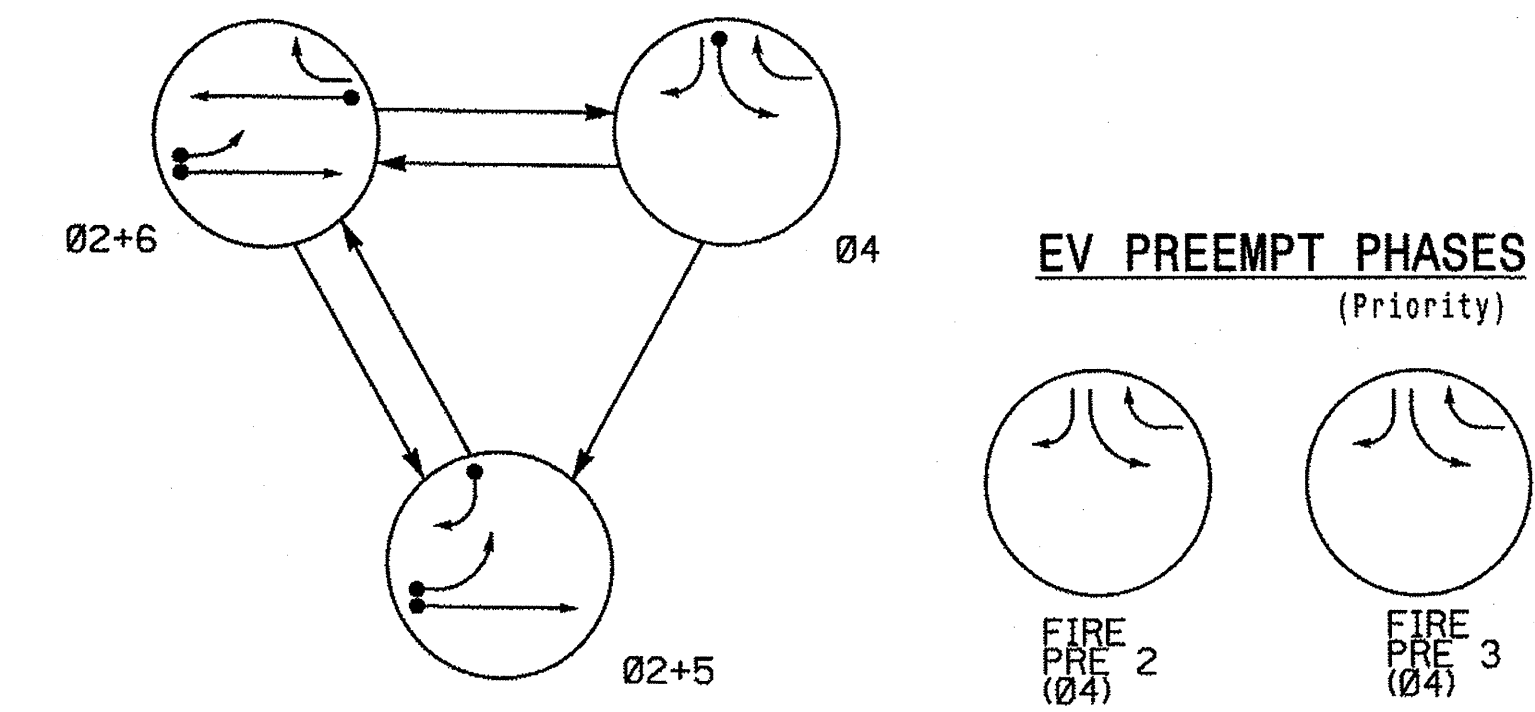
**AECOM**

NC Firm License No.: F-0342  
701 Corporate Center Drive  
Suite 475 Raleigh, NC 27607  
Phone: 919-854-6200

**METAL POLE LOADING DETAIL**

	SR 3060 (Morrisville Pkwy) at Crabtree Crossing Parkway	SEAL 37856
	Division 5 Wake County Morrisville	PREPARED BY: S. W. Cox REVIEWED BY: S. Mandagiri
	PLAN DATE: May 2013 REVIEWED BY: A. Demers PREPARED BY: S. W. Cox REVIEWED BY: S. Mandagiri	SIGNATURE DATE: 05-30-13 SIG. INVENTORY NO. 05-2257

PHASING DIAGRAM



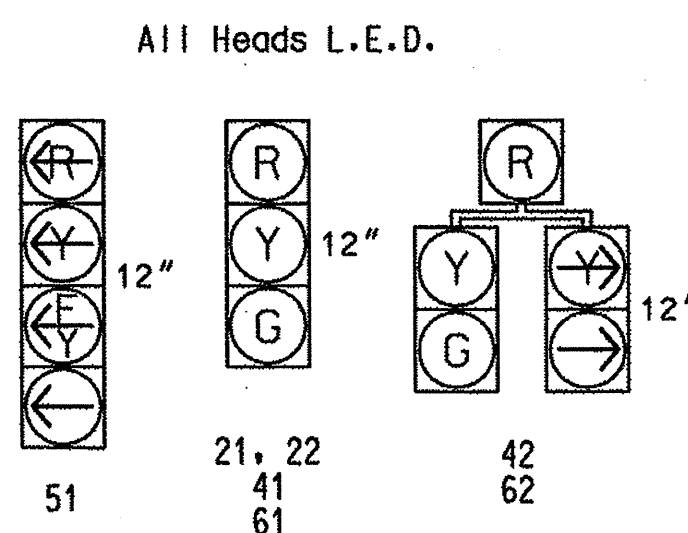
**PHASING DIAGRAM DETECTION LEGEND**  
 ● DETECTED MOVEMENT  
 ○ UNDETECTED MOVEMENT (OVERLAP)  
 — UNSIGNALIZED MOVEMENT  
 — PEDESTRIAN MOVEMENT

**TABLE OF OPERATION**

SIGNAL FACE	PHASE					
	Ø2+5	Ø2+6	Ø4	FIRE PRE 2	FIRE PRE 3	FLASH
21, 22	G	G	R	R	Y	
41	R	R	G	G	G	R
42	R	R	G	G	G	R
51		F	R	R	R	Y
61	R	G	R	R	R	Y
62	R	G	R	R	R	Y

F = Flashing Yellow Arrow

SIGNAL FACE I.D.



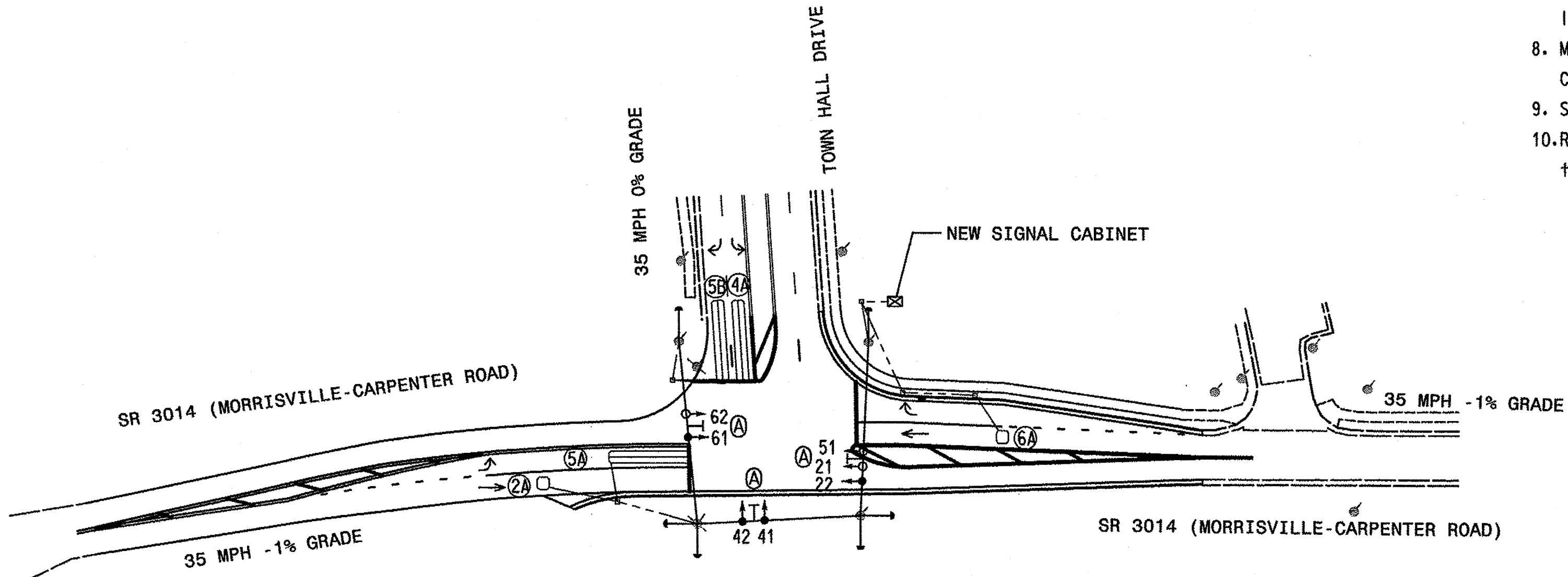
**NEMA LOOP & DETECTOR INSTALLATION CHART**  
with TS-2 CABINET

LOOP NO.	SIZE (ft)	DIST. FROM STOPBAR (ft)	TURNS	INDUCTIVE LOOPS		DETECTOR UNITS					
				NEW	EXISTING	NEMA PHASE	EXISTING	TIMING FEATURE	TIMING TIME	INHIBIT DELAY DURING GREEN?	
2A	6X6	70	4	X	-	2	-	X	-	-	NO
4A	6X40	0	2-4-2	X	-	4	-	X	-	-	NO
5A	6X40	0	2-4-2	X	-	5	-	X	DELAY	15	YES
5B	6X40	0	2-4-2	X	-	5	-	X	DELAY	15	YES
6A	6X6	70	4	X	-	6	-	X	-	-	NO

3 Phase Fully Actuated w/ Emergency Vehicle Preempt (Cary Signal System)

NOTES

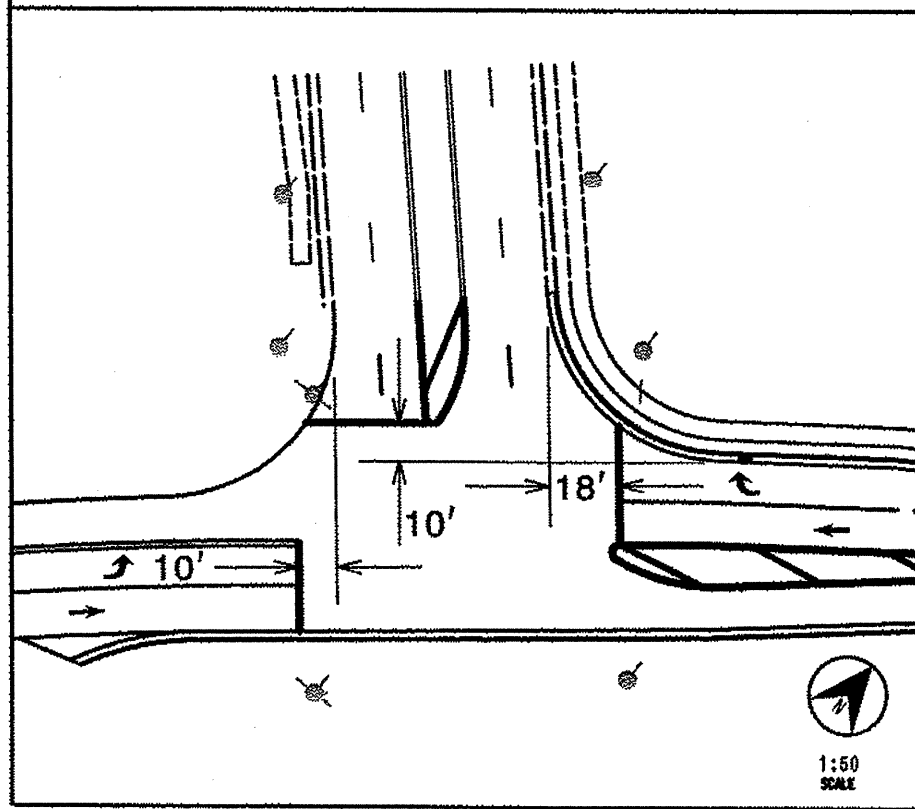
- Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
- Do not program signal for late night flashing operation unless otherwise directed by the engineer.
- Phase 5 may be lagged.
- Set all detector units to presence mode.
- Locate new cabinet so as to not obstruct sight distance of vehicles turning right on red.
- The Division Traffic Engineer will determine the Delay before Preempt and Preempt Dwell Min Green time for the emergency vehicle preemption timing.
- Fire Preempt 2 is for vehicles turning west off Town Hall Drive. Fire Preempt 3 is for vehicles turning east towards NC 54 and is linked to SIN 05-1281.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- System data: Address number 9, Channel number 17.
- Reroute and reconnect fibers to / from signals 05-1541, 05-1281 to new cabinet location.



**NEMA TIMING CHART**  
2070LN2 CONTROLLER

FEATURE	PHASE			
	Ø2	Ø4	Ø5	Ø6
MINIMUM GREEN *	10 SEC.	7 SEC.	7 SEC.	10 SEC.
PASSAGE GAP *	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	3.9 SEC.	3.0 SEC.	3.0 SEC.	3.9 SEC.
RED CLEARANCE	1.5 SEC.	2.3 SEC.	2.1 SEC.	1.5 SEC.
MAX. I *	60 SEC.	25 SEC.	30 SEC.	60 SEC.
RECALL POSITION	MIN. RECALL	NONE	NONE	MIN. RECALL
VEHICLE CALL MEMORY	LOCK	NONLOCK	NONLOCK	LOCK
WALK *	- SEC.	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.
VOLUME DENSITY	OFF	OFF	OFF	OFF
ACTUATION B4 ADD *	- VEH.	- VEH.	- VEH.	- VEH.
SEC. PER ACTUATION *	- SEC.	- SEC.	- SEC.	- SEC.
MAX. INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.
TIME B4 REDUCTION *	- SEC.	- SEC.	- SEC.	- SEC.
TIME TO REDUCE *	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	- SEC.	- SEC.	- SEC.	- SEC.

STOPBAR LOCATION DIAGRAM



**RAILROAD PREEMPTION**

FUNCTION	PRE 2	PRE 3
PRIORITY	NO	YES
EXIT PHASE	4	4
DELAY BEFORE PREEMPT	**	**
PED. CLEAR BEFORE PREEMPT	0	0
MIN. GREEN BEFORE PREEMPT	1	1
YELLOW CLEAR BEFORE PREEMPT	0.0*	0.0*
RED CLEAR BEFORE PREEMPT	0.0*	0.0*
PREEMPT DWELL MIN. GREEN	**	**
YELLOW CLR AFTER PREEMPT	3.0	3.0
RED CLEAR AFTER PREEMPT	2.3	2.3
PED. CLEAR THROUGH YELLOW	N	N

\* Time defaults to time used for phase during normal operation  
 \*\* See Note 6.

**LEGEND**

PROPOSED	EXISTING

**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

**SIGNAL UPGRADE**

SR 3014 (Morrisville-Carpenter Road) at Town Hall Drive

Division 5 Wake County Morrisville

PLAN DATE: May 2013 REVIEWED BY: A. Demers

PREPARED BY: S. W. Cox REVIEWED BY: S. Nandagiri

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

SCALE: 1" = 50'

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER STEVEN W. COX 37856

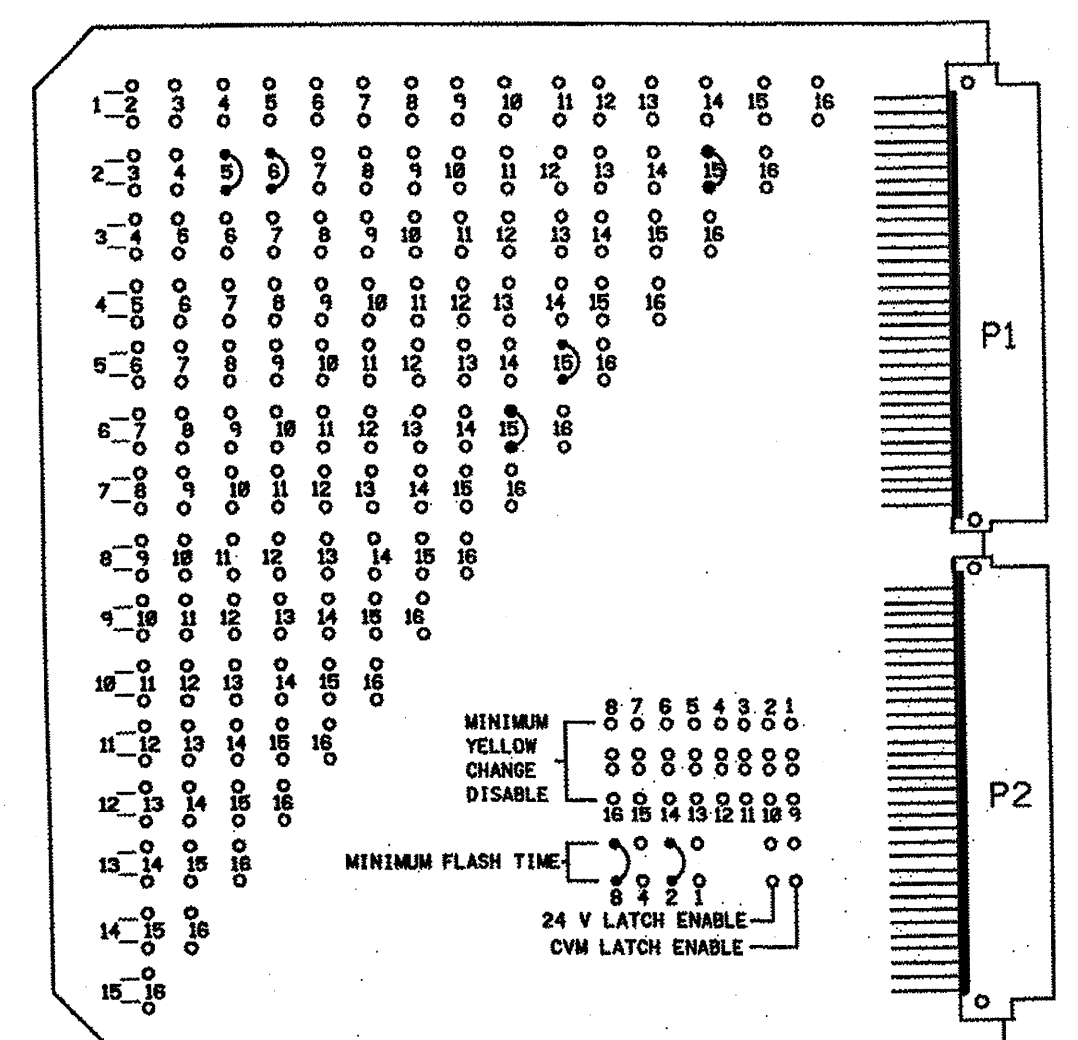
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SIG. INVENTORY NO. 05-2258

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**EDI MODEL MMU-16LE  
MALFUNCTION MANAGEMENT UNIT  
PROGRAMMING DETAIL**

(Replace existing MMU-16E; program card and tables as shown below)



MMU PROGRAMMING CARD

CHANNEL NUMBER	ENABLE/DISABLE
1	DISABLE
2	ENABLE
3	DISABLE
4	ENABLE
5	ENABLE
6	ENABLE
7	DISABLE
8	DISABLE
9	DISABLE
10	DISABLE
11	DISABLE
12	DISABLE
13	DISABLE
14	DISABLE
15	ENABLE
16	DISABLE

OPTION	SETTING
RECURRENT PULSE	ON
WALK DISABLE	OFF
LOG CVM FAULTS	ON
EXTERN WATCHDOG	OFF
24V-2=12VDC	OFF
PM CARD MEMORY	ON
LEDguard	ON
FORCE TYPE 16	OFF
TYPE12-SDLC	OFF

CH. GROUP FOR PROTECTED GREEN ARROWS	CH. 1,3,5,7
ENABLE CHANNEL PAIR, FYA	
CH 1-13	OFF
CH 3-14	OFF
CH 5-15	ON
CH 7-16	OFF

MMU PROGRAMMING NOTE  
1. ENSURE YELLOW CHANGE PLUS RED CLEARANCE MONITORING IS ENABLED FOR ALL CHANNELS.

- NOTES**
- To prevent "Flash-conflict" problems, wire all unused load switches to flash red. Verify that signal heads flash in accordance with the signal plans.
  - To prevent red failures on unused monitor channels, tie unused load switch red outputs 1,3,7,8,9,10,11,12,13,14, and 16 to load switch AC+ by inserting a jumper plug in the unused load switch socket from pin 1 (LS AC+) to pin 3 (red out). Make sure all flash transfer relays are in place.
  - Program controller to start up in phases 2 and 6 green.
  - Set power-up flash time to 10 seconds and implement on the Malfunction Management Unit. Set controller power-up flash time to 0 seconds.
  - Enable Simultaneous Gap-out feature, on controller unit, for all phases.
  - Program detectors in accordance with the manufacturer's instructions to accomplish the detection schemes shown on the signal design plans.
  - Program detector call delay and extension timing on the controller, unless otherwise specified.
  - Set all detector card unit channels to "presence" mode.
  - This controller and cabinet are part of the Cary Signal System.

**SIGNAL HEAD HOOK-UP CHART**

PHASE	1	2	3	4	5	6	7	8	2 PED	4 PED	6 PED	8 PED	OLA	OLB	OLC	OLD
SIGNAL HEAD NO.	NU	21,22	NU	41,42	62	42	51*	61,62	NU	NU	NU	NU	NU	NU	51*	NU
RED		2R		4R		*	6R									
YELLOW		2Y		4Y			6Y									
GREEN		2G		4G			6G									
RED ARROW																15R
YELLOW ARROW				4Y	5Y											15Y
FLASHING YELLOW ARROW																15G
GREEN ARROW				4G	5G	5G										

\* Denotes install Load Resistor, see Load Resistor installation detail on this sheet.  
★ See pictorial of head wiring detail this sheet.

**DETECTOR RACK SET-UP DETAIL**

INSERT DETECTOR CARDS IN RACK ACCORDING TO THE DETAIL SHOWN BELOW. PARTICULAR DETECTOR CHANNELS WILL CALL PHASES INDICATED.

RACK #	BIU	CH1	CH2	CH1	CH2	CH1	CH2	CH1	CH2	CH1	CH2	CH1	CH2	CH1	CH2	CH1	CH2
RACK #1	BIU	L3	L1	L1	L2	L5	L6	L5	L6	L5	L6	L5	L6	L5	L6	L5	L6
		Ø5	Ø2	Ø2	Ø4	Ø5	Ø6	Ø5	Ø6	Ø5	Ø6	Ø5	Ø6	Ø5	Ø6	Ø5	Ø6
RACK #2	BIU	L4	L2	L3	L4	L7	L8	L7	L8	L7	L8	L7	L8	L7	L8	L7	L8
		Ø2	Ø4	Ø2	Ø4	Ø2	Ø4	Ø2	Ø4	Ø2	Ø4	Ø2	Ø4	Ø2	Ø4	Ø2	Ø4

WIRE LOOPS TO TERMINALS ON LOOP PANEL AS SHOWN IN THE CHART BELOW

LOOP NO.	LOOP PANEL TERMINALS
2A	L1A+L1B
4A	L2A+L2B
5A	L3A+L3B
	L4A+L4B
5B	L5A+L5B
6A	L6A+L6B
NU	L7A+L7B
NU	L8A+L8B
NU	L9A+L9B
NU	L10A+L10B
NU	L11A+L11B
NU	L12A+L12B
NU	L13A+L13B
NU	L14A+L14B
NU	L15A+L15B
NU	L16A+L16B

ADD JUMPERS FROM L3A TO L4A, AND L3B TO L4B

NU = NOT USED

**NOTE**  
BE SURE TO PROGRAM DETECTOR TYPES AND TIMERS (EXTEND AND DELAY) AS SHOWN ON THE SIGNAL PLANS.

PROGRAM CONTROLLER DETECTORS ACCORDING TO THE SCHEDULE SHOWN IN THE CHART BELOW

CONTROLLER DETECTOR NO.	FUNCTION	TIMING	
		FEATURE	TIME(SEC)
1	Ø2		
2	Ø4		
3	Ø5	DELAY	15
4	Ø2		
5	Ø5	DELAY	15
6	Ø6		
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

**EQUIPMENT INFORMATION**

CONTROLLER.....2070L  
CABINET .....ECONOLITE TS-2 NC-8  
SOFTWARE .....ECONOLITE ASC/2070  
CABINET MOUNT.....BASE  
LOADBAY POSITIONS.....16  
LOAD SWITCHES USED.....2,4,5,6,15  
PHASES USED.....2,4,5,6  
OLA.....NOT USED  
OLB.....NOT USED  
OLC.....\*  
OLD.....NOT USED

\* See Sheet 2 of 5 Econolite ASC/2070 Overlap Programming Detail.

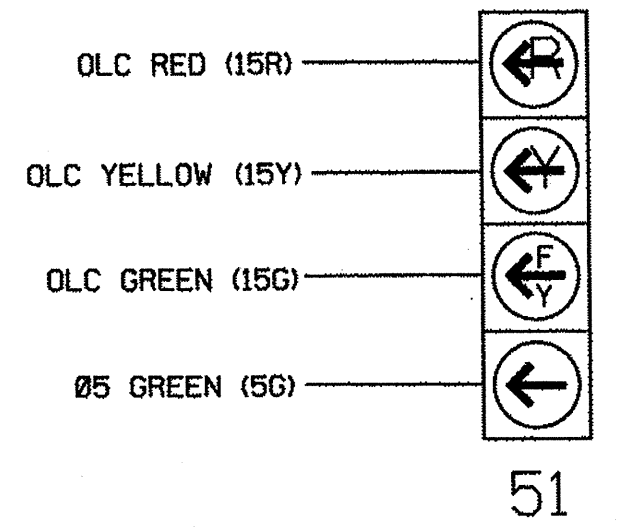
**LOAD SWITCH ASSIGNMENT DETAIL**

(program controller according to schedule in chart below)

LOAD SWITCH NUMBER	FUNCTION
1	Ø1
2	Ø2
3	Ø3
4	Ø4
5	Ø5
6	Ø6
7	Ø7
8	Ø8
9	Ø2 PED
10	Ø4 PED
11	Ø6 PED
12	Ø8 PED
13	OLA
14	OLB
15	OLC
16	OLD

**4 SECTION FYA PPLT SIGNAL WIRING DETAIL**

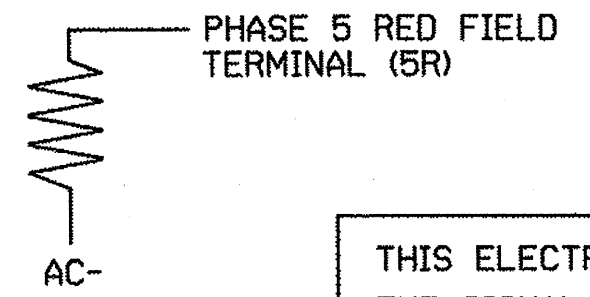
(wire signal head as shown)



**NOTE**  
1. See overlap programming instructions sheet 2 of 5.

**LOAD RESISTOR INSTALLATION DETAIL**

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



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2258  
DESIGNED: May 2013  
SEALED: September 30, 2013  
REVISED: N/A

**AECOM**  
NC Firm License No.: F-0342  
701 Corporate Center Drive  
Suite 475 Raleigh, NC 27607  
Phone: 919-854-6200

**SIGNAL UPGRADE**

Division 5  
PLAN DATE: May 2013  
PREPARED BY: M W Yalch  
REVISIONS

SR 3014 (Morrisville-Carpenter Road) at Town Hall Drive  
Wake County, Morrisville  
REVIEWED BY: J O Deaton  
REVIEWED BY:

Sheet 1 of 5

Signature: [Signature]  
Date: 9/30/13  
SIG. INVENTORY NO. 05-2258

1:31:19 PM 0:46:02 38003#00... Technical Information... 03/08/11



ECONOLITE ASC/2070 OVERLAP PROGRAMMING DETAIL

(program controller as shown)

FROM MAIN MENU SELECT 2 (CONTROLLER) AND THEN 5 (OVERLAP DATA)

OVERLAP A CONTROLLER OVERLAP DATA table with columns 1-12 and rows for STANDARD, PROTECTED, PERMITTED, ENABLE LAG, ENABLE LEAD, SPARE, and timer settings.

OVERLAP B CONTROLLER OVERLAP DATA table with columns 1-12 and rows for STANDARD, PROTECTED, PERMITTED, ENABLE LAG, ENABLE LEAD, SPARE, and timer settings.

OVERLAP C CONTROLLER OVERLAP DATA table with columns 1-12 and rows for STANDARD, PROTECTED, PERMITTED, ENABLE LAG, ENABLE LEAD, SPARE, and timer settings.

OVERLAP D CONTROLLER OVERLAP DATA table with columns 1-12 and rows for STANDARD, PROTECTED, PERMITTED, ENABLE LAG, ENABLE LEAD, SPARE, and timer settings.

PED OVERLAP PED OVERLAP ASSIGNMENTS table with columns 1-12 and rows for OVERLAP CONSISTS OF PHASES.

ECONOLITE ASC/2070 EMERGENCY VEHICLE PREEMPTOR PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS 4 (PREEMPTOR)

PREEMPTOR SUBMENU table with 8 items: 1. PRIORITY PMT 1, 2. PRIORITY PMT 2, 3. PRIORITY PMT 3, 4. PRIORITY PMT 4, 5. PRIORITY PMT 5, 6. PRIORITY PMT 6, 7. BUS PREEMPTORS.

PRIORITY PREEMPTOR 2 table with columns 1-12 and rows for PHASE, TERM PHASE OVLP, TRK CLR PHASE, HOLD PHASES, EXIT PHASES, EXIT CALLS, TERM OVERLAP, ACTIVE, PRIORITY, DET LOCK, HOLD FLASH, TERM OVLP ASAP, TERM PHASES.

PRIORITY PREEMPTOR 2 table with rows for DON'T OVERRIDE FLASH, FLASH ALL OUTPUTS, YELLOW-RED GOES GREEN, ENABLE MAX PREEMPT TIME, ACTIVE ONLY DURING HOLD, NO CVM IN FLASH, FAST FLASH GRN ON HOLD, OUT OF FLASH.

PRIORITY PREEMPTOR 2 table with rows for MAX TIME, MIN HOLD TIME, MIN PED CLEAR, EXIT MAX, GRN YEL RED, MINIMUM, TRACK CLEAR, HOLD.

return to Preemptor Submenu

PREEMPTOR SUBMENU table with 8 items: 1. PRIORITY PMT 1, 2. PRIORITY PMT 2, 3. PRIORITY PMT 3, 4. PRIORITY PMT 4, 5. PRIORITY PMT 5, 6. PRIORITY PMT 6, 7. BUS PREEMPTORS.

PRIORITY PREEMPTOR 3 table with columns 1-12 and rows for PHASE, TERM PHASE OVLP, TRK CLR PHASE, HOLD PHASES, EXIT PHASES, EXIT CALLS, TERM OVERLAP, ACTIVE, PRIORITY, DET LOCK, HOLD FLASH, TERM OVLP ASAP, TERM PHASES.

PRIORITY PREEMPTOR 3 table with rows for DON'T OVERRIDE FLASH, FLASH ALL OUTPUTS, YELLOW-RED GOES GREEN, ENABLE MAX PREEMPT TIME, ACTIVE ONLY DURING HOLD, NO CVM IN FLASH, FAST FLASH GRN ON HOLD, OUT OF FLASH.

PRIORITY PREEMPTOR 3 table with rows for MAX TIME, MIN HOLD TIME, MIN PED CLEAR, EXIT MAX, GRN YEL RED, MINIMUM, TRACK CLEAR, HOLD.

end of programming

\* The Division Traffic Engineer will determine the Delay Before Preempt and Preempt Dwell Min Green time for the emergency vehicle preemption timing.

ECONOLITE ASC/2070 SPECIAL MMU PROGRAMMING

(program controller as shown below)

CONFIGURATION SUBMENU table with 9 items: 1. CONTROLLER SEQUENCE, 2. PHASES IN USE, 3. PH TO LS ASSIGN, 4. SDLC OPTIONS, 5. SERIAL PORT 1, 6. SERIAL PORT 2, 7. ENABLE LOGGING, 8. OPTIONS, 9. MMU PROGRAM.

PRESS KEYS 1..9 TO SELECT

CAUTION!

SET INTERSECTION TO FLASH BEFORE ATTEMPTING TO ENTER OR CHANGE ANY MMU PROGRAMMING DATA. THIS PROGRAMMING AND THAT OF THE MMU PROGRAMMING CARD MUST MATCH EXACTLY. IF THEY DO NOT, THE INTERSECTION WILL BE PLACED INTO FLASH.

MMU PROGRAM CAN SERVE WITH: table with columns CHANNEL 1-15 and rows for 1-15.

WRITE-PROTECT FOR FLASHING YELLOW ARROWS DETAIL

(program controller as shown below)

FROM MAIN MENU SELECT 8 (UTILITIES) AND THEN 9 (WRITE PROTECT DATA)

UTILITIES SUBMENU table with 8 items: 1. COPY, 2. MEMORY CLEAR, 3. RESERVED, 4. RESERVED, 5. SIGN ON, 6. LOG BUFFERS, 7. SEND D.M., 8. D.M. UTILS.

PRESS KEYS 1..0 TO SELECT

WRITE PROTECT DATA

ADDRESS 1/9 008-00F 40

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2258 DESIGNED: May 2013 SEALED: September 30, 2013 REVISED: N/A

SIGNAL UPGRADE

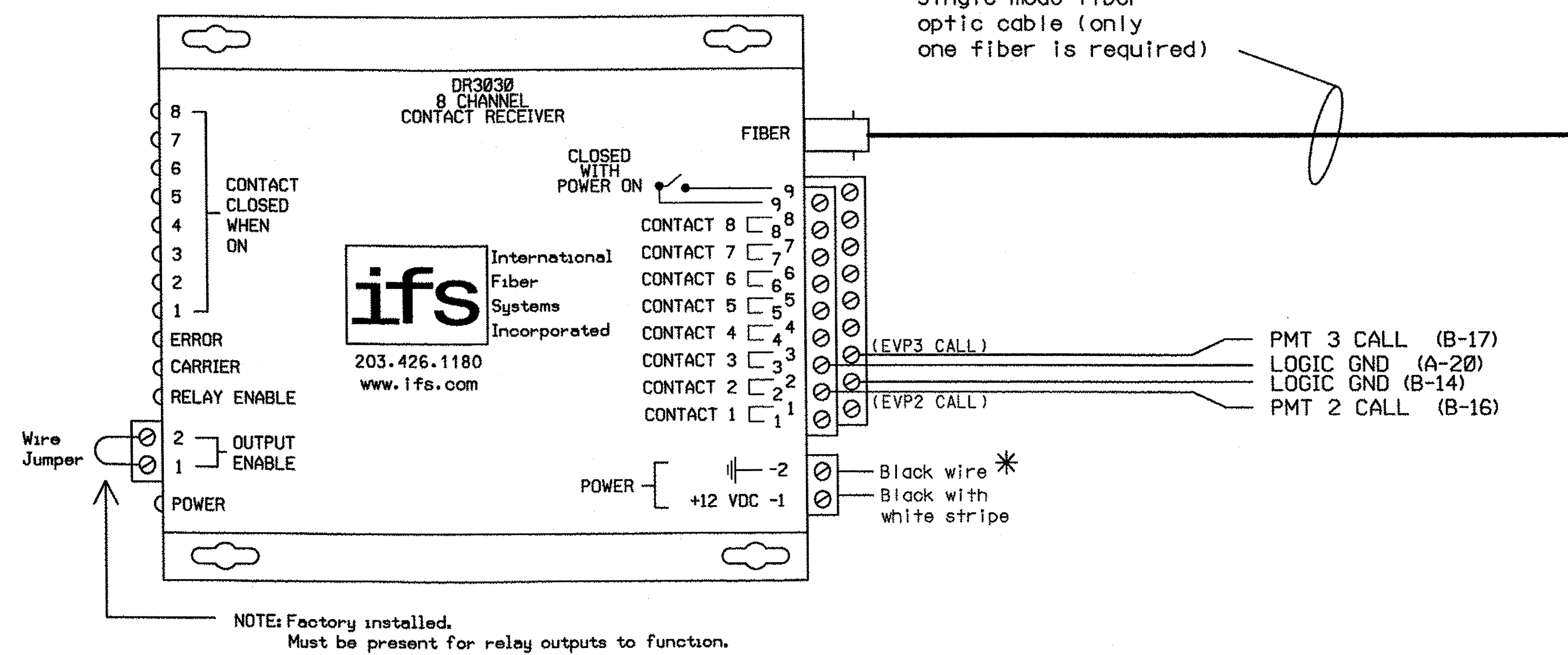
AECOM NC Firm License No.: F-0342 701 Corporate Center Drive Suite 475 Raleigh, NC 27607 Phone: 919-854-6200

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared in the Offices of: NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

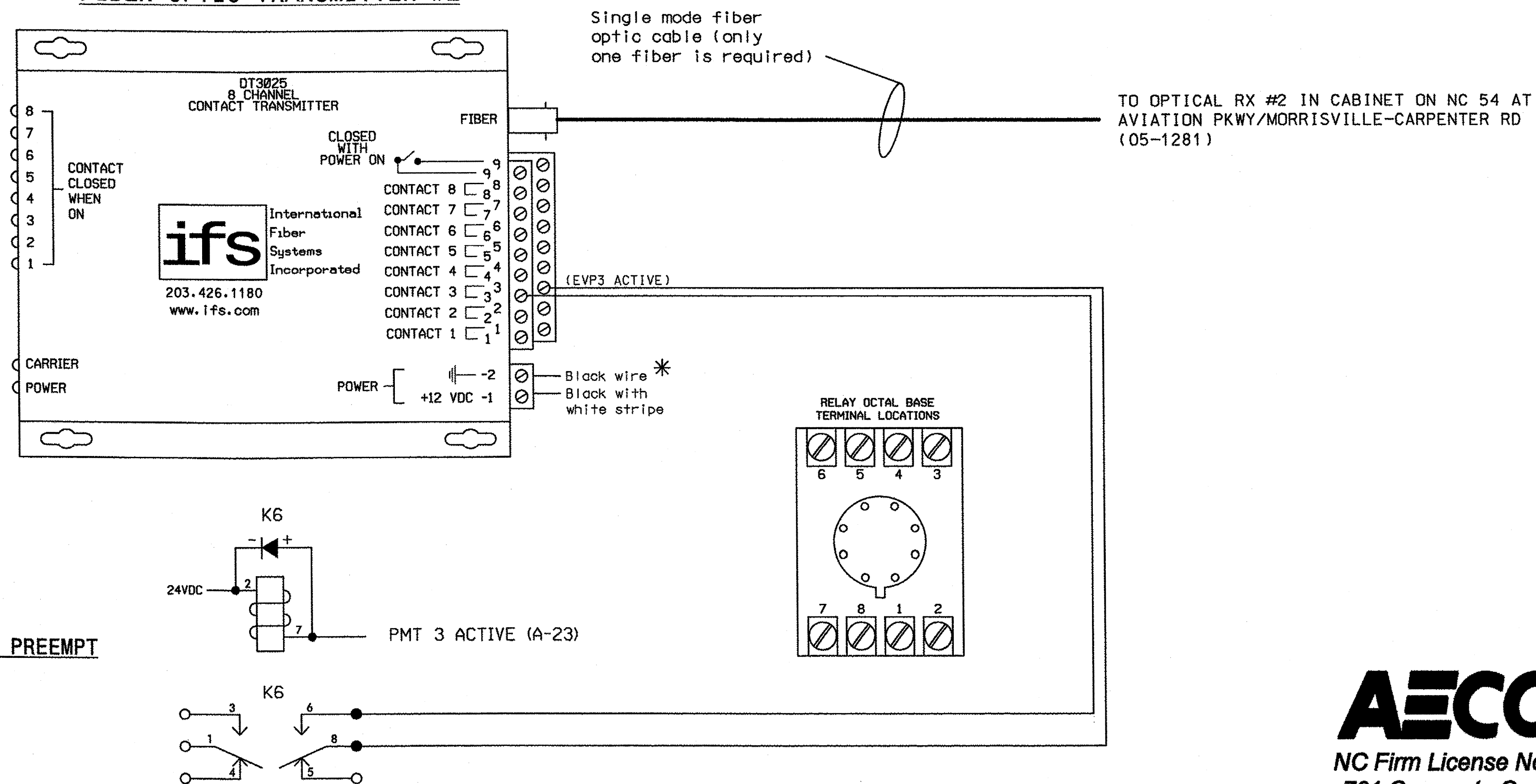
SR 3014 (Morrisville-Carpenter Road) at Town Hall Drive Wake County Morrisville Division 5 PLAN DATE: May 2013 REVIEWED BY: J O Deaton PREPARED BY: M W Yalch REVIEWED BY: ENGINEER JAMES O. DEATON 9/30/13

SEAL NORTH CAROLINA DEPARTMENT OF TRANSPORTATION SEAL 07438 ENGINEER JAMES O. DEATON 9/30/13 SIGNATURE DATE SIG. INVENTORY NO. 05-2258

**FIBER OPTIC RECEIVER #1**



**FIBER OPTIC TRANSMITTER #2**



**OPTIC TRANSMITTER/RECEIVER NOTES**

1. The International Fiber Systems DT3025 is an 8-channel contact mapping transmitter capable of sensing contact closures from a DR3030 receiver over fiber optic cable up to 2.5 miles away.
2. The International Fiber Systems DR3030 is an 8-channel contact mapping receiver capable of sensing contact closures from a DT3025 transmitter over fiber optic cable up to 2.5 miles away.
- \* 3. Power connections are with the supplied 12 Volt DC Plug-in Power Supply.

**RELAY NOTES**

1. RELAY K6 IS A DPDT WITH A 24VDC COIL, 10A CONTACTS (POTTER & BRUMFIELD NO. KRPA11DG-24).
2. RELAY K6 IS SHOWN IN THE NORMAL DE-ENERGIZED STATE (PREEMPT NOT ACTIVE).

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2258  
 DESIGNED: May 2013  
 SEALED: September 30, 2013  
 REVISED: N/A

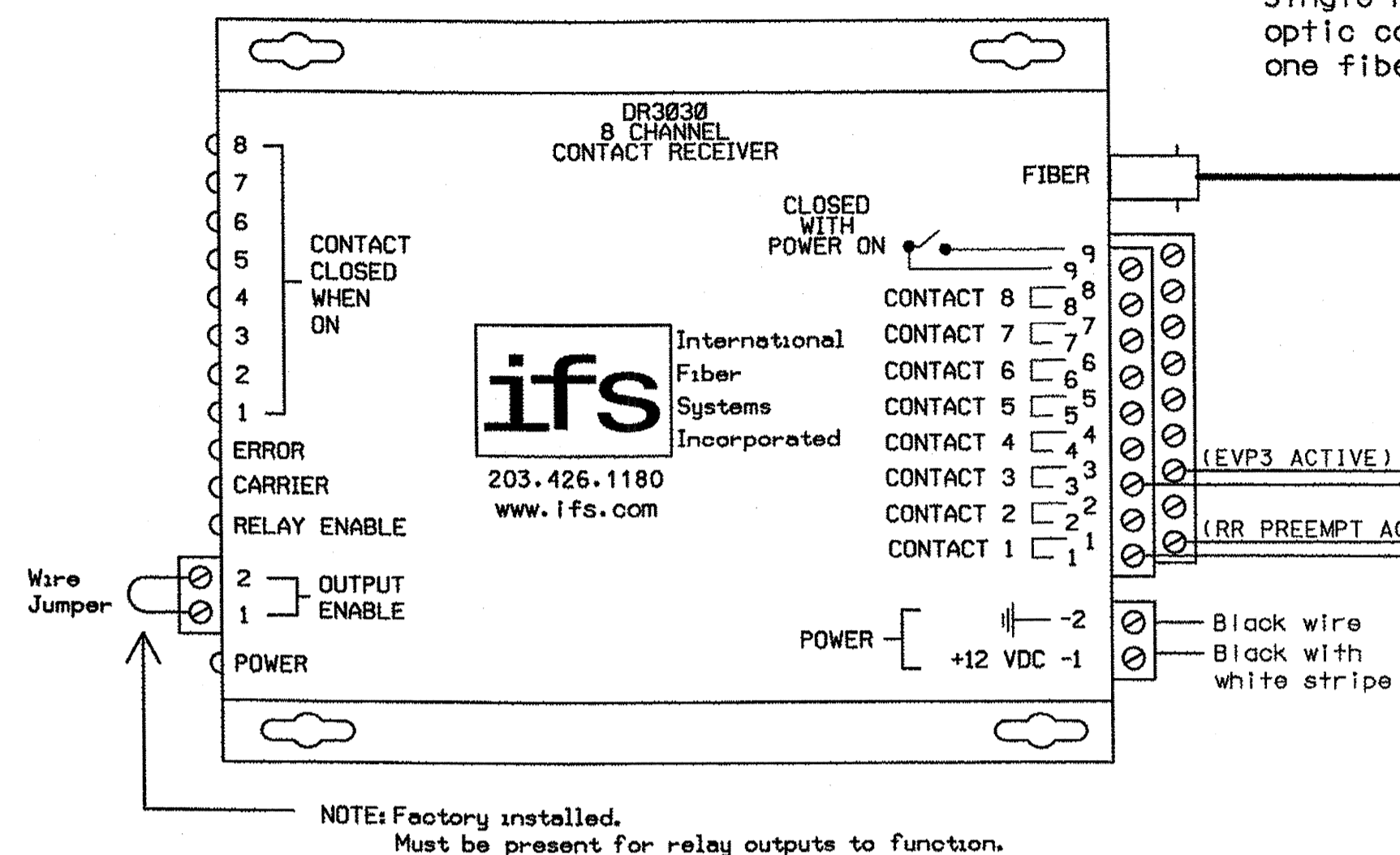
**SIGNAL UPGRADE**

**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared in the Offices of: 	SR 3014 (Morrisville-Carpenter Road) at Town Hall Drive	
	Division 5 Wake County Morrisville	PLAN DATE: May 2013 REVIEWED BY: J O Deaton
PREPARED BY: M W Yalch	REVIEWED BY:	REVISIONS:
750 N. Greenfield Pkwy, Garner, NC 27529	INIT. DATE	SIGNATURE DATE SIG. INVENTORY NO. 05-2258

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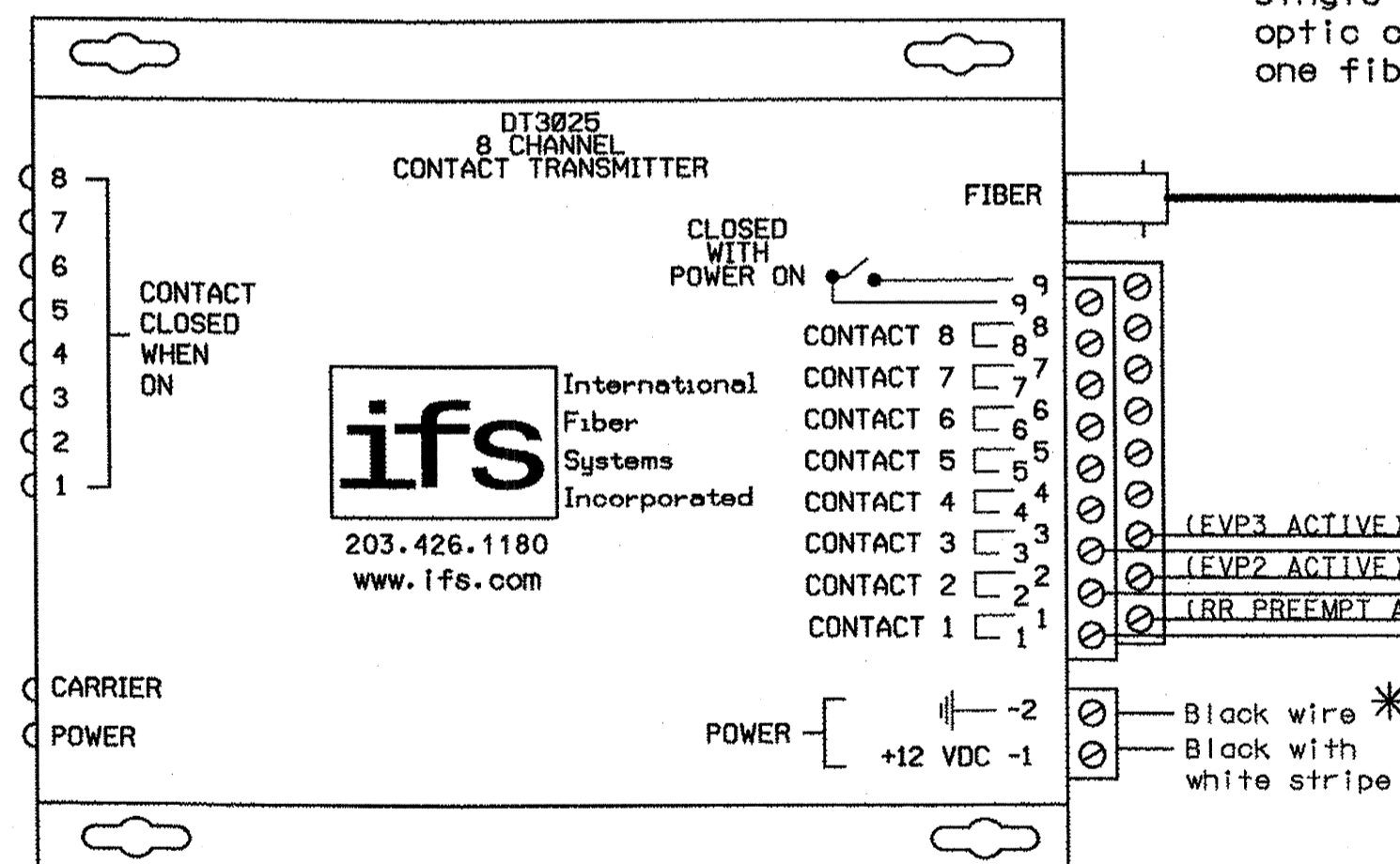
FIBER OPTIC RECEIVER #3



Single mode fiber optic cable (only one fiber is required)

FROM OPTICAL TX #3 IN CABINET ON NC 54 AT AVIATION PKWY/MORRISVILLE-CARPENTER RD (05-1281)

FIBER OPTIC TRANSMITTER #4



Single mode fiber optic cable (only one fiber is required)

TO OPTICAL RX #4 IN CABINET ON TOWN HALL DR AT MORRISVILLE FIRE STATION #1 (05-1541)

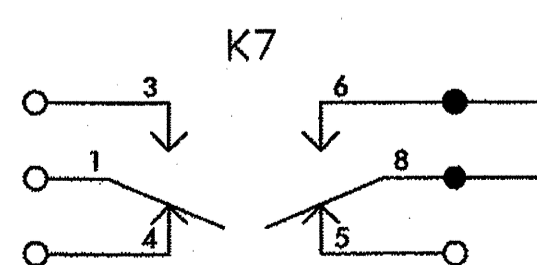
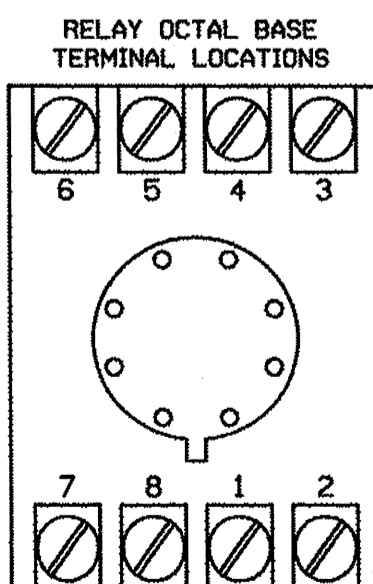
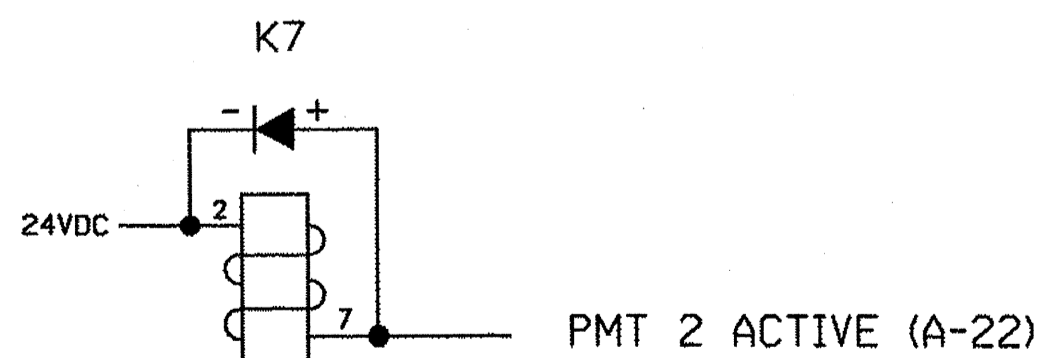
OPTIC TRANSMITTER/RECEIVER NOTES

1. The International Fiber Systems DT3025 is an 8-channel contact mapping transmitter capable of sensing contact closures from a DR3030 receiver over fiber optic cable up to 2.5 miles away.
2. The International Fiber Systems DR3030 is an 8-channel contact mapping receiver capable of sensing contact closures from a DT3025 transmitter over fiber optic cable up to 2.5 miles away.
- \* 3. Power connections are with the supplied 12 Volt DC Plug-in Power Supply.

RELAY NOTES

1. RELAY K7 IS A DPDT WITH A 24VDC COIL, 10A CONTACTS (POTTER & BRUMFIELD NO. KRPA11DG-24).
2. RELAY K7 IS SHOWN IN THE NORMAL DE-ENERGIZED STATE (PREEMPT NOT ACTIVE).

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2258  
 DESIGNED: May 2013  
 SEALED: September 30, 2013  
 REVISED: N/A



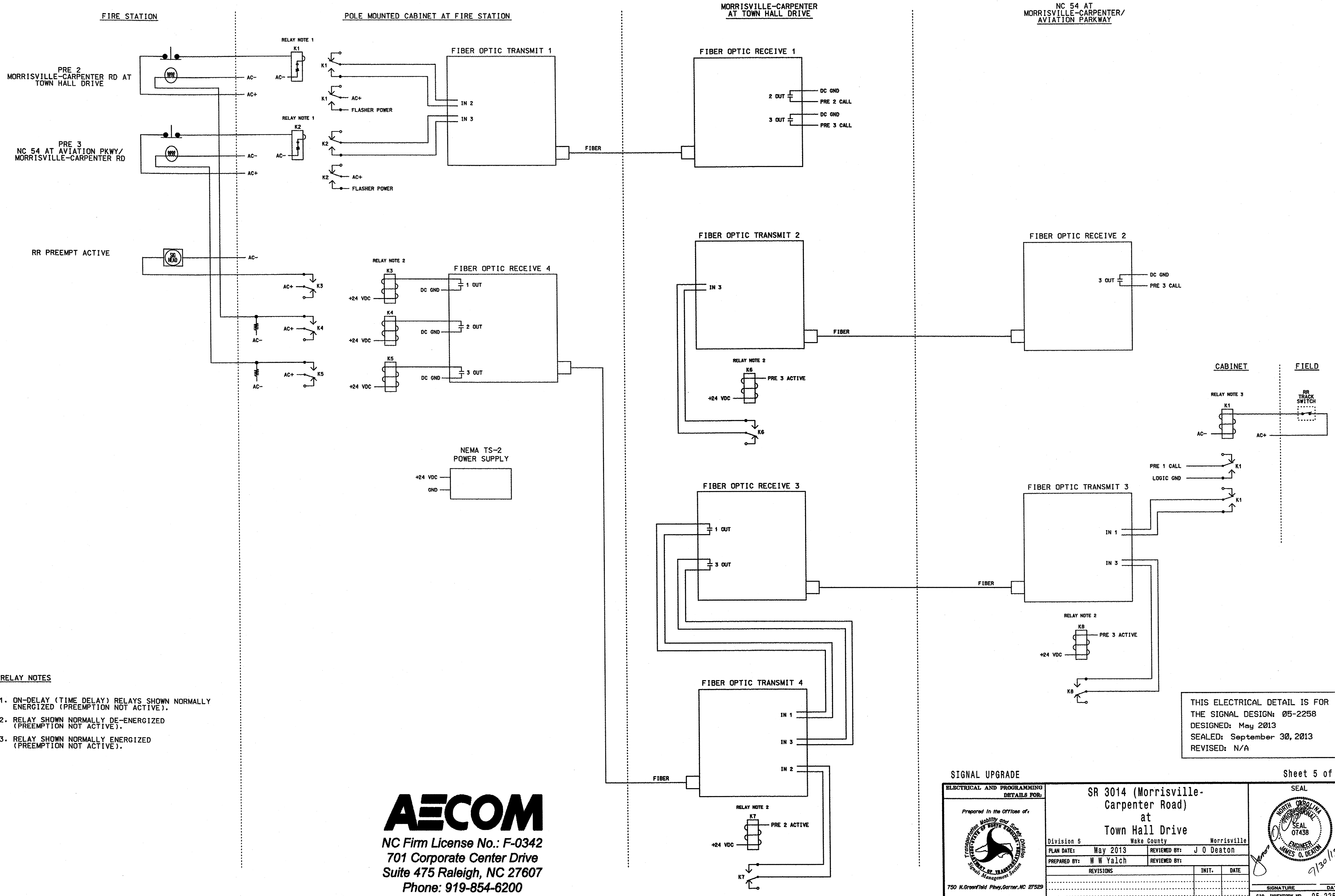
SIGNAL UPGRADE

ELECTRICAL AND PROGRAMMING DETAILS FOR:  Prepared in the Offices of: 750 N. Greenfield Pkwy, Garner, NC 27529	SR 3014 (Morrisville-Carpenter Road) at Town Hall Drive Wake County Morrisville		SEAL 
	Division 5 PLAN DATE: May 2013 PREPARED BY: M W Yalch	REVIEWED BY: J O Deaton REVIEWED BY:	

**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

1: 5116, RN, 01-24-2013, 05:00, Technical Information, D:\rec\_f\1\es460\_MCDTST\TechDes\gpf\1\es460\05-2258-02-160.dgn

[EXISTING] FIBER OPTIC CONTACT CLOSURE SCHEMATIC FOR MORRISVILLE FIRE DEPARTMENT PREEMPT (ON TOWN HALL DRIVE)



RELAY NOTES

1. ON-DELAY (TIME DELAY) RELAYS SHOWN NORMALLY ENERGIZED (PREEMPTION NOT ACTIVE).
2. RELAY SHOWN NORMALLY DE-ENERGIZED (PREEMPTION NOT ACTIVE).
3. RELAY SHOWN NORMALLY ENERGIZED (PREEMPTION NOT ACTIVE).

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2258  
 DESIGNED: May 2013  
 SEALED: September 30, 2013  
 REVISED: N/A

**AECOM**  
 NC Firm License No.: F-0342  
 701 Corporate Center Drive  
 Suite 475 Raleigh, NC 27607  
 Phone: 919-854-6200

SIGNAL UPGRADE

Electrical and Programming Details For:

Prepared in the Offices of:

Wake County

SR 3014 (Morrisville-Carpenter Road) at Town Hall Drive

Division 5

PLAN DATE: May 2013

PREPARED BY: M W Yalch

REVIEWED BY: J O Deaton

750 N. Greenfield Pkwy, Garner, NC 27529

SEAL

Division 5

Wake County

Morrisville

PLAN DATE: May 2013

REVIEWED BY: J O Deaton

PREPARED BY: M W Yalch

REVIEWED BY:

REVISIONS

INIT. DATE

SIGNATURE

DATE

SIG. INVENTORY NO. 05-2258

Sheet 5 of 5

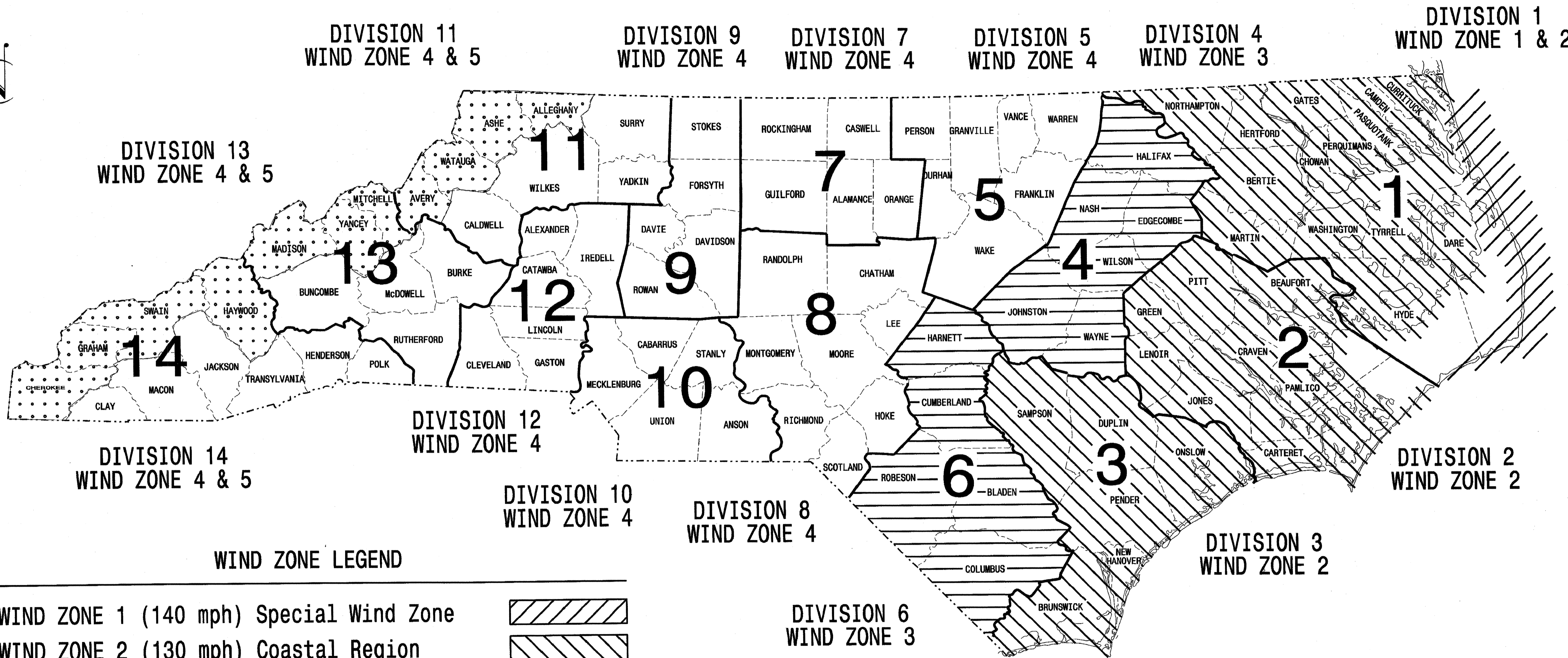
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**NCDOT METAL POLE STANDARDS**

**STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS**

STATE	PROJECT NO.	SHEET NO.
N.C.	P-5201	Sig. 37
F. A. PROJ. NO.	M 1	
PROJECT ID. NO.		

**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

**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	Standard Strain Poles

**NCDOT CONTACTS:**

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

G. A. FULLER, P.E. - STATE ITS AND SIGNALS ENGINEER

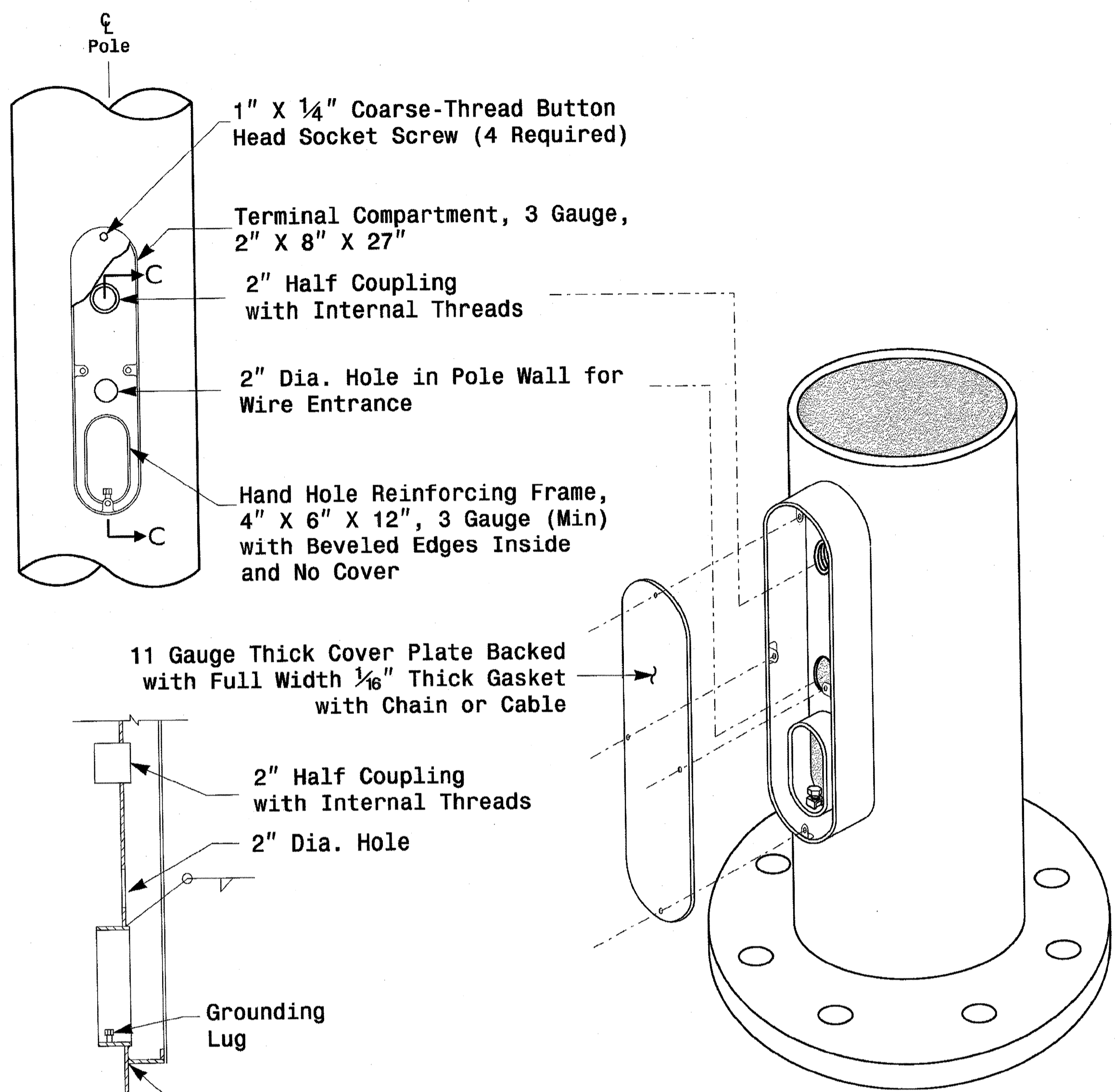
G. G. MURR, JR., P.E. - STATE SIGNALS ENGINEER

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

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

SEAL

D. Sarkar 8.7.2013  
SIGNATURE DATE



Section C-C Note: Unless otherwise specified, locate Terminal Compartment 1 foot above the pole base plate at 180 degrees on the pole's radial index.

**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 _____	

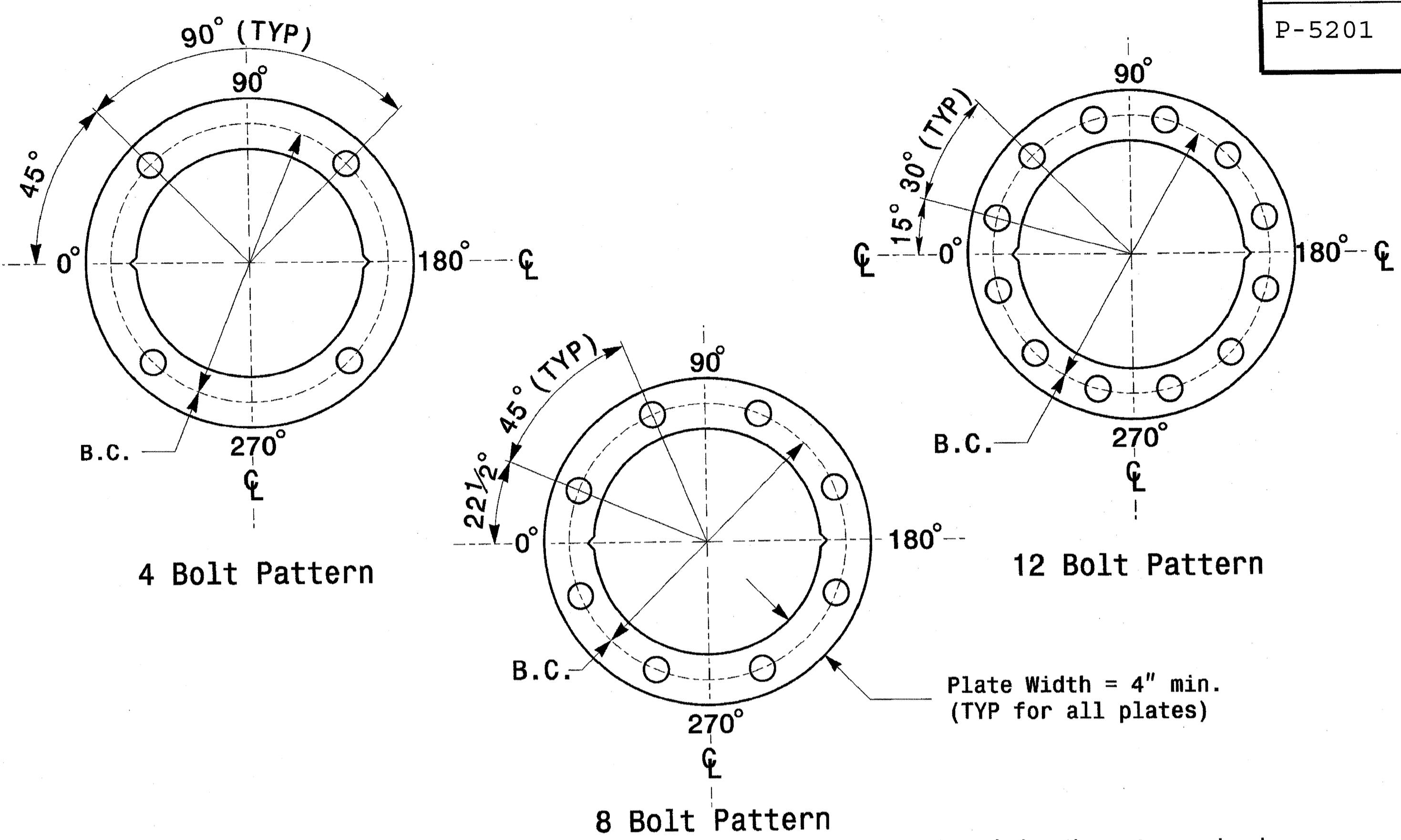
Shaft I.D. Tag (Provide on Strain Poles and Mast Arm Poles)

- 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.

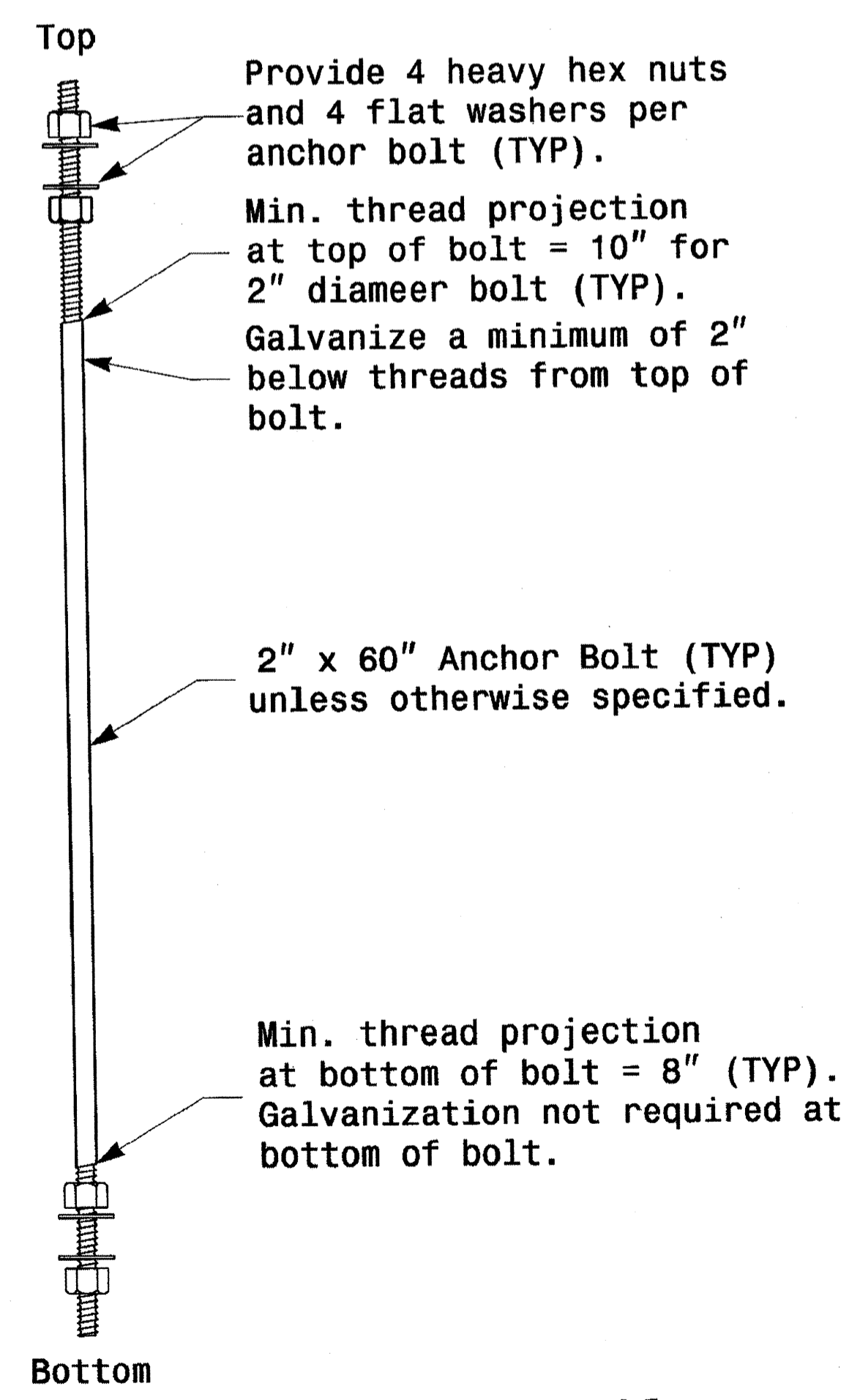
**Identification Tag Details**

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

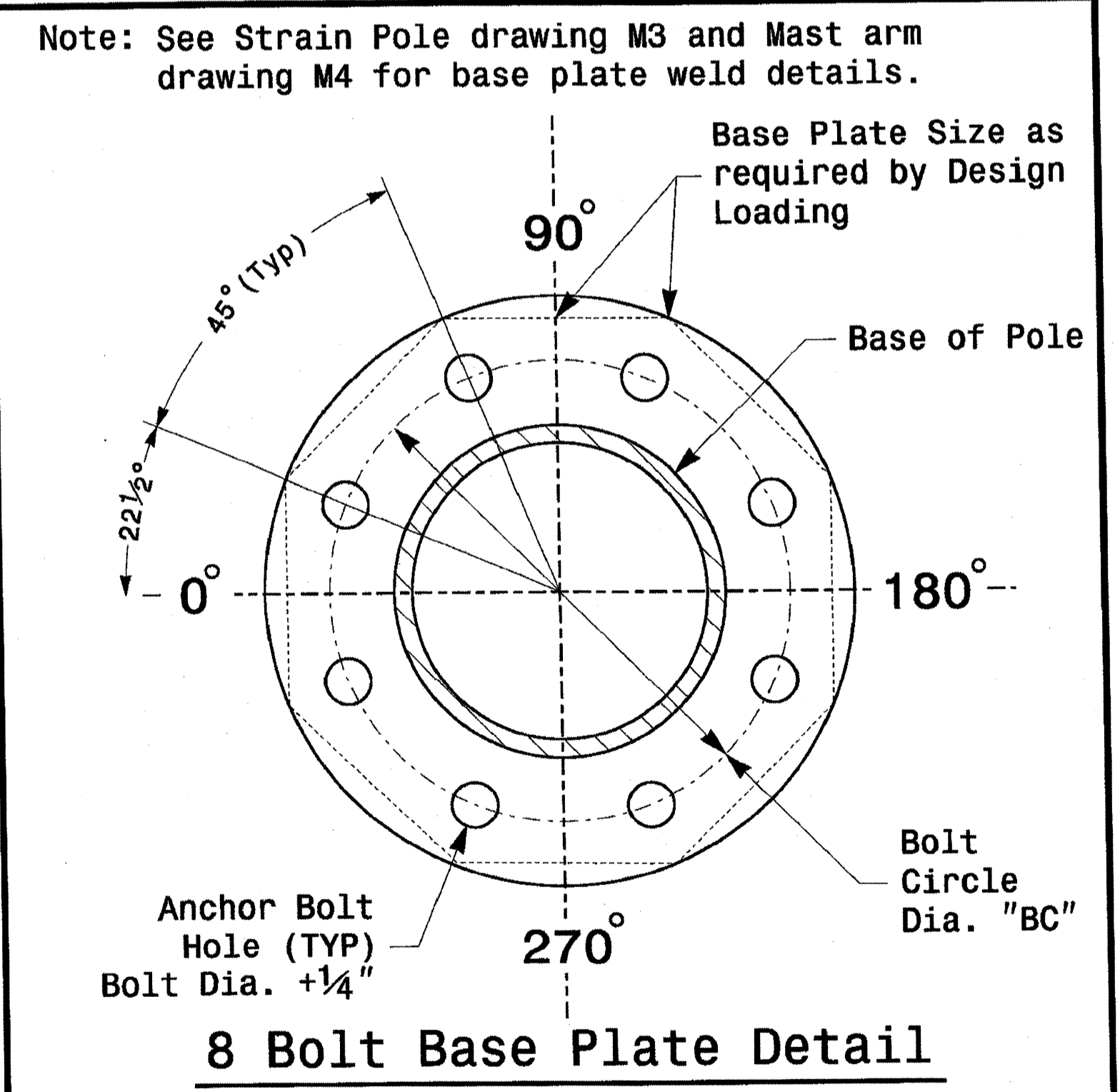
Arm I.D. Tag (Provide on each section of a multi-section mast arm)



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



**Anchor Bolt Detail**

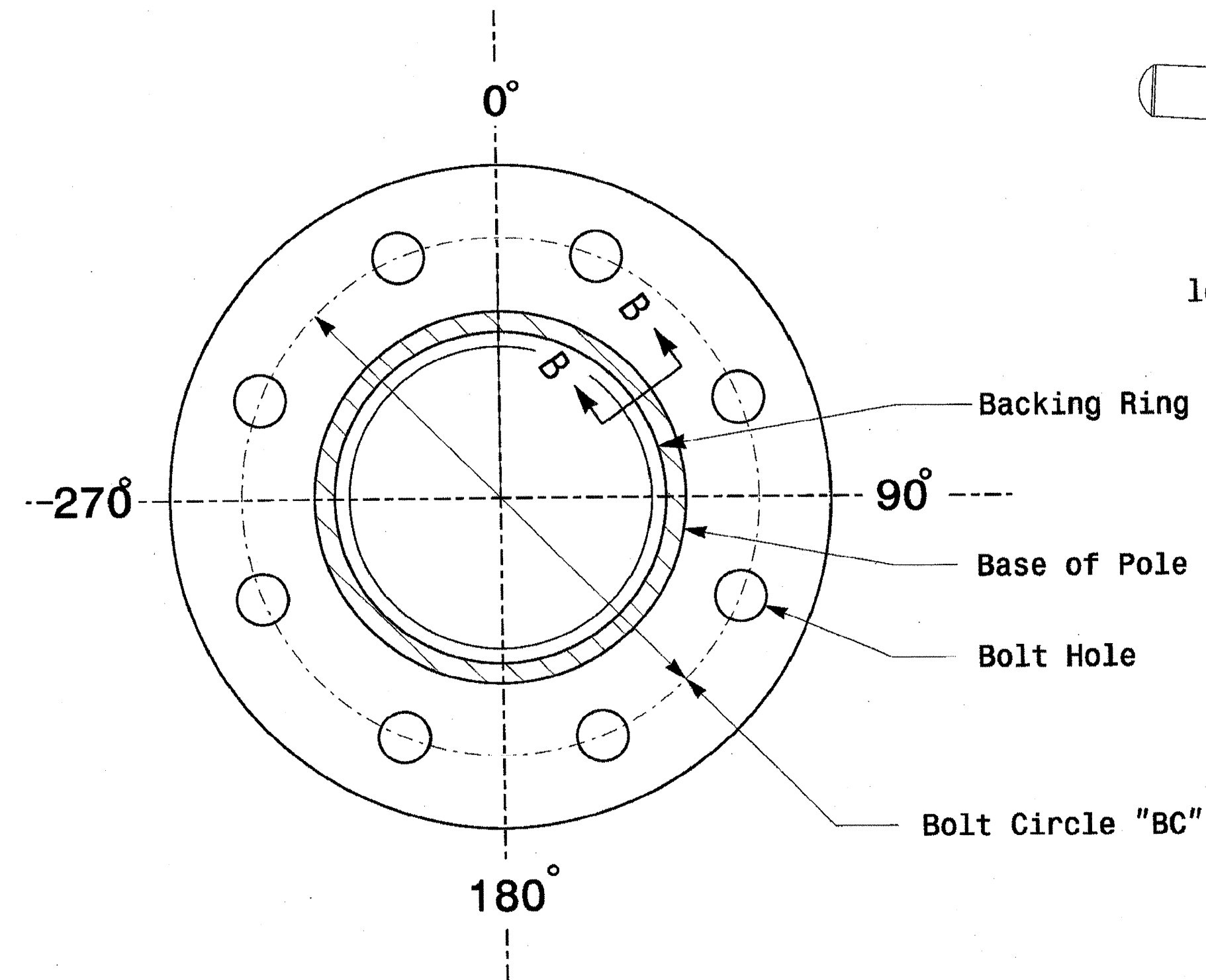


**8 Bolt Base Plate Detail**

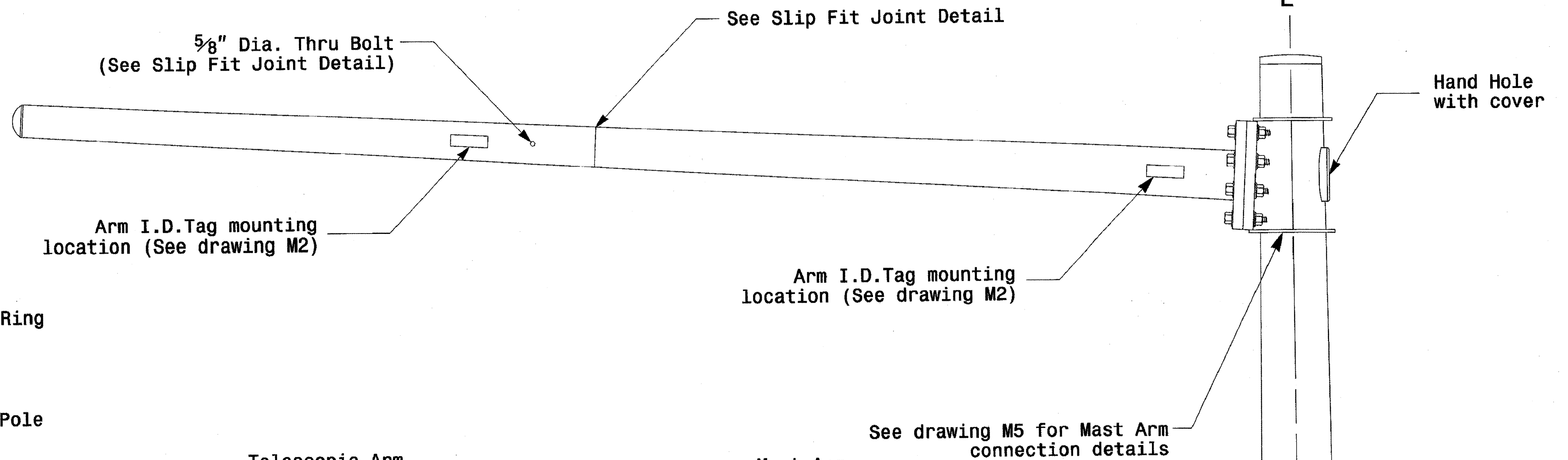
	<p>Typical Fabrication Details Common To All Metal Poles</p>		
	<p>PLAN DATE: AUGUST 2013 DESIGNED BY: C.F. ANDREWS</p> <p>PREPARED BY: N. BITTING REVIEWED BY: D.C. SARKAR</p>	<p>REVISIONS</p>	
<p>730 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>SCALE: 0 NA NONE</p>	<p>SIGNATURE: N. Sarkar DATE: 8-7-2013</p>	<p>SEAL INVENTORY NO.</p>

07-AUG-2013 13:15 SS:HTS:SUMITS:SignalStructureDrawings02 Standard Strain Pole Design 2012.m2.dgn

**Fabrication Details - All Poles**

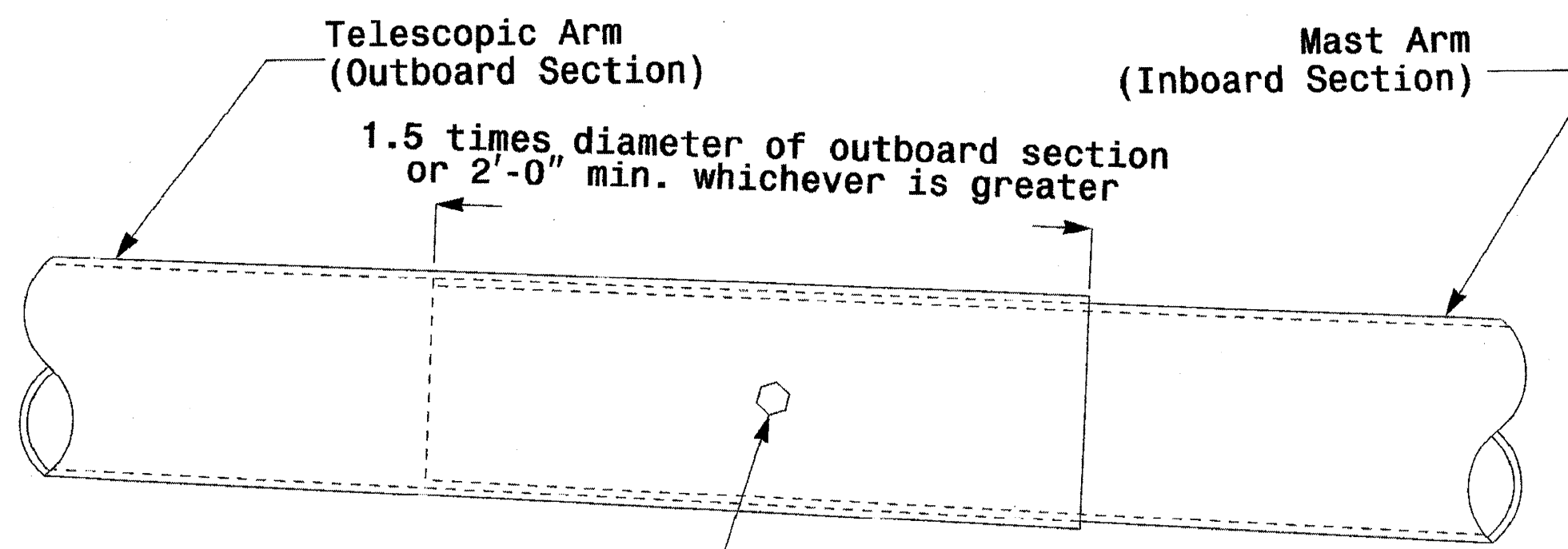


Section A-A  
(See drawing M 2)  
**Pole Base Plate**



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

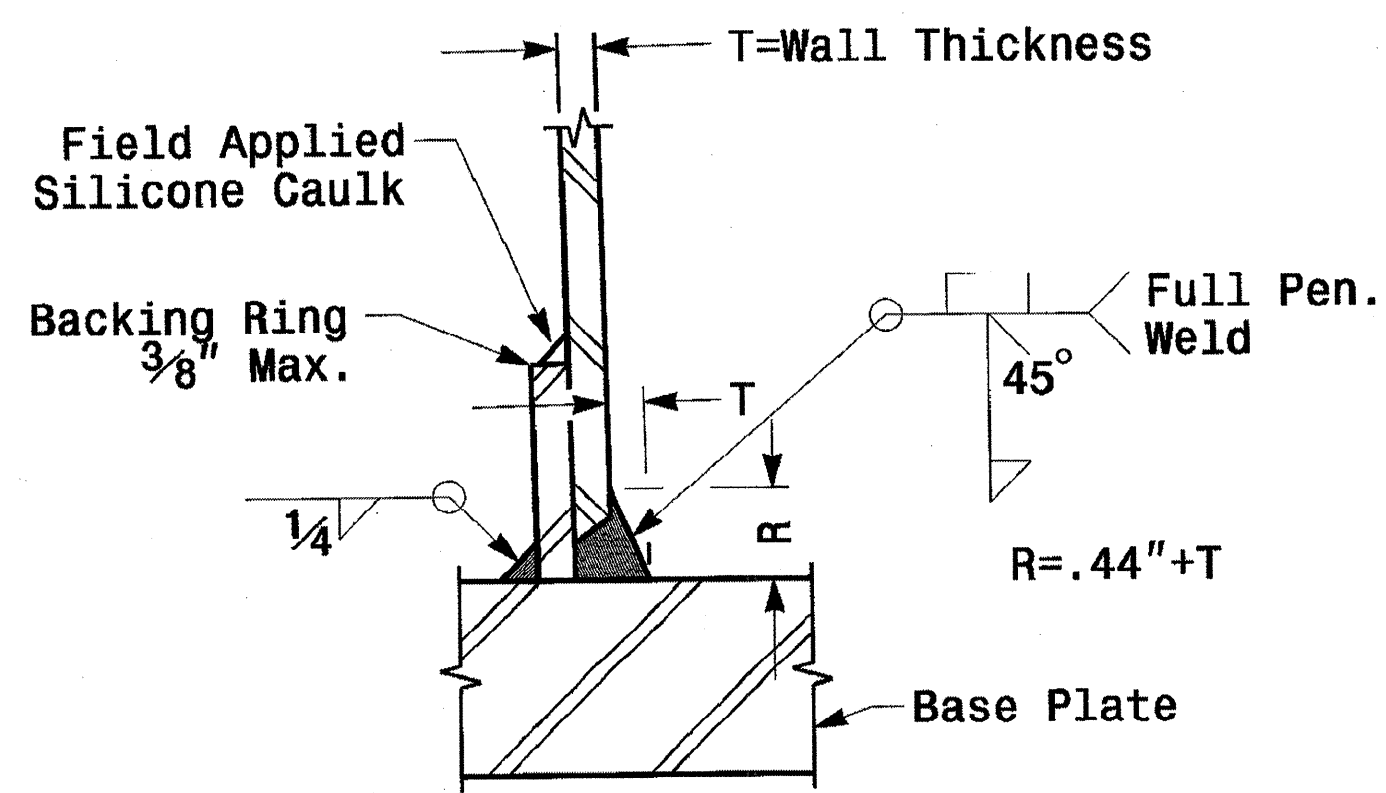
**Slip Fit Joint Detail for Mast Arm**



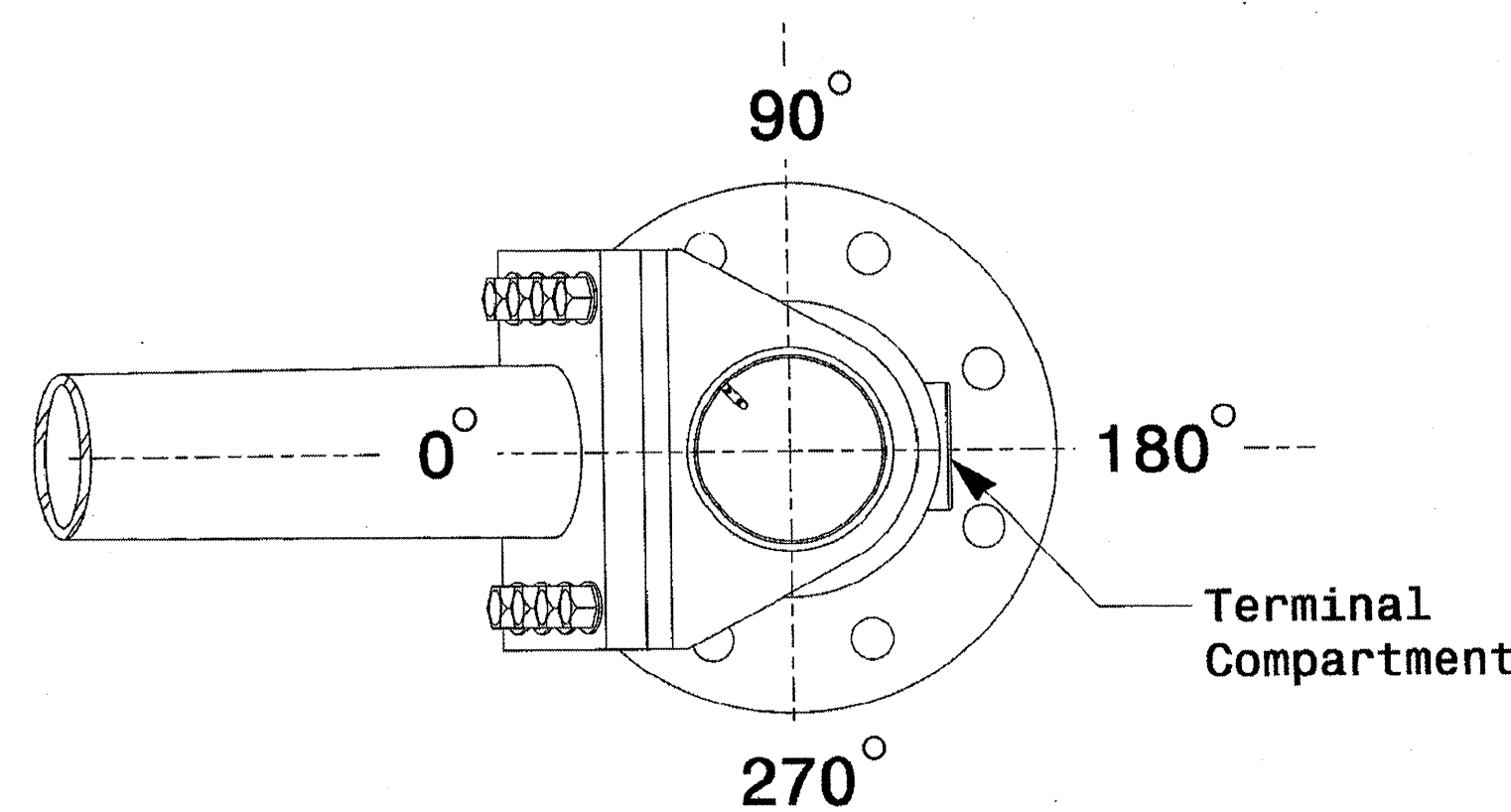
See drawing M5 for Mast Arm connection details

Terminal Compartment (See drawing M2)

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



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



**Mast Arm Radial Orientation**

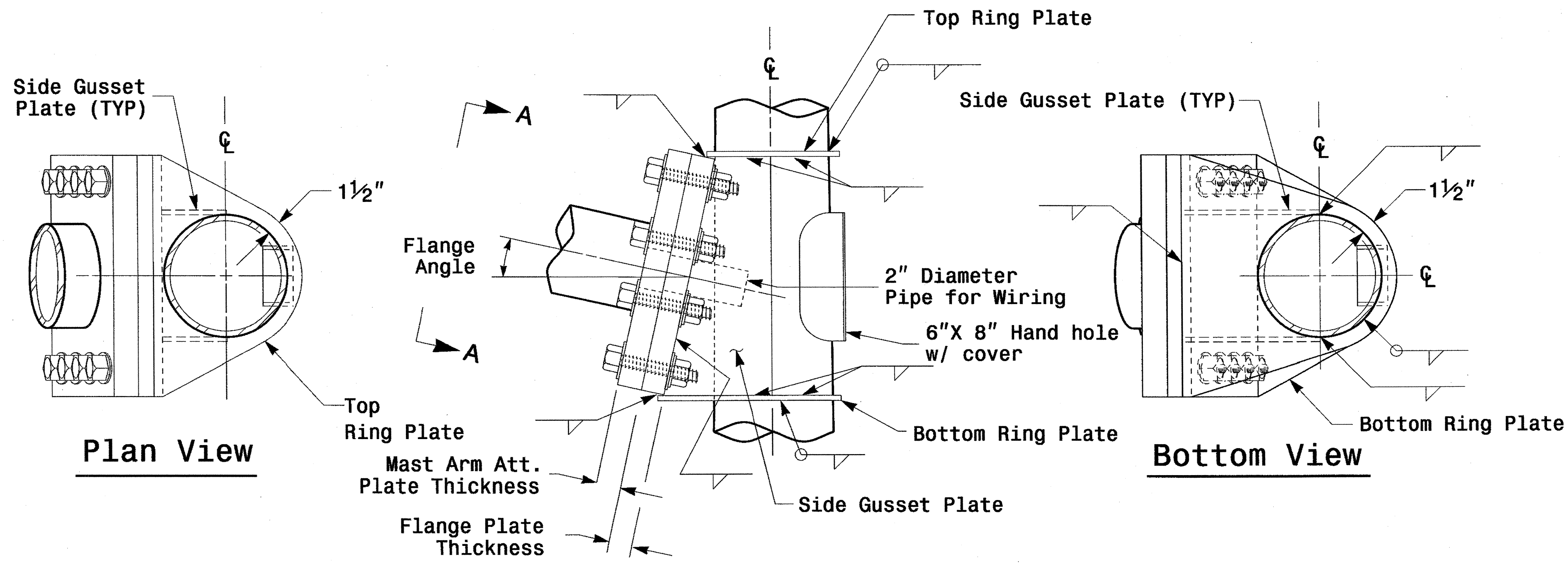
	<b>Typical Fabrication Details for Mast Arm Poles</b>		
	PLAN DATE: AUGUST 2013 PREPARED BY: N. BITTING REVISIONS:	DESIGNED BY: C.F. ANDREWS REVIEWED BY: D.C. SARKAR INIT. DATE	

07-AUG-2013 13:35 S:\15\AS\15\15 Signal\work\p\p\structures\Drawings\2012 Standard Strain Pole Drawings\2012 del-dp.dwg

**Fabrication Details - Mast Arm Poles**

# Welded Ring Stiffened Mast Arm Connection

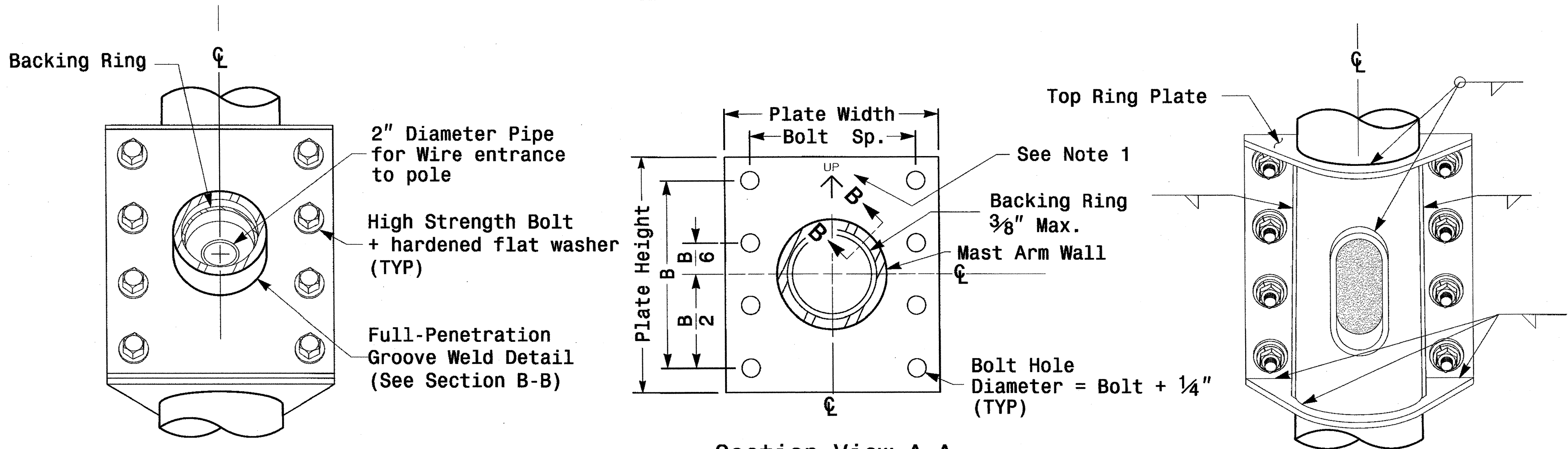
0422DEL\_P19



**Plan View**

**Side Elevation View**

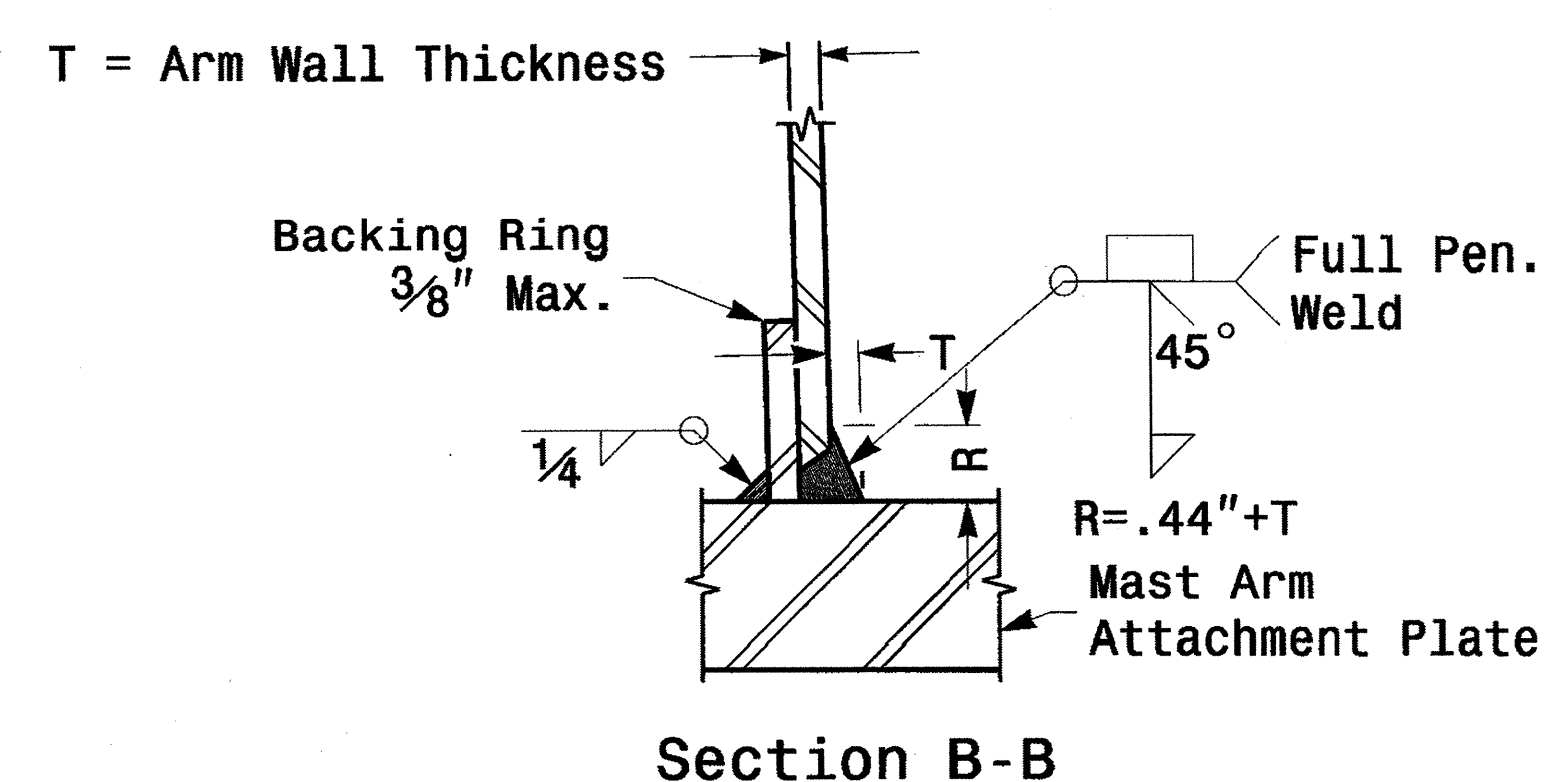
**Bottom View**



**Front Elevation View**

**Mast Arm Attachment Plate**

**Back Elevation View**



**Section B-B  
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.

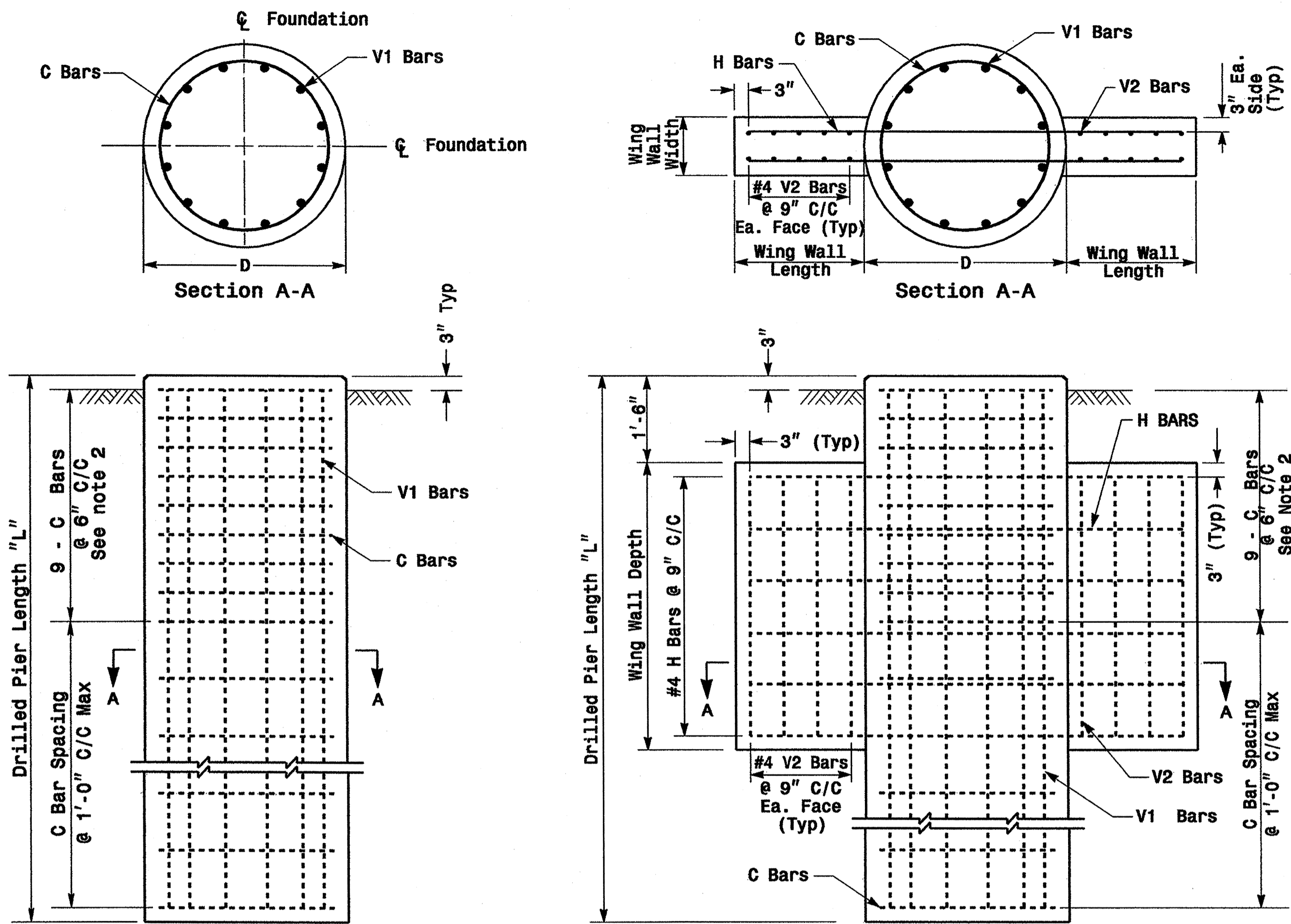
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S:\115\SUM\115 51\p\115\workgroups\structures\Drawings\2012 Standard Strain Pole Dwgset\2012\_m5.dgn  
N.BITTING

	<p><b>Fabrication Details For Mast Arm Connection To Pole</b></p>	<p>SEAL</p>				
<table border="1" style="width: 100%; font-size: 8px;"> <tr> <td>PLAN DATE: AUGUST 2013</td> <td>DESIGNED BY: C.F. ANDREWS</td> </tr> <tr> <td>PREPARED BY: N. BITTING</td> <td>REVIEWED BY: D.C. SARKAR</td> </tr> </table>		PLAN DATE: AUGUST 2013	DESIGNED BY: C.F. ANDREWS	PREPARED BY: N. BITTING	REVIEWED BY: D.C. SARKAR	<p style="font-size: 8px;">Signature: <i>D. Sarkar</i> 8.7.2013 DATE</p>
PLAN DATE: AUGUST 2013	DESIGNED BY: C.F. ANDREWS					
PREPARED BY: N. BITTING	REVIEWED BY: D.C. SARKAR					
<p style="font-size: 8px;">SCALE: 0 NA NONE</p>						
<p style="font-size: 8px;">Prepared in the Offices of: Tribal Mobility and Safety Division Department of Transportation State of Florida Special Design Section 750 N. Greenfield Pkwy, Garner, NC 27529</p>		<p style="font-size: 8px;">SIG. INVENTORY NO.</p>				

Fabrication Details – Mast Arm Poles



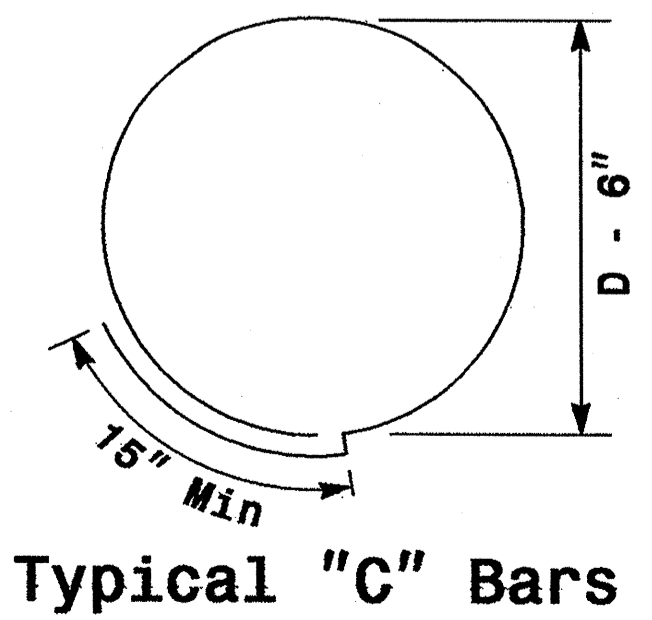
### Reinforcing Steel Bars



**REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (42" & 48" DIAMETER)**

Shaft Dia (in.)	Conc. Volume (cu. yds.)	Bar Name	No.	Size	Type	Length
42"	.356 x L	V1	9	#8	STR.	**
		C	*	#4	CIR.	10'-9"
48"	.465 x L	V1	12	#8	STR.	**
		C	*	#4	CIR.	12'-6"

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



Typical "C" Bars

**REINFORCING STEEL TABLE FOR STANDARD 42" and 48" DRILL PIER SHAFT WITH TYPE 1 AND TYPE 2 WING WALLS**

Wing Wall Type	Drill Pier Shaft Dia. (in.)	Reinforcing Steel				
		Bar Name	No.	Size	Type	Length
TYPE 1	42"	V1	9	#8	STR.	**
		V2	12	#4	STR.	2'-6"
		H	8	#4	STR.	6'-0"
		C	*	#4	CIR.	10'-9"
TYPE 2	42"	V1	9	#8	STR.	**
		V2	16	#4	STR.	4'-6"
		H	12	#4	STR.	9'-0"
		C	*	#4	CIR.	10'-9"
TYPE 2	48"	V1	12	#8	STR.	**
		V2	16	#4	STR.	4'-6"
		H	12	#4	STR.	9'-6"
		C	*	#4	CIR.	12'-6"

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

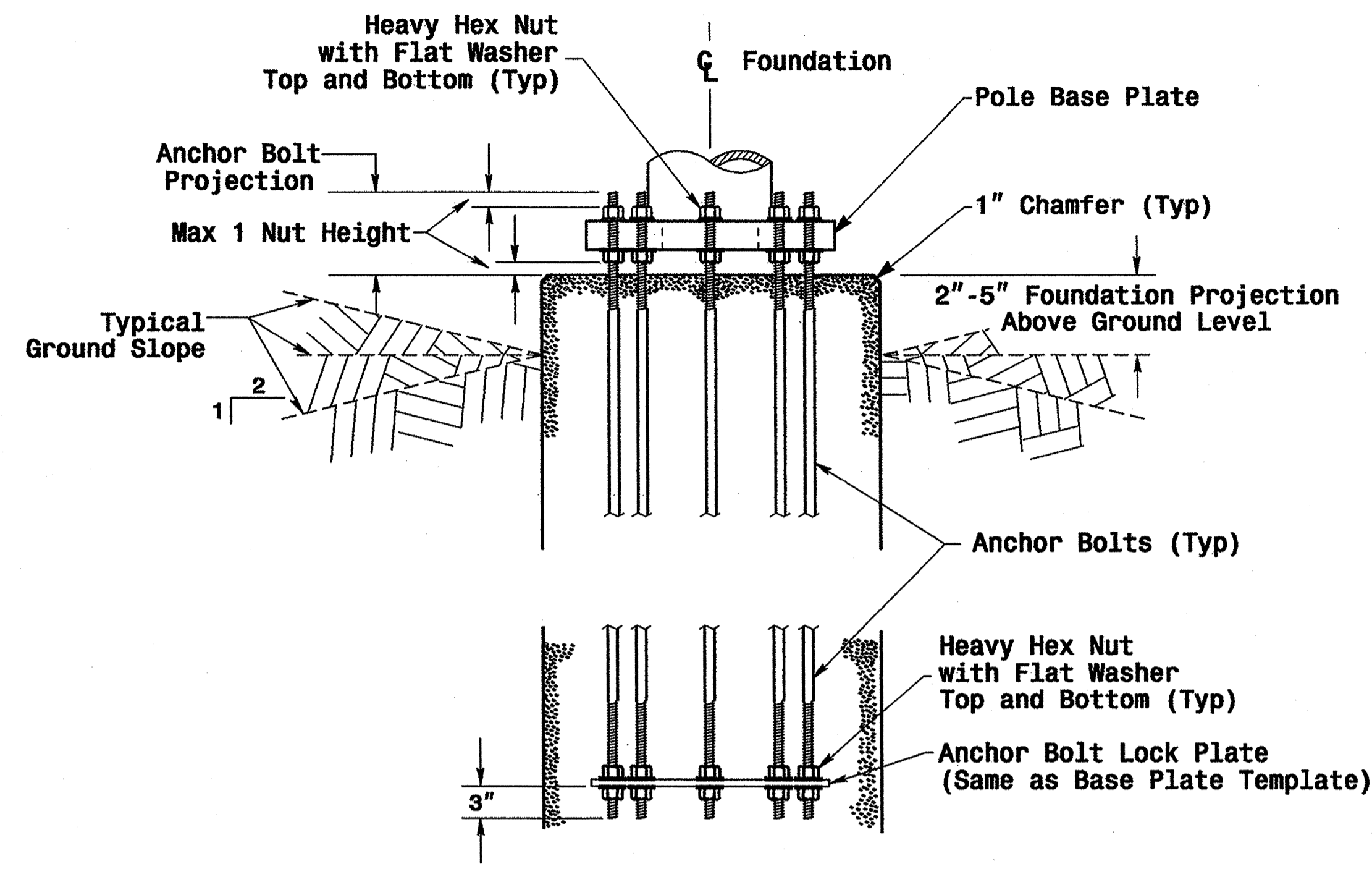
**WING WALL DETAILS**

Wing Wall Type	Wing Wall Length (Ft.)	Wing Wall Width (Ft.)	Wing Wall Depth (Ft.)	Concrete Volume (Cu. Yds.)
TYPE 1	1'-6"	1'-0"	3'-0"	.4
TYPE 2	3'-0"	1'-0"	5'-0"	1.2

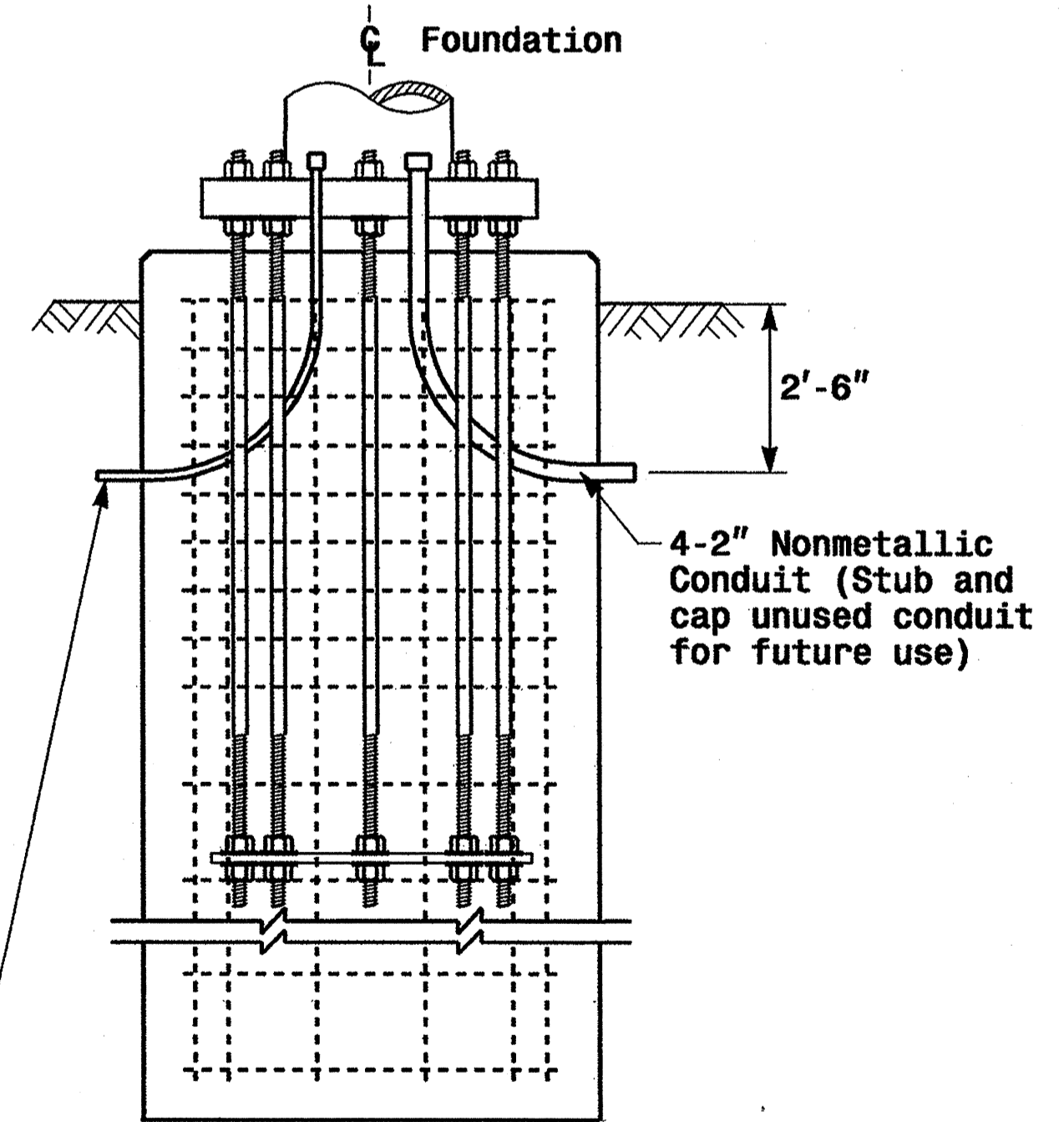
See Note No. 4

### 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. For standard foundations, see sheet M 8.
- 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 sheet M 8.
- The quantities for steel and concrete shown in the Wing Wall Details Chart reflect the amount of material for 1 pair of wing walls (2 wing walls per drilled pier shaft.)

Construction Details - Foundations

Prepared in the Office of:

**Construction Details Foundations**

PLAN DATE: May 2005 REVIEWED BY: P.L. ALEXANDER  
 PREPARED BY: C.F. ANDREWS REVIEWED BY: A.W. ESPOSITO

SCALE: 0 NA NONE

SIGNATURE: *D. Sarkar* 9.2.2005  
 DATE: \_\_\_\_\_  
 SIG. INVENTORY NO. \_\_\_\_\_