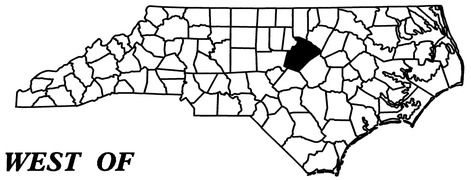
Project No.	Sheet No.
U-4432	Sig. 1

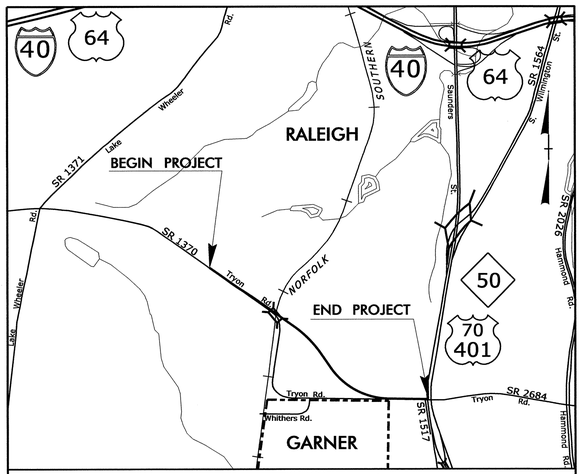
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

WAKE COUNTY



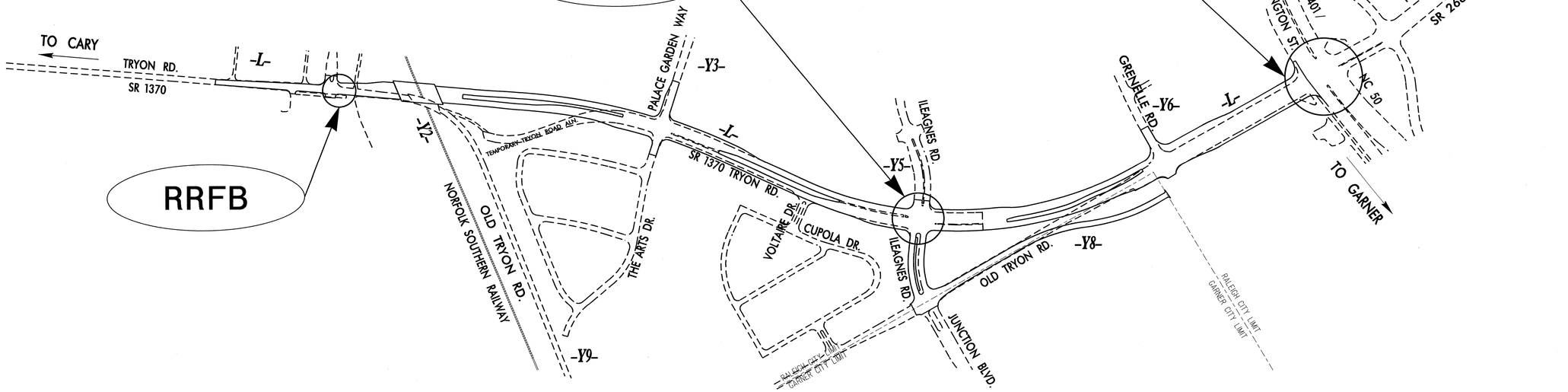
LOCATION: RALEIGH – SR 1370 (TRYON ROAD) FROM WEST OF BRIDGE No. 259 TO US 70–401 /NC 50 (WILMINGTON STREET)

TYPE OF WORK: TRAFFIC SIGNALS AND COMMUNICATION CABLE



VICINITY MAP

NAD 83/ NSRS 2007



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

Index of Plans

Sheet #	Reference #	Location/Description
Sig. 1	---------	Title Sheet
N/A	RRFB	Rectangular Rapid Flashing Beacon (See Sheet TMP 4A)
Sig. 2–7	05–0068	SR 1370 (Tryon Road) at Ileagnes Road
Sig. 8–11	05–0151	US 70–401/NC 50 (S. Wilmington St.) at SR 1370/SR 2684 (Tryon Rd.)
Sig. 12–17	N/A	Standard Drawings for Metal Poles
Sig. 18–21	N/A	Communications Cable and Conduit Routing Plans

INTELLIGENT TRANSPORTATION AND SIGNALS UNIT

Contacts:

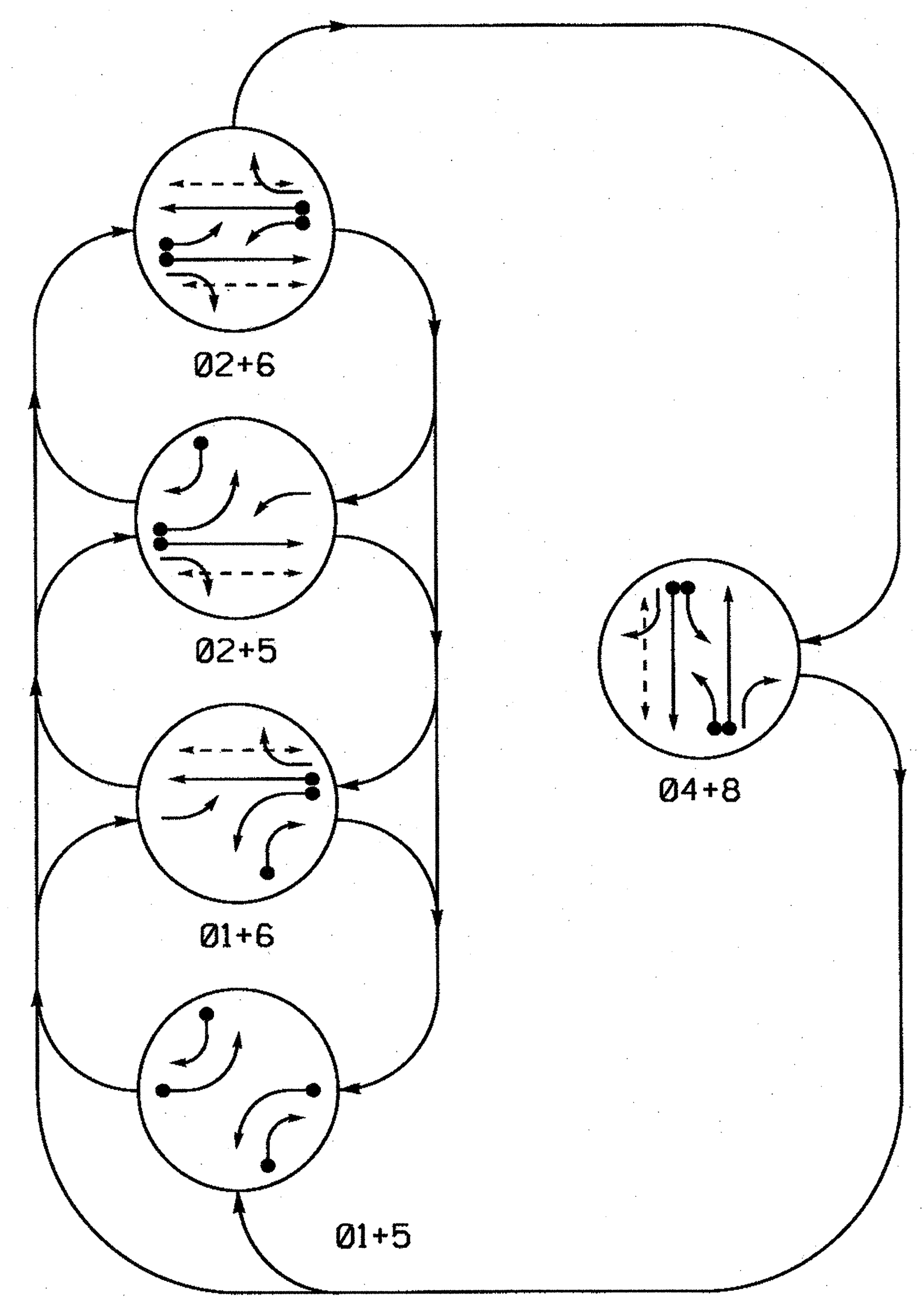
Robert J. Ziemba, PE – Cental Region Signals Engineer
George C. Brown, PE – Signal Equipment Design Engineer
I. Neil Avery – Signal Communications Project Engineer

Prepared In the Office of:
DIVISION OF HIGHWAYS
TRANSPORTATION MOBILITY AND SAFETY BRANCH
Signal Design Section
750 N. Greenfield Parkway, Garner, NC 27529

TIP PROJECT: U-4432

WBS: 35029.1.2

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	←F/Y	←F/Y	←R	←Y
21, 22	R	R	G	G	R	Y
41	R	R	R	R	G	R
42	R/→	R	R/→	R	G	R
51	←	←F/Y	←	←F/Y	←R	←Y
61, 62	R	G	R	G	R	Y
81	R	R	R	R	G	R
82	R/→	R/→	R	R	G	R
P21, P22	DW	DW	W	W	DW	DRK
P41, P42	DW	DW	DW	DW	W	DRK
P61, P62	DW	W	DW	W	DW	DRK

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

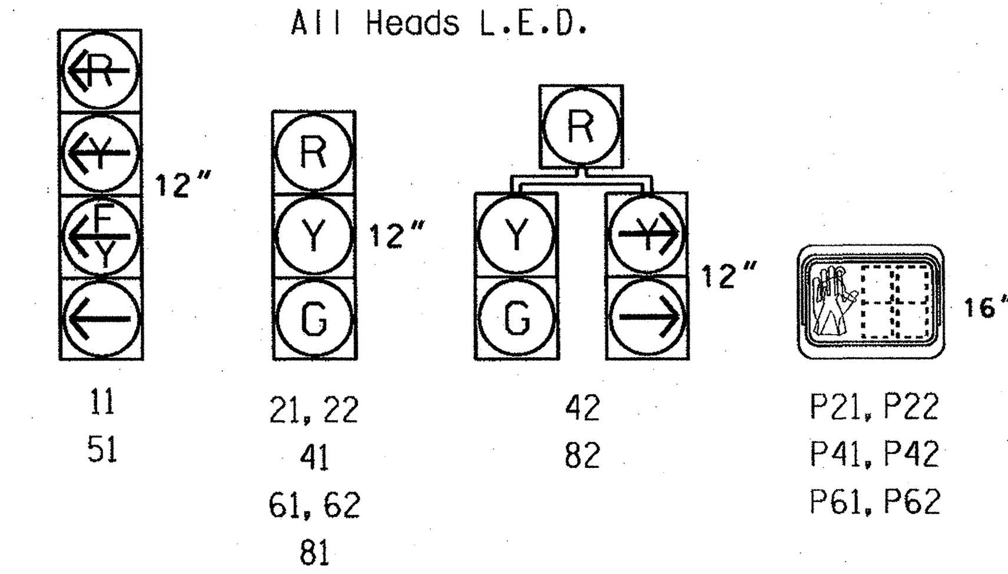
LOOP & DETECTOR UNIT INSTALLATION CHART

SE-PAC 2070 CONTROLLER WITH 170 CABINET

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	ASSIGNED PHASE	DELAY	EXTEND (STRETCH)	0 VEHICLE	1 PEDESTRIAN	2 1 CALL	3 STOP A	4 STOP B	5 PROT/PER LEFT	6 PROT/PER THROUGH	7 AND	SWITCH	SYSTEM LOOPS	STATUS NEW	STATUS EXISTING
1A	6X40	2-4-2	0	X	-	1	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
						6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
1B	6X40	2-4-2	0	X	-	1	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
2A	6X6	4	300	X	-	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
4A	6X40	2-4-2	0	X	-	4	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
4B	6X40	2-4-2	0	X	-	4	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
5A	6X40	2-4-2	0	X	-	5	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
						2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
5B	6X40	2-4-2	0	X	-	5	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
6B	6X6	4	300	X	-	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
8A	6X40	2-4-2	0	X	-	8	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
8B	6X40	2-4-2	0	X	-	8	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-

SIGNAL FACE I.D.

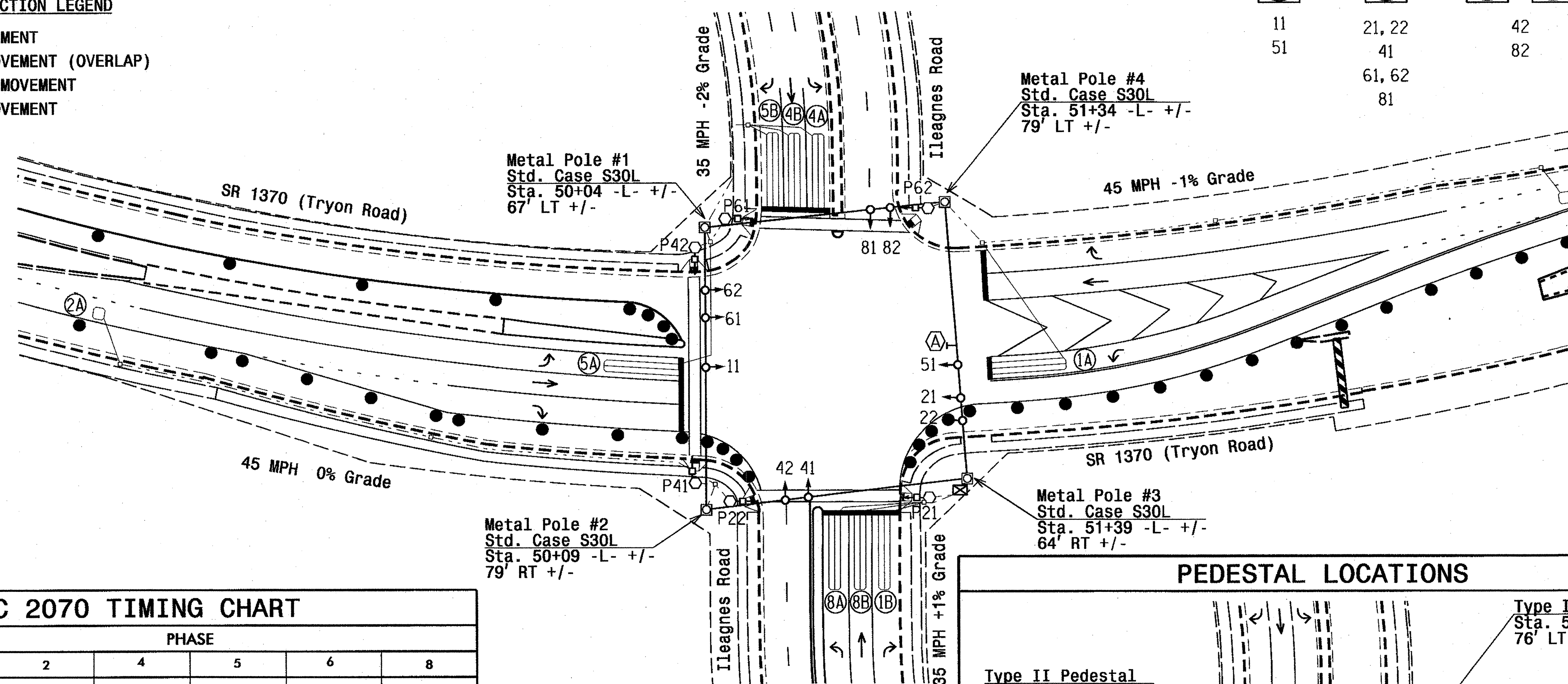
All Heads L.E.D.



5 Phase
Fully Actuated
(Raleigh Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Set all detector units to presence mode.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
8. Install pedestrian pushbuttons in accordance with section 4E.08 of the 2009 MUTCD.
9. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

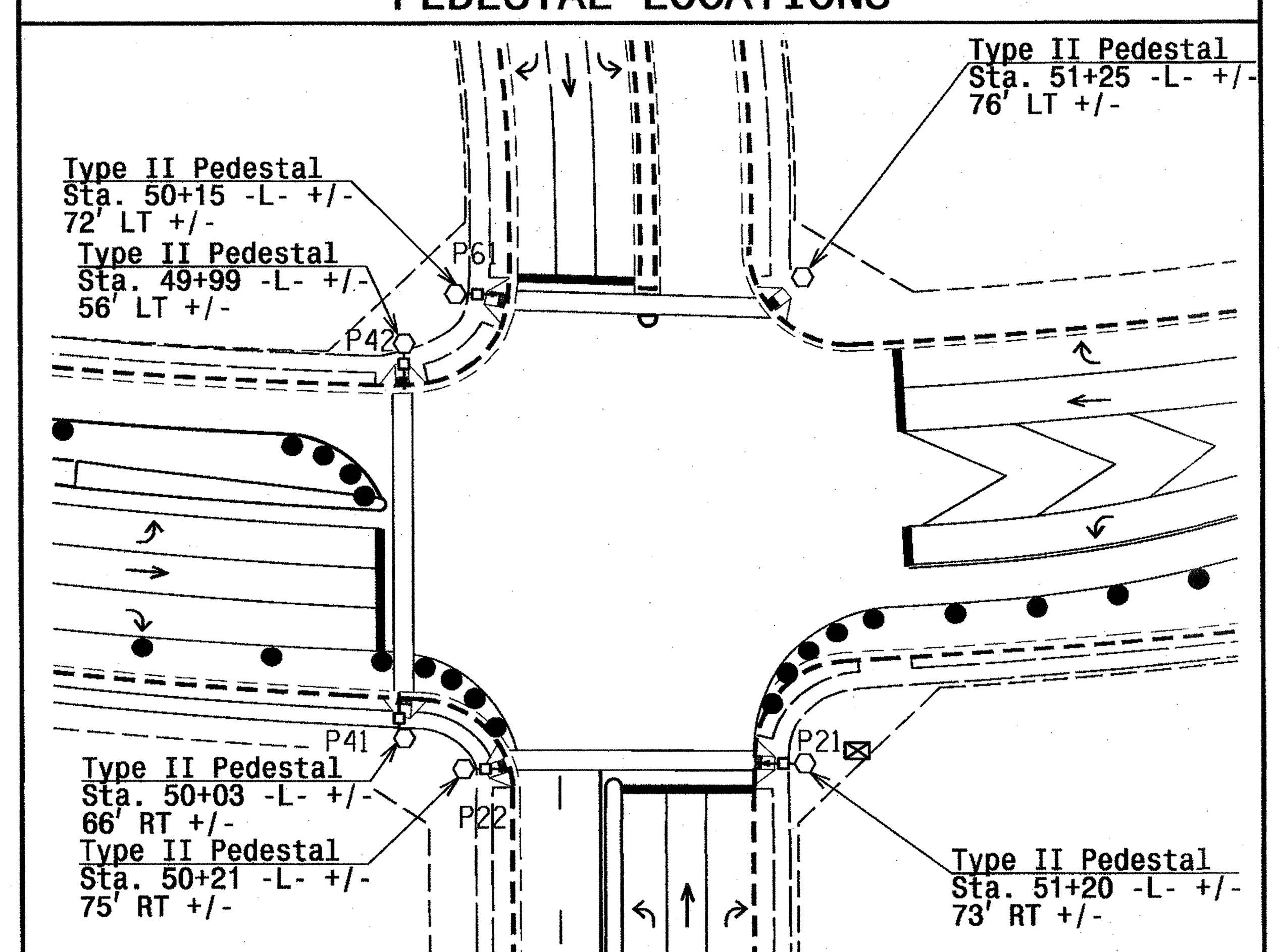
PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Metal Strain Pole	
N/A	Wheelchair Ramp	
	Signal Pedestal	
	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	

SE-PAC 2070 TIMING CHART

FEATURE	Phase 1	Phase 2	Phase 4	Phase 5	Phase 6	Phase 8
Min Green *	7	12	7	7	12	7
Passage Gap *	2.0	6.0	2.0	2.0	6.0	2.0
Maximum Green *	20	60	30	20	60	30
Yellow Change	3.0	4.6	4.0	3.0	4.6	3.8
Red Clear	3.5	2.3	2.9	3.6	2.3	3.1
Walk *	-	7	7	-	7	-
Pedestrian Clear	-	17	26	-	17	-
Added Initial *	-	1.5	-	-	1.5	-
Maximum Initial *	-	34	-	-	34	-
Time Before Reduction *	-	20	-	-	20	-
Time To Reduce *	-	40	-	-	40	-
Minimum Gap	-	3.0	-	-	3.0	-
Recall Mode	-	MIN RECALL	-	-	MIN RECALL	-
Vehicle Call Memory	NON-LOCK	LOCK	NON-LOCK	NON-LOCK	LOCK	NON-LOCK
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON	ON

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

PEDESTAL LOCATIONS



New Installation - Temporary Design (TMP Phase II)

Prepared In the Offices of: Transportation Mobility and Safety Division, Signal Design Section
750 N.Greenfield Pkwy.Garner.NC 27529

SR 1370 (Tryon Road)
at
Ileagnes Road

Division 5 Wake County Raleigh

PLAN DATE: August 2013 REVIEWED BY:
PREPARED BY: I. O. Umozurike REVIEWED BY:

SCALE 0 50 1"=50'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 10/11/13 DATE
SIG. INVENTORY NO. 05-0068T

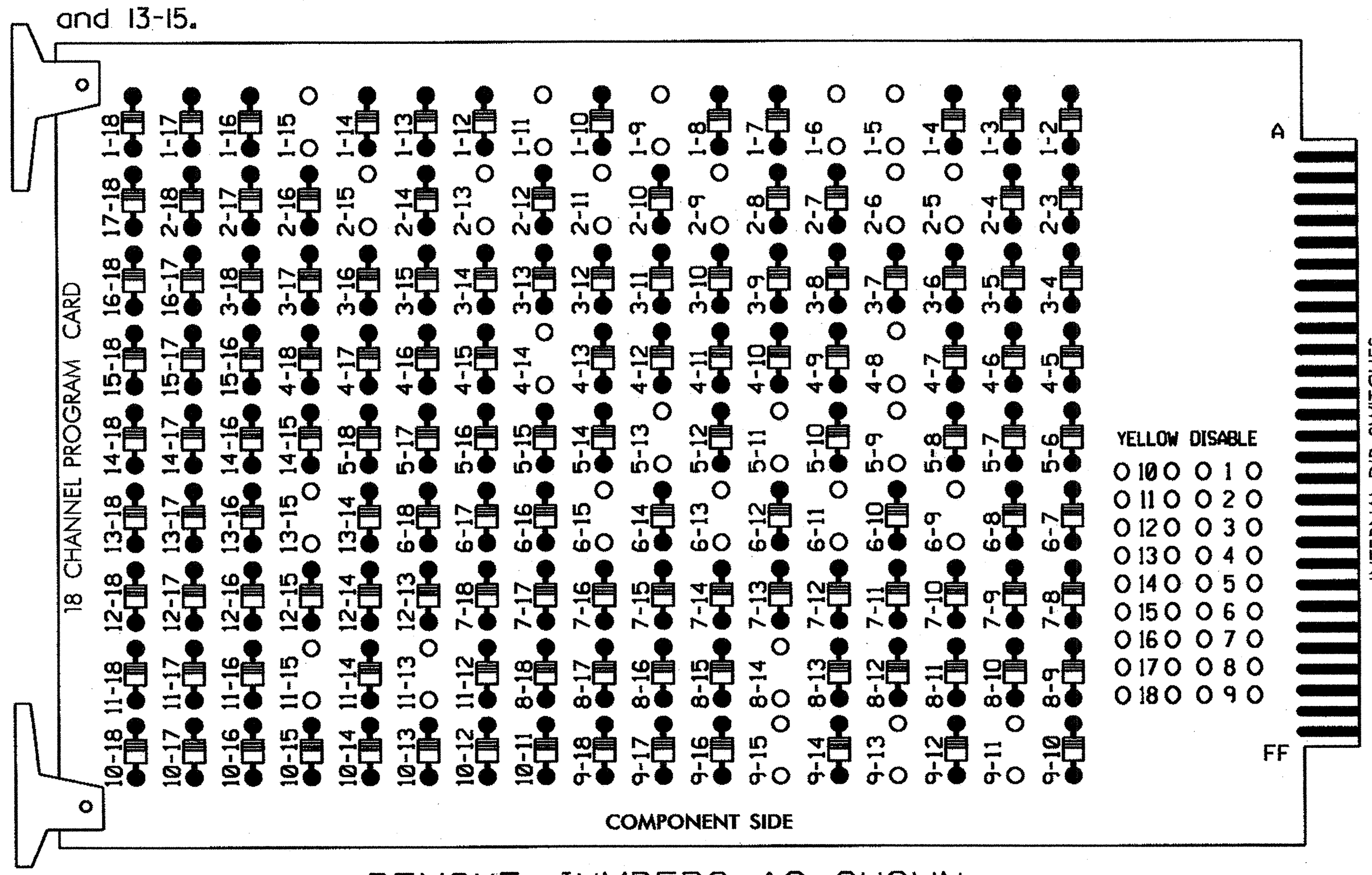
24-OCT-2013 11:18
R:*Traffic*Signals*Design*Signals*05-0068*050068T_sig_dsn_20131011.dgn
ioumozurike

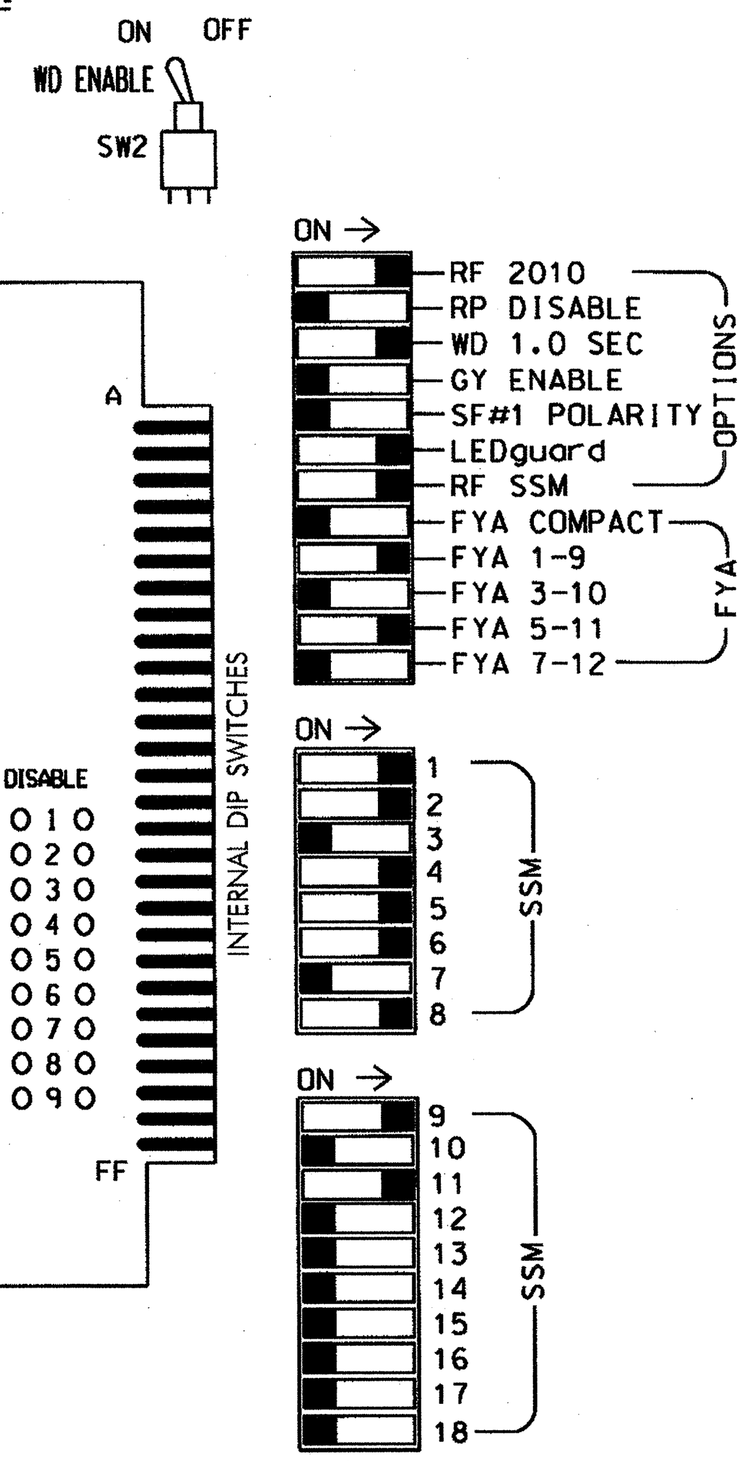
PROJECT REFERENCE NO.	SHEET NO.
U-4432	Sig. 3

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 1-15, 2-5, 2-6, 2-9, 2-11, 2-13, 2-15, 4-8, 4-14, 5-9, 5-11, 5-13, 6-9, 6-11, 6-13, 6-15, 8-14, 9-11, 9-13, 9-15, 11-13, 11-15, and 13-15.





■ = DENOTES POSITION OF SWITCH

REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. Program controller to start up in phases 2 and 6 green.
3. Enable simultaneous gap-out feature, on controller unit, for all phases.
4. Program phases 4 and 8, on controller unit, for dual entry.
5. Program phases 2 and 6, on controller unit, for volume density operation.
6. The cabinet and controller are part of the Raleigh City Signal System.

EQUIPMENT INFORMATION

CONTROLLER..............2070L
CABINET.................332 /W/ AUX
SOFTWARE................SE-PAC2070
CABINET MOUNT...........BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED......S1,S2,S3,S5,S6,S7,S8,S9,S11, AUX S1,AUX S4
PHASES USED.............1,2,2 PED,4,4 PED,5,6,6 PED,8
OVERLAP "A".............*
OVERLAP "B".............NOT USED
OVERLAP "C".............*
OVERLAP "D".............NOT USED

* See sheet 2 for Overlap and Protected & Permissive Phases programming.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S3	S4	S5	S6	S7		S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1		2	13	3	4	14	5		6	15	7	8	16	9	10	17	11	12	18
PHASE	1		2	2 PED	3	4	4 PED	5		6	6 PED	7	8	8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	11★	82	21,22	P21, P22	NU	41,42	P41, P42	42	51★	61,62	P61, P62	NU	81,82	NU	11★	NU	NU	51★	NU	NU
RED		✳	128			101		✳		134			107							
YELLOW			129			102				135			108							
GREEN			130			103				136			109							
RED ARROW															A121			A114		
YELLOW ARROW		126						132							A122			A115		
FLASHING YELLOW ARROW															A123			A116		
GREEN ARROW	127	127						133	133											
(DON'T WALK hand)				113			104				119									
(WALK person)				115			106				121									

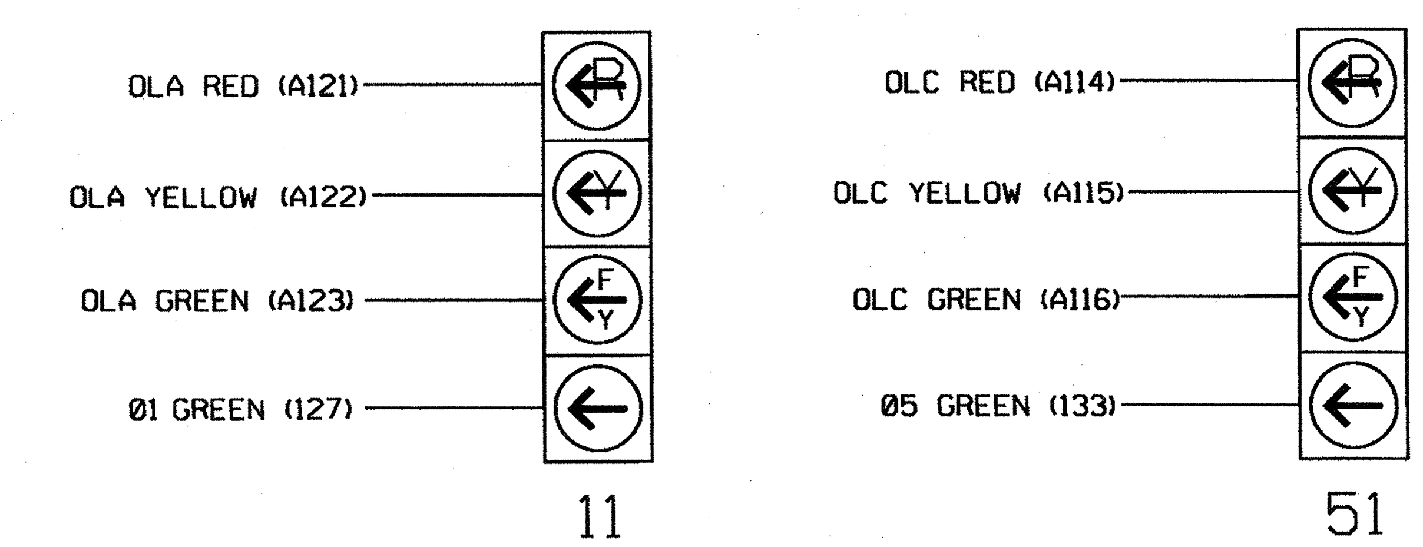
NU = Not Used

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

★ See pictorial of head wiring in detail below.

4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

1. See sheet 2 for Protected & Permissive Phases programming.

INPUT FILE POSITION LAYOUT

(front view)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I" U	Ø1 1A	Ø1 1B	Ø2 2A	WIRED INPUT ⊗	SLOT EMPTY	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø2 PED DC ISOLATOR	Ø6 PED DC ISOLATOR	FS DC ISOLATOR
FILE "I" L	NOT USED	NOT USED	NOT USED			Ø4 4B						Ø4 PED DC ISOLATOR	NOT USED	ST DC ISOLATOR
FILE "J" U	Ø5 5A	Ø5 5B	NOT USED	WIRED INPUT ⊗	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
FILE "J" L	NOT USED	NOT USED	Ø6 6B			Ø8 8B								

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

FS = FLASH SENSE
ST = STOP TIME

⊗ Wired Input - Do not populate slot with detector card

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
1A[1]	TB2-1,2	I1U	56	1	1	15	
	-	J4U	48	25	6		
1B	TB2-5,6	I2U	39	3	1	15	
2A	TB2-9,10	I3U	63	5	2		
4A	TB4-9,10	I6U	41	11	4		
4B	TB4-11,12	I6L	45	12	4		
5A[2]	TB3-1,2	J1U	55	19	5	15	
	-	I4U	47	7	2		
5B	TB3-5,6	J2U	40	21	5	15	
6B	TB3-11,12	J3L	77	24	6		
8A	TB5-9,10	J6U	42	31	8		
8B	TB5-11,12	J6L	46	32	8		
PED PUSH BUTTONS							
P21,P22	TB8-4,6	I12U	67	PED 2	2 PED		
P41,P42	TB8-5,6	I12L	69	PED 4	4 PED		
P61,P62	TB8-7,9	I13U	68	PED 6	6 PED		

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

[1] Add jumper from I1-W to J4-W, on rear of input file.
[2] Add jumper from J1-W to I4-W, on rear of input file.

INPUT FILE POSITION LEGEND: J2L

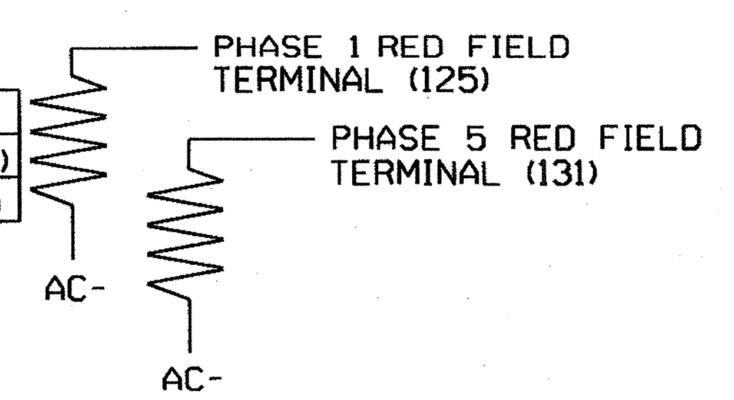
FILE J
SLOT 2
LOWER

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)



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

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: 05-0068T
DESIGNED: August 2013
SEALED: 10/11/13
REVISED: N/A

Electrical Detail - Temp Design - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of: Transportation Mobility and Safety Division, Signals Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

SR 1370 (Tryon Road)
at
Ileagnes Road

Division 5 Wake County Raleigh

PLAN DATE: October 2013 REVIEWED BY: T. J...
PREPARED BY: C. Strickland REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022013 GEORGE C. BROWN

SIGNATURE George C. Brown DATE 10/16/13

SIG. INVENTORY NO. 05-0068T

14-OCT-2013 13:16
S:*ITS&SU*ITS Signals*Workgroups*Sig Man*Strickland*050068_sm_ele_xxx.dgn
cestrickland

PROJECT REFERENCE NO.	SHEET NO.
U-4432	Sig. 4

FLASHING YELLOW ARROW PROTECTED/PERMITTED SPECIAL SEQUENCE PROGRAMMING DETAIL

(program controller as shown below)

SELECT (4) FROM MAIN MENU

```
SE-PAC UNIT DATA              PRESS # DESIRED

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

Do NOT enter any OVL PHASES! →

```
SE-PAC OVERLAP - A             (0-NO / 1-YES)

OVL PHASES:  000000000 0000000
  PHS/CHN:   123456789 0123456789 01234
OVL CHN(S):  000000000 0001000000 00000

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

PRESS 'B' TWICE

Do NOT enter any OVL PHASES! →

```
SE-PAC OVERLAP - C             (0-NO / 1-YES)

OVL PHASES:  000000000 0000000
  PHS/CHN:   123456789 0123456789 01234
OVL CHN(S):  000000000 0000010000 00000

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

select F – return to Unit Data menu

```
SE-PAC UNIT DATA              PRESS # DESIRED

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

SE-PAC OVLP.	A	B	C	D	E	F	G	H	
TR GRN	0	0	0	0	0	0	0	0	
YEL/10	40	40	40	40	40	40	40	40	
RED/10	20	20	20	20	20	20	20	20	
-G/Y	1	0	5	0	0	0	0	0	← PROTECTED PHASES
+GRN	2	0	6	0	0	0	0	0	← PERMITTED PHASES

(-) #-PH G/Y KILLS OVLP= (+) #-PH G STRT

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

end of programming

NOTE: THIS PROGRAMMING IS REQUIRED FOR SIGNAL HEADS 11 AND 51 SO THAT THE SOLID GREEN ARROW TURNS ON EXCLUSIVELY DURING THE PROTECTED GREEN INTERVALS OF PHASES 1 & 5. THE FLASHING YELLOW ARROW FOR SIGNAL HEADS 11 AND 51 TURNS ON EXCLUSIVELY DURING PERMITTED GREEN PHASES 2 & 6.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0068T
DESIGNED: August 2013
SEALED: 10/11/13
REVISED: N/A

Electrical Detail - Temp Design - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of: Transportation Mobility and Safety Division, Signals Management Section

750 N.Greenfield Pkwy,Garner,NC 27529

SR 1370 (Tryon Road)
at
Ileagnes Road

Division 5 — Wake County — Raleigh

PLAN DATE: October 2013 — REVIEWED BY: T. Joyner

PREPARED BY: C. Strickland — REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL — NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022013 GEORGE C. BROWN

SIGNATURE — DATE 10/16/13

SIG. INVENTORY NO. 05-0068T

14-OCT-2013 13:16
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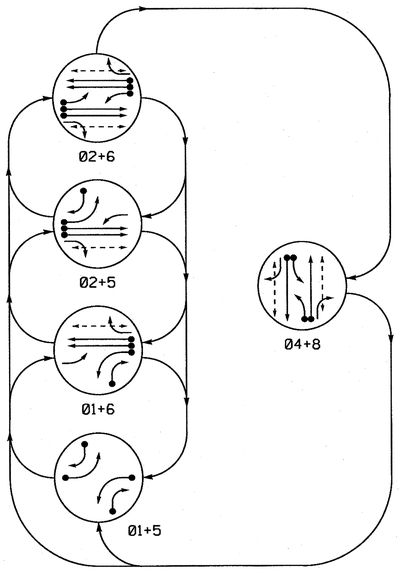
cestrickland

PROJECT REFERENCE NO.	SHEET NO.
U-4432	Sig. 5

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

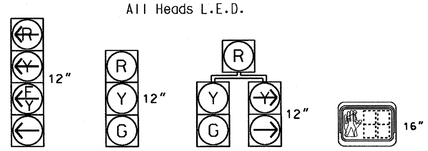
TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	04+8	FLASH
11	←	←	F Y	F Y	~~R~~	~~Y~~
21, 22	R	R	G	G	R	Y
41	R	R	R	R	G	R
42	R/←	R	R/←	R	G	R
51	←	F Y	←	F Y	~~R~~	~~Y~~
61, 62	R	G	R	G	R	Y
81	R	R	R	R	G	R
82	R/←	R/←	R	R	G	R
P21, P22	DW	DW	W	W	DW	DRK
P41, P42	DW	DW	DW	DW	W	DRK
P61, P62	DW	W	DW	W	DW	DRK
P81, P82	DW	DW	DW	DW	W	DRK

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

SIGNAL FACE I.D.

All Heads L.E.D.



LOOP & DETECTOR UNIT INSTALLATION CHART

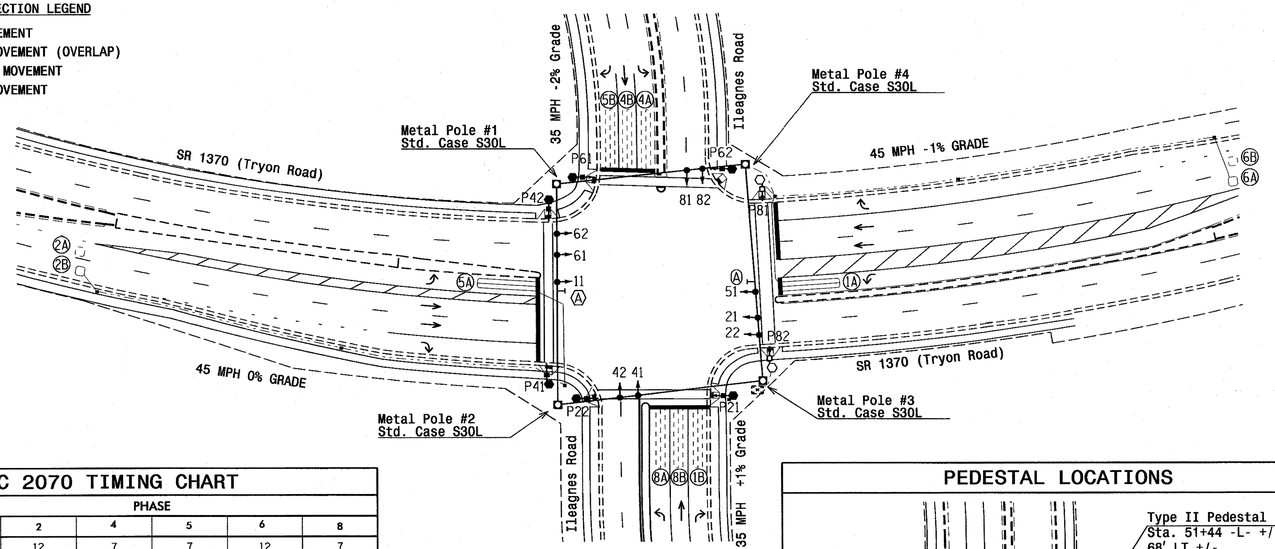
SE-PAC 2070 CONTROLLER WITH 170 CABINET

INDUCTIVE LOOPS						DETECTOR PROGRAMMING																
								TIMING		OPERATION MODE										STATUS		
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	ASSIGNED PHASE	DELAY	EXTEND (STRETCH)	0 VEHICLE	1 PEDESTRIAN	2 1 CALL	3 STOP A	4 STOP B	5 FROG/PED	6 LEFT FROG/PED THROUGH	7 AND	SWITCH	SYSTEM LOOPS	NEW	EXISTING
1A	6X40	2-4-2	0	X	-	1	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
						6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
1B	6X40	2-4-2	0	-	X	1	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
2A	6X6	4	300	-	X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
2B	6X6	4	300	X	-	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
4A	6X40	2-4-2	0	-	X	4	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
4B	6X40	2-4-2	0	-	X	4	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
5A	6X40	2-4-2	0	X	-	5	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
						2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
5B	6X40	2-4-2	0	-	X	5	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
6A	6X6	4	300	X	-	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
6B	6X6	4	300	-	X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
8A	6X40	2-4-2	0	-	X	8	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
8B	6X40	2-4-2	0	-	X	8	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X

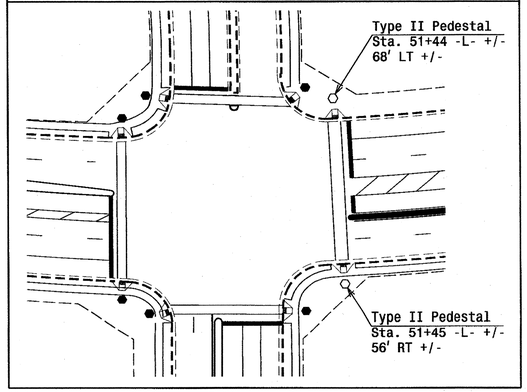
5 Phase
Fully Actuated
(Raleigh Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Reposition existing signal heads numbered 11. 21. 22. 51. 61 & 62.
5. Set all detector units to presence mode.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
8. Install pedestrian pushbuttons in accordance with section 4E.08 of the 2009 MUTCD.
9. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



PEDESTAL LOCATIONS



SE-PAC 2070 TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Min Green *	7	12	7	7	12	7
Passage Gap *	2.0	6.0	2.0	2.0	6.0	2.0
Maximum Green *	20	60	30	20	60	30
Yellow Change	3.0	4.6	4.0	3.0	4.6	3.8
Red Clear	3.6	2.3	2.9	3.5	2.3	2.9
Walk *	-	7	7	-	7	7
Pedestrian Clear	-	17	23	-	17	23
Added Initial *	-	1.5	-	-	1.5	-
Maximum Initial *	-	34	-	-	34	-
Time Before Reduction *	-	20	-	-	20	-
Time To Reduce *	-	40	-	-	40	-
Minimum Gap	-	3.0	-	-	3.0	-
Recall Mode	-	MIN RECALL	-	-	MIN RECALL	-
Vehicle Call Memory	NON-LOCK	LOCK	NON-LOCK	NON-LOCK	LOCK	NON-LOCK
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON	ON

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

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□↓	Pedestrian Signal Head With Push Button & Sign	■↓
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
------	2-in Underground Conduit	------
N/A	Right of Way	------
→	Directional Arrow	→
◎	Metal Strain Pole	◘
N/A	Wheelchair Ramp	◢
⬡	Signal Pedestal	⬢
Ⓐ	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	Ⓐ

Signal Upgrade - Final Design

Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

SR 1370 (Tryon Road) at Ileagnes Road

Division 5 Wake County Raleigh

PLAN DATE: July 2013 REVIEWED BY:

PREPARED BY: I. O. Umozurike REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 50 1"=50'

SEAL
NORTH CAROLINA
PROFESSIONAL SEAL 026486 ENGINEER
ROBERT J. ZIEMBA
SIGNATURE 10/11/13 DATE

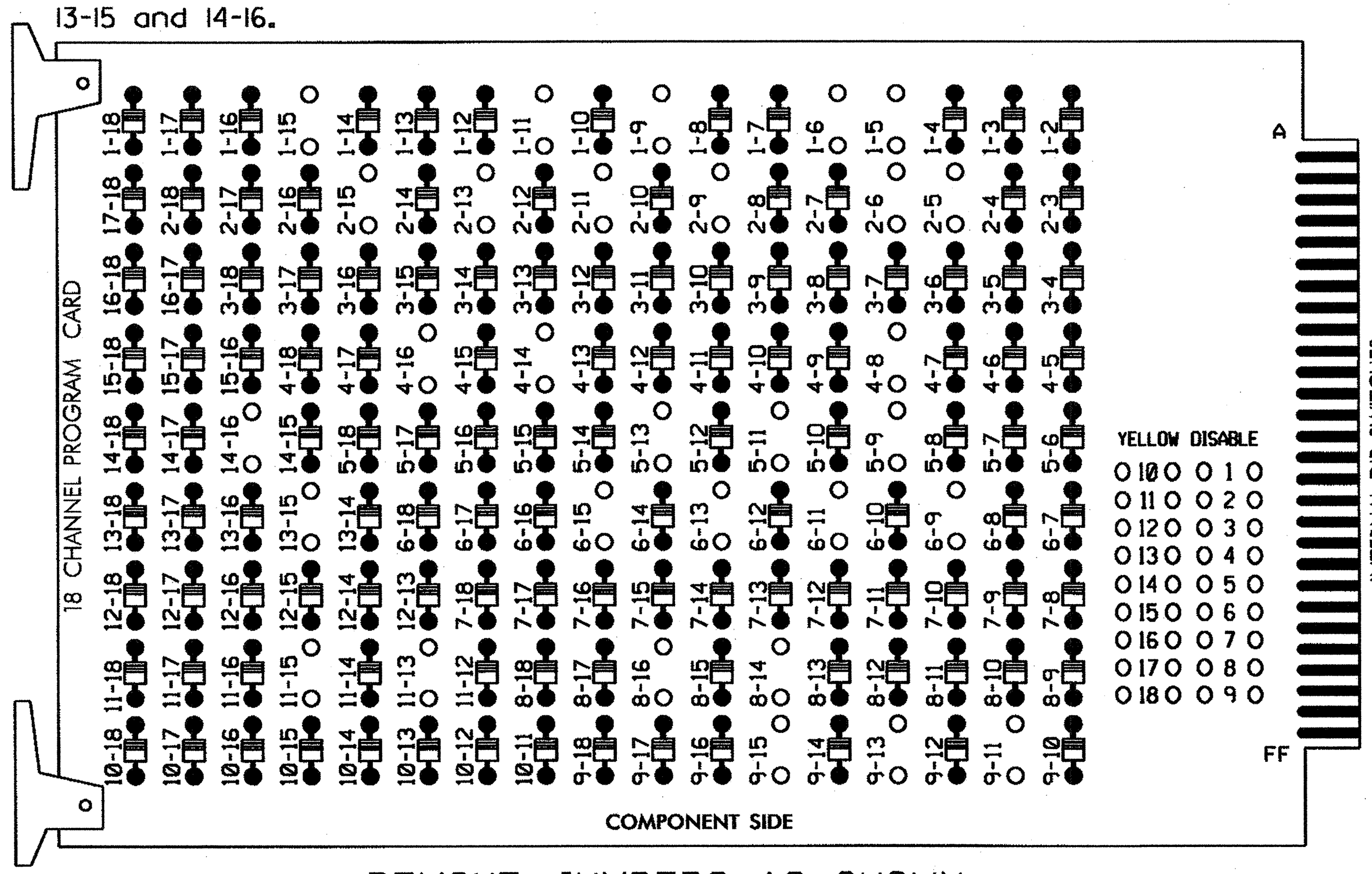
SIG. INVENTORY NO. 05-0068

24-OCT-2013 11:19
R:\Traffic\Signals\Design\Signals\05-0068\050068_sig_dsn_20131011.dgn
iumozur-lxe

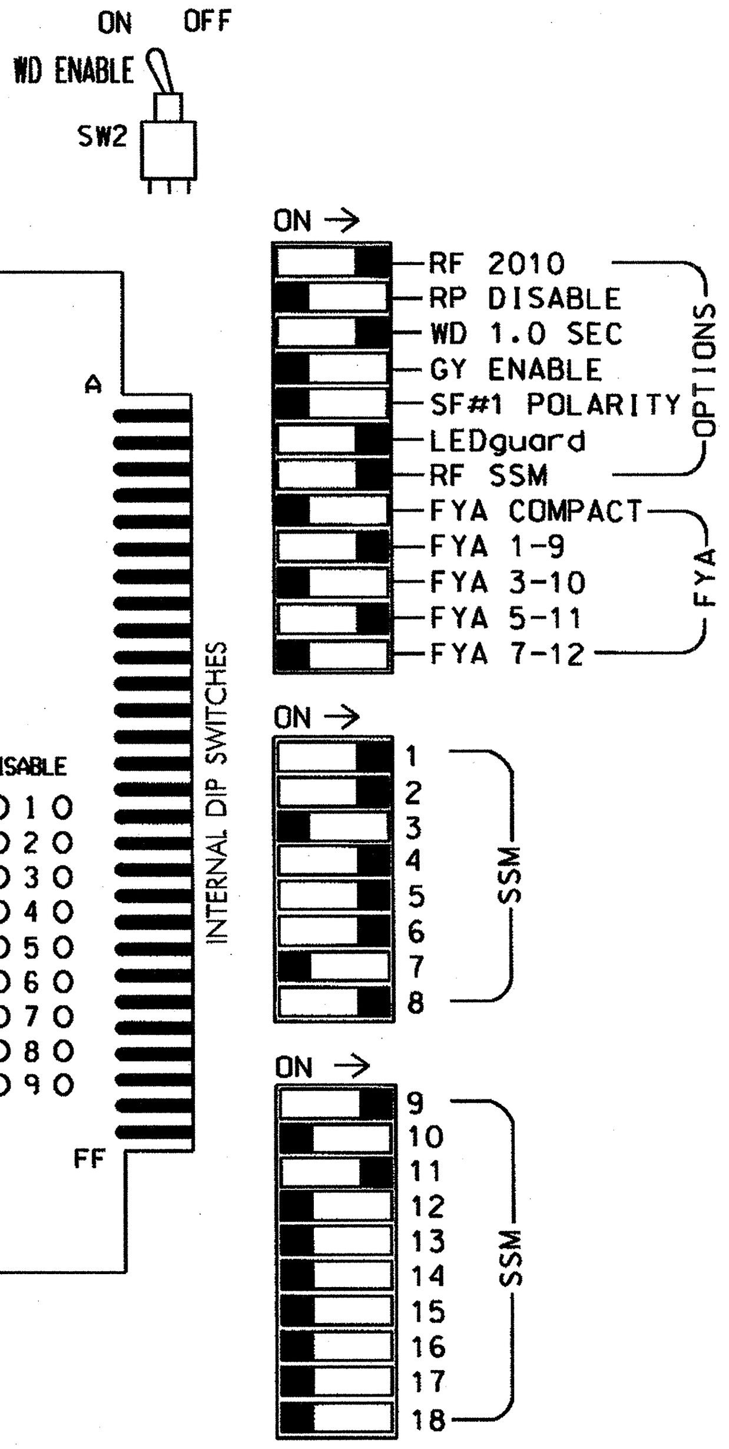
EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 1-15, 2-5, 2-6, 2-9, 2-11, 2-13, 2-15, 4-8, 4-14, 4-16, 5-9, 5-11, 5-13, 6-9, 6-11, 6-13, 6-15, 8-14, 8-16, 9-11, 9-13, 9-15, 11-13, 11-15, 13-15 and 14-16.



REMOVE JUMPERS AS SHOWN



■ = DENOTES POSITION OF SWITCH

NOTES:

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

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. Program controller to start up in phases 2 and 6 green.
3. Enable simultaneous gap-out feature, on controller unit, for all phases.
4. Program phases 4 and 8, on controller unit, for dual entry.
5. Program phases 2 and 6, on controller unit, for volume density operation.
6. The cabinet and controller are part of the Raleigh City Signal System.

EQUIPMENT INFORMATION

CONTROLLER..............2070L
CABINET.................332 /W/ AUX
SOFTWARE................SE-PAC2070
CABINET MOUNT...........BASE
OUTPUT FILE POSITIONS...18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED......S1,S2,S3,S5,S6,S7,S8,S9,S11,S12, AUX S1,AUX S4
PHASES USED.............1,2,2 PED,4,4 PED,5,6,6 PED, 8,8 PED
OVERLAP "A".............*
OVERLAP "B".............NOT USED
OVERLAP "C".............*
OVERLAP "D".............NOT USED

* See sheet 2 for Overlap and Protected & Permissive Phases programming.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S3	S4	S5	S6	S7		S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1		2	13	3	4	14	5		6	15	7	8	16	9	10	17	11	12	18
PHASE	1		2	2 PED	3	4	4 PED	5		6	6 PED	7	8	8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	11★	82	21,22	P21, P22	NU	41,42	P41, P42	42	51★	61,62	P61, P62	NU	81,82	P81, P82	11★	NU	NU	51★	NU	NU
RED		✱	128			101		✱		134			107							
YELLOW			129			102				135			108							
GREEN			130			103				136			109							
RED ARROW															A121			A114		
YELLOW ARROW		126						132							A122			A115		
FLASHING YELLOW ARROW															A123			A116		
GREEN ARROW	127	127						133	133											
✋				113			104				119			110						
🚶				115			106				121			112						

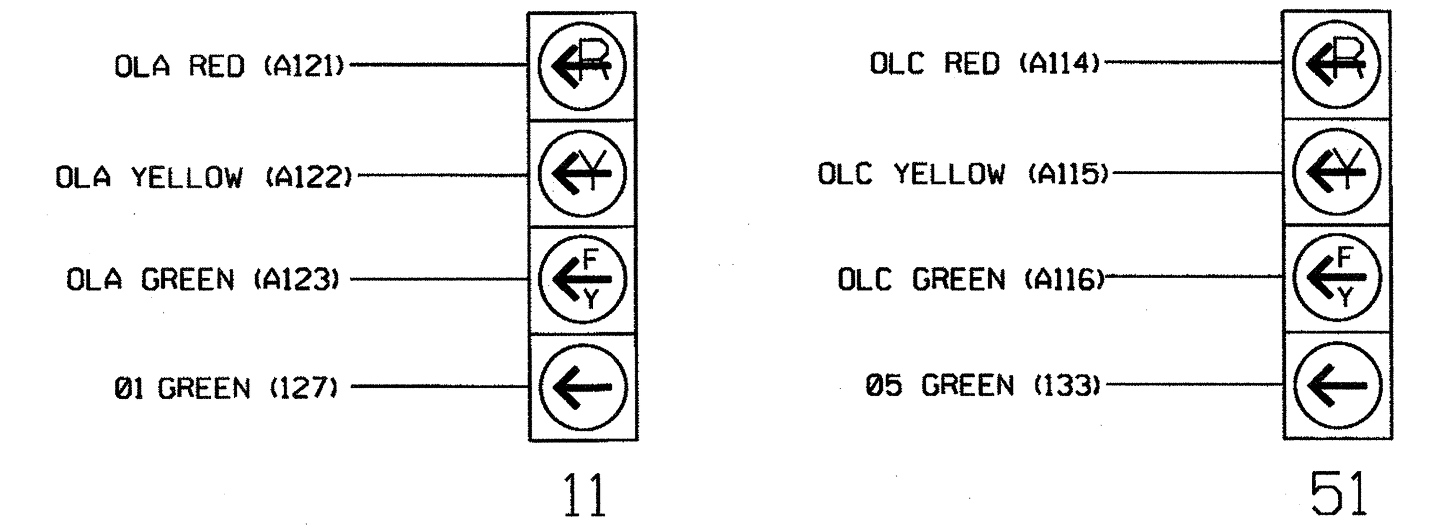
NU = Not Used

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

★ See pictorial of head wiring in detail below.

4 SECTION FYA PPLT SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE

1. See sheet 2 for Protected & Permissive Phases programming.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø1 1A	Ø1 1B	Ø2 2A	WIRED INPUT ⊗	SLOT EMPTY	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø2 PED DC ISOLATOR	Ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L	NOT USED	NOT USED	Ø2 2B			Ø4 4B						Ø4 PED DC ISOLATOR	Ø8 PED DC ISOLATOR	ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø5 5B	Ø6 6A	WIRED INPUT ⊗	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	NOT USED	Ø6 6B			Ø8 8B								

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

FS = FLASH SENSE
ST = STOP TIME

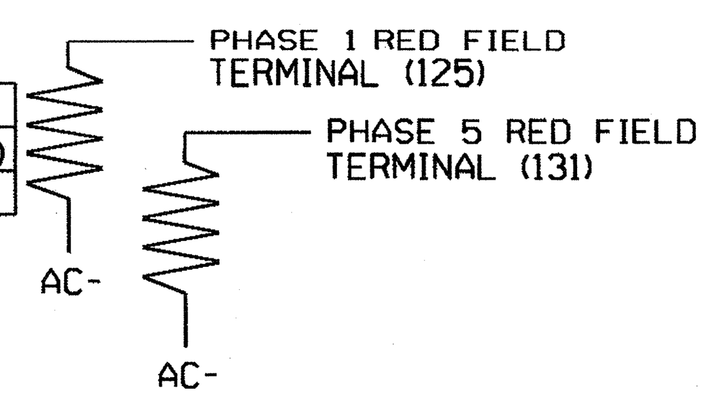
⊗ Wired Input - Do not populate slot with detector card

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)



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

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
1A[1]	TB2-1,2	I1U	56	1	1	15	
	-	J4U	48	25	6		
1B	TB2-5,6	I2U	39	3	1	15	
2A	TB2-9,10	I3U	63	5	2		
2B	TB2-11,12	I3L	76	6	2		
4A	TB4-9,10	I6U	41	11	4		
4B	TB4-11,12	I6L	45	12	4		
5A[2]	TB3-1,2	J1U	55	19	5	15	
	-	I4U	47	7	2		
5B	TB3-5,6	J2U	40	21	5	15	
6A	TB3-9,10	J3U	64	23	6		
6B	TB3-11,12	J3L	77	24	6		
8A	TB5-9,10	J6U	42	31	8		
8B	TB5-11,12	J6L	46	32	8		
PED PUSH BUTTONS							
P21,P22	TB8-4,6	I12U	67	PED 2	2 PED		
P41,P42	TB8-5,6	I12L	69	PED 4	4 PED		
P61,P62	TB8-7,9	I13U	68	PED 6	6 PED		
P81,P82	TB8-8,9	I13L	70	PED 8	8 PED		

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

[1] Add jumper from I1-W to J4-W, on rear of input file.
[2] Add jumper from J1-W to I4-W, on rear of input file.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

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: 05-0068
DESIGNED: July 2013
SEALED: 10/11/13
REVISED: N/A

Electrical Detail - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of: Transportation Mobility and Safety Division, Signals Management Section, State of North Carolina Department of Transportation
750 N.Greenfield Pkwy,Garner,NC 27529

SR 1370 (Tryon Road)
at
Ileagnes Road

Division 5 | Wake County | Raleigh

PLAN DATE: October 2013 | REVIEWED BY: T. J[signature]
PREPARED BY: C. Strickland | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022013 GEORGE C. BROWN

[signature] 10/16/13
SIGNATURE DATE

SIG. INVENTORY NO. 05-0068

FLASHING YELLOW ARROW PROTECTED/PERMITTED SPECIAL SEQUENCE PROGRAMMING DETAIL

(program controller as shown below)

SELECT (4) FROM MAIN MENU

```
SE-PAC UNIT DATA              PRESS # DESIRED

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

Do NOT enter any OVL PHASES! →

```
SE-PAC OVERLAP - A             (0-NO / 1-YES)

 OVL PHASES:  000000000 0000000
    PHS/CHN:  123456789 0123456789 01234
 OVL CHN(S):  000000000 0001000000 00000

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

PRESS 'B' TWICE

Do NOT enter any OVL PHASES! →

```
SE-PAC OVERLAP - C             (0-NO / 1-YES)

 OVL PHASES:  000000000 0000000
    PHS/CHN:  123456789 0123456789 01234
 OVL CHN(S):  000000000 0000010000 00000

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

select F – return to Unit Data menu

```
SE-PAC UNIT DATA              PRESS # DESIRED

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

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

end of programming

NOTE: THIS PROGRAMMING IS REQUIRED FOR SIGNAL HEADS 11 AND 51 SO THAT THE SOLID GREEN ARROW TURNS ON EXCLUSIVELY DURING THE PROTECTED GREEN INTERVALS OF PHASES 1 & 5. THE FLASHING YELLOW ARROW FOR SIGNAL HEADS 11 AND 51 TURNS ON EXCLUSIVELY DURING PERMITTED GREEN PHASES 2 & 6.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0068
DESIGNED: July 2013
SEALED: 10/11/13
REVISED: N/A

Electrical Detail - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared In the Offices of: Transportation Mobility and Safety Division, Signals Management Section, Department of Transportation, State of North Carolina

750 N.Greenfield Pkwy.Garner,NC 27529

SR 1370 (Tryon Road)
at
Ileagnes Road

Division 5 | Wake County | Raleigh

PLAN DATE:	October 2013	REVIEWED BY:	T. J...
PREPARED BY:	C. Strickland	REVIEWED BY:	

REVISIONS	INIT.	DATE

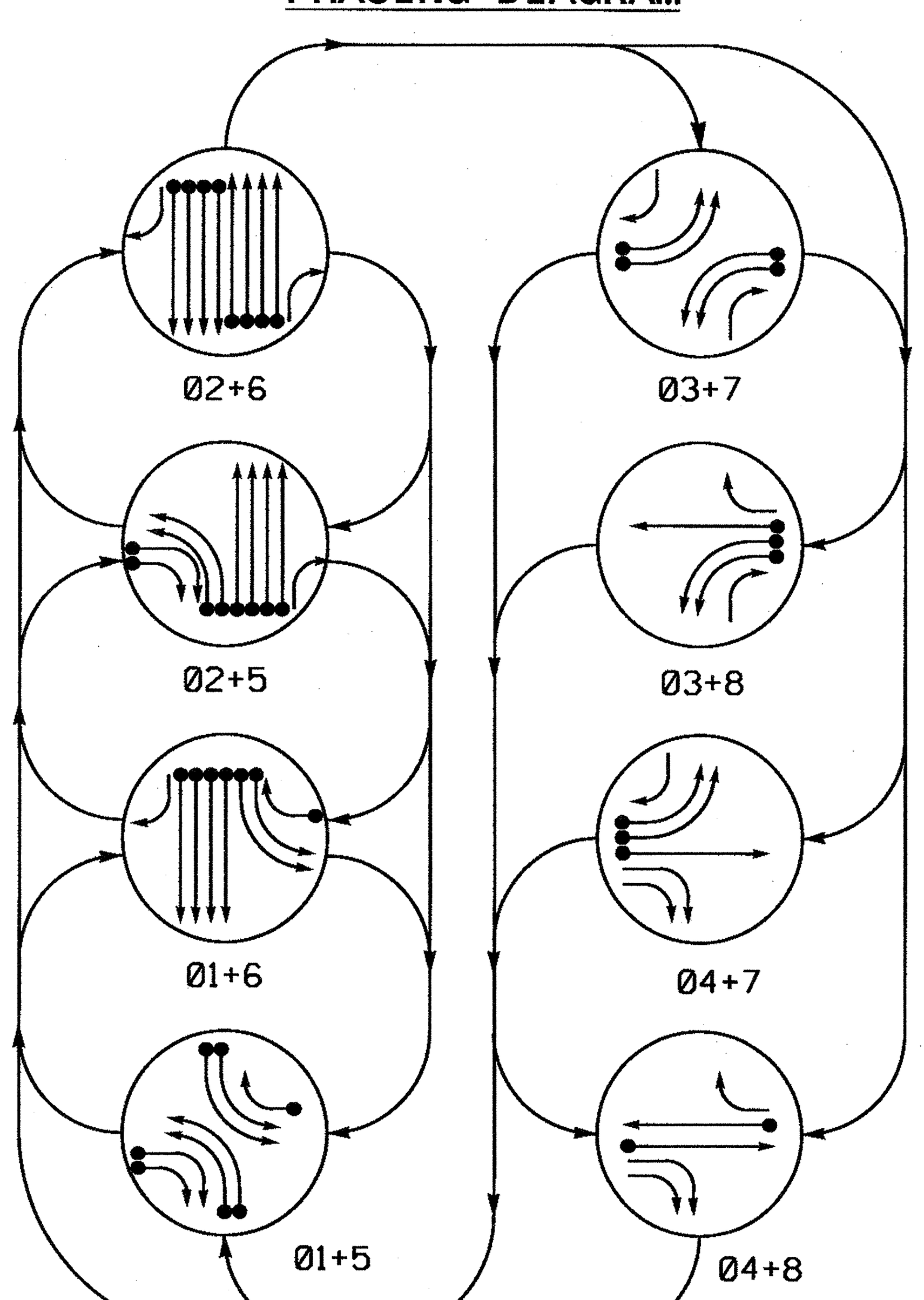
SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022013 GEORGE C. BROWN

SIGNATURE George C. Brown DATE 10/16/13

SIG. INVENTORY NO. 05-0068

14-OCT-2013 13:19
S:*ITS&SU*ITS Signals*Workgroups*Sig Man*Strickland*050068_sm_ele_xxx.dgn
cestrickland

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

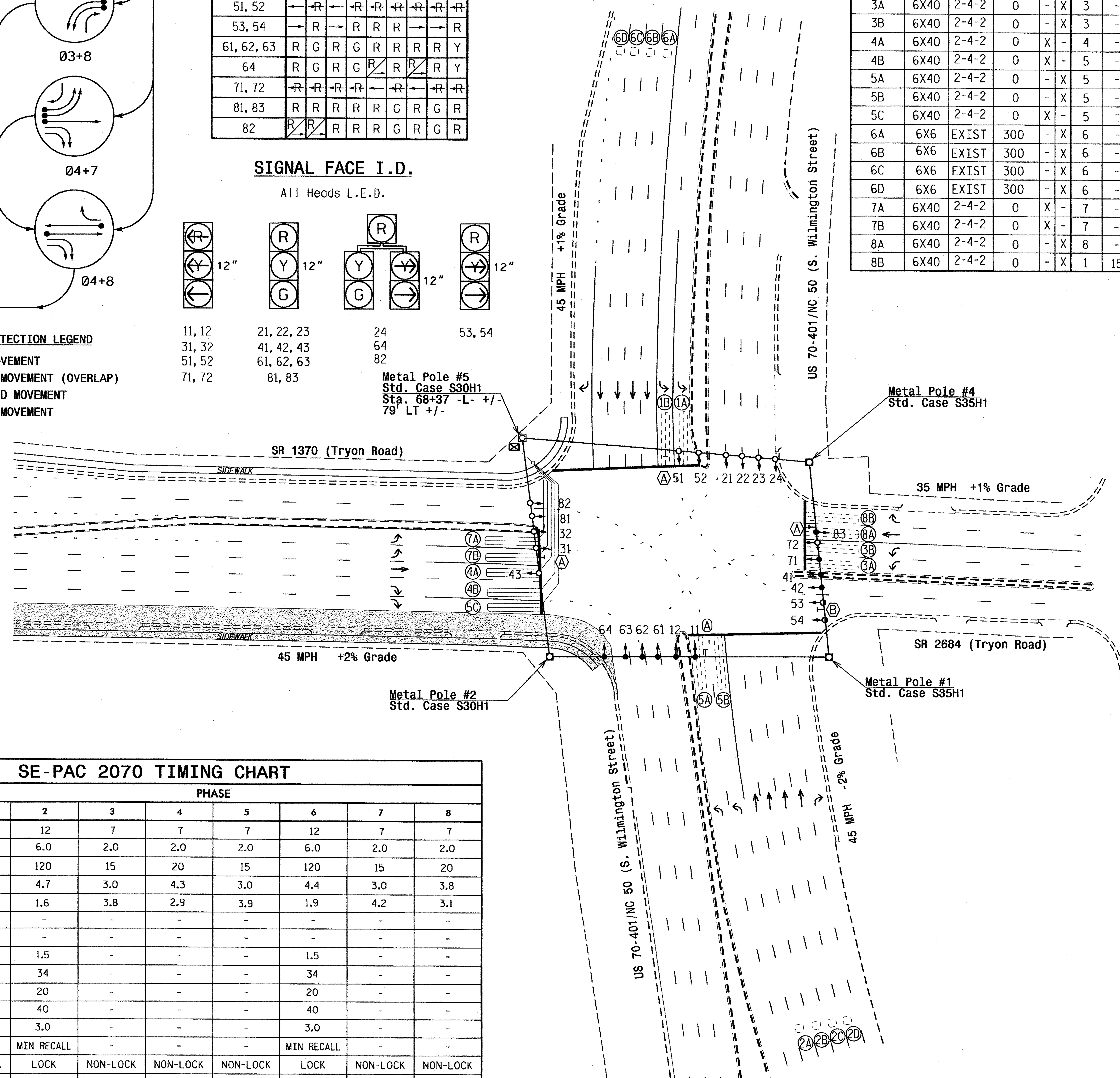
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3+7	Ø3+8	Ø4+7	Ø4+8	FLASH
11, 12	←	←	←R	←R	←R	←R	←R	←R	←R
21, 22, 23	R	R	G	G	R	R	R	R	Y
24	R	R	G	G	R/→	R/→	R	R	Y
31, 32	←R	←R	←R	←R	←	←	←R	←R	←R
41, 42, 43	R	R	R	R	R	R	G	G	R
51, 52	←	←R	←	←R	←R	←R	←R	←R	←R
53, 54	→	R	→	R	R	R	→	→	R
61, 62, 63	R	G	R	G	R	R	R	R	Y
64	R	G	R	G	R/→	R	R/→	R	Y
71, 72	←R	←R	←R	←R	←	←R	←	←R	←R
81, 83	R	R	R	R	R	G	R	G	R
82	R/→	R/→	R	R	R	G	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.

11, 12 31, 32 51, 52 71, 72	21, 22, 23 41, 42, 43 61, 62, 63 81, 83	24 64 82	53, 54



SE-PAC 2070 TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Min Green *	7	12	7	7	7	12	7	7
Passage Gap *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Maximum Green *	15	120	15	20	15	120	15	20
Yellow Change	3.0	4.7	3.0	4.3	3.0	4.4	3.0	3.8
Red Clear	3.9	1.6	3.8	2.9	3.9	1.9	4.2	3.1
Walk *	-	-	-	-	-	-	-	-
Pedestrian Clear	-	-	-	-	-	-	-	-
Added Initial *	-	1.5	-	-	-	1.5	-	-
Maximum Initial *	-	34	-	-	-	34	-	-
Time Before Reduction *	-	20	-	-	-	20	-	-
Time To Reduce *	-	40	-	-	-	40	-	-
Minimum Gap	-	3.0	-	-	-	3.0	-	-
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Vehicle Call Memory	NON-LOCK	LOCK	NON-LOCK	NON-LOCK	NON-LOCK	LOCK	NON-LOCK	NON-LOCK
Dual Entry	-	-	-	-	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON	ON	ON	ON	ON

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

LOOP & DETECTOR UNIT INSTALLATION CHART

SE-PAC 2070 CONTROLLER WITH 170 CABINET

INDUCTIVE LOOPS: LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	DETECTOR PROGRAMMING: ASSIGNED PHASE	TIMING: DELAY	EXTEND (STRETCH)	OPERATION MODE 0 VEHICLE	1 PEDESTRIAN	2 1 CALL	3 STOP A	4 STOP B	5 PROT/PER LEFT	6 PROT/PER THROUGH	7 AND	SWITCH	SYSTEM LOOPS	STATUS: NEW	EXISTING
1A	6X40	2-4-2	0	-	X	1	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
1B	6X40	2-4-2	0	-	X	1	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
2A	6X6	EXIST	300	-	X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
2B	6X6	EXIST	300	-	X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
2C	6X6	EXIST	300	-	X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
2D	6X6	EXIST	300	-	X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
3A	6X40	2-4-2	0	-	X	3	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
3B	6X40	2-4-2	0	-	X	3	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
4A	6X40	2-4-2	0	X	-	4	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
4B	6X40	2-4-2	0	X	-	5	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
5A	6X40	2-4-2	0	-	X	5	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
5B	6X40	2-4-2	0	-	X	5	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
5C	6X40	2-4-2	0	X	-	5	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
6A	6X6	EXIST	300	-	X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
6B	6X6	EXIST	300	-	X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
6C	6X6	EXIST	300	-	X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
6D	6X6	EXIST	300	-	X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
7A	6X40	2-4-2	0	X	-	7	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
7B	6X40	2-4-2	0	X	-	7	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
8A	6X40	2-4-2	0	-	X	8	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
8B	6X40	2-4-2	0	-	X	1	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-

8 Phase
Fully Actuated
(Raleigh Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Reposition existing signal heads numbered 41, 42, 53 and 54.
6. Set all detector units to presence mode.
7. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Metal Strain Pole	
	Construction Zone Drums	
	Construction Zone	
A	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	A
B	"NO TURN ON RED" Sign (R10-11)	B

Signal Upgrade - Temporary Design (TMP Phase II)

Prepared in the Offices of: Transportation Mobility and Safety Division, Signal Design Section, State of North Carolina Department of Transportation
750 N.Greenfield Pkwy,Garner,NC 27529

US 70-401/NC 50 (S. Wilmington St.)
at
SR 1370/SR 2684 (Tryon Road)

Division 5 Wake County Raleigh

PLAN DATE: August 2013 REVIEWED BY:
PREPARED BY: I. O. Umozurike REVIEWED BY:

SCALE 0 50 1"=50'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 026486 ROBERT J. ZIEMBA
SIGNATURE 10/23/13 DATE
SIG. INVENTORY NO. 05-0151T

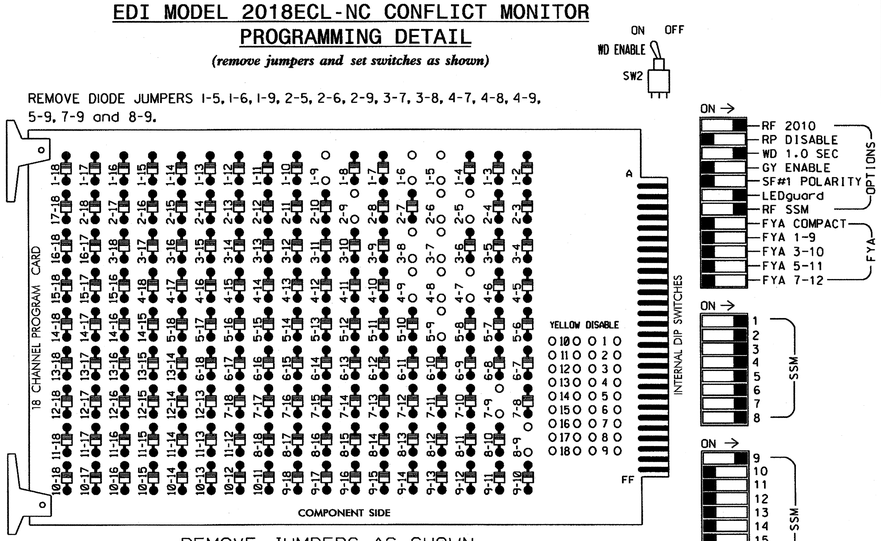
24-OCT-2013 10:17
R:*Traffic*Signals*Design*Signals*05-0151*050151T_sig_dsn_20131011 .dgn
ioumozurike

PROJECT REFERENCE NO.	SHEET NO.
U-4432	Sig. 9

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

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



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

NOTES:

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

NOTES

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

EQUIPMENT INFORMATION

CONTROLLER.....2070L
CABINET .....332 /W/ AUX
SOFTWARE SE-PAC2070
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS..18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S4,S5,S7,S8,S10,S11,AUX S1
PHASES USED.....1,2,3,4,5,6,7,8
OVERLAP A.....4+5

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S3	S4		S5	S6	S7	S8	S9	S10		S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1		2	13	3		4	14	5	6	15	7		8	16	9	10	17	11	12	18
PHASE	1		2	2 PED	3		4	4 PED	5	6	6 PED	7		8	8 PED	* OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	11,12	82	21,22, 23,24	NU	24	31,32	41, 42,43	NU	51,52	61,62, 63,64	NU	64	71,72	81, 82,83	NU	53,54	NU	NU	NU	NU	NU
RED			128				101			134				107		A121					
YELLOW			129				102			135				108							
GREEN			130				103			136				109							
RED ARROW	125					116			131				122								
YELLOW ARROW	126	126			117	117			132			123	123			A122					
GREEN ARROW	127	127			118	118			133			124	124			A123					

NU = Not Used
*Flash Note: Wire Overlap "A" to flash on Flasher unit #2, Circuit #2.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	ø1	ø2	ø2	SLOT EMPTY	ø3	ø4	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
		1A	2A	2C		3A	4A								
	L	ø1	ø2	ø2		ø3	ø5								ST
		1B	2B	2D		3B	4B								DC ISOLATOR
FILE "J"	U	ø5	ø6	ø6	SLOT EMPTY	ø7	ø8	SLOT EMPTY	SLOT EMPTY	ø5	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
		5A	6A	6C		7A	8A			5C					
	L	ø5	ø6	ø6		ø7	ø1			NOT USED					
		5B	6B	6D		7B	8B								

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
1A	TB2-1,2	I1U	56	1	1		
1B	TB2-3,4	I1L	56	1	1		
2A	TB2-5,6	I2U	39	3	2		
2B	TB2-7,8	I2L	43	4	2		
2C	TB2-9,10	I3U	63	5	2		
2D	TB2-11,12	I3L	76	6	2		
3A	TB4-5,6	I5U	58	9	3		
3B	TB4-7,8	I5L	58	9	3		
4A	TB4-9,10	I6U	41	11	4		
4B	TB4-11,12	I6L	45	12	5		
5A	TB3-1,2	J1U	55	19	5		
5B	TB3-3,4	J1L	55	19	5		
5C	TB7-9,10	J9U	59	37	5		
6A	TB3-5,6	J2U	40	21	6		
6B	TB3-7,8	J2L	44	22	6		
6C	TB3-9,10	J3U	64	23	6		
6D	TB3-11,12	J3L	77	24	6		
7A	TB5-5,6	J5U	57	29	7		
7B	TB5-7,8	J5L	57	29	7		
8A	TB5-9,10	J6U	42	31	8		
8B	TB5-11,12	J6L	46	32	1	15	-

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0151T
DESIGNED: August 2013
SEALED: 10/23/13
REVISED: N/A

VEHICLE OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS 4 (UNIT DATA)

```
SE-PAC UNIT DATA                    PRESS # DESIRED

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

```
SE-PAC OVERLAP - A                  (0-NO / 1-YES)

 OVL PHASES:  000110000 0000000
    PHS/CHN:  123456789 0123456789 01234
 OVL CHN(S):  000000000 0001000000 00000

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

PRESS "F" TO RETURN TO UNIT DATA

Electrical Detail Temporary Design

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section

750 N.Greenfield Pkwy, Garner, NC 27529

US 70-401/NC 50 (S. Wilmington St.)
at
SR 1370/SR 2684 (Tryon Road)

Division 5 | Wake County | Raleigh

PLAN DATE: October 2013 | REVIEWED BY: T. Vaughn
PREPARED BY: C. Strickland | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

SIGNATURE 10/25/13 DATE

SIG. INVENTORY NO. 05-0151T

24-OCT-2013 11:42
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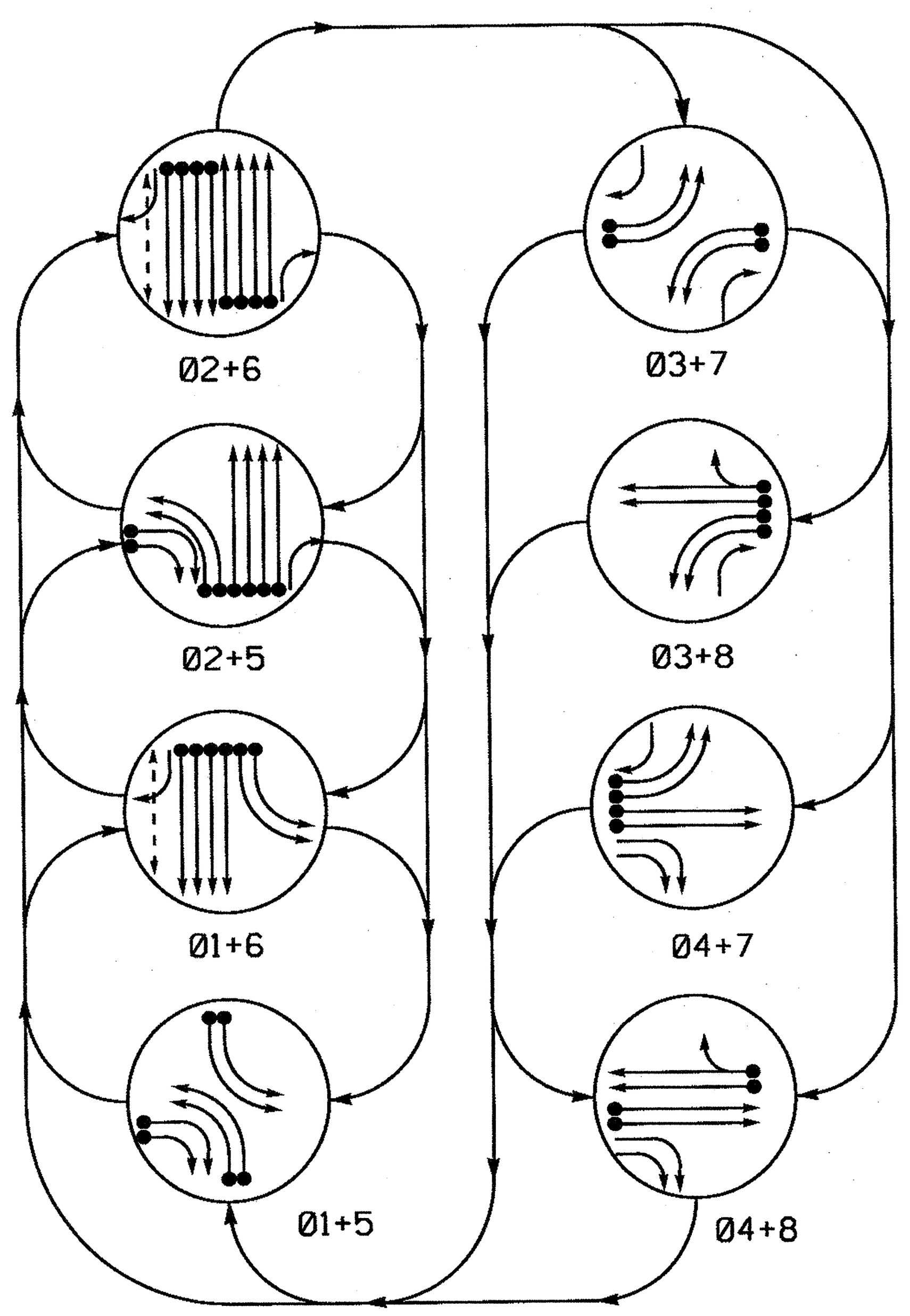
"S:\Signals\Workgroups\Sig Mgmt\Strickland\450151_ele_sm_xxx.dgn"
cstrickland

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3+7	Ø3+8	Ø4+7	Ø4+8	FLASH
11, 12	←	←	←R	←R	←R	←R	←R	←R	←R
21, 22, 23	R	R	G	G	R	R	R	R	Y
24	R	R	G	G	R/→	R/→	R	R	Y
31, 32	←R	←R	←R	←R	←	←	←R	←R	←R
41, 42, 43	R	R	R	R	R	R	G	G	R
51, 52	←	←R	←	←R	←R	←R	←R	←R	←R
53, 54	→	R	→	R	R	R	→	→	R
61, 62, 63	R	G	R	G	R	R	R	R	Y
64	R	G	R	G	R/→	R	R/→	R	Y
71, 72	←R	←R	←R	←R	←	←R	←	←R	←R
81, 82, 83	R	R	R	R	R	G	R	G	R
P61, P62	DW	W	DW	W	DW	DW	DW	DW	DRK

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

LOOP & DETECTOR UNIT INSTALLATION CHART

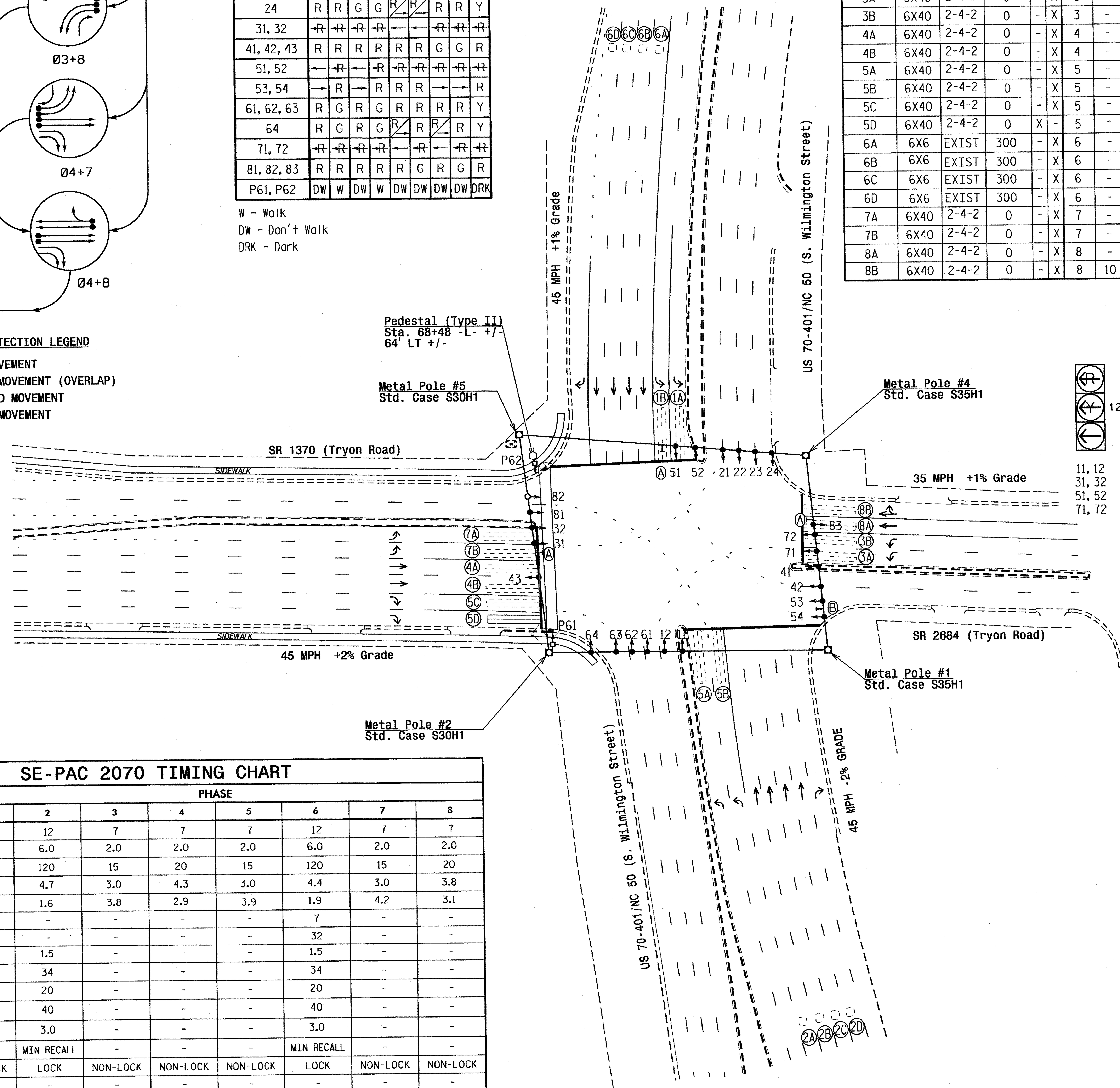
SE-PAC 2070 CONTROLLER WITH 170 CABINET

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	ASSIGNED PHASE	DELAY	EXTEND (STRETCH)	0 VEHICLE	1 PEDESTRIAN	2 1 CALL	3 STOP A	4 STOP B	5 PROT/PER LEFT	6 PROT/PER THROUGH	7 AND	SWITCH	SYSTEM LOOPS	STATUS NEW	STATUS EXISTING
1A	6X40	2-4-2	0	-	X	1	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
1B	6X40	2-4-2	0	-	X	1	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
2A	6X6	EXIST	300	-	X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
2B	6X6	EXIST	300	-	X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
2C	6X6	EXIST	300	-	X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
2D	6X6	EXIST	300	-	X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
3A	6X40	2-4-2	0	-	X	3	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
3B	6X40	2-4-2	0	-	X	3	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
4A	6X40	2-4-2	0	-	X	4	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
4B	6X40	2-4-2	0	-	X	4	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
5A	6X40	2-4-2	0	-	X	5	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
5B	6X40	2-4-2	0	-	X	5	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
5C	6X40	2-4-2	0	-	X	5	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
5D	6X40	2-4-2	0	X	-	5	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
6A	6X6	EXIST	300	-	X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
6B	6X6	EXIST	300	-	X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
6C	6X6	EXIST	300	-	X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
6D	6X6	EXIST	300	-	X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
7A	6X40	2-4-2	0	-	X	7	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
7B	6X40	2-4-2	0	-	X	7	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
8A	6X40	2-4-2	0	-	X	8	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X
8B	6X40	2-4-2	0	-	X	8	10 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	-	X

8 Phase Fully Actuated (Raleigh Signal System)

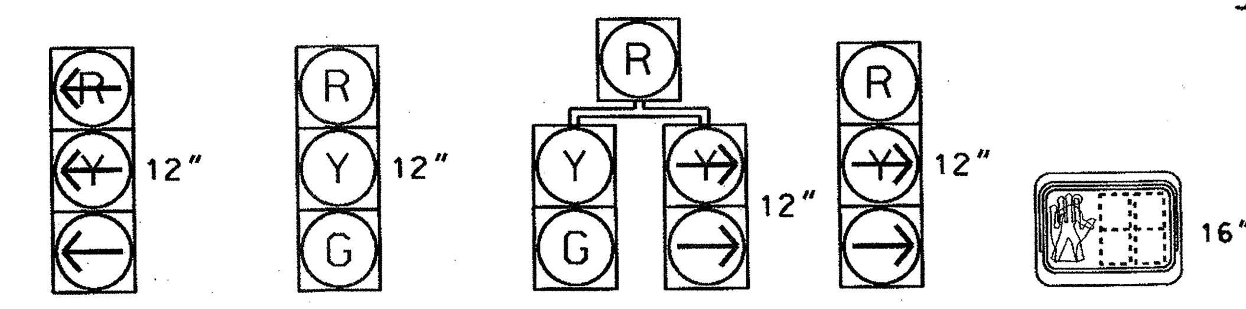
NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Reposition existing signal heads numbered 41, 42, 43, 53 and 54.
6. Set all detector units to presence mode.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
9. 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.



11, 12 / 31, 32 / 51, 52 / 71, 72 — 21, 22, 23 / 41, 42, 43 / 61, 62, 63 / 81, 82, 83 — 24 / 64 — 53, 54 — P61, P62

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Metal Strain Pole	
N/A	Wheelchair Ramp	
	Signal Pedestal	
Ⓐ	"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	Ⓐ
Ⓑ	"NO TURN ON RED" Sign (R10-11)	Ⓑ

SE-PAC 2070 TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Min Green *	7	12	7	7	7	12	7	7
Passage Gap *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Maximum Green *	15	120	15	20	15	120	15	20
Yellow Change	3.0	4.7	3.0	4.3	3.0	4.4	3.0	3.8
Red Clear	3.9	1.6	3.8	2.9	3.9	1.9	4.2	3.1
Walk *	-	-	-	-	-	7	-	-
Pedestrian Clear	-	-	-	-	-	32	-	-
Added Initial *	-	1.5	-	-	-	1.5	-	-
Maximum Initial *	-	34	-	-	-	34	-	-
Time Before Reduction *	-	20	-	-	-	20	-	-
Time To Reduce *	-	40	-	-	-	40	-	-
Minimum Gap	-	3.0	-	-	-	3.0	-	-
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Vehicle Call Memory	NON-LOCK	LOCK	NON-LOCK	NON-LOCK	NON-LOCK	LOCK	NON-LOCK	NON-LOCK
Dual Entry	-	-	-	-	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON	ON	ON	ON	ON

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

23-OCT-2013 16:34
R:*Traffic*Signals*Design*Signals*05-0151*050151_sig_dsn_20131011.dgn
ioumozurike

Signal Upgrade - Final Design

Prepared In the Offices of: Transportation Mobility and Safety Division, Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

US 70-401/NC 50 (S. Wilmington St.)
at
SR 1370/SR 2684 (Tryon Road)

Division 5 Wake County Raleigh

PLAN DATE: August 2013 | REVIEWED BY:
PREPARED BY: I. O. Umozurike | REVIEWED BY:

SCALE 0 50 1"=50'

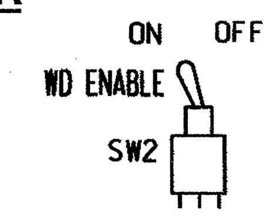
REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 026486 ROBERT J. ZIEMBA
SIGNATURE 10/23/13 DATE
SIG. INVENTORY NO. 05-0151

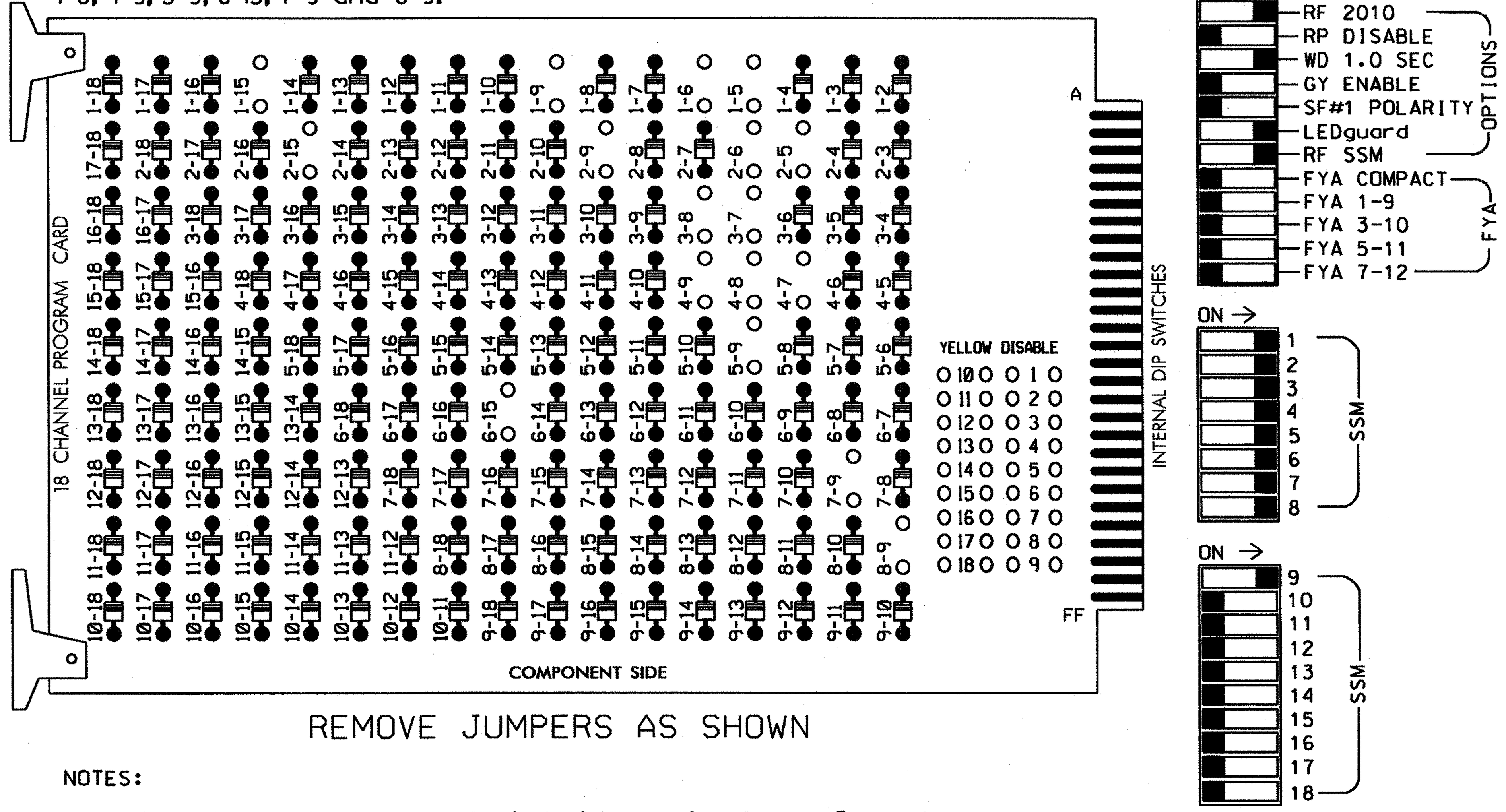
PROJECT REFERENCE NO.	SHEET NO.
U-4432	Sig. 11

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-15, 2-5, 2-6, 2-9, 2-15, 3-7, 3-8, 4-7, 4-8, 4-9, 5-9, 6-15, 7-9 and 8-9.



REMOVE JUMPERS AS SHOWN

NOTES:

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

NOTES

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

EQUIPMENT INFORMATION

CONTROLLER.............2070L
CABINET ....332 /W/ AUX
SOFTWARE SE-PAC2070
CABINET MOUNT..........BASE
OUTPUT FILE POSITIONS..18 WITH AUX. OUTPUT FILE
LOAD SWITCHES USED.....S1,S2,S4,S5,S7,S8,S9,S10,S11,AUX S1
PHASES USED............1,2,3,4,5,6,6 PED,7,8
OVERLAP A..............4+5

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S4	S5	S6	S7	S8	S9	S10	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3		4	14	5	6	15	7		8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3		4	4 PED	5	6	6 PED	7		8	8 PED	* OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	11,12	21,22, 23,24	NU	24	31,32	41, 42,43	NU	51,52	61,62, 63,64	P61, P62	64	71,72	81, 82,83	NU	53,54	NU	NU	NU	NU	NU
RED		128				101			134				107		A121					
YELLOW		129				102			135				108							
GREEN		130				103			136				109							
RED ARROW	125				116			131				122								
YELLOW ARROW	126			117	117			132			123	123			A122					
GREEN ARROW	127			118	118			133			124	124			A123					
(Don't Walk hand symbol)										119										
(Walk pedestrian symbol)										121										

NU = Not Used

* Flash Note: Wire Overlap "A" to flash on Flasher unit #2. Circuit #2.

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

INPUT FILE POSITION LAYOUT

(front view)

FILE		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	ø1 1A	ø2 2A	ø2 2C	SLOT EMPTY	ø3 3A	ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L	ø1 1B	ø2 2B	ø2 2D		ø3 3B	ø4 4B							NOT USED	ST DC ISOLATOR
FILE "J"	U	ø5 5A	ø6 6A	ø6 6C	SLOT EMPTY	ø7 7A	ø8 8A	SLOT EMPTY	SLOT EMPTY	ø5 5C	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	ø5 5B	ø6 6B	ø6 6D		ø7 7B	ø8 8B			ø5 5D					

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
1A	TB2-1,2	I1U	56	1	1		
1B	TB2-3,4	I1L	56	1	1		
2A	TB2-5,6	I2U	39	3	2		
2B	TB2-7,8	I2L	43	4	2		
2C	TB2-9,10	I3U	63	5	2		
2D	TB2-11,12	I3L	76	6	2		
3A	TB4-5,6	I5U	58	9	3		
3B	TB4-7,8	I5L	58	9	3		
4A	TB4-9,10	I6U	41	11	4		
4B	TB4-11,12	I6L	45	12	4		
5A	TB3-1,2	J1U	55	19	5		
5B	TB3-3,4	J1L	55	19	5		
5C	TB7-9,10	J9U	59	37	5		
5D	TB7-11,12	J9L	61	38	5		
6A	TB3-5,6	J2U	40	21	6		
6B	TB3-7,8	J2L	44	22	6		
6C	TB3-9,10	J3U	64	23	6		
6D	TB3-11,12	J3L	77	24	6		
7A	TB5-5,6	J5U	57	29	7		
7B	TB5-7,8	J5L	57	29	7		
8A	TB5-9,10	J6U	42	31	8		
8B	TB5-11,12	J6L	46	32	8	10	
PED PUSH BUTTONS							
P61,P62	TB8-7,9	I13U	68	PED 6	6 PED		

NOTE:
INSTALL DC ISOLATORS IN INPUT FILE SLOT I13.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

VEHICLE OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS 4 (UNIT DATA)

```
SE-PAC UNIT DATA               PRESS # DESIRED

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

```
SE-PAC OVERLAP - A             (0-NO / 1-YES)

OVL PHASES:  000110000 0000000
   PHS/CHN:  123456789 0123456789 01234
OVL CHN(S):  000000000 0001000000 00000

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

PRESS "F" TO RETURN TO UNIT DATA

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0151
DESIGNED: August 2013
SEALED: 10/23/13
REVISED: N/A

Electrical Detail Final Design

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of: Transportation Mobility and Safety Division, State of North Carolina Department of Transportation, Signals Management Section
750 N.Greenfield Pkwy.Garner,NC 27529

US 70-401/NC 50 (S. Wilmington St.)
at
SR 1370/SR 2684 (Tryon Road)

Division 5 | Wake County | Raleigh

PLAN DATE: October 2013 | REVIEWED BY: T. J...
PREPARED BY: C. Strickland | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022013 GEORGE C. BROWN
George C. Brown 10/25/13
SIGNATURE DATE
SIG. INVENTORY NO. 05-0151

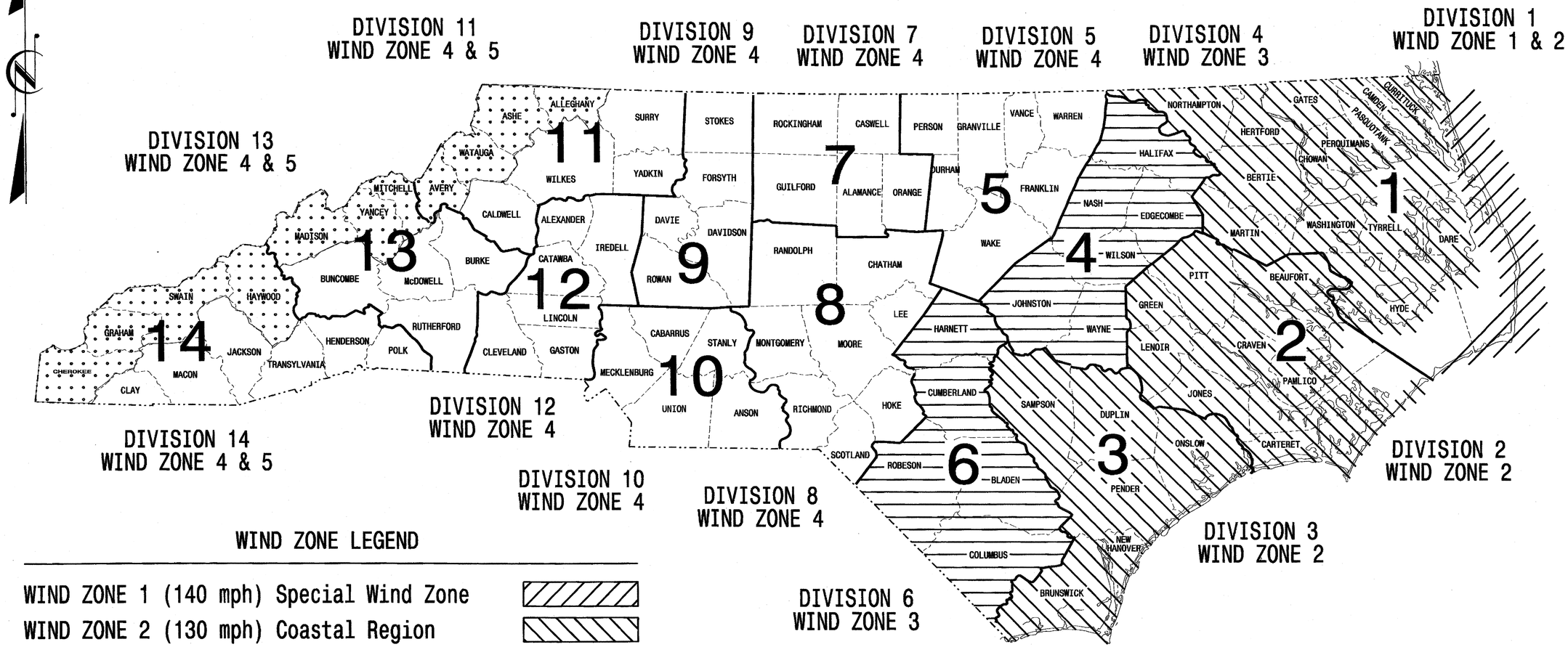
24-OCT-2013 11:43
S:\ITS&SU\ITS Signals\Workgroups\Sig Man\Strickland\050151_ele_sm_xxx.dgn
cestrickland

STATE	PROJECT NO.	SHEET NO.
N.C.	U-4432	Sig. 12
F. A. PROJ. NO.		M 1
PROJECT ID. NO.		

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR METAL POLES

NCDOT METAL POLE STANDARDS



WIND ZONE LEGEND

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

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

Prepared In the Offices of:

Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section

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, Luminares, and Traffic Signals

INDEX OF PLANS

NCDOT CONTACTS:

MOBILITY AND SAFETY DIVISION – ITS AND SIGNALS UNIT

G. A. FULLER, P.E. – STATE ITS AND SIGNALS ENGNEER

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 STRUCTUIRAL ENGINEER

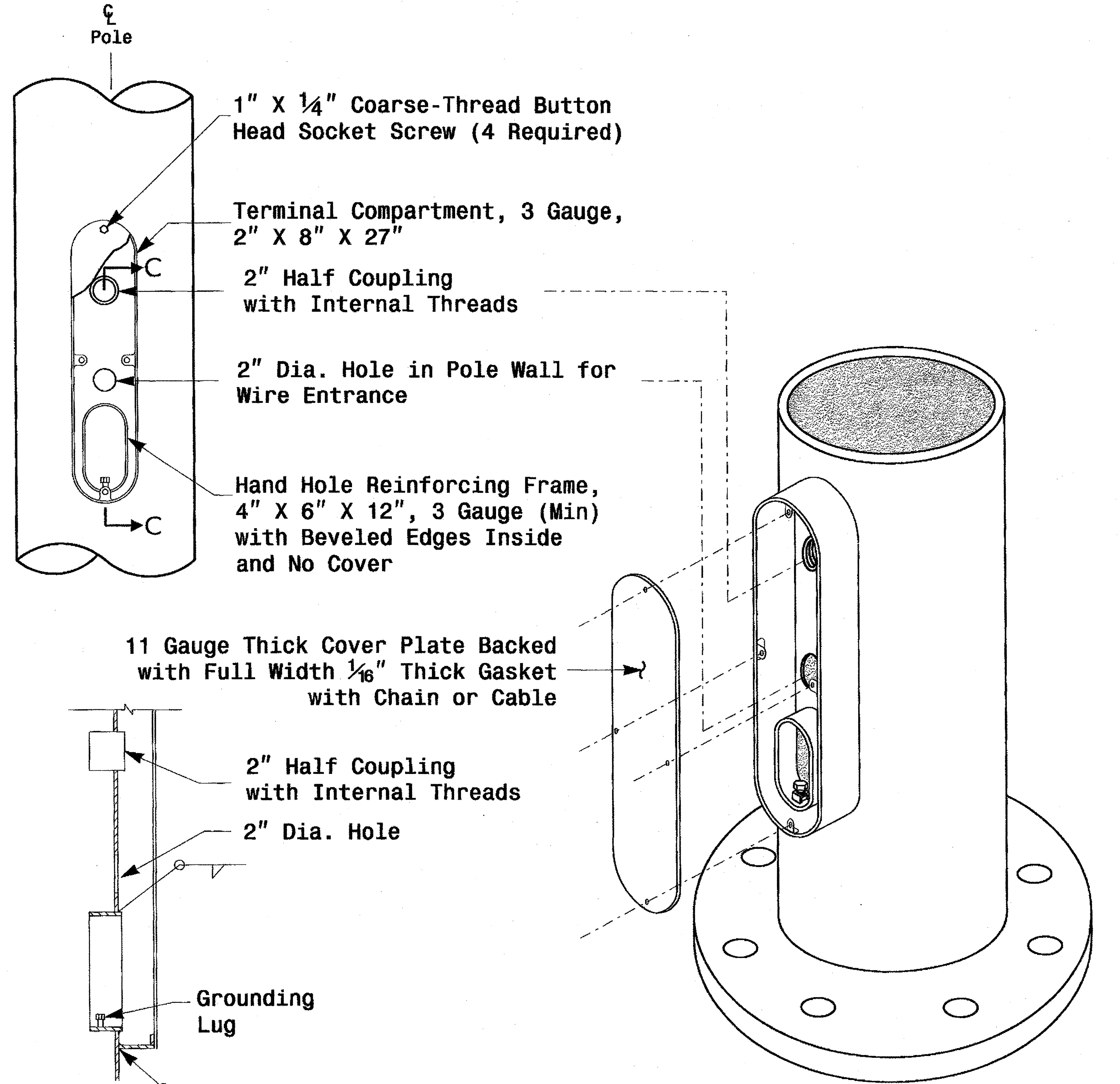
SEAL

NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

D. Sarkar 8.7.2013
SIGNATURE DATE

PROJECT REFERENCE NO. U-4432
SHEET NO. Sig. 13 M 2

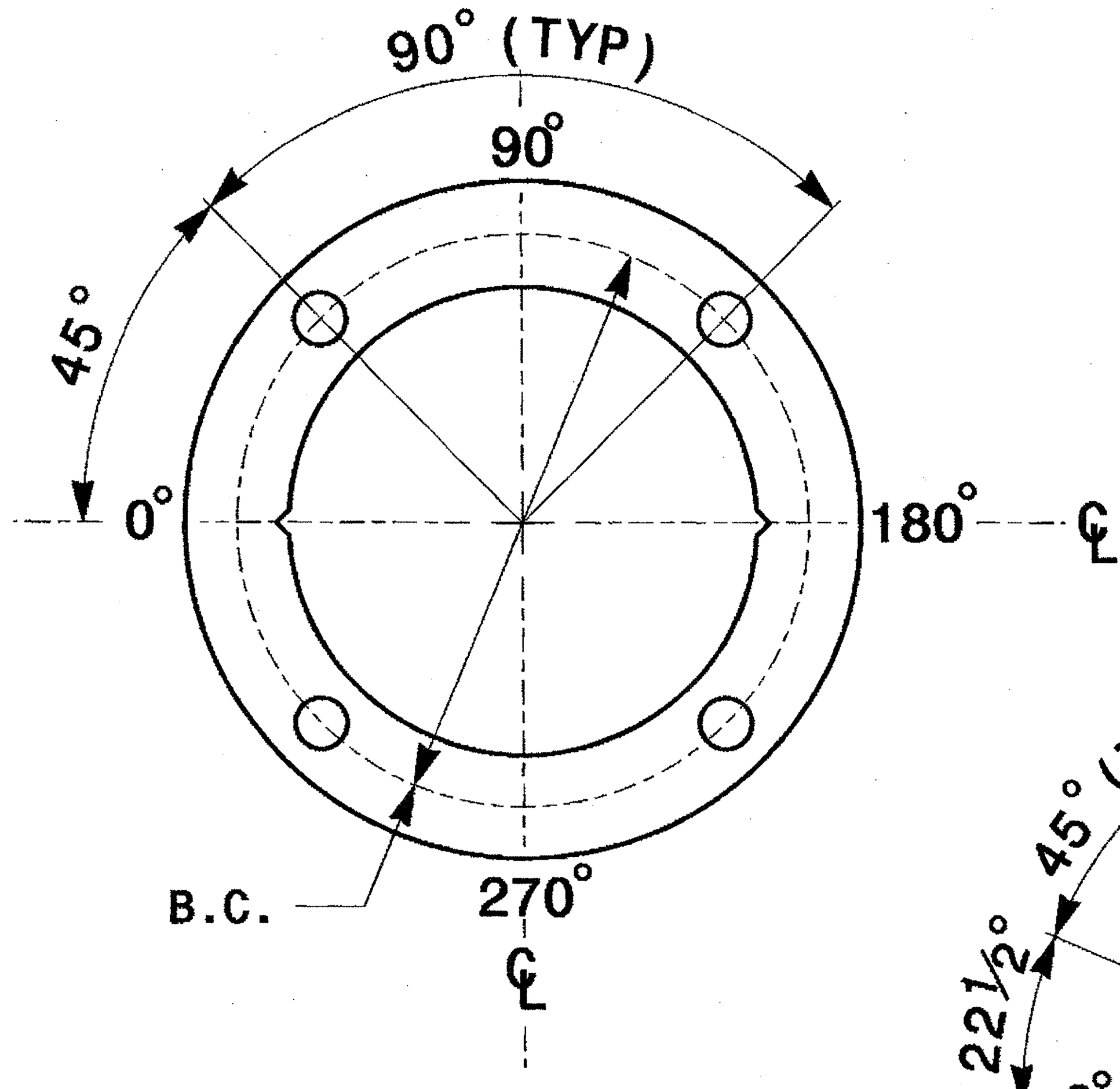
Fabrication Details - All Poles



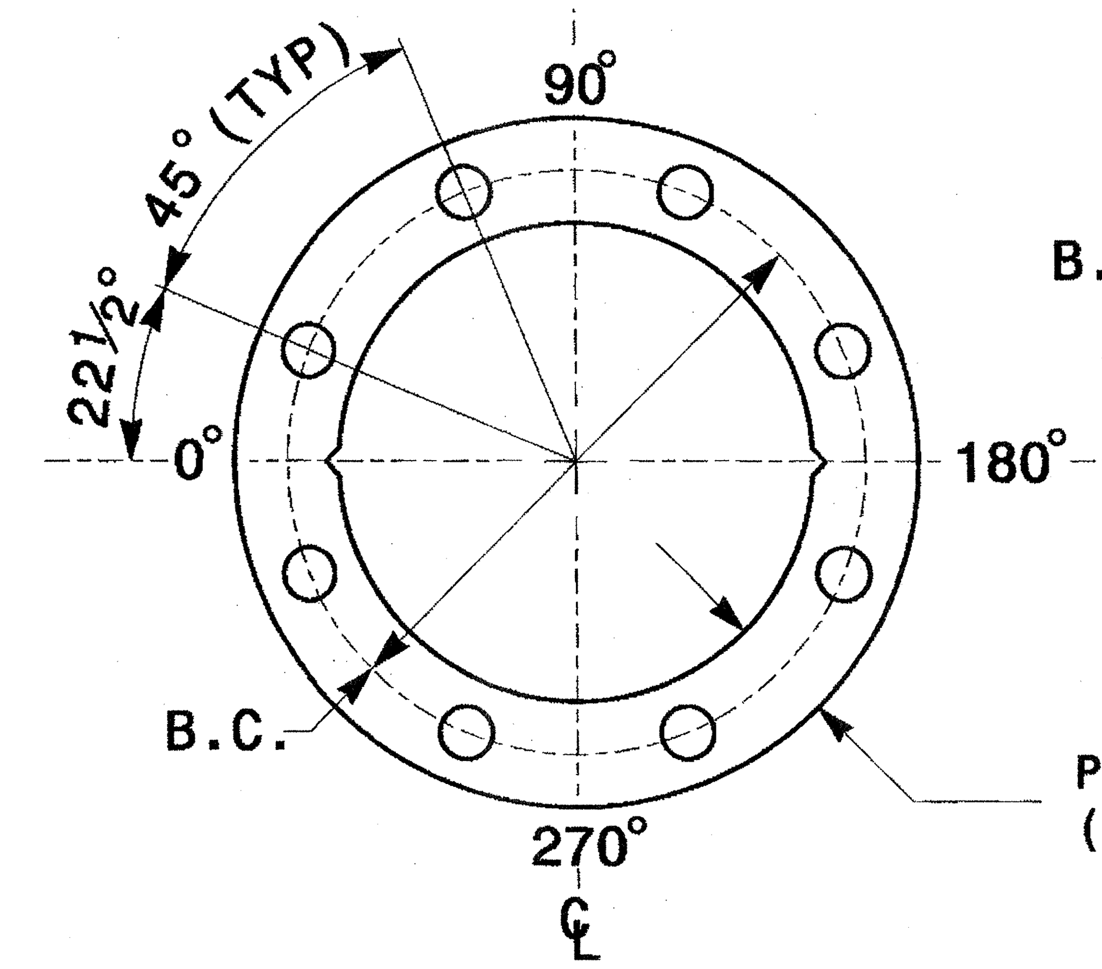
Section C-C

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

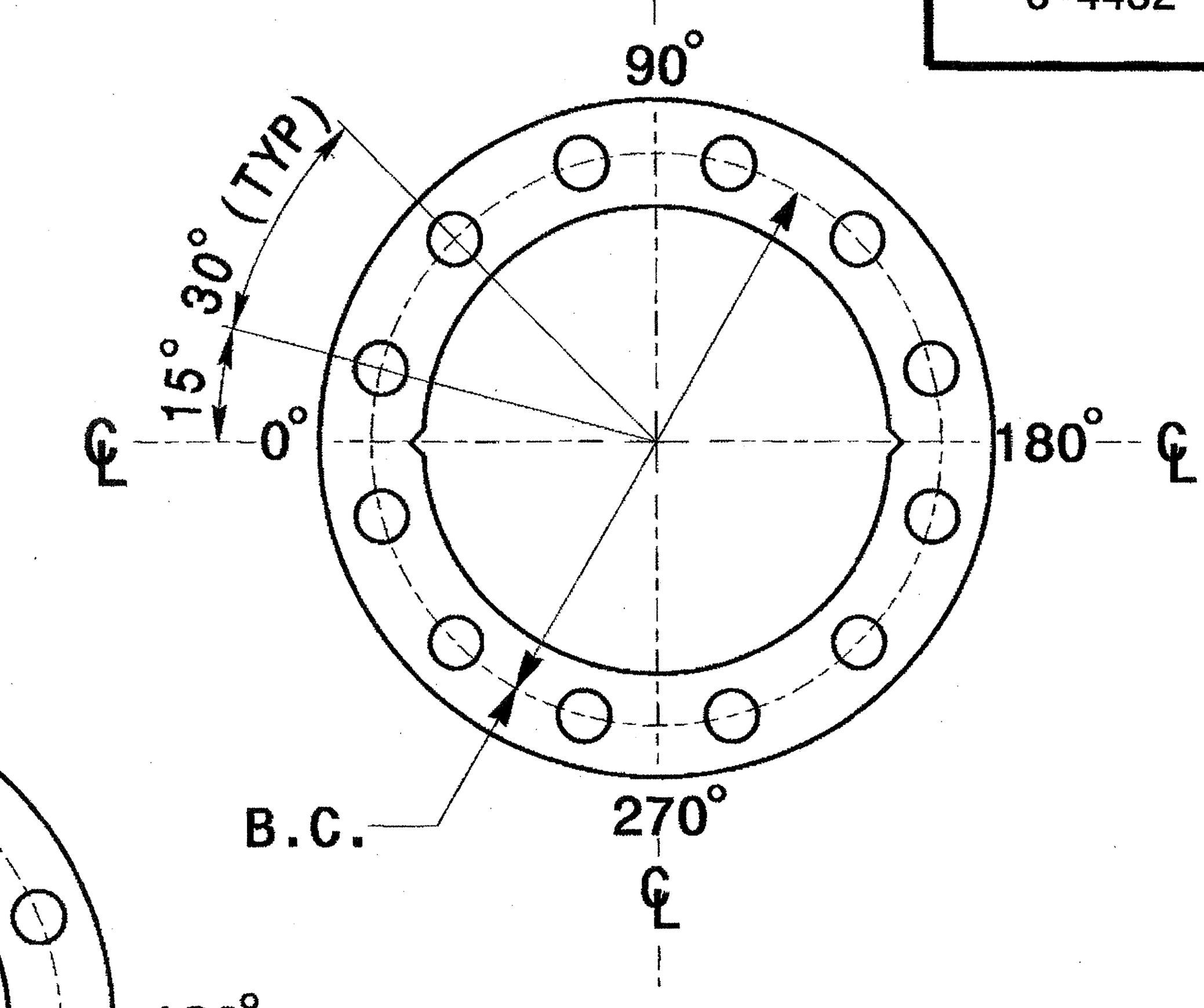
Terminal Compartment Detail



4 Bolt Pattern



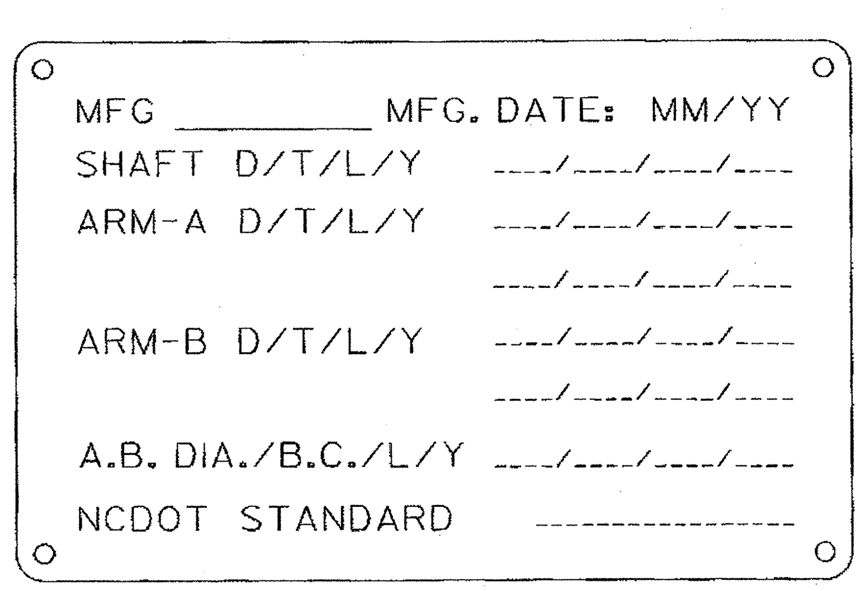
8 Bolt Pattern



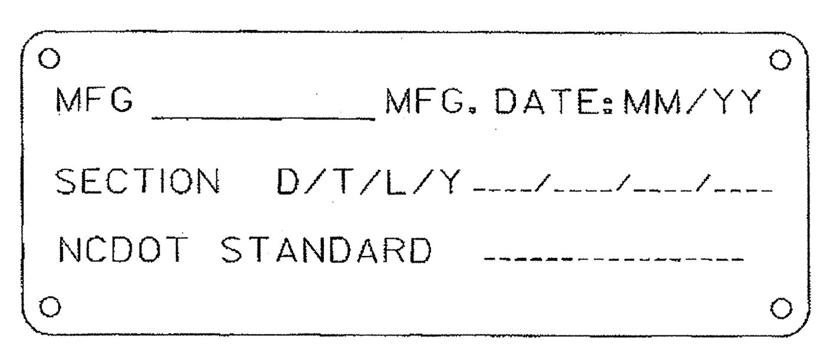
12 Bolt Pattern

Construct Templates and Plates from ¼" min. thick Steel. Galvanizing is not required.

Base Plate Template and Anchor Bolt Lock Plate Details



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



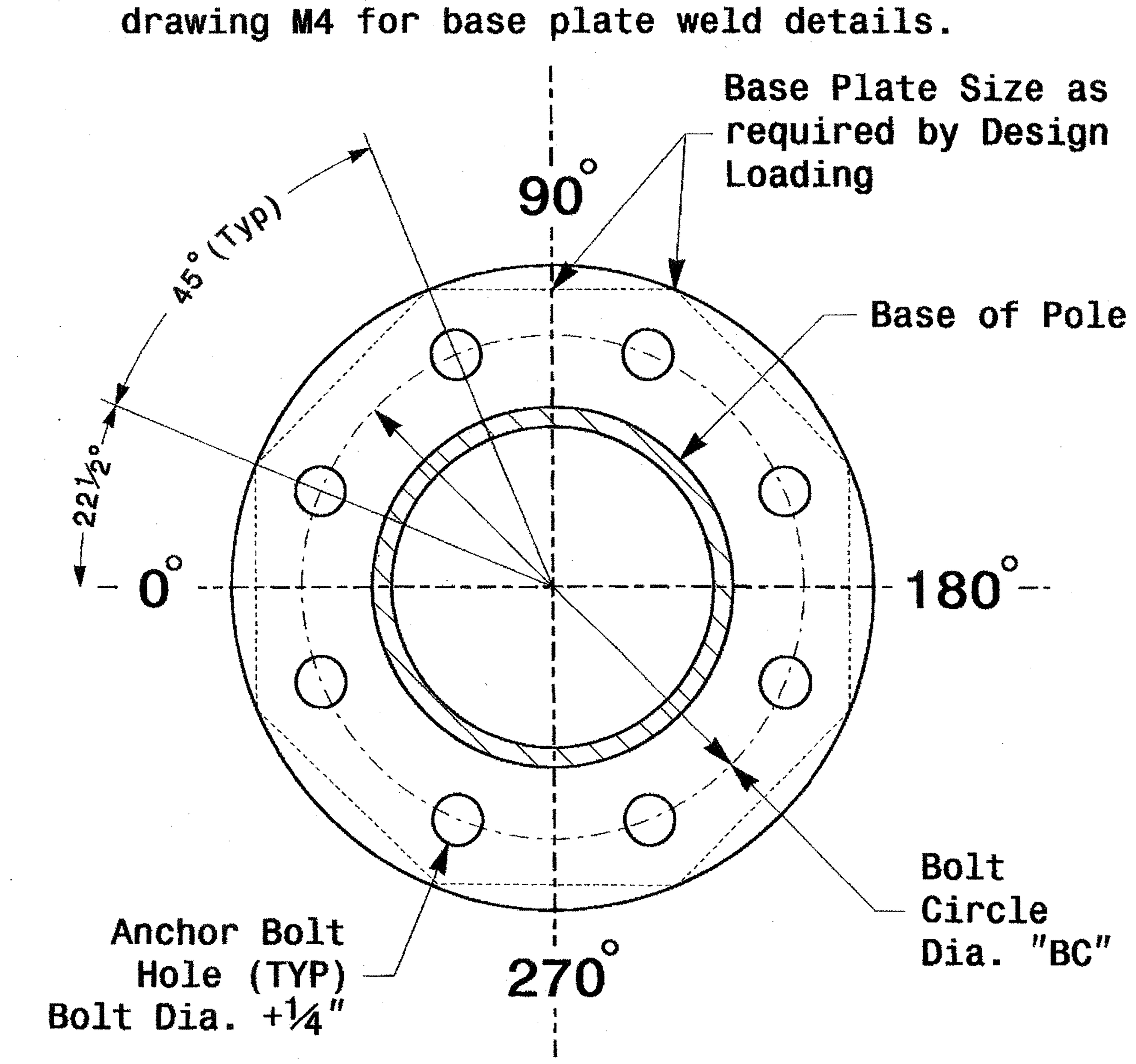
Arm I.D. Tag
(Provide on each section of a multi-section mast arm)

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

Identification Tag Details

Anchor Bolt Detail

Note: See Strain Pole drawing M3 and Mast arm drawing M4 for base plate weld details.



8 Bolt Base Plate Detail

Prepared in the Offices of:
Transportation Mobility and Safety Division, Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

Typical Fabrication Details Common To All Metal Poles

PLAN DATE:	AUGUST 2013	DESIGNED BY:	C.F. ANDREWS
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

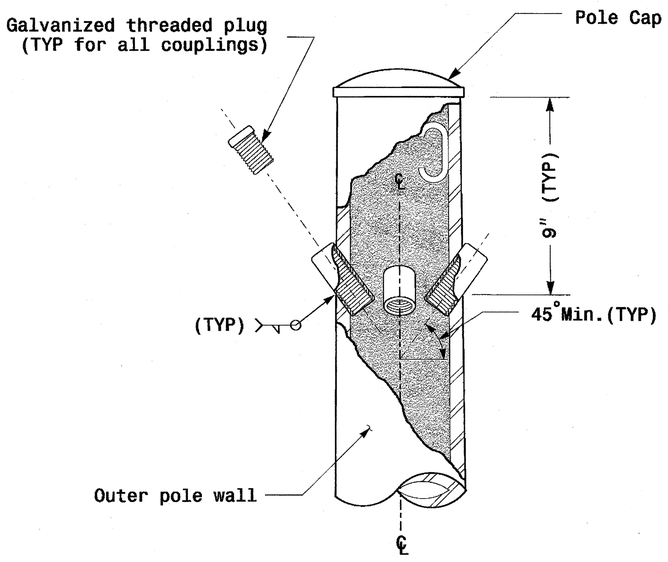
SCALE 0 NA NONE

REVISIONS	INIT.	DATE

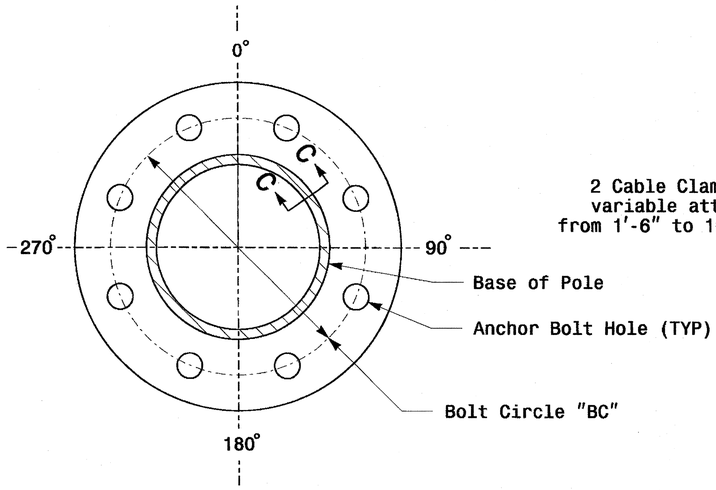
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR
D. Sarkar 8.7.2013
SIGNATURE DATE
SIG. INVENTORY NO.

07-AUG-2013 13:15
S:*ITS&SU*ITS Signals*Workgroups*Structures*Drawings*2012 Standard Strain Pole Dwgs*2012 m2.dgn
nbitting

PROJECT REFERENCE NO.	SHEET NO.
U-4432	Sig. 14 M 3



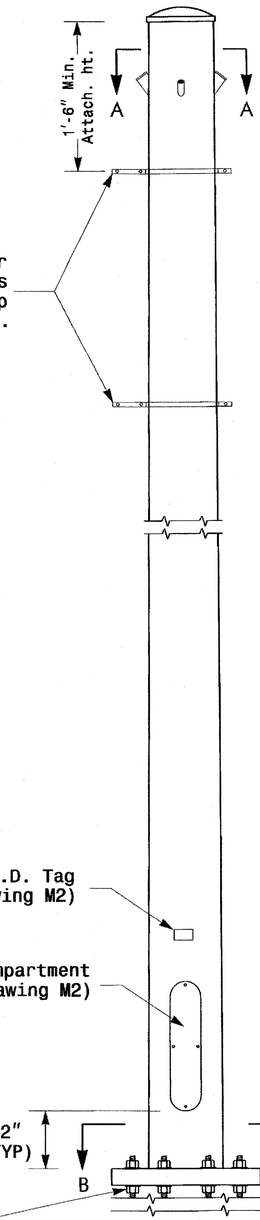
Cable Entrances at Top of Pole



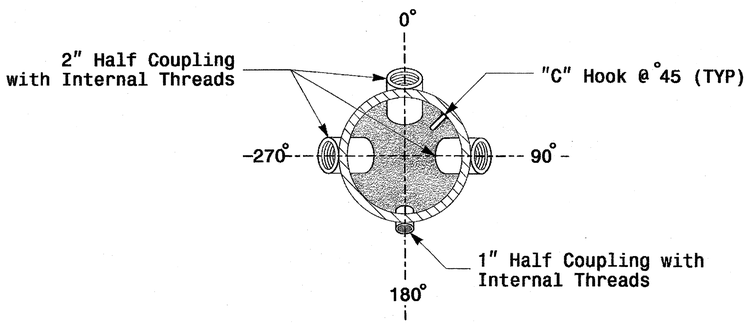
Section B-B

(See drawing M2)

Pole Base Plate

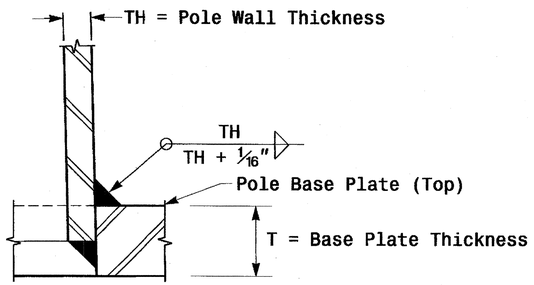


Monotube Strain Pole
(.14"/Foot Taper)



Section A-A

Radial Orientation for Factory Installed Accessories at Top of Pole



Section C-C

Socket Connection Weld Detail

Fabrication Details – Strain Poles

Prepared in the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

Typical Fabrication Details
For Strain Poles

PLAN DATE:	AUGUST 2013	DESIGNED BY:	C.F. ANDREWS
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

SCALE
0 NA
NONE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DIBESH C. SARKAR

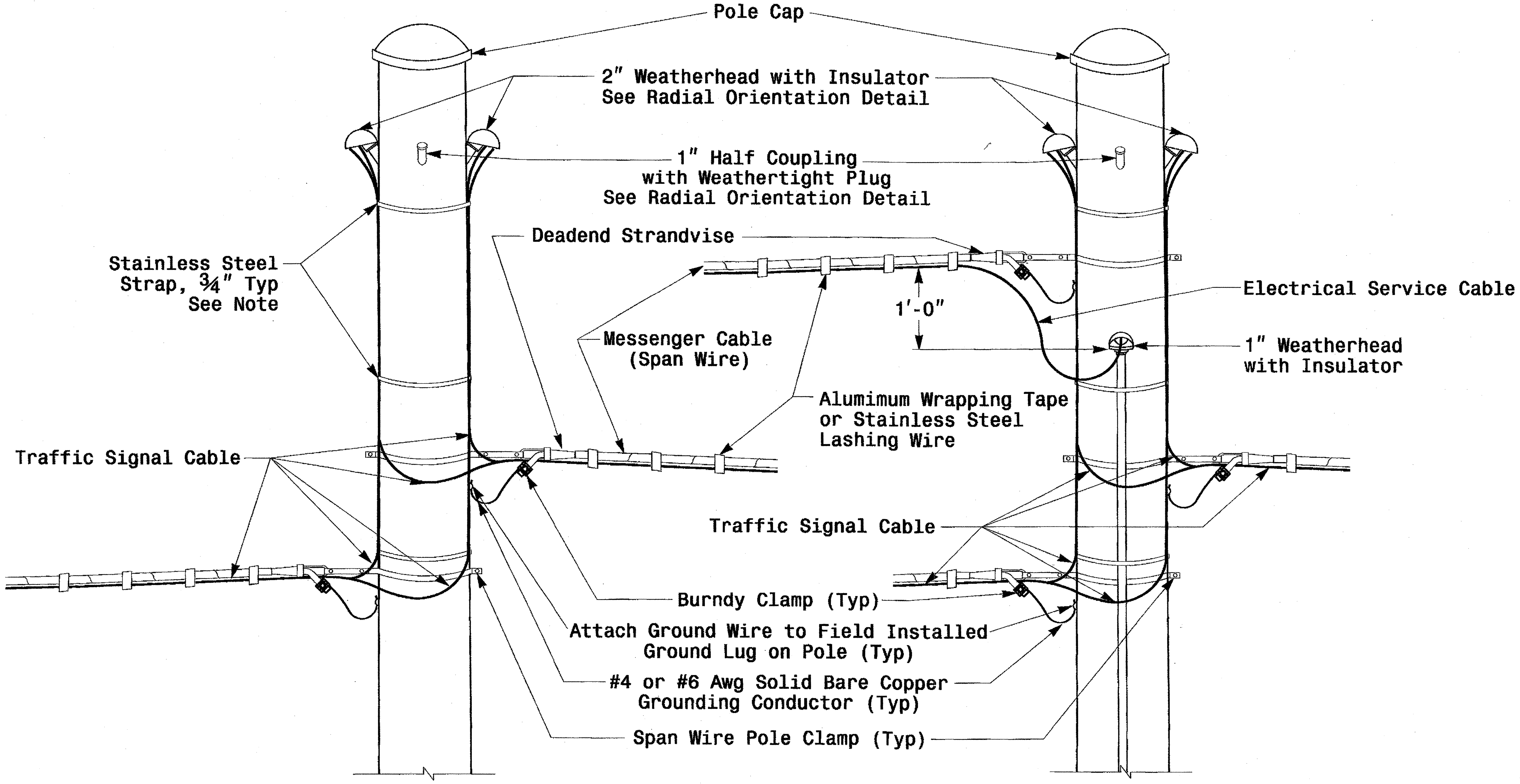
D.Sarkar 8.7.2013
SIGNATURE DATE

SIG. INVENTORY NO.

07-AUG-2013 13:11
S:\eTIS&SLW\ITS Signals\Workgroups\Structures\Drawings\2012 Standard Strain Pole Dwgs\M2012 m3.dgn
Matting

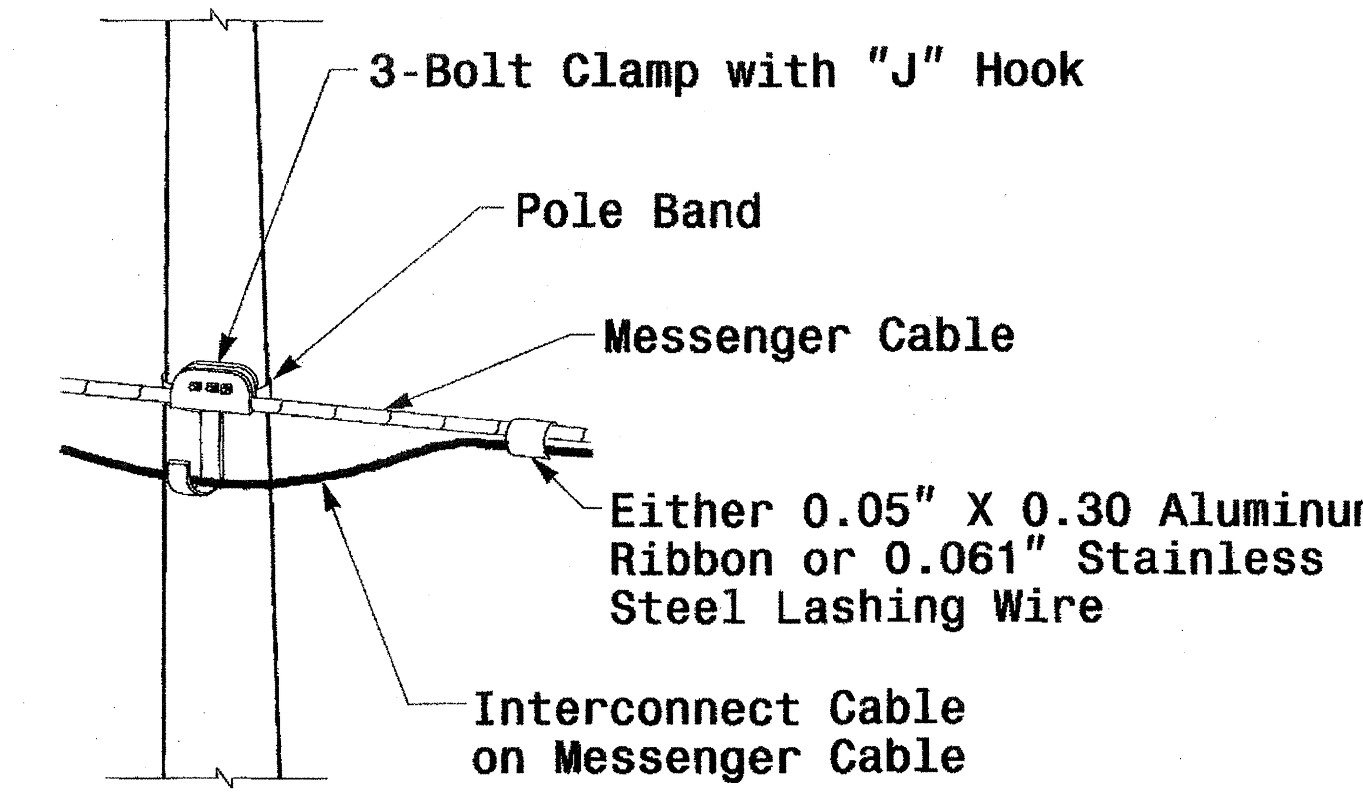
PROJECT REFERENCE NO.	SHEET NO.
U-4432	Sig. 15 M 6

Construction Details – Strain Poles

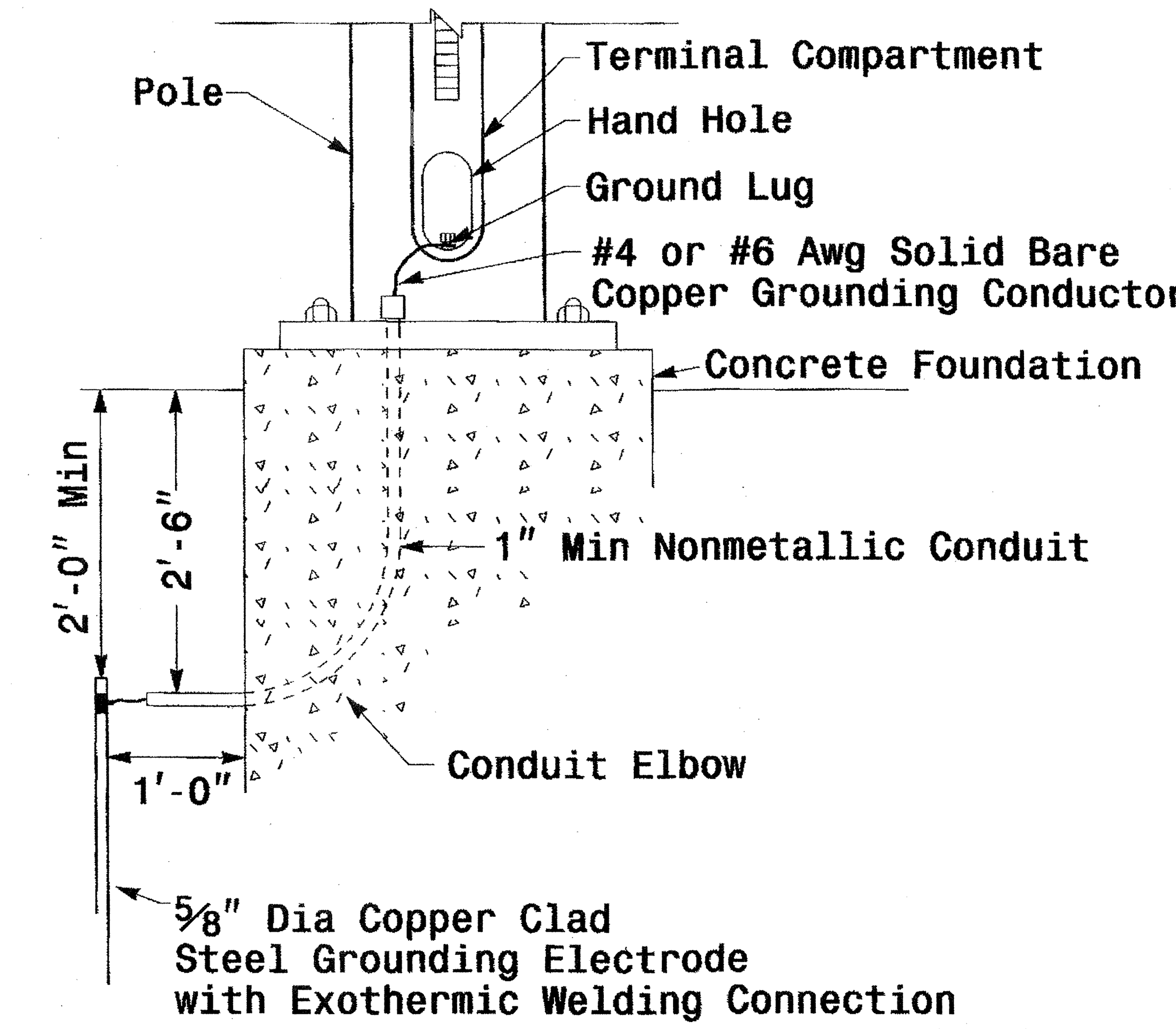


Strain Pole Attachments

Note: Strap all signal cables to the side of the pole with 3/4" stainless steel straps when the distance between the spanwire attachment clamp and the weatherheads exceeds 36"



Attachment of Cable to Intermediate Metal Pole



Metal Pole Grounding Detail

Prepared in the Offices of: Transportation Mobility and Safety Division, Signal Design Section, State of North Carolina Department of Transportation
750 N.Greenfield Pkwy,Garner,NC 27529

Construction Details
Strain Poles

PLAN DATE:	AUGUST 2013	REVIEWED BY:	C.F. ANDREWS
PREPARED BY:	N. BITTING	REVIEWED BY:	D.C. SARKAR

REVISIONS	INIT.	DATE

SCALE
0 NA
NONE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

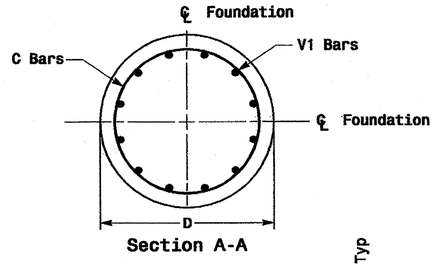
D. Sarkar 8.7.2013
SIGNATURE DATE

SIG. INVENTORY NO.

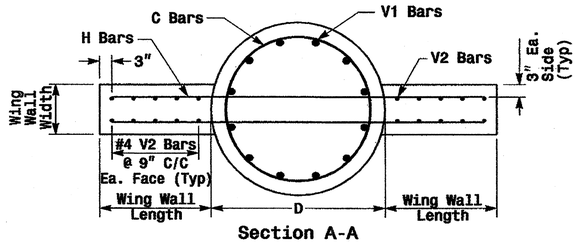
07-AUG-2013 13:39
S:*ITS&SU*ITS Signals*Workgroups*Structures*Drawings*2012 Standard Strain Pole Dwgs*2012 m6.dgn
nbitting

PROJECT REFERENCE NO.	SHEET NO.
U-4432	Sig. 16 M 7

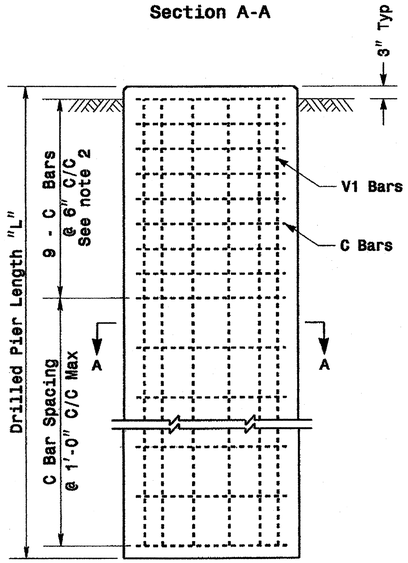
Reinforcing Steel Bars

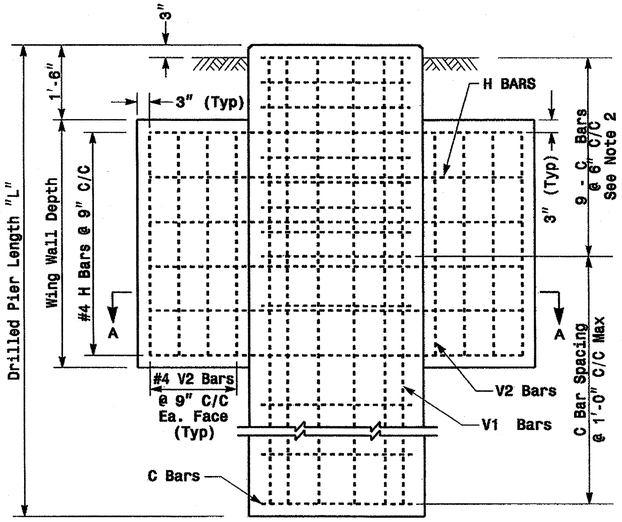


Section A-A



Section A-A



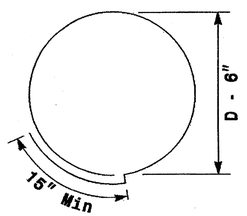


REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (42" & 48" DIAMETER)						
Shaft Dia (in.)	Conc. Volume (cu. yds.)	Bar Name	No.	Size	Type	Length
42"	.356 x L	V1	9	#8	STR.	**
		C	*	#4	CIR.	10'-9"
48"	.465 x L	V1	12	#8	STR.	**
		C	*	#4	CIR.	12'-6"

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

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



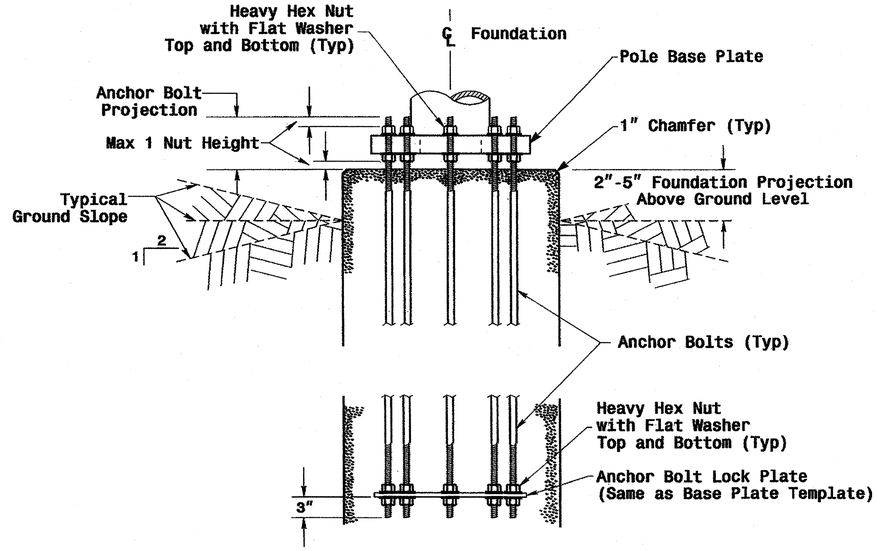
Typical "C" Bars

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

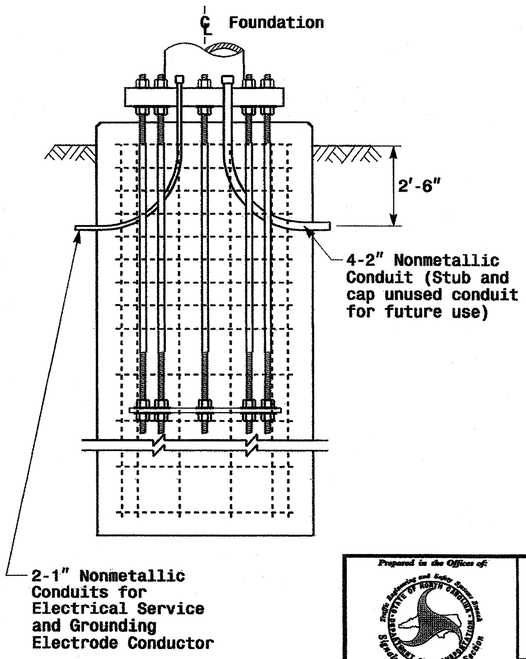
See Note No. 4

Typical Foundation Anchor Bolt Details

(Reinforcing Cage Not Shown for Clarity)



Typical Foundation Conduit Details



Notes

1. The number of C-bars is based on foundation depth. For standard foundations, see sheet M 8.
2. Circular tie reinforcing rings may be vertically adjusted by +/- 3" at a depth between 2'-0" and 3'-0" to facilitate the installation of electrical conduit entering in the cage.
3. The length of V1-bars is based on foundation depth. For standard foundations, see sheet M 8.
4. 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:
North Carolina Department of Transportation
Structure Design Unit
122 N. McDowell St., Raleigh, NC 27603

Construction Details
Foundations

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

SCALE	REVISIONS	INIT.	DATE
0 NA			
NONE			

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

D. Sarkar 9.2.2005
SIGNATURE DATE

SIG. INVENTORY NO.

01-SEP-2005 11:48
w:\esposites-unit\workgroups\2004 metal pole standards\2004 mf.dgn
poleander

		STANDARD STRAIN POLES				STANDARD FOUNDATIONS 42" Diameter Drilled Pier Length (L) – Feet						
						Clay				Sand		
		Case No.	Pole Height (Ft.)	Base Plate BC (In.)	Moment at the Pole Base (ft-kp)	Medium N-Value 4-8	Stiff N-Value 9-15	Very Stiff N-Value 16-30	Hard N-Value >30	Loose N-Value 4-10	Medium N-Value 11-30	Dense N-Value >30
WIND ZONE 1	LIGHT	S26L3	26	25	280	20.5	14.0	11.5	9.5	18.0	16.0	14.0
	LIGHT	S30L3	30	25	310	21.0	14.5	11.5	9.5	18.5	16.5	14.5
	LIGHT	S35L3	35	25	350	22.5	15.0	12.0	10.0	19.5	17.5	15.5
	HEAVY	S30H3	30	29	450	25.5	16.5	13.0	11.0	21.0	18.5	16.5
	HEAVY	S35H3	35	29	540	26.0	17.0	13.5	11.5	22.0	19.5	17.0
WIND ZONE 2	LIGHT	S26L2	26	23	250	19.5	13.5	11.0	9.0	18.0	15.5	14.0
	LIGHT	S30L2	30	23	290	20.0	14.0	11.5	9.5	18.5	16.0	14.0
	LIGHT	S35L2	35	23	315	21.0	14.5	11.5	9.5	19.0	16.5	14.5
	HEAVY	S30H2	30	29	415	24.5	16.0	13.0	10.5	21.0	18.5	16.0
	HEAVY	S35H2	35	29	485	25.5	16.5	13.5	11.0	21.5	19.0	16.5
WIND ZONE 3	LIGHT	S26L2	26	23	250	18.5	13.0	10.5	9.0	17.5	15.0	13.5
	LIGHT	S30L2	30	23	290	19.5	13.5	11.0	9.0	18.0	15.5	14.0
	LIGHT	S35L2	35	23	315	20.0	14.0	11.5	9.5	18.5	16.0	14.5
	HEAVY	S30H2	30	29	415	23.0	15.5	12.5	10.0	20.5	17.5	16.0
	HEAVY	S35H2	35	29	485	24.0	16.0	13.0	10.5	21.0	18.0	16.5
WIND ZONE 4	LIGHT	S26L1	26	22	195	18.0	13.0	10.5	9.0	16.5	14.5	13.0
	LIGHT	S30L1	30	22	225	18.5	13.0	10.5	9.0	17.0	15.0	13.5
	LIGHT	S35L1	35	22	255	19.0	13.5	11.0	9.0	17.5	15.5	14.0
	HEAVY	S30H1	30	25	330	22.0	15.0	12.0	9.5	19.5	17.0	15.0
	HEAVY	S35H1	35	25	385	23.0	15.5	12.5	10.0	20.0	17.5	15.5
WIND ZONE 5	LIGHT	S26L2	26	23	250	19.0	13.5	10.5	9.0	17.5	15.5	13.5
	LIGHT	S30L2	30	23	290	20.0	14.0	11.0	9.5	18.0	16.0	14.0
	LIGHT	S35L2	35	23	315	21.0	14.5	11.5	10.0	19.0	16.5	14.5
	HEAVY	S30H2	30	29	415	23.5	15.5	12.5	10.5	21.0	18.0	16.0
	HEAVY	S35H2	35	29	485	25.0	16.5	13.0	11.0	21.5	18.5	16.5

Concrete Volume (cubic yards)=.356 X L

Fabrication Design Notes:

1. Values shown in "Moment at the Pole Base" column represents the minimum acceptable capacity allowable for design using a design CSR of 1.
2. Base plate thickness (T) is 2.0 inches.

Foundation Selection:

1. Perform a standard penetration test at each proposed foundation site to determine "N" value.
2. Select the appropriate wind zone from sheet M 1.
3. Select the soil type (Clay or Sand) that best describes the soil characteristics.
4. Get the appropriate pole case load number from the plans or from the Engineer.
5. Select the appropriate column in the chart based on soil type and "N" value. Select the appropriate row based on the pole load case. The foundation depth is the value where the column and the row intersect.

Standard Strain Poles

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch, State of North Carolina Department of Transportation, Signals and Geometrics Section
122 N. McDowell St., Raleigh, NC 27603

Standard Strain Poles
and
Standard Foundations

PLAN DATE: May 2005 | REVIEWED BY: C.F. Andrews
PREPARED BY: P.L. Alexander | REVIEWED BY: A.M. Esposito

SCALE 0 NA None

REVISIONS | INIT. | DATE

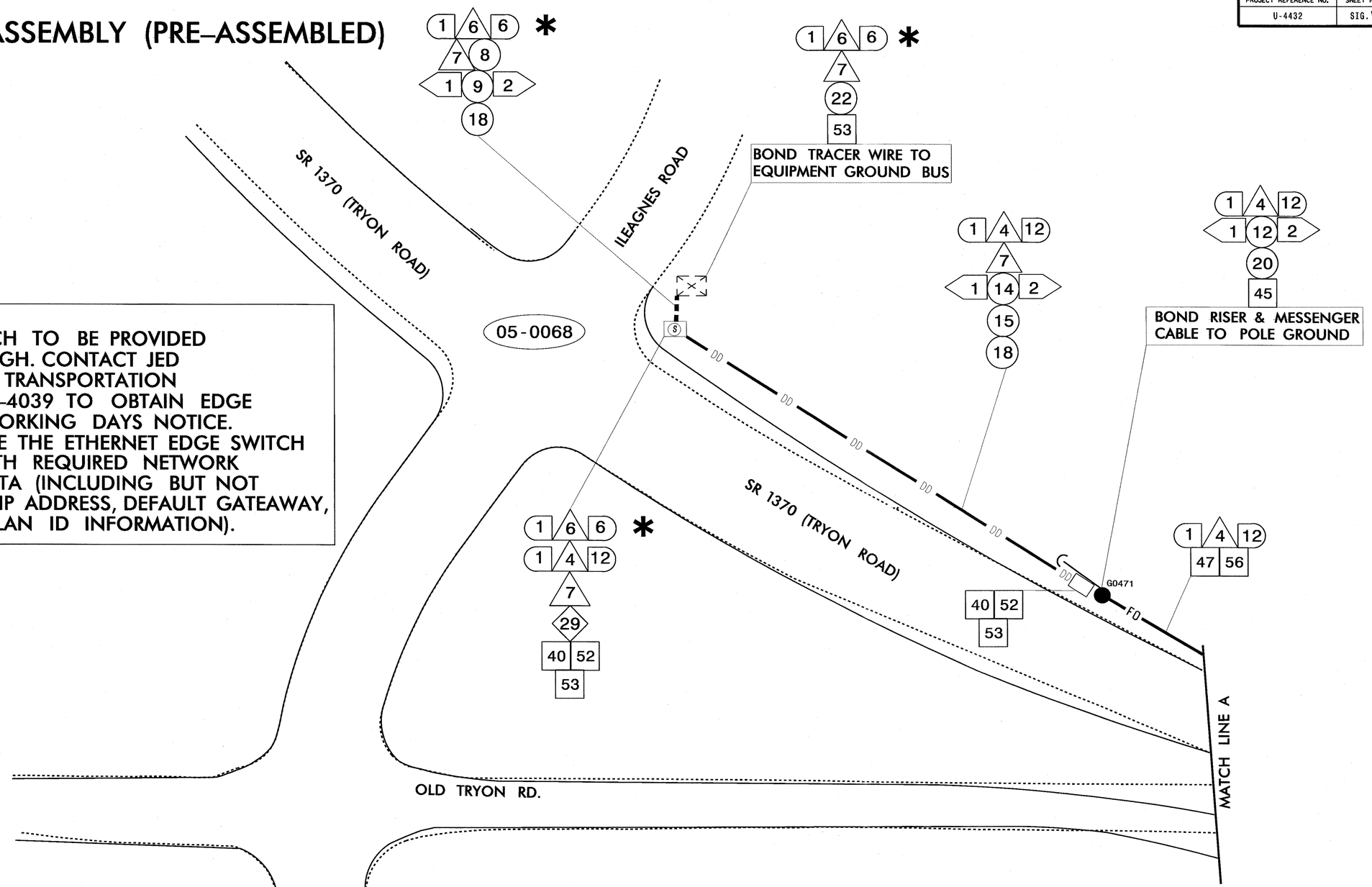
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR
D. Sarkar 9.2.2005
SIGNATURE DATE

02-SEP-2005 12:42
w:\peoples-unit\workgroups\2004 metal pole standards\2004 m8 std strain pole.dgn
palexander

PROJECT REFERENCE NO.	SHEET NO.
U-4432	SIG. 18

* DROP CABLE ASSEMBLY (PRE–ASSEMBLED)

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



NOTE 1. ALL CABLE ATTACHMENT POINTS ARE 40 INCHES BELOW POWER, FRONT SIDE OF POLE UNLESS OTHERWISE NOTED.

Prepared in the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Integrated Mobility Division
750 N. Greenfield Pkwy., Garner, NC 27529

SCALE 0

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN
TRYON RD. FROM BRIDGE NO.259 TO US 70-401/NC 50(WILMINGTON ST.)
DIVISION 05 WAKE COUNTY RALEIGH

PLAN DATE:	OCTOBER 2013	REVIEWED BY:	I. N. AVERY
PREPARED BY:	P. C. LOUDER	REVIEWED BY:	G.A.FULLER,PE

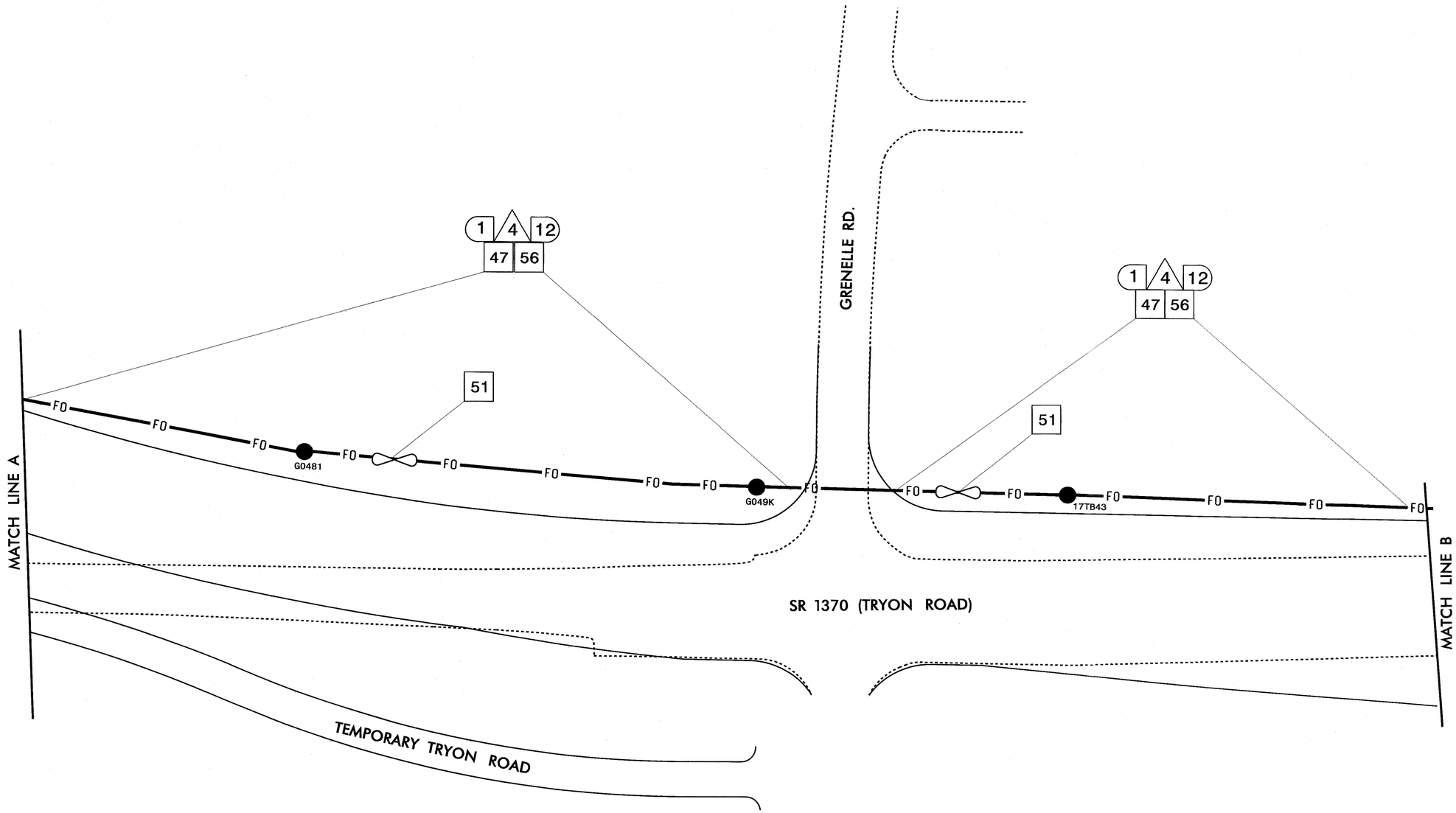
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
023919
ENGINEER
GREGORY A. FULLER

Gregory A. Fuller, 10/10/13
SIGNATURE DATE

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
U-4432	SIG. 19



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Prepared in the Offices of:
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Transportation Mobility and Safety Division
Integrated Mobility Systems Section
750 N. Greenfield Pkwy., Garner, NC 27529

SCALE 0

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN
TRYON RD. FROM BRIDGE NO.259 TO US 70-401/NC 50(WILMINGTON ST.)

DIVISION 05 WAKE COUNTY RALEIGH

PLAN DATE:	OCTOBER 2013	REVIEWED BY:	I. N. AVERY
PREPARED BY:	P. C. LOUDER	REVIEWED BY:	G.A.FULLER,PE

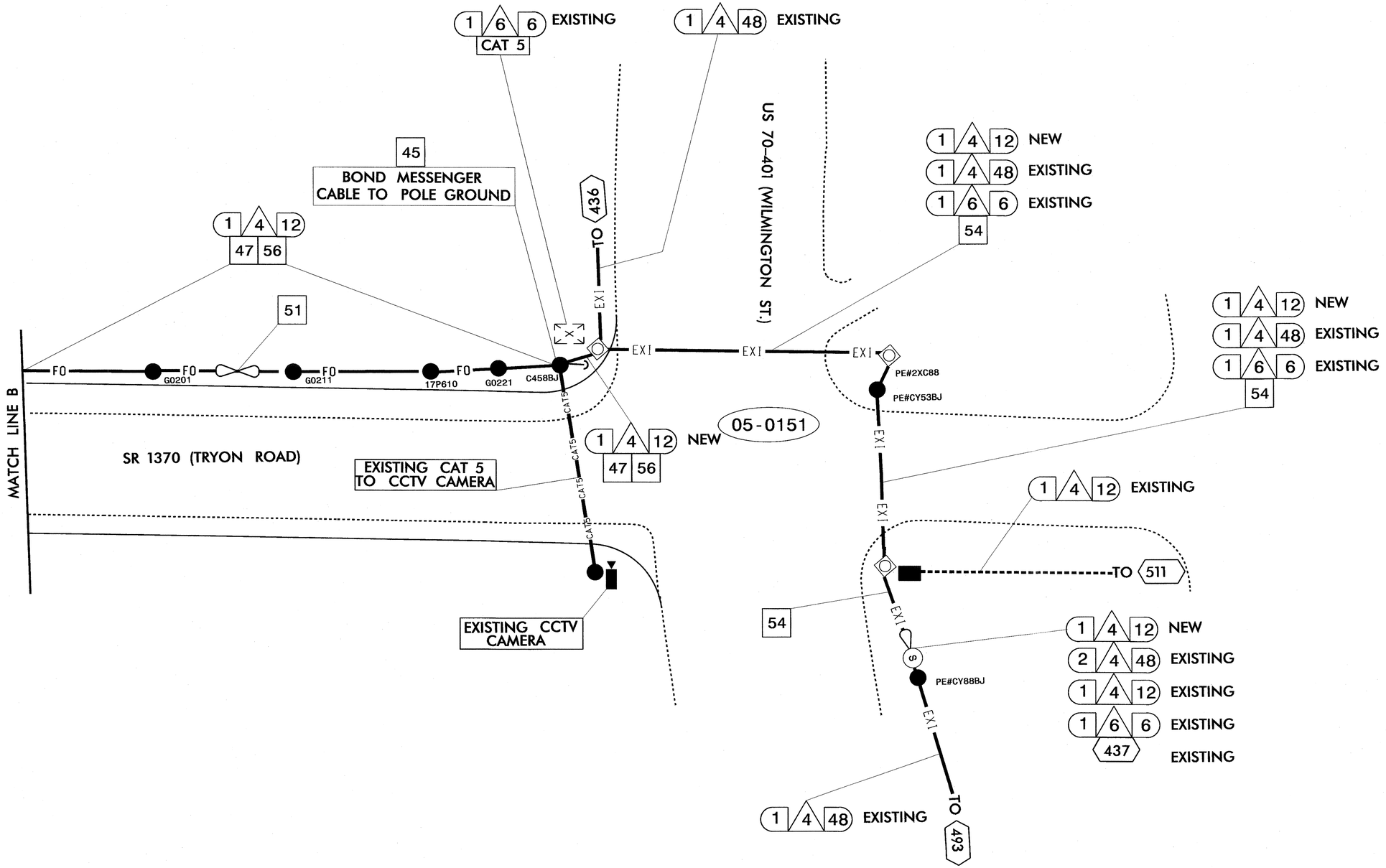
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

SIGNATURE 10/16/13 DATE

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
U-4432	SIG. 20



NOTE 1. ALL CABLE ATTACHMENT POINTS ARE 40 INCHES BELOW POWER, FRONT SIDE OF POLE UNLESS OTHERWISE NOTED.

Prepared in the Offices of:
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Transportation Mobility and Safety Division
Integrated Transportation Systems Section
750 N. Greenfield Pkwy., Garner, NC 27529

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN
TRYON RD. FROM BRIDGE NO.259 TO US 70-401/NC 50(WILMINGTON ST.)

DIVISION 05 WAKE COUNTY RALEIGH

PLAN DATE:	OCTOBER 2013	REVIEWED BY:	I. N. AVERY
PREPARED BY:	P. C. LOUDER	REVIEWED BY:	G.A.FULLER,PE

SCALE 0

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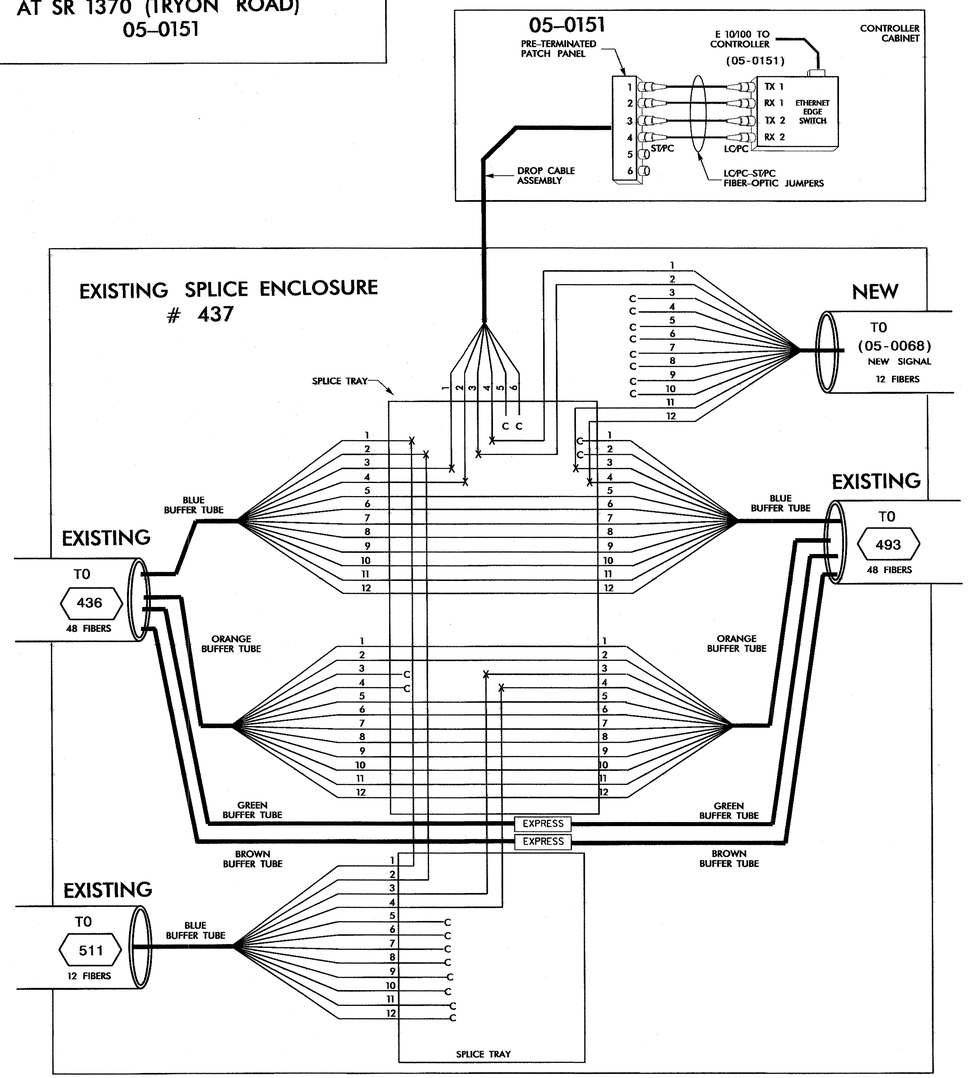
023919
ENGINEER
GREGORY A. FULLER

SIGNATURE 10/16/13 DATE

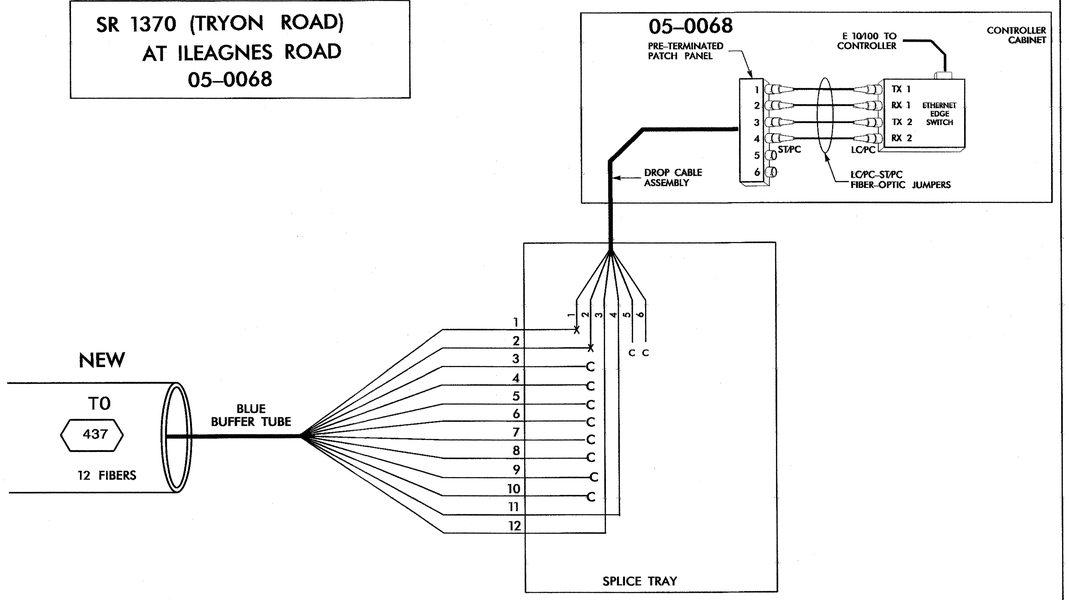
CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
U-4432	SIG.21

US 70–401 (WILMINGTON ST.) AT SR 1370 (TRYON ROAD) 05–0151



SR 1370 (TRYON ROAD) AT ILEAGNES ROAD 05–0068



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

Prepared in the Offices of:
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Transportation Mobility and Safety Division
Intermodal Transportation Systems Section
750 N. Greenfield Pkwy., Garner, NC 27529

SCALE 0

SPLICE PLAN

DIVISION 05 WAKE COUNTY RALEIGH

PLAN DATE: OCTOBER 2013 REVIEWED BY: I. N. AVERY

PREPARED BY: P. C. LOUDER REVIEWED BY: G.A.FULLER,PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

Gregory A. Fuller 10/16/13
SIGNATURE DATE

CADD Filename: