09/08/99

TIP PROJECT: U-0071

CONTRACT: C203394

$$$$$SYSTIME$$$$
$$$$$$$$$$$$
$$$$USERNAME$$$$DGN$$$$$$$$$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.1

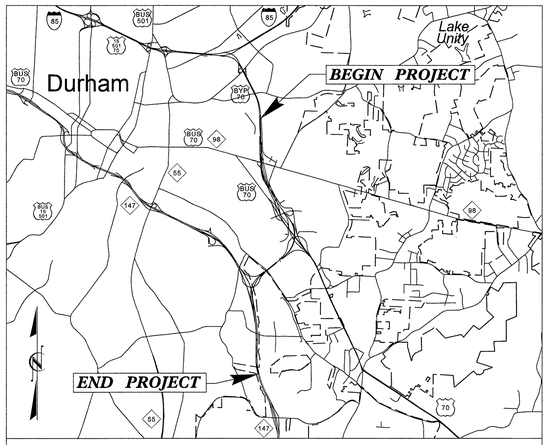
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

DURHAM COUNTY

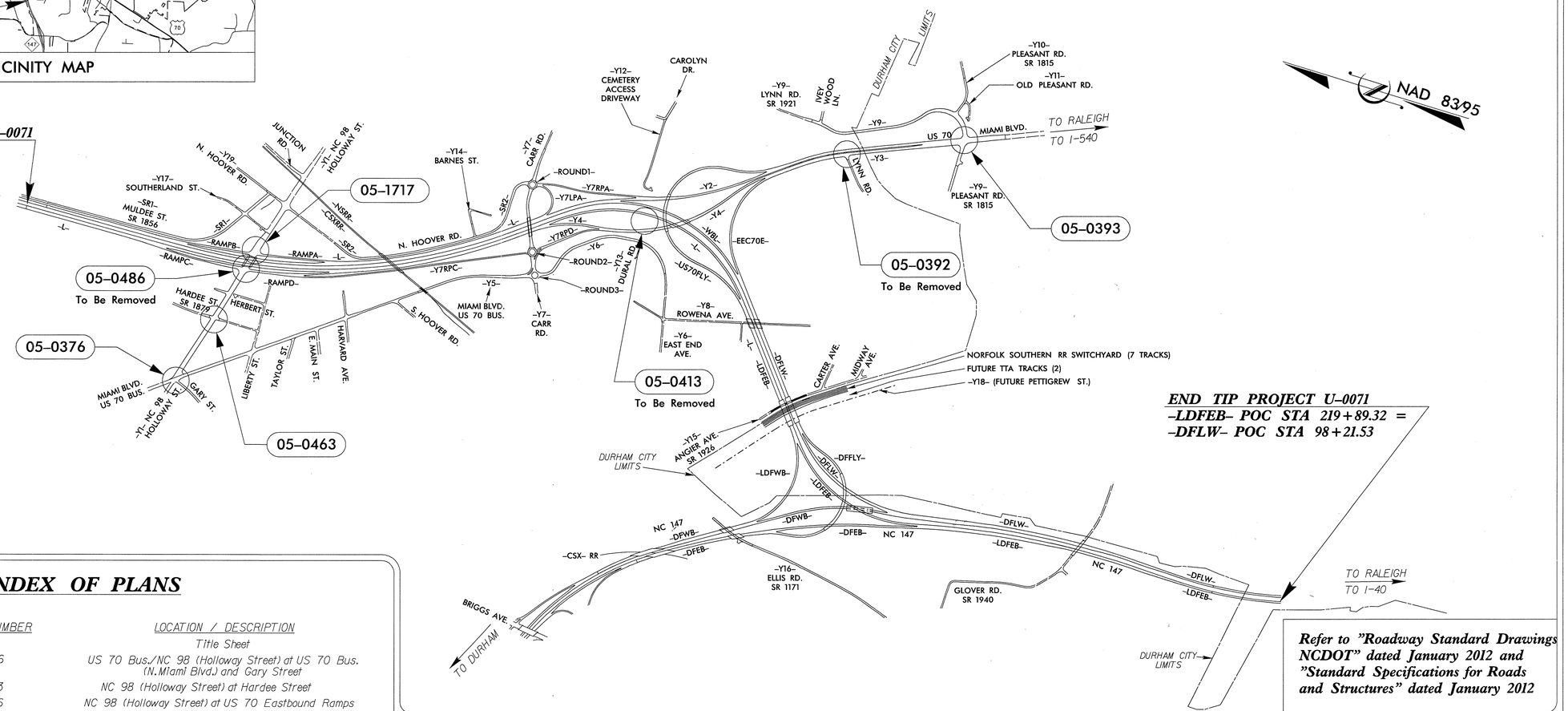
LOCATION: DURHAM EAST END CONNECTOR FROM NC 147 (BUCK DEAN FREEWAY) TO NORTH OF NC 98

TYPE OF WORK: TRAFFIC SIGNALS & SIGNAL COMMUNICATIONS

Part 4 Of 4



VICINITY MAP



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

INDEX OF PLANS

SHEET NUMBER	SIGNAL INV.NUMBER	LOCATION / DESCRIPTION
1	-	Title Sheet
2 - 10	05-0376	US 70 Bus./NC 98 (Holloway Street) at US 70 Bus. (N.Miami Blvd.) and Gary Street
11 - 15	05-0463	NC 98 (Holloway Street) at Hardee Street
16 - 19	05-0486	NC 98 (Holloway Street) at US 70 Eastbound Ramps
20 - 35	05-1717	NC 98 (Holloway Street) at US 70 Ramps
36 - 37	05-0413	US 70 (South Miami Boulevard) at SR 1925 (East End Avenue)
38 - 41	05-0392	US 70 at SR 1921 (Lynn Road)
42 - 52	05-0393	US 70 at SR 1815 (Pleasant Drive)
53 - 57	-	Metal Pole Design Plans
58 - 65	-	Standard Metal Pole Details
66 - 85	-	Communications Cable and Conduit Routing Plans
86 - 93	-	Splice Details
94 - 95	-	CCTV Metal Pole Details

PLANS PREPARED BY:

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

JEFFREY HOCHANADEL, P.E. - PROJECT MANAGER
MATTHEW COPPLE, P.E. - PROJECT ENGINEER
CLIFTON LAWSON, E.I. - DESIGN ENGINEER

LEGEND

##-#### SIGNAL INVENTORY NUMBER

TRANSPORTATION PLANS PREPARED FOR:

MOBILITY AND SAFETY DIVISION / ITS & SIGNALS UNIT
ROBERT J. ZIEMBA, P.E. - CENTRAL REGION SIGNALS ENGINEER
GEORGE C. BROWN, P.E. - SIGNAL EQUIPMENT DESIGN ENGINEER
I. NEIL AVERY - SIGNAL COMMUNICATIONS PROJECT ENGINEER

ENGLISH

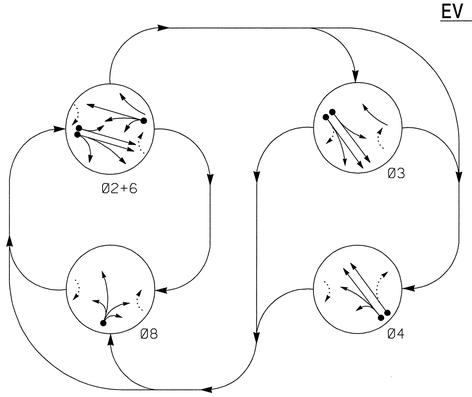
ALL DIMENSIONS IN THESE PLANS ARE IN FEET UNLESS OTHERWISE NOTED

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

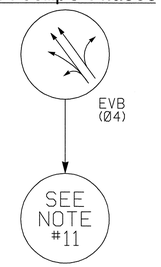
SIGNATURE DATE 11/22/13

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 2

PHASING DIAGRAM



EV Preempt Phases



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	Ø3	Ø4	Ø8	EVB	FLASH
21, 22	G	R	R	R	R	Y
31	R	G	R	R	R	R
32,33	R	G	R	R	R	R
41	R	R	G	R	G	R
42	R	R	G	R	G	R
61	G	R	R	R	R	Y
62	G	R	R	R	R	Y
81	R	R	R	G	R	R
82	R	R	R	G	R	R

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING														
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6x6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6x6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
3A	6x40	2-4-2	0	X	-	3	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
3B	6x40	2-4-2	0	X	-	3	5 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6x40	2-4-2	0	X	-	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4B	6x40	2-4-2	0	X	-	4	5 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6x6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6x40	2-4-2	+5	X	-	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-

SIGNAL FACE I.D.

All Heads L.E.D.

4 Phase Fully Actuated w/ EV Preemption (Durham Signal System)

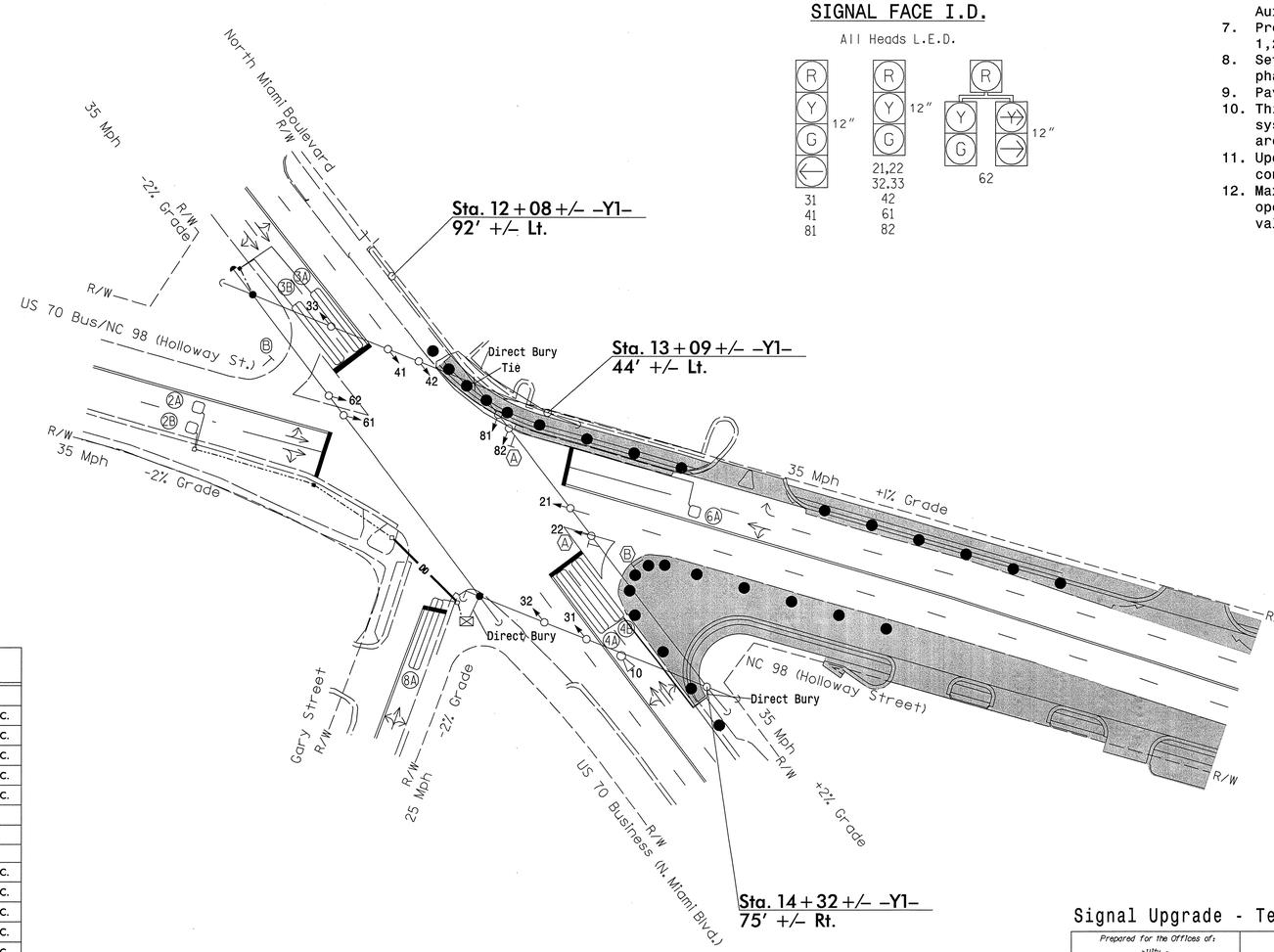
NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. The order of phase 3, 4 and/or phase 8 may be reversed.
4. Set all detector units to presence mode.
5. Locate new cabinet as to not obstruct sight distance of vehicles turning right on red.
6. The cabinet should be designed to include an Auxilary Output File for future use.
7. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
8. Set phase bank 3 maximum limit to 250 seconds for phases used.
9. Pavement markings are existing.
10. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
11. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
12. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

2033 EV PREEMPTION

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	0
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	20
PREEMPT EXTEND**	2.0

** Program Timing on Optical Detector Unit



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	
	Directional Drill	N/A
	"No Turn on Red" Sign (R10-11)	
	"Yield" Sign (R1-2)	
	Optical Detector	
	Work Area	N/A
	Barrels	N/A
	Direct Bury	N/A

TIMING CHART

2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø6	Ø8
MINIMUM INITIAL *	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.0 SEC.	4.0 SEC.	3.7 SEC.	3.8 SEC.	3.3 SEC.
RED CLEARANCE	2.7 SEC.	2.6 SEC.	2.7 SEC.	2.3 SEC.	3.0 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	25 SEC.	45 SEC.	20 SEC.
RECALL POSITION	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF
WALK *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 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.

$$$$$$$$SYSTIME$$$$
$$$$$$$$SYSTIME$$$$
$$$$$$$$SYSTIME$$$$
$$$$USERNAME$$$$

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
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Fax:919-789-9591
License #: C-2197

Signal Upgrade - Temporary Design 1 (TMP Phase I, Step 2)

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

SCALE 0 40 1"=40'

US 70 Bus./NC 98 (Holloway Street) at US 70 Bus. (N. Miami Blvd.) and Gary Street

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson	REVIEWED BY:

REVISIONS DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

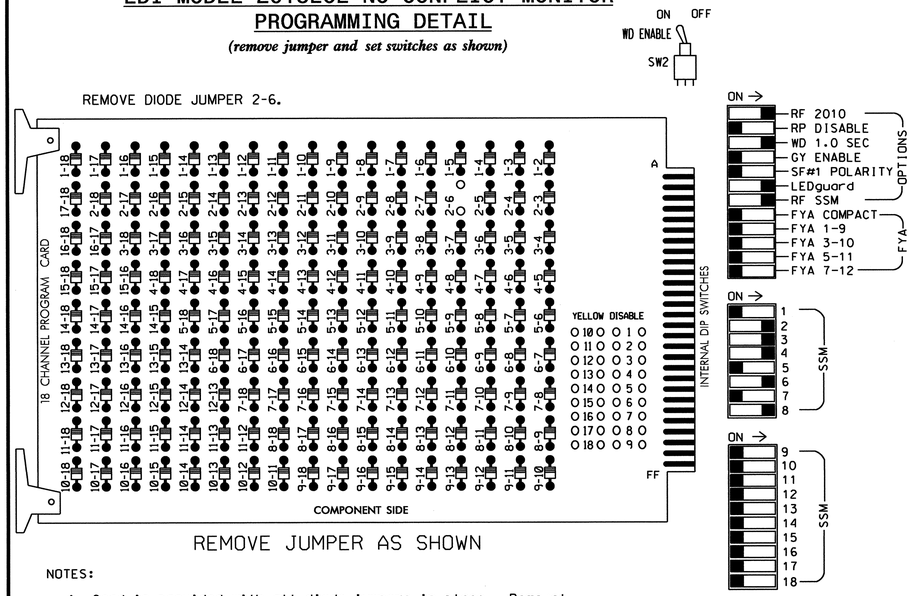
SIGNATURE DATE 11/22/13

SIG. INVENTORY NO. 05-0376TI

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.3

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches 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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. This cabinet and controller are part of the Durham Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4			S5		S6	S7	S8	S9	S10	S11		S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3			4		14	5	6	15	7	8		16	9	10	17	11	12	18
PHASE	1	2	2 PED	3			4		4 PED	5	6	6 PED	7	8		8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	31	32,33	62	41	42	NU	NU	61,62	NU	NU	81	82	NU	NU	NU	NU	NU	NU	NU
RED		128		116	116		101	101			134			107	107							
YELLOW		129		117	117		102	102			135			108	108							
GREEN		130		118	118		103	103			136			109	109							
RED ARROW																						
YELLOW ARROW						117																
GREEN ARROW				118		118	103							109								

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S4,S5,S8,S11
PHASES USED.....2,3,4,6,8
OVERLAPS.....NONE

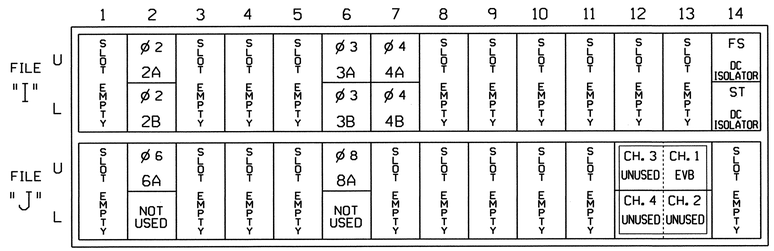
EMERGENCY VEHICLE PREEMPTION PROGRAMMING FOR EVB

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 2) EMERGENCY VEHICLE
   EVB Clear = 20
   EVB Clearance Phases = 4
2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

Program extend time on optical detector unit for 2.0 sec for EVB.

INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME
EVB = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD INSERT CARD INTO SLOT J13

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
3A	TB4-9,10	I6U	3	41	5 7	3
3B	TB4-11,12	I6L	7	45	5 7	3
4A	TB6-1,2	I7U	23	65	5 7	4
4B	TB6-3,4	I7L	31	78	5 7	4
6A	TB3-5,6	J2U	2	40	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

PHASE SEQUENCE PROGRAMMING

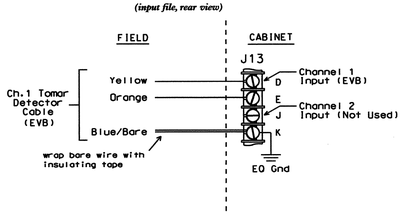
Implement Exclusive Phases as follows:

Main Menu - 9) UTILITIES - 5) CONFIGURATION
Permit = 2,3,4,6,8
Exclusive = 3,4,8

2	3	4	
6			8

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0376T1
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 1 (TMP Phase I, Step 2)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 70 Bus./NC 98 (Holloway Street) at US 70 Bus. (N. Miami Blvd.) and Gary Street

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	JTK
PREPARED BY:	S. Armstrong	REVIEWED BY:	

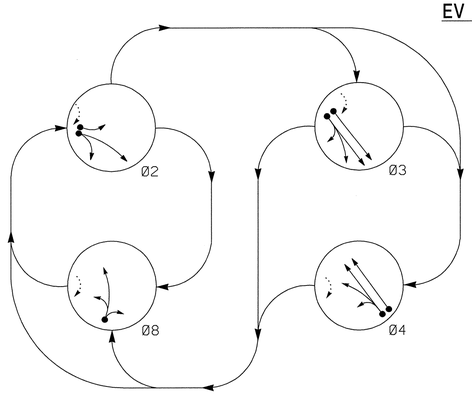
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE DATE 11-26-13
SIG. INVENTORY NO. 05-0376T1

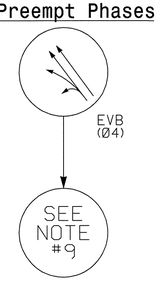
26-NOV-2013 07:27
C:\Users\sarmstrong\Documents\05037G_smi_ele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 4

PHASING DIAGRAM



EV Preempt Phases



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

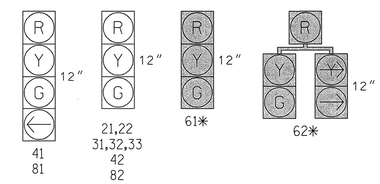
SIGNAL FACE	PHASE Ø2	Ø3	Ø4	Ø8	EVB	FLASH
21, 22	G	R	R	R	R	Y
31,32,33	R	G	R	R	R	R
41	R	R	G	R	G	R
42	R	R	G	R	G	R
81	R	R	R	G	R	R
82	R	R	R	G	R	R

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING														
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6x6	4	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2B	6x6	4	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
3A	6x40	2-4-2	0	-	X	3	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
3B	6x40	2-4-2	0	-	X	3	5 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4A	6x40	2-4-2	0	-	X	4	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4B	6x40	2-4-2	0	-	X	4	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
8A	6x40	2-4-2	+5	-	X	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X

SIGNAL FACE I.D.

All Heads L.E.D.
* SEE NOTE 10



4 Phase Fully Actuated w/ EV Preemption (Durham Signal System)

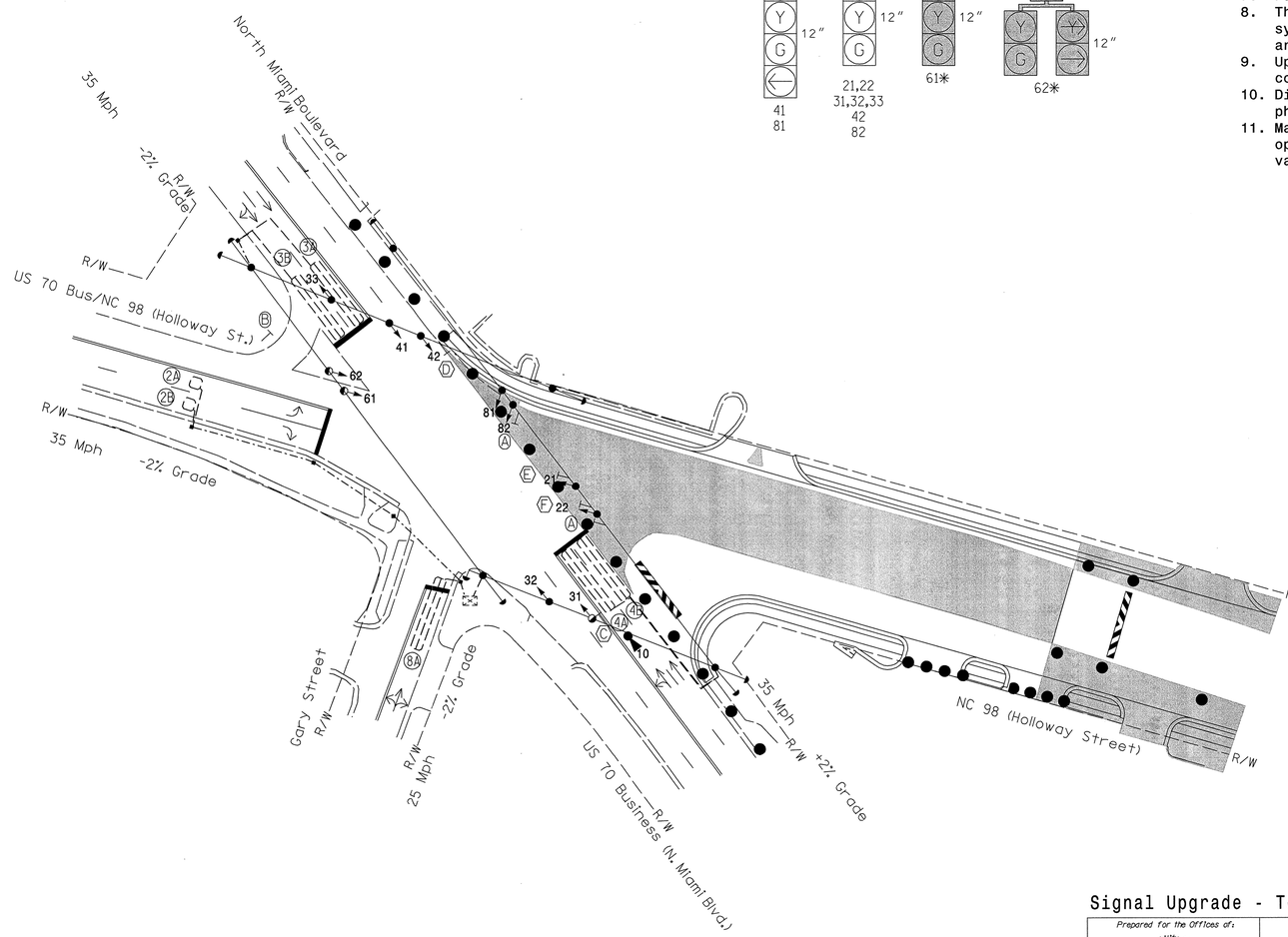
NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. The order of phase 3, 4, and/or phase 8 may be reversed.
4. Set all detector units to presence mode.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Pavement markings are existing.
8. This intersection features an optical preemption system. Shown locations of optical dectectors are conceptual only.
9. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
10. Disconnect and bag signal heads #61 and #62 during this phase of construction.
11. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

2033 EV PREEMPTION

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	0
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	20
PREEMPT EXTEND**	2.0

** Program Timing on Optical Detector Unit



TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø8
MINIMUM INITIAL *	10 SEC.	7 SEC.	7 SEC.	7 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.0 SEC.	4.0 SEC.	3.7 SEC.	3.3 SEC.
RED CLEARANCE	1.8 SEC.	2.6 SEC.	2.7 SEC.	3.0 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	25 SEC.	20 SEC.
RECALL POSITION	VEH. RECALL	NONE	NONE	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	NONLOCK	NONLOCK	NONLOCK
DOUBLE ENTRY	OFF	OFF	OFF	OFF
WALK *	- SEC.	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 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.

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	
DD	Directional Drill	N/A
A	"No Turn on Red" Sign (R10-11)	A
B	"Yield" Sign (R1-2)	B
C	"No Left Turn" (R3-2)	C
D	"No Right Turn" (R3-1)	D
E	"Left Turn Only" (R3-5L)	E
F	"Right Turn Only" (R3-5R)	F
	Optical Detector	
	Work Area	N/A
	Barrels	N/A
	Barricades	N/A
	Direct Bury	N/A

Signal Upgrade - Temporary Design 2 (TMP Phase I, Step 3)

SEPI
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

Prepared for 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

SCALE 1"=40' (0 – 40)

US 70 Bus./NC 98 (Holloway Street) at US 70 Bus. (N. Miami Blvd.) and Gary Street
Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: J Hochanadel		
PREPARED BY: C Lawson	REVIEWED BY:		
REVISIONS		INIT.	DATE

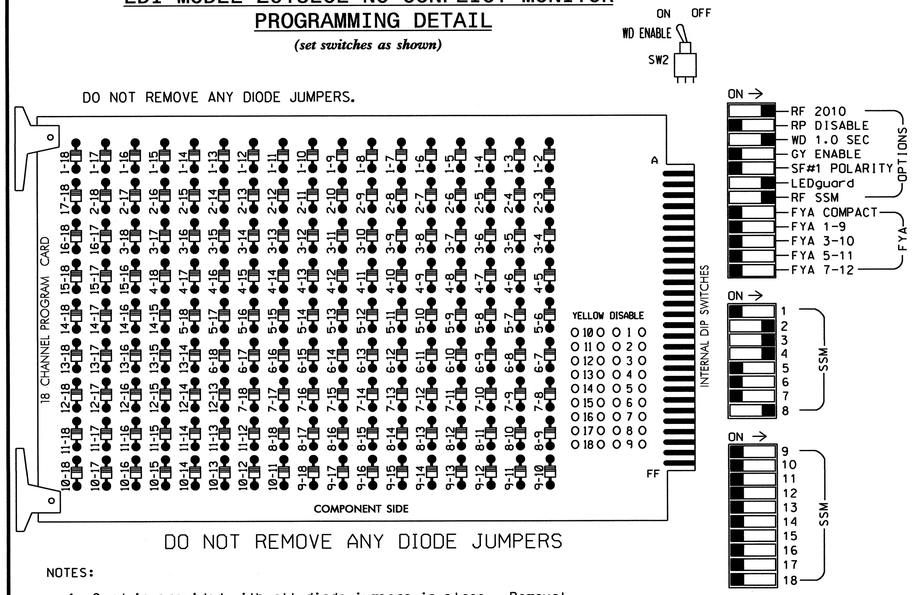
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 11/22/13 DATE
SIG. INVENTORY NO. 05-0376T2

$$$$USERNAME$$$$ $$$$SYSTIME$$$$ $$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.5

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(set switches 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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phase 2 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. This cabinet and controller are part of the Durham Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5		S6	S7	S8	S9	S10	S11		S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4		14	5	6	15	7	8		16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4		4 PED	5	6	6 PED	7	8		8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	31,32 33	41	42	NU	NU	NU	NU	NU	81	82	NU	NU	NU	NU	NU	NU	NU
RED		128		116	101	101						107	107							
YELLOW		129		117	102	102						108	108							
GREEN		130		118	103	103						109	109							
RED ARROW																				
YELLOW ARROW																				
GREEN ARROW					103							109								

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S4,S5,S11
PHASES USED.....2,3,4,8
OVERLAPS.....NONE

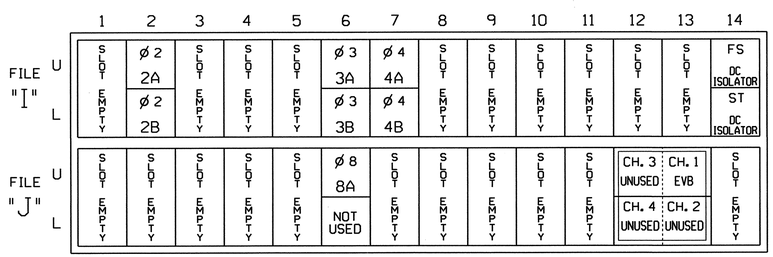
EMERGENCY VEHICLE PREEMPTION PROGRAMMING FOR EVB

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 2) EMERGENCY VEHICLE
   EVB Clear = 20
   EVB Clearance Phases = 4
2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

Program extend time on optical detector unit for 2.0 sec for EVB.

INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME
EVB = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD
INSERT CARD INTO SLOT J13

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
3A	TB4-9,10	I6U	3	41	5 7	3
3B	TB4-11,12	I6L	7	45	5 7	3
4A	TB6-1,2	I7U	23	65	5 7	4
4B	TB6-3,4	I7L	31	78	5 7	4
8A	TB5-9,10	J6U	4	42	5 7	8

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

PHASE SEQUENCE PROGRAMMING

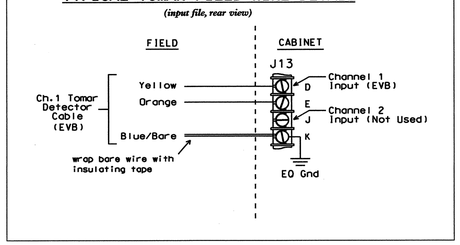
Implement Exclusive Phases as follows:

Main Menu - 9) UTILITIES - 5) CONFIGURATION
Permit = 2,3,4,8
Exclusive = 3,4,8

2	3	4	
			8

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0376T2
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 2 (TMP Phase I, Step 3)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 70 Bus./NC 98 (Holloway Street) at US 70 Bus. (N. Miami Blvd.) and Gary Street

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE 11-26-13 DATE

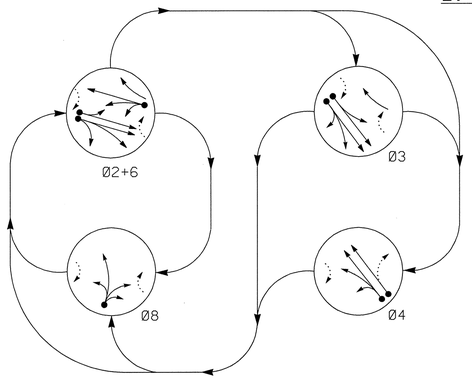
SIG. INVENTORY NO. 05-0376T2

26-NOV-2013 07:27
C:\Users\sarmstrong\Documents\05037G_sml_ele.xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 6

4 Phase
Fully Actuated
w/ EV Preemption
(Durham Signal System)

PHASING DIAGRAM



EV Preempt Phases

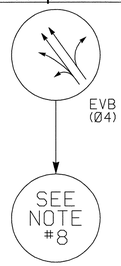


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	Ø3	Ø4	Ø8	EVB	FLASH
21, 22	G	R	R	R	R	Y
31	R	G	R	R	R	R
32,33	R	G	R	R	R	R
41	R	R	G	R	G	R
42	R	R	G	R	G	R
61	G	R	R	R	R	Y
62	G	R	R	R	R	Y
81	R	R	R	G	R	R
82	R	R	R	G	R	R

2033 SOFTWARE w/ 2070 CONTROLLER
LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING														
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME 2 SYSTEM	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6x6	4	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2B	6x6	4	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
3A	6x40	2-4-2	0	-	X	3	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
3B	6x40	2-4-2	0	-	X	3	5 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4A	6x40	2-4-2	0	-	X	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4B	6x40	2-4-2	0	-	X	4	5 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6A	6x6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
8A	6x40	2-4-2	+5	-	X	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X

SIGNAL FACE I.D.

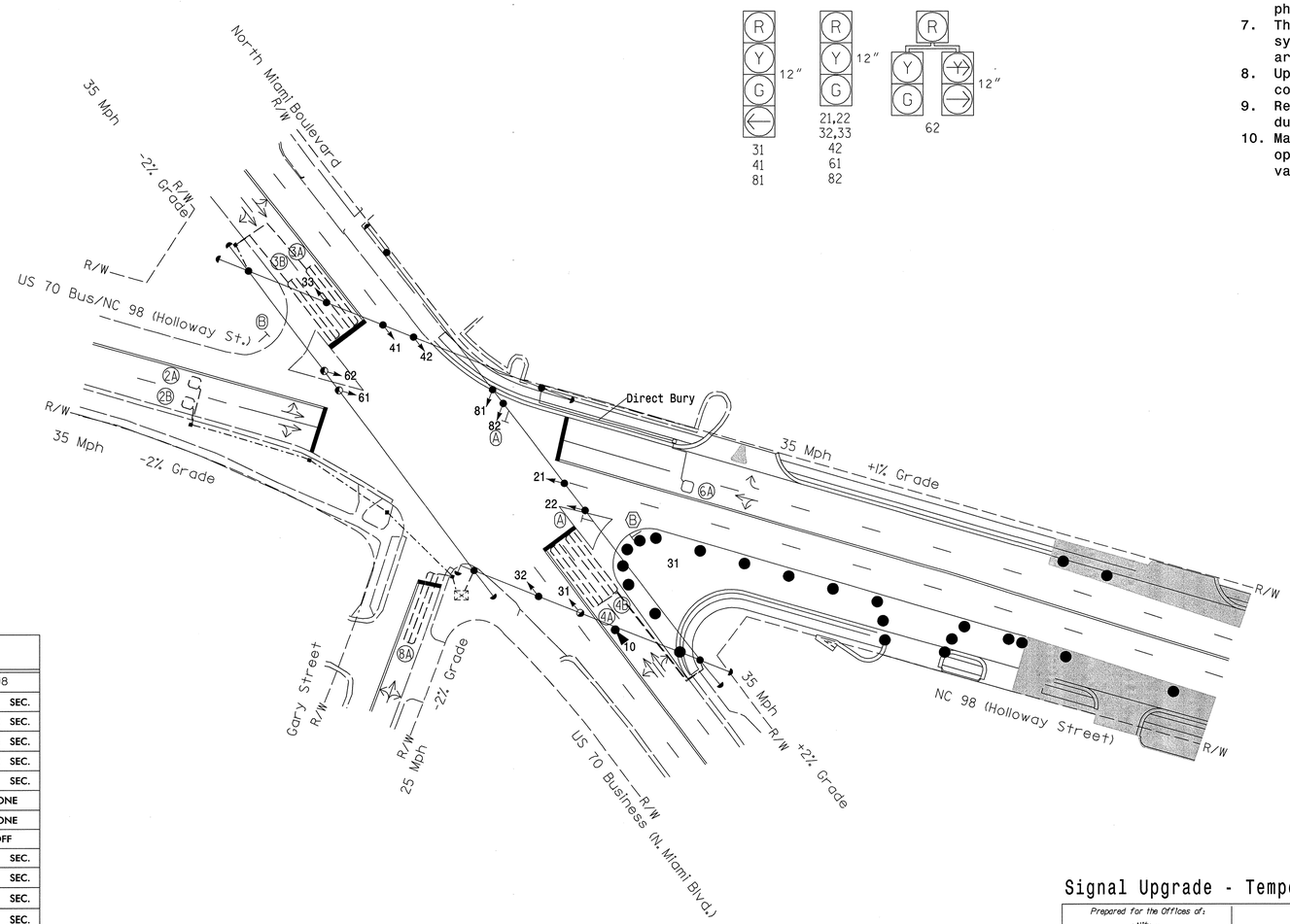
All Heads L.E.D.

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. The order of phase 3, 4 and/or phase 8 may be reversed.
4. Set all detector units to presence mode.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. This intersection features an optical preemption system. Shown locations of optical dectectors are conceptual only.
8. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
9. Reconnect and unbag signal heads #61 and #62 during this phase of construction.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

PHASING DIAGRAM DETECTION LEGEND

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



2033 EV PREEMPTION

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	0
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	20
PREEMPT EXTEND**	2.0

** Program Timing on Optical Detector Unit

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø6	Ø8
MINIMUM INITIAL *	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.0 SEC.	4.0 SEC.	3.7 SEC.	3.8 SEC.	3.3 SEC.
RED CLEARANCE	2.7 SEC.	2.6 SEC.	2.7 SEC.	2.3 SEC.	3.0 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	25 SEC.	45 SEC.	20 SEC.
RECALL POSITION	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 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.

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	
	Directional Drill	N/A
	"No Turn on Red" Sign (R10-11)	
	"Yield" Sign (R1-2)	
	Optical Detector	
	Work Area	N/A
	Barrels	N/A
	Direct Bury	N/A

Signal Upgrade - Temporary Design 3 (TMP Phase I, Step 4)

SEPI
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 1"=40' (0 – 40)

US 70 Bus./NC 98 (Holloway Street) at US 70 Bus. (N. Miami Blvd.) and Gary Street

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 1/12/13 DATE

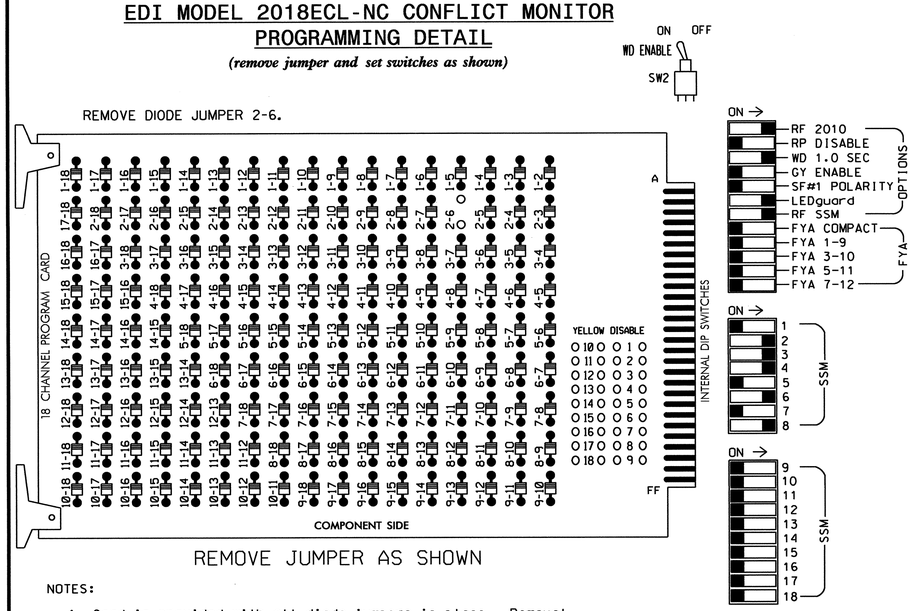
SIG. INVENTORY NO. 05-0376T3

$$$$$$$SWITTIME$$$$$
$$$$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 7

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches 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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. This cabinet and controller are part of the Durham Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4			S5		S6	S7	S8	S9	S10	S11		S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3			4		14	5	6	15	7	8		16	9	10	17	11	12	18
PHASE	1	2	2 PED	3			4		4 PED	5	6	6 PED	7	8		8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	31	32,33	62	41	42	NU	NU	61,62	NU	NU	81	82	NU	NU	NU	NU	NU	NU	NU
RED		128		116	116		101	101			134			107	107							
YELLOW		129		117	117		102	102			135			108	108							
GREEN		130		118	118		103	103			136			109	109							
RED ARROW																						
YELLOW ARROW						117																
GREEN ARROW				118		118	103							109								

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S4,S5,S8,S11
PHASES USED.....2,3,4,6,8
OVERLAPS.....NONE

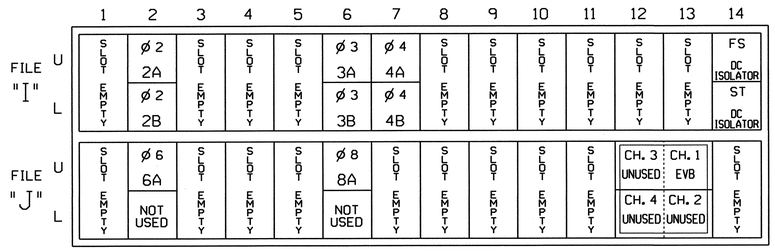
EMERGENCY VEHICLE PREEMPTION PROGRAMMING FOR EVB

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 2) EMERGENCY VEHICLE
   EVB Clear = 20
   EVB Clearance Phases = 4
2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

Program extend time on optical detector unit for 2.0 sec for EVB.

INPUT FILE POSITION LAYOUT

(front view)



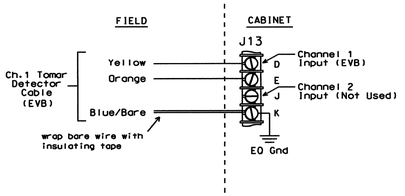
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVB = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
3A	TB4-9,10	I6U	3	41	5 7	3
3B	TB4-11,12	I6L	7	45	5 7	3
4A	TB6-1,2	I7U	23	65	5 7	4
4B	TB6-3,4	I7L	31	78	5 7	4
6A	TB3-5,6	J2U	2	40	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

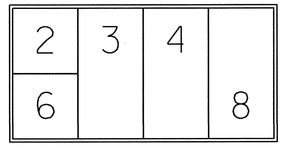
INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0376T3
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

PHASE SEQUENCE PROGRAMMING

Implement Exclusive Phases as follows:

Main Menu - 9) UTILITIES - 5) CONFIGURATION
Permit = 2,3,4,6,8
Exclusive = 3,4,8



Signal Upgrade - Temporary Design 3 (TMP Phase I, Step 4)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 70 Bus./NC 98 (Holloway Street) at US 70 Bus. (N. Miami Blvd.) and Gary Street

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

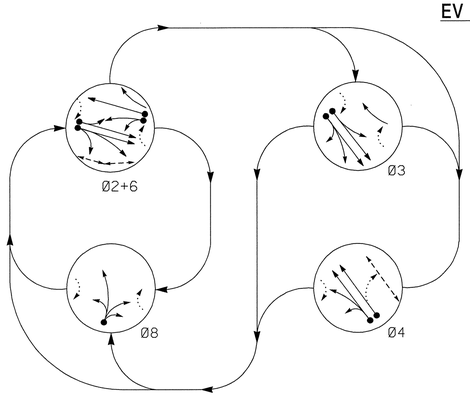
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE 11-26-13 DATE
SIG. INVENTORY NO. 05-0376T3

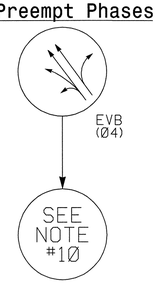
26-NOV-2013 07:26
C:\Users\scarmstrong\Documents\05076_sml_ele_xxx.dgn
scarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 8

PHASING DIAGRAM



EV Preempt Phases



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	Ø3	Ø4	Ø8	EVB	FLASH
21, 22	G	R	R	R	R	Y
31	R	G	R	R	R	R
32,33	R	G	R	R	R	R
41	R	R	G	R	G	R
42, 43	R	R	G	R	G	R
61	FY	~~R~~	~~R~~	~~R~~	~~R~~	~~Y~~
62	G	R	R	R	R	Y
63	G	R	R	R	R	Y
81	R	R	R	G	R	R
82	R	R	R	G	R	R
P21,P22	W	DW	DW	DW	DW	DRK
P22,P23	W	DW	DW	DW	DW	DRK
P41,P42	DW	DW	W	DW	DW	DRK

FY = FLASHING YELLOW ARROW

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS					DETECTOR PROGRAMMING														
						TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE E	SYSTEM LOOPS	NEW	EXISTING
2A	6x6	4	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2B	6x6	4	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
3A	6x40	2-4-2	0	X	-	3	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
3B	6x40	2-4-2	0	X	-	3	5 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4A	6x40	2-4-2	0	X	-	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4B	6x40	2-4-2	0	X	-	4	5 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6A	6x6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6B	6x40	2-4-2	0	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6x40	2-4-2	+5	-	X	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
S50	6x6	4	+255	X	-	N/A	- SEC.	- SEC.	-	-	-	-	-	-	-	-	X	X	-
S51	6x6	4	+255	X	-	N/A	- SEC.	- SEC.	-	-	-	-	-	-	-	-	X	X	-
PEDESTRIAN DETECTION																			
P21,P22	N/A	N/A	N/A	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P23,P24	N/A	N/A	N/A	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P41,P42	N/A	N/A	N/A	X	-	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-

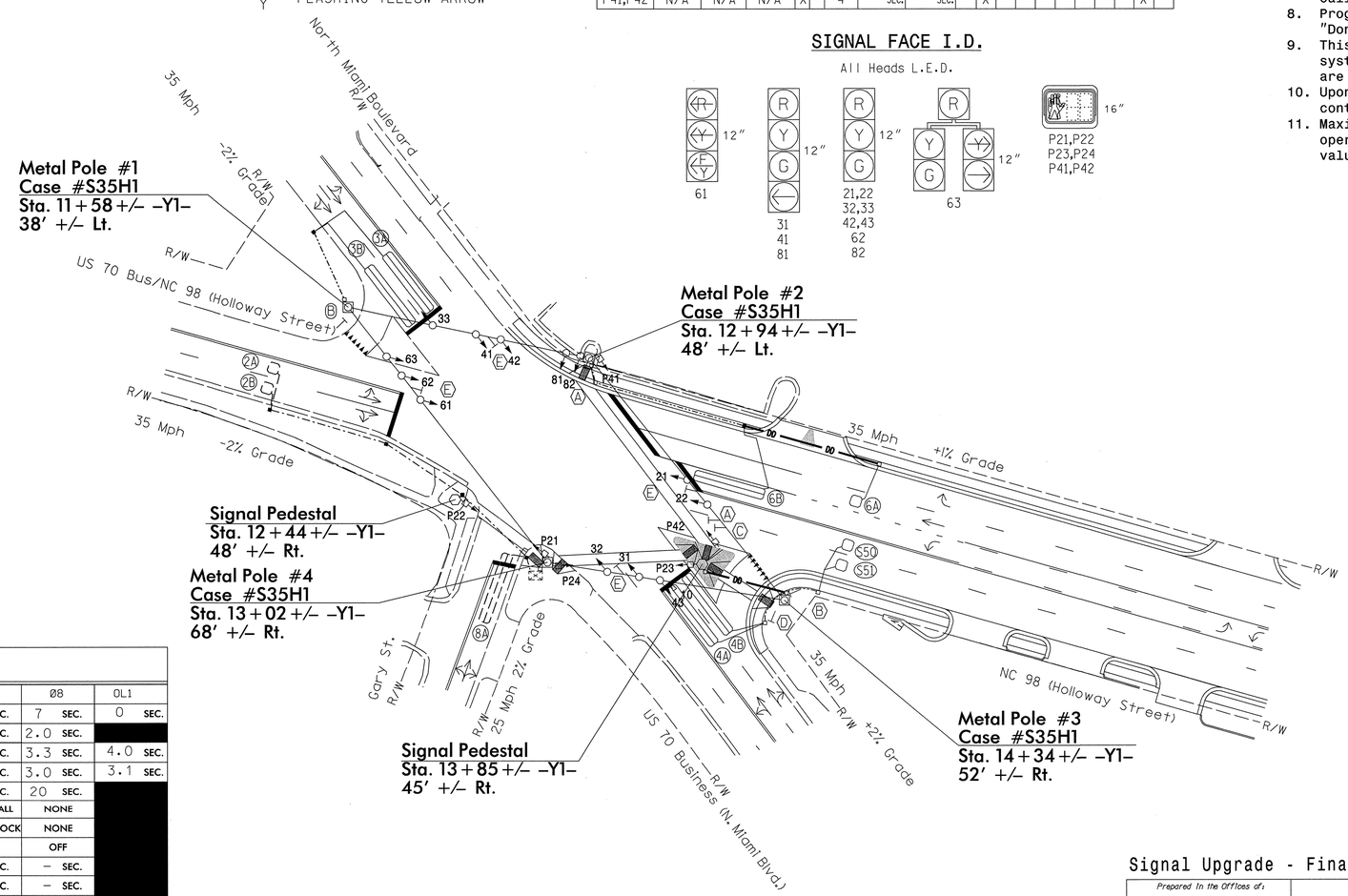
SIGNAL FACE I.D.

All Heads L.E.D.

4 Phase Fully Actuated w/ EV Preemption (Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. The order of phase 3, 4 and/or phase 8 may be reversed.
4. Set all detector units to presence mode.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time.
9. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only.
10. Upon completion of Emergency Vehicle Preemption, controller returns to normal operation.
11. 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	
	Directional Arrow	
	Directional Drill	N/A
A	"No Turn on Red" Sign (R10-11)	A
B	"Yield" Sign (R1-2)	B
C	"Turning Traffic Must Yield to Pedestrians" Sign (R10-15)	C
D	"Pedestrian Traffic" Sign (W11-2)	D
E	Street Name Sign	E
	Optical Detector	
	Type 2 Signal Pedestal	

2033 EV PREEMPTION

FUNCTION	EVB (SECONDS)
DELAY BEFORE PREEMPT	0
PED. CLEAR BEFORE PREEMPT	0
MIN. GREEN BEFORE PREEMPT	1
CLEARANCE TIME	20
PREEMPT EXTEND**	2.0

** Program Timing on Optical Detector Unit

TIMING CHART

2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø6	Ø8	OL1
MINIMUM INITIAL *	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.	0 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	
YELLOW CHANGE INT.	4.0 SEC.	4.0 SEC.	3.7 SEC.	4.0 SEC.	3.3 SEC.	4.0 SEC.
RED CLEARANCE	3.1 SEC.	3.2 SEC.	3.4 SEC.	3.1 SEC.	3.0 SEC.	3.1 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	25 SEC.	45 SEC.	20 SEC.	
RECALL POSITION	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE	
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE	
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF	
WALK *	4 SEC.	- SEC.	4 SEC.	- SEC.	- SEC.	
FLASHING DON'T WALK	16 SEC.	- SEC.	30 SEC.	- SEC.	- SEC.	
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	
MINIMUM GAP	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 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.

$$$$$$SYSTIME$$$$$
$$$$$$SYSDOM$$$$$
$$$$$$USERNAME$$$$$

Signal Upgrade - Final Design

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 40 1"=40'

US 70 Bus./NC 98 (Holloway Street) at US 70 Bus. (N. Miami Blvd.) and Gary Street

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

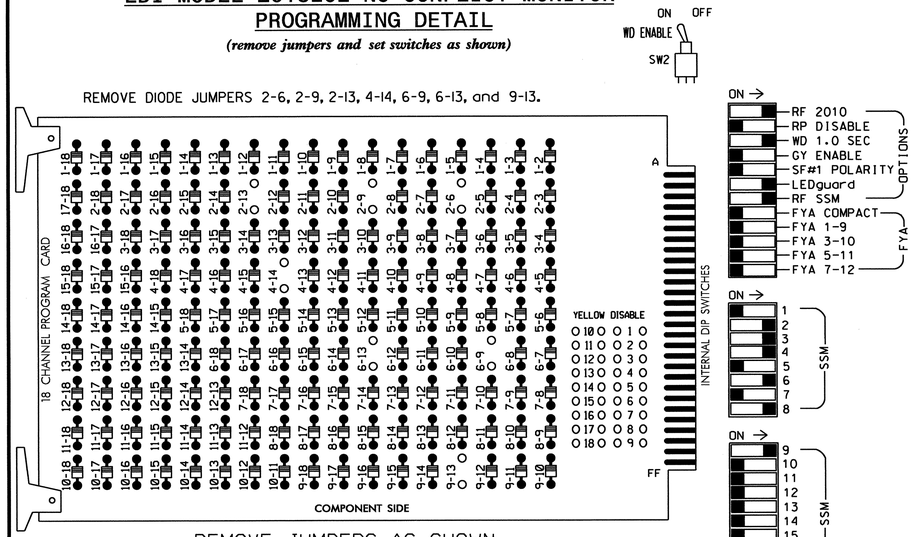
SIGNATURE 11/22/13 DATE

SIG. INVENTORY NO. 05-0376

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 9

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches 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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. Program Startup Ped Calls for phases 2 and 4.
9. This cabinet and controller are part of the Durham Signal System.

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	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	P21,P22 P23,P24	31	32,33	63	41	42,43	P41, P42	NU	62,63	NU	NU	81	82	NU	61★	NU	NU	NU	NU	NU
RED		128		116	116		101	101			134			107	107							
YELLOW		129		117	117		102	102			135			108	108							
GREEN		130		118	118		103	103			136			109	109							
RED ARROW																	A121					
YELLOW ARROW						117											A122					
FLASHING YELLOW ARROW																	A123					
GREEN ARROW				118		118	103							109								
✋			113						104													
🚶			115						106													

NU = Not Used

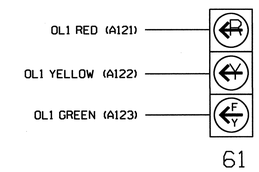
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S3,S4,S5,S6,S8,S11,AUX S1
PHASES USED.....2,2PED,3,4,4PED,6,8
OVERLAP 1.....6
OVERLAP 2.....NOT USED
OVERLAP 3.....NOT USED
OVERLAP 4.....NOT USED

FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT	Ø2 2A	SLOT	SLOT	SLOT	Ø3 3A	Ø4 4A	SLOT	SYS. DET. S50	SLOT	SLOT	Ø2 PED DC ISOLATOR	SLOT	FS DC ISOLATOR
	L	EMPTY	Ø2 2B	EMPTY	EMPTY	EMPTY	Ø3 3B	Ø4 4B	EMPTY	SYS. DET. S51	EMPTY	EMPTY	Ø4 PED DC ISOLATOR	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	Ø6 6A	SLOT	SLOT	SLOT	Ø8 8A	SLOT	SLOT	SLOT	SLOT	SLOT	CH. 3 UNUSED	CH. 1 EVB	SLOT
	L	EMPTY	Ø6 6B	EMPTY	EMPTY	EMPTY	NOT USED	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	CH. 4 UNUSED	CH. 2 UNUSED	EMPTY

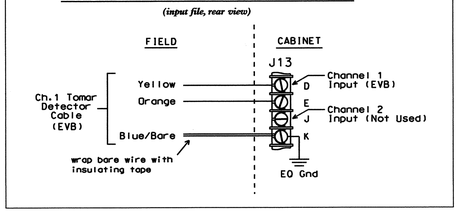
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME
EVB = EMERGENCY VEHICLE PREEMPT

4 CHANNEL TOMAR OSP CARD INSERT CARD INTO SLOT J13

TYPICAL TOMAR FIELD WIRE DETAIL

(input file, rear view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
3A	TB4-9,10	I6U	3	41	5 7	3
3B	TB4-11,12	I6L	7	45	5 7	3
4A	TB6-1,2	I7U	23	65	5 7	4
4B	TB6-3,4	I7L	31	78	5 7	4
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
S50	TB6-9,10	I9U	18	60		SYS
S51	TB6-11,12	I9L	20	62		SYS
PED PUSH BUTTONS						
P21,P22,P23,P24	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED

NOTE:
INSTALL DC ISOLATOR IN INPUT FILE SLOT I12.

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

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: 05-0376
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Final Design - Sheet 1 of 2

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 Bus./NC 98
(Holloway Street) at
US 70 Bus. (N. Miami Blvd.)
and Gary Street

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE DATE 11-26-13
SIG. INVENTORY NO. 05-0376

26-NOV-2013 07:26
C:\Users\scarmstrong\Documents\M50376_sample_xxx.dgn
scarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig 10

OVERLAP PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

OVERLAP [1]:
LOADSWITCH = 9
VEH SET 1 = 6
YELLOW CLEARANCE = 4.0
RED CLEARANCE = 3.1

END OF OVERLAP PROGRAMMING

PEDESTRIAN LOADSWITCH ASSIGNMENTS

Program the pedestrian loadswitch output assignments as follows:
Main Menu - 6) OUTPUTS - 7) PEDS
PED 2P = 2
PED 4P = 4

OVERLAP GREEN FLASH PROGRAMMING DETAIL

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrows. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 1

EMERGENCY VEHICLE PREEMPTION PROGRAMMING FOR EVB

1. Program EVB preempt as follows:
   Main Menu - 2) PREEMPT - 2) EMERGENCY VEHICLE
   EVB Clear = 20
   EVB Clearance Phases = 4

2. Program general preemption parameters as follows:
   Main Menu - 2) PREEMPT - 6) MISC PREEMPTION PARAMETERS
   Min Time Before PE ForceOff = 1

Program extend time on optical detector unit for 2.0 sec for EVB.

PHASE SEQUENCE PROGRAMMING

Implement Exclusive Phases as follows:

Main Menu - 9) UTILITIES - 5) CONFIGURATION
Permit = 2,3,4,6,8
Exclusive = 3,4,8

2	3	4	
6			8

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0376
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Final Design - Sheet 2 of 2

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 Bus./NC 98
(Holloway Street) at
US 70 Bus. (N. Miami Blvd.)
and Gary Street

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE 11-26-13 DATE
SIG. INVENTORY NO. 05-0376

20-NOV-2013 08:32
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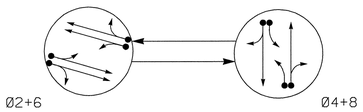
armstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 11

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

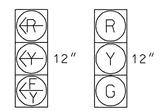
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4+8	FLASH
21,22	G	R	Y
41	~~R~~	F	~~R~~
42,43	R	G	R
61,62	G	R	Y
81	~~R~~	F	~~R~~
82,83	R	G	R

F = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



41
81

21,22
42,43
61,62
82,83

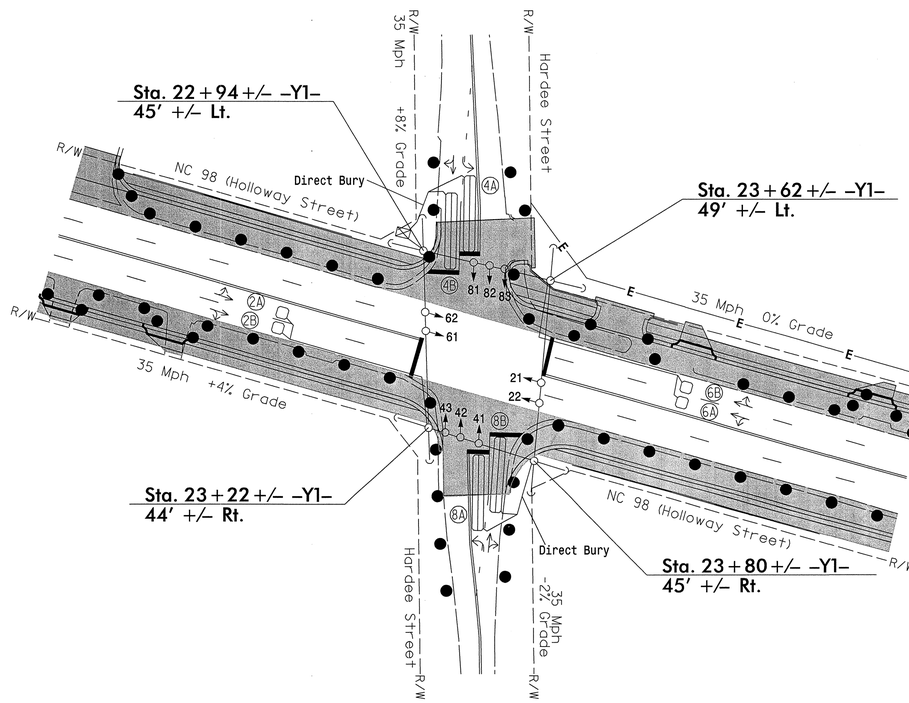
2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES								STATUS		
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6X6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6X6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6X40	2-4-2	0	X	-	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4B	6X40	2-4-2	0	X	-	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6X6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6B	6X6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6X40	2-4-2	0	X	-	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8B	6X40	2-4-2	0	X	-	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-

2 Phase
Fully Actuated
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. Set all detector units to presence mode.
4. Locate new cabinet as to not obstruct sight distance of vehicles turning right on red.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Pavement Markings are existing.
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	
	Directional Arrow	
	Work Area	N/A
	Barrels	N/A
E	Construction Easement	N/A
	Direct Bury	N/A

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø4	Ø6	Ø8	OL2	OL4
MINIMUM INITIAL *	10 SEC.	7 SEC.	10 SEC.	7 SEC.	0 SEC.	0 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.		
YELLOW CHANGE INT.	3.6 SEC.	4.0 SEC.	3.8 SEC.	4.0 SEC.	4.0 SEC.	4.0 SEC.
RED CLEARANCE	1.0 SEC.	1.9 SEC.	1.2 SEC.	1.9 SEC.	1.9 SEC.	1.9 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	45 SEC.	25 SEC.		
RECALL POSITION	VEH. RECALL	NONE	VEH. RECALL	NONE		
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	YELLOW LOCK	NONE		
DOUBLE ENTRY	OFF	ON	OFF	ON		
WALK *	– SEC.	– SEC.	– SEC.	– SEC.		
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.		
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.		
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.		
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.		
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.		
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.		
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.		
MINIMUM GAP	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 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.

$$$$$$SYSTIME$$$$
$$$$$$SYSDATE$$$$
$$$$$$SYSDOW$$$$
$$$$$$USERNAME$$$$

Signal Upgrade - Temporary Design 1 (TMP Phase I, Step 2)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 40 1"=40'

NC 98 (Holloway Street)
at
Hardee Street

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson	REVIEWED BY:

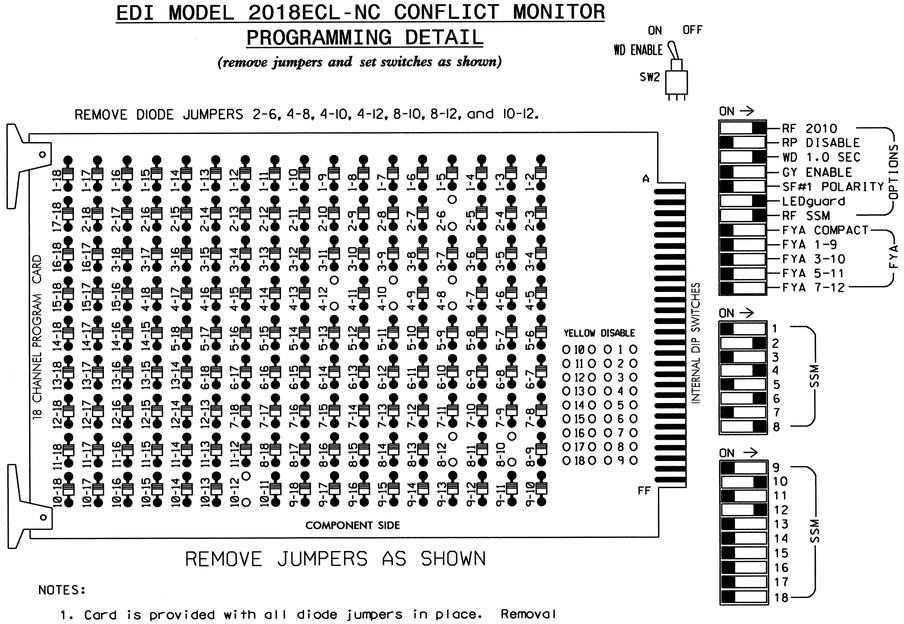
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE DATE 11/12/13
SIG. INVENTORY NO. 05-0463TI

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 12

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches 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.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT	Ø2 2A	SLOT	SLOT	SLOT	Ø4 4A	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS DC ISOLATOR
	L	EMPTY	Ø2 2B	EMPTY	EMPTY	EMPTY	Ø4 4B	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST DC ISOLATOR
FILE "J"	U	SLOT	Ø6 6A	SLOT	SLOT	SLOT	Ø8 8A	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
	L	EMPTY	Ø6 6B	EMPTY	EMPTY	EMPTY	Ø8 8B	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
4B	TB4-11,12	I6L	7	45	5 7	4
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
8B	TB5-11,12	J6L	8	46	5 7	8

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Dual Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. This cabinet and controller are part of the Durham Signal System.

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	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	NU	42,43	NU	NU	61,62	NU	NU	82,83	NU	NU	81★	NU	NU	41★	NU
RED		128			101			134			107							
YELLOW		129			102			135			108							
GREEN		130			103			136			109							
RED ARROW														A124			A101	
YELLOW ARROW														A125			A102	
FLASHING YELLOW ARROW														A126			A103	
GREEN ARROW																		

NU = Not Used

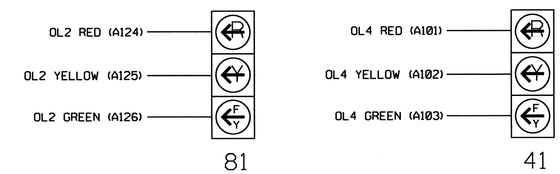
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S5,S8,S11,AUX S2,AUX S5
PHASES USED.....2,4,6,8
OVERLAP 1.....NOT USED
OVERLAP 2.....8
OVERLAP 3.....NOT USED
OVERLAP 4.....4

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



OVERLAP PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

Press "+"

OVERLAP [2]:
LOADSWITCH = 10
VEH SET 1 = 8
YELLOW CLEARANCE = 4.0
RED CLEARANCE = 1.9

(Press '+' key twice)

OVERLAP [4]:
LOADSWITCH = 12
VEH SET 1 = 4
YELLOW CLEARANCE = 4.0
RED CLEARANCE = 1.9

END OF OVERLAP PROGRAMMING

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0463T1
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

OVERLAP GREEN FLASH PROGRAMMING DETAIL

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrows. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 2,4

Signal Upgrade - Temporary Design 1 (TMP Phase I, Step 2)

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

NC 98 (Holloway Street)
at
Hardee Street

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

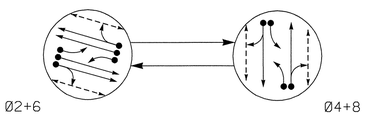
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE John T. Rowe Jr. DATE 11-25-13
SIG. INVENTORY NO. 05-0463T1

20-NOV-2013 08:28
S:#ITS&SU#ITS Signals#workgroups#Sig Mgmt#armstrong#050463_smlele_xxx.dgn
armstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 13

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

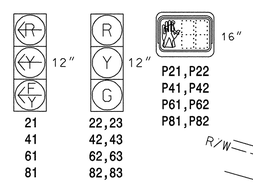
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4+8	FLASH
21	~~F/Y~~	~~R~~	~~Y~~
22,23	G	R	Y
41	~~R~~	~~F/Y~~	~~R~~
42,43	R	G	R
61	~~F/Y~~	~~R~~	~~Y~~
62,63	G	R	Y
81	~~R~~	~~F/Y~~	~~R~~
82,83	R	G	R
P21,P22	W	DW	DRK
P41,P42	DW	W	DRK
P61,P62	W	DW	DRK
P81,P82	DW	W	DRK

F/Y = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



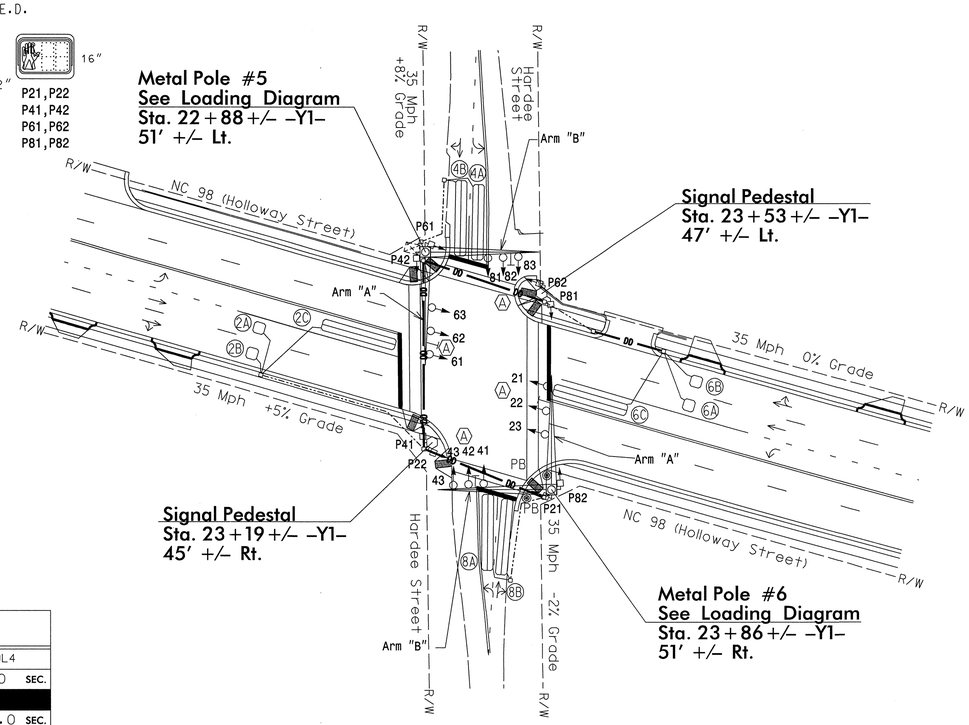
2033 SOFTWARE w/ 2070 CONTROLLER
LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6X6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-		X
2B	6X6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-		X
2C	6X40	2-4-2	0	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6X40	2-4-2	0	X	-	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4B	6X40	2-4-2	0	X	-	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6A	6X6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6B	6X6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6C	6X40	2-4-2	0	X		6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6X40	2-4-2	0	X	-	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
8B	6X40	2-4-2	0	X	-	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
PEDESTRIAN DETECTION																			
P21,P22	N/A	N/A	N/A	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P41,P42	N/A	N/A	N/A	X	-	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P61,P62	N/A	N/A	N/A	X	-	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P81,P82	N/A	N/A	N/A	X	-	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-

2 Phase
Fully Actuated
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. Set all detector units to presence mode.
4. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
5. Set phase bank 3 maximum limit to 250 seconds for phases used.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time.
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	
	Directional Arrow	
	Directional Drill	N/A
	Type 2 Signal Pedestal	
N/A	Ped Push Button on Rigid Conduit PB	
	Street Name Sign	

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø4	Ø6	Ø8	OL1	OL2	OL3	OL4
MINIMUM INITIAL *	10 SEC.	7 SEC.	10 SEC.	7 SEC.	0 SEC.	0 SEC.	0 SEC.	0 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.				
YELLOW CHANGE INT.	3.8 SEC.	4.0 SEC.	3.8 SEC.	4.0 SEC.	3.8 SEC.	4.0 SEC.	3.8 SEC.	4.0 SEC.
RED CLEARANCE	1.5 SEC.	2.2 SEC.	1.5 SEC.	2.2 SEC.	1.5 SEC.	2.2 SEC.	1.5 SEC.	2.2 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	45 SEC.	25 SEC.				
RECALL POSITION	VEH. RECALL	NONE	VEH. RECALL	NONE				
VEHICLE CALL MEMORY	YELLOW LOCK	NONLOCK	YELLOW LOCK	NONLOCK				
DOUBLE ENTRY	OFF	ON	OFF	ON				
WALK *	4 SEC.	4 SEC.	4 SEC.	4 SEC.				
FLASHING DON'T WALK	8 SEC.	17 SEC.	8 SEC.	21 SEC.				
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.				
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.				
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.				
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.				
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.				
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.				
MINIMUM GAP	3.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 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.

$$$$$SYSTIME$$$$$
$$$$$SYSDATE$$$$$
$$$$$USERNAME$$$$$

Signal Upgrade - Final Design

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 1"=40' (0 – 40)

NC 98 (Holloway Street) at Hardee Street
Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson	REVIEWED BY:

REVISIONS	INIT.	DATE

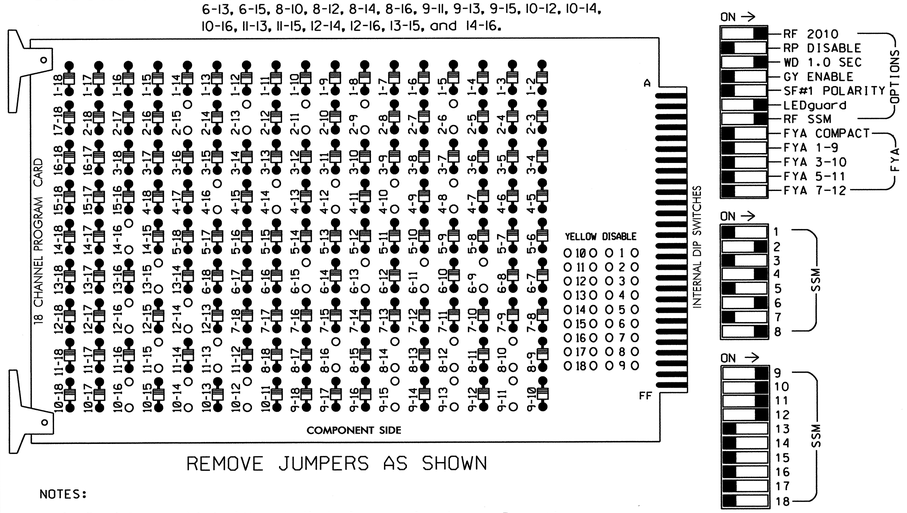
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 11/12/13 DATE
SIG. INVENTORY NO. 05-0463

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.14

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-6, 2-9, 2-11, 2-13, 2-15, 4-8, 4-10, 4-12, 4-14, 4-16, 6-9, 6-11, 6-13, 6-15, 8-10, 8-12, 8-14, 8-16, 9-11, 9-13, 9-15, 10-12, 10-14, 10-16, 11-13, 11-15, 12-14, 12-16, 13-15, and 14-16.



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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Dual Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. Program Startup Ped Calls for phases 2, 4, 6, and 8.
10. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S3,S5,S6,S8,S9,S11,S12, AUX S1,AUX S2,AUX S4,AUX S5
PHASES USED.....2,2PED,4,4PED,6,6PED,8,8PED
OVERLAP 1.....6
OVERLAP 2.....8
OVERLAP 3.....2
OVERLAP 4.....4

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.

SIGNAL HEAD HOOK-UP CHART

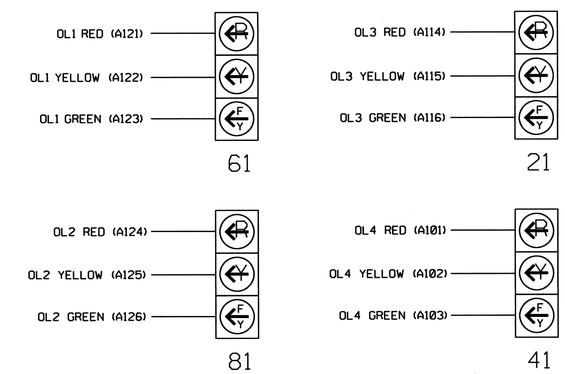
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	22,23	P21, P22	NU	42,43	P41, P42	NU	62,63	P61, P62	NU	82,83	P81, P82	61★	81★	NU	21★	41★	NU
RED		128			101			134			107							
YELLOW		129			102			135			108							
GREEN		130			103			136			109							
RED ARROW													A121	A124		A114	A101	
YELLOW ARROW													A122	A125		A115	A102	
FLASHING YELLOW ARROW													A123	A126		A116	A103	
GREEN ARROW																		
✋			113			104			119			110						
🚶			115			106			121			112						

NU = Not Used

★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



INPUT FILE POSITION LAYOUT

(front view)

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

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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
2C	TB2-9,10	I3U	21	63	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
4B	TB4-11,12	I6L	7	45	5 7	4
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
6C	TB3-9,10	J3U	22	64	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
8B	TB5-11,12	J6L	8	46	5 7	8
PED PUSH BUTTONS						
P21,P22	TB8-4,6	I12U	25	67	2	2 PED
P41,P42	TB8-5,6	I12L	27	69	2	4 PED
P61,P62	TB8-7,9	I13U	26	68	2	6 PED
P81,P82	TB8-8,9	I13L	28	70	2	8 PED

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

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0463
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Final Design - Sheet 1 of 2

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

NC 98 (Holloway Street) at Hardee Street

Division 5 | Durham County | Durham

PLAN DATE: October 2013	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE DATE 11-25-13
SIG. INVENTORY NO. 05-0463

20-NOV-2013 08:28
S:*ITS&SU*ITS Signals*Workgroups*Sig Mgmt*Armstrong*H050463_SMelle_xxx.dgn
armstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.15

OVERLAP PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

```
OVERLAP [1]:
                LOADSWITCH = 9
                VEH SET 1  = 6
          YELLOW CLEARANCE = 3.8
             RED CLEARANCE = 1.5

Press "+"

OVERLAP [2]:
                LOADSWITCH = 10
                VEH SET 1  = 8
          YELLOW CLEARANCE = 4.0
             RED CLEARANCE = 2.2

Press "+"

OVERLAP [3]:
                LOADSWITCH = 11
                VEH SET 1  = 2
          YELLOW CLEARANCE = 3.8
             RED CLEARANCE = 1.5

Press "+"

OVERLAP [4]:
                LOADSWITCH = 12
                VEH SET 1  = 4
          YELLOW CLEARANCE = 4.0
             RED CLEARANCE = 2.2

      END OF OVERLAP PROGRAMMING
```

OVERLAP GREEN FLASH PROGRAMMING DETAIL

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrows. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 1,2,3,4

PEDESTRIAN LOADSWITCH ASSIGNMENTS

Program the pedestrian loadswitch output assignments as follows:
Main Menu - 6) OUTPUTS - 7) PEDS

PED 2P = 2
PED 4P = 4
PED 6P = 6
PED 8P = 8

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0463
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Final Design - Sheet 2 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 98 (Holloway Street)
at
Hardee Street

Division 5 Durham County Durham

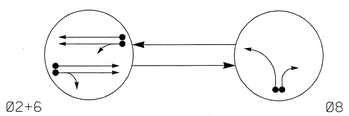
PLAN DATE: October 2013		REVIEWED BY: JTR	
PREPARED BY: S. Armstrong		REVIEWED BY:	
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE 11-25-13 DATE
SIG. INVENTORY NO. 05-0463

20-NOV-2013 08:27
S:*ITS&SI*ITS Signals*Workgroups*SIG Man*armstrong*050463_sm_ele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 16

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

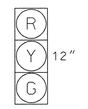
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø8	FLASH
21, 22	G	R	Y
61, 62	G	R	Y
81, 82	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



21,22
61,62
81,82

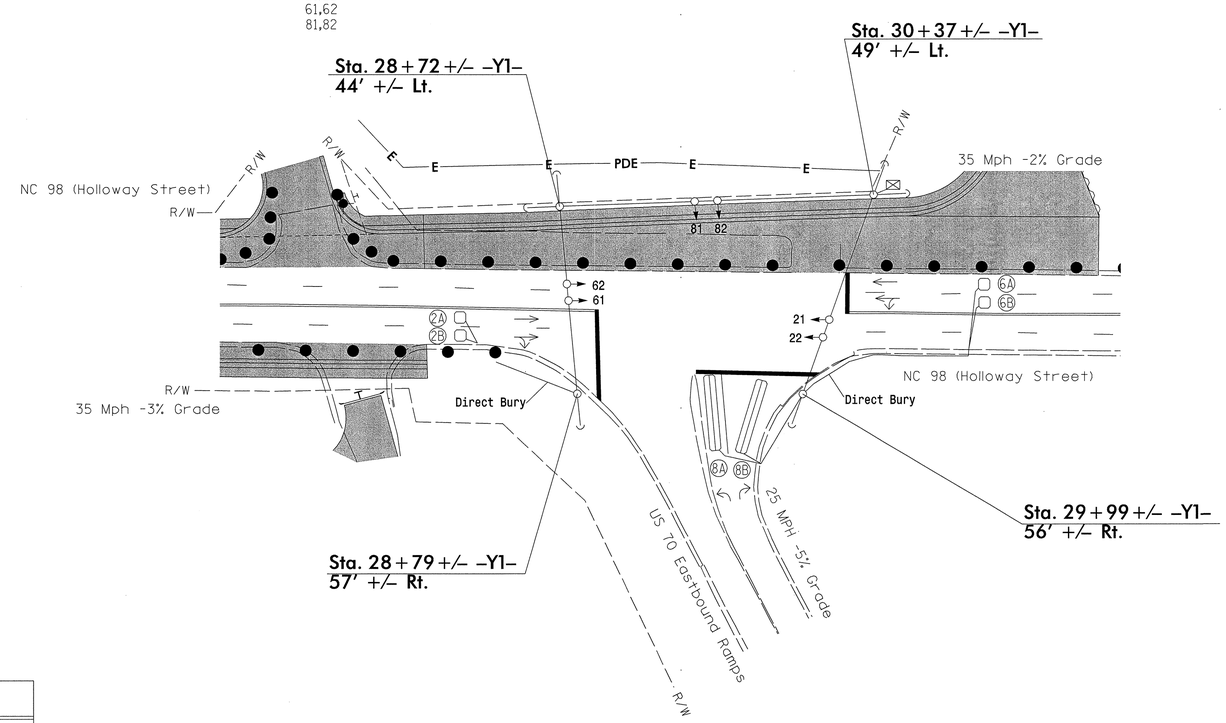
2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES								STATUS		
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6x6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6x6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6x6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6B	6x6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6x40	2-4-2	0	X	-	8	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8B	6x40	2-4-2	0	X	-	8	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-

2 Phase
Fully Actuated
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. Set all detector units to presence mode.
4. Locate new cabinet as to not obstruct sight distance of vehicles turning right on red.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Pavement markings are existing.
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	
	Directional Arrow	
	Work Area	N/A
	Barrels	N/A
E	Construction Easement	N/A
PDE	Permanent Drainage Easement	N/A
	Direct Bury	N/A

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø6	Ø8
MINIMUM INITIAL *	10 SEC.	10 SEC.	7 SEC.
VEHICLE EXTENSION *	3.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	4.1 SEC.	4.0 SEC.	3.1 SEC.
RED CLEARANCE	1.6 SEC.	2.3 SEC.	2.1 SEC.
MAXIMUM LIMIT *	45 SEC.	45 SEC.	25 SEC.
RECALL POSITION	VEH. RECALL	VEH. RECALL	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	YELLOW LOCK	NONE
DOUBLE ENTRY	OFF	OFF	OFF
WALK *	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.
MAXIMUM GAP*	3.0 SEC.	3.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	3.0 SEC.	2.0 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.

$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$$$$USERNAME$$$$$

Signal Upgrade - Temporary Design 1 (TMP Phase I, Step 2)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
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License #: C-2197

Prepared for 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

SCALE 0 40 1"=40'

NC 98 (Holloway Street)
at
US 70 Eastbound Ramps

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	J Hochanadel
PREPARED BY:	C Lawson	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

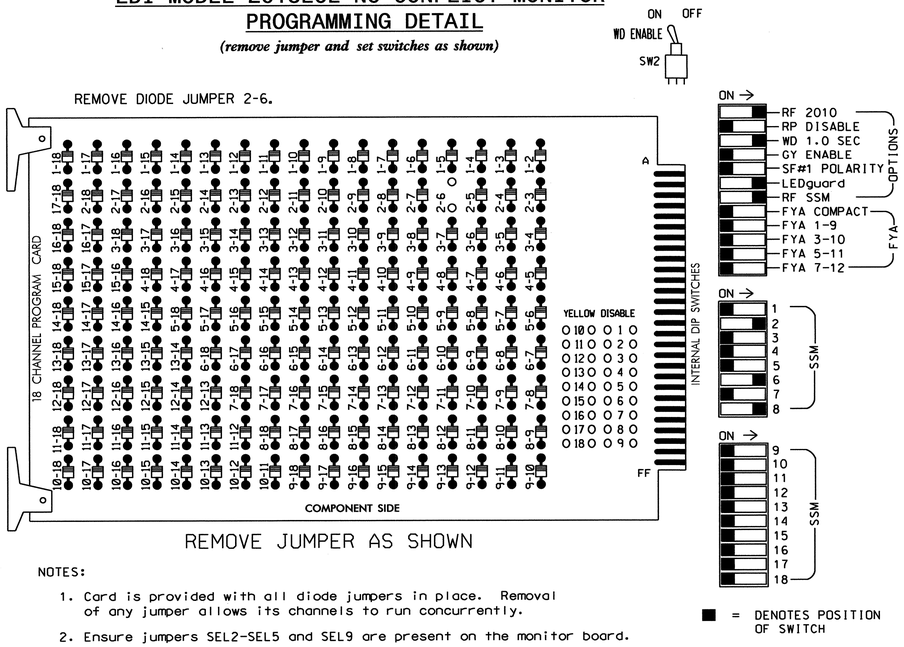
SIGNATURE 11/22/13 DATE

SIG. INVENTORY NO. 05-0486TI

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.17

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



REMOVE JUMPER 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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. This cabinet and controller are part of the Durham Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	NU	NU	NU	61,62	NU	NU	81,82	NU
RED		128						134			107	
YELLOW		129						135			108	
GREEN		130						136			109	
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S8,S11
PHASES USED.....2,6,8
OVERLAPS.....NONE

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	Ø2 2A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L		Ø2 2B												ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	Ø6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		Ø6 6B				Ø8 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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
8B	TB5-11,12	J6L	8	46	5 7	8

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0486T1
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 1 (TMP Phase 1, Step 2)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 98 (Holloway Street)
at
US 70 Eastbound Ramps

Division 5 Durham County Durham

PLAN DATE: October 2013 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

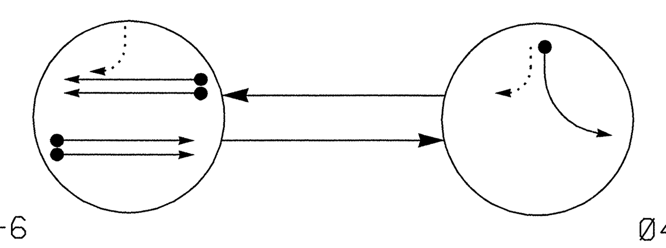
Prepared in the Offices of:
Transportation Mobility and Safety Division
Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE DATE 11-26-13
SIG. INVENTORY NO. 05-0486T1

20-NOV-2013 08:19
S:*ITS&SU*ITS Signals*Workgroups*Sig Mgmt*Armstrong*050486_sm_ele.xxx.dgn
armstrong

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

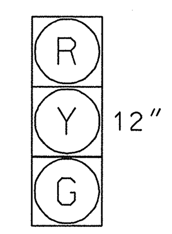
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4	PHASE FLASH
21, 22	G	R	Y
41, 42	R	G	R
61, 62	G	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



21,22
41,42
61,62

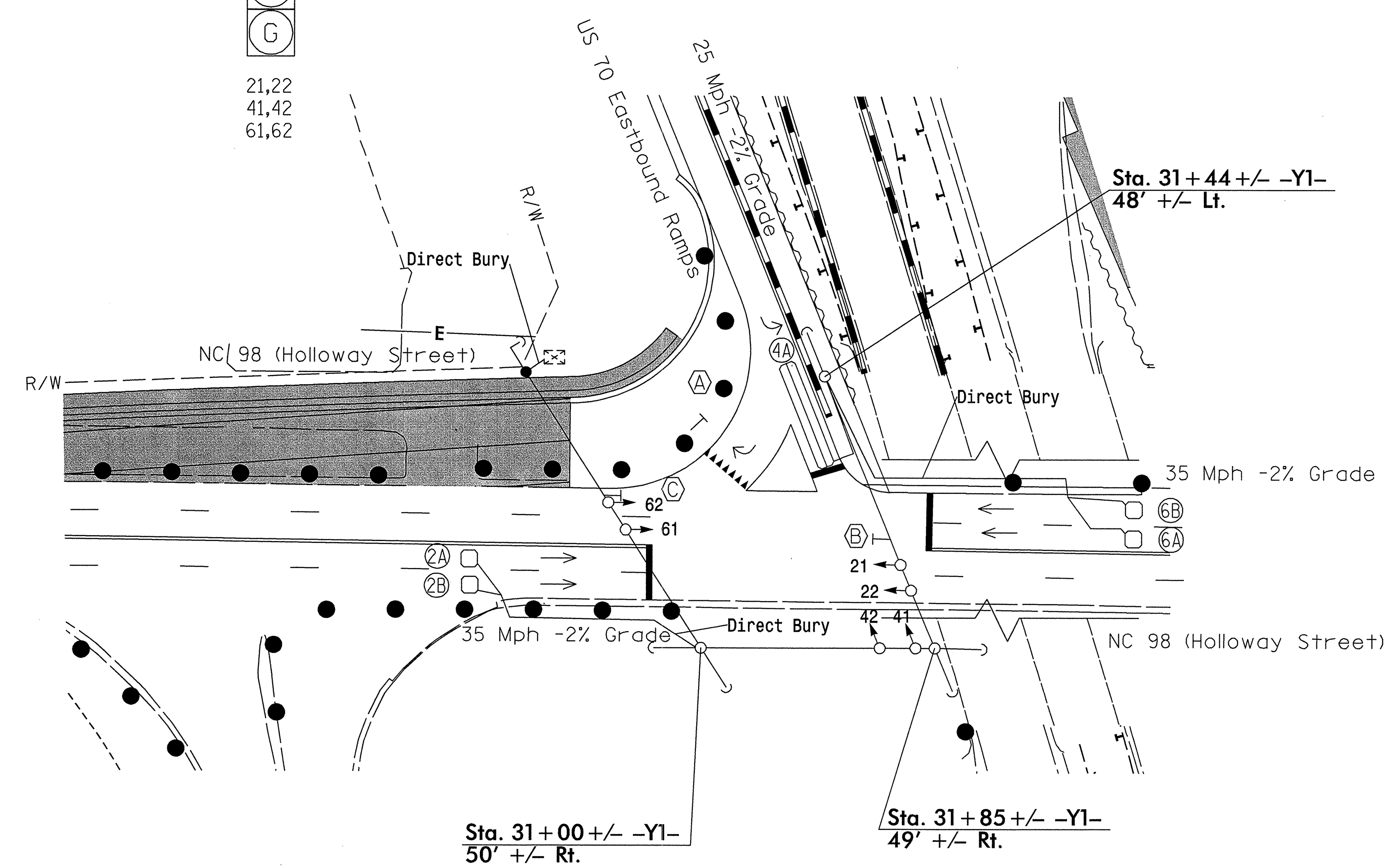
2033 SOFTWARE w/ 2070 CONTROLLER
LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	TIMING DELAY	TIMING CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	STATUS NEW	STATUS EXISTING
2A	6x6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2B	6x6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4A	6x40	2-4-2	0	X	-	4	5 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6x6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6B	6x6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X

2 Phase
Fully Actuated
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. Set all detector units to presence mode.
4. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
5. Set phase bank 3 maximum limit to 250 seconds for phases used.
6. 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	
	Directional Arrow	
(A)	"Yield" Sign (R1-2)	(A)
(B)	"No Left Turn" Sign (R3-2)	(B)
(C)	"No Right Turn" Sign (R3-1)	(C)
	Work Area	N/A
	Barrels	N/A
E	Construction Easement	N/A
	Direct Bury	N/A

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø4	Ø6
MINIMUM INITIAL *	10 SEC.	7 SEC.	10 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	4.0 SEC.	3.0 SEC.	4.0 SEC.
RED CLEARANCE	1.8 SEC.	1.2 SEC.	1.0 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	45 SEC.
RECALL POSITION	VEH. RECALL	NONE	VEH. RECALL
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	YELLOW LOCK
DOUBLE ENTRY	OFF	OFF	OFF
WALK *	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	3.0 SEC.
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.
MINIMUM GAP	3.0 SEC.	2.0 SEC.	3.0 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.

$$$$$$SYSTIME$$$$$
$$$$$$$$$DGN$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
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License #: C-2197

Signal Upgrade - Temporary Design 2 (TMP Phase IV)

Prepared for 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

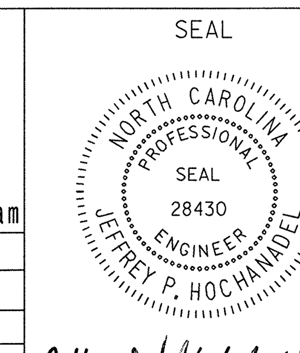
SCALE 0 40 1"=40'

NC 98 (Holloway Street) at US 70 Eastbound Ramps

Division 5	Durham County	Durham
PLAN DATE: October 2013	REVIEWED BY: J Hochanadel	
PREPARED BY: C Lawson	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL



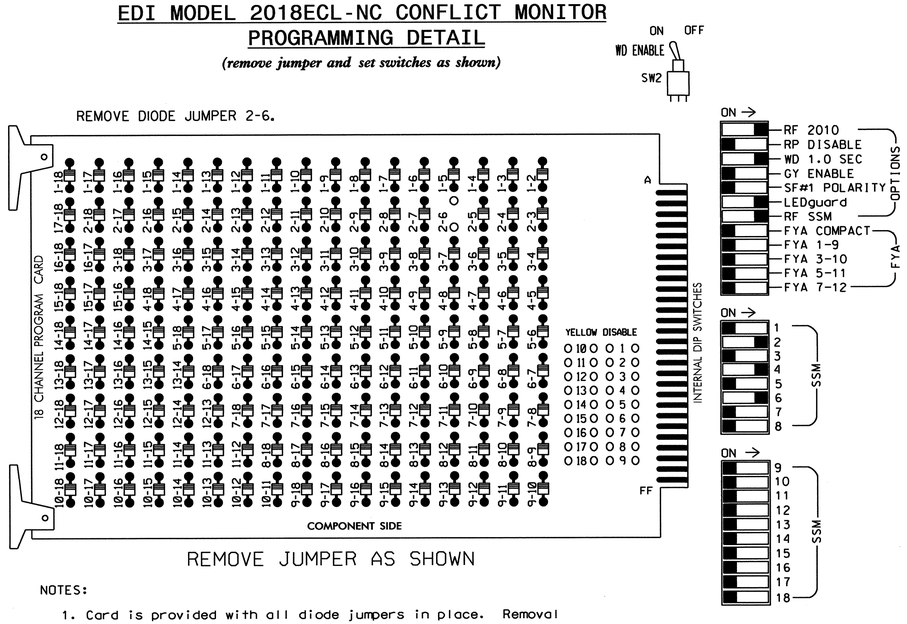
SIGNATURE 11/22/13 DATE

SIG. INVENTORY NO. 05-0486T2

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.19

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches 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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. This cabinet and controller are part of the Durham Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	NU	NU	61,62	NU	NU	NU	NU
RED		128			101			134				
YELLOW		129			102			135				
GREEN		130			103			136				
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S5,S8
PHASES USED.....2,4,6
OVERLAPS.....NONE

INPUT FILE POSITION LAYOUT

(front view)

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

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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0486T2
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 2 (TMP Phase IV)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 98 (Holloway Street)
at
US 70 Eastbound Ramps

Division 5 Durham County Durham

PLAN DATE: October 2013 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

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

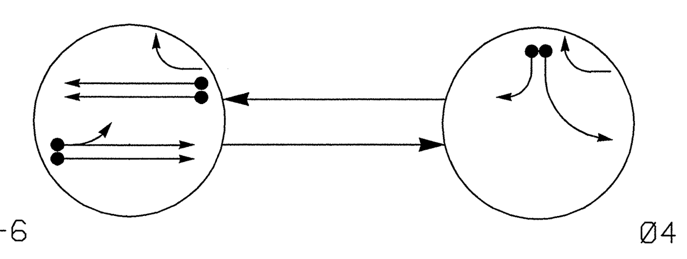
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE DATE 11-26-13
SIG. INVENTORY NO. 05-0486T2

20-NOV-2013 08:19
S:\ITS&SU\ITS Signals\Workgroups\Sig Mgmt\Armstrong\050486_smu_ele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 20

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

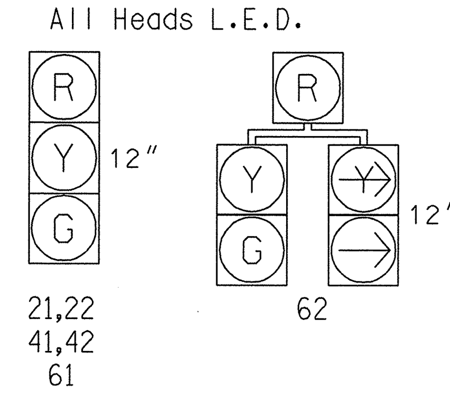
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø4	PHASE FLASH
21, 22	G	R	Y
41, 42	R	G	R
61	G	R	Y
62	G	R/→	Y

SIGNAL FACE I.D.

All Heads L.E.D.



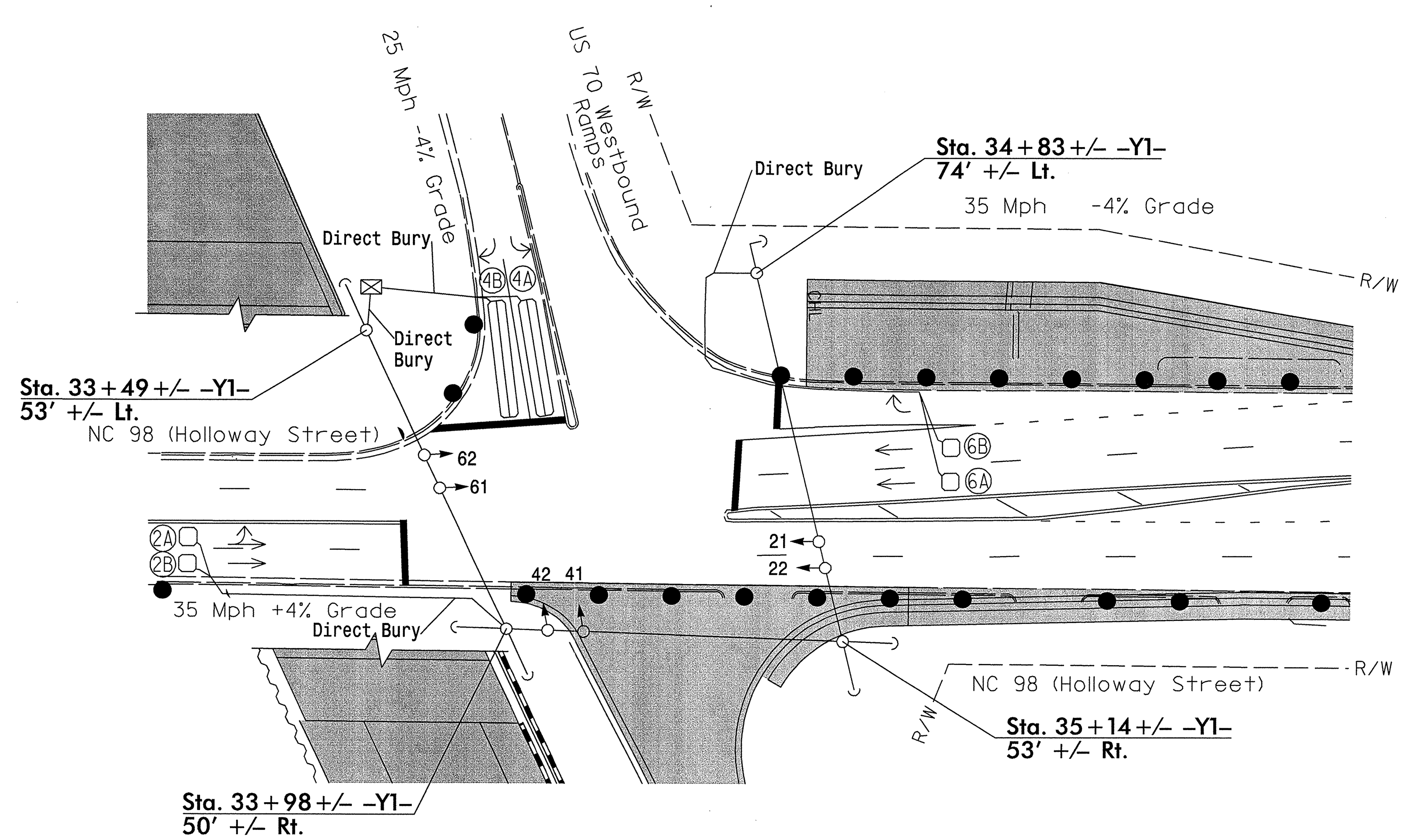
2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS: LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	DETECTOR PROGRAMMING: NEMA PHASE	TIMING: DELAY	TIMING: CARRY (STRETCH)	ATTRIBUTES 1: FULL TIME DELAY	2: PEDESTRIAN CALL	3: RESERVED	4: COUNT	5: EXTENSION	6: TYPE 3	7: CALLING	8: ALTERNATE	SYSTEM LOOPS	STATUS: NEW	STATUS: EXISTING
2A	6x6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6x6	4	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6x40	2-4-2	0	X	-	4	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4B	6x40	2-4-2	0	X	-	4	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6x6	5	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6B	6x6	5	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-

2 Phase
Fully Actuated
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. Set all detector units to presence mode.
4. Locate new cabinet as to not obstruct sight distance of vehicles turning right on red.
5. The cabinet should be designed to include an Auxilary Output File for future use.
6. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
7. Set phase bank 3 maximum limit to 250 seconds for phases used.
8. Pavement Markings are existing.
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	
	Directional Arrow	
	Work Area	N/A
	Barrels	N/A
	Direct Bury	N/A

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø4	Ø6
MINIMUM INITIAL *	10 SEC.	7 SEC.	10 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	3.6 SEC.	3.0 SEC.	4.1 SEC.
RED CLEARANCE	2.4 SEC.	1.0 SEC.	1.6 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	45 SEC.
RECALL POSITION	VEH. RECALL	NONE	VEH. RECALL
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	YELLOW LOCK
DOUBLE ENTRY	OFF	OFF	OFF
WALK *	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	3.0 SEC.
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.
MINIMUM GAP	3.0 SEC.	2.0 SEC.	3.0 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.

$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

Signal Upgrade - Temporary Design 1 (TMP Phase I, Step 2)

Prepared for 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

SCALE 0 40 1"=40'

NC 98 (Holloway Street) at US 70 Westbound Ramps

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

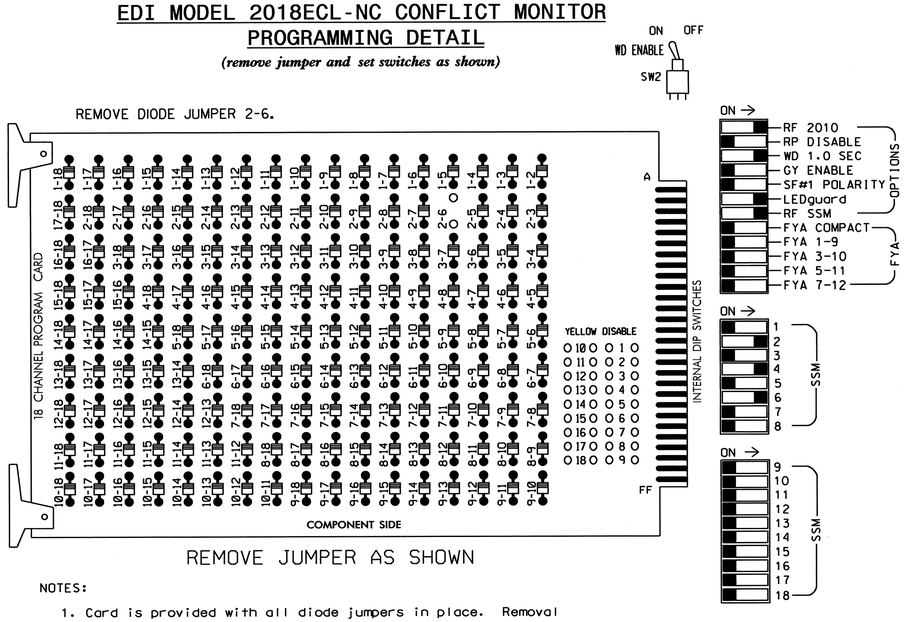
SIGNATURE 11/22/13 DATE

SIG. INVENTORY NO. 05-1717TI

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.21

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches 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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. This cabinet and controller are part of the Durham Signal System.

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	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	62	NU	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		128			101				134										
YELLOW		129			102				135										
GREEN		130			103				136										
RED ARROW																			
YELLOW ARROW						102													
GREEN ARROW						103													

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S5,S8
PHASES USED.....2,4,6
OVERLAPS.....NONE

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	ø 2 / 2A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø 4 / 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS / DC ISOLATOR
	L		ø 2 / 2B				ø 4 / 4B								ST / DC ISOLATOR
FILE "J"	U	SLOT EMPTY	ø 6 / 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		ø 6 / 6B												

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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
4B	TB4-11,12	I6L	7	45	5 7	4
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1717T1
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 1 (TMP Phase I, Step 2)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 98 (Holloway Street)
at
US 70 Westbound Ramps

Division 5 Durham County Durham

PLAN DATE: October 2013 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE DATE 11-26-13
SIG. INVENTORY NO. 05-1717T1

20-NOV-2013 08:14
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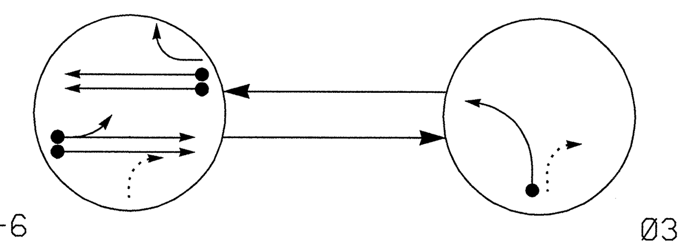
sarmstrong

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

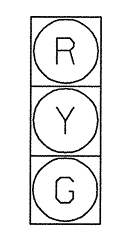
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	Ø3	FLASH
21, 22	G	R	Y
31, 32	R	G	R
61, 62	G	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



21,22
31,32
61,62

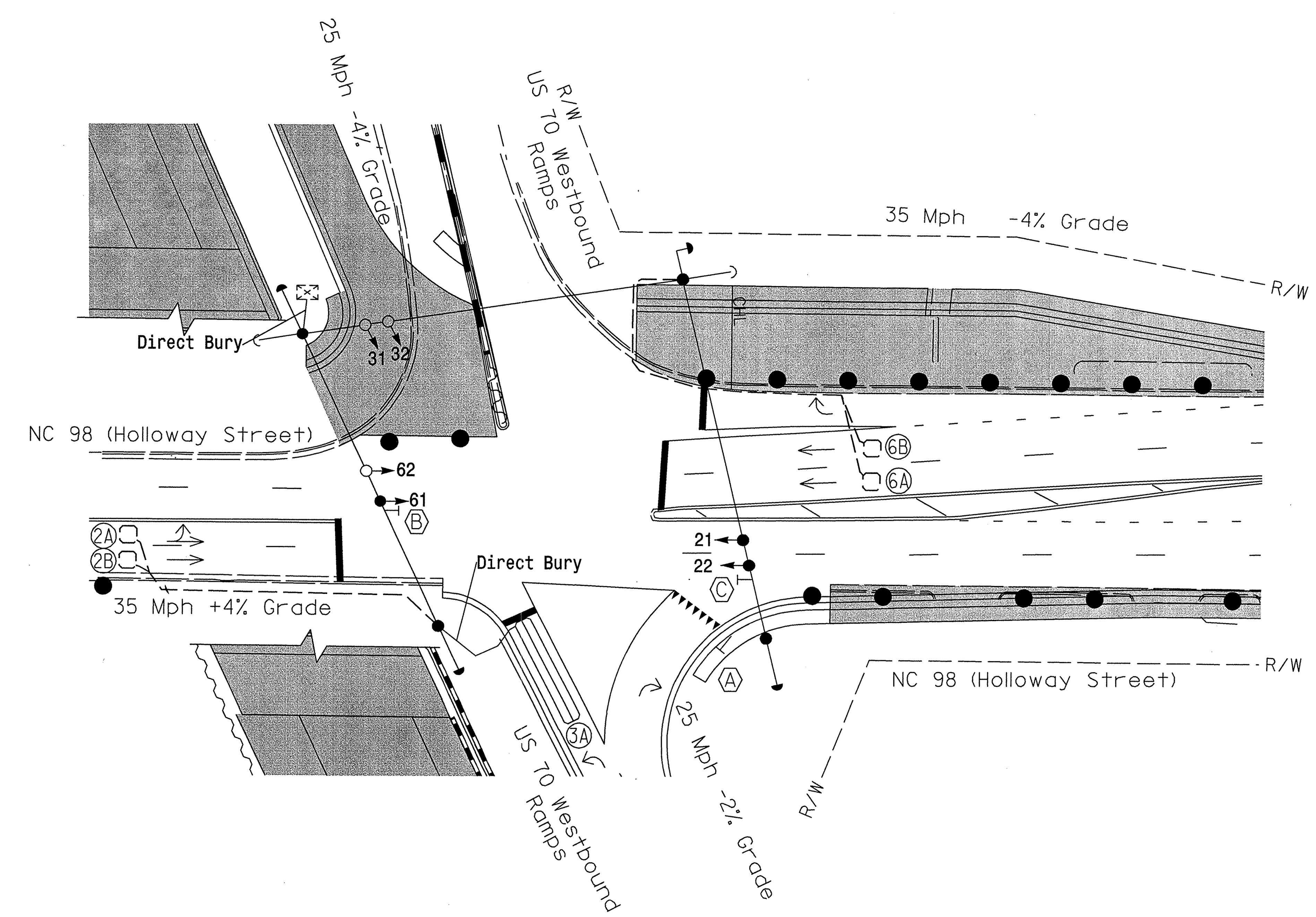
2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6x6	4	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2B	6x6	4	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
3A	6x40	2-4-2	0	X	-	3	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6x6	5	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6B	6x6	5	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X

2 Phase
Fully Actuated
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. Set all detector units to presence mode.
4. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
5. Set phase bank 3 maximum limit to 250 seconds for phases used.
6. 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	
	Directional Arrow	
Ⓐ	"Yield" Sign (R1-2)	Ⓐ
Ⓑ	No Left Turn Sign (R3-2)	Ⓑ
Ⓒ	No Right Turn Sign (R3-1)	Ⓒ
	Work Area	N/A
	Barrels	N/A
	Direct Bury	N/A

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø3	Ø6
MINIMUM INITIAL *	10 SEC.	7 SEC.	10 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	3.6 SEC.	3.0 SEC.	4.1 SEC.
RED CLEARANCE	2.4 SEC.	1.8 SEC.	1.6 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	45 SEC.
RECALL POSITION	VEH. RECALL	NONE	VEH. RECALL
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	YELLOW LOCK
DOUBLE ENTRY	OFF	OFF	OFF
WALK *	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	3.0 SEC.
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.
MINIMUM GAP	3.0 SEC.	2.0 SEC.	3.0 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.

$$$$SYSTIME$$$$
$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

Signal Upgrade - Temporary Design 2 (TMP Phase III, Step 2)

Prepared for 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

SCALE 0 40 1"=40'

NC 98 (Holloway Street) at US 70 Westbound Ramps

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson	REVIEWED BY:

REVISIONS	INIT.	DATE

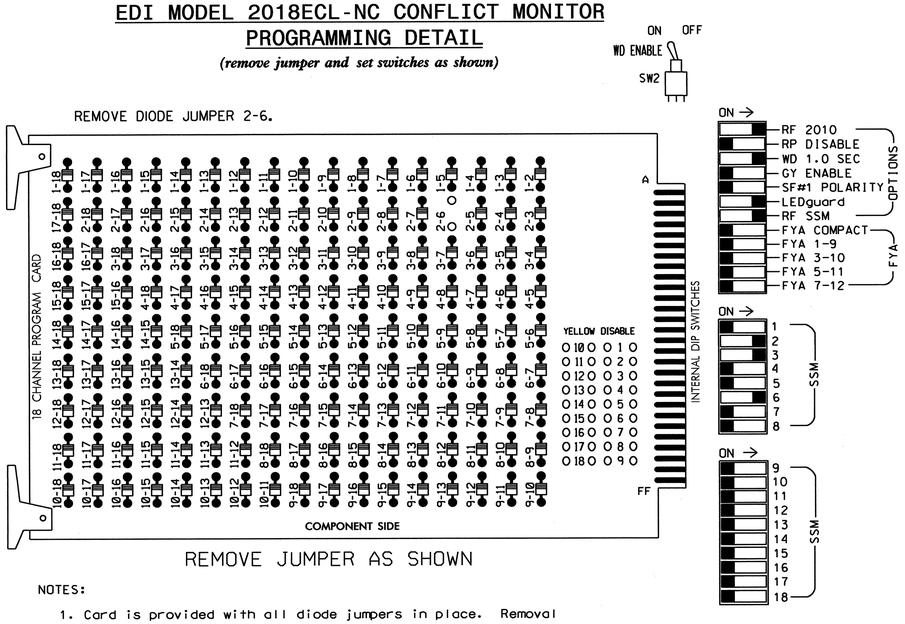
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE
SIG. INVENTORY NO.

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.23

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches 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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. This cabinet and controller are part of the Durham Signal System.

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	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	31,32	NU	NU	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		128		116				134										
YELLOW		129		117				135										
GREEN		130		118				136										
RED ARROW																		
YELLOW ARROW																		
GREEN ARROW																		

NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S4,S8
PHASES USED.....2,3,6
OVERLAPS.....NONE

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT	ø 2	SLOT	SLOT	ø 3	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS
			2A			3A									DC ISOLATOR
	L	EMPTY	ø 2	EMPTY	EMPTY	NOT USED	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST
			2B												DC ISOLATOR
FILE "J"	U	SLOT	ø 6	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
			6A												
	L	EMPTY	ø 6	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY
			6B												

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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
3A	TB4-5,6	I5U	16	58	5 7	3
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1717T2
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 2 (TMP Phase III, Step 2)

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

NC 98 (Holloway Street)
at
US 70 Westbound Ramps

Division 5 | Durham County | Durham

PLAN DATE: October 2013 | REVIEWED BY: JTR
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

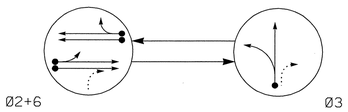
SIGNATURE | DATE 11-26-13

SIG. INVENTORY NO. 05-1717T2

20-NOV-2013 08:13
S:\TSASU\TS Signals\Workgroups\Sig Man\Armstrong\05117_sm_ele_xxx.dgn
armstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 24

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

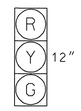
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø3	FLASH
21, 22	G	R	Y
31, 32	R	G	R
61, 62	G	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



21,22
31,32
61,62

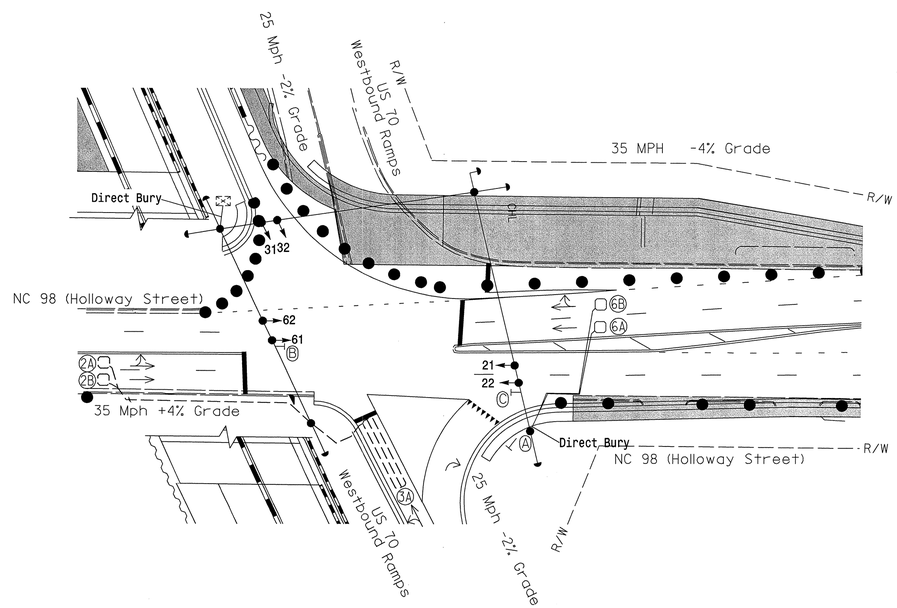
2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES								STATUS		
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	6x6	4	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2B	6x6	4	70	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
3A	6x40	2-4-2	0	-	X	3	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6A	6x6	4	70	X	-	6	- SEC.	- SEC.	-		-	-	X	-	X	-	-	-	X
6B	6x6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X

2 Phase
Fully Actuated
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. Set all detector units to presence mode.
4. Reposition existing signal heads numbered 61 and 62.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. 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	
	Directional Arrow	
A	"Yield" Sign (R1-2)	A
B	No Left Turn Sign (R3-2)	B
C	No Right Turn Sign (R3-1)	C
	Work Area	N/A
	Barrels	N/A
	Direct Bury	N/A

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø3	Ø6
MINIMUM INITIAL *	10 SEC.	7 SEC.	10 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	3.6 SEC.	3.3 SEC.	4.1 SEC.
RED CLEARANCE	1.3 SEC.	1.8 SEC.	1.5 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	45 SEC.
RECALL POSITION	VEH. RECALL	NONE	VEH. RECALL
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	YELLOW LOCK
DOUBLE ENTRY	OFF	OFF	OFF
WALK *	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	3.0 SEC.
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.
MINIMUM GAP *	3.0 SEC.	2.0 SEC.	3.0 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.

$$$$SYSTIME$$$$
$$$$SECONDS$$$$

Signal Upgrade - Temporary Design 3 (TMP Phase IV)

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

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

SCALE 1"=40' (0 – 40)

NC 98 (Holloway Street) at US 70 Westbound Ramps

Division 5 Durham County Durham

PLAN DATE: October 2013 REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson REVIEWED BY:

REVISIONS	INIT.	DATE

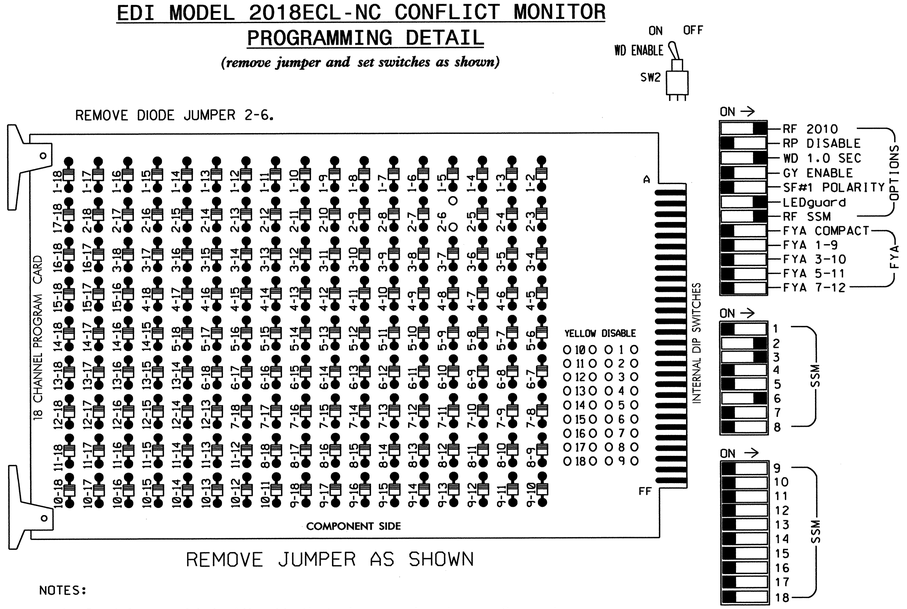
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 11/22/15 DATE
SIG. INVENTORY NO. 05-171773

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.25

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



REMOVE JUMPER 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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. This cabinet and controller are part of the Durham Signal System.

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	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	31,32	NU	NU	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		128		116				134										
YELLOW		129		117				135										
GREEN		130		118				136										
RED ARROW																		
YELLOW ARROW																		
GREEN ARROW																		

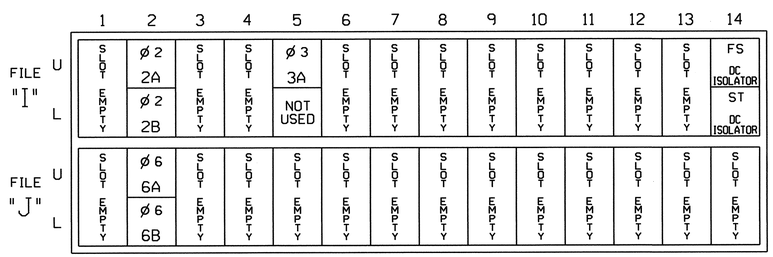
NU = Not Used

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S4,S8
PHASES USED.....2,3,6
OVERLAPS.....NONE

INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
3A	TB4-5,6	I5U	16	58	5 7	3
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1717T3
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 3 (TMP Phase IV)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:

Transportation Mobility and Safety Division
Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

NC 98 (Holloway Street)
at
US 70 Westbound Ramps

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE DATE 11-26-13

SIG. INVENTORY NO. 05-1717T3

20-NOV-2013 08:13
S:#ITS&SU#ITS Signals#Workgroups#Sig Man#Armstrong#05117_sm_ele_xxx.dgn
sarmstrong

PHASING DIAGRAM

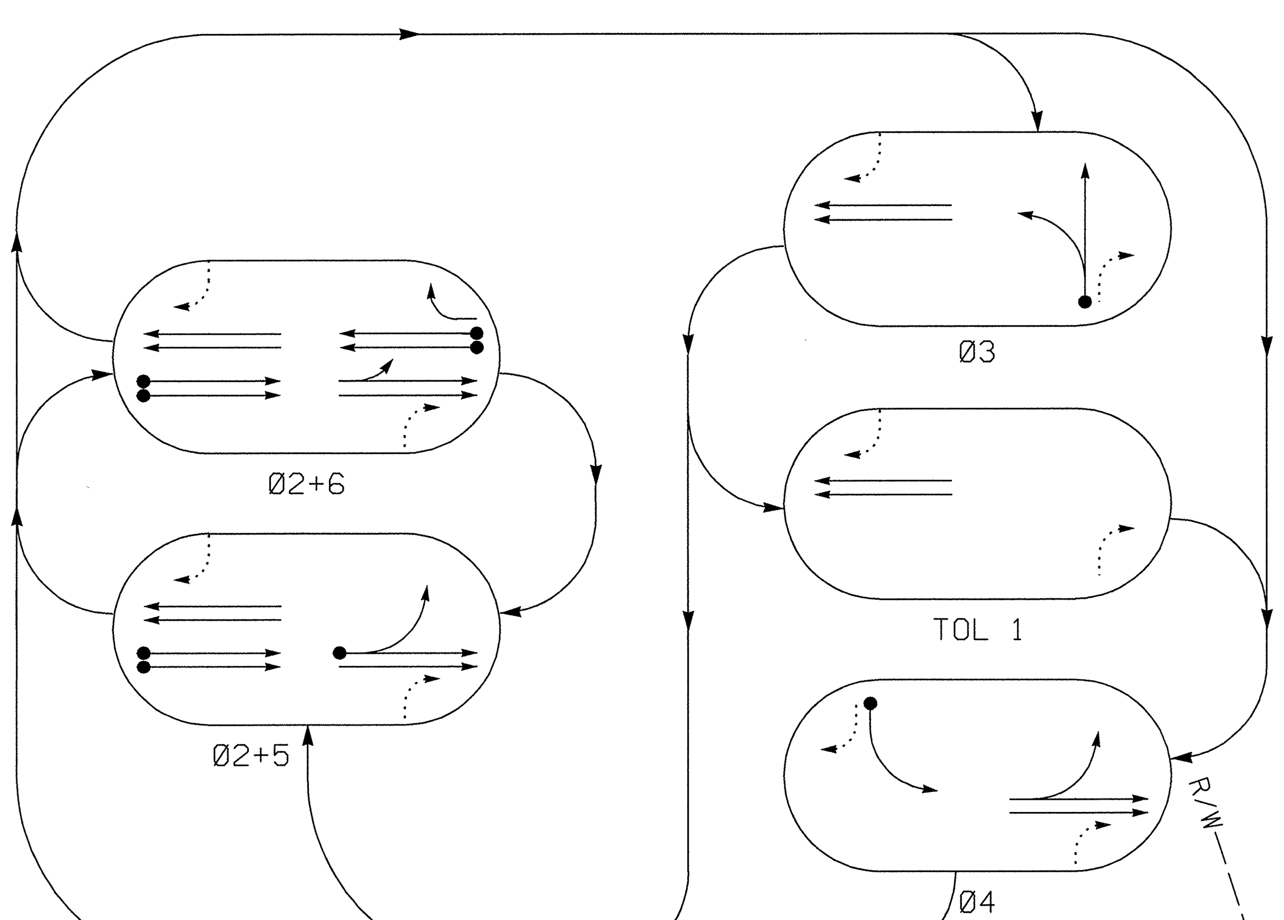
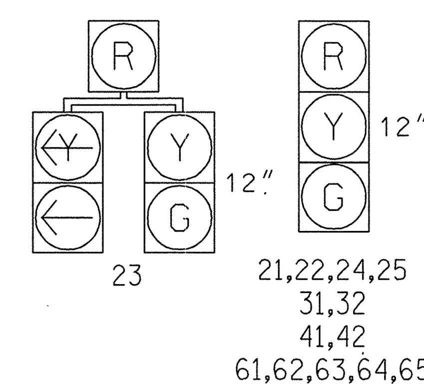


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø3	TOL 1	Ø4	FLASH
21, 22	G	G	R	R	R	Y
23	←G	G	R	R	←G	Y
24, 25	G	G	R	R	G	Y
31, 32	R	R	G	R	R	R
41, 42	R	R	R	R	G	R
61, 62	R	G	R	R	R	Y
63, 64, 65	G	G	G	G	R	Y

SIGNAL FACE I.D.

All Heads L.E.D.



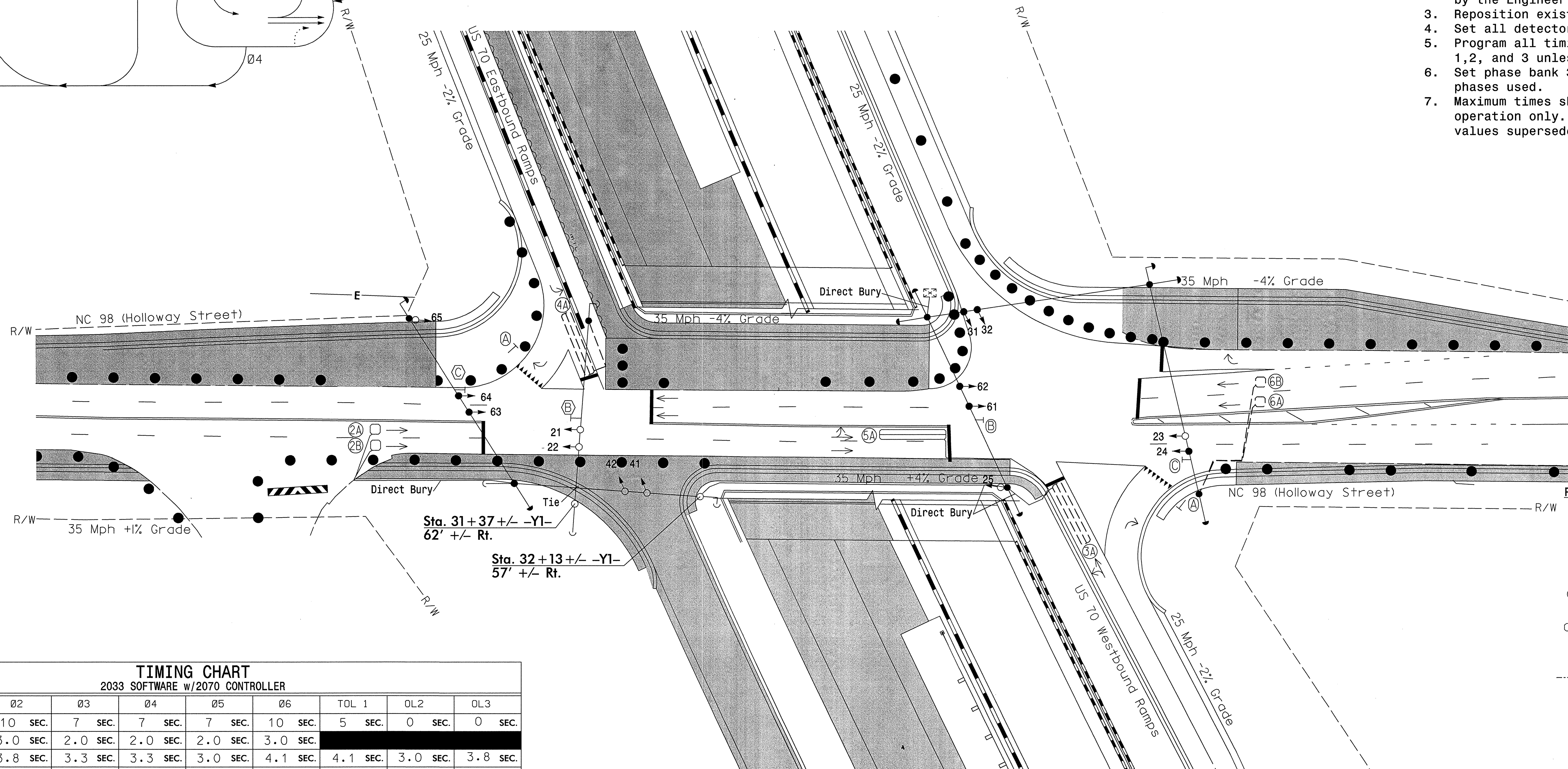
2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	TIMING: DELAY	TIMING: CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	STATUS: NEW	STATUS: EXISTING
2A	6x6	6	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2B	6x6	6	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
3A	6x40	2-4-2	0	-	X	3	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4A	6x40	2-4-2	0	-	X	4	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
5A	6x40	2-4-2	0	X	-	5	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6x6	4	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6B	6x6	4	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X

4 Phase
Fully Actuated
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. Reposition existing signal heads numbered 61 and 62.
4. Set all detector units to presence mode.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø5	Ø6	TOL 1	OL2	OL3
MINIMUM INITIAL *	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	5 SEC.	0 SEC.	0 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.			
YELLOW CHANGE INT.	3.8 SEC.	3.3 SEC.	3.3 SEC.	3.0 SEC.	4.1 SEC.	4.1 SEC.	3.0 SEC.	3.8 SEC.
RED CLEARANCE	1.8 SEC.	2.4 SEC.	1.1 SEC.	1.9 SEC.	1.5 SEC.	1.5 SEC.	1.9 SEC.	1.7 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	25 SEC.	25 SEC.	45 SEC.			
RECALL POSITION	VEH. RECALL	NONE	NONE	NONE	VEH. RECALL			
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	NONE	NONE	YELLOW LOCK			
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF			
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.			
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.			
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.			
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.			
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.			
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.			
MAXIMUM GAP*	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.			
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.			
MINIMUM GAP	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 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.

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	
Ⓐ	"Yield" Sign (R1-2)	Ⓐ
Ⓑ	No Left Turn Sign (R3-2)	Ⓑ
Ⓒ	No Right Turn Sign (R3-1)	Ⓒ
	Work Area	N/A
	Barrels	N/A
—E—	Construction Easement	N/A
	Barricade	N/A
	Direct Bury	N/A

Signal Upgrade - Temporary Design 4 (TMP Phase V, Step 2)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

NC 98 (Holloway Street)
at
US 70 Ramps

Division 5	Durham County	Durham
PLAN DATE: October 2013	REVIEWED BY: J Hochanadel	
PREPARED BY: C Lawson	REVIEWED BY:	

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 11/22/13 DATE

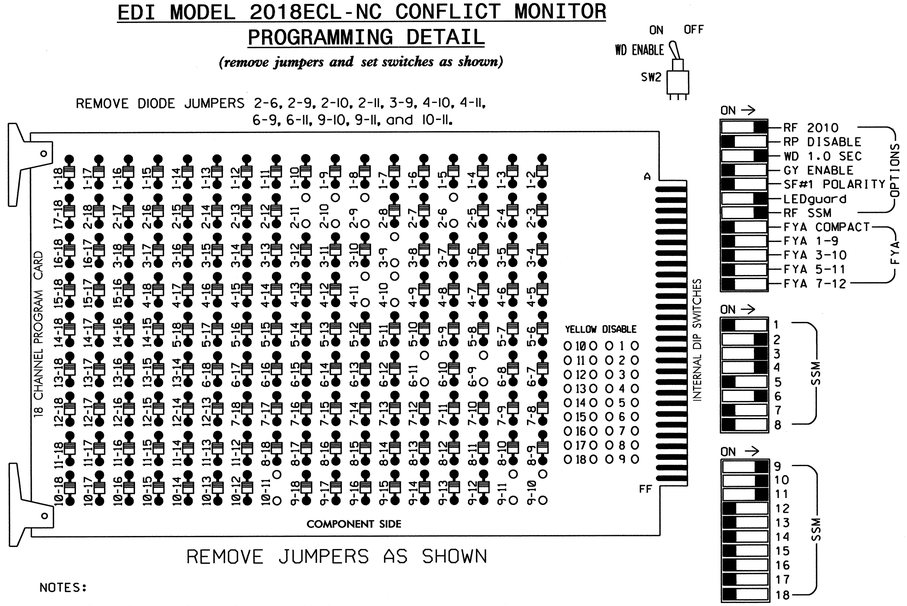
SIG. INVENTORY NO. 05-1717T4

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.27

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches 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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. This cabinet and controller are part of the Durham Signal System.

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	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	31,32	41,42	NU	NU	61,62	NU	NU	NU	NU	63,64 65	23	NU	23,24 25	NU	NU
RED		128		116	101			134					A121	*		A114		
YELLOW		129		117	102			135					A122			A115		
GREEN		130		118	103			136					A123			A116		
RED ARROW																		
YELLOW ARROW														A125				
GREEN ARROW														A126				

NU = Not Used

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

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S2,S4,S5,S8,AUX S1,AUX S2,AUX S4
PHASES USED.....2,3,4,5,6
OVERLAP 1.....2+3
OVERLAP 2.....4+5
OVERLAP 3.....2+4
OVERLAP 4.....NOT USED

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	ø 2 2A	SLOT EMPTY	SLOT EMPTY	ø 3 3A	ø 4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L		ø 2 2B			NOT USED	NOT USED								ST DC ISOLATOR
FILE "J"	U	ø 5 5A	ø 6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	ø 6 6B												

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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
3A	TB4-5,6	I5U	16	58	5 7	3
4A	TB4-9,10	I6U	3	41	5 7	4
5A	TB3-1,2	J1U	13	55	5 7	5
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L

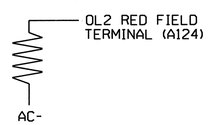
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1717T4
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



Signal Upgrade - Temporary Design 4 (TMP Phase V, Step 2) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 98 (Holloway Street) at US 70 Ramps

Division 5 Durham County Durham

PLAN DATE: October 2013 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE DATE 11-26-13
SIG. INVENTORY NO. 05-1717T4

20-NOV-2013 08:13
S:#ITS&SU#ITS Signals#workgroups#Sig Mgmt#armstrong#051717_sm_ele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.28

OVERLAP PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

```
OVERLAP [1]:
                LOADSWITCH = 9
                VEH SET 1  = 2,3
             NEGATIVE VEH = 4
           GREEN CLR OMIT = 2
          GREEN CLEARANCE = 5
         YELLOW CLEARANCE = 4.1
            RED CLEARANCE = 1.5

Press "+"

OVERLAP [2]:
                LOADSWITCH = 10
                VEH SET 1  = 4,5
         YELLOW CLEARANCE = 3.0
            RED CLEARANCE = 1.9

Press "+"

OVERLAP [3]:
                LOADSWITCH = 11
                VEH SET 1  = 2,4
         YELLOW CLEARANCE = 3.8
            RED CLEARANCE = 1.7

     END OF OVERLAP PROGRAMMING
```

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1717T4
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 4 (TMP Phase V, Step 2) - Sheet 2 of 2

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

NC 98 (Holloway Street)
at
US 70 Ramps

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

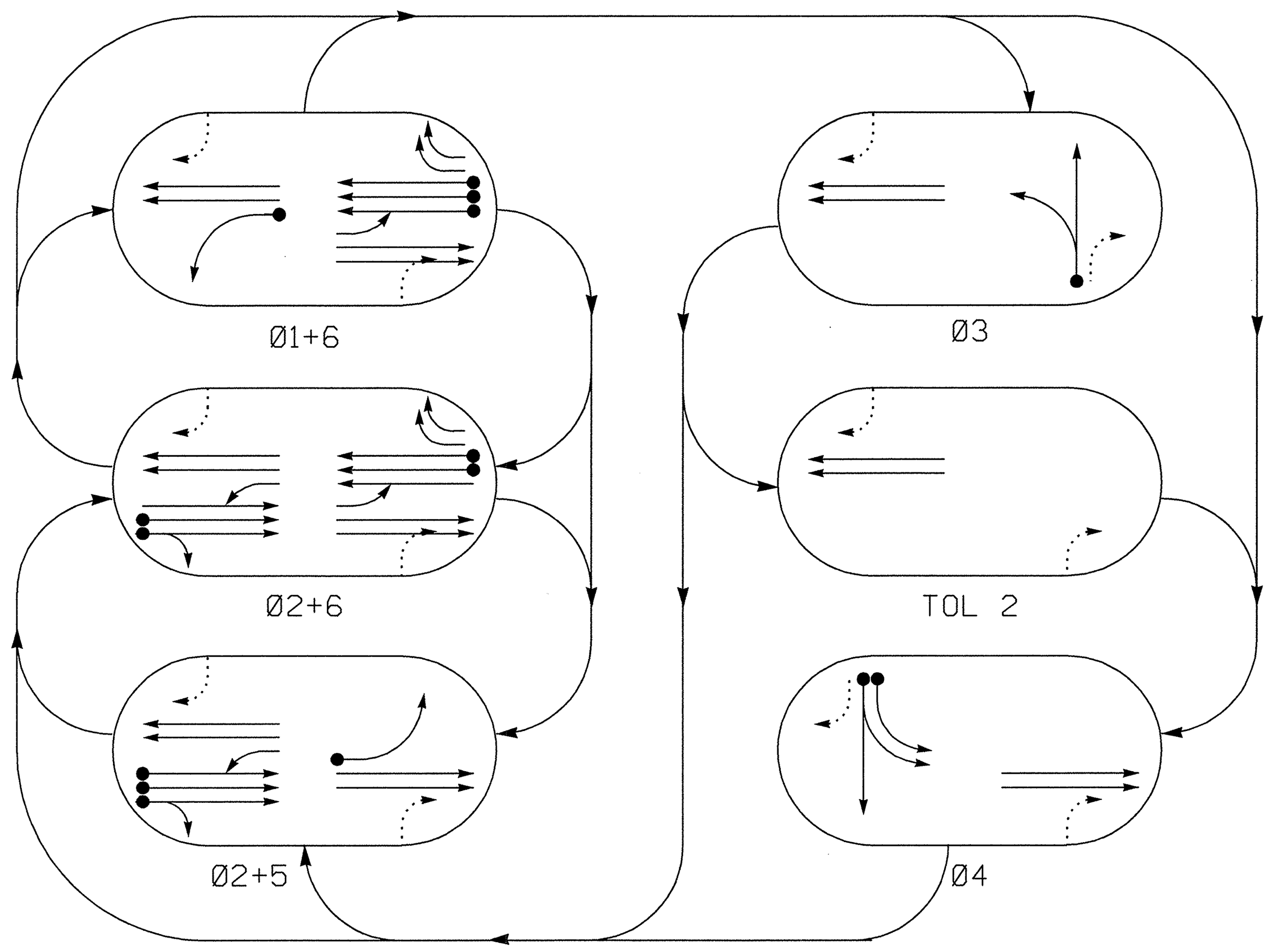
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

John T Rowe 11-26-13
SIGNATURE DATE
SIG. INVENTORY NO. 05-1717T4

20-NOV-2013 08:13
S:#ITS&SU#ITS Signals#Workgroups#Sig Mon#armstrong#051717_sm.ele_xxx.dgn
armstrong

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

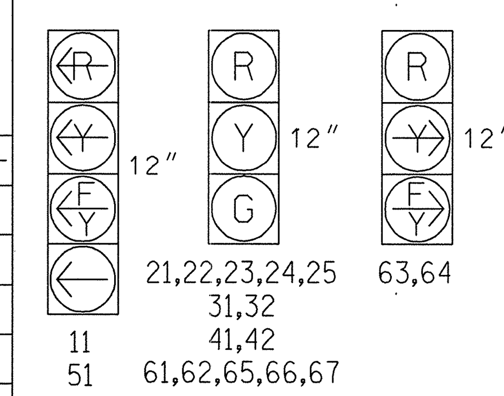
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+6	Ø2+5	Ø2+6	Ø3	TOL 2	Ø4	FLASH
11	←	F/Y	F/Y	←R	←R	←R	←R
21, 22	R	G	G	R	R	R	Y
23,24,25	G	G	G	R	R	G	Y
31,32	R	R	R	G	R	R	R
41,42	R	R	R	R	R	G	R
51	F/Y	←	F/Y	←R	←R	←R	←R
61,62	G	R	G	R	R	R	Y
63,64	F/Y→	R	F/Y→	R	R	R	Y→
65,66,67	G	G	G	G	G	R	Y

F/Y = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



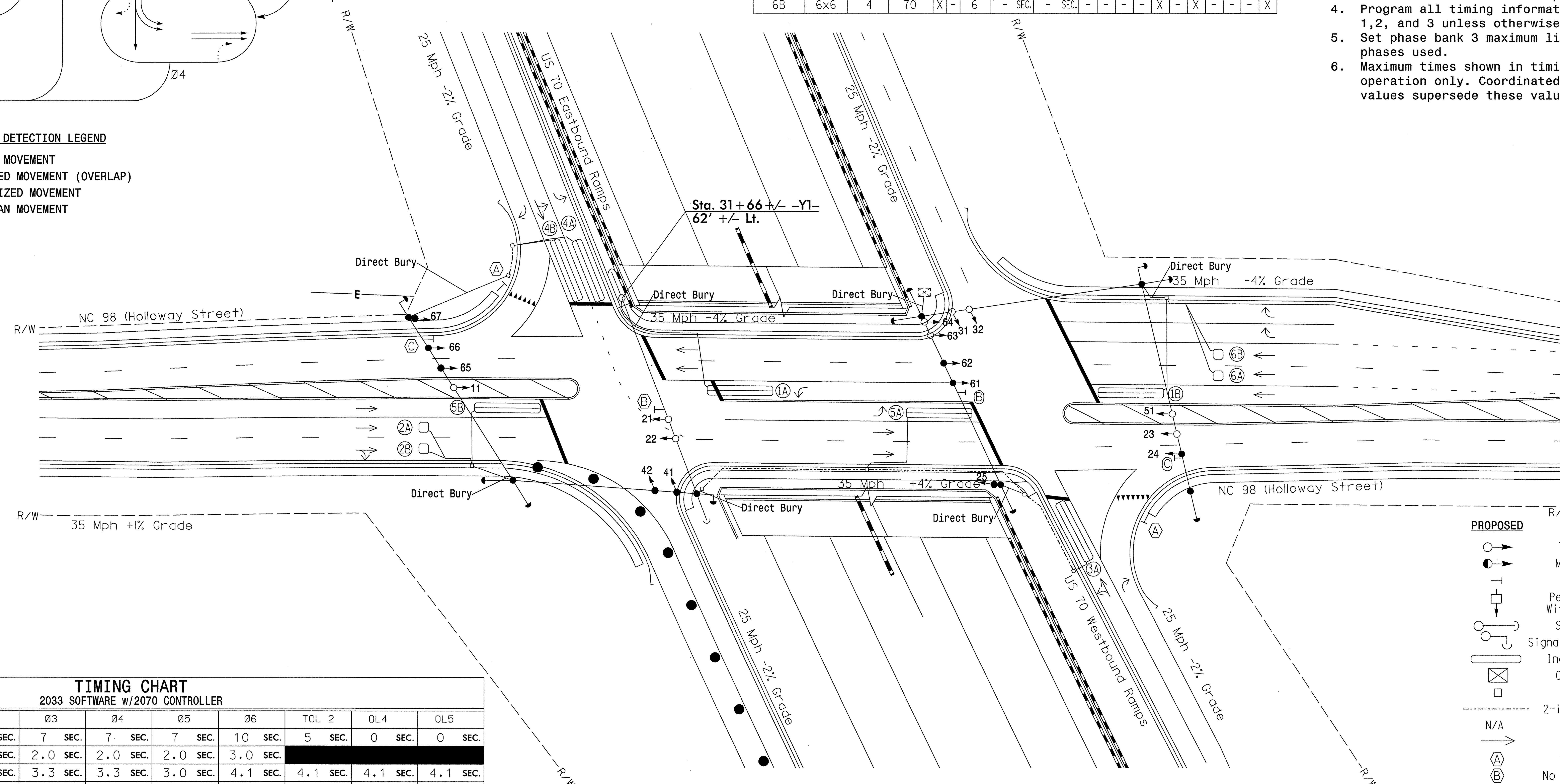
2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	STATUS NEW	STATUS EXISTING
1A	6x40	2-4-2	+5	X	-	1	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
1B	6x40	2-4-2	0	X	-	1	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2A	6x6	6	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2B	6x6	6	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
3A	6x40	2-4-2	0	X	-	3	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4A	6x40	2-4-2	0	X	-	4	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4B	6x40	2-4-2	0	X	-	4	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
5A	6x40	2-4-2	0	X	-	5	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
5B	6x40	2-4-2	0	X	-	5	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6x6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6B	6x6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X

5 Phase
Fully Actuated
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. Set all detector units to presence mode.
4. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
5. Set phase bank 3 maximum limit to 250 seconds for phases used.
6. 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	— — —
→	Directional Arrow	→
(A)	"Yield" Sign (R1-2)	(A)
(B)	No Left Turn Sign (R3-2)	(B)
(C)	No Right Turn Sign (R3-1)	(C)
●	Barrels	N/A
—E—	Construction Easement	N/A
——	Direct Bury	N/A

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	TOL 2	OL4	OL5
MINIMUM INITIAL *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	5 SEC.	0 SEC.	0 SEC.
VEHICLE EXTENSION *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.			
YELLOW CHANGE INT.	3.0 SEC.	4.1 SEC.	3.3 SEC.	3.3 SEC.	3.0 SEC.	4.1 SEC.	4.1 SEC.	4.1 SEC.	4.1 SEC.
RED CLEARANCE	2.4 SEC.	1.8 SEC.	3.4 SEC.	2.9 SEC.	2.6 SEC.	1.8 SEC.	1.3 SEC.	1.8 SEC.	1.8 SEC.
MAXIMUM LIMIT *	25 SEC.	45 SEC.	25 SEC.	25 SEC.	25 SEC.	45 SEC.			
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	NONE	VEH. RECALL			
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	NONE	NONE	YELLOW LOCK			
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF	OFF			
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.			
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.			
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.			
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.			
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.			
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.			
MAXIMUM GAP*	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.			
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.			
MINIMUM GAP	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 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.

$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$
$$$USERNAME$$$$

Signal Upgrade - Temporary Design 5 (TMP Phase VI, Step 2)

SEPI
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

Prepared for 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

SCALE 0 40
1"=40'

NC 98 (Holloway Street)
at
US 70 Ramps

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	J Hochanadel
PREPARED BY:	C Lawson	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 11/22/13 DATE

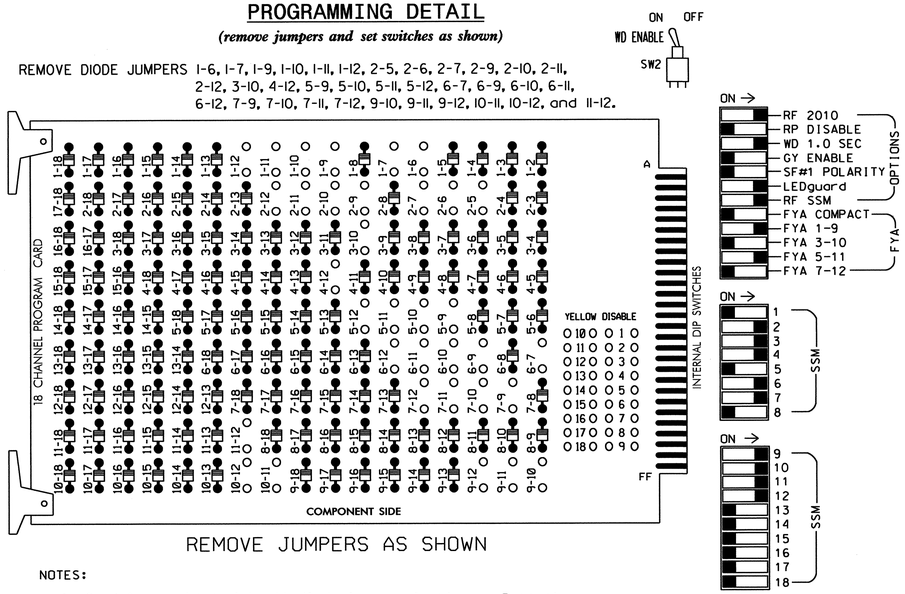
SIG. INVENTORY NO. 05-1717T5

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.30

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-6, 1-7, 1-9, 1-10, 1-11, 1-12, 2-5, 2-6, 2-7, 2-9, 2-10, 2-11, 2-12, 3-10, 4-12, 5-9, 5-10, 5-11, 5-12, 6-7, 6-9, 6-10, 6-11, 6-12, 7-9, 7-10, 7-11, 7-12, 9-10, 9-11, 9-12, 10-11, 10-12, and 11-12.



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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S4,S5,S7,S8,S10,AUX S1, AUX S2,AUX S4,AUX S5
PHASES USED.....1,2,3,4,5,6
OVERLAP 1.....*
OVERLAP 2.....2+3+6
OVERLAP 3.....*
OVERLAP 4.....2+4+6
OVERLAP 5.....6

* See Flashing Yellow Arrow Programming Detail on sheet 2.

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	OL5	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11★	21,22	NU	31,32	41,42	NU	51★	61,62	NU	63,64★	NU	NU	11★	65,66 67	NU	51★	23,24 25	NU
RED		128		116	101			134		122				A124			A101	
YELLOW	*	129		117	102		*	135						A125			A102	
GREEN		130		118	103			136						A126			A103	
RED ARROW													A121			A114		
YELLOW ARROW										123			A122			A115		
FLASHING YELLOW ARROW										124			A123			A116		
GREEN ARROW	127						133											

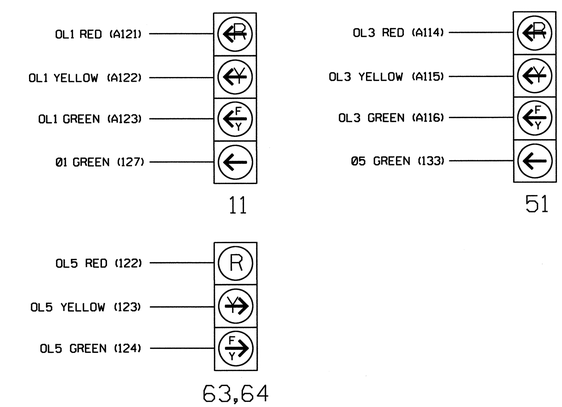
NU = Not Used

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

★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE:
See Flashing Yellow Arrow Programming Detail on sheet 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 1A	Ø2 2A	SLOT EMPTY	SLOT EMPTY	Ø3 3A	Ø4 4A	SLOT EMPTY	SLOT EMPTY	Ø1 1B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L	NOT USED	Ø2 2B			NOT USED	Ø4 4B			NOT USED					ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø5 5B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	Ø6 6B							NOT USED					

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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	14	56	5 7	1
1B	TB6-9,10	I9U	18	60	5 7	1
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
3A	TB4-5,6	I5U	16	58	5 7	3
4A	TB4-9,10	I6U	3	41	5 7	4
4B	TB4-11,12	I6L	7	45	5 7	4
5A	TB3-1,2	J1U	13	55	5 7	5
5B	TB7-9,10	J9U	17	59	5 7	5
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

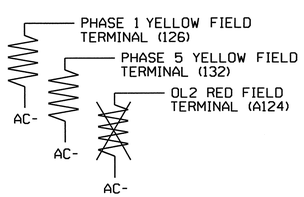
1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES

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



! IMPORTANT: Remove load resistor for OL2 Red Field terminal if one is currently installed.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1717T5
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 5 (TMP Phase VI, Step 2) - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 98 (Holloway Street) at US 70 Ramps

Division 5 Durham County Durham

PLAN DATE: October 2013 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE DATE 11-22-13
SIG. INVENTORY NO. 05-1717T5

20-NOV-2013 08:10
S:##TSASU##TS Signals##Workgroups##Sig Man##armstrong##051717_sm_ele_xxx.dgn
armstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.31

OVERLAP PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

Press "+"

OVERLAP [2]:

```
LOADSWITCH = 10
VEH SET 1  = 2,3,6
NEGATIVE VEH = 4
GREEN CLR OMIT = 2,6
GREEN CLEARANCE = 5
YELLOW CLEARANCE = 4.1
RED CLEARANCE = 1.3
```

Press "+" twice

OVERLAP [4]:

```
LOADSWITCH = 12
VEH SET 1  = 2,4,6
YELLOW CLEARANCE = 4.1
RED CLEARANCE = 1.8
```

Press "+" once

OVERLAP [5]:

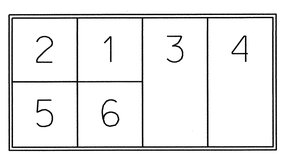
```
LOADSWITCH = 7
VEH SET 1  = 6
YELLOW CLEARANCE = 4.1
RED CLEARANCE = 1.8
```

END OF OVERLAP PROGRAMMING

PHASE SEQUENCE PROGRAMMING

The following programming establishes the permitted phases, sets phase 1 as a lag phase during free run, and ensures that phase 1 and 5 cannot run concurrently:

Main Menu - 9) UTILITIES - 5) CONFIGURATION
Permit = 1,2,3,4,5,6
Lag Free = 1,4,6,8
Restricted = 1,5



FLASHING YELLOW ARROW PROGRMMING

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1,5

2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99
   Phase 5 = 90

3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98
   Phase 5 RED = 88, Phase 5 YELLOW = 89

OVERLAP GREEN FLASH PROGRAMMING DETAIL

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrows. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 5

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1717T5
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 5 (TMP Phase VI, Step 2) - Sheet 2 of 2

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

NC 98 (Holloway Street)
at
US 70 Ramps

Division 5 | Durham County | Durham

PLAN DATE:	October 2013	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

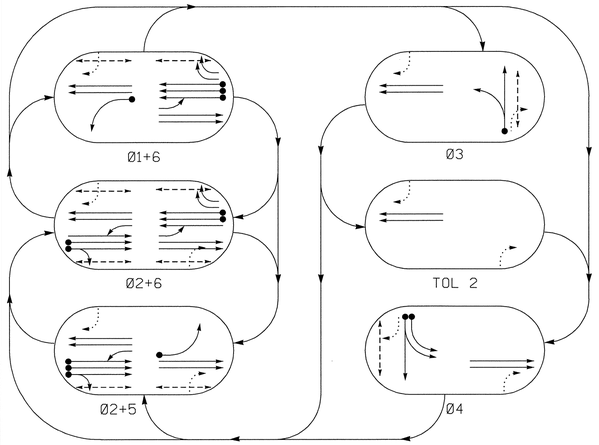
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE John T Rowe Jr. DATE 11-26-13
SIG. INVENTORY NO. 05-1717T5

20-NOV-2013 08:10
S:\TSASU\ITS Signals\Workgroups\Sig Man\Armstrong\05117_sm_ele_xxx.dgn
armstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 32

PHASING DIAGRAM

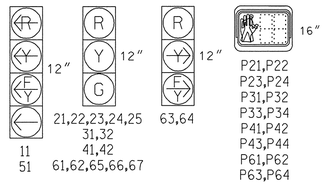


PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.

All Heads L.E.D.



NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. Set all detector units to presence mode.
4. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
5. Set phase bank 3 maximum limit to 250 seconds for phases used.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Activate LED Blankout Sign during pedestrian push button actuation only.

5 Phase
Fully Actuated
(Durham Signal System)

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

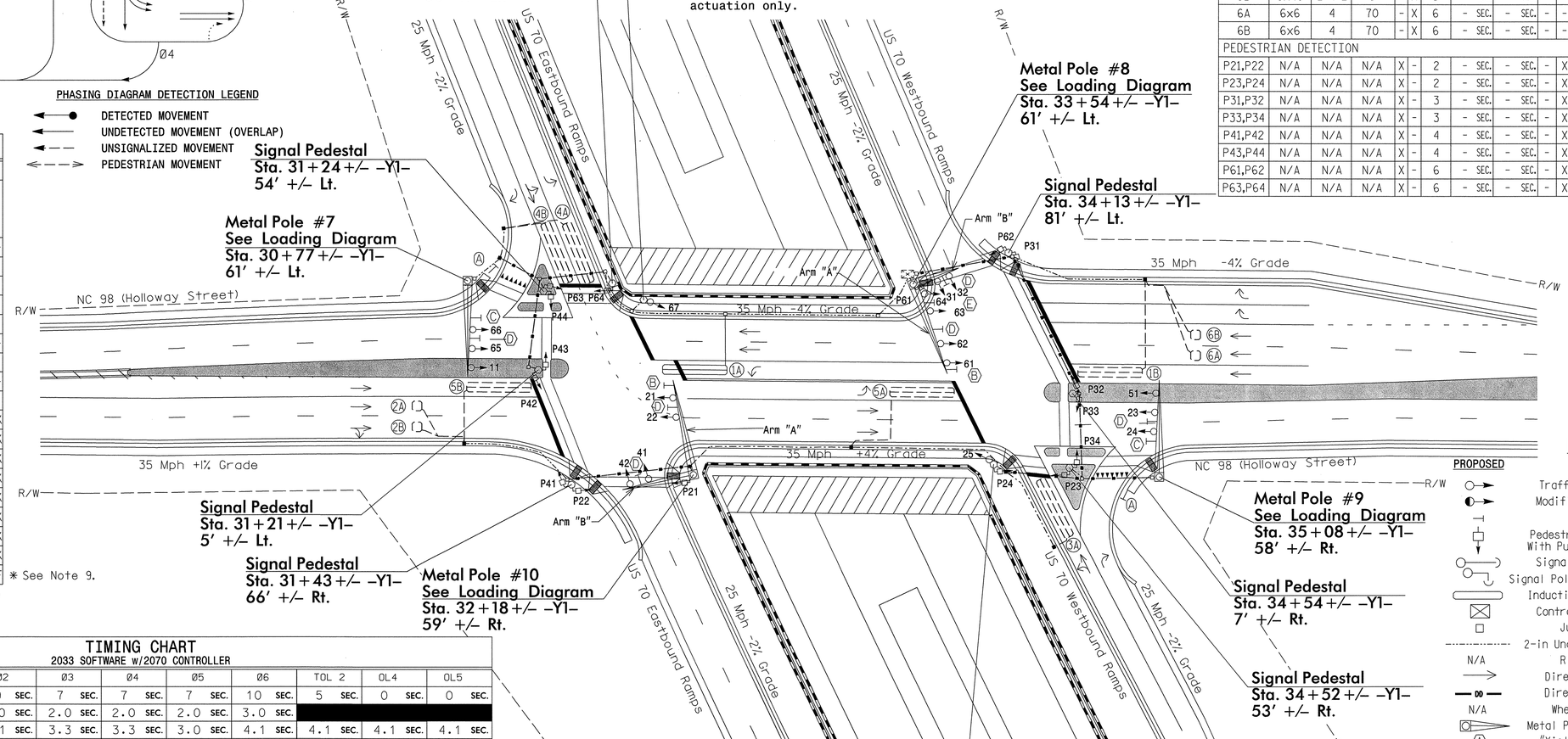
INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES								STATUS		
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
1A	6x40	2-4-2	+5	X	-	1	3 SEC.	- SEC.	-	-	-	X	-	X	-	-	-	-	X
1B	6x40	2-4-2	0	-	X	1	- SEC.	- SEC.	-	-	-	X	-	X	-	-	-	-	X
2A	6x6	4	70	-	X	2	- SEC.	- SEC.	-	-	-	X	-	X	-	-	-	-	X
2B	6x6	4	70	-	X	2	- SEC.	- SEC.	-	-	-	X	-	X	-	-	-	-	X
3A	6x40	2-4-2	0	-	X	3	- SEC.	- SEC.	-	-	-	X	-	X	-	-	-	-	X
4A	6x40	2-4-2	0	-	X	4	- SEC.	- SEC.	-	-	-	X	-	X	-	-	-	-	X
4B	6x40	2-4-2	0	-	X	4	- SEC.	- SEC.	-	-	-	X	-	X	-	-	-	-	X
5A	6x40	2-4-2	0	-	X	5	3 SEC.	- SEC.	-	-	-	X	-	X	-	-	-	-	X
5B	6x40	2-4-2	0	-	X	5	- SEC.	- SEC.	-	-	-	X	-	X	-	-	-	-	X
6A	6x6	4	70	-	X	6	- SEC.	- SEC.	-	-	-	X	-	X	-	-	-	-	X
6B	6x6	4	70	-	X	6	- SEC.	- SEC.	-	-	-	X	-	X	-	-	-	-	X
PEDESTRIAN DETECTION																			
P21,P22	N/A	N/A	N/A	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P23,P24	N/A	N/A	N/A	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P31,P32	N/A	N/A	N/A	X	-	3	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P33,P34	N/A	N/A	N/A	X	-	3	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P41,P42	N/A	N/A	N/A	X	-	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P43,P44	N/A	N/A	N/A	X	-	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P61,P62	N/A	N/A	N/A	X	-	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-
P63,P64	N/A	N/A	N/A	X	-	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X	-

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+6	Ø2+5	Ø2+6	Ø3	TOL 2	Ø4	FLASH
11	←	F	F	R	R	R	R
21, 22	R	G	G	R	R	R	Y
23,24,25	G	G	G	R	R	G	Y
31,32	R	R	R	G	R	R	R
41,42	R	R	R	R	R	G	R
51	F	←	F	R	R	R	R
61,62	G	R	G	R	R	R	Y
63,64	F	R	F	R	R	R	Y
65,66,67	G	G	G	G	G	R	Y
P21,P22	DW	W	W	DW	DW	DW	DRK
P23,P24	DW	W	W	DW	DW	DW	DRK
P31,P32	DW	DW	DW	W	DW	DW	DRK
P33,P34	DW	DW	DW	W	DW	DW	DRK
P41,P42	DW	DW	DW	DW	W	DW	DRK
P43,P44	DW	DW	DW	DW	W	DW	DRK
P61,P62	W	DW	W	DW	DW	DW	DRK
P63,P64	W	DW	W	DW	DW	DW	DRK
* Sign E	ON	OFF	ON	OFF	OFF	OFF	OFF

* See Note 9.

F = FLASHING YELLOW ARROW



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	
	Directional Drill	N/A
N/A	Wheelchair Ramp	
	Metal Pole with Mastarm	
A	"Yield" Sign (R1-2)	A
B	"No Left/U-Turn" Sign (R3-18)	B
C	No Right Turn Sign (R3-1)	C
D	Street Name Sign	D
E	"RIGHT TURN YIELD TO PEDS" L.E.D. Blankout Sign	E
	Type 2 Signal Pedestal	

TIMING CHART

2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	TOL 2	OL4	OL5
MINIMUM INITIAL *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	5 SEC.	0 SEC.	0 SEC.
VEHICLE EXTENSION *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.			
YELLOW CHANGE INT.	3.0 SEC.	4.1 SEC.	3.3 SEC.	3.3 SEC.	3.0 SEC.	4.1 SEC.	4.1 SEC.	4.1 SEC.	4.1 SEC.
RED CLEARANCE	2.9 SEC.	2.1 SEC.	3.5 SEC.	3.3 SEC.	2.9 SEC.	2.1 SEC.	2.1 SEC.	2.1 SEC.	2.1 SEC.
MAXIMUM LIMIT *	25 SEC.	45 SEC.	25 SEC.	25 SEC.	25 SEC.	45 SEC.			
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	NONE	VEH. RECALL			
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	NONE	NONE	YELLOW LOCK			
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF	OFF			
WALK *	- SEC.	4 SEC.	4 SEC.	4 SEC.	- SEC.	4 SEC.			
FLASHING DON'T WALK	- SEC.	10 SEC.	20 SEC.	14 SEC.	- SEC.	6 SEC.			
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MAXIMUM GAP*	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.			
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.			
MINIMUM GAP	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 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.

** Timing to be determined by the City of Durham.

$$$$$SYSTIME$$$$$
$$$$$USERNAME$$$$$

Signal Upgrade - Final Design

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

Prepared for 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

SCALE 0 40 1"=40'

NC 98 (Holloway Street) at US 70 Ramps

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	J Hochanadel
PREPARED BY:	C Lawson	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

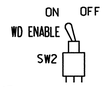
SIGNATURE DATE 11/22/13

SIG. INVENTORY NO. 05-1717

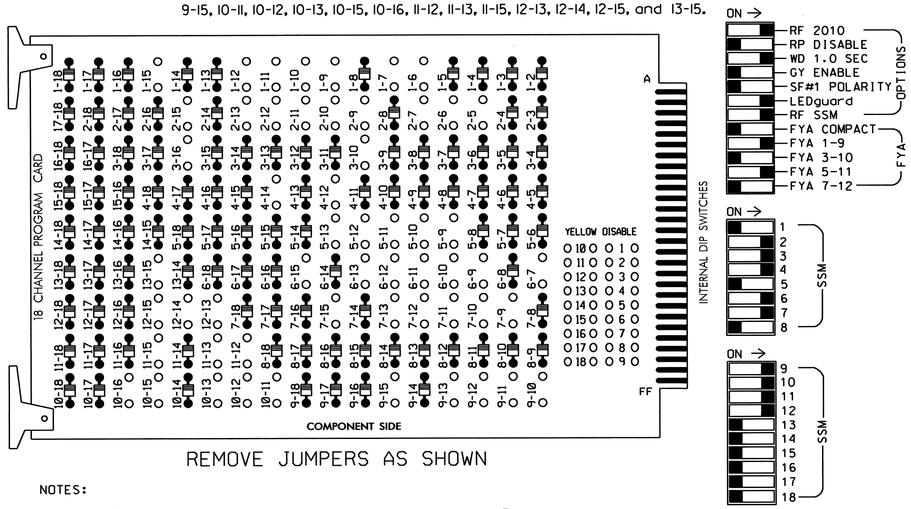
PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.33

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 1-6, 1-7, 1-9, 1-10, 1-11, 1-12, 1-15, 2-5, 2-6, 2-7, 2-9, 2-10, 2-11, 2-12, 2-13, 2-15, 3-10, 3-16, 4-12, 4-14, 5-9, 5-10, 5-11, 5-12, 5-13, 6-7, 6-9, 6-10, 6-11, 6-12, 6-13, 6-15, 7-9, 7-10, 7-11, 7-12, 7-13, 7-15, 9-10, 9-11, 9-12, 9-13, 9-15, 10-11, 10-12, 10-13, 10-15, 10-16, 11-12, 11-13, 11-15, 12-13, 12-14, 12-15, and 13-15.



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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. Program Startup Ped Calls for phases 2, 3, 4, and 6.
9. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S3,S4,S5,S6,S7,S8,S9,S10, S12,AUX S1,AUX S2,AUX S4,AUX S5
PHASES USED.....1,2,2PED,3,3PED,4,4PED,5,6,6PED
OVERLAP 1.....*
OVERLAP 2.....2+3+6
OVERLAP 3.....*
OVERLAP 4.....2+4+6
OVERLAP 5.....6

* See Flashing Yellow Arrow Programming Detail on sheet 2.

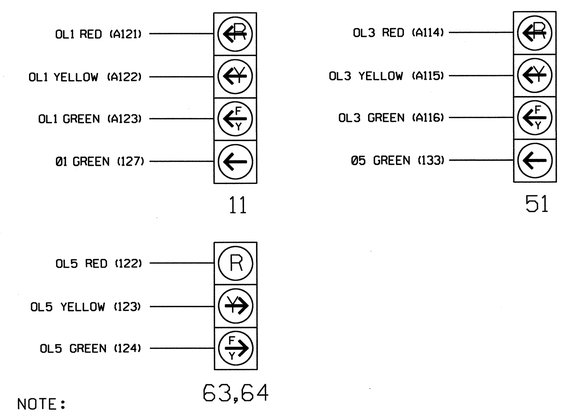
SIGNAL HEAD HOOK-UP CHART

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	OL5	8	3 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11★	21,22	P21,P22 P23,P24	31,32	41,42	P41,P42 P43,P44	51★	61,62	P61,P62 P63,P64	63,64★	NU	P31,P32 P33,P34	11★	65,66 67	NU	51★	23,24 25	NU
RED		128		116	101			134		122				A124			A101	
YELLOW	*	129		117	102		*	135						A125			A102	
GREEN		130		118	103			136						A126			A103	
RED ARROW													A121			A114		
YELLOW ARROW										123			A122			A115		
FLASHING YELLOW ARROW										124			A123			A116		
GREEN ARROW	127						133											
✋			113			104			119			110						
PED YELLOW									BLANKOUT 120 SIGN									
🚶			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.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



NOTE:
See Flashing Yellow Arrow Programming Detail on sheet 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 1A	Ø2 2A	SLOT EMPTY	SLOT EMPTY	Ø3 3A	Ø4 4A	SLOT EMPTY	SLOT EMPTY	Ø1 1B	SLOT EMPTY	SLOT EMPTY	Ø2 PED DC ISOLATOR	Ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L	NOT USED	Ø2 2B			NOT USED	Ø4 4B			NOT USED			Ø4 PED DC ISOLATOR	Ø3 PED DC ISOLATOR	ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø5 5B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	Ø6 6B							NOT USED					

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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	14	56	5 7	1
1B	TB6-9,10	I9U	18	60	5 7	1
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
3A	TB4-5,6	I5U	16	58	5 7	3
4A	TB4-9,10	I6U	3	41	5 7	4
4B	TB4-11,12	I6L	7	45	5 7	4
5A	TB3-1,2	J1U	13	55	5 7	5
5B	TB7-9,10	J9U	17	59	5 7	5
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
PED PUSH BUTTONS						
P21,P22,P23,P24	TB8-4,6	I12U	25	67	2	2 PED
P31,P32,P33,P34	TB8-8,9	I13L	28	70	2	3 PED
P41,P42,P43,P44	TB8-5,6	I12L	27	69	2	4 PED
P61,P62,P63,P64	TB8-7,9	I13U	26	68	2	6 PED

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

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

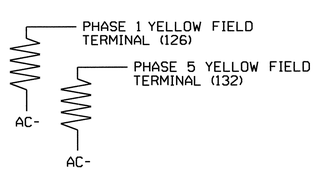
1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

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: 05-1717
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Final Design - Sheet 1 of 3

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

NC 98 (Holloway Street) at US 70 Ramps

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: JTR
PREPARED BY: S. Armstrong	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

John T Rowe Jr 11-26-13
SIGNATURE DATE

SIG. INVENTORY NO. 05-1717

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sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.34

OVERLAP PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

Press "+"

OVERLAP [2]:

```
LOADSWITCH = 10
VEH SET 1  = 2,3,6
NEGATIVE VEH = 4
GREEN CLR OMIT = 2,6
GREEN CLEARANCE = 5
YELLOW CLEARANCE = 4.1
RED CLEARANCE = 2.1
```

Press "+" twice

OVERLAP [4]:

```
LOADSWITCH = 12
VEH SET 1  = 2,4,6
YELLOW CLEARANCE = 4.1
RED CLEARANCE = 2.1
```

Press "+" once

OVERLAP [5]:

```
LOADSWITCH = 7
VEH SET 1  = 6
YELLOW CLEARANCE = 4.1
RED CLEARANCE = 2.1
```

END OF OVERLAP PROGRAMMING

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

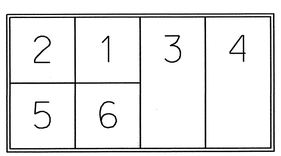
Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

PHASE SEQUENCE PROGRAMMING

The following programming establishes the permitted phases, sets phase 1 as a lag phase during free run, and ensures that phase 1 and 5 cannot run concurrently:

Main Menu - 9) UTILITIES - 5) CONFIGURATION

```
Permit     = 1,2,3,4,5,6
Lag Free   = 1,4,6,8
Restricted = 1,5
```



FLASHING YELLOW ARROW PROGRMMING

1. Program Flashing Yellow Arrow phases as follows:
   Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
   PPLT FYA = PHASE 1,5

2. Assign output pin for Flashing Yellow Arrow as follows:
   Main Menu - 6) OUTPUTS - F) FYA PPLT
   Phase 1 = 99
   Phase 5 = 90

3. Redirect RED and YELLOW outputs for the left turn phases as follows:
   Main Menu - 6) OUTPUTS - 8) REDIRECT PHASE
   Phase 1 RED = 97, Phase 1 YELLOW = 98
   Phase 5 RED = 88, Phase 5 YELLOW = 89

OVERLAP GREEN FLASH PROGRAMMING DETAIL

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrows. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 5

PEDESTRIAN LOADSWITCH ASSIGNMENTS

Program the pedestrian loadswitch output assignments as follows:
Main Menu - 6) OUTPUTS - 7) PEDS

```
PED 2P = 2
PED 4P = 4
PED 6P = 6
PED 8P = 3
```

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1717
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Final Design - Sheet 2 of 3

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

NC 98 (Holloway Street)
at
US 70 Ramps

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE John T Rowe DATE 11-26-13
SIG. INVENTORY NO. 05-1717

20-NOV-2013 07:56
S:\ITS&SU\ITS Signals\Workgroups\Sig Mgmt\armstrong\051717_smu_ele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.35

PROGRAMMABLE INTERNAL LOGIC DETAIL

The following programming steps utilize internal programmable logic, and build a virtual circuit that enables the controller to turn on a blankout sign when PED 6 WALK is timing, and turn off the blankout sign one second after PED 6 DON'T WALK has finished timing:

Main Menu - 1) IN/OUT LOGIC - 7)LATCH

Enter the following under Latch 1:

SET = 28
RESET = 201
OUT = 36

Press 'ESC'

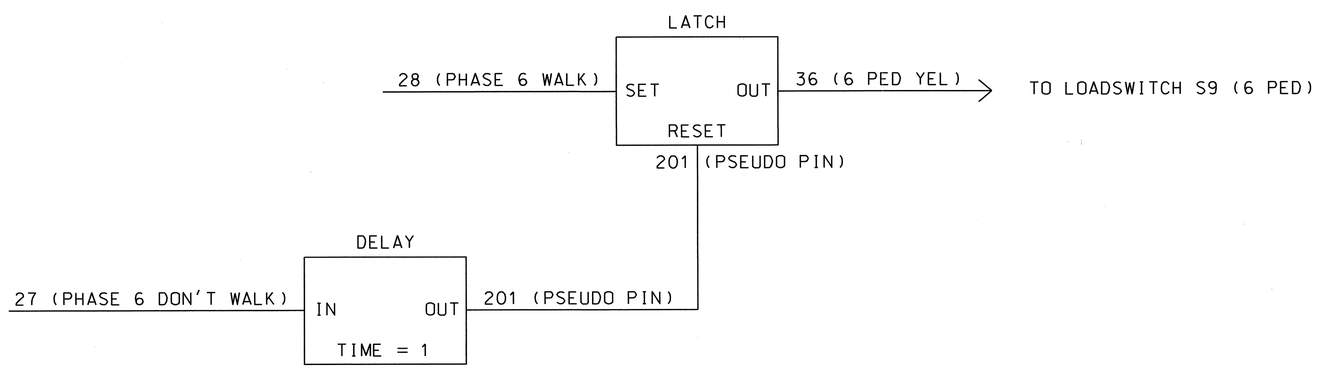
6) DELAY

Enter the following under Delay 1:

INPUT = 27
TIME = 1
OUTPUT = 201

INTERNAL LOGIC PROGRAMMING COMPLETE

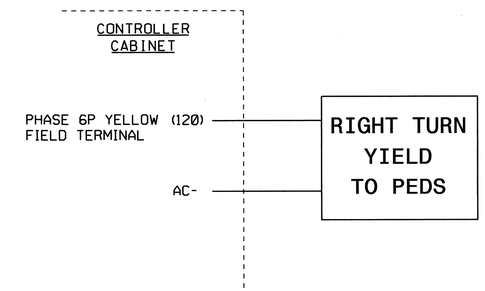
LOGIC DIAGRAM FOR BLANKOUT SIGN CONTROL



NOTE: pin numbers shown above are controller C-1 pins or internal Pseudo Pins.

BLANKOUT SIGN WIRING DETAIL

(wire sign as shown)



NOTE: IF FIELD TERMINAL 120 HAS A CONFLICT MONITOR WIRE CONNECTED, REMOVE, TAPE AND LABEL WIRE.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-1717
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Final Design - Sheet 3 of 3

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

NC 98 (Holloway Street)
at
US 70 Ramps

Division 5 Durham County Durham

PLAN DATE: October 2013 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

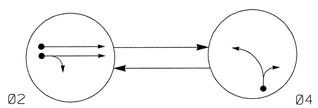
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE John T Rowe DATE 11-26-13
SIG. INVENTORY NO. 05-1717

20-NOV-2013 07:55
S:*ITS&S1*ITS Signals*Workgroups*Sig Man*Armstrong*051717_smlele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 36

2 Phase
Fully Actuated
(Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

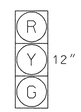
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

SIGNAL HEAD TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø4	FLASH
21, 22	G	R	Y
41, 42	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



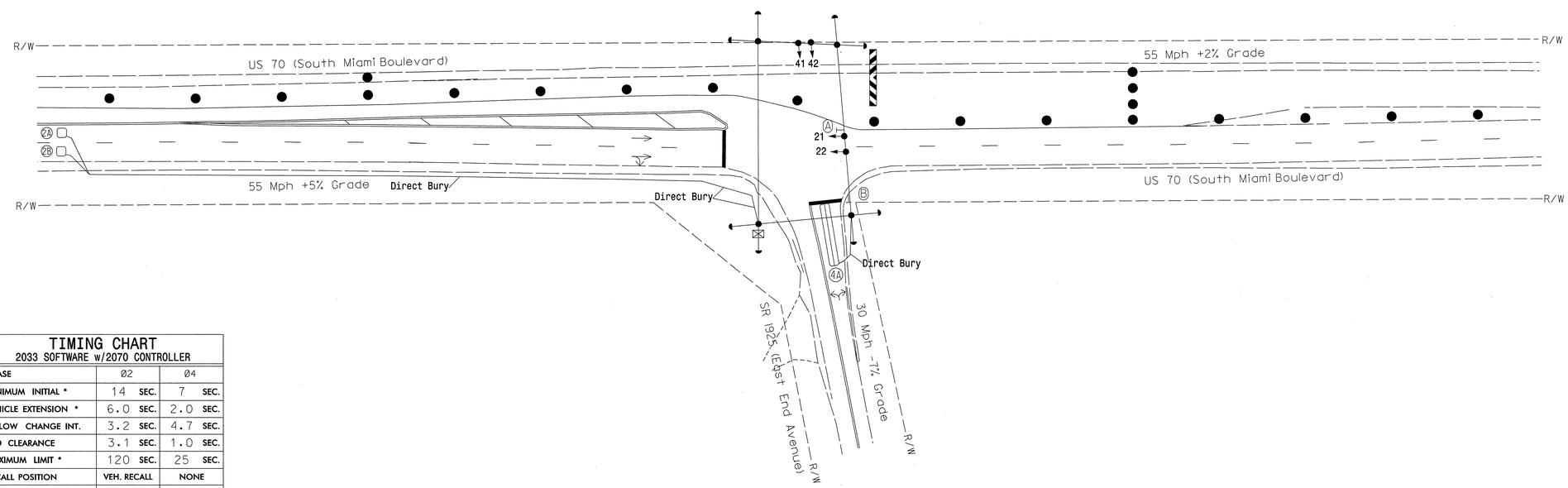
21, 22
41, 42

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING														
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY/ PEDESTRIAN CALL	2 RESERVED	3 COUNT	4 EXTENSION	5 TYPE 3	6 CALLING	7 ALTERNATE	8 SYSTEM LOOPS	NEW	EXISTING
2A	6X6	4	420	X	-	2	- SEC.	- SEC.	-	-	-	X	-	X	-	-	X	-
2B	6X6	4	420	X	-	2	- SEC.	- SEC.	-	-	-	X	-	X	-	-	X	-
4A	6X40	2-4-2	0	X	-	4	5 SEC.	- SEC.	-	-	-	X	-	X	-	-	X	-

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. Set all detector units to presence mode.
4. Locate new cabinet as to not obstruct sight distance of vehicles turning right on red.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Pavement markings are existing.
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	
	Directional Arrow	
A	No U-Turn Sign (R3-4)	A
B	"STOP HERE ON RED" Sign (R10-6)	B
	Barrels	N/A
	Barricades	N/A
	Direct Bury	N/A

TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø2	Ø4
MINIMUM INITIAL *	14 SEC.	7 SEC.
VEHICLE EXTENSION *	6.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.2 SEC.	4.7 SEC.
RED CLEARANCE	3.1 SEC.	1.0 SEC.
MAXIMUM LIMIT *	120 SEC.	25 SEC.
RECALL POSITION	VEH. RECALL	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	NONE
DOUBLE ENTRY	OFF	OFF
WALK *	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.
TYPE 3 LIMIT	– SEC.	– SEC.
ALTERNATE EXTENSION	– SEC.	– SEC.
ADD PER VEHICLE *	1.5 SEC.	SEC.
MAXIMUM INITIAL *	46 SEC.	– SEC.
MAXIMUM GAP*	7.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	1.5 SEC.	– SEC.
MINIMUM GAP	3.4 SEC.	2.0 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.

Signal Upgrade - Temporary Design (TMP Phase IV, Step 2)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

Prepared for 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

SCALE 0 40 1"=40'

US 70 (South Miami Boulevard)
at
SR 1925 (East End Avenue)

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

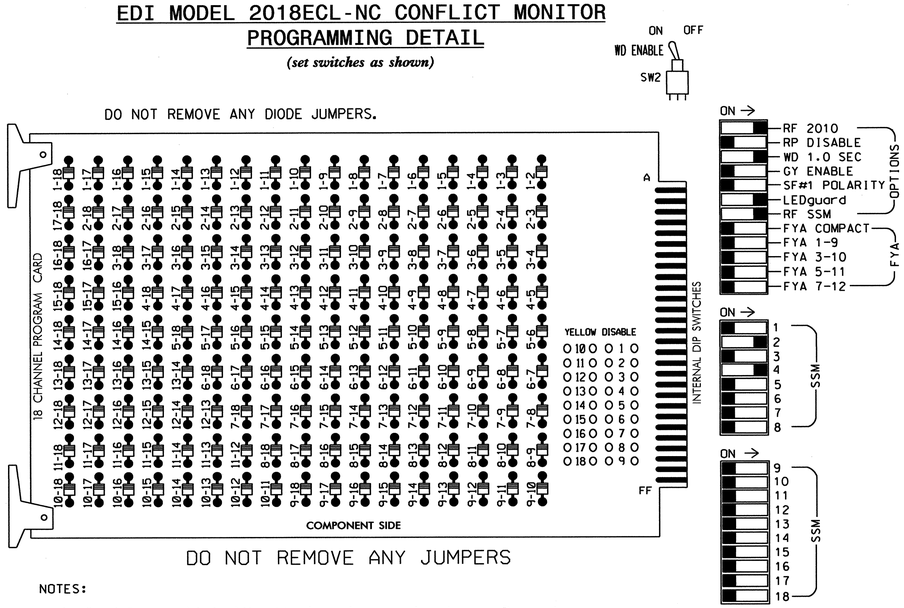
SIGNATURE 11/21/13 DATE

SIG. INVENTORY NO. 05-0413T

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.37

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(set switches 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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phase 2 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phase 2 for Volume Density Operation.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S5
PHASES USED.....2,4
OVERLAPS.....NONE

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	11	21,22	NU	NU	41,42	NU	NU	NU	NU	NU	NU	
RED		128			101							
YELLOW		129			102							
GREEN		130			103							
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋												
🚶												

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)

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

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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0413T
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design (TMP Phase IV, Step 2)

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 (South Miami Boulevard)
at
SR 1925 (East End Avenue)

Division 5 | Durham County | Durham

PLAN DATE:	October 2013	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

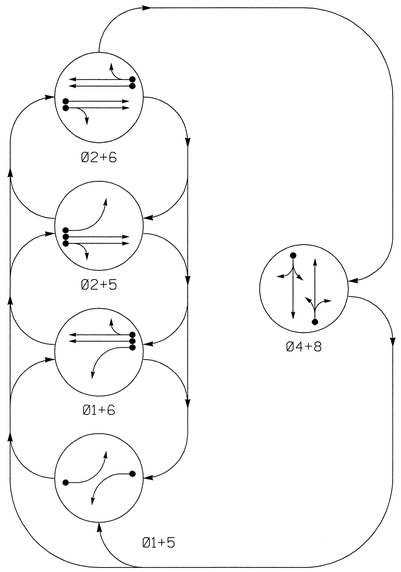
SIGNATURE | DATE 11-27-13

SIG. INVENTORY NO. 05-0413T

20-NOV-2013 07:30
S:*TSS$*TS Signals*Workgroups*Sig Mom*Armstrong*050413T_smele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 38

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

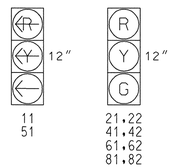
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~
21,22	R	R	G	G	R	Y
41,42	R	R	R	R	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~
61,62	R	G	R	G	R	Y
81,82	R	R	R	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING												
							TIMING		ATTRIBUTES								STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
1A	6X40	2-4-2	+5	X	-	1	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2A	6X6	5	420	X	-	2	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6X6	5	420	X	-	2	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	X	-
2C	6X6	4	110	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2D	6X6	4	110	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6X40	2-4-2	0	X	-	4	5 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4B	6X6	4	0	X	-	4	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
5A	6X40	2-4-2	+5	X	-	5	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6X6	6	420	X	-	6	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	X	-
6B	6X6	6	420	X	-	6	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	X	-
6C	6X6	4	110	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6D	6X6	4	110	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6X40	2-4-2	+5	X	-	8	5 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8B	6X6	4	0	X	-	8	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-

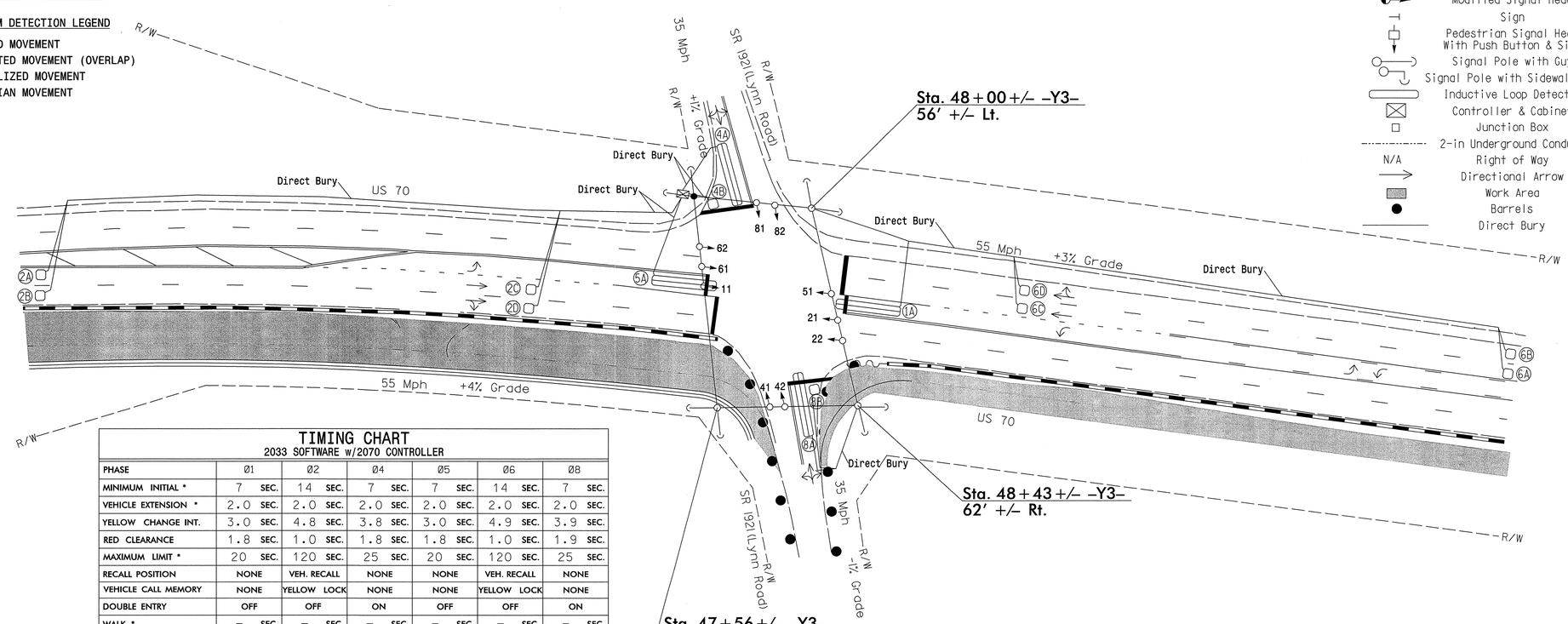
5 Phase Fully Actuated (Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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 5 may be lagged.
4. Set all detector units to presence mode.
5. Locate new cabinet as not to obstruct sight distance of vehicles turning right on red.
6. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
7. Set phase bank 3 maximum limit to 250 seconds for phases used.
8. Pavement Markings are existing.
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	
	Directional Arrow	
	Work Area	N/A
	Barrels	N/A
	Direct Bury	N/A



TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø5	Ø6	Ø8
MINIMUM INITIAL *	7 SEC.	14 SEC.	7 SEC.	7 SEC.	14 SEC.	7 SEC.
VEHICLE EXTENSION *	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.8 SEC.	3.8 SEC.	3.0 SEC.	4.9 SEC.	3.9 SEC.
RED CLEARANCE	1.8 SEC.	1.0 SEC.	1.8 SEC.	1.8 SEC.	1.0 SEC.	1.9 SEC.
MAXIMUM LIMIT *	20 SEC.	120 SEC.	25 SEC.	20 SEC.	120 SEC.	25 SEC.
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE
DOUBLE ENTRY	OFF	OFF	ON	OFF	OFF	ON
WALK *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	SEC.
ADD PER VEHICLE *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM GAP*	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 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.

Signal Upgrade - Temporary Design 1 (TMP Phase I, Step 2)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 40 1"=40'

US 70 at SR 1921 (Lynn Road)

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	J Hochanadel
PREPARED BY:	C Lawson	REVIEWED BY:	

REVISIONS DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE DATE 11/22/13

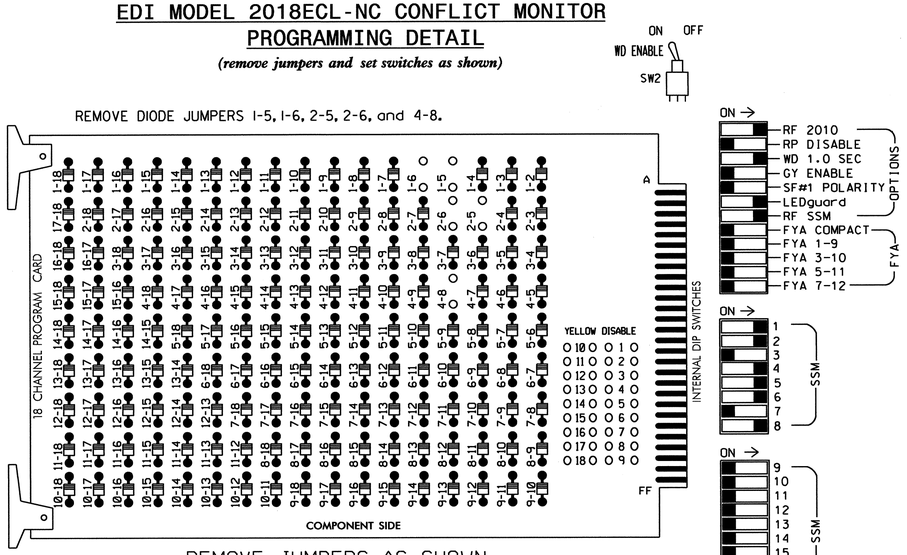
SIG. INVENTORY NO. 05-0392TI

$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
$$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.39

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches 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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Dual Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S1,S2,S5,S7,S8,S11
PHASES USED.....1,2,4,5,6,8
OVERLAPS.....NONE

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	11	21,22	NU	NU	41,42	NU	51	61,62	NU	NU	81,82	NU
RED		128			101			134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW	125						131					
YELLOW ARROW	126						132					
GREEN ARROW	127						133					
✋												
🚶												

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø 1	Ø 2	Ø 2	SLOT	SLOT	Ø 4	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS
		1A	2A	2C	EMPTY	EMPTY	4A	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	DC ISOLATOR
	L	NOT USED	Ø 2	Ø 2			Ø 4								ST
			2B	2D			4B								DC ISOLATOR
FILE "J"	U	Ø 5	Ø 6	Ø 6	SLOT	SLOT	Ø 8	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
		5A	6A	6C	EMPTY	EMPTY	8A	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY
	L	NOT USED	Ø 6	Ø 6			Ø 8								
			6B	6D			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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	14	56	5 7	1
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
2C	TB2-9,10	I3U	21	63	5 7	2
2D	TB2-11,12	I3L	29	76	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
4B	TB4-11,12	I6L	7	45	5 7	4
5A	TB3-1,2	J1U	13	55	5 7	5
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
6C	TB3-9,10	J3U	22	64	5 7	6
6D	TB3-11,12	J3L	30	77	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
8B	TB5-11,12	J6L	8	46	5 7	8

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0392T1
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 1 (TMP Phase I, Step 2)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 70
at
SR 1921 (Lynn Road)

Division 5 Durham County Durham

PLAN DATE: October 2013 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

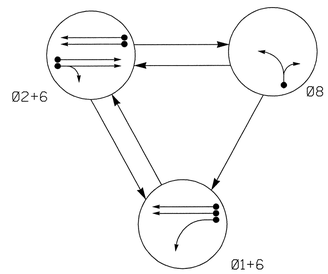
Prepared in the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE DATE 11-27-13
SIG. INVENTORY NO. 05-0392T1

20-NOV-2013 07:27
S:*ITSASU*ITS Signals*Workgroups*Sig Mgmt*Armstrong*050392_smu_ele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 40

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

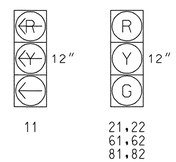
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+6	PHASE Ø2+6	PHASE Ø8	FLASH
11	←	~~R~~	~~R~~	~~R~~
21,22	R	G	R	Y
61,62	G	G	R	Y
81,82	R	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING															
							TIMING		ATTRIBUTES										STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
1A	6X40	2-4-2	+5	X	-	1	- SEC.	- SEC.	-	-	-	X	-	X	-	-	-	X	
2A	6X6	5	420	X	-	2	- SEC.	2.2 SEC.	-	-	-	X	-	X	-	-	-	X	
2B	6X6	5	420	X	-	2	- SEC.	2.2 SEC.	-	-	-	X	-	X	-	-	-	X	
2C	6X6	4	110	X	-	2	- SEC.	- SEC.	-	-	-	X	-	X	-	-	-	X	
2D	6X6	4	110	X	-	2	- SEC.	- SEC.	-	-	-	X	-	X	-	-	-	X	
6A	6X6	6	420	X	-	6	- SEC.	2.2 SEC.	-	-	-	X	-	X	-	-	-	X	
6B	6X6	6	420	X	-	6	- SEC.	2.2 SEC.	-	-	-	X	-	X	-	-	-	X	
6C	6X6	4	110	X	-	6	- SEC.	- SEC.	-	-	-	X	-	X	-	-	-	X	
6D	6X6	4	110	X	-	6	- SEC.	- SEC.	-	-	-	X	-	X	-	-	-	X	
8A	6X40	2-4-2	+5	X	-	8	5 SEC.	- SEC.	-	-	-	X	-	X	-	-	-	X	
8B	6X6	4	0	X	-	8	15 SEC.	- SEC.	-	-	-	X	-	X	-	-	-	X	

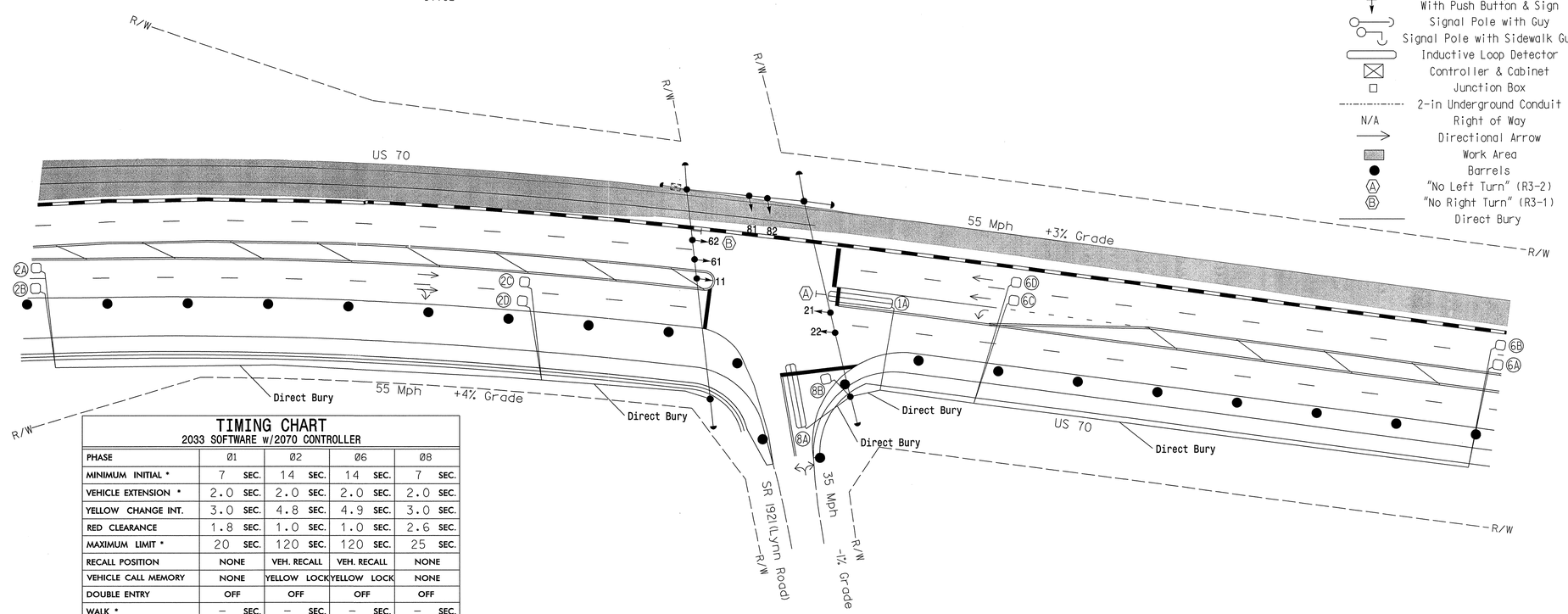
3 Phase Fully Actuated (Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. Set all detector units to presence mode.
4. Phase 1 may be lagged.
5. Program all timing information into phase banks 1, 2, 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phase used.
7. 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	
	Directional Arrow	
	Work Area	N/A
	Barrels	N/A
A	"No Left Turn" (R3-2)	A
B	"No Right Turn" (R3-1)	B
	Direct Bury	N/A



TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø1	Ø2	Ø6	Ø8
MINIMUM INITIAL *	7 SEC.	14 SEC.	14 SEC.	7 SEC.
VEHICLE EXTENSION *	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.8 SEC.	4.9 SEC.	3.0 SEC.
RED CLEARANCE	1.8 SEC.	1.0 SEC.	1.0 SEC.	2.6 SEC.
MAXIMUM LIMIT *	20 SEC.	120 SEC.	120 SEC.	25 SEC.
RECALL POSITION	NONE	VEH. RECALL	VEH. RECALL	NONE
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	YELLOW LOCK	NONE
DOUBLE ENTRY	OFF	OFF	OFF	OFF
WALK *	– SEC.	– SEC.	– SEC.	– SEC.
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.
MAXIMUM GAP*	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.
MINIMUM GAP	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 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.

Signal Upgrade - Temporary Design 2 (TMP Phase III, Step 3)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

Prepared for 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

SCALE 0 40 1"=40'

US 70 at SR 1921 (Lynn Road)

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	J Hochanadel
PREPARED BY:	C Lawson	REVIEWED BY:	

REVISIONS DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE DATE 11/22/13

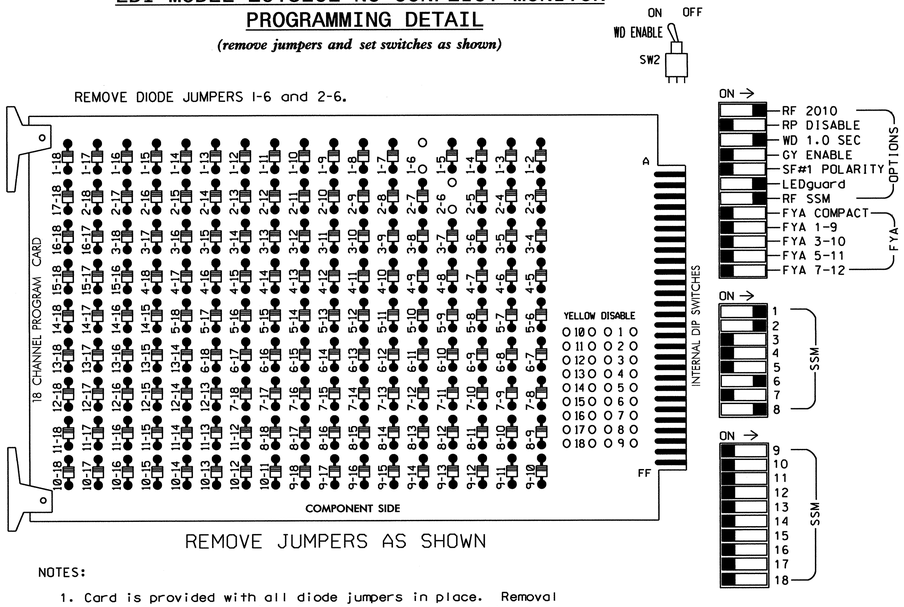
SIG. INVENTORY NO. 05-0392T2

$$$$SYSTIME$$$$
$$$$DGN$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 41

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches 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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. This cabinet and controller are part of the Durham Signal System.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	11	21,22	NU	NU	NU	NU	NU	61,62	NU	NU	81,82	NU
RED		128						134			107	
YELLOW		129						135			108	
GREEN		130						136			109	
RED ARROW	125											
YELLOW ARROW	126											
GREEN ARROW	127											
✋												
🚶												

NU = Not Used

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

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S1,S2,S8,S11
PHASES USED.....1,2,6,8
OVERLAPS.....NONE

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø 1 / 1A	Ø 2 / 2A	Ø 2 / 2C	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS / DC ISOLATOR
	L	NOT USED	Ø 2 / 2B	Ø 2 / 2D											ST / DC ISOLATOR
FILE "J"	U	SLOT EMPTY	Ø 6 / 6A	Ø 6 / 6C	SLOT EMPTY	SLOT EMPTY	Ø 8 / 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		Ø 6 / 6B	Ø 6 / 6D			Ø 8 / 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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	14	56	5 7	1
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
2C	TB2-9,10	I3U	21	63	5 7	2
2D	TB2-11,12	I3L	29	76	5 7	2
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
6C	TB3-9,10	J3U	22	64	5 7	6
6D	TB3-11,12	J3L	30	77	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
8B	TB5-11,12	J6L	8	46	5 7	8

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0392T2
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 2 (TMP Phase III, Step 3)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 70
at
SR 1921 (Lynn Road)

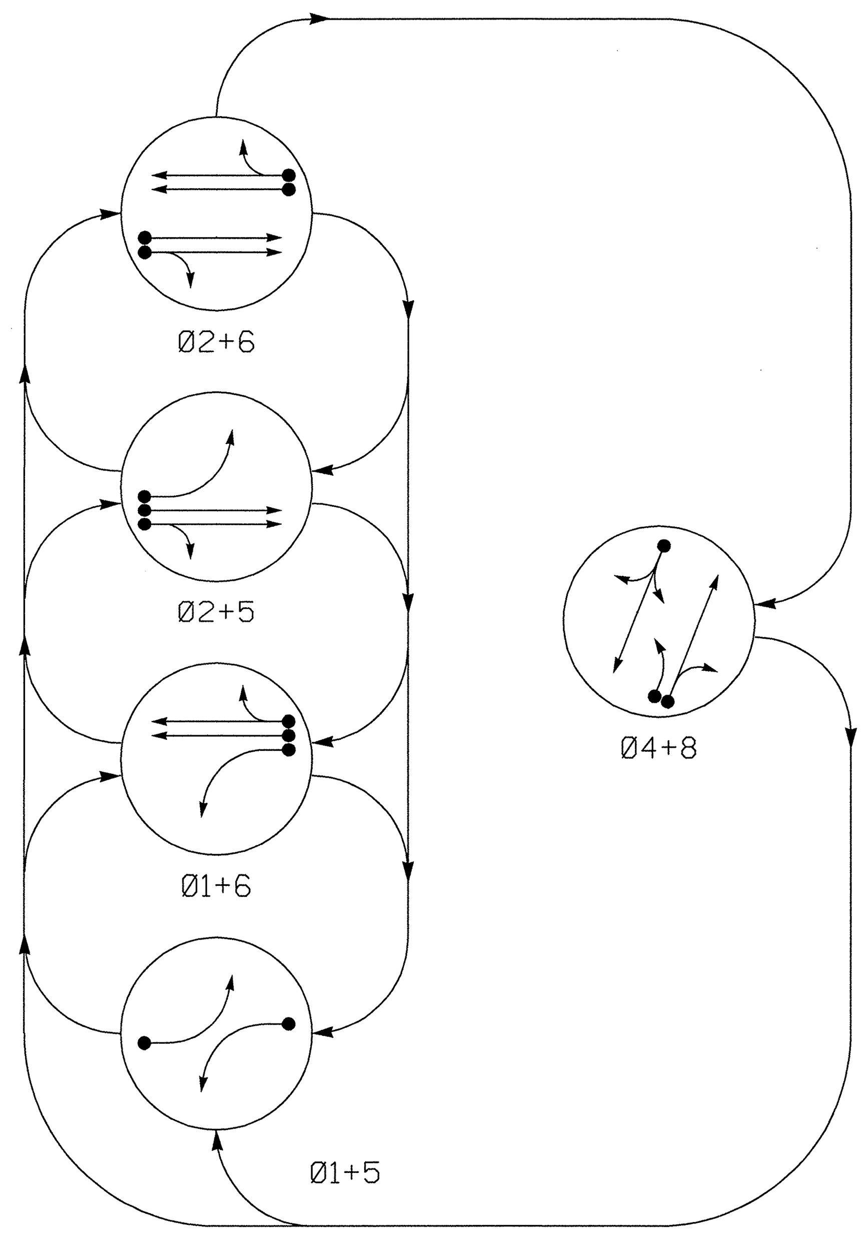
Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE 11-27-13 DATE
SIG. INVENTORY NO. 05-0392T2

20-NOV-2013 07:27
S:\TTSASU\TS Signals\Workgroups\Sig Mon\Armstrong\05092_sm.ele.xxx.dgn
SArmstrong

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.

All Heads L.E.D.

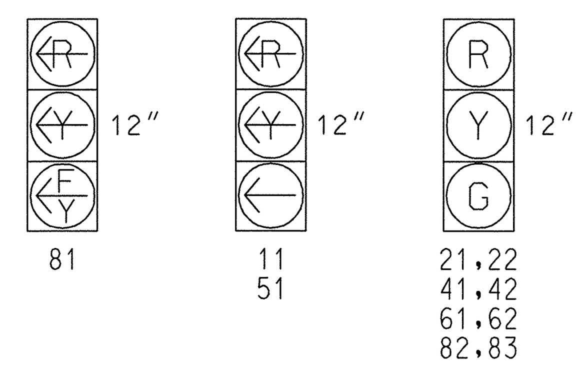


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	←R	←R	←R	←R
21,22	R	R	G	G	R	Y
41,42	R	R	R	R	G	R
51	←	←R	←	←R	←R	←R
61,62	R	G	R	G	R	Y
81	←R	←R	←R	←R	←FY	←R
82,83	R	R	R	R	G	R

←FY = FLASHING YELLOW ARROW

2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	TIMING: DELAY	TIMING: CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	STATUS: NEW	STATUS: EXISTING
1A	6X40	2-4-2	+5	X	-	1	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2A	6X6	6	420	X	-	2	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	X	-
2B	6X6	6	420	X	-	2	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	X	-
2C	6X6	4	110	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2D	6X6	4	110	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
4A	6X40	2-4-2	+5	X	-	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
5A	6X40	2-4-2	+5	X	-	5	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6X6	6	420	X	-	6	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	X	-
6B	6X6	6	420	X	-	6	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	X	-
6C	6X6	4	110	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6D	6X6	4	110	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6X40	2-4-2	+5	X	-	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8B	6X40	2-4-2	+5	X	-	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 42

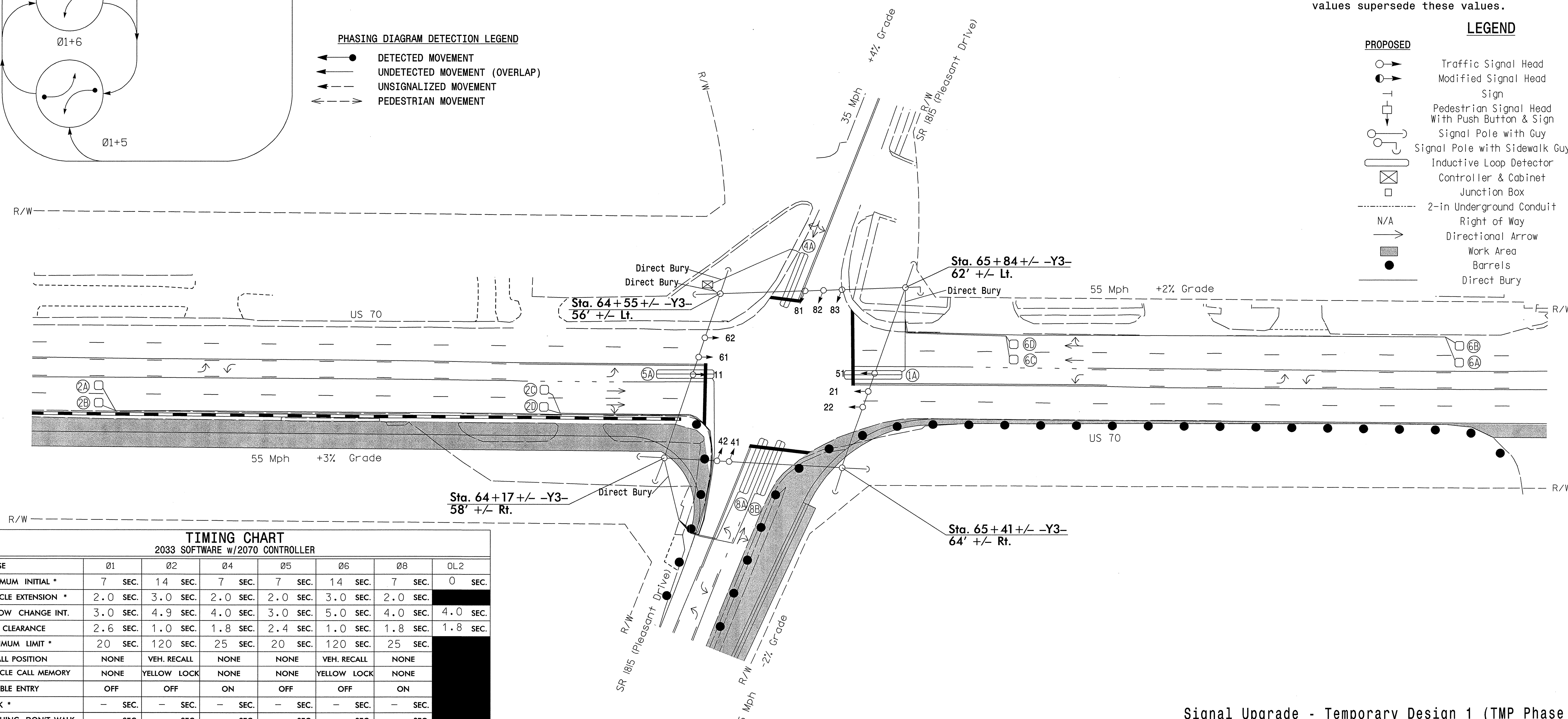
5 Phase
Fully Actuated
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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 as to not obstruct sight distance of vehicles turning right on red.
6. The cabinet should be designed to include an Auxiliary Output File for future use.
7. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
8. Set phase bank 3 maximum limit to 250 seconds for phases used.
9. Pavement Markings are existing.
10. 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	
	Directional Arrow	
	Work Area	N/A
	Barrels	N/A
	Direct Bury	N/A



TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø5	Ø6	Ø8	OL2
MINIMUM INITIAL *	7 SEC.	14 SEC.	7 SEC.	7 SEC.	14 SEC.	7 SEC.	0 SEC.
VEHICLE EXTENSION *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	
YELLOW CHANGE INT.	3.0 SEC.	4.9 SEC.	4.0 SEC.	3.0 SEC.	5.0 SEC.	4.0 SEC.	4.0 SEC.
RED CLEARANCE	2.6 SEC.	1.0 SEC.	1.8 SEC.	2.4 SEC.	1.0 SEC.	1.8 SEC.	1.8 SEC.
MAXIMUM LIMIT *	20 SEC.	120 SEC.	25 SEC.	20 SEC.	120 SEC.	25 SEC.	
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE	
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE	
DOUBLE ENTRY	OFF	OFF	ON	OFF	OFF	ON	
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM GAP*	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MINIMUM GAP	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 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.

$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

Signal Upgrade - Temporary Design 1 (TMP Phase I, Step 2)

Prepared for 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

SCALE 0 40 1″=40′

US 70 at SR 1815 (Pleasant Drive)

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

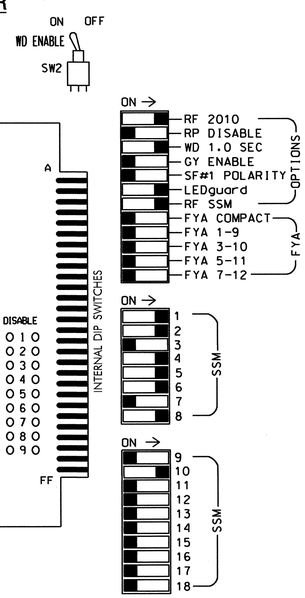
SIGNATURE 11/22/13 DATE

SIG. INVENTORY NO. 05-0393TI

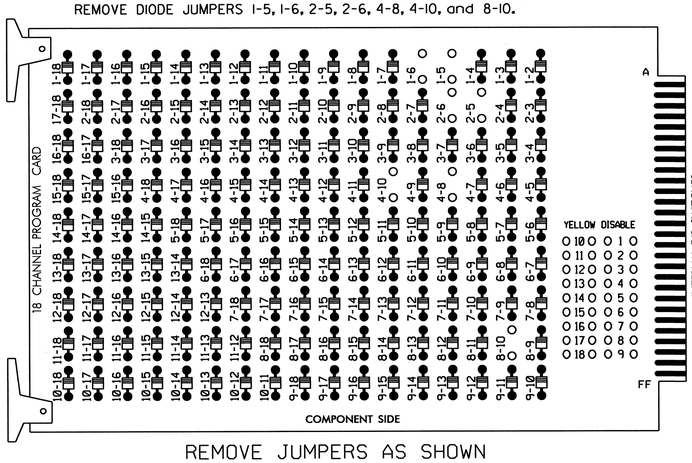
PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.43

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 1-5, 1-6, 2-5, 2-6, 4-8, 4-10, and 8-10.



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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Dual Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S5,S7,S8,S11,AUX S2
PHASES USED.....1,2,4,5,6,8
OVERLAP 1.....NOT USED
OVERLAP 2.....8
OVERLAP 3.....NOT USED
OVERLAP 4.....NOT USED

SIGNAL HEAD HOOK-UP CHART

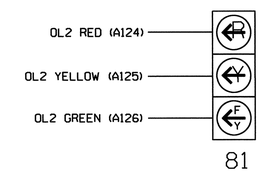
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	21,22	NU	NU	41,42	NU	51	61,62	NU	NU	82,83	NU	NU	81 ★	NU	NU	NU	NU
RED		128			101			134			107							
YELLOW		129			102			135			108							
GREEN		130			103			136			109							
RED ARROW	125						131							A124				
YELLOW ARROW	126						132							A125				
FLASHING YELLOW ARROW														A126				
GREEN ARROW	127						133											
✋																		
🚶																		

NU = Not Used

★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø 1	Ø 2	Ø 2	SLOT	SLOT	Ø 4	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	FS
		1A	2A	2C			4A								DC ISOLATOR
	L	NOT USED	Ø 2	Ø 2	EMPTY	EMPTY	NOT USED	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	ST
			2B	2D											DC ISOLATOR
FILE "J"	U	Ø 5	Ø 6	Ø 6	SLOT	SLOT	Ø 8	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT	SLOT
		5A	6A	6C			8A								
	L	NOT USED	Ø 6	Ø 6	EMPTY	EMPTY	Ø 8	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY
			6B	6D			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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	14	56	5 7	1
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
2C	TB2-9,10	I3U	21	63	5 7	2
2D	TB2-11,12	I3L	29	76	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
5A	TB3-1,2	J1U	13	55	5 7	5
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
6C	TB3-9,10	J3U	22	64	5 7	6
6D	TB3-11,12	J3L	30	77	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
8B	TB5-11,12	J6L	8	46	5 7	8

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

OVERLAP PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

Press "+"

OVERLAP [2]:
LOADSWITCH = 10
VEH SET 1 = 8
YELLOW CLEARANCE = 4.0
RED CLEARANCE = 1.8

END OF OVERLAP PROGRAMMING

OVERLAP GREEN FLASH PROGRAMMING DETAIL

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrows. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 2

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0393T1
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 1 (TMP Phase I, Step 2)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 70
at
SR 1815 (Pleasant Drive)

Division 5 Durham County Durham

PLAN DATE: October 2013 REVIEWED BY: JTR
PREPARED BY: S. Armstrong REVIEWED BY:

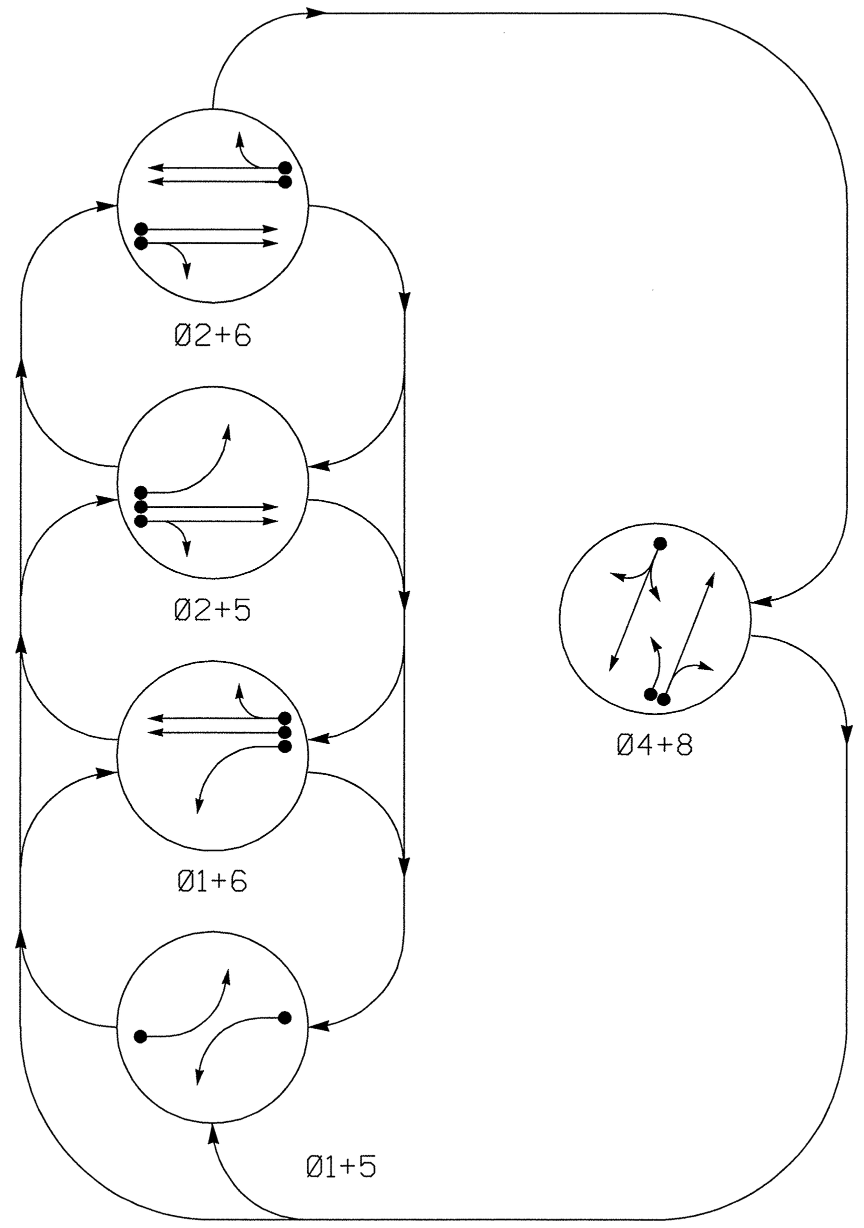
REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE DATE 11-27-13
SIG. INVENTORY NO. 05-0393T1

20-NOV-2013 07:23
S:##ITS&SU##ITS Signals##workgroups##Sig Mgmt#armstrong#050393_smu_ele_xxx.dgn
armstrong

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

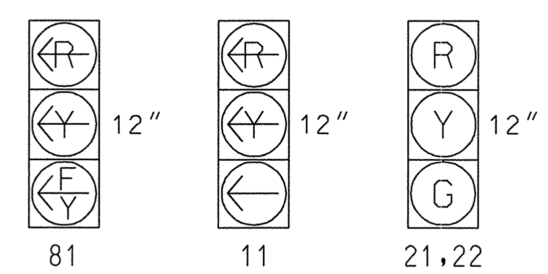
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	←R	←R	←R	←R
21,22	R	R	G	G	R	Y
41,42	R	R	R	R	G	R
51	←	←R	←	←R	←R	←R
61,62	R	G	R	G	R	Y
81	←R	←R	←R	←R	←FY	←R
82,83	R	R	R	R	G	R

←FY = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	STATUS NEW	STATUS EXISTING
1A	6X40	2-4-2	+5	-	X	1	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2A	6X6	6	420	-	X	2	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
2B	6X6	6	420	-	X	2	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
2C	6X6	4	110	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2D	6X6	4	110	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4A	6X40	2-4-2	+5	X	-	4	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
5A	6X40	2-4-2	+5	-	X	5	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6A	6X6	6	420	-	X	6	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
6B	6X6	6	420	-	X	6	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
6C	6X6	4	110	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6D	6X6	4	110	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
8A	6X40	2-4-2	+5	-	X	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
8B	6X40	2-4-2	+5	-	X	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X

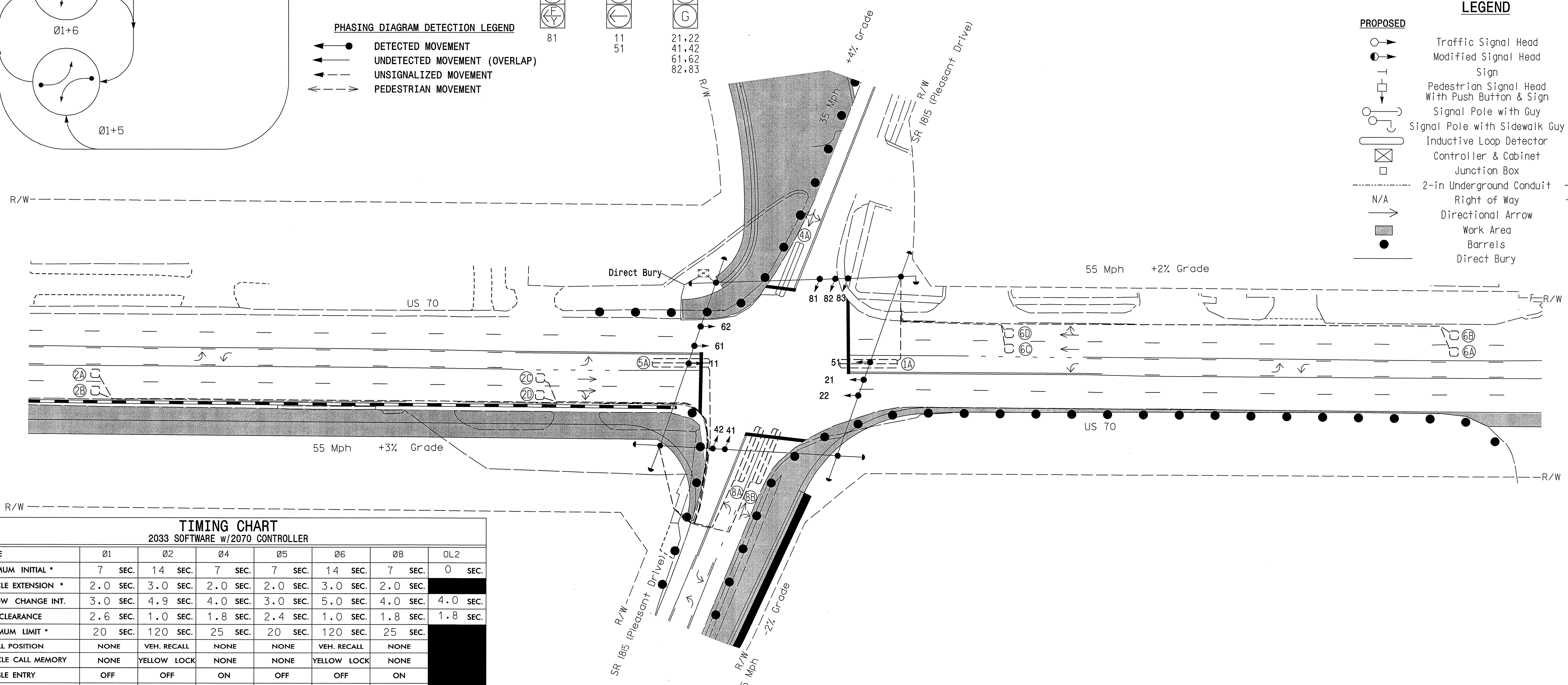
5 Phase
Fully Actuated
(Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Pavement Markings are existing.
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	
	Directional Arrow	
	Work Area	N/A
	Barrels	N/A
	Direct Bury	N/A



TIMING CHART

2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø5	Ø6	Ø8	OL2
MINIMUM INITIAL *	7 SEC.	14 SEC.	7 SEC.	7 SEC.	14 SEC.	7 SEC.	0 SEC.
VEHICLE EXTENSION *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	
YELLOW CHANGE INT.	3.0 SEC.	4.9 SEC.	4.0 SEC.	3.0 SEC.	5.0 SEC.	4.0 SEC.	4.0 SEC.
RED CLEARANCE	2.6 SEC.	1.0 SEC.	1.8 SEC.	2.4 SEC.	1.0 SEC.	1.8 SEC.	1.8 SEC.
MAXIMUM LIMIT *	20 SEC.	120 SEC.	25 SEC.	20 SEC.	120 SEC.	25 SEC.	
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE	
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE	
DOUBLE ENTRY	OFF	OFF	ON	OFF	OFF	ON	
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM GAP*	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MINIMUM GAP	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 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.

$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

Signal Upgrade - Temporary Design 2 (TMP Phase III, Step 2)

SEPI
ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 40 1"=40'

US 70
at
SR 1815 (Pleasant Drive)

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

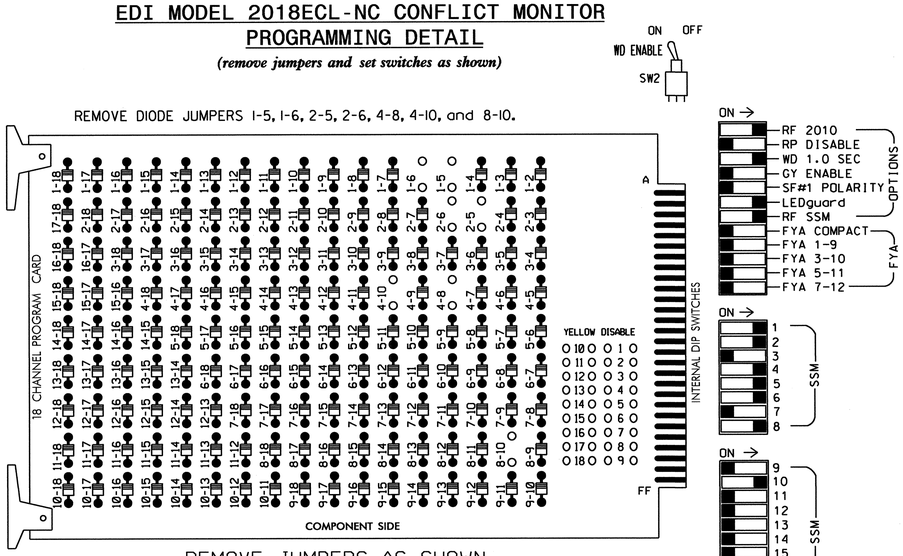
SIGNATURE 11/22/13 DATE

SIG. INVENTORY NO. 05-0393T2

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.45

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Dual Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S5,S7,S8,S11,AUX S2
PHASES USED.....1,2,4,5,6,8
OVERLAP 1.....NOT USED
OVERLAP 2.....8
OVERLAP 3.....NOT USED
OVERLAP 4.....NOT USED

SIGNAL HEAD HOOK-UP CHART

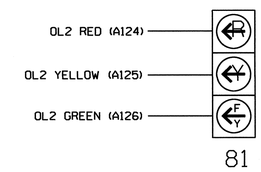
LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	21,22	NU	NU	41,42	NU	51	61,62	NU	NU	82,83	NU	NU	81 ★	NU	NU	NU	NU
RED		128			101			134			107							
YELLOW		129			102			135			108							
GREEN		130			103			136			109							
RED ARROW	125						131							A124				
YELLOW ARROW	126						132							A125				
FLASHING YELLOW ARROW														A126				
GREEN ARROW	127						133											
✋																		
🚶																		

NU = Not Used

★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



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	Ø2 / 2A	Ø2 / 2C	SLOT EMPTY	SLOT EMPTY	Ø4 / 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS / DC ISOLATOR
	L	NOT USED	Ø2 / 2B	Ø2 / 2D			NOT USED								ST / DC ISOLATOR
FILE "J"	U	Ø5 / 5A	Ø6 / 6A	Ø6 / 6C	SLOT EMPTY	SLOT EMPTY	Ø8 / 8A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	Ø6 / 6B	Ø6 / 6D			Ø8 / 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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	14	56	5 7	1
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
2C	TB2-9,10	I3U	21	63	5 7	2
2D	TB2-11,12	I3L	29	76	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
5A	TB3-1,2	J1U	13	55	5 7	5
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
6C	TB3-9,10	J3U	22	64	5 7	6
6D	TB3-11,12	J3L	30	77	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
8B	TB5-11,12	J6L	8	46	5 7	8

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

OVERLAP PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

Press "+"

OVERLAP [2]:
LOADSWITCH = 10
VEH SET 1 = 8
YELLOW CLEARANCE = 4.0
RED CLEARANCE = 1.8

END OF OVERLAP PROGRAMMING

OVERLAP GREEN FLASH PROGRAMMING DETAIL

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrows. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 2

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0393T2
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 2 (TMP Phase III, Step 2)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 70
at
SR 1815 (Pleasant Drive)

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

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.
SIGNATURE 11-27-13 DATE
SIG. INVENTORY NO. 05-0393T2

20-NOV-2013 07:23
S:\TSAS\ITS Signals\Workgroups\Sig Mgmt\Armstrong\050393_sml_ele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 46

5 Phase
Fully Actuated
(Durham Signal System)

PHASING DIAGRAM

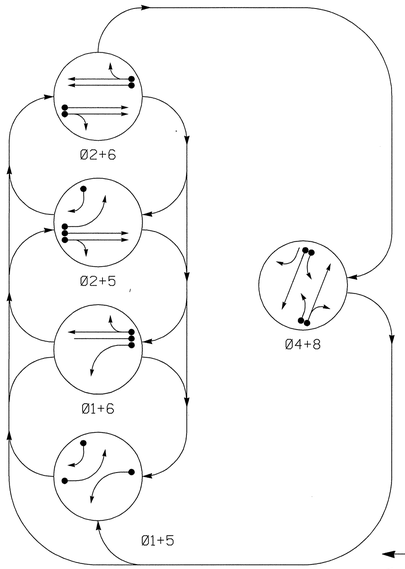


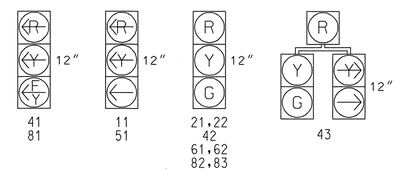
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~
21,22	R	R	G	G	R	Y
41	~~R~~	~~R~~	~~R~~	~~R~~	F Y	~~R~~
42	R	R	R	R	G	R
43	R →	R	R →	R	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~
61,62	R	G	R	G	R	Y
81	~~R~~	~~R~~	~~R~~	~~R~~	F Y	~~R~~
82,83	R	R	R	R	G	R

F Y = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



2033 SOFTWARE w/ 2070 CONTROLLER
LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING												
							TIMING		ATTRIBUTES								STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
1A	6X40	2-4-2	0	X	-	1	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2A	6X6	6	420	X	-	2	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
2B	6X6	6	420	X	-	2	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
2C	6X6	4	110	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2D	6X6	4	110	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4A	6X40	2-4-2	0	X	-	4	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4B	6X40	2-4-2	0	X	-	4	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
5A	6X40	2-4-2	0	X	-	5	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
5B	6X40	2-4-2	0	X	-	5	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
6A	6X6	6	420	X	-	6	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
6B	6X6	6	420	X	-	6	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
6C	6X6	4	110	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6D	6X6	4	110	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
8A	6X40	2-4-2	0	X	-	8	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
8B	6X40	2-4-2	0	X	-	8	10 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X

NOTES

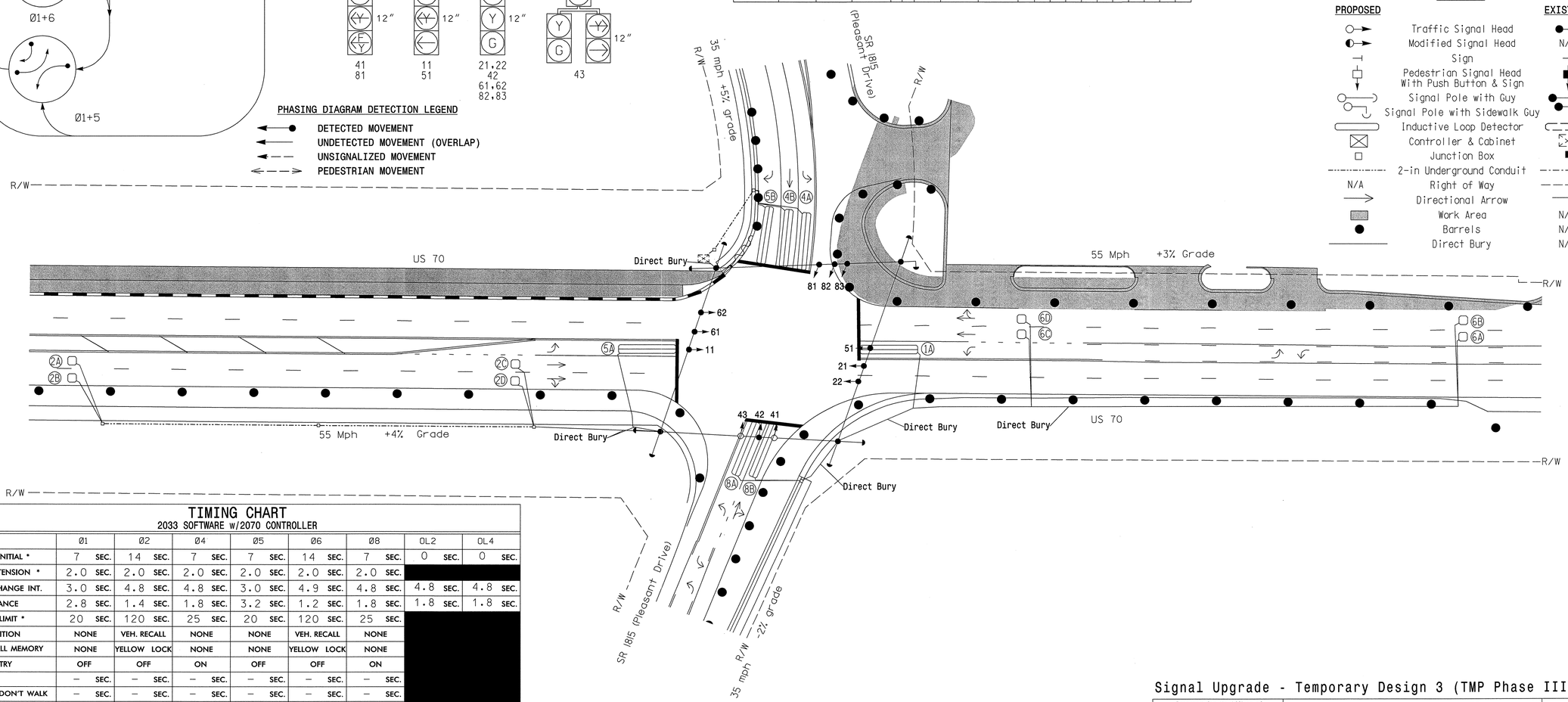
1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Set all detector units to presence mode.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. 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	
	Directional Arrow	
	Work Area	N/A
	Barrels	N/A
	Direct Bury	N/A

PHASING DIAGRAM DETECTION LEGEND

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



TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø5	Ø6	Ø8	OL2	OL4
MINIMUM INITIAL *	7 SEC.	14 SEC.	7 SEC.	7 SEC.	14 SEC.	7 SEC.	0 SEC.	0 SEC.
VEHICLE EXTENSION *	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.		
YELLOW CHANGE INT.	3.0 SEC.	4.8 SEC.	4.8 SEC.	3.0 SEC.	4.9 SEC.	4.8 SEC.	4.8 SEC.	4.8 SEC.
RED CLEARANCE	2.8 SEC.	1.4 SEC.	1.8 SEC.	3.2 SEC.	1.2 SEC.	1.8 SEC.	1.8 SEC.	1.8 SEC.
MAXIMUM LIMIT *	20 SEC.	120 SEC.	25 SEC.	20 SEC.	120 SEC.	25 SEC.		
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE		
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE		
DOUBLE ENTRY	OFF	OFF	ON	OFF	OFF	ON		
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.		
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.		
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.		
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.		
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.		
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.		
MAXIMUM GAP*	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.		
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.		
MINIMUM GAP	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 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.

Signal Upgrade - Temporary Design 3 (TMP Phase III, Step 3)

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 40 1"=40'

US 70
at
SR 1815 (Pleasant Drive)

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 11/22/13 DATE

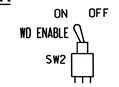
SIG. INVENTORY NO. 05-0393T3

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

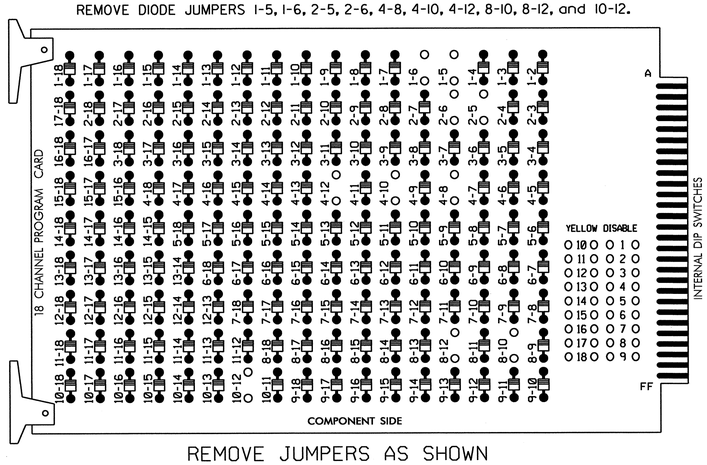
PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.47

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

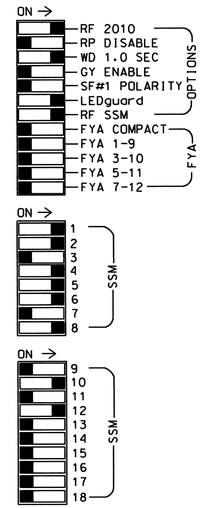
(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 1-5, 1-6, 2-5, 2-6, 4-8, 4-10, 4-12, 8-10, 8-12, and 10-12.



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. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Program phases 4 and 8 for Dual Entry.
8. Ensure start up flash phases are coordinated with flash program block assignments.
9. This cabinet and controller are part of the Durham Signal System.

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	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	21,22	NU	NU	42,43	NU	43	51	61,62	NU	NU	82,83	NU	NU	81★	NU	NU	41★	NU
RED		128			101				134			107							
YELLOW		129			102				135			108							
GREEN		130			103				136			109							
RED ARROW	125							131							A124			A101	
YELLOW ARROW	126						132	132							A125			A102	
FLASHING YELLOW ARROW															A126			A103	
GREEN ARROW	127						133	133											
✋																			
🚶																			

NU = Not Used

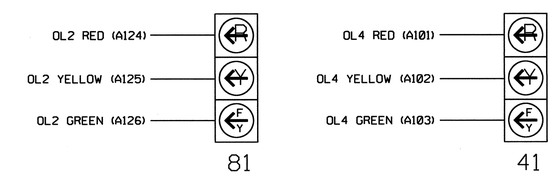
★ See pictorial of head wiring in detail below.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S5,S7,S8,S11,AUX S2,AUX S5
PHASES USED.....1,2,4,5,6,8
OVERLAP 1.....NOT USED
OVERLAP 2.....8
OVERLAP 3.....NOT USED
OVERLAP 4.....4

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



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	Ø2 2A	Ø2 2C	SLOT EMPTY	SLOT EMPTY	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L	NOT USED	Ø2 2B	Ø2 2D			Ø4 4B								ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø6 6A	Ø6 6C	SLOT EMPTY	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	Ø5 5B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	Ø6 6B	Ø6 6D			Ø8 8B			NOT USED					

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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	14	56	5 7	1
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
2C	TB2-9,10	I3U	21	63	5 7	2
2D	TB2-11,12	I3L	29	76	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
4B	TB4-11,12	I6L	7	45	5 7	4
5A	TB3-1,2	J1U	13	55	5 7	5
5B	TB7-9,10	J9U	17	59	5 7	5
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
6C	TB3-9,10	J3U	22	64	5 7	6
6D	TB3-11,12	J3L	30	77	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8
8B	TB5-11,12	J6L	8	46	5 7	8

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

OVERLAP PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

Press "+"

OVERLAP [2]:
LOADSWITCH = 10
VEH SET 1 = 8
YELLOW CLEARANCE = 4.8
RED CLEARANCE = 1.8

Press "+" twice

OVERLAP [4]:
LOADSWITCH = 12
VEH SET 1 = 4
YELLOW CLEARANCE = 4.8
RED CLEARANCE = 1.8

END OF OVERLAP PROGRAMMING

OVERLAP GREEN FLASH PROGRAMMING DETAIL

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrows. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 2,4

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0393T3
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 3 (TMP Phase III, Step 3)

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
at
SR 1815 (Pleasant Drive)

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE 11-27-13 DATE
SIG. INVENTORY NO. 05-0393T3

20-NOV-2013 07:19
S:*ITS&SUM*ITS Signals*Workgroups*Sig Mon*armstrong*050393_smLele_xxx.dgn
samstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 48

6 Phase
Fully Actuated
(Durham Signal System)

PHASING DIAGRAM

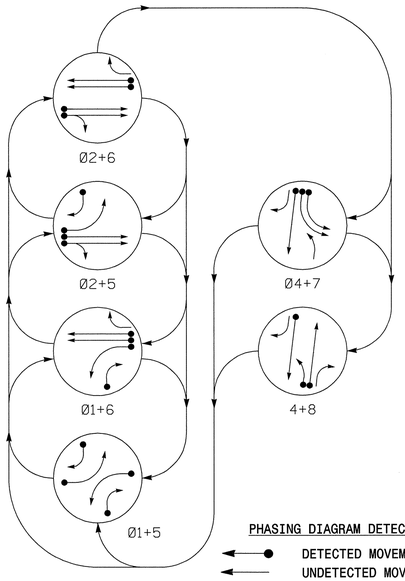


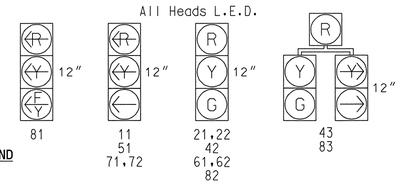
TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	04+7	04+8	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
21,22	R	R	G	G	R	R	Y
42	R	R	R	R	G	G	R
43	R→	R	R→	R	G	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~	~~R~~
61,62	R	G	R	G	R	R	Y
71,72	~~R~~	~~R~~	~~R~~	~~R~~	←	~~R~~	~~R~~
81	~~R~~	~~R~~	~~R~~	~~R~~	FY	FY	~~R~~
82	R	R	R	R	R	G	R
83	R→	R→	R	R	R	G	R

FY = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



2033 SOFTWARE w/ 2070 CONTROLLER
LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES								STATUS		
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
1A	6X40	2-4-2	+5	X	-	1	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
1B	6X40	2-4-2	0	X	-	1	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
2A	6X6	6	420	-	X	2	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
2B	6X6	6	420	-	X	2	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
2C	6X6	4	110	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2D	6X6	4	110	-	X	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4A	6X40	2-4-2	0	X	-	4	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
5A	6X40	2-4-2	0	-	X	5	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
5B	6X40	2-4-2	0	X	-	5	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6A	6X6	6	420	X	-	6	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
6B	6X6	6	420	X	-	6	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
6C	6X6	4	110	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6D	6X6	4	110	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
7A	6X40	2-4-2	0	X	-	7	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
7B	6X40	2-4-2	0	X	-	7	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
8A	6X40	2-4-2	0	X	-	8	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
8B	6X40	2-4-2	0	X	-	8	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X

NOTES

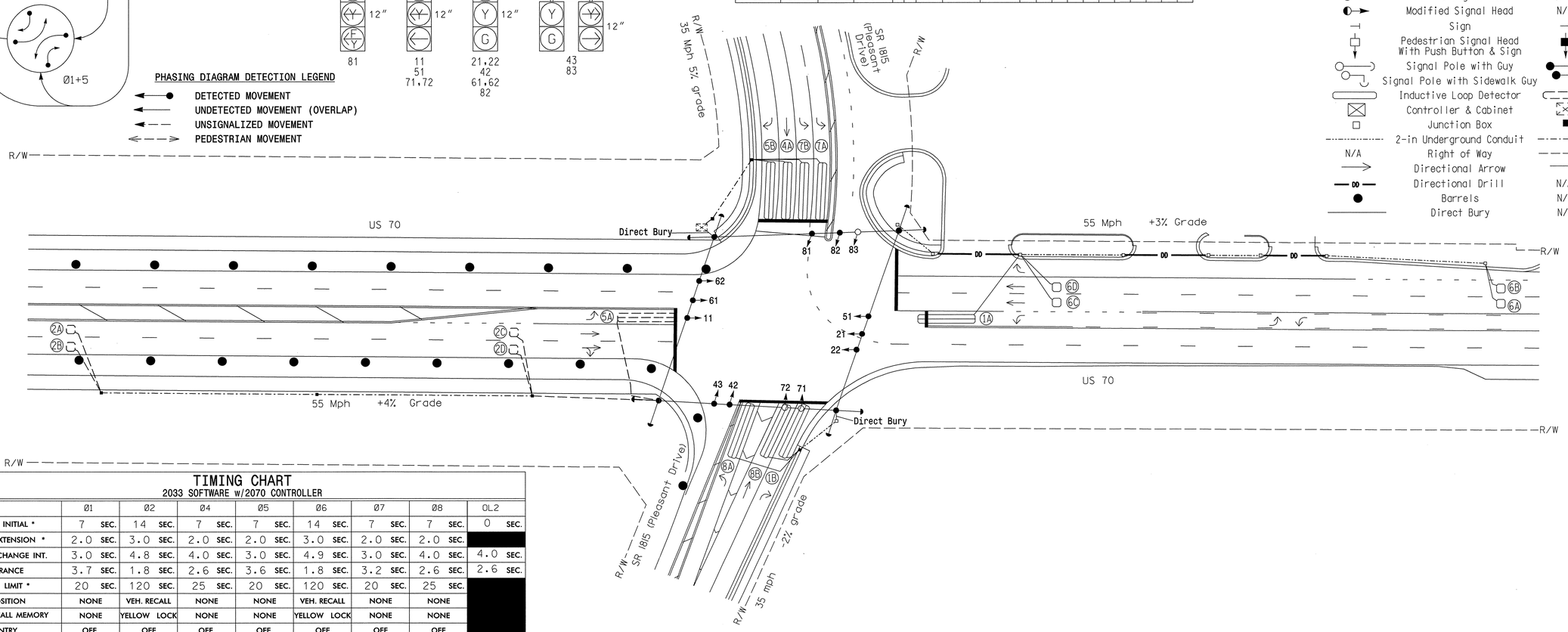
1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1, 5, and/or phase 7 may be lagged.
4. Set all detector units to presence mode.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. 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	
	Directional Arrow	
DD	Directional Drill	N/A
	Barrels	N/A
	Direct Bury	N/A

PHASING DIAGRAM DETECTION LEGEND

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



TIMING CHART
2033 SOFTWARE w/2070 CONTROLLER

PHASE	01	02	04	05	06	07	08	OL2
MINIMUM INITIAL *	7 SEC.	14 SEC.	7 SEC.	7 SEC.	14 SEC.	7 SEC.	7 SEC.	0 SEC.
VEHICLE EXTENSION *	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	
YELLOW CHANGE INT.	3.0 SEC.	4.8 SEC.	4.0 SEC.	3.0 SEC.	4.9 SEC.	3.0 SEC.	4.0 SEC.	4.0 SEC.
RED CLEARANCE	3.7 SEC.	1.8 SEC.	2.6 SEC.	3.6 SEC.	1.8 SEC.	3.2 SEC.	2.6 SEC.	2.6 SEC.
MAXIMUM LIMIT *	20 SEC.	120 SEC.	25 SEC.	20 SEC.	120 SEC.	20 SEC.	25 SEC.	
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE	NONE	
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE	NONE	
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM GAP*	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MINIMUM GAP	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	

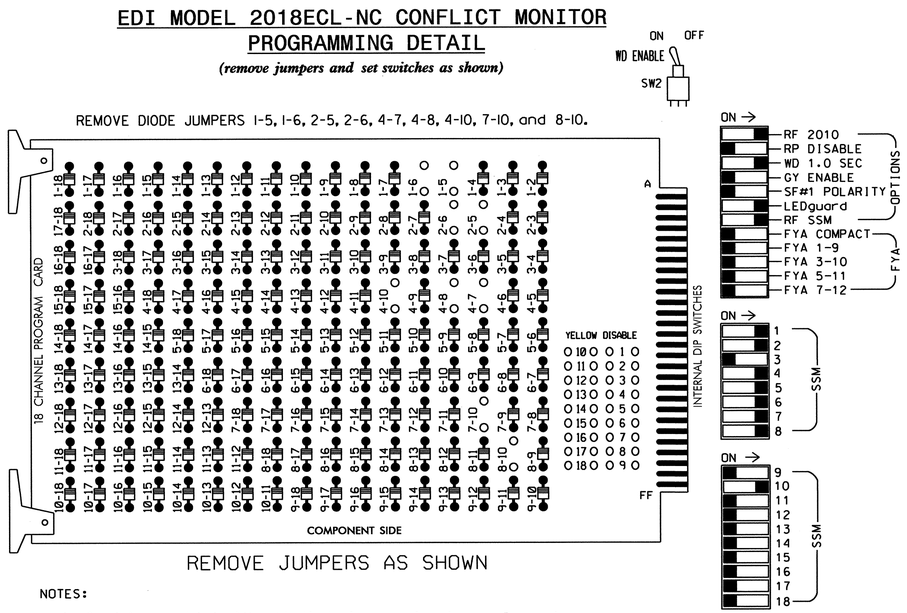
* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

$$$$$$SYSTIME$$$$$
$$$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.49

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches 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.

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	Ø2 2A	Ø2 2C	SLOT EMPTY	SLOT EMPTY	Ø4 4A	SLOT EMPTY	SLOT EMPTY	Ø1 1B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L	NOT USED	Ø2 2B	Ø2 2D			NOT USED			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 5B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	Ø6 6B	Ø6 6D		NOT USED	Ø8 8B			Ø7 7B					

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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	14	56	5 7	1
1B	TB6-9,10	I9U	18	60	5 7	1
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
2C	TB2-9,10	I3U	21	63	5 7	2
2D	TB2-11,12	I3L	29	76	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
5A	TB3-1,2	J1U	13	55	5 7	5
5B	TB7-9,10	J9U	17	59	5 7	5
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
6C	TB3-9,10	J3U	22	64	5 7	6
6D	TB3-11,12	J3L	30	77	5 7	6
7A	TB5-5,6	J5U	15	57	5 7	7
7B	TB7-11,12	J9L	19	61	5 7	7
8A	TB5-9,10	J6U	4	42	5 7	8
8B	TB5-11,12	J6L	8	46	5 7	8

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S5,S7,S8,S10,S11,AUX S2
PHASES USED.....1,2,4,5,6,7,8
OVERLAP 1.....NOT USED
OVERLAP 2.....4
OVERLAP 3.....NOT USED
OVERLAP 4.....NOT USED

OVERLAP PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

Press "+"

OVERLAP [2]:
LOADSWITCH = 10
VEH SET 1 = 4
YELLOW CLEARANCE = 4.0
RED CLEARANCE = 2.6

END OF OVERLAP PROGRAMMING

OVERLAP GREEN FLASH PROGRAMMING DETAIL

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrows. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 2

SIGNAL HEAD HOOK-UP CHART

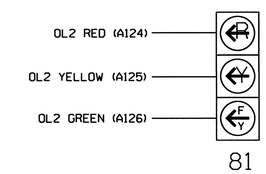
LOAD SWITCH NO.	S1		S2	S3	S4	S5	S6	S7		S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1		2	13	3	4	14	5		6	15	7	8	16	9	10	17	11	12	18
PHASE	1		2	2 PED	3	4	4 PED	5		6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	83	21,22	NU	NU	42,43	NU	43	51	61,62	NU	71,72	82,83	NU	NU	81★	NU	NU	NU	NU
RED			128			101				134			107							
YELLOW			129			102				135			108							
GREEN			130			103				136			109							
RED ARROW	125								131			122				A124				
YELLOW ARROW	126	126						132	132			123				A125				
FLASHING YELLOW ARROW																A126				
GREEN ARROW	127	127						133	133			124								
✋																				
🚶																				

NU = Not Used

★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0393T4
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Temporary Design 4 (TMP Phase IV)

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

US 70
at
SR 1815 (Pleasant Drive)

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

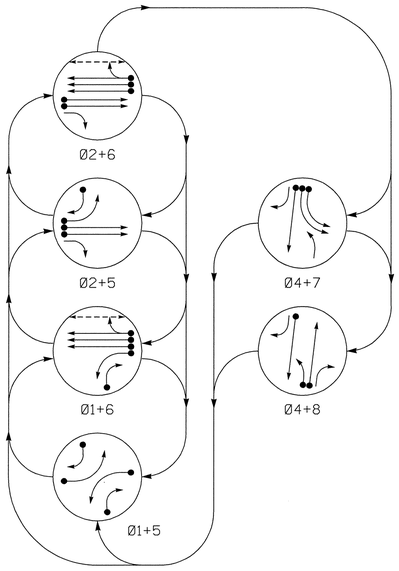
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE DATE 11-22-13
SIG. INVENTORY NO. 05-0393T4

20-NOV-2013 07:19
S:#TTSASU#ITS Signals#Workgroups#Sig Man#Armstrong#05039_sm_ele_xxx.dgn
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 50

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

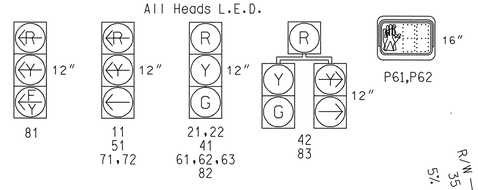
TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	04+7	04+8	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
21,22	R	R	G	G	R	R	Y
41	R	R	R	R	G	G	R
42	R/→	R	R/↓	R	G	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~	~~R~~
61,62,63	R	G	R	G	R	R	Y
71,72	~~R~~	~~R~~	~~R~~	~~R~~	←	~~R~~	~~R~~
81	~~R~~	~~R~~	~~R~~	~~R~~	F Y	F Y	~~R~~
82	R	R	R	R	R	G	R
83	R/→	R/↓	R	R	R	G	R
P61,P62	DW	W	DW	W	DW	DW	DRK

F Y = FLASHING YELLOW ARROW

SIGNAL FACE I.D.

All Heads L.E.D.



2033 SOFTWARE w/ 2070 CONTROLLER LOOP & DETECTOR UNIT INSTALLATION CHART

INDUCTIVE LOOPS						DETECTOR PROGRAMMING														
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
1A	6X40	2-4-2	+5	-	X	1	3 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
1B	6X40	2-4-2	0	-	X	1	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2A	6X6	6	420	X	-	2	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
2B	6X6	6	420	X	-	2	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
2C	6X6	4	110	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
2D	6X6	4	110	X	-	2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
4A	6X40	2-4-2	0	-	X	4	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
5A	6X40	2-4-2	0	X	-	5	- SEC.	3 SEC.	-	-	-	-	X	-	X	-	-	-	X
5B	6X40	2-4-2	0	-	X	5	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6A	6X6	6	420	-	X	6	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
6B	6X6	6	420	-	X	6	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	-	X
6C	6X6	6	420	X	-	6	- SEC.	2.2 SEC.	-	-	-	-	X	-	X	-	-	X	-
6D	6X6	4	110	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6E	6X6	4	110	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
6F	6X6	4	110	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	-
7A	6X40	2-4-2	0	-	X	7	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
7B	6X40	2-4-2	0	-	X	7	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
8A	6X40	2-4-2	0	-	X	8	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
8B	6X40	2-4-2	0	-	X	8	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	-	X
PEDESTRIAN DETECTION																			
P61,P62	N/A	N/A	N/A	X	-	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X	X	-

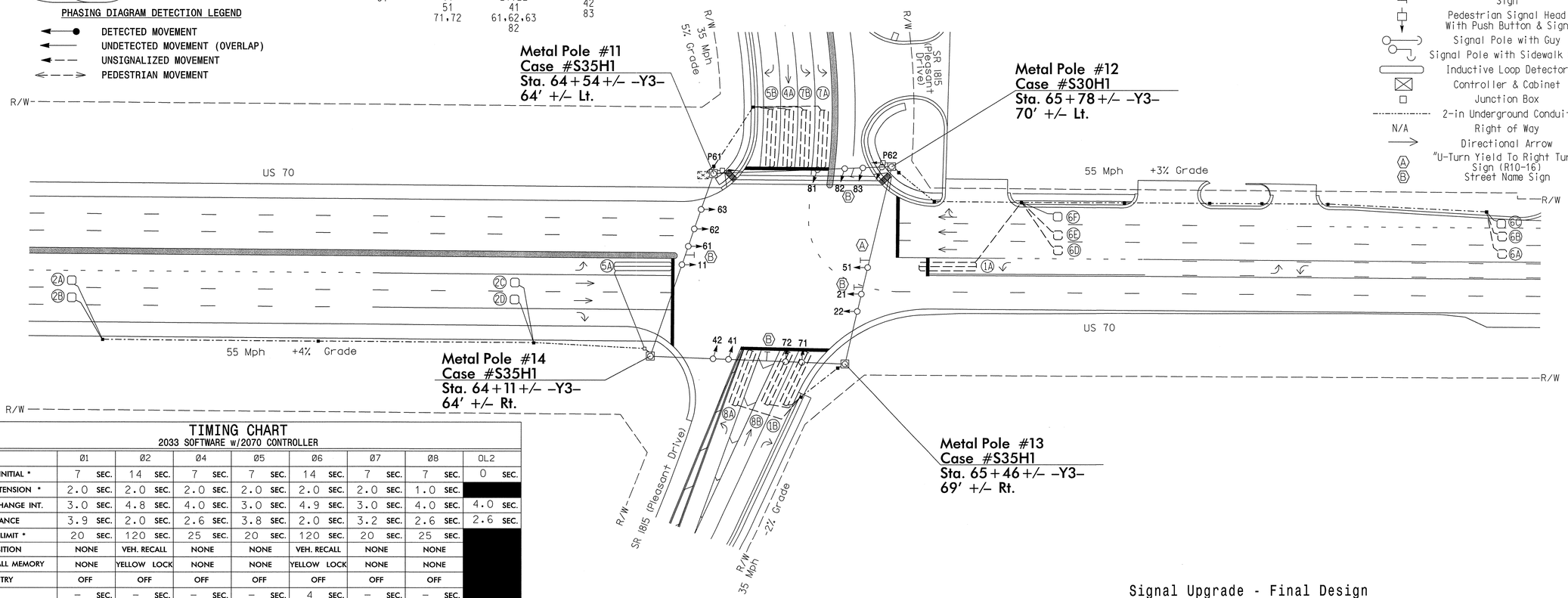
6 Phase Fully Actuated (Durham Signal System)

NOTES

1. Refer to "Road Standard Drawings NCDOT" dated January 2012, "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, 5, and/or phase 7 may be lagged.
4. Set all detector units to presence mode.
5. Program all timing information into phase banks 1,2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time.
9. Maximum times shown in timing chart are for free-runoperation 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	
	Directional Arrow	
Ⓐ	"U-Turn Yield To Right Turn" Sign (R10-16)	Ⓐ
Ⓑ	Street Name Sign	Ⓑ



TIMING CHART

2033 SOFTWARE w/2070 CONTROLLER

PHASE	01	02	04	05	06	07	08	OL2
MINIMUM INITIAL *	7 SEC.	14 SEC.	7 SEC.	7 SEC.	14 SEC.	7 SEC.	7 SEC.	0 SEC.
VEHICLE EXTENSION *	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	1.0 SEC.	
YELLOW CHANGE INT.	3.0 SEC.	4.8 SEC.	4.0 SEC.	3.0 SEC.	4.9 SEC.	3.0 SEC.	4.0 SEC.	4.0 SEC.
RED CLEARANCE	3.9 SEC.	2.0 SEC.	2.6 SEC.	3.8 SEC.	2.0 SEC.	3.2 SEC.	2.6 SEC.	2.6 SEC.
MAXIMUM LIMIT *	20 SEC.	120 SEC.	25 SEC.	20 SEC.	120 SEC.	20 SEC.	25 SEC.	
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE	NONE	
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE	NONE	
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
WALK *	– SEC.	– SEC.	– SEC.	– SEC.	4 SEC.	– SEC.	– SEC.	
FLASHING DON'T WALK	– SEC.	– SEC.	– SEC.	– SEC.	24 SEC.	– SEC.	– SEC.	
TYPE 3 LIMIT	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ALTERNATE EXTENSION	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
ADD PER VEHICLE *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM INITIAL *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MAXIMUM GAP*	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	
REDUCE 0.1 SEC EVERY *	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	– SEC.	
MINIMUM GAP	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 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.

$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

Signal Upgrade - Final Design

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 40 1"=40'

US 70
at
SR 1815 (Pleasant Drive)

Division 5 Durham County Durham

PLAN DATE: October 2013	REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 11/22/13 DATE

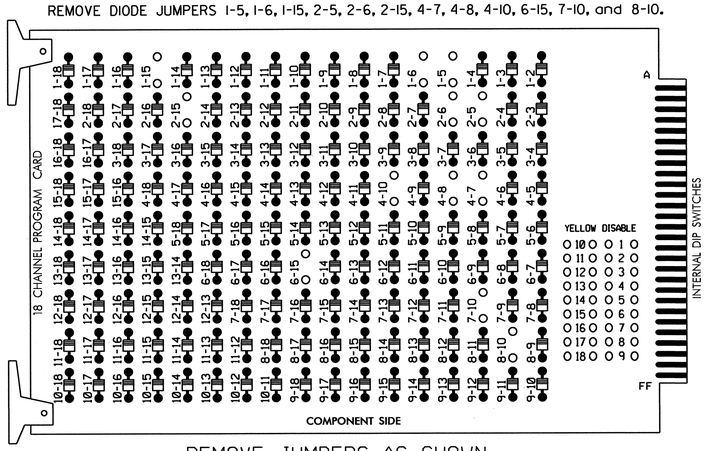
SIG. INVENTORY NO. 05-0393

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 52

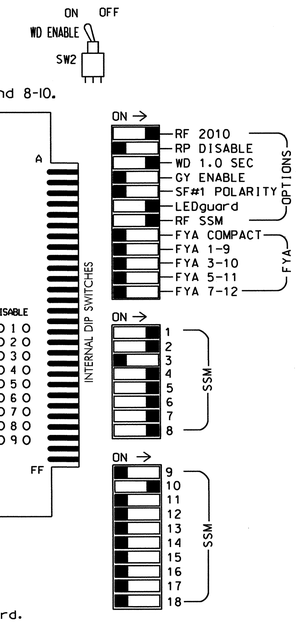
EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-15, 2-5, 2-6, 2-15, 4-7, 4-8, 4-10, 6-15, 7-10, and 8-10.



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.

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	Ø2 2A	Ø2 2C	SLOT EMPTY	SLOT EMPTY	Ø4 4A	SLOT EMPTY	SLOT EMPTY	Ø1 1B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L	NOT USED	Ø2 2B	Ø2 2D			NOT USED			NOT USED				NOT USED	ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø6 6A	Ø6 6C	SLOT EMPTY	Ø7 7A	Ø8 8A	Ø6 6E	SLOT EMPTY	Ø5 5B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	Ø6 6B	Ø6 6D		NOT USED	Ø8 8B	Ø6 6F		Ø7 7B					

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.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	14	56	5 7	1
1B	TB6-9,10	I9U	18	60	5 7	1
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
2C	TB2-9,10	I3U	21	63	5 7	2
2D	TB2-11,12	I3L	29	76	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
5A	TB3-1,2	J1U	13	55	5 7	5
5B	TB7-9,10	J9U	17	59	5 7	5
6A	TB3-5,6	J2U	2	40	5 7	6
6B	TB3-7,8	J2L	6	44	5 7	6
6C	TB3-9,10	J3U	22	64	5 7	6
6D	TB3-11,12	J3L	30	77	5 7	6
6E	TB7-1,2	J7U	24	66	5 7	6
6F	TB7-3,4	J7L	32	79	5 7	6
7A	TB5-5,6	J5U	15	57	5 7	7
7B	TB7-11,12	J9L	19	61	5 7	7
8A	TB5-9,10	J6U	4	42	5 7	8
8B	TB5-11,12	J6L	8	46	5 7	8
PED PUSH BUTTONS						
P61,P62	TB8-7,9	I13U	26	68	2	6 PED

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

DETECTOR ATTRIBUTES LEGEND:

1-FULL TIME DELAY
2-PED CALL
3-RESERVED
4-COUNTING
5-EXTENSION
6-TYPE 3
7-CALLING
8-ALTERNATE

NOTE: PROGRAM DETECTOR DELAY AND CARRYOVER TIMES AS SPECIFIED ON SIGNAL DESIGN PLANS.

NOTE:
INSTALL DC ISOLATOR IN INPUT FILE SLOT I13.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. verify that signal heads flash in accordance with the signal plans.
2. Program controller to Start Up in phases 2 and 6 green.
3. Set power-up flash time to 10 seconds and implement within the controller programming.
4. Enable Simultaneous Gap-Out feature for all phases.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Ensure start up flash phases are coordinated with flash program block assignments.
8. Program Startup Ped Call for Phase 6.
9. This cabinet and controller are part of the Durham Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070E
CABINET.....332 W/ AUX
SOFTWARE.....McCAIN 2033
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S5,S7,S8,S9,S10,S11,AUX S2
PHASES USED.....1,2,4,5,6,6PED,7,8
OVERLAP 1.....NOT USED
OVERLAP 2.....4
OVERLAP 3.....NOT USED
OVERLAP 4.....NOT USED

OVERLAP PROGRAMMING DETAIL

Program overlaps as follows:
Main Menu - 4) OVERLAP

Press "+"

OVERLAP [2]:
LOADSWITCH = 10
VEH SET 1 = 4
YELLOW CLEARANCE = 4.0
RED CLEARANCE = 2.6

END OF OVERLAP PROGRAMMING

OVERLAP GREEN FLASH PROGRAMMING DETAIL

The following will cause the overlap green outputs to flash, which are wired to the flashing yellow arrows. Program as follows:

Main Menu - 1) PHASE - 2) PHASE FUNCTIONS PAGE TWO
OLAP G FL = 2

SIGNAL HEAD HOOK-UP CHART

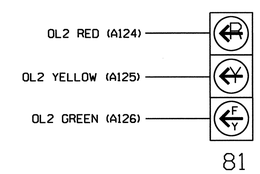
LOAD SWITCH NO.	S1		S2	S3	S4	S5	S6	S7		S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1		2	13	3	4	14	5		6	15	7	8	16	9	10	17	11	12	18
PHASE	1		2	2 PED	3	4	4 PED	5		6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	83	21,22	NU	NU	41,42	NU	42	51	61,62 63	P61, P62	71,72	82,83	NU	NU	81★	NU	NU	NU	NU
RED			128			101				134			107							
YELLOW			129			102				135			108							
GREEN			130			103				136			109							
RED ARROW	125								131			122				A124				
YELLOW ARROW	126	126						132	132			123				A125				
FLASHING YELLOW ARROW																A126				
GREEN ARROW	127	127						133	133			124								
✋											119									
🚶											121									

NU = Not Used

★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

(wire signal head as shown)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 05-0393
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Final Design - Sheet 1 of 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

US 70
at
SR 1815 (Pleasant Drive)

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	JTR
PREPARED BY:	S. Armstrong	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE 11-27-13 DATE

SIG. INVENTORY NO. 05-0393

20-NOV-2013 07:19
S:#TSASU#ITS Signals#Workgroups#Sig Man#Armstrong#050393_sm_ele_xxx.dgn
armstrong

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig 52

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

PEDESTRIAN LOADSWITCH ASSIGNMENTS

Program the pedestrian loadswitch output assignments as follows:

Main Menu - 6) OUTPUTS - 7) PEDS

PED 6P = 6

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: 05-0393
DESIGNED: October 2013
SEALED: 11/22/13
REVISED: N/A

Signal Upgrade - Final Design - Sheet 2 of 2

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
at
SR 1815 (Pleasant Drive)

Division 5 | Durham County | Durham

PLAN DATE: October 2013	REVIEWED BY: JTR		
PREPARED BY: S. Armstrong	REVIEWED BY:		
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR.

SIGNATURE | DATE 11-27-13

SIG. INVENTORY NO. 05-0393

20-NOV-2013 07:18
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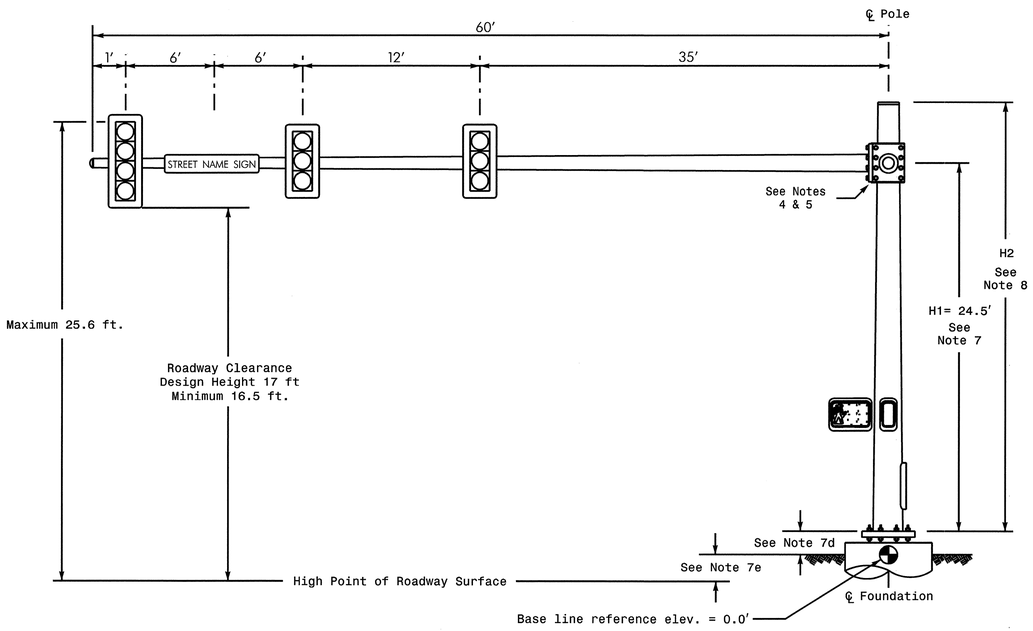
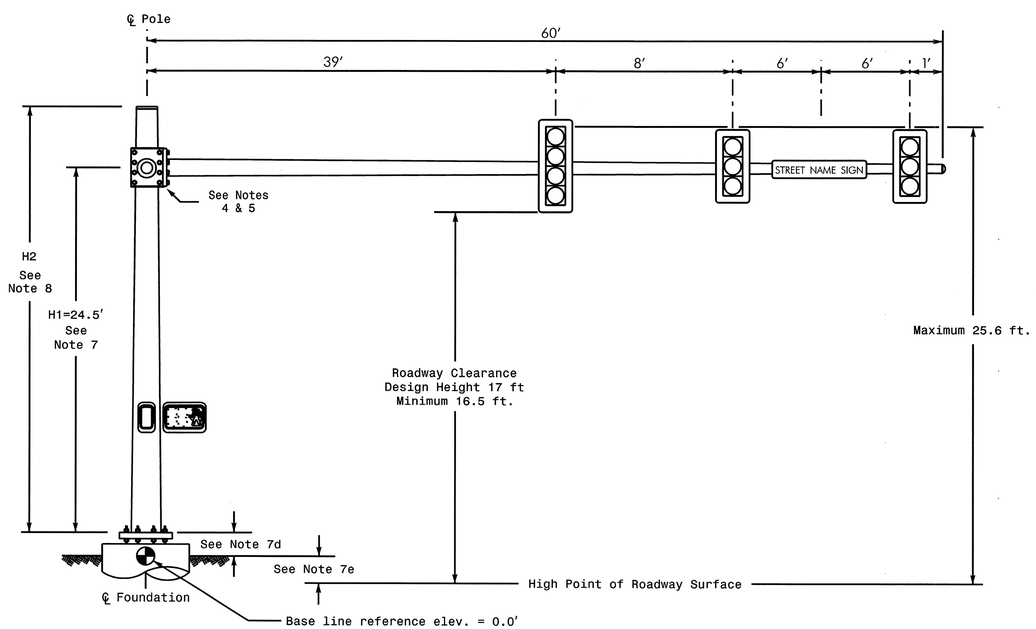
armstrong

Design Loading for METAL POLE NO. 5, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 5, MAST ARM B



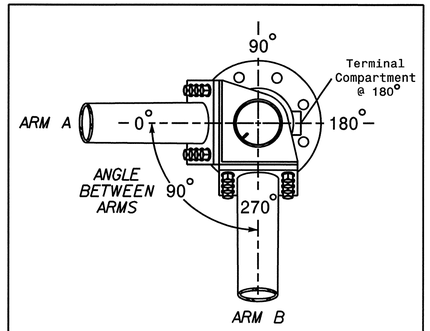
Elevation View @ 0°

SPECIAL NOTE

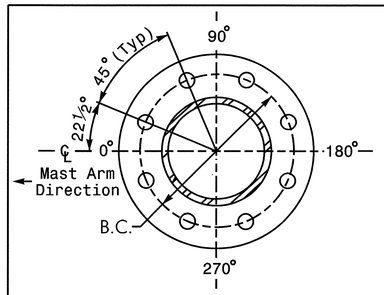
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+5.40 ft.	Data Not Provided
Elevation difference at Edge of travelway or face of curb	+4.82 ft.	Data Not Provided

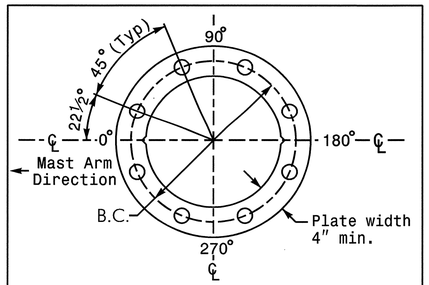


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

METAL POLE No. 5

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 53

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12″–3 SECTION–WITH BACKPLATE AND ASTRO–BRAC	9.3 S.F.	25.5″ W X 52.5″ L	60 LBS
	SIGNAL HEAD 12″–4 SECTION (VERTICAL)–WITH BACKPLATE AND ASTRO–BRAC	11.5 S.F.	25.5″ W X 66.0″ L	74 LBS
STREET NAME SIGN	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

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

Design Requirements

2. 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.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate arm connection points.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
8. The pole manufacturer will determine the total height (H2) of the pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Structural Engineer for assistance at (919) 773-2800.
10. The contractor is responsible for verifying that the mast arm lengths shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
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Fax:919-789-9591
License #: C-2197

NCDOT Wind Zone 4 (90 mph)

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

NC 98 (Holloway Street) at Hardee Street

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	J Hochanadel
PREPARED BY:	C Lawson	REVIEWED BY:	

SCALE: 0 N/A N/A

REVISIONS	INIT.	DATE

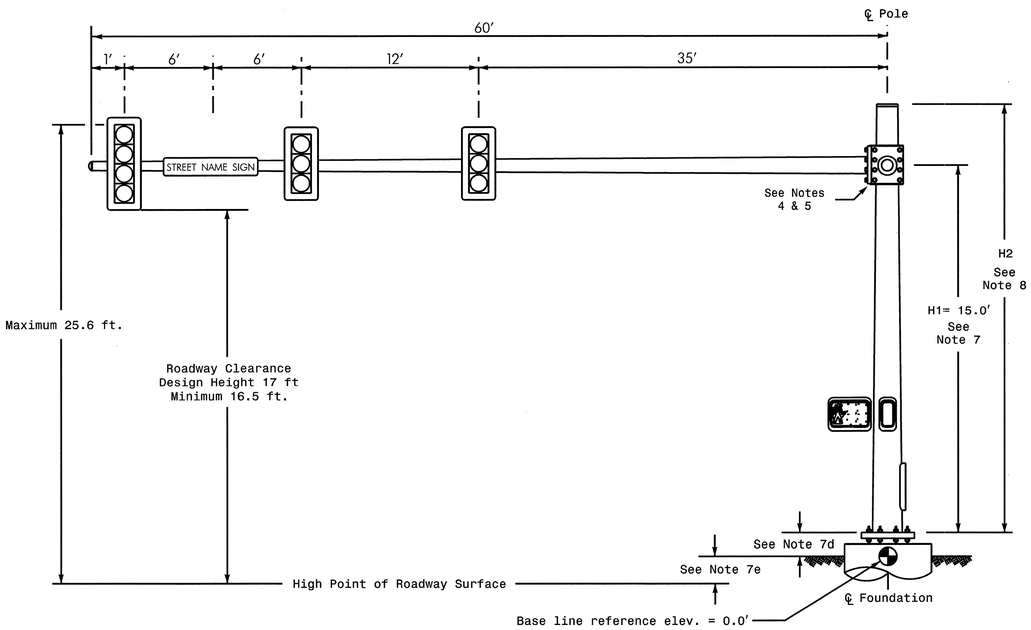
SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 11/12/13 DATE

SIG. INVENTORY NO. 05-0463

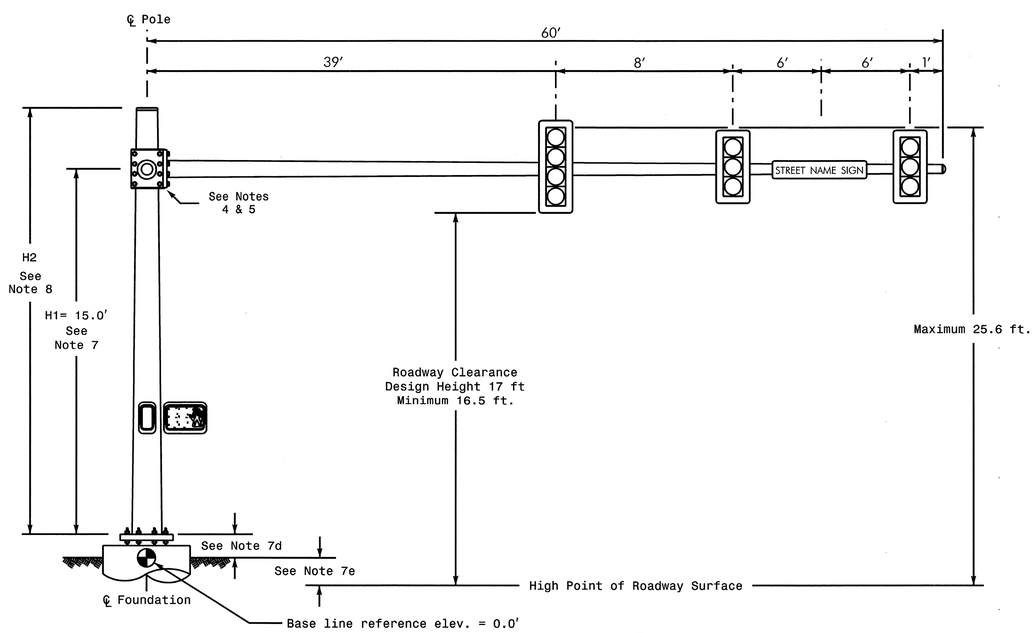
$$$$$$$SYSTIME$$$$$$
$$$$$$$USERNAME$$$$$$

Design Loading for METAL POLE NO. 6, MAST ARM A



Elevation View @ 270°

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



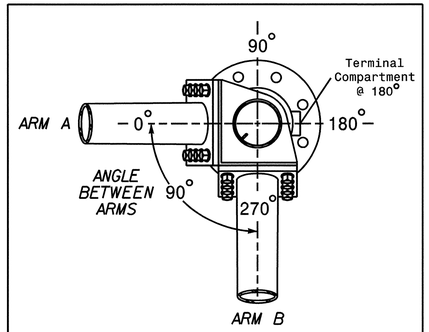
Elevation View @ 0°

SPECIAL NOTE

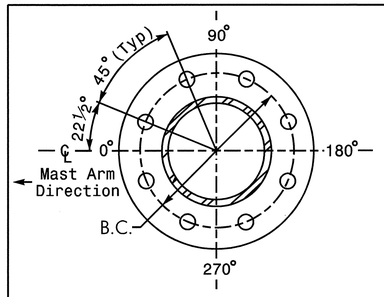
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-5.04 ft.	Data Not Provided
Elevation difference at Edge of travelway or face of curb	-4.40 ft.	Data Not Provided

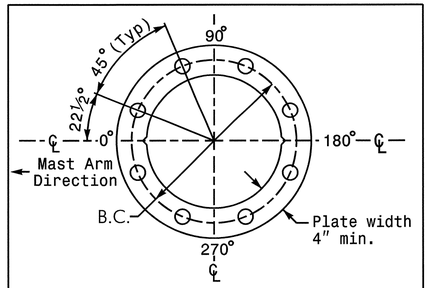


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

METAL POLE No. 6

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 54

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12″–3 SECTION–WITH BACKPLATE AND ASTRO–BRAC	9.3 S.F.	25.5″ W X 52.5″ L	60 LBS
	SIGNAL HEAD 12″–4 SECTION (VERTICAL)–WITH BACKPLATE AND ASTRO–BRAC	11.5 S.F.	25.5″ W X 66.0″ L	74 LBS
STREET NAME SIGN	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

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

Design Requirements

2. 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.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate arm connection points.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
8. The pole manufacturer will determine the total height (H2) of the pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Structural Engineer for assistance at (919) 773-2800.
10. The contractor is responsible for verifying that the mast arm lengths shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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NCDOT Wind Zone 4 (90 mph)

Prepared for 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

NC 98 (Holloway Street) at Hardee Street

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	J Hochanadel
PREPARED BY:	C Lawson	REVIEWED BY:	

SCALE: 0 N/A — N/A

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

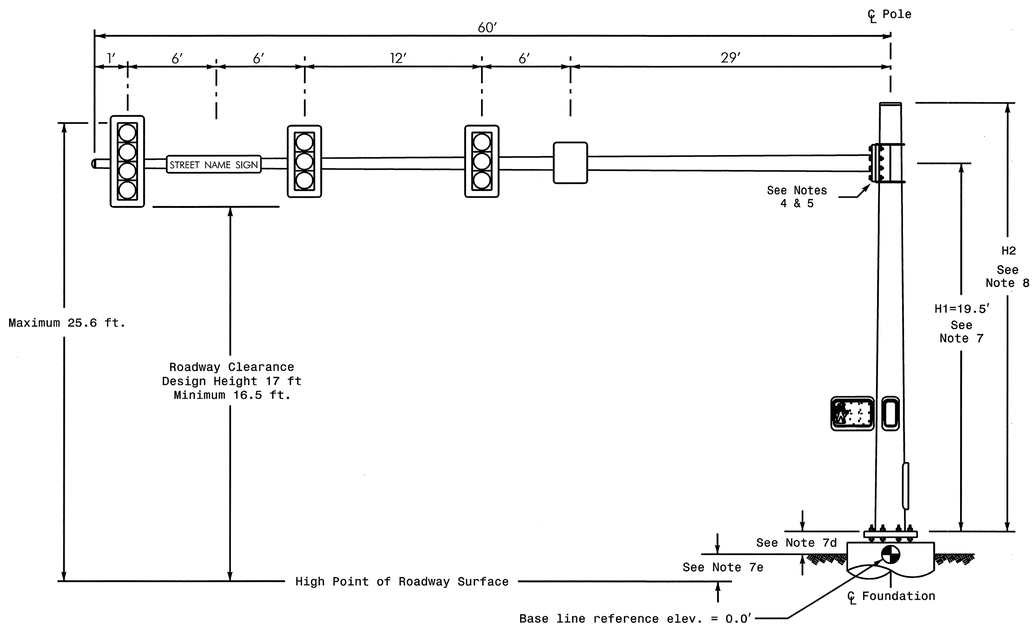
SIGNATURE: 11/12/13 DATE

SIG. INVENTORY NO. 05-0463

$$$$$$SYSTIME$$$$$$
$$$$$$USERNAME$$$$$$
$$$$$$SERVERNAME$$$$$$

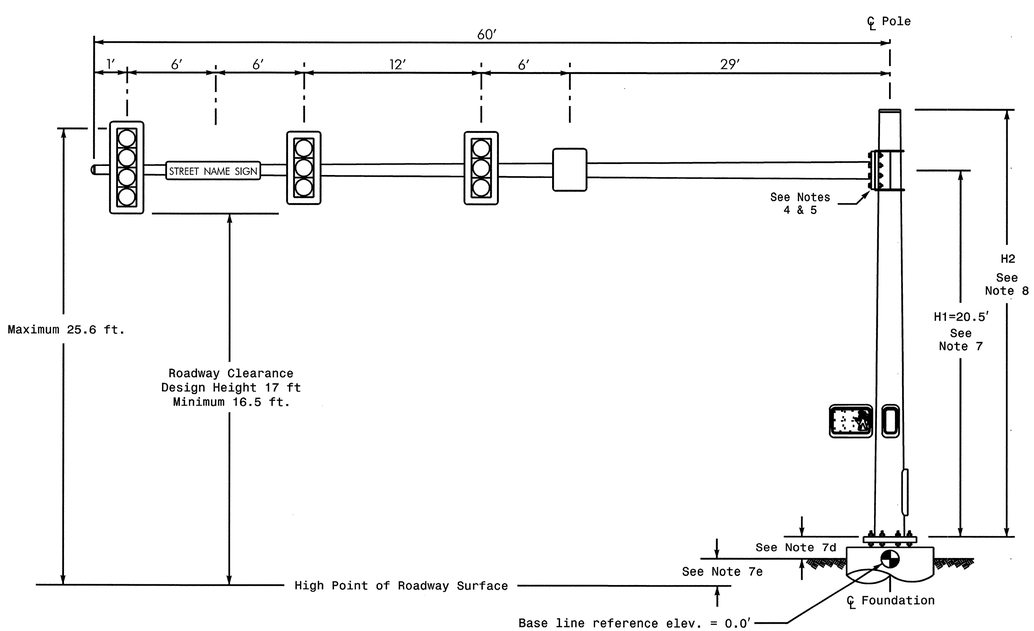
METAL POLE No. 7 and 9	PROJECT REFERENCE NO.	SHEET NO.
	U-0071	Sig. 55

Design Loading for METAL POLE NO. 7



Elevation View

Design Loading for METAL POLE NO. 9



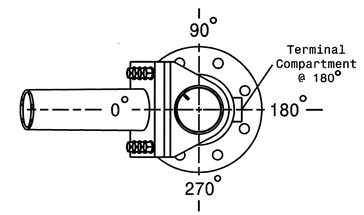
Elevation View

SPECIAL NOTE

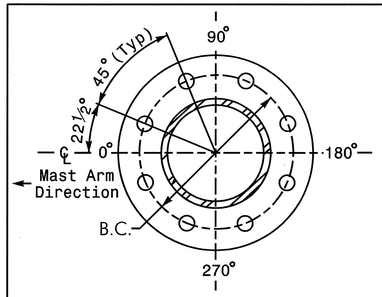
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 7	Pole 9
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.13 ft.	+1.33 ft.
Elevation difference at Edge of travelway or face of curb	+0.81 ft.	+0.24 ft.

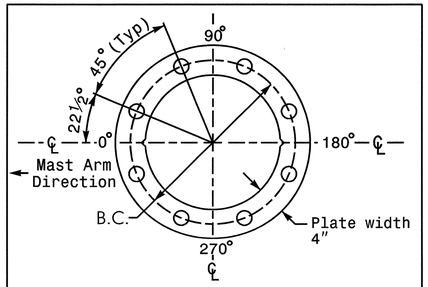


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



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 8″–4 SECTION (VERTICAL)–WITH BACKPLATE AND ASTRO–BRAC	7.9 S.F.	22.0″ W X 52.0″ L	53.5 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	STREET NAME SIGN RIGID MOUNTED WITH ASTRO–SIGN–BRAC	12.0 S.F.	18.0″ W X 96.0″ L	27 LBS
	SIGN RIGID MOUNTED WITH ASTRO–SIGN–BRAC	7.5 S.F.	30.0″ W X 36.0″ L	14 LBS

NOTES

Design Reference Material

1. Design the traffic signal structure and foundation in accordance with:
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   - The 2012 NCDOT Roadway Standard Drawings.
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Design Requirements

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3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. 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.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
8. 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 ½ of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Structural Engineer for assistance at (919) 773-2800.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

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NCDOT Wind Zone 4 (90 mph)

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

NC 98 (Holloway Street) at US 70 Ramps

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	J Hochanadel
PREPARED BY:	C Lawson	REVIEWED BY:	

SCALE: 0 N/A N/A

REVISIONS	INIT.	DATE

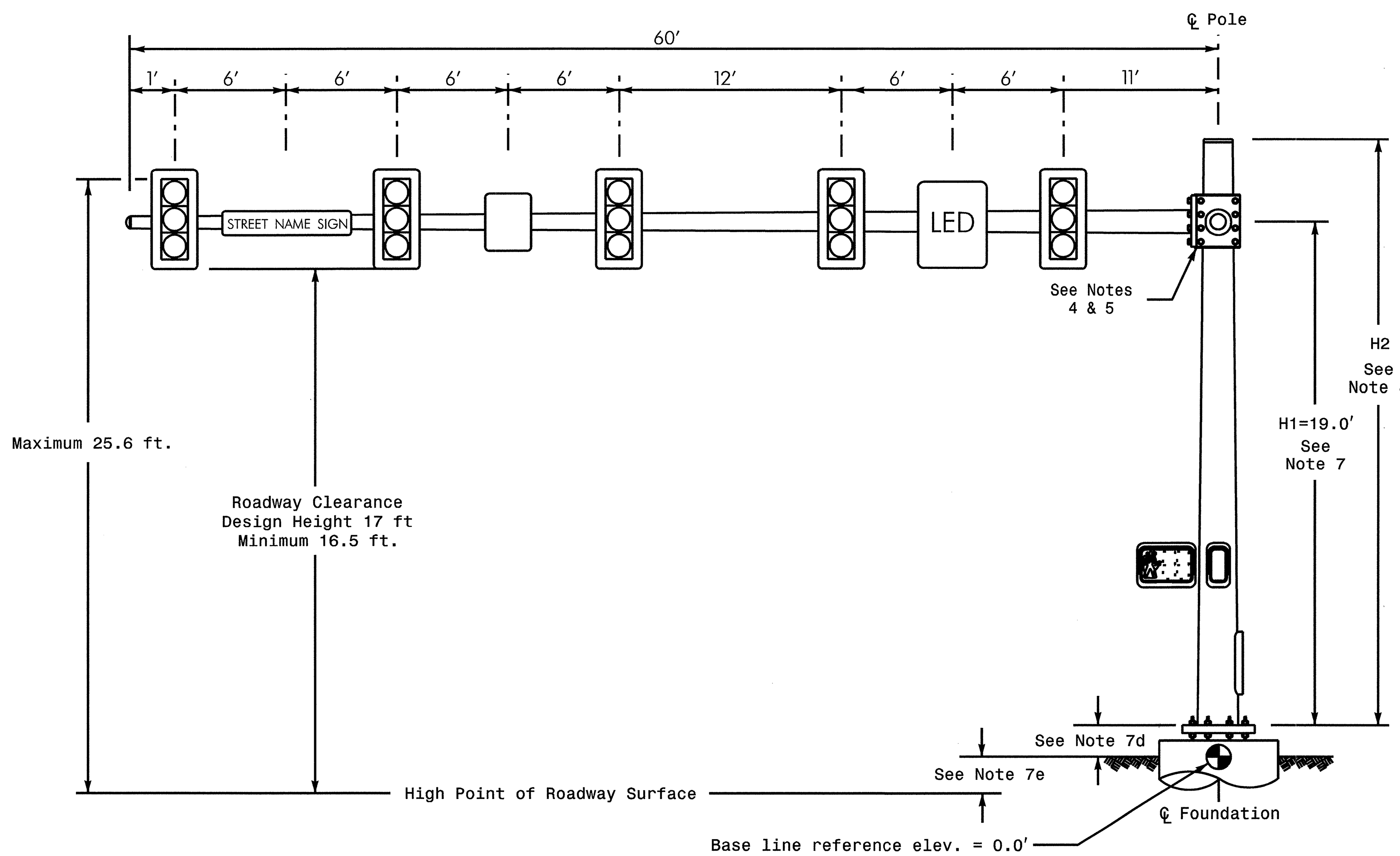
SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE: 11/21/13 DATE

SIG. INVENTORY NO. 05-1717

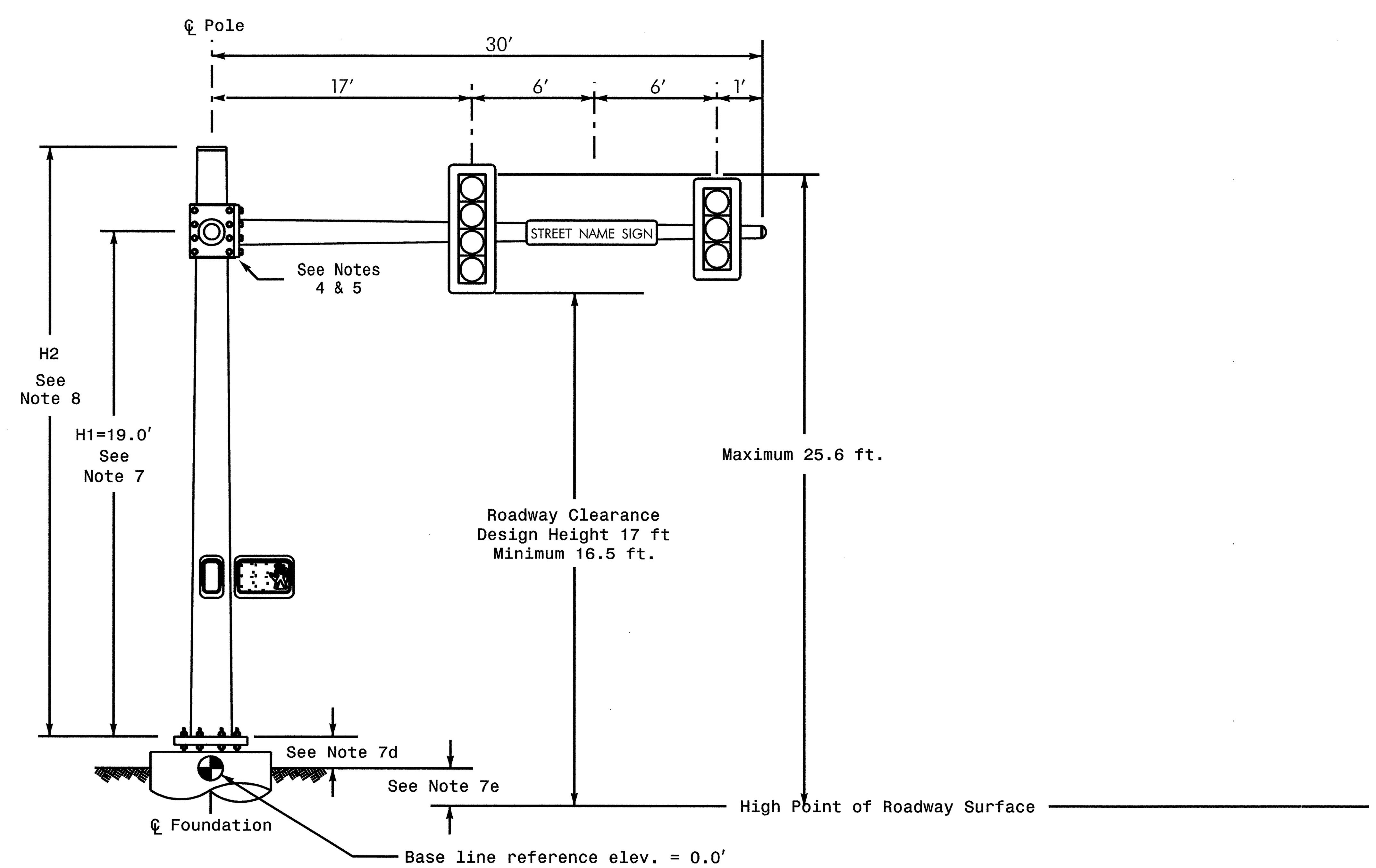
$$$$USERNAME$$$$

Design Loading for METAL POLE NO. 8, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 8, MAST ARM B



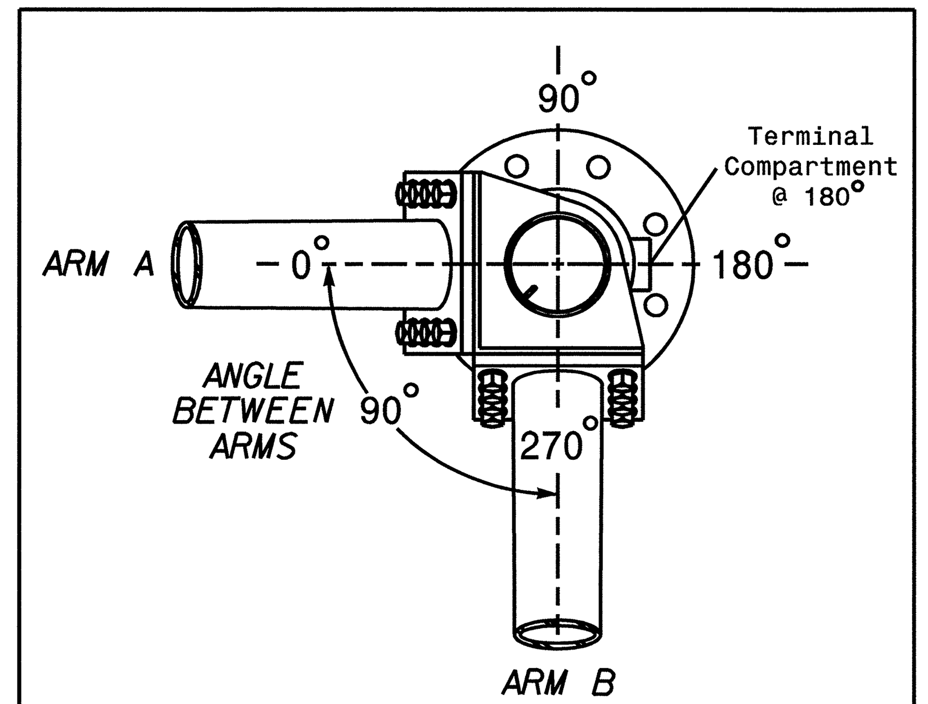
Elevation View @ 0°

SPECIAL NOTE

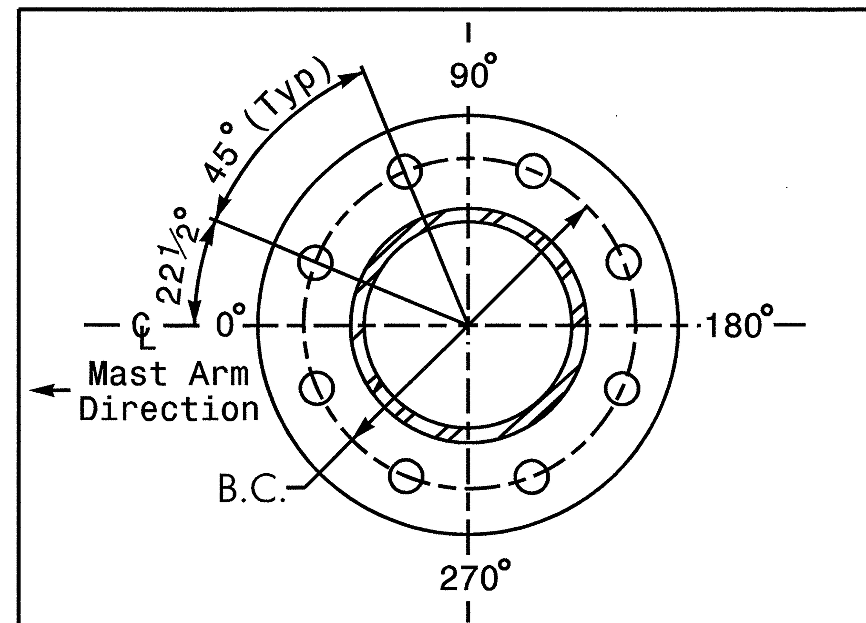
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.04 ft.	Data Not Provided
Elevation difference at Edge of travelway or face of curb	-0.80 ft.	Data Not Provided

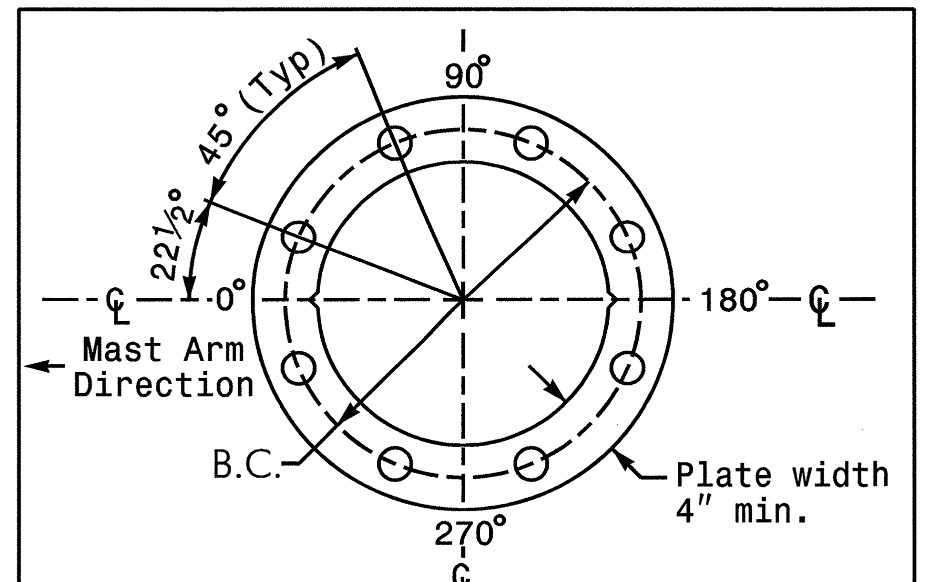


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



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	11.5 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	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
	SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	7.5 S.F.	30.0" W X 36.0" L	14 LBS
LED	SIGN, L.E.D. BLANKOUT WITH HANGER	5.0 S.F.	24.0" W X 36.0" L	110 LBS

NOTES

Design Reference Material

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

Design Requirements

2. 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.
3. Design all signal supports using stress ratios that do not exceed 0.9.
4. The camber design for mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate arm connection points.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
8. The pole manufacturer will determine the total height (H2) of the pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Structural Engineer for assistance at (919) 773-2800.
10. The contractor is responsible for verifying that the mast arm lengths shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

NCDOT Wind Zone 4 (90 mph)

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

NC 98 (Holloway Street)
at
US 70 Ramps

Division 5 Durham County Durham

PLAN DATE: October 2013 REVIEWED BY: J Hochanadel
PREPARED BY: C Lawson REVIEWED BY:

SCALE 0 N/A
N/A

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 11/22/13 DATE

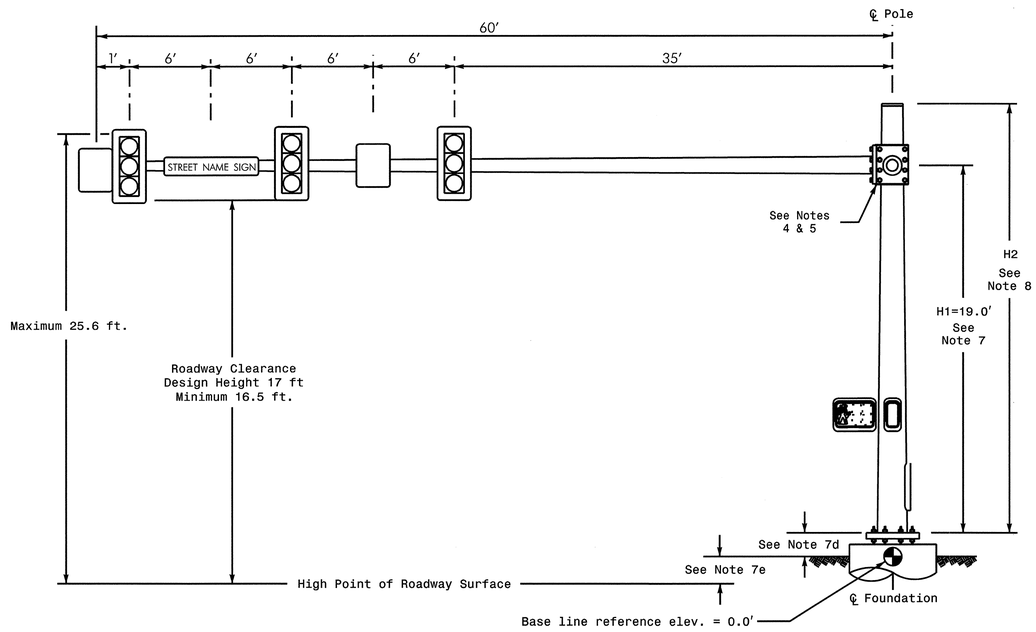
SIG. INVENTORY NO. 05-1717

$$$$$SYSTIME$$$$$
$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 57

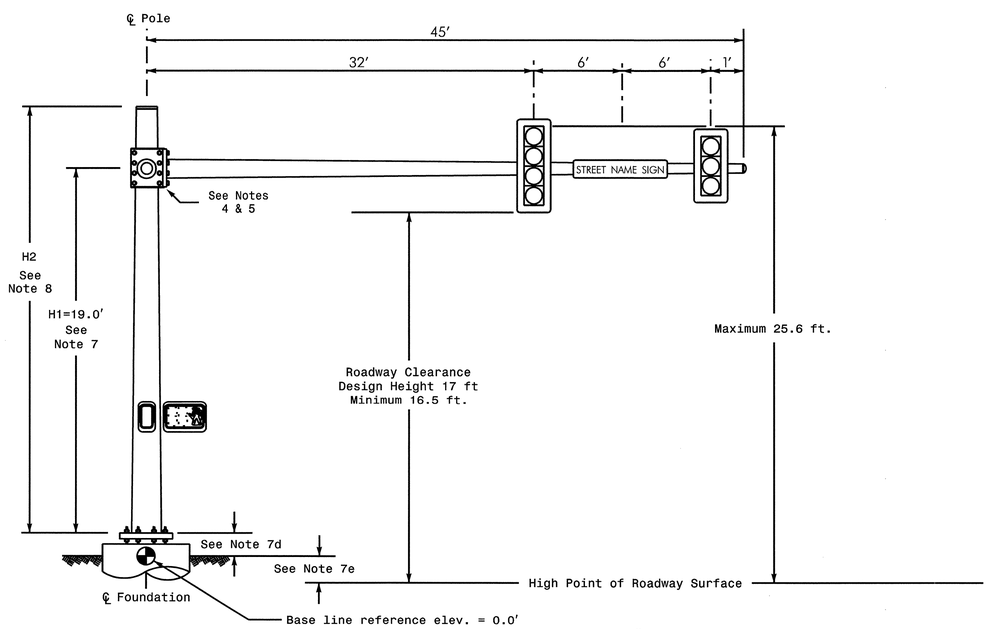
METAL POLE No. 10

Design Loading for METAL POLE NO. 10, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 10, MAST ARM B



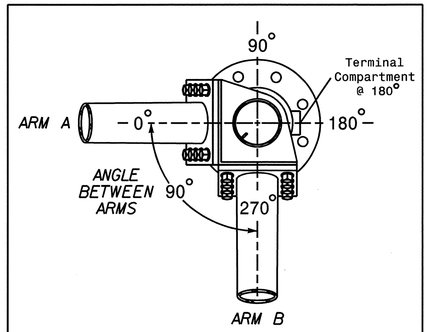
Elevation View @ 0°

SPECIAL NOTE

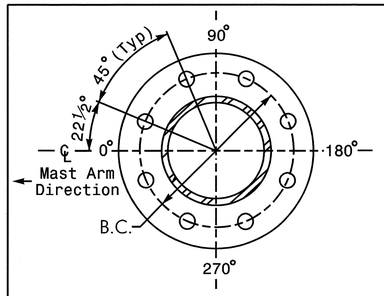
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.47 ft.	Data Not Provided
Elevation difference at Edge of travelway or face of curb	+0.76 ft.	Data Not Provided

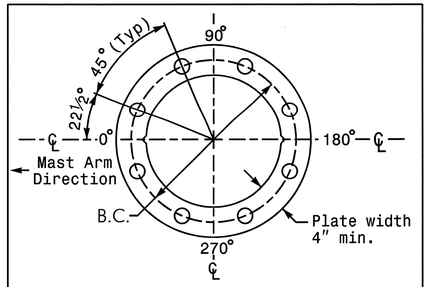


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

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   - 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.
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Design Requirements

2. 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.
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SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
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Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

NCDOT Wind Zone 4 (90 mph)

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

NC 98 (Holloway Street) at US 70 Ramps

Division 5 Durham County Durham

PLAN DATE:	October 2013	REVIEWED BY:	J Hochanadel
PREPARED BY:	C Lawson	REVIEWED BY:	

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 11/12/13 DATE

SIG. INVENTORY NO. 05-1717

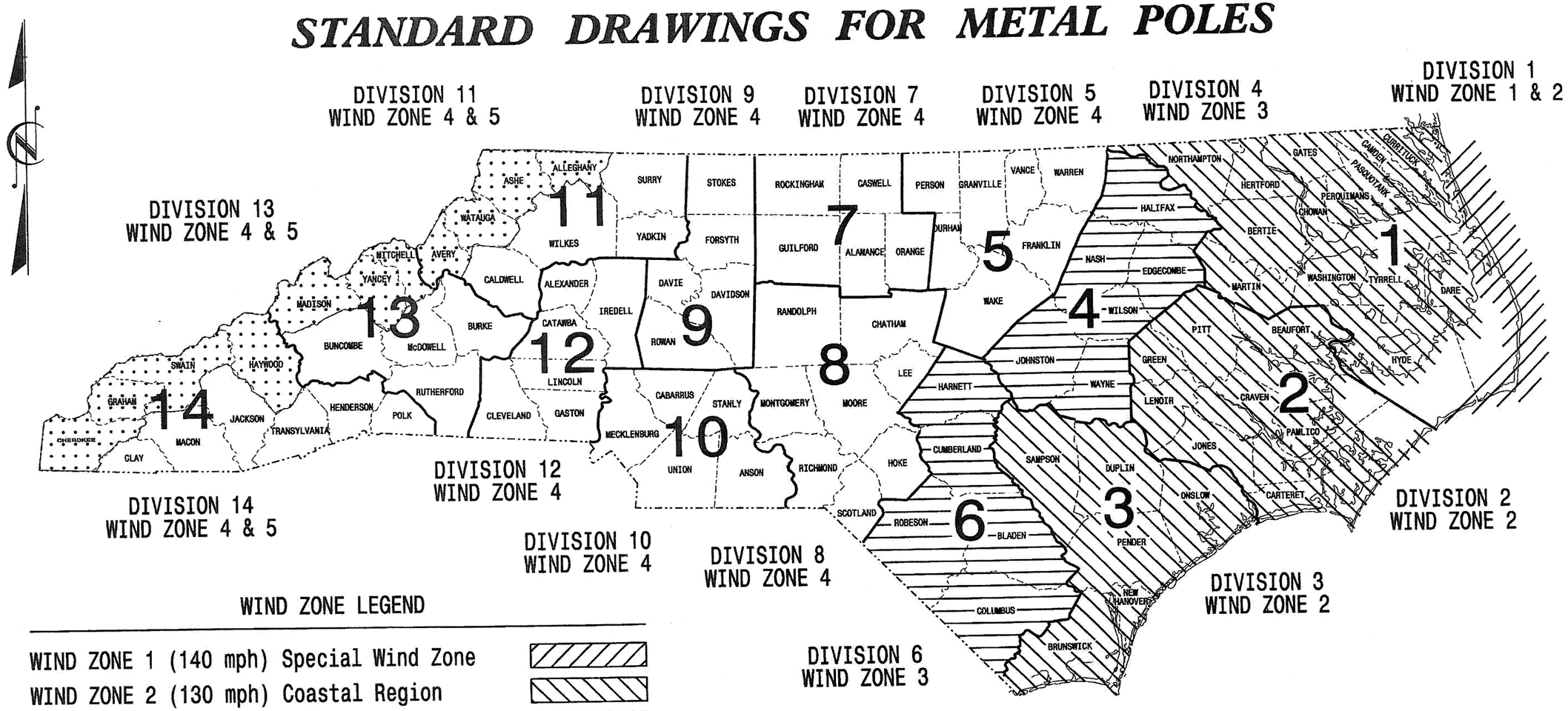
$$$$USERNAME$$$$

STATE	PROJECT NO.	SHEET NO.
N.C.	U-0071	Sig.58
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

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 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

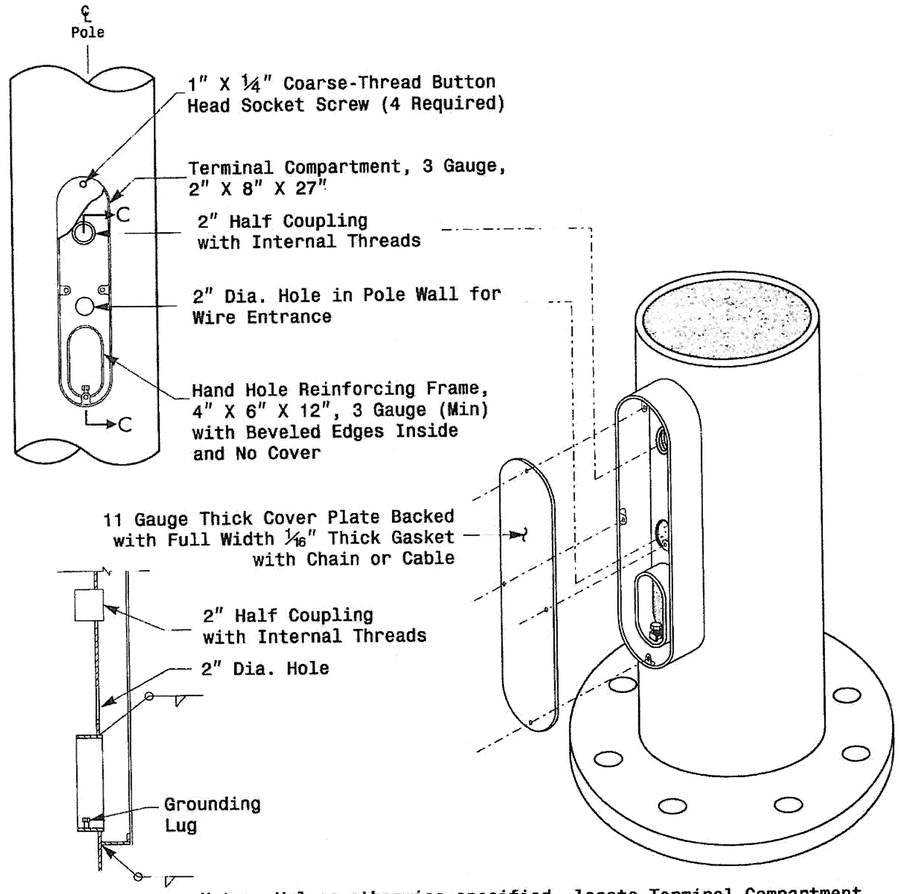
SEAL

NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DIBESH C. SARKAR

D. Sarkar 8.7.2013

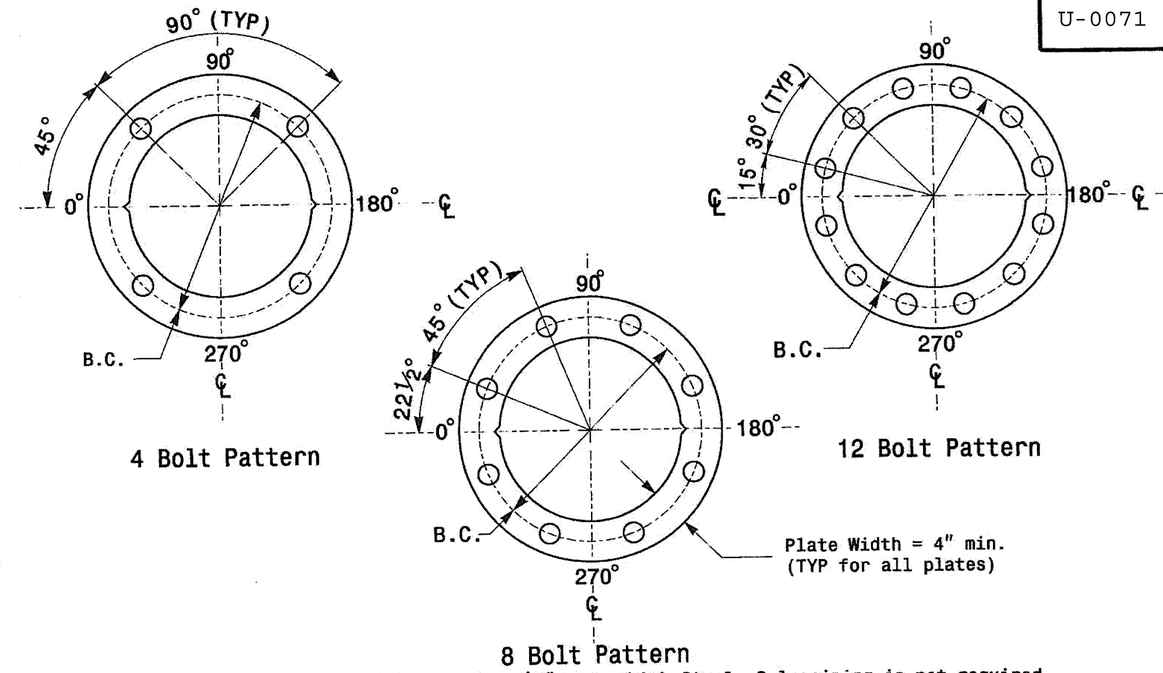
SIGNATURE DATE

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.59 M 2



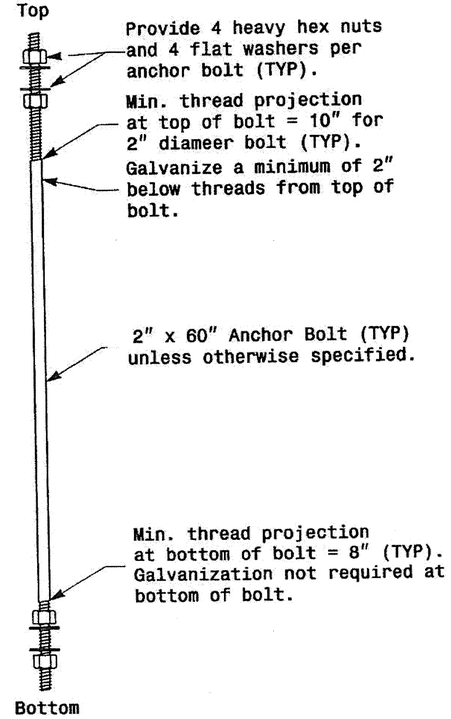
Note: Unless otherwise specified, locate Terminal Compartment 1 foot above the pole base plate at 180 degrees on the pole's radial index.

Terminal Compartment Detail



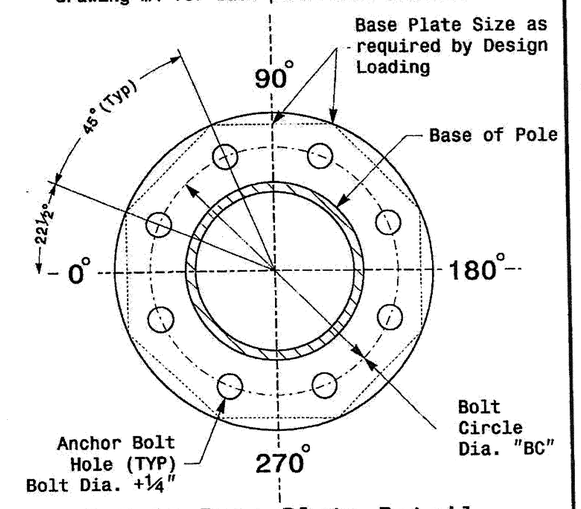
Construct Templates and Plates from ¼" min. thick Steel. Galvanizing is not required.

Base Plate Template and Anchor Bolt Lock Plate 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

MFG _____ MFG. DATE: MM/YY
SHAFT D/T/L/Y ----/----/----/--
ARM-A D/T/L/Y ----/----/----/----
----/--- / ---/----
ARM-B D/T/L/Y ----/----/----/----
----/----/----/
A.B. DIA./B.C./L/Y ----/----/----/----
NCDOT STANDARD ----------

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

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

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

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

Identification Tag Details

Fabrication Details – All Poles

Prepared in the Offices of: Transportation Mobility and Safety Division, Traffic Engineering Branch, Signal Design Section, 730 N. Greenfield Pkwy, Garner, NC 27529

SCALE: 0 NA NONE

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

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBASISH C. SARKAR

D. Sarkar 8-7-2013
SIGNATURE DATE

SIG. INVENTORY NO.

07-AUG-2013 13:15
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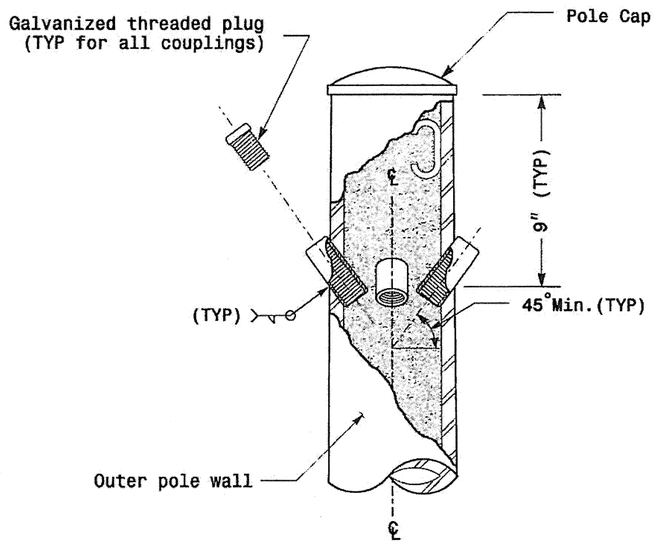
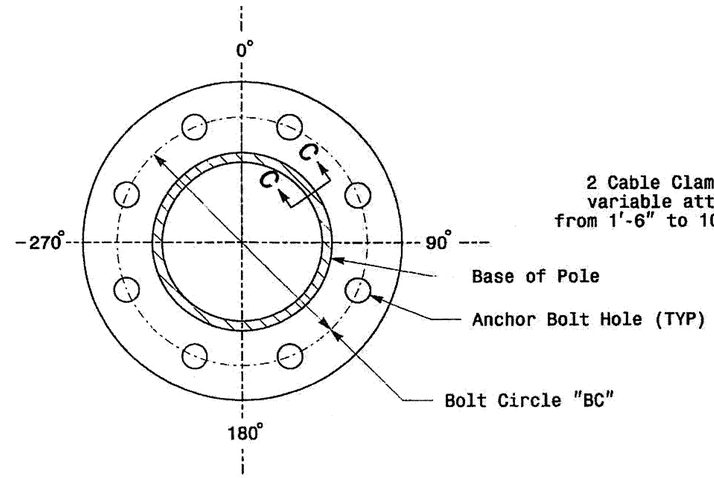
PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.60 M 3

Fabrication Details – Strain Poles



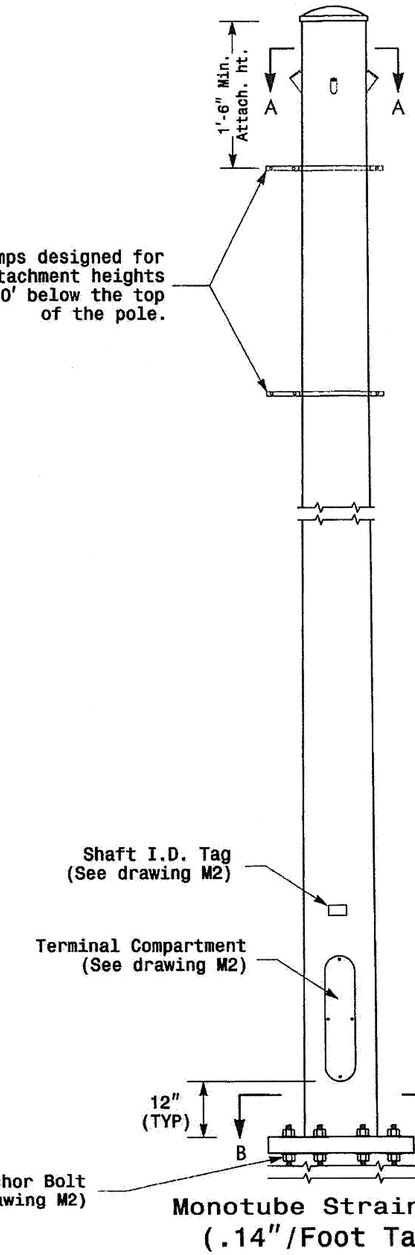
Cable Entrances at Top of Pole



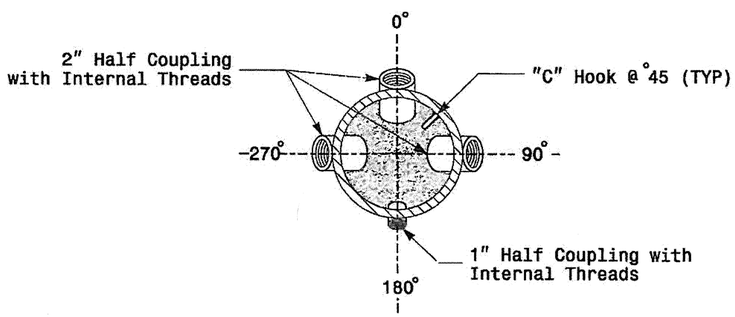
Section B-B

(See drawing M2)

Pole Base Plate

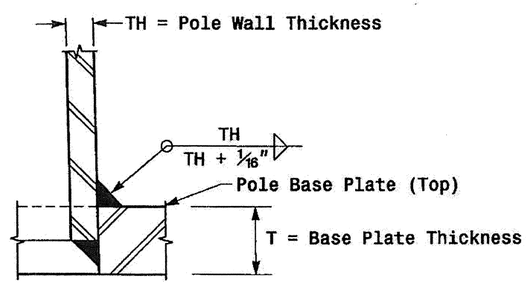


Monotube Strain Pole
(.14"/Foot Taper)



Section A-A

Radial Orientation for Factory Installed Accessories at Top of Pole



Section C-C

Socket Connection Weld Detail

Prepared in the Offices of:
Transportation Mobility and Safety Division
Traffic Engineering 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

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 13:11
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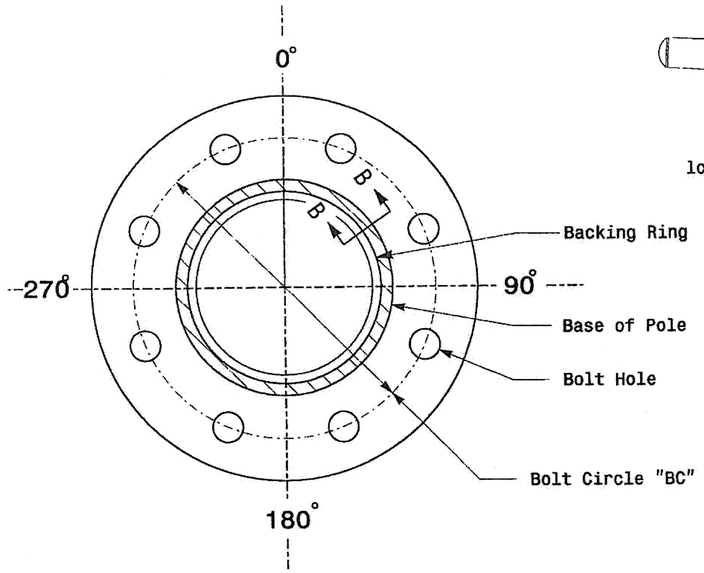
PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 61 M 4

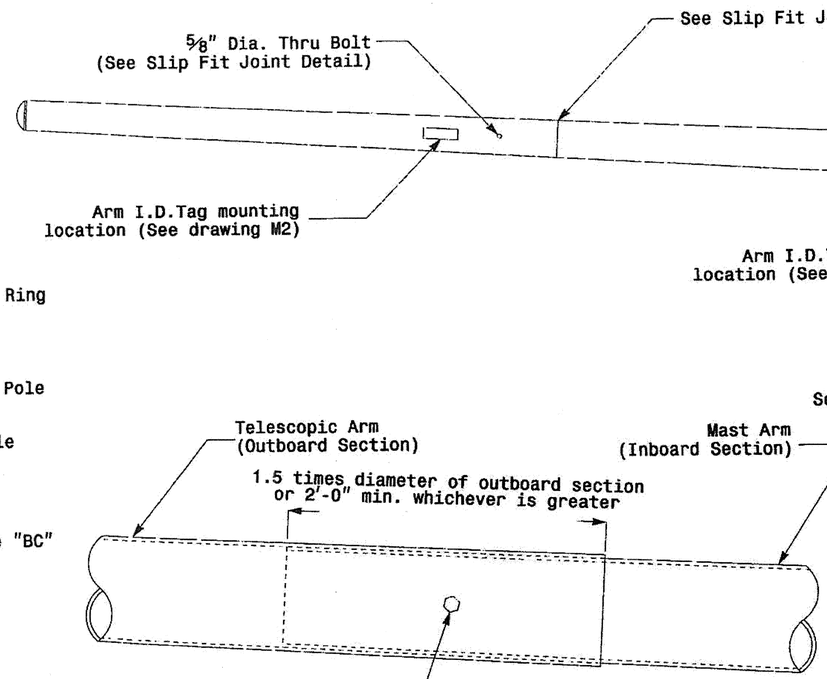
Fabrication Details – Mast Arm Poles



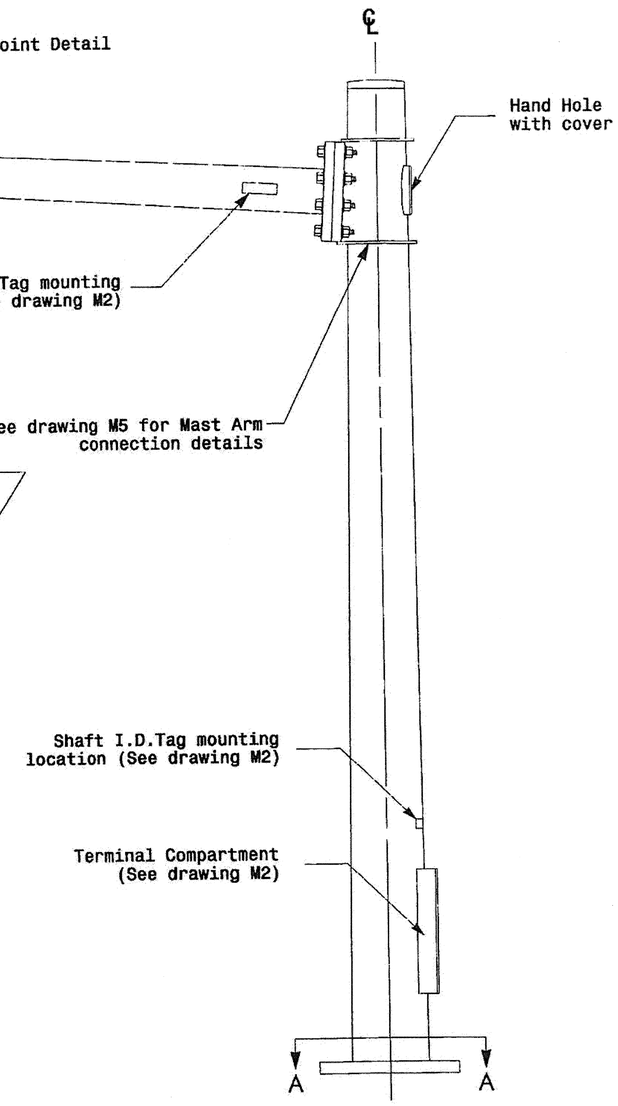
Section A-A

(See drawing M 2)

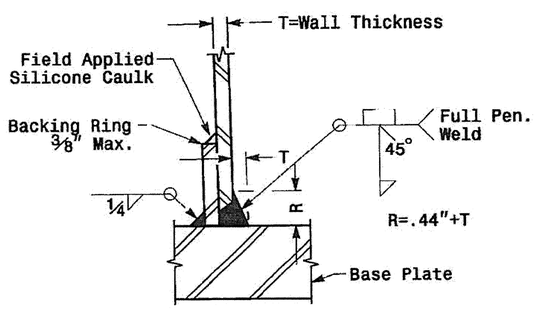
Pole Base Plate



Slip Fit Joint Detail for Mast Arm



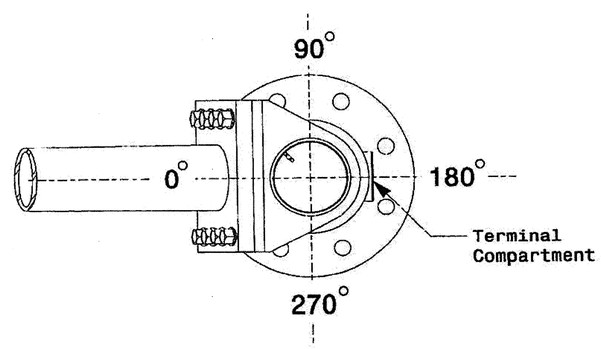
Monotube Mast Arm Pole
(.14in./ft. taper)



Section B-B

(Pole Attachment to Base Plate)

Full-Penetration Groove Weld Detail



Mast Arm Radial Orientation

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

SCALE: 0 NA — NONE

Typical Fabrication Details
for Mast Arm Poles

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

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

SIGNATURE: D. Sarkar DATE: 8.7.2013

SIG. INVENTORY NO.

07-AUG-2013 13:35
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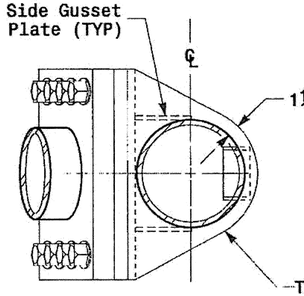
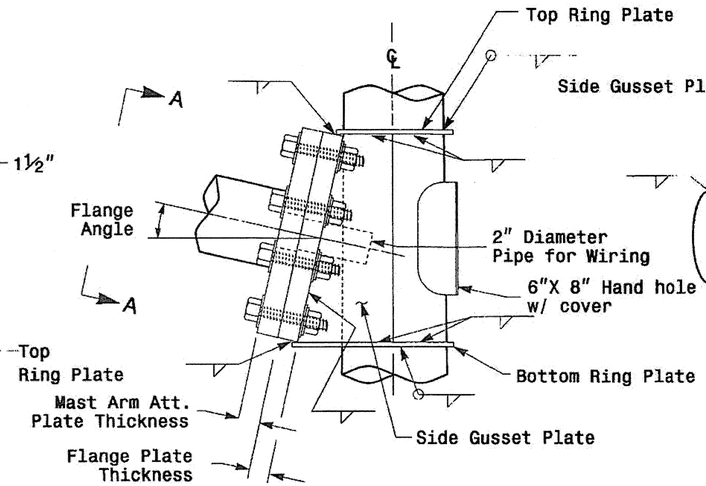
Bitting

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 62 M 5

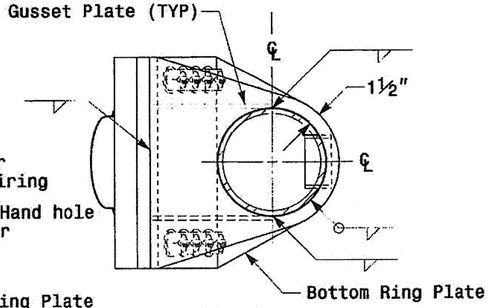
Welded Ring Stiffened Mast Arm Connection



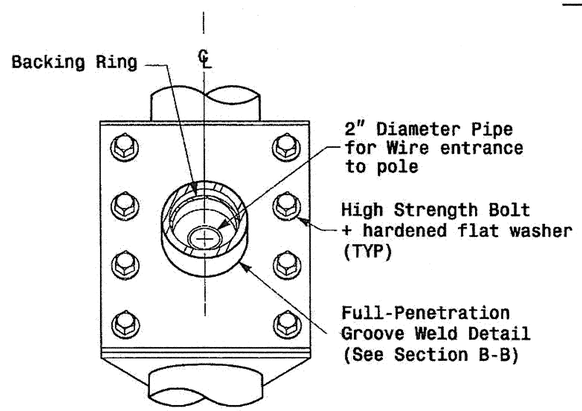
Plan View



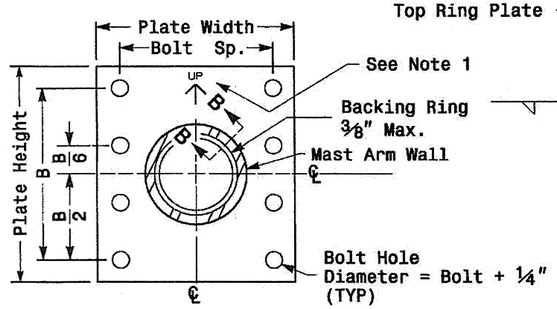
Side Elevation View



Bottom View

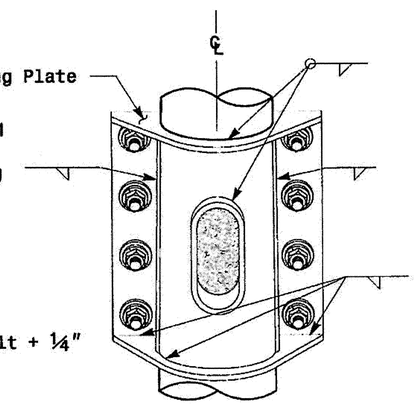


Front Elevation View

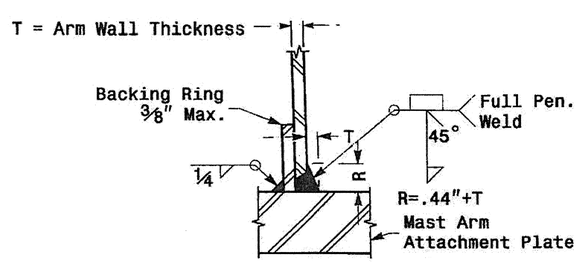


Section View A-A

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.

Fabrication Details – Mast Arm Poles

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

Fabrication Details For Mast Arm Connection To Pole

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 13:37
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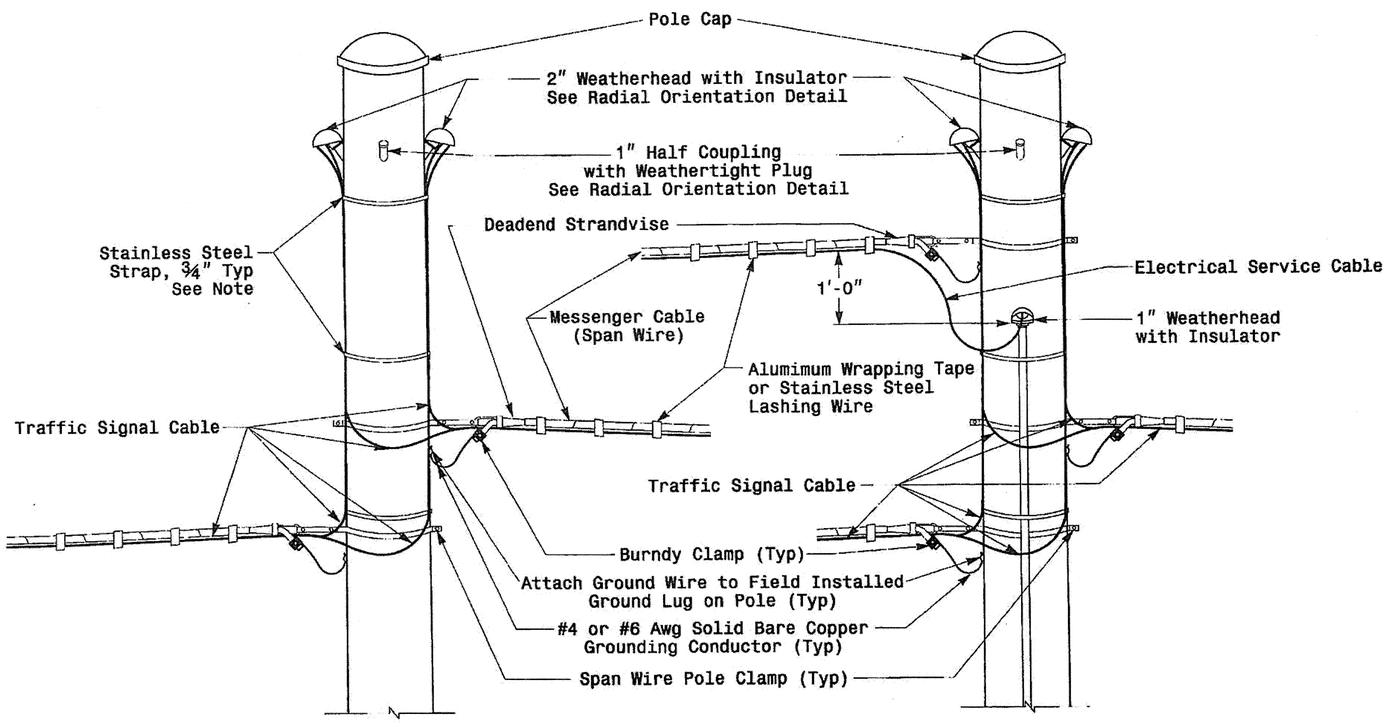
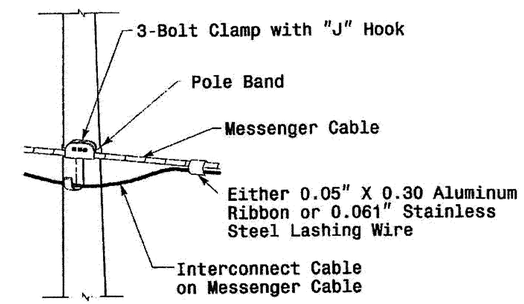
nbitting

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.63 M 6

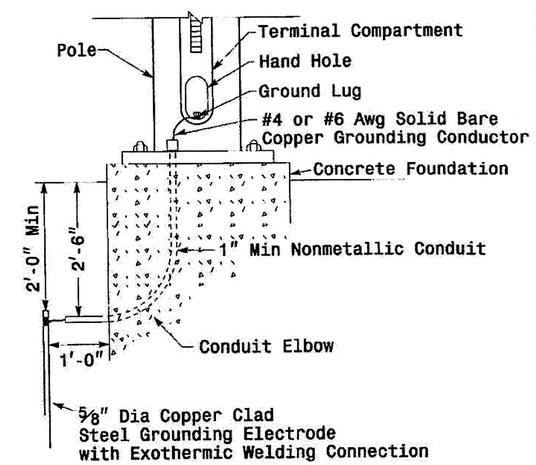


Strain Pole Attachments

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

Construction Details – Strain Poles

Prepared in the Offices of:
Transportation Mobility and Safety Division
Traffic Engineering Design Unit
Signal Design Section
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 DEBISH C. SARKAR

D. Sarkar 8.7.2013
SIGNATURE DATE

SIG. INVENTORY NO.

07-AUG-2013 13:39
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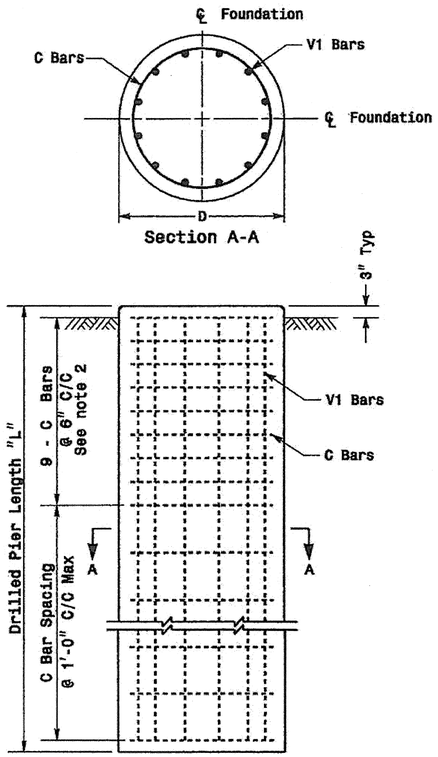
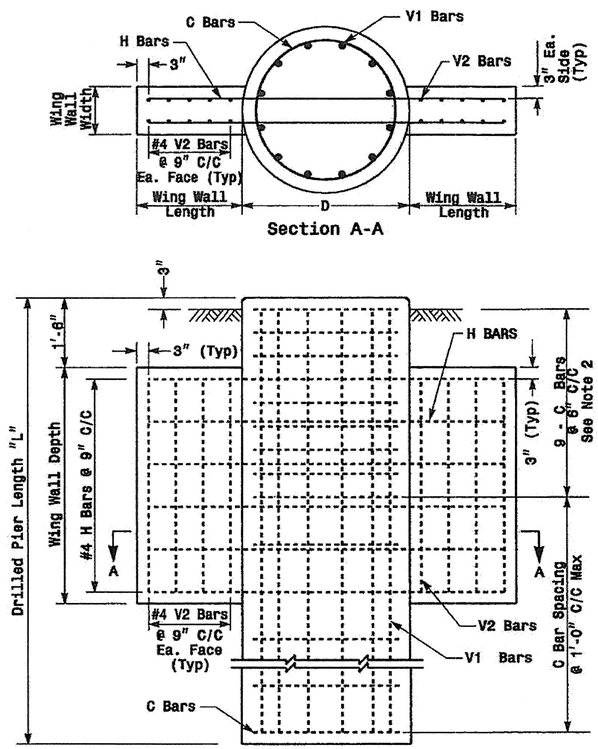
2:1=1:10

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 64 M 7

Construction Details – Foundations

Reinforcing Steel Bars



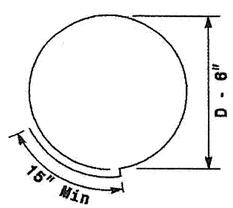


REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (42" & 48" DIAMETER)						
Shaft Dia (in.)	Conc. Volume (cu. yds.)	Bar Name	No.	Size	Type	Length
42"	.356 x L	V1	9	#8	STR.	**
		C	*	#4	CIR.	10'-9"
48"	.465 x L	V1	12	#8	STR.	**
		C	*	#4	CIR.	12'-6"

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

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



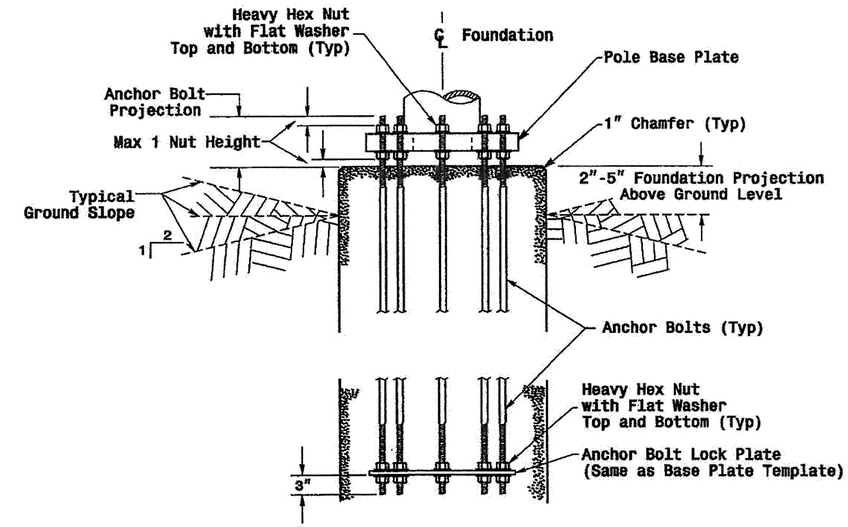
Typical "C" Bars

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

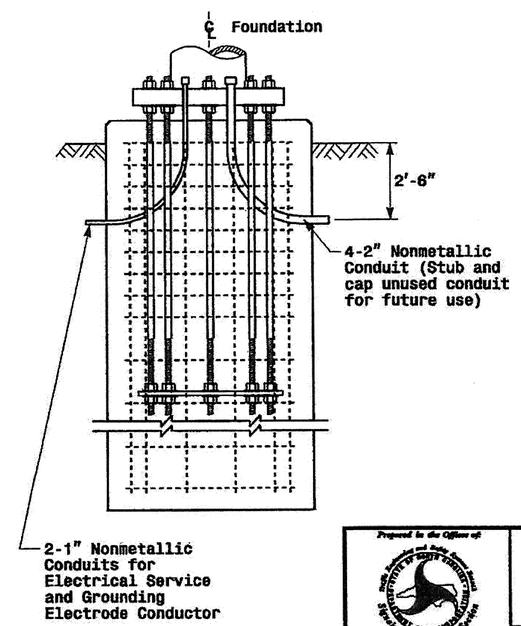
See Note No. 4

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.)

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

SCALE: 0 NA — NONE

Construction Details Foundations

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

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

D. Sarkar 9.2.2005
SIGNATURE DATE

SIG. INVENTORY NO.

01-SEP-2005 17:48
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paleander

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.65 M 8

		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
		S30L3	30	25	310	21.0	14.5	11.5	9.5	18.5	16.5	14.5
		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
		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
		S30L2	30	23	290	20.0	14.0	11.5	9.5	18.5	16.0	14.0
		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
		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
		S30L2	30	23	290	19.5	13.5	11.0	9.0	18.0	15.5	14.0
		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
		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
		S30L1	30	22	225	18.5	13.0	10.5	9.0	17.0	15.0	13.5
		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
		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
		S30L2	30	23	290	20.0	14.0	11.0	9.5	18.0	16.0	14.0
		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
		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

Proposed in the Offices of: Geotechnical Engineering Unit, Structure Design Unit, Roadway Design Unit, Traffic Engineering Unit, Division of Highways, N.C. Department of Transportation, 1222 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.W. Esposito

REVISIONS	INIT.	DATE

SCALE: 0 NA None

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DINESH C. SARKAR

D. Sarkar 9.2.2005
SIGNATURE DATE

02-SEP-2005 12:40
v:\design\sar-all\workgroups\2004 metal pole standards\2004 m8 std strain pole.dgn
polexander

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 66

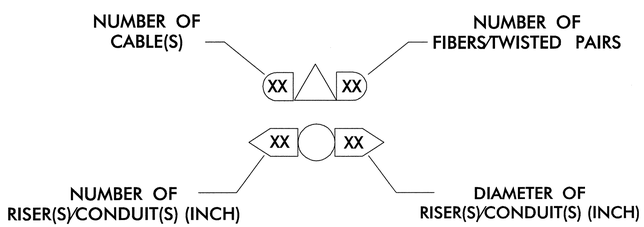
1. INSTALL REA, PE – 22, SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
2. INSTALL REA, PE – 38, (FIGURE – 8) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
3. INSTALL REA, PE – 39, (UNDERGROUND) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
4. INSTALL SMFO CABLE
5. INSTALL MMFO CABLE
6. INSTALL FIBER OPTIC DROP CABLE
7. INSTALL TRACER WIRE
8. TRENCH
9. INSTALL PVC CONDUIT
10. INSTALL RIGID, GALVANIZED STEEL CONDUIT
11. INSTALL RIGID, GALVANIZED STEEL RISER WITH WEATHERHEAD
12. INSTALL RIGID, GALVANIZED STEEL RISER WITH FIBER OPTIC CABLE SEAL
13. INSTALL OUTER–DUCT POLYETHYLENE CONDUIT
14. INSTALL POLYETHYLENE CONDUIT
15. DIRECTIONAL DRILL CONDUIT
16. BORE AND JACK CONDUIT
17. INSTALL CABLE(S) IN EXISTING CONDUIT
18. INSTALL CABLE(S) IN NEW CONDUIT
19. INSTALL CABLE(S) IN EXISTING RISER
20. INSTALL CABLE(S) IN NEW RISER
21. INSTALL CABLE(S) IN EXISTING CONDUIT STUBOUTS
22. INSTALL NEW CONDUIT INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB–OUTS WHEN AVAILABLE)
23. INSTALL NEW RISER INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB–OUTS WHEN AVAILABLE)
24. INSTALL NEW CONDUIT INTO EXISTING POLE MOUNTED CABINET
25. INSTALL NEW RISER INTO EXISTING POLE MOUNTED CABINET
26. TERMINATE COMMUNICATIONS CABLE ON EXISTING TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
27. INSTALL NEW TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
28. INSTALL INTERCONNECT CENTER, PATCH PANEL, JUMPERS, AND FUSION SPLICE CABLE IN CABINET
29. INSTALL UNDERGROUND SPLICE ENCLOSURE
30. INSTALL AERIAL SPLICE ENCLOSURE
31. INSTALL POLE MOUNTED SPLICE CABINET
32. INSTALL BASE MOUNTED SPLICE CABINET
33. REMOVE EXISTING SPLICE CABINET
34. INSTALL CABINET FOUNDATION
35. REMOVE EXISTING CABINET FOUNDATION
35A. REMOVE EXISTING CABINET
36. INSTALL CCTV CAMERA ASSEMBLY
36A. EXISTING CCTV CAMERA ASSEMBLY
36B. REMOVE EXISTING CCTV CAMERA ASSEMBLY
37. INSTALL CCTV CAMERA WOOD POLE
38. INSTALL CCTV CAMERA METAL POLE AND FOUNDATION
38A. EXISTING CCTV CAMERA METAL POLE AND FOUNDATION
38B. REMOVE EXISTING CCTV CAMERA METAL POLE AND FOUNDATION
39. INSTALL JUNCTION BOX
40. INSTALL OVERSIZED JUNCTION BOX
40A. EXISTING OVERSIZED JUNCTION BOX
41. REMOVE EXISTING JUNCTION BOX
42. INSTALL WOOD POLE
43. REMOVE EXISTING WOOD POLE
44. INSTALL AERIAL GUY ASSEMBLY
45. INSTALL STANDARD GUY ASSEMBLY
46. INSTALL SIDEWALK GUY ASSEMBLY
47. INSTALL MESSENGER CABLE
48. REMOVE EXISTING COMMUNICATIONS CABLE AND MESSENGER CABLE
49. REMOVE EXISTING COMMUNICATIONS CABLE
50. INSTALL TELEPHONE SERVICE
51. INSTALL CABLE STORAGE RACKS (SNOW SHOES) AND STORE 100 FEET OF CABLE
52. INSTALL DELINEATOR MARKER
53. STORE 60 FEET OF COMMUNICATIONS CABLE
53A. STORE 20 FEET OF COMMUNICATIONS CABLE
54. LASH CABLE(S) TO EXISTING SIGNAL/COMMUNICATIONS CABLE
55. LASH CABLE(S) TO EXISTING MESSENGER CABLE
56. LASH CABLE(S) TO NEW MESSENGER CABLE
57. MODIFY EXISTING ELECTRICAL SERVICE
58. INSTALL NEW ELECTRICAL SERVICE
58A. EXISTING ELECTRICAL SERVICE
59. REUSE EXISTING ETHERNET TRANSCEIVER FOR MVD
59A. RELOCATE AND REUSE EXISTING ETHERNET TRANSCEIVER FOR MVD
60. INSTALL POLE MOUNTED CCTV CABINET
60A. EXISTING POLE MOUNTED CCTV CABINET
61. INSTALL FIBER OPTIC DATA TRANSCIEVER
62. INSTALL FIBER OPTIC VIDEO TRANSMITTER W/DATA
62A. EXISTING FIBER OPTIC VIDEO TRANSMITTER W/DATA
62B. RELOCATE AND REUSE EXISTING FIBER OPTIC VIDEO TRANSMITTER W/DATA AND INSTALL NEW VIDEO ENCODER
63. INSTALL POLE MOUNTED MICROWAVE VEHICLE DETECTOR
63A. EXISTING POLE MOUNTED MICROWAVE VEHICLE DETECTOR
63B. RELOCATE AND REUSE EXISTING POLE MOUNTED MICROWAVE VEHICLE DETECTOR

LEGEND

- F. O. — NEW FIBER OPTIC COMMUNICATIONS CABLE
- TWIST. PR. — NEW TWISTED PAIR COMMUNICATIONS CABLE
- EXIST. — EXISTING COMMUNICATIONS CABLE
- REM. — EXISTING COMMUNICATIONS CABLE TO BE REMOVED
- NEW AERIAL GUY ASSEMBLY
- NEW CONDUIT
- EXISTING CONDUIT
- D D — NEW DIRECTIONAL DRILLED CONDUIT
- B & J — NEW BORED AND JACKED CONDUIT
- NEW JUNCTION BOX
- EXISTING JUNCTION BOX
- EXISTING WOOD POLE (TO REMAIN)
- EXISTING WOOD POLE
- S — NEW AERIAL SPLICE ENCLOSURE
- NEW METAL POLE
- EXISTING METAL POLE
- NEW CCTV CAMERA ASSEMBLY
- EXISTING CCTV CAMERA ASSEMBLY
- NEW STANDARD GUY ASSEMBLY
- NEW SIDEWALK GUY ASSEMBLY
- NEW CABLE STORAGE RACKS (SNOW SHOES)
- EXISTING CONTROLLER AND CABINET
- S — EXISTING SPLICE CABINET
- S — NEW SPLICE CABINET
- SP — SIGNAL POLE
- XX–XXXX — SIGNAL INVENTORY NUMBER
- YAGI ANTENNA (SINGLE)
- OMNI ANTENNA

CONSTRUCTION NOTE SYMBOLOGY KEY

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



SEPI ENGINEERING & CONSTRUCTION
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Raleigh, NC 27605
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Fax:919-789-9591
License #: C-2197

Prepared for 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

SCALE
0
N/A

CONSTRUCTION NOTES

Division 05 Durham County Durham

PLAN DATE: November 2013	REVIEWED BY: J Hochanadel		
PREPARED BY: R Drayton	REVIEWED BY:		
		INIT.	DATE

SIGNATURE 11/22/13 DATE

CADD FILE NAME

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 67

CABLE ROUTING NOTES:

NC 98 (HOLLOWAY AVENUE) – TMP PHASE I – STEP 2

1) REVIEW INTERMEDIATE CONTRACT TIME ASSOCIATED WITH THIS WORK.

2) RECORD THE EXISTING SPLICING ARRANGEMENTS AT 05–0367; SPLICE ENCLOSURE #1 (EE 304); 05–0463; SPLICE ENCLOSURE #2 (EE 305); 05–0486; 05–1717 AND SPLICE CABINET #3 (EE 401); FOR COMPARISON TO THE SUPPLIED SPLICE PLANS. IF DISCREPANCIES EXIST, CONTACT MR. PETE NICHOLAS (919–560–4366) OF THE "CITY OF DURHAM TRAFFIC MANAGEMENT CENTER" TO DETERMINE HOW TO PROCEED WITH RE SPLICING. COORDINATE ALL WORK WITH THE CITY OF DURHAM TRAFFIC MANAGEMENT CENTER (MR. PETE NICHOLAS @ 919–560–4366) AND THE TRIANGLE TRANSPORTATION MANAGEMENT CENTER (MR. ED SIRGANY @ 919–825–2636).

3) INSTALL WIRELESS COMMUNICATIONS LINK BETWEEN 05–0463 AND 05–0486. INSTALL MASTER RADIO AT 05–0463 AND LOCAL RADIO AT 05–0486. MAINTAIN WIRELESS COMMUNICATIONS BETWEEN INTERSECTIONS UNTIL IMPLEMTATION OF TMP PHASE V STEP 2.

4) INSTALL NEW FIBER OPTIC COMMUNICATIONS CABLE BETWEEN AERIAL SPLICE ENCLOSURE #1 AND SPLICE CABINET #3 AS SHOWN. INSTALL CONDUIT SYSTEM AROUND US 70/NC 98 INTERCHANGE/BRIDGE TO AVOID CONSTRUCION ACTIVITIES AND MINIMIZE DAMAGE. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING COMMUNICATIONS THROUGHOUT CONSTRUCTION. INSTALL NEW SPLICE IN ACCORDANCE WITH PLANS AT SPLICE ENCLOSURE #2.

5) PROVIDE SEVEN (7) DAYS NOTICE TO THE CITY OF DURHAM TRAFFIC MANAGEMENT CENTER PRIOR TO BEGINNING CUT–OVER TO NEW FIBER OPTIC COMMUNICATIONS LINE. PRIOR TO CUTTING AND REMOVING ANY EXISTING FIBER OPTIC COMMUNICATIONS CABLE, CONTRACTOR SHALL MAKE PREPARATIONS TO HAVE NEW CABLES INSTALLED AND READY FOR TERMINATIONS TO MINIMIZE SYSTEM DOWNTIME.

6) BEGIN CUT–OVER TO NEW FIBER OPTIC COMMUNICATIONS LINE. CUT NCDOT/CITY OF DURHAM COMMUNICATIONS CABLE INTO THREE SEGMENTS 'A', 'B' AND 'C'.

SEGMENT 'A' – BACK PULL SEGMENT 'A' TO POLE #1 AND REROUTE THROUGH RISERS AND CONDUIT SYSTEM AS SHOWN TO AERIAL SPLICE ENCLOSURE #1. INSTALL NEW SPLICE IN ACCORDANCE WITH PLANS AT SPLICE ENCLOSURE #1. REMOVE EXISTING MESSENGER CABLE.

SEGMENT 'B' – REMOVE EXISTING COMMUNICATIONS CABLE AND MESSENGER CABLE

SEGMENT 'C' – BACK PULL SEGMENT 'C' TO POLE #2 AND REROUTE VIA NEW POLES AND MESSENGER WIRE AND THROUGH RISERS AND CONDUIT SYSTEM AS SHOWN TO SPLICE CABINET #3. INSTALL NEW SPLICE IN ACCORDANCE WITH PLANS AT SPLICE CABINET #3. REMOVE EXISTING MESSENGER CABLE.

7) VERIFY ALL ITS COMPONENTS ALONG NC 98 ARE OPERATIONAL AND COMMUNICATIONS LINKS TO THE CITY OF DURHAM TRAFFIC MANAGEMENT CENTER AND THE TRIANGLE TRANSPORTATION MANAGEMENT CENTER ARE FUNCTIONING AS REQUIRED.

8) REMOVE COMMUNICATIONS CABLE BETWEEN SPLICE CABINET AT POLE #3 NORTHWARD ALONG US 70 TO NEW AERIAL SPLICE ENCLOSURE #4 AS SHOWN IN PLANS.

9) VERIFY CCTV 2007 IS FULLY OPERATIONAL AND COMMUNICATIONS ARE FULLY ESTABLISHED BETWEEN CCTV 2007 AND THE TRIANGLE TRANSPORTATION MANAGEMENT CENTER.

10) REMOVE EXISTING CCTV/POLE/FOUNDATION SUBSEQUENT TO INSTALLATION OF PROPOSED CCTV 2007. ALL EXISITNG CCTV EQUIPMENT SHALL BE RETURNED TO THE RESIDENT ENGINEER AND BE FULLY OPERATIONAL.

NC 98 (HOLLOWAY AVENUE) – TMP PHASE V – STEP 2

11) UPON REMOVAL OF 05–0486, REMOVE MASTER RADIO (05–0463) AND LOCAL RADIO (05–0486) AS WELL AS ALL OMNI ANTENNAS. ALL WIRELESS EQUIPMENT SHALL BE RETURNED TO RESIDENT ENGINEER AND BE FULLY OPERATIONAL.

12) COIL 12 FIBER CABLE RUNNING BETWEEN AERIAL SPLICE ENCLOSURE #4 AND SPLICE CABINET #3 (EE–401) ON SNOW SHOE AND IN SPLICE CABINET FOR FUTURE USE BY OTHERS.

NC 98 (HOLLOWAY AVE.)
TMP PHASE I - STEP 2
TMP PHASE V - STEP 2

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

SCALE 0 50 1"=50'

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 5 Durham County Durham

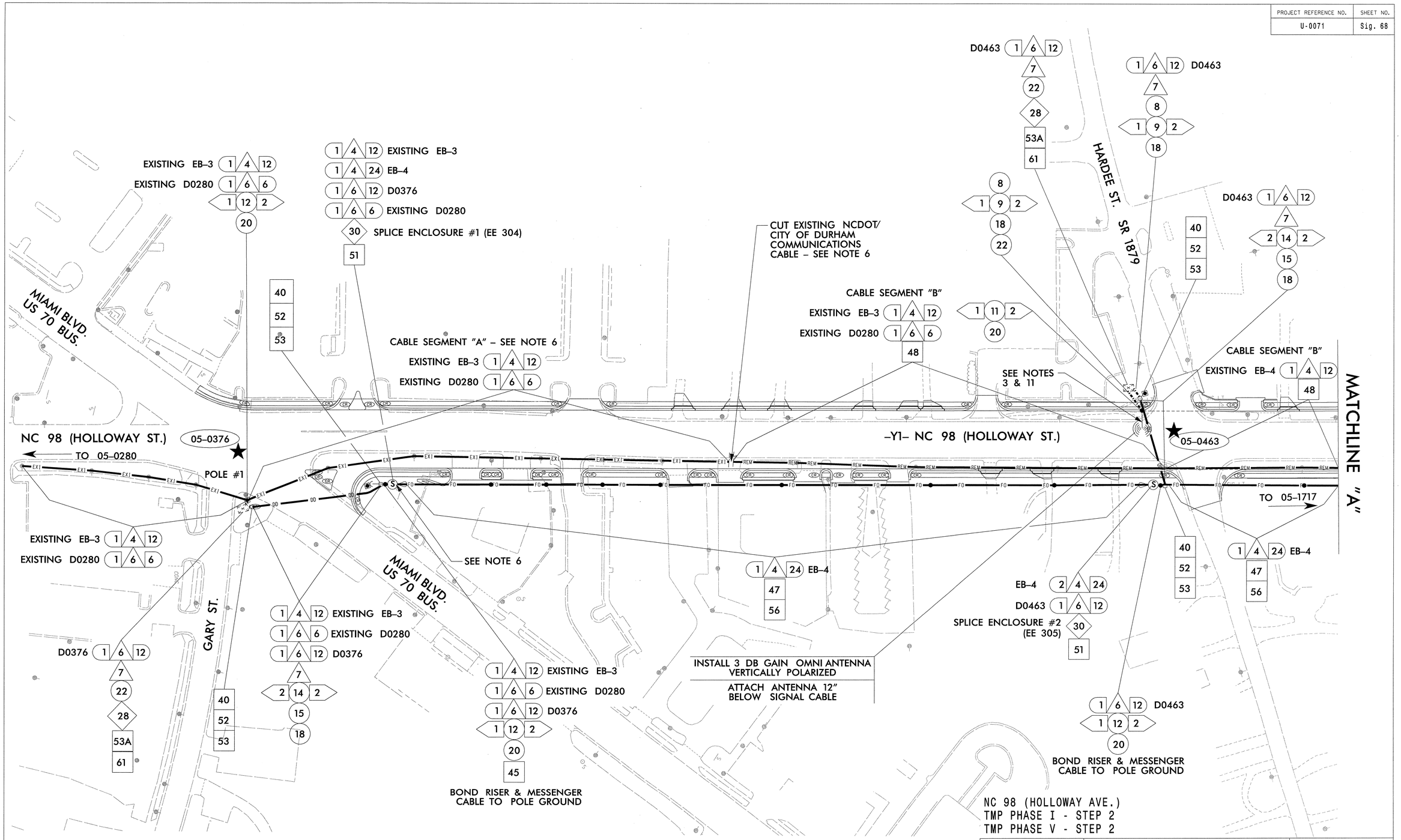
PLAN DATE:	July 2014	REVIEWED BY:	J Hochanadel
PREPARED BY:	R Drayton	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 7/2/14 DATE
SIG. INVENTORY NO.

$$$$USERNAME$$$$
$$$$SIGNDATE$$$$
$$$$SIGNTIME$$$$
$$$$SYSTIME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 68



NC 98 (HOLLOWAY AVE.)
TMP PHASE I - STEP 2
TMP PHASE V - STEP 2

Prepared for the Offices of:
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Signal Design Section
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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SEPI
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SCALE
0 50
1"=50'

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

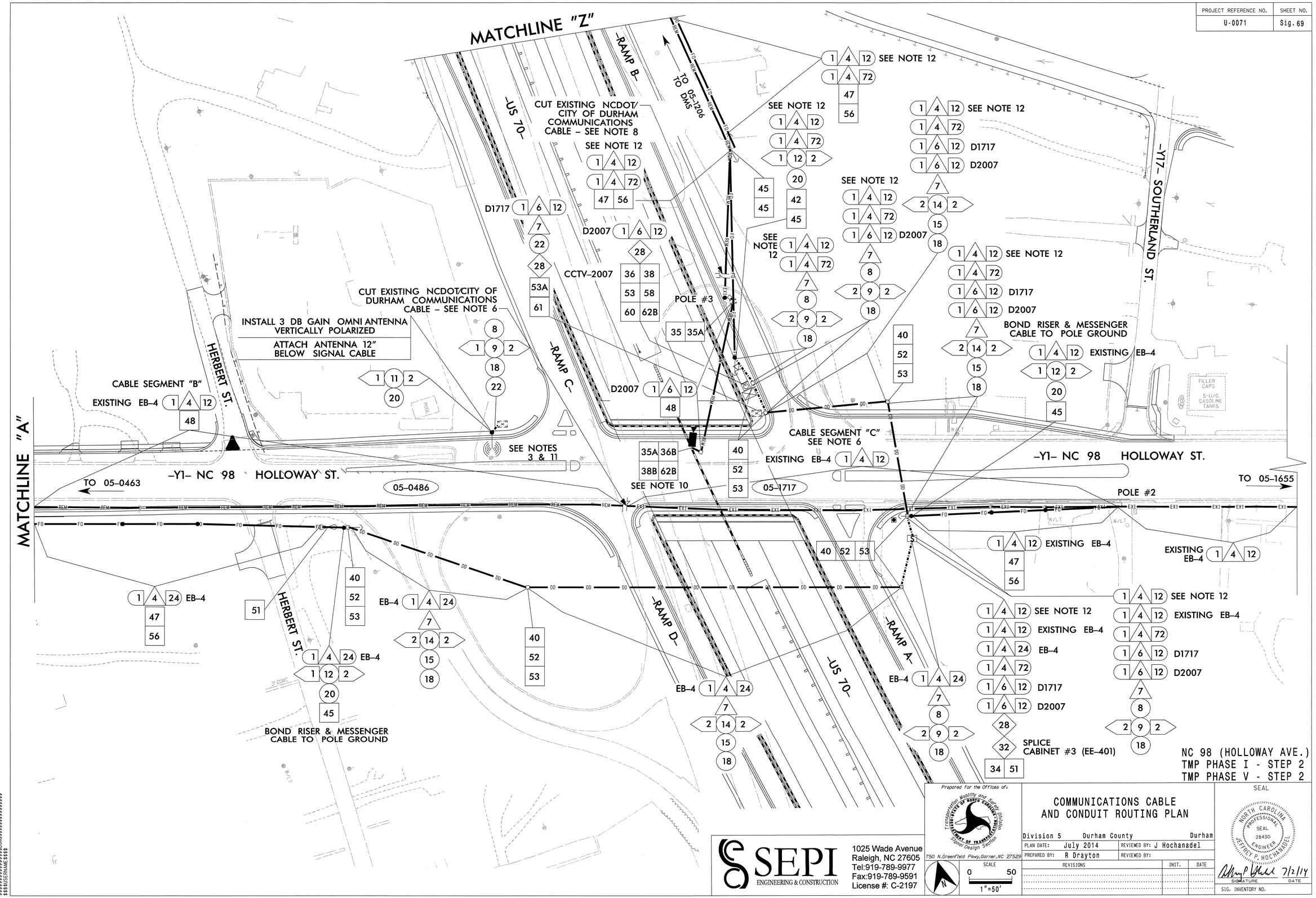
Division 5 Durham County Durham

PLAN DATE: November 2013		REVIEWED BY: J Hochanadel	
PREPARED BY: R Drayton		REVIEWED BY:	
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 12/2/13 DATE
SIG. INVENTORY NO.

$$$$$SYSTIME$$$$$
$$$$$USERNAME$$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 69



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SCALE 0 50 1"=50'

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 5 Durham County Durham

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PREPARED BY:	R Drayton	REVIEWED BY:	

REVISIONS	INIT.	DATE

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NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 7/2/14 DATE
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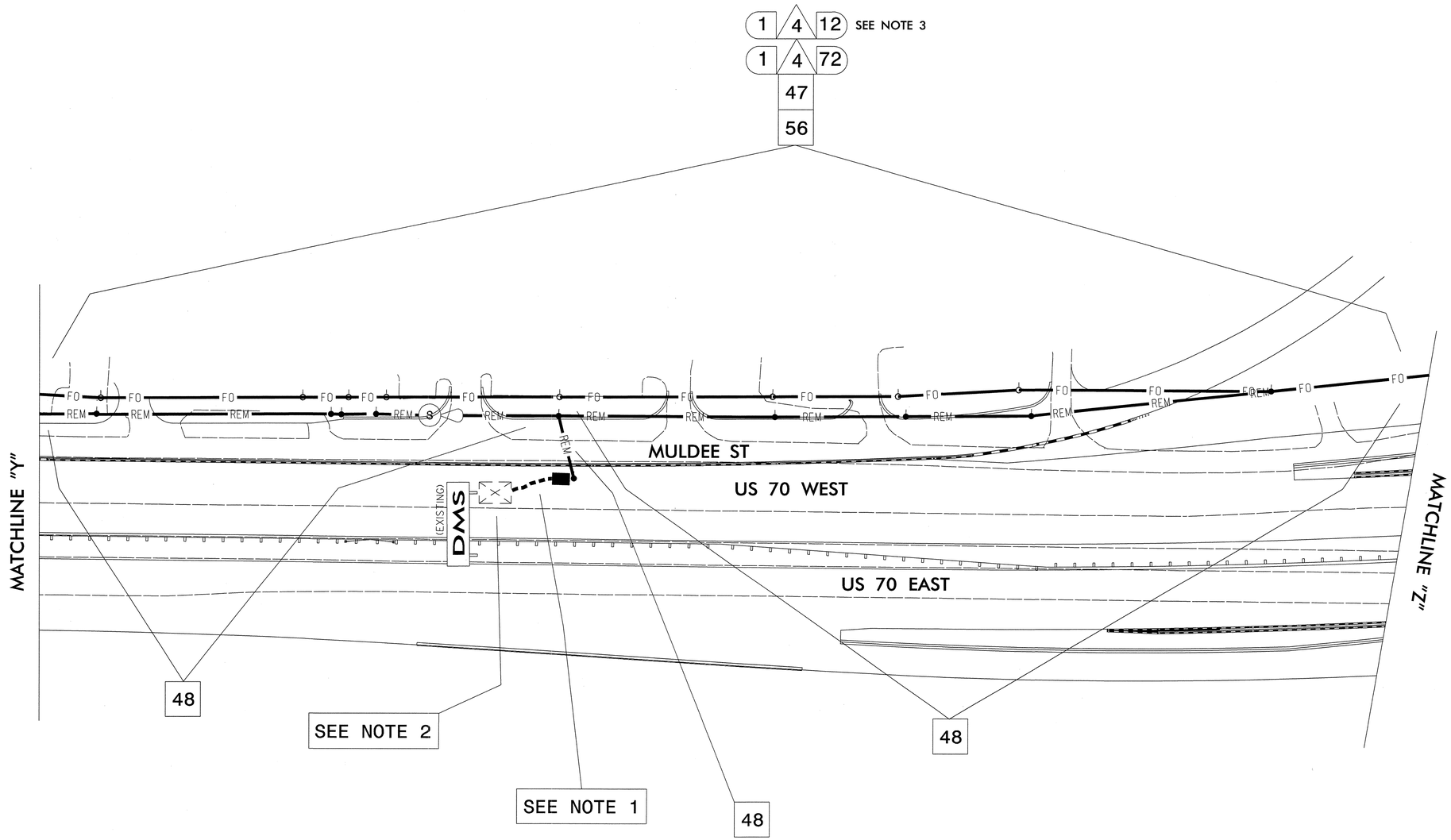
PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 69A



NOTES:

1. CUT, BACKPULL, AND DISCARD FIBER OPTIC CABLE. REMOVE JUNCTION BOX AND BACKFILL WITH SUITABLE MATERIAL TO GRADE.

2. RELOCATE DMS AND DMS CONTROLLER CABINET TO NEW LOCATION (SEE SHEET 69B). RELOCATE ETHERNET SWITCH FOR MVD'S TO NEW LOCATION.

3. COIL 12 FIBER CABLE RUNNING BETWEEN AERIAL SPLICE ENCLOSURE #4 AND SPLICE CABINET #3 (EE-401) ON SNOW SHOE AND IN THE SPLICE CABINET FOR FUTURE USE BY OTHERS.

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SCALE 0 60 1"=60'

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 5 Durham County Durham

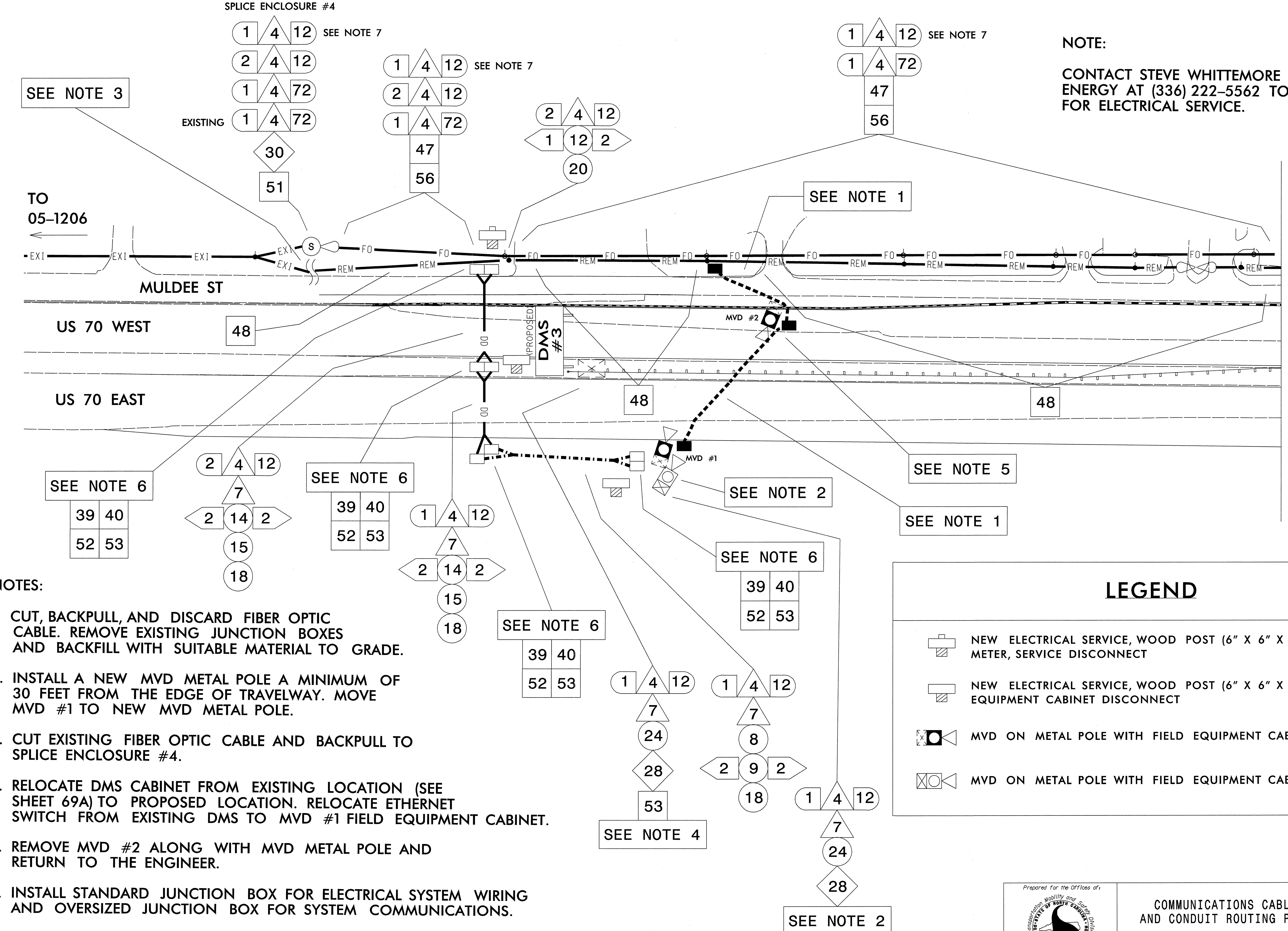
PLAN DATE:	July 2014	REVIEWED BY:	J Hochanadel
PREPARED BY:	R Drayton	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 7/2/14 DATE

SIG. INVENTORY NO.



NOTE:

CONTACT STEVE WHITTEMORE WITH DUKE ENERGY AT (336) 222-5562 TO OBTAIN POWER FOR ELECTRICAL SERVICE.

NOTES:

1. CUT, BACKPULL, AND DISCARD FIBER OPTIC CABLE. REMOVE EXISTING JUNCTION BOXES AND BACKFILL WITH SUITABLE MATERIAL TO GRADE.
2. INSTALL A NEW MVD METAL POLE A MINIMUM OF 30 FEET FROM THE EDGE OF TRAVELWAY. MOVE MVD #1 TO NEW MVD METAL POLE.
3. CUT EXISTING FIBER OPTIC CABLE AND BACKPULL TO SPLICE ENCLOSURE #4.
4. RELOCATE DMS CABINET FROM EXISTING LOCATION (SEE SHEET 69A) TO PROPOSED LOCATION. RELOCATE ETHERNET SWITCH FROM EXISTING DMS TO MVD #1 FIELD EQUIPMENT CABINET.
5. REMOVE MVD #2 ALONG WITH MVD METAL POLE AND RETURN TO THE ENGINEER.
6. INSTALL STANDARD JUNCTION BOX FOR ELECTRICAL SYSTEM WIRING AND OVERSIZED JUNCTION BOX FOR SYSTEM COMMUNICATIONS.
7. COIL 12 FIBER CABLE RUNNING BETWEEN AERIAL SPLICE ENCLOSURE #4 AND SPLICE CABINET #3 (EE-401) ON SNOW SHOE AND IN THE SPLICE CABINET FOR FUTURE USE BY OTHERS.

LEGEND

- NEW ELECTRICAL SERVICE, WOOD POST (6" X 6" X 8'), METER, SERVICE DISCONNECT
- NEW ELECTRICAL SERVICE, WOOD POST (6" X 6" X 8'), EQUIPMENT CABINET DISCONNECT
- MVD ON METAL POLE WITH FIELD EQUIPMENT CABINET (EXISTING)
- MVD ON METAL POLE WITH FIELD EQUIPMENT CABINET (PROPOSED)

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750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 60 1"=60'

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 5	Durham County	Durham
PLAN DATE: July 2014	REVIEWED BY: J Hochanadel	
PREPARED BY: R Drayton	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 7/2/14 DATE

SIG. INVENTORY NO.

$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 70

CABLE ROUTING NOTES:

US 70 – TMP PHASE I – STEP 2

1) REVIEW INTERMEDIATE CONTRACT TIME ASSOCIATED WITH THIS WORK. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING EXISTING COMMUNICATIONS THROUGHOUT CONSTRUCTION.

2) RECORD THE EXISTING SPLICING ARRANGEMENTS AT 05–0413; 05–0392; AND 05–0393 AND ANY ASSOCIATED SPICE ENCLOSURES FOR COMPARISON TO THE SUPPLIED SPLICE PLANS. IF DISCREPANCIES EXIST, CONTACT MR. PETE NICHOLAS (919–560–4366) OF THE "CITY OF DURHAM TRAFFIC MANAGEMENT CENTER" TO DETERMINE HOW TO PROCEED WITH RE–SPLICING.

3) INSTALL WIRELESS COMMUNICATIONS LINK BETWEEN 05–0413, 05–0392 AND 05–0393. INSTALL MASTER RADIO AT 05–0393 AND LOCAL RADIOS AT 05–0413 AND 05–0392. MAINTAIN WIRELESS COMMUNICATIONS BETWEEN INTERSECTIONS UNTIL IMPLEMENTATION OF TMP PHASE VI STEP 2. REMOVE EXISTING FIBER OPTIC COMMUNICATIONS CABLES, MESSENGER CABLE AND POLE LINE HARDWARE BETWEEN 05–0413 AND 05–0393.

4) INSTALL PROPOSED CONDUIT SYSTEM AND NEW FIBER OPTIC COMMUNICATIONS CABLE FROM SPLICE CABINET #5 TO 05–0393, FROM SPLICE CABINET #5 TO AERIAL SPLICE ENCLOSURE #6, AND FROM SPLICE CABINET #5 TO AERIAL SPLICE ENCLOSURE #7. INSTALL NEW SPLICE IN ACCORDANCE WITH PLANS AT SPLICE CABINET #5.

5) INSTALL PROPOSED CONDUIT SYSTEM AND NEW FIBER OPTIC COMMUNICATIONS CABLE EB–5 FROM SPLICE CABINET #5 TO WOODEN POLE LOCATED AT –Y3– US 70 STA 36+30+/– INSTALL OVERHEAD STORAGE RACK AND COIL 800 FEET OF FIBER OPTIC COMMUNICATIONS CABLE.

6) PROVIDE SEVEN (7) DAYS NOTICE TO THE CITY OF DURHAM TRAFFIC MANAGEMENT CENTER PRIOR TO BEGINNING CUT–OVER TO NEW FIBER OPTIC COMMUNICATIONS CABLE. PRIOR TO CUTTING AND REMOVING ANY EXISTING FIBER OPTIC COMMUNICATIONS CABLE, CONTRACTOR SHALL MAKE PREPARATIONS TO HAVE NEW CABLES INSTALLED AND READY FOR TERMINATIONS TO MINIMIZE SYSTEM DOWNTIME.

7) BEGIN CUT–OVER TO NEW FIBER OPTIC COMMUNICATIONS CABLE. CUT THE EXISTING FIBER OPTIC COMMUNICATIONS CABLE AND BACK PULL SEGEMENT 'A' TO AERIAL SPLICE ENCLOSURE #6. INSTALL NEW SPLICE IN ACCORDANCE WITH PLANS AT SPLICE ENCLOSURE #6.

8) CUT THE EXISTING FIBER OPTIC COMMUNICATIONS CABLE CABLE AND BACK PULL SEGEMENT 'B' TO AERIAL SPLICE ENCLOSURE #7. INSTALL NEW SPLICE IN ACCORDANCE WITH PLANS AT SPLICE ENCLOSURE #7.

9) VERIFY ALL ITS COMPONENTS ALONG US 70 ARE OPERATIONAL AND COMMUNICATIONS LINKS TO THE CITY OF DURHAM TRAFFIC MANAGEMENT CENTER ARE FUNCTIONING AS REQUIRED.

US 70 – TMP PHASE VI – STEP 2

10) INSTALL CONDUIT SYSTEM BETWEEN WOODEN POLE LOCATED AT –Y3– US 70 STA 36+30+/– (INSTALLED DURING TMP PHASE I – STEP 2) AND OVERSIZE JB LOCATED AT –Y4– US 70 STA 41+05+/–. UNCOIL FIBER OPTIC COMMMUNICATIONS CABLE EB–5 AND REROUTE TO NEW OVERSIZED JUNCTION BOX AT –Y4– US 70 STA 41+05+/–. COIL 100 FEET OF SPARE FIBER OPTIC COMMUNICATIONS CABLE IN NEW OVERSIZED JUNCTION BOX FOR FUTURE USE BY OTHERS AND REMAINDER ON OVERHEAD STORAGE RACK LOCATED AT –Y3– US 70 STA 36+30+/–.

11) UPON REMOVAL OF 05–0413 AND 05–0392, REMOVE MASTER RADIO (05–0393) AND LOCAL RADIOS (05–0413 AND 05–0392) AS WELL AS ALL YAGI ANTENNAS. ALL WIRELESS EQUIPMENT SHALL BE RETURNED TO THE RESIDENT ENGINEER AND BE FULLY OPERATIONAL.

US 70
TMP PHASE I - STEP 2
TMP PHASE VI - STEP 2

SEPI ENGINEERING & CONSTRUCTION
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Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50 1"=50'

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 5 Durham County Durham

PLAN DATE: November 2013 REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 12/2/13 DATE
SIG. INVENTORY NO.

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
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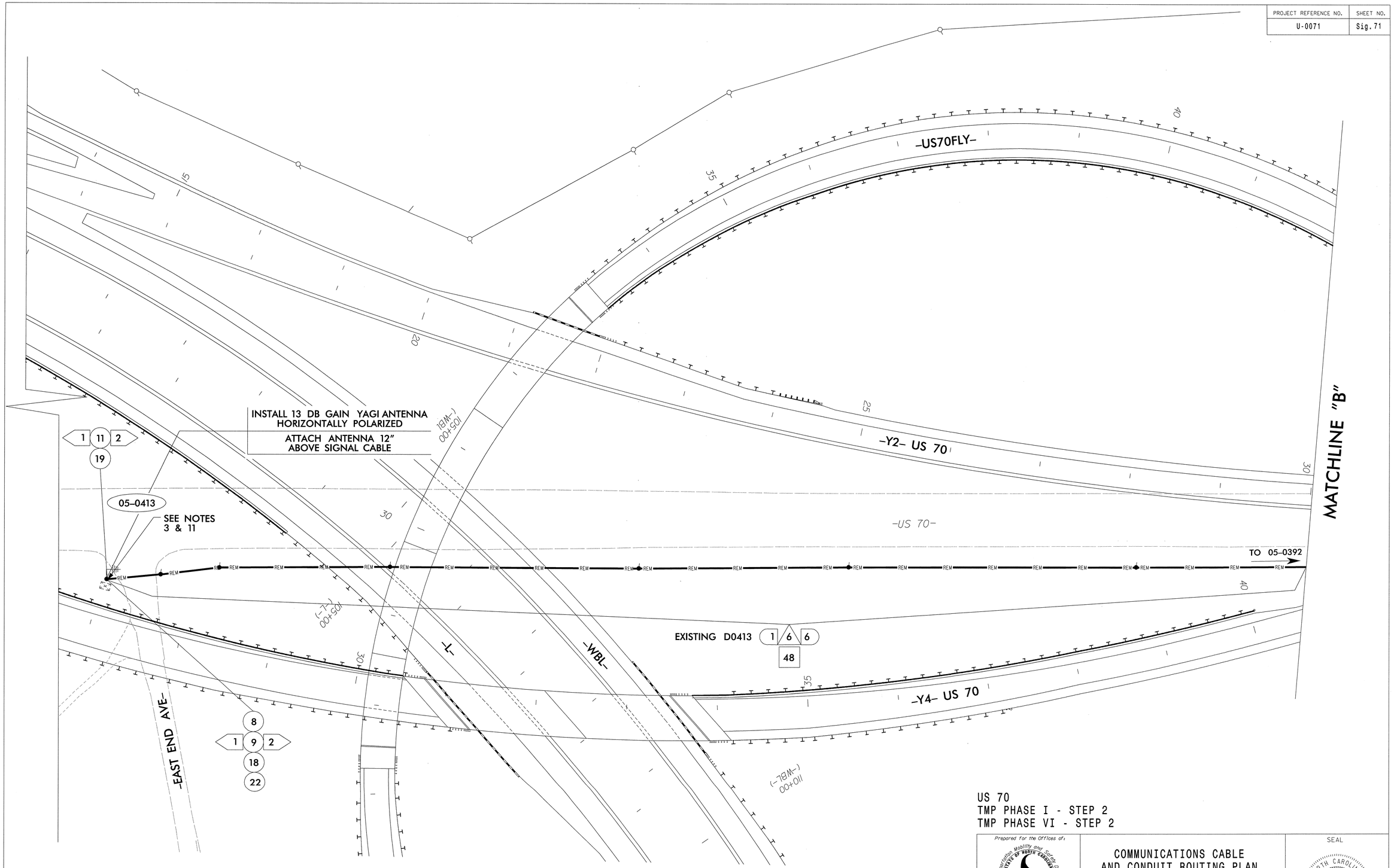
PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 71



US 70
TMP PHASE I - STEP 2
TMP PHASE VI - STEP 2

Prepared for the Offices of:
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STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE
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1"=50'

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 5 Durham County Durham

PLAN DATE:	November 2013	REVIEWED BY:	J Hochanadel
PREPARED BY:	R Drayton	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 12/2/13 DATE
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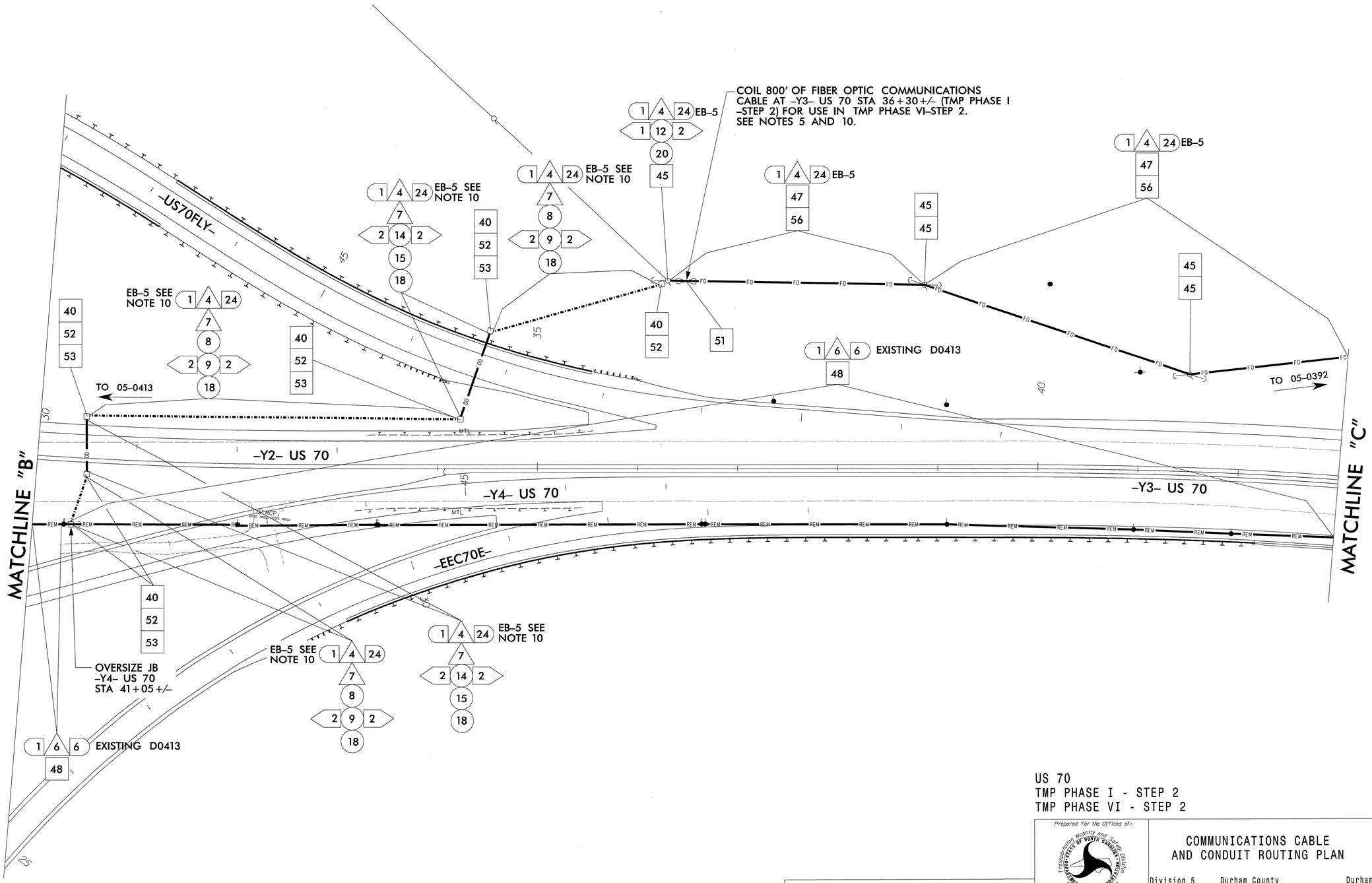
PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.72



US 70
TMP PHASE I - STEP 2
TMP PHASE VI - STEP 2

SEPI
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COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 5 Durham County Durham

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SIGNATURE 12/2/13 DATE

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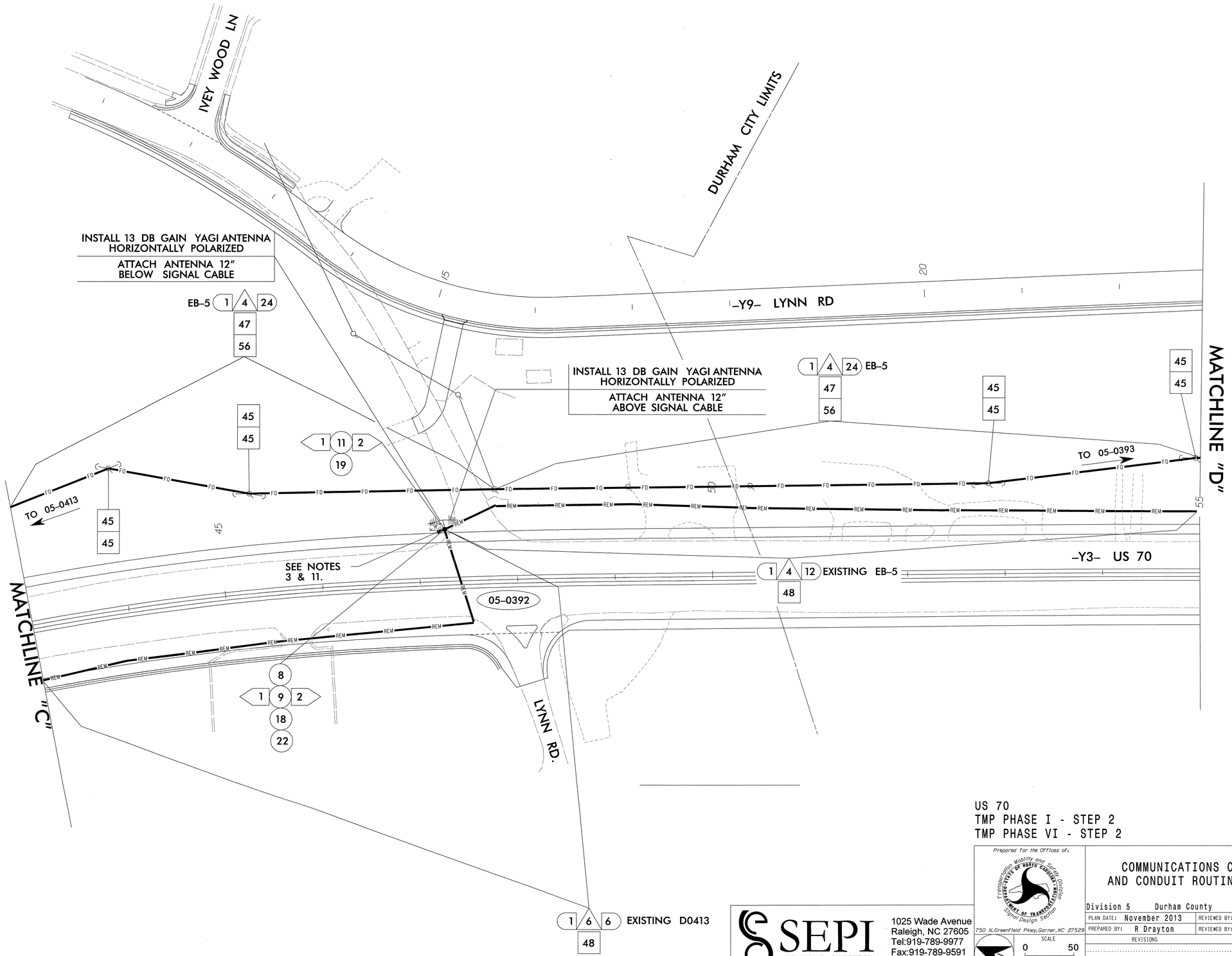
PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 73



US 70
TMP PHASE I - STEP 2
TMP PHASE VI - STEP 2

Prepared for 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

SCALE 0 50 1"=50'

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 5 Durham County Durham

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PREPARED BY: R Drayton REVIEWED BY:

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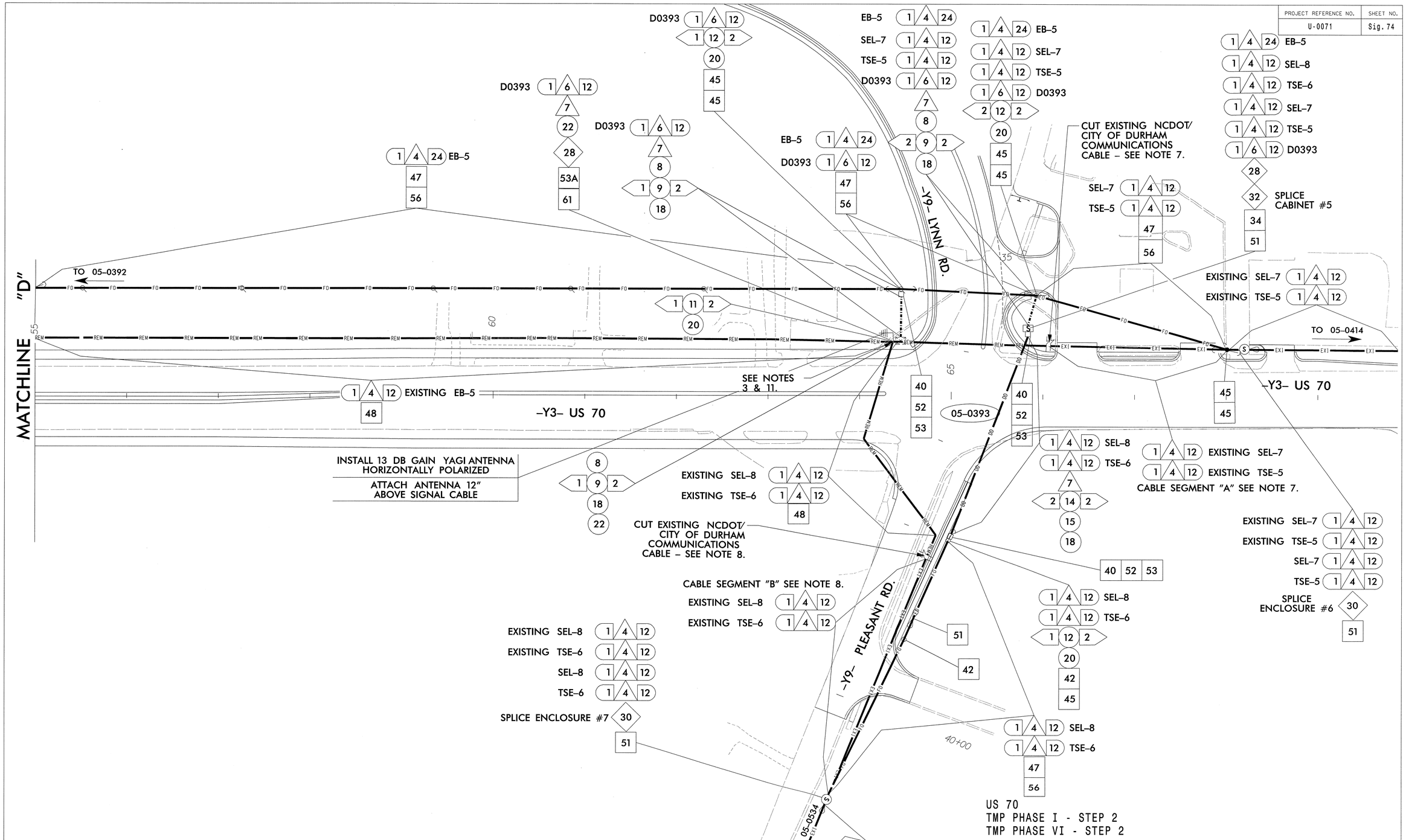
PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 74



US 70
TMP PHASE I - STEP 2
TMP PHASE VI - STEP 2

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$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 75

CABLE ROUTING NOTES:
ANGIER AVENUE TMP PHASE I

1) REVIEW INTERMEDIATE CONTRACT TIME ASSOCIATED WITH THIS WORK. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING EXISTING COMMUNICATIONS THROUGHOUT CONSTRUCTION.

2) INSTALL PROPOSED CONDUIT SYSTEM AND RISERS AS SHOWN ON THE PLANS AROUND BRIDGE TO AVOID CONSTRUCTION ACTIVITIES AND MINIMIZE DAMAGE. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING COMMUNICATIONS THROUGHOUT CONSTRUCTION. INSTALL NEW FIBER OPTIC COMMUNICATIONS CABLE BETWEEN SPLICE ENCLOSURE #8 AND SPLICE ENCLOSURE #9 AS SHOWN.

3) PROVIDE SEVEN (7) DAYS NOTICE TO THE CITY OF DURHAM TRAFFIC MANAGEMENT CENTER PRIOR TO BEGINNING CUT–OVER TO NEW FIBER OPTIC COMMUNICATIONS CABLE. PRIOR TO CUTTING AND REMOVING ANY EXISTING FIBER OPTIC COMMUNICATIONS CABLE, CONTRACTOR SHALL MAKE PREPARATIONS TO HAVE NEW CABLES INSTALLED AND READY FOR TERMINATIONS TO MINIMIZE SYSTEM DOWNTIME.

4) BEGIN CUT–OVER TO NEW FIBER OPTIC COMMUNICATIONS CABLE. CUT THE EXISTING FIBER OPTIC COMMUNICATIONS CABLE APPROXIMATELY 100 FT NORTHWEST OF SPLICE ENCLOSURE #8 AND AND BACK PULL THE FIBER OPTIC COMMUNICATIONS CABLE TO SPLICE ENCLOSURE #8. CUT THE EXISTING FIBER OPTIC COMMUNICATIONS CABLE APPROXIMATELY 100 FT SOUTHEAST OF SPLICE ENCLOSURE #9 AND AND BACK PULL THE FIBER OPTIC COMMUNICATIONS CABLE TO SPLICE ENCLOSURE #9.

5) INSTALL NEW SPLICE IN ACCORDANCE WITH PLANS AT SPLICE ENCLOSURE #8 AND SPLICE ENCLOSURE #9.

6) VERIFY ALL COMMUNICATIONS LINKS TO THE CITY OF DURHAM TRAFFIC MANAGEMENT CENTER ARE ARE OPERATIONAL AND FUNCTIONING AS REQUIRED.

7) REMOVE EXISTING FIBER OPTIC COMMUNICATIONS CABLES, MESSENGER CABLE AND POLE LINE HARDWARE AS SHOWN IN PLANS.

ANGIER AVENUE
TMP PHASE I

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Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50
1"=50'

COMMUNICATIONS CABLE
AND CONDUIT ROUTING PLAN

Division 5 Durham County Durham

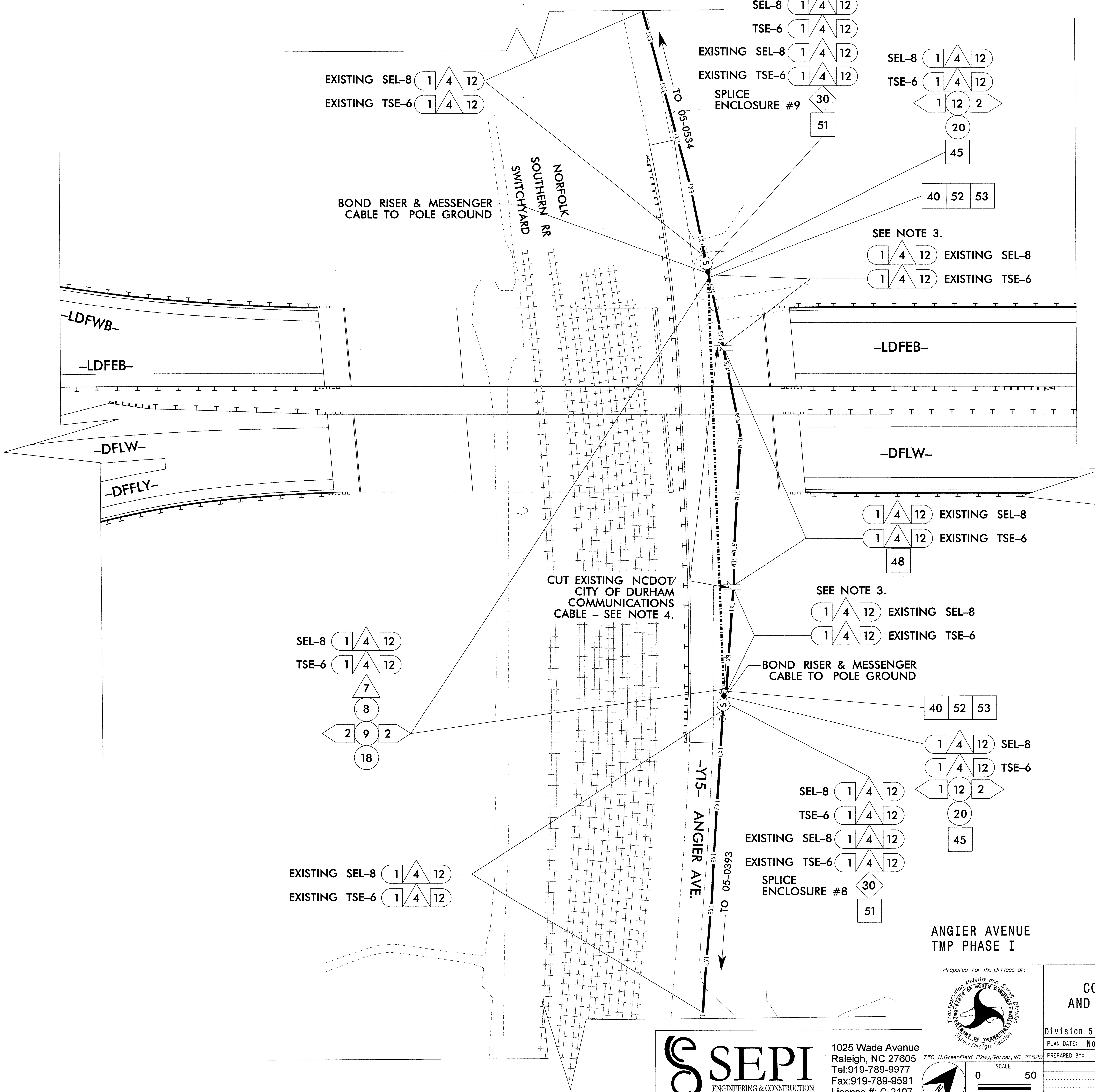
PLAN DATE: November 2013 REVIEWED BY: J Hochanadel
PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 12/2/13 DATE
SIG. INVENTORY NO.

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$BUSERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 76



ANGIER AVENUE
TMP PHASE I

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

Prepared for 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

SCALE 0 50
1"=50'

COMMUNICATIONS CABLE
AND CONDUIT ROUTING PLAN

Division 5	Durham County	Durham
PLAN DATE: November 2013	REVIEWED BY: J Hochanadel	
PREPARED BY: R Drayton	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 12/2/13 DATE
SIG. INVENTORY NO.

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.77

CABLE ROUTING NOTES:

NC 147 (DURHAM FREEWAY) – TMP PHASE II – STEP 2

1) REVIEW INTERMEDIATE CONTRACT TIME ASSOCIATED WITH THIS WORK. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING EXISTING COMMUNICATIONS THROUGHOUT CONSTRUCTION.

2) LOCATE EXISTING CCTV–8; CCTV–7; AND SPLICE ENCLOSURE #12. RECORD THE EXISTING SPLICING ARRANGEMENTS FOR COMPARISON TO THE SUPPLIED SPLICE PLANS. IF DISCREPANCIES EXIST, CONTACT MR. ED SIRGANY @ 919–825–2636 OF THE TRIANGLE TRANSPORTATION MANAGEMENT CENTER TO DETERMINE HOW TO PROCEED WITH RE–SPLICING.

3) PRIOR TO PERFORMING ANY WORK RELATED TO INSTALLING OR REMOVING THE FIBER OPTIC COMMUNICATIONS CABLE OVER THE CSX RAILROAD TRACKS PROVIDE A MINIMUM OF 30 DAYS NOTICE TO CSX TO OBTAIN FLAGMEN. ENSURE ALL INSURANCE REQUIREMENTS ARE MET (SEE PSP).

4) INSTALL PROPOSED DIRECTIONAL DRILL AND TRENCHED CONDUIT AND WOODEN POLES WITH MESSENGER WIRE AS SHOWN ON THE PLANS. INSTALL CONDUIT SYSTEM AROUND NC 147/US 70 INTERCHANGE/BRIDGE TO AVOID CONSTRUCTION ACTIVITIES AND MINIMIZE DAMAGE. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING COMMUNICATIONS THROUGHOUT CONSTRUCTION. INSTALL NEW FIBER OPTIC COMMUNICATIONS CABLE BETWEEN SPLICE ENCLOSURE #10 AND SPLICE ENCLOSURE #12 AS SHOWN. INSTALL NEW SPLICE IN ACCORDANCE WITH PLANS AT SPLICE ENCLOSURE #11.

5) PROVIDE SEVEN (7) DAYS NOTICE TO THE THE TRIANGLE TRANSPORTATION MANAGEMENT CENTER PRIOR TO BEGINNING CUT–OVER TO NEW FIBER OPTIC COMMUNICATIONS CABLE. PRIOR TO CUTTING AND REMOVING ANY EXISTING FIBER OPTIC COMMUNICATIONS CABLE, CONTRACTOR SHALL MAKE PREPARATIONS TO HAVE NEW CABLES INSTALLED AND READY FOR TERMINATIONS TO MINIMIZE SYSTEM DOWNTIME.

6) BEGIN CUT–OVER TO NEW FIBER OPTIC COMMUNICATIONS LINE. DISCONNECT AND CUT THE EXISTING FIBER OPTIC COMMUNICATIONS CABLE AT EXISTING CCTV–8 (TO BE REMOVED). LOCATE EXISTING JUNCTION BOX #1 AND BACK PULL THE FIBER OPTIC COMMUNICATIONS CABLE TO THIS LOCATION.

7) LOCATE THE EXISTING CONDUIT SYSTEM IN THE VICINITY OF THE PROPOSED CCTV–8 AND INTERCEPT THE CONDUIT SYSTEM. PLACE PROPOSED OVERSIZED JUNCTION BOX AT NC 147 WB –DFWB– STA 15+25+/– OVER EXISTING CONDUIT AND PREVIOUSLY INSTALLED DIRECTIONAL DRILL CONDUIT ACROSS NC 147.

8) RE–ROUTE EXISTING FIBER OPTIC COMMUNICATIONS CABLE THAT WAS BACK PULLED IN NOTE #6 ABOVE IN EXISTING CONDUIT TO PROPOSED OVERSIZED JUNCTION BOX INSTALLED IN NOTE #7. INSTALL NEW SPLICE IN ACCORDANCE WITH PLANS AT SPLICE ENCLOSURE #10. RELOCATE AND REUSE EXISTING FIBER OPTIC VIDEO TRANSMITTER WITH DATA, MICROWAVE VEHICLE DETECTOR (MVD– 6) ETHERNET TRANSCIEVER AND INSTALL NEW VIDEO ENCODER AT CCTV–8.

9) LOCATE THE EXISTING CONDUIT SYSTEM IN THE VICINITY OF THE SPLICE ENCLOSURE #12. DISCONNECT AND CUT THE EXISTING FIBER OPTIC COMMUNICATIONS CABLE AT EXISTING JUNCTION BOX #2. INSTALL NEW SPLICE IN ACCORDANCE WITH PLANS AT SPLICE ENCLOSURE #12. CONNECT EXISTING CCTV–7 AND MVD–5.

10) VERIFY ALL ITS COMPONENTS ALONG NC 147 ARE OPERATIONAL AND COMMUNICATIONS LINKS TO THE TRIANGLE TRANSPORTATION MANAGEMENT CENTER ARE FUNCTIONING AS REQUIRED.

11) REMOVE EXISTING FIBER OPTIC COMMUNICATIONS CABLES, MESSENGER CABLE, WOODEN POLES, POLE LINE HARDWARE AND CCTV POLES, FOUNDATIONS AND ANCILLARY HARDWARE. WHERE AN UNDERGROUND CONDUIT SYSTEM EXISTS THAT REQUIRES REMOVAL OF THE FIBER OPTIC CABLE, REMOVE THE JUNCTION BOX AND BACKFILL WITH SUITABLE MATERIAL. ABANDON REMAINING CONDUIT IN PLACE.

NC 147 (DURHAM FREEWAY)
TMP PHASE II - STEP 2

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License #: C-2197

Prepared for 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

SCALE 0 50 1"=50'

CABLE ROUTING / SPLICE NOTES

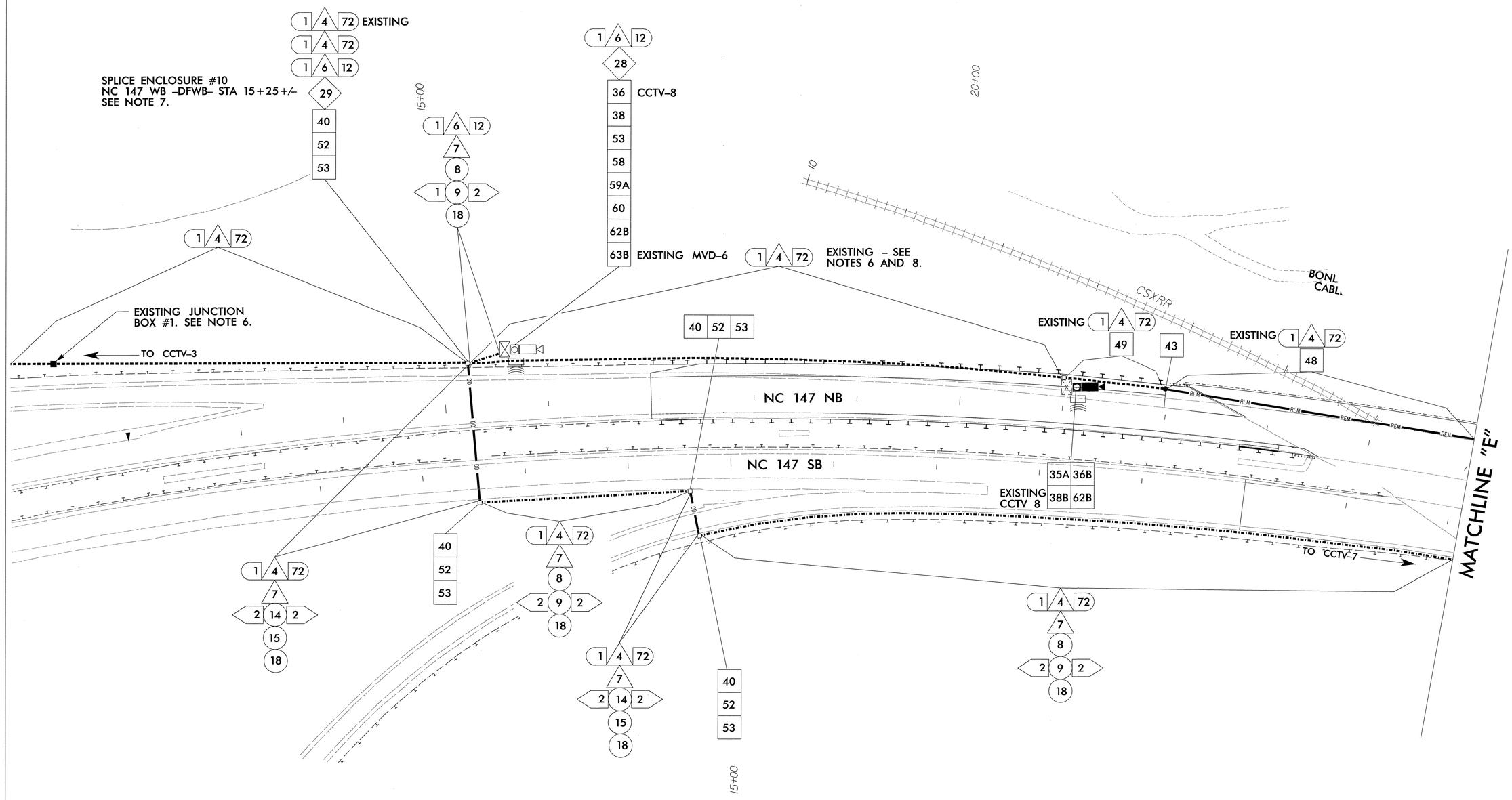
Division 5 Durham County Durham

PLAN DATE: November 2013		REVIEWED BY: J Hochanadel	
PREPARED BY: R Drayton		REVIEWED BY:	
REVISIONS		INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 12/2/13 DATE
SIG. INVENTORY NO.

$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 78



NC 147 (DURHAM FREEWAY)
TMP PHASE II - STEP 2

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COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 5 Durham County Durham

PLAN DATE: November 2013 REVIEWED BY: J Hochanadel

PREPARED BY: R Drayton REVIEWED BY:

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NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 12/2/13 DATE

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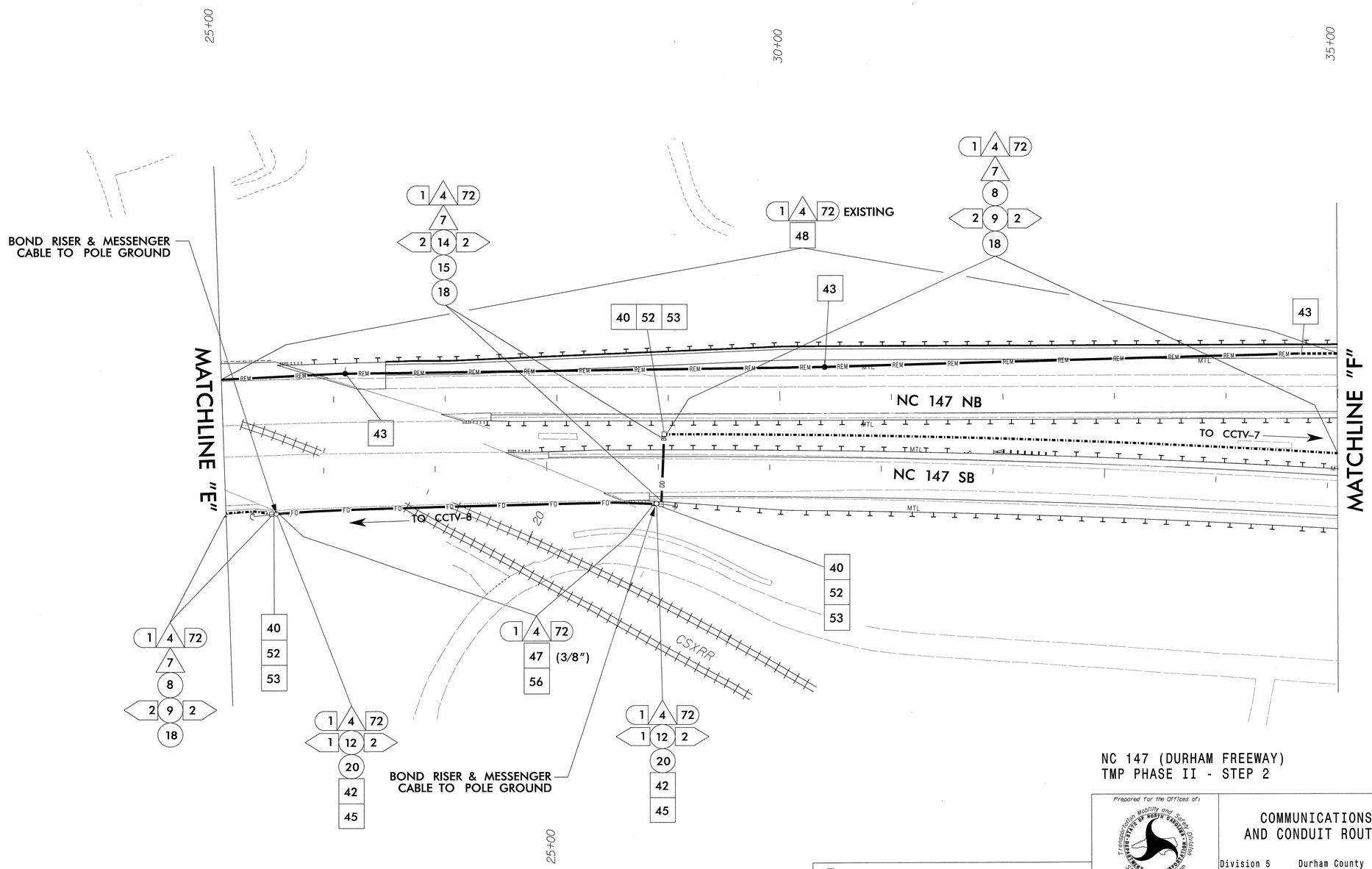
U-0071	Sig. 79



NC 147 (DURHAM FREEWAY)
TMP PHASE II - STEP 2

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750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 50
1"=50'

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 5 Durham County Durham

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PREPARED BY: R Drayton REVIEWED BY:

REVISIONS	INIT.	DATE

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SEAL
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SIGNATURE 11/21/13 DATE

SIG. INVENTORY NO.

$$$$$$SYSTIME$$$$$
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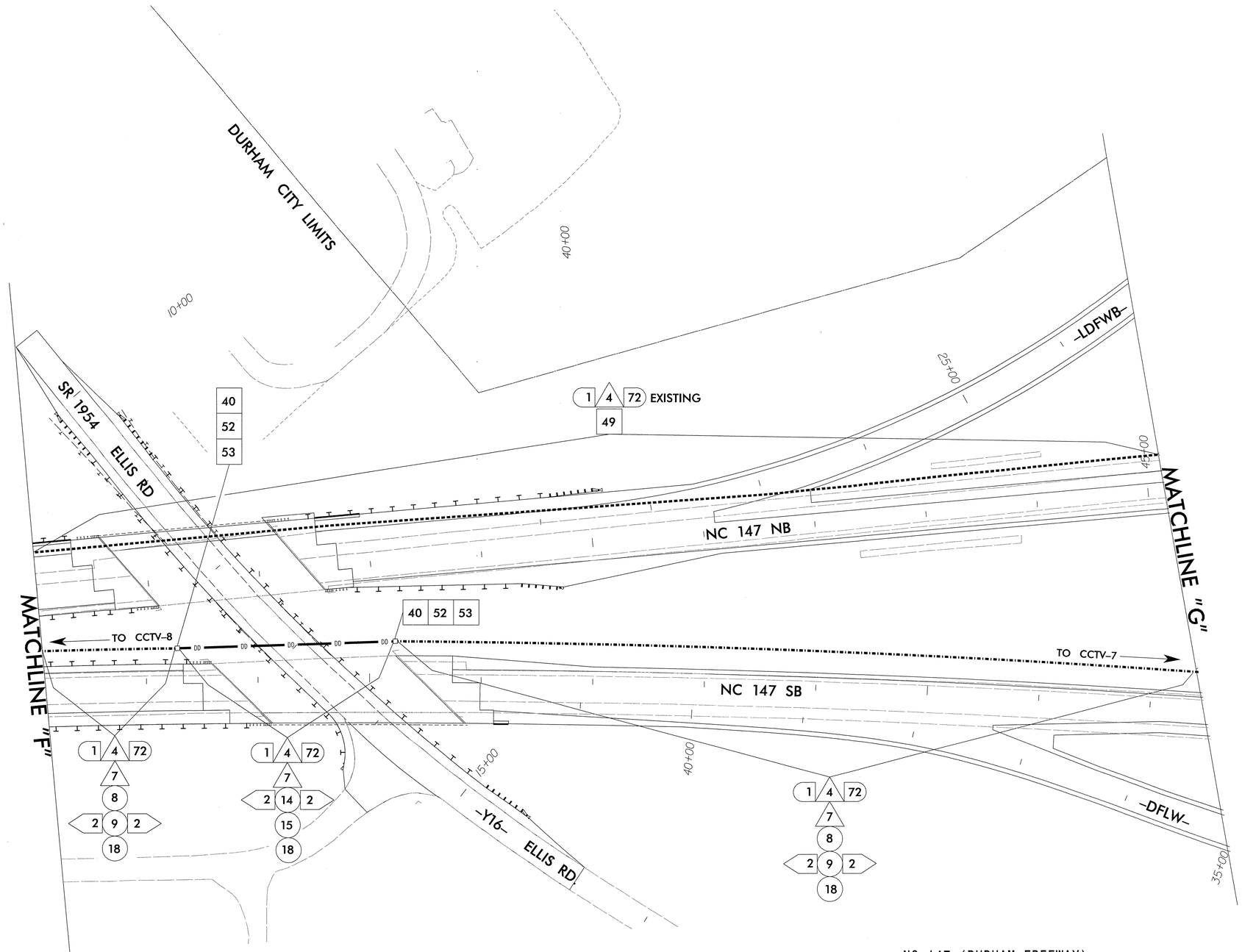
PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.80



NC 147 (DURHAM FREEWAY)
TMP PHASE II - STEP 2

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COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 5 Durham County Durham

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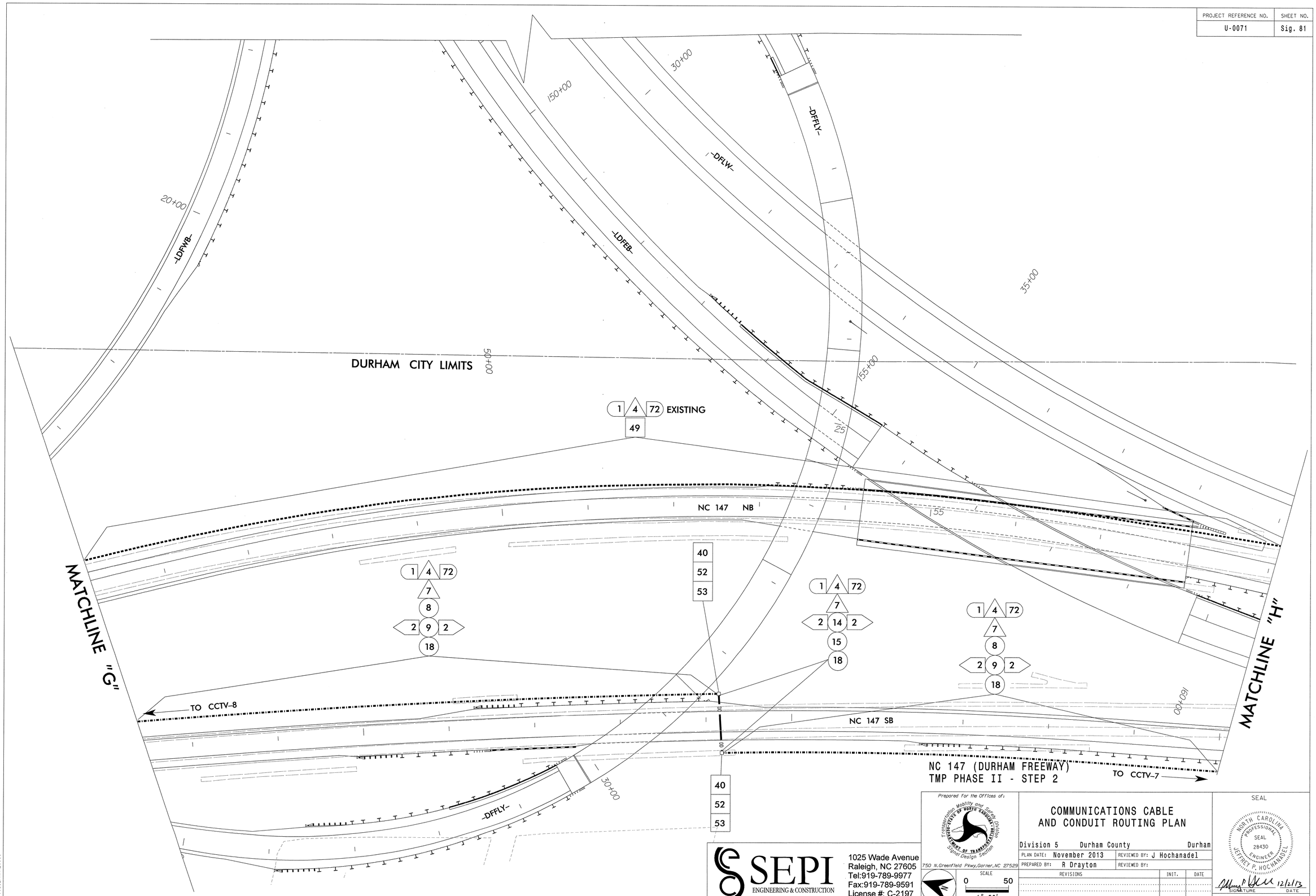
PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 81



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COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 5 Durham County Durham

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PREPARED BY:	R Drayton	REVIEWED BY:	

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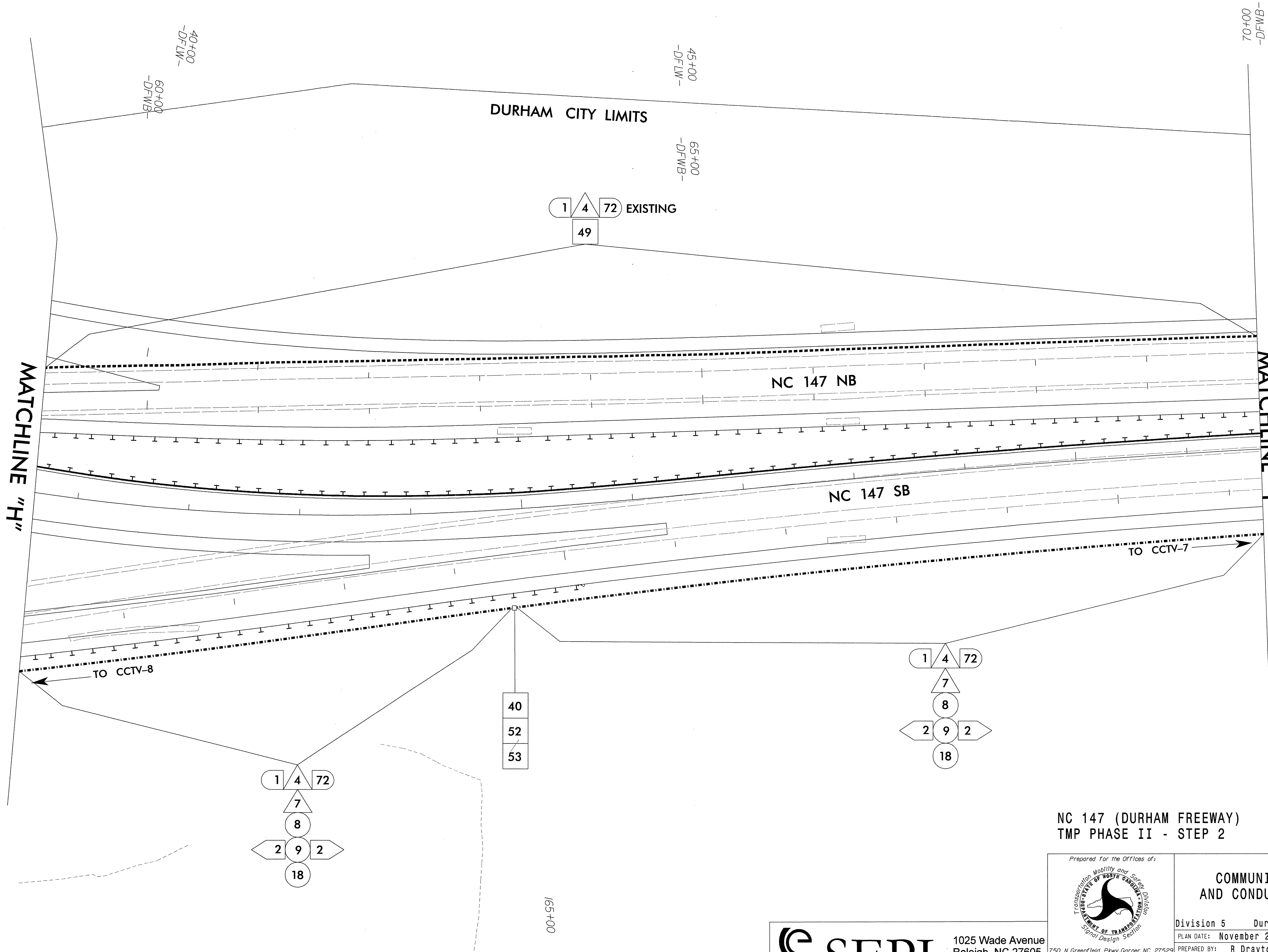
SIGNATURE 12/2/13 DATE

SIG. INVENTORY NO.

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 82



NC 147 (DURHAM FREEWAY)
TMP PHASE II - STEP 2

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STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
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SCALE 0 50 1"=50'

COMMUNICATIONS CABLE
AND CONDUIT ROUTING PLAN

Division 5 Durham County Durham

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$$$$$SYSTIME$$$$$
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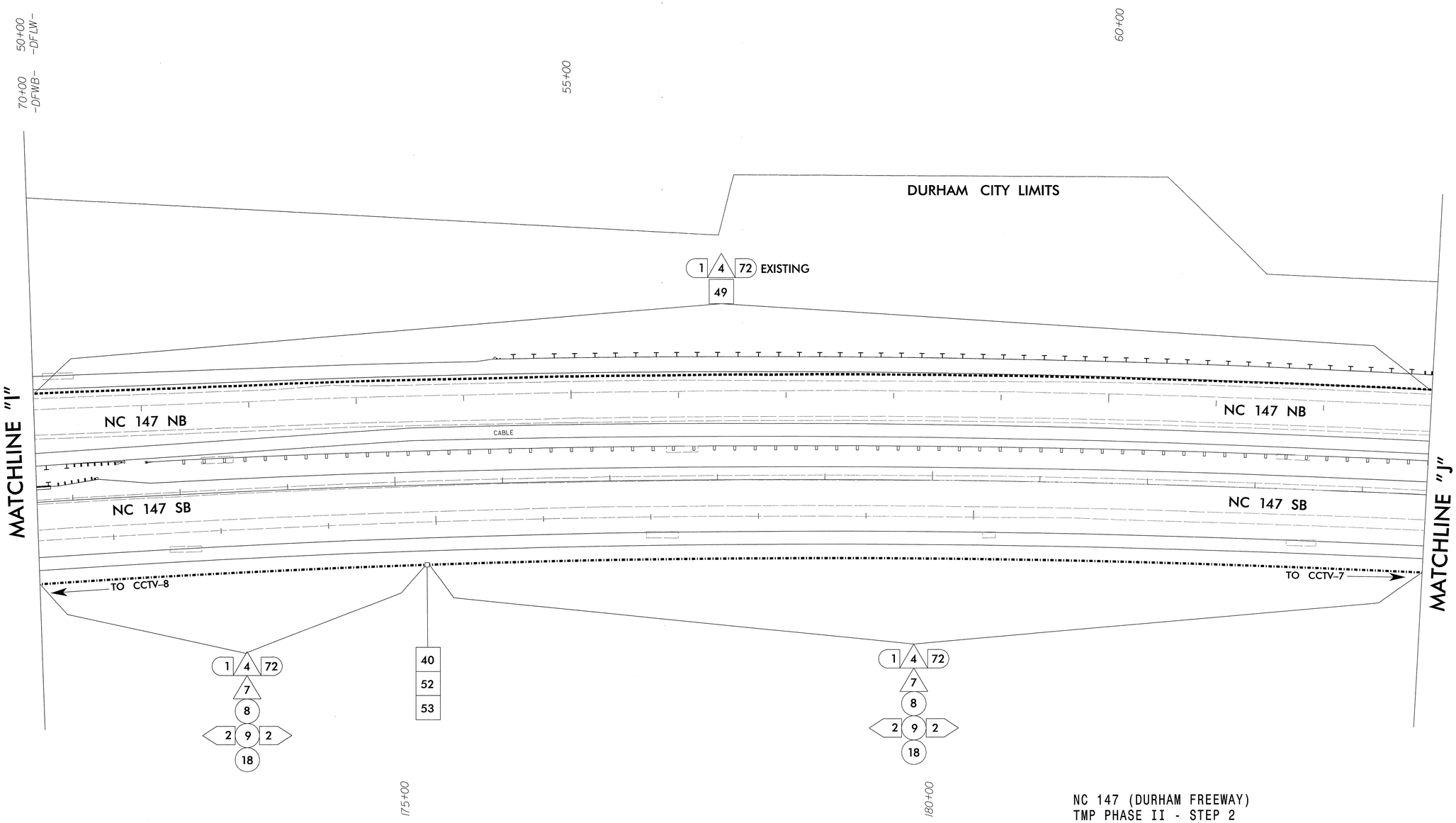
PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 83



NC 147 (DURHAM FREEWAY)
TMP PHASE II - STEP 2

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COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

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PROJECT REFERENCE NO.	SHEET NO.
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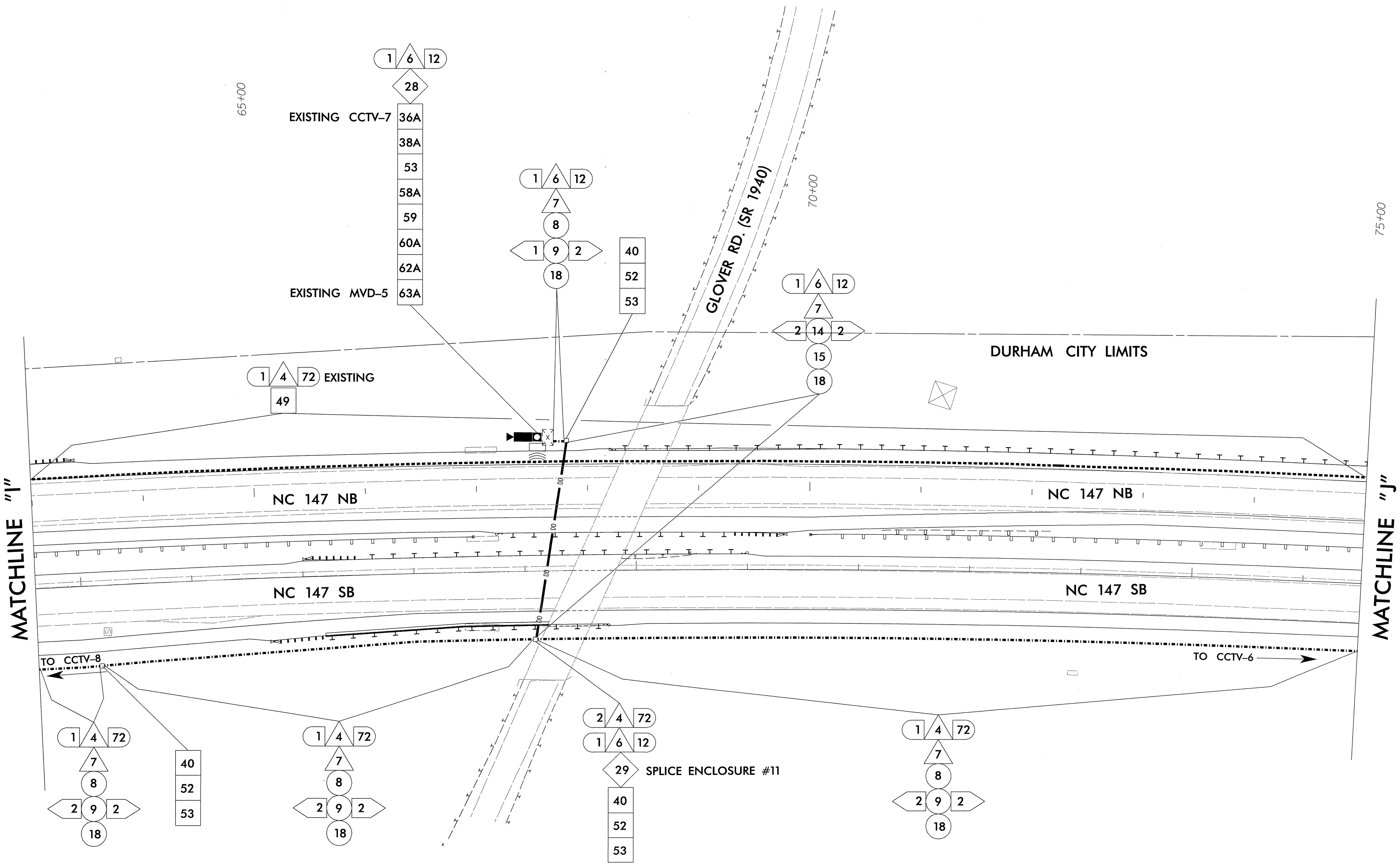

NC 147 (DURHAM FREEWAY)
TMP PHASE II - STEP 2

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COMMUNICATIONS CABLE
AND CONDUIT ROUTING PLAN

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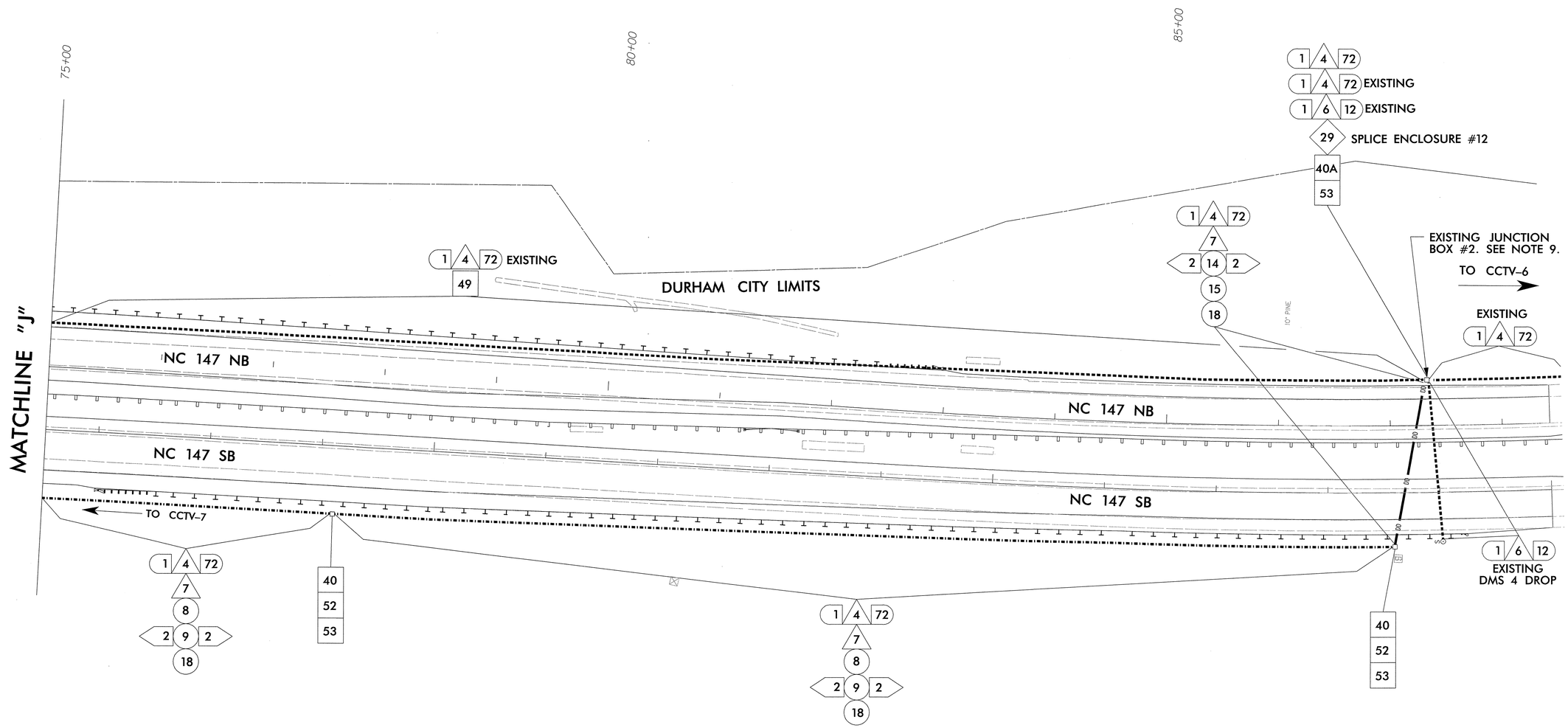
PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 85



NC 147 (DURHAM FREEWAY)
TMP PHASE II - STEP 2

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COMMUNICATIONS CABLE AND CONDUIT ROUTING PLAN

Division 5 Durham County Durham

PLAN DATE: November 2013	REVIEWED BY: J Hochanadel
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SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 12/2/13 DATE

SIG. INVENTORY NO.

$$$$$$SYSTIME$$$$$
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$$$$$$USERNAME$$$$

FIBER OPTIC CABLE

EE-304 (Overhead Splice Enclosure #1)
Vicinity of:
US 70 Bus /NC 98 (Holloway St) at
US 70 Bus (N Miami Blvd) & Gary St

Notes:

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

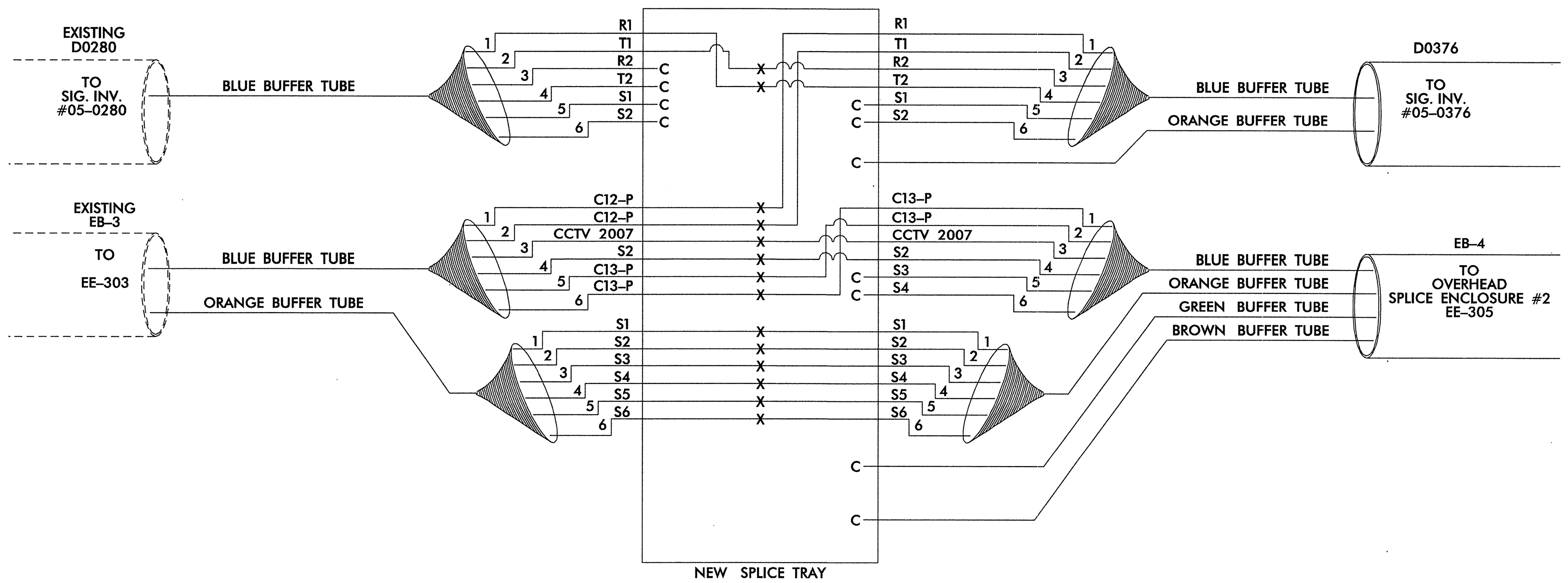
COLOR CODE TIA/EIA 598-A

(1) BLUE	(7) RED
(2) ORANGE	(8) BLACK
(3) GREEN	(9) YELLOW
(4) BROWN	(10) VIOLET
(5) SLATE	(11) ROSE
(6) WHITE	(12) AQUA

LEGEND

X – FUSION SPLICE INDIVIDUAL FIBER
C – CAP AND SEAL SPLICE INDIVIDUAL FIBER
E – EXISTING SPLICE

SPLICE – SPLICE ALL INDIVIDUAL FIBERS AS NOTED
EXPRESS – EXPRESS ENTIRE BUFFER TUBE AS NOTED



FIBER OPTIC CABLE

EE-305 (Overhead Splice Enclosure #2)
Vicinity of:
NC 98 (Holloway St)
at SR 1879 (Hardee St)

Notes:

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

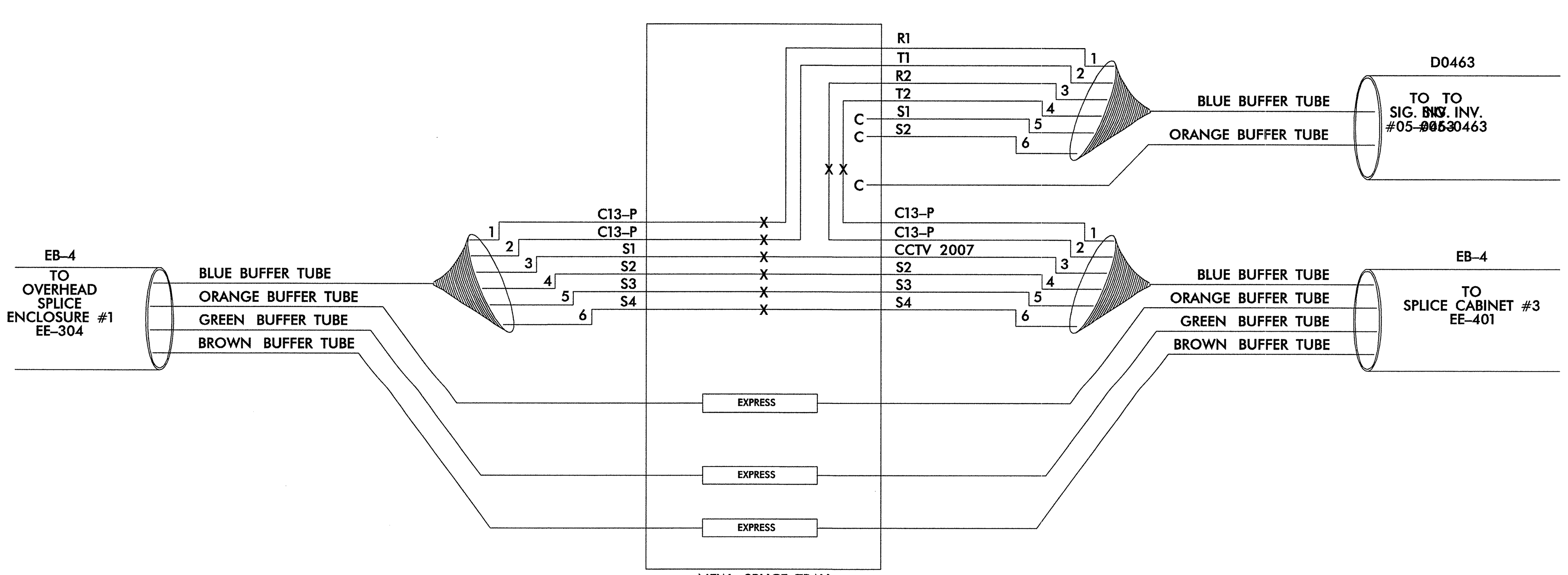
COLOR CODE TIA/EIA 598-A

(1) BLUE	(7) RED
(2) ORANGE	(8) BLACK
(3) GREEN	(9) YELLOW
(4) BROWN	(10) VIOLET
(5) SLATE	(11) ROSE
(6) WHITE	(12) AQUA

LEGEND

X – FUSION SPLICE INDIVIDUAL FIBER
C – CAP AND SEAL SPLICE INDIVIDUAL FIBER
E – EXISTING SPLICE

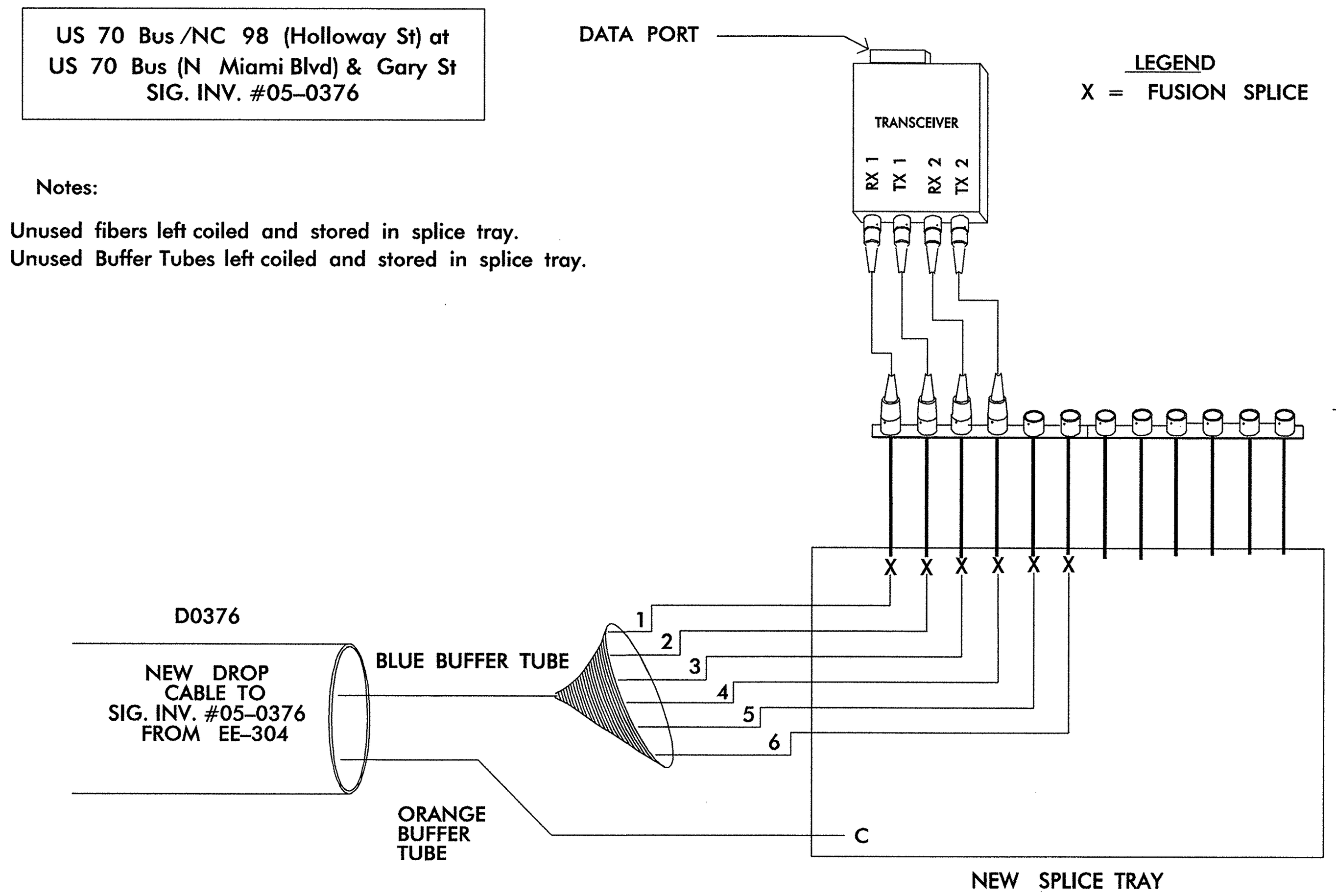
SPLICE – SPLICE ALL INDIVIDUAL FIBERS AS NOTED
EXPRESS – EXPRESS ENTIRE BUFFER TUBE AS NOTED



US 70 Bus /NC 98 (Holloway St) at
US 70 Bus (N Miami Blvd) & Gary St
SIG. INV. #05-0376

Notes:

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



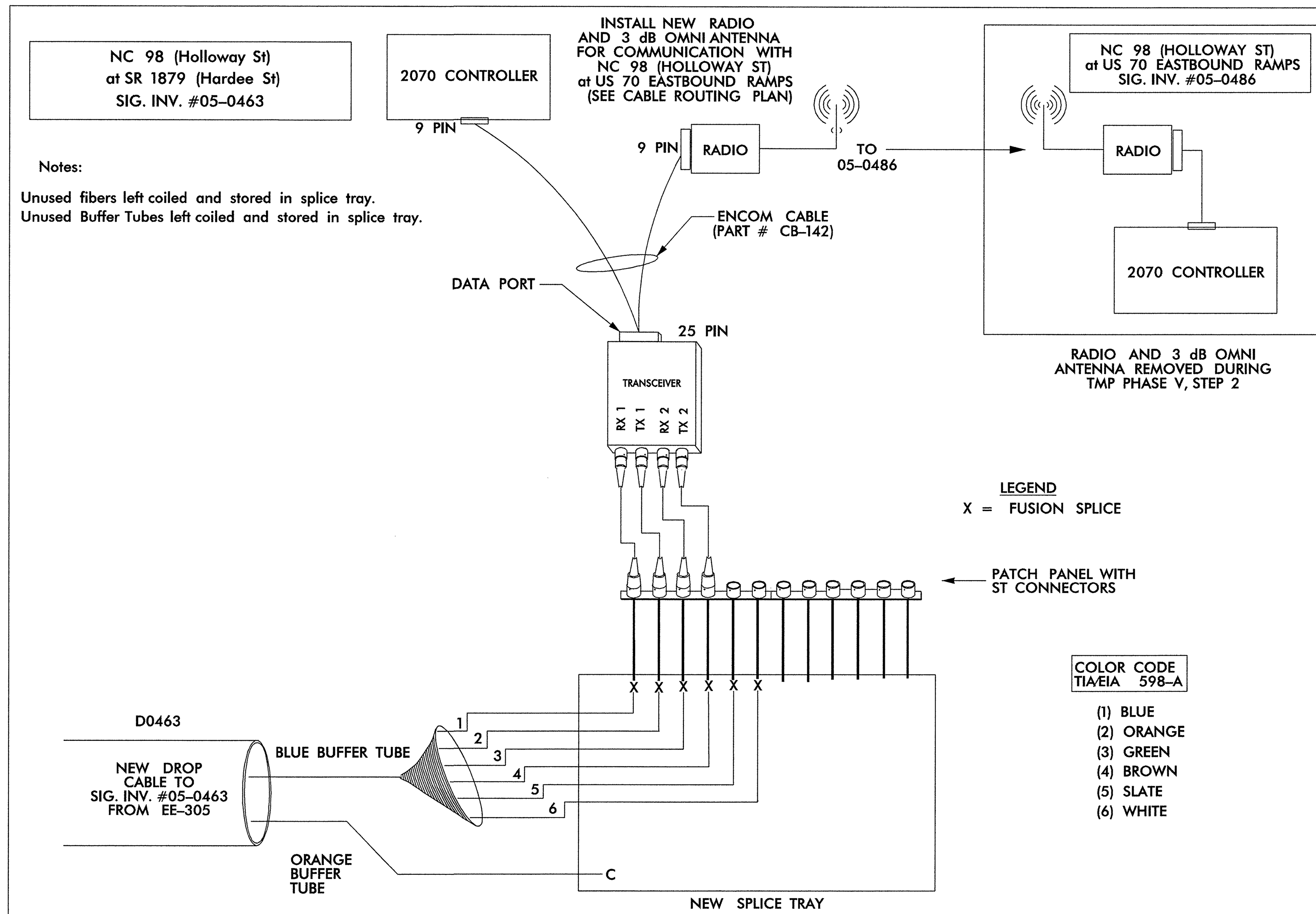
COLOR CODE TIA/EIA 598-A

(1) BLUE
(2) ORANGE
(3) GREEN
(4) BROWN
(5) SLATE
(6) WHITE

NC 98 (Holloway St)
at SR 1879 (Hardee St)
SIG. INV. #05-0463

Notes:

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



COLOR CODE TIA/EIA 598-A

(1) BLUE
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(4) BROWN
(5) SLATE
(6) WHITE

INCLUDE ON THE COVER OF EACH SPLICE TRAY THE FOLLOWING:
REFERENCE SECTION 1731 "FIBER OPTIC SPLICE ENCLOSURE"

1) SPLICE LOCATION
2) DATE
3) COMPANY NAME
4) NAME OF INDIVIDUAL PERFORMING THE SPLICING

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

NC 98 (HOLLOWAY AVE.)
TMP PHASE I - STEP 2
TMP PHASE V - STEP 2

SEPI ENGINEERING & CONSTRUCTION
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STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 NTS

NC 98 (HOLLOWAY AVE.) SPLICE DETAILS

Division 5 Durham County Durham

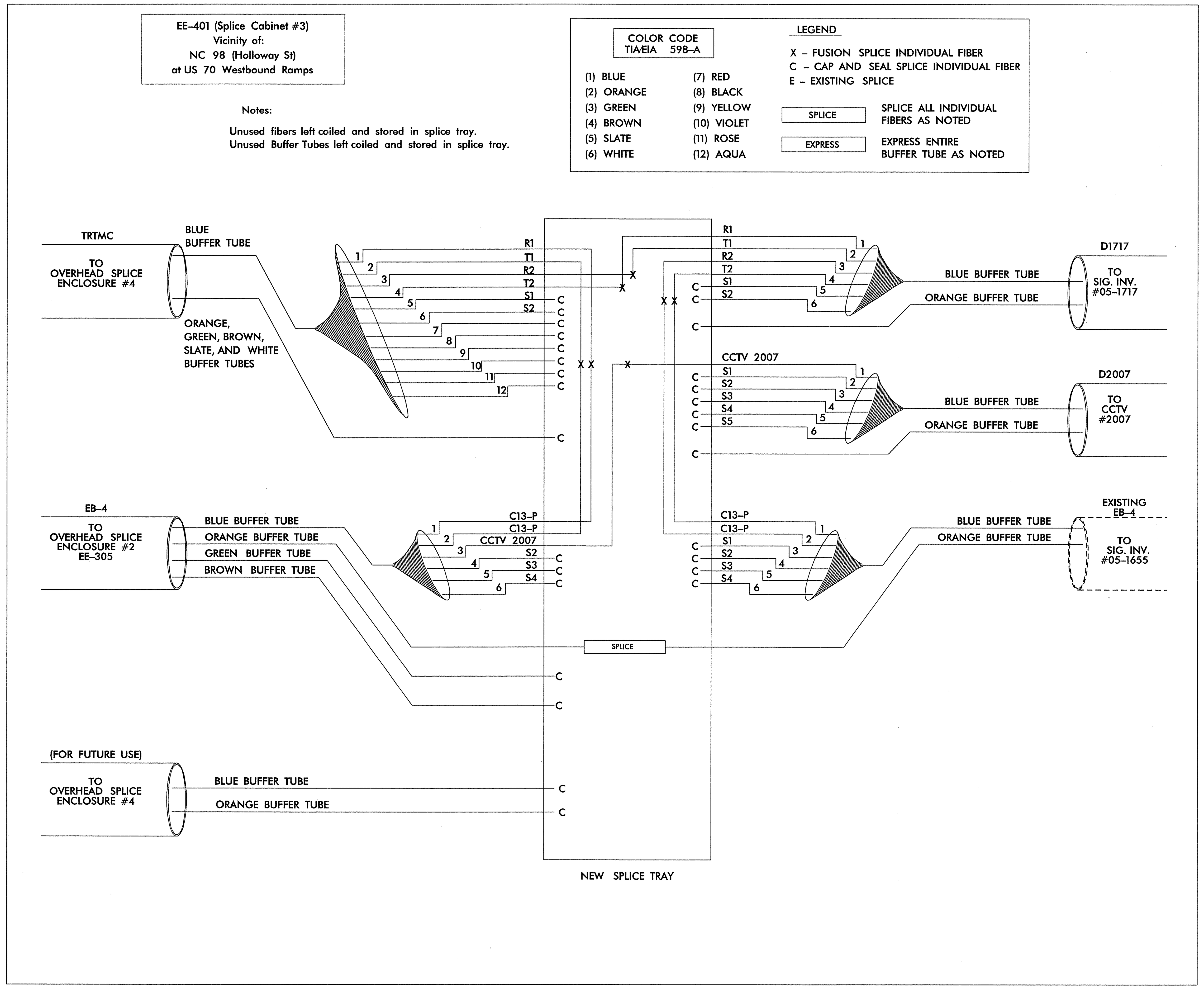
PLAN DATE:	November 2013	REVIEWED BY:	J Hochanadel
PREPARED BY:	J Kopaskie	REVIEWED BY:	

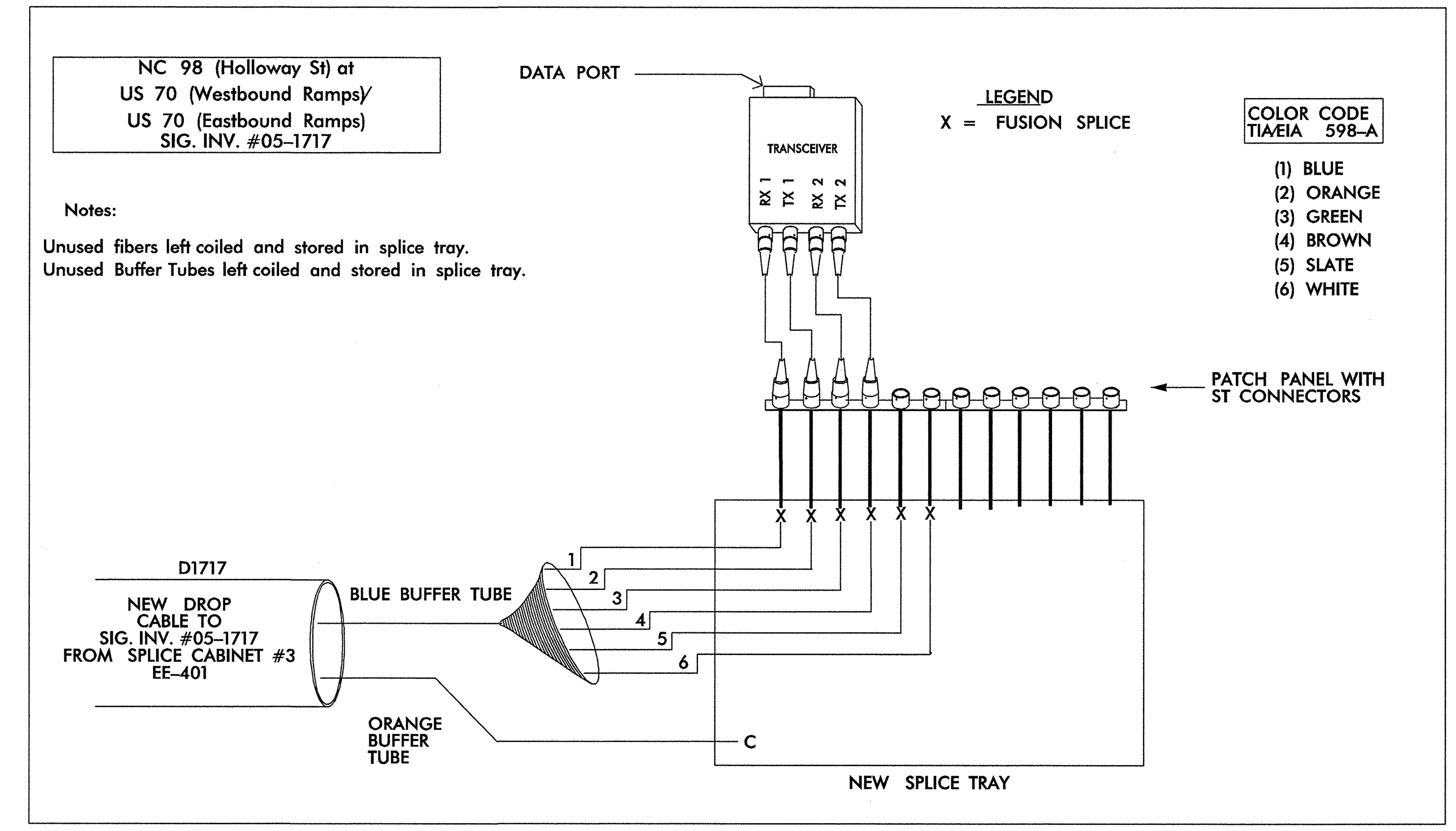
REVISIONS	INIT.	DATE

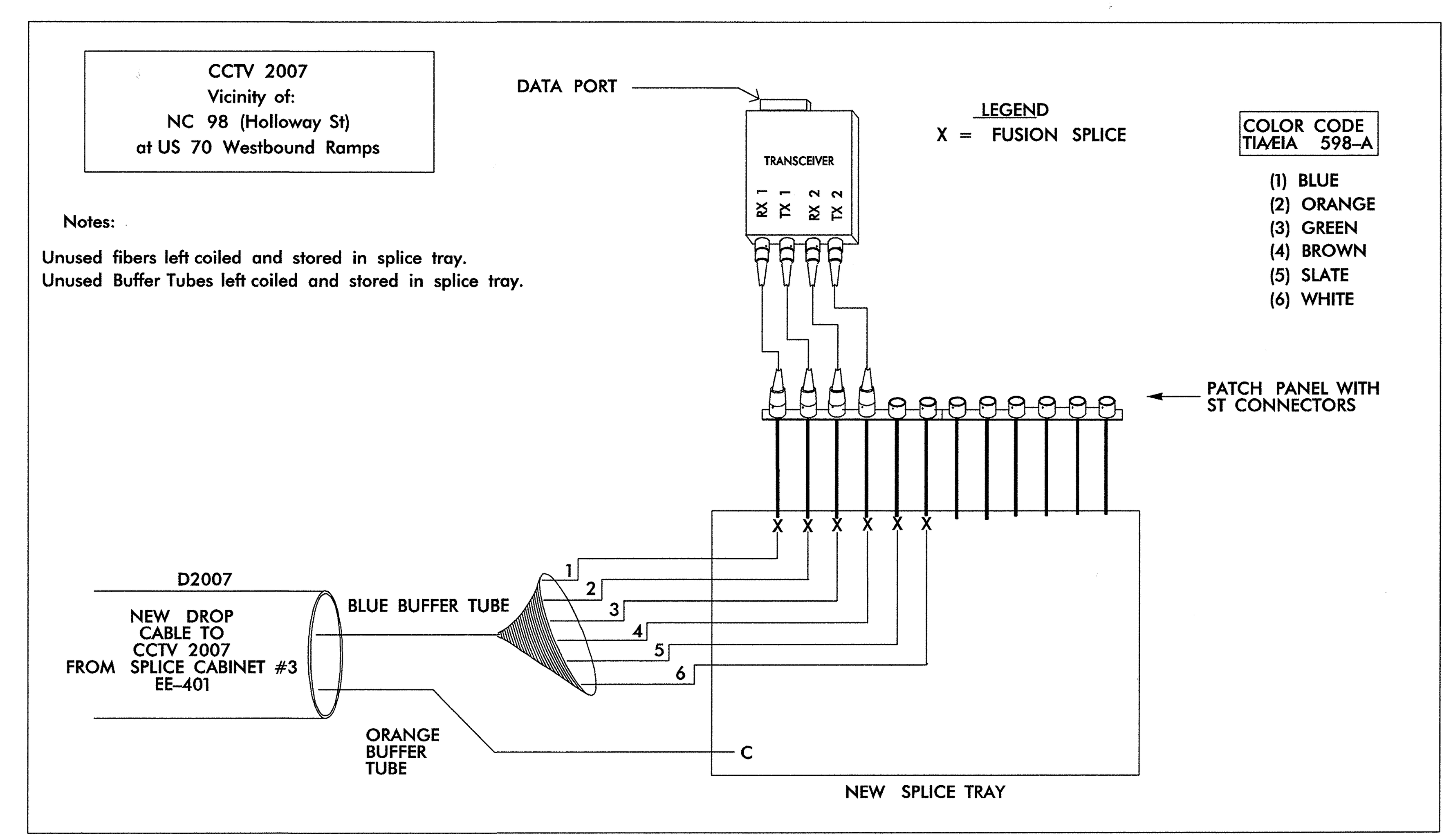
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
12/2/13
SIGNATURE DATE
CADD Filename: -

$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

FIBER OPTIC CABLE







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1) SPLICE LOCATION
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NC 98 (HOLLOWAY AVE.)
TMP PHASE I - STEP 2
TMP PHASE V - STEP 2

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SCALE 0 NTS

COMMUNICATIONS CABLE
AND CONDUIT ROUTING PLAN

Division 5	Durham County	Durham
PLAN DATE: July 2014	REVIEWED BY: J Hochanadel	
PREPARED BY: R Drayton	REVIEWED BY:	
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 7/2/14 DATE
SIG. INVENTORY NO.

$$$$$SYSTIME$$$$$
$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$
$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 87A

FIBER OPTIC CABLE

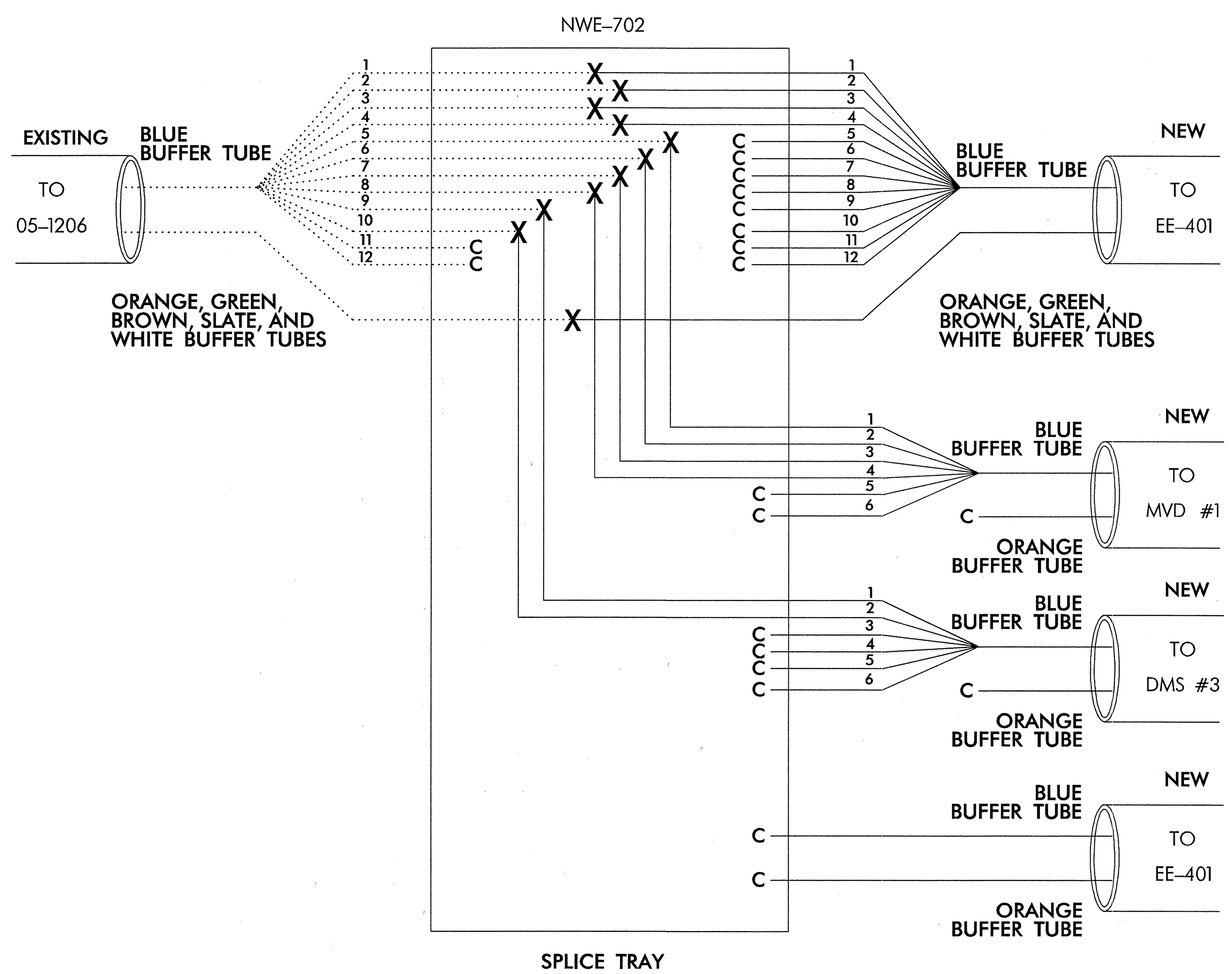
US 70 BETWEEN
CHEEK RD AND HOLLOWAY ST
SPLICE ENCLOSURE #4

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

LEGEND
X = FUSION SPLICE
C = CAP IN TRAY

COLOR CODE
TIA/EIA 598–A

(1) BLUE
(2) ORANGE
(3) GREEN
(4) BROWN
(5) SLATE
(6) WHITE
(7) RED
(8) BLACK
(9) YELLOW
(10) VIOLET
(11) ROSE
(12) AQUA



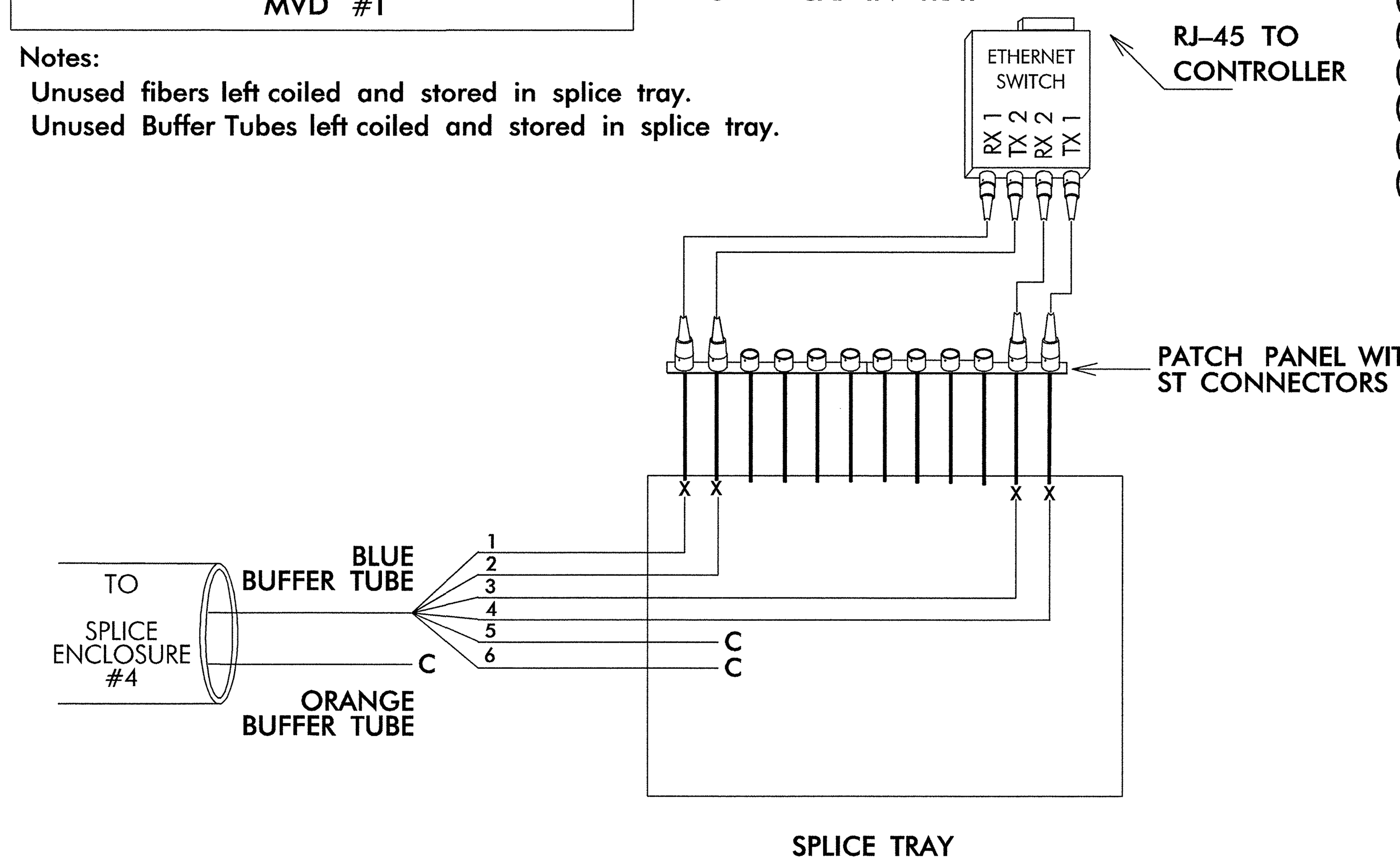
US 70 BETWEEN
CHEEK RD AND HOLLOWAY ST
MVD #1

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

LEGEND
X = FUSION SPLICE
C = CAP IN TRAY

COLOR CODE
TIA/EIA 598–A

(1) BLUE
(2) ORANGE
(3) GREEN
(4) BROWN
(5) SLATE
(6) WHITE



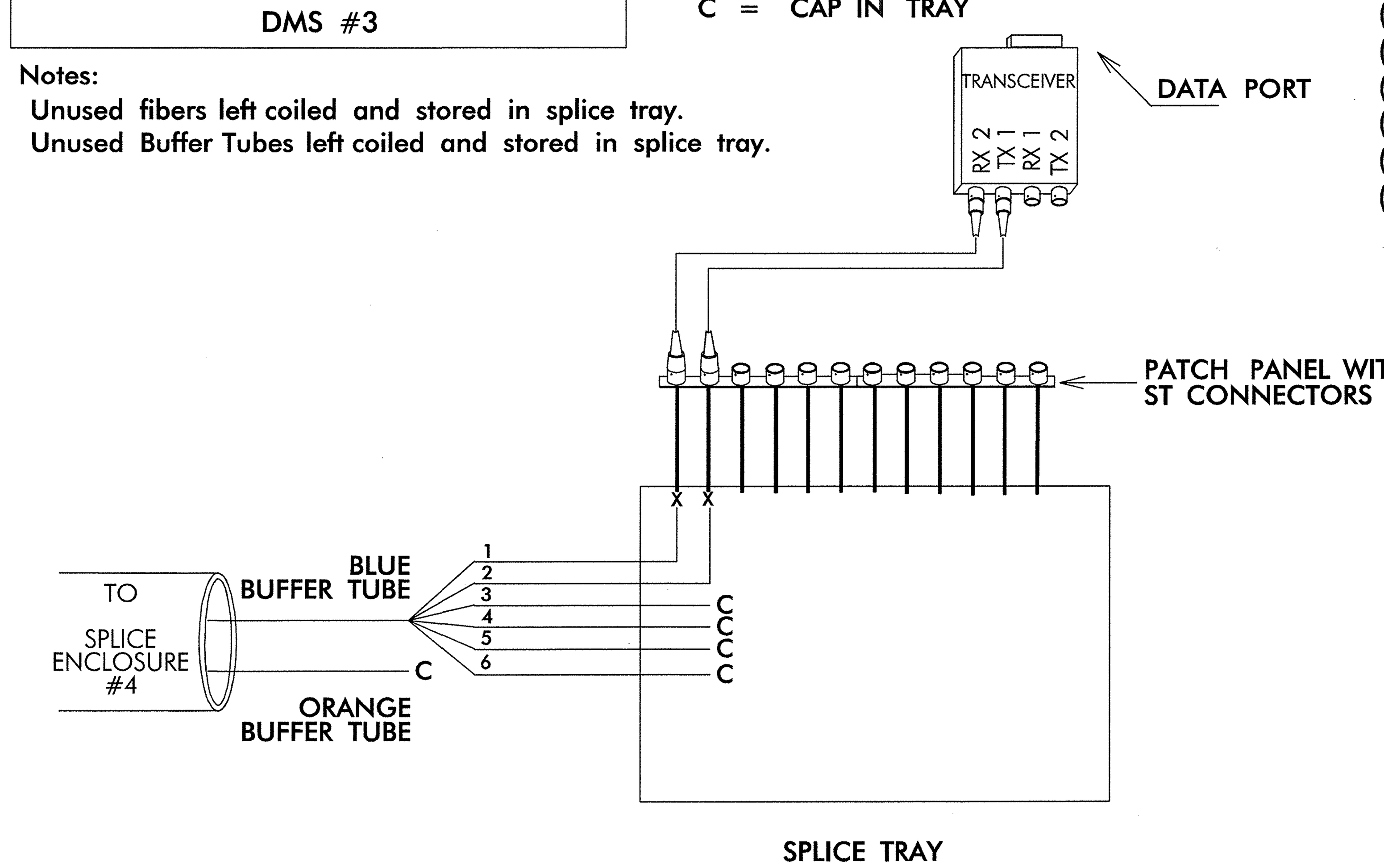
US 70 BETWEEN
CHEEK RD AND HOLLOWAY ST
DMS #3

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

LEGEND
X = FUSION SPLICE
C = CAP IN TRAY

COLOR CODE
TIA/EIA 598–A

(1) BLUE
(2) ORANGE
(3) GREEN
(4) BROWN
(5) SLATE
(6) WHITE



INCLUDE ON THE COVER OF EACH SPLICE TRAY THE FOLLOWING:
REFERENCE SECTION 1731 "FIBER OPTIC SPLICE ENCLOSURE"

1) SPLICE LOCATION
2) DATE
3) COMPANY NAME
4) NAME OF INDIVIDUAL PERFORMING THE SPLICING

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

NOTES:

TRANSCEIVER TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING \ ENSURING PROPER TERMINATIONS.

NOTIFY THE CITY OF DURHAM'S TRANSPORTATION ENGINEER (PETE NICHOLAS @ 919 560–4366 EXT 36436) 24 HOURS PRIOR TO BEGINNING WORK ON SIGNAL SYSTEMS COMMUNICATION CABLE. NOTIFY THE CITY TRANSPORTATION ENGINEER AFTER ALL WORK IS PERFORMED TO ENSURE THAT ALL FIBER CIRCUITS ARE FUNCTIONING PROPERLY.

$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$USERNAME$$$$

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

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

COMMUNICATIONS CABLE
AND CONDUIT ROUTING PLAN

Division 5	Durham County		Durham
PLAN DATE: July 2014		REVIEWED BY: J Hochanadel	
PREPARED BY: R Drayton		REVIEWED BY:	
REVISIONS		INIT.	DATE

SCALE
0
NTS

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 7/2/14 DATE
SIG. INVENTORY NO.

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 88

FIBER OPTIC CABLE

Splice Cabinet #5
Vicinity of:
US 70 at SR 1921 (Lynn Rd)/
SR 1815 (Pleasant Rd)

Notes:

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

COLOR CODE
TIA/EIA 598-A

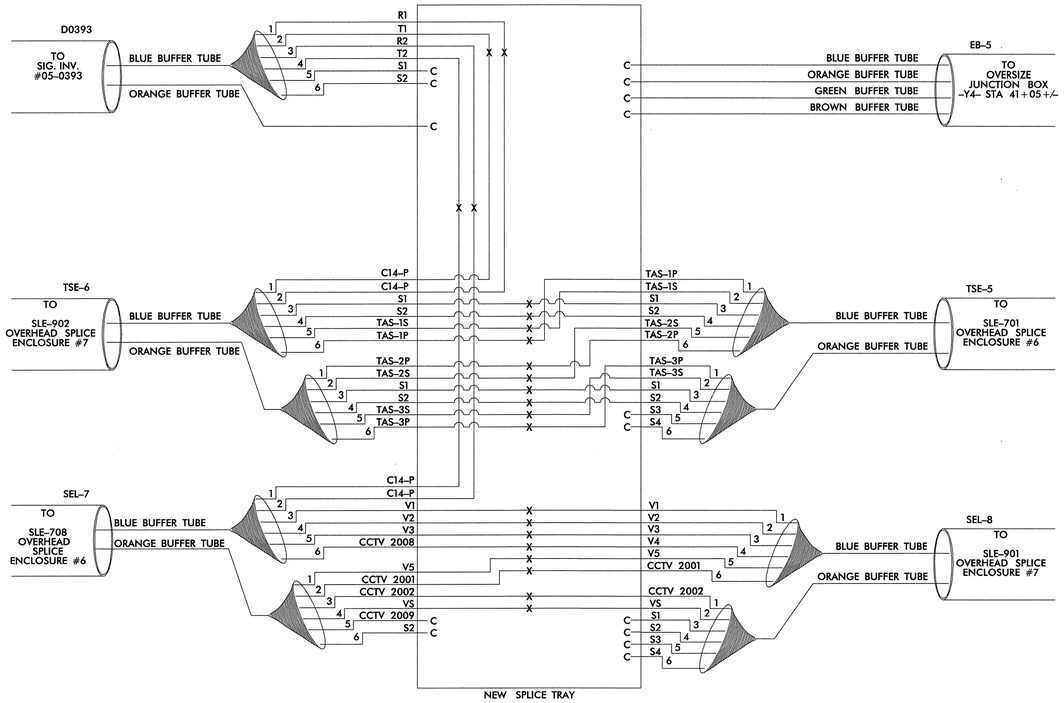
(1) BLUE
(2) ORANGE
(3) GREEN
(4) BROWN
(5) SLATE
(6) WHITE
(7) RED
(8) BLACK
(9) YELLOW
(10) VIOLET
(11) ROSE
(12) AQUA

LEGEND

X – FUSION SPLICE INDIVIDUAL FIBER
C – CAP AND SEAL SPLICE INDIVIDUAL FIBER
E – EXISTING SPLICE

SPLICE — SPLICE ALL INDIVIDUAL FIBERS AS NOTED

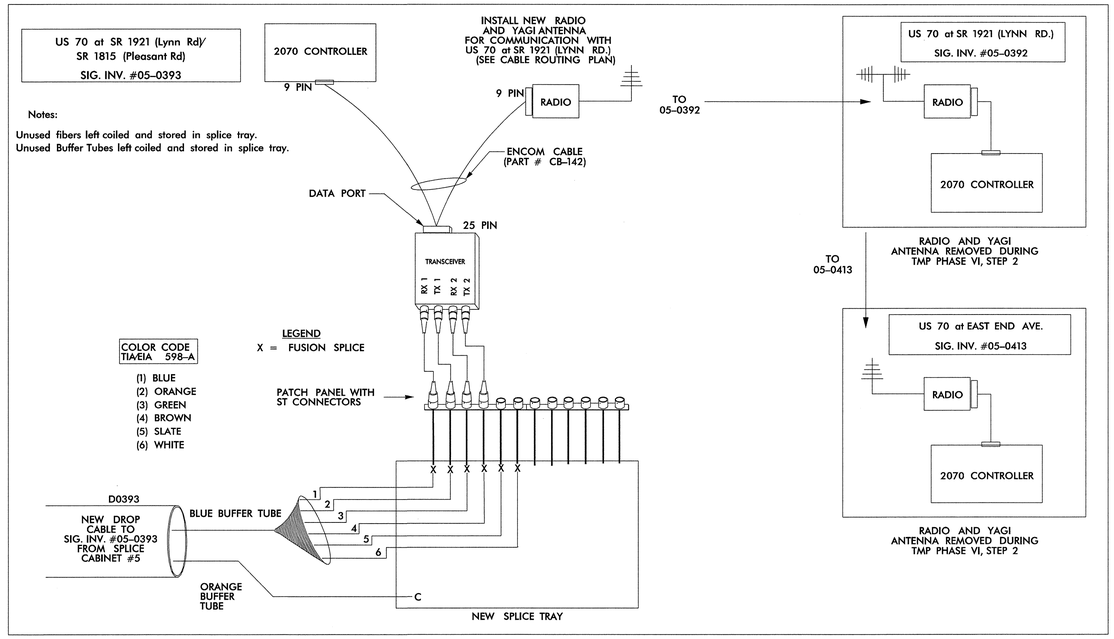
EXPRESS — EXPRESS ENTIRE BUFFER TUBE AS NOTED



US 70 at SR 1921 (Lynn Rd)/
SR 1815 (Pleasant Rd)
SIG. INV. #05-0393

Notes:

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



INCLUDE ON THE COVER OF EACH SPLICE TRAY THE FOLLOWING:
REFERENCE SECTION 1731 "FIBER OPTIC SPLICE ENCLOSURE"

1) SPLICE LOCATION
2) DATE
3) COMPANY NAME
4) NAME OF INDIVIDUAL PERFORMING THE SPLICING

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

US 70
TMP PHASE I - STEP 2
TMP PHASE VI - STEP 2

SEPI
ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

Prepared for 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

SCALE
0
NTS

US 70
SPLICE DETAILS

Division 5 Durham County Durham

PLAN DATE:	November 2013	REVIEWED BY:	J Hochanadel
PREPARED BY:	J Kopaskie	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE DATE 12/2/13

CADD Filename: -

$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 89

FIBER OPTIC CABLE

Overhead Splice Enclosure #6
Vicinity of:
South of US 70 at SR 1921 (Lynn Rd)/
SR 1815 (Pleasant Rd)

Notes:

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

COLOR CODE
TIA/EIA 598-A

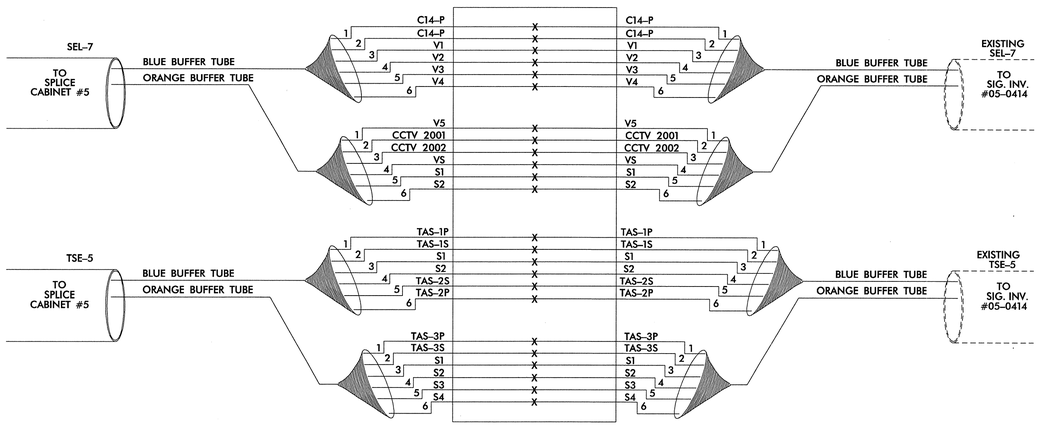
(1) BLUE	(7) RED
(2) ORANGE	(8) BLACK
(3) GREEN	(9) YELLOW
(4) BROWN	(10) VIOLET
(5) SLATE	(11) ROSE
(6) WHITE	(12) AQUA

LEGEND

X – FUSION SPLICE INDIVIDUAL FIBER
C – CAP AND SEAL SPLICE INDIVIDUAL FIBER
E – EXISTING SPLICE

SPLICE — SPLICE ALL INDIVIDUAL FIBERS AS NOTED

EXPRESS — EXPRESS ENTIRE BUFFER TUBE AS NOTED



FIBER OPTIC CABLE

Overhead Splice Enclosure #7
Vicinity of:
West of US 70 at SR 1921 (Lynn Rd)/
SR 1815 (Pleasant Rd)

Notes:

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

COLOR CODE
TIA/EIA 598-A

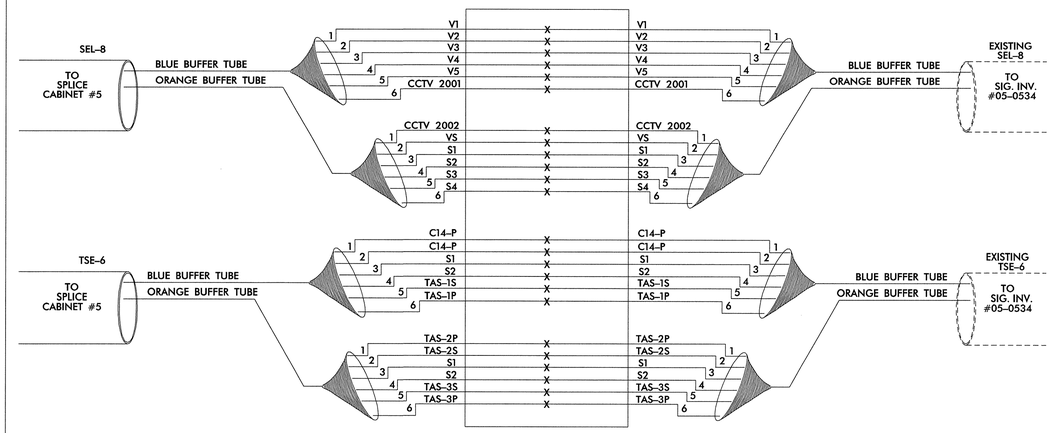
(1) BLUE	(7) RED
(2) ORANGE	(8) BLACK
(3) GREEN	(9) YELLOW
(4) BROWN	(10) VIOLET
(5) SLATE	(11) ROSE
(6) WHITE	(12) AQUA

LEGEND

X – FUSION SPLICE INDIVIDUAL FIBER
C – CAP AND SEAL SPLICE INDIVIDUAL FIBER
E – EXISTING SPLICE

SPLICE — SPLICE ALL INDIVIDUAL FIBERS AS NOTED

EXPRESS — EXPRESS ENTIRE BUFFER TUBE AS NOTED



INCLUDE ON THE COVER OF EACH SPLICE TRAY THE FOLLOWING:
REFERENCE SECTION 1731 "FIBER OPTIC SPLICE ENCLOSURE"

1) SPLICE LOCATION
2) DATE
3) COMPANY NAME
4) NAME OF INDIVIDUAL PERFORMING THE SPLICING

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

US 70
TMP PHASE I - STEP 2
TMP PHASE VI - STEP 2

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

Prepared for 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

SCALE
0
NTS

US 70
SPLICE DETAILS

Division 5 Durham County Durham

PLAN DATE:	November 2013	REVIEWED BY:	J Hochanadel
PREPARED BY:	J Kopaskie	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

SIGNATURE 12/2/13 DATE

CADD Filename: -

$$$$SYSTIME$$$$
$$$$USERNAME$$$$

FIBER OPTIC CABLE

Overhead Splice Enclosure #8
Vicinity of:
Angier Avenue – South of Connector

Notes:

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

COLOR CODE
TIA/EIA 598-A

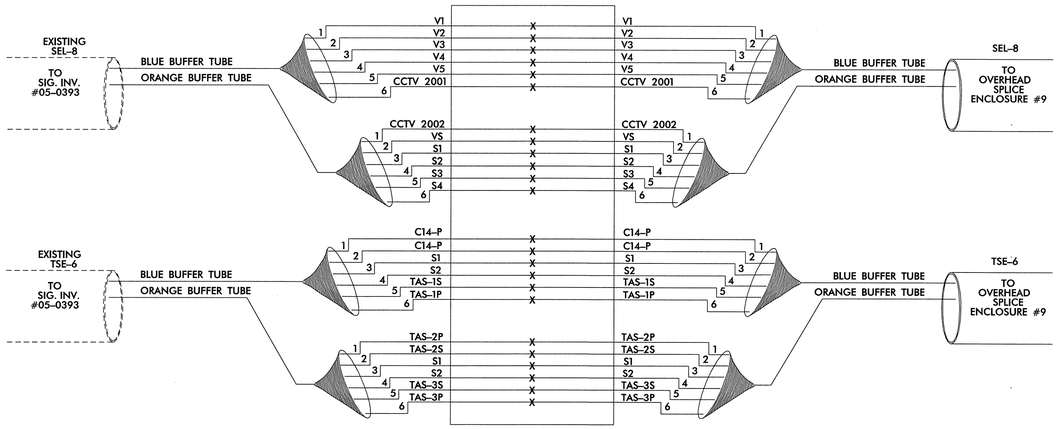
(1) BLUE	(7) RED
(2) ORANGE	(8) BLACK
(3) GREEN	(9) YELLOW
(4) BROWN	(10) VIOLET
(5) SLATE	(11) ROSE
(6) WHITE	(12) AQUA

LEGEND

X – FUSION SPLICE INDIVIDUAL FIBER
C – CAP AND SEAL SPLICE INDIVIDUAL FIBER
E – EXISTING SPLICE

SPLICE — SPLICE ALL INDIVIDUAL FIBERS AS NOTED

EXPRESS — EXPRESS ENTIRE BUFFER TUBE AS NOTED



FIBER OPTIC CABLE

Overhead Splice Enclosure #9
Vicinity of:
Angier Avenue – North of Connector

Notes:

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

COLOR CODE
TIA/EIA 598-A

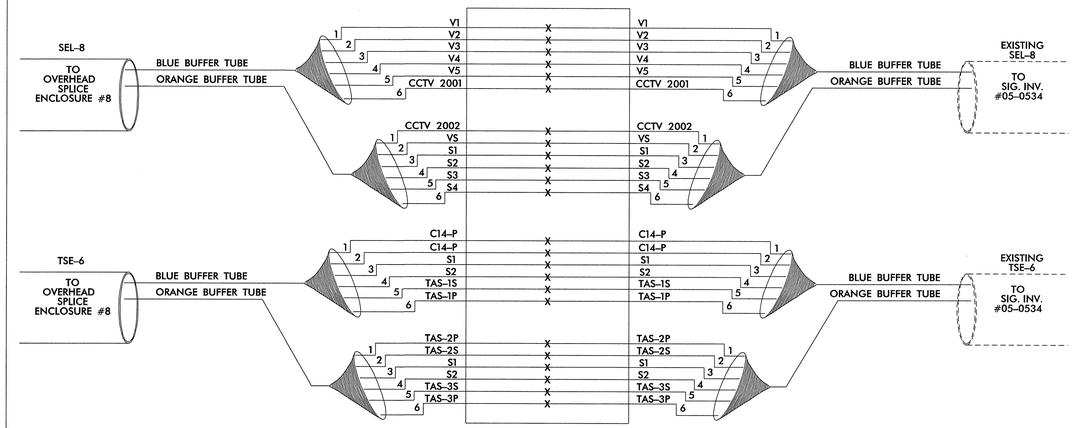
(1) BLUE	(7) RED
(2) ORANGE	(8) BLACK
(3) GREEN	(9) YELLOW
(4) BROWN	(10) VIOLET
(5) SLATE	(11) ROSE
(6) WHITE	(12) AQUA

LEGEND

X – FUSION SPLICE INDIVIDUAL FIBER
C – CAP AND SEAL SPLICE INDIVIDUAL FIBER
E – EXISTING SPLICE

SPLICE — SPLICE ALL INDIVIDUAL FIBERS AS NOTED

EXPRESS — EXPRESS ENTIRE BUFFER TUBE AS NOTED



INCLUDE ON THE COVER OF EACH SPLICE TRAY THE FOLLOWING:
REFERENCE SECTION 1731 "FIBER OPTIC SPLICE ENCLOSURE"

1) SPLICE LOCATION
2) DATE
3) COMPANY NAME
4) NAME OF INDIVIDUAL PERFORMING THE SPLICING

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

ANGIER AVENUE
TMP PHASE I

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

Prepared for 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

SCALE
0
NTS

ANGIER AVENUE
SPLICE DETAILS

Division 5 Durham County Durham

PLAN DATE:	November 2013	REVIEWED BY:	J Hochanadel
PREPARED BY:	J Kopaskie	REVIEWED BY:	

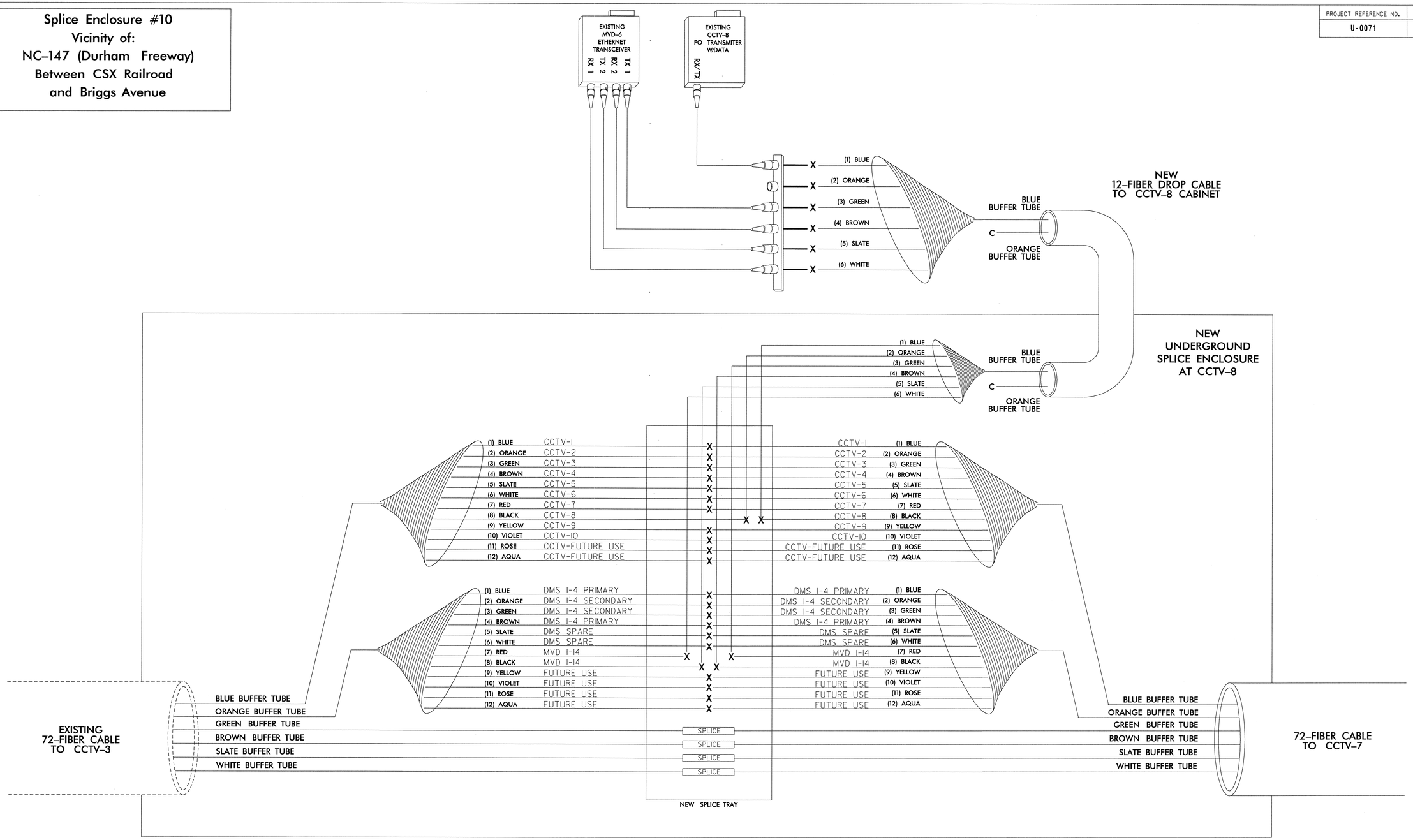
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 12/2/13
DATE
CADD Filename: -

$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.91

Splice Enclosure #10
Vicinity of:
NC–147 (Durham Freeway)
Between CSX Railroad
and Briggs Avenue



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

LEGEND

X – FUSION SPLICE INDIVIDUAL FIBER
C – CAP AND SEAL SPLICE INDIVIDUAL FIBER
E – EXISTING SPLICE

SPLICE — SPLICE ALL INDIVIDUAL FIBERS AS NOTED

EXPRESS — EXPRESS ENTIRE BUFFER TUBE AS NOTED

INCLUDE ON THE COVER OF EACH SPLICE TRAY THE FOLLOWING:
REFERENCE SECTION 1731 "FIBER OPTIC SPLICE ENCLOSURE"

1) SPLICE LOCATION
2) DATE
3) COMPANY NAME
4) NAME OF INDIVIDUAL PERFORMING THE SPLICING

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

SEPI ENGINEERING & CONSTRUCTION
1025 Wade Avenue
Raleigh, NC 27605
Tel:919-789-9977
Fax:919-789-9591
License #: C-2197

NC 147 (DURHAM FREEWAY)
TMP PHASE II - STEP 2

Prepared for 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

NC 147 (DURHAM FREEWAY) SPLICE DETAILS

Division 5 Durham County Durham

PLAN DATE: November 2013	REVIEWED BY: J Hochanadel
PREPARED BY: J Kopaskie	REVIEWED BY:

SCALE 0 NTS

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

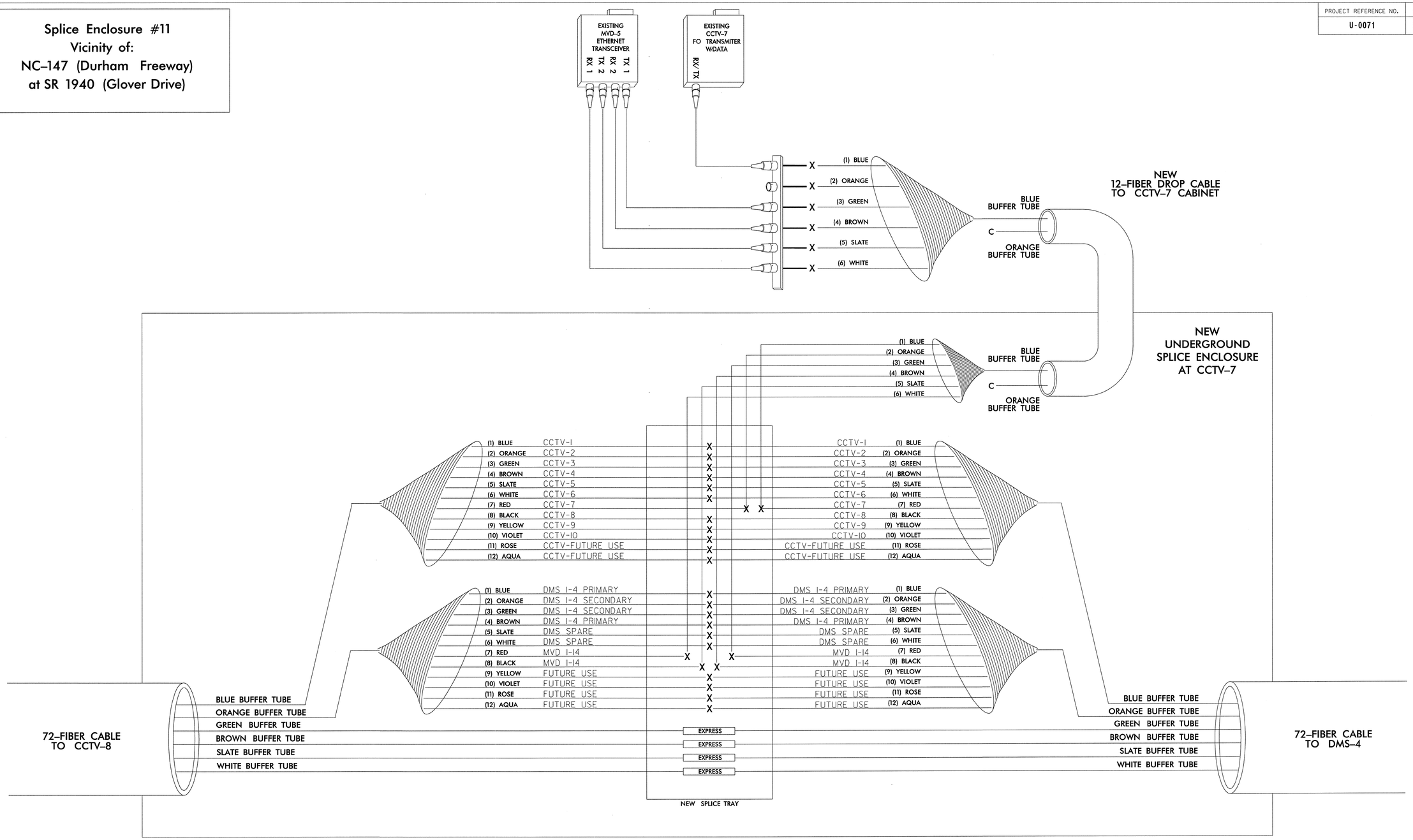
SIGNATURE — DATE 12/2/13

CADD Filename: -

$$$$$SYSTIME$$$$$
$$$$$USERNAME$$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.92

Splice Enclosure #11
Vicinity of:
NC-147 (Durham Freeway)
at SR 1940 (Glover Drive)



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

LEGEND

X – FUSION SPLICE INDIVIDUAL FIBER
C – CAP AND SEAL SPLICE INDIVIDUAL FIBER
E – EXISTING SPLICE

SPLICE — SPLICE ALL INDIVIDUAL FIBERS AS NOTED

EXPRESS — EXPRESS ENTIRE BUFFER TUBE AS NOTED

INCLUDE ON THE COVER OF EACH SPLICE TRAY THE FOLLOWING:
REFERENCE SECTION 1731 "FIBER OPTIC SPLICE ENCLOSURE"

1) SPLICE LOCATION
2) DATE
3) COMPANY NAME
4) NAME OF INDIVIDUAL PERFORMING THE SPLICING

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

NC 147 (DURHAM FREEWAY)
TMP PHASE II - STEP 2

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Tel:919-789-9977
Fax:919-789-9591
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Prepared for 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

SCALE 0 NTS

NC 147 (DURHAM FREEWAY) SPLICE DETAILS

Division 5 Durham County Durham

PLAN DATE: November 2013	REVIEWED BY: J Hochanadel
PREPARED BY: J Kopaskie	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL

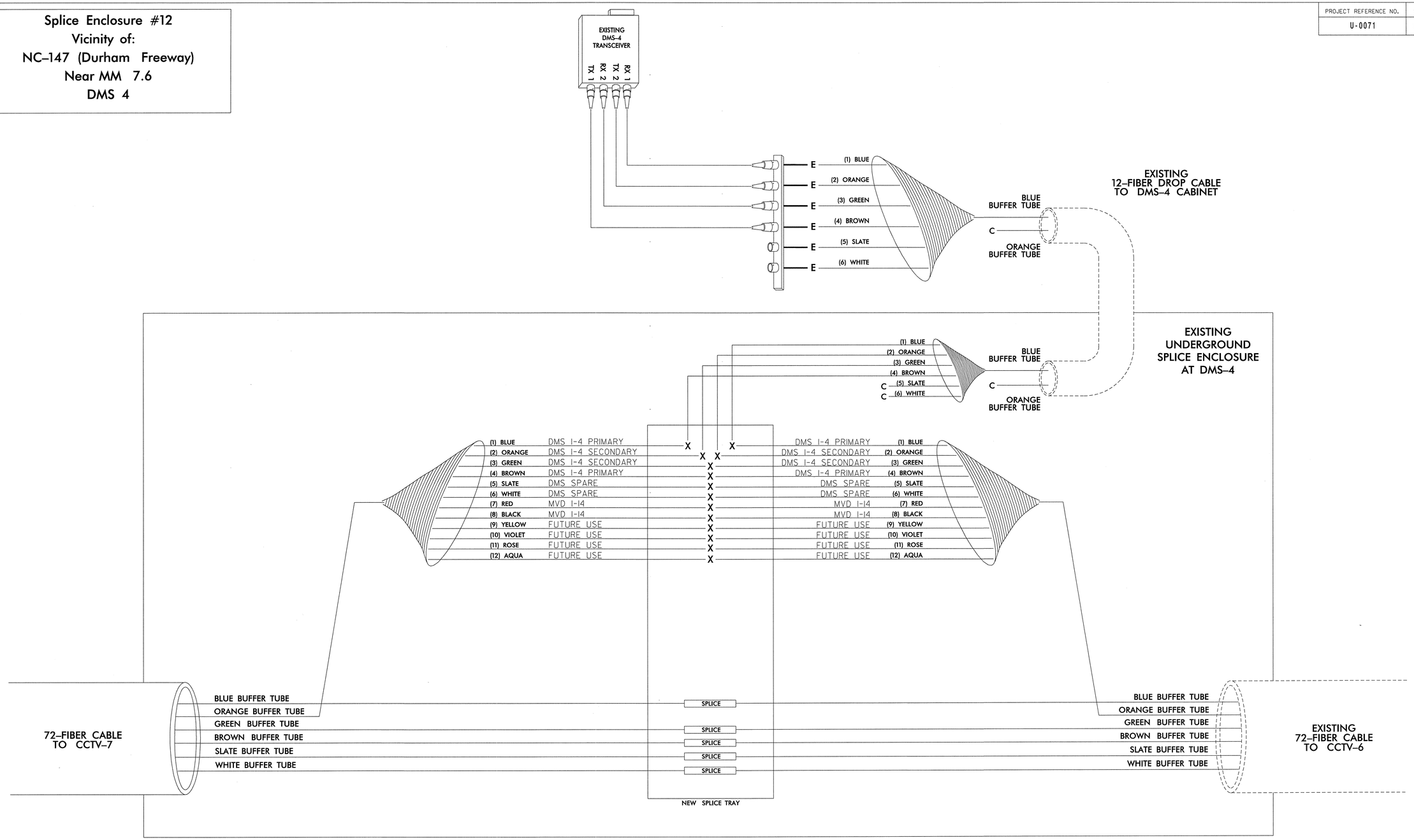
SIGNATURE — DATE 12/2/13

CADD Filename: -

$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig.93

Splice Enclosure #12
Vicinity of:
NC-147 (Durham Freeway)
Near MM 7.6
DMS 4



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

LEGEND

X - FUSION SPLICE INDIVIDUAL FIBER
C - CAP AND SEAL SPLICE INDIVIDUAL FIBER
E - EXISTING SPLICE

SPLICE — SPLICE ALL INDIVIDUAL FIBERS AS NOTED

EXPRESS — EXPRESS ENTIRE BUFFER TUBE AS NOTED

INCLUDE ON THE COVER OF EACH SPLICE TRAY THE FOLLOWING:
REFERENCE SECTION 1731 "FIBER OPTIC SPLICE ENCLOSURE"

1) SPLICE LOCATION
2) DATE
3) COMPANY NAME
4) NAME OF INDIVIDUAL PERFORMING THE SPLICING

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

NC 147 (DURHAM FREEWAY)
TMP PHASE II - STEP 2

SEPI ENGINEERING & CONSTRUCTION
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Raleigh, NC 27605
Tel:919-789-9977
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Prepared for the Offices of:
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STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 NTS

NC 147
(DURHAM FREEWAY)
SPLICE DETAILS

Division 5 Durham County Durham

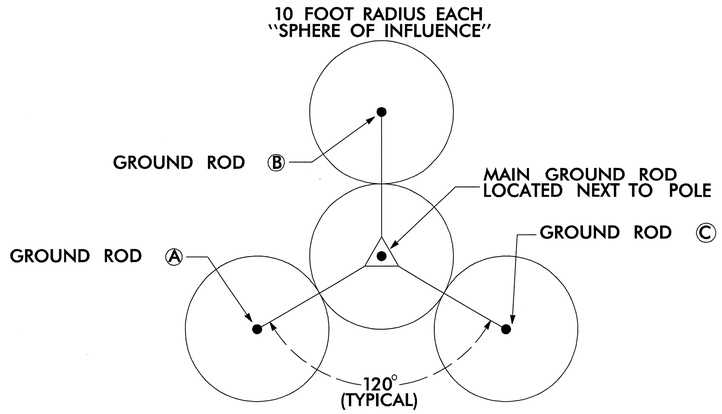
PLAN DATE: November 2013	REVIEWED BY: J Hochanadel
PREPARED BY: J Kopaskie	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 28430 ENGINEER JEFFREY P. HOCHANADEL
SIGNATURE 12/2/13 DATE

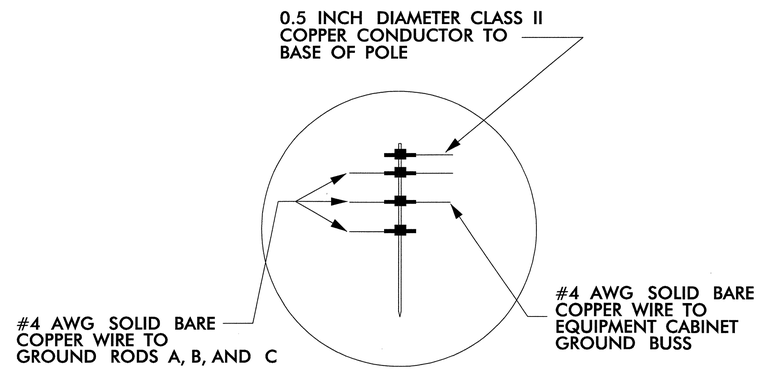
$$$$$$SYSTIME$$$$$
$$$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 94

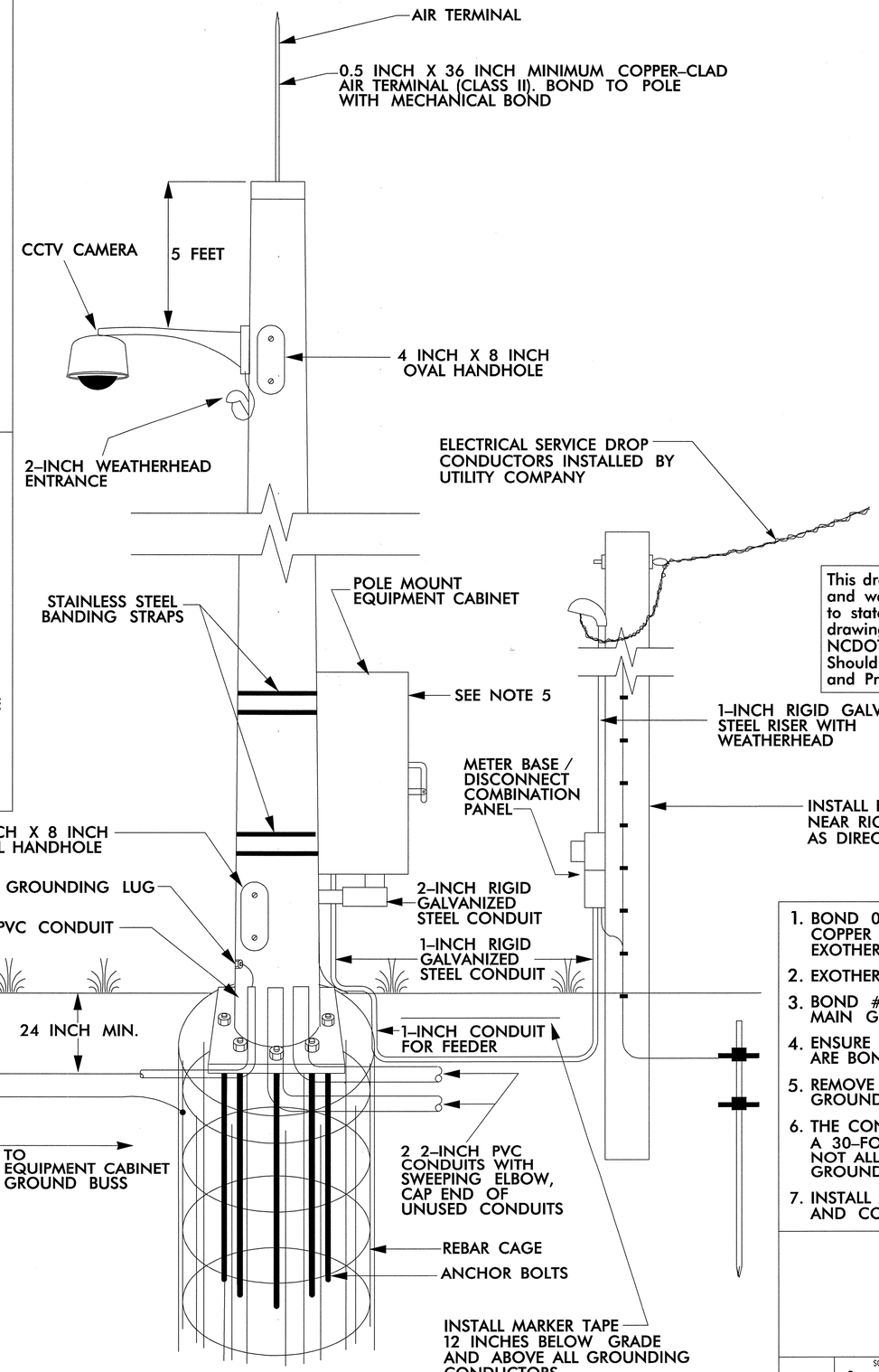


GROUND ROD PLACEMENT DETAIL

(TYPICAL EACH POLE)

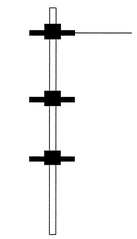


INSET `A'



ALTERNATE GROUNDING METHOD

IF SPACE IS NOT AVAILABLE TO DRIVE MULTIPLE RODS, DRIVE SECTIONAL GROUND RODS A MINIMUM OF 30 FEET.



JOIN SECTIONAL GROUND RODS BY EXOTHERMIC WELDING CONNECTION

This drawing was originally created and provided by the NCDOT and was unchanged by SEPI Engineering & Construction. This is to state, to the best of our knowledge and belief, that this detail drawing was created to adhere to the latest "Road Standard Drawings NCDOT" (dated 2012) and U-0071 Project Special Provisions. Should deviations from either occur, the aforementioned Standards and Project Special Provisions should be used.

NOTES

1. BOND 0.5 INCH DIAMETER, 28 STRAND (MINIMUM) CLASS II COPPER CONDUCTOR TO THE MAIN GROUND ROD BY AN EXOTHERMIC WELD METHOD.
2. EXOTHERMICALLY WELD ALL CONNECTIONS TO GROUND RODS.
3. BOND #4 AWG SOLID BARE COPPER WIRE TO REBAR CAGE AND THE MAIN GROUND ROD BY AN EXOTHERMIC WELD METHOD.
4. ENSURE CAMERA HOUSING, CAMERA, AND PAN -TILT UNIT ARE BONDED TO POLE.
5. REMOVE BONDING JUMPER BETWEEN EQUIPMENT CABINET GROUND BUSS AND NEUTRAL BUSS.
6. THE CONTRACTOR MAY, UPON APPROVAL OF THE ENGINEER, INSTALL A 30-FOOT SECTIONAL GROUND ROD WHEN CONDITIONS WILL NOT ALLOW FOR THE INSTALLATION OF THE 3 - RADIAL GROUND RODS.
7. INSTALL MARKER TAPE DIRECTLY ABOVE ALL GROUNDING ELECTRODES AND CONDUCTORS AT A DEPTH OF 12 INCHES.

CCTV CAMERA INSTALLATION
FOR METAL POLE WITH
AERIAL ELECTRICAL SERVICE
TYPICAL DETAIL

PLAN DATE:	REVIEWED BY:
PREPARED BY:	REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0

SEAL

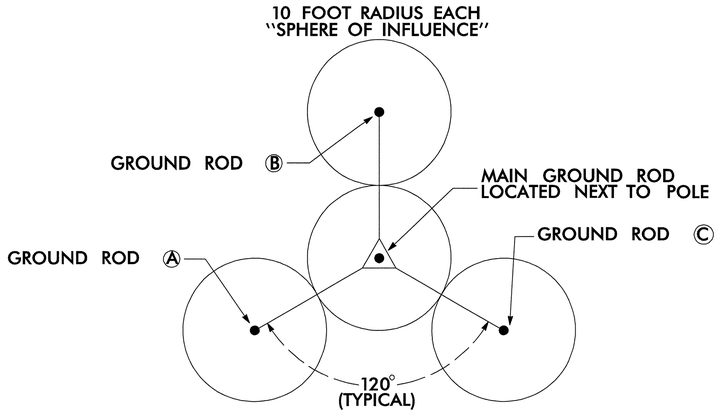
NORTH CAROLINA PROFESSIONAL SEAL 07438 ENGINEER JAMES O. DENTON

12/2/15

SIGNATURE DATE

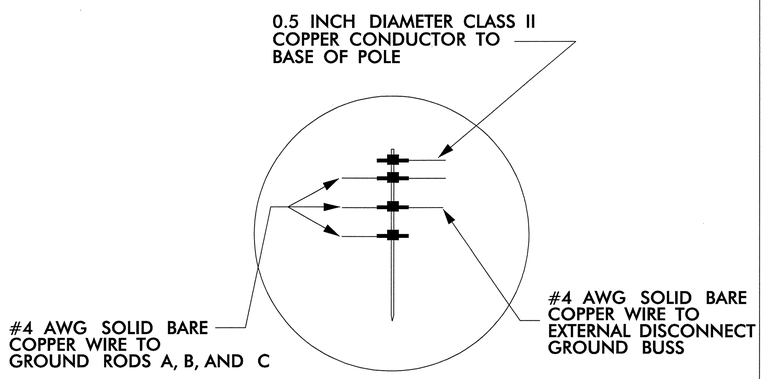
CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
U-0071	Sig. 95



GROUND ROD PLACEMENT DETAIL

(TYPICAL EACH POLE)



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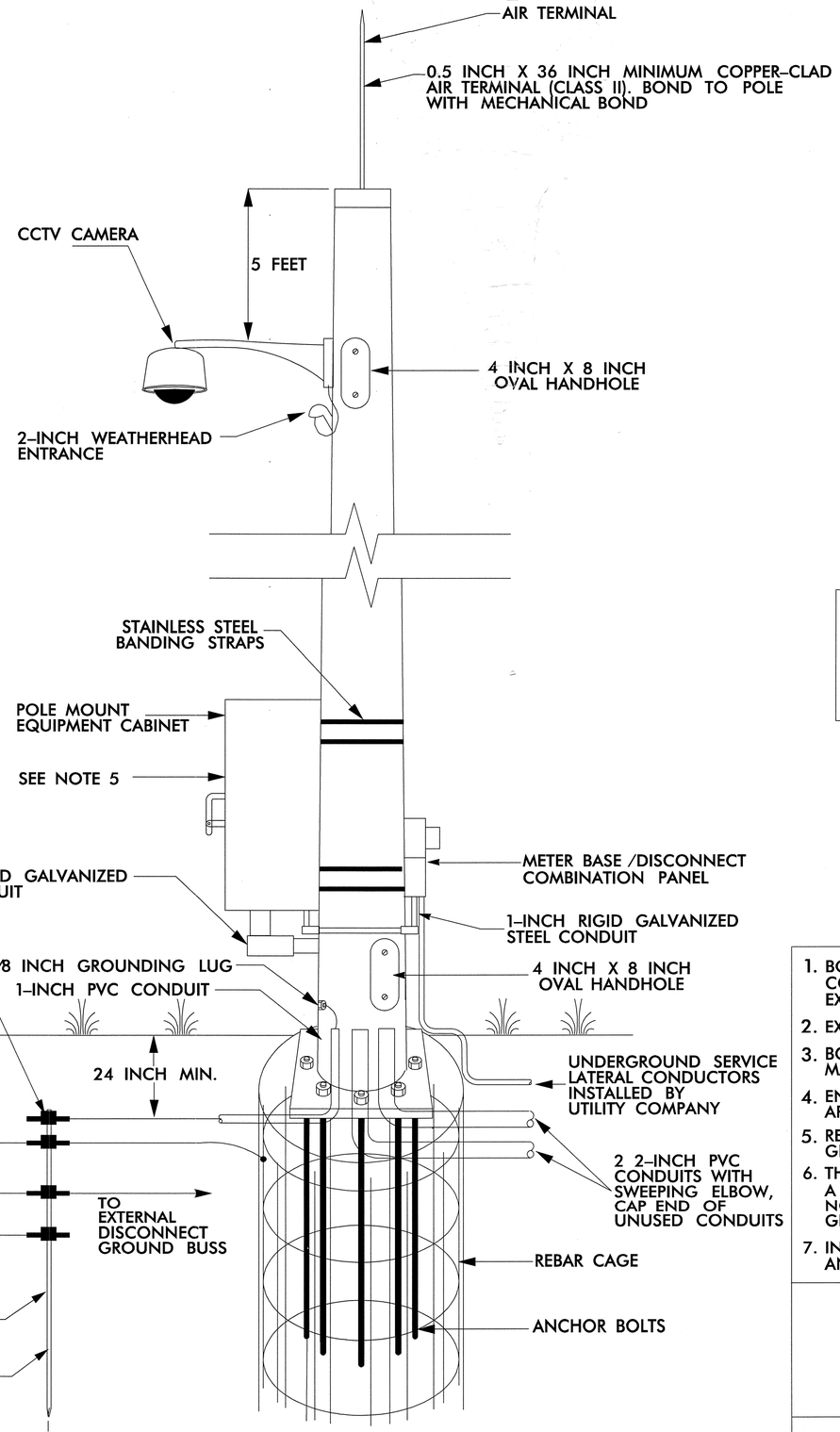
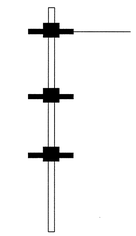


ALTERNATE GROUNDING METHOD

IF SPACE IS NOT AVAILABLE TO DRIVE MULTIPLE RODS, DRIVE SECTIONAL GROUND RODS A MINIMUM OF 30 FEET.



JOIN SECTIONAL GROUND RODS BY EXOTHERMIC WELDING CONNECTION

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NOTES

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5. REMOVE BONDING JUMPER BETWEEN EQUIPMENT CABINET GROUND BUSS AND NEUTRAL BUSS.
6. THE CONTRACTOR MAY, UPON APPROVAL OF THE ENGINEER, INSTALL A 30-FOOT SECTIONAL GROUND ROD WHEN CONDITIONS WILL NOT ALLOW FOR THE INSTALLATION OF THE 3 - RADIAL GROUND RODS.
7. INSTALL MARKER TAPE DIRECTLY ABOVE ALL GROUNDING ELECTRODES AND CONDUCTORS AT A DEPTH OF 12 INCHES.

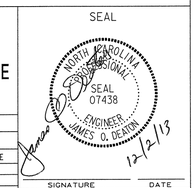
SCALE: 0

CCTV CAMERA INSTALLATION
FOR METAL POLE WITH
UNDERGROUND ELECTRICAL SERVICE
TYPICAL DETAIL

PLAN DATE:	REVIEWED BY:
PREPARED BY:	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL



12/2/13

SIGNATURE DATE

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