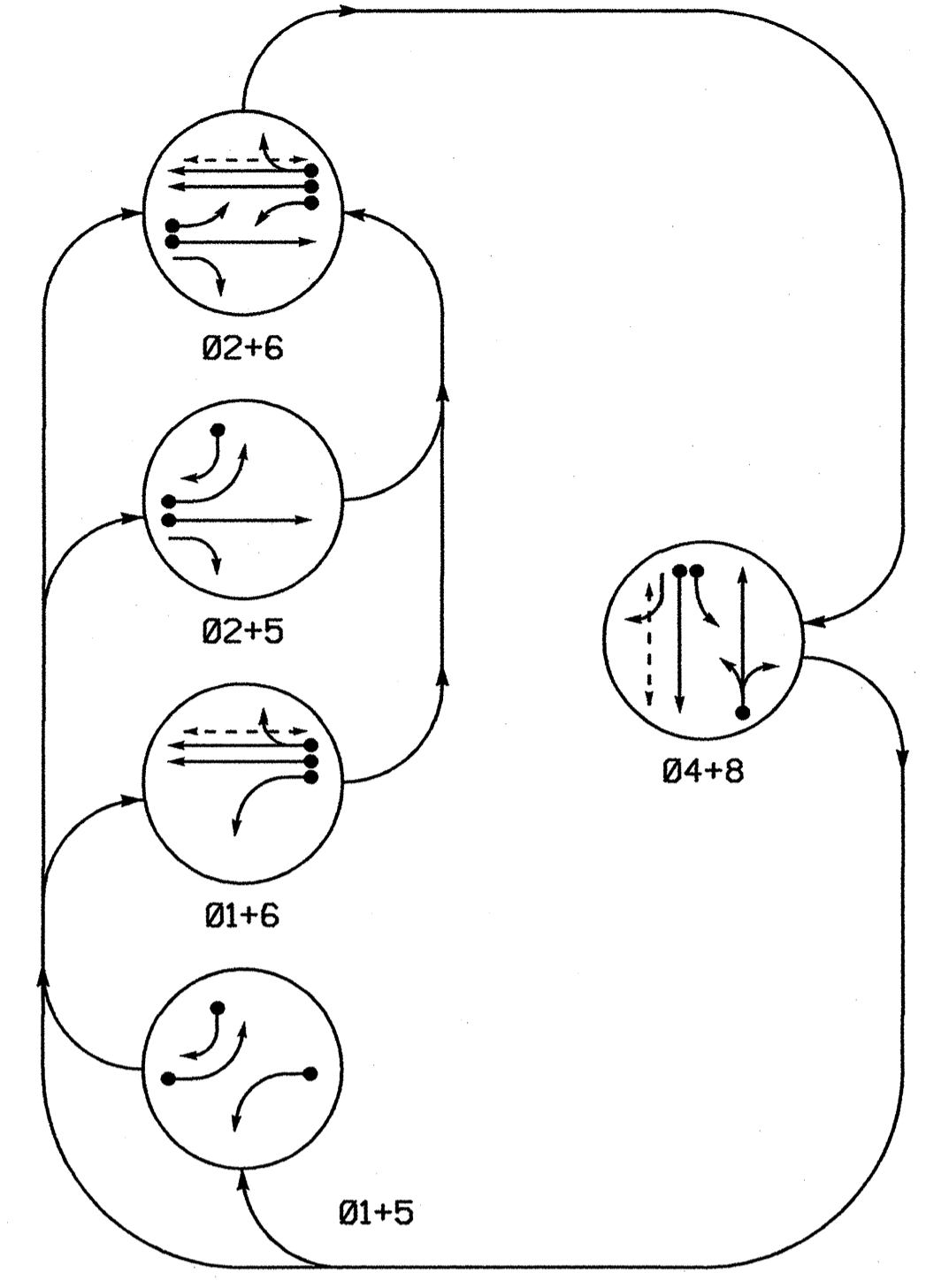


PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE					
	01+5	01+6	02+5	02+6	04+8	FL
21	R	R	G	G	R	Y
22	R	R	G	G	R	Y
41	R	R	R	R	G	R
42	R	R	R	R	G	R
61	R	G	R	G	R	Y
62, 63	R	G	R	G	R	Y
81, 82	R	R	R	R	G	R
P41, P42	DW	DW	DW	DW	W	DRK
P61, P62	DW	W	DW	W	DW	DRK

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

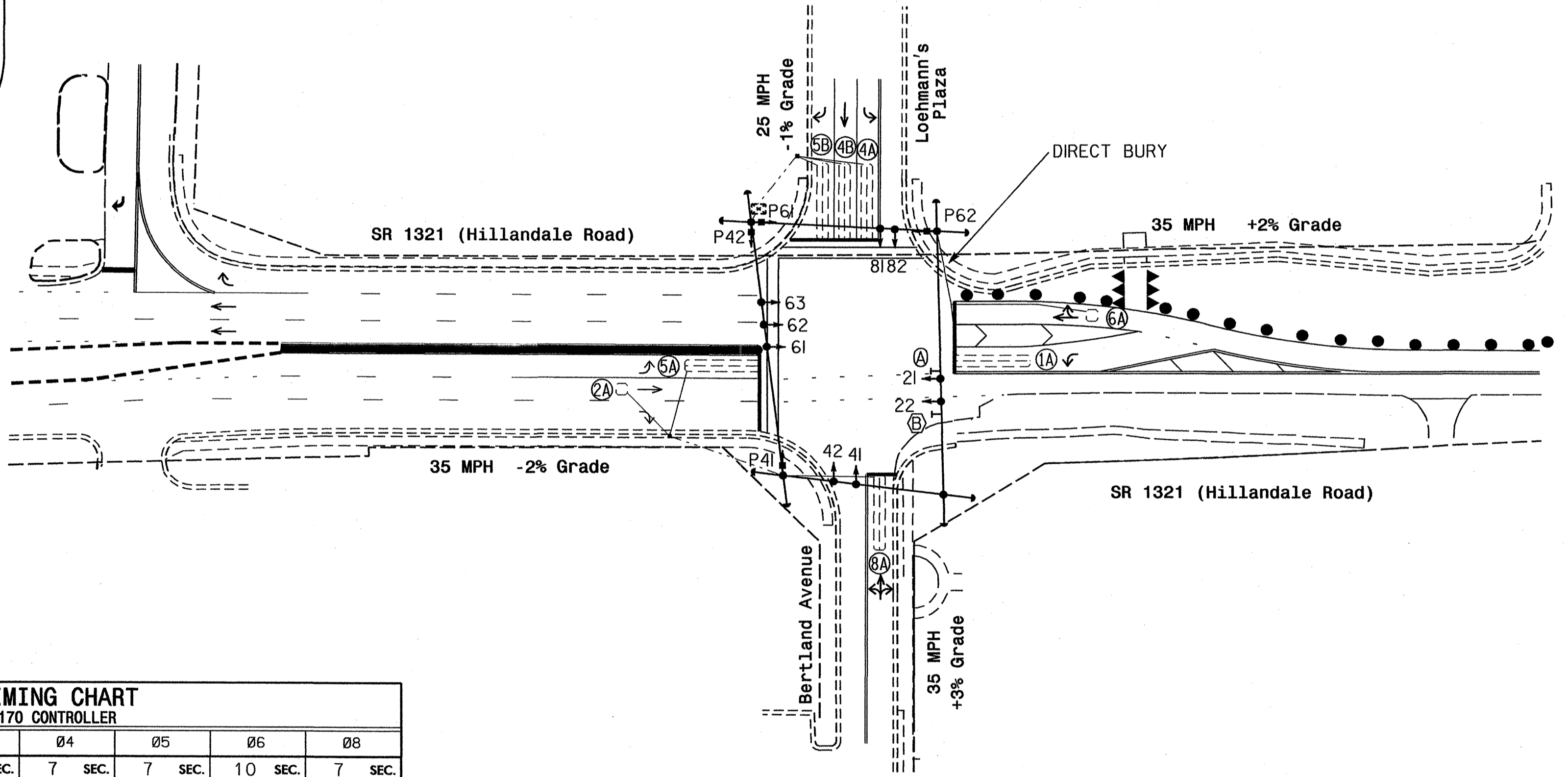
170 LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DETECTOR PROGRAMMING												STATUS	
							TIMING		ATTRIBUTES								SYSTEM LOOPS	NEW	EXISTING	
							DELAY	CARRY (STRETCH)	1	2	3	4	5	6	7	8				
1A	6X40	2-4-2	0	-	X	1	15 SEC.	- SEC.	-	-	-	-	-	X	-	X	-	-	X	
							4	15 SEC.	- SEC.	-	-	-	-	-	X	-	-	-	X	
							6	- SEC.	- SEC.	-	-	-	-	X	-	-	-	-	X	
2A	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	- SEC.	- SEC.	-	-	-	-	-	X	-	X	-	-	X	
5A	6X40	2-4-2	0	-	X	5	15 SEC.	- SEC.	-	-	-	-	-	X	-	X	-	-	X	
							4	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	
							2	- SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	
5B	6X40	2-4-2	0	-	X	5	15 SEC.	- SEC.	-	-	-	-	-	X	-	X	-	-	X	
							4	15 SEC.	- SEC.	-	-	-	-	X	-	X	-	-	X	
6A	6X6	4	70	-	X	6	- SEC.	- SEC.	-	-	-	-	-	X	-	X	-	-	X	
8A	6X40	2-4-2	0	-	X	8	- SEC.	- SEC.	-	-	-	-	-	X	-	X	-	-	X	
P41, P42	-	-	-	-	X	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X	
P61, P62	-	-	-	-	X	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X	

5 Phase Fully Actuated (Durham Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Program phase 1 as protected/permissive.
4. Program phase 5 as protected/permissive.
5. Program controller to clear from phase 2+6 to phase 1 and/or 5 by progressing through phase 4+8 (see Electrical Details).
6. Reposition existing signal heads number 61, 62, and 63.
7. Set all detector units to presence mode.
8. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
9. Set phase bank 3 maximum limit to 250 seconds for phases used.
10. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
11. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
12. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

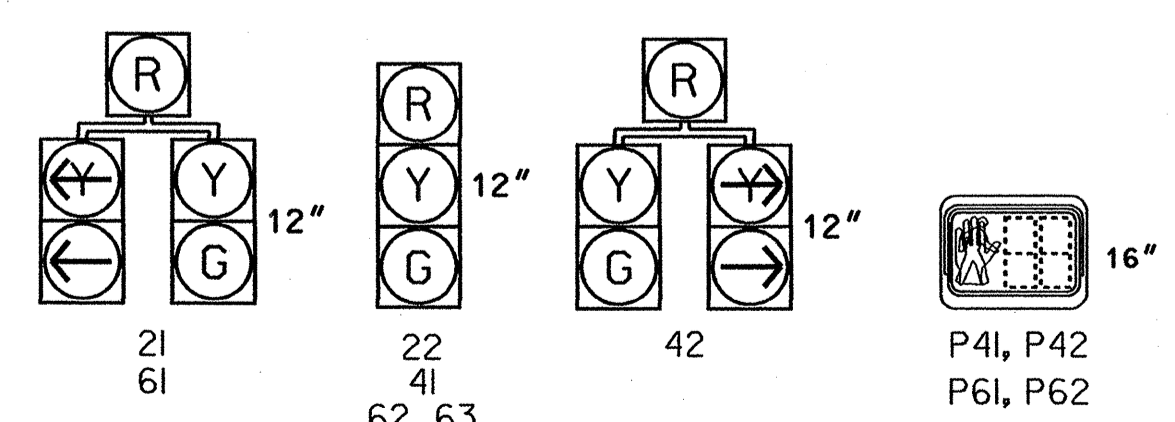


TIMING CHART
170 CONTROLLER

PHASE	01	02	04	05	06	08
MINIMUM INITIAL *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 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.	4.0 SEC.	3.2 SEC.	3.0 SEC.	3.7 SEC.	3.7 SEC.
RED CLEARANCE	2.3 SEC.	2.1 SEC.	2.8 SEC.	3.1 SEC.	1.9 SEC.	2.5 SEC.
MAXIMUM LIMIT *	20 SEC.	40 SEC.	20 SEC.	20 SEC.	40 SEC.	20 SEC.
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE
VEHICLE CALL MEMORY	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK	YELLOW LOCK	NONLOCK
DOUBLE ENTRY	OFF	OFF	ON	OFF	OFF	ON
WALK *	- SEC.	- SEC.	7 SEC.	- SEC.	7 SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	22 SEC.	- SEC.	17 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.	3.0 SEC.	2.0 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.	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.

SIGNAL FACE I.D.



LEGEND

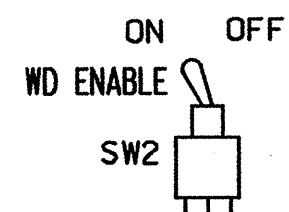
- | PROPOSED | EXISTING |
|--|--|
| ○ → Traffic Signal Head | ● → Traffic Signal Head |
| ○ → Modified Signal Head | N/A |
| □ → Sign | N/A |
| □ → Pedestrian Signal Head With Push Button & Sign | □ → Pedestrian Signal Head |
| □ → Signal Pole with Sign | □ → Signal Pole with Sign |
| □ → Signal Pole with Sidewalk Guy | □ → Signal Pole with Sidewalk Guy |
| □ → Inductive Loop Detector | □ → Inductive Loop Detector |
| □ → Controller & Cabinet | □ → Controller & Cabinet |
| □ → Junction Box | □ → Junction Box |
| --- 2-in Underground Conduit | --- 2-in Underground Conduit |
| N/A | → Right of Way |
| → Directional Arrow | → Directional Arrow |
| (A) "U-TURN YIELD TO RIGHT TURN" Sign (R10-16) | (A) "U-TURN YIELD TO RIGHT TURN" Sign (R10-16) |
| (B) Right Arrow "ONLY" Sign (R3-5R) | (B) Right Arrow "ONLY" Sign (R3-5R) |

Signal Upgrade Temporary Design 2 (Construction Phase II)

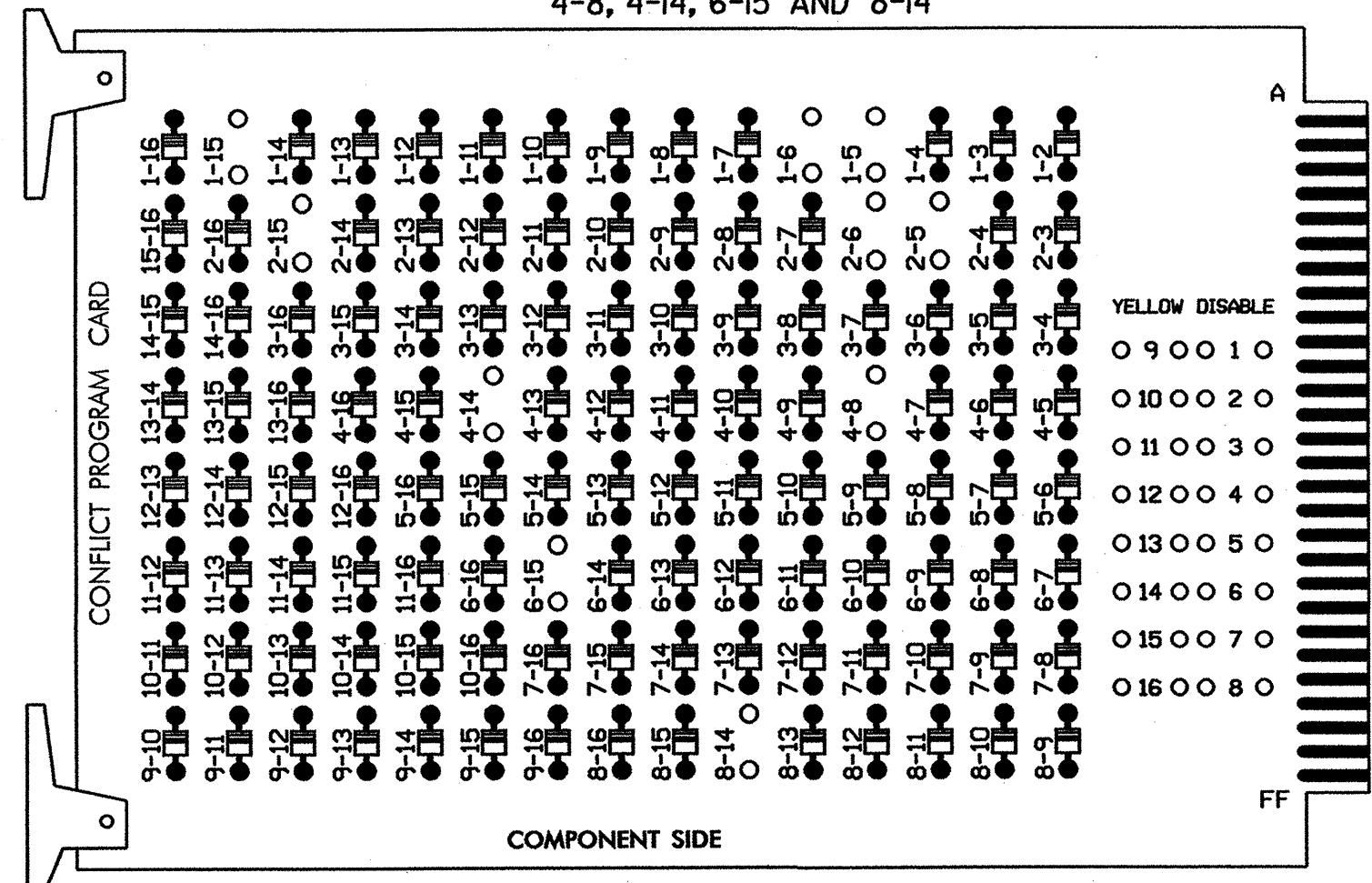
	<p>SR 1321 (Hillendale Road) at Bertrand Avenue</p>		
	<p>Division 5 Durham County Durham</p>	<p>PLAN DATE: October 2009 REVIEWED BY:</p>	
<p>750 N. Greenfield Pkwy, Garner, NC 27529</p>	<p>SCALE 0 50 1"=50'</p>	<p>REVISIONS</p>	<p>SIGNATURE DATE</p>
<p>SIG. INVENTORY NO. 05-2379T2</p>			<p>DATE 12/12/09</p>

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



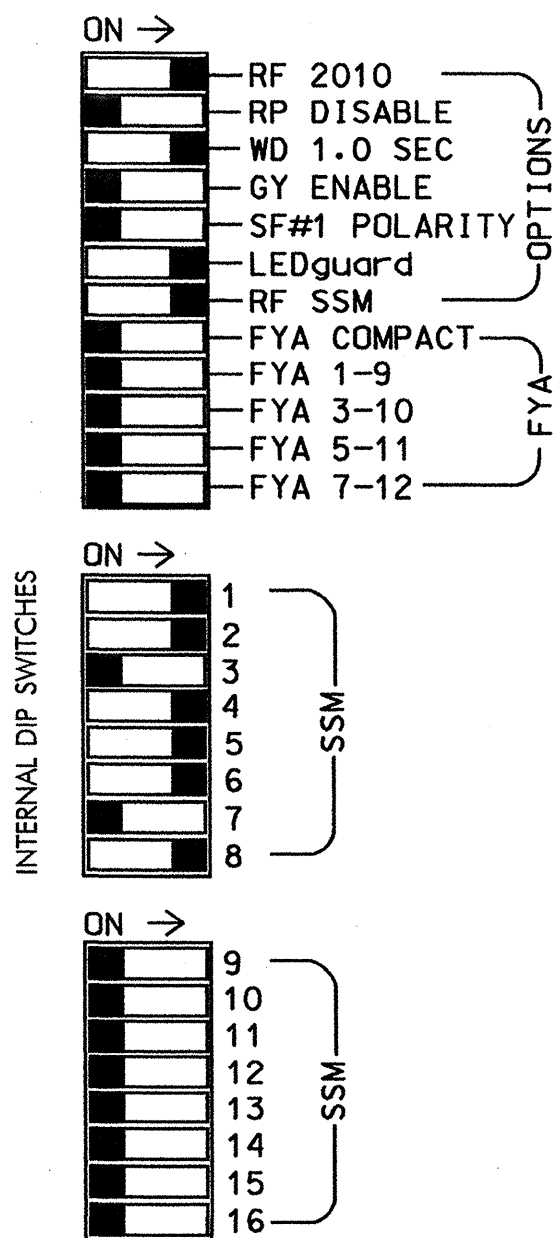
REMOVE DIODE JUMPERS 1-5, 1-6, 1-15, 2-5, 2-6, 2-15
4-8, 4-14, 6-15 AND 8-14



REMOVE JUMPERS AS SHOWN

NOTES:

- Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
- Make sure jumpers SEL2-SEL5 are present on the monitor board.
- Ensure that Red Enable is active at all times during normal operation.



■ = DENOTES POSITION OF SWITCH

NOTES

- 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.
- TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 3,7,9, 10,11,12,13,14,15 AND 16, TIE UNUSED RED MONITOR INPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
- SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE FOR ALL PHASES.
- PROGRAM PHASES 4 AND 8 FOR DOUBLE ENTRY.
- PROGRAM ALL TIMING INFORMATION INTO PHASE BANKS 1,2 & 3.
- SET PHASE BANK 3 MAXIMUM LIMIT TO 250 SEC. FOR PHASES USED.
- SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
- THIS CABINET AND CONTROLLER ARE PART OF THE DURHAM CITY SIGNAL SYSTEM.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED TYPE 170E
CABINETCONTRACTOR SUPPLIED MODEL 332
SOFTWAREBI TRANS 233NC2
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S1,S2,S4,S4P,S5,S6,S6P,S8
PHASES USED.....1,2,4,5,6,8,4PED,6PED
OVERLAPS USED.....NONE

PEDESTRIAN PHASE PROGRAMMING

PROGRAM PEDESTRIAN 4P OUTPUT AT KEYPAD INPUT E/125+F+7=ø4
PROGRAM PEDESTRIAN 6P OUTPUT AT KEYPAD INPUT E/125+F+6=ø6

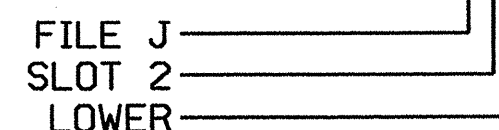
INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	1	56	5 7	1
			2	56	7	4
			3	56	5 7	6
2A	TB2-5,6	I2U	4	39	5 7	2
			5			
4A	TB4-9,10	I6U	6	41	5 7	4
			7	45	5 7	4
5A	TB3-1,2	J1U	8	55	5 7	5
			9	55	7	4
			10	55	5 7	2
6A	TB3-5,6	J2U	11	40	5 7	6
			12			
5B	TB3-9,10	J3U	13	64	5 7	5
			14	64	7	4
8A	TB5-9,10	J6U	15	42	5 7	8
			16			
PED PUSH BUTTONS	*		16			
			17	69	2	4PED
P41, P42	TB8-5,6	I12L	17	68	2	6PED
P61, P62	TB8-7,9	I13U	18	68	2	6PED
*			19			

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

* RESERVED FOR FUTURE PROGRAMMING

INPUT FILE POSITION LEGEND: J2L



SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	61	21,22	NU	NU	41,42	P41, P42	21,42	61,62, 63	P61, P62	NU	81,82	NU
RED	*	128			101		*	134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW	126							132				
GREEN ARROW	127							133				
Hand icon						104			119			
Person icon						106			121			

NU = Not Used

** **

* Denotes install load resistor. See Load Resistor Installation Detail this sheet.

** See 'Countdown Pedestrian Signal Operation' note below.

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

BACK-UP PROTECTION NOTE

TO ENSURE THAT THE CONTROLLER WILL NOT SEQUENCE FROM PHASE 2+6 DIRECTLY TO PHASE 1 AND/OR 5, SPECIAL PROGRAMMING HAS TO BE ENABLED IN THE BI TRANS 233NC2 SOFTWARE. PROGRAM 170E CONTROLLER AS FOLLOWS:

- PROGRAM PHASES 1 & 5 AS PROTECTED/PERMITTED AT KEYPAD INPUT E/125+E+4=ø1,5
- LOOPS '1A,5A & 5B' WILL HAVE TO BE PROGRAMMED TO CALL PHASE 4 (WITH APPROPRIATE DELAY TIME) TO ALLOW CONTROLLER TO SEQUENCE THRU PHASE 4+8 BEFORE PROCEEDING TO PHASE 5. (SEE INPUT FILE PROGRAMMING THIS SHEET).

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGNS: 05-2379T1
DESIGNED: OCTOBER 2009 05-2379T2
SEALED: 12/22/09
REVISED: N/A

Temporary Design 1 (Construction Phase II)
Temporary Design 2 (Construction Phase II)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1321 (Hillandale Road) at Bertland Avenue

Division 05 Durham County Durham

PLAN DATE: December 2009 REVIEWED BY: MJA

PREPARED BY: F.E. RUSS REVIEWED BY:

REVISIONS: INIT. DATE

750 N. Greenfield Pkwy, Garner, NC 27529

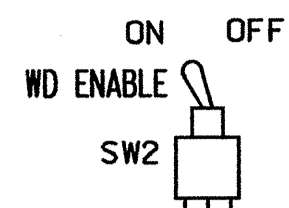
SEAL: JOHN T. ROWE, ENGINEER, SEAL 008453

Signature: John T. Rowe, 12-22-09

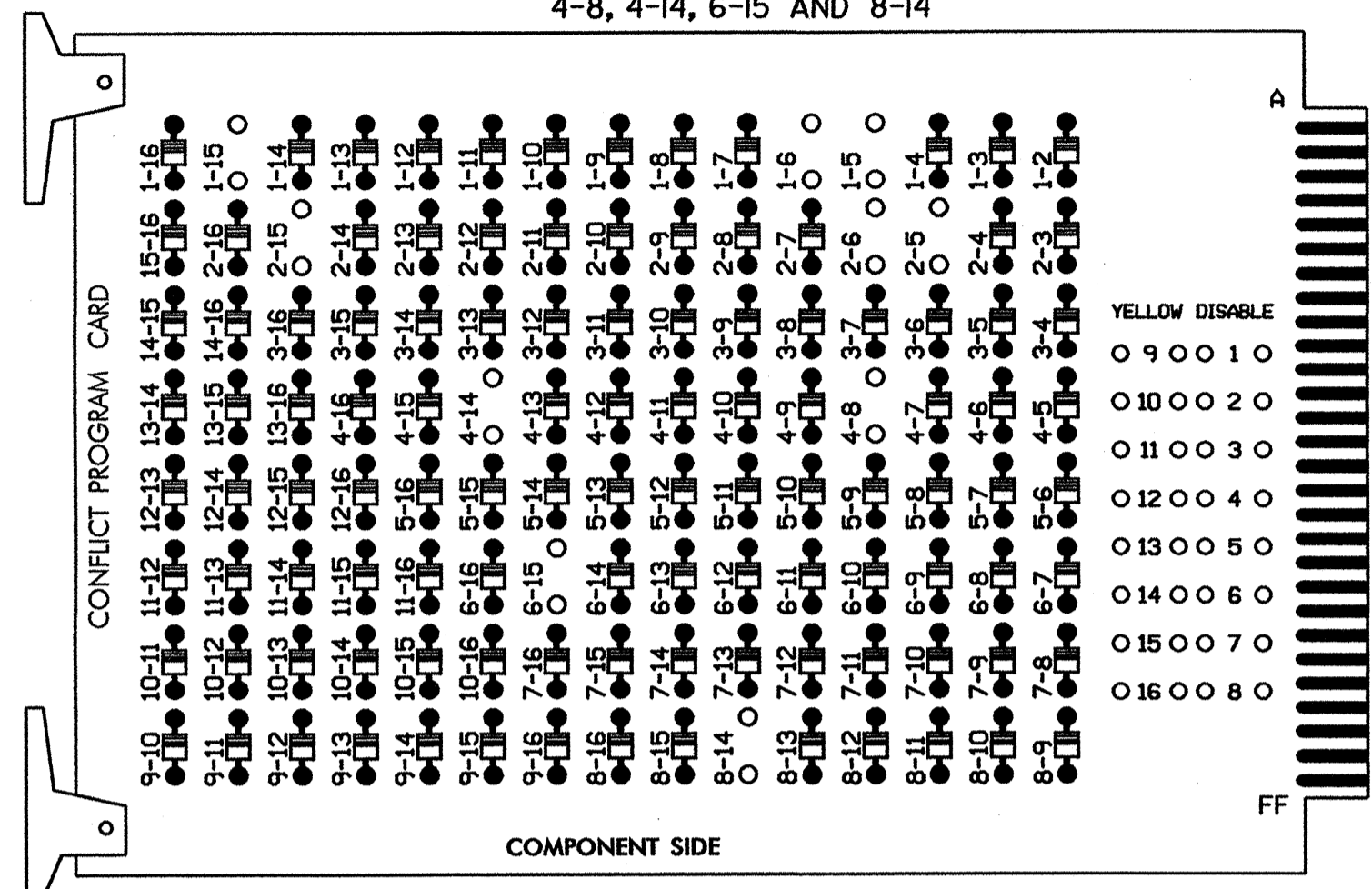
SIG. INVENTORY NO. 05-2379T1, T2

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



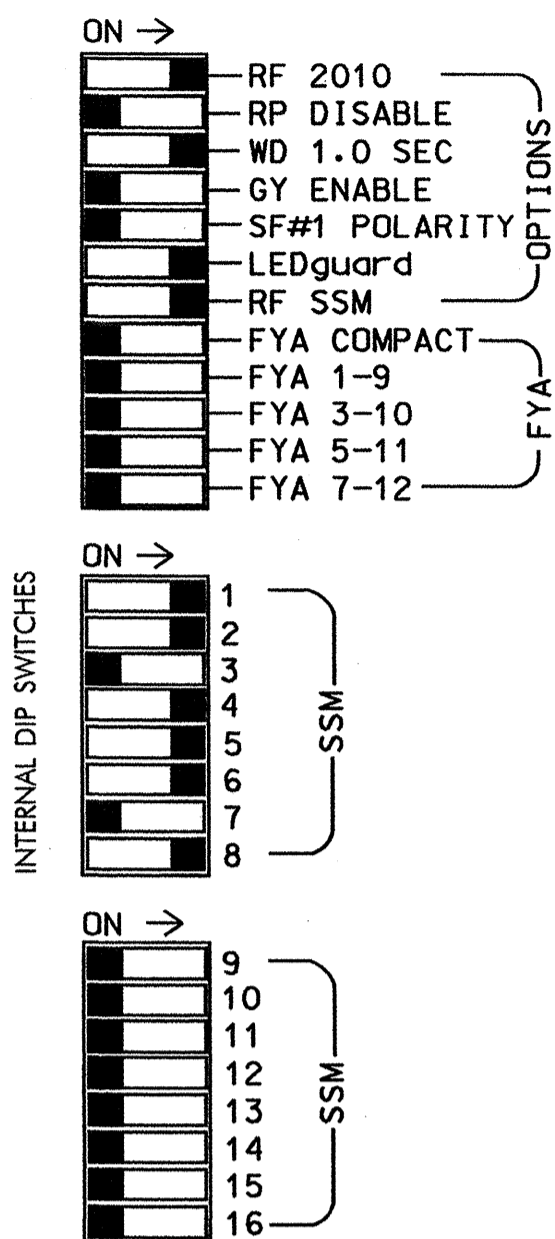
REMOVE DIODE JUMPERS 1-5, 1-6, 1-15, 2-5, 2-6, 2-15
4-8, 4-14, 6-15 AND 8-14



REMOVE JUMPERS AS SHOWN

NOTES:

- Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
- Make sure jumpers SEL2-SEL5 are present on the monitor board.
- Ensure that Red Enable is active at all times during normal operation.



NOTES

- 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.
- TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 3,7,9, 10,11,12,13,14,15 AND 16, TIE UNUSED RED MONITOR INPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
- SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE FOR ALL PHASES.
- PROGRAM PHASES 4 AND 8 FOR DOUBLE ENTRY.
- PROGRAM ALL TIMING INFORMATION INTO PHASE BANKS 1,2 & 3.
- SET PHASE BANK 3 MAXIMUM LIMIT TO 250 SEC. FOR PHASES USED.
- SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
- THIS CABINET AND CONTROLLER ARE PART OF THE DURHAM CITY SIGNAL SYSTEM.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED TYPE 170E
CABINETCONTRACTOR SUPPLIED MODEL 332
SOFTWAREBI TRANS 233NC2
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S1,S2,S4,S4P,S5,S6,S6P,S8
PHASES USED.....1,2,4,5,6,8,4PED,6PED
OVERLAPS USED.....NONE

PEDESTRIAN PHASE PROGRAMMING

PROGRAM PEDESTRIAN 4P OUTPUT AT KEYPAD INPUT E/125+F+7=Ø4
PROGRAM PEDESTRIAN 6P OUTPUT AT KEYPAD INPUT E/125+F+6=Ø6

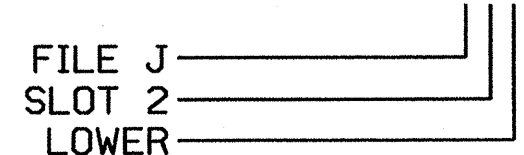
INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE			
1A	TB2-1,2	I1U	1	56	5 7	1			
			2	56	7	4			
			3	56	5 7	6			
2A	TB2-5,6	I2U	4	39	5 7	2			
			*	5					
4A	TB4-9,10	I6U	6	41	5 7	4			
			4B	TB4-11,12	I6L	7	45	5 7	4
5A	TB3-1,2	J1U	8	55	5 7	5			
			9	55	7	4			
			10	55	5 7	2			
6B	TB3-5,6	J2U	11	40	5 7	6			
			*	12					
5B	TB3-9,10	J3U	13	64	5 7	5			
			14	64	7	4			
8A	TB5-9,10	J6U	15	42	5 7	8			
			*						
PED PUSH BUTTONS	*		16						
			P41, P42	TB8-5,6	I12L	17	69	2	4PED
			P61, P62	TB8-7,9	I13U	18	68	2	6PED
			*	19					

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

* RESERVED FOR FUTURE PROGRAMMING

INPUT FILE POSITION LEGEND: J2L



SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	61	21,22	NU	NU	41,42	P41, P42	21,42	61,62, 63	P61, P62	NU	81,82	NU
RED	*	128			101		*	134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW	126							132				
GREEN ARROW	127							133				
						104			119			
						106			121			

NU = Not Used

** **

* Denotes install load resistor. See Load Resistor Installation Detail this sheet.

** See 'Countdown Pedestrian Signal Operation' note below.

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

BACK-UP PROTECTION NOTE

TO ENSURE THAT THE CONTROLLER WILL NOT SEQUENCE FROM PHASE 2+6 DIRECTLY TO PHASE 1 AND/OR 5, SPECIAL PROGRAMMING HAS TO BE ENABLED IN THE BI TRANS 233NC2 SOFTWARE. PROGRAM 170E CONTROLLER AS FOLLOWS:

- PROGRAM PHASES 1 & 5 AS PROTECTED/PERMITTED AT KEYPAD INPUT E/125+E+4=Ø1,5
- LOOPS '1A,5A & 5B' WILL HAVE TO BE PROGRAMMED TO CALL PHASE 4 (WITH APPROPRIATE DELAY TIME) TO ALLOW CONTROLLER TO SEQUENCE THRU PHASE 4+8 BEFORE PROCEEDING TO PHASE 5. (SEE INPUT FILE PROGRAMMING THIS SHEET).

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 05-2379T3
DESIGNED: OCTOBER 2009
SEALED: 12/22/09
REVISED: N/A

INPUT FILE POSITION LAYOUT

(front view)

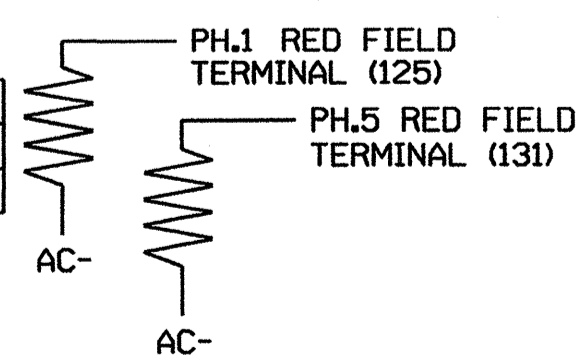
FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	Ø1,4,6	Ø2	S	S	S	Ø4	S	S	S	S	S	S	Ø6 PED	FS
L	1A	2A	-	-	-	4A	-	-	-	-	-	-	DC ISOLATOR	DC ISOLATOR
U	NOT USED	FUTURE USE	-	-	-	Ø4	-	-	-	-	-	-	Ø4 PED	ST
L	5A	6B	5B	-	-	NOT USED	-	-	-	-	-	-	DC ISOLATOR	DC ISOLATOR

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

FS = FLASH SENSE
ST = STOP TIME

LOAD RESISTOR INSTALLATION DETAIL

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



NOTE: THE PURPOSE OF THESE RESISTORS IS TO LOAD THE CHANNEL RED MONITOR INPUTS IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON THESE CHANNELS, WHICH DO NOT USE THE RED DISPLAY IN THE FIELD.

DETECTOR ATTRIBUTES LEGEND:

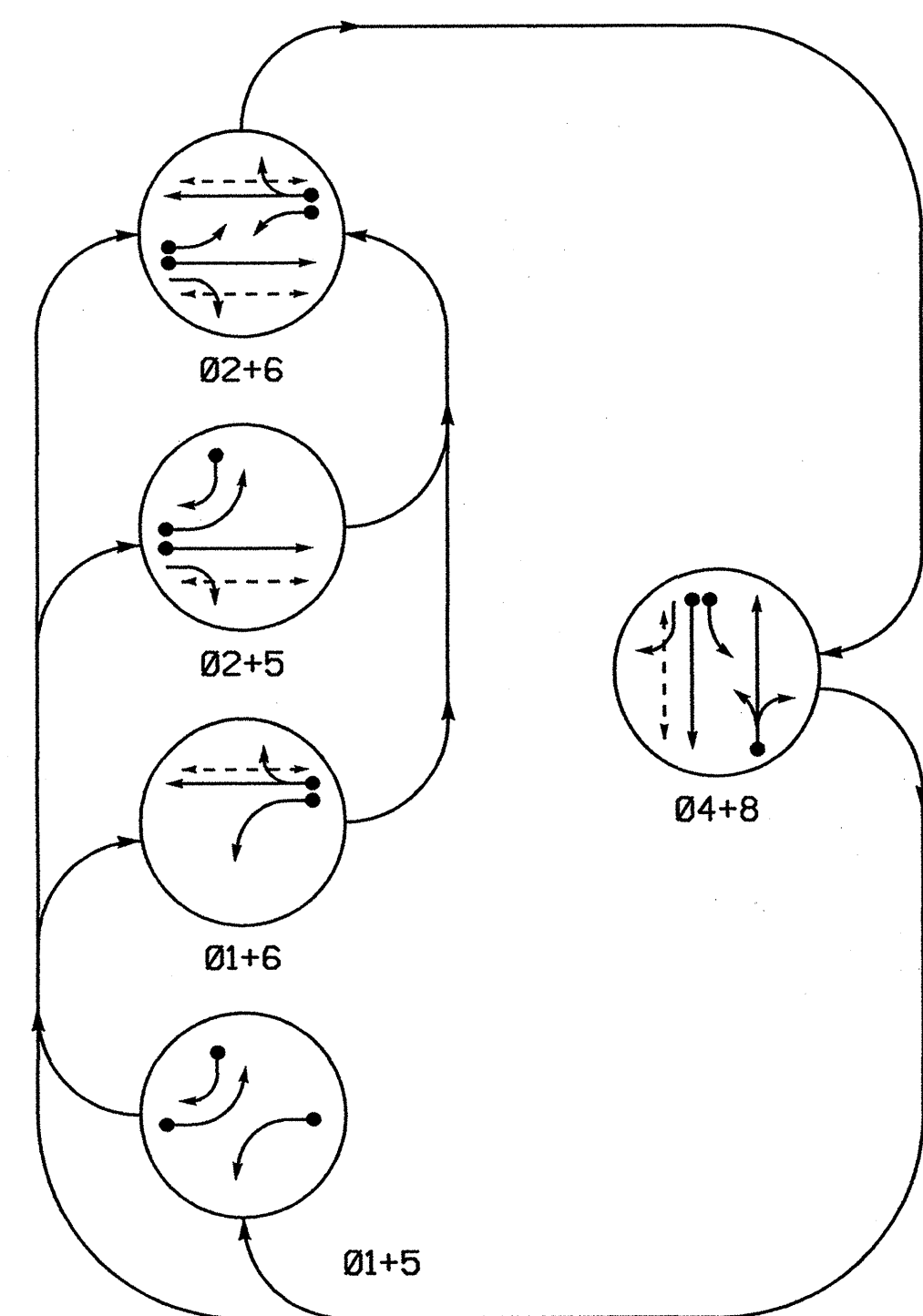
- FULL TIME DELAY
- PED CALL
- RESERVED
- COUNTING
- EXTENSION
- TYPE 3
- CALLING
- ALTERNATE

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

Temporary Design 3 (Construction Phase III)

ELECTRICAL AND PROGRAMMING DETAILS FOR:		SR 1321 (Hillandale Road) at Bertland Avenue		SEAL	
Prepared In the Office of:		Division 05 Durham County Durham		SEAL	
		PLAN DATE: December 2009 REVIEWED BY: F.E. RUSS PREPARED BY: F.E. RUSS REVIEWED BY:		SEAL 008453 ENGINEER JOHN T. ROWE, PE	
750 N. Greenfield Pkwy, Garner, NC 27529		REVISIONS: _____ INIT. DATE _____ SIGNATURE: _____ DATE: 12-22-09		SIGNATURE: _____ DATE: _____ SIG. INVENTORY NO. 05-2379T3	

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	F
21	R	R	G	G	R	Y
22	R	R	G	G	R	Y
41	R	R	R	R	G	R
42	R	R	R	R	G	R
61	R	G	R	R	G	Y
62, 63	R	G	R	R	G	Y
81, 82	R	R	R	R	G	R
P21, P22	DW	DW	W	W	DW	DRK
P41, P42	DW	DW	DW	DW	W	DRK
P61, P62	DW	W	DW	W	DW	DRK

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

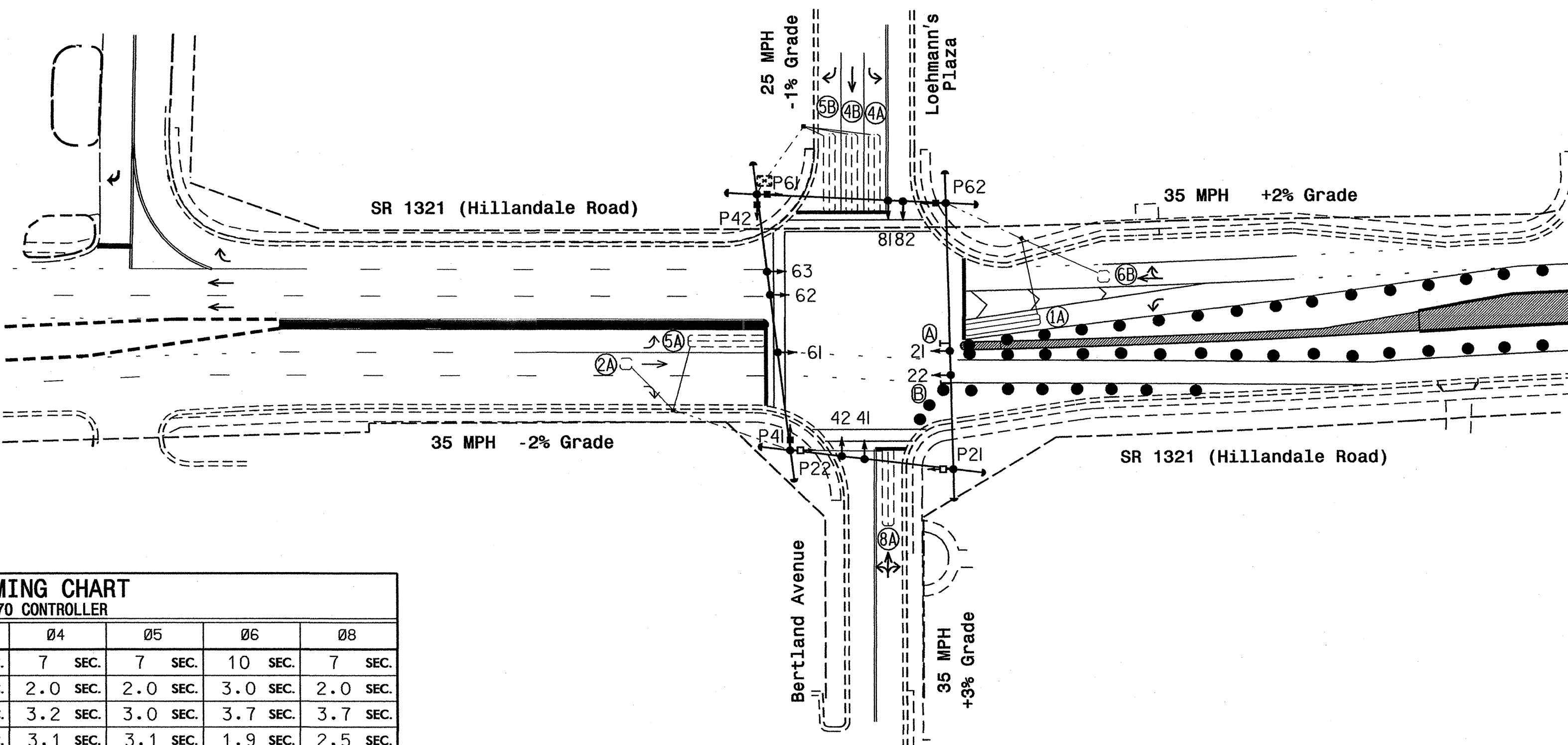
170 LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	DETECTOR PROGRAMMING													
						NEMA PHASE	TIMING		ATTRIBUTES								STATUS		
							DELAY	CARRY (STRETCH)	1	2	3	4	5	6	7	8	NEW	EXISTING	
1A	6X40	2-4-2	0	X	-	1	15 SEC.	- SEC.	-	-	-	-	-	X	-	X	-	-	X
2A	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	- SEC.	- SEC.	-	-	-	-	-	X	-	X	-	-	X
5A	6X40	2-4-2	0	-	X	5	15 SEC.	- SEC.	-	-	-	-	-	X	-	X	-	-	X
5B	6X40	2-4-2	0	-	X	4	15 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
P21, P22	-	-	-	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X
P41, P42	-	-	-	X	-	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X
P61, P62	-	-	-	X	-	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	-	X

5 Phase Fully Actuated (Durham Signal System)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Program phase 1 as protected/permissive.
- Program phase 5 as protected/permissive.
- Program controller to clear from phase 2+6 to phase 1 and/or 5 by progressing through phase 4+8 (see Electrical Details).
- Set all detector units to presence mode.
- Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
- Set phase bank 3 maximum limit to 250 seconds for phases used.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



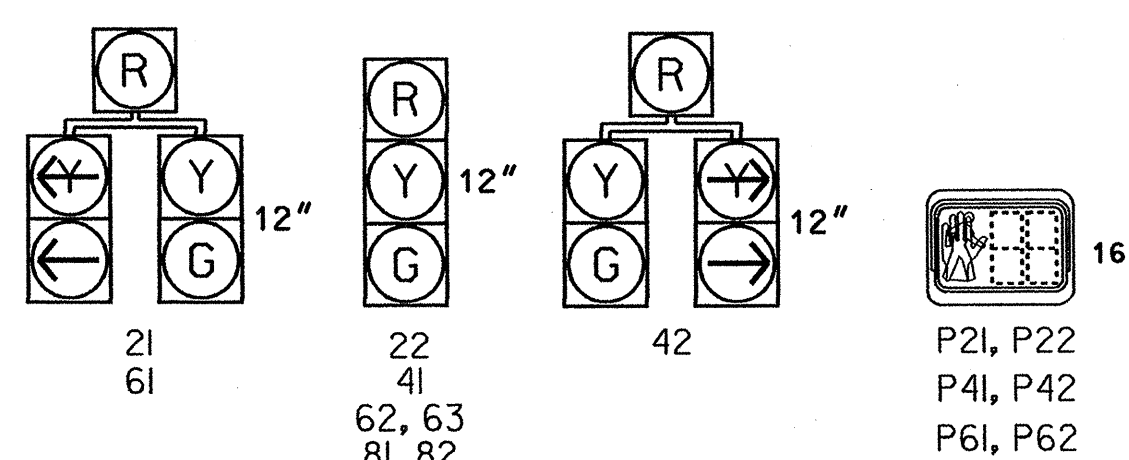
TIMING CHART 170 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø5	Ø6	Ø8
MINIMUM INITIAL *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 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.	4.0 SEC.	3.2 SEC.	3.0 SEC.	3.7 SEC.	3.7 SEC.
RED CLEARANCE	2.6 SEC.	2.1 SEC.	3.1 SEC.	3.1 SEC.	1.9 SEC.	2.5 SEC.
MAXIMUM LIMIT *	20 SEC.	40 SEC.	20 SEC.	20 SEC.	40 SEC.	20 SEC.
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	VEH. RECALL	NONE
VEHICLE CALL MEMORY	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK	YELLOW LOCK	NONLOCK
DOUBLE ENTRY	OFF	OFF	ON	OFF	OFF	ON
WALK *	- SEC.	7 SEC.	7 SEC.	- SEC.	7 SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	10 SEC.	22 SEC.	- SEC.	17 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.	3.0 SEC.	2.0 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.	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.

SIGNAL FACE I.D.

All Heads L.E.D.



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 | → |
| Construction Zone | Construction Zone |
| Construction Zone Drums | Construction Zone Drums |
| Ⓐ "U-TURN YIELD TO RIGHT TURN" Sign (R10-16) | Ⓐ |
| Ⓑ Right Arrow "ONLY" Sign (R3-5R) | Ⓑ |

Signal Upgrade Temporary Design 4 (Construction Phase IV)

Prepared in the Offices of:
TRANSPORTATION MOBILITY AND SAFETY DIVISION
UNIVERSITY OF NORTH CAROLINA
SIGNAL DESIGN SECTION

SR 1321 (Hillandale Road) at Bertrand Avenue

Division 5 Durham County Durham
PLAN DATE: October 2009 REVIEWED BY:
PREPARED BY: C.E. Carter REVIEWED BY:
REVISIONS INIT. DATE

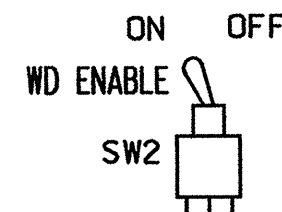
0 SCALE 50
1"=50'

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER
ROBERT L. LITTELL
12/12/09
SIG. INVENTORY NO. 05-237914

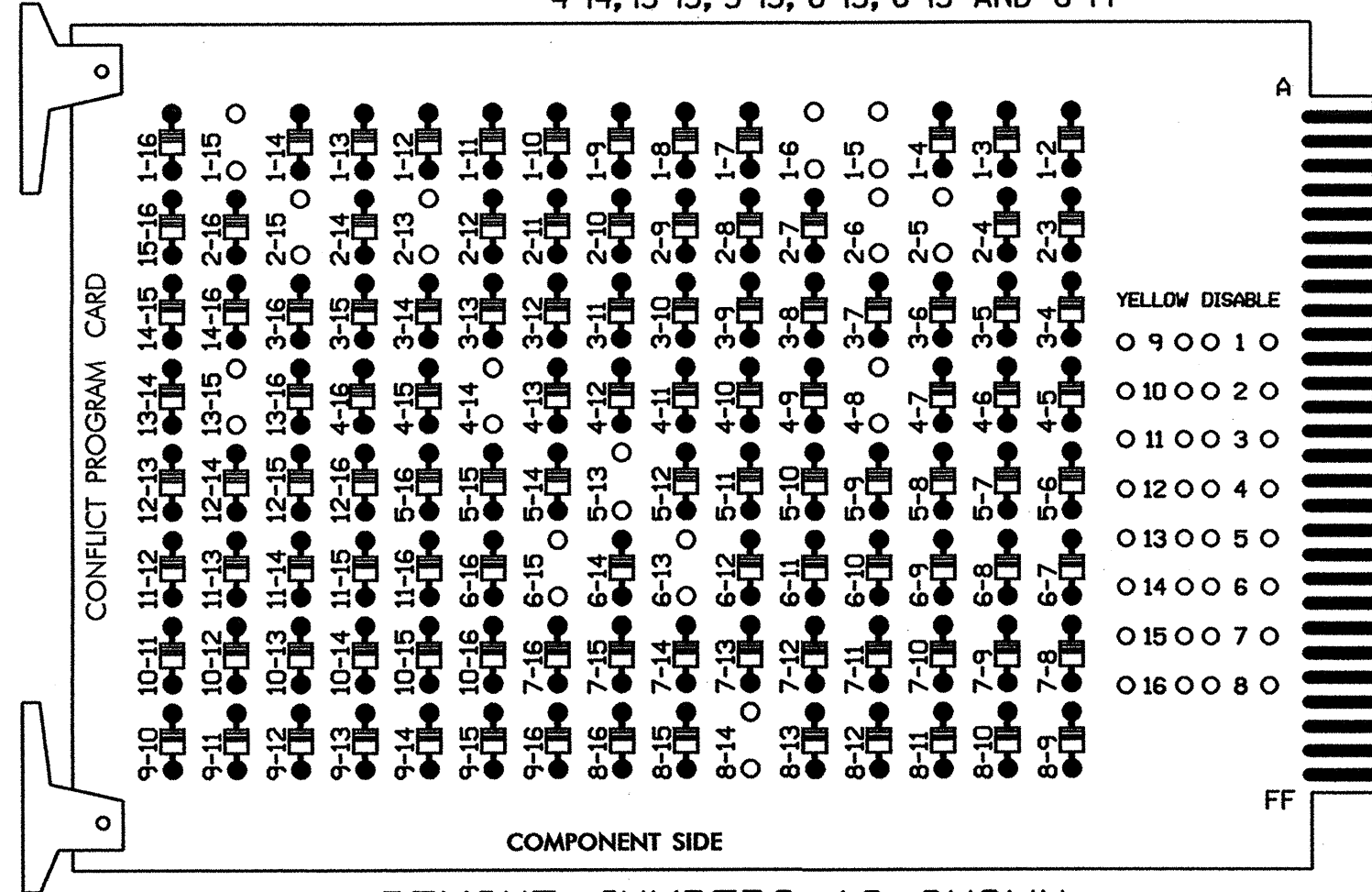
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PZ:lemo

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

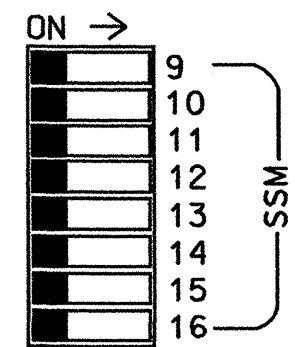
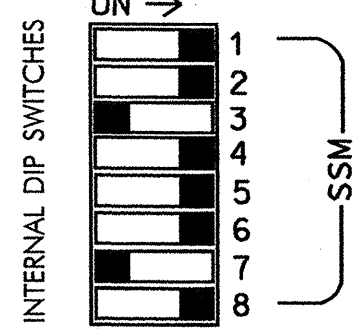
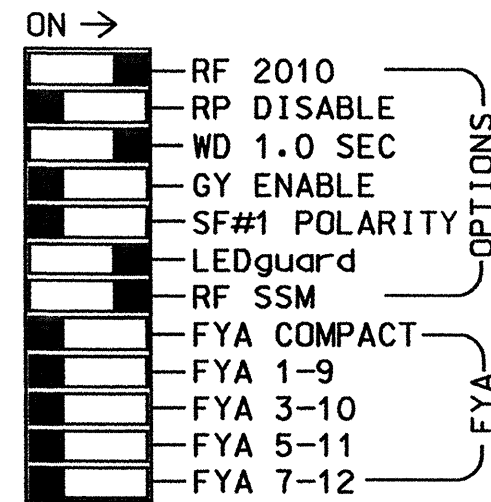
(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 1-5, 1-6, 1-15, 2-5, 2-6, 2-13, 2-15, 4-8, 4-14, 13-15, 5-13, 6-13, 6-15 AND 8-14



REMOVE JUMPERS AS SHOWN



■ = DENOTES POSITION OF SWITCH

NOTES:

- Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
- Make sure jumpers SEL2-SEL5 are present on the monitor board.
- Ensure that Red Enable is active at all times during normal operation.

INPUT FILE POSITION LAYOUT

(front view)

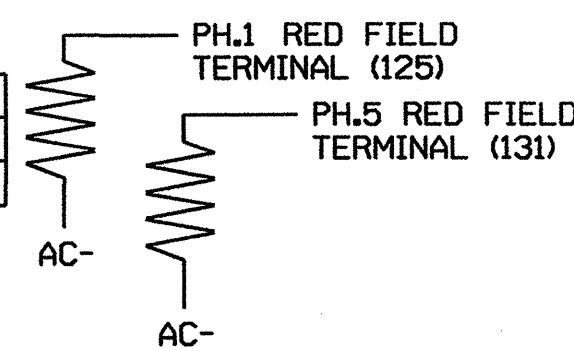
FILE "I"	U	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	L	∅1,4,6 1A	∅2 2A	S TOP	S TOP	S TOP	∅4 4A	S TOP	S TOP	S TOP	S TOP	S TOP	∅2PED DC ISOLATOR	∅6PED DC ISOLATOR	FS DC ISOLATOR
	L	NOT USED	FUTURE USE	←-VZM	←-VZM	←-VZM	∅4 4B	←-VZM	←-VZM	←-VZM	←-VZM	←-VZM	←-VZM	←-VZM	←-VZM
FILE "J"	U	∅5,4,2 5A	∅6 6B	∅5,4 5B	S TOP	S TOP	∅8 8A	S TOP	S TOP	S TOP	S TOP	S TOP	S TOP	S TOP	S TOP
	L	NOT USED	FUTURE USE	NOT USED	←-VZM	←-VZM	←-VZM	←-VZM	←-VZM	←-VZM	←-VZM	←-VZM	←-VZM	←-VZM	←-VZM

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

FS = FLASH SENSE
ST = STOP TIME

LOAD RESISTOR INSTALLATION DETAIL

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



NOTE: THE PURPOSE OF THESE RESISTORS IS TO LOAD THE CHANNEL RED MONITOR INPUTS IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON THESE CHANNELS, WHICH DO NOT USE THE RED DISPLAY IN THE FIELD.

DETECTOR ATTRIBUTES LEGEND:

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

NOTES

- 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.
- TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 3,7,9, 10,11,12,13,14,15 AND 16, TIE UNUSED RED MONITOR INPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
- SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE FOR ALL PHASES.
- PROGRAM PHASES 4 AND 8 FOR DOUBLE ENTRY.
- PROGRAM ALL TIMING INFORMATION INTO PHASE BANKS 1,2 & 3.
- SET PHASE BANK 3 MAXIMUM LIMIT TO 250 SEC. FOR PHASES USED.
- SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
- THIS CABINET AND CONTROLLER ARE PART OF THE DURHAM CITY SIGNAL SYSTEM.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED TYPE 170E CABINETCONTRACTOR SUPPLIED MODEL 332 SOFTWAREBI TRANS 233NC2 CABINET MOUNT.....BASE OUTPUT FILE POSITIONS...12 LOAD SWITCHES USED.....S1,S2,S2P,S4,S4P,S5,S6,S6P,S8 PHASES USED.....1,2,4,5,6,8,2PED,4PED,6PED OVERLAPS USED.....NONE

PEDESTRIAN PHASE PROGRAMMING

PROGRAM PEDESTRIAN 2P OUTPUT AT KEYPAD INPUT E/125+F+5=∅2
PROGRAM PEDESTRIAN 4P OUTPUT AT KEYPAD INPUT E/125+F+7=∅4
PROGRAM PEDESTRIAN 6P OUTPUT AT KEYPAD INPUT E/125+F+6=∅6

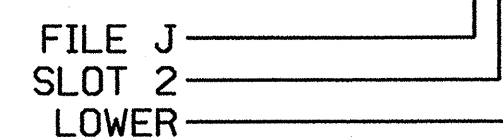
INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	1	56	5 7	1
			2	56	7	4
			3	56	5 7	6
2A	TB2-5,6	I2U	4	39	5 7	2
			5			
4A	TB4-9,10	I6U	6	41	5 7	4
			7	45	5 7	4
4B	TB4-11,12	I6L	8	55	5 7	5
			9	55	7	4
5A	TB3-1,2	J1U	10	55	5 7	2
			11	40	5 7	6
6B	TB3-5,6	J2U	12			
			13	64	5 7	5
5B	TB3-9,10	J3U	14	64	7	4
			15	42	5 7	8
8A	TB5-9,10	J6U				
PED PUSH BUTTONS						
P21, P22	TB8-4,6	I12U	16	67	2	2PED
P41, P42	TB8-5,6	I12L	17	69	2	4PED
P61, P62	TB8-7,9	I13U	18	68	2	6PED
*			19			

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

* RESERVED FOR FUTURE PROGRAMMING

INPUT FILE POSITION LEGEND:



SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	61	21,22	P21, P22	NU	41,42	P41, P42	21,42	61,62, 63	P61, P62	NU	81,82	NU
RED	*	128			101		*	134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW	126						132					
GREEN ARROW	127						133					
Hand icon			113			104			119			
Walking person icon			115			106			121			

NU = Not Used ** ** *

* Denotes install load resistor. See Load Resistor Installation Detail this sheet.

** See 'Countdown Pedestrian Signal Operation' note below.

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

BACK-UP PROTECTION NOTE

TO ENSURE THAT THE CONTROLLER WILL NOT SEQUENCE FROM PHASE 2+6 DIRECTLY TO PHASE 1 AND/OR 5. SPECIAL PROGRAMMING HAS TO BE ENABLED IN THE BI TRANS 233NC2 SOFTWARE. PROGRAM 170E CONTROLLER AS FOLLOWS:

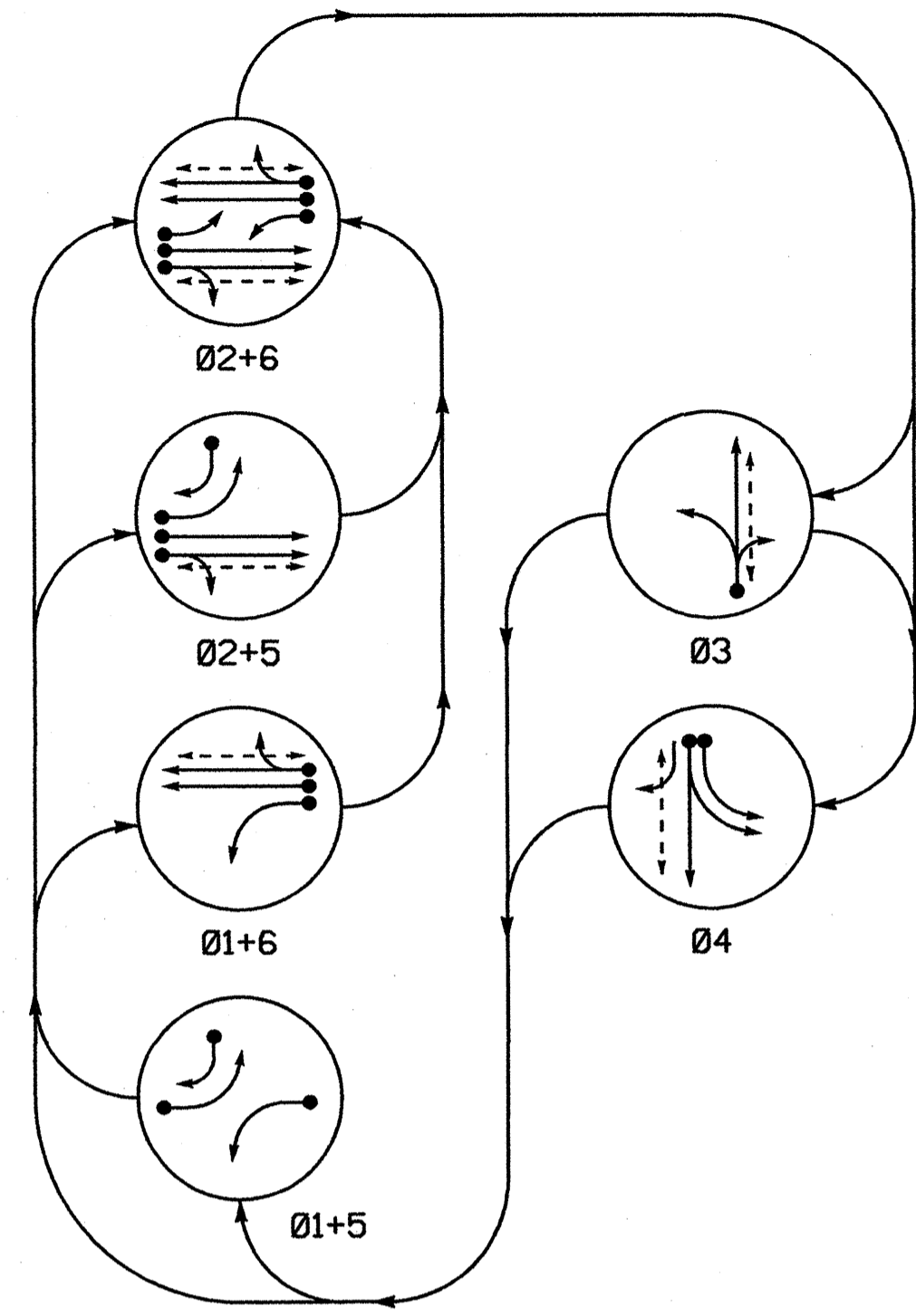
- PROGRAM PHASES 1 & 5 AS PROTECTED/PERMITTED AT KEYPAD INPUT E/125+E+4=∅1,5
- LOOPS '1A, 5A & 5B' WILL HAVE TO BE PROGRAMMED TO CALL PHASE 4 (WITH APPROPRIATE DELAY TIME) TO ALLOW CONTROLLER TO SEQUENCE THRU PHASE 4+8 BEFORE PROCEEDING TO PHASE 5. (SEE INPUT FILE PROGRAMMING THIS SHEET).

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 05-2379T4
DESIGNED: OCTOBER 2009
SEALED: 12/22/09
REVISED: N/A

Temporary Design 4 (Construction Phase IV)

	SR 1321 (Hillandale Road) at Bertland Avenue	
	Division 05 PLAN DATE: December 2009 PREPARED BY: F.E. Russ	Durham County Durham REVIEWED BY: [Signature] REVIEWED BY:
REVISIONS INIT. DATE	SIGNATURE DATE	S.I.C. INVENTORY NO. 05-2379T4

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE						FLASH
	01+5	01+6	02+5	02+6	03	04	
21	R	R	G	G	R	R	Y
22	R	R	G	G	R	R	Y
31	R	R	R	R	G	R	R
32	R	R	R	R	G	R	R
41	R	R	R	R	R	G	R
42	R	R	R	R	R	G	R
61	R	G	R	G	R	R	Y
62, 63	R	G	R	G	R	R	Y
P21, P22	DW	DW	W	W	DW	DW	DRK
P31, P32	DW	DW	DW	DW	W	DW	DRK
P41, P42	DW	DW	DW	DW	W	DW	DRK
P61, P62	DW	W	DW	W	DW	DW	DRK

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

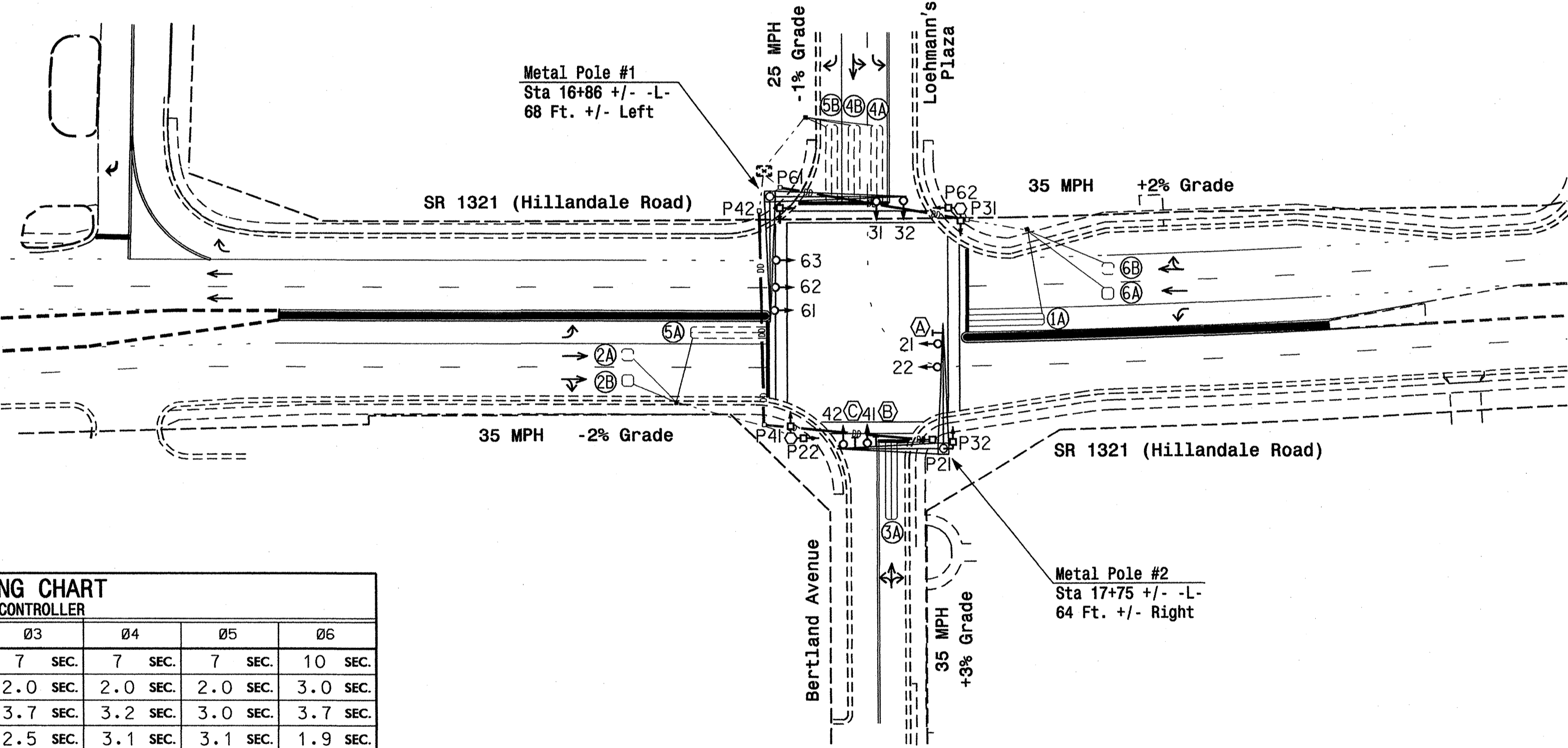
170 LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW EXISTING	DETECTOR PROGRAMMING													
					NEMA PHASE	TIMING		ATTRIBUTES								STATUS		
						DELAY	CARRY (STRETCH)	1	2	3	4	5	6	7	8	NEW	EXISTING	
1A	6X40	2-4-2	0	X	-	1	15 SEC.	- SEC.	-	-	-	-	X	-	-	-	X	-
2A	6X6	4	70	-	X	-	-	-	-	-	-	-	X	-	-	-	-	X
2B	6X6	4	70	X	-	-	-	-	-	-	-	-	X	-	-	-	-	X
3A	6X40	2-4-2	0	X	-	3	10 SEC.	- SEC.	-	-	-	-	X	-	-	-	-	X
4A	6X40	2-4-2	0	-	X	4	3 SEC.	- SEC.	-	-	-	-	X	-	-	-	-	X
4B	6X40	2-4-2	0	-	X	4	- SEC.	- SEC.	-	-	-	-	X	-	-	-	-	X
5A	6X40	2-4-2	0	-	X	4	15 SEC.	- SEC.	-	-	-	-	X	-	-	-	-	X
5B	6X40	2-4-2	0	-	X	5	15 SEC.	- SEC.	-	-	-	-	X	-	-	-	-	X
6A	6X6	4	70	X	-	6	- SEC.	- SEC.	-	-	-	-	X	-	-	-	-	X
6B	6X6	4	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	-	-	-	-	X
P21, P22	-	-	-	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X
P31, P32	-	-	-	X	-	3	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X
P41, P42	-	-	-	X	-	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X
P61, P62	-	-	-	X	-	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X

6 Phase Fully Actuated (Durham Signal System)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Program phase 1 as protected/permissive.
- Program phase 5 as protected/permissive.
- Program controller to clear from phase 2+6 to phase 1 and/or 5 by progressing through phase 4 (see Electrical Details).
- The order of phase 3 and phase 4 may be reversed.
- Set all detector units to presence mode.
- Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
- Set phase bank 3 maximum limit to 250 seconds for phases used.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

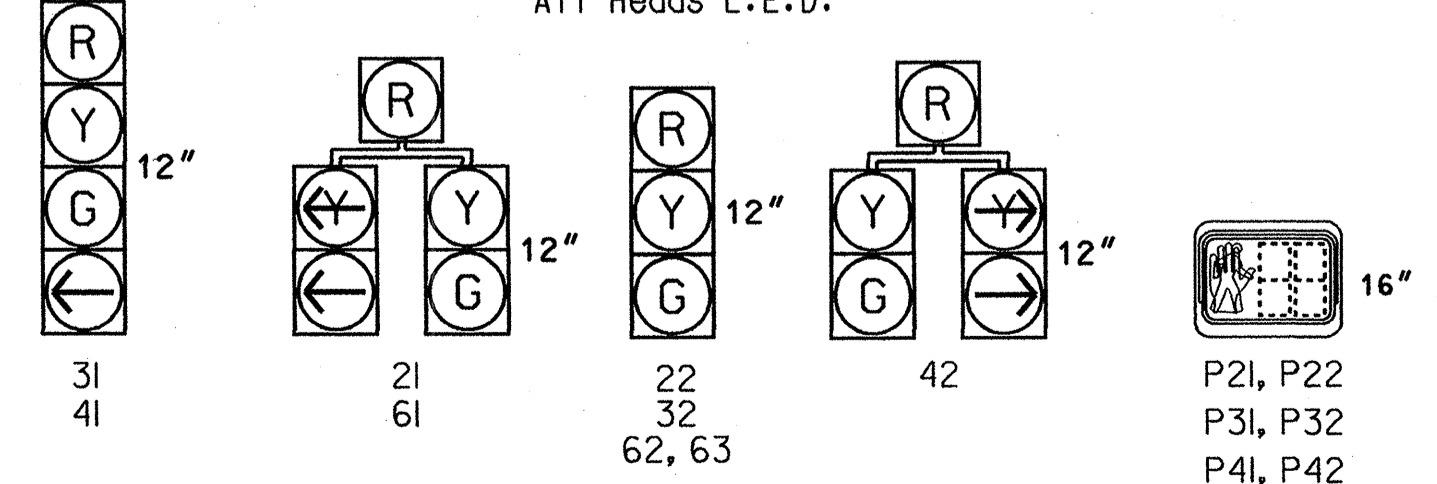


TIMING CHART
170 CONTROLLER

PHASE	01	02	03	04	05	06
MINIMUM INITIAL *	7 SEC.	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 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.	4.0 SEC.	3.7 SEC.	3.2 SEC.	3.0 SEC.	3.7 SEC.
RED CLEARANCE	2.6 SEC.	2.1 SEC.	2.5 SEC.	3.1 SEC.	3.1 SEC.	1.9 SEC.
MAXIMUM LIMIT *	20 SEC.	40 SEC.	20 SEC.	20 SEC.	20 SEC.	40 SEC.
RECALL POSITION	NONE	VEH. RECALL	NONE	NONE	NONE	VEH. RECALL
VEHICLE CALL MEMORY	NONLOCK	YELLOW LOCK	NONLOCK	NONLOCK	NONLOCK	YELLOW LOCK
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF	OFF
WALK *	- SEC.	7 SEC.	7 SEC.	7 SEC.	- SEC.	7 SEC.
FLASHING DON'T WALK	- SEC.	10 SEC.	20 SEC.	22 SEC.	- SEC.	17 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.

SIGNAL FACE I.D.
All Heads L.E.D.



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	—
Right of Way	—
Directional Arrow	→
Metal Pole with Mastarm	■
Signal Pedestal	●
Directional Drill	N/A
"U-TURN YIELD TO RIGHT TURN" Sign (R10-16)	ⓐ
Left Arrow "ONLY" Sign (R3-5L)	ⓑ
Combined Through and Left Arrow Sign (R3-6L)	ⓒ

This plan supersedes the plan signed and sealed on 12/22/09.

Signal Upgrade - Final Design

SR 1321 (Hillandale Road) at Bertrand Avenue and Loehmann's Plaza

Division 5 Durham County Durham

PLAN DATE: February 2010 REVIEWED BY: C.E. Carter

PREPARED BY: C.E. Carter

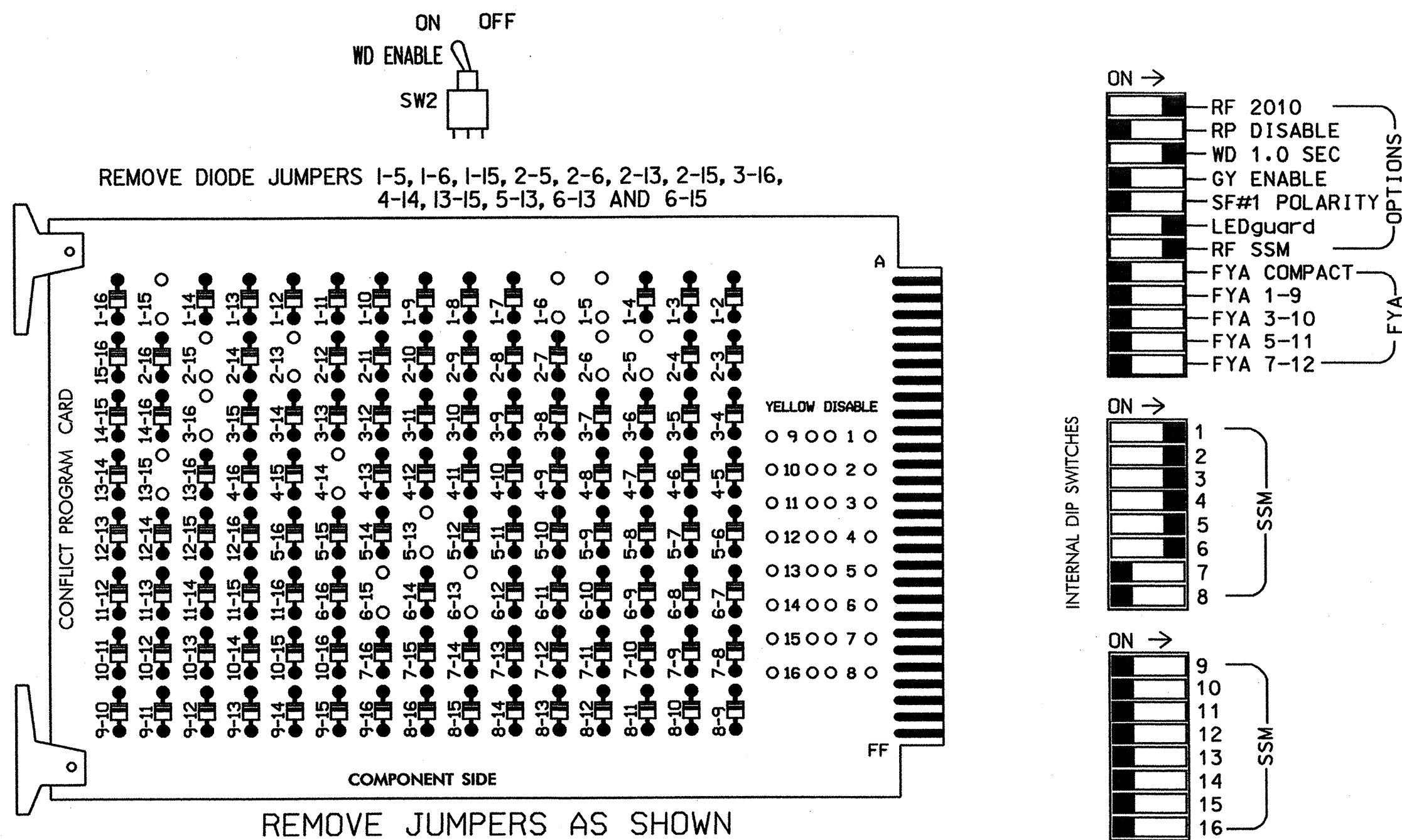
SCALE: 1"=50'

SIG. INVENTORY NO. 05-2379

10-FEB-2010 12:52 S:\ITS_Signals\mch\gr\groups\TIP Projects\U-3804\MSI\p01\sig\bas\gn\05-2379-05-2379_sig.dwg 20100210.dgn

EDI MODEL 2010ECL-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, 2-13, 2-15, 3-16, 4-14, 13-15, 5-13, 6-13 AND 6-15

REMOVE JUMPERS AS SHOWN

- NOTES:**
- Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
 - Make sure jumpers SEL2-SEL5 are present on the monitor board.
 - Ensure that Red Enable is active at all times during normal operation.

NOTES

- 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.
- TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 7,8,9, 10,11,12,13,14,15 AND 16, TIE UNUSED RED MONITOR INPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
- SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE FOR ALL PHASES.
- PROGRAM ALL TIMING INFORMATION INTO PHASE BANKS 1,2 & 3.
- SET PHASE BANK 3 MAXIMUM LIMIT TO 250 SEC. FOR PHASES USED.
- SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
- THIS CABINET AND CONTROLLER ARE PART OF THE DURHAM CITY SIGNAL SYSTEM.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED TYPE 170E
 CABINETCONTRACTOR SUPPLIED MODEL 332
 SOFTWAREBI TRANS 233NC2
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S1,S2,S2P,S3,S4,S4P,S5,S6,S6P,S8P
 PHASES USED.....1,2,3,4,5,6,2PED,3PED,4PED,6PED
 OVERLAPS USED.....NONE

PEDESTRIAN PHASE PROGRAMMING

PROGRAM PEDESTRIAN 2P OUTPUT AT KEYPAD INPUT E/125+F+5=ϕ2
 PROGRAM PEDESTRIAN 4P OUTPUT AT KEYPAD INPUT E/125+F+7=ϕ4
 PROGRAM PEDESTRIAN 6P OUTPUT AT KEYPAD INPUT E/125+F+6=ϕ6
 PROGRAM PEDESTRIAN 8P OUTPUT AT KEYPAD INPUT E/125+F+8=ϕ3 <--- NOTICE !

INPUT FILE CONNECTION & PROGRAMMING CHART

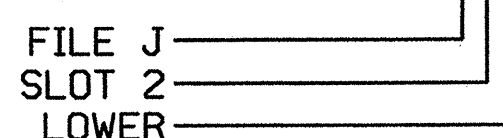
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	1	56	5 7	1
			2	56	7	4
			3	56	5 7	6
2A	TB2-5,6	I2U	4	39	5 7	2
2B	TB2-7,8	I2L	5	43	5 7	2
3A	TB4-5,6	I5U	6	58	5 7	3
4A	TB4-9,10	I6U	7	41	5 7	4
4B	TB4-11,12	I6L	8	45	5 7	4
5A	TB3-1,2	J1U	9	55	5 7	5
			10	55	7	4
6A	TB3-5,6	J2U	12	40	5 7	6
6B	TB3-7,8	J2L	13	44	5 7	6
5B	TB3-9,10	J3U	14	64	5 7	5
			15	64	7	4
PED PUSH BUTTONS						
P21, P22	TB8-4,6	I12U	16	67	2	2PED
P41, P42	TB8-5,6	I12L	17	69	2	4PED
P61, P62	TB8-7,9	I13U	18	68	2	6PED
P31, P32	TB8-8,9	I13L	19	70	2	3PED

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

<--- NOTICE !

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

INPUT FILE POSITION LEGEND:



INPUT FILE POSITION LAYOUT

(front view)

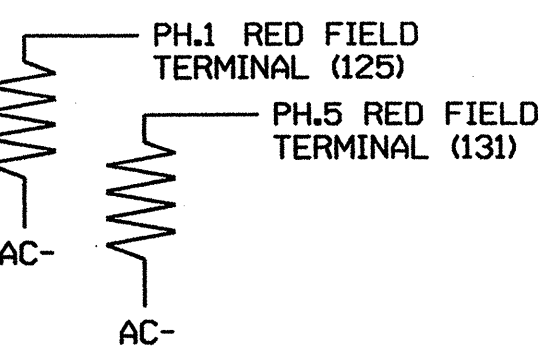
FILE	U	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	ϕ1,4,6 1A	ϕ2 2A	ϕ3 3A	ϕ4 4A	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
	L	NOT USED	ϕ2 2B	NOT USED	ϕ4 4B	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
FILE "J"	U	ϕ5,4,2 5A	ϕ6 6A	ϕ5,4 5B	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
	L	NOT USED	ϕ6 6B	NOT USED	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS

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

FS = FLASH SENSE
 ST = STOP TIME

LOAD RESISTOR INSTALLATION DETAIL

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



NOTE: THE PURPOSE OF THESE RESISTORS IS TO LOAD THE CHANNEL RED MONITOR INPUTS IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON THESE CHANNELS, WHICH DO NOT USE THE RED DISPLAY IN THE FIELD.

DETECTOR ATTRIBUTES LEGEND:

- FULL TIME DELAY
- PED CALL
- RESERVED
- COUNTING
- EXTENSION
- TYPE 3
- CALLING
- ALTERNATE

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	3 PED
SIGNAL HEAD NO.	61	21,22	P21, P22	31 32	41 42	P41, P42	21,42	61,62, 63	P61, P62	NU	NU	P31, P32
RED	*	128		116 116	101 101		*	134				
YELLOW		129		117 117	102 102			135				
GREEN		130		118 118	103 103			136				
RED ARROW												
YELLOW ARROW	126							132				
GREEN ARROW	127			118	103			133				
Hand icon				113				104		119		110
Walking person icon				115				106		121		112

NU = Not Used ** ** ** **

* Denotes install load resistor. See Load Resistor Installation Detail this sheet.

** See 'Countdown Pedestrian Signal Operation' note below.

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

BACK-UP PROTECTION NOTE

TO ENSURE THAT THE CONTROLLER WILL NOT SEQUENCE FROM PHASE 2+6 DIRECTLY TO PHASE 1 AND/OR 5, SPECIAL PROGRAMMING HAS TO BE ENABLED IN THE BI TRANS 233NC2 SOFTWARE. PROGRAM 170E CONTROLLER AS FOLLOWS:

- PROGRAM PHASES 1 & 5 AS PROTECTED/PERMITTED AT KEYPAD INPUT E/125+E+4=ϕ1,5
- LOOPS '1A,5A & 5B' WILL HAVE TO BE PROGRAMMED TO CALL PHASE 4 (WITH APPROPRIATE DELAY TIME) TO ALLOW CONTROLLER TO SEQUENCE THRU PHASE 4 BEFORE PROCEEDING TO PHASE 5. (SEE INPUT FILE PROGRAMMING THIS SHEET).

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2379
 DESIGNED: FEBRUARY 2010
 SEALED: 2/10/10
 REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED DECEMBER 2009 AND SEALED 12-22-09

Final Design

ELECTRICAL AND PROGRAMMING DETAILS FOR:

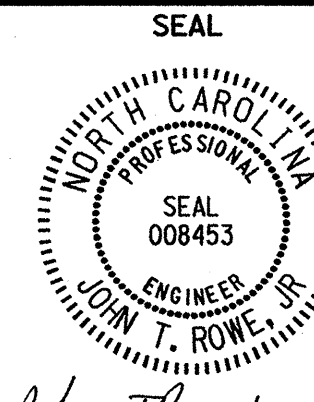
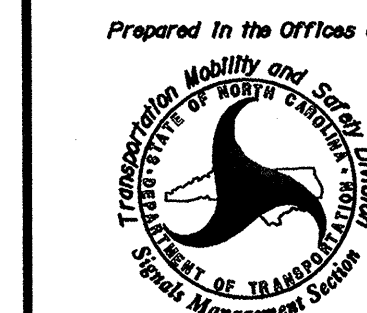
SR 1321 (Hillandale Road) at Bertland Avenue and Loehmann's Plaza

Division 05 Durham County Durham

PLAN DATE: February 2010 REVIEWED BY: YLW

PREPARED BY: F.E. RUSS REVIEWED BY:

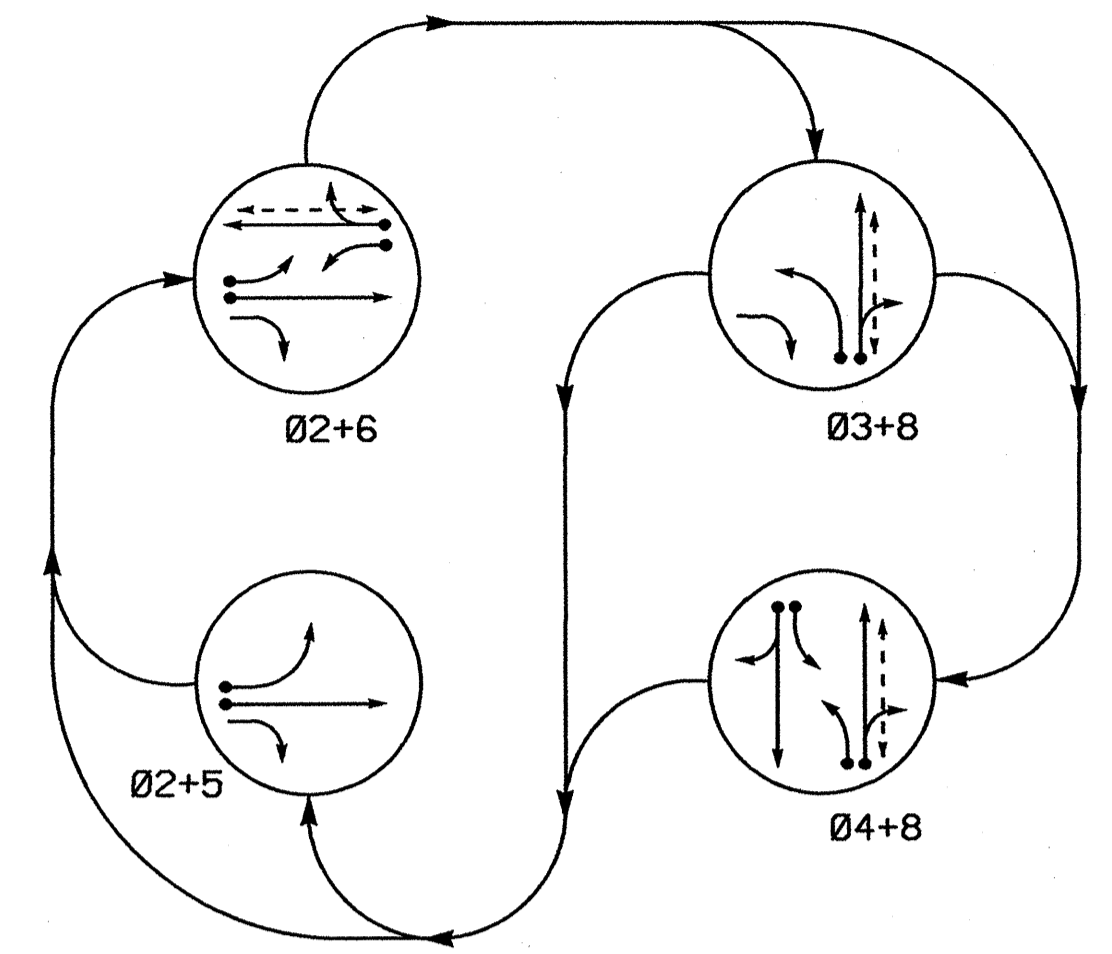
REVISIONS INIT. DATE



Sig. INVENTORY NO. 05-2379

4 Phase Fully Actuated (Durham Signal System)

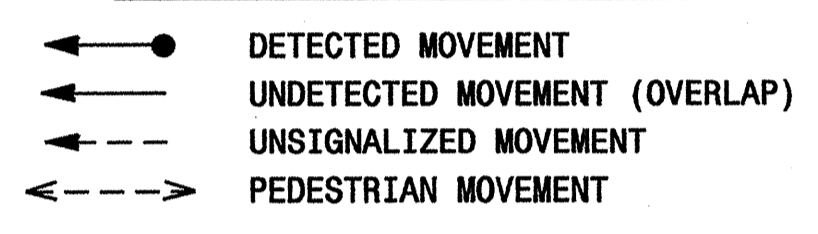
PHASING DIAGRAM



SIGNAL FACE	PHASE				
	Ø2+5	Ø2+6	Ø3+8	Ø4+8	F L C O S D E
21	G	R	R	Y	
22	G	R	R	Y	
41, 42	R	R	G	R	
61, 62	R	G	R	Y	
81	R	R	G	R	
82	R	R	G	R	
P61, P62	DW	W	DW	DRK	
P81, P82	DW	W	W	DRK	

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

PHASING DIAGRAM DETECTION LEGEND

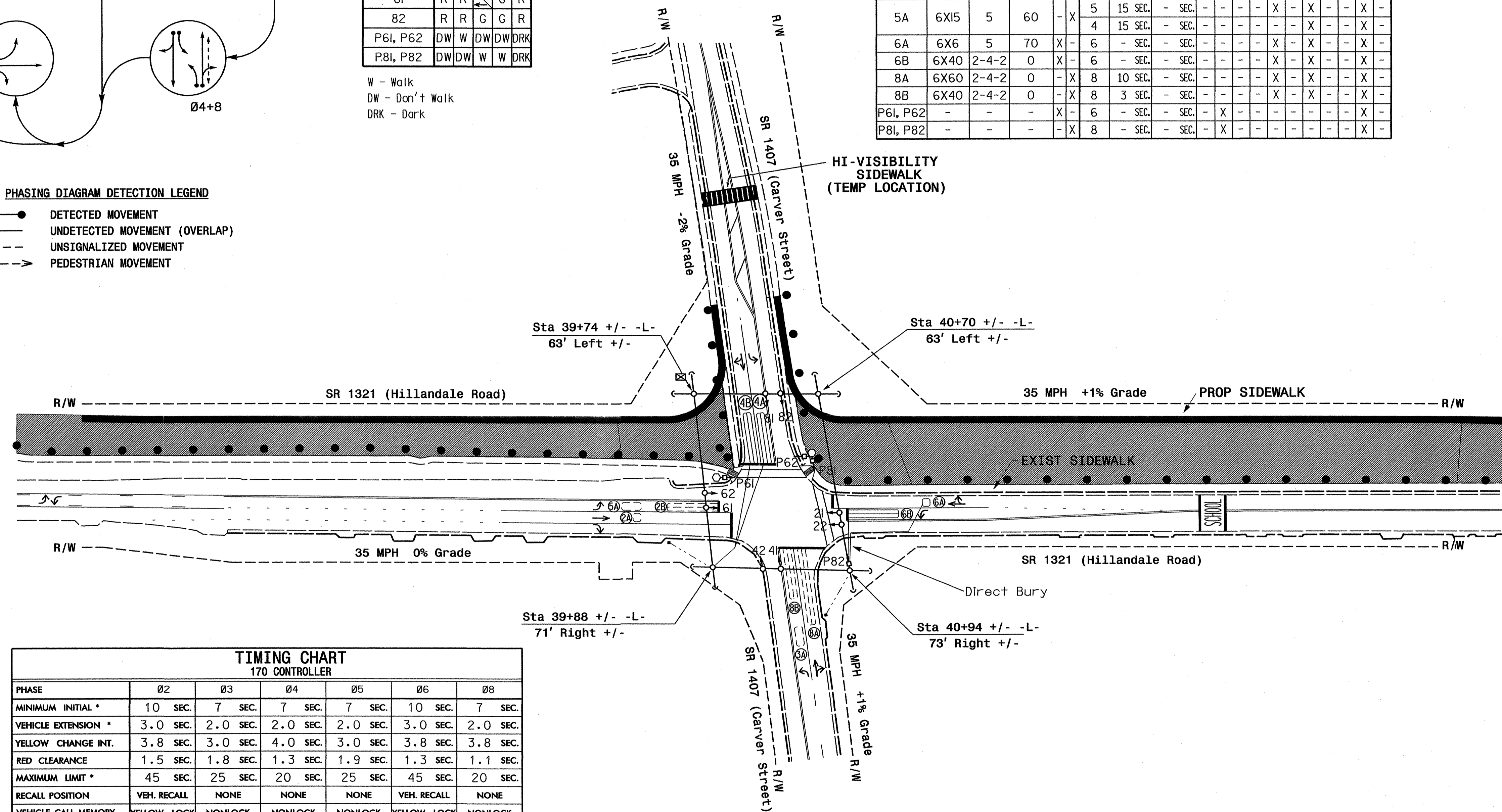


170 LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DETECTOR PROGRAMMING												STATUS				
							TIMING		ATTRIBUTES								SYSTEM	LOOPS					
							DELAY	CARRY (STRETCH)	1	2	3	4	5	6	7	8				9	10		
2A	6X6	5	70	-	X	2	-	SEC.	-	SEC.	-	-	-	-	-	X	-	X	-	X	-		
2B	6X40	2-4-2	0	-	X	2	-	SEC.	-	SEC.	-	-	-	-	-	X	-	X	-	X	-		
3A	6X15	5	60	-	X	3	10	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	-		
5A	6X15	5	60	-	X	5	15	SEC.	-	SEC.	-	-	-	-	-	X	-	X	-	X	-		
6A	6X6	5	70	X	-	6	-	SEC.	-	SEC.	-	-	-	-	-	X	-	X	-	X	-		
6B	6X40	2-4-2	0	X	-	6	-	SEC.	-	SEC.	-	-	-	-	-	X	-	X	-	X	-		
8A	6X60	2-4-2	0	-	X	8	10	SEC.	-	SEC.	-	-	-	-	-	X	-	X	-	X	-		
8B	6X40	2-4-2	0	-	X	8	3	SEC.	-	SEC.	-	-	-	-	-	X	-	X	-	X	-		
P61, P62	-	-	-	X	-	6	-	SEC.	-	SEC.	-	X	-	-	-	-	-	-	-	-	X	-	
P81, P82	-	-	-	-	X	8	-	SEC.	-	SEC.	-	X	-	-	-	-	-	-	-	-	-	X	-

NOTES

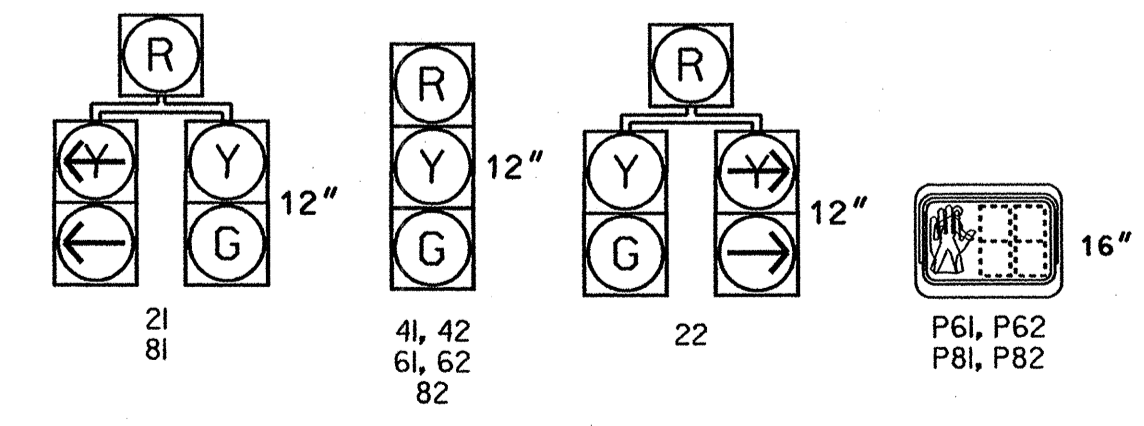
- Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Program phase 3 as protected/permissive.
- Program phase 5 as protected/permissive.
- Program controller to clear from phase 2+6 to phase 2+5 by progressing through phase 4+8 (see Electrical Details).
- Set all detector units to presence mode.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
- Set phase bank 3 maximum limit to 250 seconds for phases used.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Pavement markings are existing.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



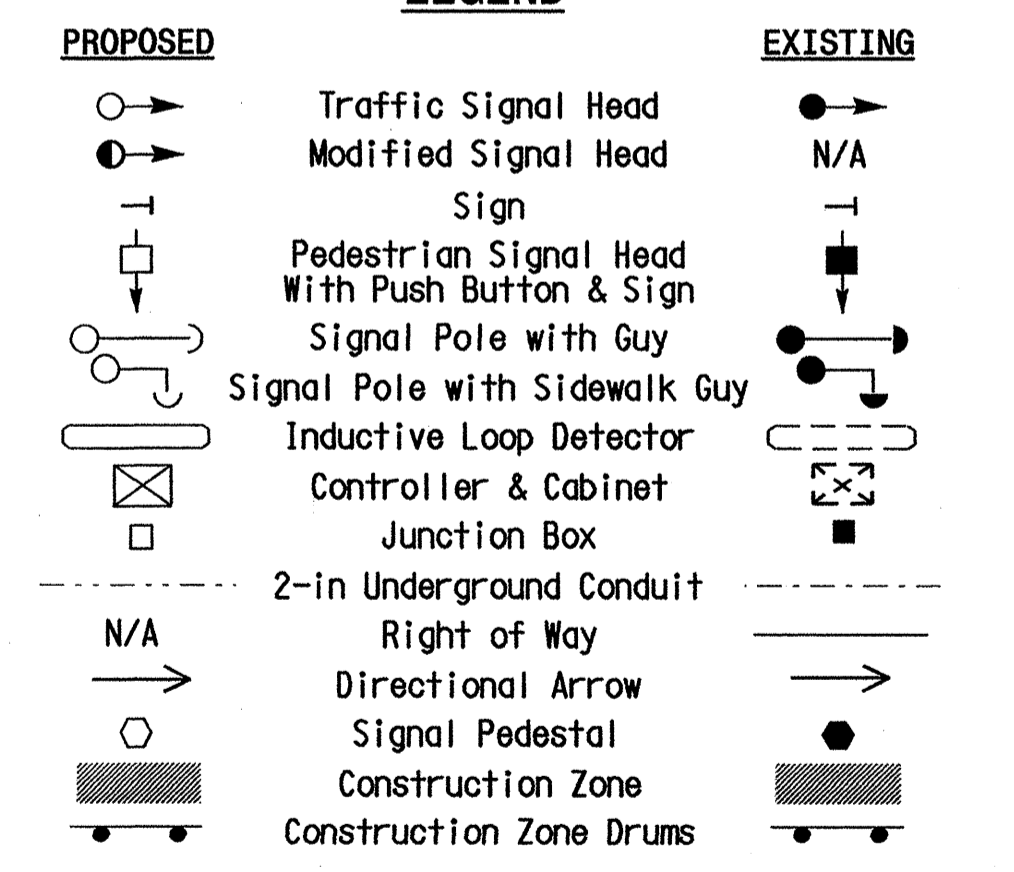
PHASE	TIMING CHART 170 CONTROLLER					
	Ø2	Ø3	Ø4	Ø5	Ø6	Ø8
MINIMUM INITIAL *	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.8 SEC.	3.0 SEC.	4.0 SEC.	3.0 SEC.	3.8 SEC.	3.8 SEC.
RED CLEARANCE	1.5 SEC.	1.8 SEC.	1.3 SEC.	1.9 SEC.	1.3 SEC.	1.1 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	20 SEC.	25 SEC.	45 SEC.	20 SEC.
RECALL POSITION	VEH. RECALL	NONE	NONE	NONE	VEH. RECALL	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	NONLOCK	NONLOCK	NONLOCK	YELLOW LOCK	NONLOCK
DOUBLE ENTRY	OFF	OFF	ON	OFF	OFF	ON
WALK *	- SEC.	- SEC.	- SEC.	- SEC.	7 SEC.	7 SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.	9 SEC.	8 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*	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	2.0 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.

SIGNAL FACE I.D.



LEGEND



Signal Upgrade Temporary Design 1 (Construction Phase I)

SR 1321 (Hillandale Road) at SR 1407 (Carver Street)

Division 5 Durham County Durham

PLAN DATE: September 2009 REVIEWED BY:

PREPARED BY: C.E. Carter REVIEWED BY:

SCALE: 1"=50'

750 N. Greenfield Place, Cary, NC 27529

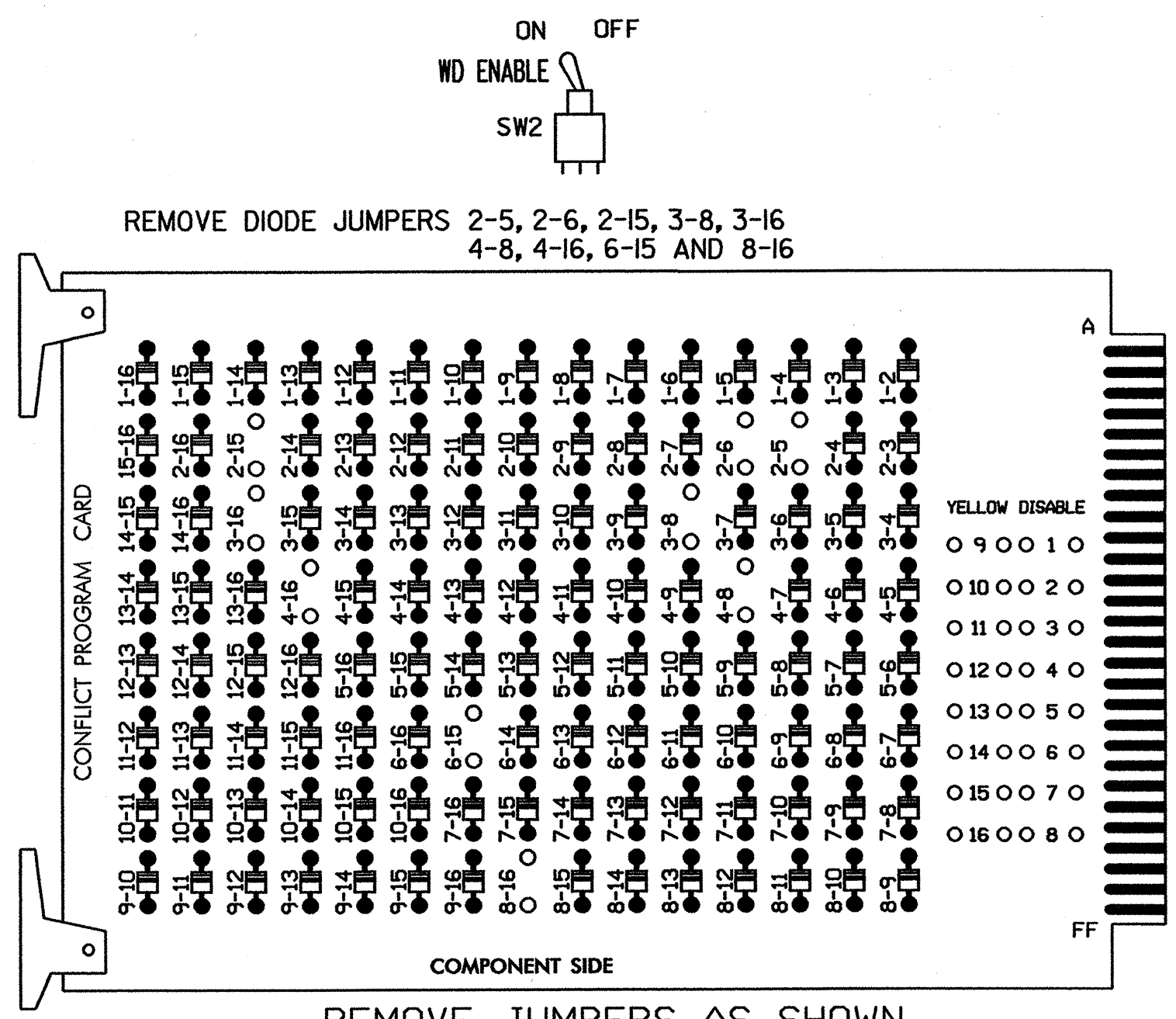
SEAL NORTH CAROLINA PROFESSIONAL ENGINEER ROBERT J. ZIEMBA

SIG. INVENTORY NO. 05-1020 11

22-DEC-2009 15:53 s:\m\118\signal\workgroups\118\p\objects\3804\sig\05-1020-051020-sig.dsn_2009xxxx.dgn

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

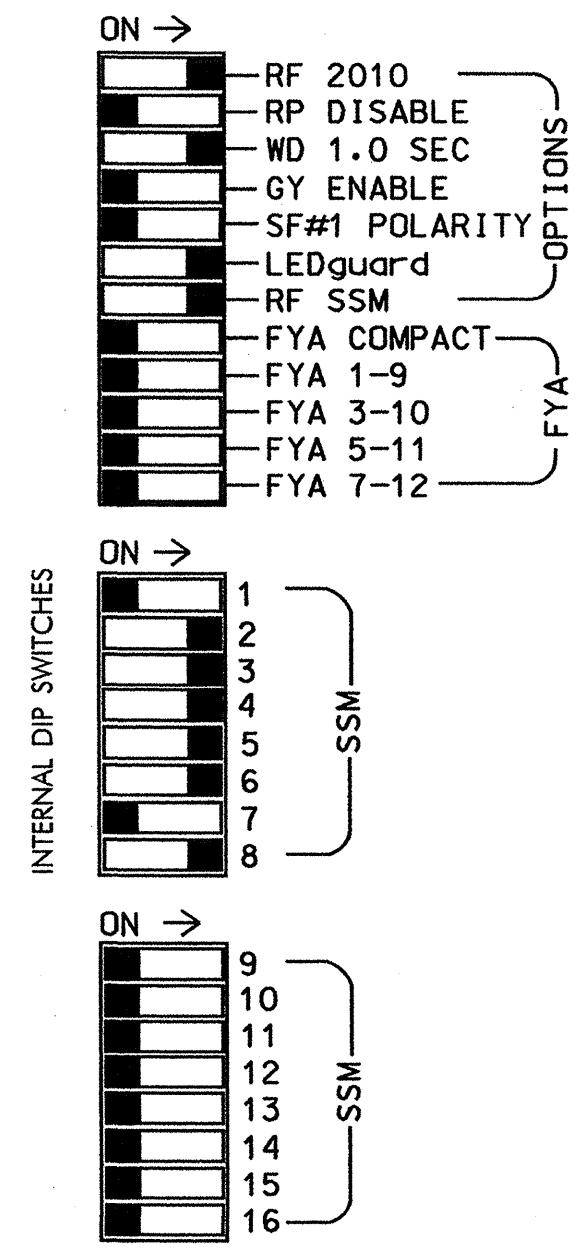
(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 2-5, 2-6, 2-15, 3-8, 3-16
4-8, 4-16, 6-15 AND 8-16

REMOVE JUMPERS AS SHOWN

- NOTES:
- Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
 - Make sure jumpers SEL2-SEL5 are present on the monitor board.
 - Ensure that Red Enable is active at all times during normal operation.



■ = DENOTES POSITION OF SWITCH

NOTES

- 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.
- TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 1,7,9, 10,11,12,13,14,15 AND 16, TIE UNUSED RED MONITOR INPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
- SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE FOR ALL PHASES.
- PROGRAM PHASES 4 AND 8 FOR DOUBLE ENTRY.
- PROGRAM ALL TIMING INFORMATION INTO PHASE BANKS 1,2 & 3.
- SET PHASE BANK 3 MAXIMUM LIMIT TO 250 SEC. FOR PHASES USED.
- SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
- THIS CABINET AND CONTROLLER ARE PART OF THE DURHAM CITY SIGNAL SYSTEM.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED TYPE 170E
CABINETCONTRACTOR SUPPLIED MODEL 332
SOFTWAREBI TRANS 233NC2
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S3,S4,S5,S6,S6P,S8,S8P
PHASES USED.....2,3,4,5,6,8,6PED,8PED
OVERLAPS USED.....NONE

PEDESTRIAN PHASE PROGRAMMING

PROGRAM PEDESTRIAN 6P OUTPUT AT KEYPAD INPUT E/125+F+6=Ø6
PROGRAM PEDESTRIAN 8P OUTPUT AT KEYPAD INPUT E/125+F+8=Ø8

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	2	43	5 7	2
3A	TB4-5,6	I5U	3	58	5 7	3
*			4			
4A	TB4-9,10	I6U	5	41	5 7	4
4B	TB4-11,12	I6L	6	45	5 7	4
5A	TB3-1,2	J1U	7	55	5 7	5
*			8	55	7	4
*			9			
6A	TB3-5,6	J2U	10	40	5 7	6
6B	TB3-7,8	J2L	11	44	5 7	6
*			12			
8A	TB5-9,10	J6U	13	42	5 7	8
8B	TB5-11,12	J6L	18<	46	5 7	8
PED PUSH BUTTONS						
*			>14			
*			15			
P61, P62	TB8-7,9	I13U	16	68	2	6PED
P81, P82	TB8-8,9	I13L	17---	70	2	8PED

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

* RESERVED FOR FUTURE PROGRAMMING

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

INPUT FILE POSITION LAYOUT

(front view)

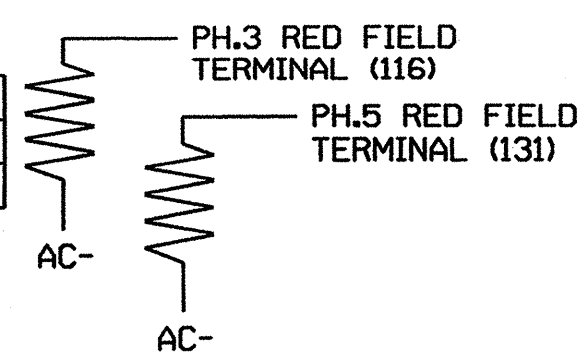
FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	Ø1	2A	Ø2	Ø3	Ø4	Ø4	Ø5	Ø6	Ø7	Ø8	Ø9	Ø10	Ø11	Ø12
L	2B	NOT USED	4A	4B	5A	6A	6B	7A	7B	8A	8B	9A	9B	10A
U	Ø5,4	Ø6	Ø7	Ø8	Ø9	Ø10	Ø11	Ø12	Ø13	Ø14	Ø15	Ø16	Ø17	Ø18
L	5A	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A
U	NOT USED	Ø6	Ø7	Ø8	Ø9	Ø10	Ø11	Ø12	Ø13	Ø14	Ø15	Ø16	Ø17	Ø18
L	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A

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

FS = FLASH SENSE
ST = STOP TIME

LOAD RESISTOR INSTALLATION DETAIL

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



NOTE: THE PURPOSE OF THESE RESISTORS IS TO LOAD THE CHANNEL RED MONITOR INPUTS IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON THESE CHANNELS, WHICH DO NOT USE THE RED DISPLAY IN THE FIELD.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	22,81	41,42	NU	21	61,62	P61, P62	NU	81,82	P81, P82
RED		128		*	101		*	134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW				117			132					
GREEN ARROW				118			133					
Hand icon									119			110
Person icon									121			112

NU = Not Used

* Denotes install load resistor. See Load Resistor Installation Detail this sheet.
** See 'Countdown Pedestrian Signal Operation' note below.

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

BACK-UP PROTECTION NOTE

TO ENSURE THAT THE CONTROLLER WILL NOT SEQUENCE FROM PHASE 6 DIRECTLY TO PHASE 5, OR FROM PHASE 4 DIRECTLY TO PHASE 3, SPECIAL PROGRAMMING HAS TO BE ENABLED IN THE BI TRANS 233NC2 SOFTWARE. PROGRAM 170E CONTROLLER AS FOLLOWS:

- PROGRAM PHASES 3 & 5 AS PROTECTED/PERMITTED AT KEYPAD INPUT E/125+E+4=Ø3,5
- LOOP '5A' WILL HAVE TO BE PROGRAMMED TO CALL PHASE 4 (WITH APPROPRIATE DELAY TIME) TO ALLOW CONTROLLER TO SEQUENCE THRU PHASE 4+8 BEFORE PROCEEDING TO PHASE 5. (SEE INPUT FILE PROGRAMMING THIS SHEET).

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 05-1020T1
DESIGNED: SEPTEMBER 2009
SEALED: 12/22/09
REVISED: N/A

Temporary Design 1 (Construction Phase I)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1321 (Hillandale Road)
at
SR 1407 (Carver Street)

Division 05 Durham County Durham

PLAN DATE: December 2009 REVIEWED BY: MWH

PREPARED BY: F.E. RUSS REVIEWED BY:

REVISIONS INIT. DATE

750 N.Greenfield Pkwy.,Gardner, NC 27529

SEAL
JOHN T. ROWE, JR.
ENGINEER
SEAL 008453

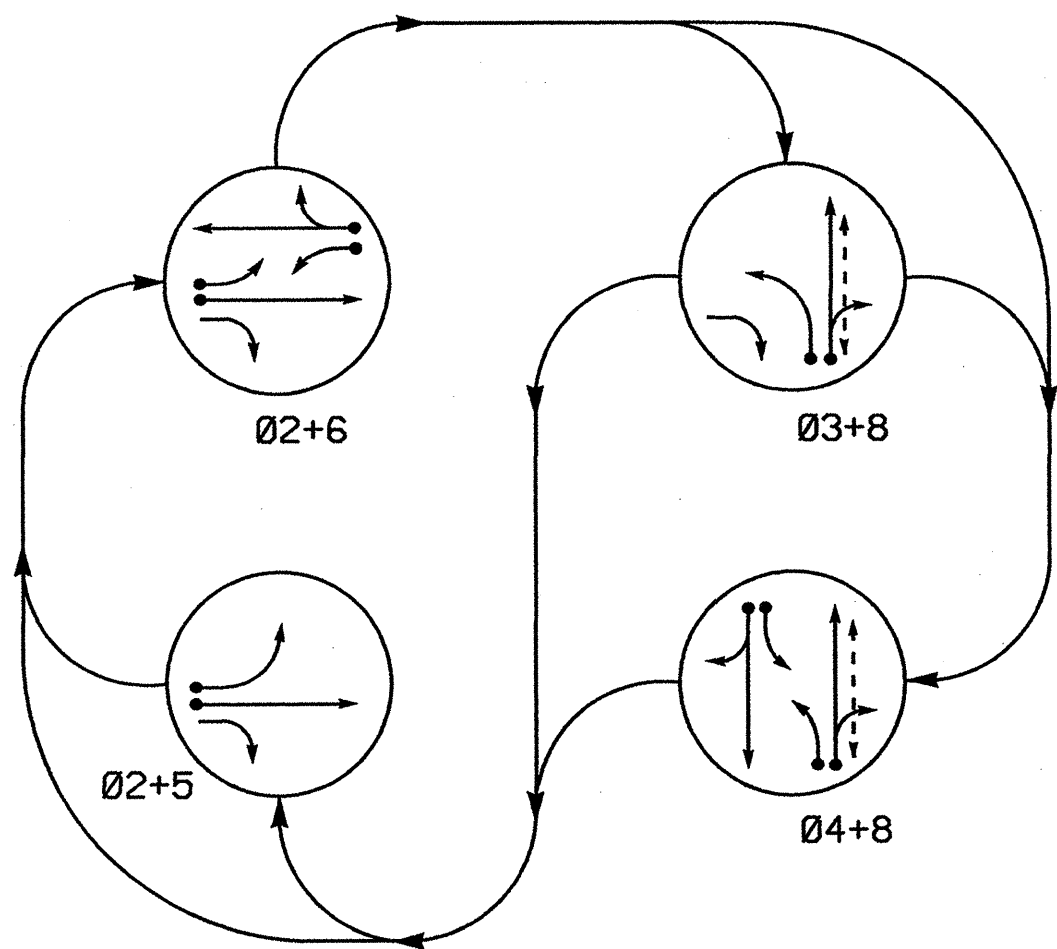
John T. Rowe 1-4-10
DATE

SIG. INVENTORY NO. 05-1020T1

04-JAN-2010 11:16 S:\MTS_Sig\ed\work\groups\eds\10_MonRusse\170ange\051020_sml_e_200912xx.dgn

4 Phase Fully Actuated (Durham Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE	PHASE				
	Ø2+5	Ø2+6	Ø3+8	Ø4+8	F L C O U D E
21	G	R	R	Y	
22	G	R	R	Y	
41, 42	R	R	R	G	
61, 62	R	G	R	Y	
81	R	R	G	R	
82	R	R	G	R	
P81, P82	DW	DW	W	DRK	

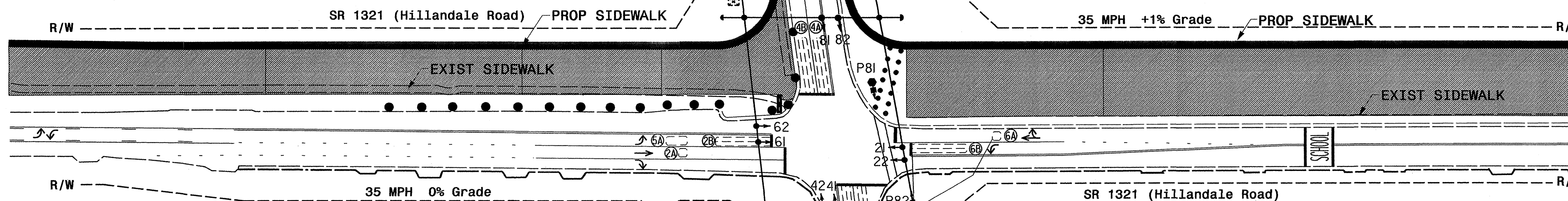
W - Walk
DW - Don't Walk
DRK - Dark

170 LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW EXISTING	NEMA PHASE	DETECTOR PROGRAMMING										STATUS				
						TIMING		ATTRIBUTES								NEW	EXISTING			
						DELAY	CARRY (STRETCH)	1	2	3	4	5	6	7	8			9		
2A	6X6	5	70	-	X	2	-	SEC.	-	SEC.	-	-	-	-	-	-	-	-	-	X
2B	6X40	2-4-2	0	-	X	2	-	SEC.	-	SEC.	-	-	-	-	-	-	-	-	-	X
3A	6X15	5	60	-	X	3	10	SEC.	-	SEC.	-	-	-	-	-	-	-	-	-	X
4A	6X40	2-4-2	0	-	X	4	3	SEC.	-	SEC.	-	-	-	-	-	-	-	-	-	X
4B	6X40	2-4-2	0	-	X	4	10	SEC.	-	SEC.	-	-	-	-	-	-	-	-	-	X
5A	6X15	5	60	-	X	5	15	SEC.	-	SEC.	-	-	-	-	-	-	-	-	-	X
6A	6X6	5	70	-	X	6	-	SEC.	-	SEC.	-	-	-	-	-	-	-	-	-	X
6B	6X40	2-4-2	0	-	X	6	-	SEC.	-	SEC.	-	-	-	-	-	-	-	-	-	X
8A	6X60	2-4-2	0	-	X	8	10	SEC.	-	SEC.	-	-	-	-	-	-	-	-	-	X
8B	6X40	2-4-2	0	-	X	8	3	SEC.	-	SEC.	-	-	-	-	-	-	-	-	-	X
P81, P82	-	-	-	-	X	8	-	SEC.	-	SEC.	-	-	-	-	-	-	-	-	-	X

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Program phase 3 as protected/permissive.
- Program phase 5 as protected/permissive.
- Program controller to clear from phase 2+6 to phase 2+5 by progressing through phase 4+8 (see Electrical Details).
- Set all detector units to presence mode.
- Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
- Set phase bank 3 maximum limit to 250 seconds for phases used.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



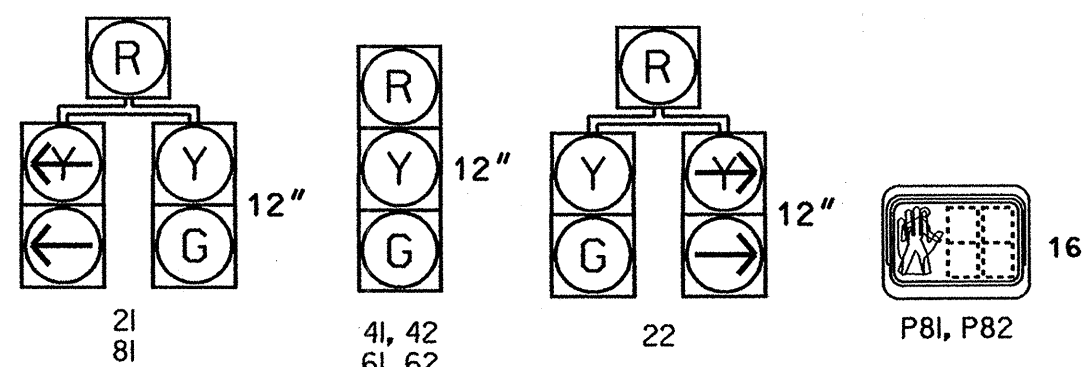
TIMING CHART 170 CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø5	Ø6	Ø8
MINIMUM INITIAL *	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.8 SEC.	3.0 SEC.	4.0 SEC.	3.0 SEC.	3.8 SEC.	3.8 SEC.
RED CLEARANCE	1.5 SEC.	1.8 SEC.	1.3 SEC.	1.9 SEC.	1.3 SEC.	1.1 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	20 SEC.	25 SEC.	45 SEC.	20 SEC.
RECALL POSITION	VEH. RECALL	NONE	NONE	NONE	VEH. RECALL	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	NONLOCK	NONLOCK	NONLOCK	YELLOW LOCK	NONLOCK
DOUBLE ENTRY	OFF	OFF	ON	OFF	OFF	ON
WALK *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	7 SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	8 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*	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	2.0 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.

SIGNAL FACE I.D.

All Heads L.E.D.



LEGEND

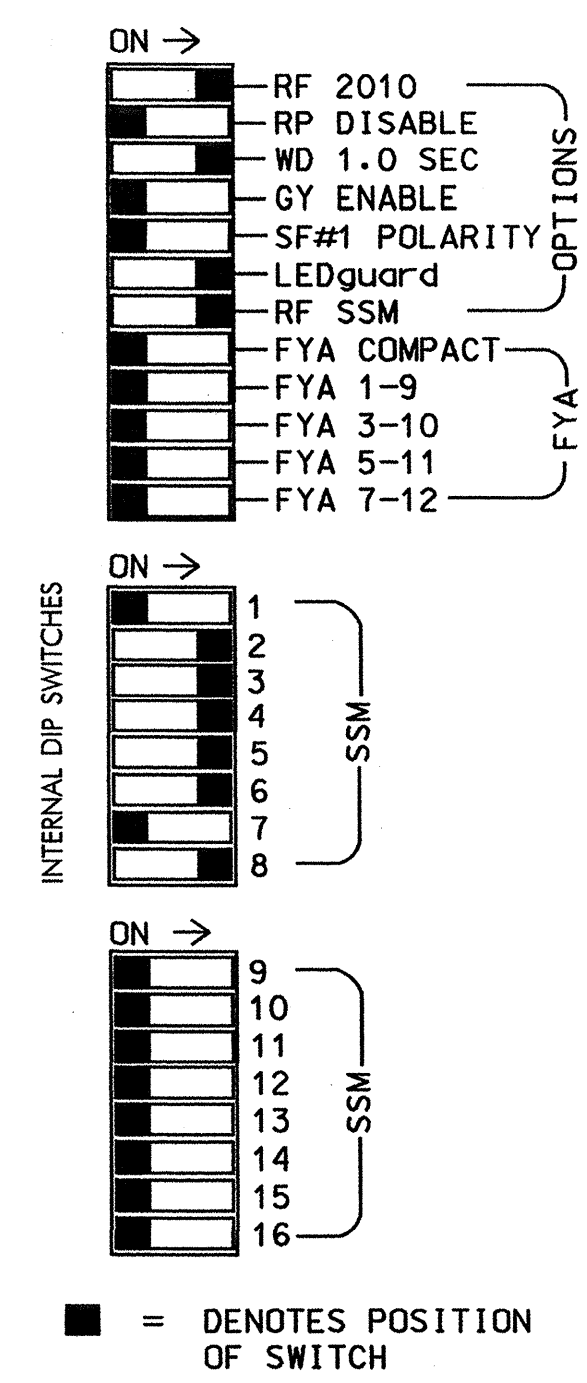
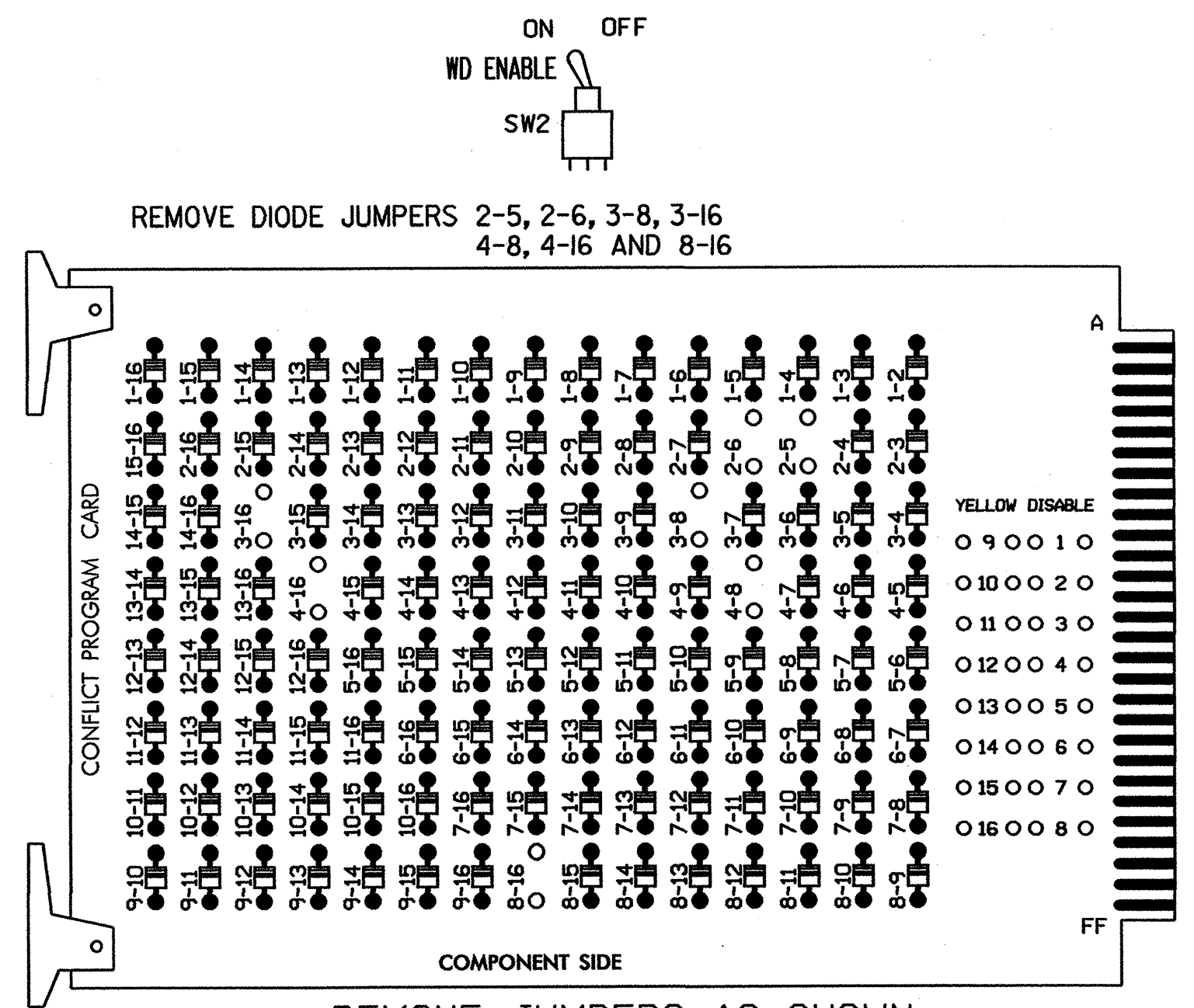
- | PROPOSED | EXISTING |
|--|--|
| ○ → Traffic Signal Head | ● → N/A |
| ○ → Modified Signal Head | ○ → N/A |
| ⊥ Sign | ⊥ Sign |
| ⊥ Pedestrian Signal Head With Push Button & Sign | ⊥ Pedestrian Signal Head With Push Button & Sign |
| ○ Signal Pole with Guy | ○ Signal Pole with Guy |
| ○ Signal Pole with Sidewalk Guy | ○ Signal Pole with Sidewalk Guy |
| ⊠ Inductive Loop Detector | ⊠ Inductive Loop Detector |
| □ Controller & Cabinet | □ Controller & Cabinet |
| □ Junction Box | □ Junction Box |
| 2-in Underground Conduit | 2-in Underground Conduit |
| N/A Right of Way | N/A Right of Way |
| → Directional Arrow | → Directional Arrow |
| ○ Signal Pedestal | ○ Signal Pedestal |
| ■ Construction Zone | ■ Construction Zone |
| ○ Construction Zone Drums | ○ Construction Zone Drums |

Signal Upgrade Temporary Design 2 (Construction Phase III)

	<p>SR 1321 (Hillandale Road) at SR 1407 (Carver Street)</p>		
	<p>Division 5 Durham County Durham</p>		
<p>PLAN DATE: September 2009</p>		<p>REVIEWED BY:</p>	
<p>PREPARED BY: C.E. Carter</p>		<p>REVIEWED BY:</p>	
<p>REVISIONS</p>		<p>INIT. DATE</p>	
<p>SCALE: 1"=50'</p>		<p>SIGNATURE: [Signature] DATE: 12/2/09</p>	
<p>SIG. INVENTORY NO. 05-1020 T2</p>			

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



- NOTES:**
1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
 2. Make sure jumpers SEL2-SEL5 are present on the monitor board.
 3. Ensure that Red Enable is active at all times during normal operation.

- 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. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 1,7,9, 10,11,12,13,14,15 AND 16, TIE UNUSED RED MONITOR INPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
 3. PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
 4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
 5. ENABLE SIMULTANEOUS GAP-OUT FEATURE FOR ALL PHASES.
 6. PROGRAM PHASES 4 AND 8 FOR DOUBLE ENTRY.
 7. PROGRAM ALL TIMING INFORMATION INTO PHASE BANKS 1,2 & 3.
 8. SET PHASE BANK 3 MAXIMUM LIMIT TO 250 SEC. FOR PHASES USED.
 9. SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
 10. THIS CABINET AND CONTROLLER ARE PART OF THE DURHAM CITY SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	22,81	41,42	NU	21	61,62	NU	NU	81,82	P81, P82
RED		128		*	101		*	134				107
YELLOW		129			102			135				108
GREEN		130			103			136				109
RED ARROW												
YELLOW ARROW				117			132					
GREEN ARROW				118			133					
												110
												112

NU = Not Used

* Denotes install load resistor. See Load Resistor Installation Detail this sheet.

** See 'Countdown Pedestrian Signal Operation' note below.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED TYPE 170E CABINETCONTRACTOR SUPPLIED MODEL 332 SOFTWAREBI TRANS 233NC2 CABINET MOUNT.....BASE OUTPUT FILE POSITIONS...12 LOAD SWITCHES USED.....S2,S3,S4,S5,S6,S8,S8P PHASES USED.....2,3,4,5,6,8,8PED OVERLAPS USED.....NONE

PEDESTRIAN PHASE PROGRAMMING

PROGRAM PEDESTRIAN 8P OUTPUT AT KEYPAD INPUT E/125+F+8=ø8

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.

BACK-UP PROTECTION NOTE

TO ENSURE THAT THE CONTROLLER WILL NOT SEQUENCE FROM PHASE 6 DIRECTLY TO PHASE 5, OR FROM PHASE 4 DIRECTLY TO PHASE 3, SPECIAL PROGRAMMING HAS TO BE ENABLED IN THE BI TRANS 233NC2 SOFTWARE. PROGRAM 170E CONTROLLER AS FOLLOWS:

1. PROGRAM PHASES 3 & 5 AS PROTECTED/PERMITTED AT KEYPAD INPUT E/125+E+4=ø3,5
2. LOOP '5A' WILL HAVE TO BE PROGRAMMED TO CALL PHASE 4 (WITH APPROPRIATE DELAY TIME) TO ALLOW CONTROLLER TO SEQUENCE THRU PHASE 4+8 BEFORE PROCEEDING TO PHASE 5. (SEE INPUT FILE PROGRAMMING THIS SHEET).

INPUT FILE POSITION LAYOUT

(front view)

FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	ø2	ø2	ø3	ø4	ø3	ø4								
L	2A	2B	NOT USED	4A	4B									
U	ø5,4	ø6		ø8										
L	5A	6A		8A										
U	NOT USED	ø6		ø8										
L		6B		8B										

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

* THESE PEDS ARE TO BE DISABLED DURING THIS TEMPORARY DESIGN 2. DISCONNECT WIRES AT TERMINAL BLOCK; COIL, TAPE, & LABEL WIRES FOR RE-CONNECTION DURING TEMPORARY DESIGN 3.

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	2	43	5 7	2
3A	TB4-5,6	I5U	3	58	5 7	3
**			4			
4A	TB4-9,10	I6U	5	41	5 7	4
4B	TB4-11,12	I6L	6	45	5 7	4
5A	TB3-1,2	J1U	7	55	5 7	5
**			8	55	7	4
**			9			
6A	TB3-5,6	J2U	10	40	5 7	6
6B	TB3-7,8	J2L	11	44	5 7	6
			12			
8A	TB5-9,10	J6U	13	42	5 7	8
8B	TB5-11,12	J6L	18	46	5 7	8
PED PUSH BUTTONS						
**			14			
**			15			
* P61, P62	TB8-7,9		16			
P81, P82	TB8-8,9	I13L	17	70	2	8PED

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

NOTE: INSTALL DC ISOLATOR IN INPUT FILE SLOT 113.

** RESERVED FOR FUTURE PROGRAMMING

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

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES	PH.3 RED FIELD TERMINAL (116)
VALUE (ohms)	PH.5 RED FIELD TERMINAL (131)
1.5K - 1.9K	AC-
2.0K - 3.0K	AC-

NOTE: THE PURPOSE OF THESE RESISTORS IS TO LOAD THE CHANNEL RED MONITOR INPUTS IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON THESE CHANNELS, WHICH DO NOT USE THE RED DISPLAY IN THE FIELD.

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 05-1020T2
DESIGNED: SEPTEMBER 2009
SEALED: 12/22/09
REVISED: N/A

Temporary Design 2 (Construction Phase III)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared In the Office of:
TRANSPORTATION MOBILITY AND SAFETY DIVISION
DEPARTMENT OF TRANSPORTATION
TRAFFIC MANAGEMENT SYSTEMS
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1321 (Hillendale Road) at SR 1407 (Carver Street)

Division 05 Durham County Durham

PLAN DATE: December 2009 REVIEWED BY: MWH

PREPARED BY: F.E. Russ REVIEWED BY:

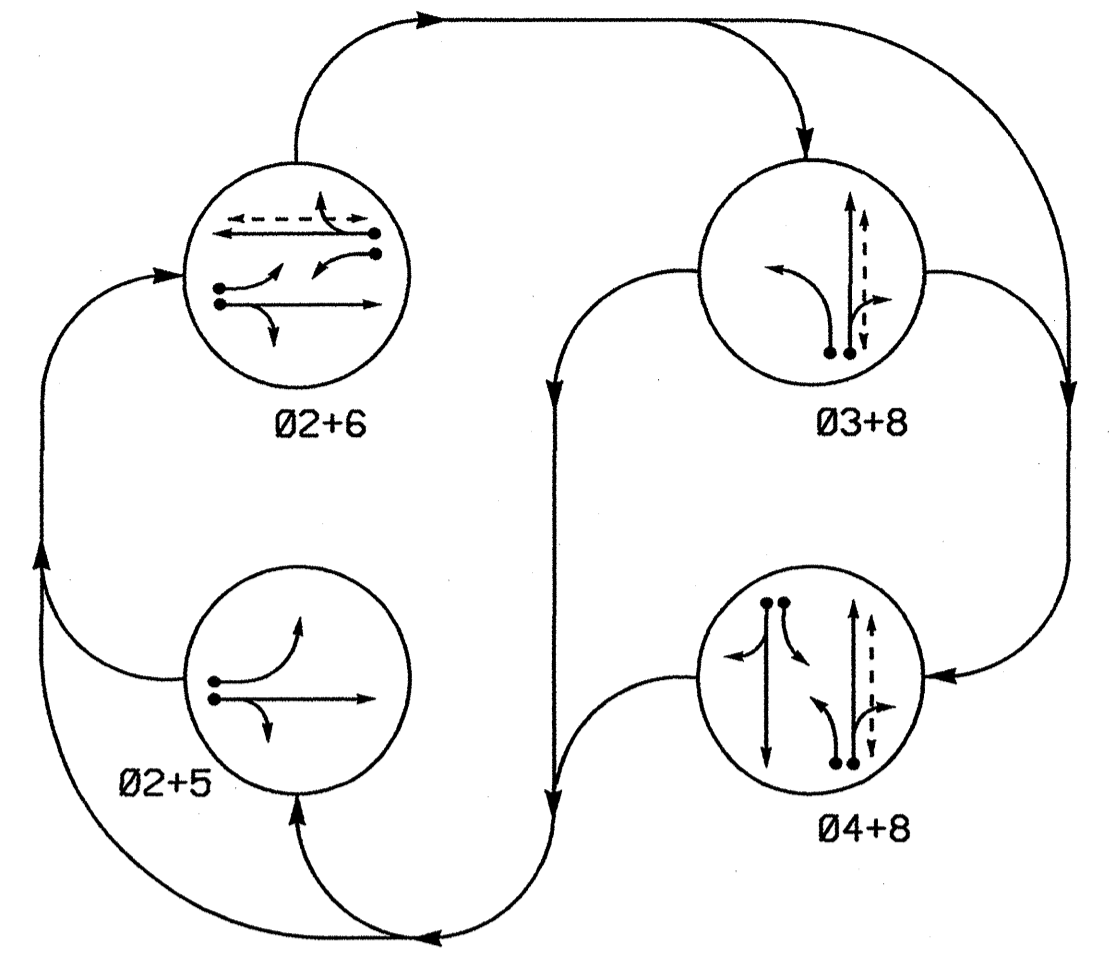
REVISIONS INIT. DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER
SEAL 008453
JOHN T. ROWE, III
12-30-09
DATE

SIG. INVENTORY NO. 05-1020T2

23-DEC-2009 15:29 23-DEC-2009 15:29 Signal System Configuration.dgn: 1020_sam.e (e.20091222).dgn

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE			
	Ø2+5	Ø2+6	Ø3+8	Ø4+8
21	G	R	R	Y
22	G	R	R	Y
41, 42	R	R	R	G
61, 62	R	G	R	Y
81	R	R	G	R
82	R	R	G	R
P61, P62	DW	W	DW	DRK
P81, P82	DW	DW	W	DRK

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

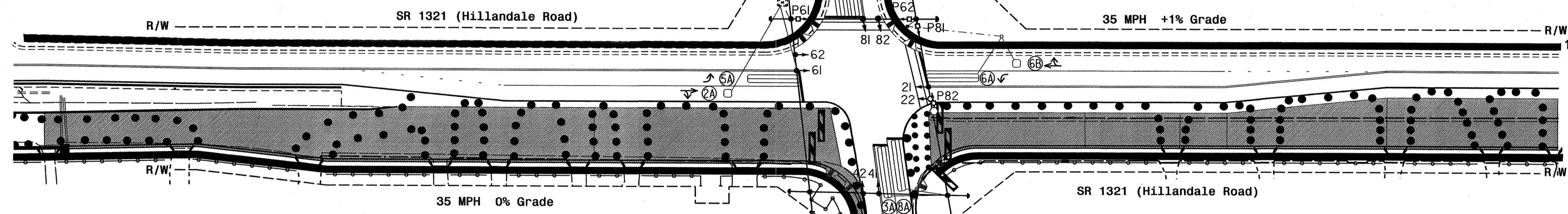
170 LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	DETECTOR PROGRAMMING												STATUS					
							TIMING		ATTRIBUTES								SYSTEM	NEW		EXISTING				
							DELAY	CARRY (STRETCH)	1	2	3	4	5	6	7	8								
2A	6X6	5	70	X	-	2	- SEC.	- SEC.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	
3A	6X40	2-4-2	0	X	-	3	15 SEC.	- SEC.	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	X
4A	6X40	2-4-2	0	X	-	4	3 SEC.	- SEC.	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	X
4B	6X40	2-4-2	0	X	-	4	10 SEC.	- SEC.	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	X
5A	6X40	2-4-2	0	X	-	5	15 SEC.	- SEC.	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	X
6A	6X40	2-4-2	0	X	-	6	- SEC.	- SEC.	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	X
6B	6X6	5	70	X	-	6	- SEC.	- SEC.	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	X
8A	6X60	2-4-2	0	X	-	8	10 SEC.	- SEC.	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	X
P61, P62	-	-	-	X	-	6	- SEC.	- SEC.	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	X
P81, P82	-	-	-	X	-	8	- SEC.	- SEC.	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	X

4 Phase Fully Actuated (Durham Signal System)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Program phase 3 as protected/permissive.
- Program phase 5 as protected/permissive.
- Program controller to clear from phase 2+6 to phase 2+5 by progressing through phase 4+8 (see Electrical Details).
- Reposition existing signal heads numbered 21, 61, and 62.
- Set all detector units to presence mode.
- Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
- Set phase bank 3 maximum limit to 250 seconds for phases used.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

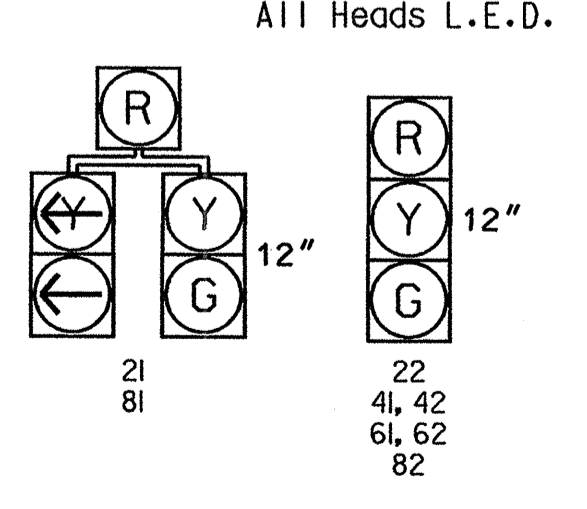


TIMING CHART 170 CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø5	Ø6	Ø8
MINIMUM INITIAL *	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.8 SEC.	3.0 SEC.	4.0 SEC.	3.0 SEC.	3.8 SEC.	3.8 SEC.
RED CLEARANCE	1.8 SEC.	2.4 SEC.	1.6 SEC.	2.4 SEC.	1.3 SEC.	1.7 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	20 SEC.	25 SEC.	45 SEC.	20 SEC.
RECALL POSITION	VEH. RECALL	NONE	NONE	NONE	VEH. RECALL	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	NONLOCK	NONLOCK	NONLOCK	YELLOW LOCK	NONLOCK
DOUBLE ENTRY	OFF	OFF	ON	OFF	OFF	ON
WALK *	- SEC.	- SEC.	- SEC.	- SEC.	7 SEC.	7 SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.	10 SEC.	8 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*	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	2.0 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.

SIGNAL FACE I.D.



LEGEND

- | PROPOSED | EXISTING |
|--|--|
| ○ Traffic Signal Head | ● Traffic Signal Head |
| ○ Modified Signal Head | N/A |
| ⊥ Sign | ⊥ Sign |
| ⊥ Pedestrian Signal Head With Push Button & Sign | ⊥ Pedestrian Signal Head With Push Button & Sign |
| ⊥ Signal Pole with Guy | ⊥ Signal Pole with Guy |
| ⊥ Signal Pole with Sidewalk Guy | ⊥ Signal Pole with Sidewalk Guy |
| ⊠ Inductive Loop Detector | ⊠ Inductive Loop Detector |
| ⊠ Controller & Cabinet | ⊠ Controller & Cabinet |
| ⊠ Junction Box | ⊠ Junction Box |
| --- 2-in Underground Conduit | --- 2-in Underground Conduit |
| N/A Right of Way | --- Right of Way |
| → Directional Arrow | → Directional Arrow |
| ○ Signal Pedestal | ○ Signal Pedestal |
| ■ Construction Zone | ■ Construction Zone |
| ○ Construction Zone Drums | ○ Construction Zone Drums |

Signal Upgrade Temporary Design 3 (Construction Phase III)

SR 1321 (Hillandale Road) at SR 1407 (Carver Street)

Division 5 Durham County Durham

PLAN DATE: September 2009 REVIEWED BY: C.E. Carter

PREPARED BY: C.E. Carter

SEAL

026486

ROBERT J. ZIEMBA

12/22/09

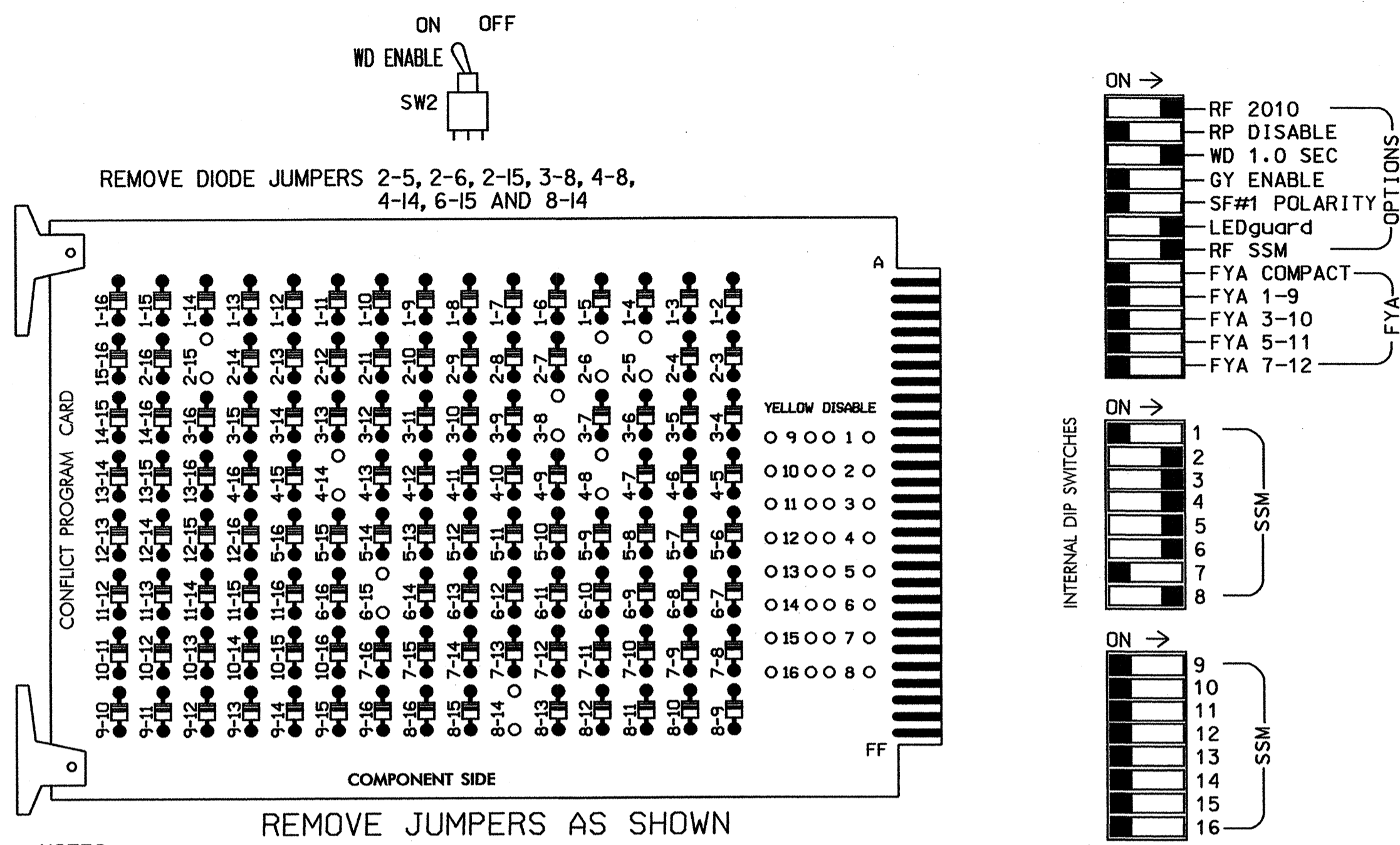
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE: 0 50 1"=50'

20-SEC-2009-15-49 22:41:41 Signal Upgrade 3804.dwg 10/20/09 10:20:05 1020-010-020-010.dwg 2009-xxxx.dwg P-21.dwg

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



- NOTES:
- Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
 - Make sure jumpers SEL2-SEL5 are present on the monitor board.
 - Ensure that Red Enable is active at all times during normal operation.

INPUT FILE POSITION LAYOUT

(front view)

FILE "I"	U	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		∅ 2	∅ 3,8	∅ 4	∅ 4	∅ 5,4,2	∅ 6	∅ 8	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4
		2A	3A	4A	4A	5A	6A	8A	4B	4B	4B	4B	4B	4B	4B
		FUTURE USE	NOT USED	∅ 4	∅ 4	NOT USED	∅ 6	NOT USED	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4
FILE "J"	L	∅ 5,4,2	∅ 6	∅ 8	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4
		5A	6A	8A	4B	4B	4B	4B	4B	4B	4B	4B	4B	4B	4B
		NOT USED	∅ 6	NOT USED	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4	∅ 4

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

LOAD RESISTOR INSTALLATION DETAIL

ACCEPTABLE VALUES	PH.3 RED FIELD TERMINAL (116)	PH.5 RED FIELD TERMINAL (131)
VALUE (ohms)	WATTAGE	
1.5K - 1.9K	25W (min)	
2.0K - 3.0K	10W (min)	

NOTE: THE PURPOSE OF THESE RESISTORS IS TO LOAD THE CHANNEL RED MONITOR INPUTS IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON THESE CHANNELS, WHICH DO NOT USE THE RED DISPLAY IN THE FIELD.

NOTES

- 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.
- TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 1,7,9, 10,11,12,13,14,15 AND 16, TIE UNUSED RED MONITOR INPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
- SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE FOR ALL PHASES.
- PROGRAM PHASES 4 AND 8 FOR DOUBLE ENTRY.
- PROGRAM ALL TIMING INFORMATION INTO PHASE BANKS 1,2 & 3.
- SET PHASE BANK 3 MAXIMUM LIMIT TO 250 SEC. FOR PHASES USED.
- SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
- THIS CABINET AND CONTROLLER ARE PART OF THE DURHAM CITY SIGNAL SYSTEM.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED TYPE 170E
 CABINETCONTRACTOR SUPPLIED MODEL 332
 SOFTWAREBI TRANS 233NC2
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S2,S3,S4,S4P,S5,S6,S6P,S8
 PHASES USED.....2,3,4,5,6,8,4PED,6PED
 OVERLAPS USED.....NONE

PEDESTRIAN PHASE PROGRAMMING

PROGRAM PEDESTRIAN 4P OUTPUT AT KEYPAD INPUT E/125+F+7=∅4
 PROGRAM PEDESTRIAN 6P OUTPUT AT KEYPAD INPUT E/125+F+6=∅6
 PROGRAM PEDESTRIAN 8P OUTPUT AT KEYPAD INPUT E/125+F+8=∅8

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
*			2			
3A	TB4-5,6	I5U	3	58	5 7	3
			4	58	5 7	8
4A	TB4-9,10	I6U	5	41	5 7	4
4B	TB4-11,12	I6L	6	45	5 7	4
			7	55	5 7	5
5A	TB3-1,2	J1U	8	55	7 4	4
			9	55	5 7	2
6A	TB3-5,6	J2U	10	40	5 7	6
6B	TB3-7,8	J2L	11	44	5 7	6
*			12			
8A	TB5-9,10	J6U	13	42	5 7	8
PED PUSH BUTTONS						
*			14			
P41, P42	TB8-5,6	I12L	15	69	2	4PED
P61, P62	TB8-7,9	I13U	16	68	2	6PED
P81 *	TB8-8,9	I13L	17	70	2	8PED

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

- * RESERVED FOR FUTURE PROGRAMMING
- * BAGGED DURING THIS TEMPORARY DESIGN 4

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

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	81	41,42	P41, P42	21	61,62	P61, P62	NU	81,82	* P81
RED		128		*	101		*	134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW					117			132				
GREEN ARROW					118			133				
Hand						104			119			110
Person						106			121			112

NU = Not Used ** ** *

- * Denotes install load resistor. See Load Resistor Installation Detail this sheet.
- ** See 'Countdown Pedestrian Signal Operation' note below.
- * Ped head P81 to be bagged during this Temporary Design 4. REMOVE LOAD SWITCH

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.

BACK-UP PROTECTION NOTE

TO ENSURE THAT THE CONTROLLER WILL NOT SEQUENCE FROM PHASE 6 DIRECTLY TO PHASE 5, OR FROM PHASE 4 DIRECTLY TO PHASE 3, SPECIAL PROGRAMMING HAS TO BE ENABLED IN THE BI TRANS 233NC2 SOFTWARE. PROGRAM 170E CONTROLLER AS FOLLOWS:

- PROGRAM PHASES 3 & 5 AS PROTECTED/PERMITTED AT KEYPAD INPUT E/125+E+4=∅3,5
- LOOP '5A' WILL HAVE TO BE PROGRAMMED TO CALL PHASE 4 (WITH APPROPRIATE DELAY TIME) TO ALLOW CONTROLLER TO SEQUENCE THRU PHASE 4+8 BEFORE PROCEEDING TO PHASE 5. (SEE INPUT FILE PROGRAMMING THIS SHEET).

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 05-1020T4
 DESIGNED: NOVEMBER 2009
 SEALED: 12/22/09
 REVISED: N/A

Temporary Design 4 (Construction Phase III)

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1321 (Hillendale Road) at SR 1407 (Carver Street)

Division 05 Durham County Durham

PLAN DATE: December 2009 REVIEWED BY: MWH

PREPARED BY: F.E. RUSS REVIEWED BY:

REVISIONS INIT. DATE

750 N. Greenfield Pkwy, Garner, NC 27529

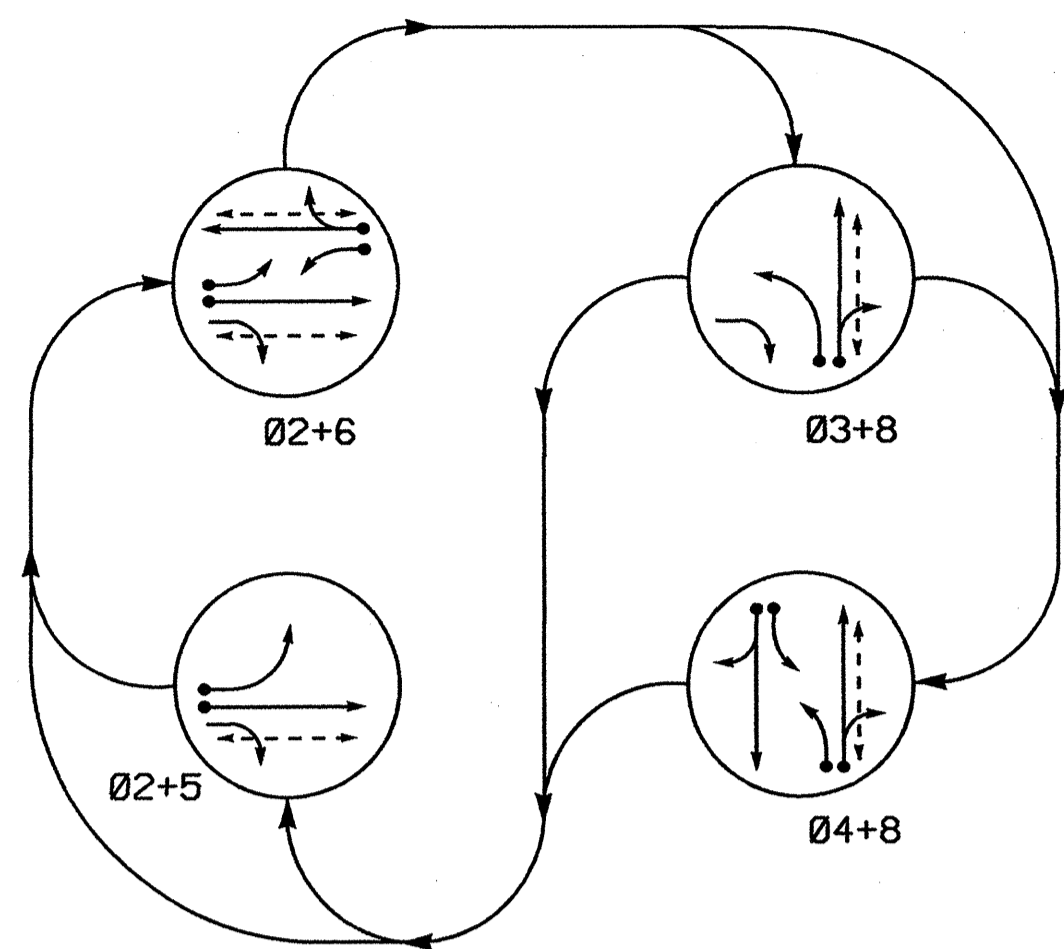
SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 008453 JOHN T. ROWE, P.E.

Signature: John Rowe 1-4-10 DATE

SIG. INVENTORY NO. 05-1020T4

04-JAN-2010 11:17 S:\ITS Signal\Workgroups\10_MemoRuss\170e\051020_sme.le_200912xx.dgn

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE	PHASE				FLASH
	Ø2+5	Ø2+6	Ø3+8	Ø4+8	
21	G	R	R	Y	
22	G	R	R	Y	
41, 42	R	R	R	G	
61, 62	R	R	R	Y	
81	R	R	R	G	
82	R	R	R	G	
P21, P22	W	W	DW	DRK	
P61, P62	DW	W	DW	DRK	
P81, P82	DW	DW	W	DRK	

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

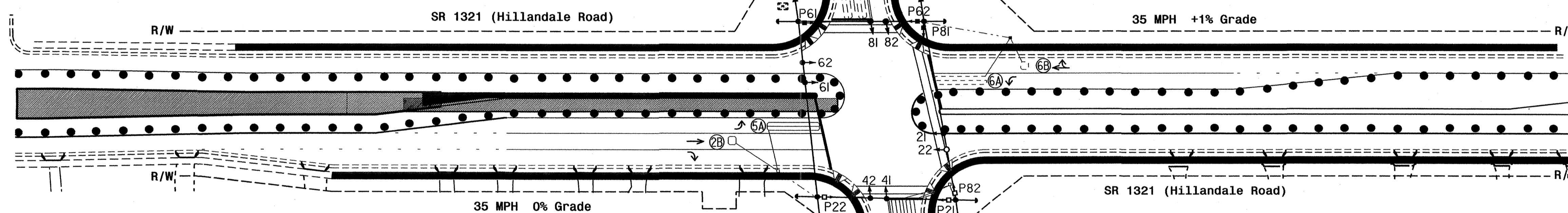
170 LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW EXISTING	NEMA PHASE	DETECTOR PROGRAMMING											
						TIMING		ATTRIBUTES								STATUS	
						DELAY	CARRY (STRETCH)	1	2	3	4	5	6	7	8	NEW	EXISTING
2B	6X6	5	70	X	-	2	- SEC.	- SEC.	-	-	-	-	X	X	-	-	X
3A	6X40	2-4-2	0	X	-	3	15 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
5A	6X40	2-4-2	0	X	-	5	15 SEC.	- SEC.	-	-	-	-	X	X	-	-	X
6A	6X40	2-4-2	0	-	X	6	- SEC.	- SEC.	-	-	-	-	X	X	-	-	X
6B	6X6	5	70	-	X	6	- SEC.	- SEC.	-	-	-	-	X	X	-	-	X
8A	6X60	2-4-2	0	X	-	8	10 SEC.	- SEC.	-	-	-	-	X	X	-	-	X
P21, P22	-	-	-	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X
P61, P62	-	-	-	-	X	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X
P81	-	-	-	-	X	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X
P82	-	-	-	-	X	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	X

4 Phase Fully Actuated (Durham Signal System)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Program phase 3 as protected/permissive.
- Program phase 5 as protected/permissive.
- Program controller to clear from phase 2+6 to phase 2+5 by progressing through phase 4+8 (see Electrical Details).
- Reposition existing signal head numbered 21.
- Set all detector units to presence mode.
- Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
- Set phase bank 3 maximum limit to 250 seconds for phases used.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

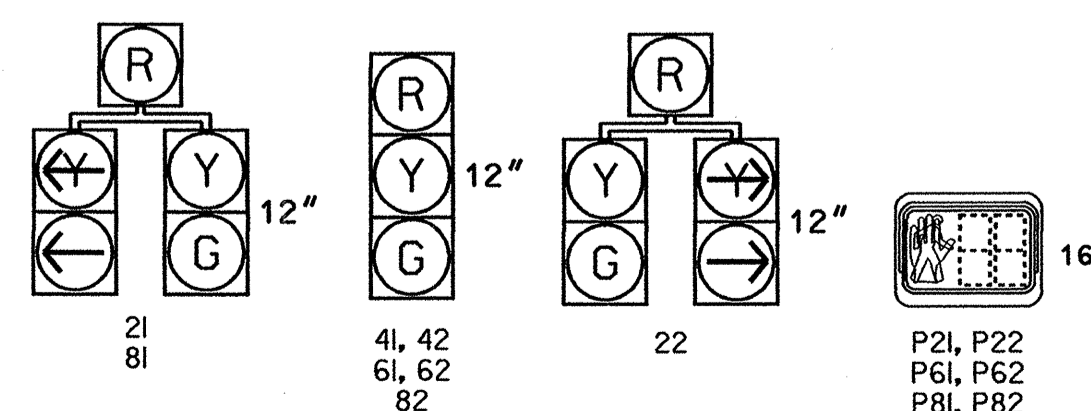


TIMING CHART 170 CONTROLLER

PHASE	Ø2	Ø3	Ø4	Ø5	Ø6	Ø8
MINIMUM INITIAL *	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.8 SEC.	3.0 SEC.	4.0 SEC.	3.0 SEC.	3.8 SEC.	3.8 SEC.
RED CLEARANCE	2.3 SEC.	3.3 SEC.	2.6 SEC.	3.1 SEC.	2.4 SEC.	2.6 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	20 SEC.	25 SEC.	45 SEC.	20 SEC.
RECALL POSITION	VEH. RECALL	NONE	NONE	NONE	VEH. RECALL	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	NONLOCK	NONLOCK	NONLOCK	YELLOW LOCK	NONLOCK
DOUBLE ENTRY	OFF	ON	ON	OFF	OFF	ON
WALK *	7 SEC.	- SEC.	- SEC.	- SEC.	7 SEC.	7 SEC.
FLASHING DON'T WALK	9 SEC.	- SEC.	- SEC.	- SEC.	10 SEC.	19 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*	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	2.0 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.

SIGNAL FACE I.D.



LEGEND

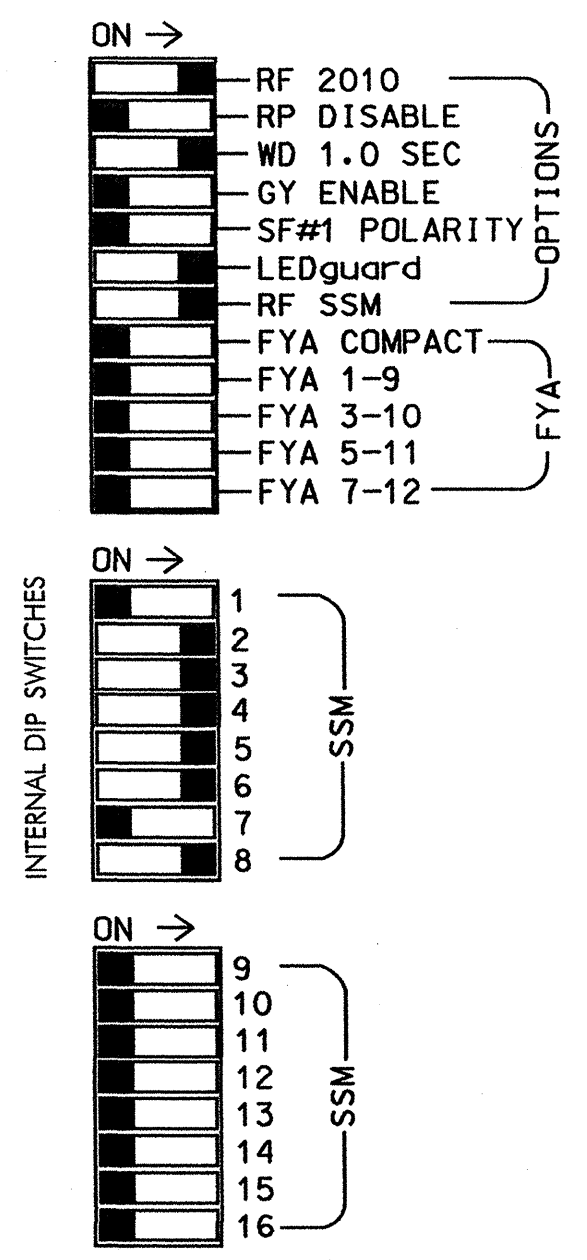
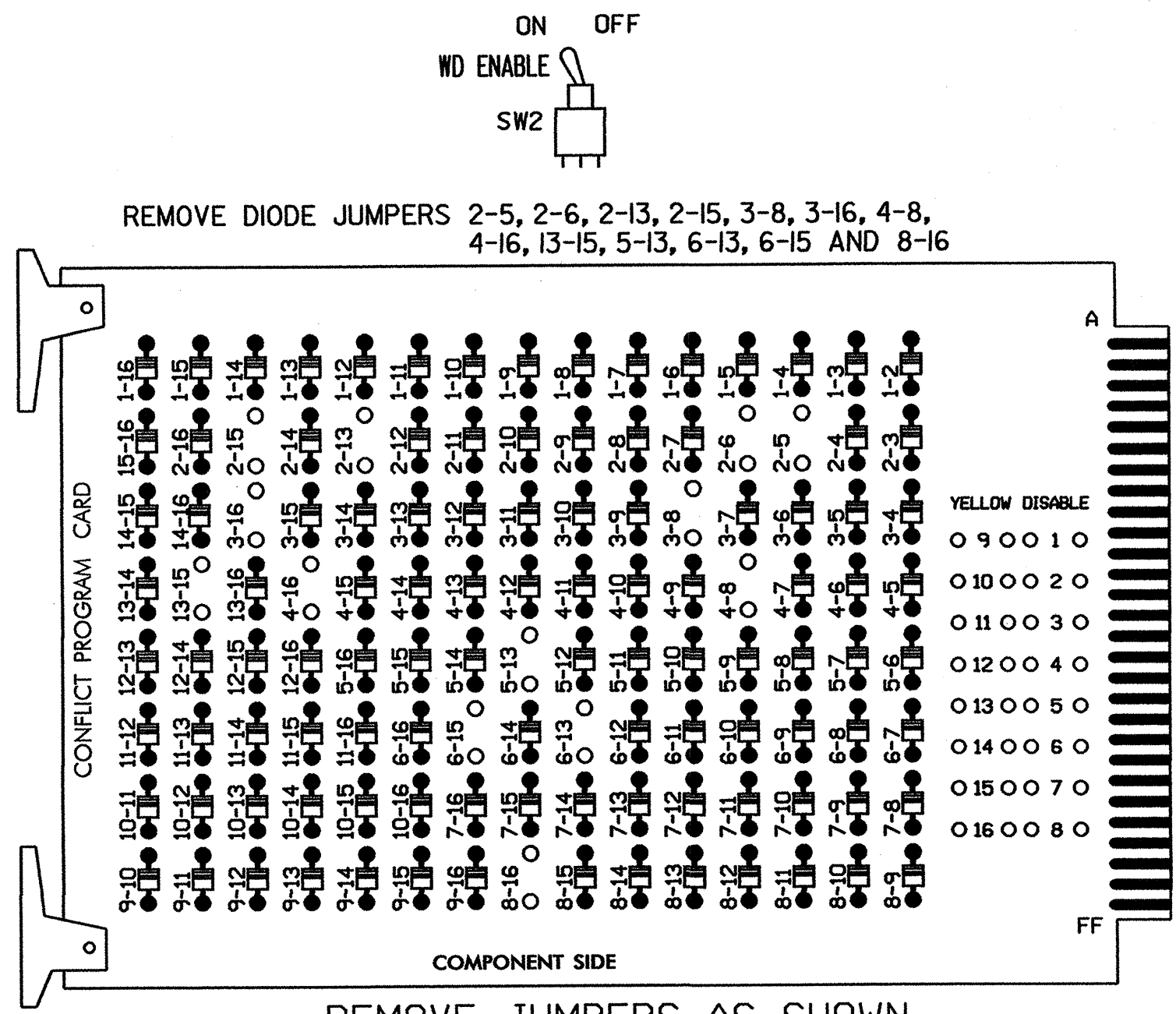
- | PROPOSED | EXISTING |
|--|---------------------------------|
| ○ Traffic Signal Head | ● Traffic Signal Head |
| ○ Modified Signal Head | N/A |
| ○ Sign | ○ Sign |
| ○ Pedestrian Signal Head With Push Button & Sign | ○ Pedestrian Signal Head |
| ○ Signal Pole with Guy | ○ Signal Pole with Guy |
| ○ Signal Pole with Sidewalk Guy | ○ Signal Pole with Sidewalk Guy |
| □ Inductive Loop Detector | □ Inductive Loop Detector |
| □ Controller & Cabinet | □ Controller & Cabinet |
| □ Junction Box | □ Junction Box |
| --- 2-in Underground Conduit | --- 2-in Underground Conduit |
| N/A Right of Way | Right of Way |
| → Directional Arrow | → Directional Arrow |
| Construction Zone | Construction Zone |
| Construction Zone Drums | Construction Zone Drums |

Signal Upgrade Temporary Design 5 (Construction Phase IV)

	SR 1321 (Hillandale Road) at SR 1407 (Carver Street)		SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 026486 ROBERT J. ZIEGLER ENGINEER 12/22/09
	Division 5 Durham County Durham	PLAN DATE: September 2009 PREPARED BY: C.E. Carter	REVIEWED BY: REVISIONS
750 N. Greenfield Pkwy, Garner, NC 27529	SCALE 0 50 1" = 50'	REVISIONS	SIG. INVENTORY NO. 05-1020 15

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



- NOTES:
- Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
 - Make sure jumpers SEL2-SEL5 are present on the monitor board.
 - Ensure that Red Enable is active at all times during normal operation.

INPUT FILE POSITION LAYOUT

(front view)

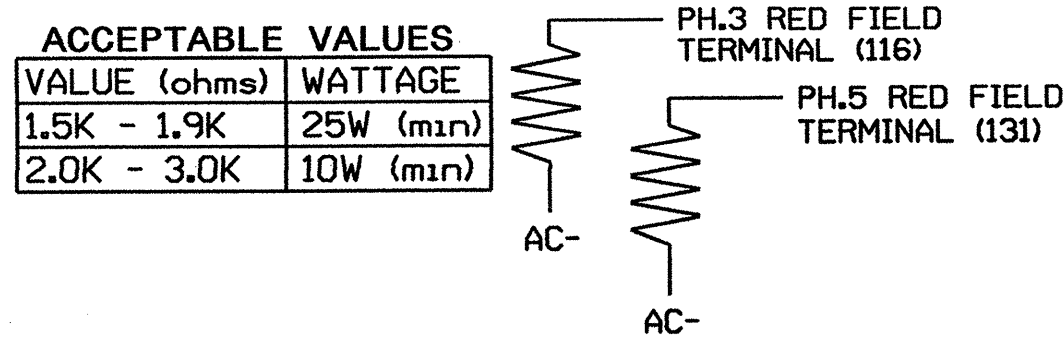
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	U	U	U	U	U	U	U	U	U	U	U	U	U
	∅2	∅2	∅2	∅2	∅3,8	∅4	∅4	∅4	∅4	∅4	∅4	∅4	∅4	∅4
	2B	2B	2B	2B	3A	4A	4A	4A	4A	4A	4A	4A	4A	4A
	∅5,4,2	∅6	∅6	∅6	∅8	∅8	∅8	∅8	∅8	∅8	∅8	∅8	∅8	∅8
	5A	6A	6A	6A	8A	8A	8A	8A	8A	8A	8A	8A	8A	8A
FILE "J"	U	U	U	U	U	U	U	U	U	U	U	U	U	U
	NOT USED	∅6	∅6	∅6	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED

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

FS = FLASH SENSE
ST = STOP TIME

* THESE DETECTOR CHANNELS ARE TO BE DISABLED DURING THIS TEMPORARY DESIGN 5. DISCONNECT WIRES AT TERMINAL BLOCK; COIL, TAPE, AND LABEL WIRES FOR RE-CONNECTION DURING FINAL DESIGN.

LOAD RESISTOR INSTALLATION DETAIL



NOTE: THE PURPOSE OF THESE RESISTORS IS TO LOAD THE CHANNEL RED MONITOR INPUTS IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON THESE CHANNELS, WHICH DO NOT USE THE RED DISPLAY IN THE FIELD.

NOTES

- 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.
- TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 1,7,9, 10,11,12,13,14,15 AND 16, TIE UNUSED RED MONITOR INPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
- SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE FOR ALL PHASES.
- PROGRAM PHASES 4 AND 8 FOR DOUBLE ENTRY.
- PROGRAM ALL TIMING INFORMATION INTO PHASE BANKS 1,2 & 3.
- SET PHASE BANK 3 MAXIMUM LIMIT TO 250 SEC. FOR PHASES USED.
- SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
- THIS CABINET AND CONTROLLER ARE PART OF THE DURHAM CITY SIGNAL SYSTEM.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED TYPE 170E
CABINETCONTRACTOR SUPPLIED MODEL 332
SOFTWAREBI TRANS 233NC2
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S2P,S3,S4,S5,S6,S6P,S8,S8P
PHASES USED.....2,3,4,5,6,8,2PED,6PED,8PED
OVERLAPS USED.....NONE

PEDESTRIAN PHASE PROGRAMMING

PROGRAM PEDESTRIAN 2P OUTPUT AT KEYPAD INPUT E/125+F+5=∅2
PROGRAM PEDESTRIAN 6P OUTPUT AT KEYPAD INPUT E/125+F+6=∅6
PROGRAM PEDESTRIAN 8P OUTPUT AT KEYPAD INPUT E/125+F+8=∅8

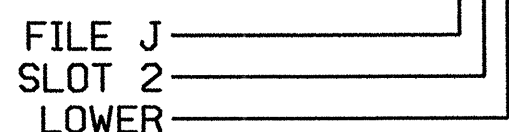
INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
* 2A	TB2-5,6	I2L	1	43	5 7	2
2B	TB2-7,8	I2L	2	58	5 7	3
3A	TB4-5,6	I5U	4	58	5 7	8
4A	TB4-9,10	I6U	5	41	5 7	4
4B	TB4-11,12	I6L	6	45	5 7	4
			7	55	5 7	5
5A	TB3-1,2	J1U	8	55	7	4
			9	55	5 7	2
6A	TB3-5,6	J2U	10	40	5 7	6
6B	TB3-7,8	J2L	11	44	5 7	6
**			12			
8A	TB5-9,10	J6U	13	42	5 7	8
PED PUSH BUTTONS						
* P21, P22	TB8-4,6	I12U	14	67	2	2PED
P41, P42	TB8-5,6	I15U	15			
P61, P62	TB8-7,9	I13U	16	68	2	6PED
P81, P82	TB8-8,9	I13L	17	70	2	8PED

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

** RESERVED FOR FUTURE PROGRAMMING

INPUT FILE POSITION LEGEND: J2L



DETECTOR ATTRIBUTES LEGEND:

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

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	P21, P22	22,81	41,42	NU	21	61,62	P61, P62	NU	81,82	P81, P82
RED		128	*	101		*	134				107	
YELLOW		129		102			135				108	
GREEN		130		103			136				109	
RED ARROW												
YELLOW ARROW				117			132					
GREEN ARROW				118			133					
Hand			113						119			110
Person			115						121			112

NU = Not Used * ** **

* Denotes install load resistor. See Load Resistor Installation Detail this sheet.

** See 'Countdown Pedestrian Signal Operation' note below.

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

BACK-UP PROTECTION NOTE

TO ENSURE THAT THE CONTROLLER WILL NOT SEQUENCE FROM PHASE 6 DIRECTLY TO PHASE 5, OR FROM PHASE 4 DIRECTLY TO PHASE 3, SPECIAL PROGRAMMING HAS TO BE ENABLED IN THE BI TRANS 233NC2 SOFTWARE. PROGRAM 170E CONTROLLER AS FOLLOWS:

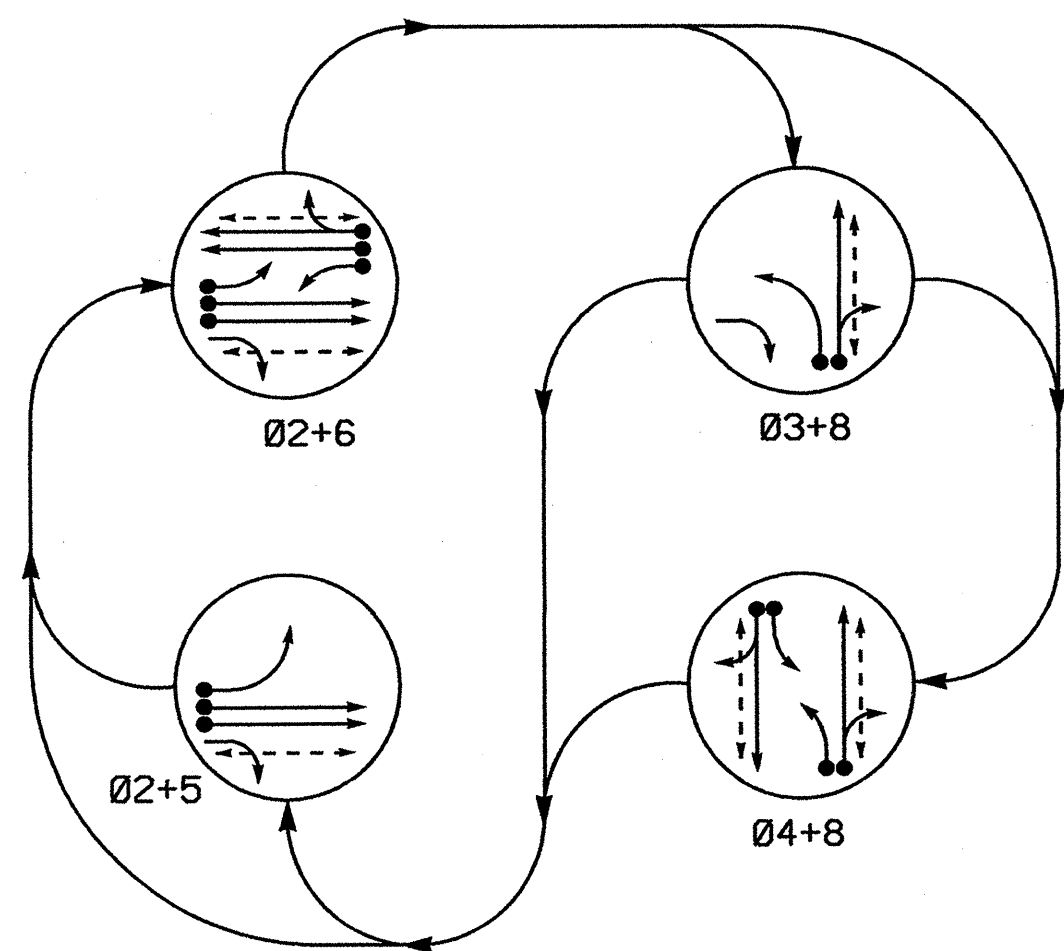
- PROGRAM PHASES 3 & 5 AS PROTECTED/PERMITTED AT KEYPAD INPUT E/125+E+4=∅3,5
- LOOP '5A' WILL HAVE TO BE PROGRAMMED TO CALL PHASE 4 (WITH APPROPRIATE DELAY TIME) TO ALLOW CONTROLLER TO SEQUENCE THRU PHASE 4+8 BEFORE PROCEEDING TO PHASE 5. (SEE INPUT FILE PROGRAMMING THIS SHEET).

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 05-1020T5
DESIGNED: SEPTEMBER 2009
SEALED: 12/22/09
REVISED: N/A

Temporary Design 5 (Construction Phase IV)

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared in the Offices of: 750 N. Greenfield Pkwy, Garner, NC 27529	SR 1321 (Hillandale Road) at SR 1407 (Carver Street)		SEAL JOHN T. ROWE, JR. ENGINEER DATE: 12-30-09
	Division 05 Durham County Durham PLAN DATE: December 2009 REVIEWED BY: MWH PREPARED BY: F.E. RUSS REVIEWED BY:	REVISIONS INIT. DATE	

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE	PHASE				L	T
	Ø2+5	Ø2+6	Ø3+8	Ø4+8		
21	G	R	R	Y		
22	G	G	R	Y		
23	G	G	R	Y		
41, 42	R	R	R	G		
61, 62	R	G	R	Y		
81	R	R	G	R		
82	R	R	G	R		
P21, P22	W	W	DW	DRK		
P41, P42	DW	DW	W	DRK		
P61, P62	DW	W	DW	DRK		
P81, P82	DW	DW	W	DRK		

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

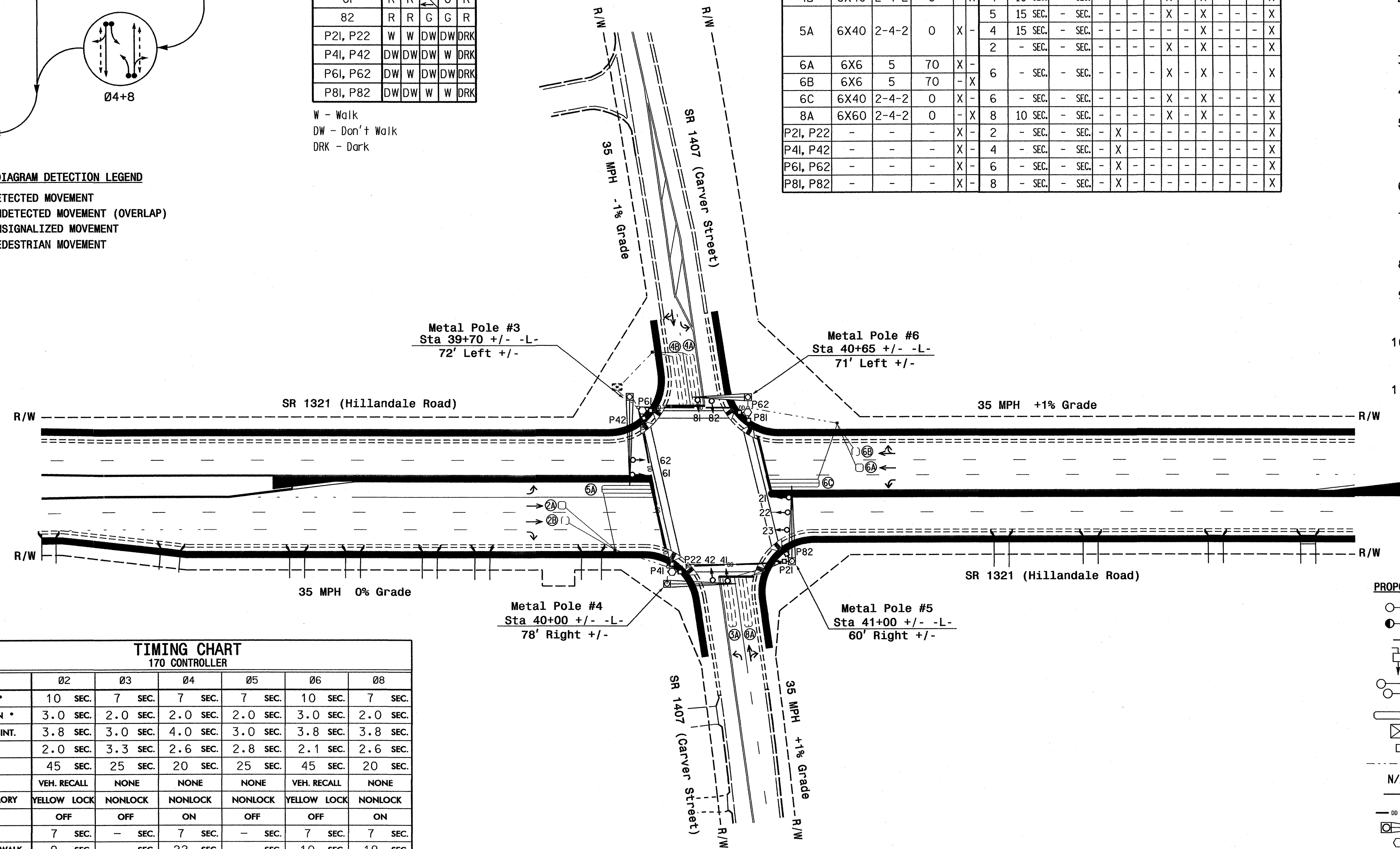
170 LOOP & DETECTOR UNIT INSTALLATION CHART

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	DETECTOR PROGRAMMING												
						NEMA PHASE	TIMING		ATTRIBUTES								STATUS	
							DELAY	CARRY (STRETCH)	FULL TIME	RESERVED	PRESTAN	RESERVED	COUNT	EXTENSION	TYPE 3	CALLING	ALTERNATE	SYSTEM
2A	6X6	5	70	X	-	2	- SEC.	- SEC.	-	-	-	-	-	X	X	-	-	X
2B	6X6	5	70	-	X	8	3 SEC.	- SEC.	-	-	-	-	-	X	X	-	-	X
3A	6X40	2-4-2	0	-	X	3	15 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
5A	6X40	2-4-2	0	X	-	5	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
6C	6X40	2-4-2	0	X	-	6	- SEC.	- SEC.	-	-	-	-	-	X	X	-	-	X
8A	6X60	2-4-2	0	-	X	8	10 SEC.	- SEC.	-	-	-	-	-	X	X	-	-	X
P21, P22	-	-	-	X	-	2	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X
P41, P42	-	-	-	X	-	4	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X
P61, P62	-	-	-	X	-	6	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X
P81, P82	-	-	-	X	-	8	- SEC.	- SEC.	-	X	-	-	-	-	-	-	-	X

4 Phase Fully Actuated (Durham Signal System)

NOTES

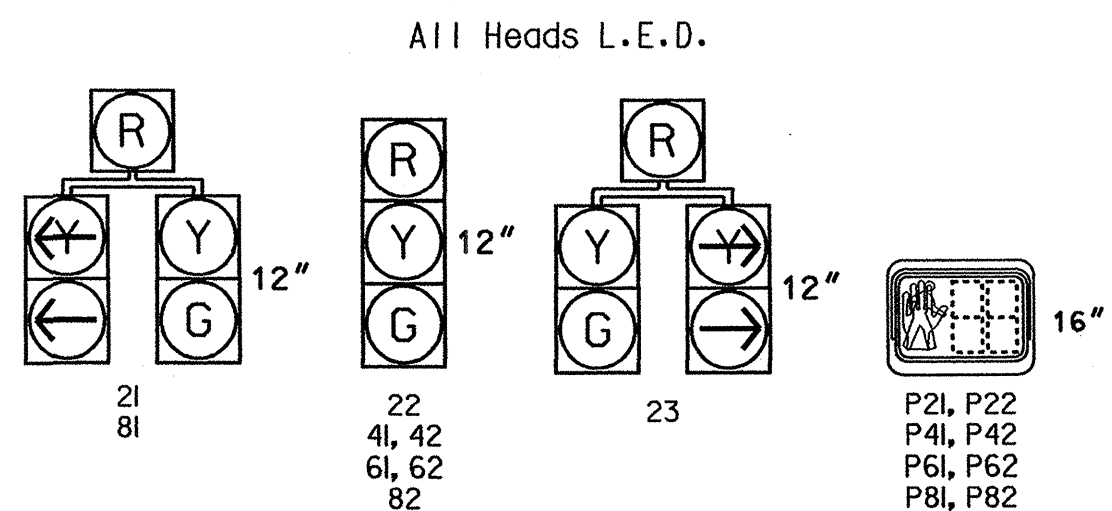
1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Program phase 3 as protected/permissive.
4. Program phase 5 as protected/permissive.
5. Program controller to clear from phase 2+6 to phase 2+5 by progressing through phase 4+8 (see Electrical Details).
6. Set all detector units to presence mode.
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. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
10. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
11. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



TIMING CHART 170 CONTROLLER						
PHASE	Ø2	Ø3	Ø4	Ø5	Ø6	Ø8
MINIMUM INITIAL *	10 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.
VEHICLE EXTENSION *	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
YELLOW CHANGE INT.	3.8 SEC.	3.0 SEC.	4.0 SEC.	3.0 SEC.	3.8 SEC.	3.8 SEC.
RED CLEARANCE	2.0 SEC.	3.3 SEC.	2.6 SEC.	2.8 SEC.	2.1 SEC.	2.6 SEC.
MAXIMUM LIMIT *	45 SEC.	25 SEC.	20 SEC.	25 SEC.	45 SEC.	20 SEC.
RECALL POSITION	VEH. RECALL	NONE	NONE	NONE	VEH. RECALL	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	NONLOCK	NONLOCK	NONLOCK	YELLOW LOCK	NONLOCK
DOUBLE ENTRY	OFF	OFF	ON	OFF	OFF	ON
WALK *	7 SEC.	- SEC.	7 SEC.	- SEC.	7 SEC.	7 SEC.
FLASHING DON'T WALK	9 SEC.	- SEC.	22 SEC.	- SEC.	10 SEC.	19 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*	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.
REDUCE 0.1 SEC EVERY *	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	2.0 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.

SIGNAL FACE I.D.



LEGEND

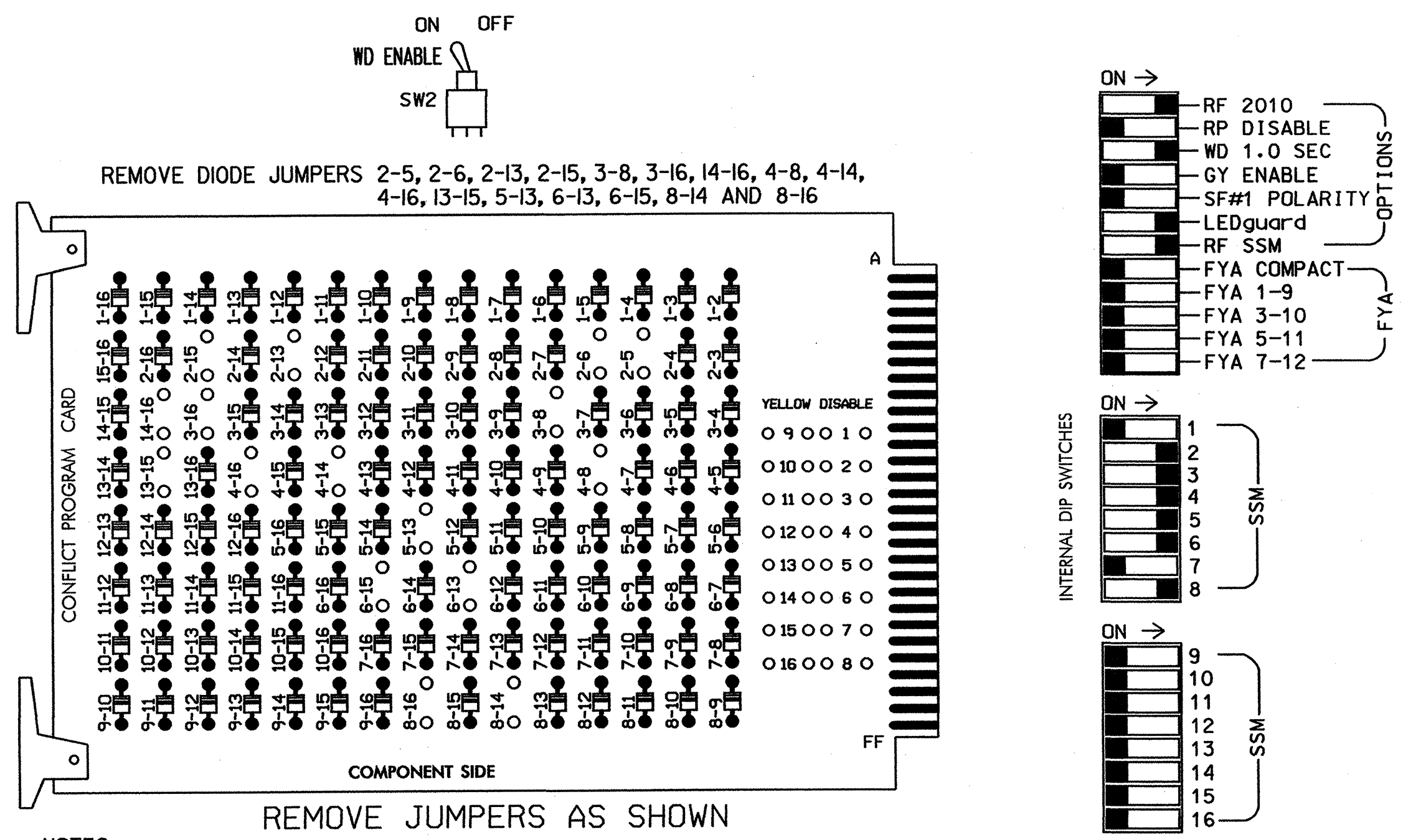
- | PROPOSED | EXISTING |
|----------------------------------|----------------------------------|
| ○→ Traffic Signal Head | ●→ Traffic Signal Head |
| ○→ Modified Signal Head | N/A |
| ○→ Pedestrian Signal Head | ○→ Pedestrian Signal Head |
| ○→ Signal Pole with Sign | ○→ Signal Pole with Sign |
| ○→ Signal Pole with Sidewalk Guy | ○→ Signal Pole with Sidewalk Guy |
| □→ Inductive Loop Detector | □→ Inductive Loop Detector |
| □→ Controller & Cabinet | □→ Controller & Cabinet |
| □→ Junction Box | □→ Junction Box |
| --- 2-in Underground Conduit | --- 2-in Underground Conduit |
| N/A → Right of Way | N/A → Right of Way |
| → Directional Arrow | → Directional Arrow |
| → Directional Drill | N/A |
| ○→ Metal Pole with Mastarm | ○→ Metal Pole with Mastarm |
| ○→ Signal Pedestal | ○→ Signal Pedestal |

Signal Upgrade - Final Design

	<p>SR 1321 (Hillandale Road) at SR 1407 (Carver Street)</p>		
	<p>Division 5 Durham County Durham</p> <p>PLAN DATE: November 2009</p> <p>PREPARED BY: C.E. Carter</p>	<p>REVIEWED BY:</p>	
<p>SCALE: 1"=50'</p>	<p>INIT. DATE</p>	<p>SIGNATURE</p>	<p>DATE</p>
<p>STG. INVENTORY NO. 05-1020</p>			<p>05-1020</p>

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



- NOTES:**
- Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
 - Make sure jumpers SEL2-SEL5 are present on the monitor board.
 - Ensure that Red Enable is active at all times during normal operation.

- NOTES**
- 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.
 - TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 1,7,9, 10,11,12,13,14,15 AND 16, TIE UNUSED RED MONITOR INPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
 - PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
 - SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
 - ENABLE SIMULTANEOUS GAP-OUT FEATURE FOR ALL PHASES.
 - PROGRAM PHASES 4 AND 8 FOR DOUBLE ENTRY.
 - PROGRAM ALL TIMING INFORMATION INTO PHASE BANKS 1,2 & 3.
 - SET PHASE BANK 3 MAXIMUM LIMIT TO 250 SEC. FOR PHASES USED.
 - SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
 - THIS CABINET AND CONTROLLER ARE PART OF THE DURHAM CITY SIGNAL SYSTEM.

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22, 23	P21, P22	23,81	41,42	P41, P42	21	61,62	P61, P62	NU	81,82	P81, P82
RED		128		*	101		*	134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW				117			132					
GREEN ARROW				118			133					
			113			104			119			110
			115			106			121			112

NU = Not Used ** ** ** **

* Denotes install load resistor. See Load Resistor Installation Detail this sheet.

** See 'Countdown Pedestrian Signal Operation' note below.

INPUT FILE POSITION LAYOUT

(front view)

FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	2A	2B	NOT USED	3A	4A	4B	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED
L	2A	2B	NOT USED	3A	4A	4B	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED
U	5A, 4, 2	6A	6C	NOT USED	8A	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED
L	5A, 4, 2	6A	6C	NOT USED	8A	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED	NOT USED

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

PEDESTRIAN PHASE PROGRAMMING

PROGRAM PEDESTRIAN 2P OUTPUT AT KEYPAD INPUT E/125+F+5=φ2
 PROGRAM PEDESTRIAN 4P OUTPUT AT KEYPAD INPUT E/125+F+7=φ4
 PROGRAM PEDESTRIAN 6P OUTPUT AT KEYPAD INPUT E/125+F+6=φ6
 PROGRAM PEDESTRIAN 8P OUTPUT AT KEYPAD INPUT E/125+F+8=φ8

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	2	43	5 7	2
3A	TB4-5,6	I5U	3	58	5 7	3
			4	58	5 7	8
4A	TB4-9,10	I6U	5	41	5 7	4
			6	45	5 7	4
5A	TB3-1,2	J1U	7	55	5 7	5
			8	55	7	4
			9	55	5 7	2
6A	TB3-5,6	J2U	10	40	5 7	6
6B	TB3-7,8	J2L	11	44	5 7	6
6C	TB3-9,10	J3U	12	64	5 7	6
8A	TB5-9,10	J6U	13	42	5 7	8
PED PUSH BUTTONS						
P21, P22	TB8-4,6	I12U	14	67	2	2PED
P41, P42	TB8-5,6	I12L	15	69	2	4PED
P61, P62	TB8-7,9	I13U	16	68	2	6PED
P81, P82	TB8-8,9	I13L	17	70	2	8PED

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

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

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

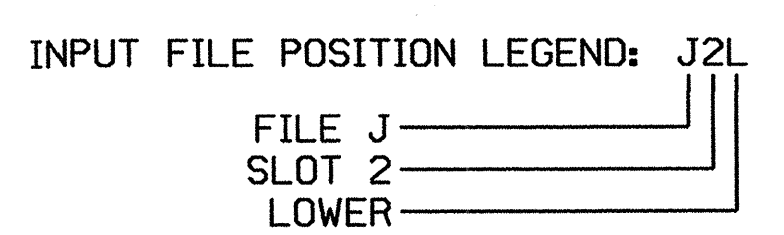
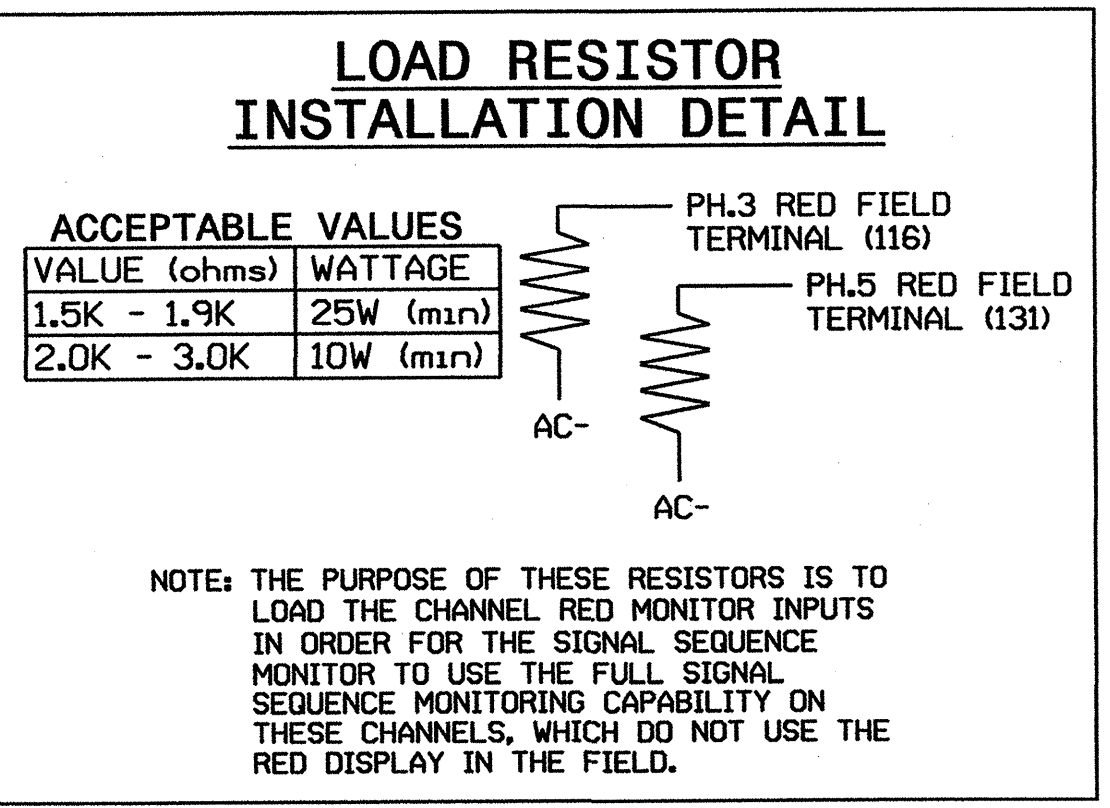
COUNTDOWN PED SIGNALS ARE REQUIRED TO DISPLAY TIMING ONLY DURING PED CLEARANCE INTERVAL. CONSULT PED SIGNAL MODULE USER'S MANUAL FOR INSTRUCTIONS ON SELECTING THIS FEATURE.

BACK-UP PROTECTION NOTE

TO ENSURE THAT THE CONTROLLER WILL NOT SEQUENCE FROM PHASE 6 DIRECTLY TO PHASE 5, OR FROM PHASE 4 DIRECTLY TO PHASE 3, SPECIAL PROGRAMMING HAS TO BE ENABLED IN THE BI TRANS 233NC2 SOFTWARE. PROGRAM 170E CONTROLLER AS FOLLOWS:

- PROGRAM PHASES 3 & 5 AS PROTECTED/PERMITTED AT KEYPAD INPUT E/125+E+4=φ3,5
- LOOP '5A' WILL HAVE TO BE PROGRAMMED TO CALL PHASE 4 (WITH APPROPRIATE DELAY TIME) TO ALLOW CONTROLLER TO SEQUENCE THRU PHASE 4+8 BEFORE PROCEEDING TO PHASE 5. (SEE INPUT FILE PROGRAMMING THIS SHEET).

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1020
 DESIGNED: NOVEMBER 2009
 SEALED: 12/22/09
 REVISED: N/A



- DETECTOR ATTRIBUTES LEGEND:**
- FULL TIME DELAY
 - PED CALL
 - RESERVED
 - COUNTING
 - EXTENSION
 - TYPE 3
 - CALLING
 - ALTERNATE

Final Design

ELECTRICAL AND PROGRAMMING DETAILS FOR: SR 1321 (Hillandale Road) at SR 1407 (Carver Street)

Division 05 Durham County Durham

Prepared In the Office of: TRANSPORTATION MOBILITY AND SAFETY DIVISION

Prepared By: F.E. RUSS REVIEWED BY: MWH

PLAN DATE: December 2009

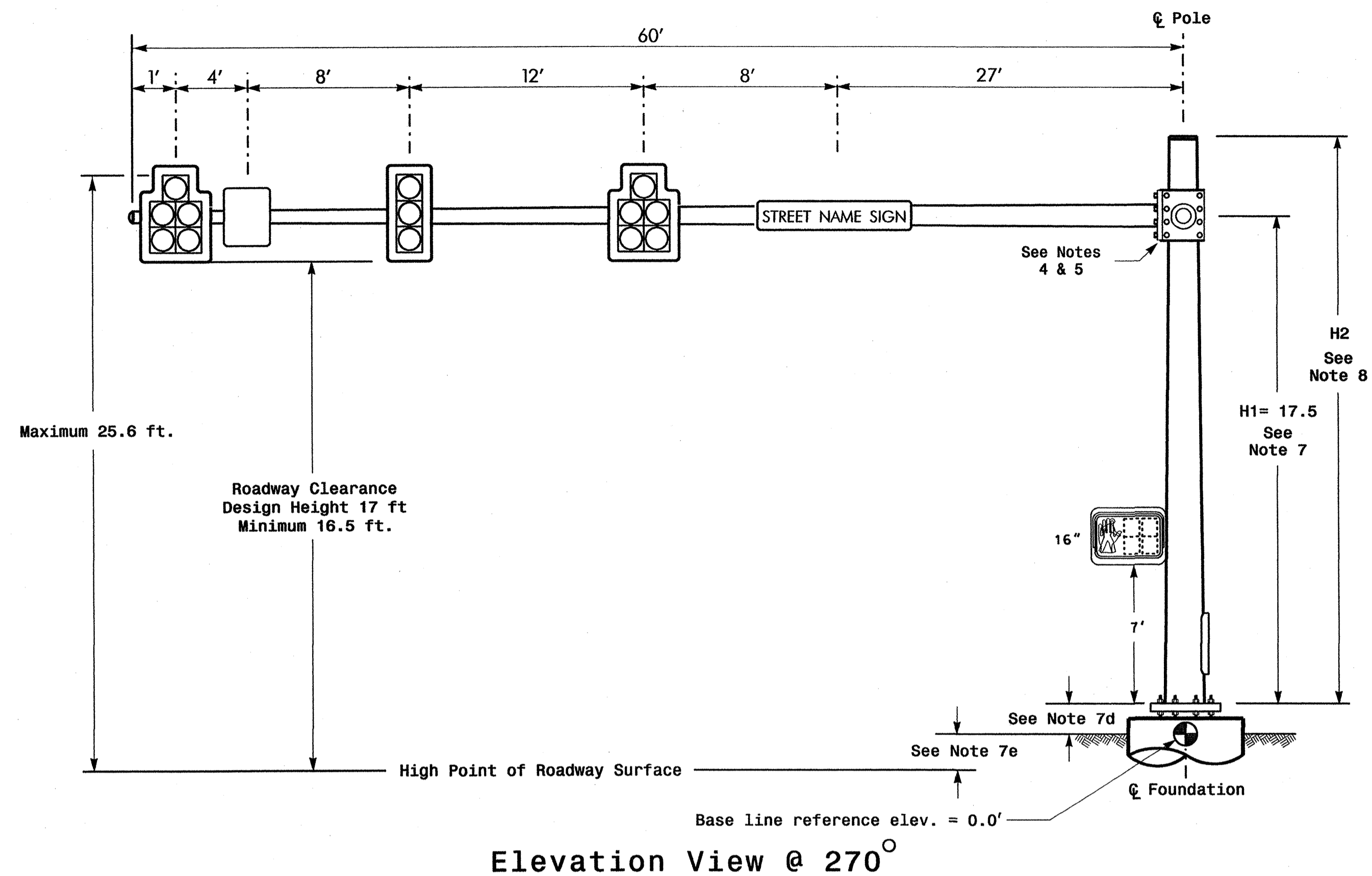
REVISIONS: INIT. DATE

Signature: John T. Rowe 12-30-09

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

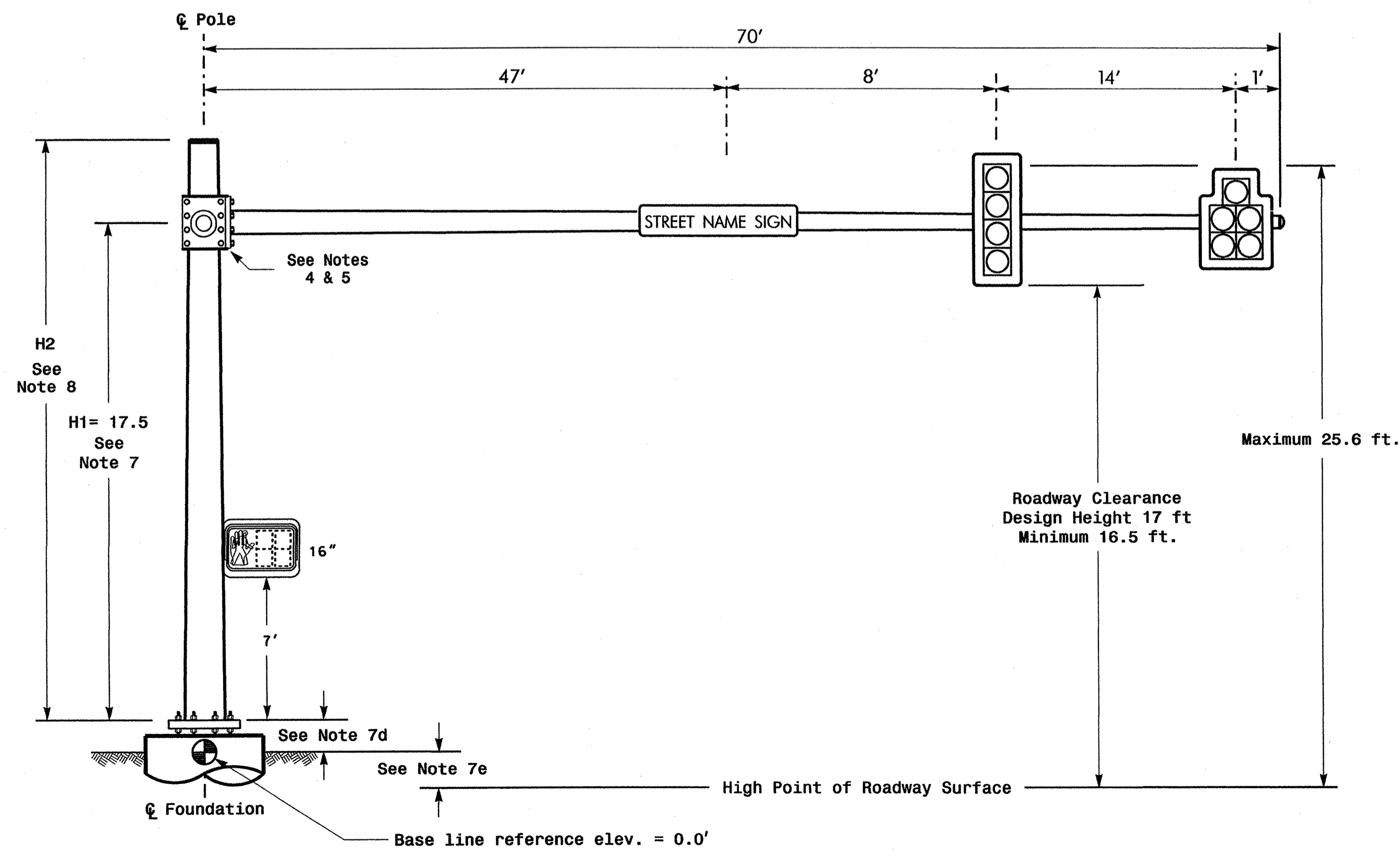
Sig. Inventory No. 05-1020

Design Loading for METAL POLE NO. 1, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 1, MAST ARM B

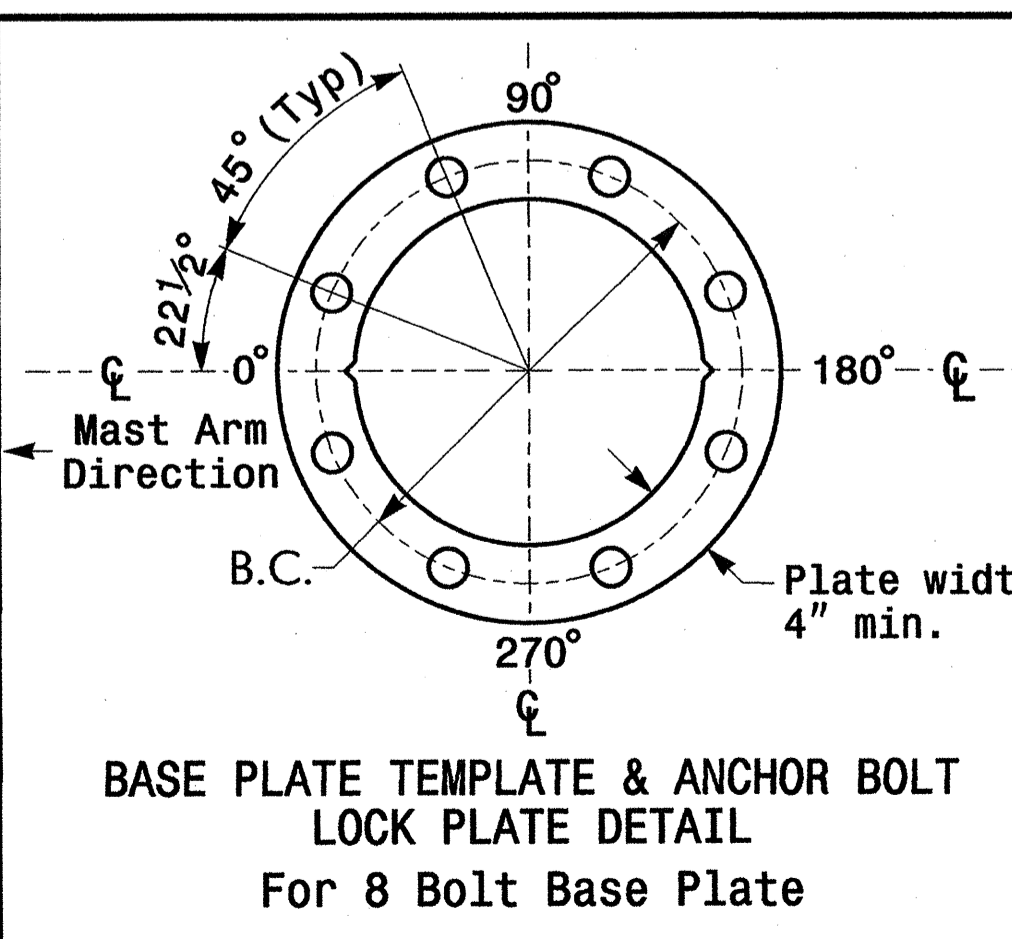
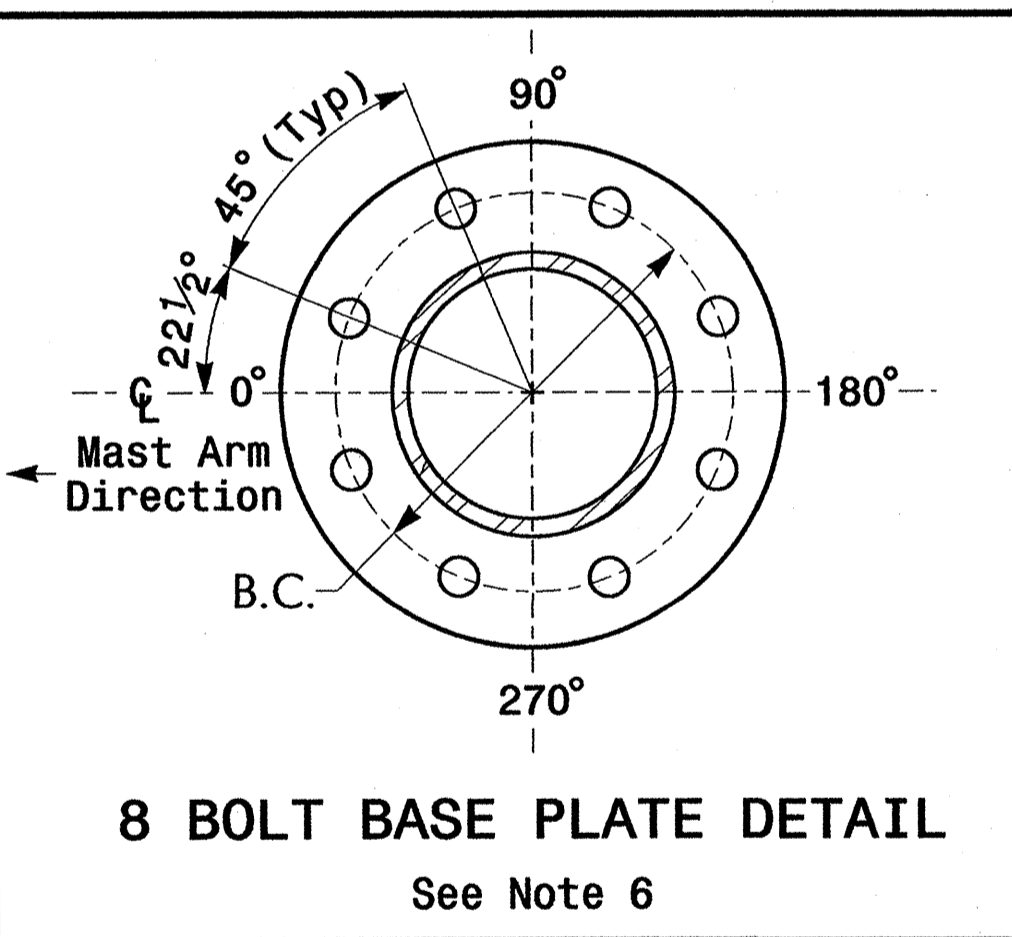
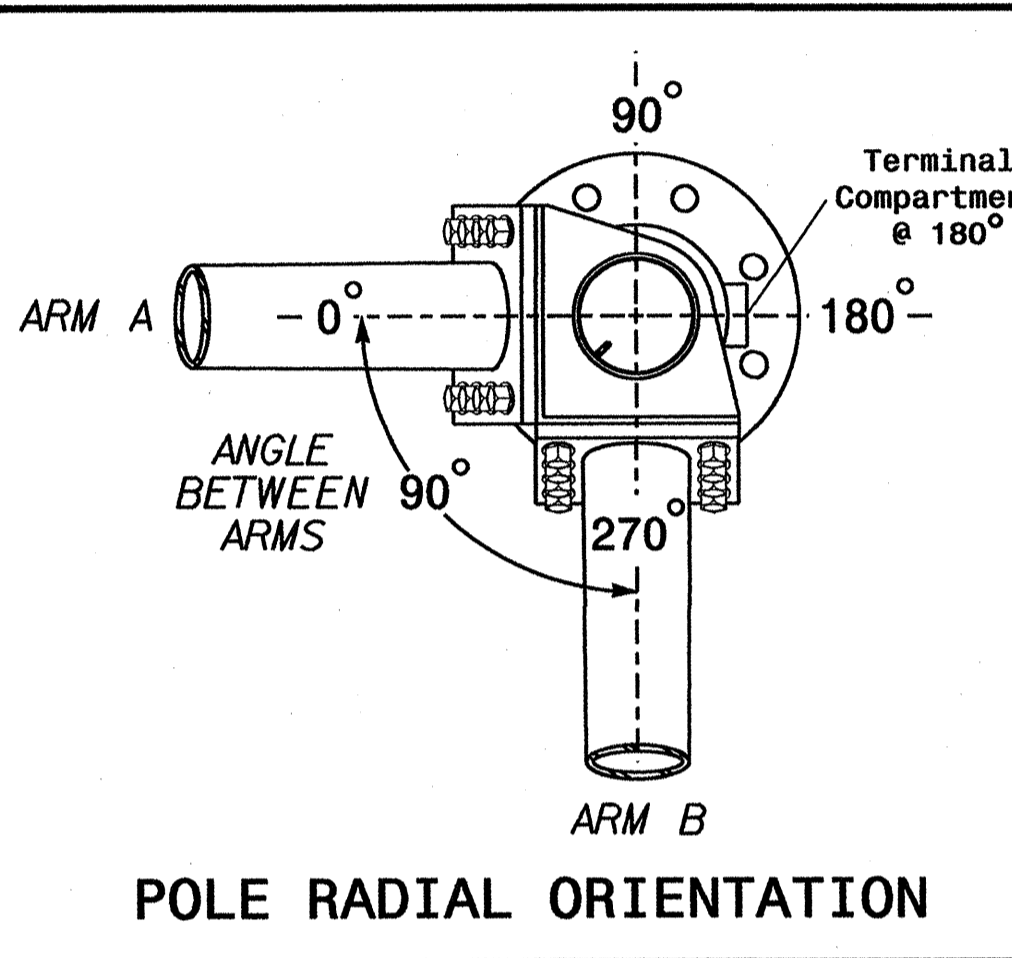


Elevation View @ 0°

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 ϕ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-1.8 ft.	-1.8 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A



METAL POLE No. 1

PROJECT REFERENCE NO.	SHEET NO.
U-3804	Fig. 23

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	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
	SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	7.5 S.F.	30.0" W X 36.0" L	14 LBS
	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

Design Reference Material

- Design the traffic signal structure and foundation in accordance with:
 - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
 - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
 - The 2006 NCDOT Roadway Standard Drawings.
 - The traffic signal project plans and special provisions.
 - The NCDOT "Metal Pole Standards" located at the following NCDOT website: <http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html>

Design Requirements

- Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
- Design all signal supports using stress ratios that do not exceed 0.9.
- 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.
- 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.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
 - Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
 - Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
 - The roadway clearance height for design is as shown in the elevation views.
 - The top of the pole base plate is .75 feet above the ground elevation.
 - Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
- 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 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
- If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
- The contractor is responsible for verifying that the mast arm lengths shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

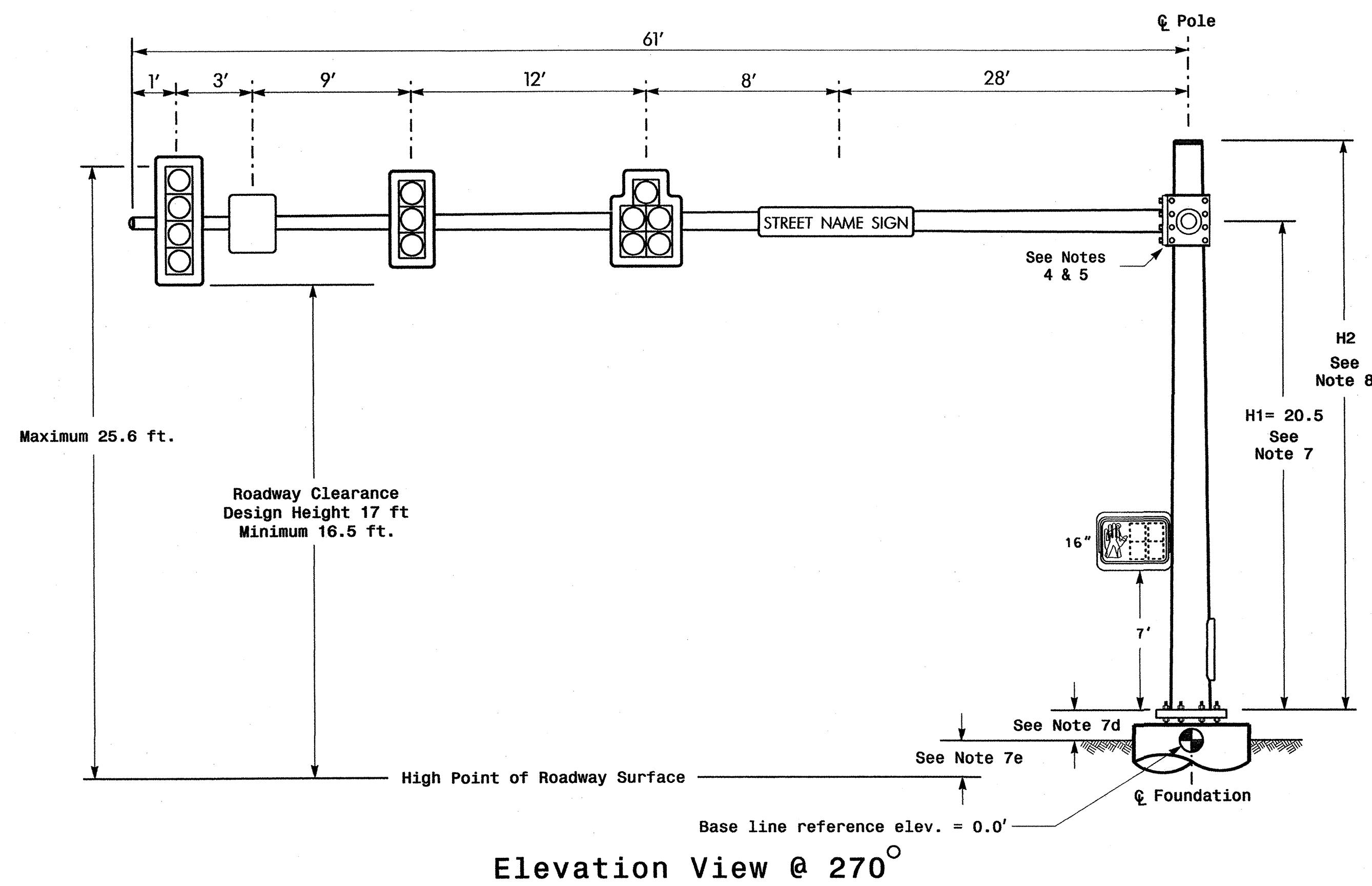
This plan supersedes the plan signed and sealed on 1/6/10.

NCDOT Wind Zone 4 (90 mph)

	SR 1321 (Hillendale Road) at Bertrand Ave. and Loehmann's Plaza Durham, NC		SEAL NORTH CAROLINA PROFESSIONAL ENGINEER ROBERT J. ZIEMBA 026486 10/10/10
	Division 5 PLAN DATE: February 2010 PREPARED BY: C.E. Carter	Durham County REVIEWED BY: 	
SCALE: N/A N/A		SIGNATURE: _____ DATE: _____ SIG. INVENTORY NO. 05-2379	

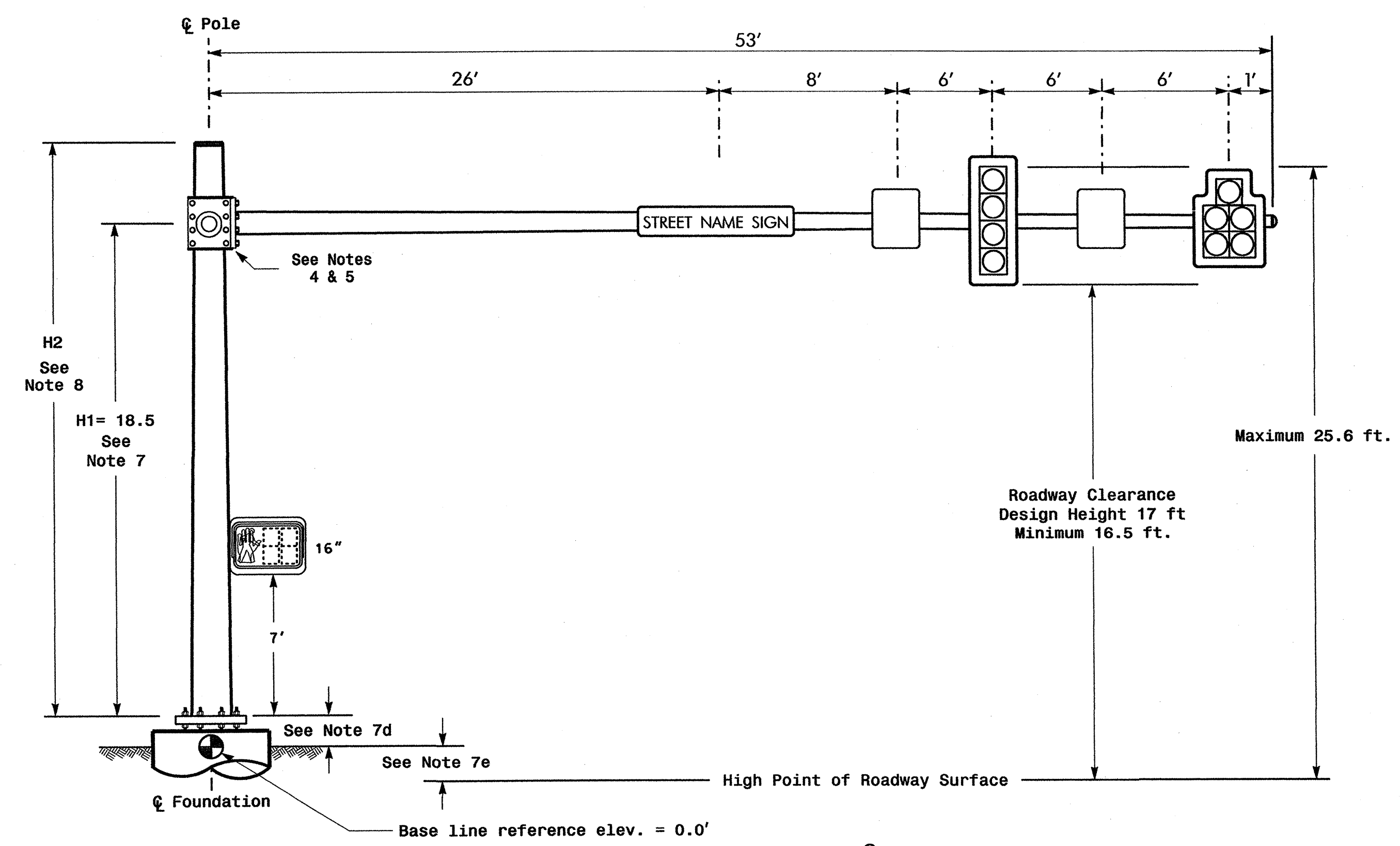
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Design Loading for METAL POLE NO. 2, MAST ARM A



Elevation View @ 270°

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

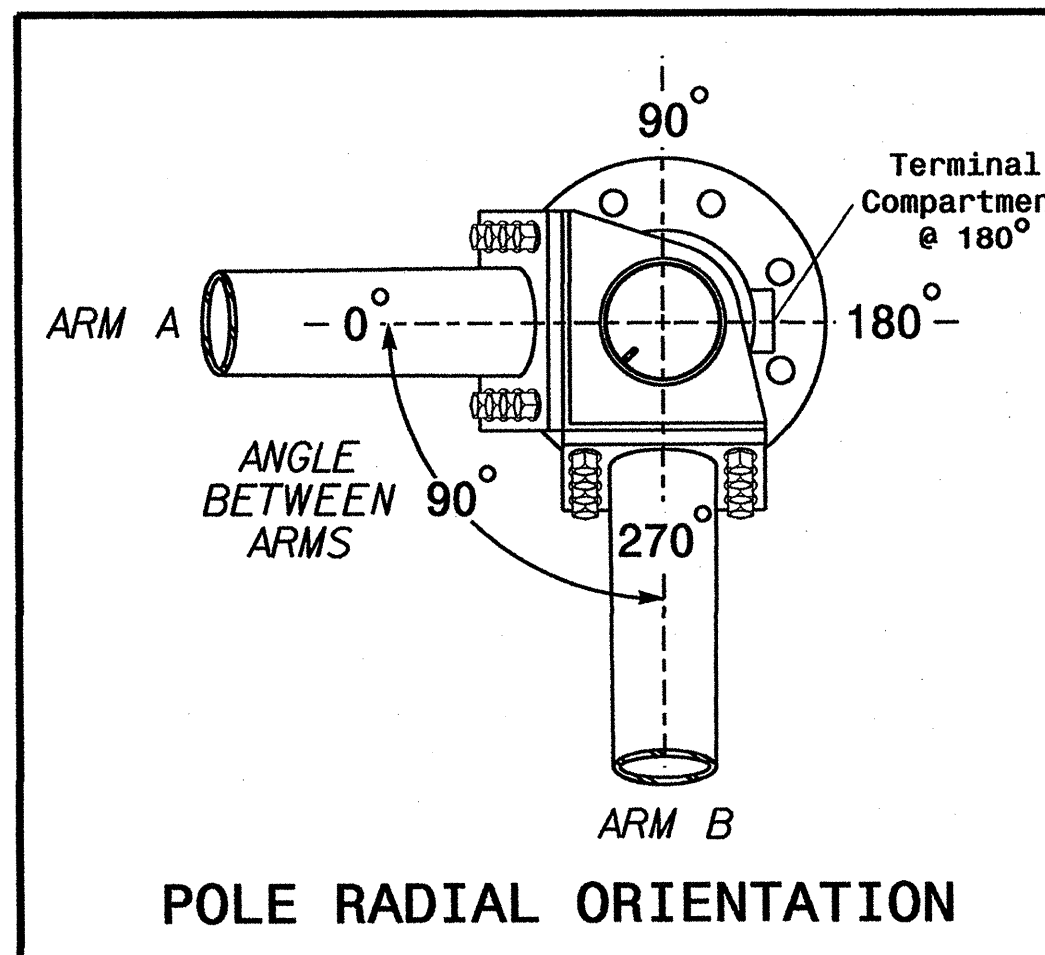


Elevation View @ 0°

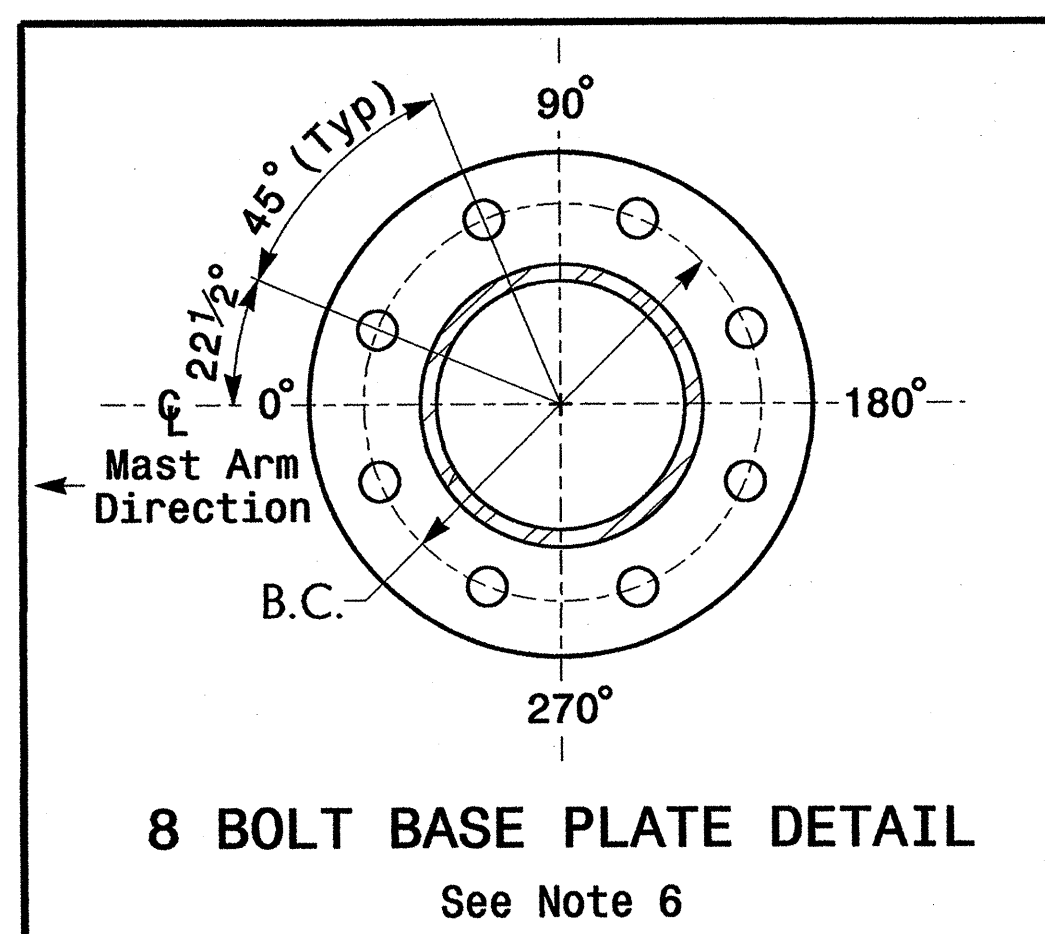
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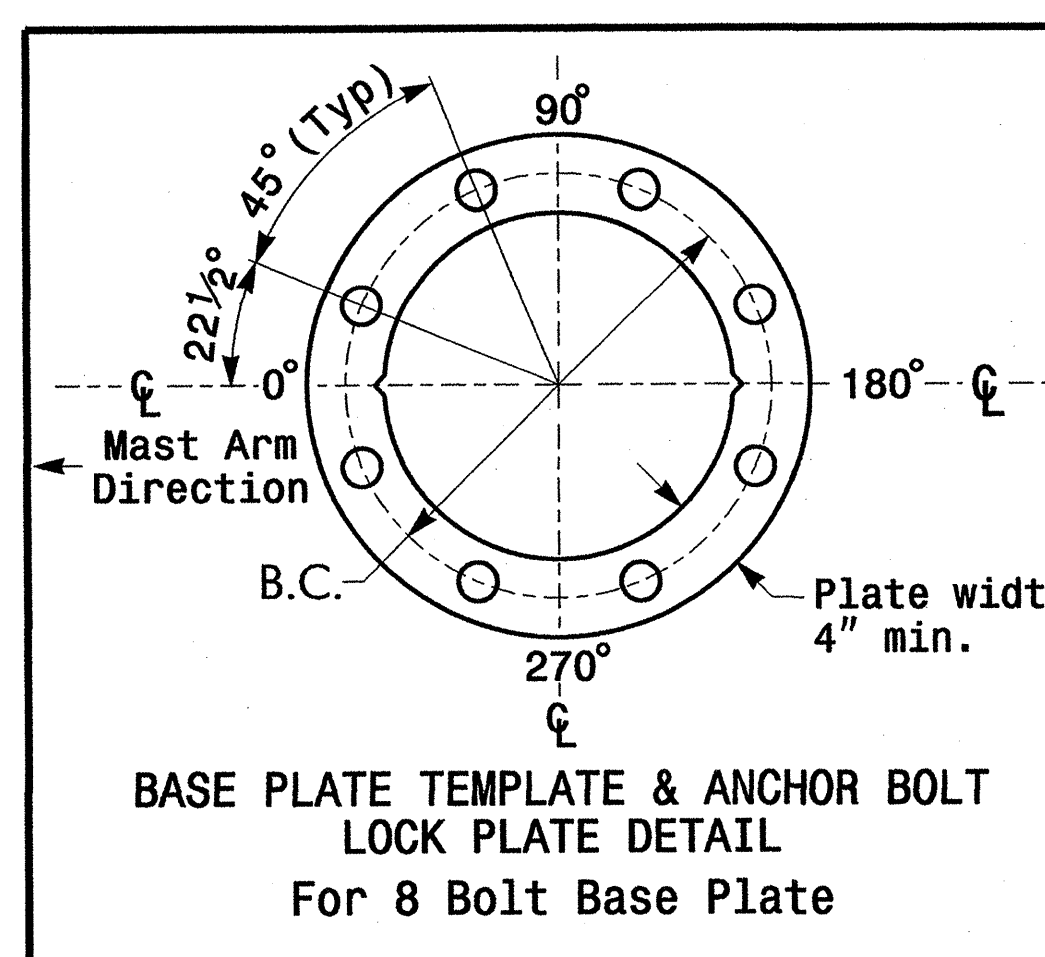
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Elevation difference at High point of roadway surface	+1.2 ft.	-0.8 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A



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"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
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 - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
 - The 2006 NCDOT Roadway Standard Drawings.
 - The traffic signal project plans and special provisions.
 - The NCDOT "Metal Pole Standards" located at the following NCDOT website: <http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html>

Design Requirements

- Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
- Design all signal supports using stress ratios that do not exceed 0.9.
- 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.
- 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.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
 - Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
 - Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
 - The roadway clearance height for design is as shown in the elevation views.
 - The top of the pole base plate is .75 feet above the ground elevation.
 - Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
- 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 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
- If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
- The contractor is responsible for verifying that the mast arm lengths shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

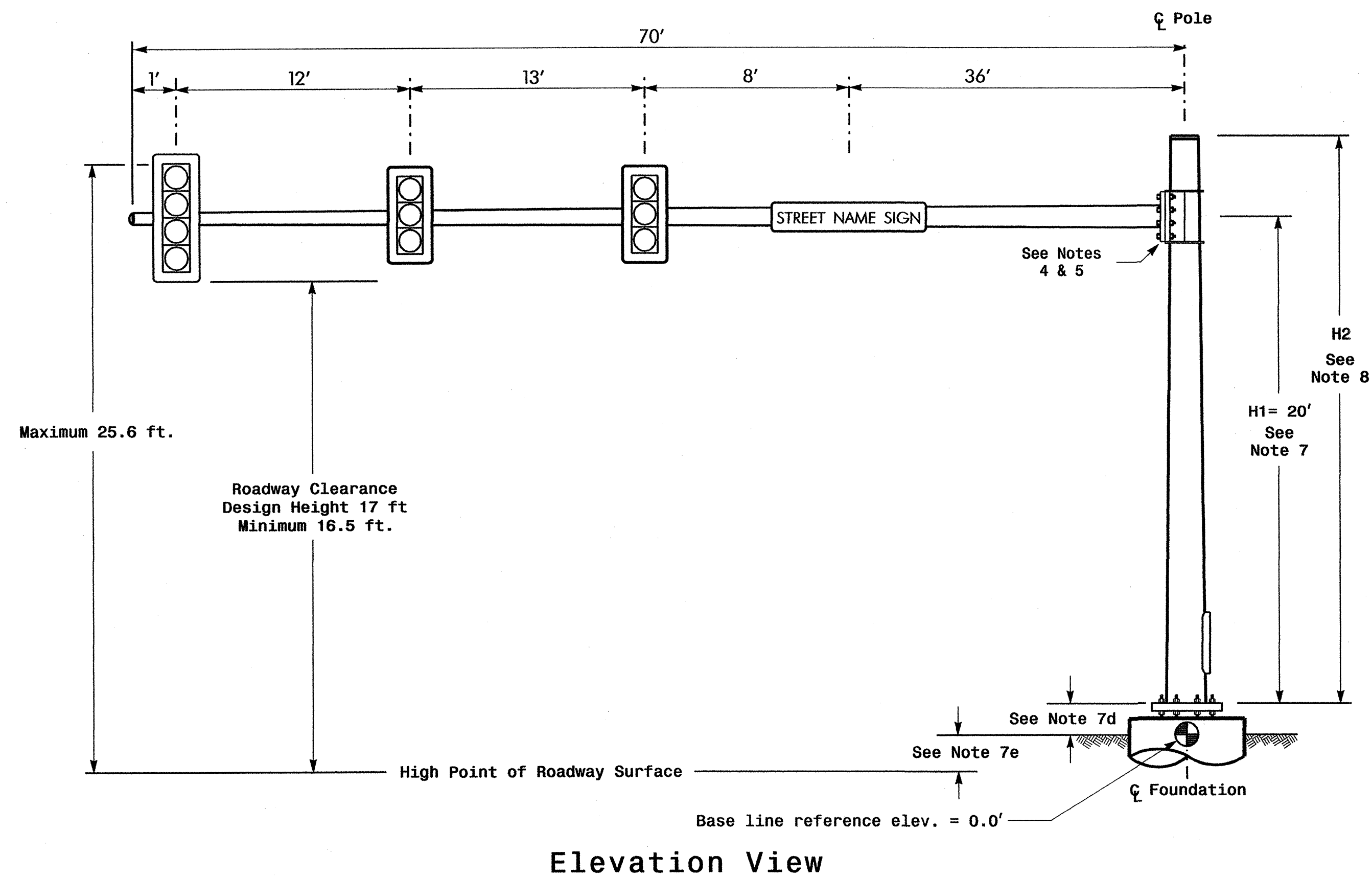
This plan supersedes the plan signed and sealed on 1/6/10.

NCDOT Wind Zone 4 (90 mph)

	SR 1321 (Hillendale Road) at Bertland Ave. and Loehmann's Plaza Durham County Durham		
	Division 5	February 2010	
PREPARED BY: C.E. Carter	REVIEWED BY:	REVISIONS	INIT. DATE
SCALE: N/A	N/A	N/A	N/A
SIGNATURE:			DATE: 2/10/10
SIG. INVENTORY NO. 05-2379			

15-FEB-2010 15:00
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 rzl/emo

Design Loading for METAL POLE NO. 3



Elevation View

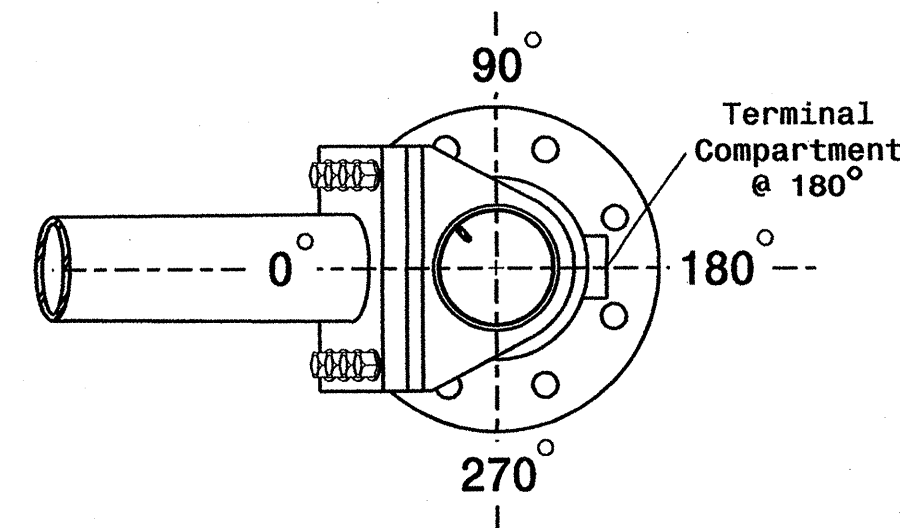
SPECIAL NOTE
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project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

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 3	Pole 4
Baseline reference point at ϕ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.90 ft.	+0.80 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A

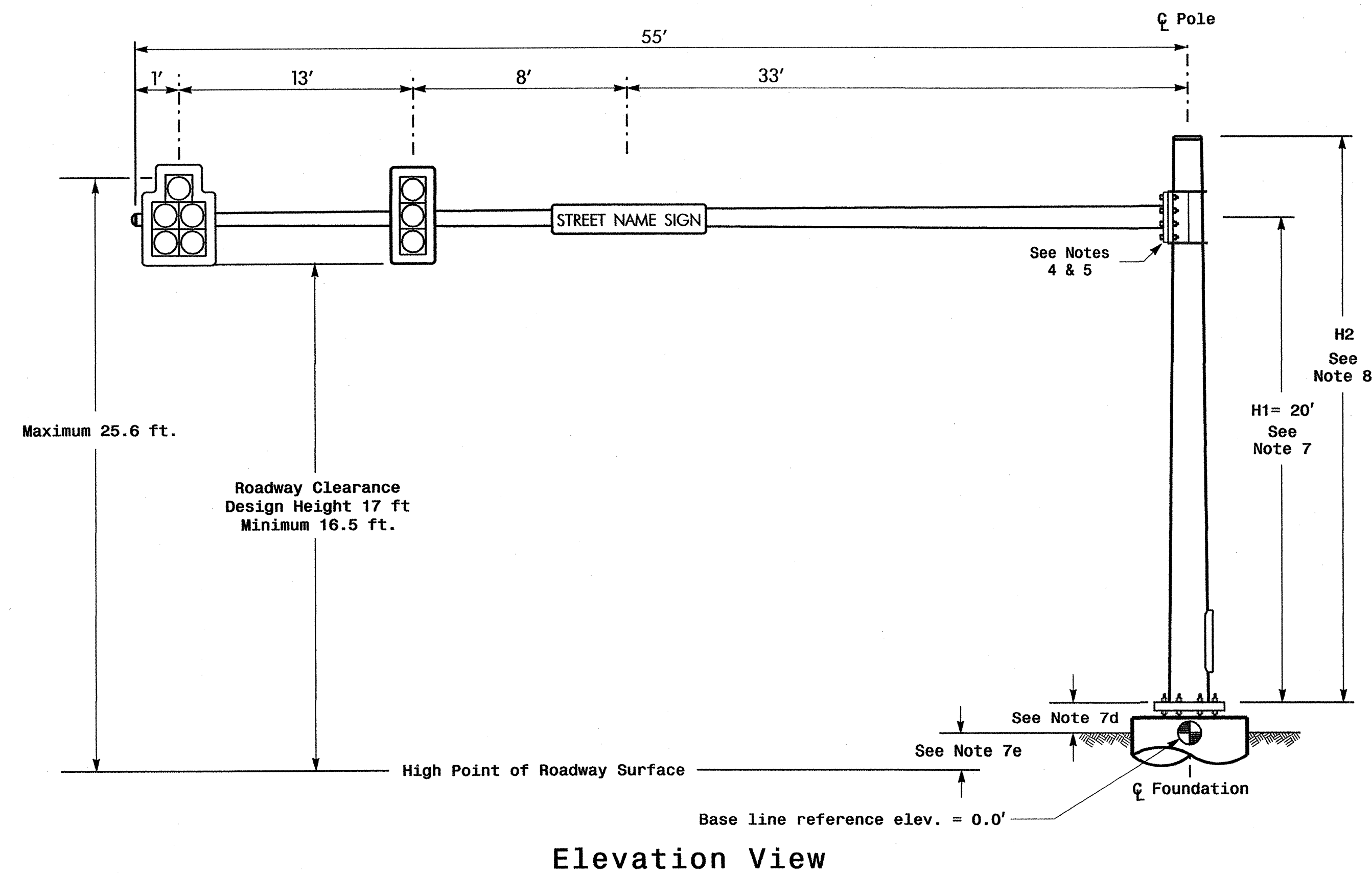
MAST ARM LOADING SCHEDULE

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"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE AND ASTRO-BRAC	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

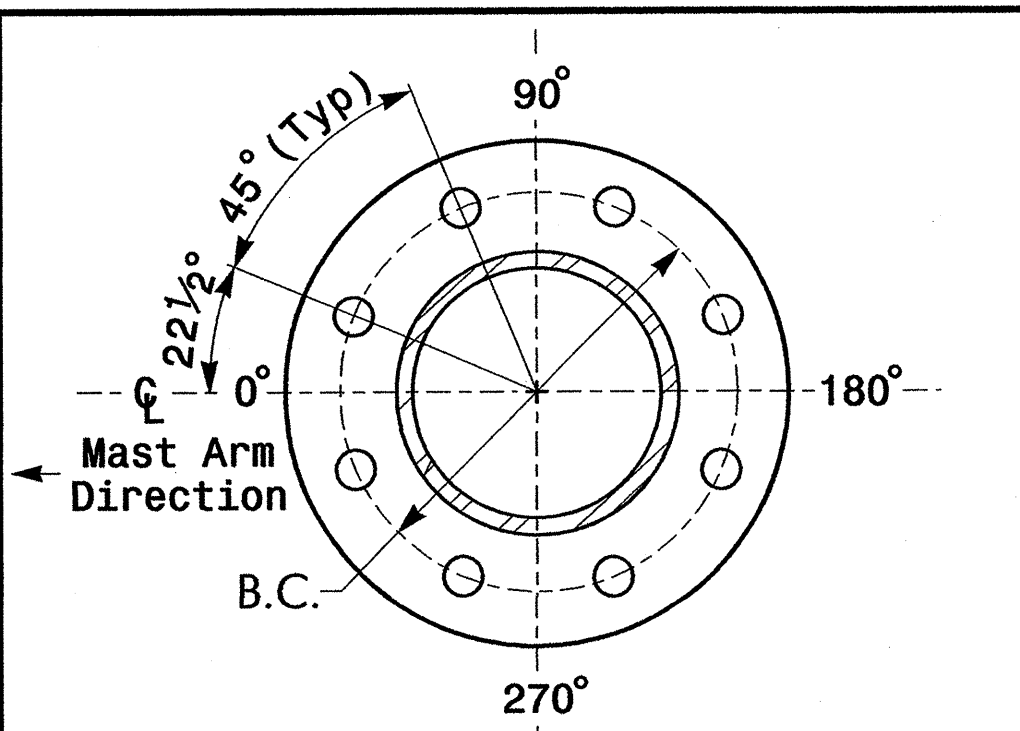


POLE RADIAL ORIENTATION

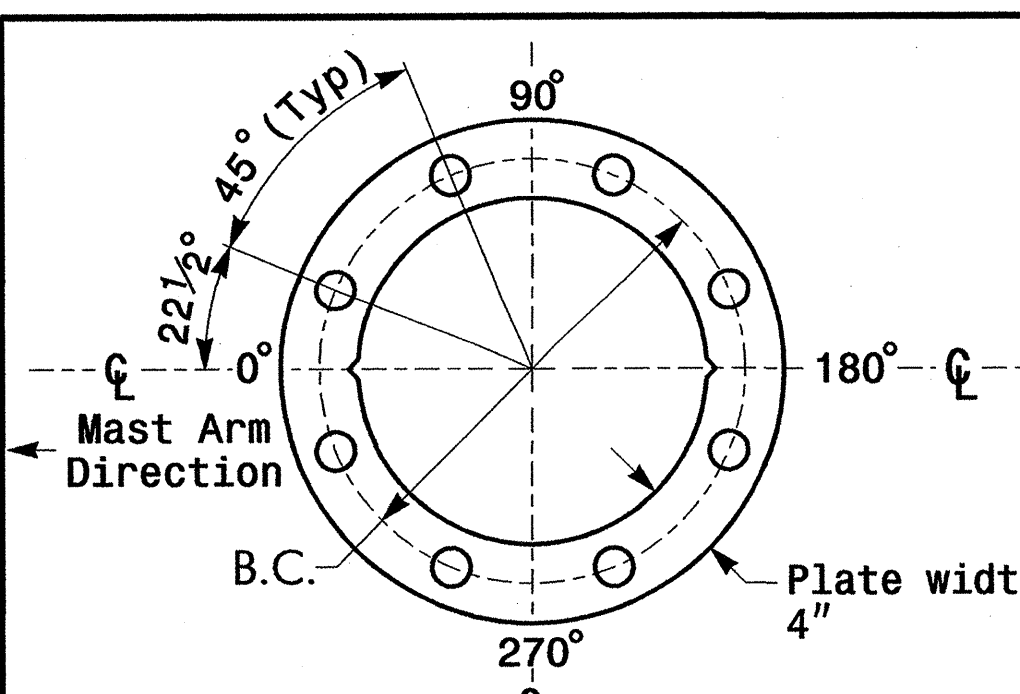
Design Loading for METAL POLE NO. 4



Elevation View



8 BOLT BASE PLATE DETAIL
See Note 6



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

Design Reference Material

- Design the traffic signal structure and foundation in accordance with:
 - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
 - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
 - The 2006 NCDOT Roadway Standard Drawings.
 - The traffic signal project plans and special provisions.
 - The NCDOT "Metal Pole Standards" located at the following NCDOT website: <http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html>

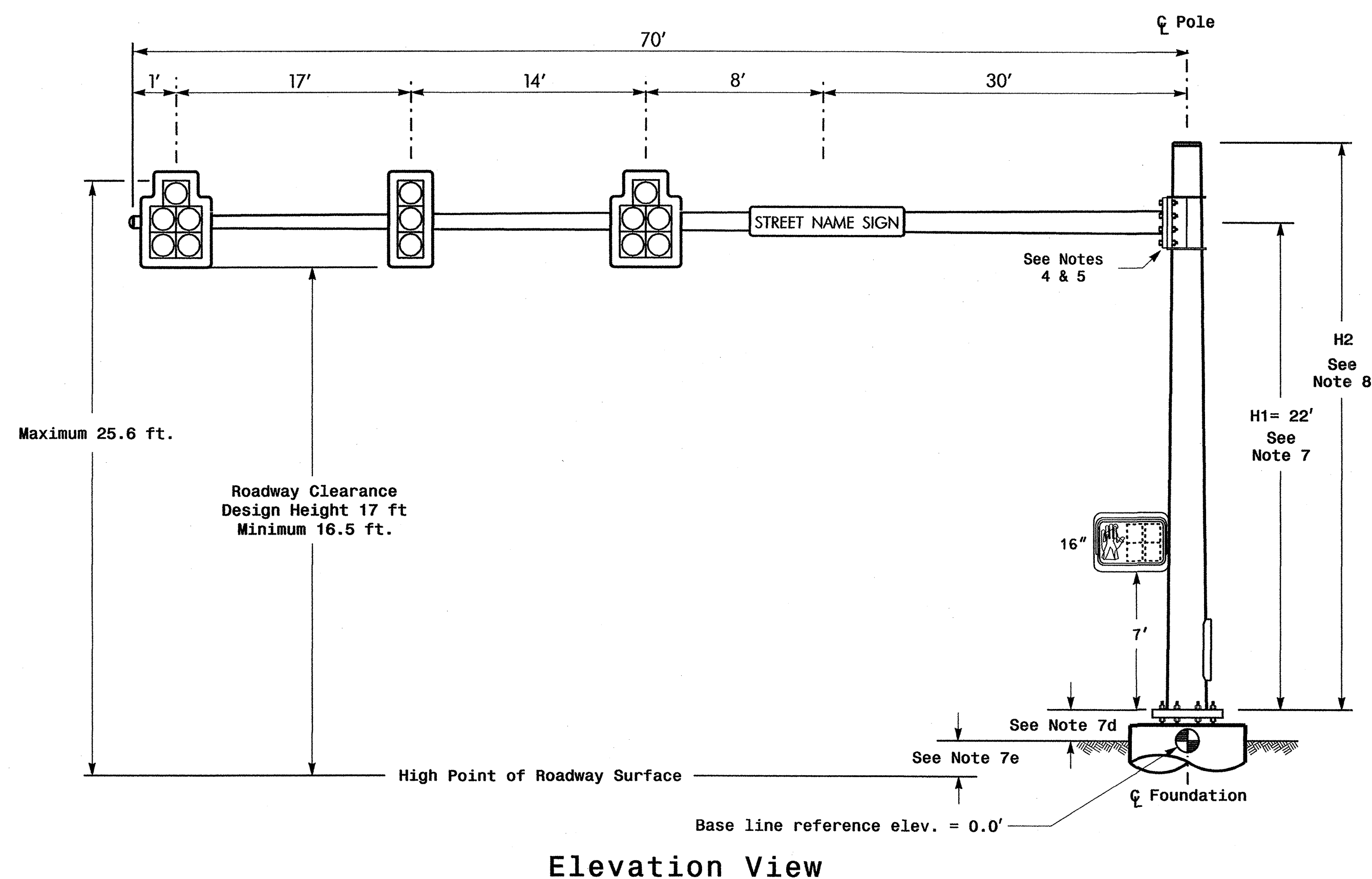
Design Requirements

- Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
- Design all signal supports using stress ratios that do not exceed 0.9.
- 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.
- A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
- The mast arm attachment height (H1) shown is based on the following design assumptions:
 - Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
 - Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
 - The roadway clearance height for design is as shown in the elevation views.
 - The top of the pole base plate is .75 feet above the ground elevation.
 - Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
- The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
 - Mast arm attachment height (H1) plus 2 feet, or
 - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
- If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
- The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
- The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 4 (90 mph)

	Prepared in the Offices of: SR 1321 (Hillandale Road) at SR 1407 (Carver Street)		SEAL
	Division 5 Durham County Durham PLAN DATE: December 2009 PREPARED BY: C.E. Carter	REVIEWED BY: REVIEWED BY:	
SCALE: 0 N/A N/A	REVISIONS:	INIT.:	DATE:
SIG. INVENTORY NO. 05-1020			

Design Loading for METAL POLE NO. 5



Elevation View

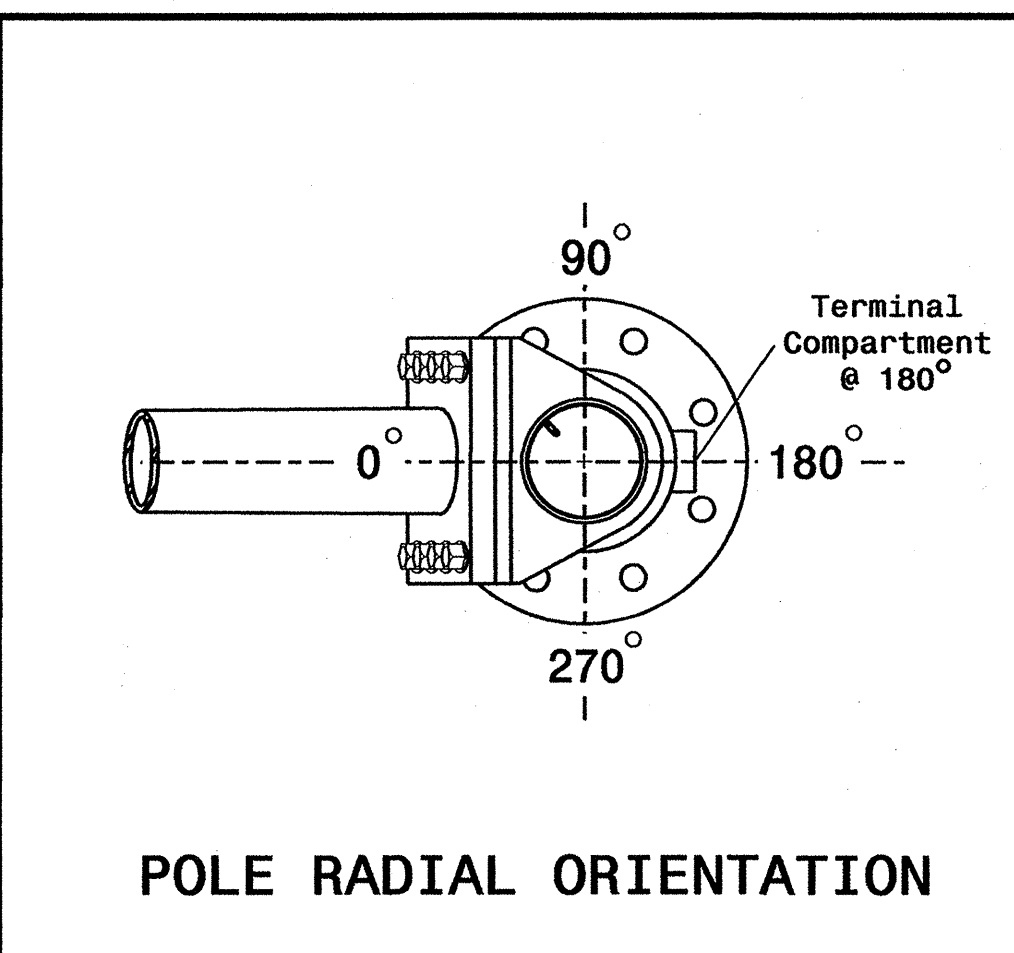
SPECIAL NOTE
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project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

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 5	Pole 6
Baseline reference point at ϕ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+2.8 ft.	-0.60 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A

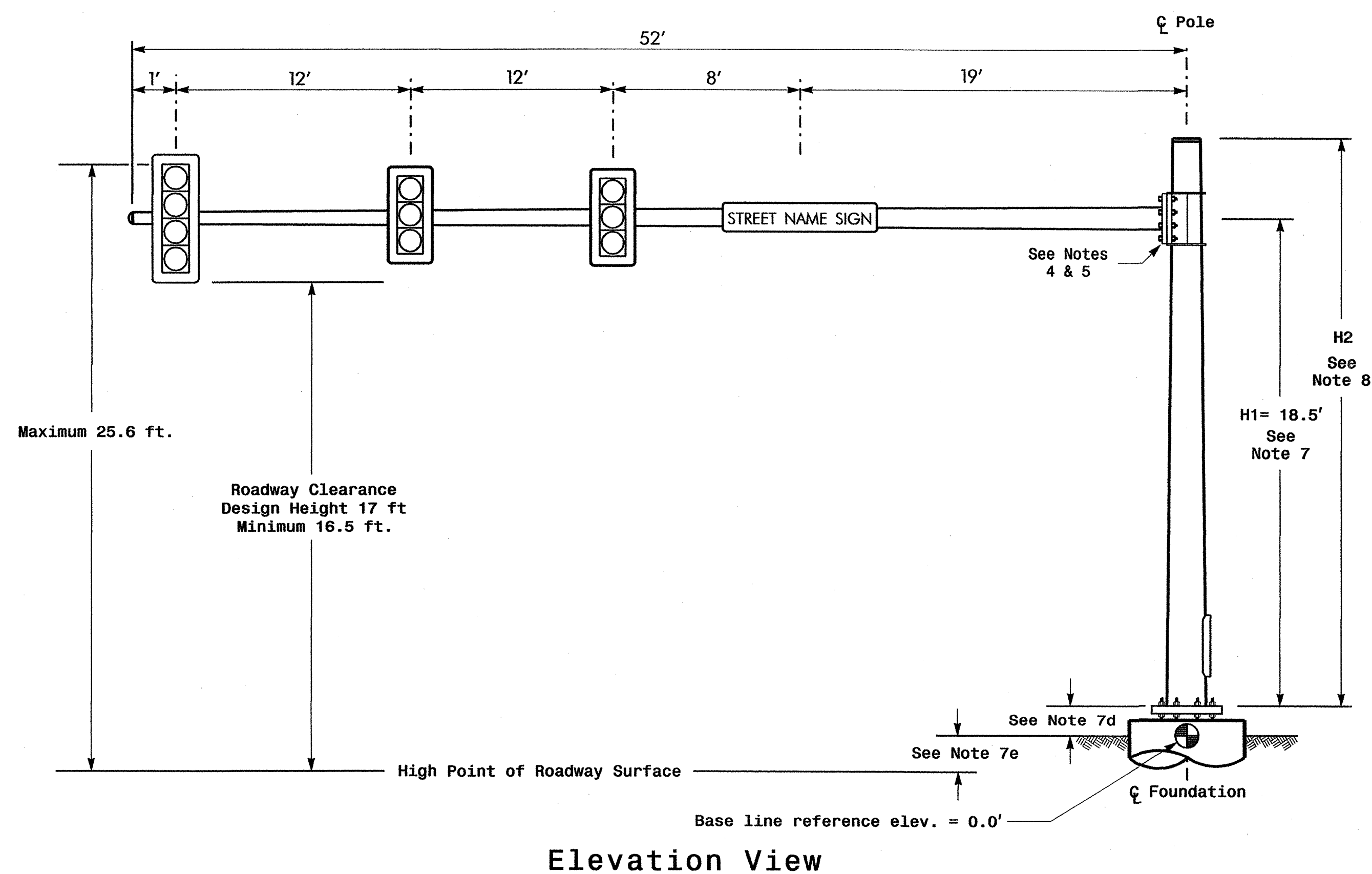
MAST ARM LOADING SCHEDULE

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"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE AND ASTRO-BRAC	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

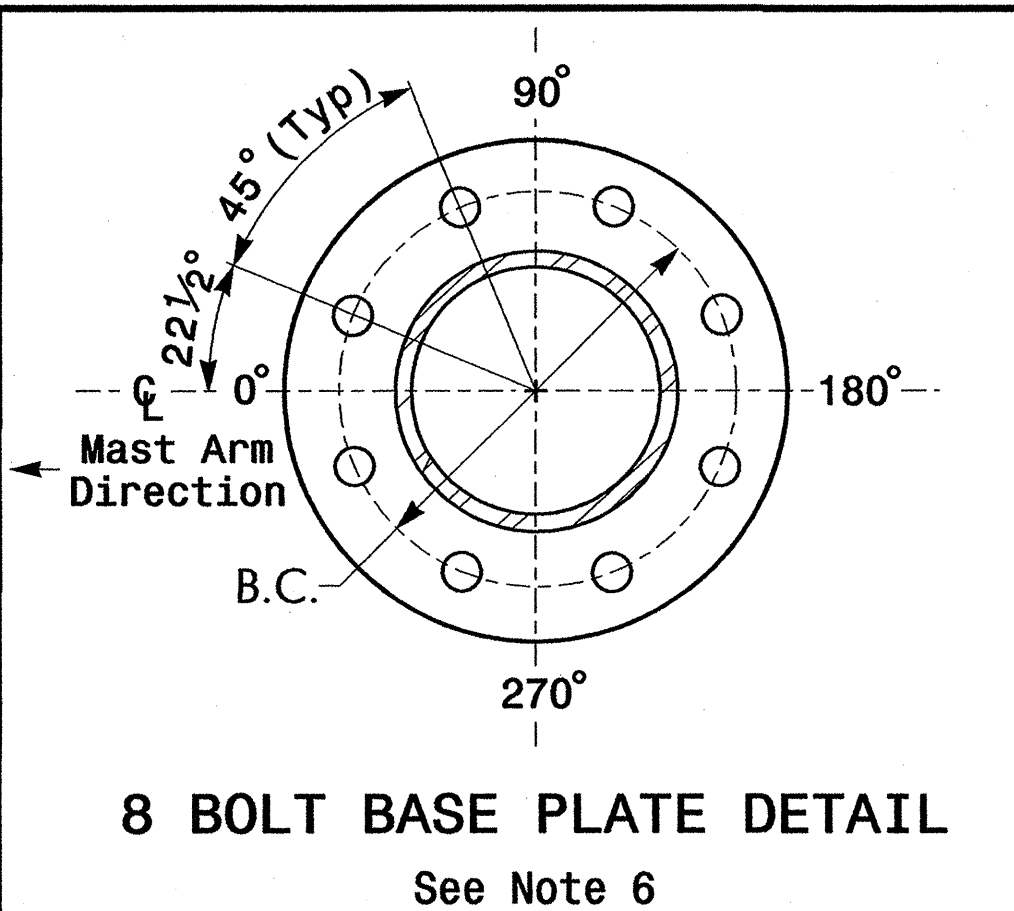


POLE RADIAL ORIENTATION

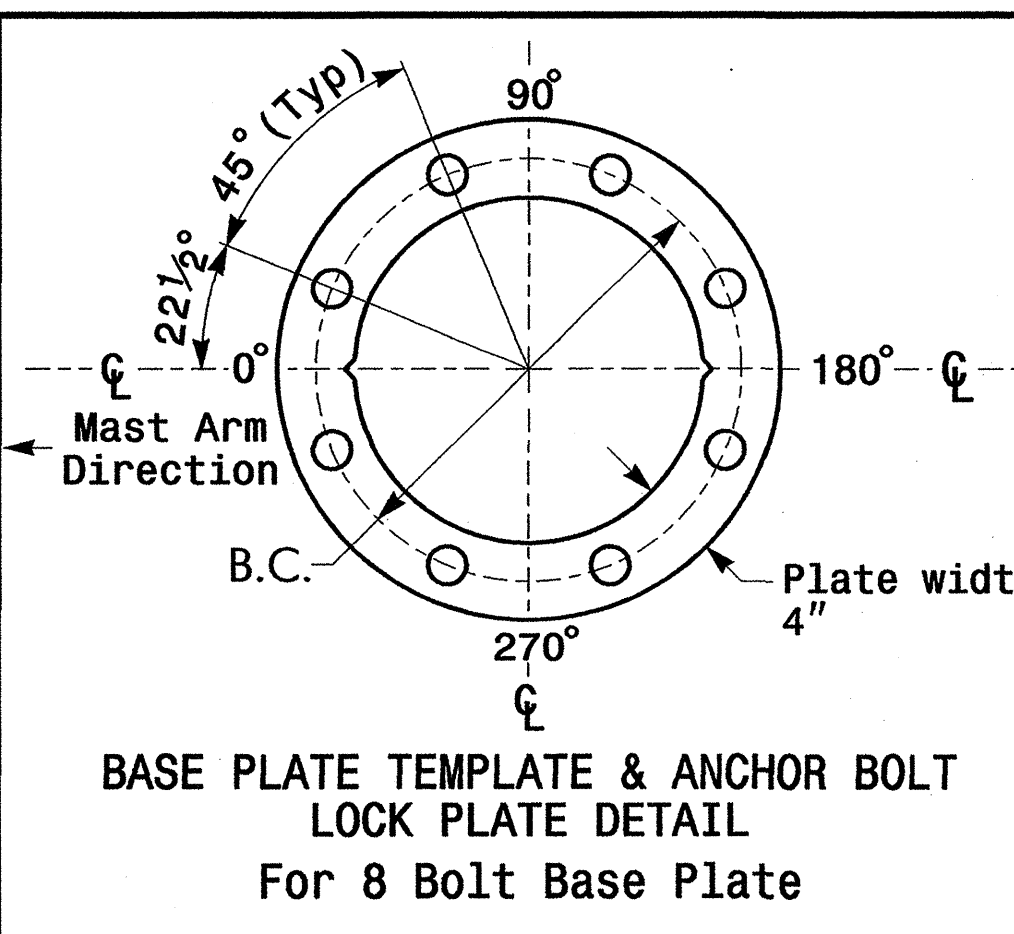
Design Loading for METAL POLE NO. 6



Elevation View



8 BOLT BASE PLATE DETAIL
See Note 6



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

NOTES

- Design Reference Material**
- Design the traffic signal structure and foundation in accordance with:
 - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
 - The 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
 - The 2006 NCDOT Roadway Standard Drawings.
 - The traffic signal project plans and special provisions.
 - The NCDOT "Metal Pole Standards" located at the following NCDOT website: <http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html>
 - Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
 - Design all signal supports using stress ratios that do not exceed 0.9.
 - 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.
 - A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
 - Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
 - The mast arm attachment height (H1) shown is based on the following design assumptions:
 - Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
 - Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
 - The roadway clearance height for design is as shown in the elevation views.
 - The top of the pole base plate is .75 feet above the ground elevation.
 - Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
 - The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
 - Mast arm attachment height (H1) plus 2 feet, or
 - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
 - If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
 - The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
 - The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 4 (90 mph)

Prepared in the Offices of:

SR 1321 (Hillandale Road) at SR 1407 (Carver Street)

Division 5 Durham County Durham

PLAN DATE: December 2009 REVIEWED BY:

PREPARED BY: C.E. Carter REVIEWED BY:

REVISIONS

REVISIONS	INIT.	DATE

SCALE: 0 N/A

SEAL: ROBERT J. ZEMBA, PROFESSIONAL ENGINEER, No. 026486

SIGNATURE: [Signature] DATE: 1/6/10

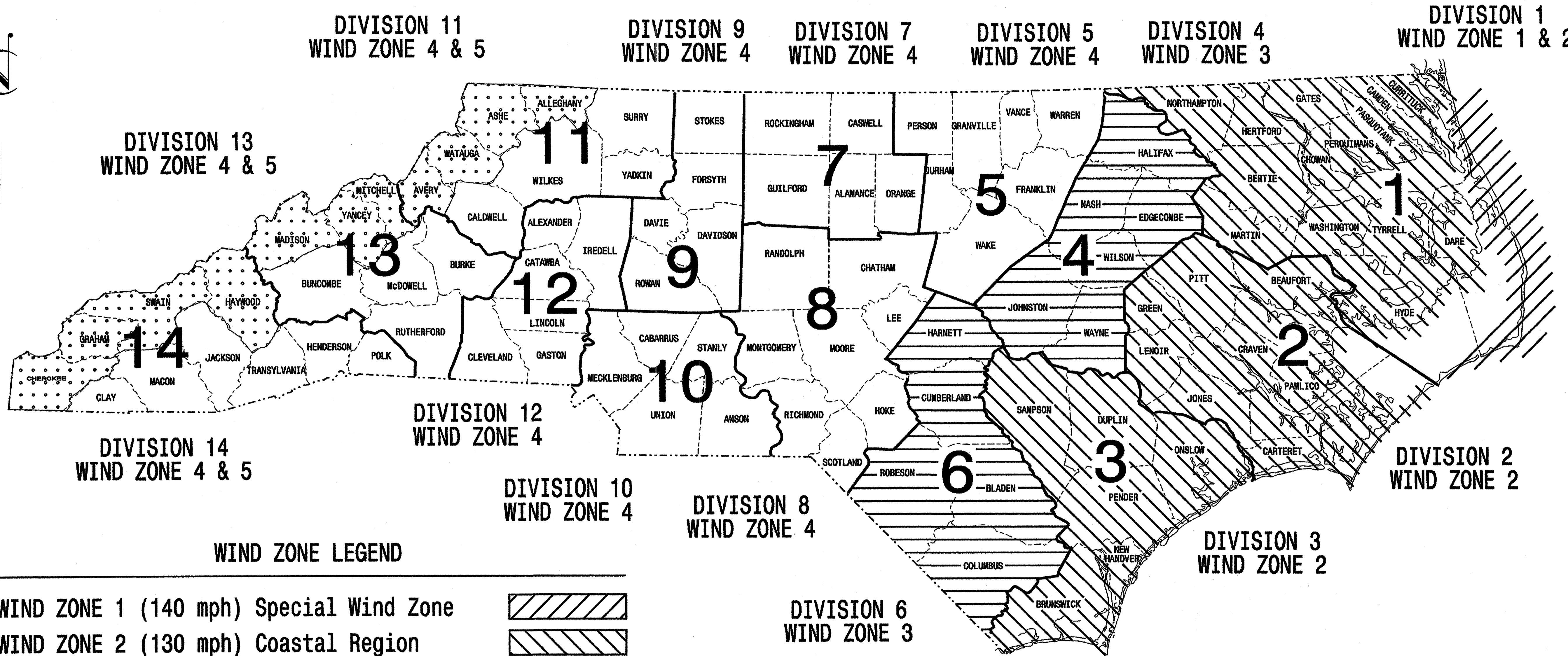
SIG. INVENTORY NO. 05-1020

06-JAN-2010 12:53
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STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

STATE	PROJECT NO.	SHEET NO.
N.C.	U-3804	Sig. 27
F. A. PROJ. NO.	M 1	
PROJECT ID. NO.		

STANDARD DRAWINGS FOR METAL POLES



WIND ZONE LEGEND

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

<http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html>

Prepared In the Offices of:

750 N. Greenfield Pkwy, Garner, NC 27529

Designed in conformance with the 2002 Interim to the 4th Edition 2001

AASHTO

Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

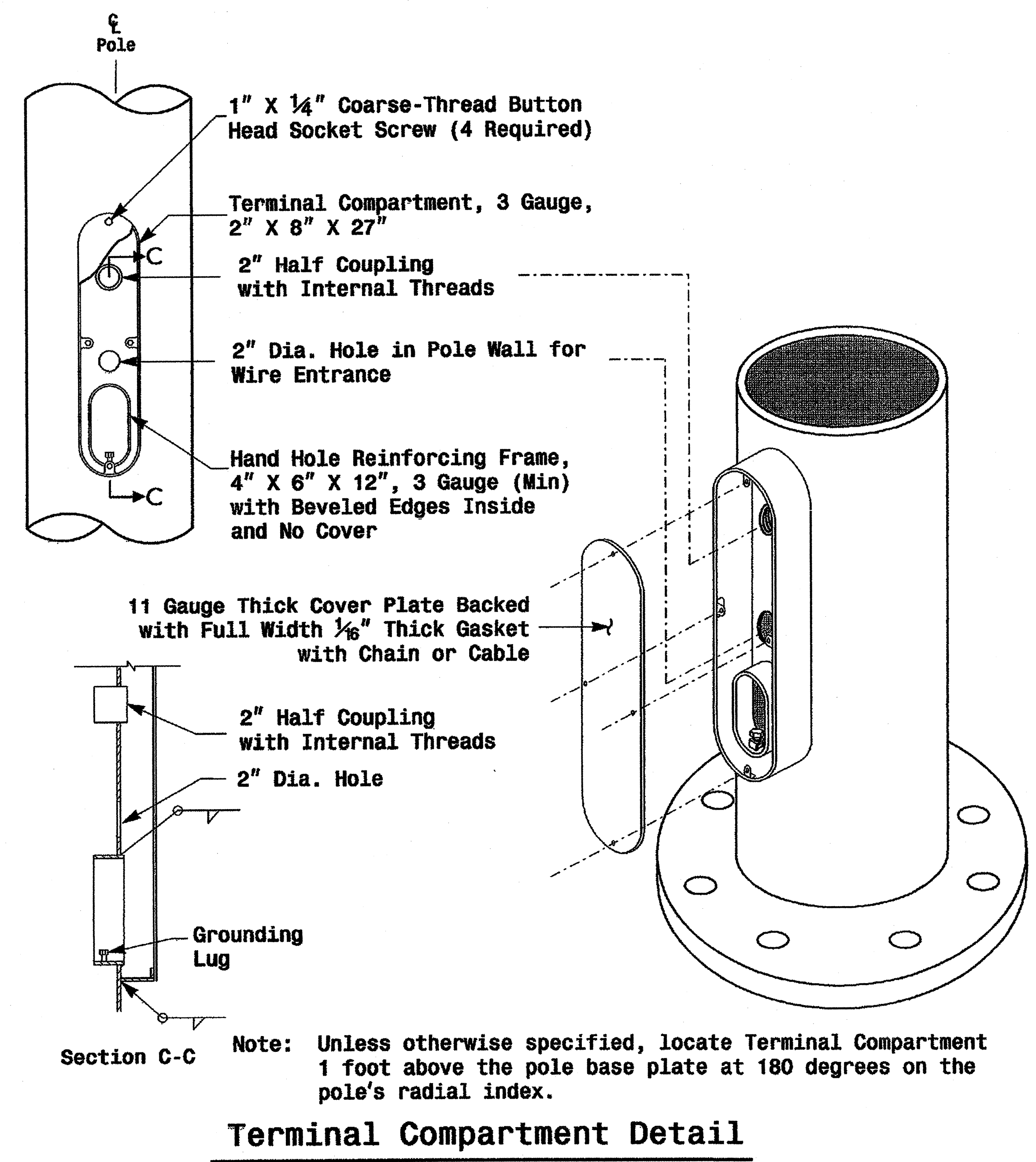
DRAWING NUMBER	DESCRIPTION
M 1	Title Sheet
M 2	Fabrication Details - All Poles
M 3	Fabrication Details - Strain Poles
M 4,5	Fabrication Details - Mast Arm Poles
M 6	Construction Details - Strain Poles
M 7	Construction Details - Foundations
M 8	Standard Strain Poles

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

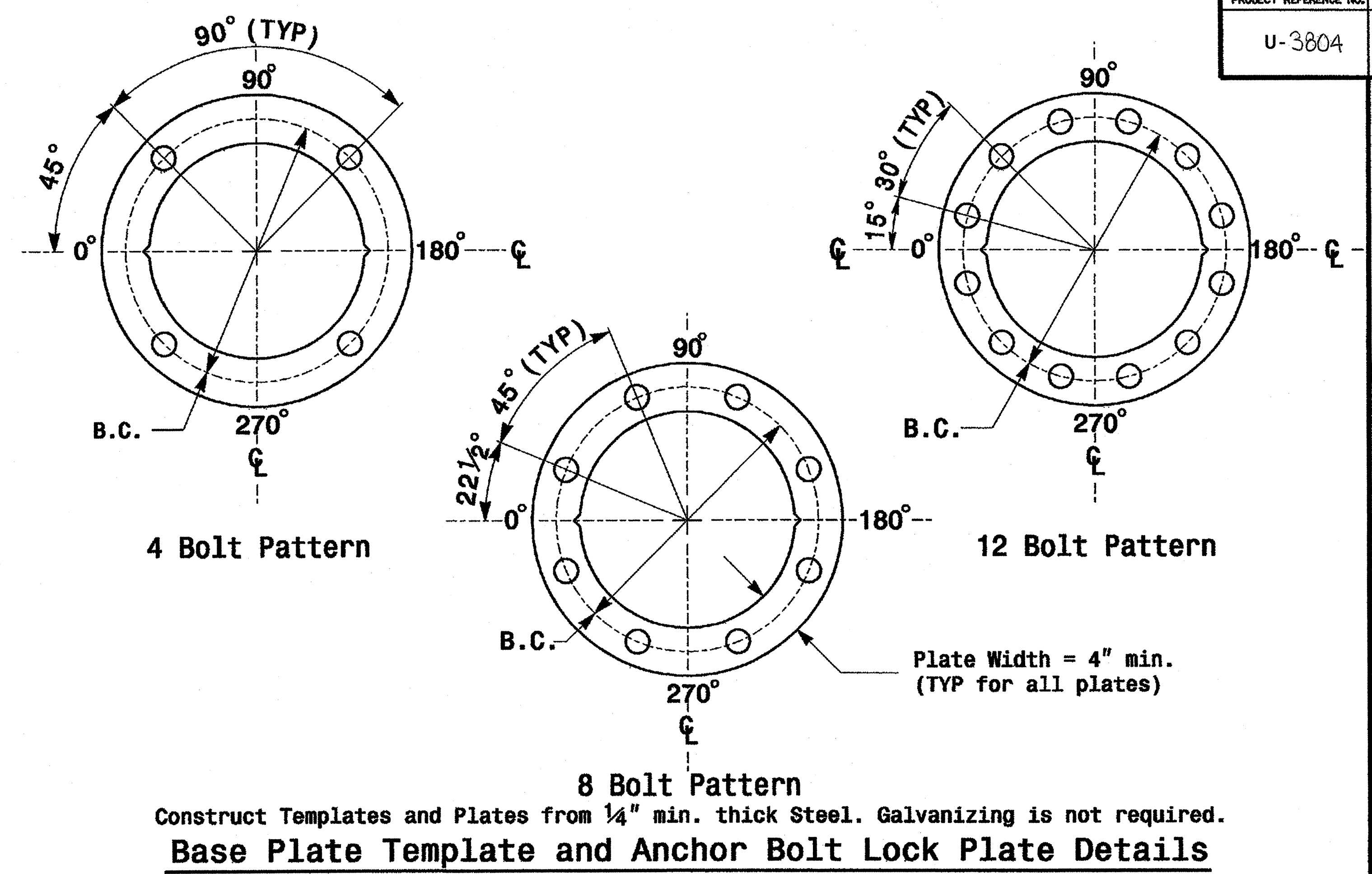
G. A. Fuller, P.E. - State ITS and Signals Engineer
 G. G. Murr, Jr., P.E. - State Signals Engineer
 D. C. Sarkar, P.E. - ITS and Signals Senior Structural Engineer
 C. F. Andrews, Jr. - ITS and Signals Structural Project Engineer
 M. Aslam - ITS and Signals Structural Project Engineer
 N. Bitting, P.E. - ITS and Signals Structural Project Engineer

SEAL

D. Sarkar 7.21.2009
 SIGNATURE DATE



Terminal Compartment Detail



Base Plate Template and Anchor Bolt Lock Plate Details

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

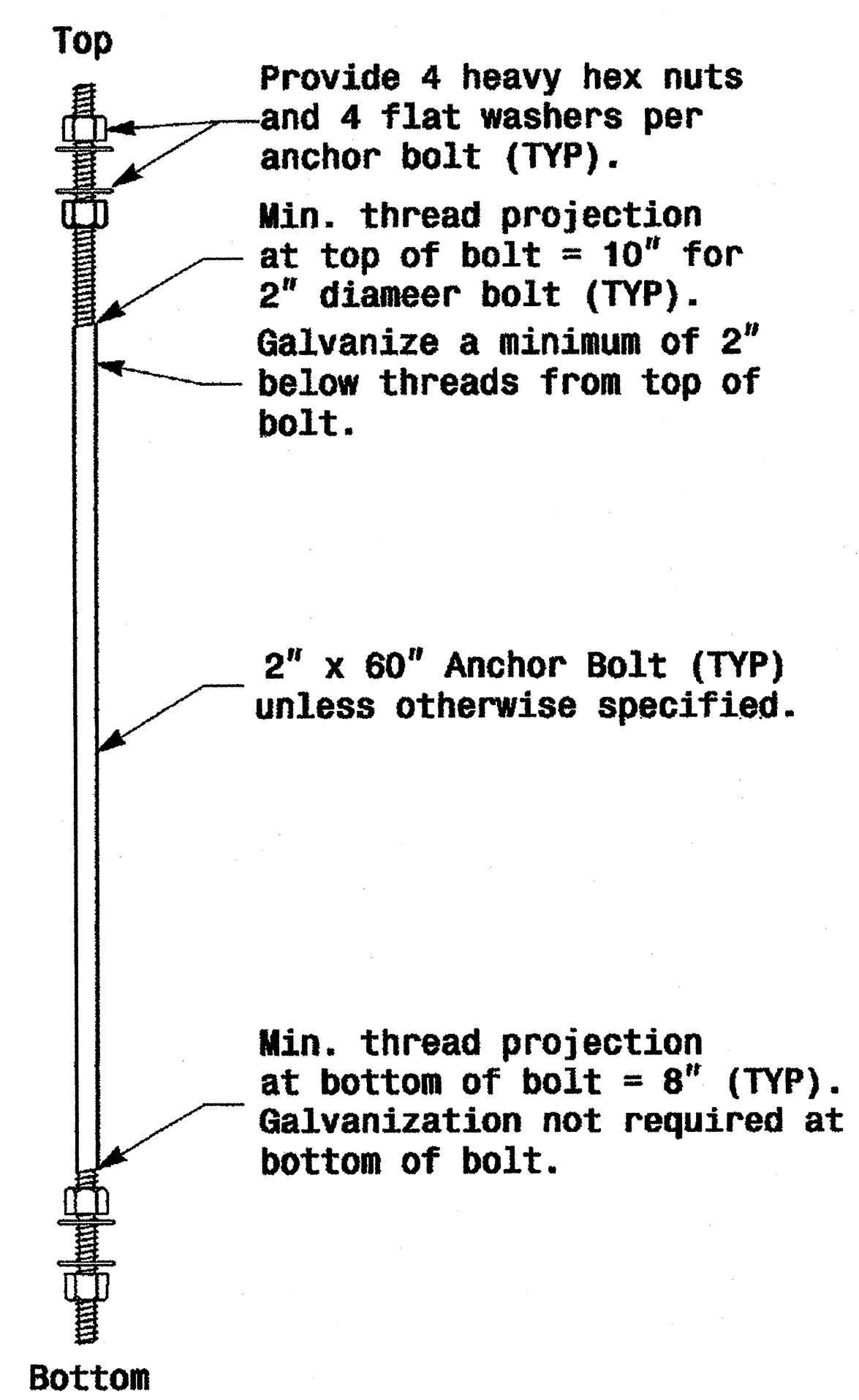
MFG _____ MFG. DATE: MM/YY
 SHAFT D/T/L/Y _____
 ARM-A D/T/L/Y _____
 ARM-B D/T/L/Y _____
 A.B. DIA./B.C./L/Y _____
 NCDOT STANDARD _____

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

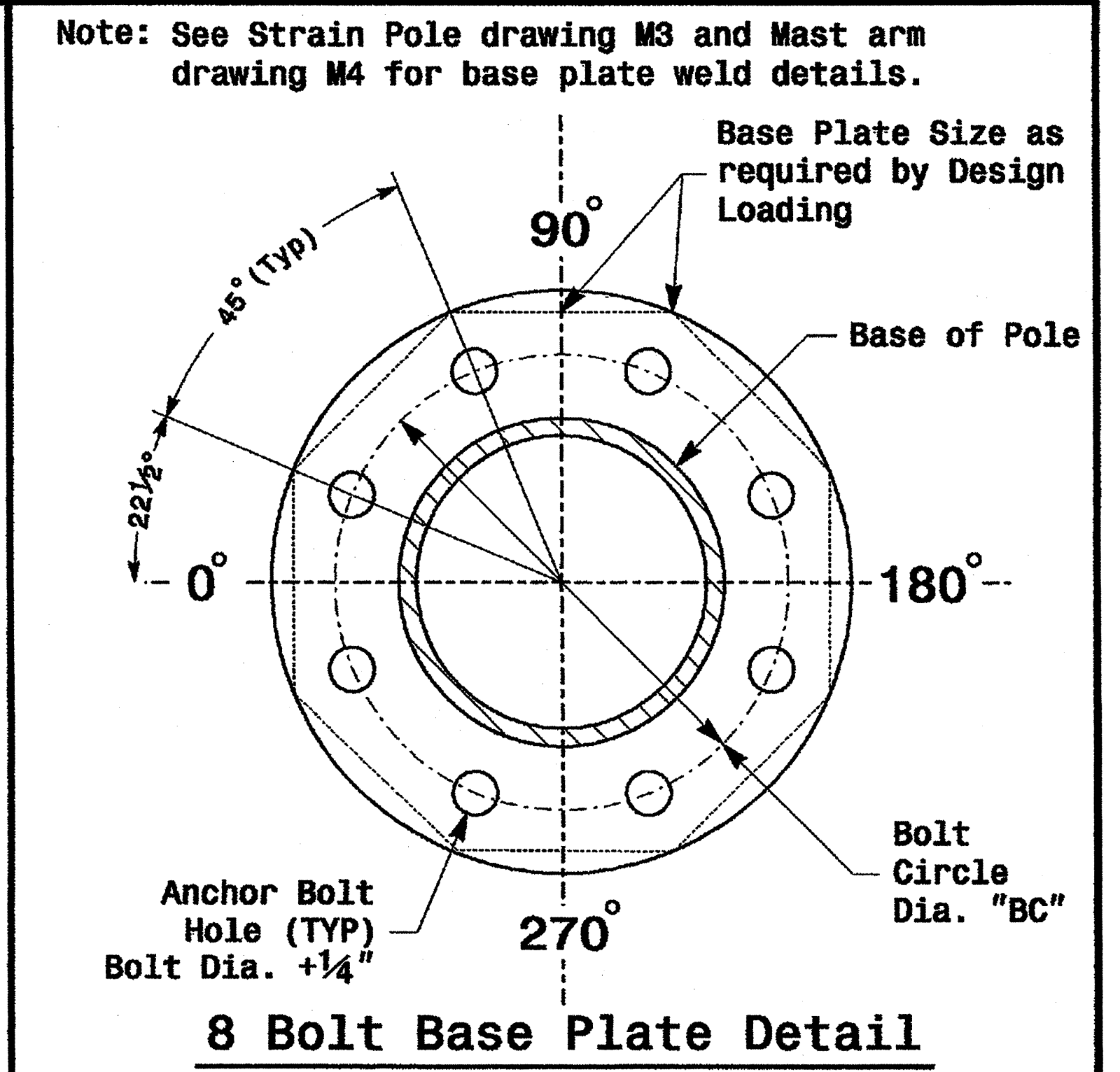
MFG _____ MFG. DATE: MM/YY
 SECTION D/T/L/Y _____
 NCDOT STANDARD _____

- 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 plan pole I.D.
 - 5) See drawing M4 for mounting positions of I.D. tags.

Identification Tag Details



Anchor Bolt Detail



8 Bolt Base Plate Detail

Prepared in the Office of:

Typical Fabrication Details Common To All Metal Poles

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

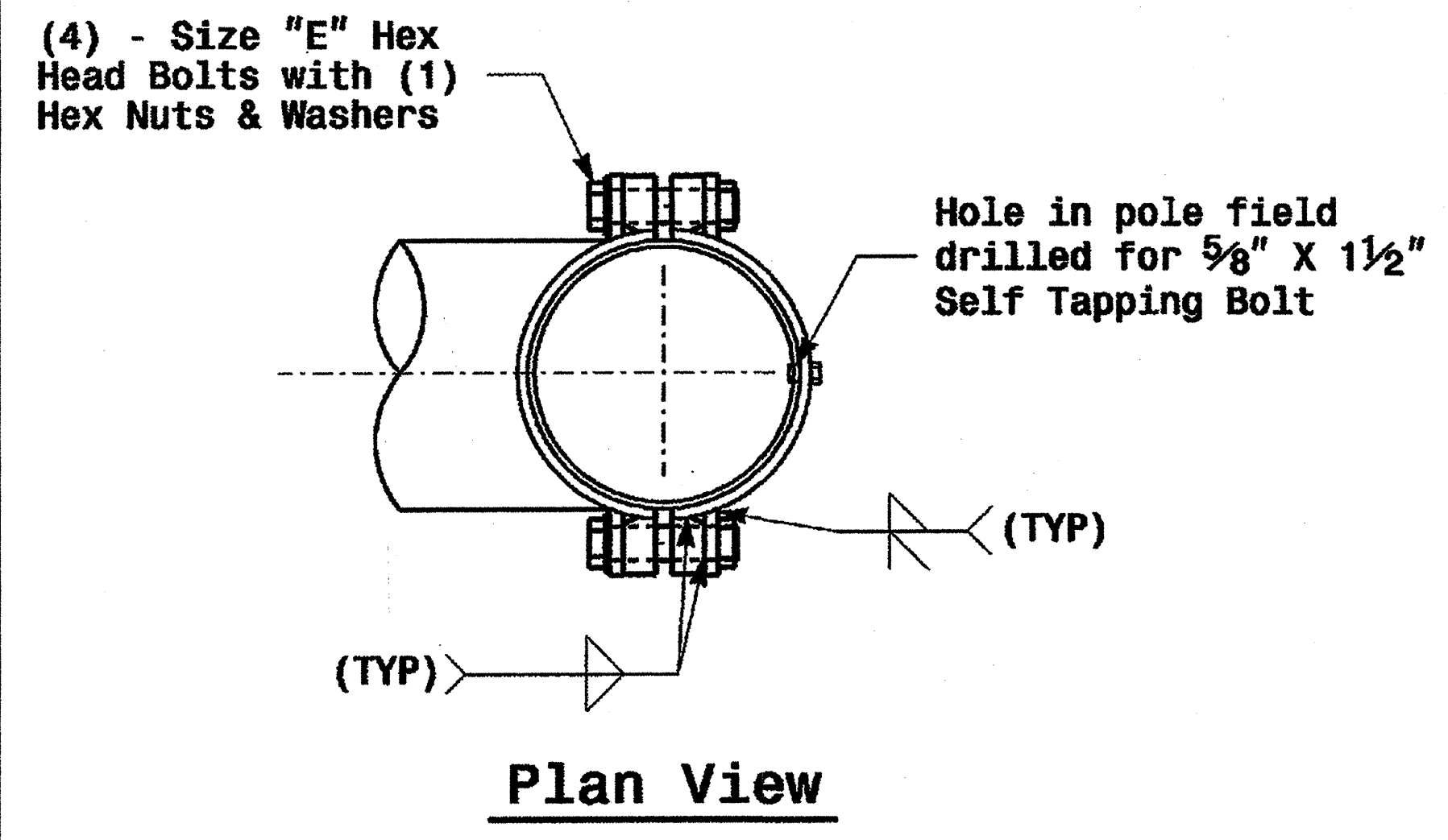
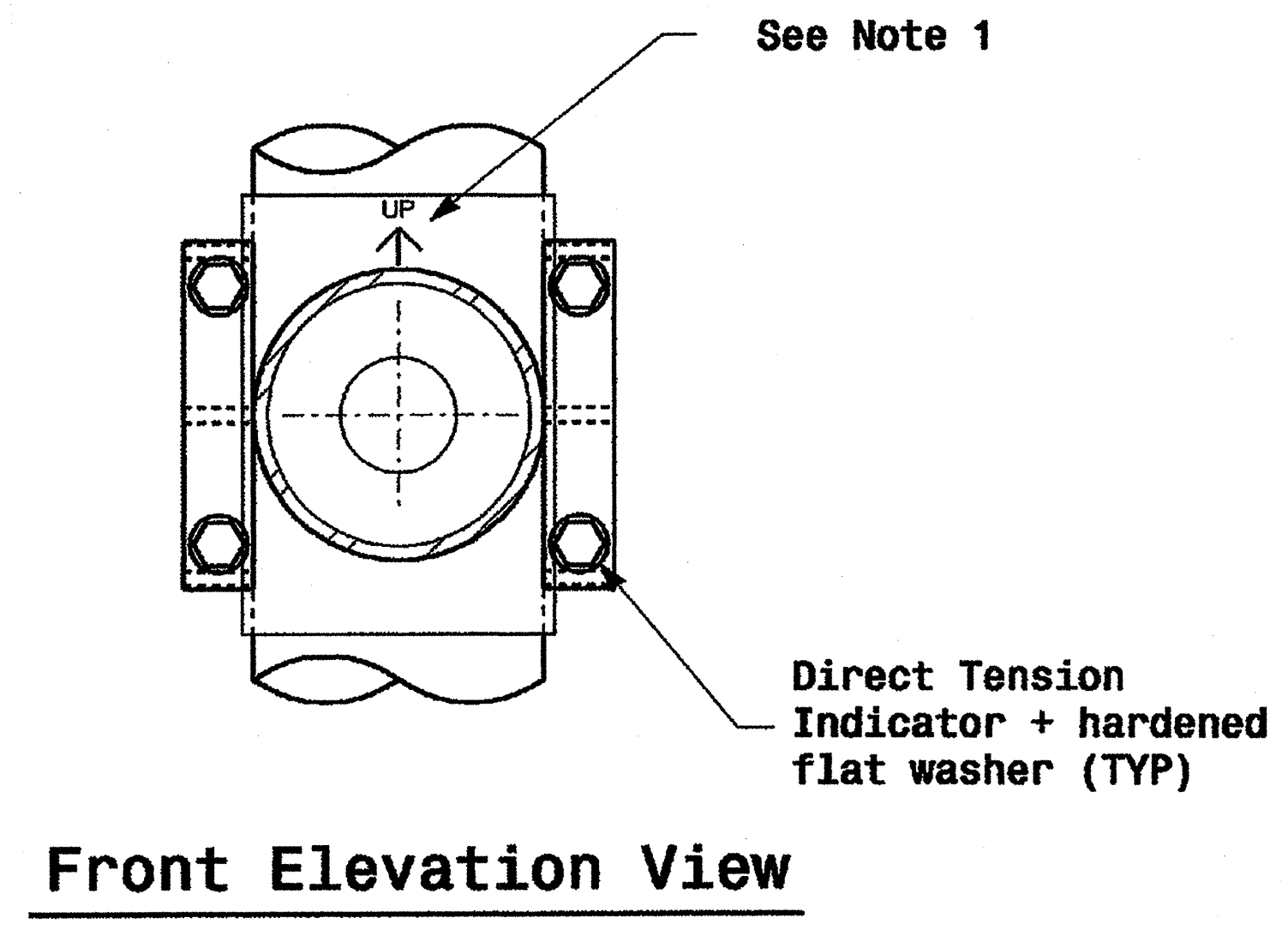
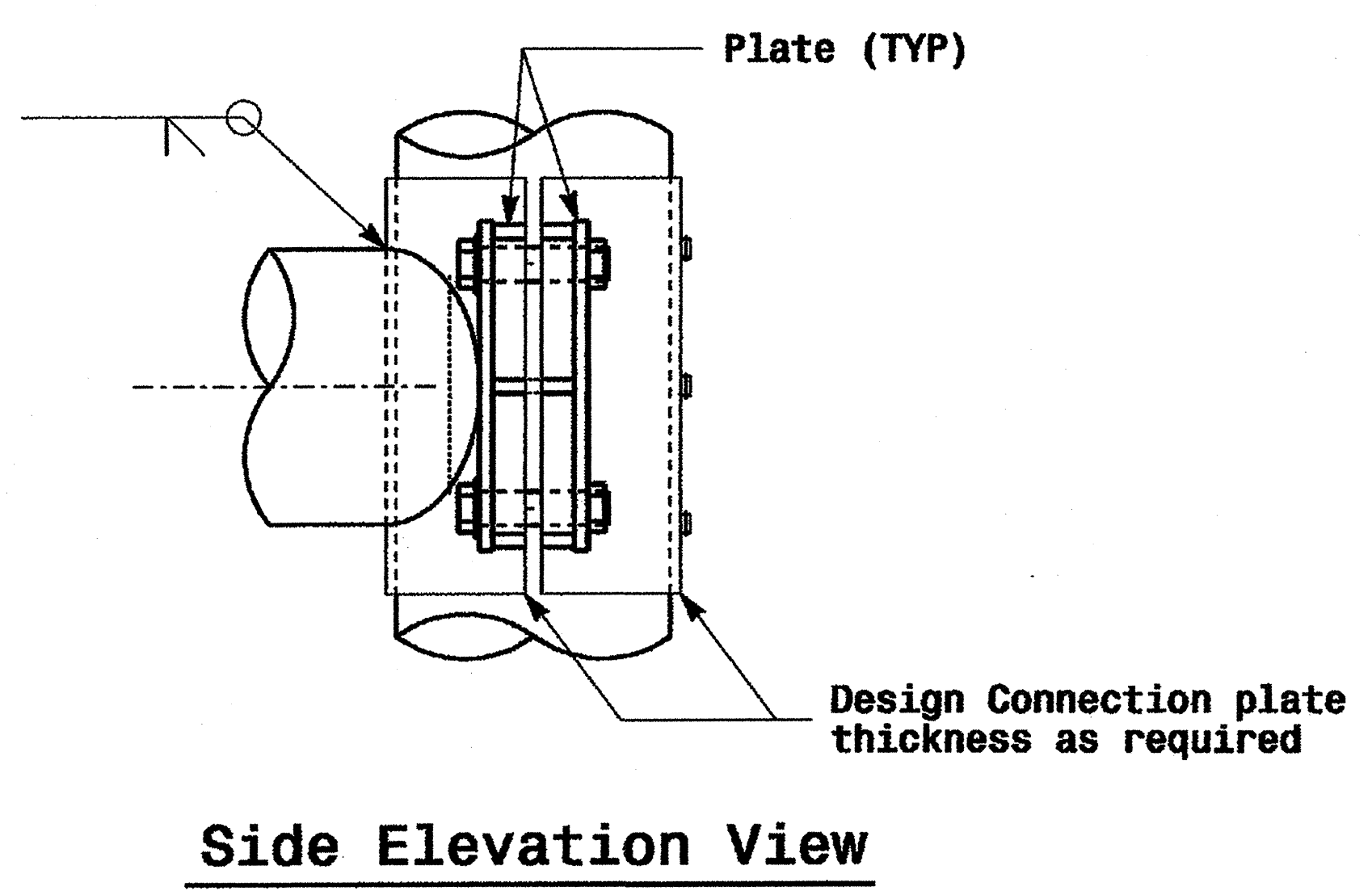
Signature: *J. Sarkar* 9.2.2005

SIG. INVENTORY NO.

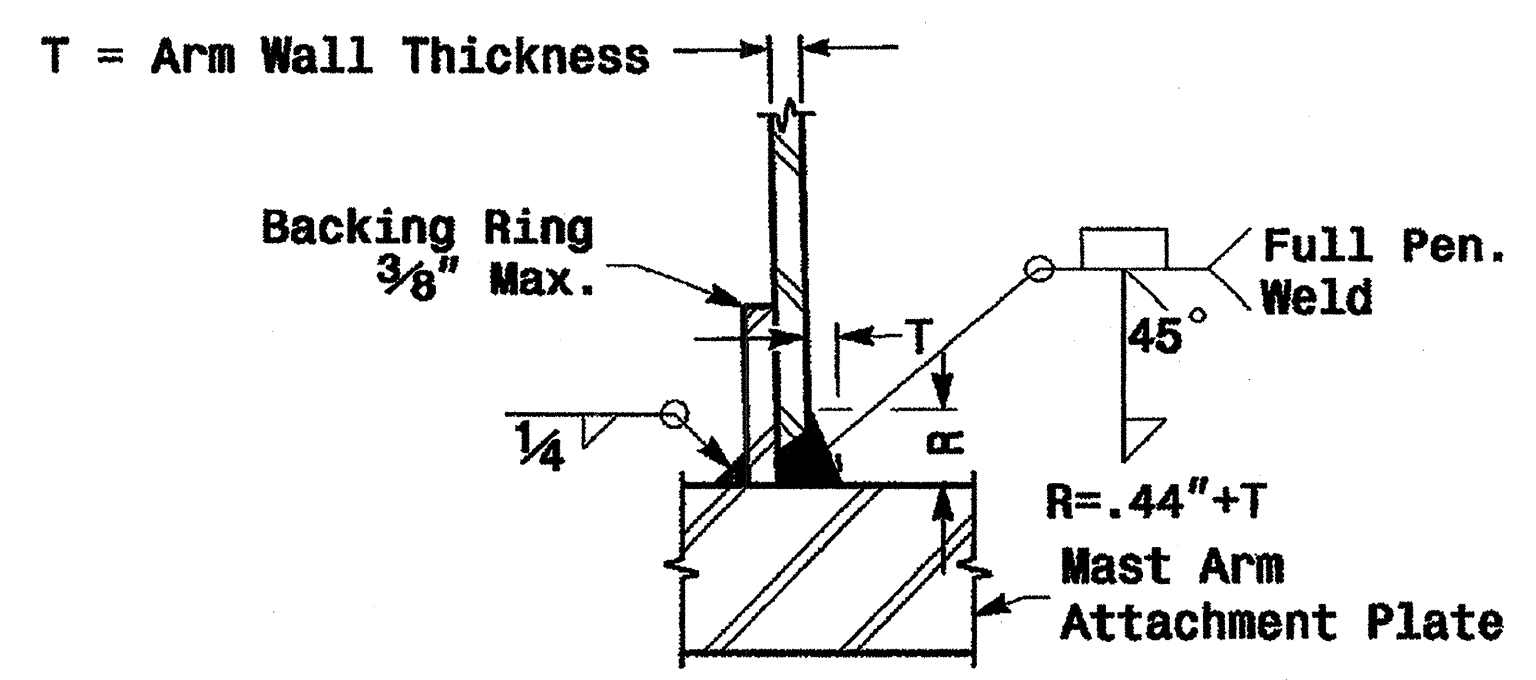
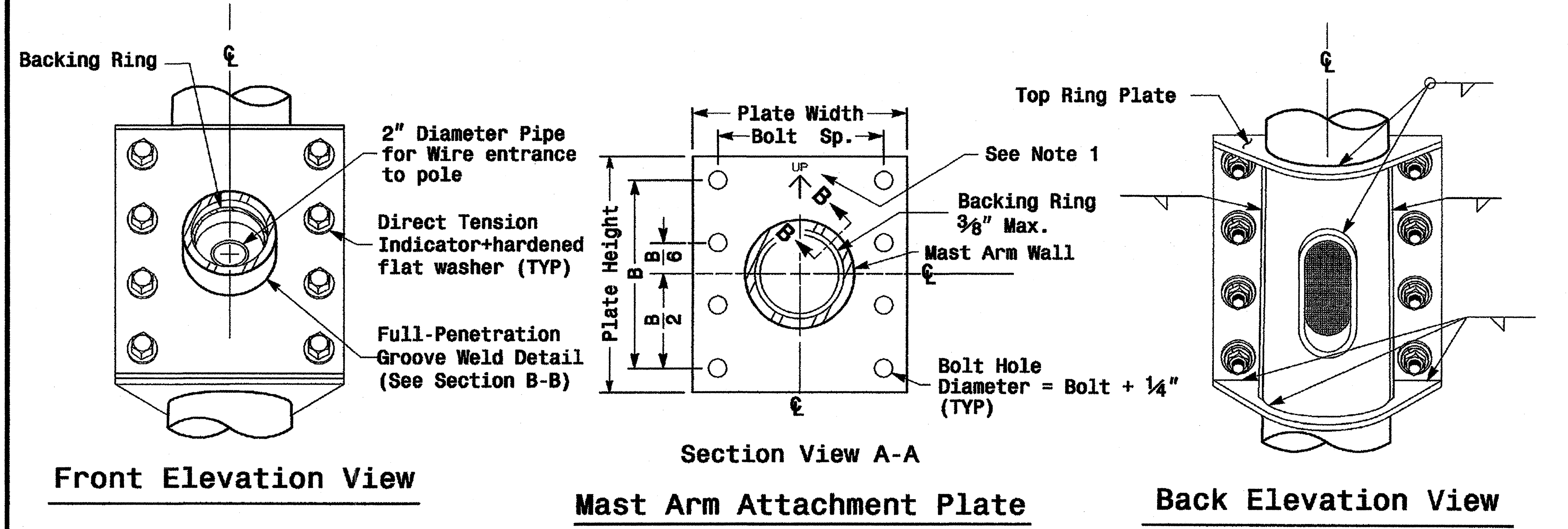
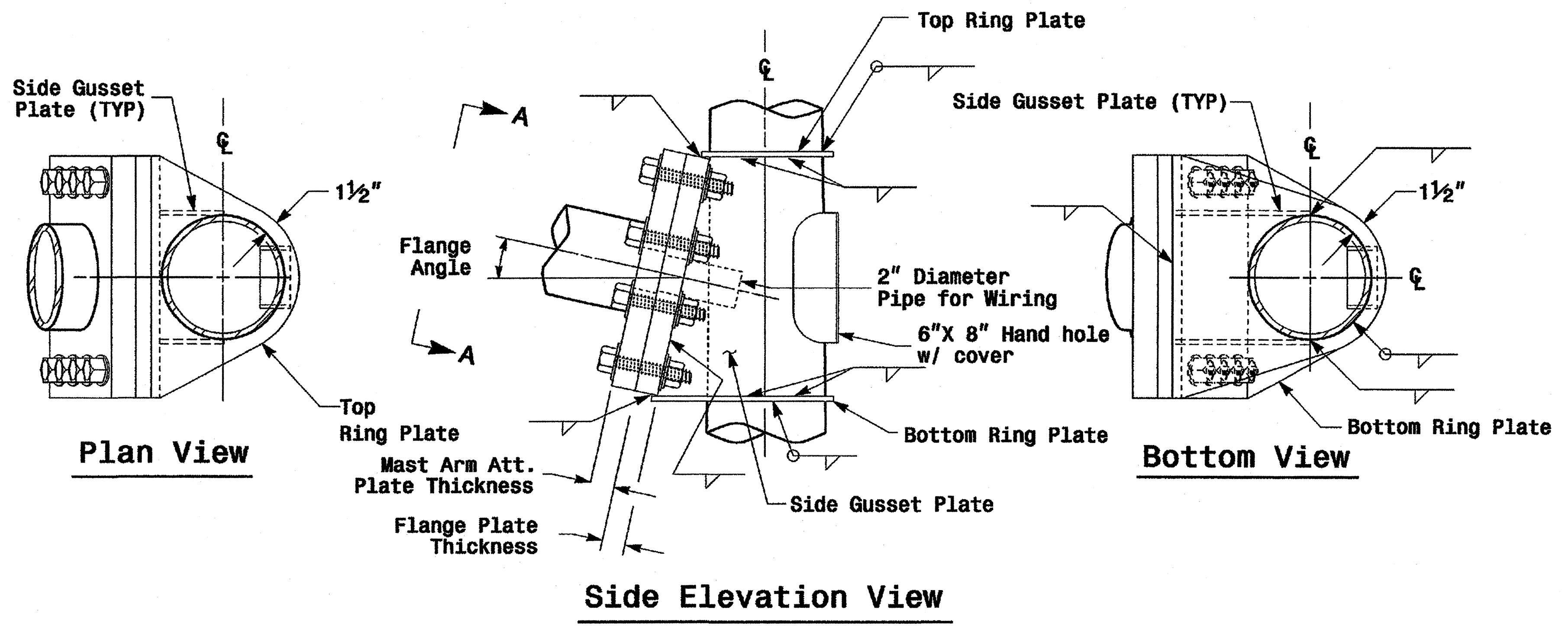
Fabrication Details - All Poles

01-555-2105 18-22
01-555-2105 18-22
01-555-2105 18-22

Adjustable Clamp Type Bolted Mast Arm Connection



Welded Ring Stiffened Mast Arm Connection



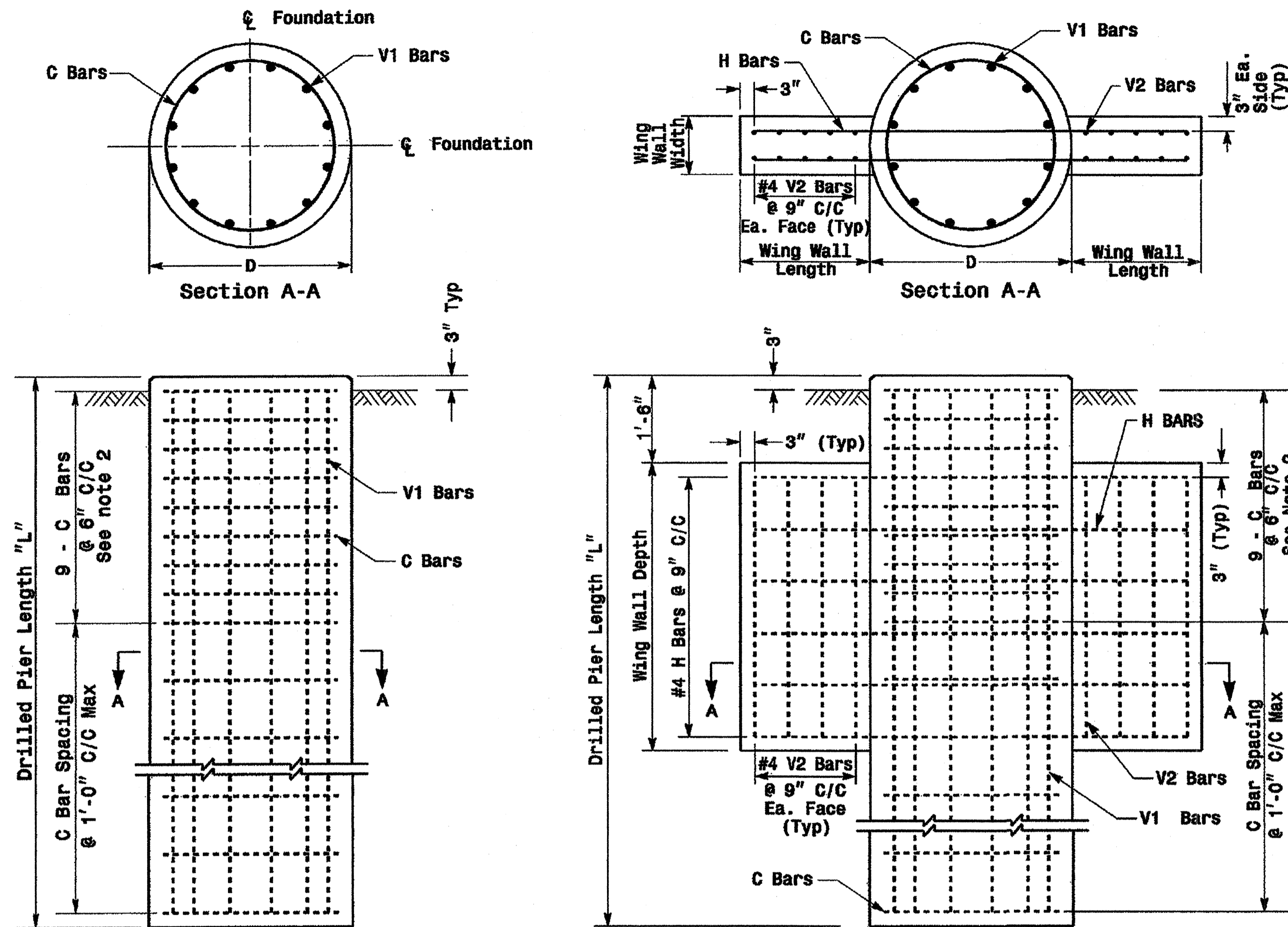
- Notes:
1. Provide a permanent means of identification above the mast arm to indicate proper attachment orientation of the mast arm.
 2. Designer will determine the size of all structural components, plates, fasteners, and welds shown unless they are already specified.
 3. Designer is responsible for providing appropriate drainage points.

Fabrication Details - Mast Arm Poles

01-SEP-2005 14:11 P:\Projects\2005\05-01\mca\mca.dwg

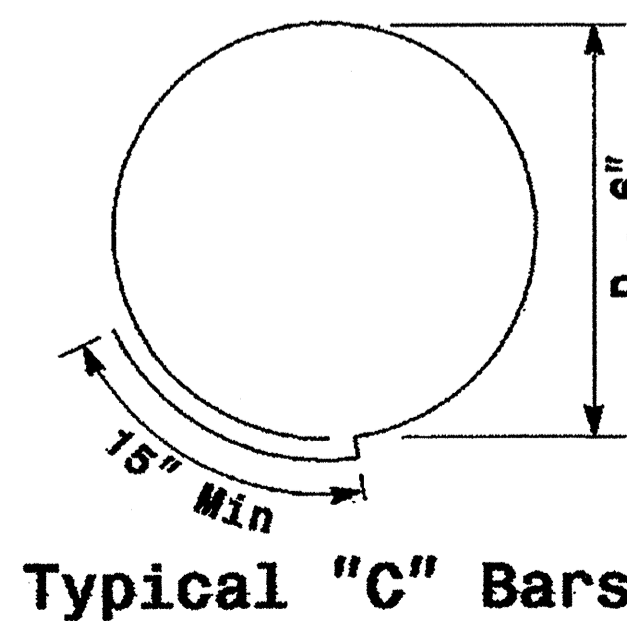
	Fabrication Details For Mast Arm Connection To Pole	
	PLAN DATE: May 2005	REVIEWED BY: C.F. Andrews
PREPARED BY: P.L. Alexander	REVIEWED BY: A.M. Esposito	SCALE: 0 NA NONE
REVISIONS	INIT.	DATE
DATE: 9.2.2005	SIGNATURE: <i>D. Sarkar</i>	SIG. INVENTORY NO.

Reinforcing Steel Bars



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

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



Typical "C" Bars

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

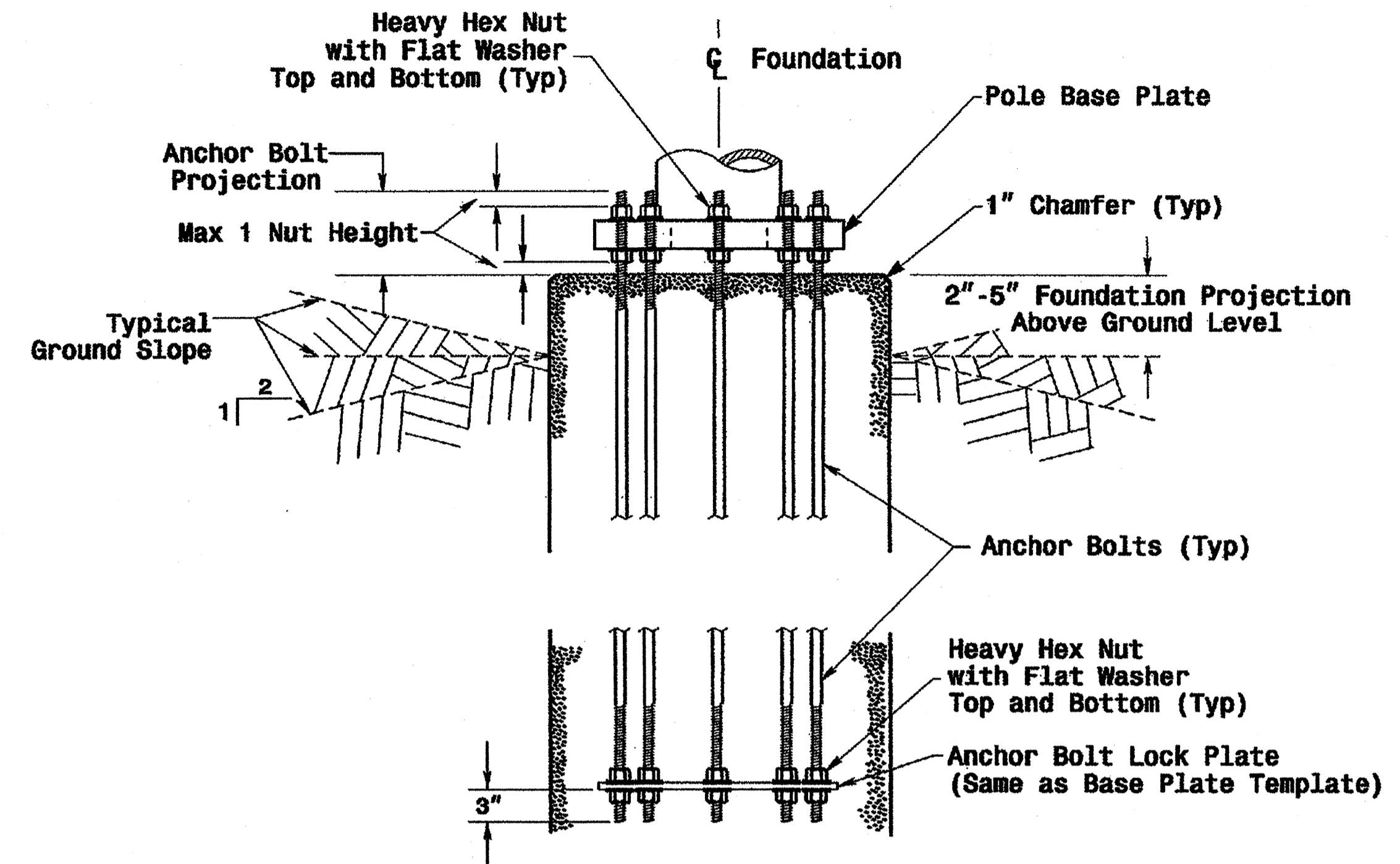
* See Note No. 1
** See Note No. 3

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

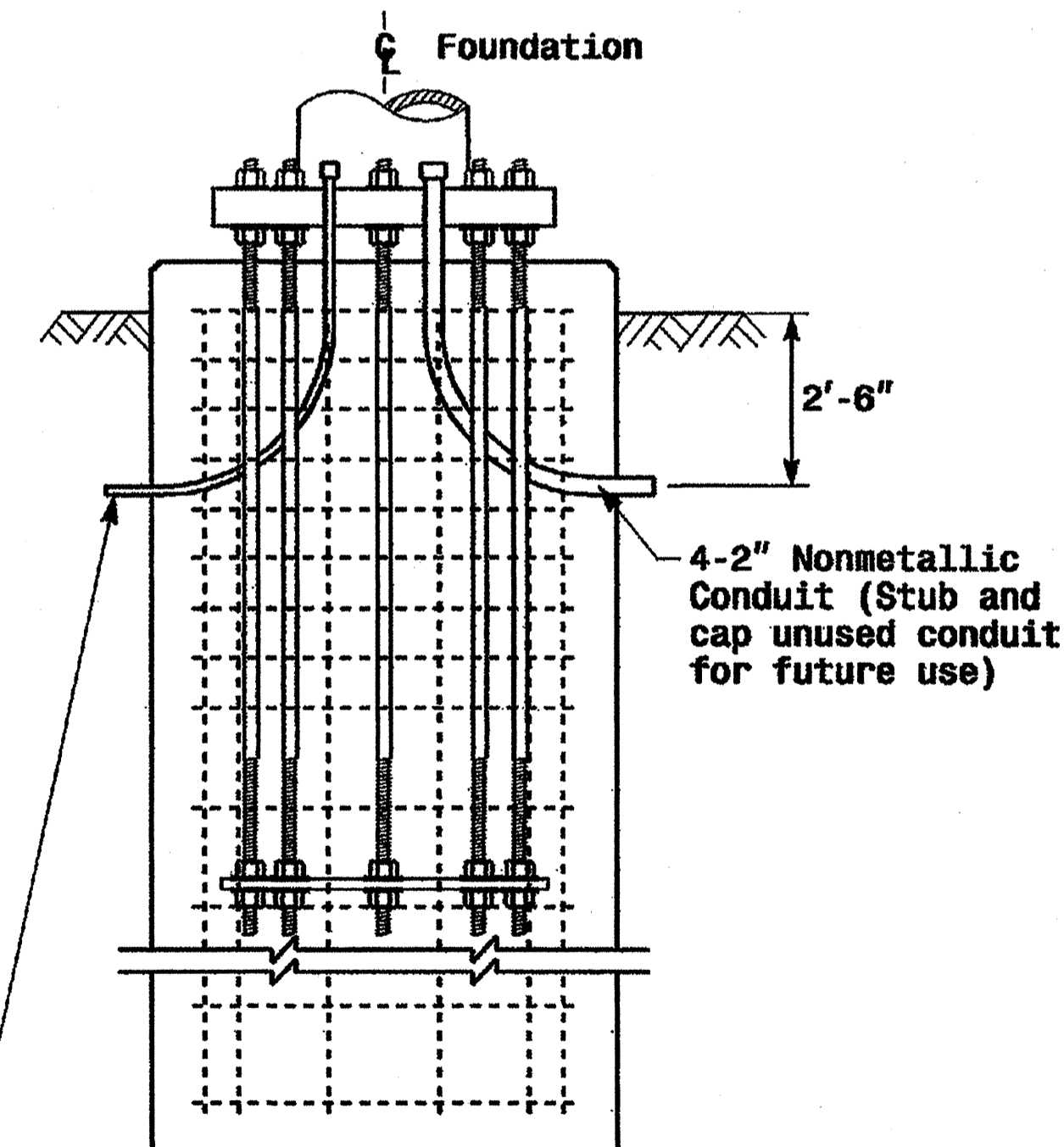
See Note No. 4

Typical Foundation Anchor Bolt Details

(Reinforcing Cage Not Shown for Clarity)



Typical Foundation Conduit Details



Notes

- The number of C-bars is based on foundation depth. For standard foundations, see sheet M 8.
- Circular tie reinforcing rings may be vertically adjusted by +/- 3" at a depth between 2'-0" and 3'-0" to facilitate the installation of electrical conduit entering in the cage.
- The length of V1-bars is based on foundation depth. For standard foundations, see sheet M 8.
- The quantities for steel and concrete shown in the Wing Wall Details Chart reflect the amount of material for 1 pair of wing walls (2 wing walls per drilled pier shaft.)

	Construction Details Foundations		
	PLAN DATE: May 2005 PREPARED BY: C.F. ANDREWS SCALE: 0 NA NONE	REVIEWED BY: P.L. ALEXANDER REVIEWED BY: A.M. ESPOSITO	

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

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS

SHEET 1 OF 3
1725D01

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

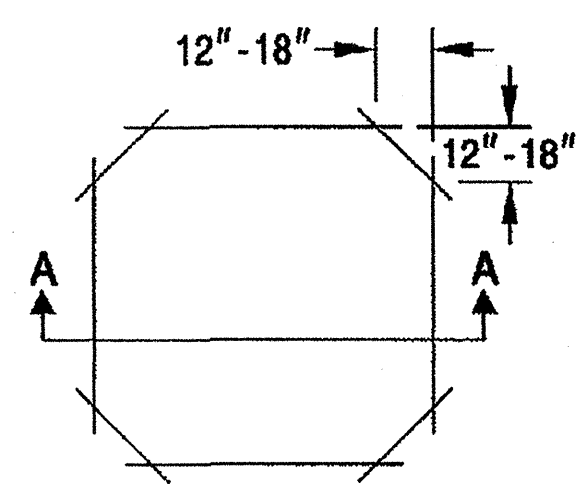
ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS

SHEET 1 OF 3
1725D01

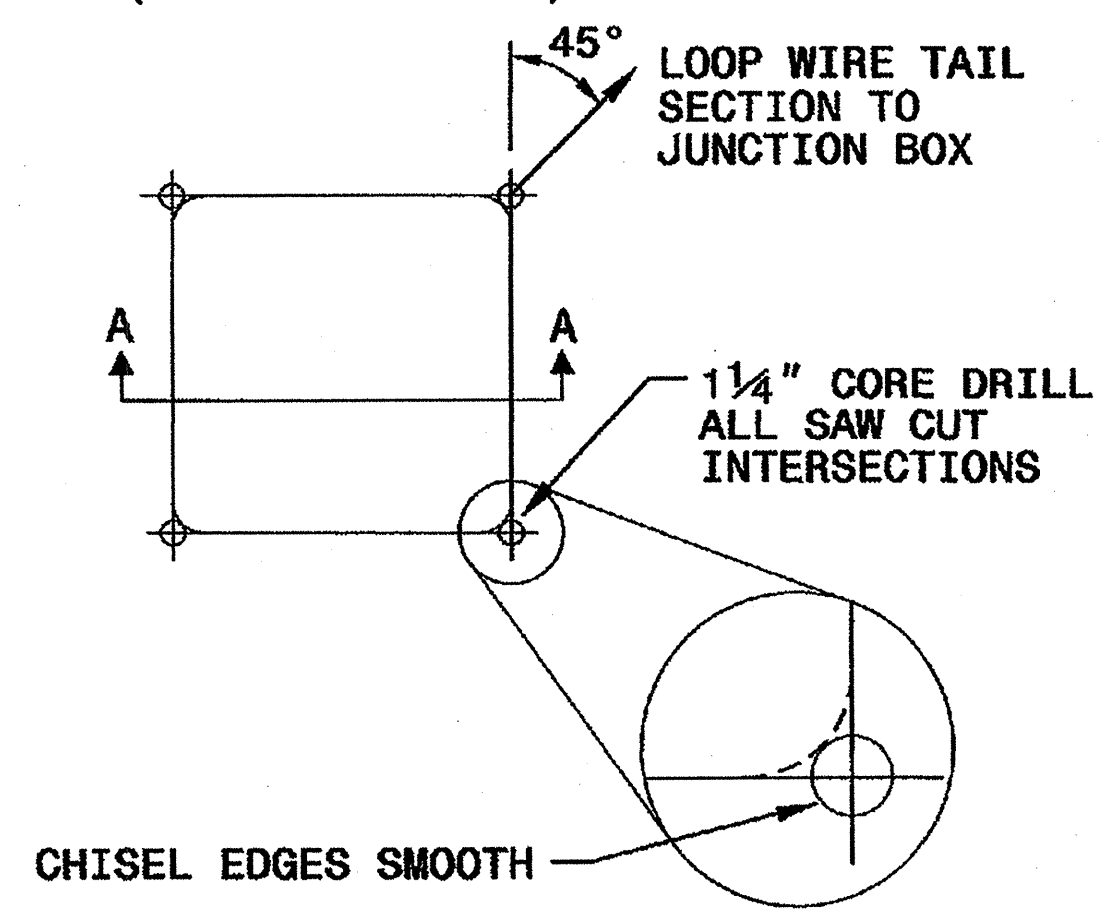
CONVENTIONAL 4-SIDED LOOP

SAW CUT OPTIONS

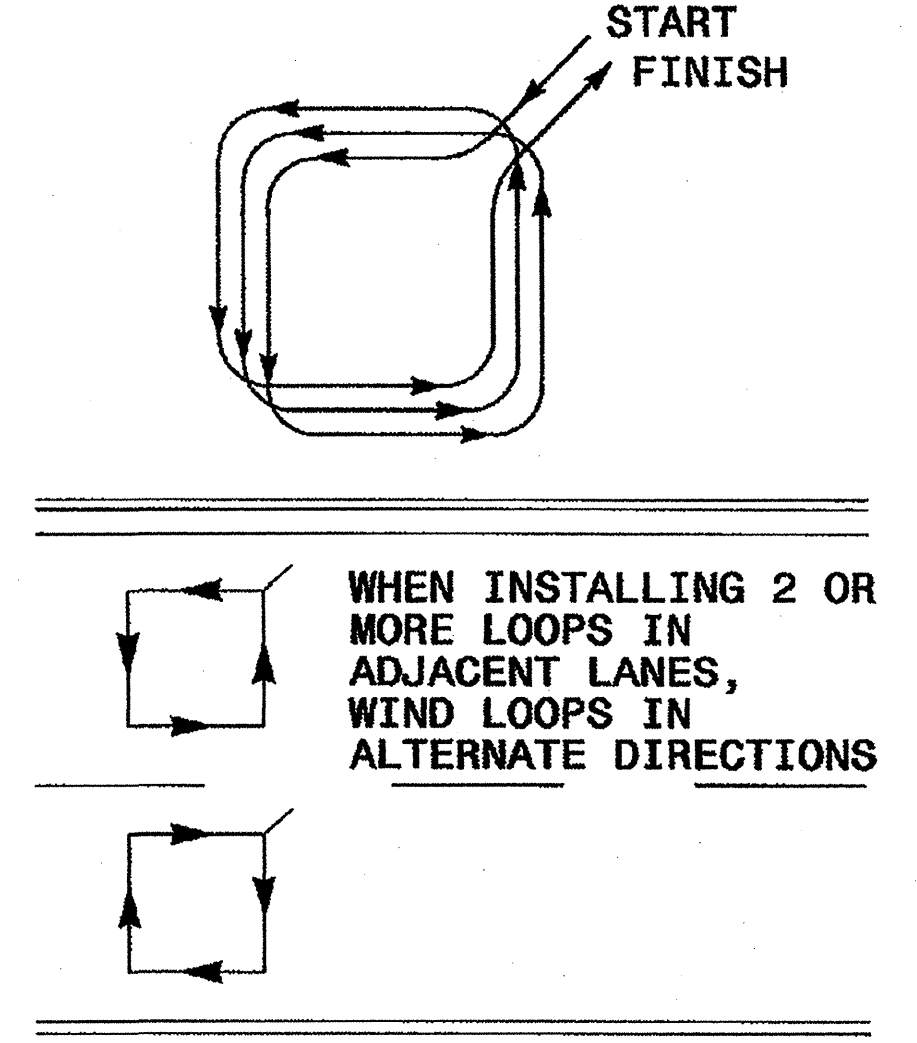
OPTION 1



OPTION 2 (POOR PAVEMENT)

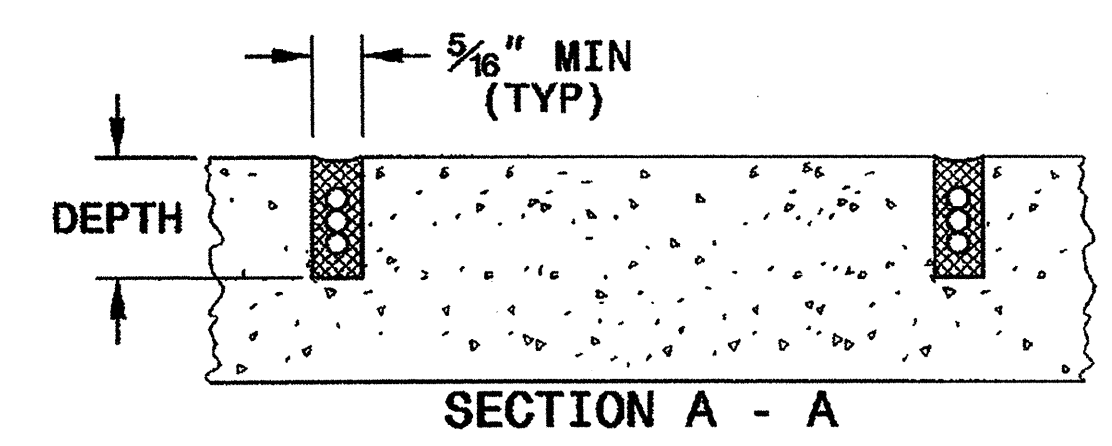


LOOP WINDING METHOD

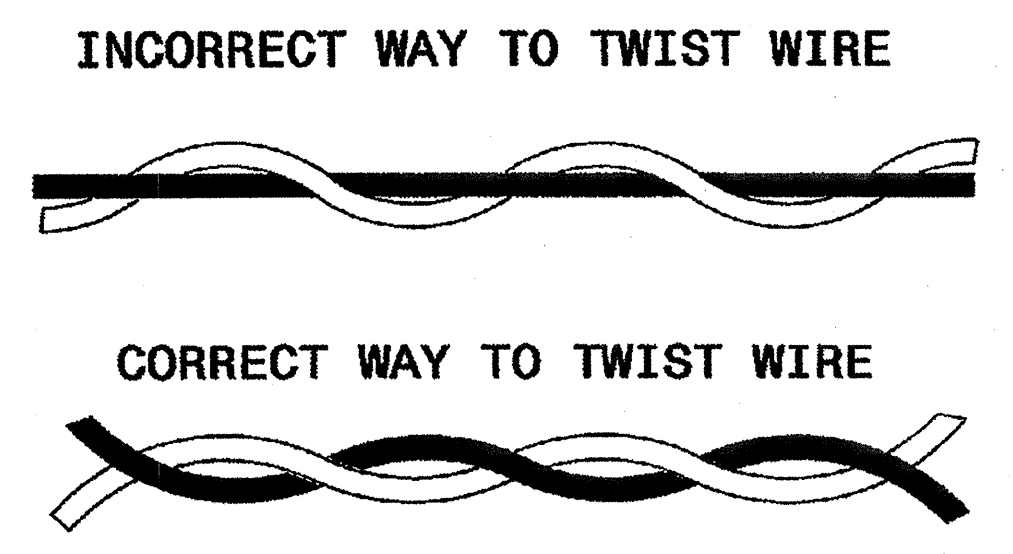


SAW SLOT DEPTH CHART

DEPTH (IN)	NO. OF WIRE TURNS				
	2	3	4	5	6
CONCRETE	2.0	2.0	2.5	2.5	3.0
ASPHALT	2.0	2.5	3.0	3.0	3.0



LOOP WIRE TWISTING METHOD



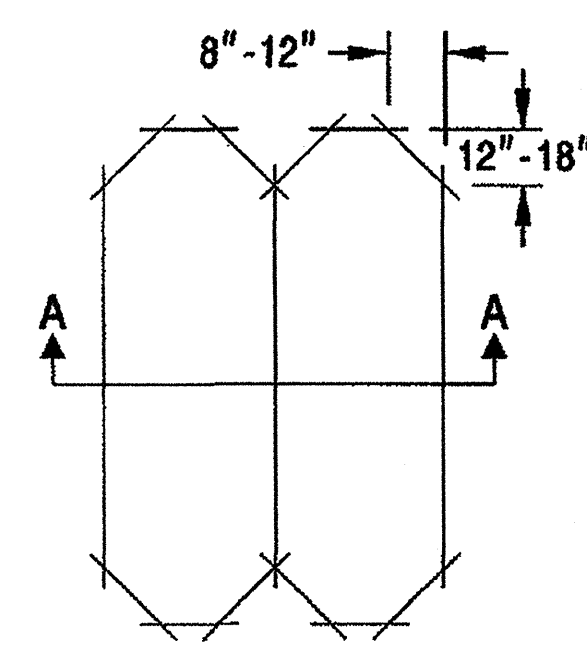
NOTES

1. OVERLAP SAW CUTS AT CORNERS AND INTERSECTION POINTS TO ENSURE UNIFORM SAW SLOT DEPTH.
2. MAINTAIN 12" SPACING BETWEEN LOOP WIRE TAIL SECTIONS.
3. WIRE LOOPS CONNECTED TO THE SAME DETECTOR CHANNEL IN SERIES.
4. LOCATE LOOPS IN CENTER OF LANES UNLESS OTHERWISE SHOWN ON PLANS OR APPROVED BY ENGINEER.

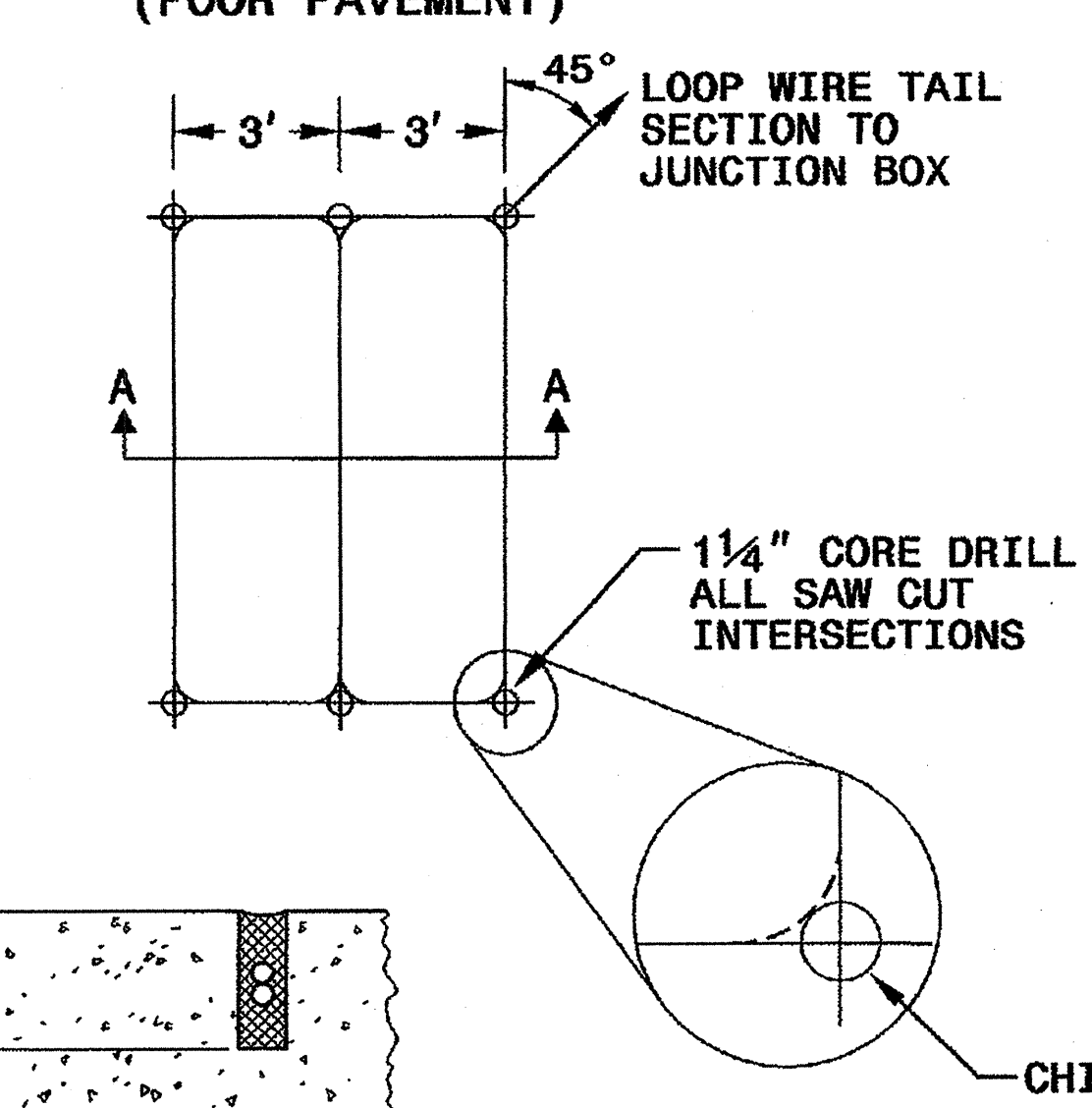
QUADRUPOLE LOOP

SAW CUT OPTIONS

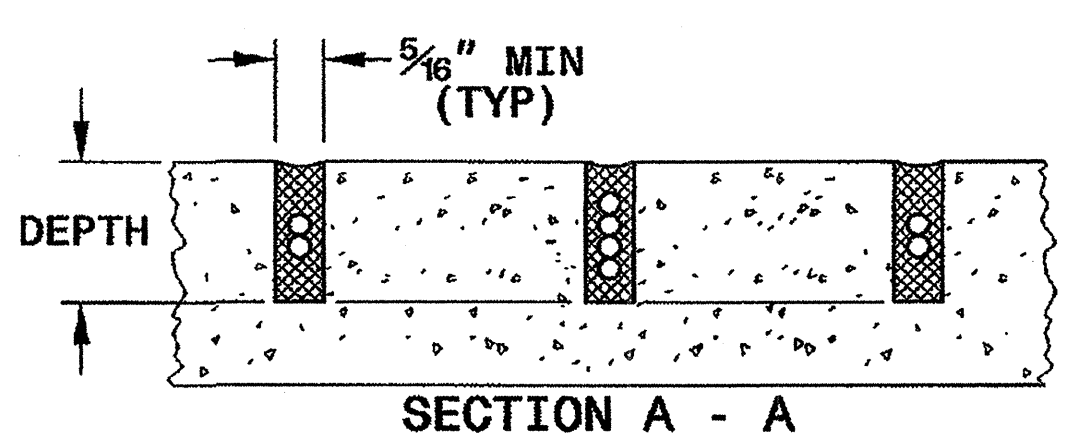
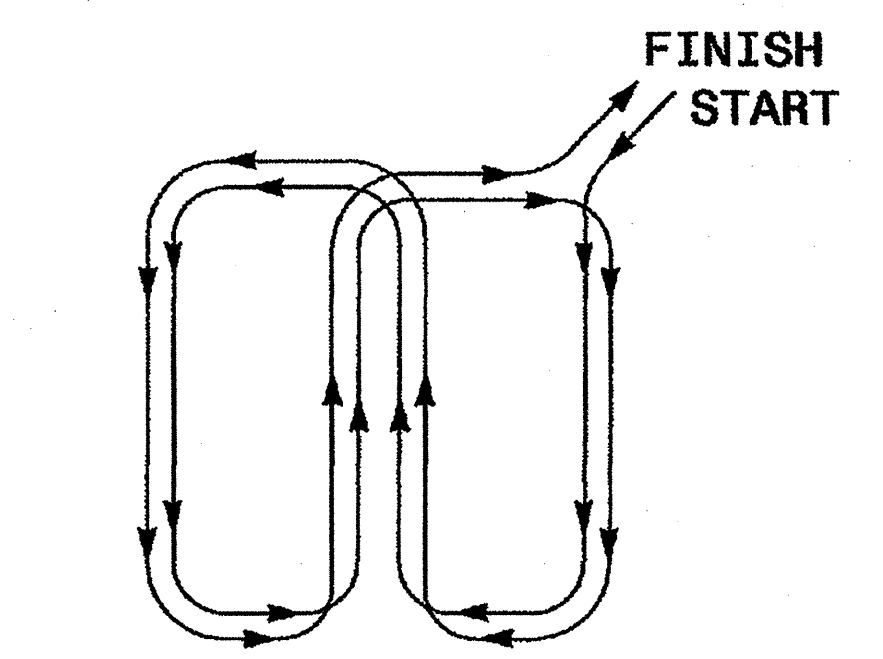
OPTION 1



OPTION 2 (POOR PAVEMENT)



LOOP WINDING METHOD



DEPTH IS 2.5" FOR CONCRETE AND 3.0" FOR ASPHALT

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See Plate for Title

Prepared in the Offices of:

750 N. Greenfield Parkway
Garner, NC 27529

SEAL

Milton Dean 11/24/08
SIGNATURE DATE

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

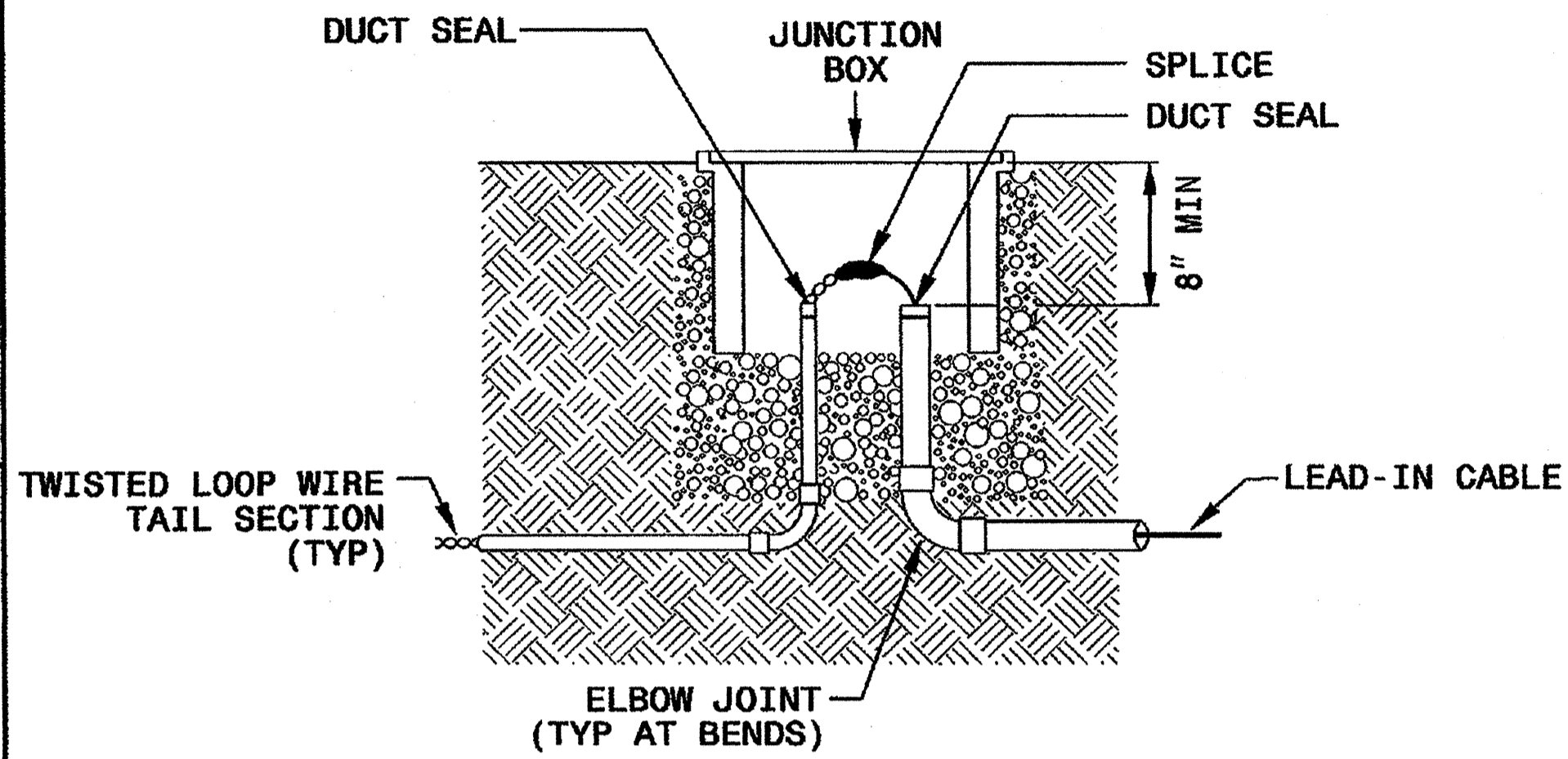
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ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

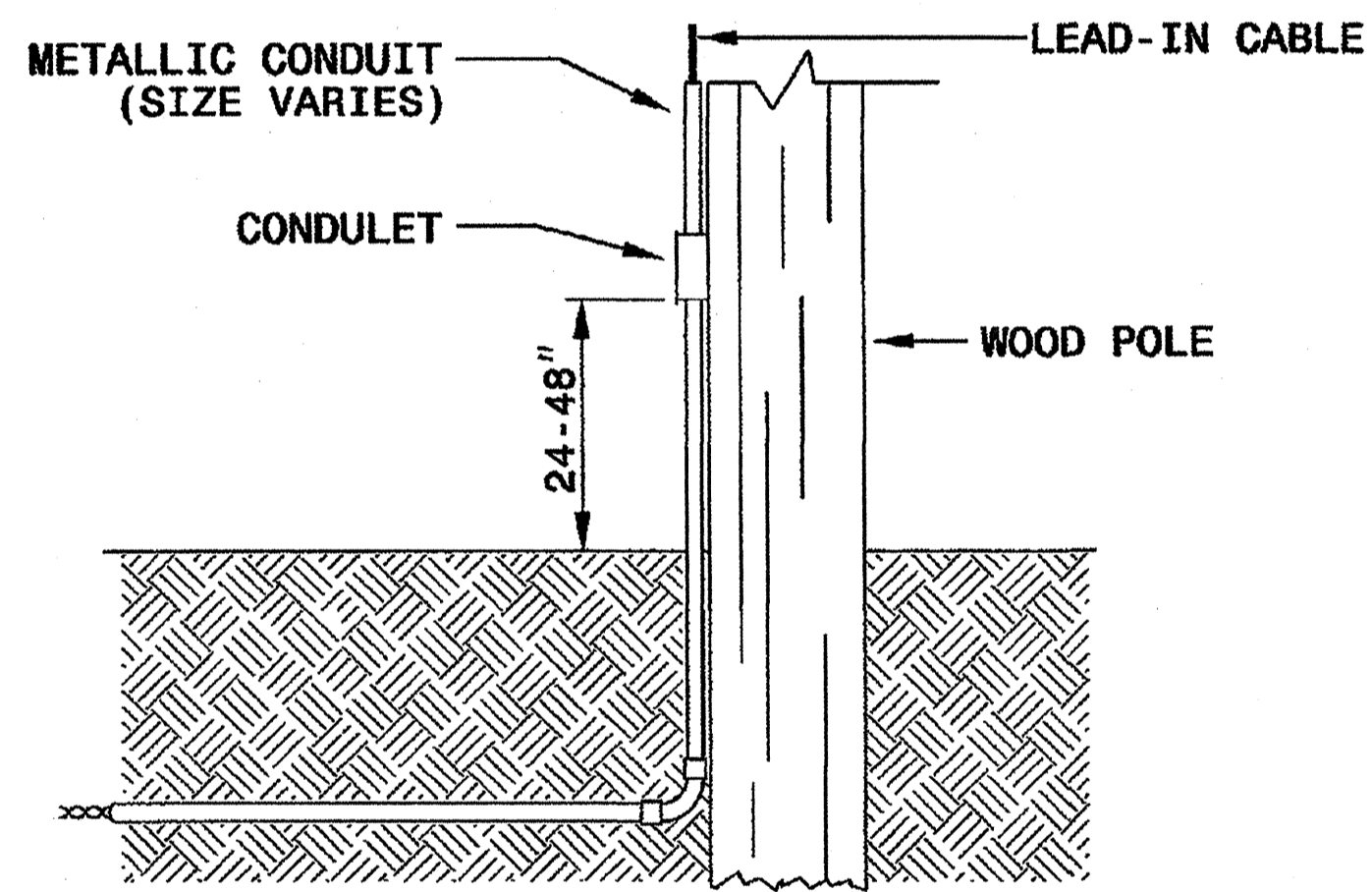
SHEET 2 OF 3
1725D01

LOOP WIRE SPLICE POINT DETAILS

LOOP WIRE AT JUNCTION BOX



LOOP WIRE AT POLE

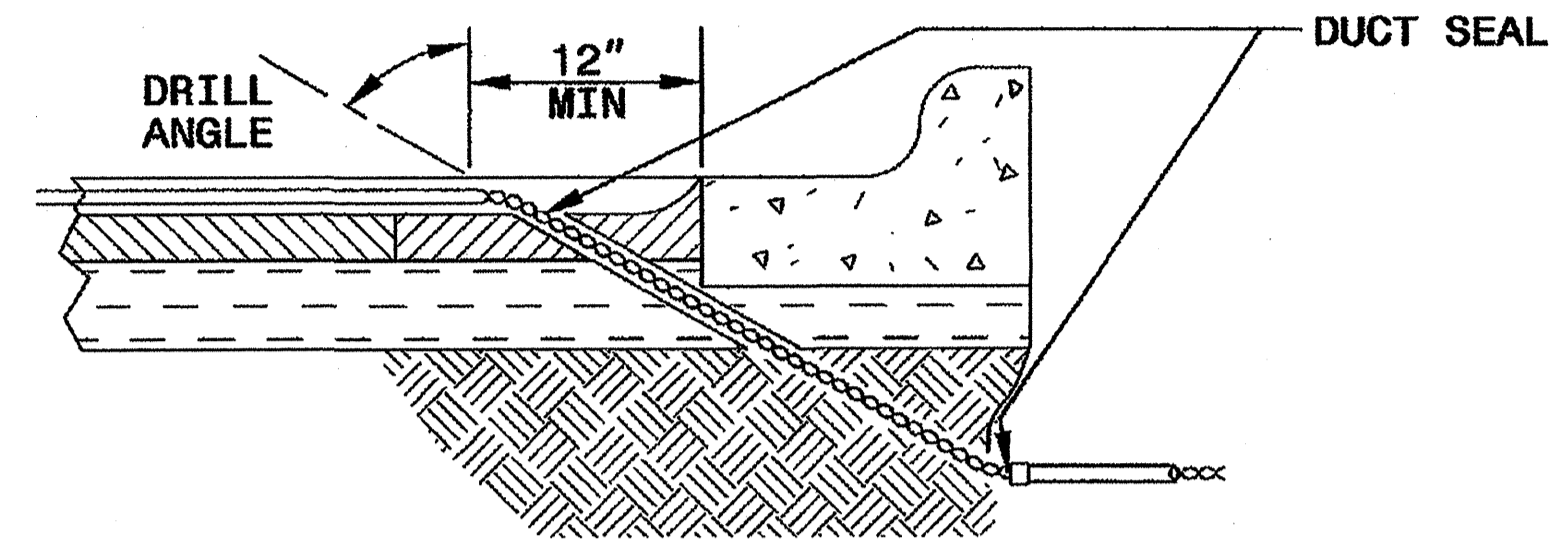


NOTE

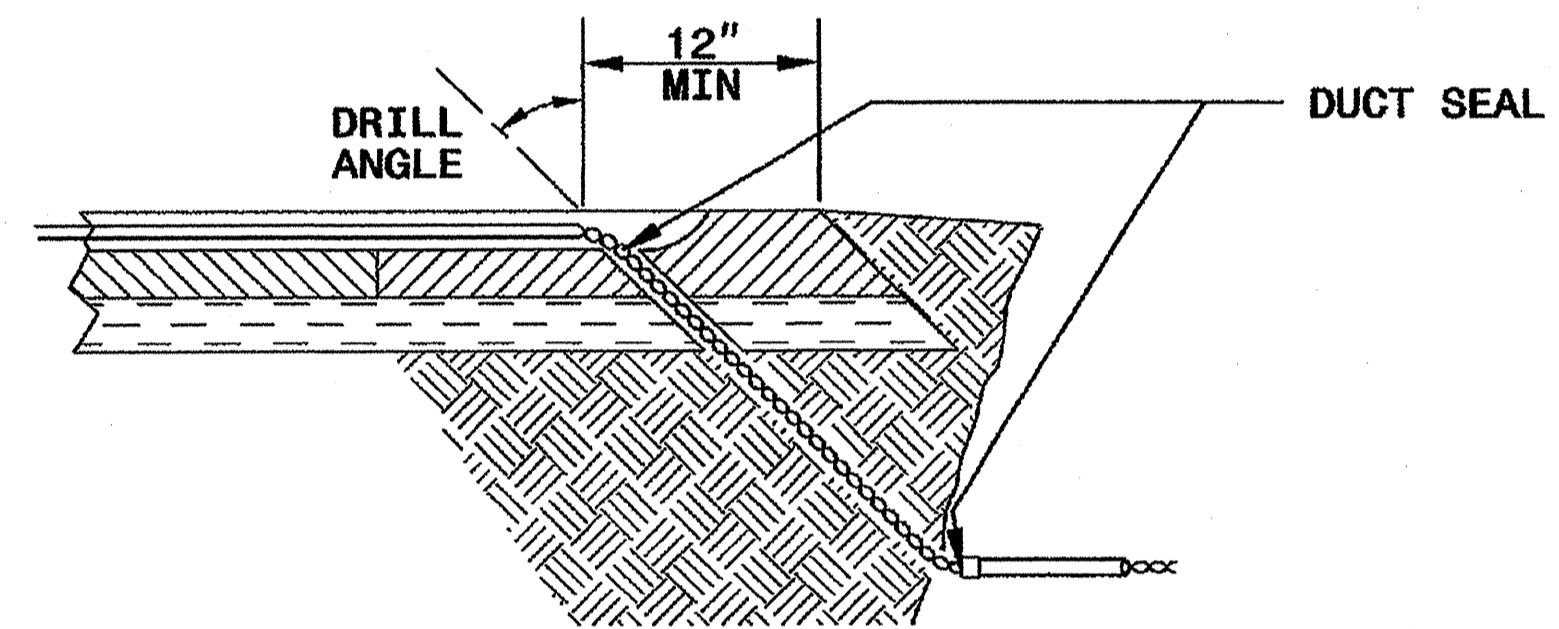
SPLICE ALL LOOP WIRE TAIL SECTIONS/LEAD-IN CABLE IN JUNCTION BOXES OR APPROVED CONDULETS.

LOOP WIRE PAVEMENT EDGE DETAILS

LOOP WIRE AT CURB & GUTTER SECTION



LOOP WIRE AT PAVEMENT SECTION



NOTES

1. DO NOT EXCAVATE UNDER CURB AND GUTTER SECTIONS FOR CONDUIT INSTALLATION.
2. TWIST LOOP WIRE TAIL SECTIONS FROM WHERE LOOP WIRE TAIL LEAVES SAW CUT TO JUNCTION BOX, INCLUDING THROUGH CONDUIT.
3. BEFORE SEALING LOOPS, INSTALL DUCT SEAL WHERE LOOP WIRE TAIL SECTION LEAVES SAW CUT IN PAVEMENT AND AT ENTRANCE OF CONDUIT TO JUNCTION BOX.

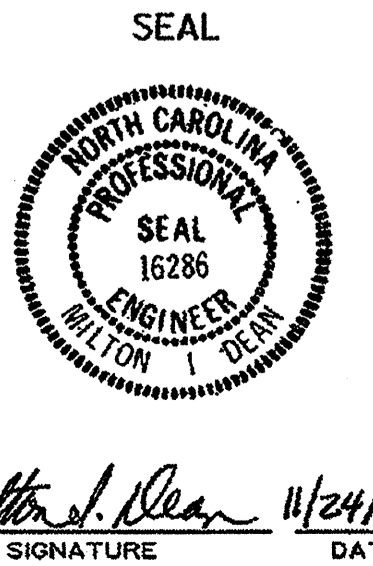
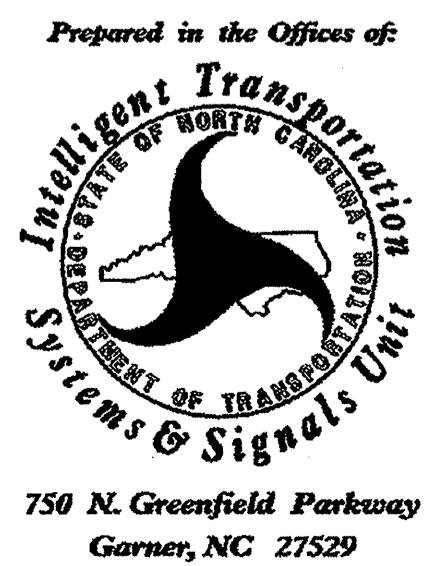
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

11-08

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

SHEET 2 OF 3
1725D01

See Plate for Title



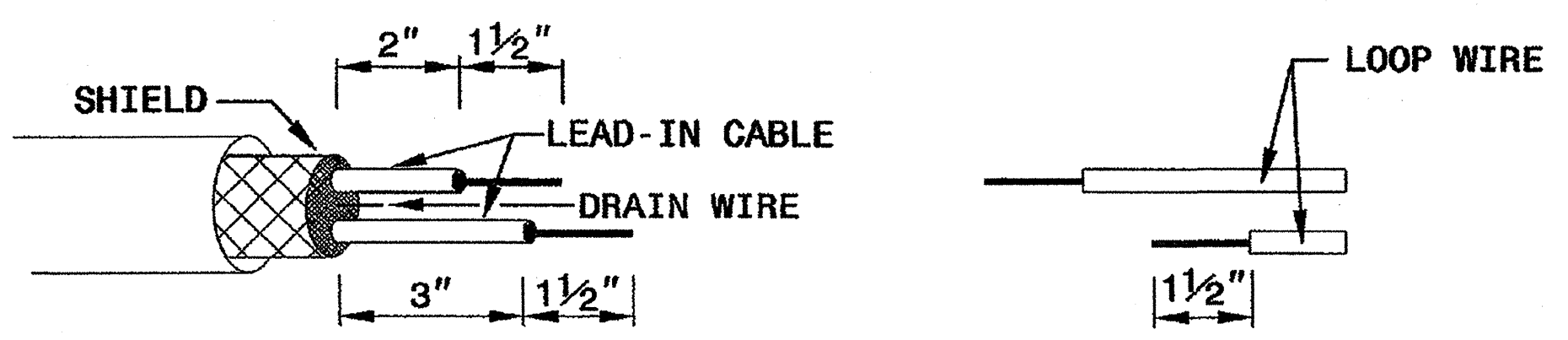
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

11-08

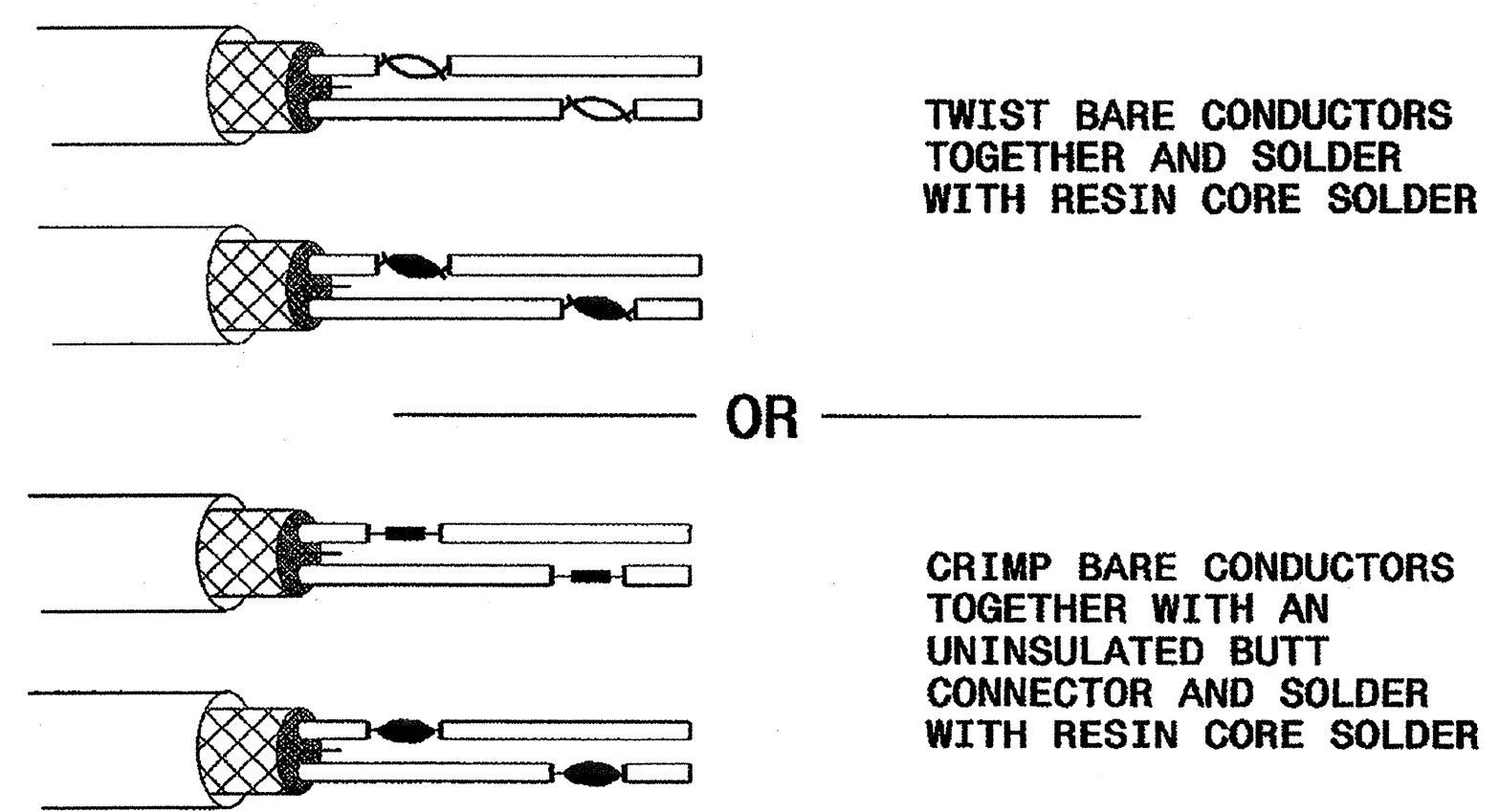
ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
SPlicing FOR LEAD-IN CABLE AND LOOP WIRE

SHEET 3 OF 3
1725D01

STEP 1. STRIP LOOP WIRE AND LEAD-IN CABLE

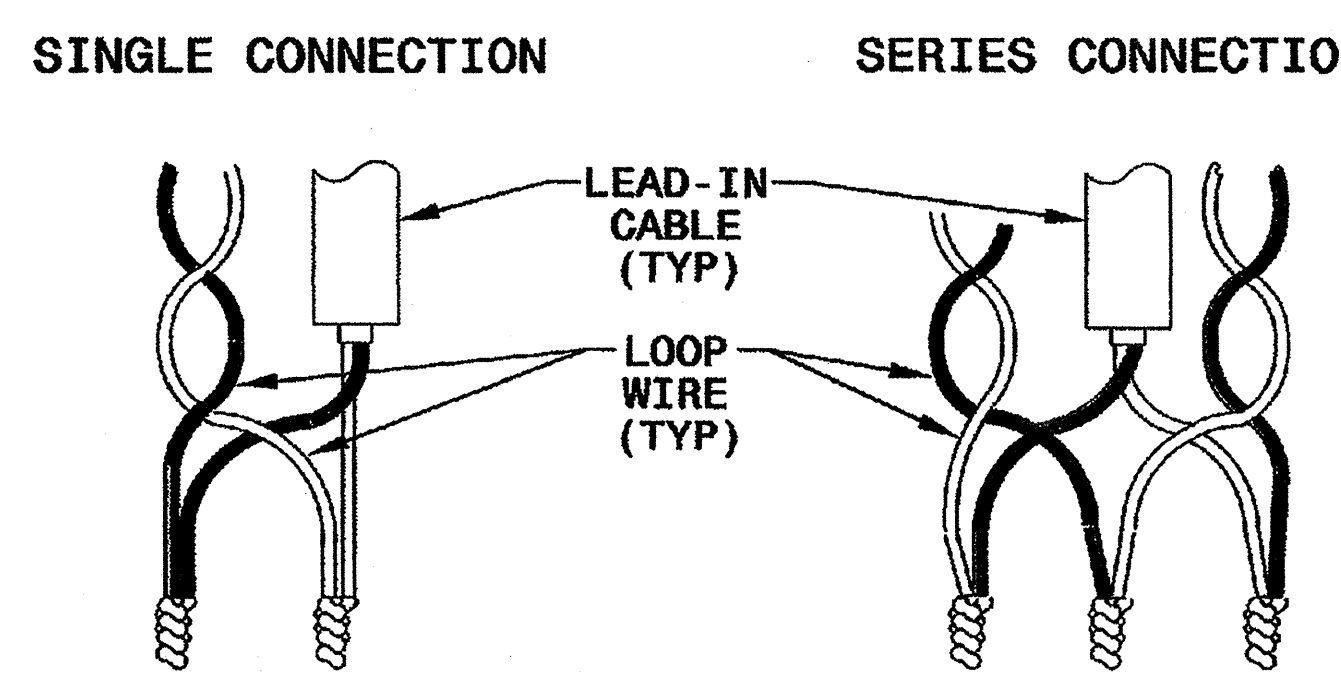


STEP 2. CONNECT AND SOLDER

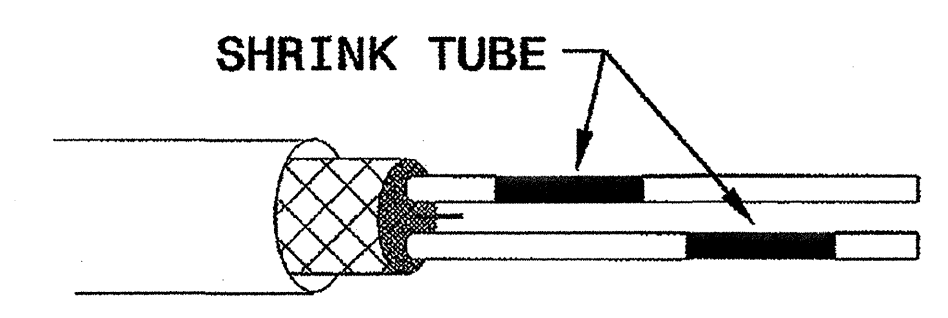


BOND SHIELD DRAIN WIRE AT SPLICE SECTIONS (DO NOT GROUND)

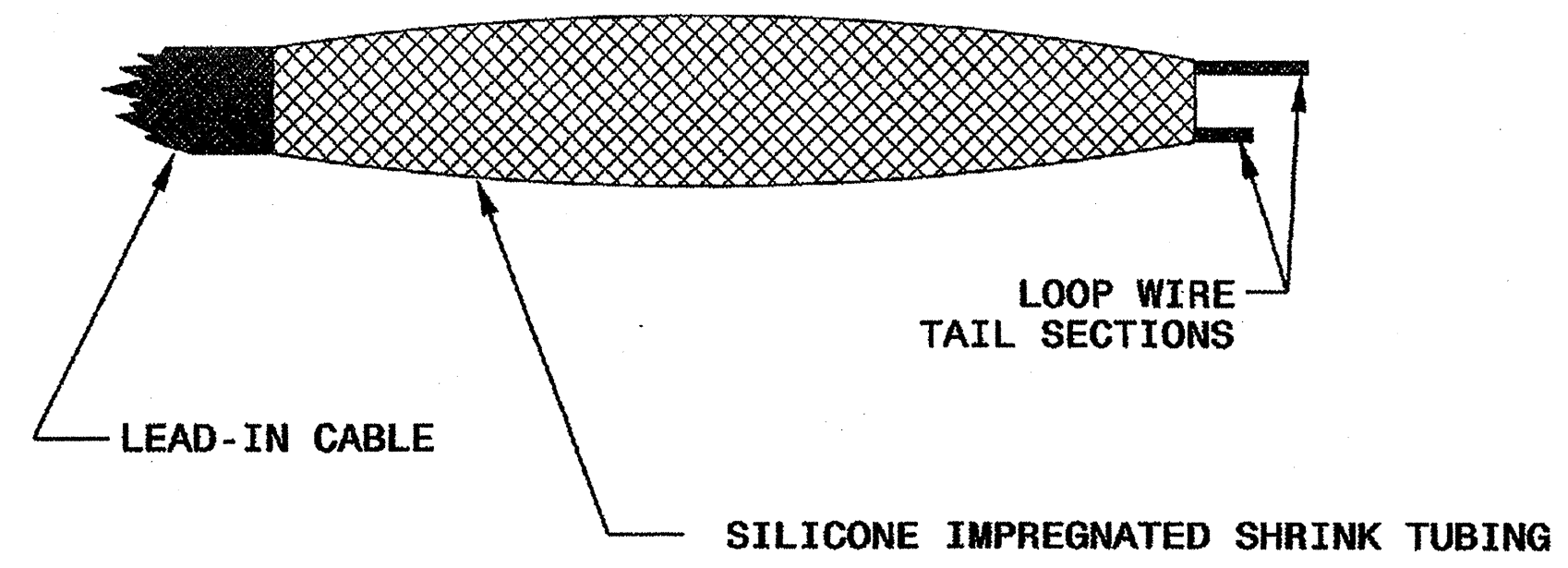
LOOP WIRE AND LEAD-IN CABLE CONNECTION DETAILS



STEP 3. INSULATE EACH SOLDER JOINT SEPARATELY



STEP 4. ENVIRONMENTALLY PROTECT SPLICE



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

11-08

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
SPlicing FOR LEAD-IN CABLE AND LOOP WIRE

SHEET 3 OF 3
1725D01

See Plate for Title

Prepared in the Offices of:
Intelligent Transportation Systems & Signals Unit
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
750 N. Greenfield Parkway
Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 16286
Milton Dean
Milton Dean 11/24/08
SIGNATURE DATE

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

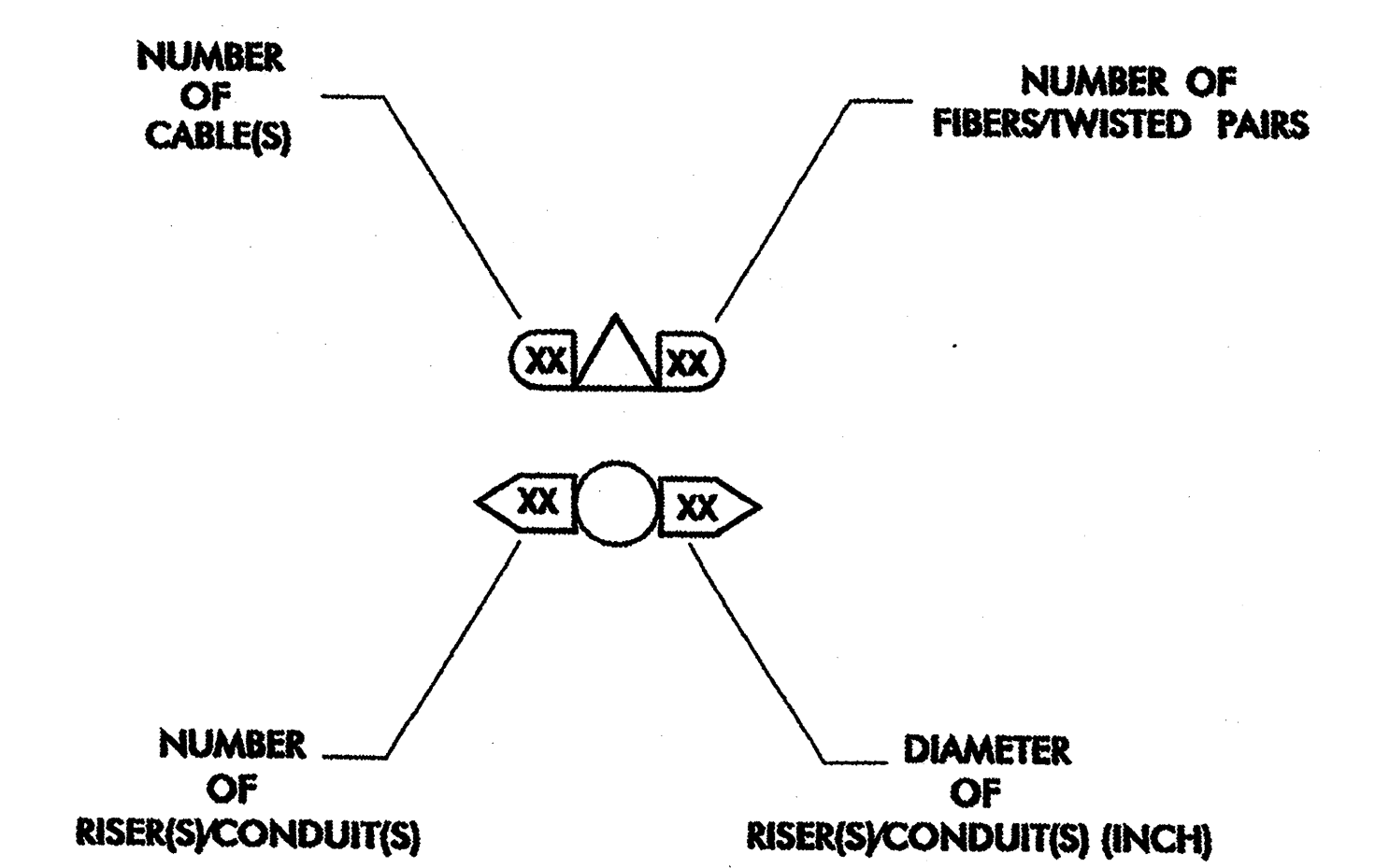
- 34 INSTALL CABINET FOUNDATION
- 35 REMOVE EXISTING CABINET FOUNDATION
- 36 INSTALL CCTV CAMERA ASSEMBLY
- 37 INSTALL CCTV CAMERA WOOD POLE
- 38 INSTALL CCTV CAMERA METAL POLE AND FOUNDATION
- 39 INSTALL JUNCTION BOX
- 40 INSTALL OVERSIZED JUNCTION BOX
- 41 REMOVE EXISTING JUNCTION BOX
- 42 INSTALL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

LEGEND

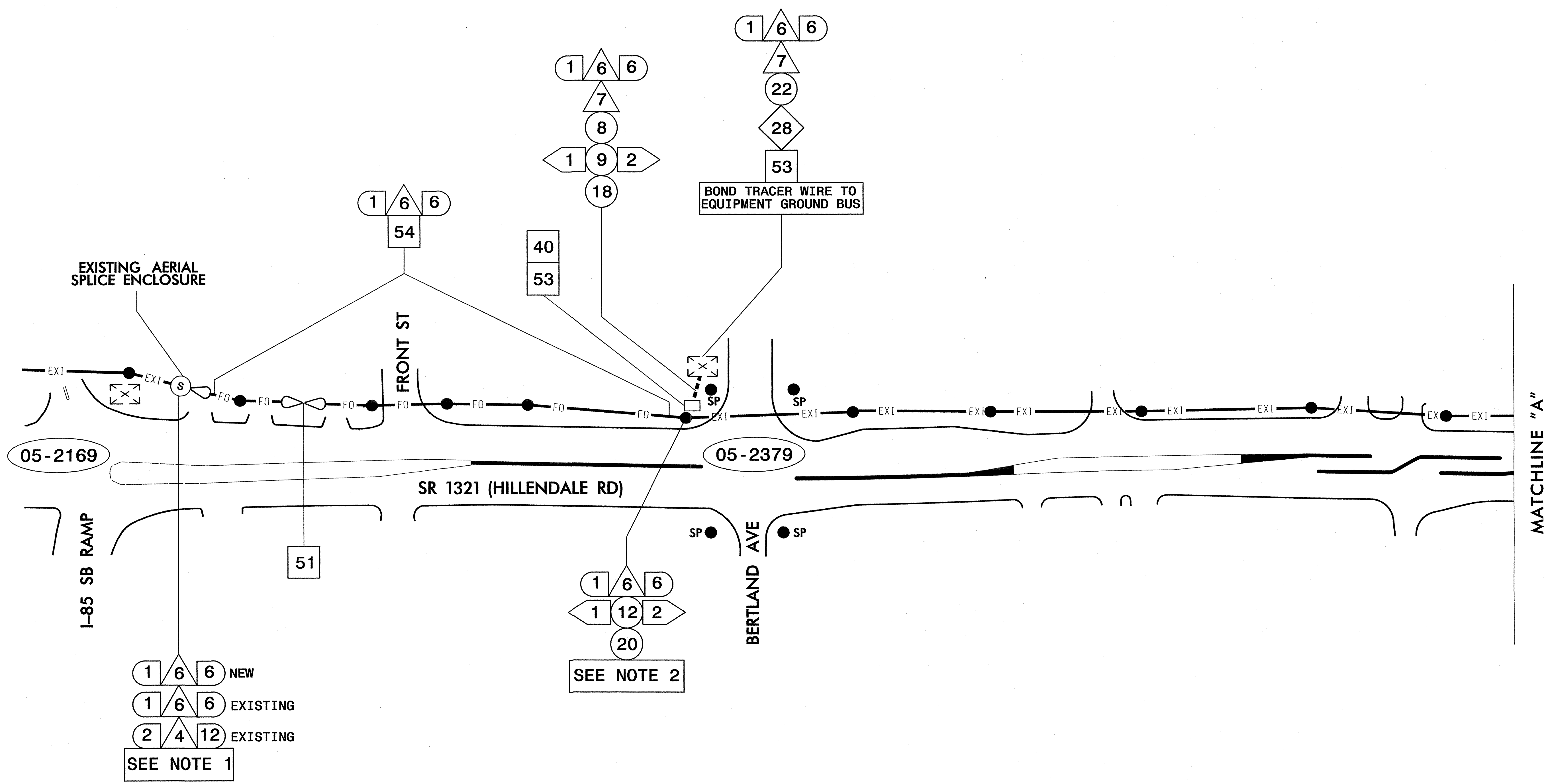
- FO NEW FIBER OPTIC COMMUNICATIONS CABLE
- TWIST PR NEW TWISTED PAIR COMMUNICATIONS CABLE
- EXI EXISTING COMMUNICATIONS CABLE
- REM EXISTING COMMUNICATIONS CABLE TO BE REMOVED
- NEW AERIAL GUY ASSEMBLY
- NEW CONDUIT
- EXISTING CONDUIT
- DD NEW DIRECTIONAL DRILLED CONDUIT
- B&J NEW BORED AND JACKED CONDUIT
- NEW JUNCTION BOX
- EXISTING JUNCTION BOX
- NEW WOOD POLE
- EXISTING WOOD POLE
- AERIAL SPICE ENCLOSURE
- NEW METAL POLE
- EXISTING METAL POLE
- NEW CCTV ASSEMBLY
- NEW STANDARD GUY ASSEMBLY
- NEW SIDEWALK GUY ASSEMBLY
- NEW CABLE STORAGE RACKS (SNOW SHOES)
- EXISTING CONTROLLER AND CABINET
- EXISTING SPICE CABINET
- NEW SPICE CABINET
- SP SIGNAL POLE
- XX-XXXX SIGNAL INVENTORY NUMBER

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)



<p>Prepared in the Office of: STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION Traffic Management System 222 N. McDowell St., Raleigh, NC 27602</p>	CONSTRUCTION NOTES		<p>SEAL</p> <p>DATE</p>								
	<p>PLAN DATE: _____</p> <p>PREPARED BY: _____</p>	<p>REVIEWED BY: _____</p> <p>REVIEWED BY: G. A. FULLER</p>		<table border="1"> <thead> <tr> <th>REVISIONS</th> <th>INIT.</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	REVISIONS	INIT.	DATE				
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NOTES:

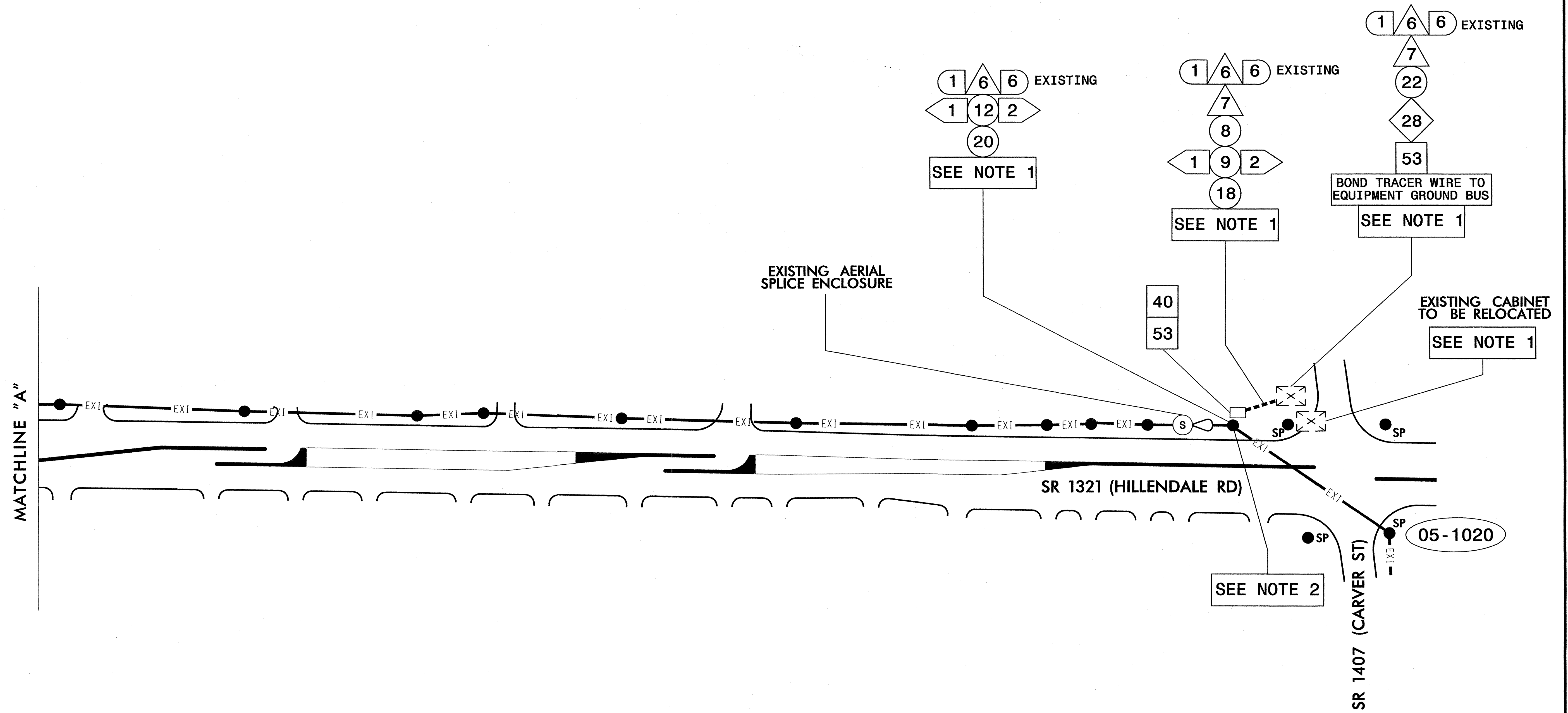
1. INSTALL NEW 6 FIBER DROP CABLE IN EXISTING SPLICE ENCLOSURE AND RUN NEW DROP CABLE TO NEW SIGNAL 05-2379.
2. INSTALL NEW RISER ON POWER POLE CLOSEST TO NEW CABINET LOCATION. DO NOT INSTALL RISER ON SIGNAL POLE.
3. CONTRACTOR TO CONTACT LARRY McGLOTHLIN, CITY OF DURHAM TRAFFIC ENGINEER (919-560-4366), PRIOR TO BEGINNING WORK ON SYSTEM SPLICING. PROVIDE 5 DAYS ADVANCE NOTICE PRIOR TO BEGINNING WORK.
4. RECORD AND PROVIDE TO THE ENGINEER DOCUMENTATION OF EXISTING SPLICES IN THE EXISTING SPLICE ENCLOSURE PRIOR TO REMOVAL OF ANY SPLICES.
5. FOR INSTALLATION OF NEW DROP CABLE, COMPARE SPLICE CONFIGURATION DATA RECORDED PREVIOUSLY TO THE SPLICE PLANS. IF THERE ARE VARIATIONS FOR EXISTING CABLES, SPLICE BACK ACCORDING TO EXISTING FIELD DATA TAKEN PRIOR TO REMOVAL.

(1/6/6) NEW
 (1/6/6) EXISTING
 (2/4/12) EXISTING
 SEE NOTE 1

(1/6/6)
 (1/12/2)
 (20)
 SEE NOTE 2

TEMPORARY SIGNAL DESIGN 1 (CONSTRUCTION PHASE 2)

	COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS		
	DIVISION 05 DURHAM CO. DURHAM		
PLAN DATE: DECEMBER 2009		REVIEWED BY: I.N. AVERY	
PREPARED BY: S.C. WARDLE		REVIEWED BY: G.A. FULLER	
SCALE: 0		REVISIONS: _____ INIT. DATE	
		Signature: <i>Gregory A. Fuller</i> DATE: _____ CADD File Name:	



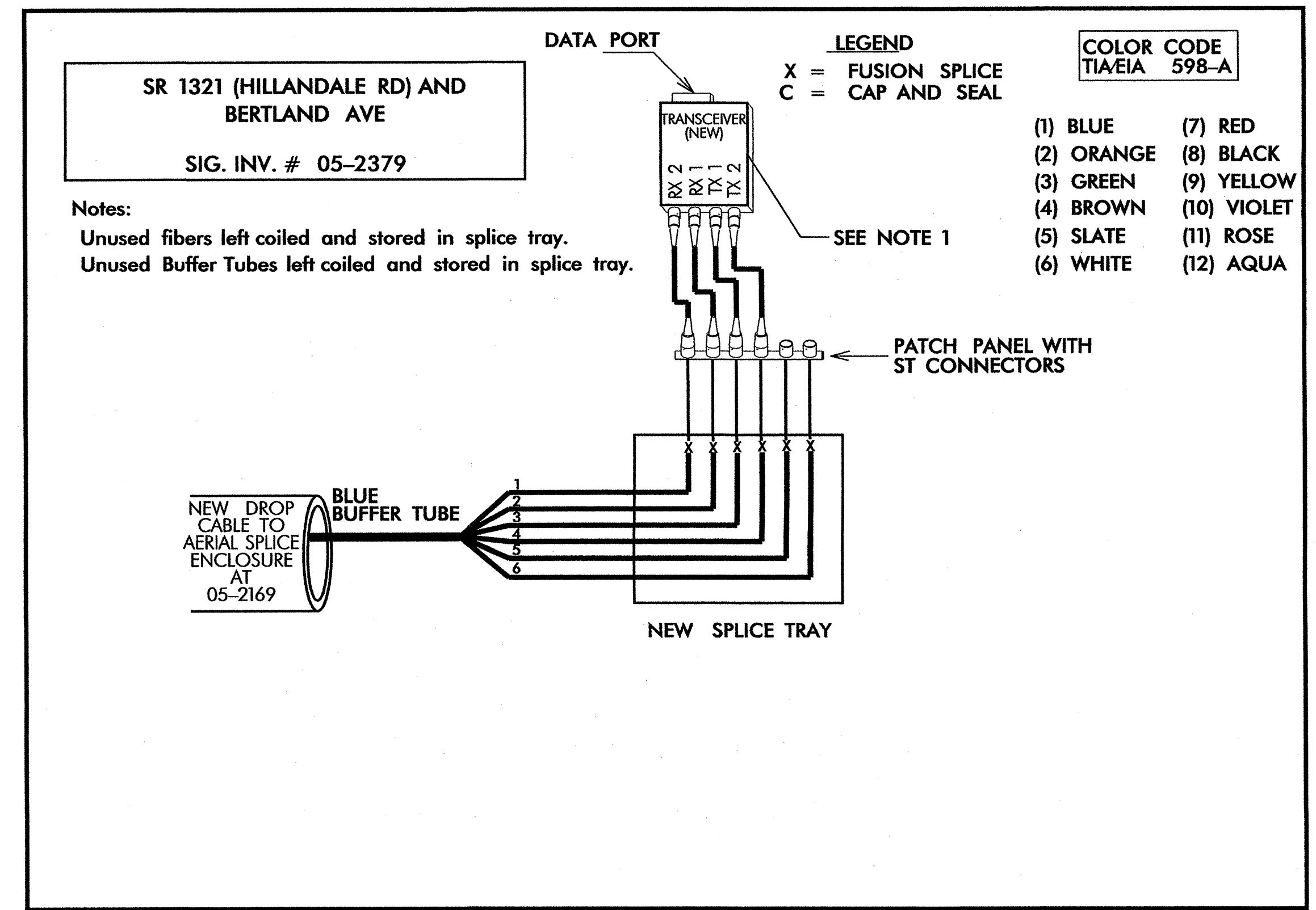
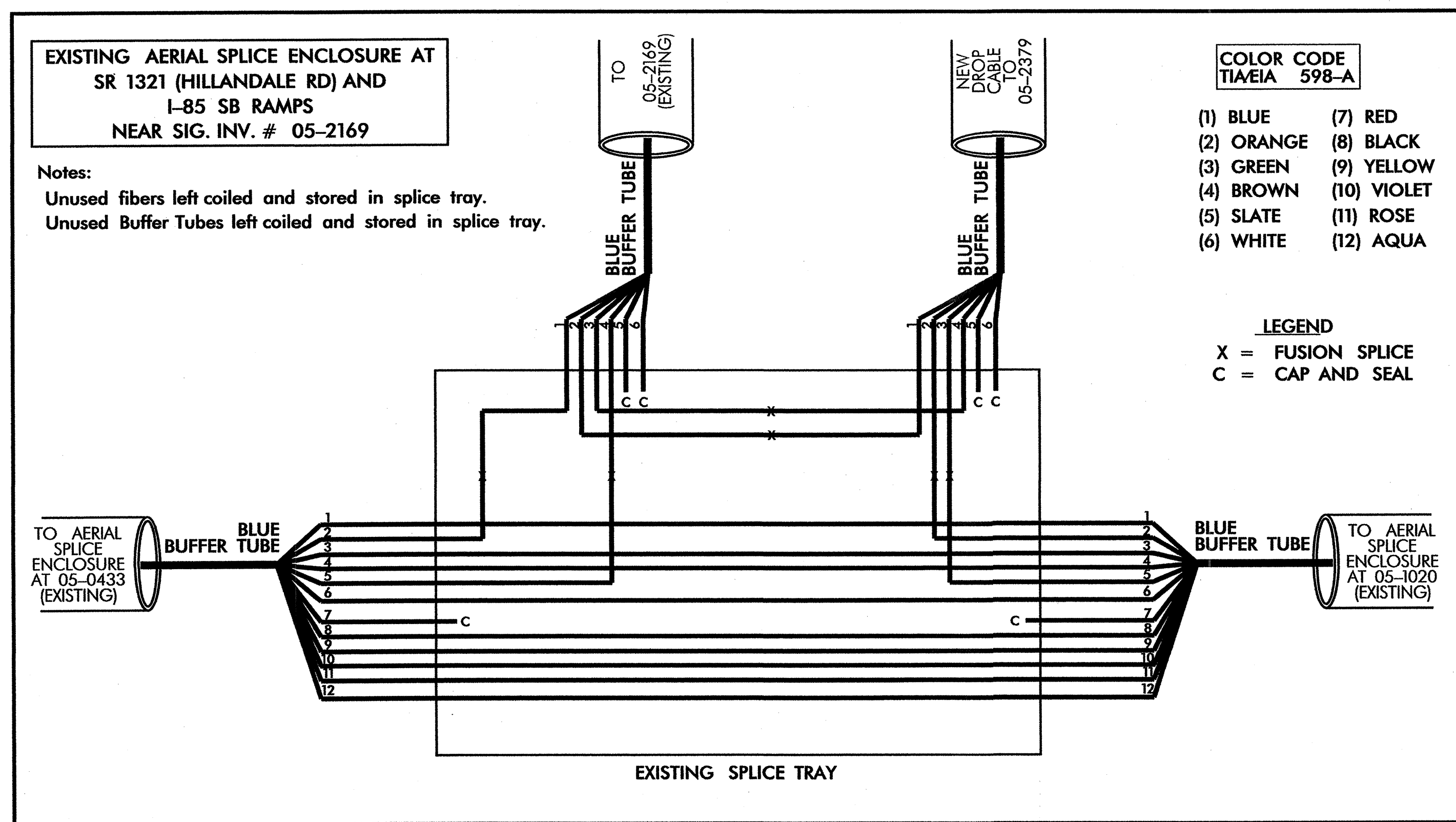
NOTES:

1. REMOVE EXISTING 6 FIBER DROP CABLE FROM EXISTING CABINET AND COIL AT SPLICE ENCLOSURE FOR FUTURE USE. CAP AND SEAL ALL FIBERS USING SILICONE HEAT SHRINK OR AN APPROVED EQUIVALENT TO PREVENT WATER PENETRATION. WHEN NEW SIGNAL CABINET IS INSTALLED, RE-INSTALL EXISTING DROP CABLE TO CABINET AND TERMINATE IN NEW INTERCONNECT CENTER.
2. INSTALL NEW RISER ON POWER POLE CLOSEST TO NEW CABINET LOCATION. DO NOT INSTALL RISER ON SIGNAL POLE.
3. CONTRACTOR TO CONTACT LARRY McGLOTHLIN, CITY OF DURHAM TRAFFIC ENGINEER (919-560-4366), PRIOR TO BEGINNING WORK ON SYSTEM SPLICING. PROVIDE 5 DAYS ADVANCE NOTICE PRIOR TO BEGINNING WORK.
4. RECORD AND PROVIDE TO THE ENGINEER DOCUMENTATION OF EXISTING SPLICES IN BOTH THE EXISTING SPLICE ENCLOSURE AND THE EXISTING SIGNAL CABINET (SIN #05-1020) PRIOR TO REMOVAL OF ANY SPLICES.
5. FOR INSTALLATION OF NEW INTERCONNECT CENTER, COMPARE SPLICE CONFIGURATION DATA RECORDED PREVIOUSLY TO THE SPLICE PLANS. IF THERE ARE VARIATIONS, SPLICE BACK ACCORDING TO EXISTING FIELD DATA TAKEN PRIOR TO REMOVAL.

TEMPORARY SIGNAL DESIGN 1 (CONSTRUCTION PHASE 2)

	COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS		
	DIVISION 05 DURHAM CO. DURHAM		
PLAN DATE: DECEMBER 2009		REVIEWED BY: I. N. AVERY	
PREPARED BY: S. C. WARDLE		REVIEWED BY: G. A. FULLER	
REVISIONS		INIT. DATE	
SCALE		SIGNATURE: <i>G. A. Fuller</i> DATE: 12/16	
CADD File Name:			

FIBER OPTIC CABLE



NOTES:

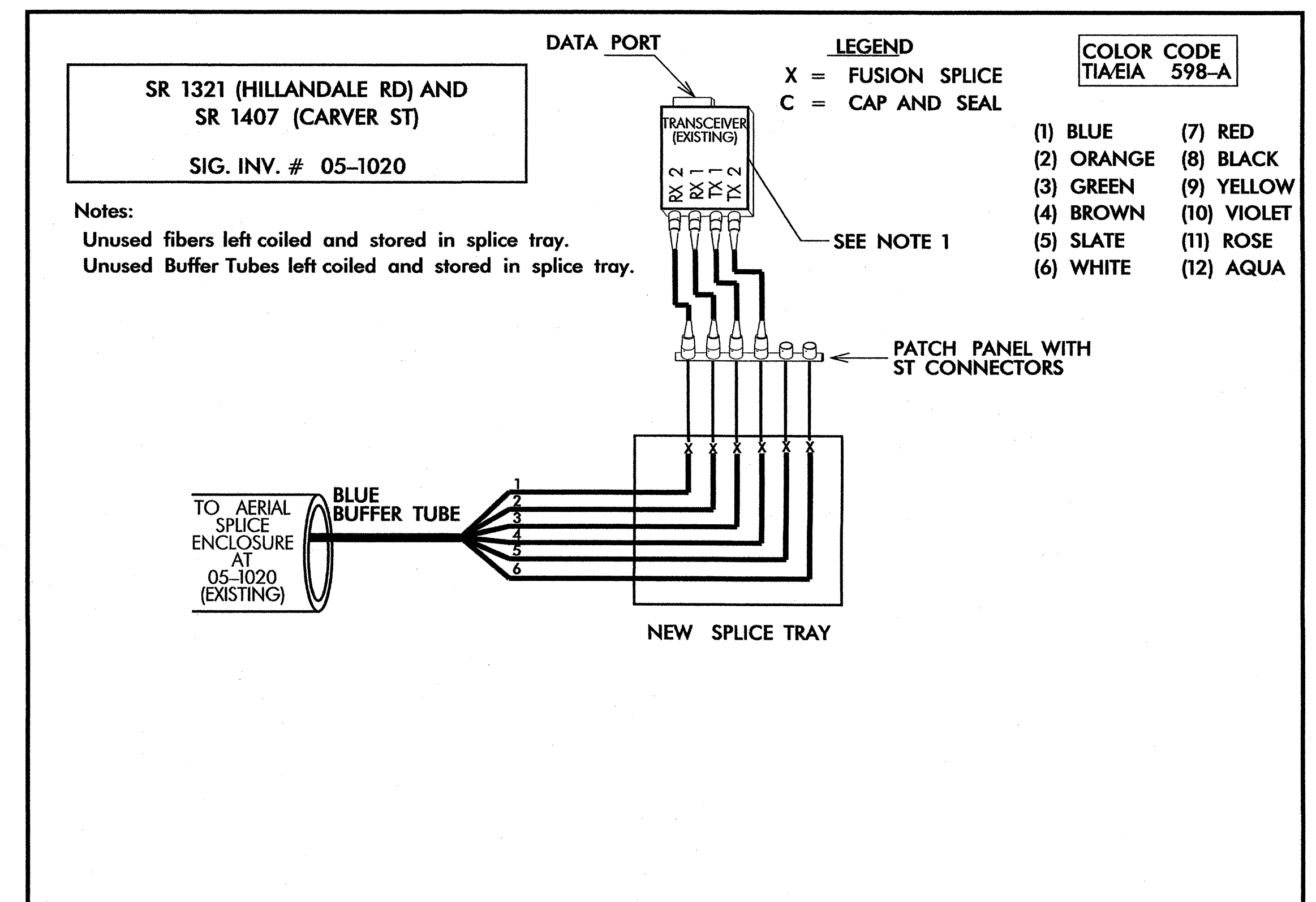
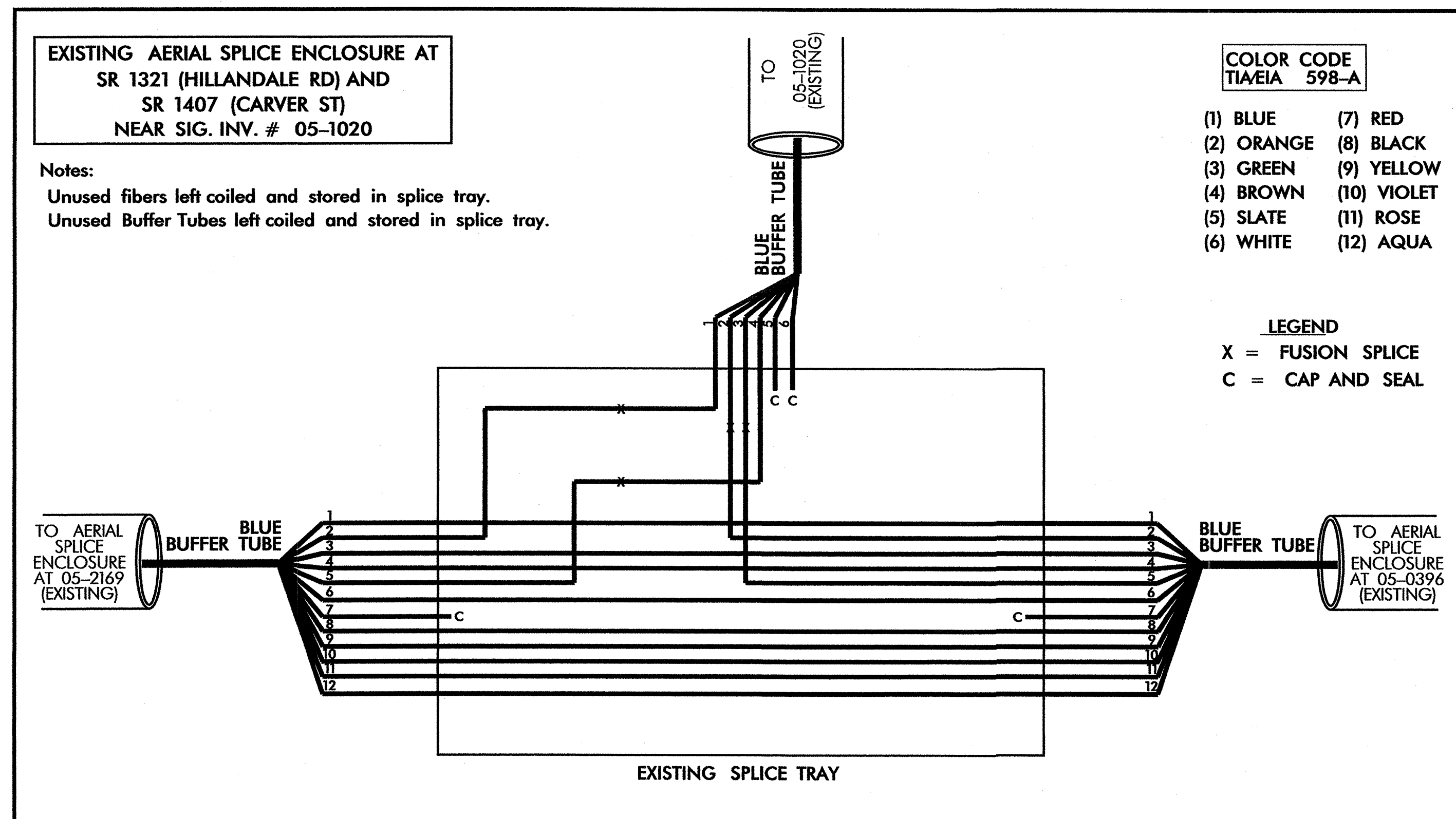
1. PROVIDE IFS MODEL D19130 SHR TRANSCEIVER OR AN APPROVED EQUIVALENT FOR COMPATIBILITY WITH DURHAM SIGNAL SYSTEM.
2. CONTRACTOR TO CONTACT LARRY McGLATHLIN, CITY OF DURHAM TRAFFIC ENGINEER (919-560-4366), PRIOR TO BEGINNING WORK ON SYSTEM SPlicing.
3. CONTRACTOR TO RECORD EXISTING SPlicing PRIOR TO REMOVAL OF ANY SPlicing. RESPLICING ACCORDING TO EXISTING SPlicing.

TRANSCEIVER TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING \ ENSURING PROPER TERMINATIONS

	SPLICE PLAN										
	DIVISION 05 DURHAM CO. DURHAM PLAN DATE: DECEMBER 2009 REVIEWED BY: I.N. AVERY PREPARED BY: S.C. WARDLE REVIEWED BY: G.A. FULLER										
SCALE 	REVISIONS <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><th>NO.</th><th>DATE</th><th>DESCRIPTION</th></tr> <tr><td> </td><td> </td><td> </td></tr> </table>	NO.	DATE	DESCRIPTION				INIT. DATE <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td> </td><td> </td></tr> </table>			SIGNATURE
NO.	DATE	DESCRIPTION									

FIBER OPTIC CABLE

****NOTE: NO WORK REQUIRED IN THIS SPLICE ENCLOSURE****



****SHOWN FOR INFORMATIONAL PURPOSES ONLY****

NOTES:

1. RELOCATE EXISTING IFS MODEL D19130 SHR TRANSCEIVER FROM EXISTING SIGNAL CABINET TO NEW CABINET AND INSTALL WITH NEW INTERCONNECT CENTER.
2. CONTRACTOR TO CONTACT LARRY MCGLOTHLIN, CITY OF DURHAM TRAFFIC ENGINEER (919-560-4366), PRIOR TO BEGINNING WORK ON SYSTEM SPLICING. PROVIDE 5 DAYS ADVANCE NOTICE PRIOR TO BEGINNING WORK.
3. CONTRACTOR TO RECORD EXISTING SPLICING PRIOR TO REMOVAL OF ANY SPLICES. RESPLICE ACCORDING TO EXISTING SPLICES.

TRANSCEIVER TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING \ ENSURING PROPER TERMINATIONS

	SPLICE PLAN		
	DIVISION 05 DURHAM CO. DURHAM		
	PLAN DATE: DECEMBER 2009	REVIEWED BY: I.N. AVERY	
PREPARED BY: S.C. WARDLE	REVIEWED BY: G.A. FULLER	SCALE: 0	
REVISIONS	INIT.	DATE	CADD Filename: