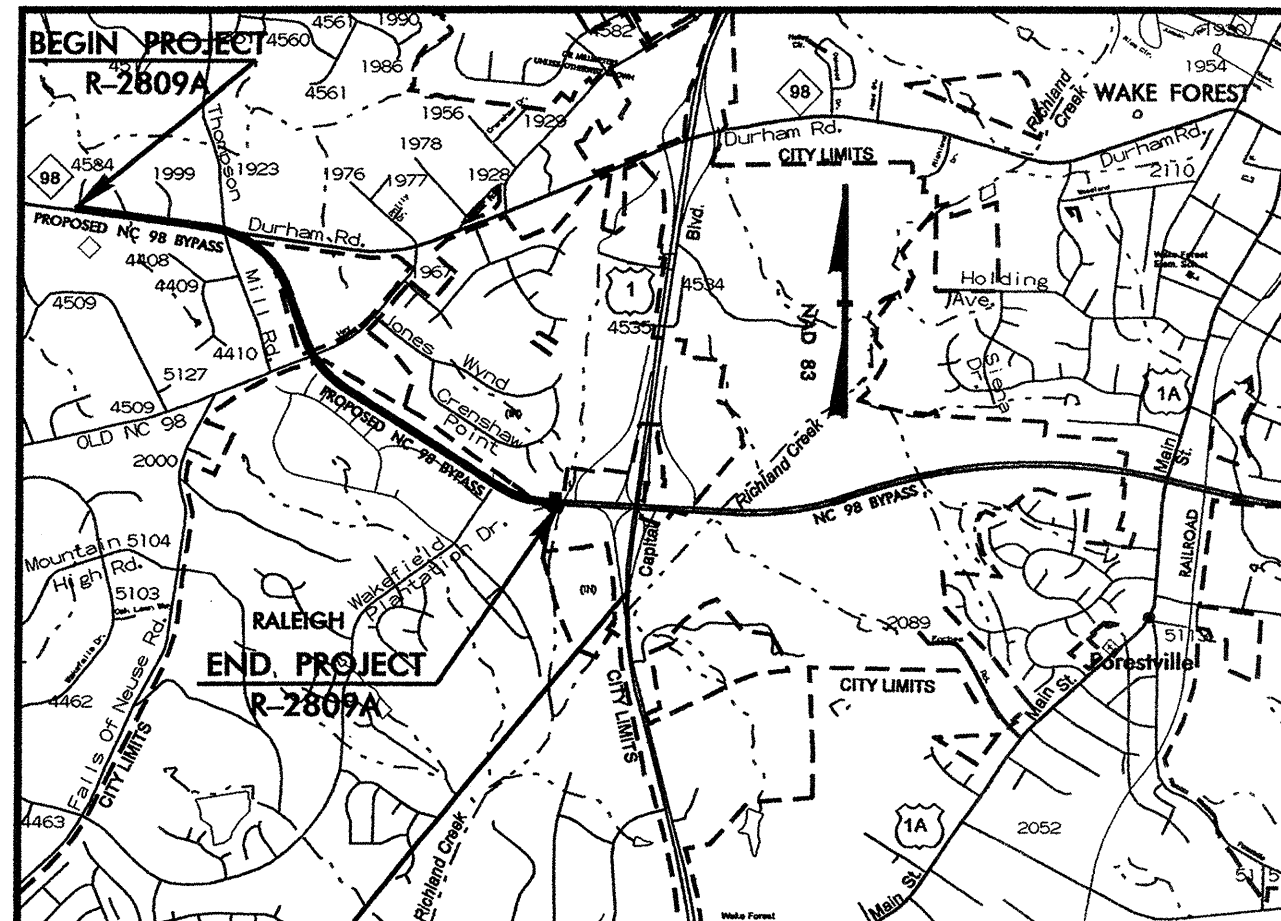


**PROJECT: R-2809A**



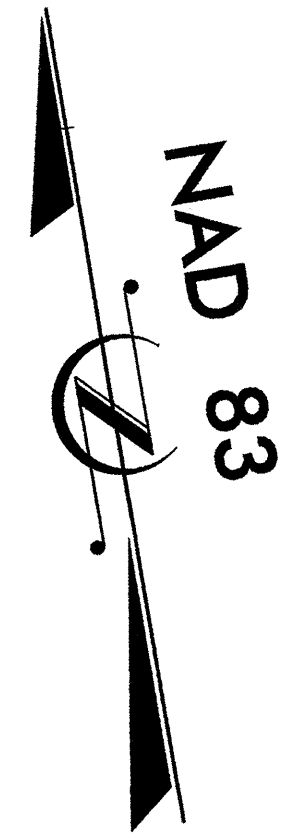
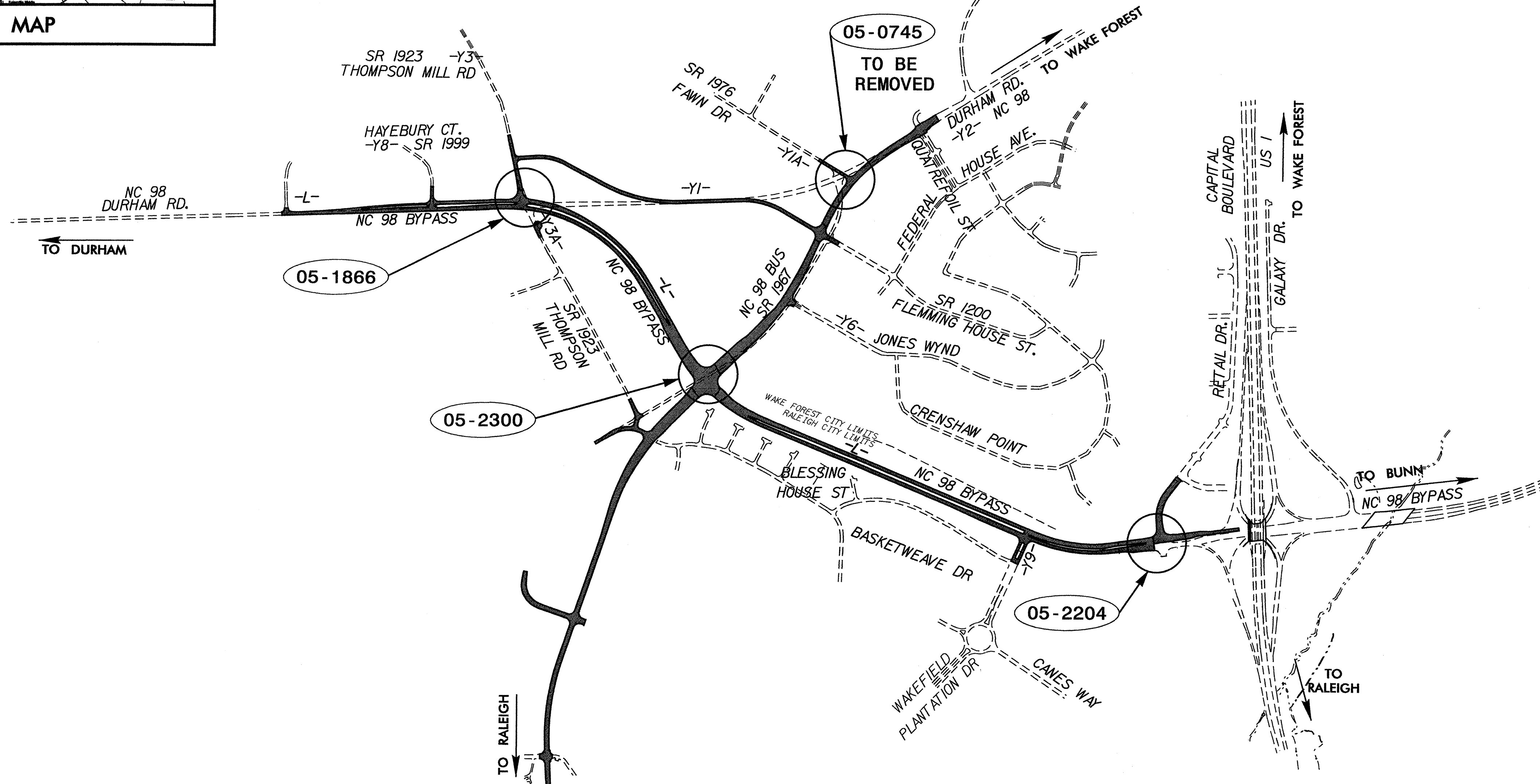
VICINITY MAP

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

**WAKE COUNTY**

**LOCATION:** NC 98 (WAKE FOREST BYPASS) FROM WEST OF SR 1923 (THOMPSON MILL ROAD) TO WEST OF US 1 (CAPITAL BLVD.)

**TYPE OF WORK:** TRAFFIC SIGNALS AND FIBER OPTIC COMMUNICATIONS



STATE	PROJECT NO.	SHEET NO.
N.C.	R-2809A	Fig. 1
F.A. PROJ. NO.		
PROJECT ID. NO.		

**INDEX OF PLANS**

SHEET NO.	SIGNAL INVENTORY NO.	LOCATION /DESCRIPTION
SIG. 1	N/A	Title Sheet
SIG. 2-7	05-1866T & Final	NC 98 Bypass at SR 1923 (Thompson Mill Road)
SIG. 8-15	05-2300T1, T2 & Final	NC 98 Bypass at NC 98 Business
SIG. 16-18	05-2204	NC 98 Bypass at SR 4535 (Retail Drive)/Northpark Drive
SIG. 19-23	N/A	Metal Pole Typicals
SIG. 24-29	N/A	Communications Cable and Conduit Routing Plans

**LEGEND**

##-#### SIGNAL INVENTORY NUMBER

**NCDOT CONTACTS:**

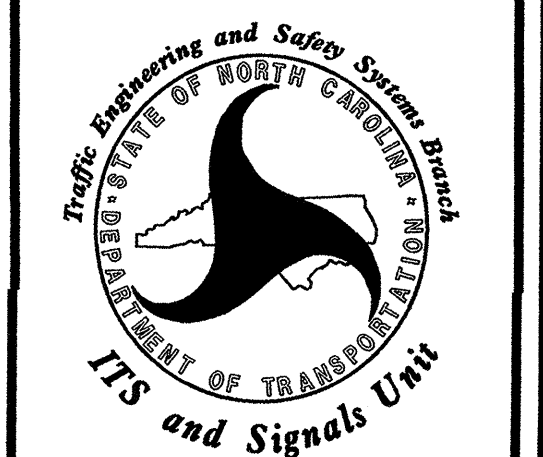
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

Timothy J. Williams, PE - S&G Contracts & PEF Support Engineer

John T. Rowe Jr., PE - Signal Equipment Design Engineer

G. G. Murr, Jr., PE - ITS Engineer

Prepared in the Offices of:



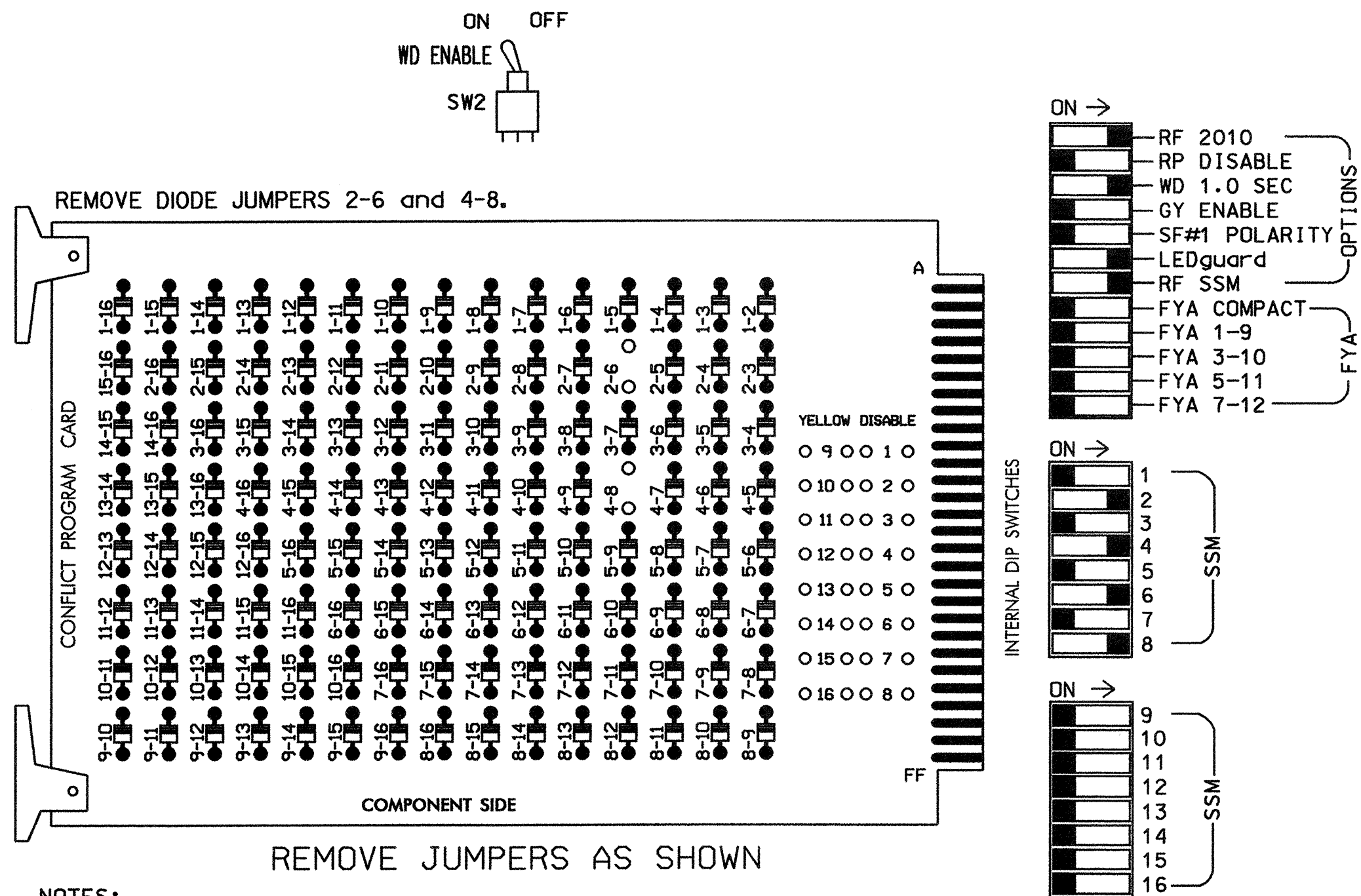
750 N. Greenfield Parkway, Garner, NC 27529





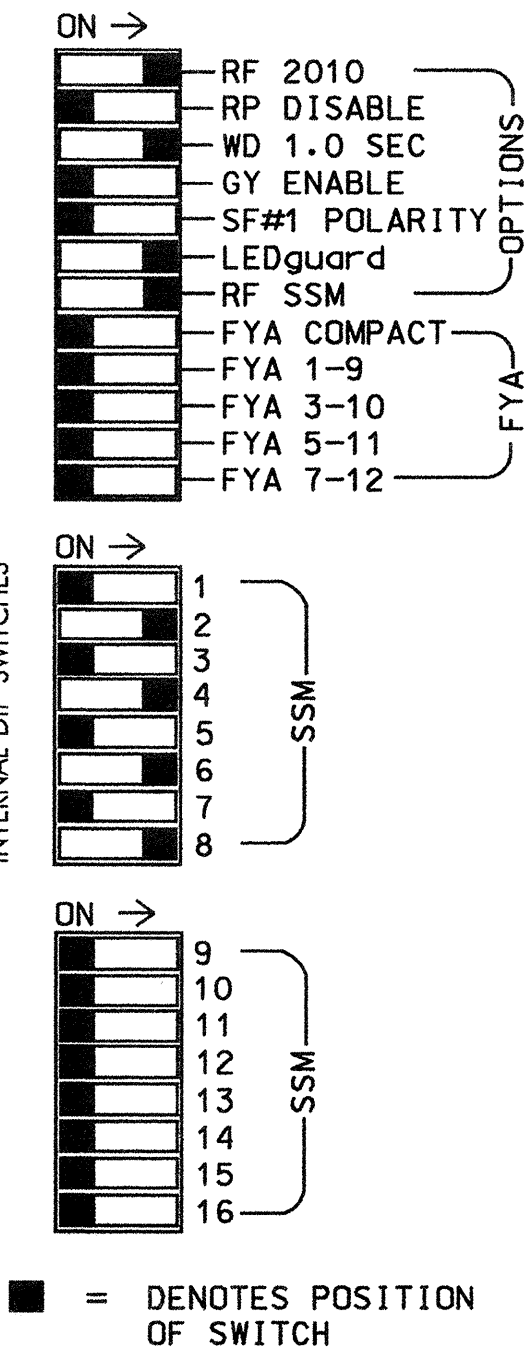
**EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL**

(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.



**NOTES**

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3,5,7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 4 and 8, on the controller unit, for Dual Entry.
6. Program phases 2 and 6, on the controller unit, for Variable Initial and Gap Reduction.

**EQUIPMENT INFORMATION**

CONTROLLER.....CONTRACTOR SUPPLIED 2070L  
 CABINET.....CONTRACTOR SUPPLIED 332  
 SOFTWARE.....ECONOLITE OASIS  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S2,S4,S6,S8  
 PHASES USED.....2,4,6,8  
 OVERLAPS.....NONE

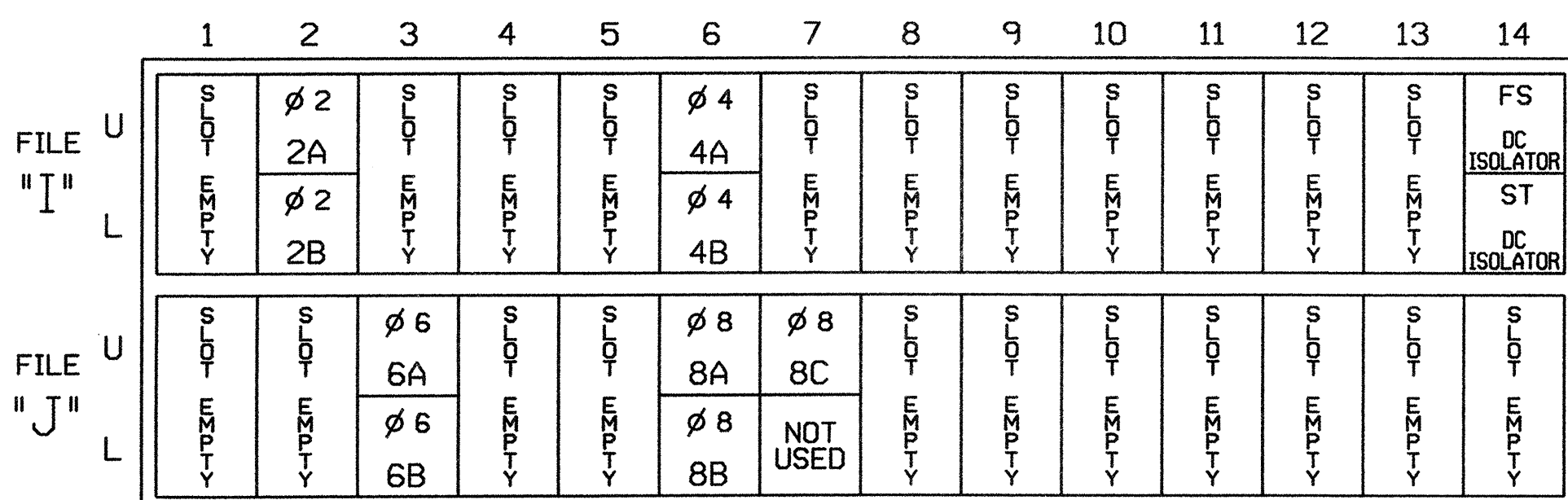
**SIGNAL HEAD HOOK-UP CHART**

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	NU	41,42	NU	NU	61,62	NU	NU	81,82	NU
RED		128			101			134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW												
GREEN ARROW												

NU = Not Used

**INPUT FILE POSITION LAYOUT**

(front view)



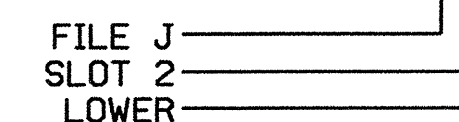
EX. : 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE  
 ST = STOP TIME

**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A	TB2-5,6	I2U	39	1	2	2	Y	Y			
2B	TB2-7,8	I2L	43	5	12	2	Y	Y	Y		3
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			3
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			
6A	TB3-9,10	J3U	64	26	36	6	Y	Y			
6B	TB3-11,12	J3L	77	39	46	6	Y	Y	Y		3
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			3
8B	TB5-11,12	J6L	46	8	18	8	Y	Y			10
8C	TB7-1,2	J7U	66	28	38	8	Y	Y			15

INPUT FILE POSITION LEGEND: J2L



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1866 T  
 DESIGNED: July 2007  
 SEALED: 08-23-07  
 REVISED: N/A

Sigal Upgrade - Temporary

Prepared in the Offices of:  
  
 122 N. McDowell St., Raleigh, NC 27603

**NC 98 Bypass at SR 1923 (Thompson Mill Road)**

Division 05 Wake County Wake Forest  
 PLAN DATE: August 2007 REVIEWED BY: JTR  
 PREPARED BY: James Peterson REVIEWED BY:

REVISIONS: INIT. DATE

Sig. INVENTORY NO. 05-1866 T

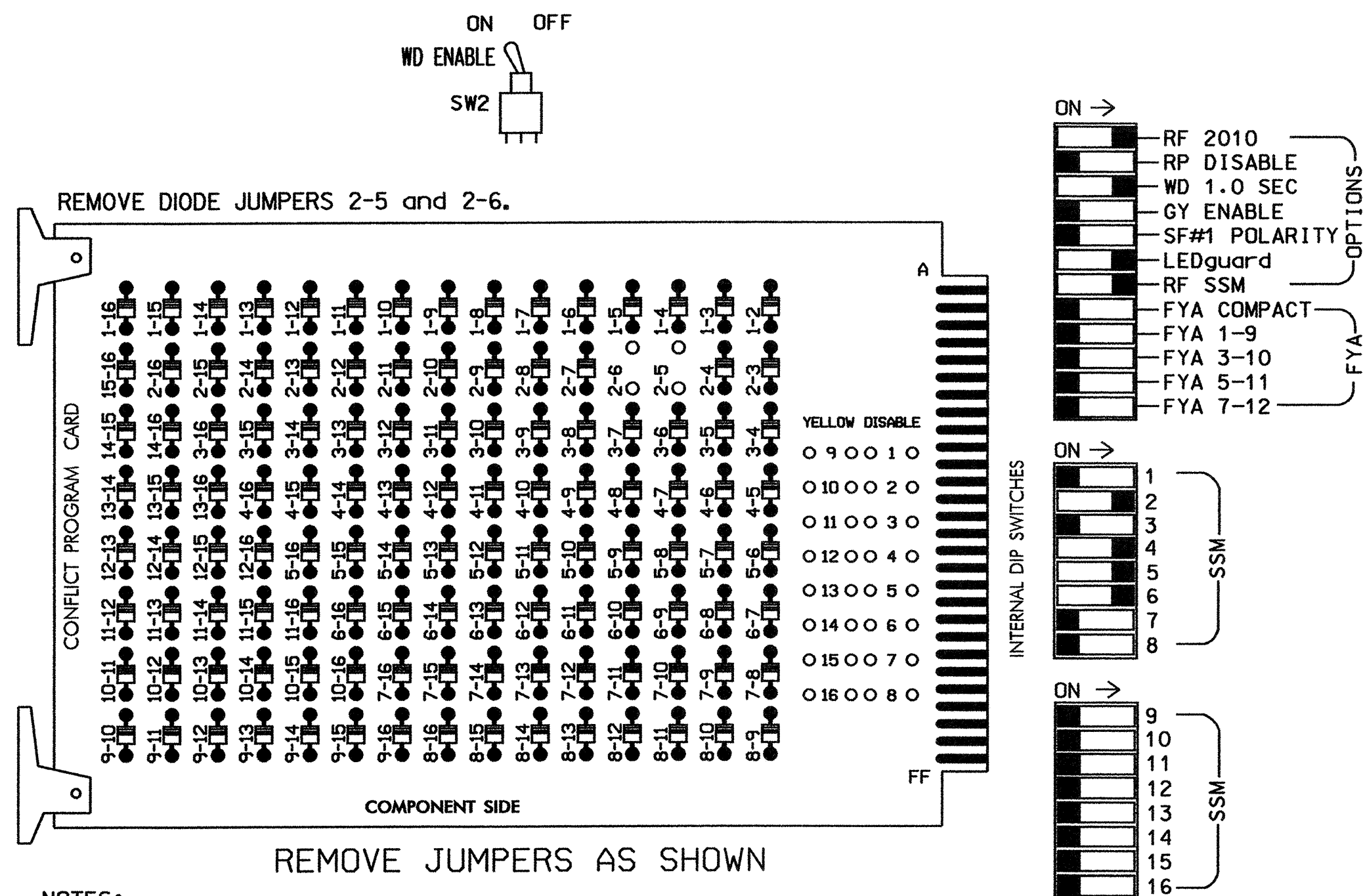
SEAL  
 NORTH CAROLINA PROFESSIONAL ENGINEER  
 SEAL 008453  
 JON T. ROWE, P.E.  
 Signature: John Rowe 8-29-07  
 DATE





**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.

■ = DENOTES POSITION OF SWITCH

**NOTES**

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,3,7, 8,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 2 and 6, on the controller unit, for Variable Initial and Gap Reduction.
6. The cabinet and controller are part of the Wake Forest Bypass Closed Loop System.

**EQUIPMENT INFORMATION**

CONTROLLER.....CONTRACTOR SUPPLIED 2070L  
 CABINET.....CONTRACTOR SUPPLIED 332  
 SOFTWARE.....ECONOLITE OASIS  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S2,S4,S5,S6  
 PHASES USED.....2,4,5,6  
 OVERLAPS.....NONE

**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	NU	41,42	62	NU	21,42	61,62	NU	NU	NU
RED		128			101		*	134				
YELLOW		129			102			135				
GREEN		130			103			136				
RED ARROW												
YELLOW ARROW					102			132				
GREEN ARROW					103			133				

NU = Not Used

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

**INPUT FILE POSITION LAYOUT**

(front view)

FILE	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	2A/S22	2A/S22	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23
L	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23	2B/S23
U	5B	5A	6A/S20	5C	5C	5C	5C	5C	5C	5C	5C	5C	5C	5C
L	5C	5C	5C	5C	5C	5C	5C	5C	5C	5C	5C	5C	5C	5C

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

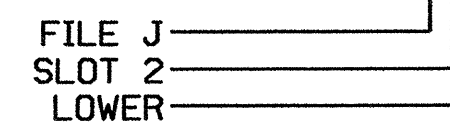
FS = FLASH SENSE  
 ST = STOP TIME

**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A/S22	TB2-5,6	I2U	39	1	2	2/SYS	Y	Y			
2B/S23	TB2-7,8	I2L	43	5	12	2/SYS	Y	Y			
4A	TB4-9,10	I6U	41	3	4	Y	Y			3	
5B	TB3-1,2	J1U	55	17	5	Y	Y			15	
5A <sup>1</sup>	TB3-5,6	J2U	40	2	6	Y	Y			15	
	TB3-7,8	J2L	44	6	16	Y	Y	Y		3	
6A/S20	TB3-9,10	J3U	64	26	36	6/SYS	Y	Y			
6B/S21	TB3-11,12	J3L	77	39	46	6/SYS	Y	Y			
5C	TB5-1,2	J4U	48	10	26	5	Y	Y		20	

<sup>1</sup>Add jumpers from TB3-5 to TB3-7, and from TB3-6 to TB3-8.

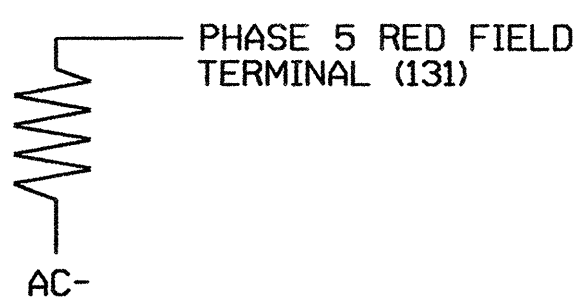
INPUT FILE POSITION LEGEND: J2L



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1866  
 DESIGNED: July 2007  
 SEALED: 08-23-07  
 REVISED: N/A

**LOAD RESISTOR INSTALLATION DETAIL**

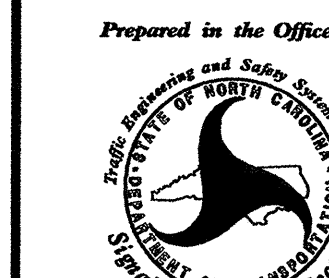
VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



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

Signal Upgrade - Final

ELECTRICAL AND PROGRAMMING DETAILS FOR:



NC 98 Bypass at SR 1923 (Thompson Mill Road)

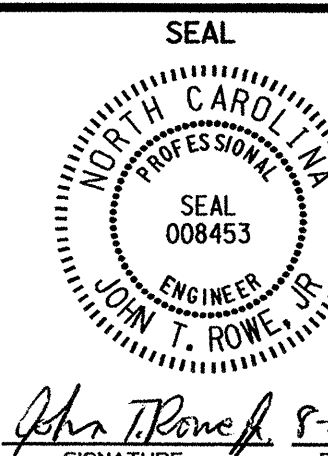
Division 5 Wake County Wake Forest

PLAN DATE: August 2007 REVIEWED BY: JTR

PREPARED BY: James Peterson REVIEWED BY:

REVISIONS INIT. DATE

750 N. Greenfield Pkwy, Garner, NC 27529



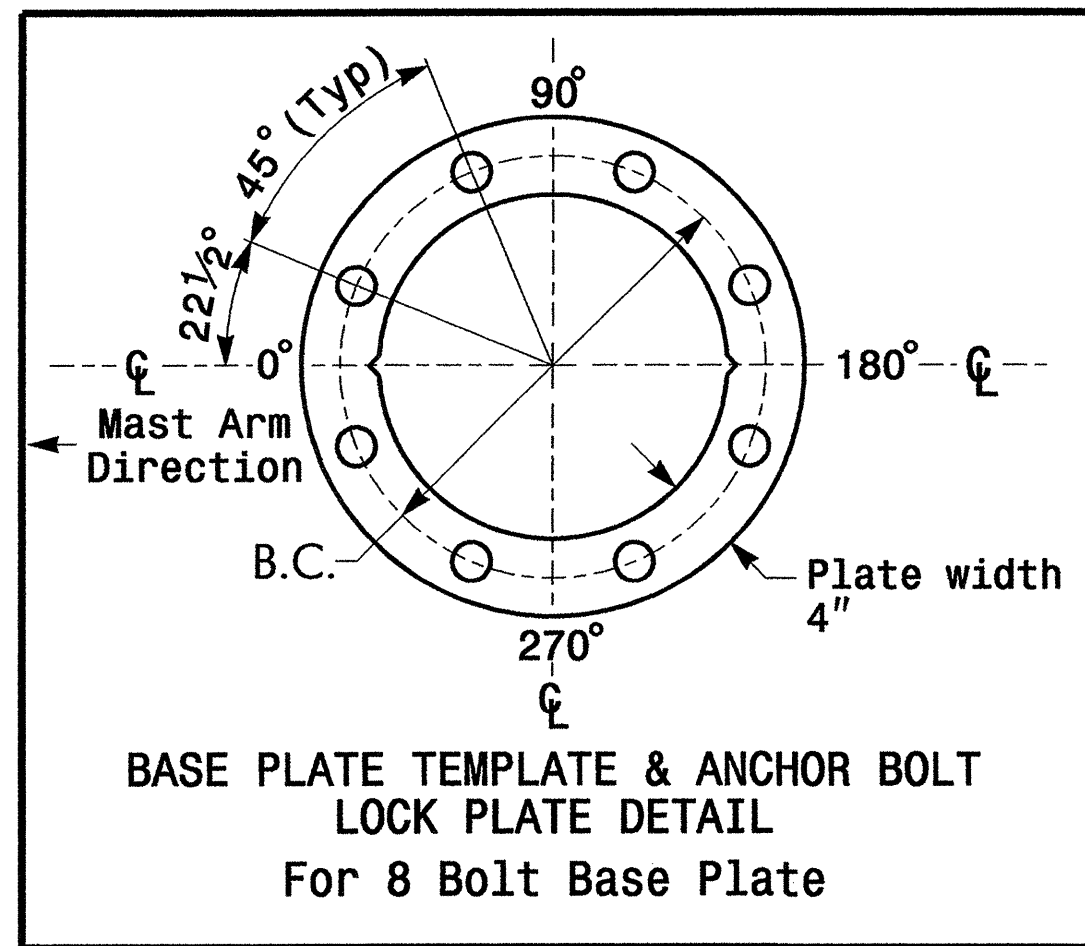
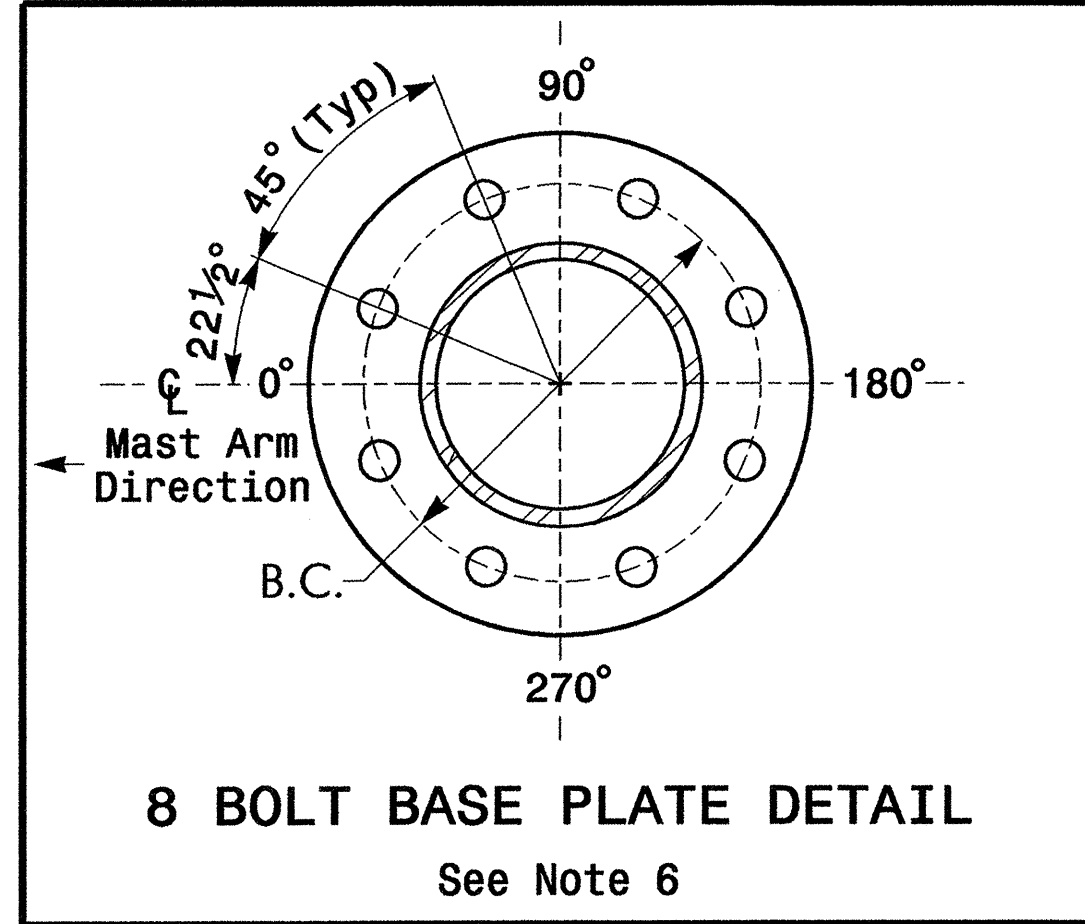
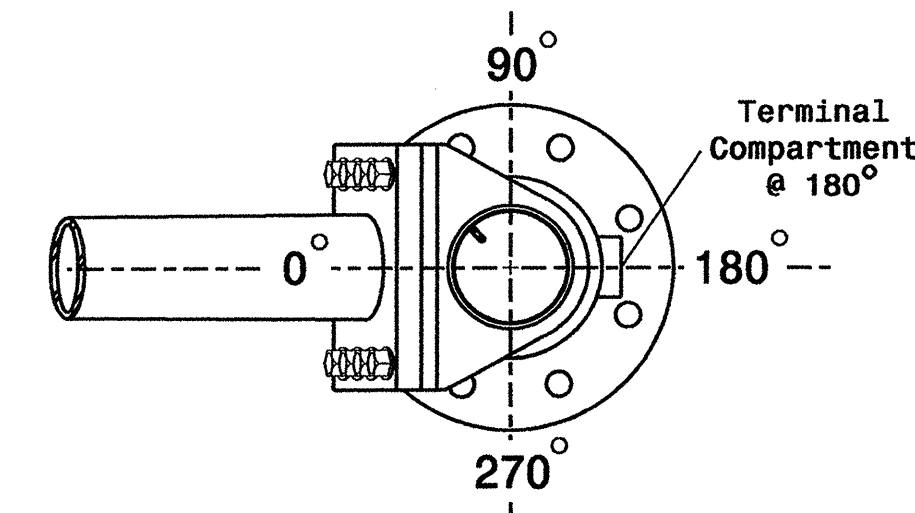
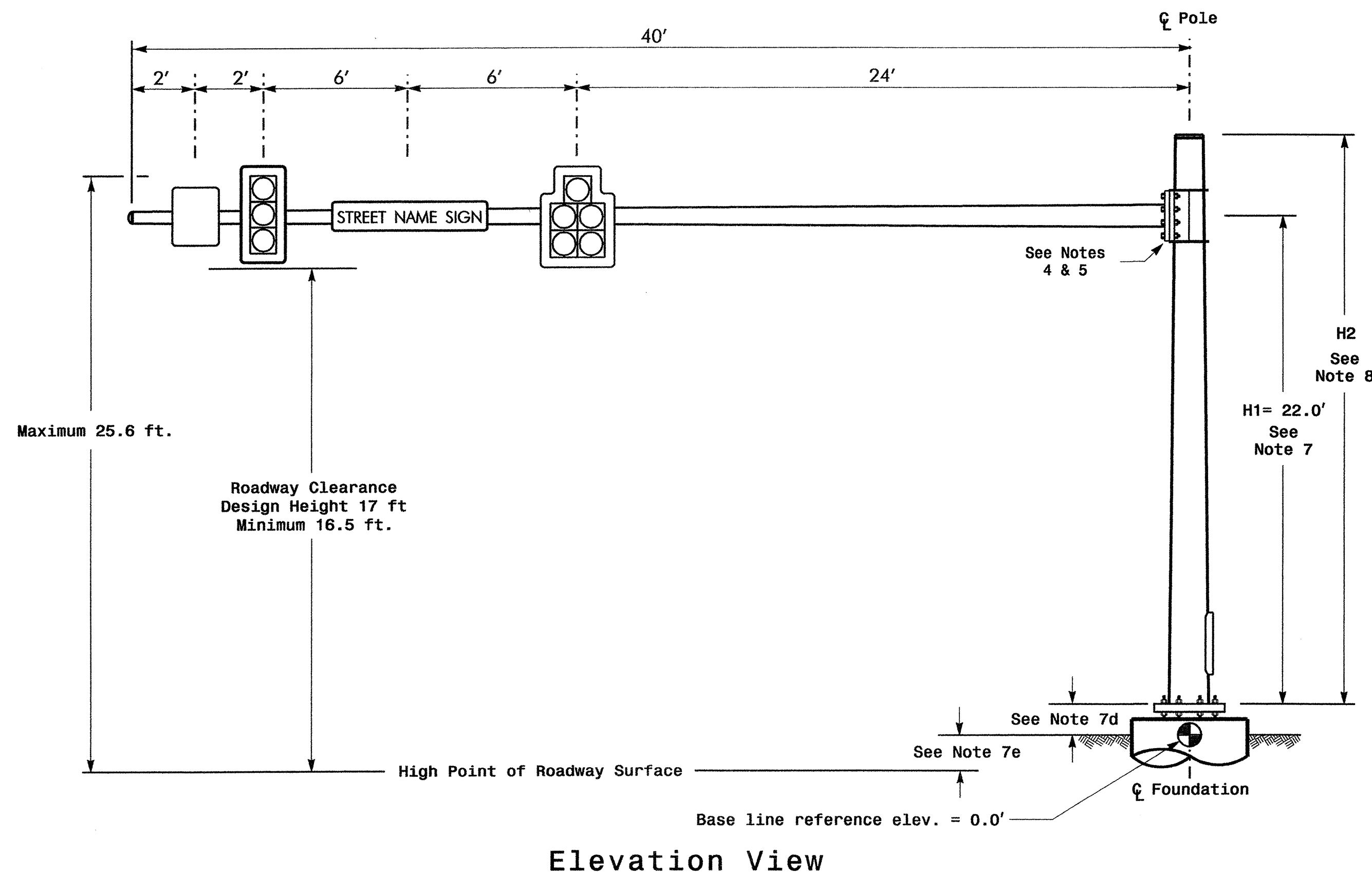
SIG. INVENTORY NO. 05-1866

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

Elevation Data for Mast Arm Attachment (H1)	
Elevation Differences for:	Pole 1
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.
Elevation difference at High point of roadway surface	+3.5 ft.
Elevation difference at Edge of travelway or face of curb	N/A

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"-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	5.0 S.F.	24.0" W X 30.0" L	11 LBS
	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

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



**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 2002 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
  - The 2002 NCDOT Roadway Standard Drawings.
  - The traffic signal project plans and special provisions.

**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.

**NOTES**

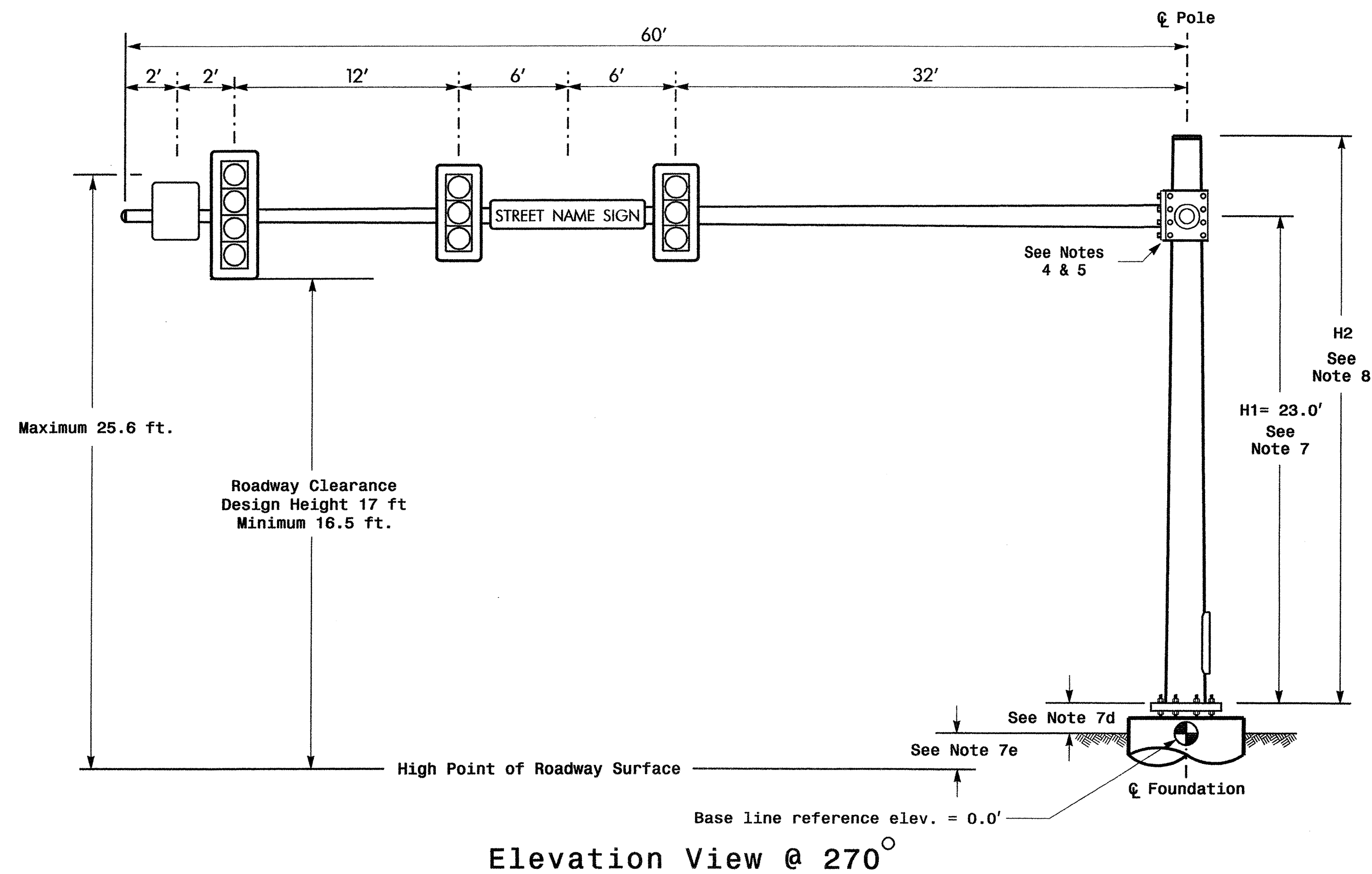
NCDOT Wind Zone 4 (90 mph)

	Prepared in the Offices of: <b>NC 98 Bypass</b> At <b>SR 1923 (Thompson Mill Road)</b> Division 5 Wake County Wake Forest		
	PLAN DATE: July 2007 PREPARED BY: Luhr	REVIEWED BY: I.O. Umozurike REVIEWED BY:	
SCALE: 0 N/A N/A	REVISIONS:	INIT. DATE:	SIG. INVENTORY NO. 05-1866

23-AUG-2007 16:22  
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 timothy.williams

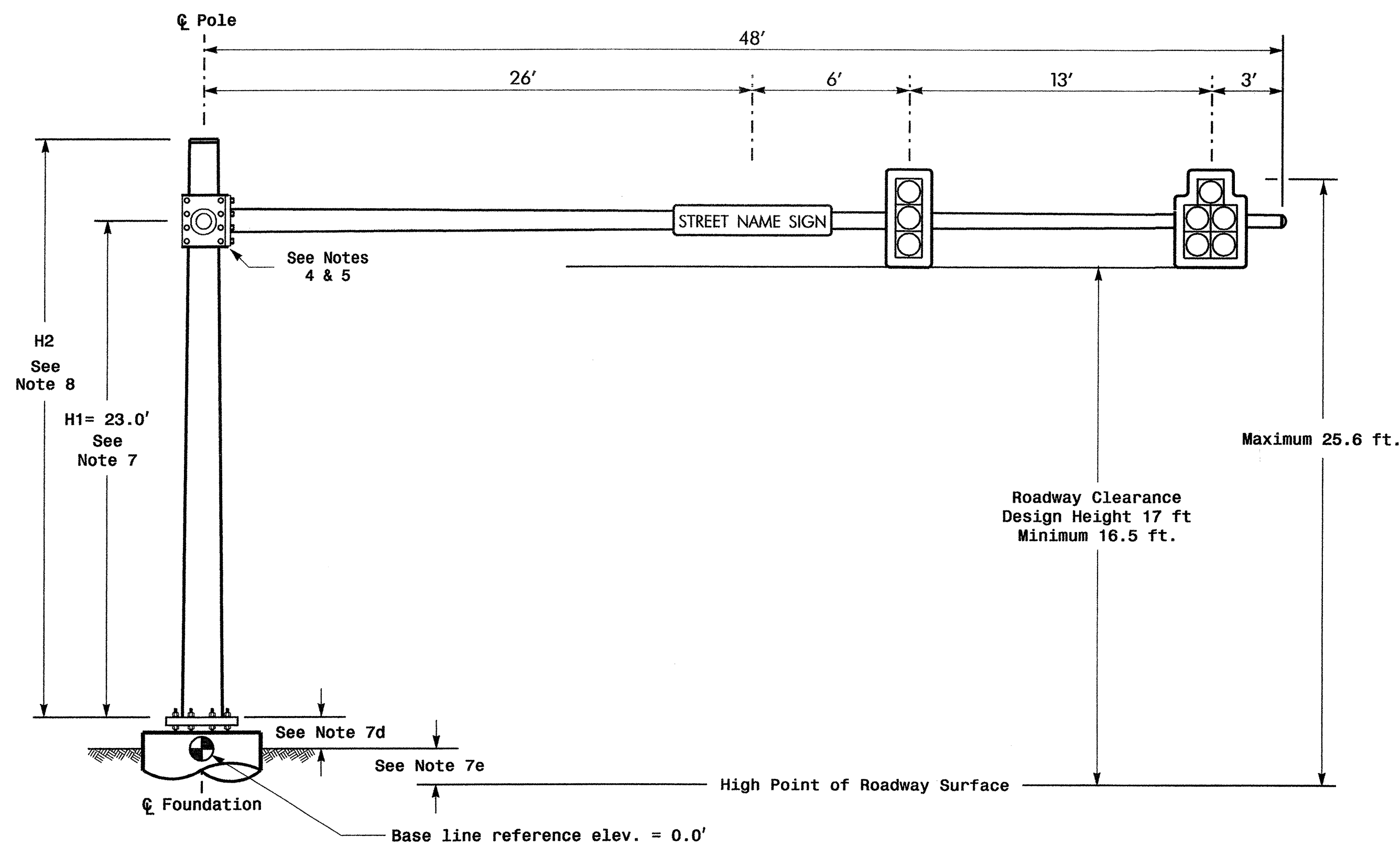


**Design Loading for METAL POLE NO. 2, MAST ARM A**



Elevation View @ 270°

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



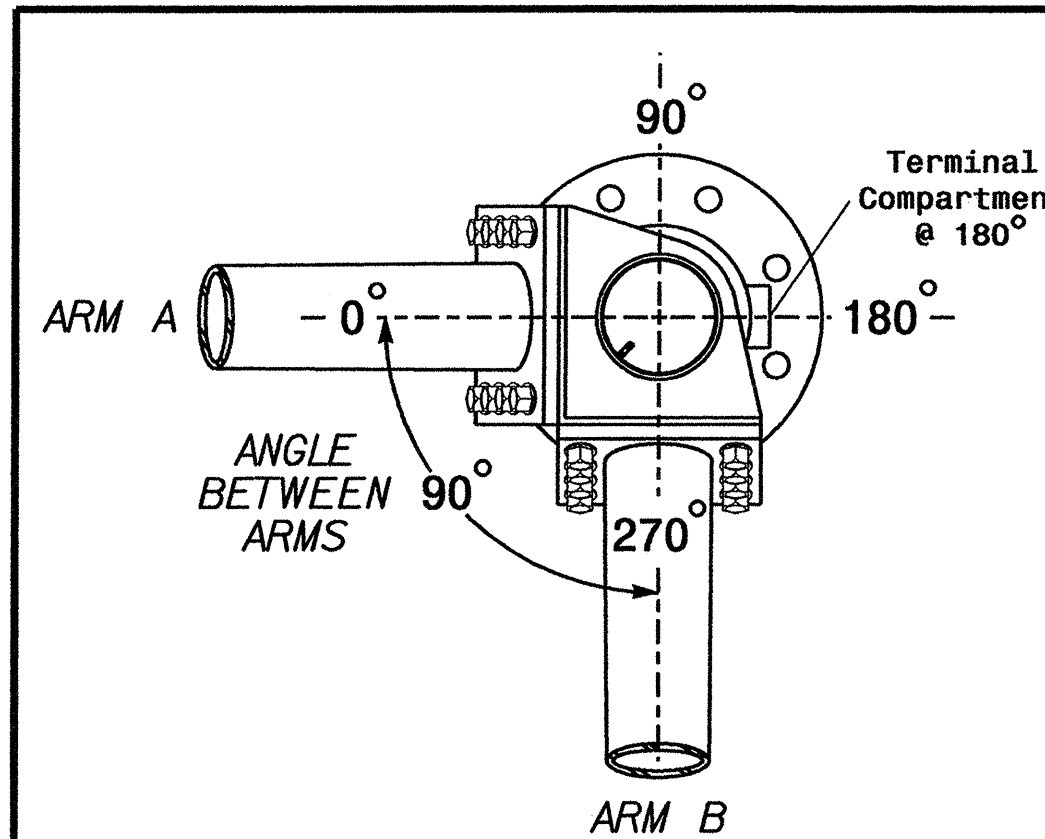
Elevation View @ 0°

**SPECIAL NOTE**

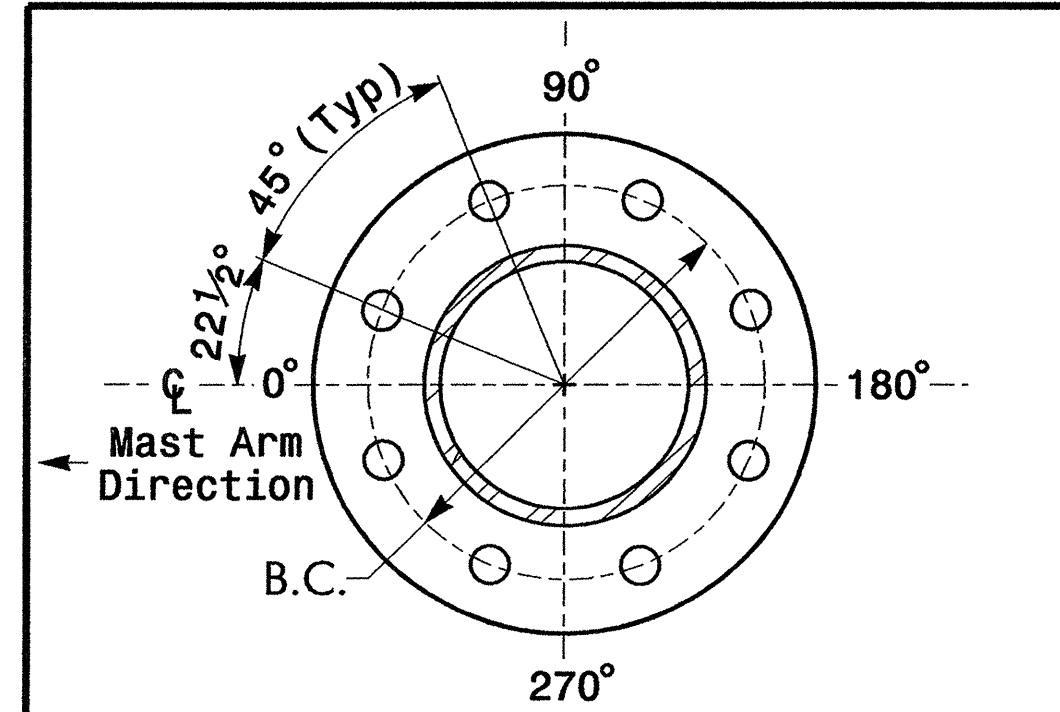
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

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

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+4.0 ft.	+4.0 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A

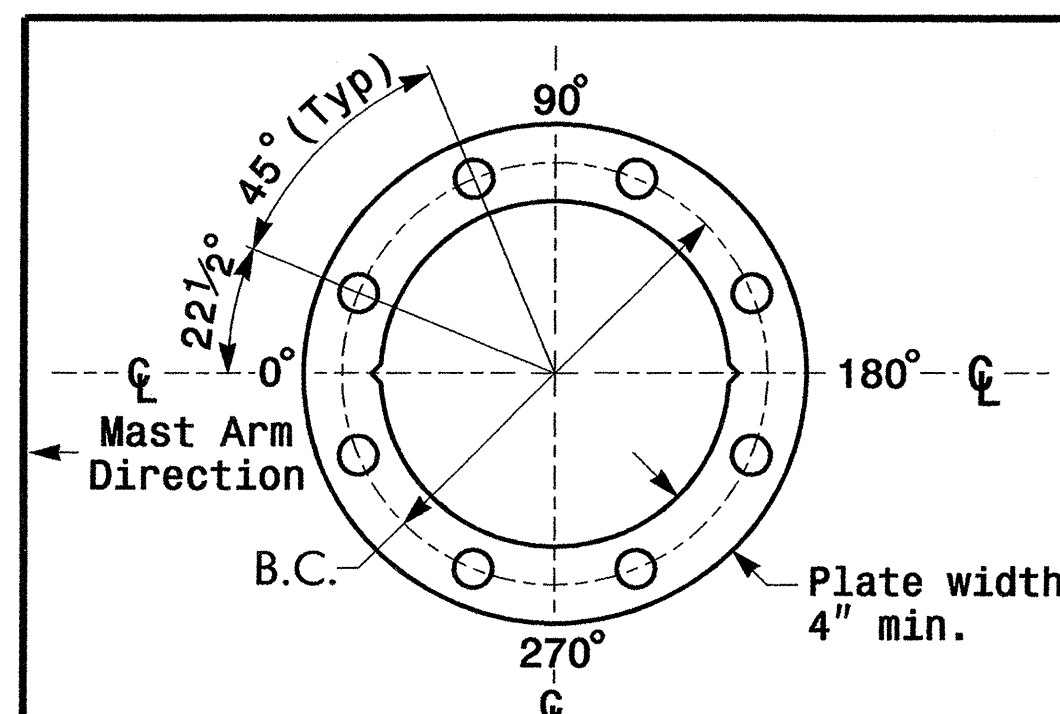


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



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

**METAL POLE No. 2**

PROJECT REFERENCE NO.	SHEET NO.
R-2809A	Sig. 7

**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	5.0 S.F.	24.0" W X 30.0" L	11 LBS
	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

**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 2002 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
  - The 2002 NCDOT Roadway Standard Drawings.
  - The traffic signal project plans and special provisions.

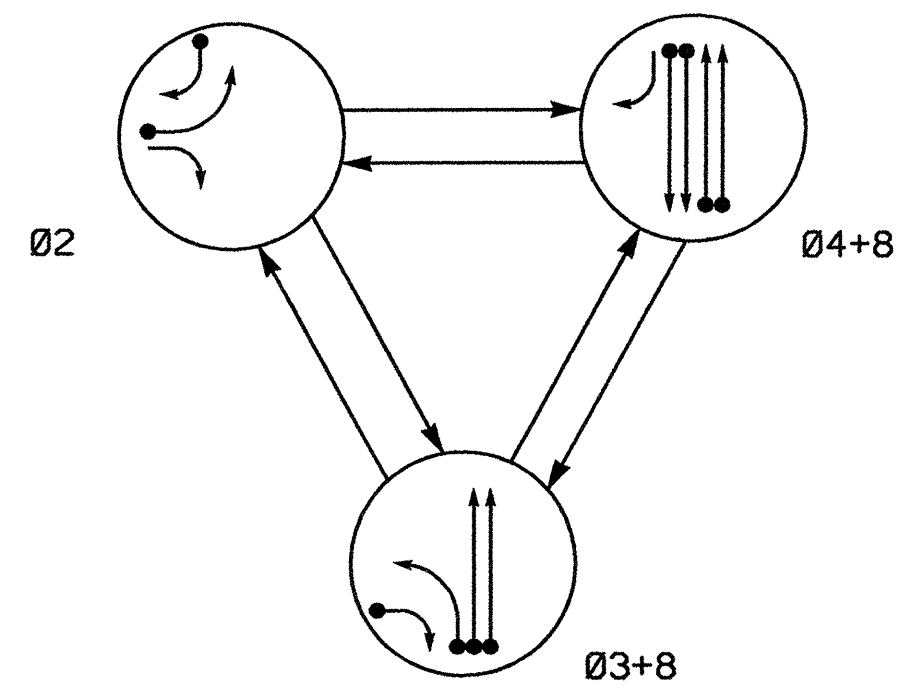
**Design Requirements**

- 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.

NCDOT Wind Zone 4 (90 mph)

	NC 98 Bypass At SR 1923 (Thompson Mill Road)		
	Division 5 Wake County Wake Forest PLAN DATE: July 2007 REVIEWED BY: I.O.Umozurike PREPARED BY: Luhr REVIEWED BY:	REVISIONS INIT. DATE	
SCALE N/A 0 N/A		SIGNATURE DATE T.J. Williams 8/29/07 SIG. INVENTORY NO. 05-1866	

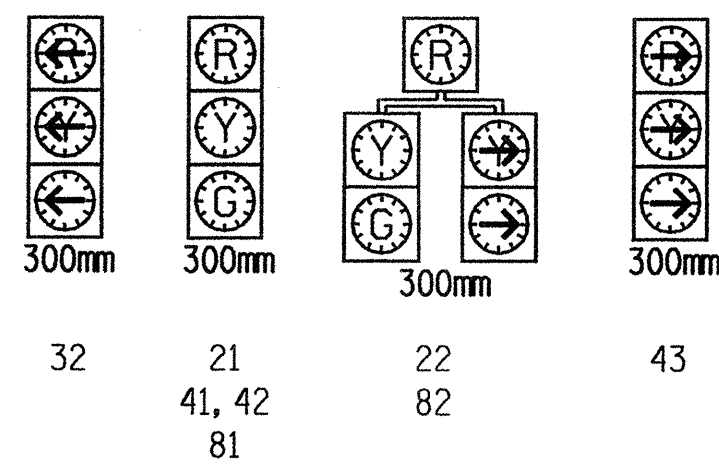
**PHASING DIAGRAM**



SIGNAL FACE	PHASE			
	02	03+8	04+8	F L S D H I
21	G	R	R	R
22	G	R	R	R
32	R	R	R	R
41, 42	R	R	G	Y
43	R	R	G	Y
81	R	G	G	Y
82	R	G	G	Y

**SIGNAL FACE I.D.**

Denotes L.E.D.



**PHASING DIAGRAM DETECTION LEGEND**

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

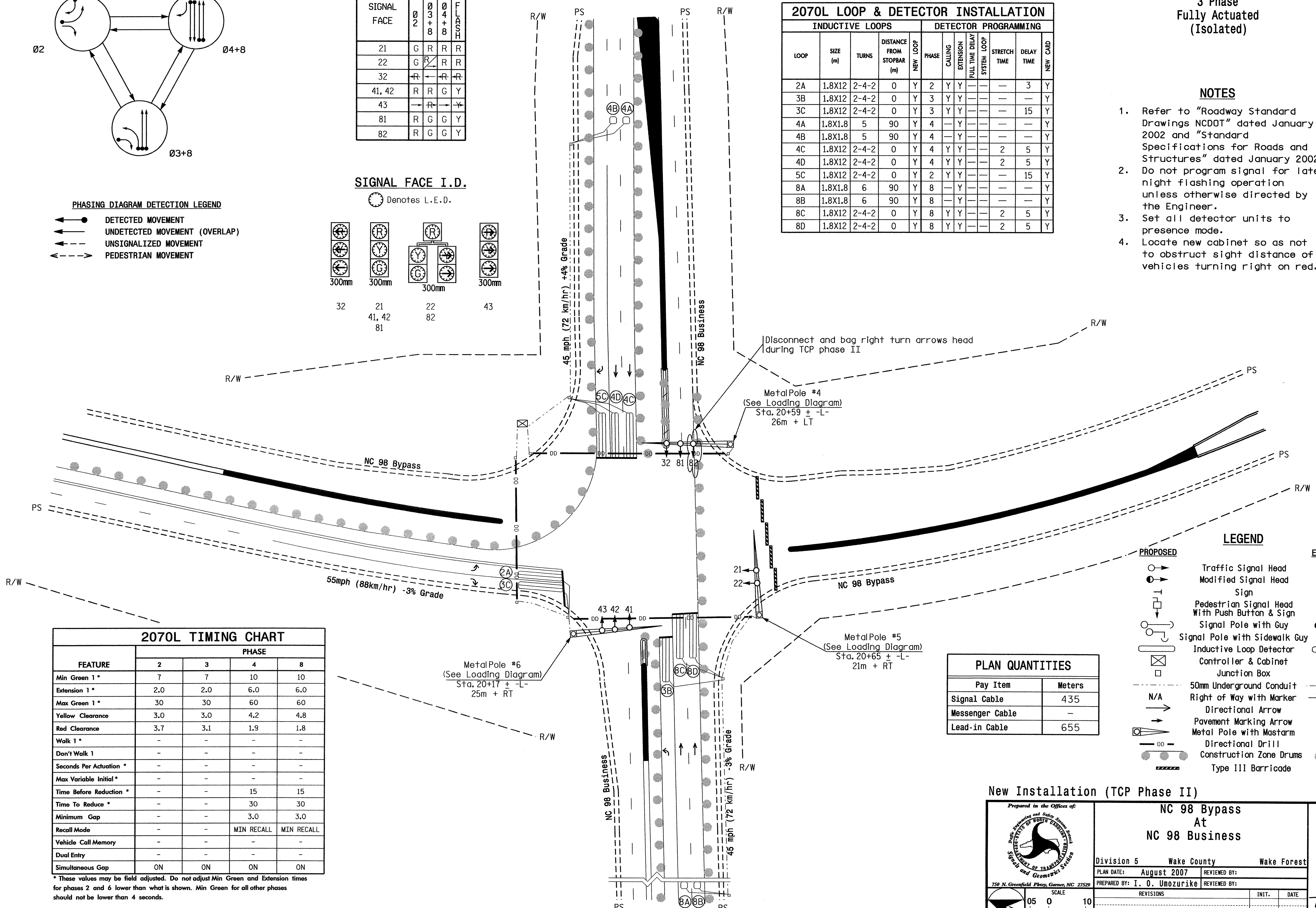
**2070L LOOP & DETECTOR INSTALLATION**

LOOP	SIZE (m)	TURNS	DISTANCE FROM STOPBAR (m)	NEW LOOP	DETECTOR PROGRAMMING							
					PHASE	CALLING	EXTENSION	FULL TIME DELAY	SYSTEM LOOP	STRETCH TIME	DELAY TIME	NEW CARD
2A	1.8X12	2-4-2	0	Y	2	Y	Y	-	-	-	3	Y
3B	1.8X12	2-4-2	0	Y	3	Y	Y	-	-	-	-	Y
3C	1.8X12	2-4-2	0	Y	3	Y	Y	-	-	-	15	Y
4A	1.8X1.8	5	90	Y	4	-	Y	-	-	-	-	Y
4B	1.8X1.8	5	90	Y	4	-	Y	-	-	-	-	Y
4C	1.8X12	2-4-2	0	Y	4	Y	Y	-	-	2	5	Y
4D	1.8X12	2-4-2	0	Y	4	Y	Y	-	-	2	5	Y
5C	1.8X12	2-4-2	0	Y	2	Y	Y	-	-	-	15	Y
8A	1.8X1.8	6	90	Y	8	-	Y	-	-	-	-	Y
8B	1.8X1.8	6	90	Y	8	-	Y	-	-	-	-	Y
8C	1.8X12	2-4-2	0	Y	8	Y	Y	-	-	2	5	Y
8D	1.8X12	2-4-2	0	Y	8	Y	Y	-	-	2	5	Y

**3 Phase Fully Actuated (Isolated)**

**NOTES**

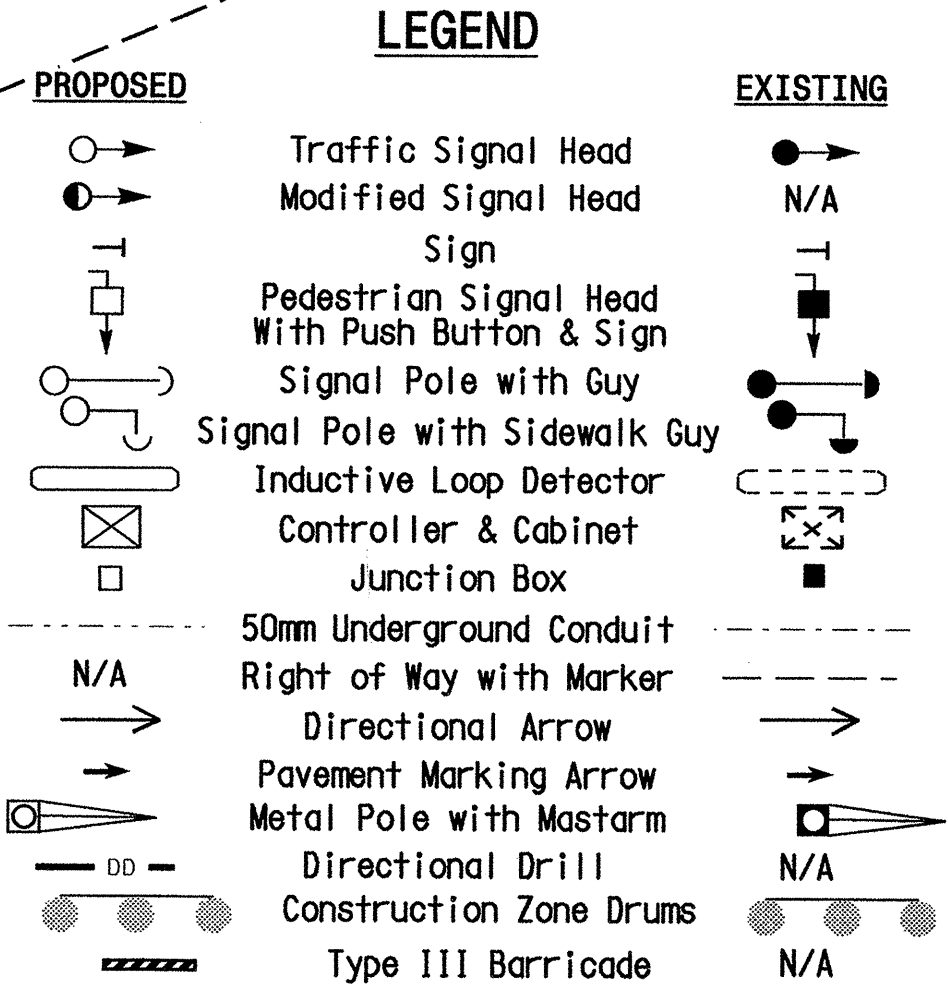
- Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Set all detector units to presence mode.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.



FEATURE	PHASE			
	2	3	4	8
Min Green 1*	7	7	10	10
Extension 1*	2.0	2.0	6.0	6.0
Max Green 1*	30	30	60	60
Yellow Clearance	3.0	3.0	4.2	4.8
Red Clearance	3.7	3.1	1.9	1.8
Walk 1*	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation*	-	-	-	-
Max Variable Initial*	-	-	-	-
Time Before Reduction*	-	-	15	15
Time To Reduce*	-	-	30	30
Minimum Gap	-	-	3.0	3.0
Recall Mode	-	-	MIN RECALL	MIN RECALL
Vehicle Call Memory	-	-	-	-
Dual Entry	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON

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

Pay Item	Meters
Signal Cable	435
Messenger Cable	-
Lead-in Cable	655



**New Installation (TCP Phase II)**

**NC 98 Bypass At NC 98 Business**

Division 5 Wake County Wake Forest

PLAN DATE: August 2007 REVIEWED BY:

PREPARED BY: I. O. UMOZURIKE REVIEWED BY:

759 N. Greenfield Pkwy, Garner, NC 27529

SCALE 1:500

SEAL NORTH CAROLINA PROFESSIONAL ENGINEER TIMOTHY J. WILLIAMS 24393

8/23/07

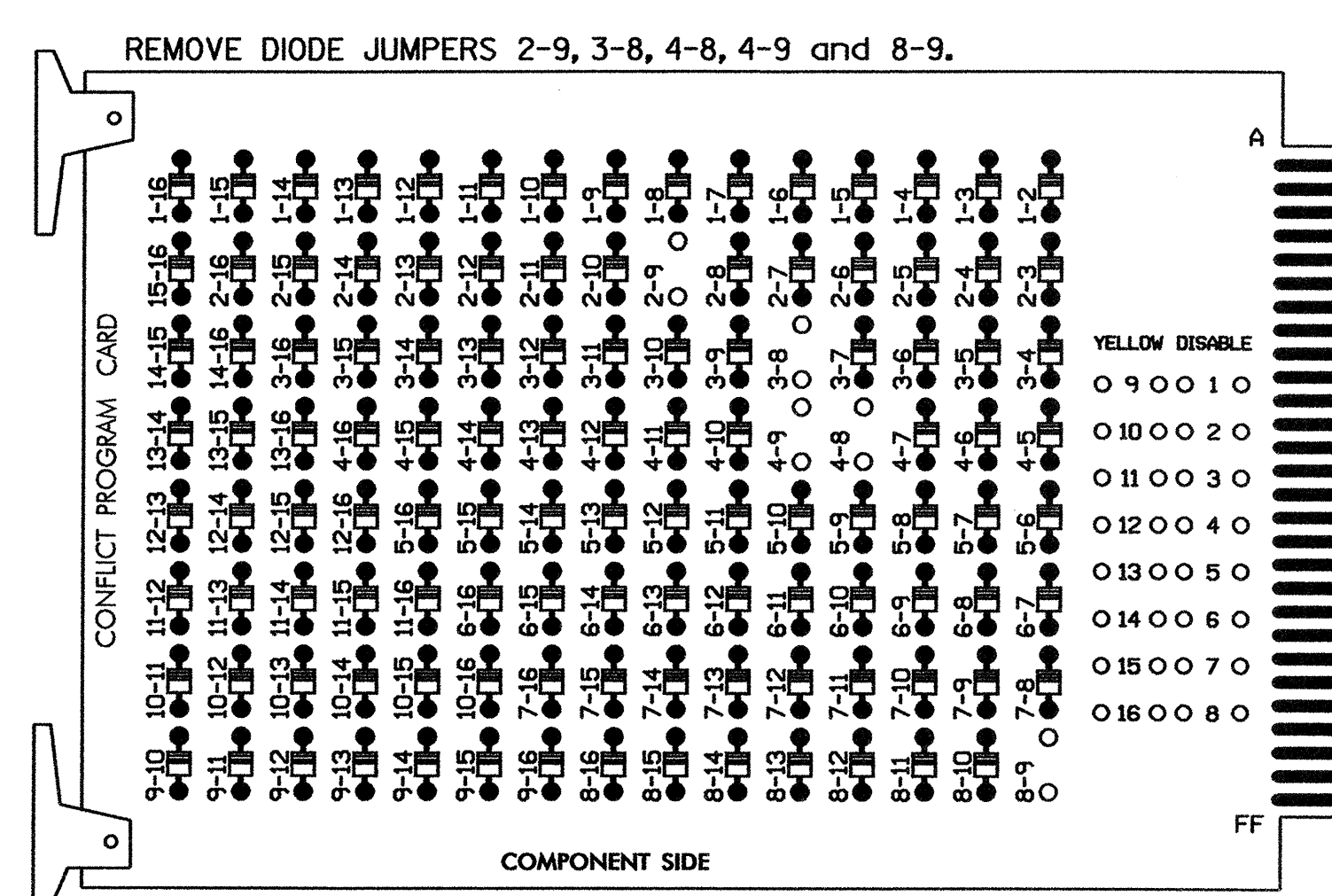
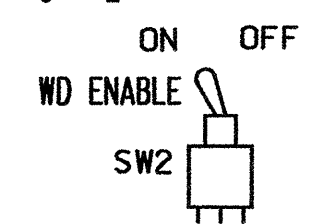
SIG. INVENTORY NO. 05-2300 T1

05-2300-2007-18-564  
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 timozurike



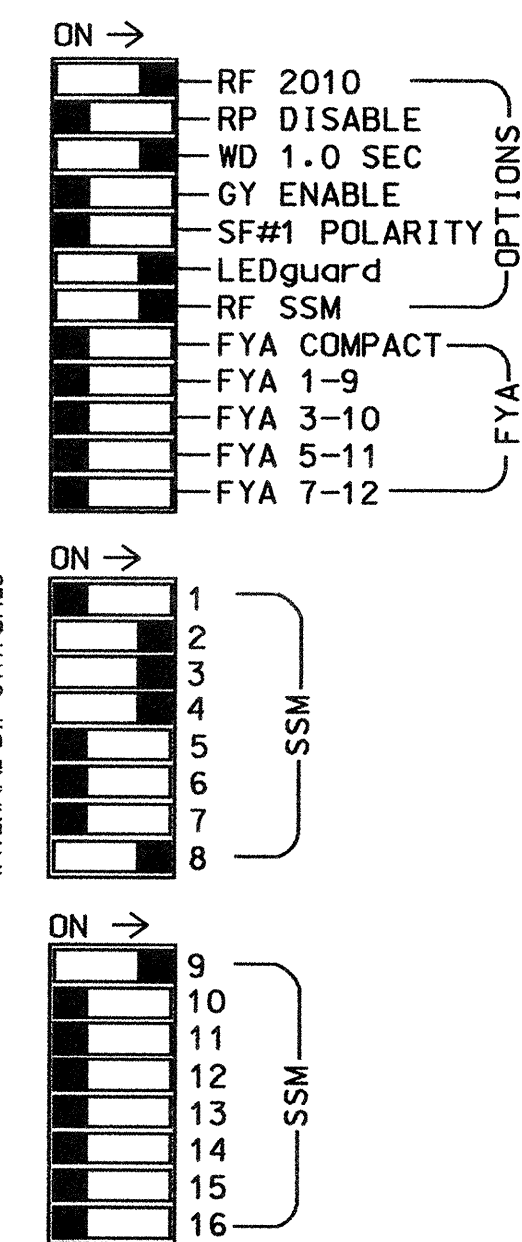
**EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL**

(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 2-9, 3-8, 4-8, 4-9 and 8-9.

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.

**NOTES**

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,5,6, 7,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
- Program phase 2, on the controller unit, for Start Up In Green.
- Enable Simultaneous Gap-Out, on the controller unit, for all phases.
- Program phases 4 and 8, on the controller unit, for Gap Reduction.

**EQUIPMENT INFORMATION**

CONTROLLER.....CONTRACTOR SUPPLIED 2070L  
 CABINET.....CONTRACTOR SUPPLIED 332  
 SOFTWARE.....ECONOLITE OASIS  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)  
 LOAD SWITCHES USED.....S2,S3,S4,S8,S9  
 PHASES USED.....2,3,4,8  
 OVERLAP A:.....2+4  
 OVERLAP B:.....NONE  
 OVERLAP C:.....NONE  
 OVERLAP D:.....NONE

**SIGNAL HEAD HOOK-UP CHART**

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14	
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	9	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	22	32	41,42	NU	NU	NU	NU	81,82	NU	43	NU	NU	NU	NU	NU	NU
RED		128			101						107								
YELLOW		129			102						108								
GREEN		130			103						109								
RED ARROW					116														A121
YELLOW ARROW					117	117													A122
GREEN ARROW					118	118													A123

NU = NOT USED

Wire Overlap 'A' to flash on Flasher unit #2, Circuit #2.

**OVERLAP PROGRAMMING DETAIL**

(program controller as shown below)

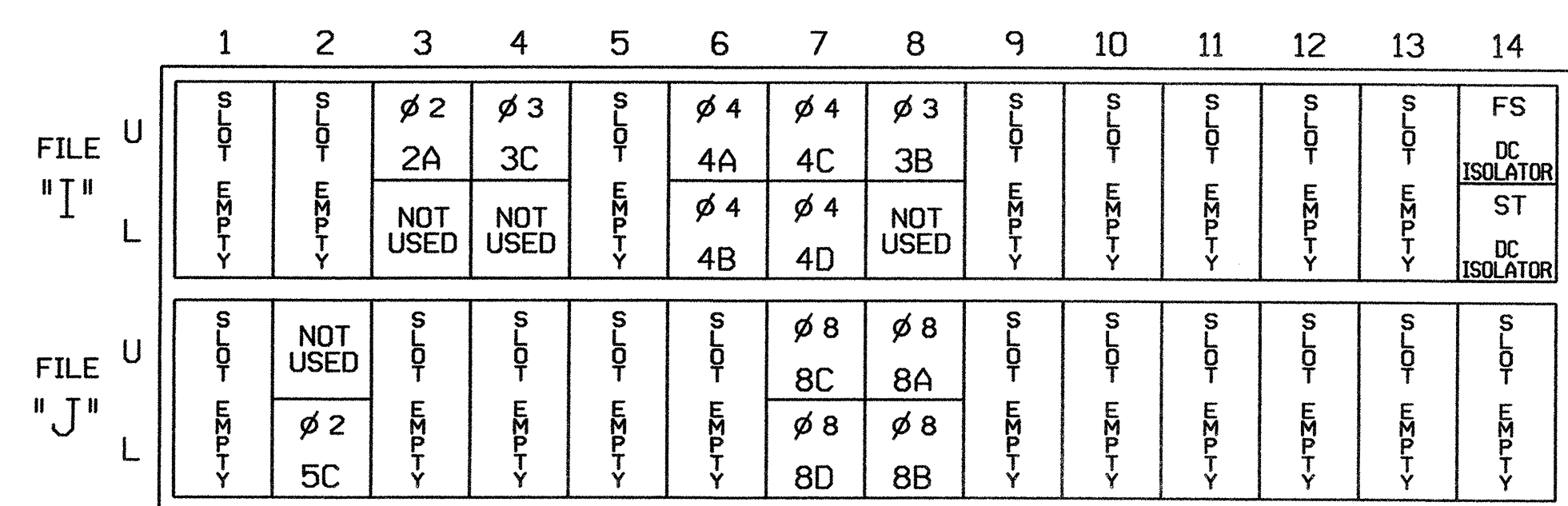
FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

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

OVERLAP PROGRAMMING COMPLETE

**INPUT FILE POSITION LAYOUT**

(front view)



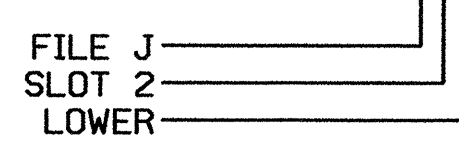
EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE  
 ST = STOP TIME

**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A	TB2-9,10	I3U	63	25	32	2	Y	Y			3
3C	TB4-1,2	I4U	47	9	22	3	Y	Y			15
4A	TB4-9,10	I6U	41	3	4	4		Y			
4B	TB4-11,12	I6L	45	7	14	4		Y			
4C	TB6-1,2	I7U	65	27	34	4	Y	Y		2	5
4D	TB6-3,4	I7L	78	40	44	4	Y	Y		2	5
3B	TB6-5,6	I8U	49	11	24	3	Y	Y			
5C	TB3-7,8	J2L	44	6	16	2	Y	Y			15
8C	TB7-1,2	J7U	66	28	38	8	Y	Y		2	5
8D	TB7-3,4	J7L	79	41	48	8	Y	Y		2	5
8A	TB7-5,6	J8U	50	12	28	8		Y			
8B	TB7-7,8	J8L	50	12	28	8		Y			

INPUT FILE POSITION LEGEND: J2L



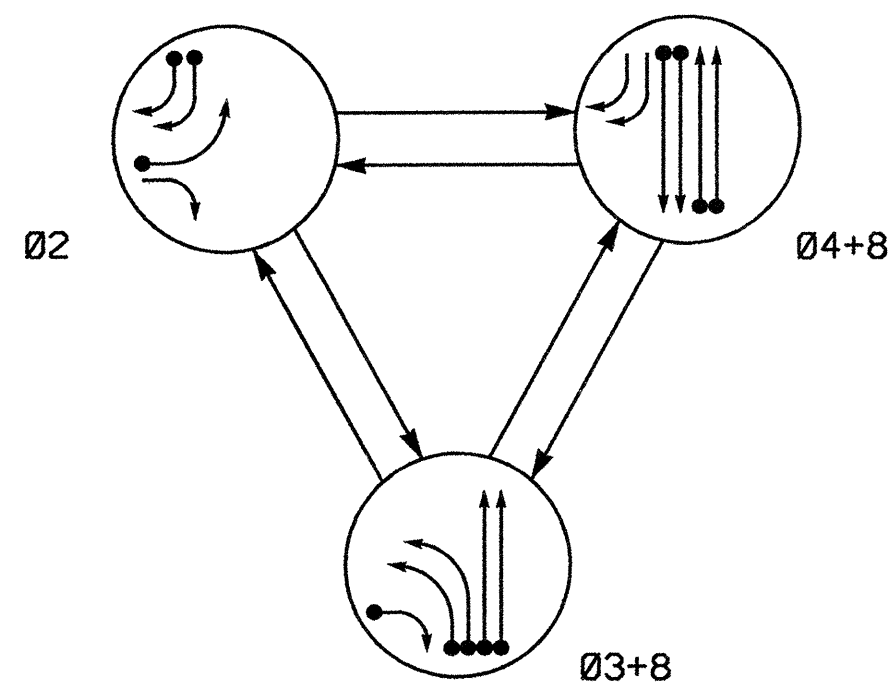
THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2300 T1  
 DESIGNED: August 2007  
 SEALED: 08-23-07  
 REVISED: N/A

**New Installation - Temporary 1**

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared in the Offices of:  750 N. Greenfield Pkwy, Garner, NC 27529	<b>NC 98 Bypass at NC 98 Business</b>		SEAL  JOHN T. ROWE, P.E.
	Division 5 Wake County Wake Forest PLAN DATE: August 2007 REVIEWED BY: JTR PREPARED BY: James Peterson REVIEWED BY:	REVISIONS INIT. DATE	
SIGNATURE: <i>John T. Rowe</i> DATE: 8-29-07			SIG. INVENTORY NO. 05-2300 T1

24-AUG-2007 09:02  
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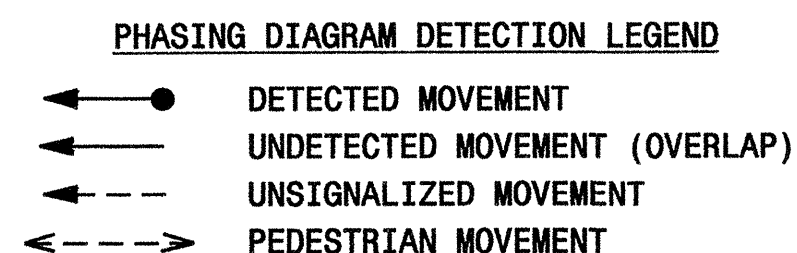
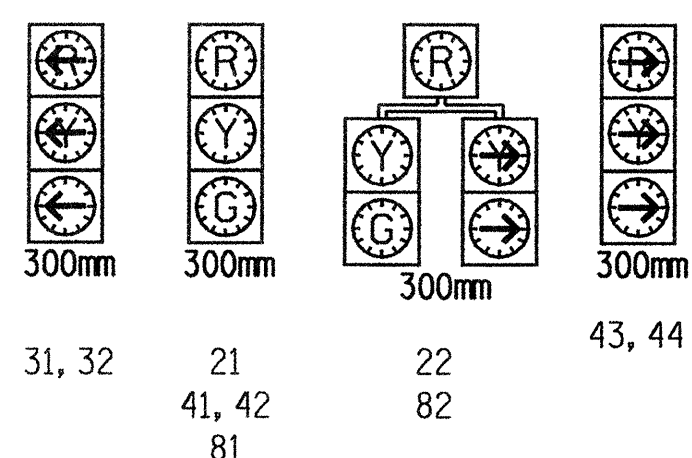
**PHASING DIAGRAM**



SIGNAL FACE	PHASE			
	Ø 2	Ø 3 + 8	Ø 4 + 8	F LASH
21	G	R	R	R
22	G	R	R	R
31, 32	R	R	R	R
41, 42	R	R	G	Y
43, 44	R	R	G	Y
81	R	G	G	Y
82	R	G	G	Y

**SIGNAL FACE I.D.**

Denotes L.E.D.



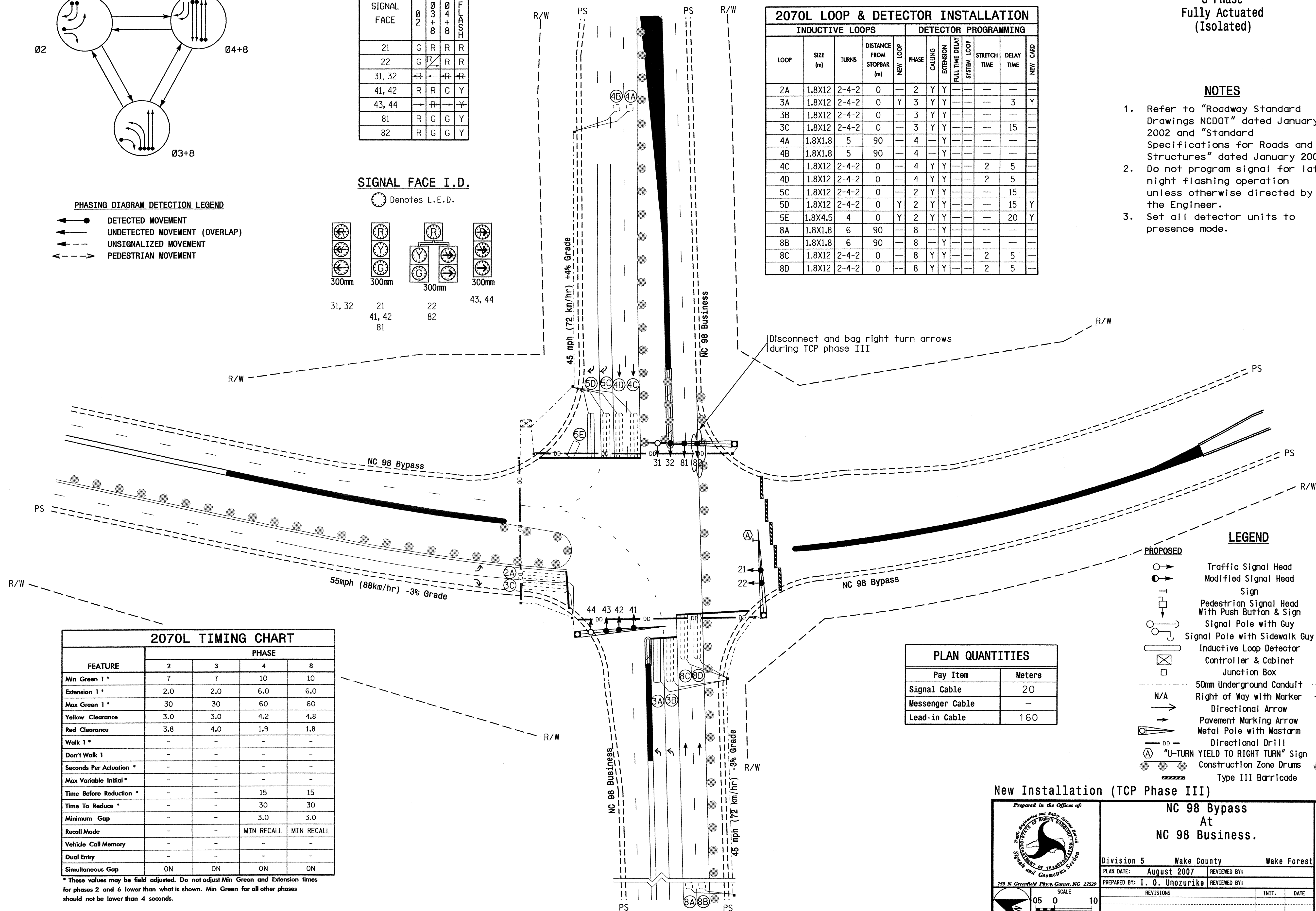
**2070L LOOP & DETECTOR INSTALLATION**

LOOP	SIZE (m)	TURNS	DISTANCE FROM STOPBAR (m)	NEW LOOP	DETECTOR PROGRAMMING						
					PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	NEW CARD
2A	1.8X12	2-4-2	0	-	2	Y	Y	-	-	-	-
3A	1.8X12	2-4-2	0	Y	3	Y	Y	-	-	3	Y
3B	1.8X12	2-4-2	0	-	3	Y	Y	-	-	-	-
3C	1.8X12	2-4-2	0	-	3	Y	Y	-	-	15	-
4A	1.8X1.8	5	90	-	4	-	Y	-	-	-	-
4B	1.8X1.8	5	90	-	4	-	Y	-	-	-	-
4C	1.8X12	2-4-2	0	-	4	Y	Y	-	2	5	-
4D	1.8X12	2-4-2	0	-	4	Y	Y	-	2	5	-
5C	1.8X12	2-4-2	0	-	2	Y	Y	-	-	15	-
5D	1.8X12	2-4-2	0	Y	2	Y	Y	-	-	15	Y
5E	1.8X4.5	4	0	Y	2	Y	Y	-	-	20	Y
8A	1.8X1.8	6	90	-	8	-	Y	-	-	-	-
8B	1.8X1.8	6	90	-	8	-	Y	-	-	-	-
8C	1.8X12	2-4-2	0	-	8	Y	Y	-	2	5	-
8D	1.8X12	2-4-2	0	-	8	Y	Y	-	2	5	-

**3 Phase Fully Actuated (Isolated)**

**NOTES**

- Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Set all detector units to presence mode.



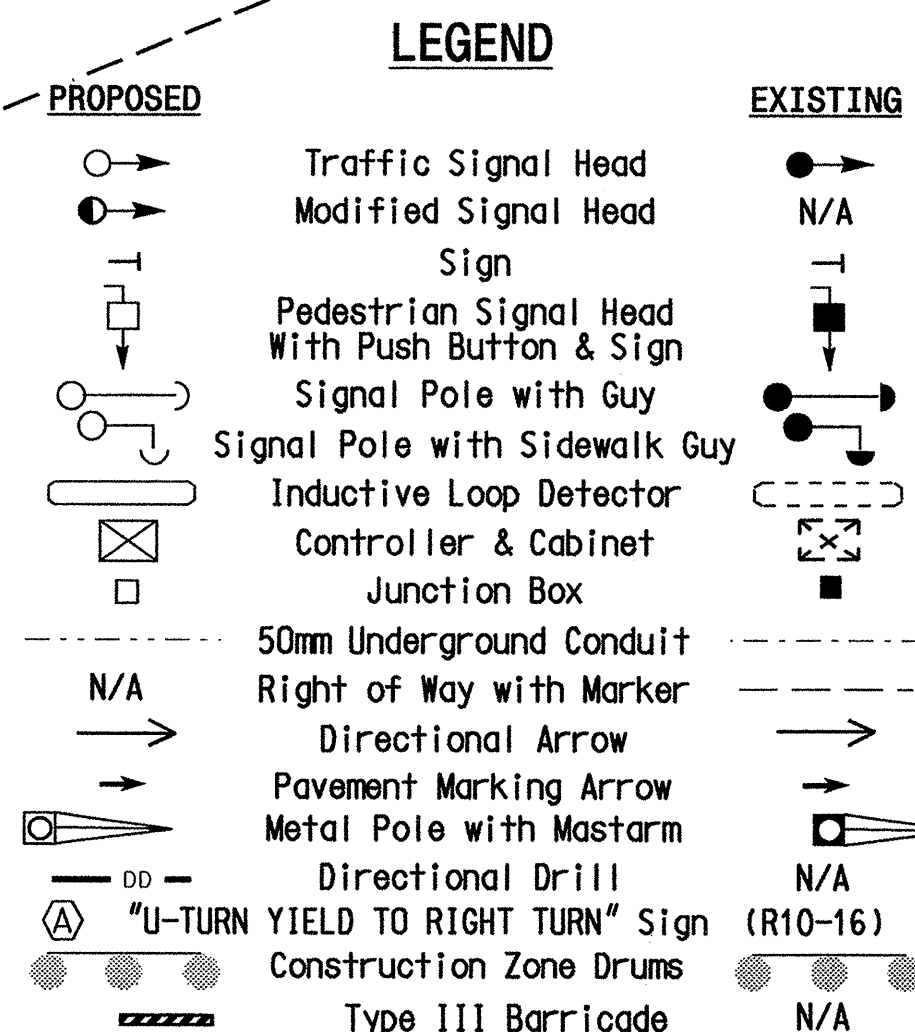
**2070L TIMING CHART**

FEATURE	PHASE			
	2	3	4	8
Min Green 1 *	7	7	10	10
Extension 1 *	2.0	2.0	6.0	6.0
Max Green 1 *	30	30	60	60
Yellow Clearance	3.0	3.0	4.2	4.8
Red Clearance	3.8	4.0	1.9	1.8
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	-	-	15	15
Time To Reduce *	-	-	30	30
Minimum Gap	-	-	3.0	3.0
Recall Mode	-	-	MIN RECALL	MIN RECALL
Vehicle Call Memory	-	-	-	-
Dual Entry	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON

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

**PLAN QUANTITIES**

Pay Item	Meters
Signal Cable	20
Messenger Cable	-
Lead-in Cable	160



**New Installation (TCP Phase III)**

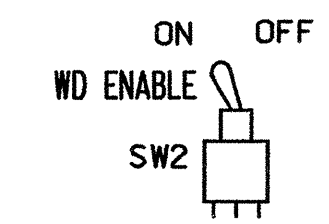
	<p><b>NC 98 Bypass At NC 98 Business.</b></p>		<p>SEAL</p>
	<p>Division 5 Wake County Wake Forest</p>		
<p>750 N. Greenfield Pkwy, Cary, NC 27529</p>	<p>PLAN DATE: August 2007</p>	<p>REVIEWED BY:</p>	<p>PREPARED BY: I. O. Umozurike</p>
<p>SCALE 1:500</p>	<p>REVISIONS</p>	<p>INIT.</p>	<p>DATE</p>
<p>8/23/07</p>			<p>SIG. INVENTORY NO. 05-2300 T2</p>

29-AUG-2007 12:04  
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 I. O. Umozurike

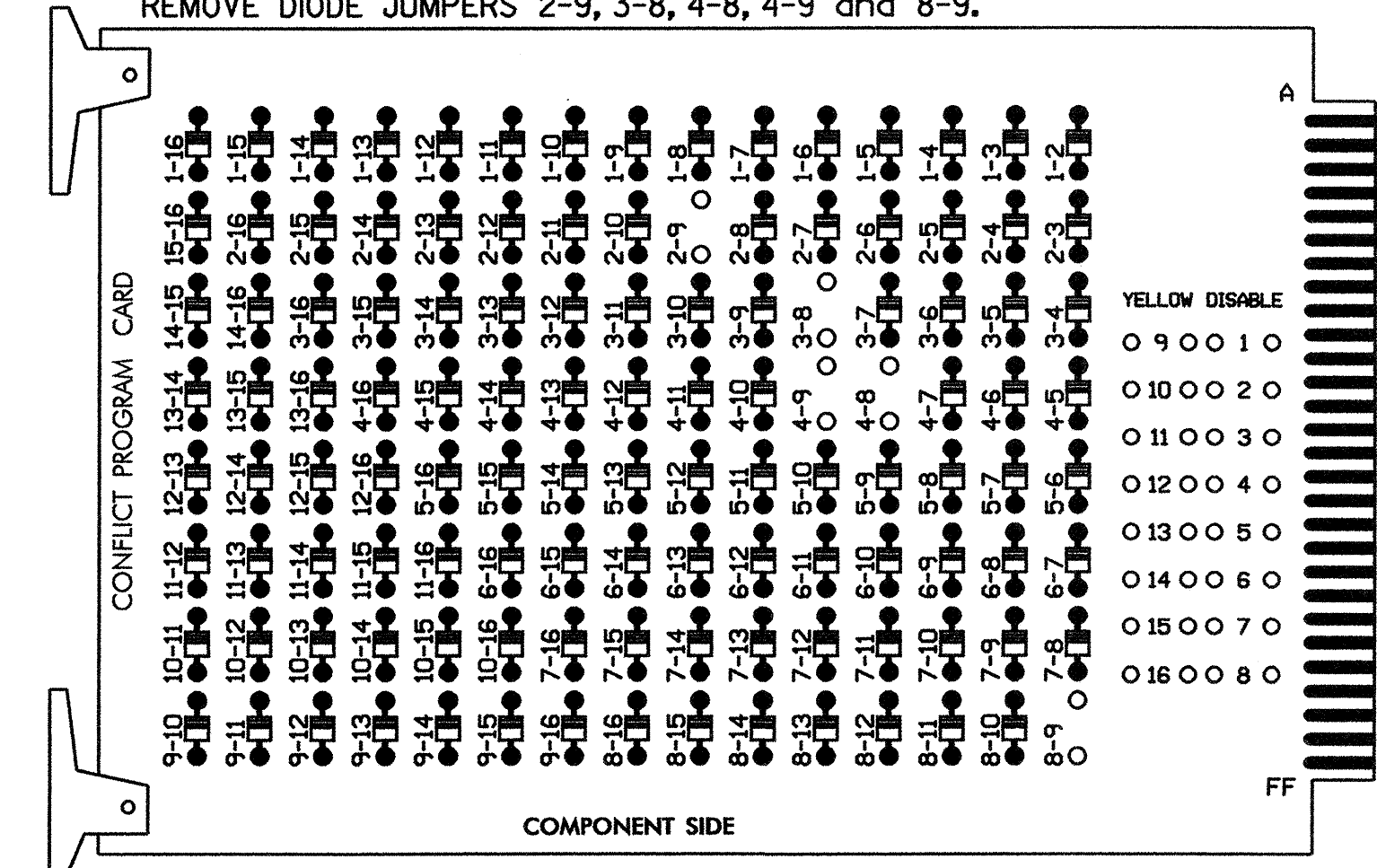


### EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



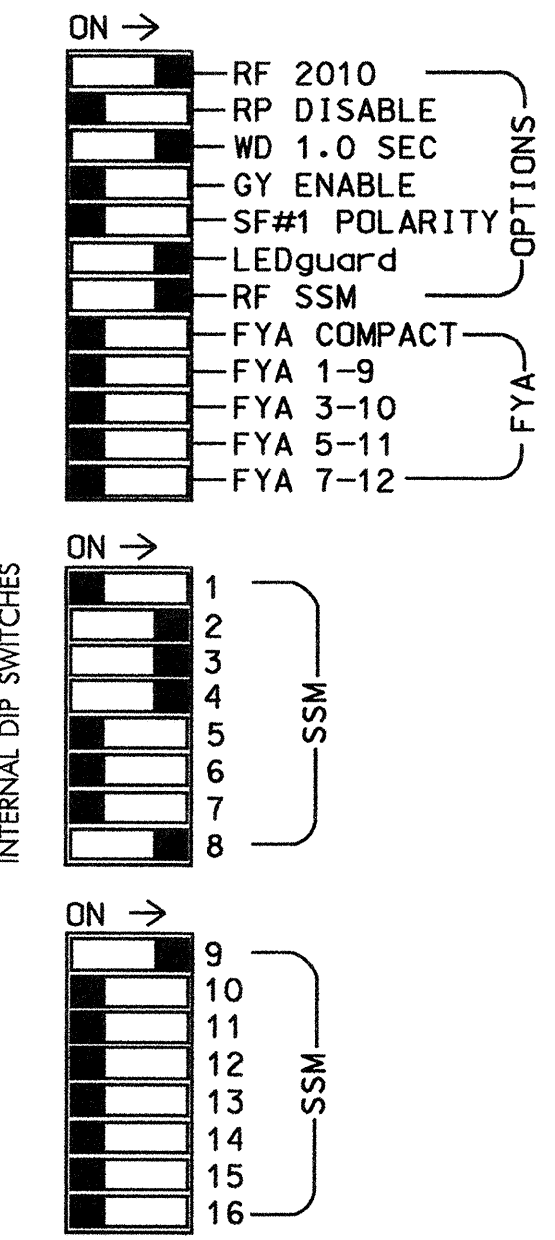
REMOVE DIODE JUMPERS 2-9, 3-8, 4-8, 4-9 and 8-9.



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.



■ = 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. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 1,5,6,7,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
- Program phase 2, on the controller unit, for Start Up In Green.
- Enable Simultaneous Gap-Out, on the controller unit, for all phases.
- Program phases 4 and 8, on the controller unit, for Gap Reduction.

### SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	22	31,32	41,42	NU	NU	NU	NU	81,82	NU	43,44	NU	NU	NU	NU	NU
RED		128			101						107							
YELLOW		129			102						108							
GREEN		130			103						109							
RED ARROW					116								A121					
YELLOW ARROW					117	117								A122				
GREEN ARROW					118	118								A123				

NU = NOT USED

Wire Overlap 'A' to flash on Flasher unit #2, Circuit #2.

### EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L  
 CABINET.....CONTRACTOR SUPPLIED 332  
 SOFTWARE.....ECONOLITE OASIS  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)  
 LOAD SWITCHES USED.....S2,S3,S4,S8,S9  
 PHASES USED.....2,3,4,8  
 OVERLAP A:.....2+4  
 OVERLAP B:.....NONE  
 OVERLAP C:.....NONE  
 OVERLAP D:.....NONE

### OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

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

```

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

OVERLAP PROGRAMMING COMPLETE

### INPUT FILE POSITION LAYOUT

(front view)

FILE	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	FS	FS	∅ 2	∅ 3	∅ 3	∅ 4	∅ 4	∅ 3	FS	FS	FS	FS	FS	FS
I	FS	FS	2A	3C	3A	4A	4C	3B	FS	FS	FS	FS	FS	FS
L	FS	FS	NOT USED	NOT USED	NOT USED	∅ 4	∅ 4	NOT USED	FS	FS	FS	FS	FS	FS
U	FS	FS	∅ 2	∅ 2	FS	∅ 8	∅ 8	FS	FS	FS	FS	FS	FS	FS
J	FS	FS	5D	5E	FS	8C	8A	FS	FS	FS	FS	FS	FS	FS
L	FS	FS	NOT USED	NOT USED	FS	∅ 8	∅ 8	FS	FS	FS	FS	FS	FS	FS
U	FS	FS	5C	FS	FS	8D	8B	FS	FS	FS	FS	FS	FS	FS

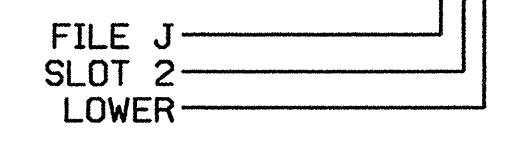
EX. : 1A, 2A, ETC. = LOOP NO.\*S

FS = FLASH SENSE  
 ST = STOP TIME

### INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A	TB2-9,10	I3U	63	25	32	2	Y	Y			
3C	TB4-1,2	I4U	47	9	22	3	Y	Y			15
3A	TB4-5,6	I5U	58	20	3	3	Y	Y			3
4A	TB4-9,10	I6U	41	3	4	4		Y			
4B	TB4-11,12	I6L	45	7	14	4		Y			
4C	TB6-1,2	I7U	65	27	34	4	Y	Y			5
4D	TB6-3,4	I7L	78	40	44	4	Y	Y		2	5
3B	TB6-5,6	I8U	49	11	24	3	Y	Y			
5C	TB3-7,8	J2L	44	6	16	2	Y	Y			15
5D	TB5-1,2	J4U	48	10	26	2	Y	Y			15
5E	TB5-5,6	J5U	57	19	7	2	Y	Y			20
8C	TB7-1,2	J7U	66	28	38	8	Y	Y		2	5
8D	TB7-3,4	J7L	79	41	48	8	Y	Y		2	5
8A	TB7-5,6	J8U	50	12	28	8		Y			
8B	TB7-7,8	J8L	50	12	28	8		Y			

INPUT FILE POSITION LEGEND: J2L



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2300 T2  
 DESIGNED: August 2007  
 SEALED: 08-23-07  
 REVISED: N/A

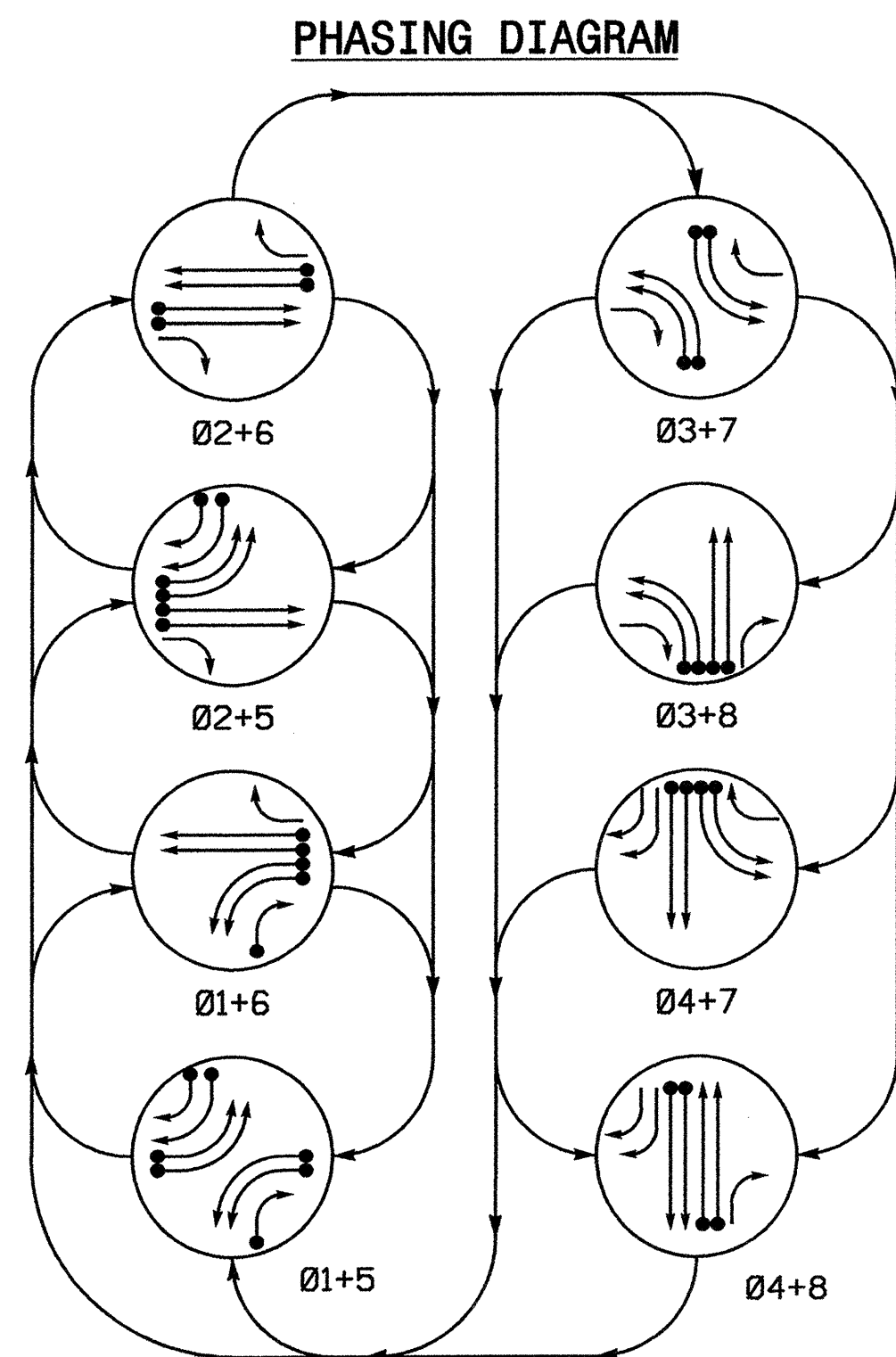
New Installation - Temporary 2

	ELECTRICAL AND PROGRAMMING DETAILS FOR:		SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 008453 JOHN T. ROWE, ESQ.
	Prepared in the Offices of: James Peterson 750 N. Greenfield Pkwy, Garner, NC 27529		
NC 98 Bypass at NC 98 Business Division 5 Wake County Wake Forest		PLAN DATE: August 2007 REVIEWED BY: JTR PREPARED BY: James Peterson REVIEWED BY:	
REVISIONS:		INIT. DATE	
SIGNATURE: <i>James Peterson</i> 8-23-07		DATE:	

SIG. INVENTORY NO. 05-2300 T2

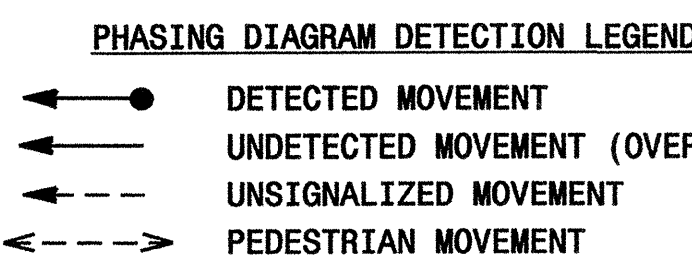
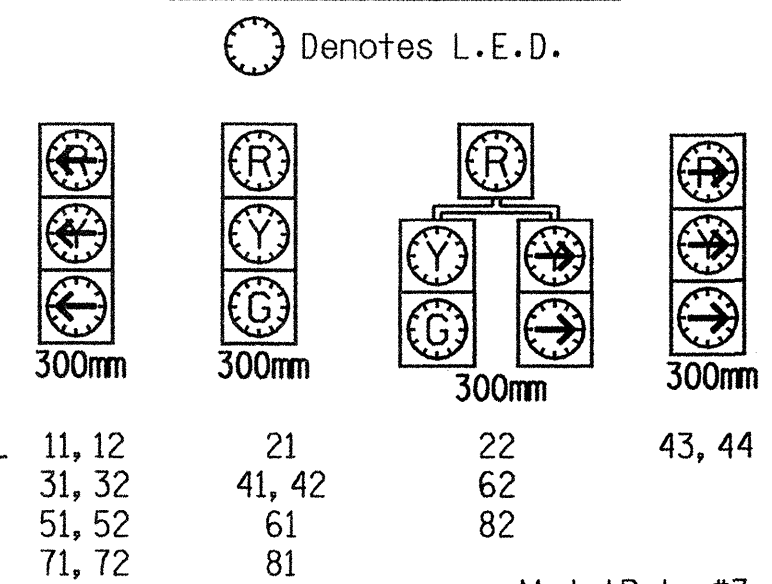
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SIGNAL FACE	PHASE								FLASH
	01+5	02+5	03+5	04+5	01+6	02+6	03+6	04+6	
11, 12	---	RR	RR	RR	RR	RR	RR	RR	---
21	R	R	G	G	R	R	R	R	Y
22	R	R	G	G	R	R	R	R	Y
31, 32	RR	RR	RR	RR	RR	RR	RR	RR	---
41, 42	R	R	R	R	R	R	G	G	R
43, 44	---	RR	RR	RR	RR	RR	RR	RR	---
51, 52	---	RR	RR	RR	RR	RR	RR	RR	---
61	R	G	R	G	R	R	R	R	Y
62	R	G	R	G	R	R	R	R	Y
71, 72	RR	RR	RR	RR	RR	RR	RR	RR	---
81	R	R	R	R	R	G	R	G	R
82	R	R	R	R	R	G	R	G	R

SIGNAL FACE I.D.

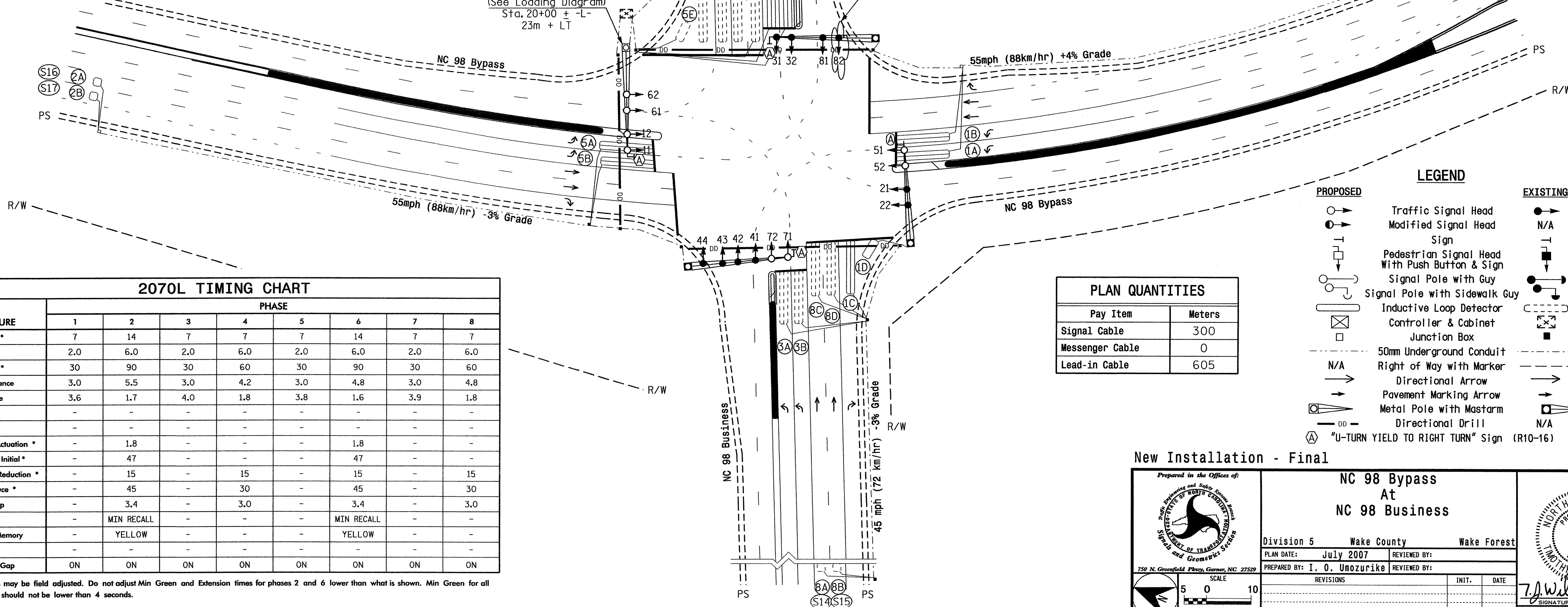
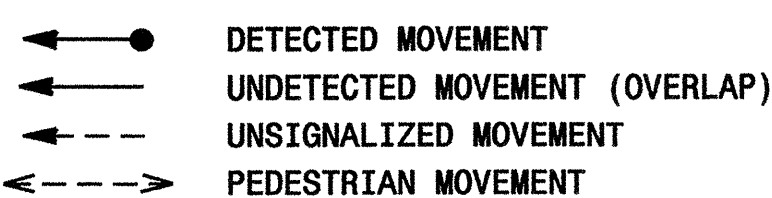


2070 LOOP & DETECTOR INSTALLATION											
INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	TURNS	DISTANCE FROM STOPBAR (FT)	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY SYSTEM LOOP	STRETCH TIME	DELAY TIME	NEW CARD
1A	1.8X12	2-4-2	0	Y	1	Y	Y	---	---	3	Y
1B	1.8X12	2-4-2	0	Y	1	Y	Y	---	---	---	Y
1C	1.8X12	2-4-2	0	Y	1	Y	Y	---	---	15	Y
1D	1.8X4.5	4	0	Y	1	Y	Y	---	---	15	---
2A/S16	1.8X1.8	6	130	Y	2	Y	Y	Y	---	---	---
2B/S17	1.8X1.8	6	130	Y	2	Y	Y	Y	---	---	---
3A	1.8X12	2-4-2	0	---	3	Y	Y	---	---	3	---
3B	1.8X12	2-4-2	0	---	3	Y	Y	---	---	---	---
4A/S18	1.8X1.8	5	90	---	4	---	Y	Y	---	---	---
4B/S19	1.8X1.8	5	90	---	4	---	Y	Y	---	---	---
4C	1.8X12	2-4-2	0	---	4	Y	Y	---	2	5	---
4D	1.8X12	2-4-2	0	---	4	Y	Y	---	2	5	---
5A	1.8X12	2-4-2	0	Y	5	Y	Y	---	---	3	Y
5B	1.8X12	2-4-2	0	Y	5	Y	Y	---	---	---	---
5C	1.8X12	2-4-2	0	---	5	Y	Y	---	---	15	---
5D	1.8X12	2-4-2	0	---	5	Y	Y	---	---	15	---
5E	1.8X4.5	4	0	---	5	Y	Y	---	---	20	---
6A/S12	1.8X1.8	6	130	Y	6	Y	Y	Y	---	---	Y
6B/S13	1.8X1.8	6	130	Y	6	Y	Y	Y	---	---	Y
7A	1.8X12	2-4-2	0	Y	7	Y	Y	---	---	3	Y
7B	1.8X12	2-4-2	0	Y	7	Y	Y	---	---	---	Y
8A/S14	1.8X1.8	6	90	---	8	---	Y	Y	---	---	---
8B/S15	1.8X1.8	6	90	---	8	---	Y	Y	---	---	---
8C	1.8X12	2-4-2	0	---	8	Y	Y	---	2	5	---
8D	1.8X12	2-4-2	0	---	8	Y	Y	---	2	5	---

8 Phase Fully Actuated (Wake Forest Bypass Closed Loop System)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 and/or phase 5 may be lagged.
- Phase 3 and/or phase 7 may be lagged.
- Set all detector units to presence mode.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Closed loop system data: Controller Asset #2300.

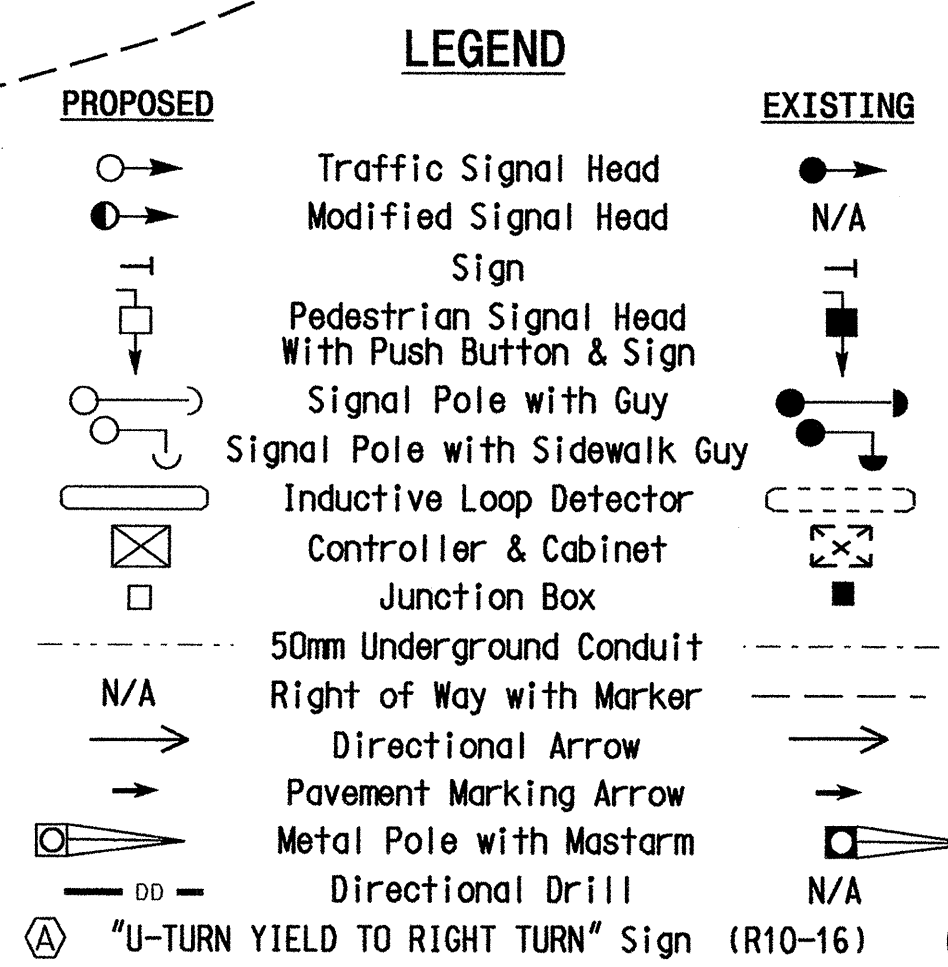


2070L TIMING CHART

FEATURE	PHASE							
	1	2	3	4	5	6	7	8
Min Green 1*	7	14	7	7	7	14	7	7
Extension 1*	2.0	6.0	2.0	6.0	2.0	6.0	2.0	6.0
Max Green 1*	30	90	30	60	30	90	30	60
Yellow Clearance	3.0	5.5	3.0	4.2	3.0	4.8	3.0	4.8
Red Clearance	3.6	1.7	4.0	1.8	3.8	1.6	3.9	1.8
Walk 1*	-	-	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-	-	-
Seconds Per Actuation*	-	1.8	-	-	-	1.8	-	-
Max Variable Initial*	-	47	-	-	-	47	-	-
Time Before Reduction*	-	15	-	15	-	15	-	15
Time To Reduce*	-	45	-	30	-	45	-	30
Minimum Gap	-	3.4	-	3.0	-	3.4	-	3.0
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Vehicle Call Memory	-	YELLOW	-	-	-	YELLOW	-	-
Dual Entry	-	-	-	-	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON	ON	ON	ON	ON

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

PLAN QUANTITIES	
Pay Item	Meters
Signal Cable	300
Messenger Cable	0
Lead-in Cable	605



New Installation - Final

Prepared in the Offices of:  
  
 NC 98 Bypass At NC 98 Business

Division 5 Wake County Wake Forest

PLAN DATE: July 2007 REVIEWED BY: [Signature]

PREPARED BY: I. O. Umozurike REVIEWED BY: [Signature]

REVISIONS: [Table]

INIT. DATE

8/23/07

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER J. WILLIAMS

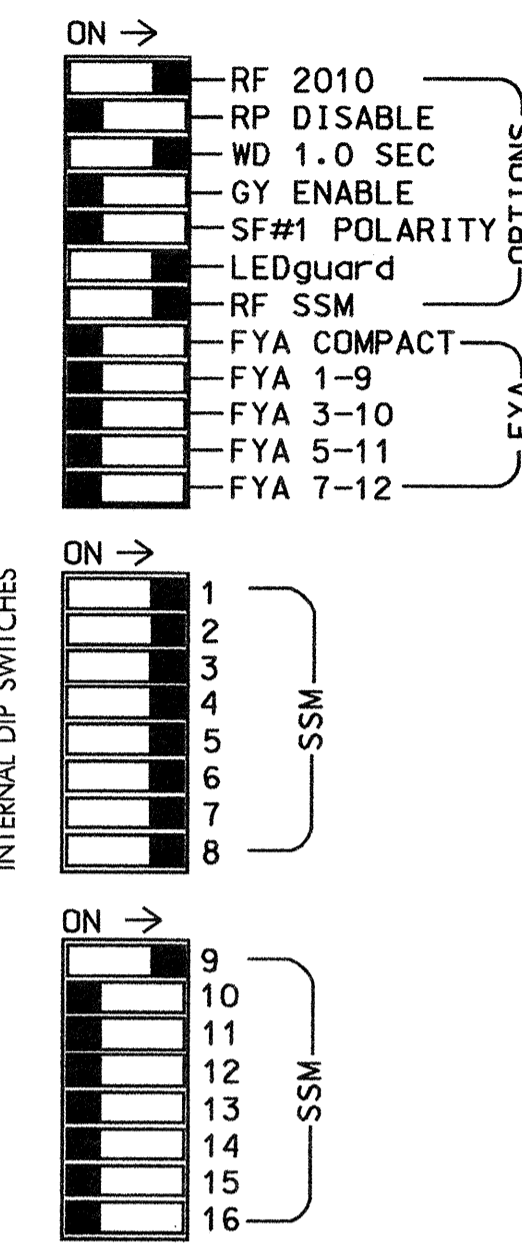
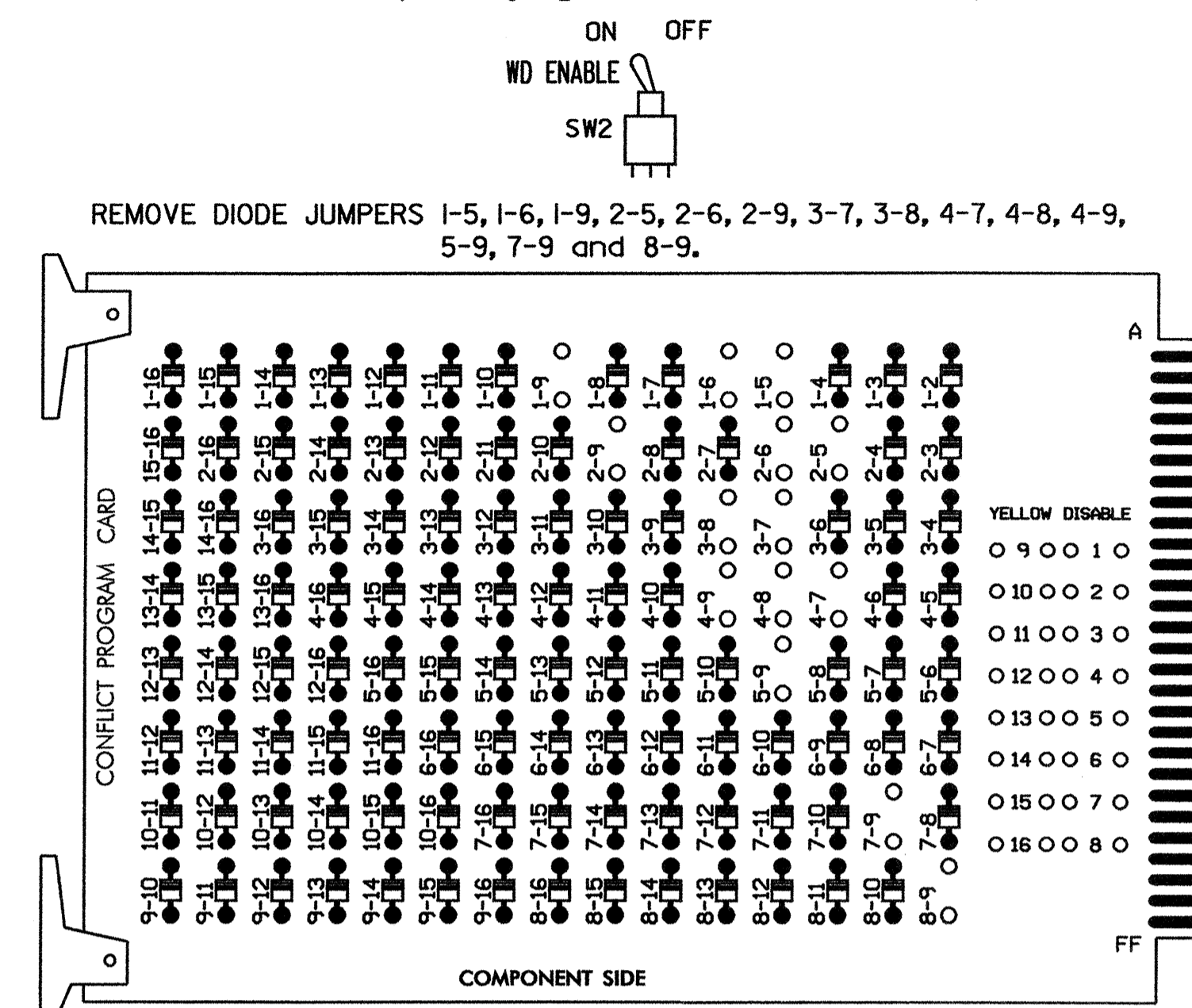
SIG. INVENTORY NO. 05-2300

23-AUG-2007 12:18  
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 I. O. Umozurike



### EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



- 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.

### NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 10, 11, 12, 13, 14, 15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
- Program phases 2 and 6, on the controller unit, for Start Up In Green.
- Enable Simultaneous Gap-Out, on the controller unit, for all phases.
- Program phases 2 and 6, on the controller unit, for Variable Initial.
- Program phases 2, 4, 6 and 8, on the controller unit, for Gap Reduction.
- The cabinet and controller are part of the Wake Forest Bypass Closed Loop System.

### EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L  
 CABINET.....CONTRACTOR SUPPLIED 332  
 SOFTWARE.....ECONOLITE OASIS  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)  
 LOAD SWITCHES USED.....S1,S2,S3,S4,S5,S6,S7,S8,S9  
 PHASES USED.....1,2,3,4,5,6,7,8  
 OVERLAP A:.....4+5  
 OVERLAP B:.....NONE  
 OVERLAP C:.....NONE  
 OVERLAP D:.....NONE

### SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14	
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE	
SIGNAL HEAD NO.	11,12	82	21,22	NU	22	31,32	41,42	NU	51,52	61,62	NU	62	71,72	81,82	NU	43,44	NU	NU	NU
RED			128			101			134				107						
YELLOW			129			102			135				108						
GREEN			130			103			136				109						
RED ARROW	125					116			131				122						A121
YELLOW ARROW	126	126				117	117		132				123	123					A122
GREEN ARROW	127	127				118	118		133				124	124					A123

NU = NOT USED  
 Wire Overlap 'A' to flash on Flasher unit #2, Circuit #2.

### OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

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

```

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

### INPUT FILE POSITION LAYOUT

(front view)

FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	∅ 1	∅ 1	∅ 2/SYS	∅ 1	∅ 3	∅ 4/SYS	∅ 4	∅ 3	S	T	S	S	S	FS
L	1A	1B	2A/S16	1D	3A	4A/S18	4C	3B	∅	∅	∅	∅	∅	DC ISOLATOR
U	NOT USED	∅ 1	∅ 2/SYS	NOT USED	NOT USED	∅ 4/SYS	∅ 4	NOT USED	∅	∅	∅	∅	∅	DC ISOLATOR
L	1C	2B/S17	NOT USED	NOT USED	4B/S19	4D	NOT USED	∅	∅	∅	∅	∅	∅	∅
U	∅ 5	∅ 5	∅ 6/SYS	∅ 5	∅ 5	∅ 7	∅ 8	∅	∅	∅	∅	∅	∅	∅
L	5A	5B	6A/S12	5D	5E	7A	8C	∅	∅	∅	∅	∅	∅	∅
U	NOT USED	∅ 5	∅ 6/SYS	NOT USED	NOT USED	∅ 7	∅ 8	∅	∅	∅	∅	∅	∅	∅
L	5C	6B/S13	NOT USED	NOT USED	7B	8D	∅	∅	∅	∅	∅	∅	∅	∅

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

### INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A	TB2-1,2	I1U	56	18	1	1	Y	Y			3
1B	TB2-5,6	I2U	39	1	2	1	Y	Y			
1C	TB2-7,8	I2L	43	5	12	1	Y	Y			15
2A/S16	TB2-9,10	I3U	63	25	32	2/SYS	Y	Y			
2B/S17	TB2-11,12	I3L	76	38	42	2/SYS	Y	Y			
1D	TB4-1,2	I4U	47	9	22	1	Y	Y			15
3A	TB4-5,6	I5U	58	20	3	3	Y	Y			3
4A/S18	TB4-9,10	I6U	41	3	4	4/SYS		Y			
4B/S19	TB4-11,12	I6L	45	7	14	4/SYS		Y			
4C	TB6-1,2	I7U	65	27	34	4	Y	Y		2	5
4D	TB6-3,4	I7L	78	40	44	4	Y	Y		2	5
3B	TB6-5,6	I8U	49	11	24	3	Y	Y			
5A	TB3-1,2	J1U	55	17	5	5	Y	Y			3
5B	TB3-5,6	J2U	40	2	6	5	Y	Y			
5C	TB3-7,8	J2L	44	6	16	5	Y	Y			15
6A/S12	TB3-9,10	J3U	64	26	36	6/SYS	Y	Y			
6B/S13	TB3-11,12	J3L	77	39	46	6/SYS	Y	Y			
5D	TB5-1,2	J4U	48	10	26	5	Y	Y			15
5E	TB5-5,6	J5U	57	19	7	5	Y	Y			20
7A	TB5-9,10	J6U	42	4	8	7	Y	Y			3
7B	TB5-11,12	J6L	46	8	18	7	Y	Y			
8C	TB7-1,2	J7U	66	28	38	8	Y	Y		2	5
8D	TB7-3,4	J7L	79	41	48	8	Y	Y		2	5
8A/S14	TB7-9,10	J9U	59	21	15	8/SYS		Y			
8B/S15	TB7-11,12	J9L	61	23	17	8/SYS		Y			

INPUT FILE POSITION LEGEND: J2L  
 FILE J  
 SLOT 2  
 LOWER

OVERLAP PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2300  
 DESIGNED: July 2007  
 SEALED: 08-23-07  
 REVISED: N/A

New Installation

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:  
 James Peterson and Sons  
 Signal Systems of Wake Forest  
 Signal Management Division  
 750 N. Greenfield Pkwy, Garner, NC 27529

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

NC 98 Bypass at NC 98 Business

Division 5 Wake County Wake Forest

PLAN DATE: August 2007 REVIEWED BY: JTK

PREPARED BY: James Peterson REVIEWED BY:

REVISIONS

INIT. DATE

Signature: John Rowe 8-29-07  
 DATE: 8/29/07

SIG. INVENTORY NO. 05-2300

29-AUG-2007 08:00  
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 J.Peterson









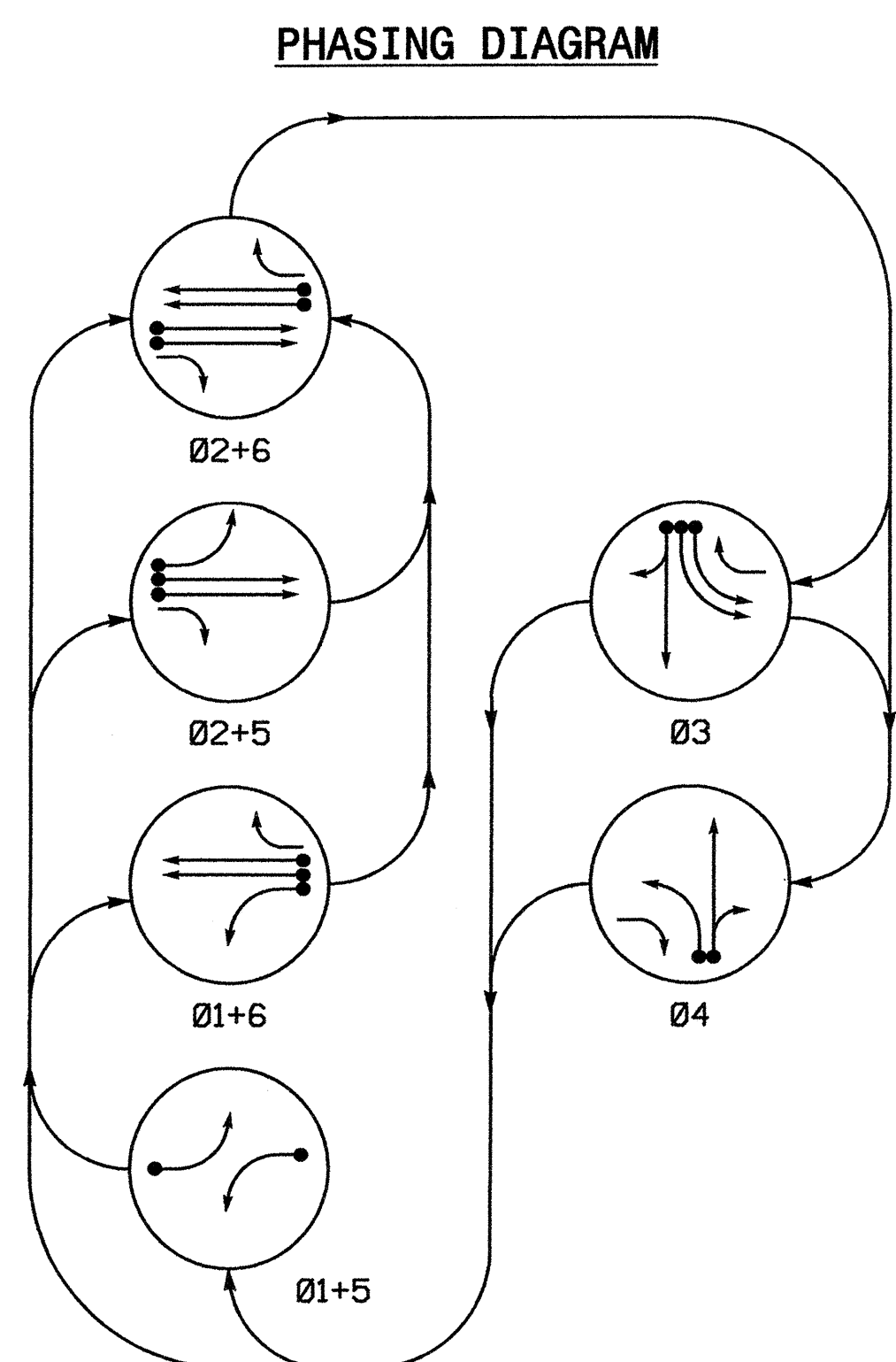
6 Phase Fully Actuated (Wake Forest Bypass Closed Loop)

NOTES

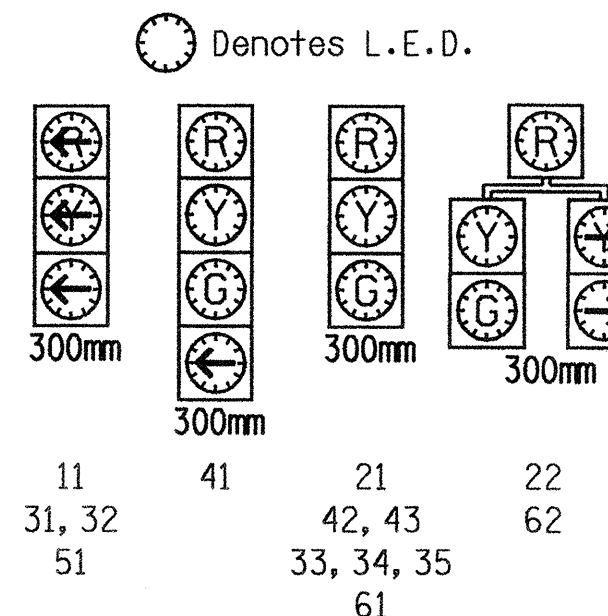
- Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Phase 1 and/or phase 5 may be lagged.
- The order of phase 3 and phase 4 may be reversed.
- Reposition existing signal heads numbered 11, 33, 42 and Sign A.
- Install backplates for signal heads numbered 11, 61 and 62.
- Set all detector units to presence mode.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Closed loop system data: Controller Asset #2204.

2070L LOOP & DETECTOR INSTALLATION												
INDUCTIVE LOOPS				DETECTOR PROGRAMMING								
LOOP	SIZE (M)	TURNS	DISTANCE FROM STOPBAR (M)	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	SYSTEM LOOP	STRETCH TIME	DELAY TIME	NEW CARD
1A	1.8X12	2-4-2	0	Y	1	Y	Y	-	-	-	-	-
2A	1.8X1.8	5	130	Y	2	Y	Y	-	-	-	-	Y
2B	1.8X1.8	5	130	Y	2	Y	Y	-	-	-	-	Y
3A	1.8X18	2-4-2	0	Y	3	Y	Y	-	-	-	3	-
3B	1.8X18	2-4-2	0	-	3	Y	Y	-	-	-	-	-
3C	1.8X18	2-4-2	0	-	3	Y	Y	-	-	-	10	-
3D	1.8X1.8	4	0	-	3	Y	Y	-	-	-	20	-
4A	1.8X18	2-4-2	0	-	4	Y	Y	-	-	-	3	-
4B	1.8X18	2-4-2	0	-	4	Y	Y	-	-	-	10	Y
4C	1.8X18	2-4-2	0	-	4	Y	Y	-	-	-	20	Y
5A	1.8X12	2-4-2	0	Y	5	Y	Y	-	-	-	-	Y
6A/S3	1.8X1.8	5	118	-	6	Y	Y	-	Y	-	-	Y
6B/S4	1.8X1.8	5	118	-	6	Y	Y	-	Y	-	-	Y
S1	1.8X1.8	5	+57	-	-	-	-	-	-	-	-	-
S2	1.8X1.8	5	+57	-	-	-	-	-	Y	-	-	-

SIGNAL FACE	PHASE						FLASH
	Ø 1 + 5	Ø 1 + 6	Ø 2 + 5	Ø 2 + 6	Ø 3	Ø 4	
11	-	-	R	R	R	R	-
21	R	R	G	G	R	R	Y
22	R	R	G	G	R	R	Y
31, 32	R	R	R	R	-	R	R
33, 34, 35	R	R	R	R	G	R	R
41	R	R	R	R	R	G	R
42, 43	R	R	R	R	R	G	R
51	-	R	-	R	R	R	R
61	R	G	R	G	R	R	Y
62	R	G	R	G	R	R	Y

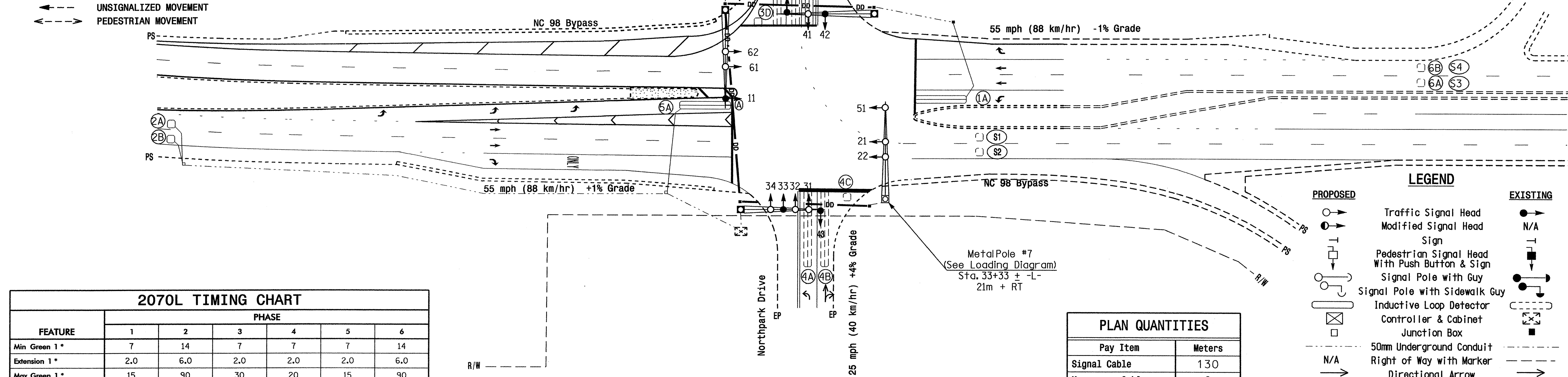


SIGNAL FACE I.D.



PHASING DIAGRAM DETECTION LEGEND

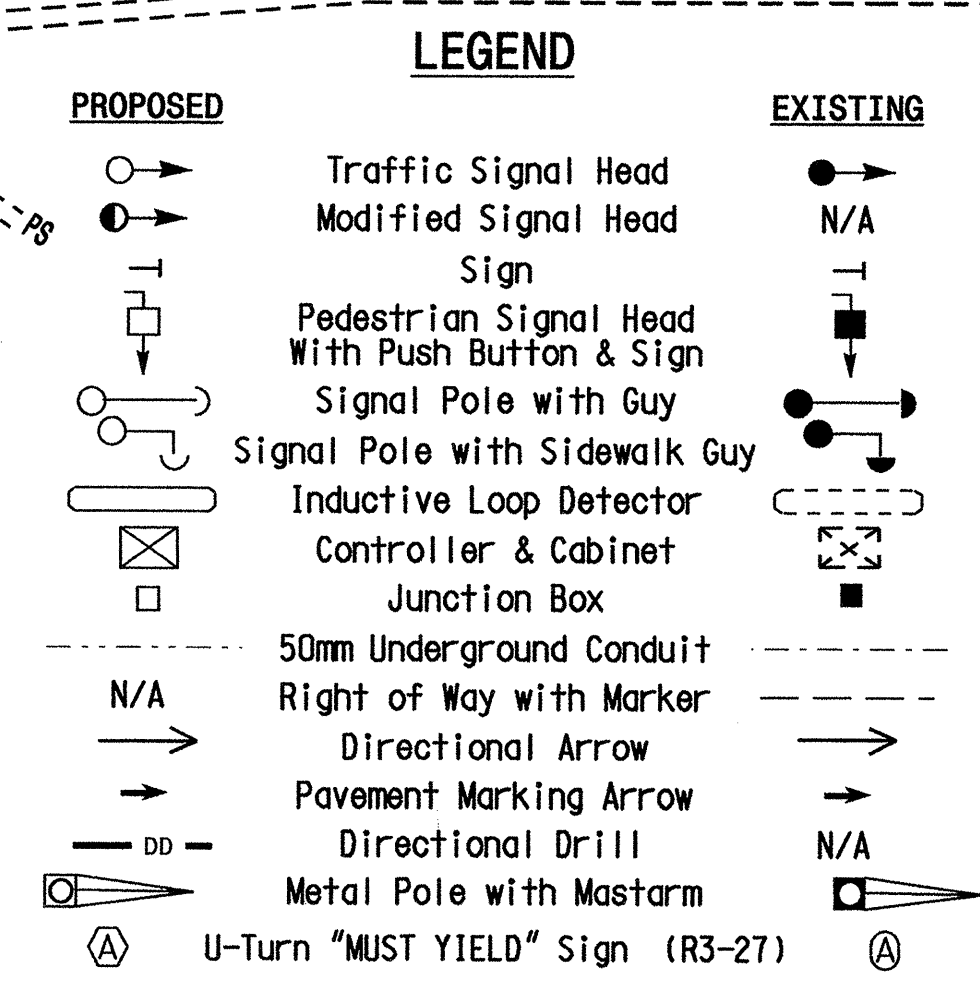
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT



FEATURE	2070L TIMING CHART					
	1	2	3	4	5	6
Min Green 1 *	7	14	7	7	7	14
Extension 1 *	2.0	6.0	2.0	2.0	2.0	6.0
Max Green 1 *	15	90	30	20	15	90
Yellow Clearance	3.0	5.1	3.5	3.0	3.0	5.3
Red Clearance	3.5	1.6	3.2	3.2	3.0	1.6
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	1.8	-	-	-	1.8
Max Variable Initial *	-	46	-	-	-	43
Time Before Reduction *	-	15	-	-	-	15
Time To Reduce *	-	45	-	-	-	45
Minimum Gap	-	3.0	-	-	-	3.0
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL
Vehicle Call Memory	-	YELLOW	-	-	-	YELLOW
Dual Entry	-	-	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON	ON	ON

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

PLAN QUANTITIES	
Pay Item	Meters
Signal Cable	130
Messenger Cable	0
Lead-in Cable	325



Signal Upgrade

Prepared in the Offices of:

NC 98 Bypass At SR 4535 (Retail Drive) / Northpark Drive Wake Forest

Division 05 Wake County Wake Forest

PLAN DATE: July 2007 REVIEWED BY: I. O. Umozurike

PREPARED BY: I. O. Umozurike REVIEWED BY:

REVISIONS: INIT. DATE

SCALE: 1:500

SIGNATURE: I. O. Umozurike DATE: 8/23/07

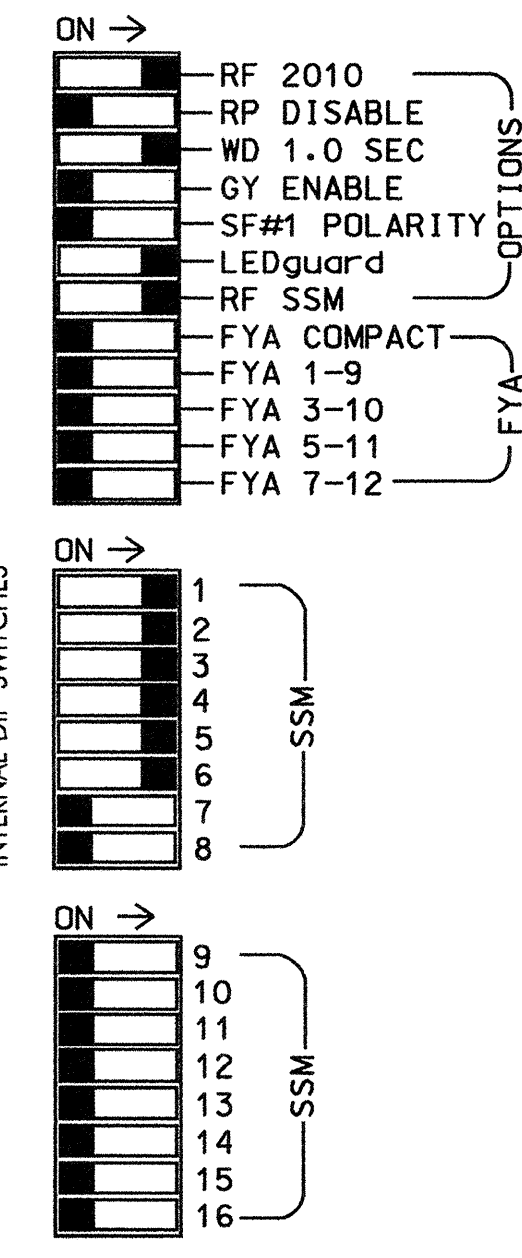
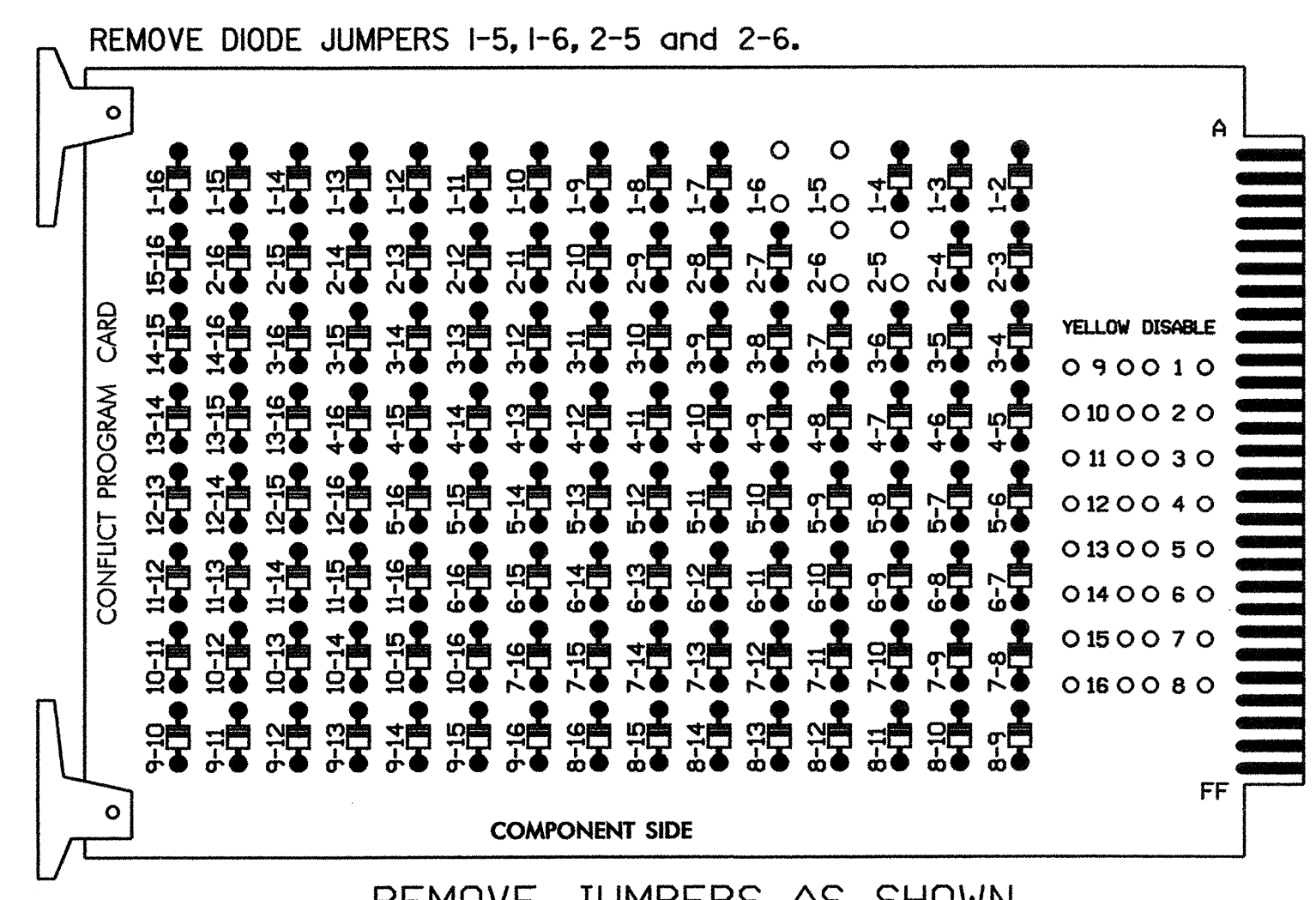
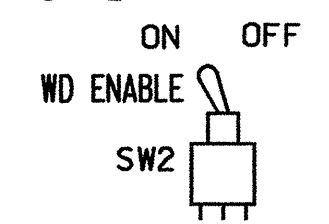
SIG. INVENTORY NO. 05-2204

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**EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL**

(remove jumpers and set switches as shown)



- REMOVE DIODE JUMPERS 1-5, 1-6, 2-5 and 2-6.
- 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.

**NOTES**

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 7,8, 9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
- Program phases 2 and 6, on the controller unit, for Start Up In Green.
- Enable Simultaneous Gap-Out, on the controller unit, for all phases.
- Program phases 2 and 6, on the controller unit, for Variable Initial and Gap Reduction.
- The cabinet and controller are part of the Wake Forest Bypass Closed Loop.

**EQUIPMENT INFORMATION**

CONTROLLER.....CONTRACTOR SUPPLIED 2070L  
 CABINET.....CONTRACTOR SUPPLIED 332  
 SOFTWARE.....ECONOLITE OASIS  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S1,S2,S3,S4,S5,S6  
 PHASES USED.....1,2,3,4,5,6  
 OVERLAPS.....NONE

**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.	11	21,22	NU	31,32	33, 34,35	62	22	41	42,43	NU	51	61,62	NU	NU	NU	NU
RED		128		116	101	101			134							
YELLOW		129		117	102	102			135							
GREEN		130		118	103	103			136							
RED ARROW	125			116					131							
YELLOW ARROW	126			117	102				132							
GREEN ARROW	127			118	103	103			133							

NU = Not Used

**INPUT FILE POSITION LAYOUT**

(front view)

FILE	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	∅ 1	∅ 2	∅ 3	∅ 3	∅ 3	∅ 4	∅ 4	SYS. DET. S1	S	S	S	S	S	FS
I	1A	2A	3A	3B	3C	4A	4C							DC ISOLATOR
L	NOT USED	2B	NOT USED	NOT USED	3D	4B	NOT USED	SYS. DET. S2						ST
U	∅ 5	∅ 6/SYS	S	S	S	S	S	S	S	S	S	S	S	S
J	5A	6A/S3												
L	NOT USED	6B/S4												

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

FS = FLASH SENSE  
 ST = STOP TIME

**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A	TB2-1,2	I1U	56	18	1	1	Y	Y			
2A	TB2-5,6	I2U	39	1	2	2	Y	Y			
2B	TB2-7,8	I2L	43	5	12	2	Y	Y			
3A	TB4-1,2	I4U	47	9	22	3	Y	Y			3
3B	TB4-5,6	I5U	58	20	3	3	Y	Y			
3C	TB4-9,10	I6U	41	3	4	3	Y	Y			10
3D	TB4-11,12	I6L	45	7	14	3	Y	Y			20
4A	TB6-1,2	I7U	65	27	34	4	Y	Y			3
4B	TB6-3,4	I7L	78	40	44	4	Y	Y			10
4C	TB6-5,6	I8U	49	11	24	4	Y	Y			20
* S1	TB6-9,10	I9U	60	22	11	SYS					
* S2	TB6-11,12	I9L	62	24	13	SYS					
5A	TB3-1,2	J1U	55	17	5	5	Y	Y			
6A/S3	TB3-5,6	J2U	40	2	6	6/SYS	Y	Y			
6B/S4	TB3-7,8	J2L	44	6	16	6/SYS	Y	Y			

\* SYSTEM DETECTOR ONLY. REMOVE THE VEHICLE PHASE ASSIGNED TO THIS DETECTOR IN THE DEFAULT PROGRAMMING.

INPUT FILE POSITION LEGEND: J2L



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-2204  
 DESIGNED: July 2007  
 SEALED: 08-23-07  
 REVISED: N/A

**Signal Upgrade**

Electrical and Programming Details For:

**NC 98 Bypass at SR 4535 (Retail Drive)/Northpark Drive**

Division 05 Wake County Wake Forest

PLAN DATE: August 2007 REVIEWED BY: JTR

PREPARED BY: James Peterson REVIEWED BY:

SEAL: JOHN T. ROWE, P.E. ENGINEER

750 N. Greenfield Pkwy, Garner, NC 27529

8-24-07

SIG. INVENTORY NO. 05-2204

25-AUG-2007 07:46 s:\rfs\signal\work\groups\jg\mmpeterson\052204\_sm\_e1\l.xxx.dgn

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

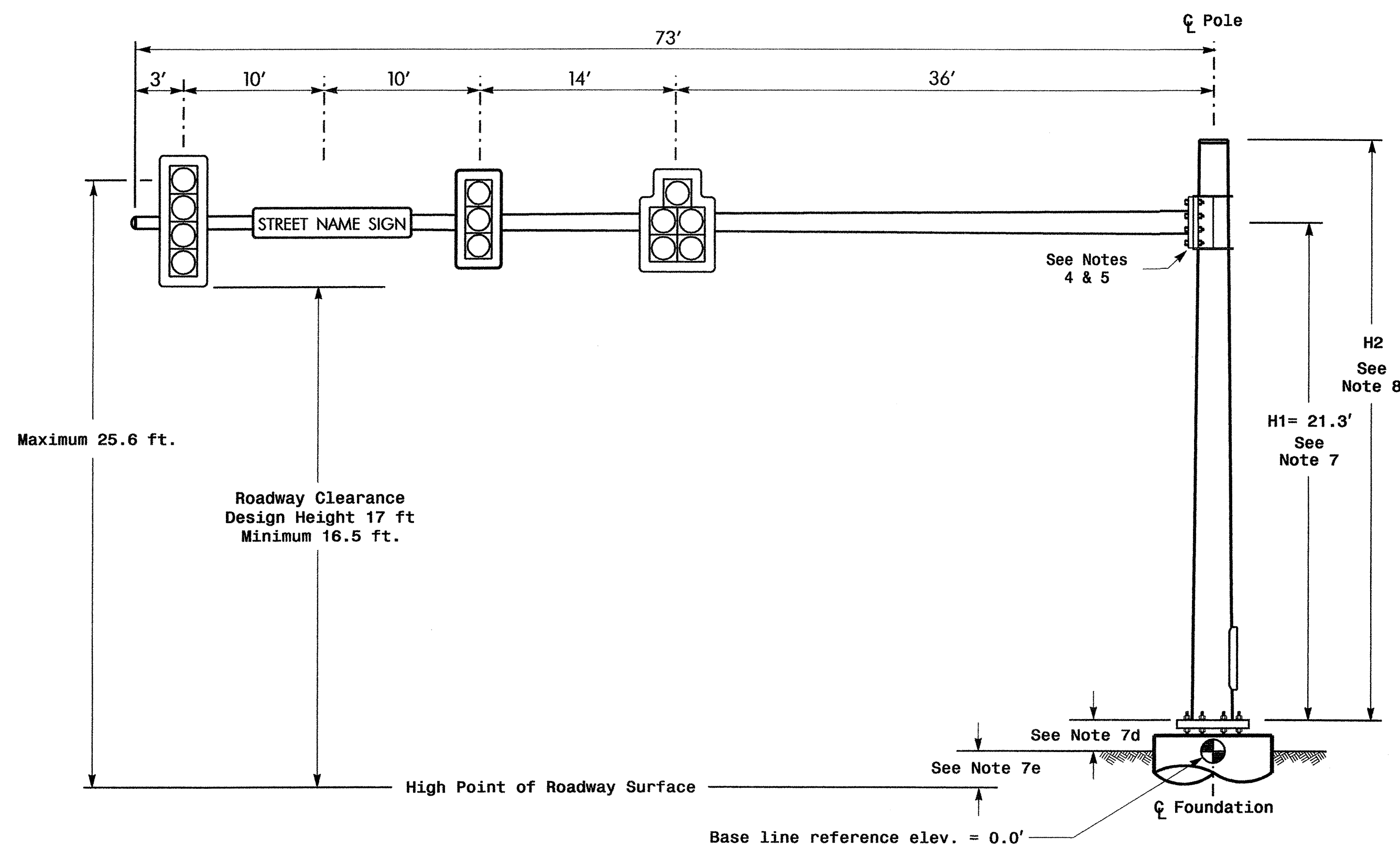
**Elevation Data for Mast Arm Attachment (H1)**

Elevation Differences for:	Pole 7
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.
Elevation difference at High point of roadway surface	+2.3 ft.
Elevation difference at Edge of travelway or face of curb	N/A

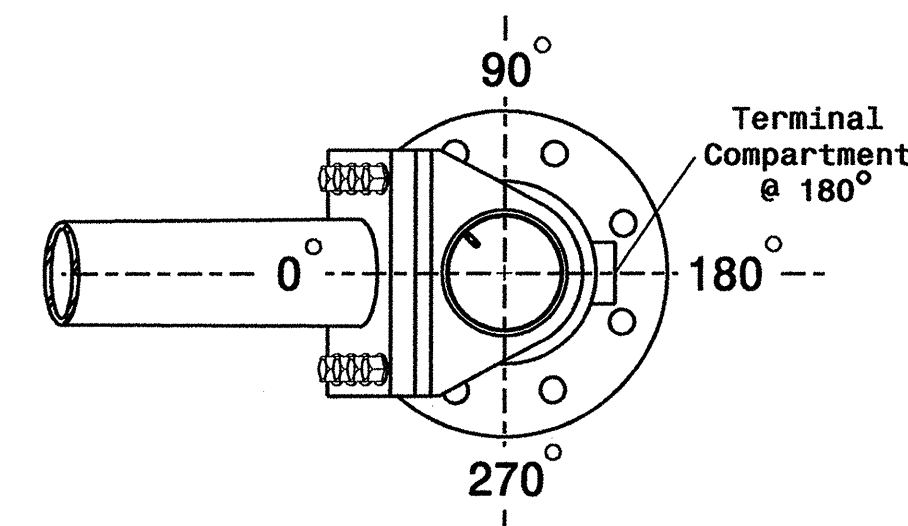
**MAST ARM LOADING SCHEDULE**

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
	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

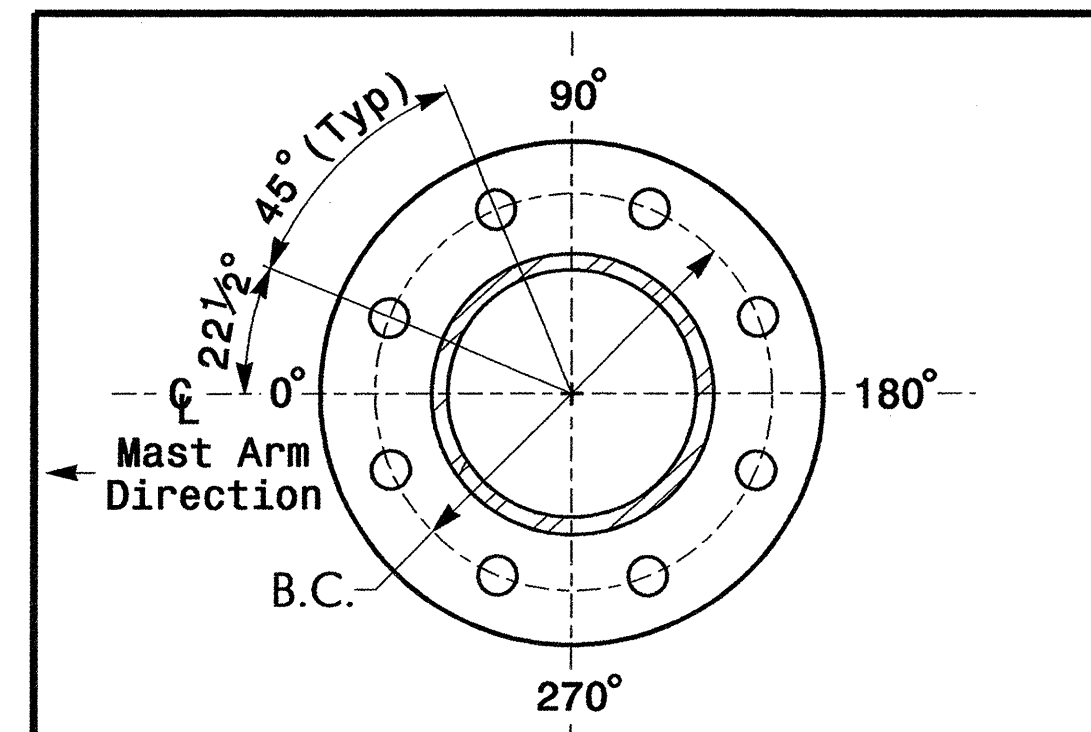
**Design Loading for METAL POLE NO. 7**



**Elevation View**

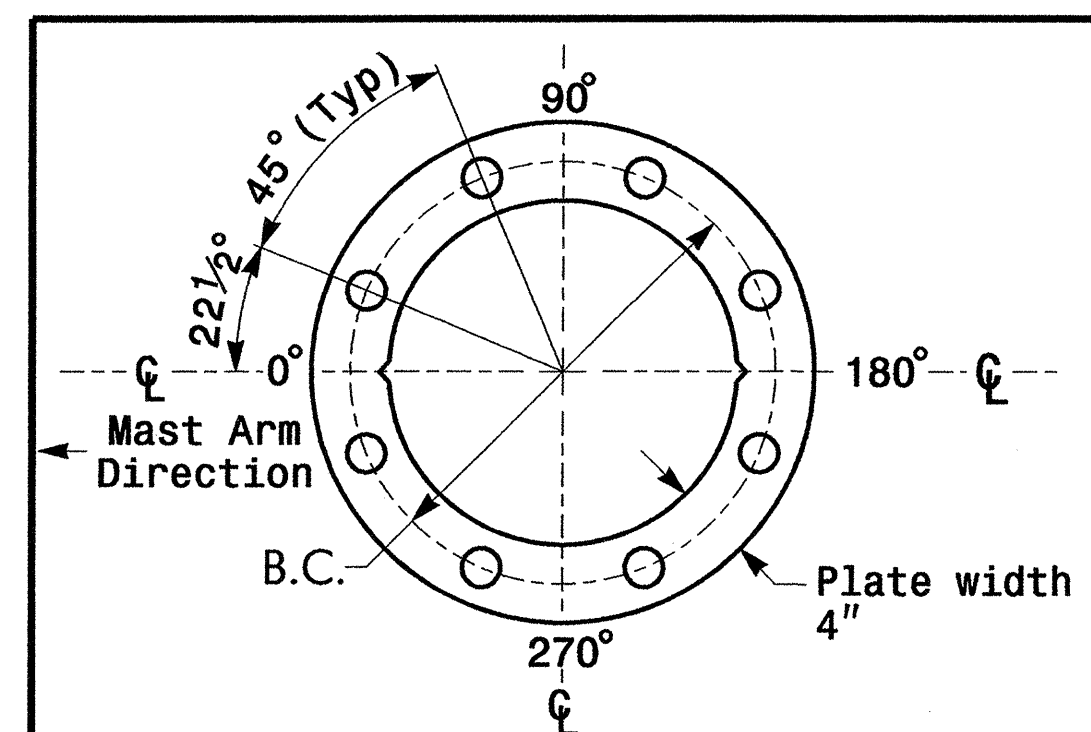


**POLE RADIAL ORIENTATION**



**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 2002 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
  - The 2002 NCDOT Roadway Standard Drawings.
  - The traffic signal project plans and special provisions.

**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.

**NOTES**

NCDOT Wind Zone 4 (90 mph)

	Prepared in the Offices of: NC 98 Bypass At SR 4535 (Retail Drive)/ North Park Drive Wake County Wake Forest		
	Division 5 PLAN DATE: July 2007 PREPARED BY: Luhr	Wake County REVIEWED BY: I.O. Umzurike REVIEWED BY:	
SCALE 0 N/A N/A	REVISIONS INIT. DATE	SIGNATURE DATE	SIG. INVENTORY NO. 05-2204

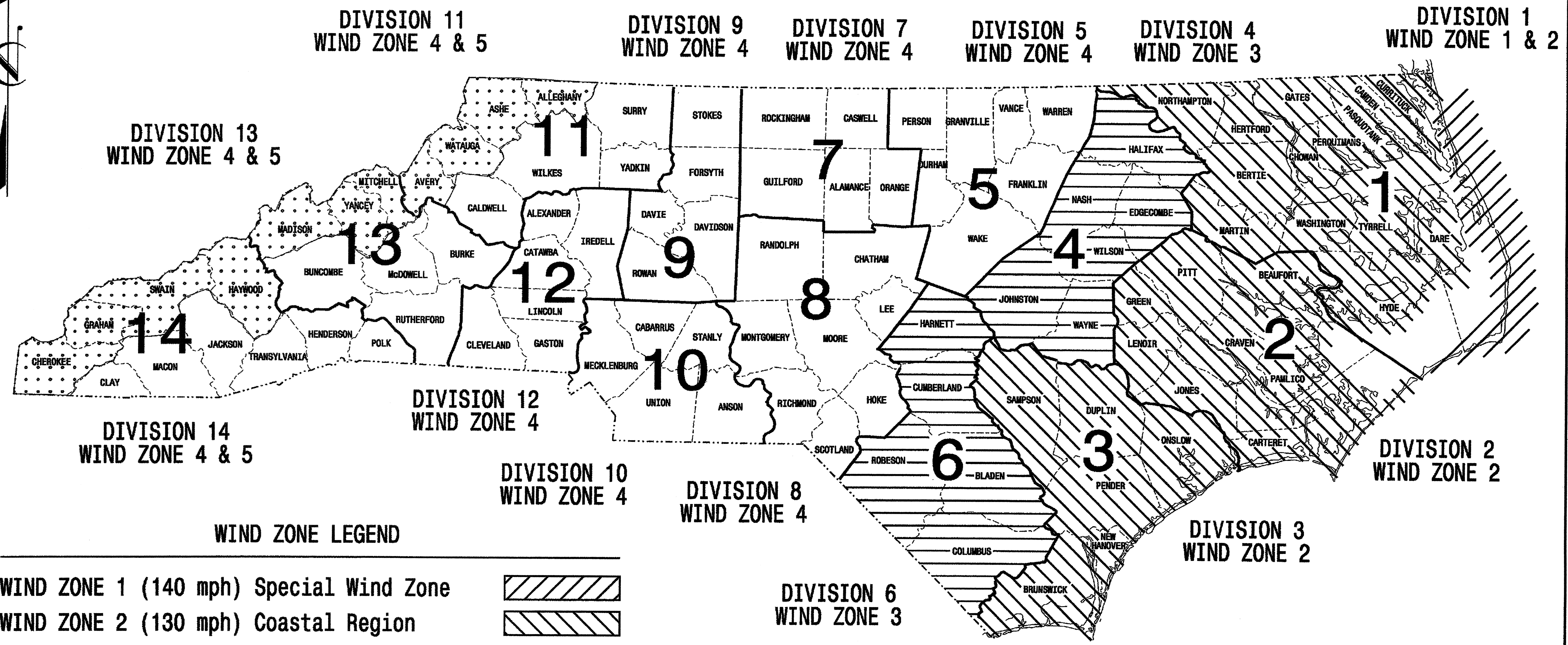
20-AUG-2007 15:21  
 s:\115 signal\sect\groups\11p\project\2809\sig\metal\_pole\2007\sig.dgn  
 I:umzurike



# STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

STATE	PROJECT NO.	SHEET NO.
N.C.	R-2809A	Sig.19
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/tmsu/ws/default.htm>

Prepared in the Offices of:

122 N. McDowell St., Raleigh, NC 27603

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

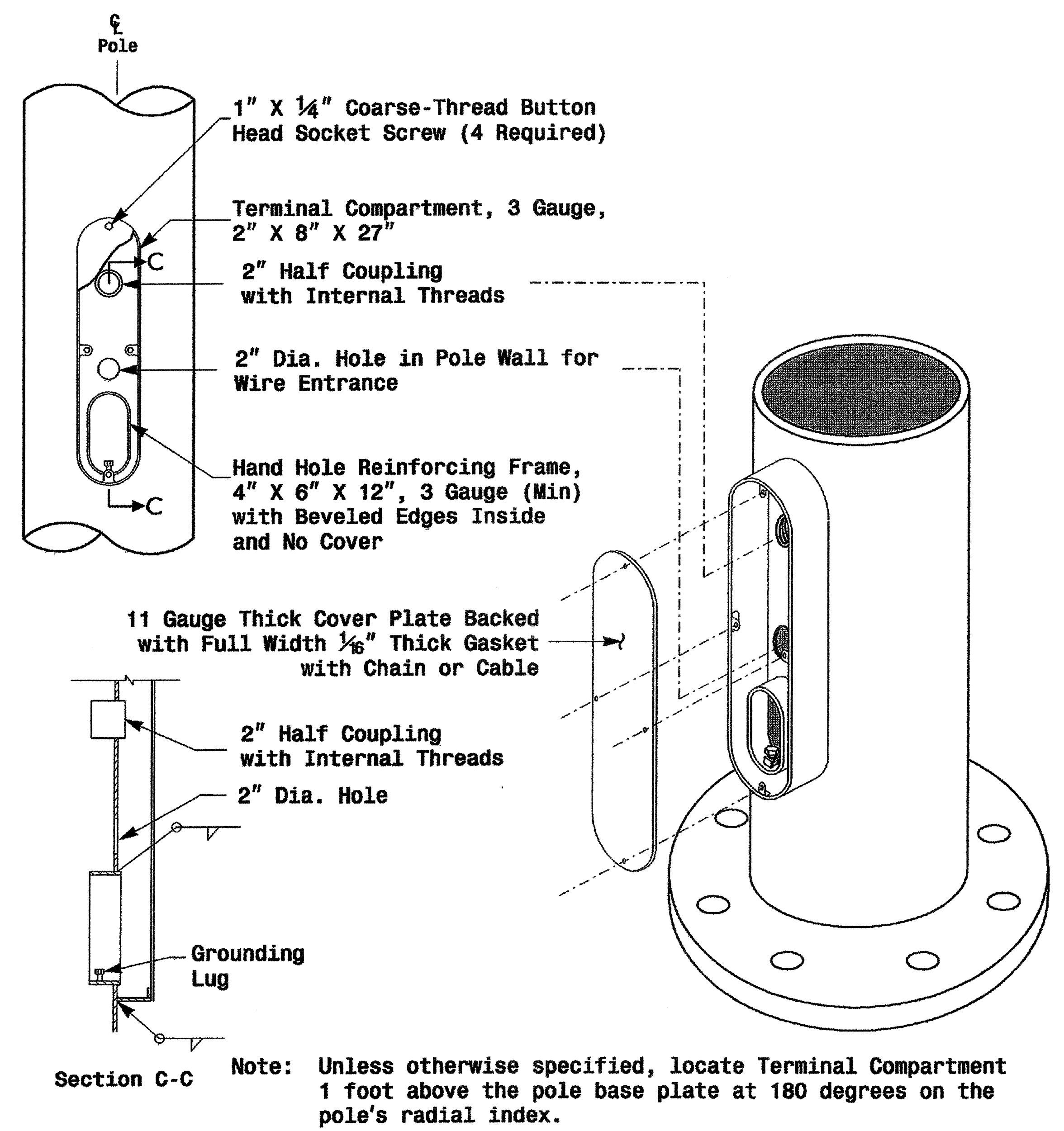
**NC DOT CONTACTS:**  
**TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH**

G. A. Fuller, P.E. - State ITS and Signals Engineer  
 R. E. Mullinax, P.E. - Signals and Geometrics Engineer  
 P. L. Alexander, P.E. - Signals and Geometrics Special Projects Engineer  
 D. C. Sarkar, P.E. - Signals and Geometrics Structural Engineer  
 A. M. Esposito, P.E. - Signals and Geometrics Project Engineer  
 C. F. Andrews, Jr. - Signals and Geometrics Project Engineer

SEAL

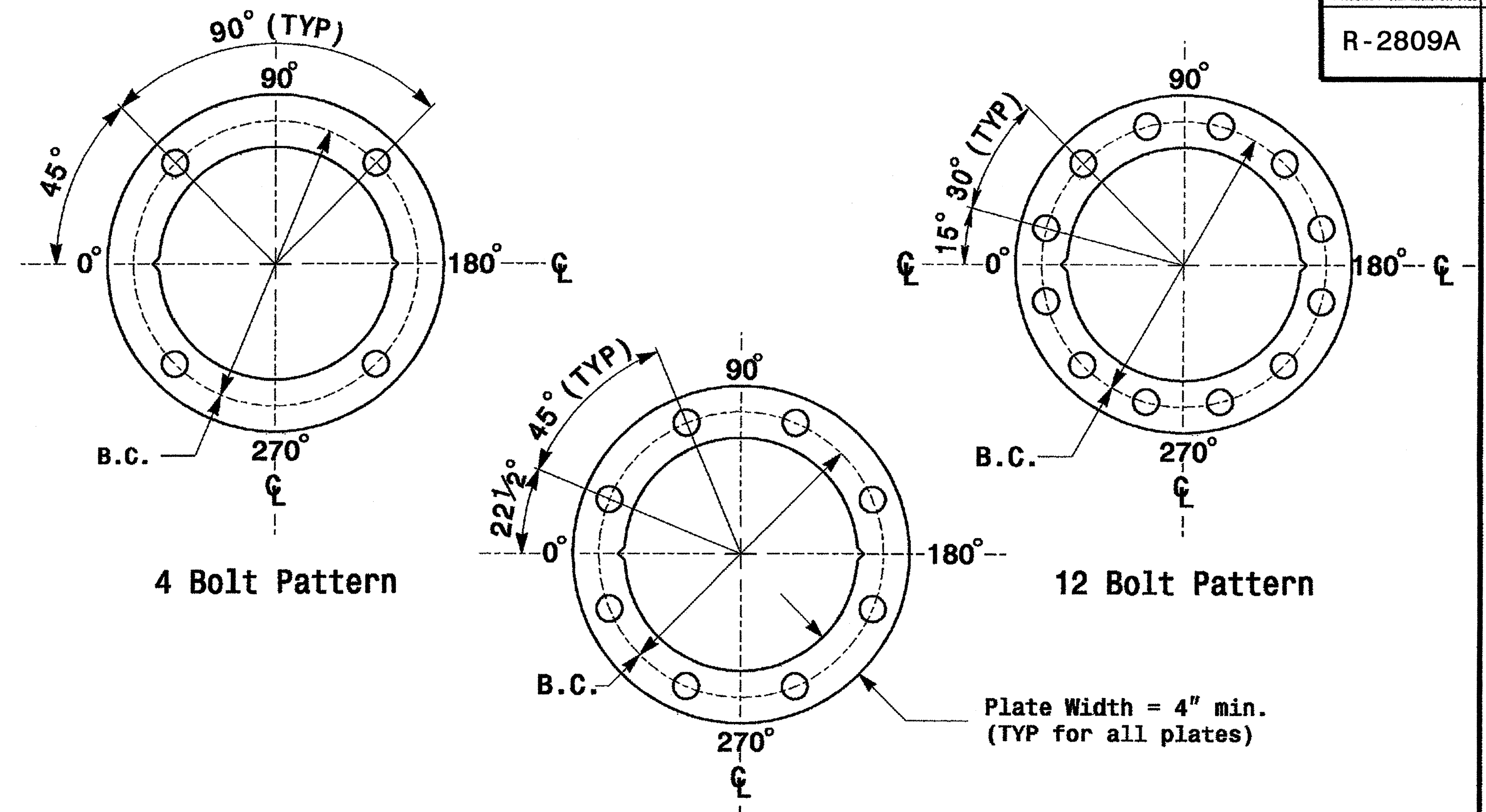
Signature: *D. Sarkar* Date: 9.2.2005





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

**Terminal Compartment Detail**



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

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

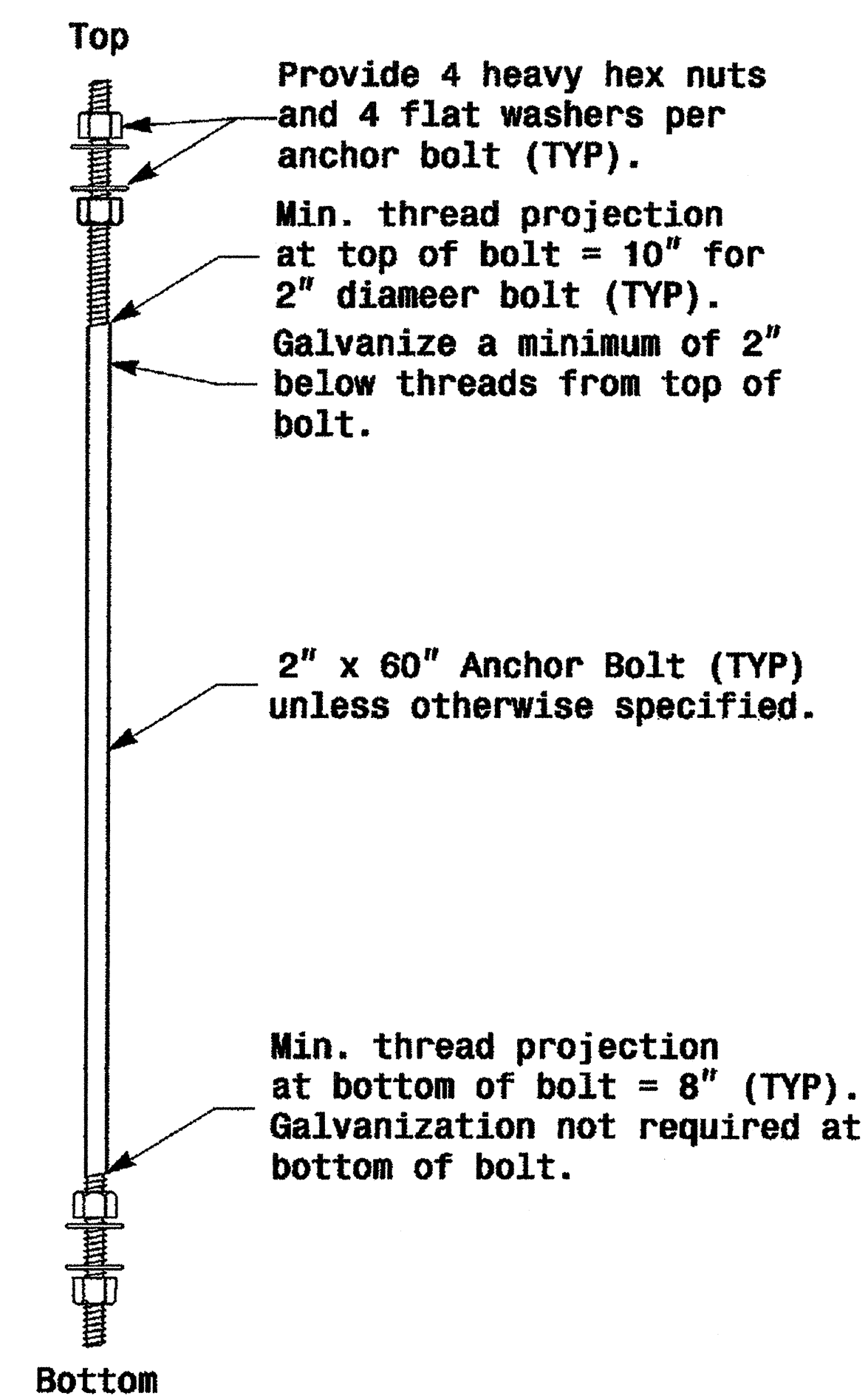
MFG \_\_\_\_\_ MFG. DATE: MM/YY  
SHAFT D/T/L/Y \_\_\_\_\_  
ARM-A D/T/L/Y \_\_\_\_\_  
ARM-B D/T/L/Y \_\_\_\_\_  
A.B. DIA./B.C./L/Y \_\_\_\_\_  
NCDOT STANDARD \_\_\_\_\_

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 \_\_\_\_\_

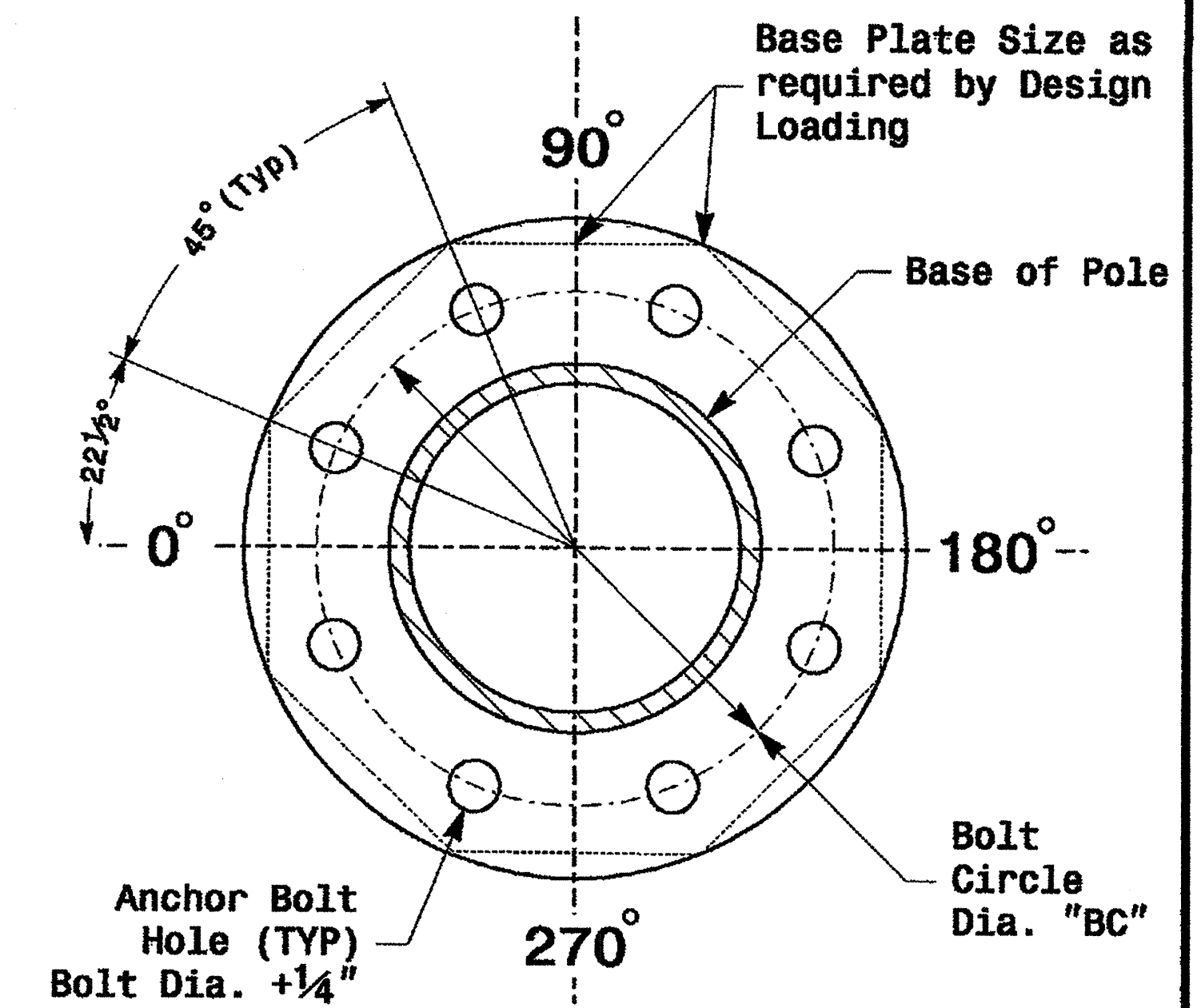
- Notes:
- 1) D= Diameter, T= Thickness, L= Length, Y= Yield Strength
  - 2) A.B. = Anchor Bolt
  - 3) B.C. = Bolt Circle of Anchor Bolts
  - 4) If Custom Design, use "NCDOT STANDARD" line for plan pole I.D.
  - 5) See drawing M4 for mounting positions of I.D. tags.

**Identification Tag Details**



**Anchor Bolt Detail**

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



**8 Bolt Base Plate Detail**

Prepared in the Office of:

**Typical Fabrication Details Common To All Metal Poles**

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

SCALE: 0 NA NONE

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

Signature: *P.L. Alexander* 9.2.2005  
DATE: 9.2.2005

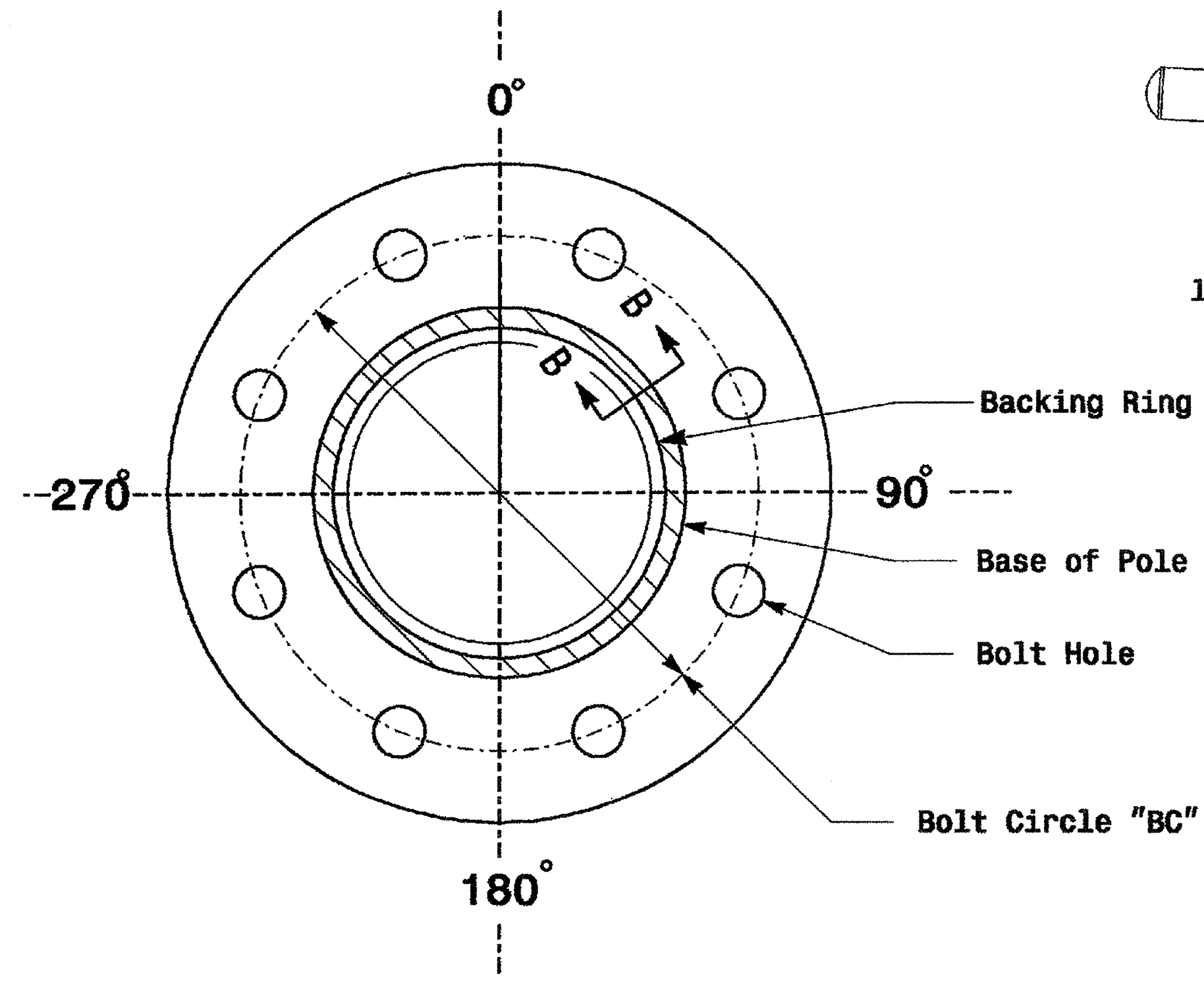
SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER JUDITH C. SARKIS

STG. INVENTORY NO. \_\_\_\_\_

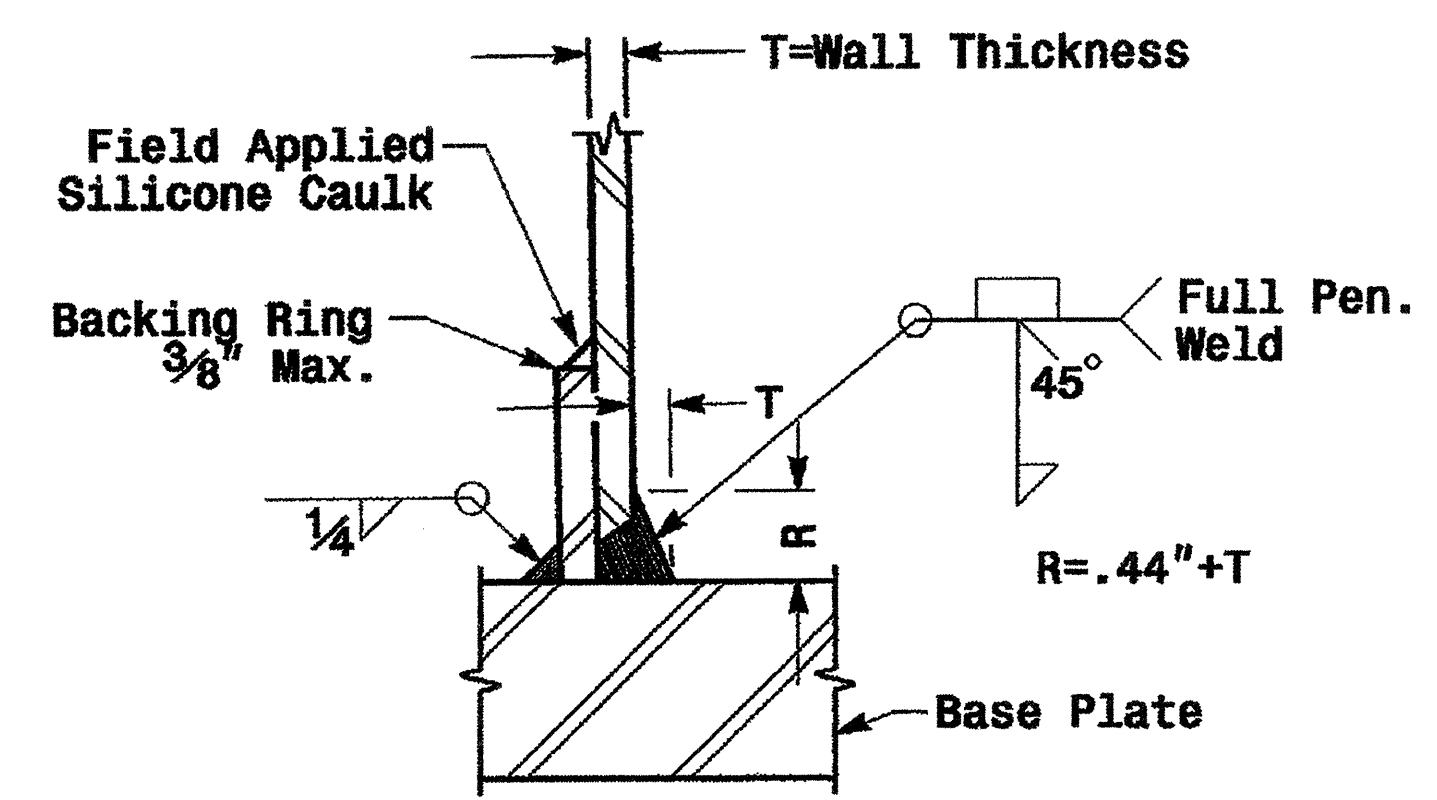
**Fabrication Details - All Poles**

01-SEP-2005 18:22 C:\R004 Metal Pole Standard.dwg04 ac thru r6.dgn

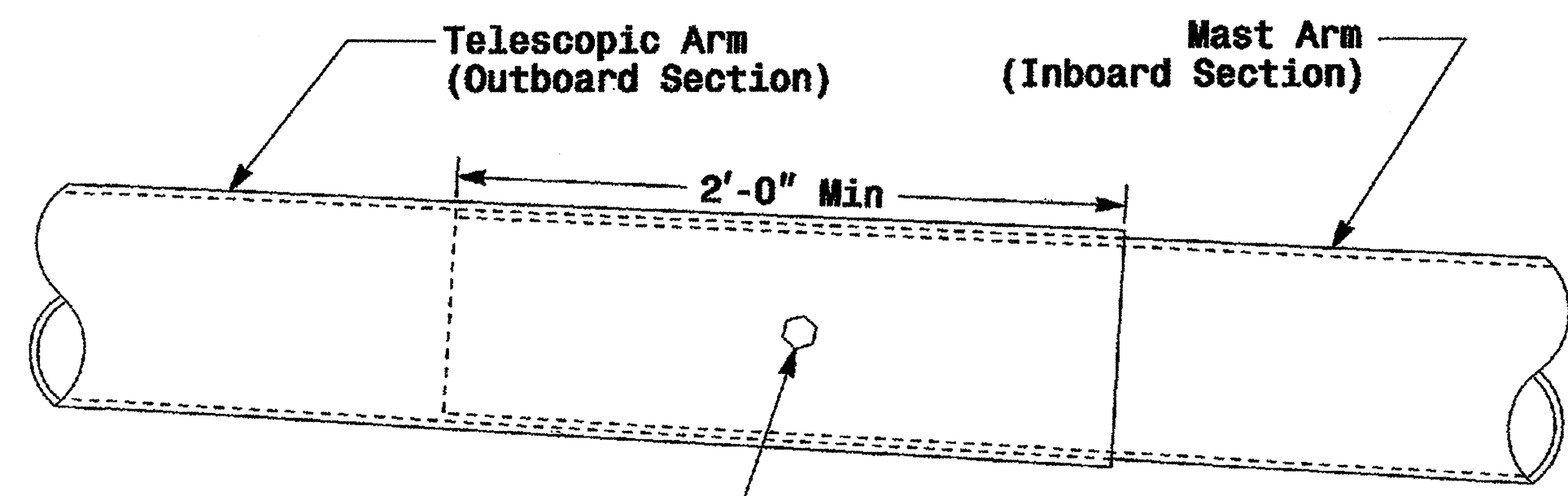
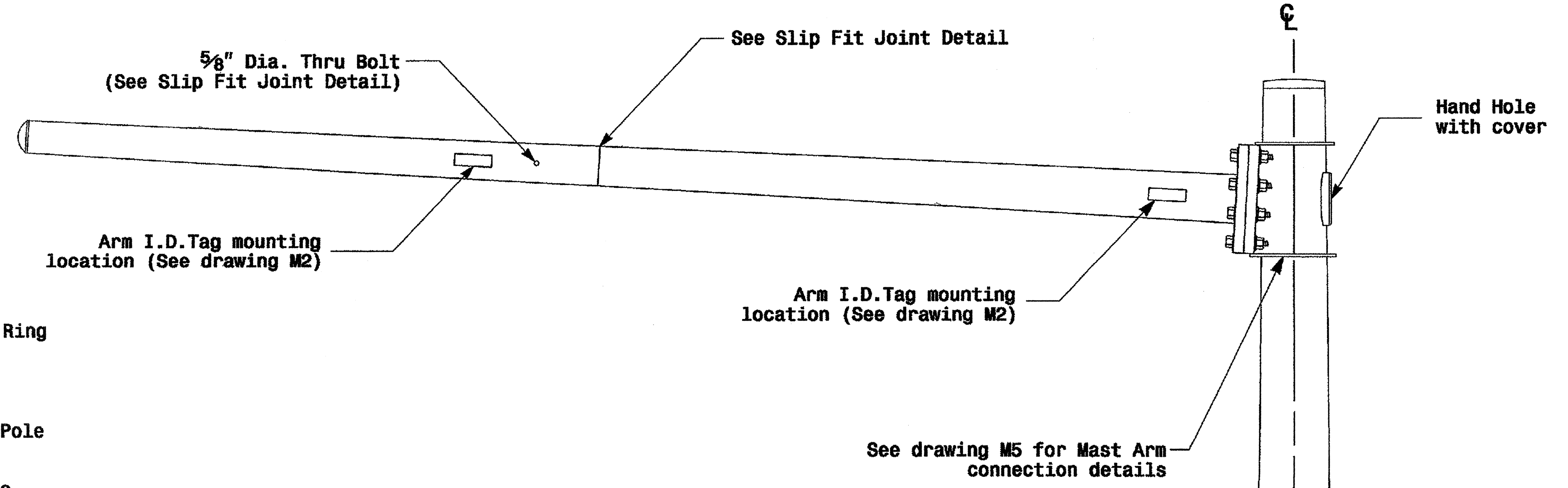




Section A-A  
(See drawing M 2)  
**Pole Base Plate**

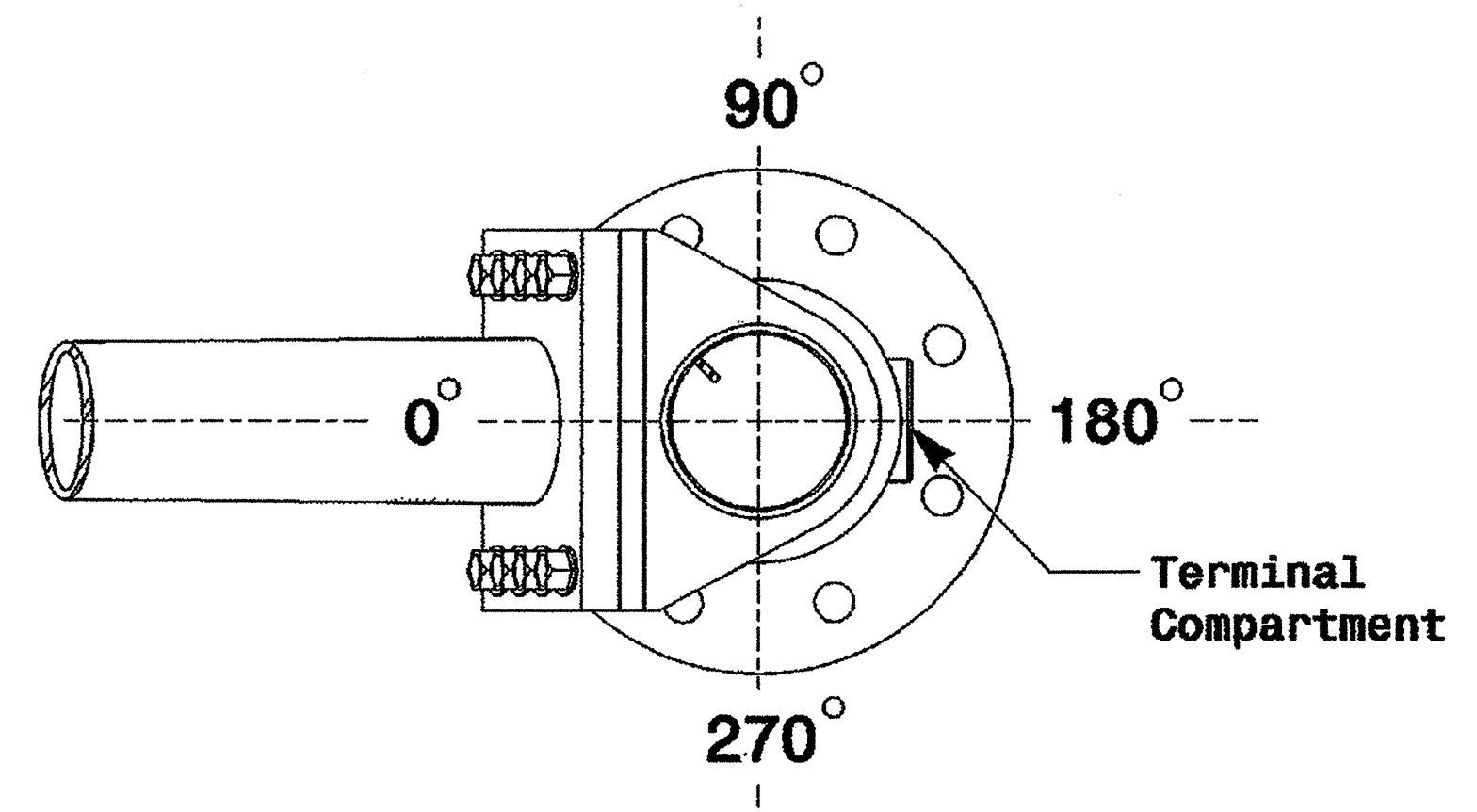


Section B-B  
(Pole Attachment to Base Plate)  
**Full-Penetration Groove Weld Detail**



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

**Slip Fit Joint Detail for Mast Arm**



**Mast Arm Radial Orientation**

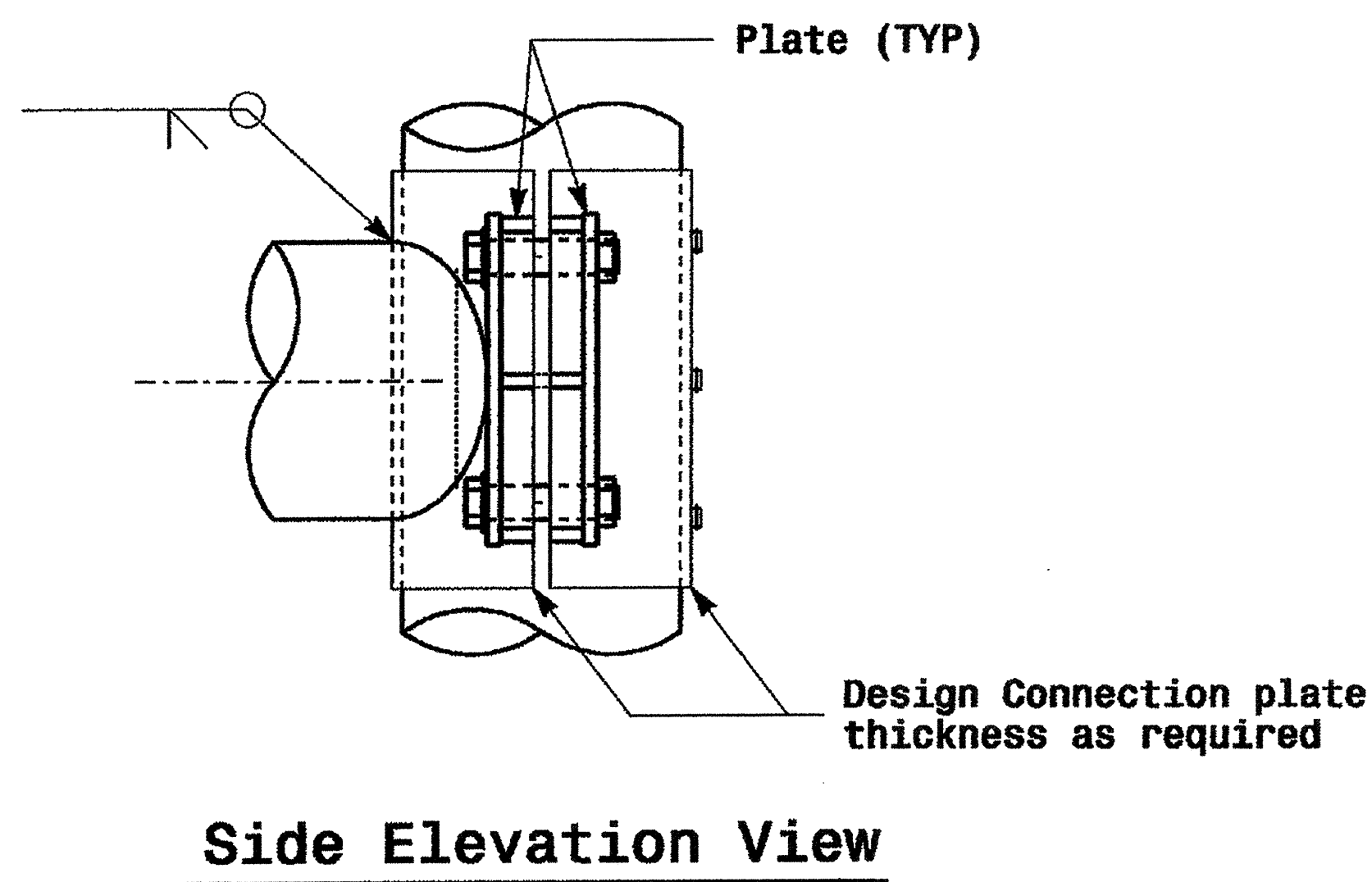
Shaft I.D. Tag mounting location (See drawing M2)  
Terminal Compartment (See drawing M2)

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

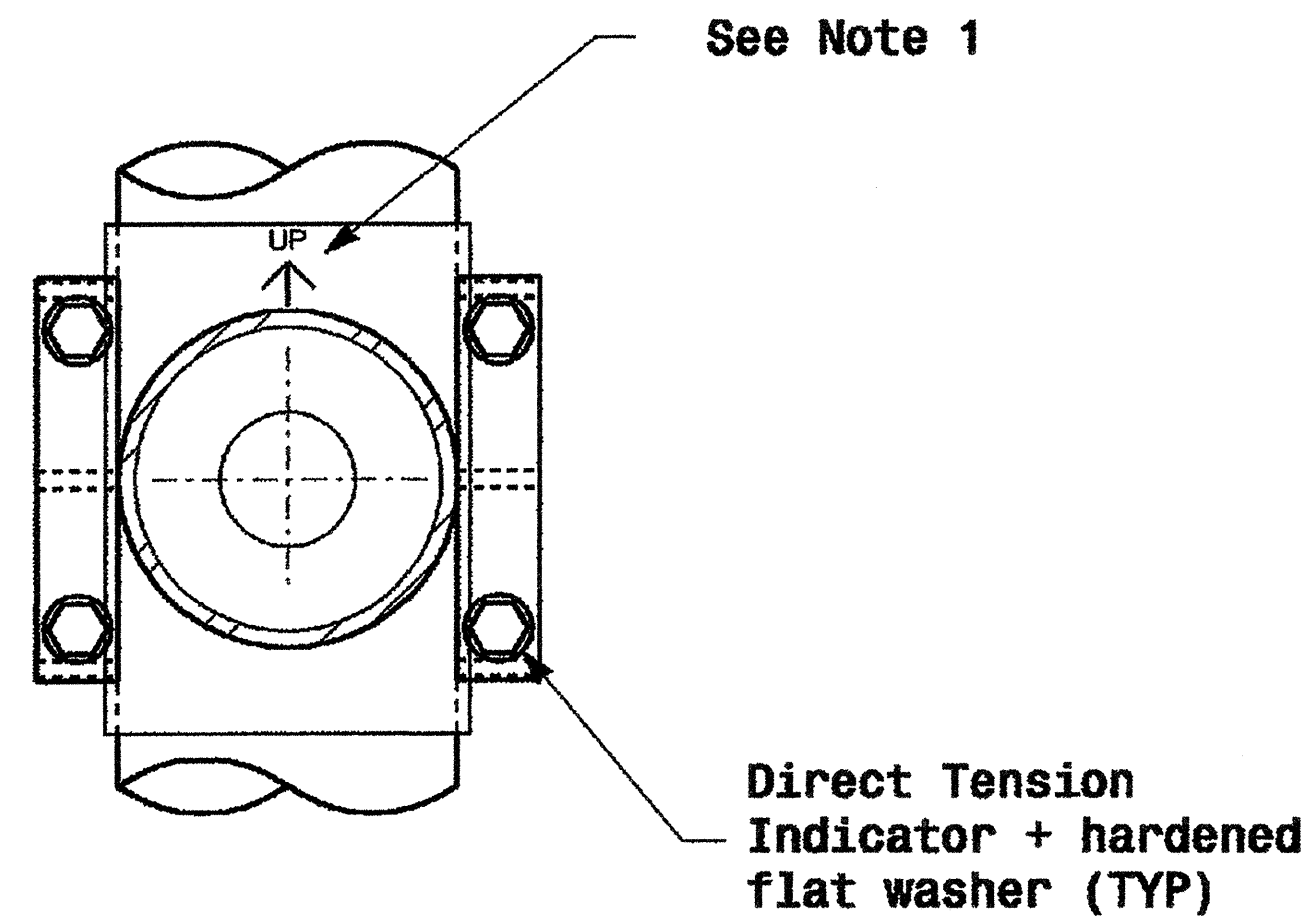
	<b>Typical Fabrication Details for Mast Arm Poles</b>		
	PLAN DATE: May 2005 PREPARED BY: P.L. Alexander	REVIEWED BY: C.F. Andrews REVIEWED BY: A.W. Esposito	

01-SEP-2005 14:08 w:\p\proj\tes-un\hcr\krc\p02004 metol pole strander\dwg2004 m.dgn P.L. Alexander

# Adjustable Clamp Type Bolted Mast Arm Connection

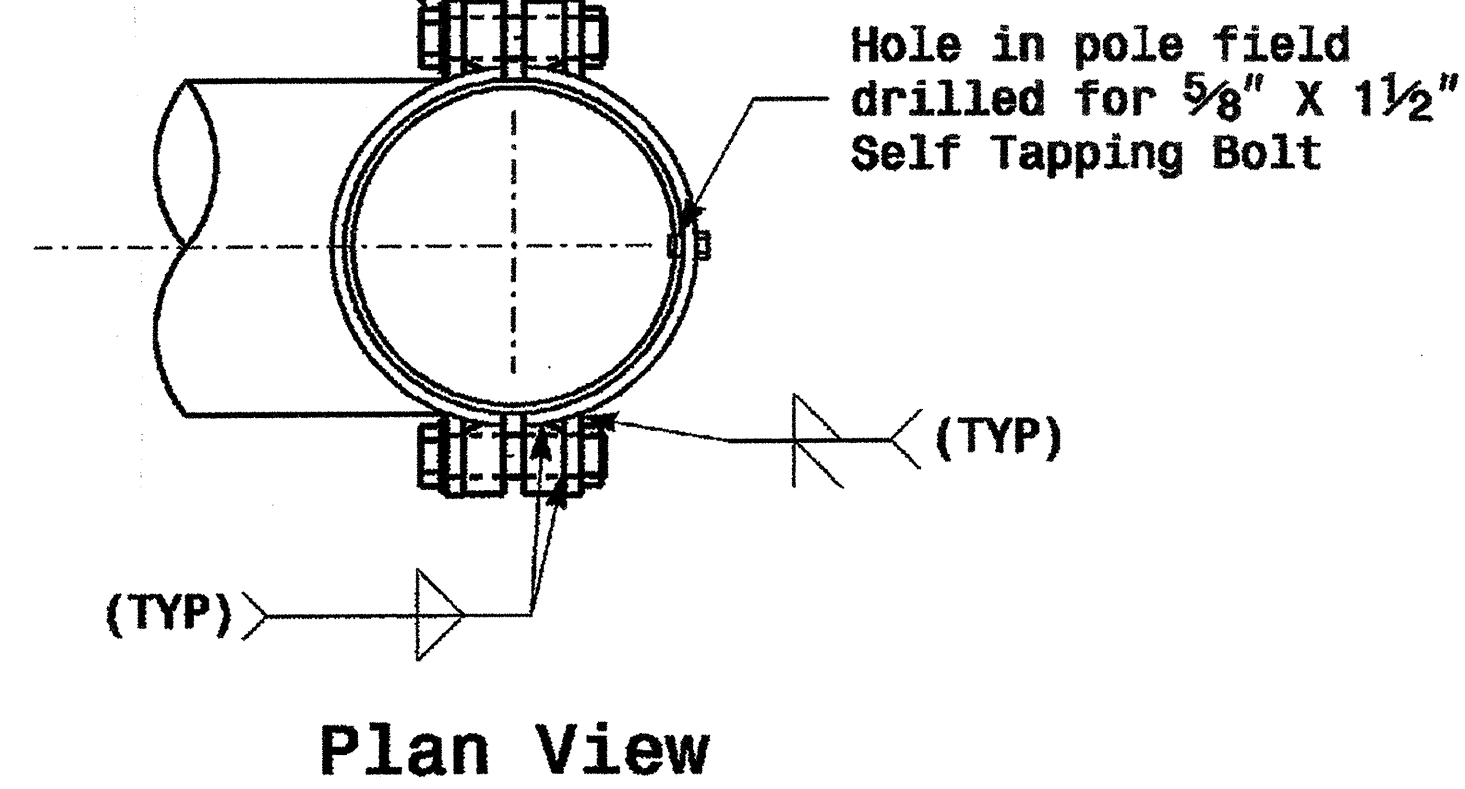


Side Elevation View



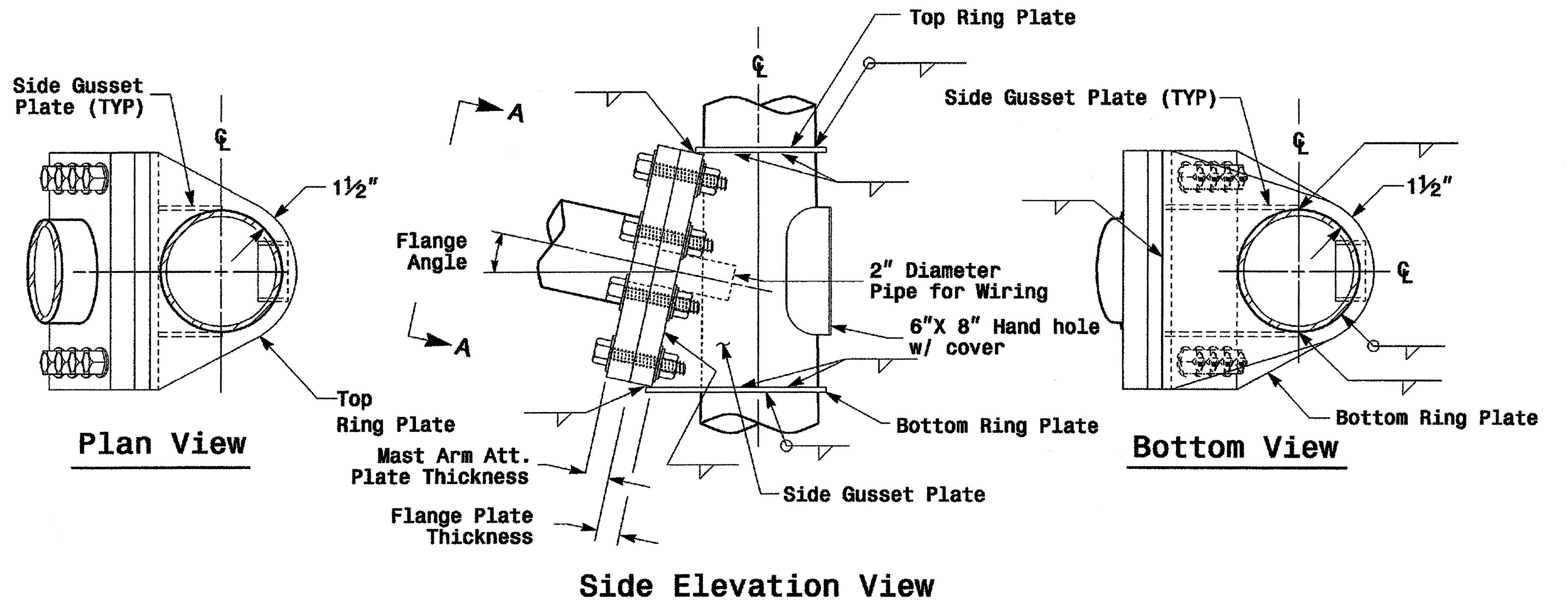
Front Elevation View

(4) - Size "E" Hex Head Bolts with (1) Hex Nuts & Washers

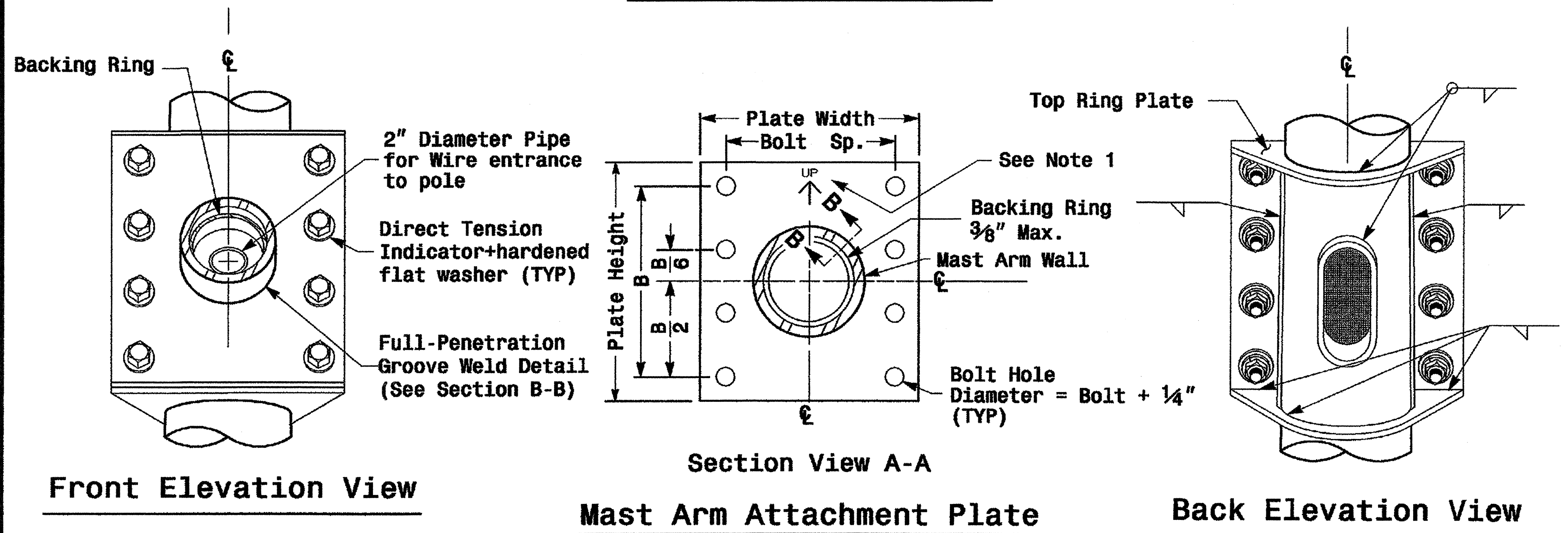


Plan View

# Welded Ring Stiffened Mast Arm Connection



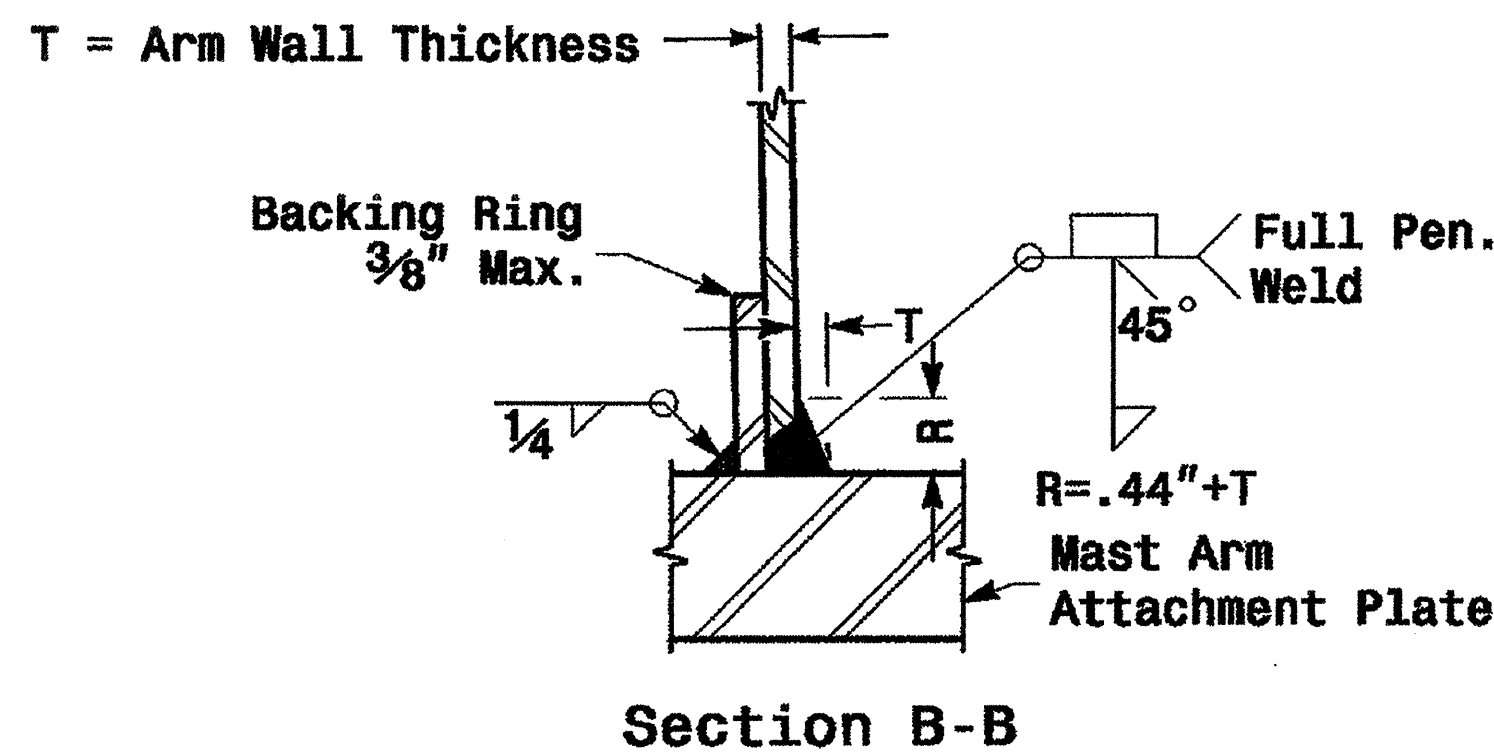
Side Elevation View



Front Elevation View

Mast Arm Attachment Plate

Back Elevation View



Full-Penetration Groove Weld Detail

Notes:

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

Fabrication Details - Mast Arm Poles

	<b>Fabrication Details For Mast Arm Connection To Pole</b>		
	PLAN DATE: May 2005 PREPARED BY: P.L. Alexander SCALE: 0 NA NONE	REVIEWED BY: C.F. Andrews REVIEWED BY: A.W. Esposito	





- 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

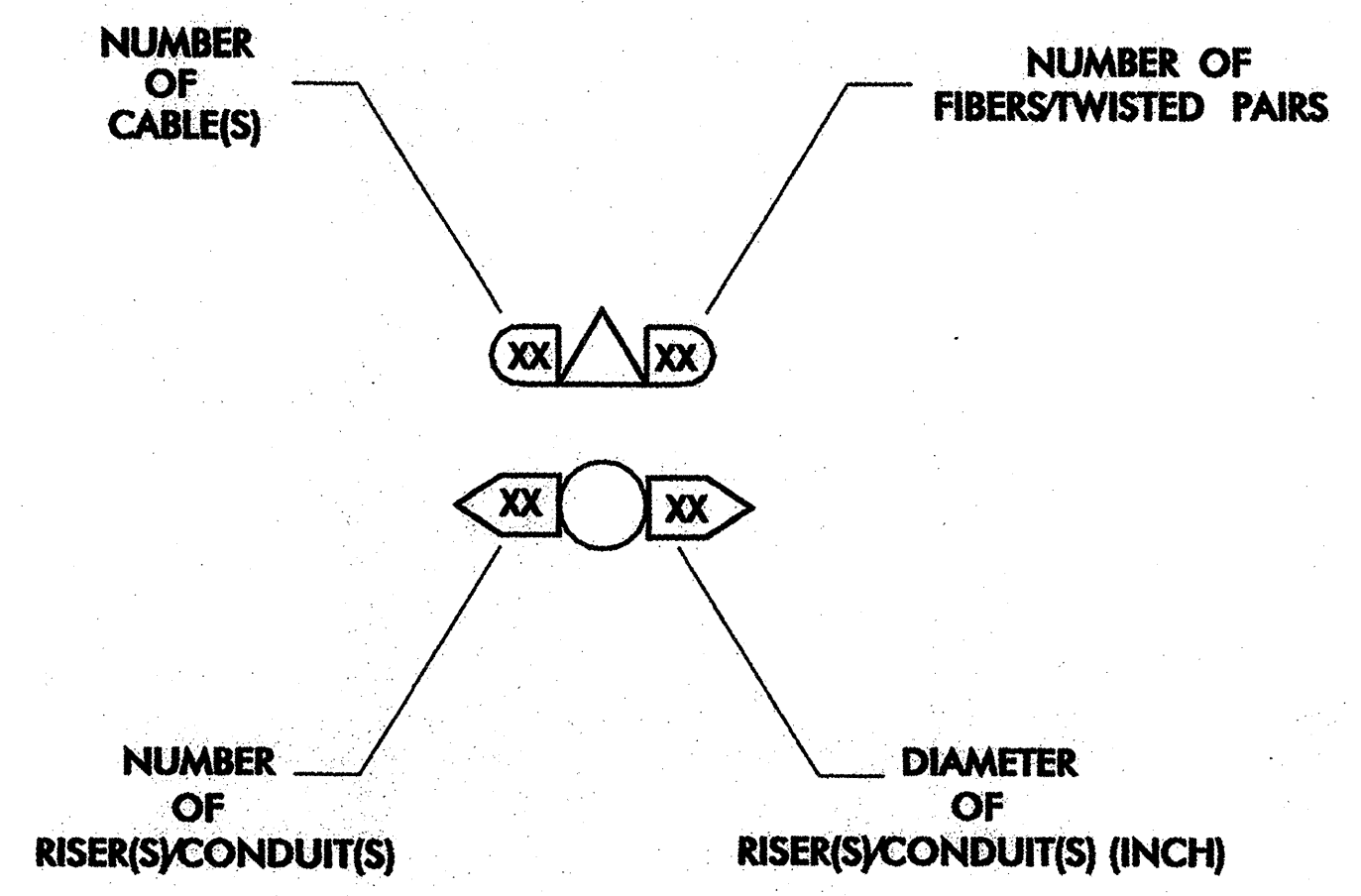
- 34 INSTALL CABINET FOUNDATION
- 35 REMOVE EXISTING CABINET FOUNDATION
- 36 INSTALL CCTV CAMERA ASSEMBLY
- 37 INSTALL CCTV CAMERA WOOD POLE
- 38 INSTALL CCTV CAMERA METAL POLE AND FOUNDATION
- 39 INSTALL JUNCTION BOX
- 40 INSTALL OVERSIZED JUNCTION BOX
- 41 REMOVE EXISTING JUNCTION BOX
- 42 INSTALL 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 SPLICE 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 SPLICE CABINET
- NEW SPLICE CABINET
- SIGNAL POLE
- XX-XXXX SIGNAL INVENTORY NUMBER

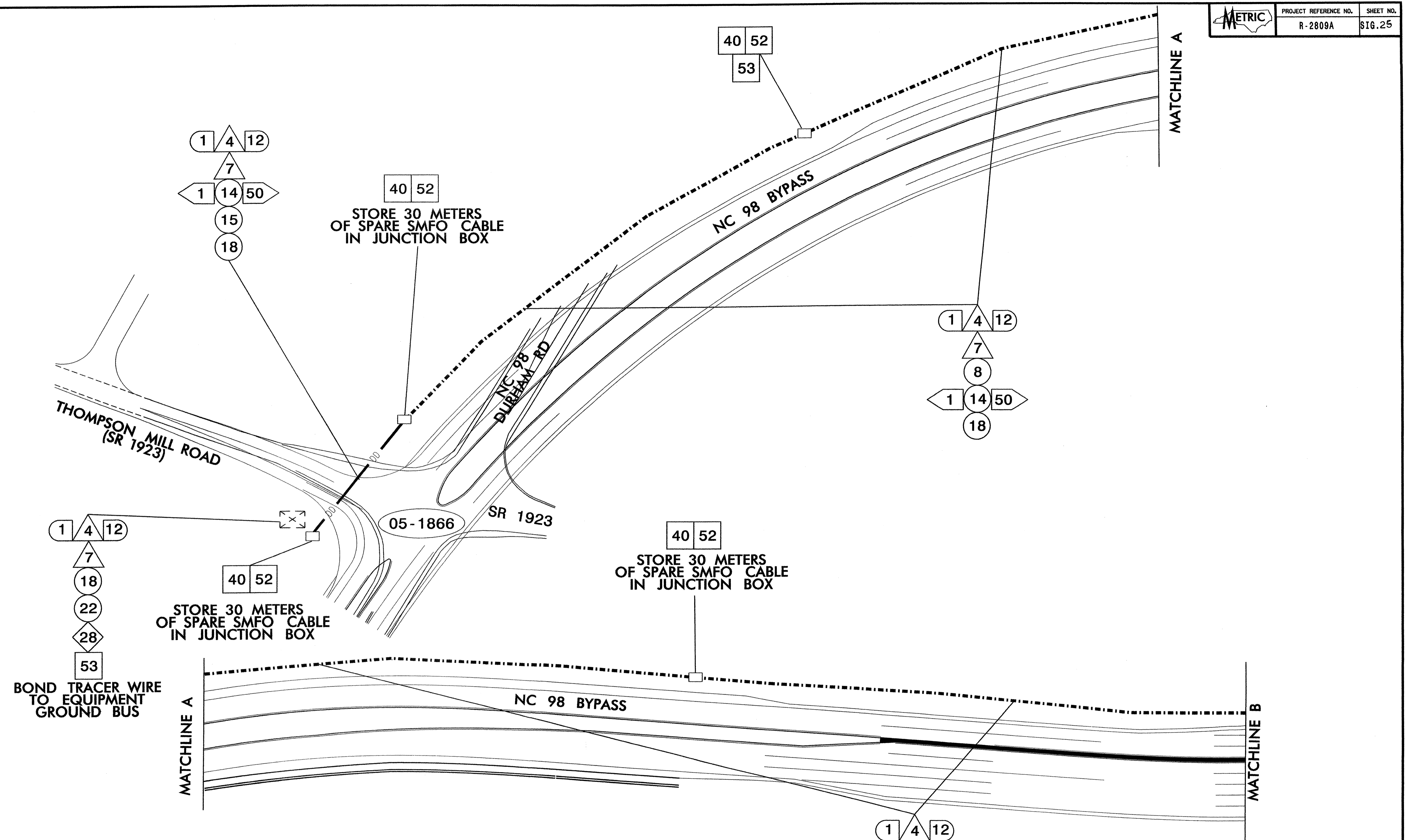
**CONSTRUCTION NOTE SYMBOLOGY KEY**

- 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)



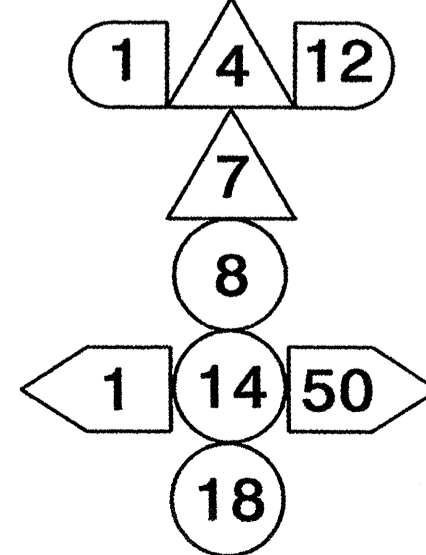
	<b>CONSTRUCTION NOTES</b>		
	PLAN DATE: _____ SCALE: _____ PREPARED BY: _____	REVIEWED BY: <b>G. A. FULLER</b> DATE: _____	



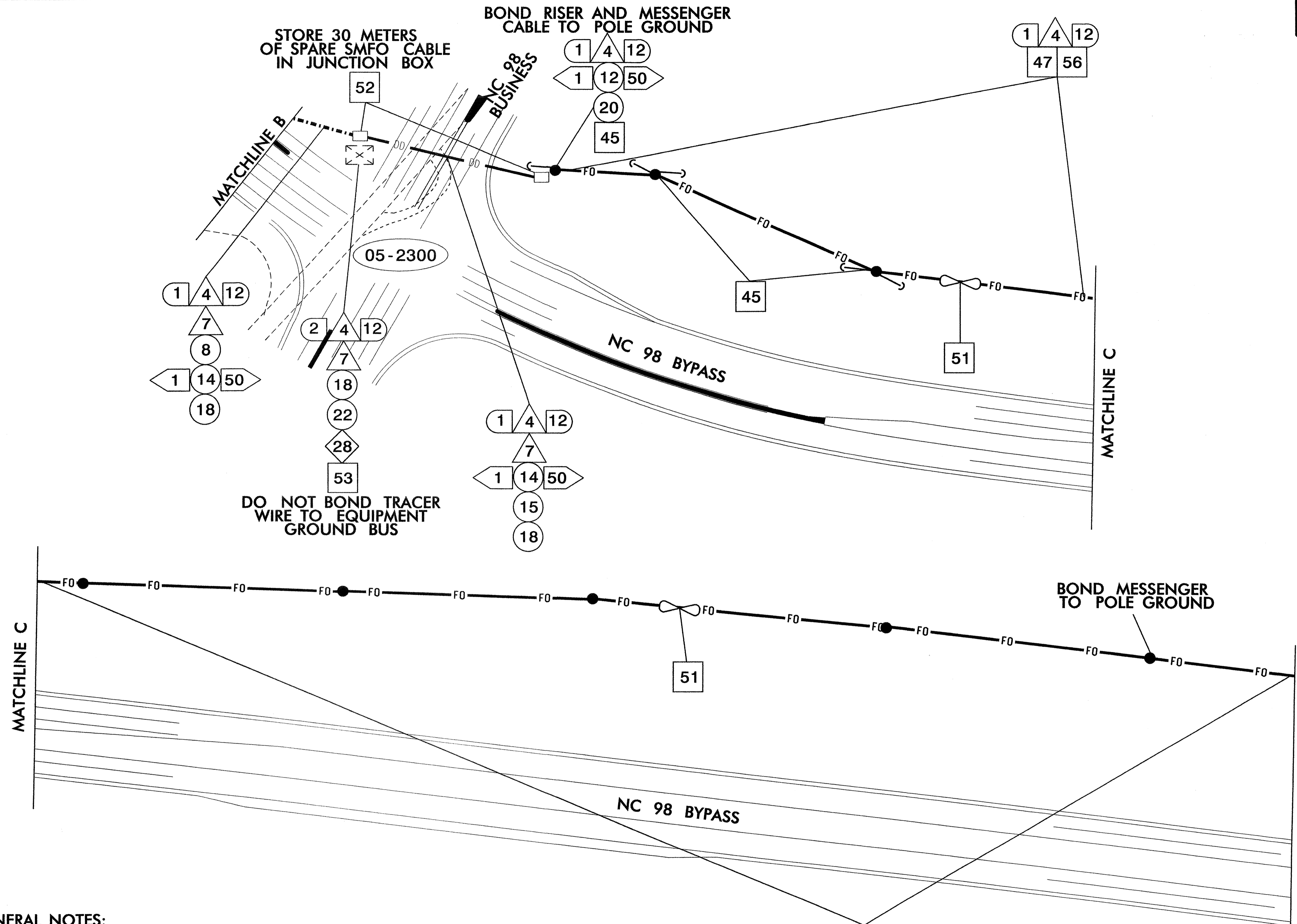


**GENERAL NOTES:**

1. ALL OVERSIZED HEAVY DUTY JUNCTION BOXES ARE SHOWN APPROXIMATELY 230 METERS APART CONTRACTOR MAY FIELD ADJUST WITH THE APPROVAL OF THE ENGINEER.
2. SEAL ALL CONDUITS WITH MECHANICAL SEALING DEVICES IN JUNCTION BOXES AND SIGNAL CABINET ENTRANCES.
3. ALL NCDOT CABLE ATTACHMENT POINTS ARE TO BE 1016MM BELOW NEUTRAL, FRONT SIDE OF POLE, UNLESS OTHERWISE NOTED.
4. INSTALL MODEL IFS D-9130SHR TRANSCEIVER TO ENSURE COMPATIBILITY WITH EXISTING SYSTEM.

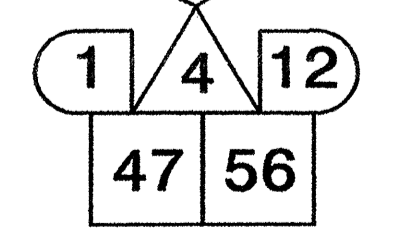


<p>Prepared in the Offices of:          STATE OF NORTH CAROLINA          DEPARTMENT OF TRANSPORTATION          Traffic Management Systems          750 Greenfield Plaza, Garner, NC 27529</p>	<b>COMMUNICATIONS CABLE          AND CONDUIT ROUTING PLANS          NC 98 BYPASS</b>		
	DIVISION 05 WAKE COUNTY WAKE FOREST PLAN DATE: JULY 2007 REVIEWED BY: I. N. AVERY PREPARED BY: H. TOMA BERGGREN REVIEWED BY: G. G. MURR, JR., PE	REVISIONS INIT. DATE	



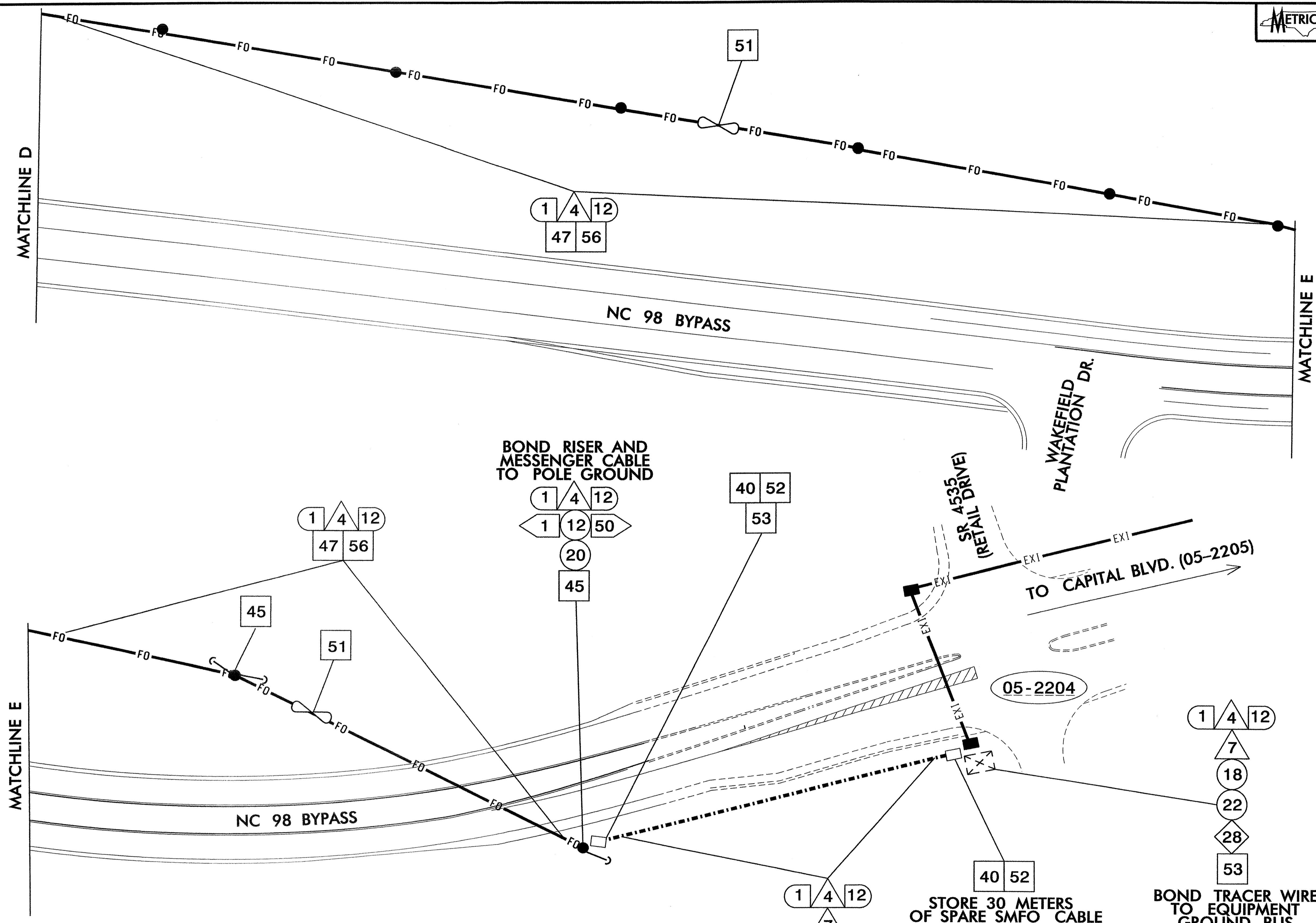
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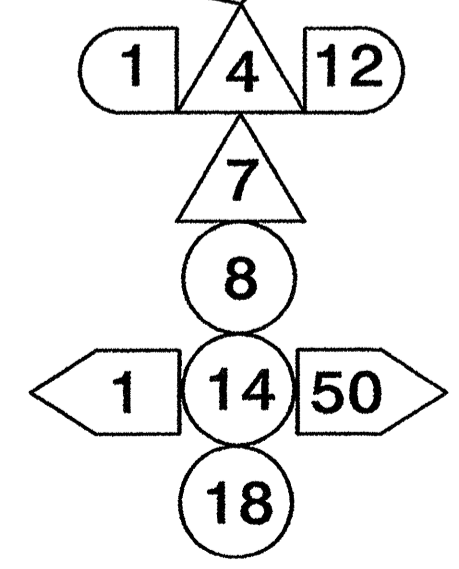
	<b>COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS</b> <b>NC 98 BYPASS</b>		
	DIVISION 05 WAKE COUNTY WAKE FOREST PLAN DATE: JULY 2007 REVIEWED BY: I. N. AVERY PREPARED BY: H. TOMA BERGGREN REVIEWED BY: G. G. MURR, JR., PE	REVISIONS IMIT. DATE	
SCALE 0		SIGNATURE: <i>[Signature]</i> DATE: 7/27-07	



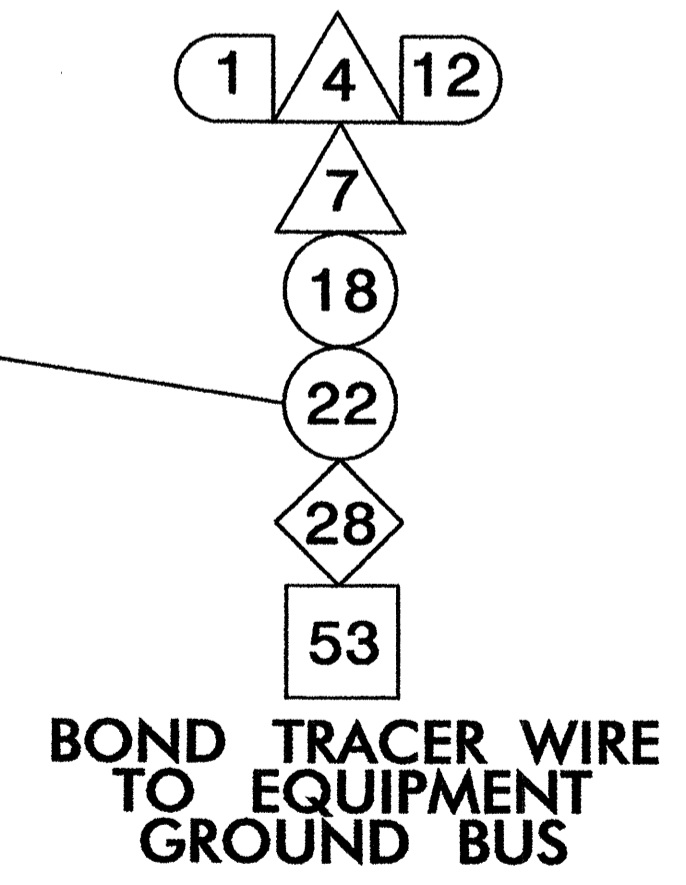


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40 52  
STORE 30 METERS OF SPARE SMFO CABLE IN JUNCTION BOX



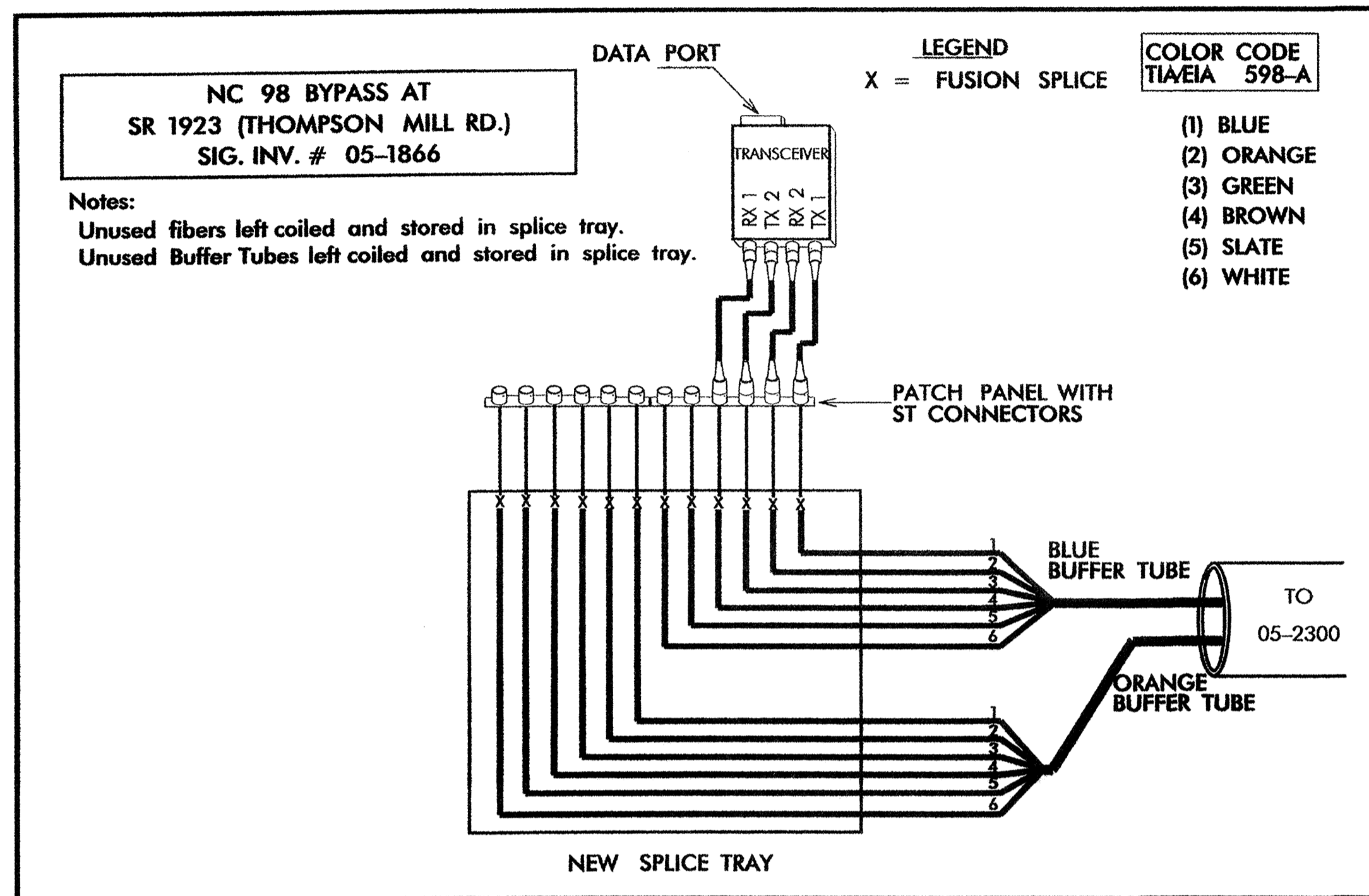
Prepared in the Offices of:  
  
 750 Greenfield Pkwy, Garner, NC 27529  
 SCALE: 0 1 2

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS		
NC 98 BYPASS		
DIVISION 05	WAKE COUNTY	WAKE FOREST
PLAN DATE: JULY 2007	REVIEWED BY: I. N. AVERY	
PREPARED BY: H. TOWA BERGGREN	REVIEWED BY: G. G. MURR, JR., PE	
REVISIONS	INIT.	DATE

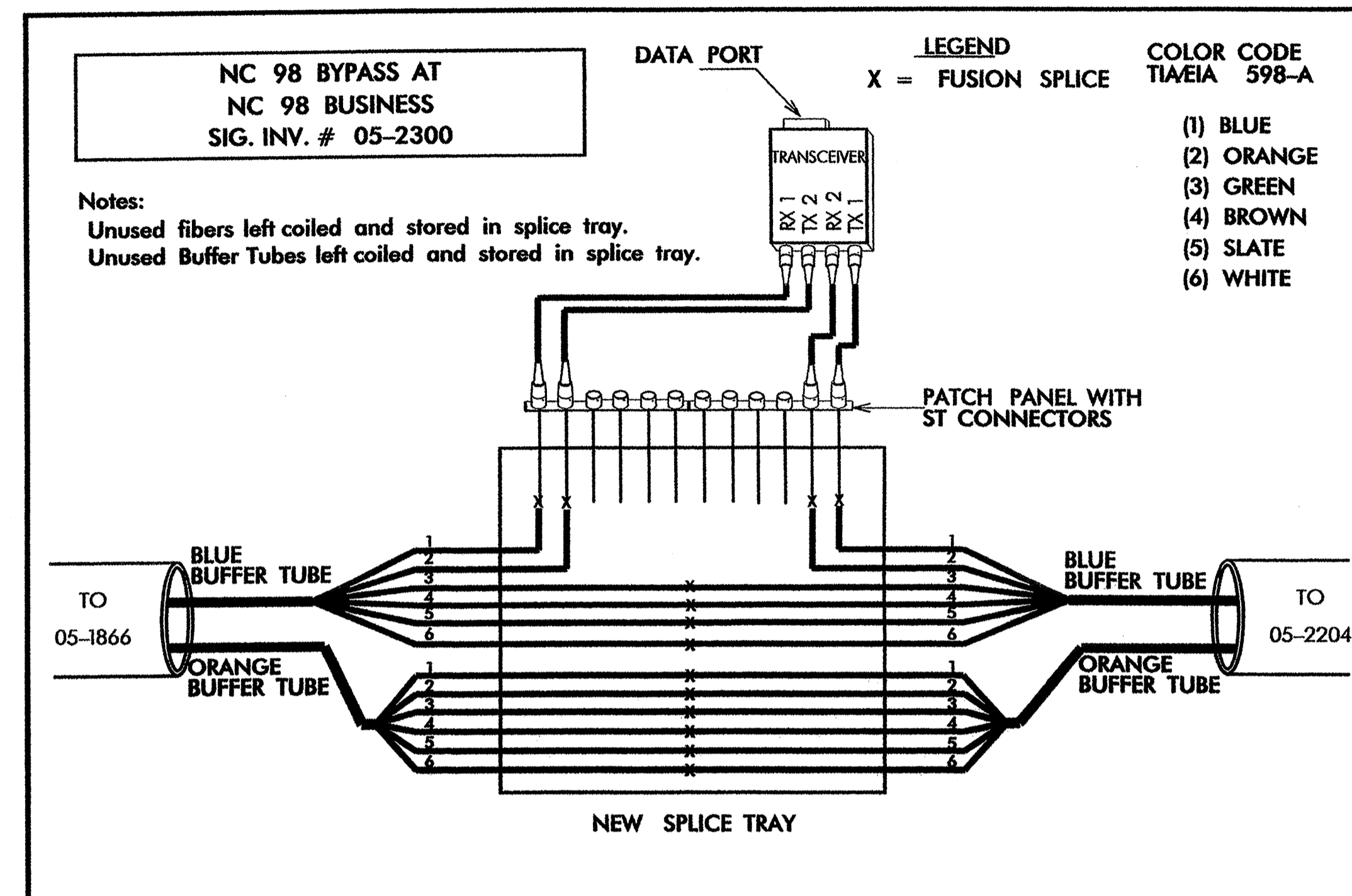
SEAL  
  
 SEAL 14543  
 GENE G. MURR, JR.  
 DATE: 7-27-07

# FIBER OPTIC CABLE

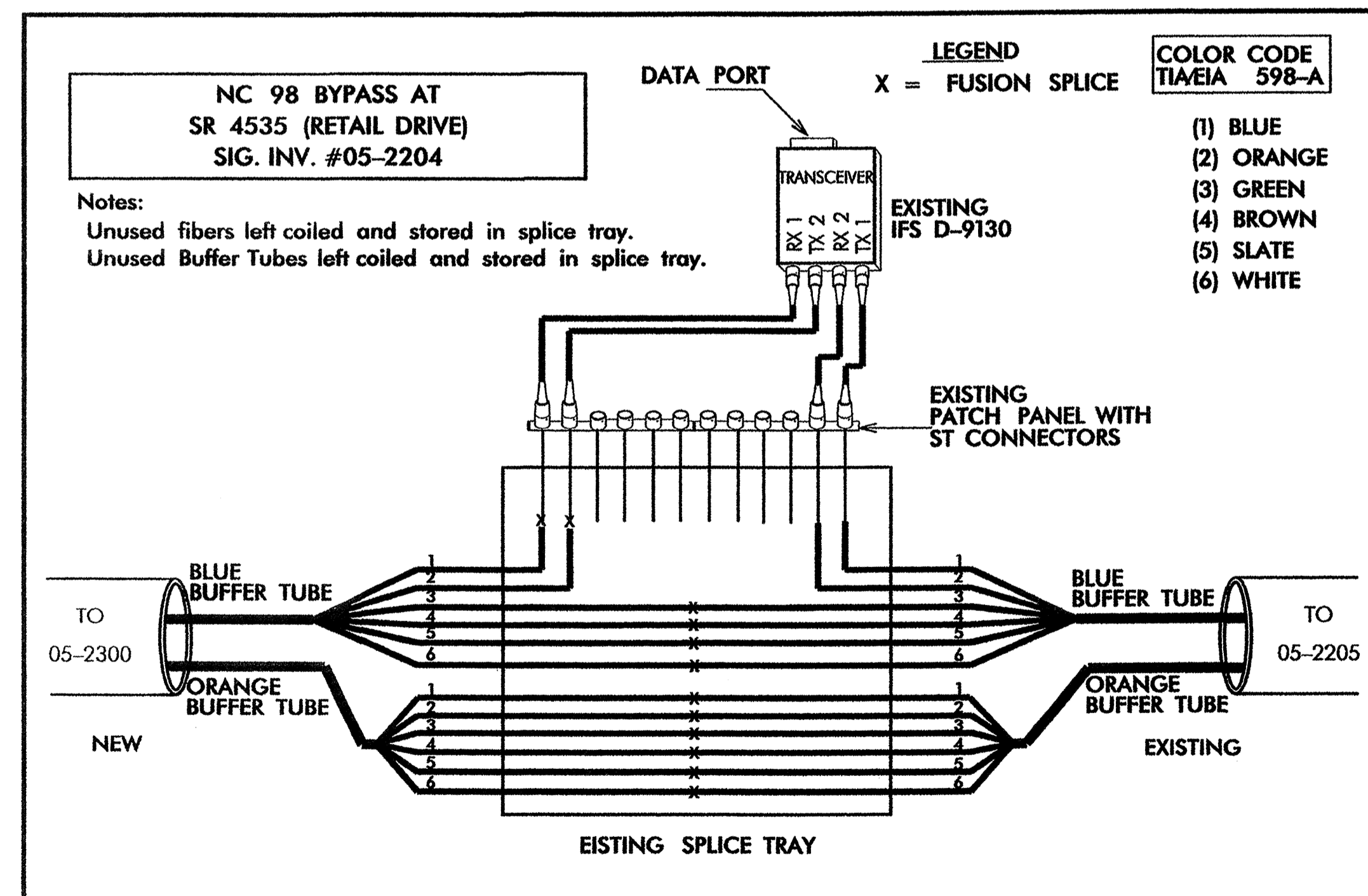
NEW



NEW



REVISE SPLICES AS SHOWN



**NOTES:**

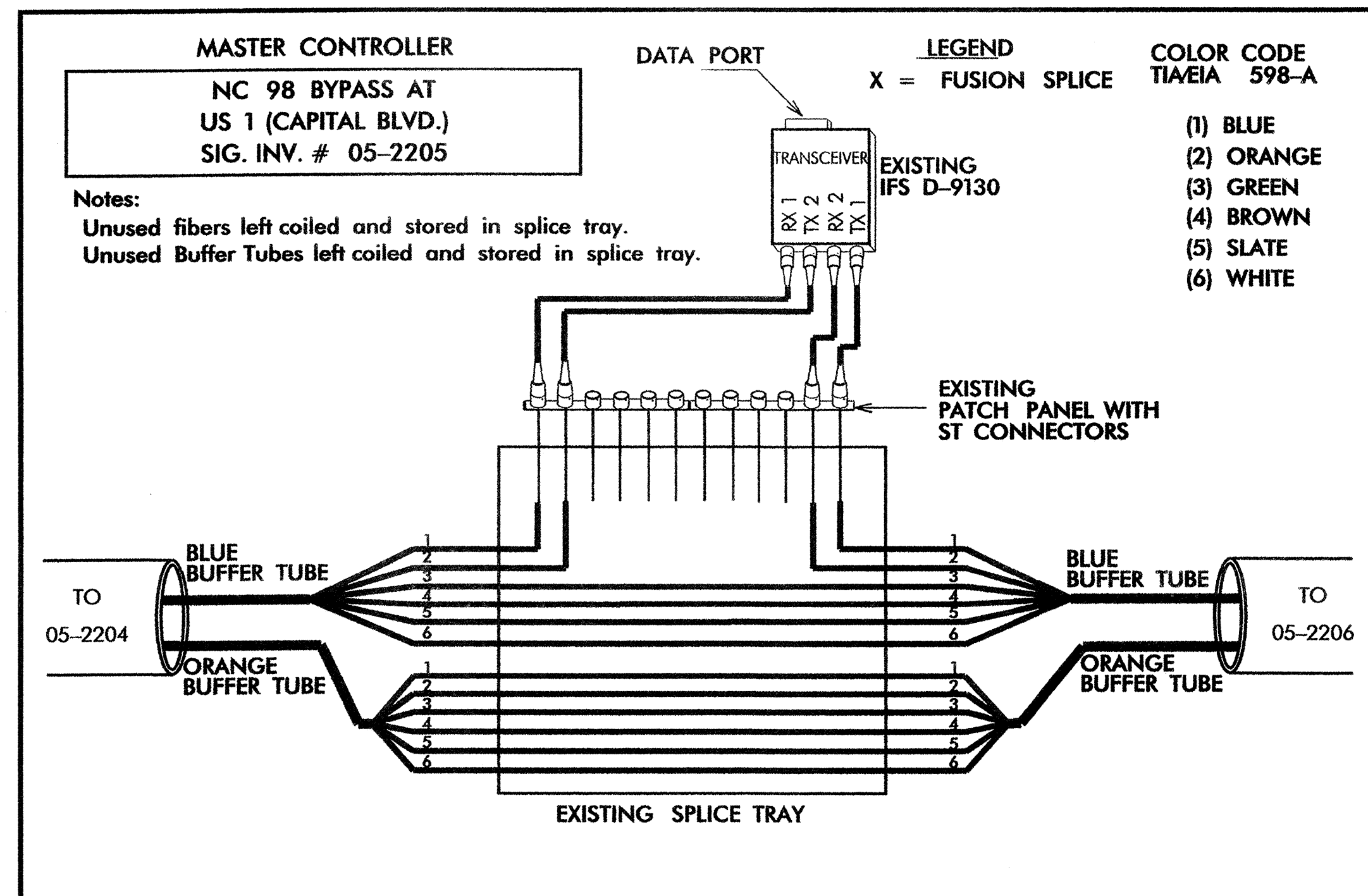
1. INSTALL IFS MODEL D-9103SHR TRANSCEIVER AT NEW LOCATIONS FOR COMPATIBILITY WITH EXISTING SYSTEM.
2. TRANSCEIVER TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING \ ENSURING PROPER TERMINATIONS

	<b>SPLICE DETAIL NC 98 BYPASS</b>		
	DIVISION: 05 WAKE COUNTY WAKE FOREST PLAN DATE: JULY 2007 REVIEWED BY: I. N. AVERY PREPARED BY: H. TOMA BERGGREN REVIEWED BY: G. G. MURR, JR.	REVISIONS INIT. DATE SIGNATURE DATE	

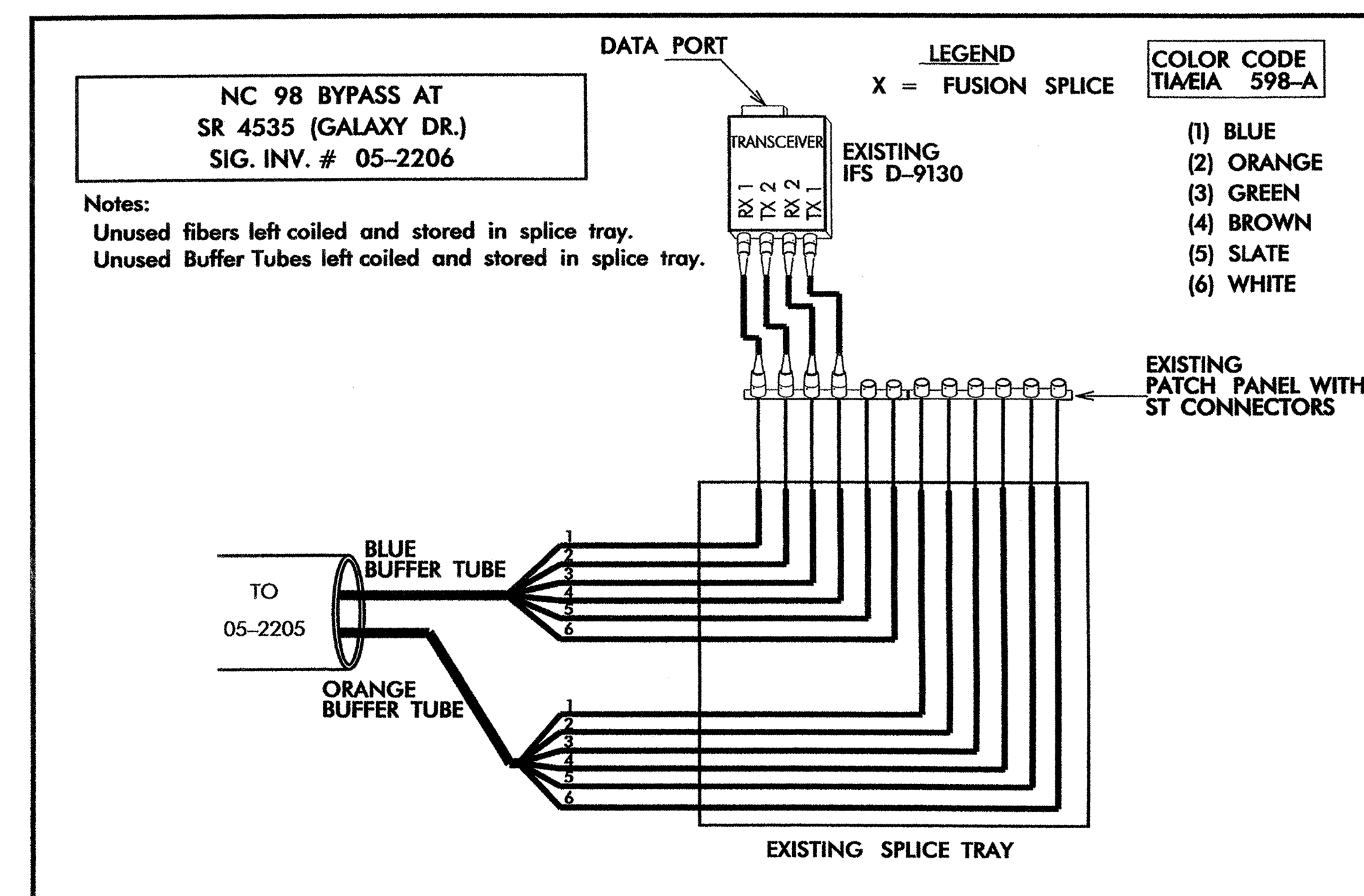


# FIBER OPTIC CABLE

SHOWN FOR INFORMATIONAL PURPOSES ONLY



SHOWN FOR INFORMATIONAL PURPOSES ONLY



**NOTES:**

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<p>122 N. McDowell St., Raleigh, NC 27603</p>	<p><b>SPLICE DETAIL</b> <b>NC 98 BYPASS</b></p>		
	<p>DIVISION: 05 WAKE COUNTY WAKE FOREST</p> <p>PLAN DATE: JULY 2007 REVIEWED BY: I. N. AVERY</p> <p>PREPARED BY: H. TOMA BERGGREN REVIEWED BY: G. G. MURR, JR.</p>	<p>REVISIONS</p> <p>INIT. DATE</p>	