

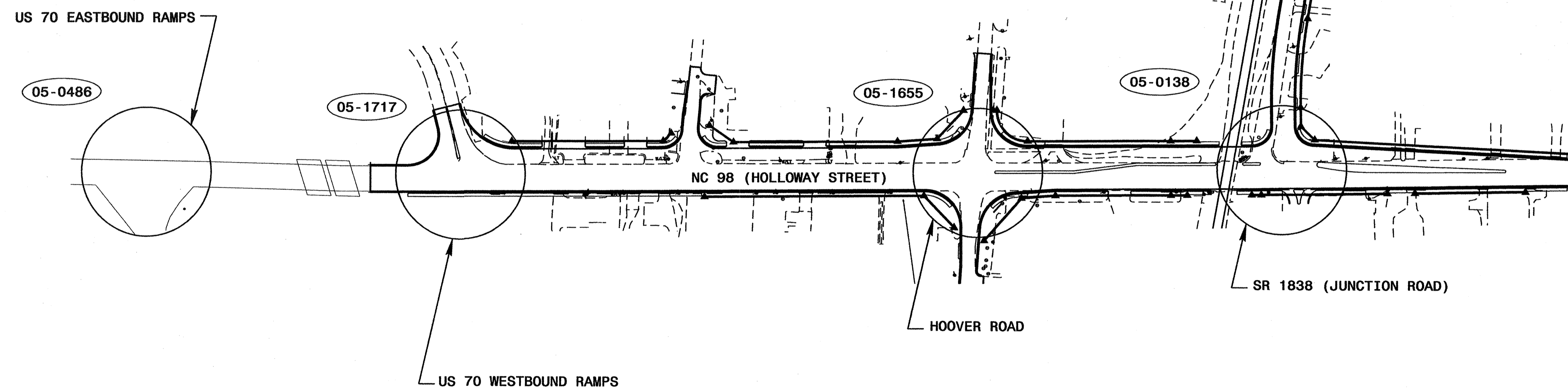
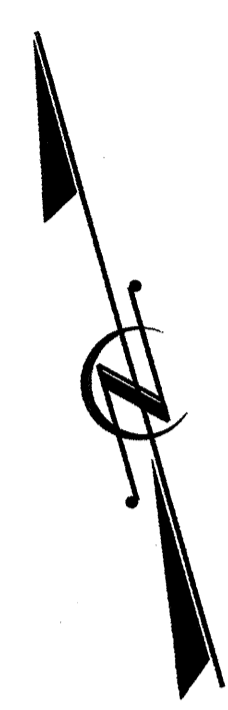
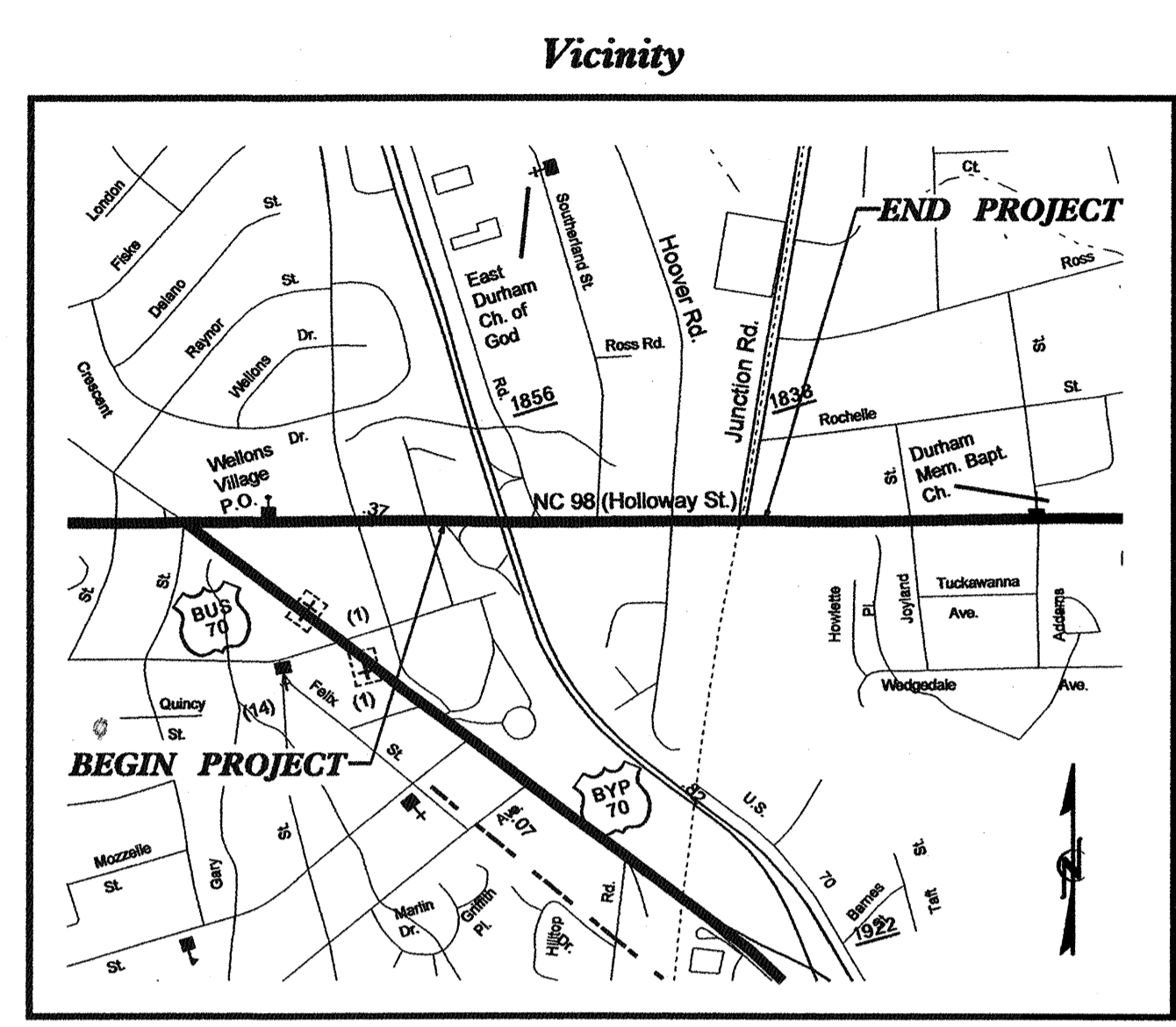
STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

**Durham County**

**LOCATION: NC 98 (Holloway Street) From  
US 70 Ramps to Junction Road in Durham**

**TYPE OF WORK: TRAFFIC SIGNALS**

**Project: U-4010**



Refer to "Roadway Standard Drawings  
NCDOT" dated July 2006 and  
"Standard Specifications for Roads  
and Structures" dated July 2006.

Sheet #	Reference #	Index of Plans
Sig. 1		Title Sheet
Sig. 2	05-0486	NC 98 (Holloway Street) at US 70 Eastbound Ramps
Sig. 5	05-1717	NC 98 (Holloway Street) at US 70 Westbound Ramps
Sig. 12	05-1655	NC 98 (Holloway Street) at Hoover Road
Sig. 19	05-0138	NC 98 (Holloway Street) at SR 1838 (Junction Road)
Sig. 28		Metal Pole Sheets
Sig. 33		Communications Cable & Conduit Routing Plans

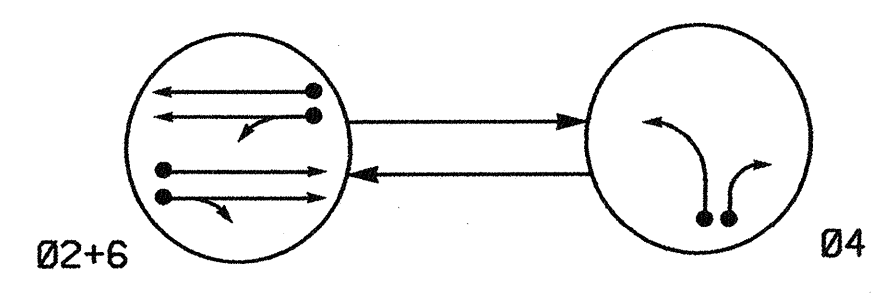
**INTELLIGENT TRANSPORTATION AND SIGNALS UNIT**  
Contacts:  
**D. Y. Ishak - Signals and Geometrics Contracts Engineer**  
**G. C. Brown, PE - Signal Equipment Design Engineer**  
**G. G. Murr, Jr., PE - Intelligent Transportation Systems Engineer**

Prepared In the Office of:  
**DIVISION OF HIGHWAYS**  
**TRAFFIC ENGINEERING AND SAFETY SYSTEMS**  
**BRANCH**

122 N. McDowell St., Raleigh, NC 27603

29-DEC-2006 11:28 SA:\ts\signals\workgroups\tp\_projects\U-4010\signal\_files from kubilins\U4010 - sig cover.dgn

**PHASING DIAGRAM**

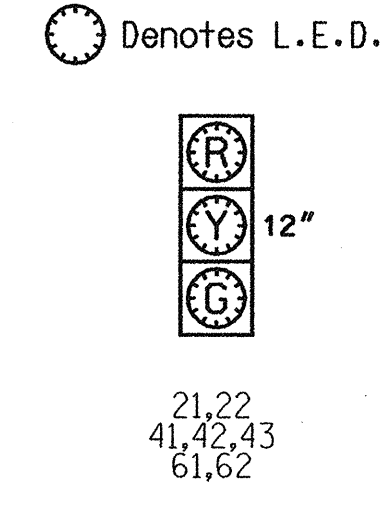


**PHASING DIAGRAM DETECTION LEGEND**  
 ←● DETECTED MOVEMENT  
 ← UNDETECTED MOVEMENT (OVERLAP)  
 - - - UNSIGNALIZED MOVEMENT  
 ← - - - PEDESTRIAN MOVEMENT

**TABLE OF OPERATION**

SIGNAL FACE	PHASE		
	Ø2+6	Ø4	Ø6
21,22	G	R	Y
41,42,43	R	G	R
61,62	G	R	Y

**SIGNAL FACE I.D.**



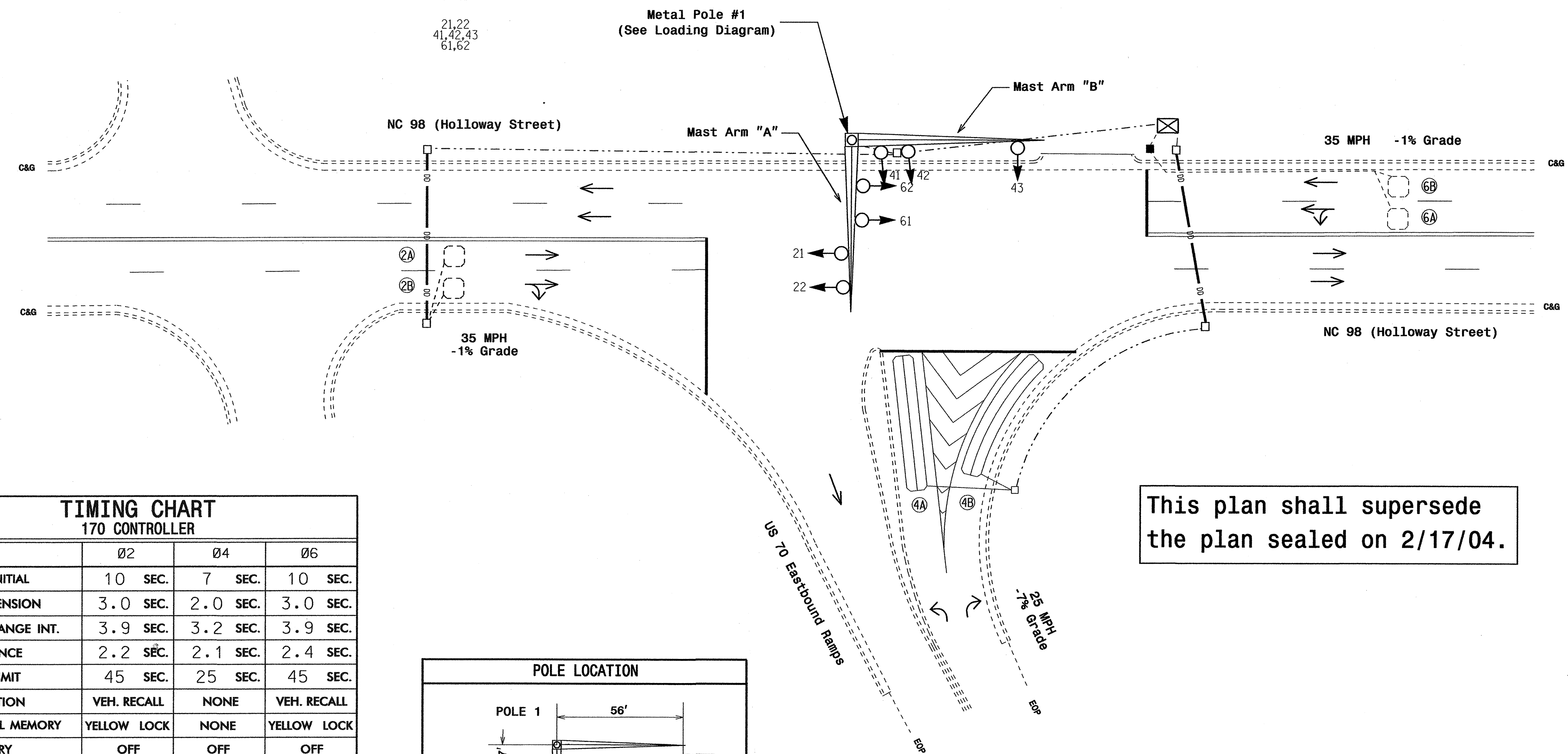
**LOOP & DETECTOR UNIT INSTALLATION CHART**  
170 CONTROLLER AND CABINET

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, 2B	6X6	EXISTING	70	X	X	2	SEC.	SEC.							X	X		X	
4A	6X40	2-4-2	0	X	X	4	SEC.	SEC.							X	X		X	
4B	6X40	2-4-2	0	X	X	4	15 SEC.	SEC.							X	X		X	
6A, 6B	6X6	EXISTING	70	X	X	6	SEC.	SEC.							X	X		X	

**2 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. Set all detector units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Pavement markings are existing.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

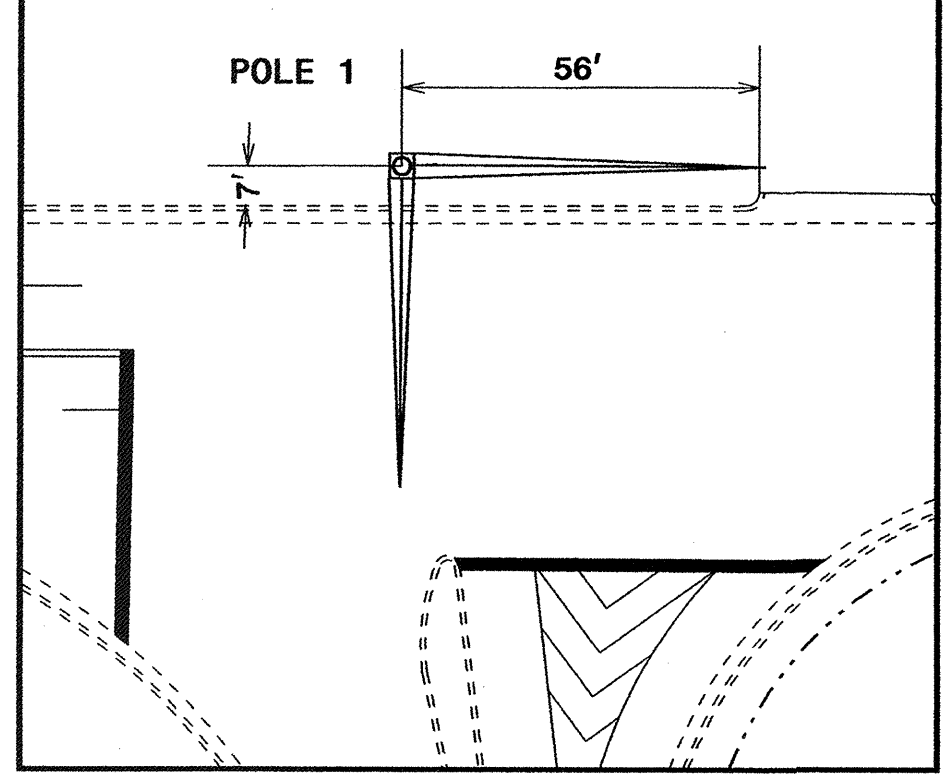


This plan shall supersede the plan sealed on 2/17/04.

**TIMING CHART**  
170 CONTROLLER

PHASE	Ø2	Ø4	Ø6
MINIMUM INITIAL	10 SEC.	7 SEC.	10 SEC.
VEHICLE EXTENSION	3.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	3.9 SEC.	3.2 SEC.	3.9 SEC.
RED CLEARANCE	2.2 SEC.	2.1 SEC.	2.4 SEC.
MAXIMUM LIMIT	45 SEC.	25 SEC.	45 SEC.
RECALL POSITION	VEH. RECALL	NONE	VEH. RECALL
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	YELLOW LOCK
DOUBLE ENTRY	OFF	OFF	OFF
WALK	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL	- SEC.	- SEC.	- SEC.
MAXIMUM GAP	3.0 SEC.	2.0 SEC.	3.0 SEC.
REDUCE 0.1 SEC EVERY	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	2.0 SEC.	3.0 SEC.

**POLE LOCATION**



**LEGEND**

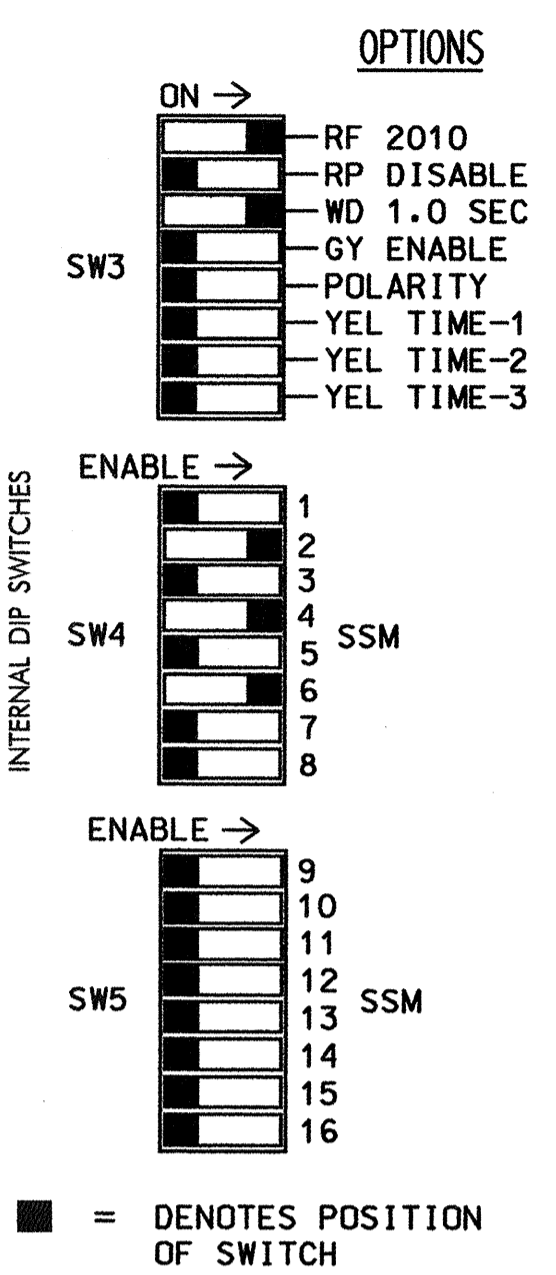
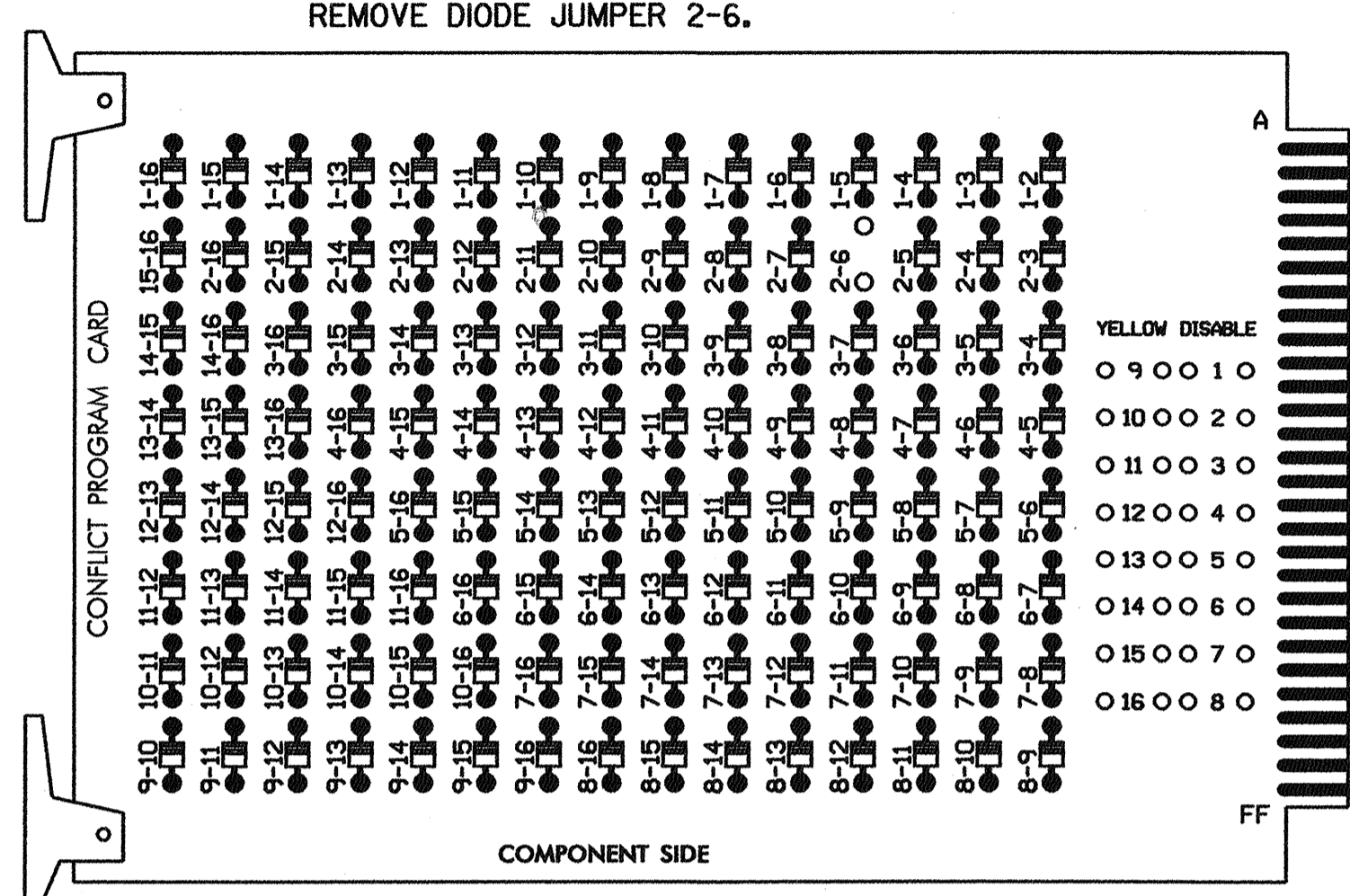
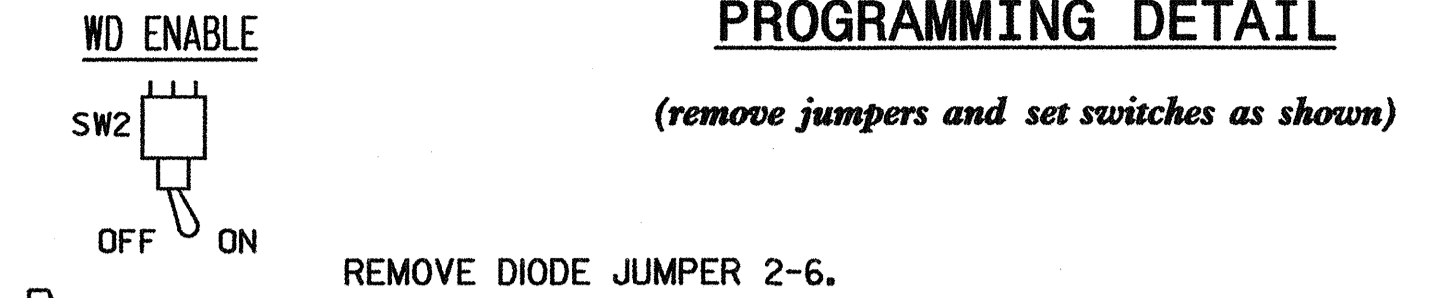
<b>PROPOSED</b>	<b>EXISTING</b>
○ → Traffic Signal Head	● → N/A
○ → Modified Signal Head	○ → N/A
— Sign	— Sign
⊥ Metal Pole with Mastarm	⊥ Metal Pole with Mastarm
□ Inductive Loop Detector	□ Inductive Loop Detector
⊠ Controller & Cabinet	⊠ Controller & Cabinet
□ Junction Box	□ Junction Box
- - - 2-in Underground Conduit	- - - 2-in Underground Conduit
- - - Directional Drill	- - - Directional Drill
N/A Right of Way with Marker	N/A Right of Way with Marker
→ Directional Arrow	→ Directional Arrow
→ Pavement Marking Arrow	→ Pavement Marking Arrow

**SIGNAL UPGRADE**

Prepared in the Offices of:  
  
**NC 98 (Holloway Street) at US 70 Eastbound Ramps**  
 Division 5 Durham County Durham  
 PLAN DATE: November 2006 REVIEWED BY: D Y Ishak  
 PREPARED BY: R M Duffy REVIEWED BY:  
 SCALE: 1" = 20'  
 REVISIONS: \_\_\_\_\_ INIT. DATE  
 SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_  
 SIG. INVENTORY NO. 05-0486



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



- REMOVE DIODE JUMPER 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 SEL1-SEL5 ARE PRESENT ON THE MONITOR BOARD.
  - ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION.

**NOTES**

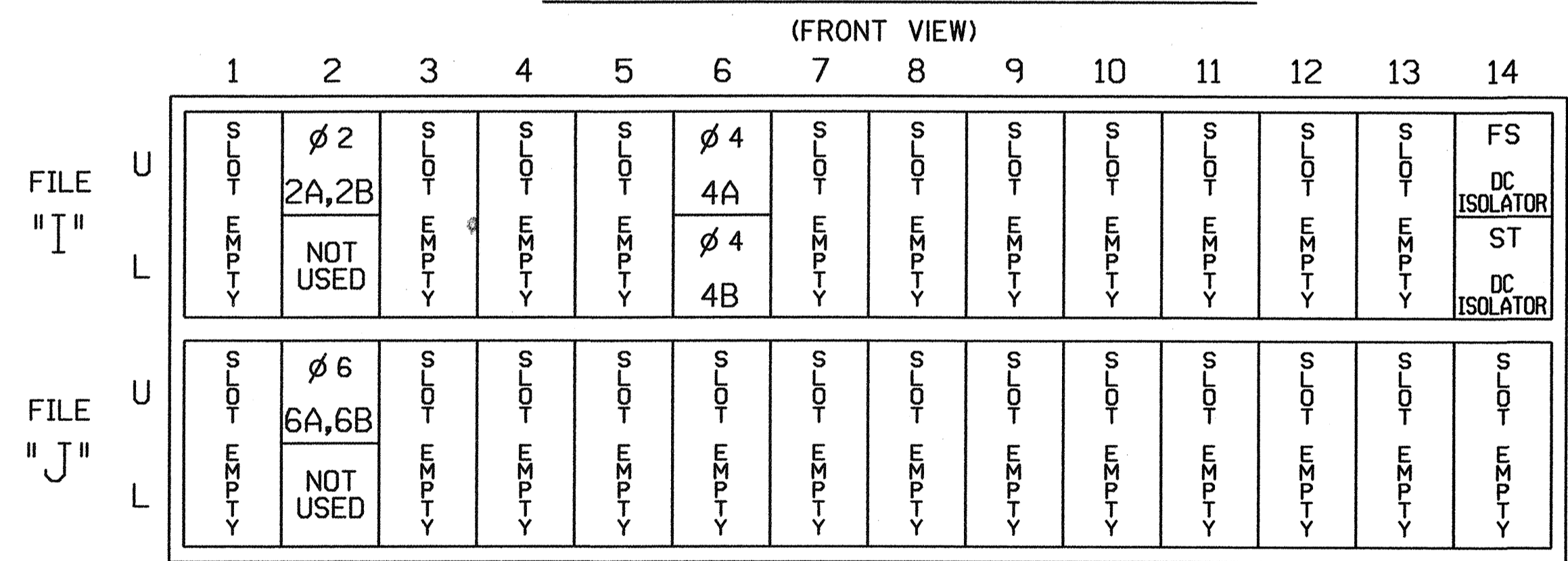
- TO PREVENT "FLASH-CONFLICT" PROBLEMS, INSERT RED FLASH PROGRAM BLOCKS FOR ALL UNUSED VEHICLE LOAD SWITCHES IN OUTPUT FILE. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 1,3,5,7, 8,9,10,11,12,13,14,15 & 16, TIE UNUSED LOAD SWITCH RED OUTPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM THE 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, ON CONTROLLER UNIT, FOR ALL PHASES.
- THE CABINET AND CONTROLLER ARE A PART OF THE DURHAM 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	NU	41, 42,43	NU	NU	61,62	NU	NU	NU	NU
RED		128			101			134				
YELLOW		129			102			135				
GREEN		130			103			136				
RED ARROW												
YELLOW ARROW												
GREEN ARROW												

NU = NOT USED

**INPUT FILE POSITION LAYOUT**



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

FS = FLASH SENSE  
ST = STOP TIME

**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A,2B	TB2-5,6	I2U	1	39	5 7	2
4A	TB4-9,10	I6U	2	41	5 7	4
4B	TB4-11,12	I6L	3	45	5 7	4
6A,6B	TB3-5,6	J2U	4	40	5 7	6

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

- INPUT FILE POSITION LEGEND: J2L
- FILE J \_\_\_\_\_  
SLOT 2 \_\_\_\_\_  
LOWER \_\_\_\_\_
- DETECTOR ATTRIBUTES LEGEND:
- FULL TIME DELAY
  - PED CALL
  - RESERVED
  - COUNTING
  - EXTENSION
  - TYPE 3
  - CALLING
  - ALTERNATE

**EQUIPMENT INFORMATION**

CONTROLLER.....CONTRACTOR SUPPLIED 170E  
CABINET .....CONTRACTOR SUPPLIED 332  
SOFTWARE .....BI TRANS 233NC2  
CABINET MOUNT.....BASE  
OUTPUT FILE POSITIONS...12  
LOAD SWITCHES USED.....S2,S4,S6  
PHASES USED.....2,4,6  
OVERLAPS.....NONE

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0486  
DESIGNED: NOVEMBER 2006  
SEALED: 12-21-06  
REVISED: N/A

TYPE 170 CONTROLLER & 332 CABINET

**THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 4/20/04.**

**SIGNAL UPGRADE**

Prepared in the Office of:

122 N. McDowell St., Raleigh, NC 27603

NC 98 (HOLLOWAY STREET) AT US 70 EASTBOUND RAMP

DIVISION 05 DURHAM COUNTY DURHAM

PLAN DATE: DECEMBER 2006 REVIEWED BY: JWA

PREPARED BY: JAMES PETERSON REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL

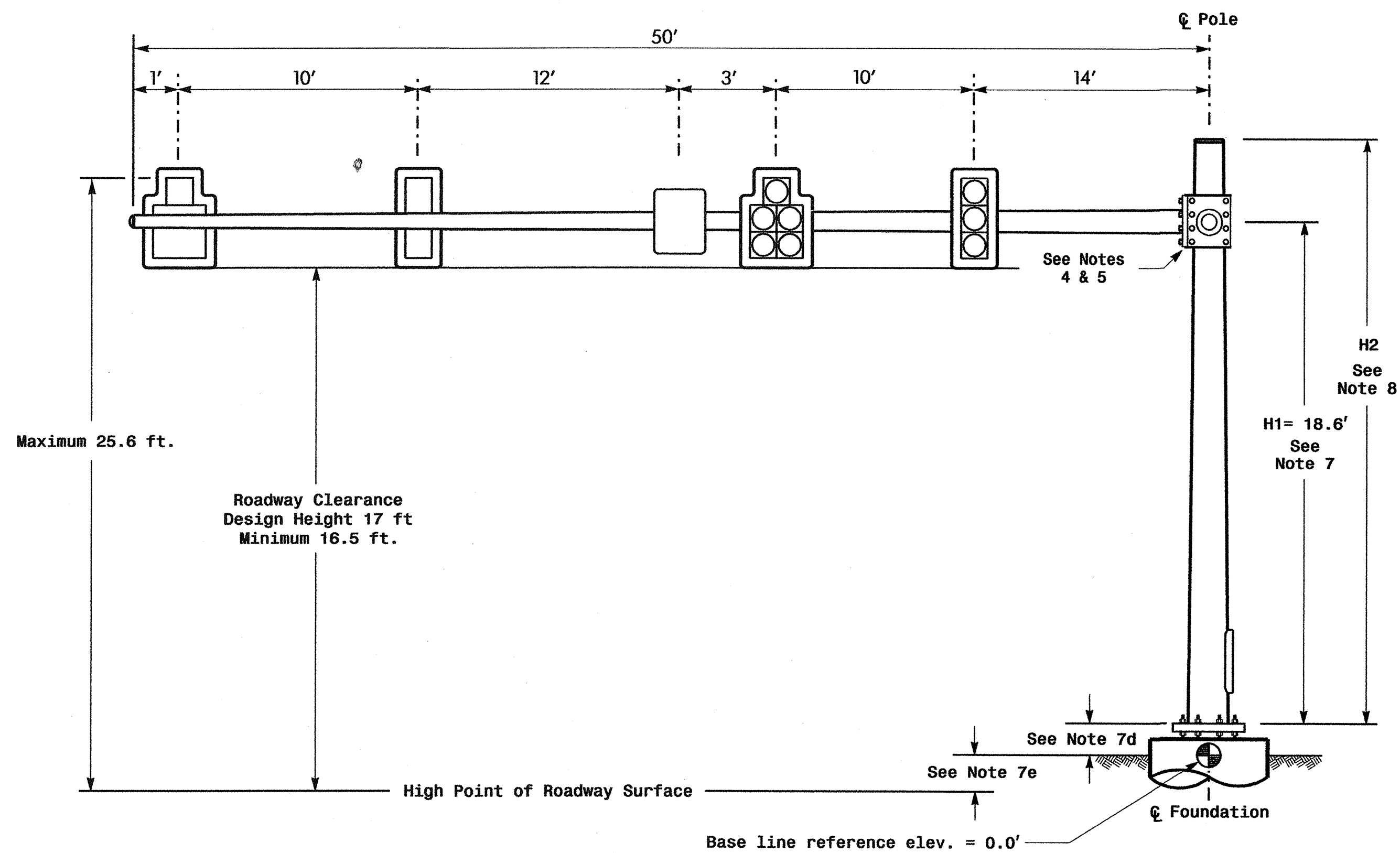
John T. Rowe 12-22-06

SIGNATURE DATE

SIG. INVENTORY NO. 05-0486

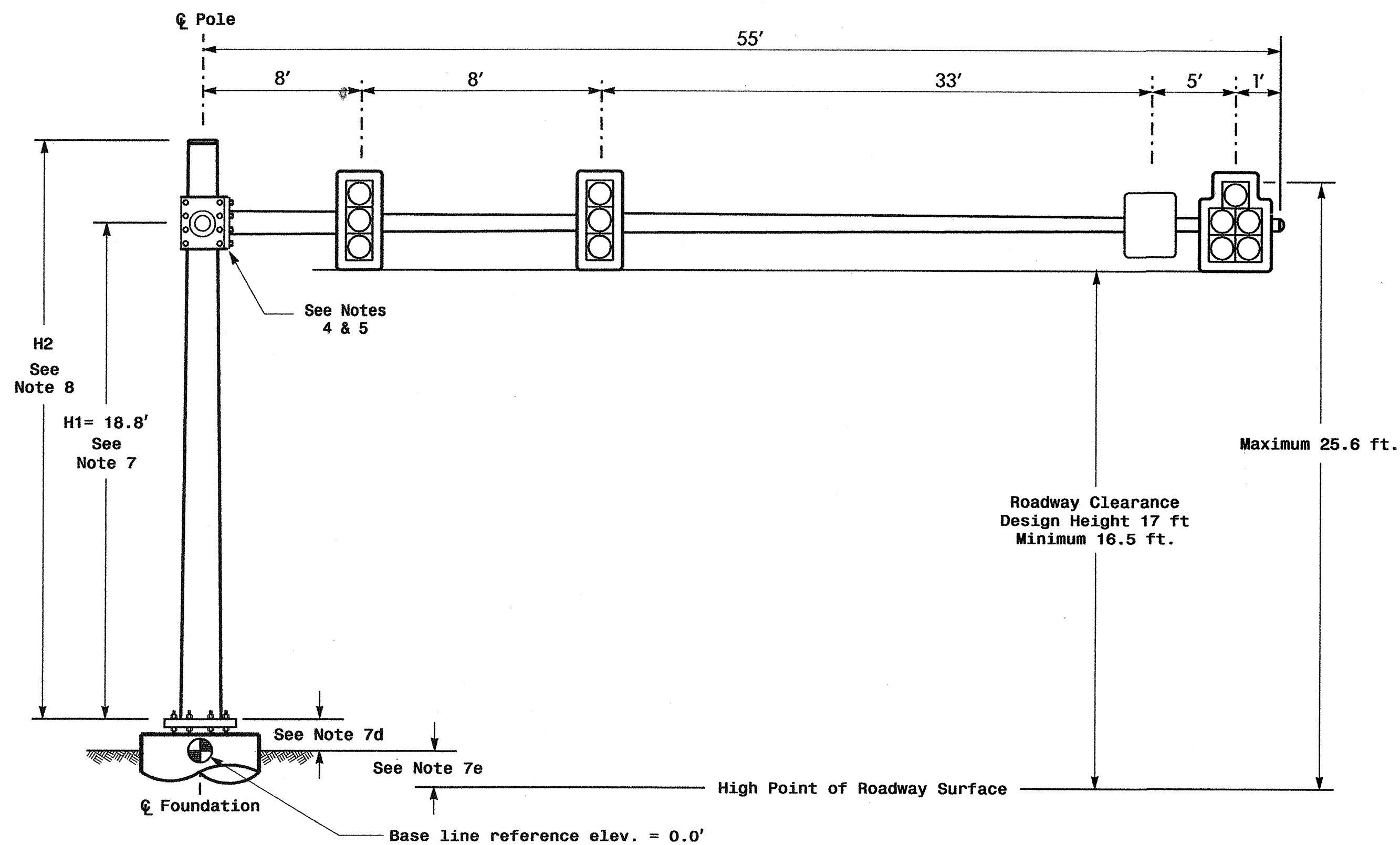


**Design Loading for METAL POLE NO. 1, MAST ARM A**



Elevation View @ 270°

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



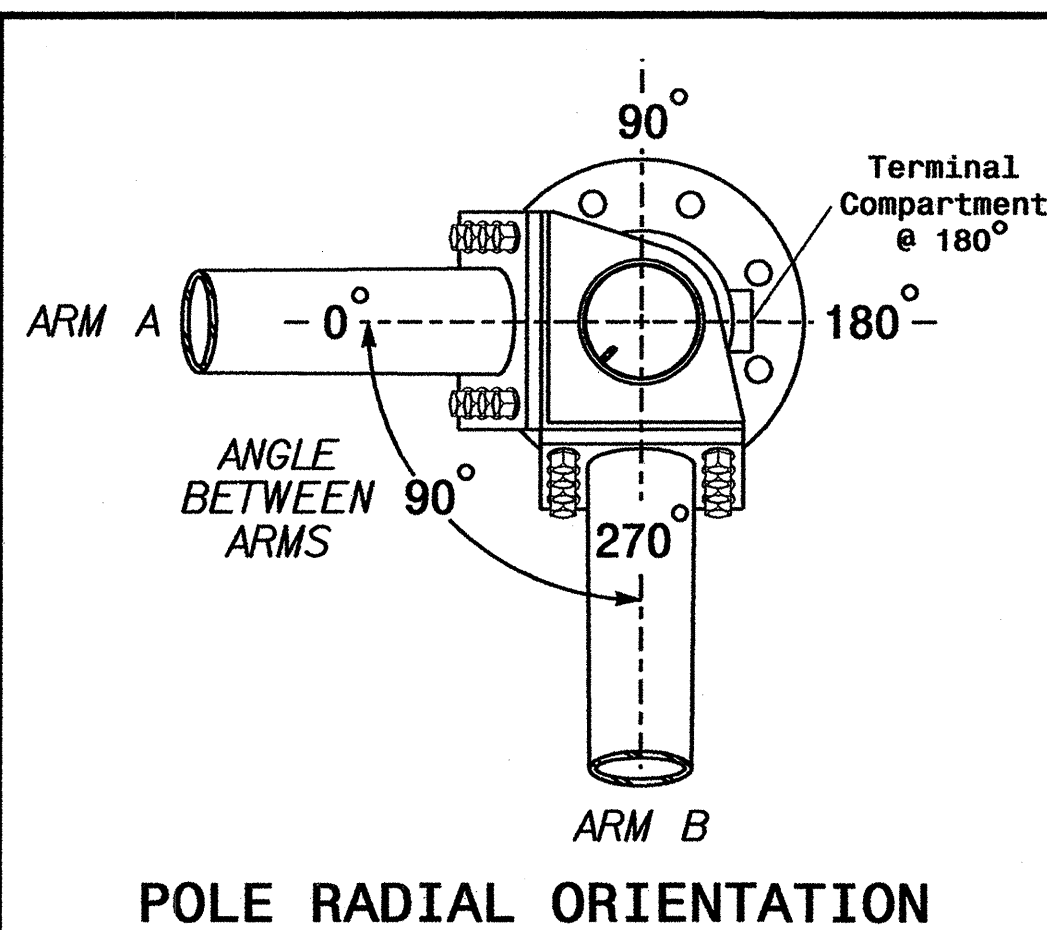
Elevation View @ 0°

**SPECIAL NOTE**

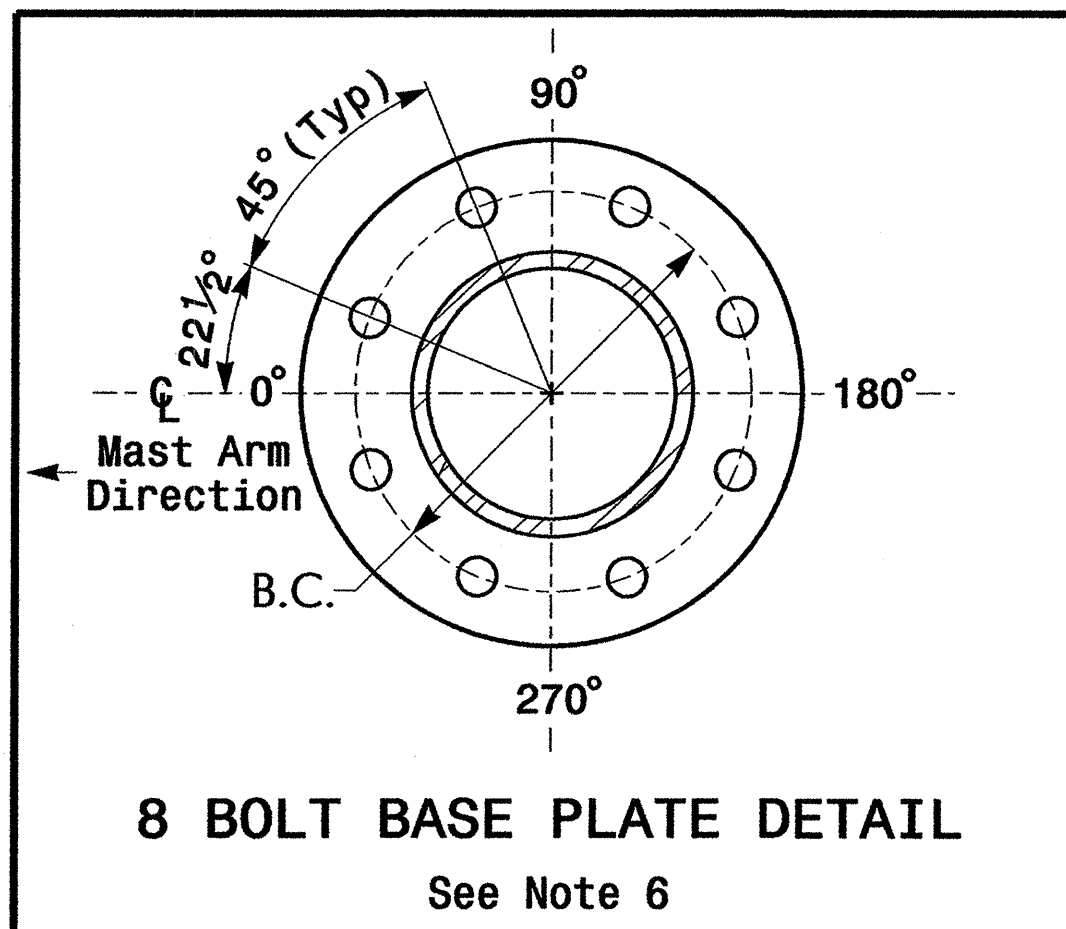
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

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

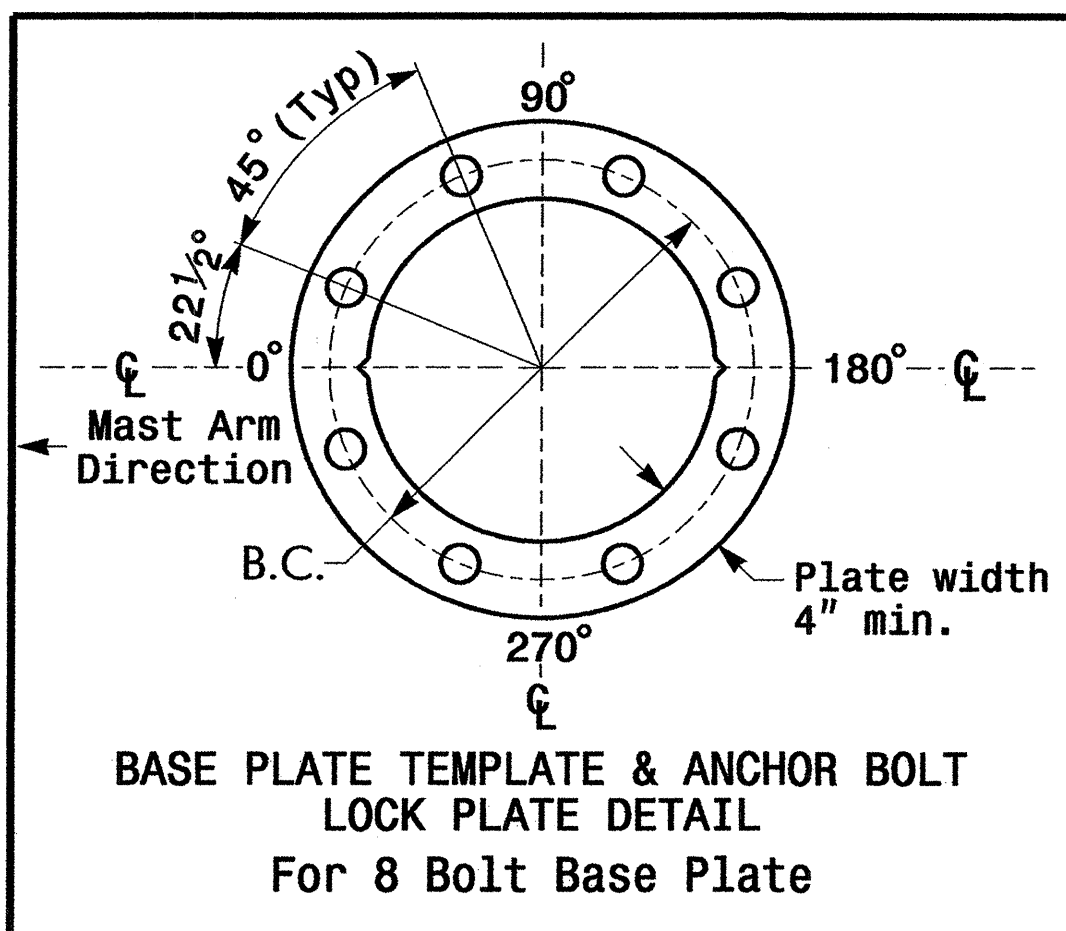
Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.2 ft.	+/-0.0 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A



POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL  
See Note 6



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

NCDOT Wind Zone 4 (90 mph)

	NC 98 (Holloway Street) at US 70 Eastbound Ramps		SEAL 
	Division 5 Durham County	Durham	
PLAN DATE: November 2006	REVIEWED BY: D.Y. Ishak	PREPARED BY: Z.M. Little	
SCALE: N/A	REVISIONS	INIT.	DATE
SIGNATURE:		DATE:	
SIG. INVENTORY NO. 05-0486		21 DECEMBER 06	

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

**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/tmssu/ws/mpoles/poles.htm>

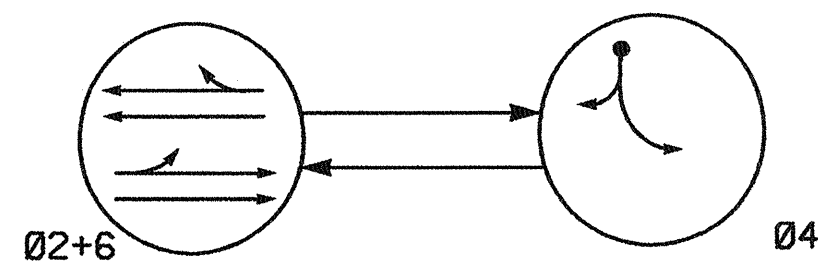
**Design Requirements**

- 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.
- Maximum allowable CSR for all signal supports is 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. The arm-to-pole attachment is a high strength connection. Use Direct Tension Indicators (ASTM F959) for each bolt.
- 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) 733-3915.
- 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.

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PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

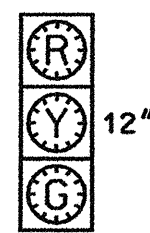
- ←● DETECTED MOVEMENT
- ← UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE		
	Ø2+6	Ø4	Ø6
21,22	G R Y		
41,42	R G R		
61,62	G R Y		

SIGNAL FACE I.D.

Denotes L.E.D.

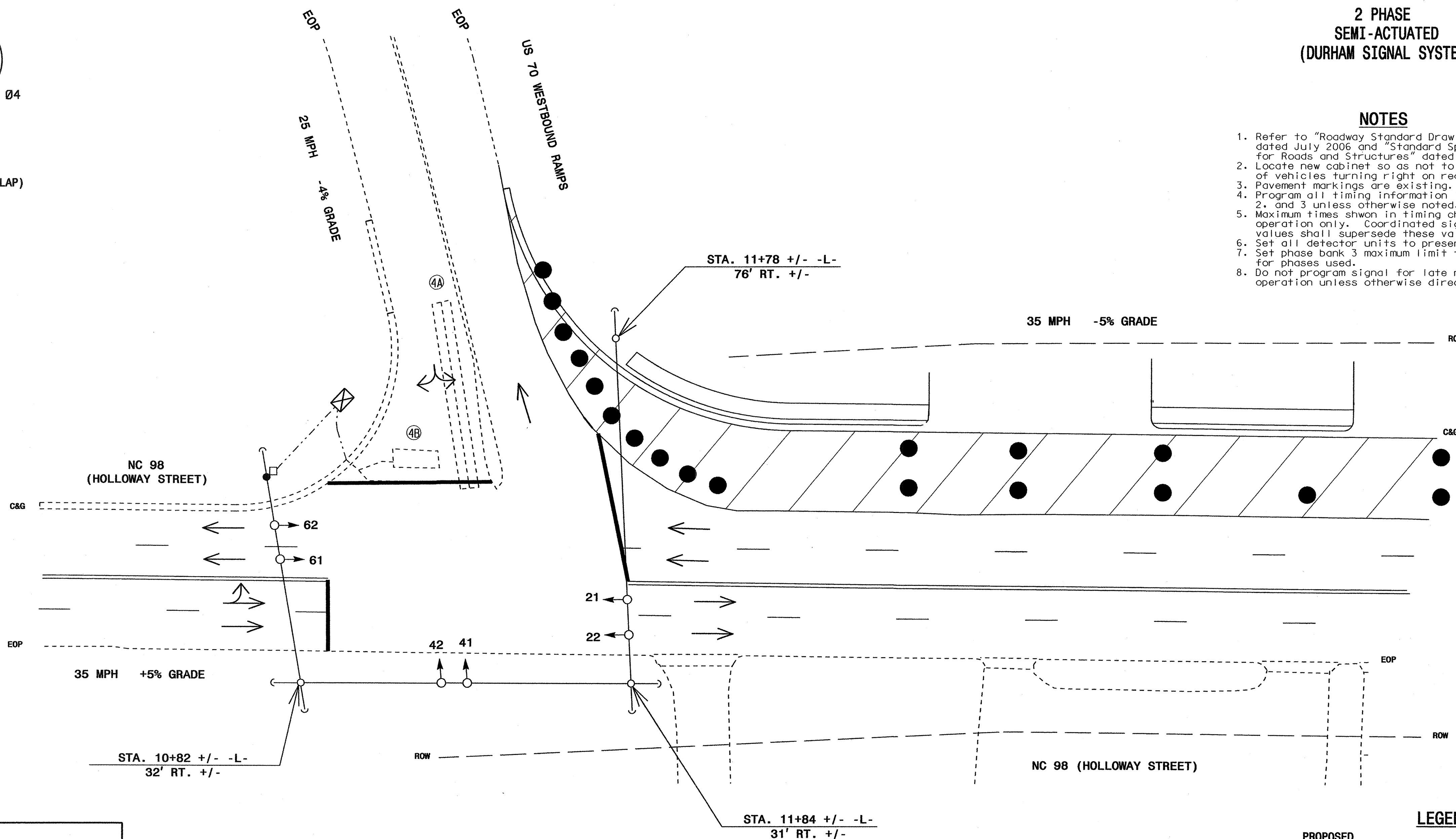


21,22  
41,42  
61,62

2 PHASE SEMI-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. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
3. Pavement markings are existing.
4. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
5. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values shall supersede these values.
6. Set all detector units to presence mode.
7. Set phase bank 3 maximum limit to 250 seconds for phases used.
8. Do not program signal for late night flashing operation unless otherwise directed by the engineer.



LEGEND

- | PROPOSED | EXISTING |
|----------|----------|
| ○→       | ●→       |
| ○→       | ●→       |
| +        | +        |
| ○→       | ○→       |
| ○→       | ○→       |
| ⊗        | ⊗        |
| □        | □        |
| ---      | ---      |
| N/A      | △        |
| →        | →        |
| →        | →        |
| N/A      | ///      |
| N/A      | ●        |

This plan shall supersede the plan sealed on 2/17/04.

TIMING CHART  
170 CONTROLLER

PHASE	Ø2	Ø4	Ø6
MINIMUM INITIAL	45 SEC.	7 SEC.	45 SEC.
VEHICLE EXTENSION	- SEC.	1.0 SEC.	- SEC.
YELLOW CHANGE INT.	3.6 SEC.	3.0 SEC.	4.2 SEC.
RED CLEARANCE	1.7 SEC.	2.1 SEC.	1.4 SEC.
MAXIMUM LIMIT	45 SEC.	25 SEC.	45 SEC.
RECALL POSITION	MAX. RECALL	NONE	MAX. RECALL
VEHICLE CALL MEMORY	NONE	NONE	NONE
DOUBLE ENTRY	OFF	OFF	OFF
WALK	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL	- SEC.	- SEC.	- SEC.
MAXIMUM GAP	- SEC.	1.0 SEC.	- SEC.
REDUCE 0.1 SEC EVERY	- SEC.	- SEC.	- SEC.
MINIMUM GAP	- SEC.	1.0 SEC.	- SEC.

LOOP & DETECTOR UNIT INSTALLATION CHART  
170 CONTROLLER AND CABINET

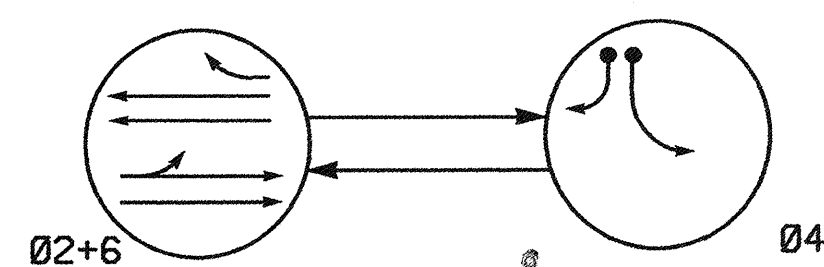
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW EXISTING	NEMA PHASE	DETECTOR PROGRAMMING								STATUS			
						TIMING		ATTRIBUTES								NEW	EXISTING
						DELAY	CARRY (STRETCH)	1	2	3	4	5	6	7	8		
4A	6X60	EXISTING	+5	X	4	5 SEC.	SEC.							X			
4B	6X14	EXISTING	0	X	4	15 SEC.	SEC.							X			

TEMPORARY DESIGN 1 - CONSTRUCTION PHASES I & II

	<b>NC 98 (HOLLOWAY STREET) AT US 70 WESTBOUND RAMP</b>		
	DIVISION 5 DURHAM CO. DURHAM		
	PLAN DATE: November 2006 PREPARED BY: Z.M. Little	REVIEWED BY: D.Y. Ishak REVIEWED BY:	
SCALE: 1"=20'		REVISIONS:	INIT. DATE:
SIGNATURE:		DATE:	
SIG. INVENTORY NO. 05-1717 T1			

2 PHASE  
SEMI-ACTUATED  
(DURHAM SIGNAL SYSTEM)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

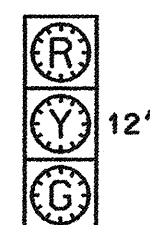
- ←● DETECTED MOVEMENT
- ← UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- ←--- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE		
	02+6	04	06
21,22	G	R	Y
41,42	R	G	R
61,62	G	R	Y

SIGNAL FACE I.D.

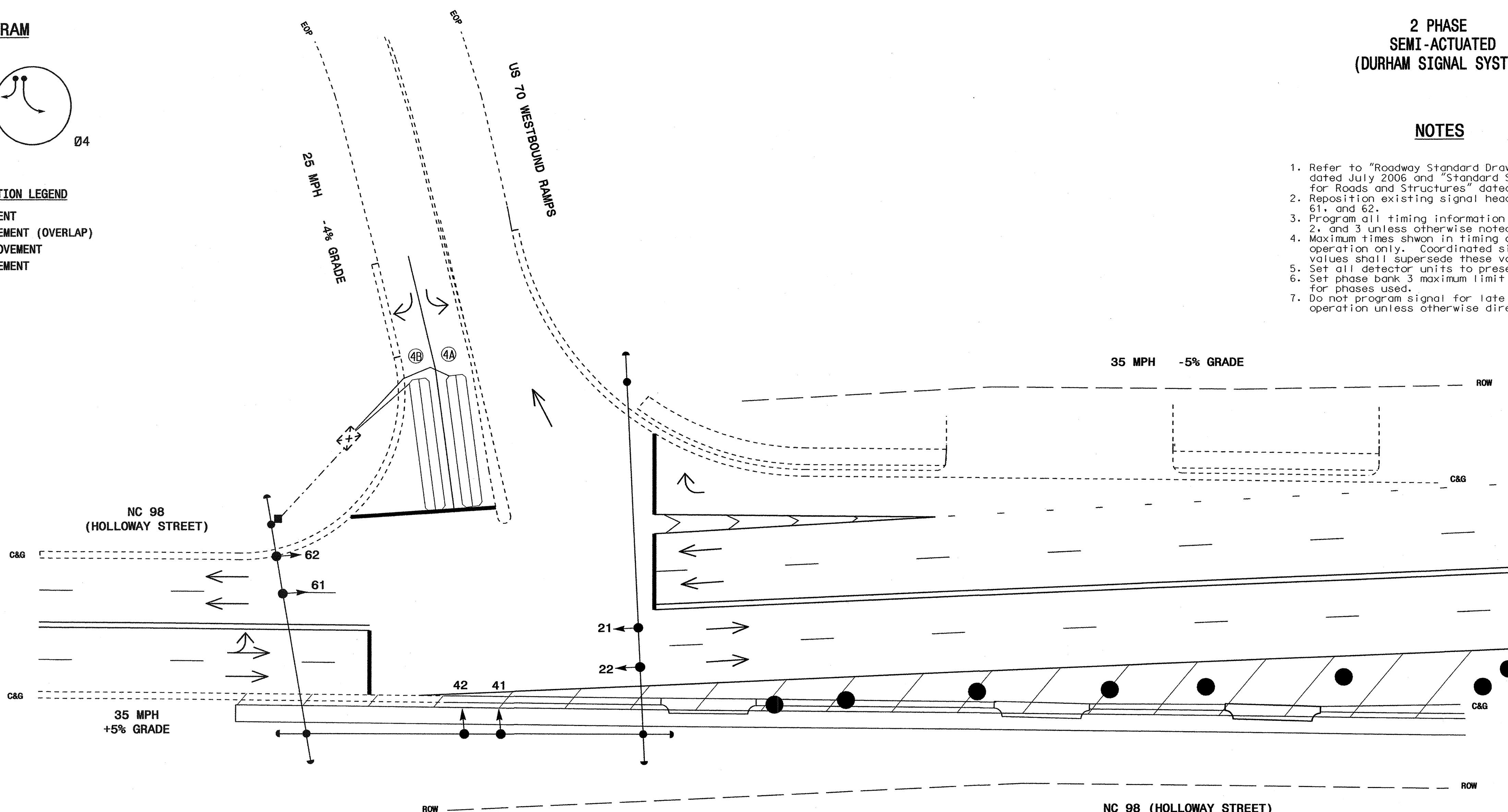
Denotes L.E.D.



21,22  
41,42  
61,62

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Reposition existing signal heads numbered 21, 22, 61, and 62.
3. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
4. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values shall supersede these values.
5. Set all detector units to presence mode.
6. Set phase bank 3 maximum limit to 250 seconds for phases used.
7. Do not program signal for late night flashing operation unless otherwise directed by the engineer.



This plan shall supersede the plan sealed on 2/17/04.

TIMING CHART  
170 CONTROLLER

PHASE	02	04	06
MINIMUM INITIAL	45 SEC.	7 SEC.	45 SEC.
VEHICLE EXTENSION	— SEC.	1.0 SEC.	— SEC.
YELLOW CHANGE INT.	3.6 SEC.	3.0 SEC.	4.2 SEC.
RED CLEARANCE	1.5 SEC.	1.8 SEC.	1.6 SEC.
MAXIMUM LIMIT	45 SEC.	25 SEC.	45 SEC.
RECALL POSITION	MAX. RECALL	NONE	MAX. RECALL
VEHICLE CALL MEMORY	NONE	NONE	NONE
DOUBLE ENTRY	OFF	OFF	OFF
WALK	— SEC.	— SEC.	— SEC.
FLASHING DON'T WALK	— SEC.	— SEC.	— SEC.
TYPE 3 LIMIT	— SEC.	— SEC.	— SEC.
ALTERNATE EXTENSION	— SEC.	— SEC.	— SEC.
ADD PER VEHICLE	— SEC.	— SEC.	— SEC.
MAXIMUM INITIAL	— SEC.	— SEC.	— SEC.
MAXIMUM GAP	— SEC.	1.0 SEC.	— SEC.
REDUCE 0.1 SEC EVERY	— SEC.	— SEC.	— SEC.
MINIMUM GAP	— SEC.	1.0 SEC.	— SEC.

LOOP & DETECTOR UNIT INSTALLATION CHART  
170 CONTROLLER AND CABINET

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

LEGEND

- | PROPOSED                          | EXISTING                          |
|-----------------------------------|-----------------------------------|
| ○ → Traffic Signal Head           | ● → Traffic Signal Head           |
| ● → Modified Signal Head          | N/A                               |
| — Sign                            | — 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 with Marker      | — Right of Way with Marker        |
| → Directional Arrow               | → Directional Arrow               |
| → Pavement Marking Arrow          | → Pavement Marking Arrow          |
| N/A Construction Zone             | /// Construction Zone             |
| N/A Construction Drum             | ● Construction Drum               |

TEMPORARY DESIGN 2 - CONSTRUCTION PHASE III

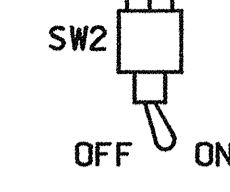
	<p>NC 98 (HOLLOWAY STREET) AT US 70 WESTBOUND RAMPS</p>		
	<p>DIVISION 5 DURHAM CO. DURHAM</p>		
	<p>PLAN DATE: November 2006</p>	<p>REVIEWED BY: D.Y. Ishak</p>	
<p>122 N. McDowell St., Raleigh, NC 27603</p>	<p>PREPARED BY: Z.M. Little</p>	<p>REVIEWED BY:</p>	<p>SCALE: 1"=20'</p>
<p>REVISIONS</p>		<p>INIT. DATE</p>	<p>SIGNATURE DATE</p>
<p>SIG. INVENTORY NO. 05-1717 T2</p>			



### EDI MODEL 2010ECL CONFLICT MONITOR

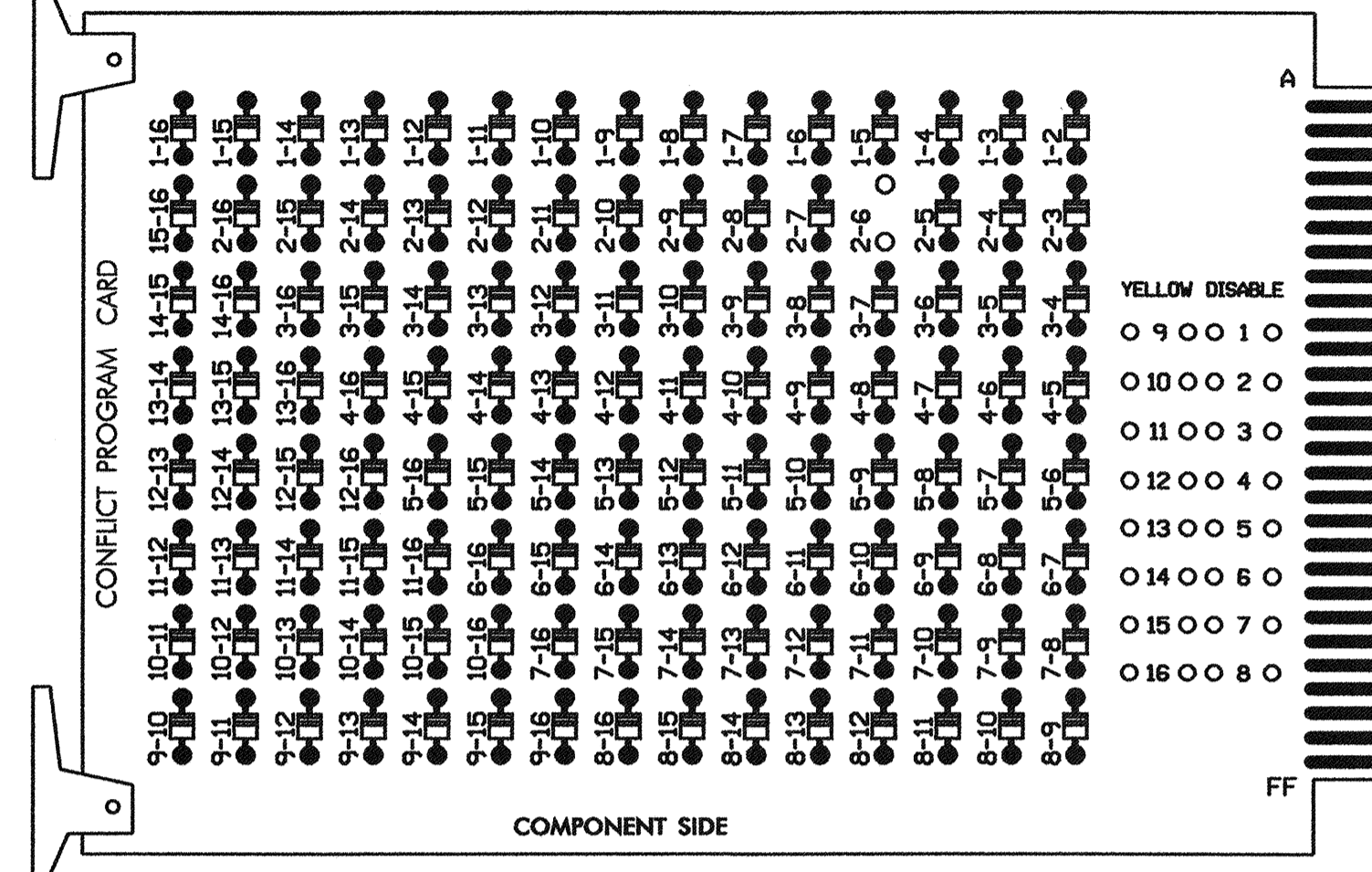
#### PROGRAMMING DETAIL

WD ENABLE

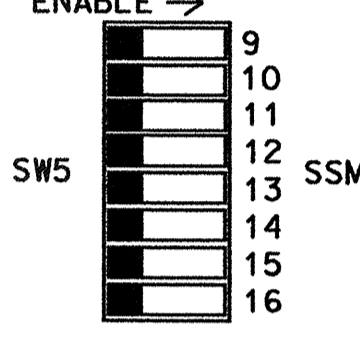
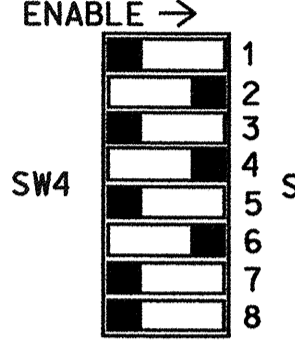
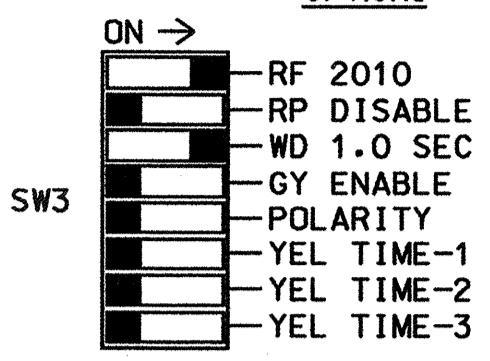


(remove jumpers and set switches as shown)

REMOVE DIODE JUMPER 2-6.



#### OPTIONS



■ = DENOTES POSITION OF SWITCH

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 SEL1-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 OUTPUT FILE. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 1,3,5,7, 8,9,10,11,12,13,14,15 & 16, TIE UNUSED LOAD SWITCH RED OUTPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM THE 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, ON CONTROLLER UNIT, FOR ALL PHASES.
- THE CABINET AND CONTROLLER ARE A PART OF THE DURHAM SIGNAL SYSTEM.

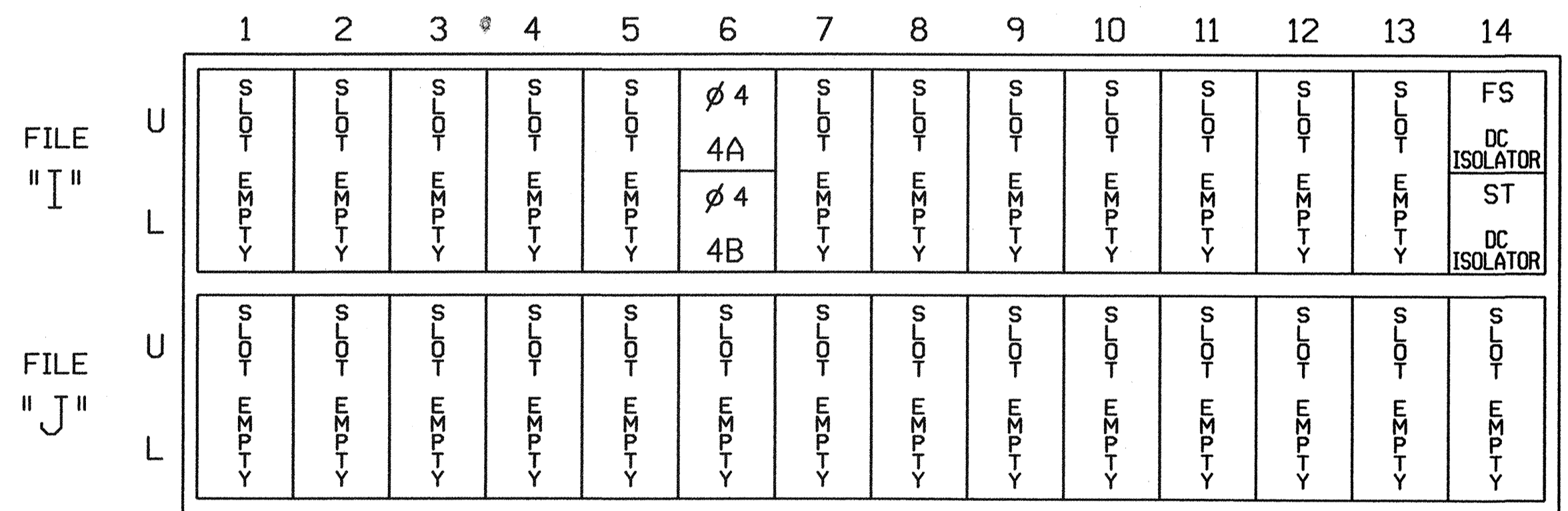
#### SIGNAL HEAD HOOK-UP CHART

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

NU = NOT USED

#### INPUT FILE POSITION LAYOUT

(FRONT VIEW)



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

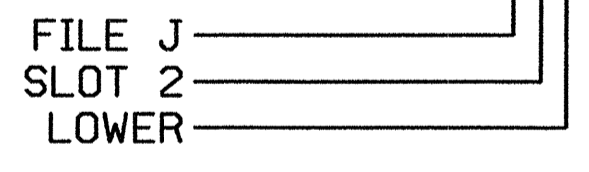
FS = FLASH SENSE  
ST = STOP TIME

#### INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
4A	TB4-9,10	I6U	1	41	5 7	4
4B	TB4-11,12	I6L	2	45	5 7	4

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

#### 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

#### EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 170E  
 CABINET .....CONTRACTOR SUPPLIED 332  
 SOFTWARE .....B1 TRANS 233NC2  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S2,S4,S6  
 PHASES USED.....2,4,6  
 OVERLAPS.....NONE

THIS ELECTRICAL DETAIL IS FOR  
 THE SIGNAL DESIGN: 05-1717T1  
 AND 05-1717T2  
 DESIGNED: NOVEMBER 2006  
 SEALED: 12-21-06  
 REVISED: N/A

TYPE 170 CONTROLLER & 332 CABINET

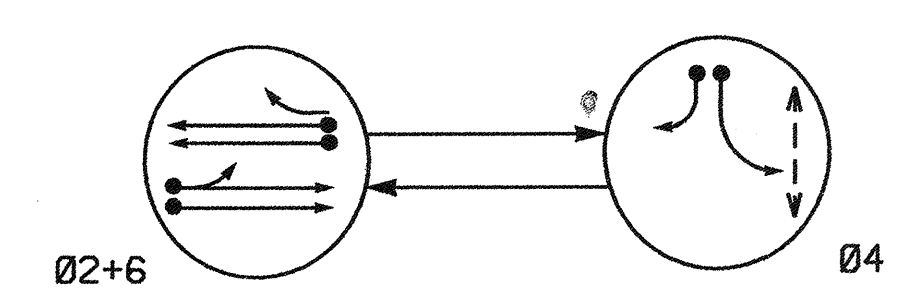
**THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 4/20/04.**

#### TEMPORARY DESIGN 1 & 2

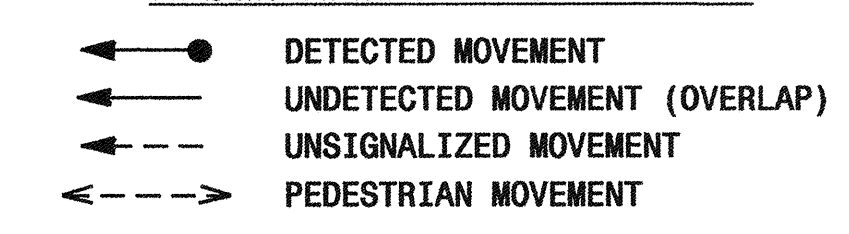
	NC 98 (HOLLOWAY STREET) AT US 70 WESTBOUND RAMP		
	DIVISION 05 DURHAM COUNTY DURHAM	PLAN DATE: DECEMBER 2006 REVIEWED BY: J.P.	
REVISIONS		INIT. DATE	SIGNATURE: Mr. Rowe, Jr. 12-22-06 DATE
ELECTRICAL AND PROGRAMMING DETAILS FOR:		SIG. INVENTORY NO.: 05-1717T	

**2 PHASE  
FULLY ACTUATED  
(DURHAM SIGNAL SYSTEM)**

**PHASING DIAGRAM**



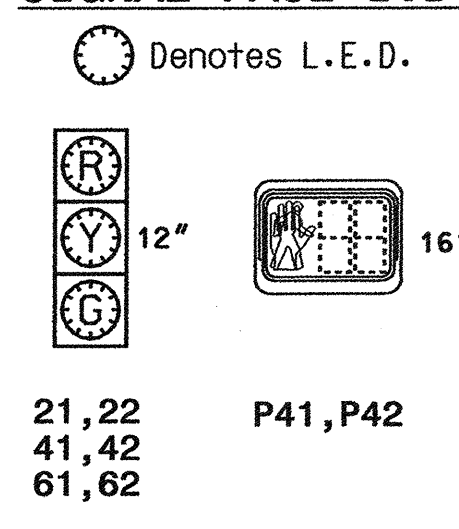
**PHASING DIAGRAM DETECTION LEGEND**



**TABLE OF OPERATION**

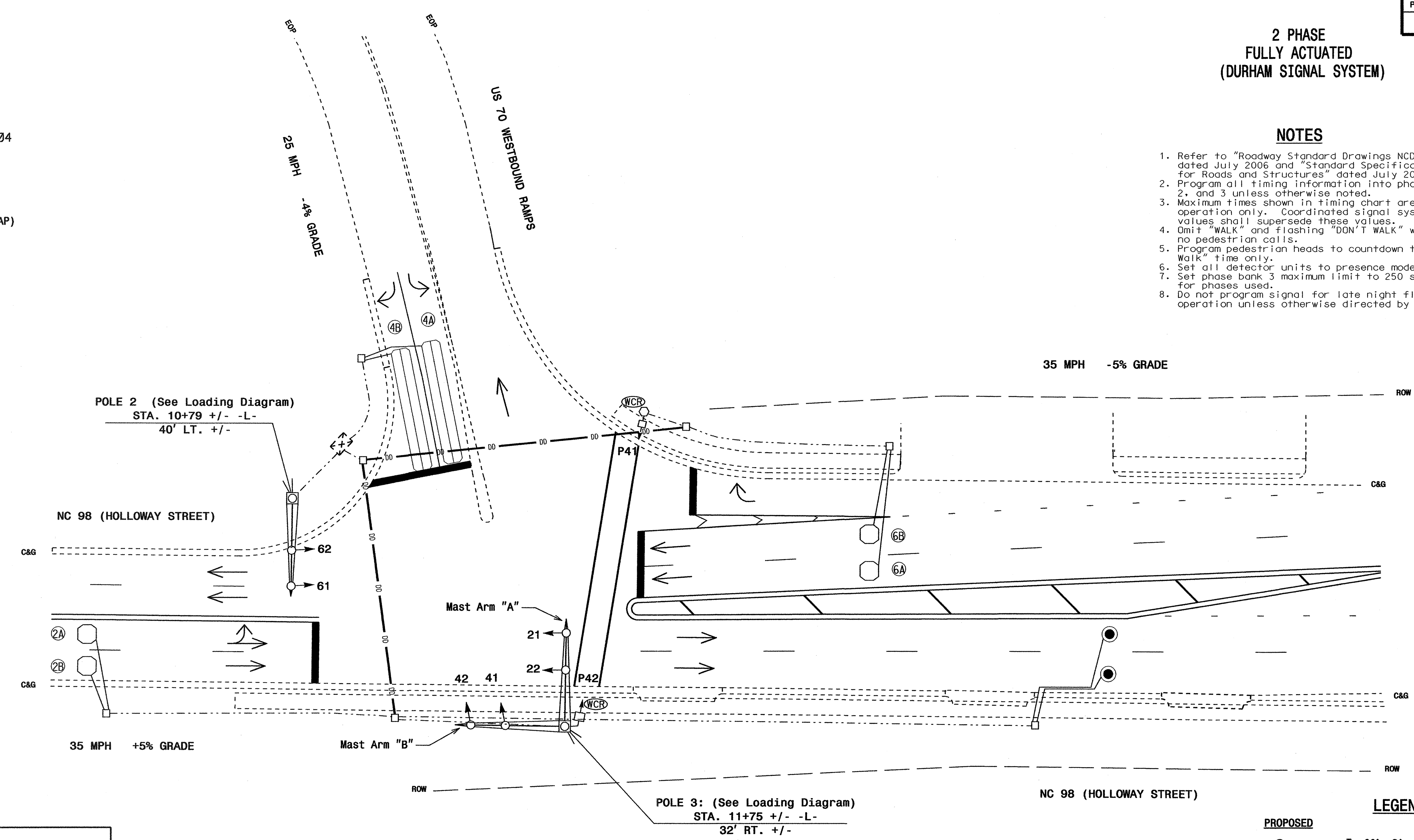
SIGNAL FACE	PHASE		
	Ø2+6	Ø4	Ø6
21,22	G R Y		
41,42	R G R		
61,62	G R Y		
P41,P42	DW W DRK		

**SIGNAL FACE I.D.**

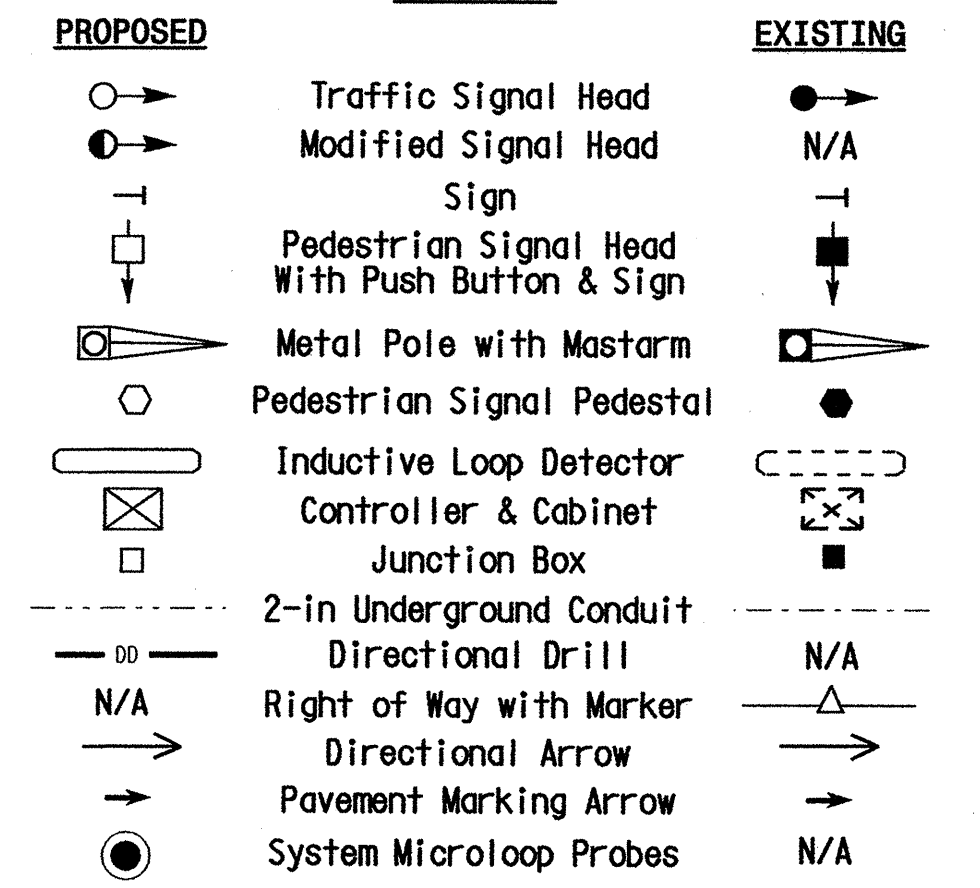


**NOTES**

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



**LEGEND**



This plan shall supersede the plan sealed on 2/17/04.

**TIMING CHART  
170 CONTROLLER**

PHASE	Ø2	Ø4	Ø6
MINIMUM INITIAL	10 SEC.	7 SEC.	10 SEC.
VEHICLE EXTENSION	3.0 SEC.	1.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	3.6 SEC.	3.0 SEC.	4.2 SEC.
RED CLEARANCE	1.8 SEC.	2.3 SEC.	1.6 SEC.
MAXIMUM LIMIT	45 SEC.	25 SEC.	45 SEC.
RECALL POSITION	VEH. RECALL	NONE	VEH. RECALL
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	YELLOW LOCK
DOUBLE ENTRY	OFF	OFF	OFF
WALK	- SEC.	4 SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	19 SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL	- SEC.	- SEC.	- SEC.
MAXIMUM GAP	3.0 SEC.	1.0 SEC.	3.0 SEC.
REDUCE 0.1 SEC EVERY	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	1.0 SEC.	3.0 SEC.

**LOOP & DETECTOR UNIT INSTALLATION CHART  
170 CONTROLLER AND CABINET**

LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW EXISTING	NEMA PHASE	DETECTOR PROGRAMMING												
						TIMING	ATTRIBUTES									SYSTEM LOOPS		STATUS
							DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	NEW	
2A, 2B	6X6	4	70	X	2	SEC.	SEC.									X		
4A	6X40	2-4-2	0	X	4	SEC.	SEC.					X	X				X	
4B	6X40	2-4-2	0	X	4	15 SEC.	SEC.					X	X				X	
6A, 6B	6X6	4	70	X	6	SEC.	SEC.					X	X			X		
SYSTEM MICROLOOP PROBES					+260	X	N/A									X	X	

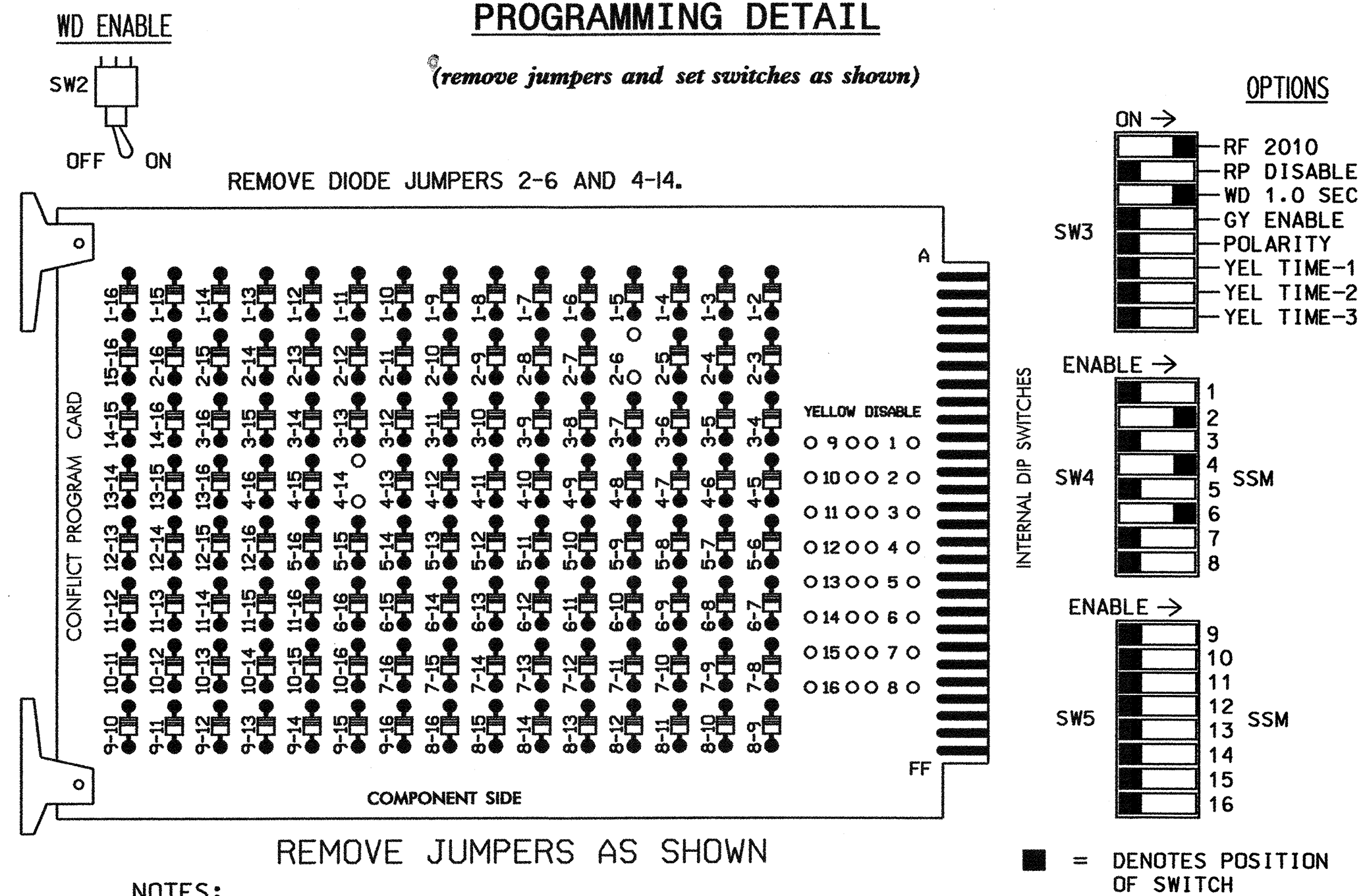
**SIGNAL UPGRADE - FINAL DESIGN**

	<b>NC 98 (HOLLOWAY STREET) AT US 70 WESTBOUND RAMP</b>		SEAL 
	DIVISION 5      DURHAM CO.      DURHAM	PLAN DATE: November 2006      REVIEWED BY: D.Y. Ishak	PREPARED BY: Z.M. Little      REVIEWED BY:
122 N. McDowell St., Raleigh, NC 27603 SCALE 0      20 1"=20'	SIGNATURE      DATE	SIG. INVENTORY NO.      05-1717	



**EDI MODEL 2010ECL CONFLICT MONITOR**

**PROGRAMMING DETAIL**



NOTES:

- CARD IS PROVIDED WITH ALL DIODE JUMPERS IN PLACE. REMOVAL OF ANY JUMPER ALLOWS ITS CHANNELS TO RUN CONCURRENTLY.
- MAKE SURE JUMPERS SEL1-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 OUTPUT FILE. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 1,3,5,7, 8,9,10,11,12,13,14,15 & 16, TIE UNUSED LOAD SWITCH RED OUTPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM THE 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, ON CONTROLLER UNIT, FOR ALL PHASES.
- THE CABINET AND CONTROLLER ARE A PART OF THE DURHAM SIGNAL SYSTEM.

**PEDESTRIAN PHASE PROGRAMMING**

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

**COUNTDOWN PEDESTRIAN SIGNAL OPERATION**

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

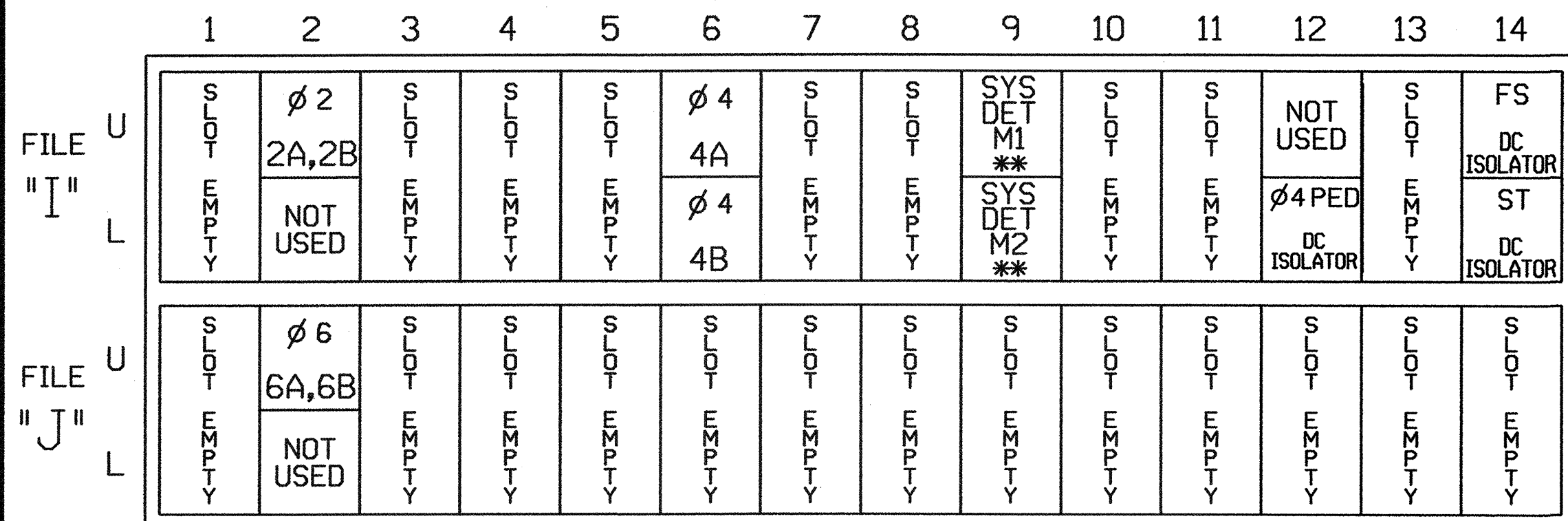
**SIGNAL HEAD HOOK-UP CHART**

LOAD SWITCH NO.	S1	S2	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	P41, P42	NU	61,62	NU	NU	NU	NU
RED		128			101			134				
YELLOW		129			102			135				
GREEN		130			103			136				
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
							104					
							106					

NU = NOT USED

**INPUT FILE POSITION LAYOUT**

(FRONT VIEW)



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

\*\* EX.: 3M CANOGA FOR MICROLOOP SYSTEM.

FS = FLASH SENSE  
ST = STOP TIME

**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A,2B	TB2-5,6	I2U	1	39	5 7	2
4A	TB4-9,10	I6U	2	41	5 7	4
4B	TB4-11,12	I6L	3	45	5 7	4
M1	TB6-9,10	I9U	4	60	*	SYS
M2	TB6-11,12	I9L	5	62	*	SYS
6A,6B	TB3-5,6	J2U	6	40	5 7	6
PED PUSH BUTTONS						
P41,P42	TB8-5,6	I12L	7	69	2	4

\*SEE SYSTEM DETECTOR ASSIGNMENT DETAIL BELOW.

NOTE: INSTALL DC ISOLATOR IN INPUT FILE SLOT 112.

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

INPUT FILE POSITION LEGEND: J2L DETECTOR ATTRIBUTES LEGEND:

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

**SYSTEM DETECTOR ASSIGNMENT DETAIL**

I9U=PROGRAM SYSTEM DETECTOR #1 AT E/126+B+1=60 (PROBE M1)  
I9L=PROGRAM SYSTEM DETECTOR #2 AT E/126+B+2=62 (PROBE M2)

**EQUIPMENT INFORMATION**

CONTROLLER.....CONTRACTOR SUPPLIED 170E  
CABINET .....CONTRACTOR SUPPLIED 332  
SOFTWARE .....BI TRANS 233NC2  
CABINET MOUNT.....BASE  
OUTPUT FILE POSITIONS...12  
LOAD SWITCHES USED.....S2,S4,S6,S4P  
PHASES USED.....2,4,6,4 PED  
OVERLAPS.....NONE

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1717  
DESIGNED: NOVEMBER 2006  
SEALED: 12-21-06  
REVISED: N/A

TYPE 170 CONTROLLER & 332 CABINET

**THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 4/20/04.**

**SIGNAL UPGRADE - FINAL DESIGN**

<p>ELECTRICAL AND PROGRAMMING DETAILS FOR:</p> <p>Prepared in the Offices of:</p> <p>122 N. McDowell St., Raleigh, NC 27603</p>	<p>NC 98 (HOLLOWAY STREET) AT US 70 WESTBOUND RAMPS</p> <p>DIVISION 05 DURHAM COUNTY DURHAM</p> <p>PLAN DATE: DECEMBER 2006 REVIEWED BY: <i>JWR</i></p> <p>PREPARED BY: JAMES PETERSON REVIEWED BY:</p>		<p>John T. Rowe 12-22-06 DATE</p>					
	<p>REVISIONS</p> <table border="1"> <thead> <tr> <th>NO.</th> <th>INIT.</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>			NO.	INIT.	DATE		
NO.	INIT.	DATE						



**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.

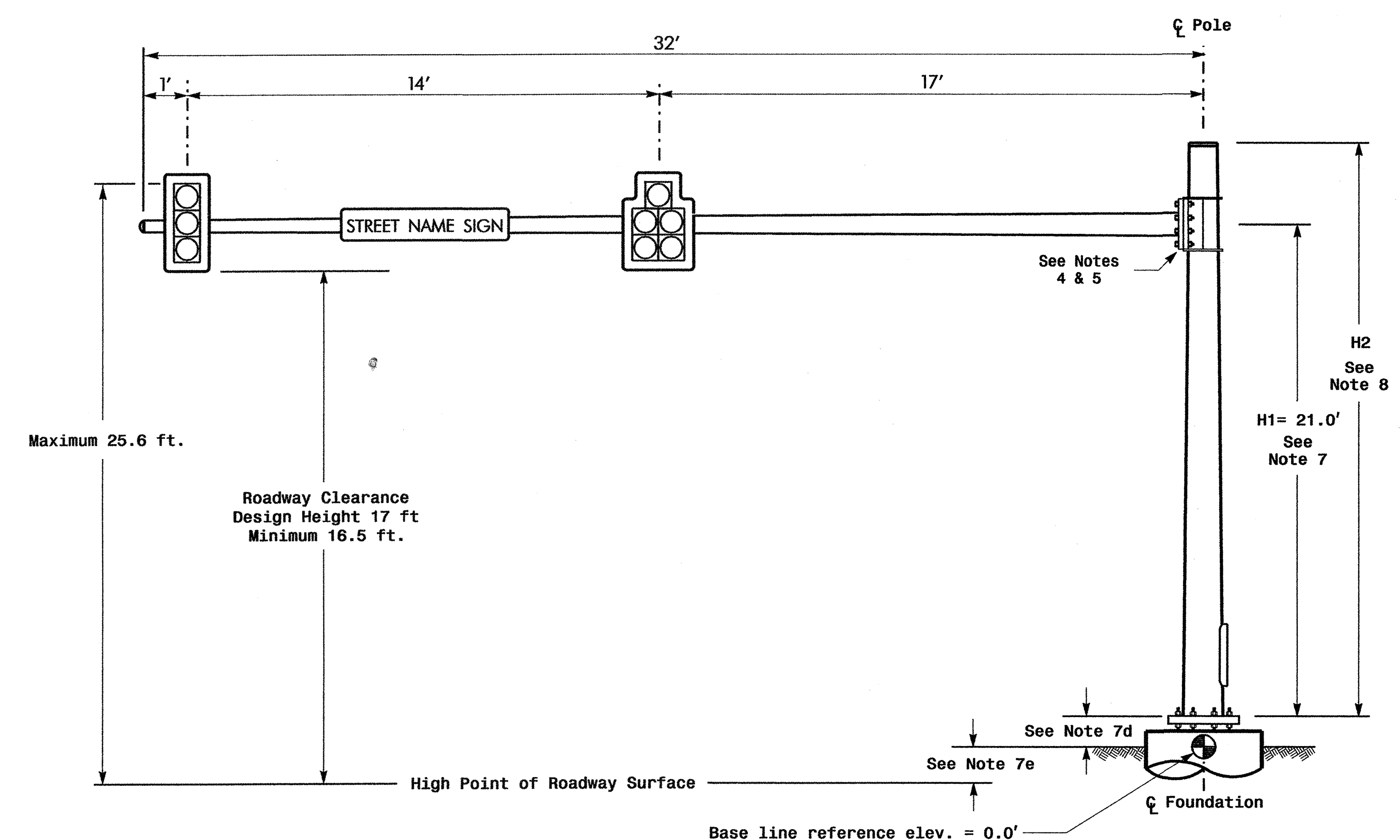
**Elevation Data for Mast Arm Attachment (H1)**

Elevation Differences for:	Pole 2
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.
Elevation difference at High point of roadway surface	+2.4 ft.
Elevation difference at Edge of travelway or face of curb	N/A

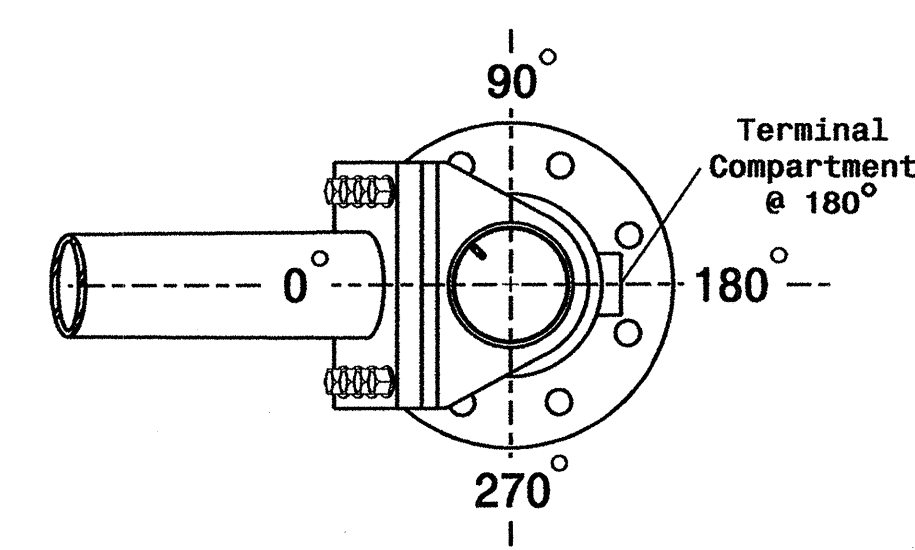
**MAST ARM LOADING SCHEDULE**

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

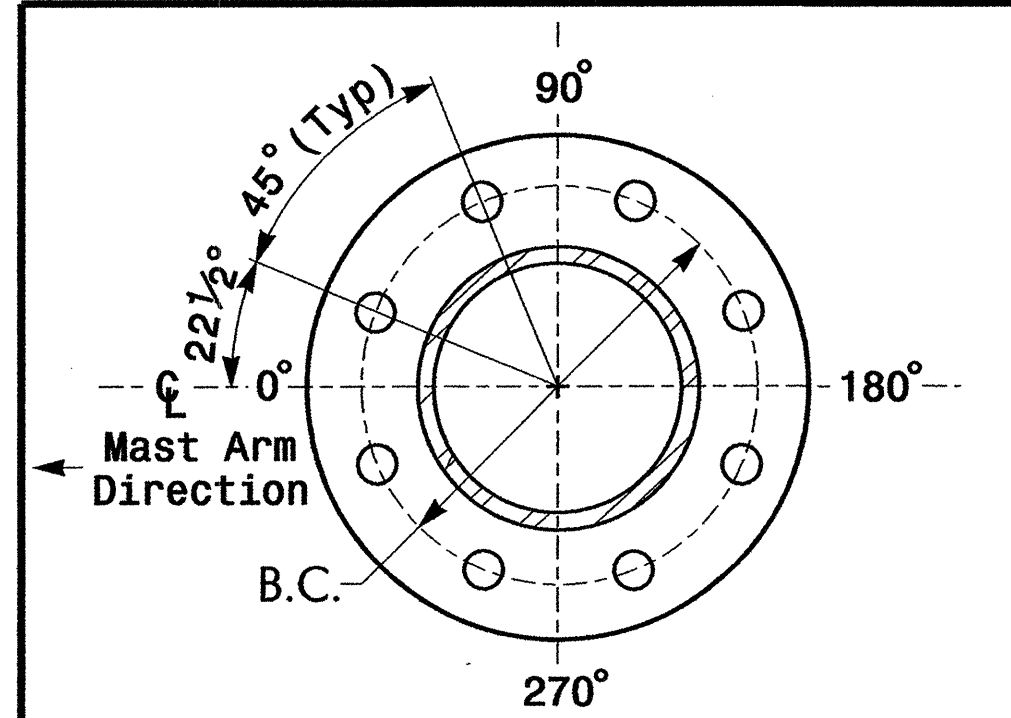
**Design Loading for METAL POLE NO. 2**



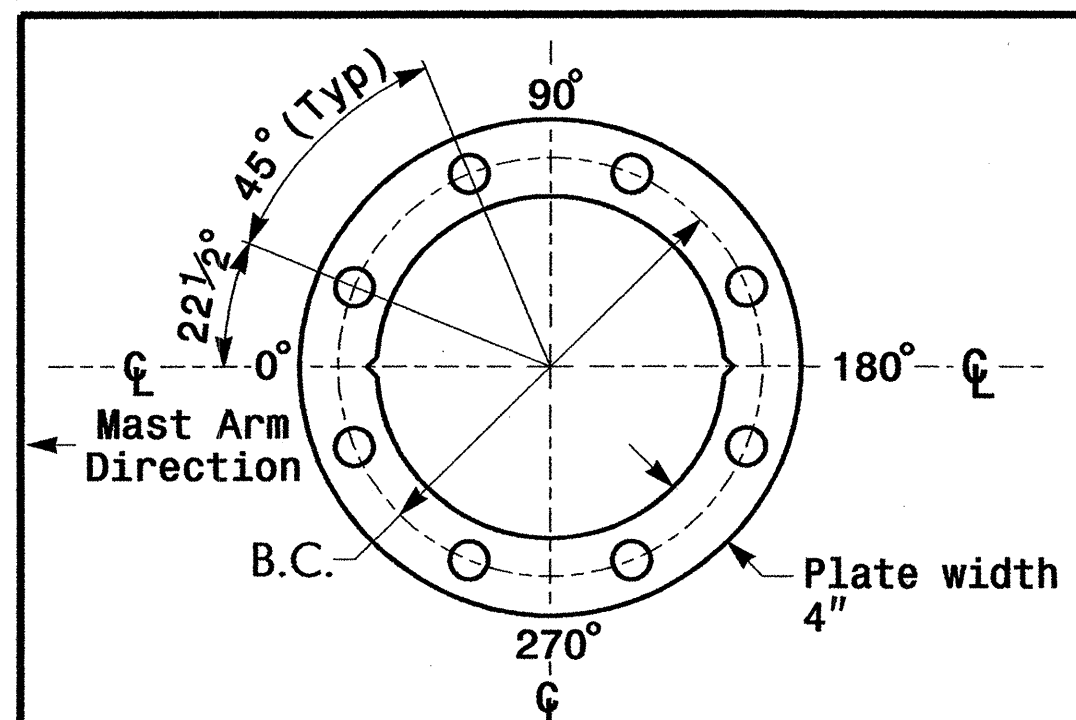
**Elevation View**



**POLE RADIAL ORIENTATION**



**8 BOLT BASE PLATE DETAIL**  
See Note 6



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

**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/tmsu/ws/mpoles/poles.htm>

**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.
- Maximum allowable CSR for all signal supports is 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 is a high strength connection. Use Direct Tension Indicators (ASTM F959) for each bolt.
- 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) 733-3915.
- 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.

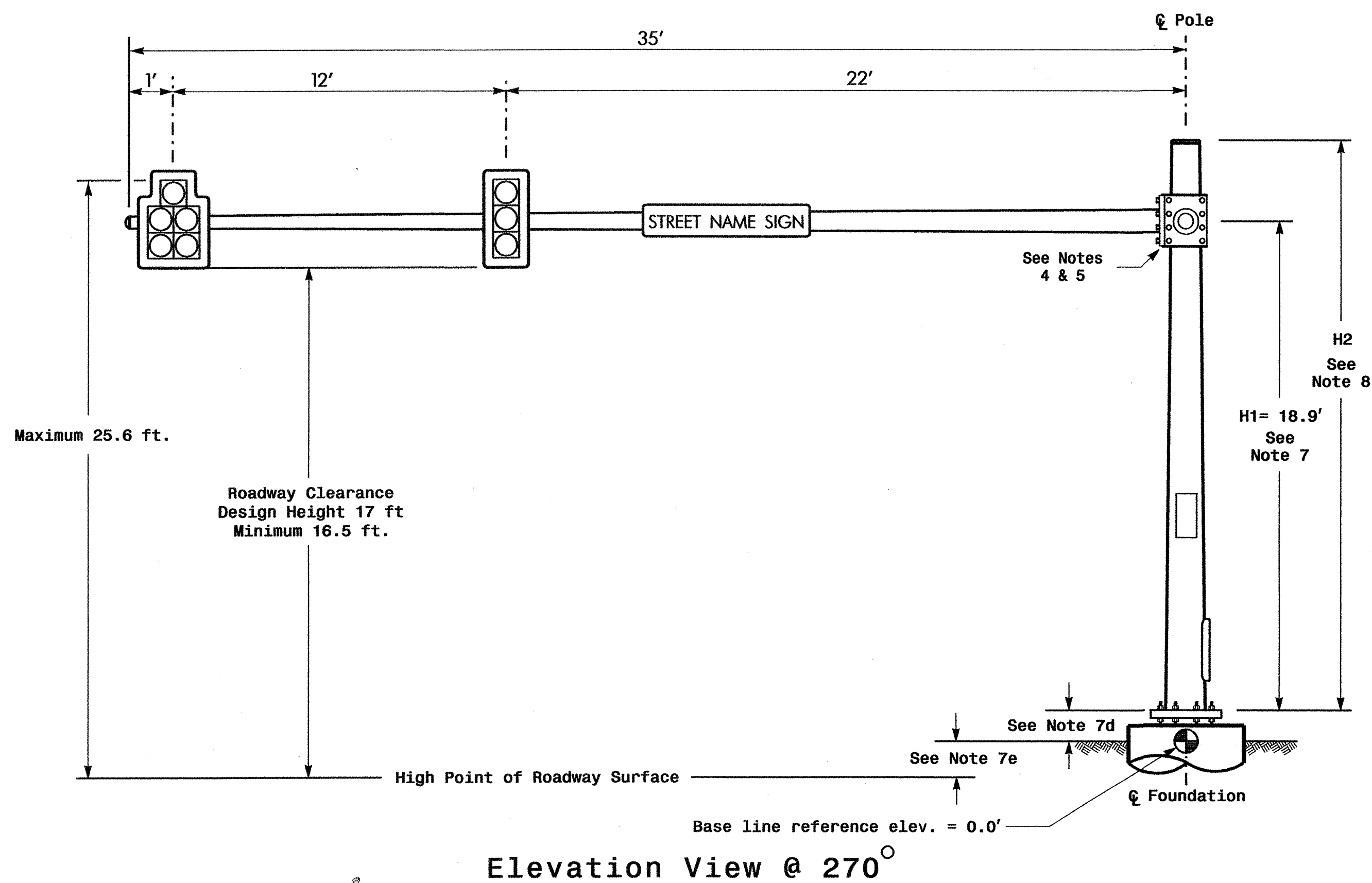
NCDOT Wind Zone 4 (90 mph)

<p>Prepared in the Offices of:                  STATE OF NORTH CAROLINA                  DEPARTMENT OF TRANSPORTATION                  Signals and Geometrics Section</p>	<p><b>NC 98 (Holloway Street) at US 70 Westbound Ramps</b></p>		
	Division 5 Durham County Durham PLAN DATE: November 2006 REVIEWED BY: D.Y. Ishak PREPARED BY: Z.M. Little REVIEWED BY:	REVISIONS INIT. DATE	
SCALE 0 N/A N/A	SIGNATURE DATE SIG. INVENTORY NO. 05-1717		

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 21111718



Design Loading for METAL POLE NO. 3, MAST ARM A

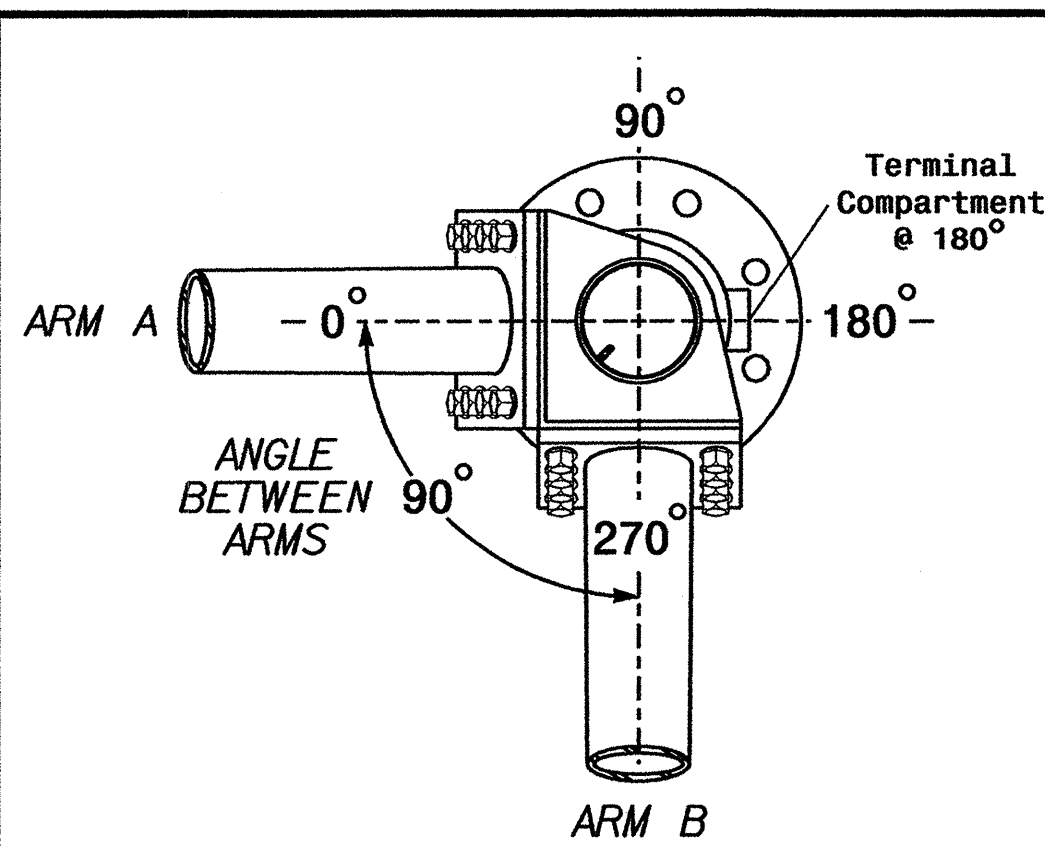


Elevation View @ 270°

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

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+0.3 ft.	+/-0.0 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A



POLE RADIAL ORIENTATION

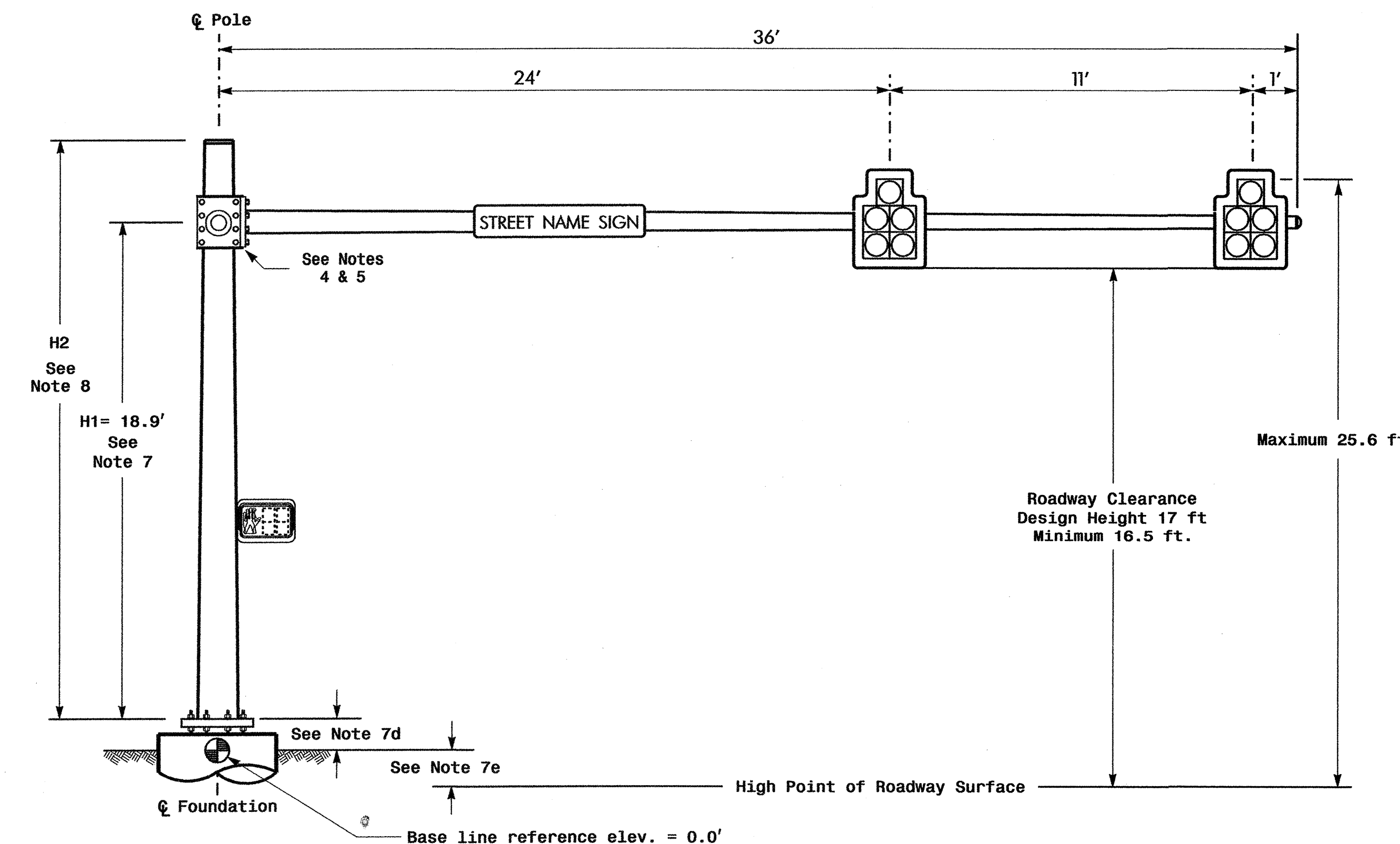
MAST ARM LOADING SCHEDULE

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
	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS

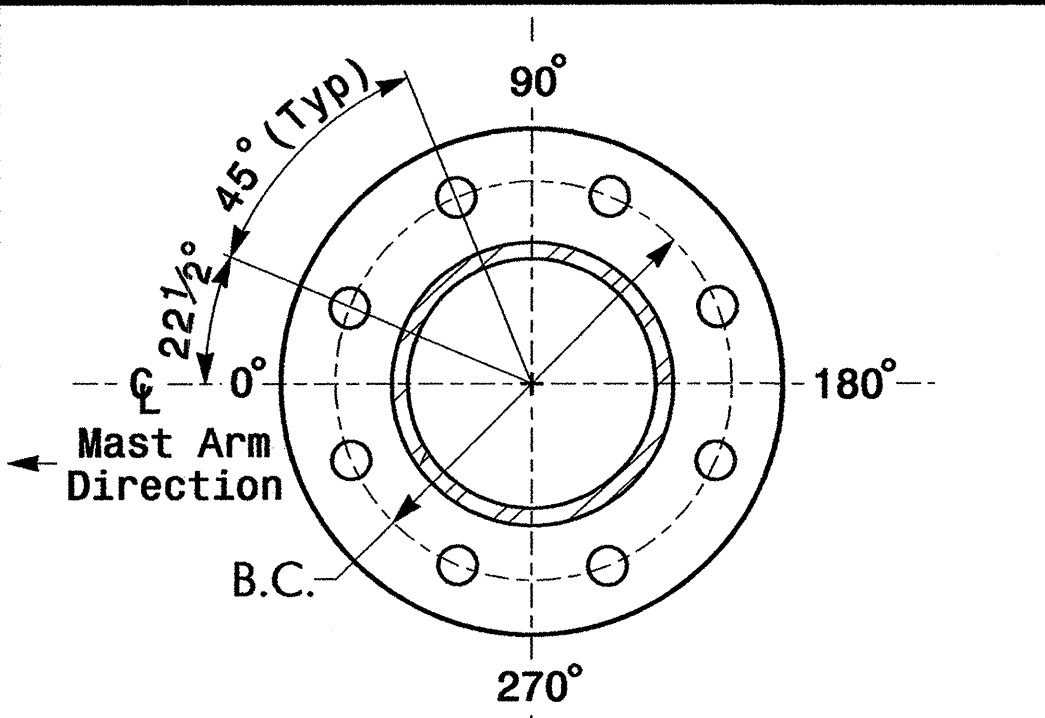
NOTES

- Design Reference Material**
- Design the traffic signal structure and foundation in accordance with:
    - The 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/tmsu/ws/mpoles/poles.htm>
  - 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.
  - Maximum allowable CSR for all signal supports is 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. The arm-to-pole attachment is a high strength connection. Use Direct Tension Indicators (ASTM F959) for each bolt.
  - 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) 733-3915.
  - 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.

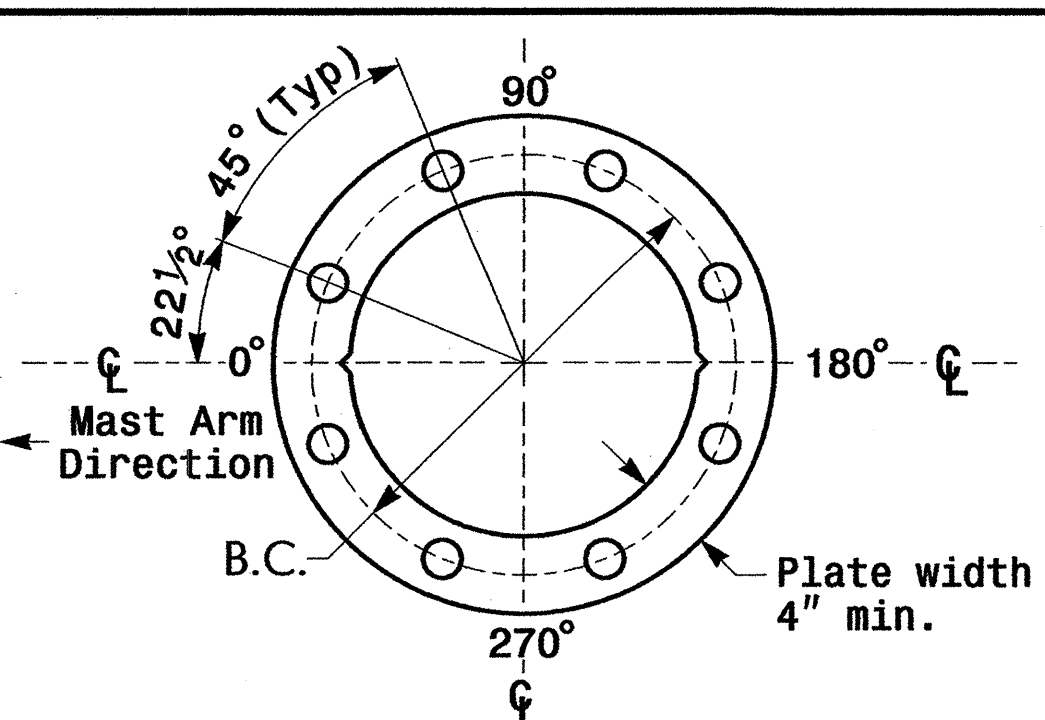
Design Loading for METAL POLE NO. 3, MAST ARM B



Elevation View @ 0°



8 BOLT BASE PLATE DETAIL



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

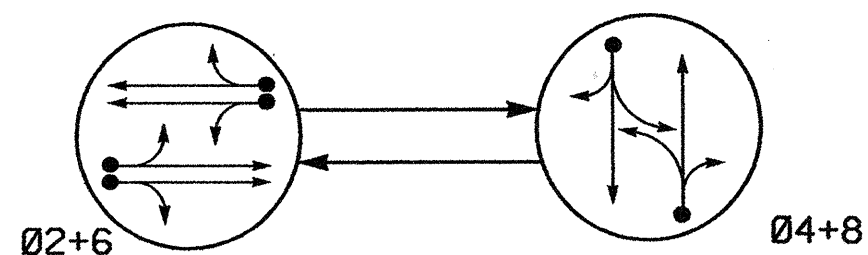
NCDOT Wind Zone 4 (90 mph)

	Prepared in the Office of: <b>NC 98 (Holloway Street)</b> at <b>US 70 Westbound Ramps</b>		SEAL 
	Division 5 Durham County Durham PLAN DATE: November 2006 REVIEWED BY: D.Y. Ishak	PREPARED BY: Z.M. Little REVIEWED BY:	
SCALE: 0 N/A N/A	REVISIONS	INIT. DATE	SIGNATURE DATE SIG. INVENTORY NO. 05-1717

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**PHASING DIAGRAM**

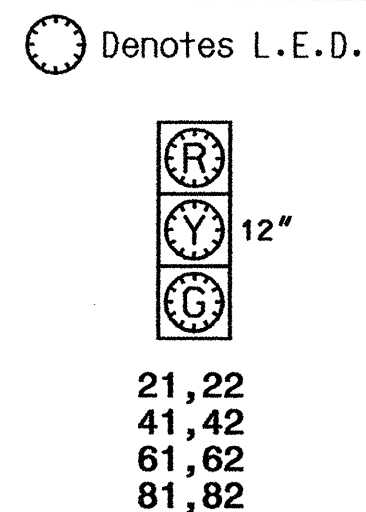


**PHASING DIAGRAM DETECTION LEGEND**

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

SIGNAL FACE	PHASE		
	02+6	04+8	FLASH
21,22	G	R	Y
41,42	R	G	R
61,62	G	R	Y
81,82	R	G	R

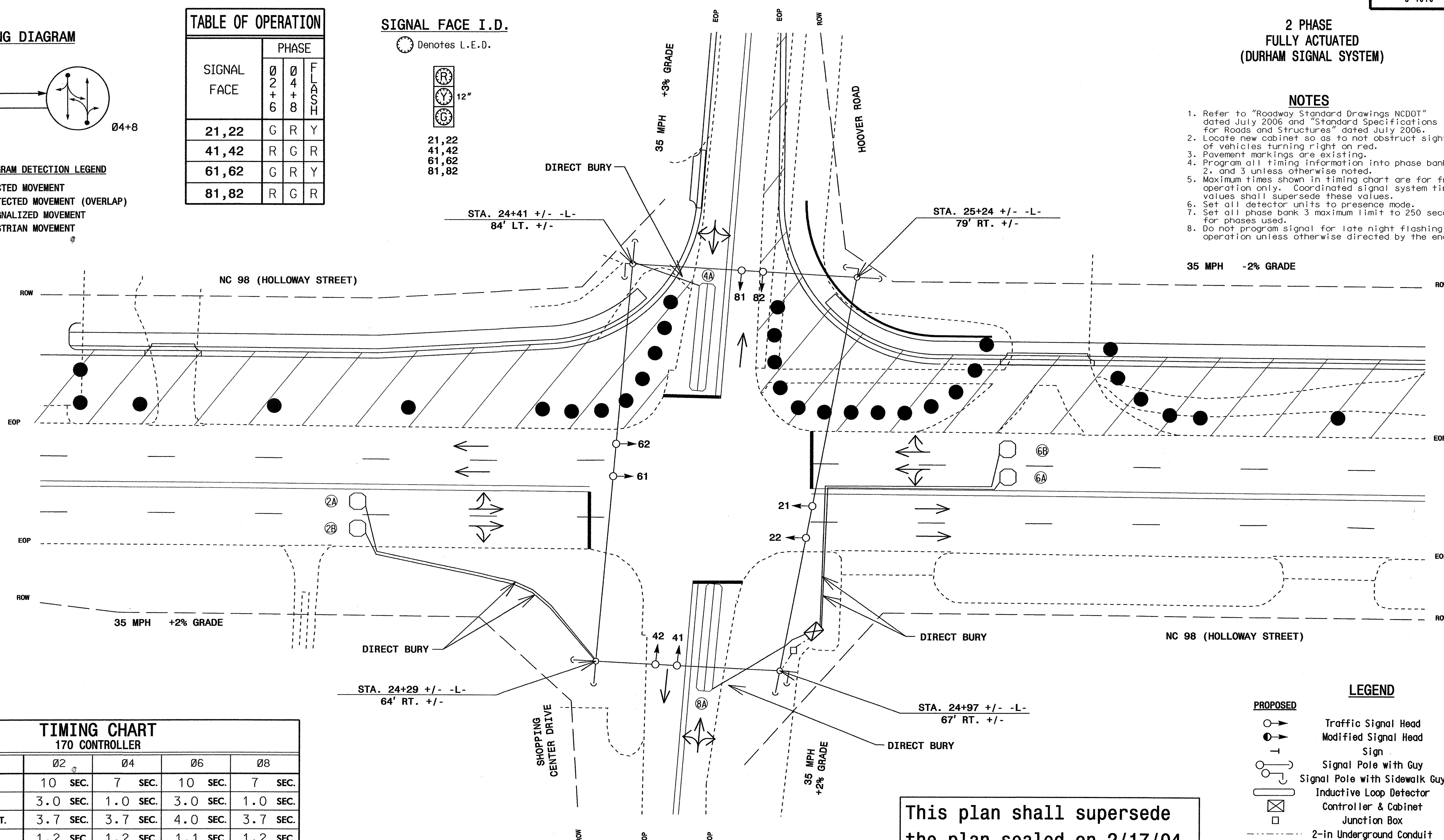
**SIGNAL FACE I.D.**



**2 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. Locate new cabinet so as to not obstruct sight distance of vehicles turning right on red.
3. Pavement markings are existing.
4. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
5. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values shall supersede these values.
6. Set all detector units to presence mode.
7. Set all phase bank 3 maximum limit to 250 seconds for phases used.
8. Do not program signal for late night flashing operation unless otherwise directed by the engineer.



PHASE	02	04	06	08
MINIMUM INITIAL	10 SEC.	7 SEC.	10 SEC.	7 SEC.
VEHICLE EXTENSION	3.0 SEC.	1.0 SEC.	3.0 SEC.	1.0 SEC.
YELLOW CHANGE INT.	3.7 SEC.	3.7 SEC.	4.0 SEC.	3.7 SEC.
RED CLEARANCE	1.2 SEC.	1.2 SEC.	1.1 SEC.	1.2 SEC.
MAXIMUM LIMIT	45 SEC.	25 SEC.	45 SEC.	25 SEC.
RECALL POSITION	VEH. RECALL	NONE	VEH. RECALL	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	YELLOW LOCK	NONE
DOUBLE ENTRY	OFF	ON	OFF	ON
WALK	- SEC.	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM GAP	3.0 SEC.	1.0 SEC.	3.0 SEC.	1.0 SEC.
REDUCE 0.1 SEC EVERY	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	1.0 SEC.	3.0 SEC.	1.0 SEC.

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

This plan shall supersede the plan sealed on 2/17/04.

PROPOSED	EXISTING
○ → Traffic Signal Head	● → N/A
● → Modified Signal Head	— → N/A
— → Sign	— → N/A
○ → Signal Pole with Guy	● → Signal Pole with Sidewalk Guy
□ → Inductive Loop Detector	□ → Controller & Cabinet
□ → Junction Box	□ → Junction Box
— → 2-in Underground Conduit	— → Right of Way with Marker
N/A → Directional Arrow	→ → Pavement Marking Arrow
N/A → Construction Zone	/// → Construction Drum
N/A → Construction Drum	● → Construction Drum

**TEMPORARY DESIGN 1 - CONSTRUCTION PHASES I & II**

**NC 98 (HOLLOWAY STREET) AT HOOVER ROAD/ SHOPPING CENTER DRIVE**

DIVISION 5 DURHAM CO.

PLAN DATE: November 2006 REVIEWED BY: D.Y. Ishak

PREPARED BY: Z.M. Little REVIEWED BY:

SEAL

122 N. McDowell St., Raleigh, NC 27603

SCALE: 1"=20'

REVISIONS

NO.	INIT.	DATE

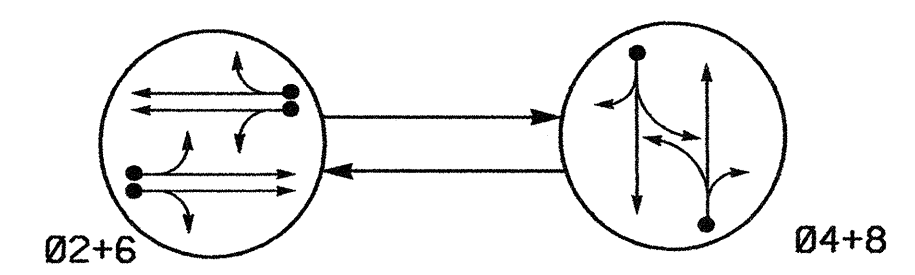
SIGNATURE DATE

SIG. INVENTORY NO. 05-1655 TT



2 PHASE  
FULLY ACTUATED  
(DURHAM SIGNAL SYSTEM)

PHASING DIAGRAM



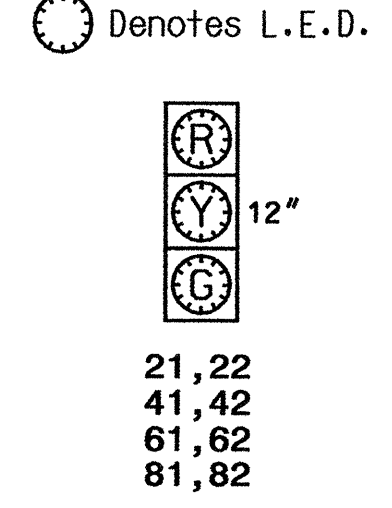
PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

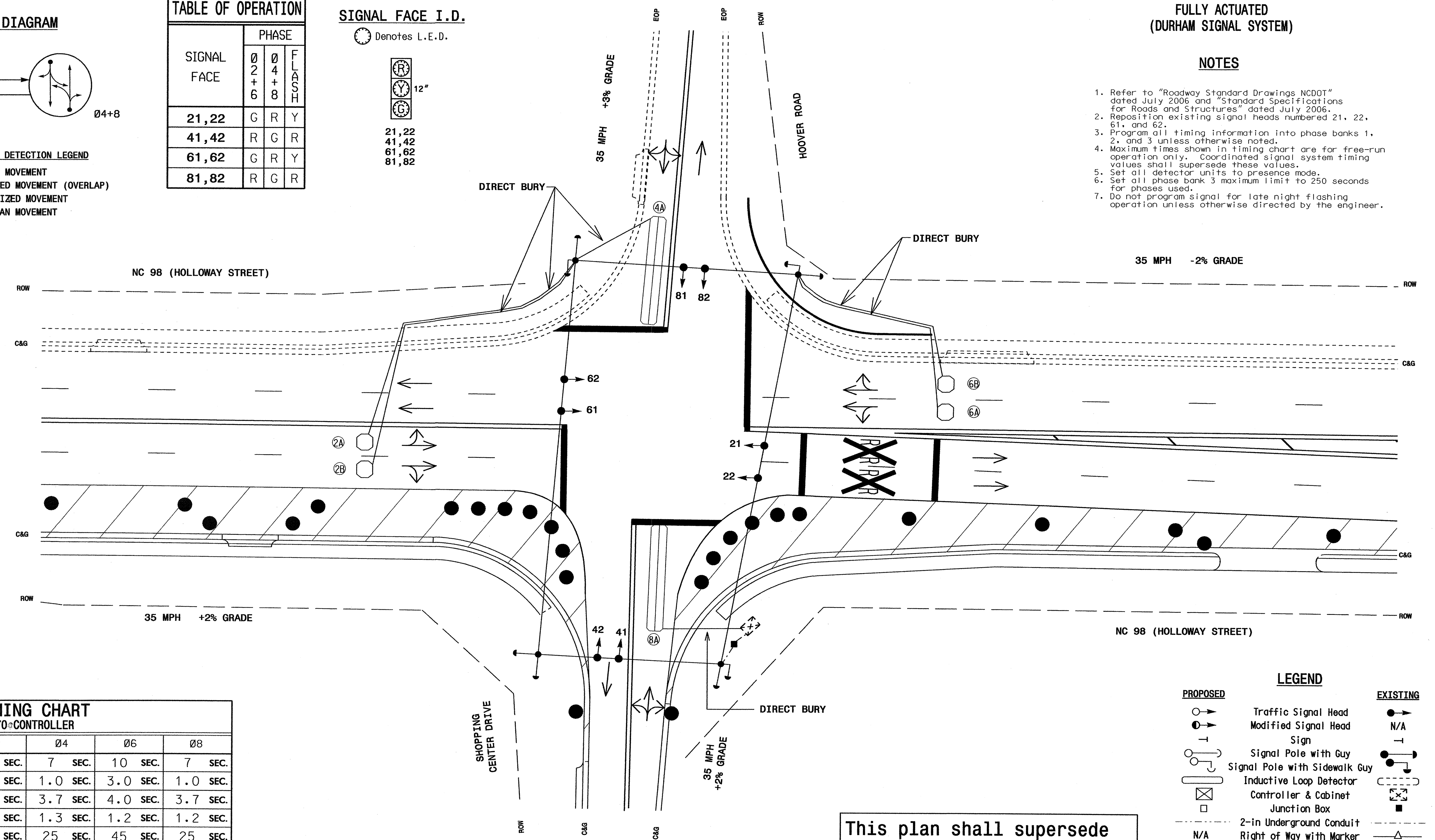
SIGNAL FACE	PHASE		
	Ø 2 + 6	Ø 4 + 8	FLASH
21,22	G	R	Y
41,42	R	G	R
61,62	G	R	Y
81,82	R	G	R

SIGNAL FACE I.D.



NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Reposition existing signal heads numbered 21, 22, 61, and 62.
3. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
4. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values shall supersede these values.
5. Set all detector units to presence mode.
6. Set all phase bank 3 maximum limit to 250 seconds for phases used.
7. Do not program signal for late night flashing operation unless otherwise directed by the engineer.



PHASE	Ø2	Ø4	Ø6	Ø8
MINIMUM INITIAL	10 SEC.	7 SEC.	10 SEC.	7 SEC.
VEHICLE EXTENSION	3.0 SEC.	1.0 SEC.	3.0 SEC.	1.0 SEC.
YELLOW CHANGE INT.	3.7 SEC.	3.7 SEC.	4.0 SEC.	3.7 SEC.
RED CLEARANCE	1.2 SEC.	1.3 SEC.	1.2 SEC.	1.2 SEC.
MAXIMUM LIMIT	45 SEC.	25 SEC.	45 SEC.	25 SEC.
RECALL POSITION	VEH. RECALL	NONE	VEH. RECALL	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	YELLOW LOCK	NONE
DOUBLE ENTRY	OFF	ON	OFF	ON
WALK	- SEC.	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM GAP	3.0 SEC.	1.0 SEC.	3.0 SEC.	1.0 SEC.
REDUCE 0.1 SEC EVERY	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	1.0 SEC.	3.0 SEC.	1.0 SEC.

LOOP & DETECTOR UNIT INSTALLATION CHART  
170 CONTROLLER AND CABINET

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			
2A, 2B	6X6	4	70	X	2	SEC.	SEC.										X	
4A	6X40	2-4-2	0	X	4	5 SEC.	SEC.					X	X					X
6A, 6B	6X6	4	70	X	6	SEC.	SEC.					X	X					X
8A	6X40	2-4-2	0	X	8	5 SEC.	SEC.					X	X					X

PROPOSED	EXISTING
○ → Traffic Signal Head	● → N/A
○ → Modified Signal Head	○ → N/A
⊥ Sign	⊥ Sign
○ Signal Pole with Guy	○ Signal Pole with Sidewalk Guy
□ Inductive Loop Detector	□ Inductive Loop Detector
⊠ Controller & Cabinet	⊠ Junction Box
--- 2-in Underground Conduit	--- 2-in Underground Conduit
N/A Right of Way with Marker	△ Right of Way with Marker
→ Directional Arrow	→ Directional Arrow
→ Pavement Marking Arrow	→ Pavement Marking Arrow
N/A Construction Zone	/// Construction Zone
N/A Construction Drum	● Construction Drum

This plan shall supersede the plan sealed on 2/17/04.

TEMPORARY DESIGN 2 - CONSTRUCTION PHASE III

NC 98 (HOLLOWAY STREET)  
AT  
HOOVER ROAD/  
SHOPPING CENTER DRIVE  
DURHAM CO., NC

PLANNING AND DESIGN DIVISION  
122 N. McDowell St., Raleigh, NC 27603

PLAN DATE: November 2006 REVIEWED BY: D.Y. Ishak  
PREPARED BY: Z. M. Little REVIEWED BY:

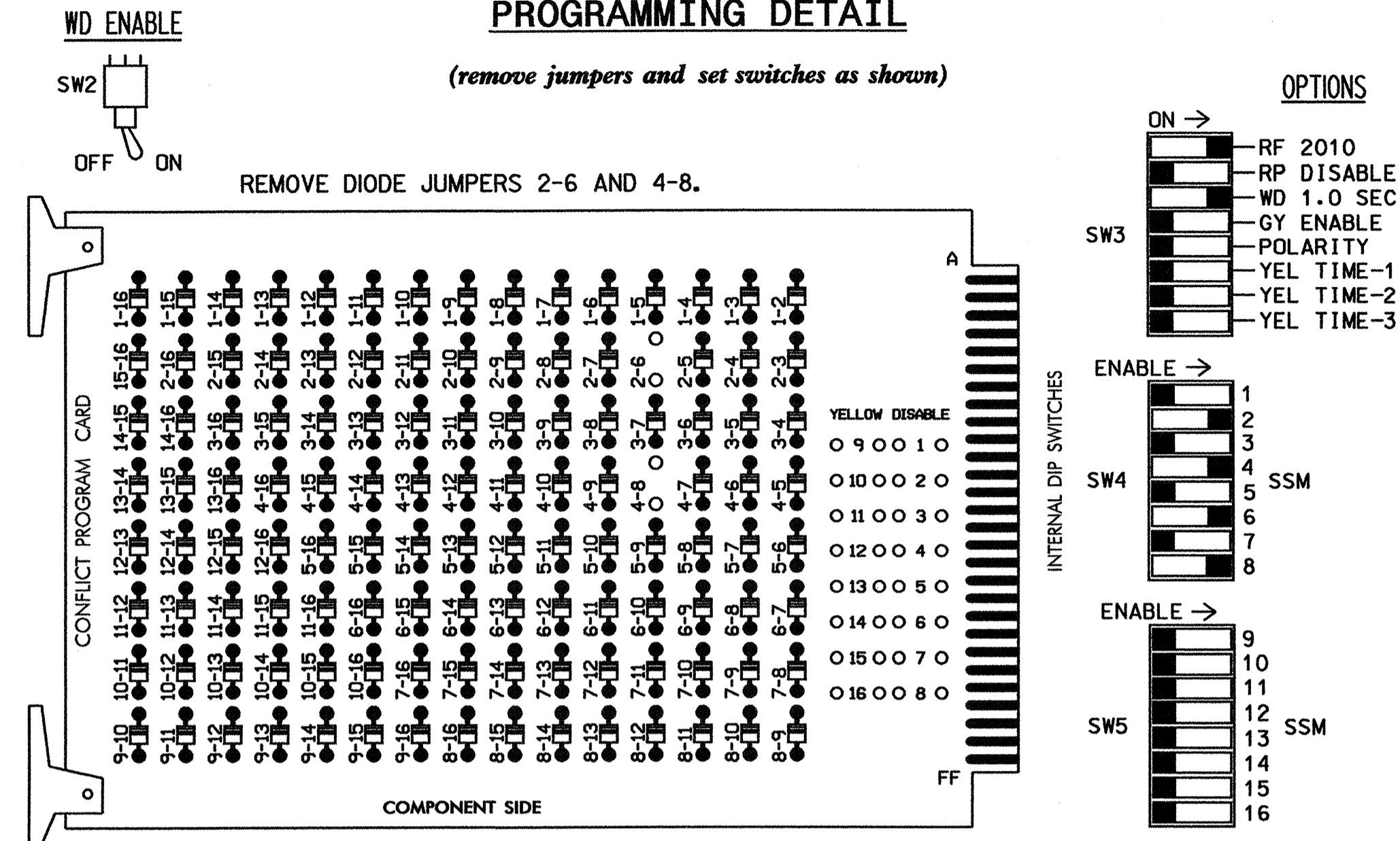
SCALE: 1" = 20'

SIGNATURE: [Signature] DATE: 21 December 06

SIG. INVENTORY NO. 05-1655 T2

**EDI MODEL 2010ECL CONFLICT MONITOR**

**PROGRAMMING DETAIL**



- 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 SEL1-SEL5 ARE PRESENT ON THE MONITOR BOARD.
  - ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION.

**NOTES**

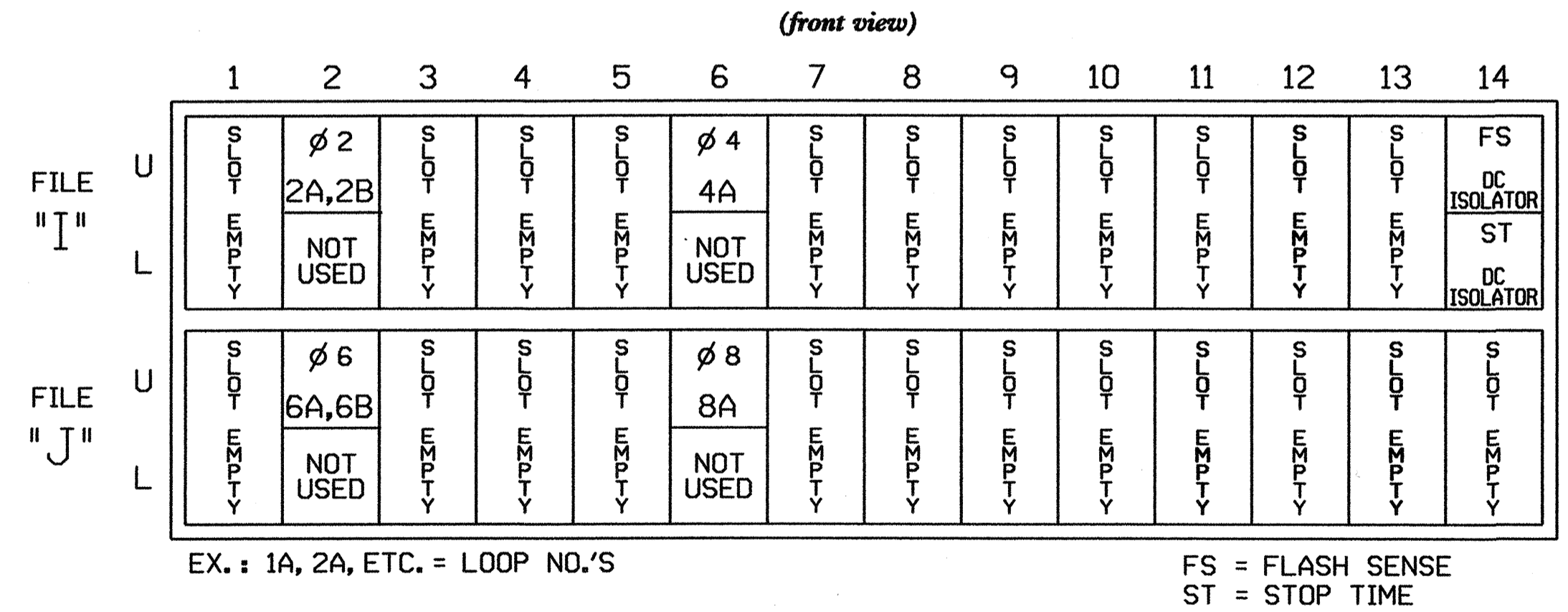
- TO PREVENT "FLASH-CONFLICT" PROBLEMS, INSERT RED FLASH PROGRAM BLOCKS FOR ALL UNUSED VEHICLE LOAD SWITCHES IN OUTPUT FILE. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 1,3,5,7, 9,10,11,12,13,14,15 & 16, TIE UNUSED LOAD SWITCH RED OUTPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM THE 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, ON CONTROLLER UNIT, FOR ALL PHASES.
- PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DOUBLE ENTRY.
- THE CABINET AND CONTROLLER ARE A PART OF THE DURHAM 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	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**



**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A,2B	TB2-5,6	I2U	1	39	5 7	2
4A	TB4-9,10	I6U	2	41	5 7	4
6A,6B	TB3-5,6	J2U	3	40	5 7	6
8A	TB5-9,10	J6U	4	42	5 7	8

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

- 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

**EQUIPMENT INFORMATION**

CONTROLLER.....CONTRACTOR SUPPLIED 170E  
 CABINET .....CONTRACTOR SUPPLIED 332  
 SOFTWARE .....BI TRANS 233NC2  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S2,S4,S6,S8  
 PHASES USED.....2,4,6,8  
 OVERLAPS.....NONE

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1655T1 AND: 05-1655T2  
 DESIGNED: NOVEMBER 2006  
 SEALED: 12-21-06  
 REVISED: N/A

**THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 4/2/04.**

TEMPORARY DESIGN 1 & 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 98 (HOLLOWAY STREET) AT HOOVER ROAD/SHOPPING CENTER DRIVE

DIVISION 05 DURHAM COUNTY DURHAM

PLAN DATE: DECEMBER 2006 REVIEWED BY: *John T. Rowe*

PREPARED BY: JAMES PETERSON REVIEWED BY:

REVISIONS	INIT.	DATE

122 N. McDowell St., Raleigh, NC 27603

SEAL  
 NORTH CAROLINA PROFESSIONAL ENGINEER  
 SEAL 008453  
 JOHN T. ROWE, JR.  
 SIGNATURE DATE 12-21-06  
 SIG. INVENTORY NO. 05-1655T

21-DEC-2006 12:17  
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 J. Peterson

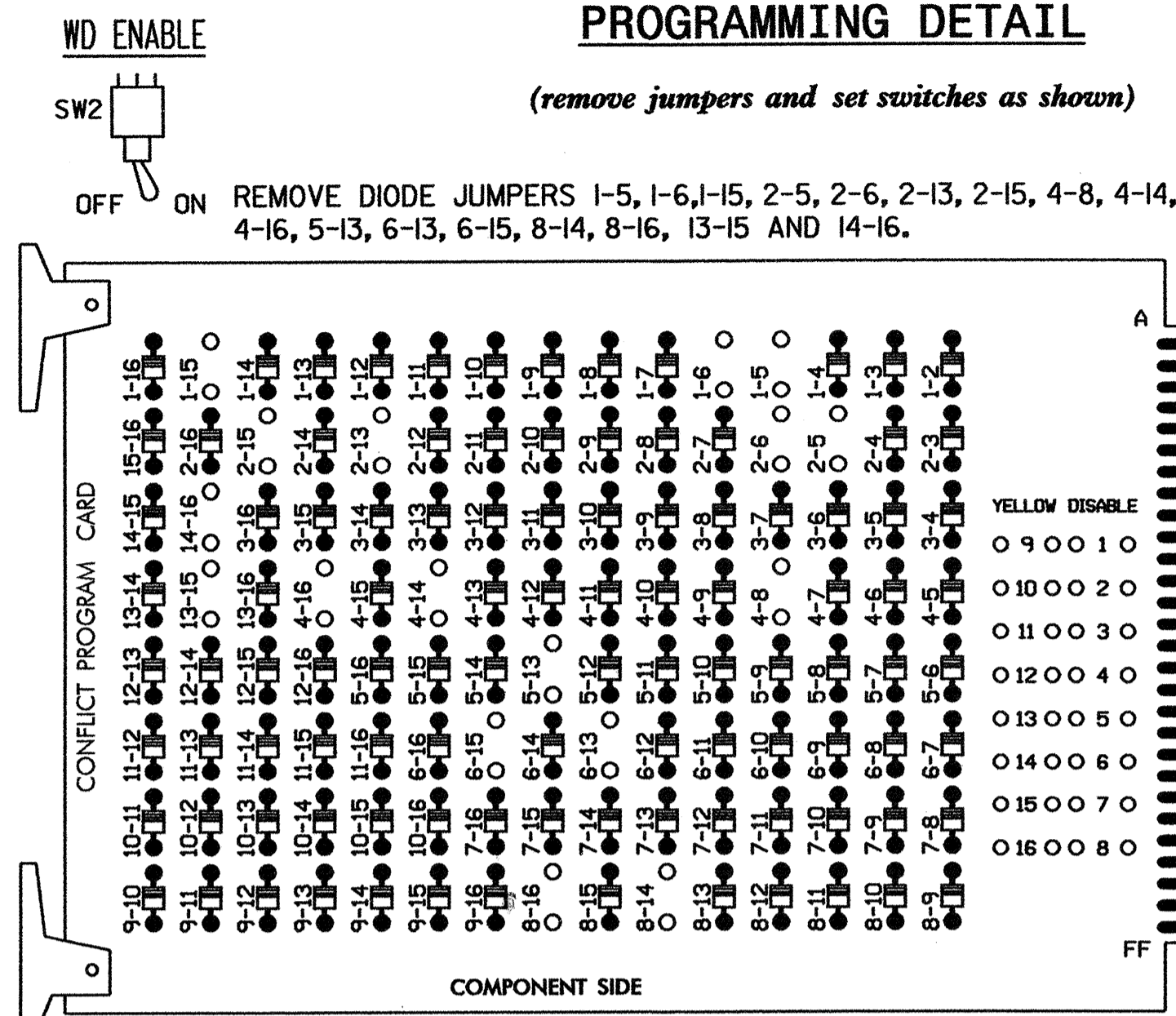






**EDI MODEL 2010ECL CONFLICT MONITOR**

**PROGRAMMING DETAIL**

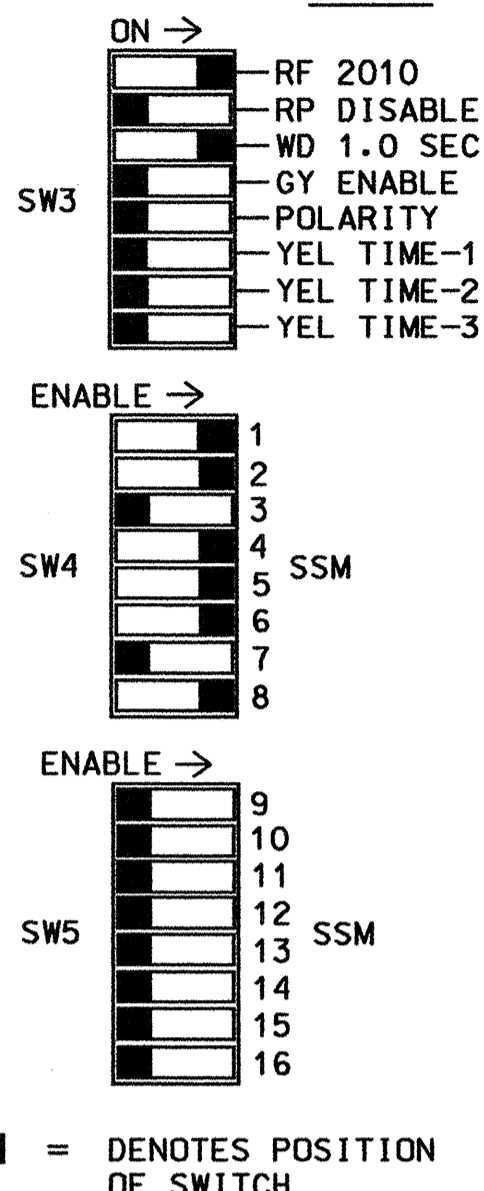


REMOVE JUMPERS AS SHOWN

**NOTES:**

- CARD IS PROVIDED WITH ALL DIODE JUMPERS IN PLACE. REMOVAL OF ANY JUMPER ALLOWS ITS CHANNELS TO RUN CONCURRENTLY.
- MAKE SURE JUMPERS SEL1-SEL5 ARE PRESENT ON THE MONITOR BOARD.
- ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION.

**OPTIONS**



■ = DENOTES POSITION OF SWITCH

**NOTES**

- TO PREVENT "FLASH-CONFLICT" PROBLEMS, INSERT RED FLASH PROGRAM BLOCKS FOR ALL UNUSED VEHICLE LOAD SWITCHES IN 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 & 16, TIE UNUSED LOAD SWITCH RED OUTPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM THE 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, ON CONTROLLER UNIT, FOR ALL PHASES.
- PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DOUBLE ENTRY.
- THE CABINET AND CONTROLLER ARE A PART OF THE DURHAM 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.	61	21,22	P21, P22	NU	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	126						132					
GREEN ARROW	127						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 PAGE.

**EQUIPMENT INFORMATION**

CONTROLLER.....CONTRACTOR SUPPLIED 170E  
CABINET .....CONTRACTOR SUPPLIED 332  
SOFTWARE .....BI TRANS 233NC2  
CABINET MOUNT.....BASE  
OUTPUT FILE POSITIONS...12  
LOAD SWITCHES USED.....S1,S2,S4,S5,S6,S8,S2P,S4P,S6P,S8P  
PHASES USED.....1,2,4,5,6,8,2 PED,4 PED,6 PED,8 PED  
OVERLAPS.....NONE

**PEDESTRIAN PHASE PROGRAMMING**

- PROGRAM PEDESTRIAN 2P OUTPUT AT KEYPAD INPUT E/125+F+5=
- PROGRAM PEDESTRIAN 4P OUTPUT AT KEYPAD INPUT E/125+F+7=
- PROGRAM PEDESTRIAN 6P OUTPUT AT KEYPAD INPUT E/125+F+6=
- PROGRAM PEDESTRIAN 8P OUTPUT AT KEYPAD INPUT E/125+F+8=

**INPUT FILE POSITION LAYOUT**

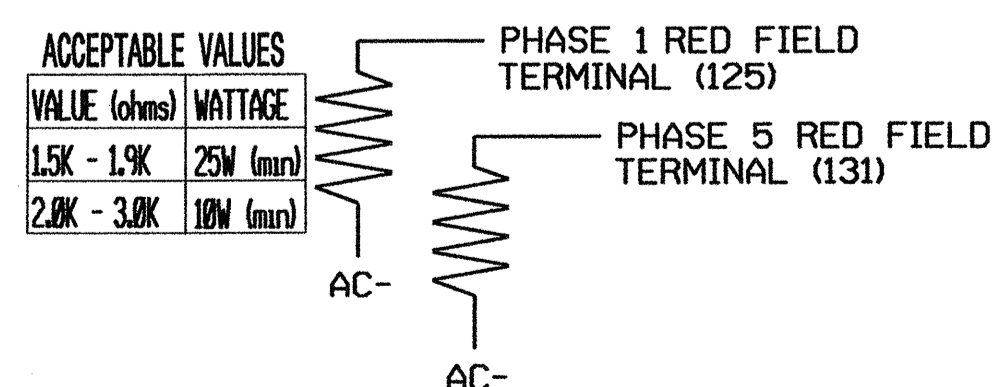
(from view)

FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	∅1,6,4	∅1	∅1	∅1	∅1	∅4	∅1	∅1	∅1	∅1	∅1	∅2 PED	∅6 PED	FS
L	1A	∅2	∅1	∅1	∅1	4A	∅1	∅1	∅1	∅1	∅1	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR
U	2A,2B	∅2	∅1	∅1	∅1	NOT USED	∅1	∅1	∅1	∅1	∅1	∅4 PED	∅8 PED	ST
L	2A,2B	∅2	∅1	∅1	∅1	NOT USED	∅1	∅1	∅1	∅1	∅1	DC ISOLATOR	DC ISOLATOR	DC ISOLATOR
U	∅2,5,4	∅1	∅1	∅1	∅1	∅8	∅1	∅1	∅1	∅1	∅1	∅1	∅1	∅1
L	5A	∅6	∅1	∅1	∅1	NOT USED	∅1	∅1	∅1	∅1	∅1	∅1	∅1	∅1
U	6A,6B	∅6	∅1	∅1	∅1	NOT USED	∅1	∅1	∅1	∅1	∅1	∅1	∅1	∅1
L	6A,6B	∅6	∅1	∅1	∅1	NOT USED	∅1	∅1	∅1	∅1	∅1	∅1	∅1	∅1

EX.: 1A, 2A, ETC. = LOOP NO.'S  
\*\* EX.: 3M CANOGA FOR MICROLOOP SYSTEM.

FS = FLASH SENSE  
ST = STOP TIME

**LOAD RESISTOR INSTALLATION DETAIL**



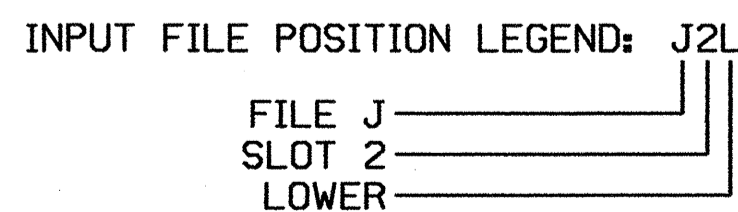
NOTE: THE PURPOSE OF THESE RESISTORS IS TO LOAD THE CHANNEL RED MONITOR INPUTS IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON CHANNELS THAT DO NOT USE THE RED DISPLAY IN THE FIELD.

**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-5,6	I2U	1	39	5 7	1
			2	39	1 5 7	6
			3	39	7	4
2A,2B	TB2-7,8	I2L	4	43	5 7	2
4A	TB4-9,10	I6U	5	41	5 7	4
M1	TB6-9,10	I9U	6	60	*	SYS
M2	TB6-11,12	I9L	7	62	*	SYS
			8	40	1 5 7	2
			9	40	5 7	5
5A	TB3-5,6	J2U	10	40	7	4
			11	44	5 7	6
			12	42	5 7	8
6A,6B	TB3-7,8	J2L	11	44	5 7	6
8A	TB5-9,10	J6U	12	42	5 7	8
PED PUSH BUTTONS						
P21,P22	TB8-4,6	I12U	13	67	2	2 PED
P41,P42	TB8-5,6	I12L	14	69	2	4 PED
P61,P62	TB8-7,9	I13U	15	68	2	6 PED
P81,P82	TB8-8,9	I13L	16	70	2	8 PED

\*SEE SYSTEM DETECTOR ASSIGNMENT DETAIL BELOW.

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



**DETECTOR ATTRIBUTES LEGEND:**

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

**SYSTEM DETECTOR ASSIGNMENT DETAIL**

I9U=PROGRAM SYSTEM DETECTOR #1 AT E/126+B+1=60 (PROBE M1)  
I9L=PROGRAM SYSTEM DETECTOR #2 AT E/126+B+2=62 (PROBE M2)

**BACK-UP PROTECTION NOTE**

TO INSURE 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 233NC SOFTWARE. PROGRAM 170E CONTROLLER AS FOLLOWS:

- PROGRAM PHASES 1 AND 5 AS PROTECTED/PERMITTED AT KEYPAD INPUT E/125+E+4= ∅1.5.
- LOOPS 1A AND 5A 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 1 AND/OR 5. SEE INPUT FILE PROGRAMMING ON THIS SHEET.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-1655  
DESIGNED: NOVEMBER 2006  
SEALED: 12-21-06  
REVISED: N/A

**THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 4/20/04.**

SIGNAL UPGRADE - FINAL DESIGN

ELECTRICAL AND PROGRAMMING DETAILS FOR: NC 98 (HOLLOWAY STREET) AT HOOVER ROAD/ SHOPPING CENTER DRIVE

Prepared in the Office of: NORTH CAROLINA PROFESSIONAL ENGINEERS SEAL 008453 JOHN T. ROWE, JR. ENGINEER

122 N. McDowell St., Raleigh, NC 27603

PLAN DATE: DECEMBER 2006 REVIEWED BY: JWR  
PREPARED BY: JAMES PETERSON REVIEWED BY: JWR

DIVISION 05 DURHAM COUNTY DURHAM

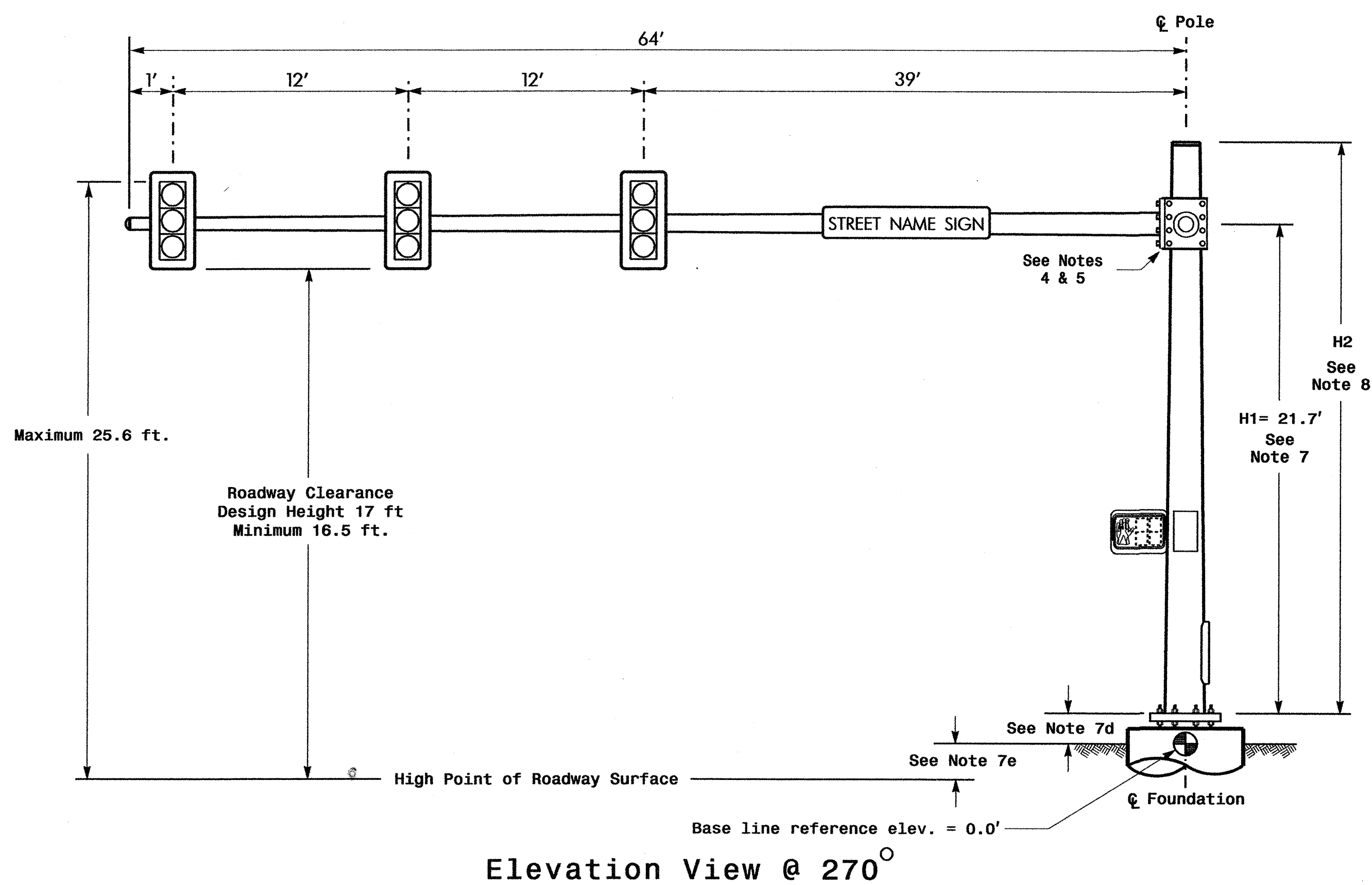
REVISIONS: \_\_\_\_\_ INIT. DATE

John Rowe 12-21-06  
SIGNATURE DATE

SIG. INVENTORY NO. 05-1655

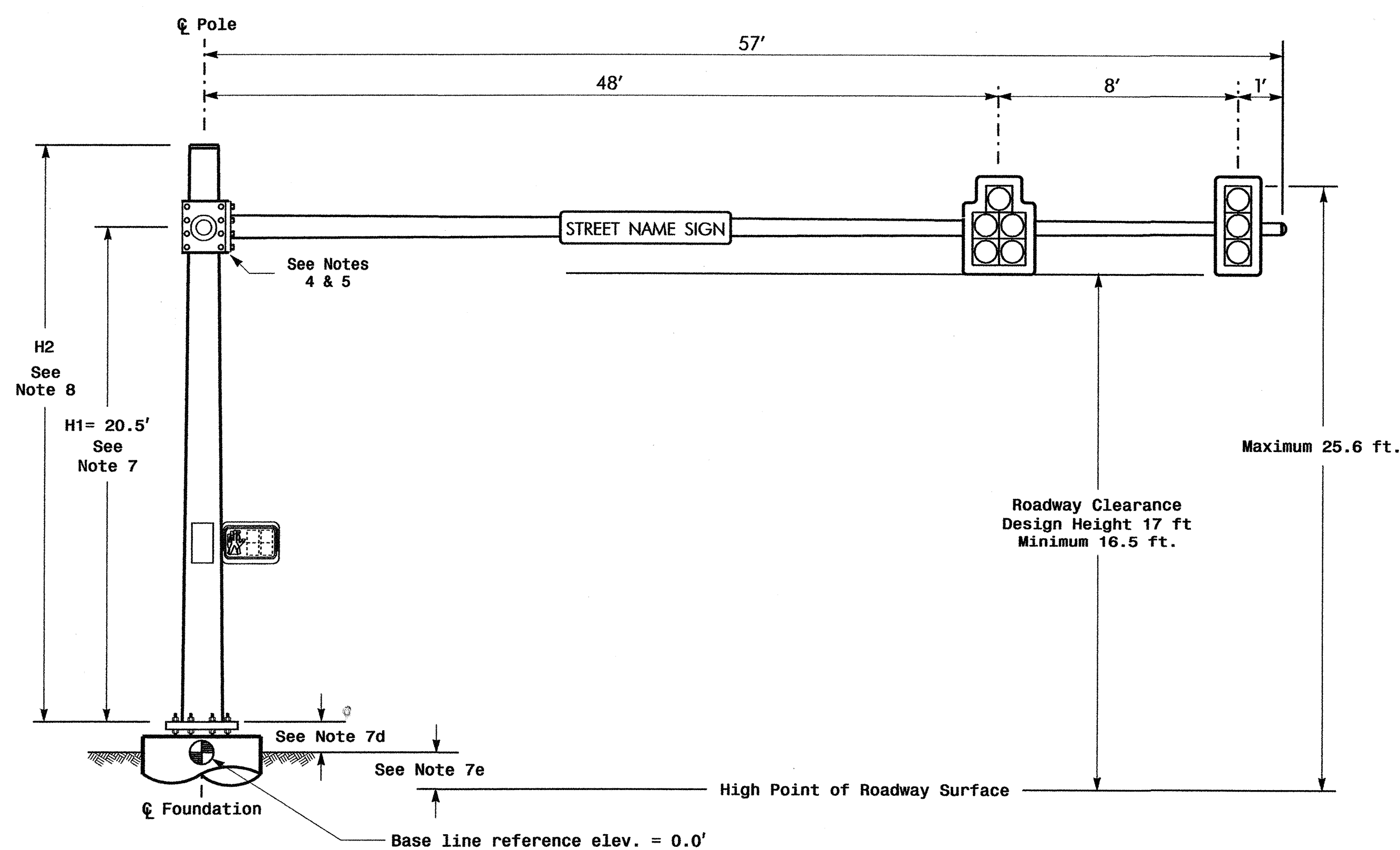


**Design Loading for METAL POLE NO. 4, MAST ARM A**



Elevation View @ 270°

**Design Loading for METAL POLE NO. 4, MAST ARM B**



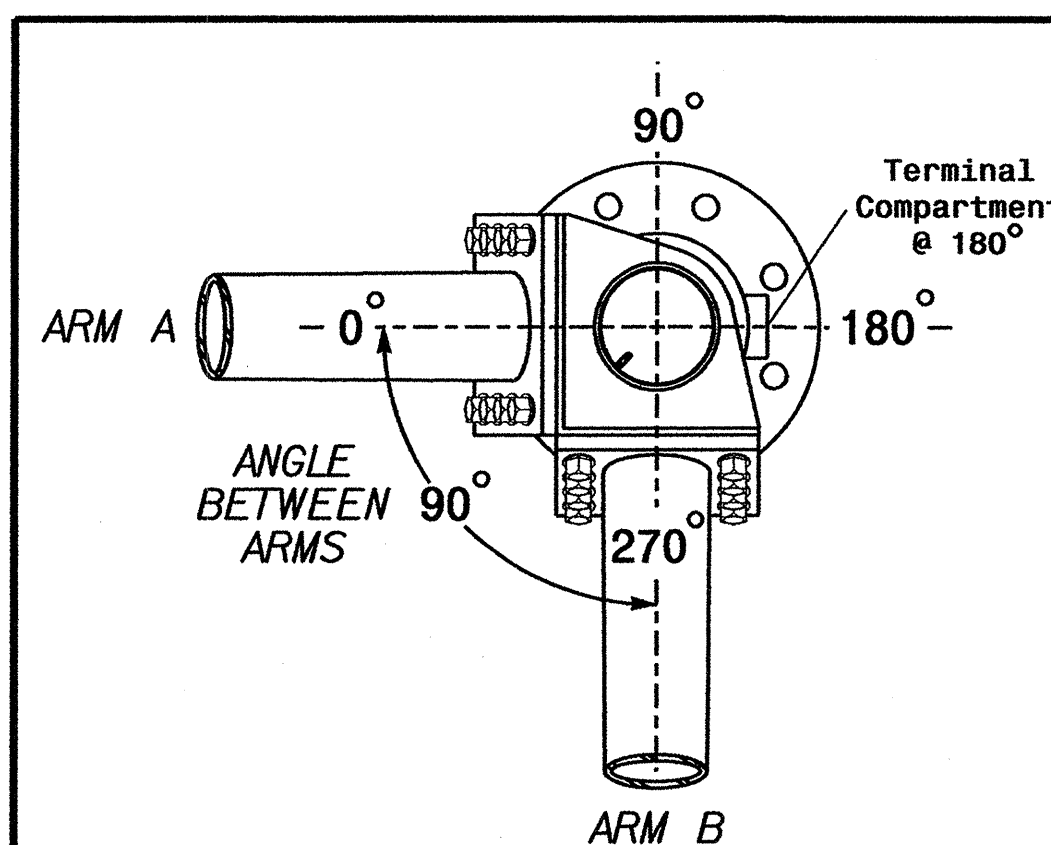
Elevation View @ 0°

**SPECIAL NOTE**

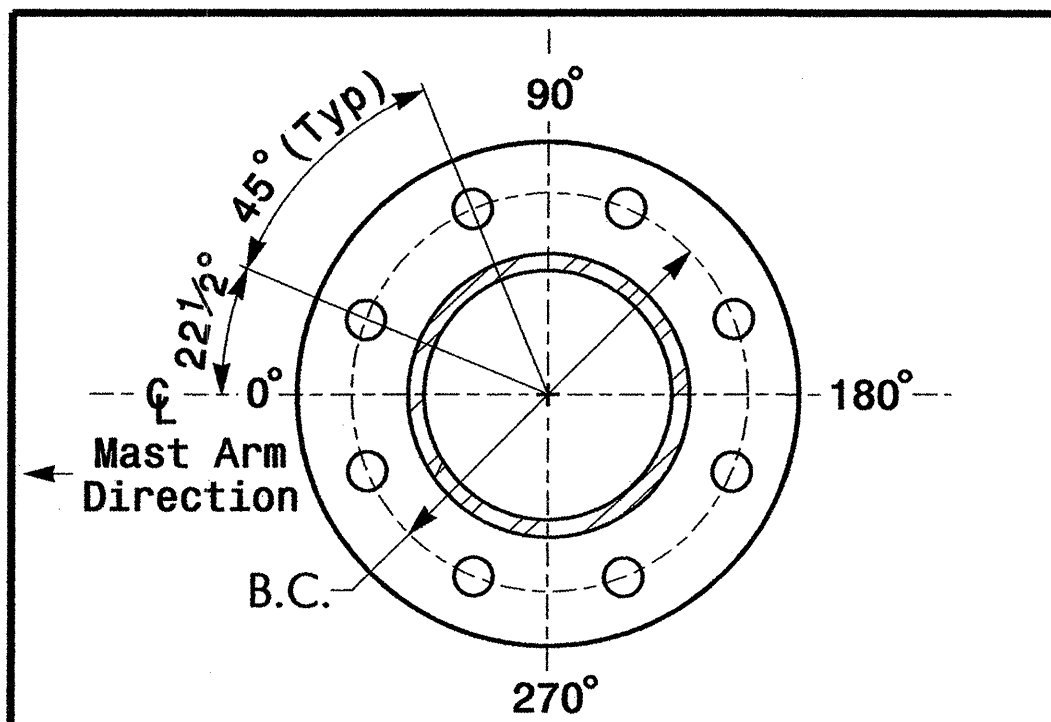
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

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

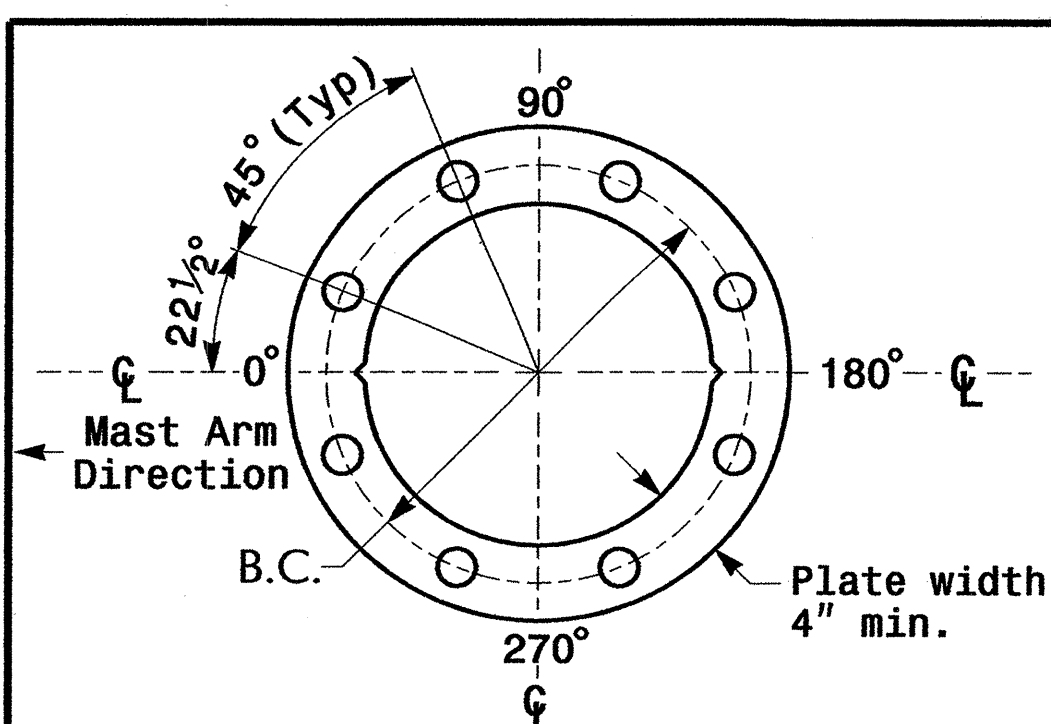
Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+3.1 ft.	+1.9 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A



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. 4**

PROJECT REFERENCE NO.	SHEET NO.
U-4010	Sig. 17

**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
	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS

**NOTES**

**Design Reference Material**

- Design the traffic signal structure and foundation in accordance with:
  - The 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/tmsu/ws/mpoles/poles.htm>

**Design Requirements**

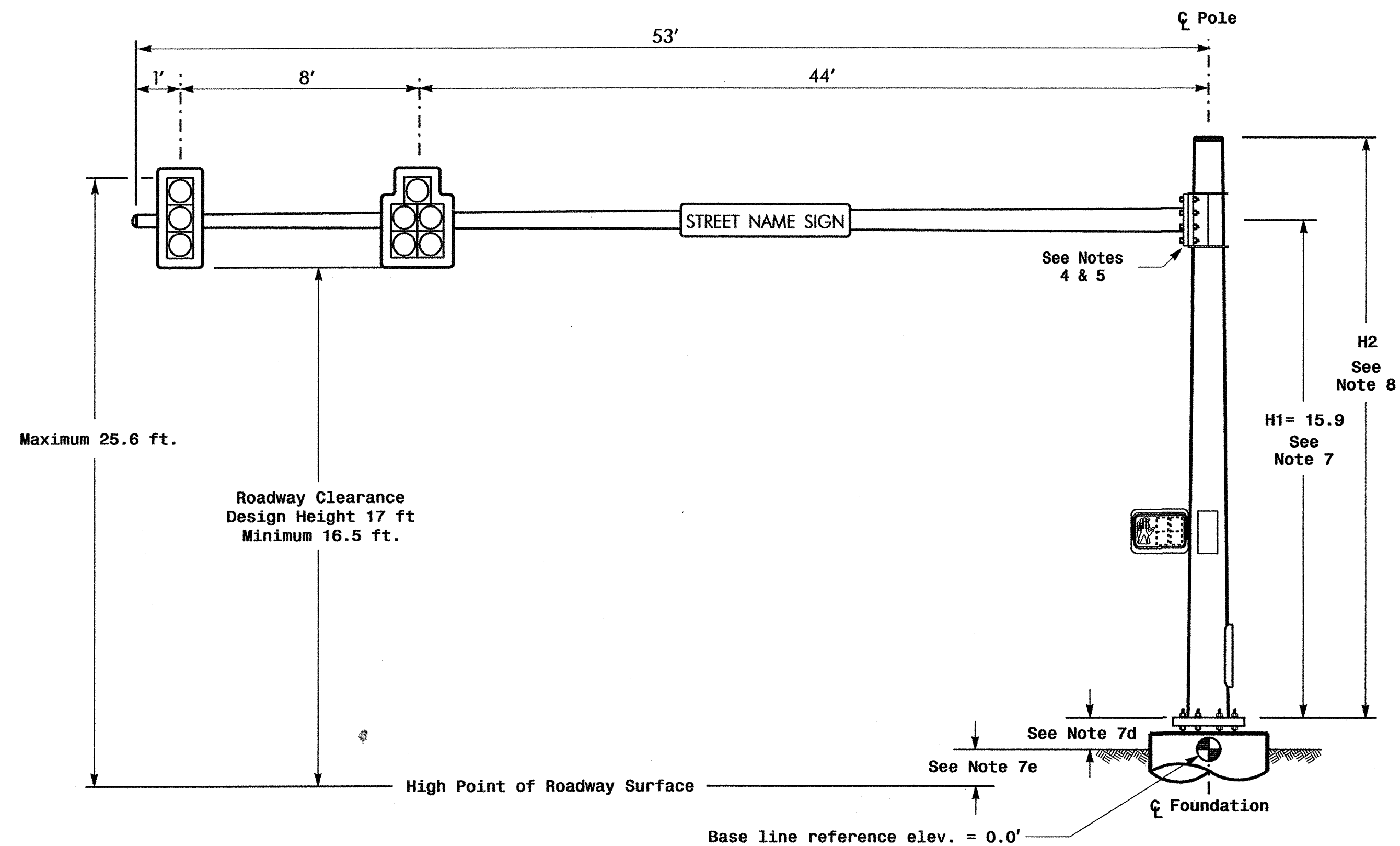
- Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
- Maximum allowable CSR for all signal supports is 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. The arm-to-pole attachment is a high strength connection. Use Direct Tension Indicators (ASTM F959) for each bolt.
- 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) 733-3915.
- 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)**

	Prepared in the Office of: <b>NC 98 (Holloway Street)</b> at <b>Hoover Road/ Shopping Center Drive</b>		SEAL 
	Division 5 PLAN DATE: November 2006	Durham County REVIEWED BY: D.Y. Ishaq	
SCALE 0 N/A N/A		REVISIONS _____ _____ _____	SIGNATURE DATE _____ _____
		SIG. INVENTORY NO. 05-1655	

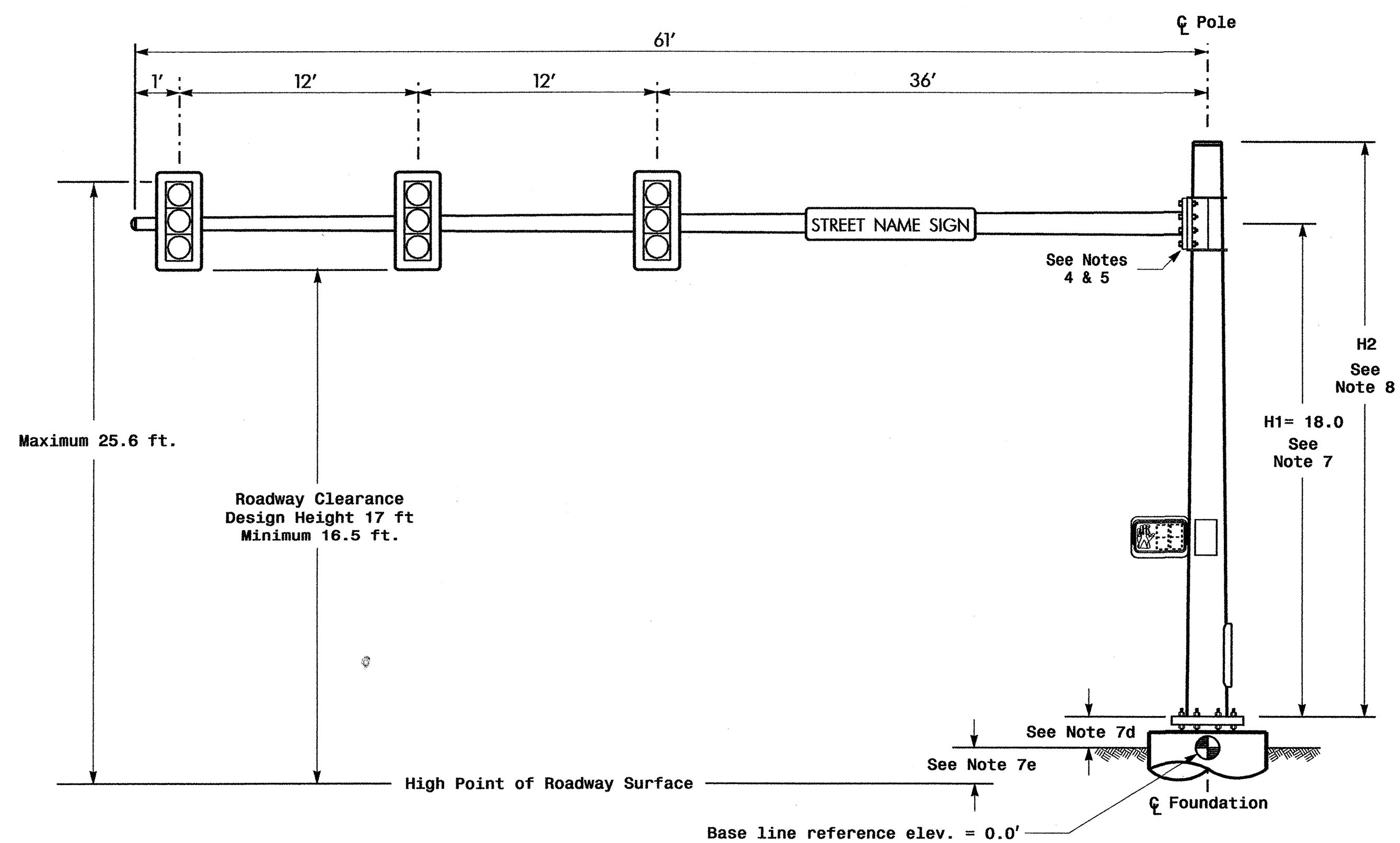


Design Loading for METAL POLE NO. 5



Elevation View

Design Loading for METAL POLE NO. 6

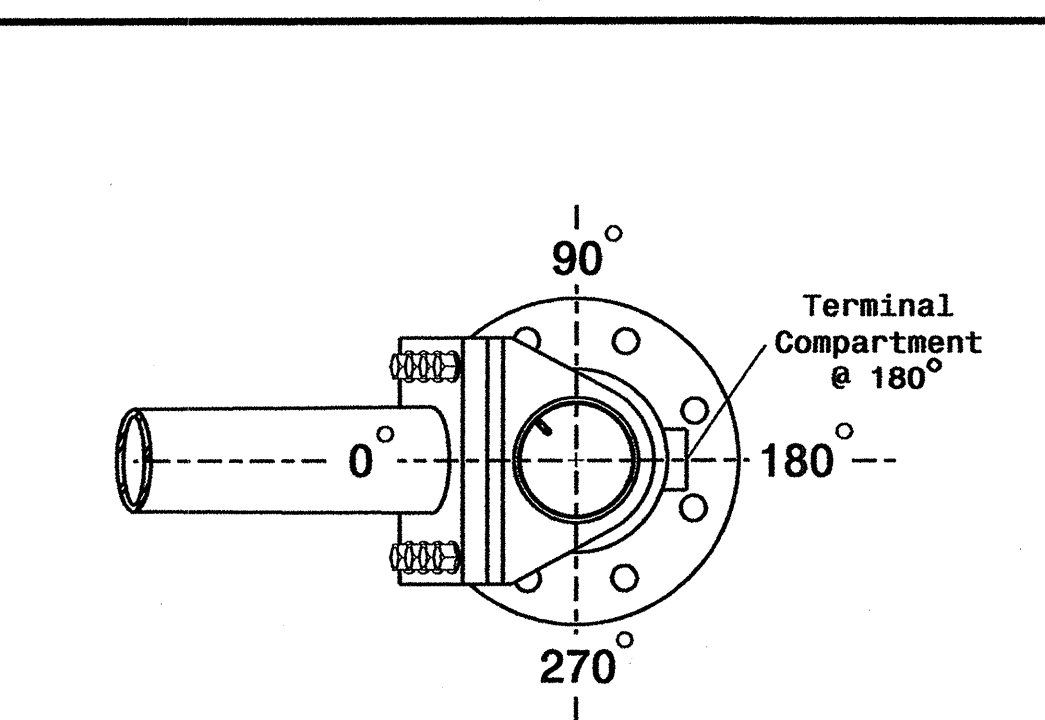


Elevation View

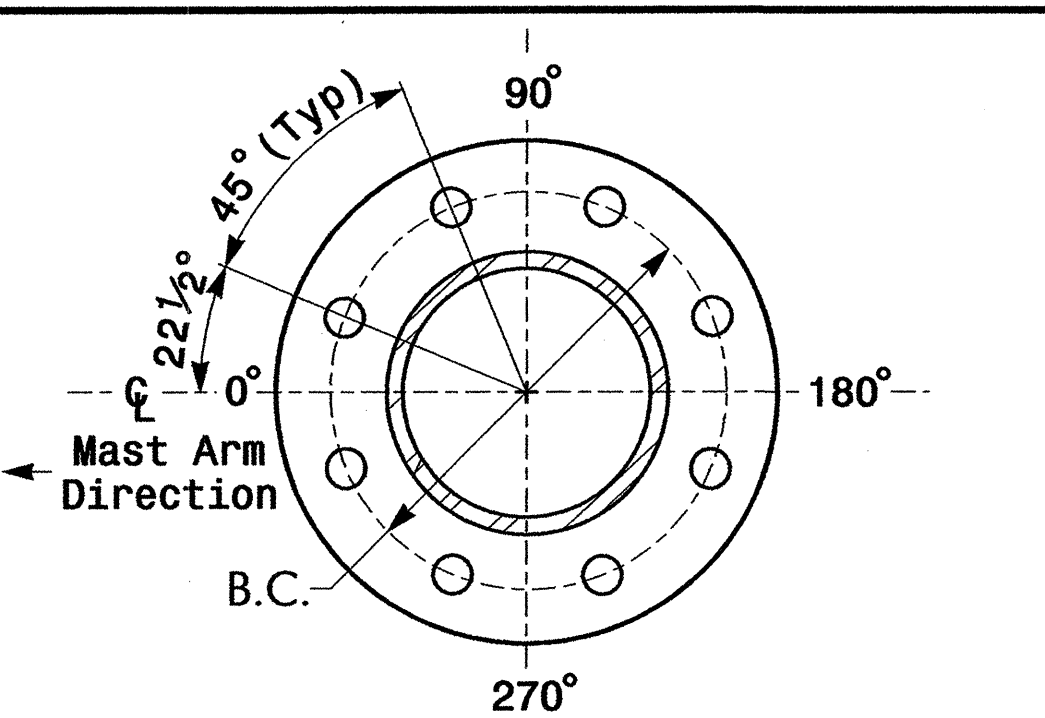
**SPECIAL NOTE**  
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available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

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

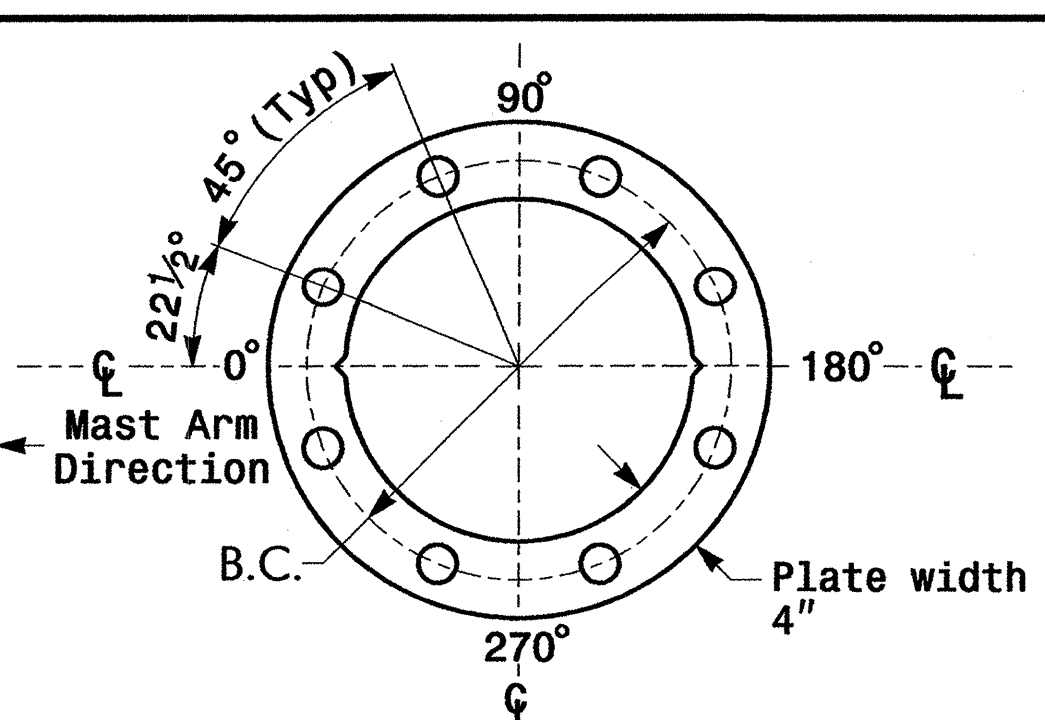
Elevation Differences for:	Pole 5	Pole 6
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-2.7 ft.	-0.6 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A



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**

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NOTES

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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.
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- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
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  - Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
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  - 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:
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- 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) 733-3915.
- 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.

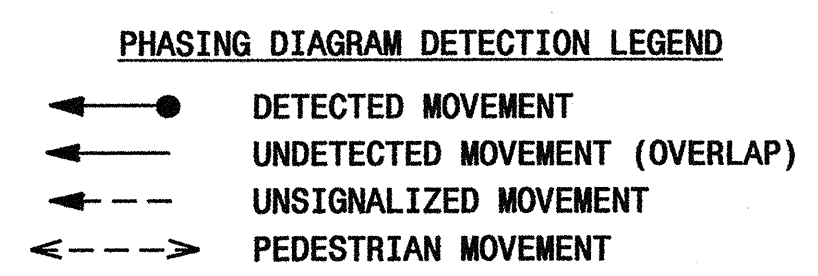
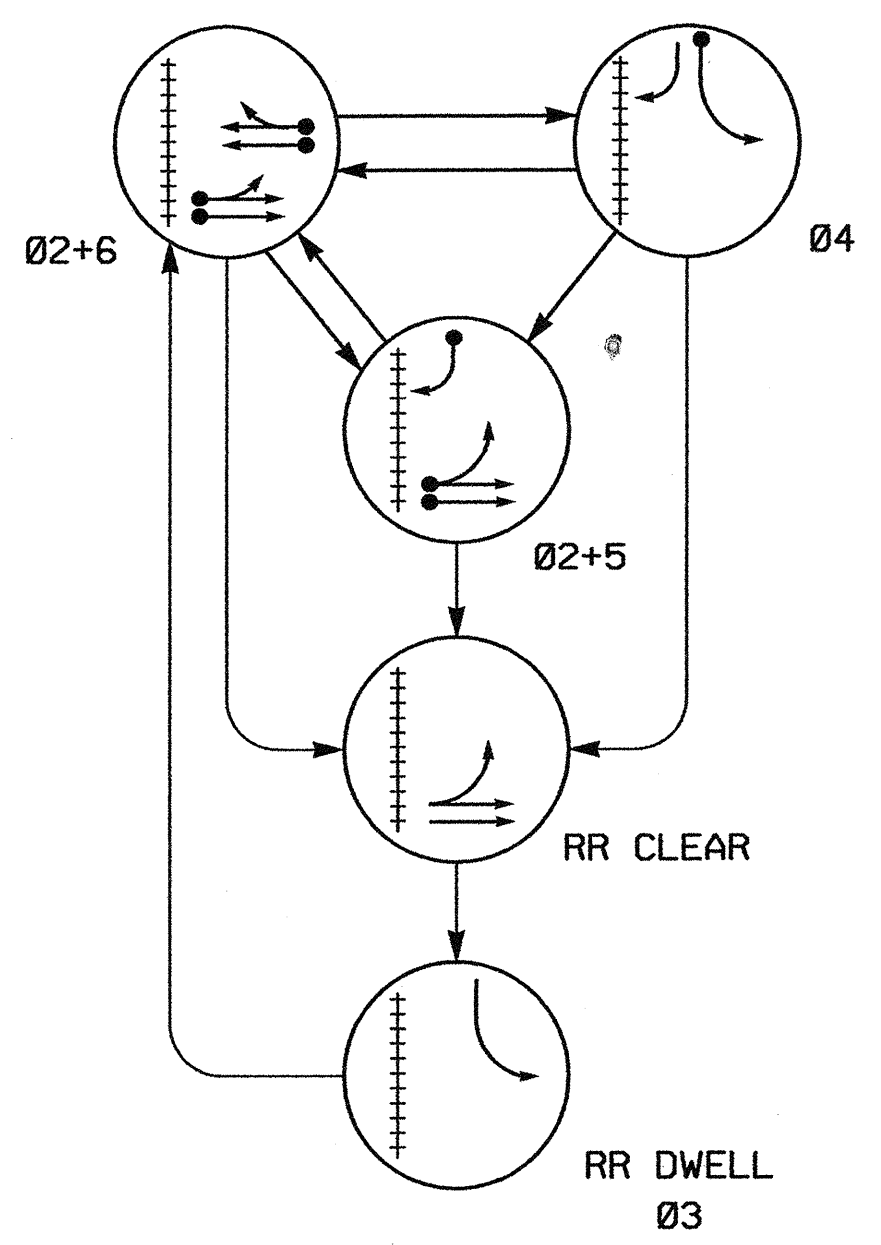
NCDOT Wind Zone 4 (90 mph)

	Prepared in the Offices of: <b>NC 98 (Holloway Street)</b> at <b>Hoover Road/ Shopping Center Drive</b>		SEAL 
	Division 5 PLAN DATE: November 2006 PREPARED BY: Z.M. Little	Durham County REVIEWED BY: D.Y. Ishak REVIEWED BY:	
SCALE: 0 N/A REVISIONS:			SIGNATURE:
INVENTORY NO. 05-1655			DATE:

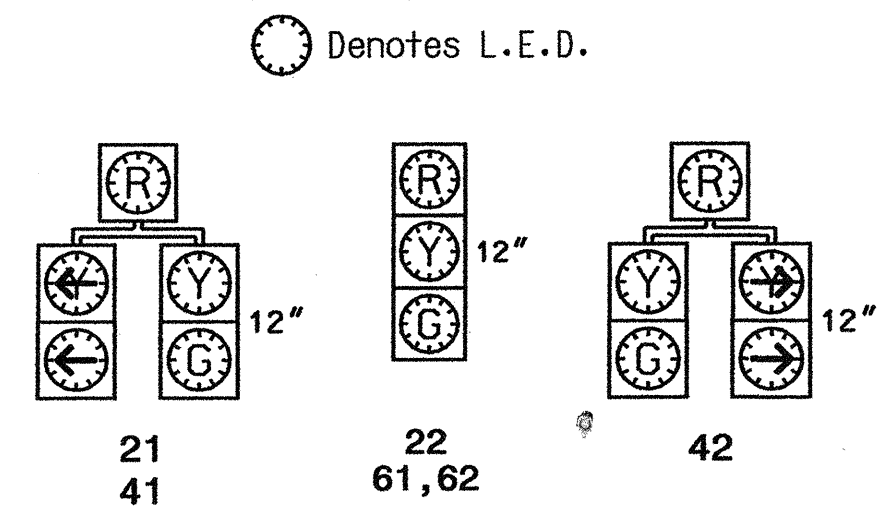
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**PHASING DIAGRAM**



**SIGNAL FACE I.D.**



**TABLE OF OPERATION**

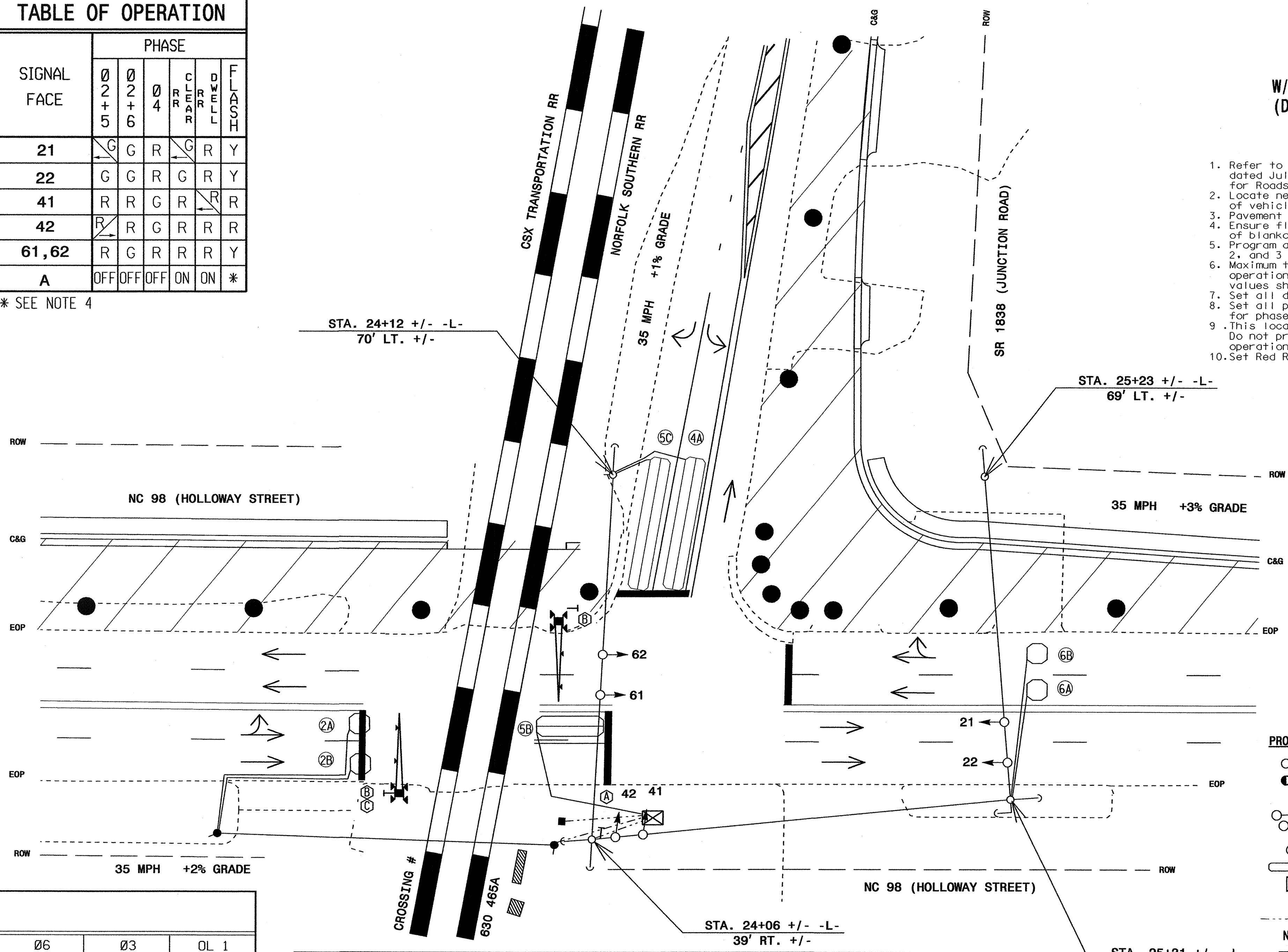
SIGNAL FACE	PHASE							
	Ø 2+5	Ø 2+6	Ø 4	C	R	R	D	F
21	G	G	R	G	R	Y		
22	G	G	R	G	R	Y		
41	R	R	G	R	R			
42	R	R	G	R	R			
61, 62	R	G	R	R	R	Y		
A	OFF	OFF	OFF	ON	ON	*		

\* SEE NOTE 4

**3 PHASE FULLY ACTUATED W/RAILROAD PREEMPTION (DURHAM SIGNAL SYSTEM)**

**NOTES**

- Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- Pavement markings are existing.
- Ensure flashing operation does not alter operation of blankout signs.
- Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values shall supersede these values.
- Set all detector units to presence mode.
- Set all phase bank 3 maximum limit to 250 seconds for phases used.
- This location contains railroad preemption phasing. Do not program signal for late night flashing operation.
- Set Red Revert time to 1.0 seconds.



**LEGEND**

PROPOSED	EXISTING
○ Traffic Signal Head	● Traffic Signal Head
○ Modified Signal Head	N/A
— Sign	— Sign
○ Signal Pole with Guy	● Signal Pole with Guy
○ Signal Pole with Sidewalk Guy	● Signal Pole with Sidewalk Guy
○ Utility Pole	● Utility Pole
□ Inductive Loop Detector	□ Inductive Loop Detector
□ Controller & Cabinet Junction Box	□ Controller & Cabinet Junction Box
— 2-in Underground Conduit	— 2-in Underground Conduit
N/A Right of Way with Marker	△ Right of Way with Marker
→ Directional Arrow	→ Directional Arrow
N/A Pavement Marking Arrow	→ Pavement Marking Arrow
N/A Construction Zone	/// Construction Zone
N/A Construction Drum	● Construction Drum
N/A Railroad Tracks	— Railroad Tracks
N/A Railroad Gate	— Railroad Gate
N/A Railroad Cabinet	■ Railroad Cabinet
Ⓐ L.E.D. Blankout Sign "NO RIGHT TURN - TRAIN"	Ⓐ L.E.D. Blankout Sign "NO RIGHT TURN - TRAIN"
Ⓑ "DO NOT STOP ON TRACKS" Sign (R8-8)	Ⓑ "DO NOT STOP ON TRACKS" Sign (R8-8)
Ⓒ "STOP HERE WHEN FLASHING" Sign (R8-10)	Ⓒ "STOP HERE WHEN FLASHING" Sign (R8-10)

**TIMING CHART 170 CONTROLLER**

PHASE	Ø2	Ø4	Ø5	Ø6	Ø3	ØL 1
MINIMUM INITIAL	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.	0.0 SEC.
VEHICLE EXTENSION	3.0 SEC.	1.0 SEC.	3.0 SEC.	3.0 SEC.		
YELLOW CHANGE INT.	3.7 SEC.	3.0 SEC.	3.0 SEC.	4.0 SEC.	3.0 SEC.	3.0 SEC.
RED CLEARANCE	1.0 SEC.	1.6 SEC.	1.4 SEC.	1.1 SEC.	1.6 SEC.	1.4 SEC.
MAXIMUM LIMIT	45 SEC.	25 SEC.	15 SEC.	45 SEC.		
RECALL POSITION	VEH. RECALL	NONE	NONE	VEH. RECALL		
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	NONE	YELLOW LOCK		
DOUBLE ENTRY	OFF	OFF	OFF	OFF		
WALK	— SEC.	— SEC.	— SEC.	— SEC.		
FLASHING DON'T WALK	— SEC.	— SEC.	— SEC.	— SEC.		
TYPE 3 LIMIT	— SEC.	— SEC.	— SEC.	— SEC.		
ALTERNATE EXTENSION	— SEC.	— SEC.	— SEC.	— SEC.		
ADD PER VEHICLE	— SEC.	— SEC.	— SEC.	— SEC.		
MAXIMUM INITIAL	— SEC.	— SEC.	— SEC.	— SEC.		
MAXIMUM GAP	3.0 SEC.	1.0 SEC.	3.0 SEC.	3.0 SEC.		
REDUCE 0.1 SEC EVERY	— SEC.	— SEC.	— SEC.	— SEC.		
MINIMUM GAP	3.0 SEC.	1.0 SEC.	3.0 SEC.	3.0 SEC.		

**LOOP & DETECTOR UNIT INSTALLATION CHART 170 CONTROLLER AND CABINET**

INDUCTIVE LOOPS				DETECTOR PROGRAMMING														
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW EXISTING	NEMA PHASE	TIMING		ATTRIBUTES								STATUS		
						DELAY	CARRY (STRETCH)	1	2	3	4	5	6	7	8	NEW	EXISTING	
2A, 2B	6X6	4	70	X	2	SEC.	SEC.							X	X			X
4A	6X40	2-4-2	0	X	4	3 SEC.	SEC.							X	X			X
5B	6X30	2-4-2	0	X	2	3 SEC.	SEC.	X						X	X			X
5C	6X40	2-4-2	0	X	5	15 SEC.	SEC.							X	X			X
6A, 6B	6X6	4	70	X	6	SEC.	SEC.							X	X			X

**RAILROAD PREEMPTION**

FUNCTION	SECONDS
DELAY BEFORE PREEMPT	0
TRACK CLEARANCE GREEN	13

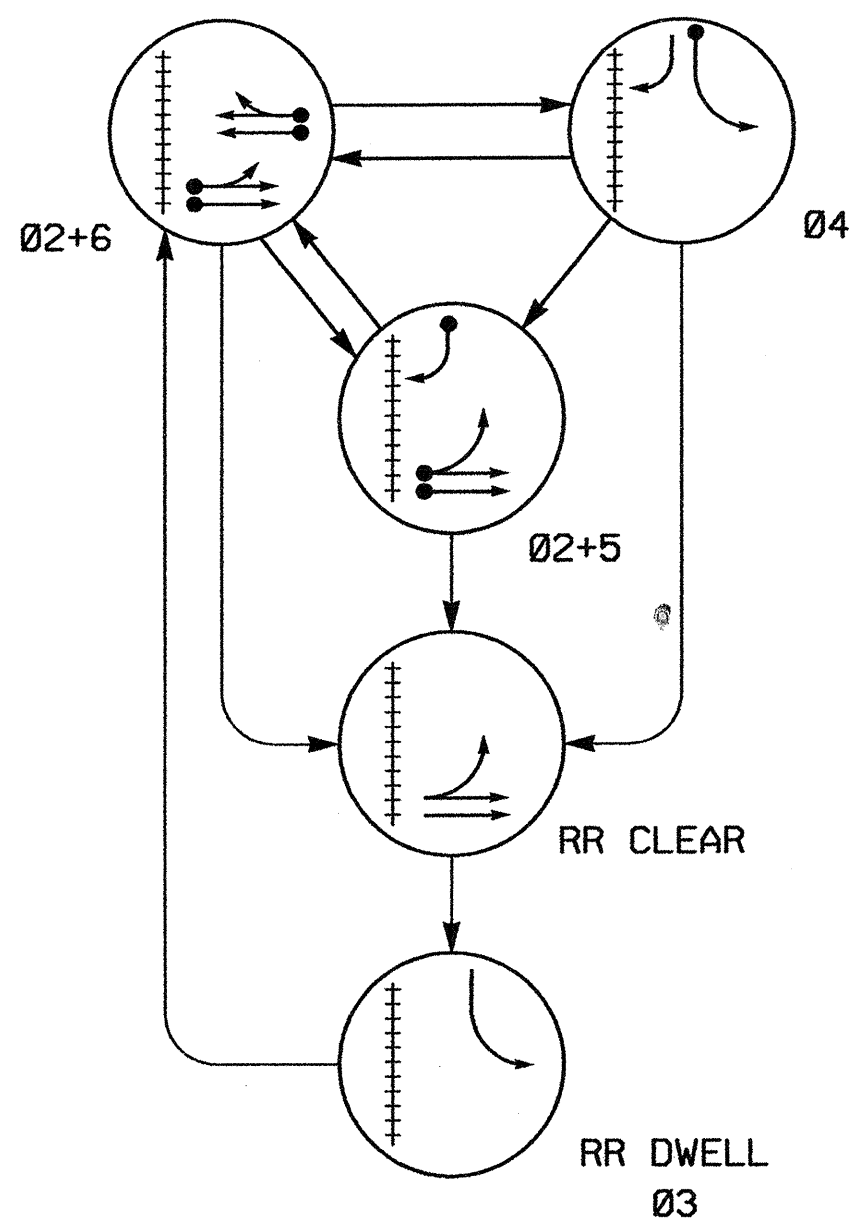
This plan shall supersede the plan sealed on 2/17/04.

**TEMPORARY DESIGN 1 - CONSTRUCTION PHASE I**

Prepared in the Offices of:  
  
**NC 98 (HOLLOWAY STREET) AT SR 1838 (JUNCTION ROAD)**  
 DIVISION 5 DURHAM CO. DURHAM  
 PLAN DATE: November 2006 REVIEWED BY: D.Y. Ishak  
 PREPARED BY: Z.M. Little REVIEWED BY:  
 SCALE: 1"=20'  
 SIGNATURE: DATE: SIG. INVENTORY NO. 05-0138 T1



PHASING DIAGRAM



SIGNAL FACE I.D.

○ Denotes L.E.D.

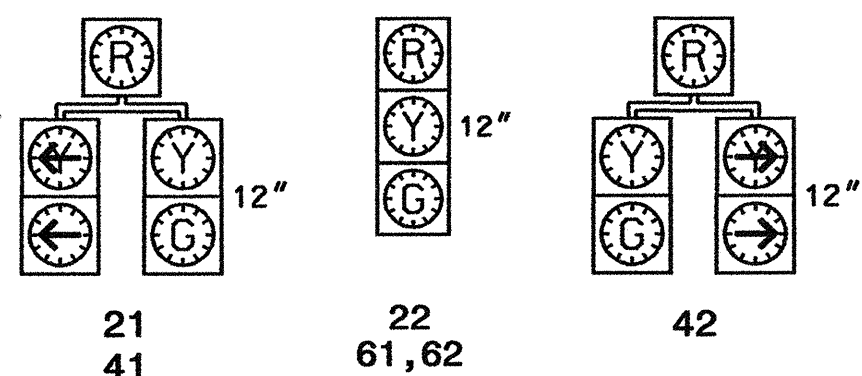


TABLE OF OPERATION

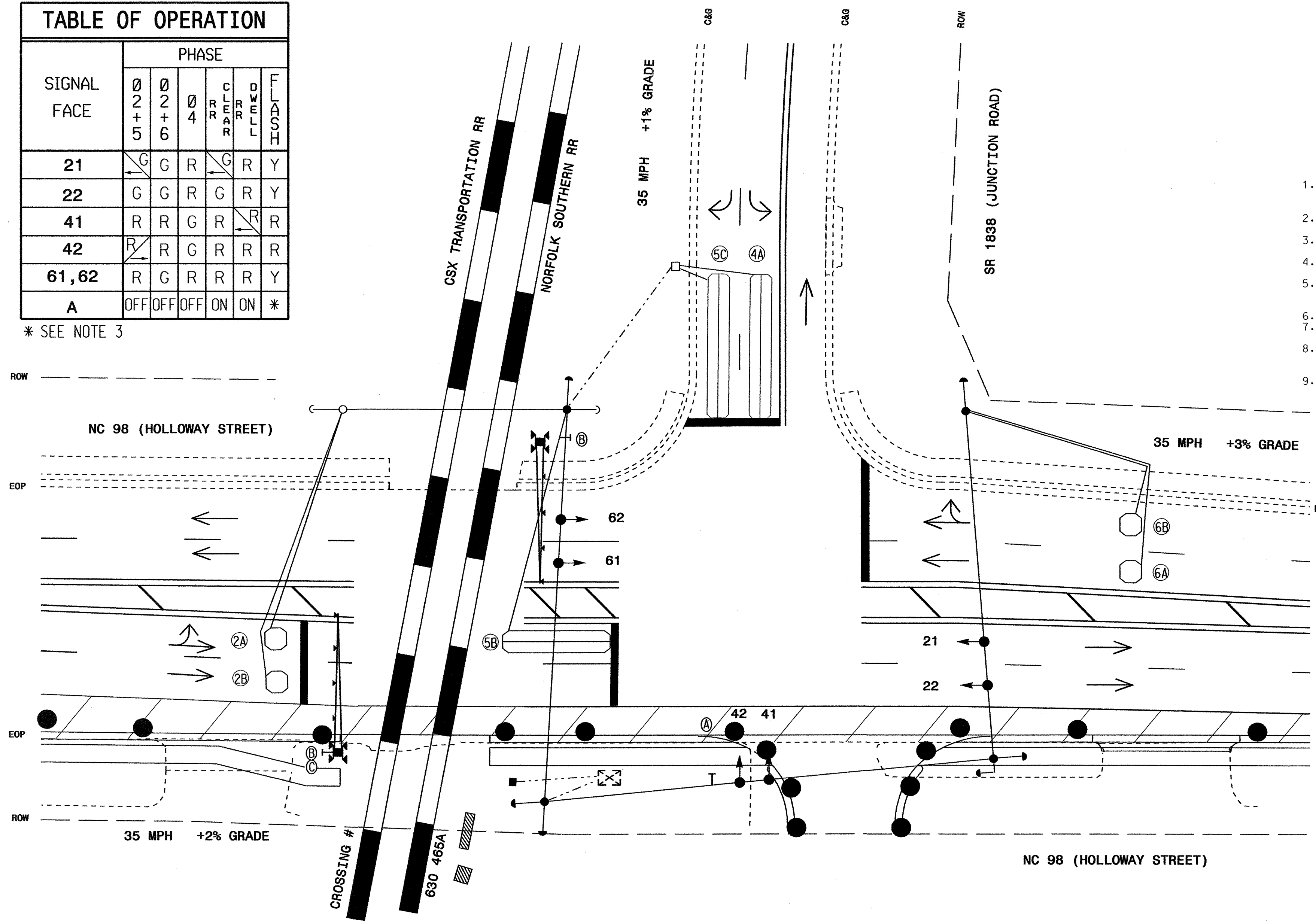
SIGNAL FACE	PHASE											
	Ø2+5	Ø2+6	Ø4	RR	RR	RR	RR	RR	RR	RR	RR	FLASH
21	G	G	R	G	R	Y						
22	G	G	R	G	R	Y						
41	R	R	G	R	R							
42	R	R	G	R	R							
61, 62	R	G	R	R	Y							
A	OFF	OFF	OFF	ON	ON	*						

\* SEE NOTE 3

3 PHASE FULLY ACTUATED W/RAILROAD PREEMPTION (DURHAM SIGNAL SYSTEM)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
- Reposition all existing signal heads and blankout sign.
- Ensure flashing operation does not alter operation of blankout signs.
- Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values shall supersede these values.
- Set all detector units to presence mode.
- Set phase bank 3 maximum limit to 250 seconds for phases used.
- This location contains railroad preemption phasing. Do not program signal for late night flashing operation.
- Set Red Revert time to 1.0 seconds.



LEGEND

- | PROPOSED | EXISTING |
|----------|----------|
| ○        | ●        |
| ○→       | N/A      |
| ○        | —        |
| ○→       | ○→       |
| ○→       | ○→       |
| ○        | ○        |
| ○        | ○        |
| □        | □        |
| □        | □        |
| N/A      | △        |
| →        | →        |
| →        | →        |
| N/A      | ///      |
| N/A      | ■        |
| N/A      | ■        |
| N/A      | ■        |
| N/A      | ■        |
| ⓐ        | ⓐ        |
| ⓑ        | ⓑ        |
| ⓒ        | ⓒ        |

TIMING CHART 170 CONTROLLER

PHASE	Ø2	Ø4	Ø5	Ø6	Ø3	OL 1
MINIMUM INITIAL	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.	0.0 SEC.
VEHICLE EXTENSION	4.0 SEC.	1.0 SEC.	3.0 SEC.	3.0 SEC.		
YELLOW CHANGE INT.	3.7 SEC.	3.0 SEC.	3.0 SEC.	4.0 SEC.	3.0 SEC.	3.0 SEC.
RED CLEARANCE	1.7 SEC.	2.1 SEC.	2.4 SEC.	1.1 SEC.	2.1 SEC.	2.4 SEC.
MAXIMUM LIMIT	45 SEC.	25 SEC.	15 SEC.	45 SEC.		
RECALL POSITION	VEH. RECALL	NONE	NONE	VEH. RECALL		
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	NONE	YELLOW LOCK		
DOUBLE ENTRY	OFF	OFF	OFF	OFF		
WALK	- SEC.	- SEC.	- SEC.	- SEC.		
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.		
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.		
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.		
ADD PER VEHICLE	- SEC.	- SEC.	- SEC.	- SEC.		
MAXIMUM INITIAL	- SEC.	- SEC.	- SEC.	- SEC.		
MAXIMUM GAP	4.0 SEC.	1.0 SEC.	3.0 SEC.	3.0 SEC.		
REDUCE 0.1 SEC EVERY	- SEC.	- SEC.	- SEC.	- SEC.		
MINIMUM GAP	4.0 SEC.	1.0 SEC.	3.0 SEC.	3.0 SEC.		

LOOP & DETECTOR UNIT INSTALLATION CHART 170 CONTROLLER AND CABINET

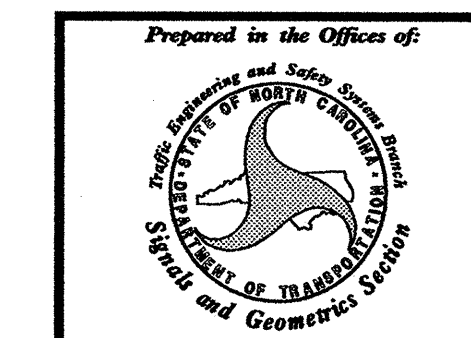
LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	NEMA PHASE	TIMING		DETECTOR PROGRAMMING								STATUS			
							DELAY	CARRY (STRETCH)	ATTRIBUTES								NEW	EXISTING		
									1	2	3	4	5	6	7	8			SYSTEM	LOOPS
2A, 2B	6X6	4	90	X		2	SEC.	SEC.						X	X				X	
4A	6X40	2-4-2	0	X		4	3 SEC.	SEC.					X	X					X	
5B	6X30	2-4-2	0	X		2	3 SEC.	SEC.	X				X	X					X	
5C	6X40	2-4-2	0	X		5	15 SEC.	SEC.					X	X					X	
6A, 6B	6X6	4	70	X		6	SEC.	SEC.					X	X					X	

RAILROAD PREEMPTION

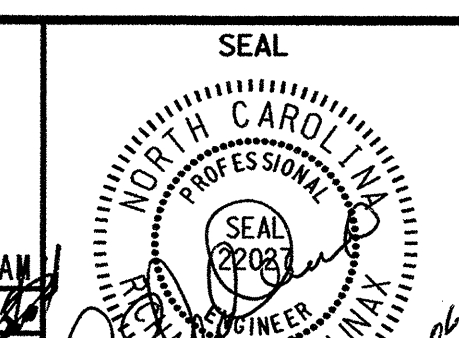
FUNCTION	SECONDS
DELAY BEFORE PREEMPT	0
TRACK CLEARANCE GREEN	13

This plan shall supersede the plan sealed on 2/17/04.

TEMPORARY DESIGN 2 - CONSTRUCTION PHASE III



NC 98 (HOLLOWAY STREET) AT SR 1838 (JUNCTION ROAD)  
 DIVISION 5 DURHAM CO. DURHAM  
 PREPARED BY: Z.M. Little REVIEWED BY: D.Y. Ishak  
 SCALE 1"=20'



REVISIONS	INIT.	DATE

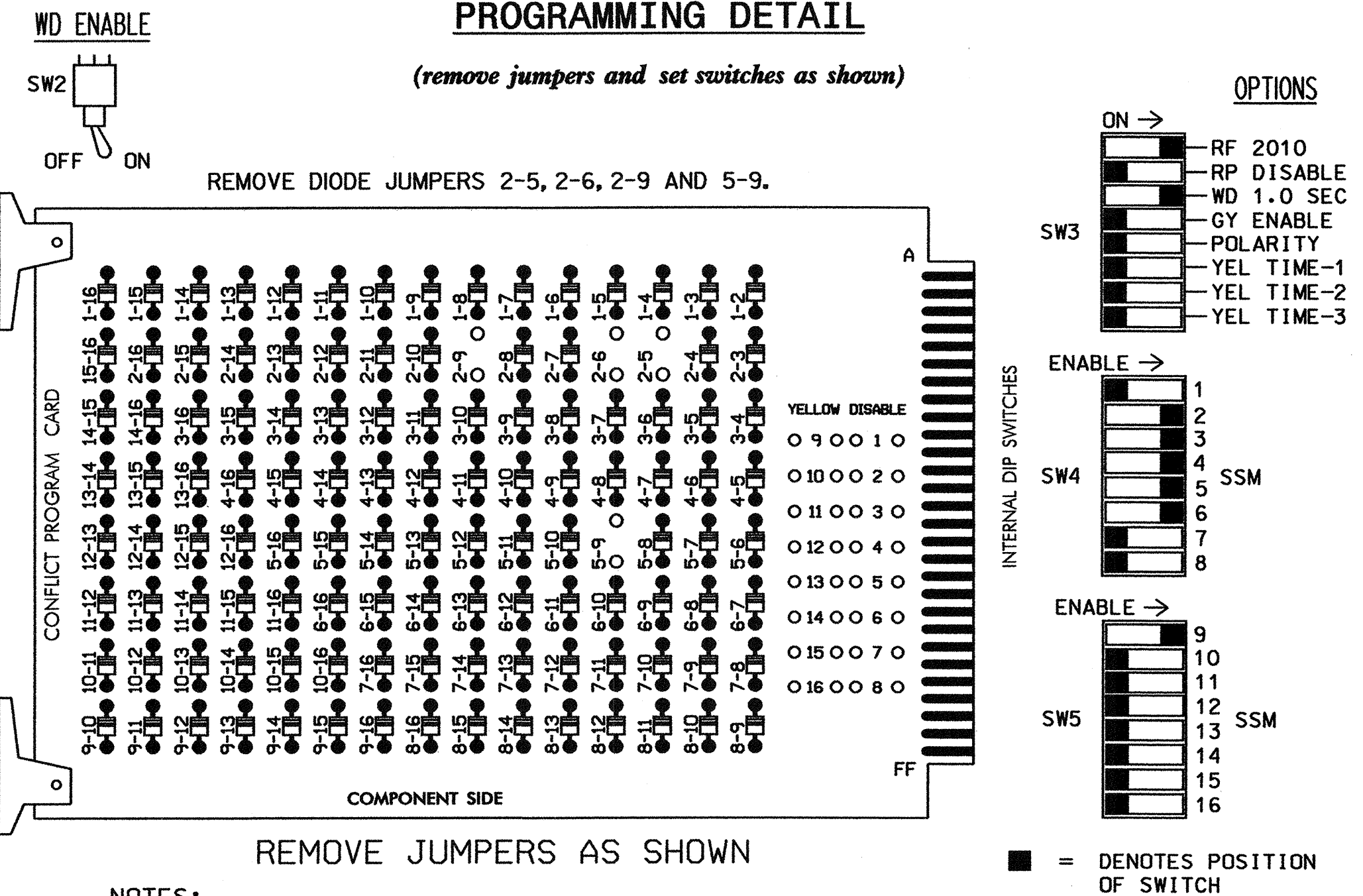
SIGNATURE	DATE

SIG. INVENTORY NO. 05-0138 T2



**EDI MODEL 2010ECL CONFLICT MONITOR**

**PROGRAMMING DETAIL**



**NOTES:**

- CARD IS PROVIDED WITH ALL DIODE JUMPERS IN PLACE. REMOVAL OF ANY JUMPER ALLOWS ITS CHANNELS TO RUN CONCURRENTLY.
- MAKE SURE JUMPERS SEL1-SEL5 ARE PRESENT ON THE MONITOR BOARD.
- ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION.

**INPUT FILE POSITION LAYOUT**

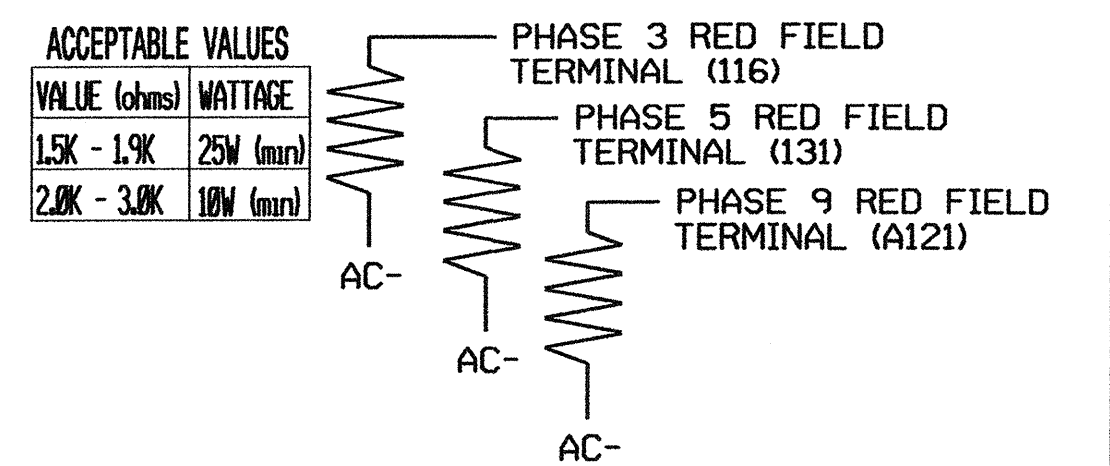
(front view)

FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	S T Y	∅ 2 2A,2B	S T Y	S T Y	S T Y	∅ 4 4A	S T Y	S T Y	S T Y	S T Y	S T Y	S T Y	S T Y	FS DC ISOLATOR
L	S T Y	NOT USED	S T Y	S T Y	S T Y	NOT USED	S T Y	S T Y	S T Y	S T Y	S T Y	S T Y	S T Y	ST DC ISOLATOR
U	S T Y	∅ 2,5 5B	∅ 5 5C	S T Y	S T Y	S T Y	S T Y	S T Y	S T Y	S T Y	S T Y	S T Y	S T Y	NOT USED
L	S T Y	NOT USED	∅ 6 6A,6B	S T Y	S T Y	S T Y	S T Y	S T Y	S T Y	S T Y	S T Y	S T Y	S T Y	RR2 AC ISOLATOR

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

FS = FLASH SENSE  
ST = STOP TIME  
RR = RAILROAD PREEMPT

**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 CHANNELS THAT DO NOT USE THE RED DISPLAY IN THE FIELD.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0138T1 AND: 05-0138T2  
DESIGNED: NOVEMBER 2006  
SEALED: 12-21-06  
REVISED: N/A

**THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 4/2/04.**

**NOTES**

- TO PREVENT "FLASH-CONFLICT" PROBLEMS, INSERT RED FLASH PROGRAM BLOCKS FOR ALL UNUSED VEHICLE LOAD SWITCHES IN OUTPUT FILE. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 1,7,8, 10,11, 12, 13, 14, 15 & 16, TIE UNUSED LOAD SWITCH RED OUTPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM THE 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, ON CONTROLLER UNIT, FOR ALL PHASES.
- THE CABINET AND CONTROLLER ARE A PART OF THE DURHAM SIGNAL SYSTEM.

**POWER-UP / RESTART PROGRAMMING NOTE**

IN ORDER FOR PHASES USED ONLY IN NORMAL OPERATION TO BE SERVED AFTER A POWER-UP OR RESTART, PROGRAM "START VEHICLE CALL" AND "START PED CALL" ON I70E CONTROLLER AS FOLLOWS:

VEH - F/2+F+E=∅ 2, 4, 5, 6  
PED - F/2+F+F= NO ACTIVE PEDS

**OVERLAP PROGRAMMING NOTES**

TO ASSURE THAT LOADSWITCH S9 IS ASSIGNED AS OVERLAP 1, PROGRAM CONTROLLER AT KEYPAD INPUT E/29+1+0=9

TO SET THE PARENT PHASE FOR OVERLAP 1 (VEH. SET 1) AS PHASE 5, PROGRAM CONTROLLER AT KEYPAD INPUT E/29+1+1=∅ 5

SET THE PARENT PHASE FOR OVERLAP 1 (VEH. SET 2) AS NONE, NO PROGRAMMING IS REQUIRED.

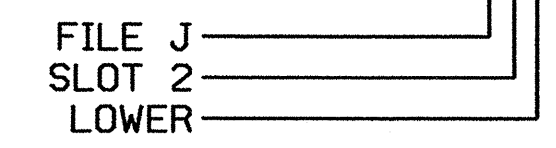
PROGRAM TIMING FOR OVERLAP 1 AS FOLLOWS:  
YELLOW CHANGE INTERVAL - E/29+1+E=3.0 (SEC.)  
RED CLEARANCE - E/29+1+F=\*\* (SEC.)  
FOR: TEMP 1 \*\* = 1.4 (SEC.)  
TEMP 2 \*\* = 2.4 (SEC.)

**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A,2B	TB2-5,6	I2U	1	39	5 7	2
4A	TB4-9,10	I6U	2	41	5 7	4
5B	TB3-5,6	J2U	3	40	1 5 7	2
			4	40	5 7	5
5C	TB3-9,10	J3U	5	64	5 7	5
6A,6B	TB3-11,12	J3L	6	77	5 7	6

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

**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	S9	S10	S11	S12	S13	S14
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	41	41,42	NU	21	61,62	NU	NU	NU	NU	42	NU	NU	NU	NU	NU
RED		128		*	101		*	134					*					
YELLOW		129			102			135										
GREEN		130			103			136										
RED ARROW																		
YELLOW ARROW														A122				
GREEN ARROW														A123				

NU = NOT USED  
\* DENOTES INSTALL LOAD RESISTOR. SEE LOAD RESISTOR INSTALLATION DETAIL THIS PAGE.

**HEAD 42 ARROW (OL1)**

**OPERATION DURING PREEMPTION**

IN ORDER FOR RR PREEMPTION TO OPERATE AS PHASES 2 AND 5 WITHOUT SIGNAL HEAD 42 RIGHT-TURN ARROW (OVERLAP 'OLI'), THE FOLLOWING PROGRAMMING MUST BE IN PLACE:

ASSIGN RR PREEMPT RR2 OUTPUT AT E/I27+D+D= 200  
ASSIGN O/L VEH. SET 2 INPUT AT E/I26+D+C=200  
200 = ASSIGNABLE PSEUDO-PIN (SOFTWARE)

**EQUIPMENT INFORMATION**

CONTROLLER.....CONTRACTOR SUPPLIED 170E  
CABINET.....CONTRACTOR SUPPLIED 332  
SOFTWARE.....BI TRANS 233NC2  
CABINET MOUNT.....BASE  
OUTPUT FILE POSITIONS...18 (12-STD, 6-AUX)  
LOAD SWITCHES USED.....S2,S3,S4,S5,S6,S9  
PHASES USED.....2,\*3,4,5,6  
OVERLAP 1:.....5 (VEH. SET 1 ONLY)  
\*USED DURING RR PREEMPTION ONLY.

**TEMPORARY DESIGN 1 & 2 - SHEET 1 OF 2**

ELECTRICAL AND PROGRAMMING DETAILS FOR:  
Prepared in the Offices of:  
Traffic Engineering and Safety Systems Group  
NORTH CAROLINA STATE UNIVERSITY  
Signal Management Section  
122 N. McDowell St., Raleigh, NC 27603

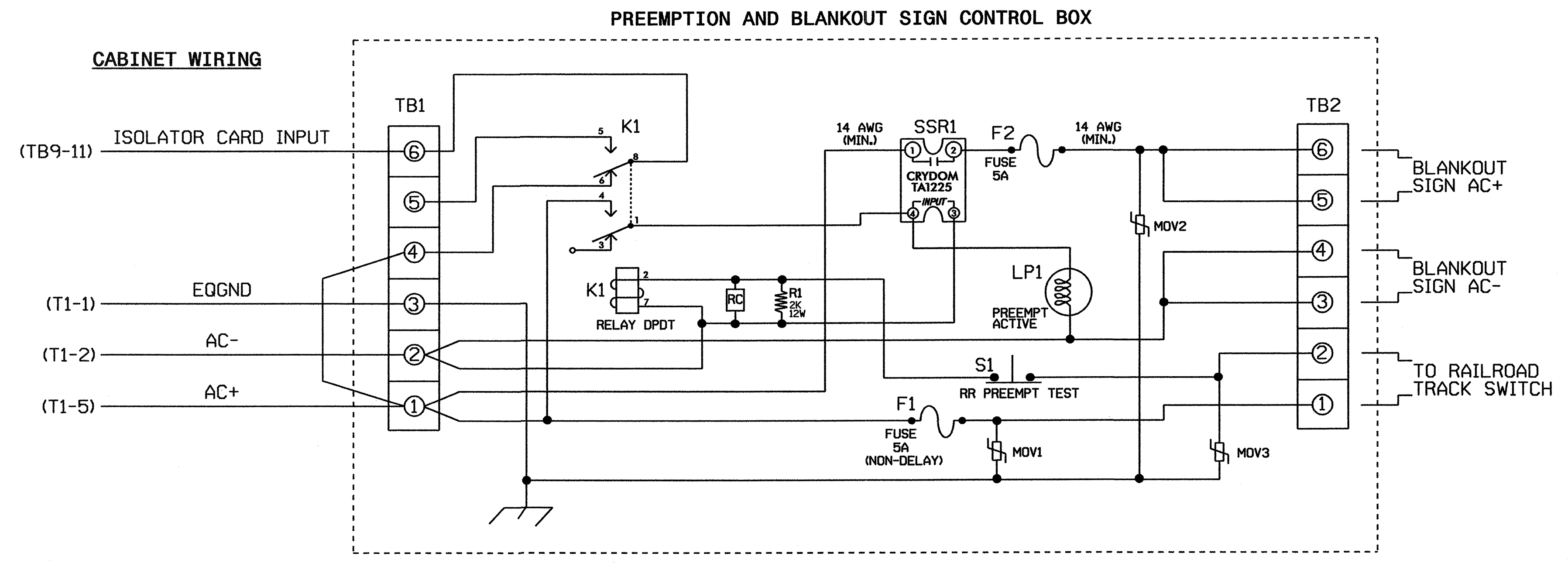
NC 98 (HOLLOWAY STREET)  
AT  
SR 1838 (JUNCTION ROAD)  
DIVISION 05 DURHAM COUNTY DURHAM  
PLAN DATE: DECEMBER 2006 REVIEWED BY: JLP  
PREPARED BY: JAMES PETERSON REVIEWED BY:  
REVISIONS INIT. DATE  
SIGNATURE DATE

SEAL  
NORTH CAROLINA STATE UNIVERSITY  
PROFESSOR  
SEAL 008453  
ENGINEER  
JOHN T. ROWELL  
12-22-06  
SIGNATURE DATE  
SIG. INVENTORY NO. 05-0138T

21-DEC-2006 14:14  
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jpeterson

### RAILROAD PREEMPTION WIRING DETAIL

(wire as shown below)



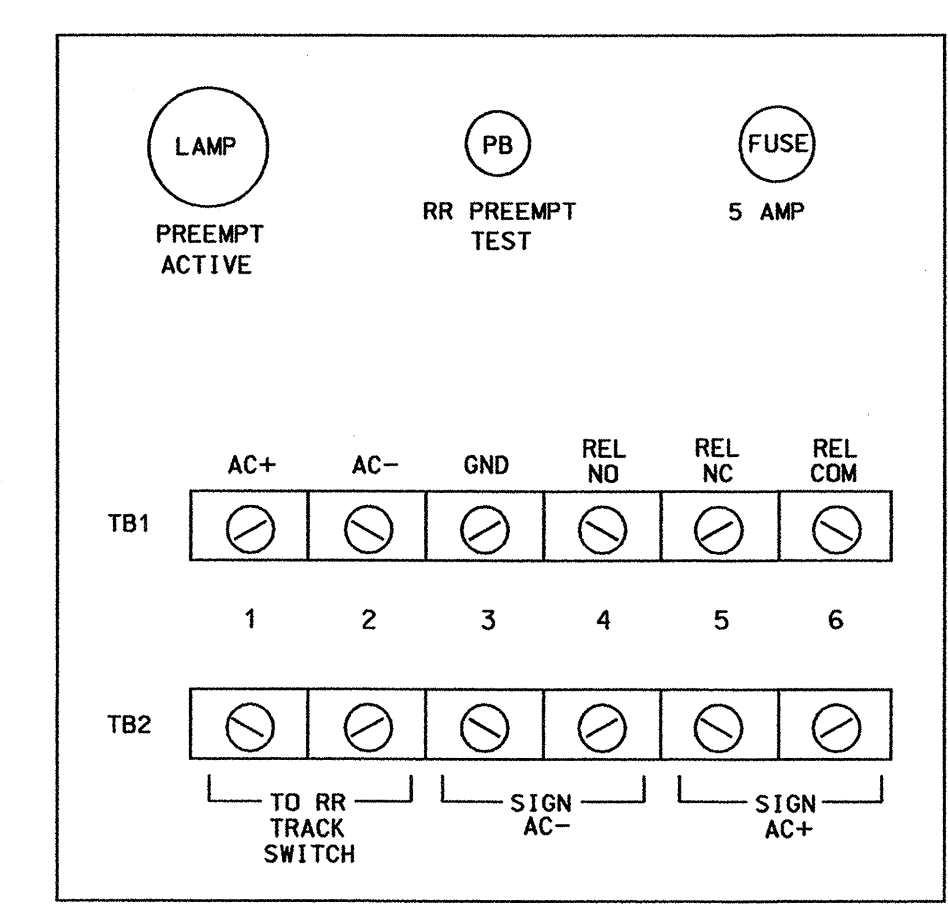
### 170E CONTROLLER RAILROAD PREEMPTION PROGRAMMING

1. PROGRAM 'RR2' INPUT PIN NO. AT E/126+F+6=52 (THIS IS DEFAULT PARAMETER)
2. PROGRAM TRACK CLEARANCE PHASES AT E/125+E+2=Ø2, 5
3. PROGRAM 'LIMITED SERVICE' PHASES AT E/125+E+3=Ø3
4. PROGRAM RR PREEMPT DELAY TIME AT F/1+E+A= 0 (SEC.)
5. PROGRAM TRACK CLEARANCE TIME AT F/1+E+B= 13 (SEC.)
6. ENABLE 'NON-LOCK' FEATURE AT E/125+F+4=6 (RR2)

### NOTES

1. RELAY K1 IS SHOWN IN THE ENERGIZED (PREEMPT NOT ACTIVE) NORMAL OPERATION STATE.
2. RELAY K1 IS A DPDT WITH 120VAC COIL. POTTER & BRUMFIELD KRP11AG WITH OCTAL BASE OR APPROVED EQUIVALENT.
3. RELAY SSR1 IS A SPST (NORMALLY OPEN) SOLID STATE RELAY WITH AC INPUT AND AC (25 AMP) OUTPUT. CRYDOM TA1225 OR APPROVED EQUIVALENT.
4. AC ISOLATOR CARD SHALL ACTIVATE PREEMPTION UPON REMOVAL OF AC+ FROM THE INPUT (AS SHOWN ABOVE).
5. RESISTOR IS VALUED AT 2K OHM, 12 WATT. CLAROSTAT PART NO. VPR10F-2K OR APPROVED EQUIVALENT.
6. RC NETWORK IS VALUED AT .1 MICROFARAD, 100 OHM.
7. IF REPLACEMENT MOV'S ARE NEEDED, GE PART NO. V150LA20A MAY BE USED.
8. PREEMPTION AND BLANKOUT SIGN CONTROL BOX IS A CONTROL TECHNOLOGIES PART NO. 2299-101 OR APPROVED EQUIVALENT.
9. ENSURE TERMINAL TB9-12 (ON INPUT PANEL) IS CONNECTED TO AC NEUTRAL (A JUMPER MAY HAVE TO BE ADDED).

### FRONT VIEW



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0138T1 AND: 05-0138T2  
 DESIGNED: NOVEMBER 2006  
 SEALED: 12-21-06  
 REVISED: N/A

**THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 4/2/04.**

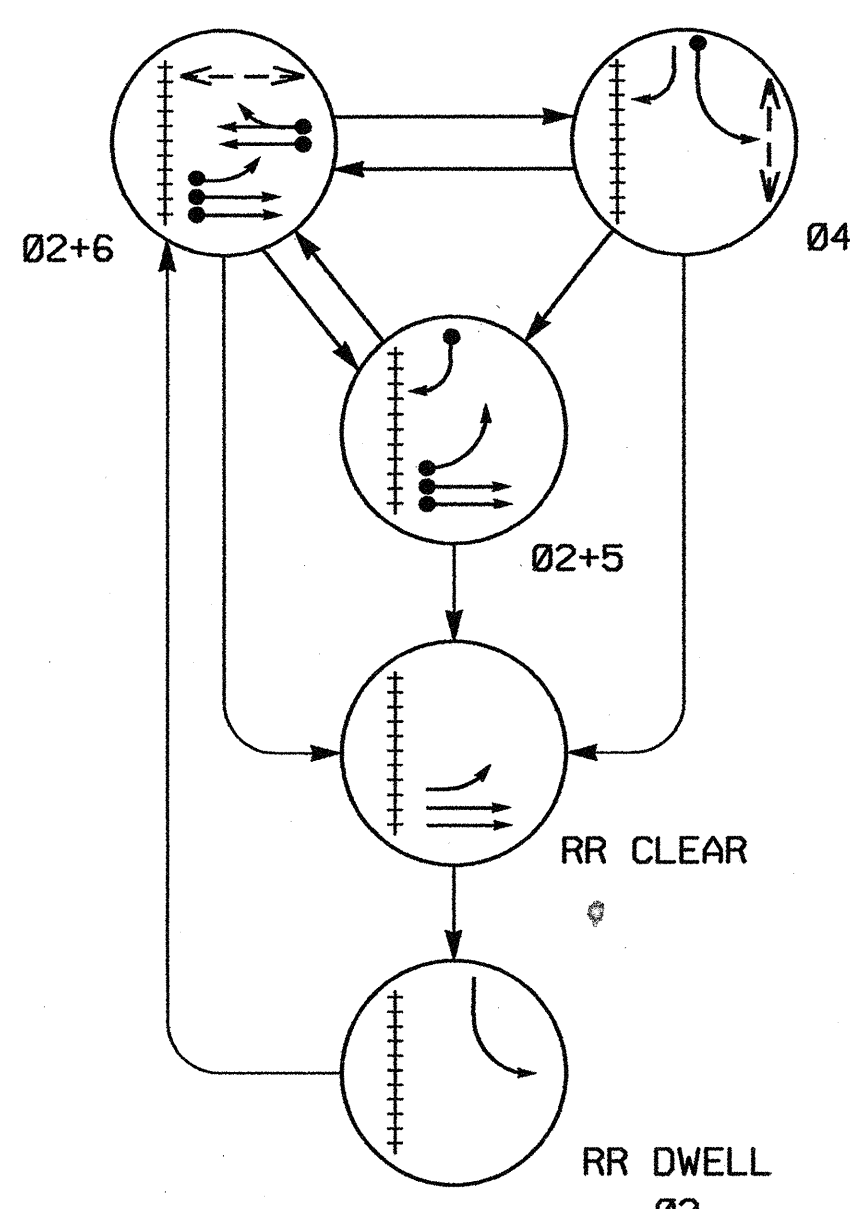
TEMPORARY DESIGN 1 & 2 - SHEET 2 OF 2

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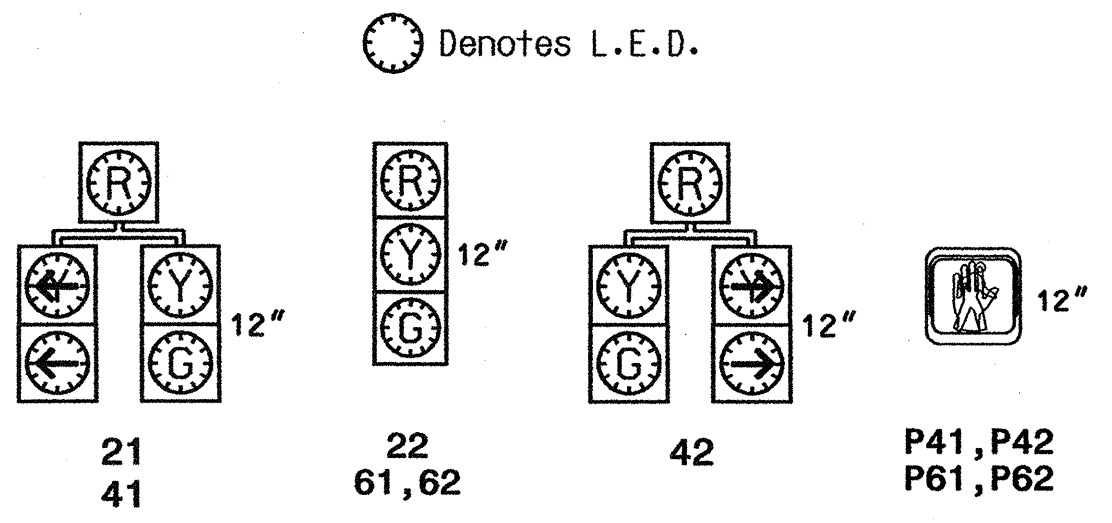
<p>Prepared in the Office of          Traffic Engineering and Safety Services          STATE OF NORTH CAROLINA          Department of Transportation          Signal Management Section          122 N. McDowell St., Raleigh, NC 27603</p>	ELECTRICAL AND PROGRAMMING DETAILS FOR: NC 98 (HOLLOWAY STREET) AT SR 1838 (JUNCTION ROAD)		SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 008453 JOHN T. ROWE, JR. ENGINEER
	DIVISION 05 DURHAM COUNTY DURHAM		
	PLAN DATE: DECEMBER 2006	REVIEWED BY: <i>JLP</i>	
	PREPARED BY: JAMES PETERSON	REVIEWED BY:	
REVISIONS	INIT.	DATE	SIGNATURE: <i>John T. Rowe, Jr.</i> DATE: 12-22-06
SIG. INVENTORY NO. 05-0138T			



**PHASING DIAGRAM**



**SIGNAL FACE I.D.**



**TABLE OF OPERATION**

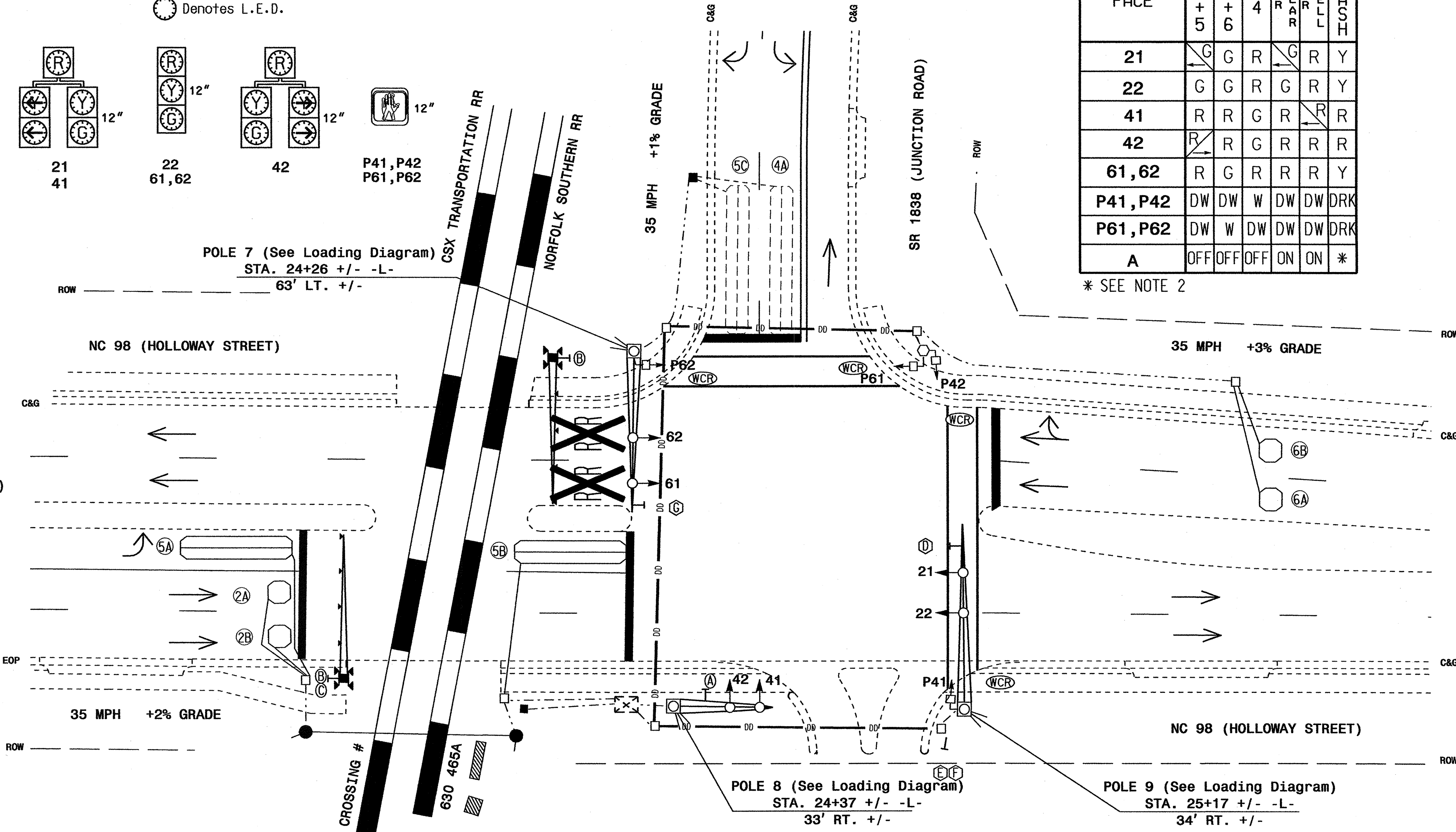
SIGNAL FACE	PHASE						
	Ø2+5	Ø2+6	Ø4	R R C	R R L	D R L	F L C S T
21	G	G	R	G	R	Y	
22	G	G	R	G	R	Y	
41	R	R	G	R	R		R
42	R	R	G	R	R		R
61,62	R	G	R	R	R	Y	
P41, P42	DW	DW	W	DW	DW	DRK	
P61, P62	DW	W	DW	DW	DW	DRK	
A	OFF	OFF	OFF	ON	ON	*	

**3 PHASE FULLY ACTUATED W/RAILROAD PREEMPTION (DURHAM SIGNAL SYSTEM)**

**NOTES**

- Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
- Ensure flashing operation does not alter operation of blankout signs.
- Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values shall supersede these values.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Set all detector units to presence mode.
- Set phase bank 3 maximum limit to 250 seconds for phases used.
- This location contains railroad preemption phasing. Do not program signal for late night flashing operation.
- Set Red Revert time to 1.0 seconds.
- Relocate existing LED Blankout Sign "A" from temporary spanwire.

\* SEE NOTE 2



**PHASING DIAGRAM DETECTION LEGEND**

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

**LEGEND**

- | PROPOSED | EXISTING |
|----------|----------|
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**TIMING CHART 170 CONTROLLER**

PHASE	Ø2	Ø4	Ø5	Ø6	Ø3	OL 1
MINIMUM INITIAL	10 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.	0.0 SEC.
VEHICLE EXTENSION	4.0 SEC.	1.0 SEC.	3.0 SEC.	3.0 SEC.		
YELLOW CHANGE INT.	3.7 SEC.	3.0 SEC.	3.0 SEC.	4.0 SEC.	3.0 SEC.	3.0 SEC.
RED CLEARANCE	1.6 SEC.	2.3 SEC.	2.3 SEC.	1.5 SEC.	2.3 SEC.	2.3 SEC.
MAXIMUM LIMIT	45 SEC.	25 SEC.	15 SEC.	45 SEC.		
RECALL POSITION	VEH. RECALL	NONE	NONE	VEH. RECALL		
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	NONE	YELLOW LOCK		
DOUBLE ENTRY	OFF	OFF	OFF	OFF		
WALK	- SEC.	4 SEC.	- SEC.	4 SEC.		
FLASHING DON'T WALK	- SEC.	16 SEC.	- SEC.	11 SEC.		
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.		
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.		
ADD PER VEHICLE	- SEC.	- SEC.	- SEC.	- SEC.		
MAXIMUM INITIAL	- SEC.	- SEC.	- SEC.	- SEC.		
MAXIMUM GAP	4.0 SEC.	1.0 SEC.	3.0 SEC.	3.0 SEC.		
REDUCE 0.1 SEC EVERY	- SEC.	- SEC.	- SEC.	- SEC.		
MINIMUM GAP	4.0 SEC.	1.0 SEC.	3.0 SEC.	3.0 SEC.		

**LOOP & DETECTOR UNIT INSTALLATION CHART 170 CONTROLLER AND CABINET**

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			
2A, 2B	6X6	4	90	X		2	SEC.	SEC.						X	X		X	
4A	6X40	2-4-2	0	X		4	3 SEC.	SEC.					X	X			X	
5A	6X30	2-4-2	0	X		2	3 SEC.	SEC.	X				X	X			X	
						5	15 SEC.	SEC.				X	X			X		
5B	6X30	2-4-2	0	X		2	3 SEC.	SEC.	X				X	X			X	
						5	15 SEC.	SEC.				X	X			X		
5C	6X40	2-4-2	0	X		5	15 SEC.	SEC.					X	X		X		
6A, 6B	6X6	4	70	X		6	SEC.	SEC.					X	X		X		

**RAILROAD PREEMPTION**

FUNCTION	SECONDS
DELAY BEFORE PREEMPT	0
TRACK CLEARANCE GREEN	13

This plan shall supersede the plan sealed on 2/17/04.

**SIGNAL UPGRADE - FINAL DESIGN**

**NC 98 (HOLLOWAY STREET) AT SR 1838 (JUNCTION ROAD)**

DIVISION 5 DURHAM CO. DURHAM

PLAN DATE: November 2006 REVIEWED BY: D.Y. Ishak

PREPARED BY: Z.M. Little REVIEWED BY:

SEAL

21 DECEMBER 06

SCALE: 1"=20'

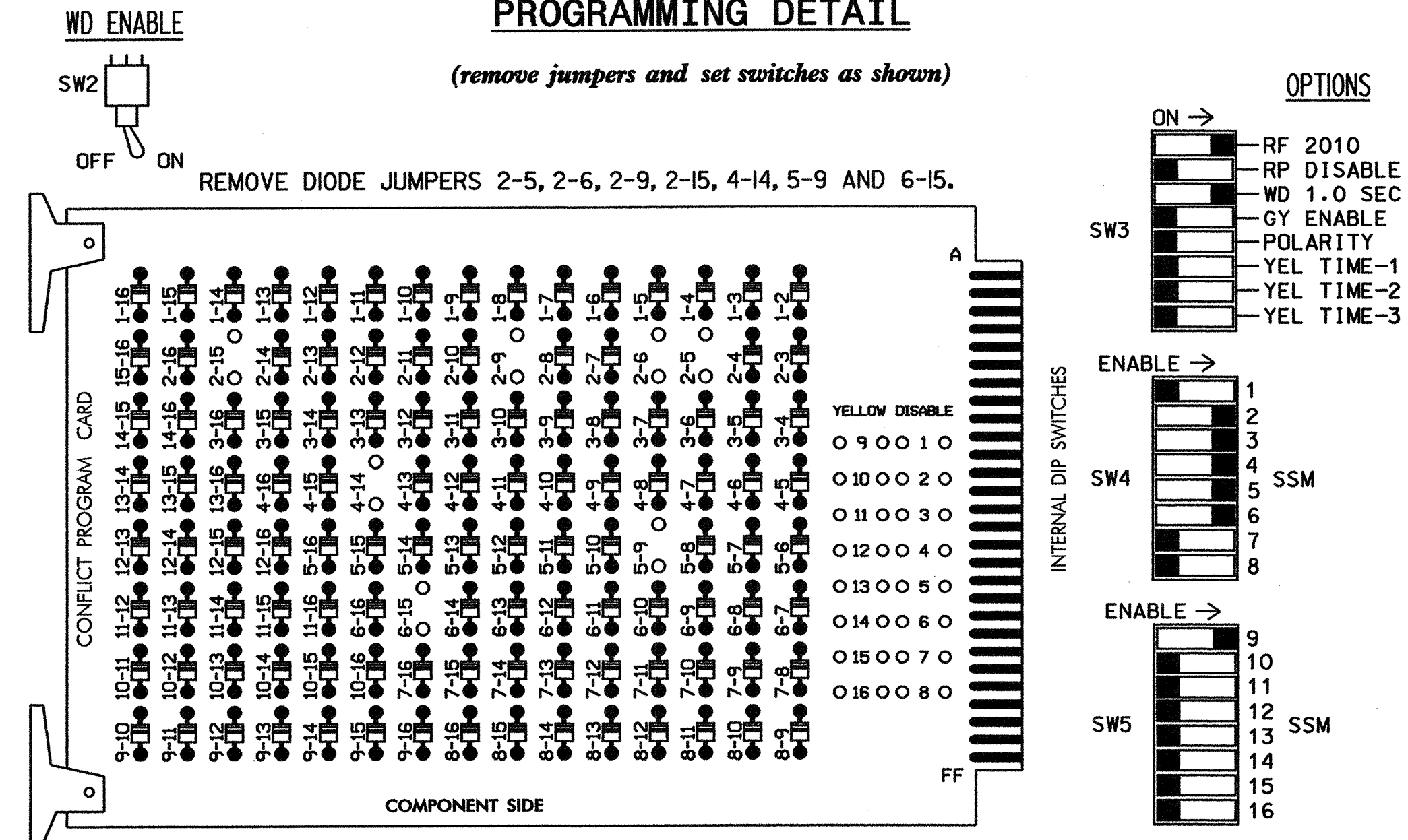
REVISIONS	INIT.	DATE

SIGNATURE: DATE: SIG. INVENTORY NO. 05-0138



**EDI MODEL 2010ECL CONFLICT MONITOR**

**PROGRAMMING DETAIL**



**NOTES:**

- CARD IS PROVIDED WITH ALL DIODE JUMPERS IN PLACE. REMOVAL OF ANY JUMPER ALLOWS ITS CHANNELS TO RUN CONCURRENTLY.
- MAKE SURE JUMPERS SEL1-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 OUTPUT FILE. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS 1,7,8, 10,11,12,13,14,15 & 16, TIE UNUSED LOAD SWITCH RED OUTPUTS TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
- PROGRAM THE 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, ON CONTROLLER UNIT, FOR ALL PHASES.
- THE CABINET AND CONTROLLER ARE A PART OF THE DURHAM SIGNAL SYSTEM.

**POWER-UP / RESTART PROGRAMMING NOTE**

IN ORDER FOR PHASES USED ONLY IN NORMAL OPERATION TO BE SERVED AFTER A POWER-UP OR RESTART, PROGRAM "START VEHICLE CALL" AND "START PED CALL" ON 170E CONTROLLER AS FOLLOWS:

VEH - F/2+F+E=Ø2, 4, 5, 6  
 PED - F/2+F+F= 4 PED, 6 PED

**PEDESTRIAN PHASE PROGRAMMING**

PROGRAM PEDESTRIAN 4P OUTPUT AT KEYPAD INPUT E/I25+F+7= Ø4.  
 PROGRAM PEDESTRIAN 6P OUTPUT AT KEYPAD INPUT E/I25+F+6= Ø6.

**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	DL1	DL2	SPARE	DL3	DL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	41	41,42	P41, P42	21	61,62	P61, P62	NU	NU	NU	42	NU	NU	NU	NU	NU
RED		128		*	101		*	134					*					
YELLOW		129			102			135										
GREEN		130			103			136										
RED ARROW																		
YELLOW ARROW					117			132								A122		
GREEN ARROW					118			133								A123		
PEDESTRIAN 4P							106		121									
PEDESTRIAN 6P							104		119									

NU = NOT USED  
 \*DENOTES INSTALL LOAD RESISTOR. SEE LOAD RESISTOR INSTALLATION DETAIL THIS PAGE.

**HEAD 42 ARROW (OL1)**

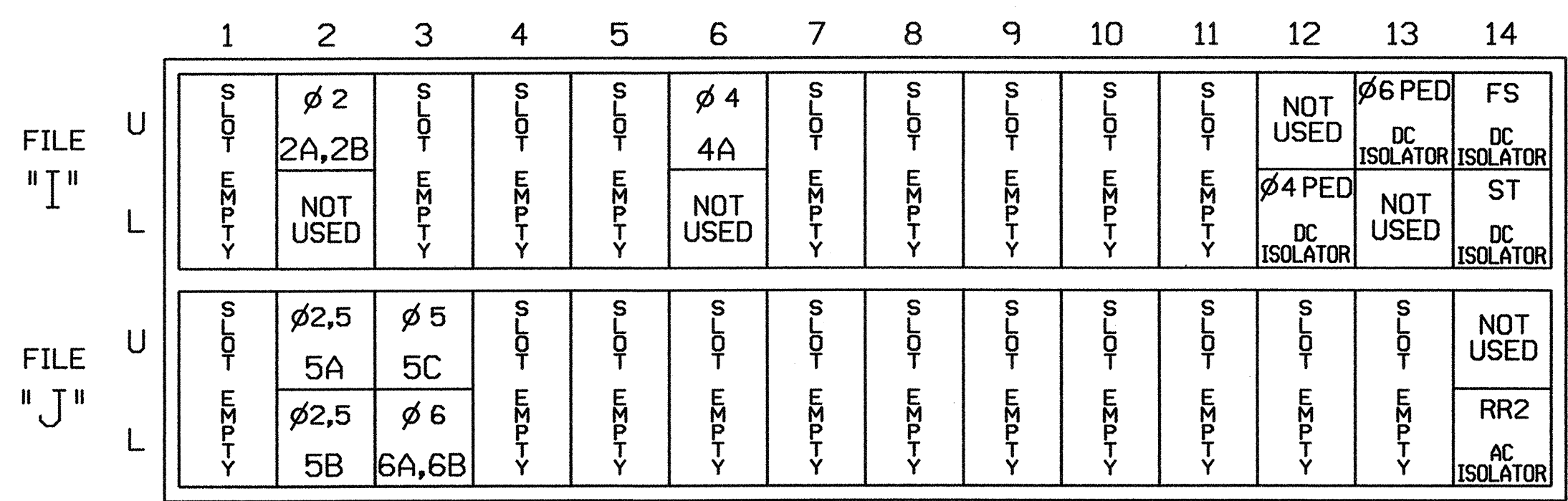
**OPERATION DURING PREEMPTION**

IN ORDER FOR RR PREEMPTION TO OPERATE AS PHASES 2 AND 5 WITHOUT SIGNAL HEAD 42 RIGHT-TURN ARROWS (OVERLAP 'OLI'), THE FOLLOWING PROGRAMMING MUST BE IN PLACE:

ASSIGN RR PREEMPT RR2 OUTPUT AT E/I27+D+D= 200  
 ASSIGN O/L VEH.SET 2 INPUT AT E/I26+D+C=200  
 200 = ASSIGNABLE PSEUDO-PIN (SOFTWARE)

**INPUT FILE POSITION LAYOUT**

(front view)



**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A,2B	TB2-5,6	I2U	1	39	5 7 2	2
4A	TB4-9,10	I6U	2	41	5 7 4	4
5A	TB3-5,6	J2U	3	40	1 5 7 2	2
			4	40	5 7 5	5
5B	TB3-7,8	J2L	5	44	1 5 7 2	2
			6	44	5 7 5	5
5C	TB3-9,10	J3U	7	64	5 7 5	5
6A,6B	TB3-11,12	J3L	8	77	5 7 6	6
PED PUSH BUTTONS						
P41,P42	TB8-5,6	I12L	9	69	2	4 PED
P61,P62	TB8-7,9	I13U	10	68	2	6 PED

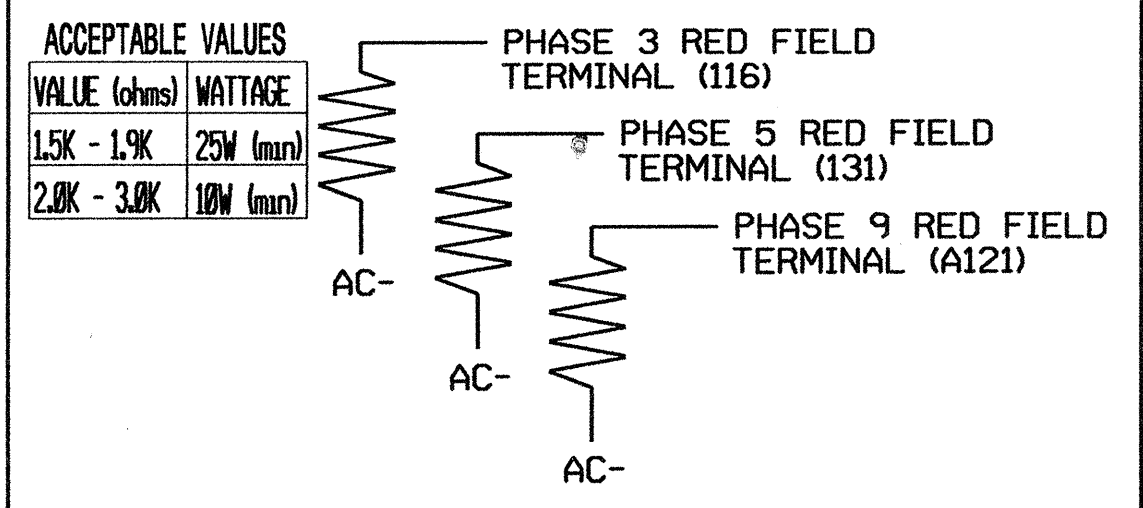
NOTE: INSTALL DC ISOLATORS IN INPUT FILE SLOTS 112 AND 113.

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

INPUT FILE POSITION LEGEND: J2L DETECTOR ATTRIBUTES LEGEND:

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

**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 CHANNELS THAT DO NOT USE THE RED DISPLAY IN THE FIELD.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 05-0138  
 DESIGNED: NOVEMBER 2006  
 SEALED: 12-21-06  
 REVISED: N/A

**THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL SEALED ON 4/21/04.**

**OVERLAP PROGRAMMING NOTES**

TO ASSURE THAT LOADSWITCH S9 IS ASSIGNED AS OVERLAP 1, PROGRAM CONTROLLER AT KEYPAD INPUT E/29+10=9

TO SET THE PARENT PHASE FOR OVERLAP 1 (VEH. SET 1) AS PHASE 5, PROGRAM CONTROLLER AT KEYPAD INPUT E/29+11= Ø5

TO SET THE PARENT PHASE FOR OVERLAP 1 (VEH. SET 2) AS NONE, NO PROGRAMMING IS REQUIRED.

PROGRAM TIMING FOR OVERLAP 1 AS FOLLOWS:  
 YELLOW CHANGE INTERVAL - E/29+1+E=3.0 (SEC.)  
 RED CLEARANCE - E/29+1+F=2.3 (SEC.)

**EQUIPMENT INFORMATION**

CONTROLLER.....CONTRACTOR SUPPLIED 170E  
 CABINET.....CONTRACTOR SUPPLIED 332  
 SOFTWARE.....BI TRANS 233NC2  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...18 (12 -STD, 6-AUX)  
 LOAD SWITCHES USED.....S2,S3,S4,S5,S6,S9,S4P,S6P  
 PHASES USED.....2,\*3,4,5,6,4 PED,6 PED  
 OVERLAP 1:.....5 (VEH. SET 1 ONLY)

\*USED DURING RR PREEMPTION ONLY.

**SIGNAL UPGRADE - FINAL DESIGN - SHEET 1 OF 2**

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:  
 Traffic Engineering and Safety Group  
 STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 Signal Management Section  
 122 N. McDowell St., Raleigh, NC 27603

NC 98 (HOLLOWAY STREET) AT SR 1838 (JUNCTION ROAD)

DIVISION 05 DURHAM COUNTY DURHAM  
 PLAN DATE: DECEMBER 2006 REVIEWED BY: JWP  
 PREPARED BY: JAMES PETERSON REVIEWED BY:

REVISIONS: INIT. DATE

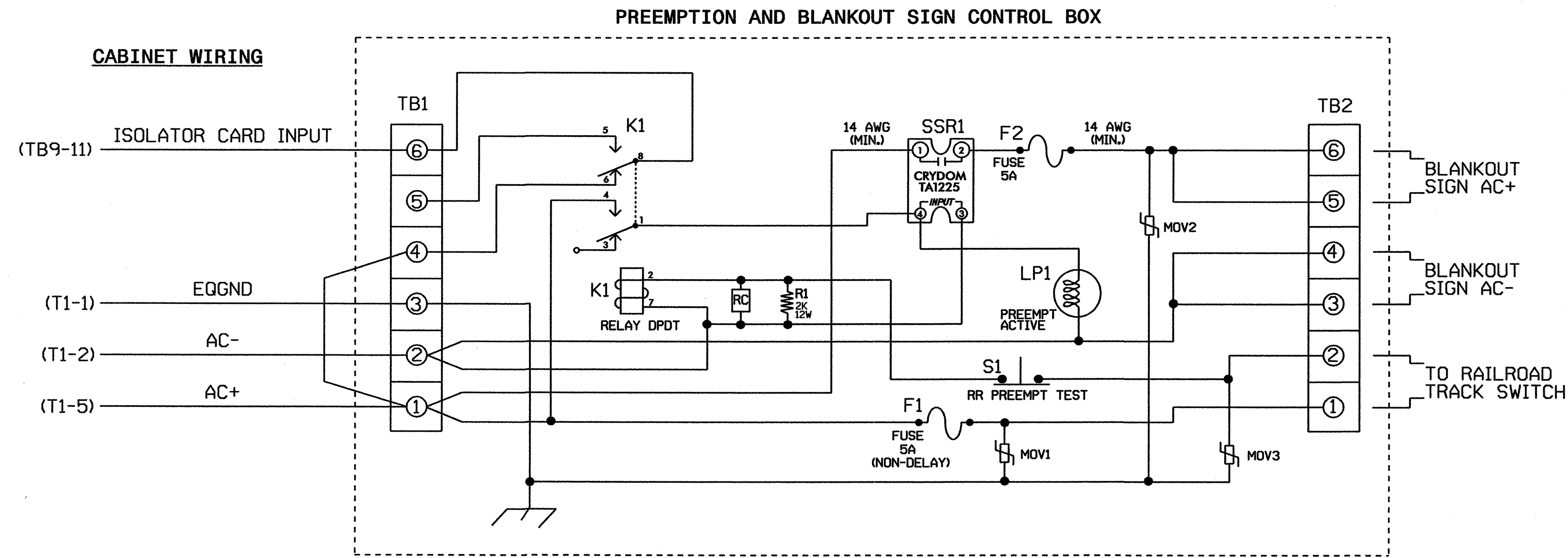
SEAL  
 NORTH CAROLINA PROFESSIONAL ENGINEER  
 SEAL 008453  
 JOHN T. ROWE, JR.  
 SIGNATURE DATE 12-21-06  
 SIG. INVENTORY NO. 05-0138

21-DEC-2006 12:14 S:\pfs\signal\work\groups\sig\mon\peter\_son\050138\_sml.e...xxx.dgn



## RAILROAD PREEMPTION WIRING DETAIL

(wire as shown below)



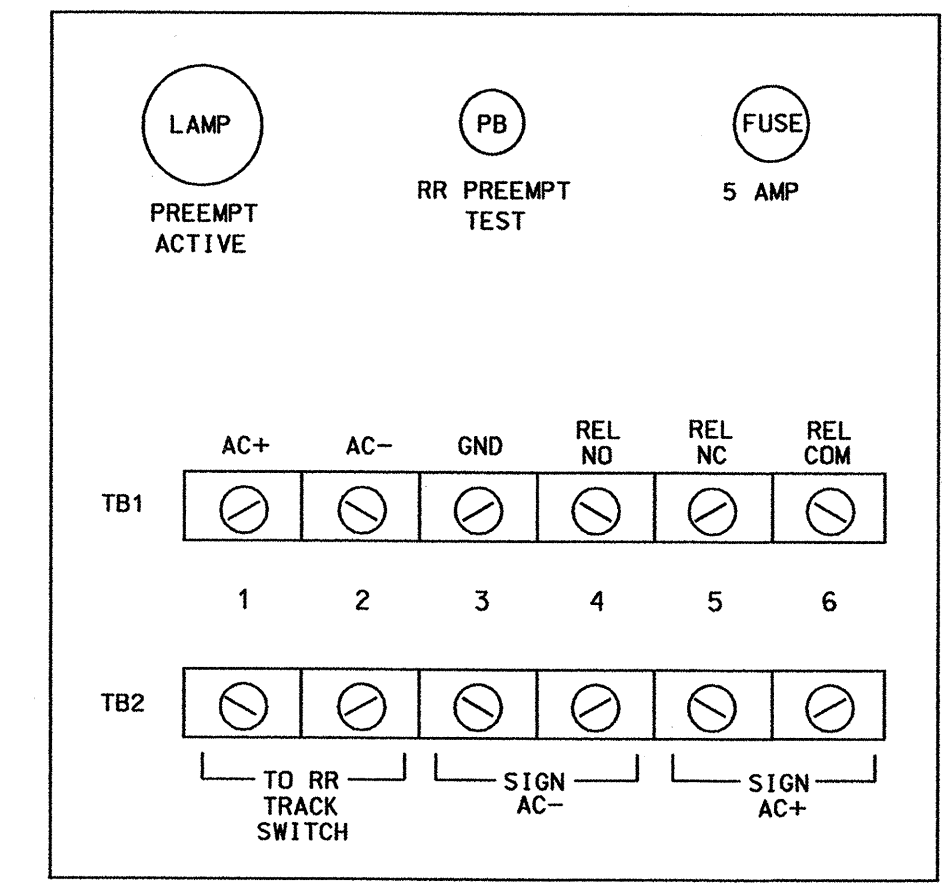
### 170E CONTROLLER RAILROAD PREEMPTION PROGRAMMING

1. PROGRAM 'RR2' INPUT PIN NO. AT E/126+F+6=52 (THIS IS DEFAULT PARAMETER)
2. PROGRAM TRACK CLEARANCE PHASES AT E/125+E+2=ϕ2, 5
3. PROGRAM 'LIMITED SERVICE' PHASES AT E/125+E+3=ϕ3
4. PROGRAM RR PREEMPT DELAY TIME AT F/1+E+A= 0 (SEC.)
5. PROGRAM TRACK CLEARANCE TIME AT F/1+E+B= 13 (SEC.)
6. ENABLE 'NON-LOCK' FEATURE AT E/125+F+4=6 (RR2)

### NOTES

1. RELAY K1 IS SHOWN IN THE ENERGIZED (PREEMPT NOT ACTIVE) NORMAL OPERATION STATE.
2. RELAY K1 IS A DPDT WITH 120VAC COIL. POTTER & BRUMFIELD KRPI1AG WITH OCTAL BASE OR APPROVED EQUIVALENT.
3. RELAY SSR1 IS A SPST (NORMALLY OPEN) SOLID STATE RELAY WITH AC INPUT AND AC (25 AMP) OUTPUT. CRYDOM TA1225 OR APPROVED EQUIVALENT.
4. AC ISOLATOR CARD SHALL ACTIVATE PREEMPTION UPON REMOVAL OF AC+ FROM THE INPUT (AS SHOWN ABOVE).
5. RESISTOR IS VALUED AT 2K OHM, 12 WATT. CLAROSTAT PART NO. VPR10F-2K OR APPROVED EQUIVALENT.
6. RC NETWORK IS VALUED AT .1 MICROFARAD, 100 OHM.
7. IF REPLACEMENT MOVs ARE NEEDED, GE PART NO. V150LA20A MAY BE USED.
8. PREEMPTION AND BLANKOUT SIGN CONTROL BOX IS A CONTROL TECHNOLOGIES PART NO. 2299-101 OR APPROVED EQUIVALENT.
9. ENSURE TERMINAL TB9-12 (ON INPUT PANEL) IS CONNECTED TO AC NEUTRAL (A JUMPER MAY HAVE TO BE ADDED).

### FRONT VIEW



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9:47:16 6:10pm jswork\jrb\cases\jrb\manipeterson\050138\_sml.ele...xxx.dgn  
22/01/06

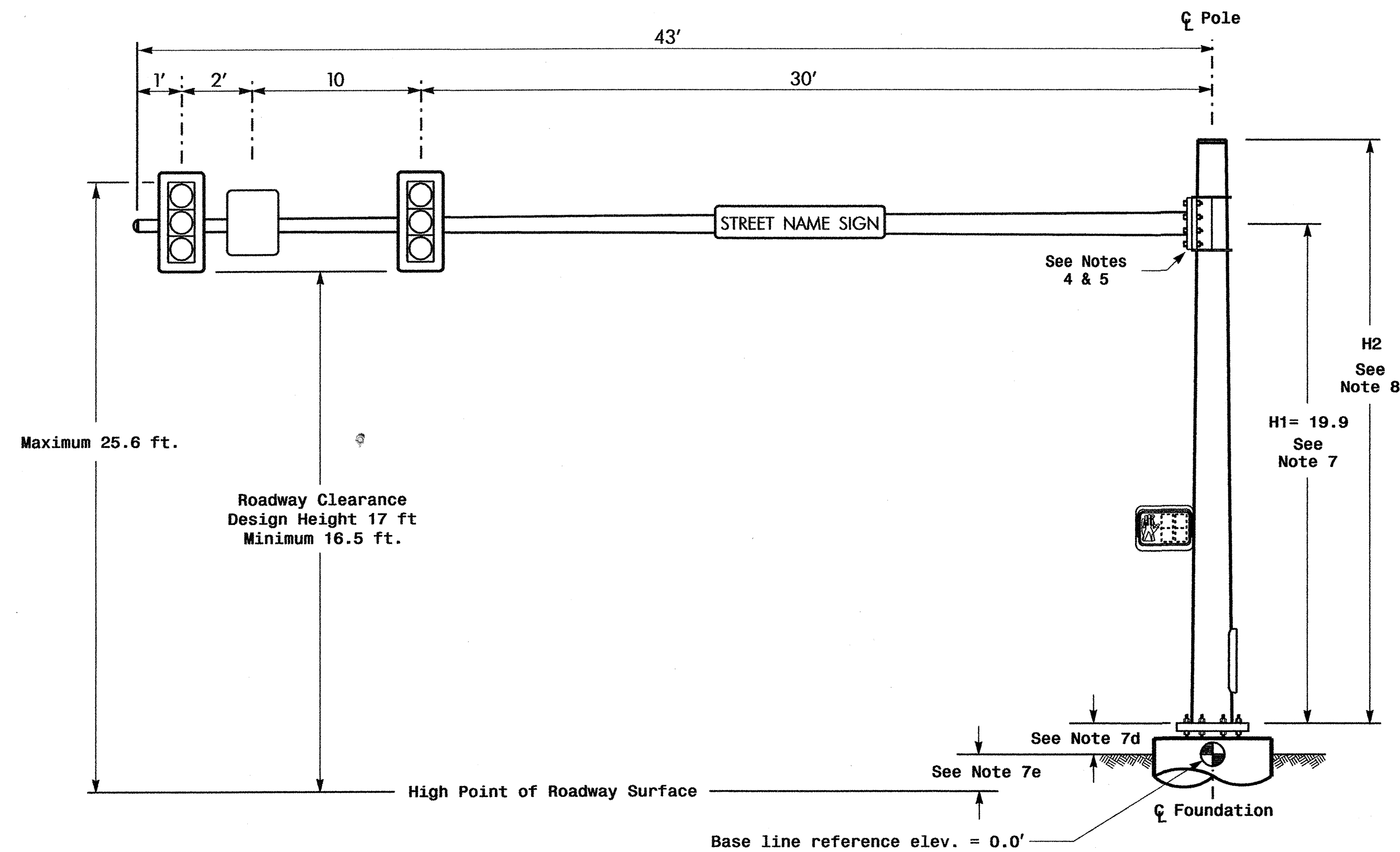
THIS ELECTRICAL DETAIL IS FOR  
THE SIGNAL DESIGN: 05-0138  
DESIGNED: NOVEMBER 2006  
SEALED: 12-21-06  
REVISED: N/A

**THIS ELECTRICAL DETAIL SUPERSEDES  
THE DETAIL SEALED ON 4/21/04.**

### SIGNAL UPGRADE - FINAL DESIGN - SHEET 2 OF 2

<p style="font-size: small;">ELECTRICAL AND PROGRAMMING DETAILS FOR:</p> <p style="font-size: x-small;">Prepared in the Offices of:</p> <p style="font-size: x-small;">122 N. McDowell St., Raleigh, NC 27603</p>	<p style="font-weight: bold; font-size: large;">NC 98 (HOLLOWAY STREET) AT SR 1838 (JUNCTION ROAD)</p> <p style="font-size: small;">DIVISION 05     DURHAM COUNTY     DURHAM</p> <p style="font-size: x-small;">PLAN DATE: DECEMBER 2006     REVIEWED BY: <i>JWP</i></p> <p style="font-size: x-small;">PREPARED BY: JAMES PETERSON     REVIEWED BY: <i>JWP</i></p> <table border="1" style="width: 100%; font-size: x-small;"> <thead> <tr> <th>REVISIONS</th> <th>INIT.</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	REVISIONS	INIT.	DATE				<p style="font-size: x-small;">SEAL</p> <p style="font-size: x-small;">SEAL 008453 ENGINEER JOHN T. ROWE, JR.</p> <p style="font-size: x-small;"><i>John T. Rowe</i> 12-22-06 SIGNATURE     DATE</p> <p style="font-size: x-small;">SIG. INVENTORY NO. 05-0138</p>
REVISIONS	INIT.	DATE						

Design Loading for METAL POLE NO. 7

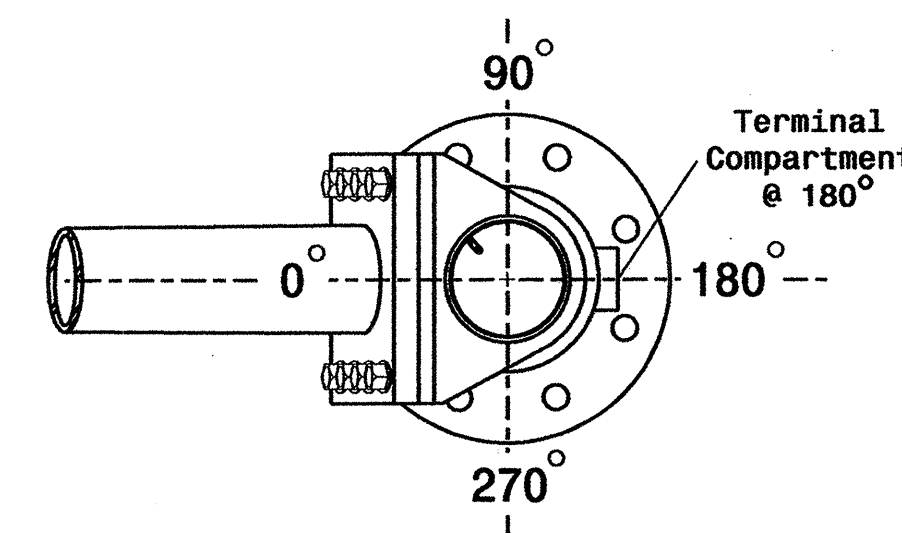


Elevation View

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

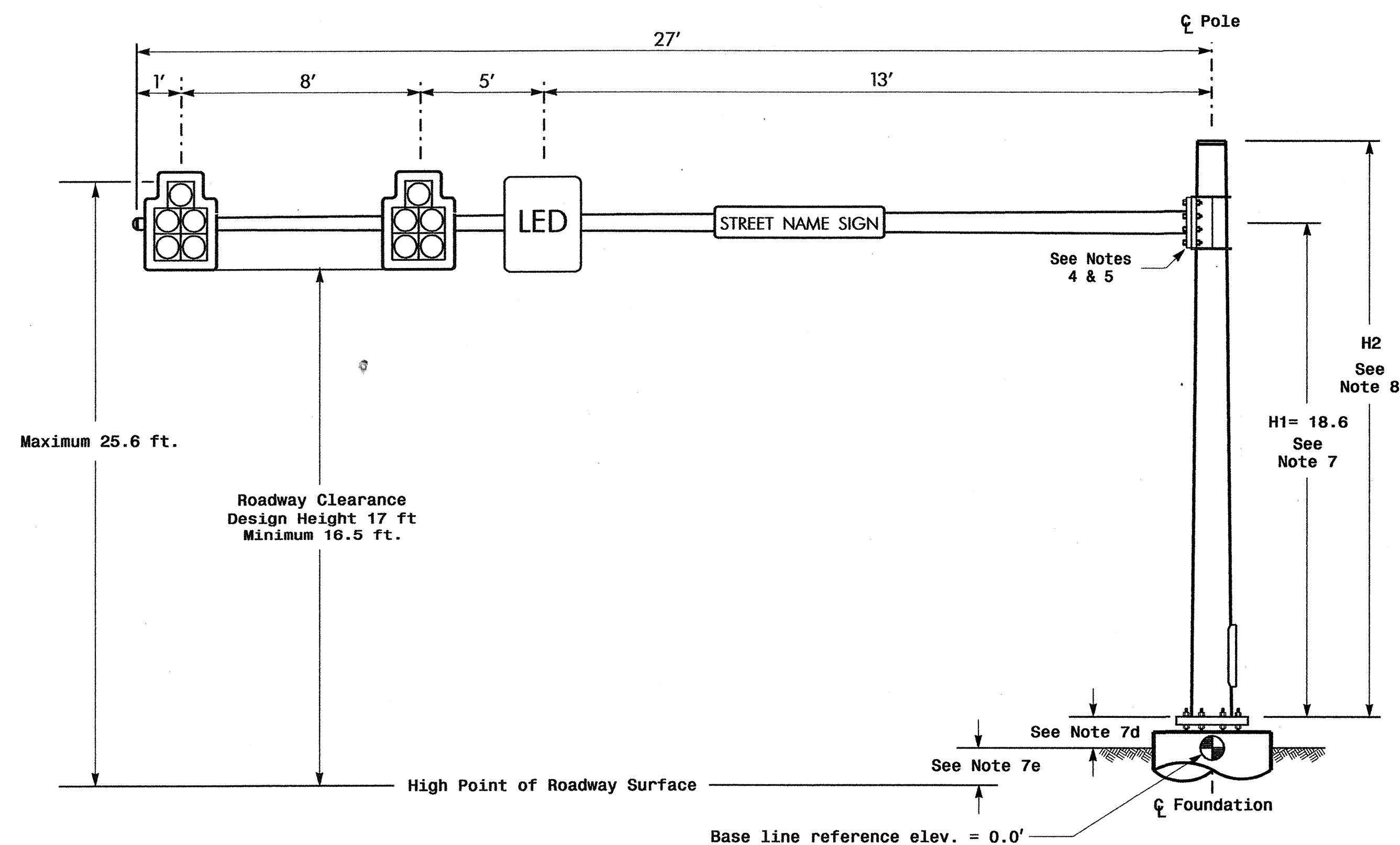
Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 7	Pole 8
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+1.3 ft.	0.0 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A

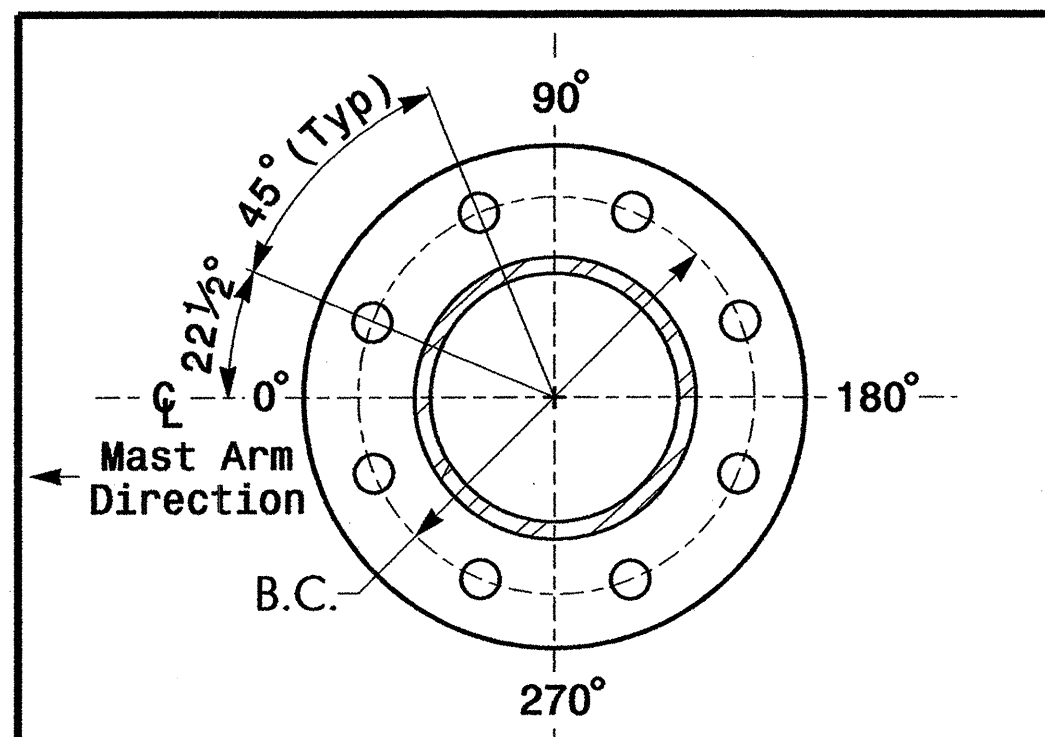


POLE RADIAL ORIENTATION

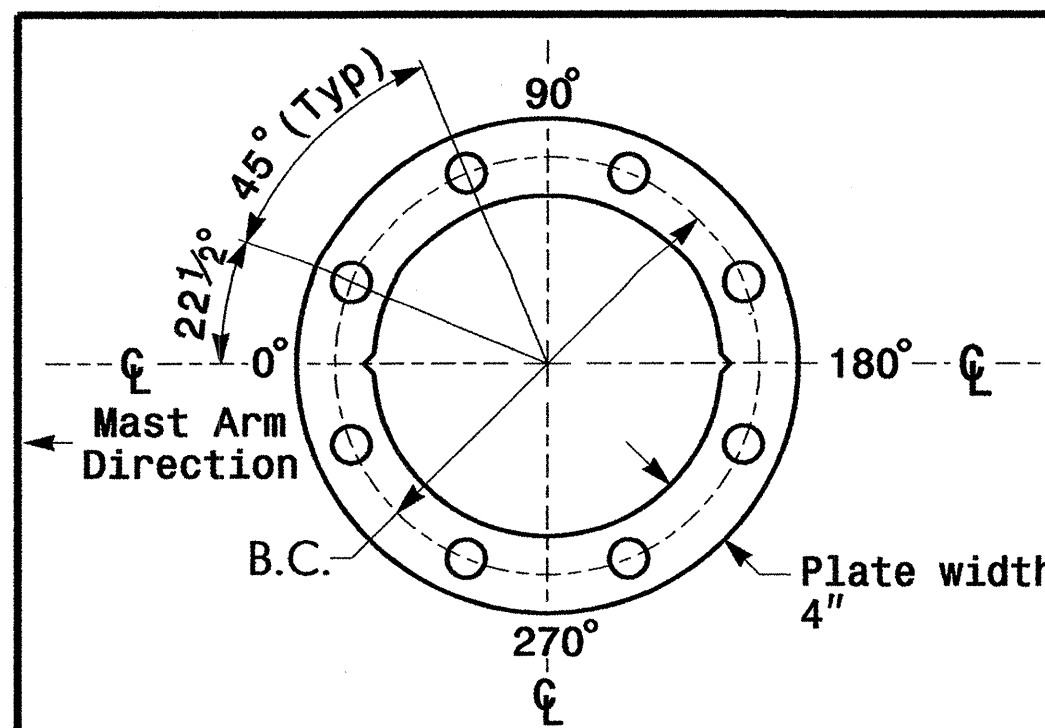
Design Loading for METAL POLE NO. 8



Elevation View



8 BOLT BASE PLATE DETAIL



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
	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
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS
	SIGN, L.E.D. BLANKOUT WITH HANGER	5.0 S.F.	24.0" W X 36.0" L	110 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 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/tmsu/ws/mpoles/poles.htm>

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.
- Maximum allowable CSR for all signal supports is 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 is a high strength connection. Use Direct Tension Indicators (ASTM F959) for each bolt.
- 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) 733-3915.
- 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)

	NC 98 (Holloway Street) at SR 1838 (Junction Road)		SEAL 
	Division 5 Durham County Durham PLAN DATE: November 2006 REVIEWED BY: D.Y. Ishak PREPARED BY: Z.M. Little REVIEWED BY:	SIGNATURE DATE SIG. INVENTORY NO. 05-0138	

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 ZML/H18



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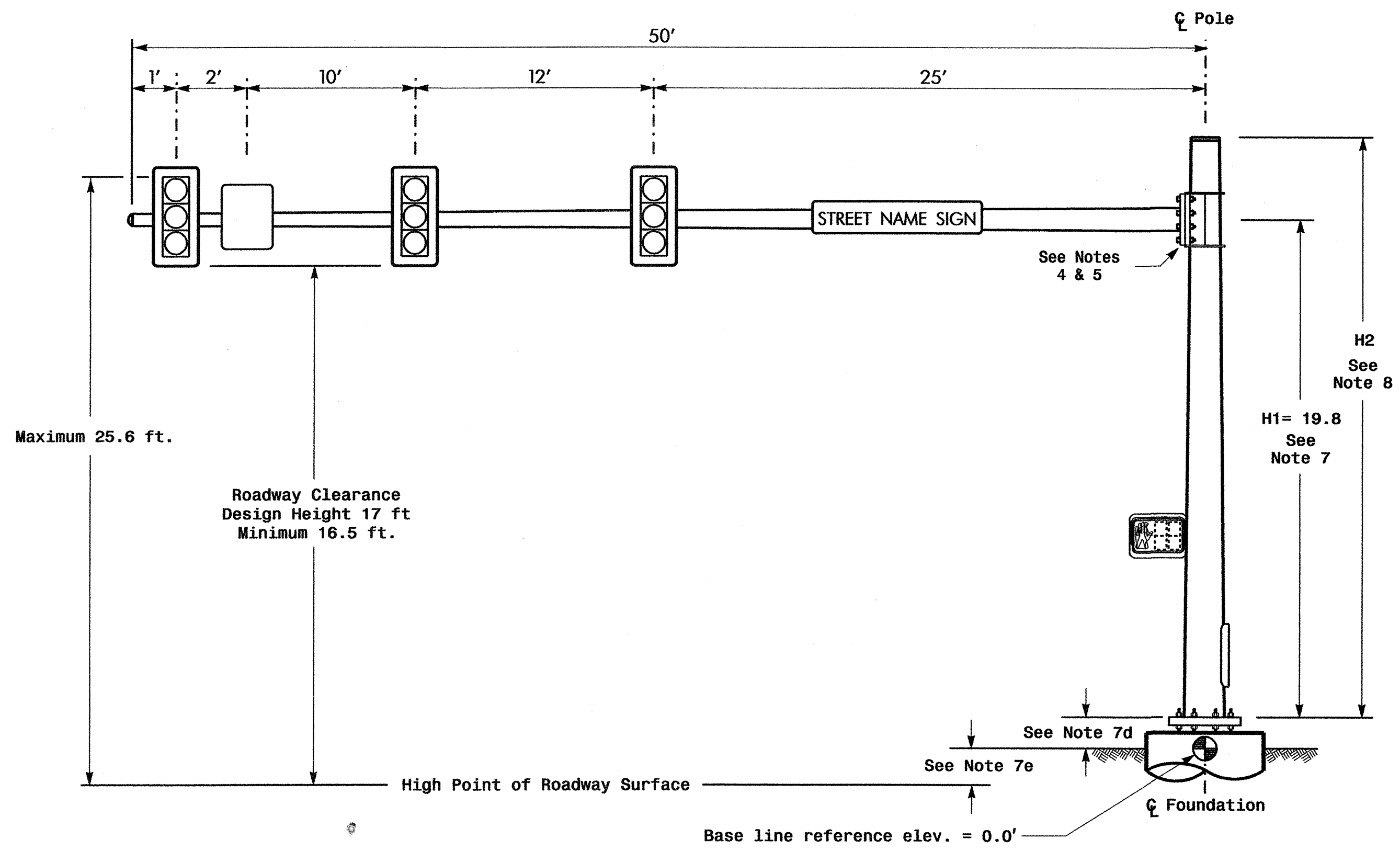
**Elevation Data for Mast Arm Attachment (H1)**

Elevation Differences for:	Pole 9
Baseline reference point at $\phi$ Foundation @ ground level	0.0 ft.
Elevation difference at High point of roadway surface	+1.2 ft.
Elevation difference at Edge of travelway or face of curb	N/A

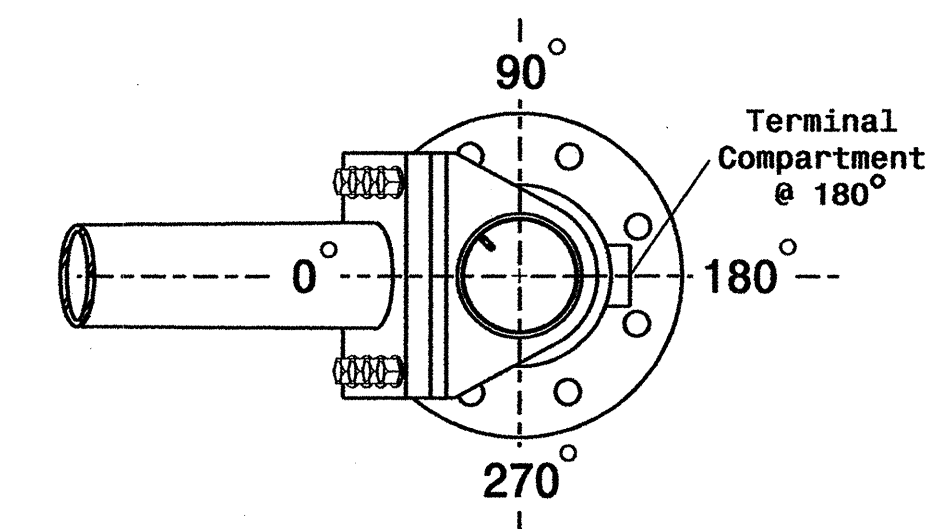
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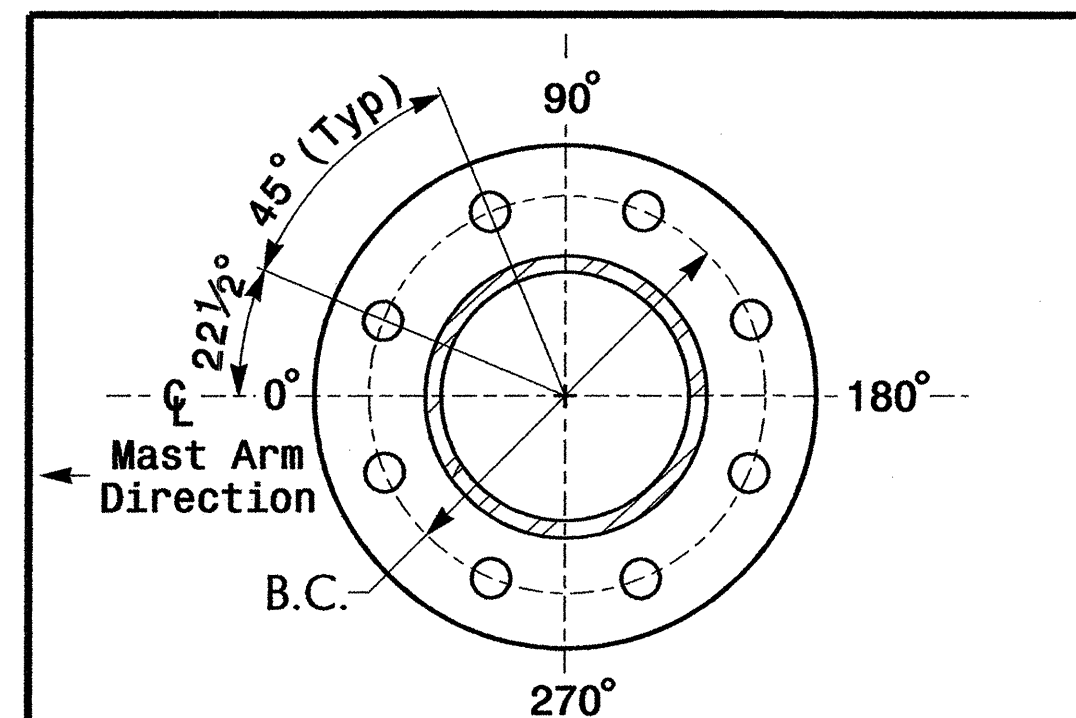
**Design Loading for METAL POLE NO. 9**



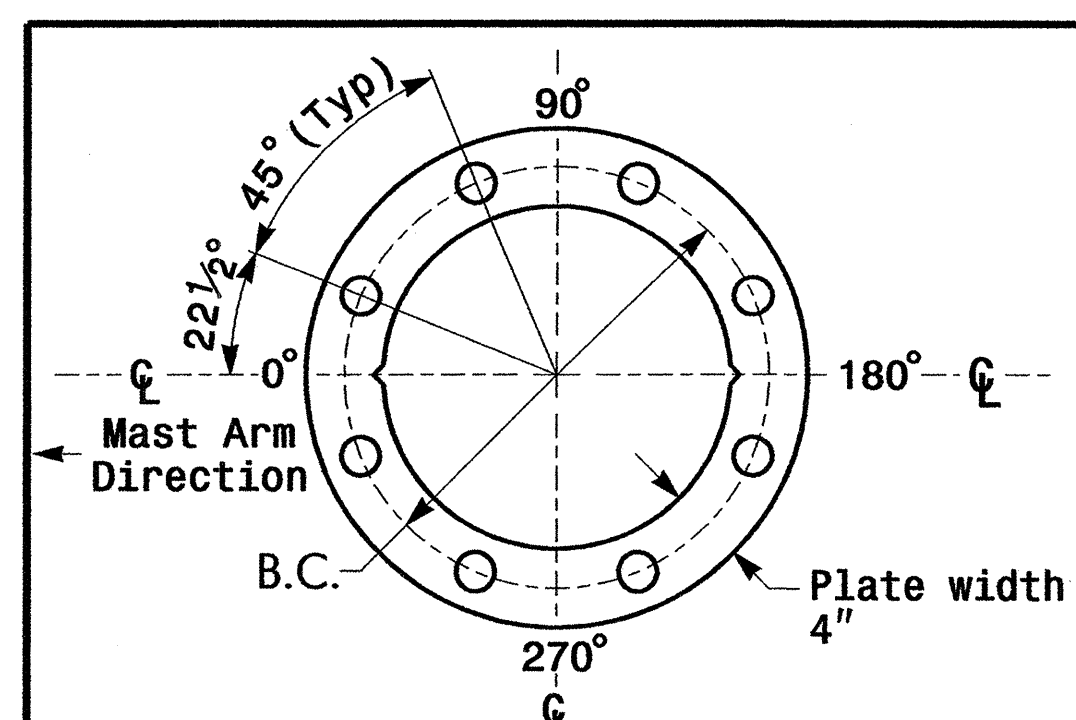
**Elevation View**



**POLE RADIAL ORIENTATION**



**8 BOLT BASE PLATE DETAIL**  
See Note 6



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

**NOTES**

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- 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 is a high strength connection. Use Direct Tension Indicators (ASTM F959) for each bolt.
- Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
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  - 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:
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NCDOT Wind Zone 4 (90 mph)

	Prepared in the Offices of: Signals and Geometrics Section 122 N. McDowell St., Raleigh, NC 27603		NC 98 (Holloway Street) at SR 1838 (Junction Road)		SEAL 
	Division 5 Durham County Durham		PLAN DATE: November 2006 REVIEWED BY: D.Y. Ishak PREPARED BY: Z.M. Little REVIEWED BY:		
SCALE: 0 N/A N/A		REVISIONS:		INIT. DATE	
SIGNATURE:		DATE:		SIG. INVENTORY NO. 05-0138	

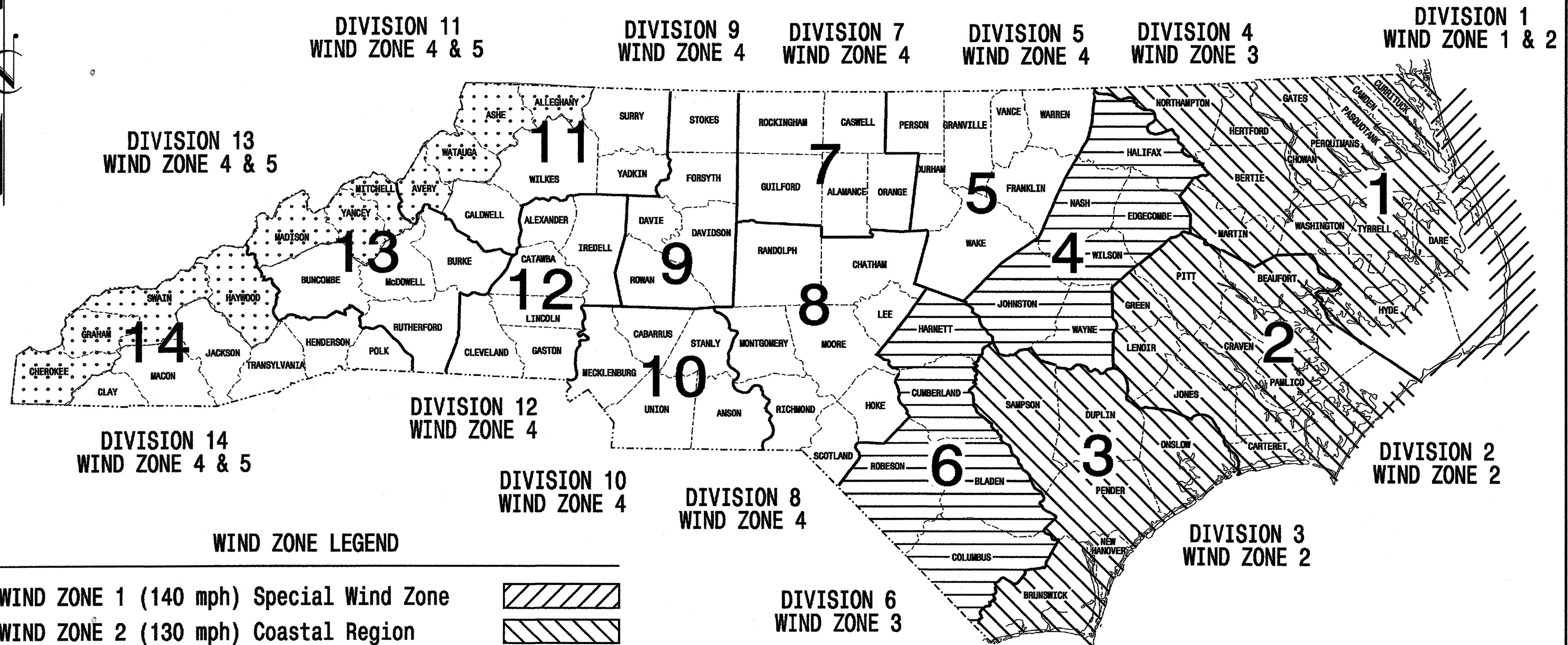
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# STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

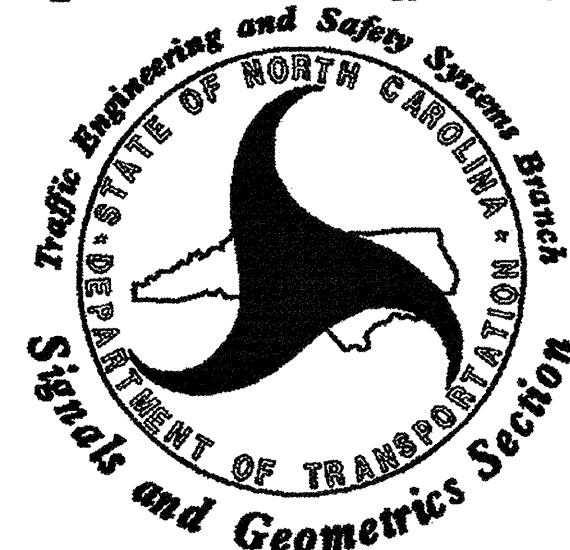
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N.C.	U-4010	Sig. 28
F. A. PROJ. NO.	M 1	
PROJECT ID. NO.		

## STANDARD DRAWINGS FOR METAL POLES



<http://www.ncdot.org/doh/preconstruct/traffic/tmssu/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

### INDEX OF PLANS

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

### NCDOT CONTACTS:

#### TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

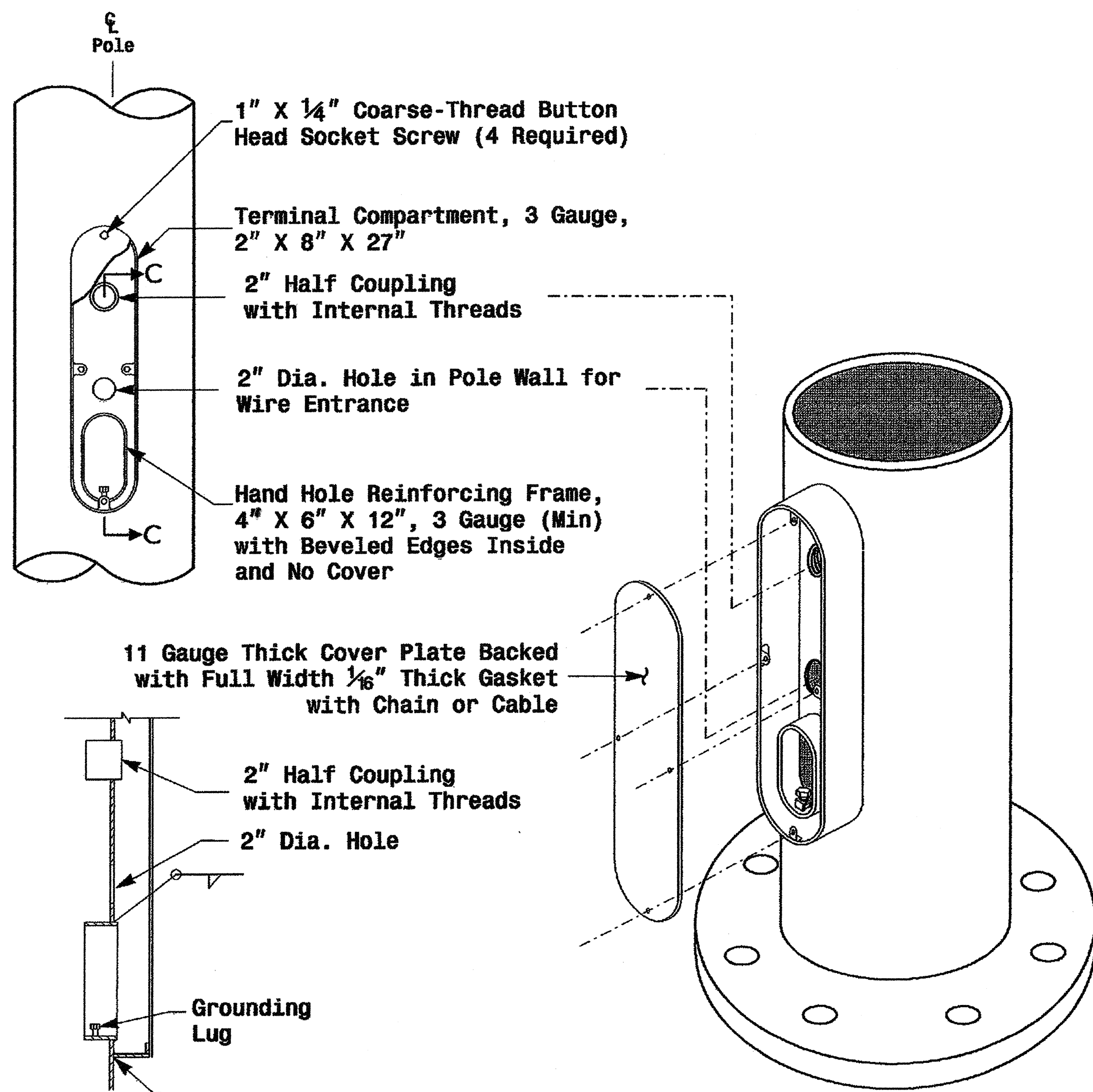
- G. A. Fuller, P.E. - State ITS and Signals Engineer
- R. E. Mullinax, P.E. - Signals and Geometrics Engineer
- P. L. Alexander, P.E. - Signals and Geometrics Special Projects Engineer
- D. C. Sarkar, P.E. - Signals and Geometrics Structural Engineer
- A. M. Esposito, P.E. - Signals and Geometrics Project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

SEAL

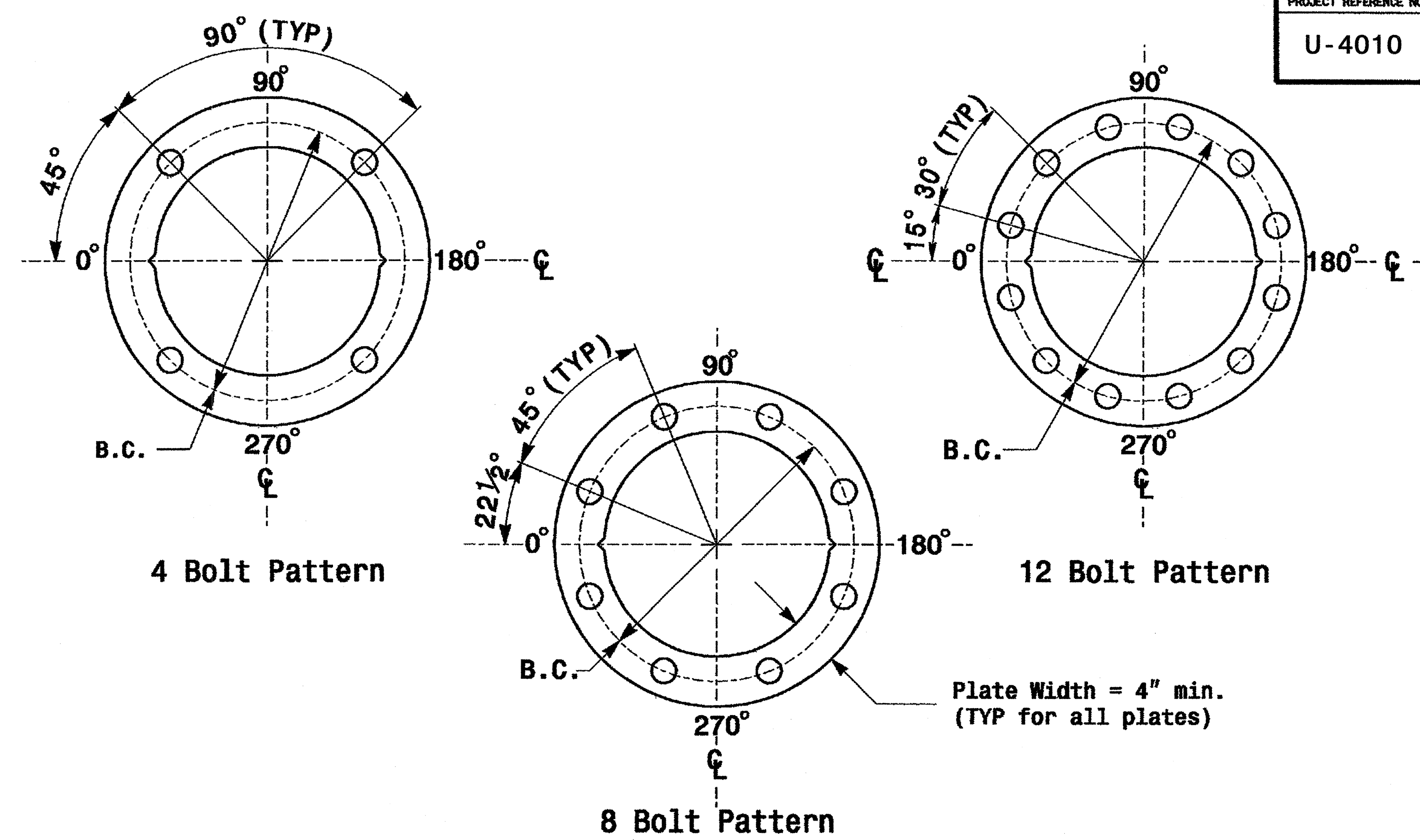


*D. Sarkar* 9.2.2005  
SIGNATURE DATE





**Terminal Compartment Detail**



Construct Templates and Plates from 1/4" 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)

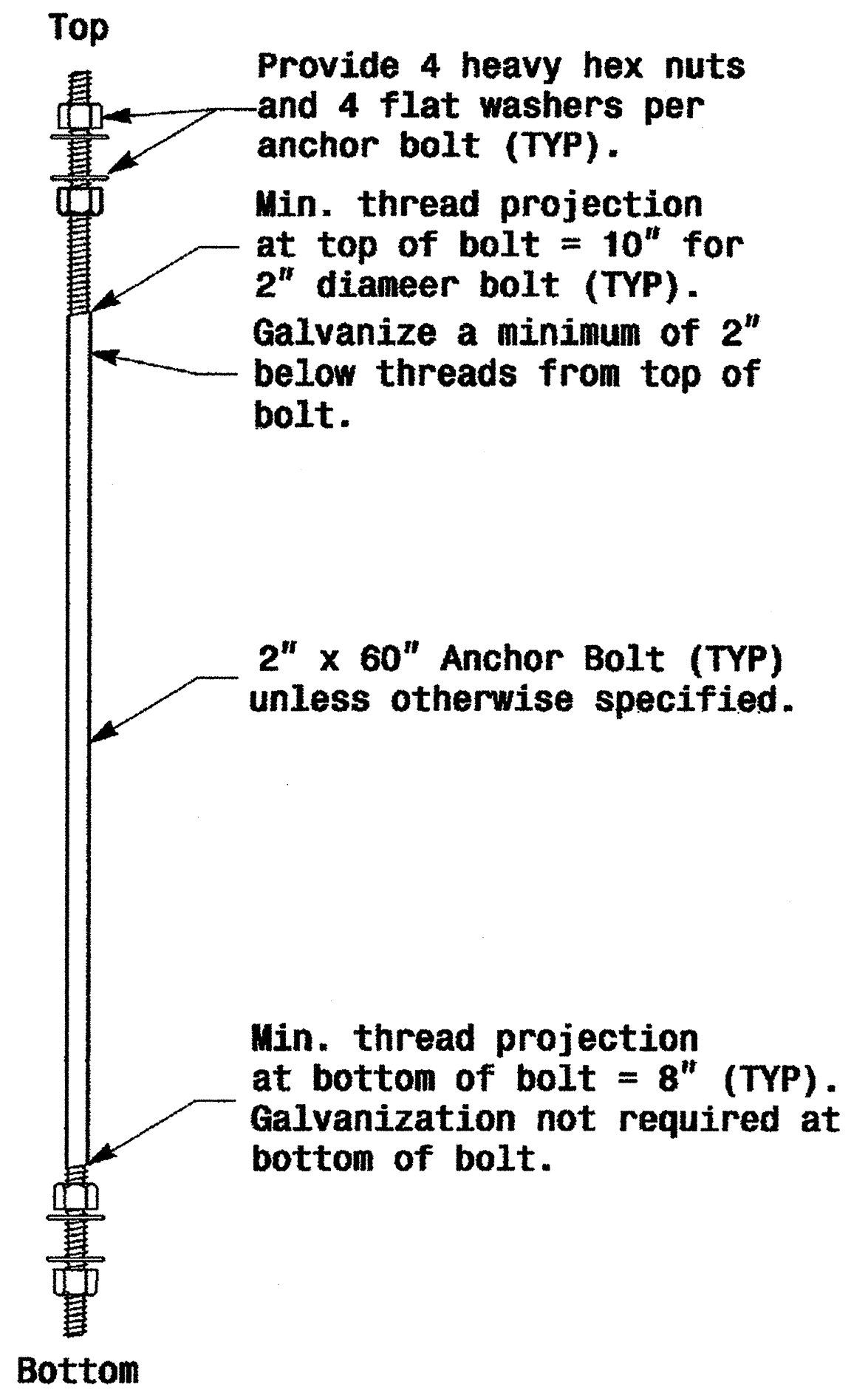
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ARM-A D/T/L/Y \_\_\_\_\_  
ARM-B D/T/L/Y \_\_\_\_\_  
A.B. DIA./B.C./L/Y \_\_\_\_\_  
NCDOT STANDARD \_\_\_\_\_

**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 \_\_\_\_\_

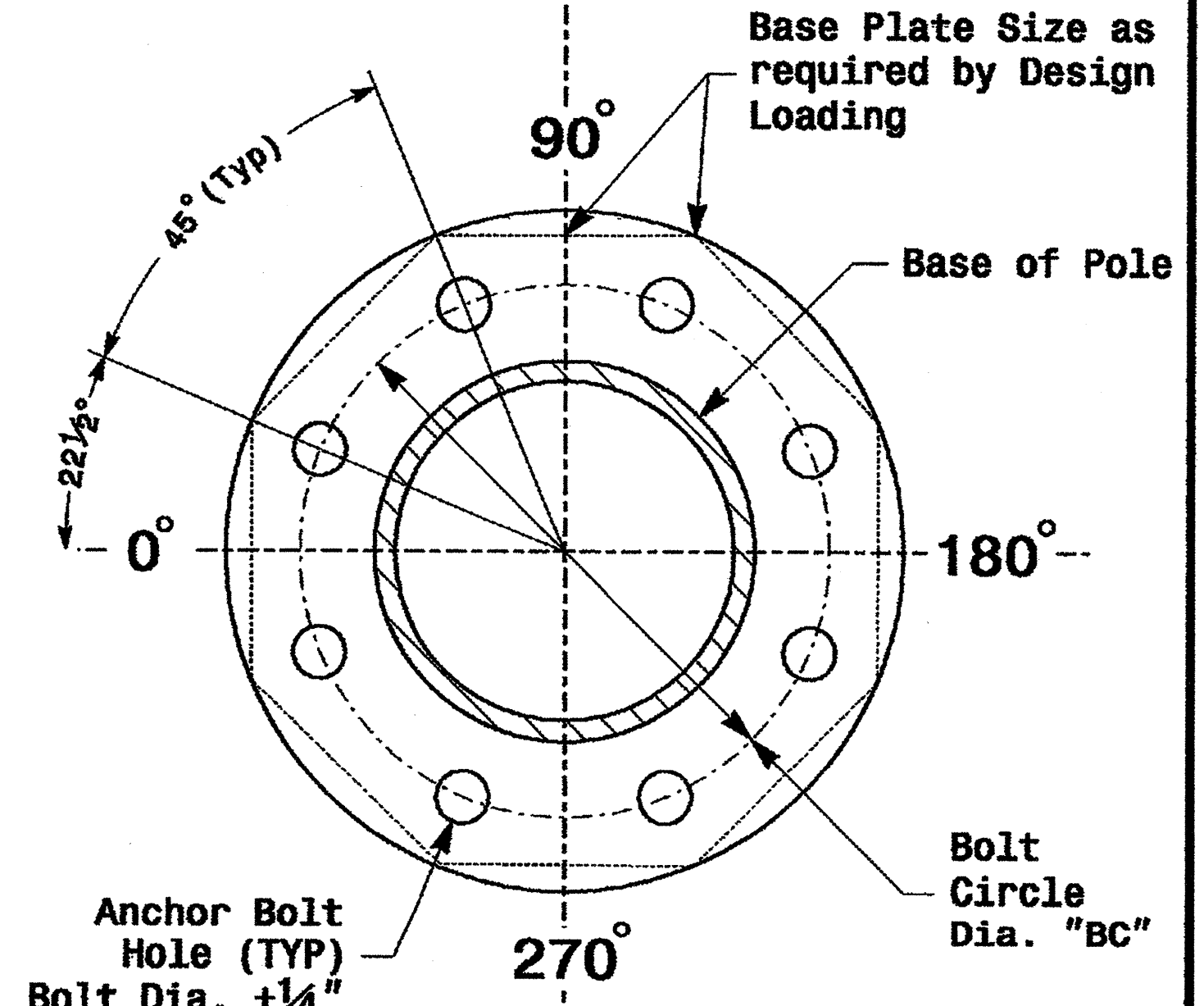
- Notes:**
- 1) D= Diameter, T= Thickness, L= Length, Y= Yield Strength
  - 2) A.B. = Anchor Bolt
  - 3) B.C. = Bolt Circle of Anchor Bolts
  - 4) If Custom Design, use "NCDOT STANDARD" line for plan pole I.D.
  - 5) See drawing M4 for mounting positions of I.D. tags.

**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**

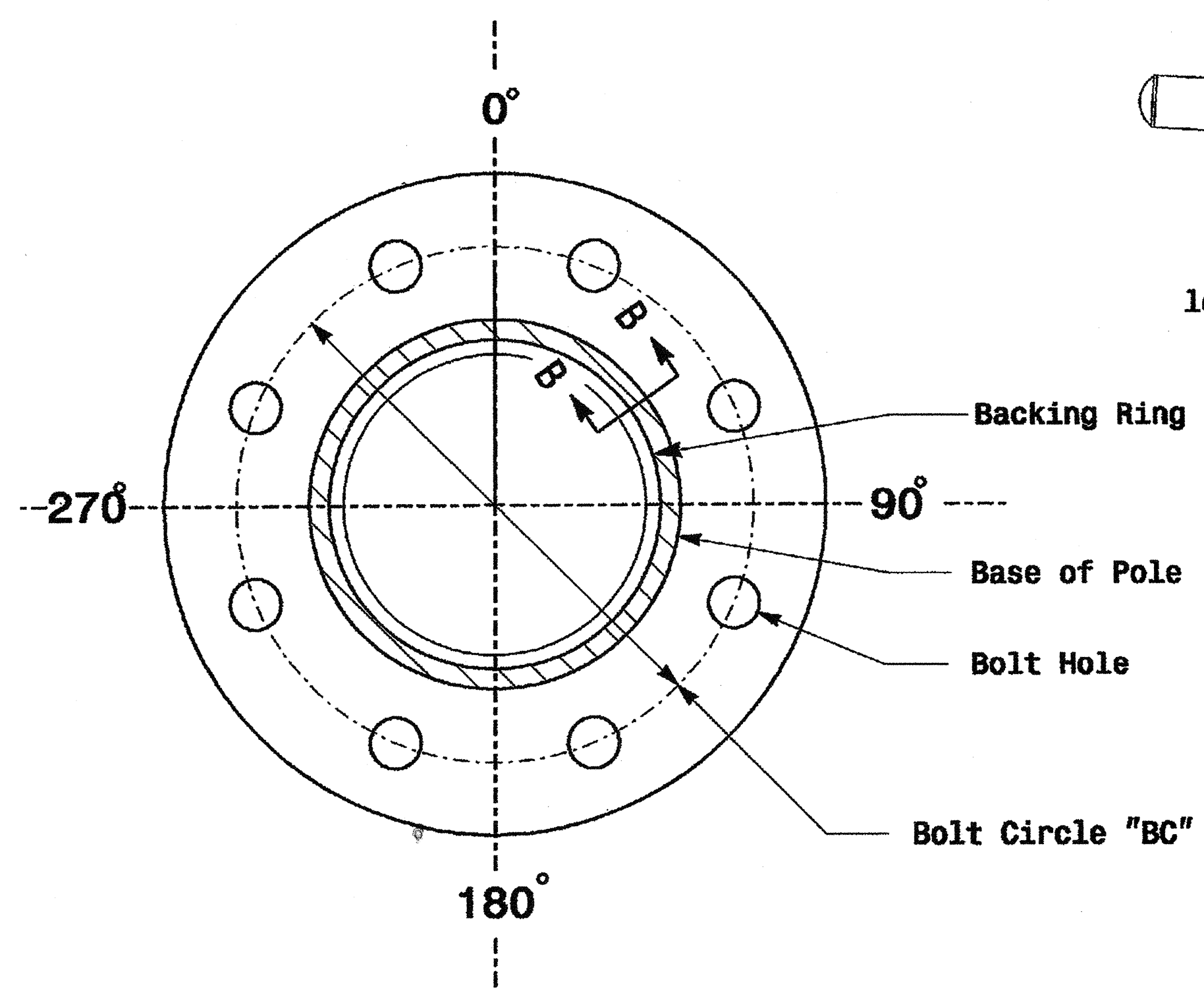
PLAN DATE: May 2005 REVISIONS: \_\_\_\_\_ INIT. DATE: \_\_\_\_\_  
PREPARED BY: P.L. Alexander REVIEWED BY: C.F. Andrews  
REVISIONS: \_\_\_\_\_ INIT. DATE: \_\_\_\_\_  
REVIEWED BY: A.M. Esposito

SCALE: NONE

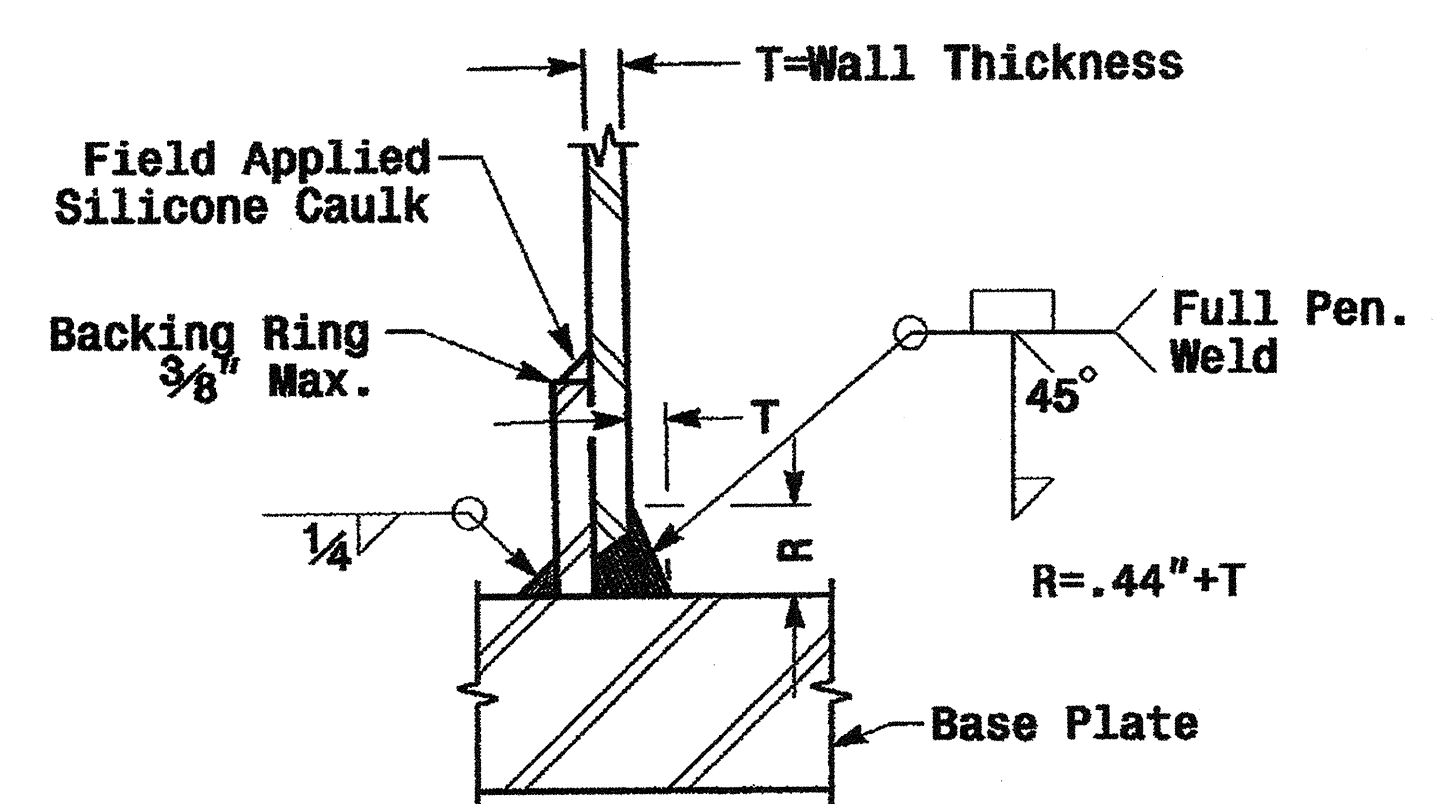
Signature: *D. Sankar* 22, 2005  
DATE: \_\_\_\_\_  
SIG. INVENTORY NO. \_\_\_\_\_

**Fabrication Details - All Poles**

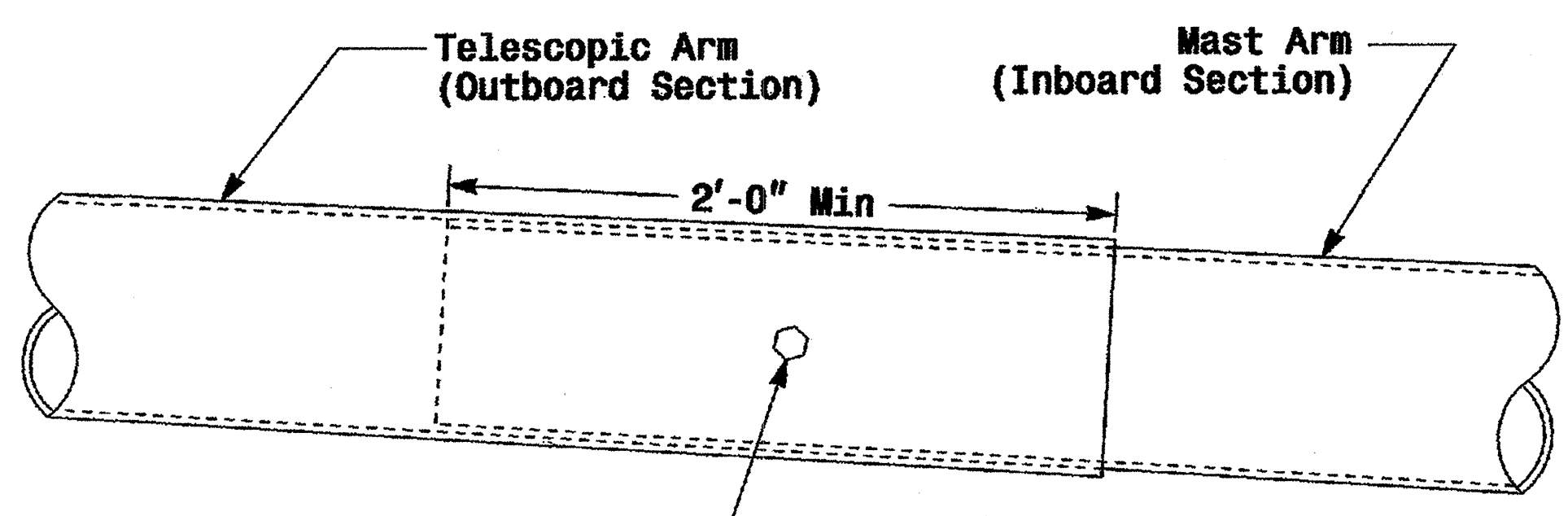
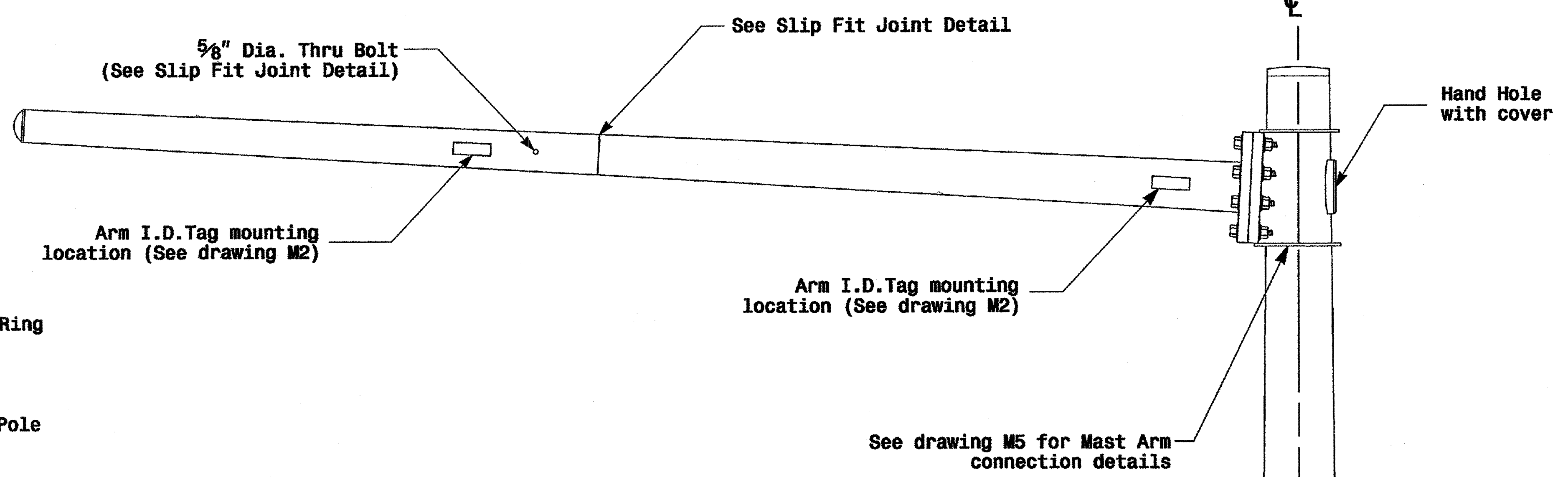
01-SEP-2005 18:22 D:\2004\_Metal\_Pole\_Standards\04\_mf.dgn caridrews



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

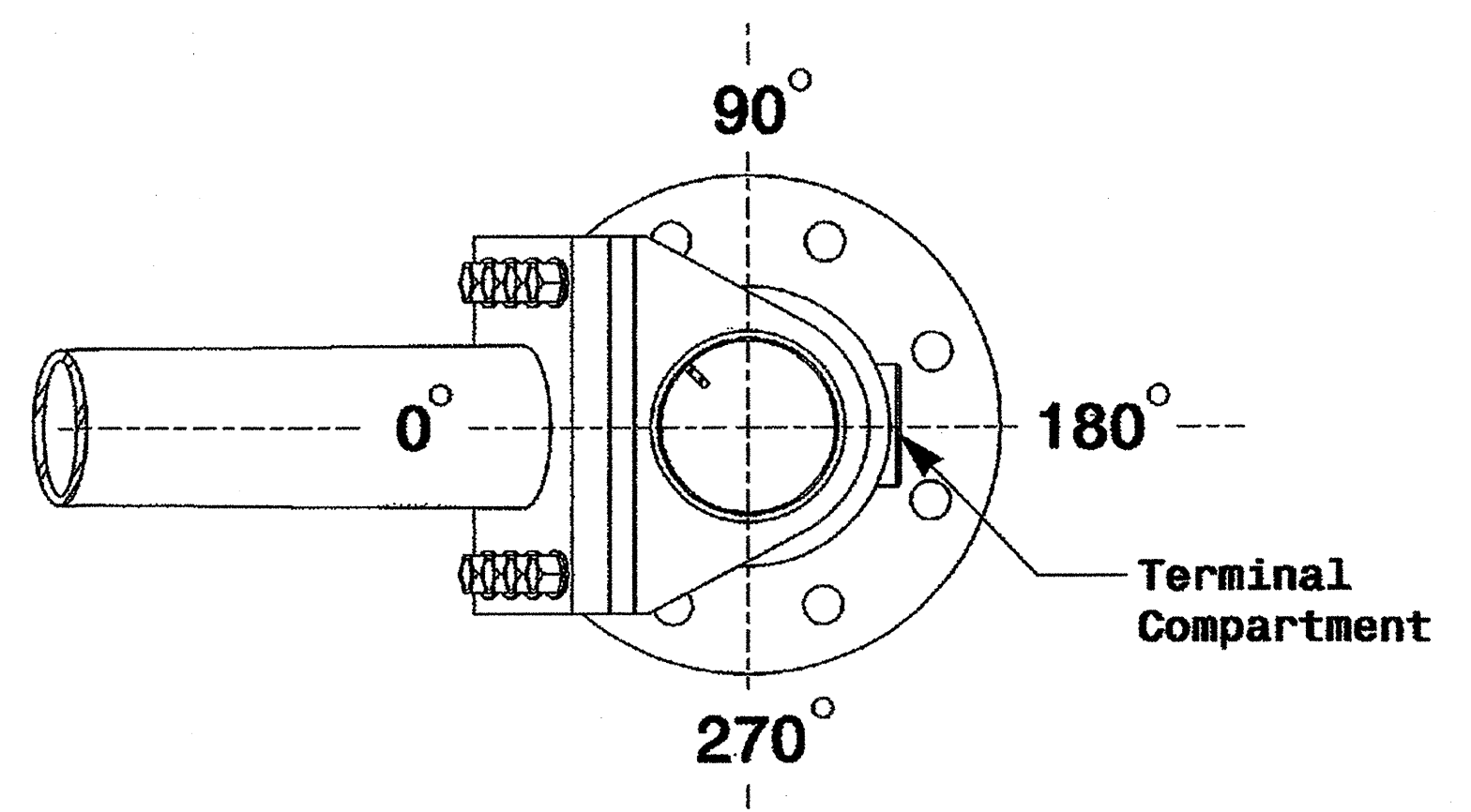


Section B-B  
(Pole Attachment to Base Plate)  
**Full-Penetration Groove Weld Detail**

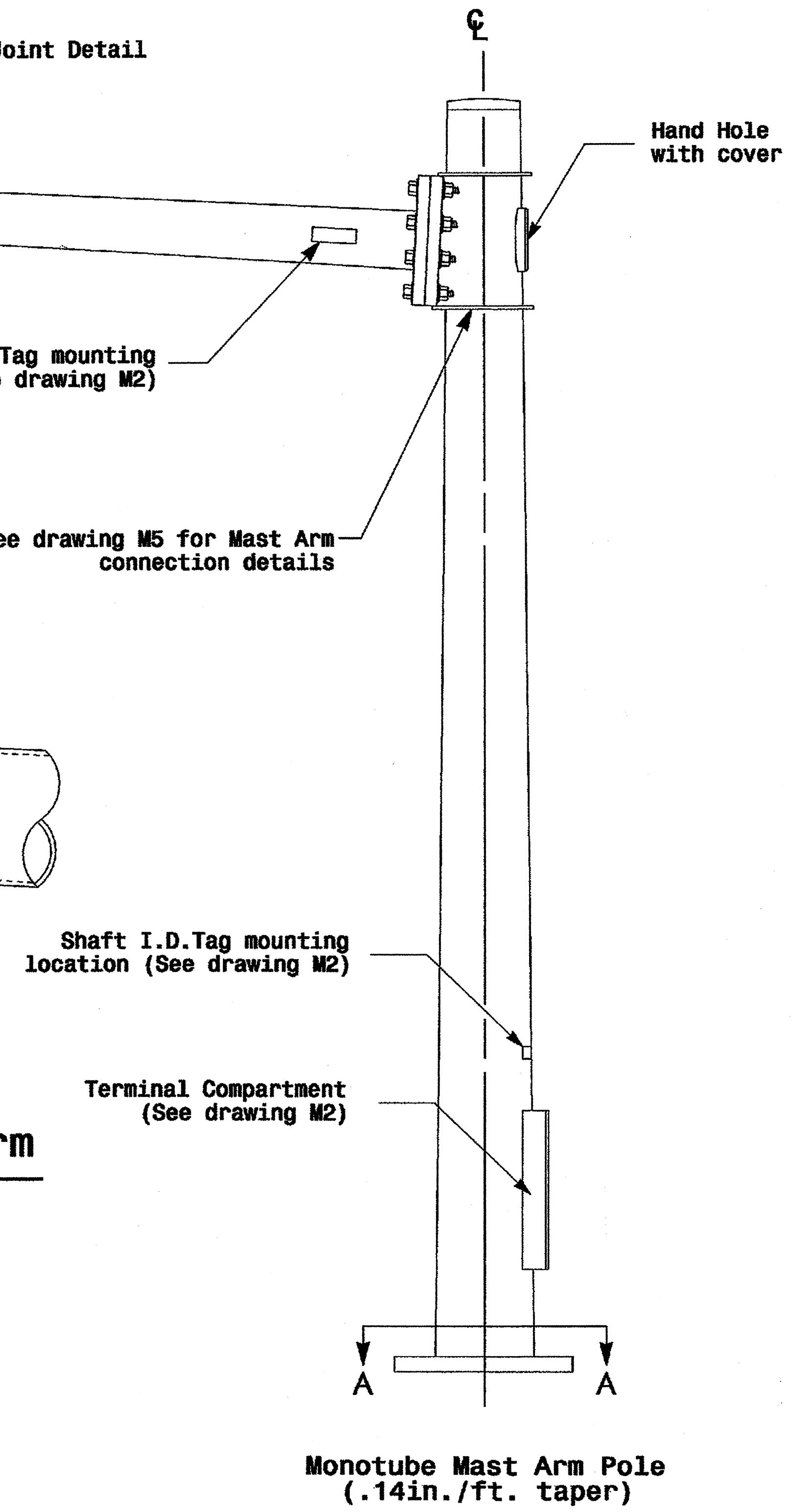


3/4" Factory Drilled Hole in Outboard Tube. Field Drill Inboard Tube. 5/8" Galvanized Thru Stud with (2) Hex. Locknuts Ea.

**Slip Fit Joint Detail for Mast Arm**



**Mast Arm Radial Orientation**

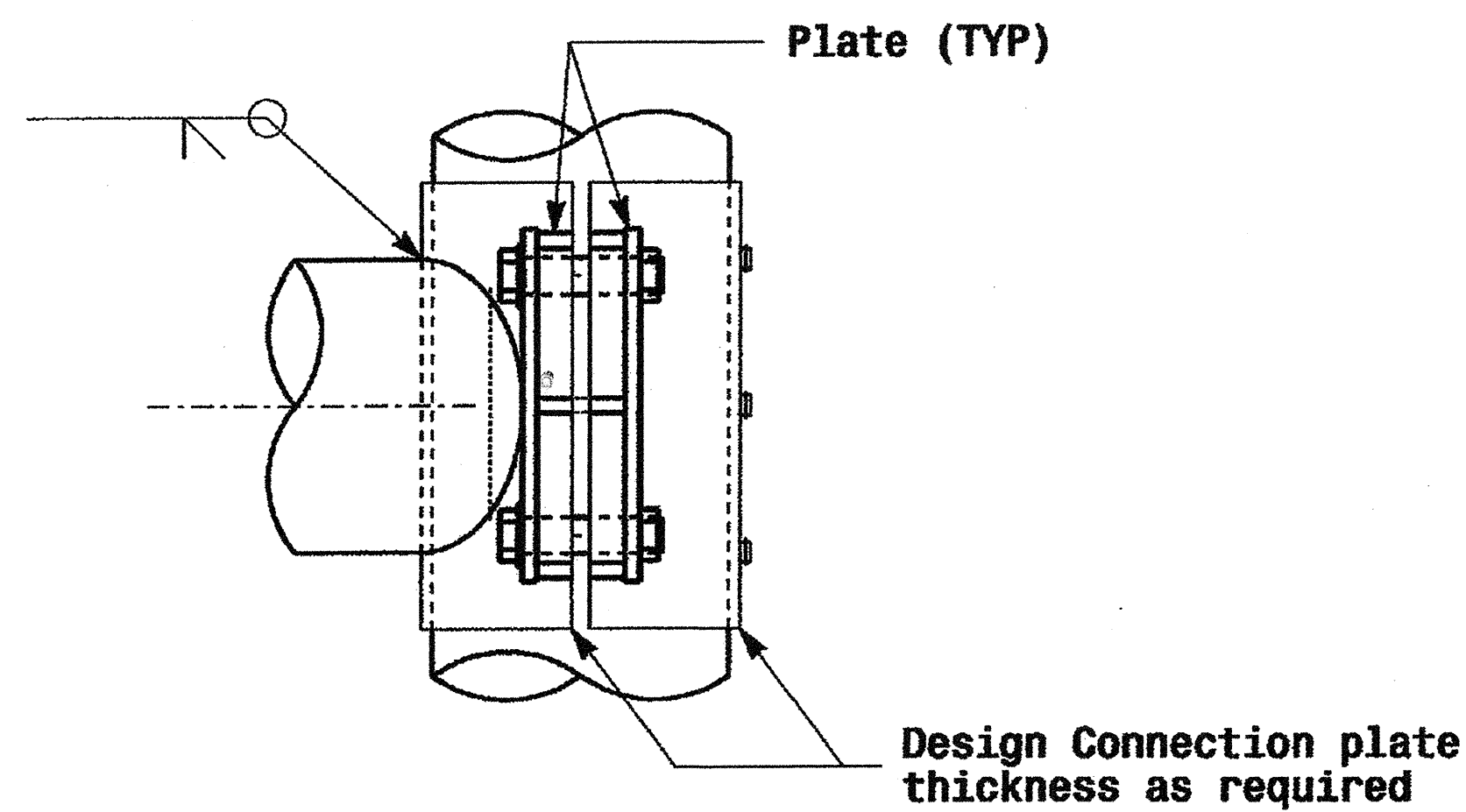


	<b>Typical Fabrication Details for Mast Arm Poles</b>		
	PLAN DATE: May 2005 PREPARED BY: P.L. Alexander	REVIEWED BY: C.F. Andrews REVIEWED BY: A.W. Esposito	
REVISIONS: _____ INIT.: _____ DATE: _____		SIGNATURE: <i>P.L. Alexander</i> DATE: 9.2.2005	SIG. INVENTORY NO.

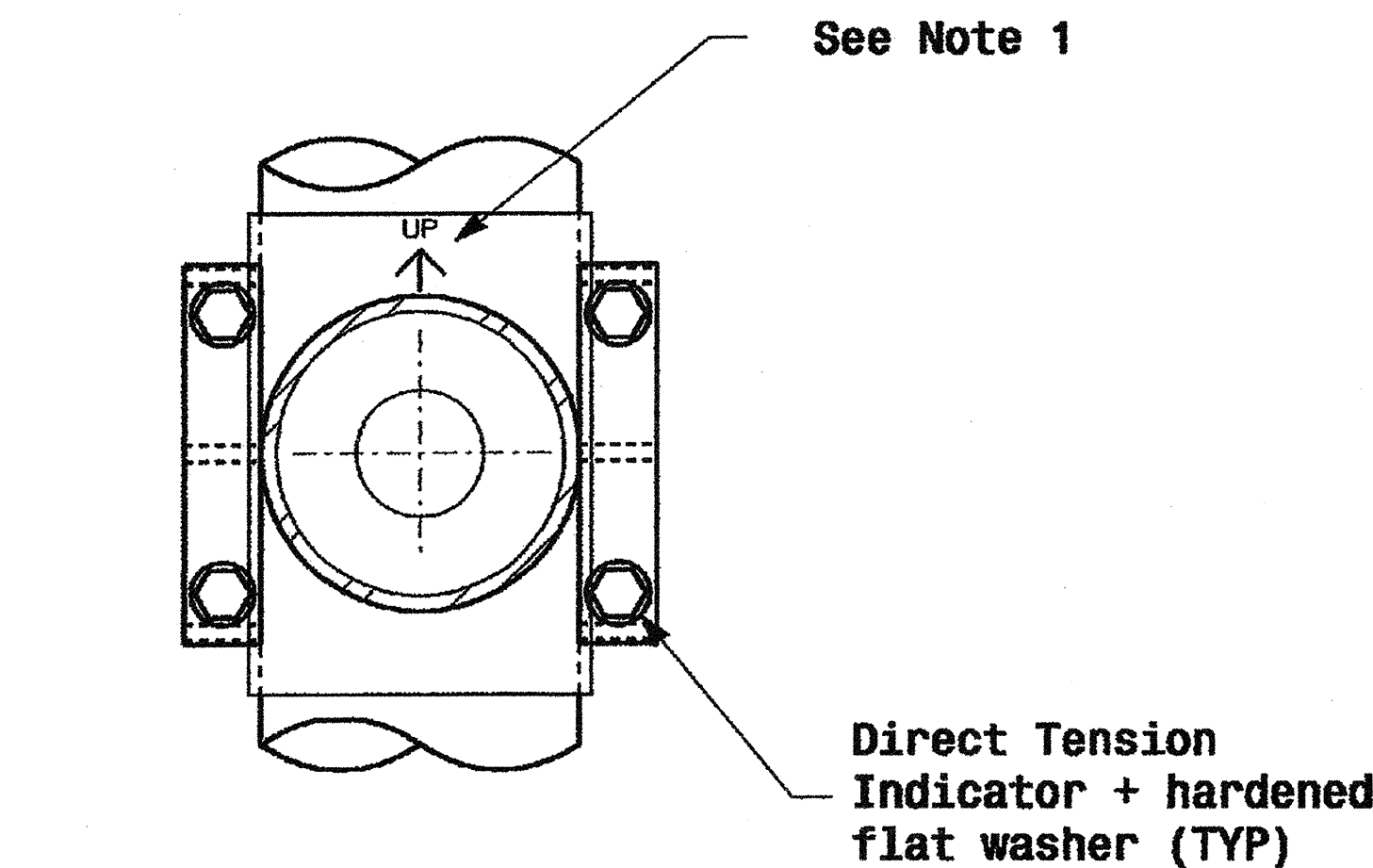
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# Adjustable Clamp Type Bolted Mast Arm Connection

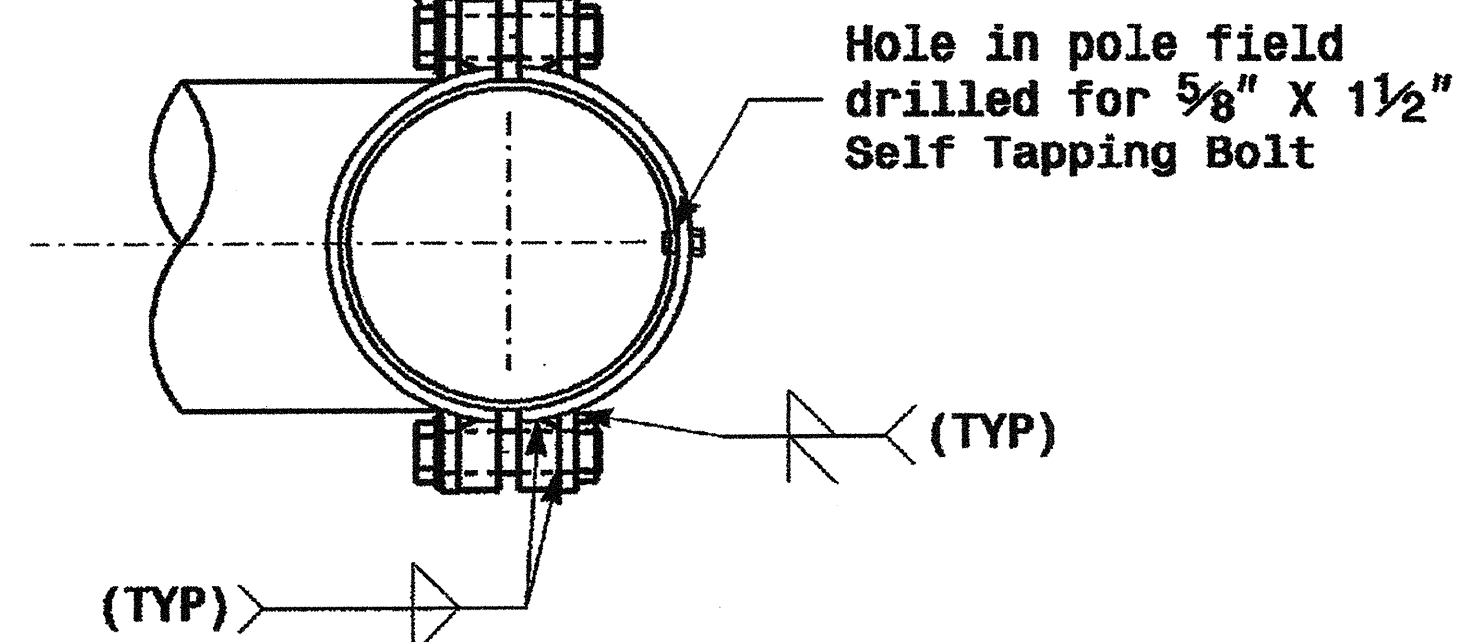


Side Elevation View



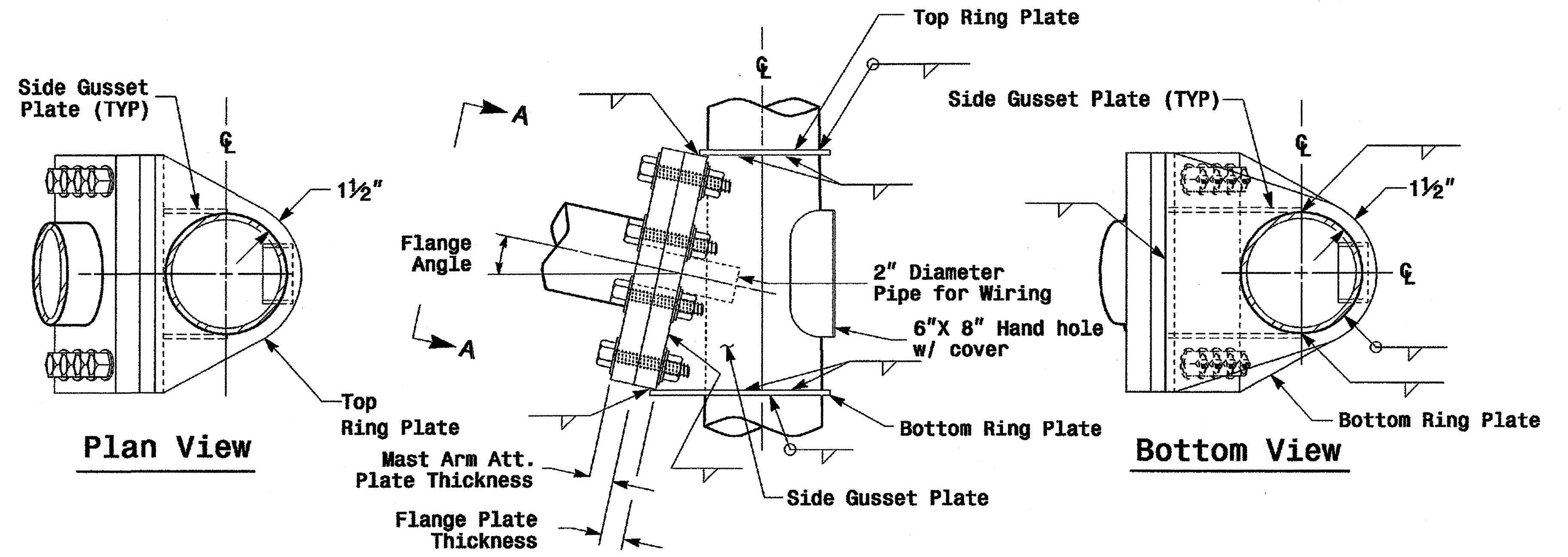
Front Elevation View

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



Plan View

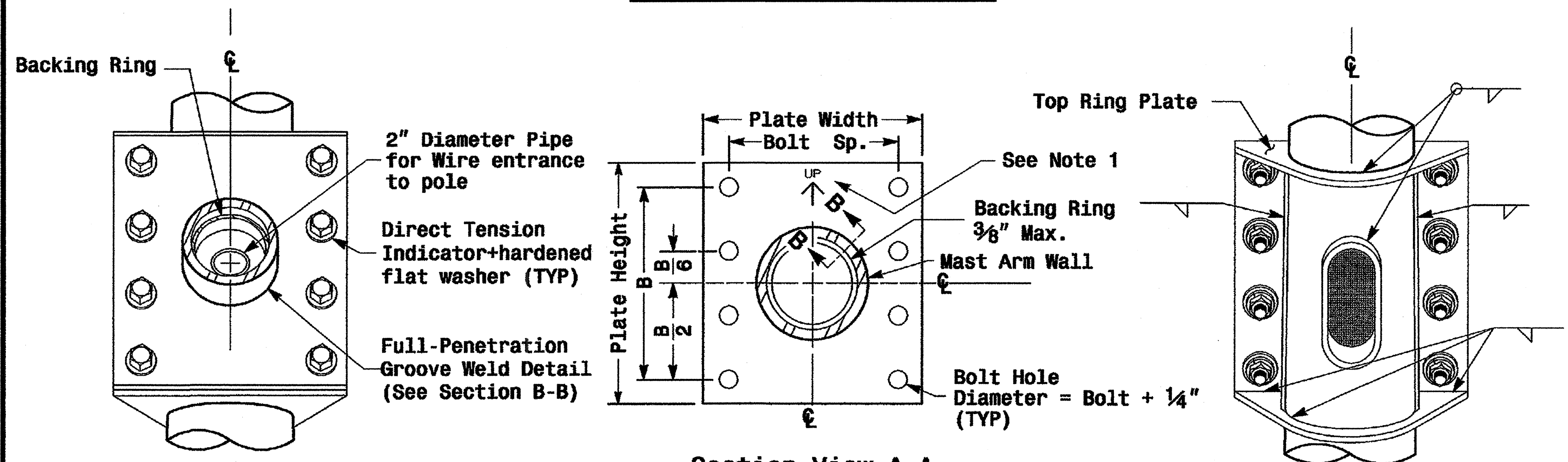
# Welded Ring Stiffened Mast Arm Connection



Plan View

Side Elevation View

Bottom View

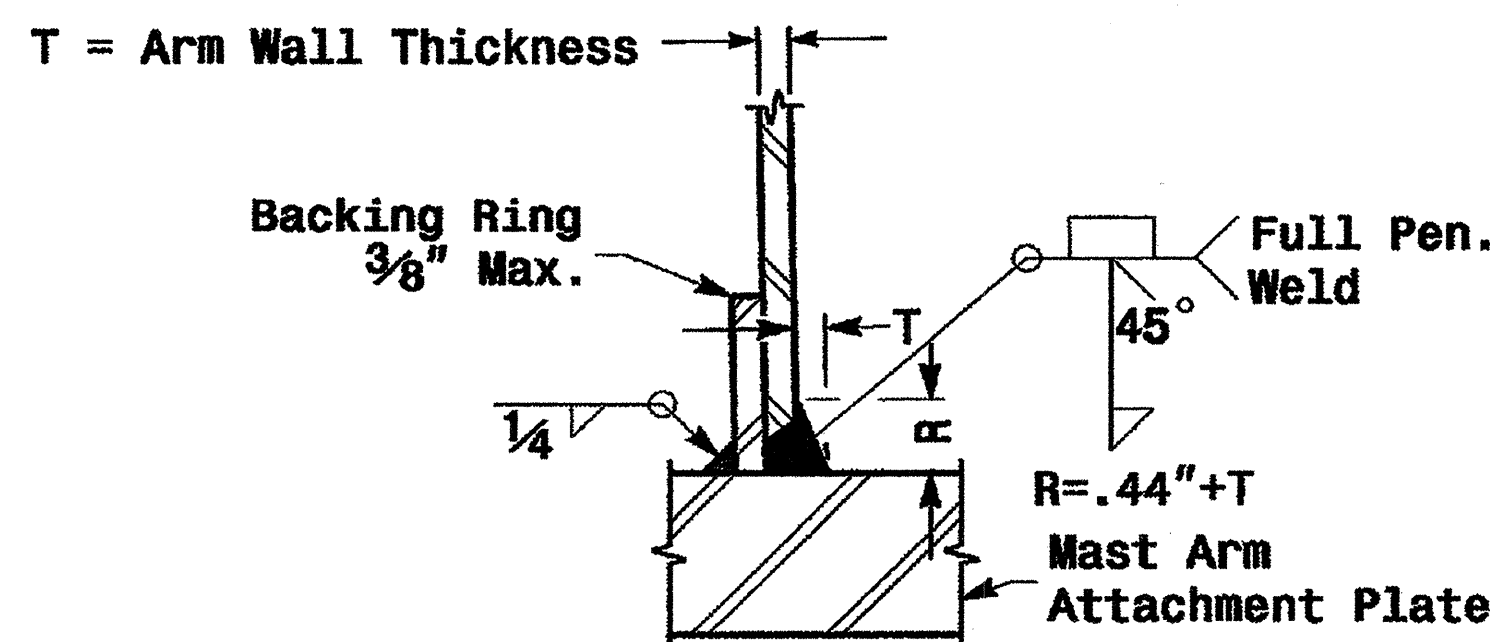


Front Elevation View

Section View A-A

Mast Arm Attachment Plate

Back Elevation View



Section B-B

Full-Penetration Groove Weld Detail

Notes:

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

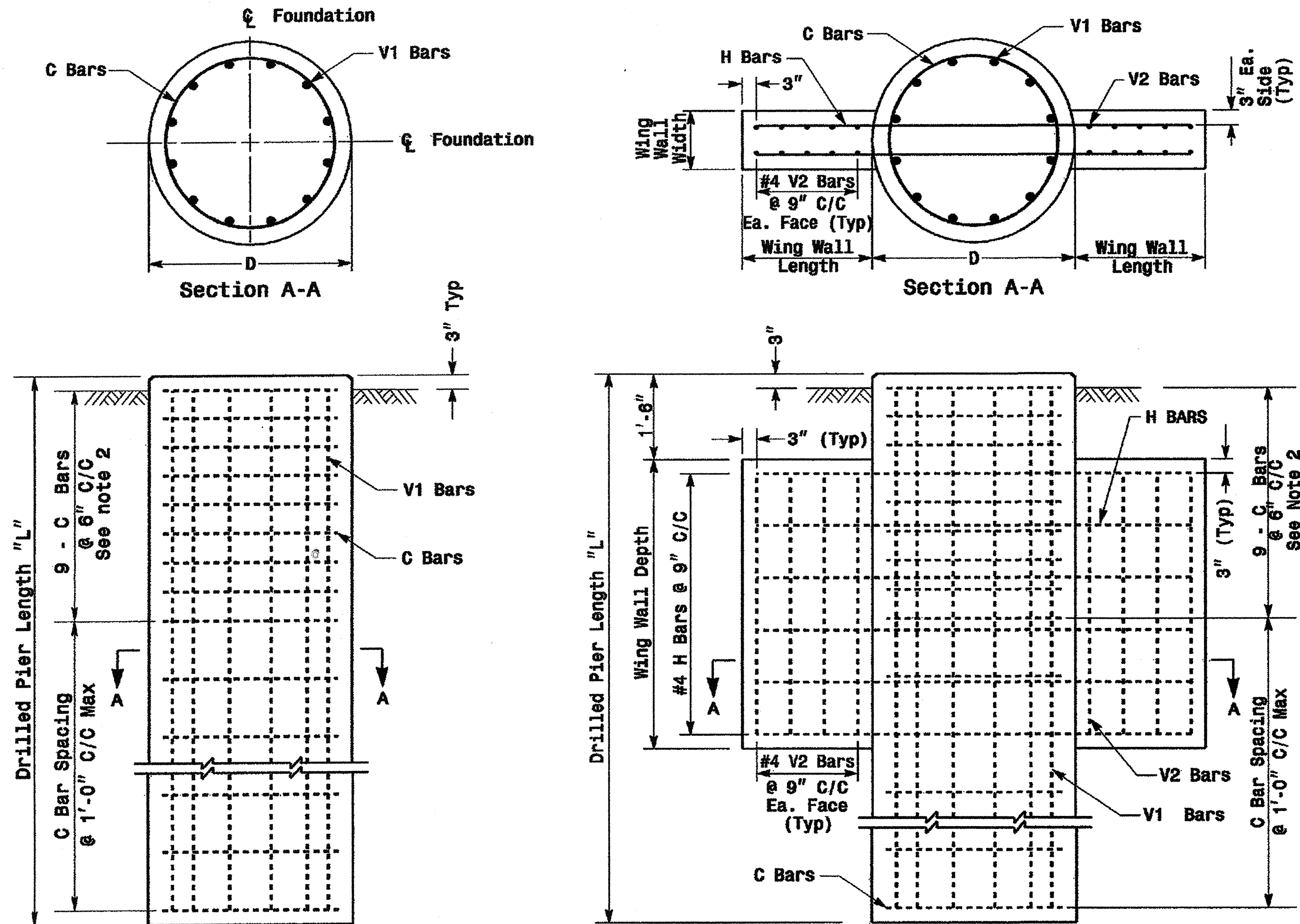
Fabrication Details - Mast Arm Poles

01-SEP-2005 14:11 w:\p\p\lee-un1\work\grcupse2004 metal pole standard\2004 m5.dgn

	<b>Fabrication Details For Mast Arm Connection To Pole</b>		
	PLAN DATE: May 2005 PREPARED BY: P. L. Alexander	REVISIONS:	
SCALE: NONE	DATE:	INIT.:	DATE:
SIGNATURE:			DATE:
SIG. INVENTORY NO.			

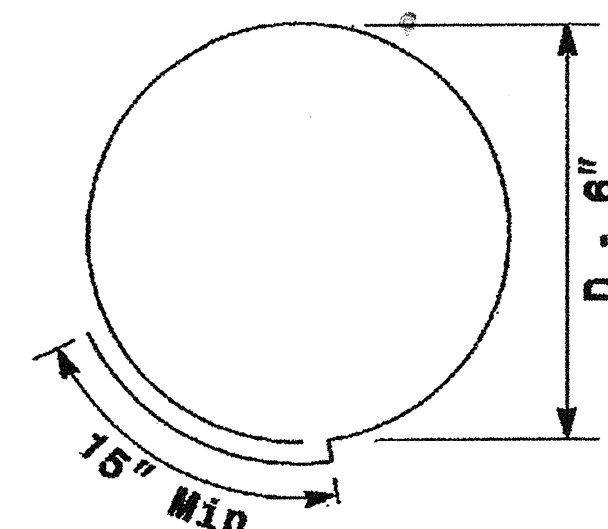


## Reinforcing Steel Bars



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"
TYPE 2	42"	C	*	#4	CIR.	10'-9"
		V1	9	#8	STR.	**
		V2	16	#4	STR.	4'-6"
TYPE 2	48"	H	12	#4	STR.	9'-0"
		C	*	#4	CIR.	10'-9"
		V1	12	#8	STR.	**
TYPE 2	48"	V2	16	#4	STR.	4'-6"
		H	12	#4	STR.	9'-6"
		C	*	#4	CIR.	12'-6"

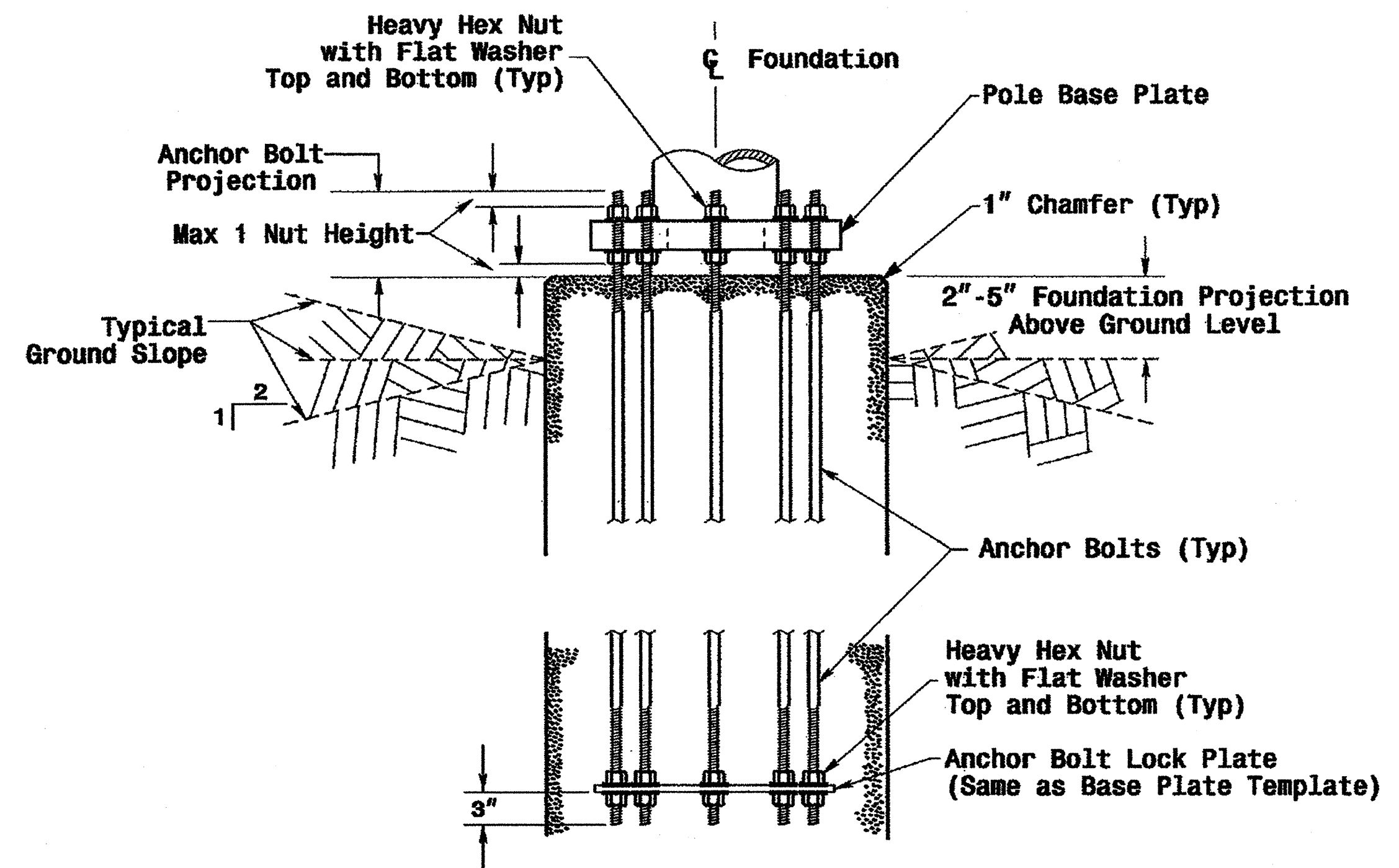
\* See Note No. 1  
 \*\* See Note No. 3

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

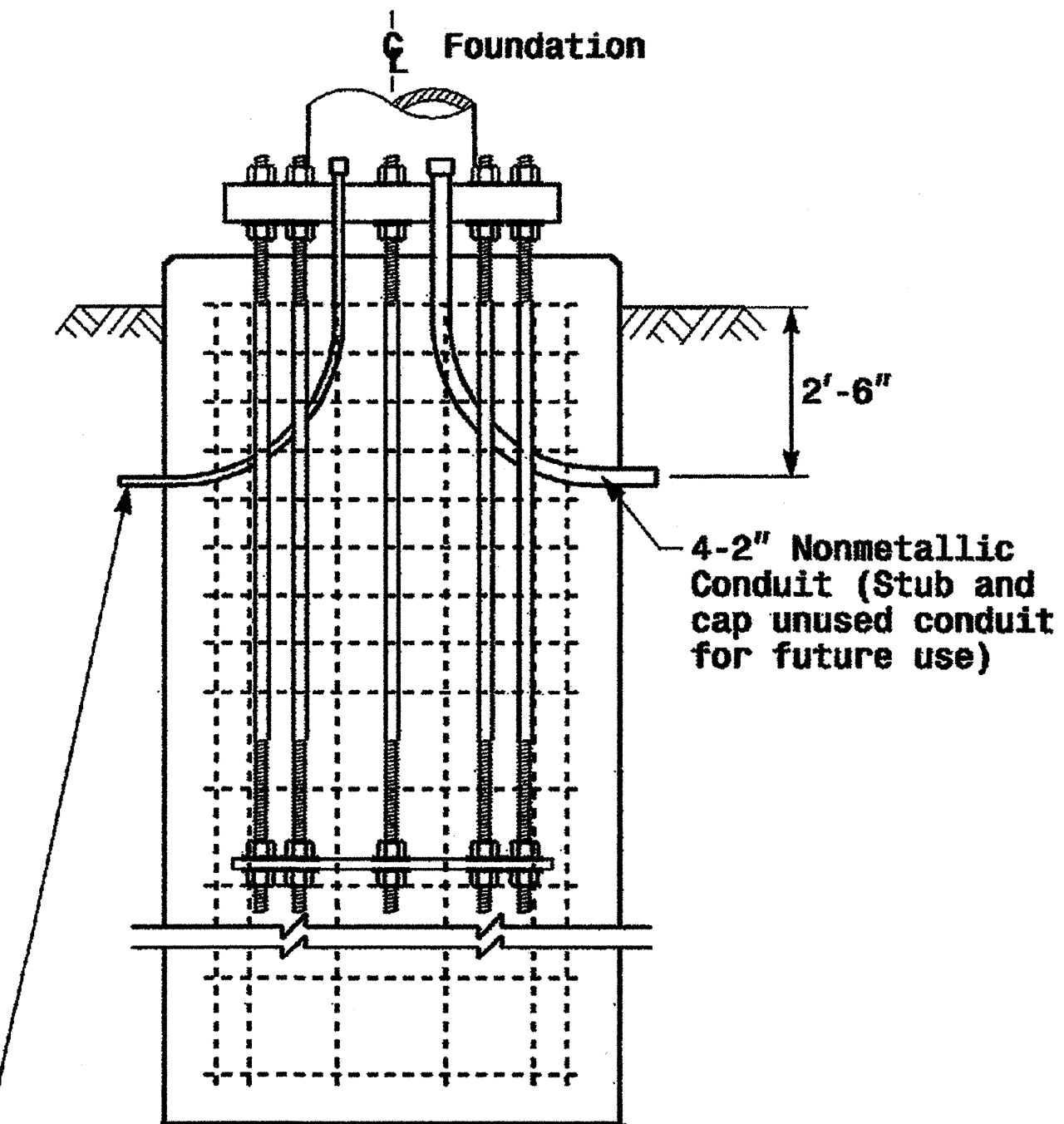
See Note No. 4

## Typical Foundation Anchor Bolt Details

(Reinforcing Cage Not Shown for Clarity)



## Typical Foundation Conduit Details



## Notes

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

PROJECT REFERENCE NO.	SHEET NO.
U-4010	Sig.32 M 7

Construction Details - Foundations

01-SEP-2005 11:48 v:\cadd\p11-11\work\groups\2004\mto\p11\founder.dwg

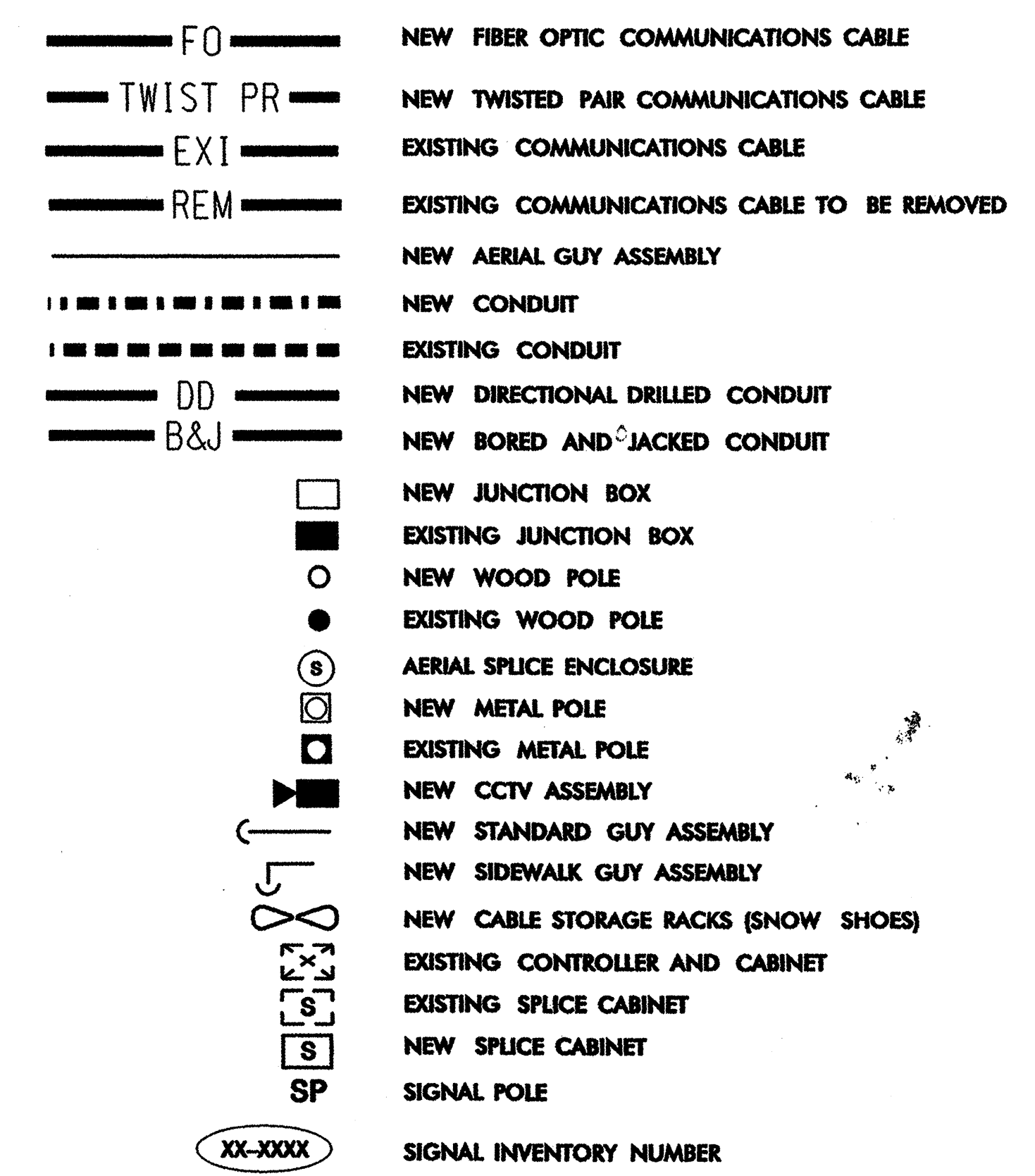
	<b>Construction Details Foundations</b>		
	PLAN DATE: May 2005 PREPARED BY: C.F. ANDREWS REVISIONS:	REVIEWED BY: P.L. ALEXANDER REVIEWED BY: A.W. ESPOSITO DATE:	



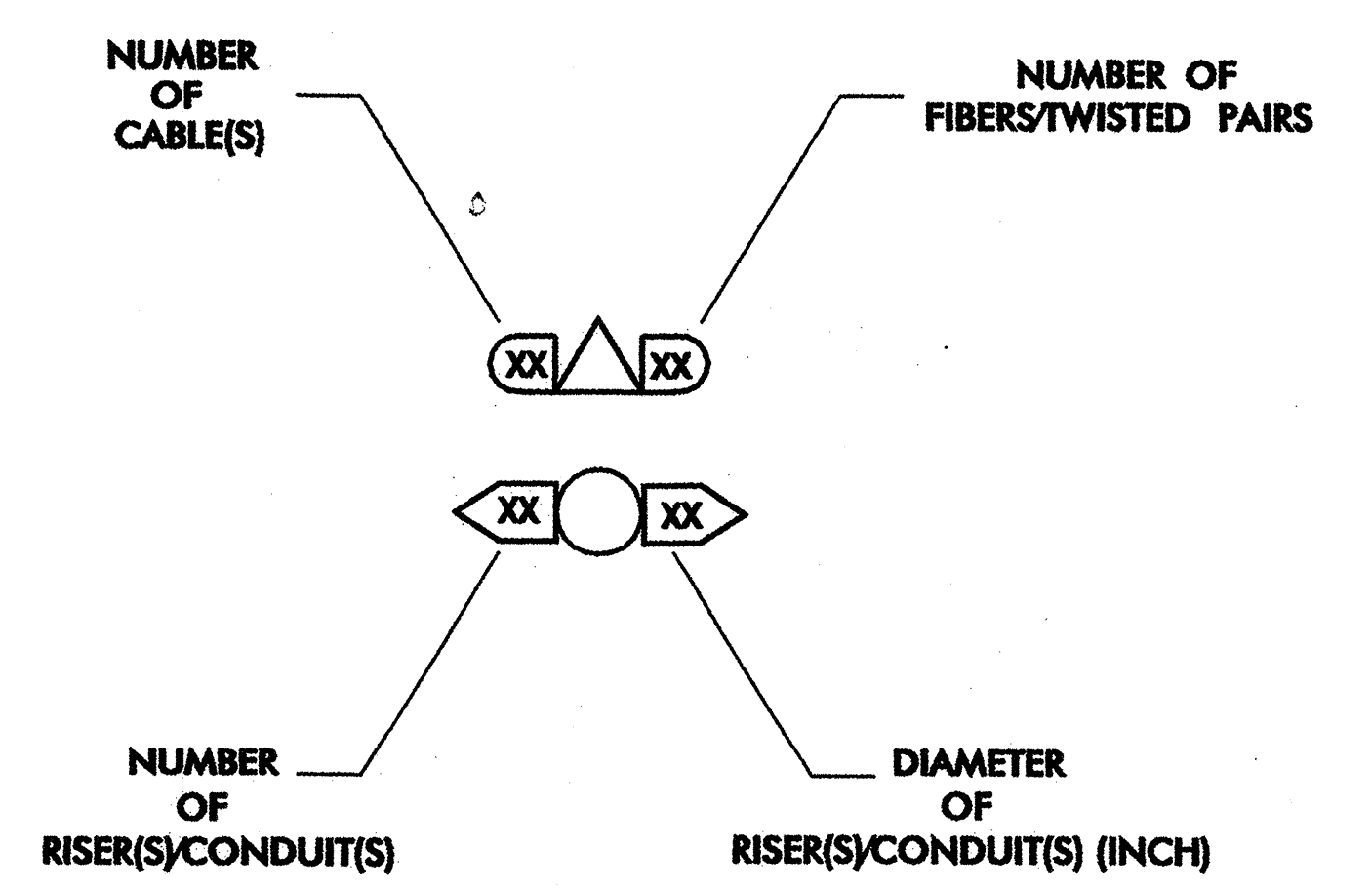
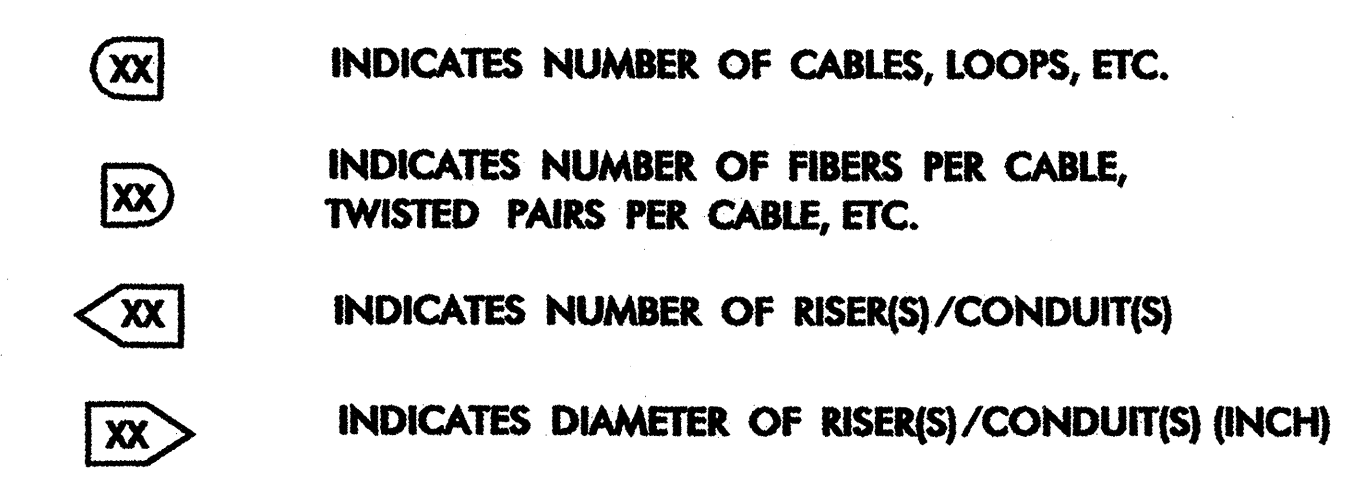
- 1 INSTALL REA, PE - 22, SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
- 2 INSTALL REA, PE - 38, (FIGURE 8) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
- 3 INSTALL REA, PE - 39, (UNDERGROUND) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
- 4 INSTALL SMFO CABLE
- 5 INSTALL MMFO CABLE
- 6 INSTALL FIBER OPTIC 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 TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
- 27 INSTALL NEW TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
- 28 INSTALL INTERCONNECT CENTER, PATCH PANEL, JUMPERS AND FUSION SPLICE CABLE IN CABINET
- 29 INSTALL UNDERGROUND SPLICE ENCLOSURE
- 30 INSTALL AERIAL SPLICE ENCLOSURE
- 31 INSTALL POLE MOUNTED SPLICE CABINET
- 32 INSTALL BASE MOUNTED SPLICE CABINET
- 33 REMOVE EXISTING SPLICE CABINET

- 34 INSTALL CABINET FOUNDATION
- 35 REMOVE EXISTING CABINET FOUNDATION
- 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

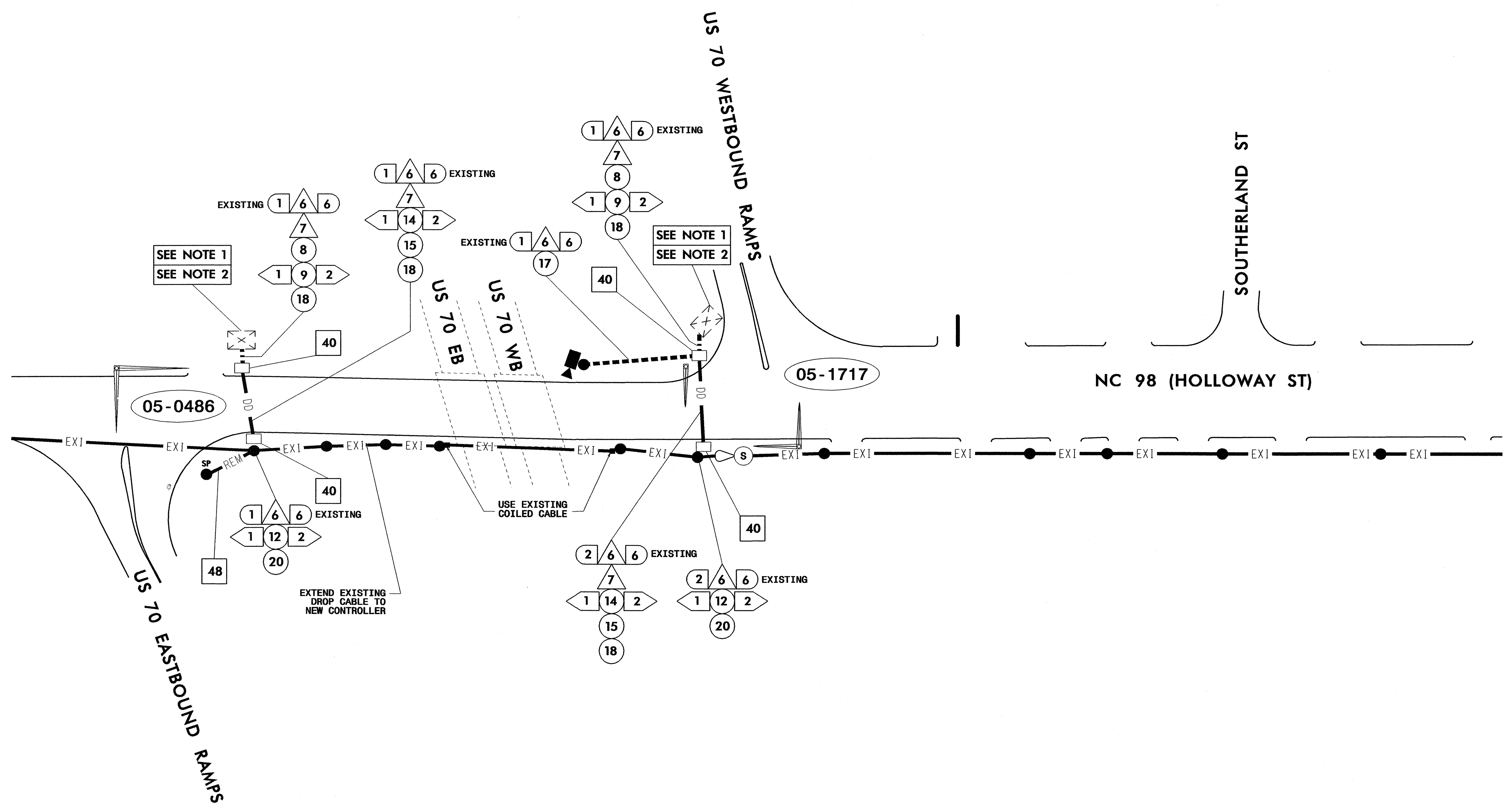
**LEGEND**



**CONSTRUCTION NOTE SYMBOLOGY KEY**



<p>222 N. McDowell St., Raleigh, NC 27603</p>	<b>CONSTRUCTION NOTES</b>		<p>SEAL</p>
	<p>PLAN DATE: _____</p> <p>REVISIONS: _____</p>	<p>REVIEWED BY: <b>G. A. FULLER</b></p> <p>INIT. DATE: _____</p>	



**NOTES:**

1. CONNECT EXISTING DROP CABLE IN CABINET. MAINTAIN EXISTING CONFIGURATION IN CABINET AS SHOWN IN SPLICE PLAN.
2. BOND TRACER WIRE TO EQUIPMENT GROUND BUS.

	<b>COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS</b>		
	DIVISION 05 DURHAM CO. DURHAM		
PLAN DATE: JANUARY 2007		REVIEWED BY: I.N. AVERY	
PREPARED BY: S.C. WARDLE		REVIEWED BY: G.G. MURR, JR.	
SCALE: 0		REVISIONS	INIT. DATE
		SIGNATURE: <i>[Signature]</i>	DATE: 1-2-07
CADD File Name:			



# FIBER OPTIC CABLE

## FIBER OPTIC CABLE

Notes:  
 Unused fibers left coiled and stored in splice tray.  
 Unused buffer tubes coiled and stored in splice tray.

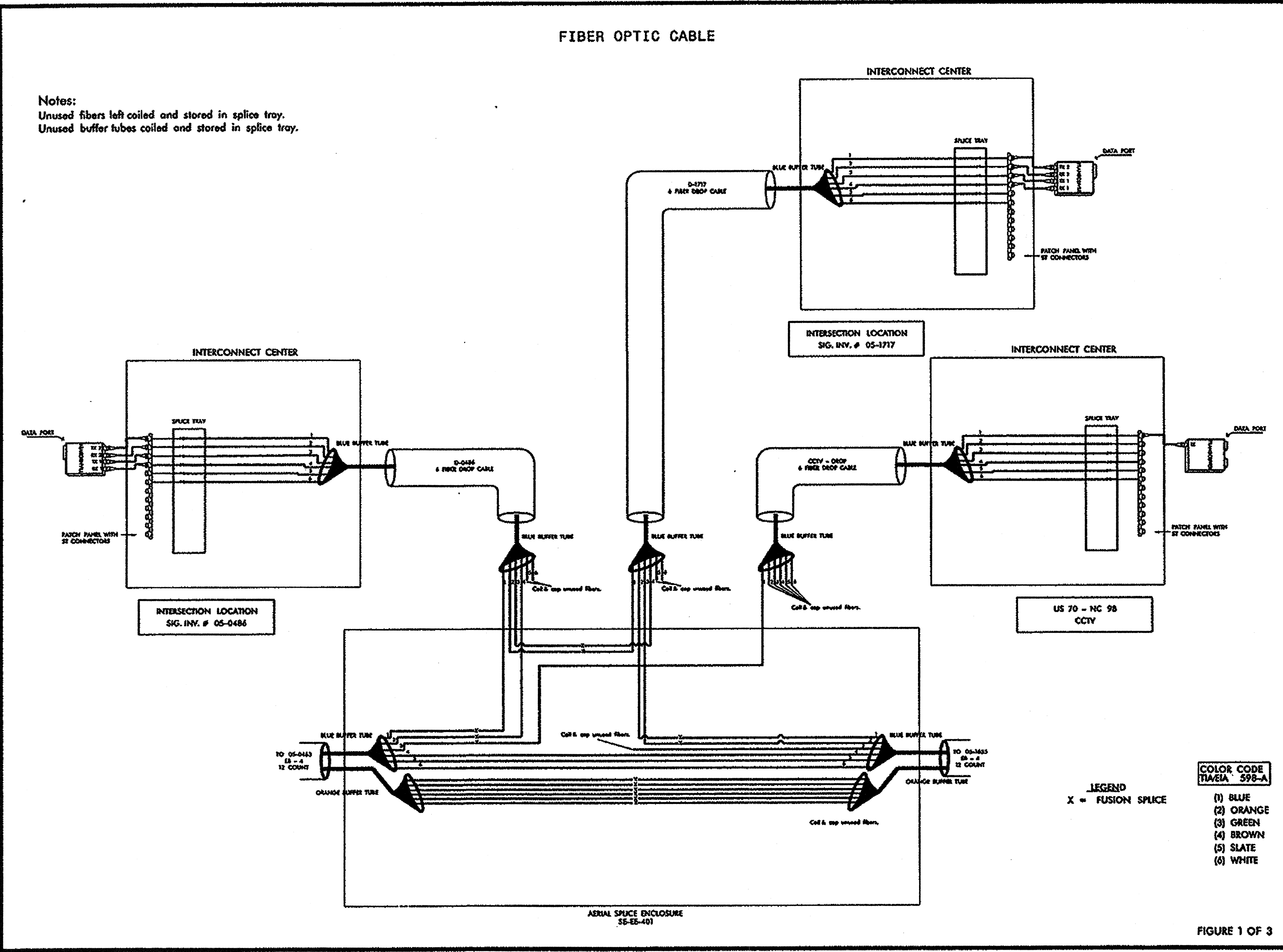


FIGURE 1 OF 3

	<b>SPLICE PLAN</b>		
	DIVISION 5 DURHAM CO. DURHAM		
PLAN DATE: FEB 2004	REVIEWED BY: MAK		
PREPARED BY: NW	REVIEWED BY: NWD		
SCALE: NTS	REVISIONS:	INT. DATE:	SIGNATURE: <i>M. Dunto</i> DATE:
CAD FILE NAME:			