

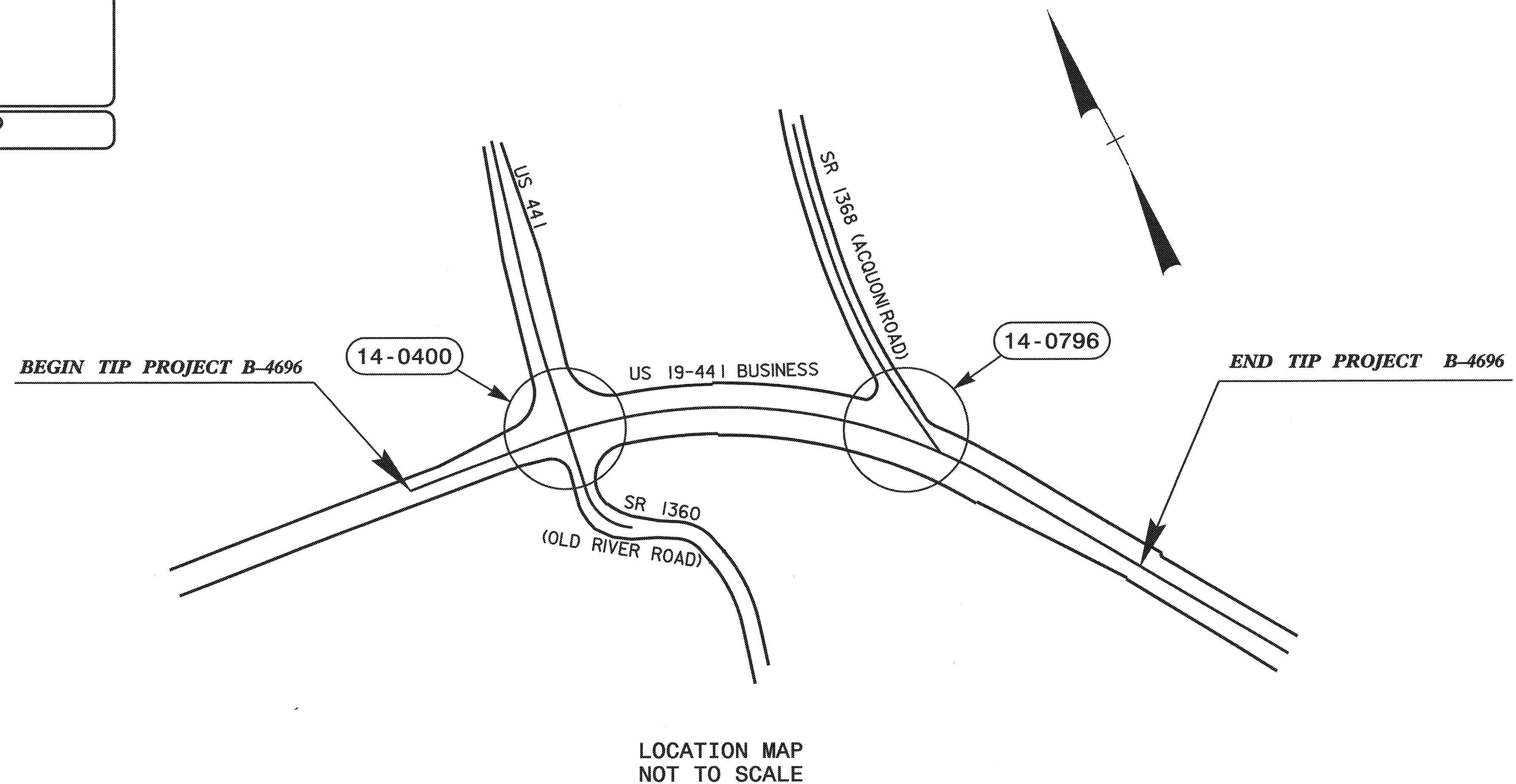
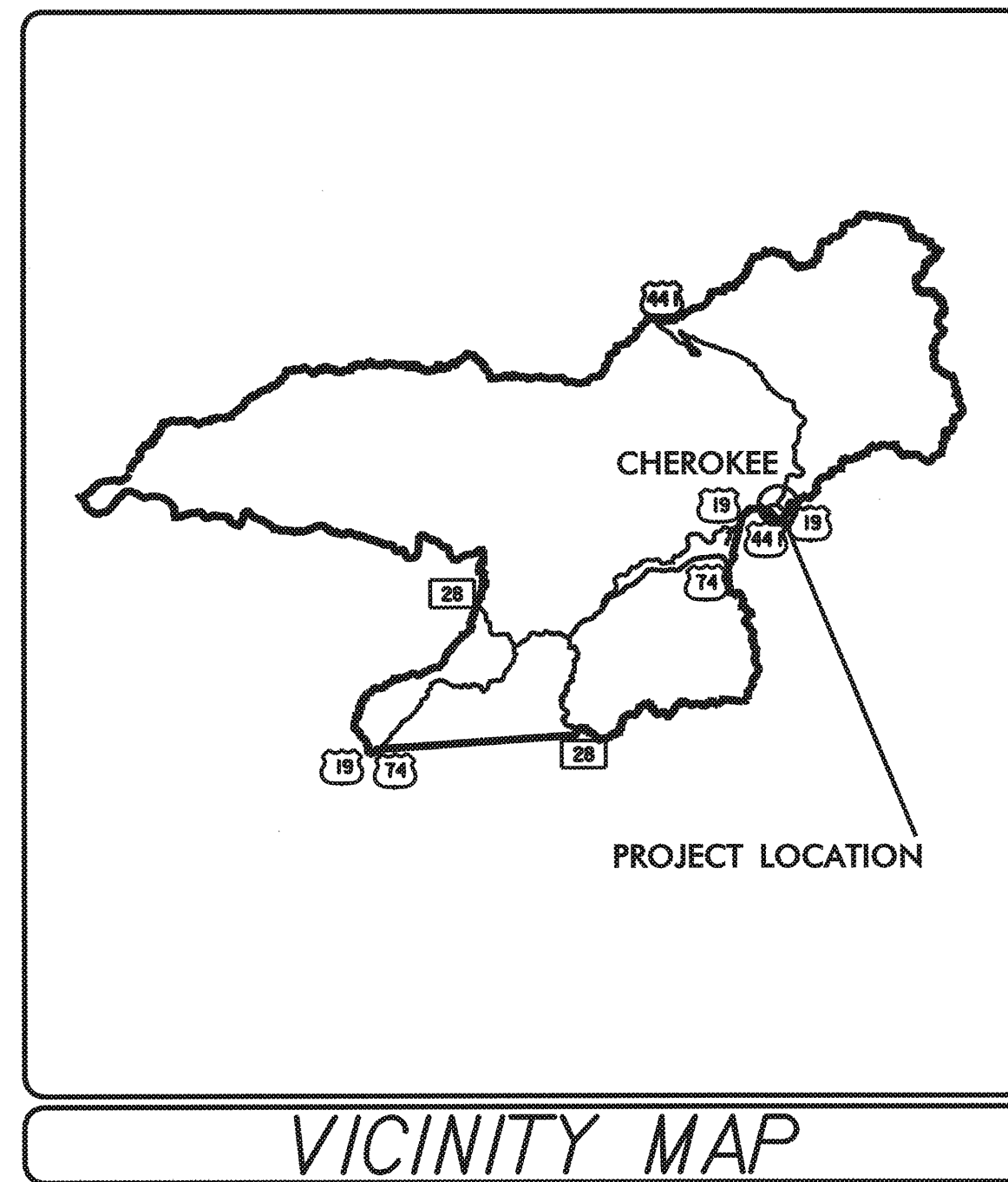
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

Swain County

**LOCATION: US 19-441 BUSINESS FROM SR 1360 (OLD RIVER ROAD)
TO SR 1368 (ACQUONI ROAD) IN CHEROKEE**

TYPE OF WORK: Traffic Signals

Project: B-4696



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

Sheet #	Reference #	Index of Plans	Location/Description
Sig. 1		Title Sheet	
Sig. 2	14-0400	US 19-441 Business at US 441/SR 1360 (Old River Road)	
Sig. 10	14-0796	US 19-441 Business at SR 1368 (Acquoni Road)	
Sig. 17	N/A	Metal Pole Details	
Sig. 22	N/A	Inductive Detection Loops Details	

INTELLIGENT TRANSPORTATION AND SIGNALS UNIT

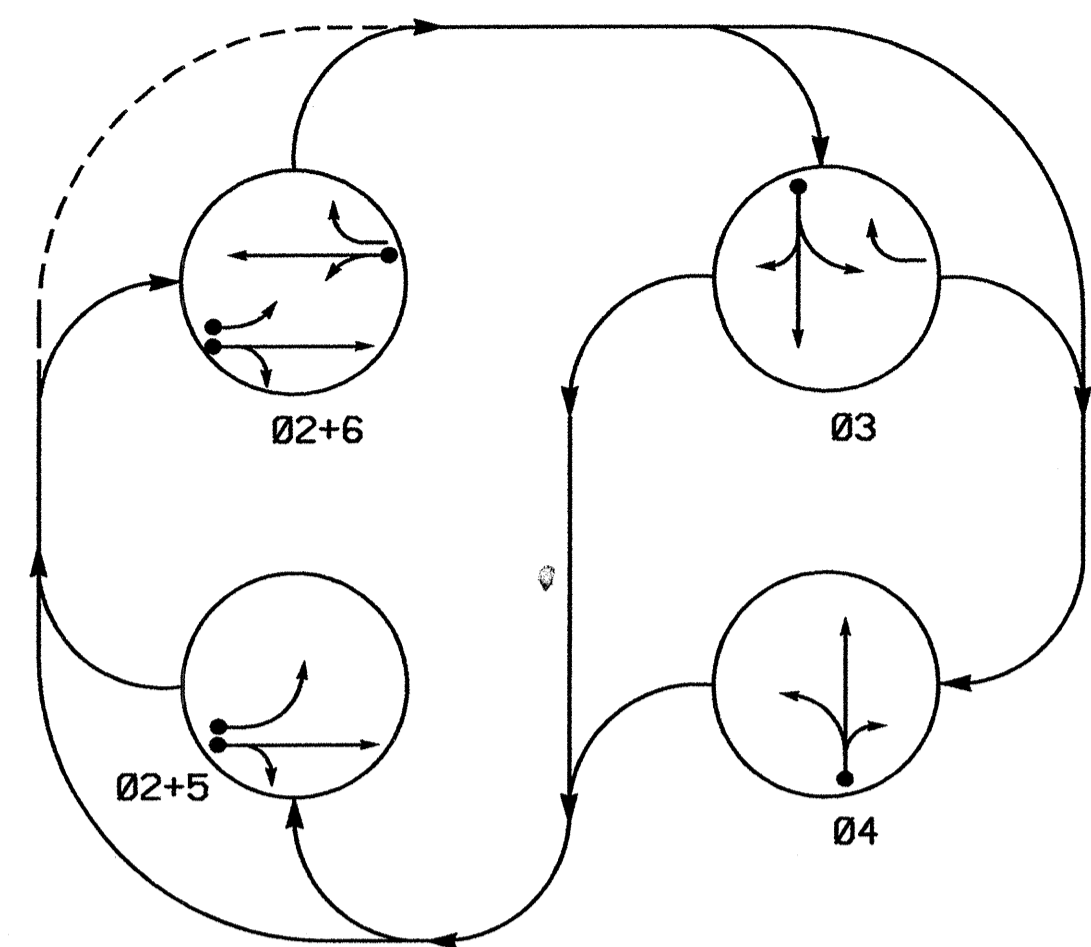
Contacts:

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

PHASING DIAGRAM



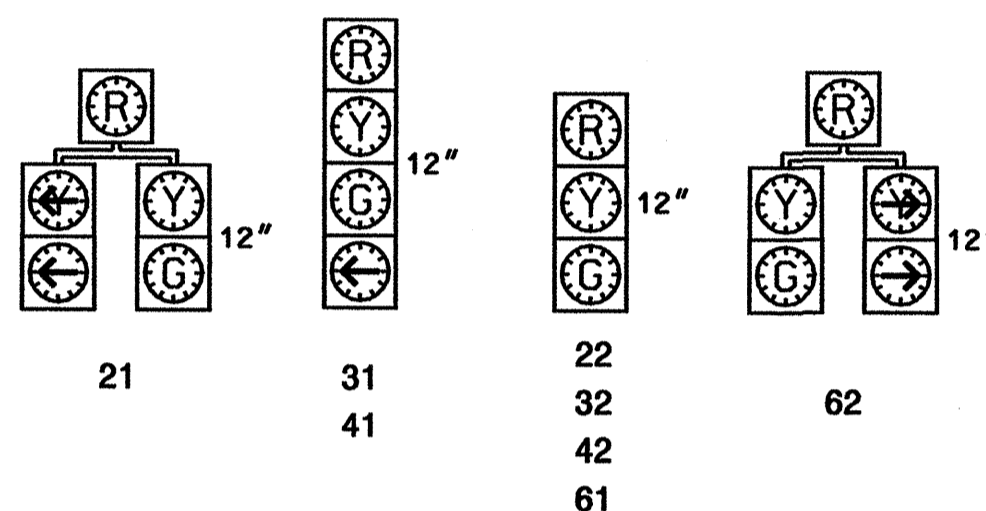
PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE	PHASE				
	Ø 2+5	Ø 2+6	Ø 3	Ø 4	FLASH
21	G	G	R	R	Y
22	G	G	R	R	Y
31	R	R	G	R	R
32	R	R	G	R	R
41	R	R	R	G	R
42	R	R	R	G	R
61	R	G	R	R	Y
62	R	G	R	R	Y

SIGNAL FACE I.D.

⊙ Denotes L.E.D.



2070L LOOP & DETECTOR INSTALLATION											
INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	TURNS	DISTANCE FROM STOPBAR (FT)	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY SYSTEM LOOP	STRETCH TIME	DELAY TIME	NEW CARD
2A	6x6	4	70	Y	2	Y	Y	-	-	-	Y
3A	6x40	2-4-2	+5	Y	3	Y	-	-	-	10	Y
4A	6x40	2-4-2	+5	Y	4	Y	-	-	-	10	Y
5A	6x40	2-4-2	+10	Y	2	Y	Y	-	-	3	Y
					5	Y	-	-	15	Y	
6A	6x40	2-4-2	+5	Y	6	Y	-	-	-	-	Y

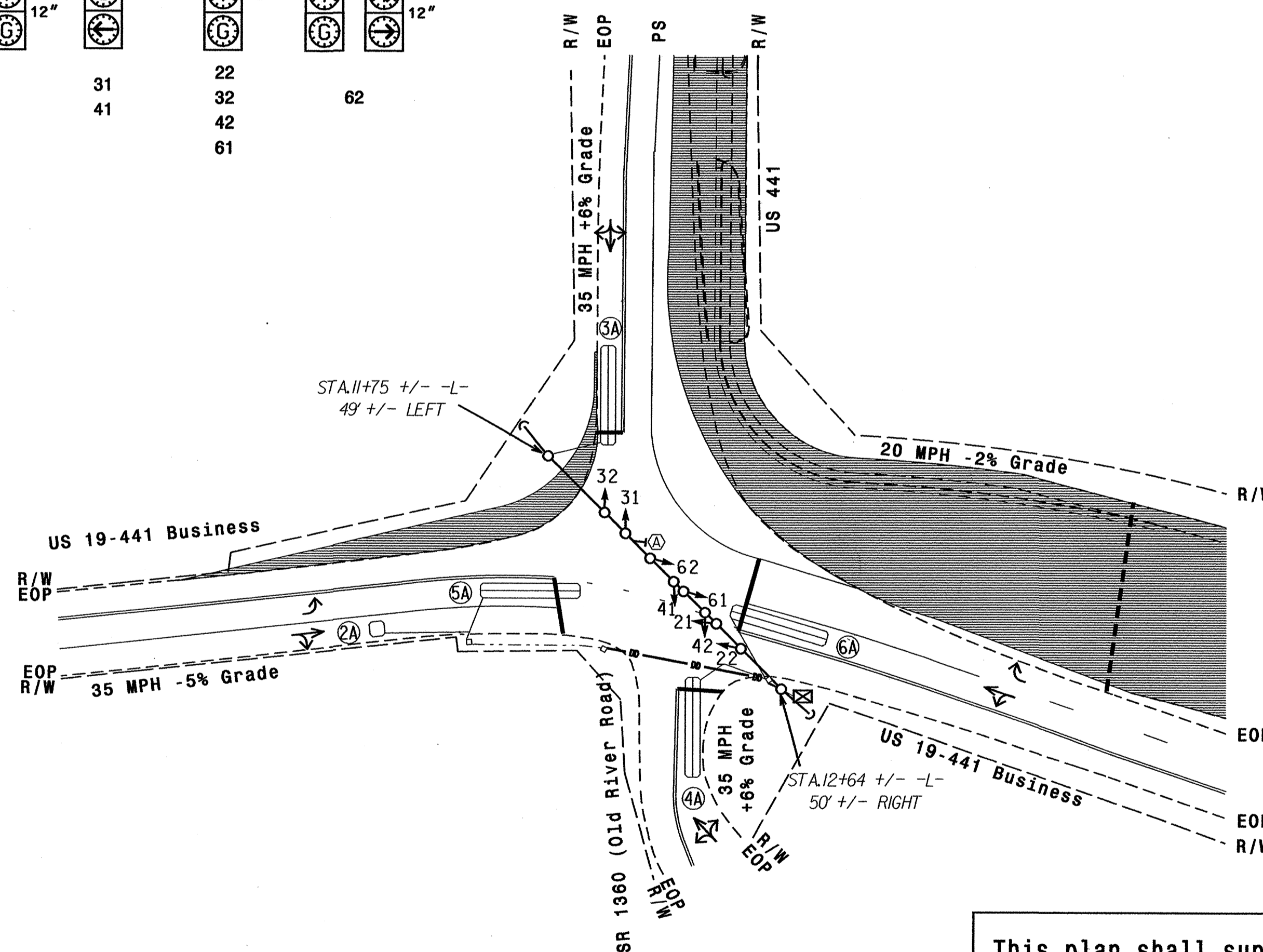
4 Phase Fully Actuated (Time-Based System)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Omit phase 5 during phase 6 on.
- Program controller to clear from phase 2+6 to phase 2+5 by progressing through phase 4 (see Electrical Details).
- The order of phase 3 and phase 4 may be reversed.
- Set all detector units to presence mode.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

FEATURE	PHASE				
	2	3	4	5	6
Min Green 1 *	10	7	7	7	10
Extension 1 *	3.0	2.0	2.0	2.0	2.0
Max Green 1 *	45	20	15	15	45
Yellow Clearance	4.2	3.5	3.5	3.1	3.0
Red Clearance	1.4	2.7	1.9	1.6	2.3
Walk 1 *	-	-	-	-	-
Don't Walk 1	-	-	-	-	-
Seconds Per Actuation *	-	-	-	-	-
Max Variable Initial *	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-
Time To Reduction *	-	-	-	-	-
Minimum Gap	-	-	-	-	-
Recall Mode	SOFT RECALL	-	-	-	SOFT RECALL
Vehicle Call Memory	YELLOW	-	-	-	YELLOW
Dual Entry	ON	-	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON

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



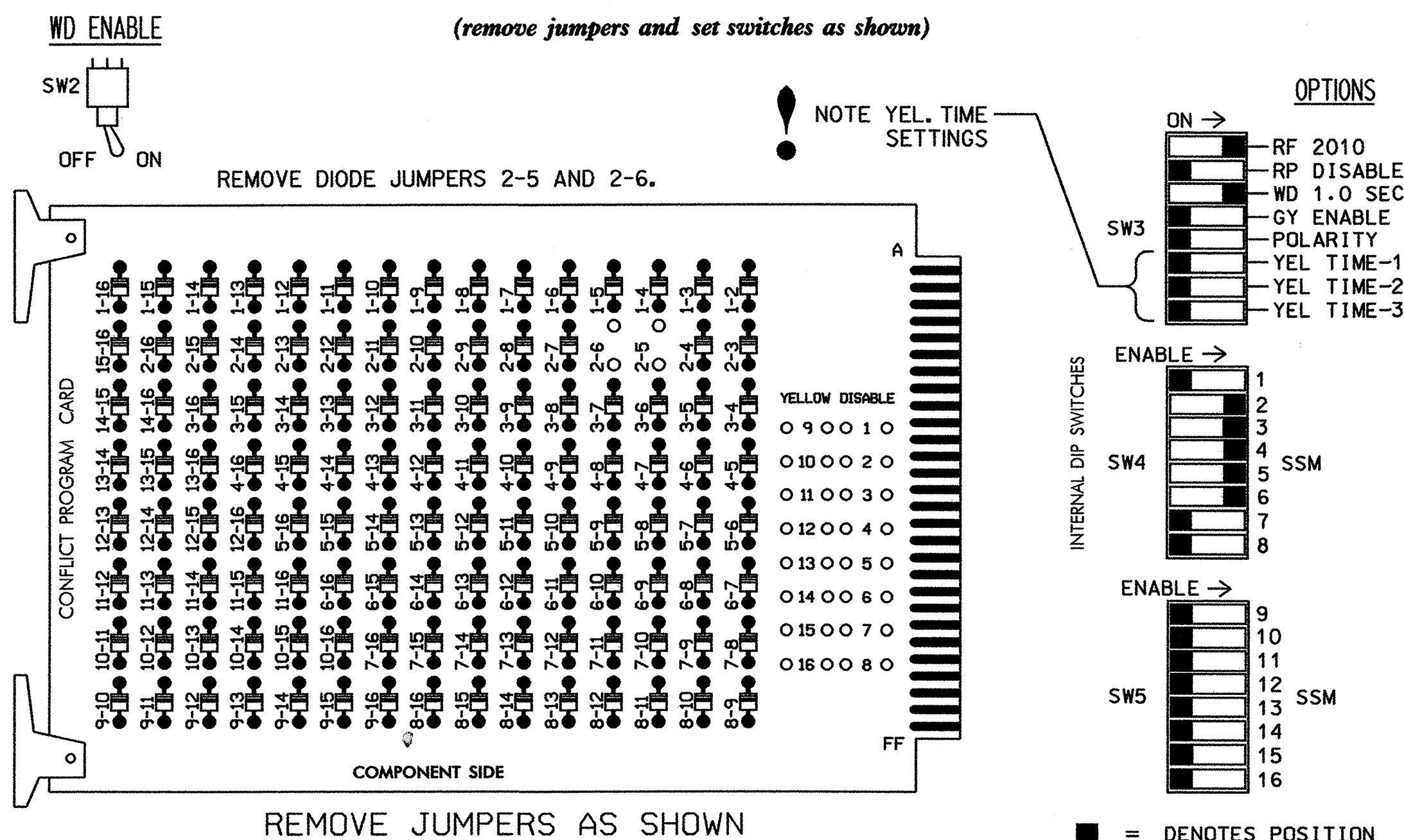
This plan shall supersede the plan signed and sealed on 4/4/03.

LEGEND	
PROPOSED	EXISTING
○→ Traffic Signal Head	●→ Modified Signal Head
○→ Pedestrian Signal Head With Push Button & Sign	N/A
□→ Signal Pole with Guy	□→ Signal Pole with Sidewalk Guy
□→ Inductive Loop Detector	□→ Controller & Cabinet
□→ Junction Box	□→ 2-in Underground Conduit
N/A	→ Right of Way with Marker
→ Directional Arrow	→ Pavement Marking Arrow
○→ Pedestrian Signal Pedestal	○→ Metal Pole with Mastarm
N/A	▭→ Wheelchair Ramp
▭→ Construction Zone	N/A
⊙→ Right Arrow "ONLY" Sign (R3-5R)	⊙→ Directional Drill
→ Directional Drill	N/A

Signal Upgrade- Temporary 1

	<p>US 19-441 Business at US 441/SR 1360(Old River Road)</p>		<p>SEAL</p>
	<p>Division 14 Swain County Cherokee</p> <p>PLAN DATE: September 2006 REVIEWED BY: D Y Ishak</p> <p>PREPARED BY: R M Duffy REVIEWED BY:</p>	<p>REVISIONS</p> <p>INIT. DATE</p>	
<p>122 N. McDowell St., Raleigh, NC 27603</p>		<p>SCALE 0 40</p> <p>1"=40'</p>	<p>SIG. INVENTORY NO. 14-0400T1</p>

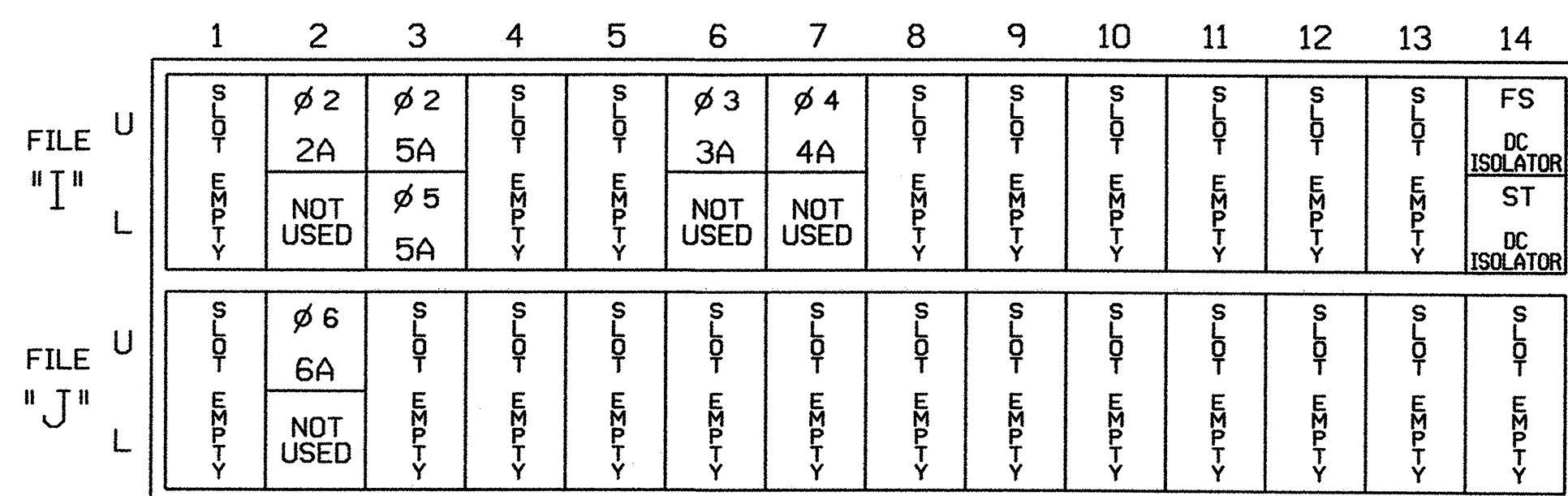
EDI MODEL 2010ECL CONFLICT MONITOR PROGRAMMING DETAIL



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.

INPUT FILE POSITION LAYOUT (front view)



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

FS = FLASH SENSE
ST = STOP TIME

NOTES

- TO PREVENT "FLASH-CONFLICT" PROBLEMS, INSERT RED FLASH PROGRAM BLOCKS FOR ALL UNUSED VEHICLE LOAD SWITCHES IN THE OUTPUT FILE. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED RED MONITOR INPUTS 1,7,8,9,10,11,12,13,14,15 & 16 TO LOAD SWITCH AC+ PER MANUFACTURER INSTRUCTIONS.
- PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR START-UP IN GREEN.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
- PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR DUAL ENTRY.
- PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR 'SOFT RECALL'.
- SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.

EQUIPMENT INFORMATION

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

INPUT FILE CONNECTION & PROGRAMMING CHART

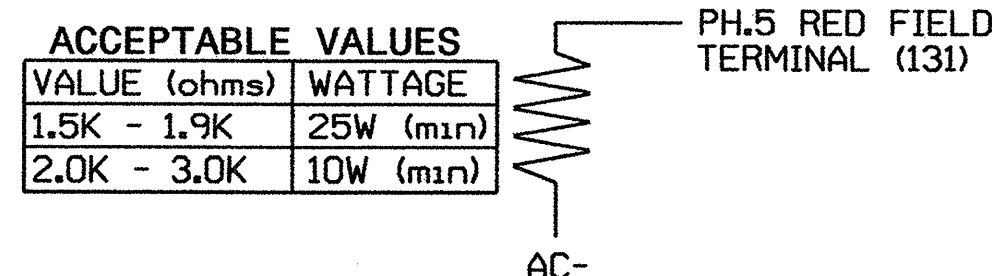
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A	TB2-5,6	I2U	39	1	2	2	Y	Y			
5A ¹	TB2-9,10	I3U	63	25	32	2	Y	Y	Y		3
	TB2-11,12	I3L	76	38	42	5	Y	Y			15
3A	TB4-9,10	I6U	41	3	4	3	Y	Y			10
4A	TB6-1,2	I7U	65	27	34	4	Y	Y			10
6A	TB3-5,6	J2U	40	2	6	6	Y	Y			

¹ADD JUMPERS FROM TB2-9 TO TB2-11, AND FROM TB2-10 TO TB2-12.

INPUT FILE POSITION LEGEND: J2L



LOAD RESISTOR INSTALLATION DETAIL



NOTE: THE PURPOSE OF THIS RESISTOR IS TO LOAD THE CHANNEL RED MONITOR INPUT IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON THIS CHANNEL, WHICH DOES NOT USE THE RED DISPLAY IN THE FIELD.

FIELD CONNECTION 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	31	32	62	41	42	NU	21	61,62	NU	NU	NU
GREEN		130		118	118		103	103			136			
YELLOW		129		117	117		102	102			135			
RED		128		116	116		101	101		*	134			
RED ARROW														
YELLOW ARROW							117				132			
GREEN ARROW				118	118	103					133			
PEDESTAL														
PEDESTAL														

NU = NOT USED

* DENOTES INSTALL LOAD RESISTOR. SEE LOAD RESISTOR INSTALLATION DETAIL THIS SHEET.

BACK-UP PROTECTION PROGRAMMING DETAIL

(program controller as shown below)

- FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE DYNAMIC/BACKUP CONTROL FUNCTION 1.
- FROM PHASE CONTROL FUNCTIONS MENU PRESS '2' (DYNAMIC/BACKUP CONTROL FUNCTIONS).

DYNAMIC/BACKUP CONTROL FUNCTION #01
OVERLAPS: ABCDEFGHIJKLMNPO
IF OVERLAPS ARE ACTIVE :
OR PHASES: 12345678910111213141516
IF PHASES ARE ON: X
OMIT PHASES: X
CALL PHASES: X

BACKUP PROTECTION PROGRAMMING COMPLETE

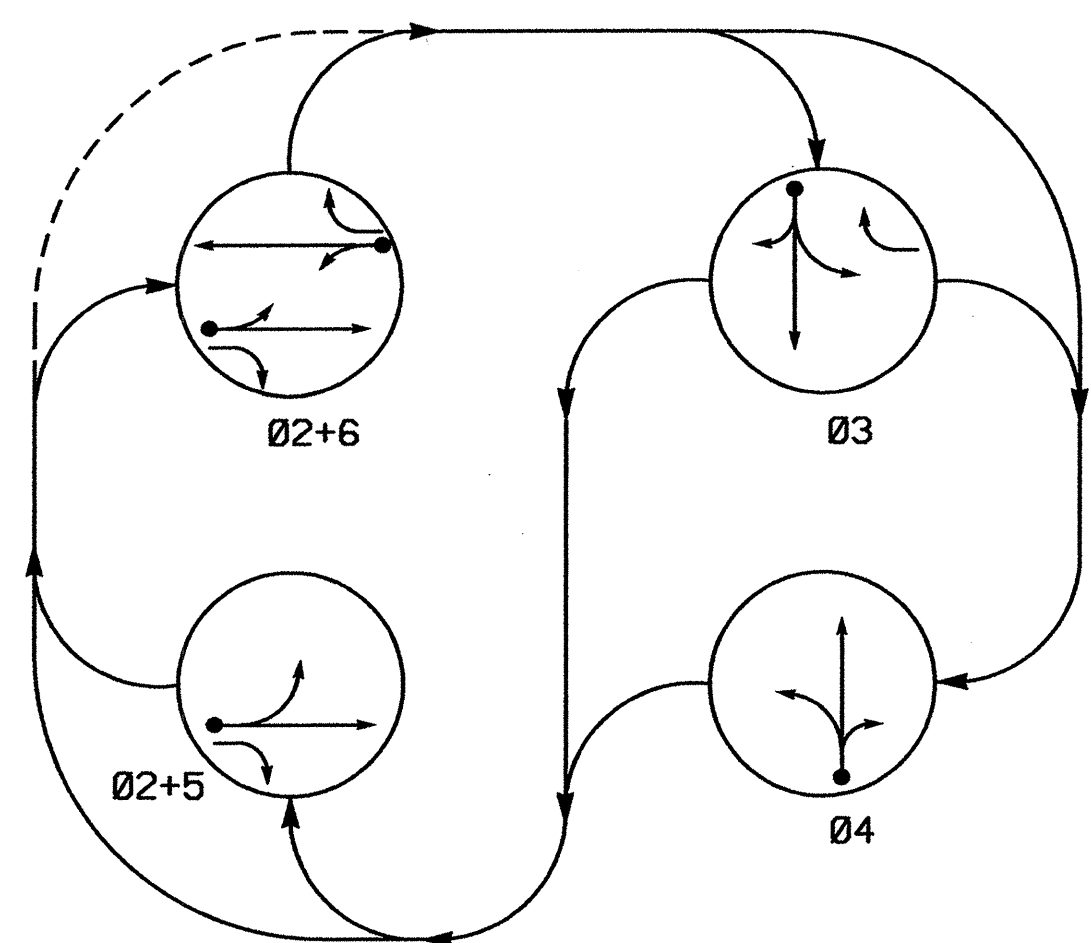
THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 14-0400T1
DESIGNED: SEPTEMBER 2006
SEALED: 25 SEPTEMBER '06
REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED FEBRUARY 2002 AND SEALED 4/9/03

TEMPORARY 1

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared in the Offices of: 122 N. McDowell St., Raleigh, NC 27603	US 19-441 BUSINESS AT US 441/SR 1360 (OLD RIVER ROAD)		SEAL JOHN T. ROWE, JR. ENGINEER
	DIVISION 14 SWAIN COUNTY CHEROKEE PLAN DATE: SEPTEMBER 2006 REVIEWED BY: <i>[Signature]</i> PREPARED BY: F.E. RUSS REVIEWED BY:	REVISIONS: _____ INIT. DATE _____ _____ _____	
SIGNATURE: <i>[Signature]</i> DATE: 9-28-06 SIG. INVENTORY NO. 14-0400T1			

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE				
	02+5	02+6	03	04	FLASH
21	Y	G	R	R	Y
22	G	G	R	R	Y
31	R	R	G	R	R
32	R	R	G	R	R
41	R	R	R	G	R
42	R	R	R	G	R
61	R	G	R	R	Y
62	R	G	R	R	Y

2070L LOOP & DETECTOR INSTALLATION

LOOP	SIZE (FT)	TURNS	DISTANCE FROM STOPBAR (FT)	DETECTOR PROGRAMMING								
				NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	SYSTEM LOOP	STRETCH TIME	DELAY TIME	NEW CARD
2A	6x6	4	70	-	DISABLE	Y	Y	-	-	-	-	-
3A	6x40	2-4-2	0	Y	3	Y	Y	-	-	-	10	-
4A	6x40	2-4-2	+5	-	4	Y	Y	-	-	-	10	-
5A	6x40	2-4-2	+10	Y	2	Y	Y	-	-	-	-	-
					5	Y	Y	-	-	-	15	-
6A	6x40	2-4-2	+5	Y	6	Y	Y	-	-	-	-	-

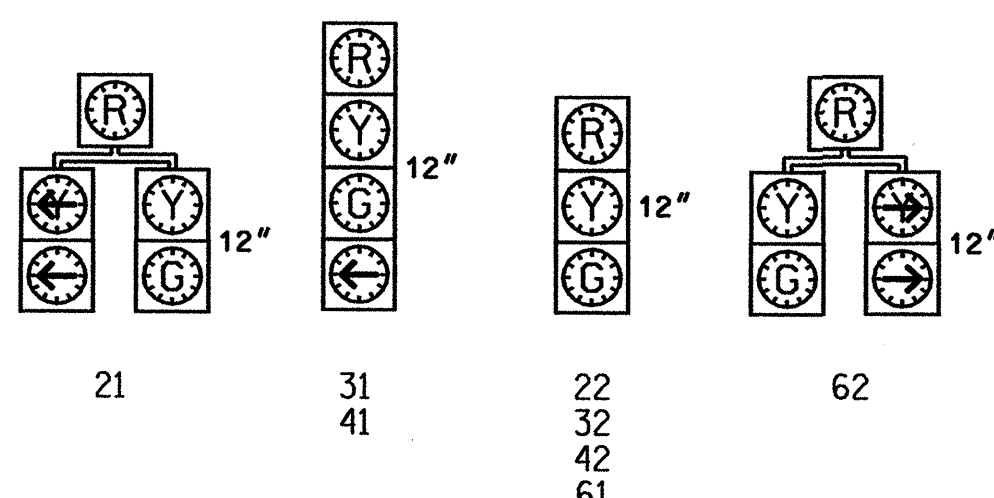
4-Phase Fully Actuated (Time-Based System)

NOTES

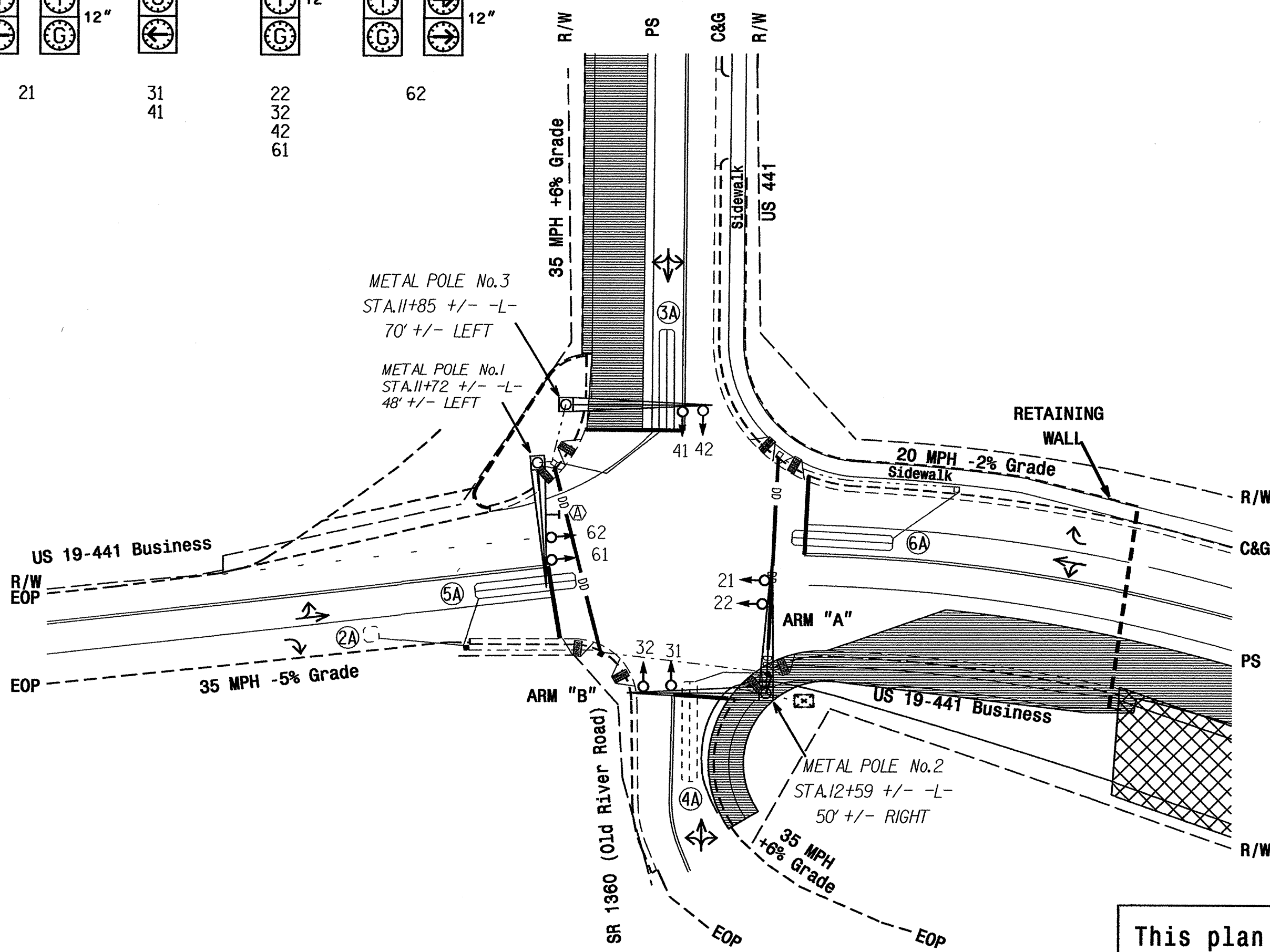
- Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- Omit phase 5 during phase 6 on.
- Program controller to clear from phase 2+6 to phase 2+5 by progressing through phase 4 (see Electrical Details).
- The order of phase 3 and phase 4 may be reversed.
- Set all detector units to presence mode.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

SIGNAL FACE I.D.

Denotes L.E.D.



21 31 22 62
41 41 32 32
61 61 42 42
61 61



2070L TIMING CHART

FEATURE	PHASE				
	2	3	4	5	6
Min Green 1 *	10	7	7	7	10
Extension 1 *	2.0	2.0	2.0	2.0	2.0
Max Green 1 *	45	20	15	15	45
Yellow Clearance	4.2	3.5	3.5	3.1	3.0
Red Clearance	1.5	1.7	1.8	2.4	2.4
Walk 1 *	-	-	-	-	-
Don't Walk 1	-	-	-	-	-
Seconds Per Actuation *	-	-	-	-	-
Max Variable Initial *	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-
Time To Reduction *	-	-	-	-	-
Minimum Gap	-	-	-	-	-
Recall Mode	SOFT RECALL	-	-	-	SOFT RECALL
Vehicle Call Memory	YELLOW	-	-	-	YELLOW
Dual Entry	ON	-	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON

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

LEGEND

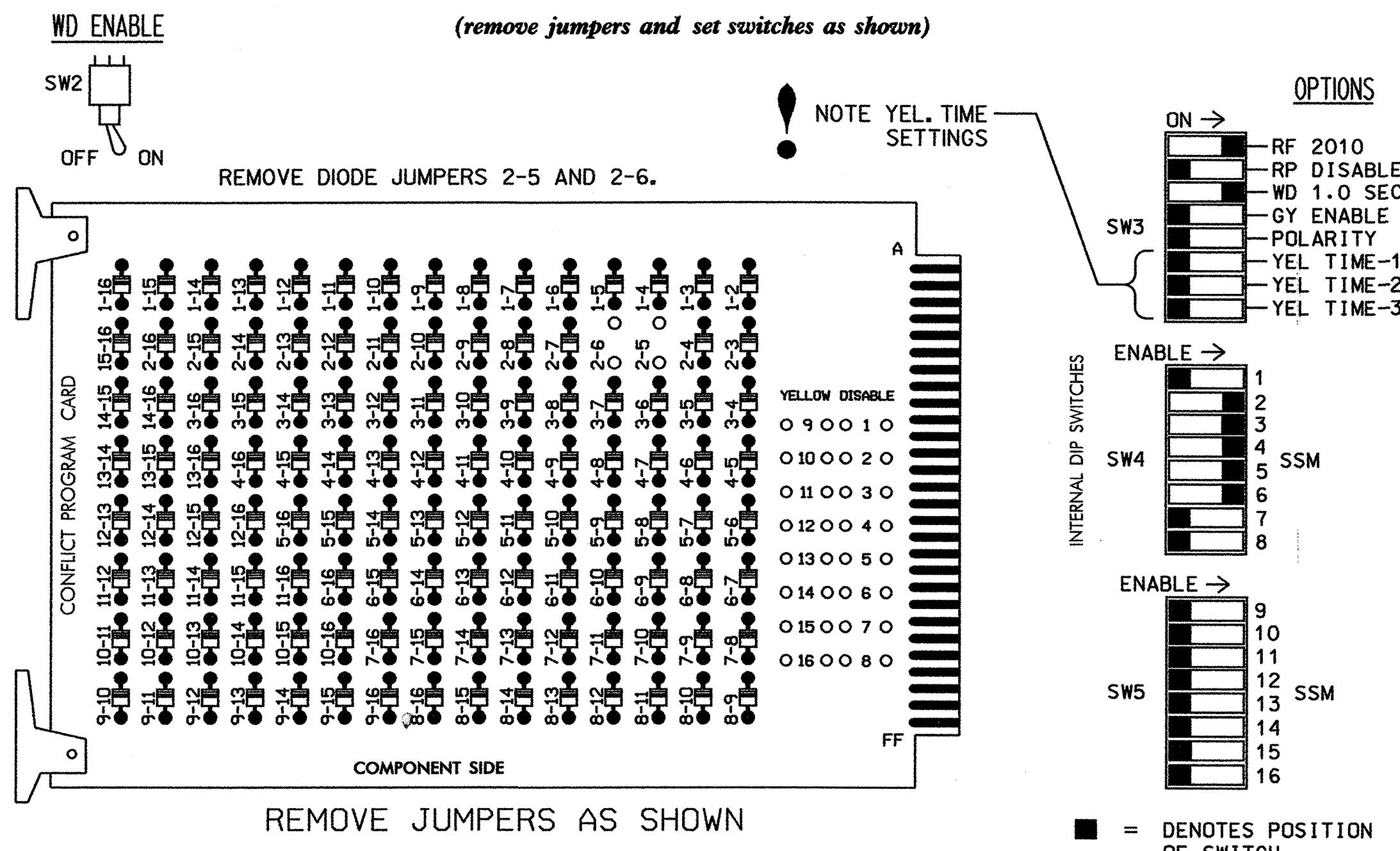
	Proposed Traffic Signal Head		Existing Traffic Signal Head
	Proposed Modified Signal Head		N/A
	Proposed Pedestrian Signal Head With Push Button & Sign		Existing Pedestrian Signal Head
	Proposed Signal Pole with Guy		Existing Signal Pole with Guy
	Proposed Signal Pole with Sidewalk Guy		Existing Signal Pole with Sidewalk Guy
	Proposed Inductive Loop Detector		Existing Inductive Loop Detector
	Proposed Controller & Cabinet		Existing Controller & Cabinet
	Proposed Junction Box		Existing Junction Box
	Proposed 2-in Underground Conduit		Existing 2-in Underground Conduit
	Proposed Right of Way with Marker		Existing Right of Way with Marker
	Proposed Directional Arrow		Existing Directional Arrow
	Proposed Pavement Marking Arrow		Existing Pavement Marking Arrow
	Proposed Pedestrian Signal Pedestal		Existing Pedestrian Signal Pedestal
	Proposed Metal Pole with Mastarm		Existing Metal Pole with Mastarm
	Proposed Wheelchair Ramp		Existing Wheelchair Ramp
	Proposed Construction Zone		N/A
	Proposed Bridge Removal		N/A
	Proposed Right Arrow "ONLY" Sign (R3-SR)		Existing Right Arrow "ONLY" Sign (R3-SR)
	Proposed Directional Drill		Existing Directional Drill

This plan shall supersede the plan signed and sealed on 04/04/03.

Signal Upgrade- Temporary 2

	<p>US 19-441 Business at US 441/SR 1360 (Old River Road)</p>		SEAL						
	<p>Division 14 Swain County Cherokee</p>	<p>DATE: September 2006 REVIEWED BY: D Y Ishak</p>							
	<p>PREPARED BY: R M Duffy REVIEWED BY:</p>	<p>SIGNATURE: DATE: 25 SEP 2006</p>							
<p>122 N. McDowell St., Raleigh, NC 27603</p>	<p>SCALE: 1"=40'</p>	<table border="1"> <tr> <th>REVISIONS</th> <th>INIT.</th> <th>DATE</th> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>	REVISIONS	INIT.	DATE				<p>SIG. INVENTORY NO. 14-0400T2</p>
REVISIONS	INIT.	DATE							

EDI MODEL 2010ECL CONFLICT MONITOR PROGRAMMING DETAIL

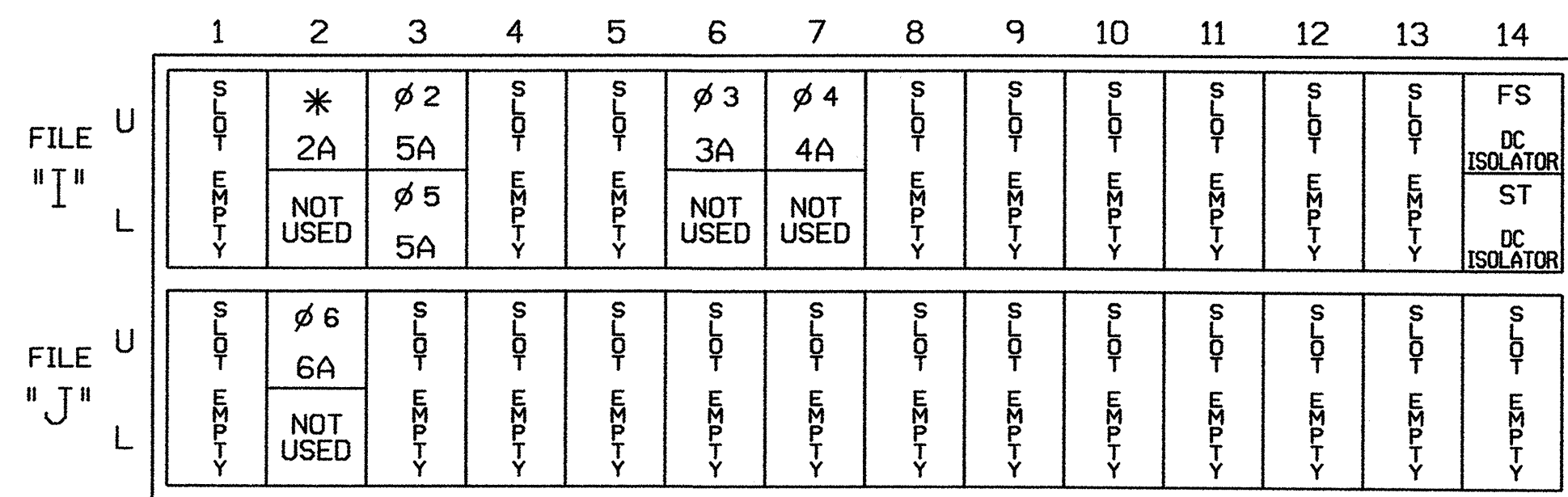


NOTES:

- 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.

INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME

NOTES

- TO PREVENT "FLASH-CONFLICT" PROBLEMS, INSERT RED FLASH PROGRAM BLOCKS FOR ALL UNUSED VEHICLE LOAD SWITCHES IN THE OUTPUT FILE. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED RED MONITOR INPUTS 1,7,8,9,10,11,12,13,14,15 & 16 TO LOAD SWITCH AC+ PER MANUFACTURER INSTRUCTIONS.
- PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR START-UP IN GREEN.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
- PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR DUAL ENTRY.
- PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR 'SOFT RECALL'.
- SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.

EQUIPMENT INFORMATION

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

EXISTING FROM TEMPORARY 1*

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A	TB2-5,6	I2U	39	1	2 *	DISABLE	Y	Y			
5A ¹	TB2-9,10	I3U	63	25	32	2	Y	Y			
	TB2-11,12	I3L	76	38	42	5	Y	Y			15
3A	TB4-9,10	I6U	41	3	4	3	Y	Y			10
4A	TB6-1,2	I7U	65	27	34	4	Y	Y			10
6A	TB3-5,6	J2U	40	2	6	6	Y	Y			

¹ADD JUMPERS FROM TB2-9 TO TB2-11, AND FROM TB2-10 TO TB2-12.

FIELD CONNECTION 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	31	32	62	41	42	NU	21	61,62	NU
GREEN		130		118	118		103	103			136	
YELLOW		129		117	117		102	102			135	
RED		128		116	116		101	101	*		134	
RED ARROW												
YELLOW ARROW						117					132	
GREEN ARROW				118	118	103					133	
PEDESTAL												
PEDESTAL												

NU = NOT USED

* DENOTES INSTALL LOAD RESISTOR. SEE LOAD RESISTOR INSTALLATION DETAIL THIS SHEET.

BACK-UP PROTECTION PROGRAMMING DETAIL

(program controller as shown below)

- FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE DYNAMIC/BACKUP CONTROL FUNCTION 1.
- FROM PHASE CONTROL FUNCTIONS MENU PRESS '2' (DYNAMIC/BACKUP CONTROL FUNCTIONS).

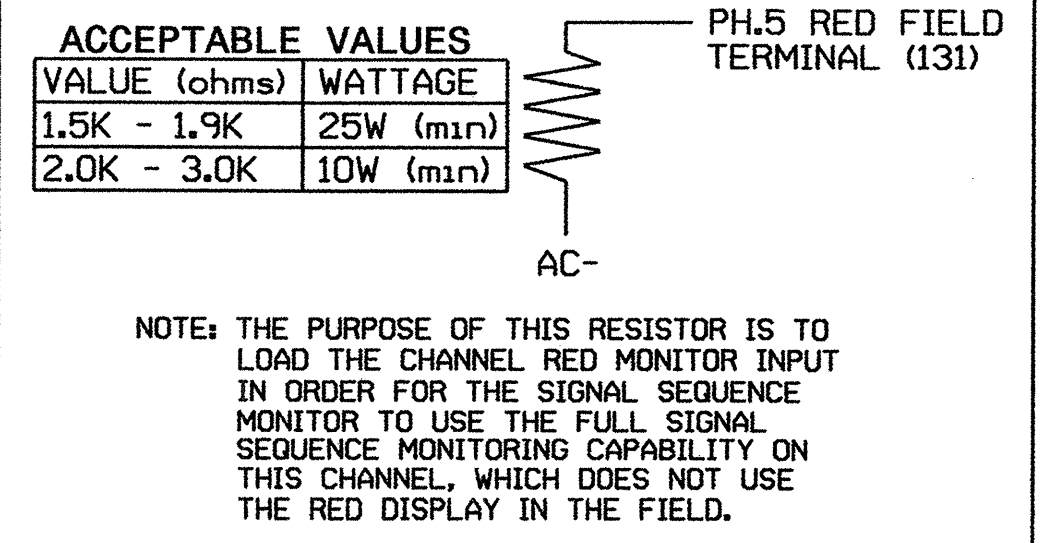
DYNAMIC/BACKUP CONTROL FUNCTION #01
OVERLAPS: ABCDEFGHIJKLMNOP
IF OVERLAPS ARE ACTIVE :
OR PHASES: 12345678910111213141516
IF PHASES ARE ON: X
OMIT PHASES: X
CALL PHASES: X

BACKUP PROTECTION PROGRAMMING COMPLETE

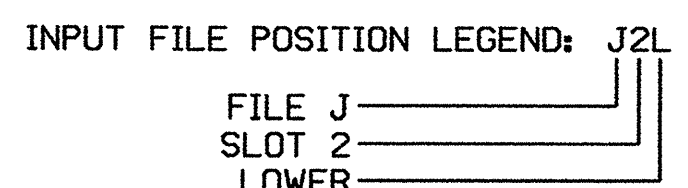
THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 14-0400T2
DESIGNED: SEPTEMBER 2006
SEALED: 25 SEPTEMBER '06
REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED FEBRUARY 2002 AND SEALED 4/9/03

LOAD RESISTOR INSTALLATION DETAIL



* LOOP '2A' DISABLE:
REMOVE DETECTOR CARD FROM INPUT FILE SLOT '12' OR DISABLE DETECTOR NO.2 IN CONTROLLER PROGRAMMING DURING THIS TEMPORARY 2 ONLY.



TEMPORARY 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 19-441 BUSINESS AT US 441/SR 1360 (OLD RIVER ROAD)

DIVISION 14 SWAIN COUNTY CHEROKEE

PLAN DATE: SEPTEMBER 2006 REVIEWED BY: YLRH

PREPARED BY: F.E. RUSS REVIEWED BY:

REVISIONS: INIT. DATE

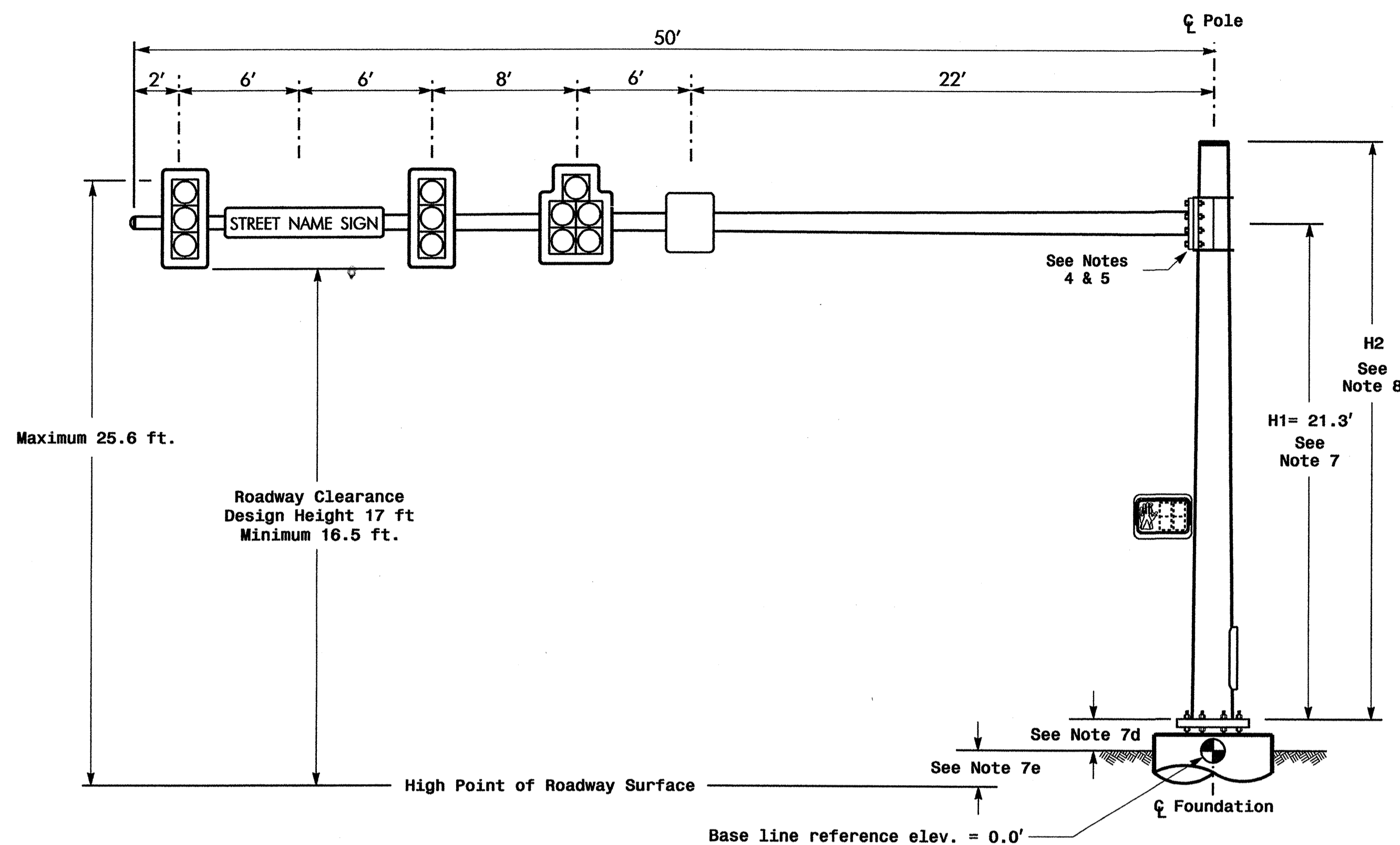
122 N. McDowell St., Raleigh, NC 27603

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

Signature: John T. Rowe Jr. 9-28-06

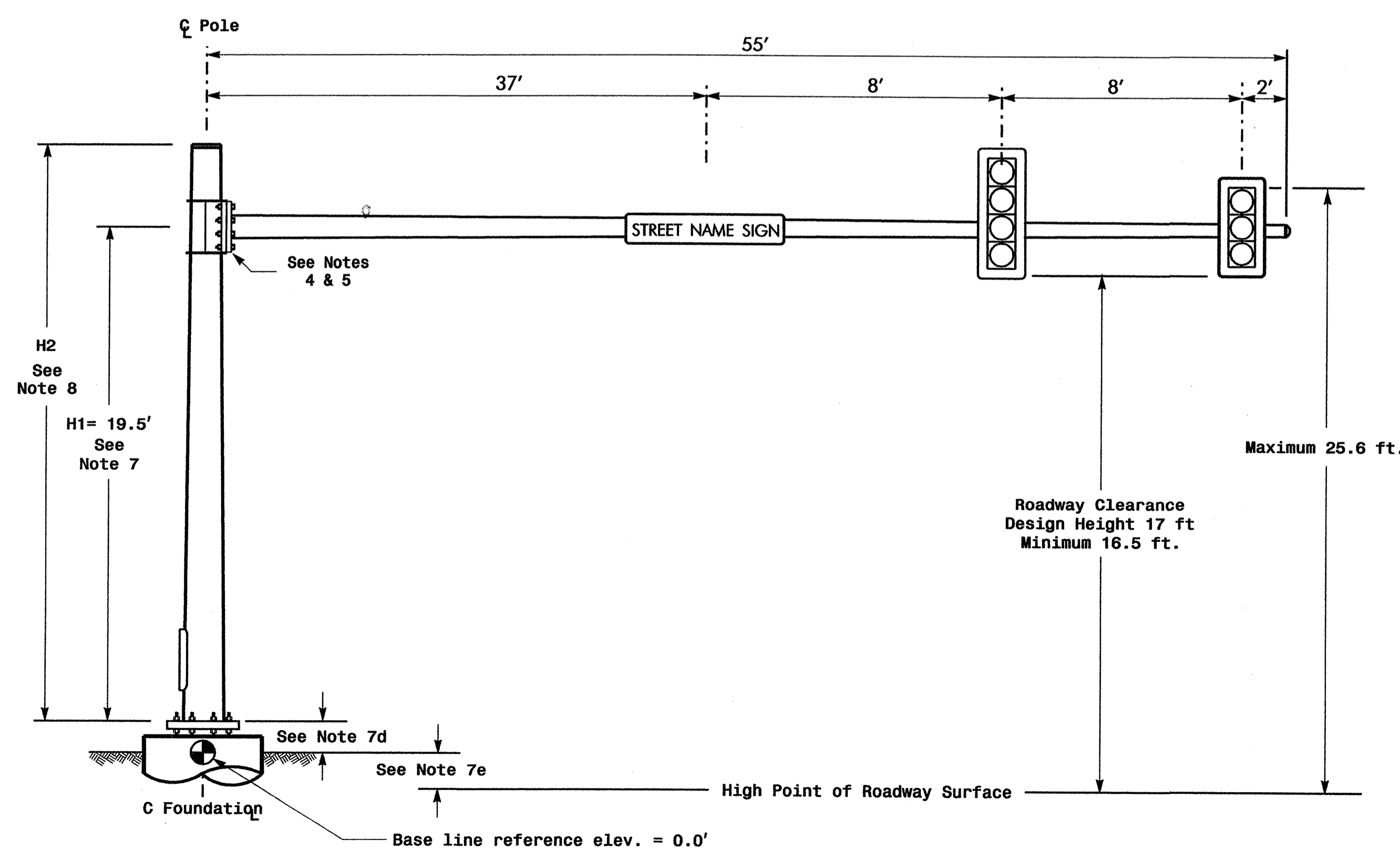
SIG. INVENTORY NO. 14-0400T2

Design Loading for METAL POLE NO. 1



Elevation View

Design Loading for METAL POLE NO. 3



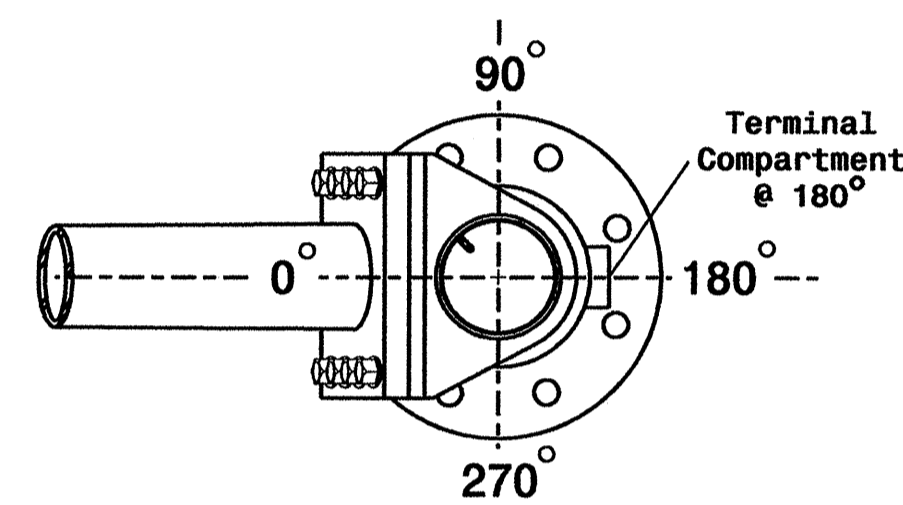
Elevation View

SPECIAL NOTE

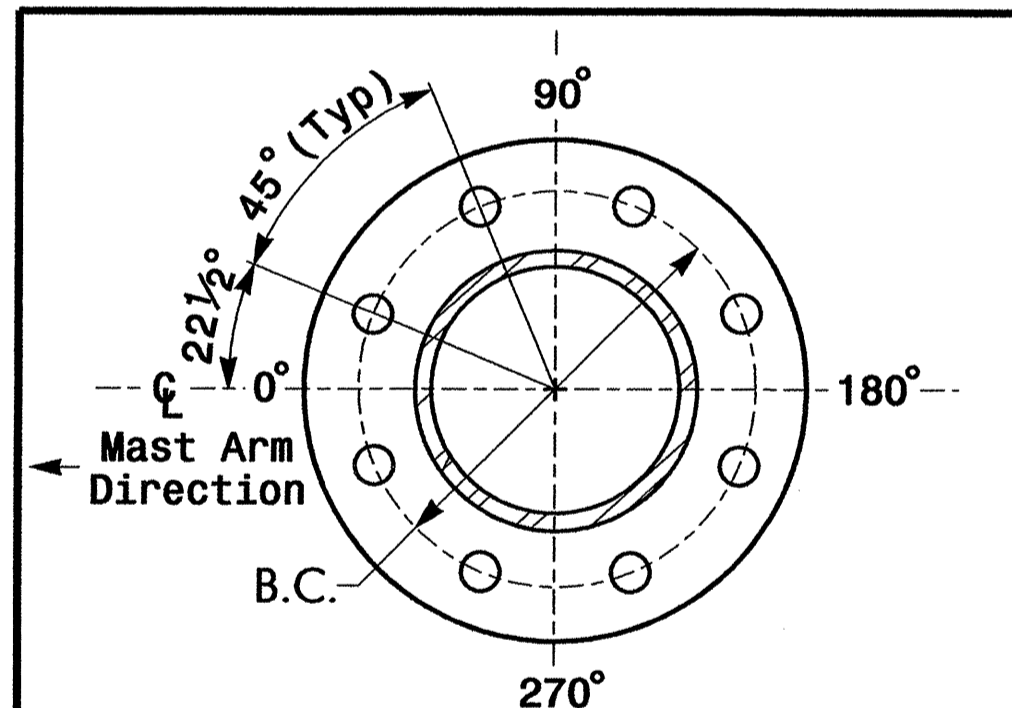
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

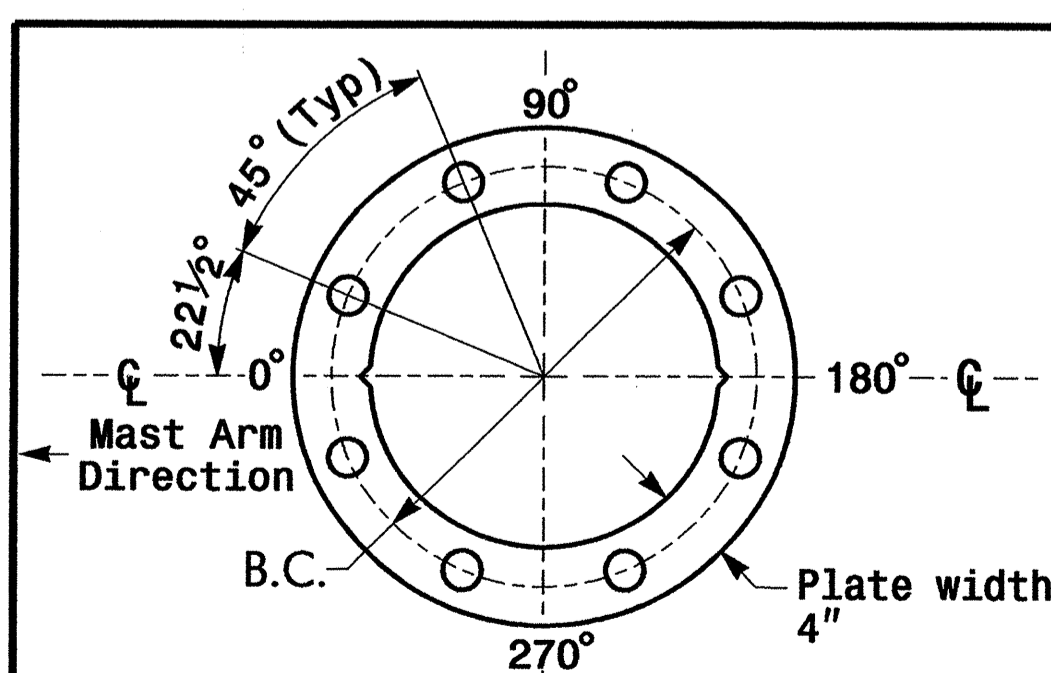
Elevation Differences for:	Pole 1	Pole 3
Baseline reference point at Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+2.8 ft.	+0.5ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A



POLE RADIAL ORIENTATION



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
	12"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	12"-4 SECTION-WITH BACKPLATE AND ASTRO-BRAC	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	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

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>

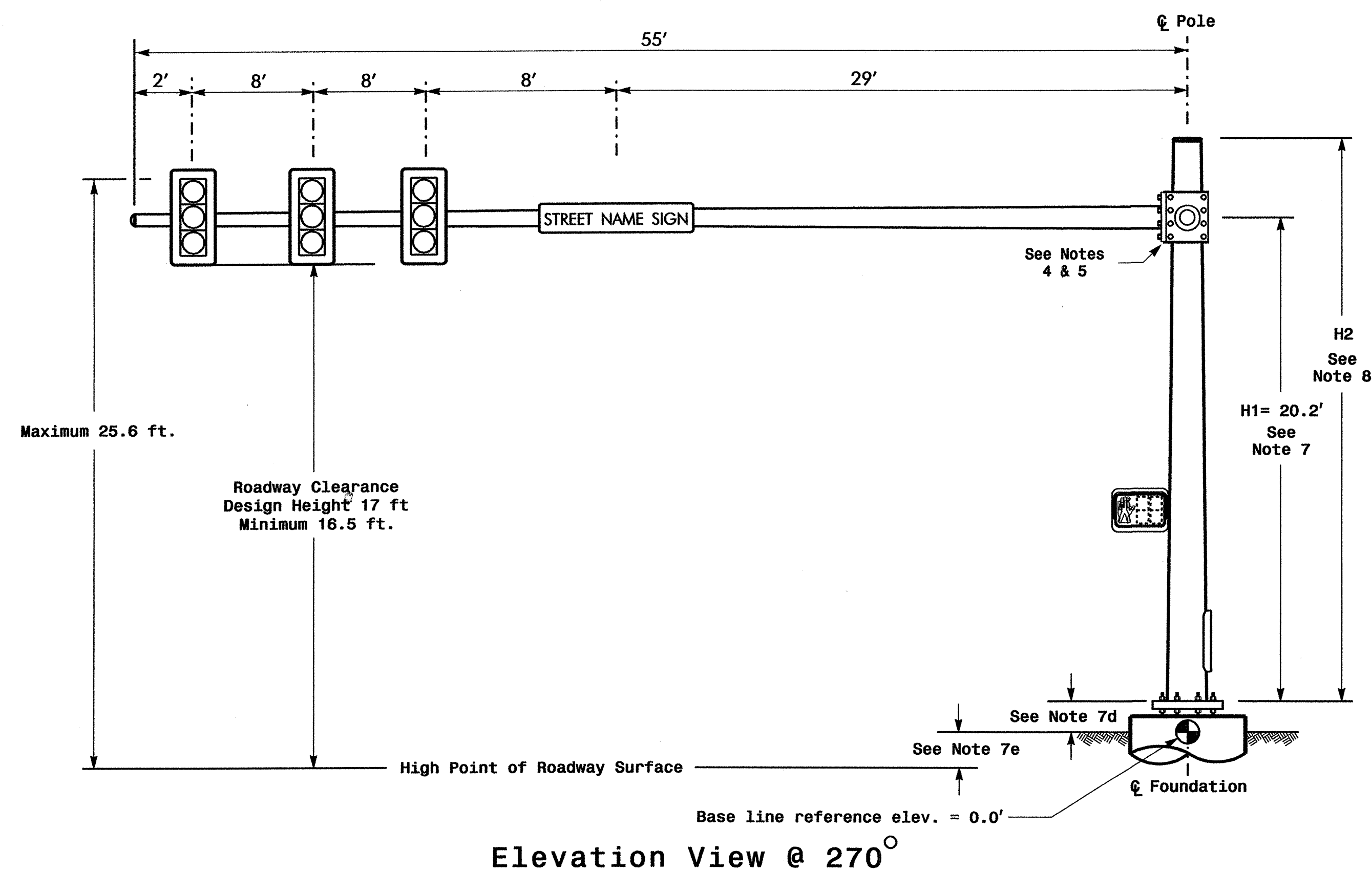
Design Requirements

- 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 5 (120 mph)

	Prepared in the Office of: US 19-441 Business at US 441/SR 1360 (Old River Road)		SEAL
	Division 14 Swain County Cherokee County PLAN DATE: October 2006 PREPARED BY: TS Thigpen	REVIEWED BY: RM Duffy REVIEWED BY: DSSHAK	
SCALE: 0 N/A N/A		REVISIONS	INIT. DATE
SIG. INVENTORY NO. 14-0400		SIGNATURE	DATE

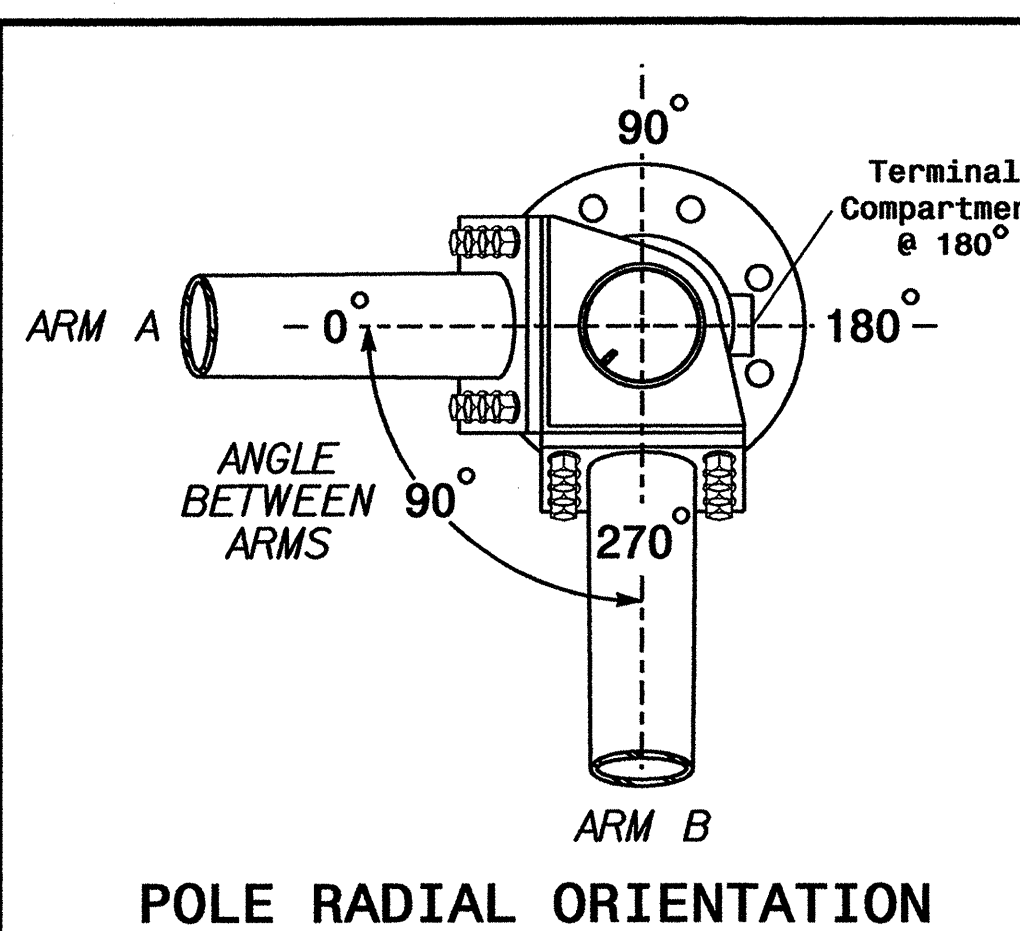
Design Loading for METAL POLE NO. 2, MAST ARM A



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

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at ϕ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+1.7 ft.	+1.7 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A



MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE AND ASTRO-BRAC	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	5.0 S.F.	24.0" W X 30.0" L	11 LBS
	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 LBS

NOTES

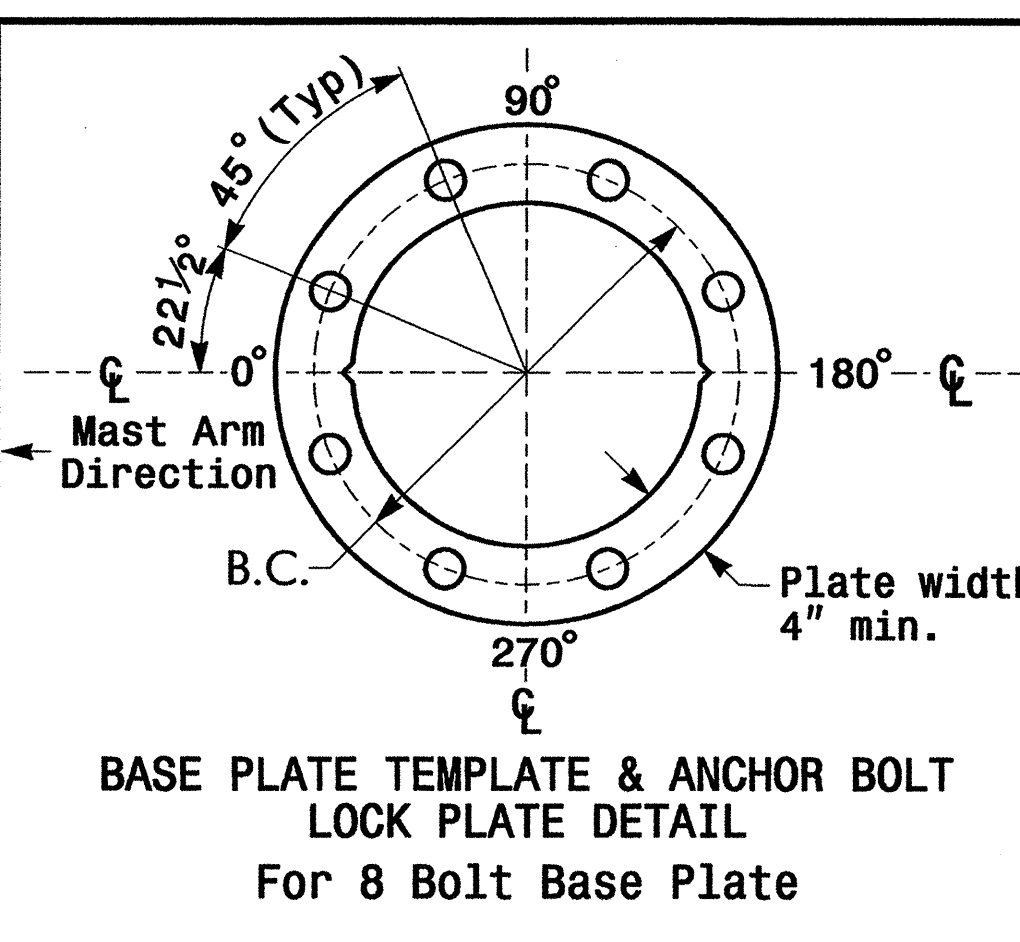
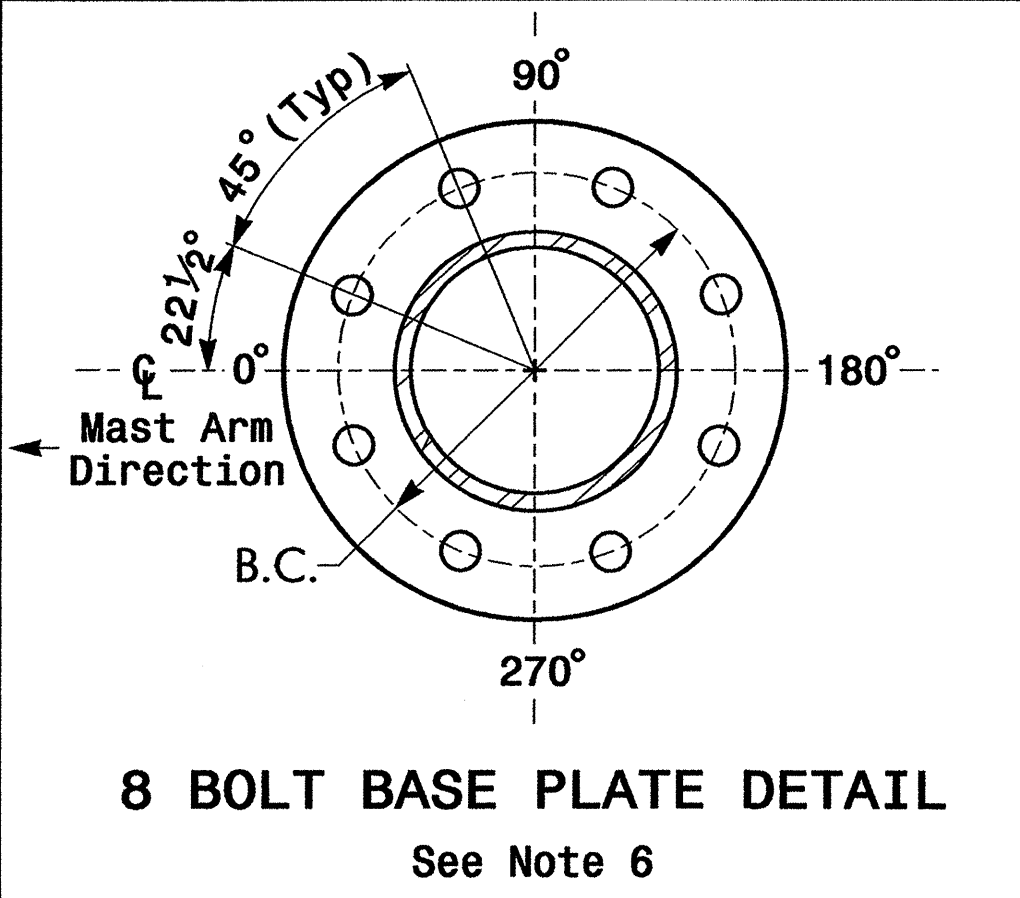
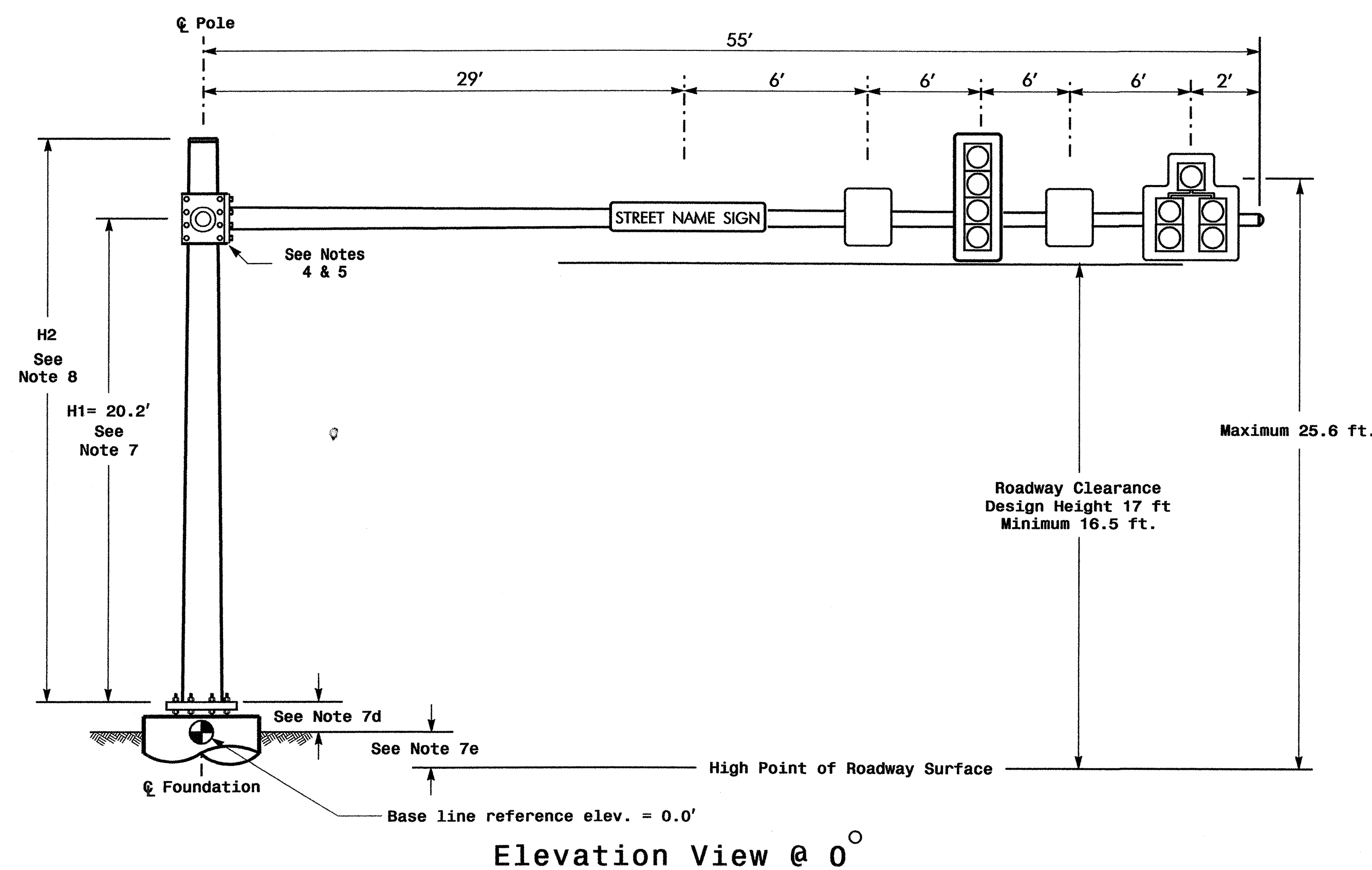
Design Reference Material

- 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. 2, MAST ARM B

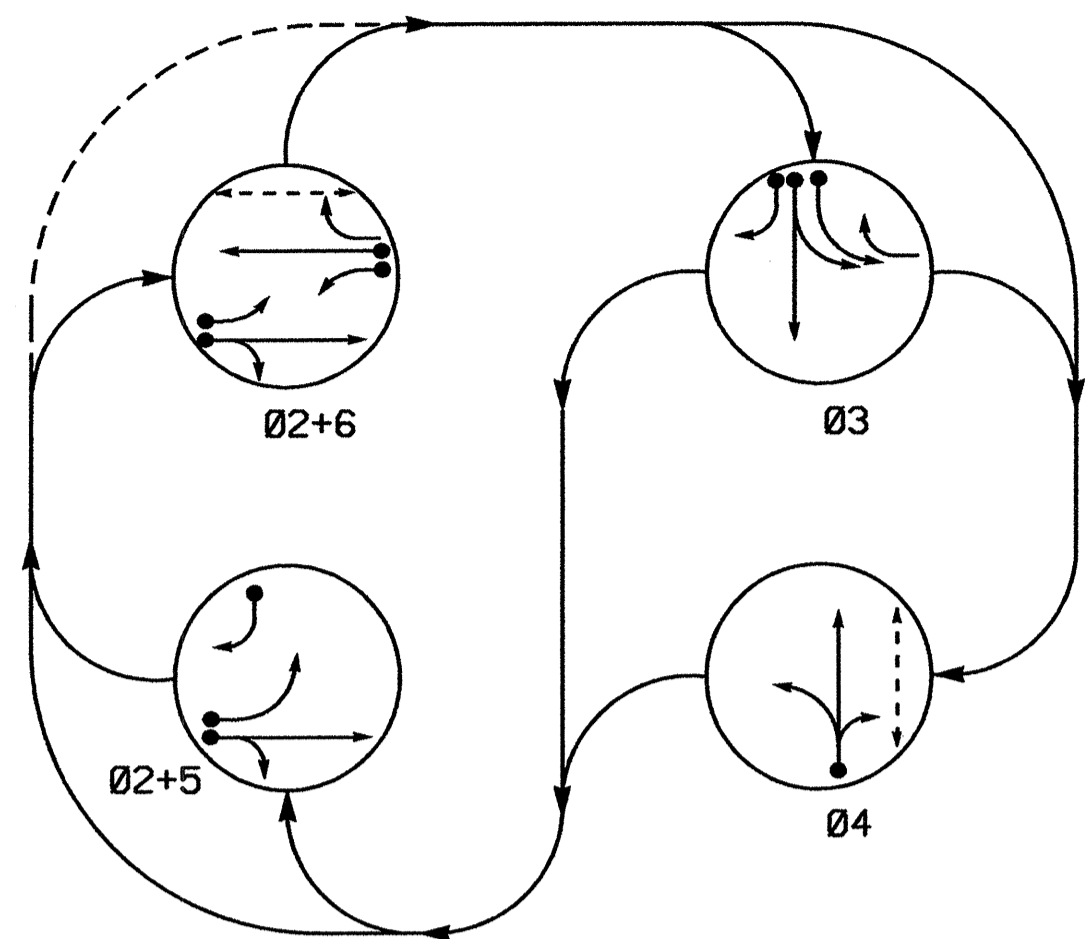


NCDOT Wind Zone 5 (120 mph)

	Prepared in the Office of: US 19-441 Business at US 441/SR 1360 (Old River Road)		SEAL
	Division 14 Swain County Cherokee County PLAN DATE: October 2006 REVIEWED BY: RM Duffy	PREPARED BY: TS Thigpen REVIEWED BY: [Signature]	
SCALE 0 N/A N/A	REVISIONS INIT. DATE	SIGNATURE DATE	SIG. INVENTORY NO. 14-0400

05-10CT-2006 14:35 s:\1\signal\workgroups\h1\p\projects\B-4696\14-0400-si\g.mpl_2006\0x.cgm

PHASING DIAGRAM



SIGNAL FACE	PHASE				
	Ø2+5	Ø2+6	Ø3	Ø4	FLASH
21	G	G	R	R	Y
22	G	G	R	R	Y
31	R	R	G	G	R
32	R	R	G	G	R
41	R	R	R	G	R
42	R	R	R	G	R
61	R	G	R	R	Y
62	R	G	R	R	Y
P41,P42	DW	DW	DW	W	DRK
P61,P62	DW	W	DW	DW	DRK

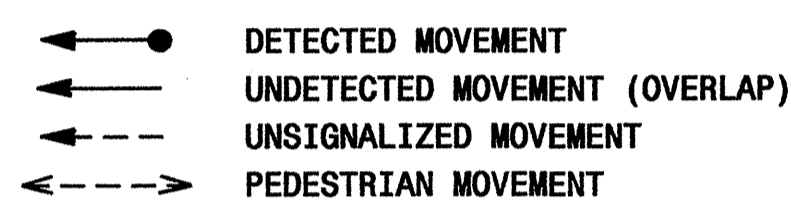
2070L LOOP & DETECTOR INSTALLATION										
LOOP	SIZE (FT)	TURNS	DISTANCE FROM STOPBAR (FT)	NEW LOOP	DETECTOR PROGRAMMING					
					PHASE	CALLING	EXTENSION	FULL TIME DELAY SYSTEM LOOP	STRETCH TIME	DELAY TIME
2A	6x6	4	70	-	2	Y	Y	-	-	-
3A	6x40	2-4-2	0	-	3	Y	Y	-	-	3
3B	6x40	2-4-2	0	Y	3	Y	Y	-	-	Y
4A	6x40	2-4-2	+5	-	4	Y	Y	-	-	10
5A	6x40	2-4-2	+10	-	2	Y	Y	Y	-	3
					5	Y	Y	-	-	15
5B	6x40	2-4-2	+5	Y	5	Y	Y	-	-	15
6A	6x6	4	70	Y	6	Y	Y	-	-	Y
6B	6x40	2-4-2	+5	Y	6	Y	Y	Y	-	3

4 Phase Fully Actuated (Time-Based System)

NOTES

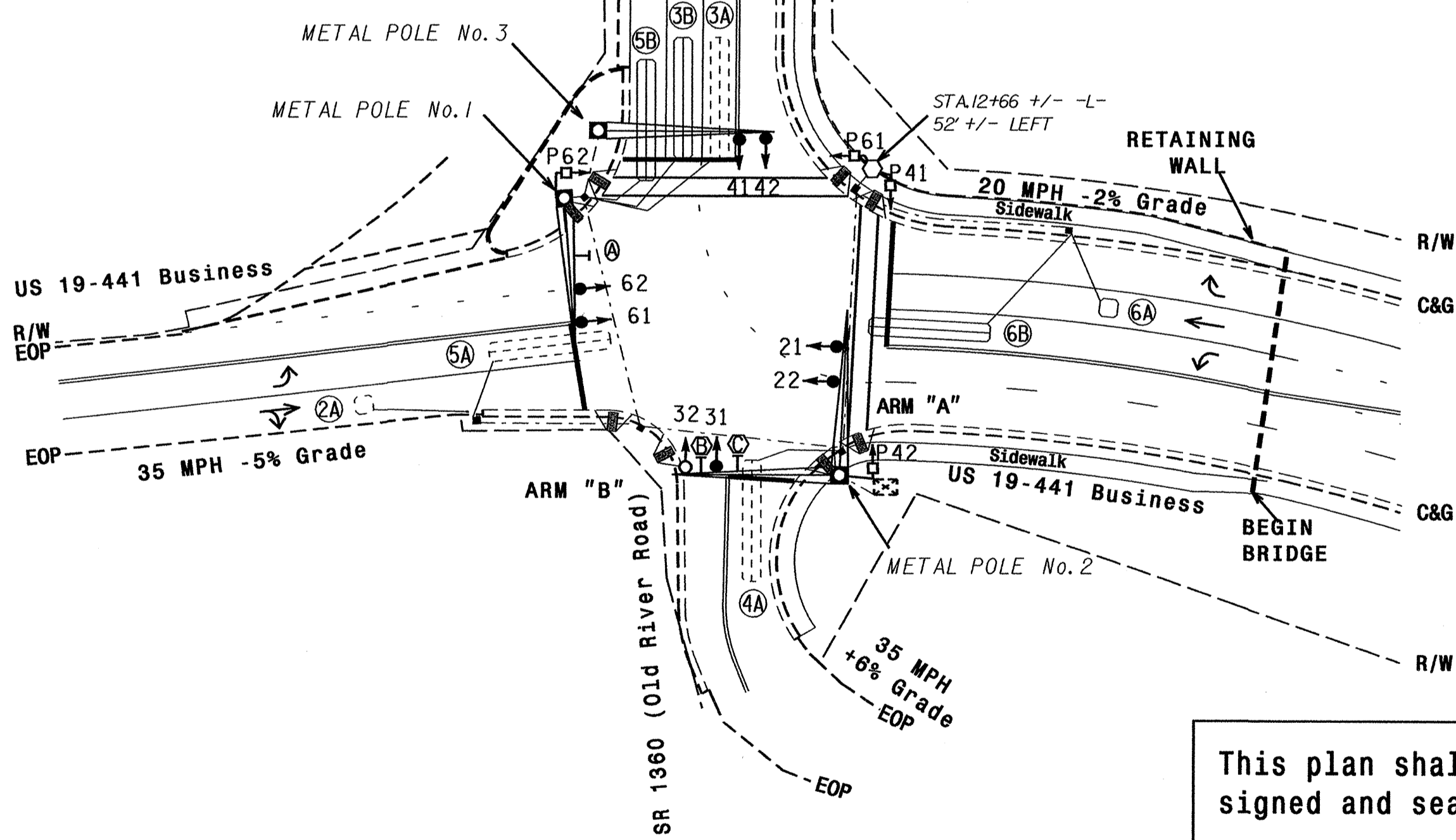
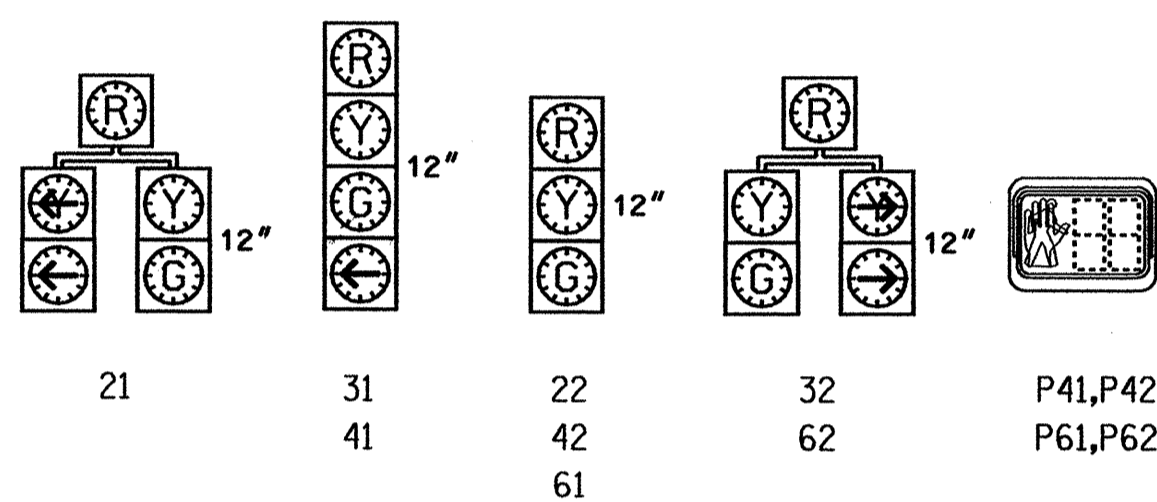
1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Omit phase 5 during phase 6 on.
4. Program controller to clear from phase 2+6 to phase 2+5 by progressing through phase 4 (see Electrical Details).
5. The order of phase 3 and phase 4 may be reversed.
6. Reposition existing signal heads numbered 21, 22, and 31.
7. Set all detector units to presence mode.
8. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
9. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
10. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

PHASING DIAGRAM DETECTION LEGEND



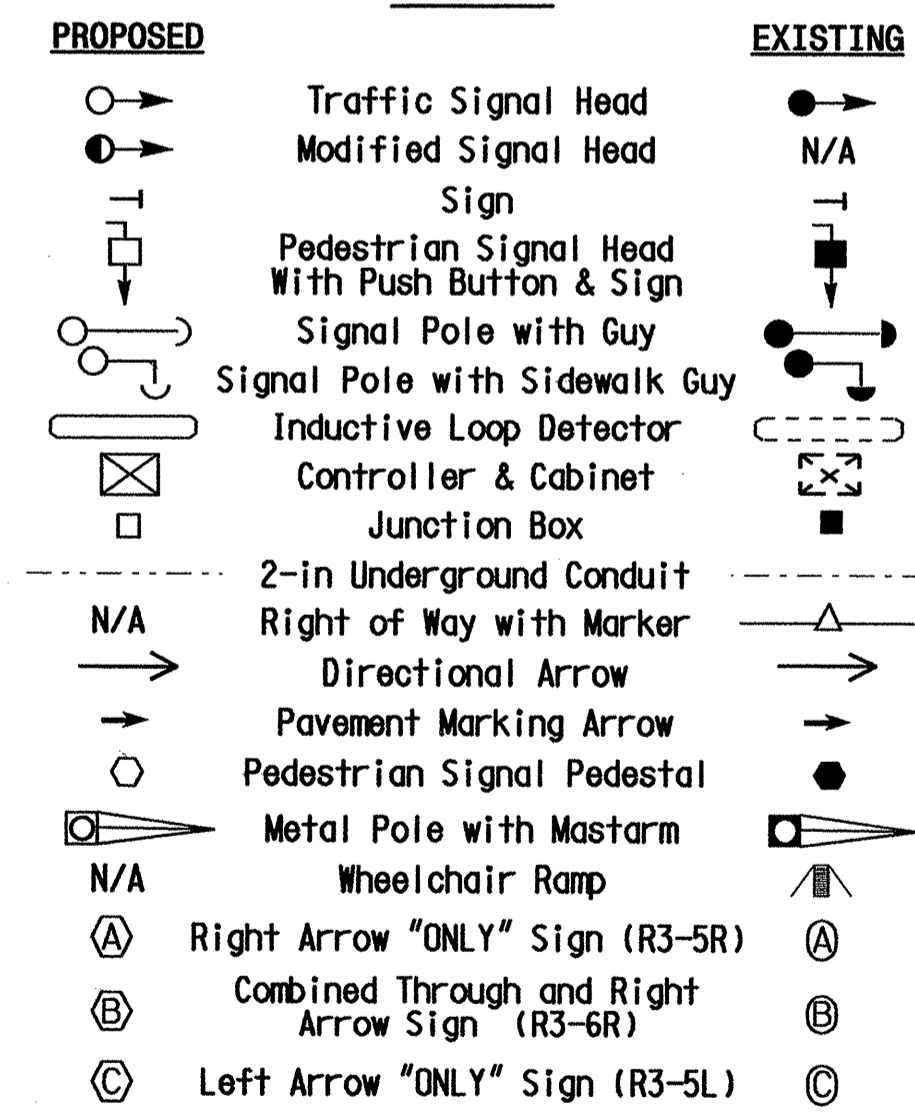
SIGNAL FACE I.D.

Denotes L.E.D.



This plan shall supersede the plan signed and sealed on 04/04/03.

LEGEND



FEATURE	PHASE				
	2	3	4	5	6
Min Green 1 *	10	7	7	7	10
Extension 1 *	3.0	2.0	2.0	2.0	3.0
Max Green 1 *	45	20	15	15	45
Yellow Clearance	4.2	3.5	3.5	3.1	3.0
Red Clearance	1.8	2.8	2.3	2.6	3.1
Walk 1 *	-	-	7	-	7
Don't Walk 1	-	-	17	-	19
Seconds Per Actuation *	-	-	-	-	-
Max Variable Initial *	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-
Time To Reduction *	-	-	-	-	-
Minimum Gap	-	-	-	-	-
Recall Mode	SOFT RECALL	-	-	-	SOFT RECALL
Vehicle Call Memory	YELLOW	-	-	-	YELLOW
Dual Entry	ON	-	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON

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

Singal Upgrade- Final Design

US 19-441 Business at US 441/SR 1360 (Old River Road)

Division 14 Swain County Cherokee

PLAN DATE: September 2006 REVIEWED BY: D Y Ishak

PREPARED BY: R M Duffy REVIEWED BY:

SEAL

122 N. McDowell St., Raleigh, NC 27603

SCALE: 0 40 1"=40'

REVISIONS	INIT.	DATE

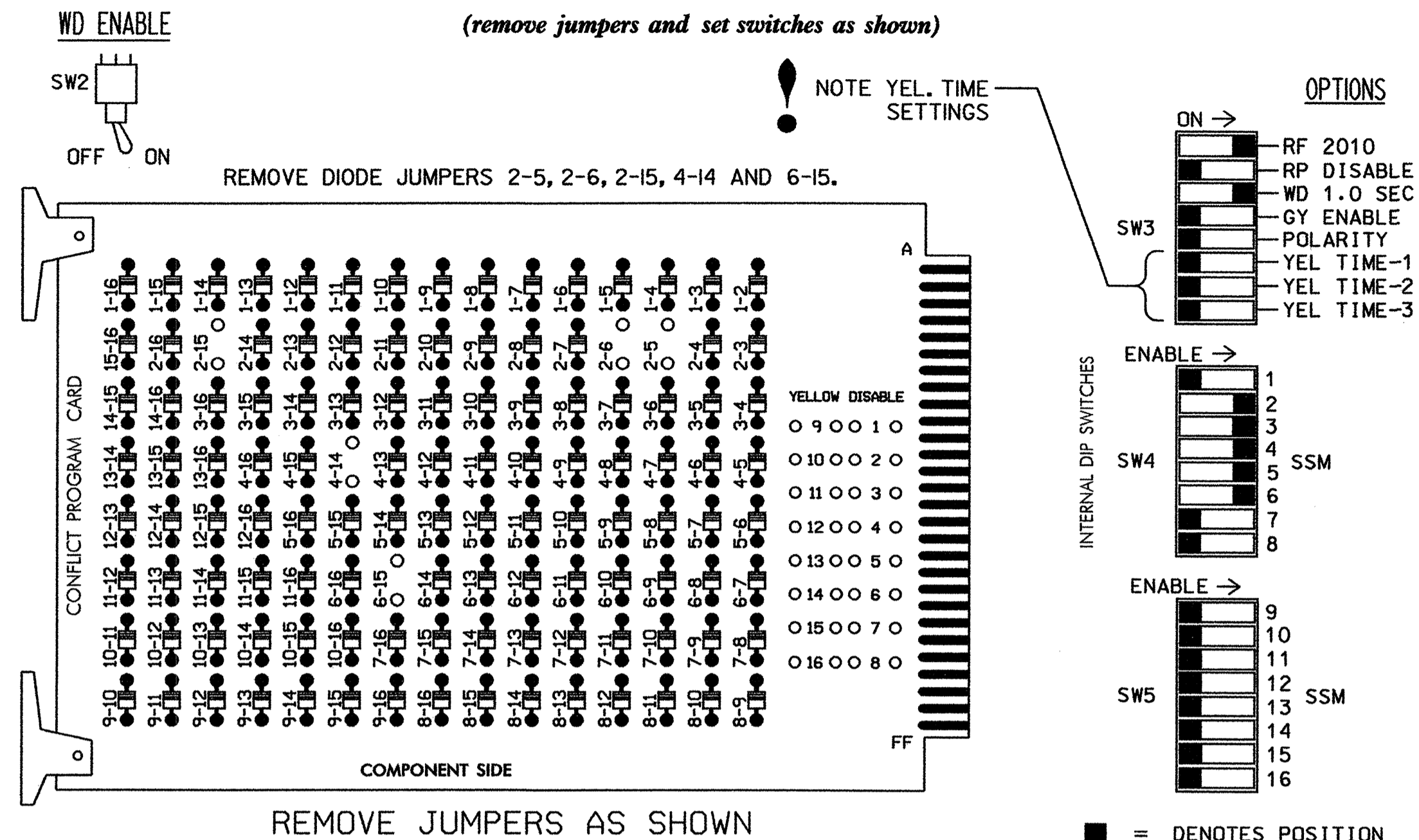
SIGNATURE _____ DATE _____

SIG. INVENTORY NO. 14-0400

25-SEP-2006 06:53 2070L Final Singal Upgrade.dwg 4686814-0000140400_20030404.dgn

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.

INPUT FILE POSITION LAYOUT

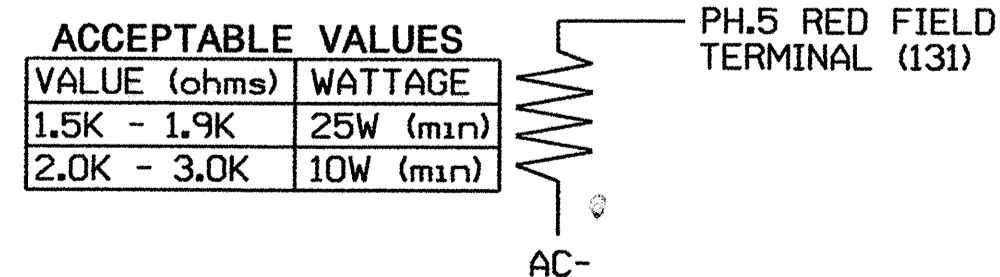
(front view)

FILE "I"	1	2	3	4	5	6	7	8	9	10	11	12	13	14
U	∅ 2	∅ 2	∅ 2	∅ 5	∅ 3	∅ 4	∅ 3	∅ 4	∅ 5	∅ 6	∅ 6	∅ 6	∅ 6	∅ 6
L	2A	5A	5A	5A	3A	4A	3B	4A	5A	6A	6A	6A	6A	6A
U	∅ 5	∅ 6	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5
L	5B	6A	5A	5A	5A	5A	5A	5A	5A	5A	5A	5A	5A	5A
U	∅ 5	∅ 6	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5	∅ 5
L	5B	6A	5A	5A	5A	5A	5A	5A	5A	5A	5A	5A	5A	5A

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

FS = FLASH SENSE
ST = STOP TIME

LOAD RESISTOR INSTALLATION DETAIL



NOTE: THE PURPOSE OF THIS RESISTOR IS TO LOAD THE CHANNEL RED MONITOR INPUT IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON THIS CHANNEL, WHICH DOES NOT USE THE RED DISPLAY IN THE FIELD.

NOTES

- TO PREVENT "FLASH-CONFLICT" PROBLEMS, INSERT RED FLASH PROGRAM BLOCKS FOR ALL UNUSED VEHICLE LOAD SWITCHES IN THE OUTPUT FILE. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED RED MONITOR INPUTS 1,7,8,9,10,11,12,13,14,15 & 16 TO LOAD SWITCH AC+ PER MANUFACTURER INSTRUCTIONS.
- PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR START-UP IN GREEN.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
- PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR DUAL ENTRY.
- PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR 'SOFT RECALL'.
- SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.
- PROGRAM PHASES 4 AND 6 FOR 'STARTUP PED CALL'.

EQUIPMENT INFORMATION

* CONTROLLER.....CONTRACTOR SUPPLIED 2070L
 * CABINET.....CONTRACTOR SUPPLIED 332
 SOFTWARE.....ECONOLITE OASIS
 CABINET MOUNT.....BASE
 OUTPUT FILE POSITIONS...12
 LOAD SWITCHES USED.....S2,S3,S4,S4P,S5,S6,S6P
 PHASES USED.....2,3,4,4PED,5,6,6PED
 OVERLAPS.....NONE

EXISTING FROM TEMPORARY 1*

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

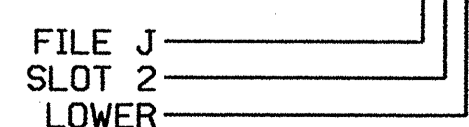
INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A	TB2-5,6	I2U	39	1	2	2	Y	Y			
5A ¹	TB2-9,10	I3U	63	25	32	2	Y	Y	Y		3
	TB2-11,12	I3L	76	38	42	5	Y	Y			15
3A	TB4-9,10	I6U	41	3	4	3	Y	Y			3
3B	TB4-11,12	I6L	45	7	14	3					
4A	TB6-1,2	I7U	65	27	34	4	Y	Y			10
5B	TB3-1,2	J1U	55	17	5	5	Y	Y			15
6A	TB3-5,6	J2U	40	2	6	6	Y	Y			
6B	TB3-7,8	J2L	44	6	16	6	Y	Y	Y		3
PED PUSH BUTTONS											
P41,P42	TB8-5,6	I12L	69	31	PED 4	4PED					
P61,P62	TB8-7,9	I13U	68	30	PED 6	6PED					

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

¹ADD JUMPERS FROM TB2-9 TO TB2-11, AND FROM TB2-10 TO TB2-12.

INPUT FILE POSITION LEGEND: J2L



FIELD CONNECTION 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	31 32 62	41 42	P41, P42	21,32	61,62	P61, P62	NU	NU	NU
GREEN		130		118 118	103 103			136				
YELLOW		129		117 117	102 102			135				
RED		128		116 116	101 101		*	134				
RED ARROW												
YELLOW ARROW					117			132				
GREEN ARROW				118	118	103		133				
**								106		121		
**								104		119		

NU = NOT USED

* DENOTES INSTALL LOAD RESISTOR. SEE LOAD RESISTOR INSTALLATION DETAIL THIS SHEET.

** SEE 'COUNTDOWN PEDESTRIAN SIGNAL OPERATION' NOTE THIS SHEET.

BACK-UP PROTECTION PROGRAMMING DETAIL

(program controller as shown below)

- FROM MAIN MENU PRESS '2' (PHASE CONTROL), THEN '1' (PHASE CONTROL FUNCTIONS). SCROLL TO THE BOTTOM OF THE MENU AND ENABLE DYNAMIC/BACKUP CONTROL FUNCTION 1.
- FROM PHASE CONTROL FUNCTIONS MENU PRESS '2' (DYNAMIC/BACKUP CONTROL FUNCTIONS).

DYNAMIC/BACKUP CONTROL FUNCTION #01
 OVERLAPS: ABCDEFGHIJKLMNPO
 IF OVERLAPS ARE ACTIVE :
 OR PHASES: 12345678910111213141516
 IF PHASES ARE ON: X
 OMIT PHASES : X
 CALL PHASES : X

BACKUP PROTECTION PROGRAMMING COMPLETE

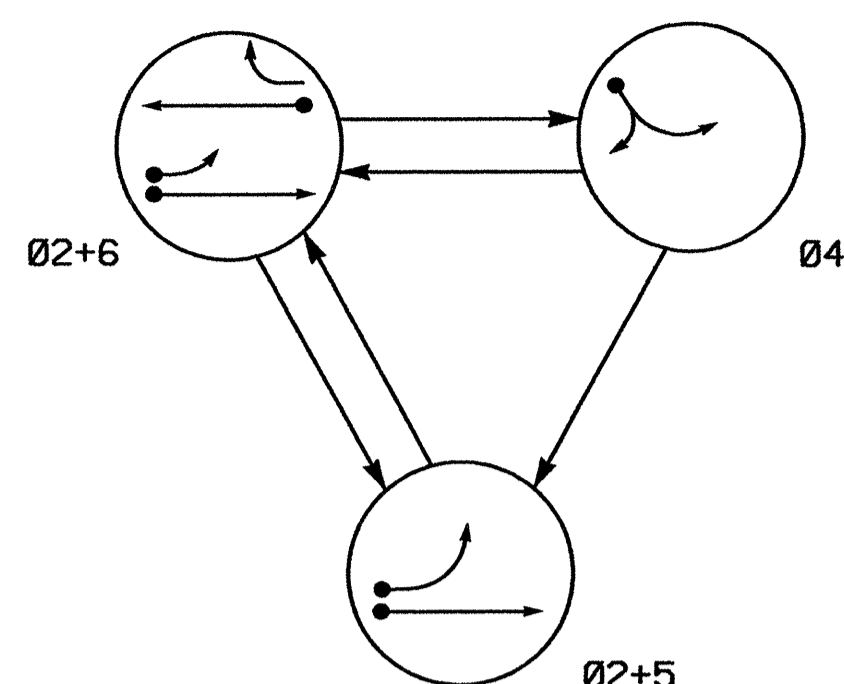
THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 14-0400
 DESIGNED: SEPTEMBER 2006
 SEALED: 25 SEPTEMBER '06
 REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED FEBRUARY 2002 AND SEALED 4/9/03

FINAL

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared in the Office of: 122 N. McDowell St., Raleigh, NC 27603	US 19-441 BUSINESS AT US 441/SR 1360 (OLD RIVER ROAD)		SEAL JOHN T. ROWE, P.E. 9-28-06
	DIVISION 14 SWAIN COUNTY CHEROKEE PLAN DATE: SEPTEMBER 2006 REVIEWED BY: <i>JWR</i> PREPARED BY: F.E. RUSS REVIEWED BY:	REVISIONS INIT. DATE	

PHASING DIAGRAM



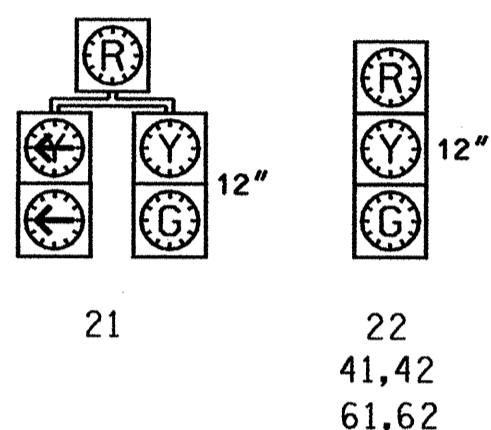
PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE	PHASE			
	Ø 2+5	Ø 2+6	Ø 4	Ø 2+5
21	G	G	R	Y
22	G	G	R	Y
41,42	R	R	G	R
61,62	R	G	R	Y

SIGNAL FACE I.D.

○ Denotes L.E.D.



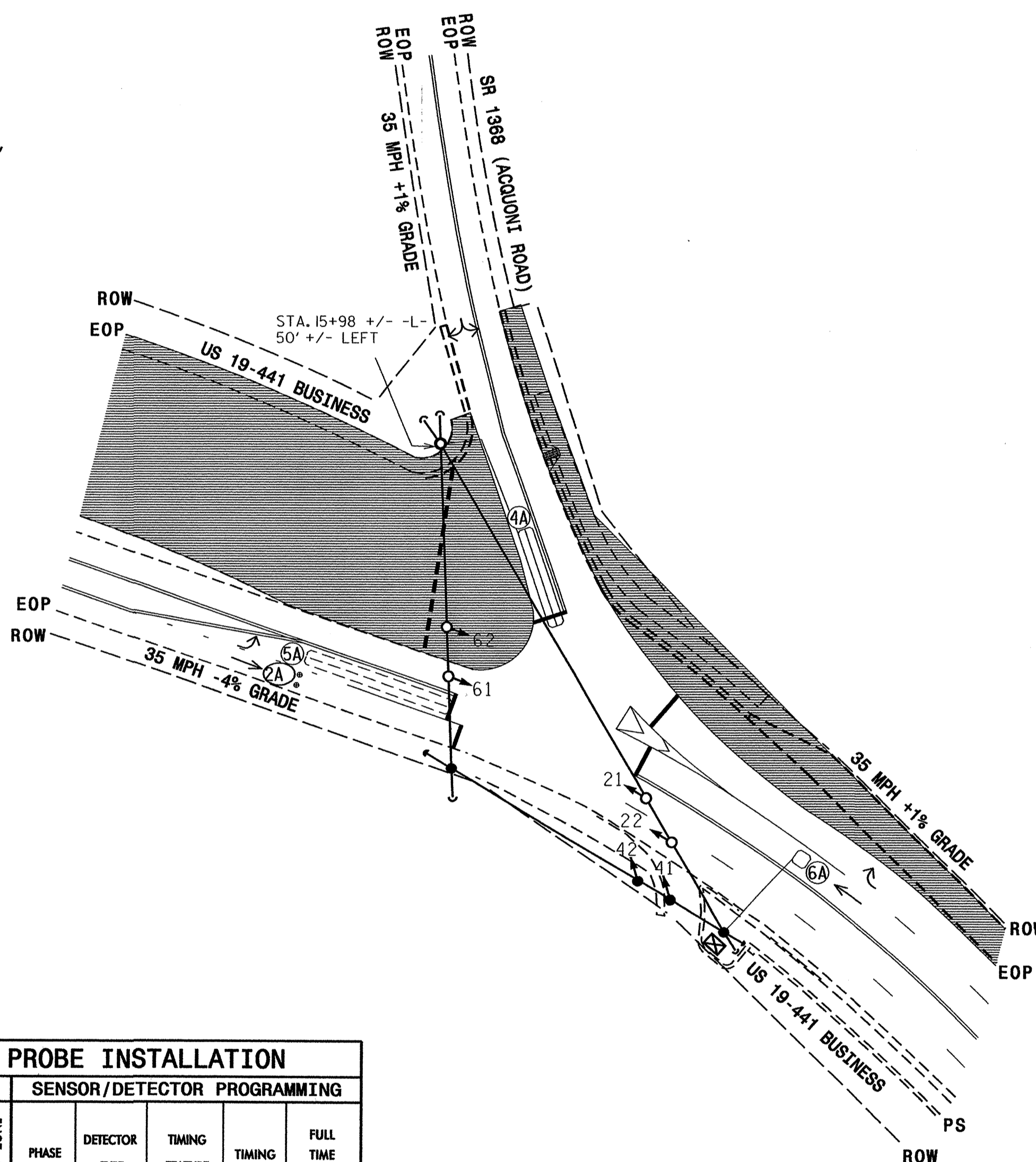
2070L LOOP & DETECTOR INSTALLATION

LOOP	INDUCTIVE LOOPS			DETECTOR PROGRAMMING							
	SIZE (FT)	TURNS	DISTANCE FROM STOPBAR (FT)	PHASE	CALLING	EXTENSION	FULL TIME DELAY	SYSTEM LOOP	STRETCH TIME	DELAY TIME	NEW CARD
4A	6X40	2-4-2	+5	Y	4	Y	Y	-	-	10	Y
6A	6X6	4	70	Y	6	Y	Y	-	-	-	Y
5A	6X60	2-4-2	0	-	2	Y	Y	-	-	3	Y
					5	Y	Y	-	-	15	Y

3-PHASE FULLY-ACTUATED (TIME-BASED SYSTEM)

NOTES

- Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- During coordination, phase 5 may be lagged.
- Set all detector units to presence mode.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

- | PROPOSED | EXISTING |
|-----------------------------------|-----------------------------------|
| ○ → Traffic Signal Head | ● → Traffic Signal Head |
| ○ → Modified Signal Head | N/A |
| ○ → Pedestrian Signal Head | N/A |
| ○ → 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 |
| ○ → Pedestrian Signal Pedestal | ○ → Pedestrian Signal Pedestal |
| ○ → Metal Pole with Mastarm | ○ → Metal Pole with Mastarm |
| N/A → Wheelchair Ramp | △ → Wheelchair Ramp |
| ▨ → Construction Zone | N/A |

This plan shall supersede the plan signed and sealed on 04/04/03.

2070L TIMING CHART

FEATURE	PHASE			
	2	4	5	6
Min Green 1 *	10	7	7	10
Extension 1 *	3.0	2.0	1.0	3.0
Max Green 1 *	45	20	15	45
Yellow Clearance	4.1	3.0	3.0	3.8
Red Clearance	1.0	2.1	2.1	1.2
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	-	-	-	-
Time To Reduction *	-	-	-	-
Minimum Gap	-	-	-	-
Recall Mode	MIN. RECALL	-	-	MIN. RECALL
Vehicle Call Memory	YELLOW	-	-	YELLOW
Dual Entry	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON

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

MICROLOOP PROBE INSTALLATION

I.D. No.	SIZE (FT)	DISTANCE FROM STOPBAR	SENSOR/DETECTOR PROGRAMMING					
			DETECTION ZONE	PHASE	DETECTOR TYPE	TIMING FEATURE	TIMING	FULL TIME DELAY
2A	*	70	-	2	MOTION	-	-	-

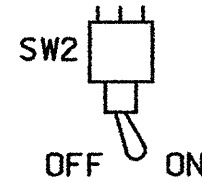
* EXISTING TWO PROBE MICROLOOP INSTALLATION SPACED FOUR FEET APART CENTERED IN LANE

Signal Upgrade - Temporary 1

	US 19-441 Business at SR 1368 (Acquoni Road)		
	Division 14 Swain County Cherokee PLAN DATE: September 2006 REVIEWED BY: RM Duffy PREPARED BY: TS Thigpen REVIEWED BY: D. SHAK	REVISIONS: _____ INIT. DATE: _____	
SCALE: 1" = 40' 		SIGNATURE: _____ DATE: _____ SIG. INVENTORY NO. 14-0796T1	

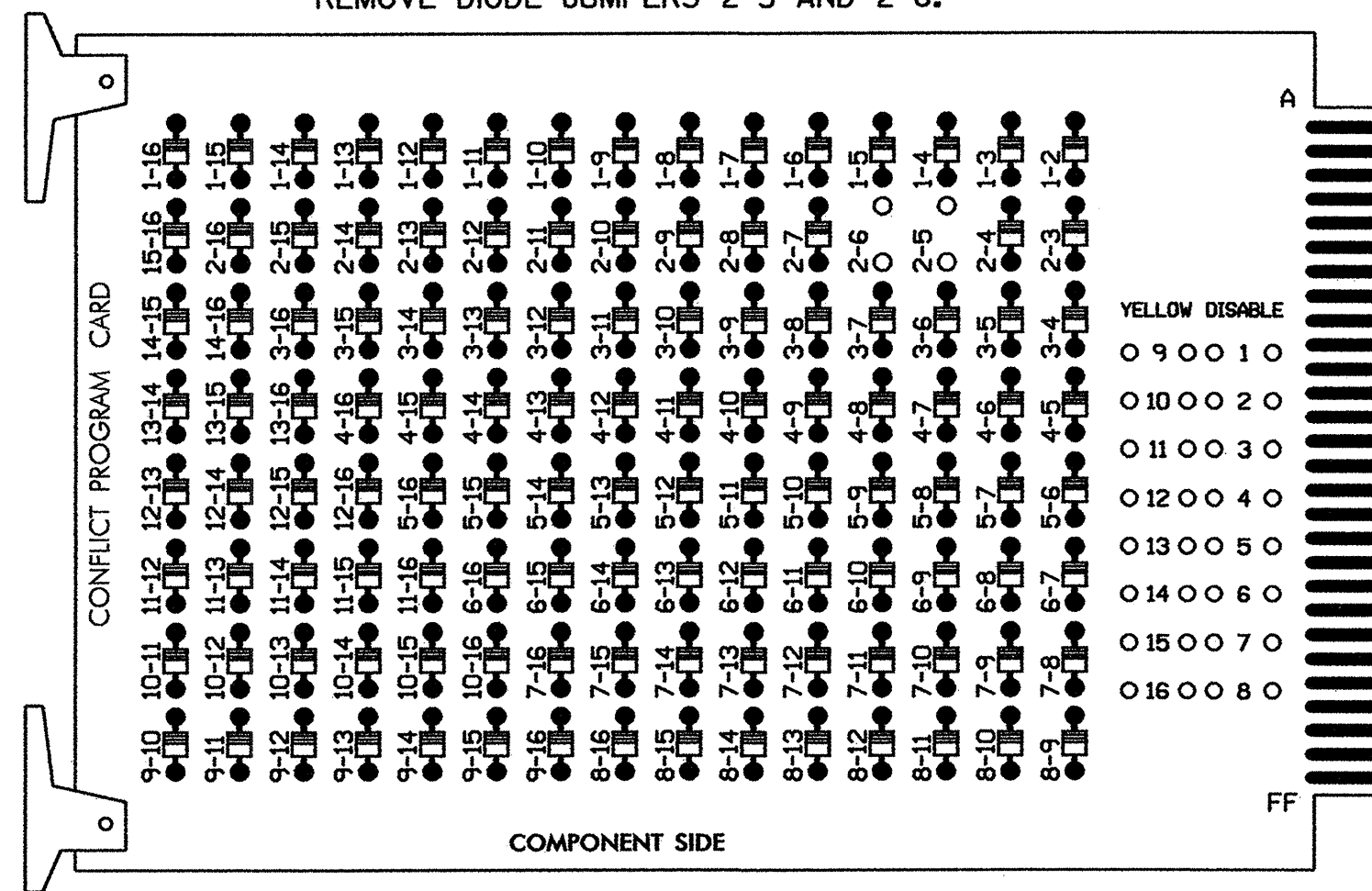
**EDI MODEL 2010ECL CONFLICT MONITOR
PROGRAMMING DETAIL**

WD ENABLE



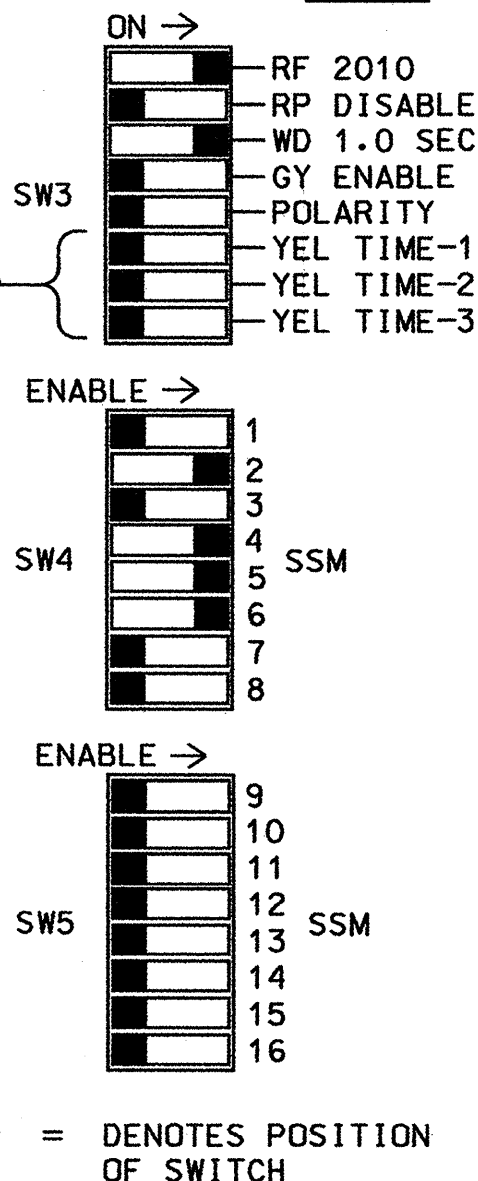
(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 2-5 AND 2-6.



REMOVE JUMPERS AS SHOWN

OPTIONS



NOTE YEL. TIME SETTINGS

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.

NOTES

- TO PREVENT "FLASH-CONFLICT" PROBLEMS, INSERT RED FLASH PROGRAM BLOCKS FOR ALL UNUSED VEHICLE LOAD SWITCHES IN THE OUTPUT FILE. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED RED MONITOR INPUTS 1,3,7,8,9,10,11,12,13,14,15 & 16 TO LOAD SWITCH AC+ PER MANUFACTURER INSTRUCTIONS.
- PROGRAM PHASES 2 AND 6, ON CONTROLLER UNIT, FOR START-UP IN GREEN.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
- A 3M 2-PROBE MICROLOOP STATION IS CURRENTLY INSTALLED FOR VEHICLE DETECTION ON PHASE 2, (LABELED '2A') LOCATED AS SHOWN ON THE SIGNAL DESIGN PLAN. USE EXISTING 3M CANOGA C400 RACK-MOUNTED DETECTOR CARD IN INPUT FILE.
- SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.

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

NU = NOT USED

* DENOTES INSTALL LOAD RESISTOR. SEE LOAD RESISTOR INSTALLATION DETAIL THIS SHEET.

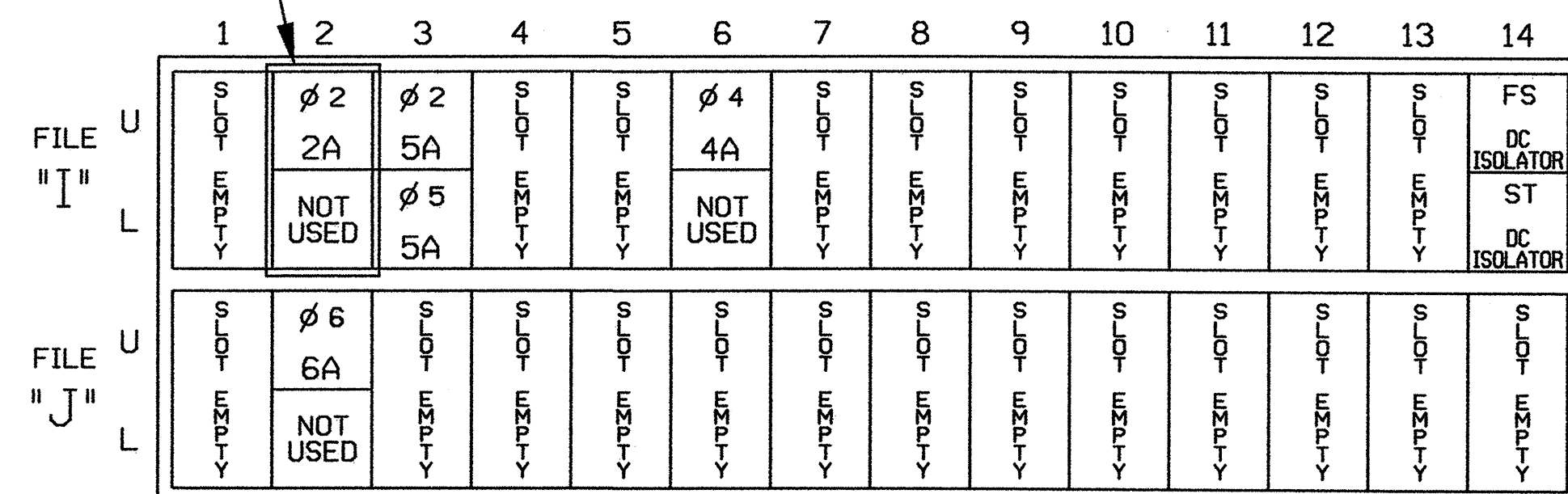
EQUIPMENT INFORMATION

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

INPUT FILE POSITION LAYOUT

(front view)

SEE NOTE 5 ABOVE



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

FS = FLASH SENSE
 ST = STOP TIME

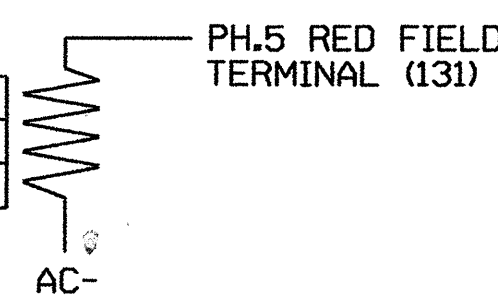
INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A	TB2-5,6	I2U	39	1	2	2	Y	Y			
5A ¹	TB2-9,10	I3U	63	25	32	2	Y	Y	Y		3
	TB2-11,12	I3L	76	38	42	5	Y	Y			15
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			10
6A	TB3-5,6	J2U	40	2	6	6	Y	Y			

¹ADD JUMPERS FROM TB2-9 TO TB2-11, AND FROM TB2-10 TO TB2-12.

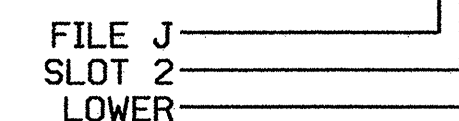
LOAD RESISTOR INSTALLATION DETAIL

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



NOTE: THE PURPOSE OF THIS RESISTOR IS TO LOAD THE CHANNEL RED MONITOR INPUT IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON THIS CHANNEL, WHICH DOES NOT USE THE RED DISPLAY IN THE FIELD.

INPUT FILE POSITION LEGEND: J2L



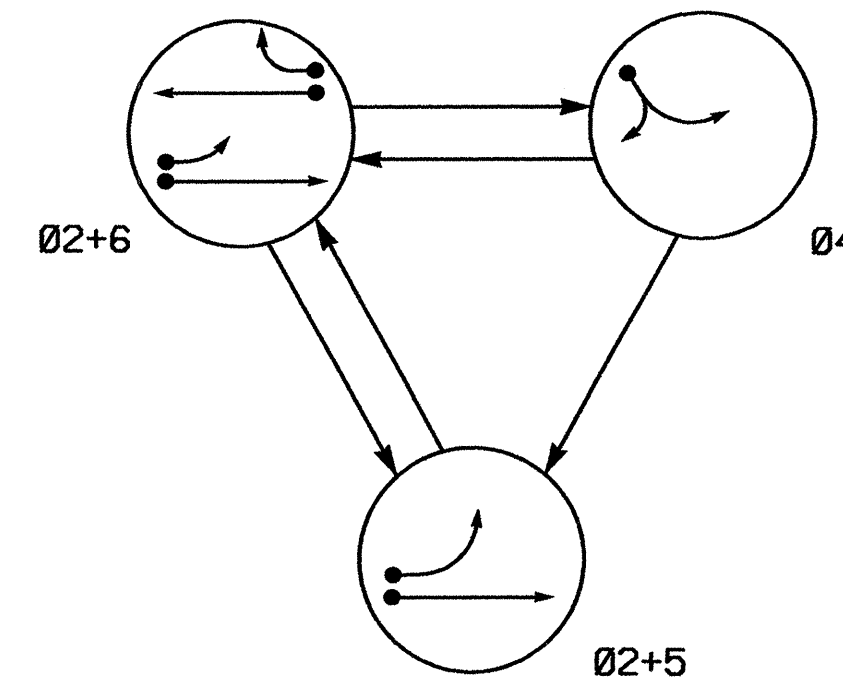
THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 14-0796T1
 DESIGNED: SEPTEMBER 2006
 SEALED: 25 SEPTEMBER '06
 REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED FEBRUARY 2002 AND SEALED 4/9/03

TEMPORARY 1

Prepared for the Offices of: 122 N. McDowell St., Raleigh, NC 27603	US 19-441 BUSINESS AT SR 1368 (ACQUONI ROAD)		SEAL JOHN T. ROWE ENGINEER
	DIVISION 14 SWAIN COUNTY CHEROKEE PLAN DATE: SEPTEMBER 2006 REVIEWED BY: <i>[Signature]</i> PREPARED BY: F.E. RUSS REVIEWED BY:	REVISIONS: _____ INIT. DATE _____ _____ INIT. DATE _____ _____ INIT. DATE _____	
SIGNATURE: <i>[Signature]</i> DATE: 9-28-06		SIG. INVENTORY NO. 14-0796T1	

PHASING DIAGRAM



SIGNAL FACE	PHASE			
	Ø 2+6 S+R	Ø 2+6 G	Ø 4 R	Ø 4 Y
21	G	G	R	Y
22	G	G	R	Y
41,42	R	R	G	R
61,62	R	G	R	Y

LOOP	SIZE (FT)	TURNS	DISTANCE FROM STOPBAR (FT)	NEW LOOP	DETECTOR PROGRAMMING					DELAY TIME	NEW CARD
					PHASE	CALLING	EXTENSION	FULL TIME DELAY	SYSTEM LOOP		
4A	6X40	2-4-2	+5	Y	4	Y	Y	-	-	10	-
6A,6B	6X6	4	70	Y	6	Y	Y	-	-	-	-
2A	6X6	*	70	*	2	Y	Y	-	-	-	*
5A	6X40	*	0	*	5	Y	Y	-	-	15	*

* VIDEO DETECTION ZONE

3-PHASE FULLY-ACTUATED (TIME-BASED SYSTEM)

NOTES

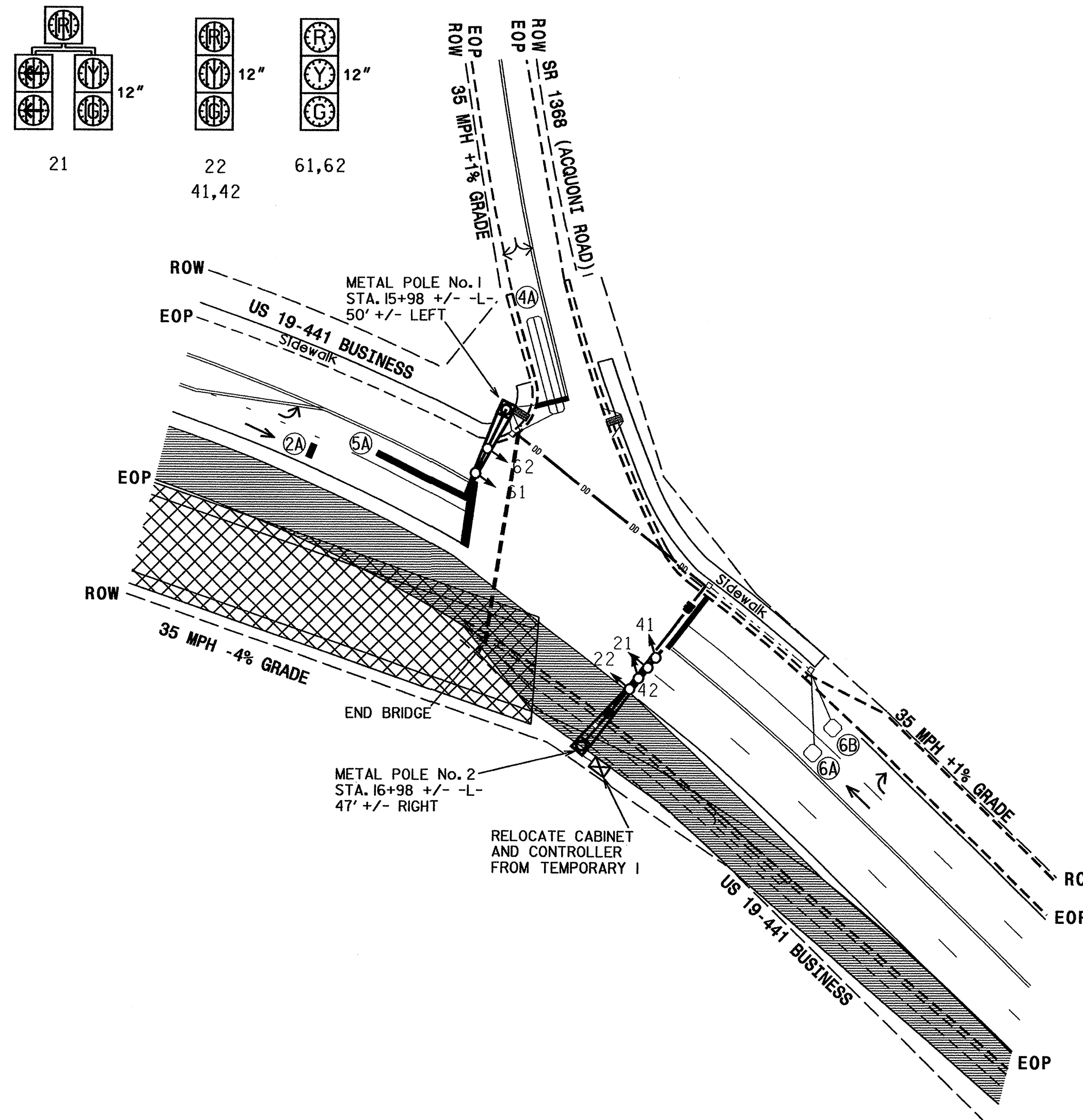
- Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- During coordination phase 5 may be lagged.
- Set all detector units to presence mode.
- Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Incorporate loop emulator system for phases 2 and 5 vehicle detection.

PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.

- Denotes L.E.D.
- Denotes Louvers



LEGEND

PROPOSED	EXISTING
	Traffic Signal Head
	Modified Signal Head
	Pedestrian Signal Head
	Signal Pole with Guy
	Video Detection Area
	Controller & Cabinet
	Junction Box
	2-in Underground Conduit
	Right of Way with Marker
	Directional Arrow
	Pavement Marking Arrow
	Pedestrian Signal Pedestal
	Metal Pole with Mastarm
	Wheelchair Ramp
	Construction Zone
	Bridge Removal
	Directional Drill

This plan shall supersede the plan signed and sealed on 04/04/03.

FEATURE	PHASE			
	2	4	5	6
Min Green 1 *	10	7	7	10
Extension 1 *	3.0	2.0	2.0	3.0
Max Green 1 *	45	20	15	45
Yellow Clearance	4.1	3.0	3.0	3.8
Red Clearance	1.7	3.3	1.9	1.9
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	-	-	-	-
Time To Reduction *	-	-	-	-
Minimum Gap	-	-	-	-
Recall Mode	MIN. RECALL	-	-	MIN. RECALL
Vehicle Call Memory	YELLOW	-	-	YELLOW
Dual Entry	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON

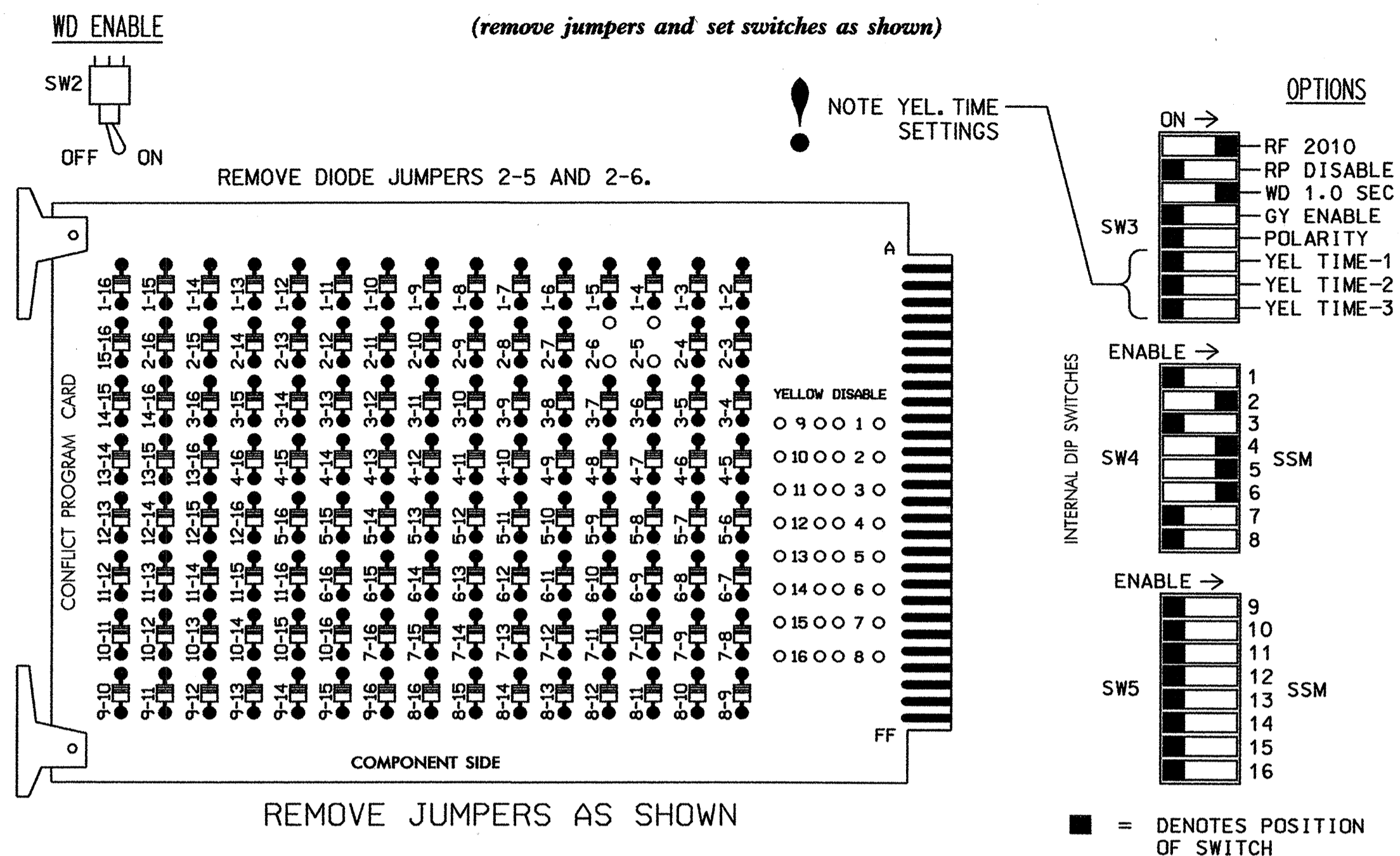
* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

20-SEP-2006 09:58
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 thl/gbn

Signal Upgrade - Temporary 2

	US 19-441 Business at SR 1368 (Acqoni Road)	SEAL
	Division 14 Swain County Cherokee PLAN DATE: September 2006 REVIEWED BY: RM Duffy PREPARED BY: TS Thigpen REVIEWED BY: D. SHAR	
122 N. McDowell St., Raleigh, NC 27603 SCALE 0 40 1" = 40'	REVISIONS INIT. DATE	SIGNATURE DATE
SIG. INVENTORY NO. 14-0796T2		

**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.

NOTES

- TO PREVENT "FLASH-CONFLICT" PROBLEMS, INSERT RED FLASH PROGRAM BLOCKS FOR ALL UNUSED VEHICLE LOAD SWITCHES IN THE OUTPUT FILE. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
- ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED RED MONITOR INPUTS 1,3,7,8,9,10,11,12,13,14,15 & 16 TO LOAD SWITCH AC+ PER MANUFACTURER INSTRUCTIONS.
- PROGRAM PHASES 2 AND 6. ON CONTROLLER UNIT, FOR START-UP IN GREEN.
- ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
- INSTALL A LOOP EMULATOR DETECTION SYSTEM FOR VEHICLE DETECTION AT AREAS OF DETECTION LABELED '2A' (PHASE 2) AND LABELED '5A' (PHASES 2 AND 5). PERFORM INSTALLATION PER MANUFACTURER'S INSTRUCTIONS AND LOCATE AT NCDOT ENGINEER-APPROVED MOUNTING LOCATIONS IN ORDER TO ACCOMPLISH THE DETECTION SCHEMES SHOWN IN 2070L LOOP & DETECTOR INSTALLATION CHART ON THE SIGNAL DESIGN PLAN. WIRE SENSORS SUCH THAT INPUT INTERFACE TO THE CONTROLLER IS ACHIEVED THROUGH ISOLATION CIRCUITRY.
- SET ALL DETECTOR CARD CHANNELS TO 'PRESENCE' MODE.

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

NU = NOT USED

* DENOTES INSTALL LOAD RESISTOR. SEE LOAD RESISTOR INSTALLATION DETAIL THIS SHEET.

EQUIPMENT INFORMATION

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

EXISTING FROM TEMPORARY 1 EXCEPT RELOCATED (SEE SIGNAL PLAN)*

INPUT FILE POSITION LAYOUT

(front view)

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

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			10
6A,6B	TB3-5,6	J2U	40	2	6	6	Y	Y			
2A *						2	Y	Y			
						2	Y	Y	Y		3
5A *						5	Y	Y			15

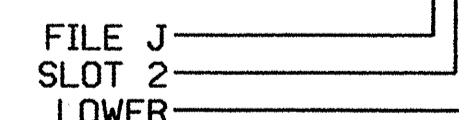
* LOOP EMULATOR AREA OF DETECTION - SEE NOTE 5 ABOVE

**LOAD RESISTOR
INSTALLATION DETAIL**

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

NOTE: THE PURPOSE OF THIS RESISTOR IS TO LOAD THE CHANNEL RED MONITOR INPUT IN ORDER FOR THE SIGNAL SEQUENCE MONITOR TO USE THE FULL SIGNAL SEQUENCE MONITORING CAPABILITY ON THIS CHANNEL, WHICH DOES NOT USE THE RED DISPLAY IN THE FIELD.

INPUT FILE POSITION LEGEND: J2L

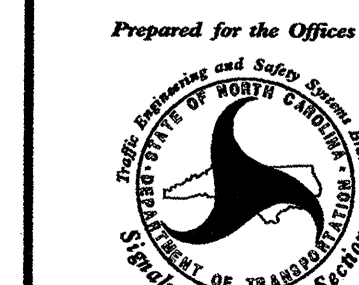


THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 14-0796T2
DESIGNED: SEPTEMBER 2006
SEALED: 25 SEPTEMBER '06
REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED FEBRUARY 2002 AND SEALED 4/9/03

TEMPORARY 2

ELECTRICAL AND PROGRAMMING DETAILS FOR:



122 N. McDowell St., Raleigh, NC 27603

US 19-441 BUSINESS
AT
SR 1368 (ACQUONI ROAD)

DIVISION 14 SWAIN COUNTY CHEROKEE

PLAN DATE: SEPTEMBER 2006 REVIEWED BY: *FR*

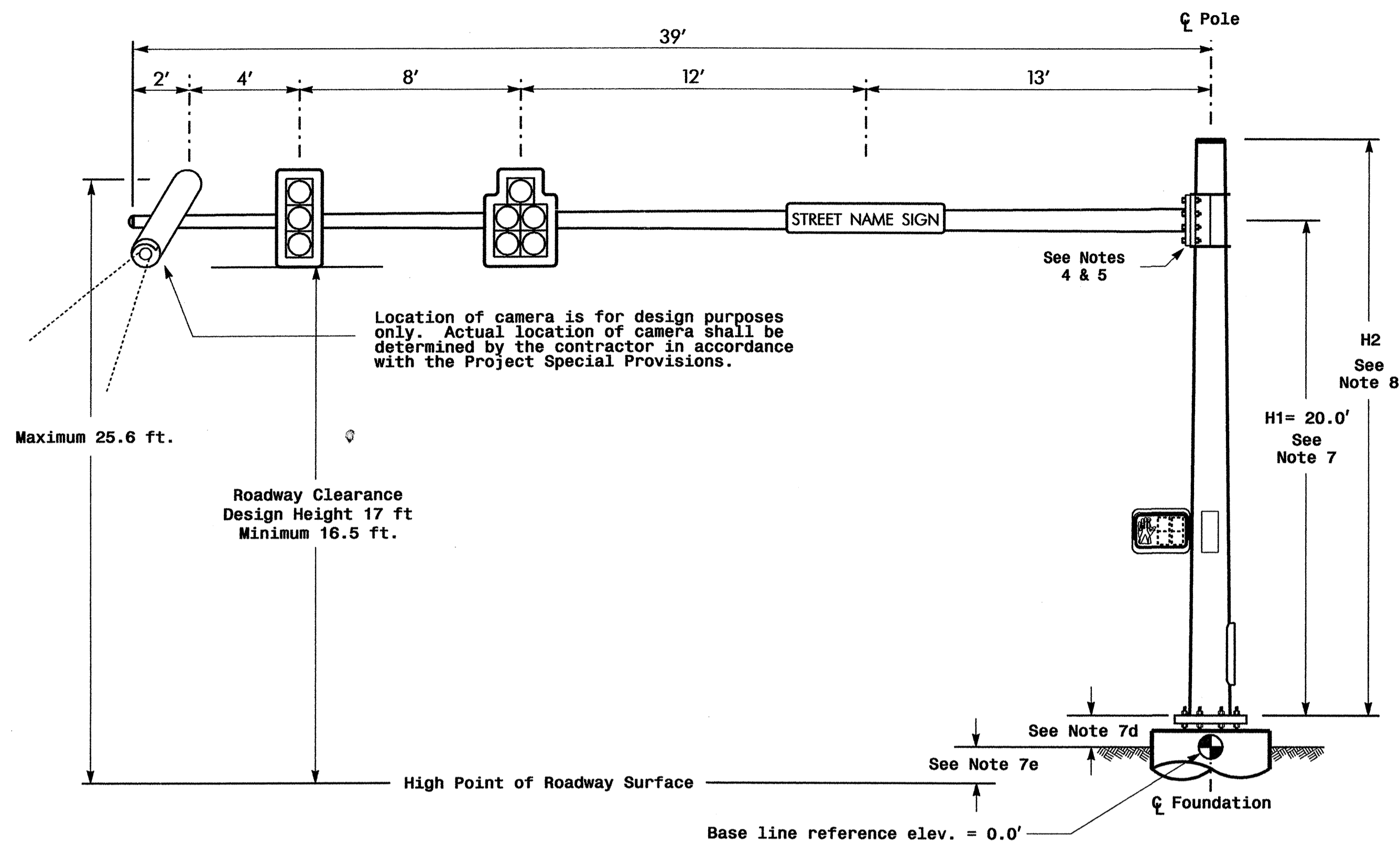
PREPARED BY: F.E. RUSS REVIEWED BY:

REVISIONS INIT. DATE

SEAL
JOHN T. ROWE
ENGINEER
STATE OF NORTH CAROLINA
LICENSE NO. 008453
DATE: 9-28-06
SIGNATURE
DATE

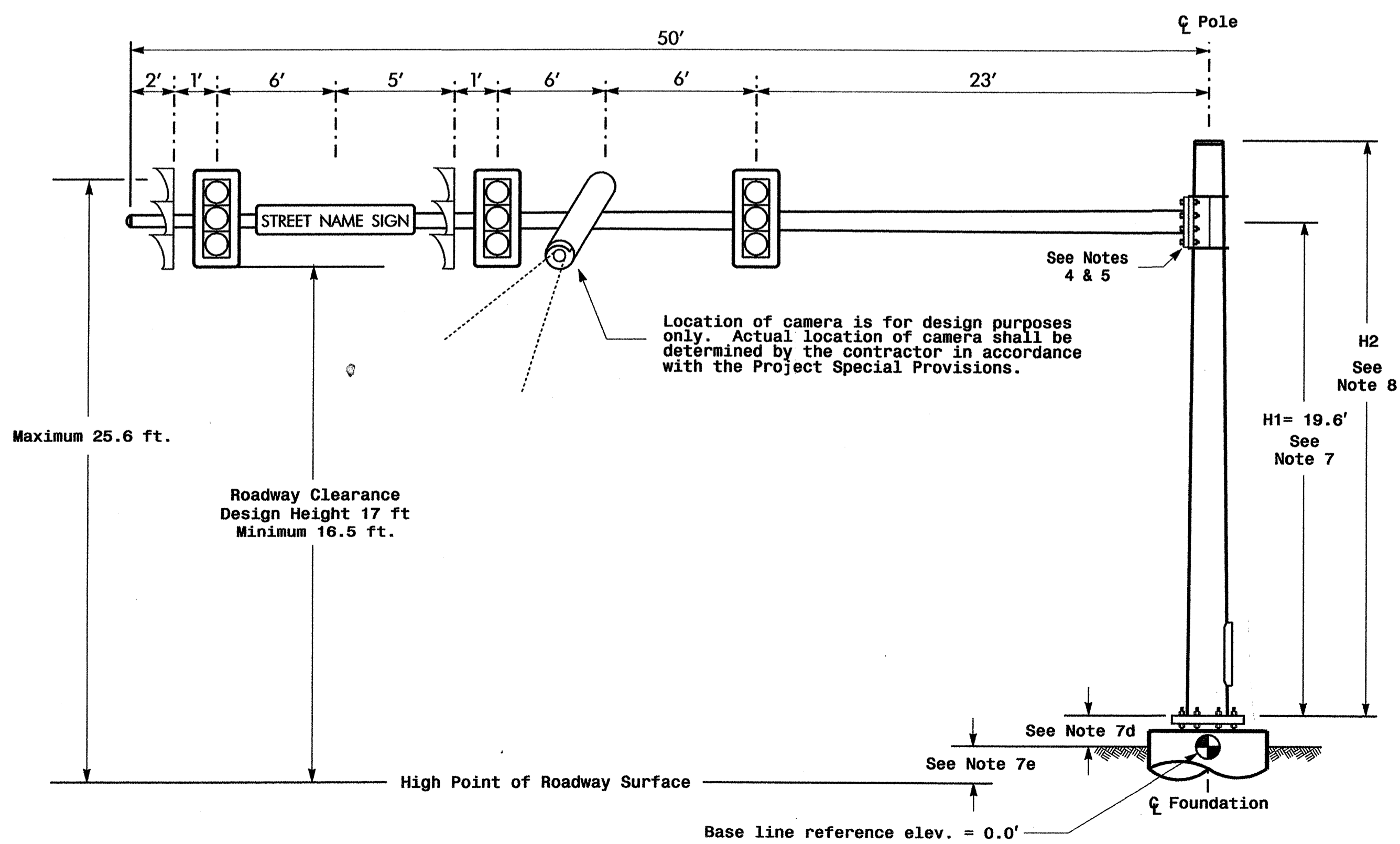
SIG. INVENTORY NO. 14-0796T2

Design Loading for METAL POLE NO. 1



Elevation View

Design Loading for METAL POLE NO. 2

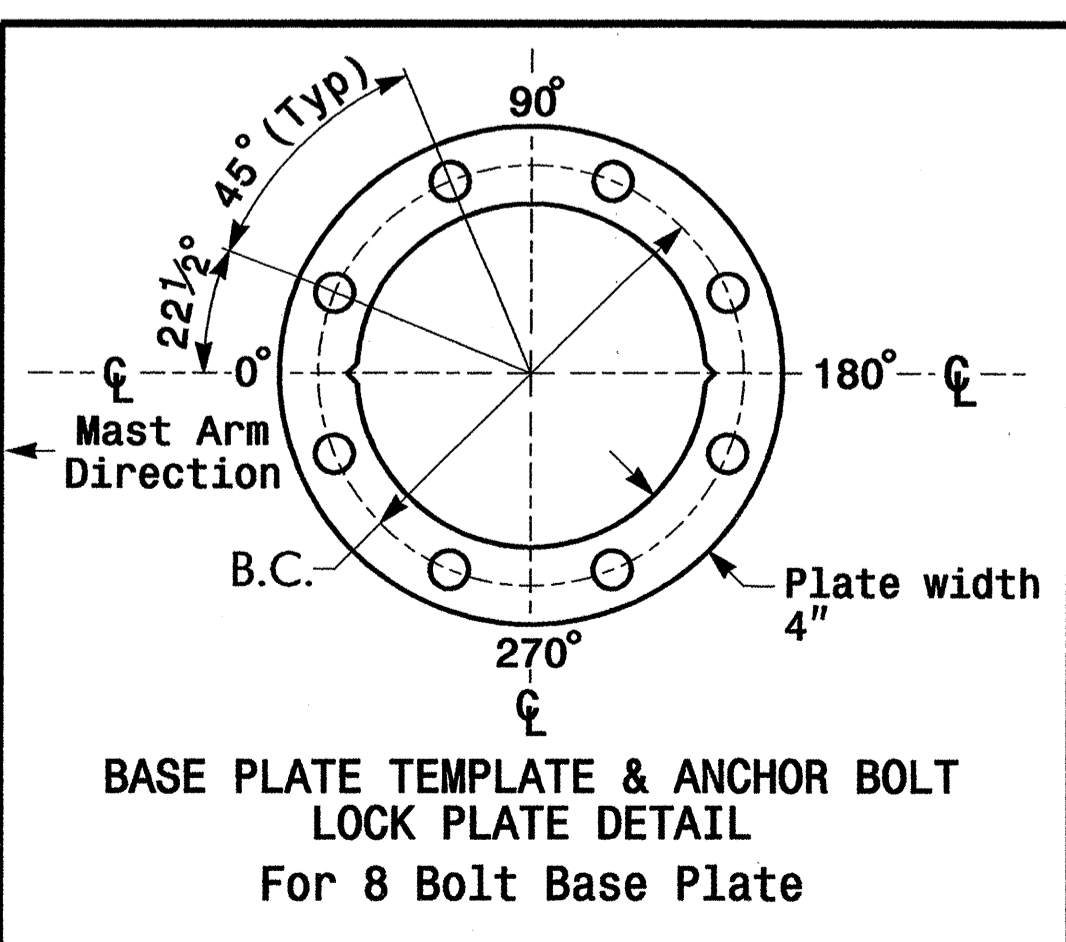
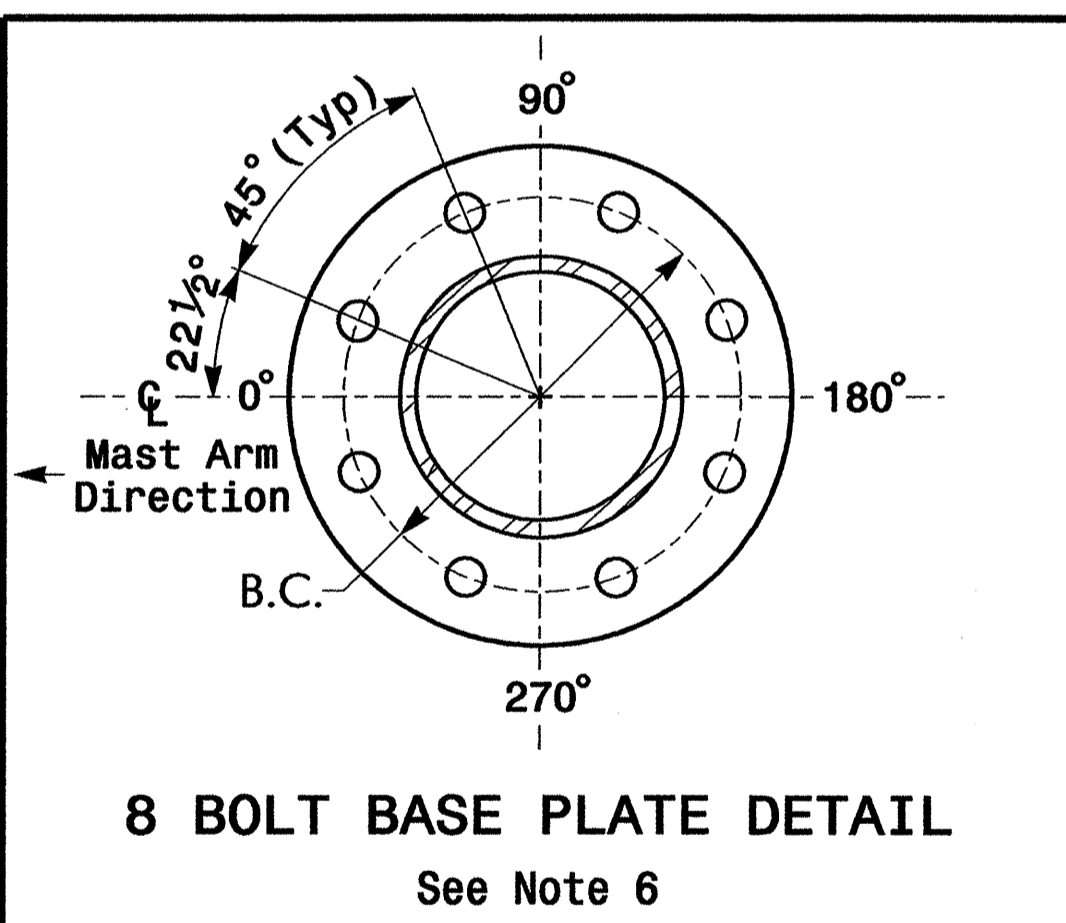
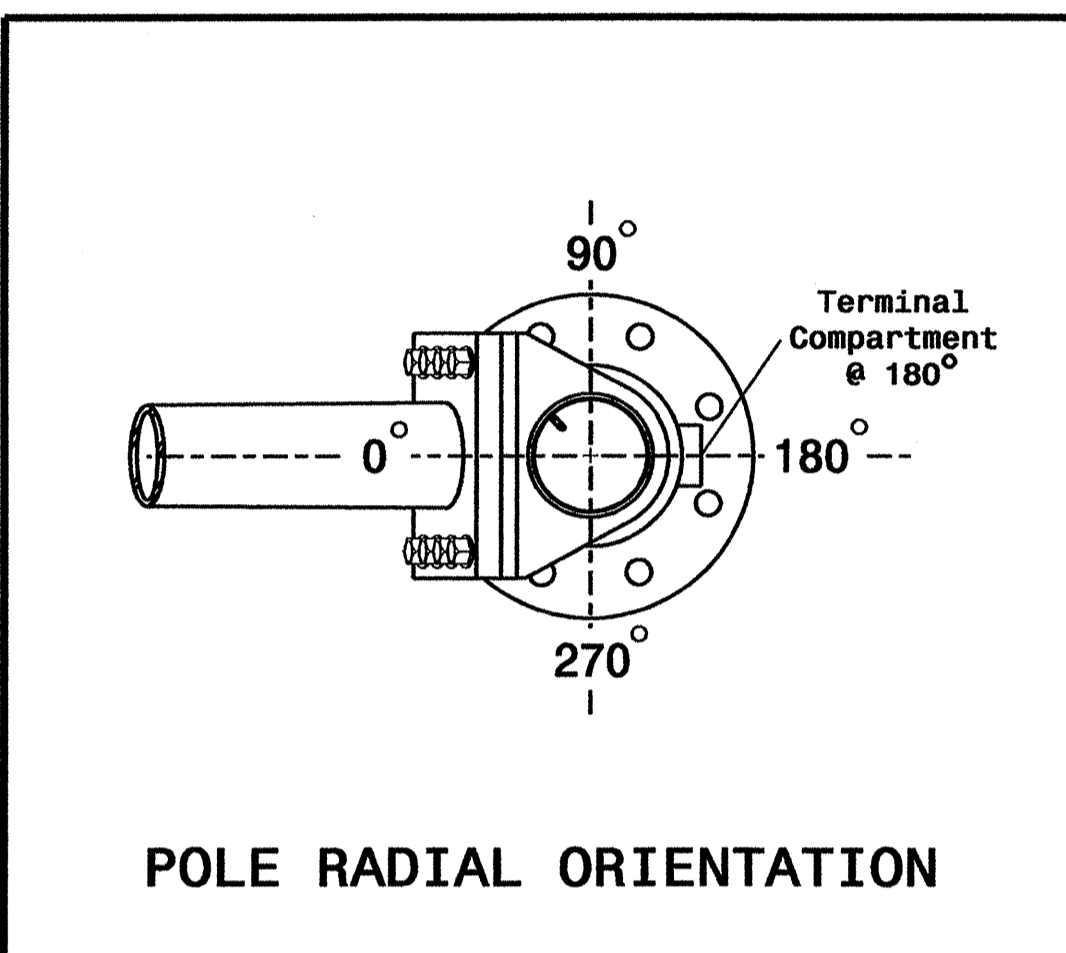


Elevation View

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 1	Pole 2
Baseline reference point at Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+1.4 ft.	+1.2 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A



MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
[Symbol]	SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
[Symbol]	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
[Symbol]	OVERHEAD VIDEO DETECTION WITH MAST ARM MOUNT	0.6 S.F.	4.0" H X 4.75" W X 21.25" L	6 LBS
[Symbol]	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS
[Symbol]	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5" W X 17.0" L	21 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/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.

This plan shall supersede the plan sign and sealed on 4/4/03.

NCDOT Wind Zone 5 (120 mph)

05-0CT-2006 11:00 s:\m\15 signals\m\kgr\coups#1\p\project\sb-4696\m\10796_s\p\m\1_2006\0xx.dgn

	Prepared in the Office of: US 19-441 Business at SR 1368 (Acquoni Road)	SEAL
	Division 14 Swain County Cherokee PLAN DATE: October 2006 REVIEWED BY: D Y Ishak PREPARED BY: R M Duffy REVIEWED BY:	
SCALE 0 N/A N/A	REVISIONS INIT. DATE	SIGNATURE DATE SIG. INVENTORY NO. 14-0796

PHASING DIAGRAM

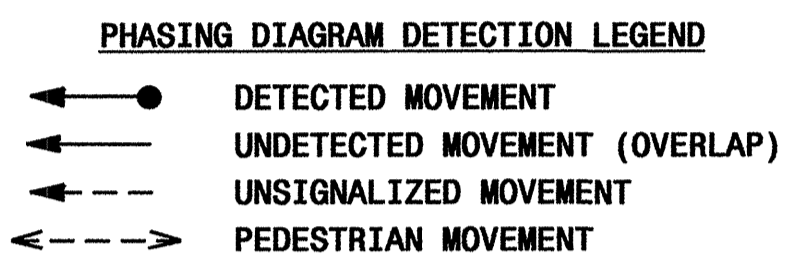
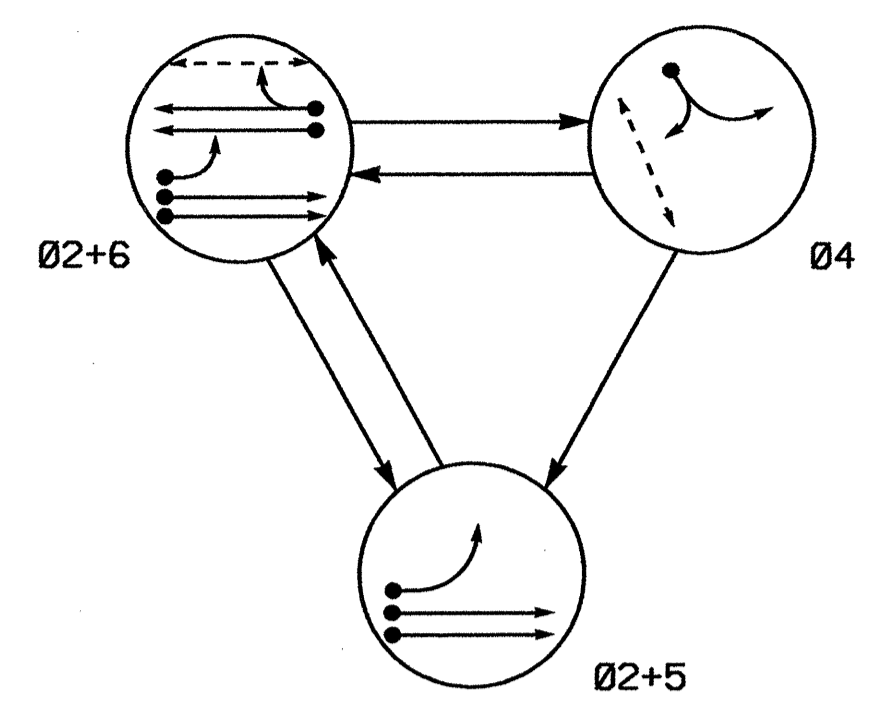
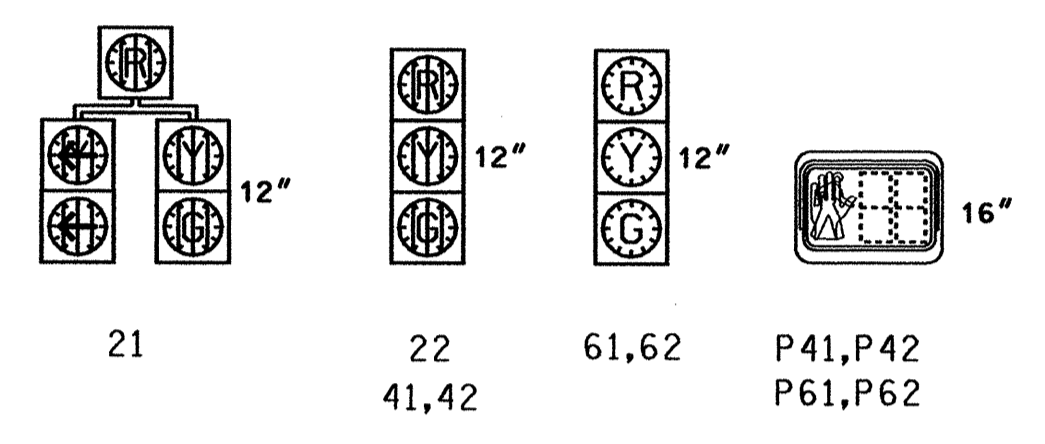
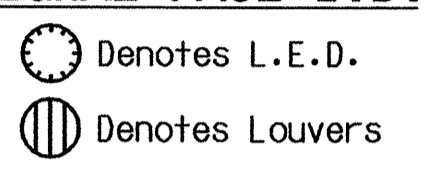


TABLE OF OPERATION

SIGNAL FACE	PHASE			
	02+5	02+6	04	PEDESTRIAN
21	G	G	R	Y
22	G	G	R	Y
41,42	R	R	G	R
61,62	R	G	R	Y
P41,P42	DW	DW	W	DRK
P61,P62	DW	W	DW	DRK

SIGNAL FACE I.D.



2070L LOOP & DETECTOR INSTALLATION

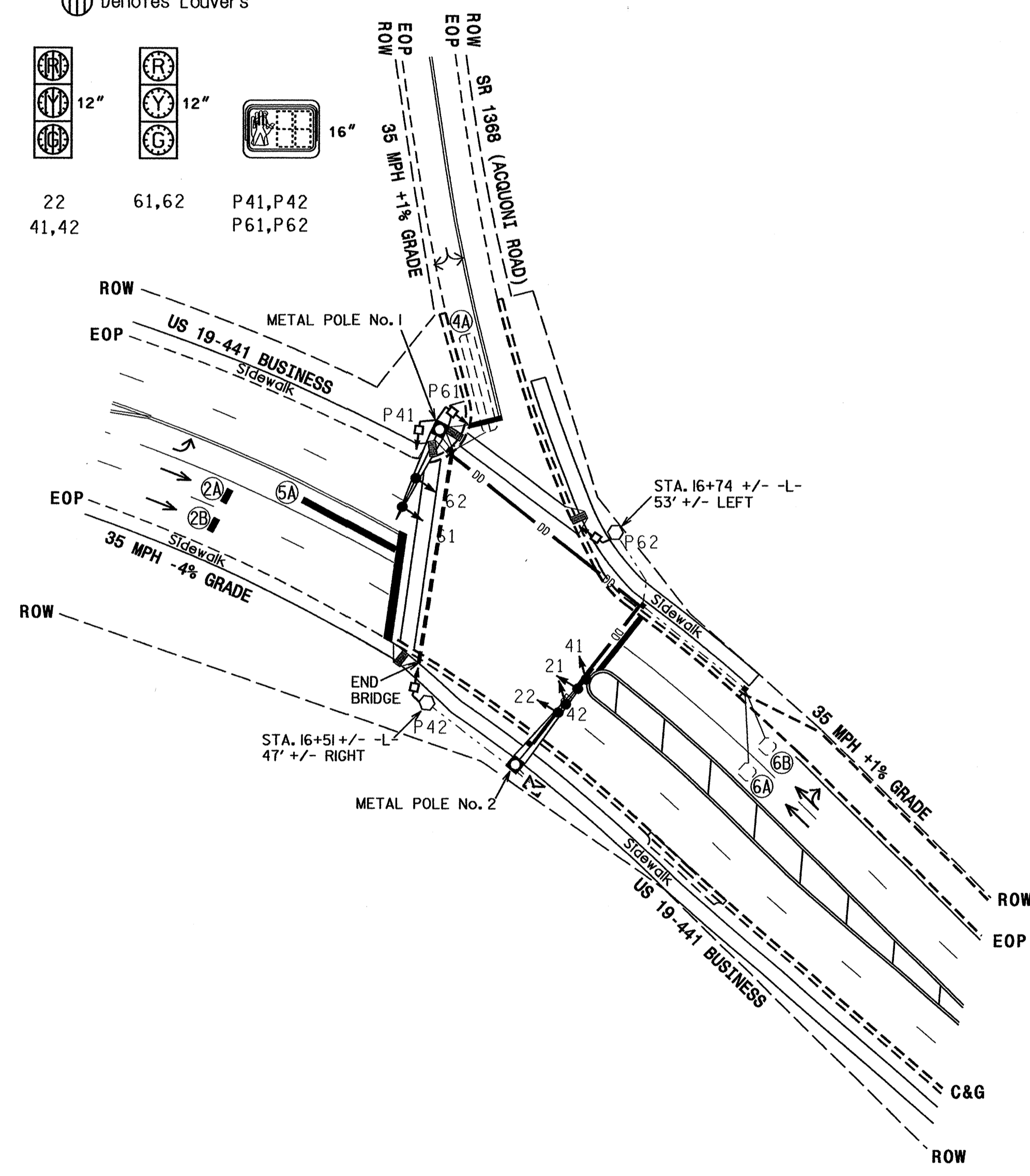
INDUCTIVE LOOPS				DETECTOR PROGRAMMING								
LOOP	SIZE (FT)	TURNS	DISTANCE FROM STOPBAR (FT)	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	SYSTEM LOOP	STRETCH TIME	DELAY TIME	NEW CARD
4A	6X40	2-4-2	+5	-	4	Y	Y	-	-	-	10	-
6A,6B	6X6	4	70	-	6	Y	Y	-	-	-	-	-
2A,2B	6X6	*	70	*	2	Y	Y	-	-	-	-	*
5A	6X40	*	0	*	2	Y	Y	Y	-	-	3	*
					5	Y	Y	-	-	-	15	*

* VIDEO DETECTION ZONE

3-PHASE FULLY-ACTUATED (TIME-BASED SYSTEM)

NOTES

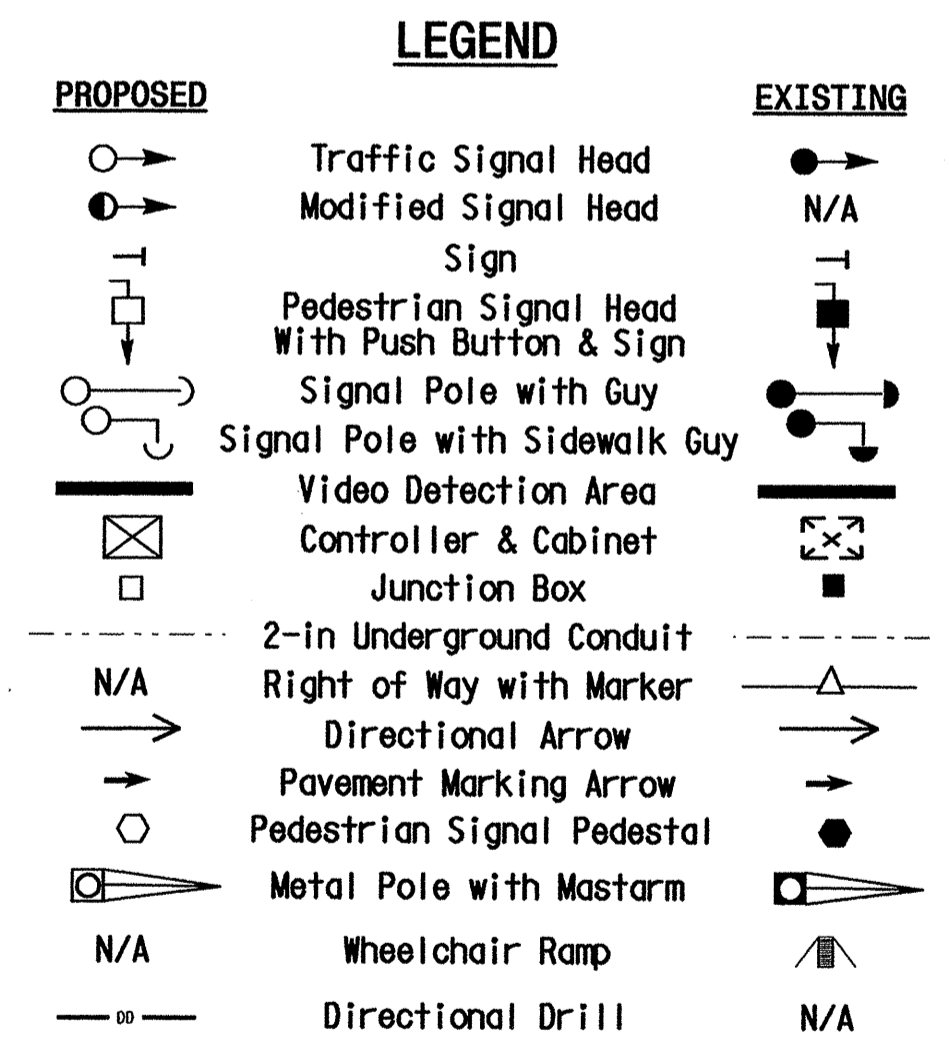
- Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
- Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
- During coordination phase 5 may be lagged.
- Reposition existing signal heads numbered 61 and 62.
- Set all detector units to presence mode.
- Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
- Program pedestrian heads to countdown the flashing "Don't Walk" time only.
- Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
- Incorporate loop emulator system for phase 2 and 5 vehicle detection.



2070L TIMING CHART

FEATURE	PHASE			
	2	4	5	6
Min Green 1*	10	7	7	10
Extension 1*	3.0	2.0	2.0	3.0
Max Green 1*	45	20	15	45
Yellow Clearance	4.1	3.0	3.0	3.8
Red Clearance	1.6	3.4	2.1	1.8
Walk 1*	-	7	-	7
Don't Walk 1	-	16	-	10
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	-	-	-	-
Time To Reduction *	-	-	-	-
Minimum Gap	-	-	-	-
Recall Mode	MIN. RECALL	-	-	MIN. RECALL
Vehicle Call Memory	YELLOW	-	-	YELLOW
Dual Entry	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON

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



This plan shall supersede the plan signed and sealed on 04/04/03.

Signal Upgrade - Final

Prepared in the Office of:
 Traffic Engineering and Safety Systems
 STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 Planning and Geometrics Section

US 19-441 Business at SR 1368 (Acquoni Road)
 Division 14 Swain County Cherokee
 PLAN DATE: September 2006 REVIEWED BY: RM Duffy
 PREPARED BY: TS Thigpen REVIEWED BY: D. SHAKR

122 N. McDowell St., Raleigh, NC 27603

SCALE: 1" = 40'

SIGNATURE: EDWARD E. MULLINX DATE: 26 SEP 2006
 SEAL: PROFESSIONAL ENGINEER NO. 42027

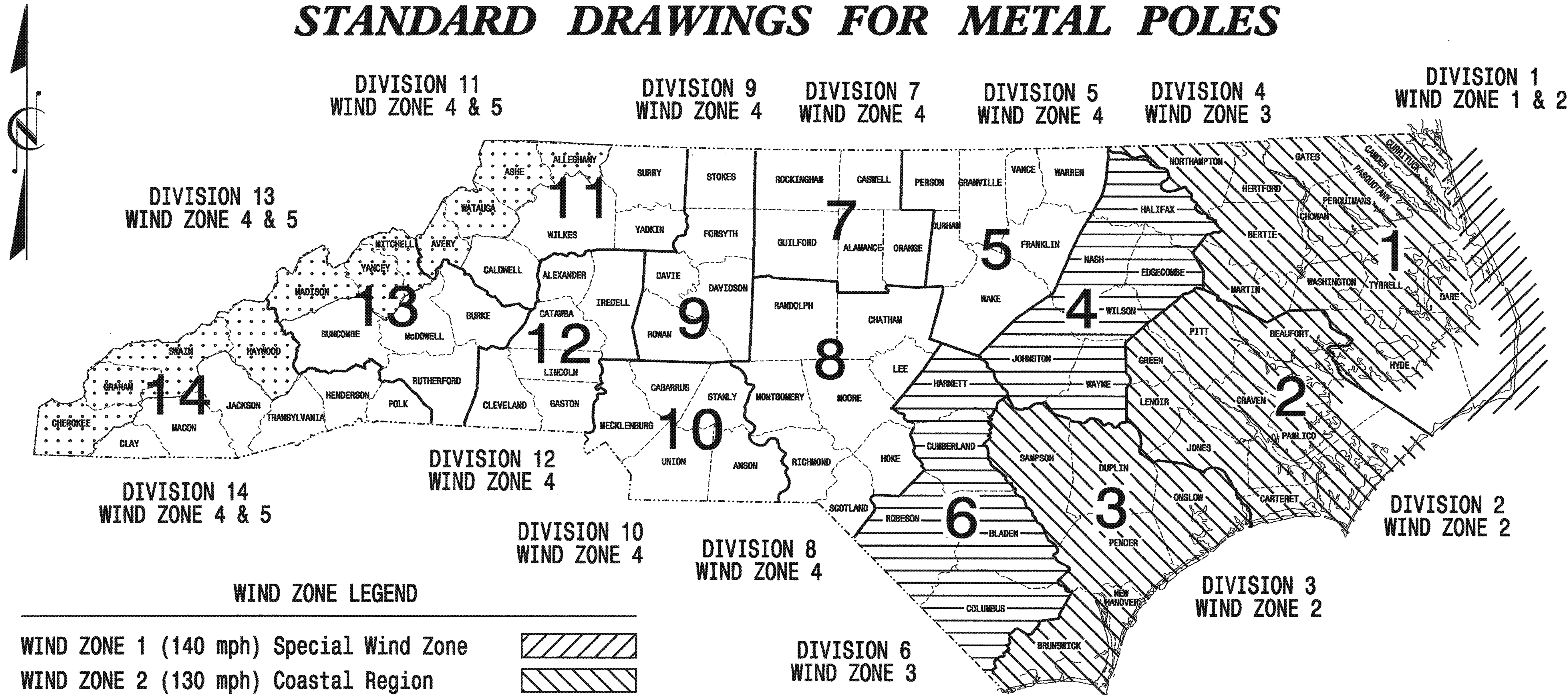
SIG. INVENTORY NO. 14-0796

20-SEP-2006 11:31 s:\p15\signal\chicago\cupss\p1\project\sig\8-4696\140796.sig_dgn...2006mmd.dgn tthjgben

STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

STATE	PROJECT NO.	SHEET NO.
N.C.	B-4696	Sig. 17
F.A. PROJ. NO.		M 1
PROJECT ID. NO.		

STANDARD DRAWINGS FOR METAL POLES



WIND ZONE LEGEND

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

<http://www.ncdot.org/doh/preconstruct/traffic/tmsu/ws/default.htm>

Prepared in the Offices of:

Traffic Engineering and Safety Systems Branch
DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section

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

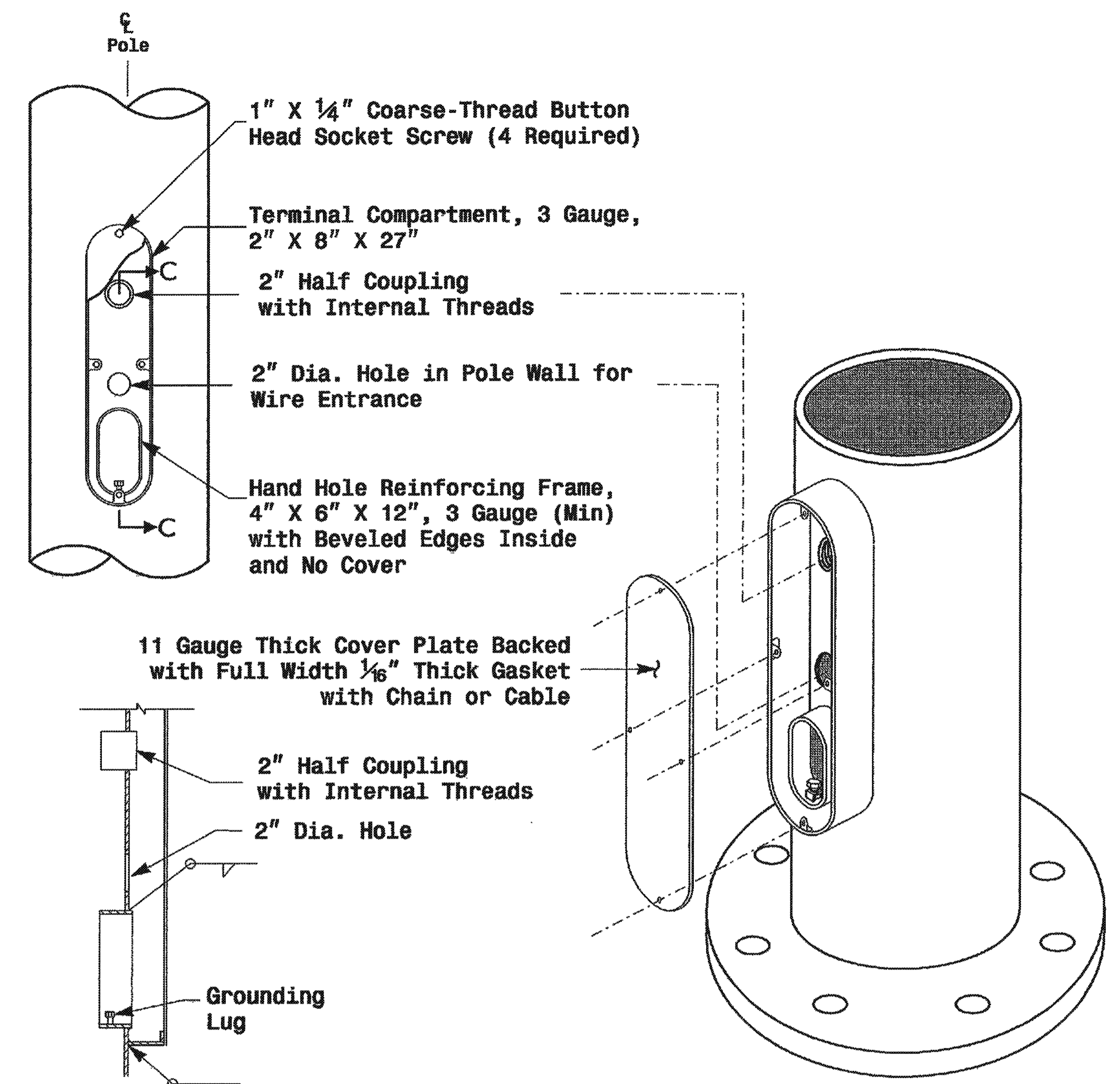
INDEX OF PLANS	
DRAWING NUMBER	DESCRIPTION
M 1	Title Sheet
M 2	Fabrication Details - All Poles
M 3	Fabrication Details - Strain Poles
M 4,5	Fabrication Details - Mast Arm Poles
M 6	Construction Details - Strain Poles
M 7	Construction Details - Foundations
M 8	Standard Strain Poles

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

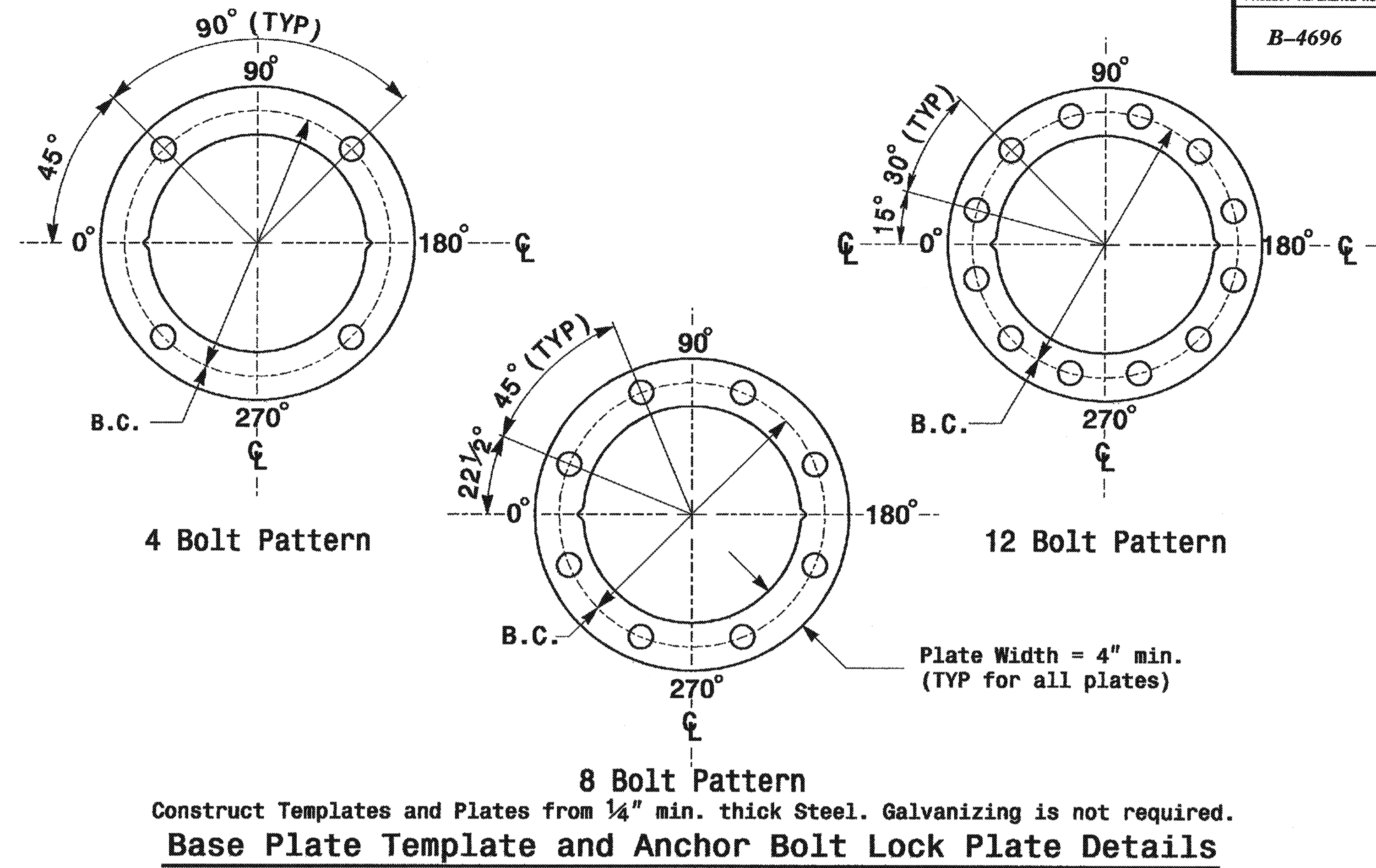
SEAL

D. C. Sarkar 9.2.2005
SIGNATURE DATE



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

Terminal Compartment Detail



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

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

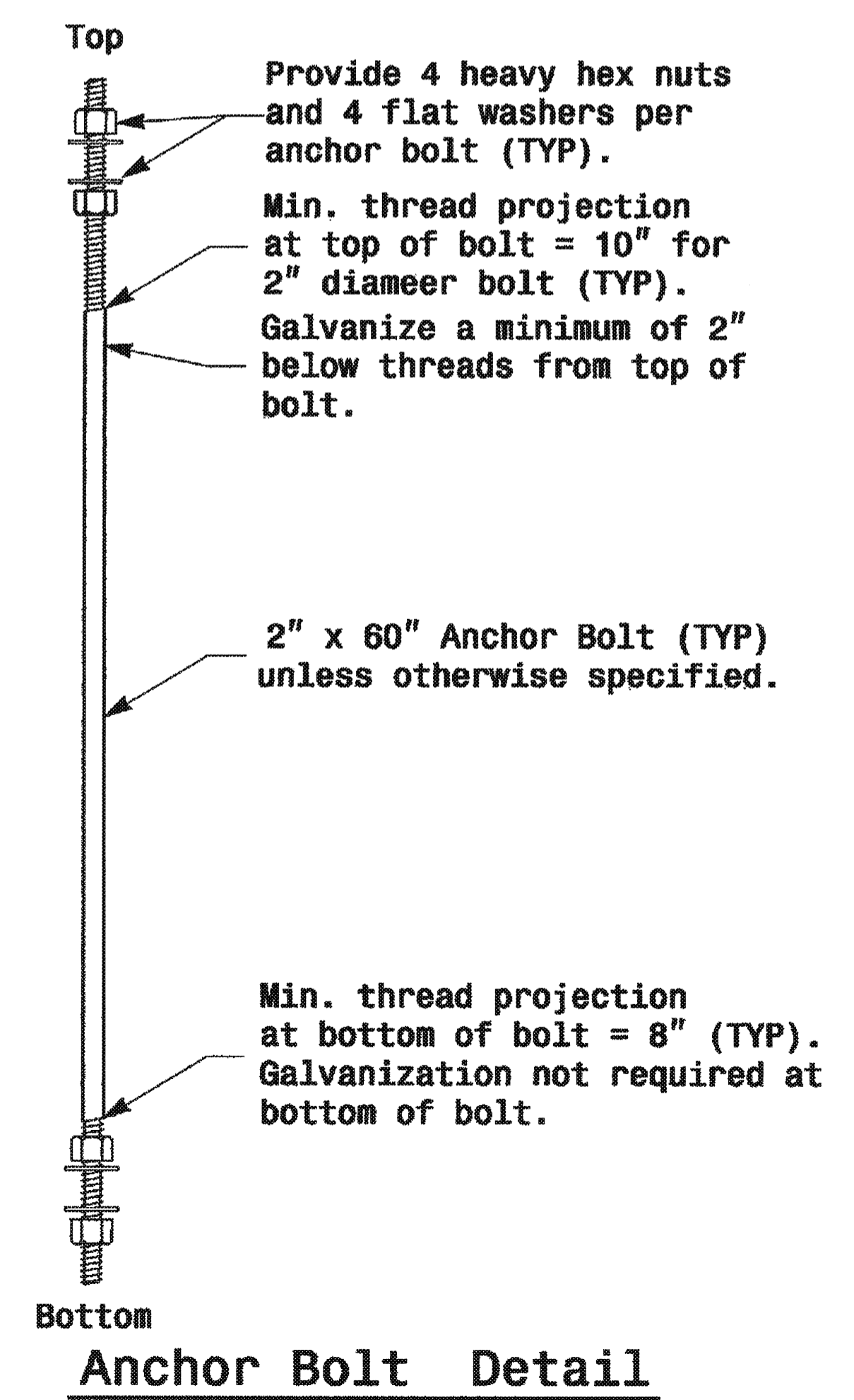
Shaft I.D. Tag
 (Provide on Strain Poles and Mast Arm Poles)

- 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.

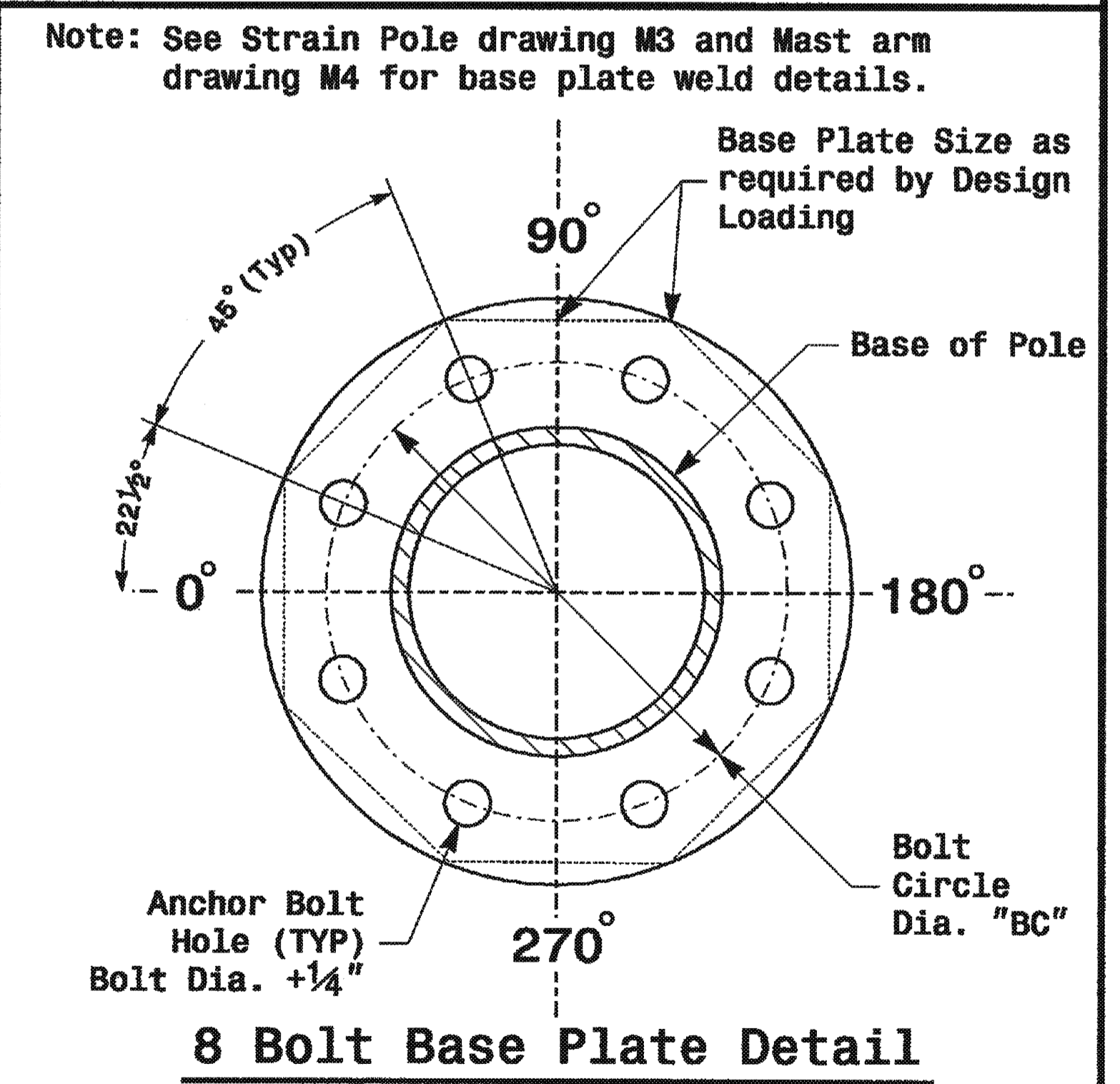
Identification Tag Details

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

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



Anchor Bolt Detail



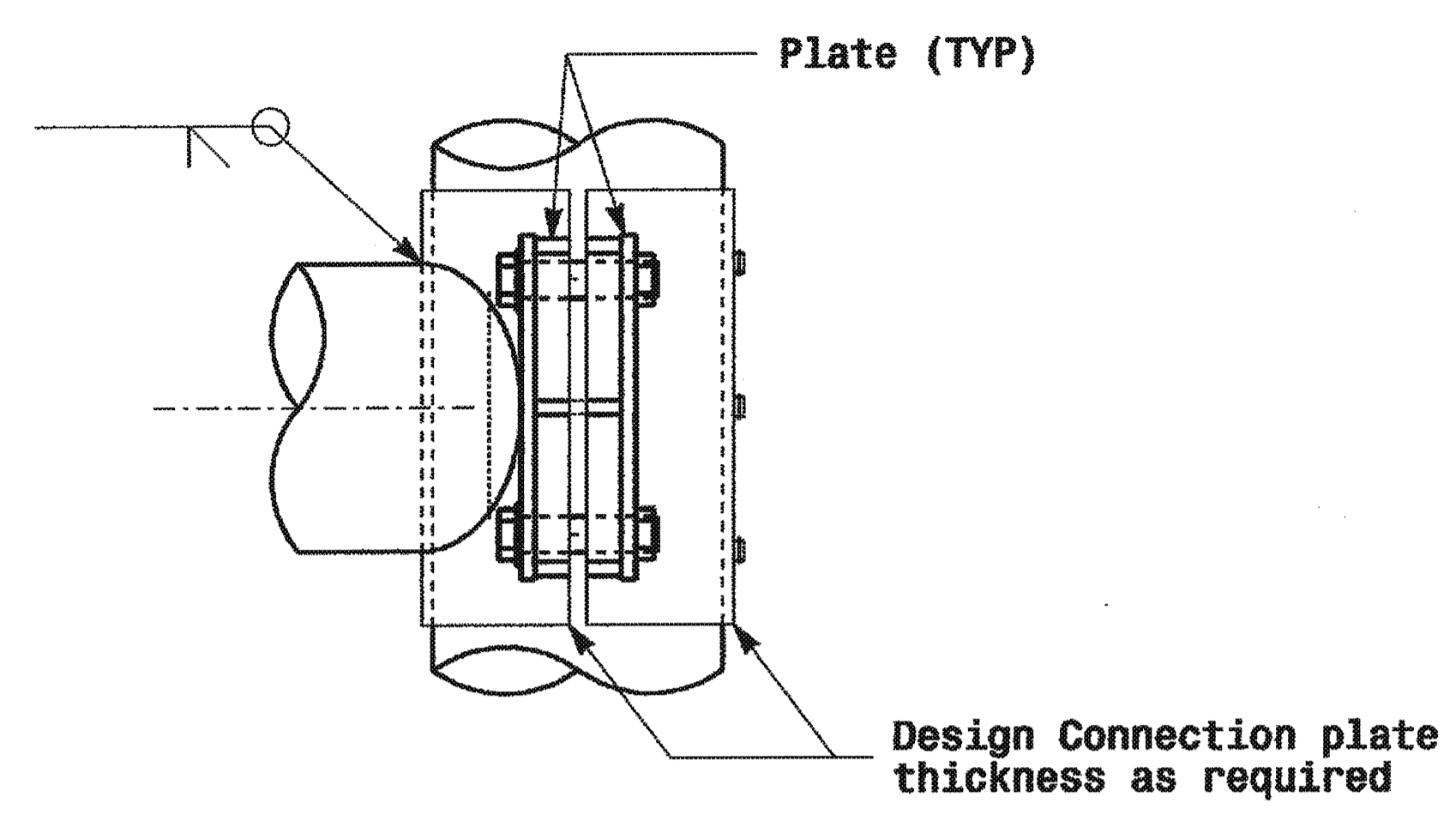
8 Bolt Base Plate Detail

	Typical Fabrication Details Common To All Metal Poles		
	PLAN DATE: May 2005 PREPARED BY: P.L. Alexander REVISIONS: _____	REVIEWED BY: C.F. Andrews REVIEWED BY: A.W. Esposito INT. DATE: _____	

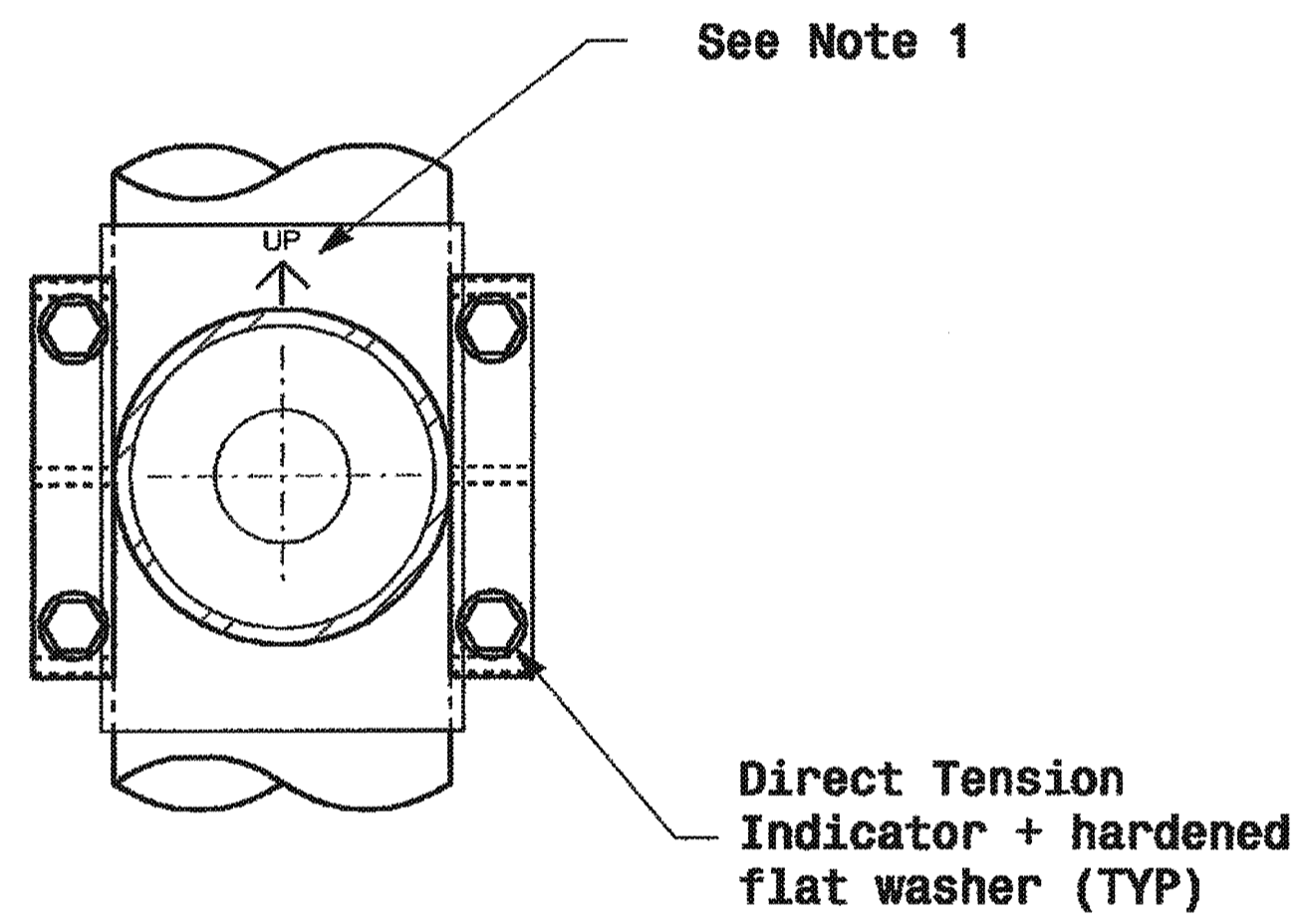
Fabrication Details - All Poles

01-SEP-2005 18:22 D:\2004_Metro_Pole_Standards\2004_m2 thru m5.dgn

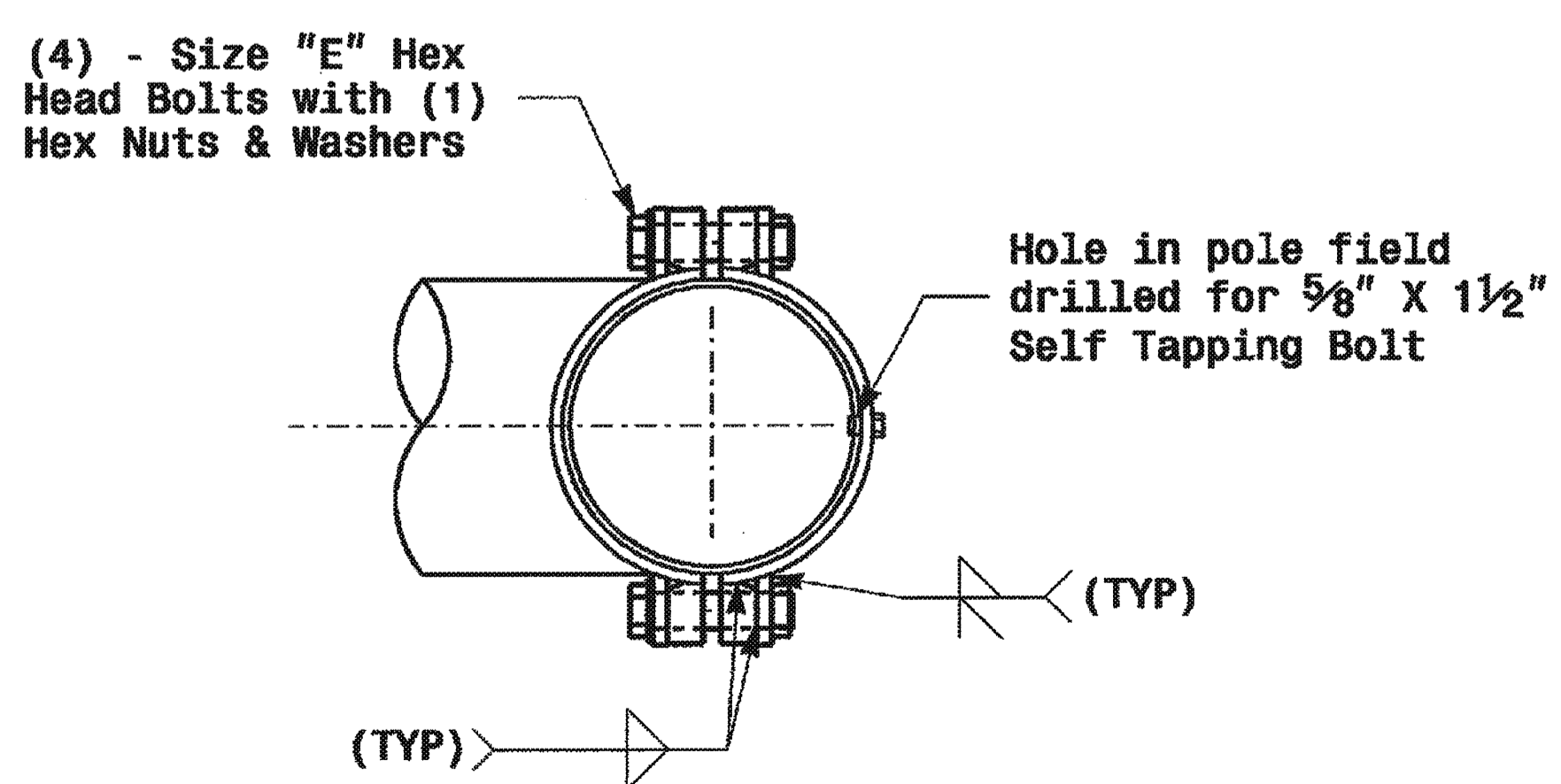
Adjustable Clamp Type Bolted Mast Arm Connection



Side Elevation View

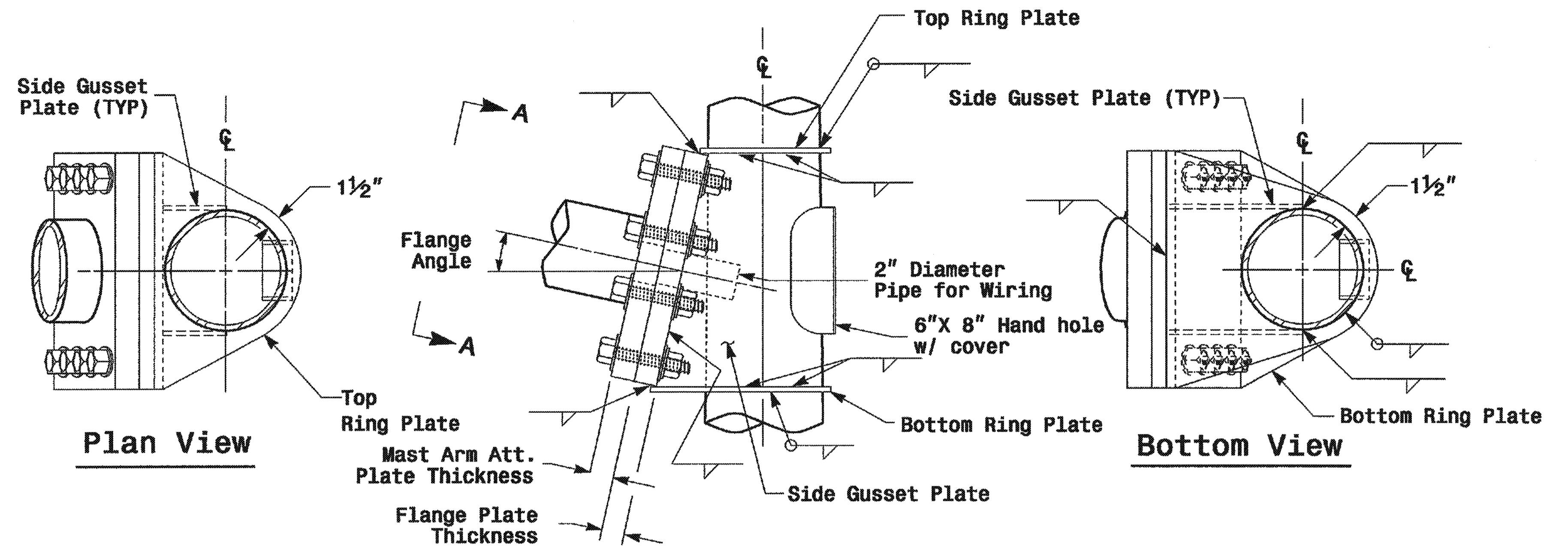


Front Elevation View

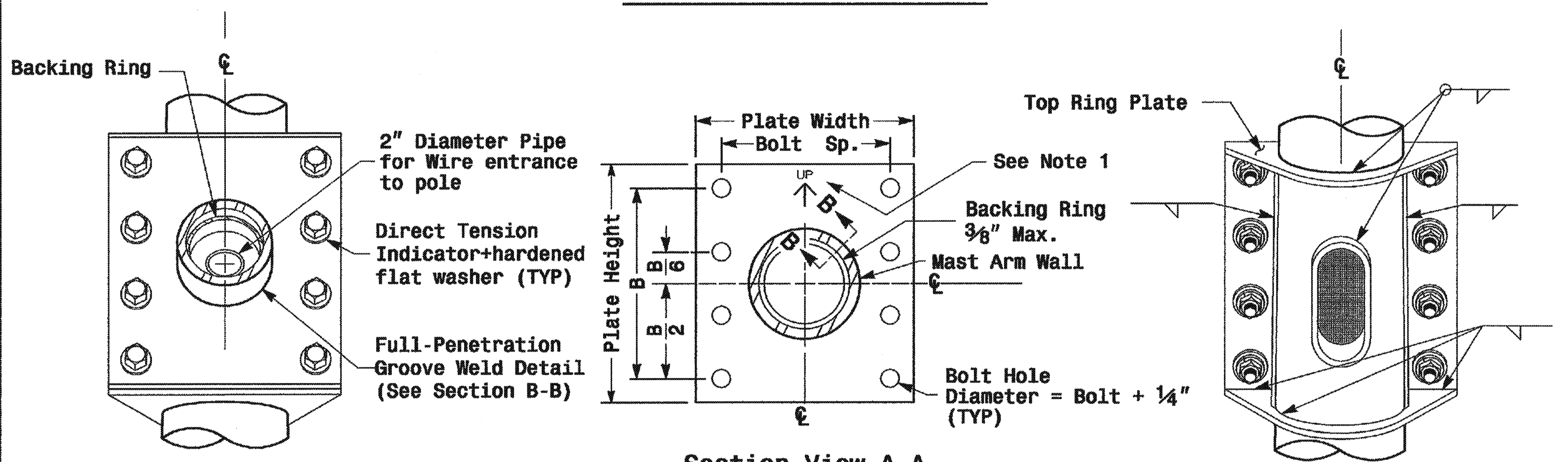


Plan View

Welded Ring Stiffened Mast Arm Connection



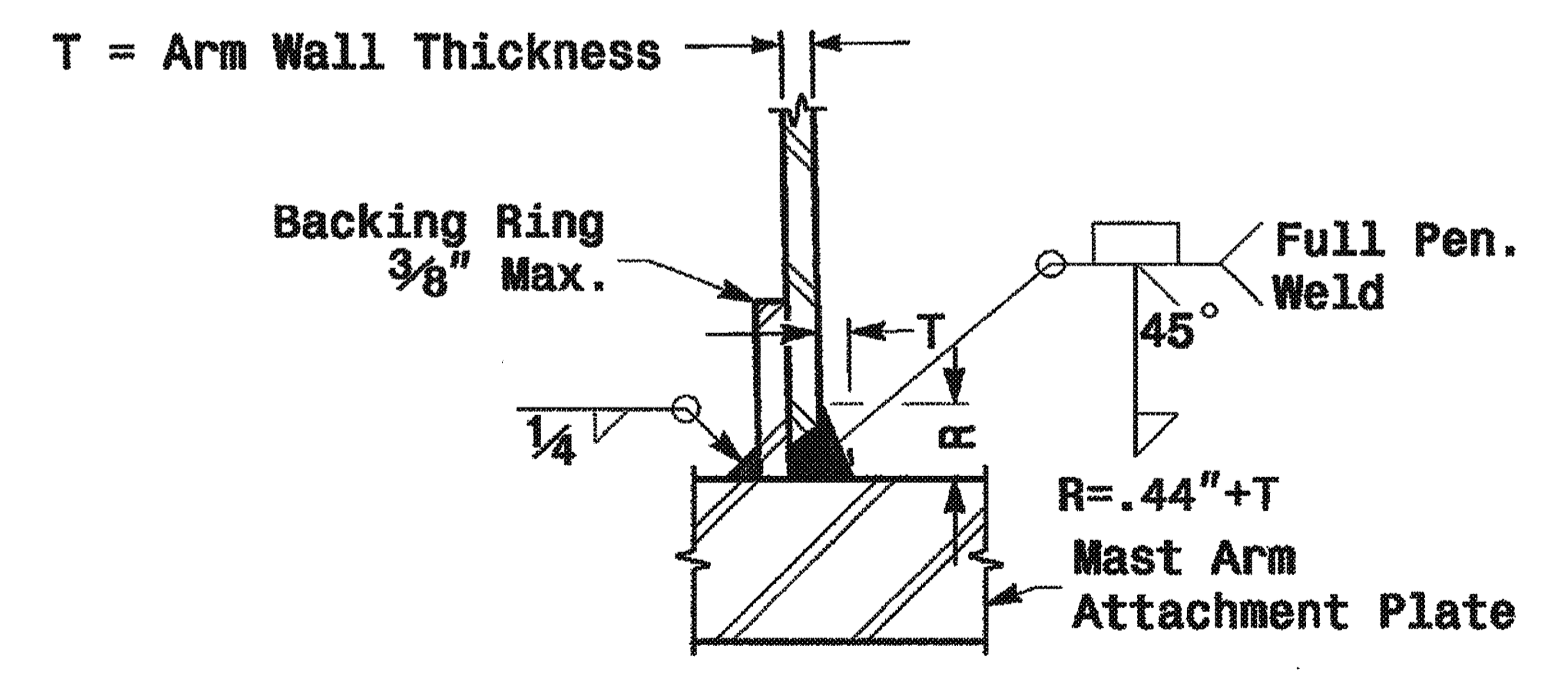
Side Elevation View



Front Elevation View

Section View A-A Mast Arm Attachment Plate

Back Elevation View



Section B-B Full-Penetration Groove Weld Detail

Notes:

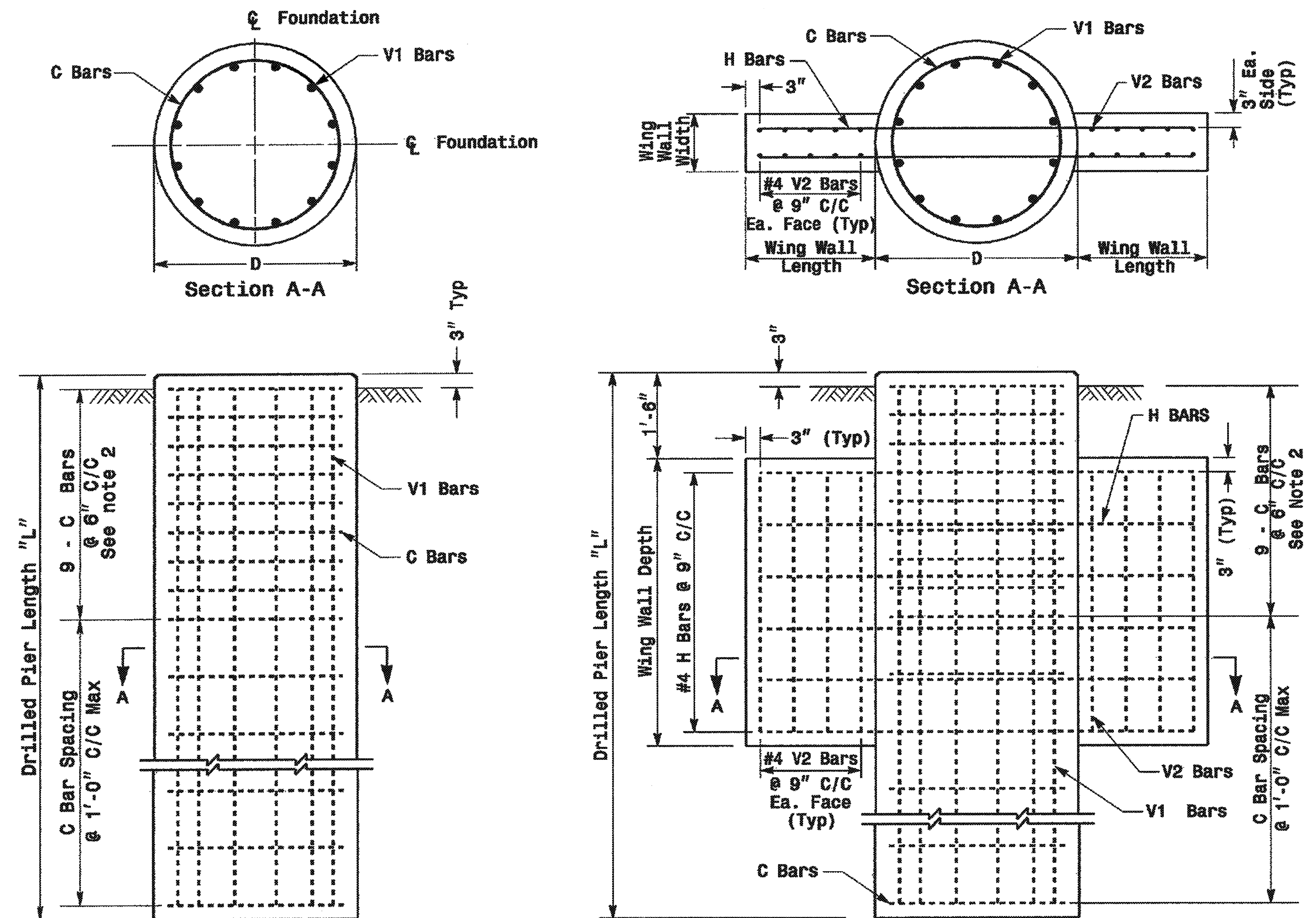
1. Provide a permanent means of identification above the mast arm to indicate proper attachment orientation of the mast arm.
2. Designer will determine the size of all structural components, plates, fasteners, and welds shown unless they are already specified.
3. Designer is responsible for providing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

01-SEP-2005 14:11 \\p0001\eg-un1\morkgroup\eg004 metal pole standard\eg004 m5.dgn

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

Fabrication Details - Mast Arm Poles

Reinforcing Steel Bars



REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (42" & 48" DIAMETER)

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

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

REINFORCING STEEL TABLE FOR STANDARD 42" and 48" DRILL PIER SHAFT WITH TYPE 1 AND TYPE 2 WING WALLS

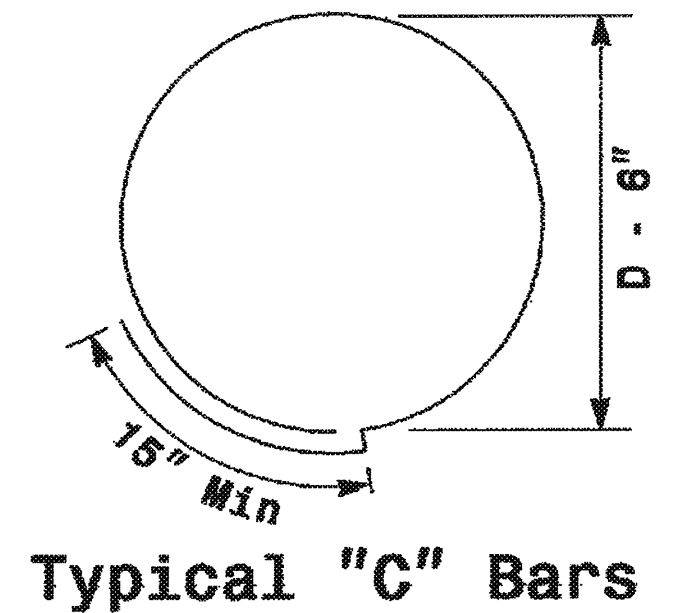
Wing Wall Type	Drill Pier Shaft Dia. (in.)	Reinforcing Steel				
		Bar Name	No.	Size	Type	Length
TYPE 1	42"	V1	9	#8	STR.	**
		V2	12	#4	STR.	2'-6"
		H	8	#4	STR.	6'-0"
		C	*	#4	CIR.	10'-9"
TYPE 2	42"	V1	9	#8	STR.	**
		V2	16	#4	STR.	4'-6"
		H	12	#4	STR.	9'-0"
TYPE 2	48"	V1	12	#8	STR.	**
		V2	16	#4	STR.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

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

WING WALL DETAILS

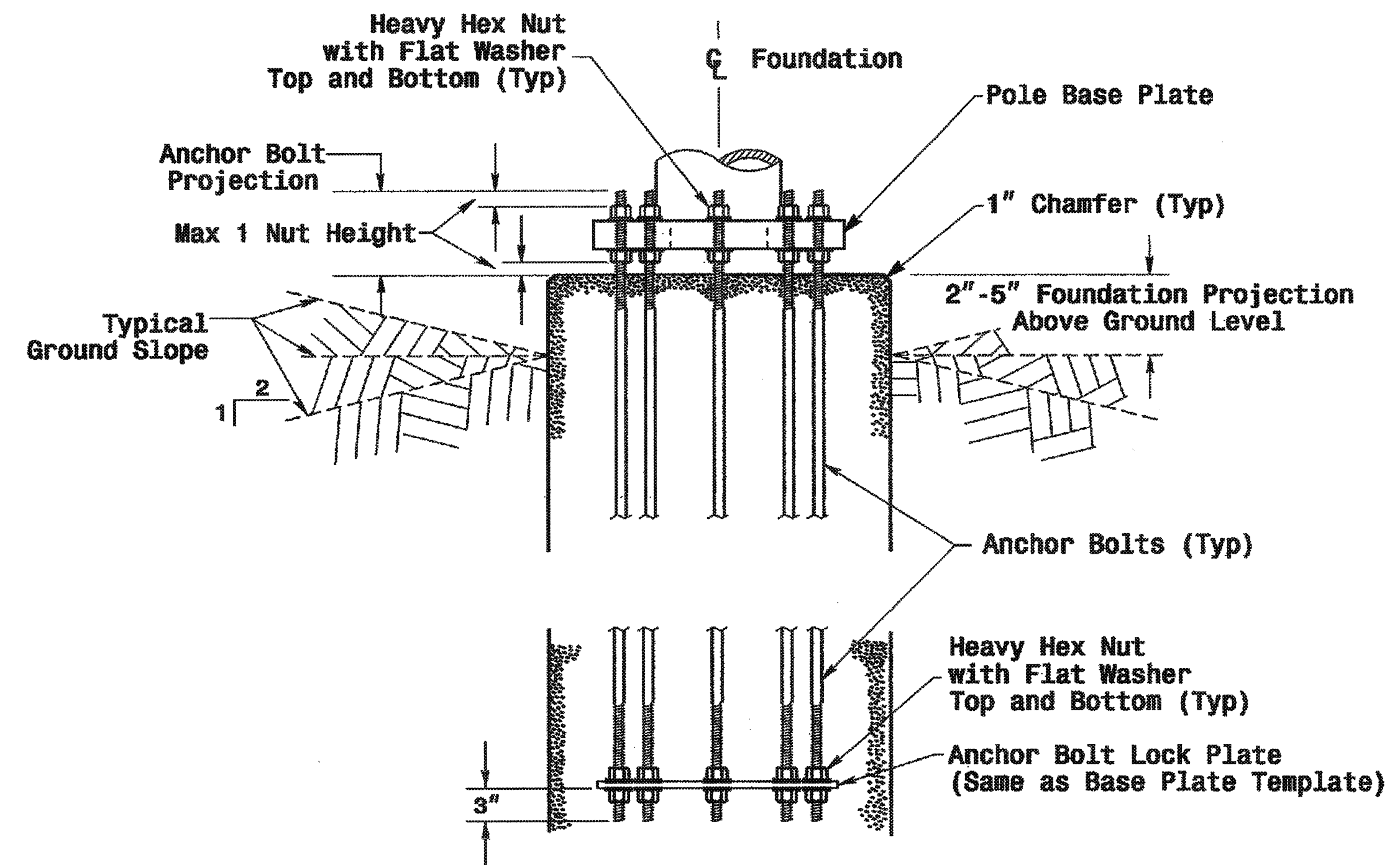
Wing Wall Type	Wing Wall Length (Ft.)	Wing Wall Width (Ft.)	Wing Wall Depth (Ft.)	Concrete Volume (Cu. Yds.)
TYPE 1	1'-6"	1'-0"	3'-0"	.4
TYPE 2	3'-0"	1'-0"	5'-0"	1.2

See Note No. 4

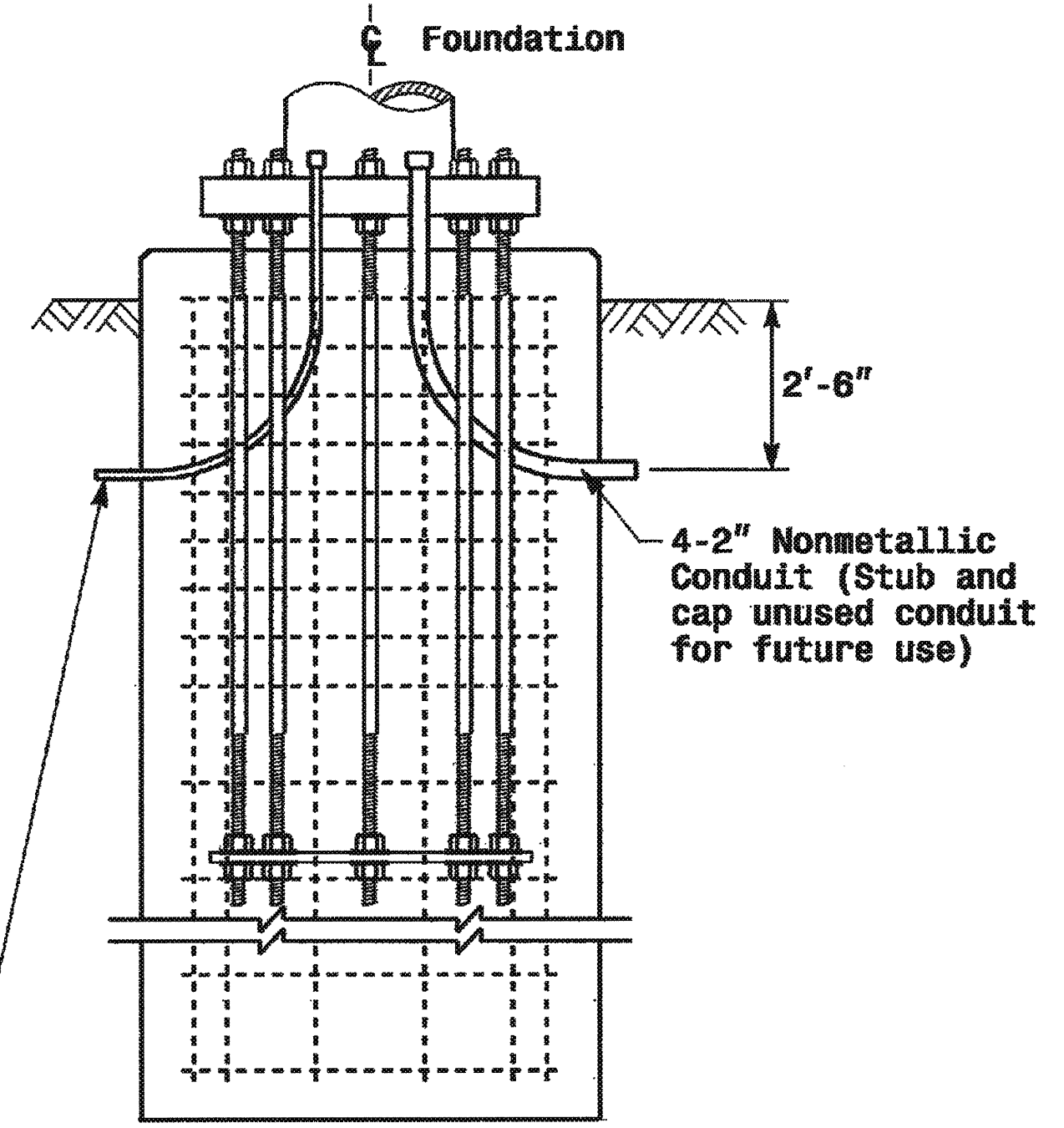


Typical Foundation Anchor Bolt Details

(Reinforcing Cage Not Shown for Clarity)



Typical Foundation Conduit Details



Notes

- 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.)

Prepared in the Office of:

Construction Details Foundations

PLAN DATE: May 2006 REVIEWED BY: P.L. ALEXANDER
 PREPARED BY: G.F. ANDREWS REVIEWED BY: A.W. ESPOSITO

REVISIONS: _____ DATE: _____

SCALE: 0 NA NONE

SIGNATURE: *D. Sarkar* DATE: 9.2.2005
 SIG. INVENTORY NO. _____

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

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS

SHEET 1 OF 3
1725D01

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

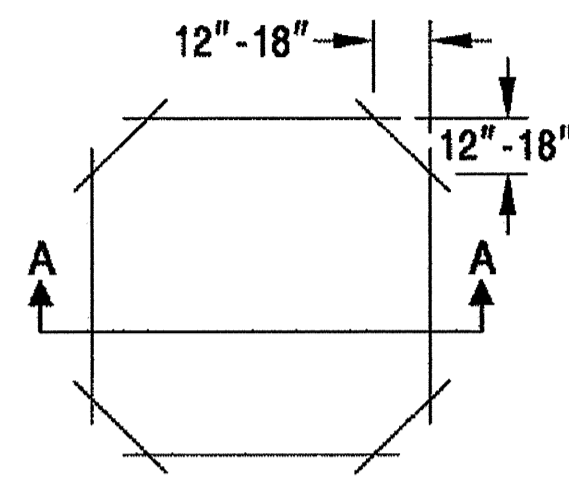
ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS

SHEET 1 OF 3
1725D01

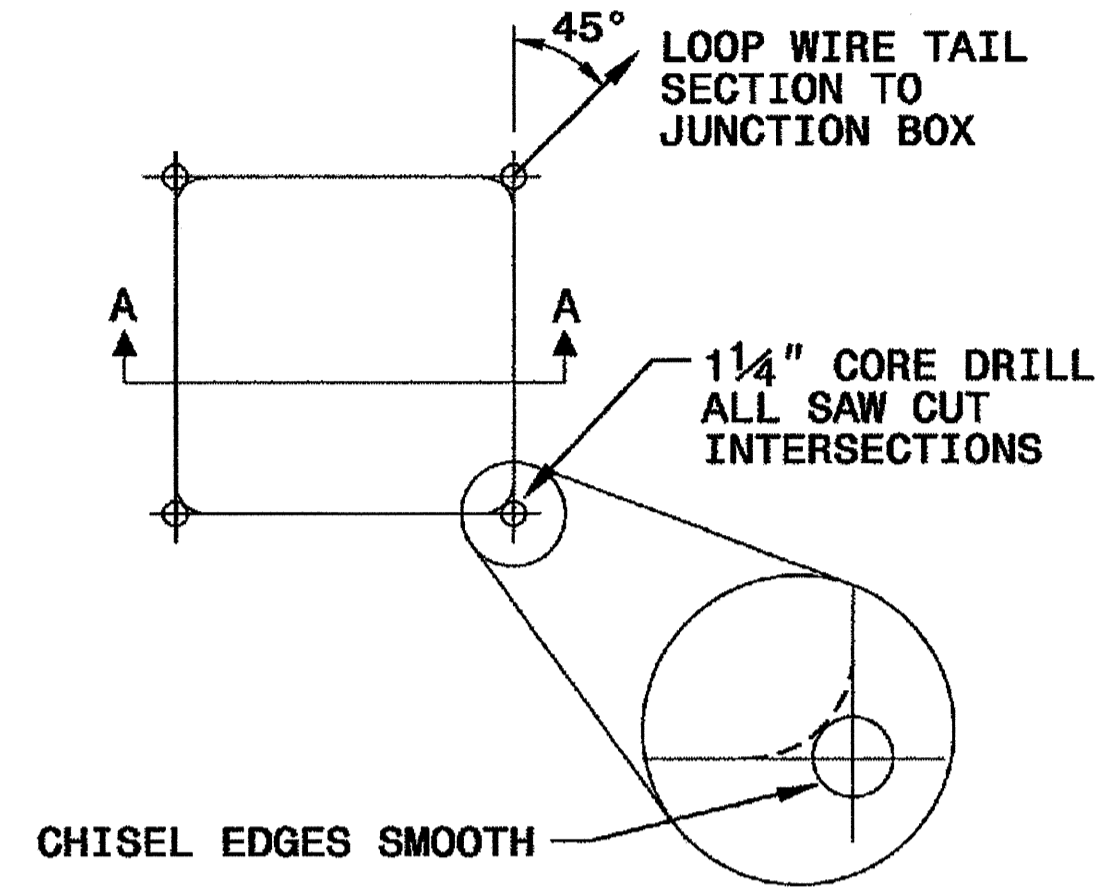
CONVENTIONAL 4-SIDED LOOP

SAW CUT OPTIONS

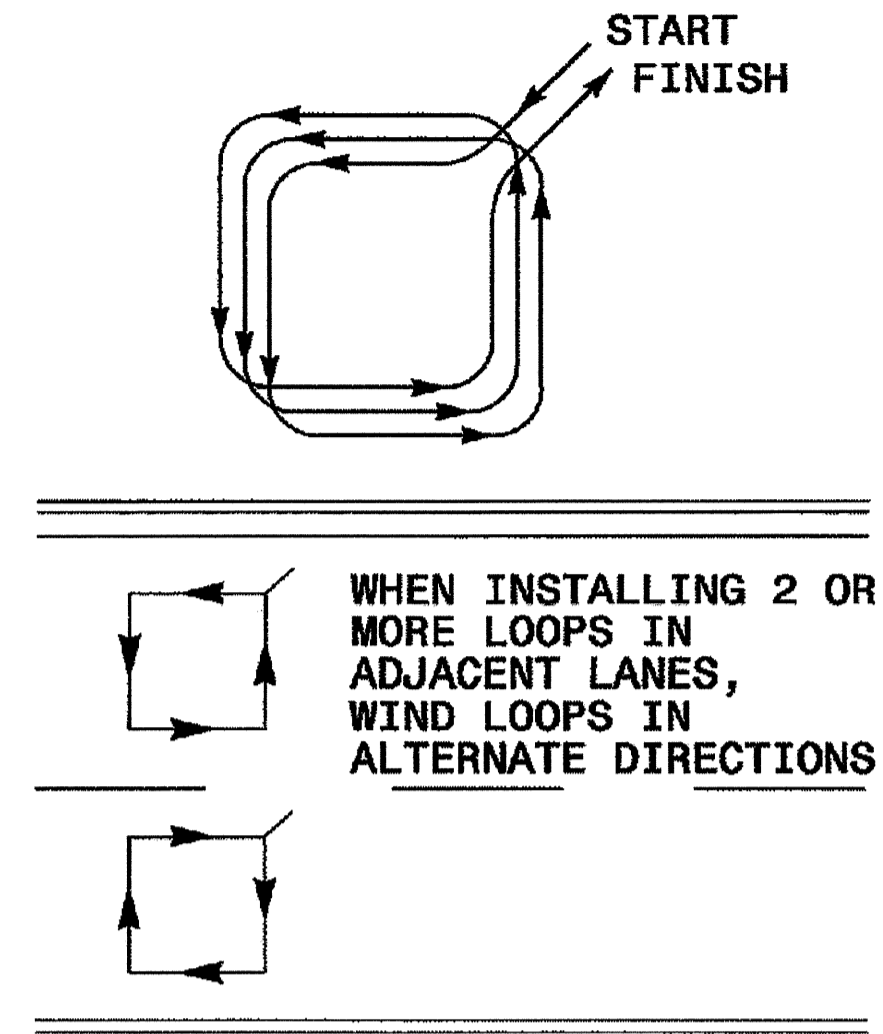
OPTION 1



OPTION 2
 (POOR PAVEMENT)

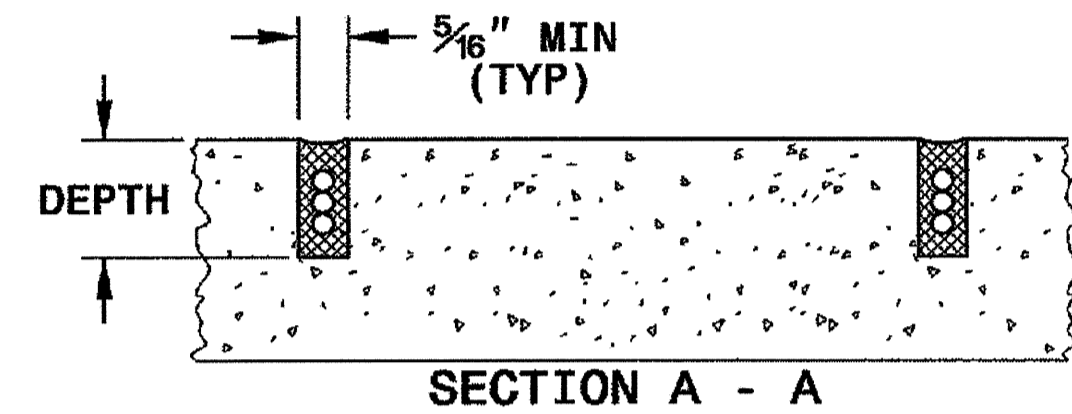


LOOP WINDING METHOD



SAW SLOT DEPTH CHART

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



LOOP WIRE TWISTING METHOD

INCORRECT WAY TO TWIST WIRE



CORRECT WAY TO TWIST WIRE



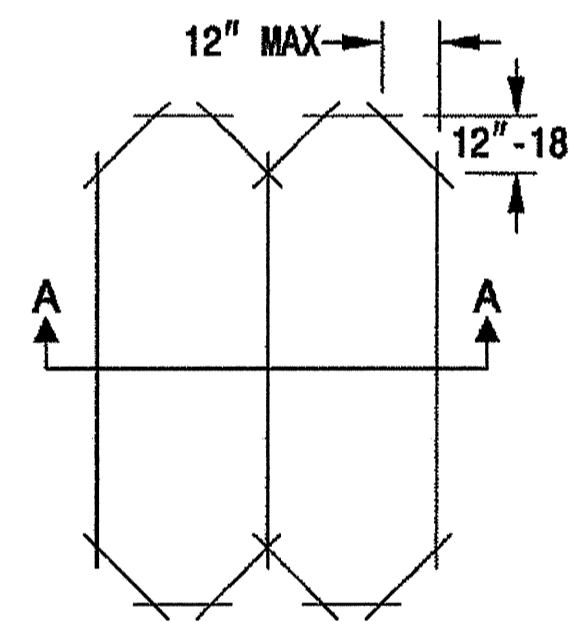
NOTES

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

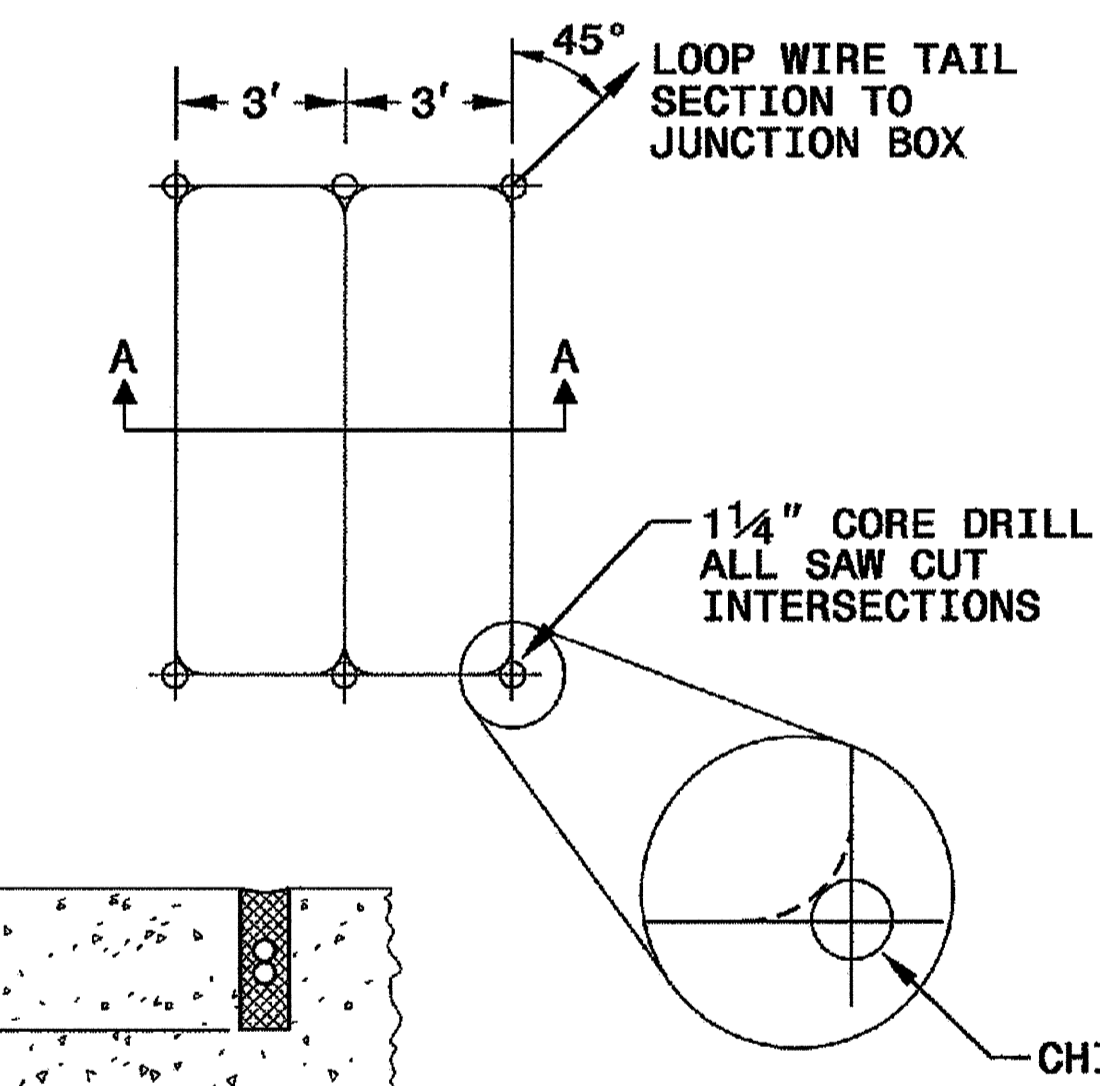
QUADRUPOLE LOOP

SAW CUT OPTIONS

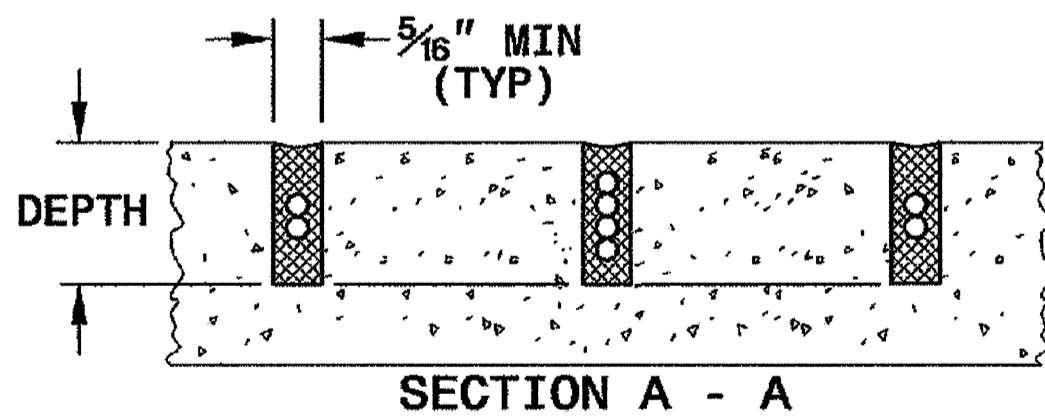
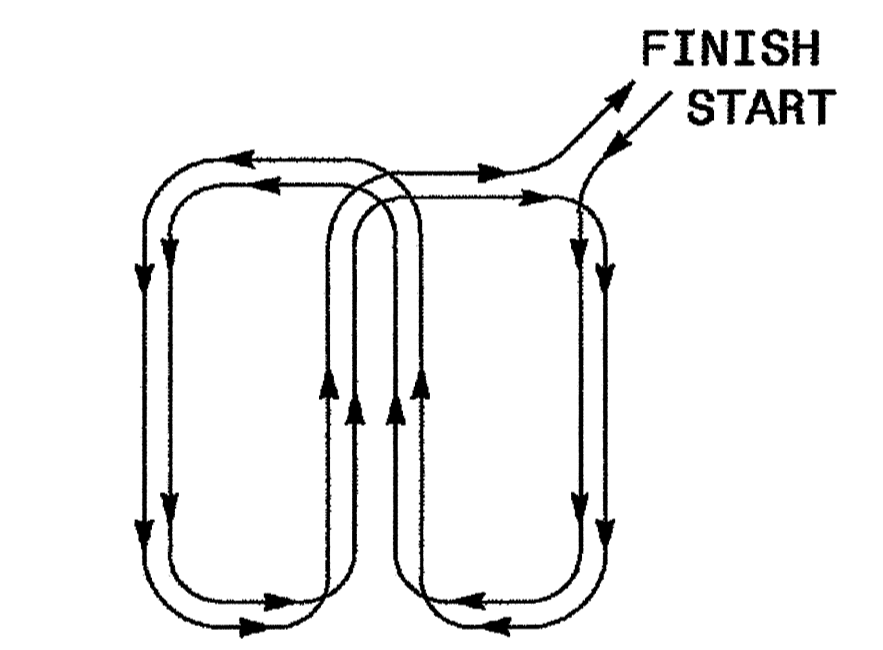
OPTION 1



OPTION 2
 (POOR PAVEMENT)



LOOP WINDING METHOD



DEPTH IS 2.5" FOR CONCRETE AND 3.0" FOR ASPHALT

See Plate for Title

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

SEAL
 NORTH CAROLINA
 PROFESSIONAL
 SEAL
 016286
 ENGINEER
 MILTON I. DEAN
 Signature: *Milton I. Dean* 9/5/07
 SIGNATURE DATE

05-SEP-2007 14:00
 c:\documents and settings\m11\ie_dor\desktop\actrand\metol.pole sheets\1725D01.mxd\2307.dgn
 2/11/10

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

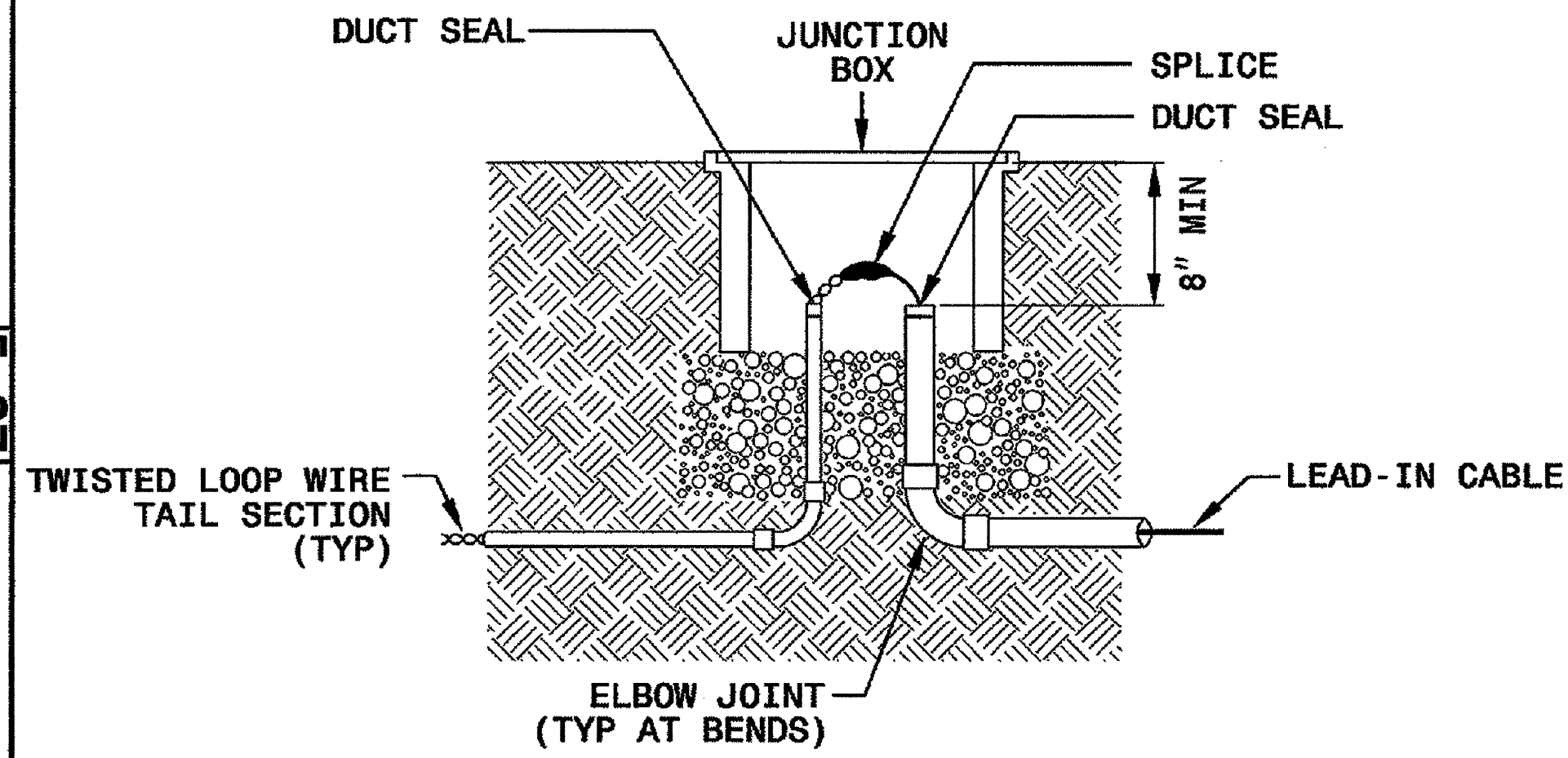
5-07

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
 LOOP WIRE DETAILS

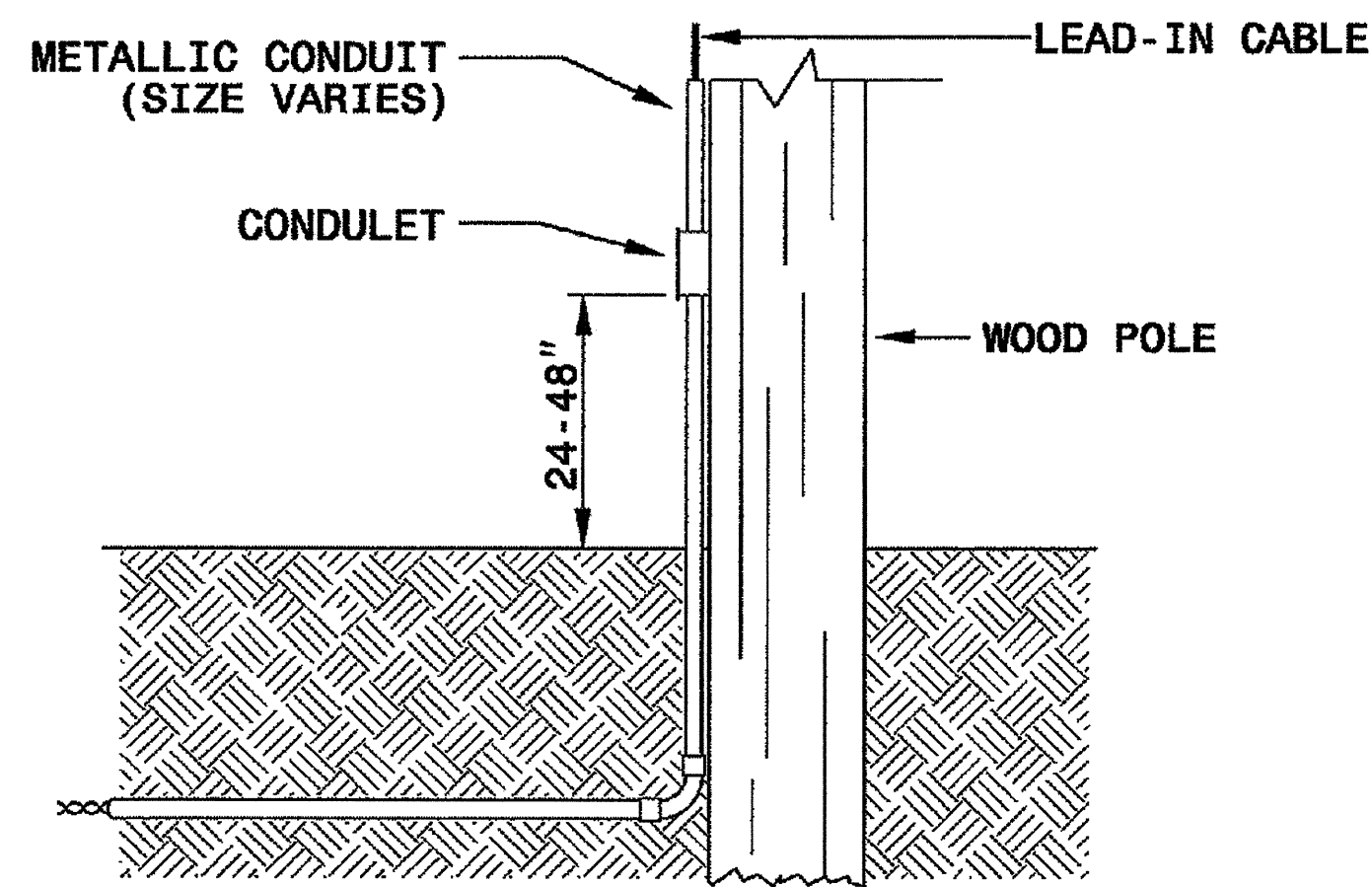
SHEET 2 OF 3
1725D01

LOOP WIRE SPLICE POINT DETAILS

LOOP WIRE AT JUNCTION BOX



LOOP WIRE AT POLE

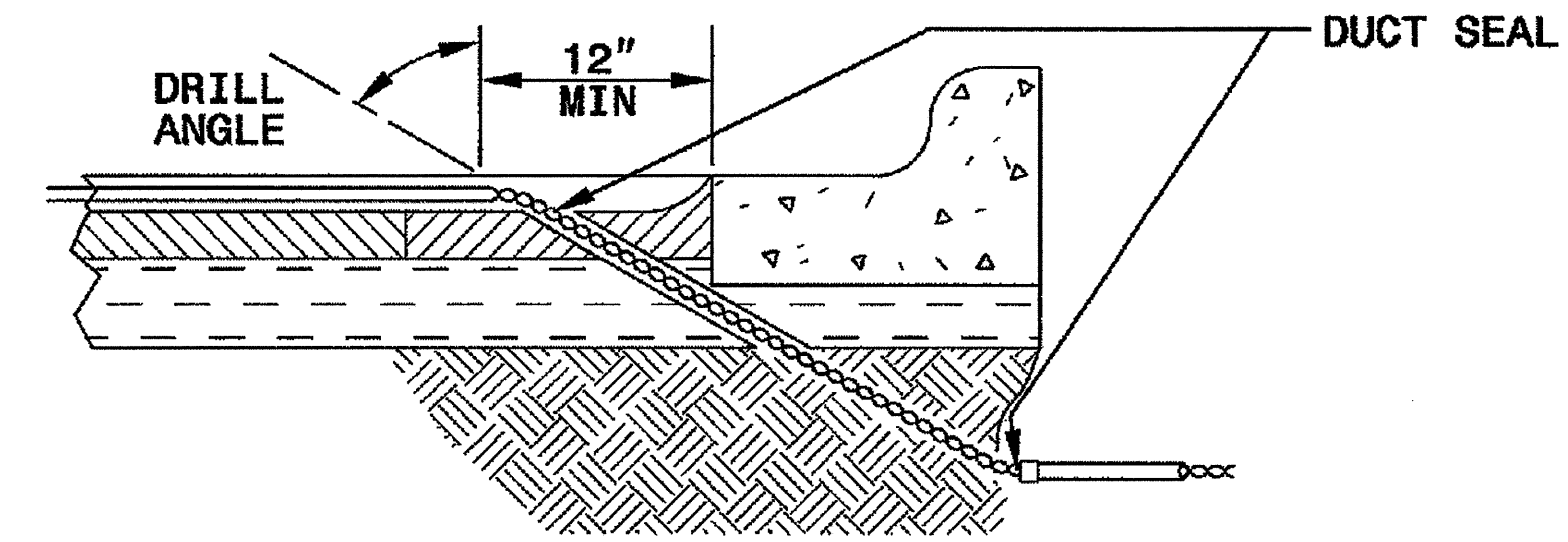


NOTE

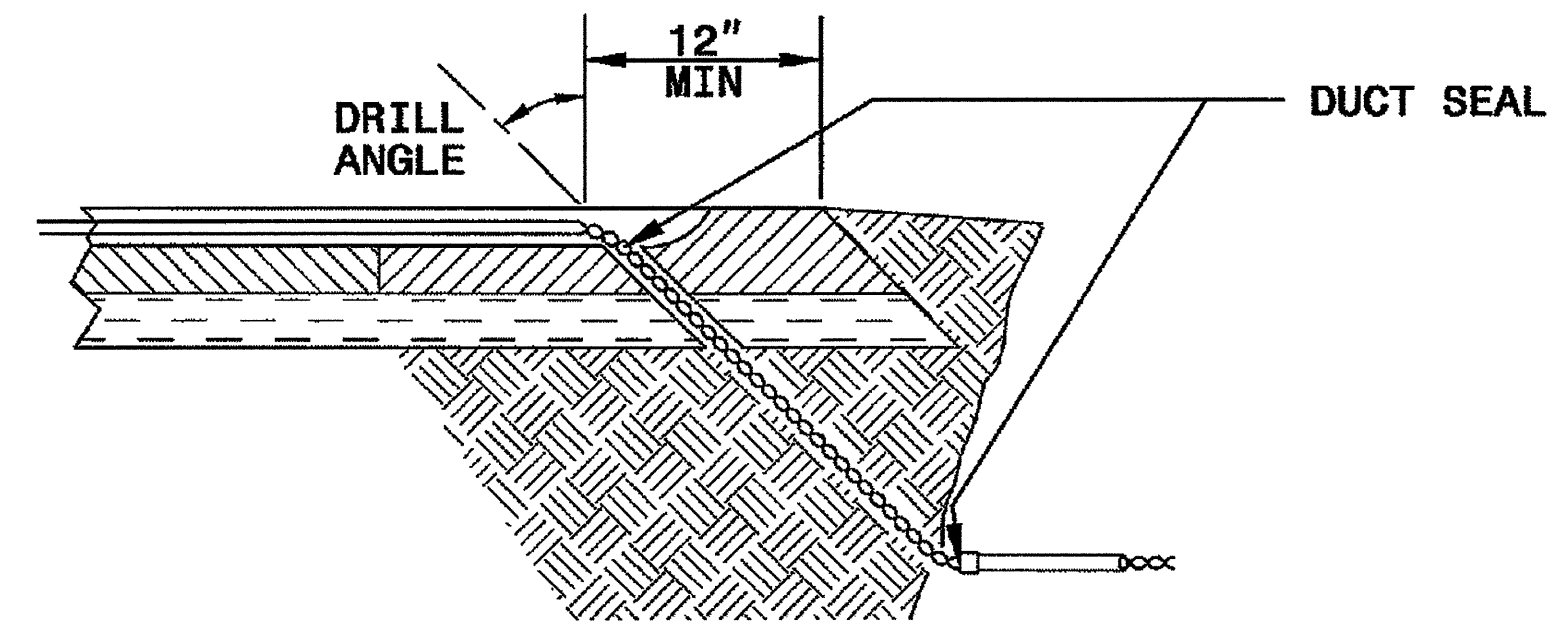
SPLICE ALL LOOP WIRE TAIL SECTIONS/LEAD-IN CABLE IN JUNCTION BOXES OR APPROVED CONDULETS.

LOOP WIRE PAVEMENT EDGE DETAILS

LOOP WIRE AT CURB & GUTTER SECTION



LOOP WIRE AT PAVEMENT SECTION



NOTES

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

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

5-07

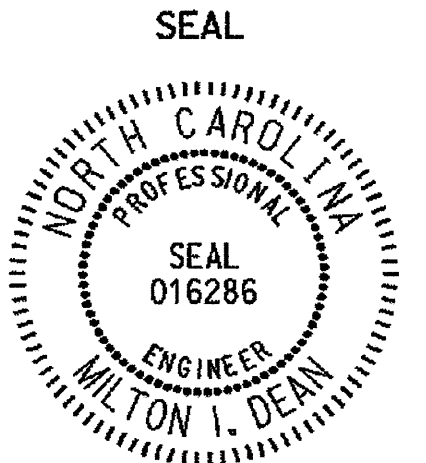
ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
 LOOP WIRE DETAILS

SHEET 2 OF 3
1725D01

See Plate for Title



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



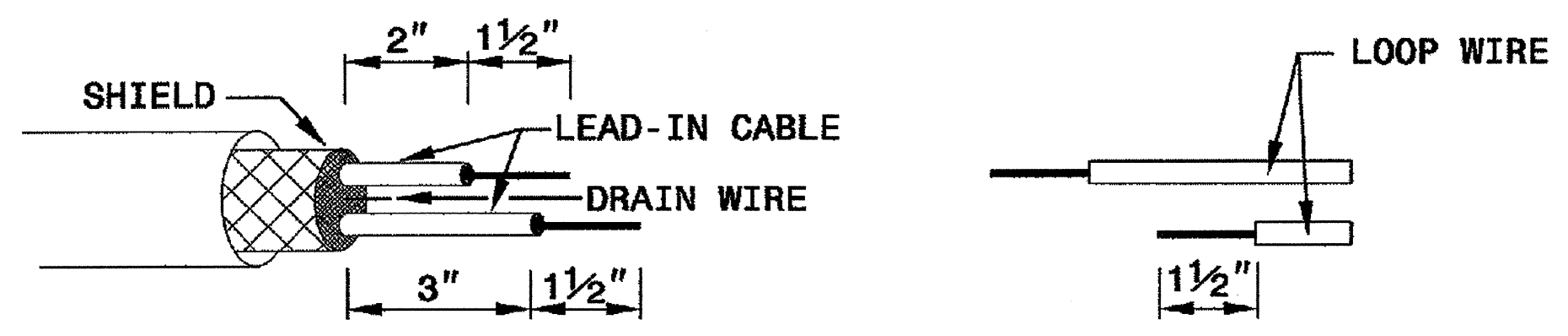
SEAL
 016286
 MILTON I. DEAN
 ENGINEER
 Signature: *Milton I. Dean*
 DATE: 9/5/07

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

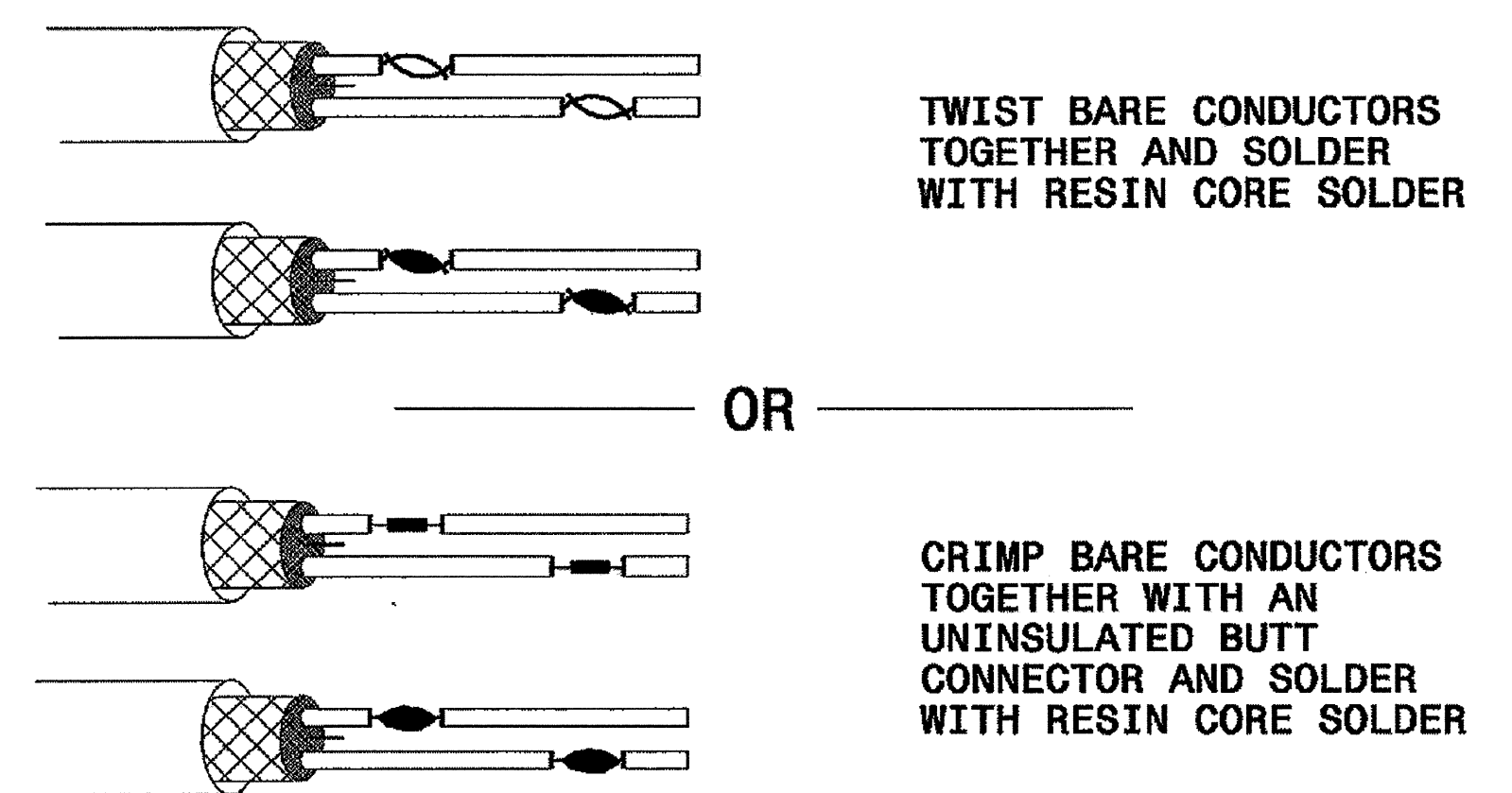
ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
 SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

SHEET 3 OF 3
1725D01

STEP 1. STRIP LOOP WIRE AND LEAD-IN CABLE

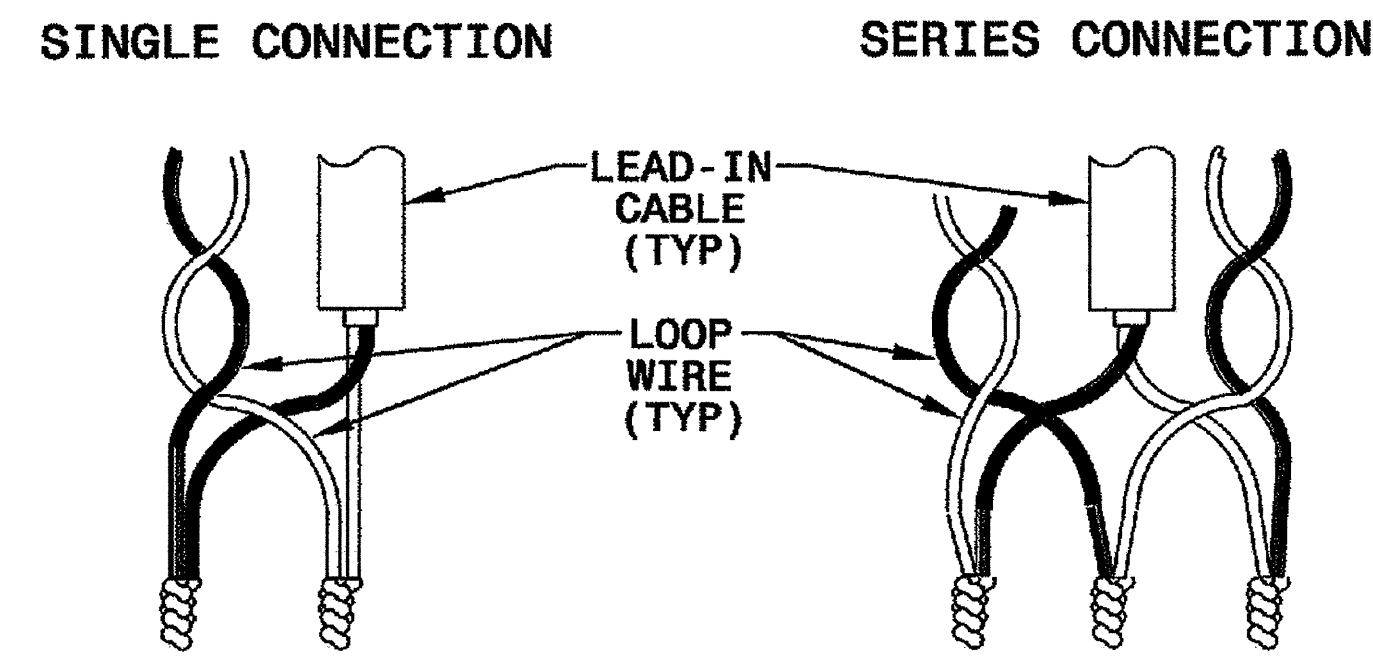


STEP 2. CONNECT AND SOLDER

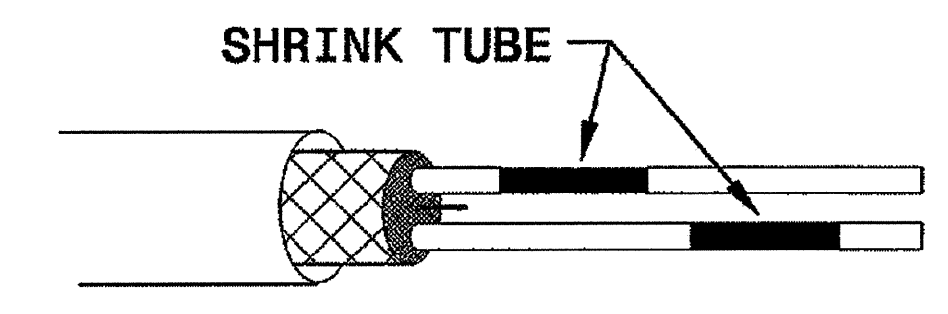


BOND SHIELD DRAIN WIRE AT SPLICE SECTIONS (DO NOT GROUND)

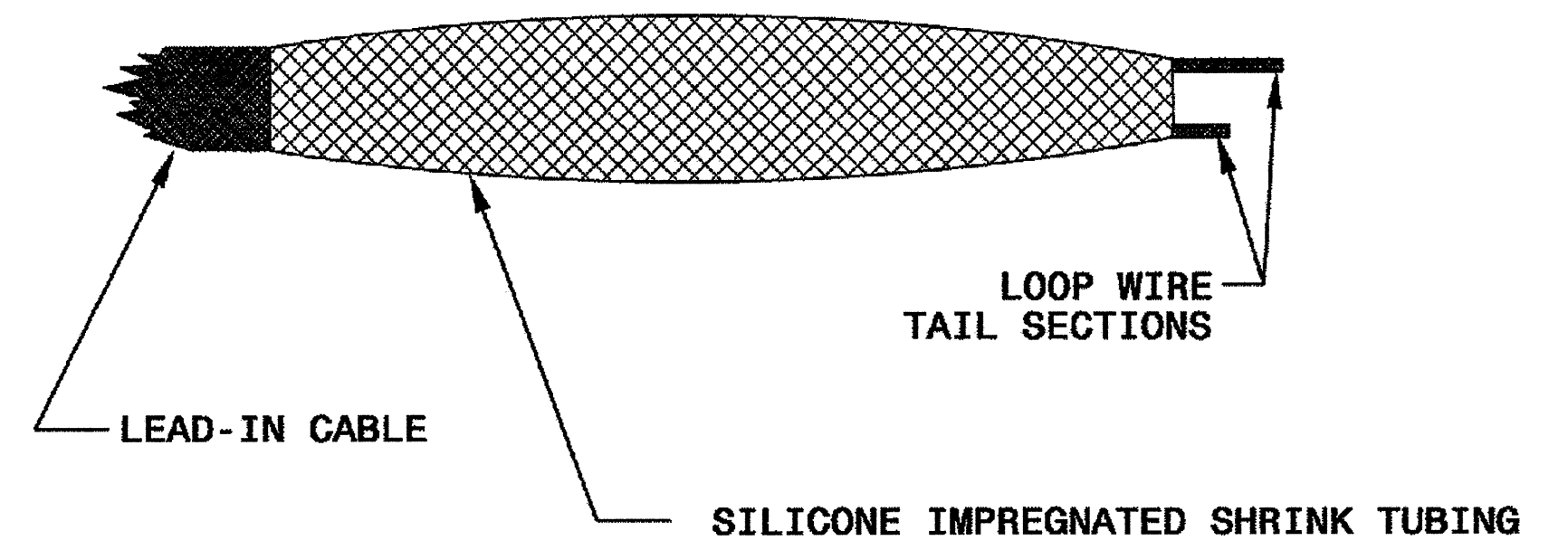
LOOP WIRE AND LEAD-IN CABLE CONNECTION DETAILS



STEP 3. INSULATE EACH SOLDER JOINT SEPARATELY



STEP 4. ENVIRONMENTALLY PROTECT SPLICE



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

SHEET 3 OF 3
1725D01

See Plate for Title

Prepared in the Offices of:

750 N. Greenfield Parkway
 Garner, NC 27529

SEAL

MILTON I. DEAN
 ENGINEER
 SEAL 016286

Signature: *Milton I. Dean* Date: 9/5/07

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