

**PROJECT: B-4033**

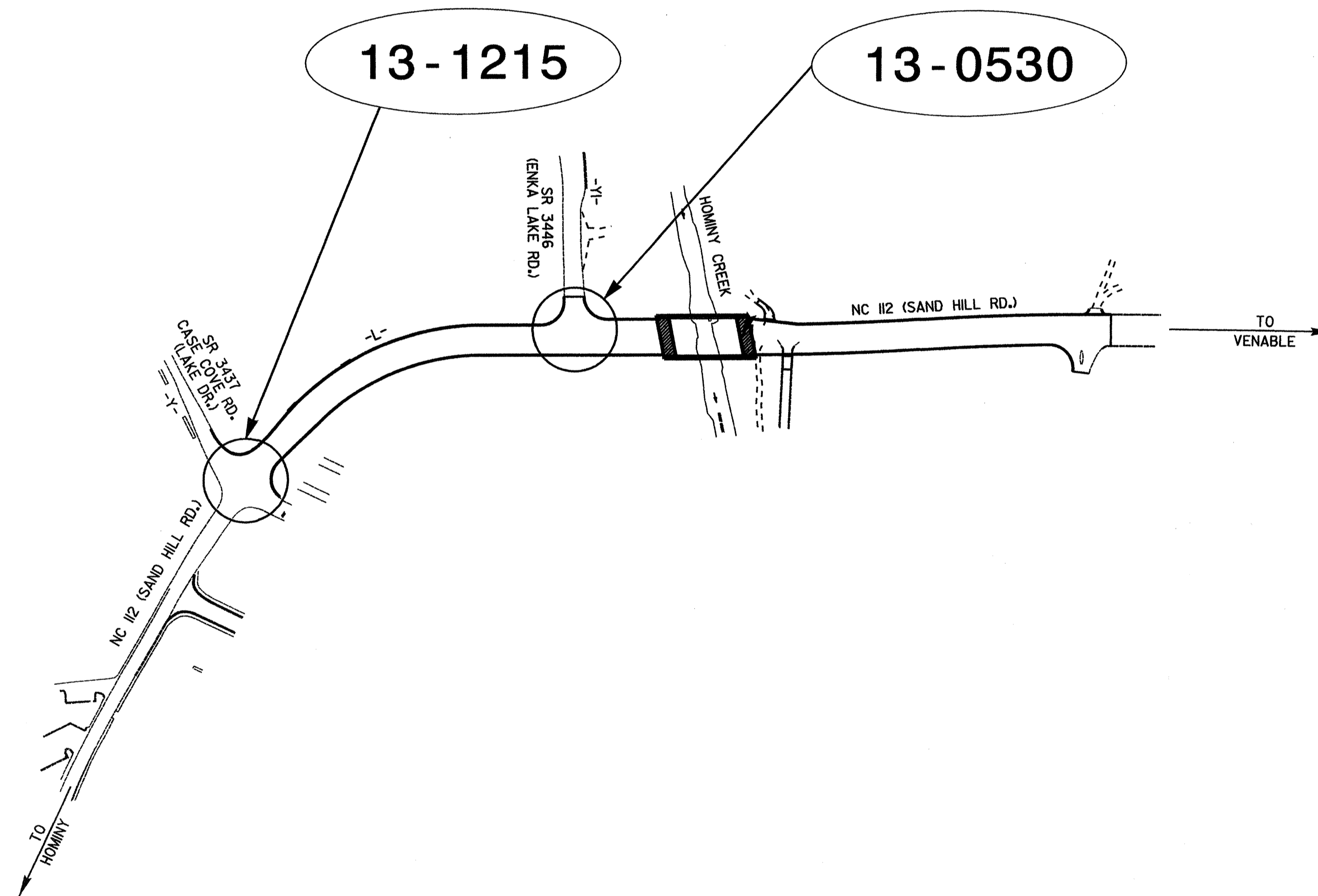
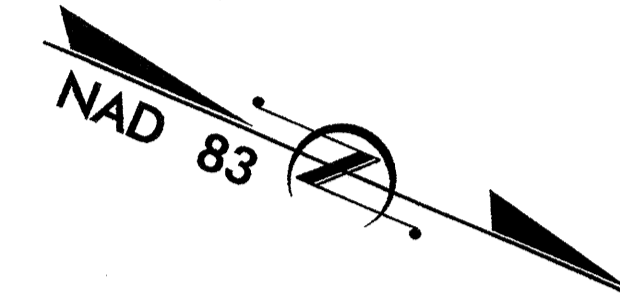
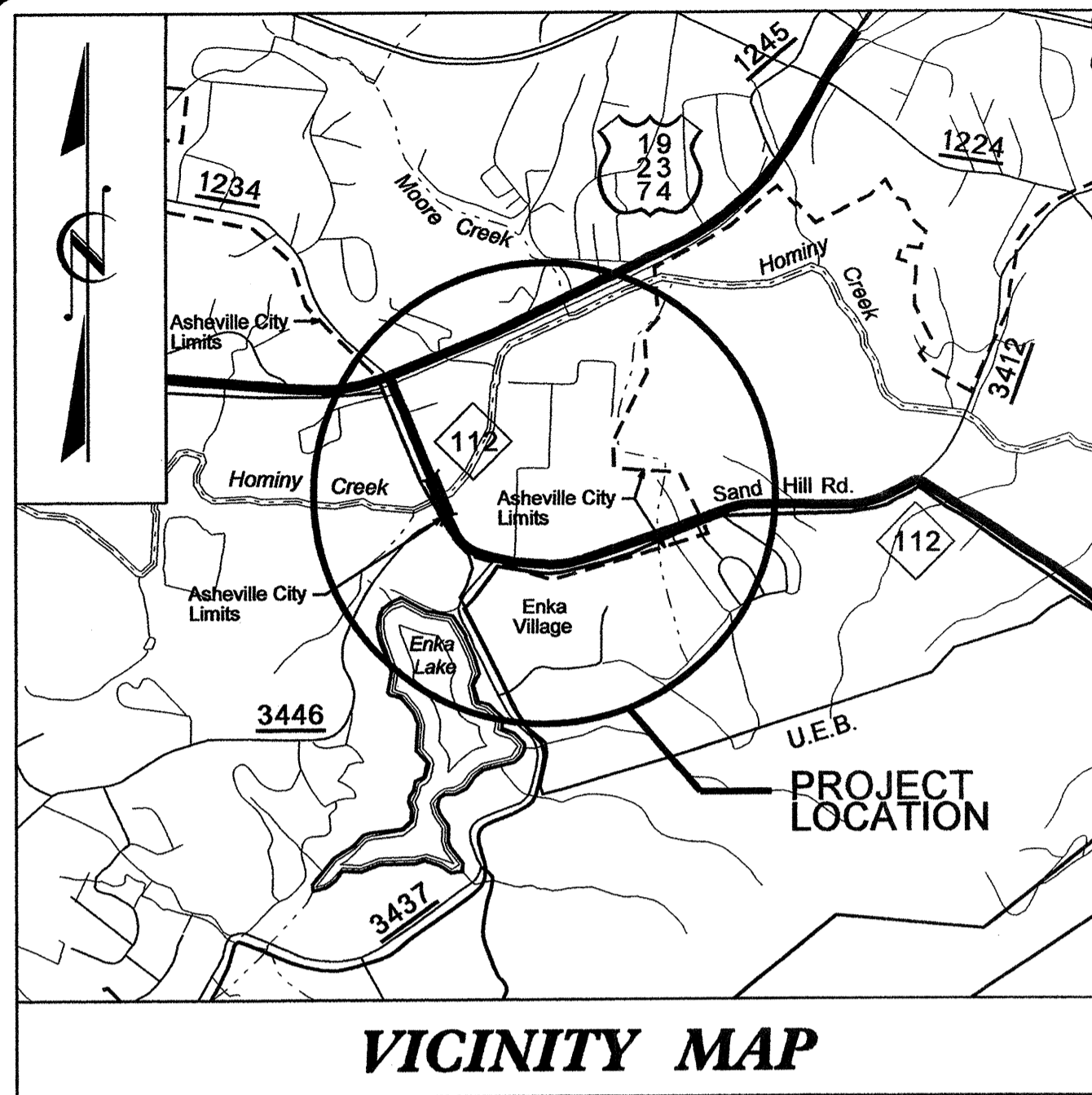
STATE	PROJECT NO.	SHEET NO.
N.C.	B-4033	Sig. 1
P.A. PROJ. NO.		
PROJECT ID. NO.		

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

**BUNCOMBE COUNTY**

**LOCATION: BRIDGE NO. 85 OVER HOMINY CREEK ON NC 112**

**TYPE OF WORK: TRAFFIC SIGNALS**



**INDEX OF PLANS**

SHEET NO.	SIGNAL INVENTORY NO.	LOCATION /DESCRIPTION
SIG. 1	N/A	Title Sheet
SIG. 2-7	13-1215 Temp. & Final	NC 112 (Sand Hill Road) at SR 3437 (Lake Drive)/Colbond Driveway
SIG. 8-15	13-0530T1, T2 & Final	NC 112 (Sand Hill Road) at SR 3446 (Enka Lake Road)
SIG. 16-20	N/A	Standard Drawings for Metal Poles
SIG. 21-23	N/A	Wireless Communications Plans
SIG. 24-26	N/A	Inductive Detection Loops Details

**LEGEND**

##-#### SIGNAL INVENTORY NUMBER

**NCDOT CONTACTS:**

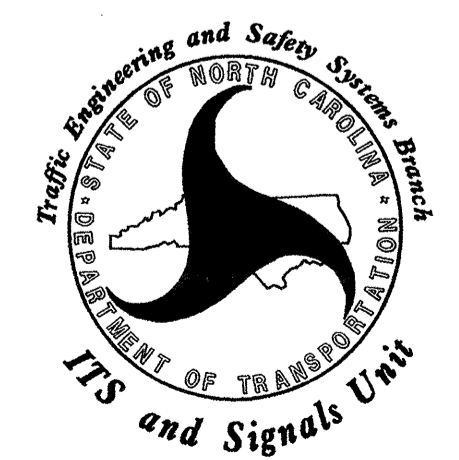
**INTELLIGENT TRANSPORTATION SYSTEMS & SIGNALS UNIT**

Timothy J. Williams, PE - Signal & Geometrics Contracts Engineer

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

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

Prepared in the Offices of:

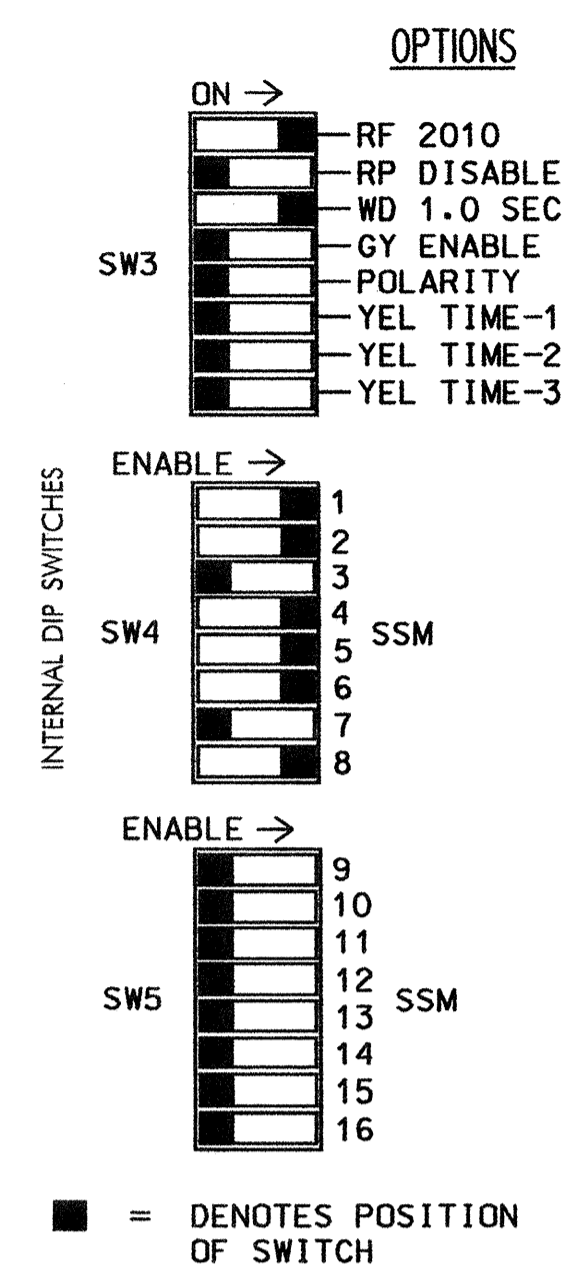
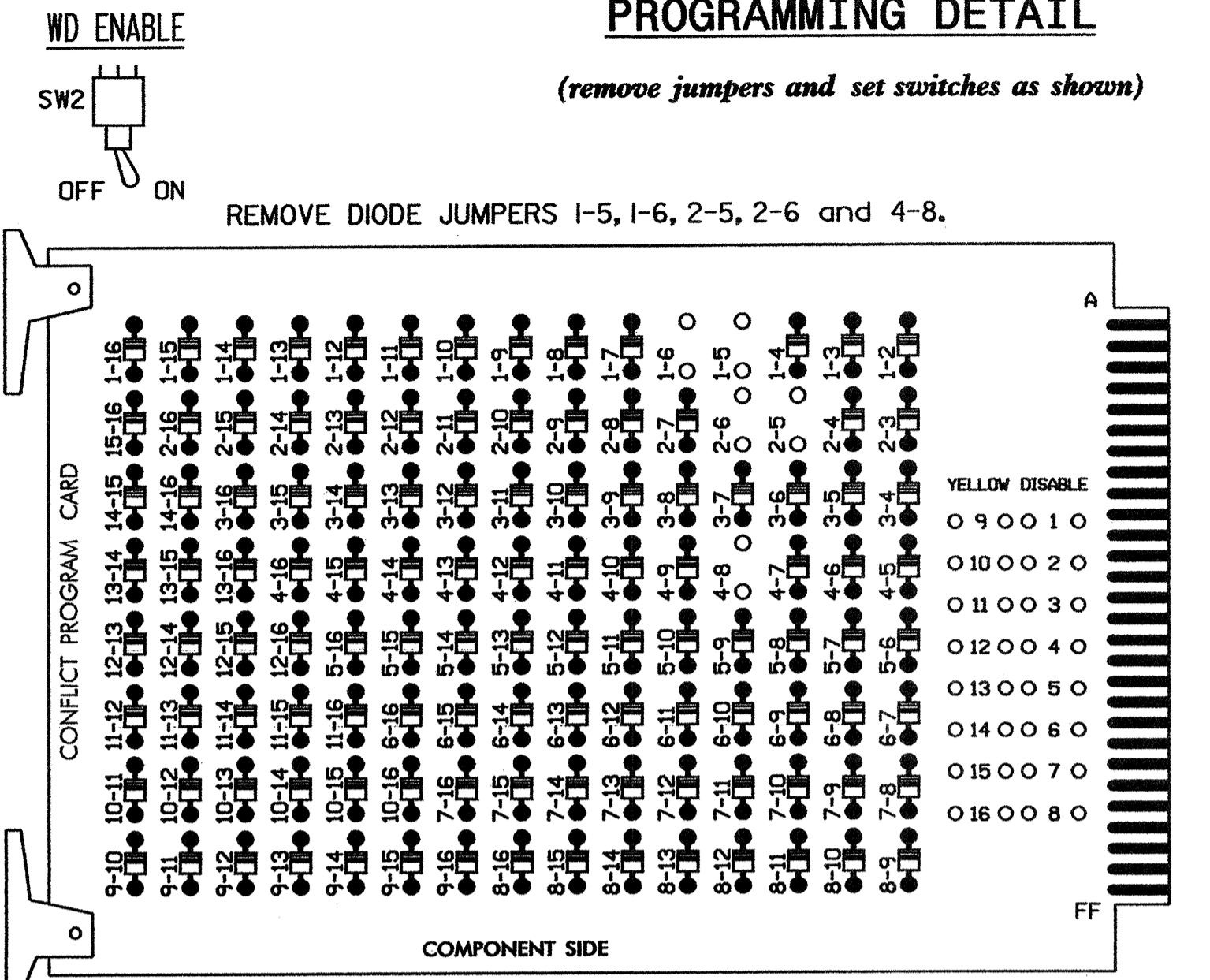


750 N. Greenfield Parkway, Garner, NC 27529



**EDI MODEL 2010ECL CONFLICT MONITOR**

**PROGRAMMING DETAIL**



- NOTES:
1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
  2. Make sure jumpers SEL1-SEL5 are present on the monitor board.

**NOTES**

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. Verify that signal heads flash in accordance with the Signal Plans.
2. To prevent red failures on unused monitor channels, see Red Monitor Board Programming Detail this sheet.
3. Program phases 2 and 6, on the controller unit, for Start-Up in Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.
5. Program phases 4 and 8, on the controller unit, for Dual Entry.
6. Set all detector card channels to 'Presence' mode.

**EQUIPMENT INFORMATION**

\* CONTROLLER.....EAGLE TYPE 2070L  
 \* CABINET.....McCain/CONTROL TECHNOLOGIES (DWG.NO.9500-332-NC DOT)  
 SOFTWARE.....ECONOLITE OASIS  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S1,S2,S4,S5,S6,S8  
 PHASES USED.....1,2,4,5,6,8  
 OVERLAPS.....NONE

EXISTING TO REMAIN IN USE\*

**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.	61,82	21,22	NU	NU	41,42	NU	21	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	126							132				
GREEN ARROW	127							133				

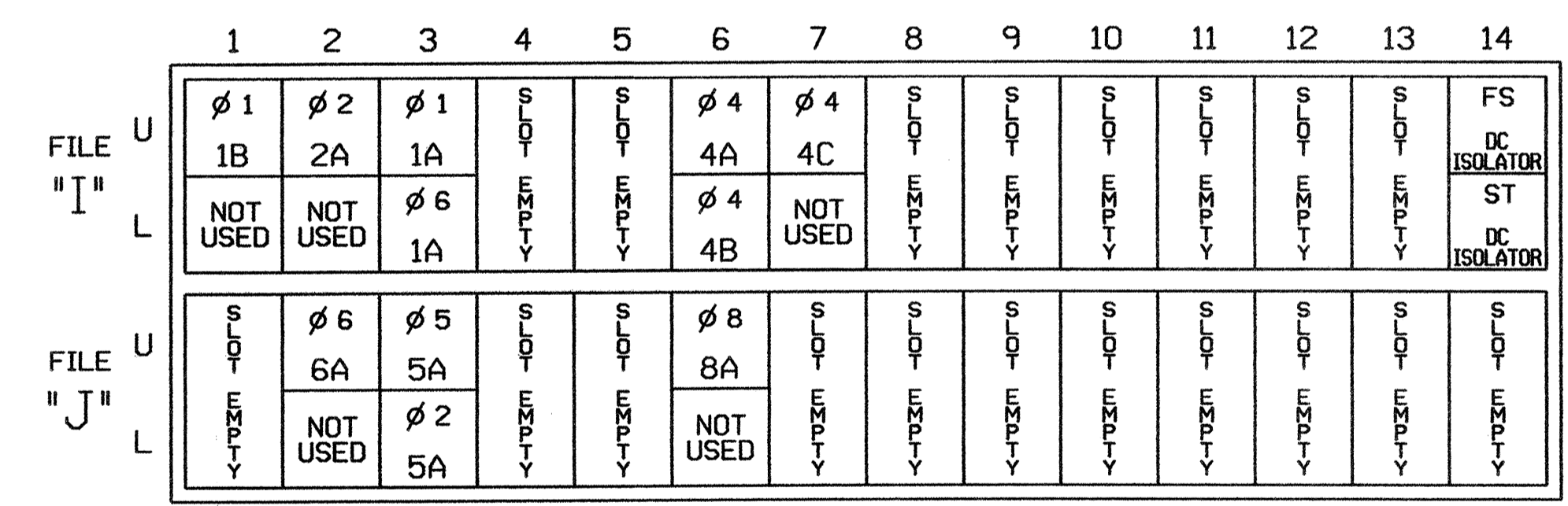
NU = Not Used  
 \* Denotes install load resistor. See Load Resistor Installation Detail this sheet.

**BACKUP PROTECTION NOTE**

From Main Menu press '2' (Phase Control), then '1' (Phase Control Functions). Program phases 2 and 6 for 'Backup Protect'. Make sure the Red Revert times shown on the Signal Design Plans are programmed in the 'Phase Timing' menu.

**INPUT FILE POSITION LAYOUT**

(front view)

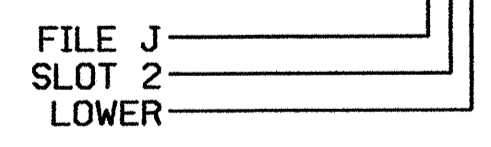


**INPUT FILE CONNECTION & PROGRAMMING CHART**

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
1B	TB2-1,2	I1U	56	18	1	1	Y	Y			15
1A <sup>1</sup>	TB2-9,10	I3U	63	25	32	1	Y	Y			15
	TB2-11,12	I3L	76	38	42	6	Y	Y			
2A	TB2-5,6	I2U	39	1	2	2	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			3
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			5
4C	TB6-1,2	I7U	65	27	34	4	Y	Y			15
5A <sup>2</sup>	TB3-9,10	J3U	64	26	36	5	Y	Y			15
	TB3-11,12	J3L	77	39	46	2	Y	Y			
6A	TB3-5,6	J2U	40	2	6	6	Y	Y			
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			5

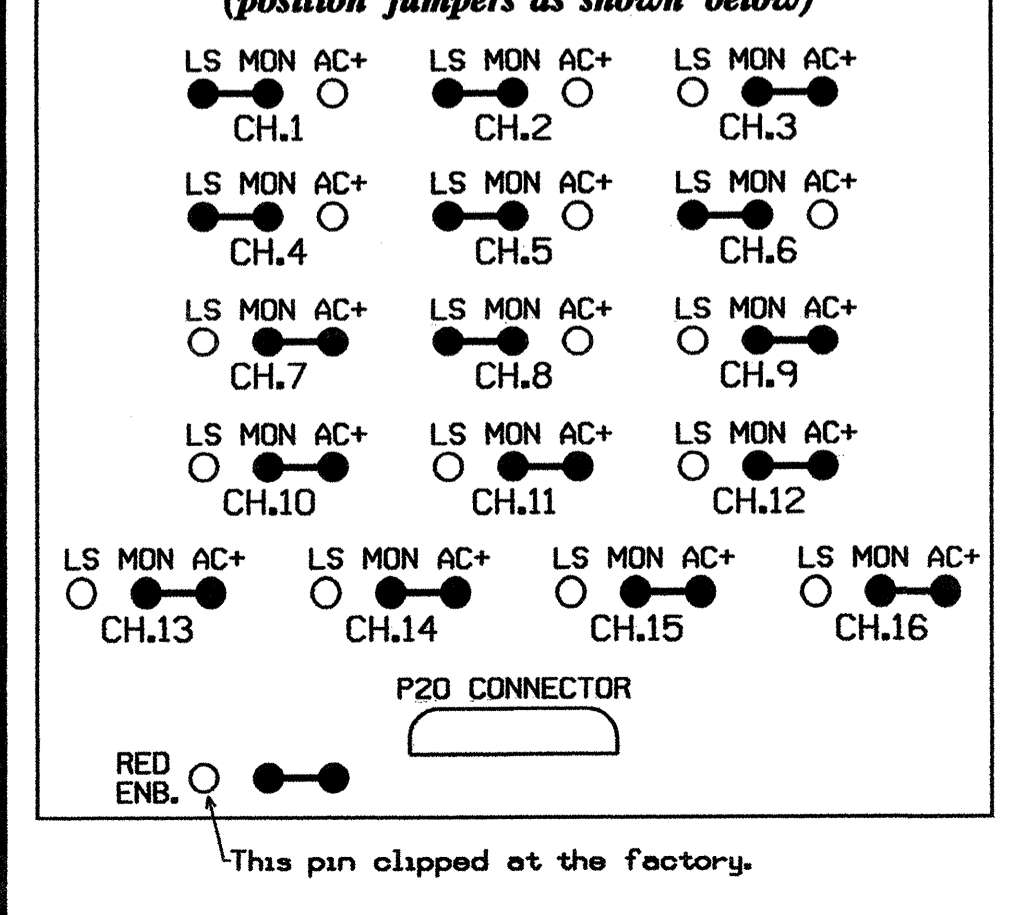
- <sup>1</sup>Add jumpers from TB2-9 to TB2-11, and from TB2-10 to TB2-12.
- <sup>2</sup>Add jumpers from TB3-9 to TB3-11, and from TB3-10 to TB3-12.

INPUT FILE POSITION LEGEND: J2L

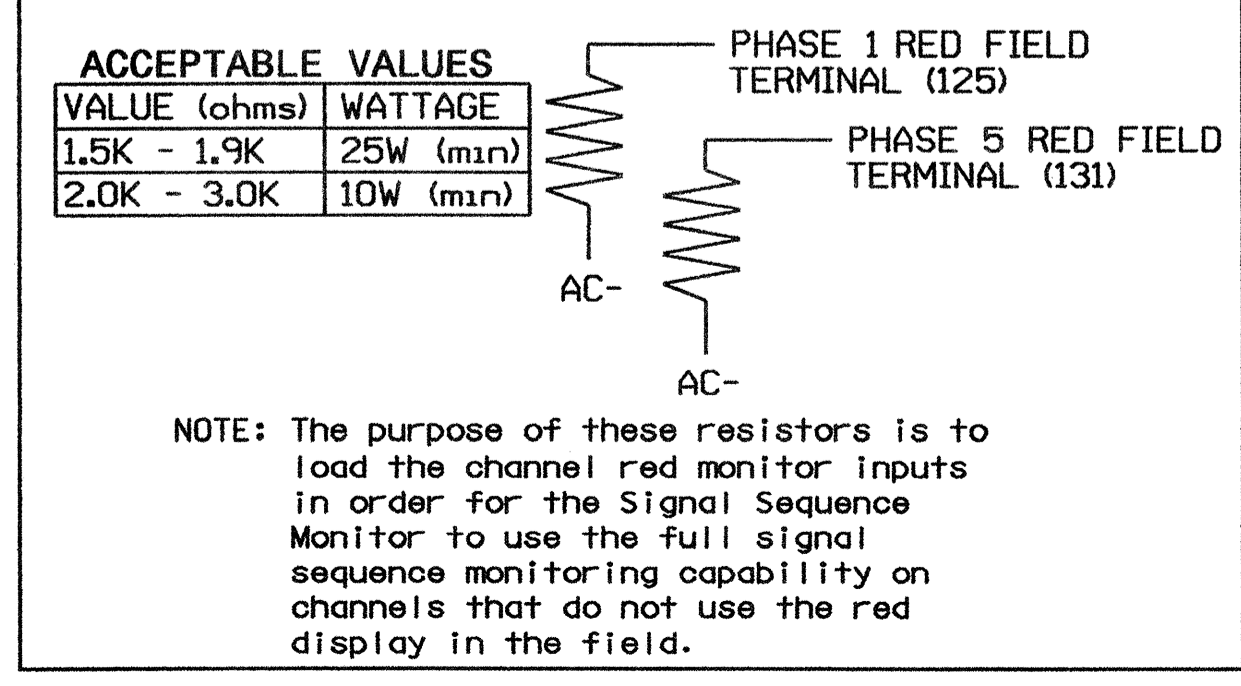


THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-1215 T  
 DESIGNED: April 2008  
 SEALED: 4/30/08  
 REVISED: N/A

**RED MONITOR BOARD PROGRAMMING**



**LOAD RESISTOR INSTALLATION DETAIL**



Signal Upgrade - Temporary

Prepared in the Offices of:  
 ENGINEERING AND SURVEYING  
 JAMES PETERSON  
 122 N. McDowell St., Raleigh, NC 27603

Division 13 Buncombe County Enka  
 PLAN DATE: April 2008 REVIEWED BY: JTR  
 PREPARED BY: James Peterson REVIEWED BY:  
 REVISIONS INIT. DATE

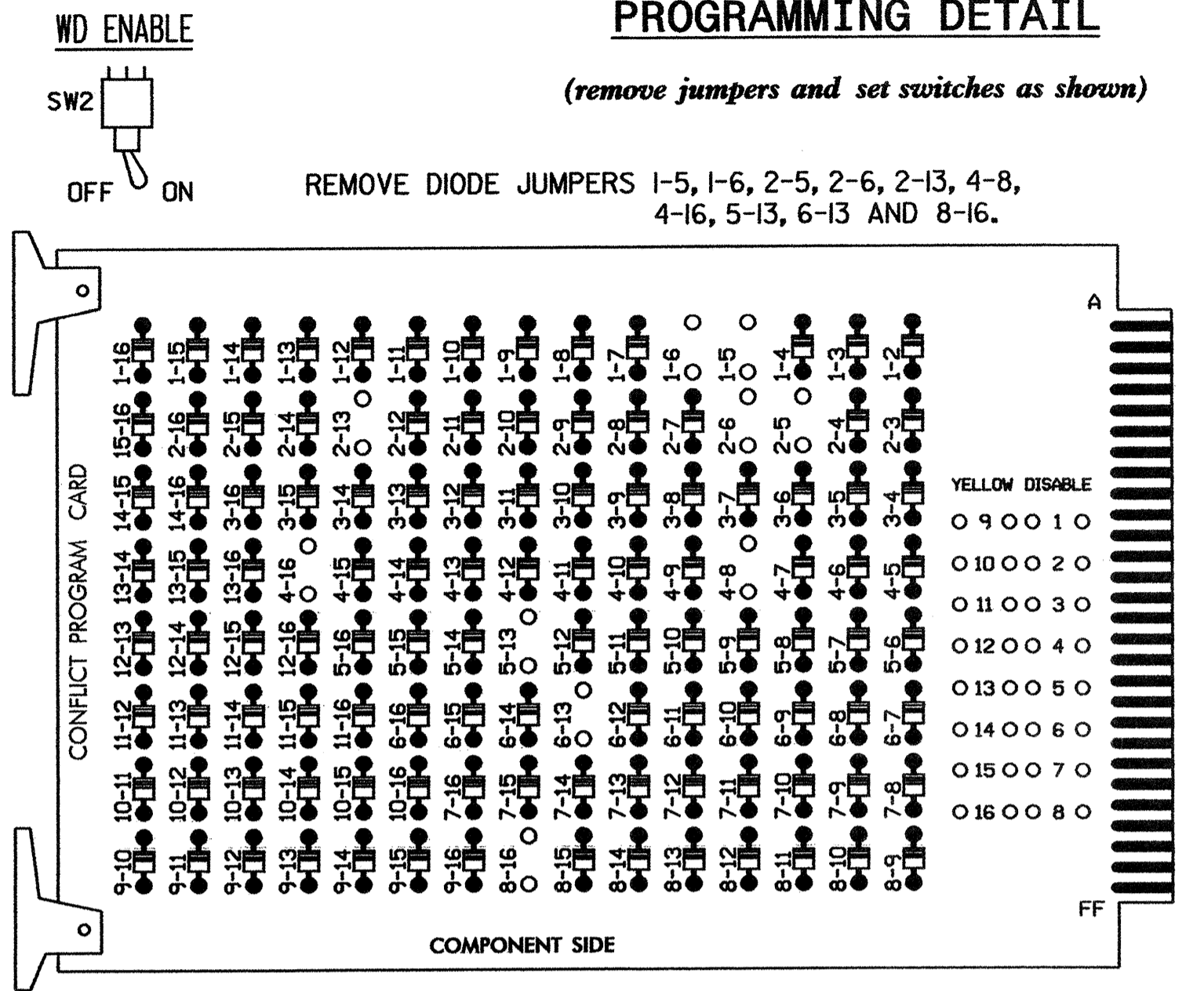
NC 112 (Sand Hill Road) at SR 3437 (Lake Drive)/ Colbond Driveway

SEAL  
 NORTH CAROLINA PROFESSIONAL ENGINEER  
 SEAL 008453  
 JOHN T. ROWE, III  
 5-6-08  
 SIGNATURE DATE  
 SIG. INVENTORY NO. 13-1215 T

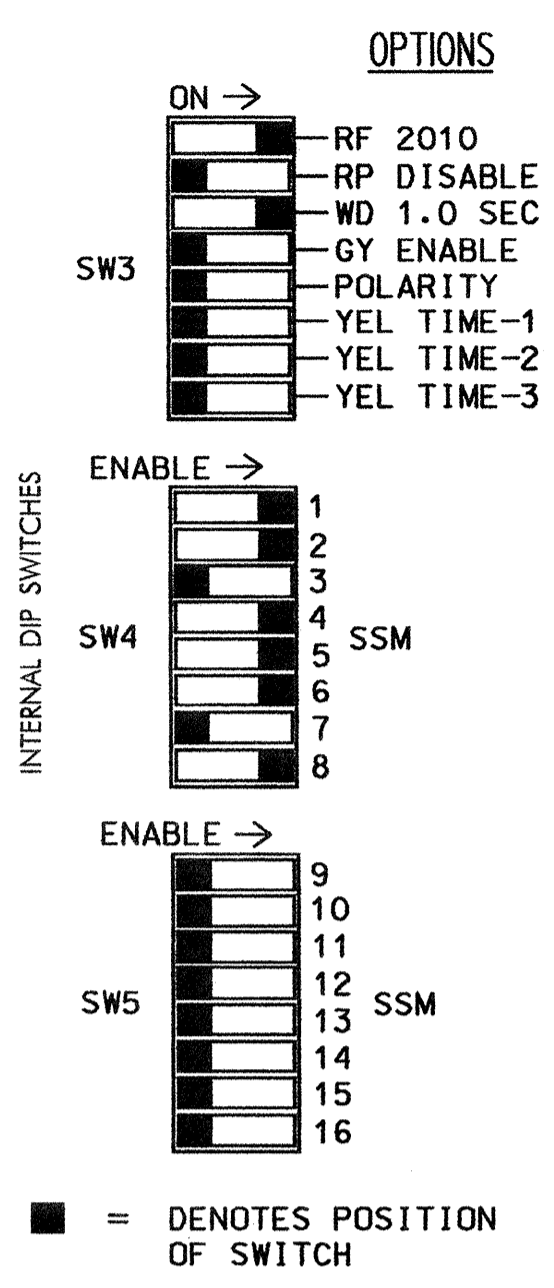


**EDI MODEL 2010ECL CONFLICT MONITOR**

**PROGRAMMING DETAIL**



(remove jumpers and set switches as shown)



- NOTES:
- Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
  - Make sure jumpers 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.
- To prevent red failures on unused monitor channels, see Red Monitor Board Programming Detail this sheet.
- Program phases 2 and 6, on the controller unit, for Start-Up in Green.
- Enable Simultaneous Gap-Out, on the controller unit, for all phases.
- Program phases 4 and 8, on the controller unit, for Dual Entry.
- Set all detector card channels to 'Presence' mode.
- Program phases 2 and 8 for 'STARTUP PED CALL'.
- The cabinet and controller are part of the NC 112 Enka Closed Loop System.

**EQUIPMENT INFORMATION**

\* CONTROLLER.....EAGLE TYPE 2070L  
 \* CABINET.....McCain/CONTROL TECHNOLOGIES (DWG.NO.9500-332-NCDDT)  
 SOFTWARE.....ECONOLITE OASIS  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S1,S2,S2P,S4,S5,S6,S8,S8P  
 PHASES USED.....1,2,2PED,4,5,6,8,8PED  
 OVERLAPS.....NONE

EXISTING TO REMAIN IN USE\*

**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.	61,82	21,22	P21, P22	NU	41,42	NU	21	61,62	NU	NU	81,82	P81, P82
RED	*	128			101		*	134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW	126						132					
GREEN ARROW	127						133					
Hand icon			113									110
Person icon			115									112

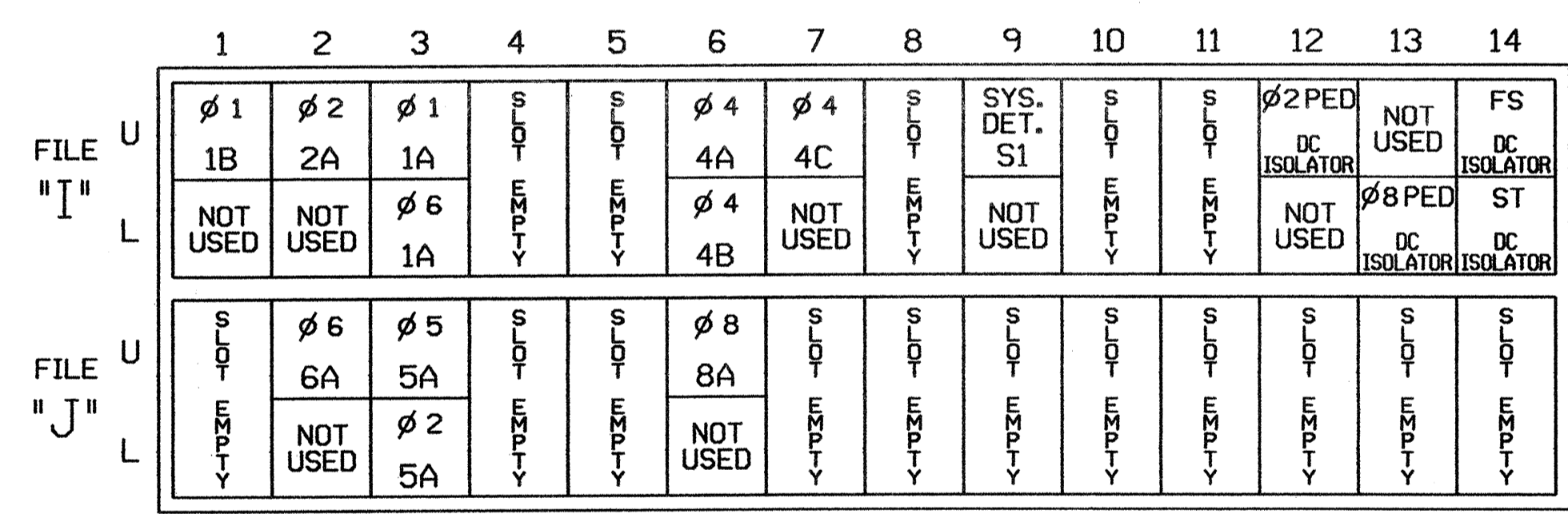
NU = Not Used \*\* Denotes install load resistor. See Load Resistor Installation Detail this sheet.  
 \*\* See 'Countdown Pedestrian Signal Operation' note below.

**COUNTDOWN PEDESTRIAN SIGNAL OPERATION**

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

**INPUT FILE POSITION LAYOUT**

(from view)



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

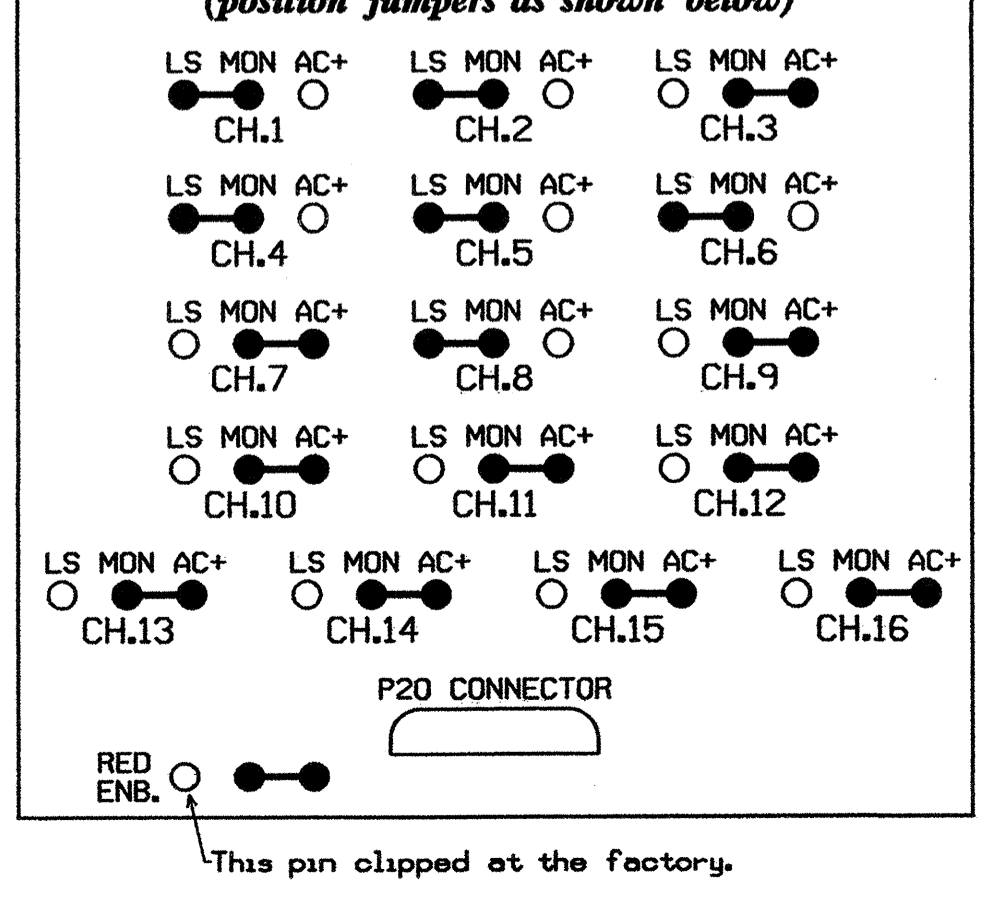
**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1B	TB2-1,2	I1U	56	18	1	1	Y	Y			15
1A <sup>1</sup>	TB2-9,10	I3U	63	25	32	1	Y	Y			15
	TB2-11,12	I3L	76	38	42	6	Y	Y			
2A	TB2-5,6	I2U	39	1	2	2	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			3
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			5
4C	TB6-1,2	I7U	65	27	34	4	Y	Y			15
* S1	TB6-9,10	I9U	60	22	11	SYS					
	TB3-9,10	J3U	64	26	36	5	Y	Y			15
5A <sup>2</sup>	TB3-11,12	J3L	77	39	46	2	Y	Y			
	TB3-5,6	J2U	40	2	6	6	Y	Y			
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			5
PED PUSH BUTTONS											
P21,P22	TB8-4,6	I12U	67	29	PED 2	2PED					
P81,P82	TB8-8,9	I13L	70	32	PED 8	8PED					

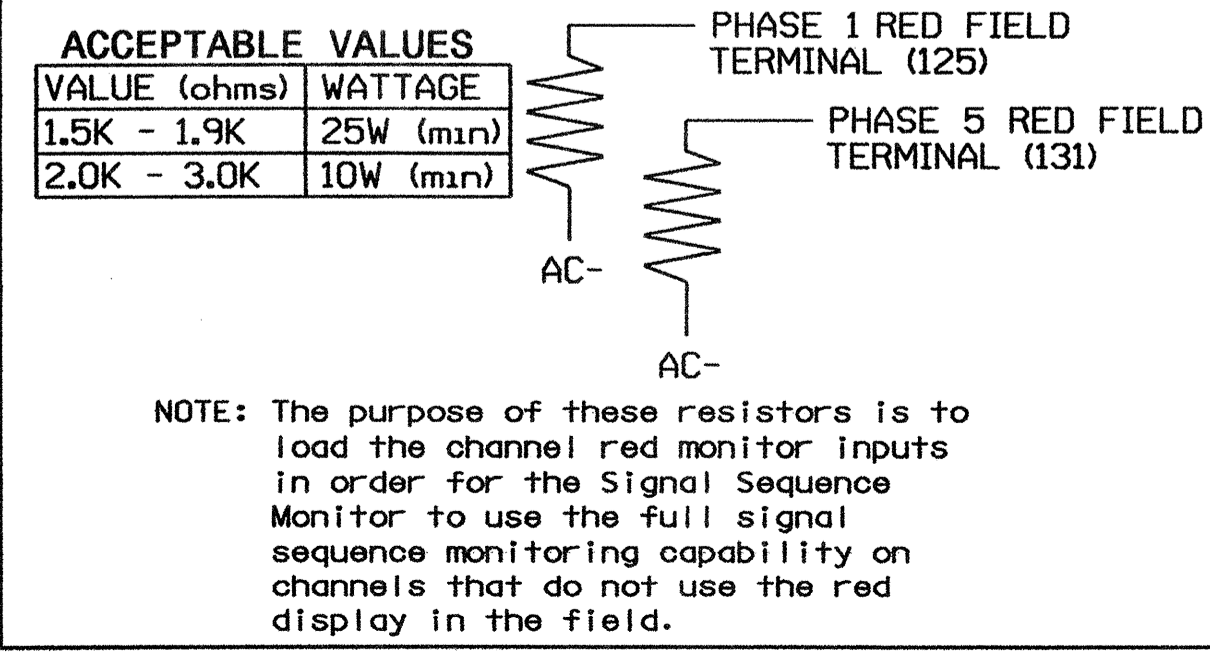
NOTE: INSTALL DC ISOLATORS IN INPUT FILE SLOTS 112 AND 113.

- Add jumpers from TB2-9 to TB2-11, and from TB2-10 to TB2-12.
  - Add jumpers from TB3-9 to TB3-11, and from TB3-10 to TB3-12.
- \* SYSTEM DETECTOR ONLY. REMOVE THE VEHICLE PHASE ASSIGNED TO THIS DETECTOR IN THE DEFAULT PROGRAMMING.

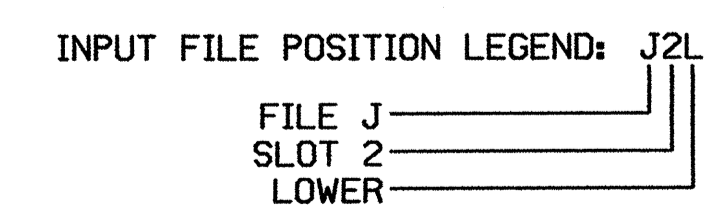
**RED MONITOR BOARD PROGRAMMING**



**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.



**BACKUP PROTECTION NOTE**

From Main Menu press '2' (Phase Control), then '1' (Phase Control Functions). Program phases 2 and 6 for 'Backup Protect'. Make sure the Red Revert times shown on the Signal Design Plans are programmed in the 'Phase Timing' menu.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-1215  
 DESIGNED: April 2008  
 SEALED: 4/30/08  
 REVISED: N/A

Signal Upgrade - Final

Electrical and Programming Details For: **NC 112 (Sand Hill Road) at SR 3437 (Lake Drive)/ Colbond Driveway**

Division 13 Buncombe County Enka

PLAN DATE: April 2008 REVIEWED BY: JTR

PREPARED BY: James Peterson REVIEWED BY:

REVISIONS INIT. DATE

Prepared in the Offices of: **THE ENGINEERING AND SURVEYING COMPANY**

222 N. McDowell St., Raleigh, NC 27603

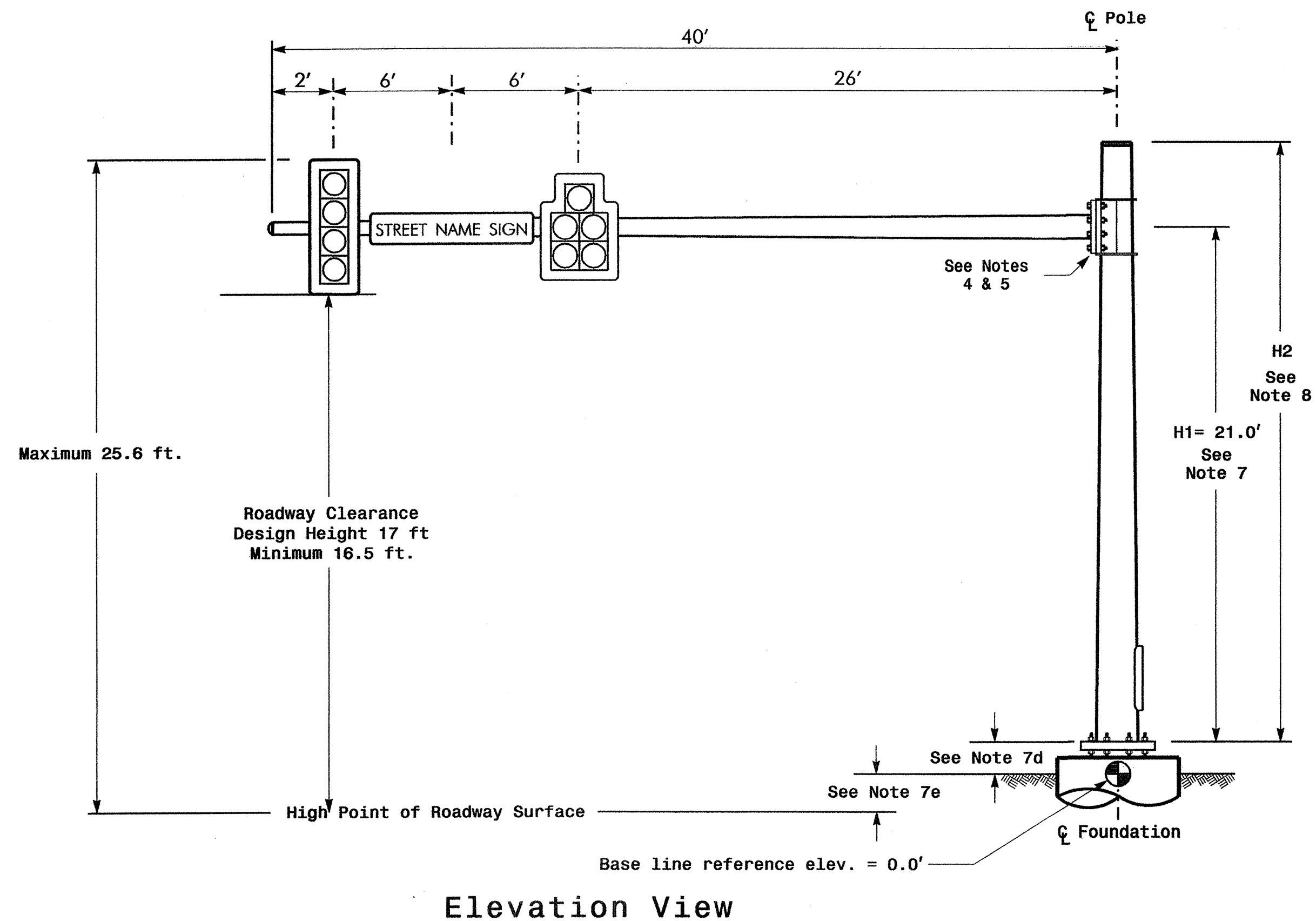
SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 008453 JOHN T. ROWE, JR. ENGINEER

Signature: John T. Rowe, Jr. 5-6-08 DATE

516. INVENTORY NO. 13-1215

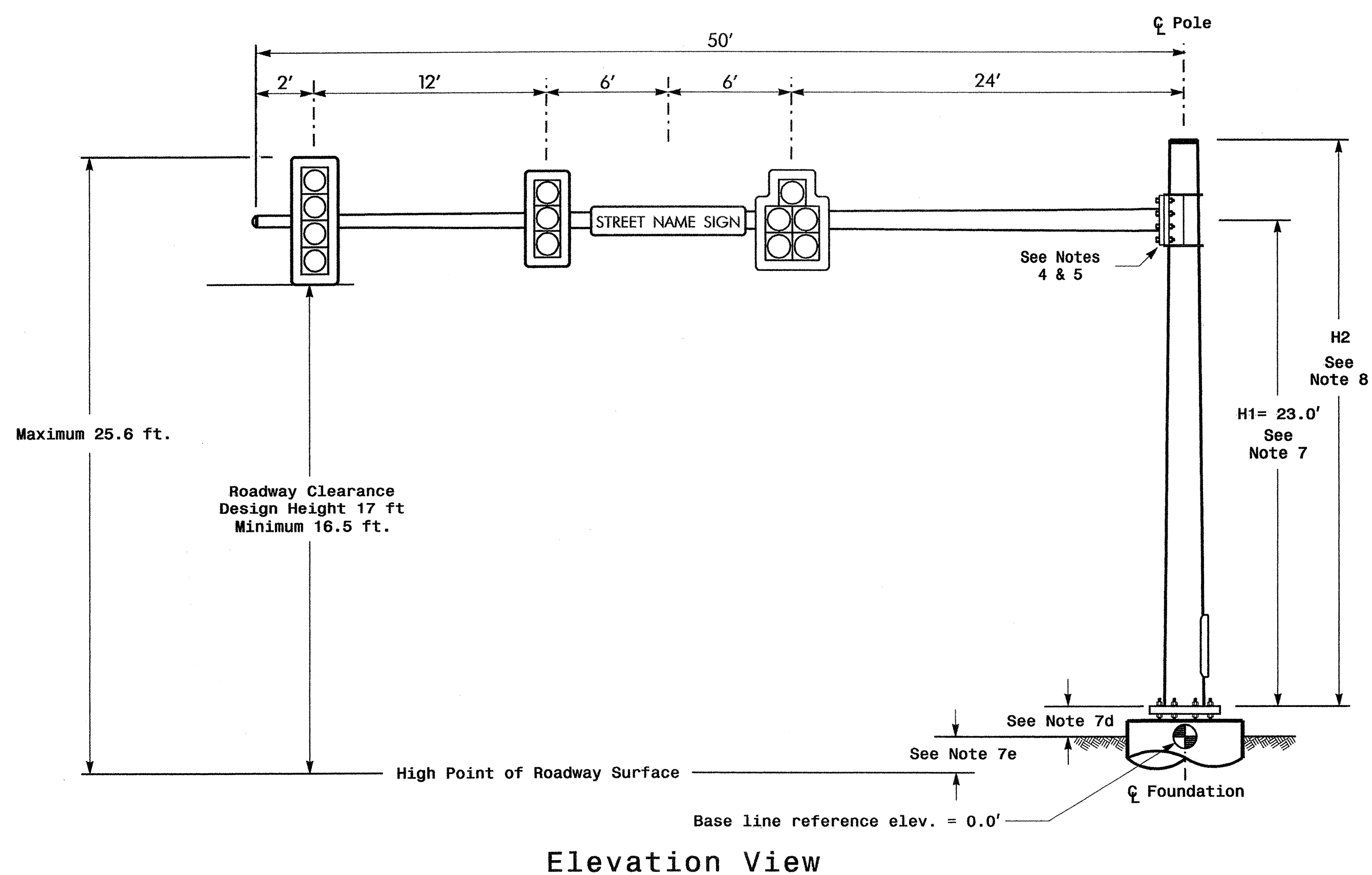


**Design Loading for METAL POLE NO. 1**



Elevation View

**Design Loading for METAL POLE NO. 3**

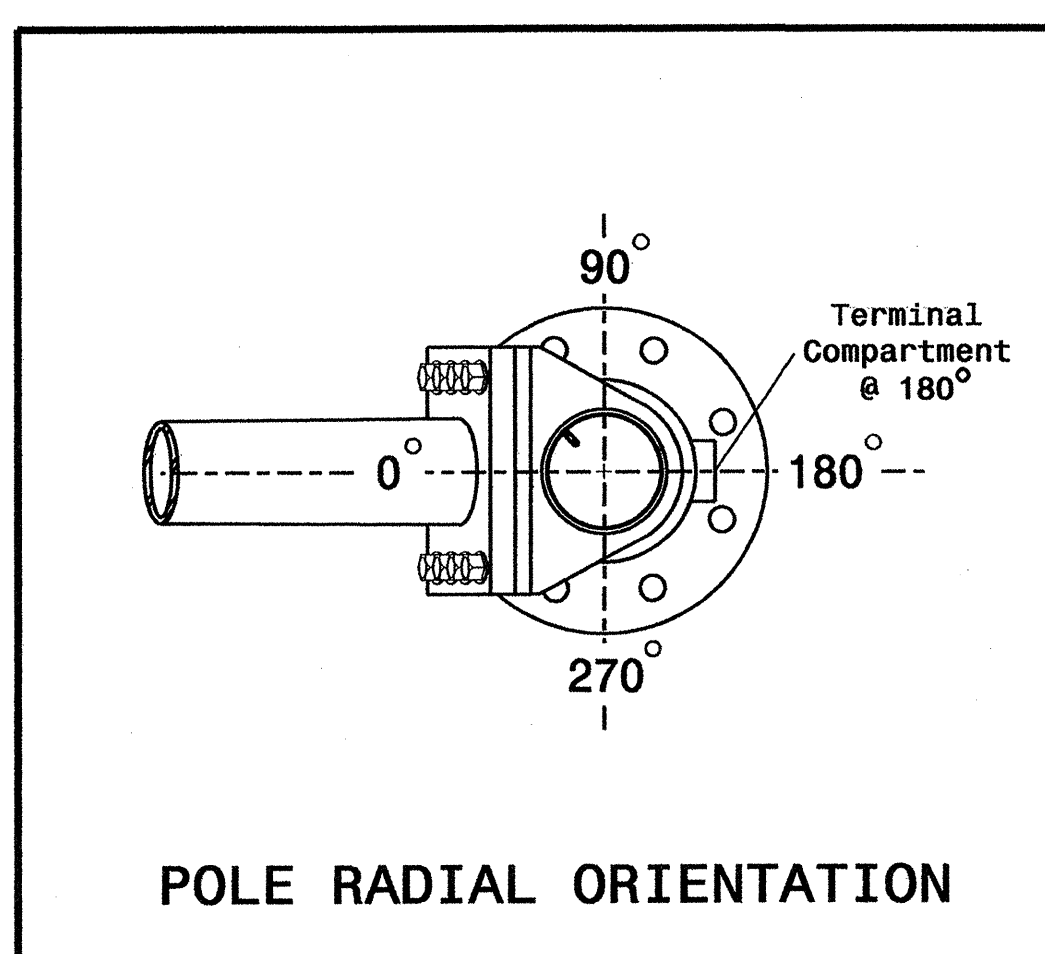


Elevation View

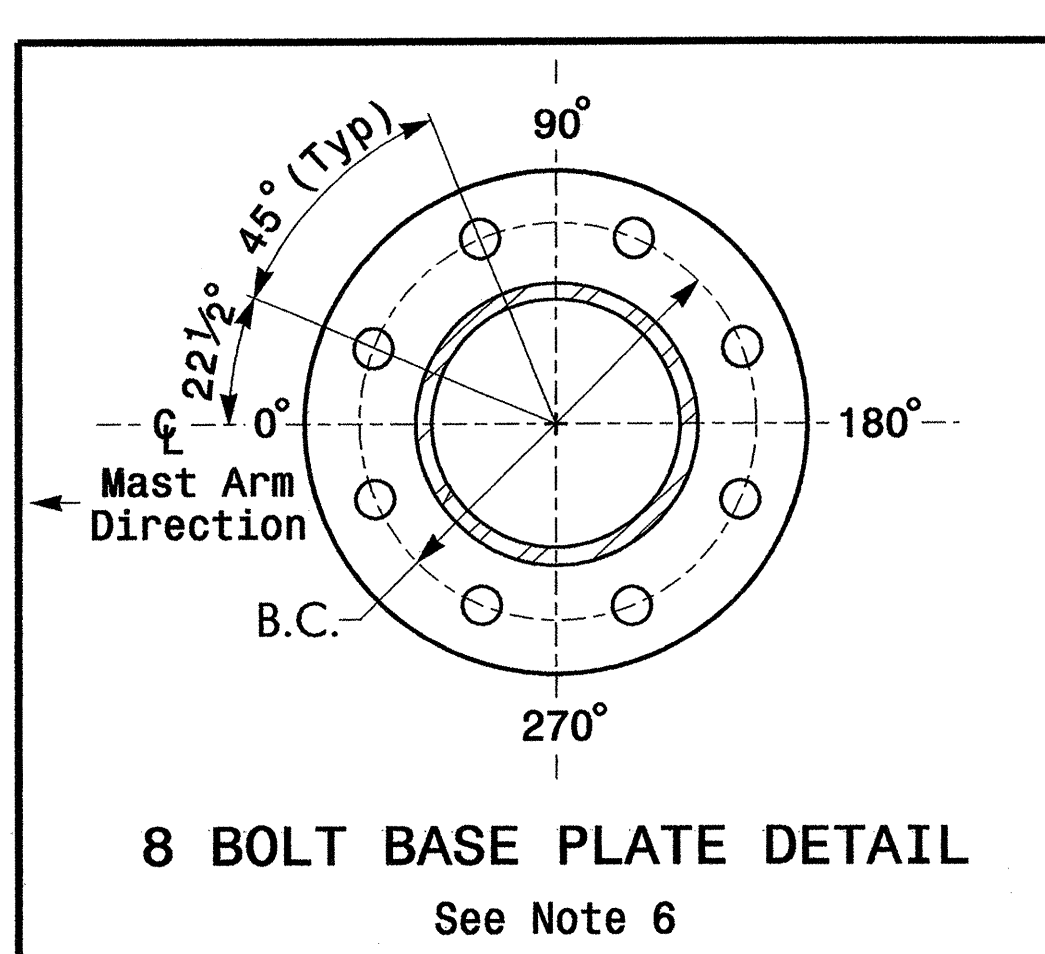
**SPECIAL NOTE**  
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available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

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

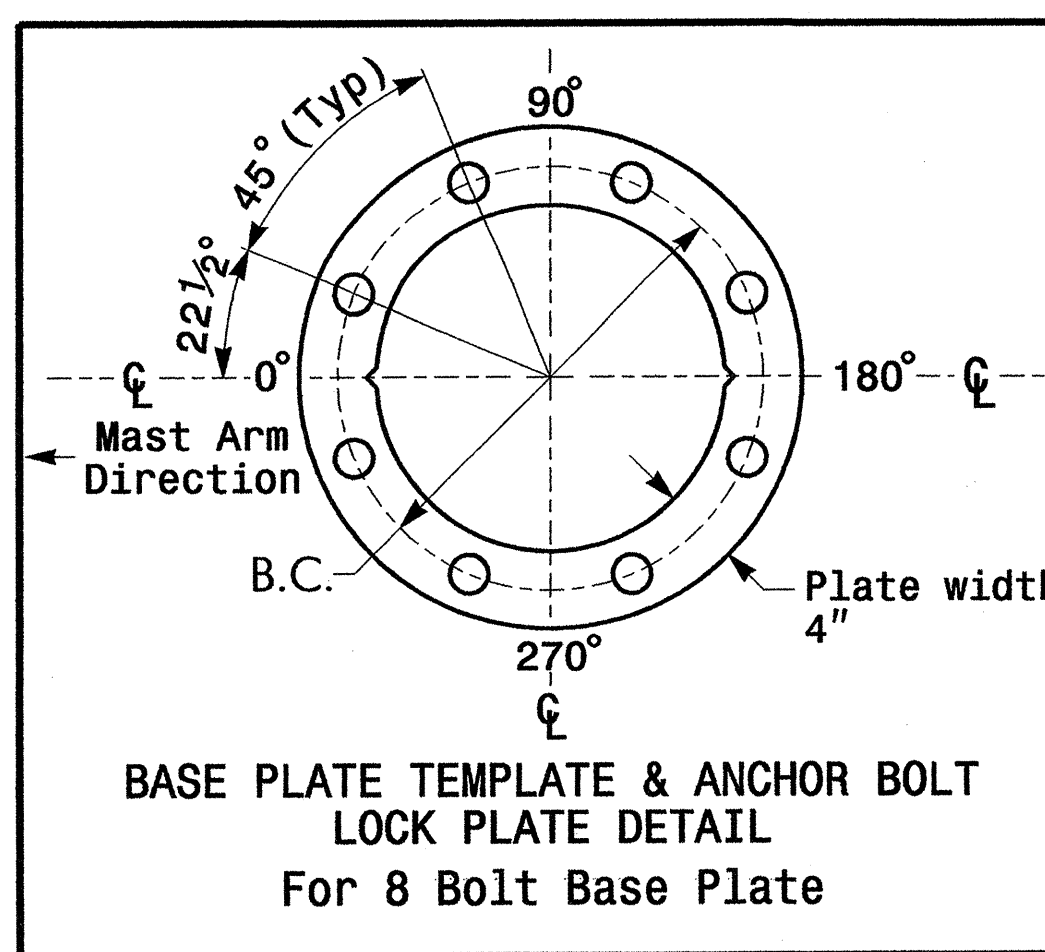
Elevation Differences for:	Pole 1	Pole 3
Baseline reference point at Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+2.0 ft.	+4.0 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A



POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL  
See Note 6



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

**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"-4 SECTION (VERTICAL)-WITH BACKPLATE AND ASTRO-BRAC	11.5 S.F.	25.5" W X 66.0" L	74 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]	STREET NAME SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	12.0 S.F.	18.0" W X 96.0" L	27 LBS

**NOTES**

**Design Reference Material**

- Design the traffic signal structure and foundation in accordance with:
  - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
  - The 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.

**Design Requirements**

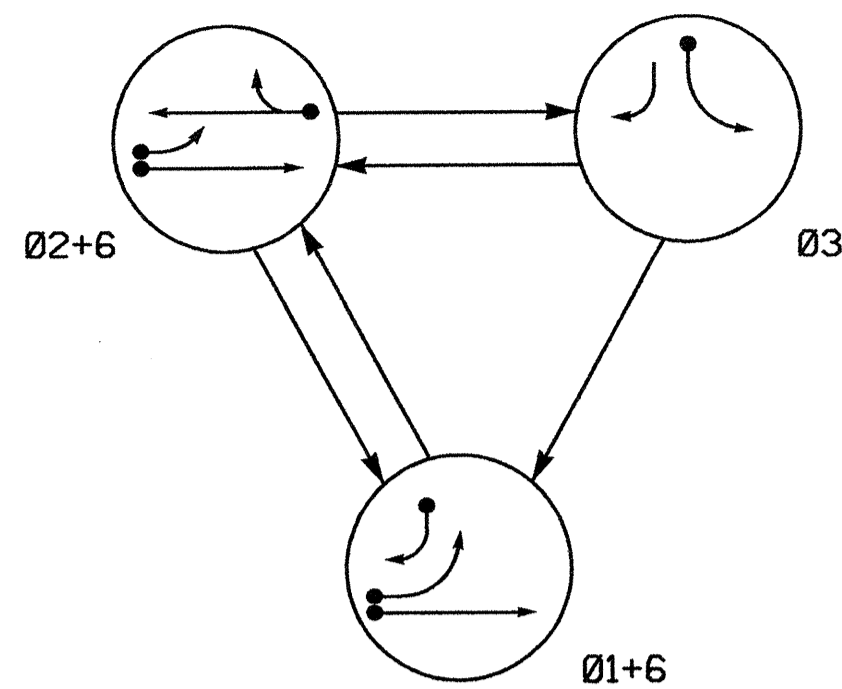
- Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "Design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the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

NCDOT Wind Zone 4 (90 mph)

	Prepared in the Offices of: NC 112 (Sand Hill Road) at SR 3437 (Lake Drive)/ Colbond Driveway Division 13 Buncombe County Enka PLAN DATE: May 2008 REVIEWED BY: PREPARED BY: I.O. Umozurike REVIEWED BY:	SEAL 
	SCALE: 0 N/A REVISIONS: _____ INIT. DATE _____ SIGNATURE: I.O. Umozurike DATE: 5/1/08 SIG. INVENTORY NO. 13-1215	

06-MAY-2008 16:52  
 s:\118 s1\p1\work\groups\1p\projects\4033\sig\1\as\as\1\13-1215\3-1215-s1\p1\mp\_2008\sig.dgn  
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PHASING DIAGRAM



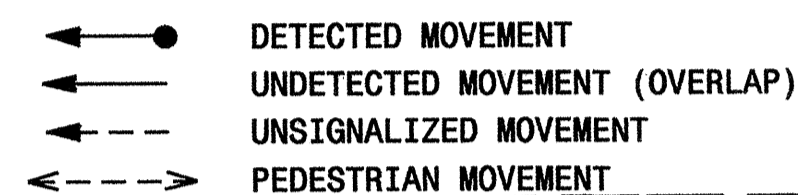
SIGNAL FACE	PHASE			
	Ø 1 + 6	Ø 2 + 6	Ø 3	F L C
21, 22	R	G	R	Y
31	R	R	G	R
32	R	R	G	R
61	G	G	R	Y
62	G	G	R	Y

2070L LOOP & DETECTOR INSTALLATION												
INDUCTIVE LOOPS				DETECTOR PROGRAMMING								
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y			15		
1B	6X60	+5	2-4-2		1	Y	Y			10		
2A	6X6	70	4		2	Y	Y					
3A	6X60	+5	2-4-2		3	Y	Y			3		
6A	6X6	70	4	Y	6	Y	Y					

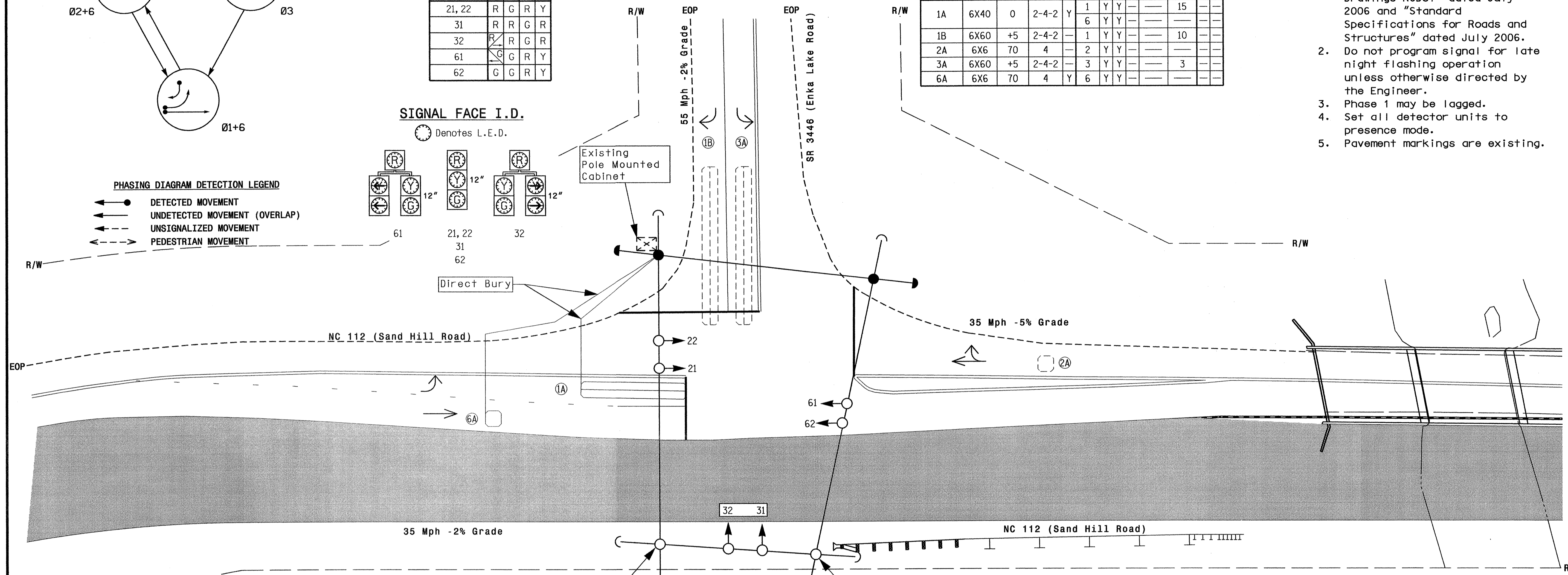
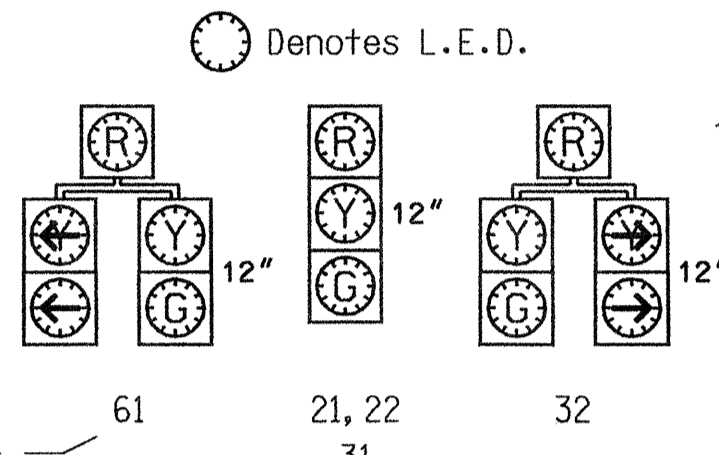
NOTES

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. Phase 1 may be lagged.
4. Set all detector units to presence mode.
5. Pavement markings are existing.

PHASING DIAGRAM DETECTION LEGEND

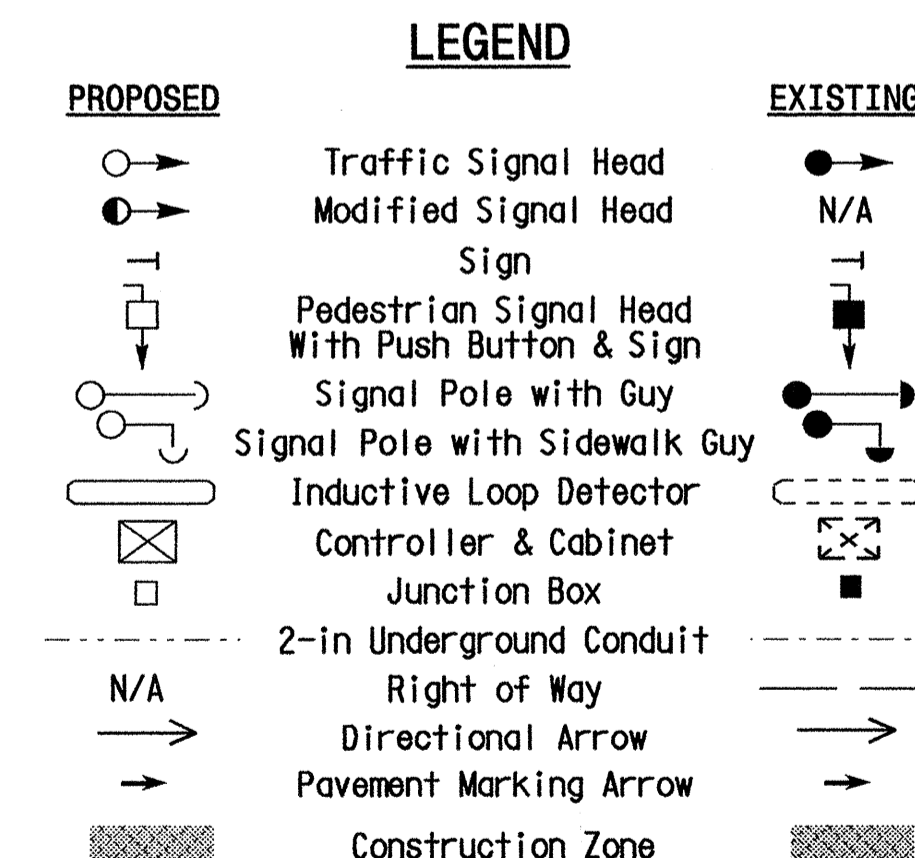


SIGNAL FACE I.D.



FEATURE	PHASE			
	1	2	3	6
Min Green 1 *	7	10	7	10
Extension 1 *	2.0	3.0	1.0	3.0
Max Green 1 *	15	35	25	35
Yellow Clearance	3.0	4.2	3.0	4.0
Red Clearance	1.4	1.2	1.9	1.2
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	-	-	-	-
Time To Reduce *	-	-	-	-
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.



Signal Upgrade - Temporary Signal 1 - (TCP Phase I)

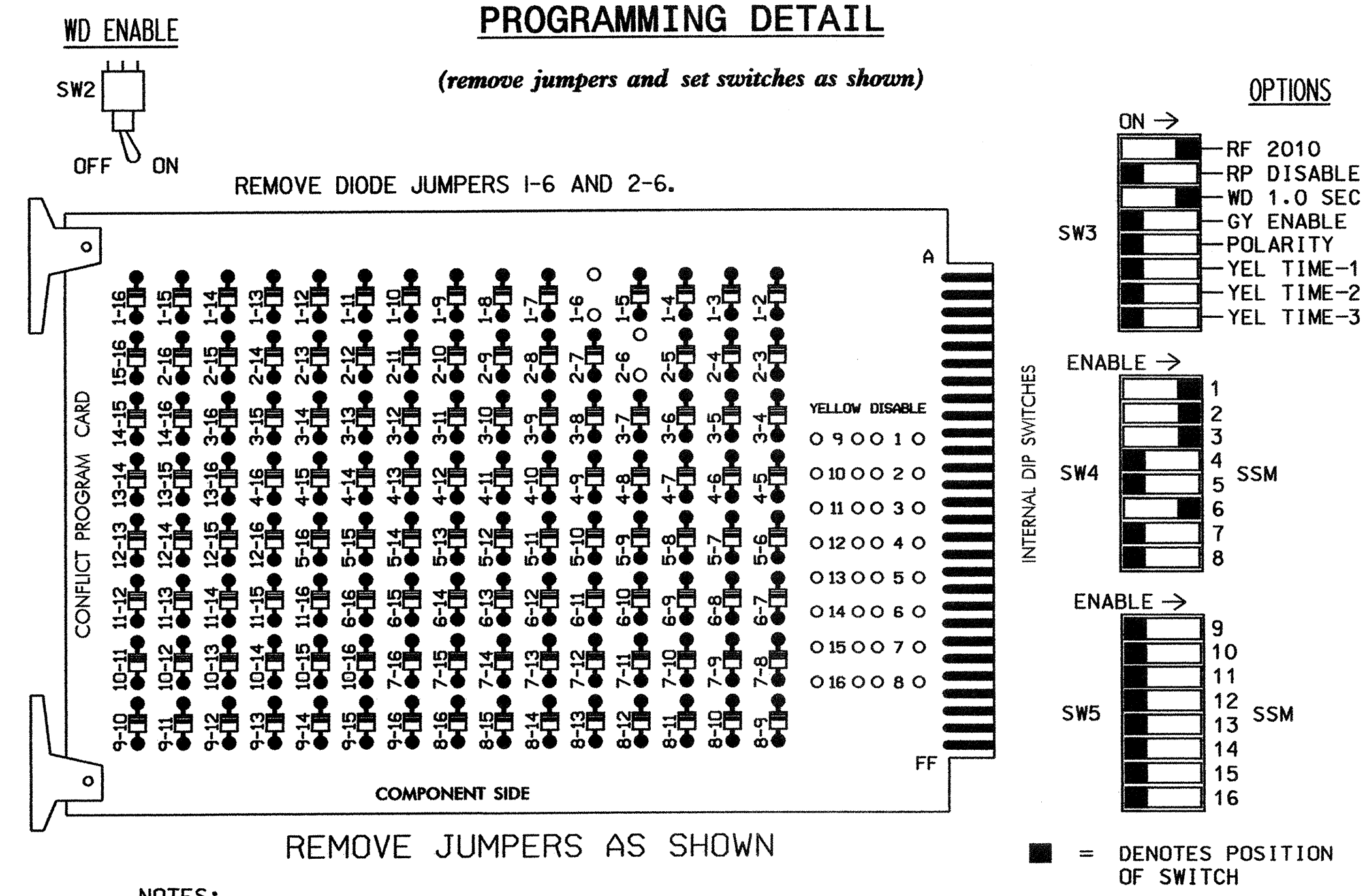
	NC 112 (Sand Hill Road) at SR 3446 (Enka Lake Road)		
	Division 13 Buncombe County Enka	PREPARED BY: I. O. Umzurike REVIEWED BY: T. J. Williams	
PLAN DATE: April 2008 PREPARED BY: I. O. Umzurike	REVIEWED BY: T. J. Williams	DATE: 4/30/08	SIG. INVENTORY NO. 13-0530 T1

30-PRF-2008-07:1:13  
 s:\t\signal\work\prf\outs\1.p\projects\B-4033\signal\wdes\gms\gms13-0530\130530\_s1.g.dsn\_2008mod.tempo.1.dgn  
 I:0402urk



(existing)  
**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. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- To prevent red failures on unused monitor channels, see Red Monitor Board Programming Detail this sheet.
- Program phases 2 and 6, on the controller unit, for Start Up In Green.
- Enable Simultaneous Gap-Out, on the controller unit, for all phases.

**EQUIPMENT INFORMATION**

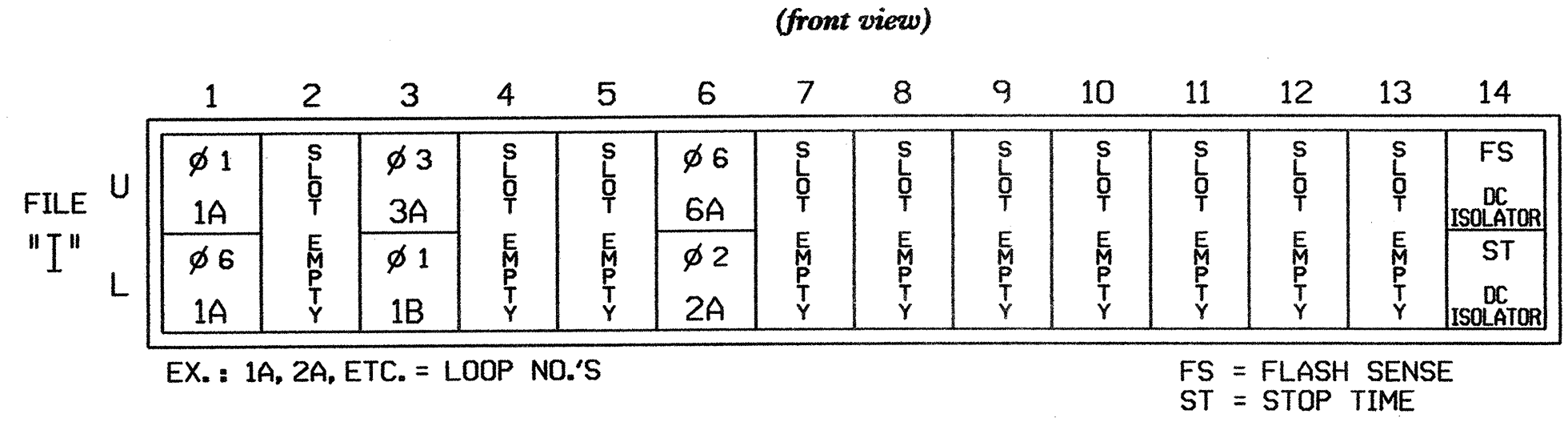
(existing)  
CONTROLLER.....EAGLE TYPE 2070L  
CABINET.....MCCAIN/CONTROL TECHNOLOGIES (DWG.NO.9500-336-NC DOT)  
SOFTWARE.....ECONOLITE OASIS  
CABINET MOUNT.....POLE  
OUTPUT FILE POSITIONS...12  
LOAD SWITCHES USED.....S1,S2,S3,S6  
PHASES USED.....1,2,3,6  
OVERLAPS.....NONE

**SIGNAL HEAD HOOK-UP CHART**

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	32,61	21,22	NU	31,32	NU	NU	NU	61,62	NU	NU	NU	NU
RED	*	128		116				134				
YELLOW		129		117				135				
GREEN		130		118				136				
RED ARROW												
YELLOW ARROW	126											
GREEN ARROW	127											

NU = Not Used  
\* Denotes install load resistor. See load resistor installation detail this sheet.

**INPUT FILE POSITION LAYOUT**



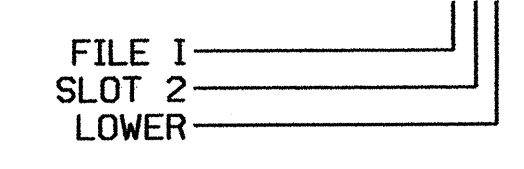
**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A <sup>1</sup>	TB21-1,2	I1U	56	18	1	1	Y	Y			15
	TB23-1,2	I1L	47	9	22	6	Y	Y			
3A	TB21-5,6	I3U	58	20	3	3	Y	Y			3
1B	TB23-5,6	I3L	49	11	24	1	Y	Y			10
6A	TB21-11,12	I6U	40	2	6	6	Y	Y			
2A	TB23-11,12	I6L	44	6	16	2	Y	Y			

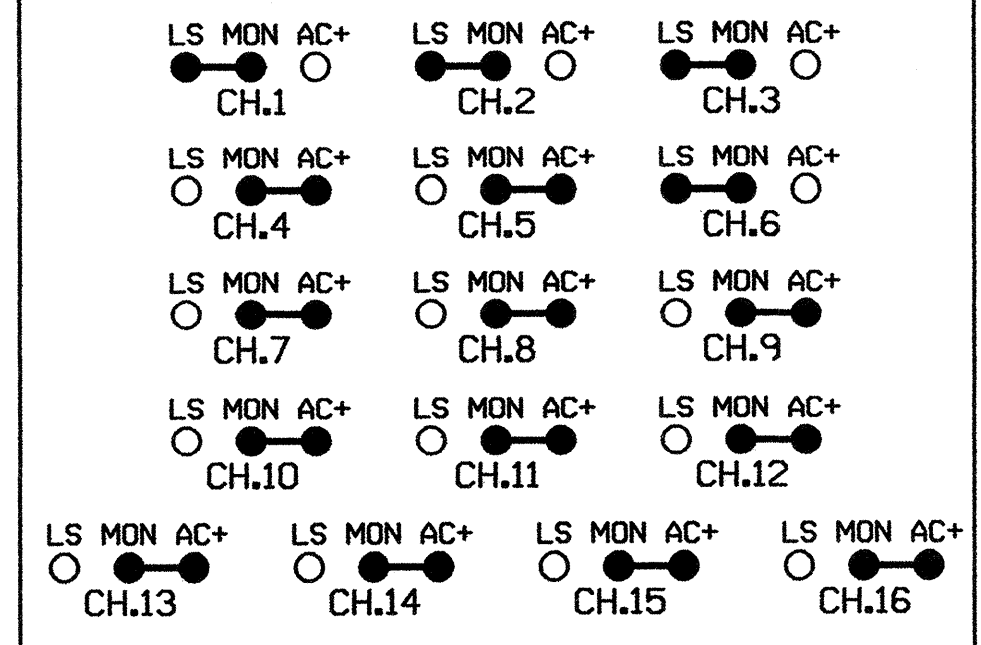
<sup>1</sup>Add jumpers from TB21-1 to TB23-1, and from TB21-2 to TB23-2.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-0530 T1  
DESIGNED: April 2008  
SEALED: 04-30-08  
REVISED: N/A

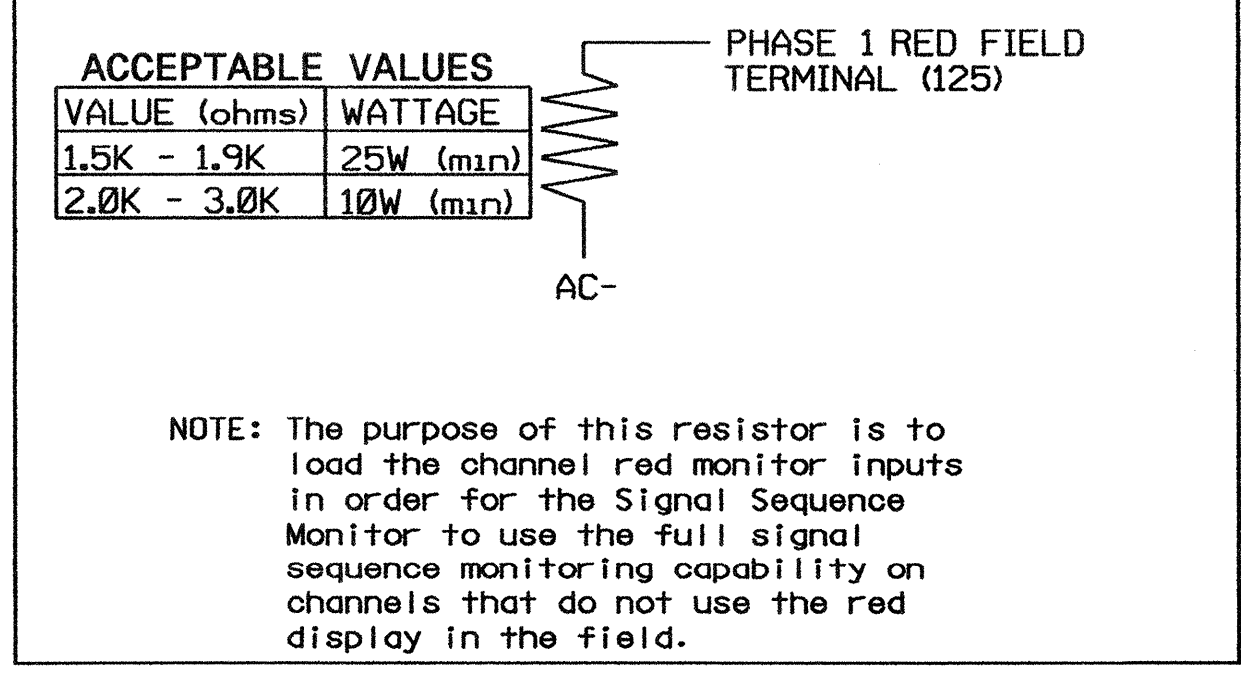
INPUT FILE POSITION LEGEND: I2L



**RED MONITOR BOARD PROGRAMMING**



**LOAD RESISTOR INSTALLATION DETAIL**



Signal Upgrade - Temporary 1

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

Division 13 Buncombe County Enka  
PLAN DATE: 01-19-06 REVIEWED BY: D.T. JOYCE  
PREPARED BY: D.H. Spaulding REVIEWED BY:  
REVISIONS  
Checked/Design on Loop 1409. Revised phase 3 from 105 2-21-06. 02-22-06  
Checked/Design on Loop 1108. LJP1 2-6-08

NC 112 at SR 3446 (Enka Lake Road)

Not a certified document as to the Original Document but Only as to the Revisions - This document originally issued and sealed by George C. Brown, PE #022013, on 02/22/06. This document is only certified as to the revisions.

REVISION SEAL  
SEAL 008453  
ENGINEER JOHN T. ROWE, JR.  
Signature: John T. Rowe, Jr. 5-6-08  
DATE: 5-6-08

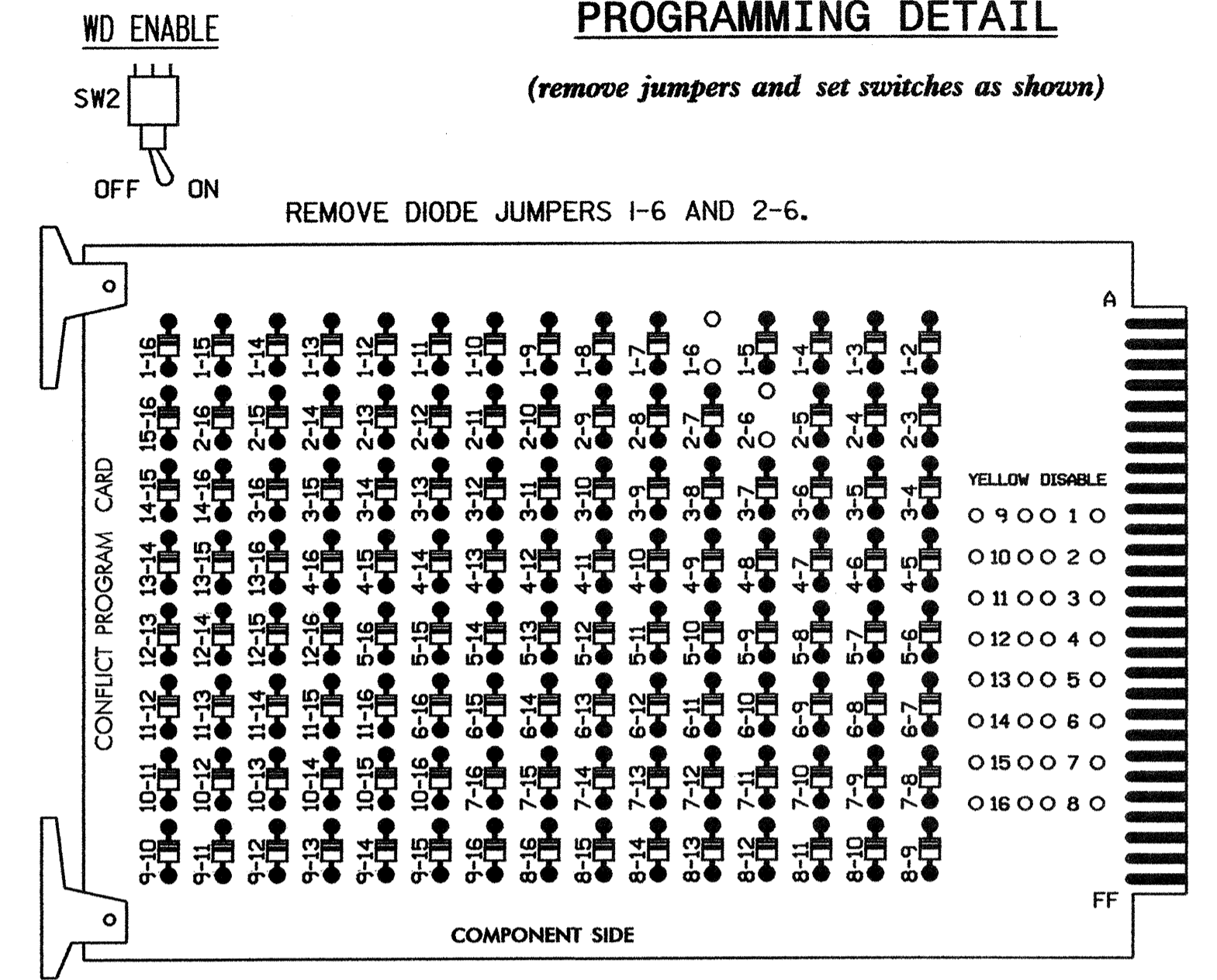
SIG. INVENTORY NO. 13-0530 T1



*(existing)*  
**EDI MODEL 2010ECL CONFLICT MONITOR**

**PROGRAMMING DETAIL**

*(remove jumpers and set switches as shown)*



- NOTES:
1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
  2. Make sure jumpers SEL1-SEL5 are present on the monitor board.

**NOTES**

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
2. To prevent red failures on unused monitor channels, see Red Monitor Board Programming Detail this sheet.
3. Program phases 2 and 6, on the controller unit, for Start Up In Green.
4. Enable Simultaneous Gap-Out, on the controller unit, for all phases.

**EQUIPMENT INFORMATION**

*(existing)*

CONTROLLER.....EAGLE TYPE 2070L  
 CABINET.....McCAIN/CONTROL TECHNOLOGIES (DWG.NO. 9500-336-NC DOT)  
 SOFTWARE.....ECONOLITE OASIS  
 CABINET MOUNT.....POLE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S1,S2,S3,S6  
 PHASES USED.....1,2,3,6  
 OVERLAPS.....NONE

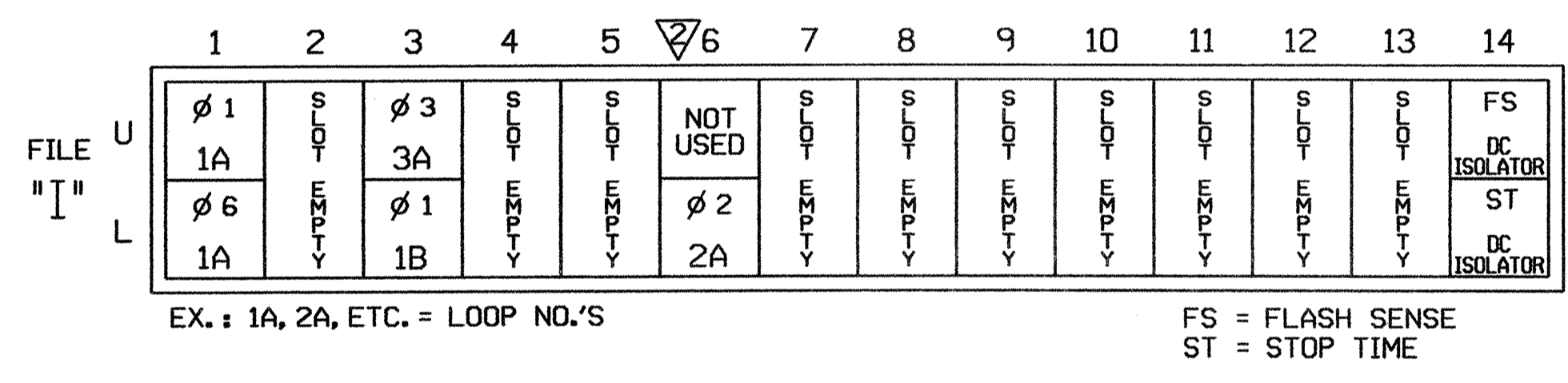
**SIGNAL HEAD HOOK-UP CHART**

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	32,61	21,22	NU	31,32	NU	NU	NU	61,62	NU	NU	NU	NU
RED	*	128		116				134				
YELLOW		129		117				135				
GREEN		130		118				136				
RED ARROW												
YELLOW ARROW	126											
GREEN ARROW	127											

NU = Not Used  
 \* Denotes install load resistor. See load resistor installation detail this sheet.

**INPUT FILE POSITION LAYOUT**

*(front view)*



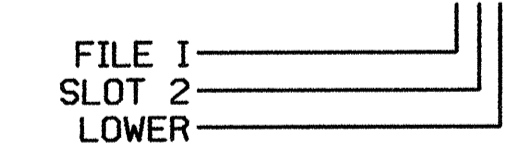
**INPUT FILE CONNECTION & PROGRAMMING CHART**

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A <sup>1</sup>	TB21-1,2	I1U	56	18	1	1	Y	Y			5
	TB23-1,2	I1L	47	9	22	6	Y	Y			
3A	TB21-5,6	I3U	58	20	3	3	Y	Y			3
1B	TB23-5,6	I3L	49	11	24	1	Y	Y			10
6A	TB21-11,12	I6U	40	2	6	6	Y	Y			
2A	TB23-11,12	I6L	44	6	16	2	Y	Y			

<sup>1</sup>Add jumpers from TB21-1 to TB23-1, and from TB21-2 to TB23-2.

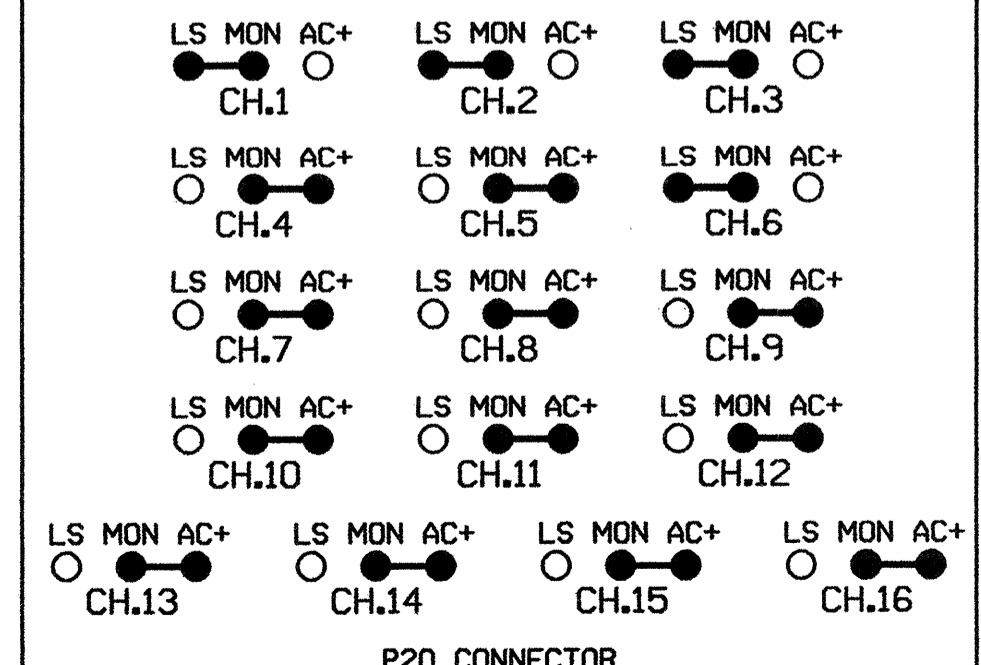
THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-0530 T2  
 DESIGNED: April 2008  
 SEALED: 04-30-08  
 REVISED: N/A

INPUT FILE POSITION LEGEND: I2L



**RED MONITOR BOARD PROGRAMMING**

*(position jumpers as shown below)*



**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 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.

Signal Upgrade - Temporary 2

Prepared in the Offices of:  
 NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
 Signal Management Section  
 122 N. McDowell St., Raleigh, NC 27603

Division 13 Buncombe County Enka  
 PLAN DATE: 01-19-06 REVIEWED BY: D.T. JOYCE  
 PREPARED BY: D.H. Spaulding REVIEWED BY:

REVISIONS  
 1 Changed Delay on Loop 1A1B. Revised phase 3, heads, MS 2-21-06. DJK 02-22-06  
 2 Removed Loop 6A and changed loop 1A delay. (JP) JTK 5-6-08

Signature: John T. Rowe, Jr. 5-6-08  
 Date: 5-6-08

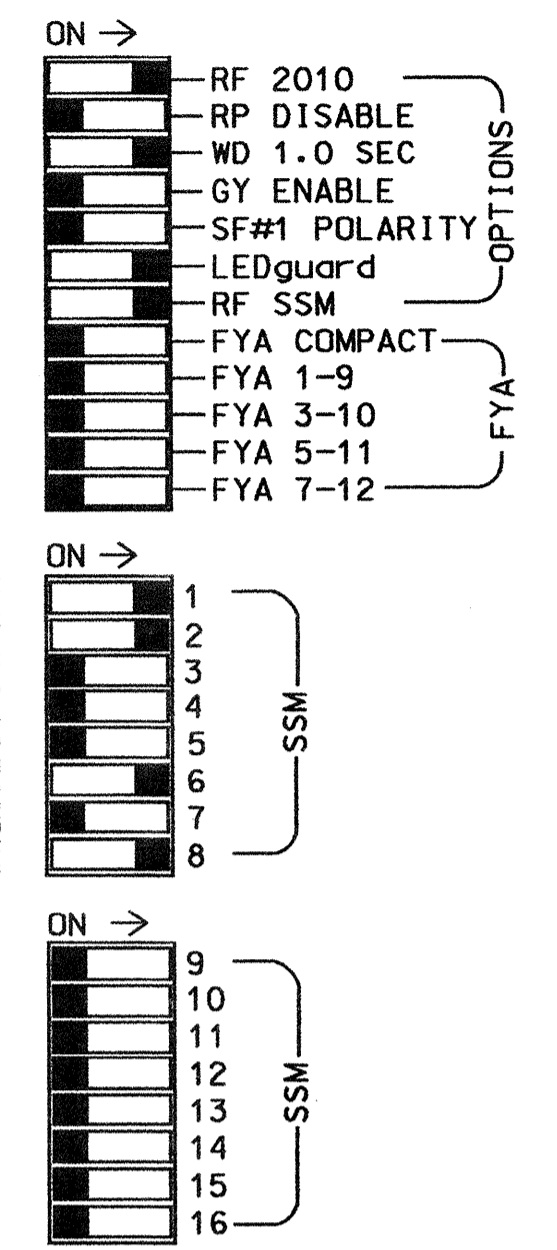
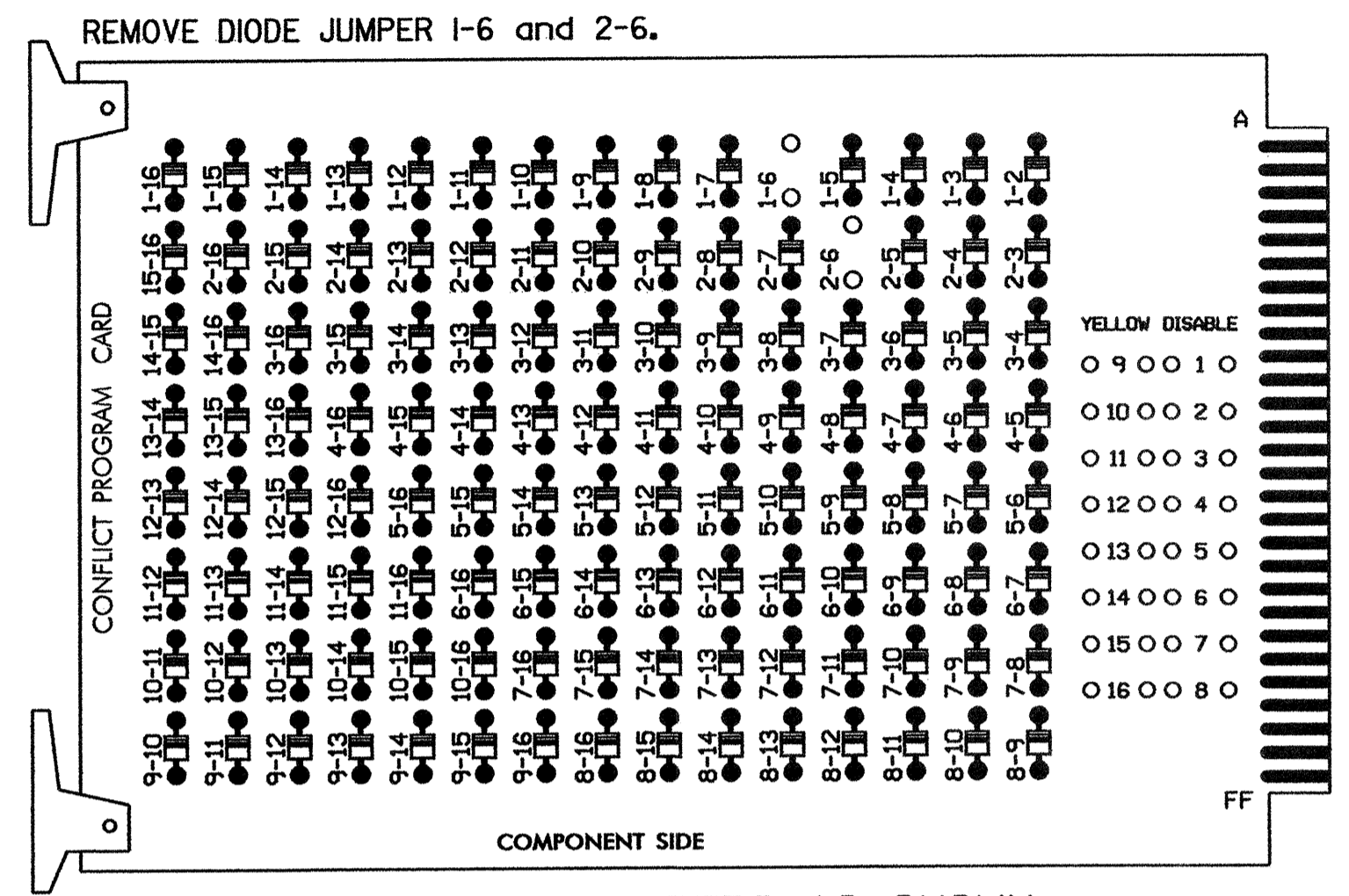
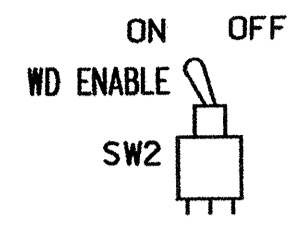
Not a certified document as to the Original Document but Only as to the Revisions - This document originally issued and sealed by George C. Brown, PE #222013, on 02/22/06. This document is only certified as to the revisions.

SIG. INVENTORY NO. 13-0530 T2



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

(remove jumpers and set switches as shown)



- NOTES:
- Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
  - Make sure jumpers SEL2-SEL5 are present on the monitor board.

### NOTES

- To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the Signal Plans.
- Ensure that Red Enable is active at all times during normal operation. To prevent Red Failures on unused monitor channels, tie unused red monitor inputs 3,4,5,7,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
- Program phases 2 and 6, on the controller unit, for Start Up In Green.
- Enable Simultaneous Gap-Out, on the controller unit, for all phases.
- The cabinet and controller are part of the NC 112 Enka Closed Loop System.

### EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L  
 CABINET.....CONTRACTOR SUPPLIED 332  
 SOFTWARE.....ECONOLITE OASIS  
 CABINET MOUNT.....BASE  
 OUTPUT FILE POSITIONS...12  
 LOAD SWITCHES USED.....S1,S2,S6,S8  
 PHASES USED.....1,2,6,8  
 OVERLAPS.....NONE

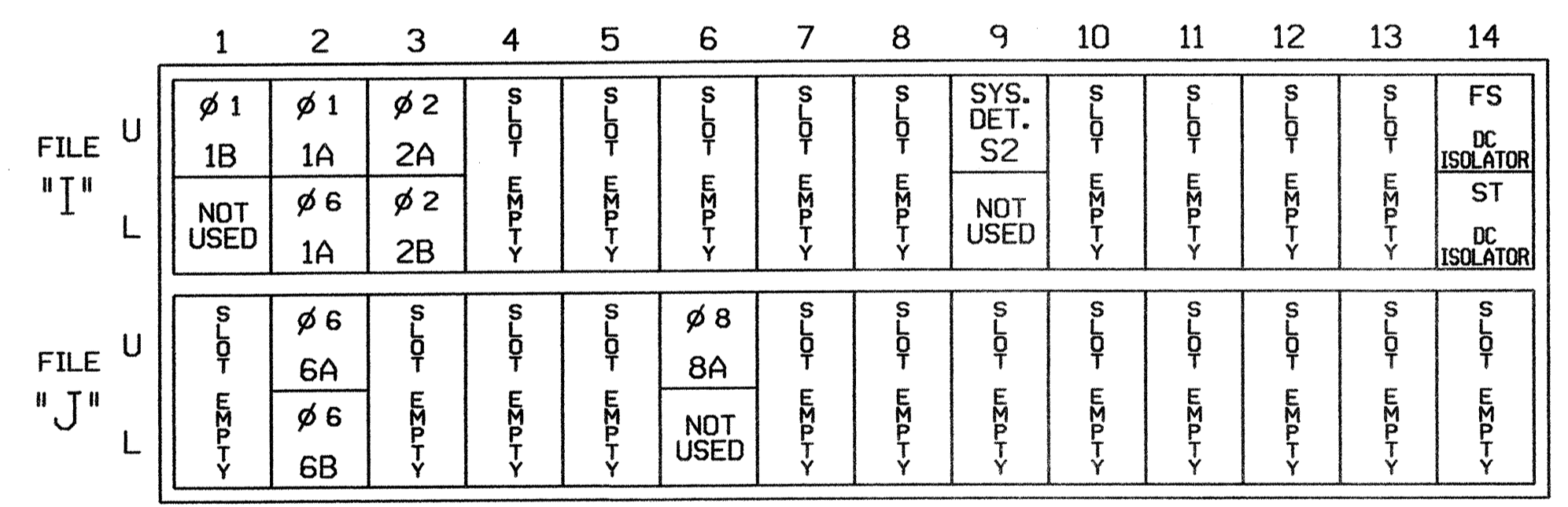
### SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	61,82	21,22	NU	NU	NU	NU	NU	61,62	NU	NU	22	81,82
RED	*	128						134				107
YELLOW		129						135				108
GREEN		130						136				109
RED ARROW												
YELLOW ARROW	126											108
GREEN ARROW	127											109

NU = Not Used  
 \* Denotes install load resistor. See load resistor installation detail this sheet.

### INPUT FILE POSITION LAYOUT

(front view)

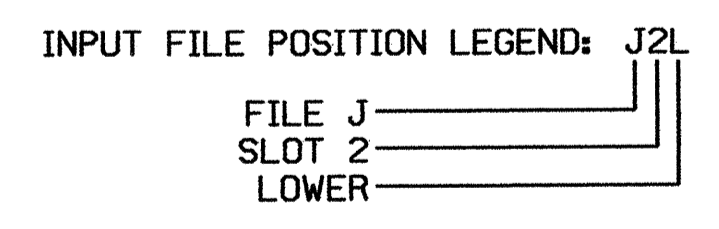


EX.: 1A, 2A, ETC. = LOOP NO.'S  
 FS = FLASH SENSE  
 ST = STOP TIME

### INPUT FILE CONNECTION & PROGRAMMING CHART

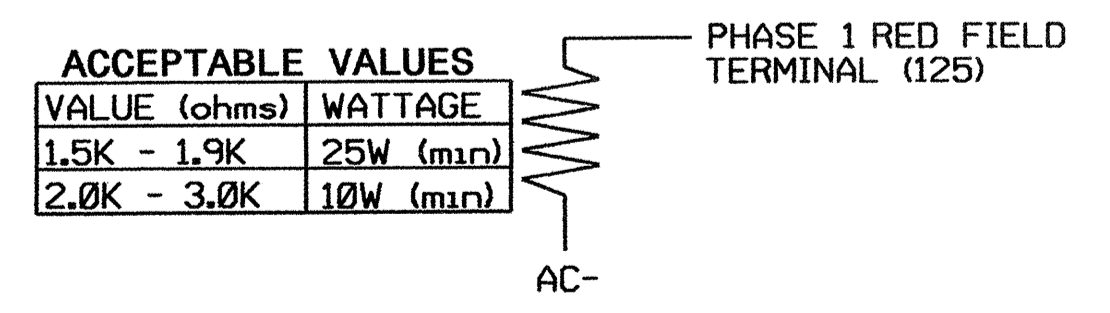
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1B	TB2-1,2	I1U	56	18	1	1	Y	Y			10
1A	TB2-5,6	I2U	39	1	2	1	Y	Y			15
	TB2-7,8	I2L	43	5	12	6	Y	Y			
2A	TB2-9,10	I3U	63	25	32	2	Y	Y			
2B	TB2-11,12	I3L	76	38	42	2	Y	Y			
* S2	TB6-9,10	I9U	60	22	11	SYS					
6A	TB3-5,6	J2U	40	2	6	6	Y	Y			
6B	TB3-7,8	J2L	44	6	16	6	Y	Y			
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			3

\* Add jumpers from TB2-5 to TB2-7, and from TB2-6 to TB2-8.  
 \* SYSTEM DETECTOR ONLY. REMOVE THE VEHICLE PHASE ASSIGNED TO THIS DETECTOR IN THE DEFAULT PROGRAMMING.



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-0530  
 DESIGNED: April 2008  
 SEALED: 04-30-08  
 REVISED: N/A

### 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 channels that do not use the red display in the field.

Signal Upgrade - Final

ELECTRICAL AND PROGRAMMING DETAILS FOR: Prepared in the Offices of:  122 N. McDowell St., Raleigh, NC 27603	NC 112 (Sand Hill Road) at SR 3446 (Enka Lake Road)		SEAL NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 008453 JOHN T. ROWE, JR. ENGINEER
	Division 13 Buncombe County Enka PLAN DATE: May 2008 REVIEWED BY: JTR PREPARED BY: James Peterson REVIEWED BY:	REVISIONS: INIT. DATE SIGNATURE DATE SIG. INVENTORY NO. 13-0530	

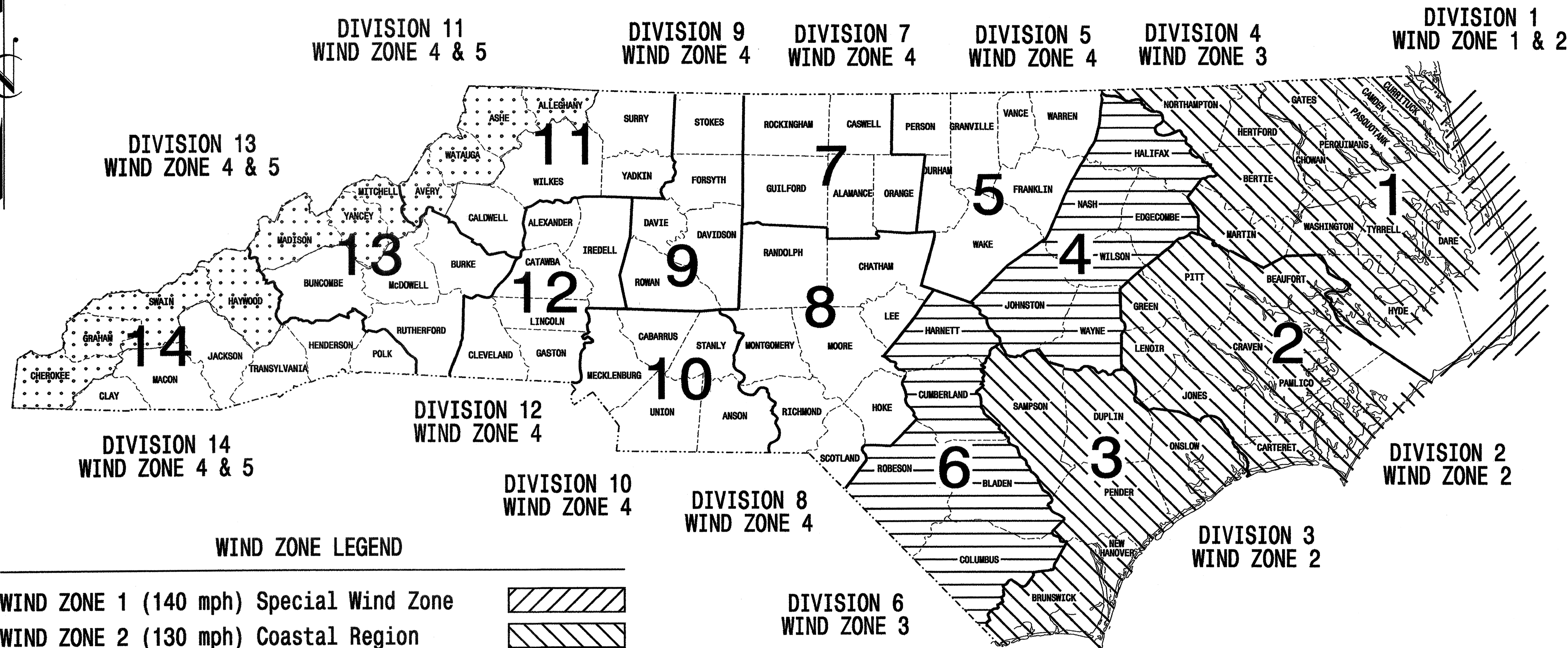




# STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS

STATE	PROJECT NO.	SHEET NO.
N.C.	B-4033	Sig. 16
F. A. PROJ. NO.	M 1	
PROJECT ID. NO.		

## STANDARD DRAWINGS FOR METAL POLES

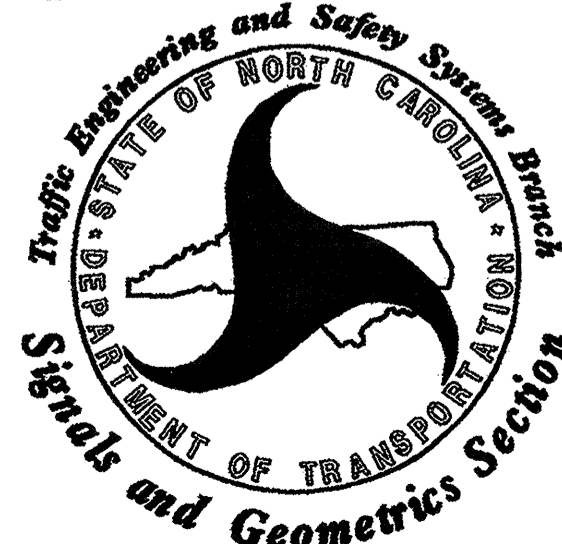


### WIND ZONE LEGEND

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

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

Prepared in the Offices of:



122 N. McDowell St., Raleigh, NC 27603

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

AASHTO

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

### INDEX OF PLANS

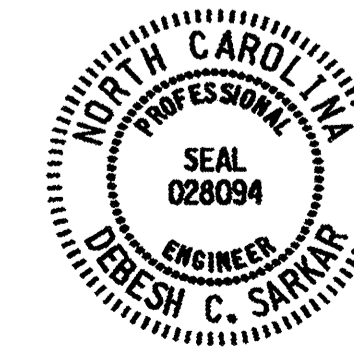
DRAWING NUMBER	DESCRIPTION
M 1	Title Sheet
M 2	Fabrication Details - All Poles
M 3	Fabrication Details - Strain Poles
M 4,5	Fabrication Details - Mast Arm Poles
M 6	Construction Details - Strain Poles
M 7	Construction Details - Foundations
M 8	Standard Strain Poles

### NCDOT CONTACTS:

#### TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

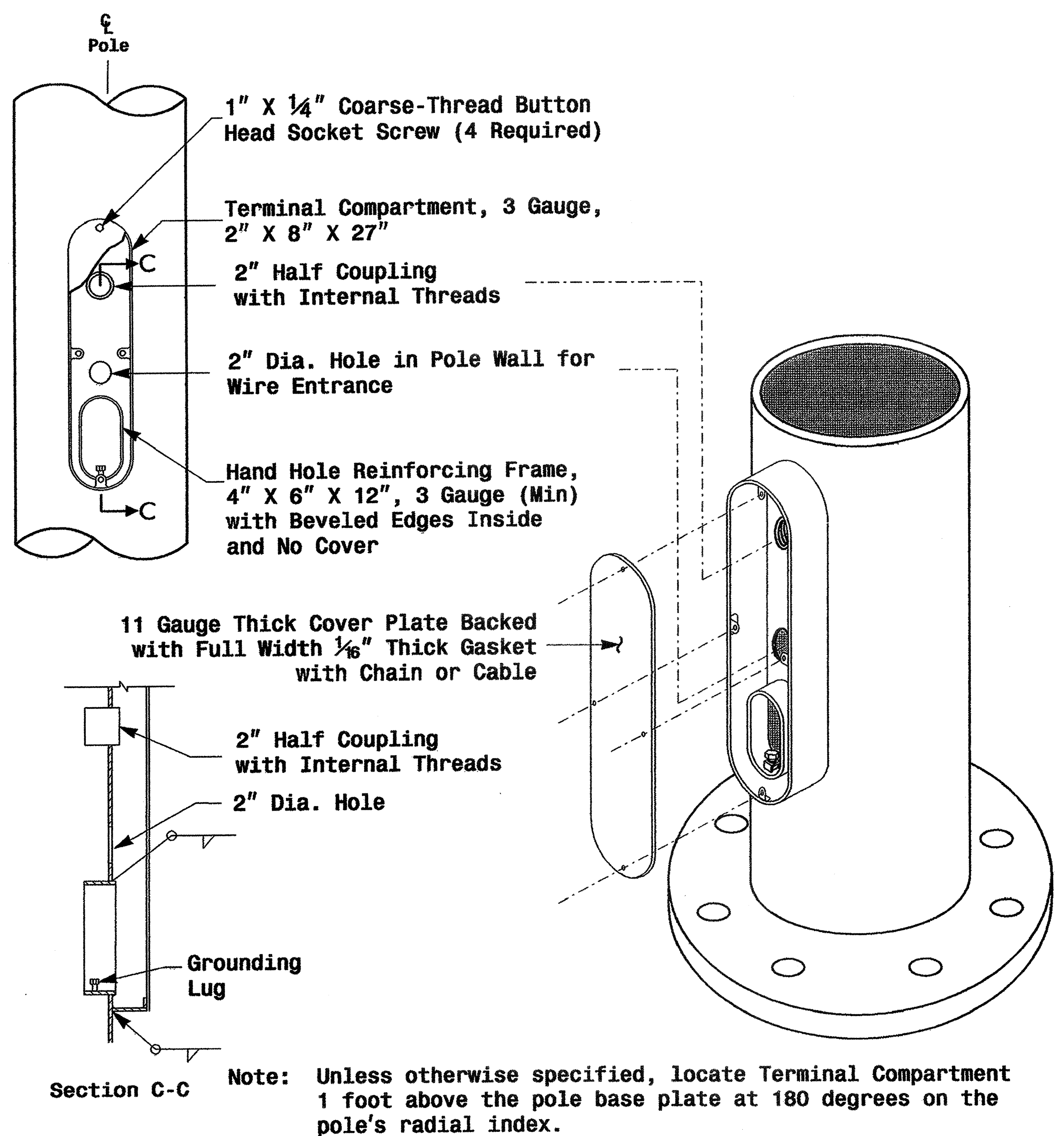
- G. A. Fuller, P.E. - State ITS and Signals Engineer
- R. E. Mullinax, P.E. - Signals and Geometrics Engineer
- P. L. Alexander, P.E. - Signals and Geometrics Special Projects Engineer
- D. C. Sarkar, P.E. - Signals and Geometrics Structural Engineer
- A. M. Esposito, P.E. - Signals and Geometrics Project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

SEAL

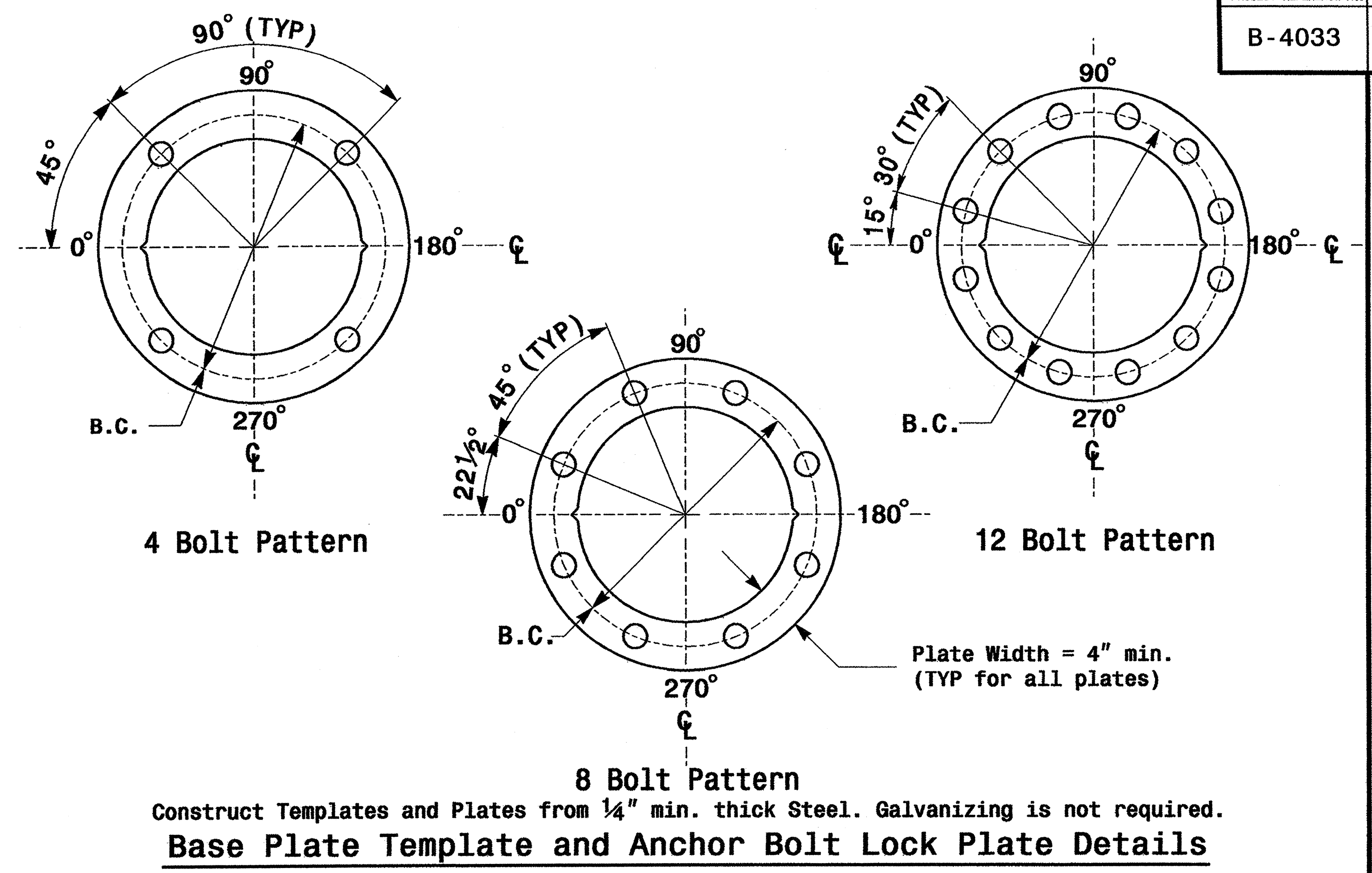


*D. Sarkar* 9.2.2005  
SIGNATURE DATE

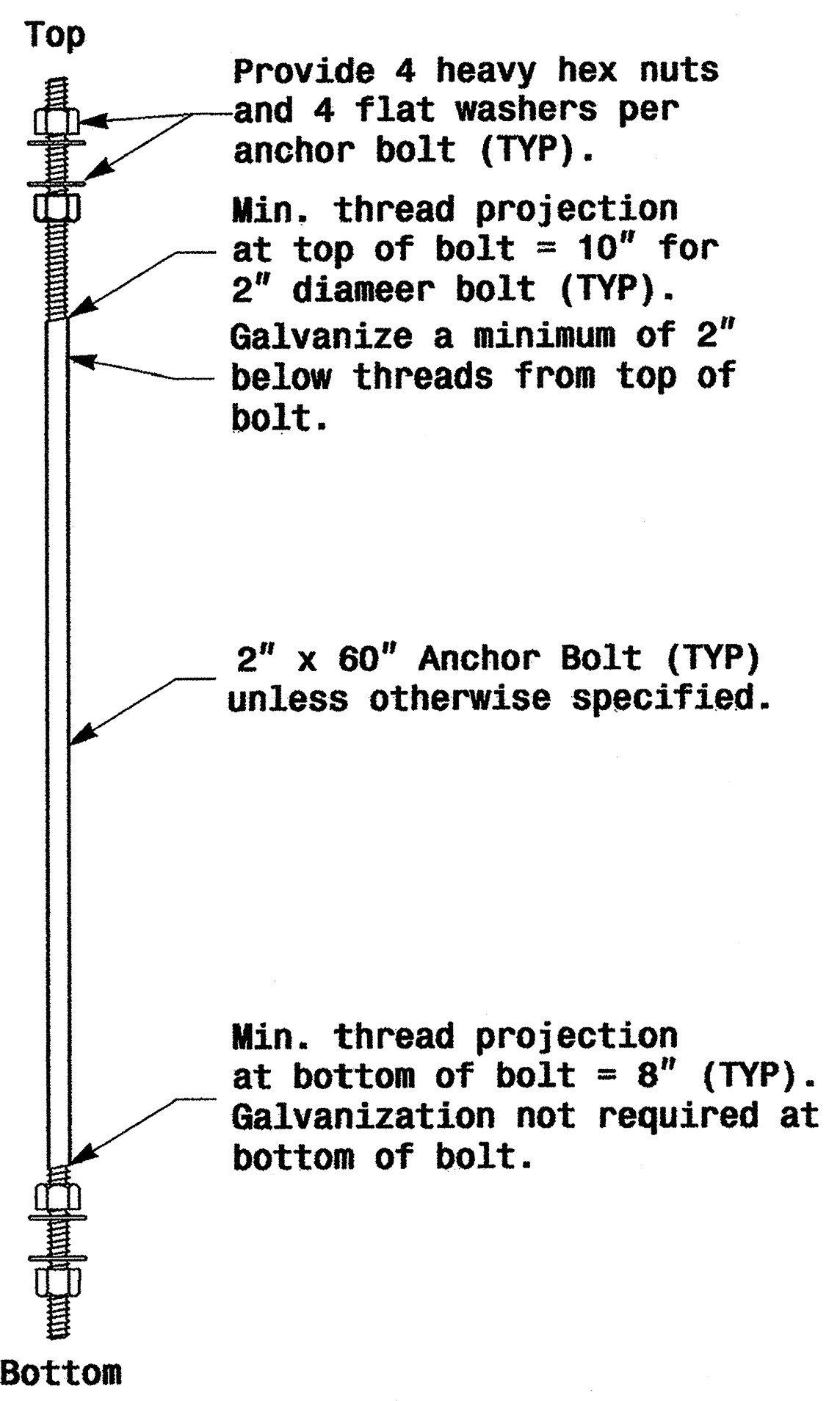




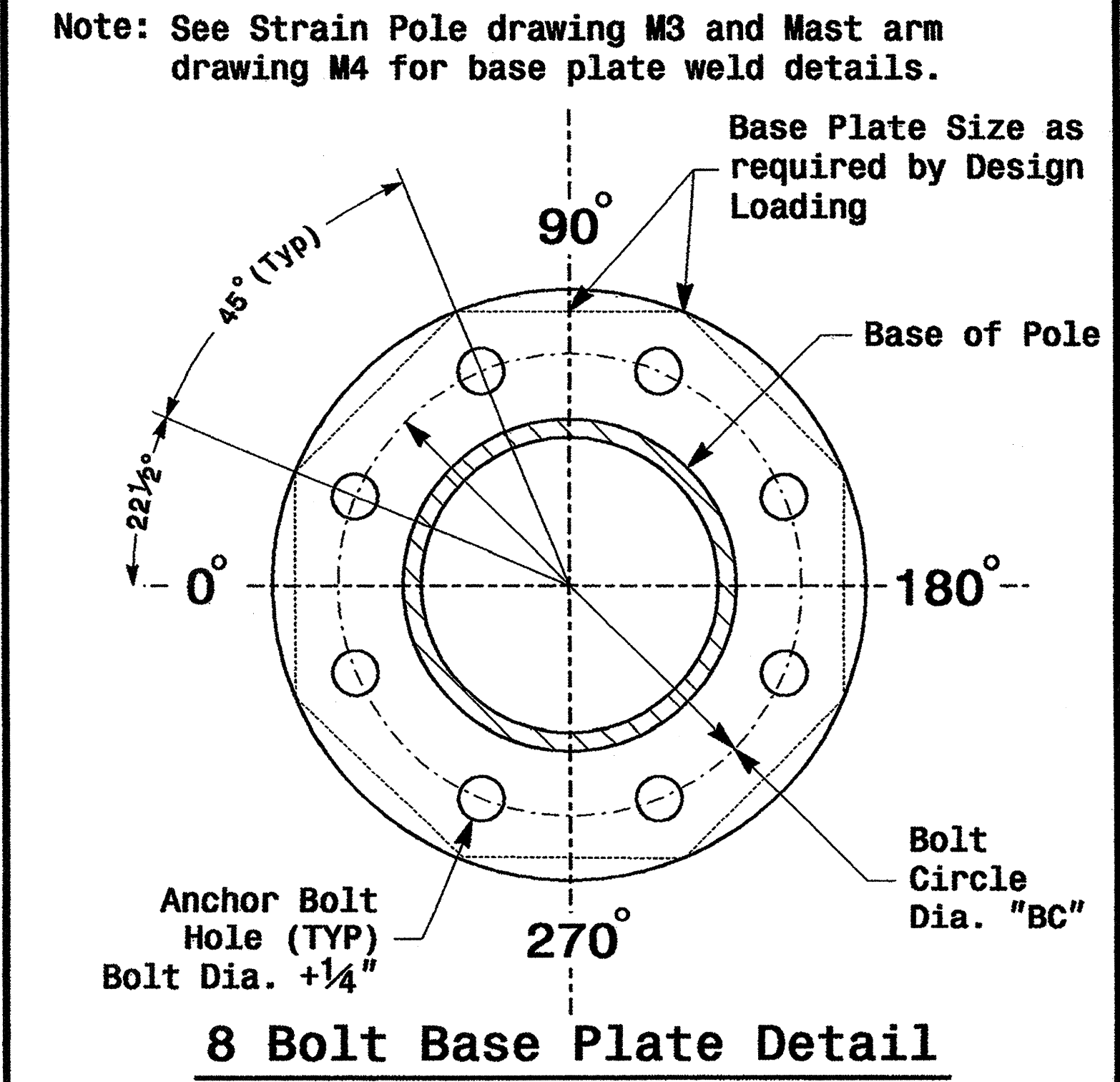
**Terminal Compartment Detail**



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



**Anchor Bolt Detail**



**8 Bolt Base Plate Detail**

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

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

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

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

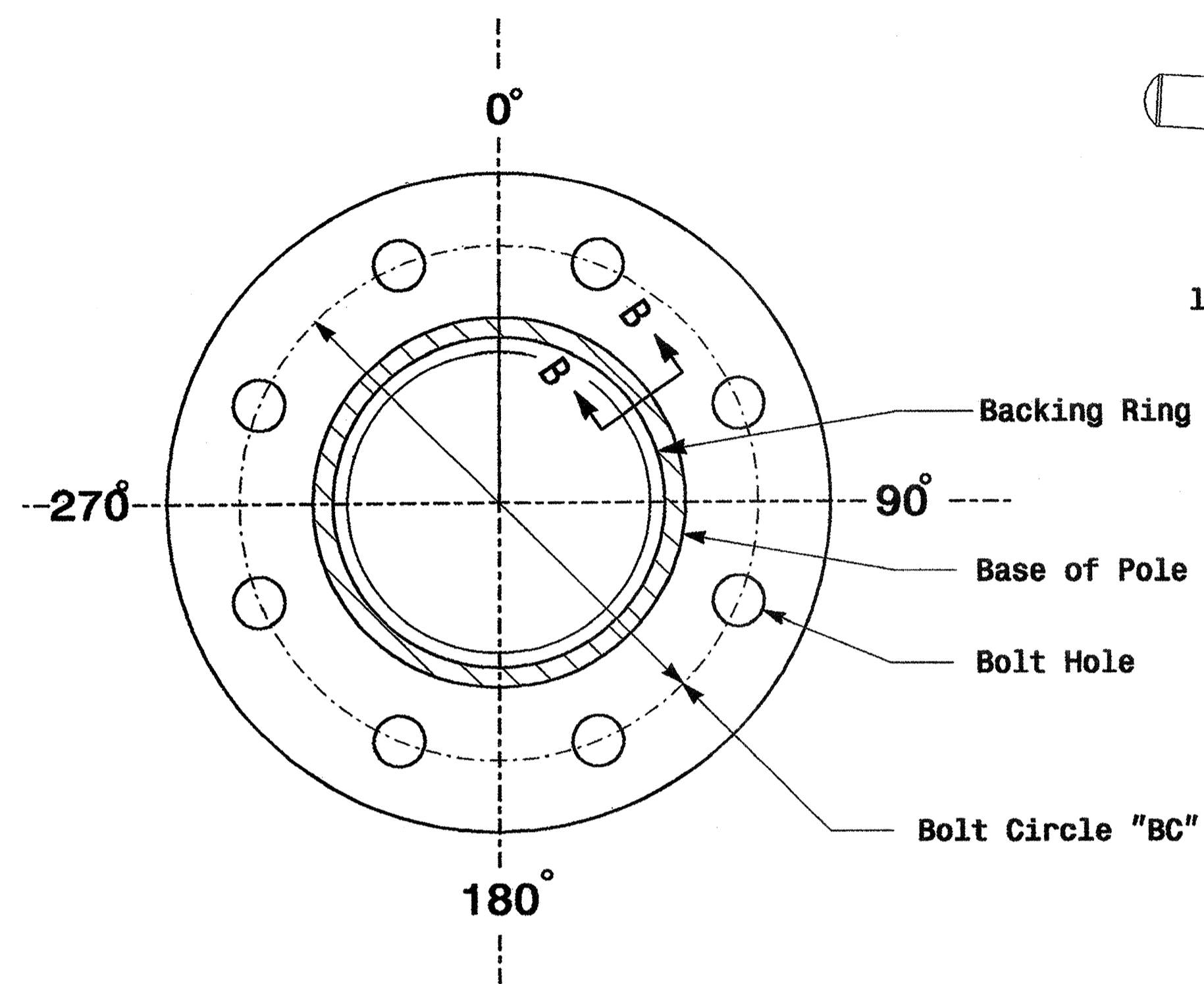
- Notes:
- 1) D= Diameter, T= Thickness, L= Length, Y= Yield Strength
  - 2) A.B. = Anchor Bolt
  - 3) B.C. = Bolt Circle of Anchor Bolts
  - 4) If Custom Design, use "NCDOT STANDARD" line for plan pole I.D.
  - 5) See drawing M4 for mounting positions of I.D. tags.

**Identification Tag Details**

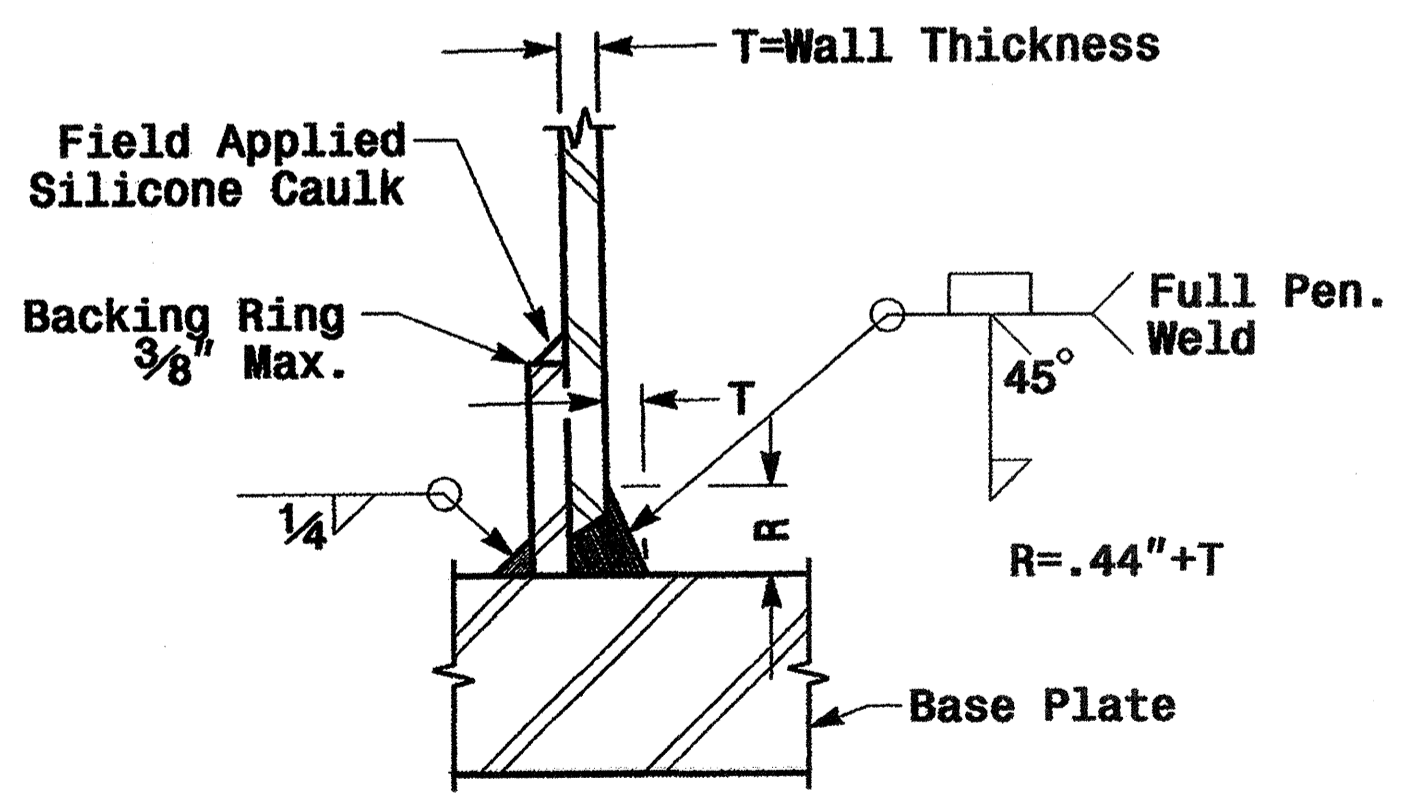
**Fabrication Details - All Poles**

01-SEP-2005 16:22 D:\21004\_Mercol Pole Standards\2004 re thru m6.dgn condrews

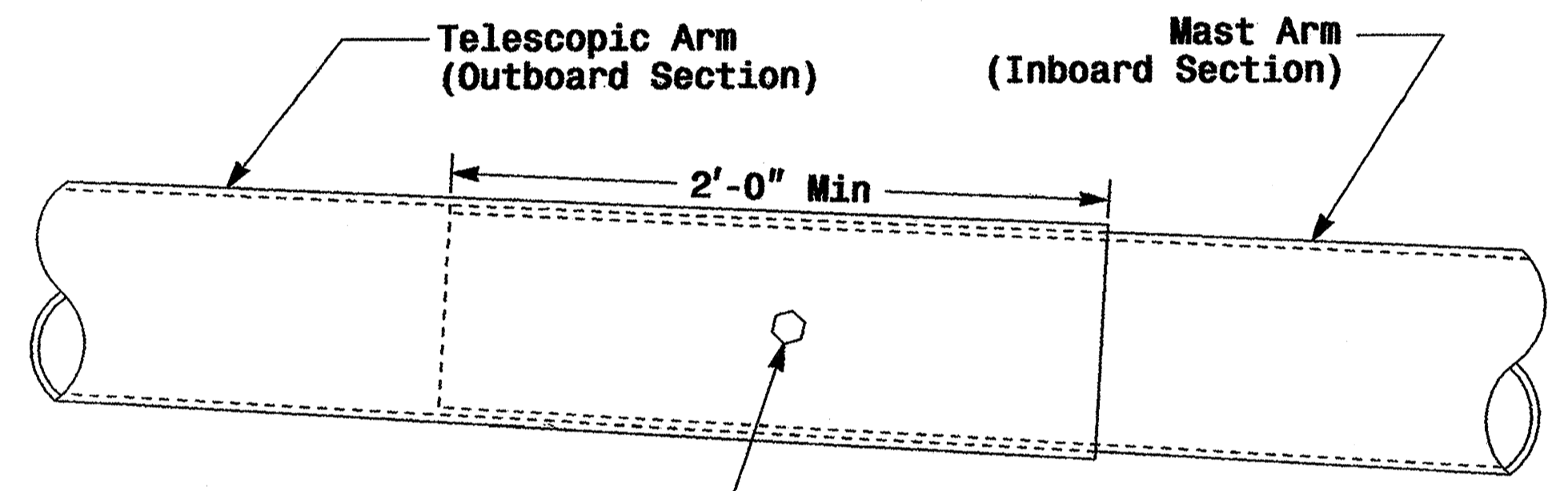
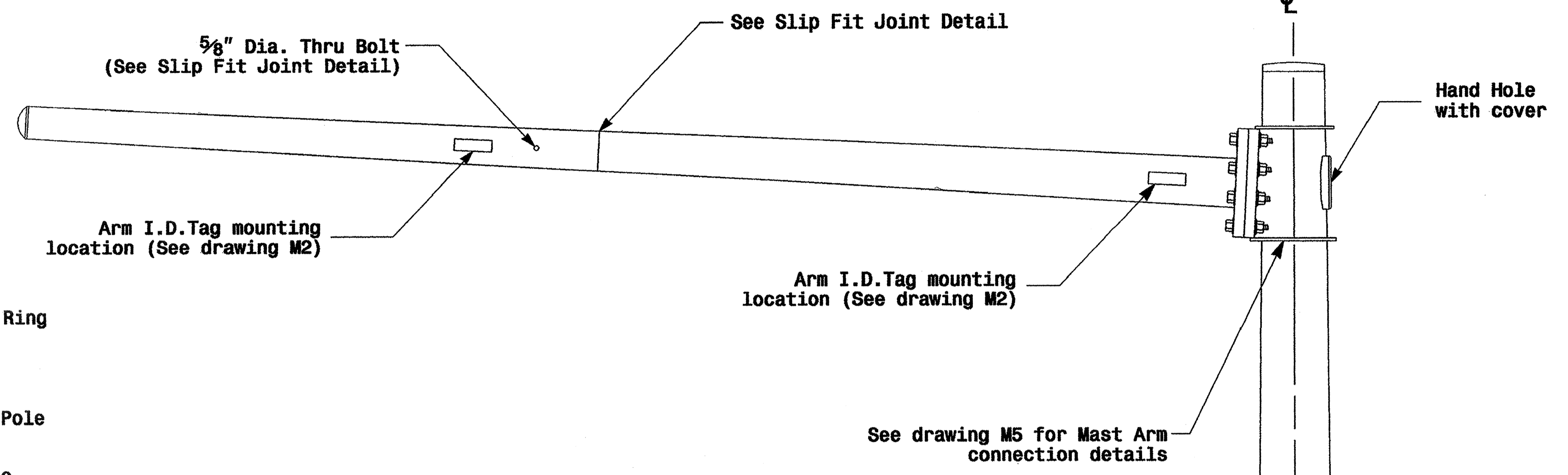
	<b>Typical Fabrication Details Common To All Metal Poles</b>		
	PLAN DATE: May 2005 PREPARED BY: P.L. Alexander SCALE: NONE	REVIEWED BY: C.F. Andrews REVIEWED BY: A.M. Esposito REVISIONS: _____ INIT. DATE	



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

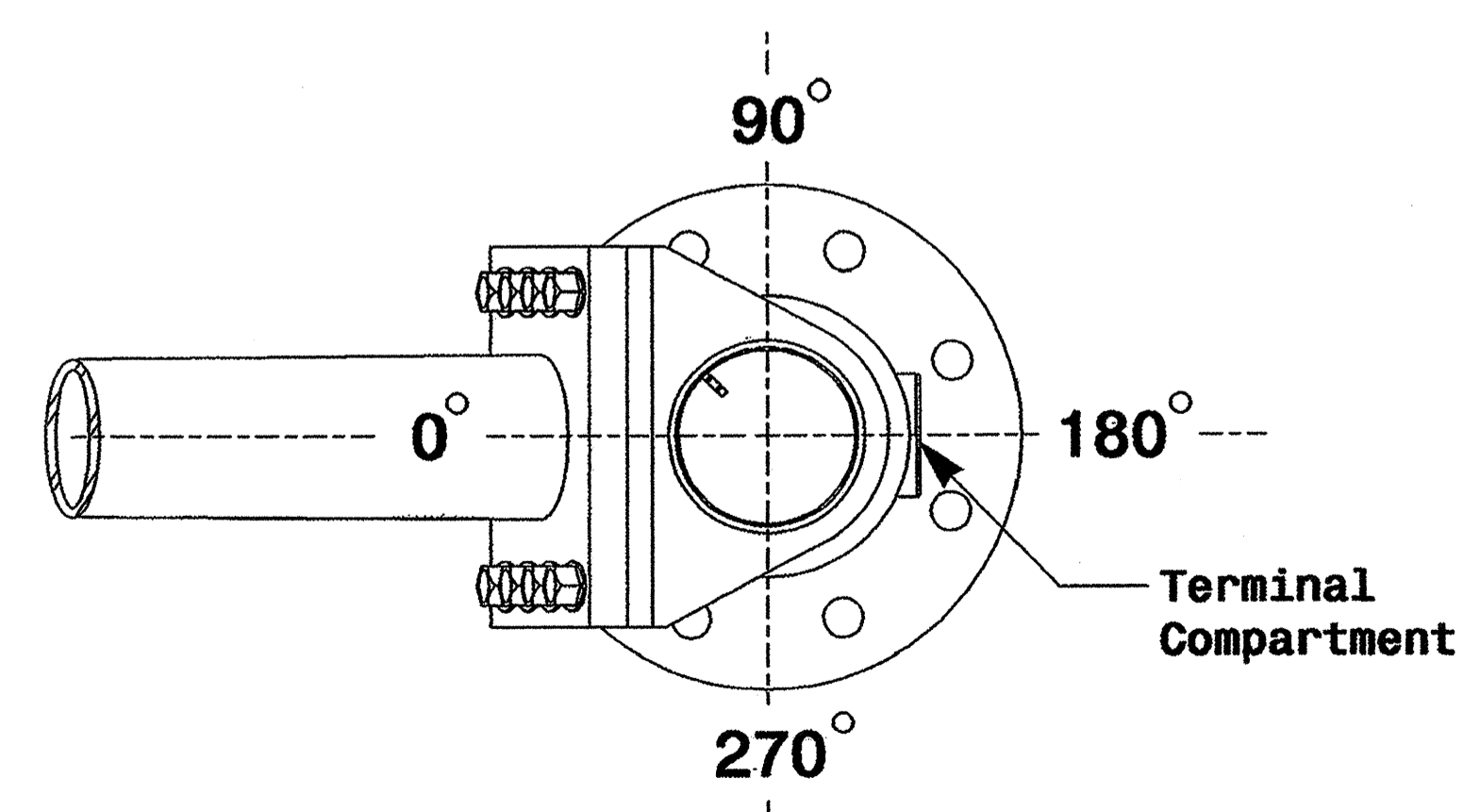


Section B-B  
(Pole Attachment to Base Plate)  
**Full-Penetration Groove Weld Detail**

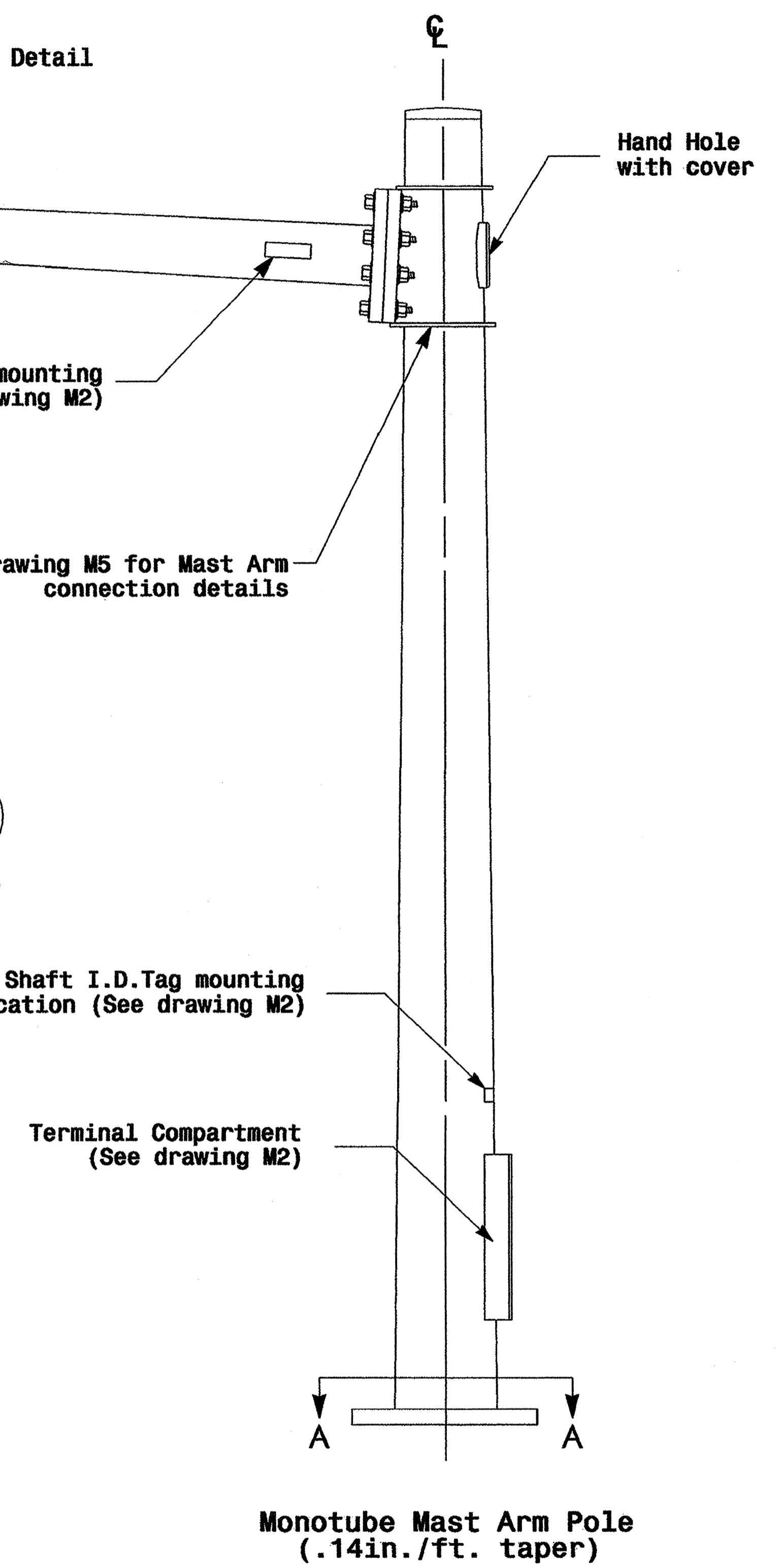


3/4" Factory Drilled Hole in Outboard Tube.  
Field Drill Inboard Tube.  
5/8" Galvanized Thru Stud with (2) Hex. Locknuts Ea.

**Slip Fit Joint Detail for Mast Arm**



**Mast Arm Radial Orientation**

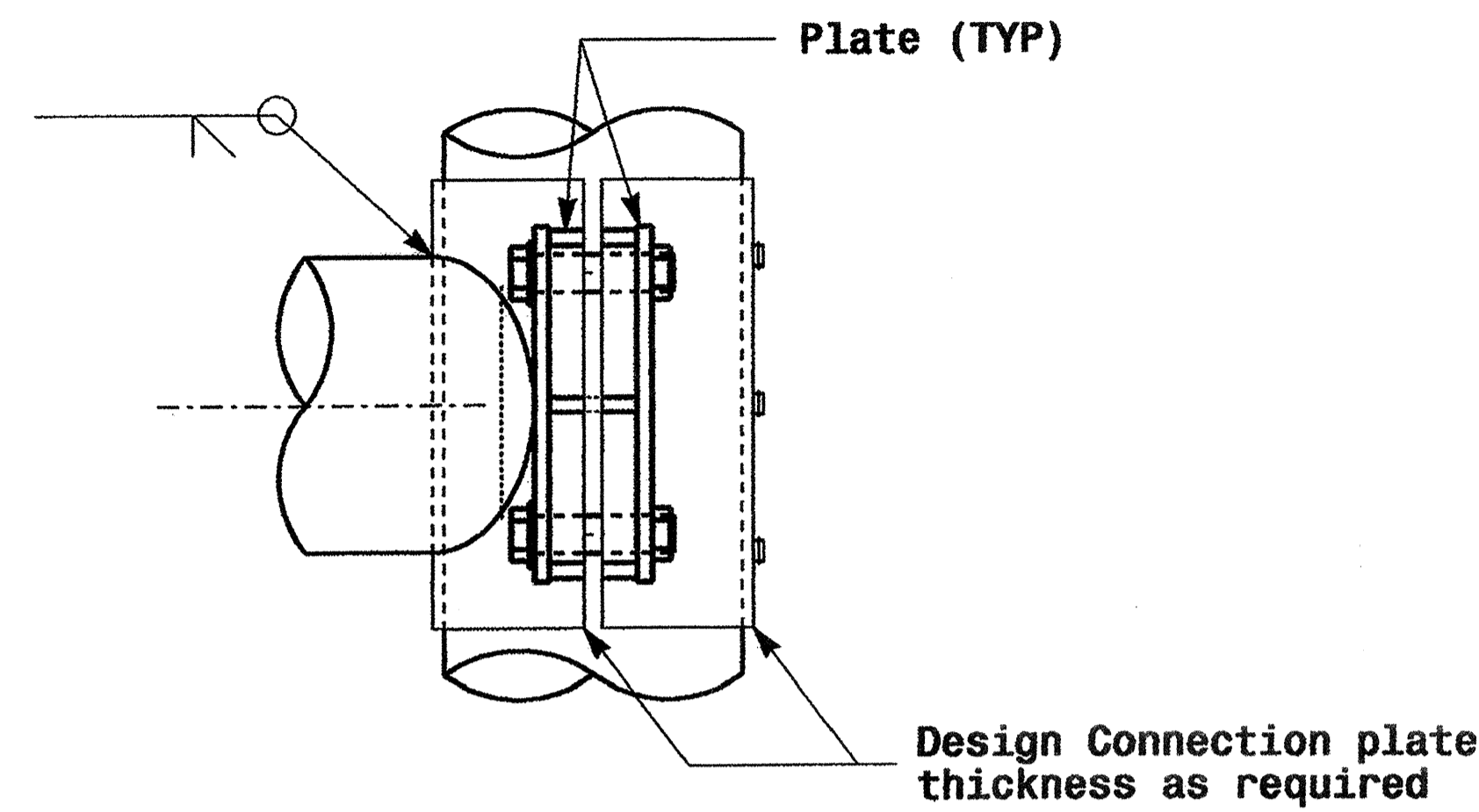


**Fabrication Details - Mast Arm Poles**

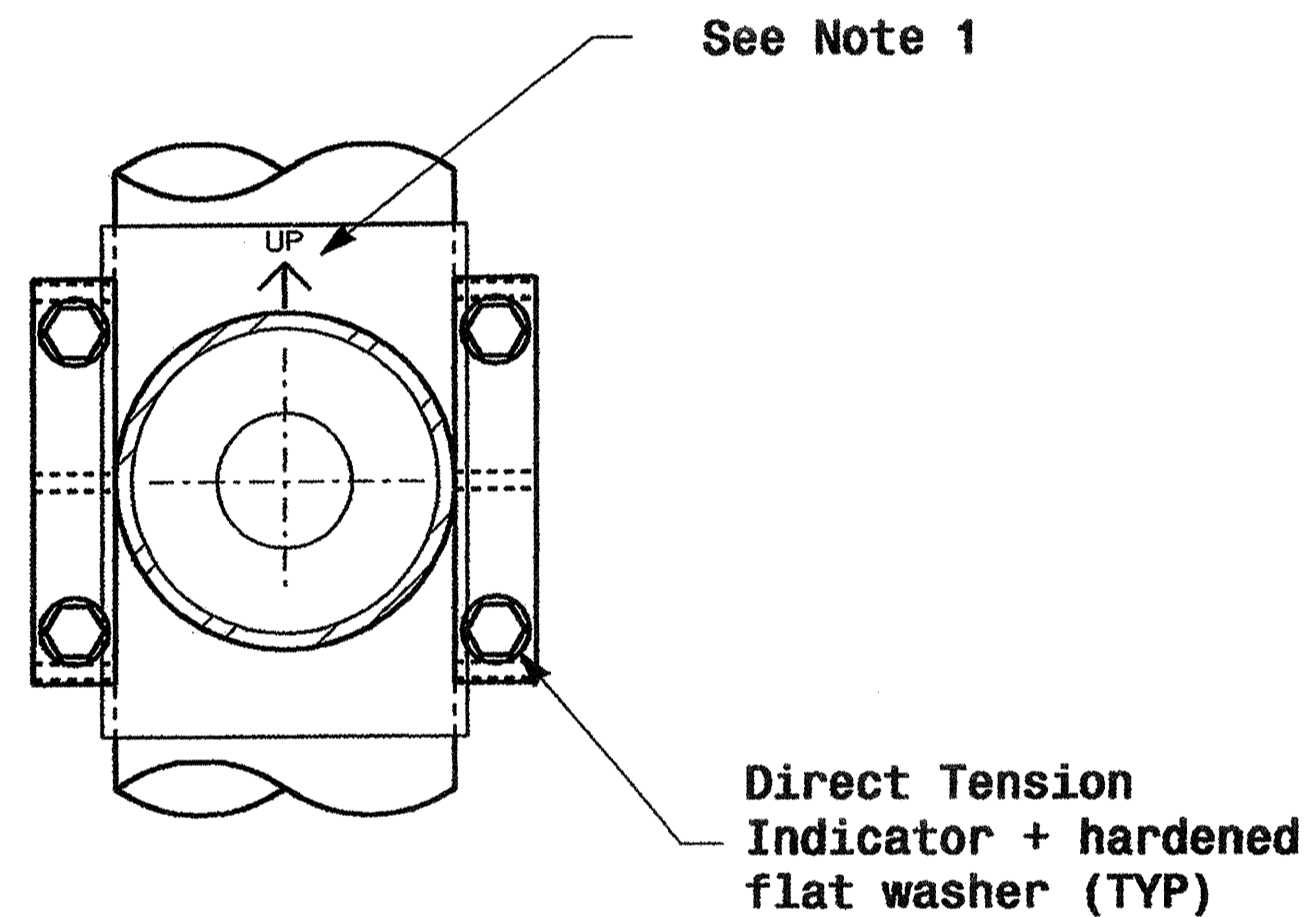
-SEP-2005 14:08  
c:\p1\work\mfg\groups\2004 metal pole standards\2004 mfg.dgn

	<b>Typical Fabrication Details for Mast Arm Poles</b>	
	PLAN DATE: <b>May 2005</b> PREPARED BY: <b>P.L. Alexander</b>	REVIEWED BY: <b>C.F. Andrews</b> REVIEWED BY: <b>A.M. Esposito</b>
SCALE: <b>NA</b> NONE	REVISIONS:	INT. DATE:
Signature: <i>D. Sackler</i> DATE: <b>9.2.2005</b>		SIG. INVENTORY NO.:

### Adjustable Clamp Type Bolted Mast Arm Connection

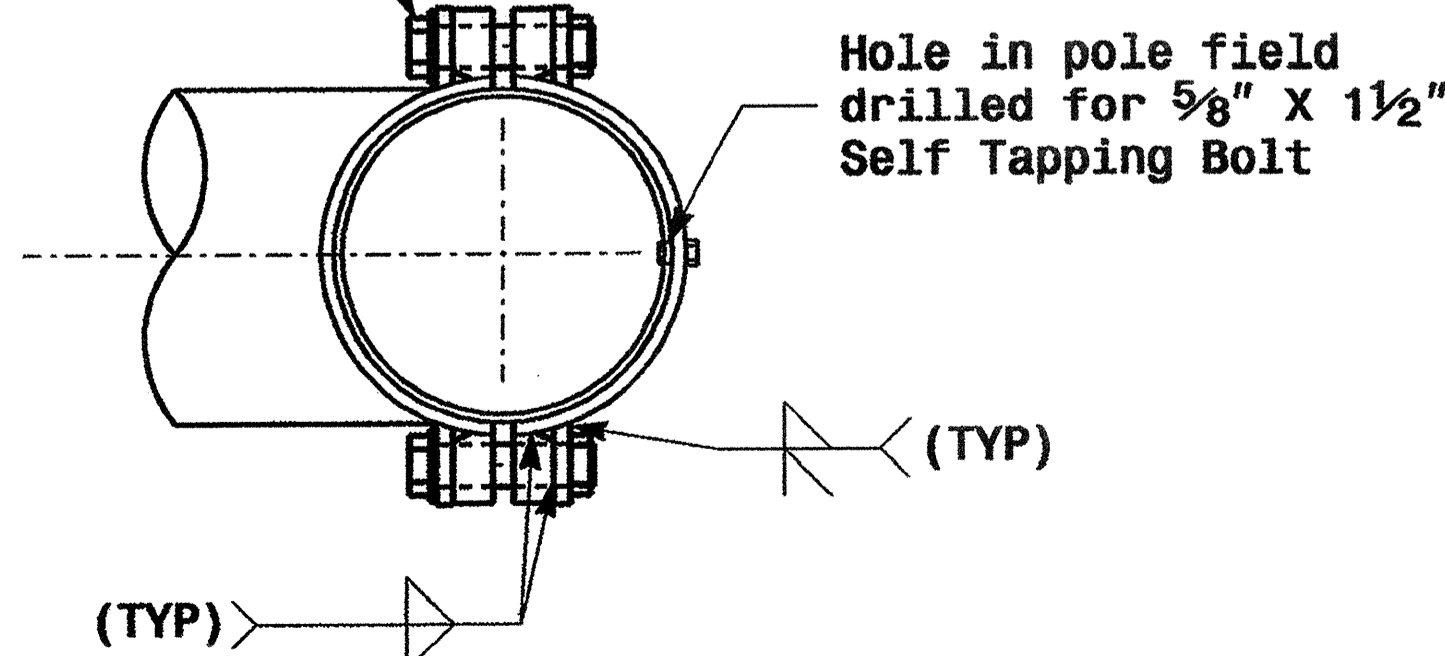


Side Elevation View



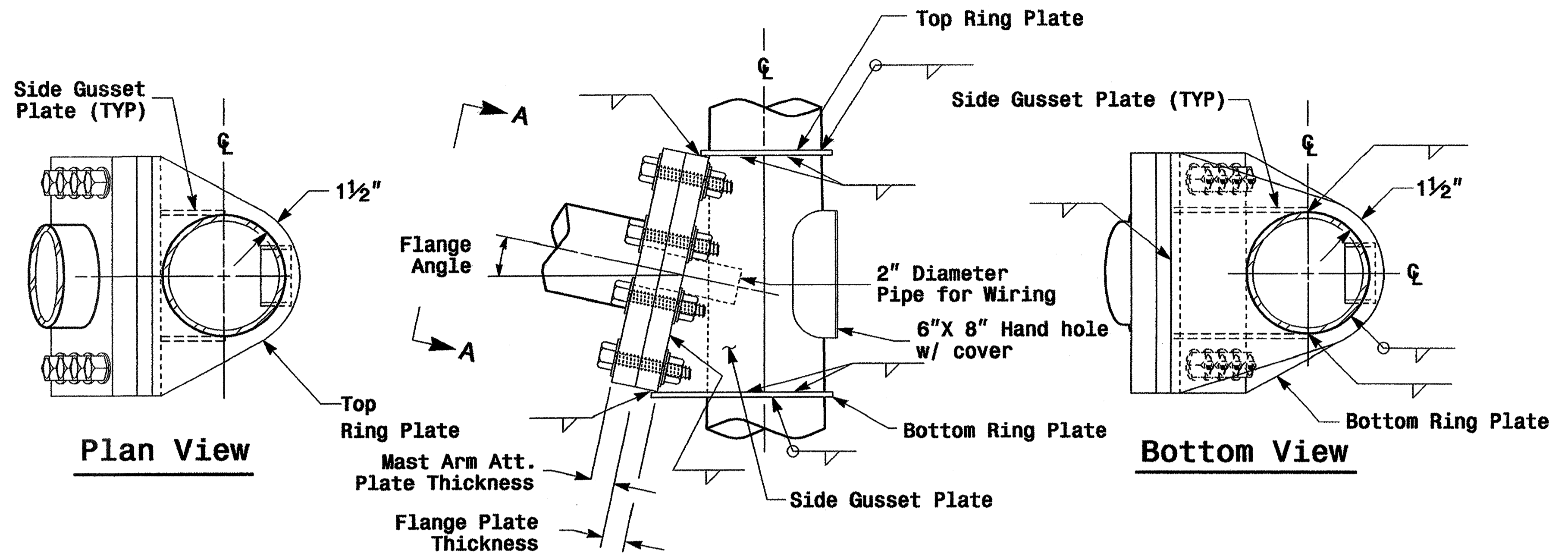
Front Elevation View

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



Plan View

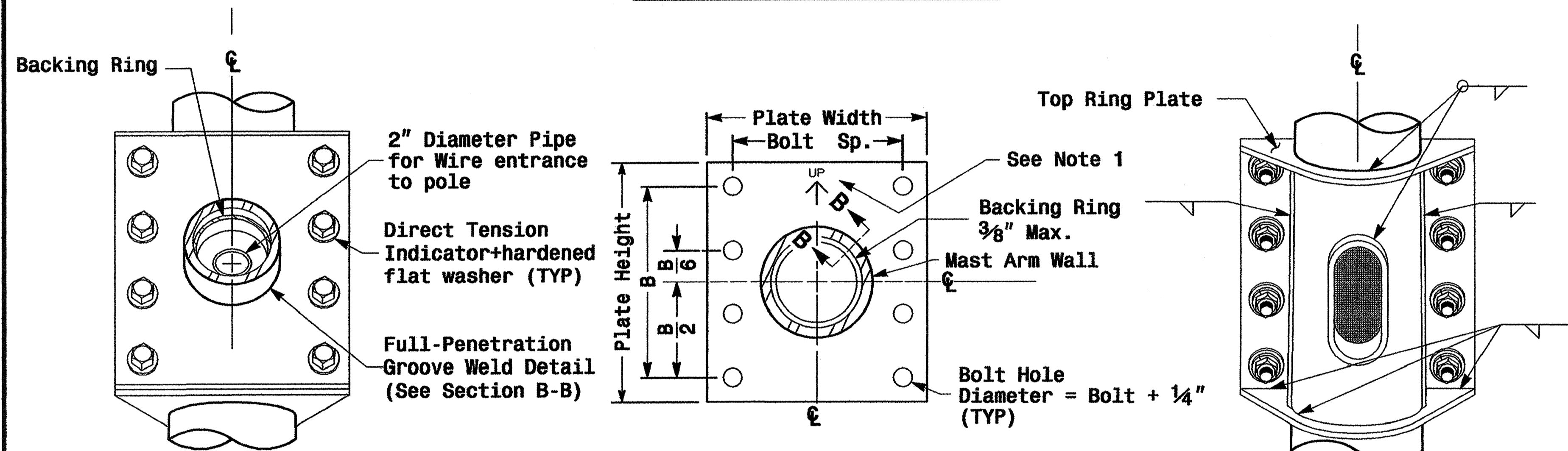
### Welded Ring Stiffened Mast Arm Connection



Plan View

Side Elevation View

Bottom View

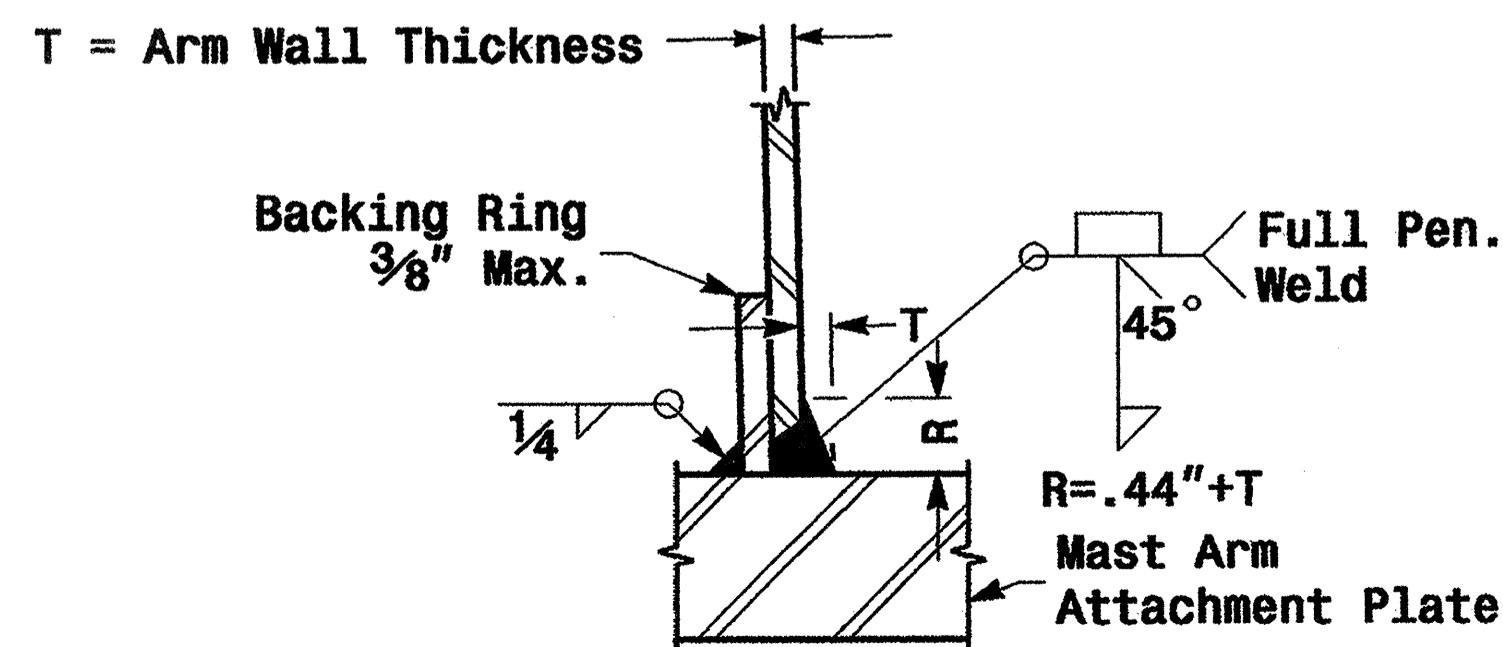


Front Elevation View

Section View A-A

Mast Arm Attachment Plate

Back Elevation View

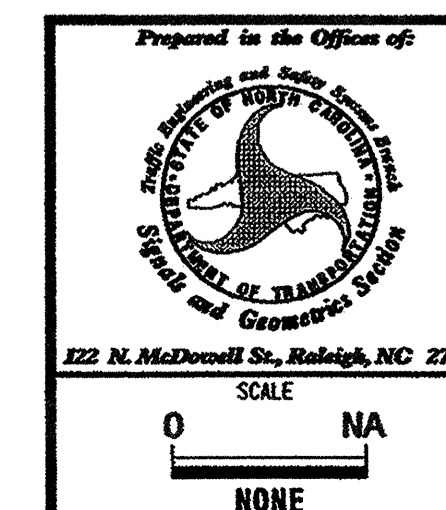


Section B-B

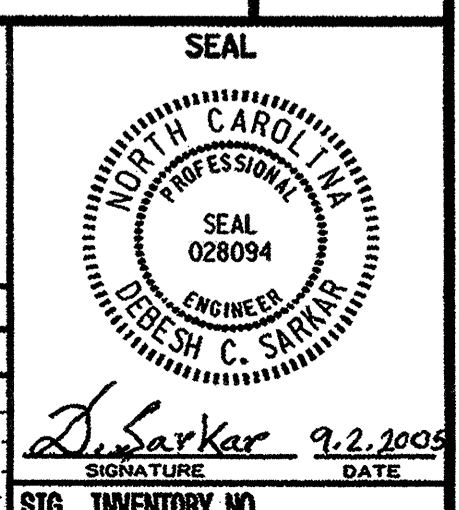
Full-Penetration Groove Weld Detail

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.



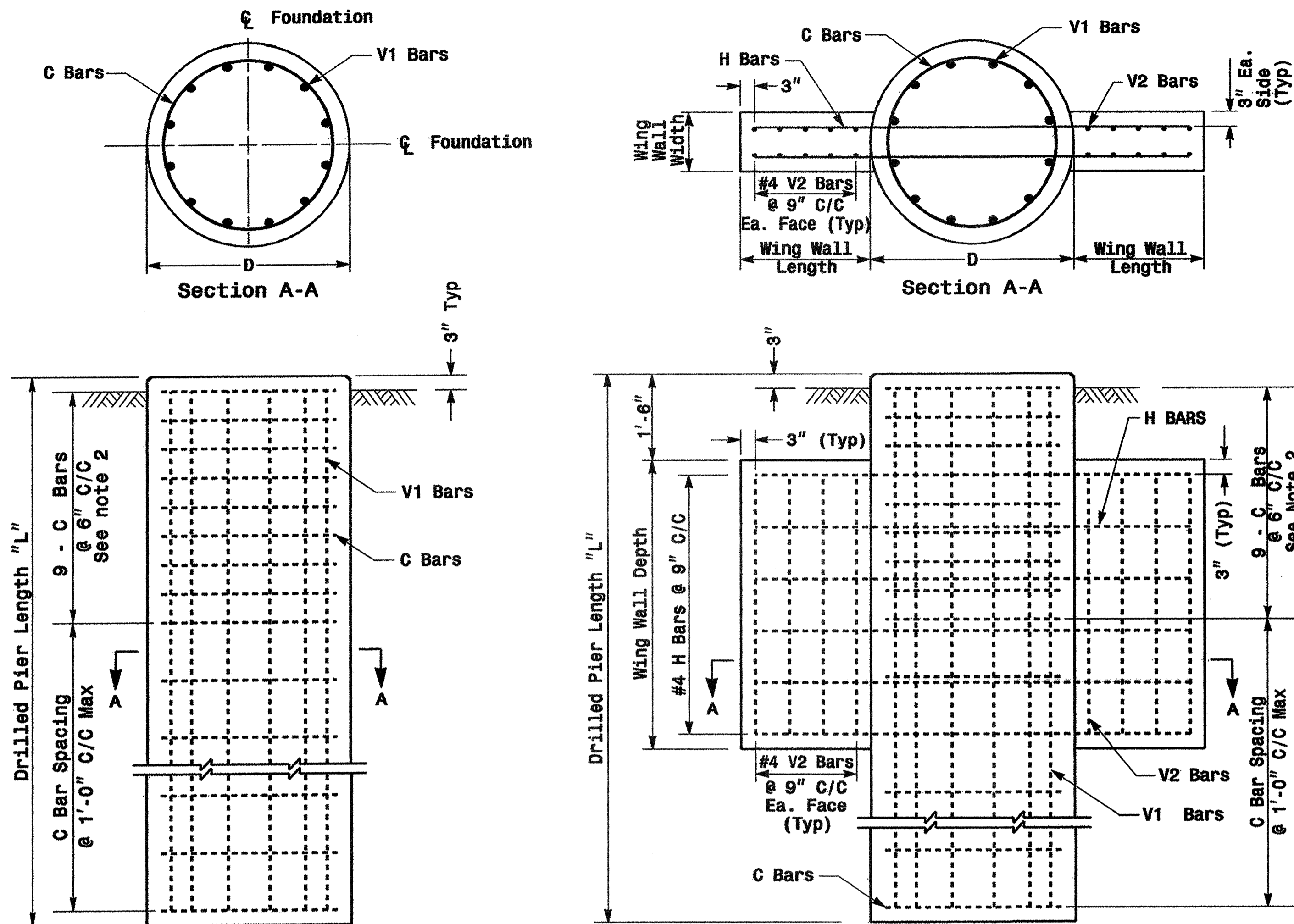
Fabrication Details For Mast Arm Connection To Pole			
PLAN DATE: May 2005	REVIEWED BY: C.F. Andrews		
PREPARED BY: P.L. Alexander	REVIEWED BY: A.M. Esposito	INIT.	DATE
REVISIONS			
SCALE: NONE			



Fabrication Details - Mast Arm Poles

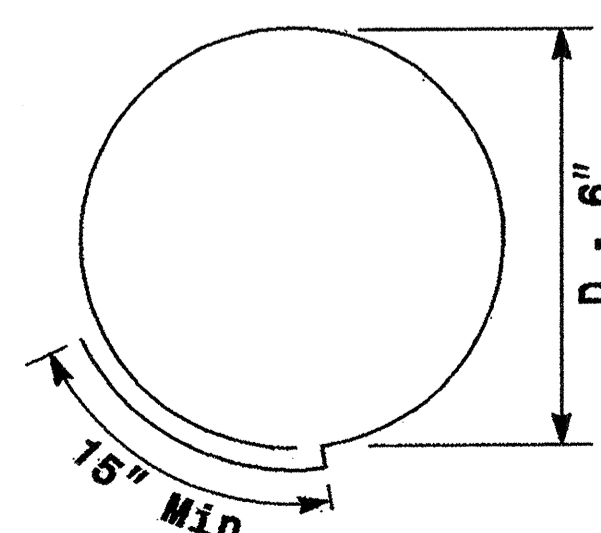
1-SEP-2005 14:11 I:\SEP-2005\14111\mtr\mtrgroups\2004 mtr\pole stander\2004 as.dgn

## Reinforcing Steel Bars



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

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



Typical "C" Bars

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

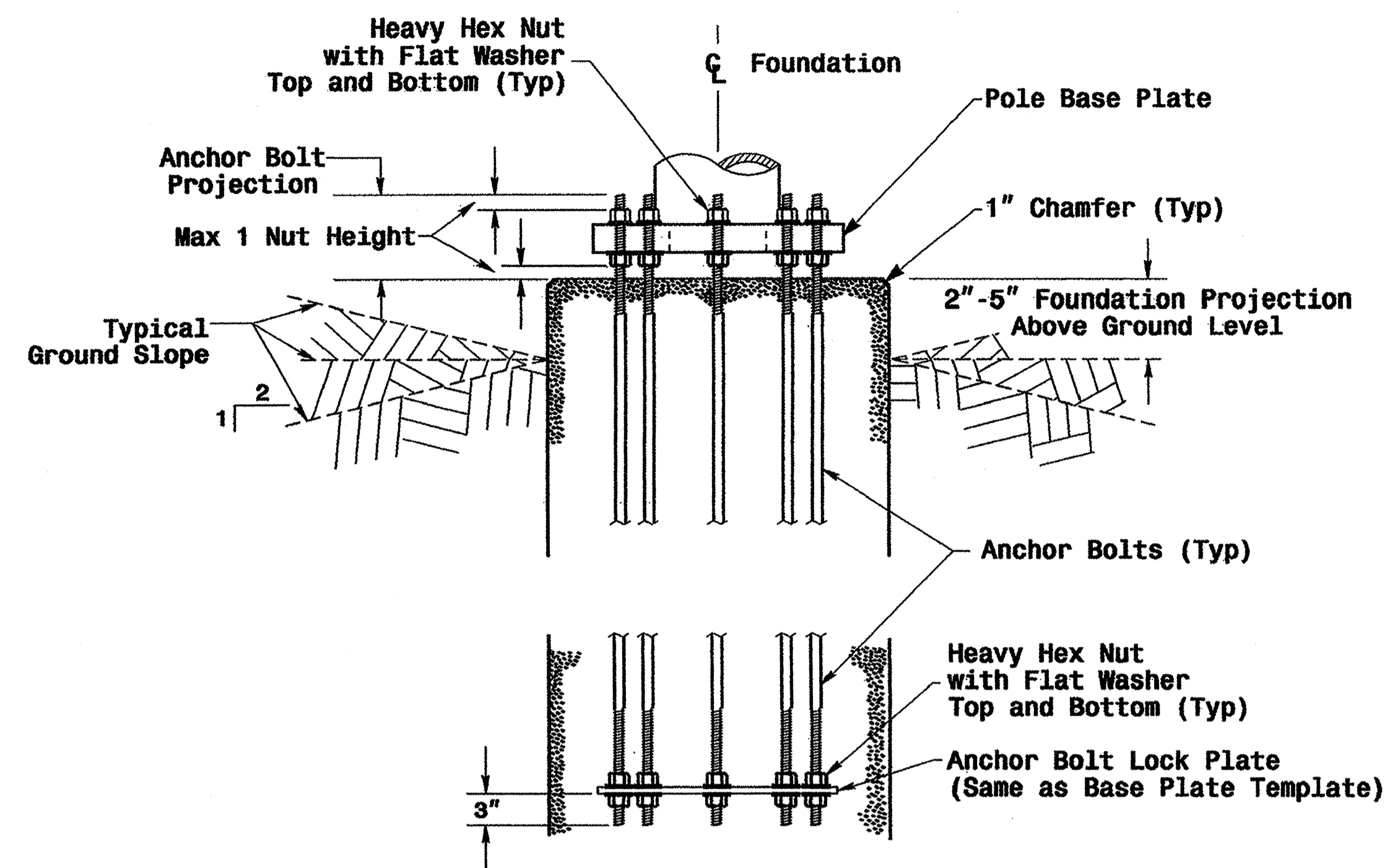
\* See Note No. 1  
\*\* See Note No. 3

Wing Wall Type	Wing Wall Length (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

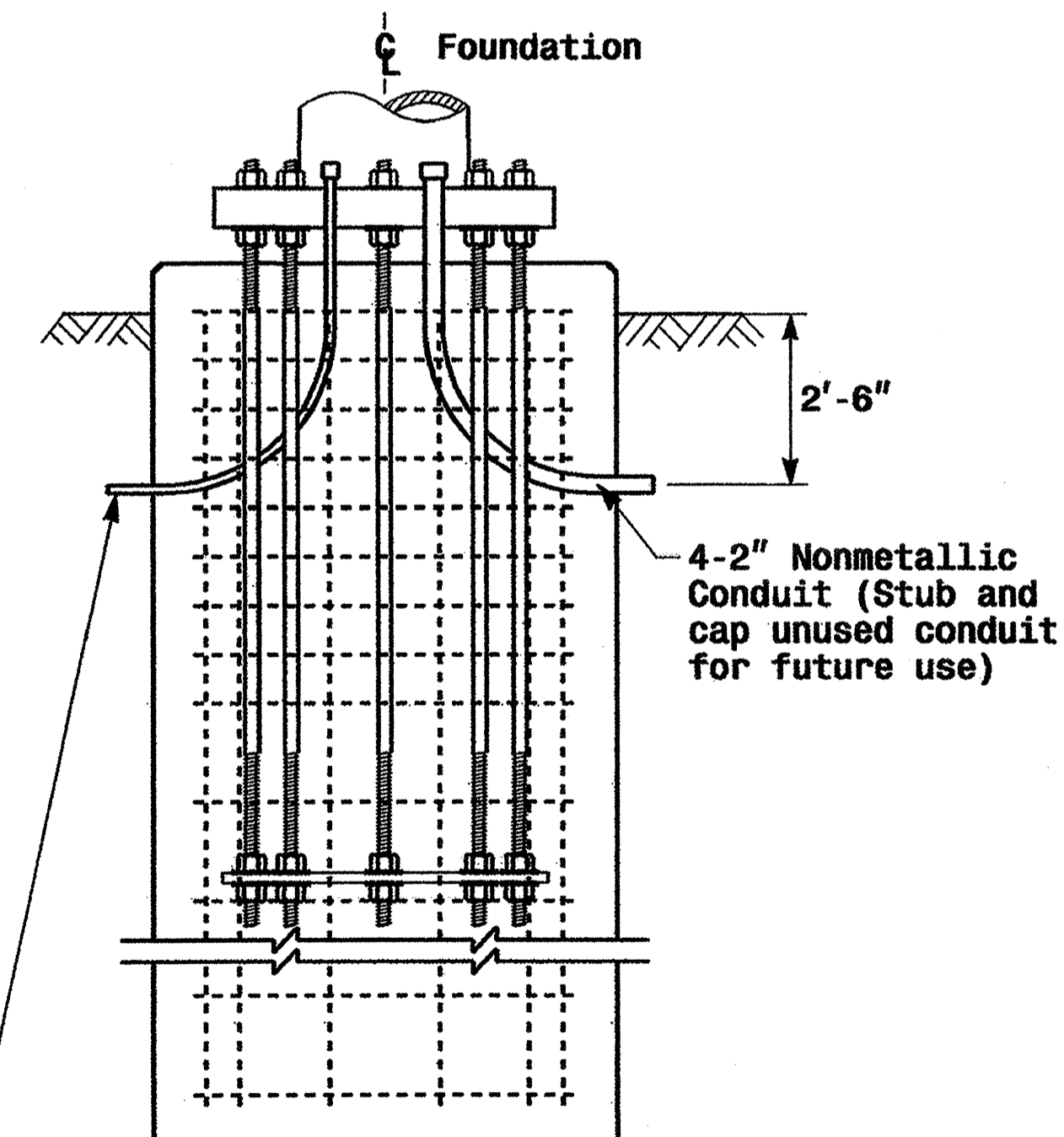
See Note No. 4

## Typical Foundation Anchor Bolt Details

(Reinforcing Cage Not Shown for Clarity)



## Typical Foundation Conduit Details



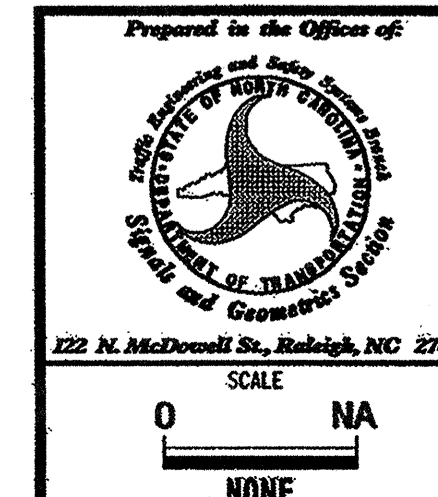
2-1" Nonmetallic Conduits for Electrical Service and Grounding Electrode Conductor

## 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. B-4033  
SHEET NO. Sig.20  
M 7

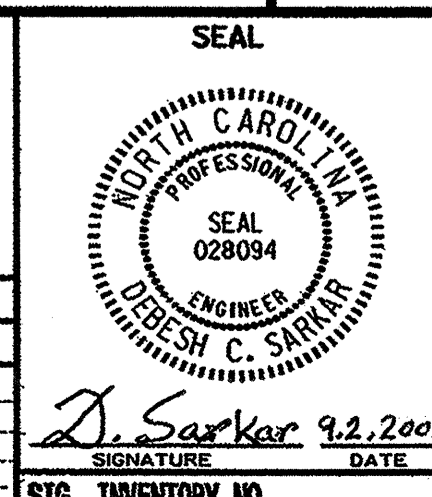
Construction Details - Foundations



### Construction Details Foundations

PLAN DATE: May 2005  
REVIEWED BY: P.L. ALEXANDER  
PREPARED BY: C.F. ANDREWS  
REVIEWED BY: A.M. ESPOSITO

SCALE: NONE



SIGNATURE: J. Sarker  
DATE: 9.2.2005

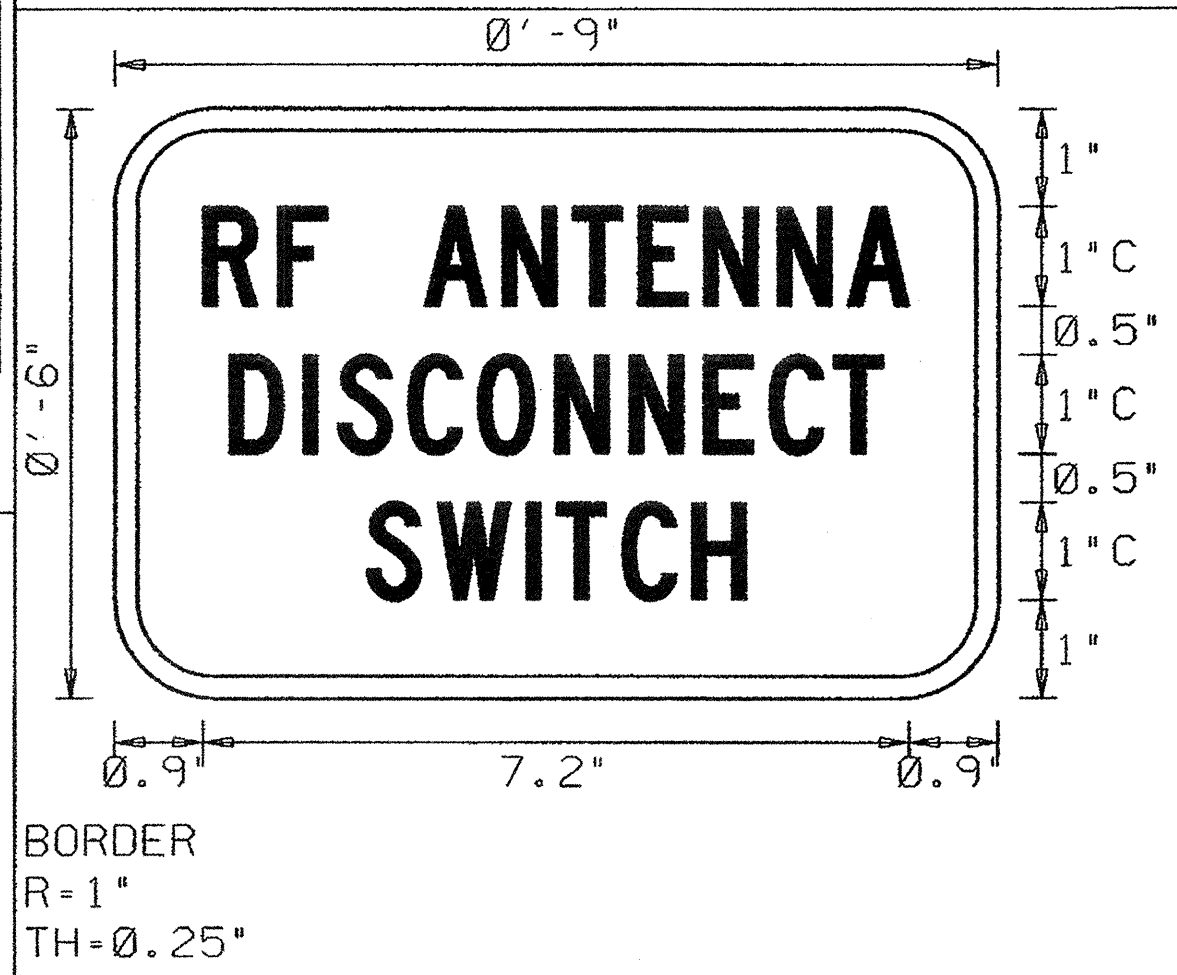
# DECAL

# POLE MOUNTED SIGN

SIGN NUMBER: SP05224  
 TYPE: DECAL  
 QUANTITY:  
 SIGN WIDTH: 0'-9"  
 HEIGHT: 0'-6"  
 TOTAL AREA: 0.4 Sq.Ft.  
 BORDER TYPE: FLUSH  
 RECESS: 0"  
 WIDTH: 0.25"  
 RADII: 1"  
 NO. Z BARS:  
 LENGTH:

SYMBOL	X	Y	WID	HT

DESIGN BY: S PIOTROWSKI DATE: Jul 18, 2005 CHECKED BY: SUSAN B. KUNZ  
 PROJECT ID: ID DIV: INTELLIGENT TRANSPORTATION SYSTEM



NOTE:  
 THIS SIGN SHALL BE PRODUCED AS A DECAL

- USE NOTES: 2, 4
- Legend and border shall be direct applied Type III reflective sheeting.
  - Legend and border shall be direct applied non-reflective sheeting.
  - Shields shall be Type III reflective sheeting on 0.032" (0.8mm) aluminum and demountable.
  - Background shall be Type III reflective sheeting.
  - Background shall be Type I reflective sheeting.
  - Center arrow(s) vertically on sign.
  - Bottom panel shall be yellow Type III sheeting. Legend shall be direct applied black non-reflective sheeting. Yellow panel is:

LETTER POSITIONS

Letter spacings are to start of next letter

Letter	R	F	A	N	T	E	N	N	A	Series/Size Text Length			
0.9	0.8	0.5	1	0.8	0.7	0.7	0.7	0.8	0.7	0.6	0.9	C1	7.2
1.2	0.8	0.3	0.7	0.7	0.8	0.8	0.8	0.7	0.7	0.5	1.2	C1	6.7
2.6	0.7	0.9	0.3	0.7	0.7	0.5	2.6					C1	3.9

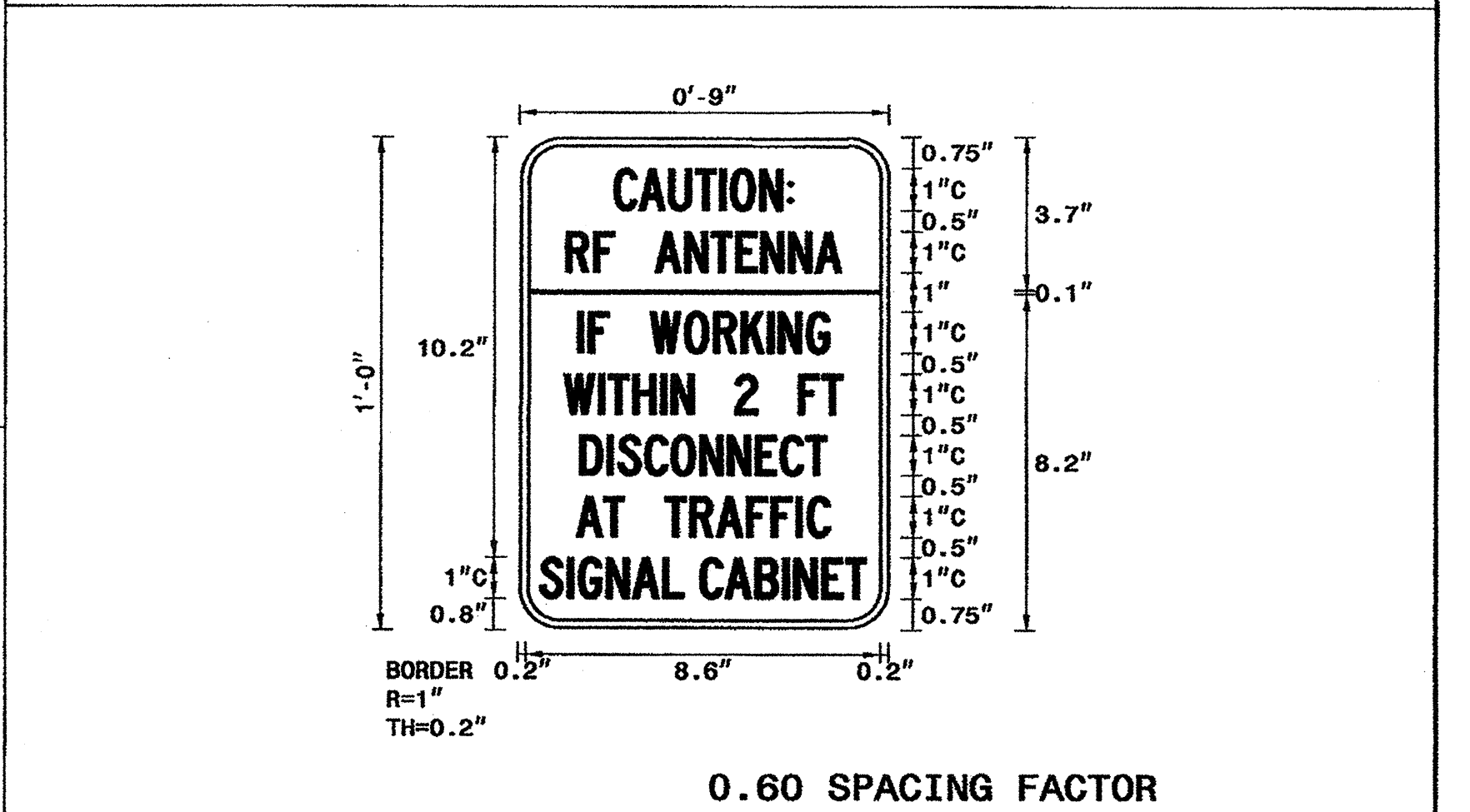
Spacing Factor is 1 unless specified otherwise

SIGN NUMBER: SP05223  
 TYPE: D  
 QUANTITY:  
 SIGN WIDTH: 0'-9"  
 HEIGHT: 1'-0"  
 TOTAL AREA: 0.8 Sq.Ft.  
 BORDER TYPE: FLUSH  
 RECESS: 0"  
 WIDTH: 0.2"  
 RADII: 1"  
 NO. Z BARS:  
 LENGTH:

SYMBOL	X	Y	WID	HT
BAR	0.2	8.2	8.6	1.0

- USE NOTES: 2, 4
- Legend and border shall be direct applied Type III reflective sheeting.
  - Legend and border shall be direct applied non-reflective sheeting.
  - Shields shall be Type III reflective sheeting on 0.032" (0.8mm) aluminum and demountable.
  - Background shall be Type III reflective sheeting.
  - Background shall be Type I reflective sheeting.
  - Center arrow(s) vertically on sign.
  - Bottom panel shall be yellow Type III sheeting. Legend shall be direct applied black non-reflective sheeting. Yellow panel is:

DESIGN BY: M. TRACEY DATE: Oct 25, 2007 CHECKED BY: SUSAN KUNZ  
 PROJECT ID: DIV: INTELLIGENT TRANSPORTATION SYSTEMS



LETTER POSITIONS

Letter spacings are to start of next letter

Letter	C	A	U	T	I	O	N	:	Series/Size Text Length								
2.3	0.6	0.7	0.6	0.6	0.3	0.7	0.7	0.1	2.3	C	4.4						
1.2	0.7	0.5	1	0.7	0.6	0.6	0.6	0.7	0.6	0.6	1.2	C	6.7				
1.4	0.3	0.5	1	0.8	0.7	0.7	0.6	0.3	0.7	0.5	1.4	C	6.1				
1.1	0.8	0.2	0.6	0.7	0.3	0.5	1	0.5	1	0.6	0.5	1.1	C	6.8			
1.5	0.7	0.3	0.6	0.6	0.7	0.7	0.7	0.6	0.6	0.5	1.5	C	6				
1.4	0.7	0.5	1	0.6	0.6	0.7	0.6	0.6	0.3	0.5	1.4	C	6.2				
0.5	0.7	0.3	0.7	0.6	0.7	0.5	0.4	0.6	0.7	0.7	0.3	0.7	0.6	0.5	0.5	C	7.9

Spacing Factor is 1 unless specified otherwise

NORTH CAROLINA D.O.T. SIGN DETAIL

Prepared in the Offices of:

750 N. Greenfield Pkwy., Garner, NC 27529

**WIRELESS RADIO ANTENNA TYPICAL DETAILS**

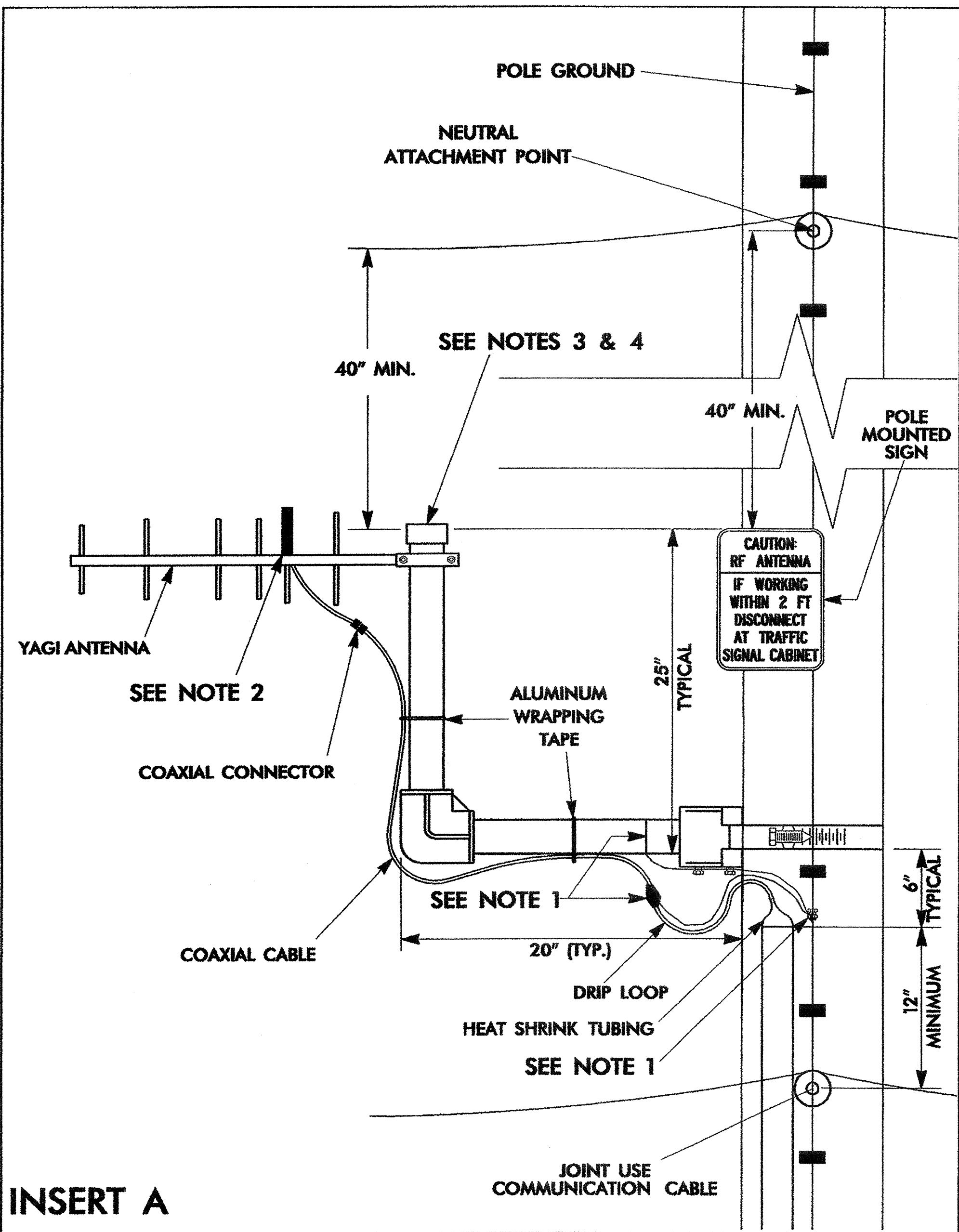
PLAN DATE: JULY 2005 REVIEWED BY: I. N. AVERY  
 PREPARED BY: A. CREECH REVIEWED BY: A. T. FAULKNER

SCALE: 0

SEAL

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

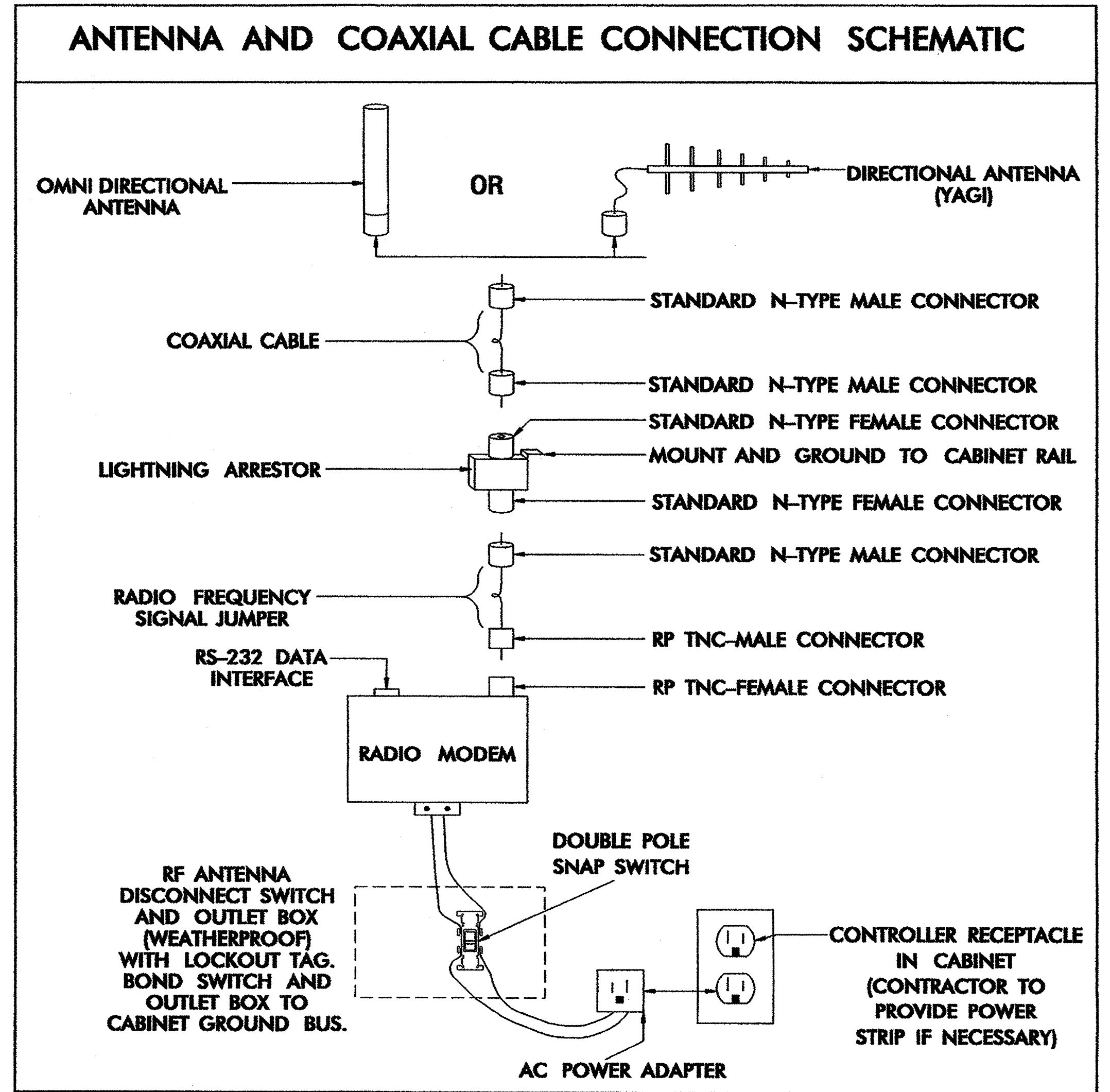
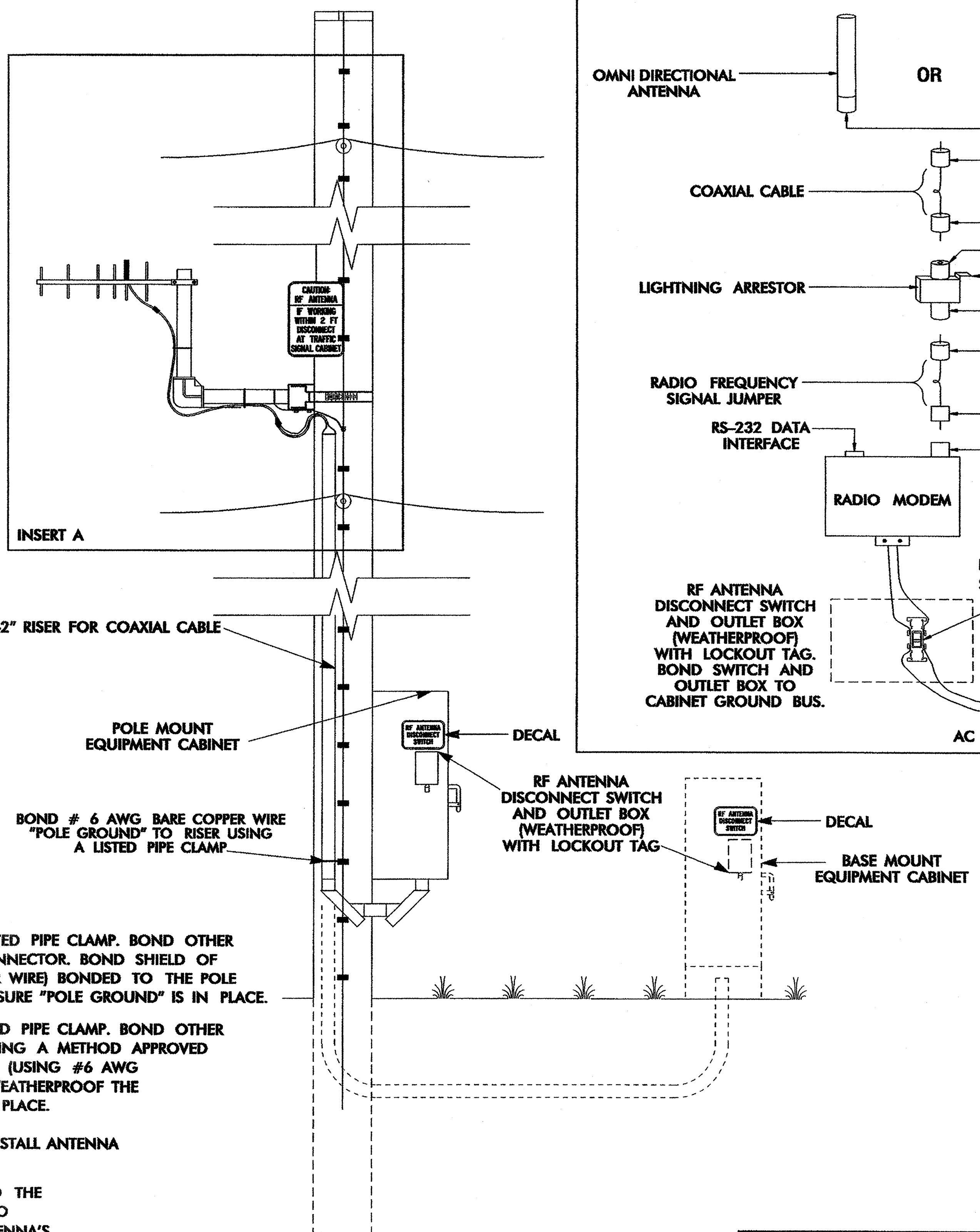
Signature: *Gregory A. Faulkner* DATE: 9/12/05



INSERT A

NOTES

- WOOD POLE — BOND # 6 AWG SOLID BARE COPPER WIRE TO ANTENNA SUPPORT USING LISTED PIPE CLAMP. BOND OTHER END OF # 6 AWG SOLID BARE COPPER WIRE TO THE POLE GROUND USING A SPLIT BOLT CONNECTOR. BOND SHIELD OF COAXIAL CABLE WITH AN APPROVED GROUNDING SYSTEM (USING #6 AWG STRANDED COPPER WIRE) BONDED TO THE POLE GROUND. WEATHERPROOF THE CONNECTION ONCE THE GROUNDING SYSTEM IS INSTALLED. ENSURE "POLE GROUND" IS IN PLACE.  
  
METAL POLE — BOND # 6 AWG SOLID BARE COPPER WIRE TO ANTENNA SUPPORT USING LISTED PIPE CLAMP. BOND OTHER END OF # 6 AWG SOLID BARE COPPER WIRE TO THE POLE OR EXISTING SYSTEM GROUND USING A METHOD APPROVED BY THE ENGINEER. BOND SHIELD OF COAXIAL CABLE WITH AN APPROVED GROUNDING SYSTEM (USING #6 AWG STRANDED COPPER WIRE) BONDED TO THE POLE BY A METHOD APPROVED BY THE ENGINEER. WEATHERPROOF THE CONNECTION ONCE THE GROUNDING SYSTEM IS INSTALLED. ENSURE "SYSTEM GROUND" IS IN PLACE.
- YAGI ANTENNA SHOWN IN VERTICAL POLARIZATION POSITION FOR CLARIFICATION. TYPICALLY INSTALL ANTENNA IN HORIZONTAL POLARIZATION POSITION.
- TO CONSERVE VERTICAL SPACING ON THE POLE (JOINT-USE OR SIGNAL POLE) WITH REGARDS TO THE SURROUNDING UTILITIES, INSTALL THE ANTENNA MOUNTING HARDWARE USING ONE OF THE TWO METHODS LISTED BELOW: (ENSURE THAT THE MOUNTING METHOD DOES NOT DEGRADE THE ANTENNA'S SIGNAL INTEGRITY)
  - ROTATE THE VERTICAL SUPPORT ARM 90 DEGREES SUCH THAT THE ANTENNA IS AT THE SAME HEIGHT AS THE HORIZONTAL SUPPORT ARM.
  - ELIMINATE THE VERTICAL SUPPORT ARM AND MOUNT THE ANTENNA TO THE HORIZONTAL SUPPORT ARM.
  - ANTENNA, ANTENNA SUPPORT ARM, AND SIGN TO MAINTAIN A 40" SEPARATION FROM NEUTRAL /POWER AND 12" FROM OTHER UTILITIES.
- INSTALL AN END CAP TO SEAL THE EXPOSED END OF THE MOUNTING PIPE.



Prepared in the Office of:

North Carolina State University  
Department of Transportation  
1700 Management Sciences

WIRELESS RADIO ANTENNA TYPICAL DETAILS

PLAN DATE: JULY 2005 REVIEWED BY: I. N. AVERY

PREPARED BY: A. GREECH REVIEWED BY: A. T. FAULKNER

122 N. McDowell St., Raleigh, NC 27608

SCALE: 0

REVISIONS

NO.	DATE	DESCRIPTION
1	9/12/05	UPDATE GROUNDING - COAXIAL CABLE SHIELD

LINK: DATE

SIGNATURE: [Signature] DATE: 9/12/05

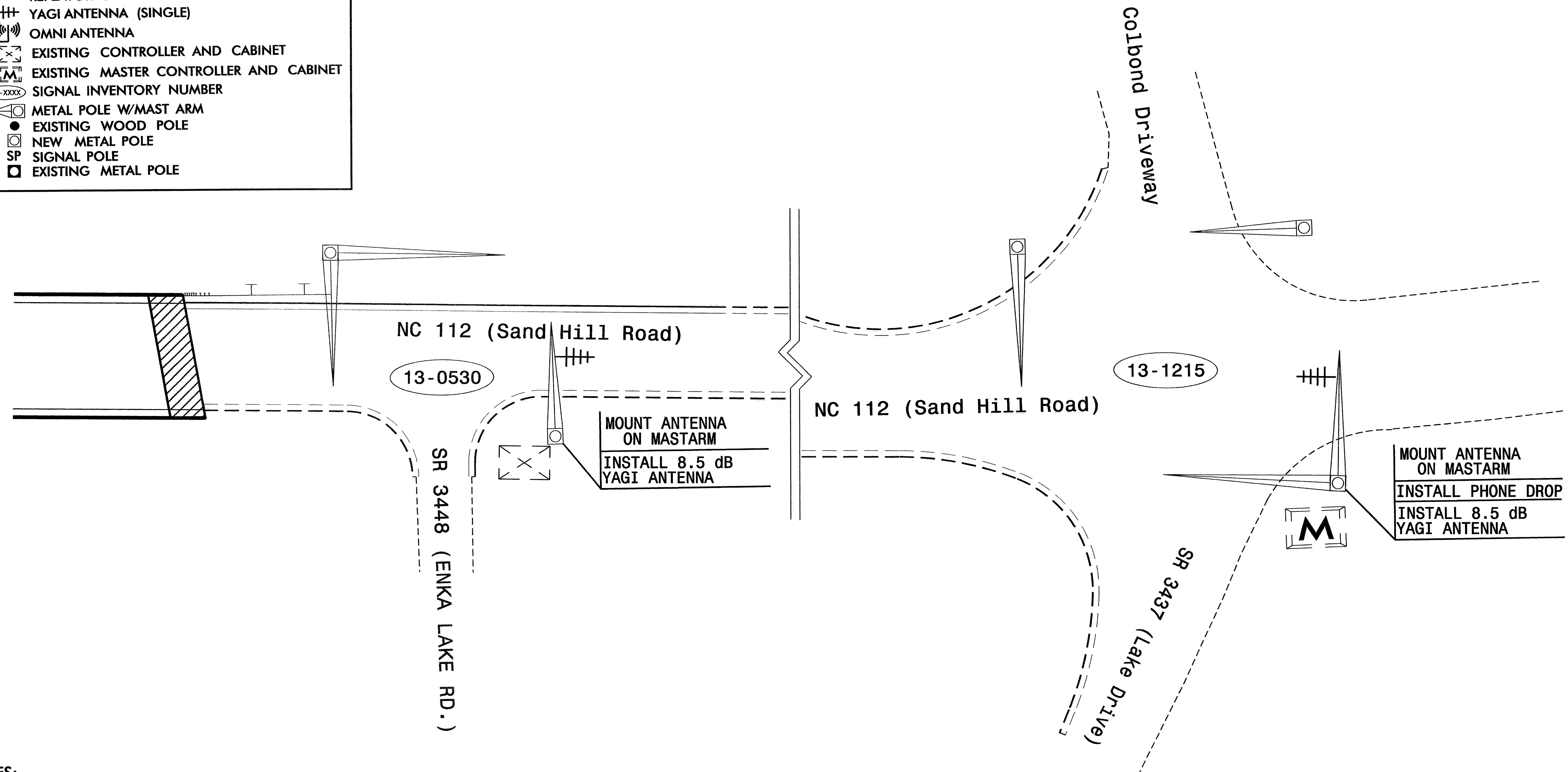
CADD File Name:

SEAL

PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

**LEGEND**

- +++ YAGI ANTENNA (DOUBLE) FOR REPEATOR OPERATION
- ++ YAGI ANTENNA (SINGLE)
- (O) OMNI ANTENNA
- [X] EXISTING CONTROLLER AND CABINET
- [M] EXISTING MASTER CONTROLLER AND CABINET
- (XX-XXXX) SIGNAL INVENTORY NUMBER
- ▲ METAL POLE W/MAST ARM
- EXISTING WOOD POLE
- NEW METAL POLE
- SP SIGNAL POLE
- ◻ EXISTING METAL POLE



**NOTES:**

1. INSTALL COAXIAL CABLE
  - A. ON WOOD POLES, INSTALL A 2" RISER WITH HEAT SHRINK TUBING TO ROUTE THE COAXIAL CABLE TO THE ANTENNA.
  - B. ON METAL POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE MAST ARM; FIELD DRILL HOLE WITH GROMMET THROUGH BOTTOM OF MAST ARM FOR INSTALLATION OF THE COAXIAL CABLE TO THE ANTENNA.
  - C. ON METAL STRAIN POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND REPLACE THE WEATHERHEAD WITH HEAT SHRINK TUBING AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
  - D. BETWEEN THE POINT OF EXITING THE METAL POLE OR MAST ARM AND THE ANTENNA, SECURE THE COAXIAL CABLE TO THE STRUCTURE USING 3/4" STAINLESS STEEL STRAPS EVERY 12".
2. IF EXISTING SPARE RISER IS AVAILABLE, REMOVE WEATHERHEAD AND INSTALL COAXIAL CABLE. RESEAL WITH HEAT SHRINK TUBING.
3. INSTALL ANTENNA ON POLE WITH RF WARNING SIGN AND AIM TOWARDS MASTER.
4. MAINTAIN PROPER CLEARANCE FROM ALL UTILITIES PER NESC.
5. INSTALL WIRELESS SERIAL RADIO MODEM WITH EXTERIOR DISCONNECT SWITCH LOCATED ON CABINET. (NOTE: RF ANTENNA DISCONNECT SWITCH NOT REQUIRED ON NCDOT-OWNED POLE.)
6. REFERENCE "WIRELESS RADIO ANTENNA TYPICAL DETAILS".

	<b>WIRELESS COMMUNICATIONS PLAN ALONG NC 112 IN ENKA</b>		
	DIVISION 13 BUNCOMBE COUNTY ENKA		
PLAN DATE: MAY 2008 PREPARED BY: P. C. LOUDER	REVIEWED BY: I. N. AVERY REVIEWED BY: G. G. MURR, JR., PE	SCALE: 0 	SIGNATURE: <i>[Signature]</i> DATE: 5-6-08

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

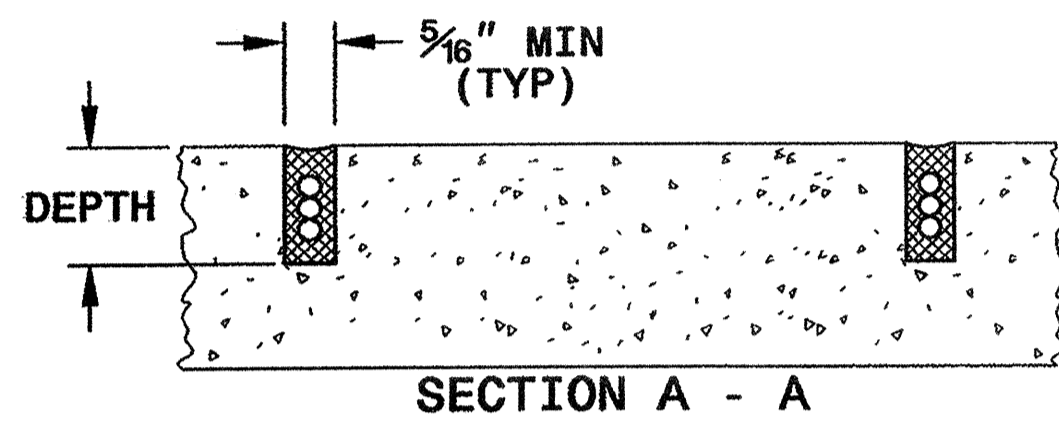
5-07

ENGLISH DETAIL DRAWING FOR  
**INDUCTIVE DETECTION LOOPS**

SHEET 1 OF 3  
**1725D01**

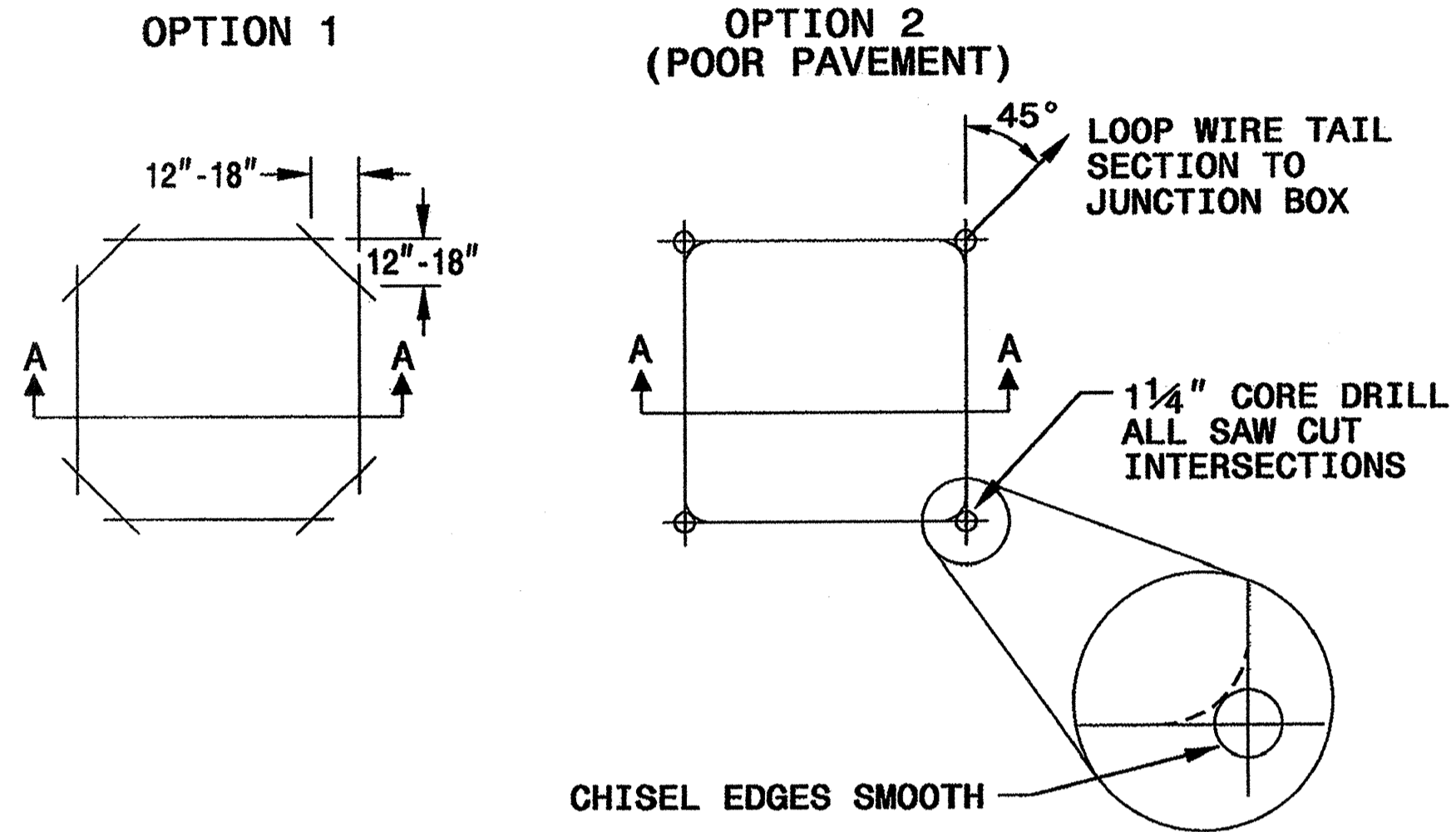
**SAW SLOT DEPTH CHART**

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

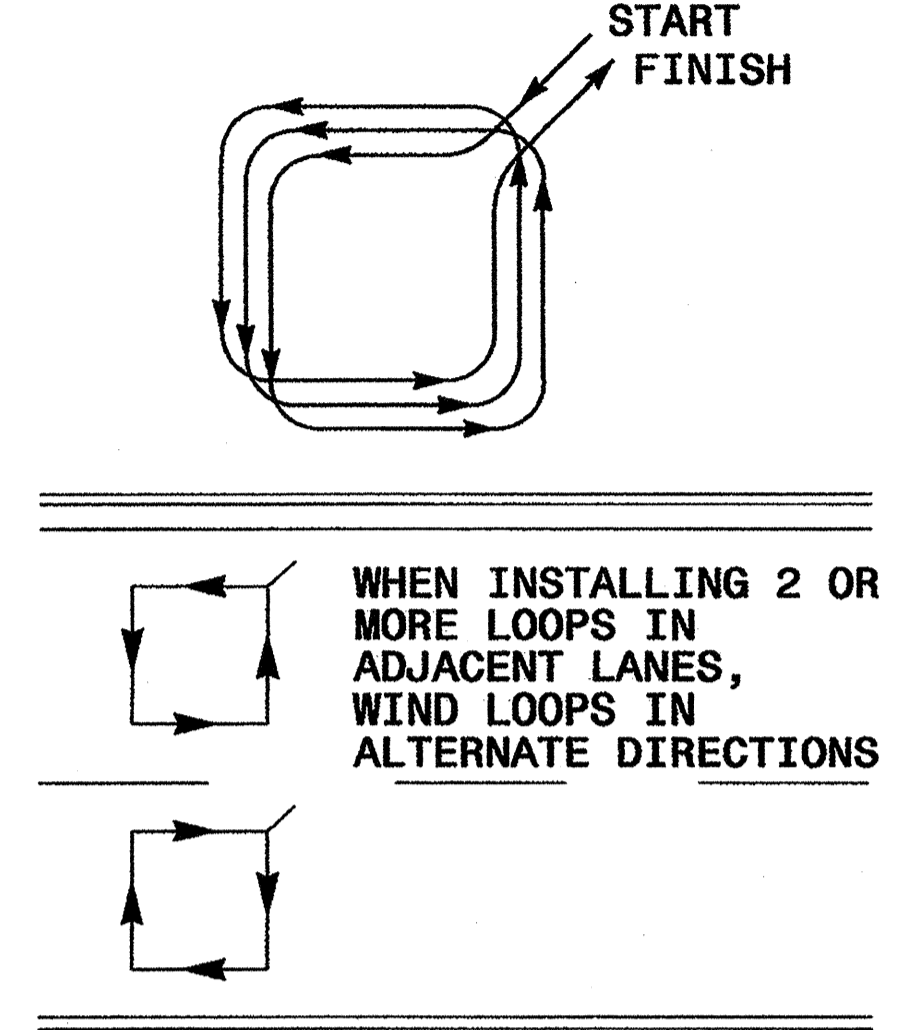


**CONVENTIONAL 4-SIDED LOOP**

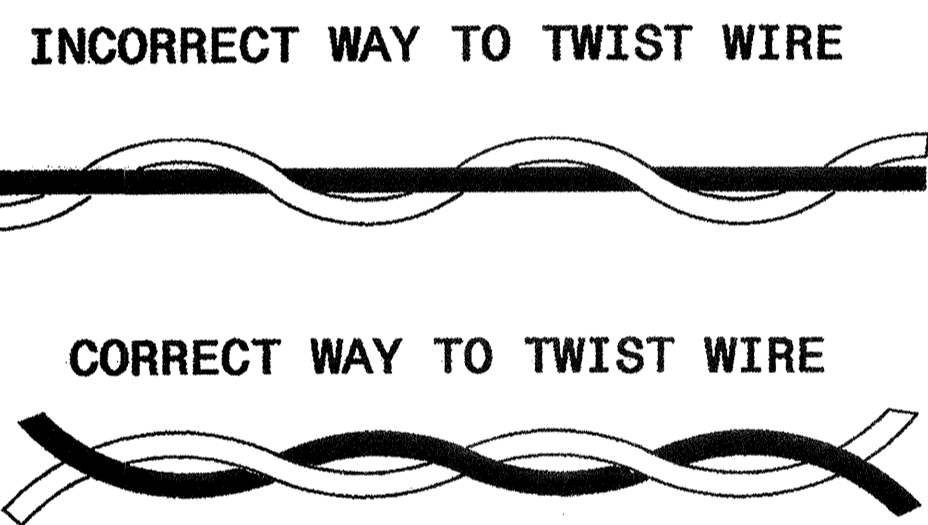
**SAW CUT OPTIONS**



**LOOP WINDING METHOD**



**LOOP WIRE TWISTING METHOD**

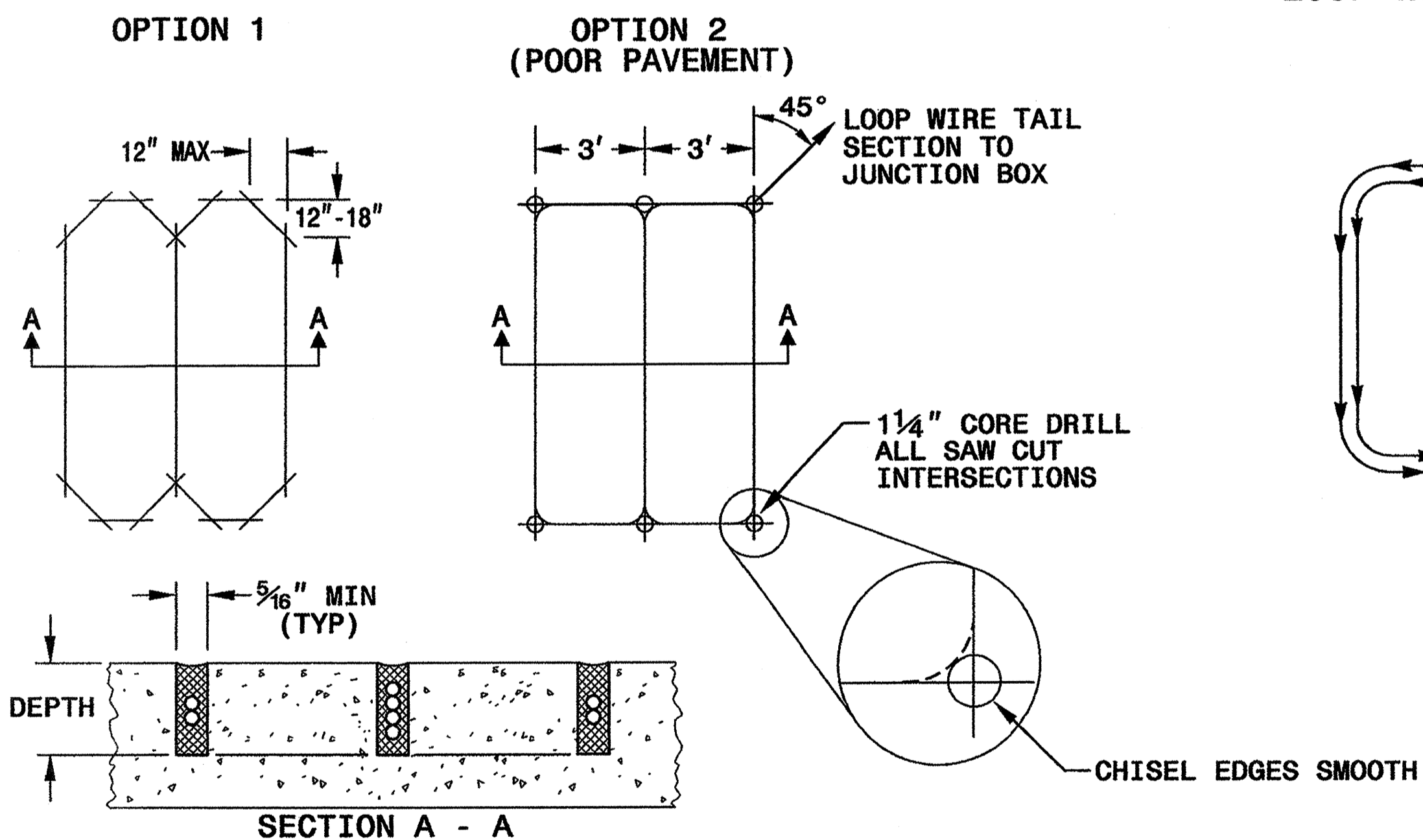


**NOTES**

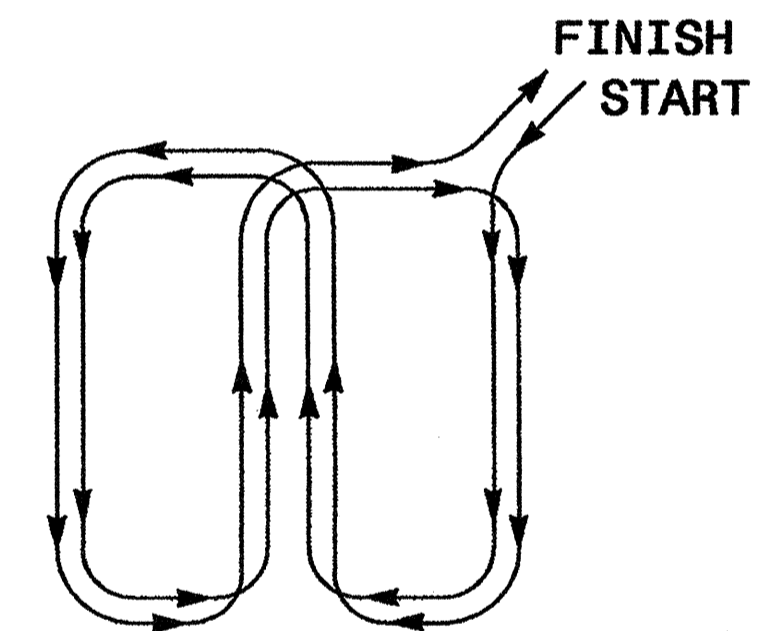
- OVERLAP SAW CUTS AT CORNERS AND INTERSECTION POINTS TO ENSURE UNIFORM SAW SLOT DEPTH.
- MAINTAIN 12" SPACING BETWEEN LOOP WIRE TAIL SECTIONS.
- WIRE LOOPS CONNECTED TO THE SAME DETECTOR CHANNEL IN SERIES.
- LOCATE LOOPS IN CENTER OF LANES UNLESS OTHERWISE SHOWN ON PLANS OR APPROVED BY ENGINEER.

**QUADRUPOLE LOOP**

**SAW CUT OPTIONS**



**LOOP WINDING METHOD**



DEPTH IS 2.5" FOR CONCRETE AND 3.0" FOR ASPHALT

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

5-07

ENGLISH DETAIL DRAWING FOR  
**INDUCTIVE DETECTION LOOPS**

SHEET 1 OF 3  
**1725D01**

See Plate for Title

Prepared in the Offices of:

750 N. Greenfield Parkway  
Garner, NC 27529

SEAL

Milton I. Dean  
9/5/07  
SIGNATURE DATE



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

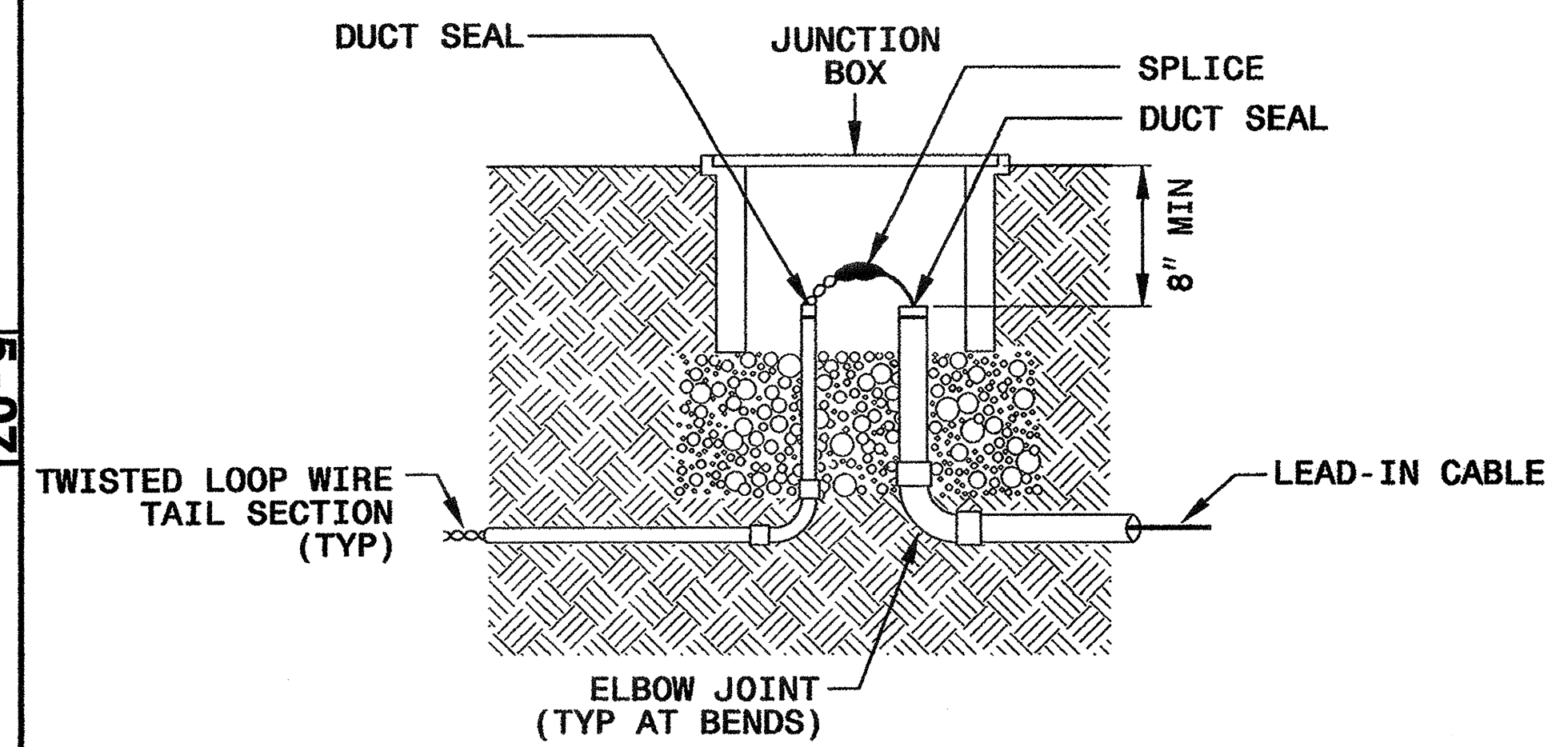
5-07

ENGLISH DETAIL DRAWING FOR  
**INDUCTIVE DETECTION LOOPS**  
LOOP WIRE DETAILS

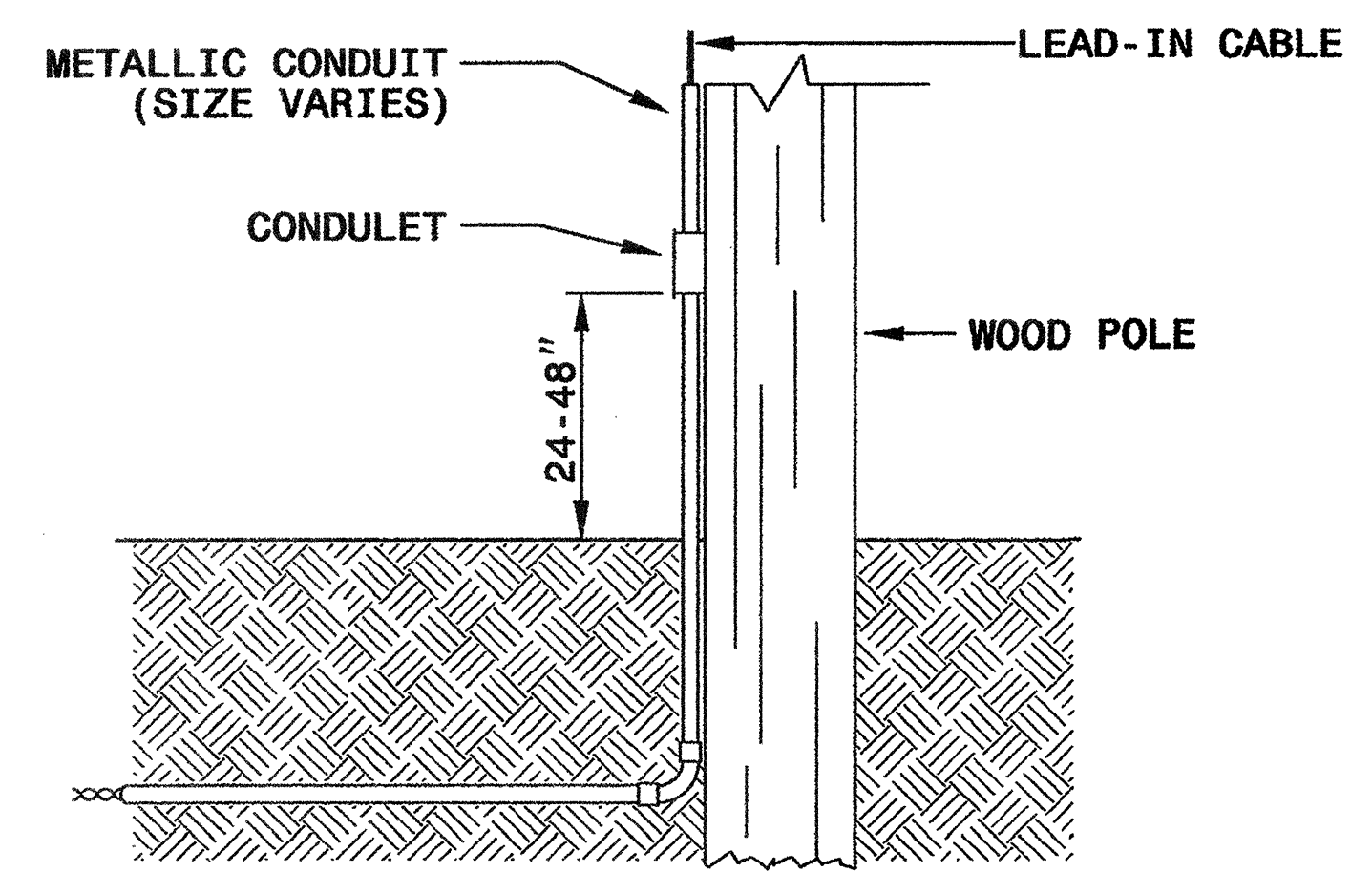
SHEET 2 OF 3  
**1725D01**

**LOOP WIRE SPLICE POINT DETAILS**

**LOOP WIRE AT JUNCTION BOX**



**LOOP WIRE AT POLE**

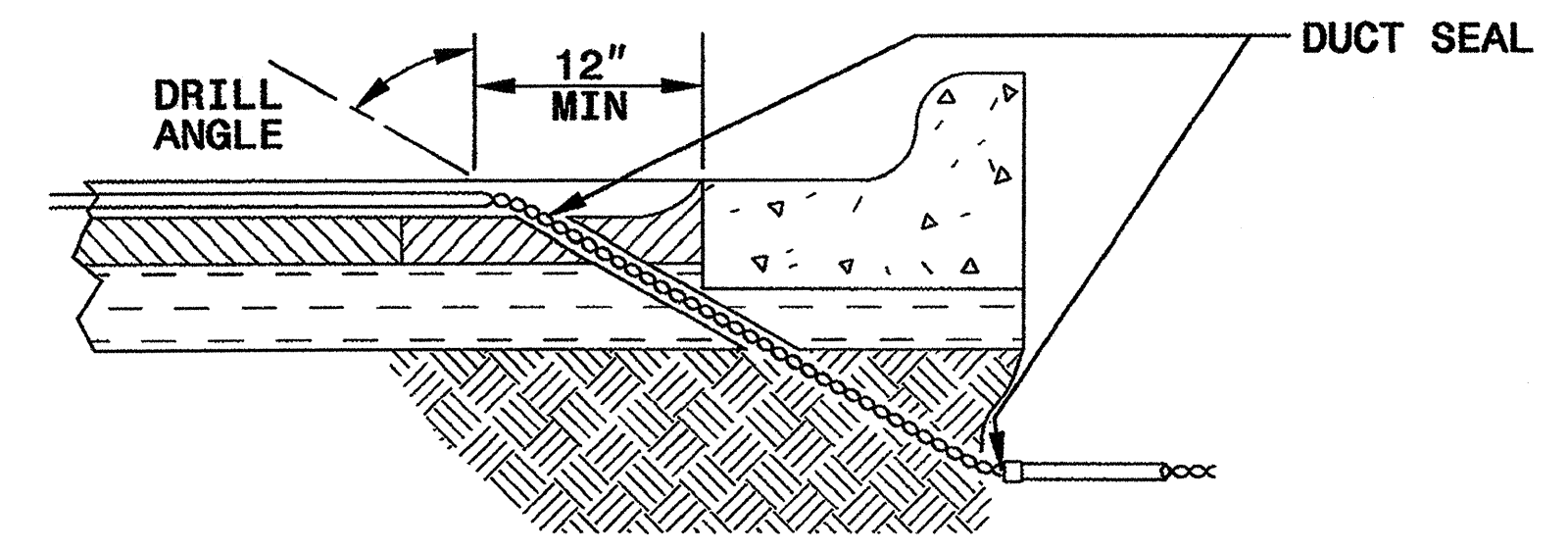


**NOTE**

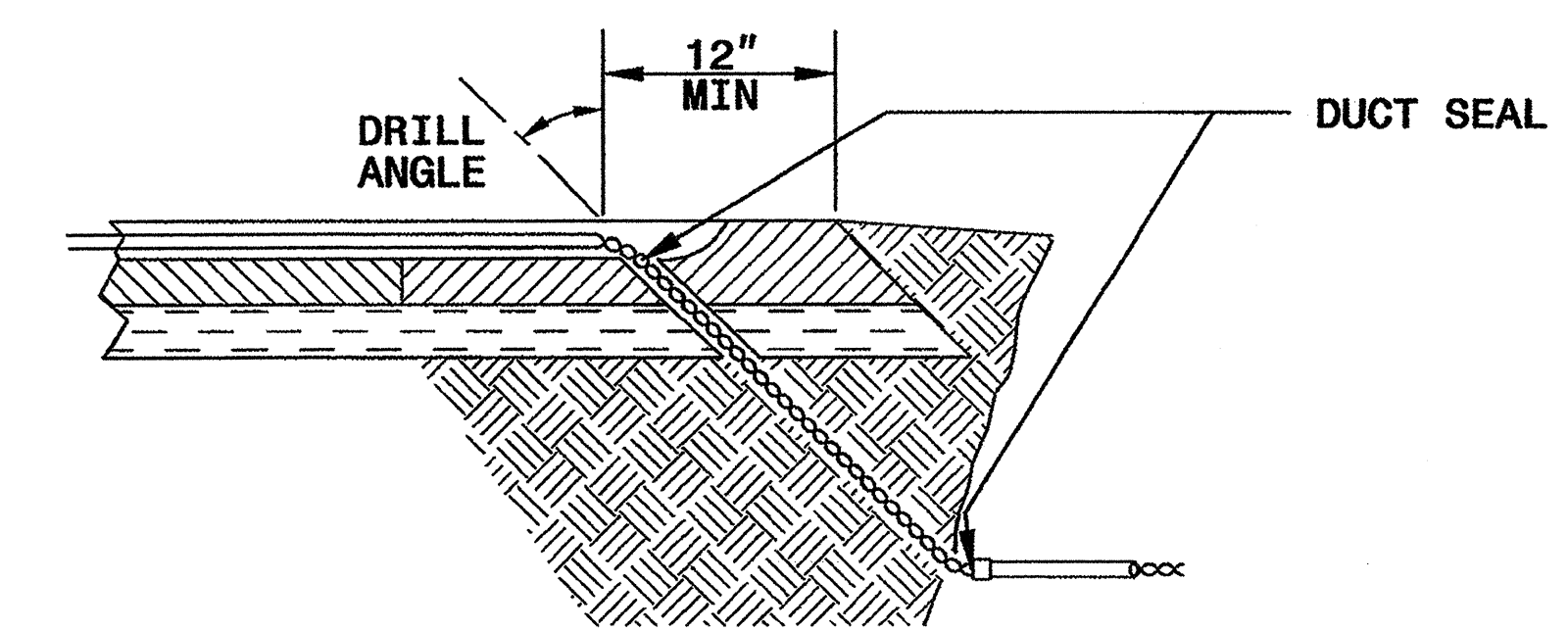
SPLICE ALL LOOP WIRE TAIL SECTIONS/LEAD-IN CABLE IN JUNCTION BOXES OR APPROVED CONDULETS.

**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.

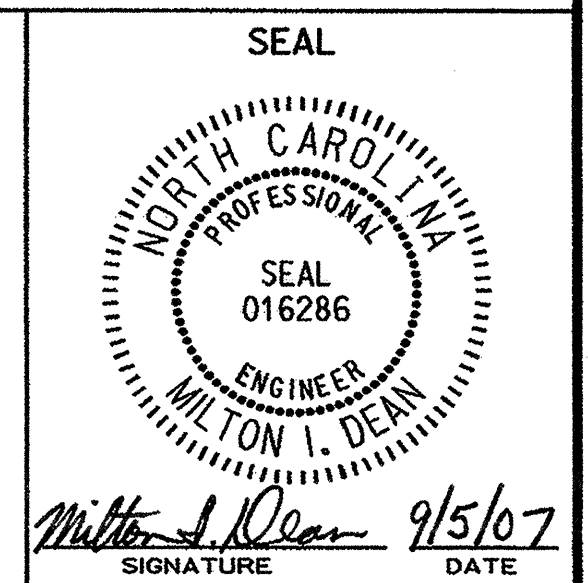
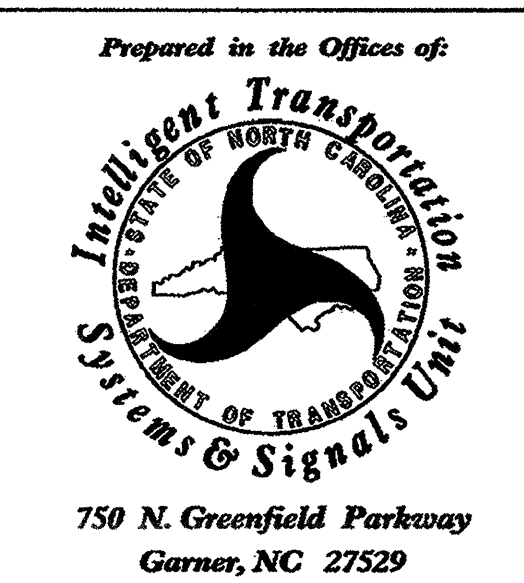
STATE OF NORTH CAROLINA  
DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
RALEIGH, N.C.

5-07

ENGLISH DETAIL DRAWING FOR  
**INDUCTIVE DETECTION LOOPS**  
LOOP WIRE DETAILS

SHEET 2 OF 3  
**1725D01**

See Plate for Title



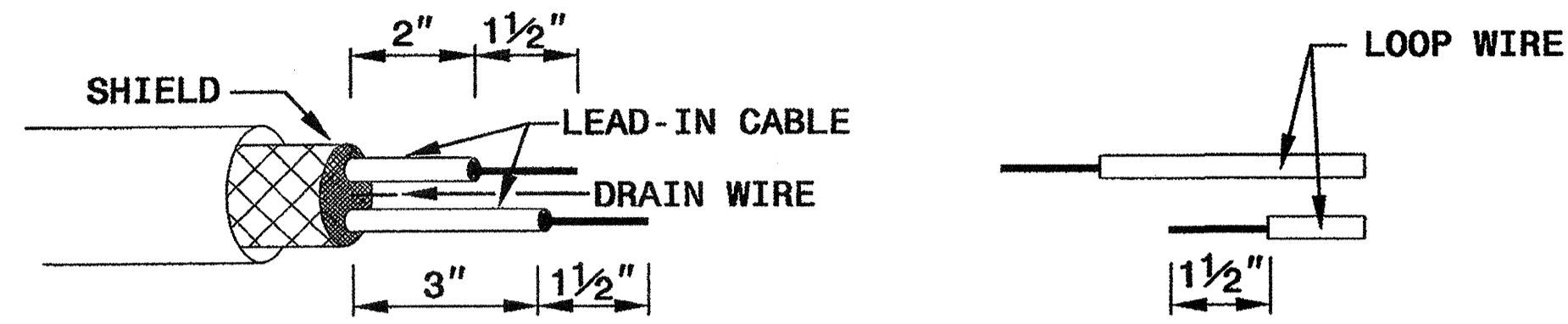
STATE OF  
NORTH CAROLINA  
DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
RALEIGH, N.C.

5-07

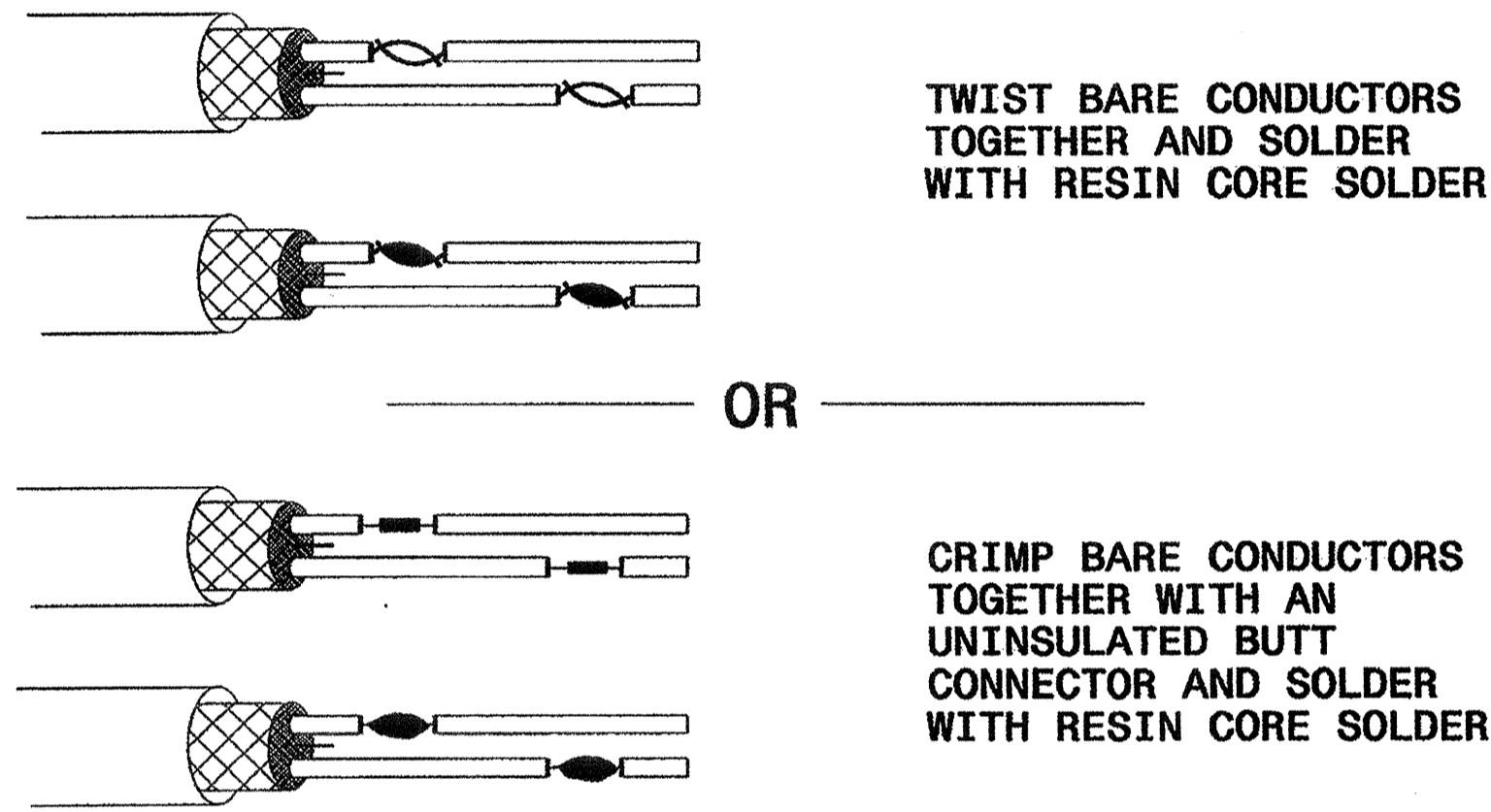
ENGLISH DETAIL DRAWING FOR  
**INDUCTION DETECTION LOOPS**  
SPlicing FOR LEAD-IN CABLE AND LOOP WIRE

SHEET 3 OF 3  
**1725D01**

**STEP 1. STRIP LOOP WIRE AND LEAD-IN CABLE**

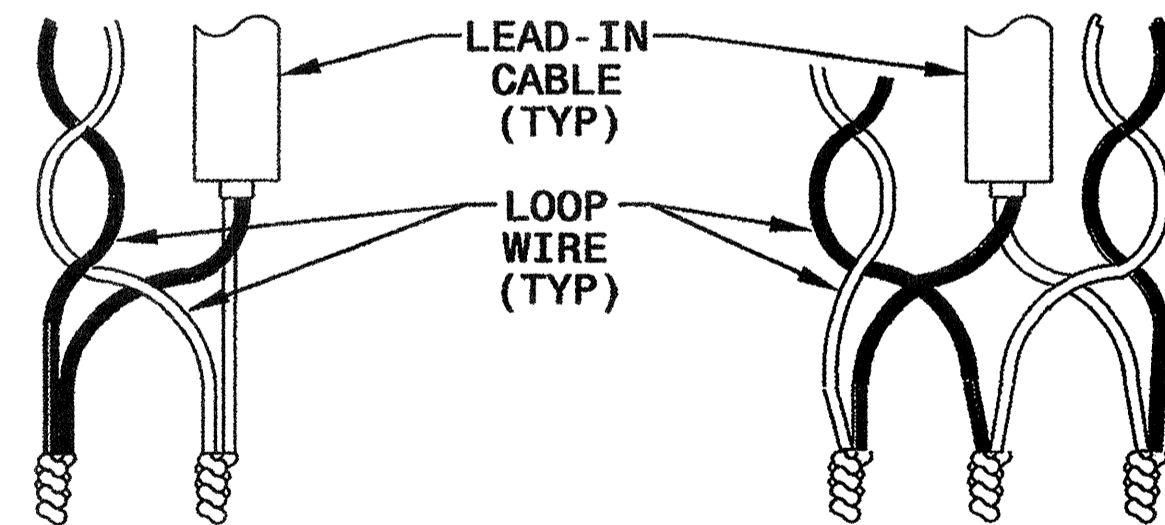


**STEP 2. CONNECT AND SOLDER**

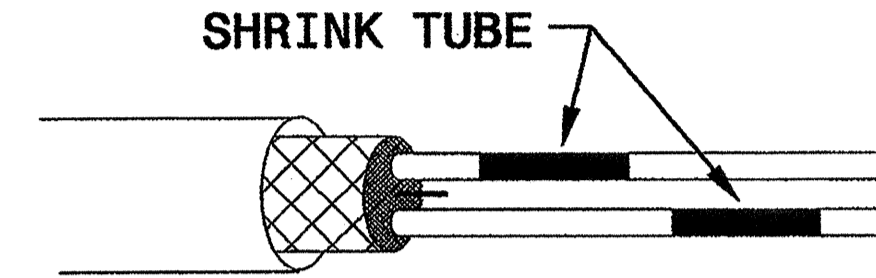


BOND SHIELD DRAIN WIRE AT SPLICE SECTIONS (DO NOT GROUND)

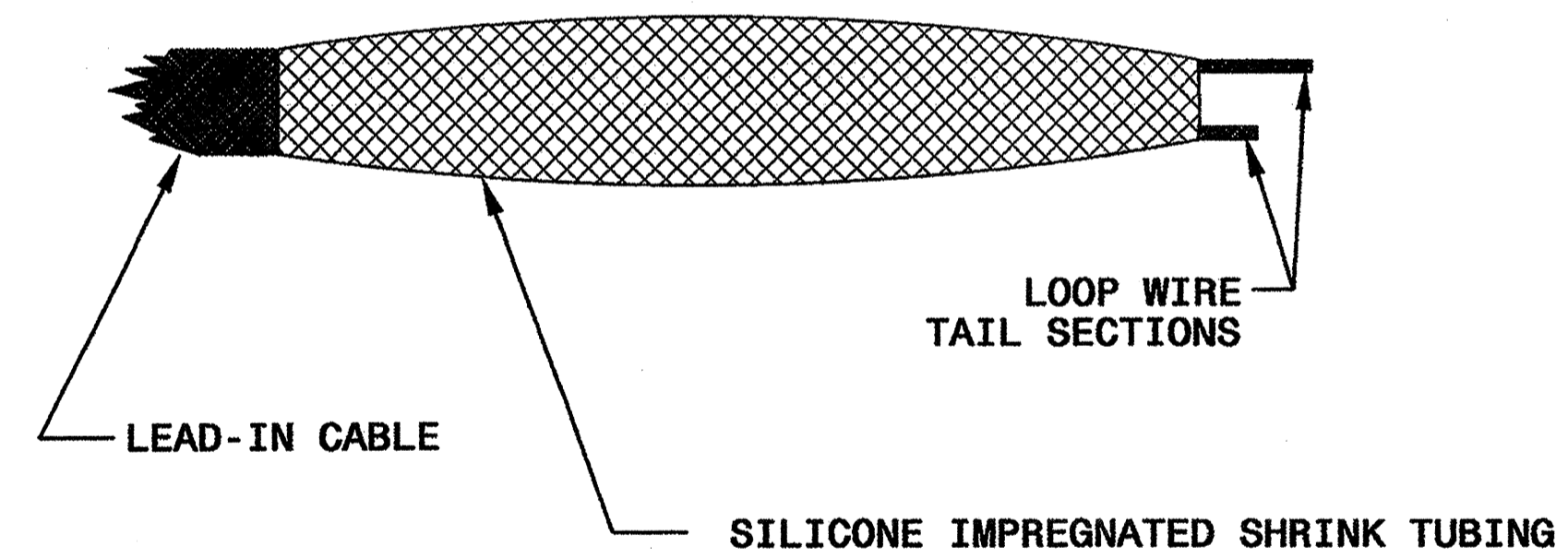
**LOOP WIRE AND LEAD-IN CABLE CONNECTION DETAILS**  
SINGLE CONNECTION      SERIES CONNECTION



**STEP 3. INSULATE EACH SOLDER JOINT SEPARATELY**



**STEP 4. ENVIRONMENTALLY PROTECT SPLICE**



STATE OF  
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DIVISION OF HIGHWAYS  
RALEIGH, N.C.

5-07

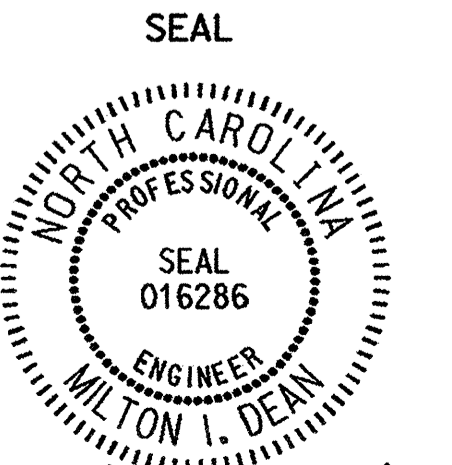
ENGLISH DETAIL DRAWING FOR  
**INDUCTION DETECTION LOOPS**  
SPlicing FOR LEAD-IN CABLE AND LOOP WIRE

SHEET 3 OF 3  
**1725D01**

See Plate for Title



750 N. Greenfield Parkway  
Raleigh, NC 27620



Milton I. Dean 9/15/07