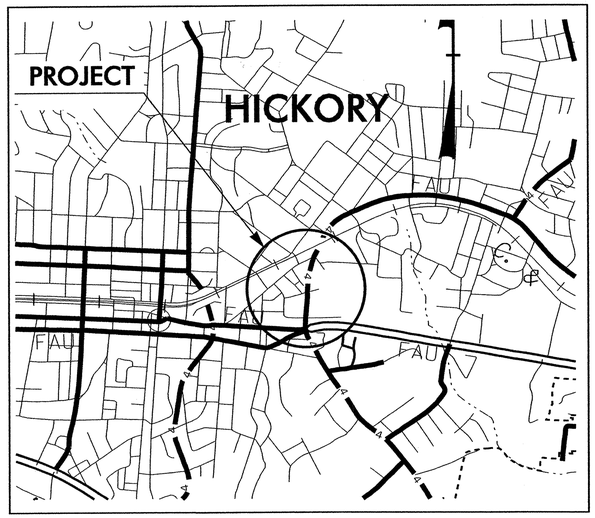
STATE	PROJECT NO.	SHEET NO.
N.C.	U–2306 A	Sig.1

PROJECT: U–2306 A

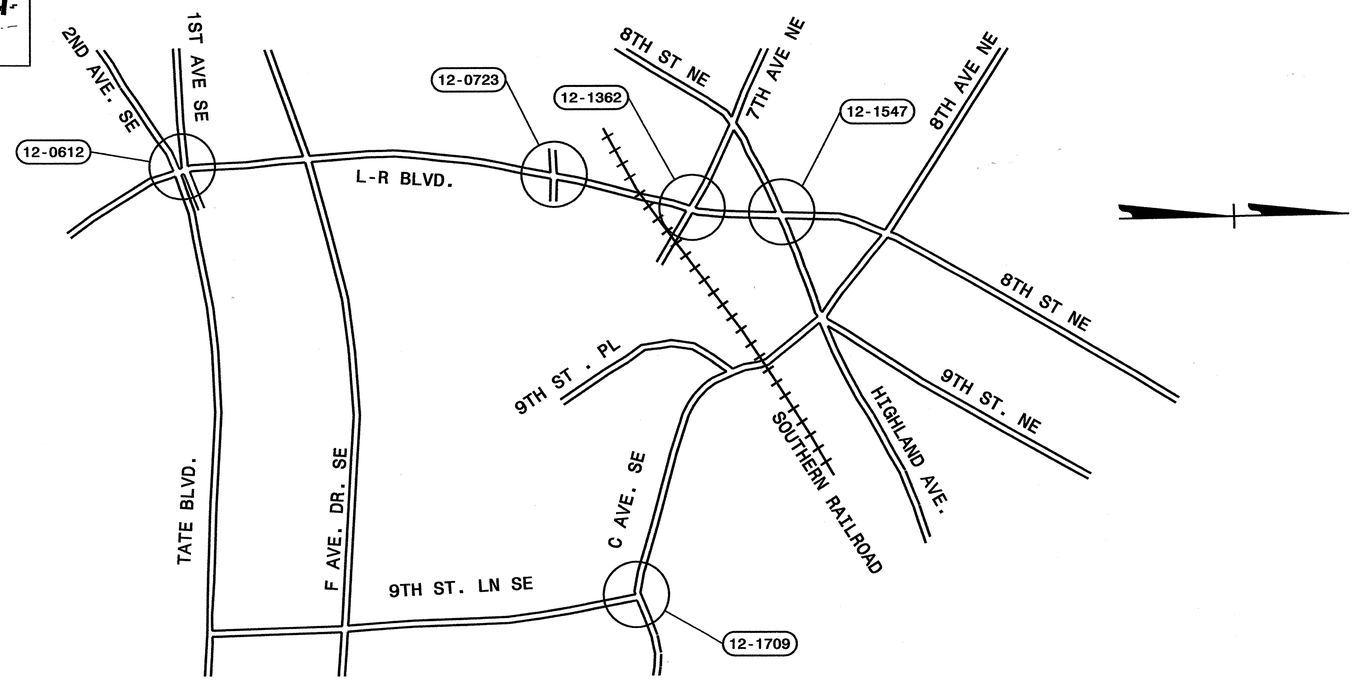


Vicinity Map

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
CATAWBA

Project Description: Lenoir Rhyne Blvd from Tate Blvd to 7th Ave NE in Hickory

Type of Work: Traffic Signals and Fiber Optic Communications Cable



INDEX OF PLANS

SHEET NUMBER	*SIGNAL INVENTORY NUMBER*	*LOCATION /DESCRIPTION*
SIG. 1	——	*Title Sheet*
SIG. 2–7	*12–0612*	*SR 1007 (Lenoir Rhyne Blvd SE) at SR 1692 (Tate Blvd. SE)/2nd Ave*
SIG. 8–11	*12–0723*	*SR 1007 (Lenoir Rhyne Blvd SE) at SR 1007 (Highland Avenue SE)/8th St Place SE*
SIG. 12–15	*12–1362*	*SR 1007 (Lenoir Rhyne Blvd NE) at 7th Avenue NE*
SIG. 16–17	*12–1547*	*SR 1007 (Lenoir Rhyne Blvd NE)/SR 1007 (Highland Avenue NE) at SR 2319 (8th Street NE)*
SIG. 18–19	*12–1709*	*C Avenue SE at 9th Street Lane SE*
SIG. 20–24	——	*Metal Poles Typicals*
SIG. 25–31	——	*Communications Cable Routing Plans*

LEGEND

(##-####) *SIGNAL INVENTORY NUMBER*

NCDOT CONTACTS:

INTELLIGENT TRANSPORTATION SYSTEMS AND SIGNALS UNIT

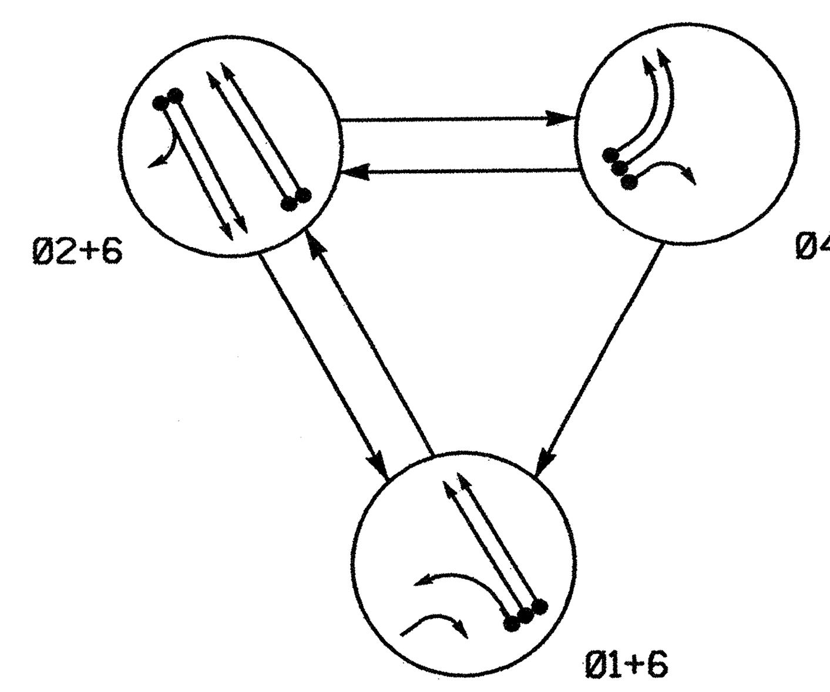
TIMOTHY J. WILLIAMS, PE – S & G CONTRACTS & PEF SUPPORT ENGINEER

GEORGE C. BROWN, PE – SIGNAL EQUIPMENT DESIGN ENGINEER

G.G. MURR JR., PE – INTELLIGENT TRANSPORTATION SYSTEMS ENGINEER

Traffic Engineering and Safety Systems Branch
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ITS and Signals Unit

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

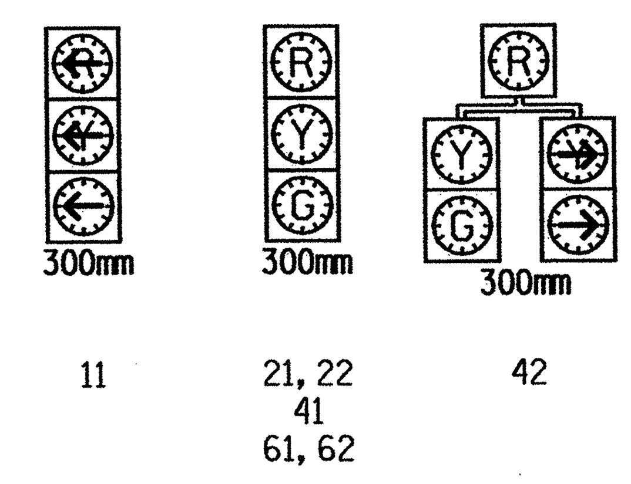
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+6	PHASE Ø2+6	PHASE Ø4	FLASH
11	←	~~←R~~	~~←R~~	~~←R~~
21, 22	R	G	R	Y
41	R	R	G	R
42	R / →	R	G	R
61, 62	G	G	R	Y

SIGNAL FACE I.D.

Denotes L.E.D.



LOOP & DETECTOR UNIT INSTALLATION CHART

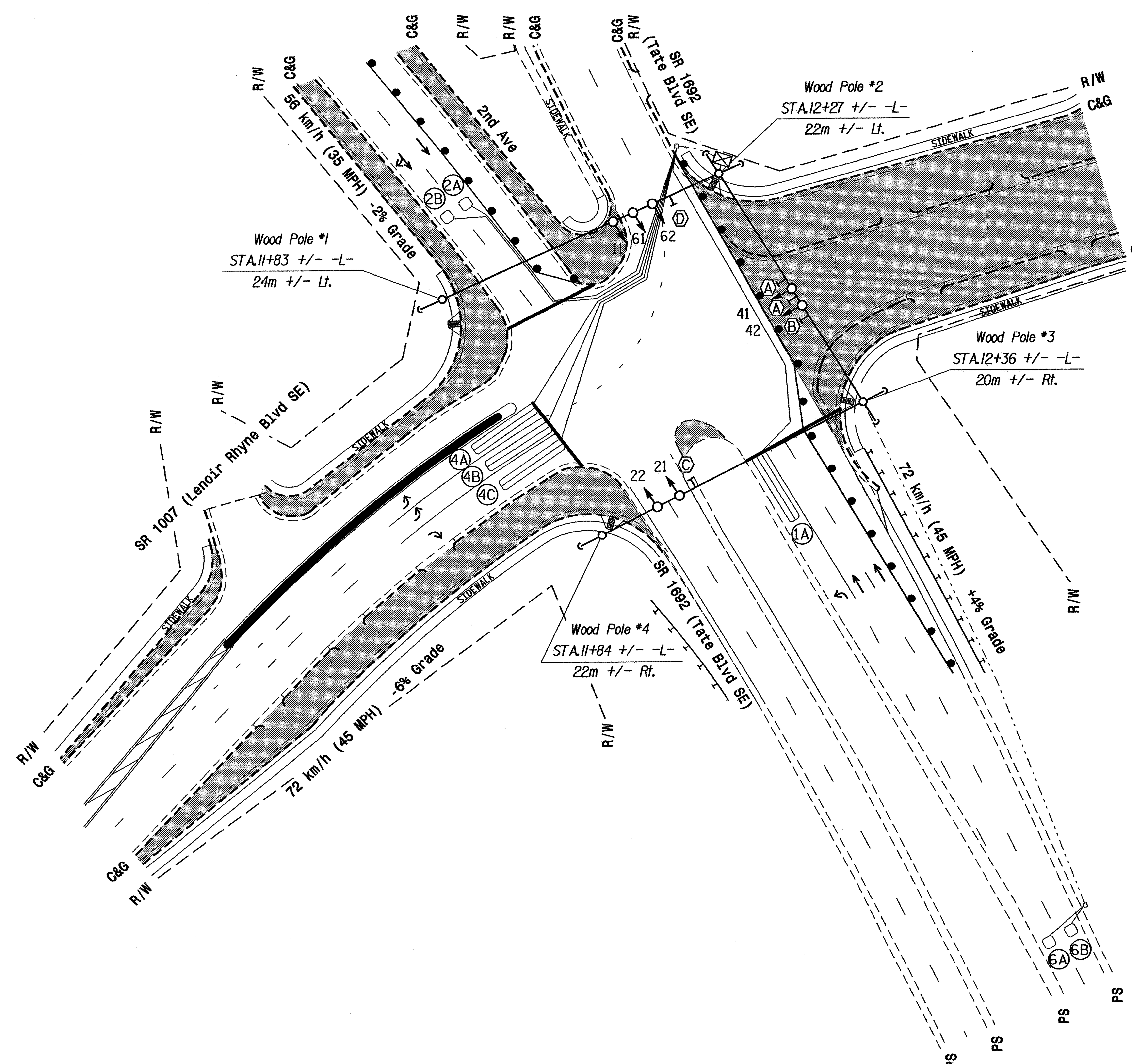
170 CONTROLLER AND CABINET

LOOP NO.	SIZE (m)	TURNS	DIST. FROM STOPBAR (m)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	STATUS NEW	STATUS EXISTING
1A	1.8X12	2-4-2	0	X		1	- SEC.	- SEC.					X		X			X	
2A	1.8X1.8	4	20	X		2	- SEC.	- SEC.					X		X			X	
2B	1.8X1.8	4	20	X		2	- SEC.	- SEC.					X		X			X	
4A	1.8X12	2-4-2	0	X		4	3 SEC.	- SEC.					X		X			X	
4B	1.8X12	2-4-2	0	X		4	- SEC.	- SEC.					X		X			X	
4C	1.8X12	2-4-2	0	X		4	15 SEC.	- SEC.					X		X			X	
6A	1.8X1.8	6	90	X		6	- SEC.	- SEC.				X	X		X			X	
6B	1.8X1.8	6	90	X		6	- SEC.	- SEC.				X	X		X			X	

3 Phase
Fully Actuated
(Hickory City Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.
2. Pavement markings are existing.
3. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
4. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
5. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values shall supersede these values.
6. Set all detector units to presence mode.
7. Set phase bank 3 maximum limit to 250 seconds for phases used.
8. Hickory City Signal System: #1116.
9. Place cabinet so as not to obstruct sight distance of vehicles turning right on red.



TIMING CHART

170 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø6
MINIMUM INITIAL	7 SEC.	10 SEC.	7 SEC.	12 SEC.
VEHICLE EXTENSION	2.0 SEC.	3.0 SEC.	2.0 SEC.	6.0 SEC.
YELLOW CHANGE INT.	3.0 SEC.	4.0 SEC.	3.1 SEC.	4.2 SEC.
RED CLEARANCE	3.8 SEC.	1.6 SEC.	3.5 SEC.	1.6 SEC.
MAXIMUM LIMIT	15 SEC.	90 SEC.	30 SEC.	90 SEC.
RECALL POSITION	NONE	VEH RECALL	NONE	VEH RECALL
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	YELLOW LOCK
DOUBLE ENTRY	OFF	OFF	OFF	OFF
WALK	- SEC.	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE	- SEC.	- SEC.	- SEC.	1.5 SEC.
MAXIMUM INITIAL	- SEC.	- SEC.	- SEC.	34 SEC.
MAXIMUM GAP	2.0 SEC.	3.0 SEC.	2.0 SEC.	7.0 SEC.
REDUCE 0.1 SEC EVERY	- SEC.	- SEC.	- SEC.	1.5 SEC.
MINIMUM GAP	2.0 SEC.	3.0 SEC.	2.0 SEC.	3.0 SEC.

PLAN QUANTITIES

Pay Item	Meters
Signal Cable	175
Messenger Cable	140
Lead-in Cable	175

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	50mm Underground Conduit	
N/A	Right of Way with Marker	
	Directional Arrow	
	Pavement Marking Arrow	
N/A	Guardrail	
	Construction Zone Drums	
	Construction Zone	
Ⓐ	Left Arrow "ONLY" Sign (R3-5L)	Ⓐ
Ⓑ	Right Arrow "ONLY" Sign (R3-5R)	Ⓑ
Ⓒ	No Left Turn Sign (R3-2)	Ⓒ
Ⓓ	No Right Turn Sign (R3-2)	Ⓓ

This Plan Shall Supersede The Plan Signed and Sealed on 5/24/2004

Signal Upgrade- Temporary Design

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, State of North Carolina Department of Transportation, Signals and Geometrics Section, 122 N. McDowell St., Raleigh, NC 27603

SR 1007 (Lenoir Rhyne Blvd SE) at SR 1692 (Tate Blvd. SE)/2nd Ave

Division 12 Catawba County Hickory

PLAN DATE: February 2006	REVIEWED BY: I.O.Umozurike
PREPARED BY: Luhr	REVIEWED BY:

SCALE 5 0 10 — 1:500

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 24393 TIMOTHY J. WILLIAMS

T.J. Williams — SIGNATURE — DATE 4/21/06

SIG. INVENTORY NO. 12-0612 T

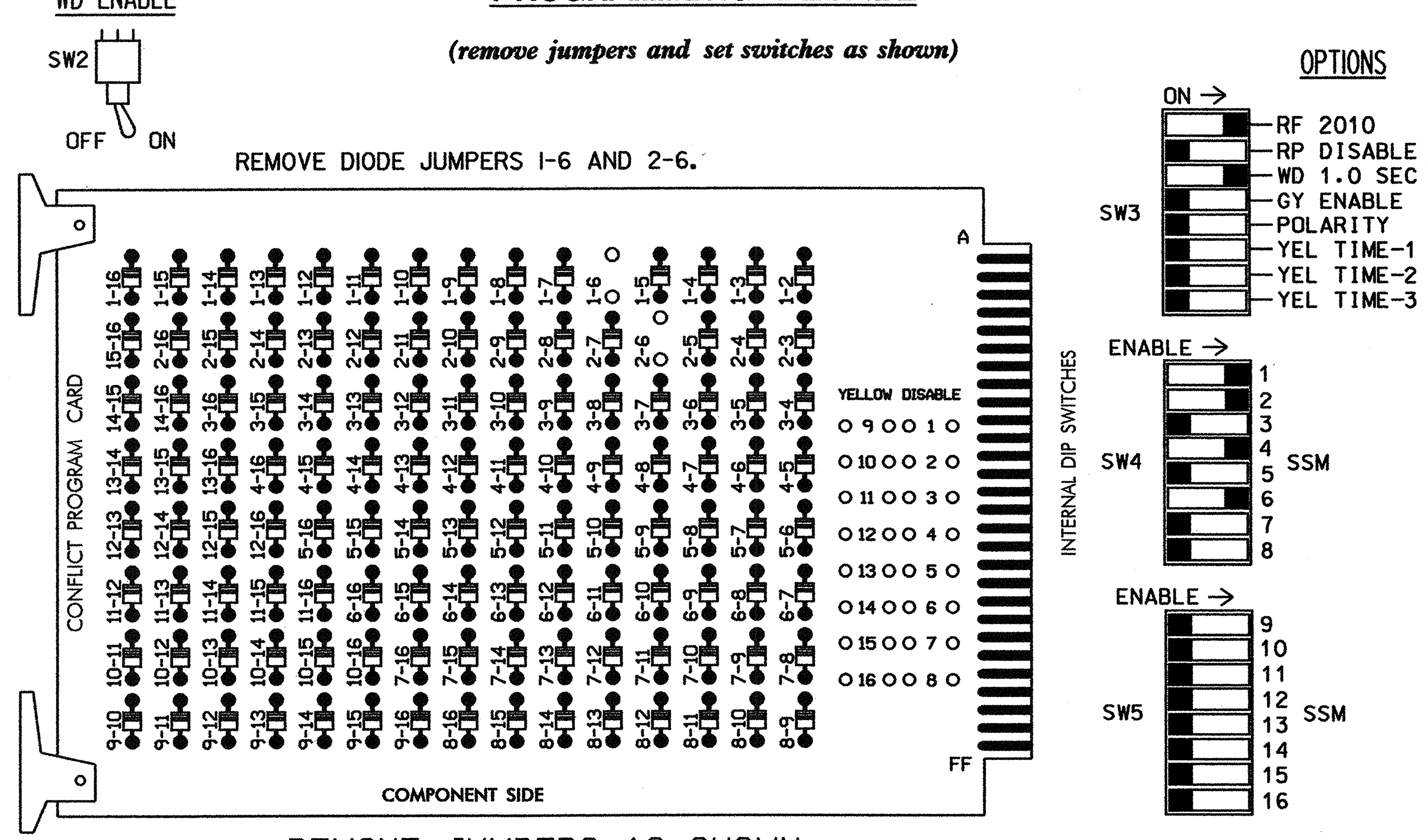
21-APR-2006 11:28
s:\its signals\workgroups\ip projects\u-2306\2006updatedsignals\12-0612\120612_sig_dsn_2006xxxx.dgn
luhr

PROJECT REFERENCE NO.	SHEET NO.
U-2306 A	Sig. 3

EDI MODEL 2010ECL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-6 AND 2-6.



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

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. 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 3,5,7, 8,9,10,11,12,13,14,15 & 16 TO LOAD SWITCH AC+ PER THE CABINET MANUFACTURER'S INSTRUCTIONS.
3. PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASE 6, ON CONTROLLER UNIT, FOR VOLUME DENSITY OPERATION.
7. THE CABINET AND CONTROLLER ARE PART OF THE CITY OF HICKORY SIGNAL SYSTEM: # 1116

EQUIPMENT INFORMATION

CONTROLLER.............CONTRACTOR SUPPLIED 170E
CABINET ....CONTRACTOR SUPPLIED 332
SOFTWARE ....BI TRANS 233NC2
CABINET MOUNT..........BASE
OUTPUT FILE POSITIONS..18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S1,S2,S4,S6
PHASES USED............1,2,4,6
OVERLAPS...............NONE

FIELD CONNECTION HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
PHASE	1		2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	42	21,22	NU	NU	41,42	NU	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
GREEN			130			103			136										
YELLOW			129			102			135										
RED			128			101			134										
RED ARROW	125																		
YELLOW ARROW	126	126																	
GREEN ARROW	127	127																	

NU = NOT USED

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	ø1 1A	ø2 2A	SLOT	SLOT	FUTURE USE	ø4 4A	ø4 4C	SLOT	SLOT	SLOT	SLOT	SLOT	FUTURE USE DC ISOLATOR	FS DC ISOLATOR
	L	NOT USED	ø2 2B	EMPTY	EMPTY	NOT USED	ø4 4B	NOT USED	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	NOT USED	ST DC ISOLATOR
FILE "J"	U	FUTURE USE	ø6 6A	FUTURE USE	SLOT	FUTURE USE	FUTURE USE	FUTURE USE	FUTURE USE	SLOT	SLOT	SLOT	FUTURE USE AC ISOLATOR	FUTURE USE AC ISOLATOR	SLOT
	L	NOT USED	ø6 6B	FUTURE USE	EMPTY	FUTURE USE	FUTURE USE	FUTURE USE	NOT USED	EMPTY	EMPTY	EMPTY	FUTURE USE AC ISOLATOR	FUTURE USE AC ISOLATOR	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	1	56	5 7	1
2A	TB2-5,6	I2U	2	39	5 7	2
2B	TB2-7,8	I2L	3	43	5 7	2
4A	TB4-9,10	I6U	4	41	5 7	4
4B	TB4-11,12	I6L	5	45	5 7	4
4C	TB6-1,2	I7U	6	65	5 7	4
6A	TB3-5,6	J2U	7	40	4 5 7	6
6B	TB3-7,8	J2L	8	44	4 5 7	6

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

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

DETECTOR ATTRIBUTES LEGEND:

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

THIS ELECTRICAL DETAIL IS FOR THE TEMPORARY SIGNAL DESIGN: 12-0612T
DESIGNED: FEBRUARY 2006
SEALED: 4/21/06
REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED MAY 2004 AND SEALED 6/4/04

TEMPORARY DESIGN

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1007 (LENOIR RHYNE BLVD SE) at SR 1692 (TATE BLVD SE)/2nd AVE

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Signals Management Section, 122 N. McDowell St., Raleigh, NC 27603

DIVISION 12 | CATAWBA COUNTY | HICKORY

PLAN DATE: APRIL 2006 | REVIEWED BY: T. Joyce
PREPARED BY: F.E. RUSS | REVIEWED BY:

REVISIONS | INIT. | DATE

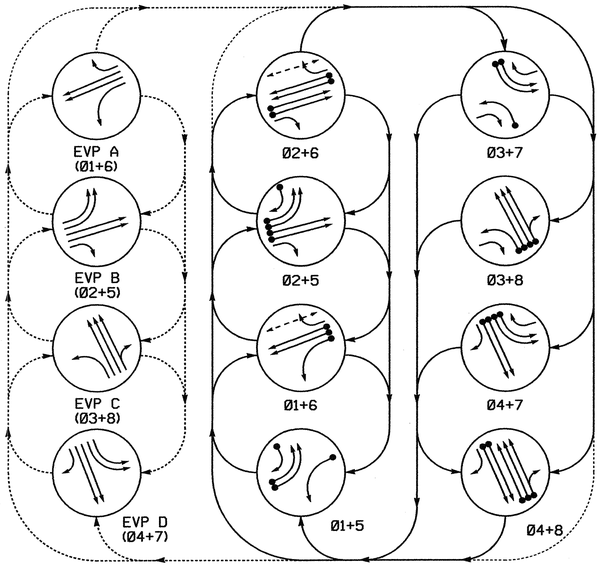
SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022013 GEORGE C. BROWN

George C. Brown 4/28/06
SIGNATURE | DATE

SIG. INVENTORY NO. 12-0612T

METRIC	PROJECT REFERENCE NO.	SHEET NO.
	U-2306 A	Sig. 4

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

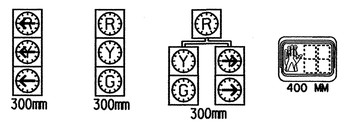
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT
- EV PREEMPTION SEQUENCE PHASING

TABLE OF OPERATION

SIGNAL FACE	PHASE												
	Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3+7	Ø3+8	Ø4+7	Ø4+8	EVPA	EVPB	EVPC	EVPD	FLASH
11	~~←~~	~~←~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~←~~	~~R~~	~~R~~	~~R~~	~~R~~
21	R	R	G	G	R	R	R	R	R	G	R	R	Y
22	R	R	G	G	R/~~R~~	~~R~~/R	R	R	R	G	R	R	Y
31	~~R~~	~~R~~	~~R~~	~~R~~	~~←~~	~~←~~	~~R~~	~~R~~	~~R~~	~~R~~	~~←~~	~~R~~	~~R~~
41	R	R	R	R	R	R	G	G	R	R	R	G	R
42	R/~~R~~	R	R/~~R~~	R	R	R	G	G	R	R	R	G	R
51, 52	~~←~~	~~R~~	~~←~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~←~~	~~R~~	~~R~~	~~R~~
61	R	G	R	G	R	R	R	G	R	R	R	Y	
62	R	G	R	G	R/~~R~~	~~R~~/R	R	G	R	R	R	Y	
71, 72	~~R~~	~~R~~	~~R~~	~~R~~	~~←~~	~~R~~	~~←~~	~~R~~	~~R~~	~~R~~	~~R~~	~~←~~	~~R~~
81, 82	R	R	R	R	R	G	R	G	R	R	G	R	R
P61, P62	DW	W	DW	W	DW	DW	DW	DW	DW	DW	DW	DW	DRK

SIGNAL FACE I.D.

Denotes L.E.D.



11	21	22	P61, P62
31	41	42	
51, 52	61	62	
71, 72	81, 82		

LOOP & DETECTOR UNIT INSTALLATION CHART
170 CONTROLLER AND CABINET

INDUCTIVE LOOPS					DETECTOR PROGRAMMING													
						TIMING		ATTRIBUTES									STATUS	
								1	2	3	4	5	6	7	8			
LOOP NO.	SIZE (m)	TURNS	DIST. FROM STOPBAR (m)	NEW / EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	FULL TIME DELAY / PEDESTRIAN CALL	RESERVED	RESERVED	COUNT	EXTENSION	TYPE 3	CALLING	ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
1A	1.8X12	2-4-2	0	X	1	3 SEC.	- SEC.					X		X			X	
2A	1.8X1.8	6	90	X	2	- SEC.	- SEC.				X	X		X			X	
2B	1.8X1.8	6	90	X	2	- SEC.	- SEC.				X	X		X			X	
3A	1.8X12	2-4-2	0	X	3	- SEC.	- SEC.					X		X			X	
4A	1.8X12	2-4-2	0	X	4	- SEC.	- SEC.					X		X			X	
4B	1.8X12	2-4-2	0	X	4	- SEC.	- SEC.					X		X			X	
5A	1.8X12	2-4-2	0	X	5	- SEC.	- SEC.					X		X			X	
5B	1.8X12	2-4-2	0	X	5	- SEC.	- SEC.					X		X			X	
5C	1.8X12	2-4-2	0	X	5	15 SEC.	- SEC.					X		X			X	
6A	1.8X1.8	4	20	X	6	- SEC.	- SEC.					X		X			X	
6B	1.8X1.8	4	20	X	6	- SEC.	- SEC.					X		X			X	
7A	1.8X12	2-4-2	0	X	7	- SEC.	- SEC.					X		X			X	
7B	1.8X12	2-4-2	0	X	7	- SEC.	- SEC.					X		X			X	
8A	1.8X1.8	5	90	X	8	- SEC.	3.4 SEC.					X					X	
8B	1.8X1.8	5	90	X	8	- SEC.	3.4 SEC.					X					X	
8C	1.8X12	2-4-2	0	X	8	- SEC.	- SEC.					X		X			X	
8D	1.8X12	2-4-2	0	X	8	- SEC.	- SEC.					X		X			X	
8E	1.8X12	2-4-2	0	X	8	10 SEC.	- SEC.					X		X			X	
P61, P62	N/A	N/A	N/A	X	6	- SEC.	- SEC.		X									
A*	EV PREEMPTOR A			X	EVPA	- SEC.	- SEC.											
B*	EV PREEMPTOR B			X	EVPB	- SEC.	- SEC.											
C*	EV PREEMPTOR C			X	EVPC	- SEC.	- SEC.											
D*	EV PREEMPTOR D			X	EVPD	- SEC.	- SEC.											

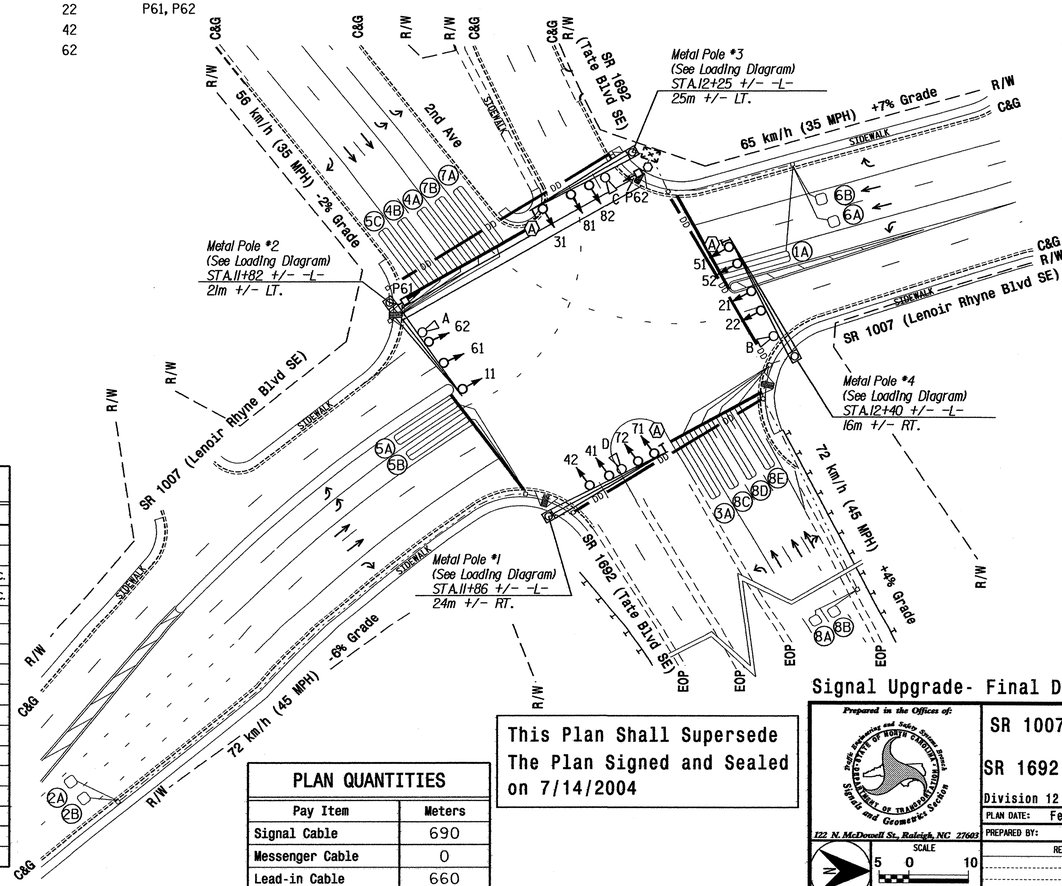
* Optical Detection Unit

170 EMERGENCY PREEMPTION TIMING CHART

FUNCTION	EVA (Ø1+6) SECONDS	EVB (Ø2+5) SECONDS	EVC (Ø3+8) SECONDS	EVD (Ø4+7) SECONDS
DELAY BEFORE PREEMPT	0	0	0	0
PED. CLEAR BEFORE PREEMPT	17	17	17	17
MIN. GREEN BEFORE PREEMPT	1.0	1.0	1.0	1.0
CLEARANCE TIME	1.0	1.0	1.0	1.0
PREEMPT EXTEND(timing on optical detection unit)	2.0	2.0	2.0	2.0

TIMING CHART
170 CONTROLLER

PHASE	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8	FOR PREEMPTION USE ONLY OL 1	OL 2	OL 3
MINIMUM INITIAL	7 SEC.	12 SEC.	7 SEC.	7 SEC.	7 SEC.	10 SEC.	7 SEC.	7 SEC.	-	-	-
VEHICLE EXTENSION	3.0 SEC.	6.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	-	-	-
YELLOW CHANGE INT.	3.0 SEC.	5.1 SEC.	3.0 SEC.	4.0 SEC.	3.1 SEC.	3.5 SEC.	3.0 SEC.	4.2 SEC.	3.0 SEC.	3.1 SEC.	3.0 SEC.
RED CLEARANCE	3.5 SEC.	2.1 SEC.	3.8 SEC.	2.4 SEC.	3.8 SEC.	3.0 SEC.	3.7 SEC.	2.0 SEC.	3.8 SEC.	3.8 SEC.	3.7 SEC.
MAXIMUM LIMIT	20 SEC.	90 SEC.	15 SEC.	30 SEC.	20 SEC.	90 SEC.	15 SEC.	30 SEC.	-	-	-
RECALL POSITION	NONE	VEH RECALL	NONE	NONE	NONE	VEH RECALL	NONE	NONE	NONE	NONE	NONE
VEHICLE CALL MEMORY	NONE	YELLOW LOCK	NONE	NONE	NONE	YELLOW LOCK	NONE	NONE	NONE	NONE	NONE
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
WALK	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	7 SEC.	- SEC.	- SEC.	-	-	-
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	34 SEC.	- SEC.	- SEC.	-	-	-
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	-	-	-
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	-	-	-
ADD PER VEHICLE	- SEC.	1.5 SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	-	-	-
MAXIMUM INITIAL	- SEC.	34 SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	-	-	-
MAXIMUM GAP	3.0 SEC.	7.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	-	-	-
REDUCE 0.1 SEC EVERY	- SEC.	1.5 SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	-	-	-
MINIMUM GAP	3.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	2.0 SEC.	2.0 SEC.	-	-	-



PLAN QUANTITIES

Pay Item	Meters
Signal Cable	690
Messenger Cable	0
Lead-in Cable	660

This Plan Shall Supersede The Plan Signed and Sealed on 7/14/2004

8 Phase
Fully Actuated
w/ Emergency Vehicle Preemption
(Hickory City Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
4. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values shall supersede these values.
5. During coordination, phase 1 or phase 5 may be lagged.
6. During coordination, phase 3 or phase 7 may be lagged.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
9. Set all detector units to presence mode.
10. Set phase bank 3 maximum limit to 250 seconds for phases used.
11. This intersection features an optical detection system. Shown location of optical detectors are conceptual only. Manufacturer shall determine optimum location of detectors.
12. Preemption calls shall be served in the sequence which they are received.
13. Hickory City Signal System: #1116.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole With Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
□	Junction Box	■
	50mm Underground Conduit	
N/A	Right of Way with Marker	
→	Directional Arrow	→
→	Pavement Marking Arrow	→
	Metal Pole with Mastarm	
	Optical Detector	
N/A	Guardrail	
DD	Directional Drill 2-50mm Polyethylene Conduit	N/A
⬡	Pedestrian Signal Pedestal	⬢
N/A	Wheelchair Ramp	
Ⓐ	U-Turn "YIELD TO RIGHT TURN" Sign (R10-16)	Ⓐ

Signal Upgrade- Final Design

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals and Geometrics Section
1722 N. McDowell St., Raleigh, NC 27603

SCALE 5 0 10 1:500

SR 1007 (Lenoir Rhyne Blvd SE) at SR 1692 (Tate Blvd. SE)/2nd Ave

Division 12 Catawba County Hickory

PLAN DATE: February 2006 REVIEWED BY: I.O.Umozurike

PREPARED BY: Luhr REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24393 ENGINEER TIMOTHY J. WILLIAMS

SIGNATURE 4/28/06 DATE

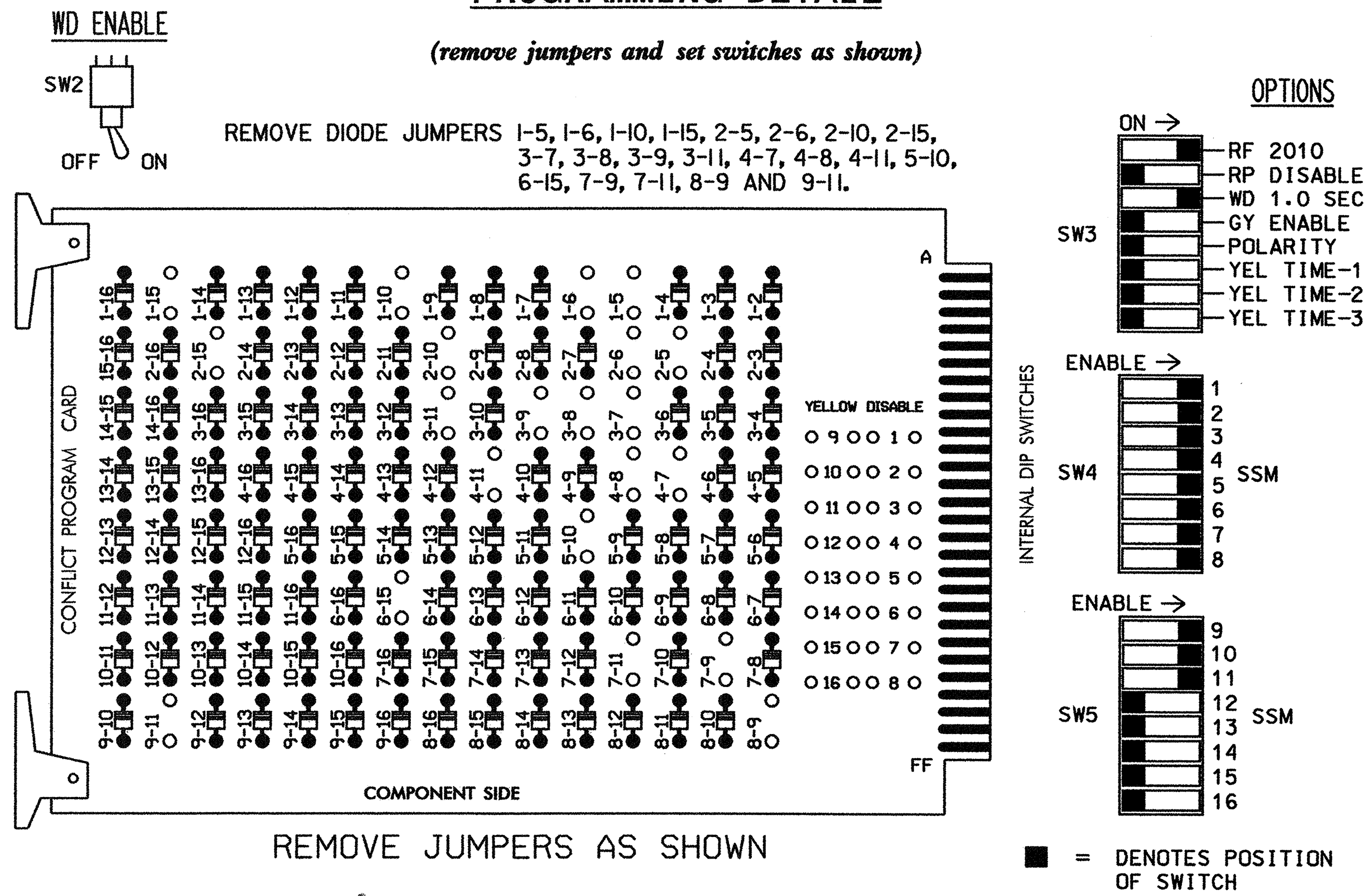
SIG. INVENTORY NO. 12-0612

28-APR-2006 11:42
S:\#ts signals\#workgroups\#tip projects\#u-2306d\#2006updatedsignals\#12-0612\#12612_sig_dsn_2006xxxx.dgn
luhr

EDI MODEL 2010ECL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-10, 1-15, 2-5, 2-6, 2-10, 2-15, 3-7, 3-8, 3-9, 3-11, 4-7, 4-8, 4-11, 5-10, 6-15, 7-9, 7-11, 8-9 AND 9-11.



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

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. 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 12, 13, 14, 15 & 16 TO LOAD SWITCH AC+ PER THE CABINET MANUFACTURER'S INSTRUCTIONS.
3. PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME FOR 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASE 2, ON CONTROLLER UNIT, FOR VOLUME DENSITY OPERATION. REMOVE VOLUME DENSITY PROGRAMMING FROM PHASE 6.
7. THE CABINET AND CONTROLLER ARE PART OF THE CITY OF HICKORY SIGNAL SYSTEM: # 1116

PROJECT REFERENCE NO.	SHEET NO.
U-2306 A	Sig.5

* SEE 'LOAD RESISTOR INSTALLATION DETAIL'
** SEE 'COUNTDOWN PEDESTRIAN SIGNAL OPERATION' NOTE

FIELD CONNECTION HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	21,22	NU	31	41,42	NU	51,52	61,62	P61, P62	71,72	81,82	NU	22	42	NU	62	NU	NU
GREEN		130			103			136			109							
YELLOW		129			102			135			108							
RED		128			101			134			107		*	*		*		
RED ARROW	125			116			131			122								
YELLOW ARROW	126			117			132			123			A122	A125		A115		
GREEN ARROW	127			118			133			124			A123	A126		A116		
** (WALK)									121									
** (DON'T WALK)									119									

NU = NOT USED

EQUIPMENT INFORMATION

*CONTROLLER............CONTRACTOR SUPPLIED 170E
*CABINET ....CONTRACTOR SUPPLIED 332
SOFTWARE ....BI TRANS 233NC2
CABINET MOUNT..........BASE
OUTPUT FILE POSITIONS..18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S1, S2, S3, S4, S5, S6, S6P, S7, S8, S9, S10, S12
PHASES USED............1, 2, 3, 4, 5, 6, 7, 8, 6PED
OVERLAPS...............OL1=ø3, OL2=ø5, OL3=ø7

EXISTING FROM TEMPORARY DESIGN INSTALLATION*

OVERLAP PROGRAMMING NOTES

1. TO ASSURE THAT LOAD SWITCH S9 IS ASSIGNED AS OVERLAP 1, PROGRAM CONTROLLER AT KEYPAD INPUT E/29+1+0=9
2. TO ASSURE THAT LOAD SWITCH S10 IS ASSIGNED AS OVERLAP 2, PROGRAM CONTROLLER AT KEYPAD INPUT E/29+2+0=10
3. TO ASSURE THAT LOAD SWITCH S12 IS ASSIGNED AS OVERLAP 3, PROGRAM CONTROLLER AT KEYPAD INPUT E/29+3+0=11
4. TO SET THE PARENT PHASE FOR OVERLAP 1 (VEH. SET 1) AS PHASE 3, PROGRAM CONTROLLER AT KEYPAD INPUT E/29+1+1=ø3
5. TO SET THE PARENT PHASE FOR OVERLAP 2 (VEH. SET 1) AS PHASE 5, PROGRAM CONTROLLER AT KEYPAD INPUT E/29+2+1=ø5
6. TO SET THE PARENT PHASE FOR OVERLAP 3 (VEH. SET 1) AS PHASE 7, PROGRAM CONTROLLER AT KEYPAD INPUT E/29+3+1=ø7
7. TO SET THE PARENT PHASES FOR OVERLAPS 1 & 2 (VEH. SET 2) AND OVERLAP 3 (VEH. SET 3) AS NONE, NO PROGRAMMING IS REQUIRED.

INPUT FILE POSITION LAYOUT

(front view)

FILE		1	2	3	4	5	6	7	8	9	10	11	12	13	14
"I"	U	ø1 1A	ø2 2A	SLOT EMPTY	SLOT EMPTY	ø3 3A	ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø6 PED DC ISOLATOR	FS DC ISOLATOR
"I"	L	NOT USED	ø2 2B			NOT USED	ø4 4B							NOT USED	ST DC ISOLATOR
"J"	U	ø5 5A	ø6 6A	ø5 5B	SLOT EMPTY	ø7 7A	ø8 8A	ø8 8C	ø8 8E	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	EVA* AC ISOLATOR	EVB* AC ISOLATOR	SLOT EMPTY
"J"	L	NOT USED	ø6 6B	ø5 5C		ø7 7B	ø8 8B	ø8 8D	NOT USED				EVC* AC ISOLATOR	EVD* AC ISOLATOR	

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

FS = FLASH SENSE
ST = STOP TIME
EV = EMERG. VEH. PREEMPT

EVA - CHANNEL 1 - PIN 71
EVB - CHANNEL 2 - PIN 72
EVC - CHANNEL 3 - PIN 73
EVD - CHANNEL 4 - PIN 74

*NOTE: WIRE OPTICAL DETECTORS TO INPUT FILE PER MANUFACTURER'S INSTRUCTIONS.

DETECTOR ATTRIBUTES LEGEND:

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

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	1	56	5 7	1
2A	TB2-5,6	I2U	2	39	4 5 7	2
2B	TB2-7,8	I2L	3	43	4 5 7	2
3A	TB4-5,6	I5U	4	58	5 7	3
4A	TB4-9,10	I6U	5	41	5 7	4
4B	TB4-11,12	I6L	6	45	5 7	4
5A	TB3-1,2	J1U	7	55	5 7	5
5B	TB3-9,10	J3U	8	64	5 7	5
5C	TB3-11,12	J3L	9	77	5 7	5
6A	TB3-5,6	J2U	10	40	5 7	6
6B	TB3-7,8	J2L	11	44	5 7	6
7A	TB5-5,6	J5U	12	57	5 7	7
7B	TB5-7,8	J5L	13	57	5 7	7
8A	TB5-9,10	J6U	14	42	5	8
8B	TB5-11,12	J6L	15	46	5	8
8C	TB7-1,2	J7U	16	66	5 7	8
8D	TB7-3,4	J7L	17	79	5 7	8
8E	TB7-5,6	J8U	18	50	5 7	8
PED PUSH BUTTONS						
P61, P62	TB8-7,9	I13U	19	68	2	6

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

HEADS 22,42,62 ARROWS (OL1,OL2,OL3) PREEMPTION OPERATION

IN ORDER FOR E.V. PREEMPTION 'B' TO OPERATE WITHOUT SIGNAL HEAD 42 RIGHT-TURN ARROWS (OVERLAP 'OL2'), THE FOLLOWING PROGRAMMING MUST BE IN PLACE:

ASSIGN E.V. PREEMPT EVB OUTPUT AT E/127+D+9= 208
ASSIGN LOGIC GATE OR-I INPUT 1 AT E/126+E+A= 208

IN ORDER FOR E.V. PREEMPTION 'C' TO OPERATE WITHOUT SIGNAL HEAD 22 RIGHT-TURN ARROWS (OVERLAP 'OL1'), THE FOLLOWING PROGRAMMING MUST BE IN PLACE:

ASSIGN E.V. PREEMPT EVC OUTPUT AT E/127+D+A= 209
ASSIGN LOGIC GATE OR-I INPUT 2 AT E/126+E+B= 209

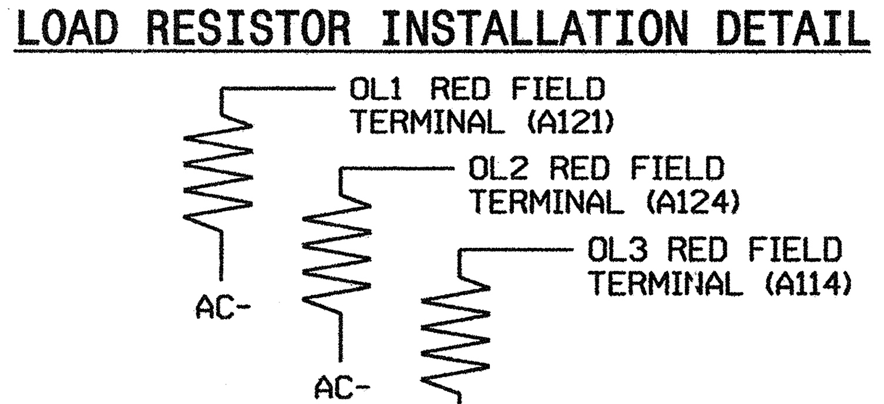
IN ORDER FOR E.V. PREEMPTION 'D' TO OPERATE WITHOUT SIGNAL HEAD 62 RIGHT-TURN ARROWS (OVERLAP 'OL3'), THE FOLLOWING PROGRAMMING MUST BE IN PLACE:

ASSIGN E.V. PREEMPT EVD OUTPUT AT E/127+D+B= 201

TO COMPLETE PROGRAMMING:

ASSIGN O/L VEH. SET 2 INPUT AT E/126+D+C= 200
ASSIGN LOGIC GATE OR-I OUTPUT AT E/127+D+I= 200
ASSIGN O/L VEH. SET 3 INPUT AT E/126+D+D= 201

LOAD RESISTOR INSTALLATION DETAIL



ACCEPTABLE VALUES

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

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

PEDESTRIAN CLEAR BEFORE PREEMPT TIMING

PROGRAM PED. PHASE 6 MIN. CLEAR BEFORE PREEMPT AT F/1+6+B= 17 (SEC.)

EMERGENCY VEHICLE PREEMPTION PROGRAMMING CHART

E. V. PREEMPT	OPTICAL DET. NO.	INPUT PIN	CLEARANCE PHASES LOCATION	DELAY TIME LOCATION	CLEAR TIME LOCATION
EVA	A	E/126+F+1=71	E/125+E+A=ø1,6	F/1+E+2=0	F/1+E+3= 1 (SEC.)
EVB	B	E/126+F+2=72	E/125+E+B=ø2,5	F/1+E+4=0	F/1+E+5= 1 (SEC.)
EVC	C	E/126+F+3=73	E/125+E+C=ø3,8	F/1+E+6=0	F/1+E+7= 1 (SEC.)
EVD	D	E/126+F+4=74	E/125+E+D=ø4,7	F/1+E+8=0	F/1+E+9= 1 (SEC.)

1. PROGRAM MINIMUM GREEN BEFORE PREEMPT AT: F/1+0+8= 1 (SEC.)
2. FOR PREEMPTION IMMEDIATE RESPONSE, DISABLE MIN. WALK AT: E/125+F+F=3
3. PROGRAM EXTEND TIME ON OPTICAL DETECTOR UNITS FOR 2.0 SEC.

OVERLAP TIMING PROGRAMMING CHART

OVERLAP	GREEN CLEAR	YELLOW CHANGE INTERVAL	RED CLEARANCE
OL1	E/29+1+D=0.0 (SEC.)	E/29+1+E=3.0 (SEC.)	E/29+1+F=3.8 (SEC.)
OL2	E/29+2+D=0.0 (SEC.)	E/29+2+E=3.1 (SEC.)	E/29+2+F=3.8 (SEC.)
OL3	E/29+3+D=0.0 (SEC.)	E/29+3+E=3.0 (SEC.)	E/29+3+F=3.7 (SEC.)

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.

PEDESTRIAN PHASE PROGRAMMING

PROGRAM PEDESTRIAN 6P OUTPUT AT KEYPAD INPUT E/125+F+6=ø6.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0612
DESIGNED: FEBRUARY 2006
SEALED: 4/28/06
REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED JULY 2004 AND SEALED 7/29/04

FINAL DESIGN

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of: Signals Management Section, Traffic Engineering and Safety Systems Branch, State of North Carolina Department of Transportation

122 N. McDowell St., Raleigh, NC 27603

SR 1007 (LENOIR RHYNE BLVD SE) at SR 1692 (TATE BLVD SE)/2nd AVE

DIVISION 12 CATAWBA COUNTY HICKORY

PLAN DATE: APRIL 2006	REVIEWED BY:
PREPARED BY: F.E. RUSS	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022013 GEORGE C. BROWN

SIGNATURE: [signature] DATE: 5/1/06

SIG. INVENTORY NO. 12-0612

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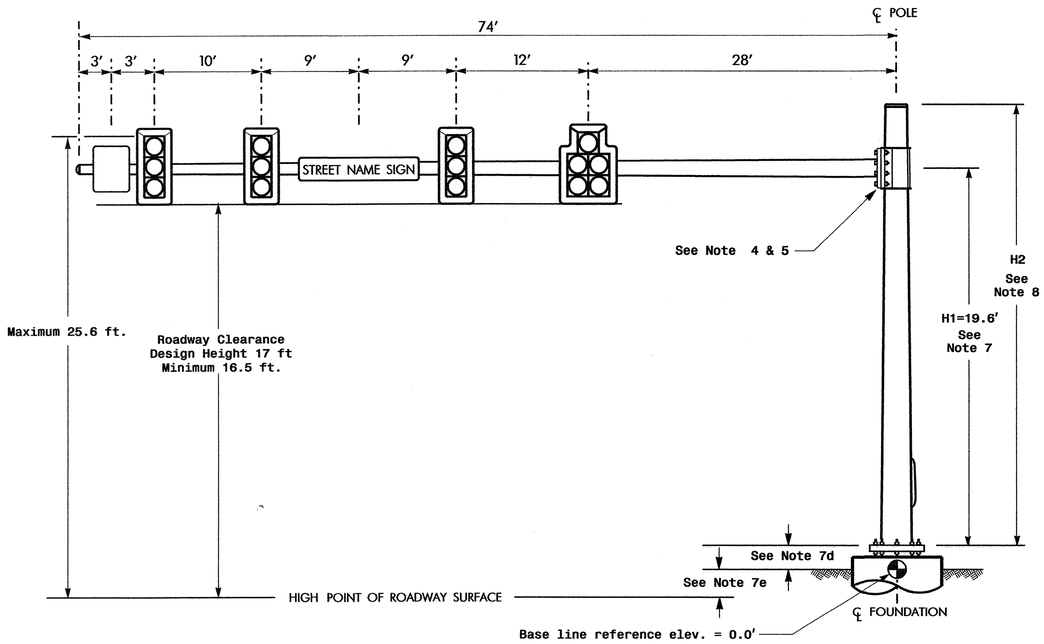
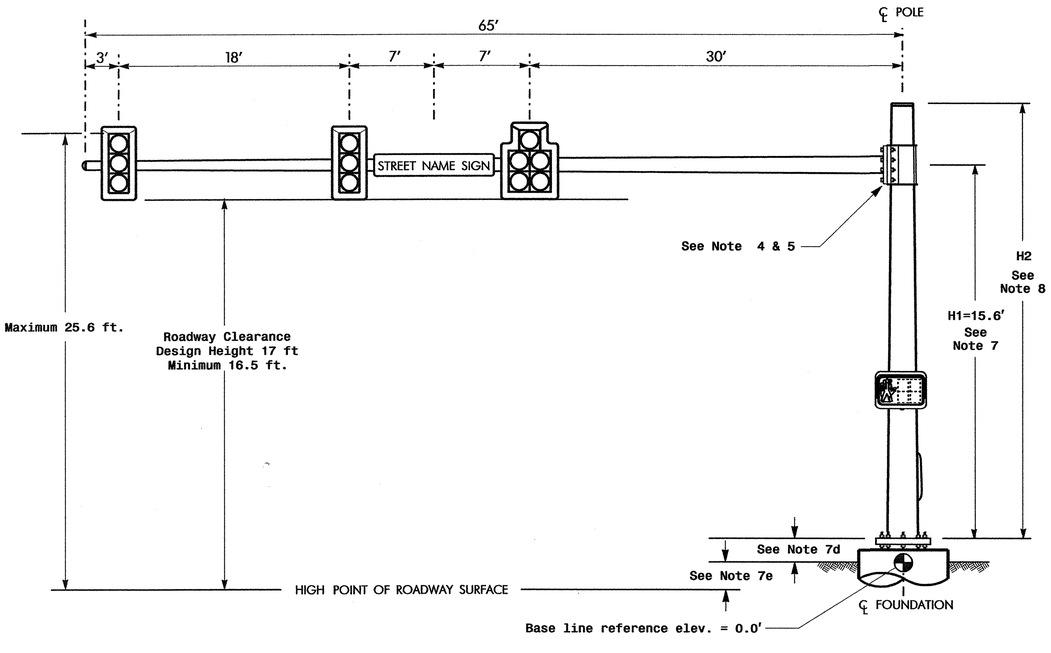


Elevation View

Design Loading for METAL POLE NO. 2



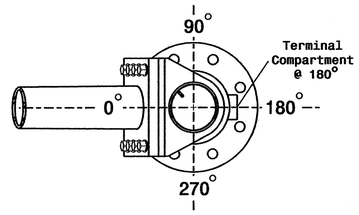
Elevation View

SPECIAL NOTE

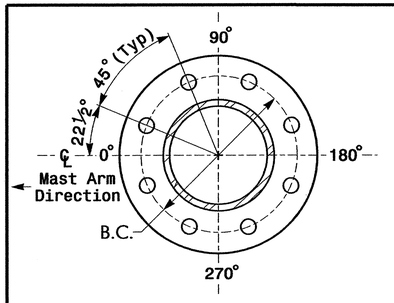
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

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	+1.0 ft.	-3.0 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A

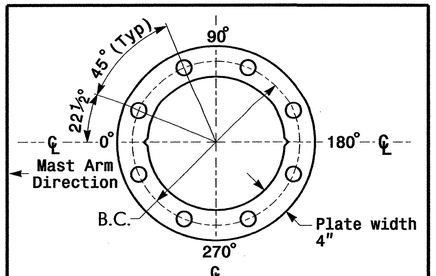


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



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

METAL POLE No. 1 and 2

PROJECT REFERENCE NO.	SHEET NO.
U-2306A	Sig. 6

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	5.0 S.F.	24.0" W X 30.0" L	11 LBS
STREET NAME SIGN	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

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2002 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2002 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: http://www.doh.dot.state.nc.us/preconstruct/traffic/tmssu/ws/mpoles/poles.htm

Design Requirements

2. 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.
3. Maximum allowable CSR for all signal supports is 0.9.
4. 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.
5. 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.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
8. 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 ½ of the total height of the mast arm attachment assembly plus 1 foot.
9. 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.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. 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:
Traffic Engineering and Safety Systems Branch
Signals and Geometrics Section
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
122 N. McDowell St., Raleigh, NC 27603

SR 1007 (Lenoir Rhyne Blvd. SE)
At
SR 1692 (Tate Blvd. SE)/2nd Ave

Division 12 Catawba County Hickory

PLAN DATE: February 2006 REVIEWED BY: I.O.Umozurike

PREPARED BY: Luhr REVIEWED BY:

SCALE 0 N/A N/A

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24393 ENGINEER TIMOTHY J. WILLIAMS

T.J. Williams 5/1/06.
SIGNATURE DATE

SIG. INVENTORY NO. 12-0612

01-MAY-2006 10:26
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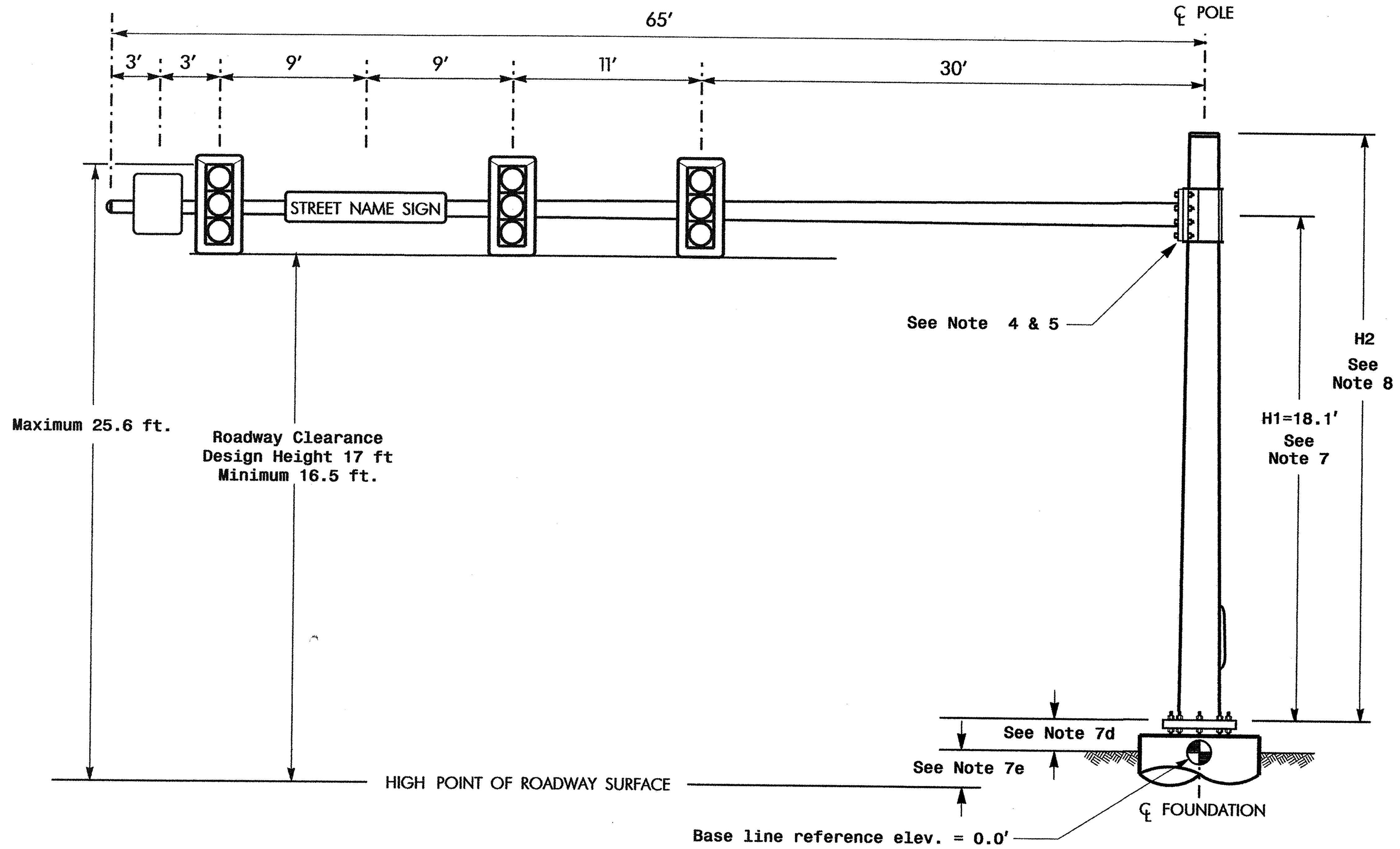
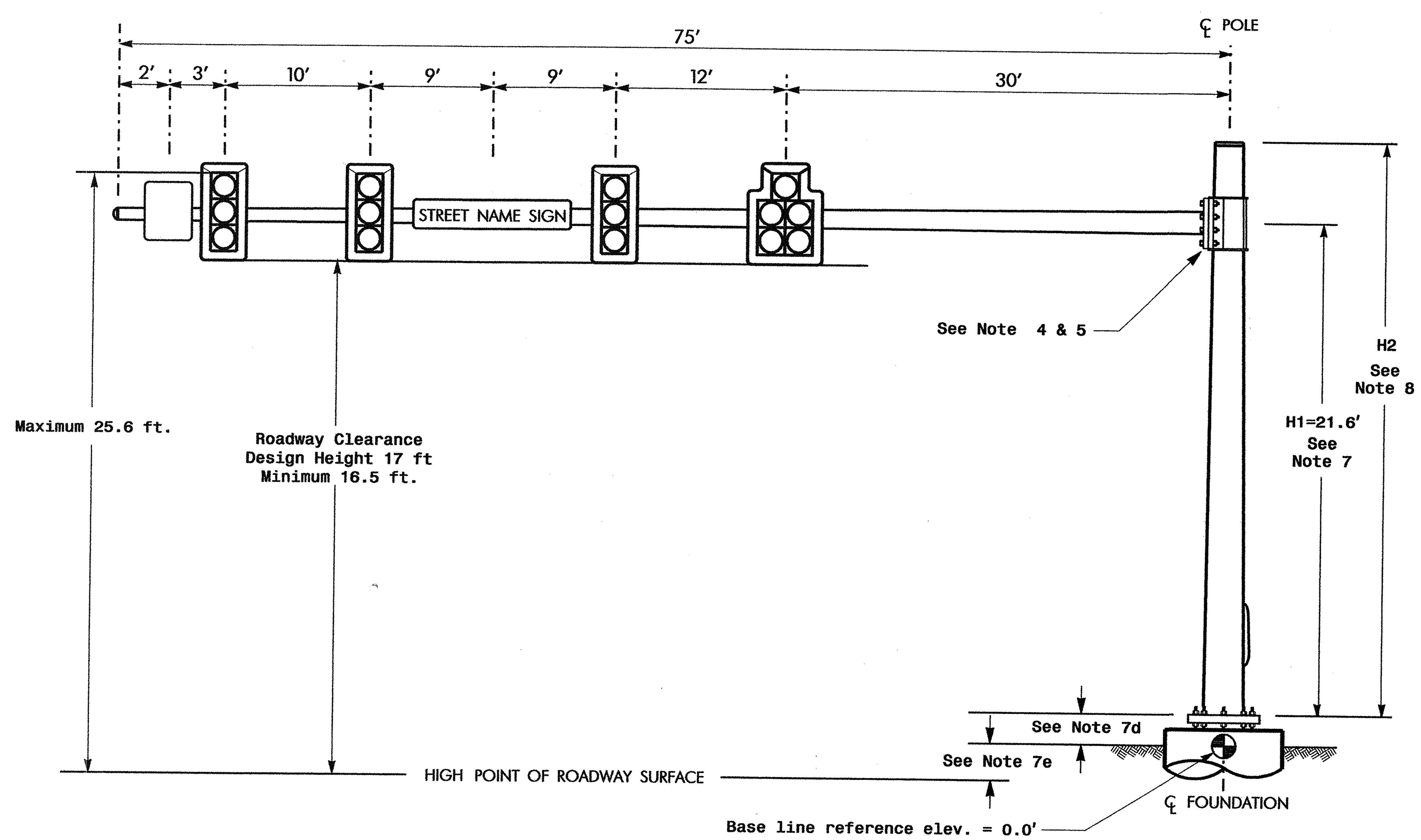
luhr

Design Loading for METAL POLE NO. 3



Elevation View

Design Loading for METAL POLE NO. 4



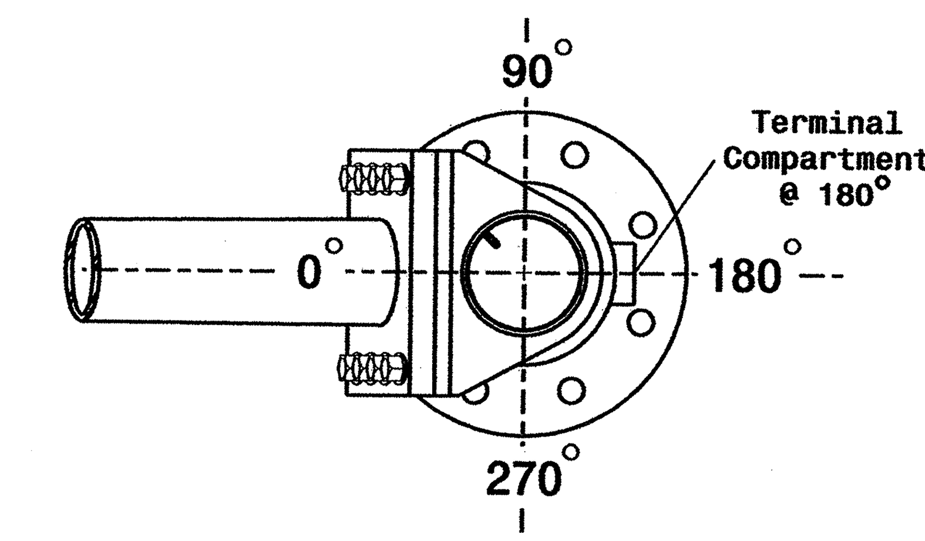
Elevation View

SPECIAL NOTE

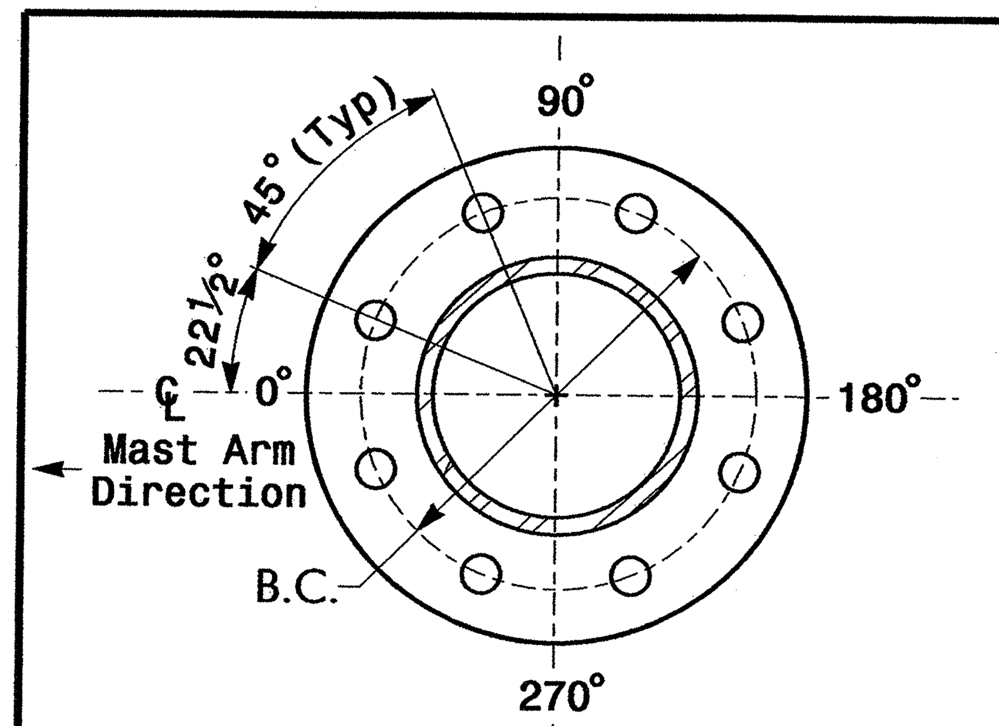
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 3	Pole 4
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	-0.5 ft.	+3.0 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A

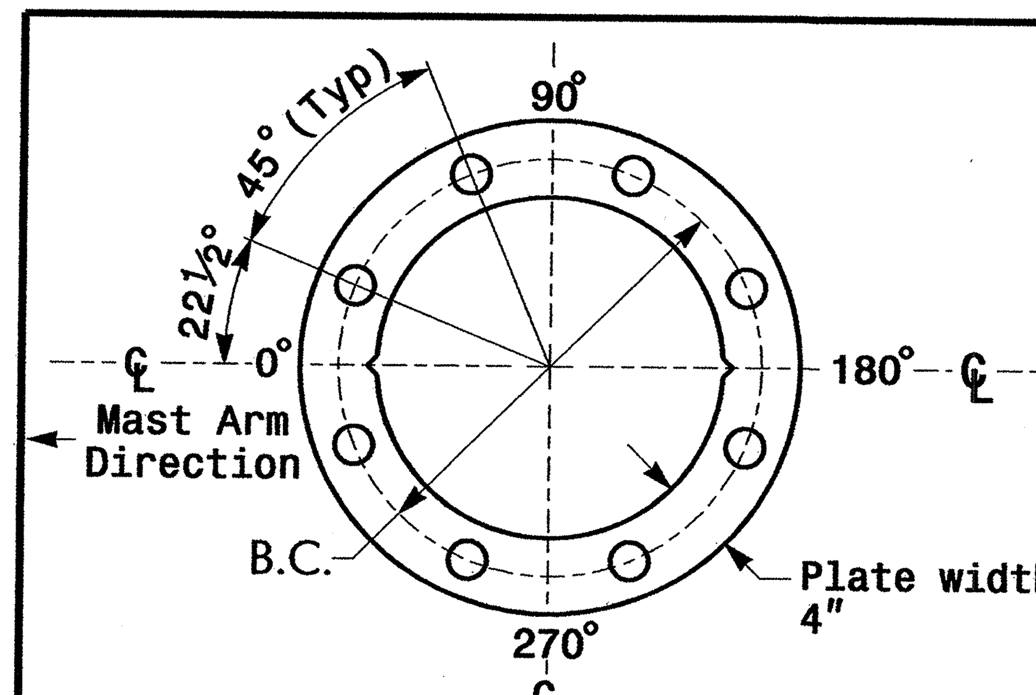


POLE RADIAL ORIENTATION



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
	SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
	SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC	5.0 S.F.	24.0" W X 30.0" L	11 LBS
STREET NAME SIGN	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

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2002 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2002 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: http://www.doh.dot.state.nc.us/preconstruct/traffic/tmssu/ws/mpoles/poles.htm

Design Requirements

2. 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.
3. Maximum allowable CSR for all signal supports is 0.9.
4. 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.
5. 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.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
8. 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 ½ of the total height of the mast arm attachment assembly plus 1 foot.
9. 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.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. 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: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section, North Carolina Department of Transportation
122 N. McDowell St., Raleigh, NC 27603

SCALE 0 N/A
N/A

SR 1007 (Lenoir Rhyne Blvd. SE)
At
SR 1692 (Tate Blvd. SE)/2nd Ave

Division 12 Catawba County Hickory

PLAN DATE: February 2006	REVIEWED BY: I.O.Umozurike
PREPARED BY: Luhr	REVIEWED BY:

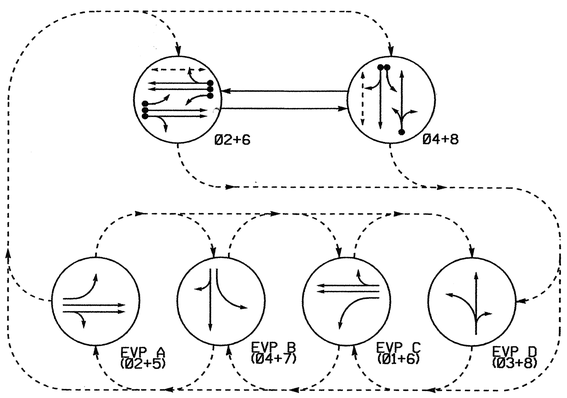
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 24393 TIMOTHY J. WILLIAMS
T.J. Williams 5/1/06
SIGNATURE DATE
SIG. INVENTORY NO. 12-0612

28-APR-2006 15:23
s:\its signals\workgroups\tip projects\u-2306a\2006updatedsignals\12-0612\120612_sig_mp1628364_20040714.dgn
luhr

METRIC	PROJECT REFERENCE NO.	SHEET NO.
	U-2306 A	Sig. 8

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT
- EV PREEMPTION SEQUENCE PHASING

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	Ø4+8	EVP A	EVP B	EVP C	EVP D	FLASH
21	G	R	G	R	R	R	Y
22	G	R	G	R	R	R	Y
41	R	G	R	G	R	R	R
42	R	G	R	G	R	R	R
61	G	R	R	R	G	R	Y
62	G	R	R	R	G	R	Y
81	R	G	R	R	R	G	R
82	R	G	R	R	R	G	R
P41, P42	DW	W	DW	DW	DW	DW	DRK
P61, P62	W	DW	DW	DW	DW	DW	DRK

SIGNAL FACE I.D.

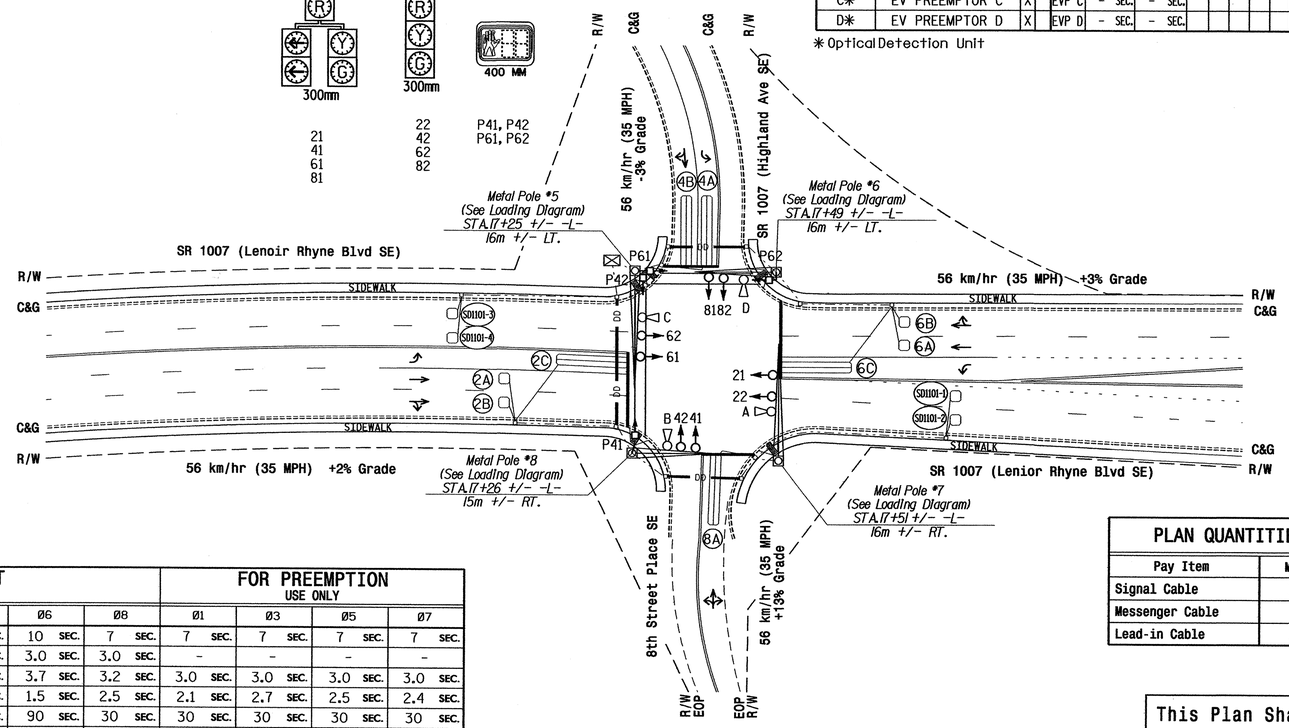
Denotes L.E.D.

LOOP & DETECTOR UNIT INSTALLATION CHART

170 CONTROLLER AND CABINET

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (m)	TURNS	DIST. FROM STOPBAR (m)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DET.	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	1.8X1.8	4	20	X		2	- SEC.	- SEC.					X		X			X	
2B	1.8X1.8	4	20	X		2	- SEC.	- SEC.					X		X			X	
2C	1.8X12	2-4-2	0	X		2	- SEC.	- SEC.					X		X			X	
4A	1.8X12	2-4-2	0	X		4	3 SEC.	- SEC.					X		X			X	
4B	1.8X12	2-4-2	0	X		4	10 SEC.	- SEC.					X		X			X	
6A	1.8X1.8	4	20	X		6	- SEC.	- SEC.					X		X			X	
6B	1.8X1.8	4	20	X		6	- SEC.	- SEC.					X		X			X	
6C	1.8X12	2-4-2	0	X		6	- SEC.	- SEC.					X		X			X	
8A	1.8X12	2-4-2	0	X		8	5 SEC.	- SEC.					X		X			X	
P41, P42	N/A	N/A	N/A	X		4	- SEC.	- SEC.		X									
P61, P62	N/A	N/A	N/A	X		6	- SEC.	- SEC.		X									
SD1101-1	1.8X1.8	4	+55	X		-	- SEC.	- SEC.									X	X	
SD1101-2	1.8X1.8	4	+55	X		-	- SEC.	- SEC.									X	X	
SD1101-3	1.8X1.8	4	+55	X		-	- SEC.	- SEC.									X	X	
SD1101-4	1.8X1.8	4	+55	X		-	- SEC.	- SEC.									X	X	
A*	EV PREEMPTOR A			X		EVP A	- SEC.	- SEC.											
B*	EV PREEMPTOR B			X		EVP B	- SEC.	- SEC.											
C*	EV PREEMPTOR C			X		EVP C	- SEC.	- SEC.											
D*	EV PREEMPTOR D			X		EVP D	- SEC.	- SEC.											

* Optical Detection Unit



PLAN QUANTITIES

Pay Item	Meters
Signal Cable	330
Messenger Cable	–
Lead-in Cable	375

This Plan Shall Supersede The Plan Signed and Sealed on 5/24/2004

TIMING CHART

170 CONTROLLER

FOR PREEMPTION USE ONLY								
PHASE	Ø2	Ø4	Ø6	Ø8	Ø1	Ø3	Ø5	Ø7
MINIMUM INITIAL	10 SEC.	7 SEC.	10 SEC.	7 SEC.	7 SEC.	7 SEC.	7 SEC.	7 SEC.
VEHICLE EXTENSION	3.0 SEC.	2.0 SEC.	3.0 SEC.	3.0 SEC.	-	-	-	-
YELLOW CHANGE INT.	3.7 SEC.	4.1 SEC.	3.7 SEC.	3.2 SEC.	3.0 SEC.	3.0 SEC.	3.0 SEC.	3.0 SEC.
RED CLEARANCE	1.8 SEC.	1.8 SEC.	1.5 SEC.	2.5 SEC.	2.1 SEC.	2.7 SEC.	2.5 SEC.	2.4 SEC.
MAXIMUM LIMIT	90 SEC.	30 SEC.	90 SEC.	30 SEC.	30 SEC.	30 SEC.	30 SEC.	30 SEC.
RED REVERT	1.5 SEC.	1.5 SEC.	1.5 SEC.	1.5 SEC.	1.5 SEC.	1.5 SEC.	1.5 SEC.	1.5 SEC.
RECALL POSITION	VEH RECALL	NONE	VEH RECALL	NONE	NONE	NONE	NONE	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	YELLOW LOCK	NONE	NONE	NONE	NONE	NONE
DOUBLE ENTRY	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
WALK	- SEC.	7 SEC.	7 SEC.	- SEC.	-	-	-	-
FLASHING DON'T WALK	- SEC.	16 SEC.	11 SEC.	- SEC.	-	-	-	-
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	-	-	-	-
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	-	-	-	-
ADD PER VEHICLE	- SEC.	- SEC.	- SEC.	- SEC.	-	-	-	-
MAXIMUM INITIAL	- SEC.	- SEC.	- SEC.	- SEC.	-	-	-	-
MAXIMUM GAP	3.0 SEC.	2.0 SEC.	3.0 SEC.	3.0 SEC.	-	-	-	-
REDUCE 0.1 SEC EVERY	- SEC.	- SEC.	- SEC.	- SEC.	-	-	-	-
MINIMUM GAP	3.0 SEC.	2.0 SEC.	3.0 SEC.	3.0 SEC.	-	-	-	-

170 EMERGENCY PREEMPTION TIMING CHART

FUNCTION	EVA (Ø2+6) SECONDS	EVB (Ø4+7) SECONDS	EVC (Ø1+6) SECONDS	EVD (Ø3+8) SECONDS
DELAY BEFORE PREEMPT	0	0	0	0
PED. CLEAR BEFORE PREEMPT	9	9	9	9
MIN. GREEN BEFORE PREEMPT	1.0	1.0	1.0	1.0
CLEARANCE TIME	1.0	1.0	1.0	1.0
PREEMPT EXTEND(timing on optical detection unit)	2.0	2.0	2.0	2.0

2 Phase w/ Emergency Vehicle Preemption Fully Actuated (Hickory City Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Program phase 1 as protected/permitted.
4. Program phase 5 as protected/permitted.
5. Program phase 3 as protected/permitted.
6. Program phase 7 as protected/permitted.
7. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values shall supersede these values.
9. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
10. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
11. Set all detector units to presence mode.
12. Set phase bank 3 maximum limit to 250 seconds for phases used.
13. Preemption calls shall be served in the sequence which they are received.
14. This intersection features an optical preemption system. Shown locations of optical detectors are conceptual only. Manufacturer shall determine optimum location of detectors.
15. Hickory City System: # 1101
16. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole With Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	50mm Underground Conduit	
N/A	Right of Way with Marker	
	Directional Arrow	
	Pavement Marking Arrow	
	Metal Pole with Mastarm	
	Optical Detector	
DD	Directional Drill 2-50mm Polyethylene Conduits	N/A
N/A	Wheelchair Ramp	

Signal Upgrade

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Traffic Engineering Division, North Carolina Department of Transportation, Signals and Geometrics Section, 122 N. McDowell St., Raleigh, NC 27603

SR 1007 (Lenoir Rhyne Blvd SE) at SR 1007 (Highland Avenue SE)/ 8th St Place SE

Division 12 Catawba County Hickory

PLAN DATE: February 2006 REVIEWED BY: I.O.Umozurike

PREPARED BY: Luhr REVIEWED BY:

SCALE 5 0 10 1:500

REVISIONS	INIT.	DATE

SEAL — NORTH CAROLINA PROFESSIONAL SEAL 24393 ENGINEER TIMOTHY J. WILLIAMS

SIGNATURE 4/28/06 DATE

SIG. INVENTORY NO. 12-0723

28-APR-2006 11:44
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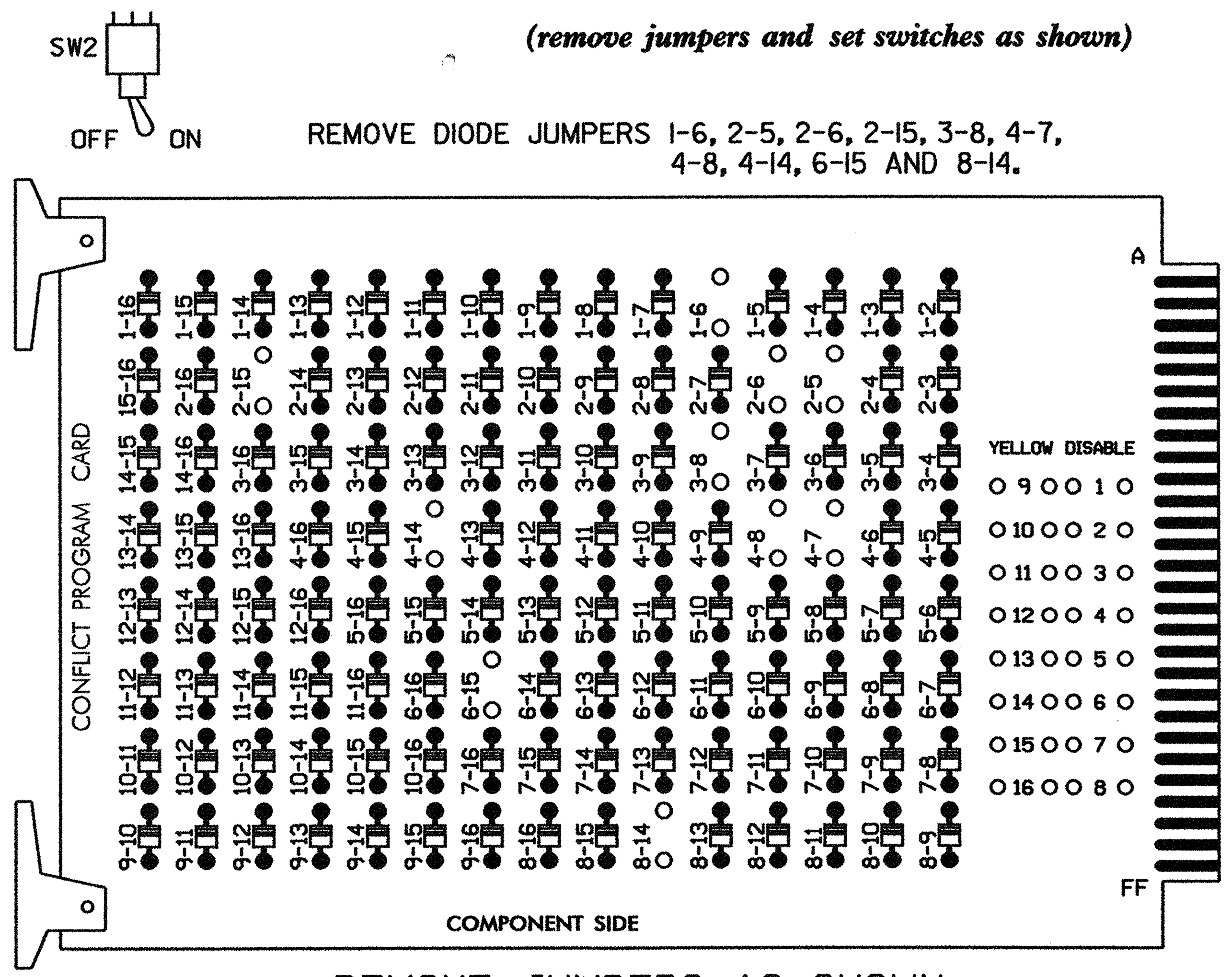
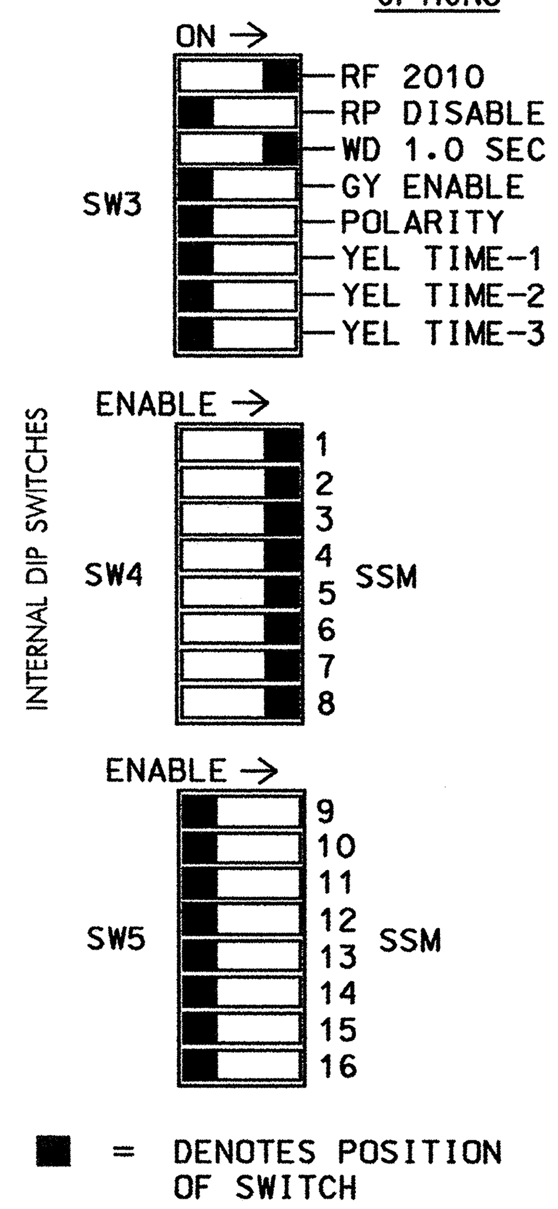
luhr

EDI MODEL 2010ECL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS 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. VERIFY THAT SIGNAL HEADS FLASH IN ACCORDANCE WITH THE SIGNAL PLANS.
2. ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED RED MONITOR INPUTS 9,10, 11,12,13,14,15 & 16 TO LOAD SWITCH AC+ PER THE CABINET MANUFACTURER'S INSTRUCTIONS.
3. PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM PHASES 4 AND 8, ON CONTROLLER UNIT, FOR DOUBLE ENTRY.
7. THE CABINET AND CONTROLLER ARE PART OF THE CITY OF HICKORY SIGNAL SYSTEM: # 1101

EQUIPMENT INFORMATION

CONTROLLER.............CONTRACTOR SUPPLIED 170E
CABINET ....CONTRACTOR SUPPLIED 332
SOFTWARE ....BI TRANS 233NC2
CABINET MOUNT..........BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED......S1,S2,S3,S4,S4P,S5,S6,S6P,S7,S8
PHASES USED............1*,2,3*,4,5*,6,7*,8,4PED,6PED
OVERLAPS...............NONE

*USED ONLY IN E.V. PREEMPTION

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

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.	61	21,22	NU	81	41,42	P41, P42	21	61,62	P61, P62	41	81,82	NU
GREEN		130			103			136			109	
YELLOW		129			102			135			108	
RED	*	128		*	101		*	134		*	107	
RED ARROW												
YELLOW ARROW	126			117			132			123		
GREEN ARROW	127			118			133			124		
** WALK						106			121			
** DON'T WALK						104			119			

NU = NOT USED

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

BACK-UP PROTECTION NOTE

PROGRAM PHASES 1, 3, 5, AND 7 AS PROTECTED/PERMITTED AT KEYPAD INPUT E/125+E+4=ø1, 3, 5, 7

PEDESTRIAN PHASE PROGRAMMING

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

POWER-UP/RE-START PROGRAMMING NOTE

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

VEH - F/2+F+E=ø2, 4, 6, 8

PED - F/2+F+F=ø4, 6

RED REVERT TIMER PROGRAMMING

PROGRAM RED REVERT TIMING AT KEYPAD INPUT F/1+0+F= 1.5 (SEC.)

INPUT FILE POSITION LAYOUT

(front view)

FILE		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT	ø2 2A	ø2 2C	SLOT	SLOT	ø4 4A	SYS. SD1101 -1	SLOT	SLOT	SLOT	SLOT	NOT USED	ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L	EMPTY	ø2 2B	NOT USED	EMPTY	EMPTY	ø4 4B	SYS. SD1101 -2	EMPTY	EMPTY	EMPTY	EMPTY	ø4 PED DC ISOLATOR	NOT USED	ST DC ISOLATOR
FILE "J"	U	SLOT	ø6 6A	ø6 6C	SLOT	SLOT	ø8 8A	SYS. SD1101 -3	SLOT	SLOT	SLOT	SLOT	EVA ** AC ISOLATOR	EVB ** AC ISOLATOR	SLOT
	L	EMPTY	ø6 6B	NOT USED	EMPTY	EMPTY	NOT USED	SYS. SD1101 -4	EMPTY	EMPTY	EMPTY	EMPTY	EVC ** AC ISOLATOR	EVD ** AC ISOLATOR	EMPTY

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

FS = FLASH SENSE
ST = STOP TIME
EV = EMERG. VEH. PREEMPT

EVA - CHANNEL 1 - PIN 71
EVB - CHANNEL 2 - PIN 72
EVC - CHANNEL 3 - PIN 73
EVD - CHANNEL 4 - PIN 74

**NOTE: WIRE OPTICAL DETECTORS TO INPUT FILE PER MANUFACTURER'S INSTRUCTIONS.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

DETECTOR ATTRIBUTES LEGEND:

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

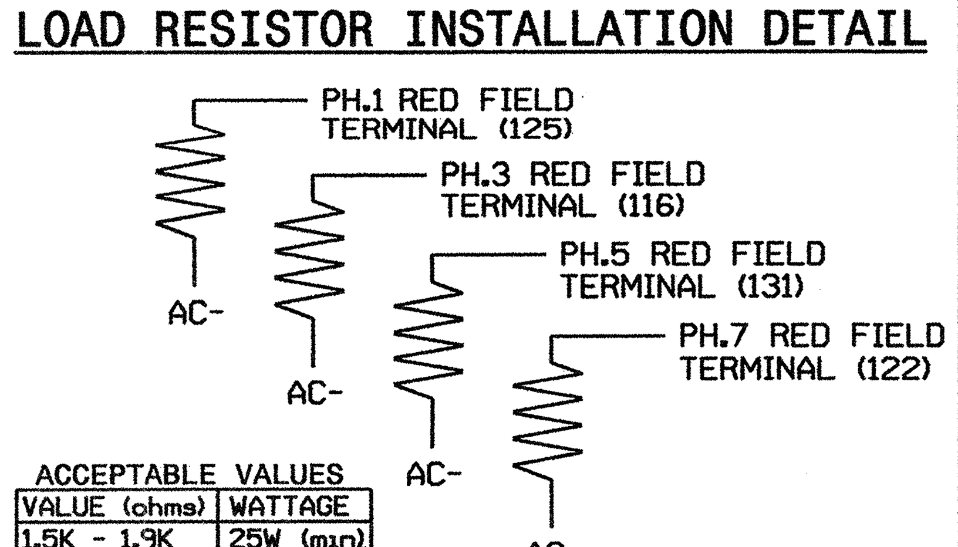
INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE	
2A	TB2-5,6	I2U	1	39	5 7	2	
2B	TB2-7,8	I2L	2	43	5 7	2	
2C	TB2-9,10	I3U	3	63	5 7	2	
4A	TB4-9,10	I6U	4	41	5 7	4	
4B	TB4-11,12	I6L	5	45	5 7	4	
6A	TB3-5,6	J2U	6	40	5 7	6	
6B	TB3-7,8	J2L	7	44	5 7	6	
6C	TB3-9,10	J3U	8	64	5 7	6	
8A	TB5-9,10	J6U	9	42	5 7	8	
PED PUSH BUTTONS							
P41, P42	TB8-5,6	I12L	10	69	2	4	
P61, P62	TB8-7,9	I13U	11	68	2	6	
SYSTEM LOOPS							
SD1101-1	TB6-1,2	I7U	—	65	—	SYS1	*
SD1101-2	TB6-3,4	I7L	—	78	—	SYS2	*
SD1101-3	TB7-1,2	J7U	—	66	—	SYS3	*
SD1101-4	TB7-3,4	J7L	—	79	—	SYS4	*

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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0723
DESIGNED: FEBRUARY 2006
SEALED: 4/28/06
REVISED: N/A

LOAD RESISTOR INSTALLATION DETAIL



ACCEPTABLE VALUES

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

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

PEDESTRIAN CLEAR BEFORE PREEMPT TIMING

PROGRAM PED. PHASE 4 MIN. CLEAR BEFORE PREEMPT AT F/1+4+B= 9 (SEC.)
PROGRAM PED. PHASE 6 MIN. CLEAR BEFORE PREEMPT AT F/1+6+B= 9 (SEC.)

EMERGENCY VEHICLE PREEMPTION PROGRAMMING CHART

E. V. PREEMPT	OPTICAL DET. NO.	INPUT PIN	CLEARANCE PHASES LOCATION	DELAY TIME LOCATION	CLEAR TIME LOCATION
EVA	A	E/126+F+1=71	E/125+E+A= ø2,5	F/1+E+2=0	F/1+E+3= 1 (SEC.)
EVB	B	E/126+F+2=72	E/125+E+B= ø4,7	F/1+E+4=0	F/1+E+5= 1 (SEC.)
EVC	C	E/126+F+3=73	E/125+E+C= ø1,6	F/1+E+6=0	F/1+E+7= 1 (SEC.)
EVD	D	E/126+F+4=74	E/125+E+D= ø3,8	F/1+E+8=0	F/1+E+9= 1 (SEC.)

1. PROGRAM MINIMUM GREEN BEFORE PREEMPT AT: F/1+0+8= 1 (SEC.)
2. FOR PREEMPTION IMMEDIATE RESPONSE, DISABLE MIN. WALK AT: E/125+F+F=3
3. PROGRAM EXTEND TIME ON OPTICAL DETECTOR UNITS FOR 2.0 SEC.

*SYSTEM DETECTOR PROGRAMMING NOTES

IN ORDER FOR SYSTEM LOOPS TO OPERATE PROPERLY, THEIR PIN ASSIGNMENTS WILL HAVE TO BE RE-ASSIGNED ON 170E CONTROLLER AS DESCRIBED BELOW.

A. IN ORDER TO ASSURE THAT THESE PINS ARE CLEARED FROM THEIR DEFAULT FUNCTION, PROGRAM AS FOLLOWS:
   PIN 65 - E/126+4+6=0   PIN 66 - E/126+4+7=0
   PIN 78 - E/126+4+E=0   PIN 79 - E/126+4+F=0

B. AFTER FOLLOWING STEP 'A' ABOVE, PROGRAM PINS FOR SYSTEM DETECTORS AS FOLLOWS:
   SYS1 - E/126+B+1=65   SYS3 - E/126+B+3=66
   SYS2 - E/126+B+2=78   SYS4 - E/126+B+4=79

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.

THIS DETAIL SUPERSEDES DETAIL DATED MAY 2004 AND SEALED 6/7/04

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1007 (LENOIR RHYNE BLVD SE)
at
SR 1007 (HIGHLAND AVENUE SE)/
8th ST PLACE SE

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch, Signals Management Section, State of North Carolina Department of Transportation
122 N. McDowell St., Raleigh, NC 27603

DIVISION 12 | CATAWBA COUNTY | HICKORY

PLAN DATE: APRIL 2006	REVIEWED BY:
PREPARED BY: F.E. RUSS	REVIEWED BY:

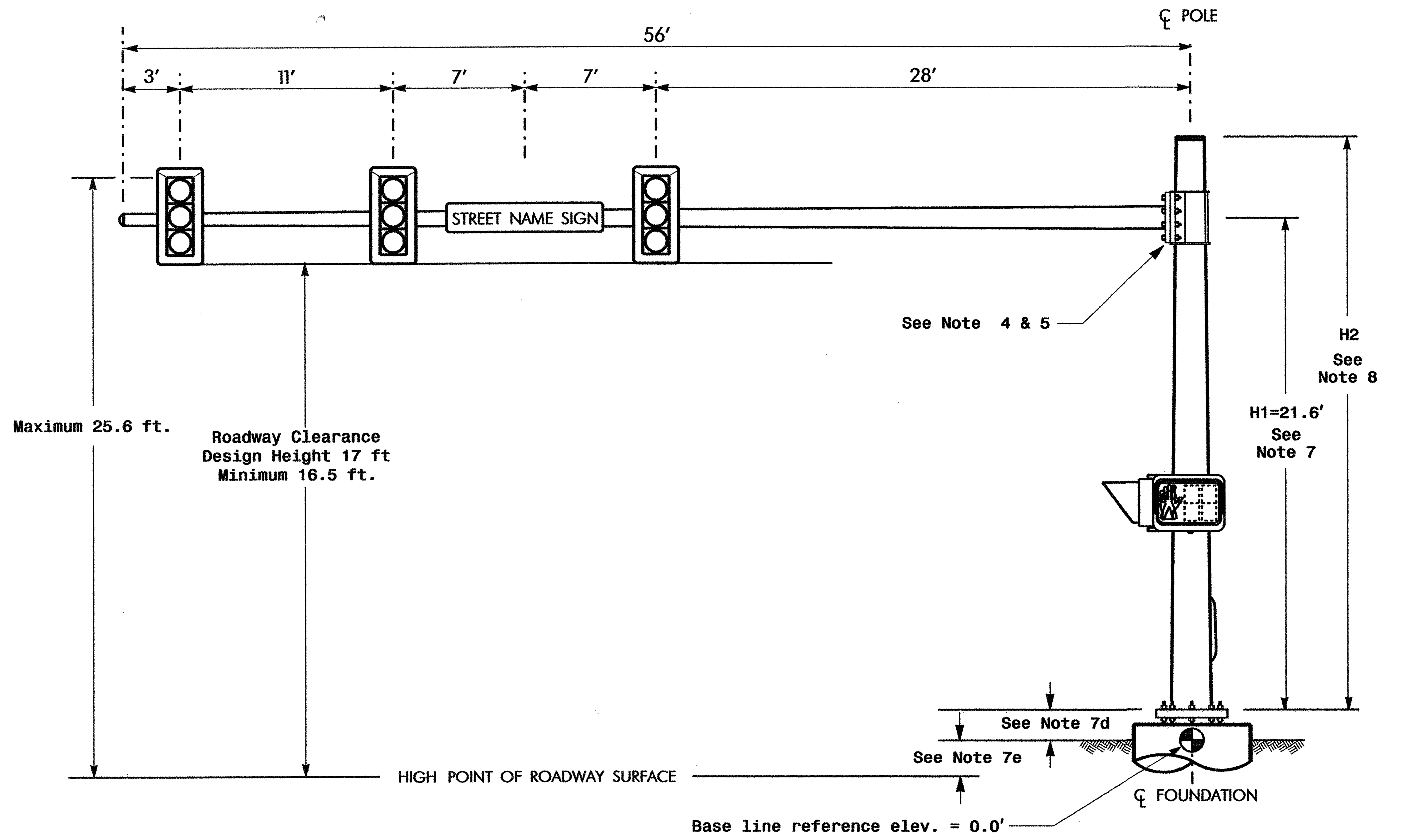
REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022013 GEORGE C. BROWN

George C. Brown 5/1/06
SIGNATURE DATE

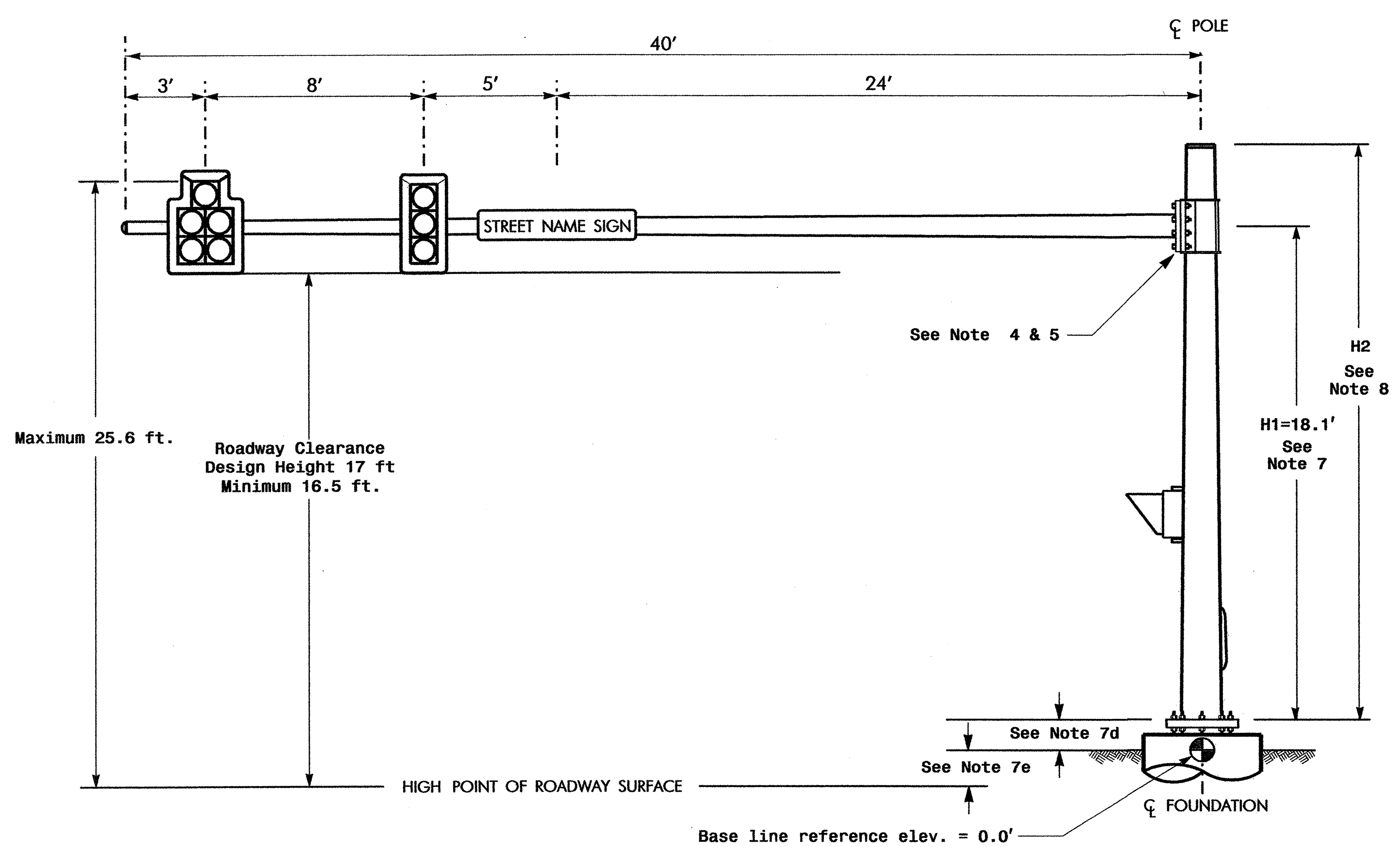
SIG. INVENTORY NO. 12-0723

Design Loading for METAL POLE NO. 5



Elevation View

Design Loading for METAL POLE NO. 6



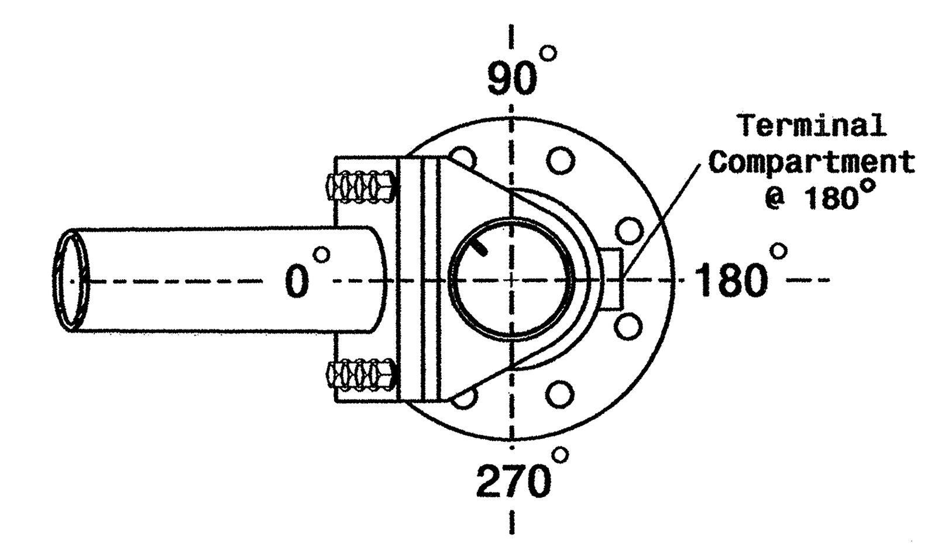
Elevation View

SPECIAL NOTE

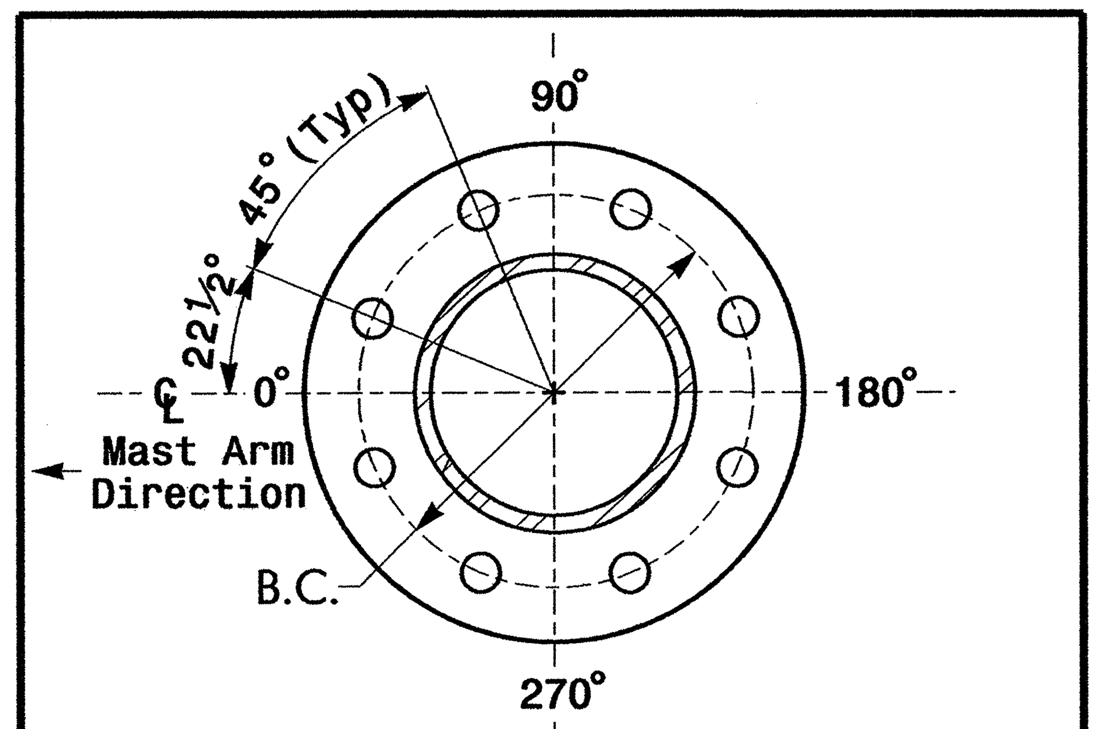
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 5	Pole 6
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+3.0 ft.	-0.5 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A

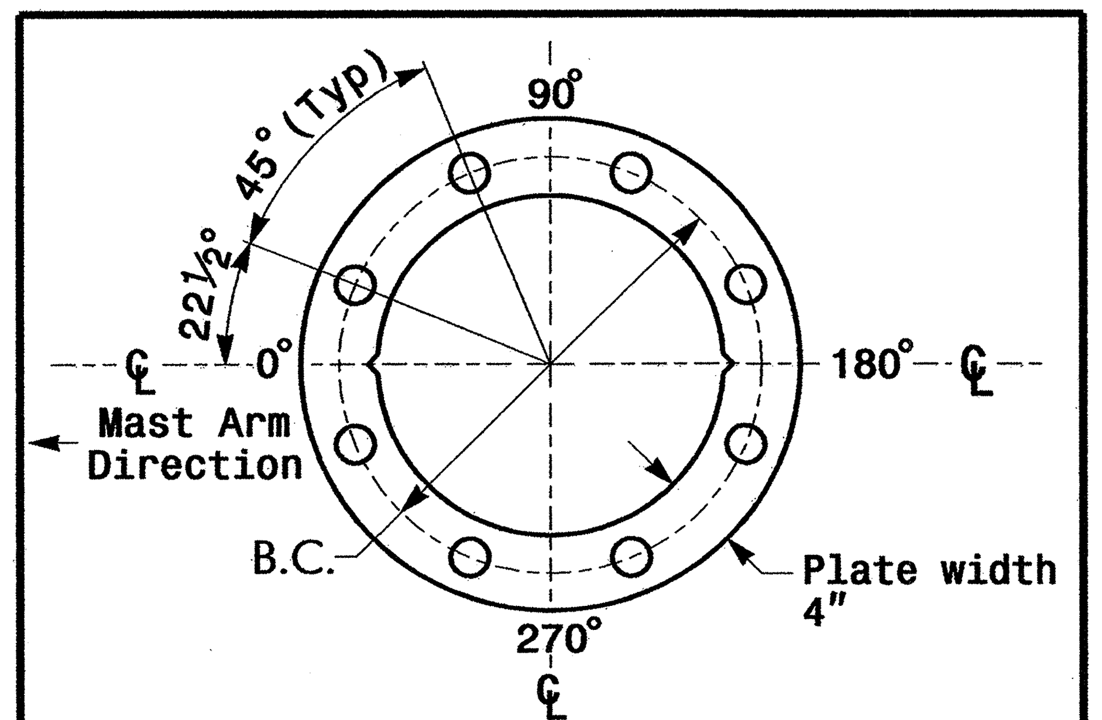


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
STREET NAME SIGN	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

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2002 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2002 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: http://www.doh.dot.state.nc.us/preconstruct/traffic/tmssu/ws/mpoles/poles.htm

Design Requirements

2. 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.
3. Maximum allowable CSR for all signal supports is 0.9.
4. 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.
5. 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.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
8. 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 ½ of the total height of the mast arm attachment assembly plus 1 foot.
9. 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.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. 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: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section, North Carolina Department of Transportation

122 N. McDowell St., Raleigh, NC 27603

SR 1007 (Lenoir Rhyne Blvd. SE) at SR 1007 (Highland Avenue SE)/ 8th St. Place SE

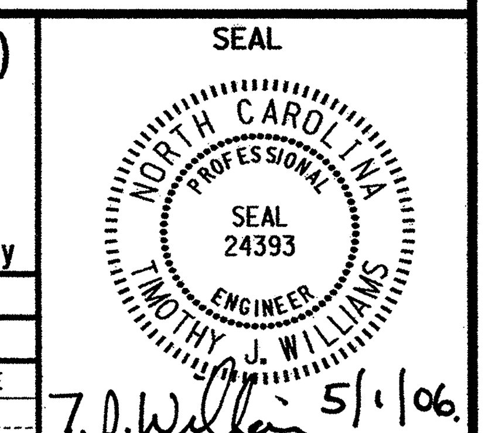
Division 12	Catawba County	Hickory
PLAN DATE: February 2006	REVIEWED BY: I.O.Umozurike	
PREPARED BY: Luhr	REVIEWED BY:	

SCALE: 0 N/A

N/A

REVISIONS	INIT.	DATE

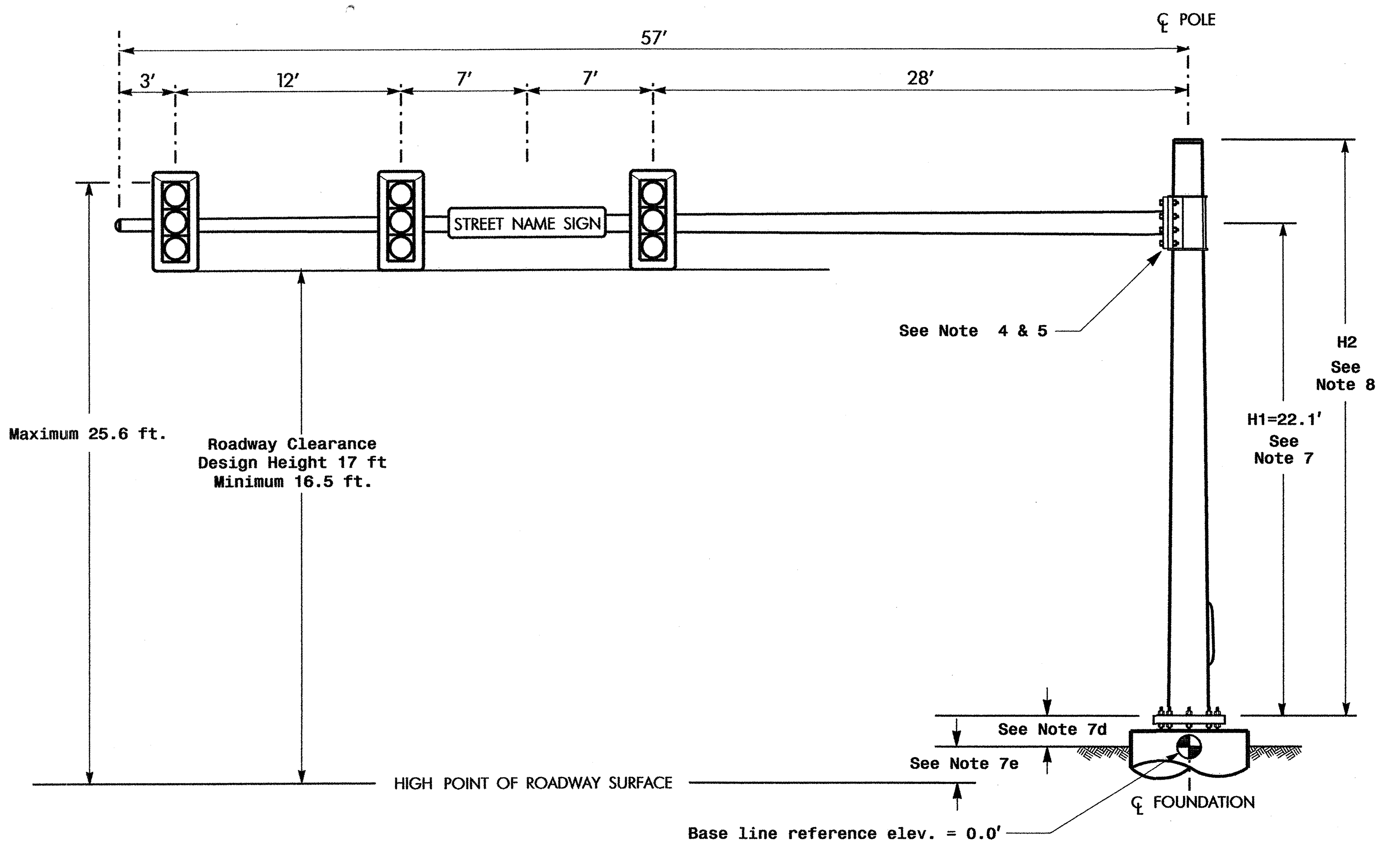
SEAL



SIGNATURE DATE

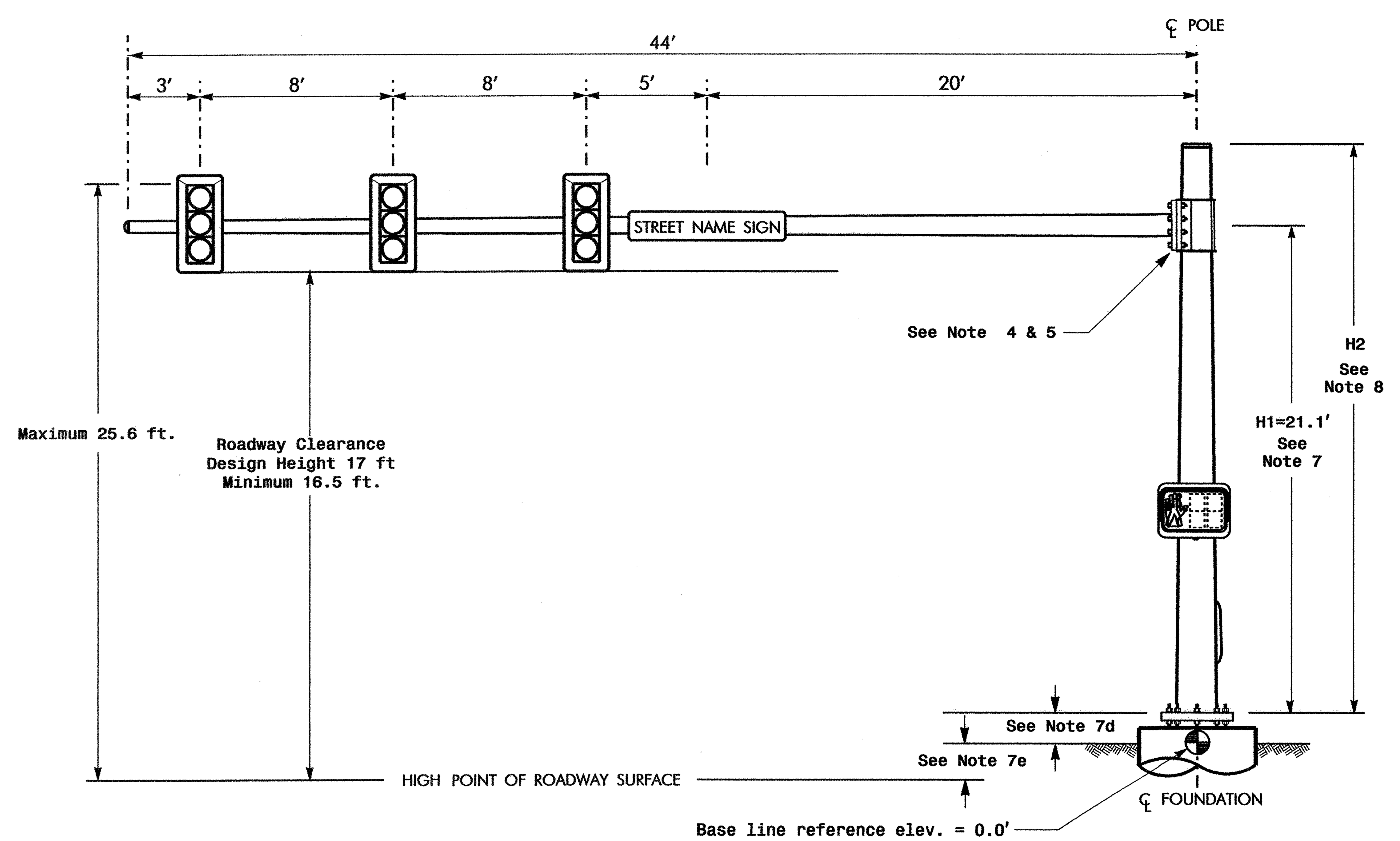
SIG. INVENTORY NO. 12-0723

Design Loading for METAL POLE NO. 7



Elevation View

Design Loading for METAL POLE NO. 8



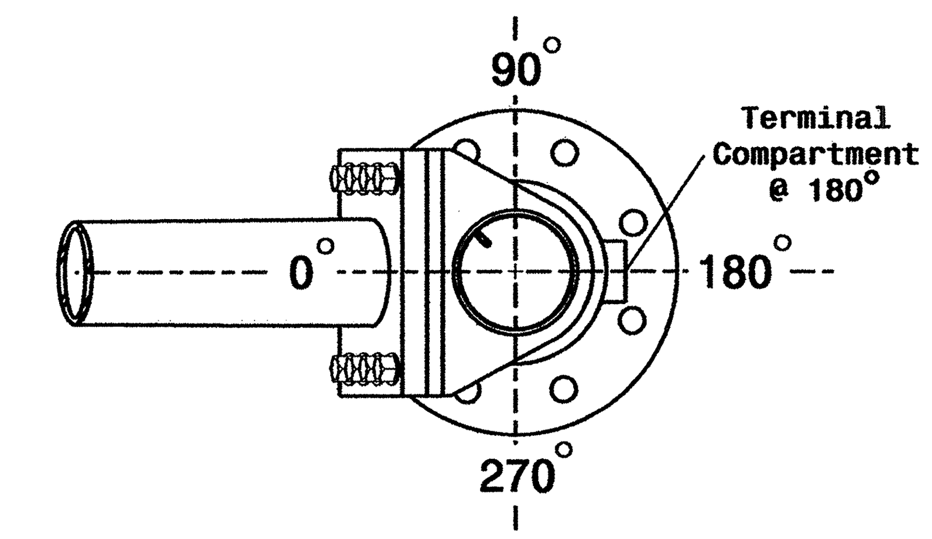
Elevation View

SPECIAL NOTE

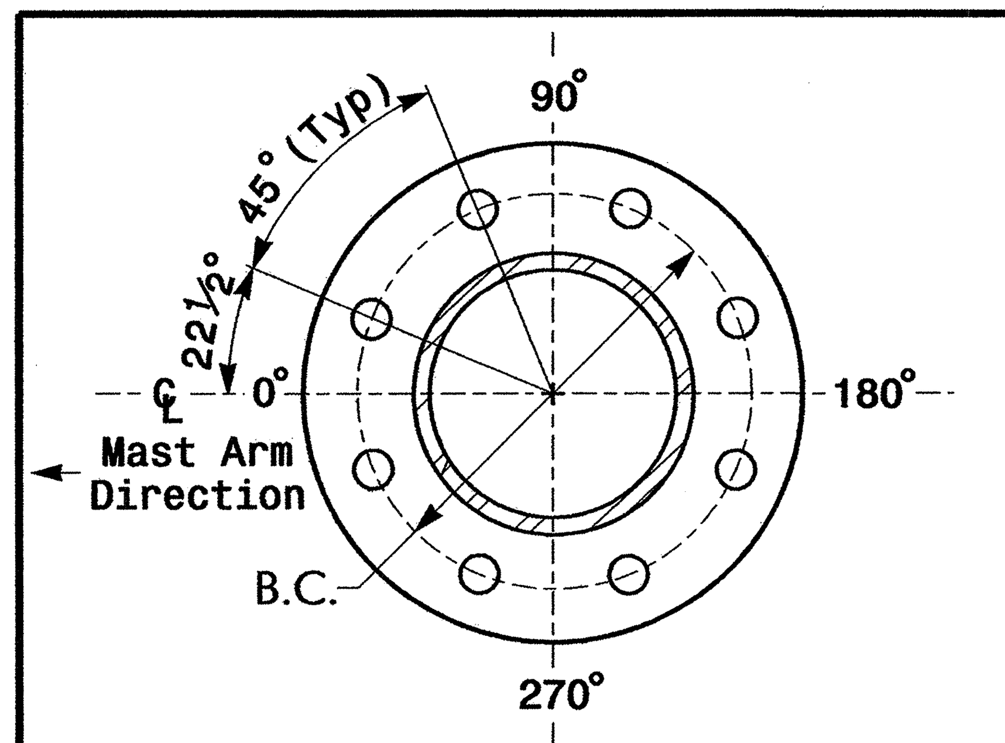
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 7	Pole 8
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+3.5 ft.	+2.5 ft.
Elevation difference at Edge of travelway or face of curb	N/A	N/A

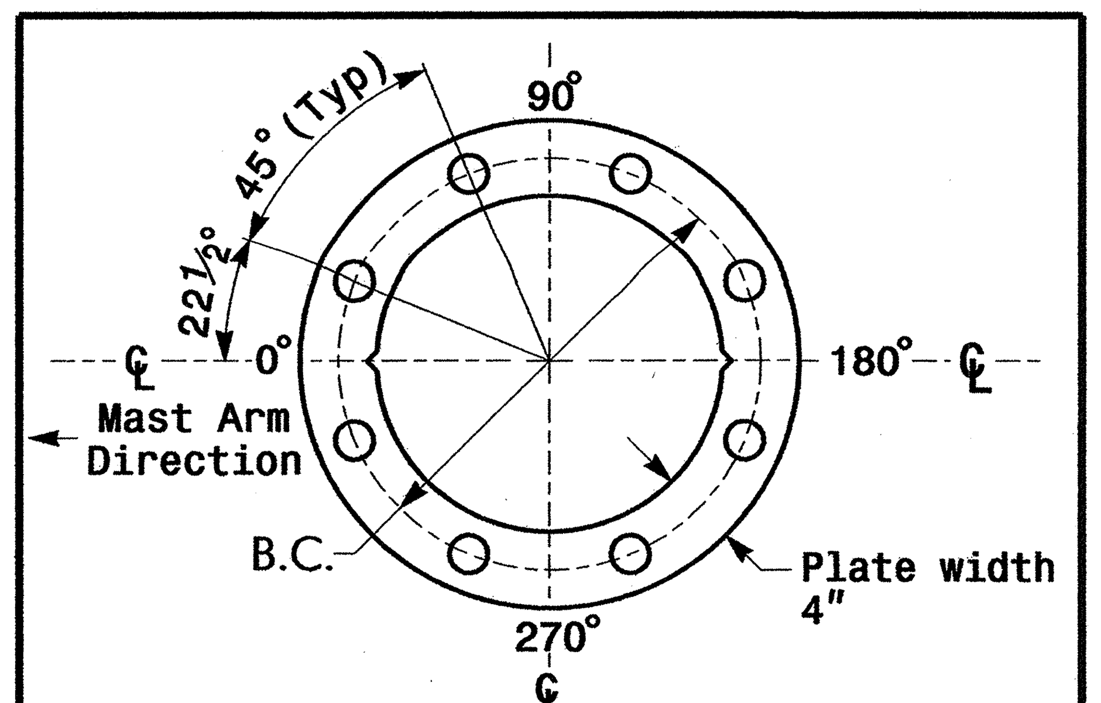


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
STREET NAME SIGN	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

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3. Maximum allowable CSR for all signal supports is 0.9.
4. 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.
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6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
8. 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 ½ of the total height of the mast arm attachment assembly plus 1 foot.
9. 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.
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11. 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: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section, 122 N. McDowell St., Raleigh, NC 27603

SR 1007 (Lenoir Rhyne Blvd. SE) at SR 1007 (Highland Avenue SE)/ 8th St. Place SE

Division 12 Catawba County Hickory

PLAN DATE: February 2006	REVIEWED BY: I.O.Umozurike
PREPARED BY: Luhr	REVIEWED BY:

SCALE: 0 N/A — N/A

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 24393 TIMOTHY J. WILLIAMS

SIGNATURE 5/1/06 DATE

SIG. INVENTORY NO. 12-0723

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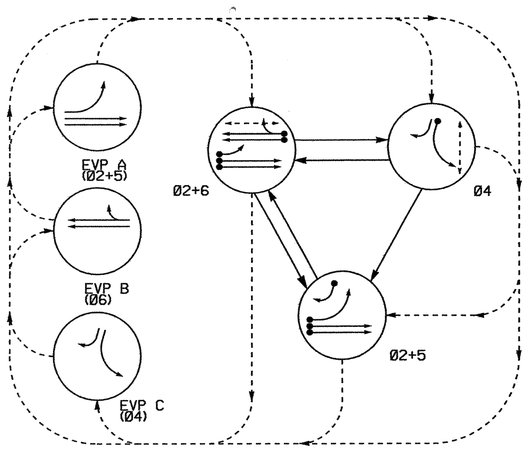
METRIC	PROJECT REFERENCE NO.	SHEET NO.
	U-2306 A	Sig. 2

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT
- EV PREEMPTION SEQUENCE PHASING

TABLE OF OPERATION

SIGNAL FACE	PHASE							
	Ø2+5	Ø2+6	Ø4	EVP A	EVP B	EVP C	FLASH
21	G	G	R	G	R	R	Y
22	G	G	R	G	R	R	Y
41	R	R	G	R	R	G	R
42	R	R	G	R	R	G	R
61, 62	R	G	R	R	G	R	Y
P41, P42	DW	DW	W	DW	DW	DW	DRK
P61, P62	DW	W	DW	DW	DW	DW	DRK

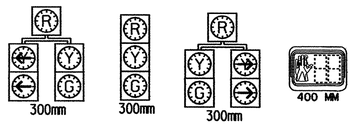
LOOP & DETECTOR UNIT INSTALLATION CHART
170 CONTROLLER AND CABINET

INDUCTIVE LOOPS						DETECTOR PROGRAMMING													
							TIMING		ATTRIBUTES									STATUS	
LOOP NO.	SIZE (m)	TURNS	DIST. FROM STOPBAR (m)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	1.8X1.8	4	20	X		2	- SEC.	- SEC.					X		X			X	
2B	1.8X1.8	4	20	X		2	- SEC.	- SEC.					X		X			X	
4A	1.8X12	2-4-2	0	X		4	- SEC.	- SEC.					X		X			X	
5A	1.8X12	2-4-2	0	X		5	15 SEC.	- SEC.					X		X			X	
						2	- SEC.	- SEC.					X		X			X	
5B	1.8X12	2-4-2	0	X		5	15 SEC.	- SEC.					X		X			X	
6A	1.8X1.8	4	20	X		6	- SEC.	- SEC.					X		X			X	
6B	1.8X1.8	4	20	X		6	- SEC.	- SEC.					X		X			X	
P41,P42	N/A	N/A	N/A	X		4	- SEC.	- SEC.		X								X	
P61,P62	N/A	N/A	N/A	X		6	- SEC.	- SEC.		X								X	
A*	EV PREEMPTOR A			X		EVPA	- SEC.	- SEC.											
B*	EV PREEMPTOR B			X		EVPB	- SEC.	- SEC.											
C*	EV PREEMPTOR C			X		EVPC	- SEC.	- SEC.											

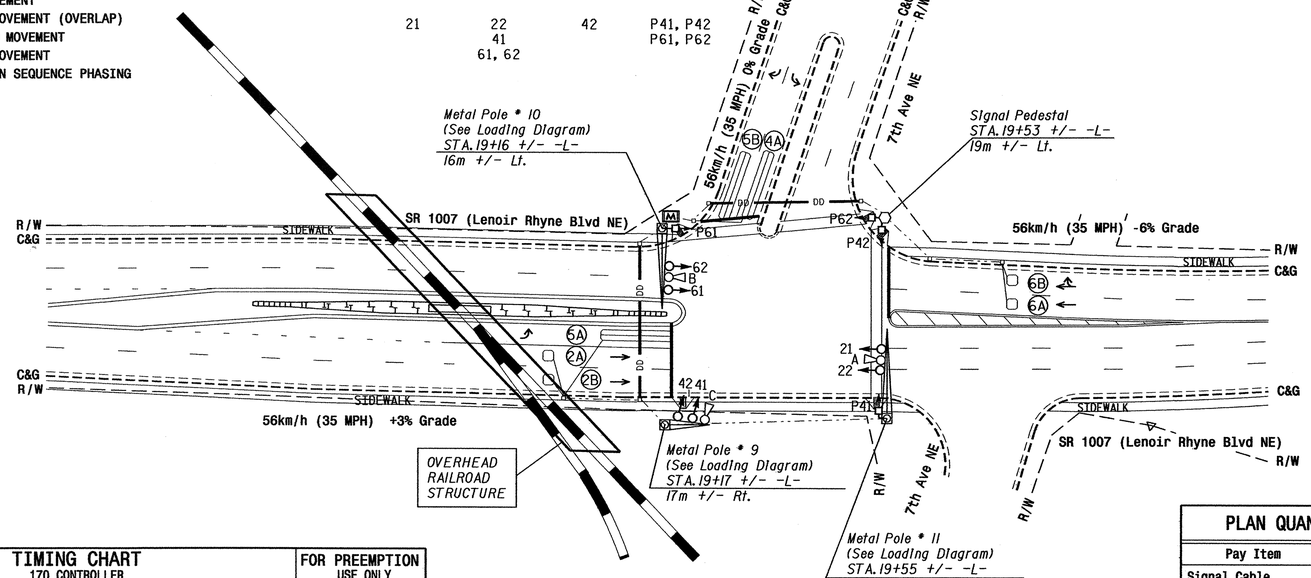
* Optical Detection Unit

SIGNAL FACE I.D.

Denotes L.E.D.



21 | 22, 41, 61, 62 | 42 | P41, P42, P61, P62



TIMING CHART
170 CONTROLLER

PHASE	Ø2	Ø4	Ø5	Ø6	FOR PREEMPTION USE ONLY
MINIMUM INITIAL	10 SEC.	7 SEC.	7 SEC.	10 SEC.	OL 1
VEHICLE EXTENSION	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	-
YELLOW CHANGE INT.	3.7 SEC.	3.0 SEC.	3.0 SEC.	4.3 SEC.	3.0
RED CLEARANCE	2.4 SEC.	3.4 SEC.	3.1 SEC.	2.1 SEC.	3.1
MAXIMUM LIMIT	60 SEC.	30 SEC.	20 SEC.	60 SEC.	-
RECALL POSITION	VEH RECALL	NONE	NONE	VEH RECALL	NONE
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	NONE	YELLOW LOCK	NONE
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF
WALK	- SEC.	7 SEC.	- SEC.	7 SEC.	-
FLASHING DON'T WALK	- SEC.	20 SEC.	- SEC.	21 SEC.	-
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	-
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	-
ADD PER VEHICLE	- SEC.	- SEC.	- SEC.	- SEC.	-
MAXIMUM INITIAL	- SEC.	- SEC.	- SEC.	- SEC.	-
MAXIMUM GAP	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	-
REDUCE 0.1 SEC EVERY	- SEC.	- SEC.	- SEC.	- SEC.	-
MINIMUM GAP	3.0 SEC.	2.0 SEC.	2.0 SEC.	3.0 SEC.	-

170 EMERGENCY PREEMPTION TIMING CHART

FUNCTION	EVA (Ø2+5) SECONDS	EVB (Ø6) SECONDS	EVC (Ø4) SECONDS
DELAY BEFORE PREEMPT	0	0	0
PED. CLEAR BEFORE PREEMPT	11	11	11
MIN. GREEN BEFORE PREEMPT	1.0	1.0	1.0
CLEARANCE TIME	1.0	1.0	1.0
PREEMPT EXTEND(timing on optical detection unit)	2.0	2.0	2.0

PLAN QUANTITIES

Pay Item	Meters
Signal Cable	360
Messenger Cable	0
Lead-in Cable	240

This Plan Shall Supersede The Plan Signed and Sealed on 5/24/2004

New Installation

3 Phase
W/ Emergency Vehicle Preemption
Fully Actuated
(Hickory City Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Program signal heads numbered 61 and 62 to clear to all red before going into preempt.
4. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
5. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values shall supersede these values.
6. During coordination, phase 5 may be lagged.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
9. Set all detector units to presence mode.
10. Set phase bank 3 maximum limit to 250 seconds for phases used.
11. Preemption calls shall be served in the sequence which they are received.
12. This intersection features an optical preemption system. Shown location of optical detectors are conceptual only. Manufacturer shall determine optimum location of detectors.
13. Hickory City System: #1115
14. Place cabinet so as not to obstruct sight distance of vehicles turning right on red.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	50mm Underground Conduit	
N/A	Right of Way with Marker	
	Directional Arrow	
	Pavement Marking Arrow	
N/A	Guardrail	
DD	Directional Drill 2-50mm Polyethylene Conduits	N/A
	Metal Pole with Mastarm	
N/A	Wheelchair Ramp	
N/A	Railroad Tracks	
	Optical Detector	
	Pedestrian Signal Pedestal	
M	Master Controller & Cabinet	M

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

SR 1007 (Lenoir Rhyne Blvd NE) at 7th Avenue NE

Division 12 Catawba County Hickory

PLAN DATE: February 2006 REVIEWED BY: I.O.Umozurike

PREPARED BY: Luhr REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 5 0 10 1:500

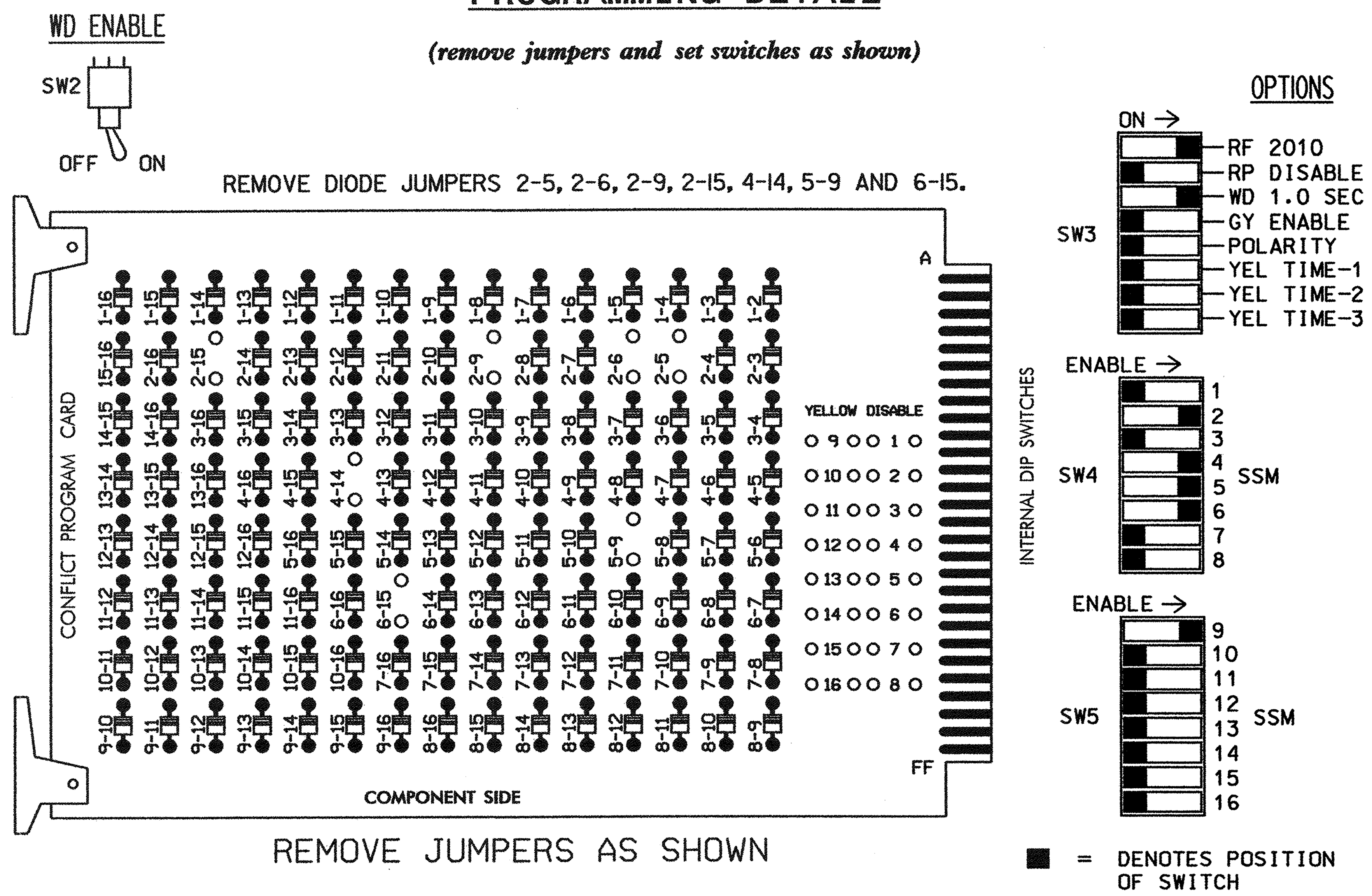
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24393 ENGINEER TIMOTHY J. WILLIAMS
SIGNATURE DATE 4/28/06

SIG. INVENTORY NO. 12-1362

28-APR-2006 11:46
s:\#ts signal\workgroups\#tp projects\u-2306a\2006updatedsignals\#12-1362\#12136 2_sig.dsn_2006xxx.dgn
luhr

EDI MODEL 2010ECL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

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. 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, 8,10,11,12,13,14,15 & 16 TO LOAD SWITCH AC+ PER THE CABINET MANUFACTURER'S INSTRUCTIONS.
3. PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. THE CABINET AND CONTROLLER ARE PART OF THE CITY OF HICKORY SIGNAL SYSTEM: # 1115

PROJECT REFERENCE NO.	SHEET NO.
U-2306 A	Sig. 13

* SEE 'LOAD RESISTOR INSTALLATION DETAIL'

** SEE 'COUNTDOWN PEDESTRIAN SIGNAL OPERATION' NOTE

FIELD CONNECTION HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	P41, P42	21	61,62	P61, P62	NU	NU	NU	42	NU	NU	NU	NU	NU
GREEN		130			103			136										
YELLOW		129			102			135										
RED		128			101		*	134					*					
RED ARROW																		
YELLOW ARROW							132						A122					
GREEN ARROW							133						A123					
** WALK						106			121									
** DON'T WALK						104			119									

NU = NOT USED

EQUIPMENT INFORMATION

CONTROLLER.............CONTRACTOR SUPPLIED 170E
*CABINET ....CONTRACTOR SUPPLIED 332
SOFTWARE ....BI TRANS 233NC2
CABINET MOUNT..........BASE
OUTPUT FILE POSITIONS..18 (12-STD, 6-AUX)
LOAD SWITCHES USED.....S2,S4,S4P,S5,S6,S6P,S9
PHASES USED...........2,4,5,6,4PED,6PED
OVERLAPS...............OL1=ø5

MASTER CONTROLLER MOUNTED IN THIS CABINET*

OVERLAP PROGRAMMING NOTES

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

TO SET THE PARENT PHASE FOR OVERLAP 1 (VEH. SET 1) AS PHASE 5, PROGRAM CONTROLLER AT KEYPAD INPUT E/29+1+1=ø5

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

PROGRAM TIMING FOR OVERLAP 1 AS FOLLOWS:
GREEN CLEAR - E/29+1+D=0.0 (SEC.)
YELLOW CHANGE INTERVAL - E/29+1+E=3.0 (SEC.)
RED CLEARANCE - E/29+1+F=3.1 (SEC.)

INPUT FILE POSITION LAYOUT

(front view)

FILE		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	ø2 2A	ø5,2 5A	SLOT EMPTY	SLOT EMPTY	ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	NOT USED	ø6PED DC ISOLATOR	FS DC ISOLATOR
	L	SLOT EMPTY	ø2 2B	ø5 5B	SLOT EMPTY	SLOT EMPTY	NOT USED	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø4PED DC ISOLATOR	NOT USED	ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	ø6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	EVA * AC ISOLATOR	EVB * AC ISOLATOR	SLOT EMPTY
	L	SLOT EMPTY	ø6 6B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	EVC * AC ISOLATOR	NOT USED	SLOT EMPTY

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

FS = FLASH SENSE
ST = STOP TIME
EV = EMERG. VEH. PREEMPT

EVA - CHANNEL 1 - PIN 71
EVB - CHANNEL 2 - PIN 72
EVC - CHANNEL 3 - PIN 73
CHANNEL 4 - SPARE

*NOTE: WIRE OPTICAL DETECTORS TO INPUT FILE PER MANUFACTURER'S INSTRUCTIONS.

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
2A	TB2-5,6	I2U	1	39	5 7	2
2B	TB2-7,8	I2L	2	43	5 7	2
4A	TB4-9,10	I6U	3	41	5 7	4
5A	TB2-9,10	I3U	4	63	5 7	5
			5	63	5 7	2
5B	TB2-11,12	I3L	6	76	5 7	5
6A	TB3-5,6	J2U	7	40	5 7	6
6B	TB3-7,8	J2L	8	44	5 7	6
PED PUSH BUTTONS						
P41, P42	TB8-5,6	I12L	9	69	2	4
P61, P62	TB8-7,9	I13U	10	68	2	6

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

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

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

HEAD 42 ARROWS (OL1) OPERATION DURING PREEMPTION

IN ORDER FOR E.V. PREEMPT 'A' TO OPERATE AS PHASES 2 AND 5 WITHOUT SIGNAL HEAD 42 RIGHT-TURN ARROWS (OVERLAP 'OL1'), THE FOLLOWING PROGRAMMING MUST BE IN PLACE:

ASSIGN O/L VEH. SET 2 INPUT AT E/126+D+C= 200
ASSIGN E.V. PREEMPT EVA OUTPUT AT E/127+D+8= 200

200 = ASSIGNABLE PSEUDO-PIN (SOFTWARE)

SPECIAL NOTE: HEADS 61,62

IT IS NECESSARY FOR HEADS 61 AND 62 TO CLEAR TO 'ALL RED' BEFORE GOING TO EMERGENCY VEHICLE PREEMPTION 'B' FROM PHASE 2+6. PROGRAM THE 170E CONTROLLER AS FOLLOWS:

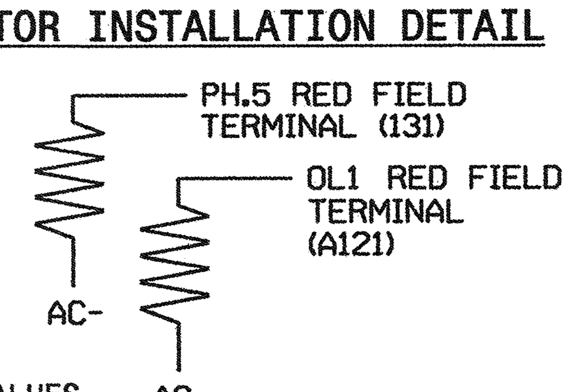
PROGRAM PHASE 1 AS PROTECTED/PERMITTED
AT KEYPAD INPUT: E/125+E+4=ø1

NOTE: PHASE 1 WILL ALSO HAVE TO BE PROGRAMMED AS AN ACTIVE PHASE IN E.V. PREEMPT 'B'. (SEE PREEMPTION CHART THIS SHEET)

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1362
DESIGNED: FEBRUARY 2006
SEALED: 4/28/06
REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED MAY 2004 AND SEALED 6/7/04

LOAD RESISTOR INSTALLATION DETAIL



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

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

PEDESTRIAN CLEAR BEFORE PREEMPT TIMING

PROGRAM PED. PHASE 4 MIN. CLEAR BEFORE PREEMPT AT F/1+4+B= 11 (SEC.)
PROGRAM PED. PHASE 6 MIN. CLEAR BEFORE PREEMPT AT F/1+6+B= 11 (SEC.)

EMERGENCY VEHICLE PREEMPTION PROGRAMMING CHART

E. V. PREEMPT	OPTICAL DET. NO.	INPUT PIN	CLEARANCE PHASES LOCATION	DELAY TIME LOCATION	CLEAR TIME LOCATION
EVA	A	E/126+F+1=71	E/125+E+A=ø2,5	F/1+E+2=0	F/1+E+3= 1 (SEC.)
EVB	B	E/126+F+2=72	E/125+E+B=ø1,6	F/1+E+4=0	F/1+E+5= 1 (SEC.)
EVC	C	E/126+F+3=73	E/125+E+C=ø4	F/1+E+6=0	F/1+E+7= 1 (SEC.)

1. PROGRAM MINIMUM GREEN BEFORE PREEMPT AT: F/1+0+8= 1 (SEC.)
2. FOR PREEMPTION IMMEDIATE RESPONSE, DISABLE MIN. WALK AT: E/125+F+F=3
3. PROGRAM EXTEND TIME ON OPTICAL DETECTOR UNITS FOR 2.0 SEC.

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.

PEDESTRIAN PHASE PROGRAMMING

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

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1007 (LENOIR RHYNE BLVD NE)
at
7th AVENUE NE

DIVISION 12 CATAWBA COUNTY HICKORY
PLAN DATE: APRIL 2006 REVIEWED BY:
PREPARED BY: F.E. RUSS REVIEWED BY:
REVISIONS INIT. DATE

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Signals Management Section
122 N. McDowell St., Raleigh, NC 27603

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022013 GEORGE C. BROWN

George C. Brown 5/1/06
SIGNATURE DATE
SIG. INVENTORY NO. 12-1362

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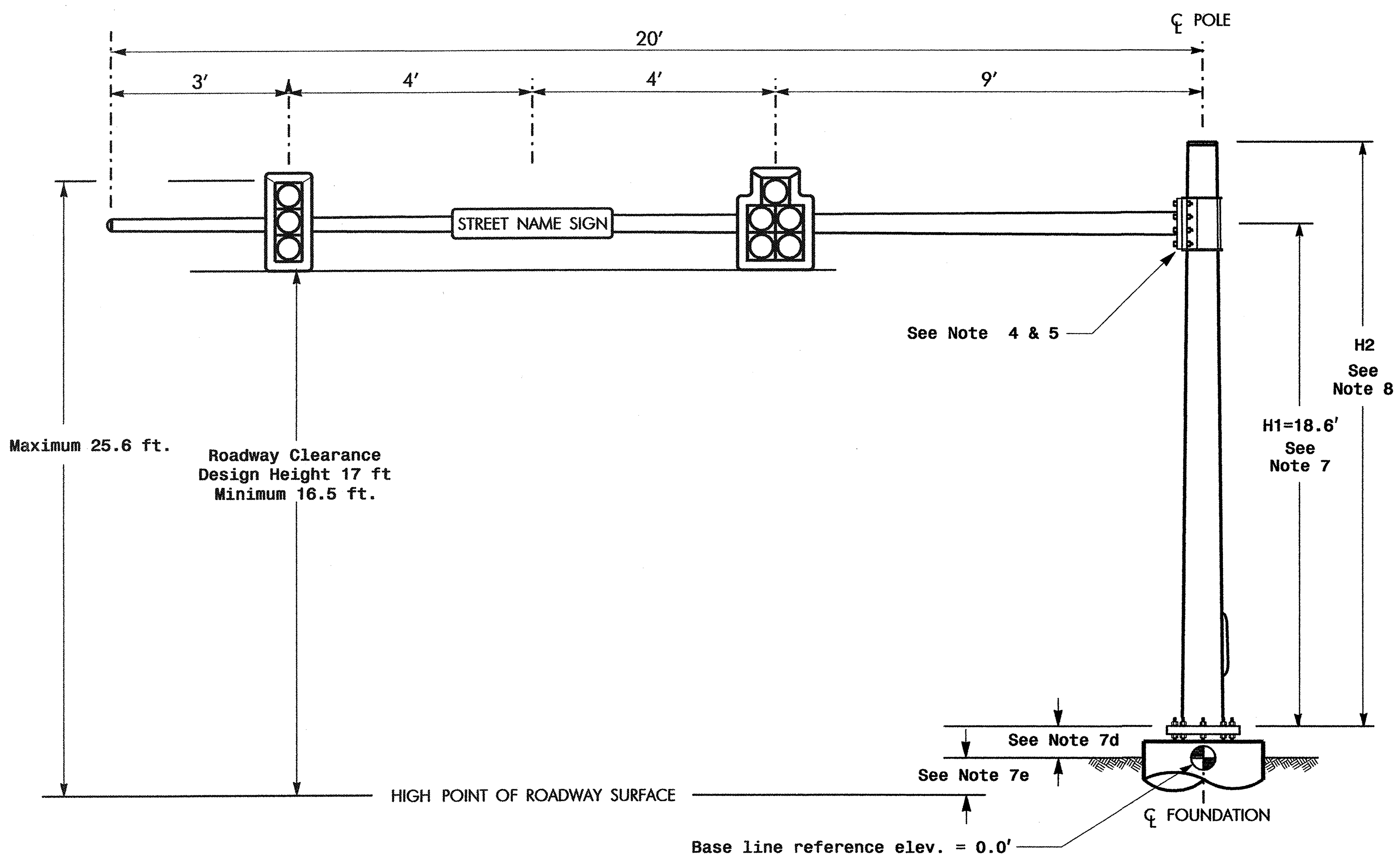
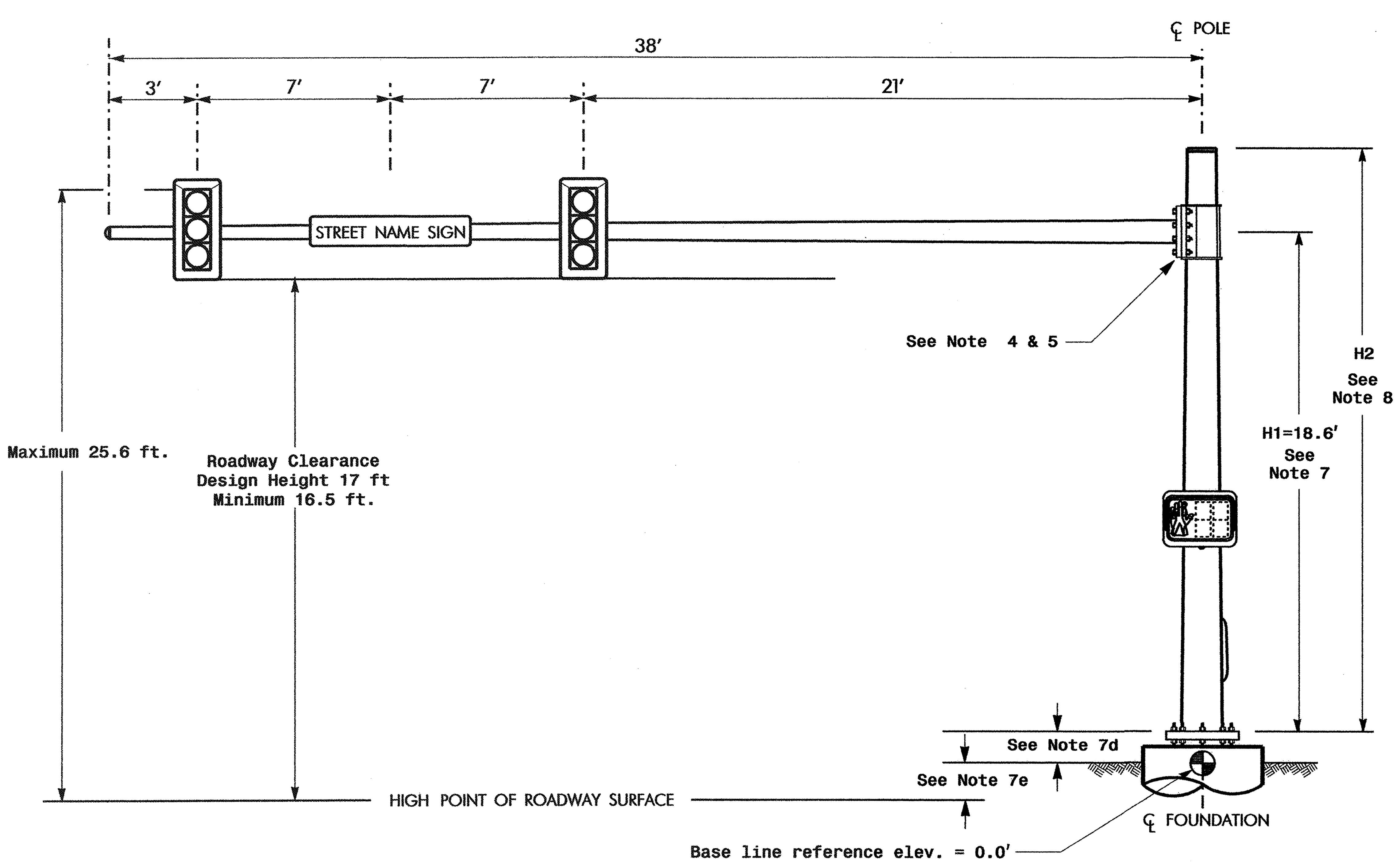
Design Loading for METAL POLE NO. 9



ELEVATION VIEW

Design Loading for METAL POLE NO. 10



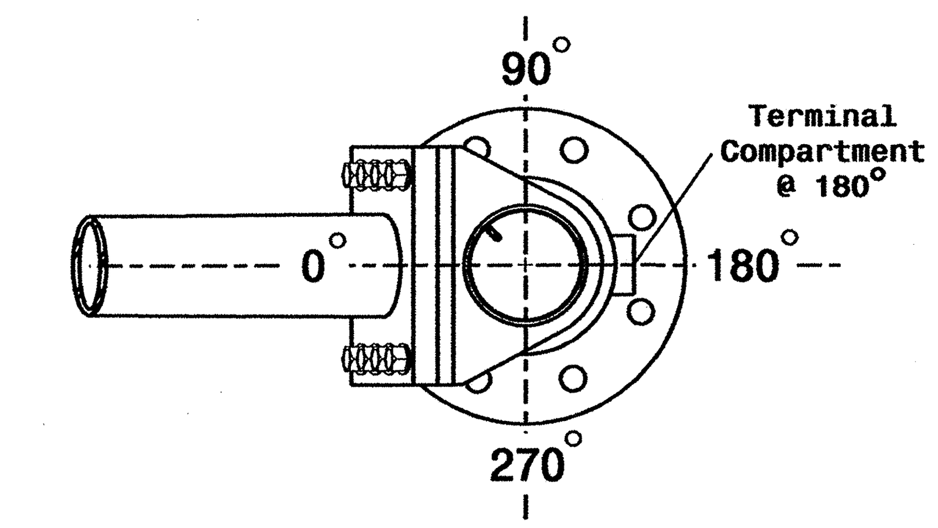
ELEVATION VIEW

SPECIAL NOTE

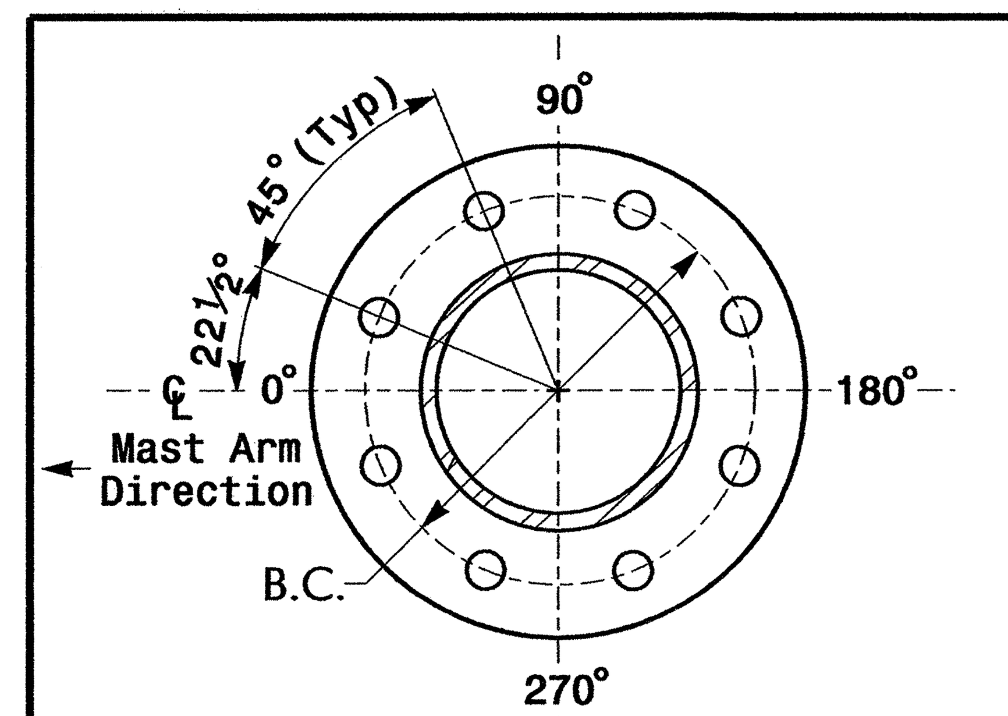
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 9	Pole 10
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	0.0	0.0
Elevation difference at Edge of travelway or face of curb	N/A	N/A

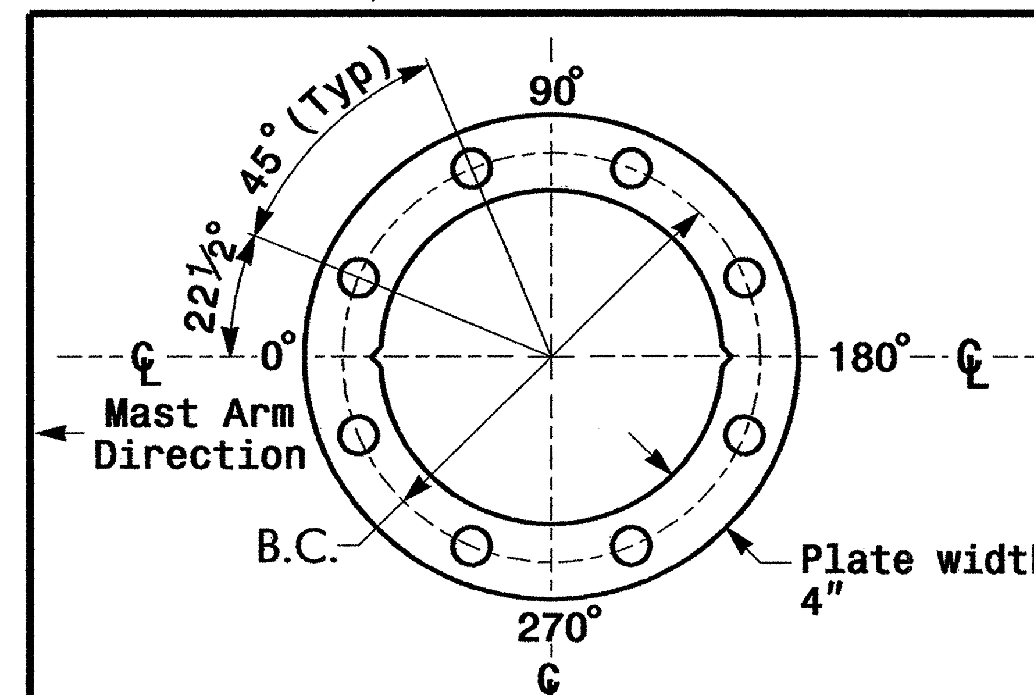


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
STREET NAME SIGN	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

1. Design the traffic signal structure and foundation in accordance with:
   - The 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2002 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2002 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: http://www.ncdot.org/doh/preconstruct/traffic/tmssu/ws/mpoles/poles.htm

Design Requirements

2. 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.
3. Maximum allowable CSR for all signal supports is 0.9.
4. 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.
5. 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.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
8. 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 ½ of the total height of the mast arm attachment assembly plus 1 foot.
9. 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.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. 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: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section, North Carolina Department of Transportation

122 N. McDowell St., Raleigh, NC 27603

SR 1007 (Lenoir Rhyne Blvd NE) at 7th Avenue NE

Division 12	Catawba County		Hickory
PLAN DATE:	February 2006	REVIEWED BY:	I.O.Umozurike
PREPARED BY:	Luhr	REVIEWED BY:	

SCALE 0 N/A

N/A

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 24393 TIMOTHY J. WILLIAMS

T.J. Williams 5/1/06

SIGNATURE DATE

SIG. INVENTORY NO. 12-1362

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luhr

METAL POLE No. 11

PROJECT REFERENCE NO.	SHEET NO.
U-2306 A	Sig.15

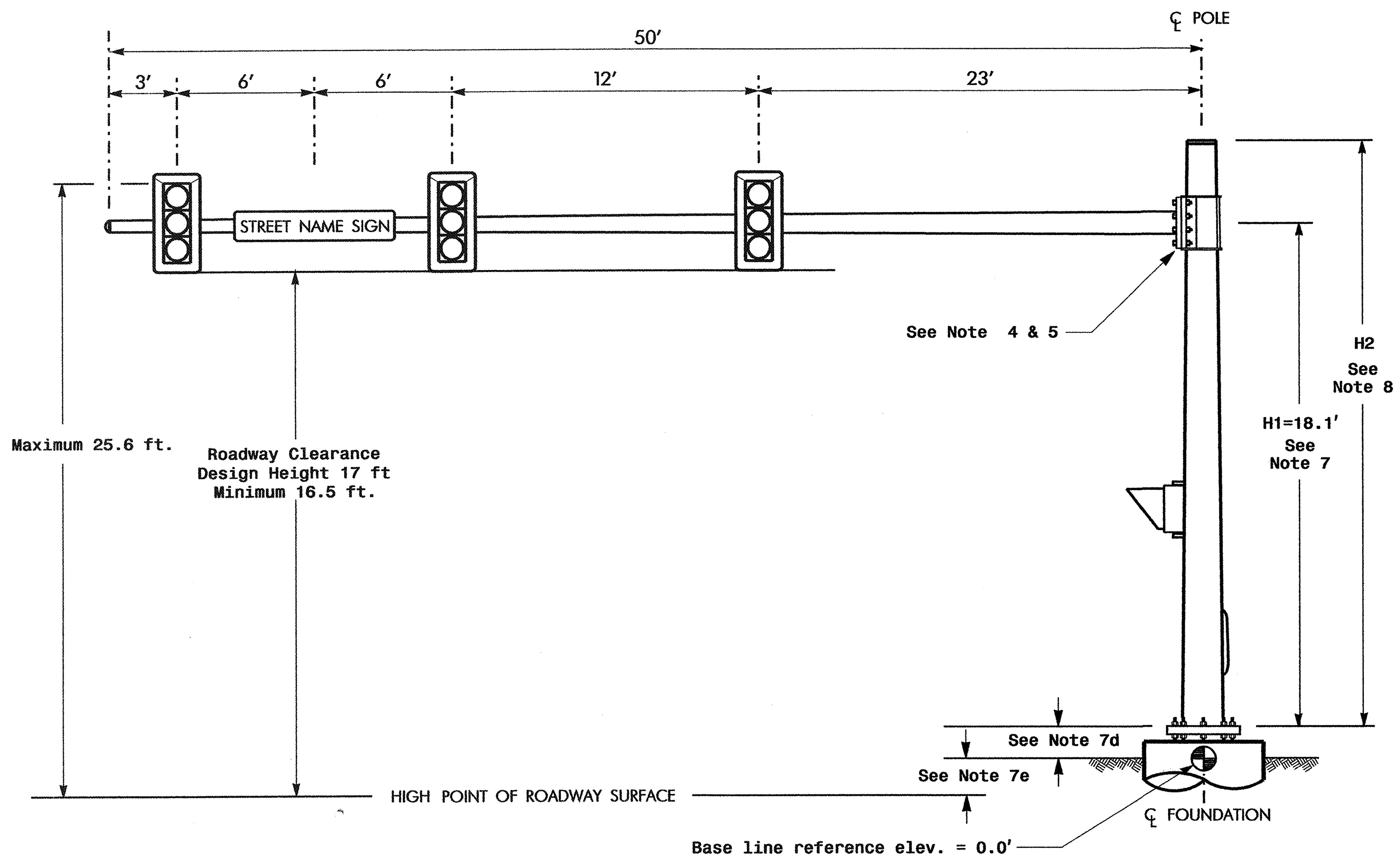
SPECIAL NOTE

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.

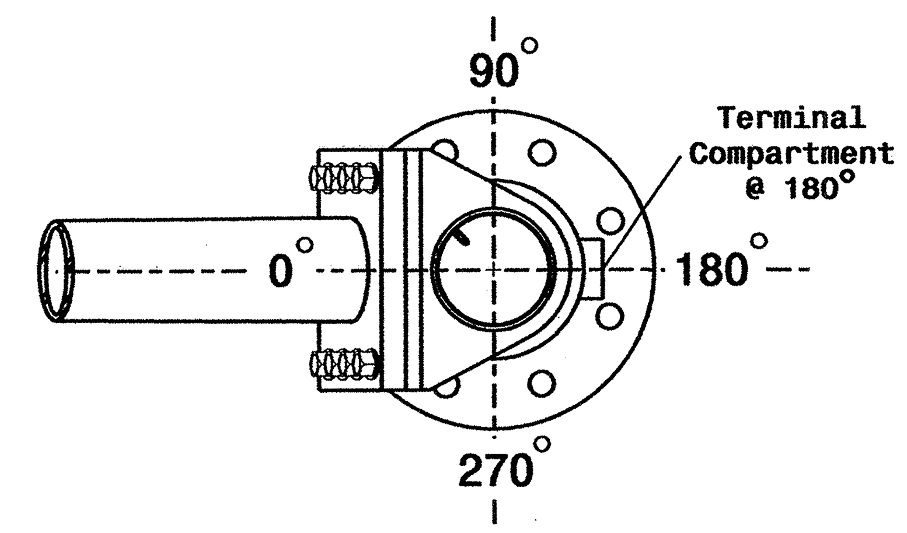
Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 11
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.
Elevation difference at High point of roadway surface	-0.5 ft.
Elevation difference at Edge of travelway or face of curb	N/A

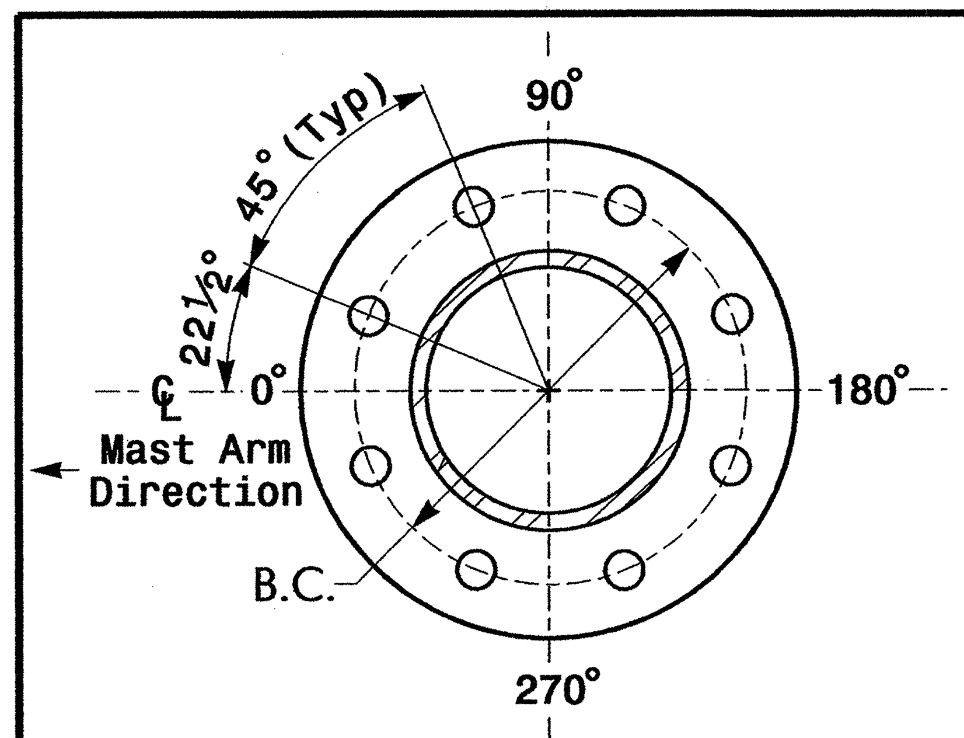
Design Loading for METAL POLE NO. 11



ELEVATION VIEW

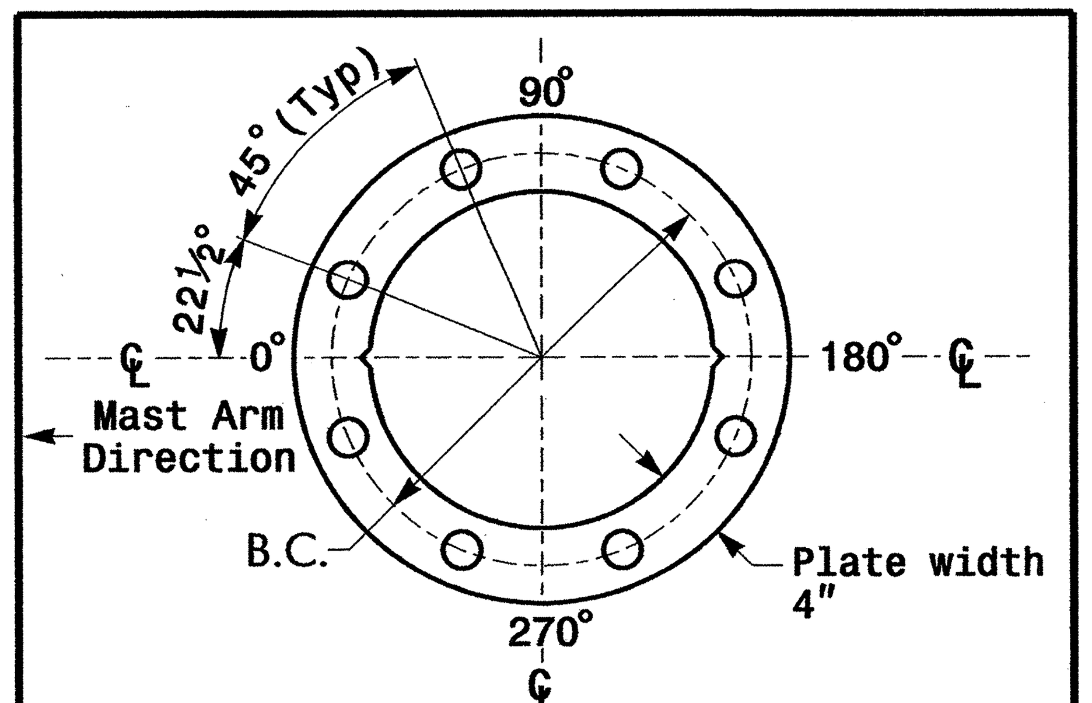


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
STREET NAME SIGN	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

1. 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.
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5. 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.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
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   b. Signal heads attached to the mast arm are rigid mounted and vertically centered on the arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is .75 feet above the ground elevation.
   e. Refer to the Elevation Data chart for elevation differences between the proposed foundation ground level and the high point on the roadway.
8. 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 ½ of the total height of the mast arm attachment assembly plus 1 foot.
9. 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.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. 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: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section

122 N. McDowell St., Raleigh, NC 27603

SCALE: 0 N/A — N/A

SR 1007 (Lenoir Rhyne Blvd NE) at 7th Avenue NE

Division 12 Catawba County Hickory

PLAN DATE: February 2006	REVIEWED BY: I.O.Umozurike
PREPARED BY: Luhr	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24393 ENGINEER TIMOTHY J. WILLIAMS

SIGNATURE 5/1/06 DATE

SIG. INVENTORY NO. 12-1362

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luhr

PROJECT REFERENCE NO. U-2306A | SHEET NO. Sig.16

METRIC

PHASING DIAGRAM

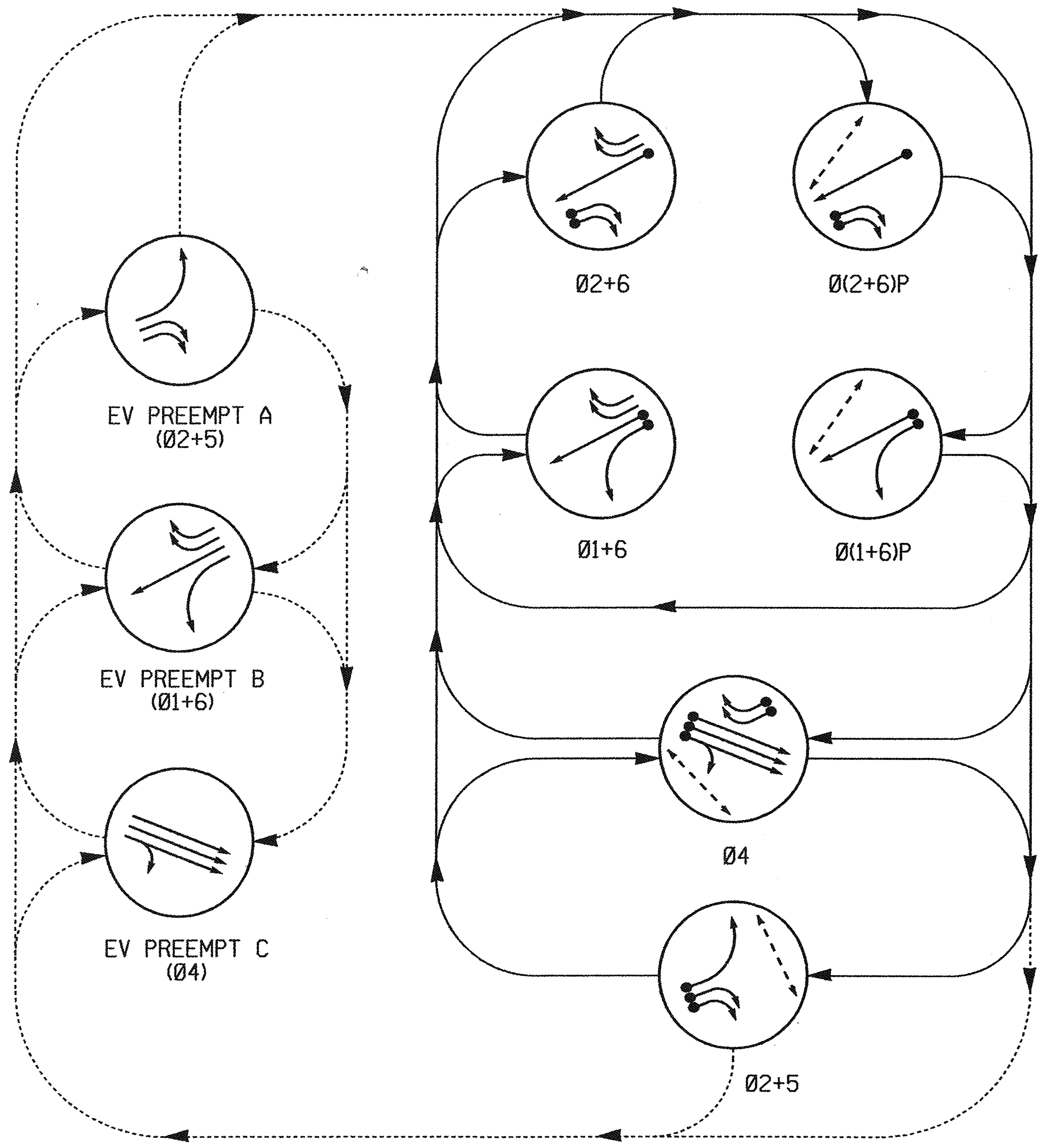


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	Ø2+6P	Ø1+6	Ø1+6P	Ø4	Ø2+5	EVA	EVB	EVC	FLASH
11	←R	←R	←	←	←R	←R	←R	←	←R	←R
21, 22	→	→	R→	R→	R→	→	→	R→	R→	Y→
41, 42	R	R	R	R	G	R	R	R	G	R
43, 44	→	R→	→	R→	→	R→	R→	→	R→	R→
51	←R	←R	←R	←R	←R	←	←	←R	←R	←R
61, 62	G	G	G	G	R	R	R	G	R	Y
P41, P42	DW	DW	DW	DW	W	DW	DW	DW	DW	DRK
P51, P52	DW	DW	DW	DW	DW	W	DW	DW	DW	DRK
P61, P62	DW	W	DW	W	DW	DW	DW	DW	DW	DRK

LOOP & DETECTOR UNIT INSTALLATION CHART
170 CONTROLLER AND CABINET

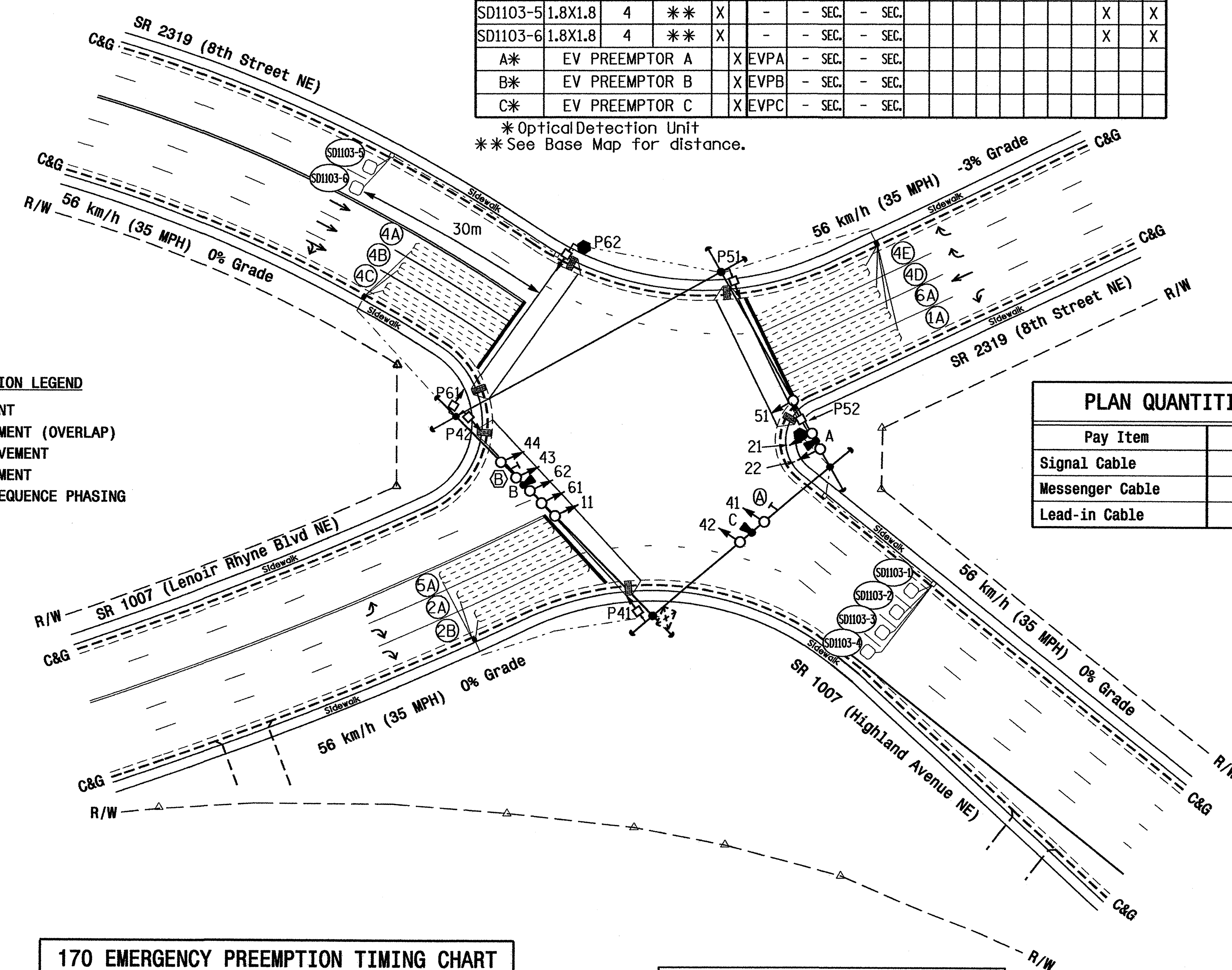
INDUCTIVE LOOPS: LOOP NO.	SIZE (m)	TURNS	DIST. FROM STOPBAR (m)	NEW	EXISTING	DETECTOR PROGRAMMING: NEMA PHASE	TIMING: DELAY	CARRY (STRETCH)	ATTRIBUTES 1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	STATUS: NEW	EXISTING
1A	1.8X18	2-4-2	0		X	1	- SEC.	- SEC.					X		X				X
2A	1.8X18	2-4-2	0		X	2	10 SEC.	- SEC.					X		X				X
2B	1.8X18	2-4-2	0		X	2	10 SEC.	- SEC.					X		X				X
4A	1.8X18	2-4-2	0		X	4	3 SEC.	- SEC.					X		X				X
4B	1.8X18	2-4-2	0		X	4	- SEC.	- SEC.					X		X				X
4C	1.8X18	2-4-2	0		X	4	10 SEC.	- SEC.					X		X				X
4D	1.8X18	2-4-2	0		X	4	- SEC.	- SEC.					X		X				X
4E	1.8X18	2-4-2	0		X	4	- SEC.	- SEC.					X		X				X
5A	1.8X18	2-4-2	0		X	5	- SEC.	- SEC.					X		X				X
6A	1.8X18	2-4-2	0		X	6	- SEC.	- SEC.					X		X				X
P41, P42	N/A	N/A	N/A	X		4	- SEC.	- SEC.		X									X
P51, P52	N/A	N/A	N/A	X		5	- SEC.	- SEC.		X									X
P61, P62	N/A	N/A	N/A	X		6	- SEC.	- SEC.		X									X
SD1103-1	1.8X1.8	4	+70	X		-	- SEC.	- SEC.									X		X
SD1103-2	1.8X1.8	4	+70	X		-	- SEC.	- SEC.									X		X
SD1103-3	1.8X1.8	4	+70	X		-	- SEC.	- SEC.									X		X
SD1103-4	1.8X1.8	4	+70	X		-	- SEC.	- SEC.									X		X
SD1103-5	1.8X1.8	4	**	X		-	- SEC.	- SEC.									X		X
SD1103-6	1.8X1.8	4	**	X		-	- SEC.	- SEC.									X		X
A*	EV PREEMPTOR A				X	EVPA	- SEC.	- SEC.											
B*	EV PREEMPTOR B				X	EVPB	- SEC.	- SEC.											
C*	EV PREEMPTOR C				X	EVPC	- SEC.	- SEC.											

* Optical Detection Unit
** See Base Map for distance.

4 Phase Fully Actuated
w/ Emergency Vehicle Preemption
(Hickory City Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Pavement markings are existing.
4. Tether signal heads numbered 43 and 44.
5. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values shall supersede these values.
7. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
8. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
9. Set all detector units to presence mode.
10. Set phase bank 3 maximum limit to 250 seconds for phases used.
11. Optically programmable sections may be replaced by programmable louver sections with LED lenses at the discretion of the Division Traffic Engineer.
12. Hickory City System: # 1103



PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT
- EV PREEMPTION SEQUENCE PHASING

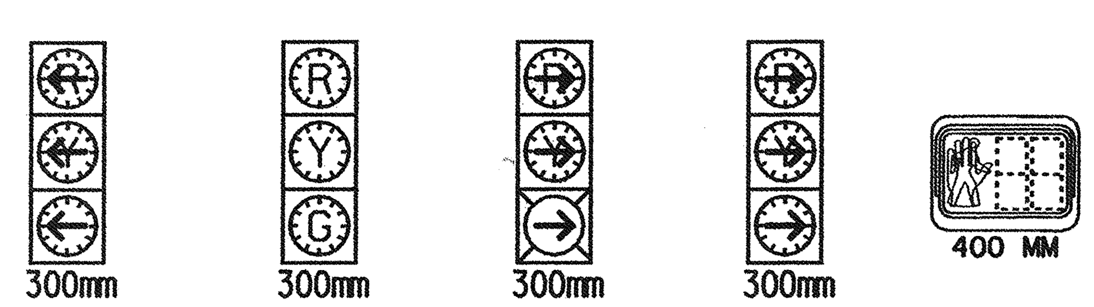
PLAN QUANTITIES

Pay Item	Meters
Signal Cable	680
Messenger Cable	0
Lead-in Cable	550

SIGNAL FACE I.D.

Denotes L.E.D.

Optically Programmable Section (See Note 10)



300mm	300mm	300mm	300mm	400 MM
11 51	41, 42 61, 62	43, 44	21, 22	P41, P42 P51, P52 P61, P62

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	50mm Underground Conduit	
N/A	Right of Way with Marker	
	Directional Arrow	
	Pavement Marking Arrow	
	Optical Detector	
	Pedestrian Signal Pedestal	
(A)	No Left Turn Sign (R3-2)	(A)
(B)	"NO TURN ON RED" Sign (R10-11)	(B)

TIMING CHART
170 CONTROLLER

PHASE	Ø1	Ø2	Ø4	Ø5	Ø6	OL 1
MINIMUM INITIAL	7 SEC.	10 SEC.	7 SEC.	7 SEC.	10 SEC.	- SEC.
VEHICLE EXTENSION	1.0 SEC.	3.0 SEC.	1.0 SEC.	1.0 SEC.	3.0 SEC.	- SEC.
YELLOW CHANGE INT.	3.0 SEC.	3.8 SEC.	3.8 SEC.	3.0 SEC.	4.1 SEC.	3.8 SEC.
RED CLEARANCE	2.4 SEC.	1.8 SEC.	2.8 SEC.	3.4 SEC.	2.5 SEC.	2.8 SEC.
MAXIMUM LIMIT	15 SEC.	55 SEC.	45 SEC.	15 SEC.	55 SEC.	- SEC.
RECALL POSITION	NONE	NONE	NONE	NONE	NONE	NONE
VEHICLE CALL MEMORY	NONE	NONE	NONE	NONE	NONE	NONE
DOUBLE ENTRY	OFF	OFF	OFF	OFF	OFF	OFF
WALK	- SEC.	- SEC.	7 SEC.	7 SEC.	7 SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	22 SEC.	14 SEC.	15 SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MAXIMUM GAP	1.0 SEC.	3.0 SEC.	1.0 SEC.	1.0 SEC.	3.0 SEC.	- SEC.
REDUCE 0.1 SEC EVERY	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.	- SEC.
MINIMUM GAP	1.0 SEC.	3.0 SEC.	1.0 SEC.	1.0 SEC.	3.0 SEC.	- SEC.

170 EMERGENCY PREEMPTION TIMING CHART

FUNCTION	EVA (Ø2+5) SECONDS	EVB (Ø1+6) SECONDS	EVC (Ø4) SECONDS
DELAY BEFORE PREEMPT	0	0	0
PED. CLEAR BEFORE PREEMPT	11	11	11
MIN. GREEN BEFORE PREEMPT	1.0	1.0	1.0
CLEARANCE TIME	1.0	1.0	1.0
PREEMPT EXTEND(timing on optical detection unit)	2.0	2.0	2.0

This Plan Shall Supersede The Plan Signed and Sealed on 5/24/2004

Signal Upgrade

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, State of North Carolina Department of Transportation, Signals and Geometrics Section
122 N. McDowell St., Raleigh, NC 27603

SR 1007 (Lenoir Rhyne Blvd NE)/ SR 1007 (Highland Avenue NE) at SR 2319 (8th Street NE)

Division 12 Catawba County Hickory

PLAN DATE: February 2006	REVIEWED BY: I.O.Umozurike
PREPARED BY: Luhr	REVIEWED BY:

SCALE 5 0 10 1:500

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL SEAL 24393 ENGINEER TIMOTHY J. WILLIAMS

T.J. Williams 4/21/06.
SIGNATURE DATE

SIG. INVENTORY NO. 12-1547

21-APR-2006 12:36
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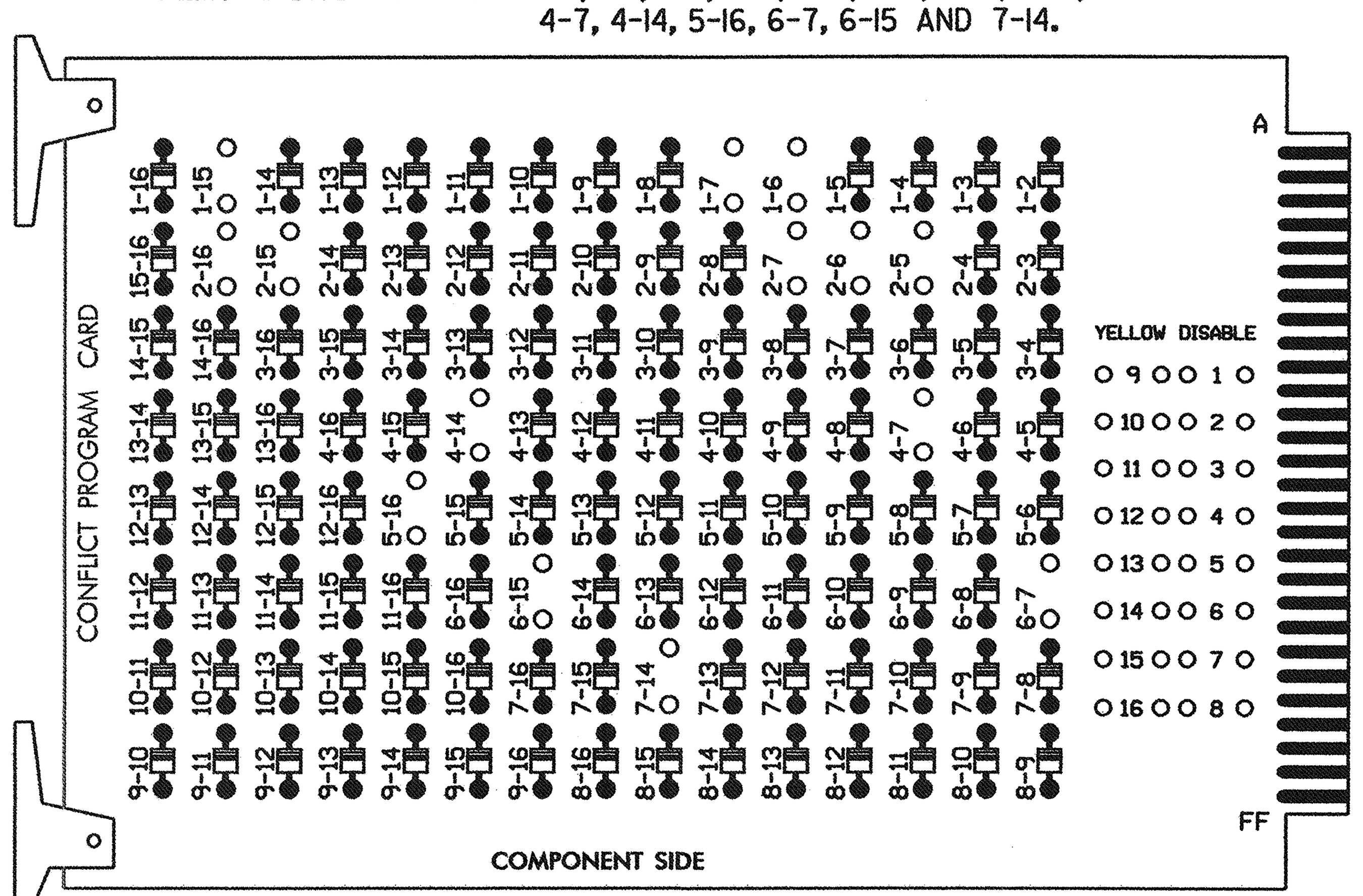
luhr

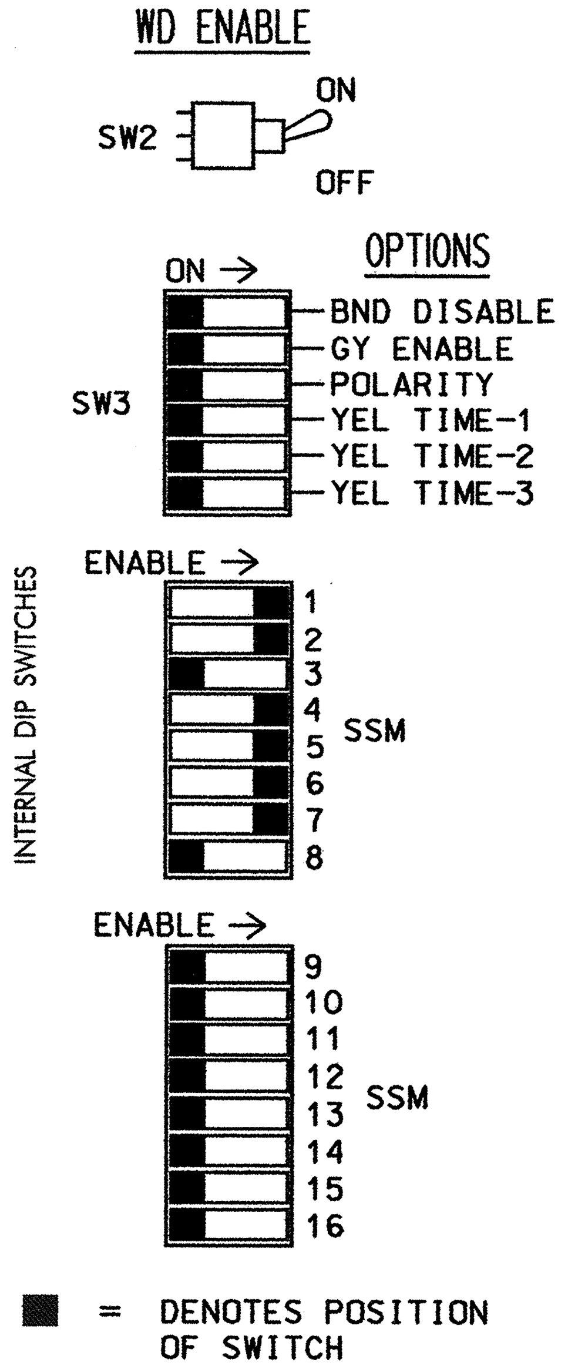
EDI MODEL 210ECL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-6, 1-7, 1-15, 2-5, 2-6, 2-7, 2-15, 2-16, 4-7, 4-14, 5-16, 6-7, 6-15 AND 7-14.



REMOVE JUMPERS AS SHOWN*



*CARD IS PROVIDED WITH ALL DIODE JUMPERS IN PLACE. REMOVAL OF ANY JUMPER ALLOWS ITS CHANNELS TO RUN CONCURRENTLY.

ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION.

INPUT FILE POSITION LAYOUT

(front view)

FILE		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	ø1 1A	ø2 2A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø4 4A	ø4 4C	ø4 4E	SYS. SD1103 -5	SLOT EMPTY	SLOT EMPTY	NOT USED	ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L	NOT USED	ø2 2B				ø4 4B	ø4 4D	NOT USED	SYS. SD1103 -6			ø4 PED DC ISOLATOR	ø5 PED DC ISOLATOR	ST DC ISOLATOR
FILE "J"	U	ø5 5A	ø6 6A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SYS. SD1103 -1	SYS. SD1103 -3	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SEE NOTE BELOW **		SLOT EMPTY
	L	NOT USED	NOT USED				SYS. SD1103 -2	SYS. SD1103 -4							

OPTICAL DETECTOR INTERFACE CARD (4-CHANNEL)

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

FS = FLASH SENSE
ST = STOP TIME

EVA - CHANNEL 1 - PIN 71
EVB - CHANNEL 2 - PIN 72
EVC - CHANNEL 3 - PIN 73
CHANNEL 4 - SPARE

** NOTE: WIRE OPTICAL DETECTORS TO INPUT FILE PER MANUFACTURER'S INSTRUCTIONS.

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.

PEDESTRIAN PHASE PROGRAMMING

PROGRAM PEDESTRIAN 4P OUTPUT AT KEYPAD INPUT E/125+F+7=ø4.
PROGRAM PEDESTRIAN 6P OUTPUT AT KEYPAD INPUT E/125+F+6=ø6.
PROGRAM PEDESTRIAN 8P OUTPUT AT KEYPAD INPUT E/125+F+8=ø5.

PEDESTRIAN CLEAR BEFORE PREEMPT TIMING

PROGRAM PED. PHASE 4 MIN. CLEAR BEFORE PREEMPT AT F/1+4+B= 11 (SEC.)
PROGRAM PED. PHASE 5 MIN. CLEAR BEFORE PREEMPT AT F/1+5+B= 11 (SEC.)
PROGRAM PED. PHASE 6 MIN. CLEAR BEFORE PREEMPT AT F/1+6+B= 11 (SEC.)

EMERGENCY VEHICLE PREEMPTION PROGRAMMING CHART

E. V. PREEMPT	OPTICAL DET. NO.	INPUT PIN	CLEARANCE PHASES LOCATION	DELAY TIME LOCATION	CLEAR TIME LOCATION
EVA	A	E/126+F+1=71	E/125+E+A= ø2,5	F/1+E+2=0	F/1+E+3= 1 (SEC.)
EVB	B	E/126+F+2=72	E/125+E+B= ø1,6	F/1+E+4=0	F/1+E+5= 1 (SEC.)
EVC	C	E/126+F+3=73	E/125+E+C= ø4	F/1+E+6=0	F/1+E+7= 1 (SEC.)

1. PROGRAM MINIMUM GREEN BEFORE PREEMPT AT: F/1+0+8= 1 (SEC.)
2. FOR PREEMPTION IMMEDIATE RESPONSE, DISABLE MIN. WALK AT: E/125+F+F=3
3. PROGRAM EXTEND TIME ON OPTICAL DETECTOR UNITS FOR 2.0 SEC.

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

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

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, TIE UNUSED RED MONITOR INPUTS 3,8,9,10,11,12,13,14,15 & 16 TO LOAD SWITCH AC+ PER CABINET MANUFACTURER'S INSTRUCTIONS.
3. PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.
6. PROGRAM "RECALL POSITION" AND "VEHICLE CALL MEMORY" AS NONE FOR ALL PHASES.
7. THE CABINET AND CONTROLLER ARE PART OF THE CITY OF HICKORY SIGNAL SYSTEM: # 1103

SPECIAL SEQUENCE: LAGGING PHASE 1 OPERATION

THE PHASING PROGRESSION DESIGN OF THIS SIGNAL REQUIRES PHASE 1 TO LAG PHASE 2. PROGRAM PHASE 1 TO LAG IN ALL COORDINATION PLANS AS WELL AS FREE-RUN OPERATION. ALL PHASE PAIRS MUST BE COVERED IN LAG PLANS. FLAG THE FOLLOWING PHASES IN ALL LAG PLANS: 1, 4, 6, 8.

EQUIPMENT INFORMATION

*CONTROLLER.............McCAIN TRAFFIC TYPE 170E
*CABINET ....McCAIN TRAFFIC MODEL 332 (DWG.NO.MDR3280 REV.B)
SOFTWARE ....BI TRANS 233NC2
CABINET MOUNT...........BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED......S1,S2,S4,S4P,S5,S6,S6P,S7,S8P
PHASES USED.............1,2,4,5,6,4PED,5PED,6PED
OVERLAPS................OL1= 4+6

EXISTING TO REMAIN IN USE*

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	DETECTOR NO.	PIN NO.	ATTRIBUTES	NEMA PHASE
1A	TB2-1,2	I1U	1	56	5 7	1
2A	TB2-5,6	I2U	2	39	5 7	2
2B	TB2-7,8	I2L	3	43	5 7	2
4A	TB4-9,10	I6U	4	41	5 7	4
4B	TB4-11,12	I6L	5	45	5 7	4
4C	TB6-1,2	I7U	6	65	5 7	4
4D	TB6-3,4	I7L	7	78	5 7	4
4E	TB6-5,6	I8U	8	49	5 7	4
5A	TB3-1,2	J1U	9	55	5 7	5
6A	TB3-5,6	J2U	10	40	5 7	6
PED PUSH BUTTONS						
P41, P42	TB8-5,6	I12L	11	69	2	4
P51, P52	TB8-8,9	I13L	12	70	2	5
P61, P62	TB8-7,9	I13U	13	68	2	6
SYSTEM LOOPS						
SD1103-1	TB5-9,10	J6U	—	42	—	SYS1 *
SD1103-2	TB5-11,12	J6L	—	46	—	SYS2 *
SD1103-3	TB7-1,2	J7U	—	66	—	SYS3 *
SD1103-4	TB7-3,4	J7L	—	79	—	SYS4 *
SD1103-5	TB10-1,2	I9U	—	60	—	SYS5 *
SD1103-6	TB10-3,4	I9L	—	62	—	SYS6 *

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

*SYSTEM DETECTOR PROGRAMMING NOTES

IN ORDER FOR SYSTEM LOOPS TO OPERATE PROPERLY, THEIR PIN ASSIGNMENTS WILL HAVE TO BE RE-ASSIGNED ON 170E CONTROLLER AS DESCRIBED BELOW.

A. IN ORDER TO ASSURE THAT THESE PINS ARE CLEARED FROM THEIR DEFAULT FUNCTION, PROGRAM AS FOLLOWS:

PIN 42 - E/126+0+3=0 PIN 79 - E/126+4+F=0
PIN 46 - E/126+0+7=0 PIN 60 - E/126+4+1=0
PIN 66 - E/126+4+7=0 PIN 62 - E/126+4+3=0

B. AFTER FOLLOWING STEP 'A' ABOVE, PROGRAM PINS FOR SYSTEM DETECTORS AS FOLLOWS:

SYS1 - E/126+B+1=42 SYS4 - E/126+B+4=79
SYS2 - E/126+B+2=46 SYS5 - E/126+B+5=60
SYS3 - E/126+B+3=66 SYS6 - E/126+B+6=62

*SEE 'OVERLAP PROGRAMMING NOTES' BELOW
**SEE 'COUNTDOWN PEDESTRIAN SIGNAL OPERATION' NOTE

PROJECT REFERENCE NO.	SHEET NO.
U-2306 A	Sig. 17

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	* OL1	8	5 PED
SIGNAL HEAD NO.	11	21,22	NU	NU	41,42	P41, P42	51	61,62	P61, P62	43,44	NU	P51, P52
GREEN					103			136				
YELLOW					102			135				
RED					101			134				
RED ARROW	125	128					131			122		
YELLOW ARROW	126	129					132			123		
GREEN ARROW	127	130					133			124		
** (walk)						106			121			112
** (don't walk)						104			119			110

NU = NOT USED

OVERLAP PROGRAMMING NOTES

TO ASSURE THAT LOADSWITCH S7 IS ASSIGNED AS OVERLAP 1, PROGRAM CONTROLLER AT KEYPAD INPUT E/29+1+0=7

TO SET THE PARENT PHASES FOR OVERLAP 1 (VEH. SET 1) AS PHASES 4 AND 6, PROGRAM CONTROLLER AT KEYPAD INPUT E/29+1+1=ø4, 6

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

PROGRAM TIMING FOR OVERLAP 1 AS FOLLOWS:
GREEN CLEAR - E/29+1+D=0.0 (SEC.)
YELLOW CHANGE INTERVAL - E/29+1+E=3.8 (SEC.)
RED CLEARANCE - E/29+1+F=2.8 (SEC.)

HEADS 43 & 44 (OL1) OPERATION DURING PREEMPTION

IN ORDER FOR E.V. PREEMPT 'C' TO OPERATE AS PHASE 4 WITHOUT SIGNAL HEADS 43 & 44 (OVERLAP 'OL1'), THE FOLLOWING PROGRAMMING MUST BE IN PLACE:

ASSIGN O/L VEH. SET 2 INPUT AT E/126+D+C= 200
ASSIGN E.V. PREEMPT EVC OUTPUT AT E/127+D+A= 200

200 = ASSIGNABLE PSEUDO-PIN (SOFTWARE)

OVERLAP NEGATIVE PEDESTRIAN PHASE PROGRAMMING

OVERLAP 1 MUST BE OMITTED DURING PED CALL ON ø6 (PED PUSHBUTTONS P61, P62).
TO ACCOMPLISH THIS, PROGRAM CONTROLLER AT KEYPAD INPUT E/29+1+5=ø6 (PED).

RESTRICTED PHASES PROGRAMMING

IN ORDER TO PROHIBIT PHASES 1 AND 5 FROM BEING SERVED TOGETHER, THEY MUST BE PROGRAMMED AS RESTRICTED PHASES. THIS IS ACCOMPLISHED BY PROGRAMMING CONTROLLER AT KEYPAD INPUT E/125+F+E= ø 1, 5

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1547
DESIGNED: FEBRUARY 2006
SEALED: 4/21/06
REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED MAY 2004 AND SEALED 6/7/04

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1007 (LENOIR RHYNE BLVD NE)/ SR 1007 (HIGHLAND AVENUE NE) at SR 2319 (8th STREET NE)

DIVISION 12 CATAWBA COUNTY HICKORY

PLAN DATE: APRIL 2006 REVIEWED BY: T. Joyce
PREPARED BY: F.E. RUSS REVIEWED BY:

REVISIONS	INIT.	DATE

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, State of North Carolina Department of Transportation, Signals Management Section
122 N. McDowell St., Raleigh, NC 27603

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN
George C. Brown 4/28/06
SIGNATURE DATE
SIG. INVENTORY NO. 12-1547

21-APR-2006 09:18
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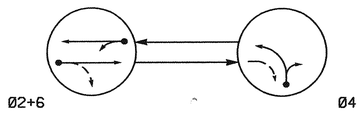
PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø2+6	PHASE Ø4	PHASE FLASH
21, 22, 23	G	R	Y
41, 42	R	G	R
61, 62, 63	G	R	Y

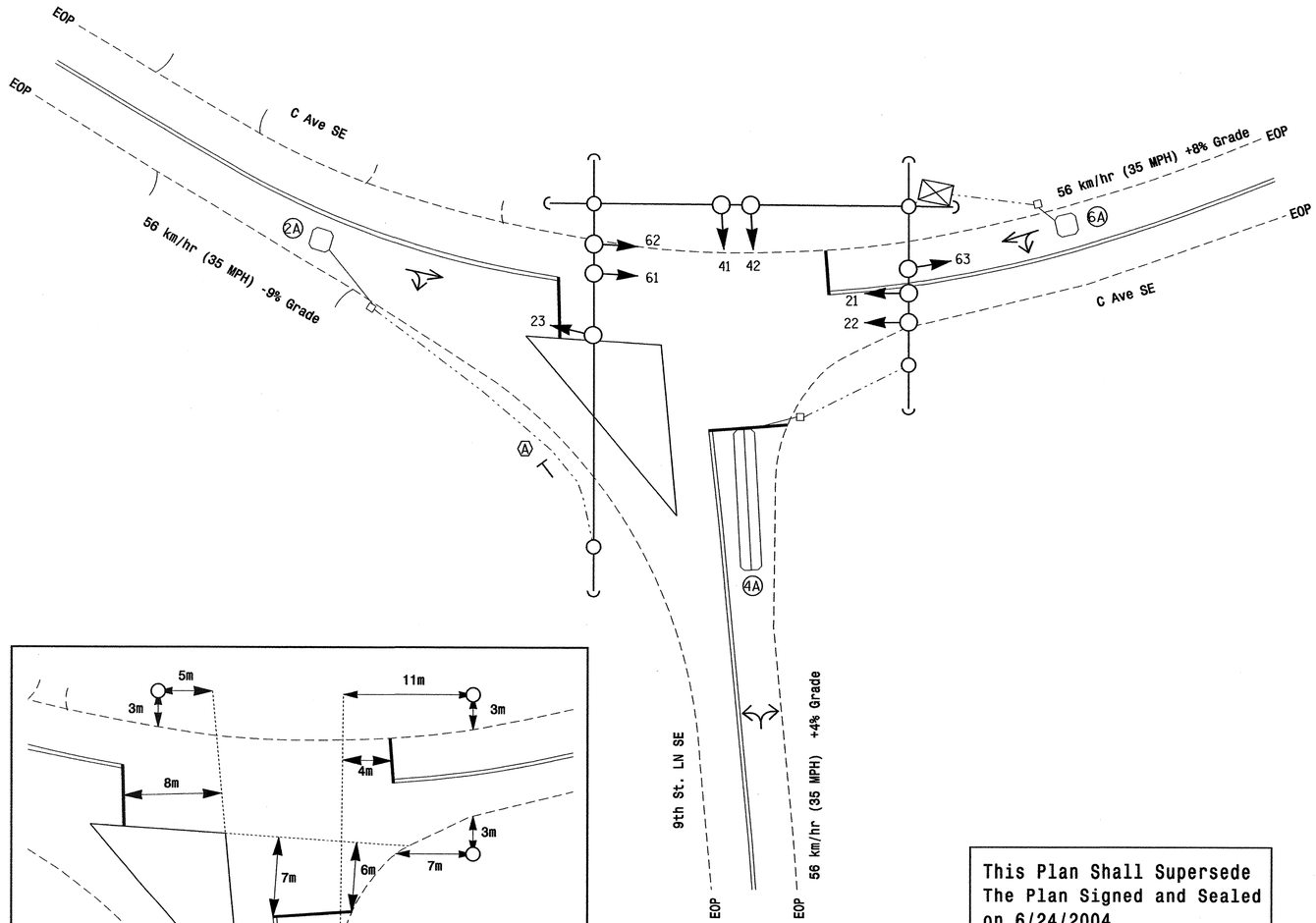
SIGNAL FACE I.D.

Denotes L.E.D.

21, 22, 23
41, 42
61, 62, 63

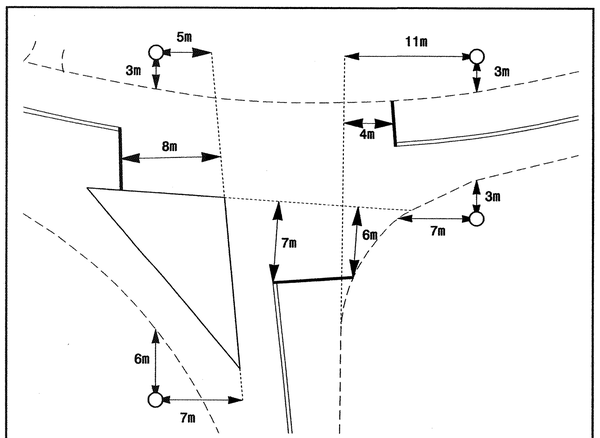
LOOP & DETECTOR UNIT INSTALLATION CHART
170 CONTROLLER AND CABINET

INDUCTIVE LOOPS						DETECTOR PROGRAMMING															
							TIMING		ATTRIBUTES										STATUS	
LOOP NO.	SIZE (m)	TURNS	DIST. FROM STOPBAR (m)	NEW	EXISTING	NEMA PHASE	DELAY	CARRY (STRETCH)	1 FULL TIME DELAY	2 PEDESTRIAN CALL	3 RESERVED	4 COUNT	5 EXTENSION	6 TYPE 3	7 CALLING	8 ALTERNATE	SYSTEM LOOPS	NEW	EXISTING
2A	1.8X1.8	4	20	Y		2	- SEC.	- SEC.					X		X			X	
4A	1.8X12	2-4-2	0	Y		4	5 SEC.	- SEC.					X		X			X	
6A	1.8X1.8	4	20	Y		6	- SEC.	- SEC.					X		X			X	



TIMING CHART
170 CONTROLLER

PHASE	Ø2	Ø4	Ø6
MINIMUM INITIAL	10 SEC.	7 SEC.	10 SEC.
VEHICLE EXTENSION	3.0 SEC.	2.0 SEC.	3.0 SEC.
YELLOW CHANGE INT.	4.6 SEC.	3.0 SEC.	3.4 SEC.
RED CLEARANCE	1.3 SEC.	1.8 SEC.	1.2 SEC.
MAXIMUM LIMIT	50 SEC.	25 SEC.	50 SEC.
RECALL POSITION	VEH RECALL	NONE	VEH RECALL
VEHICLE CALL MEMORY	YELLOW LOCK	NONE	YELLOW LOCK
DOUBLE ENTRY	OFF	OFF	OFF
WALK	- SEC.	- SEC.	- SEC.
FLASHING DON'T WALK	- SEC.	- SEC.	- SEC.
TYPE 3 LIMIT	- SEC.	- SEC.	- SEC.
ALTERNATE EXTENSION	- SEC.	- SEC.	- SEC.
ADD PER VEHICLE	- SEC.	- SEC.	- SEC.
MAXIMUM INITIAL	- SEC.	- SEC.	- SEC.
MAXIMUM GAP	3.0 SEC.	2.0 SEC.	3.0 SEC.
REDUCE 0.1 SEC EVERY	- SEC.	- SEC.	- SEC.
MINIMUM GAP	3.0 SEC.	2.0 SEC.	3.0 SEC.



Proposed Stopbar and Pole Locations

2 Phase
Fully Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2002 and "Standard Specifications for Roads and Structures" dated January 2002.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Program all timing information into phase banks 1, 2, and 3 unless otherwise noted.
4. Set all detector units to presence mode.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.

PLAN QUANTITIES	
Pay Item	Meters
Signal Cable	200
Messenger Cable	70
Lead-in Cable	160

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	50mm Underground Conduit	
N/A	Right of Way with Marker	
	Directional Arrow	
	Pavement Marking Arrow	
A	"YIELD" Sign (R1-2)	A

This Plan Shall Supersede
The Plan Signed and Sealed
on 6/24/2004

Temporary Signal- To Be Removed Upon Project Completion

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation
Signals and Geometrics Section
122 N. McDowell St., Raleigh, NC 27603

C Ave SE
at
9th St. Ln SE

Division 12 Catawba County Hickory
PLAN DATE: February 2006 REVIEWED BY: I.O.Umozurike
PREPARED BY: Luhr REVIEWED BY:

SCALE 2.5 0 5
1:250

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24393 ENGINEER TIMOTHY J. WILLIAMS
SIGNATURE 4/21/06 DATE
SIG. INVENTORY NO. 12-1709

21-APR-2006 12:34
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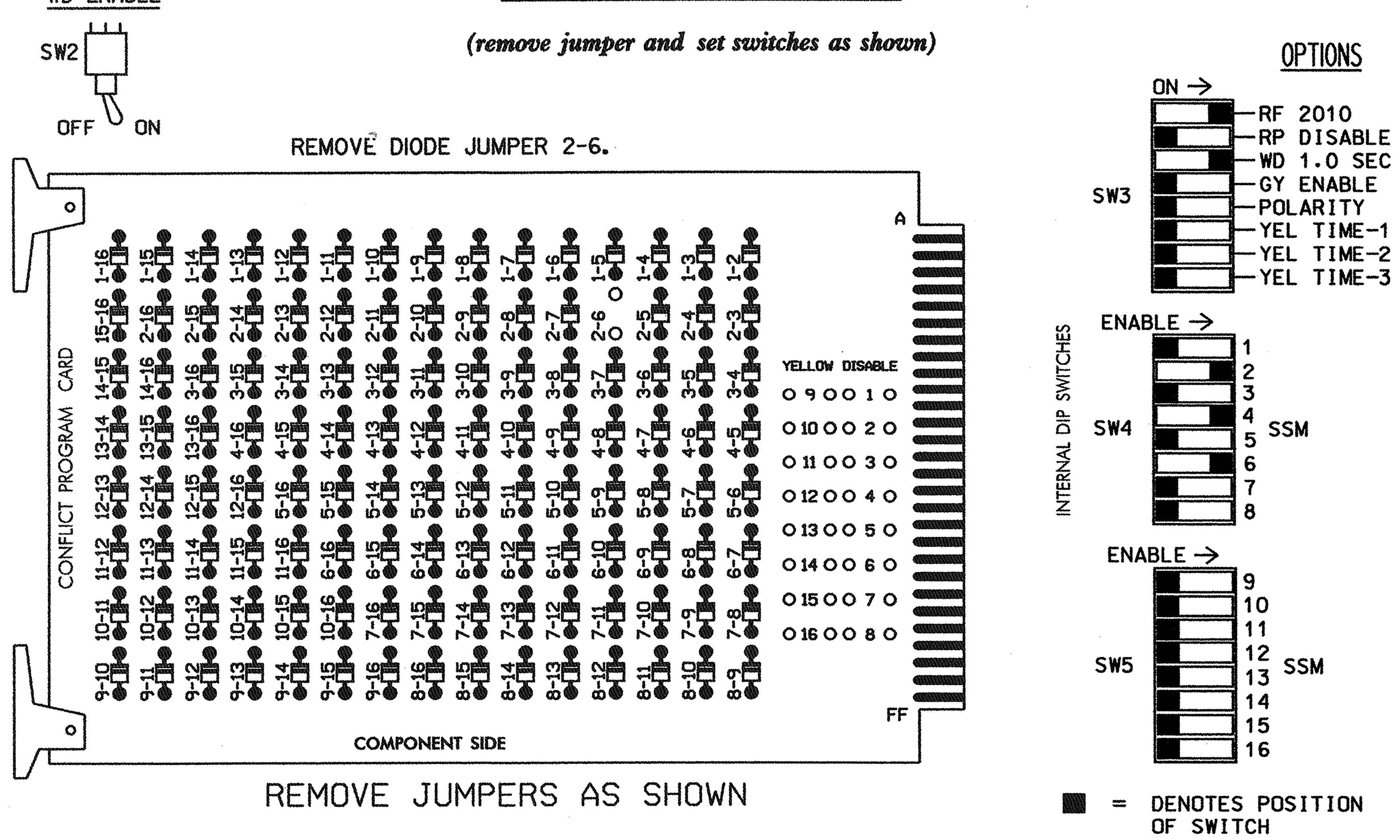
luhr

PROJECT REFERENCE NO.	SHEET NO.
U-2306 A	Sig.19

EDI MODEL 2010ECL CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

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. ENSURE THAT RED ENABLE IS ACTIVE AT ALL TIMES DURING NORMAL OPERATION. TO PREVENT RED FAILURES ON UNUSED MONITOR CHANNELS, TIE UNUSED RED MONITOR INPUTS 1,3,5,7, 8,9,10,11,12,13,14,15 & 16 TO LOAD SWITCH AC+ PER THE CABINET MANUFACTURER'S INSTRUCTIONS.
3. PROGRAM CONTROLLER TO START UP IN PHASES 2 AND 6 GREEN.
4. SET POWER-UP FLASH TIME TO 10 SECONDS AND IMPLEMENT WITHIN THE CONTROLLER PROGRAMMING.
5. ENABLE SIMULTANEOUS GAP-OUT FEATURE, ON CONTROLLER UNIT, FOR ALL PHASES.

EQUIPMENT INFORMATION

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

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, 23	NU	NU	41,42	NU	NU	61,62, 63	NU	NU	NU	NU
GREEN		130			103			136				
YELLOW		129			102			135				
RED		128			101			134				
RED ARROW												
YELLOW ARROW												
GREEN ARROW												

NU = NOT USED

INPUT FILE POSITION LAYOUT

(front view)

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

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

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

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

INPUT FILE POSITION LEGEND: J2U

FILE J
SLOT 2
UPPER

DETECTOR ATTRIBUTES LEGEND:

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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1709
DESIGNED: FEBRUARY 2006
SEALED: 4/21/06
REVISED: N/A

THIS DETAIL SUPERSEDES DETAIL DATED JULY 2004 AND SEALED 7/13/04

TEMPORARY SIGNAL - To Be Removed Upon Project Completion

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, State of North Carolina Department of Transportation, Signals Management Section

122 N. McDowell St., Raleigh, NC 27603

C AVE SE at 9th ST. LN SE

DIVISION 12 CATAWBA COUNTY HICKORY

PLAN DATE: APRIL 2006	REVIEWED BY: T. Joyce
PREPARED BY: F.E. RUSS	REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL: NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022013 GEORGE C. BROWN

George C. Brown 4/28/06
SIGNATURE DATE

SIG. INVENTORY NO. 12-1709

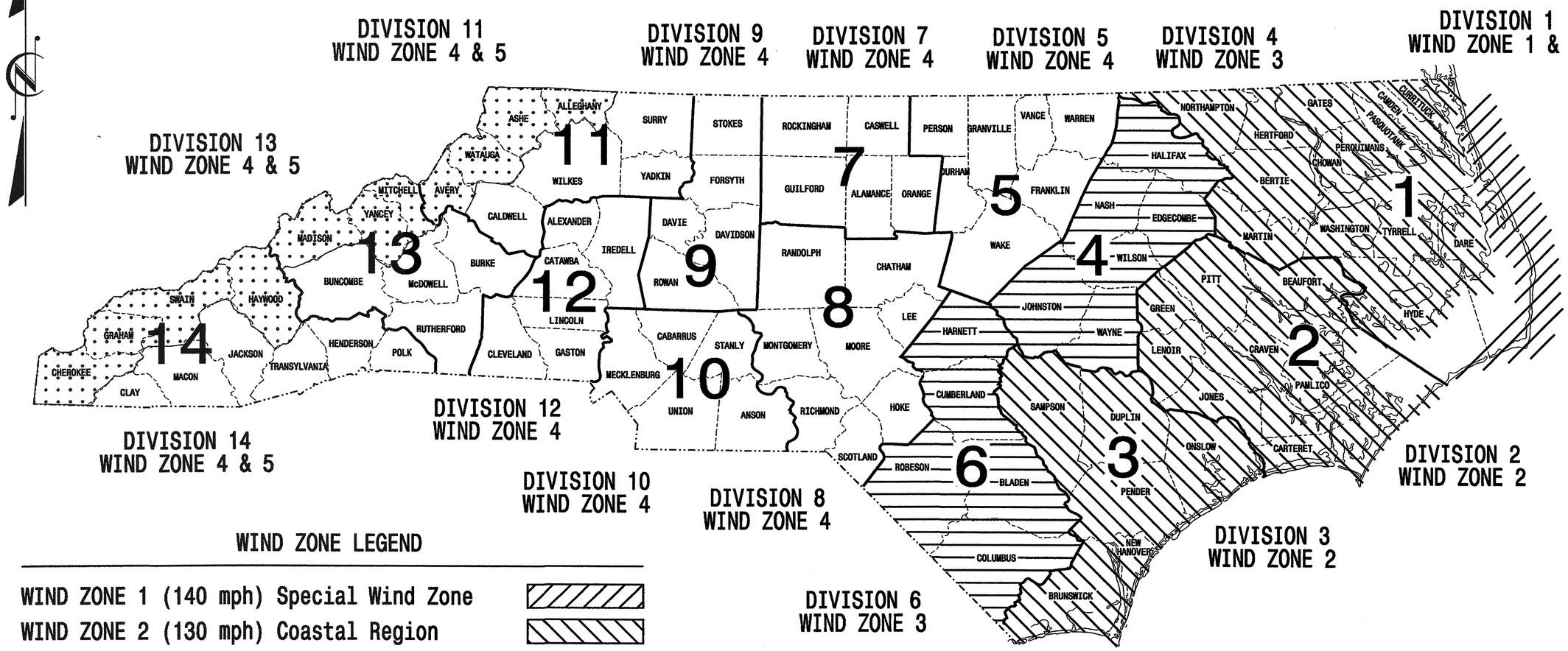
POLE STANDARDS

NCDOT METAL POLES

STATE	PROJECT NO.	SHEET NO.
N.C.	U-2306A	Sig.20
F. A. PROJ. NO.		M 1
PROJECT ID. NO.		

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

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/tmssu/ws/default.htm

Prepared in the Offices of:

Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA • 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, Luminares, 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

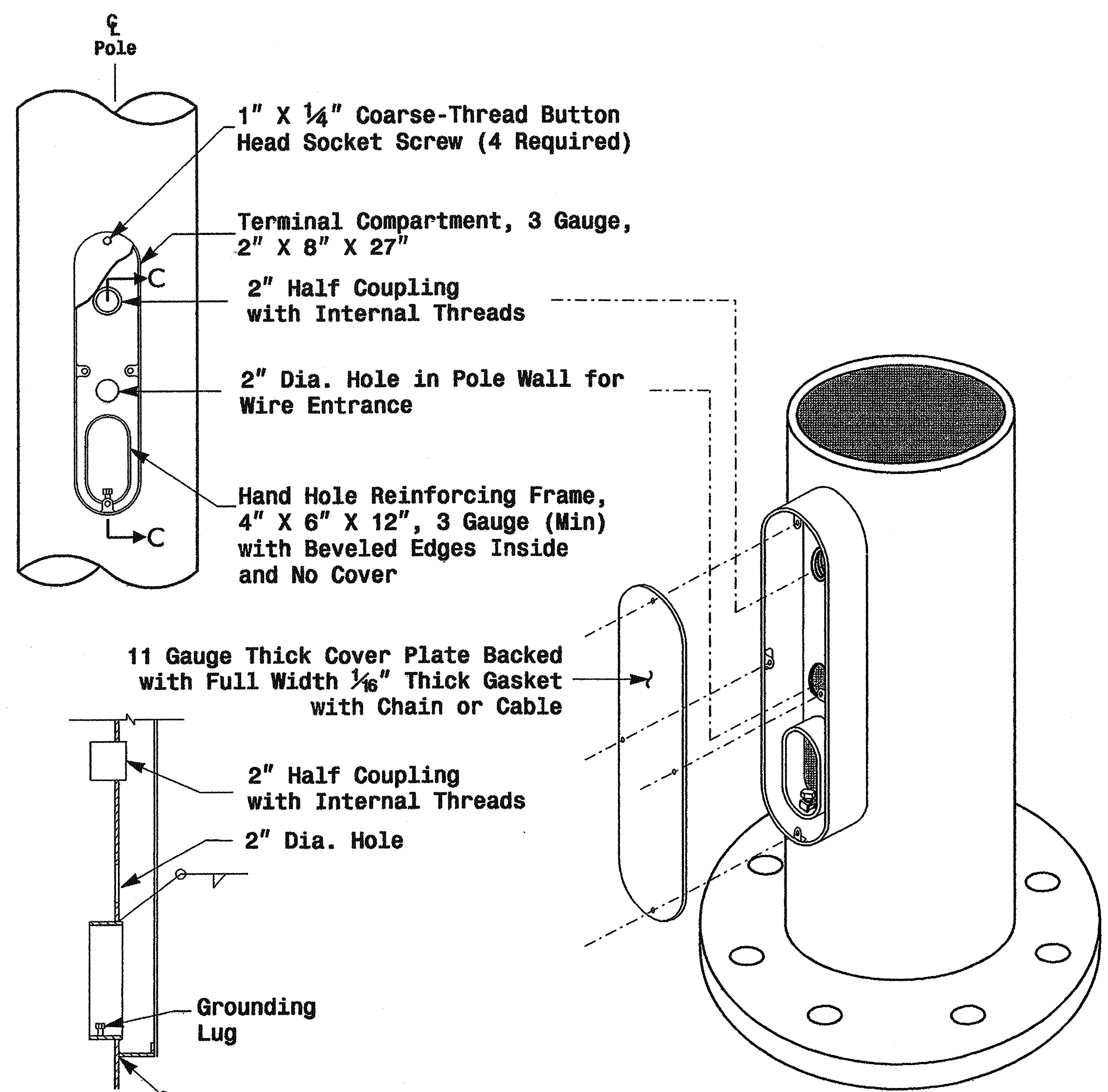
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBESH C. SARKAR

D. Sarkar — SIGNATURE

9.2.2005 — DATE

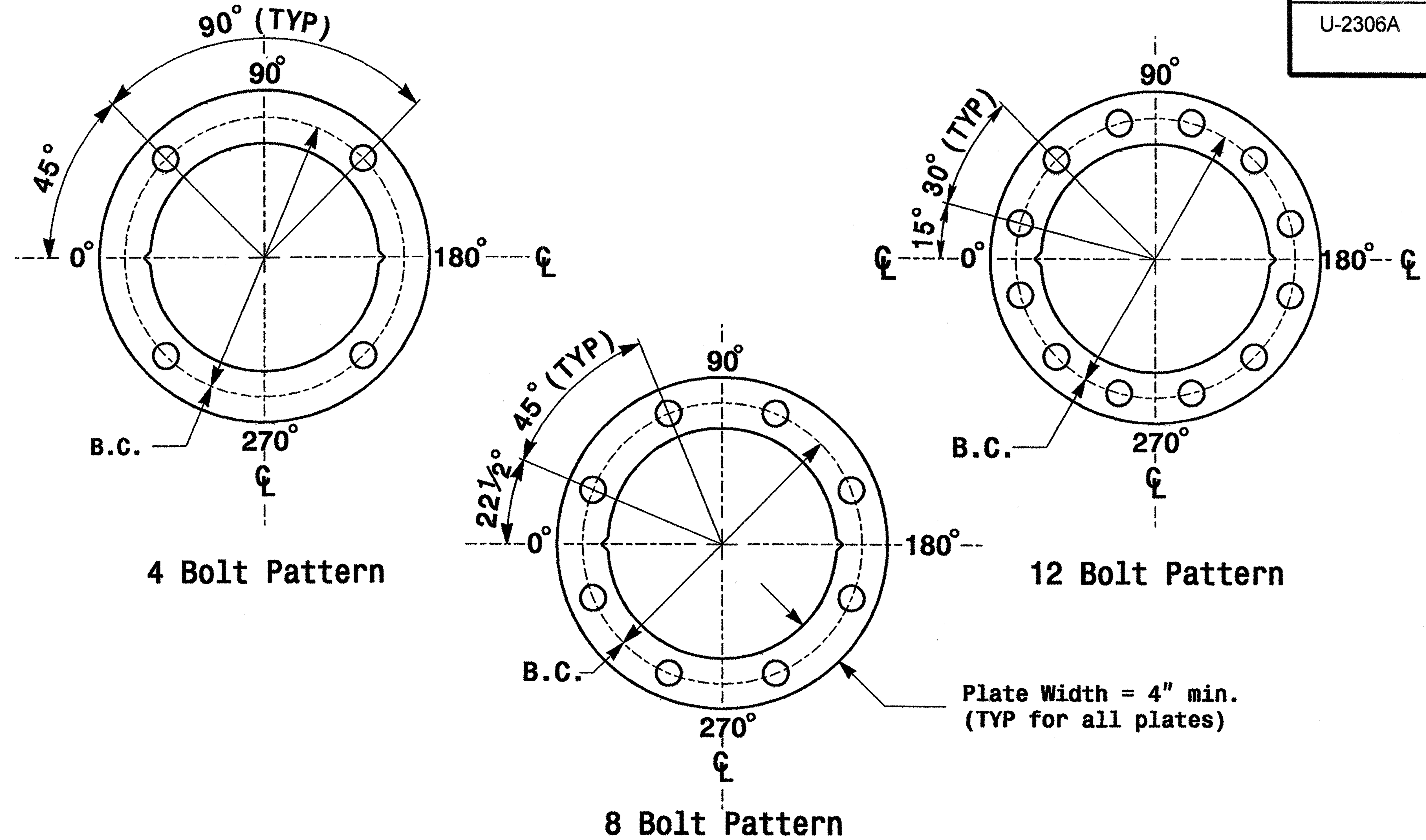
PROJECT REFERENCE NO.	SHEET NO.
U-2306A	Sig.21 M 2

Fabrication Details – All Poles



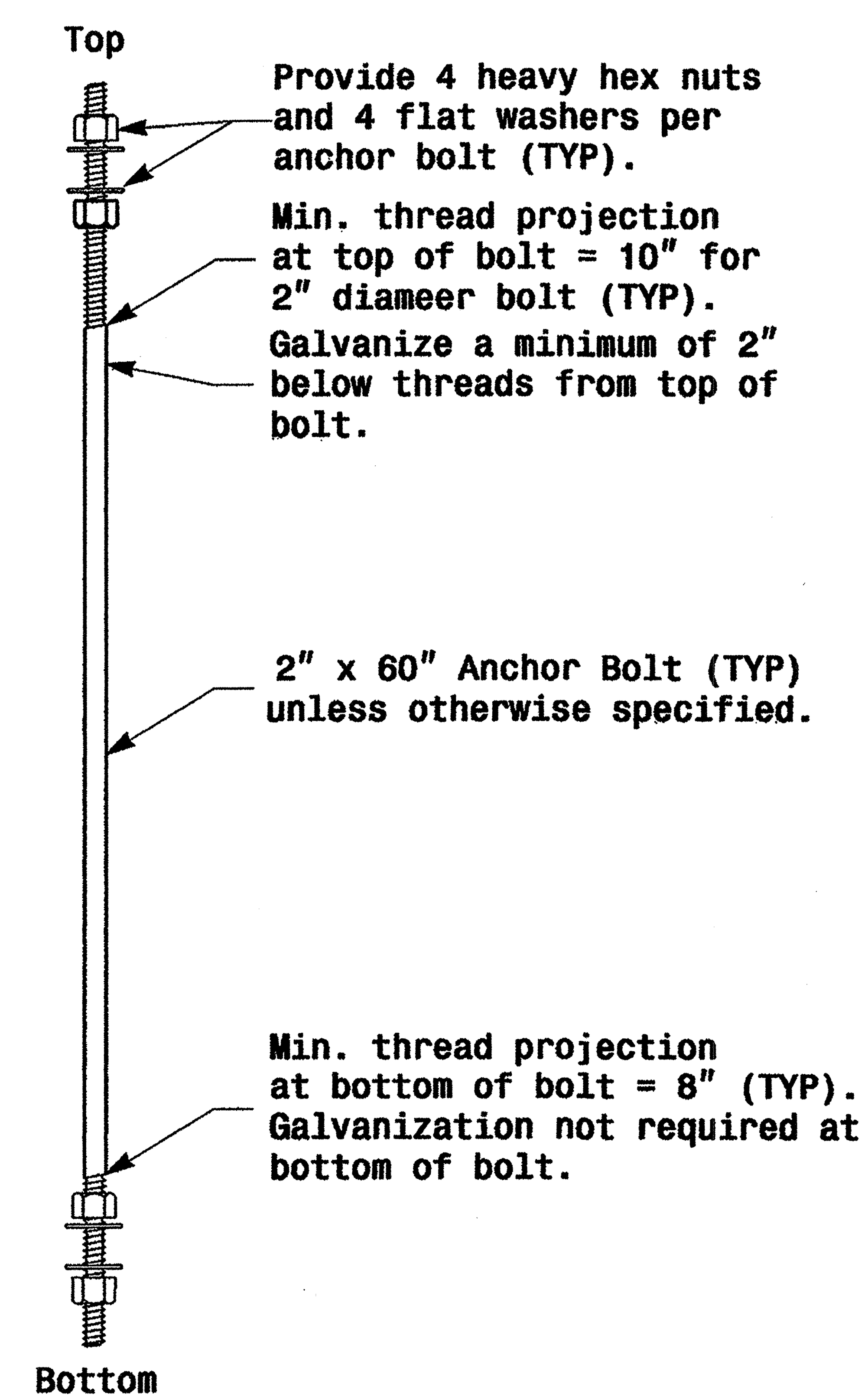
Note: Unless otherwise specified, locate Terminal Compartment 1 foot above the pole base plate at 180 degrees on the pole's radial index.

Terminal Compartment Detail



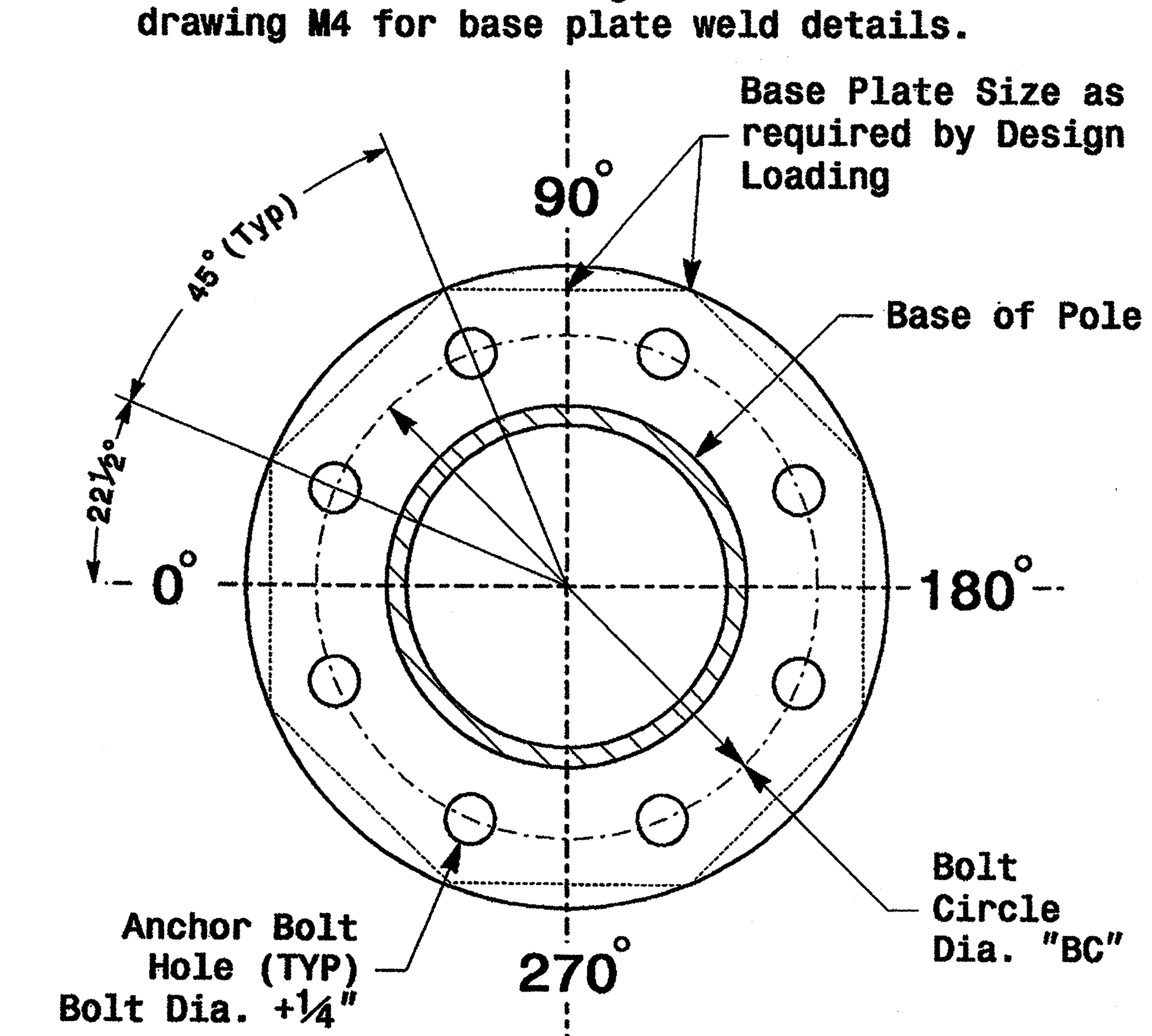
Construct Templates and Plates from ¼" min. thick Steel. Galvanizing is not required.

Base Plate Template and Anchor Bolt Lock Plate Details



Anchor Bolt Detail

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



8 Bolt Base Plate Detail

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)

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)

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

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section
122 N. McDowell St., Raleigh, NC 27603

SCALE 0 NA NONE

Typical Fabrication Details Common To All Metal Poles

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

REVISIONS | INIT. | DATE

SEAL
North Carolina Professional Engineer Seal 028094 Debesh C. Sarkar

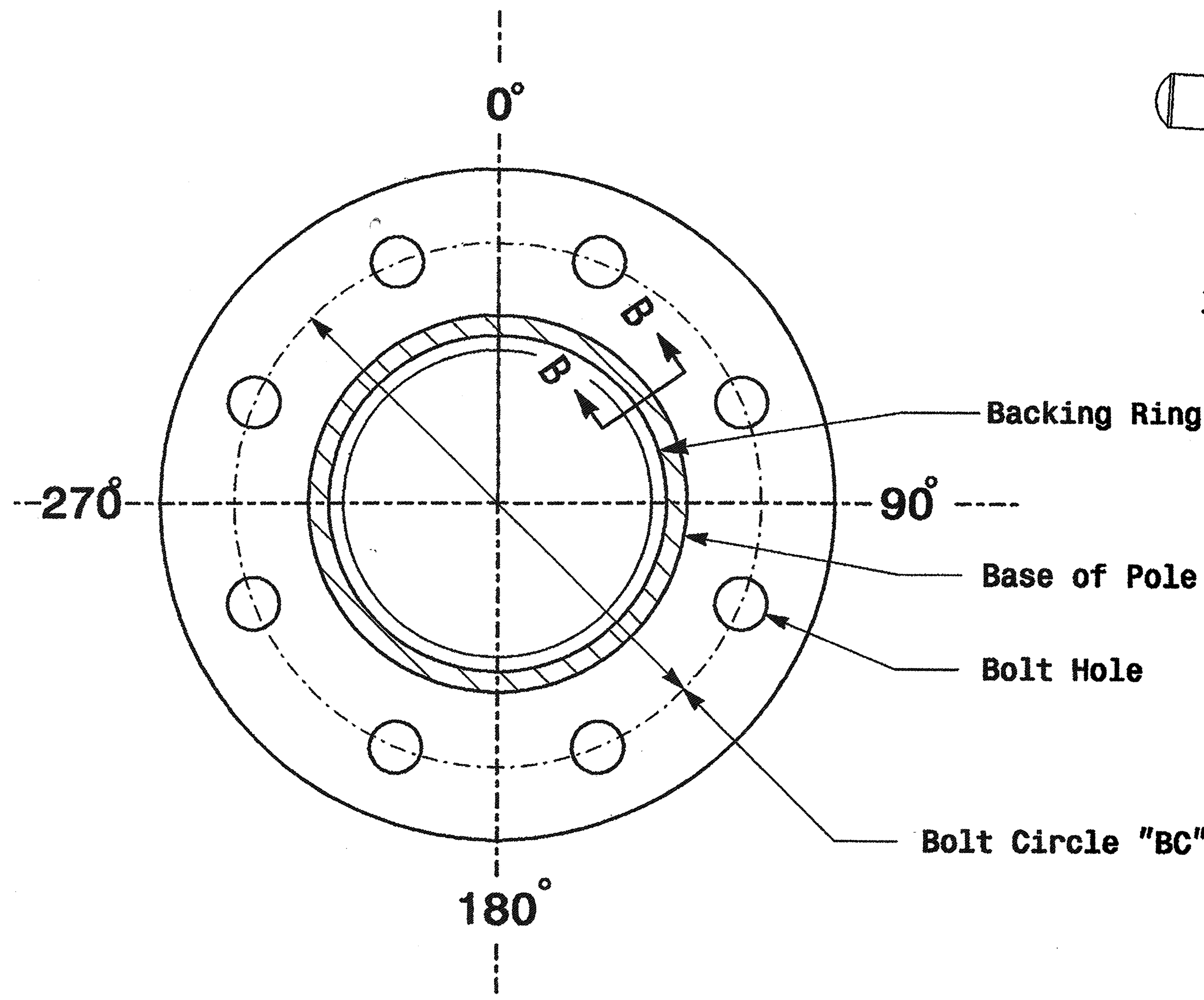
D. Sarkar 9.2.2005
SIGNATURE DATE

SIG. INVENTORY NO.

01-SEP-2005 18:22
D:\2004 Metal Pole Standards\2004 m2 thru m5.dgn
andrews

PROJECT REFERENCE NO.	SHEET NO.
U-2306A	Sig.22 M 4

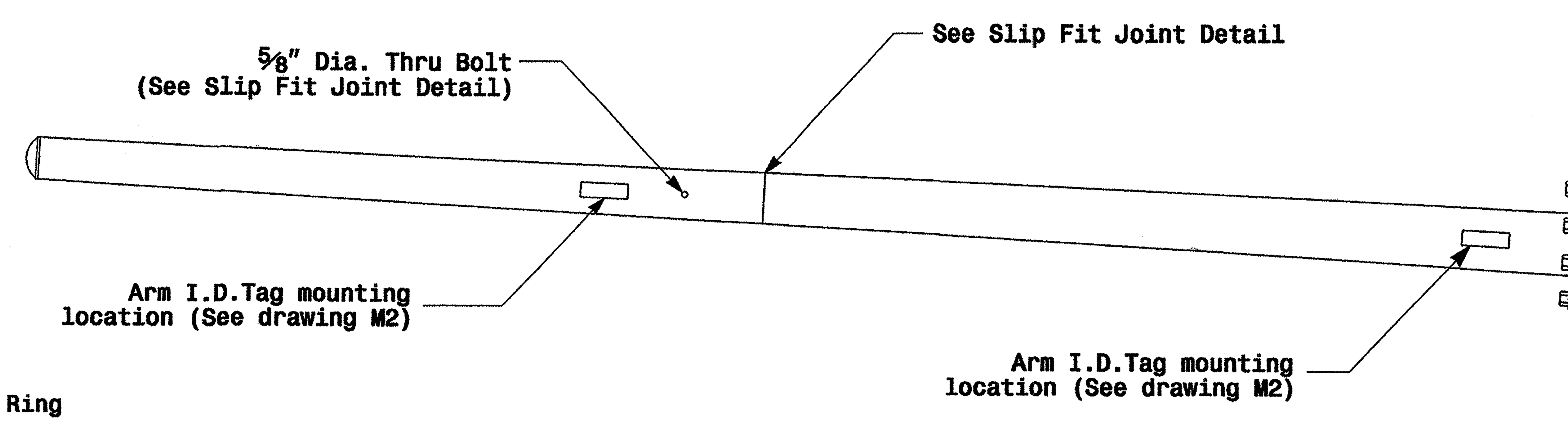
Fabrication Details – Mast Arm Poles

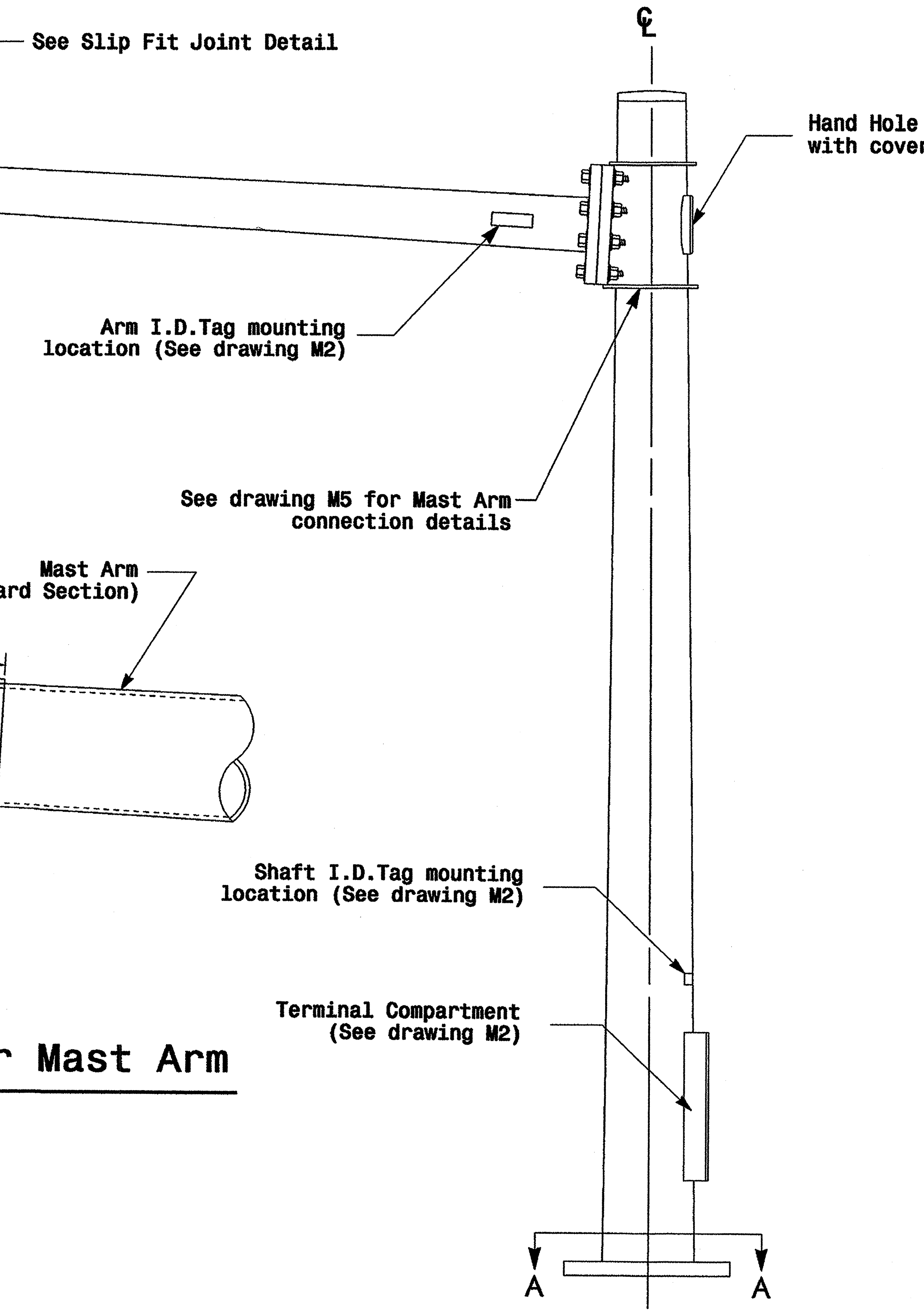


Section A-A

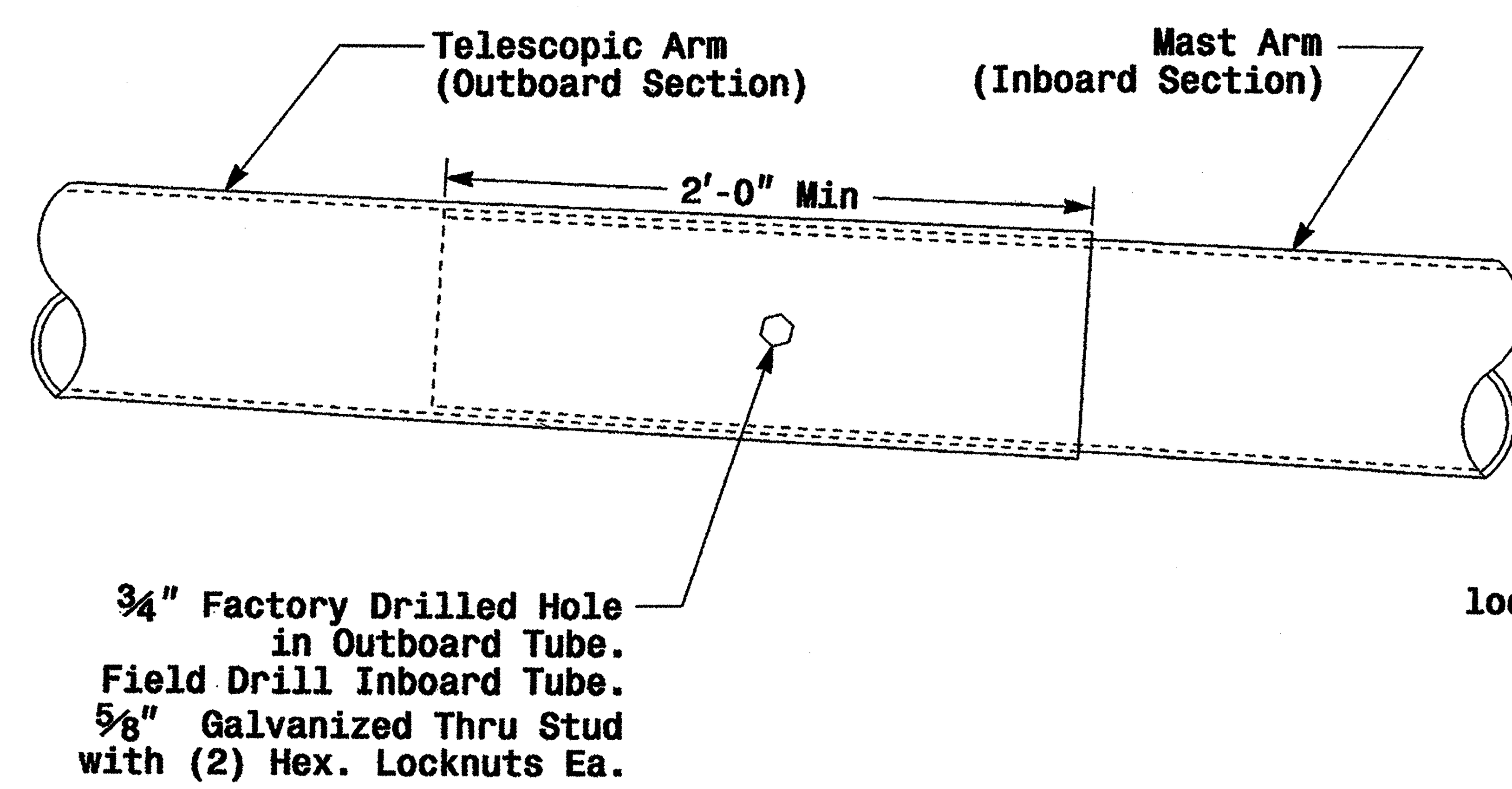
(See drawing M 2)

Pole Base Plate

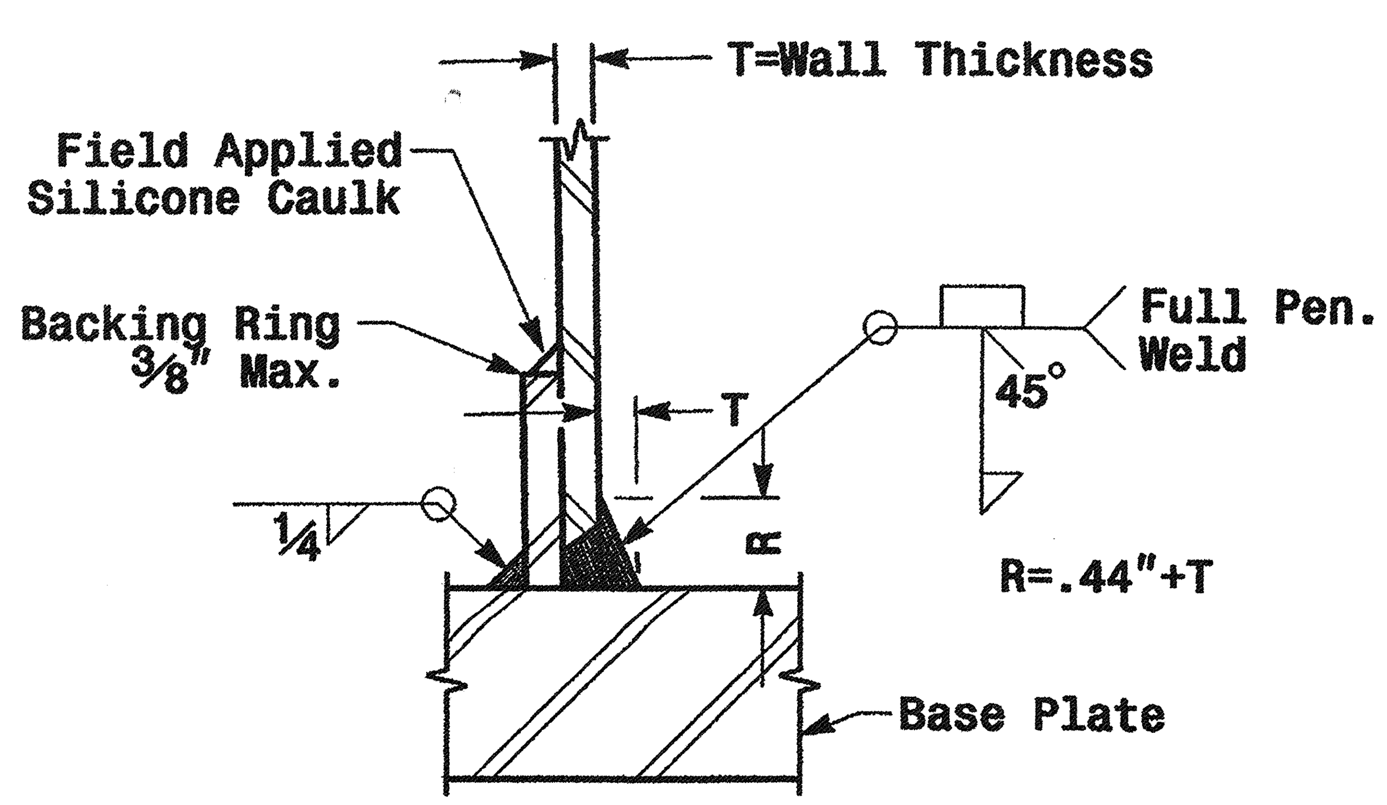




Monotube Mast Arm Pole
(.14in./ft. taper)



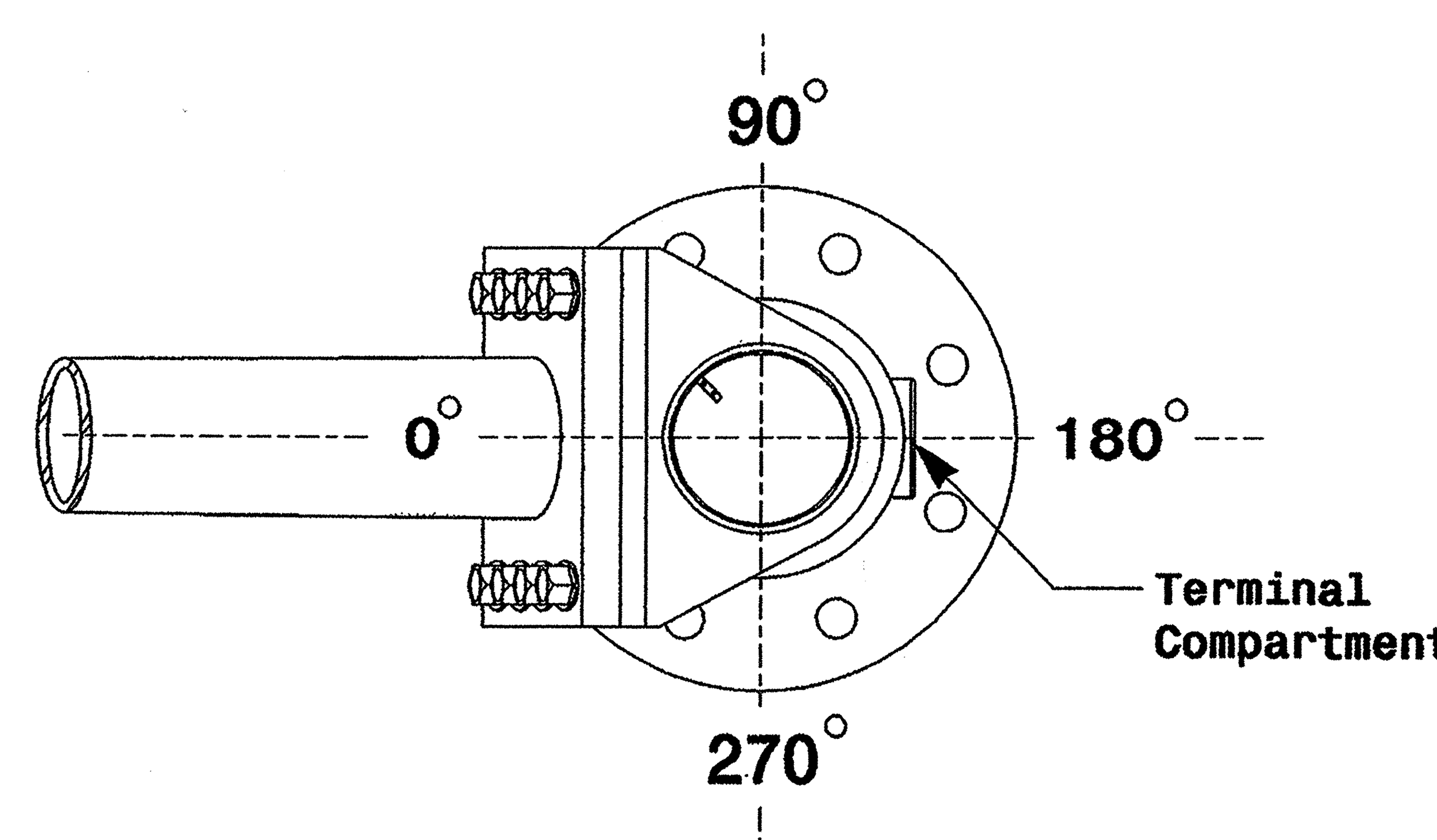
Slip Fit Joint Detail for Mast Arm



Section B-B

(Pole Attachment to Base Plate)

Full-Penetration Groove Weld Detail



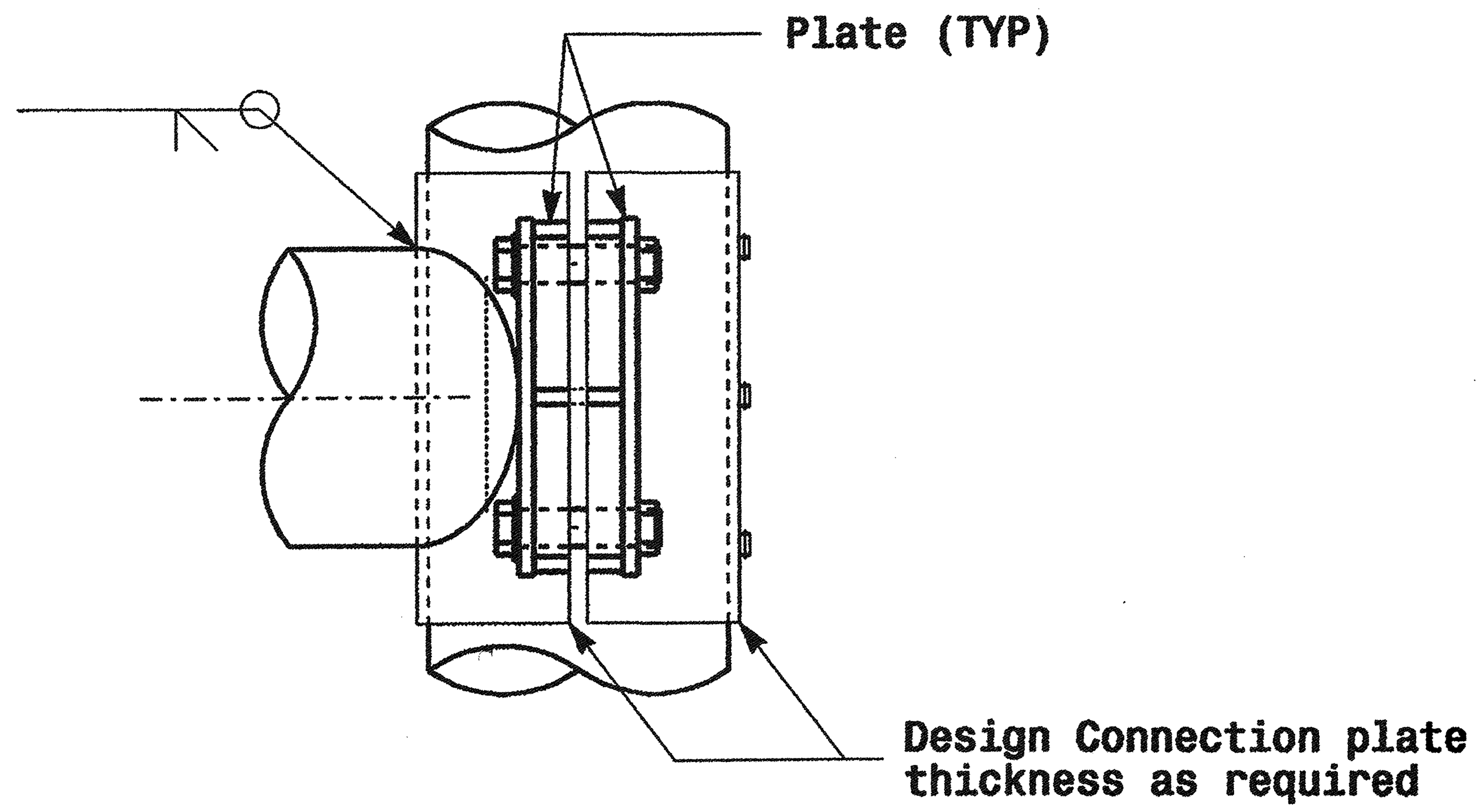
Mast Arm Radial Orientation

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section, State of North Carolina Department of Transportation. 122 N. McDowell St., Raleigh, NC 27603	Typical Fabrication Details for Mast Arm Poles	SEAL: North Carolina Professional Engineer Seal 028094 Debesh C. Sarkar
SCALE 0 NA NONE	PLAN DATE: May 2005 / REVIEWED BY: C.F. Andrews / PREPARED BY: P.L. Alexander / REVIEWED BY: A.M. Esposito	D. Sarkar (SIGNATURE) 9.2.2005 (DATE)
	REVISIONS / INIT. / DATE	SIG. INVENTORY NO.

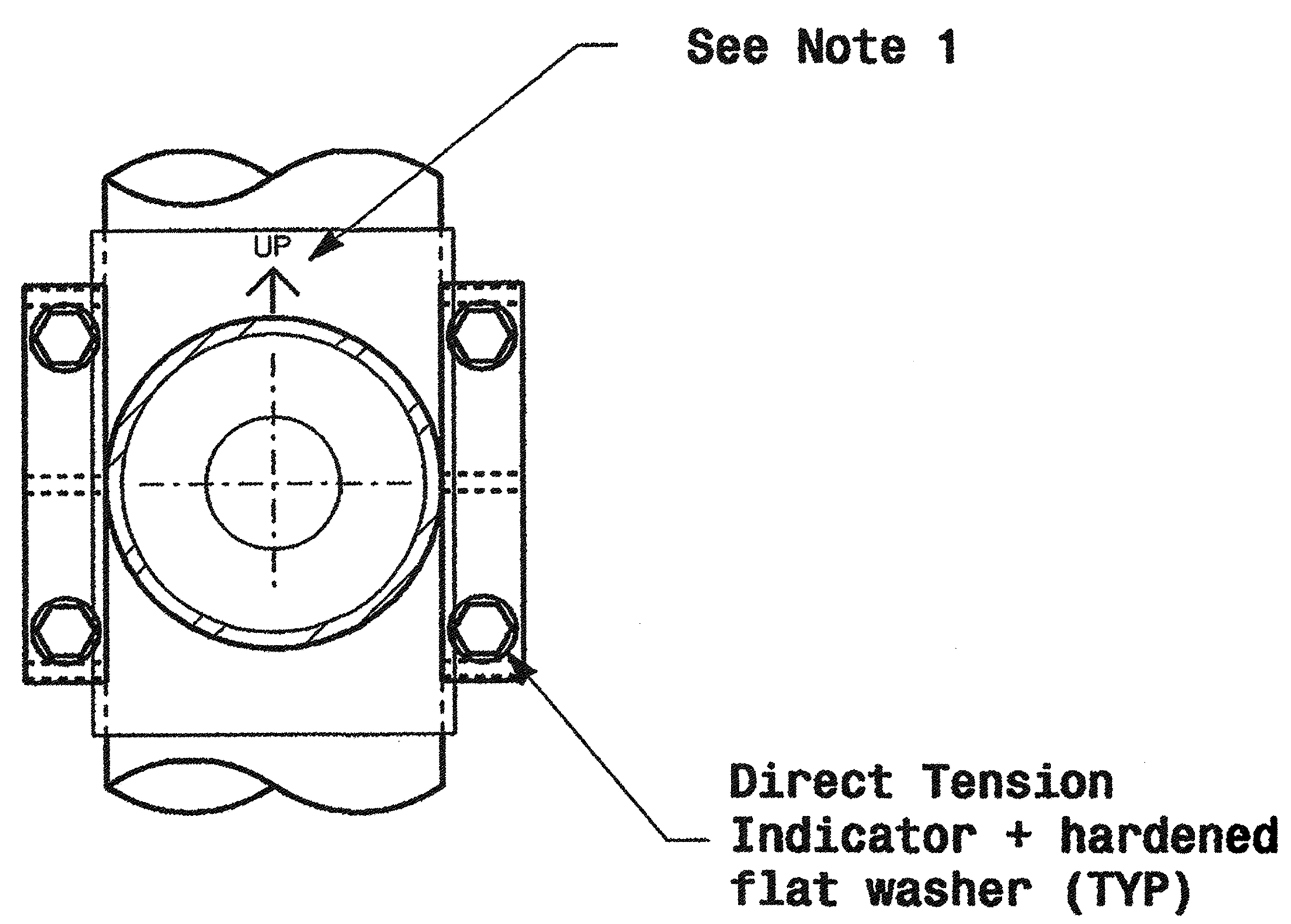
01-SEP-2005 14:08
w:*peoples-unit*workgroups*2004 metal pole standards*2004 m4.dgn
palexander

PROJECT REFERENCE NO.	SHEET NO.
U-2306A	Sig.23 M 5

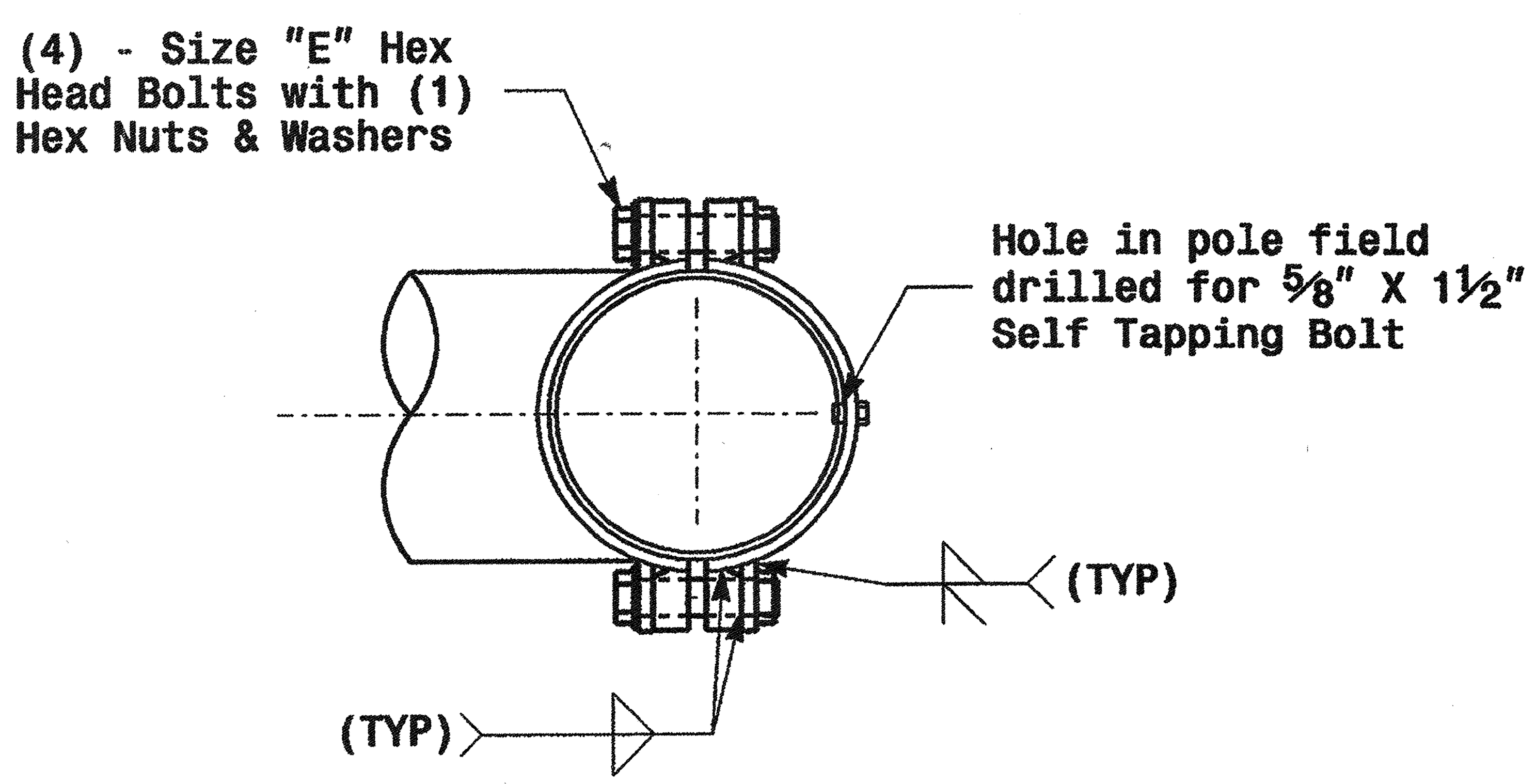
Adjustable Clamp Type Bolted Mast Arm Connection



Side Elevation View

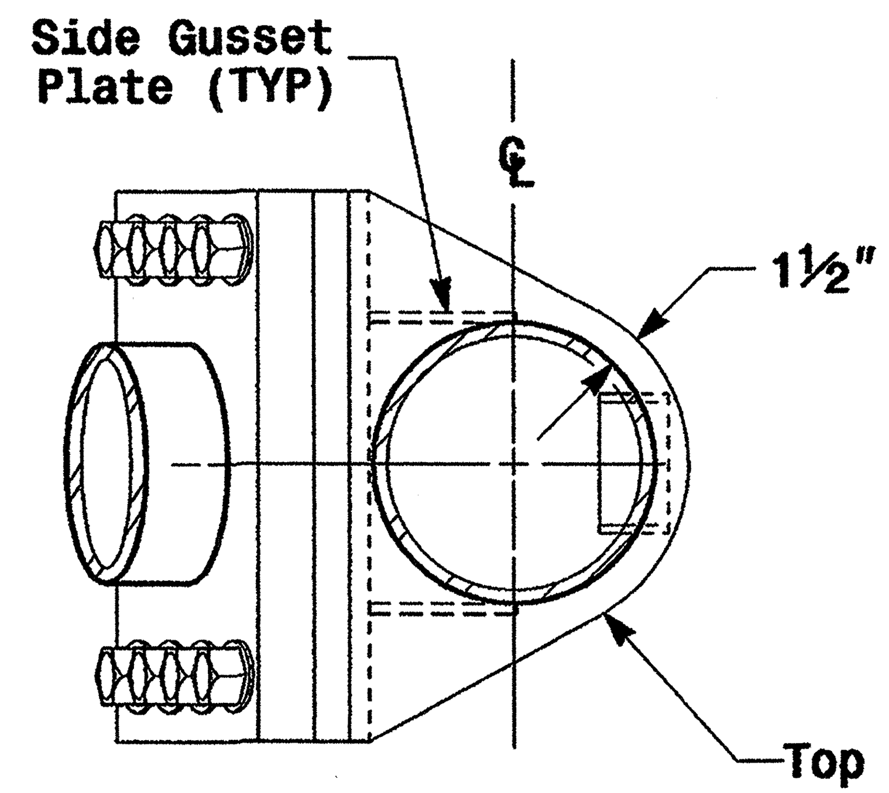


Front Elevation View

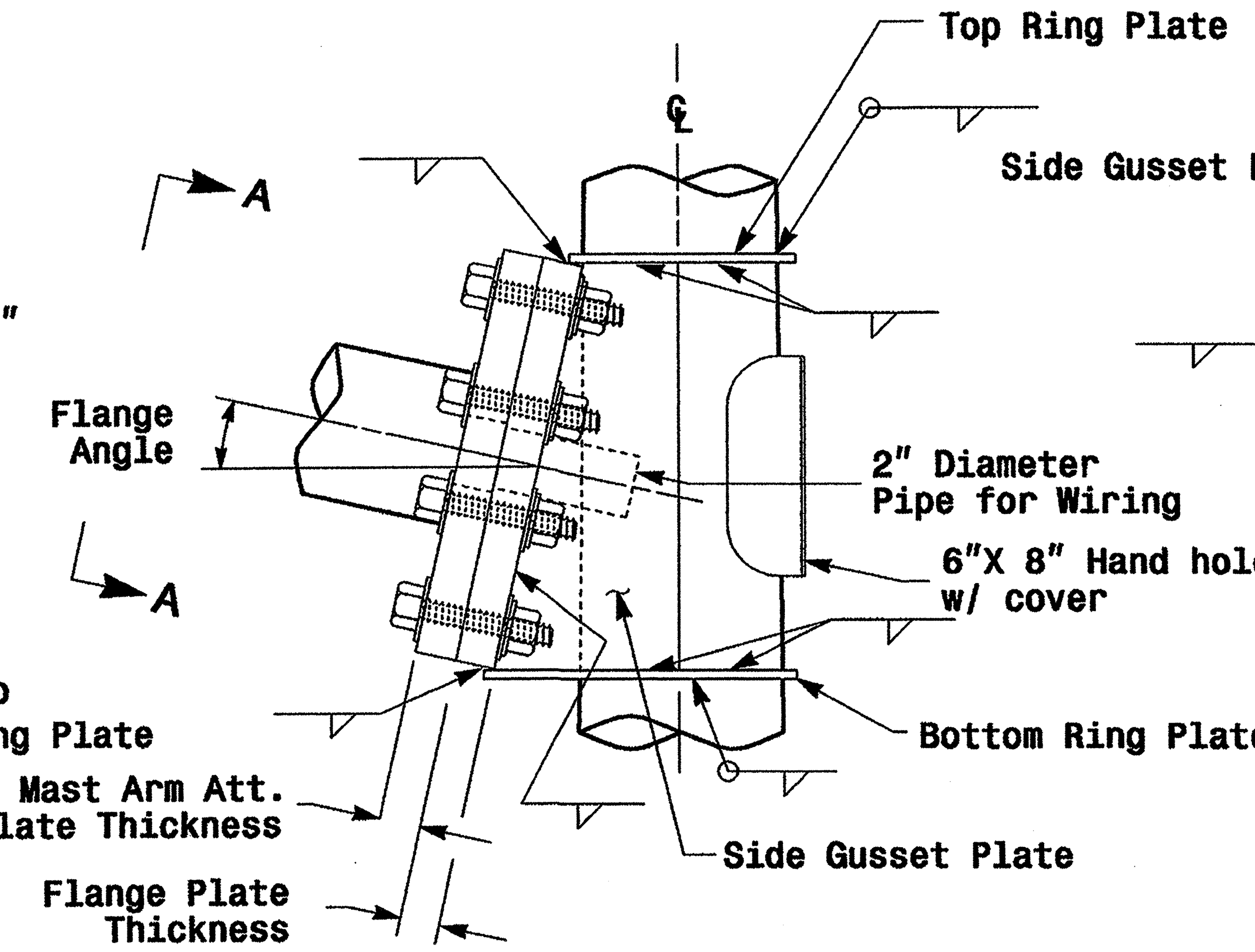


Plan View

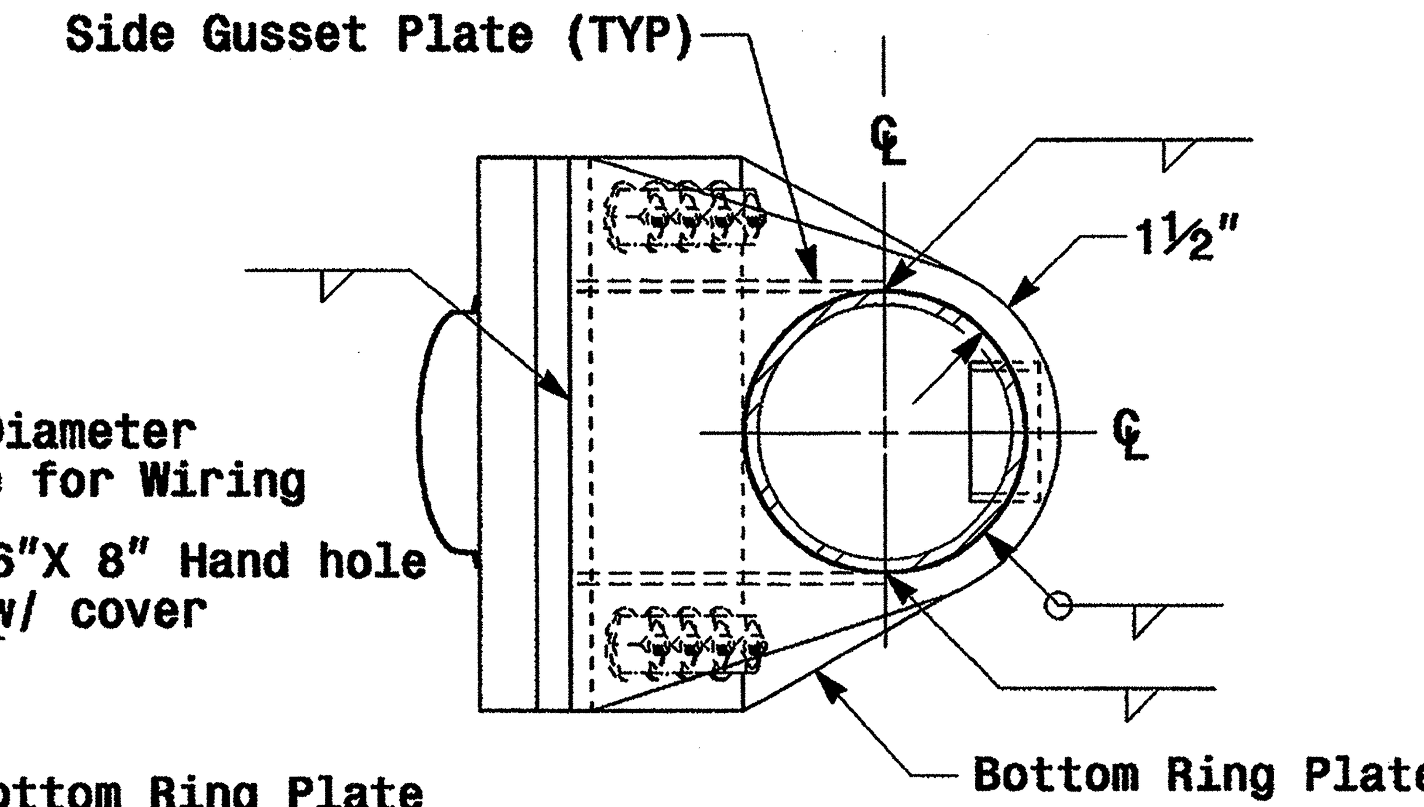
Welded Ring Stiffened Mast Arm Connection



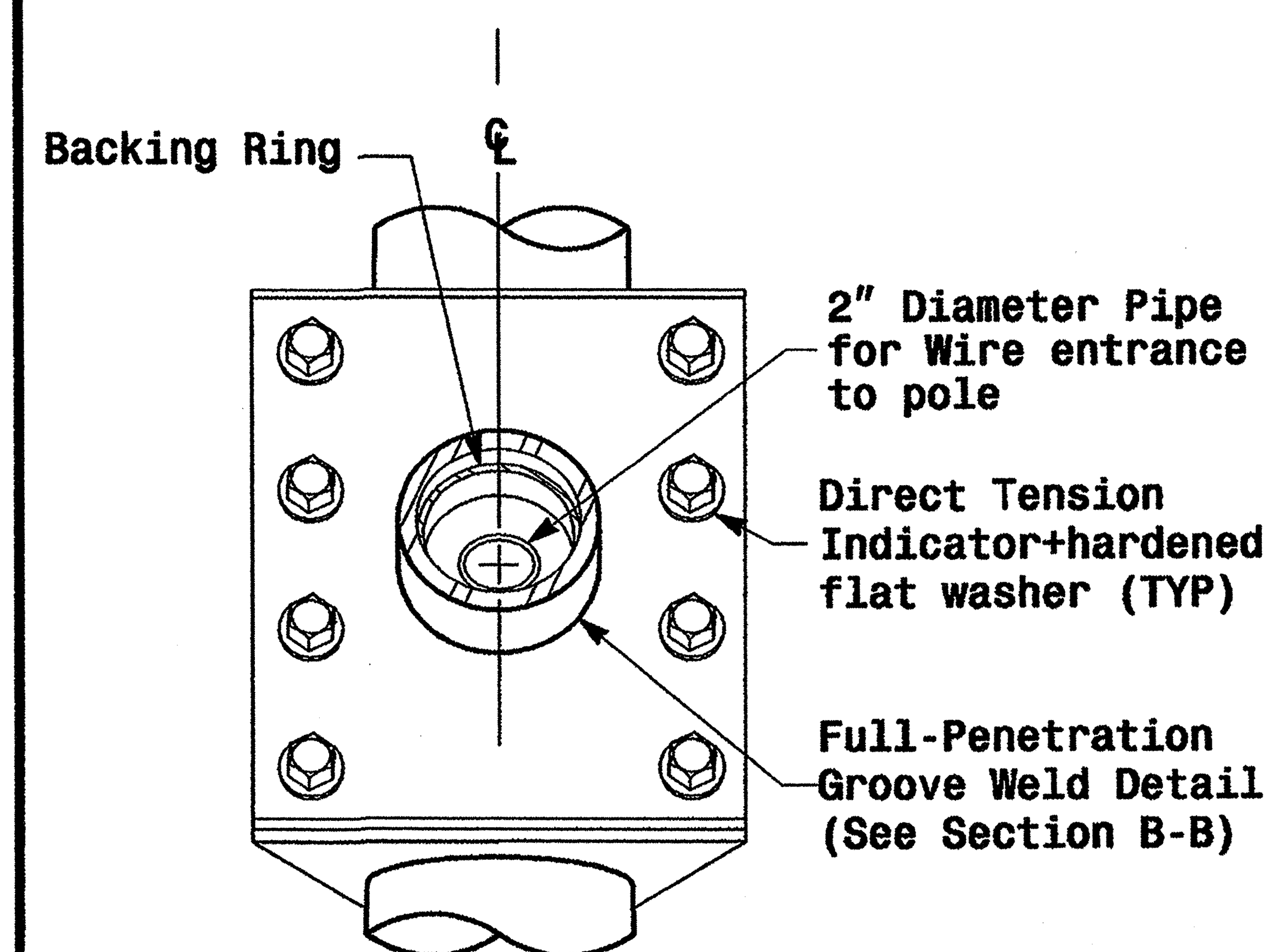
Plan View



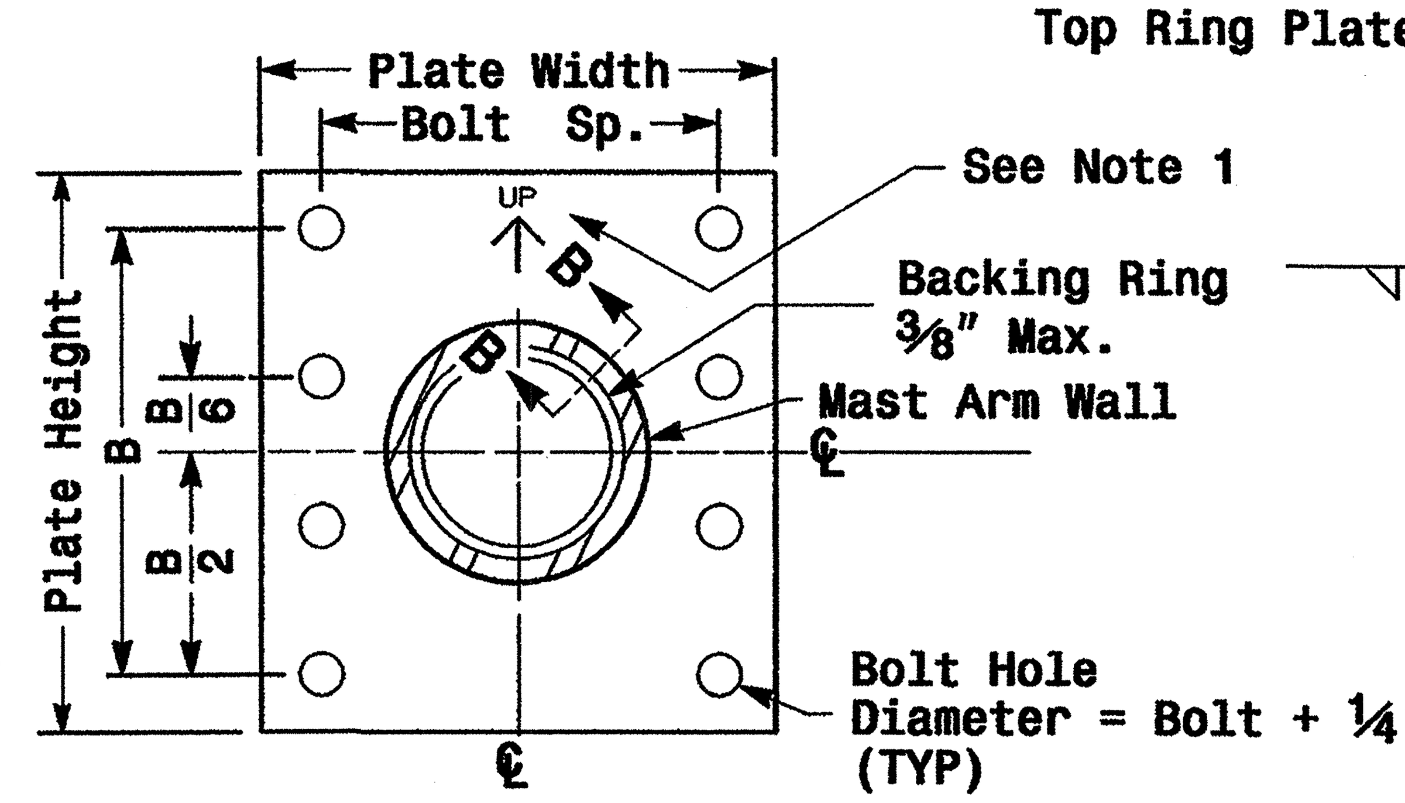
Side Elevation View



Bottom View

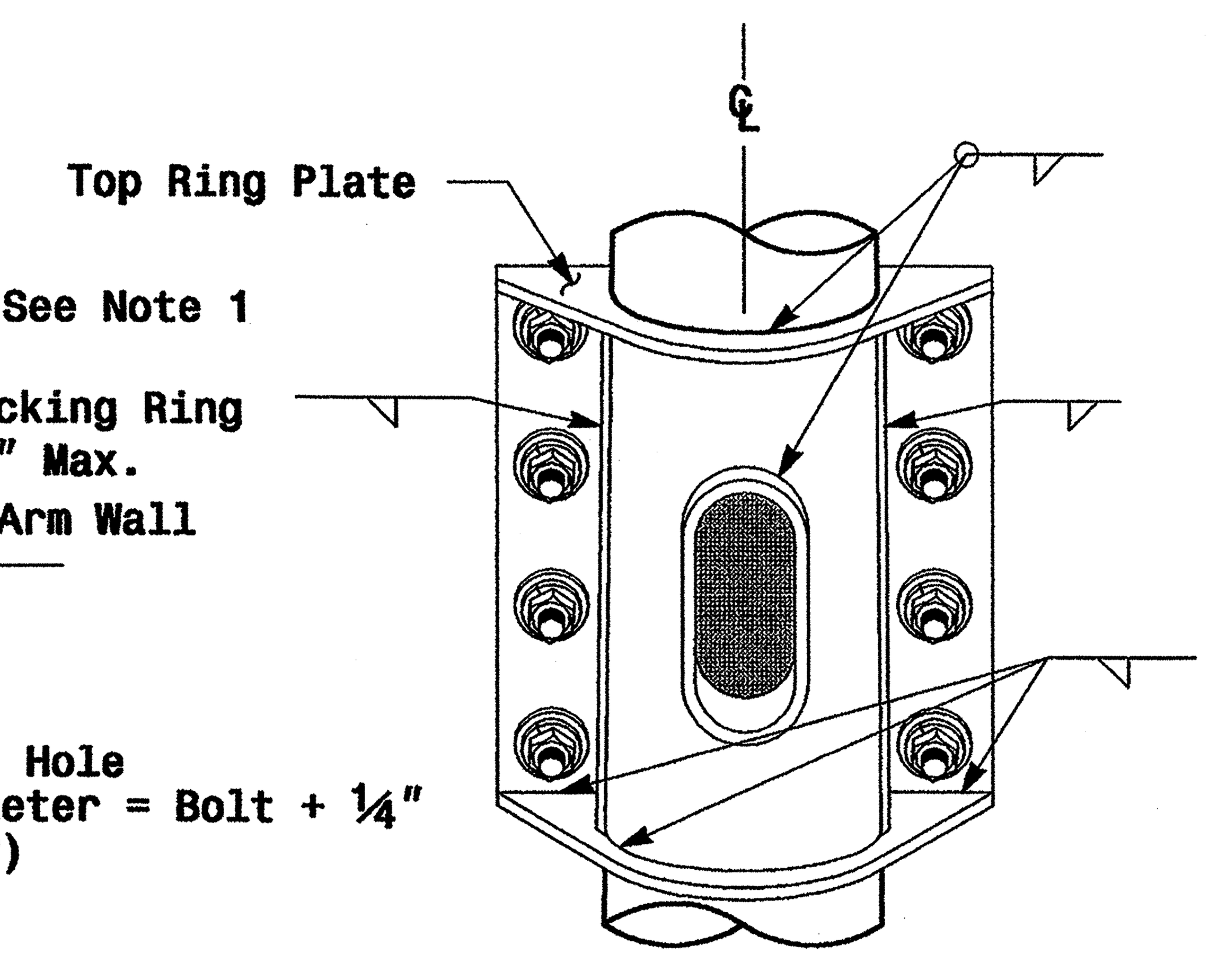


Front Elevation View

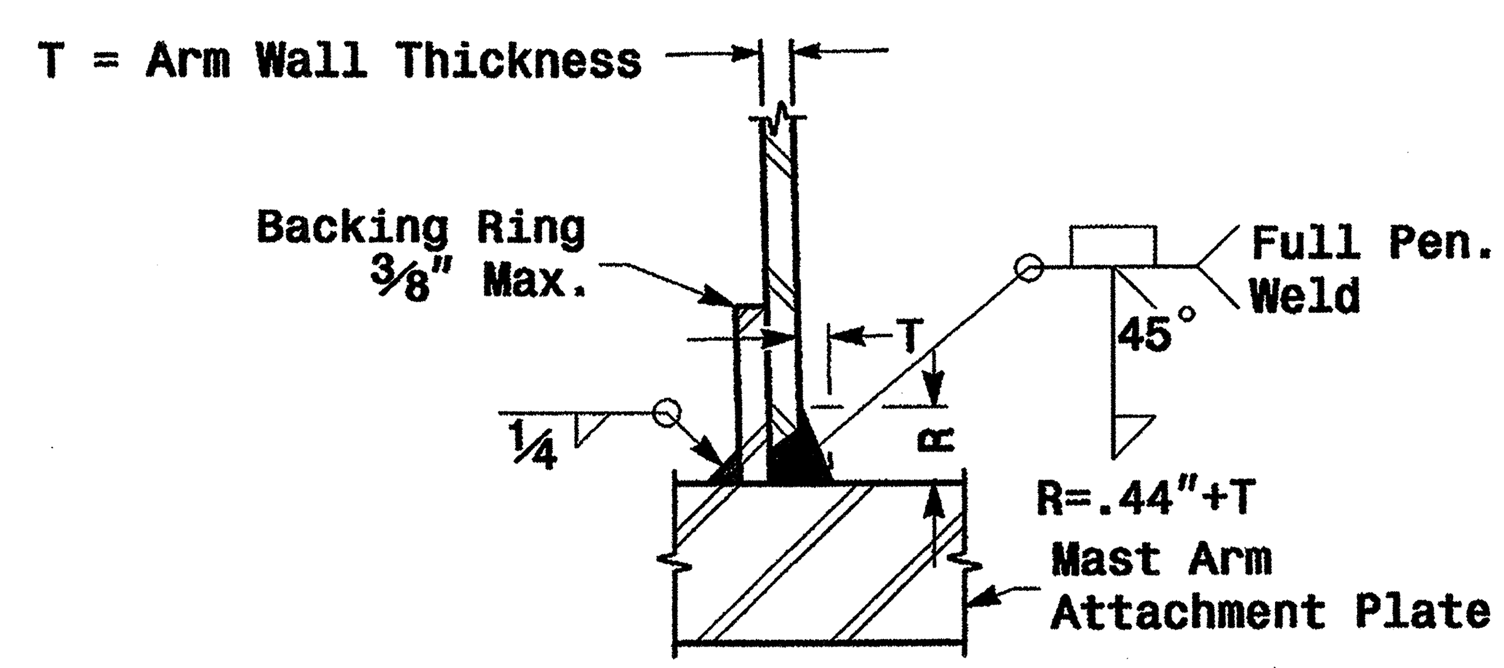


Section View A-A

Mast Arm Attachment Plate



Back Elevation View



Section B-B

Full-Penetration Groove Weld Detail

Notes:

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

Fabrication Details – Mast Arm Poles

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section, 122 N. McDowell St., Raleigh, NC 27603

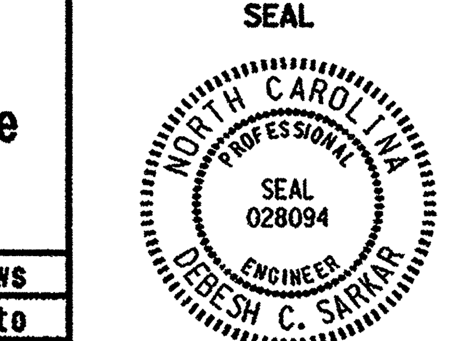
Fabrication Details For Mast Arm Connection To Pole

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

SCALE 0 NA NONE

REVISIONS	INIT.	DATE

SEAL



D. Sarkar 9.2.2005
SIGNATURE DATE

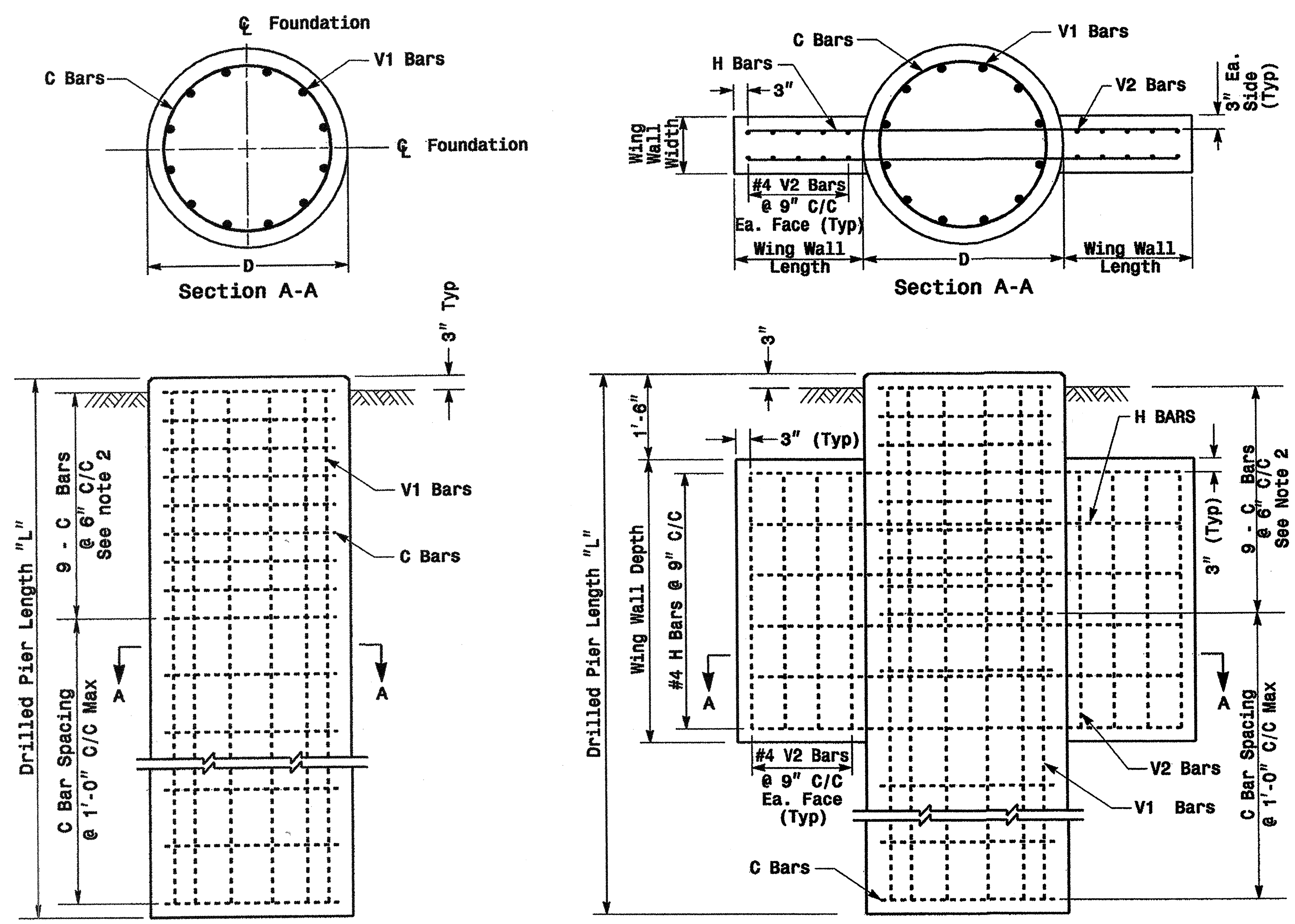
SIG. INVENTORY NO.

01-SEP-2005 14:11 w:\eeplan-unit\workgroups\2004 metal pole standards\2004 m5.dgn palexander

PROJECT REFERENCE NO.	SHEET NO.
U-2306A	Sig.24 M 7

Construction Details – Foundations

Reinforcing Steel Bars

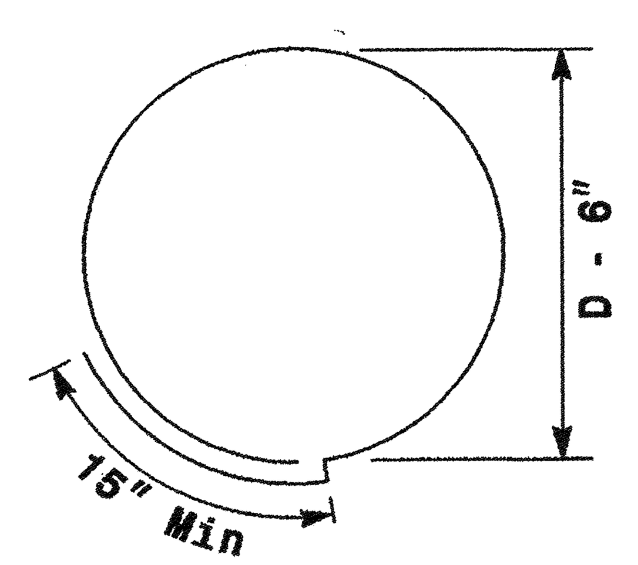


REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (42" & 48" DIAMETER)						
Shaft Dia (in.)	Conc. Volume (cu. yds.)	Bar Name	No.	Size	Type	Length
42"	.356 x L	V1	9	#8	STR.	**
		C	*	#4	CIR.	10'-9"
48"	.465 x L	V1	12	#8	STR.	**
		C	*	#4	CIR.	12'-6"

* 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"
		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



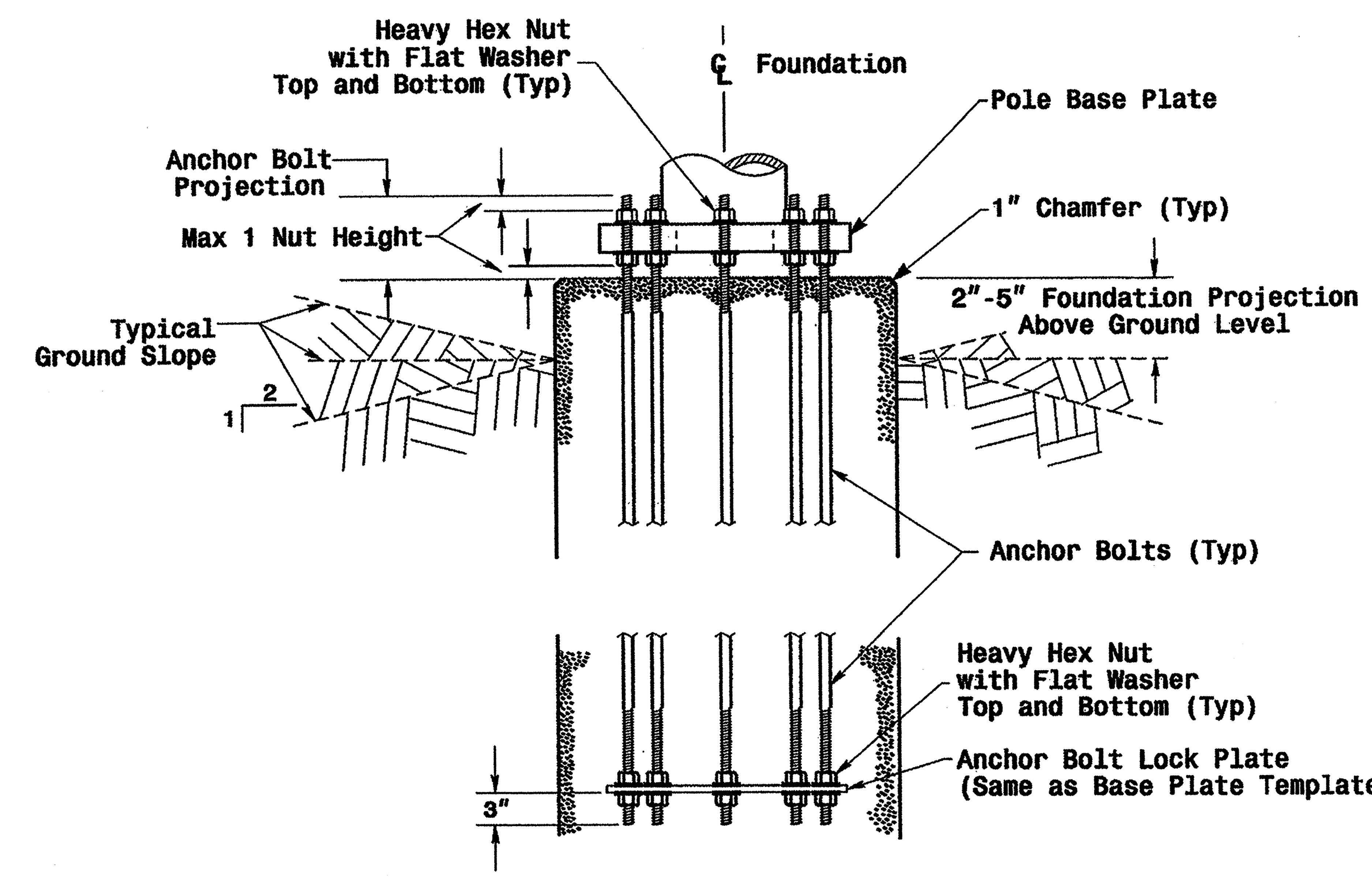
Typical "C" Bars

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

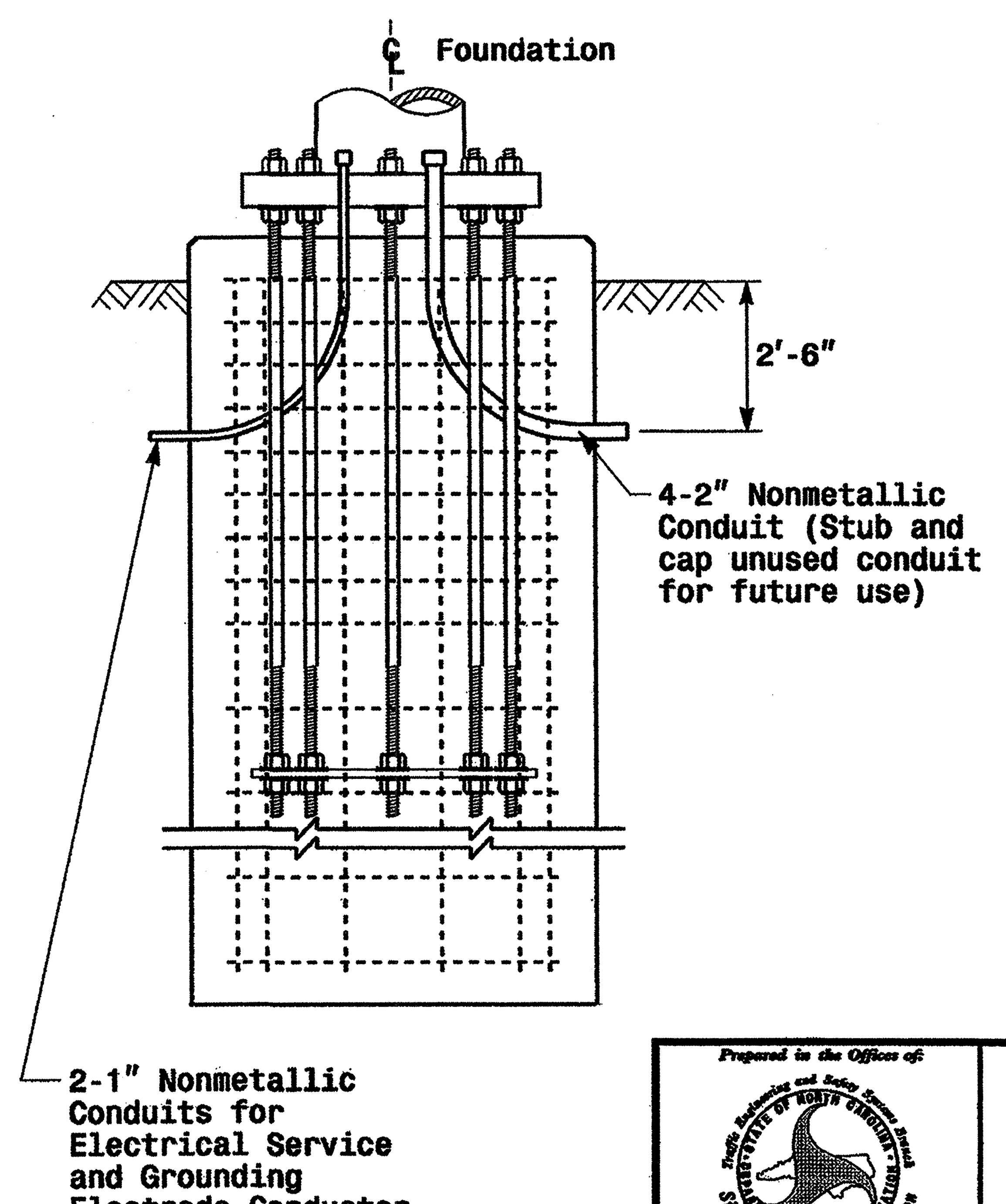
See Note No. 4

Typical Foundation Anchor Bolt Details

(Reinforcing Cage Not Shown for Clarity)



Typical Foundation Conduit Details



Notes

1. The number of C-bars is based on foundation depth. For standard foundations, see sheet M 8.
2. 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.
3. The length of V1-bars is based on foundation depth. For standard foundations, see sheet M 8.
4. 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 Offices of:
122 N. McDowell St., Raleigh, NC 27603

SCALE: 0 NA — NONE

Construction Details
Foundations

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

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 028094 DEBESH C. SARKAR
D. Sarkar 9.2.2005
SIGNATURE DATE
SIG. INVENTORY NO.

01-SEP-2005 11:48
v:\peoples-unit\workgroups\2004 metal pole standards\2004 m1.dgn
pslexandr

METRIC	PROJECT REFERENCE NO.	SHEET NO.
	U-2306A	SIG.25

U-2306A

PROJECT:

ROADWAY STANDARD DRAWINGS

THE FOLLOWING ROADWAY STANDARDS AS APPEAR IN "ROADWAY STANDARD DRAWINGS". ROADWAY DESIGN UNIT – N.C. DEPARTMENT OF TRANSPORTATION – RALEIGH, N.C., DATED JANUARY 2002 ARE APPLICABLE TO THIS PROJECT AND BY REFERENCE HEREBY ARE CONSIDERED A PART OF THESE PLANS:

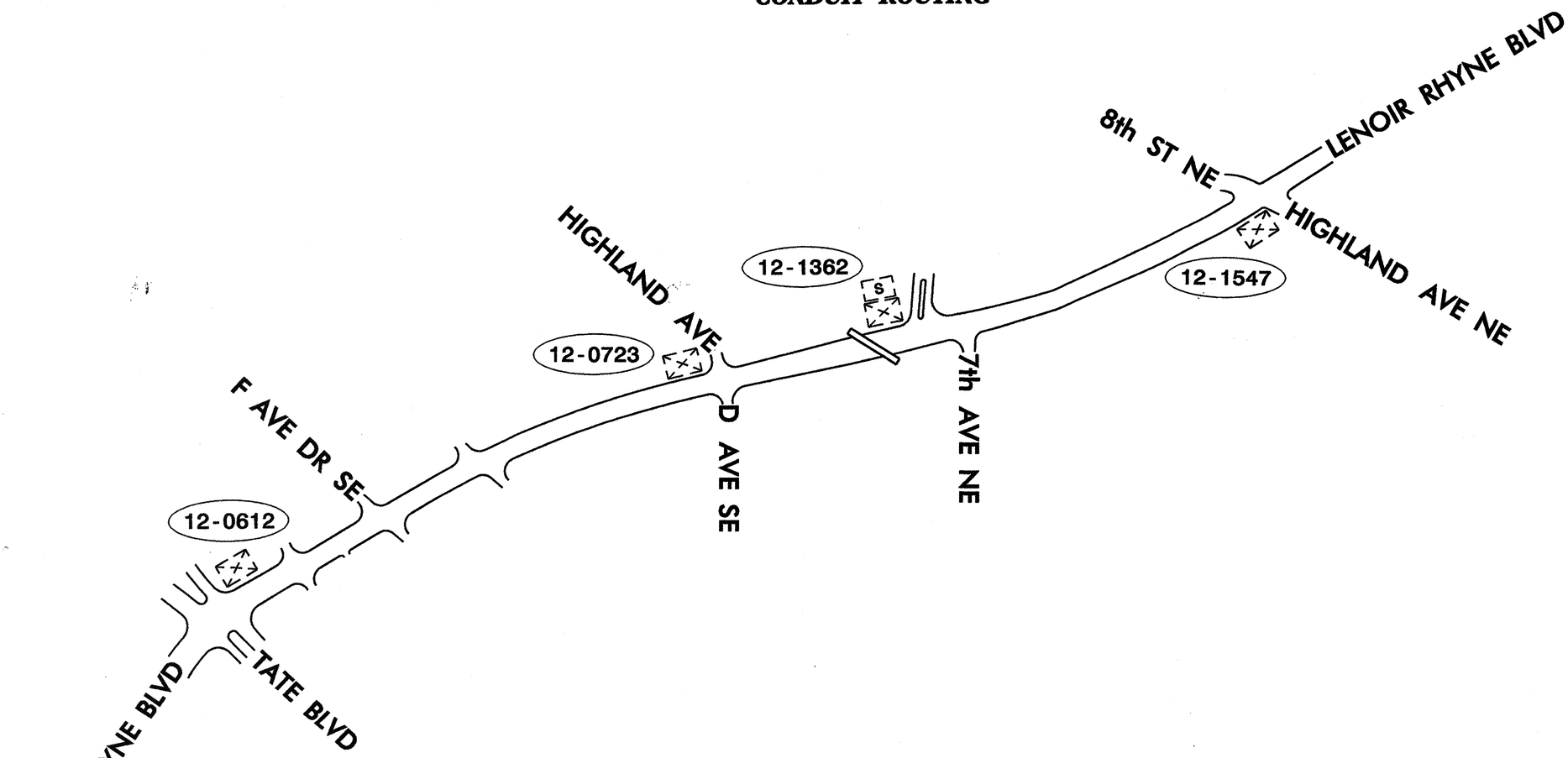
STD. NO.	TITLE
1715.01	UNDERGROUND CONDUIT
1716.01	JUNCTION BOXES
1730.01	FIBER OPTIC CABLE – SPARE CABLE STORAGE
1730.02	FIBER OPTIC CABLE – CONDUIT INSTALLATION
1733.01	DELINEATOR MARKERS

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CATAWBA COUNTY

LOCATION: LENOIR RHYNE BLVD FROM TATE BLVD TO HIGHLAND AVE NE/8th ST NE

TYPE OF WORK: COMMUNICATIONS CABLE AND CONDUIT ROUTING



NCDOT CONTACT:
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
G.G. MURR, JR., PE – TRAFFIC MANAGEMENT SYSTEMS ENGINEER

Prepared in the Office of:
Traffic Management Systems
122 N. McDowell St., Raleigh, NC 27603

SCALE 0

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS

DIVISION 12	CATAWBA CO.		HICKORY
PLAN DATE:	JUNE 2004	REVIEWED BY:	I.N. AVERY
PREPARED BY:	S.C. WARDLE	REVIEWED BY:	G.G. MURR

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 14543 ENGINEER GENE G. MURR, JR.
SIGNATURE 6-14-04 DATE
CADD Filename:

METRIC	PROJECT REFERENCE NO.	SHEET NO.
	U-2306 A	SIG, 26

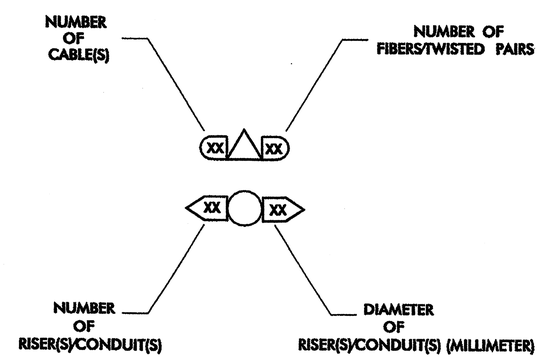
1. INSTALL REA, PE – 22, SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
2. INSTALL REA, PE – 38, (FIGURE 8) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
3. INSTALL REA, PE – 39, (UNDERGROUND) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
4. INSTALL SMFO CABLE
5. INSTALL MMFO CABLE
6. INSTALL FIBER OPTIC DROP CABLE
7. INSTALL TRACER WIRE
8. TRENCH
9. INSTALL PVC CONDUIT
10. INSTALL RIGID, GALVANIZED STEEL CONDUIT
11. INSTALL RIGID, GALVANIZED STEEL RISER WITH WEATHERHEAD
12. INSTALL RIGID, GALVANIZED STEEL RISER WITH FIBER OPTIC CABLE SEAL
13. INSTALL OUTER-DUCT POLYETHYLENE CONDUIT
14. INSTALL POLYETHYLENE CONDUIT
15. DIRECTIONAL DRILL CONDUIT
16. BORE AND JACK CONDUIT
17. INSTALL CABLE(S) IN EXISTING CONDUIT
18. INSTALL CABLE(S) IN NEW CONDUIT
19. INSTALL CABLE(S) IN EXISTING RISER
20. INSTALL CABLE(S) IN NEW RISER
21. INSTALL CABLE(S) IN EXISTING CONDUIT STUB-OUTS
22. INSTALL NEW CONDUIT INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB-OUTS WHEN AVAILABLE)
23. INSTALL NEW RISER INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB-OUTS WHEN AVAILABLE)
24. INSTALL NEW CONDUIT INTO EXISTING POLE MOUNTED CABINET
25. INSTALL NEW RISER INTO EXISTING POLE MOUNTED CABINET
26. TERMINATE COMMUNICATIONS CABLE ON EXISTING TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
27. INSTALL NEW TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
28. INSTALL INTERCONNECT CENTER, PATCH PANEL, JUMPERS AND FUSION SPLICE CABLE IN CABINET
29. INSTALL UNDERGROUND SPLICE ENCLOSURE
30. INSTALL AERIAL SPLICE ENCLOSURE
31. INSTALL POLE MOUNTED SPLICE CABINET
32. INSTALL BASE MOUNTED SPLICE CABINET
33. REMOVE EXISTING SPLICE CABINET
34. INSTALL CABINET FOUNDATION
35. REMOVE EXISTING CABINET FOUNDATION
36. INSTALL CCTV CAMERA ASSEMBLY
37. INSTALL CCTV CAMERA WOOD POLE
38. INSTALL CCTV CAMERA METAL POLE AND FOUNDATION
39. INSTALL JUNCTION BOX
40. INSTALL OVERSIZED JUNCTION BOX
41. REMOVE EXISTING JUNCTION BOX
42. INSTALL WOOD POLE
43. REMOVE EXISTING WOOD POLE
44. INSTALL AERIAL GUY ASSEMBLY
45. INSTALL STANDARD GUY ASSEMBLY
46. INSTALL SIDEWALK GUY ASSEMBLY
47. INSTALL MESSENGER CABLE
48. REMOVE EXISTING COMMUNICATIONS AND MESSENGER CABLE
49. REMOVE EXISTING MESSENGER CABLE
50. INSTALL TELEPHONE SERVICE
51. INSTALL CABLE STORAGE RACKS (SNOW SHOES) AND STORE 30 METERS OF CABLE
52. INSTALL DELINEATOR MARKER
53. STORE 6 METERS OF COMMUNICATIONS CABLE
54. LASH CABLE(S) TO EXISTING SIGNAL/COMMUNICATIONS CABLE
55. LASH CABLE(S) TO EXISTING MESSENGER CABLE
56. LASH CABLE(S) TO NEW MESSENGER CABLE
57. MODIFY EXISTING ELECTRICAL SERVICE
58. INSTALL NEW ELECTRICAL SERVICE

LEGEND

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

CONSTRUCTION NOTE SYMBOLOGY KEY

- (XX) INDICATES NUMBER OF CABLES, LOOPS, ETC.
- XX INDICATES NUMBER OF FIBERS PER CABLE, TWISTED PAIRS PER CABLE, ETC.
- <XX INDICATES NUMBER OF RISER(S)/CONDUIT(S)
- XX> INDICATES DIAMETER OF RISER(S)/CONDUIT(S) (INCH)



Prepared in the Offices of
Traffic Engineering and Safety Systems Branch
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Traffic Management Systems
122 N. McDowell St., Raleigh, NC 27603

CONSTRUCTION NOTES

PLAN DATE:
PREPARED BY:
REVIEWED BY:
REVIEWED BY: G. A. FULLER

SCALE 0

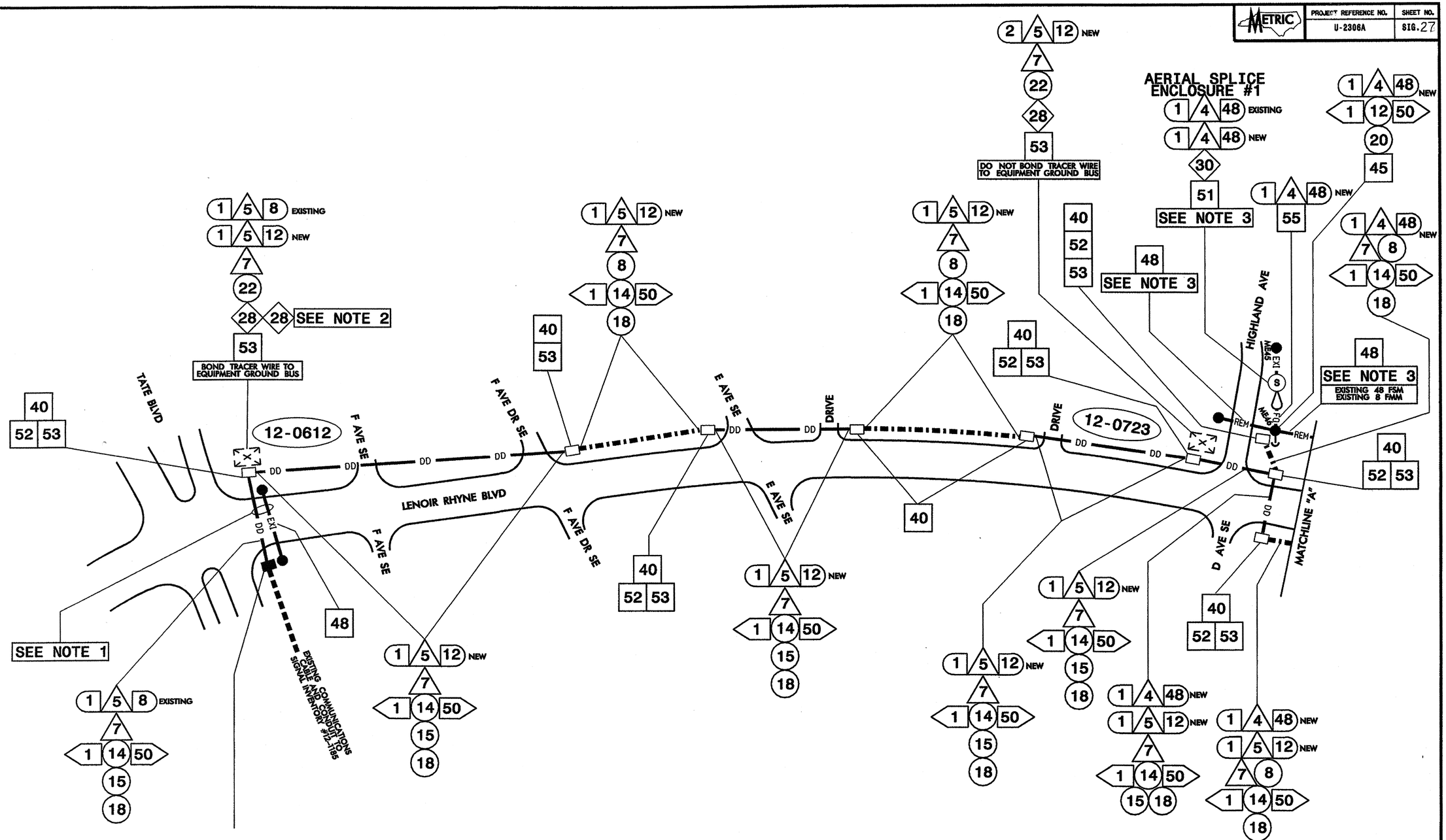
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

Gregory A. Fuller 10/31/02
SIGNATURE DATE

CADD Filename:

METRIC	PROJECT REFERENCE NO.	SHEET NO.
	U-2306A	SIG.27



EXISTING JUNCTION BOX #1

NOTES:

1. CONTRACTOR TO REMOVE THE EXISTING MULTI-MODE COMMUNICATIONS CABLE (AERIAL RUN) AND ROUTE THROUGH THE CONTRACTOR INSTALLED CONDUIT SYSTEM TO THE NEW CONTROLLER CABINET LOCATION (SIG. INV. #12-0612). STORE EXCESS SPARE COMMUNICATIONS CABLE IN EXISTING JUNCTION BOX #1.
2. TERMINATE THE EXISTING MULTI-MODE COMMUNICATIONS CABLE IN A SEPARATE INTERCONNECT CENTER AS SHOWN IN THE MULTI-MODE SPLICE PLANS.
3. REMOVE THE EXISTING 8 FIBER MULTI-MODE CABLE THAT RUNS BETWEEN SIG. INV. #12-0723 AND EXISTING SPLICE CABINET #1. THIS SECTION OF CABLE IS TO BE DISCARDED. CUT THE EXISTING 48 FIBER SINGLE-MODE CABLE, BACK PULL AND STORE FOR FUTURE TERMINATION AT "AERIAL SPLICE ENCLOSURE #1."

SEAL ALL CONDUIT ENDS WITH MECHANICAL SEALING DEVICES AT ALL JUNCTION BOX /SIGNAL CABINET ENTRANCES

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
NCDEPARTMENT OF TRANSPORTATION
Traffic Management Systems
1722 N. McDowell St., Raleigh, NC 27603

SCALE 0

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS

DIVISION 12 CATAWBA CO. HICKORY

PLAN DATE:	JUNE 2004	REVIEWED BY:	I.N. AVERY
PREPARED BY:	S.C. WARDLE	REVIEWED BY:	G.G. MURR

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 14543
ENGINEER
GENE G. MURR, JR.

SIGNATURE 6-14-04 DATE

CADD Filenames:

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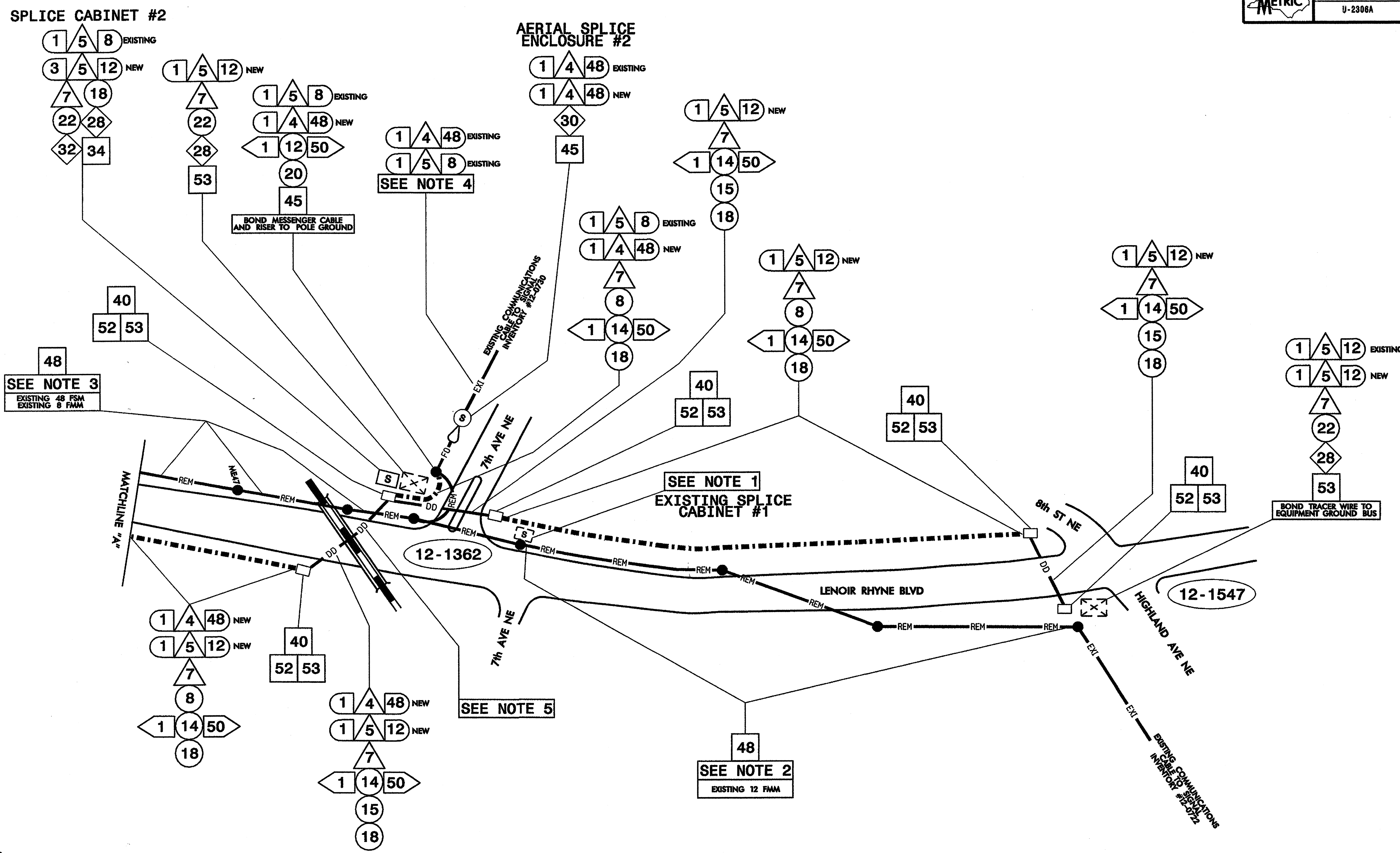
	U-2306A	SIG.28



NOTES:

1. REMOVE EXISTING SPLICE CABINET #1 AND INTERCONNECT CENTER AND RETURN TO ENGINEER
2. REMOVE THE EXISTING 12 FIBER MULTI-MODE CABLE WHICH RUNS BETWEEN "EXISTING SPLICE CABINET #1" AND SIG. INV. #12-1547. THIS SECTION OF CABLE IS TO BE DISCARDED AND REPLACED WITH NEW 12 FIBER MULTI-MODE CABLE.
3. CUT THE EXISTING 48 FIBER SINGLE-MODE CABLE, BACK PULL AND STORE FOR FUTURE TERMINATION AT "AERIAL SPLICE ENCLOSURE #2." REMOVE AND DISCARD ANY MULTI-MODE COMMUNICATIONS CABLE THAT RUNS BETWEEN "EXISTING SPLICE CABINET #1" AND SIG. INV. #12-0723.
4. RELOCATE THE SECTION OF 8 FIBER MULTI-MODE COMMUNICATIONS CABLE THAT RUNS BETWEEN "EXISTING SPLICE CABINET #1" AND SIG. INV. #12-0730. REROUTE THE EXISTING CABLE TO THE "NEW SPLICE CABINET #2" LOCATED AT SIG. INV. #12-1362.
5. CONTRACTOR MAY CONSIDER INSTALLING CONDUIT UNDER ROADWAY WHILE THE ROADBED IS OPENED FOR OTHER UTILITY WORK, DRAINAGE, ETC. THERE ARE SEVERAL UNDERGROUND UTILITIES IN THIS AREA.

SEAL ALL CONDUIT ENDS WITH MECHANICAL SEALING DEVICES AT ALL JUNCTION BOX /SIGNAL CABINET ENTRANCES

Prepared in the Offices of:
Traffic Management Systems
222 N. McDowell St., Raleigh, NC 27603

COMMUNICATIONS CABLE AND CONDUIT ROUTING PLANS

DIVISION 12	CATAWBA CO.		HICKORY
PLAN DATE:	JUNE 2004	REVIEWED BY:	I.N. AVERY
PREPARED BY:	S.C. WARDLE	REVIEWED BY:	G.G. MURR

SCALE 0

REVISIONS | INIT. | DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 14543 GENE G. MURR, JR.

SIGNATURE | DATE 6-14-04

CADD Filename:

MULTI-MODE FIBER OPTIC CABLE

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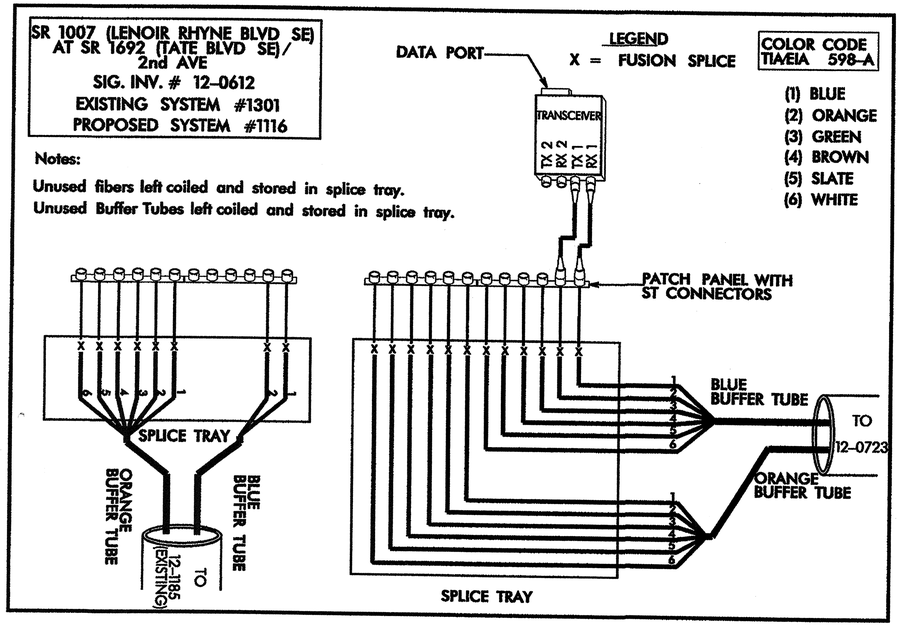
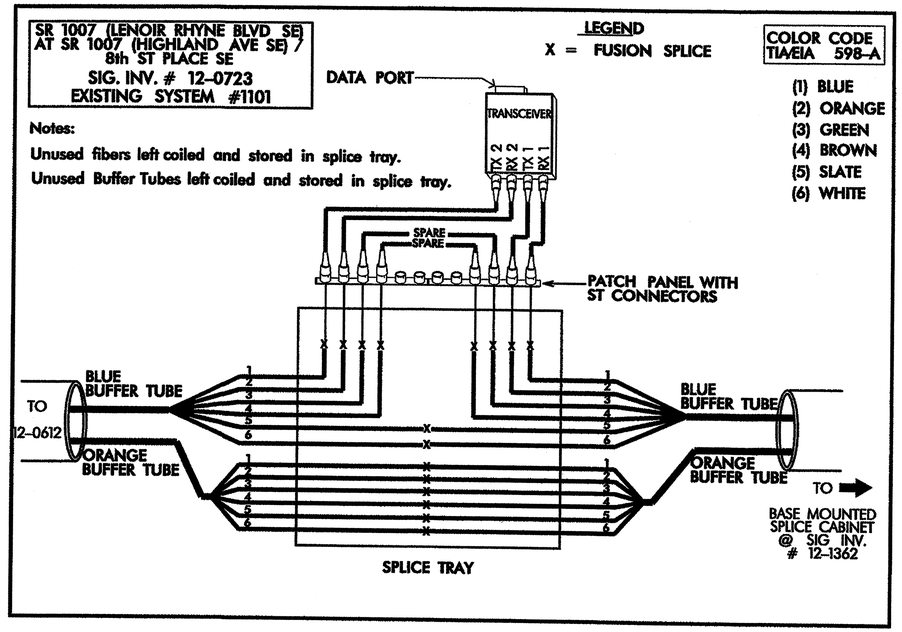
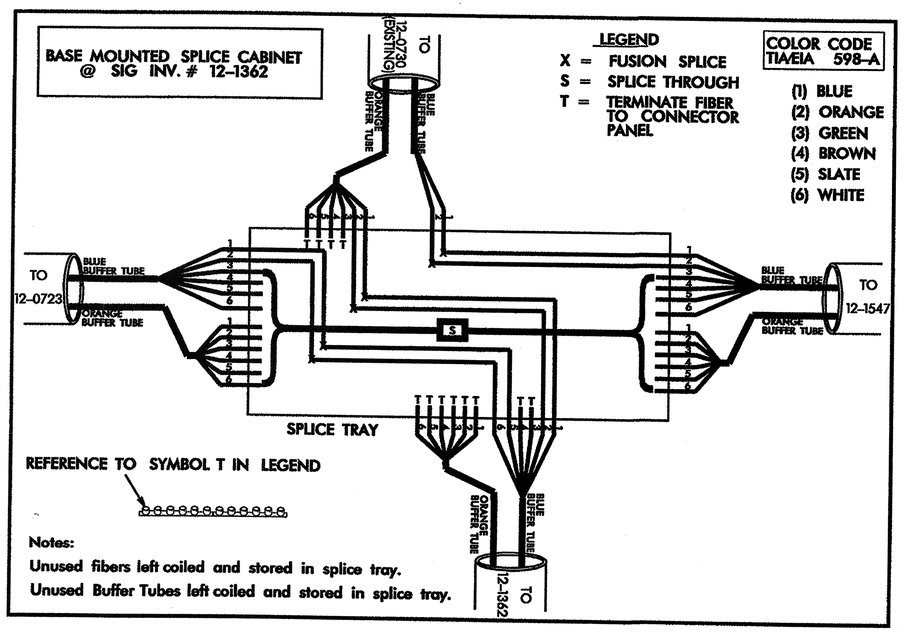
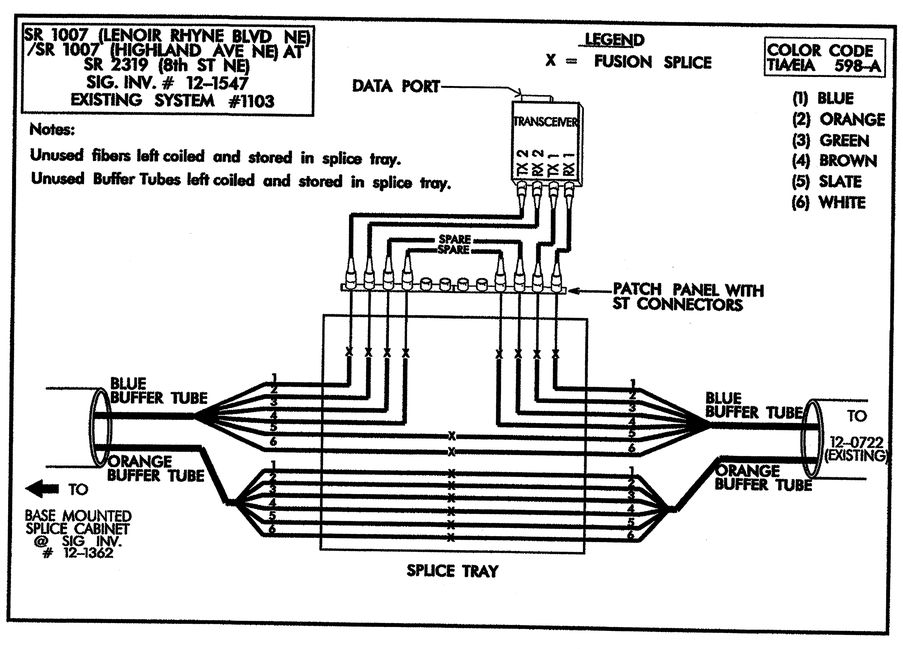
	U-2306A	SIG.29









NOTE 1: CONTRACTOR TO RETURN EXISTING TRANSCEIVERS AND INTERCONNECT CENTERS TO THE ENGINEER FOR RETURN TO THE CITY OF HICKORY

NOTE 2: FURNISH OPTELECOM MODEL 4170-S-ST TRANSCEIVERS FOR COMPATILITY WITH THE EXISTING HICKORY COMPUTERIZED SIGNAL SYSTEM

NOTE 3: TRANSCEIVER TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING \ ENSURING THE PROPER TERMINATIONS

Prepared in the Offices of
Traffic Engineering and Safety Systems Branch
N.C. DEPARTMENT OF TRANSPORTATION
Traffic Management Systems
122 N. McDowell St., Raleigh, NC 27603

SCALE 0

MULTI-MODE SPLICE PLAN

DIVISION 12 CATAWBA CO. HICKORY

PLAN DATE: JUNE 2004 REVIEWED BY: I.N. AVERY

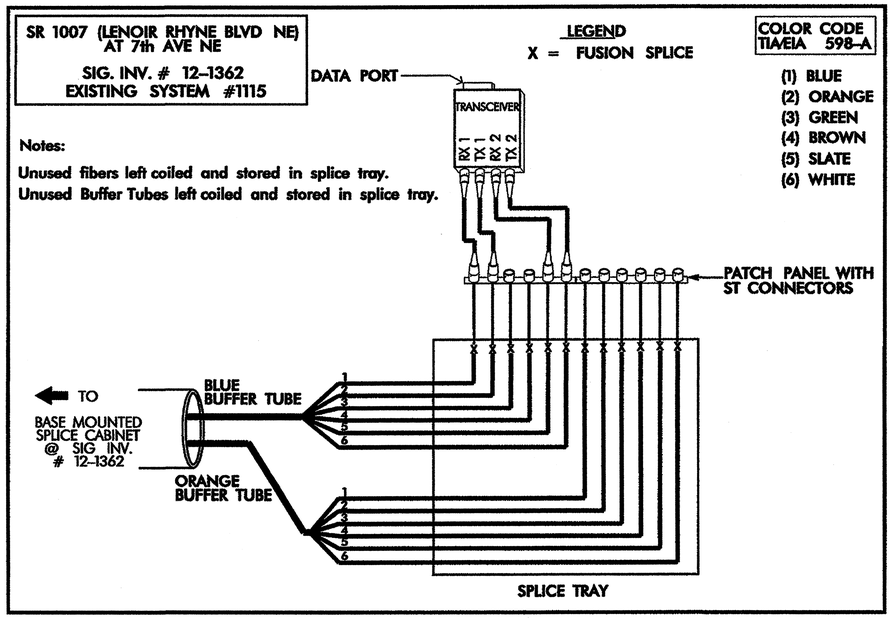
PREPARED BY: ADRIAN CREECH REVIEWED BY: G.G. MURR, JR.

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 14543 ENGINEER GENE G. MURR JR.
SIGNATURE 6-14-04 DATE

METRIC	PROJECT REFERENCE NO.	SHEET NO.
	U-2306A	SIG. 30

MULTI-MODE FIBER OPTIC CABLE



NOTE 1: CONTRACTOR TO RETURN EXISTING TRANSCEIVERS AND INTERCONNECT CENTERS TO THE ENGINEER FOR RETURN TO THE CITY OF HICKORY

NOTE 2: FURNISH OPTELECOM MODEL 4170-S-ST TRANSCEIVERS FOR COMPATILITY WITH THE EXISTING HICKORY COMPUTERIZED SIGNAL SYSTEM

NOTE 3: TRANSCEIVER TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING \ ENSURING THE PROPER TERMINATIONS

Prepared in the Offices of:
NC Department of Transportation
Traffic Management Section
1722 N. McDowell St., Raleigh, NC 27603

SCALE
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MULTI-MODE
SPLICE PLAN

DIVISION 12 CATAWBA CO. HICKORY
PLAN DATE: JUNE 2004 REVIEWED BY: I.N. AVERY
PREPARED BY: ADRIAN CREECH REVIEWED BY: G.G. MURR, JR.

REVISIONS	INIT.	DATE

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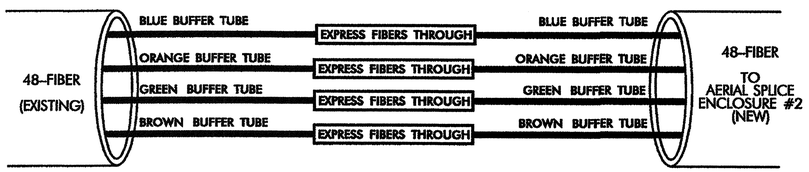
	U-2306A	SIG.31

SINGLE-MODE FIBER OPTIC CABLE

AERIAL SPLICE ENCLOSURE #1

LEGEND

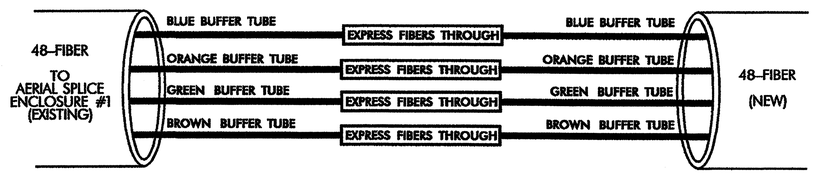
EXPRESS FIBERS THROUGH = SPLICE OR EXPRESS ENTIRE BUFFER TUBE AS NOTED



AERIAL SPLICE ENCLOSURE #2

LEGEND

EXPRESS FIBERS THROUGH = SPLICE OR EXPRESS ENTIRE BUFFER TUBE AS NOTED



NOTE 1: TRANSCEIVER TERMINATION CONFIGURATIONS ARE GENERIC. CONTRACTOR IS RESPONSIBLE FOR DETERMINING \ ENSURING THE PROPER TERMINATIONS

Prepared in the Offices of:
North Carolina Department of Transportation
Traffic Management Systems
122 N. McDowell St., Raleigh, NC 27603

SCALE 0

SINGLE-MODE SPLICE PLAN

DIVISION 12 CATAWBA CO. HICKORY

PLAN DATE: JUNE 2004 REVIEWED BY: I.N. AVERY

PREPARED BY: ADRIAN CREECH REVIEWED BY: G.G. MURR, JR.

REVISIONS	INIT.	DATE

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NORTH CAROLINA PROFESSIONAL SEAL 14543 ENGINEER GENE G. MURR, JR.

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