Project No.	Sheet No.
U–4733	Sig. 1

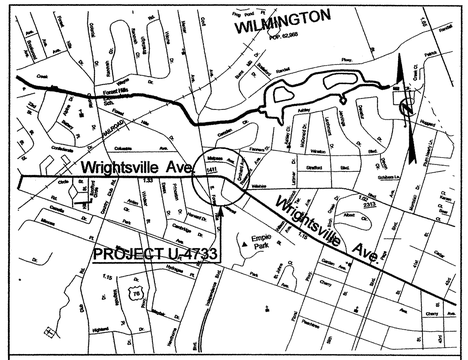
Project: U–4733

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

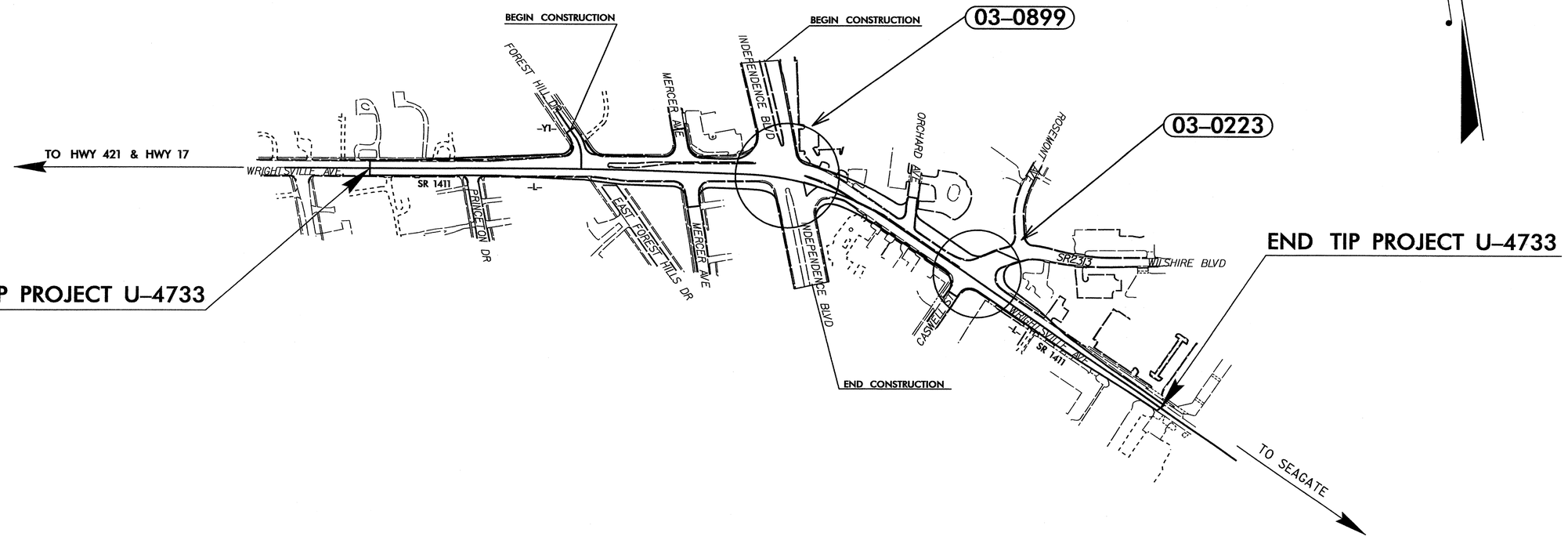
NEW HANOVER COUNTY

LOCATION: WILMINGTON – SR 1411 (WRIGHTSVILLE AVE.) FROM SR 2313 (WILSHIRE BLVD.) TO FOREST HILLS DR.

TYPE OF WORK: TRAFFIC SIGNALS & COMMUNICATIONS CABLE ROUTING PLANS



VICINITY MAP



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

Index of Plans

Sheet #	*Reference #*	*Location/Description*
Sig. 1	————	*Title Sheet*
Sig. 2–7	*03–0899*	*SR 1209 (Independence Blvd) at SR 1411 (Wrightsville Ave.)*
Sig. 8–13	*03–0223*	*SR 1411 (Wrightsville Ave.) at SR 2123 (Wilshire Blvd)/Caswell St.*
Sig. 14–18	*N/A*	*Standard Drawings for Metal Poles*
Sig. 19–25	*N/A*	*Communications Cable Routing Details*
Sig. 26–28	*N/A*	*Inductive Detection Loops Details*

INTELLIGENT TRANSPORTATION AND SIGNALS UNIT

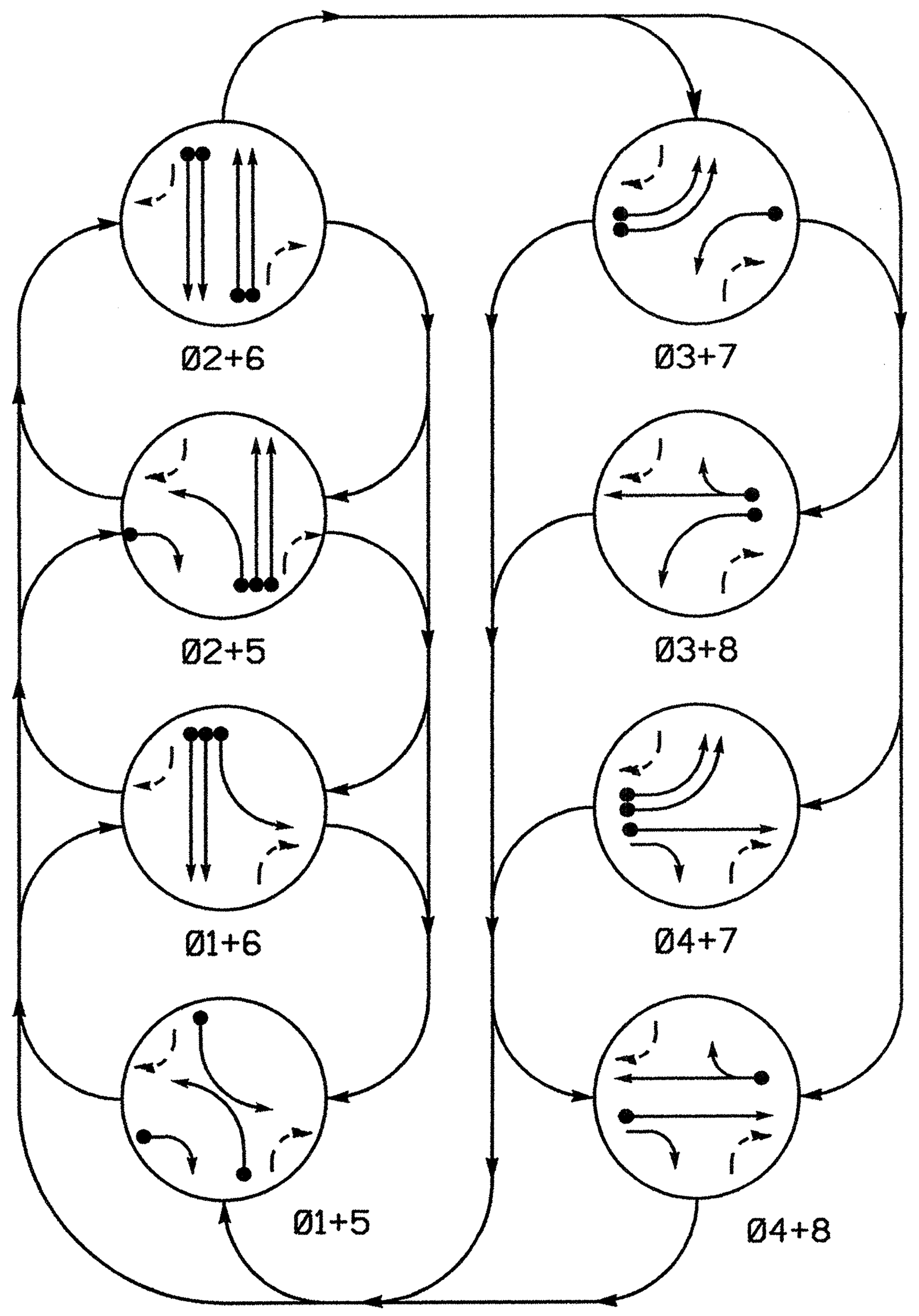
Contacts:

T. J. Williams, PE – Signals and Geometrics Contracts Engineer
J.T. Rowe, Jr., PE – Signal Equipment Design Engineer
G. G. Murr, Jr., PE – Intelligent Transportation Systems Engineer

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

750 N. Greenfield Parkway, Garner, NC 27529

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

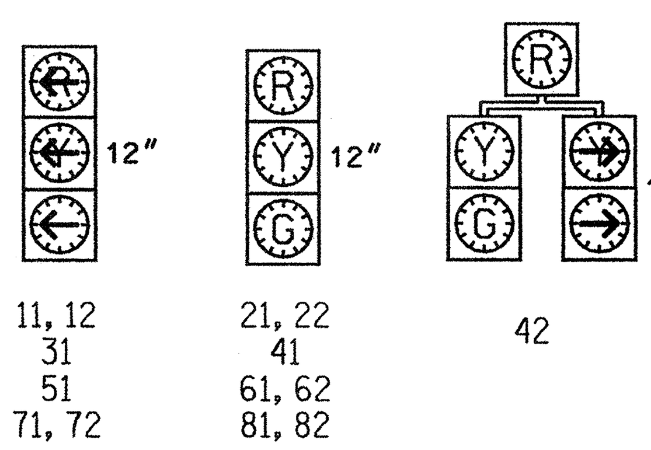
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3+7	Ø3+8	Ø4+7	Ø4+8	FLASH
11, 12	←	←	←R	←R	←R	←R	←R	←R	←R
21, 22	R	R	G	G	R	R	R	R	Y
31	←R	←R	←R	←R	←	←	←R	←R	←R
41	R	R	R	R	R	R	G	G	R
42	R/→	R	R/→	R	R	R	G	G	R
51	←	←R	←	←R	←R	←R	←R	←R	←R
61, 62	R	G	R	G	R	R	R	R	Y
71, 72	←R	←R	←R	←R	←	←R	←	←R	←R
81, 82	R	R	R	R	R	G	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.



2070L ZONE & DETECTOR INSTALLATION

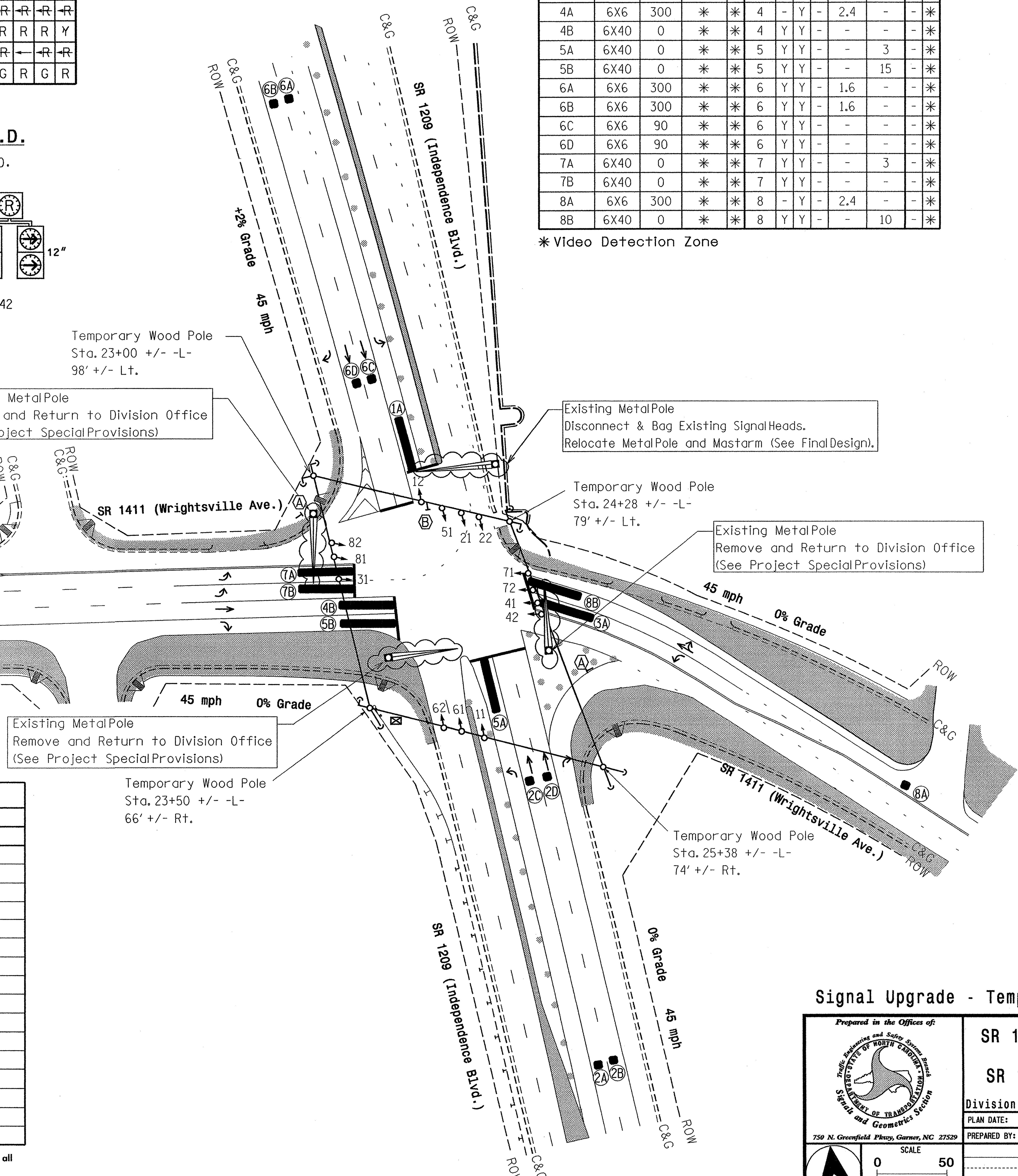
DETECTION ZONES: ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW ZONE	DETECTOR PROGRAMMING: PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	*	*	1	Y	Y	-	-	-	-	*
2A	6X6	300	*	*	2	Y	Y	-	1.6	-	-	*
2B	6X6	300	*	*	2	Y	Y	-	1.6	-	-	*
2C	6X6	90	*	*	2	Y	Y	-	-	-	-	*
2D	6X6	90	*	*	2	Y	Y	-	-	-	-	*
3A	6X40	0	*	*	3	Y	Y	-	-	3	-	*
4A	6X6	300	*	*	4	-	Y	-	2.4	-	-	*
4B	6X40	0	*	*	4	Y	Y	-	-	-	-	*
5A	6X40	0	*	*	5	Y	Y	-	-	3	-	*
5B	6X40	0	*	*	5	Y	Y	-	-	15	-	*
6A	6X6	300	*	*	6	Y	Y	-	1.6	-	-	*
6B	6X6	300	*	*	6	Y	Y	-	1.6	-	-	*
6C	6X6	90	*	*	6	Y	Y	-	-	-	-	*
6D	6X6	90	*	*	6	Y	Y	-	-	-	-	*
7A	6X40	0	*	*	7	Y	Y	-	-	3	-	*
7B	6X40	0	*	*	7	Y	Y	-	-	-	-	*
8A	6X6	300	*	*	8	-	Y	-	2.4	-	-	*
8B	6X40	0	*	*	8	Y	Y	-	-	10	-	*

* Video Detection Zone

8 Phase
Fully Actuated
(Wilmington Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 or phase 5 may be lagged.
4. Phase 3 or phase 7 may be lagged.
5. Disconnect and abandon all existing Inductive Loops.
6. Set all detector units to presence mode.
7. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Incorporate Loop Emulator Detection System for Vehicle Detection.
10. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.
11. Closed loop system data: Controller Asset # 0899.



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	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
N/A	Wheelchair Ramp	
	Metal Pole with Mastarm	
Ⓐ	"YIELD" Sign (R1-2)	N/A
Ⓑ	"U-TURN YIELD TO RIGHT TURN" Sign	(R-10-16) Ⓑ
	Construction Zone	
	Video Detection Zone	
	Construction Zone Drums	

2070L TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Min Green 1 *	7	12	7	7	7	12	7	7
Extension 1 *	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Max Green 1 *	20	90	20	60	20	90	20	60
Yellow Clearance	3.0	4.5	3.0	4.5	3.0	4.3	3.0	4.5
Red Clearance	3.7	1.1	2.3	1.4	3.4	1.4	3.3	1.6
Walk 1 *	-	-	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-	-	-
Seconds Per Actuation *	-	-	-	-	-	-	-	-
Max Variable Initial *	-	-	-	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-	-	-	-
Time To Reduce *	-	-	-	-	-	-	-	-
Minimum Gap	-	-	-	-	-	-	-	-
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Vehicle Call Memory	-	YELLOW	-	-	-	YELLOW	-	-
Dual Entry	-	-	-	-	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON	ON	ON	ON	ON

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

Signal Upgrade - Temporary Design (TCP Phase I)

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, State of North Carolina Department of Transportation, Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1209 (Independence Blvd.)
at
SR 1411 (Wrightsville Ave.)

Division 3 New Hanover Wilmington
PLAN DATE: February 2008 REVIEWED BY: T. Thigpen
PREPARED BY: C. E. Pierce REVIEWED BY:
REVISIONS INIT. DATE

SCALE 0 50
1"=50'

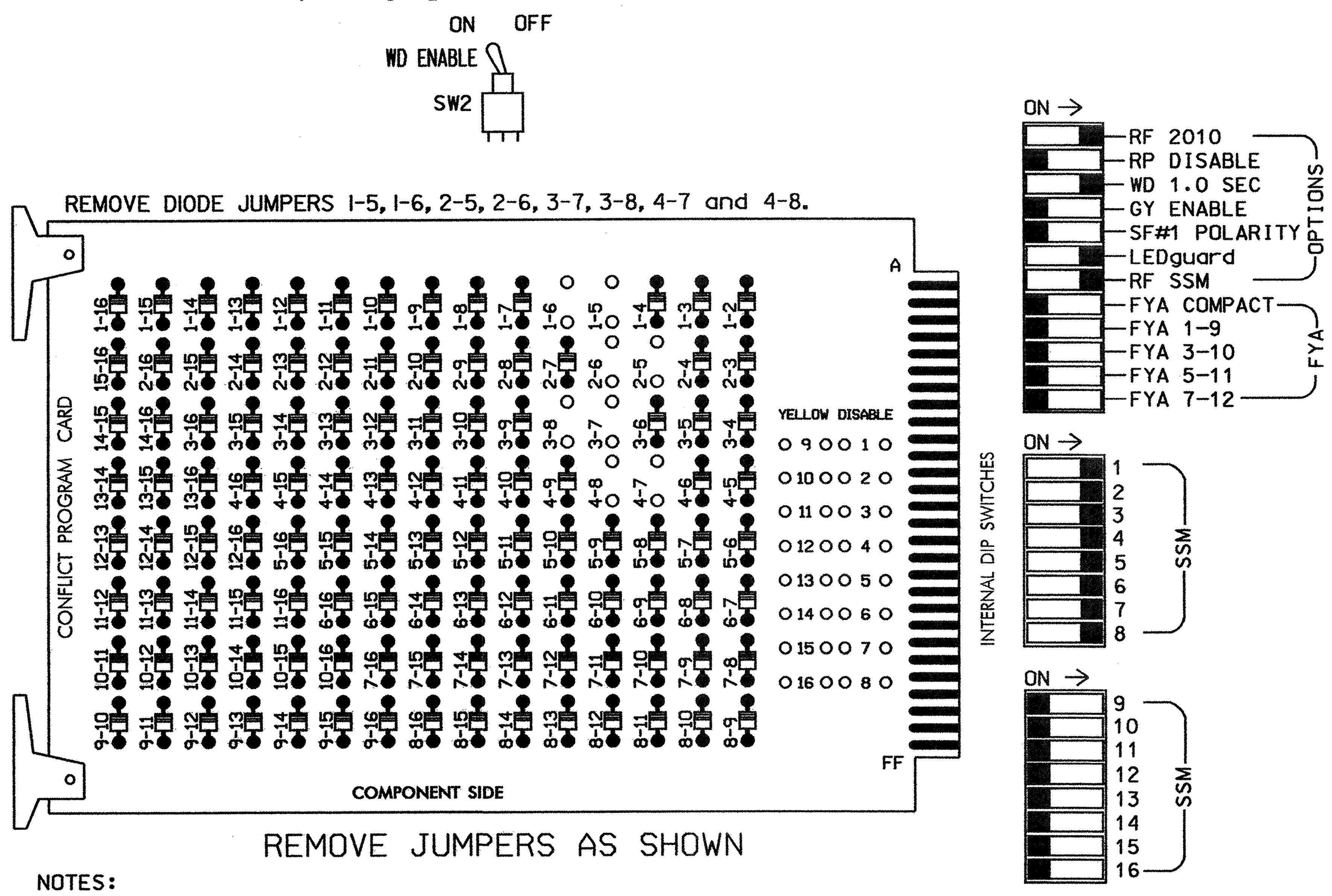
SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 24393 TIMOTHY W. WILLIAMS
3/18/08
SIGNATURE DATE
SIG. INVENTORY NO. 03-0899 T

20-MAR-2008 14:35
thigpen

PROJECT REFERENCE NO.	SHEET NO.
U-4733	Sig. 3

EDI MODEL 2010ECL-NC 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 SEL2-SEL5 are present on the monitor board.

NOTES

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

EQUIPMENT INFORMATION

CONTROLLER..............CONTRACTOR SUPPLIED 2070L
CABINET.................CONTRACTOR SUPPLIED 332
SOFTWARE................ECONOLITE OASIS
CABINET MOUNT...........BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED......S1,S2,S3,S4,S5,S6,S7,S8
PHASES USED.............1,2,3,4,5,6,7,8
OVERLAPS................NONE

SIGNAL HEAD HOOK-UP CHART

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

NU = Not Used

SPECIAL DETECTOR NOTES

INSTALL A LOOP EMULATOR DETECTION SYSTEM FOR VEHICLE DETECTION. PERFORM INSTALLATION ACCORDING TO MANUFACTURER'S DIRECTIONS AND NCDOT ENGINEER-APPROVED MOUNTING LOCATIONS TO ACCOMPLISH THE DETECTION SCHEMES SHOWN ON THE SIGNAL DESIGN PLANS.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 03-0899 T
DESIGNED: February 2008
SEALED: 03-18-08
REVISED: N/A

Signal Upgrade - Temp

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
750 N. Greenfield Pwky, Garner, NC 27529

SR 1209 (Independence Blvd.) at SR 1411 (Wrightsville Ave.)

Division 3 New Hanover Wilmington

PLAN DATE: March 2008	REVIEWED BY: JTR
PREPARED BY: James Peterson	REVIEWED BY:

REVISIONS	INIT.	DATE

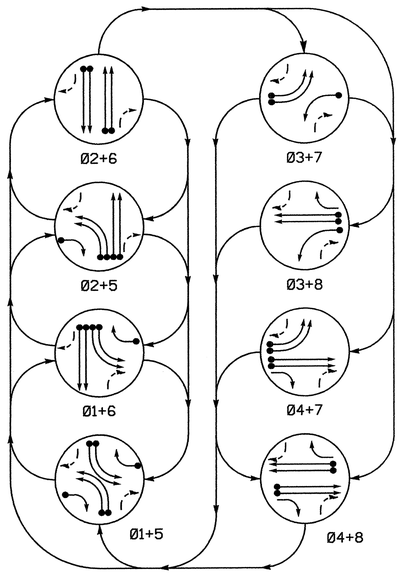
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 008453 ENGINEER JOHN T. ROWE, JR

John T. Rowe Jr. 3-19-08
SIGNATURE DATE

SIG. INVENTORY NO. 03-0899 T

PROJECT REFERENCE NO.	SHEET NO.
U-4733	Sig. 4

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+5	01+6	02+5	02+6	03+7	03+8	04+7	04+8	FLASH
11, 12	←	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
21, 22	R	R	G	G	R	R	R	R	Y
31, 32	~~R~~	~~R~~	~~R~~	~~R~~	←	←	~~R~~	~~R~~	~~R~~
41	R	R	R	R	R	R	G	G	R
42	R/→	R	R/→	R	R	R	G	G	R
51, 52	←	~~R~~	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
61, 62	R	G	R	G	R	R	R	R	Y
71, 72, 73	~~R~~	~~R~~	~~R~~	~~R~~	←	←	~~R~~	~~R~~	~~R~~
81	R	R	R	R	R	R	G	R	G	R
82	R/→	R/←	R	R	R	R	G	R	G	R

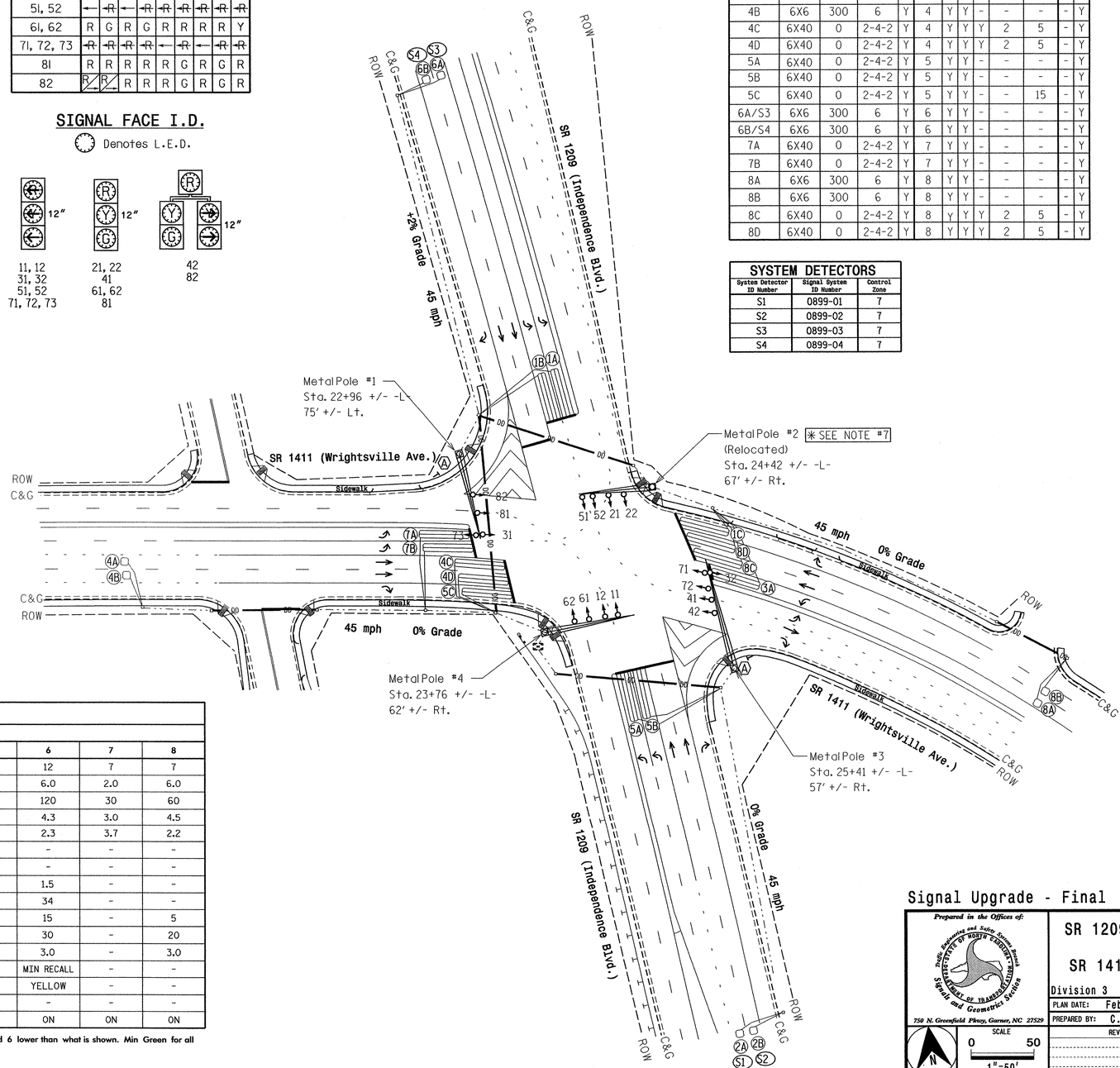
SIGNAL FACE I.D.

Denotes L.E.D.

11, 12
31, 32
51, 52
71, 72, 73

21, 22
41
61, 62
81

42
82



2070L LOOP & DETECTOR INSTALLATION

INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	-	-	Y
1B	6X40	0	2-4-2	Y	1	Y	Y	-	-	-	-	Y
1C	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	Y
2A/S1	6X6	300	6	Y	2	Y	Y	-	-	-	-	Y
2B/S2	6X6	300	6	Y	2	Y	Y	-	-	-	-	Y
3A	6X40	0	2-4-2	Y	3	Y	Y	-	-	-	-	Y
4A	6X6	300	6	Y	4	Y	Y	-	-	-	-	Y
4B	6X6	300	6	Y	4	Y	Y	-	-	-	-	Y
4C	6X40	0	2-4-2	Y	4	Y	Y	Y	2	5	-	Y
4D	6X40	0	2-4-2	Y	4	Y	Y	Y	2	5	-	Y
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	-	-	Y
5B	6X40	0	2-4-2	Y	5	Y	Y	-	-	-	-	Y
5C	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
6A/S3	6X6	300	6	Y	6	Y	Y	-	-	-	-	Y
6B/S4	6X6	300	6	Y	6	Y	Y	-	-	-	-	Y
7A	6X40	0	2-4-2	Y	7	Y	Y	-	-	-	-	Y
7B	6X40	0	2-4-2	Y	7	Y	Y	-	-	-	-	Y
8A	6X6	300	6	Y	8	Y	Y	-	-	-	-	Y
8B	6X6	300	6	Y	8	Y	Y	-	-	-	-	Y
8C	6X40	0	2-4-2	Y	8	Y	Y	Y	2	5	-	Y
8D	6X40	0	2-4-2	Y	8	Y	Y	Y	2	5	-	Y

SYSTEM DETECTORS

System Detector ID Number	Signal System ID Number	Control Zone
S1	0899-01	7
S2	0899-02	7
S3	0899-03	7
S4	0899-04	7

2070L TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Min Green 1 *	7	12	7	7	7	12	7	7
Extension 1 *	2.0	6.0	2.0	6.0	2.0	6.0	2.0	6.0
Max Green 1 *	25	120	20	60	25	120	30	60
Yellow Clearance	3.1	4.5	3.0	4.5	3.2	4.3	3.0	4.5
Red Clearance	3.9	2.2	3.3	2.3	3.8	2.3	3.7	2.2
Walk 1 *	-	-	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-	-	-
Seconds Per Actuation *	-	1.5	-	-	-	1.5	-	-
Max Variable Initial *	-	34	-	-	-	34	-	-
Time Before Reduction *	-	15	-	5	-	15	-	5
Time To Reduce *	-	30	-	20	-	30	-	20
Minimum Gap	-	3.0	-	3.0	-	3.0	-	3.0
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL	-	-
Vehicle Call Memory	-	YELLOW	-	-	-	YELLOW	-	-
Dual Entry	-	-	-	-	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON	ON	ON	ON	ON

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

8 Phase Fully Actuated (Wilmington Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 or phase 5 may be lagged.
4. Phase 3 or phase 7 may be lagged.
5. Set all detector units to presence mode.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Contractor shall add 8ft. extension sleeve to existing Metal Pole #2. Backplates not allowed on Metal Pole #2.
8. Closed loop system data: Controller Asset # 0899.

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	■
-·-·-	2-in Underground Conduit	-·-·-
N/A	Right of Way	———
→	Directional Arrow	→
→	Pavement Marking Arrow	→
N/A	Wheelchair Ramp	♿
▷	Metal Pole with Mastarm	▷
Ⓐ	"YIELD" Sign (R1-2)	N/A
—DD—	Directional Drill (2-2" Polyethelyne Conduits)	N/A

Signal Upgrade - Final

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Statewide and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1209 (Independence Blvd.) at SR 1411 (Wrightsville Ave.)

Division 3 | New Hanover | Wilmington

PLAN DATE: February 2008 | REVIEWED BY: T. Thigpen

PREPARED BY: C. E. Pierce | REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 50 1"=50'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24393 ENGINEER TIMOTHY J. WILLIAMS

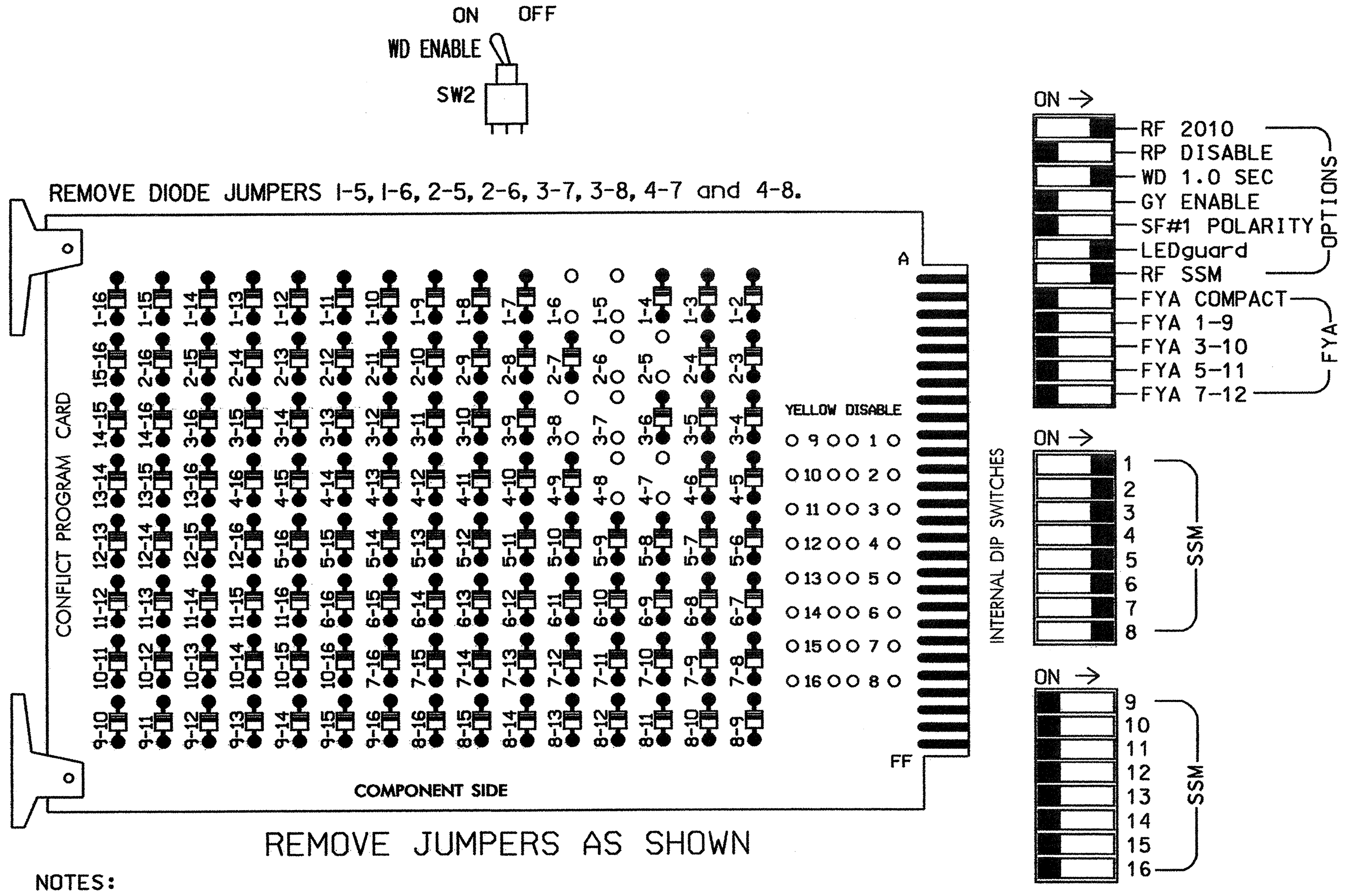
SIGNATURE | DATE 3/10/08

SIG. INVENTORY NO. 03-0899

24-MAR-2008 16:08
e:\traffic\signals\workgroups\tip projects\u-4733\signals\designsignals\03-0899\03089...
thigpen

EDI MODEL 2010ECL-NC 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 SEL2-SEL5 are present on the monitor board.

NOTES

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

EQUIPMENT INFORMATION

CONTROLLER..............CONTRACTOR SUPPLIED 2070L
CABINET.................CONTRACTOR SUPPLIED 332
SOFTWARE................ECONOLITE OASIS
CABINET MOUNT...........BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED......S1,S2,S3,S4,S5,S6,S7,S8
PHASES USED.............1,2,3,4,5,6,7,8
OVERLAPS................NONE

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S2P	S3	S4	S4P	S5		S6	S6P	S7	S8	S8P
PHASE	1		2	2 PED	3	4	4 PED	5		6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	11,12	82	21,22	NU	31,32	41,42	NU	42	51,52	61,62	NU	71, 72,73	81,82	NU
RED			128			101				134			107	
YELLOW			129			102				135			108	
GREEN			130			103				136			109	
RED ARROW	125				116				131			122		
YELLOW ARROW	126	126			117			132	132			123		
GREEN ARROW	127	127			118			133	133			124		

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	Ø 1 1A	Ø 1 1C	Ø2/SYS 2A/S1	SLOT EMPTY	Ø 3 3A	Ø 4 4A	Ø 4 4C	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L	Ø 1 1B	NOT USED	Ø2/SYS 2B/S2		NOT USED	Ø 4 4B	Ø 4 4D							ST DC ISOLATOR
FILE "J"	U	Ø 5 5A	Ø 5 5C	Ø6/SYS 6A/S3	SLOT EMPTY	Ø 7 7A	Ø 8 8A	Ø 8 8C	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	Ø 5 5B	NOT USED	Ø6/SYS 6B/S4		Ø 7 7B	Ø 8 8B	Ø 8 8D							

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

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A	TB2-1,2	I1U	56	18	1	1	Y	Y			
1B	TB2-3,4	I1L	56	18	1	1	Y	Y			
1C	TB2-5,6	I2U	39	1	2	1	Y	Y			15
2A/S1	TB2-9,10	I3U	63	25	32	2/SYS	Y	Y			
2B/S2	TB2-11,12	I3L	76	38	42	2/SYS	Y	Y			
3A	TB4-5,6	I5U	58	20	3	3	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			
4C	TB6-1,2	I7U	65	27	34	4	Y	Y	Y	2	5
4D	TB6-3,4	I7L	78	40	44	4	Y	Y	Y	2	5
5A	TB3-1,2	J1U	55	17	5	5	Y	Y			
5B	TB3-3,4	J1L	55	17	5	5	Y	Y			
5C	TB3-5,6	J2U	40	2	6	5	Y	Y			15
6A/S3	TB3-9,10	J3U	64	26	36	6/SYS	Y	Y			
6B/S4	TB3-11,12	J3L	77	39	46	6/SYS	Y	Y			
7A	TB5-5,6	J5U	57	19	7	7	Y	Y			
7B	TB5-7,8	J5L	57	19	7	7	Y	Y			
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			
8B	TB5-11,12	J6L	46	8	18	8	Y	Y			
8C	TB7-1,2	J7U	66	28	38	8	Y	Y	Y	2	5
8D	TB7-3,4	J7L	79	41	48	8	Y	Y	Y	2	5

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 03-0899
DESIGNED: February 2008
SEALED: 03-18-08
REVISED: N/A

Signal Upgrade - Final

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1209 (Independence Blvd.)
at
SR 1411 (Wrightsville Ave.)

Division 3 New Hanover Wilmington

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

750 N. Greenfield Pwky, Garner, NC 27529

PLAN DATE: March 2008	REVIEWED BY: JTR
PREPARED BY: James Peterson	REVIEWED BY:

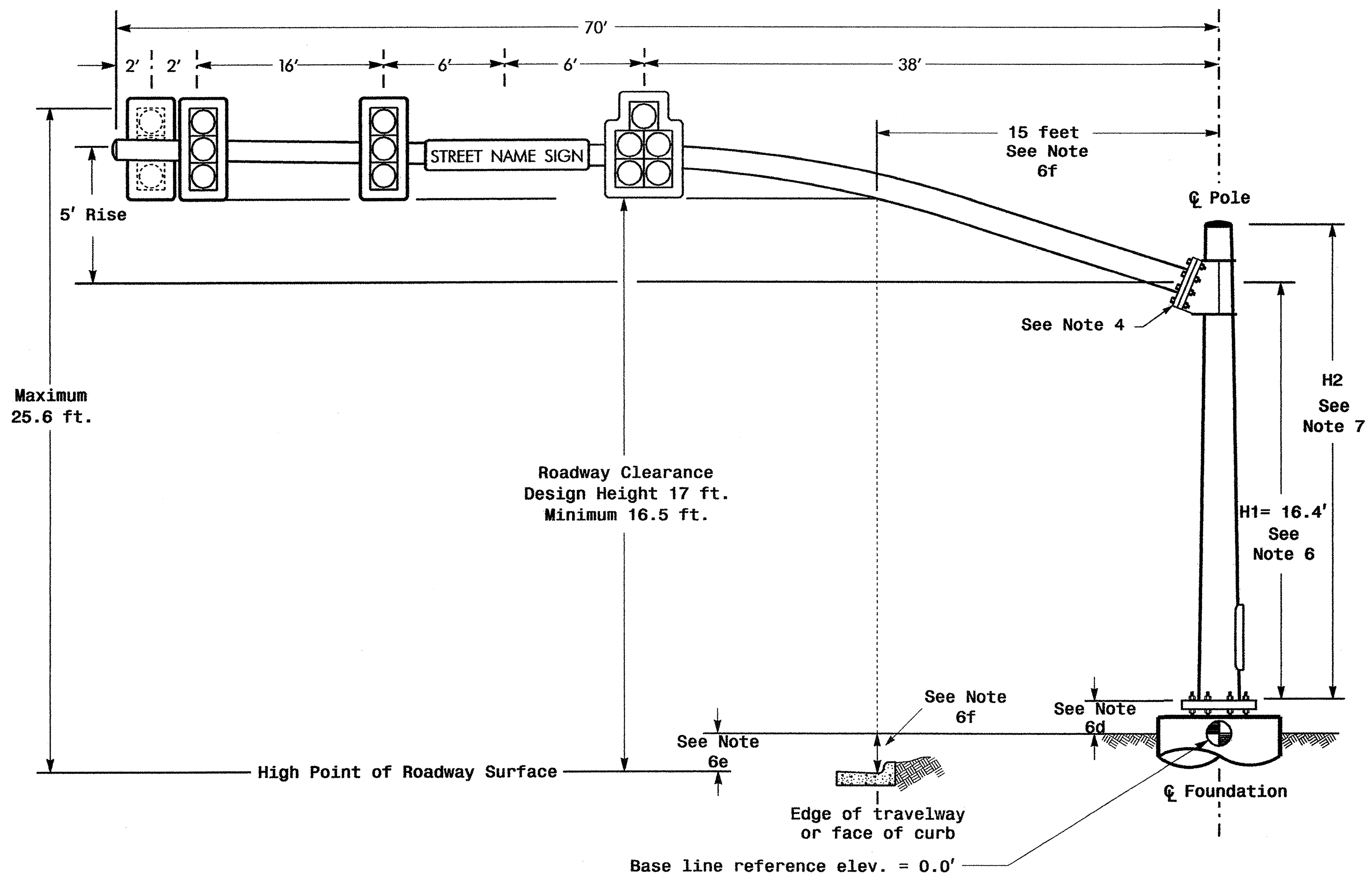
REVISIONS	INIT.	DATE

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

John T. Rowe, Jr. 3-19-08
SIGNATURE DATE

SIG. INVENTORY NO. 03-0899

Design Loading for METAL POLE NO. 1



ELEVATION VIEW

METAL POLE NO. 2

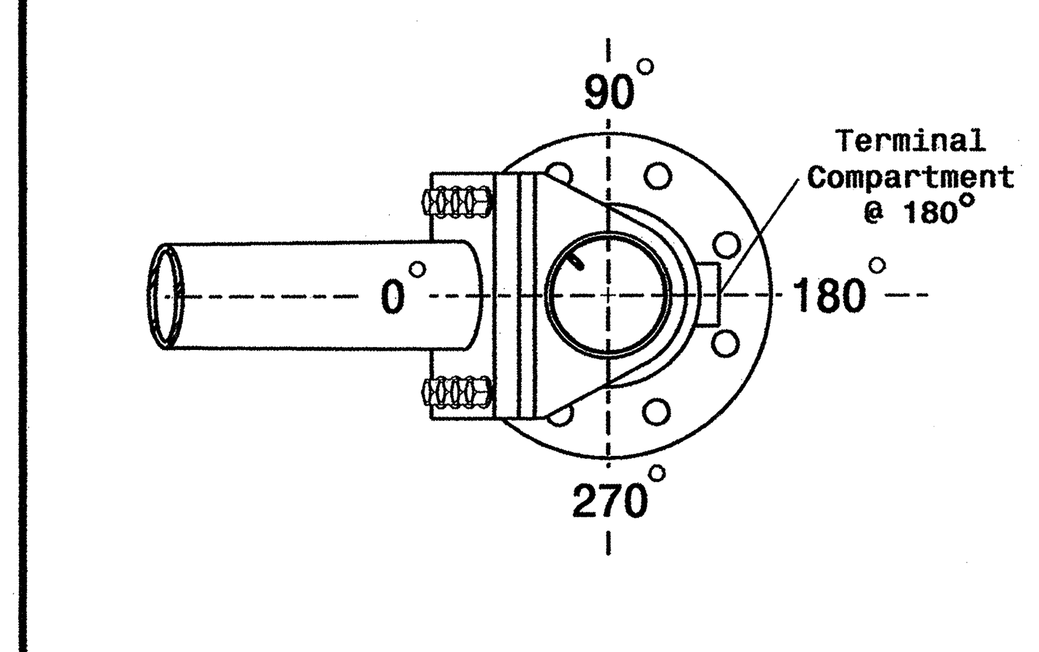
EXISTING POLE TO BE RELOCATED WITH ADDED 8' SLEEVE

SPECIAL NOTE

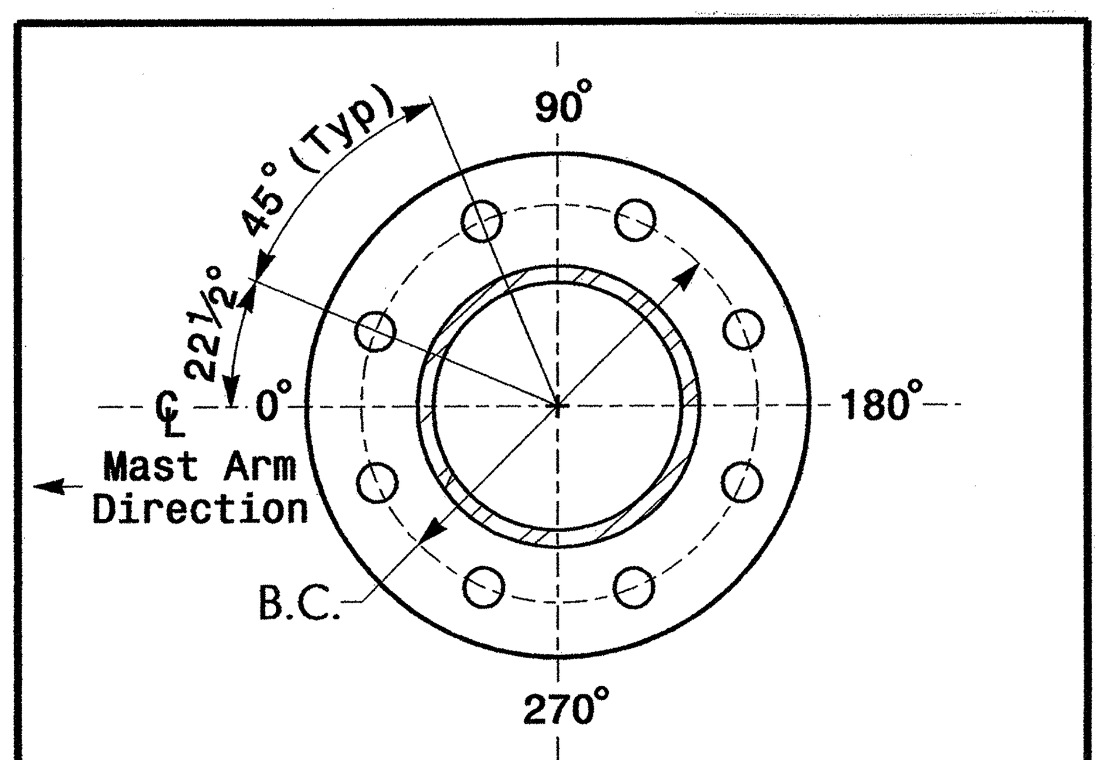
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	
Elevation difference at High point of roadway surface	+2.4 ft.	
Elevation difference at Edge of travelway or face of curb	0.0 ft.	

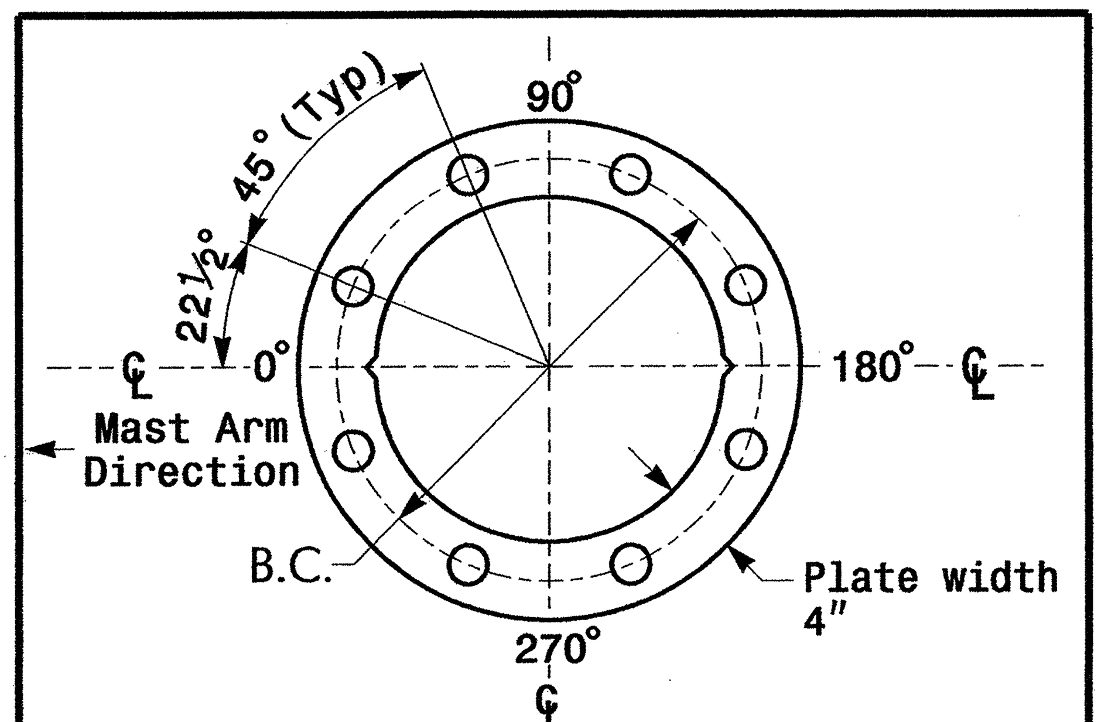


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



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

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 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2006 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.

Design Requirements

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. Design all signal supports using stress ratios that do not exceed 0.9.
4. 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.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
   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.
   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
7. 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.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. 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 2 (130 mph)

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1209 (Independence Blvd.) at SR 1411 (Wrightsville Ave.)

Division 3 | New Hanover | Wilmington

PLAN DATE:	March 2008	REVIEWED BY:	T. Thigpen
PREPARED BY:	C. E. Pierce	REVIEWED BY:	

SCALE: 0 N/A — N/A

REVISIONS	INIT.	DATE

SEAL: North Carolina Professional Engineer, SEAL 24393, Timothy J. Williams

SIGNATURE 3/18/08 DATE

SIG. INVENTORY NO. 03-0899

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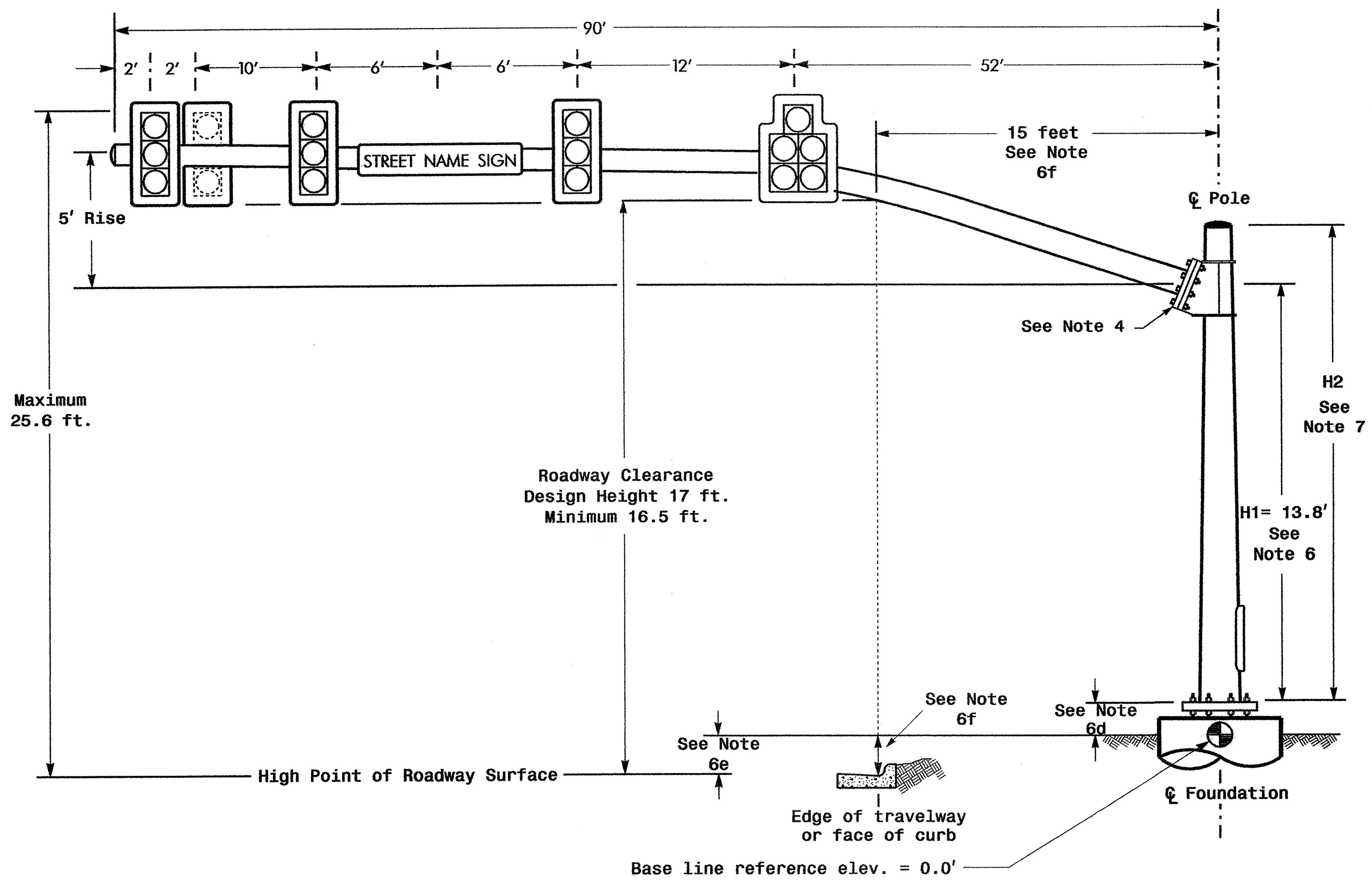
PROJECT REFERENCE NO.	SHEET NO.
U-4733	Sig. 7

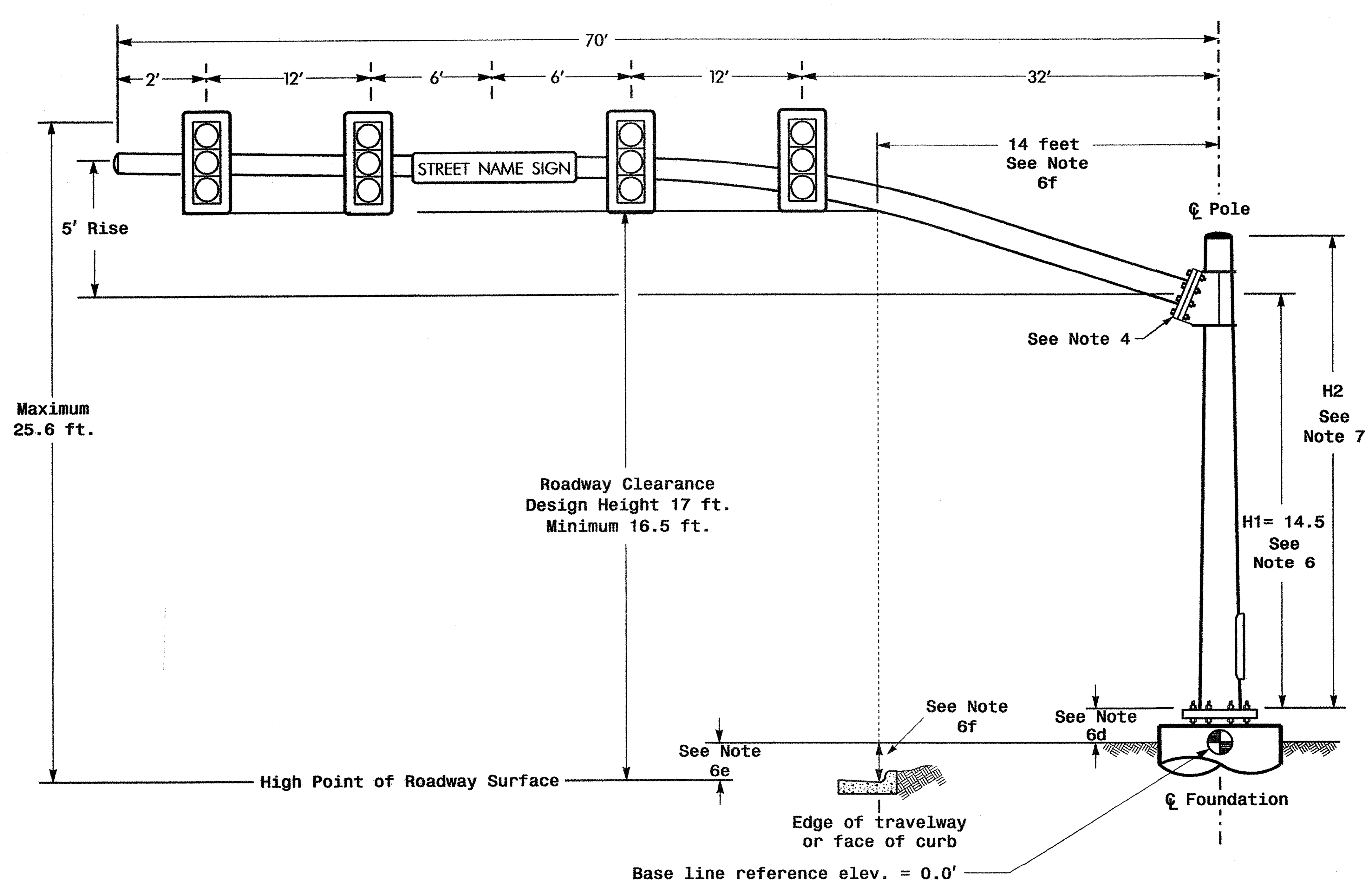
METAL POLE No. 3 and 4

Design Loading for METAL POLE NO. 3



ELEVATION VIEW

Design Loading for METAL POLE NO. 4



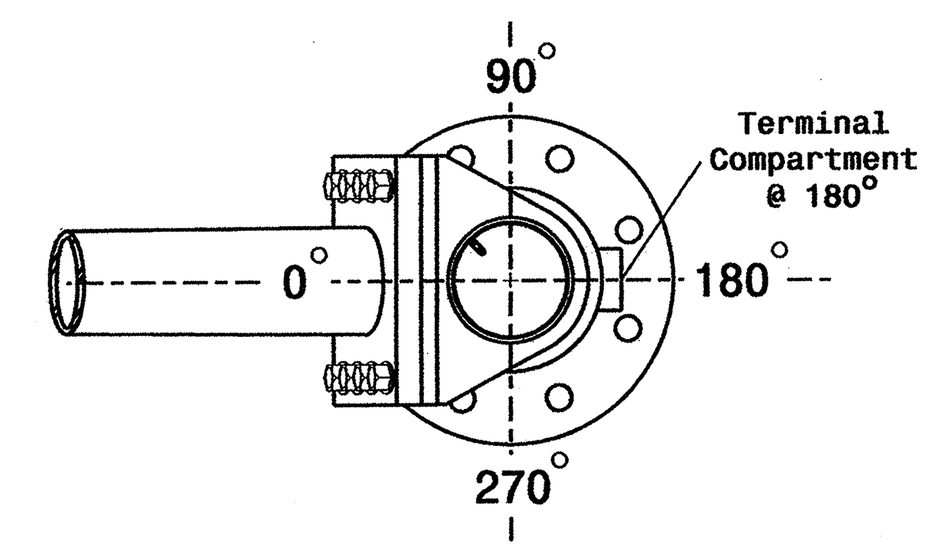
Elevation View

SPECIAL NOTE

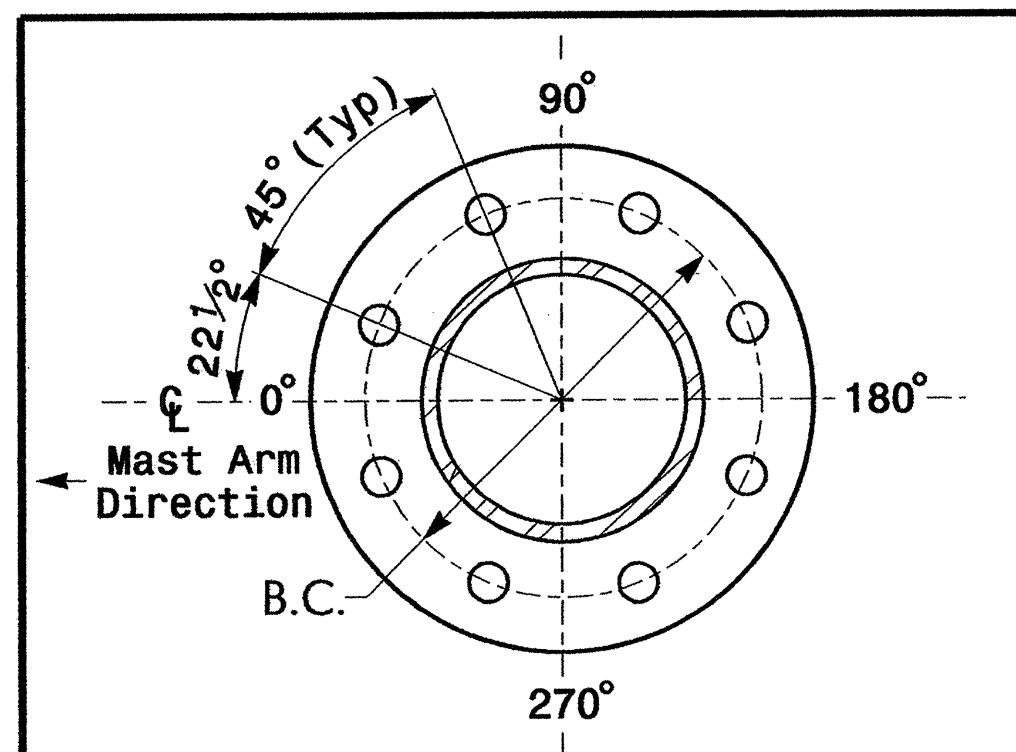
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

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	-0.3 ft.	+0.5 ft.
Elevation difference at Edge of travelway or face of curb	+0.2 ft.	-0.2 ft.

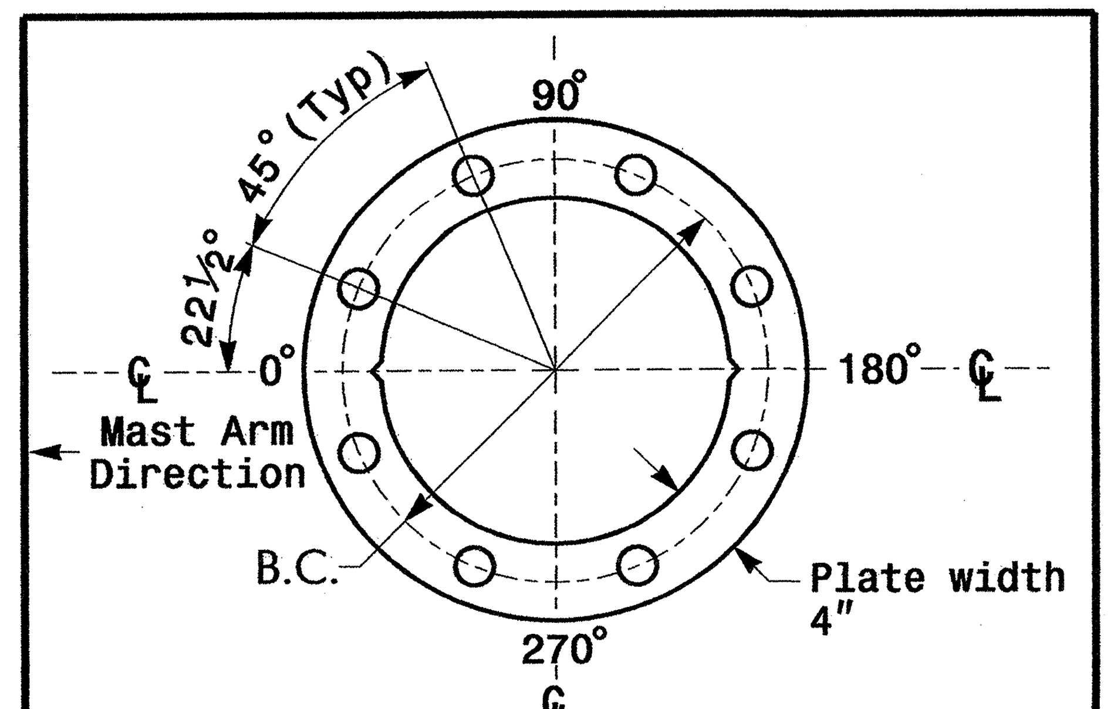


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



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
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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:
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6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
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   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.
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10. 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 2 (130 mph)

Prepared in the Offices of:
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1209 (Independence Blvd.)
at
SR 1411 (Wrightsville Ave.)

Division 3	New Hanover	Wilmington
PLAN DATE: March 2008	REVIEWED BY:	T. Thigpen
PREPARED BY: C. E. Pierce	REVIEWED BY:	

SCALE: 0 N/A

N/A

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 24393 TIMOTHY J. WILLIAMS

SIGNATURE: T. J. Williams DATE: 3/18/08

SIG. INVENTORY NO. 03-0899

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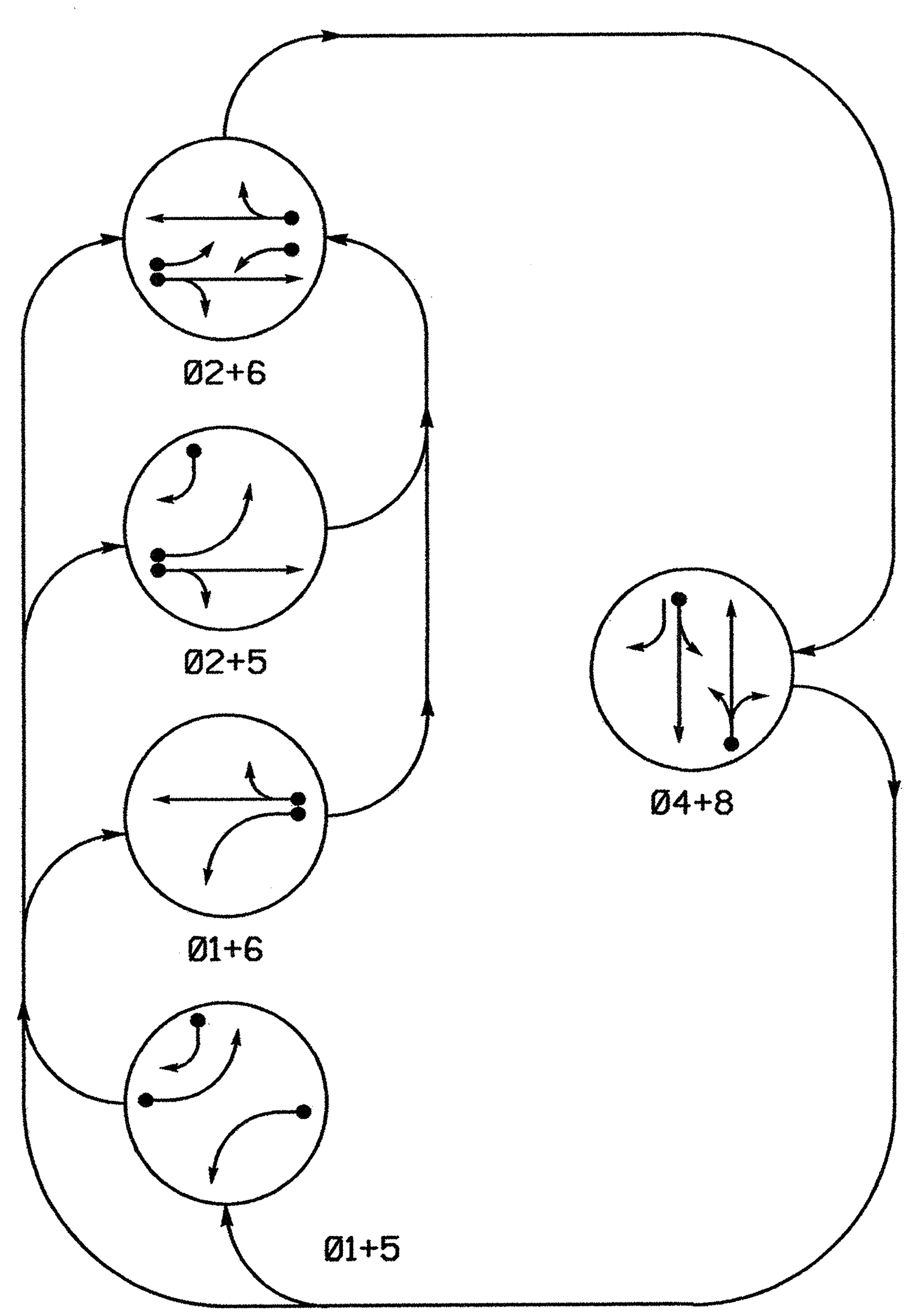
PROJECT REFERENCE NO.	SHEET NO.
U-4733	Sig. 8

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

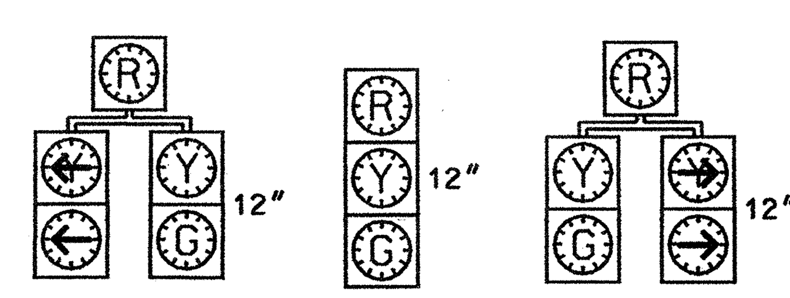
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
21	R ←	R	G ←	G	R	Y
22	R	R	G	G	R	Y
41, 43	R	R	R	R	G	R
42	R →	R	R →	R	G	R
61	R ←	G ←	R	G	R	Y
62	R	G	R	G	R	Y
81, 82, 83	R	R	R	R	G	R

SIGNAL FACE I.D.

Denotes L.E.D.



21
61

22
41, 43
62
81, 82, 83

42

2070L ZONE & DETECTOR INSTALLATION

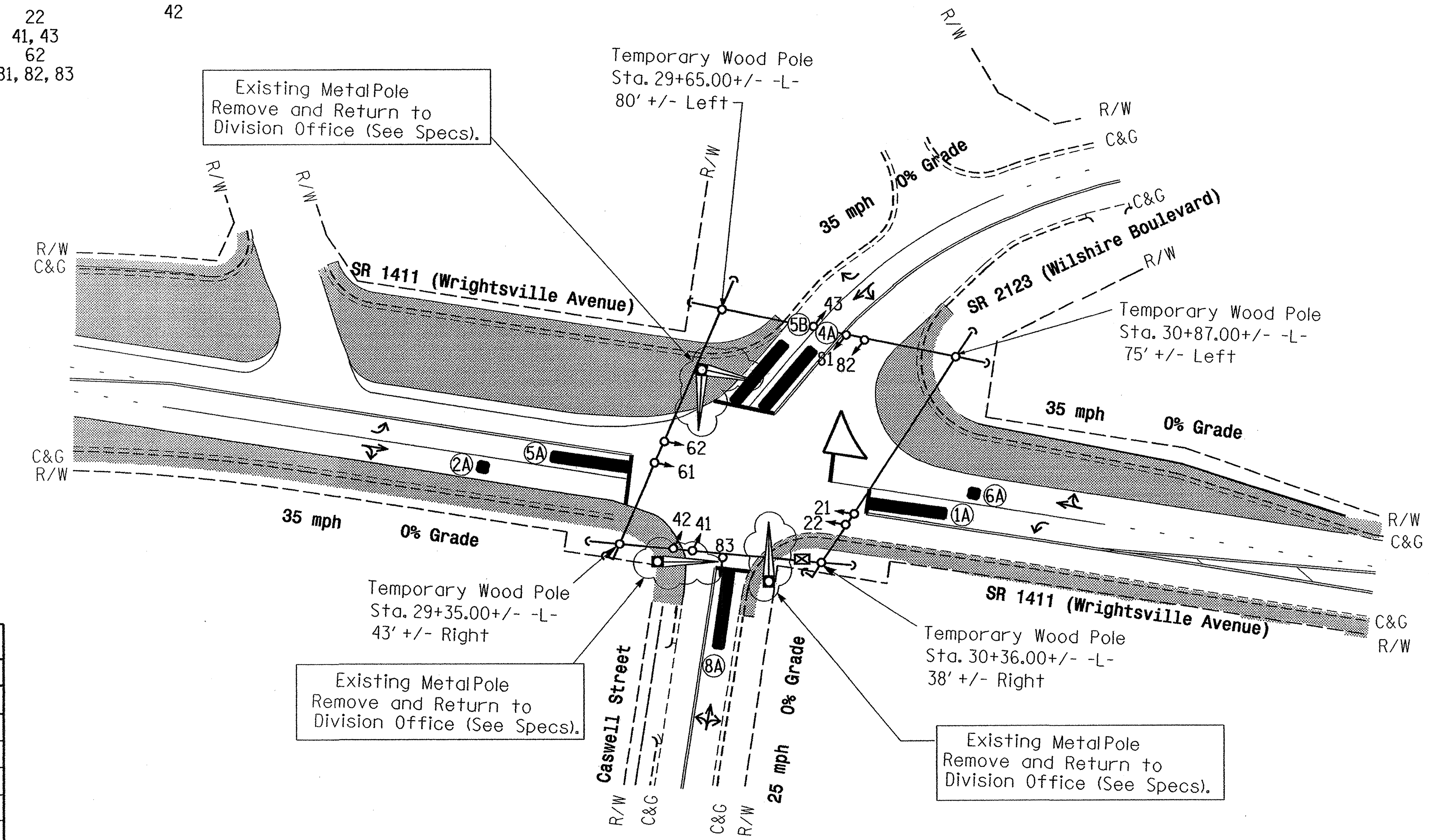
DETECTION ZONE: ZONE	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW ZONE	DETECTOR PROGRAMMING: PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	*	*	1	Y	Y	-	-	15	-	*
					6	Y	Y	-	-	-	-	*
2A	6X6	70	*	*	2	Y	Y	-	-	-	-	*
4A	6X40	0	*	*	4	Y	Y	-	-	3	-	*
5A	6X40	0	*	*	5	Y	Y	-	-	15	-	*
					2	Y	Y	-	-	-	-	*
5B	6X40	0	*	*	5	Y	Y	-	-	15	-	*
6A	6X6	70	*	*	6	Y	Y	-	-	-	-	*
8A	6X40	0	*	*	8	Y	Y	-	-	5	-	*

* Video Detection Zone

5 Phase
Fully Actuated
(Wilmington Signal System)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Omit phase 1 during phase 2 on.
4. Omit phase 5 during phase 6 on.
5. Program controller to clear from phase 2+6 to phase 1 and / or 5 by progressing through phase 4+8 (see Electrical Details).
6. Set all detector units to presence mode.
7. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Incorporate Loop Emulator Detection System for Vehicle Detection.
10. Provide the Engineer with the Manufacturer's approved camera locations and mounting heights to obtain detection zones as shown.
11. Signal System Data: Controller Asset # 0223.



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	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Pavement Marking Arrow	
N/A	Wheelchair Ramp	
	Metal Pole with Mastarm	
	Construction Zone	
	Video Detection Zone	

2070L TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Min Green 1 *	7	10	7	7	10	7
Extension 1 *	2.0	3.0	2.0	2.0	3.0	2.0
Max Green 1 *	20	60	30	20	60	30
Yellow Clearance	3.0	3.8	3.8	3.0	3.8	3.2
Red Clearance	2.6	1.6	1.2	2.3	1.8	2.1
Walk 1 *	-	-	-	-	-	-
Don't Walk 1	-	-	-	-	-	-
Seconds Per Actuation *	-	-	-	-	-	-
Max Variable Initial *	-	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-	-
Time To Reduce *	-	-	-	-	-	-
Minimum Gap	-	-	-	-	-	-
Recall Mode	-	MIN RECALL	-	-	MIN RECALL	-
Vehicle Call Memory	-	YELLOW	-	-	YELLOW	-
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON	ON

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

Signal Upgrade - Temporary Design (TCP Phase I)

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section, North Carolina Department of Transportation
750 N. Greenfield Pkwy, Garner, NC 27529

SCALE 0 50 1"=50'

SR 1411 (Wrightsville Ave.)
at
SR 2123 (Wilshire Blvd.) /
Caswell St.

Division 3 New Hanover Wilmington

PLAN DATE: February 2008 REVIEWED BY: T. Thigpen
PREPARED BY: C. E. Pierce REVIEWED BY:

REVISIONS INIT. DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24393 ENGINEER TIMOTHY J. WILLIAMS

SIGNATURE 3/18/08 DATE

SIG. INVENTORY NO. 03-0223 T

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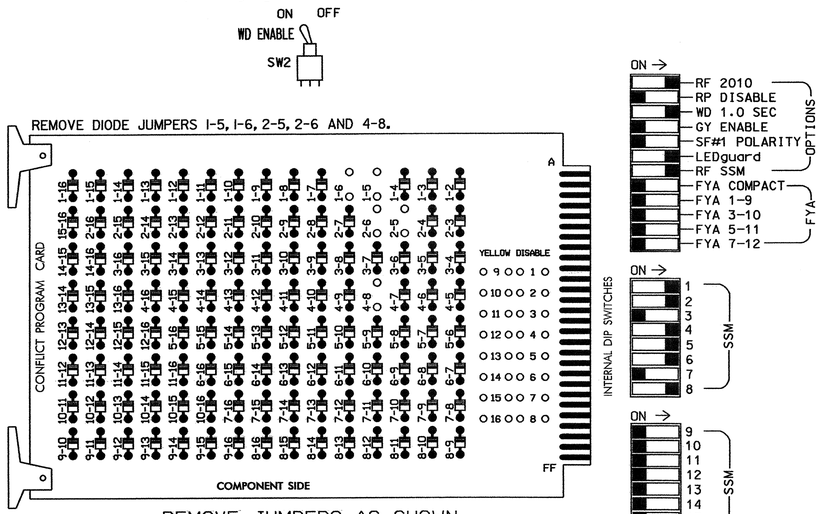
PROJECT REFERENCE NO.	SHEET NO.
U-4733	Sig.9

EDI MODEL 2010ECL-NC 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 SEL2-SEL5 are present on the monitor board.

■ = DENOTES POSITION OF SWITCH

NOTES

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

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	61	21,22	NU	NU	41, 42,43	NU	21,42	61,62	NU	NU	81, 82,83	NU
RED	*	128			101		*	134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW	126						132					
GREEN ARROW	127						133					

NU = Not Used

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

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S1,S2,S4,S5,S6,S8
PHASES USED.....1,2,4,5,6,8
OVERLAPS.....NONE

DYNAMIC BACK-UP CONTROL PROGRAMMING

(program controller as shown below)

1. From Main Menu press '2' (Phase Control), then '1' (Phase Control Functions). Scroll to the bottom of the menu and enable Dynamic/Backup Control Functions 1 and 2.
2. From Phase Control Functions Menu press '2' (Dynamic/Backup Control Functions).

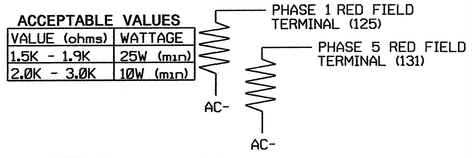
```
DYNAMIC/BACKUP CONTROL FUNCTION #01
                OVERLAPS:¦ABCDEFGHIJKLMNOP
IF OVERLAPS ARE ACTIVE  ¦
OR        PHASES:¦12345678910111213141516
IF PHASES ARE ON¦ X
OMIT PHASES     ¦X
CALL PHASES     ¦  X
```

PRESS 'NEXT'

```
DYNAMIC/BACKUP CONTROL FUNCTION #02
                OVERLAPS:¦ABCDEFGHIJKLMNOP
IF OVERLAPS ARE ACTIVE  ¦
OR        PHASES:¦12345678910111213141516
IF PHASES ARE ON¦     X
OMIT PHASES     ¦    X
CALL PHASES     ¦  X
```

BACKUP PROTECTION PROGRAMMING COMPLETE

LOAD RESISTOR INSTALLATION DETAIL



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

SPECIAL DETECTOR NOTES

INSTALL A LOOP EMULATOR DETECTION SYSTEM FOR VEHICLE DETECTION. PERFORM INSTALLATION ACCORDING TO MANUFACTURER'S DIRECTIONS AND NCDOT ENGINEER-APPROVED MOUNTING LOCATIONS TO ACCOMPLISH THE DETECTION SCHEMES SHOWN ON THE SIGNAL DESIGN PLANS.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 03-0223 T
DESIGNED: February 2008
SEALED: 03-18-08
REVISED: N/A

Signal Upgrade - Temporary

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1411 (Wrightsville Ave.) at SR 2123 (Wilshire Blvd.) / Caswell St.

Division 3 | New Hanover | Wilmington

PLAN DATE: March 2008 | REVIEWED BY: JTR

PREPARED BY: James Peterson | REVIEWED BY:

REVISIONS	INIT.	DATE

Prepared in the Offices of:

Traffic Engineering and Safety Systems Branch
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section

750 N. Greenfield Pwky, Garner, NC 27529

SEAL

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

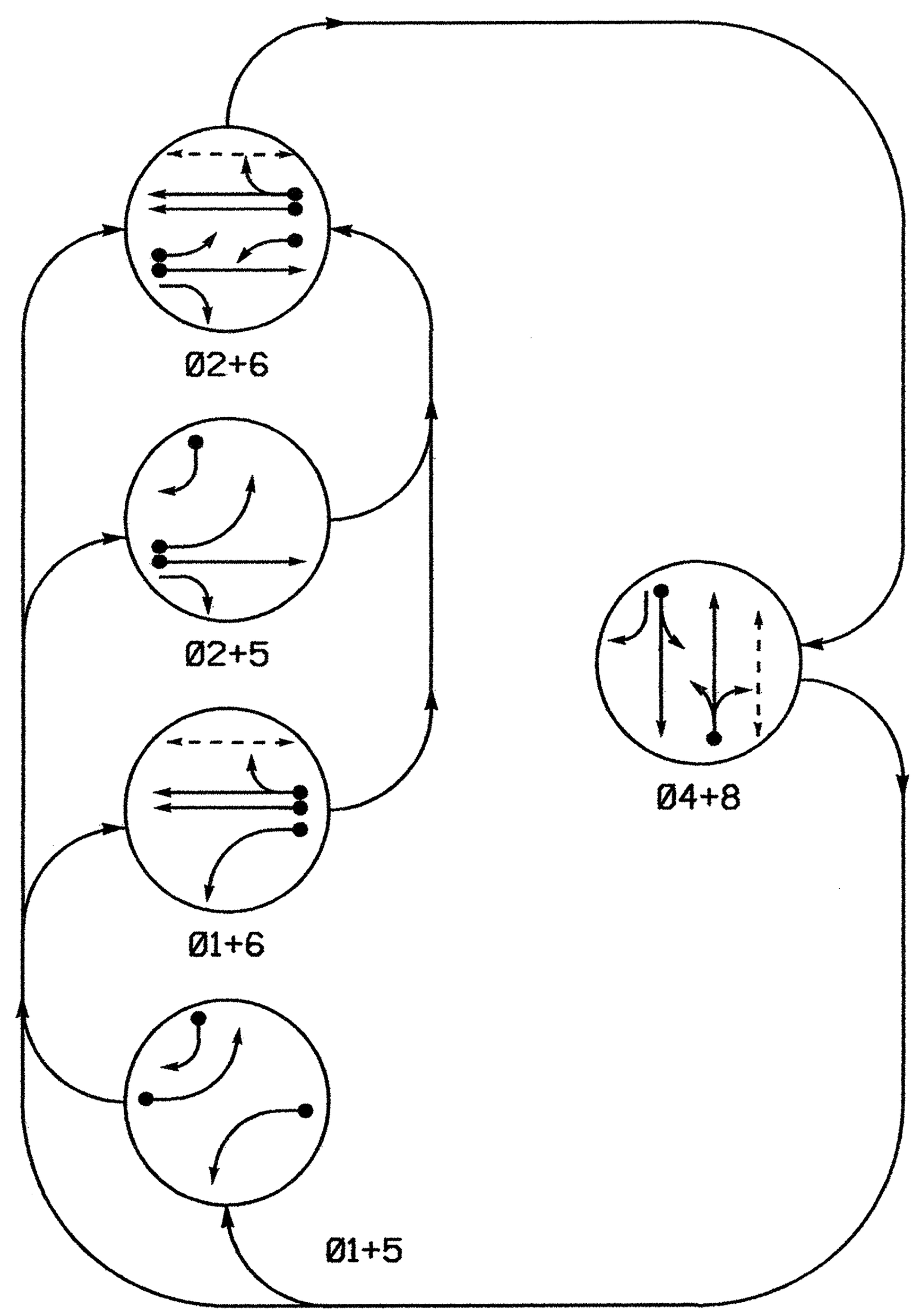
John T. Rowe, Jr. 3-19-08
SIGNATURE DATE

SIG. INVENTORY NO. 03-0223 T

PROJECT REFERENCE NO.	SHEET NO.
U-4733	Sig. 10

5 Phase
Fully Actuated
(Wilmington Signal System)

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- ◄——● DETECTED MOVEMENT
- ◄—— UNDETECTED MOVEMENT (OVERLAP)
- ◄- - - UNSIGNALIZED MOVEMENT
- <- - -> PEDESTRIAN MOVEMENT

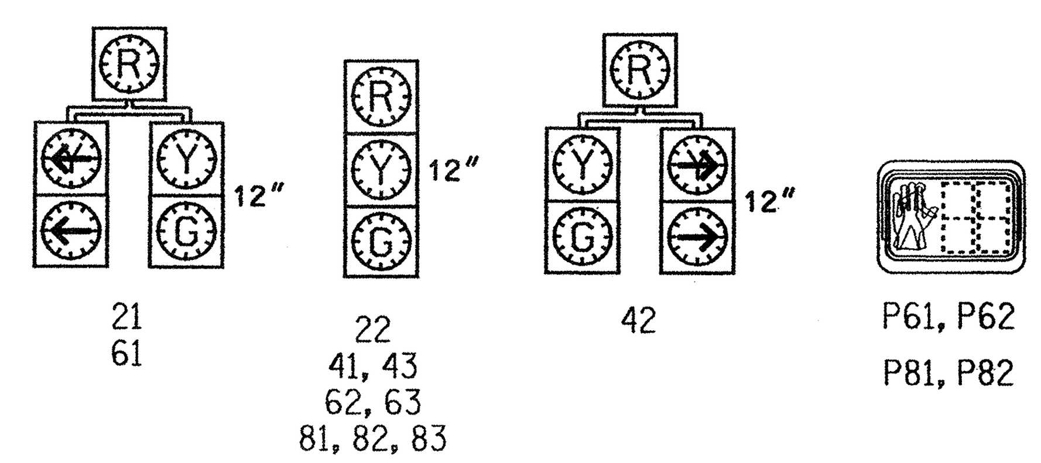
TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
21	←/R	R	←/G	G	R	Y
22	R	R	G	G	R	Y
41, 43	R	R	R	R	G	R
42	R/→	R	R/→	R	G	R
61	←/R	←/G	R	G	R	Y
62, 63	R	G	R	G	R	Y
81, 82, 83	R	R	R	R	G	R
P61, P62	DW	W	DW	W	DW	DRK
P81, P82	DW	DW	DW	DW	W	DRK

W - Walk
DW - Don't Walk
DRK - Dark

SIGNAL FACE I.D.

○ Denotes L.E.D.



2070L LOOP & DETECTOR INSTALLATION

INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
1A	6X40	0	2-4-2	Y	1	Y	Y	-	-	15	-	Y
					6	Y	Y	-	-	-	-	Y
2A	6X6	70	4	Y	2	Y	Y	-	-	-	-	Y
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	3	-	Y
5A	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
					2	Y	Y	-	-	-	-	Y
5B	6X40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
6A	6X6	70	4	Y	6	Y	Y	-	-	-	-	Y
6B	6X6	70	4	Y	6	Y	Y	-	-	-	-	Y
8A	6X40	0	2-4-2	Y	8	Y	Y	-	-	5	-	Y
S1	6X6	+160	4	Y	-	-	-	-	-	-	Y	Y
S2	6X6	+160	4	Y	-	-	-	-	-	-	Y	Y
S3	6X6	+160	4	Y	-	-	-	-	-	-	Y	Y

SYSTEM DETECTORS

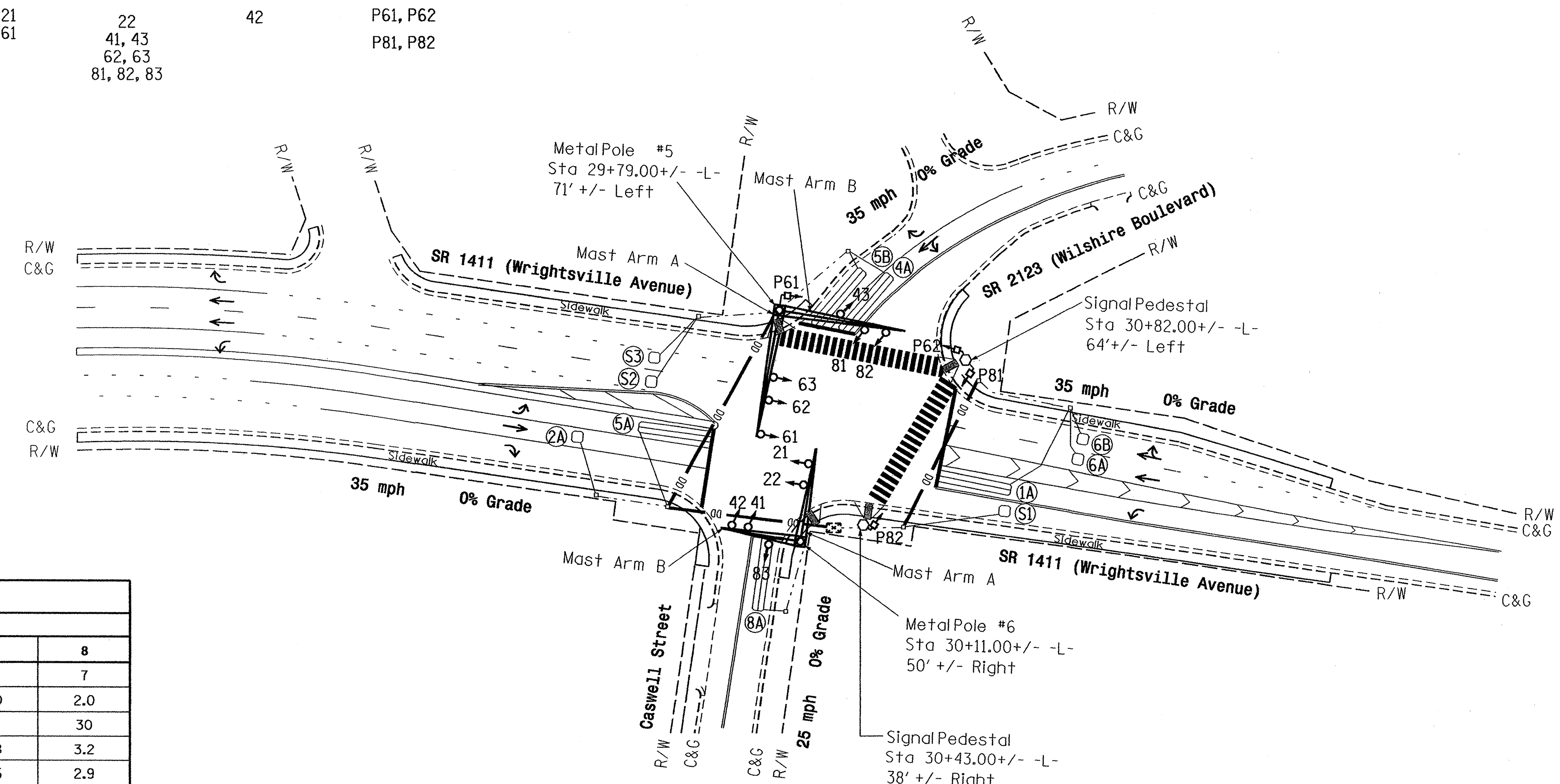
System Detector ID Number	Signal System ID Number	Control Zone
S1	0223-01	7
S2	0223-02	7
S3	0223-03	7

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Omit phase 1 during phase 2 on.
4. Omit phase 5 during phase 6 on.
5. Program controller to clear from phase 2+6 to phase 1 and / or 5 by progressing through phase 4+8 (see Electrical Details).
6. Set all detector units to presence mode.
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. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
10. Signal System Data: Controller Asset # 0223.

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	■
— DD —	Directional Drill (2-2" Polyethylene Conduits)	N/A
- - - -	2-in Underground Conduit	- - - -
N/A	Right of Way	— — —
→	Directional Arrow	→
→	Pavement Marking Arrow	→
⁄▐	Wheelchair Ramp	N/A
▭▷	Metal Pole with Mastarm	▭▷
⬡	Pedestrian Signal Pedestal	⬢
▌▌▌▌▌▌▌	Hi-Visibility Crosswalk	N/A



2070L TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Min Green 1 *	7	10	7	7	10	7
Extension 1 *	2.0	3.0	2.0	2.0	3.0	2.0
Max Green 1 *	20	60	30	20	60	30
Yellow Clearance	3.0	3.8	3.8	3.0	3.8	3.2
Red Clearance	3.3	2.1	2.1	2.9	2.5	2.9
Walk 1 *	-	-	-	-	7	7
Don't Walk 1	-	-	-	-	19	17
Seconds Per Actuation *	-	-	-	-	-	-
Max Variable Initial *	-	-	-	-	-	-
Time Before Reduction *	-	-	-	-	-	-
Time To Reduce *	-	-	-	-	-	-
Minimum Gap	-	-	-	-	-	-
Recall Mode	-	MIN RECALL	-	-	MIN RECALL	-
Vehicle Call Memory	-	YELLOW	-	-	YELLOW	-
Dual Entry	-	-	ON	-	-	ON
Simultaneous Gap	ON	ON	ON	ON	ON	ON

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

Signal Upgrade - Final

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, State of North Carolina Department of Transportation, Signals and Geometrics Section, 750 N. Greenfield Pkwy, Garner, NC 27529

SR 1411 (Wrightsville Ave.) at SR 2123 (Wilshire Blvd.) / Caswell St.

Division 3 | New Hanover | Wilmington

PLAN DATE: February 2008	REVIEWED BY: T. Thigpen
PREPARED BY: C. E. Pierce	REVIEWED BY:

SCALE 0 50, 1"=50'

REVISIONS	INIT.	DATE

SEAL: North Carolina Professional Engineer, Seal 24393, Timothy J. Williams

T. J. Williams 3/18/08.
SIGNATURE DATE

SIG. INVENTORY NO. 03-0223

18-MAR-2008 15:25
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eplerce

PROJECT REFERENCE NO.	SHEET NO.
U-4733	Sig. 11

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

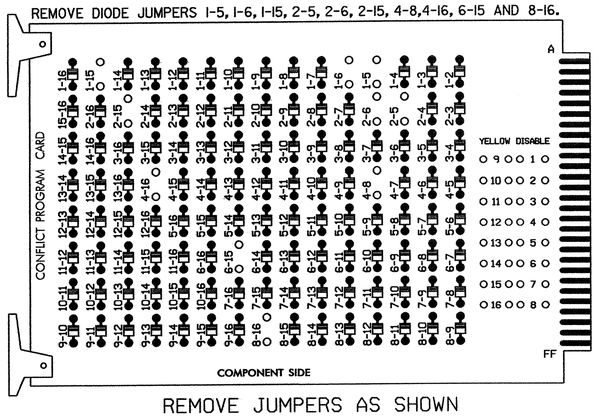
(remove jumpers and set switches as shown)

ON OFF

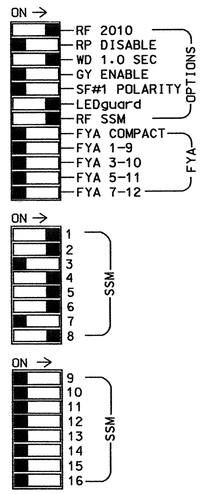
WD ENABLE

SW2

REMOVE DIODE JUMPERS 1-5, 1-6, 1-15, 2-5, 2-6, 2-15, 4-8, 4-16, 6-15 AND 8-16.



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 SEL2-SEL5 are present on the monitor board.

NOTES

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

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S1,S2,S4,S5,S6,S6P,S8,S8P
PHASES USED.....1,2,4,5,6,8,6 PED,8 PED
OVERLAPS.....NONE

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4	S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	61	21,22	NU	NU	41, 42,43	NU	21,42	61, 62,63	P61, P62	NU	81, 82,83	P81, P82
RED	*	128			101		*	134			107	
YELLOW		129			102			135			108	
GREEN		130			103			136			109	
RED ARROW												
YELLOW ARROW	126						132					
GREEN ARROW	127						133					
✋									119			110
🚶									121			112

NU = Not Used

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

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	Ø1 1A	Ø2 2A	SLOT EMPTY	SLOT EMPTY	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SYS. DET. S1	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L		Ø6 1A	NOT USED			NOT USED			SYS. DET. S2				Ø8 PED DC ISOLATOR	ST DC ISOLATOR
FILE "J"	U	Ø5 5B	Ø5 5A	Ø6 6A	SLOT EMPTY	SLOT EMPTY	Ø8 8A	SLOT EMPTY	SLOT EMPTY	SYS. DET. S3	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	Ø2 5A	Ø6 6B			NOT USED			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.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
1A[1]	TB2-5,6	I2U	39	1	2	1	Y	Y			15
	TB2-7,8	I2L	43	5	12	6	Y	Y			
2A	TB2-9,10	I3U	63	25	32	2	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			3
* S1	TB6-9,10	I9U	60	22	11	SYS					
* S2	TB6-11,12	I9L	62	24	13	SYS					
5B	TB3-1,2	J1U	55	17	5	5	Y	Y			15
5A[2]	TB3-5,6	J2U	40	2	6	5	Y	Y			15
	TB3-7,8	J2L	44	6	16	2	Y	Y			
6A	TB3-9,10	J3U	64	26	36	6	Y	Y			
6B	TB3-11,12	J3L	77	39	46	6	Y	Y			
8A	TB5-9,10	J6U	42	4	8	8	Y	Y			5
* S3	TB7-9,10	J9U	59	21	15	SYS					
PED PUSH BUTTONS											
P61,P62	TB8-7,9	I13U	68	30	PED 6	6 PED					
P81,P82	TB8-8,9	I13L	70	32	PED 8	8 PED					

NOTE:
INSTALL DC ISOLATORS IN INPUT FILE SLOT I13.

[1] Add jumpers from TB2-5 to TB2-7, and from TB2-6 to TB2-8.

[2] Add jumpers from TB3-5 to TB3-7, and from TB3-6 to TB3-8.

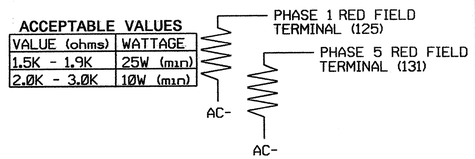
* SYSTEM DETECTOR ONLY. REMOVE THE VEHICLE PHASE ASSIGNED TO THIS DETECTOR IN THE DEFAULT PROGRAMMING.

INPUT FILE POSITION LEGEND: J2L

FILE J
SLOT 2
LOWER

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.

DYNAMIC BACK-UP CONTROL PROGRAMMING

(program controller as shown below)

1. From Main Menu press '2' (Phase Control), then '1' (Phase Control Functions). Scroll to the bottom of the menu and enable Dynamic/Backup Control Functions 1 and 2.
2. From Phase Control Functions Menu press '2' (Dynamic/Backup Control Functions).

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

PRESS 'NEXT'

```
DYNAMIC/BACKUP CONTROL FUNCTION #02
                OVERLAPS:¦ABCDEFGHIJKLMNOP
IF OVERLAPS ARE ACTIVE ¦
OR        PHASES:¦12345678910111213141516
IF PHASES ARE ON¦    X
OMIT PHASES     ¦   X
CALL PHASES     ¦  X
```

BACKUP PROTECTION PROGRAMMING COMPLETE

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 03-0223
DESIGNED: February 2008
SEALED: 03-18-08
REVISED: N/A

Signal Upgrade - Final

ELECTRICAL AND PROGRAMMING DETAILS FOR:

SR 1411 (Wrightsville Ave.) at SR 2123 (Wilshire Blvd.) / Caswell St.

Division 3 | New Hanover | Wilmington

PLAN DATE: March 2008 | REVIEWED BY: JTR

PREPARED BY: James Peterson | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL

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

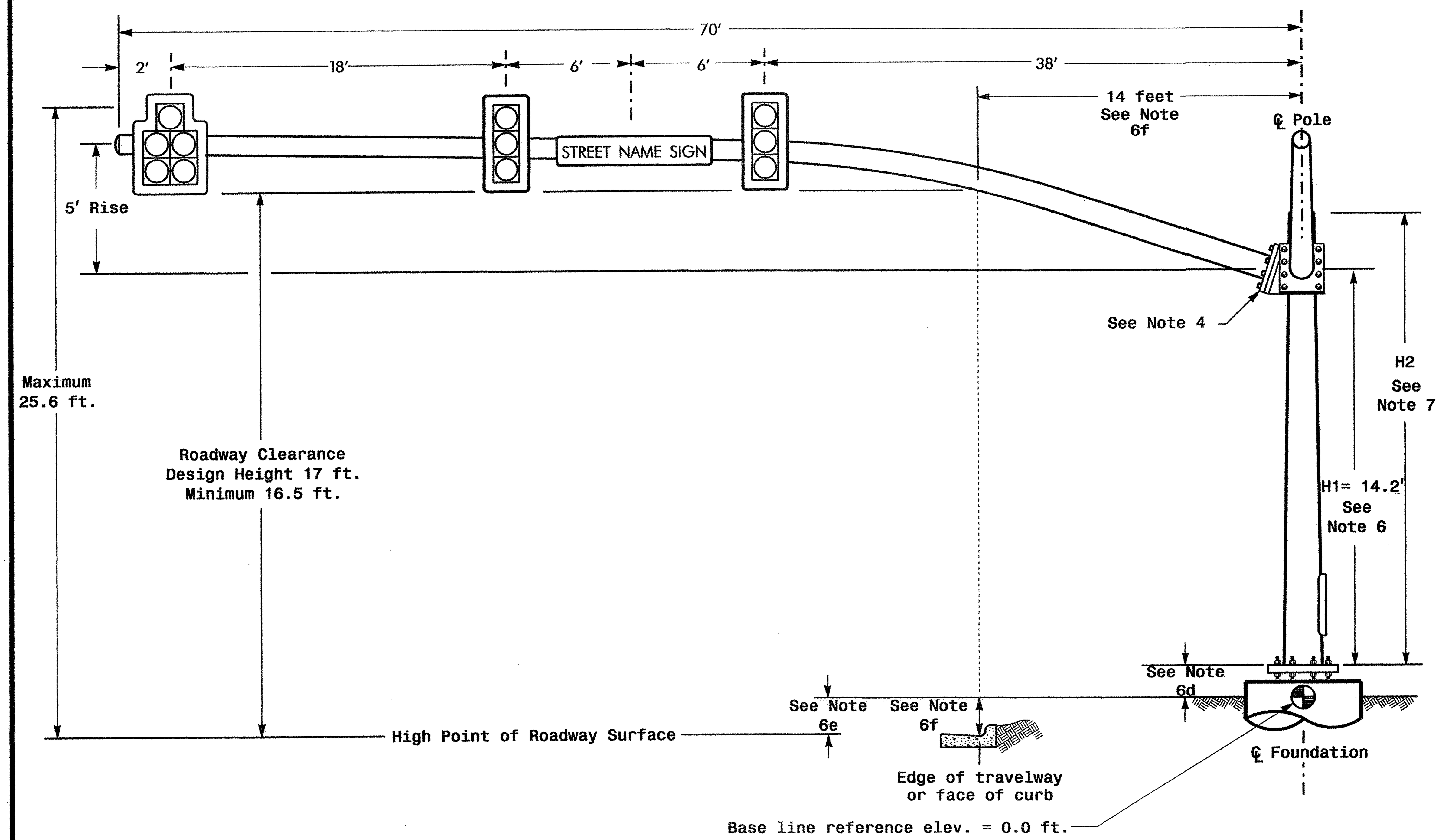
John T. Rowe Jr. 3-19-08
SIGNATURE DATE

SIG. INVENTORY NO. 03-0223

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
NCDOT Division of Highways
Traffic Management Unit
Signals Management Section
750 N. Greenfield Pwky, Garner, NC 27529

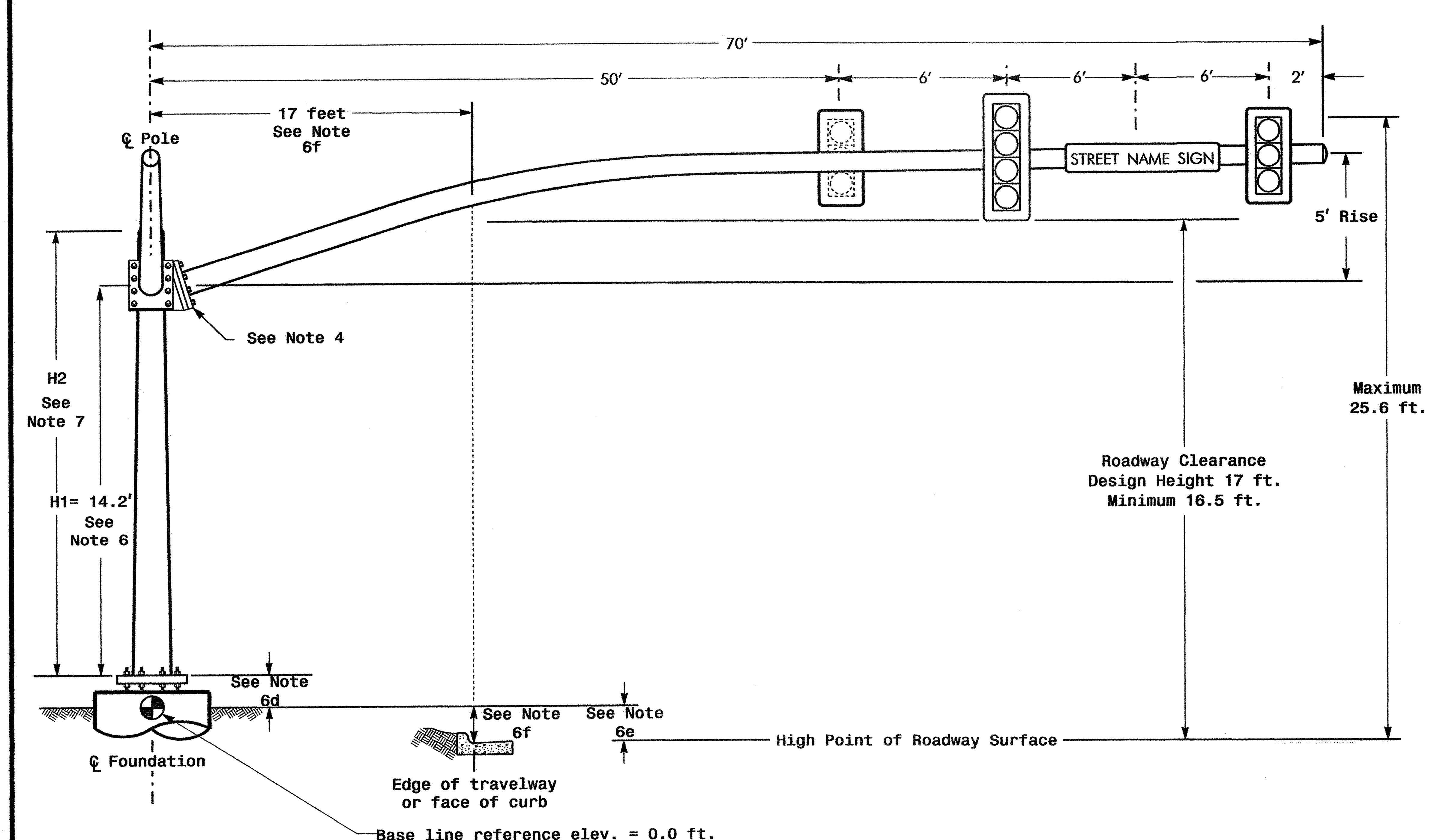
METAL POLE No. 5

Design Loading for METAL POLE NO. 5, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 5, MAST ARM B



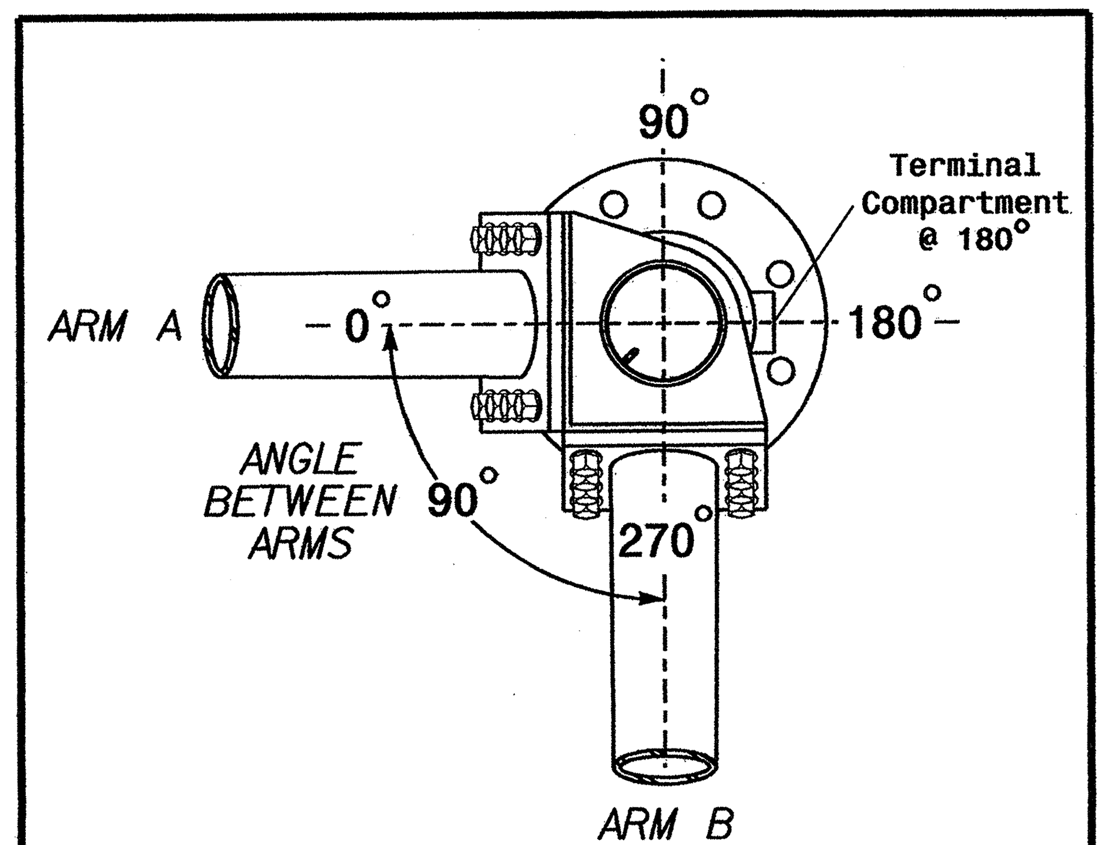
Elevation View @ 0°

SPECIAL NOTE

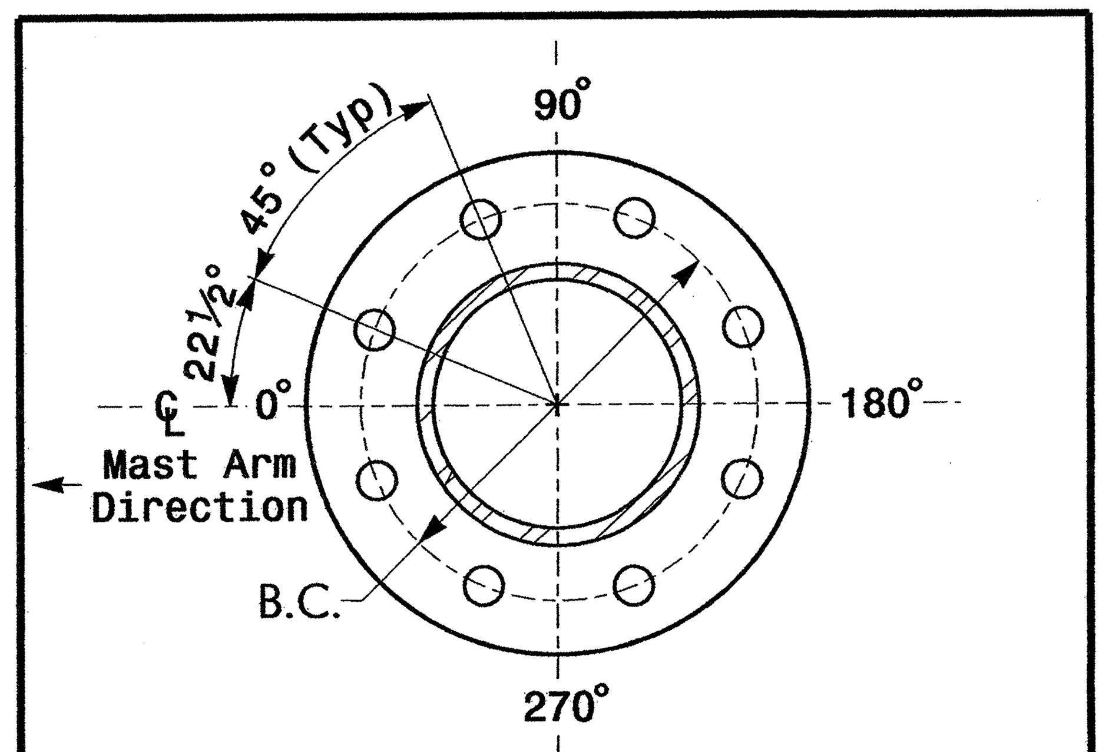
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	0.0 ft.	+0.2 ft.
Elevation difference at Edge of travelway or face of curb	0.0 ft.	+0.1 ft.

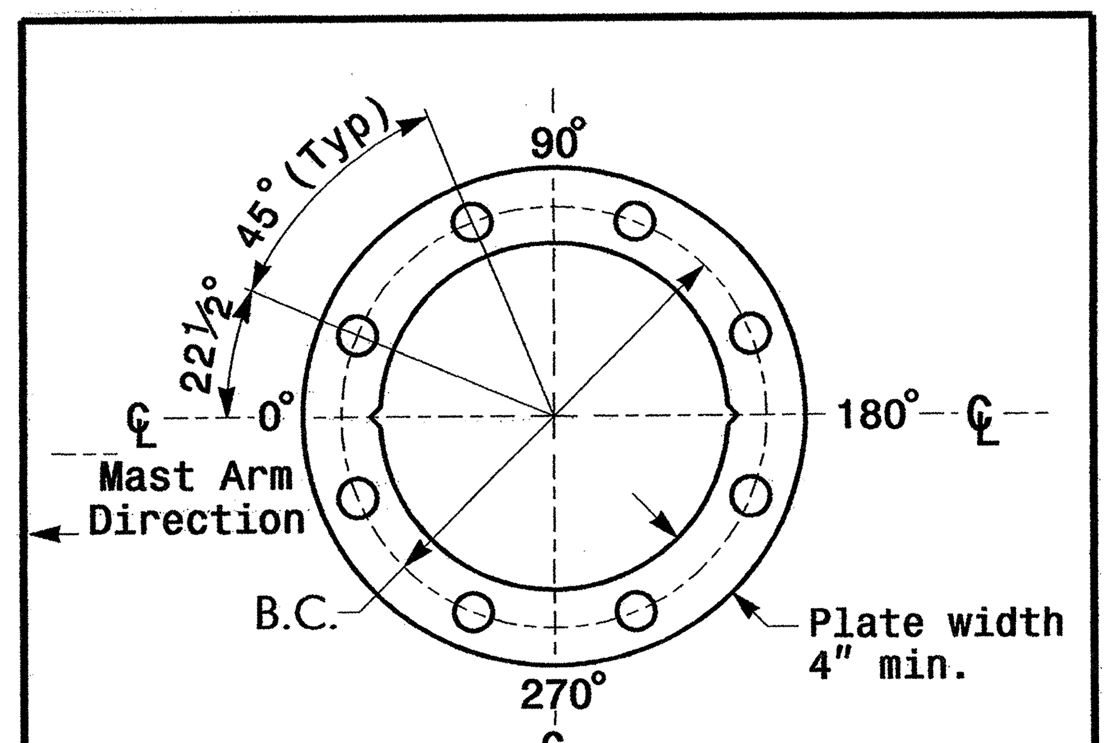


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



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"-4 SECTION-WITH BACKPLATE AND ASTRO-BRAC	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
STREET NAME SIGN	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 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2006 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.

Design Requirements

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. Design all signal supports using stress ratios that do not exceed 0.9.
4. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate connection points.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
   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.
   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
7. The pole manufacturer will determine the total height (H2) of the pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. 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 2 (130 mph)

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Signals and Geometrics Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1411 (Wrightsville Ave.) at SR 2123 (Wilshire Blvd.) / Caswell St.

Division 3 | New Hanover | Wilmington

PLAN DATE: March 2008 | REVIEWED BY: T. Thiggen
PREPARED BY: C. E. Pierce | REVIEWED BY:

SCALE 0 N/A — N/A

REVISIONS | INIT. | DATE

SEAL: North Carolina Professional Engineer, SEAL 24393, Timothy J. Williams
SIGNATURE 3/24/08 DATE
SIG. INVENTORY NO. 03-0223

20-MAR-2008 16:56
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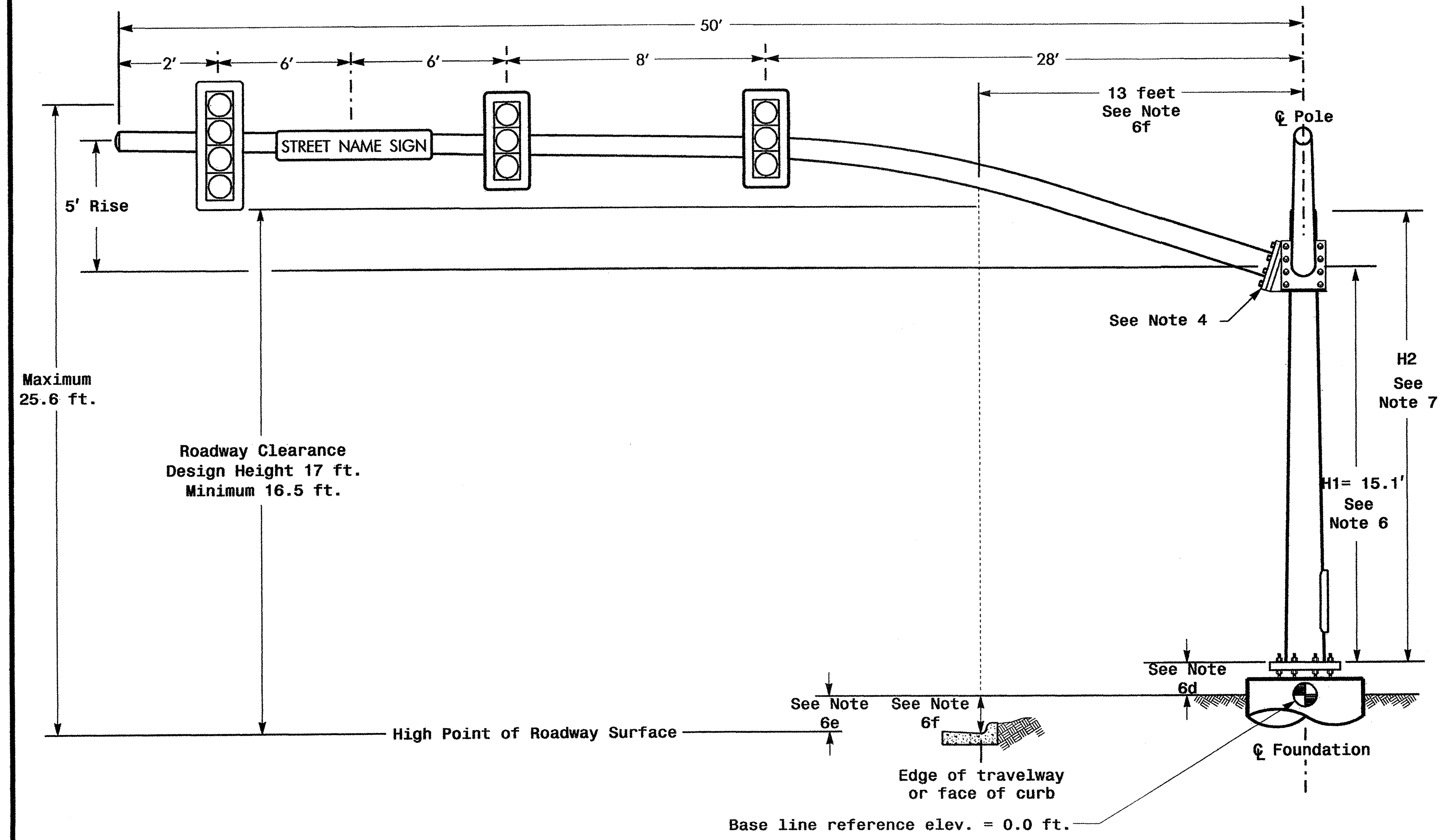
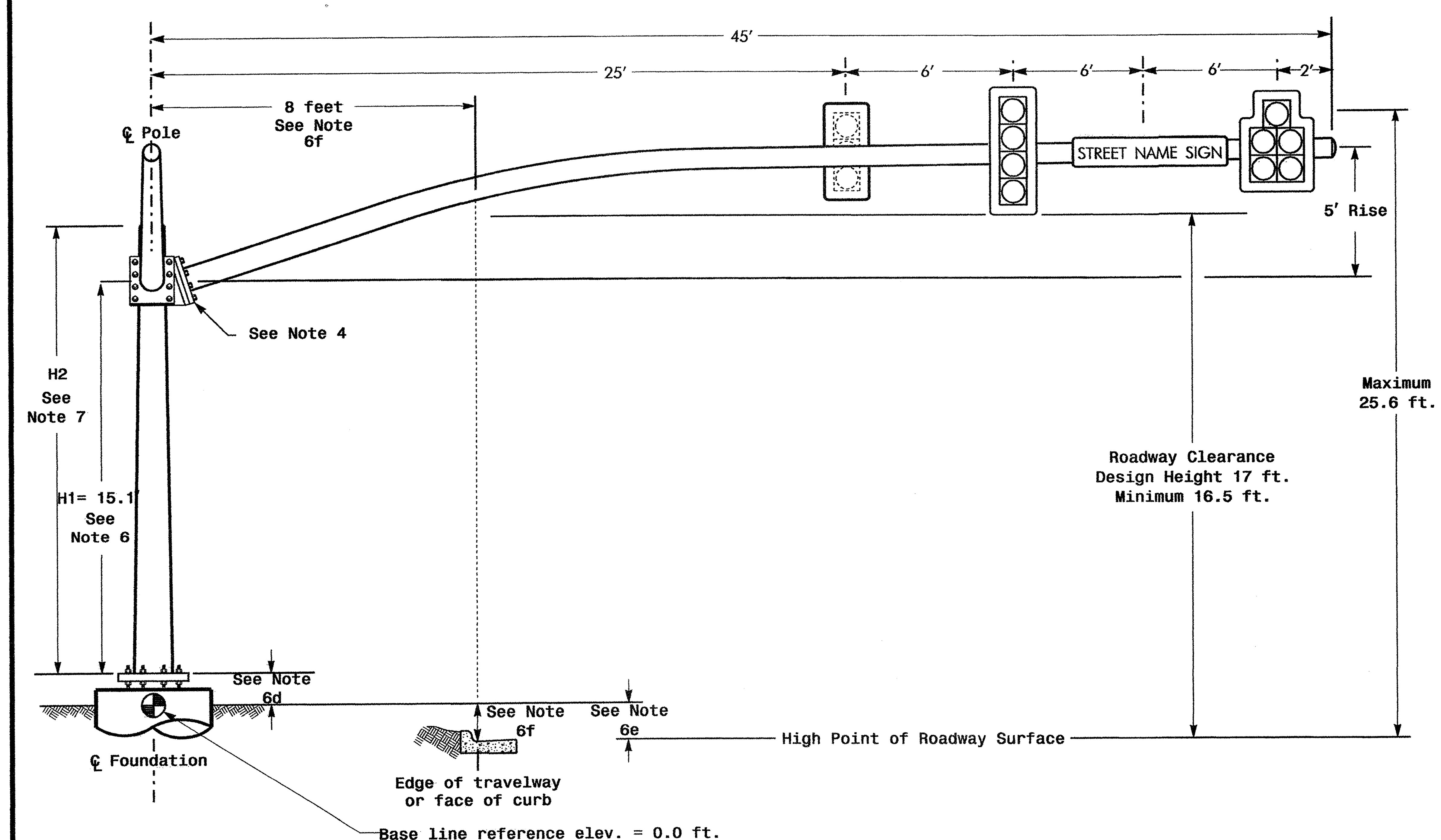
Design Loading for METAL POLE NO. 6, MAST ARM A



Elevation View @ 270°

Design Loading for METAL POLE NO. 6, MAST ARM B



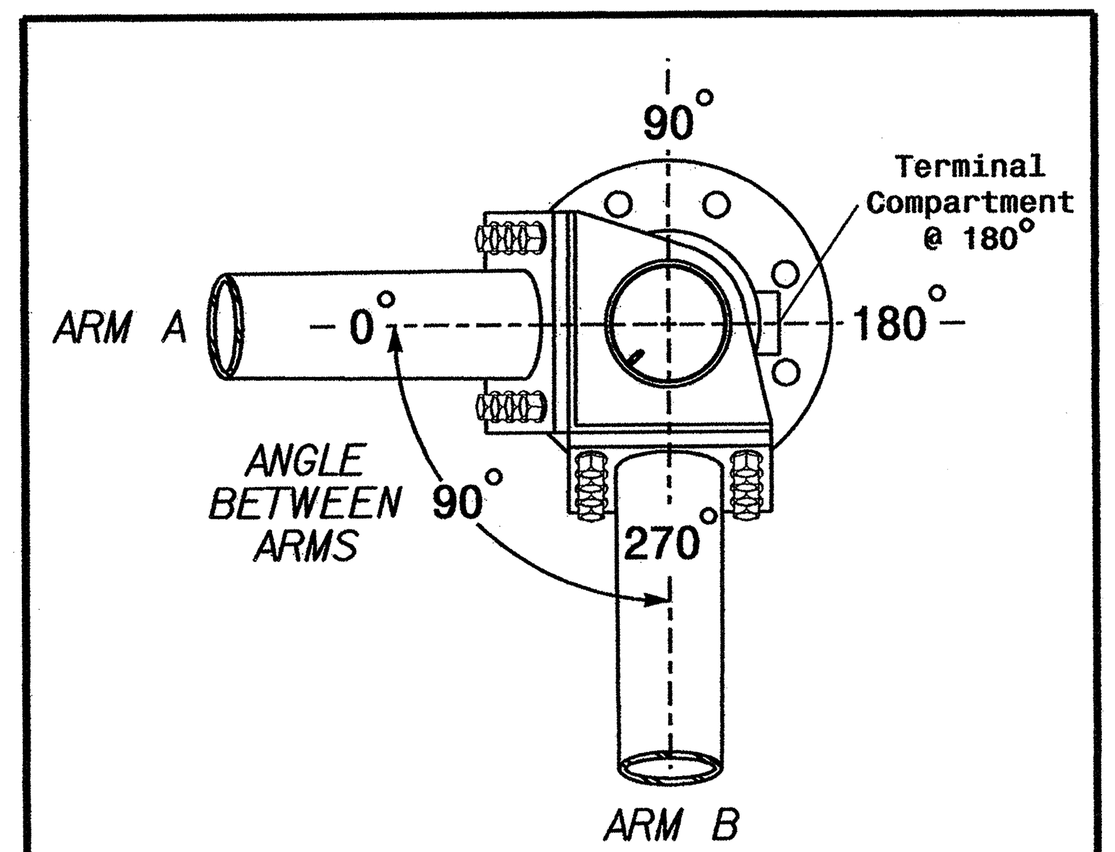
Elevation View @ 0°

SPECIAL NOTE

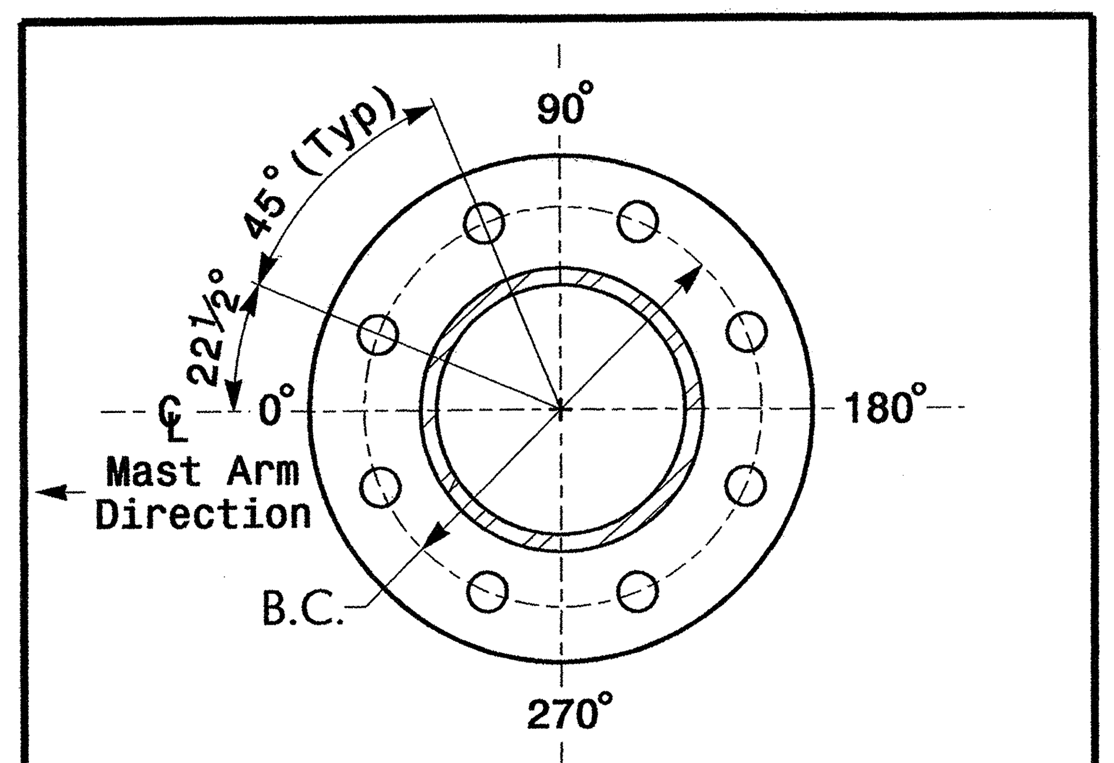
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Arm "A"	Arm "B"
Baseline reference point at ℄ Foundation @ ground level	0.0 ft.	0.0 ft.
Elevation difference at High point of roadway surface	+1.1 ft.	+1.0 ft.
Elevation difference at Edge of travelway or face of curb	-1.0 ft.	-2.0 ft.

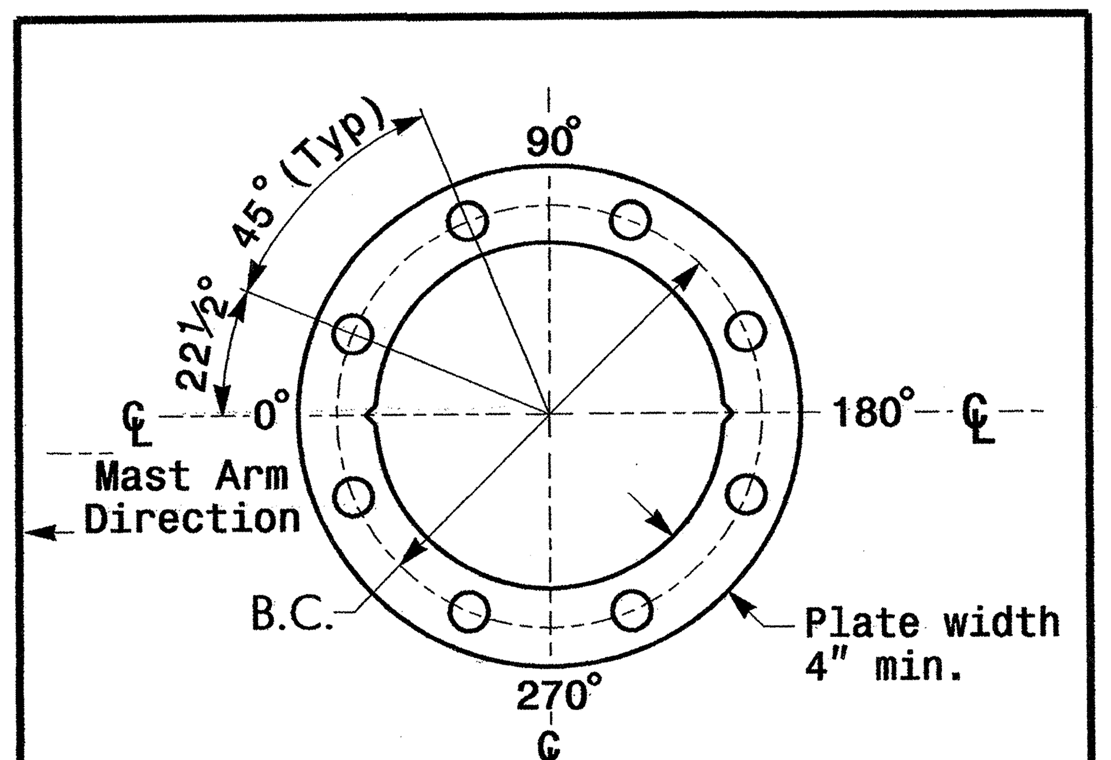


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 5



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL

For 8 Bolt Base Plate

METAL POLE No. 6

PROJECT REFERENCE NO.	SHEET NO.
U-4733	Sig.13

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC	16.3 S.F.	42.0" W X 56.0" L	103 LBS
	SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE AND ASTRO-BRAC	11.5 S.F.	25.5" W X 66.0" L	74 LBS
	SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC	9.3 S.F.	25.5" W X 52.5" L	60 LBS
STREET NAME SIGN	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 2006 NCDOT "Standard Specifications for Roads and Structures". The latest addenda to these specifications can be found in the traffic signal project special provisions.
   - The 2006 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.

Design Requirements

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. Design all signal supports using stress ratios that do not exceed 0.9.
4. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements. This requires staggering the connections. Use elevation data for each arm to determine appropriate connection points.
5. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
6. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Nominal vertical rise in mast arm is 5 feet as measured from the centerline of the arm base to the centerline of the free end of the arm.
   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.
   f. Provide horizontal distance from proposed centerline of foundation to edge of travelway. Refer to the Elevation Data chart above for elevation difference between the proposed foundation ground level and the edge of travelway. This information is necessary when arched arms are specified to ensure that the roadway clearance is maintained at the edge of the travelway and to assist in the camber design of the mast arm.
7. The pole manufacturer will determine the total height (H2) of the pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus ½ of the total height of the mast arm attachment assembly plus 1 foot.
8. If pole location adjustments are required, the contractor must gain approval from the engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signals & Geometrics Structural Engineer for assistance at (919) 773-2800.
9. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
10. 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 2 (130 mph)

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

750 N. Greenfield Pkwy, Garner, NC 27529

SR 1411 (Wrightsville Ave.) at SR 2123 (Wilshire Blvd.) / Caswell St.

Division 3 | New Hanover | Wilmington

PLAN DATE: March 2008 | REVIEWED BY: T. Thigpen

PREPARED BY: C. E. Pierce | REVIEWED BY:

SCALE: 0 N/A — N/A

REVISIONS | INIT. | DATE

SEAL: North Carolina Professional Engineer, Seal 24393, Timothy J. Williams

SIGNATURE 3/24/08 DATE

SIG. INVENTORY NO. 03-0223

20-MAR-2008 16:59
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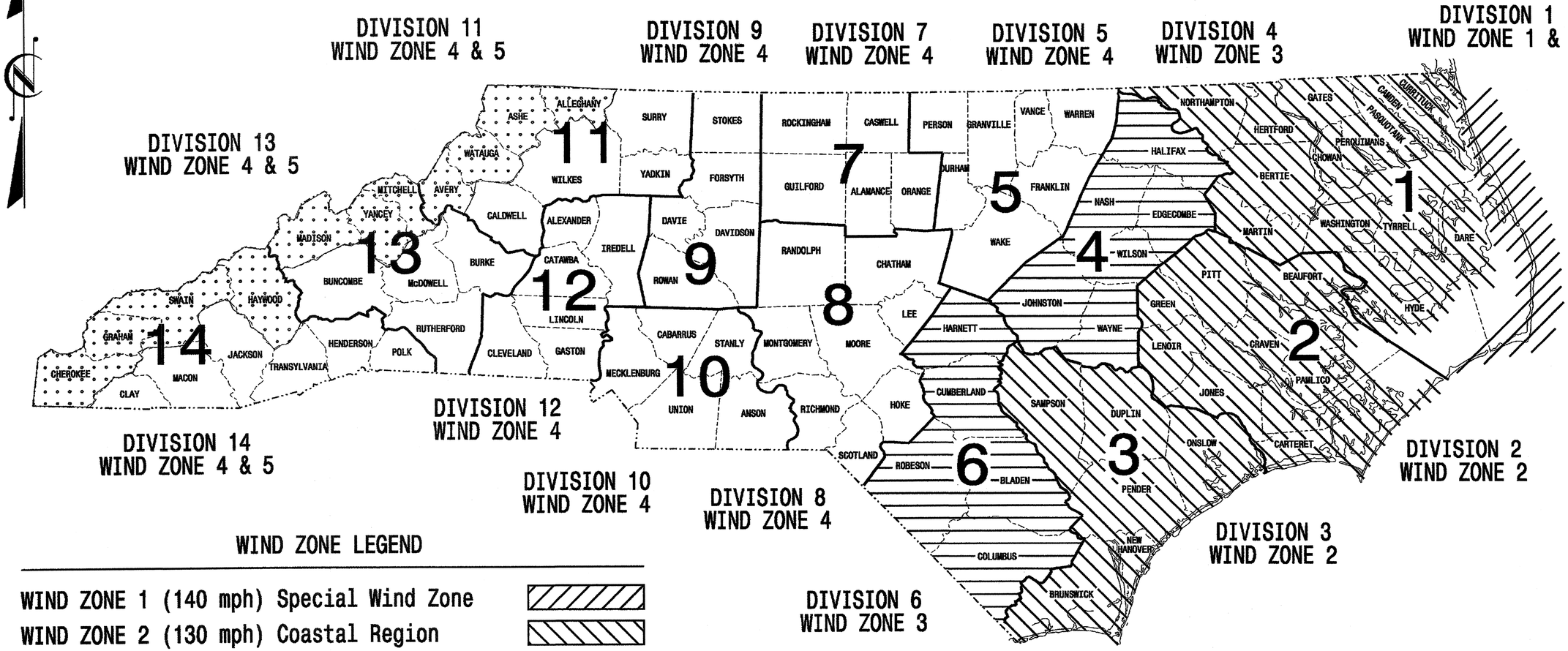
STATE	PROJECT NO.	SHEET NO.
N.C.	U-4733	Sig. 14
F. A. PROJ. NO.		M 1
PROJECT ID. NO.		

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR METAL POLES

POLE STANDARDS

NCDOT METAL P



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

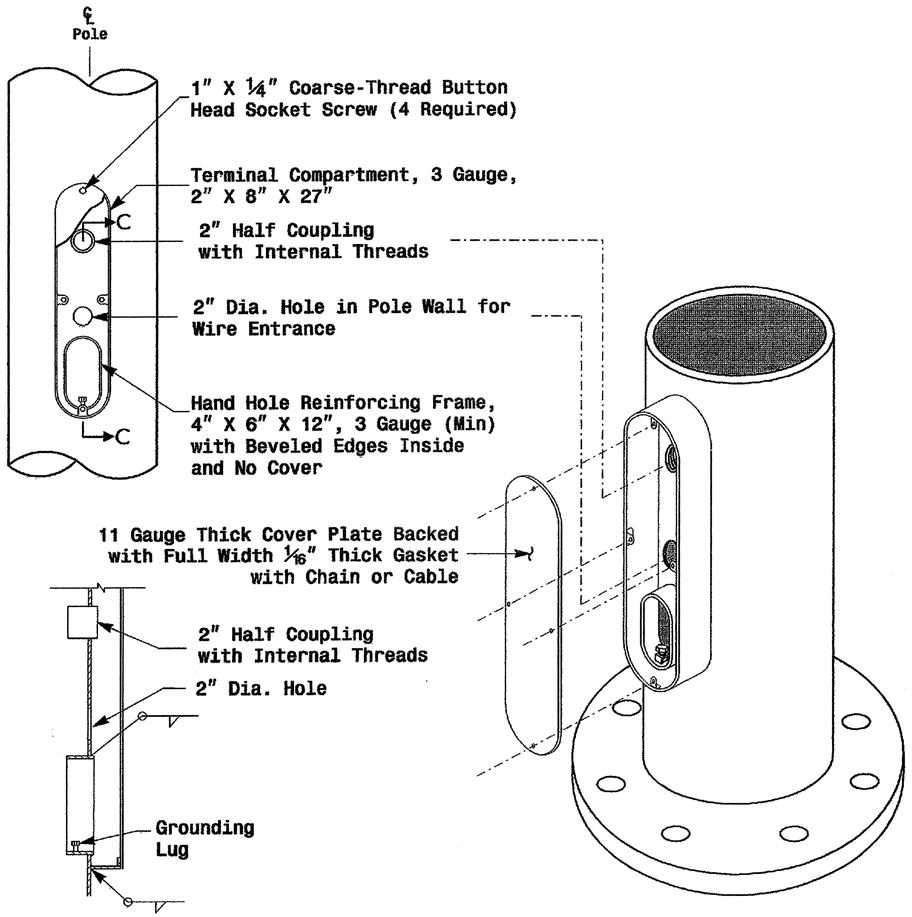
G. A. Fuller, P.E. – State ITS and Signals Engineer
R. E. Mullinax, P.E. – Signals and Geometrics Engineer
P. L. Alexander, P.E. – Signals and Geometrics Special Projects Engineer
D. C. Sarkar, P.E. – Signals and Geometrics Structural Engineer
A. M. Esposito, P.E. – Signals and Geometrics Project Engineer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



Section C-C

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

Terminal Compartment Detail

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 ----------

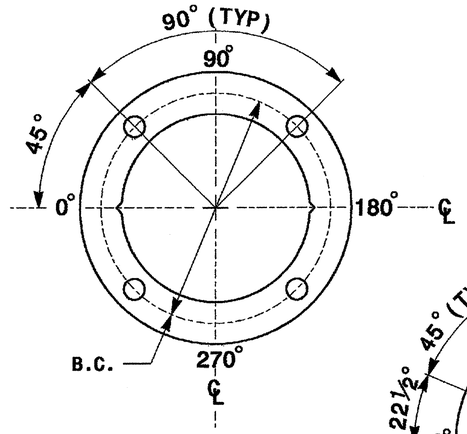
Shaft I.D. Tag
(Provide on Strain Poles and Mast Arm Poles)

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

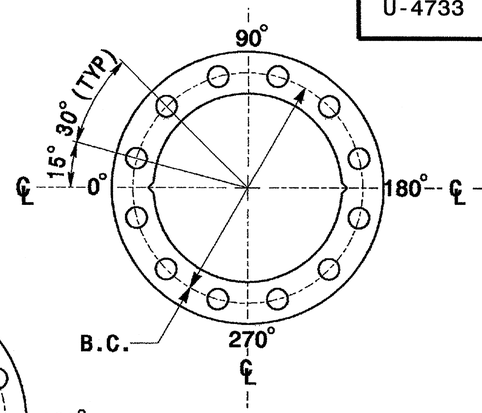
Arm I.D. Tag
(Provide on each section of a multi-section mast arm)

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



4 Bolt Pattern



12 Bolt Pattern

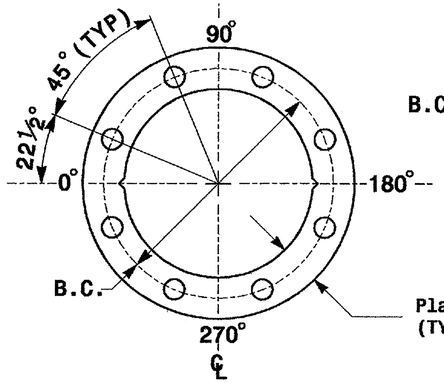
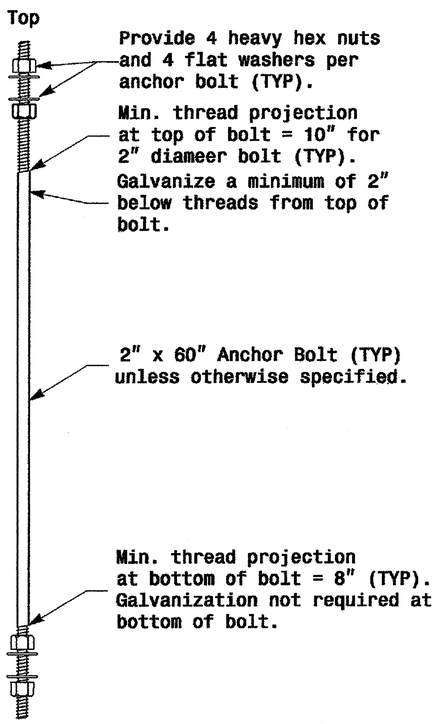


Plate Width = 4" min. (TYP for all plates)

8 Bolt Pattern

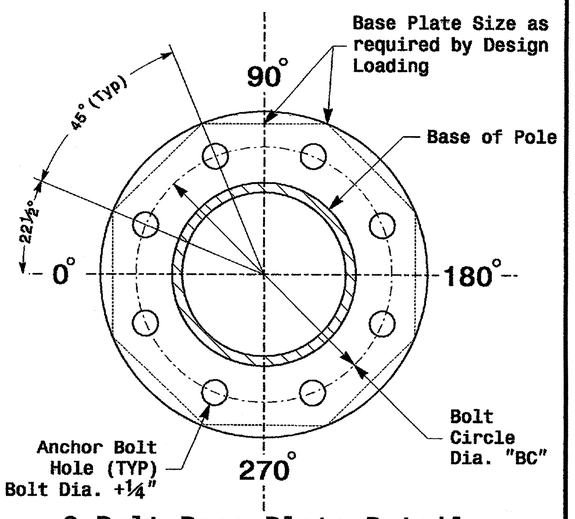
Construct Templates and Plates from ¼" min. thick Steel. Galvanizing is not required.

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

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, North Carolina Department of Transportation, Mapping and Geographics 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.W. Esposito

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DIBESH C. SARKAR

D. Sarkar 9.2.2005
SIGNATURE DATE

SIG. INVENTORY NO.

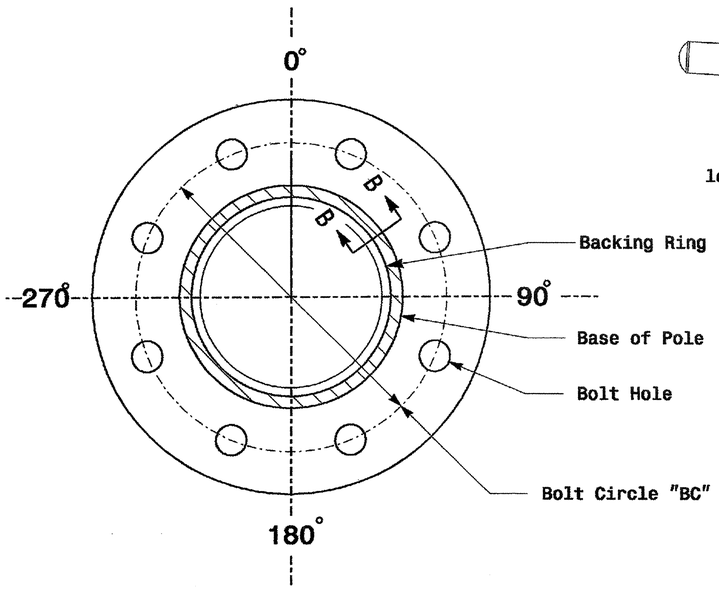
PROJECT REFERENCE NO.	SHEET NO.
U-4733	Sig.15 M 2

Fabrication Details – All Poles

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

PROJECT REFERENCE NO.	SHEET NO.
U-4733	Sig.16 M 4

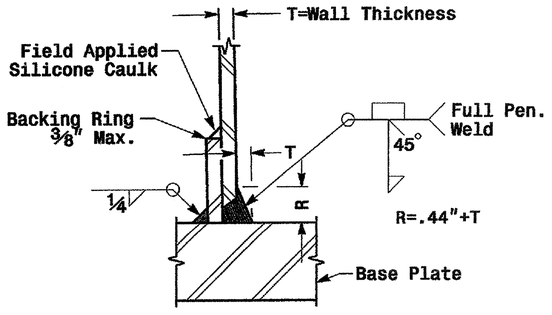
Fabrication Details – Mast Arm Poles



Section A-A

(See drawing M 2)

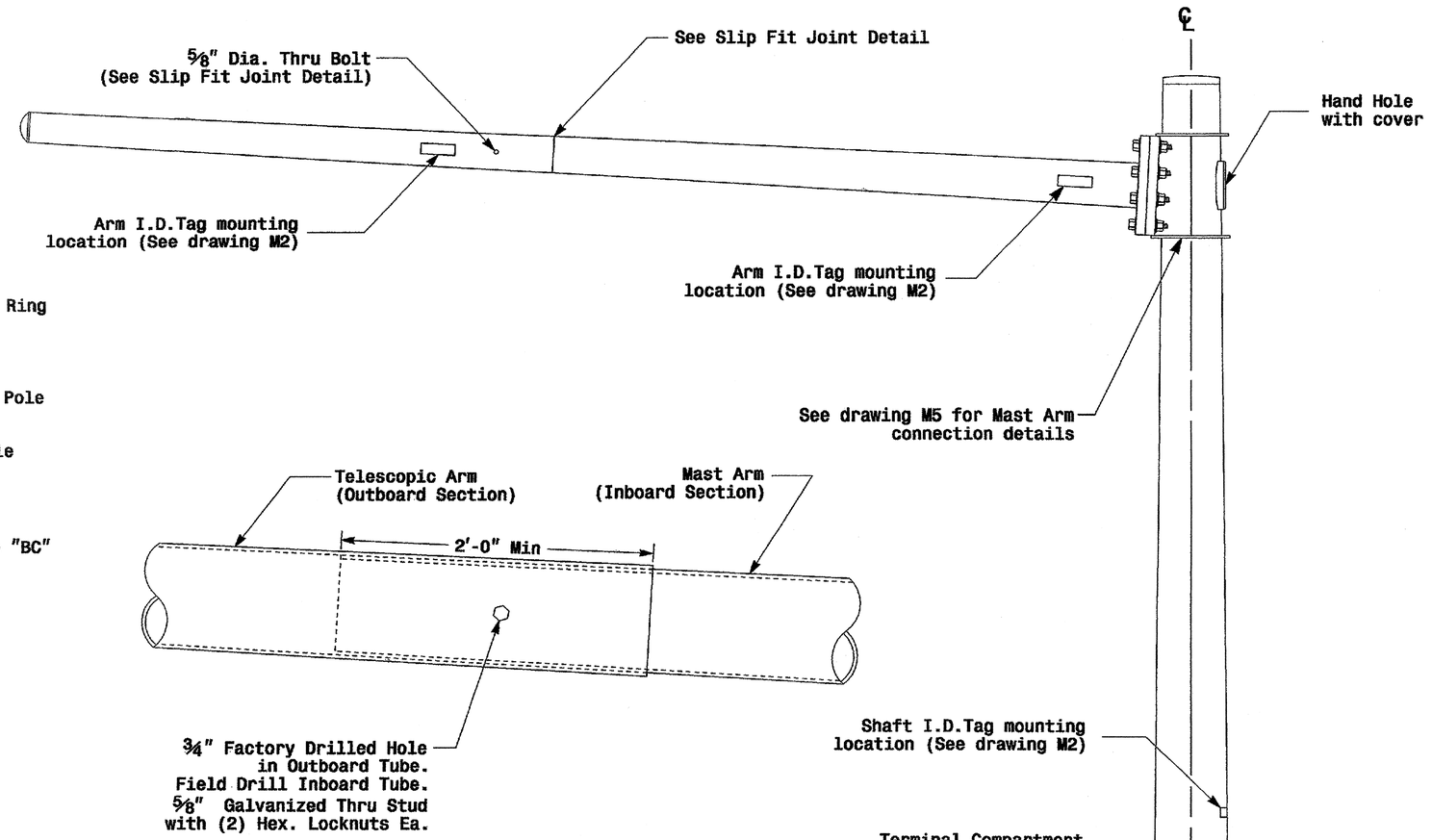
Pole Base Plate



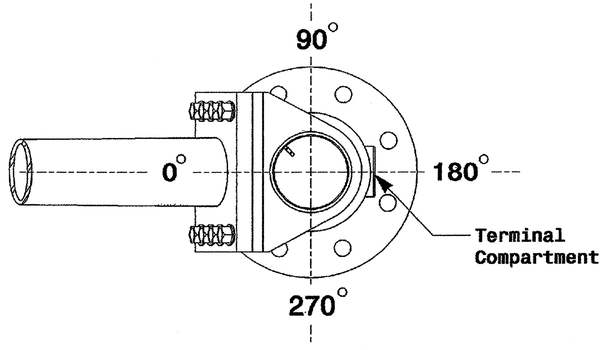
Section B-B

(Pole Attachment to Base Plate)

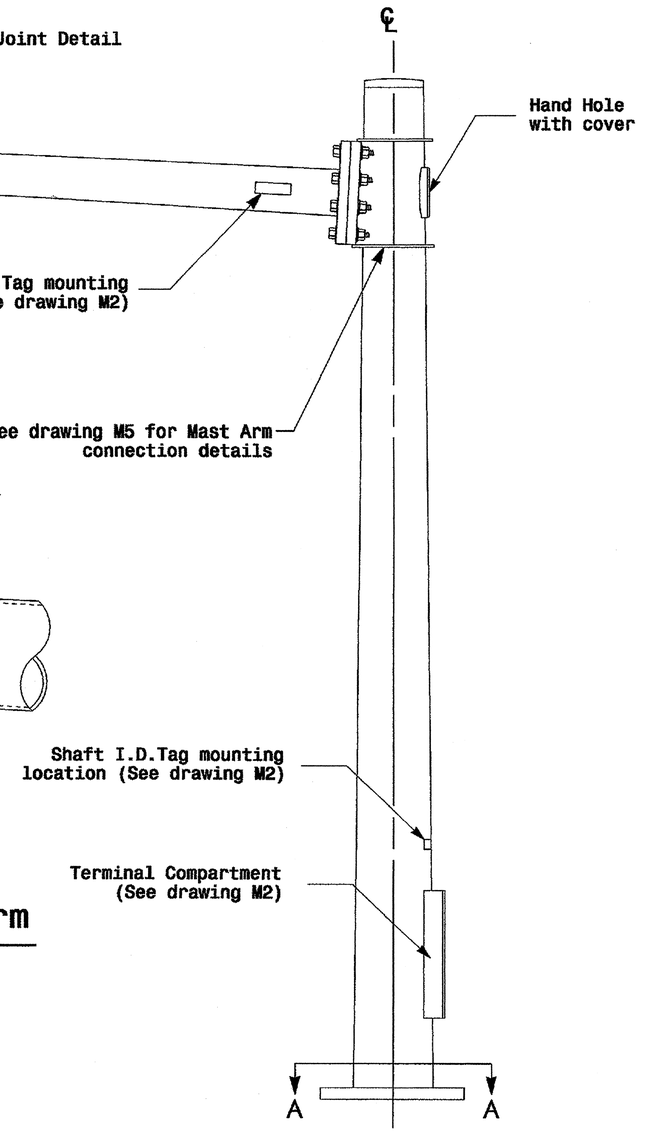
Full-Penetration Groove Weld Detail



Slip Fit Joint Detail for Mast Arm



Mast Arm Radial Orientation



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

Prepared in the Office of: Traffic Engineering Branch, Signals and Geometrics Section, North Carolina Department of Transportation
1722 N. McDowell St., Raleigh, NC 27603

Typical Fabrication Details for Mast Arm Poles

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

REVISIONS	INIT.	DATE

SCALE: 0 NA NONE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEGESH C. SARKAR

SIGNATURE: D. Sarkar 9.2.2005 DATE

SIG. INVENTORY NO.

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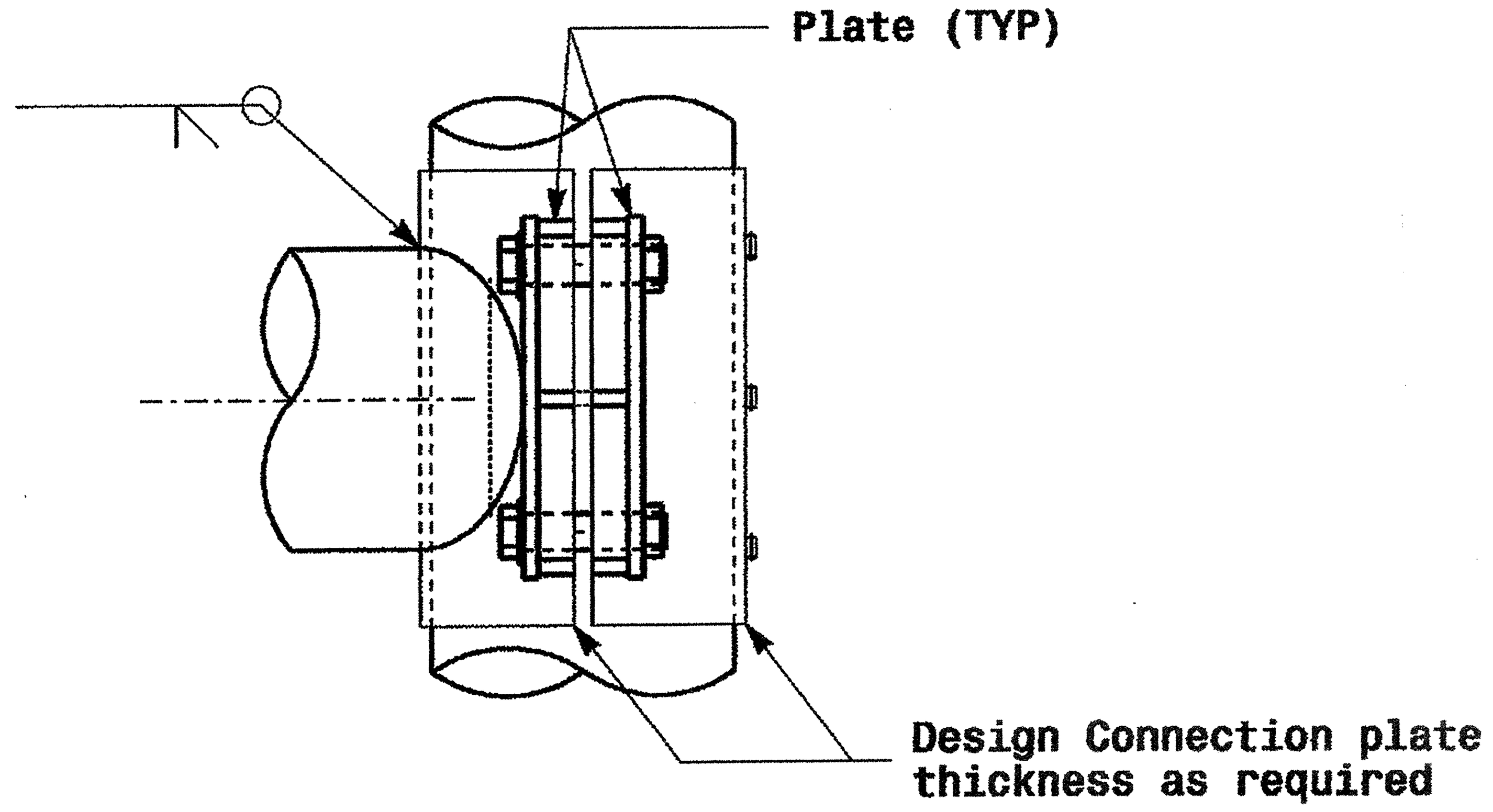
plalexander

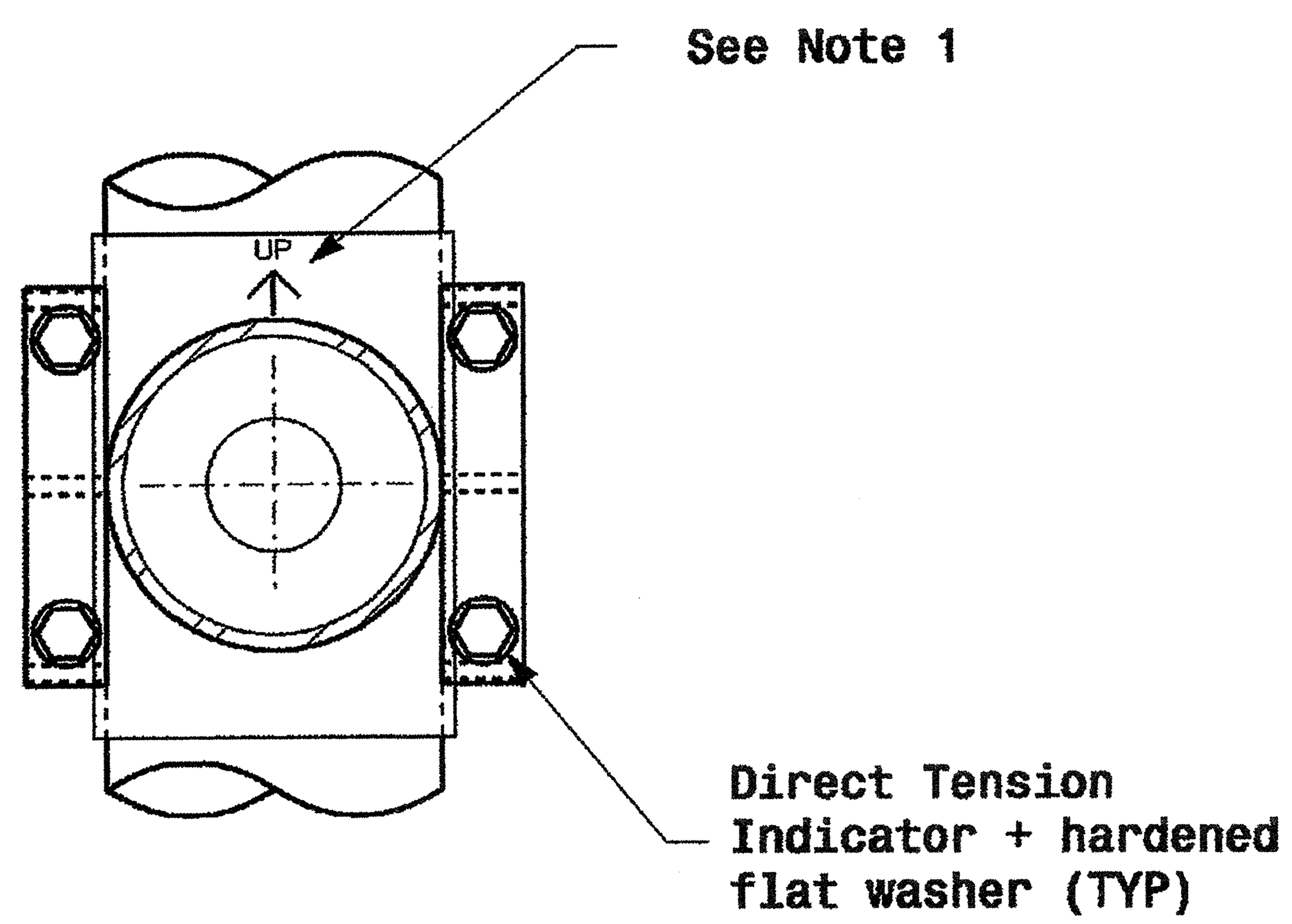
PROJECT REFERENCE NO.	SHEET NO.
U-4733	Sig.17 M 5

Fabrication Details – Mast Arm Poles

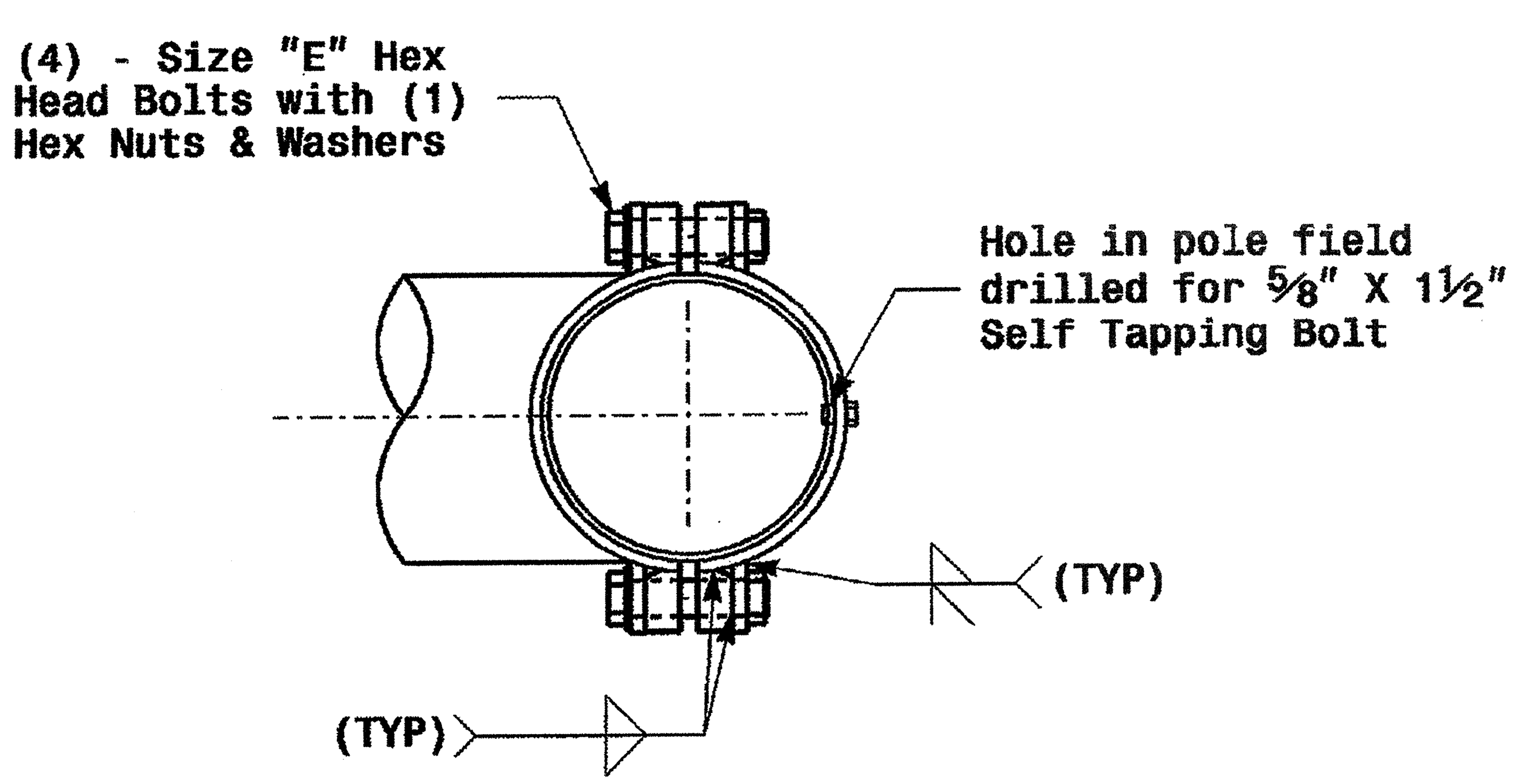
Adjustable Clamp Type Bolted Mast Arm Connection



Side Elevation View

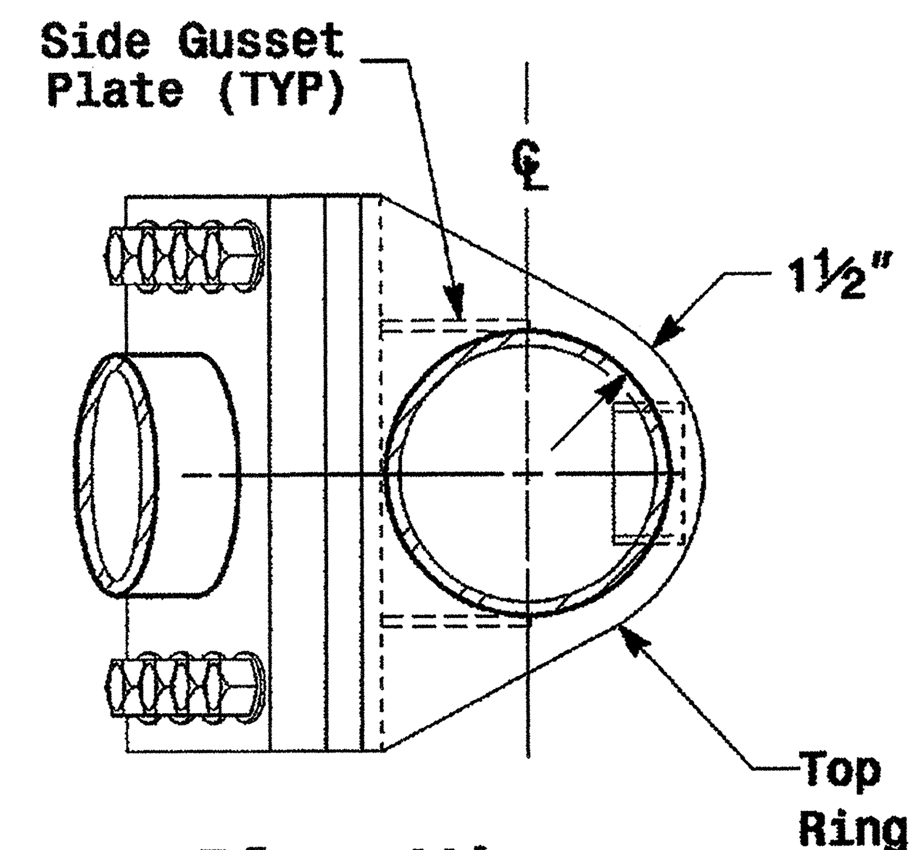


Front Elevation View

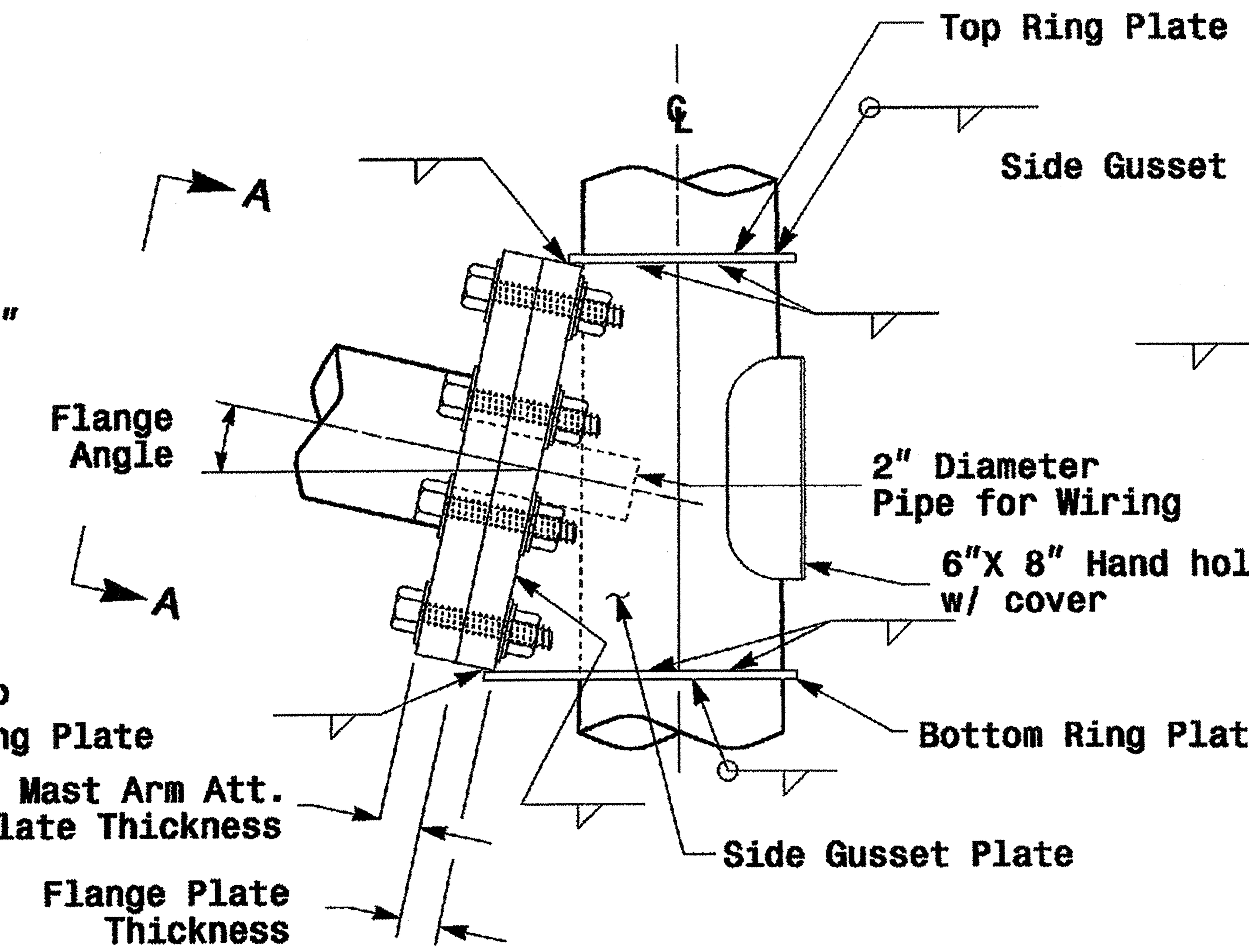


Plan View

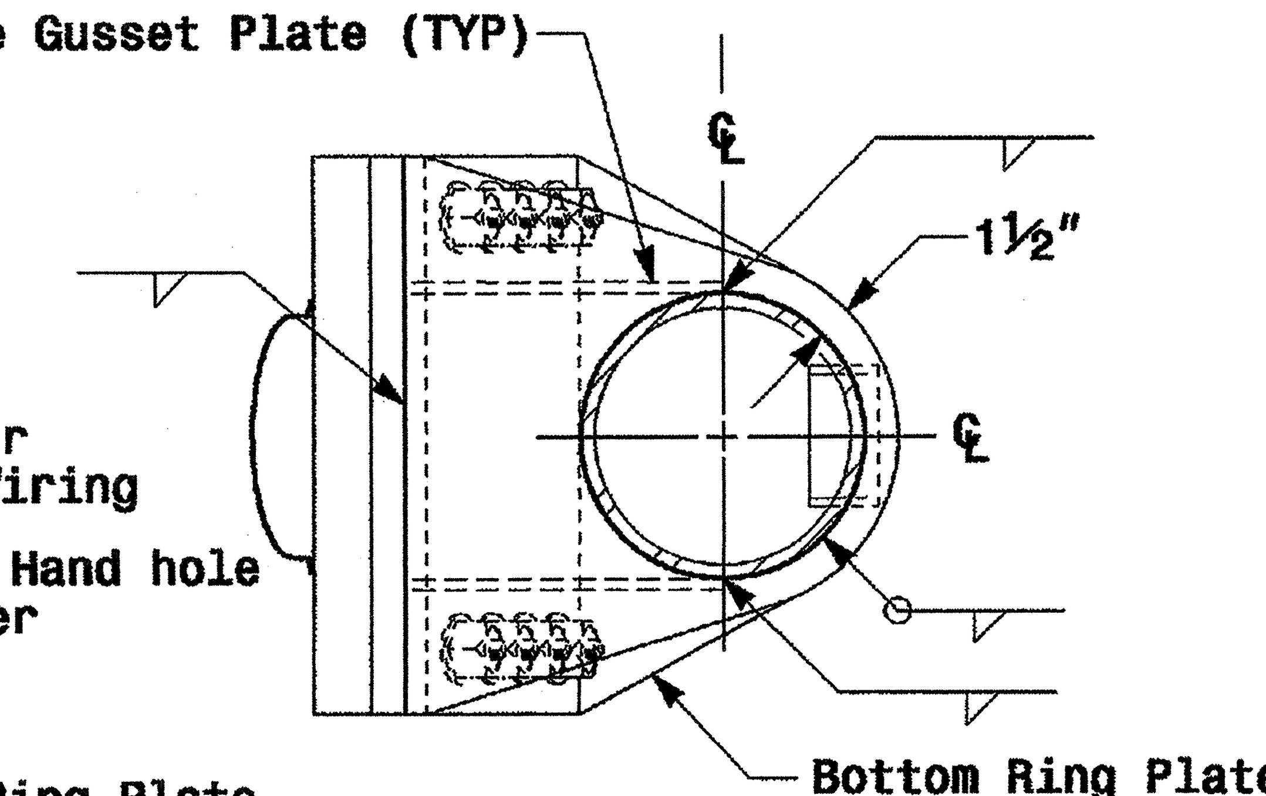
Welded Ring Stiffened Mast Arm Connection



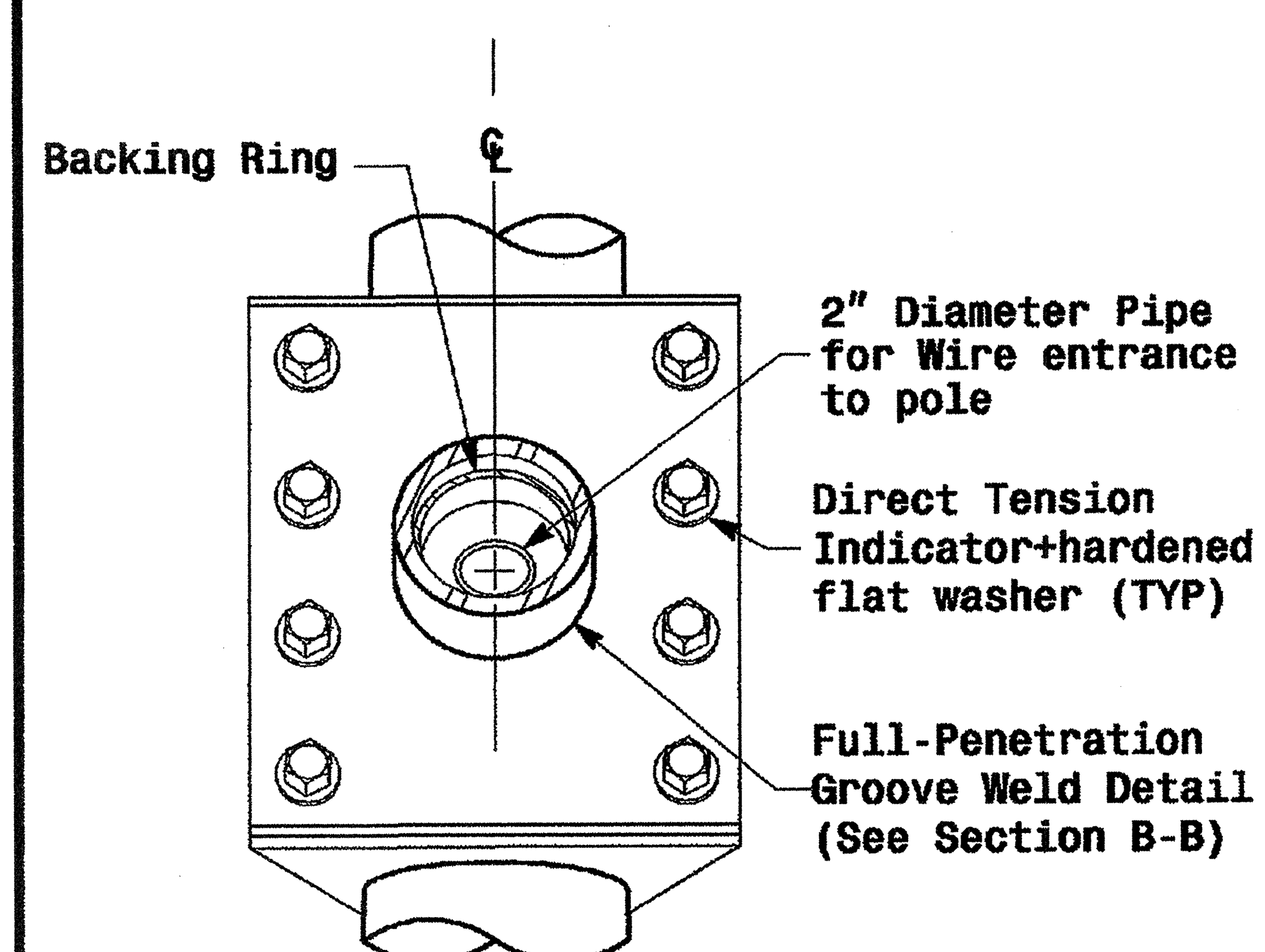
Plan View



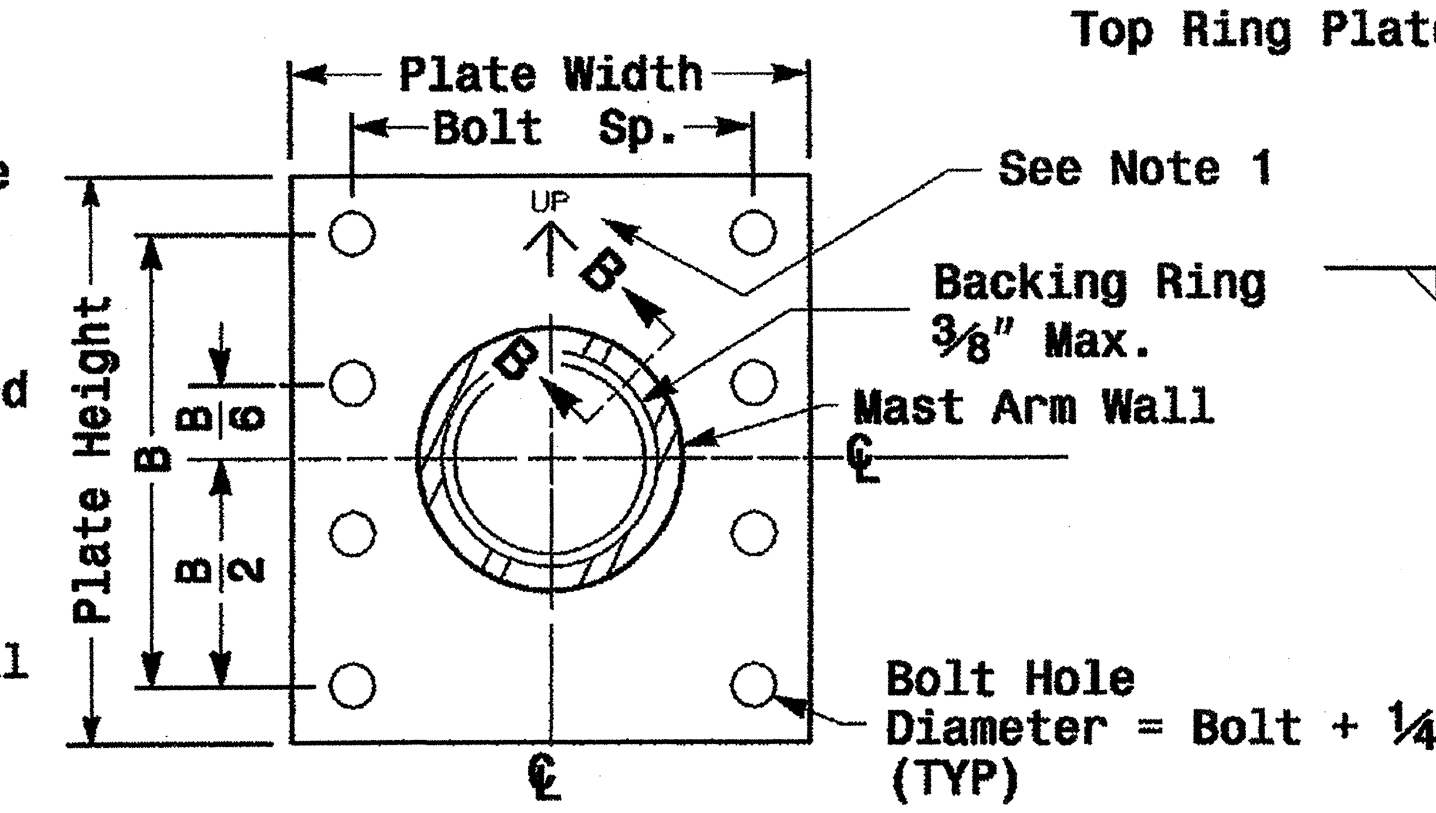
Side Elevation View



Bottom View

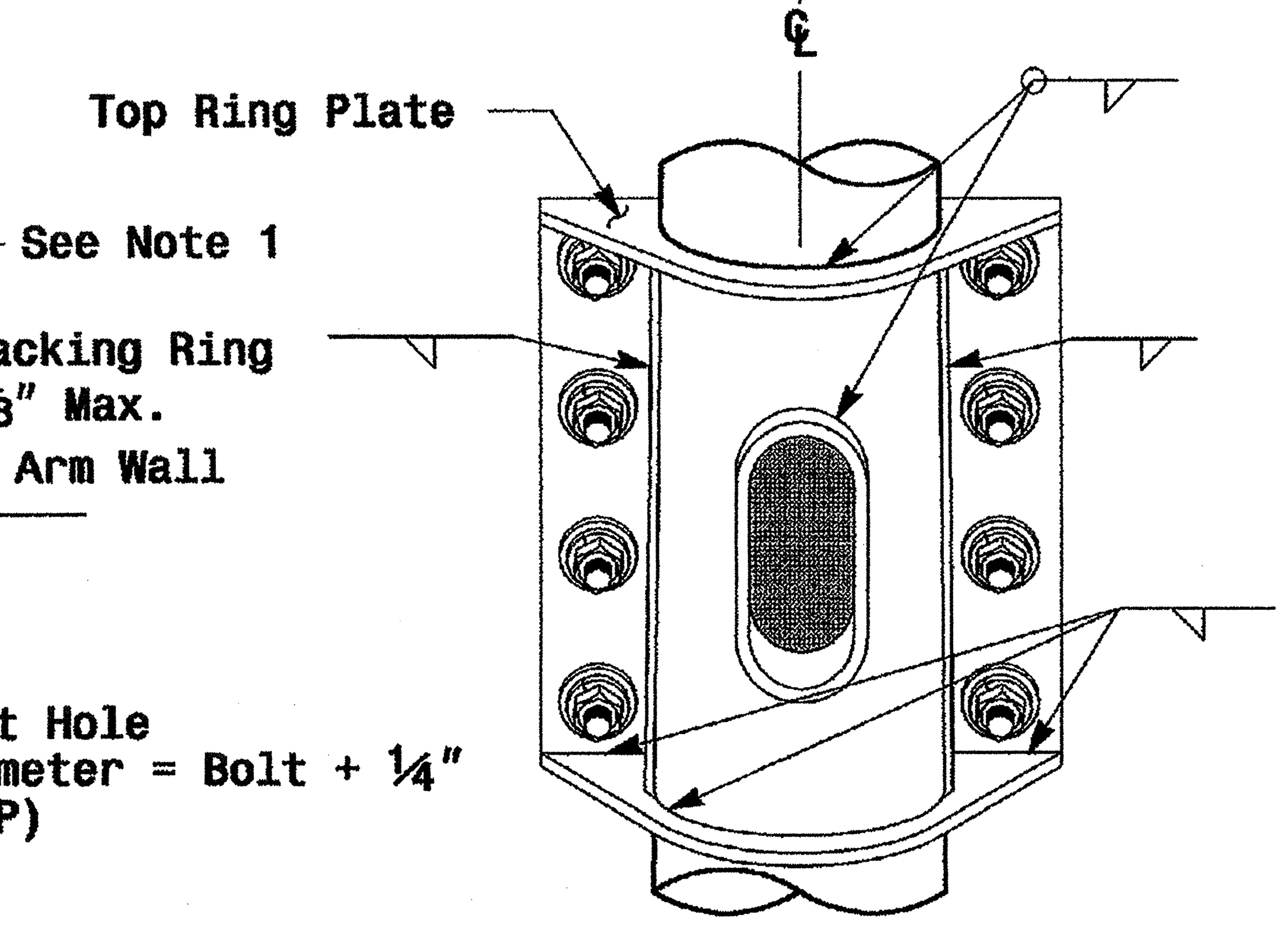


Front Elevation View

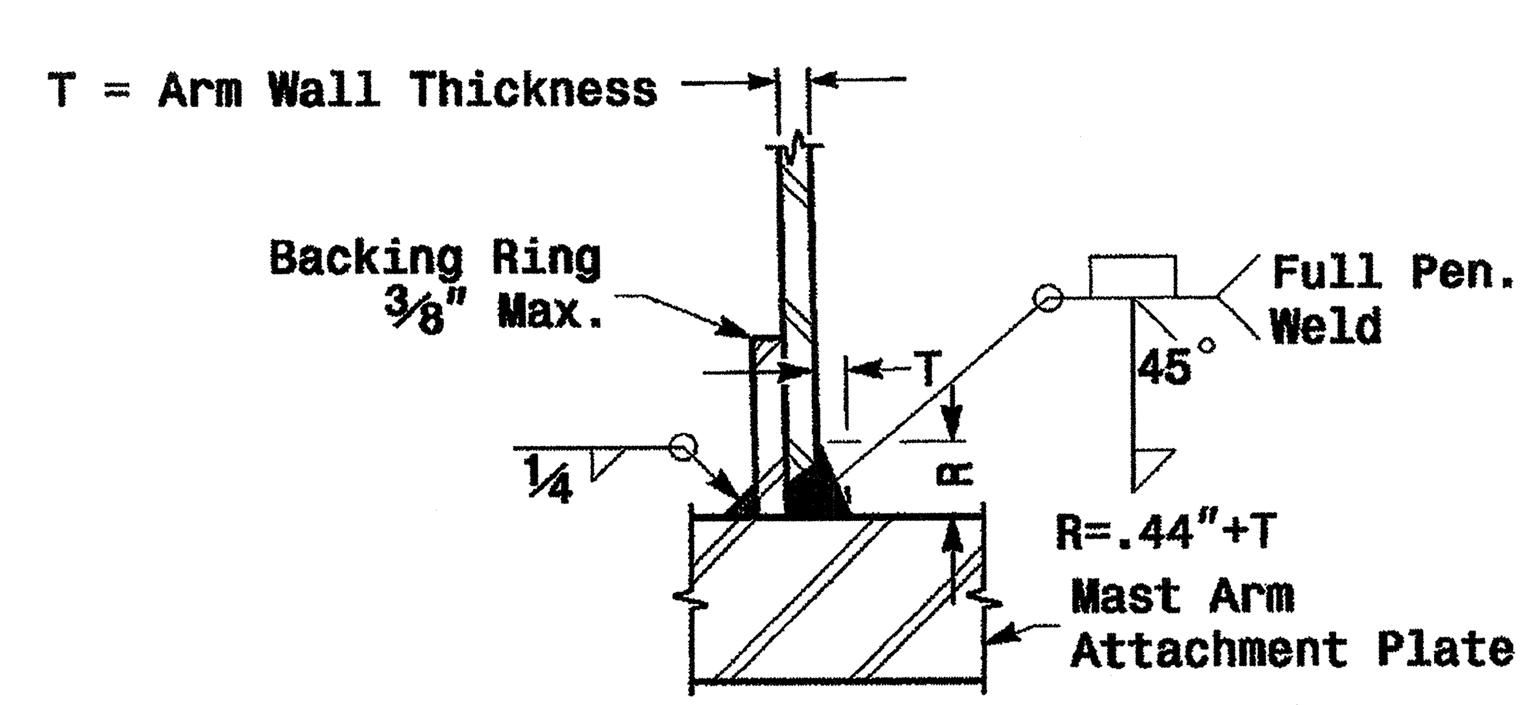


Section View A-A

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.

Prepared in the Offices of: Signals and Geometrics Section, 122 N. McDowell St., Raleigh, NC 27603

Fabrication Details For Mast Arm Connection To Pole

SCALE	PLAN DATE: May 2005	REVIEWED BY: C.F. Andrews
0 NA	PREPARED BY: P.L. Alexander	REVIEWED BY: A.M. Esposito
NONE	REVISIONS	INIT. / DATE

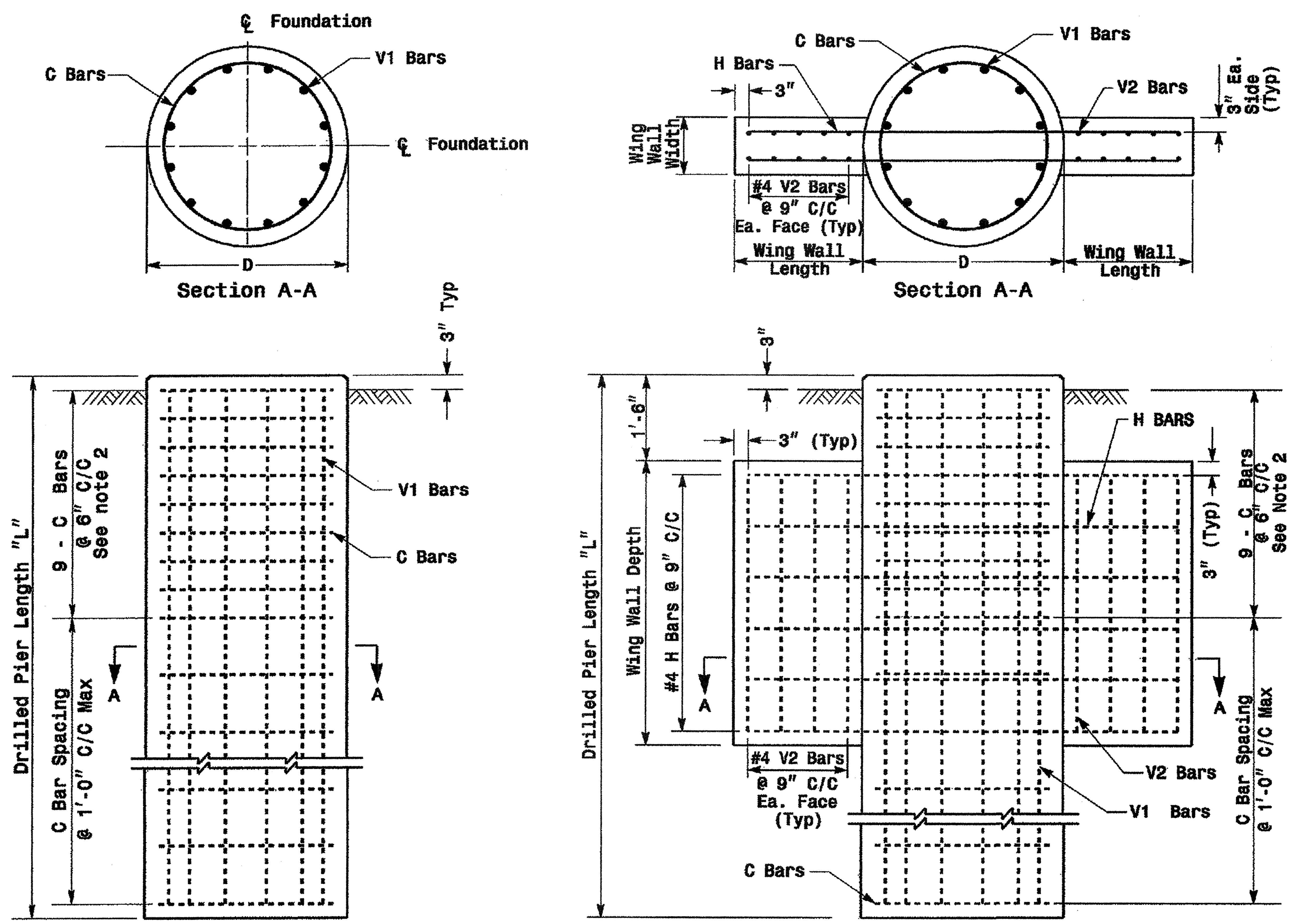
SEAL: North Carolina Professional Engineer Seal 028094 Debesh C. Sarkar

D. Sarkar 9.2.2005
SIGNATURE DATE

SIG. INVENTORY NO.

01-SEP-2005 14:11 w:\people-ul\workgroups\2004 metal pole standards\2004 m5.dgn polexander

Reinforcing Steel Bars

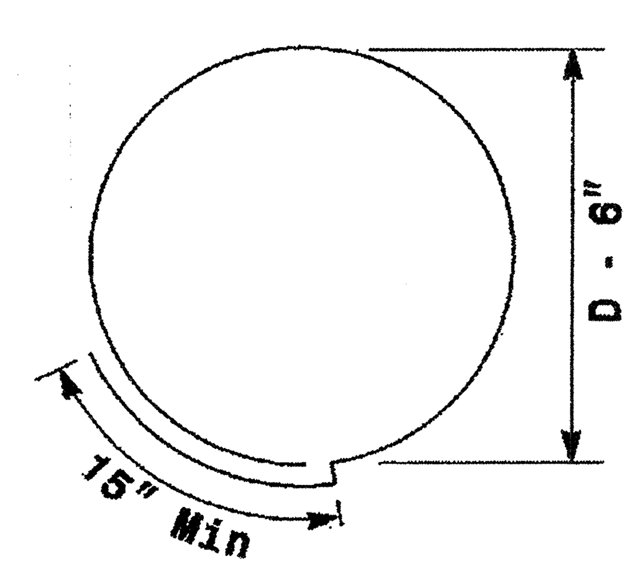


REINFORCING STEEL TABLE FOR STANDARD DRILL PIER SHAFT (42" & 48" DIAMETER)						
Shaft Dia (in.)	Conc. Volume (cu. yds.)	Bar Name	No.	Size	Type	Length
42"	.356 x L	V1	9	#8	STR.	**
		C	*	#4	CIR.	10'-9"
48"	.465 x L	V1	12	#8	STR.	**
		C	*	#4	CIR.	12'-6"

* 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		Reinforcing Steel				
Wing Wall Type	Drill Pier Shaft Dia. (in.)	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



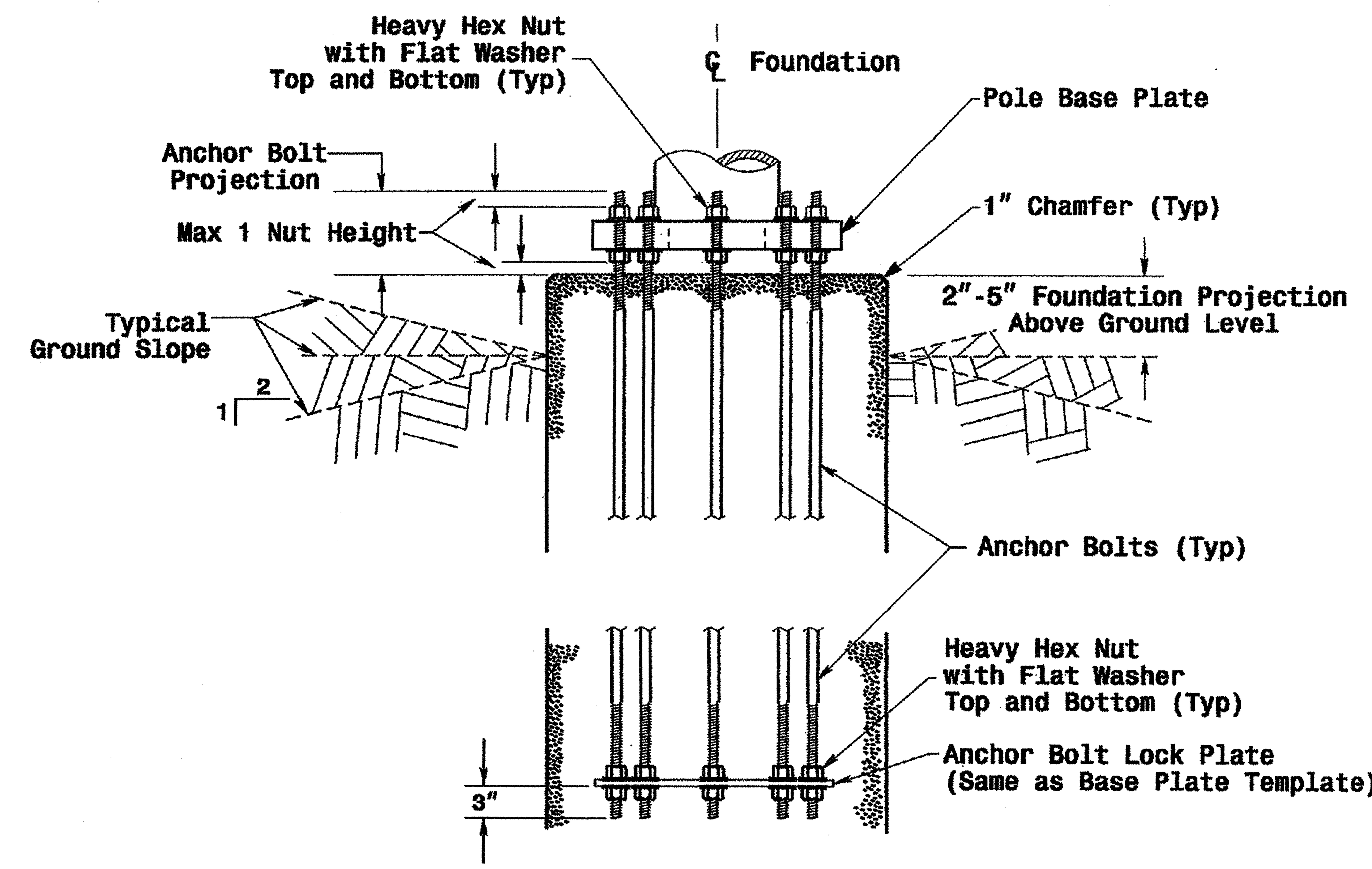
Typical "C" Bars

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

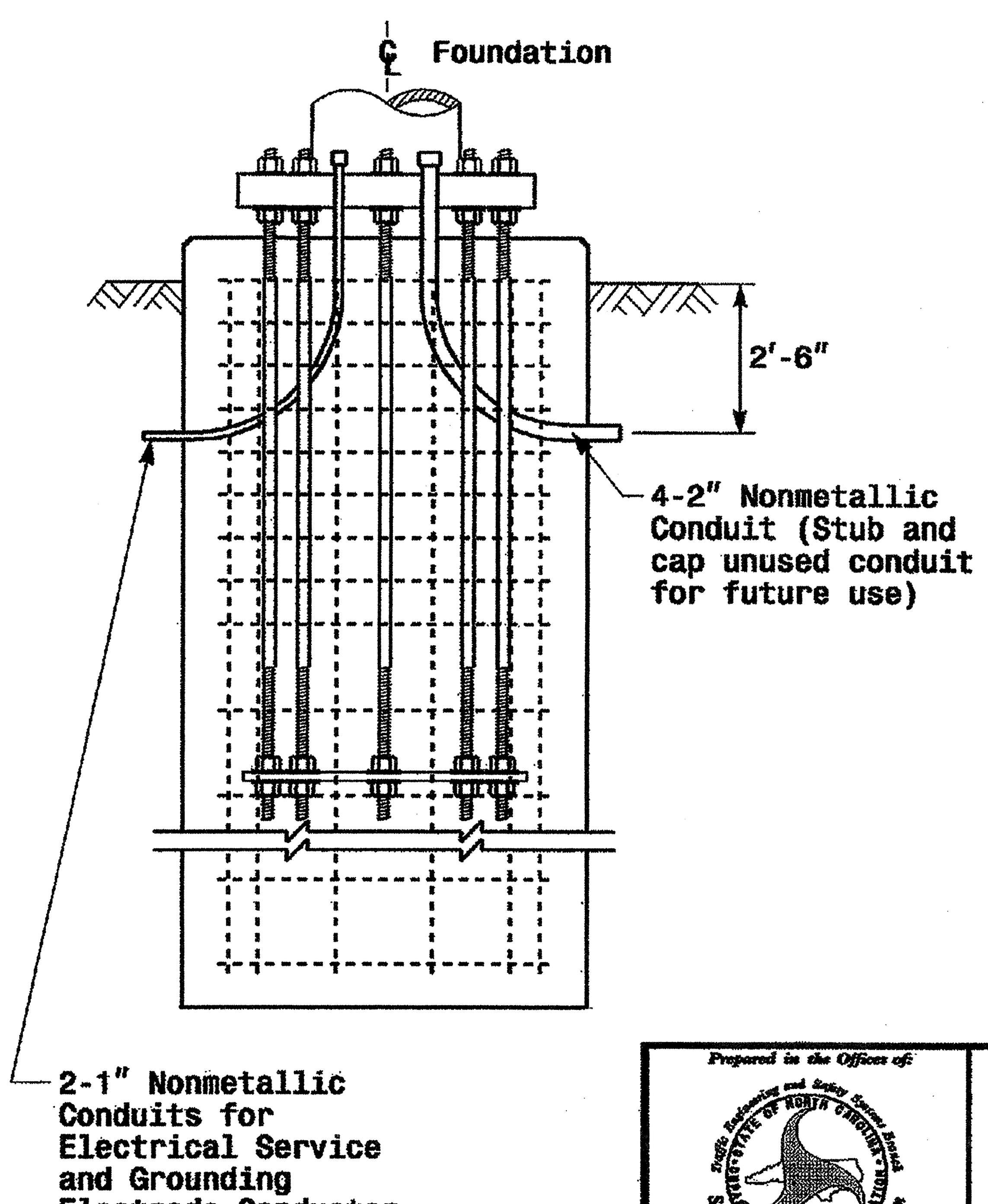
See Note No. 4

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.)

Construction Details - Foundations

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

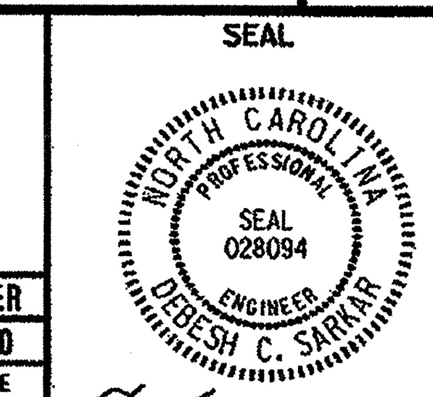
Construction Details
Foundations

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

SCALE: 0 NA NONE

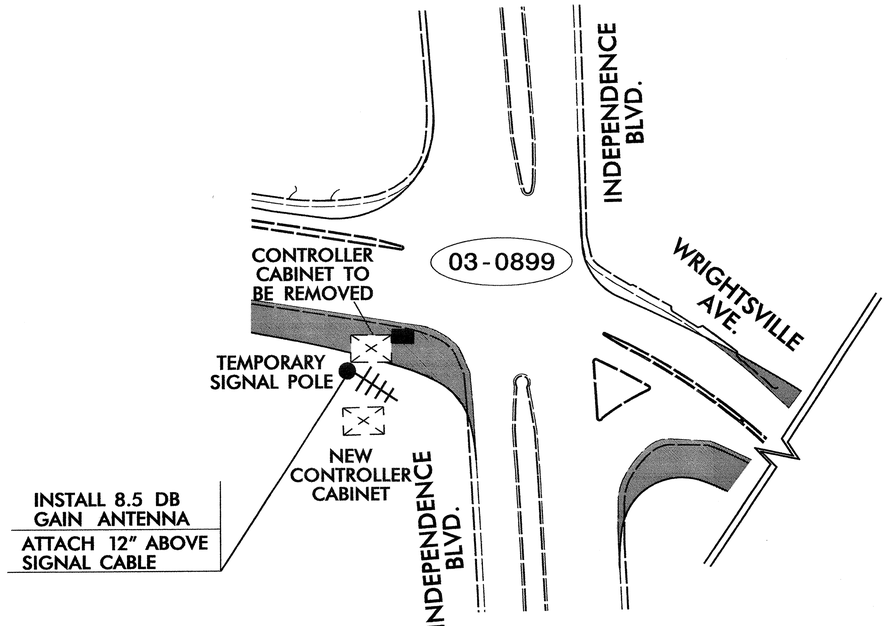
REVISIONS | INIT. | DATE

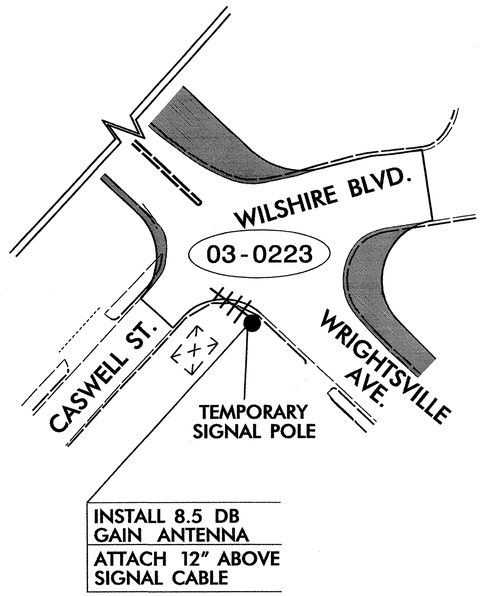
SEAL



D. Sarkar 9.2.2005
SIGNATURE DATE
SIG. INVENTORY NO.

PROJECT REFERENCE NO.	SHEET NO.
U-4733	SIG. 19





LEGEND

- YAGI ANTENNA (DOUBLE) FOR REPEATOR OPERATION
- YAGI ANTENNA (SINGLE)
- OMNI ANTENNA
- EXISTING CONTROLLER AND CABINET
- EXISTING MASTER CONTROLLER AND CABINET
- XX-XXXX SIGNAL INVENTORY NUMBER
- NEW METAL POLE W/MAST ARM
- EXISTING WOOD POLE
- NEW METAL POLE
- SP SIGNAL POLE
- EXISTING METAL POLE

GENERAL NOTE:

G1. CONTRACTOR TO INSTALL ANTENNAS ON TEMPORARY WOOD POLES (TCP – PHASE 1). UPON COMPLETION OF METAL POLES WITH MAST ARM INSTALLATIONS CONTRACTOR TO TRANSFER ANTENNAS TO METAL POLES WITH MAST ARM (SEE CABLE ROUTING AND FINAL WIRELESS INSTALLATION PLANS).

NOTES:

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

CONTRACTOR TO CONTACT CITY OF WILMINGTON TRAFFIC ENGINEERING (DON BENNETT, PE (910–341–7888)) PRIOR TO BEGINNING WORK IDENTIFIED IN THESE TEMPORARY WIRELESS PLANS.

TCP – PHASE 1

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, NC DEPARTMENT OF TRANSPORTATION, Intelligent Transportation Systems
750 N. Greenfield Pkwy., Garner, NC 27529

TEMPORARY WIRELESS PLANS
WRIGHTSVILLE AVE @ INDEPENDENCE BLVD AND WRIGHTSVILLE AVE @ WILSHIRE BLVD

DIVISION 03 NEW HANOVER CO. WILMINGTON
PLAN DATE: MARCH 2008 REVIEWED BY: I. N. AVERY
PREPARED BY: HEIDI T. BERGGREN REVIEWED BY: G.G. MURR, JR., PE

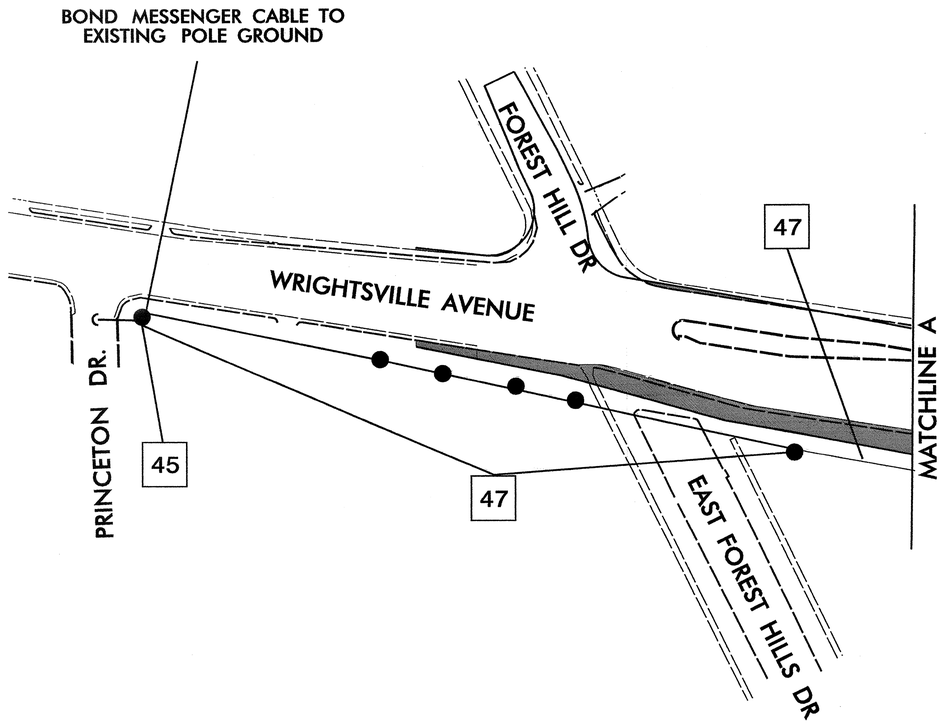
SCALE 0

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 14543 ENGINEER GENE G. MURR, JR.
SIGNATURE 3-11-08 DATE
CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
U-4733	SIG.20

CONTRACTOR TO CONTACT CITY OF WILMINGTON TRAFFIC ENGINEERING (DON BENNETT, PE (910-341-7888)) PRIOR TO BEGINNING WORK IDENTIFIED IN THESE CABLE ROUTING PLANS.



TCP – PHASE 1

GENERAL NOTES:

G1. MESSENGER CABLE ATTACHMENT POINTS ARE 40" BELOW POWER NEUTRAL CABLE, FRONT SIDE OF POLE.
G2. INSTALL COMMUNICATIONS CABLE IDENTIFICATION MARKERS TO IDENTIFY NCDOT MESSENGER CABLE.

Prepared in the Offices of:
Traffic Engineering and Signal Design Section
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Integrated Transportation Systems
750 N. Greenfield Pkwy., Garner, NC 27529

SCALE
0
N

CABLE ROUTING PLANS
WRIGHTSVILLE AVE @ INDEPENDENCE BLVD AND WRIGHTSVILLE AVE @ WILSHIRE BLVD

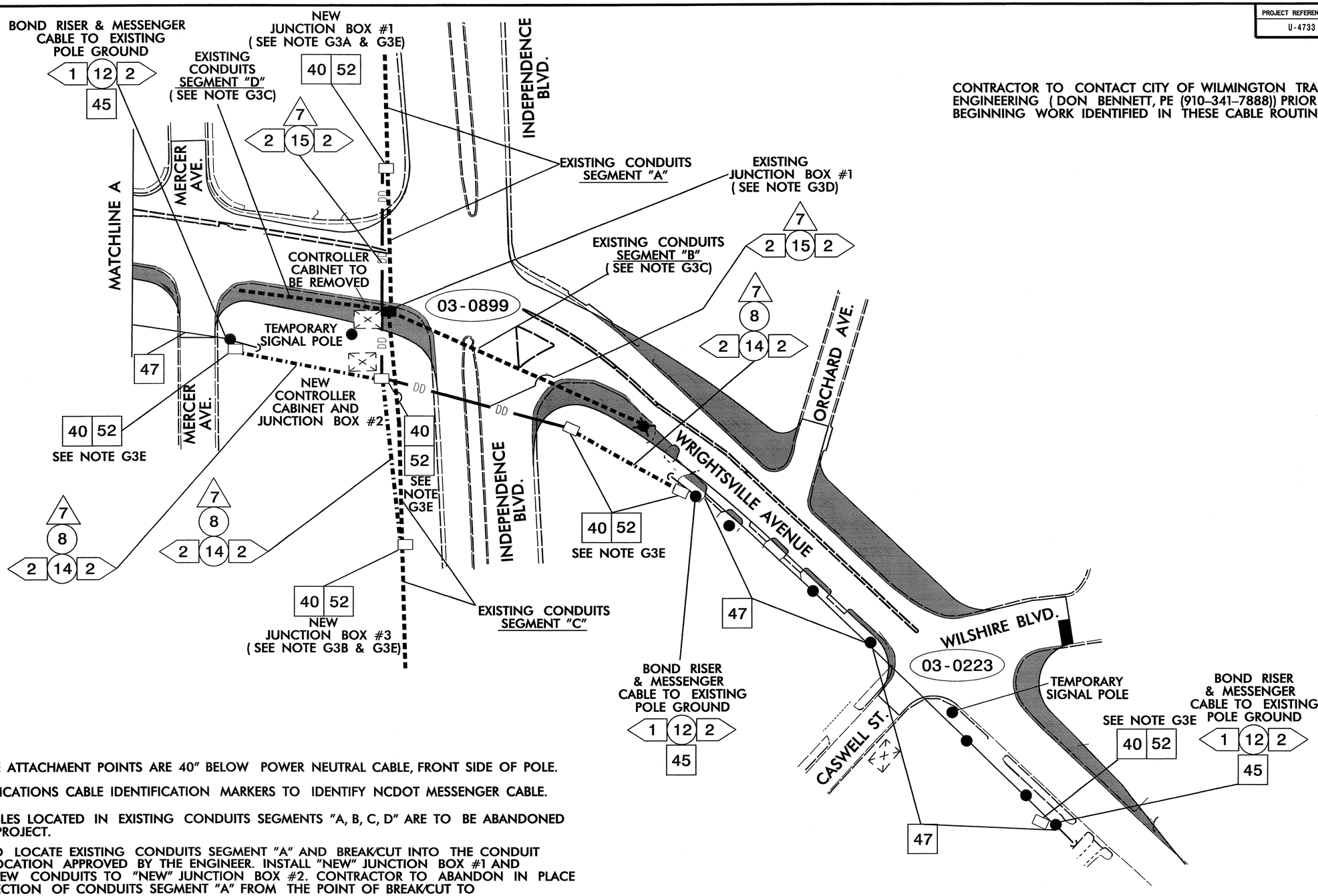
DIVISION 03 NEW HANOVER CO. WILMINGTON
PLAN DATE: MARCH 2008 REVIEWED BY: I. N. AVERY
PREPARED BY: HEIDI T. BERGGREN REVIEWED BY: G.G. MURR, JR., PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 14543 ENGINEER GENE G. MURR, JR.
SIGNATURE 3-11-08 DATE
CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
U-4733	SIG. 21

CONTRACTOR TO CONTACT CITY OF WILMINGTON TRAFFIC ENGINEERING (DON BENNETT, PE (910-341-7888)) PRIOR TO BEGINNING WORK IDENTIFIED IN THESE CABLE ROUTING PLANS.



TCP – PHASE 1

GENERAL NOTES:

G1. MESSENGER CABLE ATTACHMENT POINTS ARE 40" BELOW POWER NEUTRAL CABLE, FRONT SIDE OF POLE.

G2. INSTALL COMMUNICATIONS CABLE IDENTIFICATION MARKERS TO IDENTIFY NCDOT MESSENGER CABLE.

G3. ALL EXISTING CABLES LOCATED IN EXISTING CONDUITS SEGMENTS "A, B, C, D" ARE TO BE ABANDONED AS PART OF THE PROJECT.

A) CONTRACTOR TO LOCATE EXISTING CONDUITS SEGMENT "A" AND BREAK/CUT INTO THE CONDUIT SYSTEM AT A LOCATION APPROVED BY THE ENGINEER. INSTALL "NEW" JUNCTION BOX #1 AND EXTEND WITH NEW CONDUITS TO "NEW" JUNCTION BOX #2. CONTRACTOR TO ABANDON IN PLACE THE EXISTING SECTION OF CONDUITS SEGMENT "A" FROM THE POINT OF BREAK/CUT TO "EXISTING" JUNCTION BOX #1.

B) CONTRACTOR TO LOCATE EXISTING CONDUITS SEGMENT "C" AND BREAK/CUT INTO THE CONDUIT SYSTEM AT A LOCATION APPROVED BY THE ENGINEER. INSTALL "NEW" JUNCTION BOX #3 AND EXTEND WITH NEW CONDUITS TO "NEW" JUNCTION BOX #1. CONTRACTOR TO ABANDON IN PLACE THE EXISTING SECTION OF CONDUITS SEGMENT "C" FROM THE POINT OF BREAK/CUT TO "EXISTING" JUNCTION BOX #1.

C) EXISTING CONDUITS SEGMENTS "B" AND "D" ARE TO BE ABANDONED IN PLACE.

D) CONTRACTOR TO REMOVE "EXISTING" JUNCTION BOX #1 AND BACKFILL WITH APPROVED SUBGRADE MATERIAL.

E) CONTRACTOR TO SEAL ALL CONDUIT ENTRANCES INTO JUNCTION BOXES WITH MECHICAL SEALING DEVICES.

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
Intelligent Transportation Systems
750 N. Greenfield Pkwy., Garner, NC 27529

CABLE ROUTING PLANS
WRIGHTSVILLE AVE @ INDEPENDENCE BLVD AND WRIGHTSVILLE AVE @ WILSHIRE BLVD

DIVISION 03 NEW HANOVER CO. WILMINGTON
PLAN DATE: MARCH 2008 REVIEWED BY: I. N. AVERY
PREPARED BY: HEIDI T. BERGGREN REVIEWED BY: G.G. MURR, JR., PE

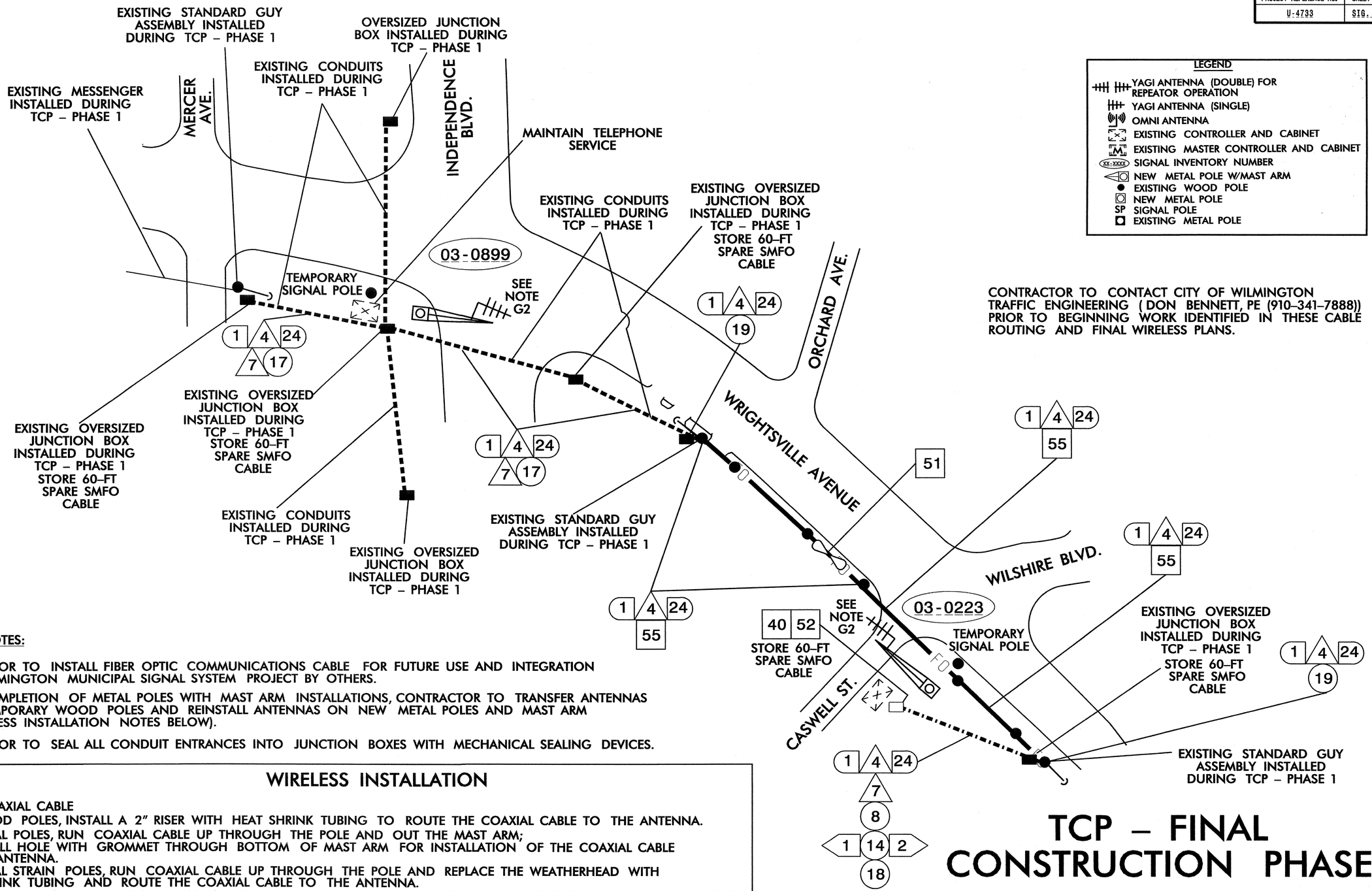
REVISIONS	INIT.	DATE

SCALE 0

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 14543 ENGINEER GENE G. MURR, JR.
SIGNATURE 3-11-08 DATE

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
U-4733	SIG. 22



LEGEND

- YAGI ANTENNA (DOUBLE) FOR REPEATOR OPERATION
- YAGI ANTENNA (SINGLE)
- OMNI ANTENNA
- EXISTING CONTROLLER AND CABINET
- EXISTING MASTER CONTROLLER AND CABINET
- XX-XXXX SIGNAL INVENTORY NUMBER
- NEW METAL POLE W/MAST ARM
- EXISTING WOOD POLE
- NEW METAL POLE
- SP SIGNAL POLE
- EXISTING METAL POLE

CONTRACTOR TO CONTACT CITY OF WILMINGTON TRAFFIC ENGINEERING (DON BENNETT, PE (910–341–7888)) PRIOR TO BEGINNING WORK IDENTIFIED IN THESE CABLE ROUTING AND FINAL WIRELESS PLANS.

GENERAL NOTES:

G1. CONTRACTOR TO INSTALL FIBER OPTIC COMMUNICATIONS CABLE FOR FUTURE USE AND INTEGRATION INTO WILMINGTON MUNICIPAL SIGNAL SYSTEM PROJECT BY OTHERS.

G2. UPON COMPLETION OF METAL POLES WITH MAST ARM INSTALLATIONS, CONTRACTOR TO TRANSFER ANTENNAS FROM TEMPORARY WOOD POLES AND REINSTALL ANTENNAS ON NEW METAL POLES AND MAST ARM (SEE WIRELESS INSTALLATION NOTES BELOW).

G3. CONTRACTOR TO SEAL ALL CONDUIT ENTRANCES INTO JUNCTION BOXES WITH MECHANICAL SEALING DEVICES.

WIRELESS INSTALLATION

NOTES:

1. INSTALL COAXIAL CABLE
   - A. ON WOOD POLES, INSTALL A 2" RISER WITH HEAT SHRINK TUBING TO ROUTE THE COAXIAL CABLE TO THE ANTENNA.
   - B. ON METAL POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE MAST ARM; FIELD DRILL HOLE WITH GROMMET THROUGH BOTTOM OF MAST ARM FOR INSTALLATION OF THE COAXIAL CABLE TO THE ANTENNA.
   - C. ON METAL STRAIN POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND REPLACE THE WEATHERHEAD WITH HEAT SHRINK TUBING AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
   - D. BETWEEN THE POINT OF EXITING THE METAL POLE OR MAST ARM AND THE ANTENNA, SECURE THE COAXIAL CABLE TO THE STRUCTURE USING 3/4" STAINLESS STEEL STRAPS EVERY 12".
2. IF EXISTING SPARE RISER IS AVAILABLE, REMOVE WEATHERHEAD AND INSTALL COAXIAL CABLE. RESEAL WITH HEAT SHRINK TUBING.
3. INSTALL ANTENNA ON POLE WITH RF WARNING SIGN AND AIM TOWARDS MASTER.
4. MAINTAIN PROPER CLEARANCE FROM ALL UTILITIES PER NESC.
5. INSTALL WIRELESS SERIAL RADIO MODEM WITH EXTERIOR DISCONNECT SWITCH LOCATED ON CABINET.
6. REFERENCE "WIRELESS RADIO ANTENNA TYPICAL DETAILS".

TCP – FINAL CONSTRUCTION PHASE

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, North Carolina Department of Transportation, Intelligent Transportation Systems
750 N. Greenfield Pkwy., Garner, NC 27529

CABLE ROUTING AND FINAL WIRELESS PLANS, WRIGHTSVILLE AVE @ INDEPENDENCE BLVD AND WRIGHTSVILLE AVE@ WILSHIRE BLVD

DIVISION 03 NEW HANOVER CO. WILMINGTON

PLAN DATE: MARCH 2008 REVIEWED BY: I. N. AVERY

PREPARED BY: HEIDI T. BERGGREN REVIEWED BY: G.G. MURR, JR., PE

SCALE: 0

REVISIONS	INIT.	DATE

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

SIGNATURE 5-11-08 DATE

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
U-4733	SIG 23

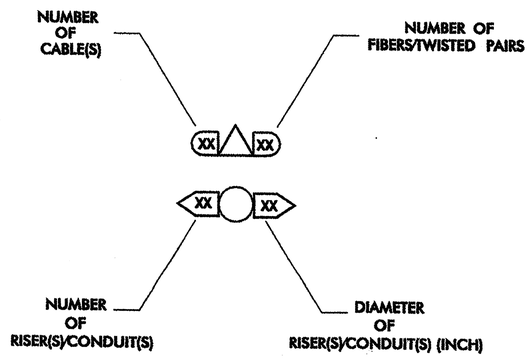
1. INSTALL REA, PE – 22, SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
2. INSTALL REA, PE – 38, (FIGURE 8) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
3. INSTALL REA, PE – 39, (UNDERGROUND) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
4. INSTALL SMFO CABLE
5. INSTALL MMFO CABLE
6. INSTALL FIBER OPTIC DROP CABLE
7. INSTALL TRACER WIRE
8. TRENCH
9. INSTALL PVC CONDUIT
10. INSTALL RIGID, GALVANIZED STEEL CONDUIT
11. INSTALL RIGID, GALVANIZED STEEL RISER WITH WEATHERHEAD
12. INSTALL RIGID, GALVANIZED STEEL RISER WITH FIBER OPTIC CABLE SEAL
13. INSTALL OUTER-DUCT POLYETHYLENE CONDUIT
14. INSTALL POLYETHYLENE CONDUIT
15. DIRECTIONAL DRILL CONDUIT
16. BORE AND JACK CONDUIT
17. INSTALL CABLE(S) IN EXISTING CONDUIT
18. INSTALL CABLE(S) IN NEW CONDUIT
19. INSTALL CABLE(S) IN EXISTING RISER
20. INSTALL CABLE(S) IN NEW RISER
21. INSTALL CABLE(S) IN EXISTING CONDUIT STUB-OUTS
22. INSTALL NEW CONDUIT INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB-OUTS WHEN AVAILABLE)
23. INSTALL NEW RISER INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB-OUTS WHEN AVAILABLE)
24. INSTALL NEW CONDUIT INTO EXISTING POLE MOUNTED CABINET
25. INSTALL NEW RISER INTO EXISTING POLE MOUNTED CABINET
26. TERMINATE COMMUNICATIONS CABLE ON EXISTING TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
27. INSTALL NEW TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
28. INSTALL INTERCONNECT CENTER, PATCH PANEL, JUMPERS AND FUSION SPLICE CABLE IN CABINET
29. INSTALL UNDERGROUND SPLICE ENCLOSURE
30. INSTALL AERIAL SPLICE ENCLOSURE
31. INSTALL POLE MOUNTED SPLICE CABINET
32. INSTALL BASE MOUNTED SPLICE CABINET
33. REMOVE EXISTING SPLICE CABINET
34. INSTALL CABINET FOUNDATION
35. REMOVE EXISTING CABINET FOUNDATION
36. INSTALL CCTV CAMERA ASSEMBLY
37. INSTALL CCTV CAMERA WOOD POLE
38. INSTALL CCTV CAMERA METAL POLE AND FOUNDATION
39. INSTALL JUNCTION BOX
40. INSTALL OVERSIZED JUNCTION BOX
41. REMOVE EXISTING JUNCTION BOX
42. INSTALL WOOD POLE
43. REMOVE EXISTING WOOD POLE
44. INSTALL AERIAL GUY ASSEMBLY
45. INSTALL STANDARD GUY ASSEMBLY
46. INSTALL SIDEWALK GUY ASSEMBLY
47. INSTALL MESSENGER CABLE
48. REMOVE EXISTING COMMUNICATIONS AND MESSENGER CABLE
49. REMOVE EXISTING MESSENGER CABLE
50. INSTALL TELEPHONE SERVICE
51. INSTALL CABLE STORAGE RACKS (SNOW SHOES) AND STORE 100 FEET OF CABLE
52. INSTALL DELINEATOR MARKER
53. STORE 20 FEET OF COMMUNICATIONS CABLE
54. LASH CABLE(S) TO EXISTING SIGNAL/COMMUNICATIONS CABLE
55. LASH CABLE(S) TO EXISTING MESSENGER CABLE
56. LASH CABLE(S) TO NEW MESSENGER CABLE
57. MODIFY EXISTING ELECTRICAL SERVICE
58. INSTALL NEW ELECTRICAL SERVICE

LEGEND

- 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
DIVISION OF HIGHWAYS
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Freight Management Section
122 N. McDowell St., Raleigh, NC 27603

CONSTRUCTION NOTES

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

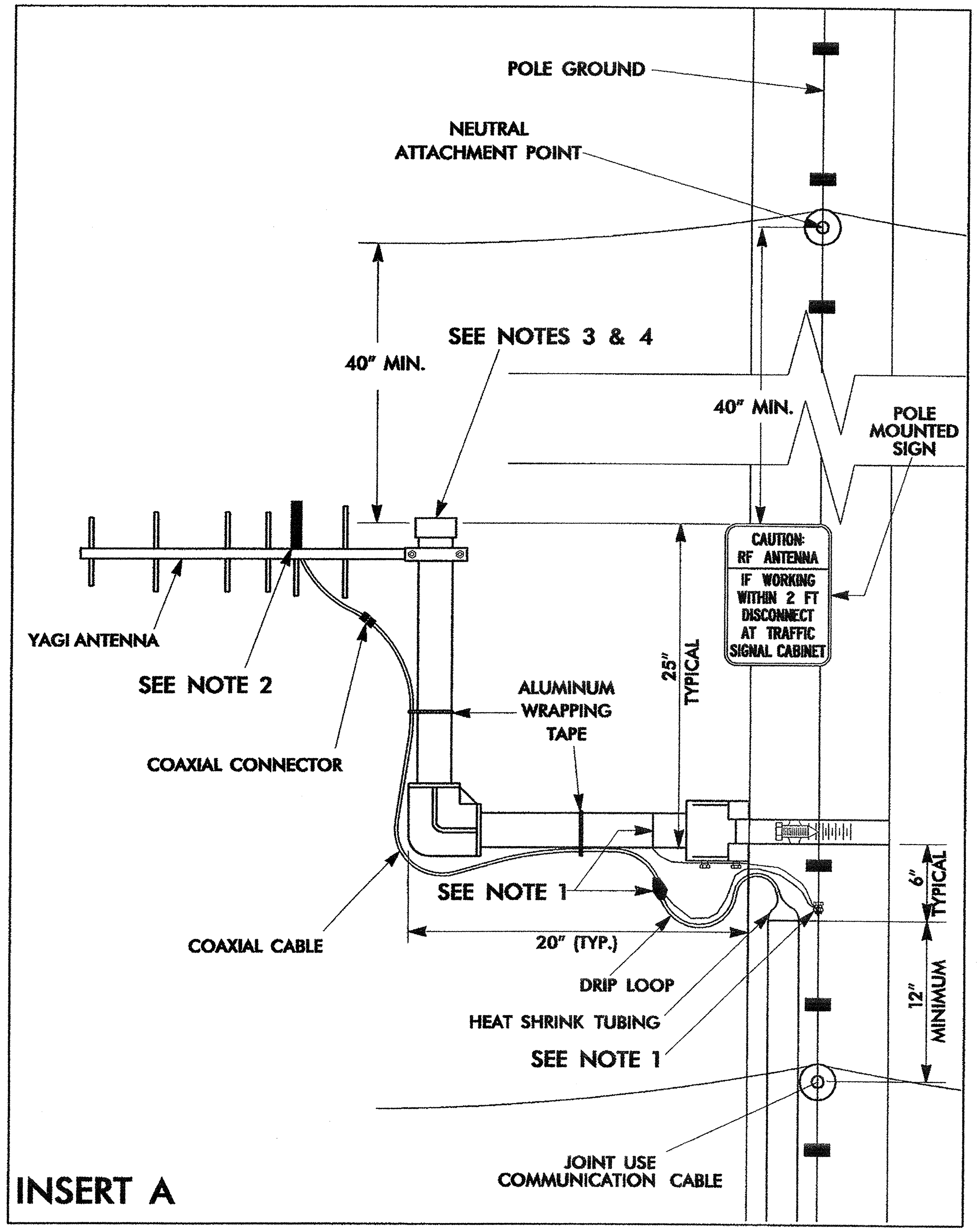
REVISIONS	INIT.	DATE

SCALE 0

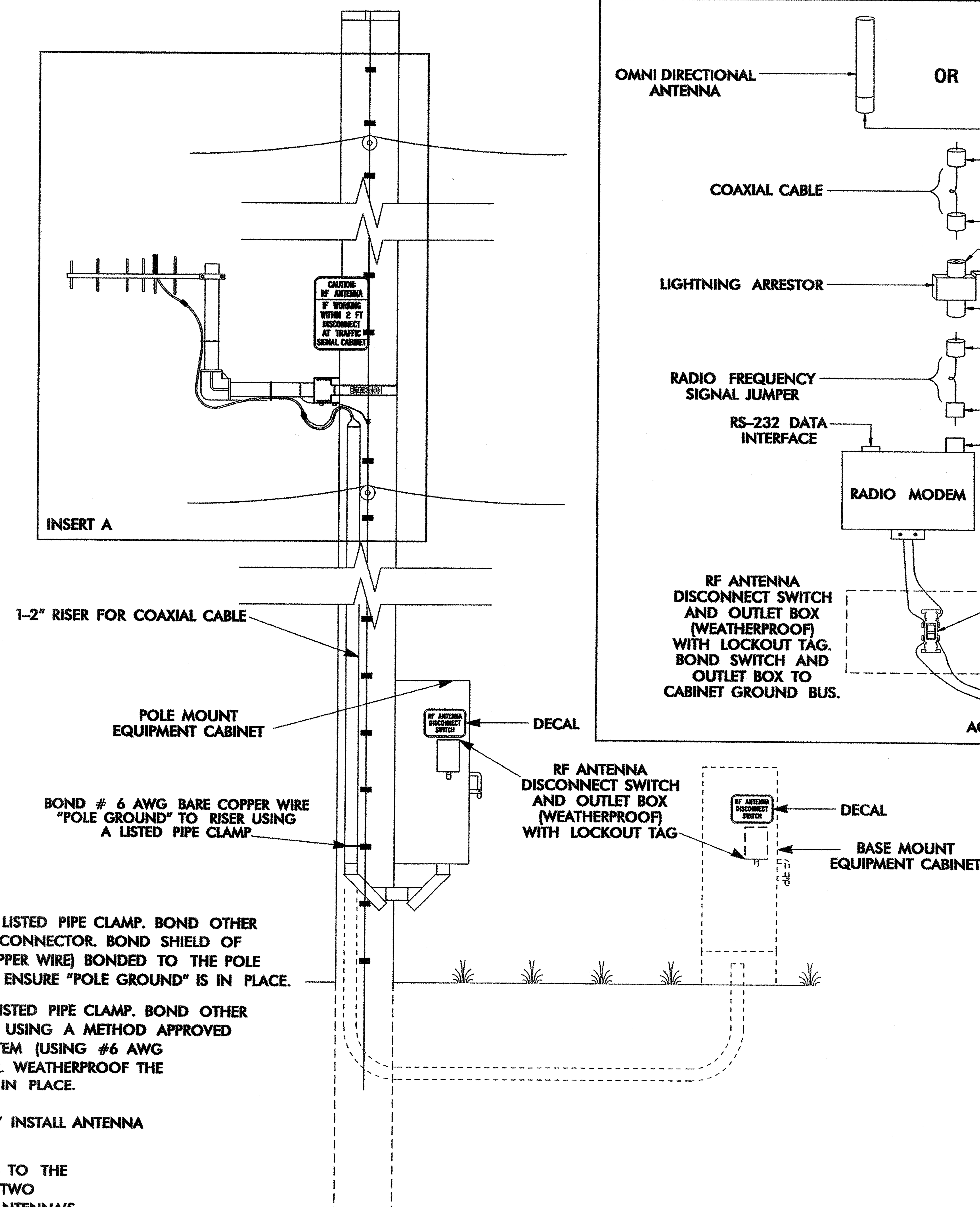
SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 023919 GREGORY A. FULLER

Gregory A. Fuller 10/31/02
SIGNATURE DATE

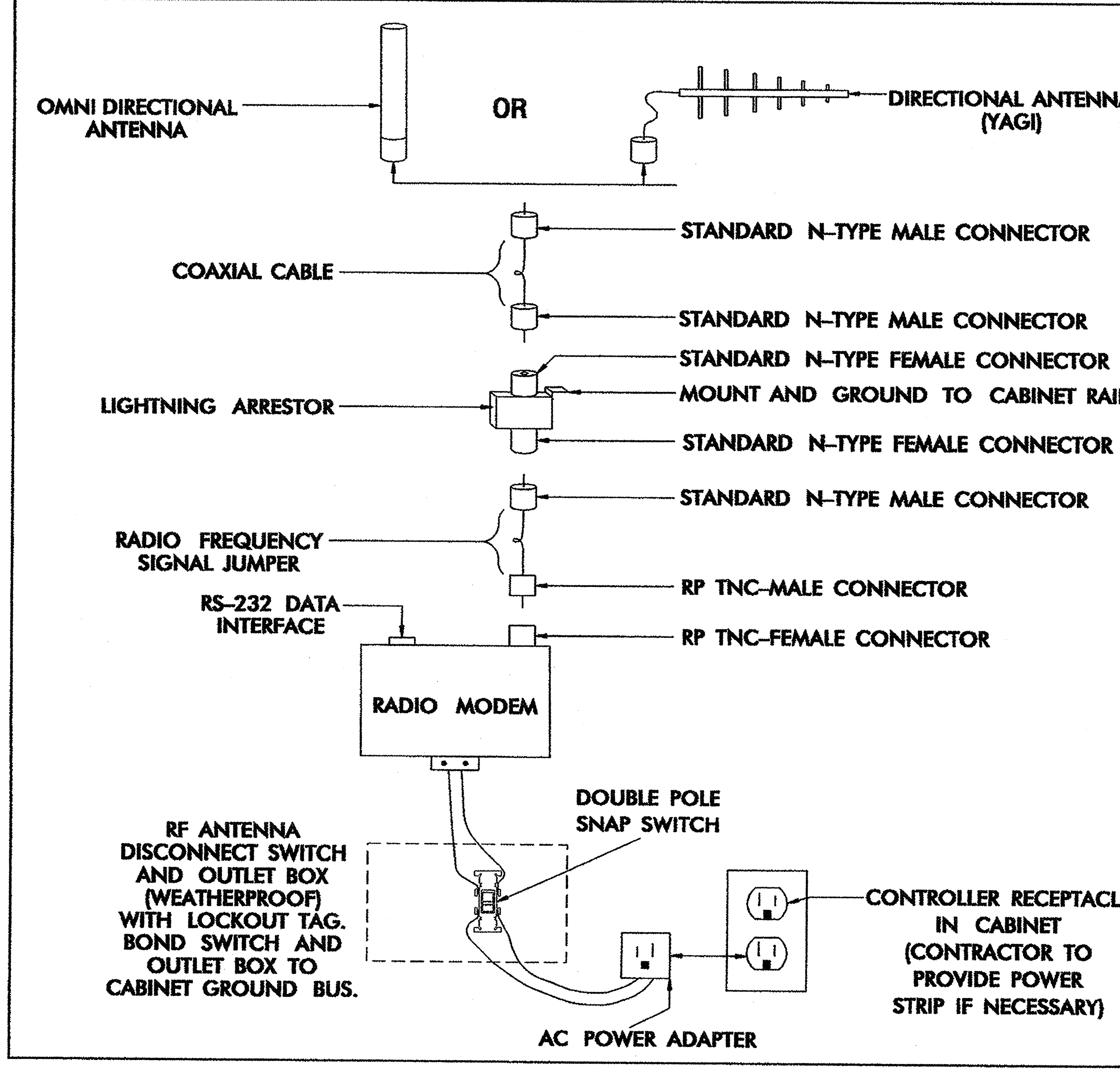
PROJECT REFERENCE NO.	SHEET NO.
U-4733	SIG. 24



INSERT A



ANTENNA AND COAXIAL CABLE CONNECTION SCHEMATIC



NOTES

1. WOOD POLE — BOND # 6 AWG SOLID BARE COPPER WIRE TO ANTENNA SUPPORT USING LISTED PIPE CLAMP. BOND OTHER END OF # 6 AWG SOLID BARE COPPER WIRE TO THE POLE GROUND USING A SPLIT BOLT CONNECTOR. BOND SHIELD OF COAXIAL CABLE WITH AN APPROVED GROUNDING SYSTEM (USING #6 AWG STRANDED COPPER WIRE) BONDED TO THE POLE GROUND. WEATHERPROOF THE CONNECTION ONCE THE GROUNDING SYSTEM IS INSTALLED. ENSURE "POLE GROUND" IS IN PLACE.

   METAL POLE — BOND # 6 AWG SOLID BARE COPPER WIRE TO ANTENNA SUPPORT USING LISTED PIPE CLAMP. BOND OTHER END OF # 6 AWG SOLID BARE COPPER WIRE TO THE POLE OR EXISTING SYSTEM GROUND USING A METHOD APPROVED BY THE ENGINEER. BOND SHIELD OF COAXIAL CABLE WITH AN APPROVED GROUNDING SYSTEM (USING #6 AWG STRANDED COPPER WIRE) BONDED TO THE POLE BY A METHOD APPROVED BY THE ENGINEER. WEATHERPROOF THE CONNECTION ONCE THE GROUNDING SYSTEM IS INSTALLED. ENSURE "SYSTEM GROUND" IS IN PLACE.

2. YAGI ANTENNA SHOWN IN VERTICAL POLARIZATION POSITION FOR CLARIFICATION. TYPICALLY INSTALL ANTENNA IN HORIZONTAL POLARIZATION POSITION.

3. TO CONSERVE VERTICAL SPACING ON THE POLE (JOINT-USE OR SIGNAL POLE) WITH REGARDS TO THE SURROUNDING UTILITIES, INSTALL THE ANTENNA MOUNTING HARDWARE USING ONE OF THE TWO METHODS LISTED BELOW: (ENSURE THAT THE MOUNTING METHOD DOES NOT DEGRADE THE ANTENNA'S SIGNAL INTEGRITY)
   A) ROTATE THE VERTICAL SUPPORT ARM 90 DEGREES SUCH THAT THE ANTENNA IS AT THE SAME HEIGHT AS THE HORIZONTAL SUPPORT ARM.
   B) ELIMINATE THE VERTICAL SUPPORT ARM AND MOUNT THE ANTENNA TO THE HORIZONTAL SUPPORT ARM.
   C) ANTENNA, ANTENNA SUPPORT ARM, AND SIGN TO MAINTAIN A 40" SEPARATION FROM NEUTRAL/POWER AND 12" FROM OTHER UTILITIES.

4. INSTALL AN END CAP TO SEAL THE EXPOSED END OF THE MOUNTING PIPE.

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

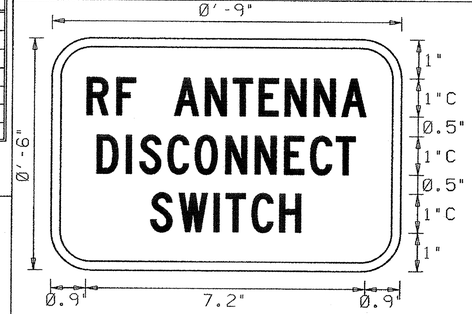
WIRELESS
RADIO ANTENNA
TYPICAL DETAILS

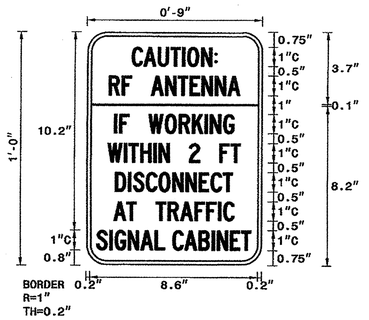
PLAN DATE:	JULY 2005	REVIEWED BY:	I. N. AVERY
PREPARED BY:	A. CREECH	REVIEWED BY:	A. T. FAULKNER

SCALE 0

REVISIONS	INIT.	DATE
UPDATE GROUNDING - COAXIAL CABLE SHIELD		9/13/06

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER
Gregory A. Fuller 9/12/05





PROJECT REFERENCE NO.	SHEET NO.
U-4733	SIG 25

DECAL

SIGN NUMBER: SP05224
TYPE: DECAL
QUANTITY:

SIGN WIDTH: 0'-9"
HEIGHT: 0'-6"
TOTAL AREA: 0.4 Sq.Ft.

BORDER TYPE: FLUSH
RECESS: 0"
WIDTH: 0.25"
RADII: 1"

NO. Z BARS:
LENGTH:

BACKG COLOR: Yellow
COPY COLOR: Black

SYMBOL	X	Y	WID	HT

MAT'L: 0.063" (1.6 mm) ALUMINUM

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

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

NOTE:
THIS
SIGN
SHALL
BE
PRODUCED
AS
A
DECAL

LETTER POSITIONS

Letter spacings are to start of next letter

												Series/Size Text Length
	R	F		A	N	T	E	N	N	A		C1
0.9	0.8	0.5	1	0.8	0.7	0.7	0.7	0.8	0.7	0.6	0.9	7.2
	D	I	S	C	O	N	N	E	C	T		C1
1.2	0.8	0.3	0.7	0.7	0.8	0.8	0.8	0.7	0.7	0.5	1.2	6.7
	S	W	I	T	C	H						C1
2.6	0.7	0.9	0.3	0.7	0.7	0.5	2.6					3.9

Spacing Factor is 1 unless specified otherwise

POLE MOUNTED SIGN

SIGN NUMBER: SP05223
TYPE: D
QUANTITY:

SIGN WIDTH: 0'-9"
HEIGHT: 1'-0"
TOTAL AREA: 0.8 Sq.Ft.

BORDER TYPE: FLUSH
RECESS: 0"
WIDTH: 0.2"
RADII: 1"

NO. Z BARS:
LENGTH:

BACKG COLOR: Yellow
COPY COLOR: Black

SYMBOL	X	Y	WID	HT
BAR	0.2	8.2	8.6	1.0

MAT'L: 0.063" (1.6 mm) ALUMINUM

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

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

0.60 SPACING FACTOR

LETTER POSITIONS

Letter spacings are to start of next letter

																Series/Size Text Length
	C	A	U	T	I	O	N	:								C
2.3	0.6	0.7	0.6	0.6	0.3	0.7	0.7	0.1	2.3							4.4
	R	F		A	N	T	E	N	N	A						C
1.2	0.7	0.5	1	0.7	0.6	0.6	0.6	0.7	0.6	0.6	1.2					6.7
	I	F		W	O	R	K	I	N	G						C
1.4	0.3	0.5	1	0.8	0.7	0.7	0.6	0.3	0.7	0.5	1.4					6.1
	W	I	T	H	I	N		2		F	T					C
1.1	0.8	0.2	0.6	0.7	0.3	0.5	1	0.5	1	0.6	0.5	1.1				6.8
	D	I	S	C	O	N	N	E	C	T						C
1.5	0.7	0.3	0.6	0.6	0.7	0.7	0.7	0.6	0.6	0.5	1.5					6
	A	T		T	R	A	F	F	I	C						C
1.4	0.7	0.5	1	0.6	0.6	0.7	0.6	0.6	0.3	0.5	1.4					6.2
	S	I	G	N	A	L		C	A	B	I	N	E	T		C
0.5	0.7	0.3	0.7	0.6	0.7	0.5	0.4	0.6	0.7	0.7	0.3	0.7	0.6	0.5	0.5	7.9

Spacing Factor is 1 unless specified otherwise

NORTH CAROLINA D.O.T. SIGN DETAIL

Prepared in the Offices of:
Traffic Engineering and Safety Systems Branch
Intelligent Transportation Systems
750 N. Greenfield Pkwy., Garner, NC 27529

WIRELESS
RADIO ANTENNA
TYPICAL DETAILS

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

SCALE
0

REVISIONS	INIT.	DATE

SEAL
SEAL 023919
GREGORY A. FULLER

Gregory A. Fuller 9/12/05
SIGNATURE DATE

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
U-4733	Sig.26

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

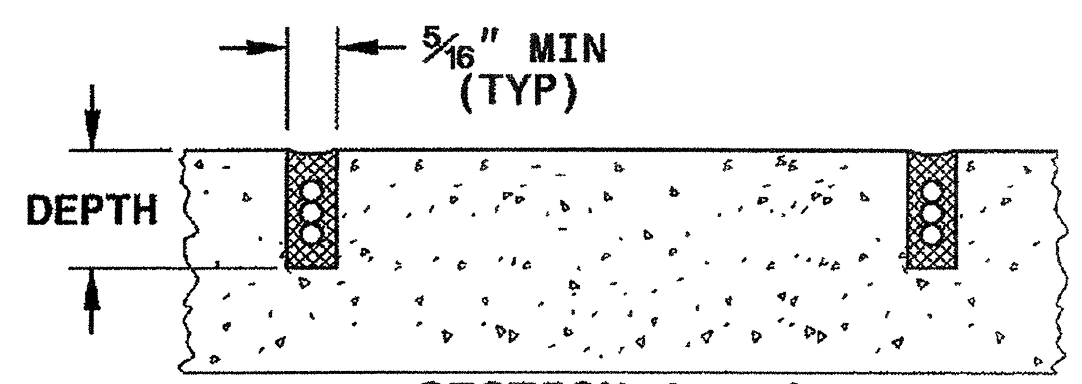
5-07

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS

CONVENTIONAL 4-SIDED LOOP

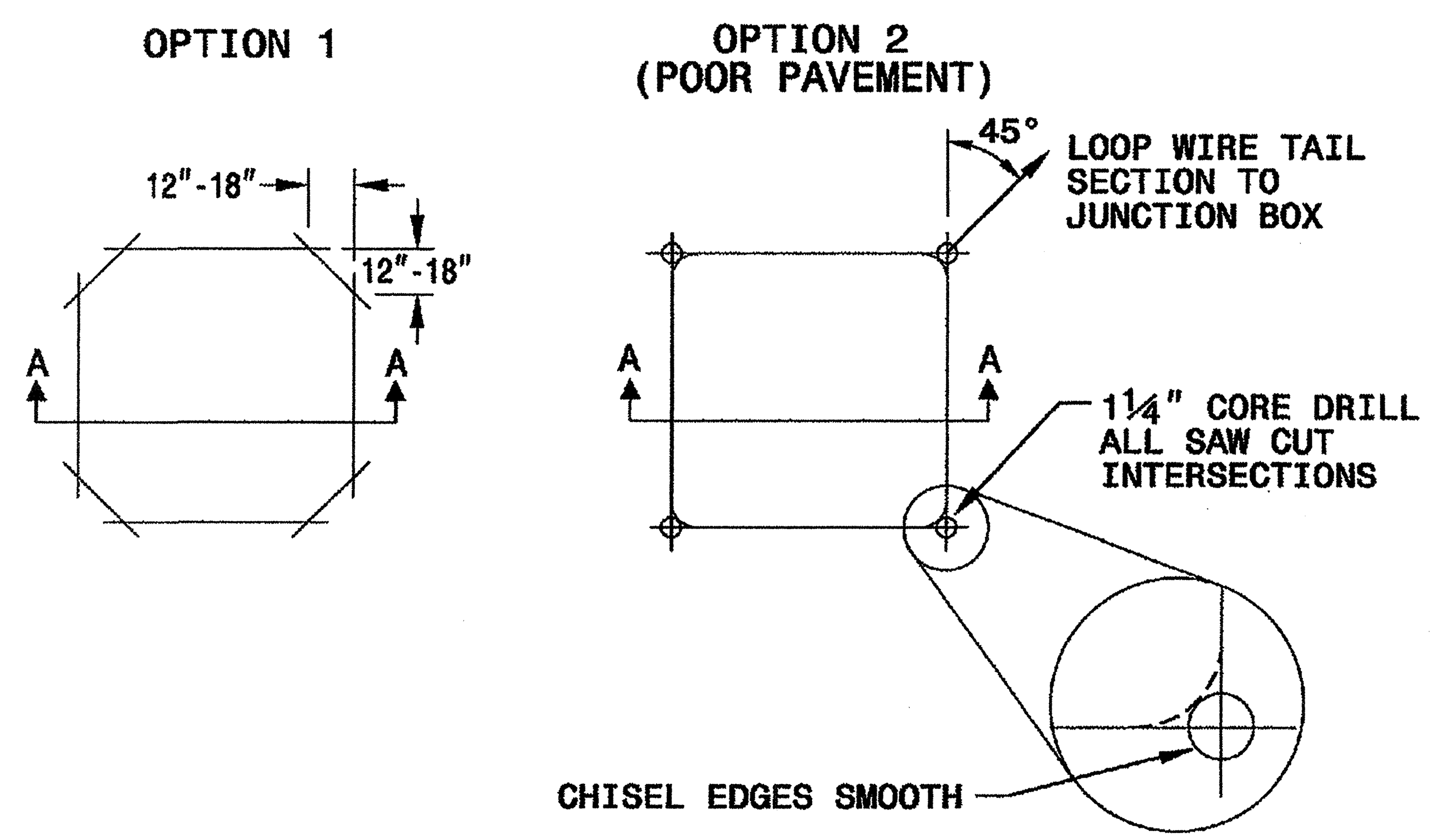
SAW SLOT DEPTH CHART

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

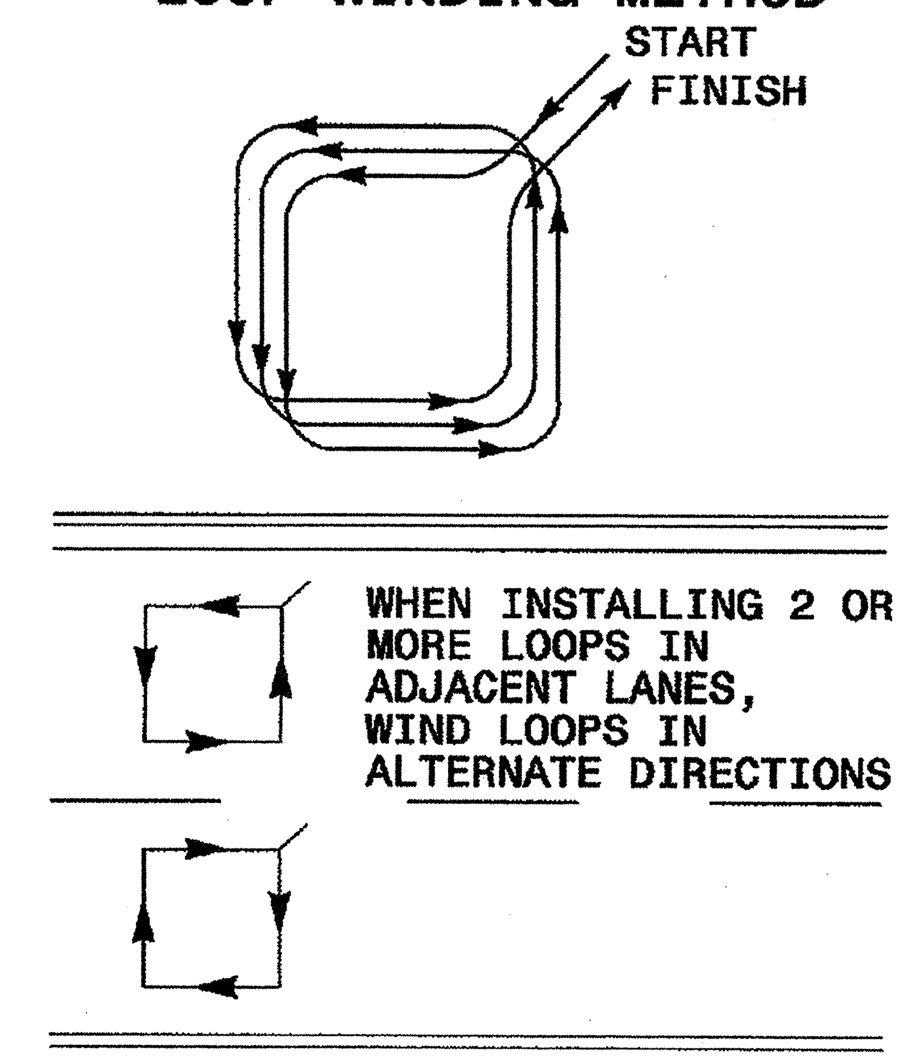


SECTION A - A

SAW CUT OPTIONS



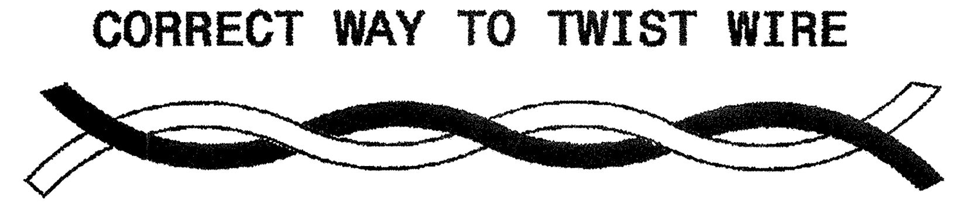
LOOP WINDING METHOD



LOOP WIRE TWISTING METHOD

INCORRECT WAY TO TWIST WIRE

CORRECT WAY TO TWIST WIRE

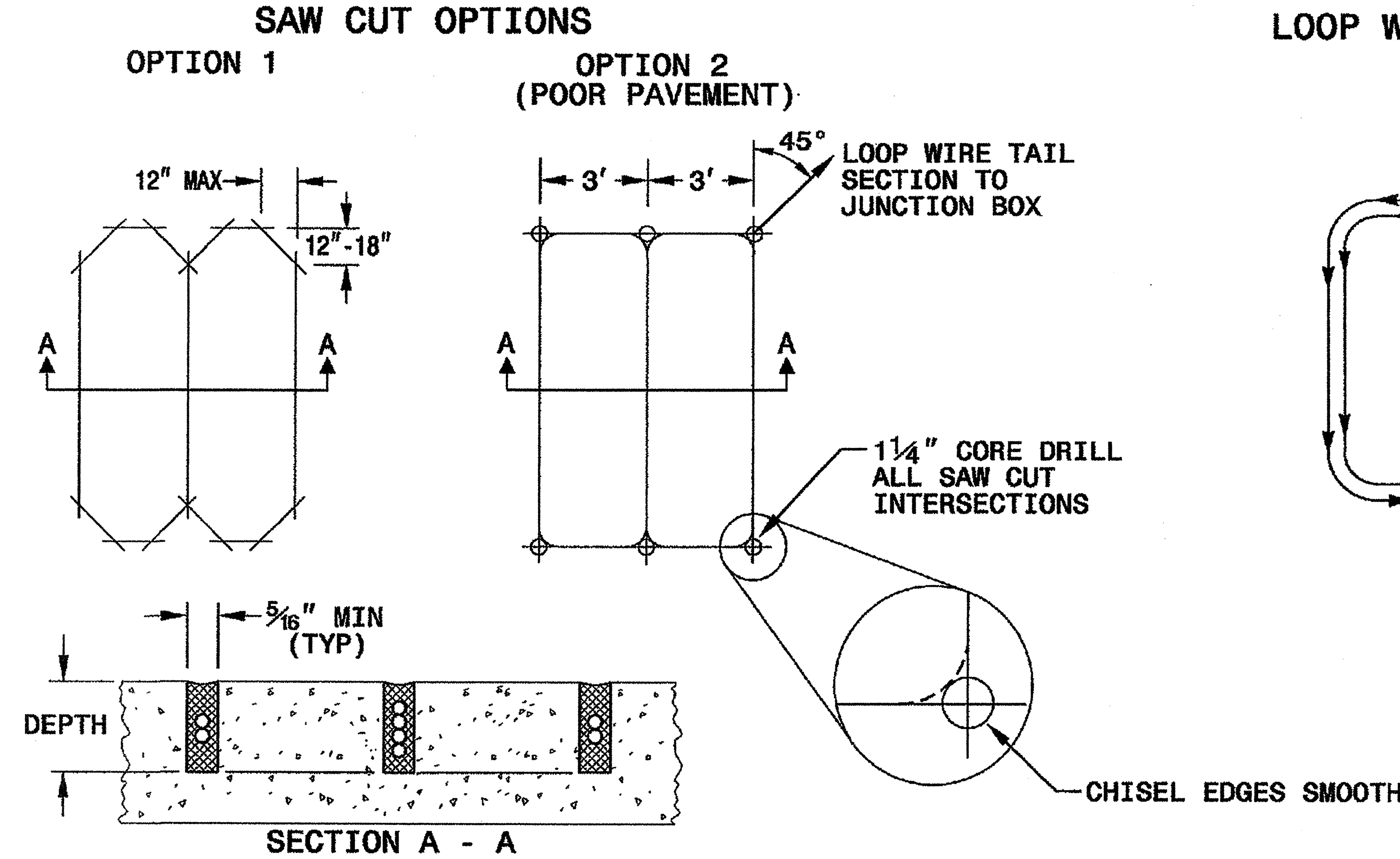


NOTES

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

QUADRUPOLE LOOP

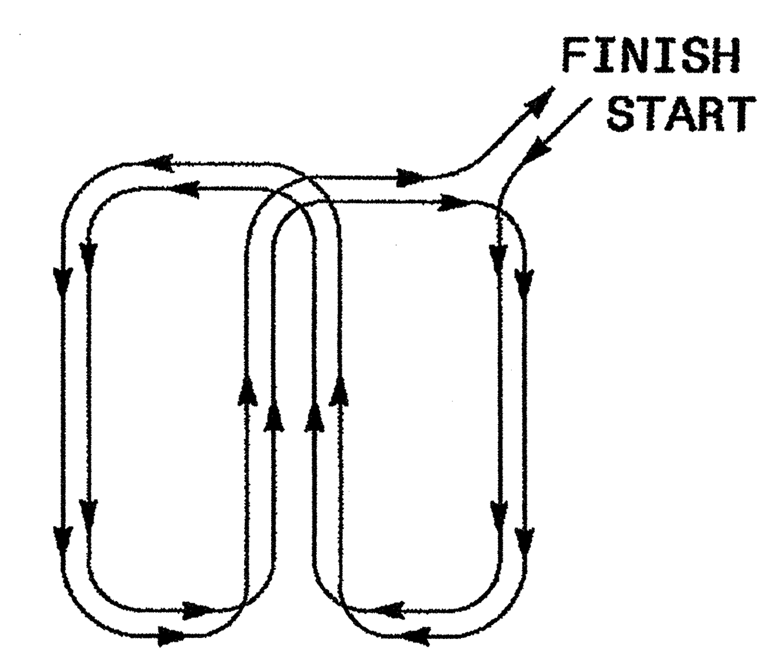
SAW CUT OPTIONS



SECTION A - A

DEPTH IS 2.5" FOR CONCRETE AND 3.0" FOR ASPHALT

LOOP WINDING METHOD



SHEET 1 OF 3
1725D01

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.
5-07
ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
SHEET 1 OF 3
1725D01

See Plate for Title

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 016286 ENGINEER MILTON I. DEAN

SIGNATURE 9/5/07 DATE

PROJECT REFERENCE NO.	SHEET NO.
U-4733	Sig. 27

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

5-07

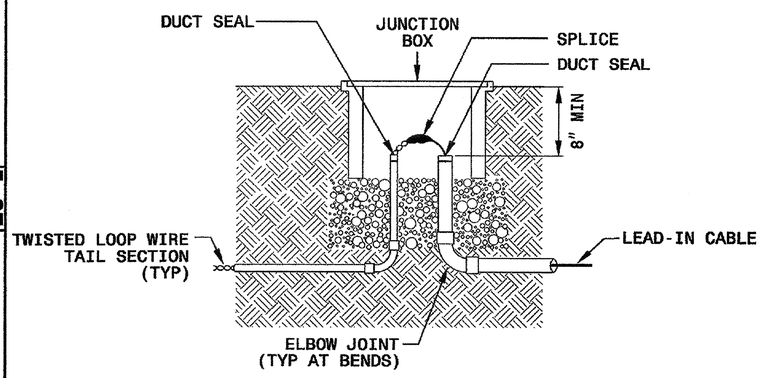
ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

SHEET 2 OF 3

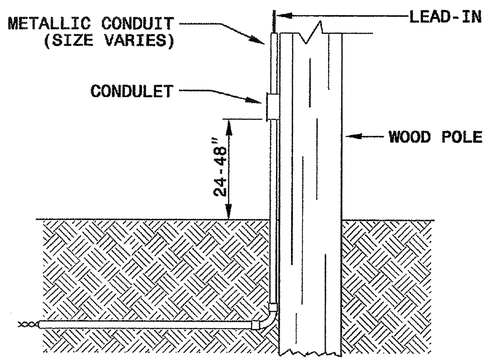
1725D01

LOOP WIRE SPLICE POINT DETAILS

LOOP WIRE AT JUNCTION BOX



LOOP WIRE AT POLE

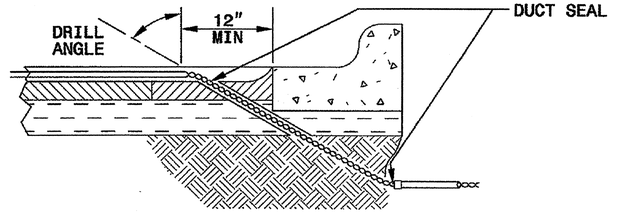


NOTE

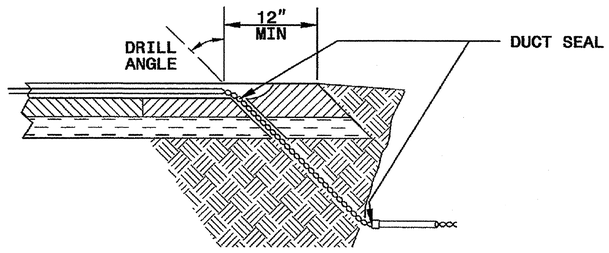
SPLICE ALL LOOP WIRE TAIL SECTIONS/LEAD-IN CABLE IN JUNCTION BOXES OR APPROVED CONDULETS.

LOOP WIRE PAVEMENT EDGE DETAILS

LOOP WIRE AT CURB & GUTTER SECTION



LOOP WIRE AT PAVEMENT SECTION



NOTES

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

STATE OF NORTH CAROLINA
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DIVISION OF HIGHWAYS
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ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

SHEET 2 OF 3

1725D01

See Plate for Title

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 016286 ENGINEER MILTON I. DEAN

Milton I. Dean 9/5/07
SIGNATURE DATE

PROJECT REFERENCE NO.	SHEET NO.
U-4733	Sig. 28

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

5-07

ENGLISH DETAIL DRAWING FOR

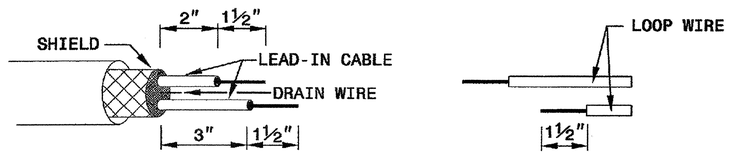
INDUCTION DETECTION LOOPS

SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

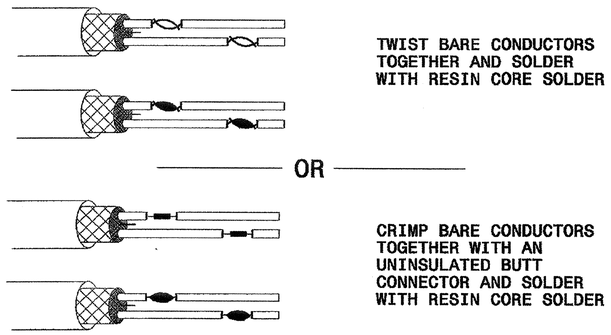
SHEET 3 OF 3

1725D01

STEP 1. STRIP LOOP WIRE AND LEAD-IN CABLE



STEP 2. CONNECT AND SOLDER



TWIST BARE CONDUCTORS TOGETHER AND SOLDER WITH RESIN CORE SOLDER

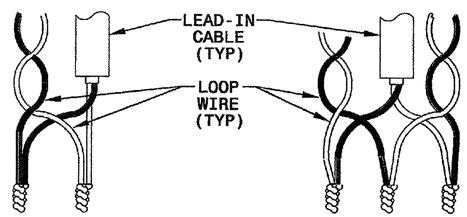
OR

CRIMP BARE CONDUCTORS TOGETHER WITH AN UNINSULATED BUTT CONNECTOR AND SOLDER WITH RESIN CORE SOLDER

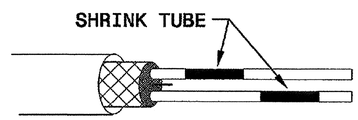
BOND SHIELD DRAIN WIRE AT SPLICE SECTIONS (DO NOT GROUND)

LOOP WIRE AND LEAD-IN CABLE CONNECTION DETAILS

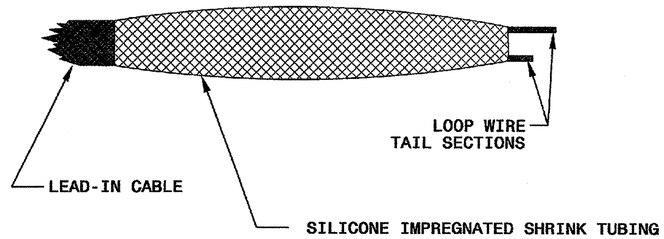
SINGLE CONNECTION SERIES CONNECTION



STEP 3. INSULATE EACH SOLDER JOINT SEPARATELY



STEP 4. ENVIRONMENTALLY PROTECT SPLICE



STATE OF NORTH CAROLINA
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RALEIGH, N.C.

5-07

ENGLISH DETAIL DRAWING FOR

INDUCTIVE DETECTION LOOPS

SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

SHEET 3 OF 3

1725D01

See Plate for Title

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 016286 ENGINEER MILTON I. DEAN
SIGNATURE
9/5/07
DATE