TIP PROJECT: U-3405

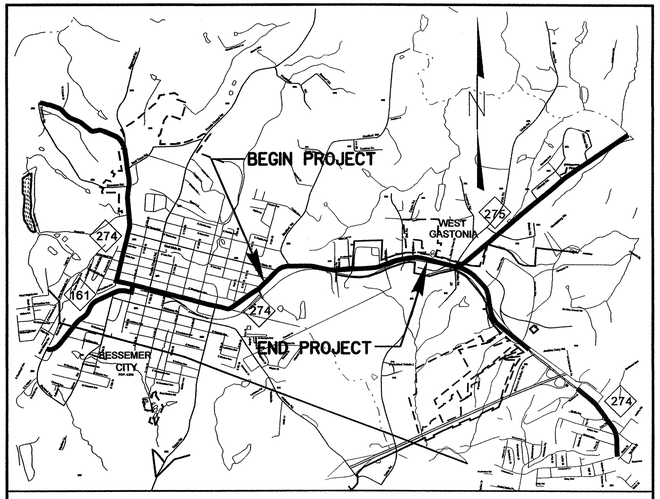
Project No.	Sheet No.
U-3405	Sig. 1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

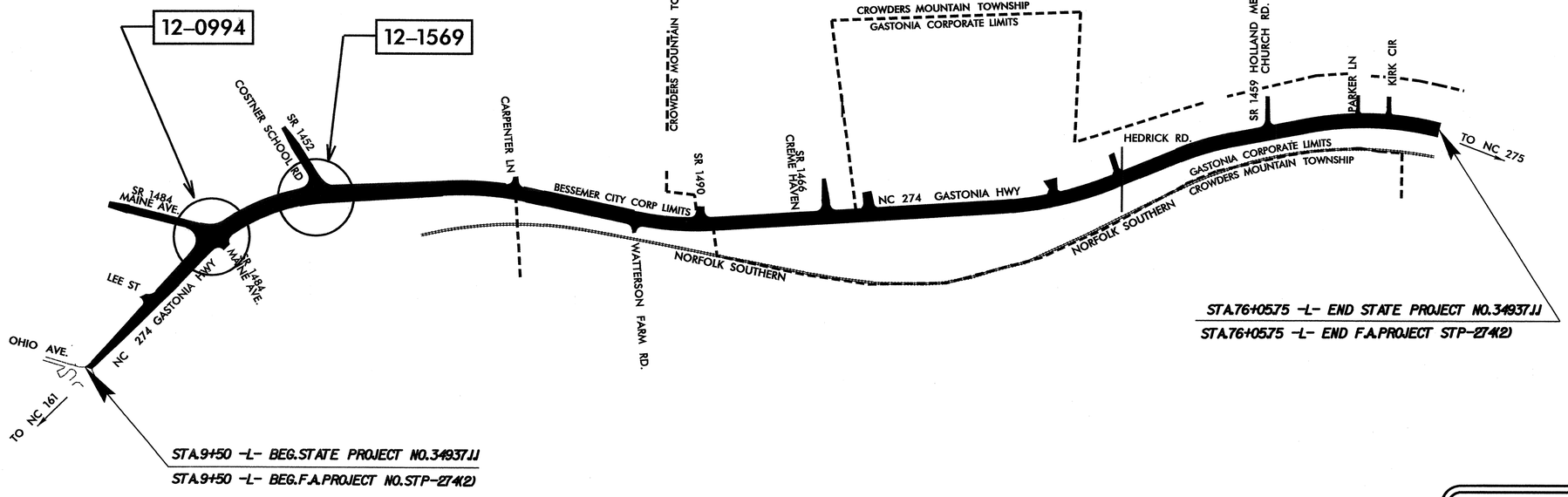
GASTON COUNTY

LOCATION: *NC 274, GASTONIA HIGHWAY FROM SR 1484, MAINE AVENUE, TO WEST OF NC 275*

TYPE OF WORK: SIGNAL PLANS



VICINITY MAP



THIS PROJECT IS WITHIN THE TOWNSHIP OF CROWDERS MOUNTAIN, WITHIN THE CORPORATE LIMITS OF BESSEMER CITY AND WITHIN THE CORPORATE LIMITS OF GASTONIA.

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

Index of Plans

INTELLIGENT TRANSPORTATION AND SIGNALS UNIT

Contacts:

Z. M. Little, PE – Signal Project Engineer
George Brown, PE – Signal Equipment Design Engineer
G. A. Fuller, PE – State ITS & Signals Engineer

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

Intelligent Transportation Systems & Signals Unit
STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION

750 N. Greenfield Parkway, Garner, NC 27529

PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig.2

PHASING DIAGRAM

PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	PHASE Ø3	PHASE Ø4	FLASH
21,22	G	R	R	Y
31	R	G	R	R
32	R	G	R	R
41	R	R	G	R
42,43	R	R	G	R
61,62	G	R	R	Y

SIGNAL FACE I.D.

ALL HEADS LED

2070L LOOP & DETECTOR INSTALLATION

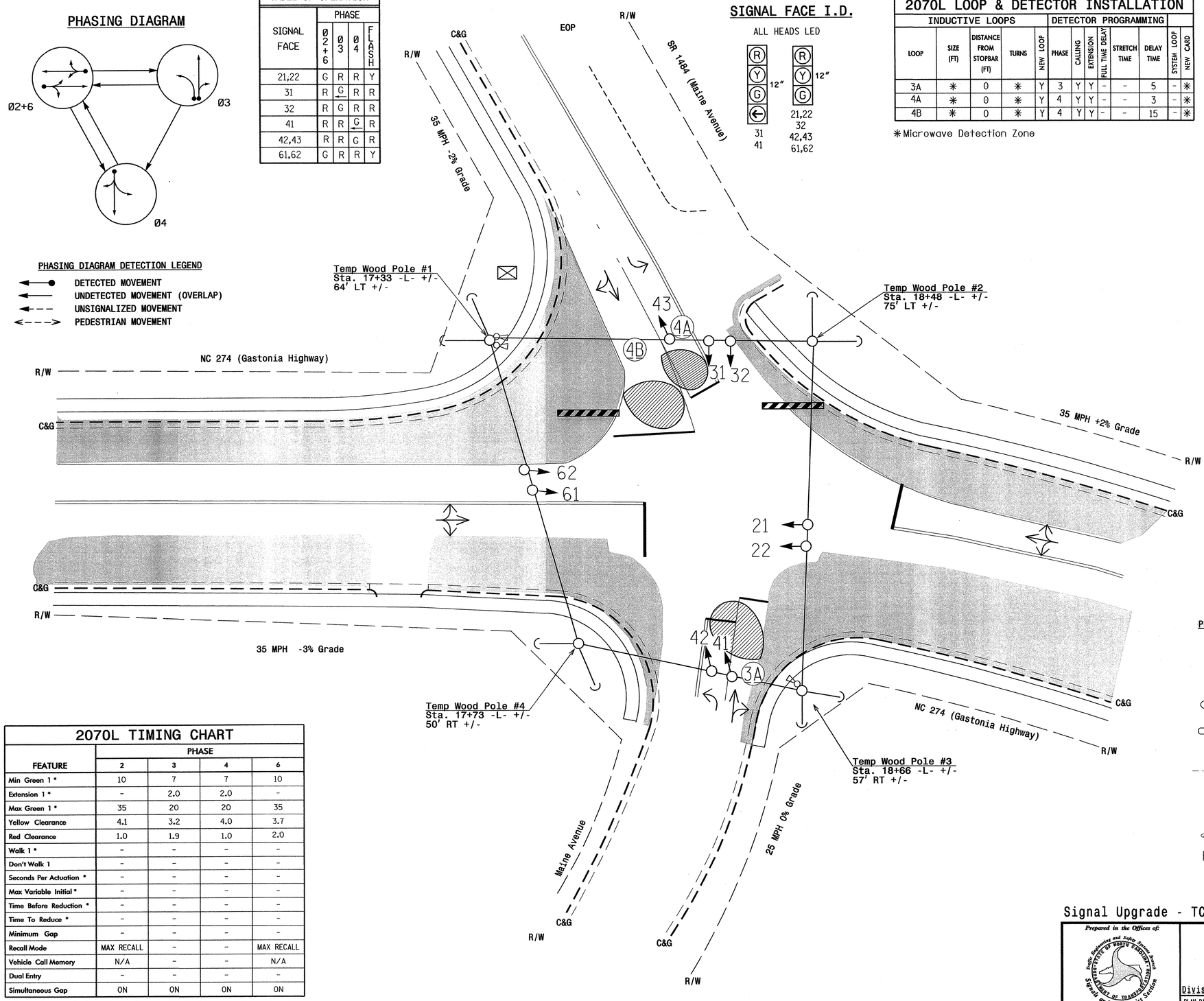
INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
3A	*	0	*	Y	3	Y	Y	-	-	5	-	*
4A	*	0	*	Y	4	Y	Y	-	-	3	-	*
4B	*	0	*	Y	4	Y	Y	-	-	15	-	*

*Microwave Detection Zone

3 Phase
Semi-Actuated
(Isolated)

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.



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	→
⋈	Out of Pavement Detector	⋈
▨	Microwave Detection Zone	▨
▩	Construction Zone	▩

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 3	PHASE 4	PHASE 6
Min Green 1 *	10	7	7	10
Extension 1 *	-	2.0	2.0	-
Max Green 1 *	35	20	20	35
Yellow Clearance	4.1	3.2	4.0	3.7
Red Clearance	1.0	1.9	1.0	2.0
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	-	-	-	-
Time To Reduce *	-	-	-	-
Minimum Gap	-	-	-	-
Recall Mode	MAX RECALL	-	-	MAX RECALL
Vehicle Call Memory	N/A	-	-	N/A
Dual Entry	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON

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

Signal Upgrade - TCP Phase I

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

NC 274 (Gastonia Highway) at SR 1484 (Maine Avenue)

Division 12 Gaston County Bessemer City

PLAN DATE: September 2008 REVIEWED BY:

PREPARED BY: Jerry Yaravitz REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 20 1"=20'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 30530 ENGINEER ZACHARY M. LITTLE

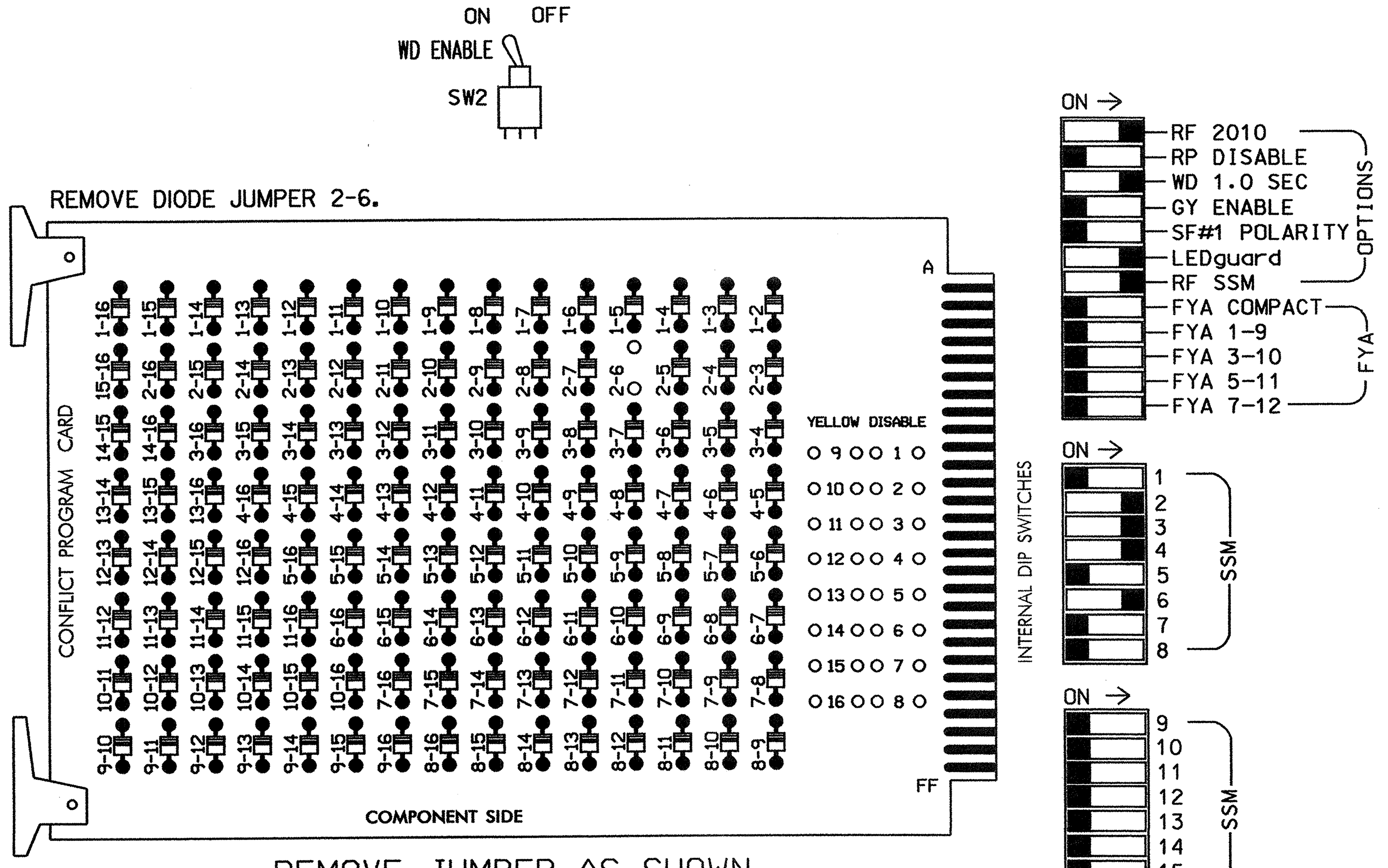
SIGNATURE DATE

SIG. INVENTORY NO. 12-0994T1

PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig.3

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



REMOVE JUMPER 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 1,5,7, 8,9,10,11,12,13,14,15 & 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.

EQUIPMENT INFORMATION

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

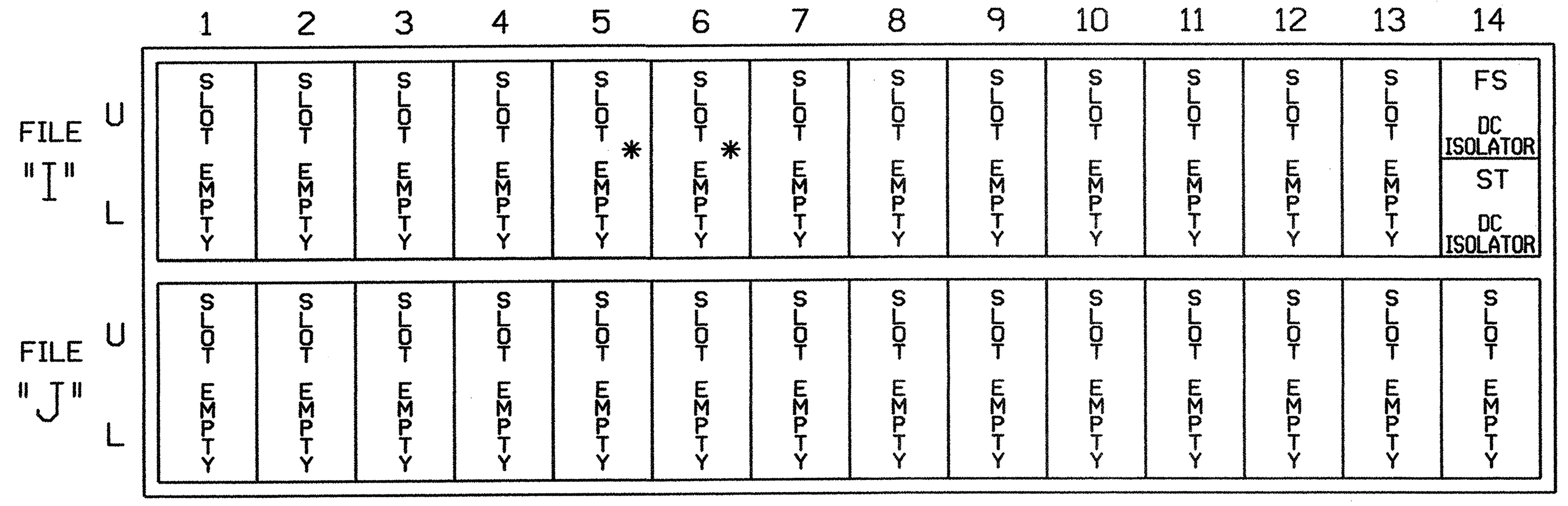
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3		S4		S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3		4		4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	31	32	41	42,43	NU	NU	61,62	NU	NU	NU	NU
RED		128		116	116	101	101			134				
YELLOW		129		117	117	102	102			135				
GREEN		130		118	118	103	103			136				
RED ARROW														
YELLOW ARROW														
GREEN ARROW				118		103								
(hand symbol)														
(walking person symbol)														

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME

* Microwave Detector - Do not populate slot with detector card. See Accuwave Detector Panel Wiring Details on sheet 2.

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
3A	*	I5U	58	20	3	3	Y	Y			5
4A	*	I6U	41	3	4	4	Y	Y			3
4B	*	I6L	45	7	14	4	Y	Y			15

* Microwave Detector - see Accuwave Detector Panel Wiring Details on sheet 2.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-0994T1
DESIGNED: September 2008
SEALED: 11-18-08
REVISED: N/A

Signal Upgrade - Sheet 1 of 2 | TCP Phase I

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 274 (Gastonia Highway) at SR 1484 (Maine Avenue)

Division 12 | Gaston County | Bessemer City

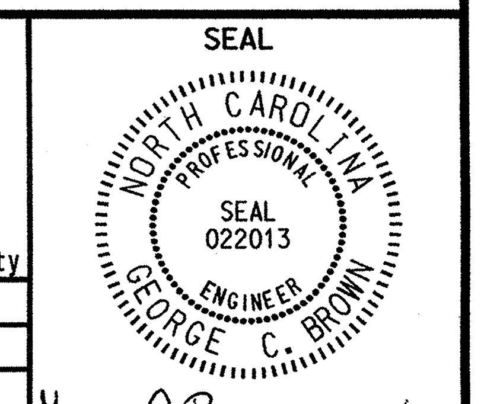
PLAN DATE: November 2008 | REVIEWED BY: T. Jga
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS | INIT. | DATE

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

750 N. Greenfield Pkwy, Garner, NC 27529

SEAL



SIGNATURE | DATE 11/20/08

SIG. INVENTORY NO. 12-0994T1

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sarmstrong

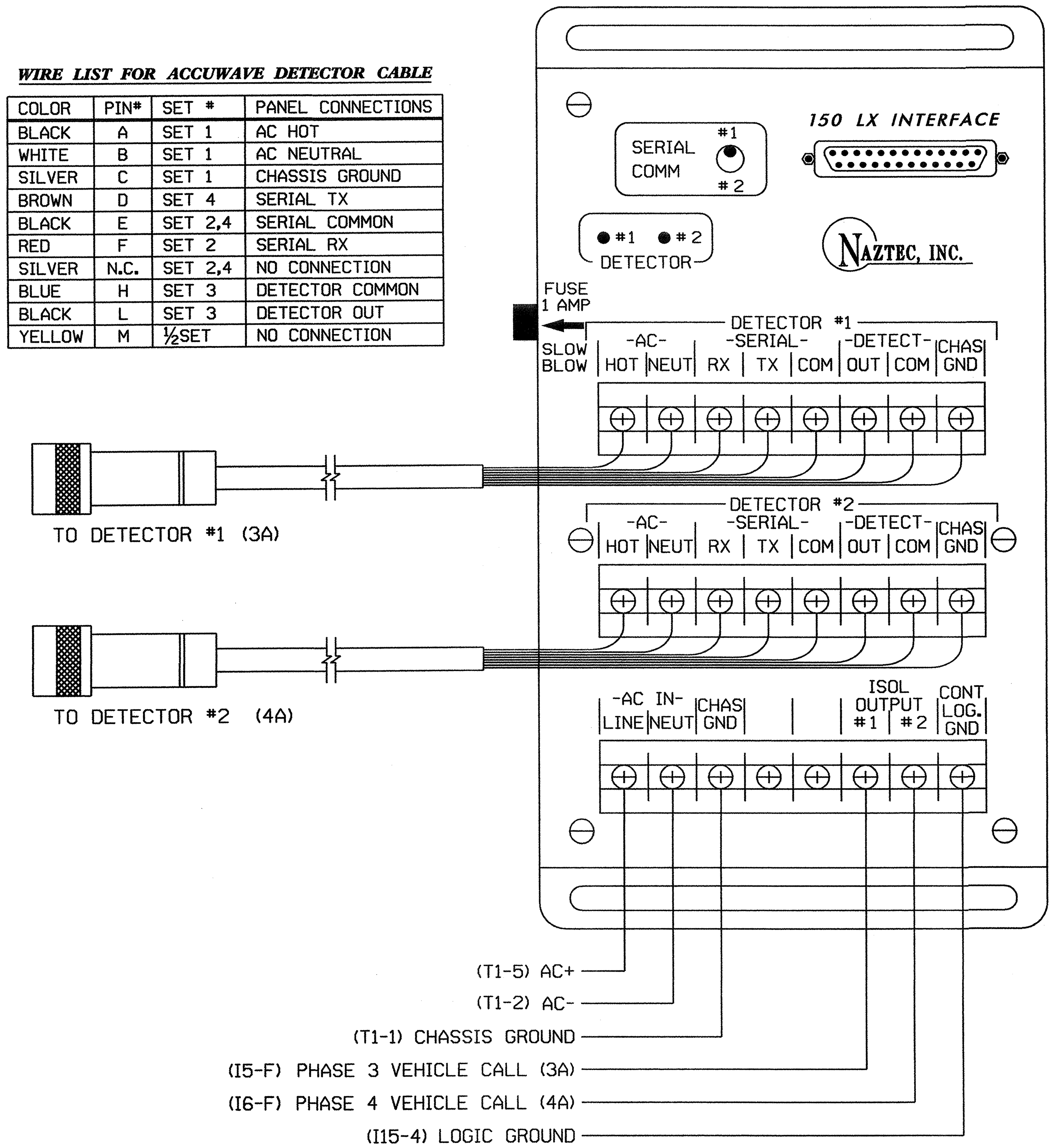
PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig.4

ACCUWAVE DETECTOR PANEL WIRING DETAIL FOR 3A & 4A

(wire as shown)

WIRE LIST FOR ACCUWAVE DETECTOR CABLE

COLOR	PIN#	SET #	PANEL CONNECTIONS
BLACK	A	SET 1	AC HOT
WHITE	B	SET 1	AC NEUTRAL
SILVER	C	SET 1	CHASSIS GROUND
BROWN	D	SET 4	SERIAL TX
BLACK	E	SET 2,4	SERIAL COMMON
RED	F	SET 2	SERIAL RX
SILVER	N.C.	SET 2,4	NO CONNECTION
BLUE	H	SET 3	DETECTOR COMMON
BLACK	L	SET 3	DETECTOR OUT
YELLOW	M	½SET	NO CONNECTION

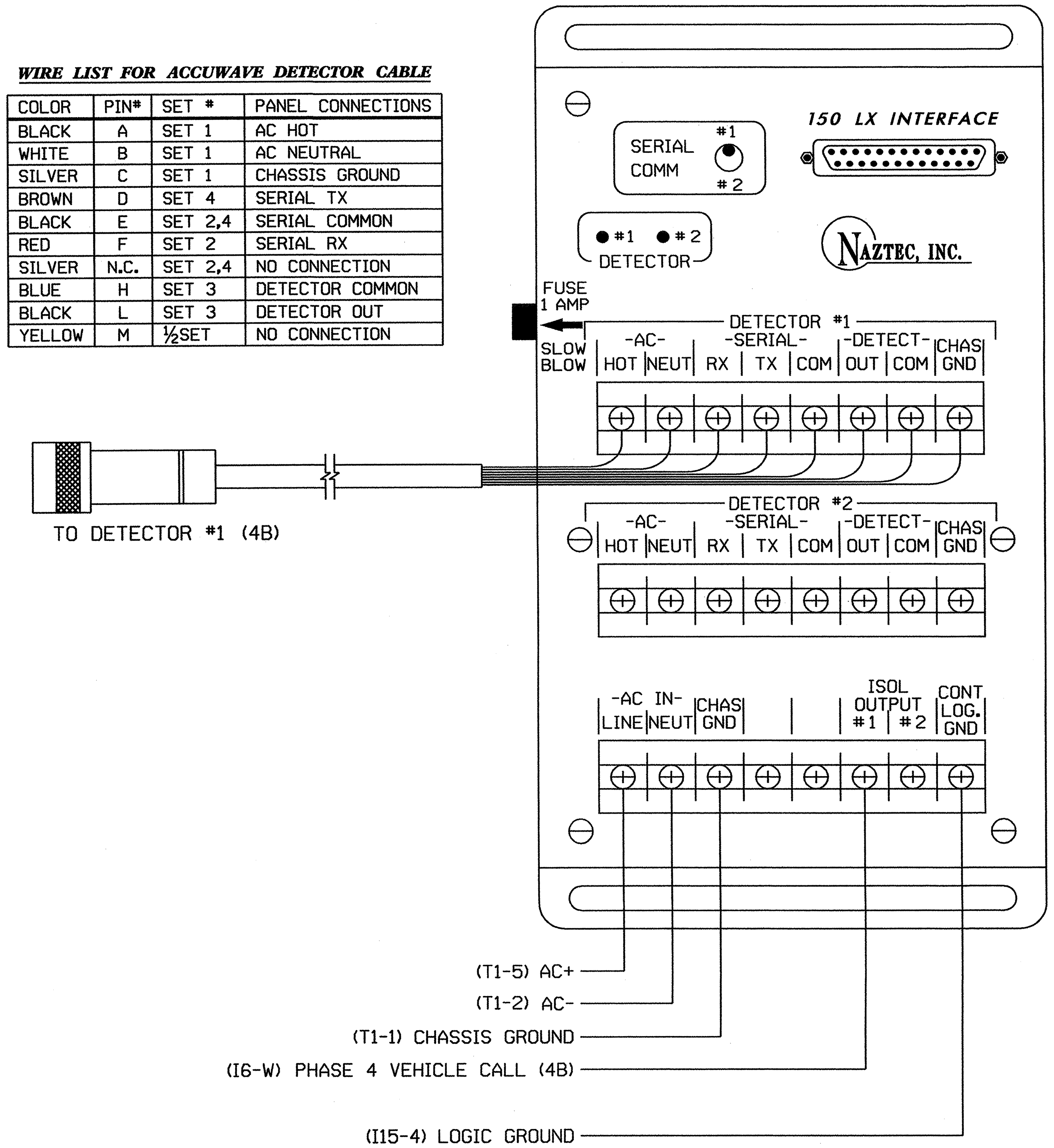


ACCUWAVE DETECTOR PANEL WIRING DETAIL FOR 4B

(wire as shown)

WIRE LIST FOR ACCUWAVE DETECTOR CABLE

COLOR	PIN#	SET #	PANEL CONNECTIONS
BLACK	A	SET 1	AC HOT
WHITE	B	SET 1	AC NEUTRAL
SILVER	C	SET 1	CHASSIS GROUND
BROWN	D	SET 4	SERIAL TX
BLACK	E	SET 2,4	SERIAL COMMON
RED	F	SET 2	SERIAL RX
SILVER	N.C.	SET 2,4	NO CONNECTION
BLUE	H	SET 3	DETECTOR COMMON
BLACK	L	SET 3	DETECTOR OUT
YELLOW	M	½SET	NO CONNECTION



NOTES:

1. Detectors are Accuwave Model 150LX presence detectors.
2. Information in the detector cable wire list chart is for cable purchased from Naztec and may vary if purchased from another source.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0994T1
DESIGNED: September 2008
SEALED: 11-18-08
REVISED: N/A

Signal Upgrade - Sheet 2 of 2 TCP Phase I

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 274 (Gastonia Highway) at SR 1484 (Maine Avenue)

Division 12 Gaston County Bessemer City

PLAN DATE: November 2008 REVIEWED BY: T. Joyce

PREPARED BY: S. Armstrong REVIEWED BY:

REVISIONS	INIT.	DATE

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

750 N. Greenfield Pkwy, Garner, NC 27529

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

SIGNATURE DATE 11/20/08

SIG. INVENTORY NO. 12-0994T1

19-NOV-2008 12:08
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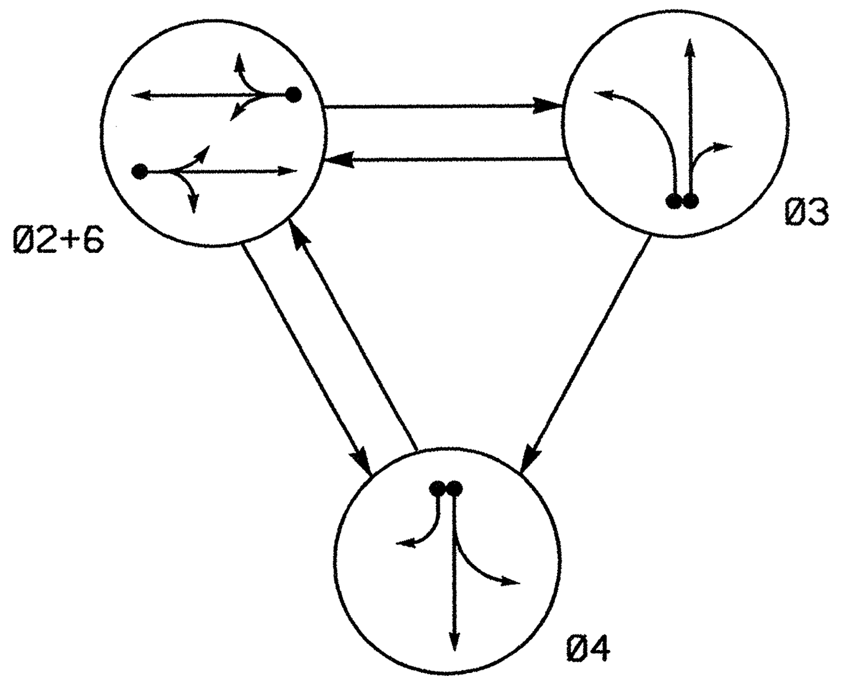
sarmstrong

PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig.5

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

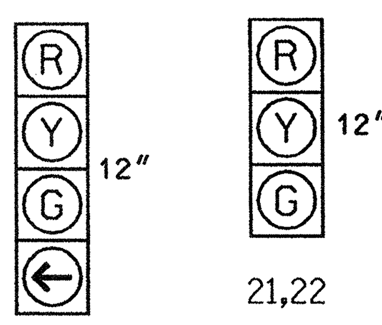
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+6	Ø3	Ø4	FLASH
21,22	G	R	R	Y
31	R	G ←	R	R
32	R	G	R	R
41	R	R	G ←	R
42,43	R	R	G	R
61,62	G	R	R	Y

SIGNAL FACE I.D.

ALL HEADS LED



2070L LOOP & DETECTOR INSTALLATION

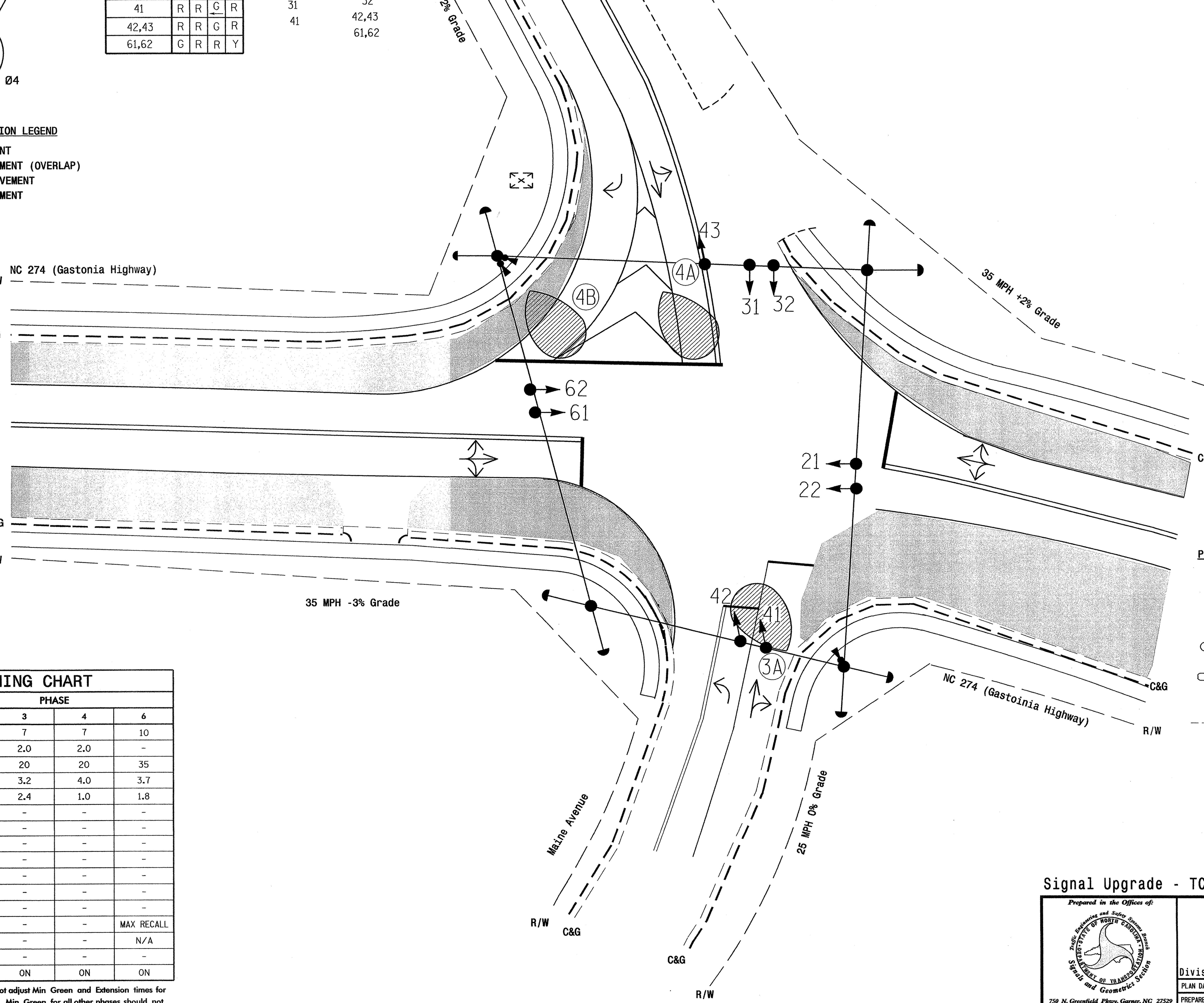
INDUCTIVE LOOPS					DETECTOR PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
3A	*	0	*	Y	3	Y	Y	-	-	5	-	*
4A	*	0	*	Y	4	Y	Y	-	-	3	-	*
4B	*	0	*	Y	4	Y	Y	-	-	15	-	*

*Microwave Detection Zone

3 Phase
Semi - Actuated
(Isolated)

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. Reposition existing signal heads as needed.
4. Set all detector units to presence mode.



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	
	Out of Pavement Detector	
	Microwave Detection Zone	
	Construction Zone	

2070L TIMING CHART

FEATURE	PHASE 2	3	4	6
Min Green 1 *	10	7	7	10
Extension 1 *	-	2.0	2.0	-
Max Green 1 *	35	20	20	35
Yellow Clearance	4.1	3.2	4.0	3.7
Red Clearance	1.5	2.4	1.0	1.8
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	-	-	-	-
Time To Reduce *	-	-	-	-
Minimum Gap	-	-	-	-
Recall Mode	MAX RECALL	-	-	MAX RECALL
Vehicle Call Memory	N/A	-	-	N/A
Dual Entry	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON

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

Signal Upgrade - TCP Phase II

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

NC 274 (Gastonia Highway)
at
SR 1484 (Maine Avenue)

Division 12	Gaston County	Bressemer City
PLAN DATE: September 2008	REVIEWED BY:	
PREPARED BY: Jerry Yaravitz	REVIEWED BY:	
REVISIONS	INIT.	DATE

SCALE 0 20
1"=20'

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 30530 ZACHARY ... LITTLE

SIGNATURE 11/18/08 DATE

SIG. INVENTORY NO. 12-0994T2

20-NOV-2008 14:20
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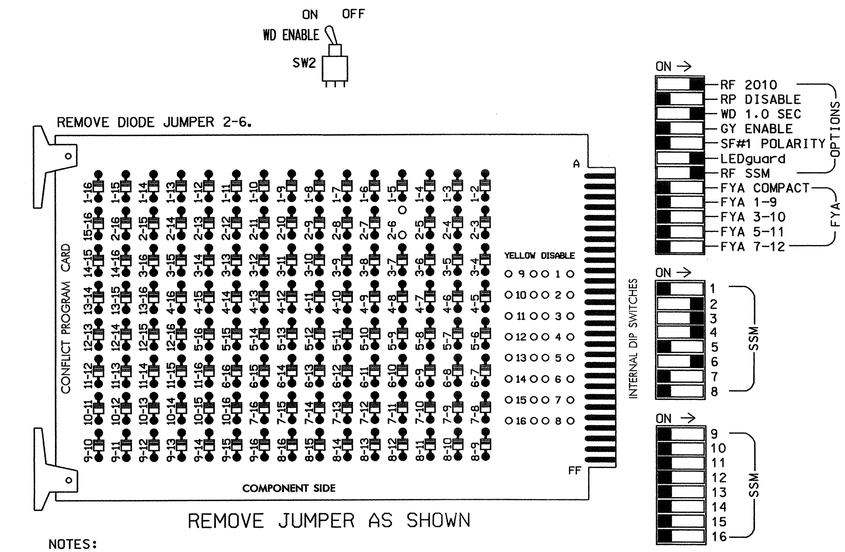
zmlittle

PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig.6

EDI MODEL 2010ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



REMOVE JUMPER 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 1,5,7, 8,9,10,11,12,13,14,15 & 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.

EQUIPMENT INFORMATION

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

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3		S4		S4P	S5	S6	S6P	S7	S8	S8P
PHASE	1	2	2 PED	3		4		4 PED	5	6	6 PED	7	8	8 PED
SIGNAL HEAD NO.	NU	21,22	NU	31	32	41	42,43	NU	NU	61,62	NU	NU	NU	NU
RED		128		116	116	101	101			134				
YELLOW		129		117	117	102	102			135				
GREEN		130		118	118	103	103			136				
RED ARROW														
YELLOW ARROW														
GREEN ARROW				118		103								
✋														
🚶														

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	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY *	SLOT EMPTY *	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
FILE "I" L														ST DC ISOLATOR
FILE "J" U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
FILE "J" L														

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

FS = FLASH SENSE
ST = STOP TIME

* Microwave Detector - Do not populate slot with detector card. See Accuwave Detector Panel Wiring Details on sheet 2.

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
3A	*	I5U	58	20	3	3	Y	Y			5
4A	*	I6U	41	3	4	4	Y	Y			3
4B	*	I6L	45	7	14	4	Y	Y			15

* Microwave Detector - see Accuwave Detector Panel Wiring Details on sheet 2.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0994T2
DESIGNED: September 2008
SEALED: 11-18-08
REVISED: N/A

Signal Upgrade - Sheet 1 of 2

TCP Phase II

ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 274 (Gastonia Highway)
at
SR 1484 (Maine Avenue)

Division 12 | Gaston County | Bessemer City

PLAN DATE: November 2008 | REVIEWED BY: T. Joyce
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

George C Brown 11/26/08
SIGNATURE DATE

SIG. INVENTORY NO. 12-0994T2

19-NOV-2008 13:09
s:\traffic\signals\workgroups\sig mon\armstrong\12094t2_sm_ele_xxx.dgn
armstrong

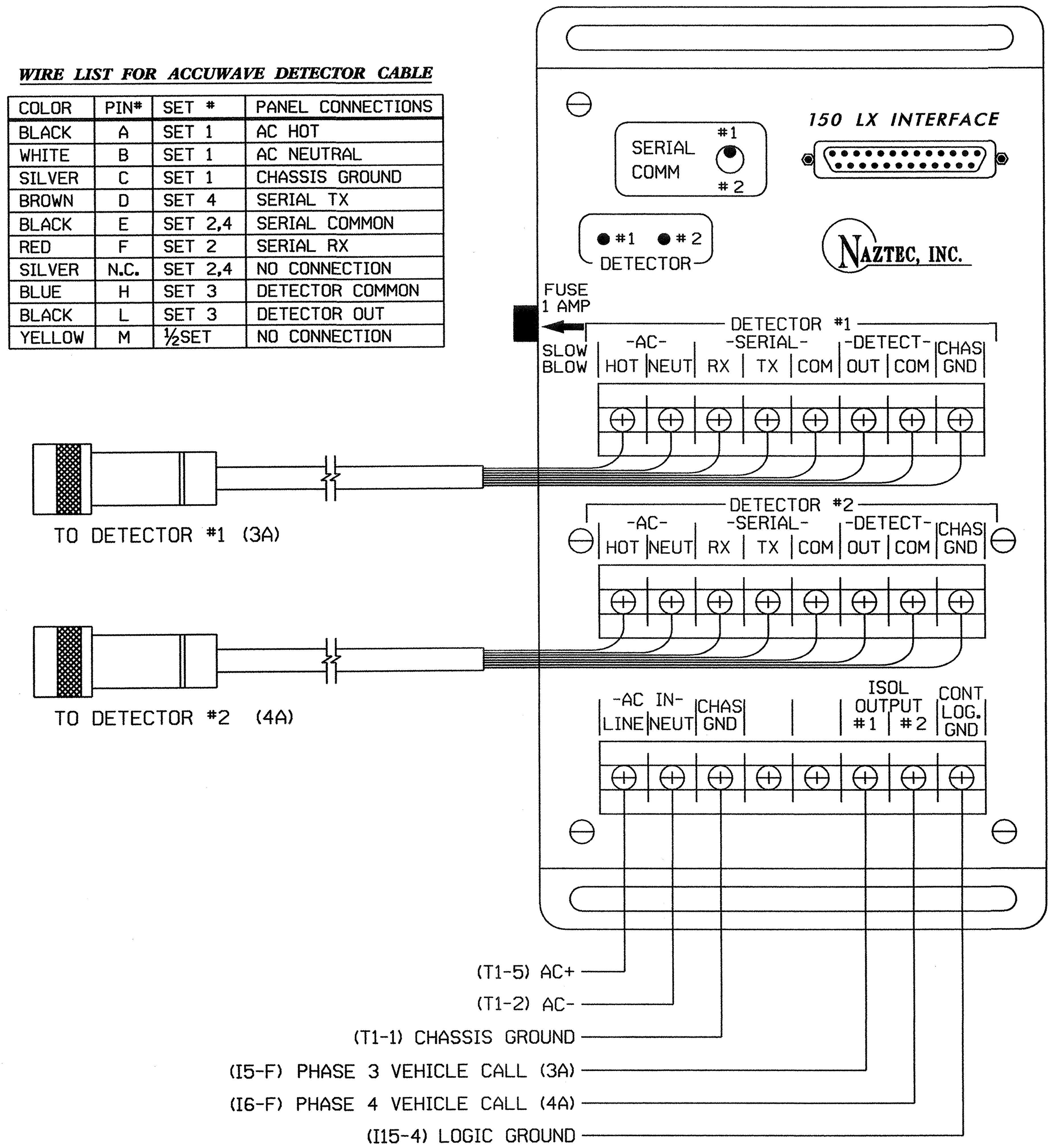
PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig.7

ACCUWAVE DETECTOR PANEL WIRING DETAIL FOR 3A & 4A

(wire as shown)

WIRE LIST FOR ACCUWAVE DETECTOR CABLE

COLOR	PIN#	SET #	PANEL CONNECTIONS
BLACK	A	SET 1	AC HOT
WHITE	B	SET 1	AC NEUTRAL
SILVER	C	SET 1	CHASSIS GROUND
BROWN	D	SET 4	SERIAL TX
BLACK	E	SET 2,4	SERIAL COMMON
RED	F	SET 2	SERIAL RX
SILVER	N.C.	SET 2,4	NO CONNECTION
BLUE	H	SET 3	DETECTOR COMMON
BLACK	L	SET 3	DETECTOR OUT
YELLOW	M	½SET	NO CONNECTION

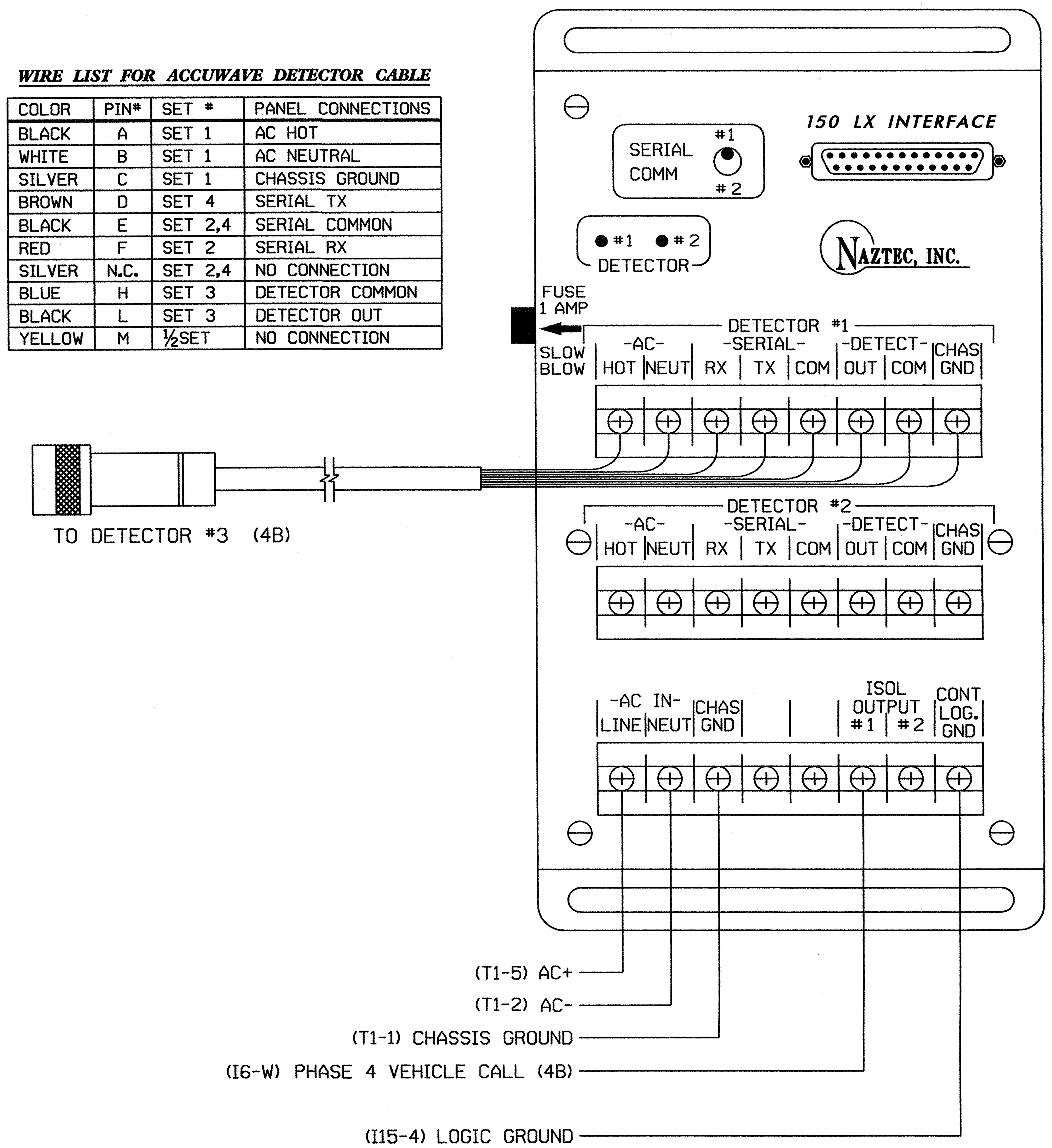


ACCUWAVE DETECTOR PANEL WIRING DETAIL FOR 4B

(wire as shown)

WIRE LIST FOR ACCUWAVE DETECTOR CABLE

COLOR	PIN#	SET #	PANEL CONNECTIONS
BLACK	A	SET 1	AC HOT
WHITE	B	SET 1	AC NEUTRAL
SILVER	C	SET 1	CHASSIS GROUND
BROWN	D	SET 4	SERIAL TX
BLACK	E	SET 2,4	SERIAL COMMON
RED	F	SET 2	SERIAL RX
SILVER	N.C.	SET 2,4	NO CONNECTION
BLUE	H	SET 3	DETECTOR COMMON
BLACK	L	SET 3	DETECTOR OUT
YELLOW	M	½SET	NO CONNECTION



NOTES:

1. Detectors are Accuwave Model 150LX presence detectors.
2. Information in the detector cable wire list chart is for cable purchased from Naztec and may vary if purchased from another source.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0994T2
DESIGNED: September 2008
SEALED: 11-18-08
REVISED: N/A

Signal Upgrade - Sheet 2 of 2

TCP Phase II

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 Pkwy, Garner, NC 27529

NC 274 (Gastonia Highway)
at
SR 1484 (Maine Avenue)

Division 12 | Gaston County | Bessemer City

PLAN DATE: November 2008 | REVIEWED BY: T.V.

PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL

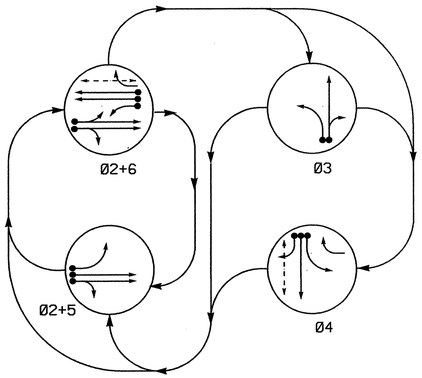
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

SIGNATURE | DATE 11/20/08

SIG. INVENTORY NO. 12-0994T2

PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig.8

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.

ALL HEADS LED

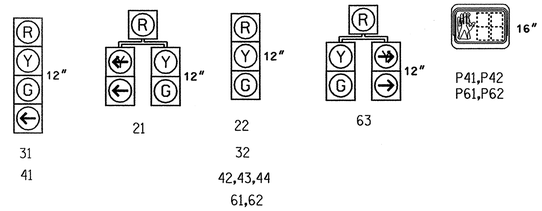


TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2+5	Ø2+6	Ø3	Ø4	FLASH
21	G	G	R	R	Y
22	G	G	R	R	Y
31	R	R	G	R	R
32	R	R	G	R	R
41	R	R	R	G	R
42,43,44	R	R	R	G	R
61,62	R	G	R	R	Y
63	R	G	R	R	Y
P41,P42	DW	DW	DW	W	DRK
P61,P62	DW	W	DW	DW	DRK

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

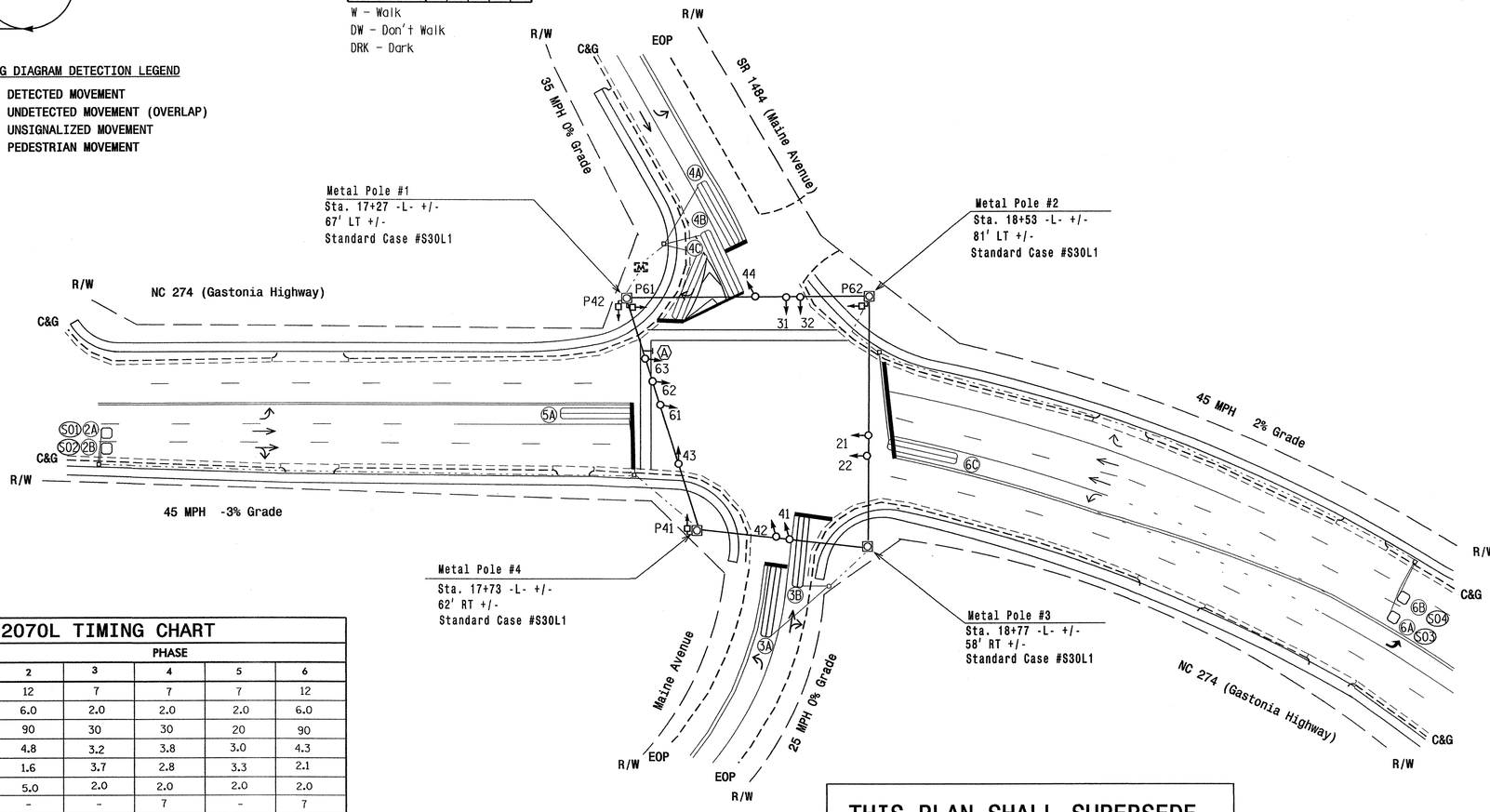
2070L LOOP & DETECTOR INSTALLATION

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
2A/S01	6X6	300	6	Y	2	Y	Y	-	-	-	Y	Y
2B/S02	6X6	300	6	Y	2	Y	Y	-	-	-	Y	Y
3A	6x40	0	2-4-2	Y	3	Y	Y	-	-	3	-	Y
3B	6x40	0	2-4-2	Y	3	Y	Y	-	-	10	-	Y
4A	6x40	0	2-4-2	Y	4	Y	Y	-	-	3	-	Y
4B	6x40	0	2-4-2	Y	4	Y	Y	-	-	3	-	Y
4C	6x40	0	2-4-2	Y	4	Y	Y	-	-	15	-	Y
5A	6x40	0	2-4-2	Y	5	Y	Y	-	-	15	-	Y
					2	Y	Y	Y	-	3	-	Y
6A/S03	6X6	300	6	Y	6	Y	Y	-	-	-	Y	Y
6B/S04	6X6	300	6	Y	6	Y	Y	-	-	-	Y	Y
6C	6x40	0	2-4-2	Y	6	Y	Y	Y	-	3	-	Y

4 Phase
Fully Actuated
NC 274 (Gastonia Highway) Closed Loop 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. Enable Backup Protect for phase 2 to allow the controller to clear from phase 2+6 to phase 2+5 by progressing through an all red display.
4. Set all detector units to presence mode.
5. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
6. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
8. Closed loop system data: Master Asset #11213, Controller Asset # 0994.



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	
	Metal Strain Pole	
Ⓐ	Right Arrow "ONLY" Sign (R3-5R)	Ⓐ

2070L TIMING CHART

FEATURE	PHASE 2	3	4	5	6
Min Green 1 *	12	7	7	7	12
Extension 1 *	6.0	2.0	2.0	2.0	6.0
Max Green 1 *	90	30	30	20	90
Yellow Clearance	4.8	3.2	3.8	3.0	4.3
Red Clearance	1.6	3.7	2.8	3.3	2.1
Red Revert	5.0	2.0	2.0	2.0	2.0
Walk 1 *	-	-	7	-	7
Don't Walk 1	-	-	15	-	25
Seconds Per Actuation *	1.5	-	-	-	1.5
Max Variable Initial *	34	-	-	-	34
Time Before Reduction *	15	-	-	-	15
Time To Reduce *	30	-	-	-	30
Minimum Gap	3.0	-	-	-	3.0
Recall Mode	MIN RECALL	-	-	-	MIN RECALL
Vehicle Call Memory	YELLOW	-	-	-	YELLOW
Dual Entry	-	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON	ON

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

THIS PLAN SHALL SUPERSEDE THE PLAN SEALED ON 11/19/08

Signal Upgrade - Final Design

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

NC 274 (Gastonia Highway)
at
SR 1484 (Maine Avenue)

Division 12 | Gaston County | Bessemer City

PLAN DATE: September 2008 | REVIEWED BY: Z.W.Little
PREPARED BY: Jerry Yaravitz | REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 30530 ZACHARY M. LITTLE
SIGNATURE 12/4/08 DATE
SIG. INVENTORY NO. 12-0994

26-JAN-2009 14:21
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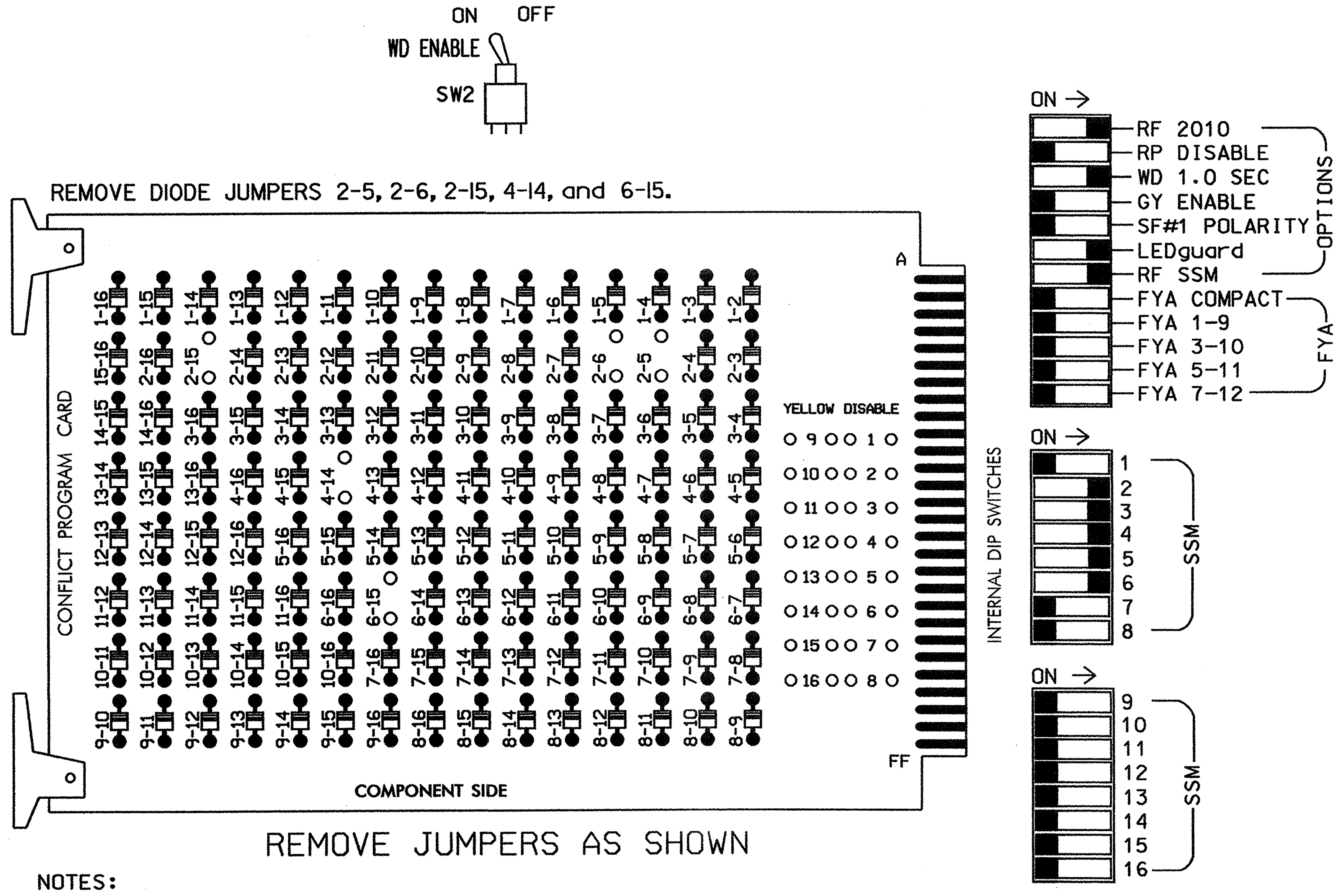
jyaravitz

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 1,7, 8,9,10,11,12,13,14,15 & 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 and Gap Reduction.
6. Program phases 4 and 6 for 'STARTUP PED CALL'.
7. The cabinet and controller are part of the NC 274 (Gastonia Highway) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.............CONTRACTOR SUPPLIED 2070L
CABINET................CONTRACTOR SUPPLIED 332
SOFTWARE...............ECONOLITE OASIS
CABINET MOUNT..........BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED......S2,S3,S4,S4P,S5,S6,S6P
PHASES USED............2,3,4,4 PED,5,6,6 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.	NU	21,22	NU	31	32	41	42,43 44	63	P41, P42	21	61,62 63	P61, P62	NU	NU	NU
RED		128		116	116	101	101			*	134				
YELLOW		129		117	117	102	102				135				
GREEN		130		118	118	103	103				136				
RED ARROW															
YELLOW ARROW								102		132					
GREEN ARROW				118		103		103		133					
(hand)									104			119			
(walking person)									106			121			

NU = Not Used

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

INPUT FILE POSITION LAYOUT

(front view)

FILE		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	Ø2/SYS 2A/S01	SLOT EMPTY	WIRED INPUT ⊗	SLOT EMPTY	Ø 3 3A	Ø 4 4A	Ø 4 4C	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	NOT USED	Ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L		Ø2/SYS 2B/S02				Ø 3 3B	Ø 4 4B	NOT USED				Ø4 PED DC ISOLATOR	NOT USED	ST DC ISOLATOR
FILE "J"	U	Ø 5 5A	Ø6/SYS 6A/S03	Ø 6 6C	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	Ø6/SYS 6B/S04	NOT USED											

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

FS = FLASH SENSE
ST = STOP TIME

⊗ Wired Input - Do not populate slot with detector card

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT ASSIGNMENT NO.	DETECTOR NO.	NEMA PHASE	CALL	EXTEND	FULL TIME DELAY	STRETCH TIME	DELAY TIME
2A/S01	TB2-5,6	I2U	39	1	2	2/SYS	Y	Y			
2B/S02	TB2-7,8	I2L	43	5	12	2/SYS	Y	Y			
3A	TB4-9,10	I6U	41	3	4	3	Y	Y			3
3B	TB4-11,12	I6L	45	7	14	3	Y	Y			10
4A	TB6-1,2	I7U	65	27	34	4	Y	Y			3
4B	TB6-3,4	I7L	78	40	44	4	Y	Y			3
4C	TB6-5,6	I8U	49	11	24	4	Y	Y			15
5A[1]	TB3-1,2	J1U	55	17	5	5	Y	Y			15
	-	I4U	47	9	22	2	Y	Y	Y		3
6A/S03	TB3-5,6	J2U	40	2	6	6/SYS	Y	Y			
6B/S04	TB3-7,8	J2L	44	6	16	6/SYS	Y	Y			
6C	TB3-9,10	J3U	64	26	36	6	Y	Y	Y		3
PED PUSH BUTTONS											
P41,P42	TB8-5,6	I12L	69	31	PED 4	4 PED					
P61,P62	TB8-7,9	I13U	68	30	PED 6	6 PED					

NOTE: INSTALL DC ISOLATORS IN INPUT FILE SLOTS I12 AND I13.

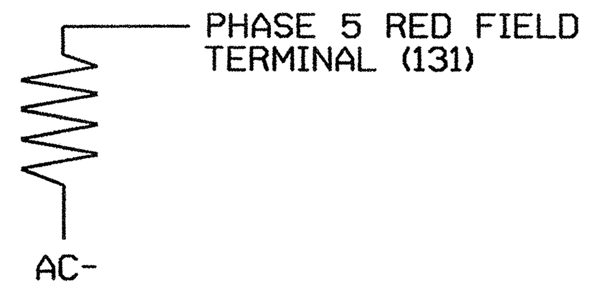
[1] Add jumper from J1-W to I4-W, on rear of input file.

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 this resistor is to load the channel red monitor input in order for the Signal Sequence Monitor to use the full signal sequence monitoring capability on channels that do not use the red display in the field.

BACKUP PROTECTION NOTE

(program controller as shown below)

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

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-0994
DESIGNED: September 2008
SEALED: 01-26-09
REVISED: N/A

THIS ELECTRICAL DETAIL SUPERSEDES THE DETAIL ORIGINALLY SEALED ON 11-20-08.

Signal Upgrade - Final Design

ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 274 (Gastonia Highway)
at
SR 1484 (Maine Avenue)

Division 12 Gaston County Bessemer City

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

PLAN DATE: January 2009	REVIEWED BY: T. Joyce
PREPARED BY: S. Armstrong	REVIEWED BY:

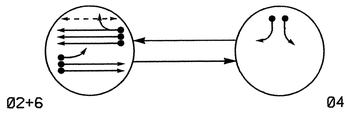
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN
George C. Brown 1/27/09
SIGNATURE DATE

SIG. INVENTORY NO. 12-0994

PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig.10

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

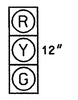
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø2+6	PHASE Ø4	FLASH
21,22	G	R	Y
41,42,43	R	G	R
61,62	G	R	Y
P61,P62	W	DW	DRK

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

SIGNAL FACE I.D.

ALL HEADS L.E.D.



21,22
41,42,43
61,62

P61,P62

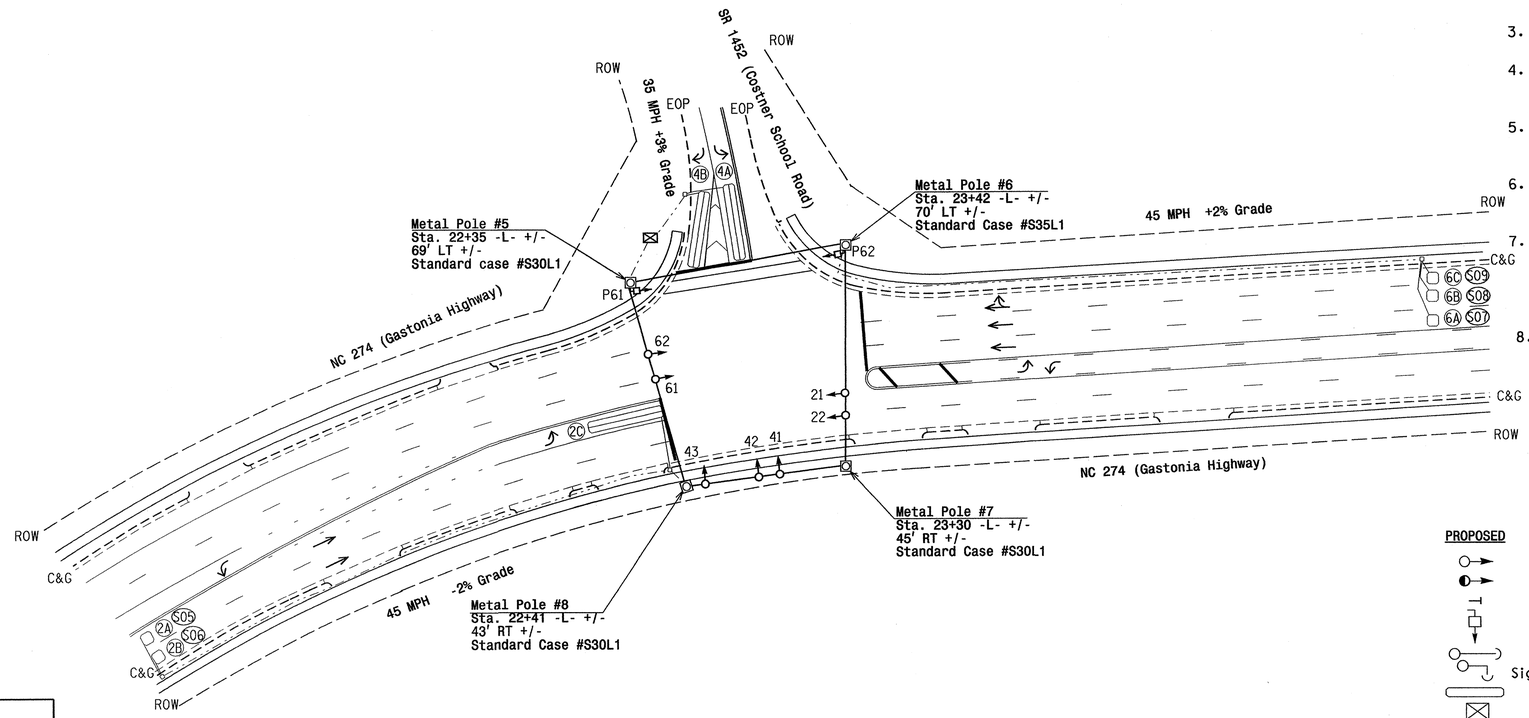
2070L LOOP & DETECTOR INSTALLATION

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
2A/S05	6X6	300	6	Y	2	Y	Y	-	-	-	Y	Y
2B/S06	6X6	300	6	Y	2	Y	Y	-	-	-	Y	Y
2C	6X6	0	6	Y	2	Y	Y	Y	-	3	-	Y
4A	6X40	0	2-4-2	Y	4	Y	Y	-	-	3	-	Y
4B	6X40	0	2-4-2	Y	4	Y	Y	-	-	15	-	Y
6A/S07	6X6	300	6	Y	6	Y	Y	-	-	-	Y	Y
6B/S08	6X6	300	6	Y	6	Y	Y	-	-	-	Y	Y
6C/S09	6X6	300	6	Y	6	Y	Y	-	-	-	Y	Y

2 Phase
Fully Actuated
NC 274 (Gastonia Highway) Clossed Loop System

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated July 2006 and "Standard Specifications for Roads and Structures" dated July 2006.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
6. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
8. Closed loop system data: Controller Asset # 1569.



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	

2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 6
Min Green 1 *	12	7	12
Extension 1 *	6.0	2.0	6.0
Max Green 1 *	90	30	90
Yellow Clearance	4.7	3.0	4.3
Red Clearance	1.2	2.8	1.3
Walk 1 *	-	-	7
Don't Walk 1	-	-	15
Seconds Per Actuation *	1.5	-	1.5
Max Variable Initial *	34	-	34
Time Before Reduction *	15	-	15
Time To Reduce *	30	-	30
Minimum Gap	3.0	-	3.0
Recall Mode	MIN RECALL	-	MIN RECALL
Vehicle Call Memory	YELLOW	-	YELLOW
Dual Entry	-	-	-
Simultaneous Gap	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.

New Installation - Final Design

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

NC 274 (Gastonia Highway)
at
SR 1452 (Costner School Road)

Division 12 Gaston County Bessemer City
PLAN DATE: January 2009 REVIEWED BY: Z.W.Little
PREPARED BY: Jerry Yaravitz REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

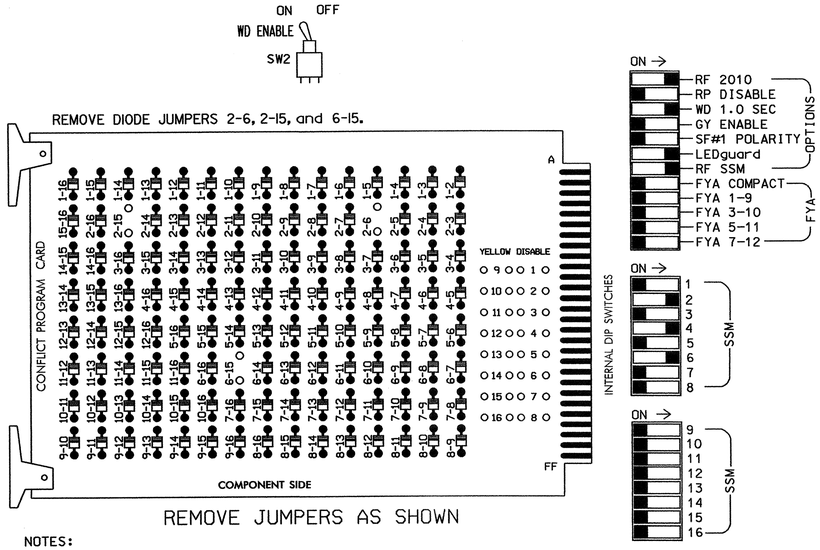
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 30530 ENGINEER ZACHARY M. LITTLE
SIGNATURE 1/26/09 DATE
SIG. INVENTORY NO. 12-1569

26-JAN-2009 14:13
s:\ts signals\workgroups\tip projects\u-3405\signals\designs\sig12-1569\sig12569_final design.dsn 2008mod.dgn
jyaravitz

PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig.11

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 1,3, 5,7,8,9,10,11,12,13,14,15 & 16 to load switch AC+ per the cabinet manufacturer's instructions.
3. Program 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 and Gap Reduction.
6. Program phase 6 for 'STARTUP PED CALL'.
7. The cabinet and controller are part of the NC 274 (Gastonia Highway) Closed Loop System.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET.....CONTRACTOR SUPPLIED 332
SOFTWARE.....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...12
LOAD SWITCHES USED.....S2,S4,S6,S6P
PHASES USED.....2,4,6,6 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.	NU	21,22	NU	NU	41,42 43	NU	NU	61,62	P61, P62	NU	NU	NU
RED		128			101			134				
YELLOW		129			102			135				
GREEN		130			103			136				
RED ARROW												
YELLOW ARROW												
GREEN ARROW												
✋									119			
🚶									121			

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	SLOT EMPTY	ø2/SYS 2A/SØ5	ø 2 2C	SLOT EMPTY	SLOT EMPTY	ø 4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L		ø2/SYS 2B/SØ6	NOT USED			ø 4 4B							NOT USED	ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	ø6/SYS 6A/SØ7	ø6/SYS 6C/SØ9	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		ø6/SYS 6B/SØ8	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
2A/SØ5	TB2-5,6	I2U	39	1	2	2/SYS	Y	Y			
2B/SØ6	TB2-7,8	I2L	43	5	12	2/SYS	Y	Y			
2C	TB2-9,10	I3U	63	25	32	2	Y	Y	Y		3
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			3
4B	TB4-11,12	I6L	45	7	14	4	Y	Y			15
6A/SØ7	TB3-5,6	J2U	40	2	6	6/SYS	Y	Y			
6B/SØ8	TB3-7,8	J2L	44	6	16	6/SYS	Y	Y			
6C/SØ9	TB3-9,10	J3U	64	26	36	6/SYS	Y	Y			
PED PUSH BUTTONS											
P61,P62	TB8-7,9	I13U	68	30	PED 6	6 PED					

NOTE: INSTALL DC ISOLATOR IN INPUT FILE SLOT I13.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

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

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1569
DESIGNED: January 2009
SEALED: Ø1-26-09
REVISED: N/A

New Installation

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:

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

750 N. Greenfield Pkwy, Garner, NC 27529

NC 274 (Gastonia Highway)
at
SR 1452 (Costner School Road)

Division 12 | Gaston County | Bessemer City

PLAN DATE: January 2009 | REVIEWED BY: T. Lloyd
PREPARED BY: S. Armstrong | REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

SIGNATURE | DATE

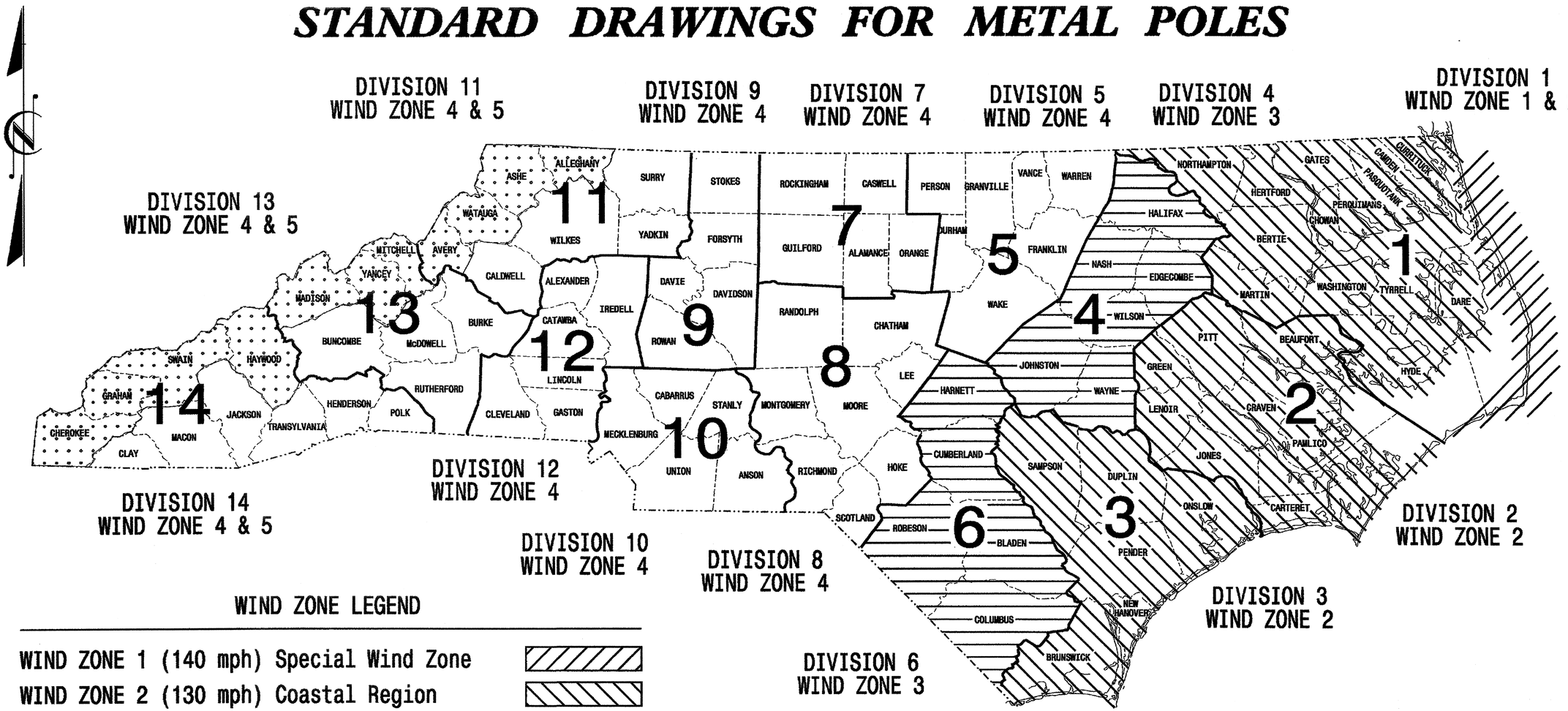
SIG. INVENTORY NO. 12-1569

STATE	PROJECT NO.	SHEET NO.
N.C.	U-3405	Sig. 12
F. A. PROJ. NO.		M 1
PROJECT ID. NO.		

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

STANDARD DRAWINGS FOR METAL POLES

NCDOT METAL POLE STANDARDS



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:

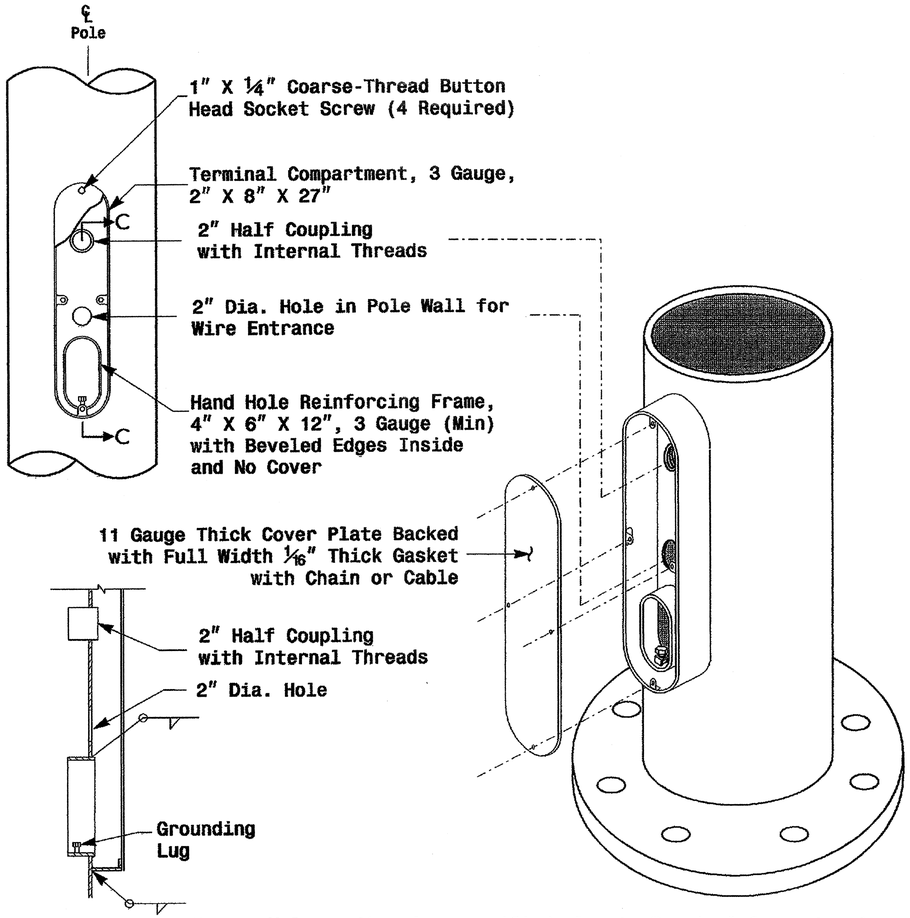
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

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 ----------

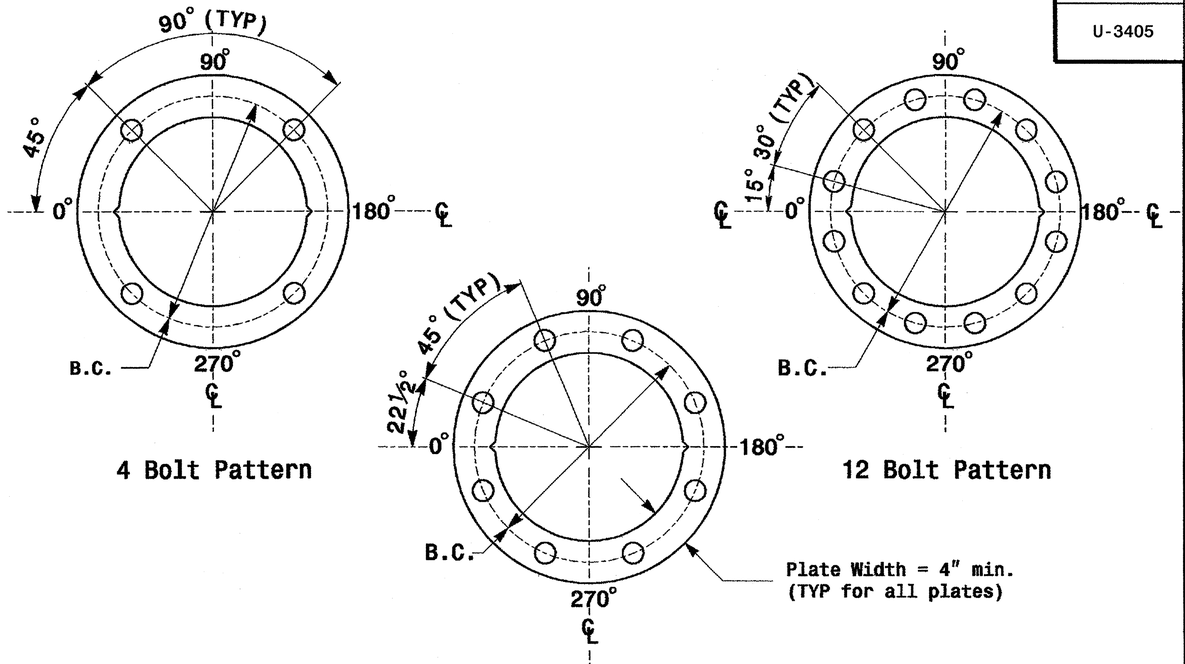
Shaft I.D. Tag
(Provide on Strain Poles and Mast Arm Poles)

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)

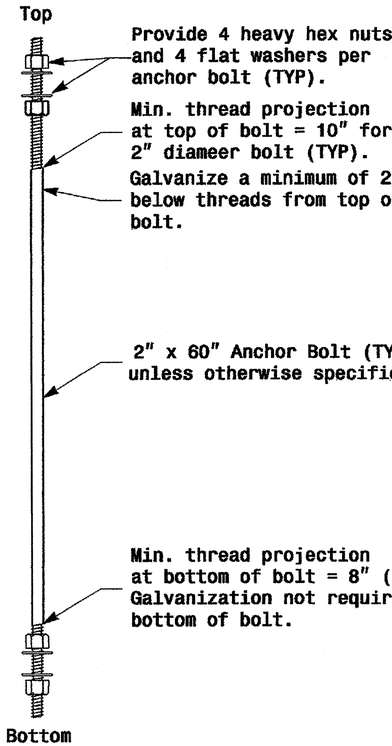
Notes:
1) D= Diameter, T= Thickness, L= Length, Y= Yield Strength
2) A.B. = Anchor Bolt
3) B.C. = Bolt Circle of Anchor Bolts
4) If Custom Design, use "NCDOT STANDARD" line for plan pole I.D.
5) See drawing M4 for mounting positions of I.D. tags.

Identification Tag Details



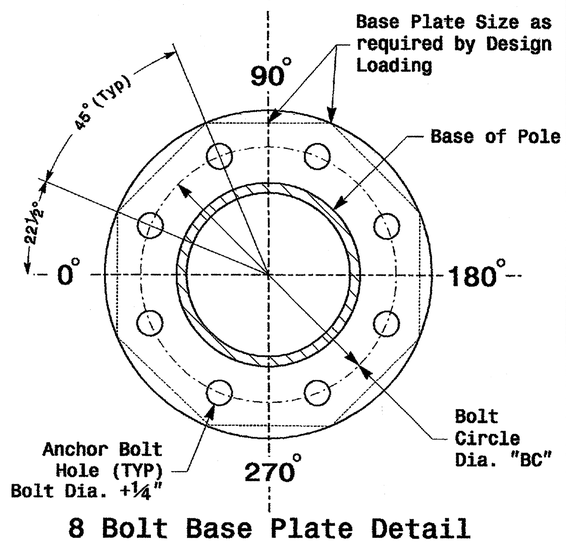
Construct Templates and Plates from ¼" min. thick Steel. Galvanizing is not required.

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

Fabrication Details – All Poles

PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig.13 M 2

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

SCALE: 0 NA NONE

Typical Fabrication Details Common To All Metal Poles

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

REVISIONS	INIT.	DATE

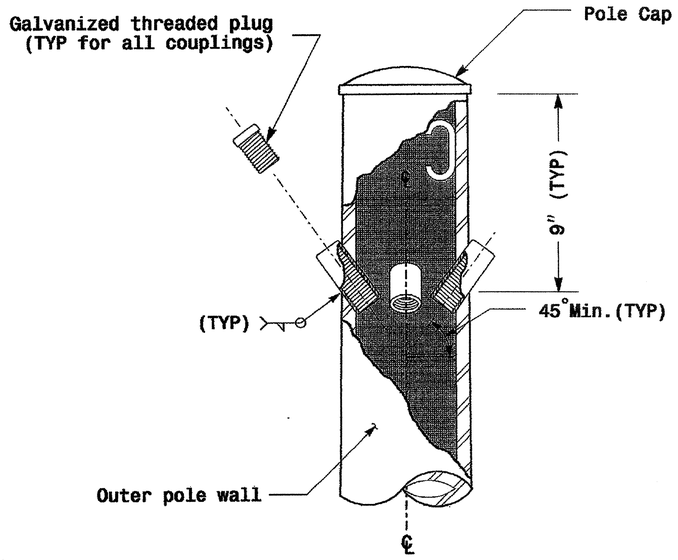
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DIBESH C. SARKAR

D. Sarkar 9.2.2005
SIGNATURE DATE

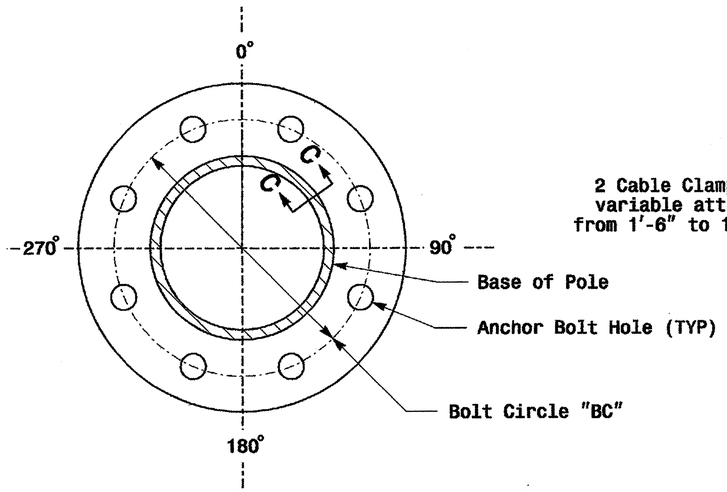
SIG. INVENTORY NO.

01-SEP-2005 18:22
D:\M2004 Metal Pole Standards\m2004 m2 thru m5.dgn
candrews

PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig. 14 M 3



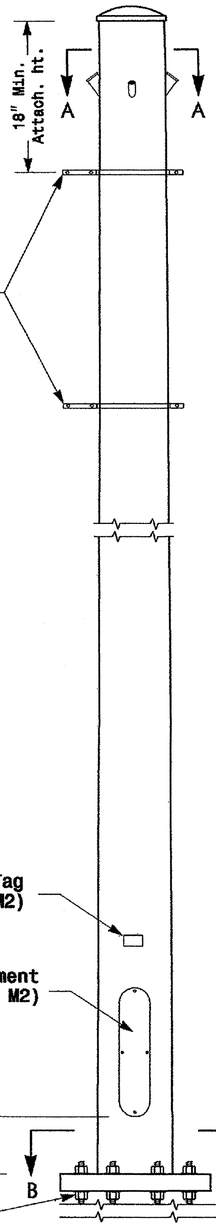
Cable Entrances at Top of Pole



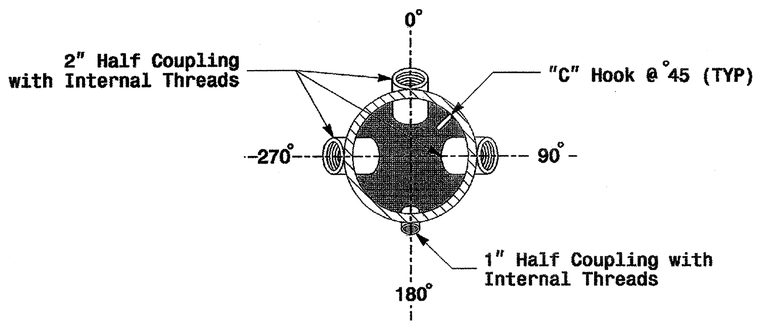
Section B-B

(See drawing M2)

Pole Base Plate

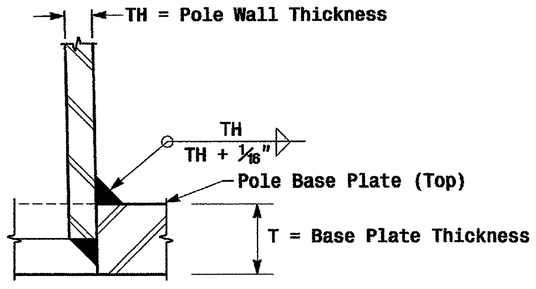


Monotube Strain Pole
(.14"/Foot Taper)



Section A-A

Radial Orientation for Factory Installed Accessories at Top of Pole



Section C-C

Socket Connection Weld Detail

Fabrication Details — Strain Poles

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

Typical Fabrication Details For Strain Poles

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

REVISIONS	INIT.	DATE

SCALE: 0 NA — NONE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 028094 ENGINEER DEBASISH C. SARKAR

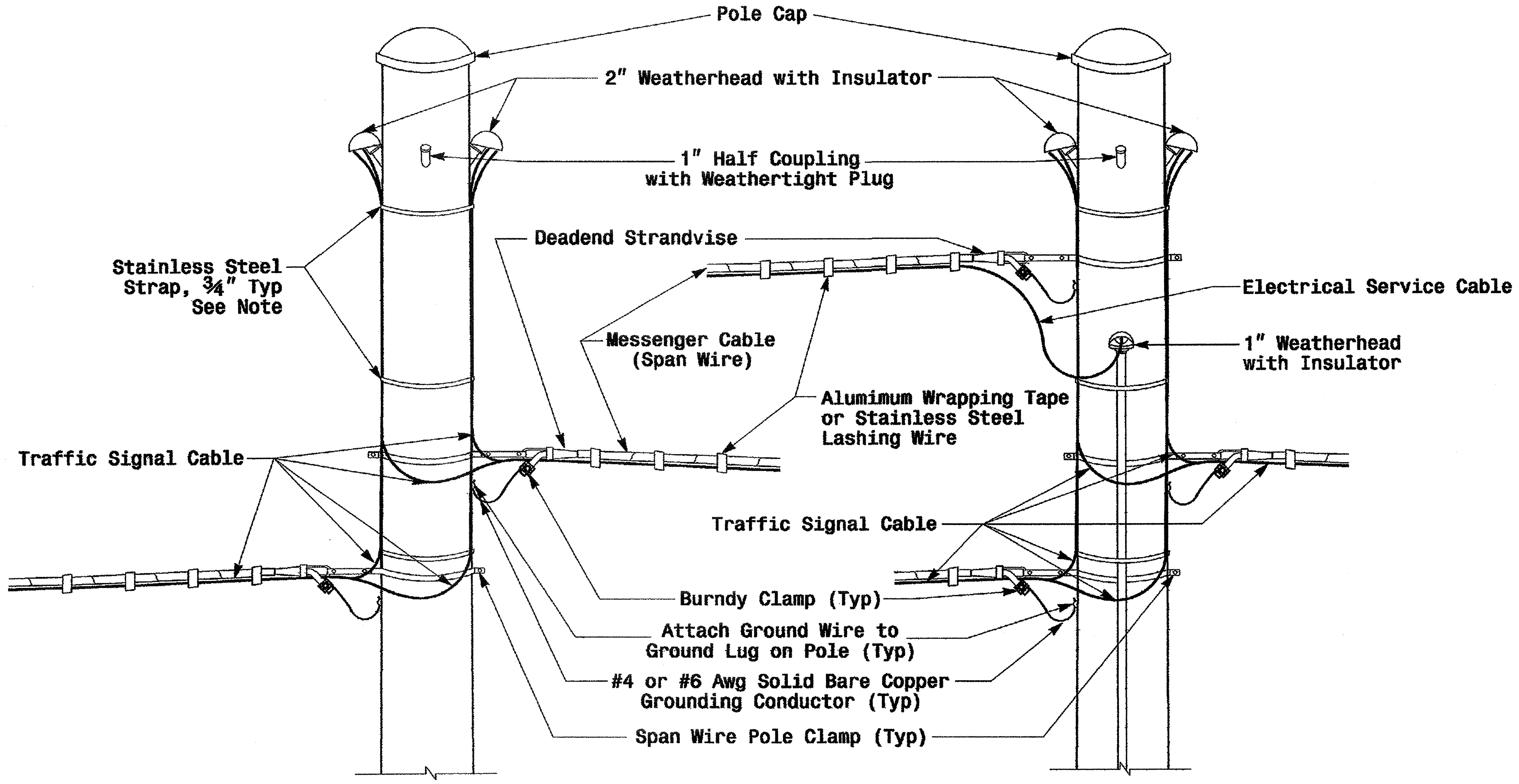
SIGNATURE: D. Sarkar DATE: 9.2.2005

SIG. INVENTORY NO.

01-SEP-2005 14:07
w:#pecoles~1#workgroups#2004 metal pole standards#2004 m3.dgn
palexander

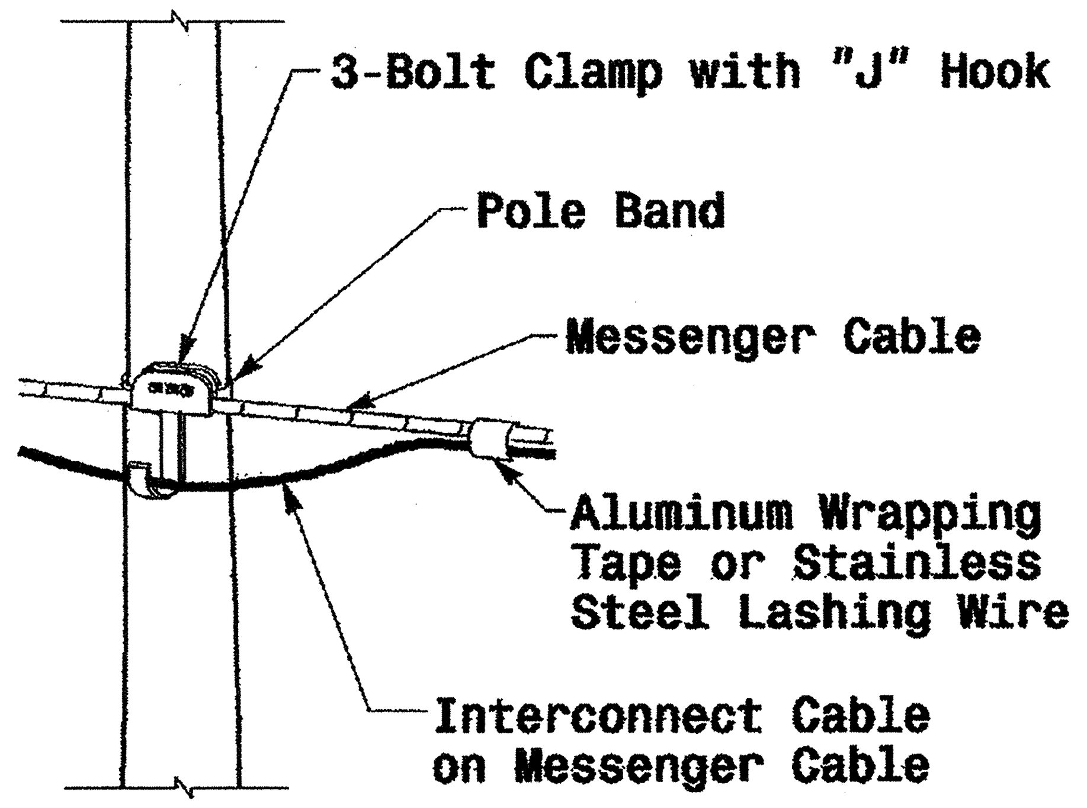
PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig.15 M 6

Construction Details – Strain Poles

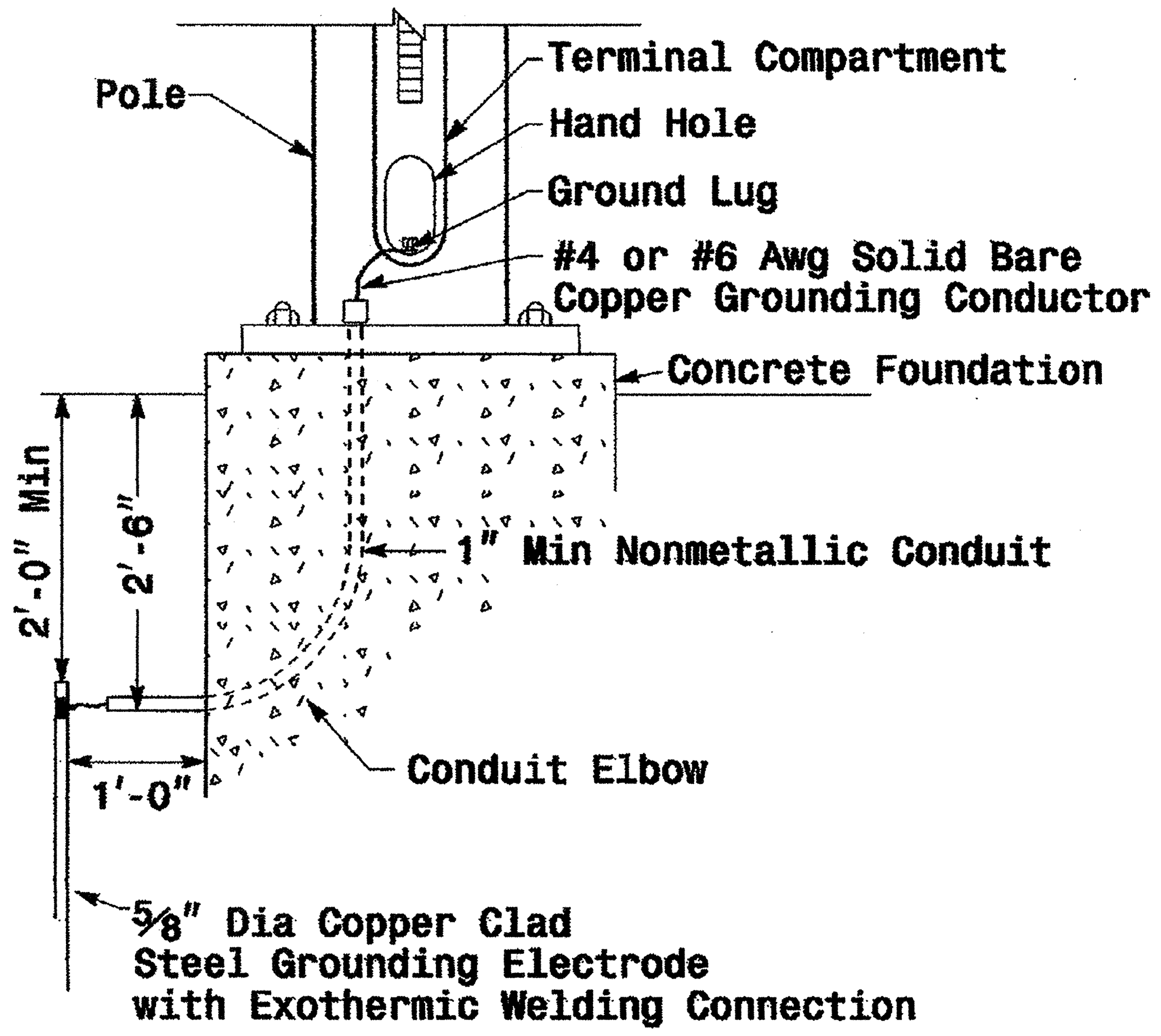


Note: Strap all signal cables to the side of the pole with 3/4" stainless steel straps when the distance between the spanwire attachment clamp and the weatherheads exceeds 36"

Strain Pole Attachments



Attachment of Cable to Intermediate Metal Pole



Metal Pole Grounding Detail

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

SCALE: 0 NA — NONE

Construction Details
Strain Poles

PLAN DATE: May 2005	REVIEWED BY: P.L. ALEXANDER
PREPARED BY: C.F. ANDREWS	REVIEWED BY: D.C. SARKAR

REVISIONS	INIT.	DATE

SEAL
North Carolina Professional Engineer, Seal 016286, Milton I. Dean

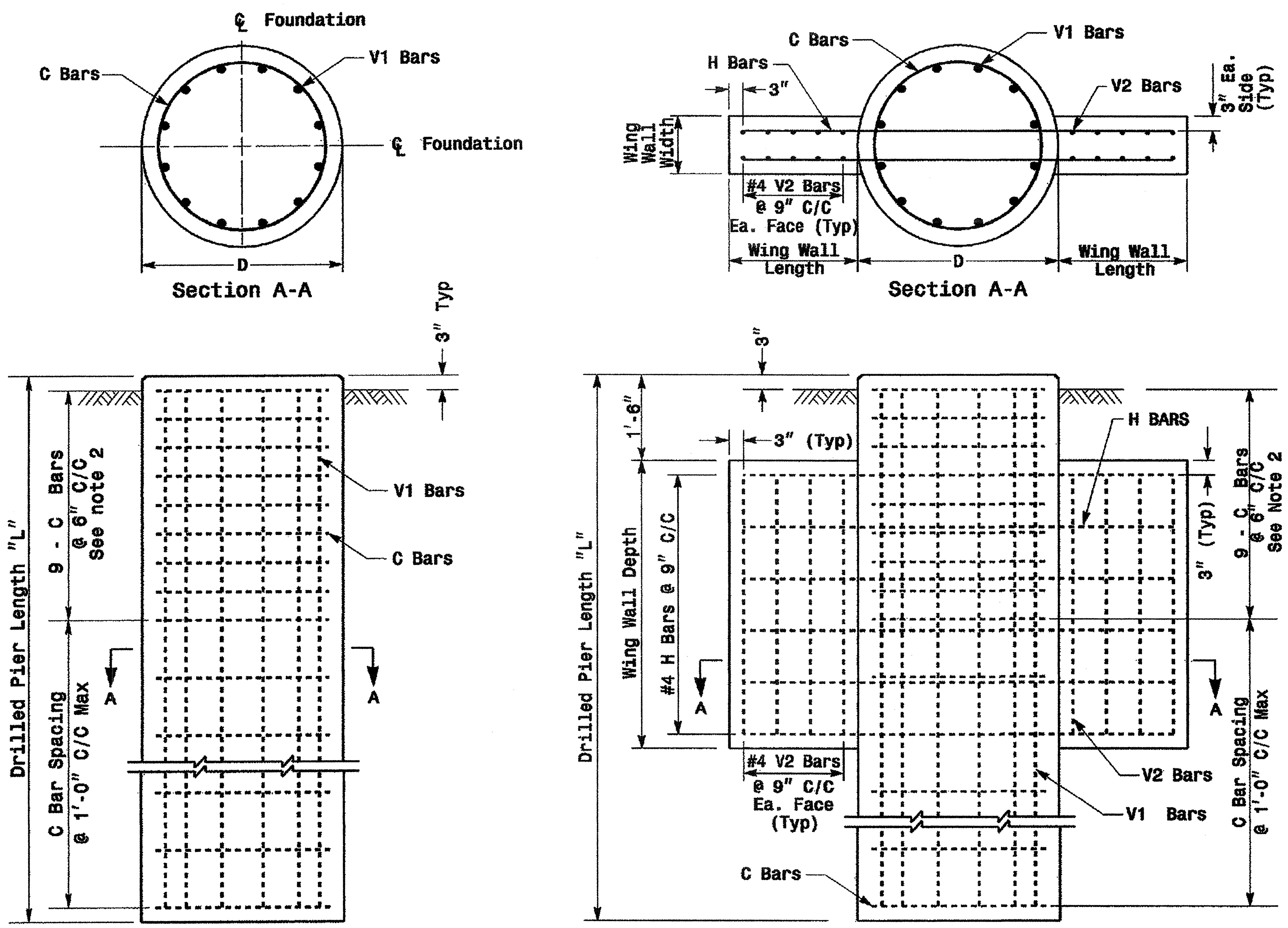
SIGNATURE: Milton I. Dean — DATE: 9-1-05

SIG. INVENTORY NO.

01-SEP-2005 16:33
palexander

Construction Details – Foundations

Reinforcing Steel Bars



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

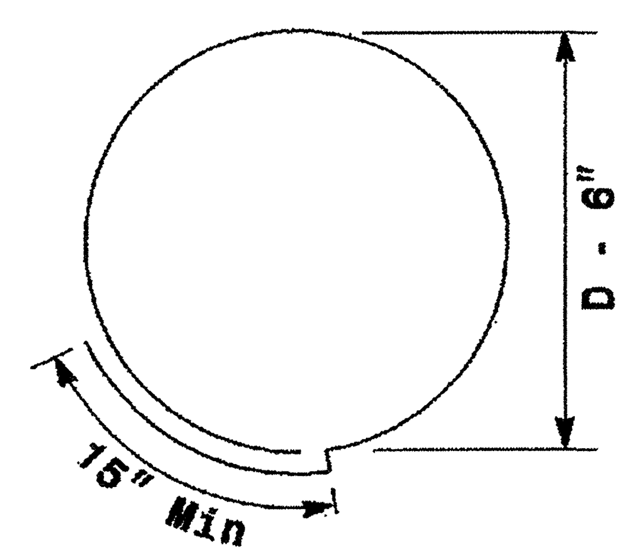
Shaft Dia (in.)	Conc. Volume (cu. yds.)	Bar Name	No.	Size	Type	Length
42"	.356 x L	V1	9	#8	STR.	**
		C	*	#4	CIR.	10'-9"
48"	.465 x L	V1	12	#8	STR.	**
		C	*	#4	CIR.	12'-6"

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

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

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

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



Typical "C" Bars

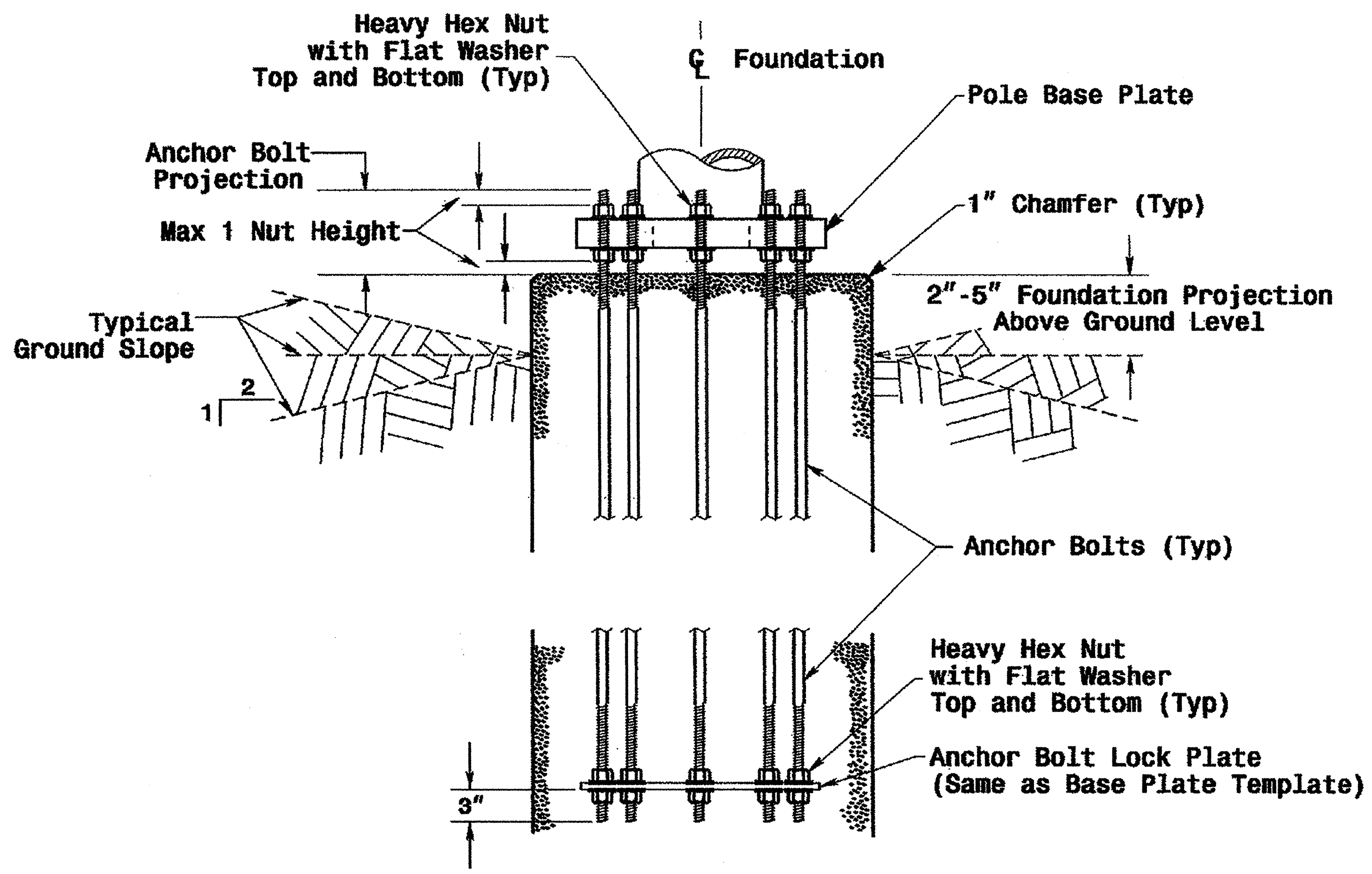
WING WALL DETAILS

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

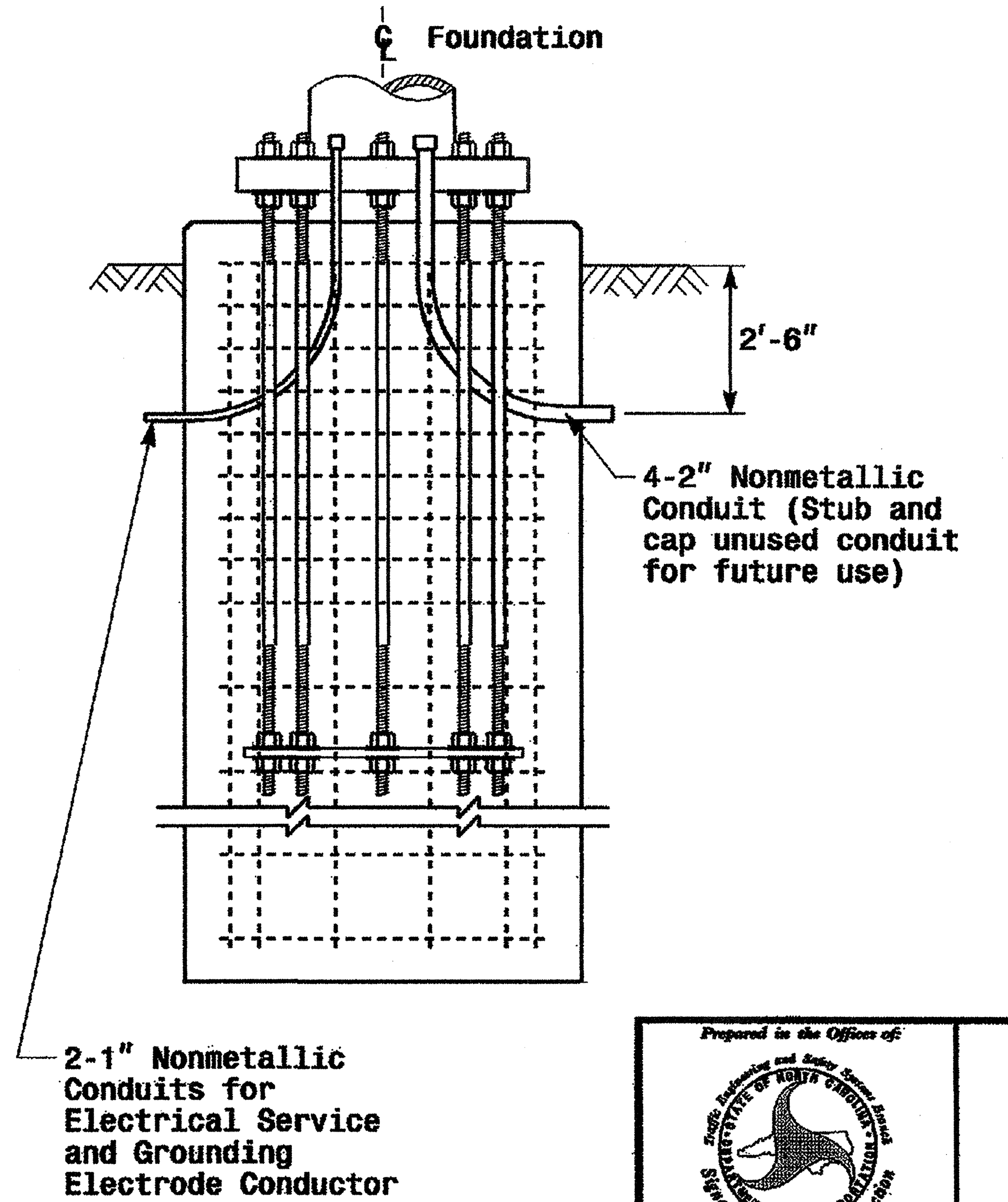
See Note No. 4

Typical Foundation Anchor Bolt Details

(Reinforcing Cage Not Shown for Clarity)



Typical Foundation Conduit Details



Notes

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

Prepared in the Offices of: Traffic Engineering and Safety Systems Branch, Department of Transportation, North Carolina, Signals and Geometrics Section
122 N. McDowell St., Raleigh, NC 27603
SCALE 0 NA NONE

Construction Details Foundations

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

REVISIONS | INIT. | DATE

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

01-SEP-2005 17:48
w:\people-unit\workgroups\2004 metal pole standards\2004 m1.dgn
poleorder

PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig.17 M 8

		STANDARD STRAIN POLES				STANDARD FOUNDATIONS 42" Diameter Drilled Pier Length (L) – Feet						
						Clay				Sand		
		Case No.	Pole Height (Ft.)	Base Plate BC (In.)	Moment at the Pole Base (ft-kp)	Medium N-Value 4-8	Stiff N-Value 9-15	Very Stiff N-Value 16-30	Hard N-Value >30	Loose N-Value 4-10	Medium N-Value 11-30	Dense N-Value >30
WIND ZONE 1	LIGHT	S26L3	26	25	280	20.5	14.0	11.5	9.5	18.0	16.0	14.0
		S30L3	30	25	310	21.0	14.5	11.5	9.5	18.5	16.5	14.5
		S35L3	35	25	350	22.5	15.0	12.0	10.0	19.5	17.5	15.5
	HEAVY	S30H3	30	29	450	25.5	16.5	13.0	11.0	21.0	18.5	16.5
		S35H3	35	29	540	26.0	17.0	13.5	11.5	22.0	19.5	17.0
WIND ZONE 2	LIGHT	S26L2	26	23	250	19.5	13.5	11.0	9.0	18.0	15.5	14.0
		S30L2	30	23	290	20.0	14.0	11.5	9.5	18.5	16.0	14.0
		S35L2	35	23	315	21.0	14.5	11.5	9.5	19.0	16.5	14.5
	HEAVY	S30H2	30	29	415	24.5	16.0	13.0	10.5	21.0	18.5	16.0
		S35H2	35	29	485	25.5	16.5	13.5	11.0	21.5	19.0	16.5
WIND ZONE 3	LIGHT	S26L2	26	23	250	18.5	13.0	10.5	9.0	17.5	15.0	13.5
		S30L2	30	23	290	19.5	13.5	11.0	9.0	18.0	15.5	14.0
		S35L2	35	23	315	20.0	14.0	11.5	9.5	18.5	16.0	14.5
	HEAVY	S30H2	30	29	415	23.0	15.5	12.5	10.0	20.5	17.5	16.0
		S35H2	35	29	485	24.0	16.0	13.0	10.5	21.0	18.0	16.5
WIND ZONE 4	LIGHT	S26L1	26	22	195	18.0	13.0	10.5	9.0	16.5	14.5	13.0
		S30L1	30	22	225	18.5	13.0	10.5	9.0	17.0	15.0	13.5
		S35L1	35	22	255	19.0	13.5	11.0	9.0	17.5	15.5	14.0
	HEAVY	S30H1	30	25	330	22.0	15.0	12.0	9.5	19.5	17.0	15.0
		S35H1	35	25	385	23.0	15.5	12.5	10.0	20.0	17.5	15.5
WIND ZONE 5	LIGHT	S26L2	26	23	250	19.0	13.5	10.5	9.0	17.5	15.5	13.5
		S30L2	30	23	290	20.0	14.0	11.0	9.5	18.0	16.0	14.0
		S35L2	35	23	315	21.0	14.5	11.5	10.0	19.0	16.5	14.5
	HEAVY	S30H2	30	29	415	23.5	15.5	12.5	10.5	21.0	18.0	16.0
		S35H2	35	29	485	25.0	16.5	13.0	11.0	21.5	18.5	16.5

Concrete Volume (cubic yards)=.356 X L

Fabrication Design Notes:

1. Values shown in "Moment at the Pole Base" column represents the minimum acceptable capacity allowable for design using a design CSR of 1.

2. Base plate thickness (T) is 2.0 inches.

Foundation Selection:

1. Perform a standard penetration test at each proposed foundation site to determine "N" value.

2. Select the appropriate wind zone from sheet M 1.

3. Select the soil type (Clay or Sand) that best describes the soil characteristics.

4. Get the appropriate pole case load number from the plans or from the Engineer.

5. Select the appropriate column in the chart based on soil type and "N" value. Select the appropriate row based on the pole load case. The foundation depth is the value where the column and the row intersect.

Standard Strain Poles

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

Standard Strain Poles
and
Standard Foundations

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

SCALE: 0 NA — None

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 028094 DEBESH C. SARKAR

D. Sarkar 9.2.2005
SIGNATURE DATE

02-SEP-2005 12:42
w:\peoples-unit\workgroups\2004 metal pole standards\2004 m8 std strain pole.dgn
palexander

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

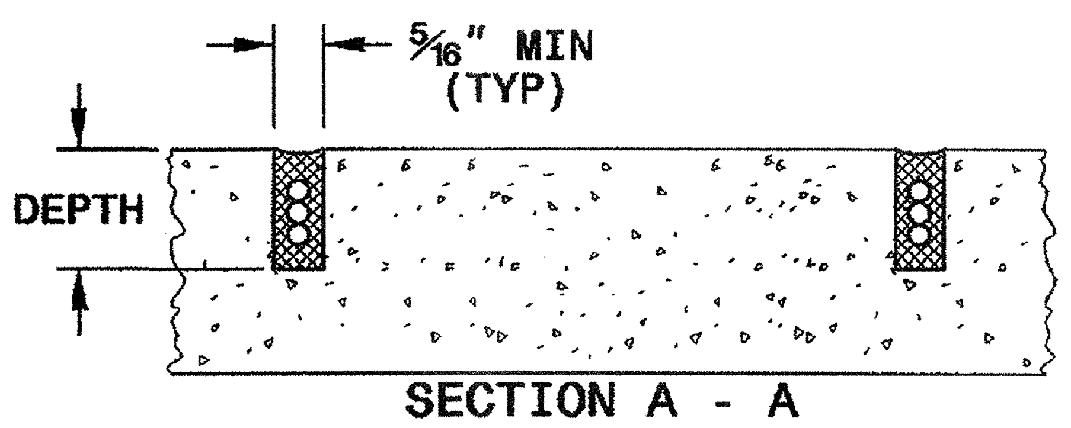
11-08

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS

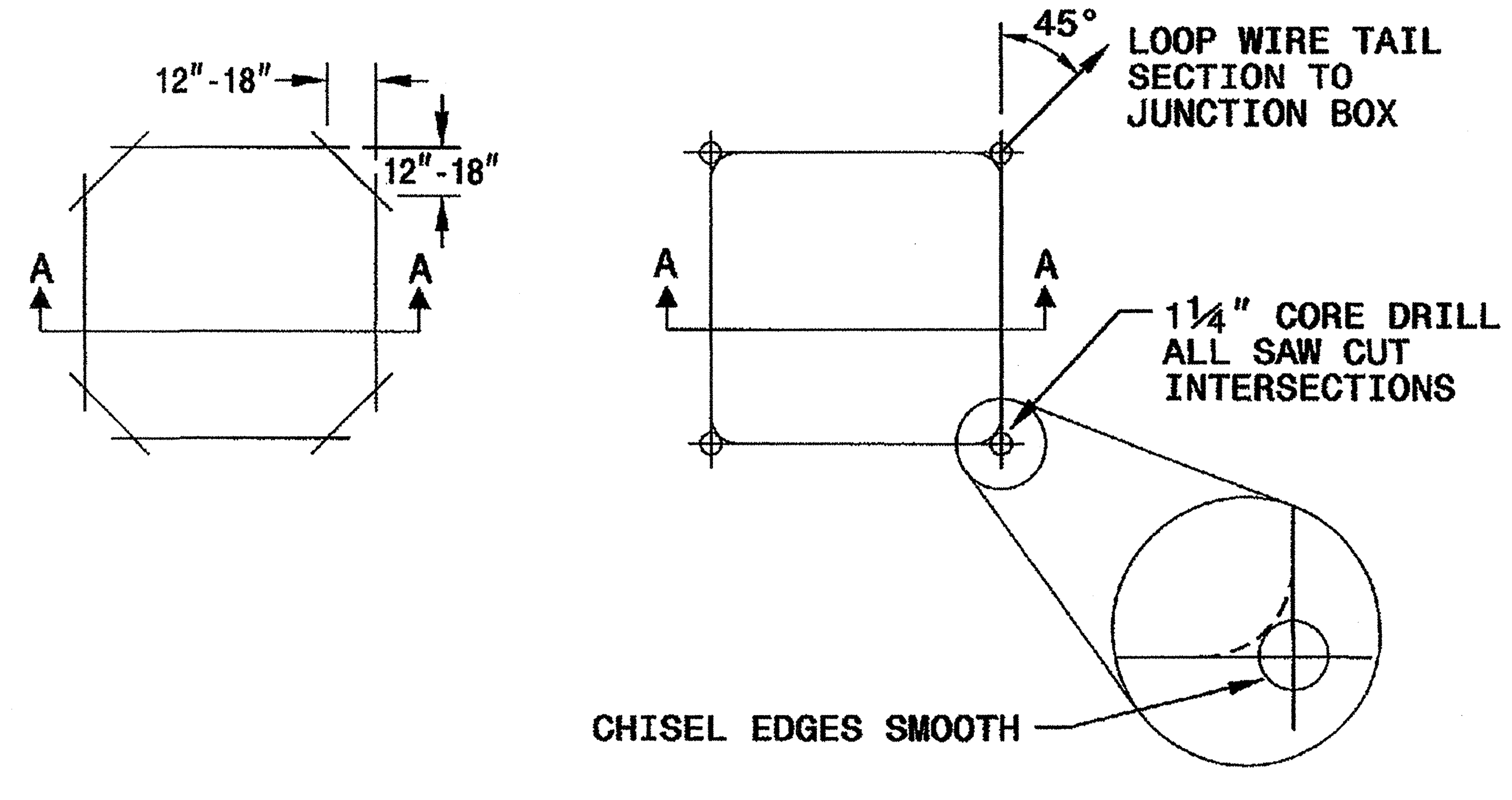
CONVENTIONAL 4-SIDED LOOP

SAW SLOT DEPTH CHART

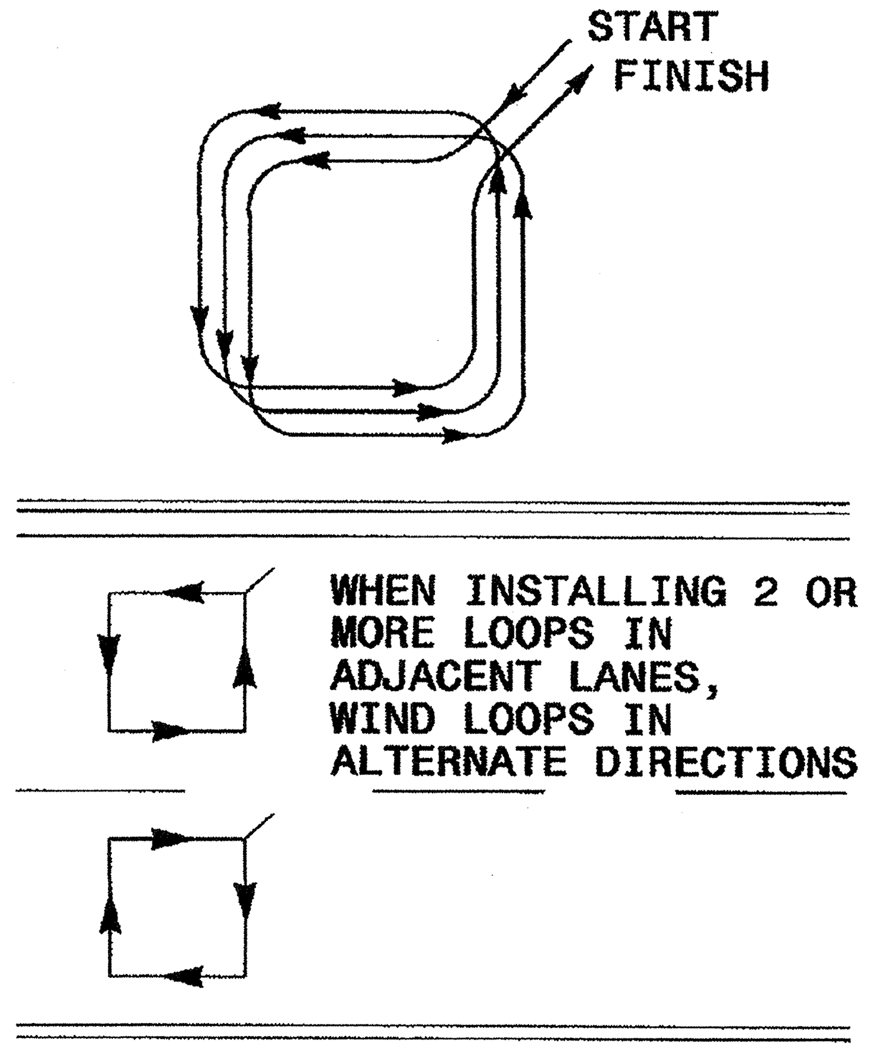
DEPTH (IN)	NO. OF WIRE TURNS 2	3	4	5	6
CONCRETE	2.0	2.0	2.5	2.5	3.0
ASPHALT	2.0	2.5	3.0	3.0	3.0



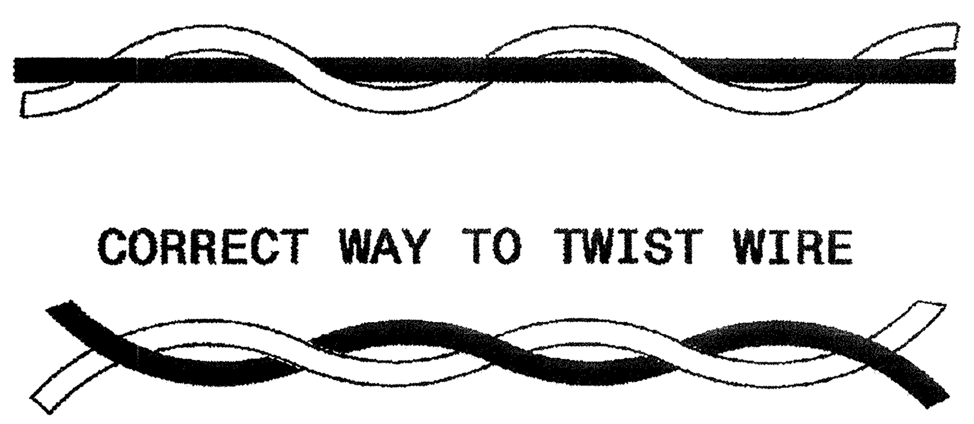
SAW CUT OPTIONS



LOOP WINDING METHOD



LOOP WIRE TWISTING METHOD

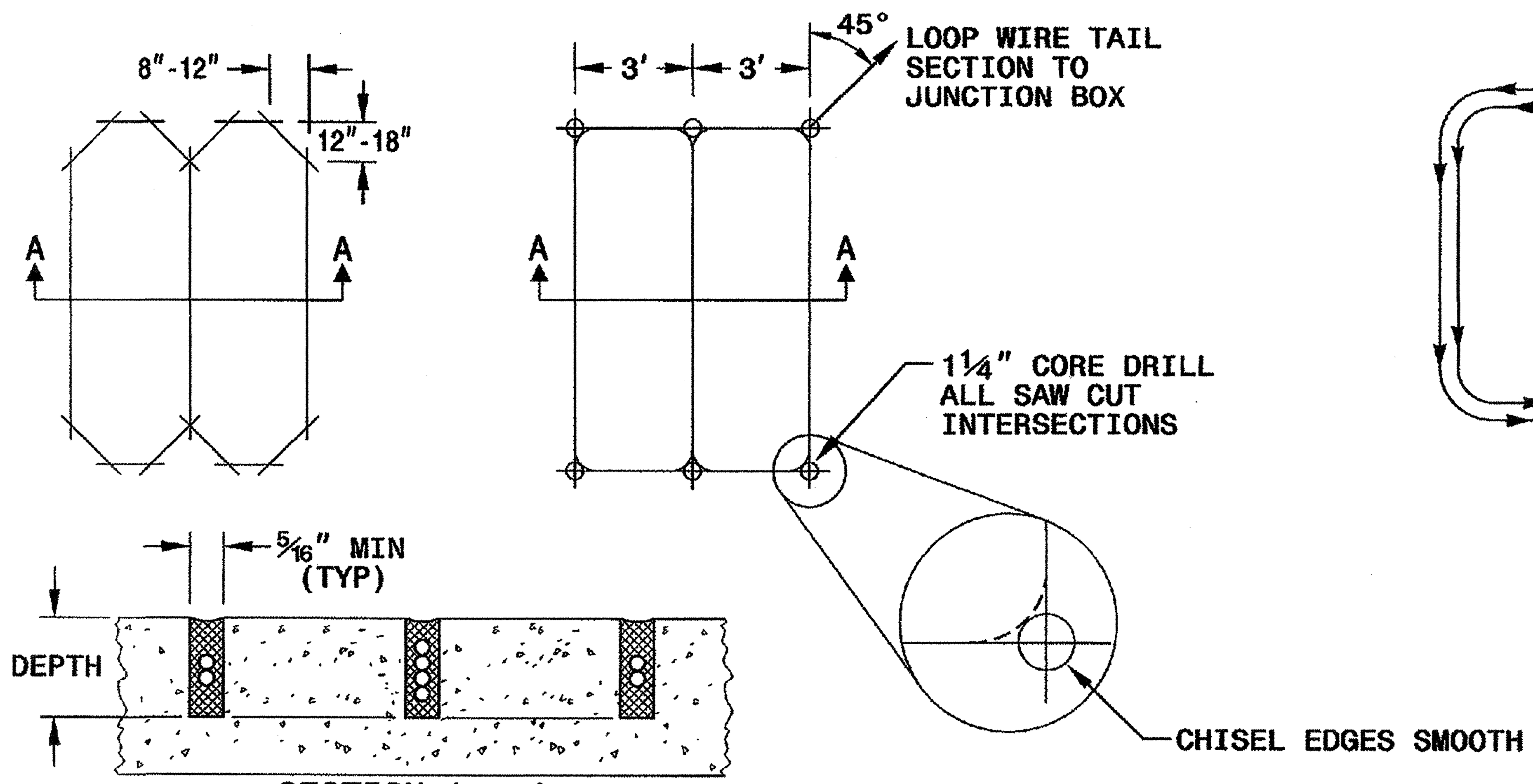


NOTES

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.

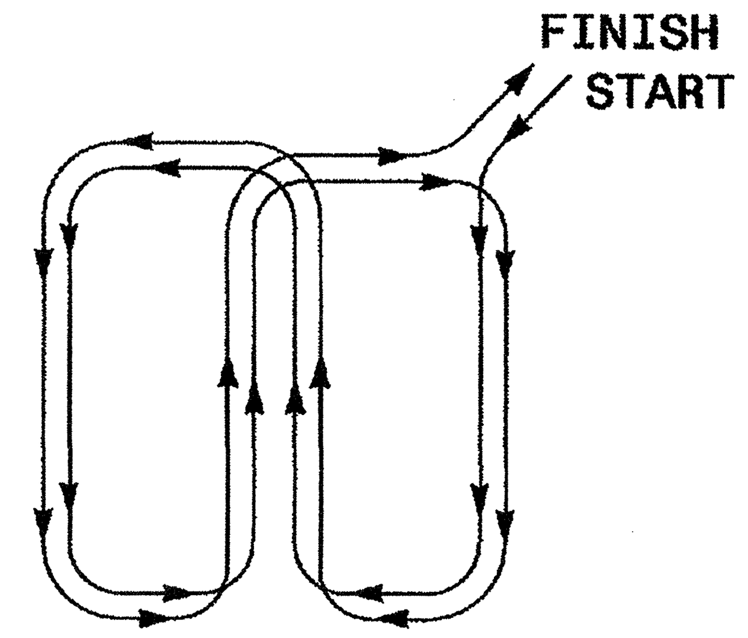
QUADRUPOLE LOOP

SAW CUT OPTIONS



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.
11-08
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
750 N. Greenfield Parkway
Garner, NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 16286 MILTON I. DEAN

SIGNATURE 11/24/08 DATE

PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig.19

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

11-08

ENGLISH DETAIL DRAWING FOR

INDUCTIVE DETECTION LOOPS

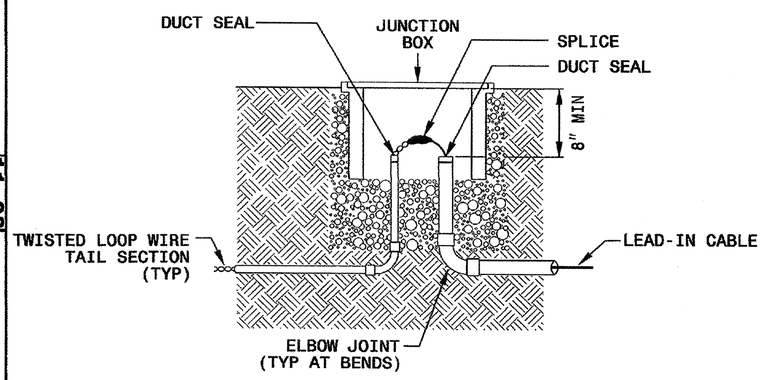
LOOP WIRE DETAILS

SHEET 2 OF 3

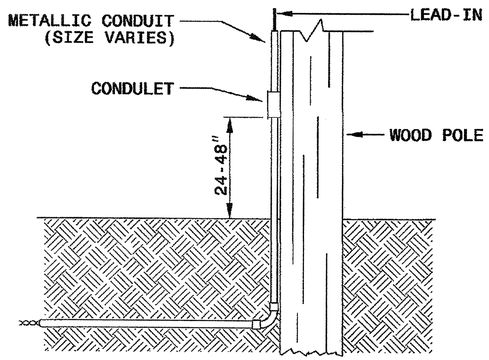
1725D01

LOOP WIRE SPLICE POINT DETAILS

LOOP WIRE AT JUNCTION BOX



LOOP WIRE AT POLE

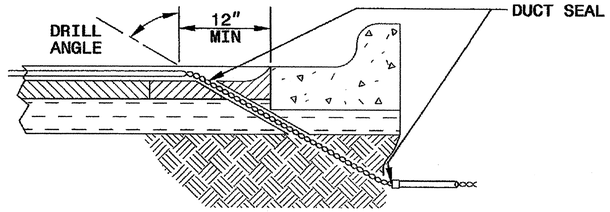


NOTE

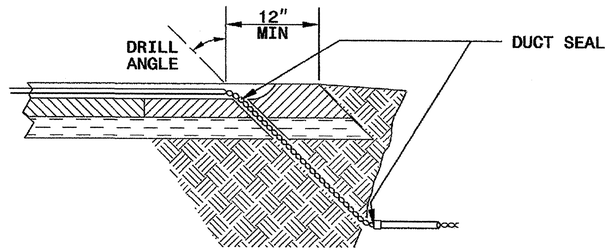
SPLICE ALL LOOP WIRE TAIL SECTIONS/LEAD-IN CABLE IN JUNCTION BOXES OR APPROVED CONDULETS.

LOOP WIRE PAVEMENT EDGE DETAILS

LOOP WIRE AT CURB & GUTTER SECTION



LOOP WIRE AT PAVEMENT SECTION



NOTES

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

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

11-08

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
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

750 N. Greenfield Parkway
Garner, NC 27529

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 16286 ENGINEER MILTON I. DEAN

Milton I. Dean 11/24/08
SIGNATURE DATE

24-NOV-2008 09:29
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zmillie

PROJECT REFERENCE NO.	SHEET NO.
U-3405	Sig.20

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

11-08

ENGLISH DETAIL DRAWING FOR

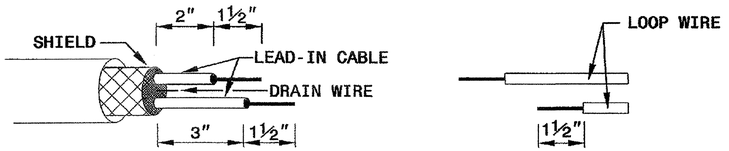
INDUCTIVE DETECTION LOOPS

SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

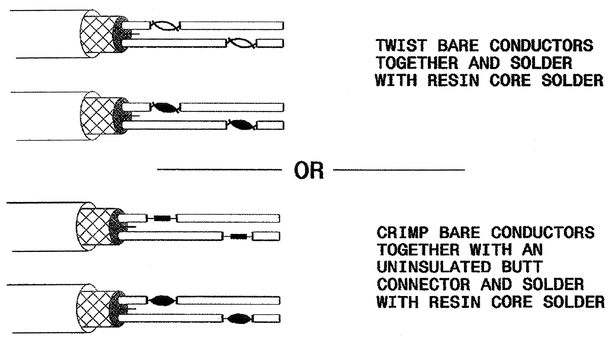
SHEET 3 OF 3

1725D01

STEP 1. STRIP LOOP WIRE AND LEAD-IN CABLE



STEP 2. CONNECT AND SOLDER



TWIST BARE CONDUCTORS TOGETHER AND SOLDER WITH RESIN CORE SOLDER

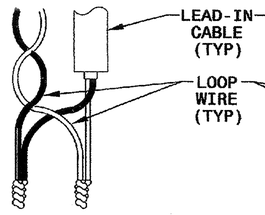
OR

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

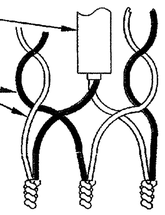
BOND SHIELD DRAIN WIRE AT SPLICE SECTIONS (DO NOT GROUND)

LOOP WIRE AND LEAD-IN CABLE CONNECTION DETAILS

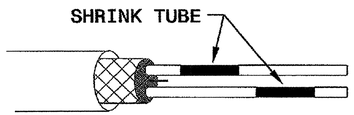
SINGLE CONNECTION



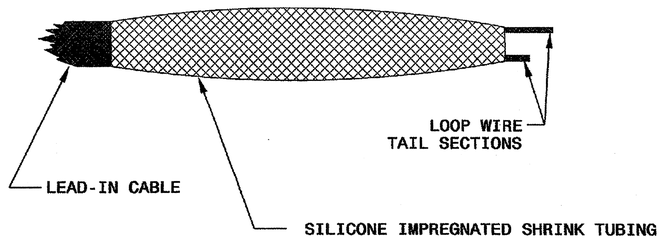
SERIES CONNECTION



STEP 3. INSULATE EACH SOLDER JOINT SEPARATELY



STEP 4. ENVIRONMENTALLY PROTECT SPLICE



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

11-08

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 16286 ENGINEER MITTON I. DEAN

SIGNATURE

11/24/08

DATE

24-NOV-2008 09:36
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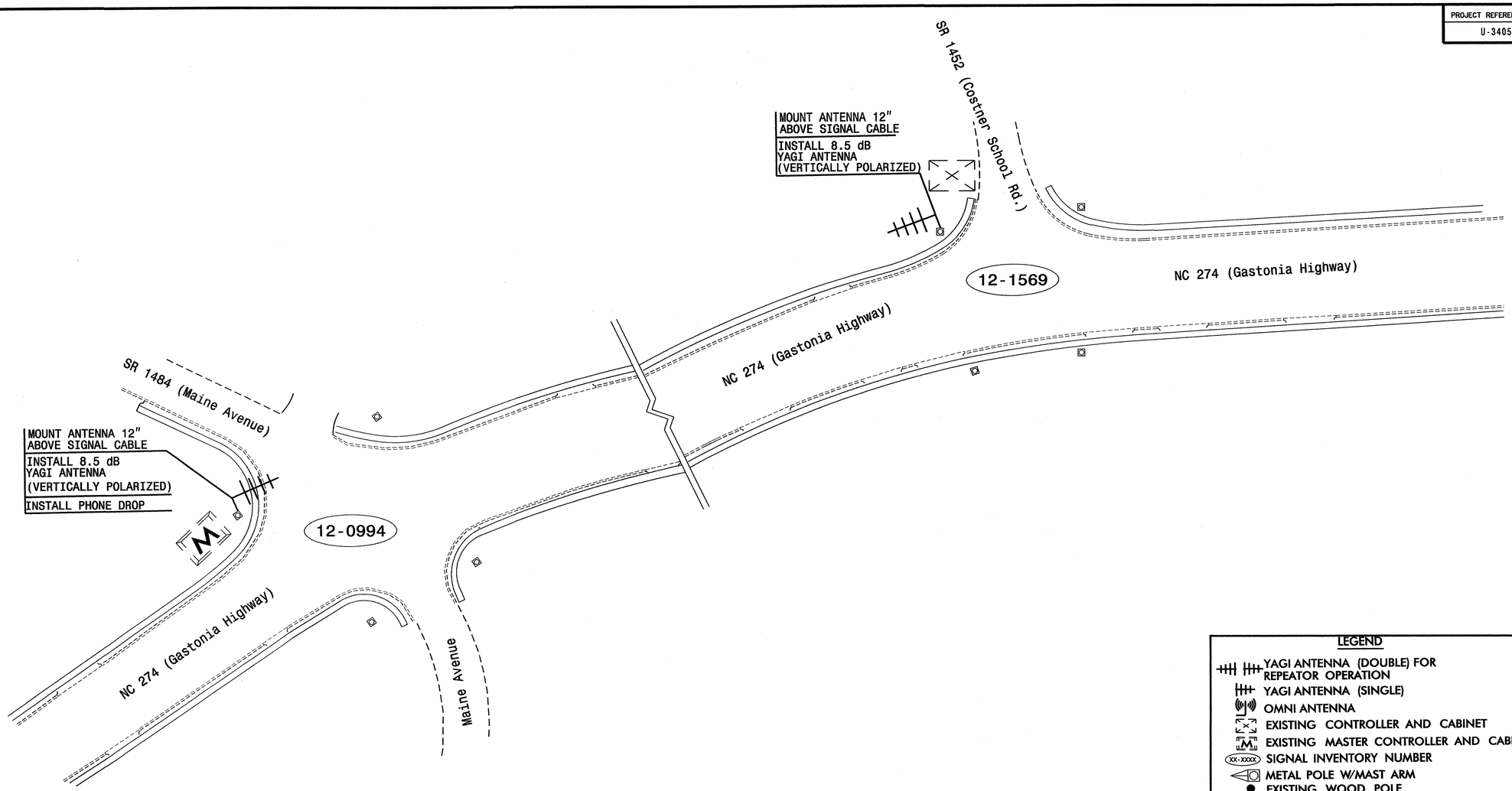
zmitton

PROJECT REFERENCE NO.	SHEET NO.
U-3405	SIG.21



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
- METAL POLE W/MAST ARM
- EXISTING WOOD POLE
- NEW METAL POLE
- SP SIGNAL POLE
- EXISTING METAL POLE

NOTES:

1. INSTALL COAXIAL CABLE
   A. ON WOOD POLES, INSTALL A 2" RISER WITH HEAT SHRINK TUBING TO ROUTE THE COAXIAL CABLE TO THE ANTENNA.
   B. ON METAL POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE MAST ARM; FIELD DRILL 1/2" 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 CABLES. RESEAL WITH HEAT SHRINK TUBING.
3. INSTALL WIRELESS ANTENNA ON POLE WITH RF WARNING SIGN AND AIM TOWARDS MASTER.
4. MAINTAIN PROPER CLEARANCE FROM ALL UTILITIES PER THE NATIONAL ELECTRICAL SAFETY CODE.
5. INSTALL WIRELESS SERIAL RADIO MODEM WITH EXTERIOR DISCONNECT SWITCH LOCATED ON CABINET. (NOTE: RF ANTENNA DISCONNECT SWITCH NOT REQUIRED ON NCDOT-OWNED POLE.)
6. REFERENCE "WIRELESS RADIO ANTENNA TYPICAL DETAILS."

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

SCALE: 0

WIRELESS COMMUNICATIONS PLAN ALONG NC 274 FROM MAINE AVE. TO COSTNER SCHOOL ROAD

DIVISION 12 GASTON COUNTY BESSEMER

PLAN DATE:	JANUARY 2009	REVIEWED BY:	I. N. AVERY
PREPARED BY:	P. C. LOUDER	REVIEWED BY:	G. A. FULLER, PE

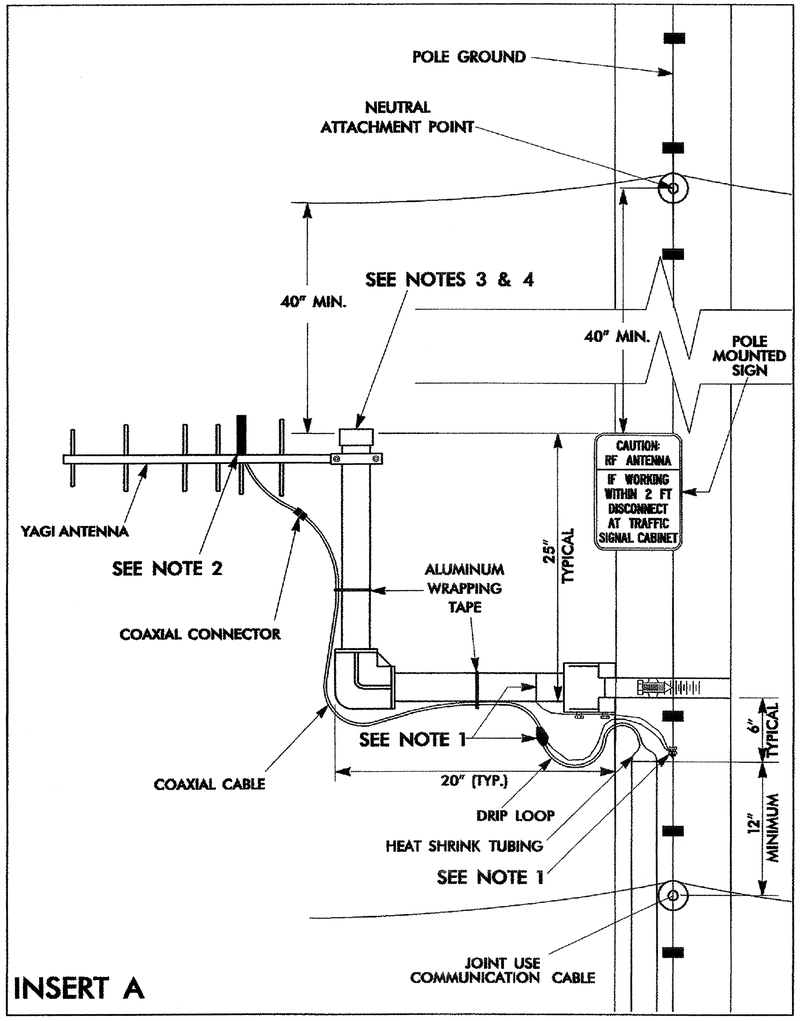
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

SIGNATURE DATE

CADD Filename:

PROJECT REFERENCE NO.	SHEET NO.
U-3405	S16,22



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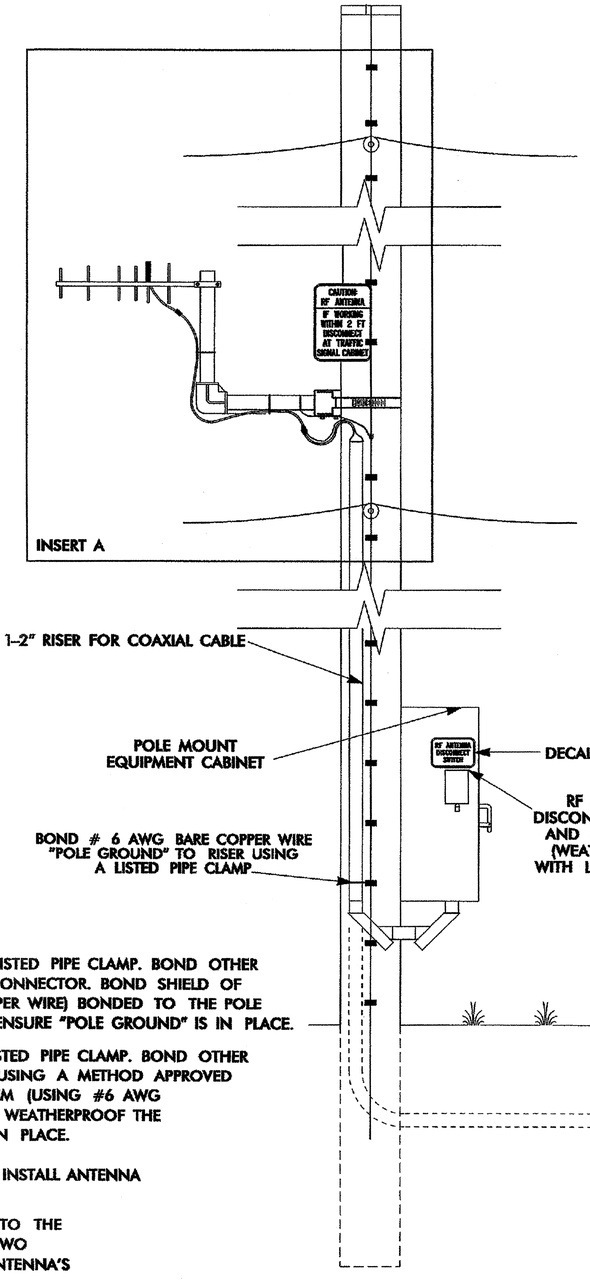
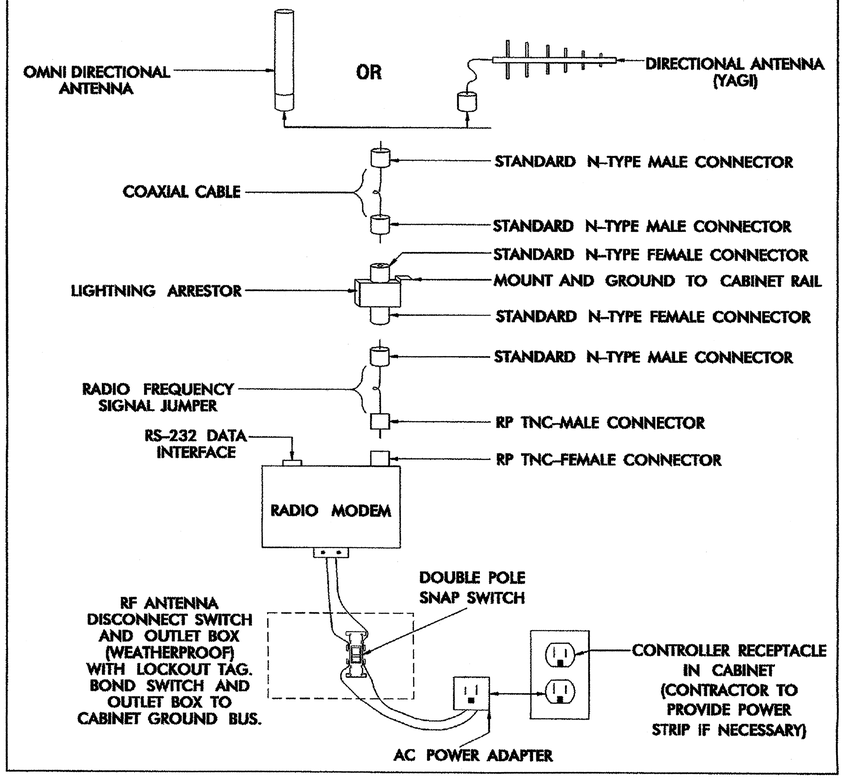


ANTENNA AND COAXIAL CABLE CONNECTION SCHEMATIC



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 Office of:
Traffic Engineering and Safety Systems Branch
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Traffic Management Systems
1122 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

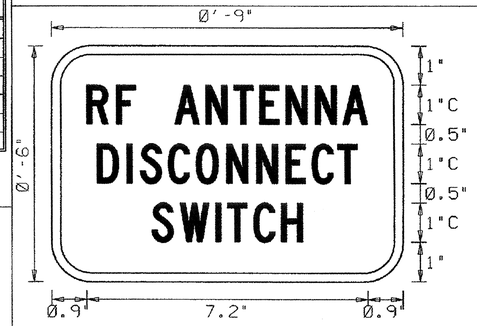
SCALE: 0

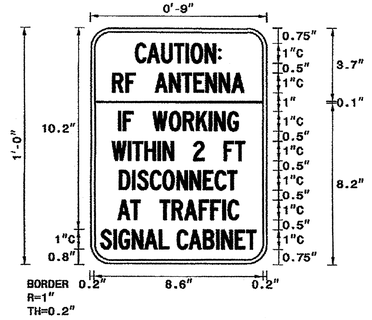
REVISIONS	UNIT.	DATE
UPDATE GROUNDING - COAXIAL CABLE SHIELD	TMS	4/13/06

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 023919 ENGINEER GREGORY A. FULLER

SIGNATURE: Gregory A Fuller DATE: 9/12/05

CADD Filename:





PROJECT REFERENCE NO.	SHEET NO.
U-3405	SIG.23

DECAL

SIGN NUMBER: SP05224
TYPE: DECAL
QUANTITY:

BACKG COLOR: Yellow
COPY COLOR: Black

SYMBOL	X	Y	WID	HT

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

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

MAT'L: 0.063" (1.6 mm) ALUMINUM

NO. Z BARS:
LENGTH:

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

NOTE:
THIS
SIGN
SHALL
BE
PRODUCED
AS
A
DECAL

USE NOTES: 2, 4
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:

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:

BACKG COLOR: Yellow
COPY COLOR: Black

SYMBOL	X	Y	WID	HT
BAR	0.2	8.2	8.6	1.0

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

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

MAT'L: 0.063" (1.6 mm) ALUMINUM

NO. Z BARS:
LENGTH:

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

0.60 SPACING FACTOR

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:

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: