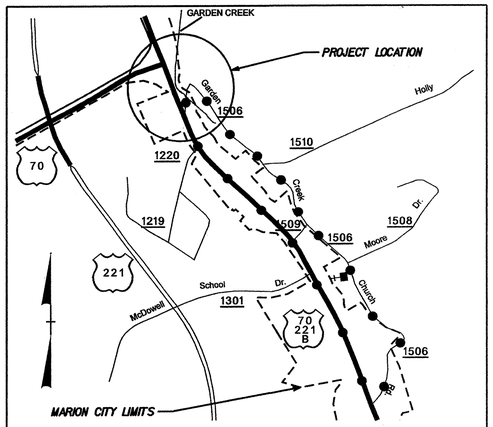
STATE	PROJECT NO.	SHEET NO.
N.C.	B-4196	Sig. 1
F. A. PROJ. NO.		
PROJECT ID. NO.		

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

McDOWELL COUNTY

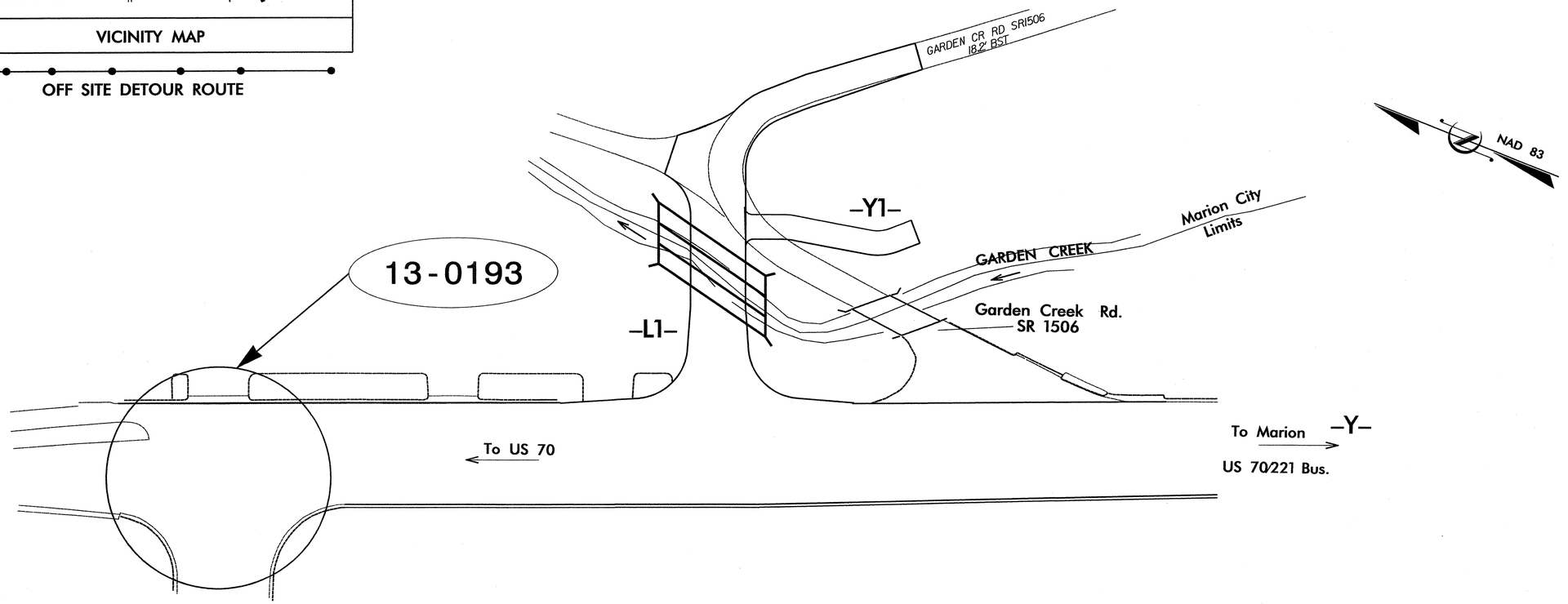
LOCATION: *Bridge No. 238 over Garden Creek on SR 1506, Garden Creek Road in Marion*

TYPE OF WORK: TRAFFIC SIGNALS



VICINITY MAP

OFF SITE DETOUR ROUTE



PROJECT: B-4196

INDEX OF PLANS

SHEET NO.	SIGNAL INVENTORY NO.	LOCATION /DESCRIPTION
SIG. 1	N/A	Title Sheet
SIG. 2-3	13-0193	US 70 at US 70/221 Bus./NC 226 and US 221 Bus./NC 226
SIG. 4-6	N/A	Inductive Detection Loops Details

LEGEND

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

NCDOT CONTACTS:

INTELLIGENT TRANSPORTATION SYSTEMS & SIGNALS UNIT

Timothy J. Williams, PE – S&G Contracts Engineer

George C. Brown, PE – Signal Equipment Design Engineer

Prepared in the Offices of:

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

750 N. Greenfield Parkway, Garner, NC 27529

PROJECT REFERENCE NO.	SHEET NO.
B-4196	Sig. 2

PHASING DIAGRAM

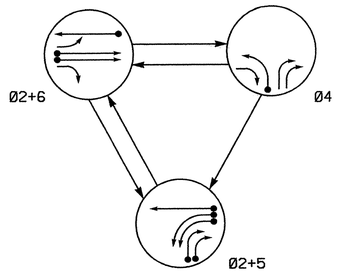


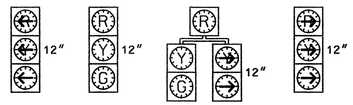
TABLE OF OPERATION				
SIGNAL FACE	PHASE Ø2+5	PHASE Ø2+6	PHASE Ø4	PHASE FLASH
21, 22	G	G	R	Y
41	~~R~~	~~R~~	←	~~R~~
42, 43	→	~~R~~	→	~~R~~
51, 52	←	~~R~~	~~R~~	~~R~~
61, 62	R	G	R	Y
63	R	G	R/→	Y

2070L LOOP & DETECTOR INSTALLATION

INDUCTIVE LOOPS					DETECTOR PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PHASE	CALLING	EXTENSION	FULL TIME DELAY	STRETCH TIME	DELAY TIME	SYSTEM LOOP	NEW CARD
2A	6X6	320	4	Y	2	Y	Y	—	1.9	—	—	Y
2B	6X6	90	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	—	—	—	—	Y
5B	6X40	0	2-4-2	Y	5	Y	Y	—	—	—	—	Y
5C	6X40	0	2-4-2	Y	5	Y	Y	—	—	10	—	Y
5D	6X40	0	2-4-2	Y	5	Y	Y	—	—	15	—	Y
6A	6X6	300	4	—	6	Y	Y	—	1.6	—	—	Y
6B	6X6	90	4	—	6	Y	Y	—	—	—	—	Y
6C	6X6	90	4	—	6	Y	Y	—	—	—	—	Y

SIGNAL FACE I.D.

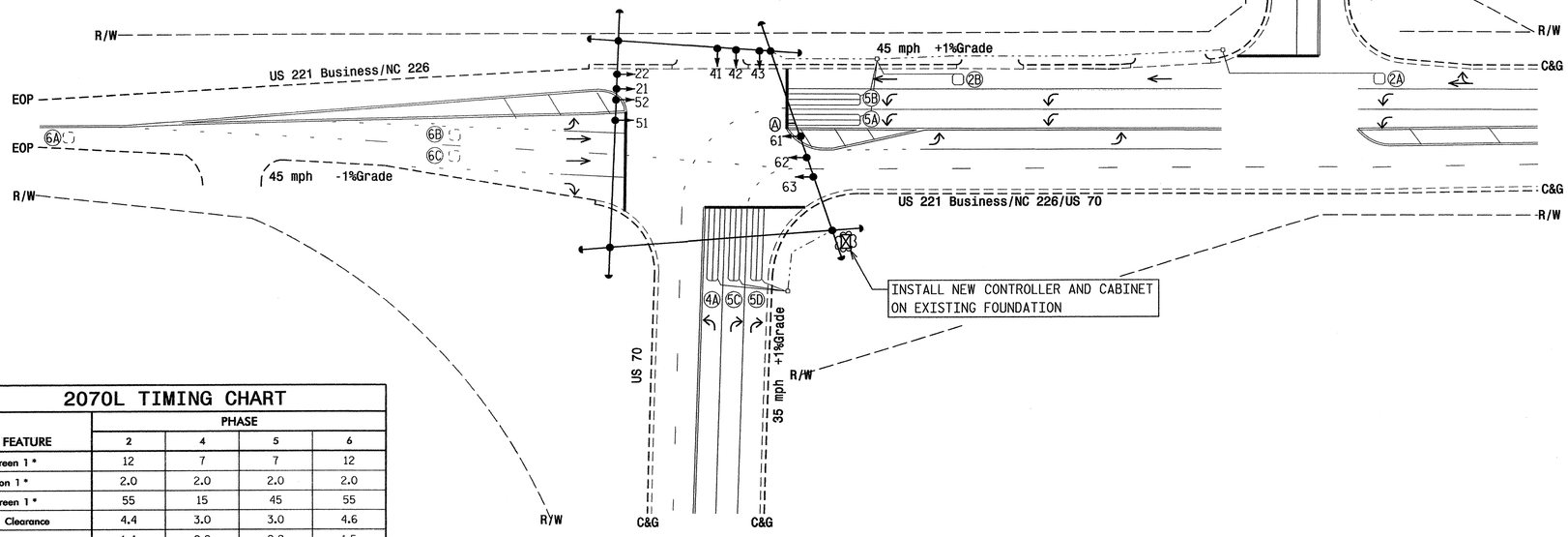
Denotes L.E.D.



41, 51, 52 | 21, 22, 61, 62 | 63 | 42, 43

PHASING DIAGRAM DETECTION LEGEND

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



2070L TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 5	PHASE 6
Min Green 1 *	12	7	7	12
Extension 1 *	2.0	2.0	2.0	2.0
Max Green 1 *	55	15	45	55
Yellow Clearance	4.4	3.0	3.0	4.6
Red Clearance	1.4	2.9	2.9	1.5
Red Revert	5.0	2.0	2.0	2.0
Walk 1 *	-	-	-	-
Don't Walk 1	-	-	-	-
Seconds Per Actuation *	-	-	-	-
Max Variable Initial *	-	-	-	-
Time Before Reduction *	-	-	-	-
Time To Reduce *	-	-	-	-
Minimum Gap	-	-	-	-
Recall Mode	MIN RECALL	-	-	MIN RECALL
Vehicle Call Memory	YELLOW	-	-	YELLOW
Dual Entry	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON

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

3 Phase
Fully 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. 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. Phase 5 may be lagged.
5. Reposition existing signal heads numbered 21, 22, 51 and 52.
6. Set all detector units to presence mode.
7. Place cabinet so as not to obstruct sight distance of vehicles turning right on red.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
T	Sign	T
○↓□	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	→
Ⓐ	Curved Left Turn "ONLY" Sign (R3-5L)	Ⓐ

Signal Upgrade

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

US 70
at
221 Business/NC 226/US 70
and US 221 Business/NC 226

Division 13 McDowell County Marion

PLAN DATE: April 2008 REVIEWED BY:

PREPARED BY: I. O. Umozurike REVIEWED BY:

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 24393 ENGINEER TIMOTHY D. WILLIAMS

T.D.W. 4/28/08
SIGNATURE DATE

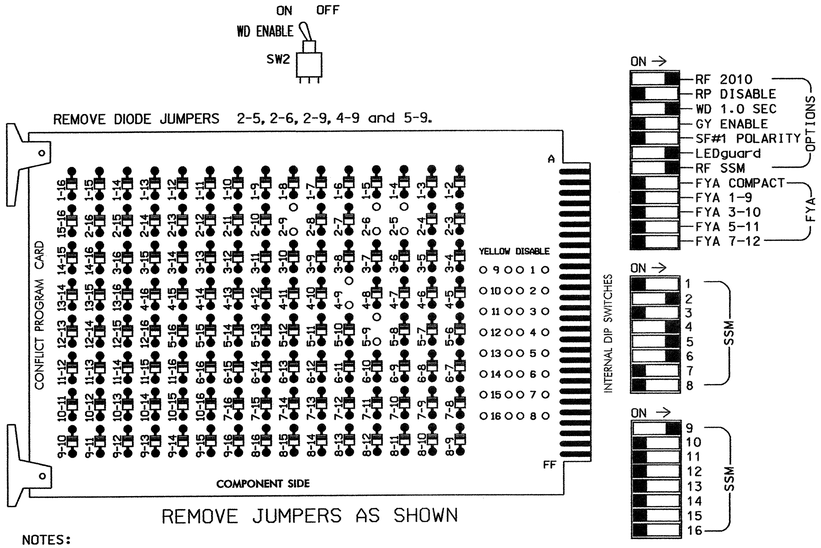
SIG. INVENTORY NO. 13-0193

05-MAY-2008 13:47
S:\TIG SIGNALS\workgroups\tip projects\b-4196\signals\designsignals\13-0193\13-0193_sig_dsn_2006mdd.dgn
lounozurike

PROJECT REFERENCE NO.	SHEET NO.
B-4196	Sig. 3

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 1,3,7,8, 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.

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.

EQUIPMENT INFORMATION

CONTROLLER.....CONTRACTOR SUPPLIED 2070L
CABINET .....CONTRACTOR SUPPLIED 332
SOFTWARE .....ECONOLITE OASIS
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS..18 (12-STD, 6 AUX)
LOAD SWITCHES USED.....S2,S4,S5,S6,S9
PHASES USED.....2,4,5,6
OVERLAP "A".....4+5

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S2P	S3	S4		S4P	S5	S6	S6P	S7	S8	S8P	S9	S10	S11	S12	S13	S14
PHASE	1	2	2 PED	3	4		4 PED	5	6	6 PED	7	8	8 PED	** OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	NU	41	63	NU	51,52	61,62 63	NU	NU	NU	NU	42,43	NU	NU	NU	NU	NU
RED		128							134										
YELLOW		129							135										
GREEN		130							136										
RED ARROW					101			131						A121					
YELLOW ARROW					102	102		132						A122					
GREEN ARROW					103	103		133						A123					
✋																			
🚶																			

NU = NOT USED

** Rewire OLA to flash on flash unit #2 circuit #2

OVERLAP PROGRAMMING DETAIL

(program controller as shown below)

FROM MAIN MENU PRESS '8' (OVERLAPS), THEN '1' (VEHICLE OVERLAP SETTINGS).

```
 PAGE 1: VEHICLE OVERLAP 'A' SETTINGS
 PHASE:          ¦12345678910111213141516
VEH OVL PARENTS: ¦   XX
VEH OVL NOT VEH: ¦
VEH OVL NOT PED: ¦
VEH OVL GRN EXT: ¦
STARTUP COLOR: _ RED  _ YELLOW  _ GREEN
FLASH COLORS:  _ RED  _ YELLOW  _ GREEN
SELECT VEHICLE OVERLAP OPTIONS:   (Y/N)
FLASH YELLOW IN CONTROLLER FLASH?...N
GREEN EXTENSION (0-255 SEC).........0
YELLOW CLEAR (0=PARENT,3-25.5 SEC)..0.0
RED CLEAR (0=PARENT,0.1-25.5 SEC)...0.0
OUTPUT AS PHASE # (0=NONE, 1-16)....0
```

OVERLAP PROGRAMMING COMPLETE

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 2A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L		ø2 2B				NOT USED								ST DC ISOLATOR
FILE "J"	U	ø5 5A	ø5 5C	ø6 6A	ø6 6C	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	ø5 5B	ø5 5D	ø6 6B	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	TB2-5,6	I2U	39	1	2	2	Y	Y		1.9	
2B	TB2-7,8	I2L	43	5	12	2	Y	Y			
4A	TB4-9,10	I6U	41	3	4	4	Y	Y			3
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			10
5D	TB3-7,8	J2L	44	6	16	5	Y	Y			15
6A	TB3-9,10	J3U	64	26	36	6	Y	Y		1.6	
6B	TB3-11,12	J3L	77	39	46	6	Y	Y			
6C	TB5-1,2	J4U	48	10	26	6	Y	Y			

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 13-0193
DESIGNED: April 2008
SEALED: 4-28-08
REVISED: N.A.

Signal Upgrade

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared in the Offices of:

Traffic Engineering and Safety Systems Branch
Division of Highways
North Carolina Department of Transportation
Signals Management Section

750 N. Greenfield Pkwy, Garner, NC 27529

US 70
at
221 Business/NC 226/US 70
and US 221 Business/NC 226

Division 13	McDowell County	Marion
PLAN DATE: 4-29-08	REVIEWED BY:	D.T. Joyce
PREPARED BY: D.H. Spaulding	REVIEWED BY:	

REVISIONS	INIT.	DATE

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 022013 ENGINEER GEORGE C. BROWN

SIGNATURE 4/30/08 DATE

SIG. INVENTORY NO. 13-0193

30-APR-2008 09:07
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dspaulding

PROJECT REFERENCE NO.	SHEET NO.
B-4196	Sig. 4

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

5-07

ENGLISH DETAIL DRAWING FOR

INDUCTIVE DETECTION LOOPS

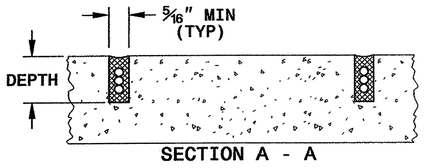
SHEET 1 OF 3

1725D01

CONVENTIONAL 4-SIDED LOOP

SAW SLOT DEPTH CHART

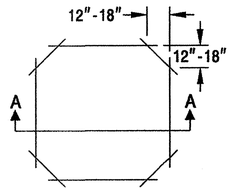
DEPTH (IN)	NO. OF WIRE TURNS				
	2	3	4	5	6
CONCRETE	2.0	2.0	2.5	2.5	3.0
ASPHALT	2.0	2.5	3.0	3.0	3.0



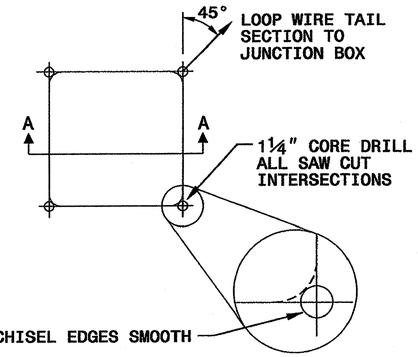
SECTION A - A

SAW CUT OPTIONS

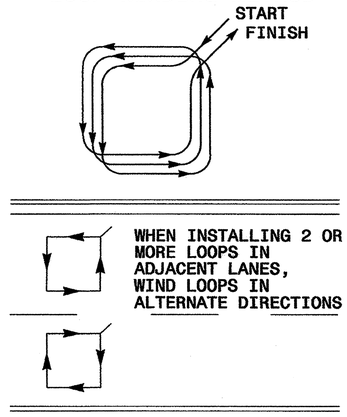
OPTION 1



OPTION 2 (POOR PAVEMENT)



LOOP WINDING METHOD



LOOP WIRE TWISTING METHOD

INCORRECT WAY TO TWIST WIRE

CORRECT WAY TO TWIST WIRE

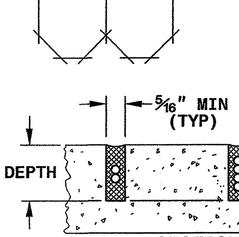
NOTES

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.

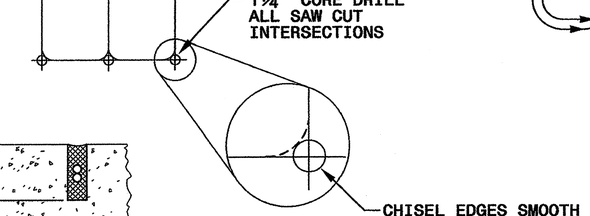
QUADRUPOLE LOOP

SAW CUT OPTIONS

OPTION 1



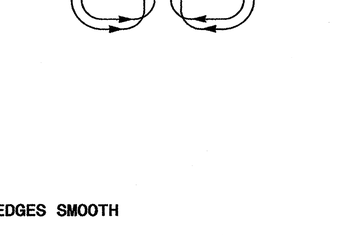
OPTION 2 (POOR PAVEMENT)



SECTION A - A

DEPTH IS 2.5" FOR CONCRETE AND 3.0" FOR ASPHALT

LOOP WINDING METHOD



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
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

05-SEP-2007 14:00
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zmittle

PROJECT REFERENCE NO.	SHEET NO.
B-4196	Sig. 5

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

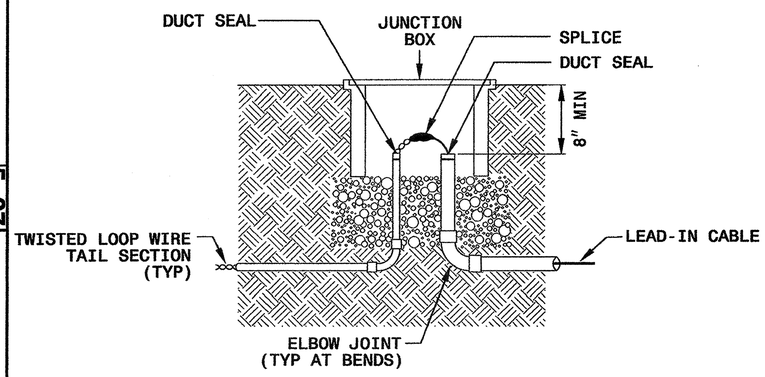
5-07

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

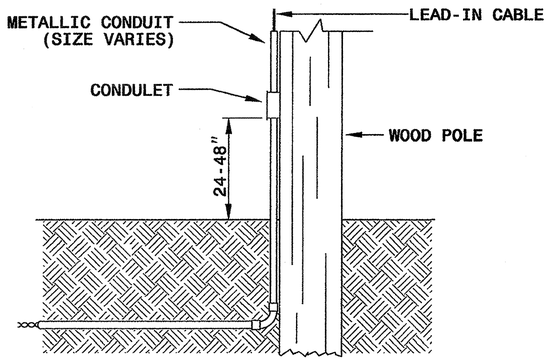
SHEET 2 OF 3
1725D01

LOOP WIRE SPLICE POINT DETAILS

LOOP WIRE AT JUNCTION BOX



LOOP WIRE AT POLE

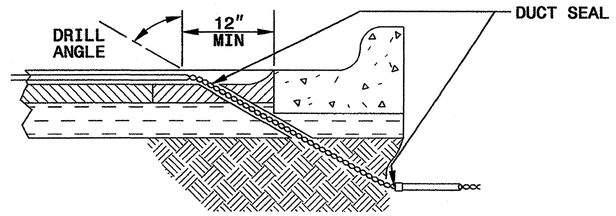


NOTE

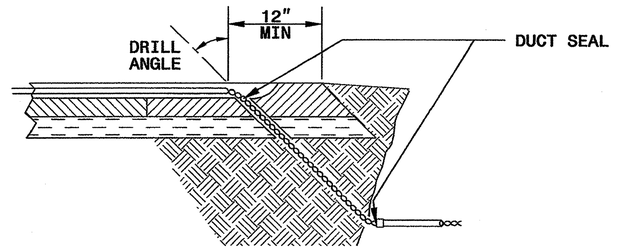
SPLICE ALL LOOP WIRE TAIL SECTIONS/LEAD-IN CABLE IN JUNCTION BOXES OR APPROVED CONDULETS.

LOOP WIRE PAVEMENT EDGE DETAILS

LOOP WIRE AT CURB & GUTTER SECTION



LOOP WIRE AT PAVEMENT SECTION



NOTES

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

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

5-07

ENGLISH DETAIL DRAWING FOR
INDUCTIVE DETECTION LOOPS
LOOP WIRE DETAILS

SHEET 2 OF 3
1725D01

See Plate for Title

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 016286 ENGINEER MILTON I. DEAN

Milton I. Dean 9/5/07
SIGNATURE DATE

05-SEP-2007 14:00
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mdittle

PROJECT REFERENCE NO.	SHEET NO.
B-4196	Sig. 6

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

5-07

ENGLISH DETAIL DRAWING FOR

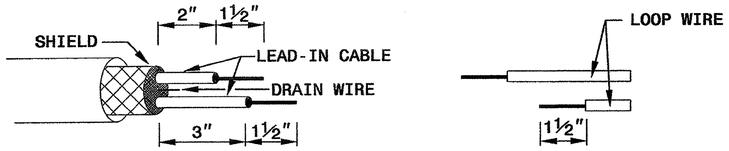
INDUCTION DETECTION LOOPS

SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

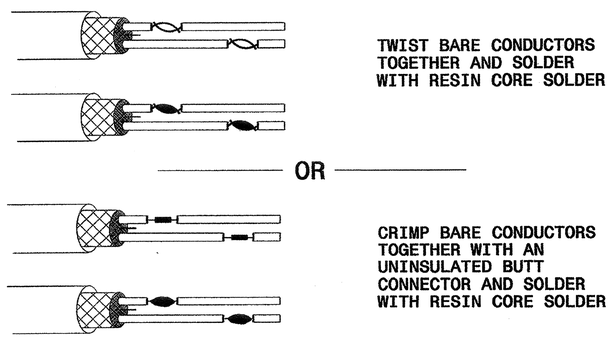
SHEET 3 OF 3

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

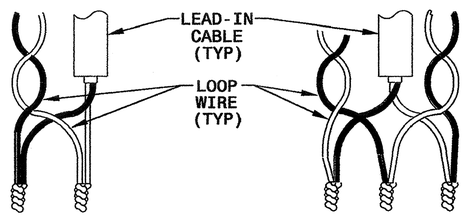
CRIMP BARE CONDUCTORS TOGETHER WITH AN UNINSULATED BUTT CONNECTOR AND SOLDER WITH RESIN CORE SOLDER

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

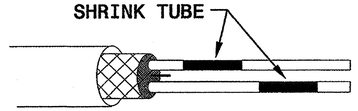
LOOP WIRE AND LEAD-IN CABLE CONNECTION DETAILS

SINGLE CONNECTION

SERIES CONNECTION



STEP 3. INSULATE EACH SOLDER JOINT SEPARATELY



STEP 4. ENVIRONMENTALLY PROTECT SPLICE

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
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

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL 016286 ENGINEER MILTON I. DEAN

Milton I. Dean 9/5/07

SIGNATURE DATE