PROJECT REFERENCE NO.	SHEET NO.
I-5116	1

I–5116
I–540 RESURFACING
WAKE AND DURHAM COUNTIES

BEGIN PROJECT I–5116 (WB LIMITS EXTENDED FOR MILLED RUMBLE STRIPS)

END PROJECT I–5116

2

1

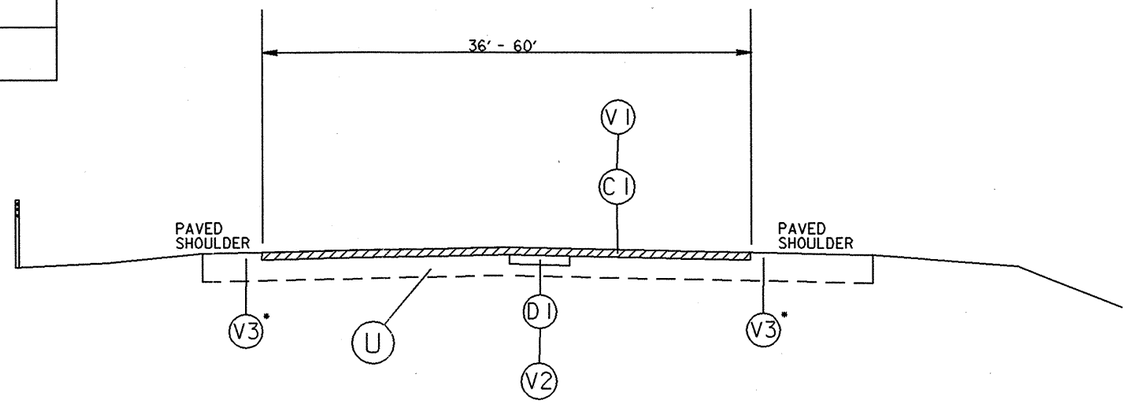
Durham County
Wake County
RALEIGH
CARY
Satellite of Cary
CITY LIMIT
Lumley Road
CRABTREE CREEK SECTION
WILLIAM B. UMSTEAD STATE PARK
Aviation Pkwy
70
540
40

PROJ. REFERENCE NO.	SHEET NO.	TOTAL SHEETS
I-5116	2	4
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
45054.3.ST1	STM-0540(16)	

PAVEMENT SCHEDULE

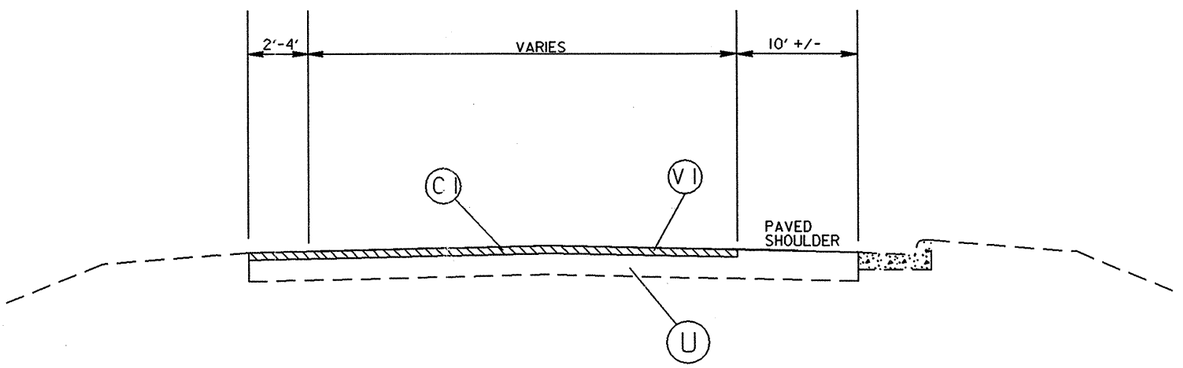
(C1)	PROP. APPROX. 2" ASPH. CONC. SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 224 LBS. PER SQ. YD.
(D1)*	PROP. APPROX. 6" ASPH. CONC. INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 342 LBS. PER SQ. YD., IN EACH OF TWO LIFTS
(V1)	MILL 2" IN DEPTH
(V2)*	MILL 6" IN DEPTH, 6' OR 12' WIDTH
(V3)	PROP. MILLED RUMBLE STRIPS
(S)	PROP. SHOULDER RECONSTRUCTION
(U)	EXISTING PAVEMENT

* NOTE: 6" MILL/PATCH TO BE DONE PRIOR TO 2" MILL AND REPLACE
2" MILL AND REPLACE WILL REMOVE TOP 2" OF PATCH
PAYMENT WILL BE MADE FOR BOTH OPERATIONS



TYPICAL SECTION NO. 1

* NEW MILLED RUMBLE STRIP INSTALLATION BEGINS AT THE STRUCTURE OVER I-40 AND ENDS AT EXISTING MILLED RUMBLE STRIPS NEAR SR 1789.
DO NOT INSTALL NEW MILLED RUMBLE STRIPS ON THE OUTSIDE SHOULDER IN THE AREA INCLUDED IN THE PROJECT LIMITS FOR R-2000AF.



TYPICAL SECTION NO. 2

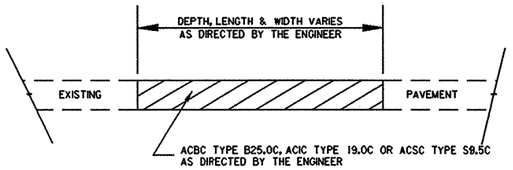
*CONTRACTOR SHALL USE THIS TYPICAL FOR RAMPS WITH CURB AND GUTTER

PROJ. REFERENCE NO.	SHEET NO.	TOTAL SHEETS
I-5116	3	4
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
45054.3.ST1	STM-0540(16)	

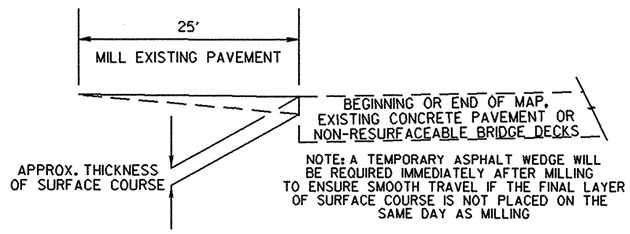
PAVEMENT SCHEDULE

(C1)	PROP. APPROX. 2" ASPH. CONC. SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 224 LBS. PER SQ. YD.
(D1)*	PROP. APPROX. 6" ASPH. CONC. INTERMEDIATE COURSE, TYPE 119.0C, AT AN AVERAGE RATE OF 342 LBS. PER SQ. YD., IN EACH OF TWO LIFTS
(V1)	MILL 2" IN DEPTH
(V2)*	MILL 6" IN DEPTH, 6' OR 12' WIDTH
(V3)	PROP. MILLED RUMBLE STRIPS
(S)	PROP. SHOULDER RECONSTRUCTION
(U)	EXISTING PAVEMENT

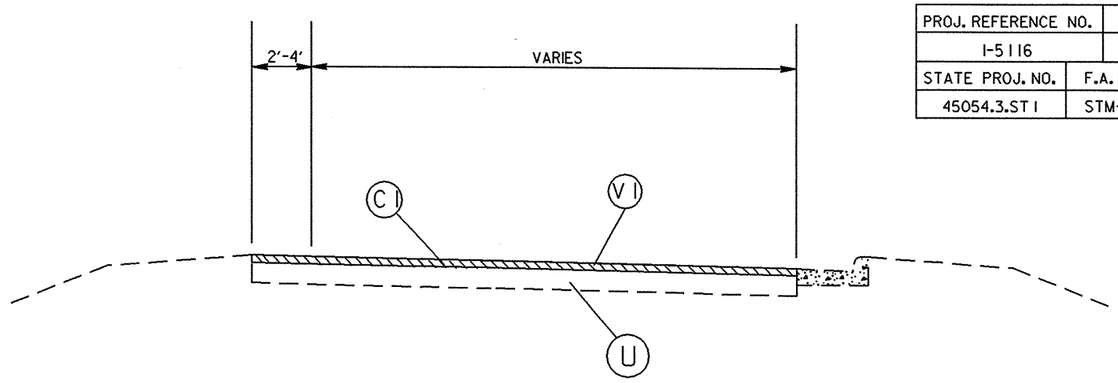
* NOTE: 6" MILL/PATCH TO BE DONE PRIOR TO 2" MILL AND REPLACE
2" MILL AND REPLACE WILL REMOVE TOP 2" OF PATCH
PAYMENT WILL BE MADE FOR BOTH OPERATIONS



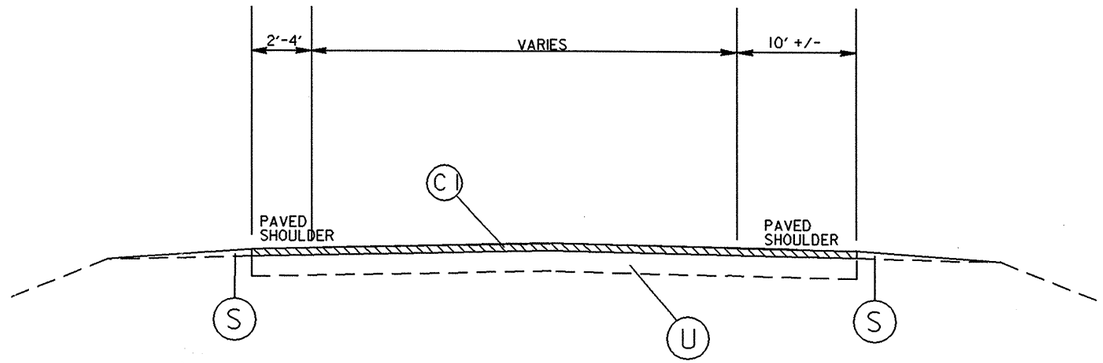
PATCHING EXISTING PAVEMENT



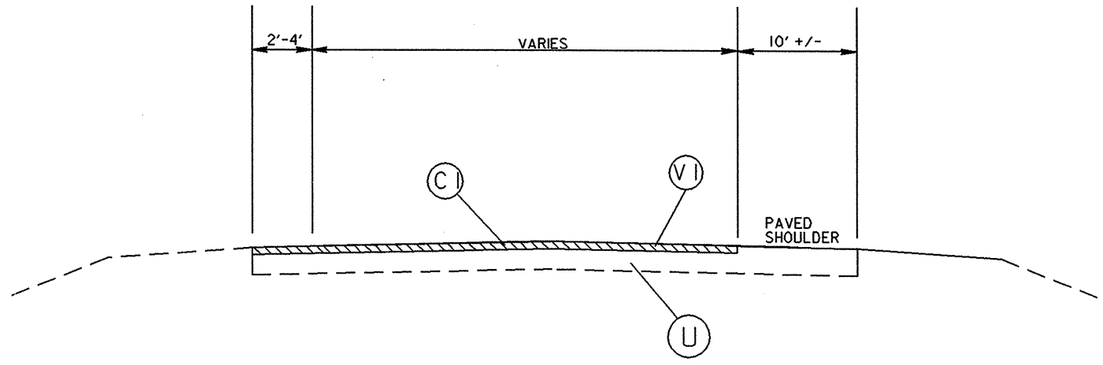
INCIDENTAL MILLNG DETAIL



TYPICAL SECTION NO. 3
*CONTRACTOR SHALL USE THIS TYPICAL FOR THE LOOPS



TYPICAL SECTION NO. 4
*CONTRACTOR SHALL USE THIS TYPICAL FOR THE RAMPS WITHOUT CURB AND GUTTER



TYPICAL SECTION NO. 5
*CONTRACTOR SHALL USE THIS TYPICAL FOR THE COLLECTOR DISTRIBUTOR

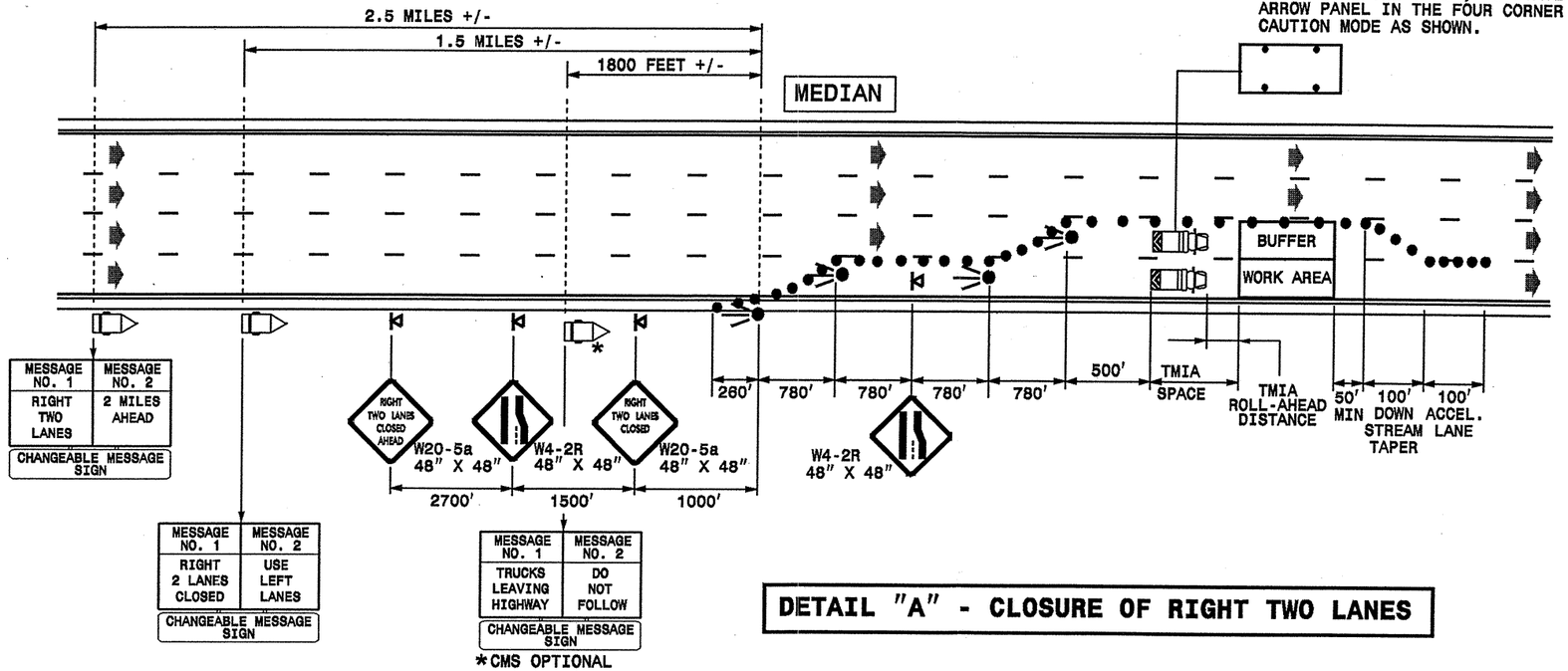
PROJECT NO.	SHEET NO.	TOTAL NO.
I-5116, 45054.3.ST1	4	

SUMMARY OF QUANTITIES

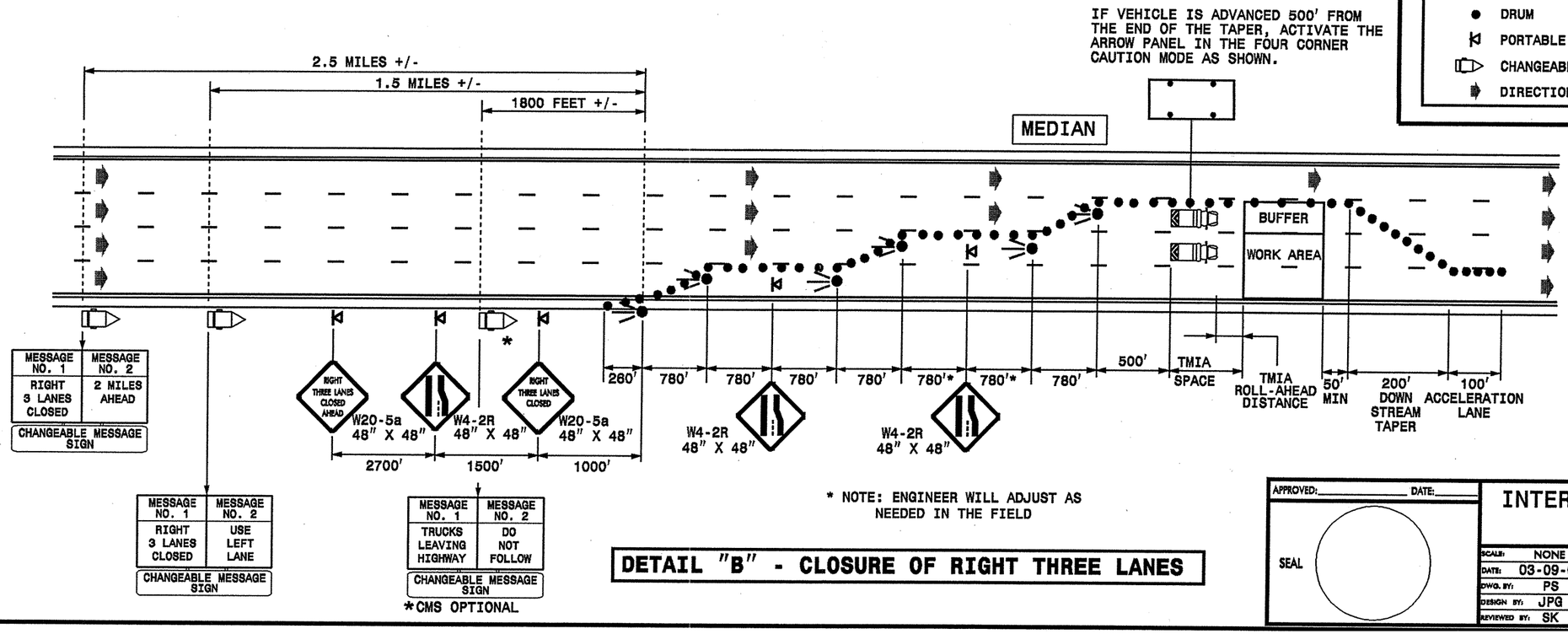
PROJECT NO	COUNTY	MAP NO	ROUTE	DESCRIPTION	TYP NO	LENGTH MI	WIDTH FT	SHOULDER RECON-STRUCTION SMI	2" MILLING SY	6" MILLING SY	MILLED RUMBLE STRIPS LF	INCIDENTAL MILLING SY	INTER-MEDIATE COURSE, I19.0C TONS	SURFACE COURSE, S9.5C TONS	PG 64-22 PLANT MIX TONS	PG 70-22 PLANT MIX TONS	PATCHING EXISTING PAVEMENT TONS	PORTABLE LIGHTING LS	SEED & MULCHING AC	INDUCTIVE LOOP LF
I-5116	Wake & Durham	1	I-540 EB AND RAMPS	FROM PAVEMENT JOINT WEST OF DURHAM CO. LINE TO PAVEMENT JOINT EAST OF US 70	1, 2, 3, 4, 5	3.8	36.5	1.2	169,268	700	6,970	450	260	20,586	12	1,235	90	1	0.90	290
		2	I-540 WB AND RAMPS	FROM BRIDGE OVER US 70 TO PAVEMENT JOINT WEST OF DURHAM COUNTY LINE	1,2,3, 4	3.65	36.5	1.9	138,907	2,300	7,996	560	850	16,084	40	965	140		1.40	
TOTAL FOR PROJ NO. 45054.3.ST1						**7.45**		**3.1**	**308,175**	**3,000**	**14,966**	**1,010**	**1,110**	**36,670**	**52**	**2,200**	**230**	**1**	**2.30**	**290**
GRAND TOTAL						**7.45**		**3.1**	**308,175**	**3,000**	**14,966**	**1,010**	**1,110**	**36,670**	**52**	**2,200**	**230**	**1**	**2.30**	**290**

THERMOPLASTIC AND PAINT QUANTITIES

PROJECT NO	COUNTY	MAP NO	ROUTE	DESCRIPTION	4605000000-N POLICE HR	4589000000-N TRAFFIC CONTROL LS	4688000000-E 6" X 90 M YELLOW THERMO LF	4688000000-E 6" X 90 M WHITE THERMO LF	4690000000-E 6" X 120 M WHITE THERMO LF	4700000000-E 12" X 90 M WHITE THERMO LF	4710000000-E 24" X 120 M WHITE THERMO LF	4721000000-E THERMO MSG ONLY 120 M EA	4725000000-E THERMO LT ARROW 90 M EA	4725000000-E THERMO RT ARROW 90 M EA	4725000000-E THERMO STR ARROW 90 M EA	4775000000-E 6" WHITE COLD APPLIED PLASTIC, TYPE III LF	4775000000-E 6" YELLOW COLD APPLIED PLASTIC, TYPE III LF	4805000000-N COLD APPLIED PLASTIC STR ARROW, TYPE III EA	4855000000-E 6" LINE REMOVAL LF	4875000000-N REML OF PVMT MRKG SYMBOLS & CHARACTERS EA	4905000000-N SNOW PLOWABLE MARKERS EA
I-5116	Wake & Durham	1	I-540 EB AND RAMPS	FROM PAVEMENT JOINT WEST OF DURHAM CO. LINE TO PAVEMENT JOINT EAST OF US 70	2,000	1	49,440	44,933	17,679	8,340	30	8	2	2	11	3,958	3,030		6,988		1,410
		2	I-540 WB AND RAMPS	FROM BRIDGE OVER US 70 TO PAVEMENT JOINT WEST OF DURHAM COUNTY LINE			37,160	32,958	16,568	7,755		8		4	10	3,683	2,810	2	6,493	2	1,258
TOTAL FOR PROJ NO. 45054.3.ST1					**2,000**	**1**	**86,600**	**77,891**	**34,247**	**16,095**	**30**	**16**	**2**	**6**	**21**	**7,641**	**5,840**	**2**	**13,481**	**2**	**2,668**
							164,491							**29**		**13,481**					
GRAND TOTAL					**2,000**	**1**	**86,600**	**77,891**	**34,247**	**16,095**	**30**	**16**	**2**	**6**	**21**	**7,641**	**5,840**	**2**	**13,481**	**2**	**2,668**
							164,491							**29**		**13,481**					



DETAIL "A" - CLOSURE OF RIGHT TWO LANES

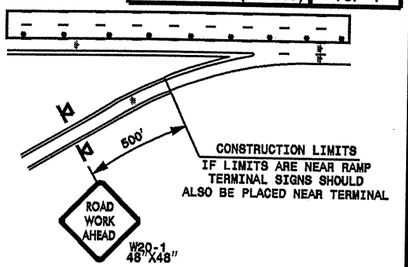


* NOTE: ENGINEER WILL ADJUST AS NEEDED IN THE FIELD

DETAIL "B" - CLOSURE OF RIGHT THREE LANES

PROJ. REFERENCE NO.	SHEET NO.
45054.3.ST1 (I-5116)	TCP-1

MAIN ROADWAY WORK ZONE



ENTRANCE RAMPS

FOR USE ONLY WHEN ONE OR MORE OUTSIDE LANES ARE OPEN DURING A MAINLINE PAVING OPERATION

GENERAL NOTES

1-Refer to Notes on Rdwy Std 1101.02 Sheet 3 of 9.

2-Coordinate use of overhead DMSs with the Division.

3-Use following configuration for FAP (Flashing Arrow Panel)

4-Symbols shown are for Right Lane Closure, use appropriate signs, messages and arrows for Left Lane Closure. Portable CMSs to remain positioned as shown.

LEGEND

- FLASHING ARROW PANEL (TYPE C)
- TRUCK MOUNTED IMPACT ATTENUATOR (TMIA)
- DRUM
- PORTABLE SIGN
- CHANGEABLE MESSAGE SIGN (CMS)
- DIRECTION OF TRAFFIC FLOW

APPROVED: _____ DATE: _____

SEAL

INTERSTATE DUAL/TRIPLE LANE CLOSURE

SCALE:	NONE
DATE:	03-09-06
DWG. BY:	PS
DESIGN BY:	JPG
REVIEWED BY:	SK

REVISIONS
03-09

CADD FILE

03-APR-2009 16:58
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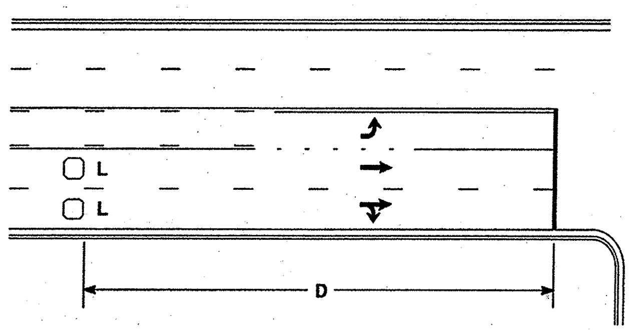
pseymore AT WTC237502

High Speed Detection

[≥40 mph (64 km/hr)]



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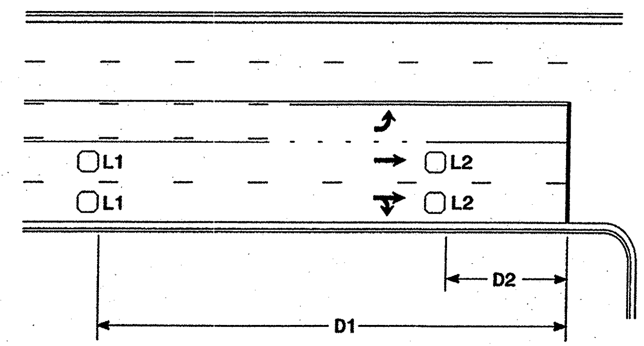


Speed Limit mph (km/hr)		D ft	(m)
40	(64)	250	(75)
45	(72)	300	(90)
50	(80)	355	(110)
55	(88)	420	(130)

L = 6ft X 6ft (1.8m X 1.8m)
Wired in series for TS1 Controllers
Wired separately for TS2, 170, and 2070L Controllers

Volume Density Operation

Speed Limit mph (km/hr)		D1 ft	(m)	D2 ft	(m)
40	(64)	250	(75)	80	(25)
45	(72)	300	(90)	90	(27)
50	(80)	355	(110)	100	(30)
55	(88)	420	(130)	110	(35)

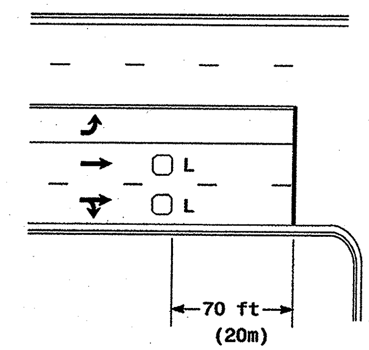
L1 = 6ft X 6ft (1.8m X 1.8m) Wired in series

L2 = 6ft X 6ft (1.8m X 1.8m) Wired in series

"Stretch" Operation

Low Speed Detection

[≤35 mph (56 km/hr)]



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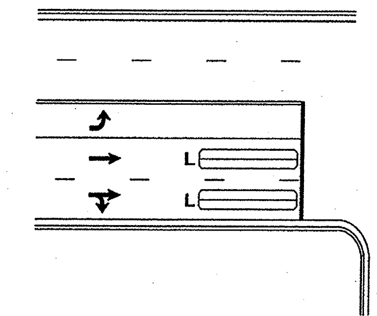
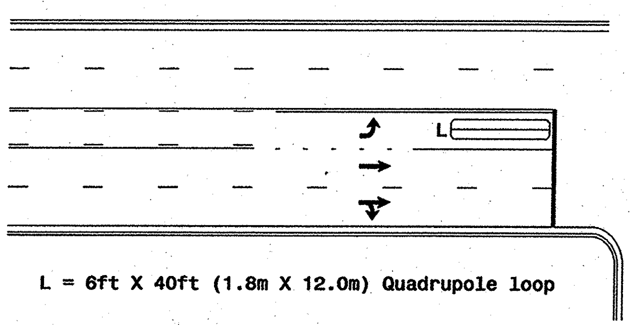


L = 6ft X 6ft (1.8m X 1.8m)
Wired in series

L = 6ft X 40ft (1.8m X 12.0m)
Quadrupole loop, wired separately

Left Turn Lane Detection



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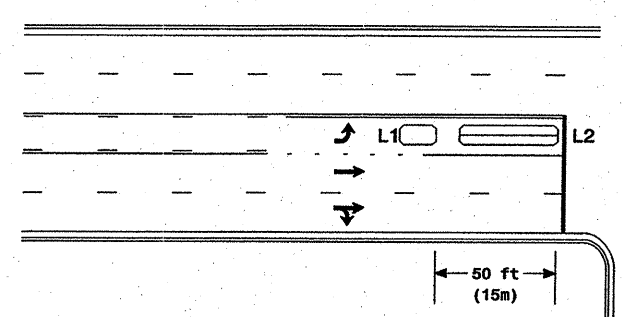


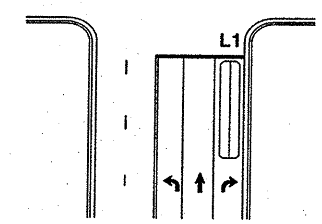
L = 6ft X 40ft (1.8m X 12.0m) Quadrupole loop

Presence Loop Detection

L1 = 6ft X 15ft (1.8m X 4.6m) Queue detector
L2 = 6ft X 40ft (1.8m X 12.0m) Quadrupole loop

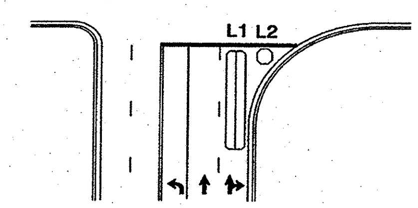
Queue Loop Detection

Right Turn Lane Detection

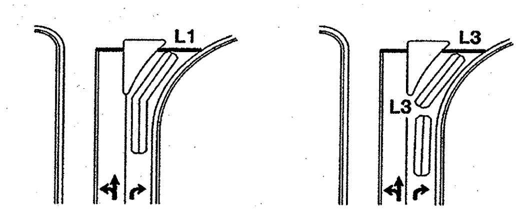


Standard Turn

L1 = 6ft X 40ft (1.8m X 12.0m) Quadrupole loop
L2 = 6ft X 6ft (1.8m X 1.8m) [Minimum] Presence loop
Wired separately
L3 = 6ft X 20ft (1.8m X 6.0m) Quadrupole loop
Wired in series

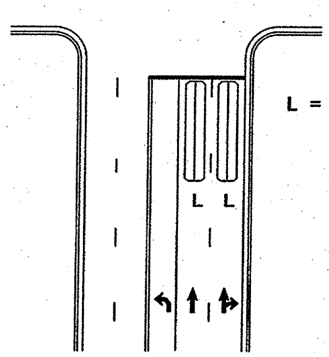


Wide Radius Turn



Channelized Turn

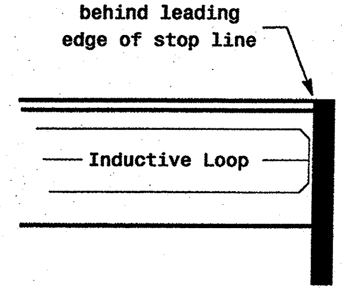
Side Street Detection



L = 6ft X 40ft (1.8m X 12.0m)
Quadrupole loop
Wired to separate detectors/channels

Presence Loop Placement at Stop Lines

Locate loop slightly behind leading edge of stop line



Note:
Loop may be located in advance of stop line when stop line is greater than 15′ (4.5m) from edge of intersecting roadway; or, when loop detects a permissive or protected/permissive left turn.

Recommended Number of Turns

Single 6′ X 6′ (1.8m X 1.8m) loop (wired separately):

Length of Lead-in ft (m)	Number of Turns
< 250 (75)	3
250-375 (75-115)	4
375-525 (115-160)	5
> 525 (160)	6

Quadrupole loops: Use 2-4-2 turns

6′ X 15′ (1.8m X 4.6m) Loops:
Lead-in < 150′ (45 m), use 2 turns
Lead-in > 150′ (45 m), use 3 turns

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

Typical Loop Locations

PLAN DATE: June 2006 | REVIEWED BY:
PREPARED BY: P L Alexander | REVIEWED BY:

SCALE N/A

REVISIONS	INIT.	DATE
Revise pavement markings		12/19/06

SEAL
North Carolina Professional Engineer Seal 23486 Pamela L. Alexander
SIGNATURE | DATE 6/6/06
SIG. INVENTORY NO.

19-DEC-2006 14:29
s:\its signals\lib turn lnsmisc\looptypical2006.dgn
psalexander

PROJECT REFERENCE NO.	SHEET NO.
I-5116	Sig.1

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

5-07

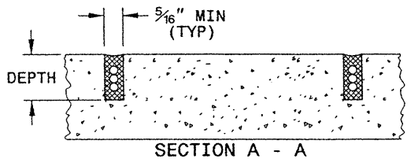
ENGLISH DETAIL DRAWING FOR

INDUCTIVE DETECTION LOOPS

CONVENTIONAL 4-SIDED LOOP

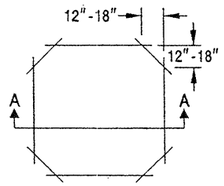
SAW SLOT DEPTH CHART

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

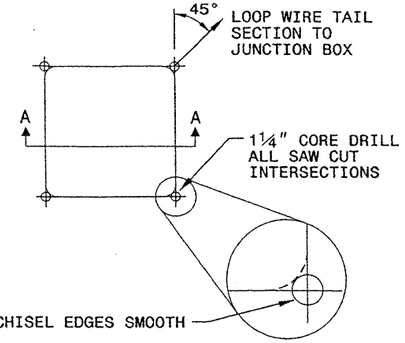


SAW CUT OPTIONS

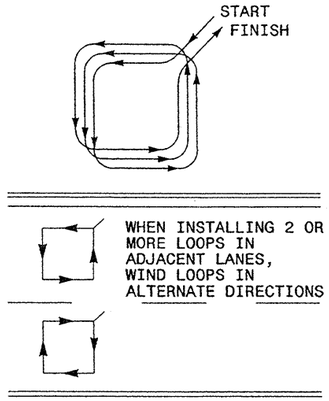
OPTION 1



OPTION 2 (POOR PAVEMENT)



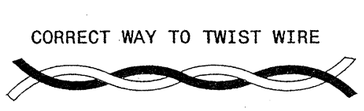
LOOP WINDING METHOD



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)

LOOP WINDING METHOD

DEPTH IS 2.5" FOR CONCRETE AND 3.0" FOR ASPHALT

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
750 N. Greenfield Parkway
Garner, NC 27529

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

05-SEP-2007 14:00
C:\documents and settings\zmillitle.dot\desktop\standard metal pole sheets\1725101.mcy2301.dgn
zmillitle

PROJECT REFERENCE NO.	SHEET NO.
I-5116	Sig. 2

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

5-07

ENGLISH DETAIL DRAWING FOR

INDUCTIVE DETECTION LOOPS

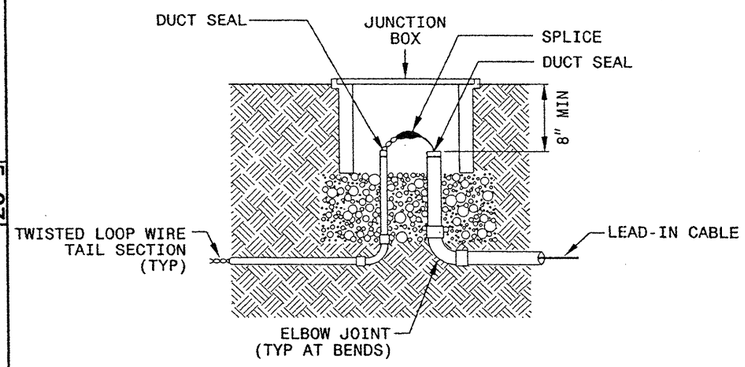
LOOP WIRE DETAILS

SHEET 2 OF 3

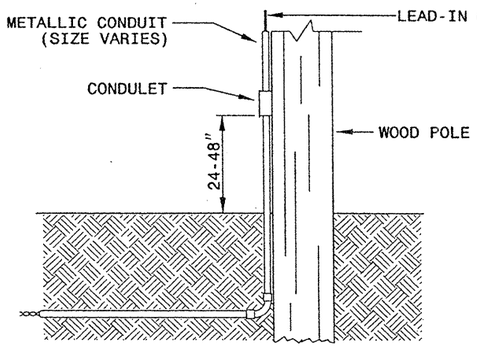
1725D01

LOOP WIRE SPLICE POINT DETAILS

LOOP WIRE AT JUNCTION BOX



LOOP WIRE AT POLE

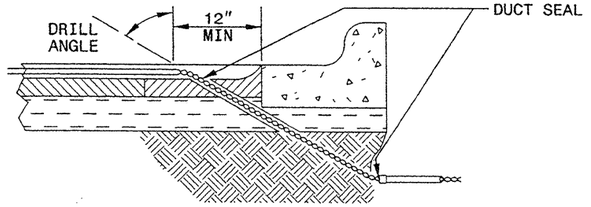


NOTE

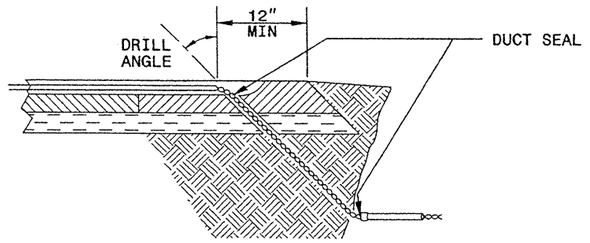
SPLICE ALL LOOP WIRE TAIL SECTIONS/LEAD-IN CABLE IN JUNCTION BOXES OR APPROVED CONDULETS.

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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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

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PROJECT REFERENCE NO.	SHEET NO.
I-5116	Sig. 3

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DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

5-07

ENGLISH DETAIL DRAWING FOR

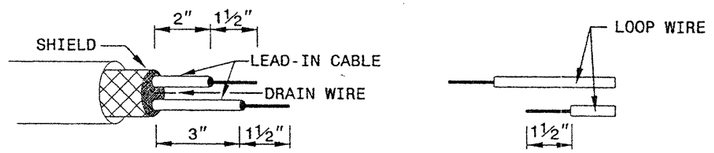
INDUCTION DETECTION LOOPS

SPLICING FOR LEAD-IN CABLE AND LOOP WIRE

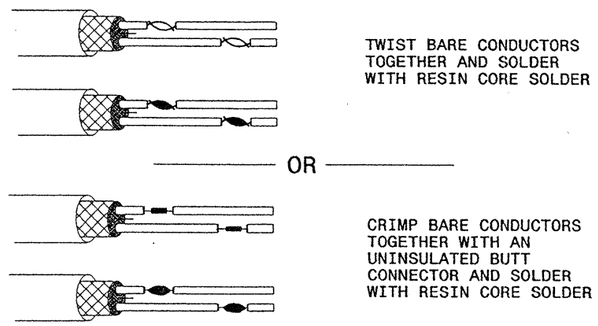
SHEET 3 OF 3

1725D01

STEP 1. STRIP LOOP WIRE AND LEAD-IN CABLE



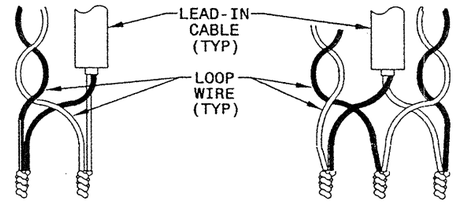
STEP 2. CONNECT AND SOLDER



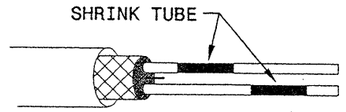
BOND SHIELD DRAIN WIRE AT SPLICE SECTIONS (DO NOT GROUND)

LOOP WIRE AND LEAD-IN CABLE CONNECTION DETAILS

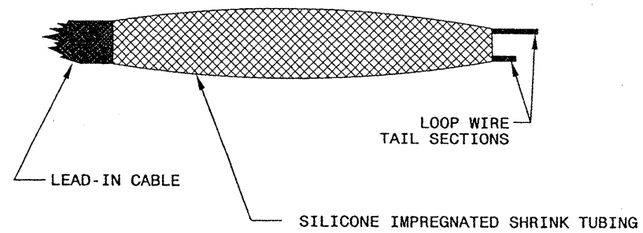
SINGLE CONNECTION SERIES CONNECTION



STEP 3. INSULATE EACH SOLDER JOINT SEPARATELY



STEP 4. ENVIRONMENTALLY PROTECT SPLICE



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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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Garner, NC 27529

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 016286 ENGINEER MILTON I. DEAN

Milton I. Dean 9/5/07
SIGNATURE DATE

05-SEP-2007 14:01
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