09/08/99

WBS NO.: 3CR.10651.166

CONTRACT: DC00089

INDEX OF SHEETS	
SHEET NO.	SHEET
1	INDEX OF SHEETS & TITLE SHEETS
2 - 3	PAVEMENT SCHEDULE, TYPICAL SECTIONS
4 - 5	SUMMARY OF QUANTITIES
6 - 18	DETAIL SHEETS

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

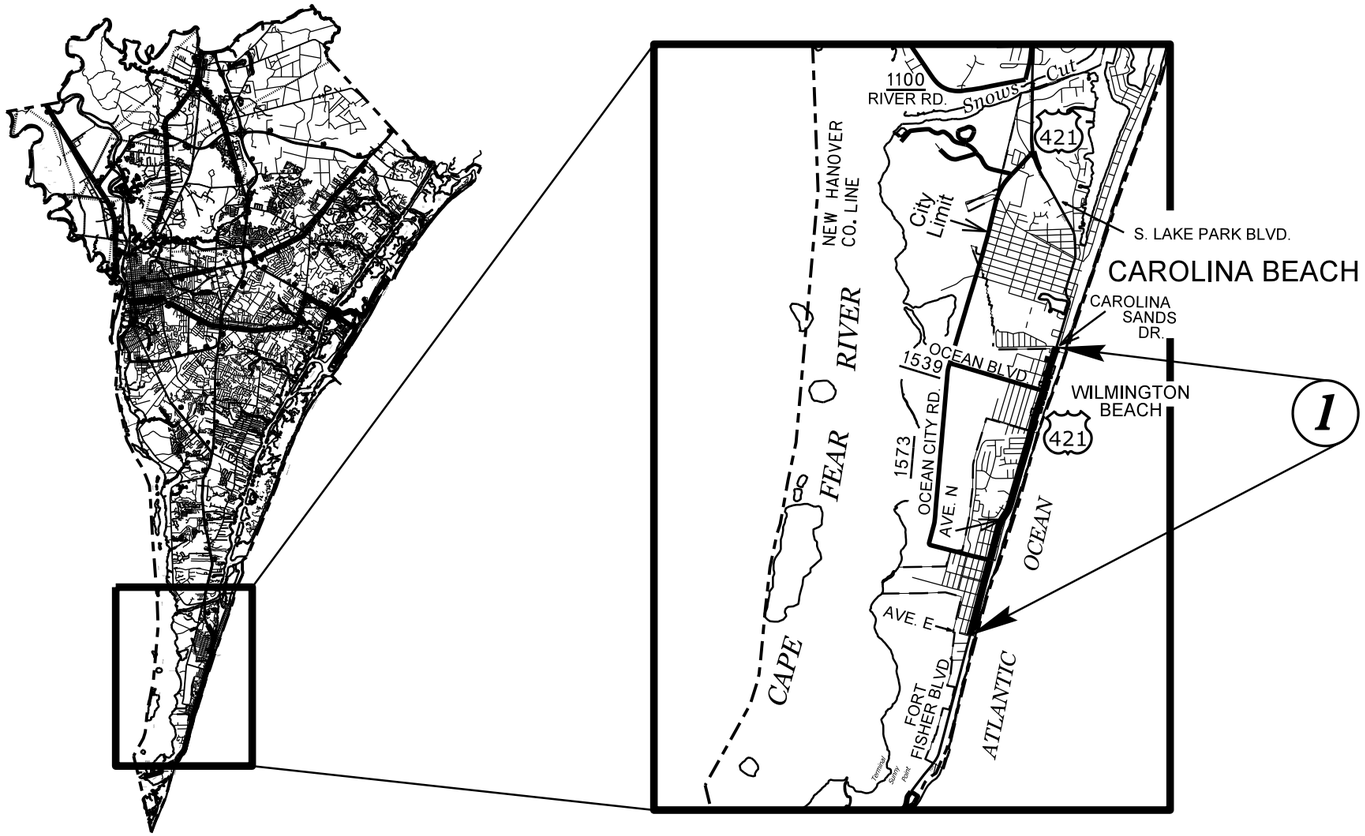
NEW HANOVER COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	3CR.10651.166	1	18

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION

LOCATION: 1 SECTION OF US 421

TYPE OF WORK: MILLING & RESURFACING, ETC.



PROJECT LENGTH

MAP NO. 1 = 2.52 MI.

TOTAL = 2.52 MI.

Prepared in the Office of:
DIVISION OF HIGHWAYS
5501 Barbados Blvd., Castle Hayne, NC 28429

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:

LETTING DATE:
OCT. 23, 2014

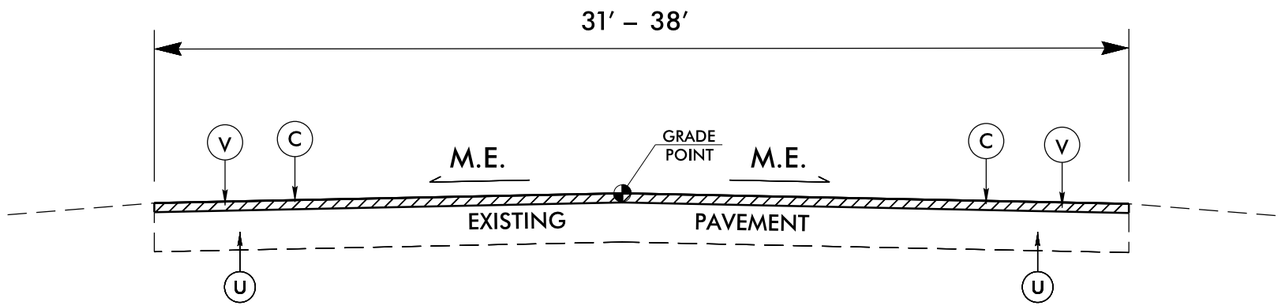
S. COOKE, P.E.
PROJECT ENGINEER

D. LEONARD, P.E.
PROJECT DESIGN ENGINEER

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

23-SEP-2014 09:44
O:\RDY\DDC\RETREAT\2015\NEW HANOVER\WBS_NEW HANOVER_NC 421_OCT_LET_RESURF\ROADWAY\Proj\3CR.10651.166_TSH.dgn
dlofave
AT D3CAD274448

PROJECT REFERENCE NO.	SHEET NO.
3CR.10651.166	2

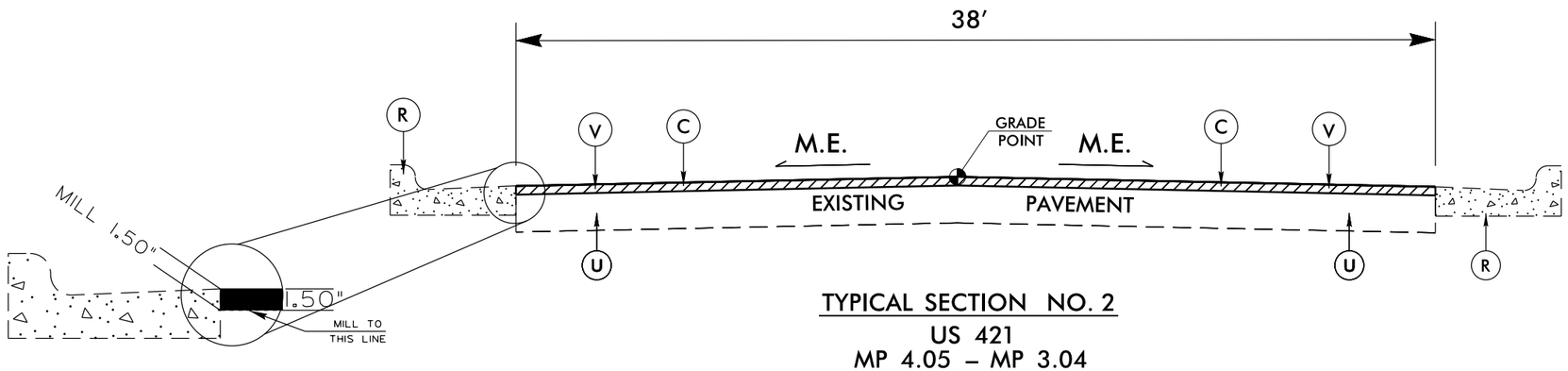


TYPICAL SECTION NO. 1

US 421

MP 5.55 – MP 4.05

PAVEMENT SCHEDULE	
C	PROP. APPROX. 1.5″ DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 168 LBS. PER SQ.YD.
R	2′-6″ CONC. C&G
U	EXISTING PAVEMENT.
V	MILLING BITUMINOUS PAVEMENT. 1.5″ DEPTH.



TYPICAL SECTION NO. 2

US 421

MP 4.05 – MP 3.04

REVISIONS

8/17/99

11-SEP-2014 16:21
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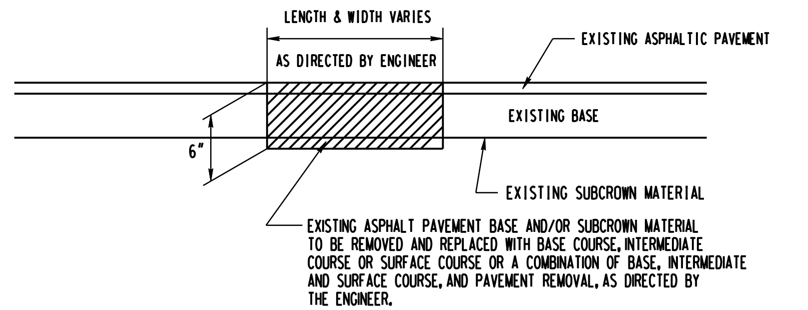
PROJECT REFERENCE NO.	SHEET NO.
3CR.10651.166	3

DETAILS OF REPAIRING EXISTING PAVEMENT PRIOR TO RESURFACING FOR FULL DEPTH AND MILLING



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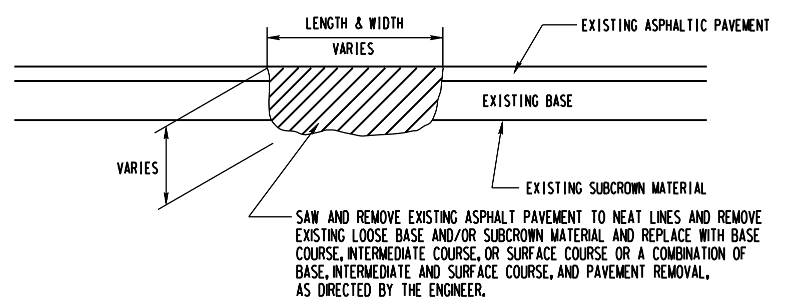

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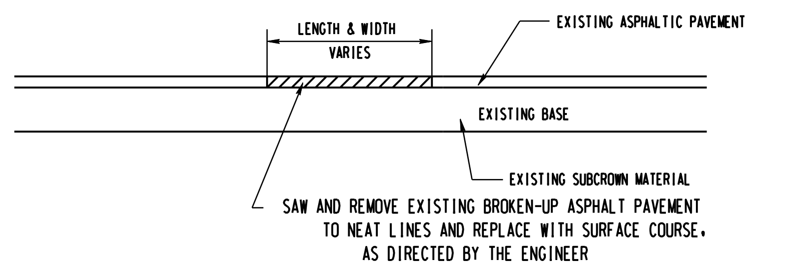

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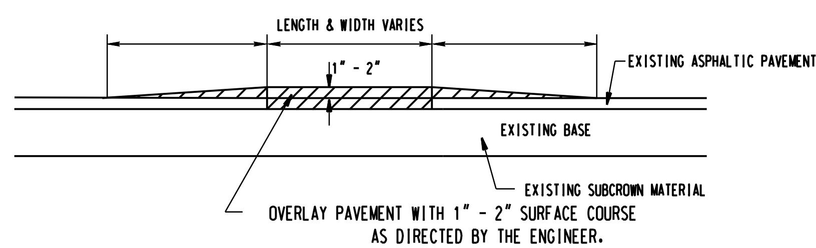

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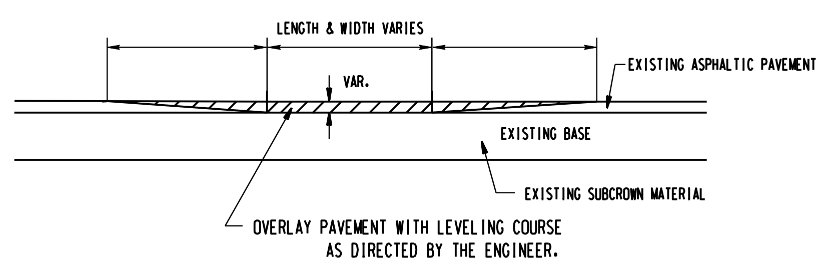
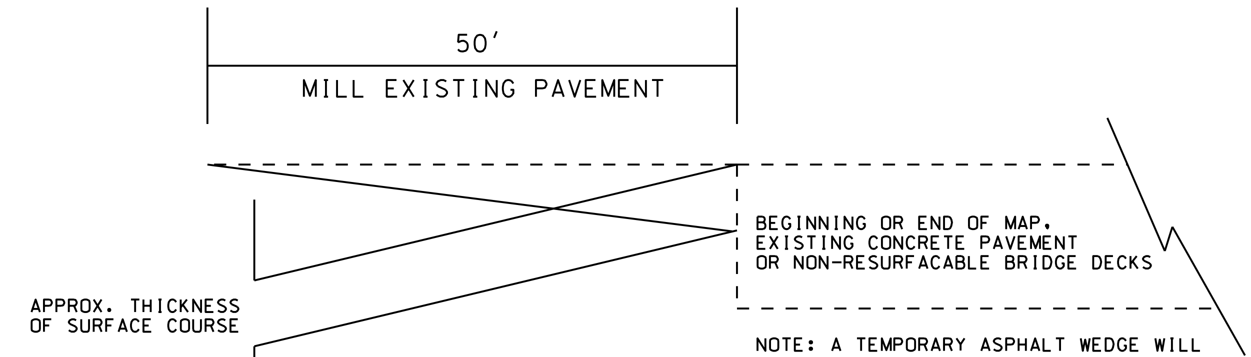
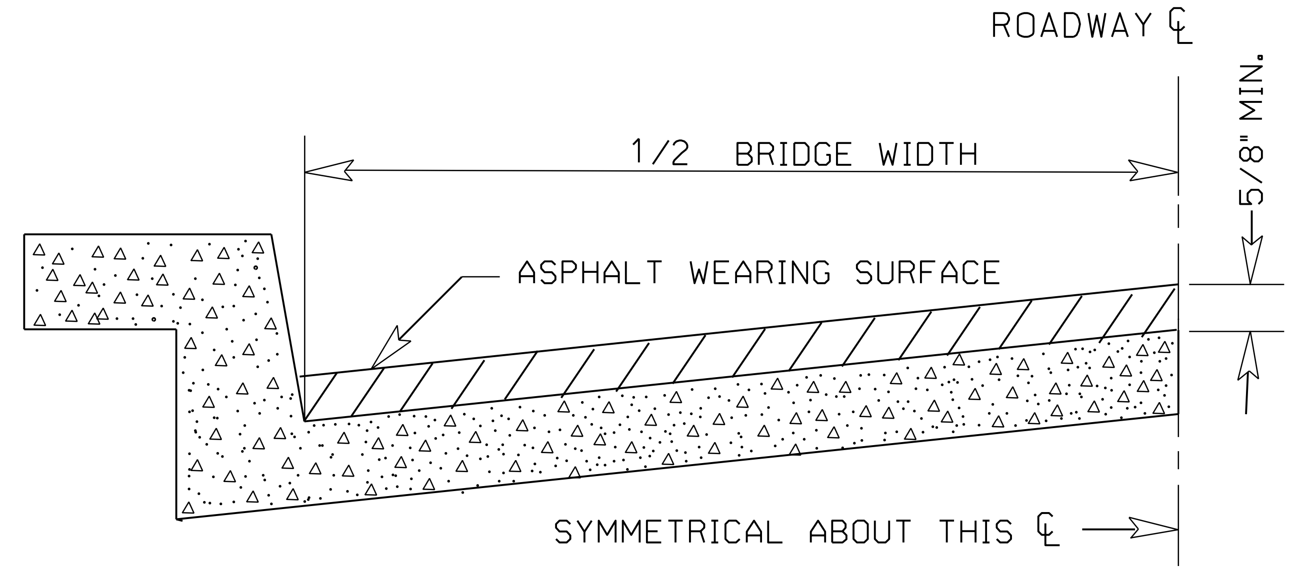


DETAIL NO. 5



NOTE: A TEMPORARY ASPHALT WEDGE WILL BE REQUIRED IMMEDIATELY AFTER MILLING TO ENSURE SMOOTH TRAVEL IF THE FINAL LAYER OF SURFACE COURSE IS NOT PLACED PRIOR TO OPENING THE LANE TO TRAFFIC.



BRIDGE HALF TYPICAL SECTION

FOR BRIDGES WITH FLOOR DRAINS, CARE SHALL BE EXERCISED IN PLACING THE WEARING SURFACE AROUND FLOOR DRAINS SO AS NOT TO HINDER EFFECTIVE DRAINAGE. ALL DRAINS SHALL BE LEFT OPEN.

THE PROPOSED WEARING SURFACE SHALL VARY IN THICKNESS AS NECESSARY TO PROVIDE A SMOOTH RIDING SURFACE. A THICKNESS OF NOT LESS THAN 5/8" SHALL BE PROVIDED. THE MAXIMUM THICKNESS SHALL PREFERABLY BE 1-1/2" UNLESS IT IS IMPRACTICAL TO PROVIDE A SMOOTH RIDING SURFACE OTHERWISE.

REVISIONS

PROJECT NO.	SHEET NO.	TOTAL NO.
3CR.10651.166	4	18

SUMMARY OF QUANTITIES

PROJECT NO	COUNTY	MAP NO	ROUTE	DESCRIPTION	TYP NO	LANES	LANE TYPE	FINAL SURFACE TESTING REQUIRED	WARM MIX ASPHALT REQUIRED	LENGTH MI	WIDTH FT	INC. STONE BASE TONS	1 1/2" MILLING SY	INC. MILLING SY	SURFACE COURSE, S9.5B TONS	ASPHALT BINDER FOR PLANT MIX TON	2'-6" CURB & GUTTER, REMOVE & REPLACE LF	REMOVE & REPLACE CURB RAMPS EA	ADJ. OF MANHOLES EA	ADJ. OF MON EA	ADJ. OF METER OR VALVE BOX EA	INDUCTIVE LOOP SAWCUT LF	LEAD-IN CABLE (14-2) LF
3CR.10651.166	NewHanover	1	US 421	MILL AND RESURFACE FROM CAROLINA SANDS DR. (NON-SYSTEM) TO N AVE. (NON-SYSTEM)	1	2	2WU	NO	NO	1.51	31	36	27,638	345	2,449	147			13		2		
		"	"	MILL AND RESURFACE FROM N AVE. (NON-SYSTEM) TO E AVE. (NON-SYSTEM)	2	2	2WU	NO	NO	1.01	38	24	22,516		1,992	120	489	21	45	4	4	1,050	150
TOTAL FOR MAP NO. 1										**2.52**		**60**	**50,154**	**345**	**4,441**	**267**	**489**	**21**	**58**	**4**	**6**	**1,050**	**150**
TOTAL FOR PROJ NO. 3CR.10651.166										**2.52**		**60**	**50,154**	**345**	**4,441**	**267**	**489**	**21**	**58**	**4**	**6**	**1,050**	**150**
GRAND TOTAL										**2.52**		**60**	**50,154**	**345**	**4,441**	**267**	**489**	**21**	**58**	**4**	**6**	**1,050**	**150**

PROJECT NO.	SHEET NO.	TOTAL NO.
3CR.10651.166	5	18

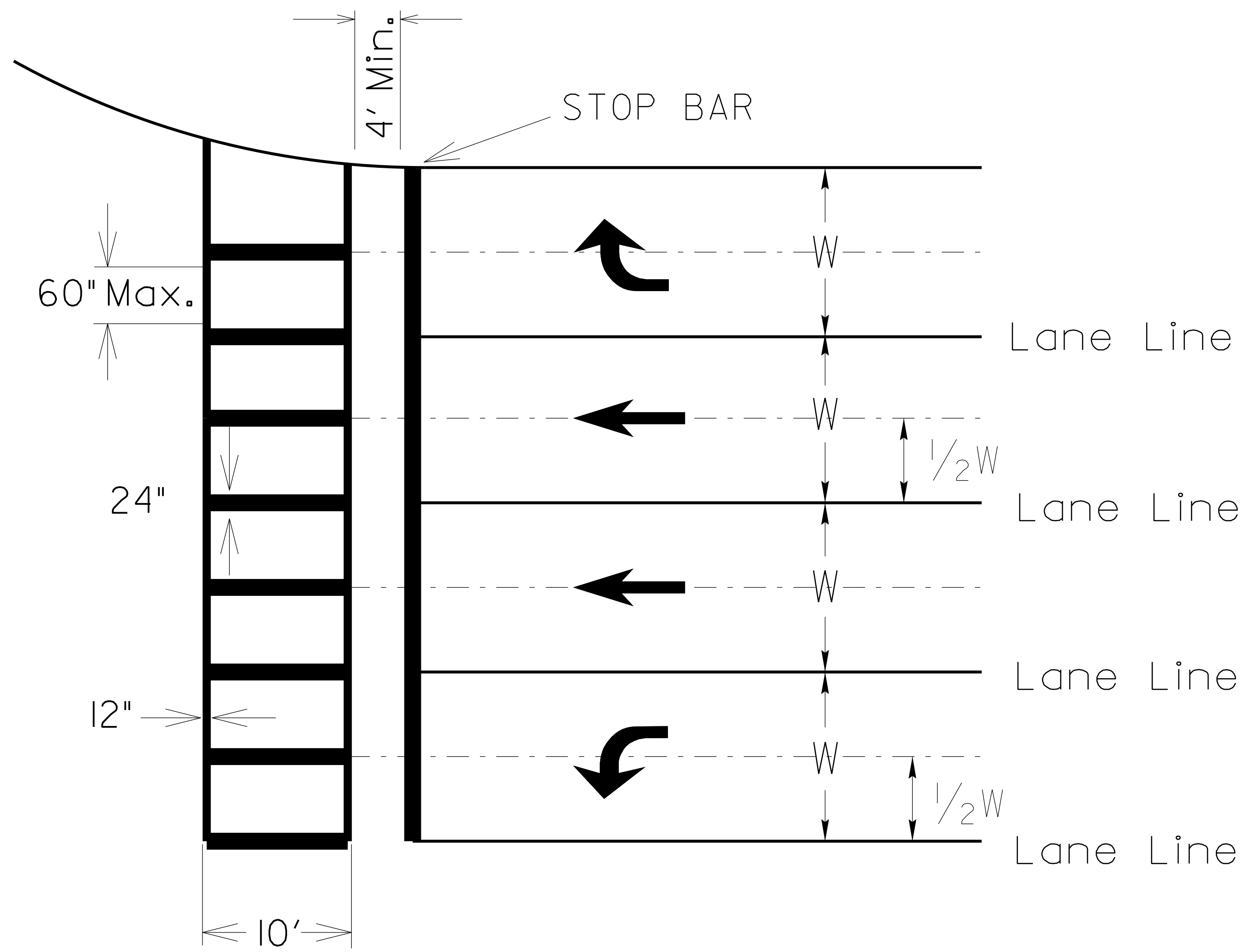
THERMOPLASTIC AND PAINT QUANTITIES

PROJECT NO	COUNTY	MAP NO	ROUTE	DESCRIPTION	TYP NO	LANES	LANE TYPE	LENGTH	WIDTH	4413000000-E WORK ZONE ADVANCE/GENERAL WARNING SIGNING SF	4457000000-N TEMPORARY TRAFFIC CONTROL LS	4510000000-N LAW ENFORCEMENT HR	4685000000-E 4" X 90 M WHITE THERMO LF	4686000000-E 4" X 120 M WHITE THERMO LF	4686000000-E 4" X 120 M YELLOW THERMO LF	4702000000-E 12" X 120 M WHITE THERMO LF	4710000000-E 24" X 120 M WHITE THERMO LF	4725000000-E THERMO LT ARROW 90 M EA	4725000000-E THERMO STR & RT ARROW 90 M EA	4725000000-E THERMO RT ARROW 90 M EA	4725000000-E THERMO BIKE LANE WITH ARROW EA	4905000000-N SNOW PLOWABLE MARKERS (C/R) EA	4905000000-N SNOW PLOWABLE MARKERS (Y/Y) EA
3CR.10651.166	NewHanover	1	US 421	MILL AND RESURFACE FROM CAROLINA SANDS DR. (NON-SYSTEM) TO N AVE. (NON-SYSTEM)	1	2	2WU	1.51	31	288	0.50	40.00	15,840	530	25,870	312	318	3	3	1	7	12	176
		"	"	MILL AND RESURFACE FROM N AVE. (NON-SYSTEM) TO E AVE. (NON-SYSTEM)	2	2	2WU	1.01	38		0.50					204	150						
TOTAL FOR MAP NO. 1								**2.52**		**288**	**1**	**40**	**15,840**	**530**	**25,870**	**516**	**468**	**3**	**3**	**1**	**7**	**12**	**176**
TOTAL FOR PROJ NO. 3CR.10651.166								**2.52**		**288**	**1**	**40**	**15,840**	**530**	**25,870**	**516**	**468**	**3**	**3**	**1**	**7**	**12**	**176**
														26,400				**14**				**188**	
GRAND TOTAL								**2.52**		**288**	**1**	**40**	**15,840**	**530**	**25,870**	**516**	**468**	**3**	**3**	**1**	**7**	**12**	**176**
														26,400				**14**				**188**	

PROJECT REFERENCE NO.	SHEET NO.
3CR.10651.166	6

PAVEMENT MARKING DETAILS

SPECIAL EMPHASIS HI-VISIBILITY CROSSWALK MARKING DETAIL



NOTES: SPACING OF CROSSWALK LINES POSITIONED TO AVOID WHEELPATHS

REVISIONS

8/17/99

11-SEP-2014 16:25
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iwmitchell1 AT D3CAD266703

PROJECT REFERENCE NO.	SHEET NO.
3CR.10651.166	7

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

ENGLISH DETAIL DRAWING FOR

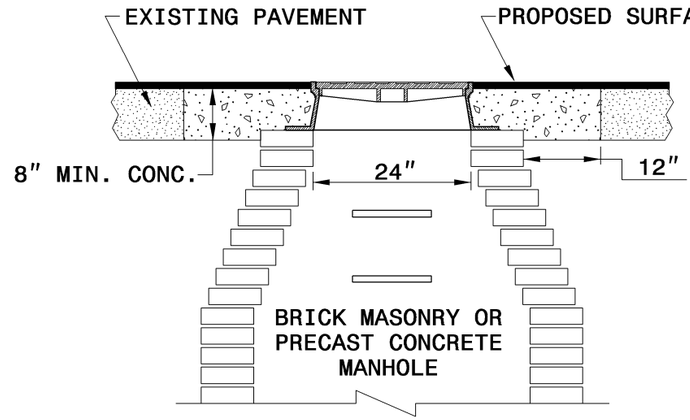
MANHOLE AND VALVE BOX ADJUSTMENTS

SHEET 1 OF 1

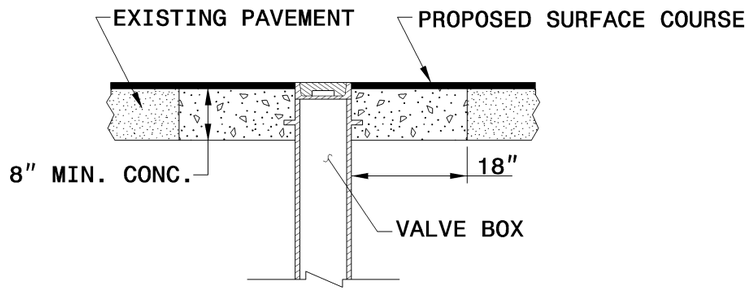
840D55

GENERAL NOTES:

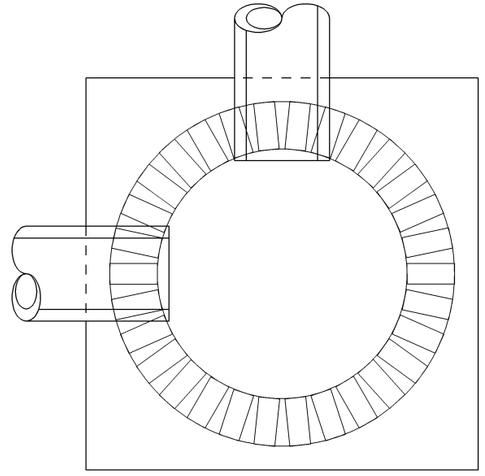
1. USE RAPID SET GROUT, MORTAR, OR CONCRETE WITH A MINIMUM COMPRESSIVE STRENGHT OF 4000 PSI.
2. REMOVE ALL FAULTY EXISTING BRICKWORK AND REPLACE WITH NEW BRICK MASONRY.
3. SHEER CUT EXCAVATION FOR THE ADJUSTMENT ON ALL SIDES.
4. FILL AREA BELOW 8" DEPTH WITH 78M OR NO. 57 CLEAN STONE.
5. MIX MORTAR TO NCDOT SPECIFICATIONS.
6. MORTAR JOINTS ½" +/- ⅛"



MANHOLE CONCRETE ENCASEMENT



VALVE BOX CONCRETE ENCASEMENT



ELEVATION VIEW

PLACE BRICK ACCORDING TO ELEVATION VIEW

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

ENGLISH DETAIL DRAWING FOR

MANHOLE AND VALVE BOX ADJUSTMENTS

SHEET 1 OF 1

840D55

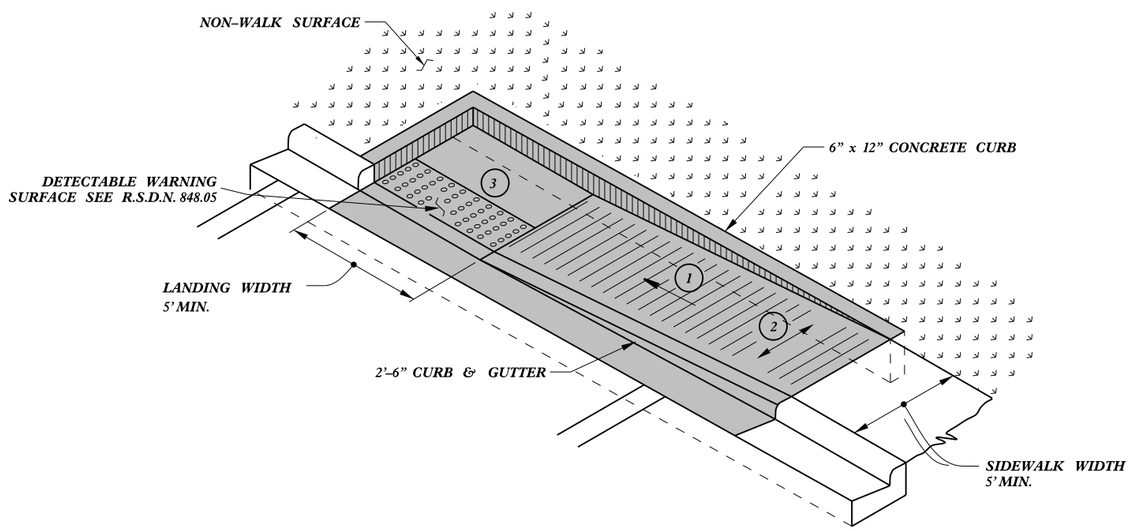
PROJECT SERVICES UNIT
STANDARDS AND SPECIAL DESIGN
Office 919-250-4128 FAX 919-250-4119

SEE PLATE FOR TITLE

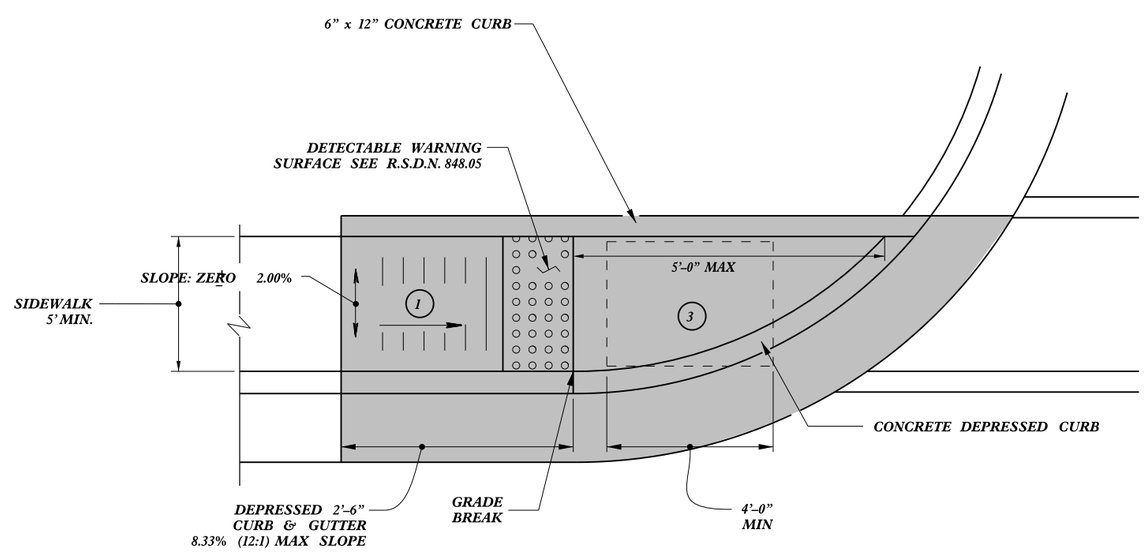
ORIGINAL BY: _____ DATE: _____
MODIFIED BY: E.E. WARD DATE: _____
CHECKED BY: _____ DATE: _____
FILE SPEC.: /usr/details/stand/840d55.dgn

PROJECT REFERENCE NO.	SHEET NO.
3CR.10651.166	8

PAY LIMITS FOR CURB RAMP



TYPE 1A



TYPE 1

(1) *8.33% (12:1) MAX RAMP SLOPE*

(2) *CROSS SLOPE: 2.00%*

(3) *CURB RAMPS REQUIRE A (4'–0") MINIMUM LANDING WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.*

REFER TO ROADWAY STANDARD DRAWING NUMBER 848.05 SHEET 3 OF 3 FOR ALL RAMP NOTES

CONTRACT STANDARDS AND DEVELOPMENT UNIT
Office 919-707-6950 FAX 919-250-4119

CURB RAMPS

Directional Ramps

ORIGINAL BY: J.S. HOWERTON DATE: 7/7/11
MODIFIED BY: _____ DATE: _____
CHECKED BY: _____ DATE: _____
FILE SPEC.: stds/2012CurbRamp/CurbRampDetails.dgn

5/14/99
22-MAR-2012 15:06
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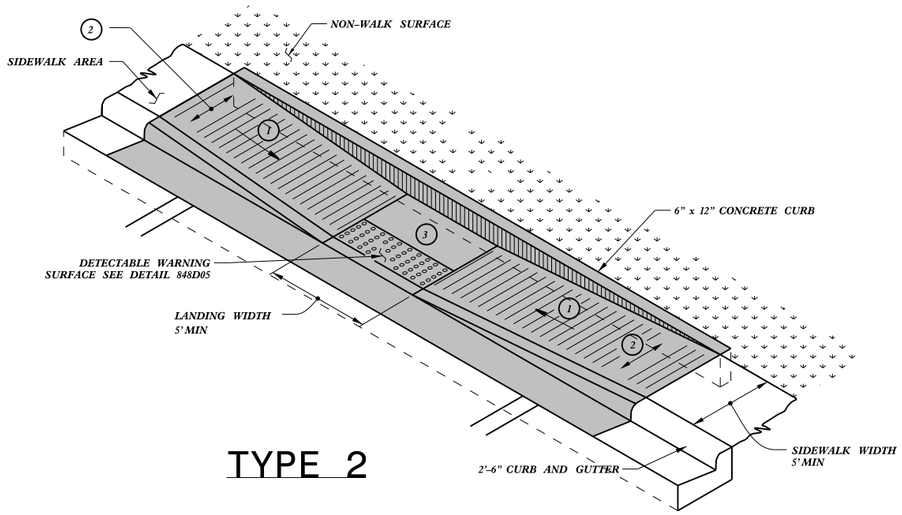
jhowerton
At CSD23760

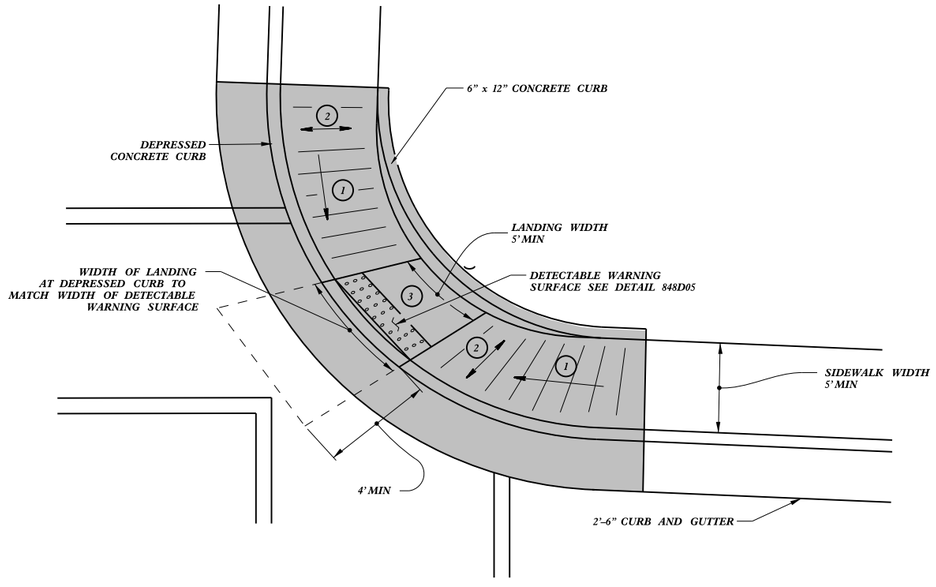
PROJECT REFERENCE NO.	SHEET NO.
3CR.10651.166	9



TYPE 2

PAY LIMITS FOR CURB RAMP

1. *8.33% (12:1) MAX RAMP SLOPE*
2. *CROSS SLOPE: 2.00%*
3. *CURB RAMPS REQUIRE A (4'-0") MINIMUM LANDING WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.*



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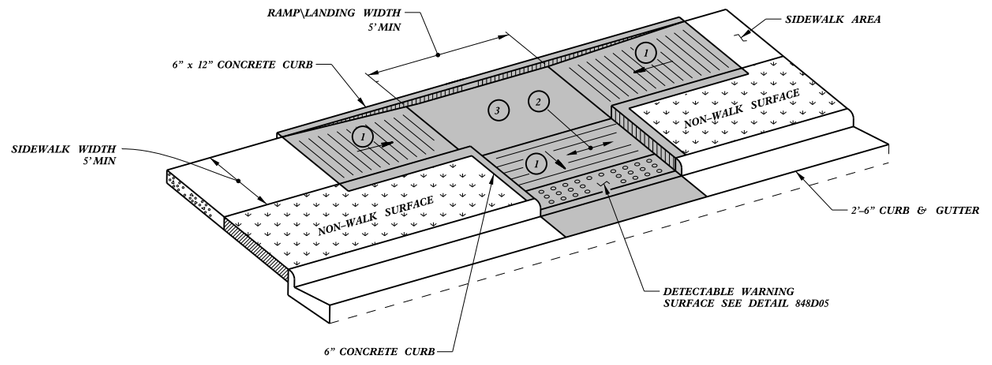

TYPE 3

REFER TO ROADWAY STANDARD DRAWING NUMBER 848.05 SHEET 3 OF 3 FOR ALL RAMP NOTES

CONTRACT STANDARDS AND DEVELOPMENT UNIT
Office 919-707-6950 FAX 919-250-4119

CURB RAMPS

Parallel Ramps

ORIGINAL BY: J.S. HOWERTON DATE: 7/7/11
MODIFIED BY: _____ DATE: _____
CHECKED BY: _____ DATE: _____
FILE SPEC.: stds/2012CurbRamp/CurbRampDetails.dgn

5/14/99

22-MAR-2012 15:07
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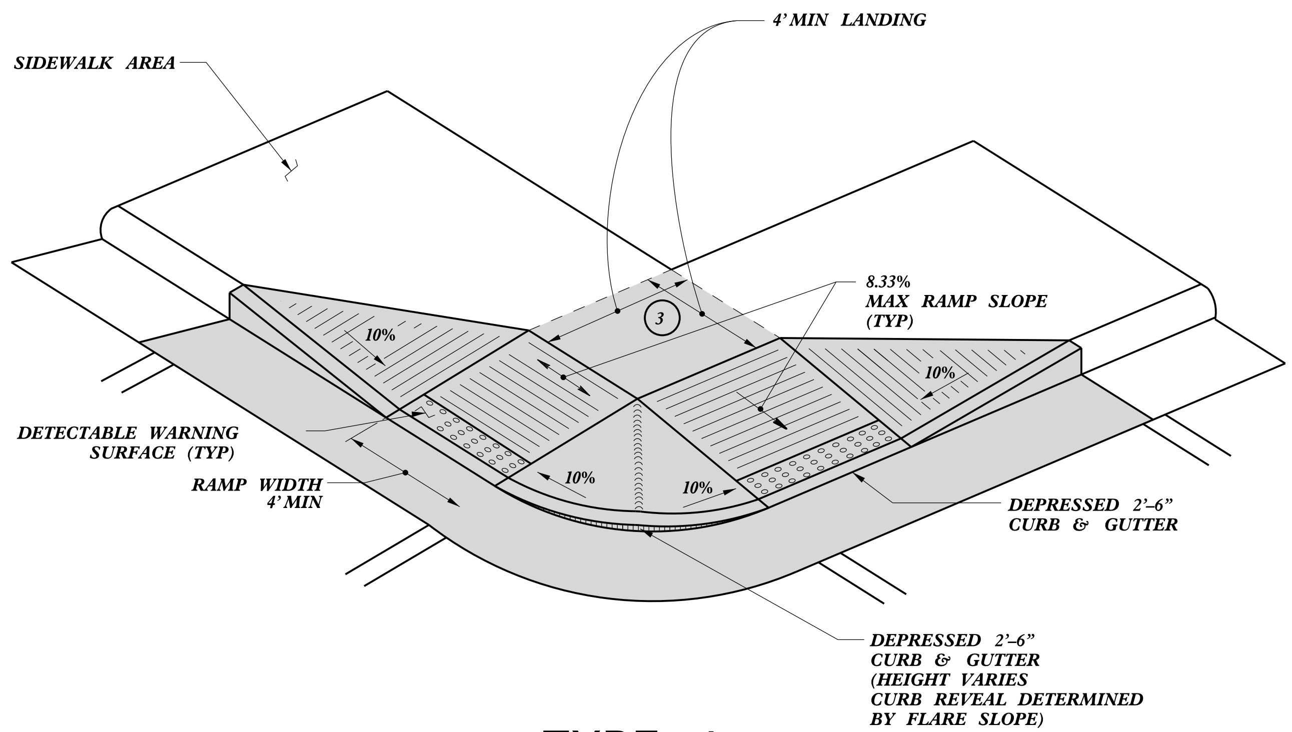
jhowerton
AT CSD0237501

PROJECT REFERENCE NO.	SHEET NO.
3CR.10651.166	10

PAY LIMITS FOR CURB RAMP



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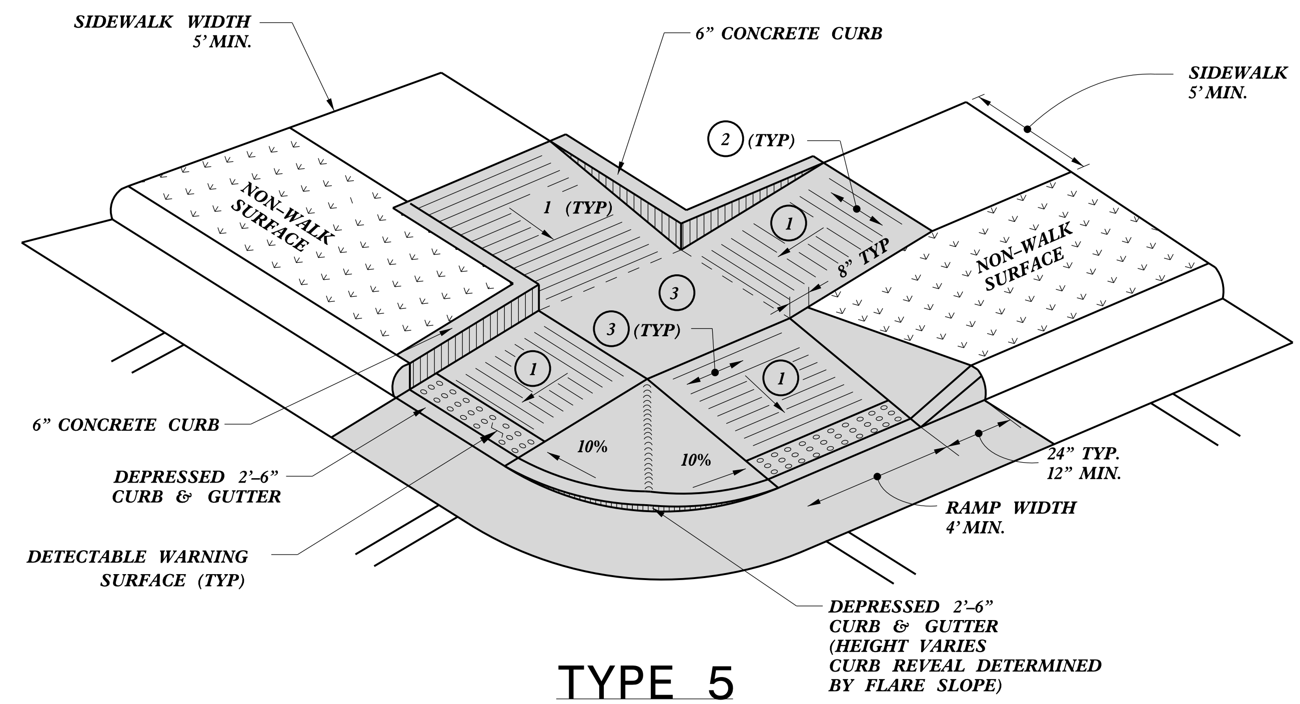

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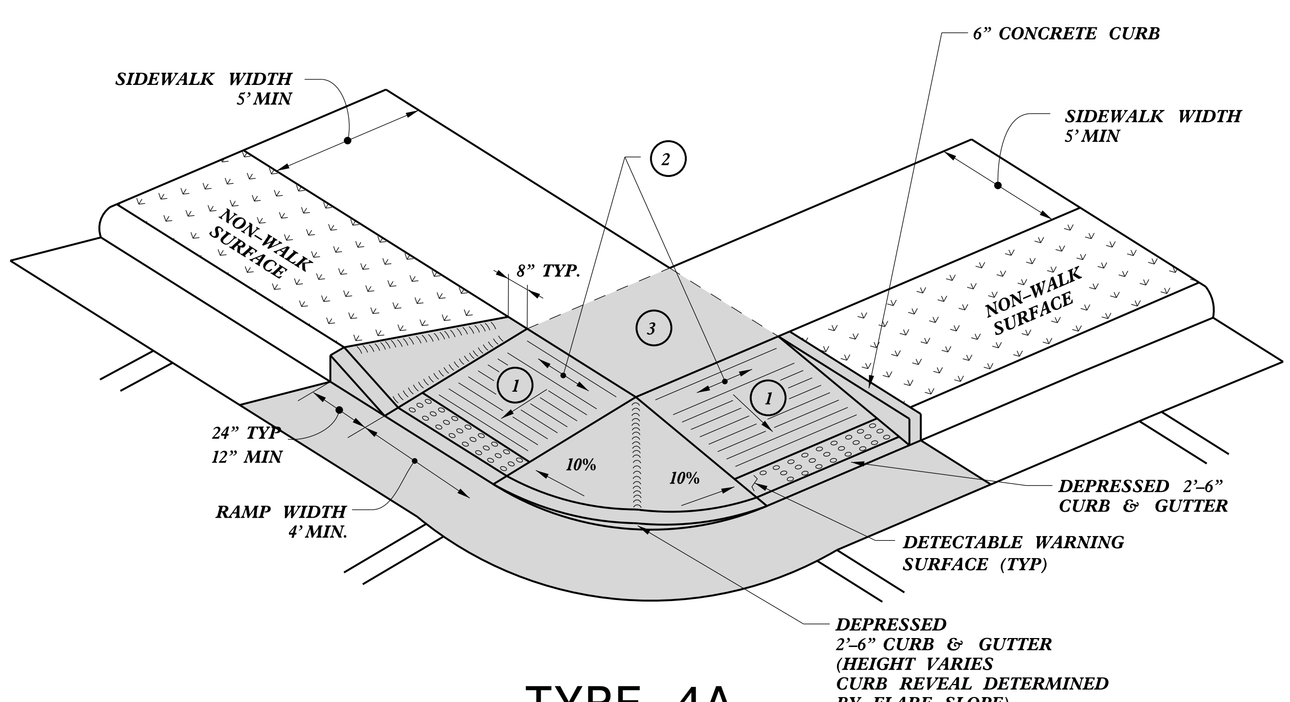


TYPE 4A

1. 8.33% (12:1) MAX RAMP SLOPE
2. CROSS SLOPE: 2.00%
3. CURB RAMPS REQUIRE A (4'-0") MINIMUM LANDING WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.

REFER TO ROADWAY STANDARD DRAWING NUMBER 848.05 SHEET 3 OF 3 FOR ALL RAMP NOTES

CONTRACT STANDARDS
AND DEVELOPMENT UNIT
Office 919-707-6950 FAX 919-250-4119

CURB RAMPS

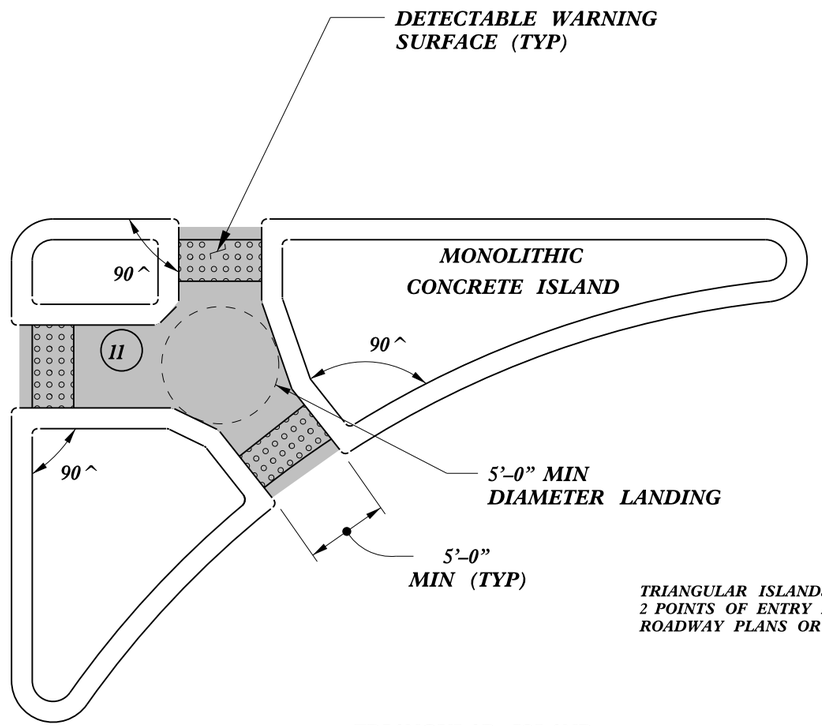
Shared Landing

ORIGINAL BY: J.S. HOWERTON DATE: 7/7/11
MODIFIED BY: DATE:
CHECKED BY: DATE:
FILE SPEC.: stds/2012CurbRamp/CurbRampDetails.dgn

5/14/99

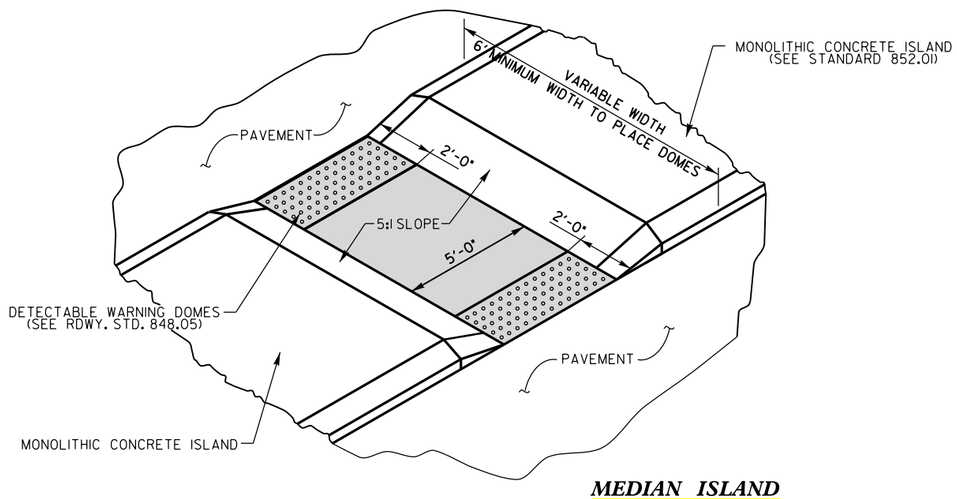
PROJECT REFERENCE NO.	SHEET NO.
3CR.10651.166	11

PAY LIMITS FOR 1 CURB RAMP

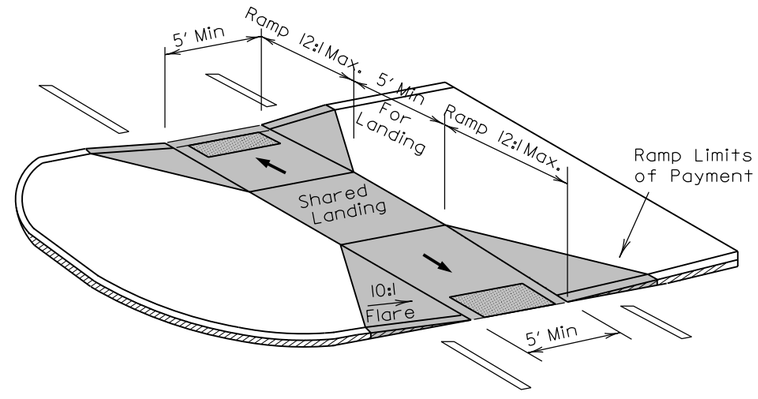


TRIANGULAR ISLANDS MAY BE CONSTRUCTED WITH ONLY 2 POINTS OF ENTRY AND EXIT AS SHOWN IN THE ROADWAY PLANS OR AS DIRECTED BY THE ENGINEER.

TRIANGULAR ISLAND WITH CUT THROUGH



MEDIAN ISLAND WITH CUT THROUGH



MEDIAN ISLAND CURB RAMPS

CONTRACT STANDARDS AND DEVELOPMENT UNIT
Office 919-707-6950 FAX 919-250-4119

CURB RAMPS

Median or Turn Lane Islands

ORIGINAL BY: J.S. HOWERTON DATE: 7/7/11
MODIFIED BY: _____ DATE: _____
CHECKED BY: _____ DATE: _____
FILE SPEC.: stds/2012CurbRamp/CurbRampDetails.dgn

$$$$SYSTIME$$$$
$$$$SYSTIME$$$$
$$$$USERNAME$$$$

5/14/99

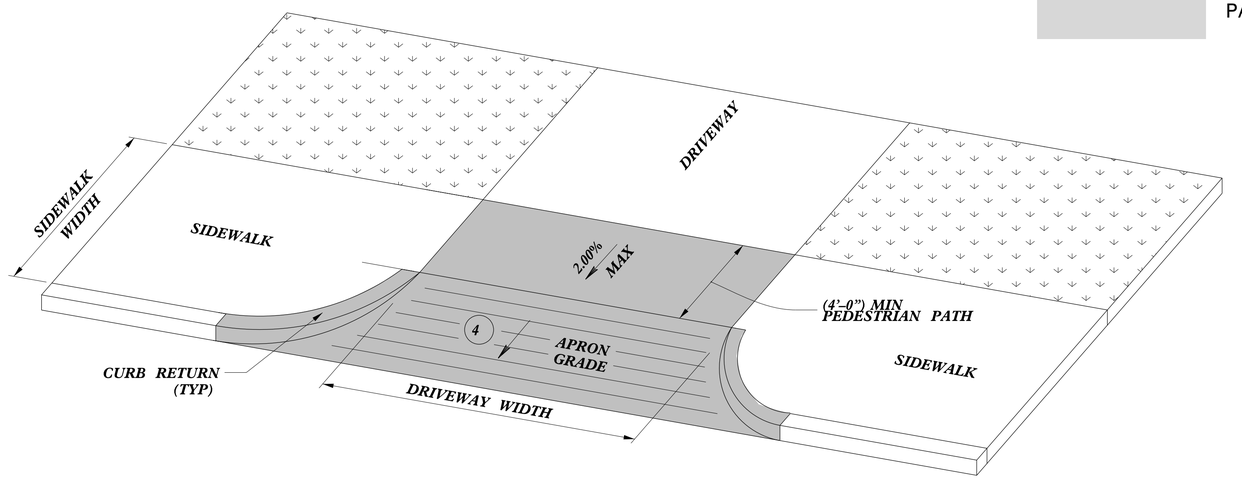
PROJECT REFERENCE NO.	SHEET NO.
3CR.10651.166	12

(1) *8.33% (12:1) MAX RAMP SLOPE*

(2) ***CROSS SLOPE:** 2.00%*

(4) *8.00% MAX CHANGE IN GRADE BETWEEN ROAD SURFACE AND DRIVEWAY*

PAY LIMITS FOR 1 CURB RAMP



DRIVEWAY APRON

OPTION 1

-SEE ROADWAY DETAIL DRAWING 848.05 FOR DETECTABLE WARNING SURFACE AND FOR RAMP NOTES.

-SEE ROADWAY STANDARD DRAWING 848.02 FOR CONCRETE DRIVEWAYS.

DRIVEWAY APRON

OPTION 2

$$$$SYSTIME$$$$
$$$$SIGNS$$$$
$$$$USERNAME$$$$

CONTRACT STANDARDS AND DEVELOPMENT UNIT
Office 919-707-6950 FAX 919-250-4119

CURB RAMPS

@ DRIVEWAY OPENINGS

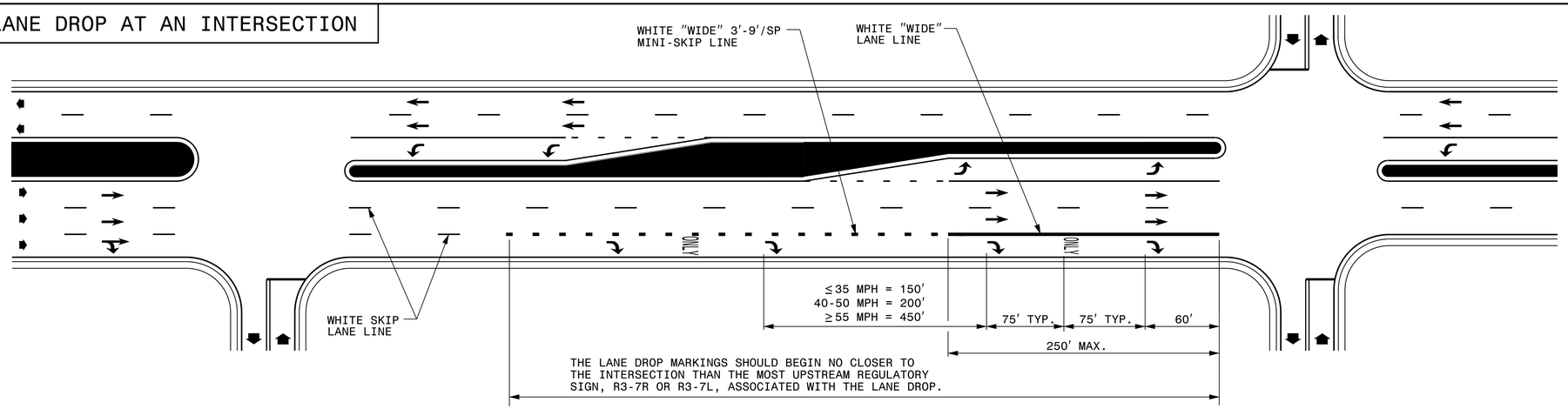
ORIGINAL BY: J.S. HOWERTON DATE: 7/7/11
MODIFIED BY: _____ DATE: _____
CHECKED BY: _____ DATE: _____
FILE SPEC.: stds/2012CurbRamp/CurbRampDetails.dgn

PROJECT REFERENCE NO.	SHEET NO.
3CR.10651.166	13

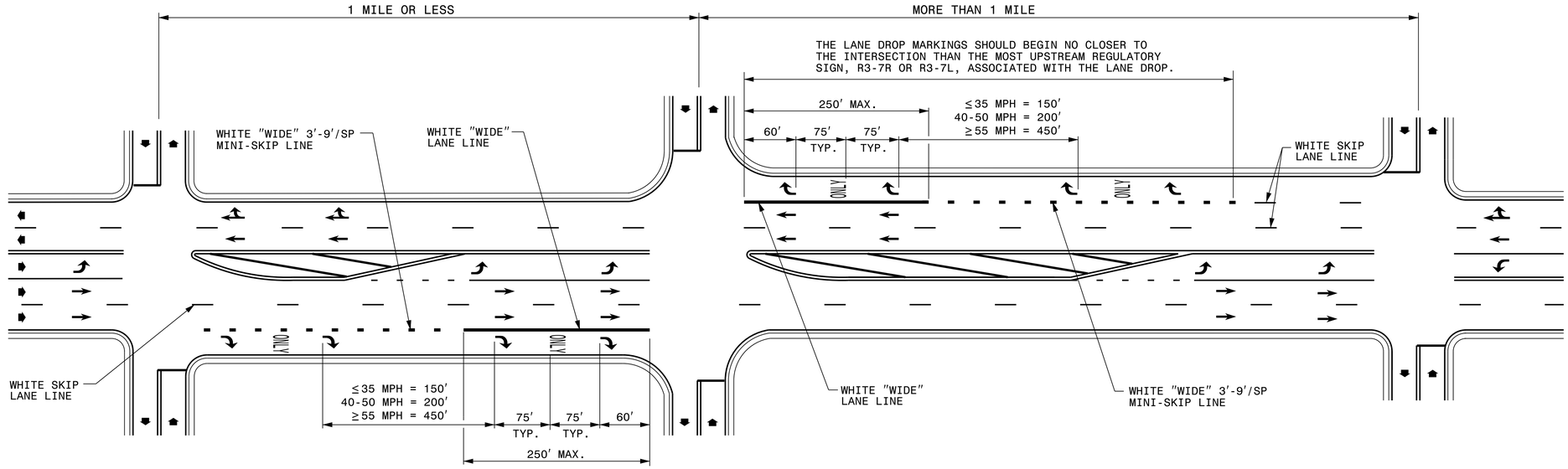
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-12

LANE DROP AT AN INTERSECTION



LANE DROP AT AN INTERSECTION WITH AN AUXILIARY LANE



GENERAL NOTES:

1- USE THE GUIDANCE SHOWN ON THE ABOVE DETAILS IN CONJUNCTION WITH INTERSECTION GUIDANCE SHOWN ON ROADWAY STANDARD DRAWING 1205.04.

2- LANE LINES INDICATED AS "WIDE" SHALL BE AT LEAST TWICE THE WIDTH OF THE NORMAL LINE.

LEGEND

W = WIDTH OF TRAVEL LANE	ONLY PAVEMENT MARKING SYMBOLS & CHARACTERS
DIRECTION OF TRAFFIC FLOW	

ENGLISH DETAIL DRAWING FOR
PAVEMENT MARKINGS
LANE DROPS

REVISED
9/14/11

SHEET 1 OF 3

1205D06

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

1-12

ENGLISH DETAIL DRAWING FOR
PAVEMENT MARKINGS
LANE DROPS

REVISED
9/14/11

SHEET 1 OF 3

1205D06

CONTRACT STANDARDS AND DEVELOPMENT UNIT
Office 919-707-6950 FAX 919-250-4119

SEE TITLE BLOCK

ORIGINAL BY: J. HOWERTON DATE: 10/5/11
MODIFIED BY: DATE:
CHECKED BY: DATE:
FILE SPEC.: s:joel/12 Stds to Special Details/560d01

07-NOV-2011 08:45
J:\projects\Contracts\Special Details\jhowerton\Standard Drawings\2012 Standard Drawings\Details in Lieu of Standards\Division 12\1205060I Revised 9-14-11.dgn
$$$$USERNAME$$$$

PROJECT REFERENCE NO.	SHEET NO.
3CR.10651.166	14

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

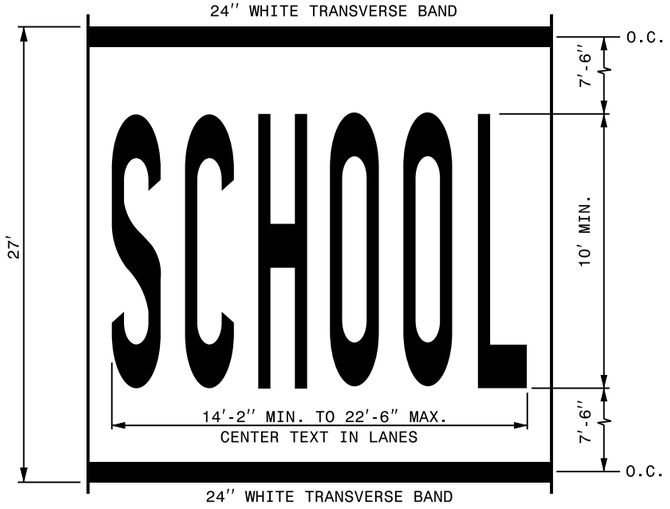
1-12

ENGLISH DETAIL DRAWING FOR

PAVEMENT MARKINGS

SYMBOLS AND WORD MESSAGES

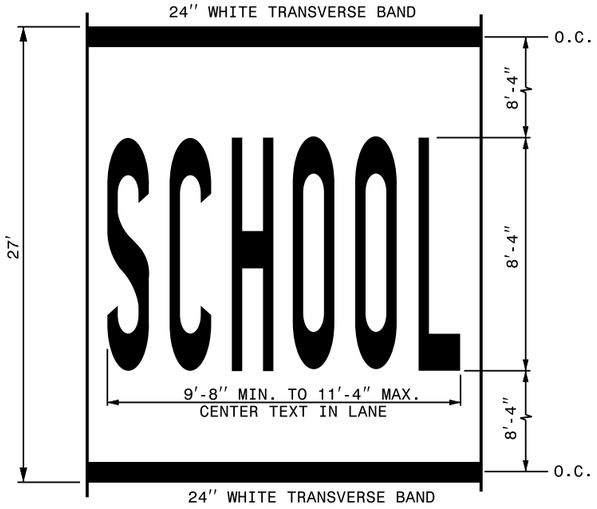
MULTI-LANE WIDTH "SCHOOL"



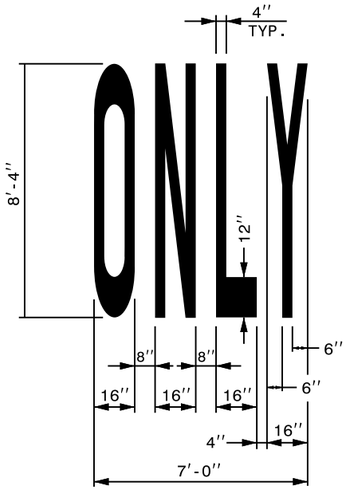
LETTER HEIGHT = 10' MIN.
LETTER WIDTH = 20"
SPACING = 10" MIN./30" MAX. (USE EQUAL SPACING BETWEEN LETTERS)

NOTE: THE TWO-LANE PAVEMENT MARKING DIMENSIONS OF "SCHOOL" SHOWN IN PART 7 OF THE MUTCD MAY ALSO BE USED.

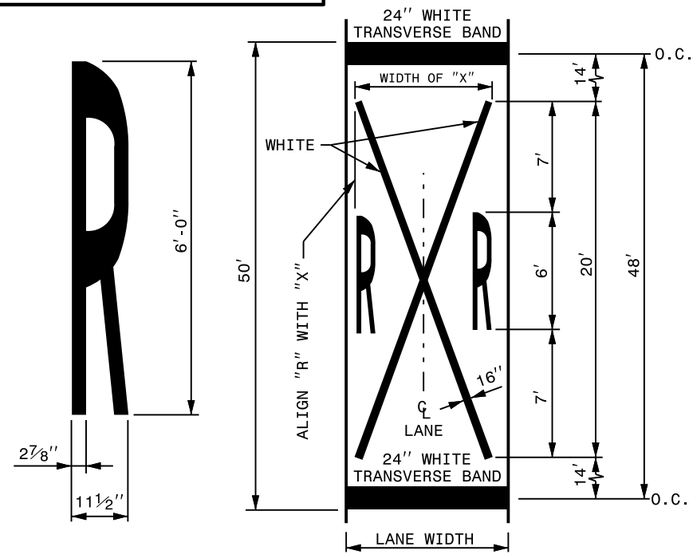
SINGLE LANE WIDTH "SCHOOL"



LETTER HEIGHT = 8'-4"
LETTER WIDTH = 16"
SPACING = 4" MIN./8" MAX. (USE EQUAL SPACING BETWEEN LETTERS)



RAILROAD RXR SYMBOL



LANE WIDTH (FEET)	WIDTH OF "X" (FEET)
8'≤W≤9'	7'
9'<W≤12'	8'
W>12'	10'

GENERAL NOTES:

1- THE SCHOOL PAVEMENT MARKING CONSISTS OF SIX (6) CHARACTERS. THE TWO (2) 24" TRANSVERSE BANDS WILL BE PAID FOR UNDER A SEPARATE PAY ITEM. REFER TO ROADWAY STANDARD DRAWING 1205.10 FOR ADDITIONAL PAVEMENT MARKING GUIDANCE.

2- PAVEMENT MARKING ADVANCE OF A HIGHWAY-RAIL CROSSING SHALL CONSIST OF TWO (2) CHARACTERS AND TWO (2) 16" LINES (FORMING AN X) WHICH ARE PAID FOR UNDER TWO SEPARATE PAY ITEMS. THE TWO (2) 24" TRANSVERSE BANDS WILL BE PAID FOR UNDER A SEPARATE PAY ITEM. REFER TO ROADWAY STANDARD DRAWING 1205.11 FOR ADDITIONAL PAVEMENT MARKING GUIDANCE.

REVISED
9/14/11
SHEET 3 OF 8
1205D08

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

1-12

ENGLISH DETAIL DRAWING FOR

PAVEMENT MARKINGS

SYMBOLS AND WORD MESSAGES

REVISED
9/14/11
SHEET 3 OF 8
1205D08

CONTRACT STANDARDS AND DEVELOPMENT UNIT
Office 919-707-6950 FAX 919-250-4119

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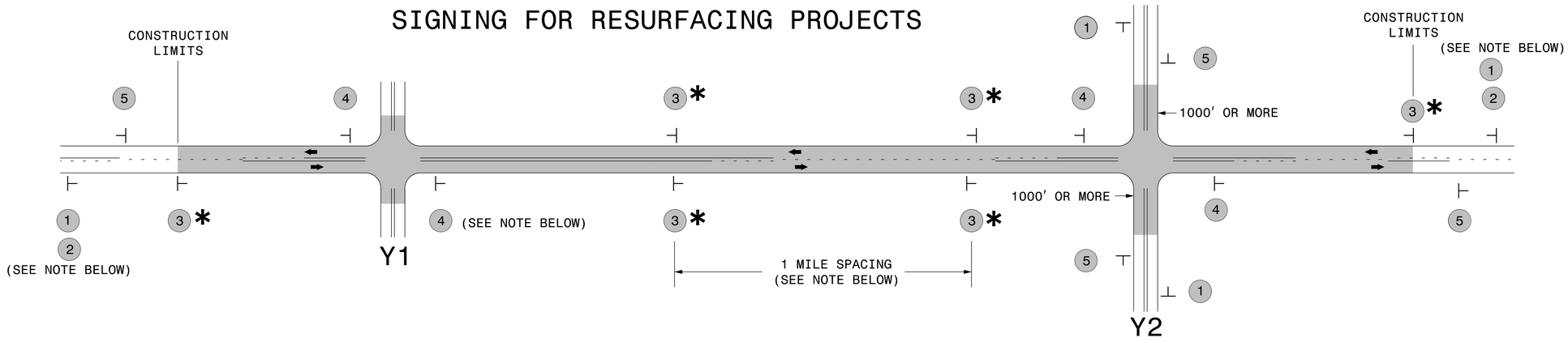
ORIGINAL BY: J. HOWERTON DATE: 10/5/11
MODIFIED BY: DATE:
CHECKED BY: DATE:
FILE SPEC.: s:joel/12 Stds to Special Details/560d01

PROJ. REFERENCE NO.	SHEET NO.
3CR.10651.166	15

SIGNING FOR RESURFACING PROJECTS



LEGEND
- ⊢ STATIONARY SIGN
- ⬅ DIRECTION OF TRAFFIC FLOW

MAINLINE (-L-) SIGNING

SIGNING NOTES AND PLACEMENT PER DIRECTION

1	ROAD WORK AHEAD W20-1 48″ X 48″	PLACE 1000′ PRIOR TO BEGINNING OF CONSTRUCTION LIMITS. ONLY USED ON -Y- LINES IF RESURFACING LIMITS EXTEND 1000′ ALONG -Y- LINE.
2	NEXT XX MILES W7-3aP 24″ X 18″	#2 SIGN ONLY USED WHEN RESURFACING LIMITS ARE 2 OR MORE MILES IN LENGTH. ROUND UP TO NEXT WHOLE NUMBER.(NO FRACTIONAL OR DECIMAL NUMBERS)
3 *	LOW/SOFT SHOULDER SP 13107 48″ X 48″	PLACE INITIALLY AT THE CONSTRUCTION LIMITS AND SPACED 1 MILE APART THEREAFTER. IF NO -Y- LINES EXIST, PLACE 2ND SET ½ MILE FROM THE CONSTRUCTION LIMITS AND THEN SPACE 1 MILE THEREAFTER.
4	ROAD UNDER CONST SP 13106 48″ X 48″	THESE ARE FOR -Y- LINES THAT ARE "THROUGH" ROADWAYS. DEAD END AND SUBDIVISION ROADS ARE NOT "THROUGH" ROADWAYS. INSTALL 500′ +/- FROM EACH -Y- LINE APPROACH AS SHOWN ABOVE. FOR MULTIPLE -Y- LINES THAT ARE SEPARATED BY 0.25 MILES OR LESS, TREAT AS A SINGLE UNIT AND INSTALL WITHIN 500′ OF EACH APPROACH. A MAXIMUM OF 2 SIGN SETS PER MILE. DO NOT INSTALL WHEN -Y- LINES ARE WITHIN 0.5 MILES FROM "END ROAD WORK" SIGN.
5	END ROAD WORK G20-2 A 48″ X 24″	PLACE 500′ FOLLOWING THE END OF CONSTRUCTION LIMITS.

-Y- LINE SIGNING

NO REQUIRED STATIONARY SIGNING FOR THE FOLLOWING -Y- LINE CONDITIONS:

1) LESS THAN 1000′ OF RESURFACING ALONG -Y- LINE
2) SUBDIVISION ROADS
3) DEAD END ROADS

WHEN PAVING/CONSTRUCTION ACTIVITIES PROCEED ACROSS AN UNSIGNED -Y- LINE, ADVANCE WARNING PORTABLE SIGNS SHALL BE USED ALONG THE -Y- LINE AS SHOWN BELOW. REMOVE UPON COMPLETION OF WORK.

ROAD WORK AHEAD W20-1 48″ X 48″ — PLACED 500′ IN ADVANCE OF FLAGGER.

W20-7 A 48″ X 48″ — PLACED 250′ IN ADVANCE OF FLAGGER.

* SIGNING FOR ASPHALT SURFACE TREATMENTS (ONLY)

SUBSTITUTE LOW/SOFT SHOULDER SIGNS BY ALTERNATING THE FOLLOWING TWO SIGNS:
STARTING WITH "UNMARKED PAVEMENT AHEAD" (SP 06026) FOLLOWED BY "LOOSE GRAVEL" (W8-7).

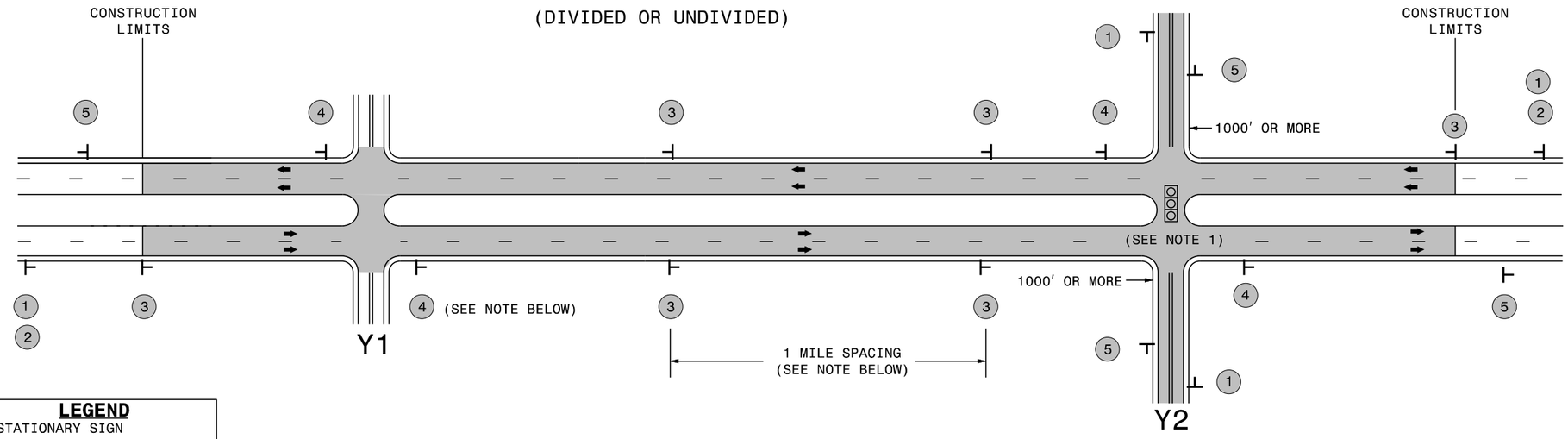
DIVISION OF HIGHWAYS · STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION · WORK ZONE TRAFFIC CONTROL

RESURFACING
ADVANCE WARNING SIGNS
FOR
RURAL AND SUBURBAN
2 LANE ROADWAYS

PROJ. REFERENCE NO.	SHEET NO.
3CR.10651.166	16

SIGNING FOR RURAL AND SUBURBAN MULTI-LANE ROADWAYS WITH SHOULDER SECTIONS

(DIVIDED OR UNDIVIDED)



LEGEND

⊢ STATIONARY SIGN

⬅ DIRECTION OF TRAFFIC FLOW

MAINLINE (-L-) SIGNING

SIGNING NOTES AND PLACEMENT PER DIRECTION

1	ROAD WORK AHEAD W20-1 48″ X 48″	PLACE 1000′ PRIOR TO BEGINNING OF CONSTRUCTION LIMITS. ONLY USED ON -Y- LINES IF RESURFACING LIMITS EXTEND 1000′ ALONG -Y- LINE.
2	NEXT XX MILES W7-3aP 24″ X 18″	#2 SIGN ONLY USED WHEN RESURFACING LIMITS ARE 2 OR MORE MILES IN LENGTH. ROUND UP TO NEXT WHOLE NUMBER.(NO FRACTIONAL OR DECIMAL NUMBERS)
3	LOW/SOFT SHOULDER SP 13107 48″ X 48″	PLACE INITIALLY AT THE CONSTRUCTION LIMITS AND SPACED 1 MILE APART THEREAFTER. IF NO -Y- LINES EXIST, PLACE 2ND SET ½ MILE FROM THE CONSTRUCTION LIMITS AND THEN SPACE 1 MILE THEREAFTER.
4	ROAD UNDER CONST SP 13106 48″ X 48″	THESE ARE FOR -Y- LINES THAT ARE "THROUGH" ROADWAYS. DEAD END AND SUBDIVISION ROADS ARE NOT "THROUGH" ROADWAYS. INSTALL 500′ +/- FROM EACH -Y- LINE APPROACH AS SHOWN ABOVE. FOR MULTIPLE -Y- LINES THAT ARE SEPARATED BY 0.25 MILES OR LESS, TREAT AS A SINGLE UNIT AND INSTALL WITHIN 500′ OF EACH APPROACH. A MAXIMUM OF 2 SIGN SETS PER MILE. DO NOT INSTALL WHEN -Y- LINES ARE WITHIN 0.5 MILES FROM "END ROAD WORK" SIGN.
5	END ROAD WORK G20-2 A 48″ X 24″	PLACE 500′ FOLLOWING THE END OF CONSTRUCTION LIMITS.

-Y- LINE SIGNING

NO REQUIRED STATIONARY SIGNING FOR THE FOLLOWING -Y- LINE CONDITIONS:

1) LESS THAN 1000′ OF RESURFACING ALONG -Y- LINE
2) SUBDIVISION ROADS
3) DEAD END ROADS

WHEN PAVING/CONSTRUCTION ACTIVITIES PROCEED ACROSS AN UNSIGNED -Y- LINE, ADVANCE WARNING PORTABLE SIGNS SHALL BE USED ALONG THE -Y- LINE AS SHOWN BELOW. REMOVE UPON COMPLETION OF WORK.

ROAD WORK AHEAD W20-1 48″ X 48″ — PLACED 500′ IN ADVANCE OF FLAGGER.

W20-7 A 48″ X 48″ — PLACED 250′ IN ADVANCE OF FLAGGER.

NOTES:

1) MAY USE LAW ENFORCEMENT TO CONTROL TRAFFIC AT SIGNALIZED INTERSECTIONS AS DIRECTED BY THE ENGINEER. PROVIDE PORTABLE "ROAD WORK AHEAD" (W20-1) SIGNS 500′ IN ADVANCE ALONG BOTH APPROACHES FROM THE SIDE STREETS WHEN PAVING PROCEEDS THROUGH THE INTERSECTION.

DIVISION OF HIGHWAYS · STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION · WORK ZONE TRAFFIC CONTROL

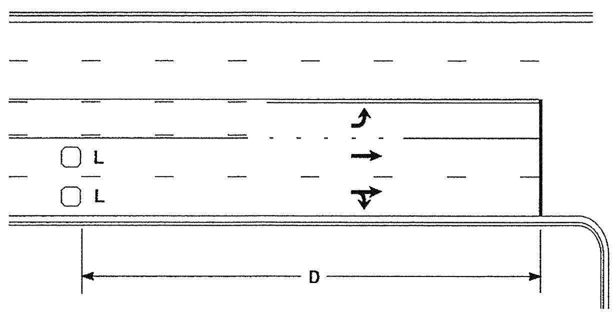
RESURFACING
ADVANCE WARNING SIGNS
FOR RURAL AND SUBURBAN
MULTI-LANE ROADWAYS
W/ SHOULDER SECTIONS
(DIVIDED OR UNDIVIDED)

2/24/2014
S:\TMDW\WZTC\Resurfacing\2013Resurfacing\2013Documents\New_Procedures_05.09.2013\Resurfacing_AdvWarn_UrSu_Shldr.dgn
User:rmgarrett

PROJECT REFERENCE NO.	SHEET NO.
3CR.10651.166	17

High Speed Detection

[≥40 mph (64 km/hr)]



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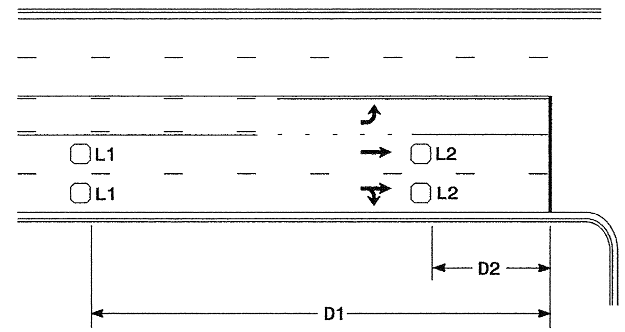


Speed Limit mph (km/hr)	D ft	(m)
40 (64)	250	(75)
45 (72)	300	(90)
50 (80)	355	(110)
55 (88)	420	(130)

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)

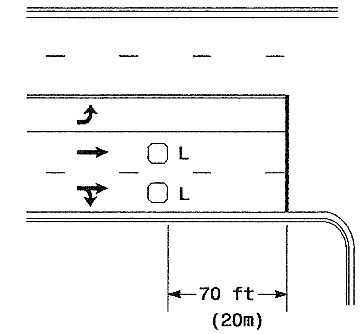
L1 = 6ft X 6ft (1.8m X 1.8m) Wired in series

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

"Stretch" Operation

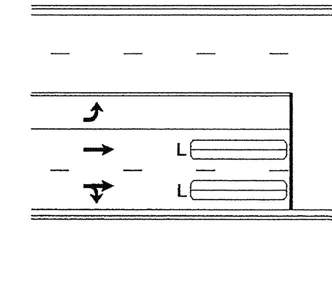
Low Speed Detection

[≤35 mph (56 km/hr)]



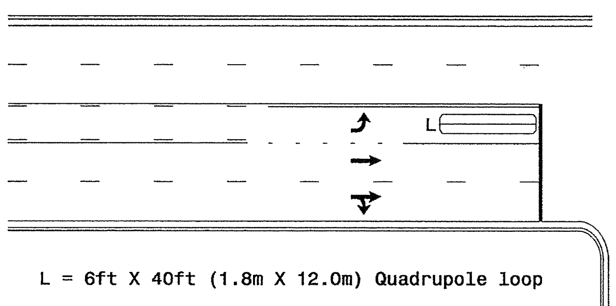
L = 6ft X 6ft (1.8m X 1.8m)
Wired in series

OR



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

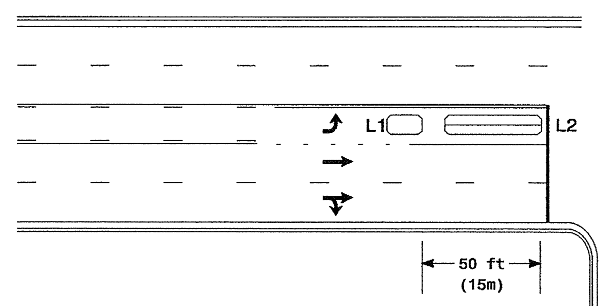
Left Turn Lane Detection



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

Presence Loop Detection

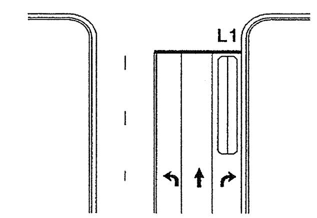
OR



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

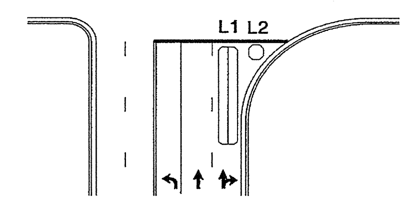
Queue Loop Detection

Right Turn Lane Detection

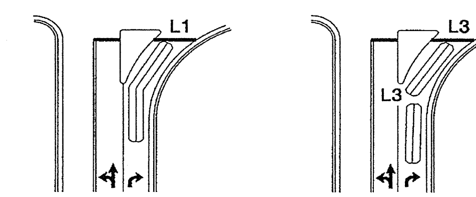


Standard Turn

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

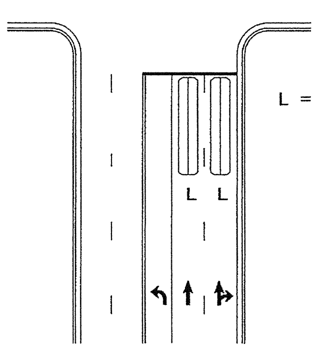


Wide Radius Turn



Channelized Turn

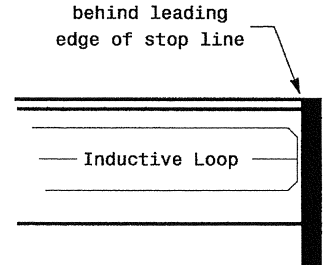
Side Street Detection



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	[illegible]	12/1/06

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 23488 PAUL ALEXANDER

SIGNATURE 6/6/06 DATE
SIG. INVENTORY NO.

19-DEC-2006 14:29
s:\its signals\lb turn in\misc\looptypical2006.dgn
palexander

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

ENGLISH STANDARD DRAWING FOR

DEEP-CUT INDUCTIVE DETECTION LOOPS

(FOR INSTALLATION PRIOR TO MILLING)

NOTES

-OVERLAP SAW CUTS AT CORNERS AND INTERSECTION POINTS TO ENSURE UNIFORM SAW SLOT DEPTH.

-MAINTAIN 12″ SPACING BETWEEN LOOP WIRE TAIL SECTIONS.

-WIRE LOOPS CONNECTED TO THE SAME DETECTOR IN SERIES.

-LOCATE LOOPS IN CENTER OF LANES UNLESS OTHERWISE SHOWN ON PLANS.

-USE A SERIES OF ONE INCH PIECES OF BACKER ROD SPACED ONE FOOT APART ALONG THE ENTIRE LENGTH OF THE FEEDER SLOT AND LOOP SAW SLOT.

-CONSULT LOOP SEALANT MANUFACTURER TO DETERMINE CURING TIME REQUIRED PRIOR TO MILLING.

SAW SLOT DEPTH CHART

ASSUMING 2″ MILLING DEPTH

DEPTH (IN)	NO. OF WIRE LAYERS				
	2	3	4	5	6
SAW SLOT DEPTH	4.0	4.5	5.0	5.0	5.0
MINIMUM TOTAL ASPHALT DEPTH REQUIRED	5.0	5.5	6.0	6.0	6.0

LOOP WIRE TWISTING METHOD

INCORRECT WAY TO TWIST WIRE

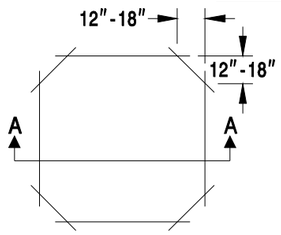
CORRECT WAY TO TWIST WIRE

CONVENTIONAL 4-SIDED LOOP

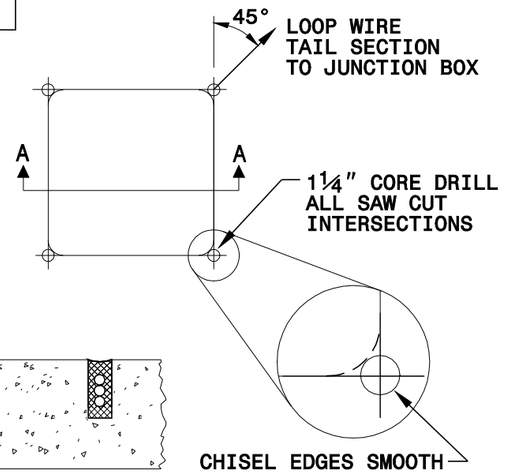
SAW CUT OPTIONS

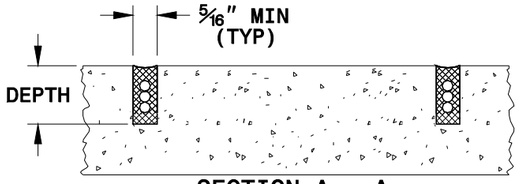
OPTION 1

INSTALL 1″ SECTIONS OF BACKER ROD ON 1 FOOT CENTERS



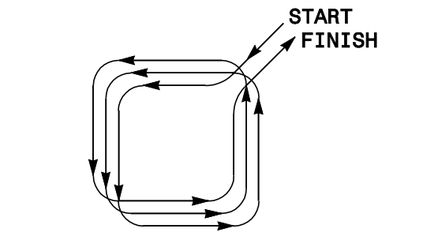
OPTION 2 (POOR PAVEMENT)

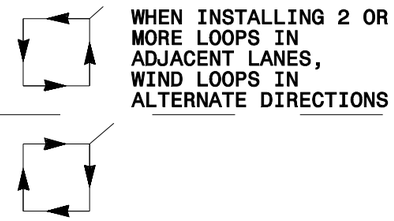




SECTION A - A

LOOP WINDING METHOD





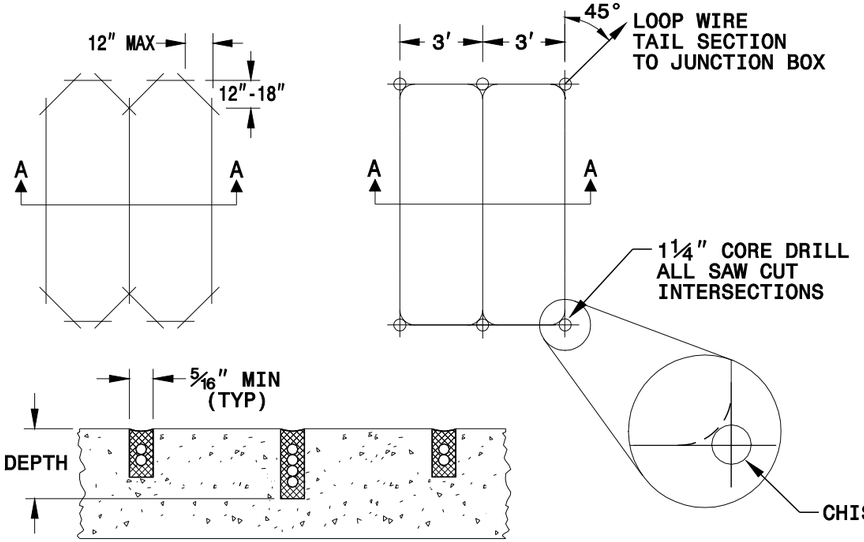
QUADRUPOLE LOOP

SAW CUT OPTIONS

OPTION 1

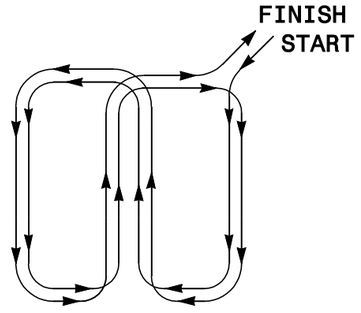
OPTION 2 (POOR PAVEMENT)

INSTALL 1″ SECTIONS OF BACKER ROD ON 1 FOOT CENTERS



SECTION A - A

LOOP WINDING METHOD



REVISIONS
REMOVED TWISTING NOTES FROM TAIL SECT. TO JUNCTION BOX. 2/26/08 MWH

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

ENGLISH STANDARD DRAWING FOR

DEEP-CUT INDUCTIVE DETECTION LOOPS

(FOR INSTALLATION PRIOR TO MILLING)

SHEET 1 OF 1