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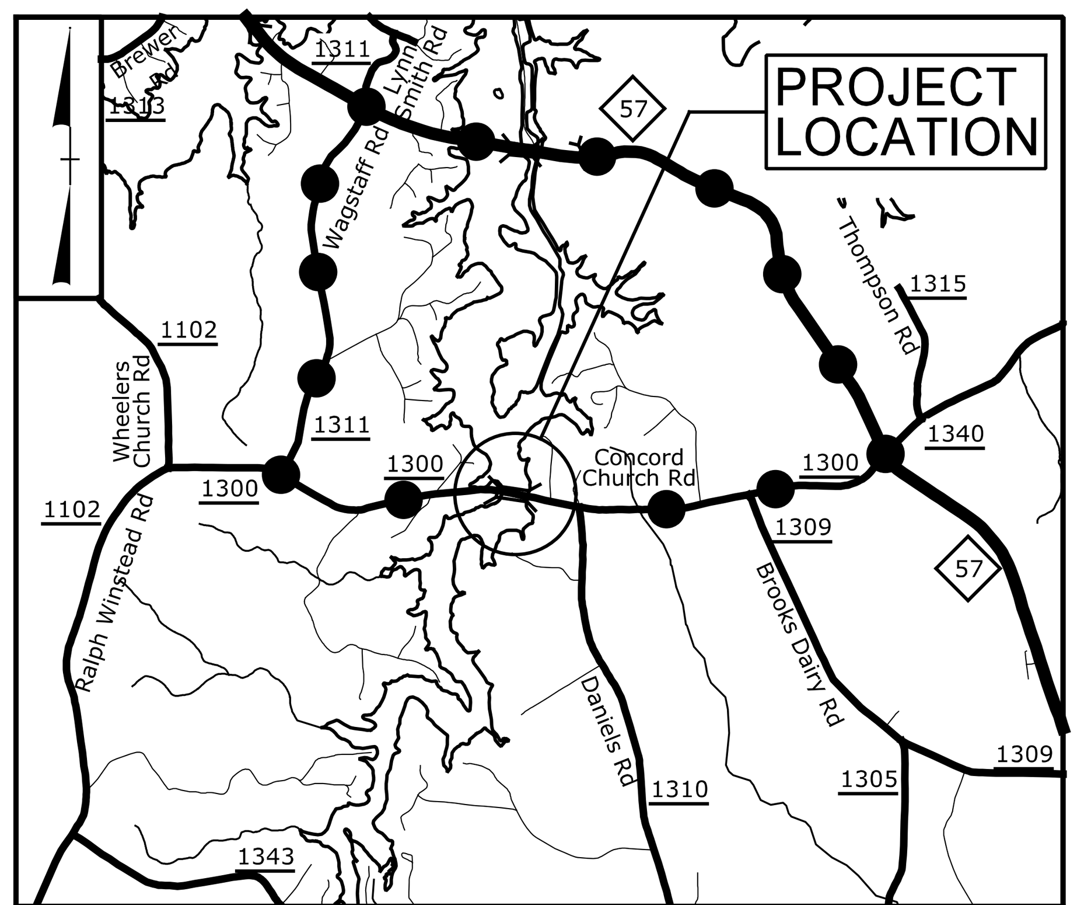
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5327	1	

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
46041.1.1	(BRZ-1300(13))	P.E.
46041.2.1		R.O.W.
46041.2.2		UTIL.
46041.3.1		CONST.

TIP PROJECT: B-5327

CONTRACT: C203958

See Sheet 1A For Index of Sheets
See Sheet 1B For Conventional Symbols
See Sheet 1C-1 For Survey Control Sheet



VICINITY MAP

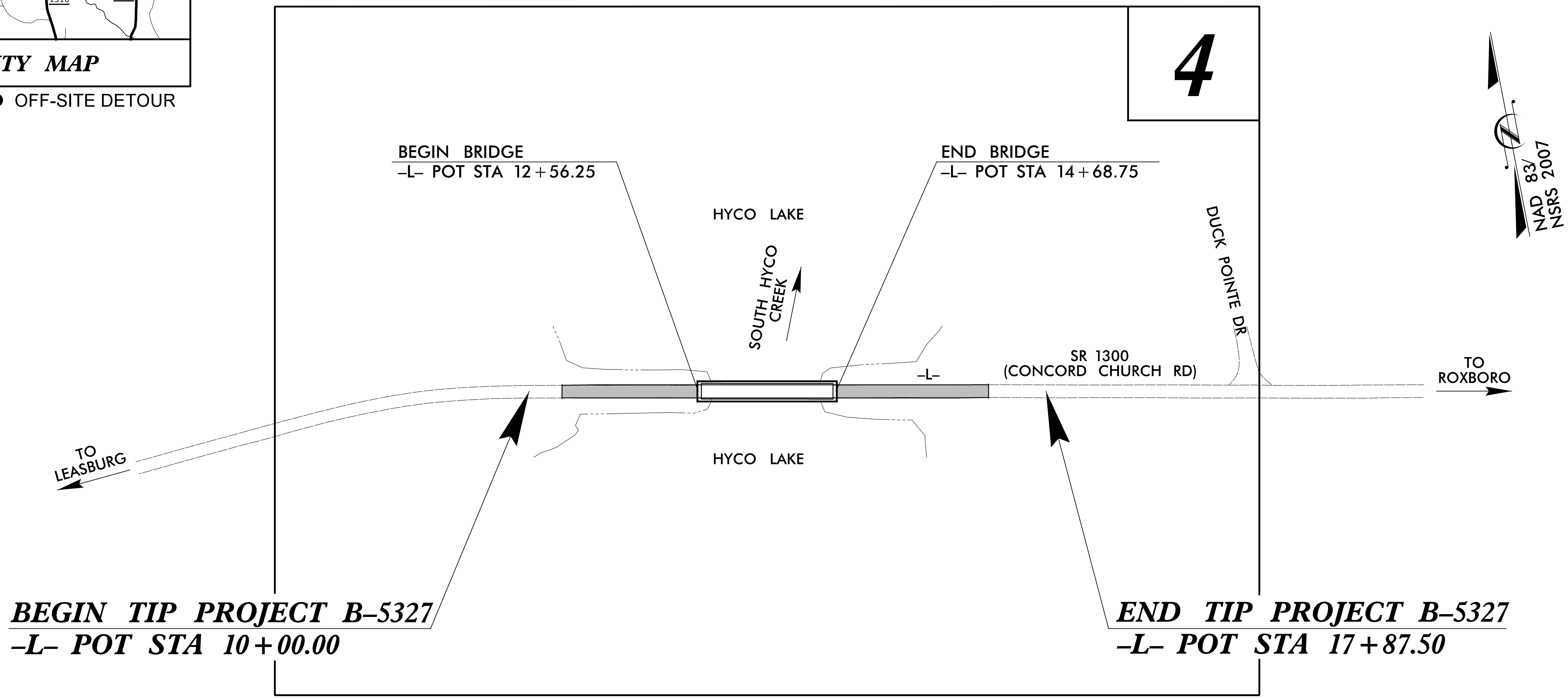
● ● ● ● ● OFF-SITE DETOUR

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

PERSON COUNTY

LOCATION: BRIDGE 49 OVER SOUTH HYCO CREEK ON SR 1300 (CONCORD CHURCH RD)

TYPE OF WORK: GRADING, PAVING, DRAINAGE AND STRUCTURE



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

DESIGN DATA

ADT 2017 = 650
ADT 2037 = 1,260
K = 9 %
D = 60 %
T = 9 % *
V = 45 MPH
* (TTST = 3% + DUAL 6%)
FUNC CLASS = LOCAL
SUB REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-5327 = 0.109 MILES
LENGTH STRUCTURE TIP PROJECT B-5327 = 0.040 MILES
TOTAL LENGTH TIP PROJECT B-5327 = 0.149 MILES

Prepared for the North Carolina Department of Transportation In the office of:

HDR | ICA

ICA Engineering, Inc.
5121 Kingdom Way, Suite 100
Raleigh, NC 27607
NC License No: F-0258

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
SEPTEMBER 23, 2016

LETTING DATE:
JULY 18, 2017

DENA C. SNEAD, PE
PROJECT ENGINEER

ALEXANDER D. SNIDER, PE
PROJECT DESIGN ENGINEER

TATIA L. WHITE, PE, PLS
ROADWAY DESIGN - PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 034364 ENGINEER TRENTON J. CORMIER

DocuSigned by: Trenton J. Cormier 5/5/2017
SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 041473 ENGINEER ALEXANDER D. SNIDER

DocuSigned by: Alexander D. Snider 5/5/2017
SIGNATURE: P.E.

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

5/5/2017
P:\TIP\B-5327\Roadway\Proj\b5327_rdy_tsh.dgn

8/17/99

ICA Engineering, Inc.
5121 Kingdom Way,
Suite 100
Raleigh, NC 27607
NC License No: F-0258

PROJECT REFERENCE NO.	SHEET NO.
B-5327	1A

ROADWAY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 041473 ENGINEER ALEXANDER D SNIDER

DocuSigned by: Alexander D. Snider 5/24/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

INDEX OF SHEETS

SHEET NUMBER	SHEET
1	TITLE SHEET
1A	INDEX OF SHEETS, GENERAL NOTES, AND STANDARD DRAWINGS
1B	CONVENTIONAL SYMBOLS
1C-1	SURVEY CONTROL SHEET
2A-1	PAVEMENT SCHEDULE AND TYPICAL SECTIONS
2C-1 THRU 2C-14	GUARDRAIL DETAILS
2C-15	MODIFIED SHOULDER BERM GUTTER DETAIL
2G-1	ROCK PLATING DETAIL
3B-1	EARTHWORK, GUARDRAIL, PAVEMENT REMOVAL AND SHOULDER BERM GUTTER SUMMARIES
3D-1	DRAINAGE SUMMARY
4	PLAN SHEET
5	PROFILE SHEET
TMP-1 THRU TMP-4	TRANSPORTATION MANAGEMENT PLANS
EC-1 THRU EC-4	EROSION CONTROL PLANS
SIGN-1 THRU SIGN-2	SIGNING PLANS
X-1A	CROSS-SECTION SUMMARY SHEET
X-1 THRU X-8	CROSS-SECTIONS
S-1 THRU S-18	STRUCTURE PLANS

GENERAL NOTES:

2012 SPECIFICATIONS
EFFECTIVE: 01-17-2012
REVISED: 01-24-2017

GRADE LINE:
GRADING AND SURFACING:

THE GRADE LINES SHOWN DENOTE THE FINISHED ELEVATION OF THE PROPOSED SURFACING AT GRADE POINTS SHOWN ON THE TYPICAL SECTIONS. GRADE LINES MAY BE ADJUSTED AT THEIR BEGINNING AND ENDING AND AT STRUCTURES AS DIRECTED BY THE ENGINEER IN ORDER TO SECURE A PROPER TIE-IN.

CLEARING:

CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III.

SUPERELEVATION:

ALL CURVES ON THIS PROJECT SHALL BE SUPERELEVATED IN ACCORDANCE WITH STD. NO. 225.04 USING THE RATE OF SUPERELEVATION AND RUNOFF SHOWN ON THE PLANS. SUPERELEVATION IS TO BE REVOLVED ABOUT THE GRADE POINTS SHOWN ON THE TYPICAL SECTIONS.

SHOULDER CONSTRUCTION:

ASPHALT, EARTH, AND CONCRETE SHOULDER CONSTRUCTION ON THE HIGH SIDE OF SUPERELEVATED CURVES SHALL BE IN ACCORDANCE WITH STD. NO. 560.01

GUARDRAIL:

THE GUARDRAIL LOCATIONS SHOWN ON THE PLANS MAY BE ADJUSTED DURING CONSTRUCTION AS DIRECTED BY THE ENGINEER. THE CONTRACTOR SHOULD CONSULT WITH THE ENGINEER PRIOR TO ORDERING GUARDRAIL MATERIAL.

TEMPORARY SHORING:

SHORING REQUIRED FOR THE MAINTENANCE OF TRAFFIC WILL BE PAID FOR AS "EXTRA WORK" IN ACCORDANCE WITH SECTION 104-7.

SUBSURFACE PLANS:

NO SUBSURFACE PLANS ARE AVAILABLE ON THIS PROJECT. THE CONTRACTOR SHOULD MAKE HIS OWN INVESTIGATION AS TO THE SUBSURFACE CONDITIONS.

END BENTS:

THE ENGINEER SHALL CHECK THE STRUCTURE END BENT PLANS, DETAILS, AND CROSS-SECTION PRIOR TO SETTING OF THE SLOPE STAKES FOR THE EMBANKMENT OR EXCAVATION APPROACHING A BRIDGE.

RIGHT-OF-WAY MARKERS:

ALL RIGHT-OF-WAY MARKERS ON THIS PROJECT SHALL BE PLACED BY CONTRACT.

EFF. 01-17-2012
REV. 02-29-2016

2012 ROADWAY ENGLISH STANDARD DRAWINGS

The following Roadway Standards as appear in "Roadway Standard Drawings" Highway Design Branch - N. C. Department of Transportation - Raleigh, N. C., Dated January, 2012 are applicable to this project and by reference hereby are considered a part of these plans:

STD.NO.	TITLE
DIVISION 2 - EARTHWORK	
200.03	Method of Clearing - Method III
225.02	Guide for Grading Subgrade - Secondary and Local
225.04	Method of Obtaining Superelevation - Two Lane Pavement
DIVISION 3 - PIPE CULVERTS	
300.01	Method of Pipe Installation
DIVISION 4 - MAJOR STRUCTURES	
422.11	Bridge Approach Fills - Sub Regional Tier
DIVISION 5 - SUBGRADE, BASES AND SHOULDERS	
560.01	Method of Shoulder Construction - High Side of Superelevated Curve - Method I
DIVISION 8 - INCIDENTALS	
806.01	Concrete Right-of-Way Marker
806.02	Granite Right-of-Way Marker
840.00	Concrete Base Pad for Drainage Structures
840.25	Anchorage for Frames - Brick or Concrete or Precast
840.29	Frames and Narrow Slot Flat Grates
840.35	Traffic Bearing Grated Drop Inlet - for Cast Iron Double Frame and Grates
840.46	Traffic Bearing Precast Drainage Structure
840.66	Drainage Structure Steps
846.04	Drop Inlet Installation in Shoulder Berm Gutter

5/24/2017
T:\5327\Roadway\Proj\b5327_rdy_tsh01A.dgn
TAE ENGINEERING, INC.

04/06/15

PROJECT REFERENCE NO.	SHEET NO.
B-5327	1B

STATE OF NORTH CAROLINA, DIVISION OF HIGHWAYS

CONVENTIONAL PLAN SHEET SYMBOLS

Note: Not to Scale **S.U.E. = Subsurface Utility Engineering*

BOUNDARIES AND PROPERTY:

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Existing Iron Pin — EIP
- Property Corner
- Property Monument — ECM
- Parcel/Sequence Number — 123
- Existing Fence Line
- Proposed Woven Wire Fence
- Proposed Chain Link Fence
- Proposed Barbed Wire Fence
- Existing Wetland Boundary — WLB
- Proposed Wetland Boundary — WLB
- Existing Endangered Animal Boundary — EAB
- Existing Endangered Plant Boundary — EPB
- Existing Historic Property Boundary — HPB
- Known Contamination Area: Soil
- Potential Contamination Area: Soil
- Known Contamination Area: Water
- Potential Contamination Area: Water
- Contaminated Site: Known or Potential

BUILDINGS AND OTHER CULTURE:

- Gas Pump Vent or U/G Tank Cap
- Sign — S
- Well — W
- Small Mine
- Foundation
- Area Outline
- Cemetery
- Building
- School
- Church
- Dam

HYDROLOGY:

- Stream or Body of Water
- Hydro, Pool or Reservoir
- Jurisdictional Stream — JS
- Buffer Zone 1 — BZ 1
- Buffer Zone 2 — BZ 2
- Flow Arrow
- Disappearing Stream
- Spring
- Wetland
- Proposed Lateral, Tail, Head Ditch — FLOW
- False Sump

RAILROADS:

- Standard Gauge — CSX TRANSPORTATION
- RR Signal Milepost — MILEPOST 35
- Switch — SWITCH
- RR Abandoned
- RR Dismantled

RIGHT OF WAY:

- Baseline Control Point
- Existing Right of Way Marker
- Existing Right of Way Line
- Proposed Right of Way Line — RW
- Proposed Right of Way Line with Iron Pin and Cap Marker — RW
- Proposed Right of Way Line with Concrete or Granite R/W Marker — RW
- Proposed Control of Access Line with Concrete C/A Marker — CA
- Existing Control of Access — CA
- Proposed Control of Access — CA
- Existing Easement Line — E
- Proposed Temporary Construction Easement — E
- Proposed Temporary Drainage Easement — TDE
- Proposed Permanent Drainage Easement — PDE
- Proposed Permanent Drainage / Utility Easement — DUE
- Proposed Permanent Utility Easement — PUE
- Proposed Temporary Utility Easement — TUE
- Proposed Aerial Utility Easement — AUE
- Proposed Permanent Easement with Iron Pin and Cap Marker

ROADS AND RELATED FEATURES:

- Existing Edge of Pavement
- Existing Curb
- Proposed Slope Stakes Cut — C
- Proposed Slope Stakes Fill — F
- Proposed Curb Ramp — CR
- Existing Metal Guardrail
- Proposed Guardrail
- Existing Cable Guiderail
- Proposed Cable Guiderail
- Equality Symbol
- Pavement Removal

VEGETATION:

- Single Tree
- Single Shrub
- Hedge
- Woods Line
- Orchard
- Vineyard — Vineyard

EXISTING STRUCTURES:

MAJOR:

- Bridge, Tunnel or Box Culvert — CONC
- Bridge Wing Wall, Head Wall and End Wall — CONC WW

MINOR:

- Head and End Wall — CONC HW
- Pipe Culvert
- Footbridge
- Drainage Box: Catch Basin, DI or JB — CB
- Paved Ditch Gutter
- Storm Sewer Manhole — S
- Storm Sewer — S

UTILITIES:

POWER:

- Existing Power Pole
- Proposed Power Pole
- Existing Joint Use Pole
- Proposed Joint Use Pole
- Power Manhole — P
- Power Line Tower
- Power Transformer
- U/G Power Cable Hand Hole
- H–Frame Pole
- U/G Power Line LOS B (S.U.E.*) — P
- U/G Power Line LOS C (S.U.E.*) — P
- U/G Power Line LOS D (S.U.E.*) — P

TELEPHONE:

- Existing Telephone Pole
- Proposed Telephone Pole
- Telephone Manhole — T
- Telephone Pedestal — T
- Telephone Cell Tower
- U/G Telephone Cable Hand Hole — HH
- U/G Telephone Cable LOS B (S.U.E.*) — T
- U/G Telephone Cable LOS C (S.U.E.*) — T
- U/G Telephone Cable LOS D (S.U.E.*) — T
- U/G Telephone Conduit LOS B (S.U.E.*) — TC
- U/G Telephone Conduit LOS C (S.U.E.*) — TC
- U/G Telephone Conduit LOS D (S.U.E.*) — TC
- U/G Fiber Optics Cable LOS B (S.U.E.*) — T FO
- U/G Fiber Optics Cable LOS C (S.U.E.*) — T FO
- U/G Fiber Optics Cable LOS D (S.U.E.*) — T FO

WATER:

- Water Manhole — W
- Water Meter
- Water Valve
- Water Hydrant
- U/G Water Line LOS B (S.U.E*) — W
- U/G Water Line LOS C (S.U.E*) — W
- U/G Water Line LOS D (S.U.E*) — W
- Above Ground Water Line — A/G Water

TV:

- TV Pedestal — C
- TV Tower
- U/G TV Cable Hand Hole — HH
- U/G TV Cable LOS B (S.U.E.*) — TV
- U/G TV Cable LOS C (S.U.E.*) — TV
- U/G TV Cable LOS D (S.U.E.*) — TV
- U/G Fiber Optic Cable LOS B (S.U.E.*) — TV FO
- U/G Fiber Optic Cable LOS C (S.U.E.*) — TV FO
- U/G Fiber Optic Cable LOS D (S.U.E.*) — TV FO

GAS:

- Gas Valve
- Gas Meter
- U/G Gas Line LOS B (S.U.E.*) — G
- U/G Gas Line LOS C (S.U.E.*) — G
- U/G Gas Line LOS D (S.U.E.*) — G
- Above Ground Gas Line — A/G Gas

SANITARY SEWER:

- Sanitary Sewer Manhole
- Sanitary Sewer Cleanout
- U/G Sanitary Sewer Line — SS
- Above Ground Sanitary Sewer — A/G Sanitary Sewer
- SS Forced Main Line LOS B (S.U.E.*) — FSS
- SS Forced Main Line LOS C (S.U.E.*) — FSS
- SS Forced Main Line LOS D (S.U.E.*) — FSS

MISCELLANEOUS:

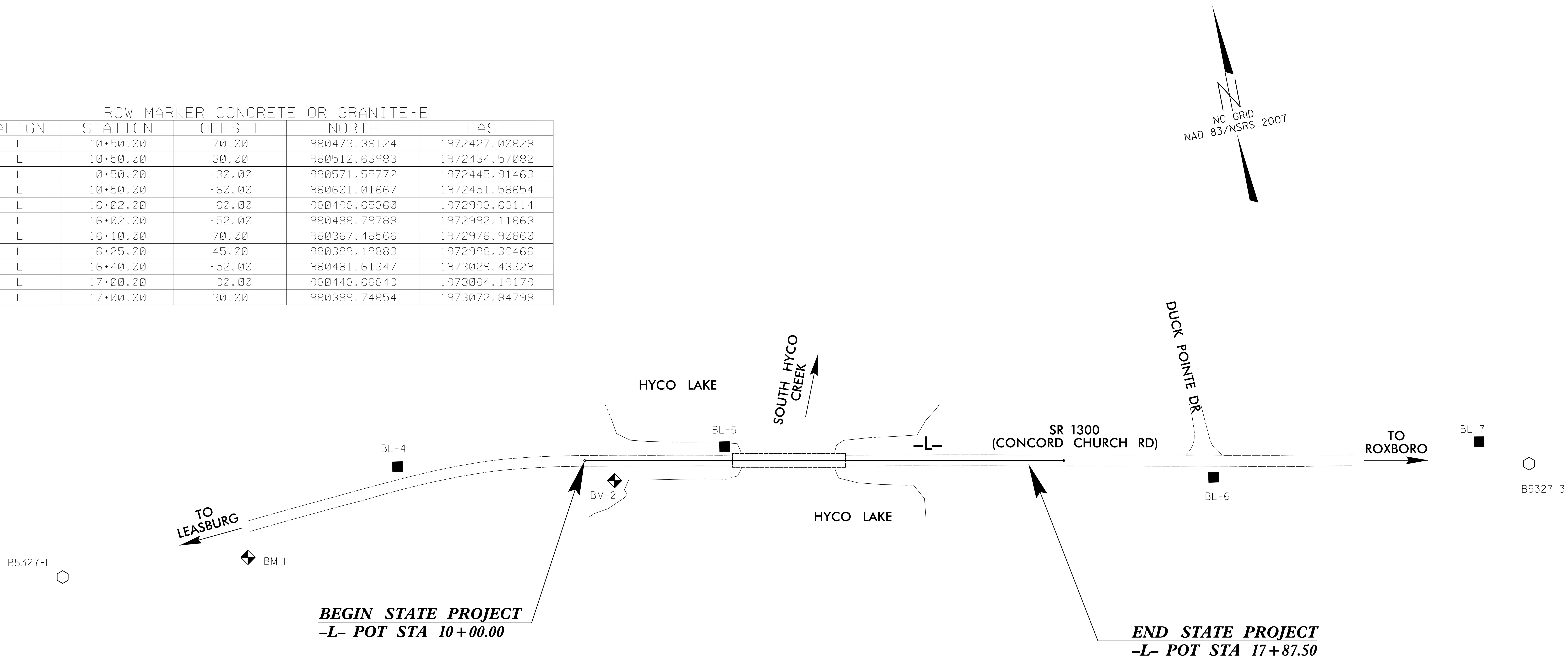
- Utility Pole
- Utility Pole with Base
- Utility Located Object
- Utility Traffic Signal Box — S
- Utility Unknown U/G Line LOS B (S.U.E.*) — ?UTL
- U/G Tank; Water, Gas, Oil
- Underground Storage Tank, Approx. Loc. — UST
- A/G Tank; Water, Gas, Oil
- Geoenvironmental Boring
- U/G Test Hole LOS A (S.U.E.*)
- Abandoned According to Utility Records — AATUR
- End of Information — E.O.I.

5/5/2014
I:\B-5327\Roadway\Proj\b5327_rdy_tsh01B.dgn
FAA ENGINEERING, INC.

SURVEY CONTROL SHEET B-5327

ROW MARKER CONCRETE OR GRANITE-E

ALIGN	STATION	OFFSET	NORTH	EAST
L	10+50.00	70.00	980473.36124	1972427.00828
L	10+50.00	30.00	980512.63983	1972434.57082
L	10+50.00	-30.00	980571.55772	1972445.91463
L	10+50.00	-60.00	980601.01667	1972451.58654
L	16+02.00	-60.00	980496.65360	1972993.63114
L	16+02.00	-52.00	980488.79788	1972992.11863
L	16+10.00	70.00	980367.48566	1972976.90860
L	16+25.00	45.00	980389.19883	1972996.36466
L	16+40.00	-52.00	980481.61347	1973029.43329
L	17+00.00	-30.00	980448.66643	1973084.19179
L	17+00.00	30.00	980389.74854	1973072.84798



BASELINE DATA

POINT	DESC.	NORTH	EAST	ELEVATION	L STATION	OFFSET
1	B5327-1	980498.9700	1971065.3440	473.11	OUTSIDE PROJECT LIMITS	
4	BL-4	980585.8500	1972059.5280	419.34	OUTSIDE PROJECT LIMITS	
5	BL-5	980519.8900	1972639.7600	416.80	12+50.12	15.91 LT
6	BL-6	980325.8910	1973484.0320	472.28	OUTSIDE PROJECT LIMITS	
7	BL-7	980267.3930	1973955.6280	493.34	OUTSIDE PROJECT LIMITS	
3	B5327-3	980163.4580	1974392.1730	478.78	OUTSIDE PROJECT LIMITS	

L

TYPE	STATION	NORTH	EAST
POT	10+00.00	980551.5520	1972391.1445
POT	18+50.00	980390.8480	1973225.8146

DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCGS FOR MONUMENT "B5327-3"
WITH NAD 83/NSRS 2007 STATE PLANE GRID COORDINATES OF
NORTHING: 980163.458(ft) EASTING: 1974392.173(ft)
ELEVATION: 478.778(ft)
THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 1.00007114
THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "B-5327-3" TO -L- STATION 10+00 IS
N 79° 01′ 26.1″ W 2,038.32′
ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES
VERTICAL DATUM USED IS NAVD 88

GEOID G09NC

NOTE: DRAWING NOT TO SCALE

****
1493 ELEVATION = 440.92
N 980496 E 1971772
L STATION 10+00.00
S 84°51′36.84" W DIST 621.62
R/R SPIKE IN 14" OAK
****

****
1191 ELEVATION = 412.32
N 980506 E 1972436
L STATION 10+53.00 36 RIGHT
R/R SPIKE IN 13" POPLAR
****

NOTES:

SITE CALIBRATION INFORMATION HAS NOT BEEN PROVIDED FOR THIS PROJECT. IF FURTHER INFORMATION IS NEEDED, PLEASE CONTACT THE LOCATION AND SURVEYS UNIT.

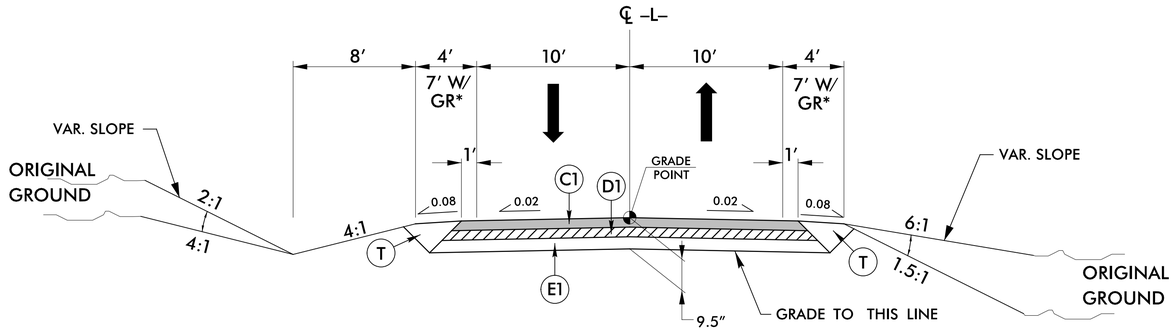
⬡ INDICATES GEODETIC CONTROL MONUMENTS USED OR SET FOR HORIZONTAL PROJECT CONTROL BY THE NCDOT LOCATION AND SURVEYS UNIT.
PROJECT CONTROL ESTABLISHED USING GLOBAL POSITIONING SYSTEM.

6/2/99

FINAL PAVEMENT SCHEDULE

C1	PROP. APPROX. 3″ ASPHALT CONCRETE SURFACE COURSE, TYPE SF9.5A, AT AN AVERAGE RATE OF 165 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.
C2	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE SF9.5A, AT AN AVERAGE RATE OF 110 LBS. PER SQ. YD. PER INCH. TO BE PLACED IN LAYERS NOT TO EXCEED 1.5″ IN DEPTH.
D1	PROP. APPROX. 2.5″ ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0B, AT AN AVERAGE RATE OF 285 LBS. PER SQ. YD.
D2	PROP. VAR. DEPTH ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0B, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER INCH. TO BE PLACED IN LAYERS NOT TO EXCEED 4″ OR LESS THAN 2.5″IN DEPTH.
E1	PROP. APPROX 4″ ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 456 LBS. PER SQ. YD.
E2	PROP. VAR. DEPTH ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER INCH. TO BE PLACED IN LAYERS NOT TO EXCEED 5.5″ OR LESS THAN 3″IN DEPTH.
J1	PROPOSED VARIABLE DEPTH SELECT MATERIAL, CLASS IV
R1	SHOULDER BERM GUTTER (SEE DETAIL SHEET 2C-1)
T	EARTH MATERIAL
W	WEDGING (SEE DETAIL SHOWING METHOD OF WEDGING)

NOTE: ALL PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE



TYPICAL SECTION NO. 1

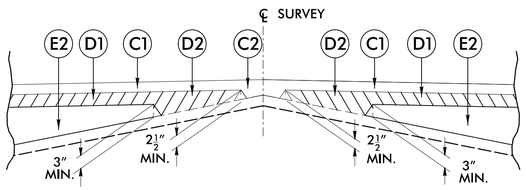
–L– CONCORD CHURCH RD

USE TYPICAL SECTION NO. 1 FROM:

–L– STA 10+50.00 TO –L– STA 12+56.25

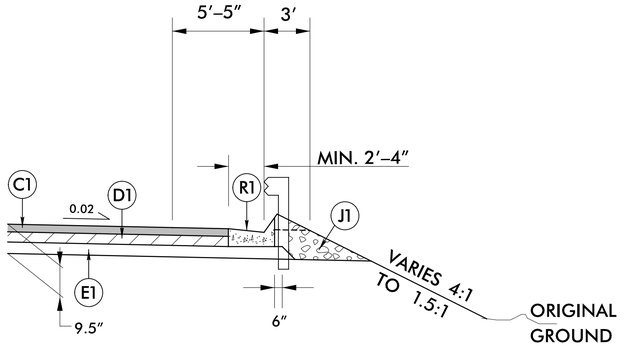
–L– STA 14+68.75 TO –L– STA 17+00.00

*PAVE TO FACE OF GUARDRAIL



Detail Showing Method of Wedging

USE IN CONJUNCTION WITH TYPICAL SECTION NO. 2

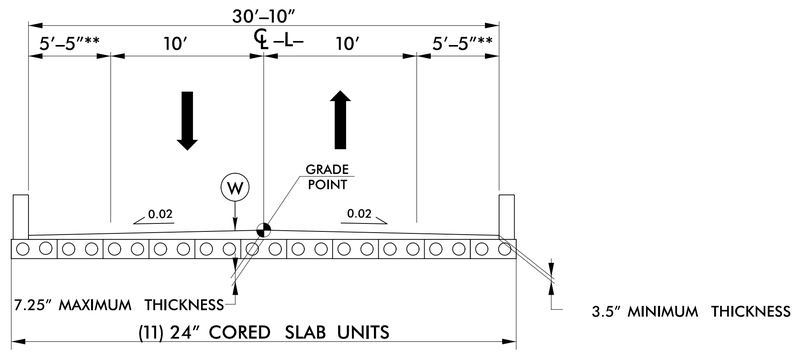


SHOULDER BERM GUTTER

PARTIAL TYPICAL SECTION NO. 1A

USE PARTIAL TYPICAL SECTION NO. 1A IN CONJUNCTION WITH TYPICAL SECTION NO. 1 AS FOLLOWS:

–L– STA 12+27.50 TO –L– STA 12+45.38 LT & RT



TYPICAL SECTION NO. 2

–L– CONCORD CHURCH RD

USE TYPICAL SECTION NO. 2 FROM:

–L– STA 12+56.25 (BEGIN BRIDGE) TO –L– STA 14+68.75 (END BRIDGE)

**ADDITIONAL WIDTH REQUIRED FOR HYDRAULIC SPREAD

FDR | ICA

ICA Engineering, Inc.
5121 Kingdom Way,
Suite 100
Raleigh, NC 27607
NC License No: F-0258

PROJECT REFERENCE NO.	SHEET NO.
B-5327	2A-1

ROADWAY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 041473 ENGINEER ALEXANDER D SNIDER

DocuSigned by: 5/5/2017
Alexander D. Snider
FD61A6

PAVEMENT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 022896 ENGINEER CLARK S MORRISON

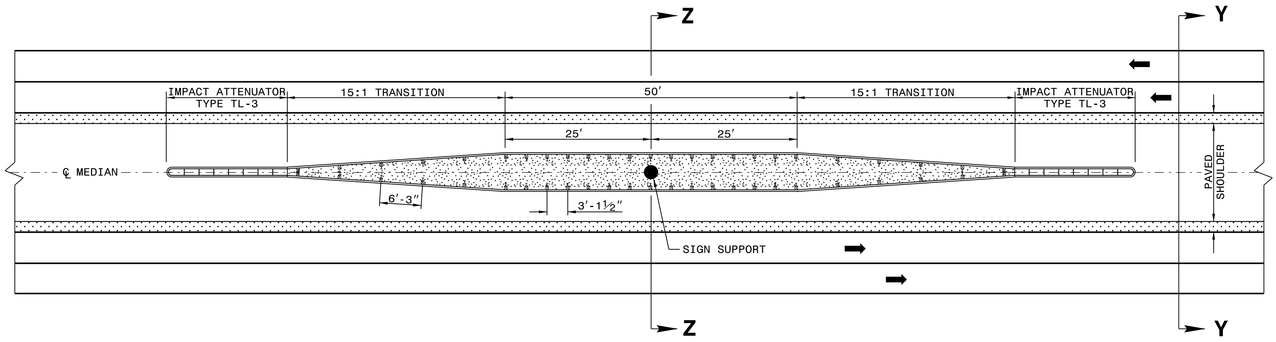
DocuSigned by: 5/8/2017
Clark S Morrison

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

5/5/2017
I:\B5327\Roadway\Proj\b5327_rdy_typ.dgn
FAY ENGINEERING, INC.

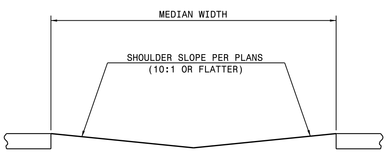
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

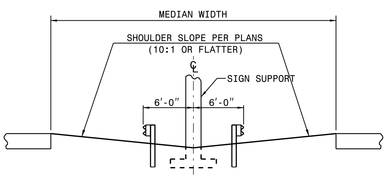


NOTE SPECIAL LAYER OF PAVEMENT .....

USE 3'-1½" POST SPACING ON THE 50' OF GUARDRAIL PARALLEL TO LANES AND 6'-3" POST SPACING ON 15:1 TRANSITION SECTIONS.
GRADE MEDIAN IN THE VICINITY OF THE SIGN SUPPORT AS ILLUSTRATED IN THE ROADWAY STANDARD DRAWINGS (STARDARD 862D01 SHEET 1 OF 12).



SECT. YY



SECT. ZZ

DETAIL OF GUARDRAIL AT MEDIAN SIGN SUPPORT

SHEET 2 OF 11
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STATE OF NORTH CAROLINA
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ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 2 OF 11
862D01

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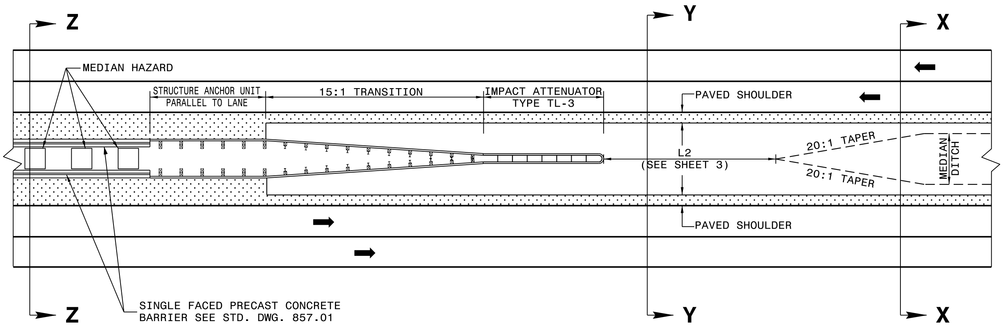
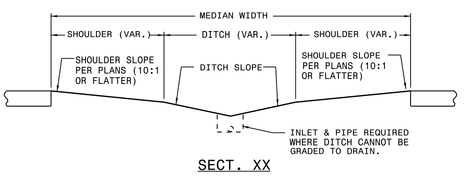
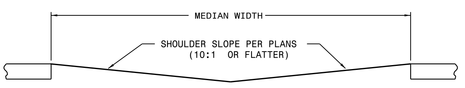
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT





SECT. XX



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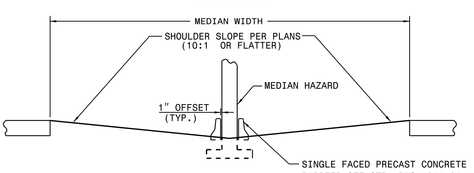
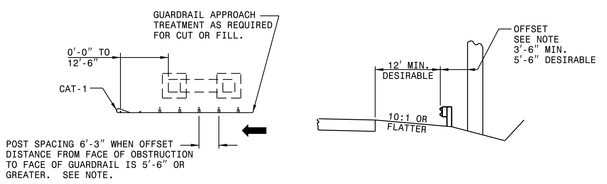


SECT. ZZ

DETAIL OF MEDIAN TREATMENT AT UNDERPASS



NOTE: WHEN OFFSET DISTANCE FROM FACE OF OBSTRUCTION TO FACE OF GUARDRAIL IS BETWEEN 3'-6" AND 5'-6", BEGIN 3'-1½" POST SPACING AT A POINT 25' BEFORE REACHING THE OBSTRUCTION AND CARRY THROUGHOUT ITS LENGTH. IF THE OFFSET IS LESS THAN 3'-6" USE CONCRETE BARRIER.

DETAIL OF RIGHT SIDE GUARDRAIL AT UNDERPASS

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ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 1 OF 11
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SHEET NO. 2C-1

PROJECT REFERENCE NO.	SHEET NO.
B-5327	2C-2

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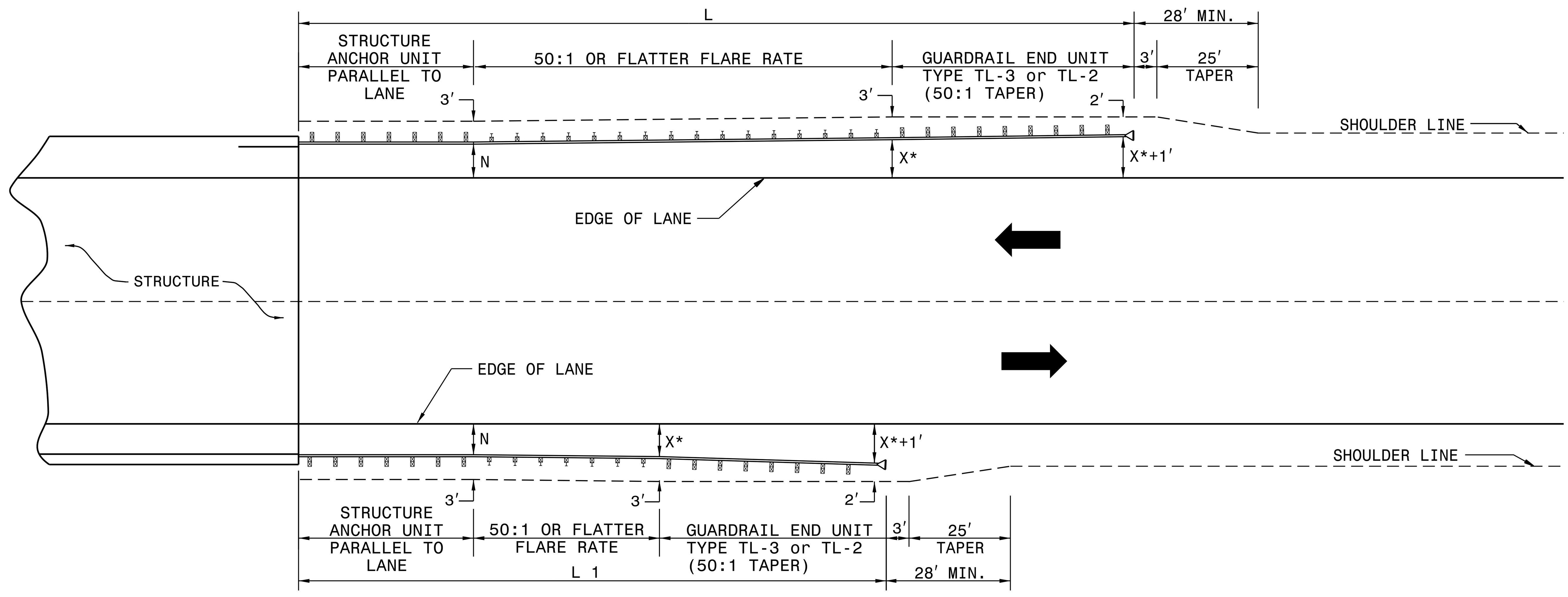
ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 4 OF 11
862D01



* USE FLARE RATE AS THE CONTROL IF THE "X" DISTANCE IS NOT OBTAINED. ("X" IS BASED ON SHOULDER WIDTHS IN THE HIGHWAY DESIGN BRANCH MANUAL, PART 1, 1-4B, F1).

"N"= DISTANCE FROM EDGE OF LANE TO FACE OF GUARDRAIL WHERE GUARDRAIL IS PARALLEL TO LANE.

SEE STD. 862.03 FOR STRUCTURE ANCHOR UNITS

FOR POSTED SPEEDS ≥ 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2

GUARDRAIL INSTALLATION AT BRIDGE APPROACHES FOR TWO-LANE, TWO-WAY TRAFFIC

DESIGN SPEED (MPH)	"L" APPROACH LENGTH (FT.)				"L1" TRAILING LENGTH (FT.)			
	DESIGN YEAR ADT		CURRENT YEAR ADT		DESIGN YEAR ADT		CURRENT YEAR ADT	
	OVER 2000	1001-2000	400-1000	UNDER 400	OVER 2000	1001-2000	400-1000	UNDER 400
70	362.5′	362.5′	350.0′	287.5′	187.5′	187.5′	175.0′	75.0′
60	300.0′	287.5	275.0′	225.0′	137.5′	137.5′	100.0′	75.0′
50	212.5′	212.5′	200.0′	162.5′	87.5′	75.0′	75.0′	75.0′
40	175.0′	150.0′	137.5′	112.5′	75.0′	75.0′	75.0′	75.0′
X *	8′	6′	4′	4′	8′	6′	4′	4′

LENGTHS AND OFFSETS FOR PROPOSED GUARDRAIL AT TWO LANE - TWO WAY LOCATIONS

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ROADWAY DETAIL DRAWING FOR
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SHEET 4 OF 11
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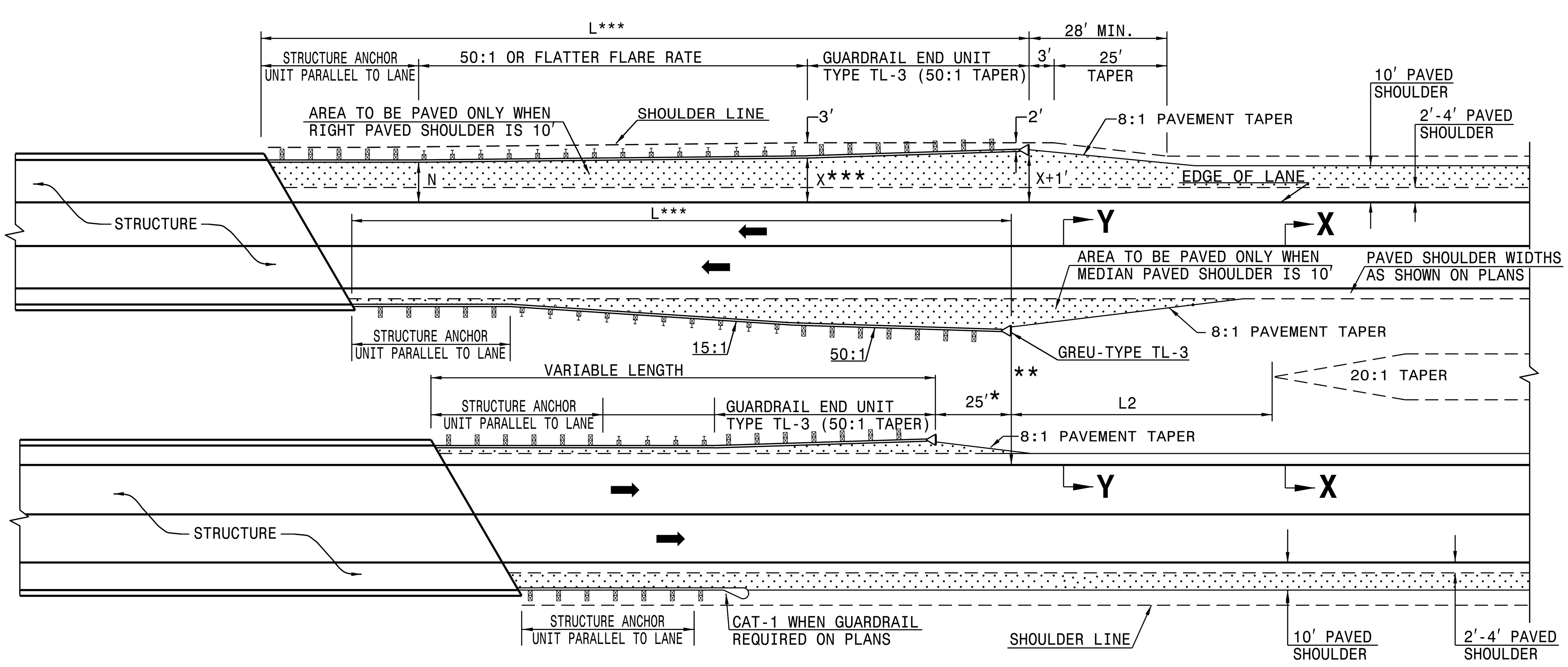
ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 3 OF 11
862D01



FOR POSTED SPEEDS ≥ 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2

DIMENSIONS FOR LENGTH OF GUARDRAIL APPROACHING DUAL LANE BRIDGES

MEDIAN WIDTH	-L-***						-L2- DIM.
	70 MPH	60 MPH	50 MPH				
30′	300.0′	250.0′	150.0′				80.0′
36′	300.0′	250.0′	150.0′				60.0′
40′ & ABOVE	300.0′	250.0′	150.0′				40.0′

NOTES: * MINOR VARIATION TO THE 25′-0″ DIMENSION IS PERMISSIBLE TO ACCOMODATE THE 12′-6″ IN GUARDRAIL LENGTHS.

** NO GUARDRAIL IS REQUIRED ON THE TRAILING END WHEN THIS DISTANCE EXCEEDS CLEAR ROADSIDE RECOVERY AREA FOR THE APPROPRIATE DESIGN SPEED.

*** BASED ON "X" OF 12′
USE FLARE RATE AS THE CONTROL IF THE "X" DISTANCE IS NOT OBTAINED. ("X" IS BASED ON SHOULDER WIDTHS IN THE HIGHWAY DESIGN BRANCH MANUAL, PART 1, 1-4B, F1A).

"N"= DISTANCE FROM EDGE OF LANE TO FACE OF GUARDRAIL WHERE GUARDRAIL IS PARALLEL TO LANE.

THE DESIGN LAYOUT FOR LENGTHS SHOWN ON THIS STANDARD ARE MINIMUM DESIGN LENGTHS.

SEE SHEET 1 OF 12 FOR SECTIONS XX, YY

SEE STD. 862.03 FOR STRUCTURE ANCHOR UNITS

DETAIL OF GUARDRAIL APPROACHING DUAL LANE BRIDGES

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ROADWAY DETAIL DRAWING FOR
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SHEET 3 OF 11
862D01

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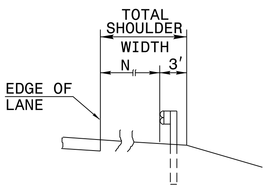

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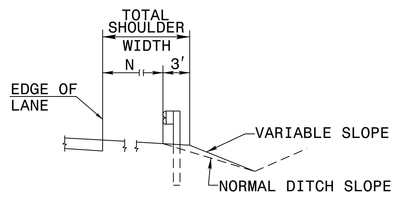
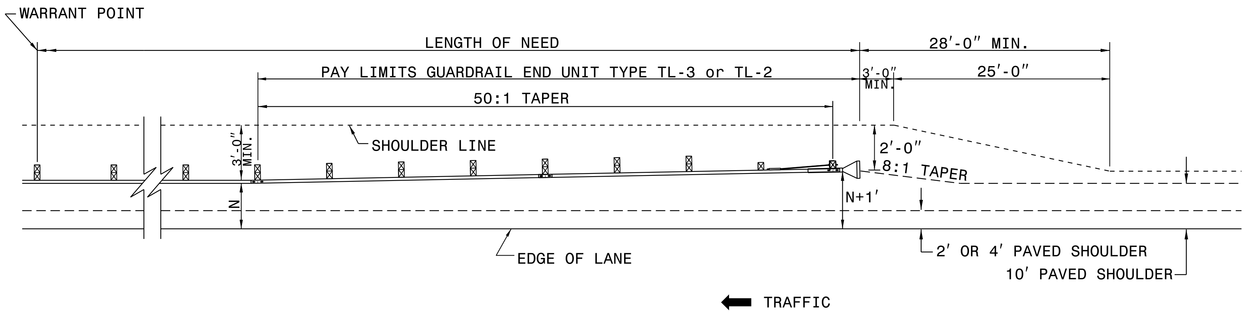


CUT SECTION

"N"= DISTANCE FROM EDGE OF LANE TO FACE OF GUARDRAIL WHERE GUARDRAIL IS PARALLEL TO LANE.



FOR POSTED SPEEDS ≥ 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2

DETAIL OF BEGINNING OF GUARDRAIL IN CUT OR FILL SECTION

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ROADWAY DETAIL DRAWING FOR
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SHEET 6 OF 11
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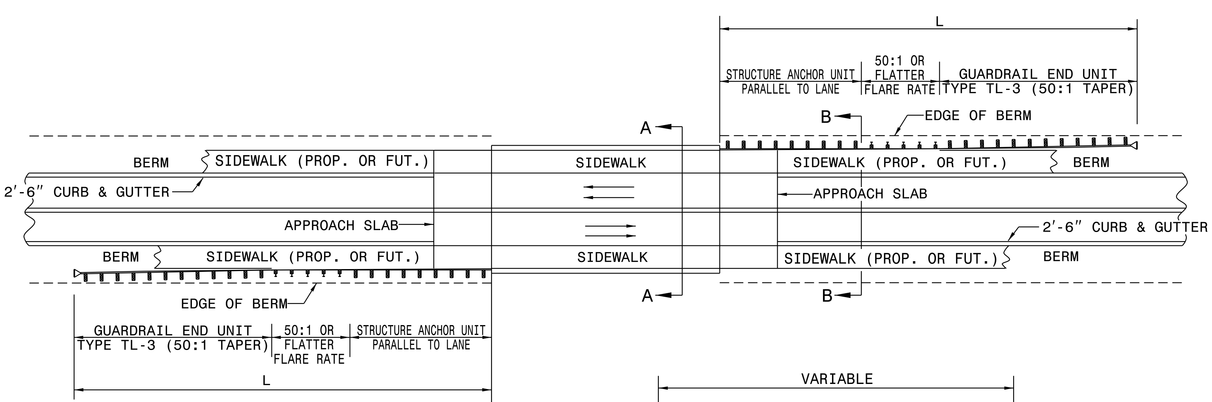
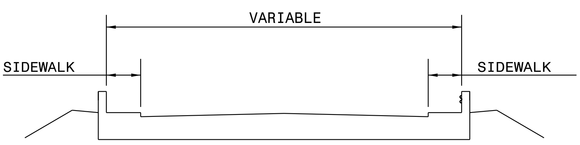
ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT



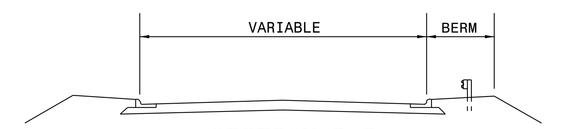
MINIMUM GUARDRAIL LENGTHS "L" REQUIRED AT BRIDGE APPROACHES ON 2'-6" CONCRETE CURB AND GUTTER ROADWAYS	
DESIGN SPEED (MPH)	"L"
40	150'
50	225'

NOTE: "L" VALUES ARE BASED ON NO HAZARDS OTHER THAN END OF BRIDGE BEING PRESENT WITHIN THE CLEAR ZONE.

SEE STD. 862D03 FOR STRUCTURE ANCHOR UNITS.



SECTION A-A



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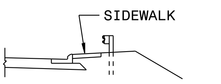

FOR POSTED SPEEDS ≥ 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2

STANDARD GUARDRAIL PLACEMENT AT BRIDGES WITH 2'-6" CONCRETE CURB AND GUTTER

SHEET 5 OF 11
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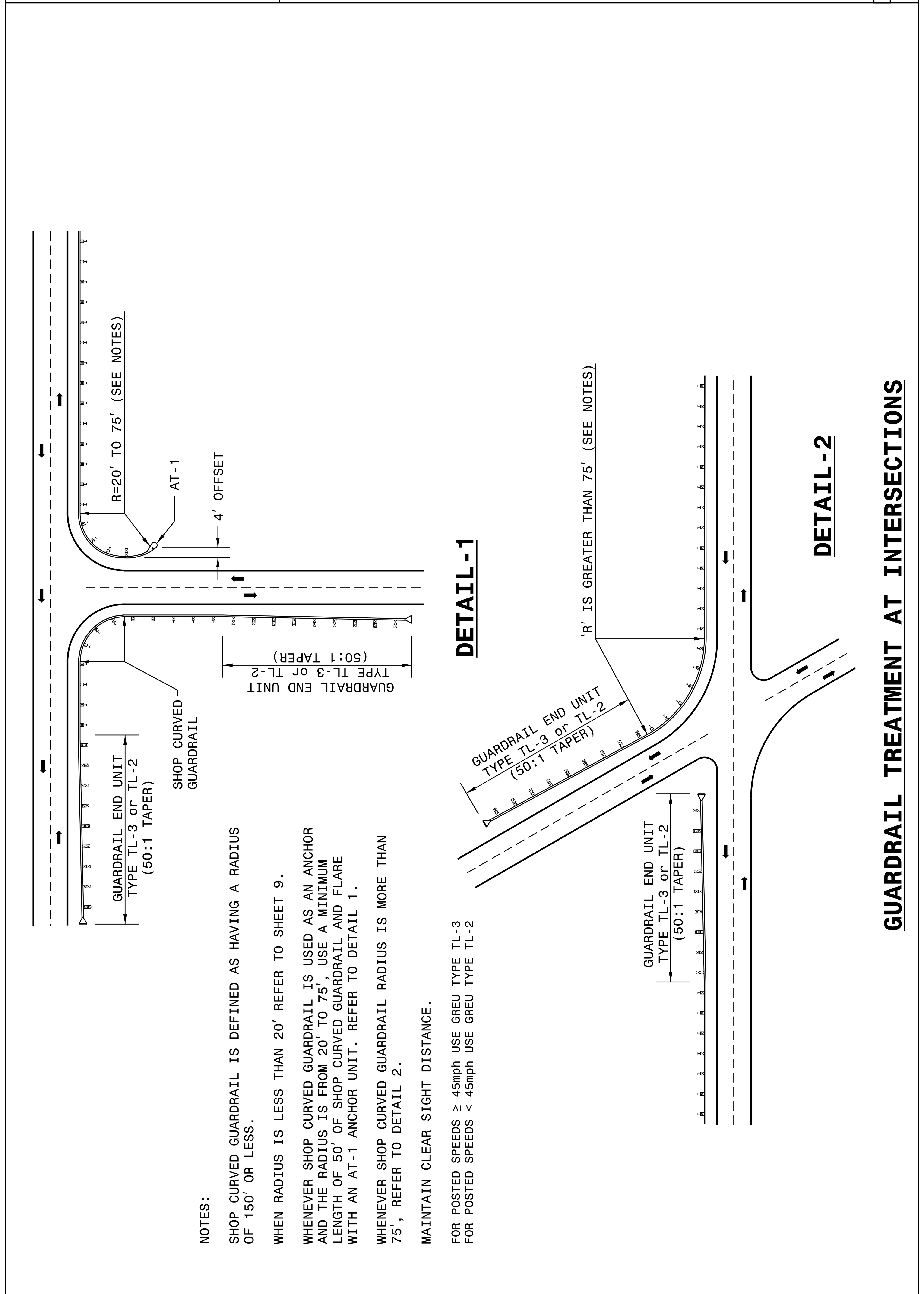
SHEET NO. 2C-3



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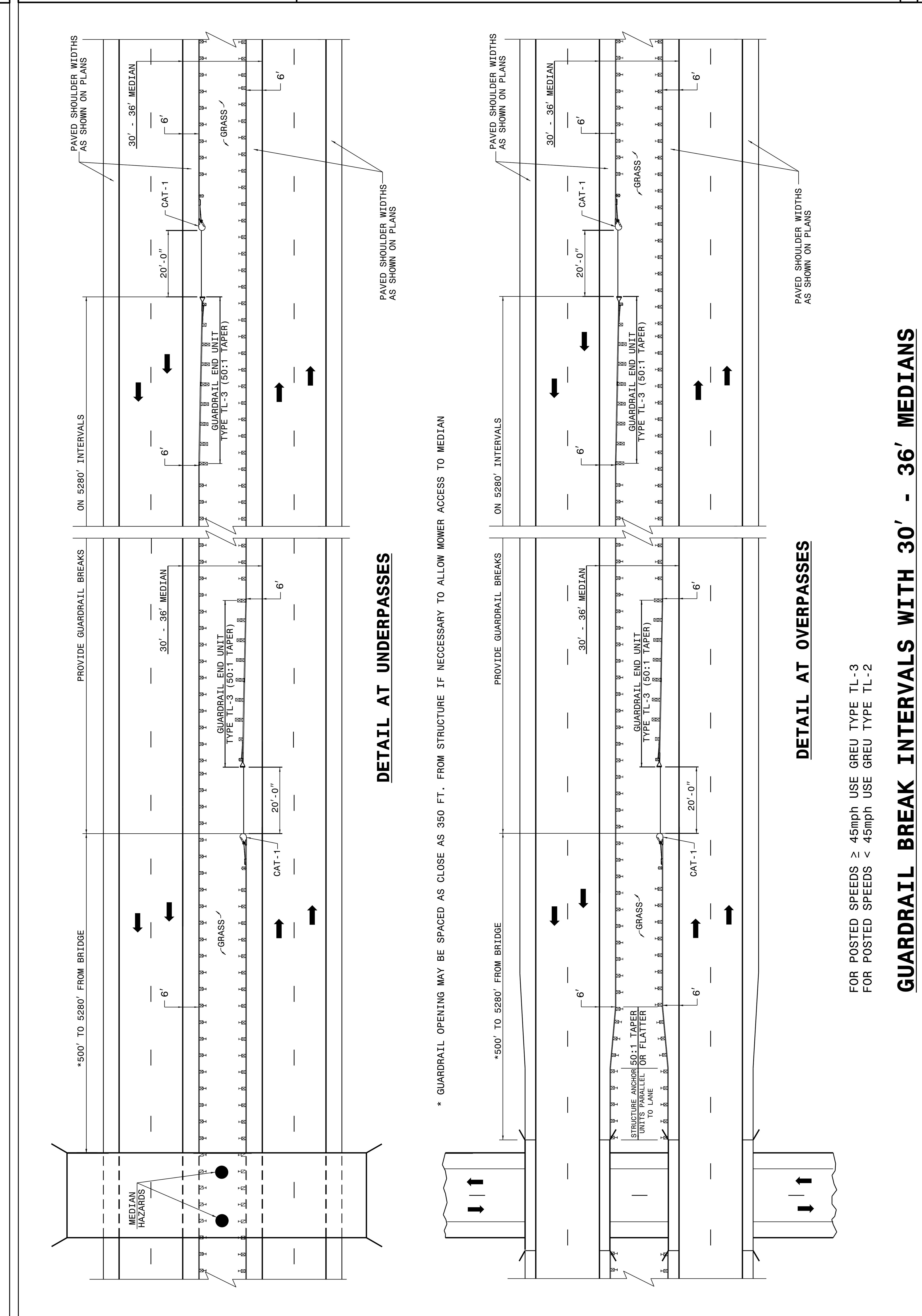
ROADWAY DETAIL DRAWING FOR GUARDRAIL PLACEMENT
SHEET 8 OF 11 862D01
R=20' TO 75' (SEE NOTES)
AT-1
4' OFFSET
SHOP CURVED GUARDRAIL
GUARDRAIL END UNIT TYPE TL-3 or TL-2 (50:1 TAPER)
DETAIL-1
'R' IS GREATER THAN 75' (SEE NOTES)
DETAIL-2
GUARDRAIL TREATMENT AT INTERSECTIONS
NOTES:
SHOP CURVED GUARDRAIL IS DEFINED AS HAVING A RADIUS OF 150' OR LESS.
WHEN RADIUS IS LESS THAN 20' REFER TO SHEET 9.
WHENEVER SHOP CURVED GUARDRAIL IS USED AS AN ANCHOR AND THE RADIUS IS FROM 20' TO 75', USE A MINIMUM LENGTH OF 50' OF SHOP CURVED GUARDRAIL AND FLARE WITH AN AT-1 ANCHOR UNIT. REFER TO DETAIL 1.
WHENEVER SHOP CURVED GUARDRAIL RADIUS IS MORE THAN 75', REFER TO DETAIL 2.
MAINTAIN CLEAR SIGHT DISTANCE.
FOR POSTED SPEEDS ≥ 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2



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ROADWAY DETAIL DRAWING FOR GUARDRAIL PLACEMENT
SHEET 7 OF 11 862D01
PAVED SHOULDER WIDTHS AS SHOWN ON PLANS
30' - 36' MEDIAN
6'
GRASS
CAT-1
20'-0"
GUARDRAIL END UNIT TYPE TL-3 (50:1 TAPER)
PROVIDE GUARDRAIL BREAKS ON 5280' INTERVALS
*500' TO 5280' FROM BRIDGE
MEDIAN HAZARDS
DETAIL AT UNDERPASSES
* GUARDRAIL OPENING MAY BE SPACED AS CLOSE AS 350 FT. FROM STRUCTURE IF NECCESSARY TO ALLOW MOWER ACCESS TO MEDIAN
STRUCTURE ANCHOR UNITS PARALLEL TO LANE
50:1 TAPER OR FLATTER
DETAIL AT OVERPASSES
FOR POSTED SPEEDS ≥ 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2
GUARDRAIL BREAK INTERVALS WITH 30' - 36' MEDIANS

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ROADWAY DETAIL DRAWING FOR
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ROADWAY DETAIL DRAWING FOR
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SHEET 7 OF 11 **862D01**

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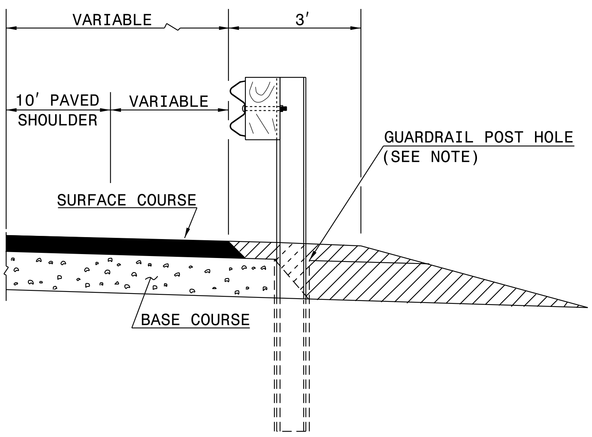
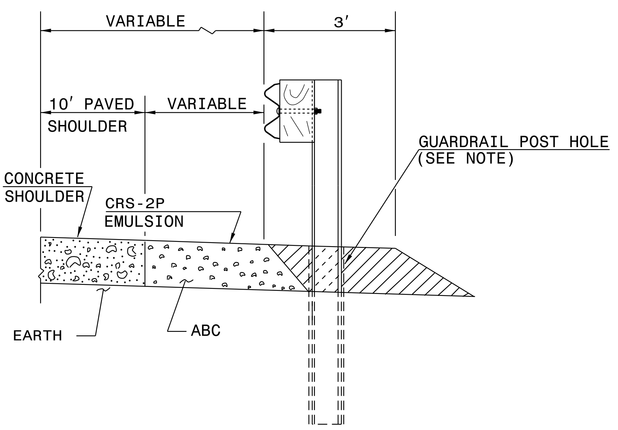
ENGLISH DETAIL DRAWING FOR
GUARDRAIL PLACEMENT



FLEXIBLE PAVED SHOULDER



CONCRETE PAVED SHOULDER

EARTH MATERIAL

NOTE:
WHEN WOODEN GUARDRAIL POSTS ARE USED, DRILL HOLES THROUGH EARTH MATERIAL AND BASE COURSE.THE POST MAY THEN BE DRIVEN TO THE PROPER DEPTH. DRILL THE HOLE OF SUFFICIENT SIZE TO ACCOMMODATE THE PARTICULAR POST BEING USED. BACKFILL AND TAMP HOLES USING THE EXCAVATED MATERIAL.

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ENGLISH DETAIL DRAWING FOR
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ROADWAY DETAIL DRAWING FOR
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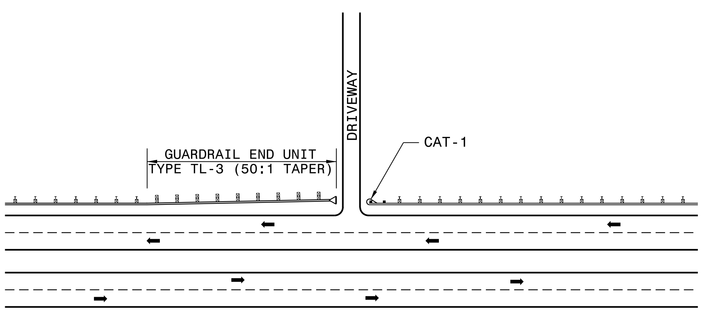
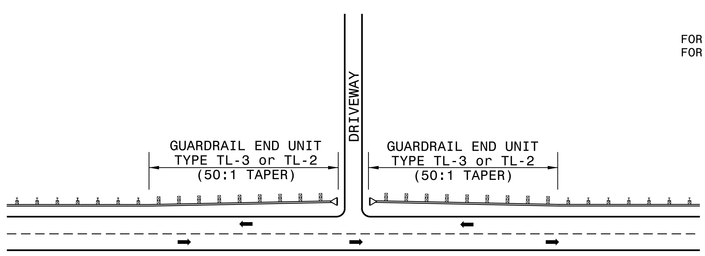


DETAIL-3
DIVIDED HIGHWAY

NOTE: USE DETAIL 3 & 4 WHENEVER 20' OR LARGER RADIUS CANNOT BE UTILIZED.

MAINTAIN CLEAR SIGHT DISTANCE.

FOR POSTED SPEEDS ≥ 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2



DETAIL-4
UNDIVIDED HIGHWAY

GUARDRAIL TREATMENT AT DRIVEWAYS

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ROADWAY DETAIL DRAWING FOR
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PROJECT REFERENCE NO.	SHEET NO.
B-5327	2C-6

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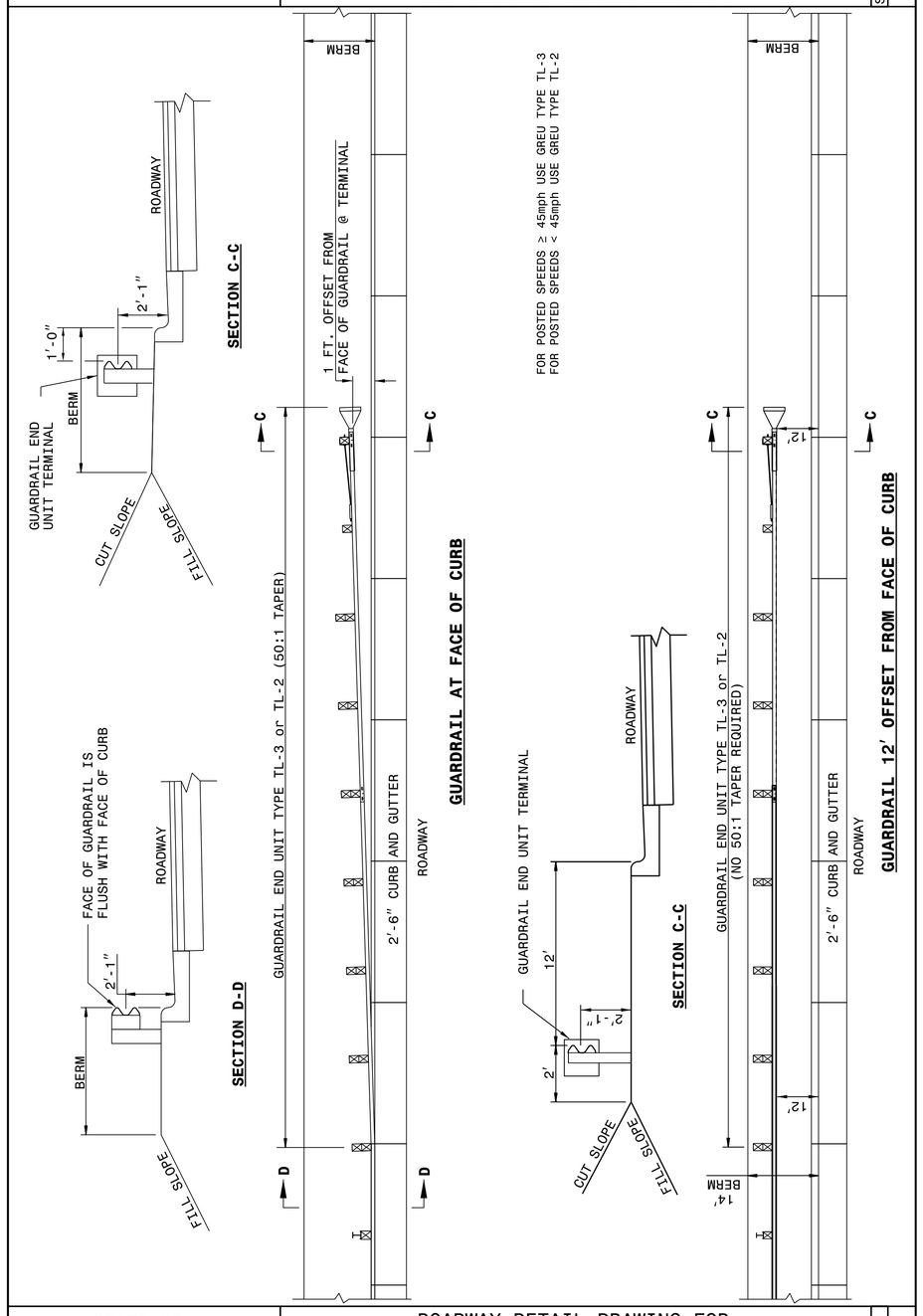
ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT
GUARDRAIL TREATMENT AT CURB AND GUTTER

SHEET 11OF 11
862D01



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ROADWAY DETAIL DRAWING FOR
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GUARDRAIL TREATMENT AT CURB AND GUTTER

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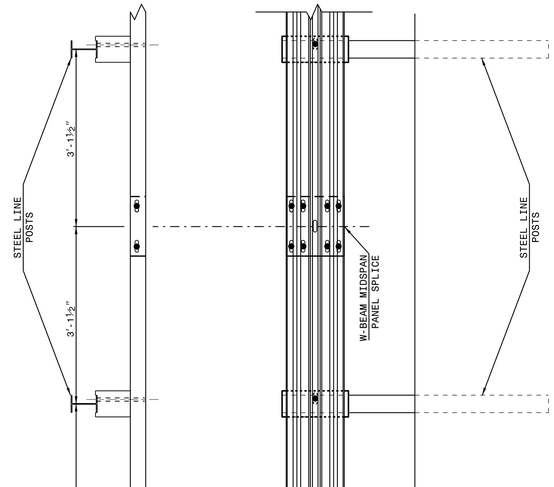
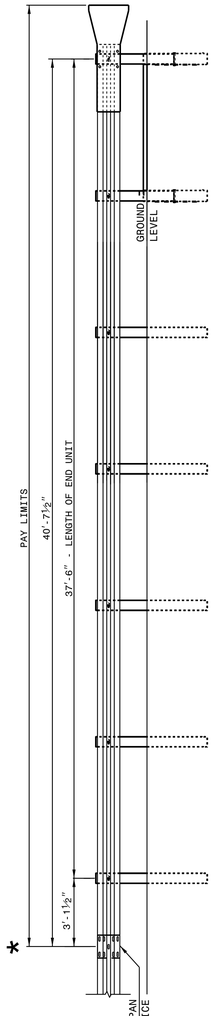
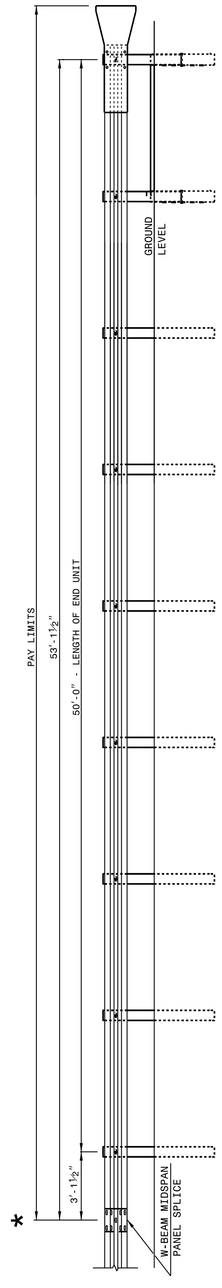


TRAILING END UNIT ASSEMBLY
C.A.T.-1 SYSTEM



FLARED AND TANGENT
ELEVATION VIEW



FLARED AND TANGENT
ELEVATION VIEW

* **WHEN INSTALLING GUARDRAIL END UNITS THAT ARE 2'-1" MOUNTING HEIGHT TO EXISTING GUARDRAIL, REMOVE THE EXISTING GUARDRAIL TO TRANSITION FROM THE EXISTING HEIGHT TO THE PROPOSED 2'-1" HEIGHT. SEE 862.02, SHEET 4 OF 8 FOR TRANSITION DETAILS.**

APPROACH END UNITS

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PROJECT REFERENCE NO.	SHEET NO.
B-5327	2C-8

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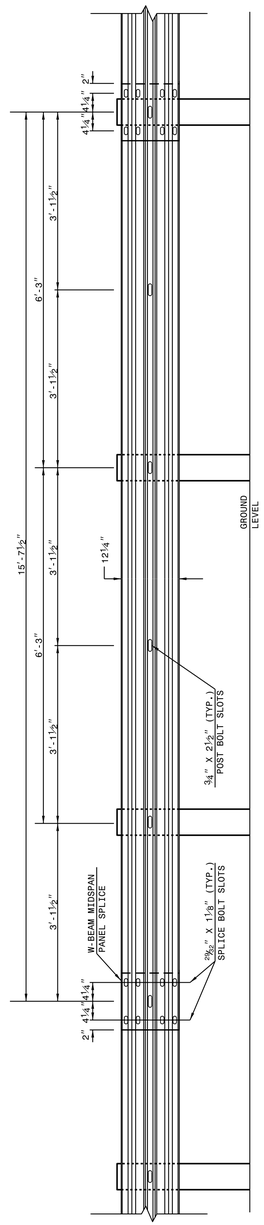
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 3 OF 8
862D02



15'-7½" W-BEAM GUARDRAIL PANEL

NOTE: USE 5-SPACE 15'-7½" W-BEAM GUARDRAIL PANEL AT THE DOWNSTREAM END OF AN EXISTING GUARDRAIL THAT DOES NOT OFFSET THE W-BEAM PANEL SPLICE TO MIDSPAN

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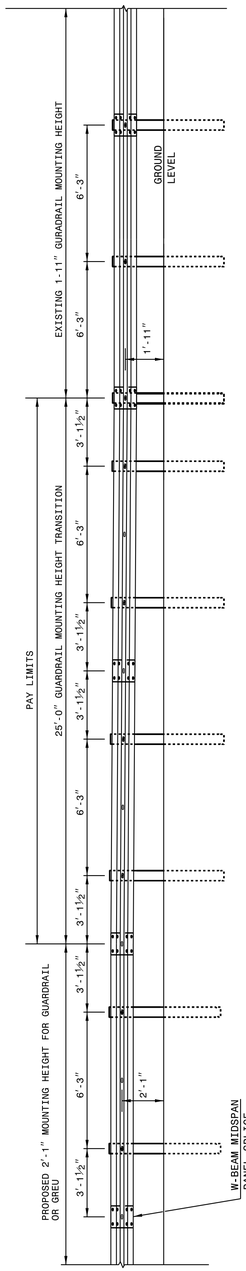
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 4 OF 8
862D02

NOTE: IF EXISTING GUARDRAIL IS LOWER THAN 1'-11", USE AN ADDITIONAL 12'-6" LONG SECTION OF GUARDRAIL, FOR EVERY 1" OF HEIGHT DIFFERENCE, TO TRANSITION FROM EXISTING GUARDRAIL TO PROPOSED 2'-1" GUARDRAIL.



ELEVATION VIEW

TRANSITION FROM OR 1'-11" TO 2'-1" W-BEAM GUARDRAIL MOUNTING HEIGHT

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RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 4 OF 8
862D02

5/25/2017

NORTH CAROLINA PROFESSIONAL SEAL 022966 ENGINEER Joel S Howerton

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PROJECT REFERENCE NO.	SHEET NO.
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STATE OF
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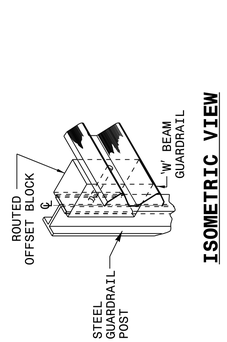
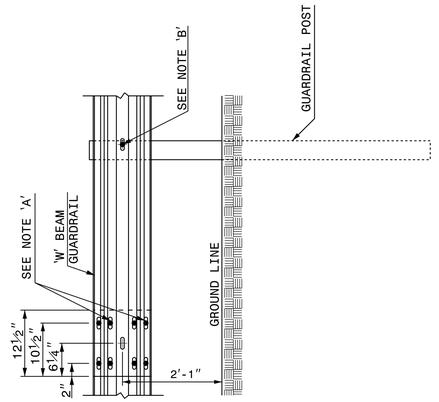
ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 5 OF 8
862D02

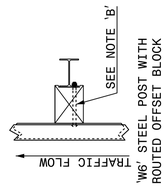
ISOMETRIC VIEW



FRONT - MID SPAN SPLICE

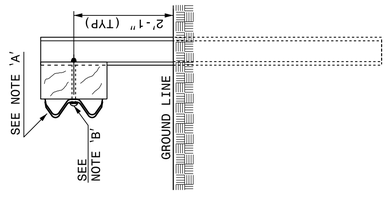


TYPICAL GUARDRAIL AND GUARDRAIL POST ALTERNATIVES



'W6' STEEL POST WITH ROUTED OFFSET BLOCK

PLAN



'W6' STEEL POST WITH ROUTED OFFSET BLOCK

SIDE

NOTES:
A - ⅞" DIA. BUTTON HEAD SPLICE BOLT 1¼" LONG (8 REQ. PER SPLICE JOINT).
B - ⅞" DIA. BUTTON HEAD BOLT 7½"/9" LONG WITH NUT FOR BOLTING 6"/8" ROUTED OFFSET BLOCK TO STEEL POSTS.
C - FIELD PUNCHING OF HOLES INTO GUARDRAIL AS DIRECTED BY THE ENGINEER.

5/25/2017

NORTH CAROLINA PROFESSIONAL SEAL 022966 ENGINEER Joel S. Howerton

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STATE OF
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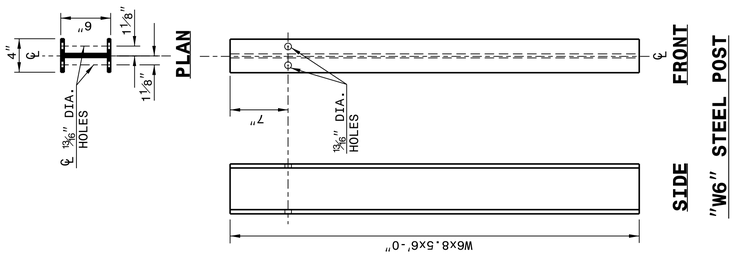
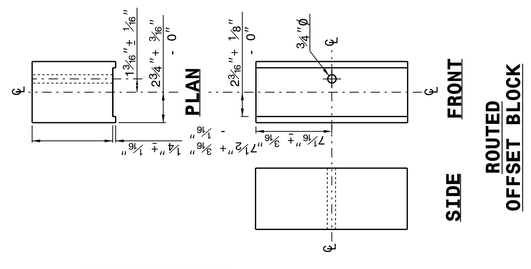
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

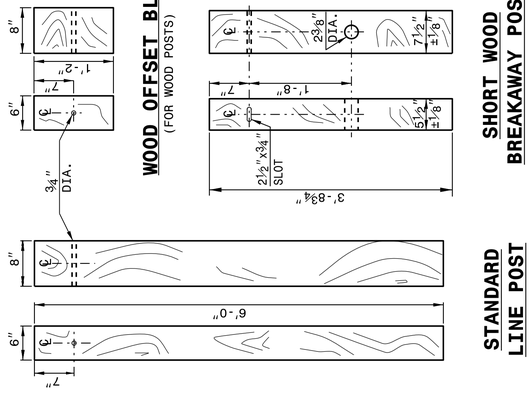
SHEET 6 OF 8
862D02

SYSTEM PARTS





STEEL TUBE
TS 6"x8"x0.1875"



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RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 6 OF 8
862D02

PROJECT REFERENCE NO.	SHEET NO.
B-5327	2C-10

STATE OF
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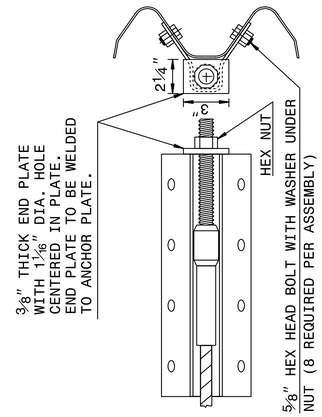
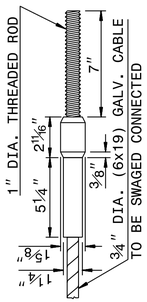
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

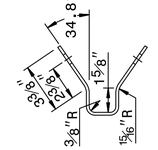
SHEET 7 OF 8 — 862D02

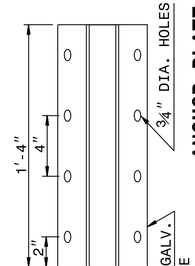


ANCHOR PLATE ASSEMBLY



SWAGED CABLE

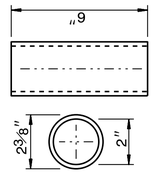




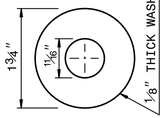
CABLE ASSEMBLY

ANCHOR PLATE

SYSTEM PARTS

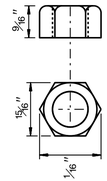


BREAKAWAY TERMINAL POST SLEEVE

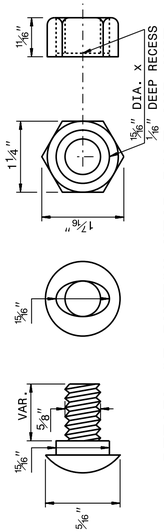


DETAIL OF STANDARD WASHER

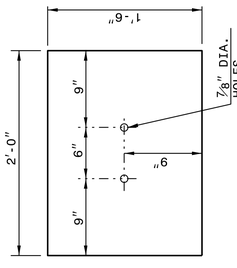
STANDARD WASHER: TYPICAL USE UNDER NUT WITH WOOD POST



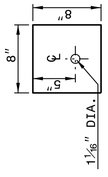
DETAIL OF STANDARD HEX BOLT AND NUT



DETAIL OF BUTTON HEAD BOLT AND NUT

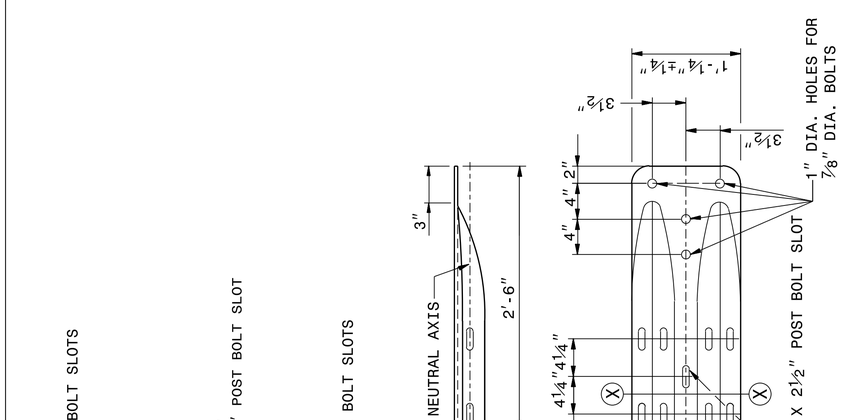


SOIL PLATE
¼" THICK PLATE

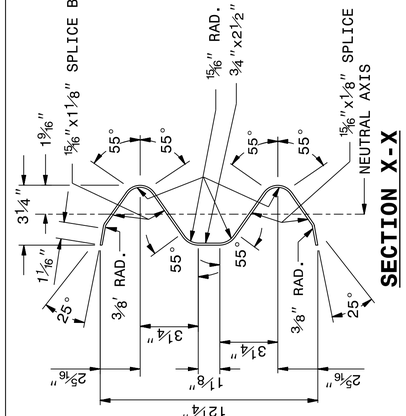


BEARING PLATE
⅝" THICK PLATE

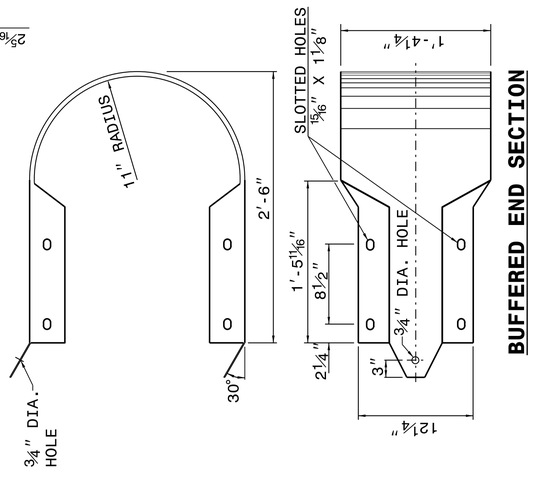
SYSTEM PARTS - GENERAL USE



TYPICAL END SHOE



SECTION X-X



BUFFERED END SECTION

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RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 8 OF 8 — 862D02

5/25/2017

NORTH CAROLINA PROFESSIONAL SEAL 022966 ENGINEER Joel S. Howerton
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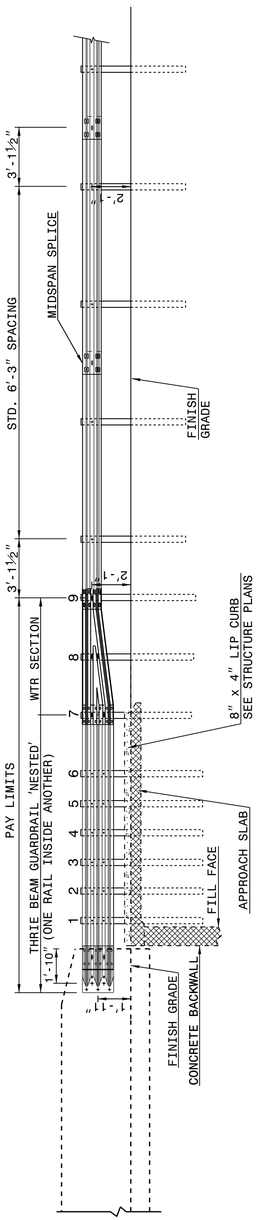
jhowerton
AT CSD-292595

PROJECT REFERENCE NO.	SHEET NO.
B-5327	2C-11

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

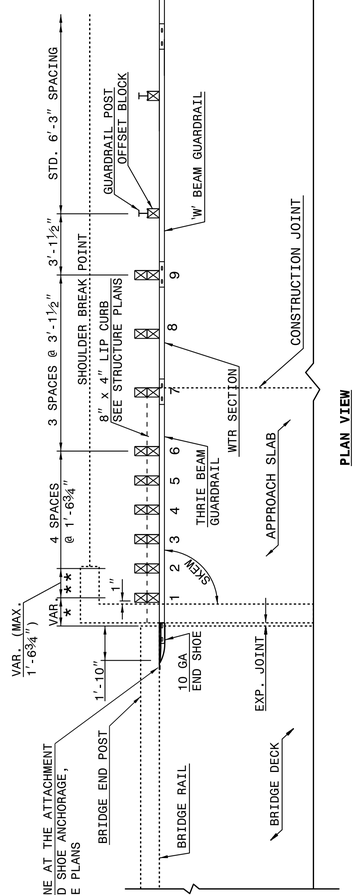
ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
GUARDRAIL ANCHOR UNIT, TYPE III FOR ATTACHMENT TO RAIL ON BRIDGE - SUB REGIONAL TIER

SHEET 2 OF 7 | **862D03**



ELEVATION

NOTE:
**POST NOT REQUIRED FOR SKEW ANGLES GREATER THAN 150° OR LESS THAN 30° UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
*THE DISTANCE FROM END OF BRIDGE RAIL TO CENTER LINE OF THE FIRST POST SHOULD BE 11½" IF CONCRETE BACKWALL IS NOT PRESENT.
-SHOULDER BERM GUTTER MUST BE INSTALLED TO THE LIMITS 8" x 4" LIP CURB IS SHOWN IF ANCHOR UNIT IS NOT ADJACENT TO AN APPROACH SLAB.
-MEASURE GUARDRAIL HEIGHT FROM THE TOP OF ADJACENT SURFACE (SHOULDER, BERM, OR GUTTER).
-LAP JOINTS IN THE DIRECTION OF TRAFFIC FLOW.
-SEE SHEET 5 FOR POST SECTIONS 1 THRU 9.



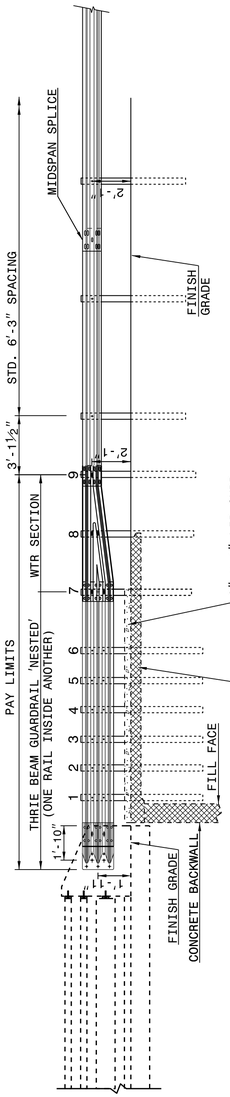
PLAN VIEW

GUARDRAIL ANCHOR UNIT, TYPE III FOR ATTACHMENT TO RAIL ON BRIDGE - SUB REGIONAL TIER

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

ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
GUARDRAIL ANCHOR UNIT, TYPE III FOR ATTACHMENT TO RAIL ON BRIDGE

SHEET 1 OF 7 | **862D03**



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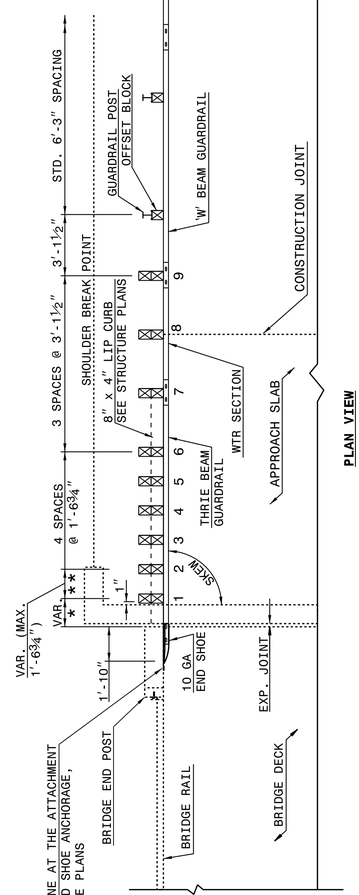
-LAP JOINTS IN THE DIRECTION OF TRAFFIC FLOW.
-SEE SHEET 5 FOR POST SECTIONS 1 THRU 9.



PLAN VIEW

GUARDRAIL ANCHOR UNIT, TYPE III FOR ATTACHMENT TO RAIL ON BRIDGE

5/25/2017

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022966 Howerton

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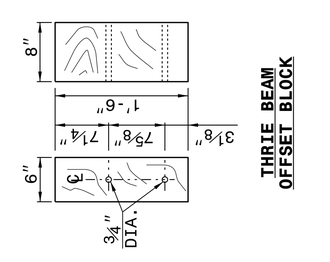
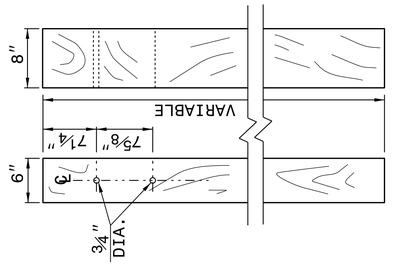
ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
GUARDRAIL ANCHOR UNIT, TYPE III FOR ATTACHMENT TO RAIL ON BRIDGE

SHEET 1 OF 7 | **862D03**

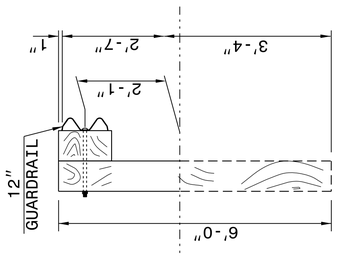
PROJECT REFERENCE NO.	SHEET NO.
B-5327	2C-12



THRIE BEAM OFFSET BLOCK

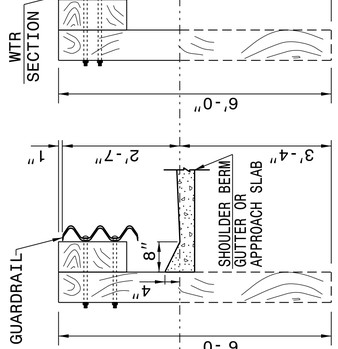


THRIE BEAM LINE POST

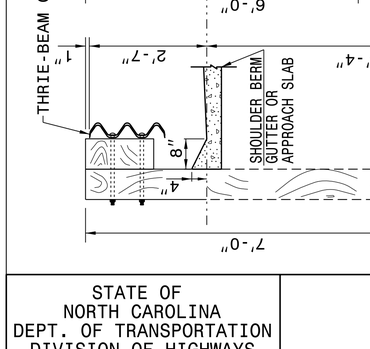


SECTION OF 'W' BEAM POST 9

SECTION OF WTR BEAM POST 8

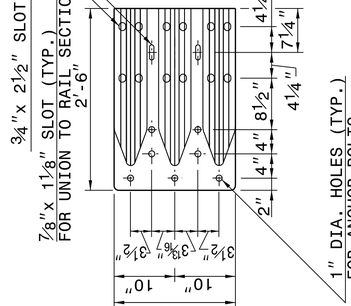


SECTION OF THRIE BEAM POST 7

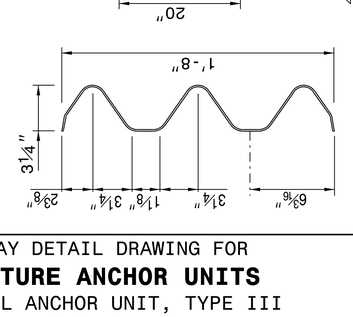


SECTION OF THRIE BEAM POSTS 1 THRU 6

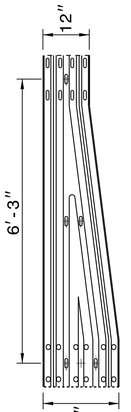
NOTE: THE MID POST AND OFFSET BLOCK OF THE WTR SECTION WILL REQUIRE SPECIAL BOLT HOLE DRILLING IN THE THRIE BEAM OFFSET BLOCK AND LINE POST.



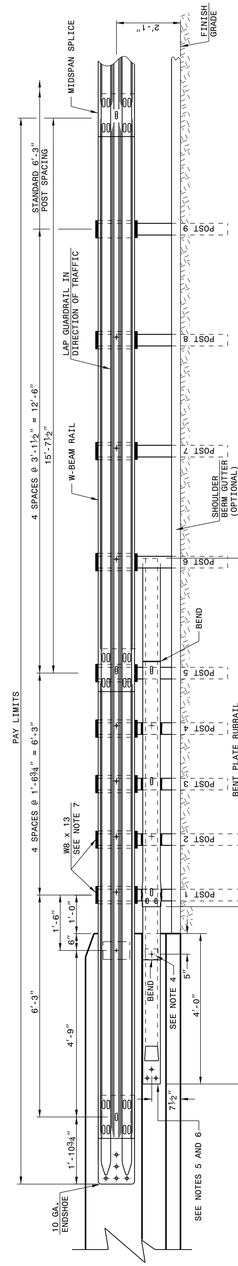
END SHOE



THRIE-BEAM SECTION

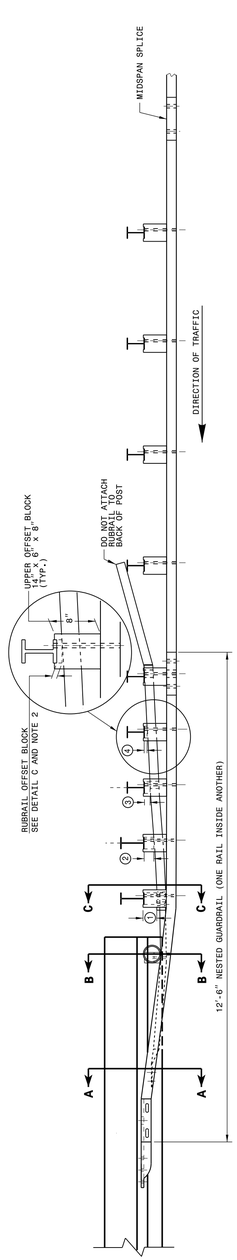


WTR SECTION
ELEVATION VIEW



ELEVATION

GENERAL NOTES:
1) POSTS 1 THROUGH 5 REQUIRE AN ADDITIONAL HOLE TO ATTACH LOWER BLOCKOUTS AND/OR RUBRAIL; 7/8" BUTTONHEAD BOLTS (SEE CHART FOR BOLT LENGTHS). RUBRAIL IS SECURED TO POST 5 WITH A 4 BOLT HOLD DOWN PLATE (SEE STD. DWG. 862.04).
2) RUBRAIL BLOCKOUTS ARE REQUIRED AT POSTS 1 AND 3. RUBRAIL IS SECURED TO POST 5 WITH A 4 BOLT HOLD DOWN PLATE (SEE STD. DWG. 862.04). SECURE BLOCKS ONLY TO POSTS 2 AND 4. SECURE RUBRAIL AND BLOCKOUTS TO POSTS 1 AND 3. RUBRAIL IS FLARED.
3) SITEEL SPACER TUBE IS A SCHEDULE 40 GALVANIZED PIPE 6" INSIDE DIAMETER x 9" LONG. ATTACH TUBE TO RAIL ELEMENT ONLY. USE 3/8" x 3" LAG BOLT WITH FLAT WASHER. SEE DETAIL D FOR SLOTTED RUBRAIL BLOCKOUT. BACK OF RUBRAIL IS FLARED TO BACK OF POST 6 AND NOT SECURED.
4) SHOP FABRICATE THE C6 x 8.2 RUBRAIL END TO BE CONSISTENT WITH THE SLOPE OF THE F SHAPE AND ATTACH FLUSH WITH THE SLOPED TOE OF THE BARRIER OR BRIDGE RAIL.
5) ANCHORAGE:
   (a) AT EXISTING BRIDGE RAIL AND NEW OR EXISTING BARRIERS, ANCHOR RUBRAIL USING THREE 5/8" x 6" CHEMICALLY ANCHORED BOLTS WITH WASHERS. MAXIMUM PROJECTION FOR BOLTS IS 1½".
   (b) AT EXISTING BRIDGE RAIL AND NEW OR EXISTING BARRIERS, ANCHOR THE W-BEAM END SHOE USING A 4 BOLT HOLD DOWN PLATE (SEE STD. DWG. 862.04). A 4 BOLT INSERT ASSEMBLY IS ALLOWED ON PRECAST REINFORCED CONCRETE BARRIER (SEE STD. DWG. 857.01). INSTALL THE W-BEAM END SHOE BEHIND THE NESTED W-BEAM ELEMENTS.
   (c) AT NEW BRIDGE RAIL, ANCHORAGE IS DETAILED ON THE STRUCTURE PLANS.
6) POSTS 1 AND 2 ARE W6 x 13, 7'-6" LONG. ALL OTHER POSTS IN THE ANCHOR UNIT ARE W6 x 8.5.



PLAN

GUARDRAIL ANCHOR UNIT TYPE B-77

5/25/2017

NORTH CAROLINA PROFESSIONAL SEAL 022966 ENGINEER Joel S. Howerton

DocuSigned by:
673F3D17DCDC45F...

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SEE TITLE BLOCK

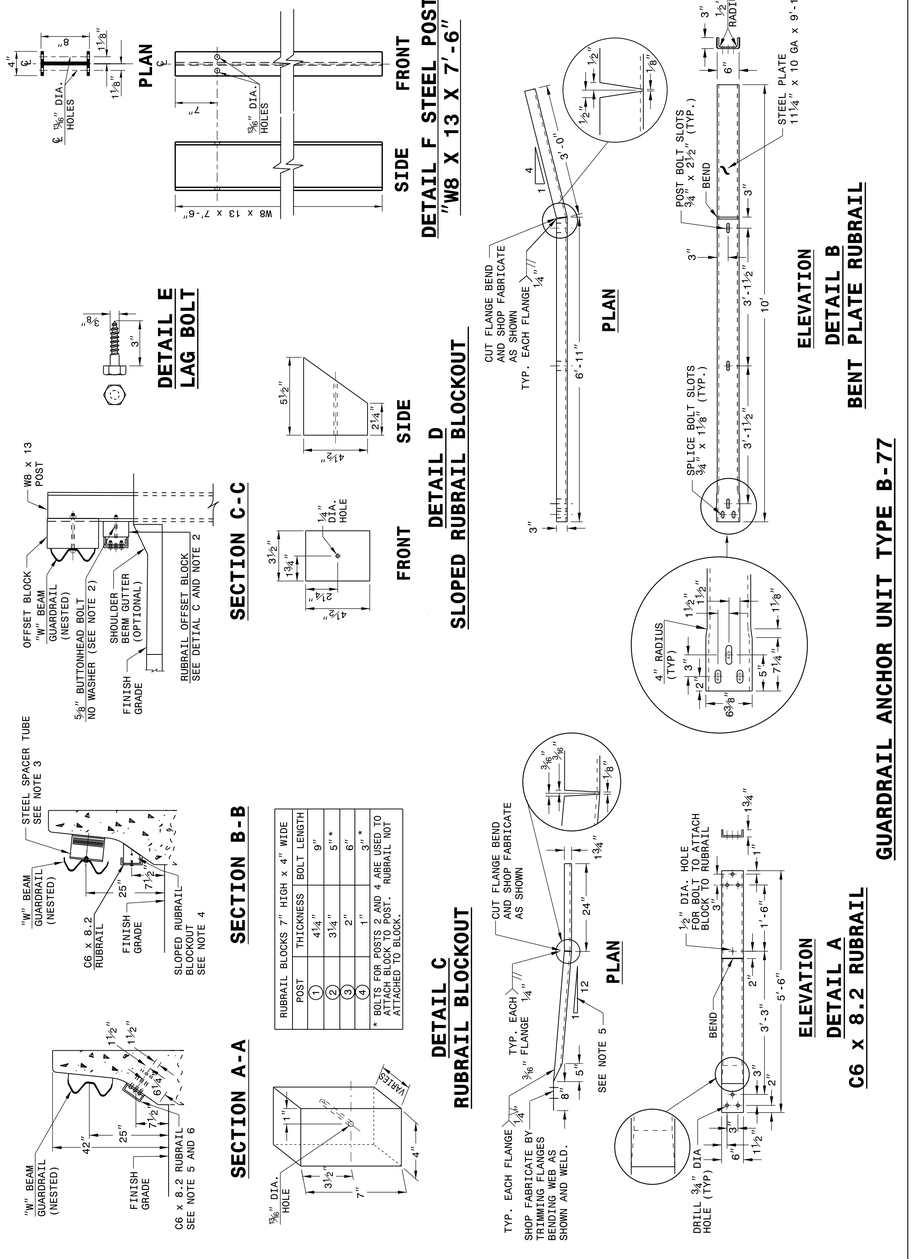
ORIGINAL BY: J HOWERTON DATE: 06-22-12
MODIFIED BY: _____ DATE: _____
CHECKED BY: _____ DATE: _____
FILE SPEC.: _____

PROJECT REFERENCE NO.	SHEET NO.
B-5327	2C-13

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

ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNIT
GUARDRAIL ANCHOR UNIT TYPE B-77
FOR F-SHAPE BARRIER

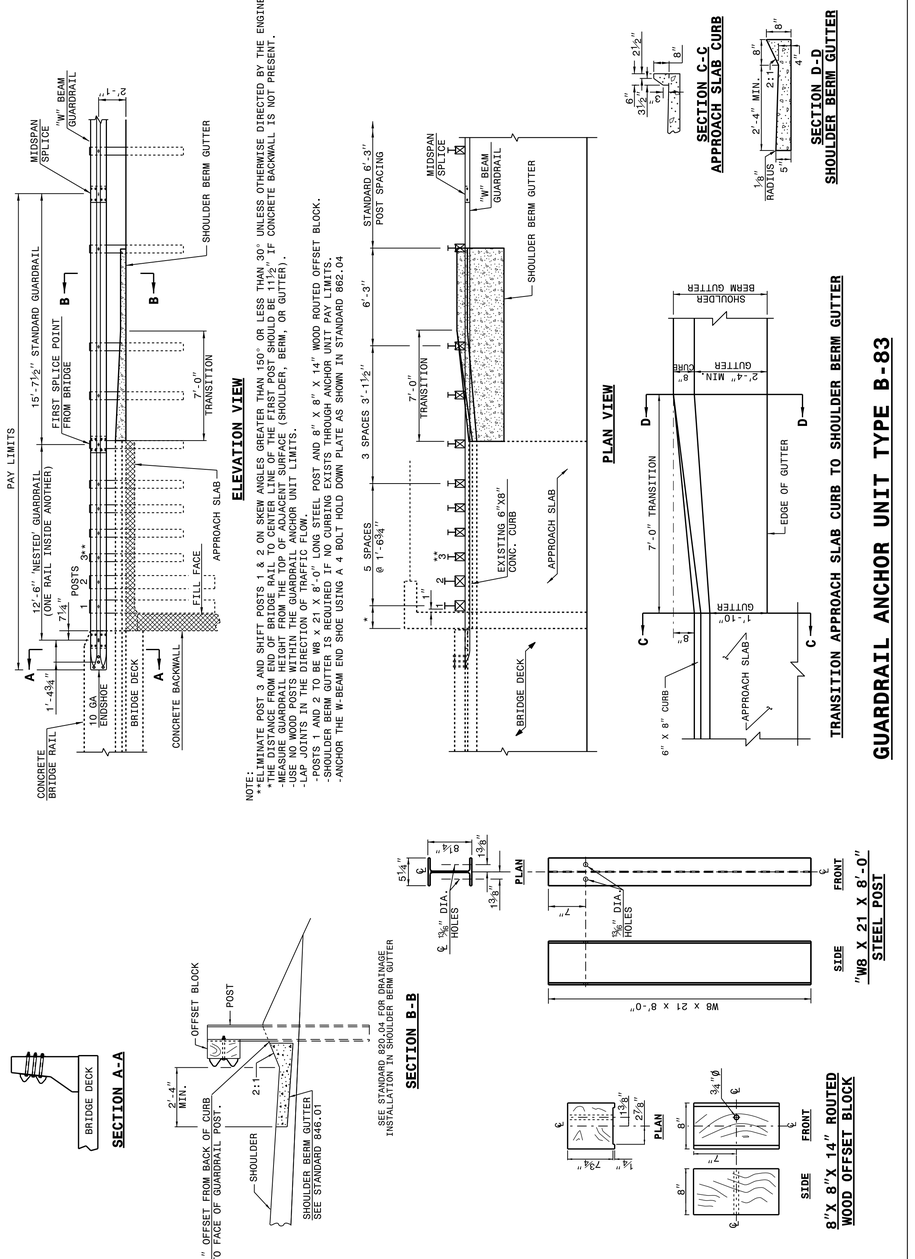
SHEET 5 OF 7
862D03



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

ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
GUARDRAIL ANCHOR UNIT TYPE B-83

SHEET 6 OF 7
862D03



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

ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNIT
GUARDRAIL ANCHOR UNIT TYPE B-77
FOR F-SHAPE BARRIER

SHEET 5 OF 7
862D03

5/25/2017

NORTH CAROLINA PROFESSIONAL SEAL 022966 ENGINEER Joel S. Howerton

DocuSigned by:
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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

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ORIGINAL BY: J HOWERTON DATE: 06-22-12
MODIFIED BY: _____ DATE: _____
CHECKED BY: _____ DATE: _____
FILE SPEC.: _____

24-MAY-2017 12:45
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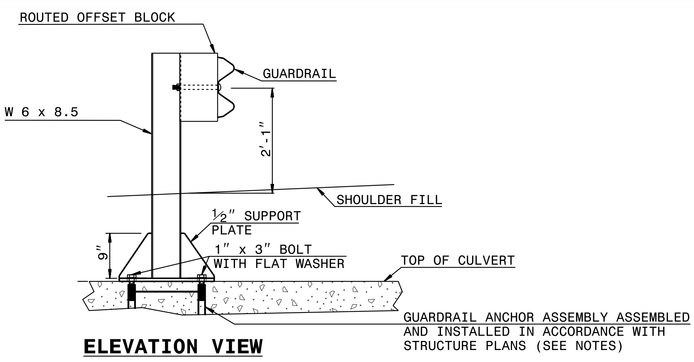
jhowerton AT CSD-292595

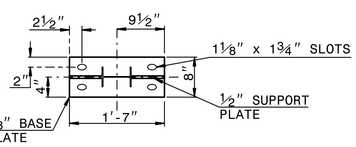
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
ANCHORAGE FOR GUARDRAIL POST ON BOX CULVERT

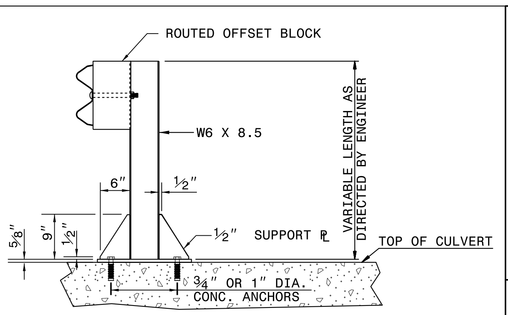
SHEET 7 OF 7
862D03



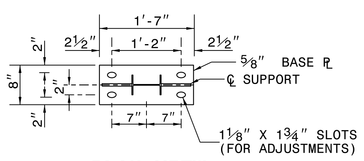
ELEVATION VIEW



PLAN VIEW



ELEVATION VIEW



PLAN VIEW

NOTES FOR:
GUARDRAIL POST ANCHORED TO STRUCTURE:
- -USE FULL LENGTH ¼" BUTT WELDS AT ALL LOCATIONS OF CONTACT BETWEEN THE BASE PLATE, SUPPORT PLATES AND STEEL POST.
- -USE POST AND POST BASE PLATES CONFORMING TO THE REQUIREMENTS OF A.S.T.M. A-36 AND GALVANIZED AFTER FABRICATION TO CONFORM TO A.S.T.M. A-123.

NEW STRUCTURES:
- -ATTACH POST TO INSERT ASSEMBLY UNITS (USING ANCHOR BOLTS SUPPLIED WITH INSERTS) WHICH HAVE BEEN CAST INTO THE STRUCTURE DURING CONSTRUCTION.

EXISTING STRUCTURES:
- -USE CONCRETE ANCHORS CONSISTING OF A STUD BOLT WITH NUT AND WASHER. USE STUDS THREADED ON ONE END AND HAVING AN EXPANDED WEDGE ASSEMBLY POSITIONED AROUND A TAPERED AREA AT THE OTHER END. USE ANCHORS WHICH PROVIDE A MINIMUM SAFE HOLDING POWER OF 2875 LBS. FOR A ¾" OR 1" DIAMETER BOLT. CALCULATE HOLDING POWER BASED ON ¼ THE ACTUAL HOLDING POWER OF THE ANCHOR IN 3500 PSI CONCRETE AS DETERMINED BY AN APPROVED COMMERCIAL TESTING LABORATORY.

- -USE ANCHORS GALVANIZED IN ACCORDANCE WITH A.S.T.M. A-153. SIZE HOLES FOR THE CONCRETE ANCHORS IN ACCORDANCE WITH THE ANCHOR MANUFACTURER'S RECOMMENDATIONS. DRILL HOLES WITH A CARBIDE OR DIAMOND TIPPED MASONRY BIT POWERED BY A ROTARY OR ROTARY IMPACT DRILL. NO OTHER IMPACT TOOLS WILL BE PERMITTED. DRILL HOLES VERTICALLY. FURNISH DOCUMENTATION OF HOLE SIZE RECOMMENDED FOR THE SPECIFIED ANCHOR TO THE ENGINEER BEFORE DRILLING HOLES. THOROUGHLY CLEAN HOLES FOR ANCHORS OF ALL CONCRETE CHIPS, DUST, GREASE, OIL, ETC. BEFORE ANCHORS ARE INSTALLED. REPAIR ALL DAMAGE CAUSED BY THIS WORK TO THE SATISFACTION OF THE ENGINEER.

ANCHORAGE FOR GUARDRAIL POST ON BOX CULVERT

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

ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
ANCHORAGE FOR GUARDRAIL POST ON BOX CULVERT

SHEET 7 OF 7
862D03

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

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5/25/2017

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022966 JAMES S. HOWERTON

SEE TITLE BLOCK

ORIGINAL BY: J HOWERTON DATE: 06-22-12
MODIFIED BY: DATE:
CHECKED BY: DATE:
FILE SPEC.:

PROJECT REFERENCE NO. B-5327
SHEET NO. 20-14

PROJECT REFERENCE NO.	SHEET NO.
B-5327	2C-15

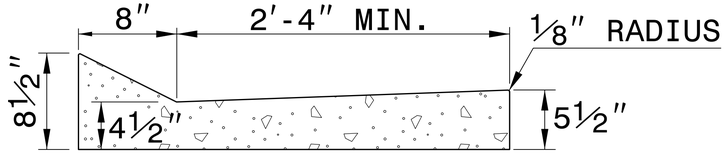
STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR

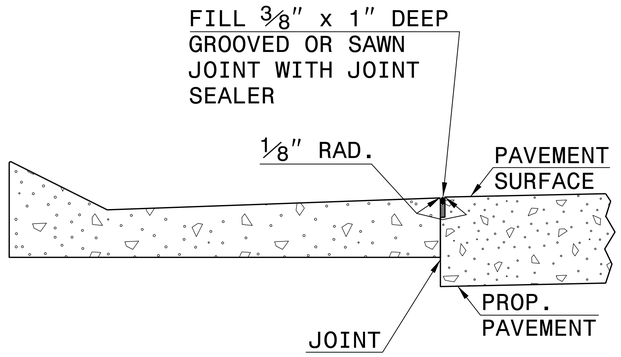
MODIFIED SHOULDER BERM GUTTER

SHEET OF

846D01

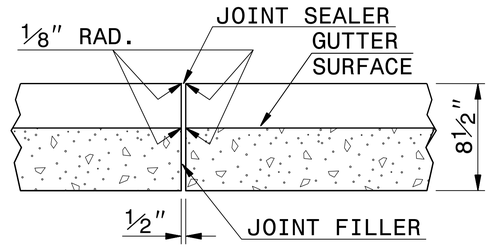


MODIFIED SHOULDER BERM GUTTER



LONGITUDINAL JOINT

GENERAL NOTES:
- -PLACE CONTRACTION JOINTS AT 10′ INTERVALS, EXCEPT THAT A 15′ SPACING MAY BE USED WHEN A MACHINE IS USED OR WHEN SATISFACTORY SUPPORT FOR THE FACE FORM CAN BE OBTAINED WITHOUT THE USE OF TEMPLATES AT 10′ INTERVALS.
- -JOINT SPACING MAY BE ALTERED IF REQUIRED BY THE ENGINEER.
- -CONTRACTION JOINTS MAY BE INSTALLED WITH THE USE OF TEMPLATES OR FORMED BY OTHER APPROVED METHODS. CONSTRUCT NON-TEMPLATE FORMED JOINTS A MIN. OF 1½″ DEEP.
- -FILL ALL CONSTRUCTION JOINTS WITH JOINT FILLER AND SEALER.
- -SPACE EXPANSION JOINTS AT 90′ INTERVALS AND ADJACENT TO ALL RIGID OBJECTS.



TRANSVERSE EXPANSION JOINT IN CURB AND GUTTER

SECTION VIEW OF JOINTS

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

ENGLISH DETAIL DRAWING FOR

MODIFIED SHOULDER BERM GUTTER

SHEET OF

846D01

5/25/2017

NORTH CAROLINA PROFESSIONAL SEAL 022966 ENGINEER JOHN S. HOWERTON

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

SEE TITLE BLOCK

ORIGINAL BY: kkempf DATE: 11/13/08
MODIFIED BY: DATE:
CHECKED BY: DATE:
FILE SPEC.: special details/kkempf/english/117x79 tbdi.dgn

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jhowerton AT CSD-2425965

PROJECT REFERENCE NO.	SHEET NO.
B-5327	2G-1

GEOTECHNICAL ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 030943 ENGINEER THEIN TUN ZAN

DocuSigned by: Thein Tun Zan 4/21/2017
A43658C08C19472...
SIGNATURE DATE

ENGINEER

SIGNATURE DATE

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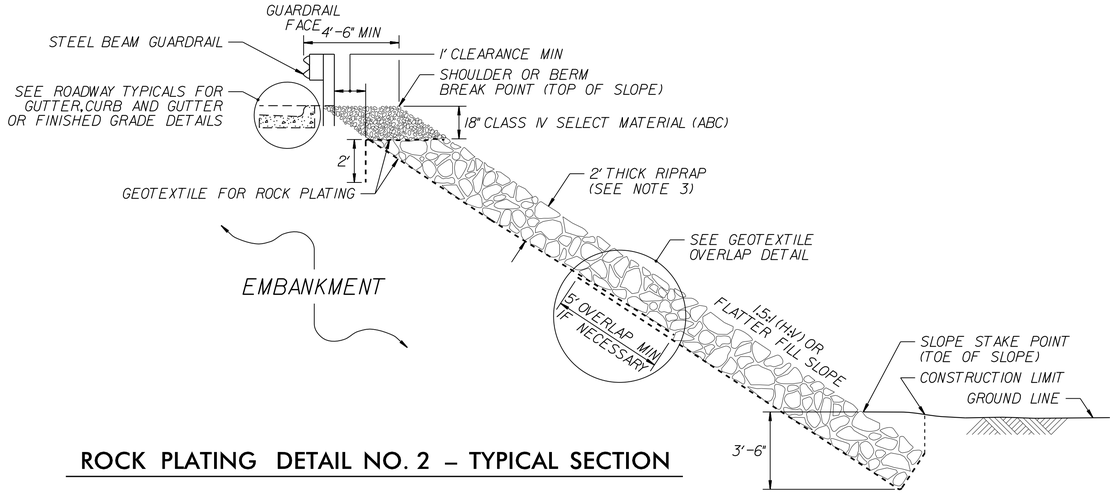
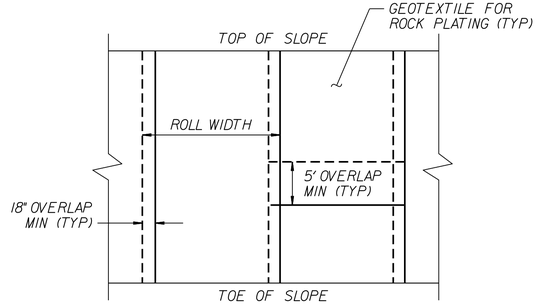


ROCK PLATING DETAIL NO. 2 – TYPICAL SECTION



GEOTEXTILE OVERLAP DETAIL
(PLAN VIEW)

ROCK PLATING

FOR ROCK PLATING, SEE SECTION 275 OF THE STANDARD SPECIFICATIONS.

USE ROCK PLATING AT FOLLOWING LOCATIONS:

LINES	BEGINNING SLOPE	APPROX. STATION	ENDING SLOPE	APPROX. STATION	LOCATION LT/RT	ROCK PLATING DETAIL NO.	RIPRAP CLASS* I/2/B	SY
-L-	1.75:1	11+75.00	1.5:1	12+56.25	LEFT	1	*	100
-L-	1.75:1	11+75.00	1.5:1	12+56.25	RIGHT	1	*	100
-L-	1.5:1	14+68.75	1.5:1	16+00.00	LEFT	1	*	345
-L-	1.5:1	16+00.00	1.75:1	16+25.00	LEFT	2	*	75
-L-	1.5:1	14+68.75	1.5:1	16+00.00	RIGHT	1	*	335
-L-	1.5:1	16+00.00	1.75:1	16+25.00	RIGHT	2	*	60

* USE CLASS 1, 2 OR B RIPRAP FOR ROCK PLATING LOCATIONS.

ESTIMATED TOTAL QUANTITY OF ROCK PLATING = 1,015 SY

ROCK EMBANKMENTS

FOR ROCK EMBANKMENTS, SEE ROCK EMBANKMENTS SPECIAL PROVISION.

USE ROCK EMBANKMENTS AT FOLLOWING LOCATIONS:

-LINE-	APPROX. BEGINNING STATION	APPROX. ENDING STATION	LOCATION LT/RT
-L-	11+75.00 -L-	12+56.25 -L-	LEFT & RIGHT
-L-	14+68.75 -L-	16+25.00 -L-	LEFT & RIGHT

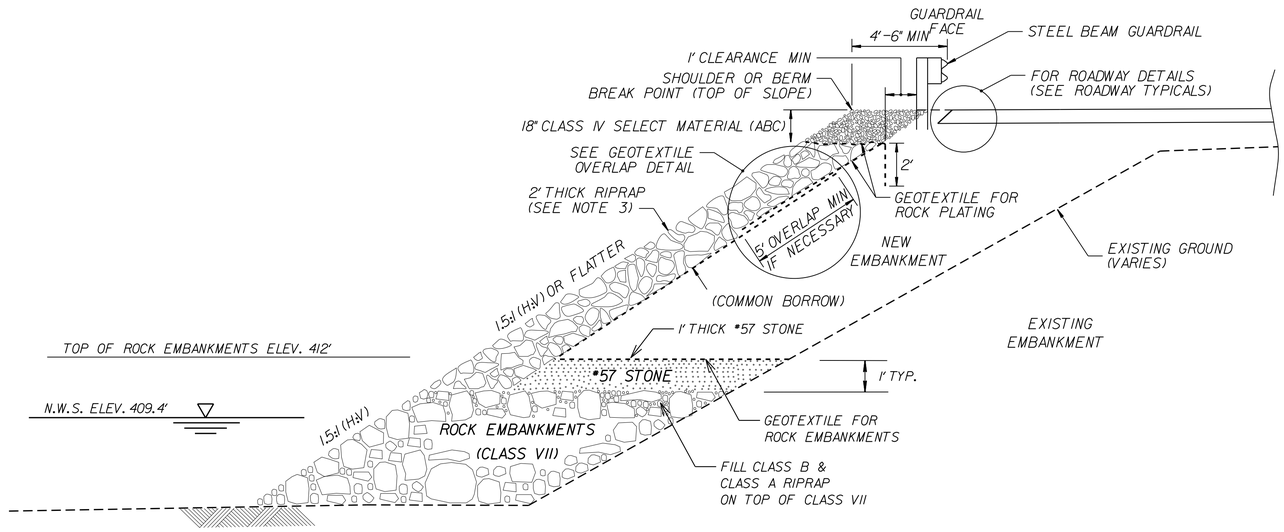
CONSTRUCT ROCK EMBANKMENTS TO THE ELEVATION SHOWN IN THE ROCK EMBANKMENTS / ROCK PLATING DETAIL NO. 1 AND ACCORDING TO THE ROCK EMBANKMENTS SPECIAL PROVISION.

FILL VOIDS IN THE TOP OF ROCK EMBANKMENTS WITH CLASS B AND CLASS A RIP RAP.

PLACE *57 STONE (SELECT MATERIAL, CLASS VI) UP TO 1 FT. ABOVE ROCK EMBANKMENTS AS SHOWN IN THE PLAN.

CONSTRUCT ROCK PLATING ABOVE ROCK EMBANKMENTS FROM ELEVATION SHOWN IN THE ROCK EMBANKMENTS / ROCK PLATING DETAIL NO. 1 TO THE SHOULDER HINGE POINT AND ACCORDING TO THE SECTION 275 OF THE STANDARD SPECIFICATIONS.

INSTALL GEOTEXTILE ON TOP OF NO. 57 STONE IN ACCORDANCE WITH THE ARTICLE 270-3 OF THE STANDARD SPECIFICATIONS.



ROCK EMBANKMENTS / ROCK PLATING DETAIL NO. 1 – TYPICAL SECTION

ESTIMATED MATERIAL QUANTITIES FOR ROCK EMBANKMENTS

ROCK EMBANKMENTS (SELECT MATERIAL, CLASS VII) = 660 TONS

RIP RAP CLASS A = 35 TONS

RIP RAP CLASS B = 35 TONS

*57 STONE (SELECT MATERIAL, CLASS VI) = 65 TONS

GEOTEXTILE FOR ROCK EMBANKMENTS = 105 SY

PREPARED BY: THEIN T. ZAN	DATE: 04-2017
REVIEWED BY: JAMES R. BATTS	DATE: 04-2017

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

ROCK EMBANKMENTS / ROCK PLATING DETAILS & NOTES

REVISIONS

NO.	BY	DATE	NO.	BY	DATE
1	-	-	3	-	-
2	-	-	4	-	-

COMPUTED BY: ADS	DATE: 5/24/17
CHECKED BY: DCS	DATE: 5/24/17

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

HDR | ICA
ICA Engineering, Inc.
5121 Kingdom Way,
Suite 100
Raleigh, NC 27607
NC License No: F–0258

PROJECT REFERENCE NO.	SHEET NO.
B-5327	3B-1

SUMMARY OF EARTHWORK
IN CUBIC YARDS

STATION	STATION	UNCL. EXCAV.	EMBANK. +%	BORROW	WASTE
SUMMARY 1					
10+50.00	12+56.25	316	101		215
SUBTOTALS:		316	101		215
SUMMARY 2					
14+68.75	17+00.00	535	199		336
SUBTOTALS:		535	199		336
PROJECT TOTALS:		851	300	0	551
GRAND TOTALS:		851	300	0	551
SAY:		900			

SEE GEOTECHNICAL RECOMMENDATIONS DATED MAY 20, 2016
FOR THE CONTINGENCY QUANTITIES LISTED BELOW:

SELECT GRANULAR MATERIAL (CY) = 150

GEOTEXTILE FOR SOIL STABILIZATION (SY) = 150

UNDERCUT EXCAVATION (CY) = 150

Note: Approximate quantities only. Clearing and Grubbing, Unclassified Excavation, Fine Grading, and Removal of Existing Pavement will be paid for at the contract lump sum price for "Grading."

PAVEMENT REMOVAL SUMMARY

SURVEY LINE	STATION	STATION	LOCATION LT/RT/CL	YD^2
–L–	10+50.00	12+62.34	CL	447
–L–	14+62.82	17+00.00	CL	508
			TOTAL:	955
			SAY:	1000

SHOULDER BERM GUTTER SUMMARY

SURVEY LINE	STATION	STATION	LOCATION LT/RT	LF
–L–	12+27.50	12+45.38	LT	17.88
–L–	12+27.50	12+45.38	RT	17.88
			TOTAL:	35.76
			SAY:	40

"N" = DISTANCE FROM EDGE OF LANE TO FACE OF GUARDRAIL.
TOTAL SHOULDER WIDTH = DISTANCE FROM EDGE OF TRAVEL LANE TO SHOULDER BREAK POINT.
FLARE LENGTH = DISTANCE FROM LAST SECTION OF PARALLEL GUARDRAIL TO END OF GUARDRAIL.
W = TOTAL WIDTH OF FLARE FROM BEGINNING OF TAPER TO END OF GUARDRAIL.
G = GATING IMPACT ATTENUATOR TYPE 350
NG = NON–GATING IMPACT ATTENUATOR TYPE 350

GUARDRAIL SUMMARY

SURVEY LINE	BEG. STA.	END STA.	LOCATION	LENGTH			WARRANT POINT		"N" DIST. FROM E.O.L.	TOTAL SHOUL. WIDTH	FLARE LENGTH		W	
				STRAIGHT	SHOP CURVED	DOUBLE FACED	APPROACH END	TRAILING END			APPROACH END	TRAILING END	APPROACH END	TRAILING END
–L–	10+00.00	12+56.25	RT	256.25			12+00.00	12+56.25	5.42	8.42	25		0.5	
–L–	10+00.00	12+56.25	LT	256.25			12+56.25	12+00.00	5.42	8.42		25		0.5
–L–	14+68.75	17+50.00	RT	281.25			14+68.75	16+50.00	5.42	8.42		25		0.5
–L–	14+68.75	17+87.50	LT	318.75			16+50.00	14+68.75	5.42	8.42	25		0.5	
	TOTAL			1112.50										
	ANCHOR UNIT DEDUCTIONS													
	GRAU–350 (TL–2)	4 @ 25′		100										
	TYPE III	4 @ 18.75′		75										
	TOTAL ANCHOR UNIT DEDUCTIONS			175										
	PROJECT TOTALS			937.5										
	SAY			950										

SURVEY LINE	BEG. STA.	END STA.	LOCATION	ANCHORS									IMPACT ATTENUATOR TYPE 350			SINGLE FACED GUARDRAIL	REMOVE EXISTING GUARDRAIL	REMOVE AND STOCKPILE EXISTING GUARDRAIL	REMARKS
				XI MOD	XI	GREU, TL–2	GREU, MEDIAN	XIII	CAT–1	VI MOD	III	TES	EA	G	NG				
–L–	10+00.00	12+56.25	RT			1					1						267		
–L–	10+00.00	12+56.25	LT			1					1						266		
–L–	14+68.75	17+50.00	RT			1					1						228		
–L–	14+68.75	17+87.50	LT			1					1						326		
	TOTAL					4					4								
	ANCHOR UNIT DEDUCTIONS																		
	GRAU–350 (TL–2)	4 @ 25′															1087		
	TYPE III	4 @ 18.75′																	
	TOTAL ANCHOR UNIT DEDUCTIONS					4					4								
	PROJECT TOTALS																1087		NOTE: 5 EACH ADDITIONAL GUARDRAIL POSTS
	SAY					4					4						1087		

5/25/2017
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ICA ENGINEERING, INC.

RAL-CND6320W23

COMPUTED BY:	KMS	DATE:	9/9/2016
CHECKED BY:	ADS	DATE:	9/9/2016

PROJECT NO.	SHEET NO.
B-5327	3D-1

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

Note: Invert Elevations indicated are for Bid Purposes only and shall not be used for project construction stakeout.
See "Standard Specifications For Roads and Structures, Section 300-5".

LIST OF PIPES, ENDWALLS, ETC. (FOR PIPES 48 INCHES & UNDER)

LINE & STATION	OFFSET	STRUCTURE NUMBER						Drainage Pipe (RCP, CSP, CAAP, HDPE, or PVC)																				R. C. PIPE CLASS IV																			DRAINAGE STRUCTURE	QUANTITIES FOR DRAINAGE STRUCTURES NOTE: TOTAL LIN. FT. FOR PAY QUANTITY SHALL BE A + (1.3 X B)				FRAME, GRATES, AND HOOD STD. 840.03				CONCRETE TRANSITIONAL SECTION																																					
SIZE								12	15	18	24	30	36	42	48	54	60	66	72	78	84							12	15	18	24	30	36	42	48	54	60	66	72	78	84								A	B																																																
THICKNESS OR GAUGE		FROM	TO	TOP ELEVATION FT.	INVERT ELEVATION FT.	INVERT ELEVATION FT.	MINIMUM REQUIRED SLOPE %																DO NOT USE RCP	DO NOT USE CSP	DO NOT USE CAAP	DO NOT USE HDPE	DO NOT USE PVC																15" SIDE DRAIN PIPE	18" SIDE DRAIN PIPE	24" SIDE DRAIN PIPE		MASONRY CY	0' THRU 5' EACH	5' THRU 10' LIN. FT.	10' AND ABOVE LIN. FT.	C.B. STD. 840.01 OR STD. 840.02	E	F	G		D.I. STD. 852.04 OR STD. 852.06	C.B. STD. 852.05	OPEN THROAT C.B. STD. 840.04 OR STD. 840.05	CONCRETE BRIDGE APPROACH D.I. STD. 840.13	D.I. STD. 840.14 OR STD. 840.15	D.I. FRAME AND GRATES STD. 840.16	G.D.I. TYPE "A" STD. 840.17 OR STD. 840.26	G.D.I. TYPE "B" STD. 840.18 OR STD. 840.27	G.D.I. TYPE "D" STD. 840.19 OR STD. 840.28	G.D.I. (W.S. FLAT) FRAME WITH GRATE STD. 840.20	G.D.I. (W.S. FLAT) FRAME W/ 2 GRATES STD. 840.20	G.D.I. (W.S. SAG) FRAME W/ GRATE STD. 840.22	G.D.I. (W.S. SAG) FRAME W/ 2 GRATES STD. 840.22	G.D.I. (N.S. SAG) FRAME W/ GRATE STD. 840.24	G.D.I. (N.S. SAG) FRAME W/ 2 GRATES STD. 840.24	G.D.I. (N.S. FLAT) FRAME W/ GRATE STD. 840.29	G.D.I. (N.S. FLAT) FRAME W/ 2 GRATES STD. 840.29	DRIVEWAY D.I. STD. 840.30	FRAME W/ GRATE FOR DRIVEWAY STD. 840.30	J.B. STD. 840.31 OR STD. 840.32	ANGLED VANE GRATES AND FRAMES STD. 840.33	T.B.J.B. STD. 840.34	T.B.D.I. STD. 840.35	T.B.D.I. FOR STEEL GRATES STD. 840.36	STEEL FRAME WITH TWO GRATES STD. 840.37	TEMP STEEL PLATE COVER MASONRY DRAINAGE	SPRING BOX STD. 840.41	M.H. STD. 840.51, STD. 840.52, OR STD. 840.53	M.H. FRAME AND COVER STD. 840.54		15" DRAINAGE ELBOW	18" DRAINAGE ELBOW	24" DRAINAGE ELBOW	30" DRAINAGE ELBOW	36" DRAINAGE ELBOW	PIPE REMOVAL LIN. FT.	REMARKS
L 12+32	14 RT	0401		417.9																																												1																								1						1														
		0401	0402		414.7	414.5																							32																																																																	
L 12+32	14 LT	0402		417.9																																												1																								1						1														
		0402	0403		414.5	413.0			12														X			X	X																																																												1						
SHEET TOTALS									12																				32																			2																								2						2								1						
PROJECT TOTALS									12																				32																			2																								2						2								1						

ABBREVIATIONS

C.A.A.	CORRUGATED ALUMINIUM ALLOY
C.B.	CATCH BASIN
C.S.	CORRUGATED STEEL
D.I.	DROP INLET
G.D.I.	GRATED DROP INLET
H.D.P.E.	HIGH DENSITY POLYETHYLENE
J.B.	JUNCTION BOX
M.H.	MANHOLE
N.S.	NARROW SLOT
P.V.C.	POLYVINYL CHLORIDE
R.C.	REINFORCED CONCRETE
T.B.D.I.	TRAFFIC BEARING DROP INLET
T.B.J.B.	TRAFFIC BEARING JUNCTION BOX
W.S.	WIDE SLOT

HDR | ICA
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Raleigh, NC 27607
NC License No: F-0258

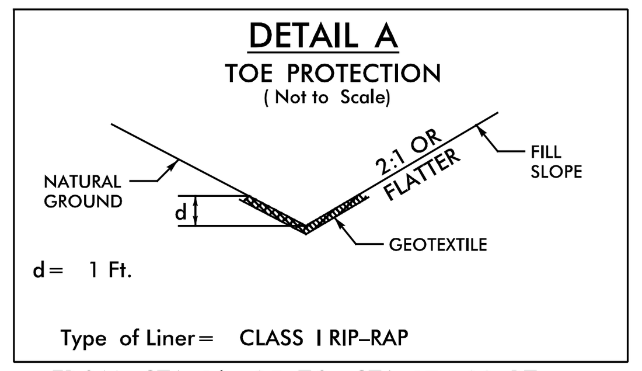
PROJECT REFERENCE NO.	SHEET NO.
B-5327	4
RW SHEET NO.	

ROADWAY DESIGN ENGINEER — NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 041473 ALEXANDER D. SNIDER — DocuSigned by: Alexander D. Snider 5/25/2017

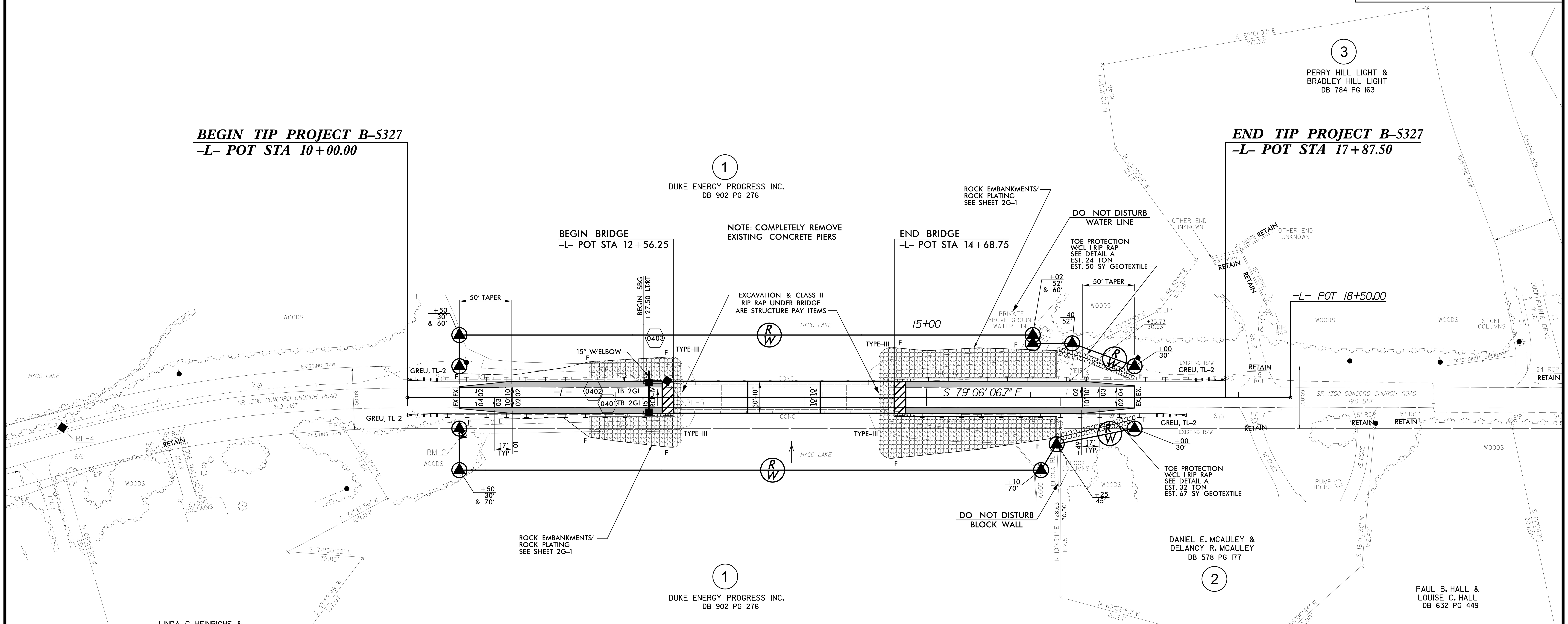
HYDRAULICS ENGINEER — NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 034364 TRENTON J. CORMIER — DocuSigned by: Trenton J. Cormier 5/25/2017

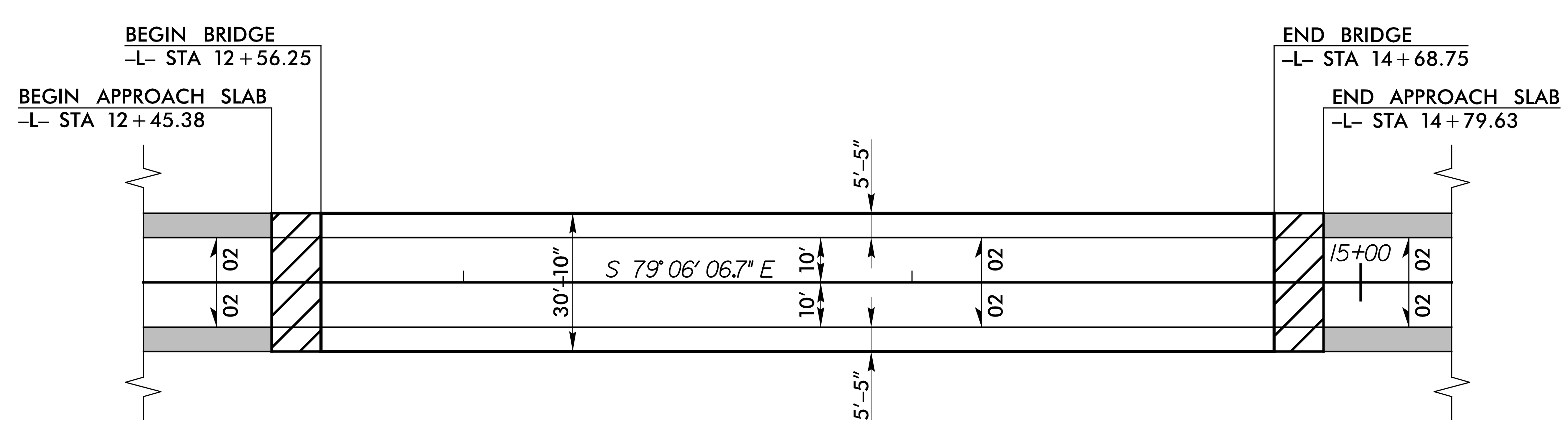
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NAD 83/NSRS 2007



FROM STA. 16+25 TO STA. 17+00 RT.
FROM STA. 16+25 TO STA. 17+00 LT.


BEGIN TIP PROJECT B-5327
-L- POT STA 10+00.00
END TIP PROJECT B-5327
-L- POT STA 17+87.50
PERRY HILL LIGHT &
BRADLEY HILL LIGHT
DB 784 PG 163
DUKE ENERGY PROGRESS INC.
DB 902 PG 276
BEGIN BRIDGE
-L- POT STA 12+56.25
END BRIDGE
-L- POT STA 14+68.75
NOTE: COMPLETELY REMOVE EXISTING CONCRETE PIERS
ROCK EMBANKMENTS/ ROCK PLATING SEE SHEET 2G-1
DO NOT DISTURB WATER LINE
TOE PROTECTION W/CL I RIP RAP SEE DETAIL A EST. 24 TON EST. 50 SY GEOTEXTILE
EXCAVATION & CLASS II RIP RAP UNDER BRIDGE ARE STRUCTURE PAY ITEMS
BEGIN SBG +27.50 LT/RT
50' TAPER
15" W/ELBOW
TYPE-III
GREU, TL-2
S 79° 06' 06.7" E
SR 1300 CONCORD CHURCH ROAD
-L- POT 18+50.00
TOE PROTECTION W/CL I RIP RAP SEE DETAIL A EST. 32 TON EST. 67 SY GEOTEXTILE
DO NOT DISTURB BLOCK WALL
DANIEL E. MCAULEY &
DELANCY R. MCAULEY
DB 578 PG 177
PAUL B. HALL &
LOUISE C. HALL
DB 632 PG 449
LINDA C. HEINRICHS &
ROLAND P. HEINRICHS
DB 832 PG 357
GEORGE C. FORTUNES
& GAIL FORTUNES
DB 856 PG 852
HYCO LAKE
WOODS
RETAIN



PAVEMENT-BRIDGE RELATIONSHIP SKETCH

FOR -L- PROFILE, SEE SHEET 5
FOR -L- STRUCTURES PLANS, SEE SHEET S-1 THRU S-18

5/25/2017
R:\P\B-5327\Roadway\Proj\b5327_rdy_psh04.dgn
ICA ENGINEERING INC

ICA Engineering, Inc.
5121 Kingdom Way,
Suite 100
Raleigh, NC 27607
NC License No: F-0258

PROJECT REFERENCE NO.	SHEET NO.
B-5327	5

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–L–

BRIDGE HYDRAULIC DATA

DESIGN DISCHARGE	=	N/A	CFS
DESIGN FREQUENCY	=	N/A	YRS
DESIGN HW ELEVATION	=	N/A	FT
BASE DISCHARGE	=	N/A	CFS
BASE FREQUENCY	=	100	YRS
BASE HW ELEVATION	=	413.0	FT
OVERTOPPING DISCHARGE	=	N/A	CFS
OVERTOPPING FREQUENCY	=	500+	YRS
OVERTOPPING ELEVATION	=	417.3	FT
DATE OF SURVEY	=	04/28/16	
W.S.ELEVATION AT DATE OF SURVEY	=	409.35	FT

FOR –L– PLAN, SEE SHEET 4