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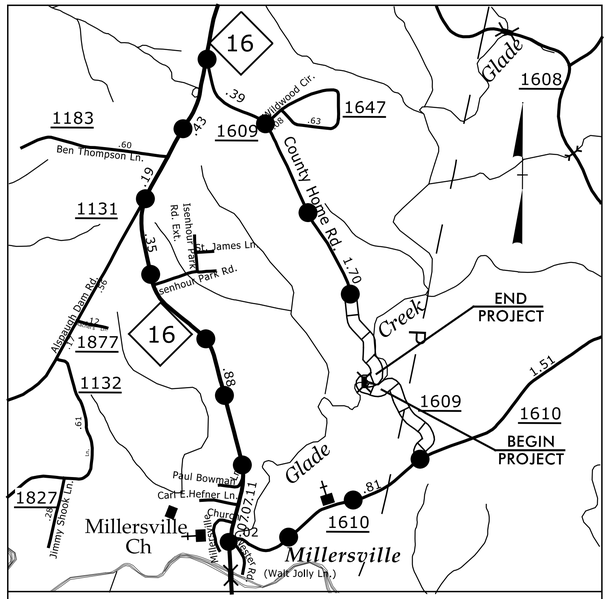
09/08/09

TIP PROJECT: B–5391

CONTRACT: C203990

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



VICINITY MAP

OFFSITE DETOUR

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

ALEXANDER COUNTY

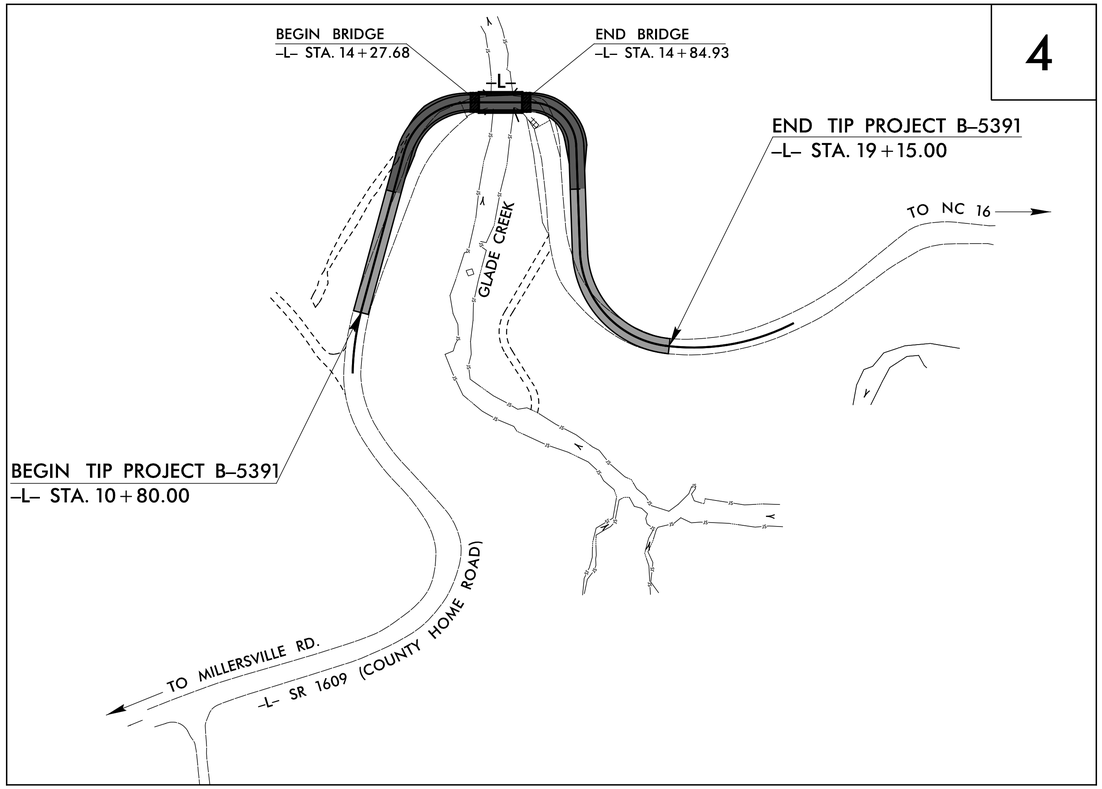
LOCATION: BRIDGE NO. 139 OVER GLADE CREEK ON SR 1609 (COUNTY HOME ROAD)

TYPE OF WORK: GRADING, DRAINAGE, PAVING, & STRUCTURE

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B–5391	1	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
46106.1.1	BRZ–1609(2)	PE
46106.2.1		R/W, UTIL.
46106.3.1		CONST.

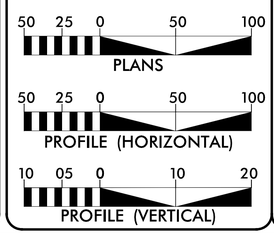
NAD 83/2011



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

** DESIGN EXCEPTION IS REQUIRED FOR DESIGN SPEED OF 15 MPH

GRAPHIC SCALES



DESIGN DATA

ADT 2017 = 115
ADT 2040 = 200
DHV = 19 %
D = 55 %
T = 15 % *
V = 55 MPH **
* TTST = 1% DUAL 14%
FUNC CLASS = RURAL LOCAL
SUBREGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B–5391 = 0.147 MILES

LENGTH STRUCTURE TIP PROJECT B–5391 = 0.011 MILES

TOTAL LENGTH OF TIP PROJECT B–5391 = 0.158 MILES

Prepared In the Office of:

LOCHNER
H. W. LOCHNER, INC.
2840 PLAZA PLACE, SUITE 202
RALEIGH, NC 27612
(919)571–7111
NC License Number F–0159

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
DECEMBER 22, 2016

LETTING DATE:
DECEMBER 19, 2017

BRIAN K. EASON, PE
PROJECT ENGINEER

BRIAN R. PEASE, EI
PROJECT DESIGN ENGINEER

BRYAN C. KEY, PE
NCDOT CONTACT

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 020870 ENGINEER MARC T. SHOWN P.E.

DocuSigned by: Marc Shown 48024AEC0A0B4C2...
9/25/2017

SIGNATURE:

ROADWAY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25523 ENGINEER BRIAN K. EASON P.E.

DocuSigned by: Brian K. Eason 9AF015AD7ACC48F...
9/21/2017

SIGNATURE:

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

9/20/2017
B5391_RDY_PSH_01.dgn
BPEASE

PROJECT REFERENCE NO.	SHEET NO.
B-5391	1A

ROADWAY DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25523 BRIAN K. EASON

9/21/2017

DocuSigned by: Brian K Eason 9AE015AD7ACC48E

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

INDEX OF SHEETS B-5391

SHEET NUMBER	
1	TITLE SHEET
1A	INDEX OF SHEETS
1B	CONVENTIONAL SYMBOLS
1C-1 and 1C-2	SURVEY CONTROL SHEET
1C-3	PROPOSED ALIGNMENT CONTROL SHEET
1C-4	RIGHT OF WAY CONTROL SHEET
2A-1	PAVEMENT SCHEDULE, TYPICAL SECTIONS, and DETAILS
2C-1 thru 2C-6	GUARDRAIL PLACEMENT
2C-7 thru 2C-10	GUARDRAIL INSTALLATION
2C-11 thru 2C-14	STRUCTURE ANCHOR UNITS
3B-1	SUMMARY OF EARTHWORK, SHOULDER BERM GUTTER SUMMARY, REMOVAL OF EXISTING ASPHALT SUMMARY, and GUARDRAIL SUMMARY
3D-1	DRAINAGE SUMMARY
3G-1	SUMMARY OF AGGREGATE SUBGRADE STABILIZATION and SUMMARY FOR SUBSURFACE DRAINAGE
4	PLAN
5	PROFILE
TMP-1 thru TMP-3	TRANSPORTATION MANAGEMENT PLANS
PMP-1 and PMP-2	PAVEMENT MARKING PLANS
EC-1 thru EC-5	EROSION CONTROL PLANS
SIGN-1 and SIGN-2	SIGNING PLANS
UO-1 and UO-2	UTILITIES BY OTHERS
X-1A	CROSS SECTION SUMMARY
X-1 thru X-7	CROSS-SECTIONS
S-1 thru S-12	STRUCTURE PLANS

2012 ROADWAY ENGLISH STANDARD DRAWINGS EFF. 01-17-2012 REV. 05-24-2017

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	
200.02	Method of Clearing - Method II
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	
815.02	Subsurface Drain
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
846.01	Concrete Curb, Gutter and Curb & Gutter
846.04	Drop Inlet Installation in Shoulder Berm Gutter
876.02	Guide for Rip Rap at Pipe Outlets
876.04	Drainage Ditches with Class 'B' Rip Rap

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 II.

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

SUBSURFACE DRAINS:

SUBSURFACE DRAINS SHALL BE CONSTRUCTED IN ACCORDANCE WITH STD. NO. 815.02 AT LOCATIONS DIRECTED BY THE ENGINEER.

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.

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.

UTILITIES:

UTILITY OWNERS ON THIS PROJECT ARE AT&T

ANY RELOCATION OF EXISTING UTILITIES WILL BE ACCOMPLISHED BY OTHERS.

RIGHT-OF-WAY MARKERS:

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

12/2/2016

PROJECT REFERENCE NO.	SHEET NO.
B-5391	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
- Computed 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 — S
- Potential Contamination Area: Soil — S
- Known Contamination Area: Water — W
- Potential Contamination Area: Water — W
- 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 & PROJECT CONTROL:

- Secondary Horiz and Vert Control Point
- Primary Horiz Control Point
- Primary Horiz and Vert Control Point
- Exist Permanent Easement Pin and Cap
- New Permanent Easement Pin and Cap
- Vertical Benchmark
- Existing Right of Way Marker
- Existing Right of Way Line
- New Right of Way Line — RW
- New Right of Way Line with Pin and Cap — RW
- New Right of Way Line with Concrete or Granite R/W Marker — RW
- New Control of Access Line with Concrete C/A Marker — CA
- Existing Control of Access — CA
- New Control of Access — CA
- Existing Easement Line — E
- New Temporary Construction Easement — E
- New Temporary Drainage Easement — TDE
- New Permanent Drainage Easement — PDE
- New Permanent Drainage / Utility Easement — DUE
- New Permanent Utility Easement — PUE
- New Temporary Utility Easement — TUE
- New Aerial Utility Easement — AUE

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.
- 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.

8/09/17

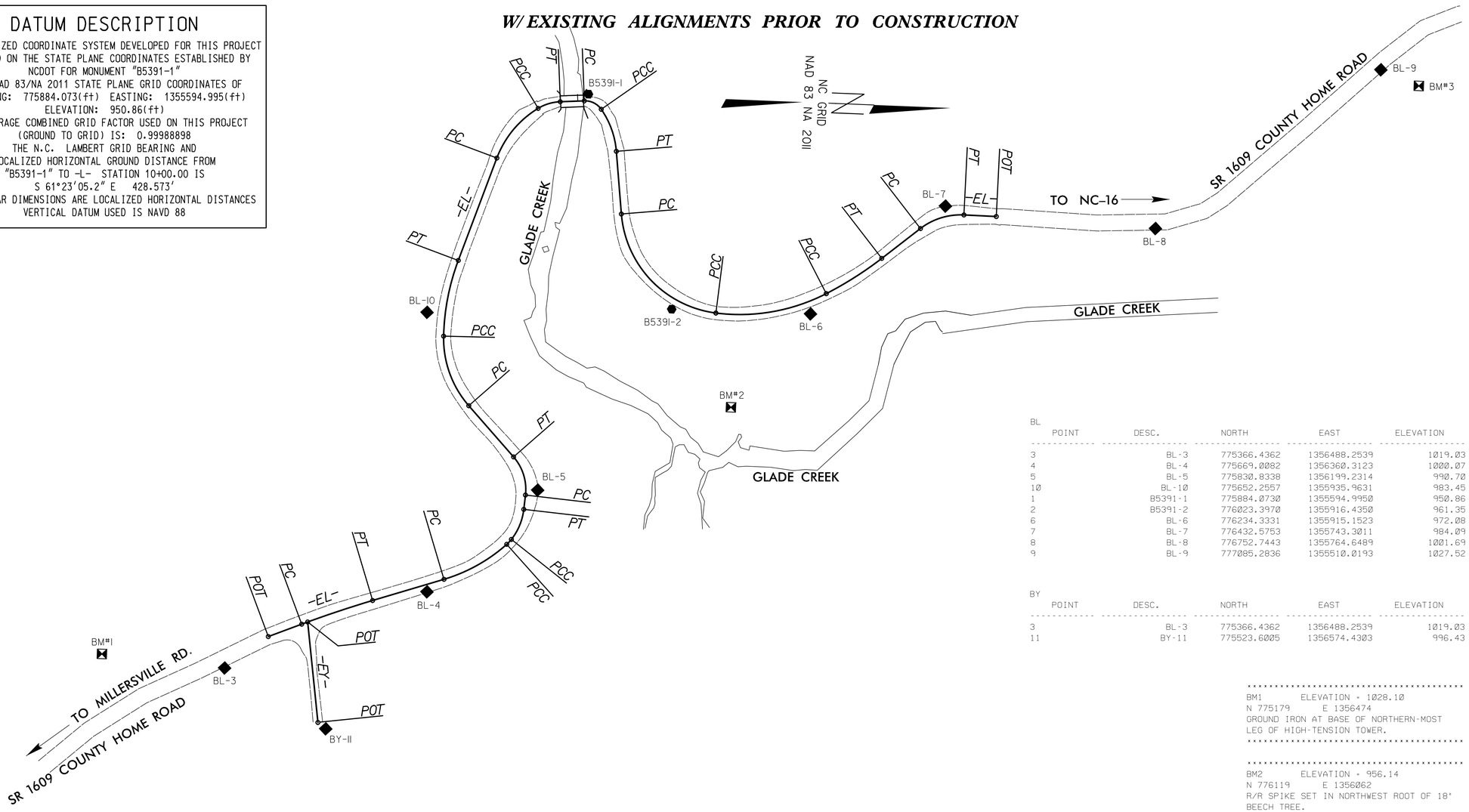
PROJECT REFERENCE NO.	SHEET NO.
B-5391	1C-1
Location and Surveys	

SURVEY CONTROL SHEET

W/ EXISTING ALIGNMENTS PRIOR TO CONSTRUCTION

DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCDOT FOR MONUMENT "B5391-1" WITH NAD 83/NA 2011 STATE PLANE GRID COORDINATES OF NORTHING: 775884.073(ft) EASTING: 1355594.995(ft) ELEVATION: 950.86(ft)
THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.99988898
THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "B5391-1" TO -L- STATION 10+00.00 IS S 61°23'05.2" E 428.573'
ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES
VERTICAL DATUM USED IS NAVD 88



BL

POINT	DESC.	NORTH	EAST	ELEVATION
3	BL-3	775366.4362	1356488.2539	1019.03
4	BL-4	775669.0082	1356360.3123	1000.07
5	BL-5	775830.8338	1356199.2314	990.70
10	BL-10	775652.2557	1355935.9631	983.45
1	B5391-1	775884.0730	1355594.9950	950.86
2	B5391-2	776023.3970	1355916.4350	961.35
6	BL-6	776234.3331	1355915.1523	972.08
7	BL-7	776432.5753	1355743.3011	984.09
8	BL-8	776752.7443	1355764.6489	1001.69
9	BL-9	777085.2836	1355510.0193	1027.52

BY

POINT	DESC.	NORTH	EAST	ELEVATION
3	BL-3	775366.4362	1356488.2539	1019.03
11	BY-11	775523.6005	1356574.4303	996.43

****
BM1 ELEVATION = 1028.10
N 775179 E 1356474
GROUND IRON AT BASE OF NORTHERN-MOST LEG OF HIGH-TENSION TOWER.
****

****
BM2 ELEVATION = 956.14
N 776119 E 1356062
R/R SPIKE SET IN NORTHWEST ROOT OF 18" BEECH TREE.
****

****
BM3 ELEVATION = 1019.76
N 777144 E 1355532
R/R SPIKE SET IN THE NORTHWEST ROOT OF 12" SYCAMORE TREE.
****

NOTES:

1. THE CONTROL DATA FOR THIS PROJECT CAN BE FOUND ELECTRONICALLY BY SELECTING PROJECT CONTROL DATA AT: HTTPS://CONNECT.NCDOT.GOV/RESOURCES/LOCATION/

2. IF FURTHER INFORMATION IS NEEDED, PLEASE CONTACT THE LOCATION AND SURVEYS UNIT.

3. PROJECT CONTROL WAS ESTABLISHED USING GNSS, THE GLOBAL NAVIGATION SATELLITE SYSTEM.

NOTE: DRAWING NOT TO SCALE

9/6/2017
B5391_1C-1.dgn
RELEASE

PROJECT REFERENCE NO.	SHEET NO.
B-5391	1C-2
Location and Surveys	

SURVEY CONTROL SHEET

W/ EXISTING ALIGNMENTS PRIOR TO CONSTRUCTION

```
BEGINNING CHAIN EL DESCRIPTION
==============================================================================

POINT 502            N     775,430.8831 E   1,356,437.9352 STA      10+00.00

COURSE FROM 502 TO PC EC1 N 22* 39' 21.86" W DIST 54.1623

                              CURVE DATA
                             *-----------*
CURVE EC1
P.I.  STATION           11+10.96  N       775,533.2784  E      1,356,395.1946
DELTA        =       3* 49' 37.03" (RT)
DEGREE       =       3* 22' 13.22"
TANGENT      =              56.7951
LENGTH       =             113.5480
RADIUS       =           1,700.0000
EXTERNAL     =               0.9485
LONG CHORD   =             113.5269
MID. ORD.    =               0.9479
P.C.  STATION           10+54.16  N       775,480.8659  E      1,356,417.0720
P.T.  STATION           11+67.71  N       775,587.0341  E      1,356,376.8641
C.C.                              N       776,135.7036  E      1,357,985.8892
BACK         = N  22* 39' 21.86" W
AHEAD        = N  18* 49' 44.83" W
CHORD BEAR   = N  20* 44' 33.35" W

COURSE FROM PT EC1 TO PC EC2 N 18* 49' 44.83" W DIST 113.1503

                              CURVE DATA
                             *-----------*
CURVE EC2
P.I.  STATION           13+36.77  N       775,747.0423  E      1,356,322.3021
DELTA        =      25* 12' 36.51" (LT)
DEGREE       =      22* 55' 05.92"
TANGENT      =              55.9049
LENGTH       =             110.0000
RADIUS       =             250.0000
EXTERNAL     =               6.1745
LONG CHORD   =             109.1148
MID. ORD.    =               6.0256
P.C.  STATION           12+80.86  N       775,694.1292  E      1,356,340.3452
P.T.  STATION           13+90.86  N       775,787.2303  E      1,356,283.4398
C.C.                              N       775,613.4425  E      1,356,103.7239
BACK         = N  18* 49' 44.83" W
AHEAD        = N  44* 02' 21.34" W
CHORD BEAR   = N  31* 26' 03.09" W

                              CURVE DATA
                             *-----------*
CURVE EC3
P.I.  STATION           13+96.03  N       775,790.9469  E      1,356,279.8458
DELTA        =       9* 50' 59.42" (LT)
DEGREE       =      95* 29' 34.68"
TANGENT      =               5.1701
LENGTH       =              10.3147
RADIUS       =              60.0000
EXTERNAL     =               0.2223
LONG CHORD   =              10.3020
MID. ORD.    =               0.2215
P.C.  STATION           13+90.86  N       775,787.2303  E      1,356,283.4398
P.T.  STATION           14+01.18  N       775,793.9939  E      1,356,275.6690
C.C.                              N       775,745.5212  E      1,356,240.3080
BACK         = N  44* 02' 21.34" W
AHEAD        = N  53* 53' 20.76" W
CHORD BEAR   = N  48* 57' 51.05" W

                              CURVE DATA
                             *-----------*
CURVE EC4
P.I.  STATION           14+26.84  N       775,809.1187  E      1,356,254.9360
DELTA        =      31* 49' 51.56" (LT)
DEGREE       =      63* 39' 43.12"
TANGENT      =              25.6635
LENGTH       =              50.0000
RADIUS       =              90.0000
EXTERNAL     =               3.5875
LONG CHORD   =              49.3595
MID. ORD.    =               3.4500
P.C.  STATION           14+01.18  N       775,793.9939  E      1,356,275.6690
P.T.  STATION           14+51.18  N       775,811.0339  E      1,356,229.3441
C.C.                              N       775,721.2849  E      1,356,222.6275
BACK         = N  53* 53' 20.76" W
AHEAD        = N  85* 43' 12.32" W
CHORD BEAR   = N  69* 48' 16.54" W

COURSE FROM PT EC4 TO PC EC5 N 85* 43' 12.32" W DIST 21.9195
```

```
                              CURVE DATA
                             *-----------*
CURVE EC5
P.I.  STATION           15+06.27  N       775,815.1457  E      1,356,174.4018
DELTA        =      47* 43' 28.68" (LT)
DEGREE       =      76* 23' 39.74"
TANGENT      =              33.1764
LENGTH       =              62.4714
RADIUS       =              75.0000
EXTERNAL     =               7.0102
LONG CHORD   =              60.6810
MID. ORD.    =               6.4110
P.C.  STATION           14+73.09  N       775,812.6698  E      1,356,207.4857
P.T.  STATION           15+35.57  N       775,792.3318  E      1,356,150.3145
C.C.                              N       775,737.8789  E      1,356,201.8886
BACK         = N  85* 43' 12.32" W
AHEAD        = S  46* 33' 19.00" W
CHORD BEAR   = S  70* 25' 03.34" W

COURSE FROM PT EC5 TO PC EC6 S 46* 33' 19.00" W DIST 103.3509

                              CURVE DATA
                             *-----------*
CURVE EC6
P.I.  STATION           16+99.21  N       775,679.8024  E      1,356,031.5039
DELTA        =      42* 30' 35.18" (RT)
DEGREE       =      36* 57' 54.07"
TANGENT      =              60.2914
LENGTH       =             115.0000
RADIUS       =             155.0000
EXTERNAL     =              11.3131
LONG CHORD   =             112.3804
MID. ORD.    =              10.5436
P.C.  STATION           16+38.92  N       775,721.2620  E      1,356,075.2778
P.T.  STATION           17+53.92  N       775,678.8186  E      1,355,971.2205
C.C.                              N       775,833.7979  E      1,355,968.6913
BACK         = S  46* 33' 19.00" W
AHEAD        = S  89* 03' 54.18" W
CHORD BEAR   = S  67* 48' 36.59" W

                              CURVE DATA
                             *-----------*
CURVE EC7
P.I.  STATION           18+13.36  N       775,677.8487  E      1,355,911.7894
DELTA        =      19* 16' 36.07" (RT)
DEGREE       =      16* 22' 12.80"
TANGENT      =              59.4390
LENGTH       =             117.7546
RADIUS       =             350.0000
EXTERNAL     =               5.0113
LONG CHORD   =             117.2000
MID. ORD.    =               4.9405
P.C.  STATION           17+53.92  N       775,678.8186  E      1,355,971.2205
P.T.  STATION           18+71.67  N       775,696.5532  E      1,355,855.3701
C.C.                              N       776,028.7720  E      1,355,965.5095
BACK         = S  89* 03' 54.18" W
AHEAD        = N  71* 39' 29.76" W
CHORD BEAR   = N  81* 17' 47.79" W

COURSE FROM PT EC7 TO PC EC8 N 71* 39' 29.76" W DIST 166.2561

                              CURVE DATA
                             *-----------*
CURVE EC8
P.I.  STATION           20+89.87  N       775,765.2154  E      1,355,648.2610
DELTA        =      38* 11' 49.87" (RT)
DEGREE       =      38* 11' 49.87"
TANGENT      =              51.9380
LENGTH       =             100.0000
RADIUS       =             150.0000
EXTERNAL     =               8.7374
LONG CHORD   =              98.1584
MID. ORD.    =               8.2565
P.C.  STATION           20+37.93  N       775,748.8713  E      1,355,697.5604
P.T.  STATION           21+37.93  N       775,808.5452  E      1,355,619.6239
C.C.                              N       775,891.2508  E      1,355,744.7630
BACK         = N  71* 39' 29.76" W
AHEAD        = N  33* 27' 39.89" W
CHORD BEAR   = N  52* 33' 34.82" W
```

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                              CURVE DATA
                             *-----------*
CURVE EC9
P.I.  STATION           21+56.04  N       775,823.6595  E      1,355,609.6347
DELTA        =      29* 01' 15.98" (RT)
DEGREE       =      81* 51' 04.01"
TANGENT      =              18.1170
LENGTH       =              35.4560
RADIUS       =              70.0000
EXTERNAL     =               2.3065
LONG CHORD   =              35.0782
MID. ORD.    =               2.2329
P.C.  STATION           21+37.93  N       775,808.5452  E      1,355,619.6239
P.T.  STATION           21+73.38  N       775,841.7221  E      1,355,608.2322
C.C.                              N       775,847.1412  E      1,355,678.0221
BACK         = N  33* 27' 39.89" W
AHEAD        = N   4* 26' 23.91" W
CHORD BEAR   = N  18* 57' 01.90" W

COURSE FROM PT EC9 TO PC EC10 N 4* 26' 23.91" W DIST 36.5433

                              CURVE DATA
                             *-----------*
CURVE EC10
P.I.  STATION           22+26.32  N       775,894.4957  E      1,355,604.1345
DELTA        =      57* 17' 44.81" (RT)
DEGREE       =     190* 59' 09.35"
TANGENT      =              16.3891
LENGTH       =              30.0000
RADIUS       =              30.0000
EXTERNAL     =               4.1848
LONG CHORD   =              28.7655
MID. ORD.    =               3.6725
P.C.  STATION           22+09.93  N       775,878.1558  E      1,355,605.4032
P.T.  STATION           22+39.93  N       775,904.3918  E      1,355,617.1985
C.C.                              N       775,880.4783  E      1,355,635.3132
BACK         = N   4* 26' 23.91" W
AHEAD        = N  52* 51' 20.90" E
CHORD BEAR   = N  24* 12' 28.50" E

                              CURVE DATA
                             *-----------*
CURVE EC11
P.I.  STATION           22+75.10  N       775,925.6271  E      1,355,645.2316
DELTA        =      30* 16' 30.37" (RT)
DEGREE       =      44* 04' 25.24"
TANGENT      =              35.1681
LENGTH       =              68.6920
RADIUS       =             130.0000
EXTERNAL     =               4.6729
LONG CHORD   =              67.8957
MID. ORD.    =               4.5108
P.C.  STATION           22+39.93  N       775,904.3918  E      1,355,617.1985
P.T.  STATION           23+08.62  N       775,929.8333  E      1,355,680.1473
C.C.                              N       775,800.7664  E      1,355,695.6955
BACK         = N  52* 51' 20.90" E
AHEAD        = N  83* 07' 51.26" E
CHORD BEAR   = N  67* 59' 36.08" E

COURSE FROM PT EC11 TO PC EC12 N 83* 07' 51.26" E DIST 95.5139

                              CURVE DATA
                             *-----------*
CURVE EC12
P.I.  STATION           25+38.06  N       775,957.2746  E      1,355,907.9403
DELTA        =      78* 07' 50.19" (LT)
DEGREE       =      34* 43' 28.97"
TANGENT      =             133.9260
LENGTH       =             225.0000
RADIUS       =             165.0000
EXTERNAL     =              47.5116
LONG CHORD   =             207.9679
MID. ORD.    =              36.8894
P.C.  STATION           24+04.13  N       775,941.2569  E      1,355,774.9756
P.T.  STATION           26+29.13  N       776,090.6909  E      1,355,919.6134
C.C.                              N       776,105.0725  E      1,355,755.2414
BACK         = N  83* 07' 51.26" E
AHEAD        = N   5* 00' 01.07" E
CHORD BEAR   = N  44* 03' 56.17" E
```

```
                              CURVE DATA
                             *-----------*
CURVE EC13
P.I.  STATION           27+18.26  N       776,179.4826  E      1,355,927.3822
DELTA        =      34* 30' 19.61" (LT)
DEGREE       =      19* 57' 49.27"
TANGENT      =              89.1308
LENGTH       =             172.8411
RADIUS       =             287.0000
EXTERNAL     =              13.5217
LONG CHORD   =             170.2409
MID. ORD.    =              12.9133
P.C.  STATION           26+29.13  N       776,090.6909  E      1,355,919.6134
P.T.  STATION           28+01.97  N       776,257.0541  E      1,355,883.4851
C.C.                              N       776,115.7061  E      1,355,633.7057
BACK         = N   5* 00' 01.07" E
AHEAD        = N  29* 30' 18.54" W
CHORD BEAR   = N  12* 15' 08.73" W

                              CURVE DATA
                             *-----------*
CURVE EC14
P.I.  STATION           28+52.11  N       776,300.6900  E      1,355,858.7919
DELTA        =      10* 25' 02.69" (LT)
DEGREE       =      10* 25' 02.69"
TANGENT      =              50.1382
LENGTH       =             100.0000
RADIUS       =             550.0000
EXTERNAL     =               2.2806
LONG CHORD   =              99.8623
MID. ORD.    =               2.2712
P.C.  STATION           28+01.97  N       776,257.0541  E      1,355,883.4851
P.T.  STATION           29+01.97  N       776,339.1416  E      1,355,826.6156
C.C.                              N       775,986.1782  E      1,355,404.8138
BACK         = N  29* 30' 18.54" W
AHEAD        = N  39* 55' 21.23" W
CHORD BEAR   = N  34* 42' 49.89" W

COURSE FROM PT EC14 TO PC EC15 N 39* 55' 21.23" W DIST 74.2648

                              CURVE DATA
                             *-----------*
CURVE EC15
P.I.  STATION           30+13.12  N       776,424.3818  E      1,355,755.2867
DELTA        =      40* 29' 25.59" (RT)
DEGREE       =      57* 17' 44.81"
TANGENT      =              36.8825
LENGTH       =              70.6692
RADIUS       =             100.0000
EXTERNAL     =               6.5848
LONG CHORD   =              69.2078
MID. ORD.    =               6.1780
P.C.  STATION           29+76.24  N       776,396.0962  E      1,355,778.9561
P.T.  STATION           30+46.91  N       776,461.2625  E      1,355,755.6522
C.C.                              N       776,460.2714  E      1,355,855.6473
BACK         = N  39* 55' 21.23" W
AHEAD        = N   0* 34' 04.35" E
CHORD BEAR   = N  19* 40' 38.44" W

COURSE FROM PT EC15 TO 512 N 0* 34' 04.35" E DIST 49.2068

POINT 512            N     776,510.4669 E   1,355,756.1399 STA      30+96.11

==============================================================================
ENDING CHAIN EL DESCRIPTION


BEGINNING CHAIN EY DESCRIPTION
==============================================================================

POINT 520            N     775,511.3937 E   1,356,565.4073 STA      10+00.00

COURSE FROM 520 TO 521 S 81* 54' 03.75" W DIST 153.5501

POINT 521            N     775,489.7610 E   1,356,413.3886 STA      11+53.55

==============================================================================
ENDING CHAIN EY DESCRIPTION
```

NOTES:

1. THE CONTROL DATA FOR THIS PROJECT CAN BE FOUND ELECTRONICALLY BY SELECTING PROJECT CONTROL DATA AT: HTTPS://CONNECT.NCDOT.GOV/RESOURCES/LOCATION/
2. IF FURTHER INFORMATION IS NEEDED, PLEASE CONTACT THE LOCATION AND SURVEYS UNIT.
3. PROJECT CONTROL WAS ESTABLISHED USING GNSS, THE GLOBAL NAVIGATION SATELLITE SYSTEM.

DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCDOT FOR MONUMENT "B5391-1"
WITH NAD 83/NA 2011 STATE PLANE GRID COORDINATES OF NORTHING: 775884.073(ft) EASTING: 1355594.995(ft)
ELEVATION: 950.86(ft)
THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.99988898
THE N.C. LAMBERT GRID BEARING AND LOCALIZED HORIZONTAL GROUND DISTANCE FROM "B5391-1" TO -L- STATION 10+00.00 IS
S 61°23'05.2" E 428.573'
ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES
VERTICAL DATUM USED IS NAVD 88

8/25/17

PROJECT REFERENCE NO.	SHEET NO.
B-5391	1C-3
Location and Surveys	

PROPOSED ALIGNMENT CONTROL SHEET

L

TYPE	STATION	NORTH	EAST
PC	10+00.00	775678.8186	1355971.2205
PT	10+84.35	775687.5690	1355887.5319
PC	12+98.43	775735.2645	1355678.8326
PT	14+15.99	775819.4183	1355608.9554
PC	14+96.36	775899.7202	1355605.7549
PT	15+88.49	775961.9401	1355661.1991
PC	17+27.56	775972.3893	1355799.8760
PCC	19+10.64	776090.6909	1355919.6134
PT	20+83.48	776257.0541	1355883.4851

DATUM DESCRIPTION

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NCDOT FOR MONUMENT "B5391-1"
WITH NAD 83/NA 2011 STATE PLANE GRID COORDINATES OF
NORTHING: 775884.073(ft) EASTING: 1355594.995(ft)
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(GROUND TO GRID) IS: 0.99988898
THE N.C. LAMBERT GRID BEARING AND
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VERTICAL DATUM USED IS NAVD 88

NOTES:

1. THE CONTROL DATA FOR THIS PROJECT CAN BE FOUND ELECTRONICALLY BY SELECTING PROJECT CONTROL DATA AT:
HTTPS://CONNECT.NCDOT.GOV/RESOURCES/LOCATION/

2. IF FURTHER INFORMATION IS NEEDED, PLEASE CONTACT THE LOCATION AND SURVEYS UNIT.

3. PROJECT CONTROL WAS ESTABLISHED USING GNSS, THE GLOBAL NAVIGATION SATELLITE SYSTEM.

8/8/2017
B-5391_1C-3.dgn
RELEASE

8/25/17

PROJECT REFERENCE NO.	SHEET NO.
B-5391	1C-4
Location and Surveys	

RIGHT OF WAY CONTROL SHEET

ROW MARKER IRON PIN AND CAP

ALIGN	STATION	OFFSET	NORTH	EAST
L	10+80.00	-15.00	775671.96307	1355888.61735
L	10+80.00	30.00	775715.95321	1355898.09720
L	10+80.00	15.00	775701.28983	1355894.93725
L	10+80.00	-30.00	775657.29969	1355885.45740
L	10+84.35	-30.00	775658.32300	1355880.84809
L	10+84.35	30.00	775716.81494	1355894.21567
L	12+57.03	30.00	775755.28690	1355725.87563
L	12+98.43	-30.00	775706.01854	1355672.14882
L	13+95.53	28.42	775806.74391	1355639.48436
L	14+15.99	-30.00	775818.22353	1355578.97919
L	14+94.39	30.00	775898.94326	1355635.80968
L	14+96.36	-30.00	775898.52549	1355575.77869
L	15+88.49	-30.00	775991.85526	1355658.94498
L	17+27.56	-30.00	776002.30454	1355797.62186
L	17+71.86	30.00	775955.66903	1355854.76765
L	19+10.64	-30.00	776093.30577	1355889.72760
L	19+10.64	30.00	776088.07612	1355949.49926
L	19+15.00	13.96	776094.03547	1355933.88145
L	19+15.00	-16.04	776096.19565	1355903.95932
L	19+15.00	-30.00	776097.20063	1355890.03856
L	19+15.00	30.00	776092.88028	1355949.88282

PERMANENT EASEMENT MARKER IRON PIN AND CAP

ALIGN	STATION	OFFSET	NORTH	EAST
L	13+80.00	-30.00	775771.91454	1355590.30210
L	14+15.99	-45.00	775817.62616	1355563.99109
L	14+50.75	50.00	775856.13761	1355657.53161
L	14+53.37	30.00	775857.95912	1355637.44313
L	14+96.36	-45.00	775897.92813	1355560.79059
L	15+30.00	-42.00	775952.86507	1355577.23193
L	15+32.14	47.91	775908.49334	1355655.44552
L	15+52.50	-30.00	775972.37530	1355609.46904
L	15+52.50	-45.00	775984.08624	1355600.09600

DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE STATE PLANE COORDINATES ESTABLISHED BY NCDOT FOR MONUMENT "B5391-1"
WITH NAD 83/NA 2011 STATE PLANE GRID COORDINATES OF
NORTHING: 775884.073(ft) EASTING: 1355594.995(ft)
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S 61°23'05.2" E 428.573'
ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES
VERTICAL DATUM USED IS NAVD 88

NOTES:

1. THESE RIGHT OF WAY MAPS MAY BE A COMPILATION OF WORK FROM SEVERAL DIFFERENT SOURCES AND/OR SURVEYORS. THOSE INDIVIDUAL COMPONENTS CAN BE FOUND ELECTRONICALLY BY SELECTING PROJECT DATA AT: HTTPS://CONNECT.NCDOT.GOV/RESOURCES/LOCATION/

2. NEW RIGHT OF WAYS AND EASEMENTS ARE SUBJECT TO CHANGE. PLEASE REFER TO DEEDS FOR FINAL DETERMINATION.

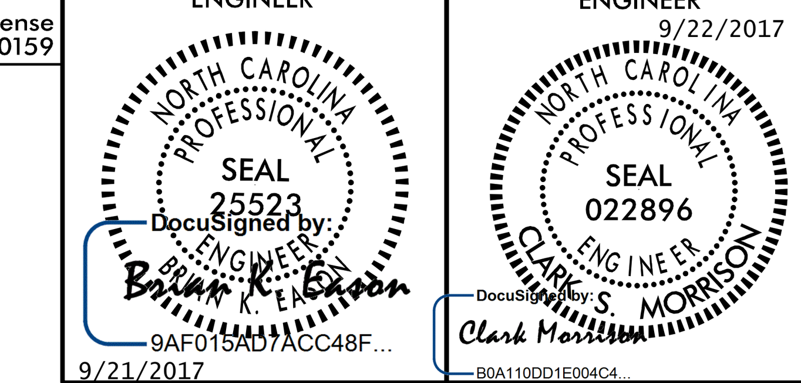
9/6/2017
B5391_1C-4.dgn
RPEARCE

5/14/99

LOCHNER

H. W. LOCHNER, INC.
2840 PLAZA PLACE, SUITE 202
RALEIGH, NC 27612
(919) 571-7111
NC License Number F-0159

PROJECT REFERENCE NO.	SHEET NO.
B-5391	2A-1
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	PAVEMENT ENGINEER



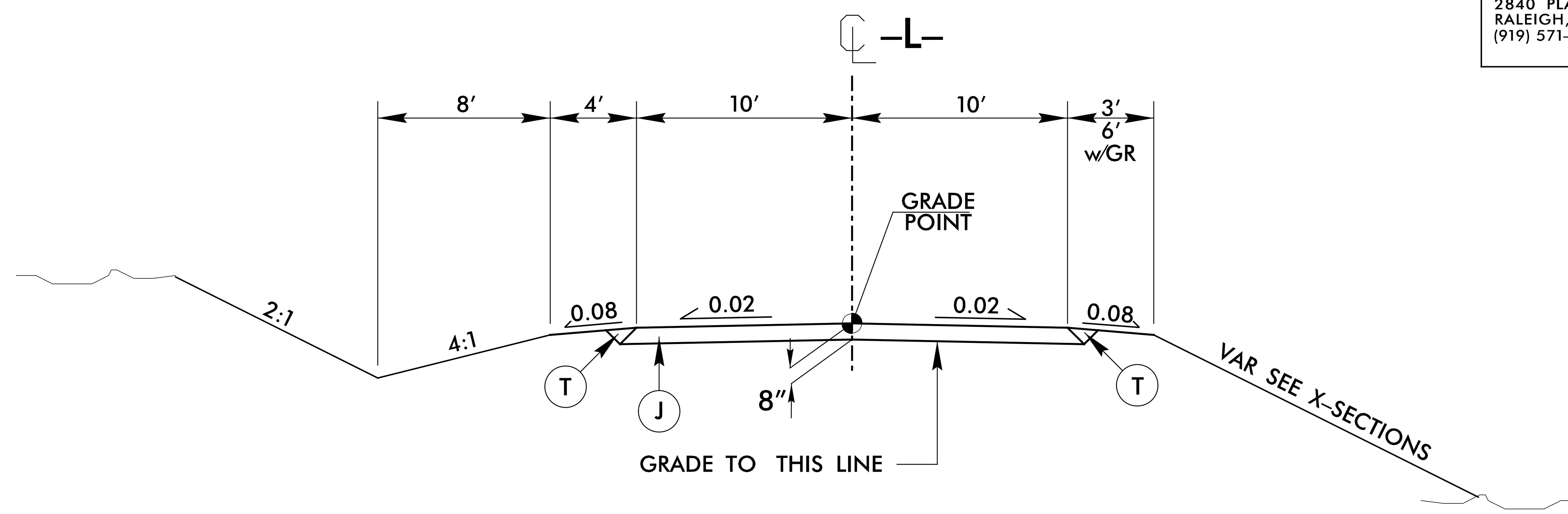
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PAVEMENT SCHEDULE

(FINAL PAVEMENT DESIGN)

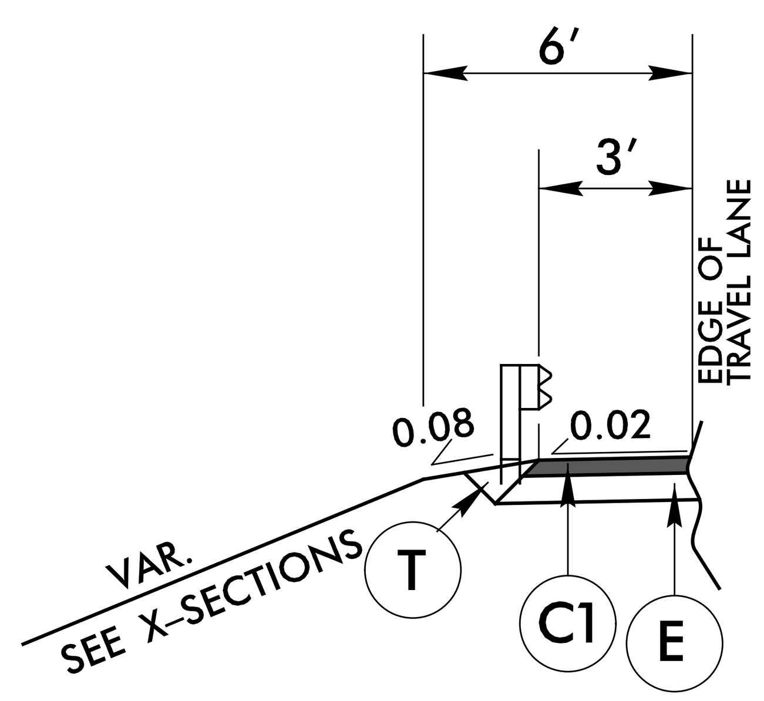
C1	PROP. APPROX. 2 1/2" ASPHALT CONCRETE SURFACE COURSE, TYPE SF9.5A, AT AN AVERAGE RATE OF 137.5 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.
C2	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE, TYPE SF9.5A, AT AN AVERAGE RATE OF 110 LBS. PER SQ. YD. PER 1" DEPTH. TO BE PLACED IN LAYERS NOT LESS THAN 1" DEPTH OR GREATER THAN 1½" IN DEPTH.
E	PROP. APPROX. 4 1/2" ASPHALT CONCRETE BASE COURSE, TYPE B25.0B, AT AN AVERAGE RATE OF 513 LBS. PER SQ. YD.
J	PROP. 8" AGGREGATE BASE COURSE.
R	SHOULDER BERM GUTTER
T	EARTH MATERIAL.

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



TYPICAL SECTION NO. 1

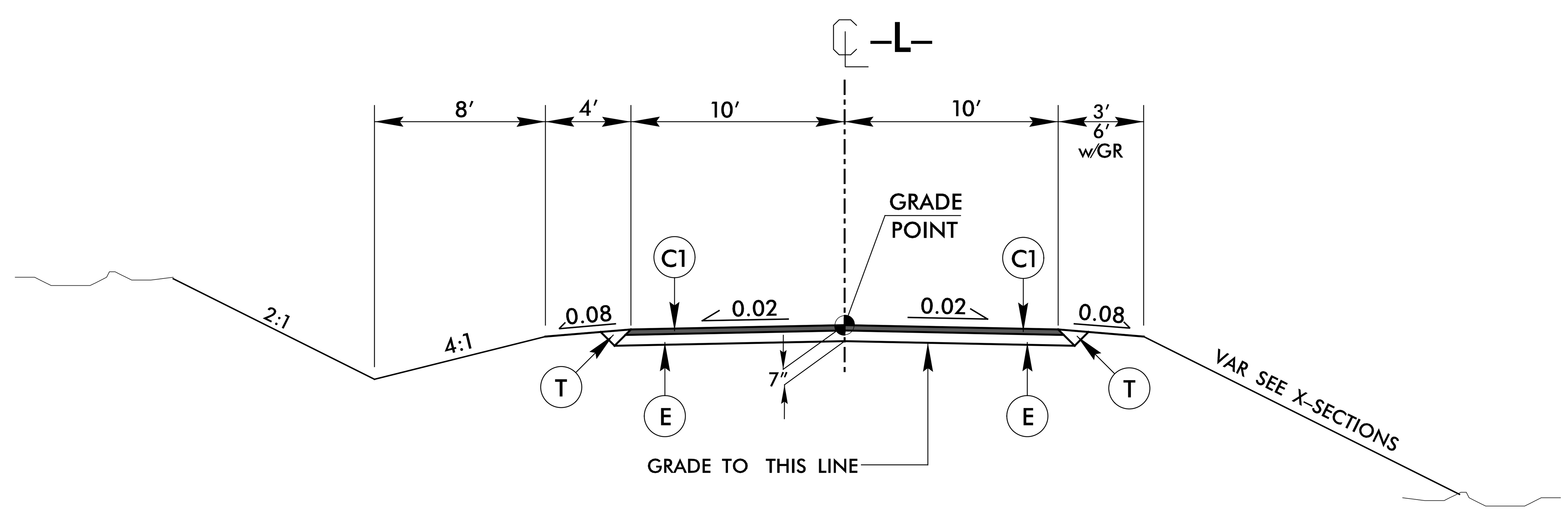
-L- STA. 10+80.00 TO 12+45.00
-L- STA. 16+45.00 TO 19+15.00



DocuSigned by: Brian K. Eason 9AF015AD7ACC48F...

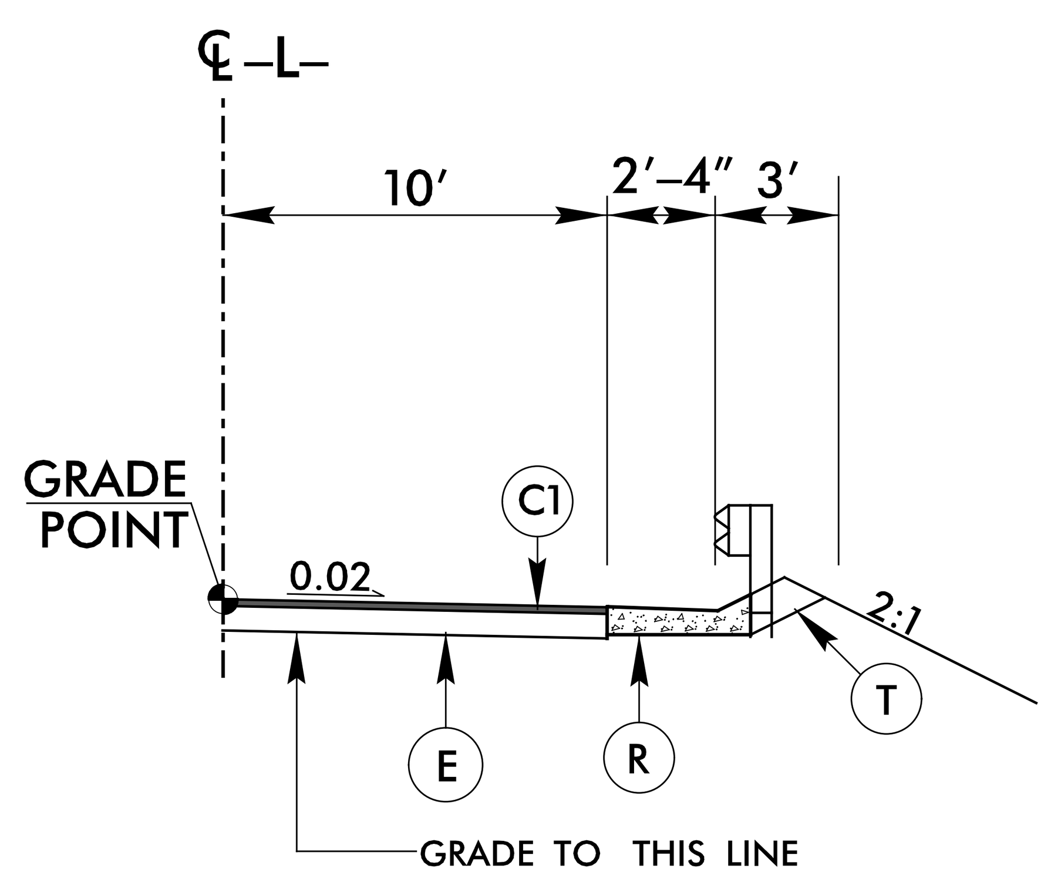
DETAIL A

PAVED SHOULDER w/GUARDRAIL
-L- STA. 13+31.60 TO STA. 14+16.81 LT
-L- STA. 12+66.42 TO STA. 14+16.81 RT
-L- STA. 14+95.81 TO STA. 16+19.42 LT
-L- STA. 14+95.81 TO STA. 16+11.42 RT



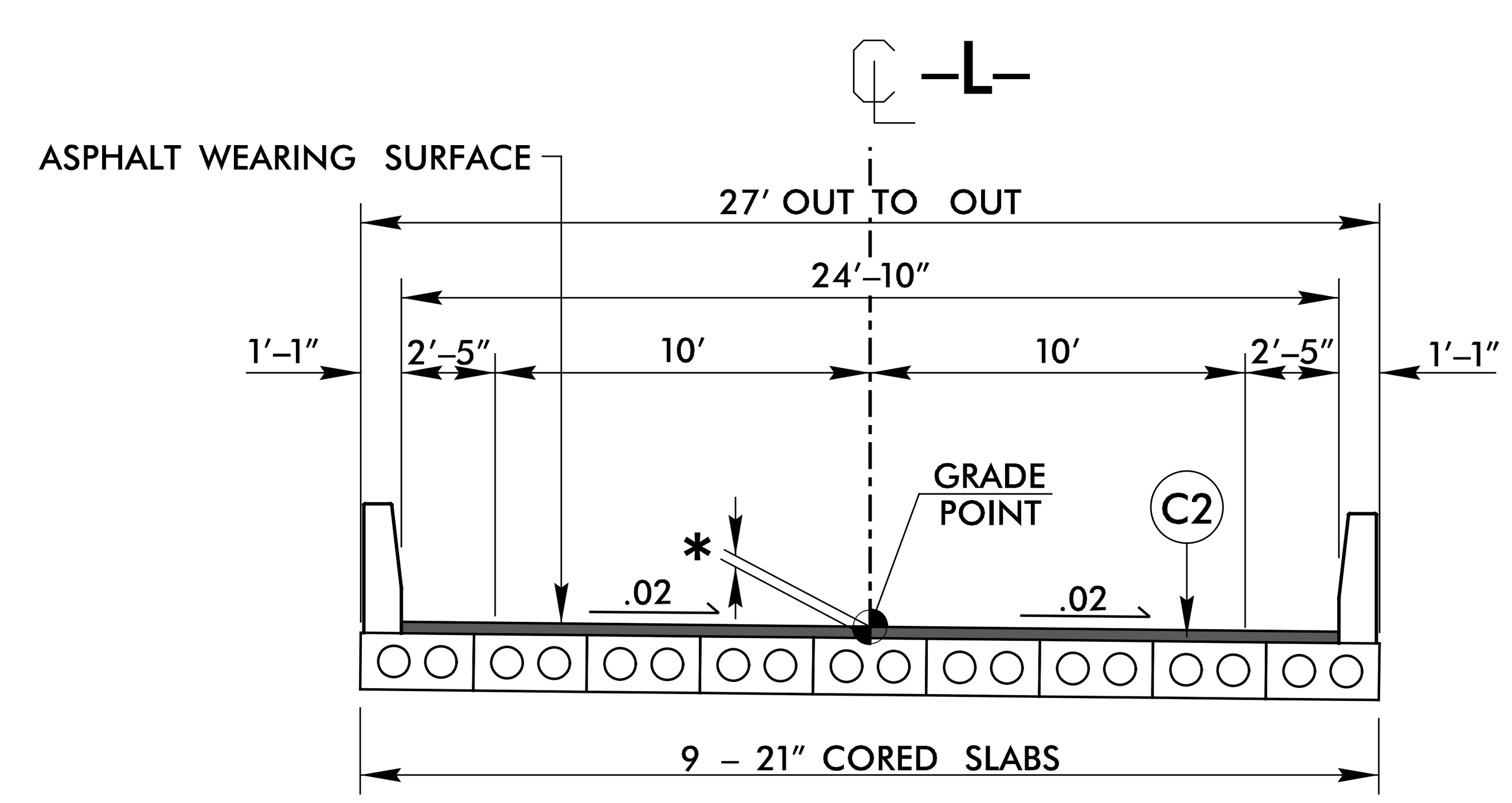
TYPICAL SECTION NO. 2

-L- STA. 12+45.00 TO 14+27.68 (BEG. BRIDGE)
-L- STA. 14+84.93 (END BRIDGE) TO 16+45.00



DETAIL B

SHOULDER BERM GUTTER
-L- STA. 14+95.81 TO STA. 15+36 RT



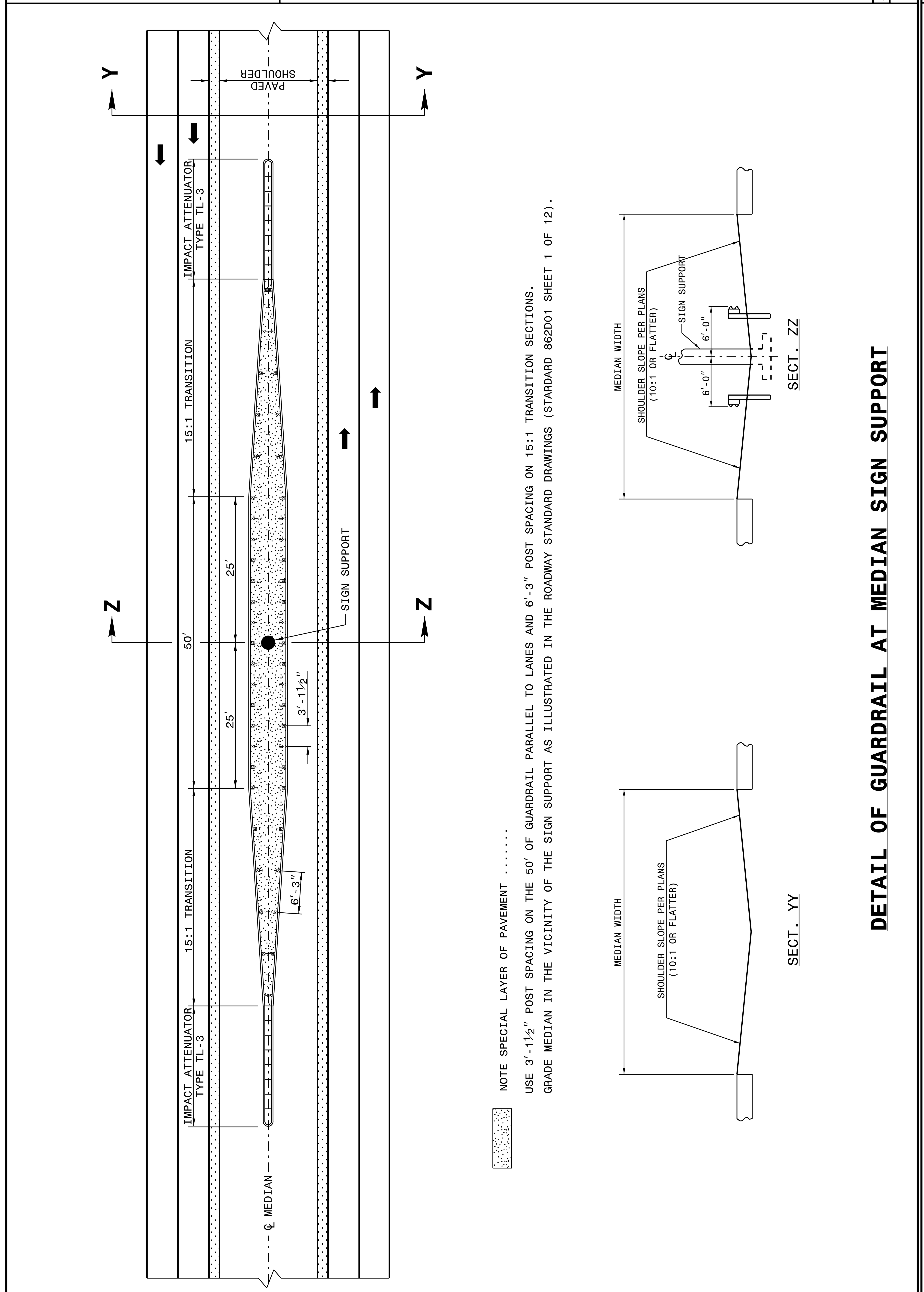
STRUCTURE TYPICAL SECTION

-L- STA. 14+27.68 TO 14+84.93

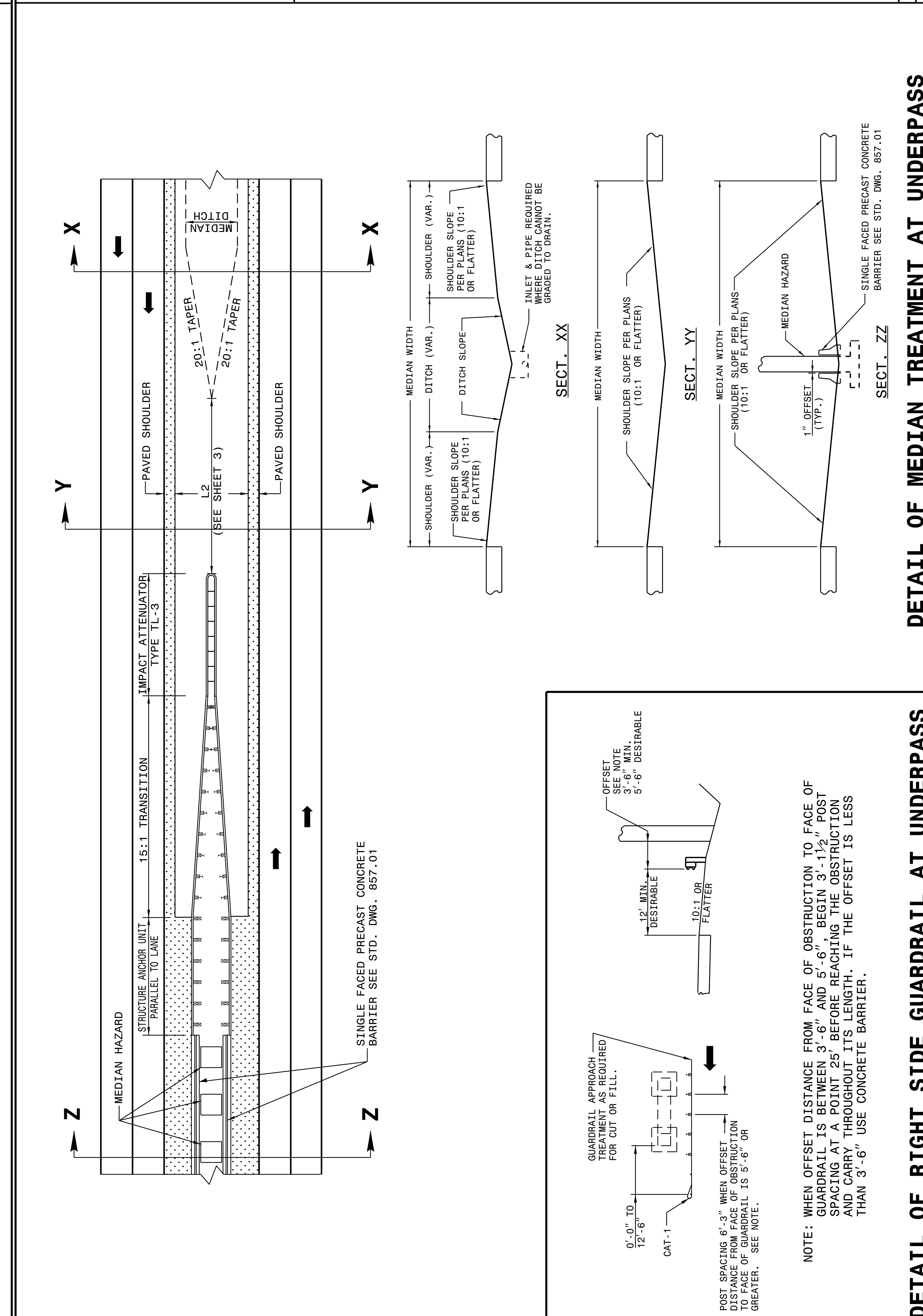
* VARIABLE PAVEMENT DEPTH (SEE STRUCTURE PLANS)

9/13/2017
B5391_RDY_PSH_02A-1.dgn
RBPBASE

PROJECT REFERENCE NO.	SHEET NO.
B-5391	2C-1



DETAIL OF GUARDRAIL AT MEDIAN SIGN SUPPORT
IMPACT ATTENUATOR TYPE TL-3
15:1 TRANSITION
50'
25'
25'
SIGN SUPPORT
PAVED SHOULDER
3'-1½"
6'-3"
℄ MEDIAN
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 (STANDARD 862D01 SHEET 1 OF 12).
MEDIAN WIDTH
SHOULDER SLOPE PER PLANS (10:1 OR FLATTER)
SIGN SUPPORT
6'-0"
SECT. ZZ
SECT. YY



DETAIL OF MEDIAN TREATMENT AT UNDERPASS
MEDIAN DITCH
20:1 TAPER
PAVED SHOULDER
L2 (SEE SHEET 3)
IMPACT ATTENUATOR TYPE TL-3
15:1 TRANSITION
STRUCTURE ANCHOR UNIT PARALLEL TO LANE
MEDIAN HAZARD
SINGLE FACED PRECAST CONCRETE BARRIER SEE STD. DWG. 857.01
SHOULDER (VAR.)
DITCH (VAR.)
MEDIAN WIDTH
SHOULDER SLOPE PER PLANS (10:1 OR FLATTER)
DITCH SLOPE
INLET & PIPE REQUIRED WHERE DITCH CANNOT BE GRADED TO DRAIN.
SECT. XX
SECT. YY
1" OFFSET (TYP.)
SECT. ZZ
DETAIL OF RIGHT SIDE GUARDRAIL AT UNDERPASS
OFFSET SEE NOTE 3'-6" MIN. 5'-6" DESIRABLE
12' MIN. DESIRABLE
10:1 OR FLATTER
GUARDRAIL APPROACH TREATMENT AS REQUIRED FOR CUT OR FILL.
0'-0" TO 12'-6"
CAT-1
POST SPACING 6'-3" WHEN OFFSET DISTANCE FROM FACE OF OBSTRUCTION TO FACE OF GUARDRAIL IS 5'-6" OR GREATER. SEE NOTE.
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.

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

ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 2 OF 11 — 862D01

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

ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 1 OF 11 — 862D01

SEAL 022966 — 11/7/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SEE TITLE BLOCK

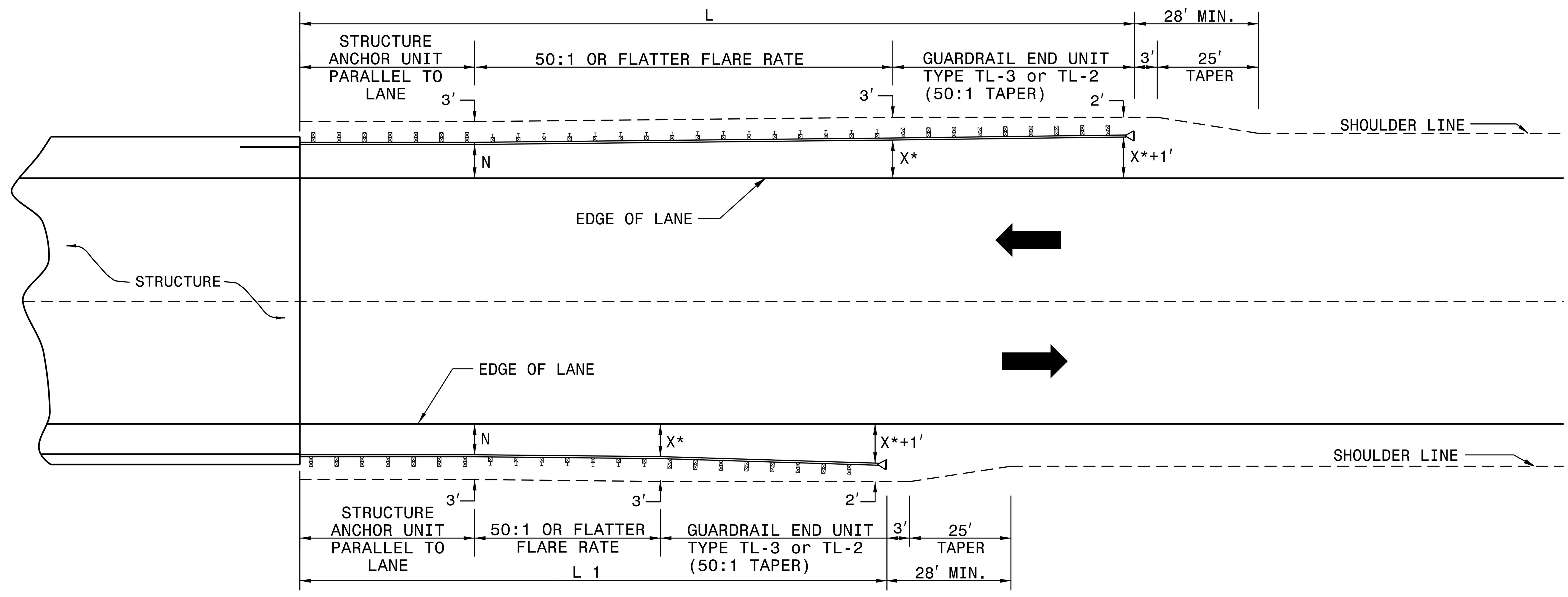
ORIGINAL BY: J HOWERTON DATE: 06-22-12
MODIFIED BY: DATE:
CHECKED BY: DATE:
FILE SPEC.:

04-MAY-2017 15:14
S:\Contracts\Contracts\Special Details\jhowerton\Standard Drawings\2012 Standard Drawings\Details in Lieu of Standards\Division 8\862d01 862d03 862d03\862d01.dgn
jhowerton AT CSD-292595

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

ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 4 OF 11
862D01



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'

* 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

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

SHEET 4 OF 11
862D01

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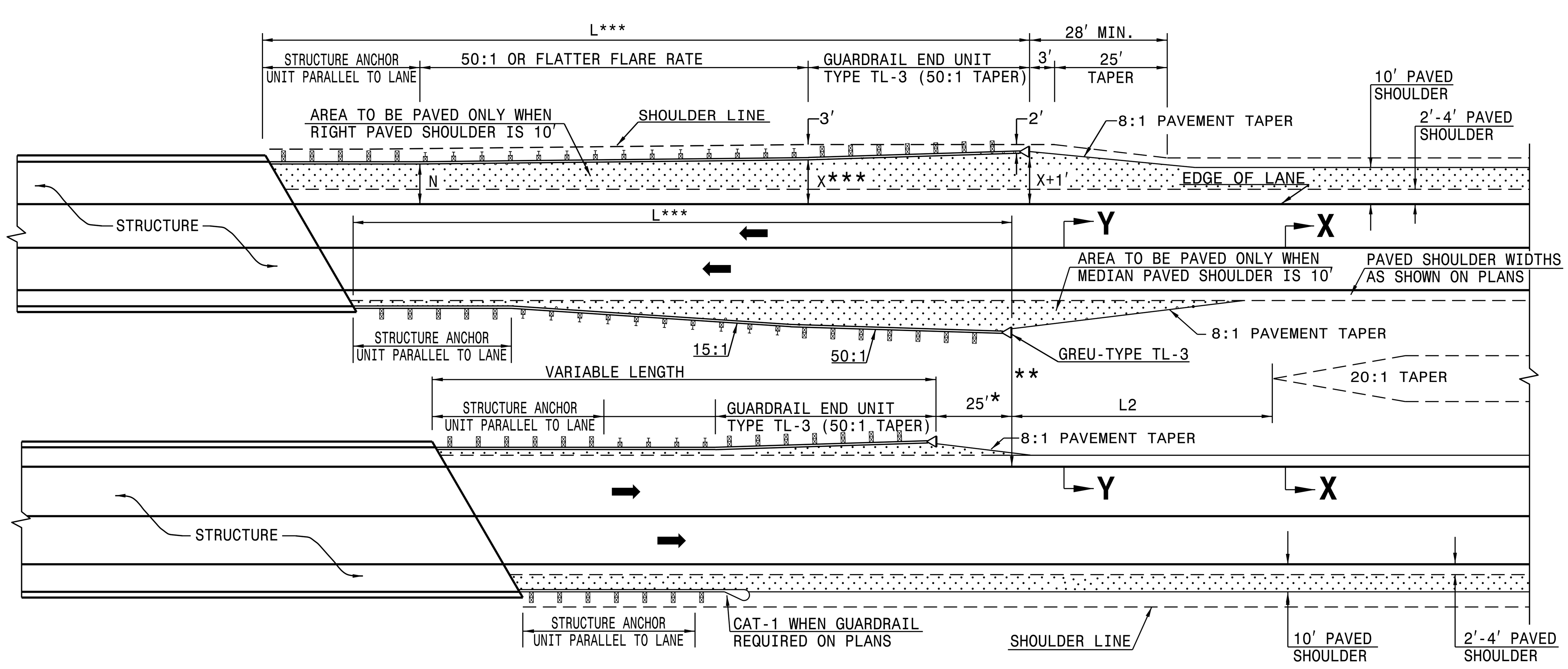
ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

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-
	70 MPH	60 MPH	50 MPH				DIM.
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

SHEET 3 OF 11
862D01

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B-5391	2C-2

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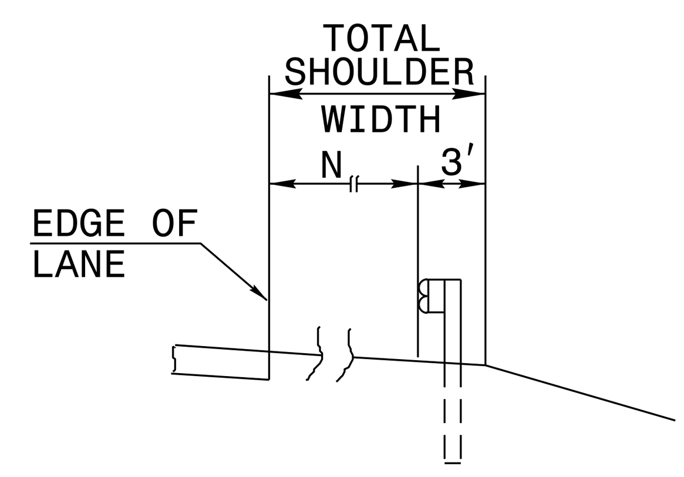
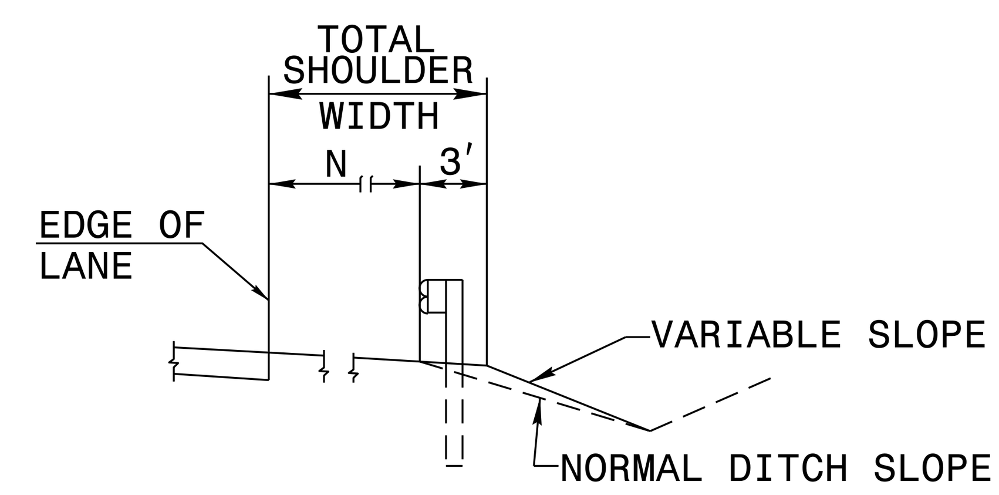
ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 6 OF 11
862D01

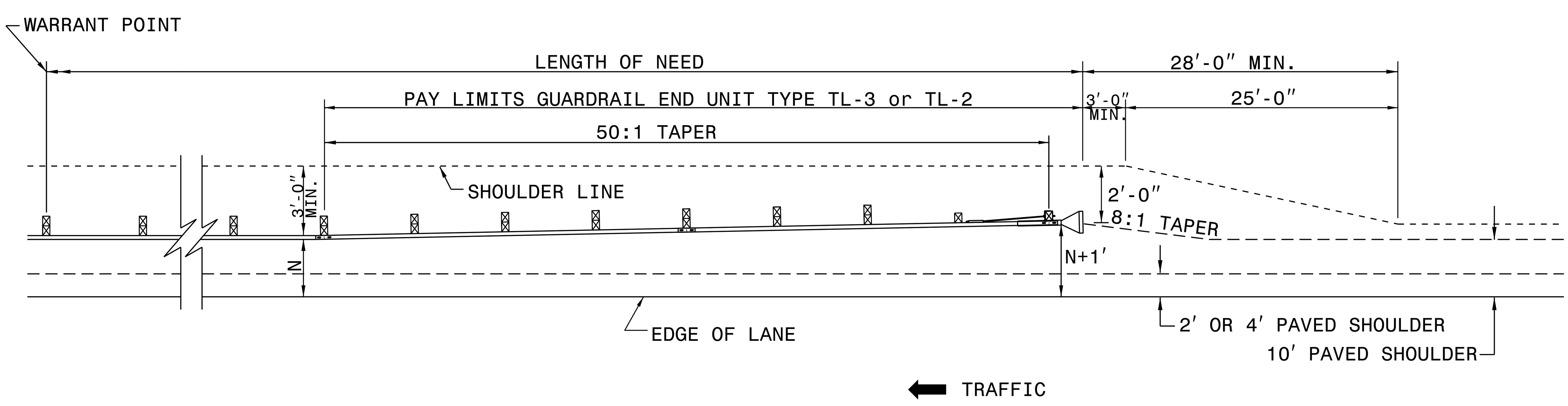


FILL SECTION



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
GUARDRAIL PLACEMENT

SHEET 6 OF 11
862D01

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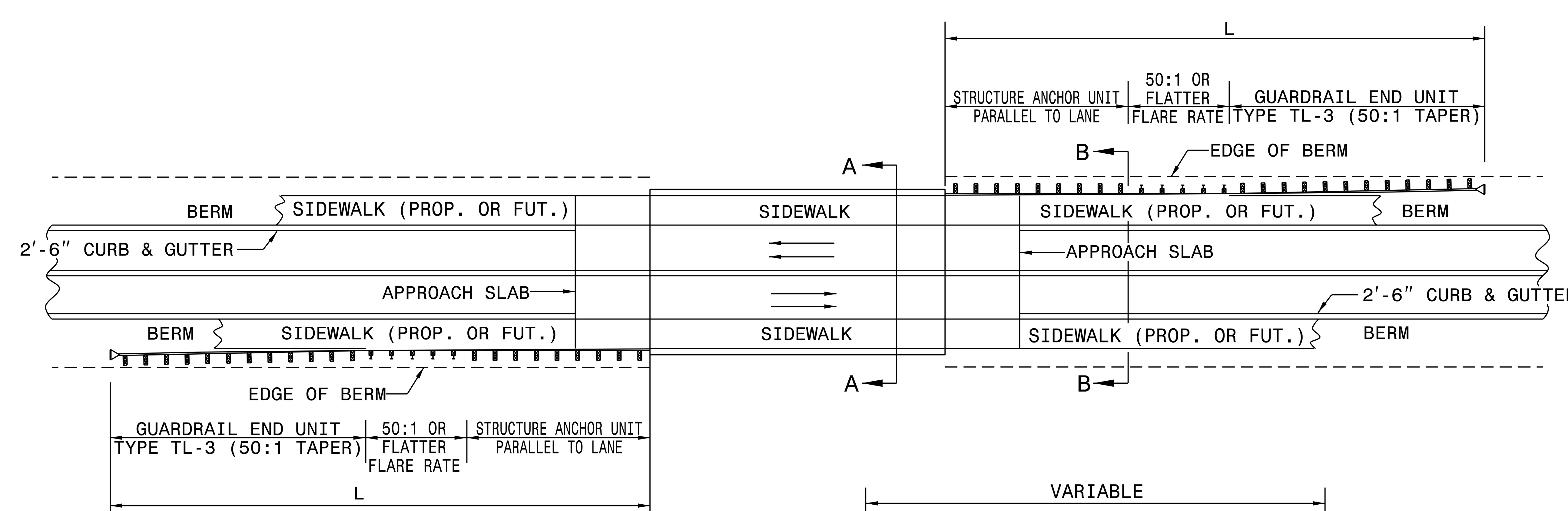
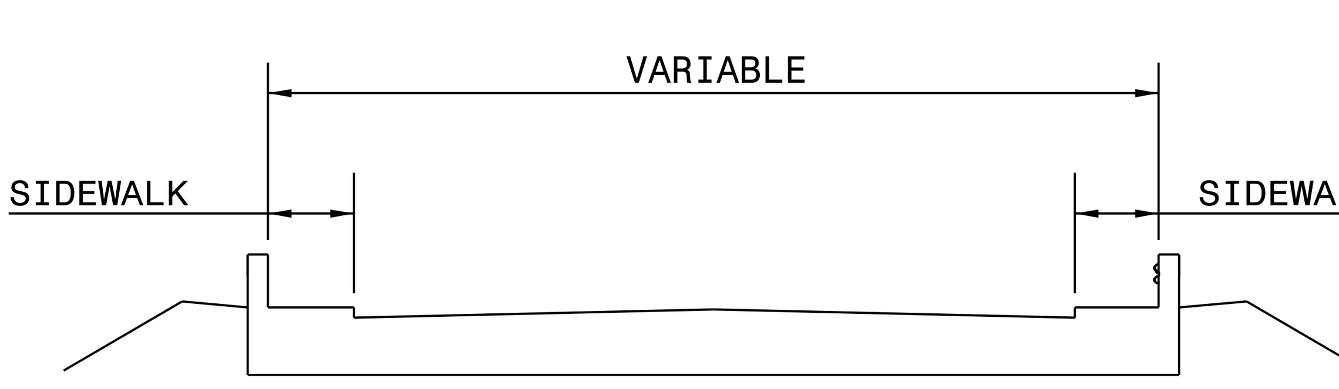
ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 5 OF 11
862D01



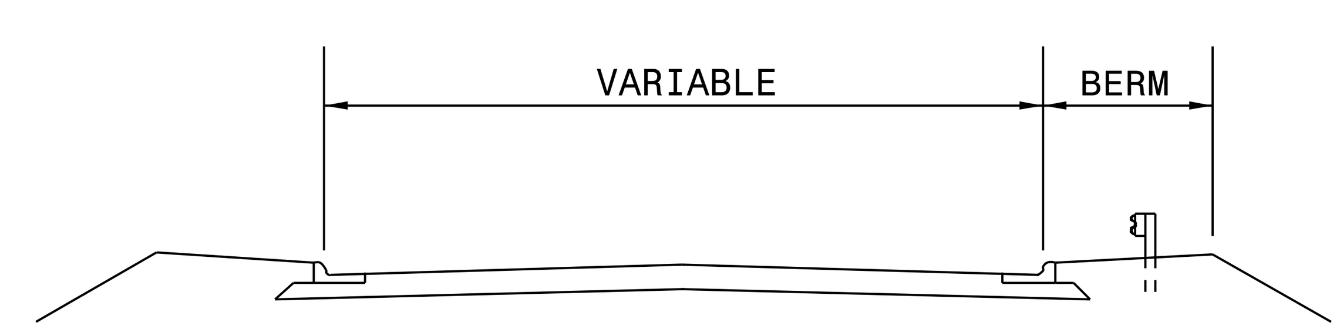


SECTION A-A

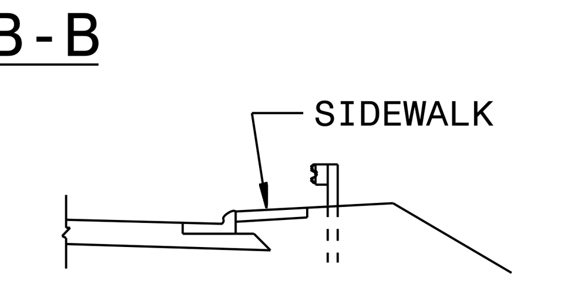
MINIMUM GUARDRAIL LENGTHS "L" REQUIRED AT BRIDGE APPROACHES ON 2'-6" CONCRETE CURB AND GUTTER ROADWAYS	
DESIGN SPEED (MPH)	"L"
40	150'
50	225'

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 B-B



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

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ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 5 OF 11
862D01

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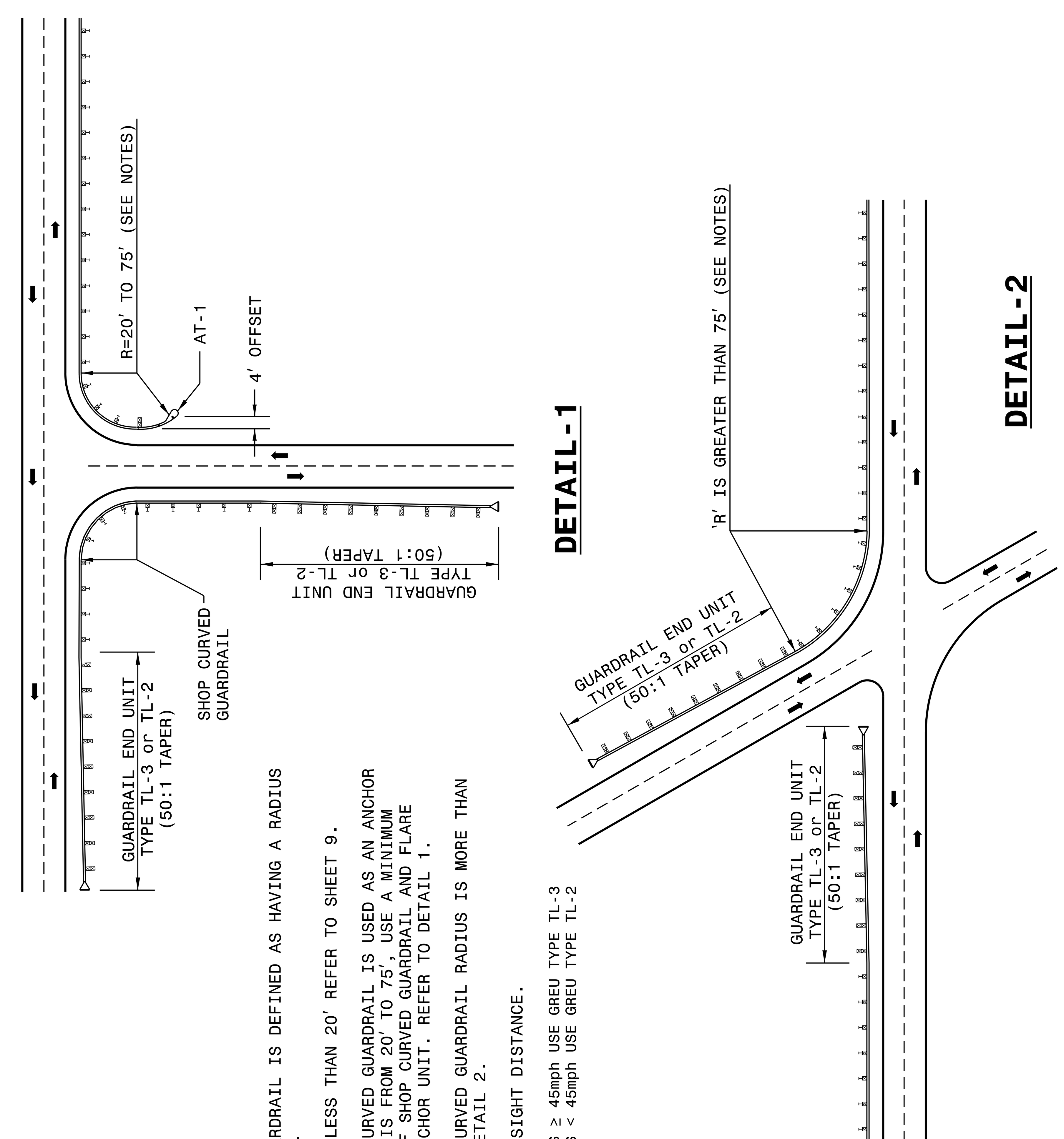
B-5391	2C-4

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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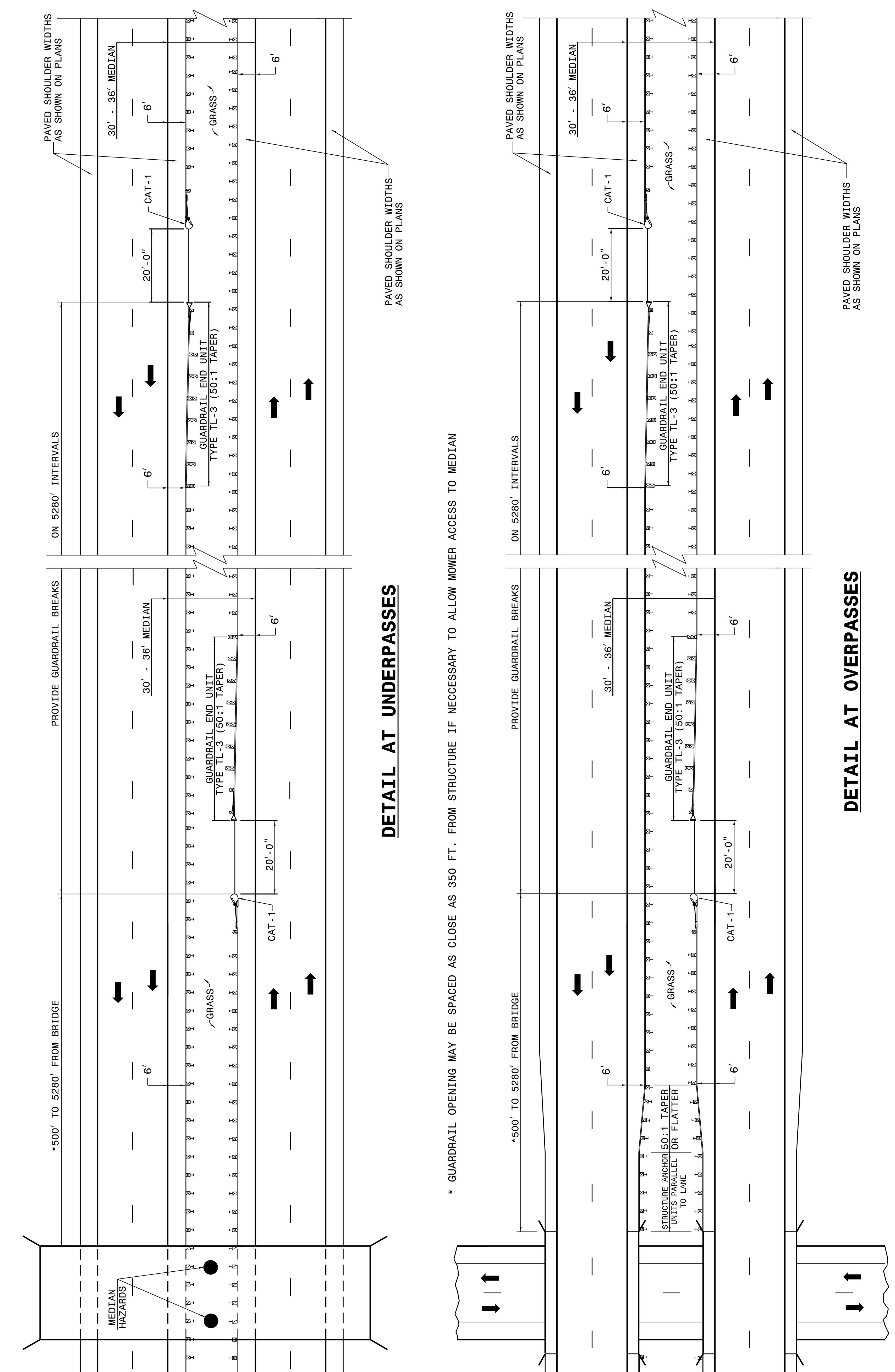
GUARDRAIL BREAK INTERVALS WITH 30' - 36' MEDIANS



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

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B-5391	2C-5

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C. — ENGLISH DETAIL DRAWING FOR GUARDRAIL PLACEMENT — SHEET 10 OF 11 862D01

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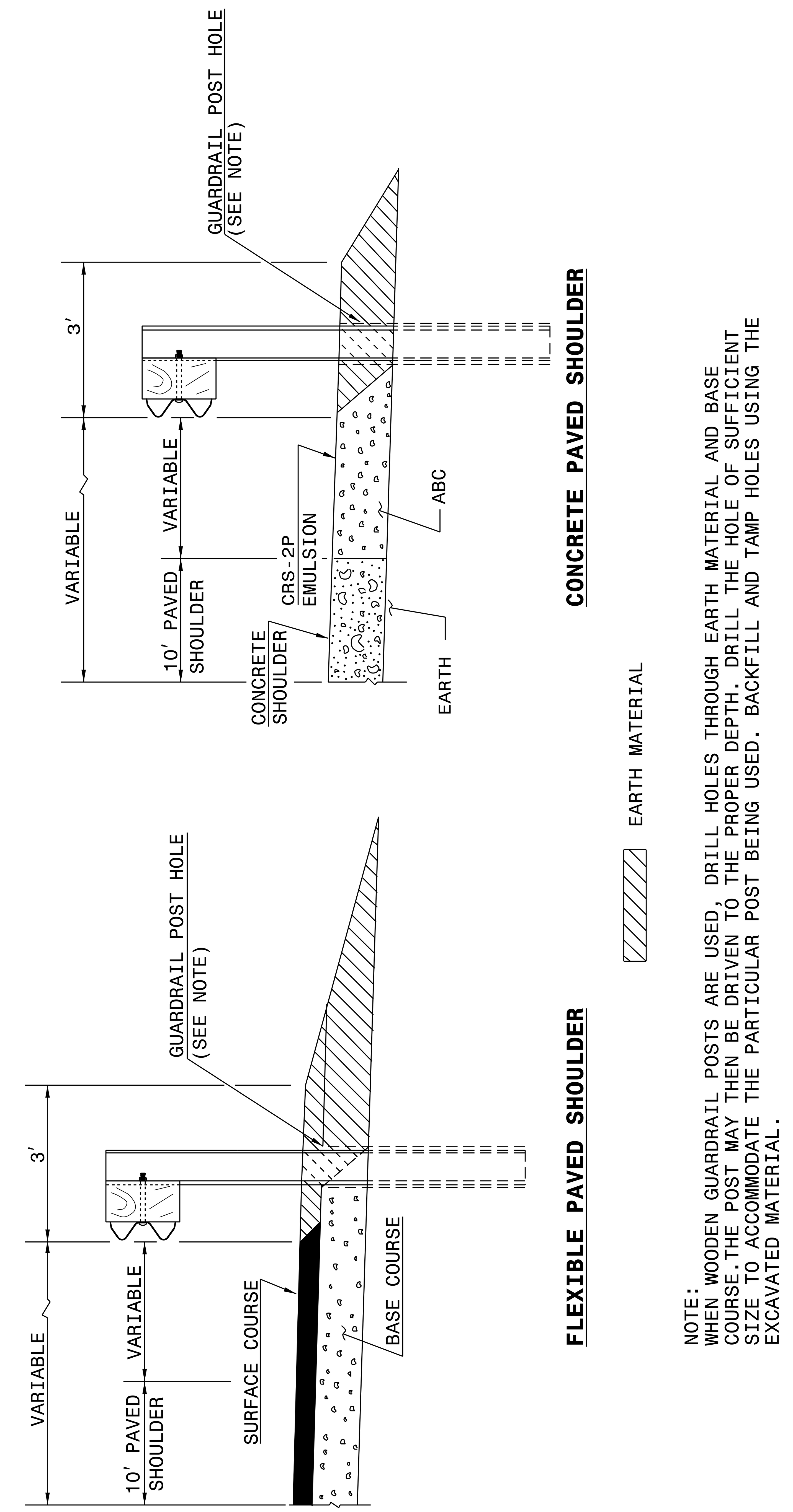

NOTE:
WHEN WOODEN GUARDRAIL POSTS ARE USED, DRILL HOLES THROUGH EARTH MATERIAL AND BASE COURSE.THE POST MAY THEN BE DRIVEN TO THE PROPER DEPTH. DRILL THE HOLE OF SUFFICIENT SIZE TO ACCOMMODATE THE PARTICULAR POST BEING USED. BACKFILL AND TAMP HOLES USING THE EXCAVATED MATERIAL.

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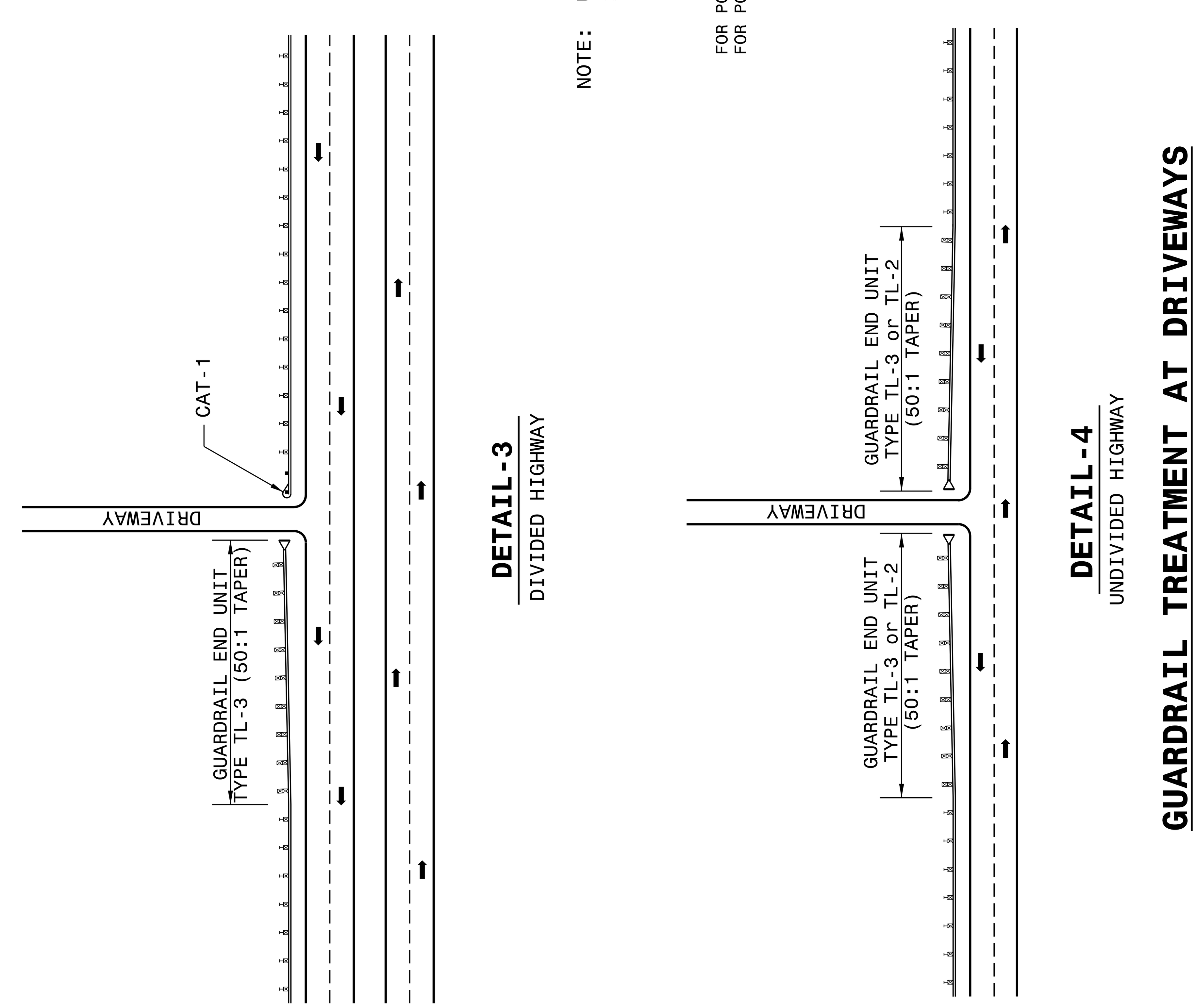

NOTE: USE DETAIL 3 & 4 WHENEVER 20' OR LARGER RADIUS CANNOT BE UTILIZED.
MAINTAIN CLEAR SIGHT DISTANCE.
FOR POSTED SPEEDS ≥ 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2

GUARDRAIL TREATMENT AT DRIVEWAYS

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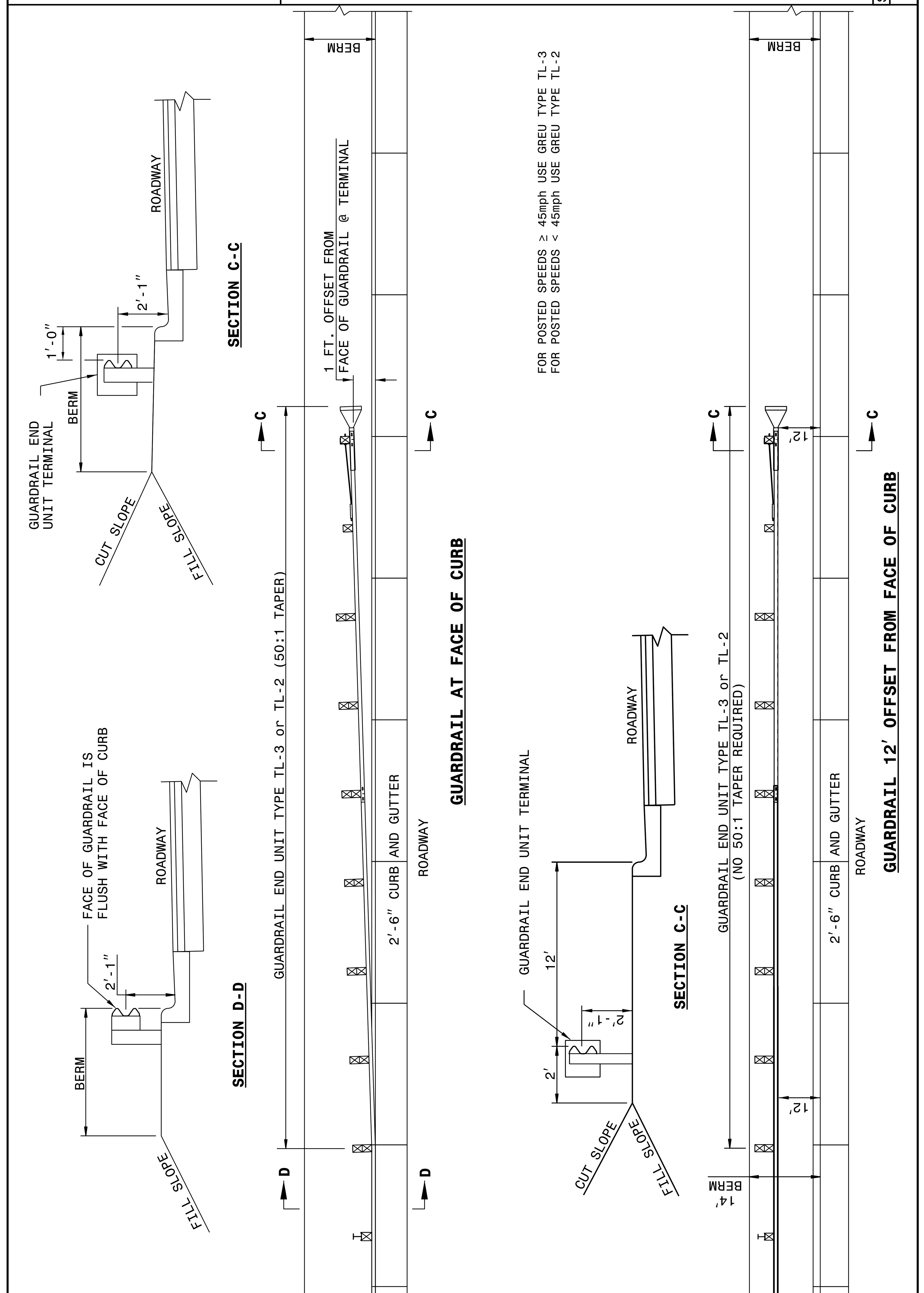
ROADWAY DETAIL DRAWING FOR GUARDRAIL PLACEMENT GUARDRAIL TREATMENT AT CURB AND GUTTER
SHEET 11 OF 11 862D01



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

SHEET 11 OF 11
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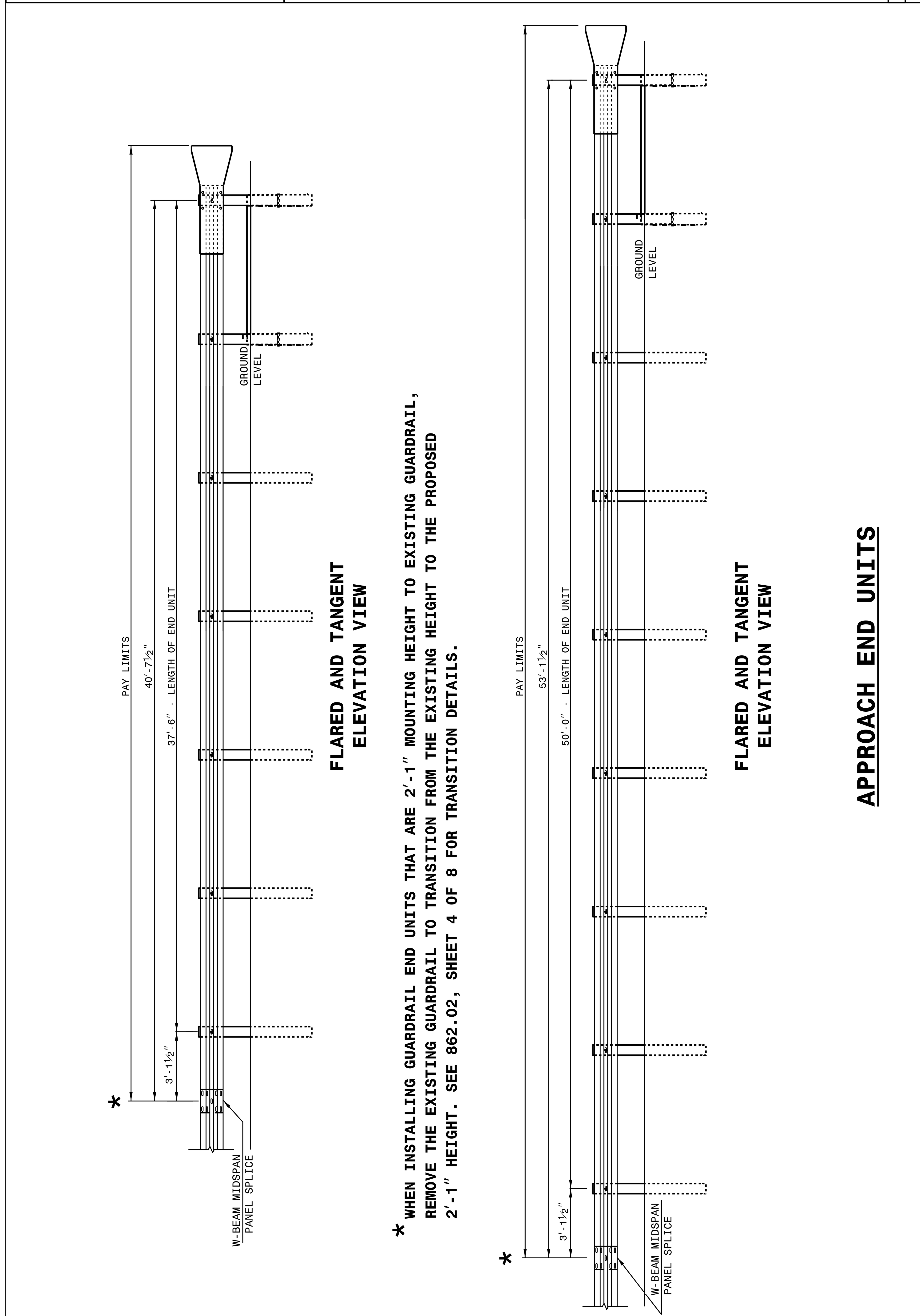

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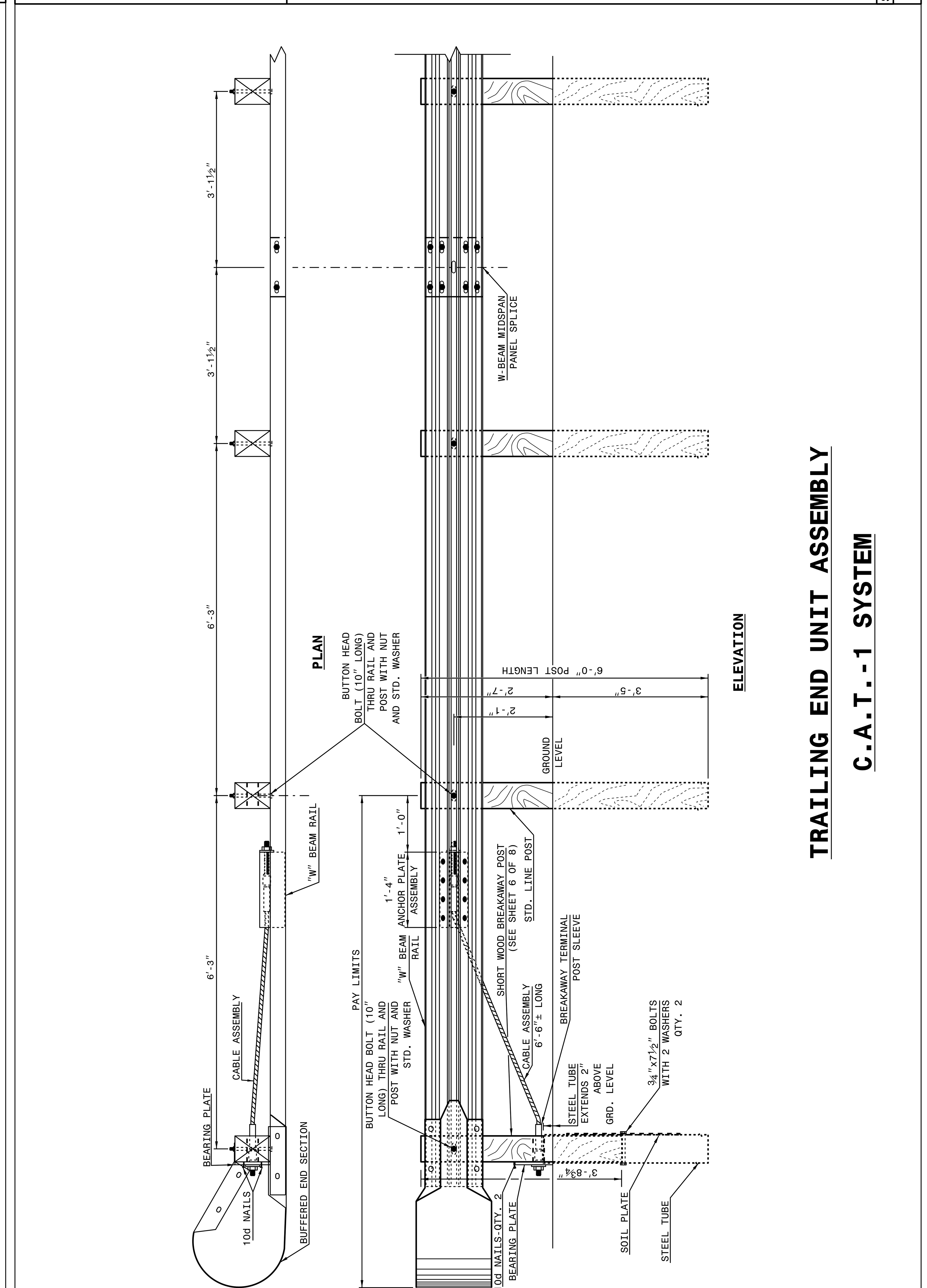
ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 2 OF 8
862D02



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ROADWAY DETAIL DRAWING FOR
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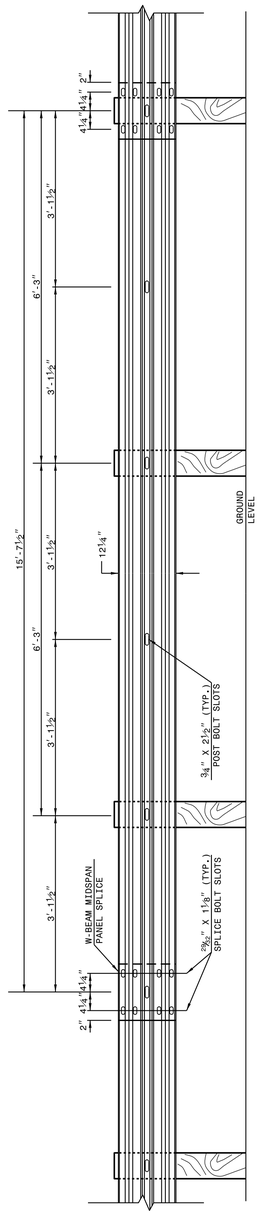

15'-7½" W-BEAM GUARDRAIL PANEL

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

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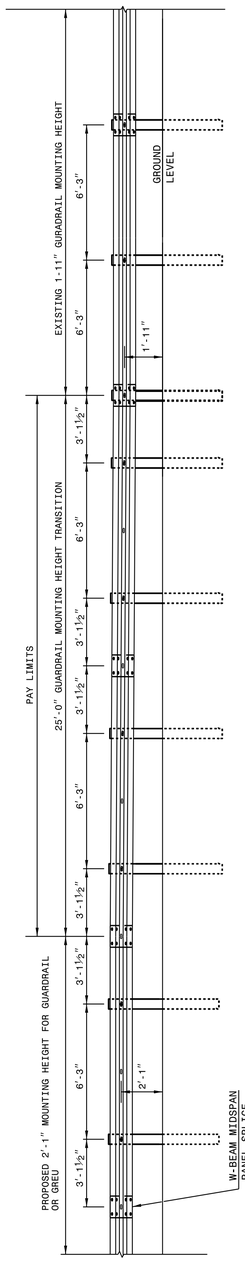
NOTE: IF EXISTING GUARDRAIL IS LOWER THAN 1'-11", USE AN ADDITIONAL 12'-6" LONG SECTION OF GUARDRAIL, FOR EVERY 1" OF HEIGHT DIFFERENCE, TO TRANSITION FROM EXISTING GUARDRAIL TO PROPOSED 2'-1" GUARDRAIL.



ELEVATION VIEW

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

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ROADWAY DETAIL DRAWING FOR
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SHEET 4 OF 8 862D02

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ROADWAY DETAIL DRAWING FOR
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SHEET 5 OF 8
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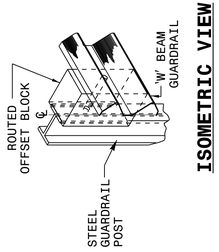
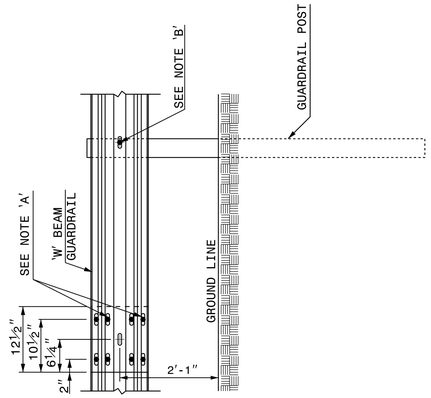
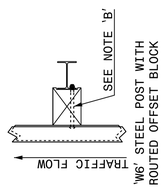
ISOMETRIC VIEW



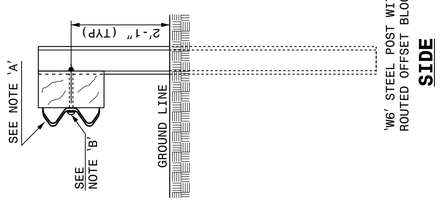
FRONT - MID SPAN SPLICE



TYPICAL GUARDRAIL AND GUARDRAIL POST ALTERNATIVES



'W6' STEEL POST WITH
ROUTED OFFSET BLOCK
PLAN



'W6' STEEL POST WITH
ROUTED OFFSET BLOCK
SIDE

NOTES:
A - 5/8" DIA. BUTTON HEAD SPLICE BOLT 1¼" LONG (8 REQ. PER SPLICE JOINT).
B - 5/8" 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.

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ROADWAY DETAIL DRAWING FOR
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SHEET 6 OF 8
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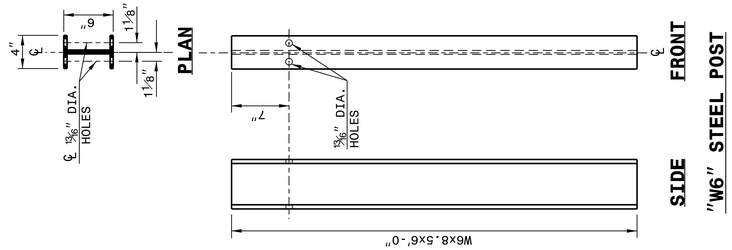
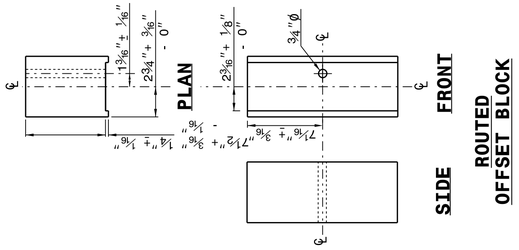
SYSTEM PARTS

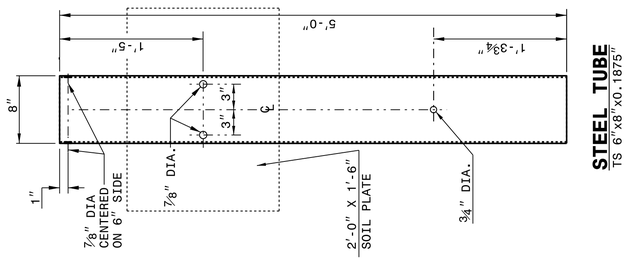
W6" STEEL POST



ROUTED OFFSET BLOCK

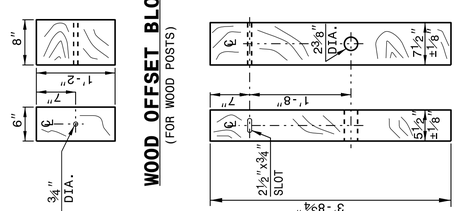


STEEL TUBE
TS 6"x8"x0.1875"

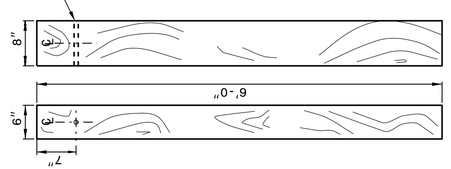


SHORT WOOD BREAKAWAY POST

WOOD OFFSET BLOCK
(FOR WOOD POSTS)



STANDARD LINE POST



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ROADWAY DETAIL DRAWING FOR
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SHEET 6 OF 8
862D02

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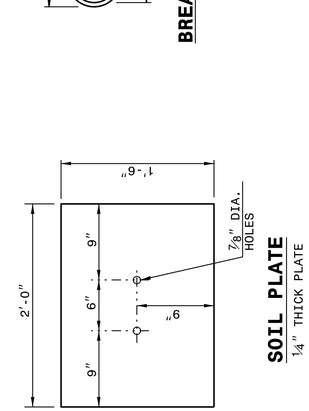
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

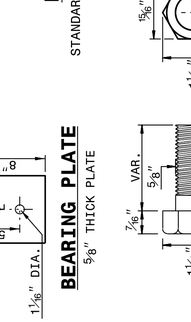
ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 7 OF 8
862D02

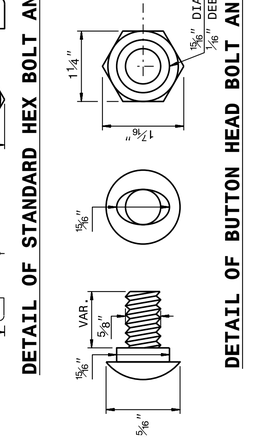
SYSTEM PARTS



ANCHOR PLATE ASSEMBLY

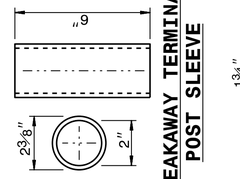


SWAGED CABLE

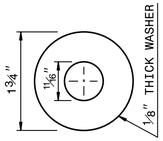


ANCHOR PLATE

CABLE ASSEMBLY



BREAKAWAY TERMINAL POST SLEEVE

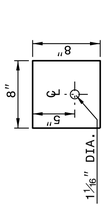


DETAIL OF STANDARD WASHER

STANDARD WASHER: TYPICAL USE UNDER NUT WITH WOOD POST

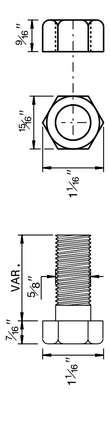
SOIL PLATE

¼" THICK PLATE



BEARING PLATE

⅝" THICK PLATE



DETAIL OF STANDARD HEX BOLT AND NUT

DETAIL OF BUTTON HEAD BOLT AND NUT

SYSTEM PARTS

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

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STATE OF
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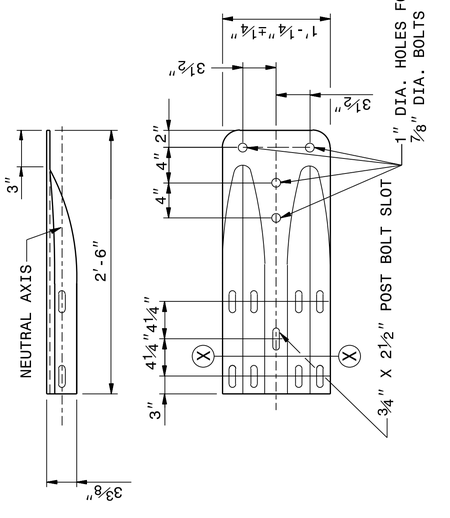
RALEIGH, N.C.

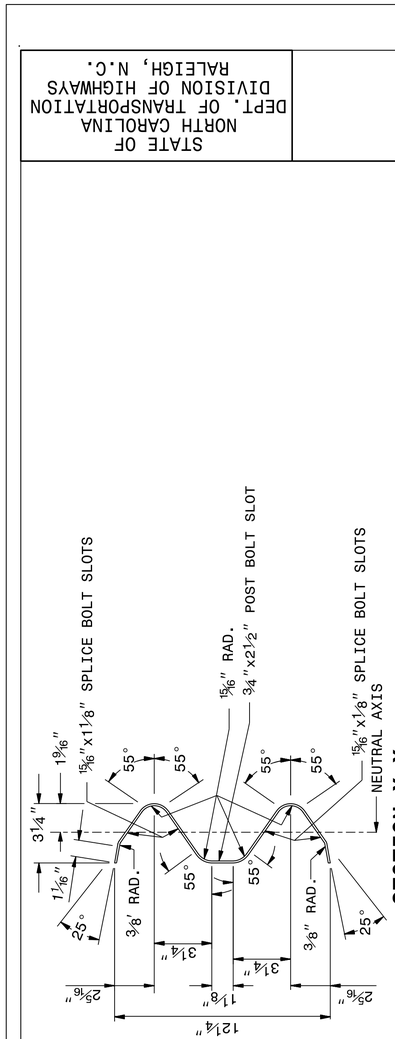
ROADWAY DETAIL DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 8 OF 8
862D02

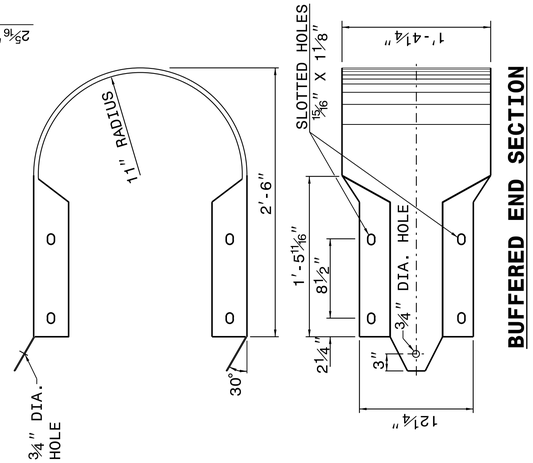
SYSTEM PARTS - GENERAL USE



TYPICAL END SHOE



SECTION X-X

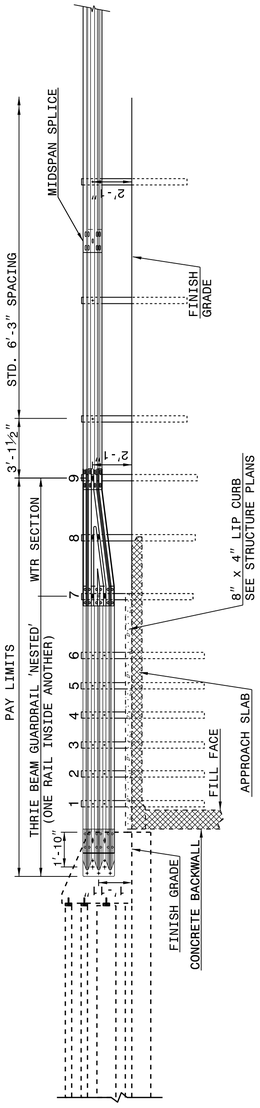


BUFFERED END SECTION

PROJECT REFERENCE NO.	SHEET NO.
B-5391	2C-11

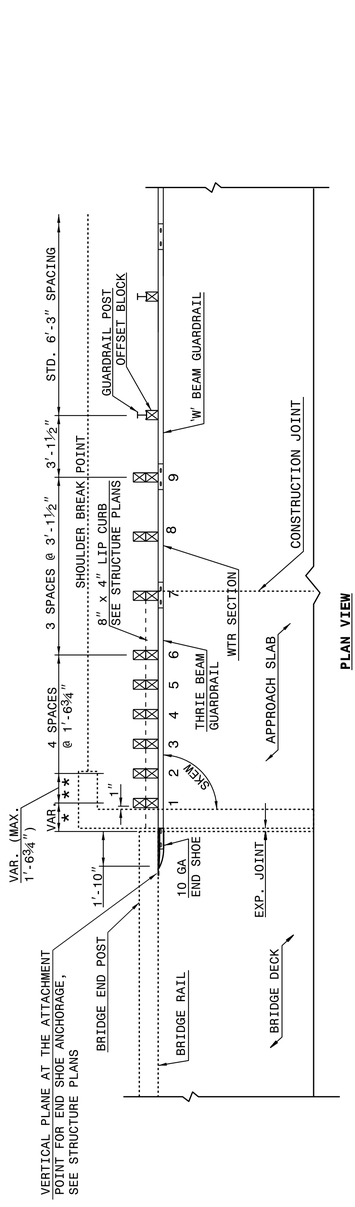
ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
GUARDRAIL ANCHOR UNIT, TYPE III
FOR ATTACHMENT TO RAIL ON BRIDGE

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



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

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

STATE OF
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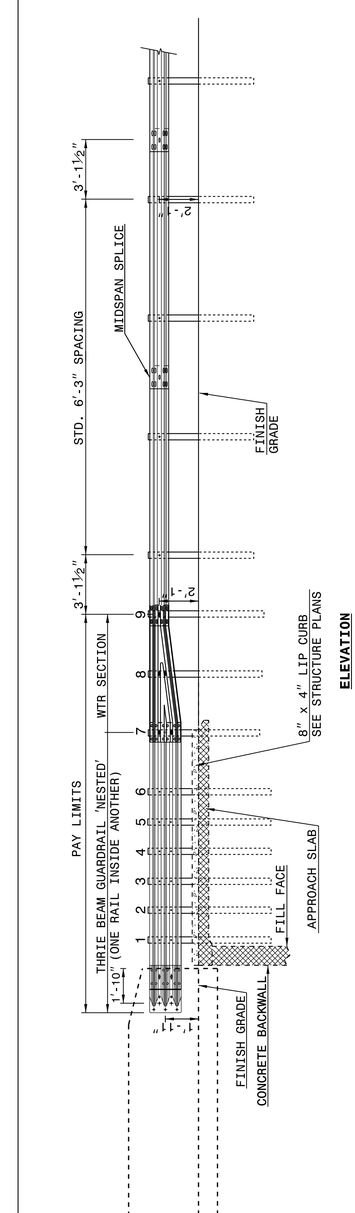
DIVISION OF HIGHWAYS
RALEIGH, N.C.



ELEVATION

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*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

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

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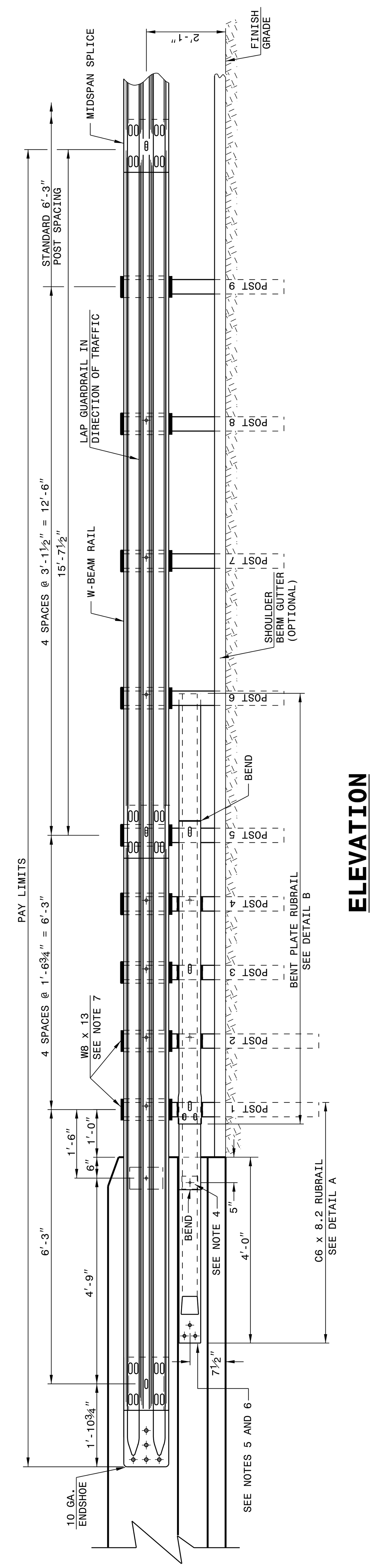
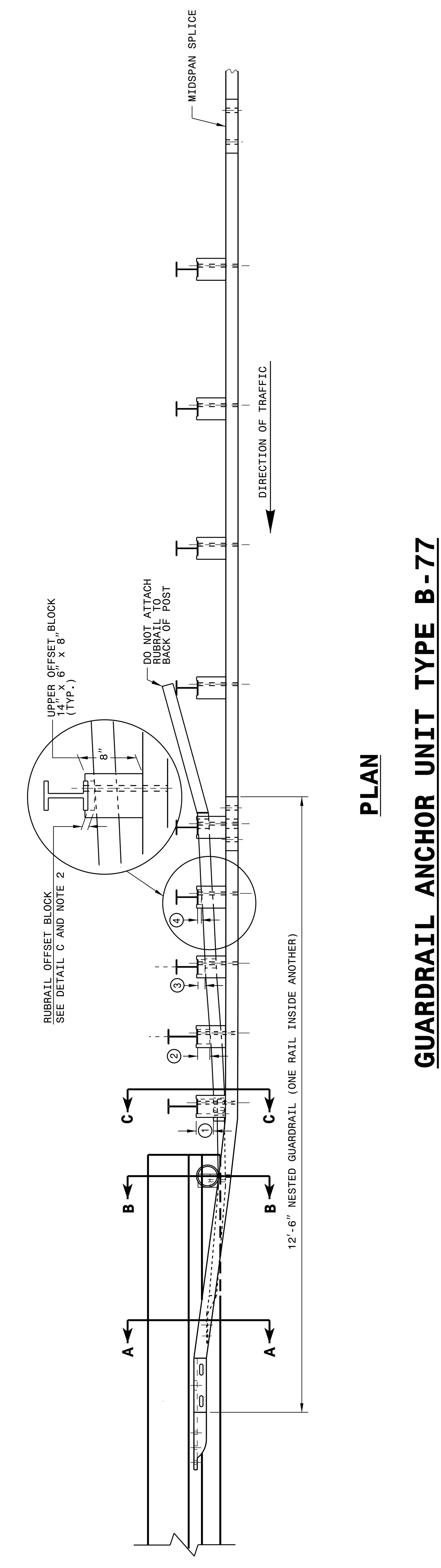
PROJECT REFERENCE NO.	SHEET NO.
B-5391	2C-12

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 4 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 III
SHEET 3 OF 7 862D03

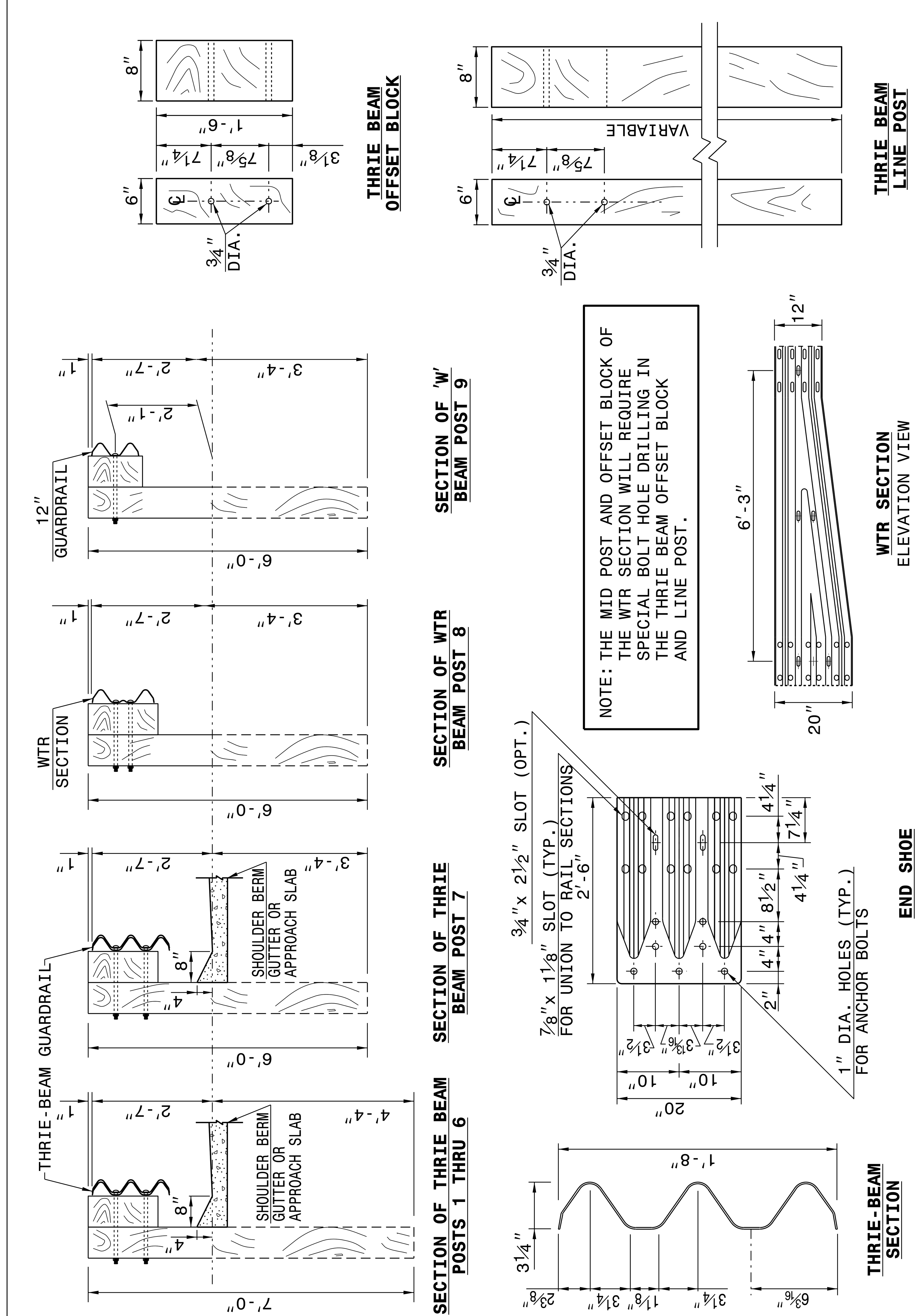


GENERAL NOTES:
1) POSTS 1 THROUGH 5 REQUIRE AN ADDITIONAL HOLE TO ATTACH LOWER BLOCKOUTS AND/OR RUBRAIL.
2) RUBRAIL BLOCKOUTS LOCATED ON POSTS 1 THROUGH 4 ARE OFFSET DRILLED AND SECURED WITH ⅝" BUTTONHEAD BOLTS (SEE CHART FOR BOLT LENGTHS). SECURE BLOCKS ONLY TO POSTS 2 AND 4. SECURE RUBRAIL AND BLOCKOUTS TO POSTS 1 AND 3. RUBRAIL IS SECURED TO POST 5 WITH A ⅝" x 4½" BUTTONHEAD BOLT. RUBRAIL IS FLARED TO BACK OF POST 6 AND NOT SECURED.
3) STEEL SPACER TUBE IS A SCHEDULE 40 GALVANIZED PIPE 6" INSIDE DIAMETER x 9" LONG. ATTACH TUBE TO GUARDRAIL ONLY WITH ⅝" x 1¼" LONG BUTTONHEAD BOLT AND RECTANGULAR PLATE WASHER.
4) SEE DETAIL D FOR SLOPED RUBRAIL BLOCKOUT. BLOCKOUT IS ATTACHED TO RAIL ELEMENT ONLY. USE ⅜" x 3" LAG BOLT WITH FLAT WASHER.
5) 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.
6) ANCHORAGE:
(a) AT EXISTING BRIDGE RAIL AND NEW OR EXISTING BARRIERS, ANCHOR RUBRAIL USING THREE ⅝" x 6" CHEMICALLY ANCHORED BOLTS WITH WASHERS. MAXIMUM PROJECTION FOR BOLTS IS ½".
(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, ANCHOR THE W-BEAM END SHOE AND RUBRAIL AS DETAILED ON THE STRUCTURE PLANS.
7) POSTS 1 AND 2 ARE W8 x 13, 7'-6" LONG. ALL OTHER POSTS IN THE ANCHOR UNIT ARE W6 x 8.5.



GUARDRAIL ANCHOR UNIT TYPE B-77

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.	ROADWAY DETAIL DRAWING FOR **GUARDRAIL ANCHOR UNIT** GUARDRAIL ANCHOR UNIT TYPE B-77 FOR F-SHAPE BARRIER	SHEET 4 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 III	SHEET 3 OF 7 **862D03**

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 022966 Joel S. Howerton
11/7/2017

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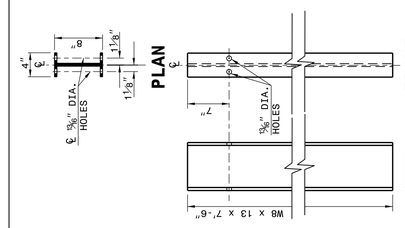
23-MAY-2017 12:52
jhowerton AT CSD-292595

PROJECT REFERENCE NO.	SHEET NO.
B-5391	2C-13

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

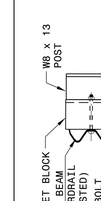
ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNIT
GUARDRAIL ANCHOR UNIT TYPE B-77
FOR F-SHAPE BARRIER

SHEET 5 OF 7
862D03

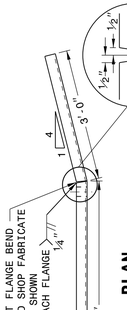


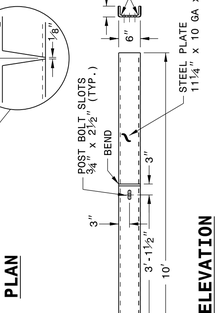
DETAIL F STEEL POST
"W8 X 13 X 7'-6"

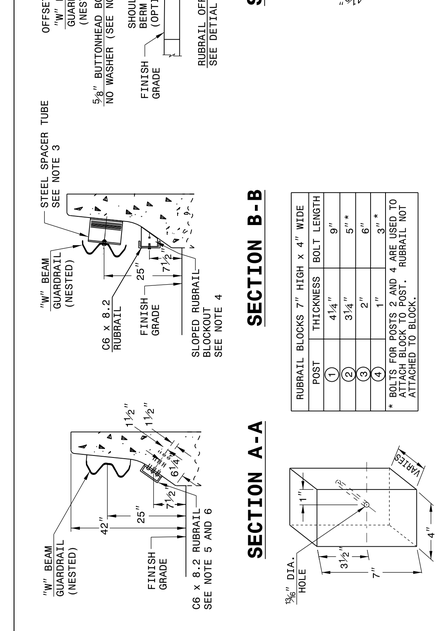
DETAIL E
LAG BOLT



DETAIL D
SLOPED RUBRAIL BLOCKOUT

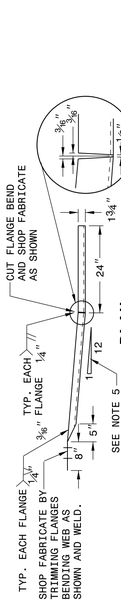






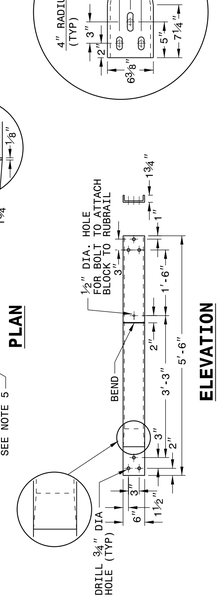
RUBRAIL BLOCKS 7" HIGH x 4" WIDE		
POST	THICKNESS	BOLT LENGTH
①	4¼"	9"
②	3¼"	5"*
③	2"	6"
④	1"	3"*

* BOLTS FOR POSTS 2 AND 4 ARE USED TO ATTACH BLOCK TO POST. RUBRAIL NOT ATTACHED TO BLOCK.



DETAIL C
RUBRAIL BLOCKOUT

GUARDRAIL ANCHOR UNIT TYPE B-77



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STATE OF
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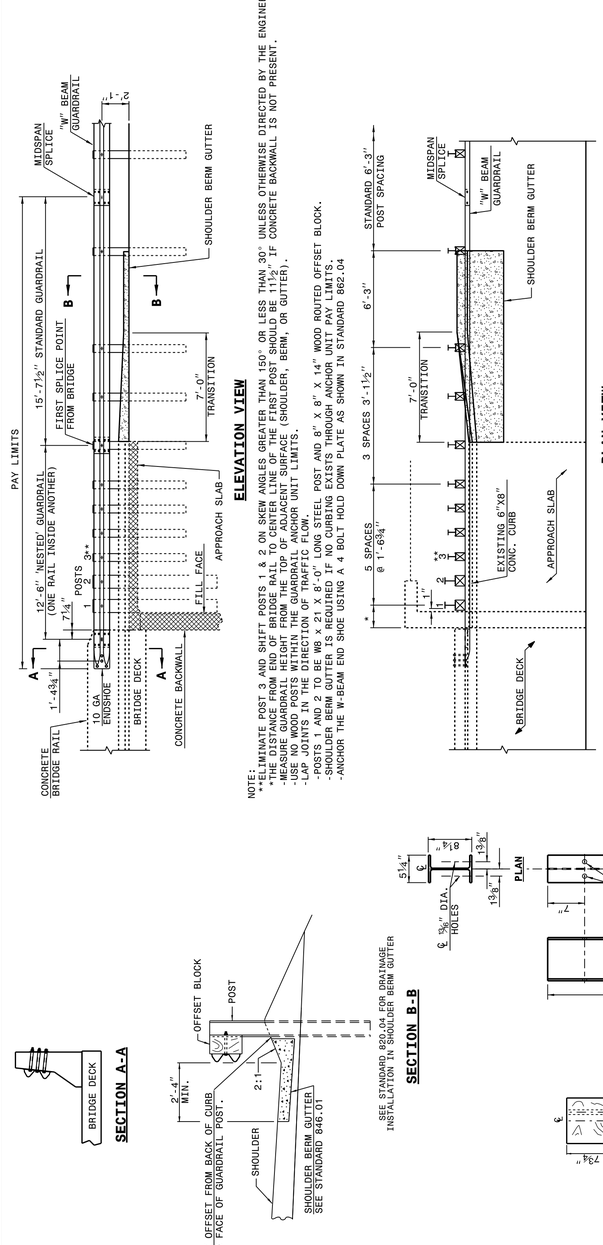
RALEIGH, N.C.

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

SHEET 6 OF 7
862D03



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

SHEET 6 OF 7
862D03

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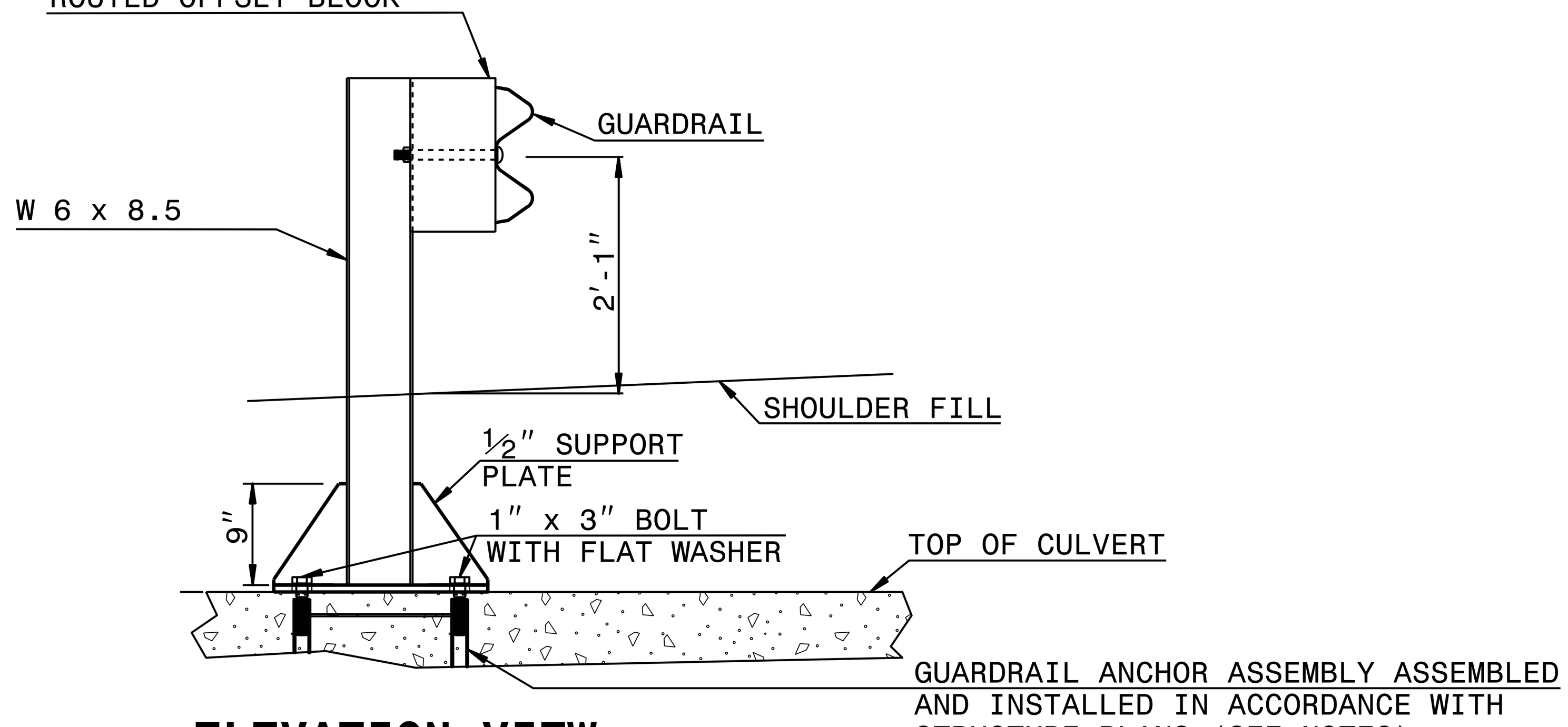
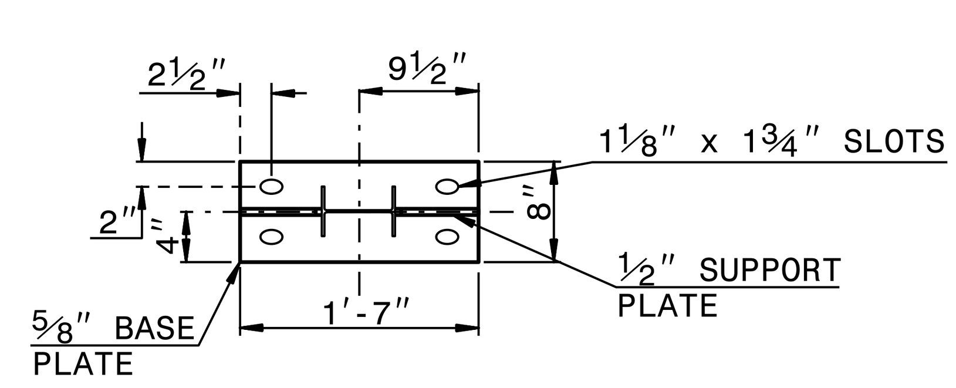
jhowerton AT CSD-292595

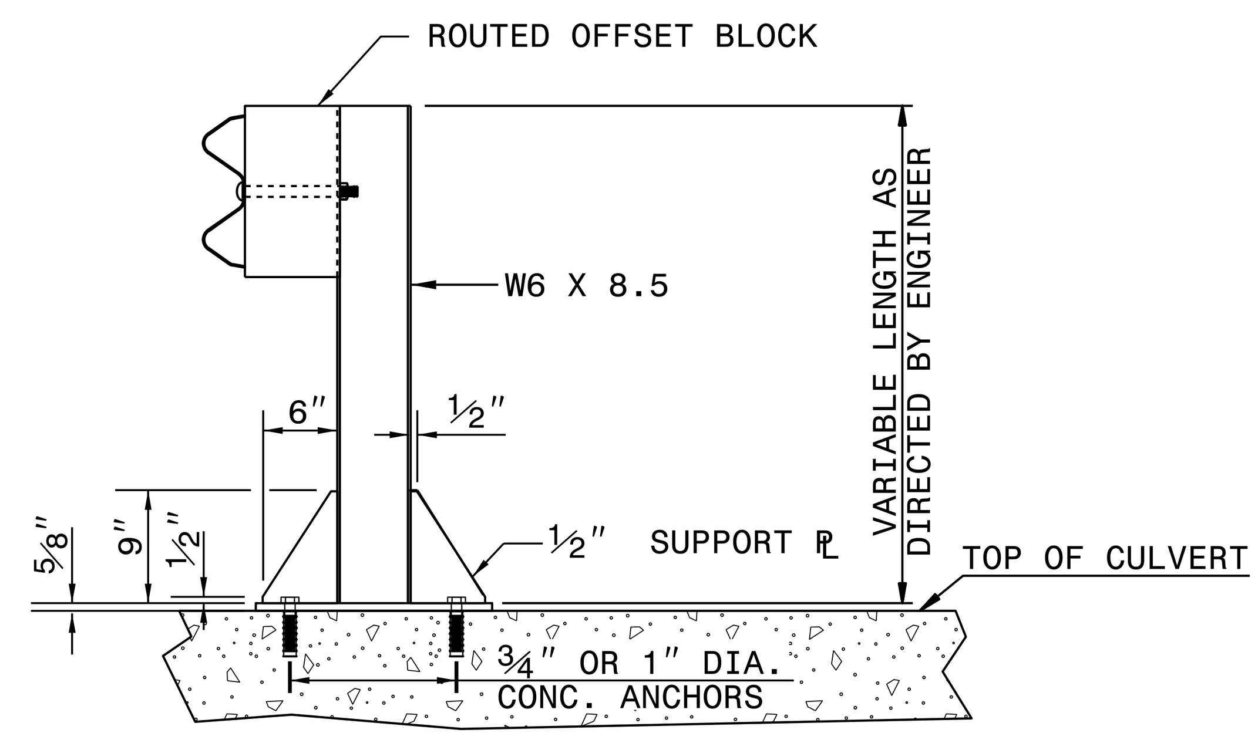
PROJECT REFERENCE NO.	SHEET NO.
B-5391	2C-14



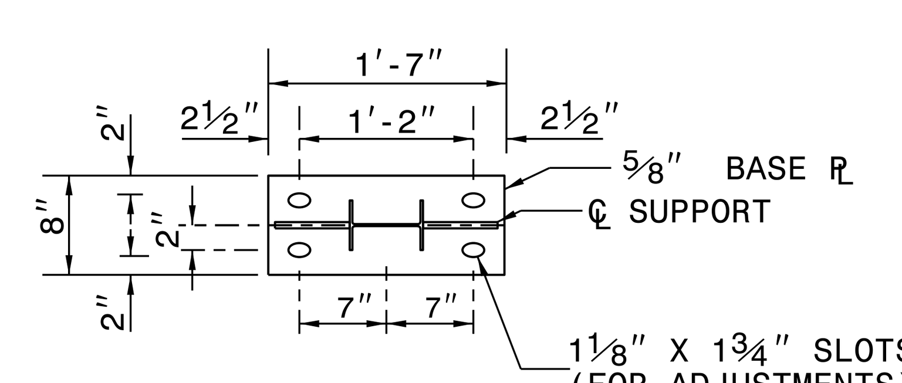
ELEVATION VIEW



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
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RALEIGH, N.C.

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

SHEET 7 OF 7
862D03

STATE OF
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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

NORTH CAROLINA PROFESSIONAL SEAL 022966 ENGINEER
11/7/2017

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8/17/99

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

LOCHNER
H. W. LOCHNER, INC.
2840 PLAZA PLACE, SUITE 202
RALEIGH, NC 27612
(919)571–7111
NC License Number F–0159

PROJECT REFERENCE NO.	SHEET NO.
B–5391	3B–1
R/W SHEET NO.	

SUMMARY OF EARTHWORK

STATION	STATION	UNCLASSIFIED EXCAVATION CY	EMBANK +% CY	BORROW CY	WASTE CY
SUMMARY 1					
–L– 10+80.00	–L– 14+27.68 BEGIN BRIDGE	1,500	75	0	1,425
SUMMARY 2					
–L– 14+84.93 END BRIDGE	–L– 19+15.00	1,825	320	0	1,505
PROJECT SUB–TOTALS		3,325	395	0	2,930
LOSS DUE TO CLEARING & GRUBBING		0			0
GRAND TOTAL		3,325			2,930
SAY		3,400			3,000

EST. DRAINAGE DITCH EXCAVATION = 85 CY
EST. UNDERCUT EXCAVATION (CONTINGENCY) = 200 CY
EST. SHALLOW UNDERCUT (CONTINGENCY) = 200 CY
EST. CLASS IV SUBGRADE STABILIZATION = 380 TONS

NOTE: Earthwork quantities are calculated by the Roadway Design Unit. These earthwork quantities are based in part on subsurface data provided by the Geotechnical Engineering Unit.

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

SHOULDER BERM GUTTER SUMMARY

LINE	STATION	STATION	SIDE	LENGTH (FT)
–L–	14+95.81	15+36.00	RT.	40.2′
		TOTAL		40.2′
		SAY		50.0′

REMOVAL OF EXISTING ASPHALT PAVEMENT

LINE	STATION	STATION	SIDE	SY
–L–	14+03.94	14+39.08	LT & RT	64.9
–L–	14+73.20	15+32.63	LT & RT	121.6
			TOTAL	186.5
			SAY	190

GUARDRAIL SUMMARY

SURVEY LINE	BEG. STA.	END STA.	LOCATION	LENGTH			WARRANT POINT		"N" DIST. FROM E.O.L.	TOTAL SHOUL. WIDTH	FLARE LENGTH		W		ANCHORS									IMPACT ATTENUATOR TYPE 350			SINGLE FACED GUARDRAIL	REMOVE EXISTING GUARDRAIL	REMOVE AND STOCKPILE EXISTING GUARDRAIL	REMARKS
				STRAIGHT	SHOP CURVED	DOUBLE FACED	APPROACH END	TRAILING END			APPROACH END	TRAILING END	APPROACH END	TRAILING END	XI MOD	XI	GREU TL–2	M–350	TYPE III	CAT–1	VI MOD	BIC	AT–1	EA	G	NG				
–L–	12+95.05	14+27.68	RT		137.50′		14+27.68 (BRIDGE)		3.00′	6.00′	25.00′		1.00′				1		1											
–L–	13+57.49	14+27.68	LT		75.00′			14+84.93 (BRIDGE)	3.00′	6.00′		25.00′		1.00′			1		1											
–L–	14+84.93	15+90.73	RT		112.50′			14+84.93 (BRIDGE)	3.00′	6.00′		25.00′		1.00′			1		1											
–L–	14+84.93	15+80.61	LT		100.00′		14+27.68 (BRIDGE)		3.00′	6.00′	25.00′		1.00′				1		1											
			SUB–TOTAL		425.00′												4		4											
		DEDUCT FOR ANCHOR UNITS:																												
		GREU TL–2	4 @ 25.00′		–100.00′																									
		TYPE–III	4 @ 18.75′		–75.00′																									
			TOTAL		250.00′																									
			SAY		250.00′												4		4											
		ADDITIONAL GUARDRAIL POSTS			5 EA																									

9/20/2017
B5391_ROY_PSH_03B-1.dgn
BRFACE

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

LOCHNER
H. W. LOCHNER, INC.
2840 PLAZA PLACE, SUITE 202
RALEIGH, NC 27612
(919)571-7111
NC License Number F-0159

PROJECT REFERENCE NO.	SHEET NO.
B-5391	3D-1
R/W SHEET NO.	

SUB-REGIONAL & REGIONAL
LIST OF PIPES, ENDWALLS, ETC. (FOR PIPES 48" & UNDER)

STATION	LOCATION (LT,RT, OR CL)	STRUCTURE NO. FROM	STRUCTURE NO. TO	TOP ELEVATION	INVERT ELEVATION	INVERT ELEVATION	SLOPE CRITICAL	DRAINAGE PIPE (RCP, CSP, CAAP, HDPE, or PVC) 15"	18"	24"	DO NOT USE RCP	DO NOT USE CSP	DO NOT USE CAAP	DO NOT USE HDPE	DO NOT USE PVC	CLASS III PIPE (UNLESS NOTED OTHRWISE) 12"	15"	18"	24"	30"	36"	42"	48"	C.S. PIPE (UNLESS OTHERWISE NOTED) 12"	15"	18"	24"	30"	36"	42"	48"	15" SIDE DRAIN PIPE	18" SIDE DRAIN PIPE	24" SIDE DRAIN PIPE	ENDWALLS STD. 838.01, STD. 838.11 OR STD. 838.80 (UNLESS NOTED OTHERWISE) CU. YDS. R.C.P.	C.S.P.	QUANTITIES FOR DRAINAGE STRUCTURES PER EACH (0' THRU 5.0')	* TOTAL L.F. FOR PAY QUANTITY SHALL BE COL. 'A' + (1.3 X COL. 'B') LIN. *FT. A 5.0' THRU 10.0'	B 10.0' AND ABOVE	G.D.I. TYPE "B" STD. 840.18 OR 840.27	G.D.I. (N.S.) FRAME WITH TWO GRATES STD. 840.24	G.D.I. FRAME (N.S. FLAT) W/2 GRATES STD. 840.29	T.B.D.I. STD. 840.35	REMARKS
THICKNESS OR GAUGE																								.064	.064	.064	.064	.079	.079	.109	.109													
15+28.89 -L-	RT	0410	0412	951.98	948.81	948.70		16																													1					1	1	
TOTALS								16																													1					1	1	

ABBREVIATIONS

C.B.	CATCH BASIN
N.D.I.	NARROW DROP INLET
D.I.	DROP INLET
G.D.I.	GRATED DROP INLET
G.D.I. (N.S.)	GRATED DROP INLET (NARROW SLOT)
J.B.	JUNCTION BOX
M.H.	MANHOLE
T.B.D.I.	TRAFFIC BEARING DROP INLET
T.B.J.B.	TRAFFIC BEARING JUNCTION BOX

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

COMPUTED BY: ____DK_____ DATE: ____8/8/17____
CHECKED BY: _____BRP_____ DATE: __8/10/17_____

PROJECT NO.	SHEET NO.
B-5391	3G-1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

SUMMARY OF AGGREGATE SUBGRADE/STABILIZATION

LINE	Station	Station	Aggregate Type ASU/AST	Aggregate Thickness INCHES	Shallow Undercut CY	Class IV Subgrade Stabilization TONS	Geotextile for Soil Stabilization SY	Stabilizer Aggregate TONS	Class IV Aggregate Stabilization TONS
CONTINGENCY			ASU		200	380	100		
			TOTAL CY/TONS/SY:		200	380	100*	0	0

ASU = Aggregate Subgrade, AST = Aggregate Stabilization
*Total square yards of Geotextile for Soil Stabilization is only the estimated quantity for ASU/AST and may only represent a portion of the geotextile quantity shown in the Item Sheets of the Proposal.

SUMMARY OF SUBSURFACE DRAINAGE

LINE	Station	Station	Location LT/RT/CL	Drain Type* UD/BD/SD	LF
CONTINGENCY				SD	100
				TOTAL LF:	100

*UD = Underdrain
*BD = Blind Drain
*SD = Subsurface Drain

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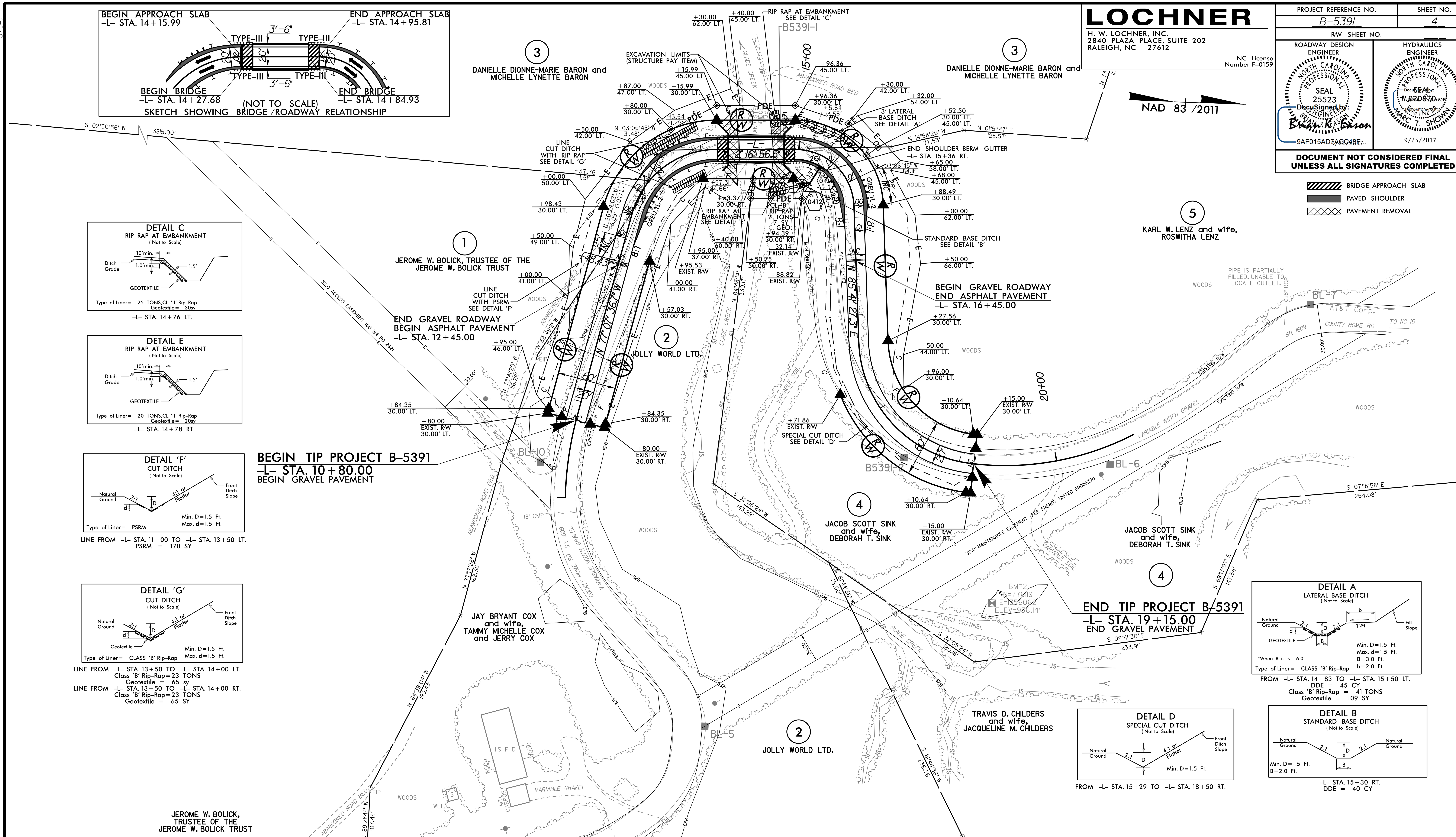
PROJECT REFERENCE NO.	SHEET NO.
B-5391	4
R/W SHEET NO.	

ROADWAY DESIGN ENGINEER — SEAL 25523 — DocuSigned by: Brian K. Eason — 9AF015AD7A0C48E...

HYDRAULICS ENGINEER — SEAL 020870 — 9/25/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

- BRIDGE APPROACH SLAB
- PAVED SHOULDER
- PAVEMENT REMOVAL


BEGIN APPROACH SLAB
-L- STA. 14+15.99
END APPROACH SLAB
-L- STA. 14+95.81
TYPE-III
3'-6"
BEGIN BRIDGE
-L- STA. 14+27.68
END BRIDGE
-L- STA. 14+84.93
(NOT TO SCALE)
SKETCH SHOWING BRIDGE /ROADWAY RELATIONSHIP
NAD 83 /2011
3
DANIELLE DIONNE-MARIE BARON and MICHELLE LYNETTE BARON
1
JEROME W. BOLICK, TRUSTEE OF THE JEROME W. BOLICK TRUST
2
JOLLY WORLD LTD.
4
JACOB SCOTT SINK and wife, DEBORAH T. SINK
5
KARL W. LENZ and wife, ROSWITHA LENZ
JAY BRYANT COX and wife, TAMMY MICHELLE COX and JERRY COX
TRAVIS D. CHILDERS and wife, JACQUELINE M. CHILDERS
EXCAVATION LIMITS (STRUCTURE PAY ITEM)
RIP RAP AT EMBANKMENT SEE DETAIL 'C'
B5391-1
LINE CUT DITCH WITH RIP RAP SEE DETAIL 'G'
LINE CUT DITCH WITH PSRM SEE DETAIL 'F'
3' LATERAL BASE DITCH SEE DETAIL 'A'
END SHOULDER BERM GUTTER -L- STA. 15+36 RT.
STANDARD BASE DITCH SEE DETAIL 'B'
SPECIAL CUT DITCH SEE DETAIL 'D'
RIP RAP AT EMBANKMENT SEE DETAIL 'E'
END GRAVEL ROADWAY
BEGIN ASPHALT PAVEMENT
-L- STA. 12+45.00
BEGIN GRAVEL ROADWAY
END ASPHALT PAVEMENT
-L- STA. 16+45.00
BEGIN TIP PROJECT B-5391
-L- STA. 10+80.00
BEGIN GRAVEL PAVEMENT
END TIP PROJECT B-5391
-L- STA. 19+15.00
END GRAVEL PAVEMENT
PIPE IS PARTIALLY FILLED. UNABLE TO LOCATE OUTLET.
AT&T Corp.
COUNTY HOME RD
SR 1609
TO NC 16
SR 1610
TO MILLERSVILLE RD.
GLADE CREEK
FLOOD CHANNEL
30.0' ACCESS EASEMENT
30.0' MAINTENANCE EASEMENT (PER ENERGY UNITED ENGINEERS)
HIGH-TENSION POWER TRANSMISSION EASEMENT (PB 1 PG 67)
BM#1 N=775176 E=1356474 ELEV=1028.10'
BM#2 N=775619 ELEV=986.14'
BL-3
BL-4
BL-5
BL-6
BL-7
BL-10
B5391-2
WOODS
DETAIL C
RIP RAP AT EMBANKMENT (Not to Scale)
Type of Liner= 25 TONS,CL 'II' Rip-Rap Geotextile = 30sy
-L- STA. 14+76 LT.
DETAIL E
RIP RAP AT EMBANKMENT (Not to Scale)
Type of Liner= 20 TONS,CL 'II' Rip-Rap Geotextile= 20sy
-L- STA. 14+78 RT.
DETAIL 'F'
CUT DITCH (Not to Scale)
Type of Liner= PSRM
Min. D=1.5 Ft. Max. d=1.5 Ft.
LINE FROM -L- STA. 11+00 TO -L- STA. 13+50 LT. PSRM = 170 SY
DETAIL 'G'
CUT DITCH (Not to Scale)
Type of Liner= CLASS 'B' Rip-Rap
Min. D=1.5 Ft. Max. d=1.5 Ft.
LINE FROM -L- STA. 13+50 TO -L- STA. 14+00 LT. Class 'B' Rip-Rap=23 TONS Geotextile = 65 sy
LINE FROM -L- STA. 13+50 TO -L- STA. 14+00 RT. Class 'B' Rip-Rap=23 TONS Geotextile = 65 SY
DETAIL A
LATERAL BASE DITCH (Not to Scale)
Min. D=1.5 Ft. Max. d=1.5 Ft. B=3.0 Ft. b=2.0 Ft.
*When B is < 6.0'
Type of Liner= CLASS 'B' Rip-Rap
FROM -L- STA. 14+83 TO -L- STA. 15+50 LT. DDE = 45 CY Class 'B' Rip-Rap = 41 TONS Geotextile = 109 SY
DETAIL D
SPECIAL CUT DITCH (Not to Scale)
Min. D=1.5 Ft.
FROM -L- STA. 15+29 TO -L- STA. 18+50 RT.
DETAIL B
STANDARD BASE DITCH (Not to Scale)
Min. D=1.5 Ft. B=2.0 Ft.
-L- STA. 15+30 RT. DDE = 40 CY

-L-

PI Sta 10+42.38	PI Sta 13+67.29	PI Sta 15+54.27	PI Sta 18+37.98	PI Sta 19+99.77
Δ = 13° 48' 29.1" (RT)	Δ = 74° 50' 40.2" (RT)	Δ = 87° 58' 23.8" (RT)	Δ = 80° 41' 26.2" (LT)	Δ = 34° 30' 19.6" (LT)
D = 16° 22' 12.8"	D = 63° 39' 43.1"	D = 95° 29' 34.7"	D = 44° 04' 25.2"	D = 19° 57' 49.3"
L = 84.35'	L = 117.57'	L = 92.13'	L = 183.08'	L = 172.84'
T = 42.38'	T = 68.87'	T = 57.91'	T = 110.42'	T = 89.13'
R = 350.00'	R = 90.00'	R = 60.00'	R = 130.00'	R = 287.00'
V = 35MPH	SE = 0.02%	SE = 0.02%	V = 20MPH	V = 30MPH
	RO = 50.00'	RO = 50.00'		
	V = 20MPH	V = 15MPH		

NOTE : DESIGN EXCEPTION IS REQUIRED FOR DESIGN SPEED OF 15 MPH

SEE SHEET 5 FOR PROFILE
SEE SHEET S-1 THRU S-12 FOR STRUCTURE PLANS

5/14/99

–L–

LOCHNER

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RALEIGH, NC 27612

NC License Number F-0159

PROJECT REFERENCE NO.	SHEET NO.
B-5391	5

ROADWAY DESIGN ENGINEER — NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 25523 BRIAN K. EASON — DocuSigned by: Brian K. Eason 9AF015AD7ACC48F... 9/21/2017

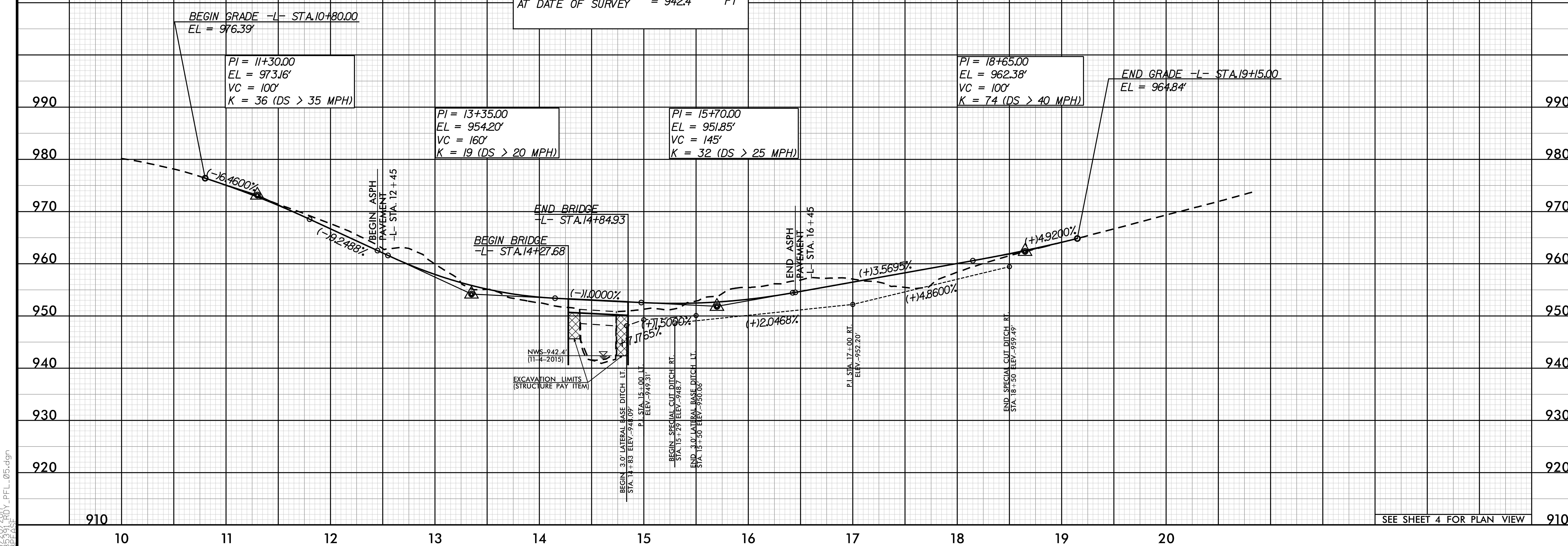
HYDRAULICS ENGINEER — NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 020870 MARC T. SHOWN — DocuSigned by: Marc Shown 4B024AEC0A0B4C2... 9/25/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

LEFT DITCH – - – - – - –
RIGHT DITCH - - - - - - - - -

BRIDGE HYDRAULIC DATA

DESIGN DISCHARGE	= 2400	CFS
DESIGN FREQUENCY	= 25	YRS
DESIGN HW ELEVATION	= 951.1	FT
BASE DISCHARGE	= 3,300	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 952.01	FT
OVERTOPPING DISCHARGE	= 3,600	CFS
OVERTOPPING FREQUENCY	= 100+	YRS
OVERTOPPING ELEVATION	= 952.6	FT
	=	FT
DATE OF SURVEY	= 05/02/16	
W.S.ELEVATION AT DATE OF SURVEY	= 942.4	FT



SEE SHEET 4 FOR PLAN VIEW

9/20/2017 B5391_HDY_PFL_05.dgn