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09/08/17

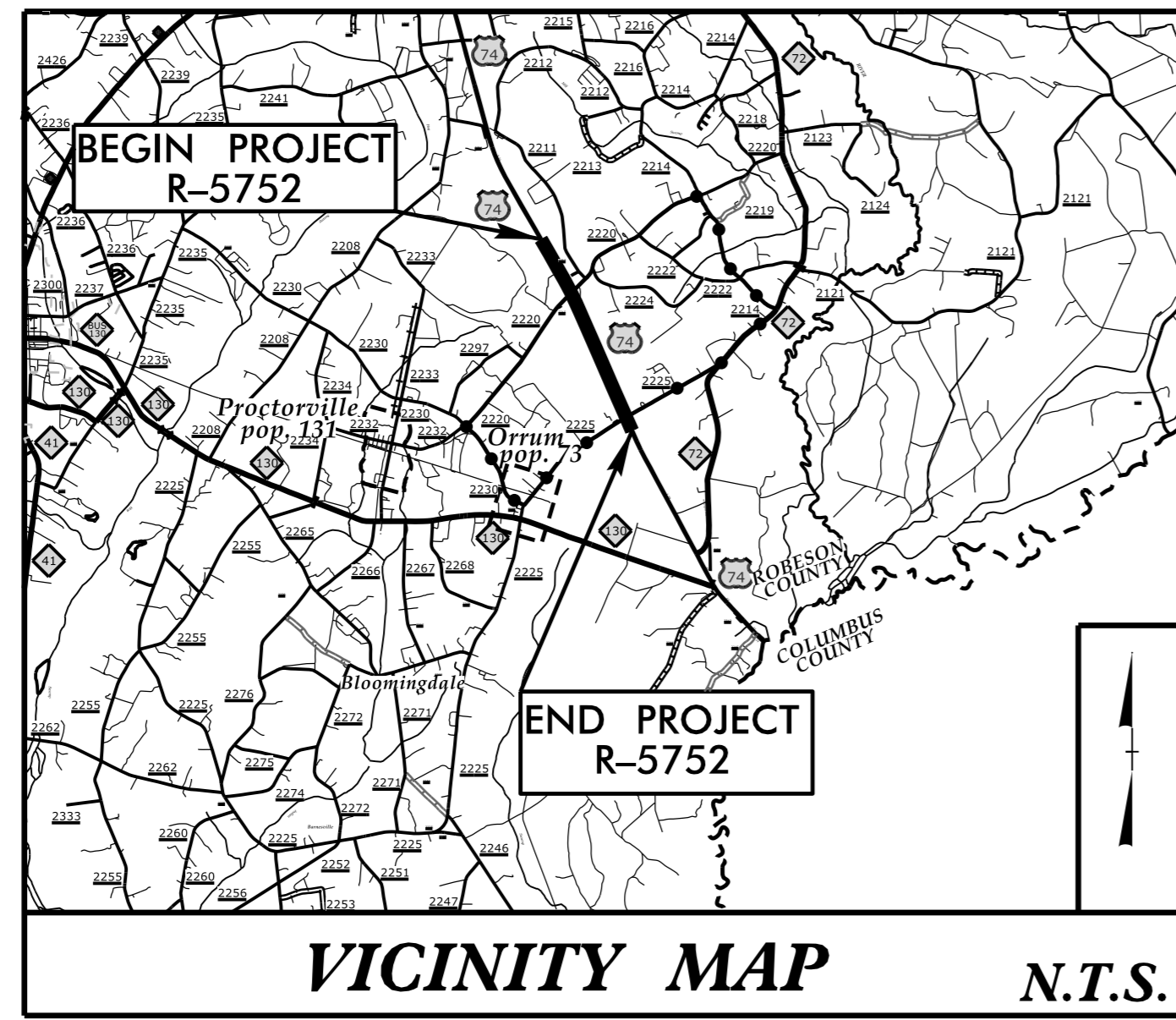
See Sheet 1-A For Index of Sheets  
See Sheet 1-B For Conventional Symbols

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

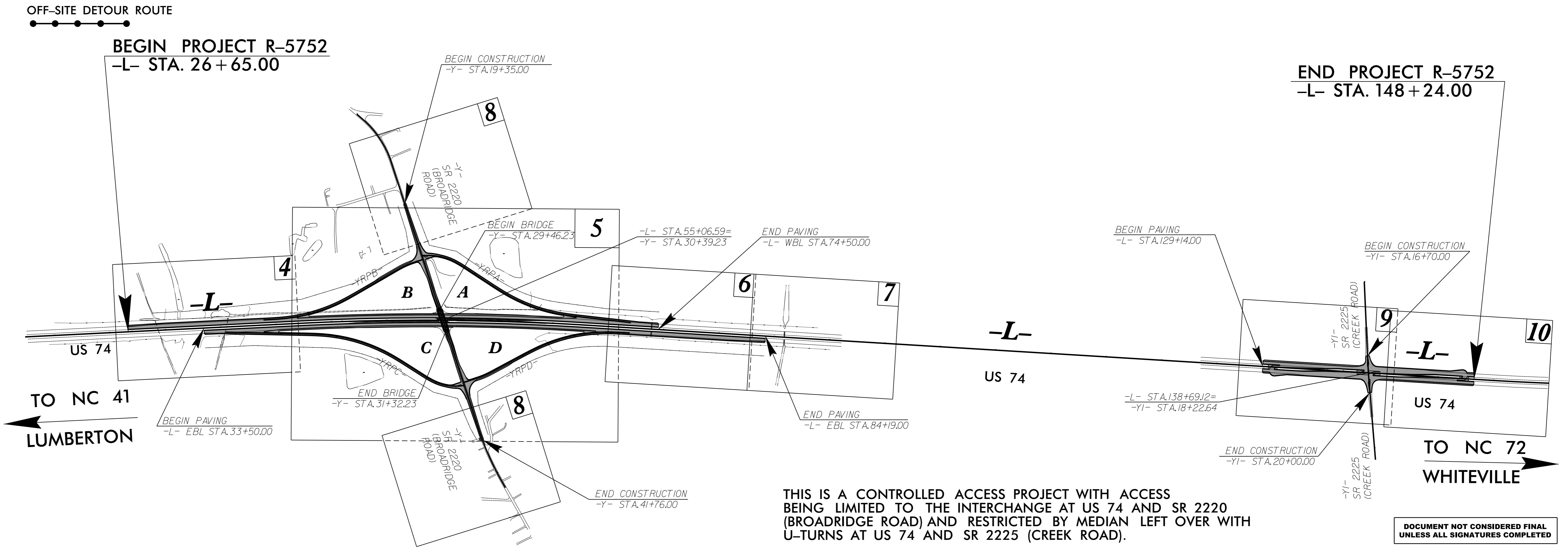
**ROBESON COUNTY**

**LOCATION: US 74 AT SR 2220 (BROADRIDGE ROAD) - CONVERT AT GRADE INTERSECTION TO INTERCHANGE AND US 74 AT SR 2225 (CREEK ROAD) - CONVERT AT GRADE INTERSECTION TO DIRECTIONAL CROSSOVER**  
**TYPE OF WORK: GRADING, DRAINAGE, PAVING, AND STRUCTURE**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5752	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
53088.1.FD1	HSIP-0074 (170)	P.E.	
53088.2.1	HSIP-0074 (200)	RW /UTIL	
53088.3.1	HSIP-0074 (170)	CONST.	

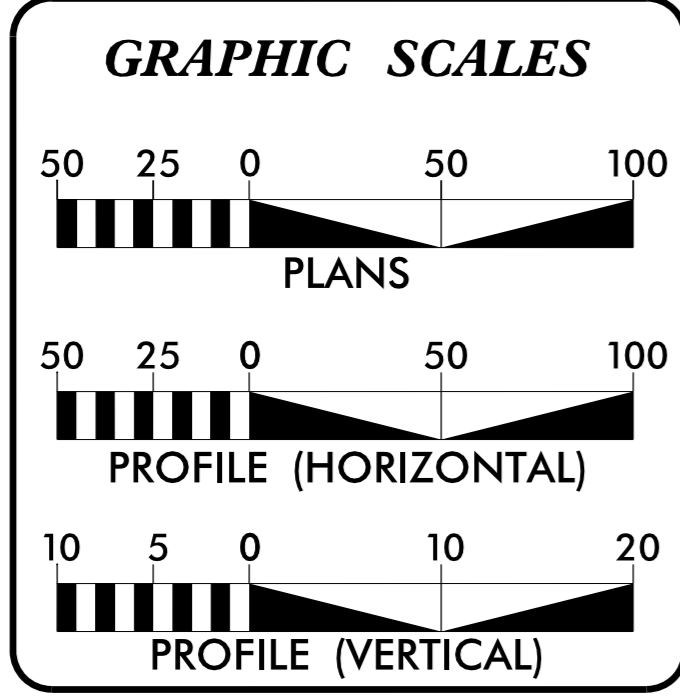


**CONTRACT: C204013 TIP PROJECT: R-5752**



THIS IS A CONTROLLED ACCESS PROJECT WITH ACCESS BEING LIMITED TO THE INTERCHANGE AT US 74 AND SR 2220 (BROADRIDGE ROAD) AND RESTRICTED BY MEDIAN LEFT OVER WITH U-TURNS AT US 74 AND SR 2225 (CREEK ROAD).

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



**DESIGN DATA**

ADT 2018	=	10,100
ADT 2038	=	16,400
DHV	=	9 %
D	=	55 %
T	=	20 % *
V	=	75 MPH
* TTST = 17 DUAL 3		
FUNC CLASS	=	INTERSTATE STATEWIDE TIER

**PROJECT LENGTH**

<b>SECTION 1:</b>		
LENGTH ROADWAY TIP PROJECT R-5752	=	1.090 MILES
<b>SECTION 2:</b>		
LENGTH ROADWAY TIP PROJECT R-5752	=	0.362 MILES
<b>TOTAL LENGTH TIP PROJECT R-5752</b>	=	<b>1.452 MILES</b>

Prepared in the Office of:  
**CDM Smith**  
CDM Smith Inc.  
5400 Glenwood Avenue  
Suite 400  
Raleigh, NC 27612-3228  
NC COA No. F-1255

FOR THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
2012 STANDARD SPECIFICATIONS

**RIGHT OF WAY DATE:**  
DECEMBER 2016

**LETTING DATE:**  
OCTOBER 17, 2017

**DAVID J. CLODGO, P.E.**  
PROJECT ENGINEER

**KIT A. PERSIANI, P.E.**  
PROJECT DESIGN ENGINEER

**SEAN MATUSZEWSKI**  
NGDOT CONTACT

**HYDRAULICS ENGINEER**

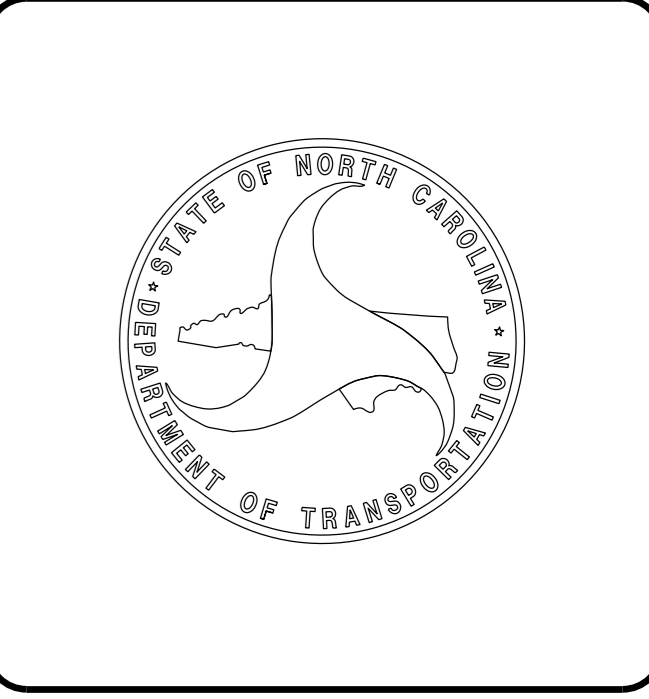
9/13/2017

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**Andrew T. Nottingham**  
SIGNATURE:

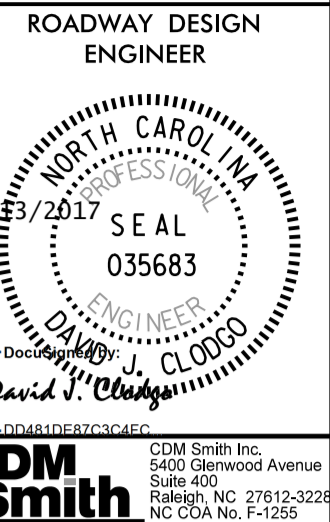
**ROADWAY DESIGN ENGINEER**

9/13/2017

DocuSigned by:  
**David J. Clodgo**  
SIGNATURE:



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\\Roadway\Proj\R5752\_Rdy\_tsh.dgn  
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EFF. 01-17-2012  
REV. 02-29-2016

INDEX OF SHEET:

SHEET NUMBER	SHEET
1	TITLE SHEET
1-A	INDEX OF SHEETS, GENERAL NOTES, AND STANDARD DRAWINGS
1-B	CONVENTIONAL SYMBOLS
1-C1	SURVEY CONTROL SHEET
2A-1 THRU 2A-4	PAVEMENT SCHEDULE AND TYPICAL SECTIONS
2B-1 THRU 2B-2	ROADWAY DETAILS
2C-1 THRU 2C-19	SPECIAL DETAILS
2D-1	DRAINAGE DETAILS
3B-1 THRU 3B-2	ROADWAY SUMMARIES
3D-1 THRU 3D-2	DRAINAGE SUMMARIES
3G-1	GEOTECHNICAL SUMMARIES
4 THRU 23	PLAN AND PROFILE SHEET
TMP-1 THRU TMP-15	TRANSPORTATION MANAGEMENT PLANS
PMP-1 THRU PMP-10	PAVEMENT MARKING PLANS
EC-1 THRU EC-17	EROSION CONTROL PLANS
SIGN-1 THRU SIGN-13	SIGNING PLANS
UC-1 THRU UC-6	UTILITY CONSTRUCTION PLANS
UO-1 THRU UO-4	UTILITY BY OTHERS
X-1 THRU X-76	CROSS SECTIONS
S-1 THRU S-24	STRUCTURE PLANS

GENERAL NOTES:

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

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:

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. 560.02 AND DETAILS IN PLANS.

SIDE ROADS:

THE CONTRACTOR WILL BE REQUIRED TO DO ALL NECESSARY WORK TO PROVIDE SUITABLE CONNECTIONS WITH ALL ROADS, STREETS, AND DRIVES ENTERING THIS PROJECT. THIS WORK WILL BE PAID FOR AT THE CONTRACT UNIT PRICE FOR THE PARTICULAR ITEMS INVOLVED.

UNDERDRAINS:

UNDERDRAINS SHALL BE CONSTRUCTED IN ACCORDANCE WITH STD. NO. 815.03 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 ROBESON COUNTY - WATER

AT&T - TELECOMMUNICATIONS, DUKE PROGRESS ENERGY - POWER DISTRIBUTION

MCNC - TELECOMMUNICATIONS

ANY RELOCATION OF EXISTING UTILITIES WILL BE ACCOMPLISHED BY OTHERS, EXCEPT AS SHOWN ON THE PLANS.

STD.NO. TITLE

200.03	Method of Clearing - Method III
225.01	Guide for Grading Subgrade - Interstate and Freeway
225.02	Guide for Grading Subgrade - Secondary and Local
225.03	Deceleration and Acceleration Lanes
225.04	Method of Obtaining Superelevation - Two Lane Pavement
225.09	Guide for Shoulder and Ditch Transition at Grade Separations
300.01	Method of Pipe Installation
422.11	Bridge Approach Fills - Sub Regional Tier
560.02	Method of Shoulder Construction - High Side of Superelevation - Method II
654.01	Pavement Repairs
665.01	Asphalt Shoulders - Milled Rumble Strips
815.03	Pipe Underdrain and Blind Drain
838.01	Concrete Endwall for Single and Double Pipe Culverts - 15" thru 48" Pipe 90 Skew
838.11	Brick Endwall for Single and Double Pipe Culverts - 15" thru 48" Pipe 90 Skew
838.80	Precast Endwalls - 12" thru 72" Pipe 90 Skew
840.00	Concrete Base Pad for Drainage Structures
840.14	Concrete Drop Inlet - 12" thru 30" Pipe
840.15	Brick Drop Inlet - 12" thru 30" Pipe
840.16	Drop Inlet Frame and Grates - for use with Std. Dwg 840.14 and 840.15
840.18	Concrete Grated Drop Inlet Type 'B' - 12" thru 36" Pipe
840.19	Concrete Grated Drop Inlet Type 'D' - 12" thru 36" Pipe
840.22	Frames and Wide Slot Sag Grates
840.25	Anchorage for Frames - Brick or Concrete or Precast
840.27	Brick Grated Drop Inlet Type 'B' - 12" thru 36" Pipe
840.28	Brick Grated Drop Inlet Type 'D' - 12" thru 36" Pipe
840.29	Frames and Narrow Slot Flat Grates
840.34	Traffic Bearing Junction Box - for Use with Pipes 42" and Under
840.35	Traffic Bearing Grated Drop Inlet - for Cast Iron Double Frame and Grates
840.45	Precast Drainage Structure
840.46	Traffic Bearing Precast Drainage Structure
840.54	Manhole Frame and Cover
840.66	Drainage Structure Steps
840.72	Pipe Collar
846.01	Concrete Curb, Gutter and Curb & Gutter
846.04	Drop Inlet Installation in Shoulder Berm Gutter
852.01	Concrete Islands
852.06	Method for Placement of Drop Inlets in Concrete Islands
857.01	Precast Reinforced Concrete Barrier - 41" Single Faced
862.04	Anchoring End of Guardrail - B-77 and B-83 Anchor Units
865.01	Cable Guiderail
866.02	Woven Wire Fence - with Wood Post
876.01	Rip Rap in Channels
876.02	Guide for Rip Rap at Pipe Outlets

# 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	□ EDM
Parcel/Sequence Number	(123)
Existing Fence Line	-x-x-x-
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	-----
False Sump	-----

## RAILROADS:

Standard Gauge	-----
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 CA 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	⊕
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	⊕
Telephone Pedestal	⊠
Telephone Cell Tower	⊠
U/G Telephone Cable Hand Hole	○
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	⊕
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	⊠
TV Tower	⊗
U/G TV Cable Hand Hole	○
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	⊠
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.

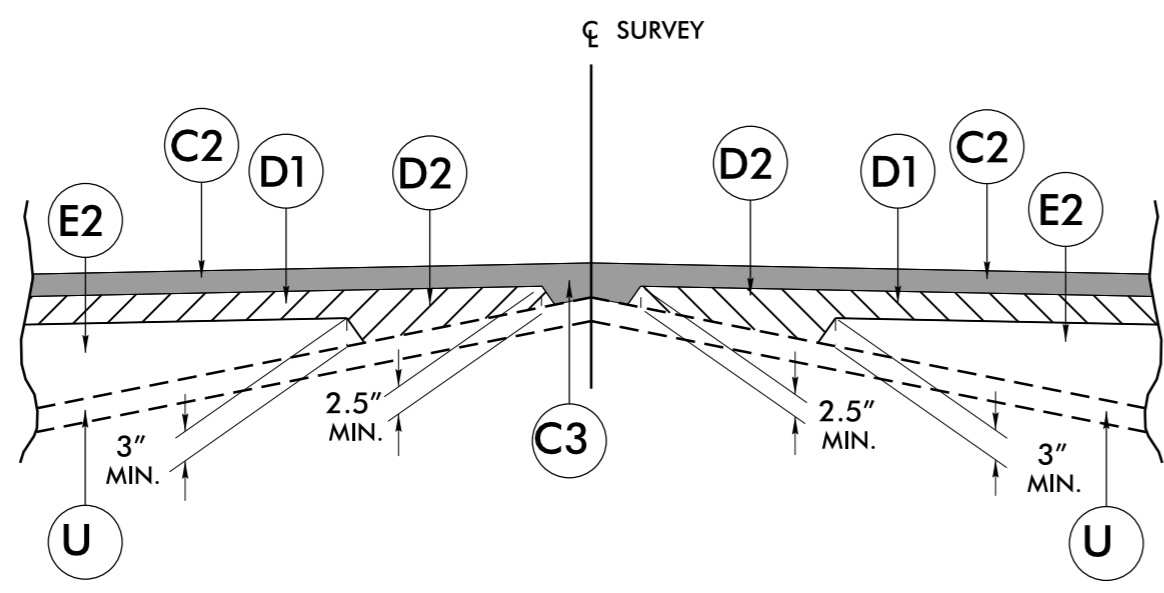


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**PAVEMENT SCHEDULE**  
FINAL PAVEMENT DESIGN

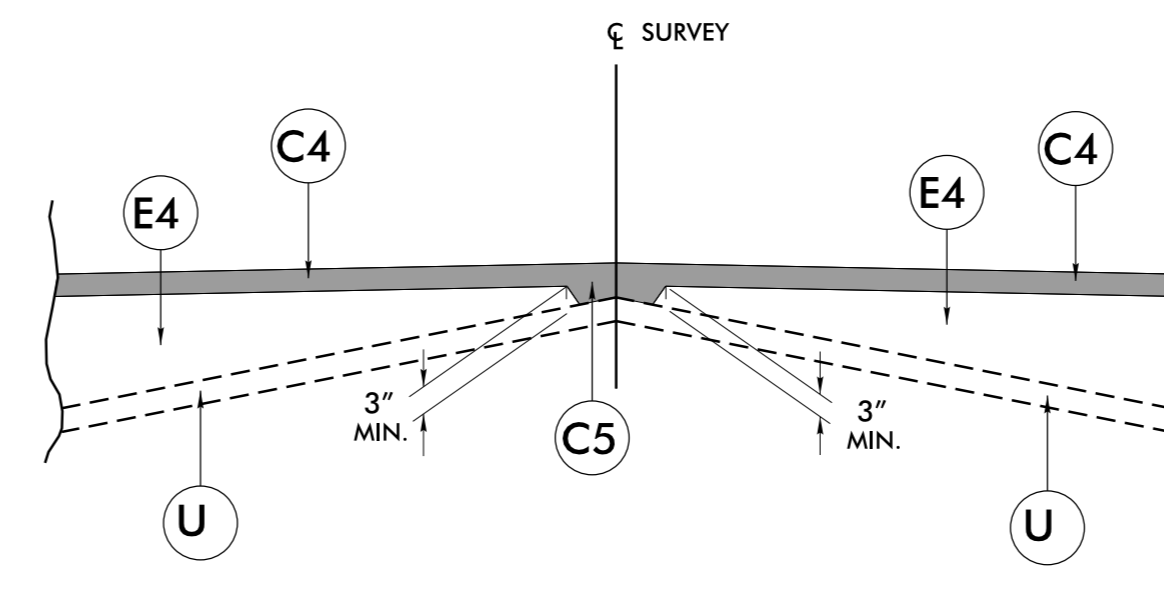
C1	PROP. APPROX. 3" ASPHALT CONCRETE SURFACE COURSE TYPE S9.5C, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.	E1	PROP. APPROX. 4.5" ASPHALT CONCRETE BASE COURSE TYPE B25.0C, AT AN AVERAGE RATE OF 513 LBS. PER SQ. YD.	T	EARTH MATERIAL
C2	PROP. APPROX. 1.5" ASPHALT CONCRETE SURFACE COURSE TYPE S9.5C, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD.	E2	PROP. VAR. DEPTH ASPHALT CONCRETE BASE COURSE TYPE B25.0C, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH. TO BE PLACED IN LAYERS NOT LESS THAN 3" IN DEPTH OR GREATER THAN 5.5" IN DEPTH.	U	EXIST. PAVEMENT
C3	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE TYPE S9.5C, AT AN AVERAGE RATE OF 112 LBS. PER SQ. YD. PER 1" DEPTH. TO BE PLACED IN LAYERS NOT TO EXCEED 2" IN DEPTH.	E3	PROP. APPROX. 4" ASPHALT CONCRETE BASE COURSE TYPE B25.0B, AT AN AVERAGE RATE OF 456 LBS. PER SQ. YD.	V	INCIDENTAL MILLING
C4	PROP. APPROX. 3" ASPHALT CONCRETE SURFACE COURSE TYPE S9.5B, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.	E4	PROP. VAR. DEPTH ASPHALT CONCRETE BASE COURSE TYPE B25.0B, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH. TO BE PLACED IN LAYERS NOT LESS THAN 3" IN DEPTH OR GREATER THAN 5.5" IN DEPTH.	W	VARIABLE DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL)
C5	PROP. VAR. DEPTH ASPHALT CONCRETE SURFACE COURSE TYPE S9.5B, AT AN AVERAGE RATE OF 112 LBS. PER SQ. YD. PER 1" DEPTH. TO BE PLACED IN LAYERS NOT TO EXCEED 2" IN DEPTH.	J1	PROP. 8" AGGREGATE BASE COURSE	W1	VARIABLE DEPTH ASPHALT PAVEMENT (SEE WEDGING DETAIL)
C6	PROP. APPROX. 1.5" ASPHALT CONCRETE SURFACE COURSE TYPE S9.5B, AT AN AVERAGE RATE OF 168 LBS. PER SQ. YD.	P1	PRIME COAT AT THE RATE OF .35 GAL. PER SQ. YD.	Y	MILLED RUMBLE STRIP
D1	PROP. APPROX. 4" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 456 LBS. PER SQ. YD.	R1	5" MONOLITHIC CONCRETE ISLAND (KEYED IN)		
D2	PROP. VAR. DEPTH ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0C, AT AN AVERAGE RATE OF 114 LBS. PER SQ. YD. PER 1" DEPTH. TO BE PLACED IN LAYERS NOT LESS THAN 2.5" IN DEPTH OR GREATER THAN 4" IN DEPTH.	R2	SHOULDER BERM GUTTER (SBG)		

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



Detail Showing Method of Wedging - W

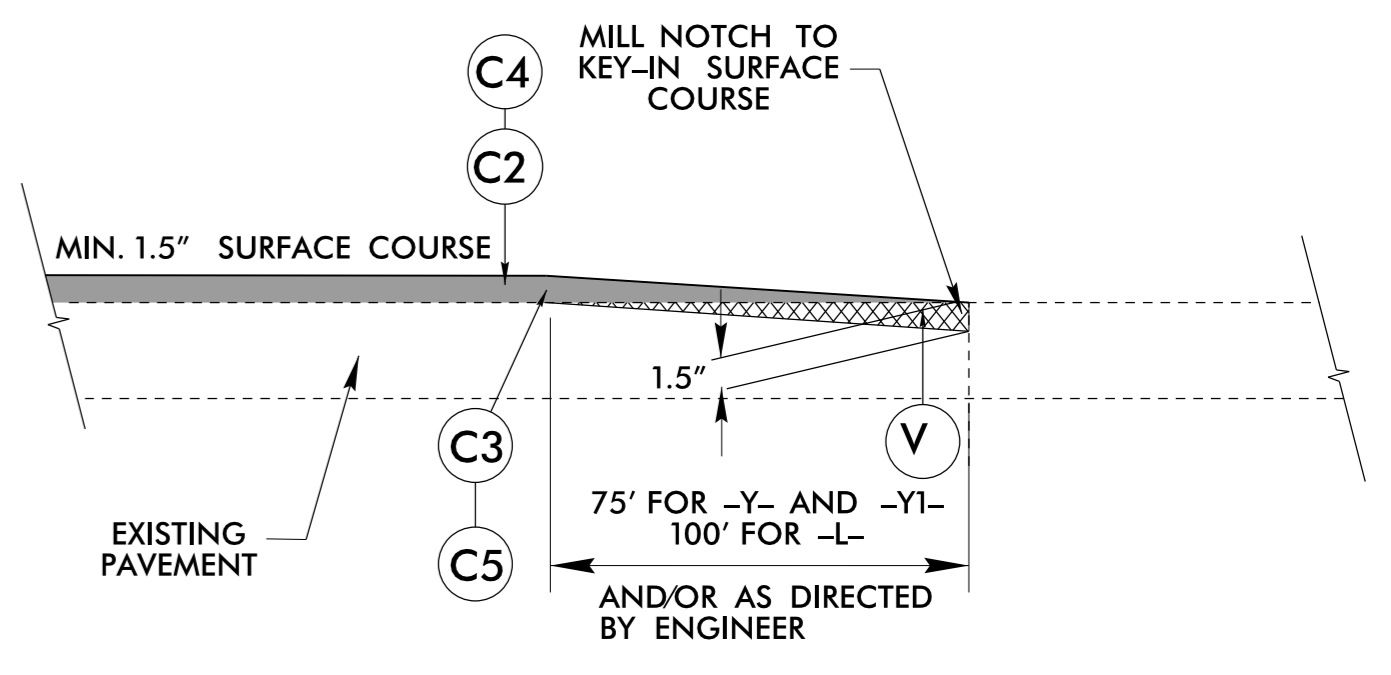
-L-



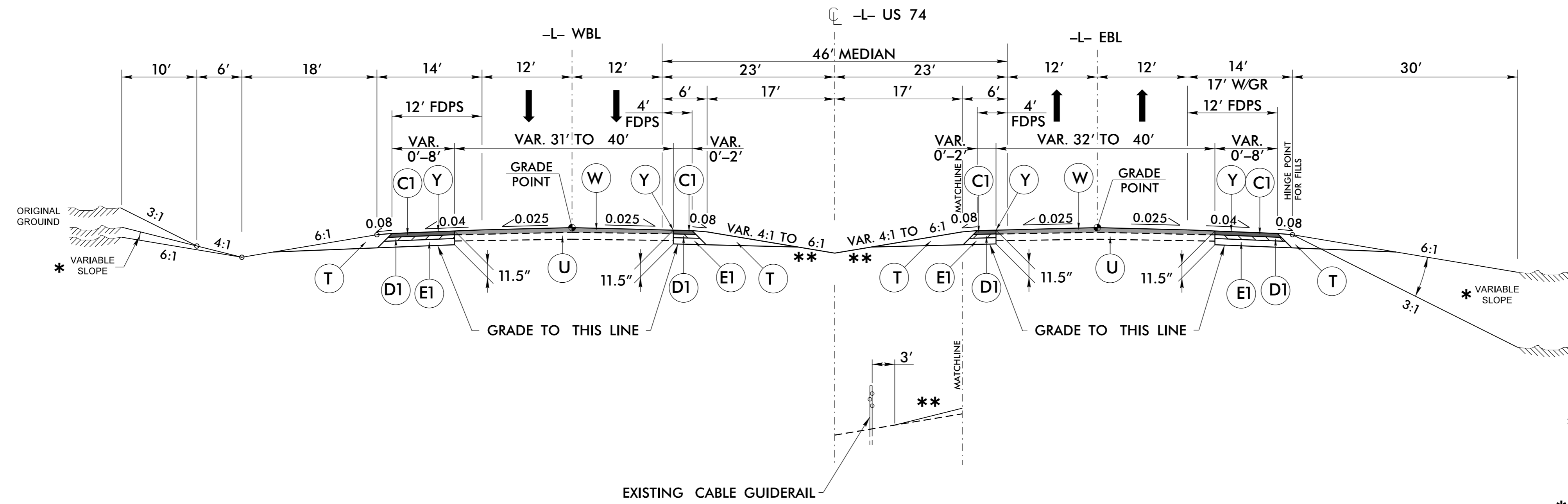
Detail Showing Method of Wedging - W1

-Y- AND -Y1-

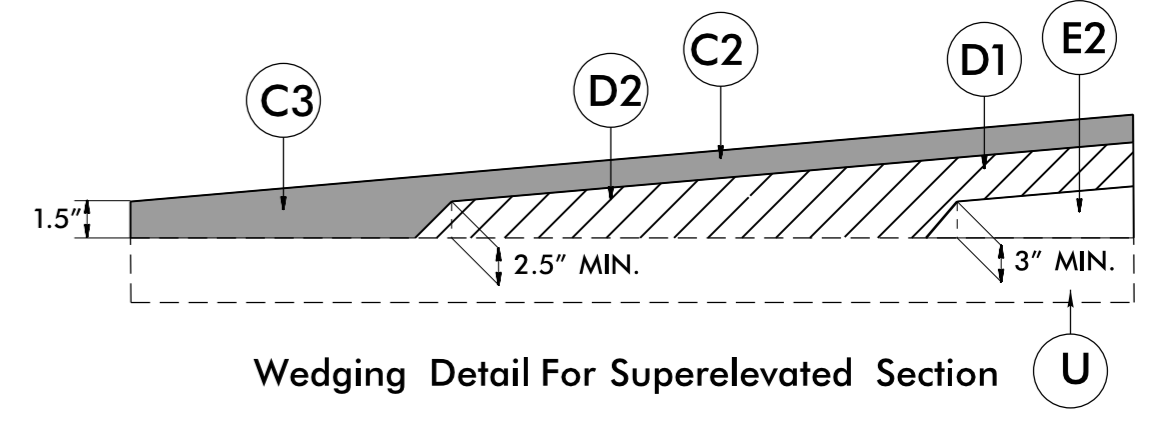
**MILLING DETAIL**  
INCIDENTAL MILLING AT BEGINEND FOR TIE-INS



- L-EBL STA. 33+50.00 AND STA. 84+19.00
- L-EBL STA. 129+14.00 AND STA. 148+24.00
- L-WBL STA. 26+65.00 AND STA. 74+50.00
- L-WBL STA. 129+14.00 AND STA. 148+24.00
- Y- STA. 19+35.00 AND STA. 41+76.00
- Y1- STA. 16+70.00 AND STA. 20+00.00



**TYPICAL SECTION NO. 1**


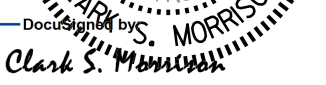



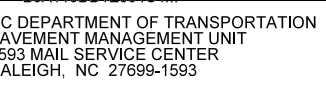


Wedging Detail For Superelevated Section




**USE TYPICAL SECTION NO. 1**

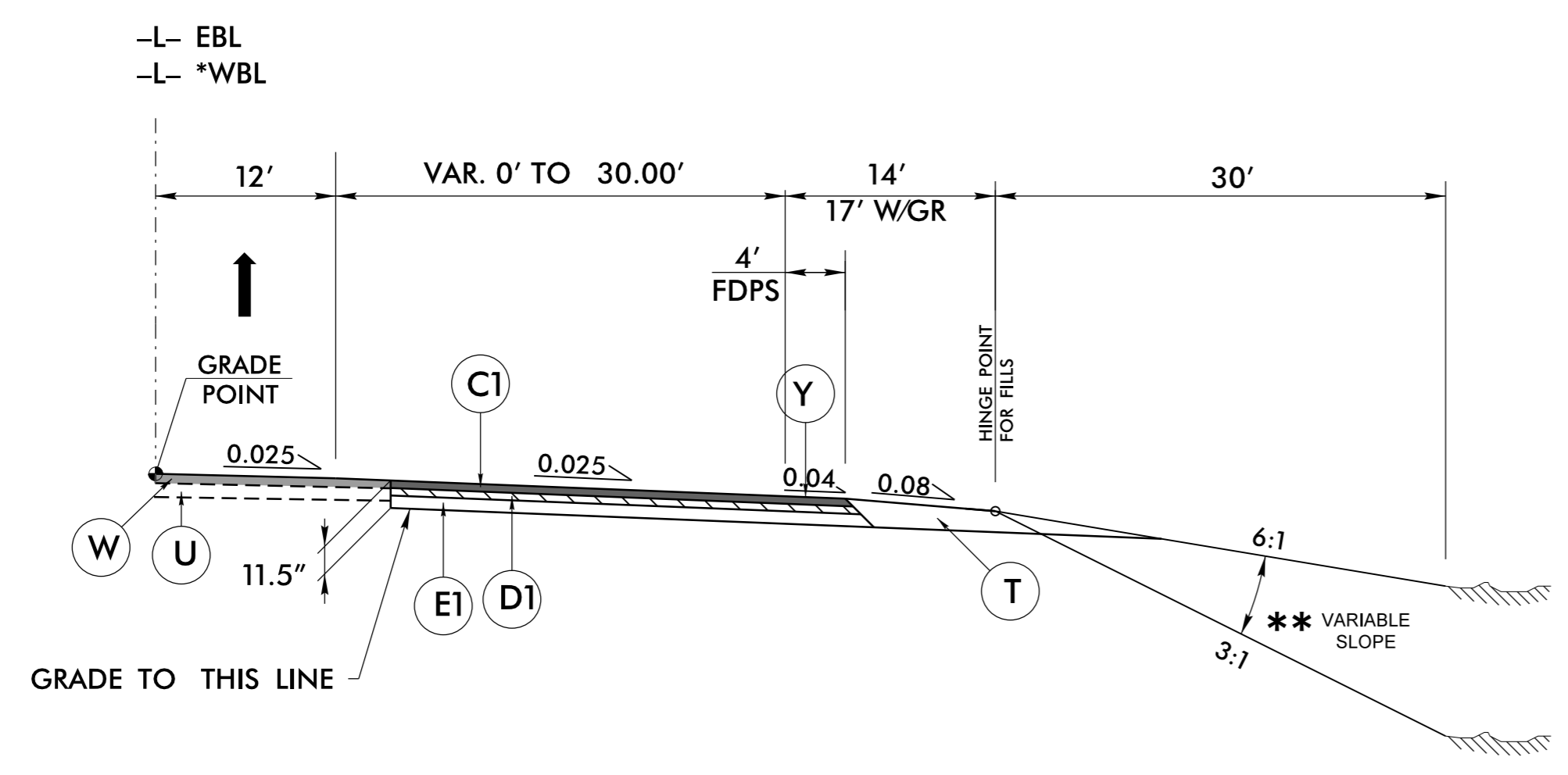
- L-EBL STA. 33+50.00 TO STA. 84+19.00
- L-EBL STA. 129+14.00 TO STA. 148+24.00
- L-WBL STA. 26+65.00 TO STA. 74+50.00
- L-WBL STA. 129+14.00 TO STA. 148+24.00

\* SEE CROSS SECTIONS FOR VARIABLE SLOPES. FILL SLOPES WITHIN THE INTERCHANGE WILL BE 4:1 OR FLATTER  
 \*\* SLOPES VARY TO MAINTAIN EXISTING MEDIAN CENTERLINE DITCH GRADE EXCEPT AT EXISTING GUIDERAIL LOCATIONS WHERE SLOPES VARY 4:1 TO 6:1 TO MAINTAIN 3' OFFSET

PROJECT REFERENCE NO. R-5752	SHEET NO. 2A-1
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
ROADWAY DESIGN ENGINEER 	PAVEMENT DESIGN ENGINEER 
	
	

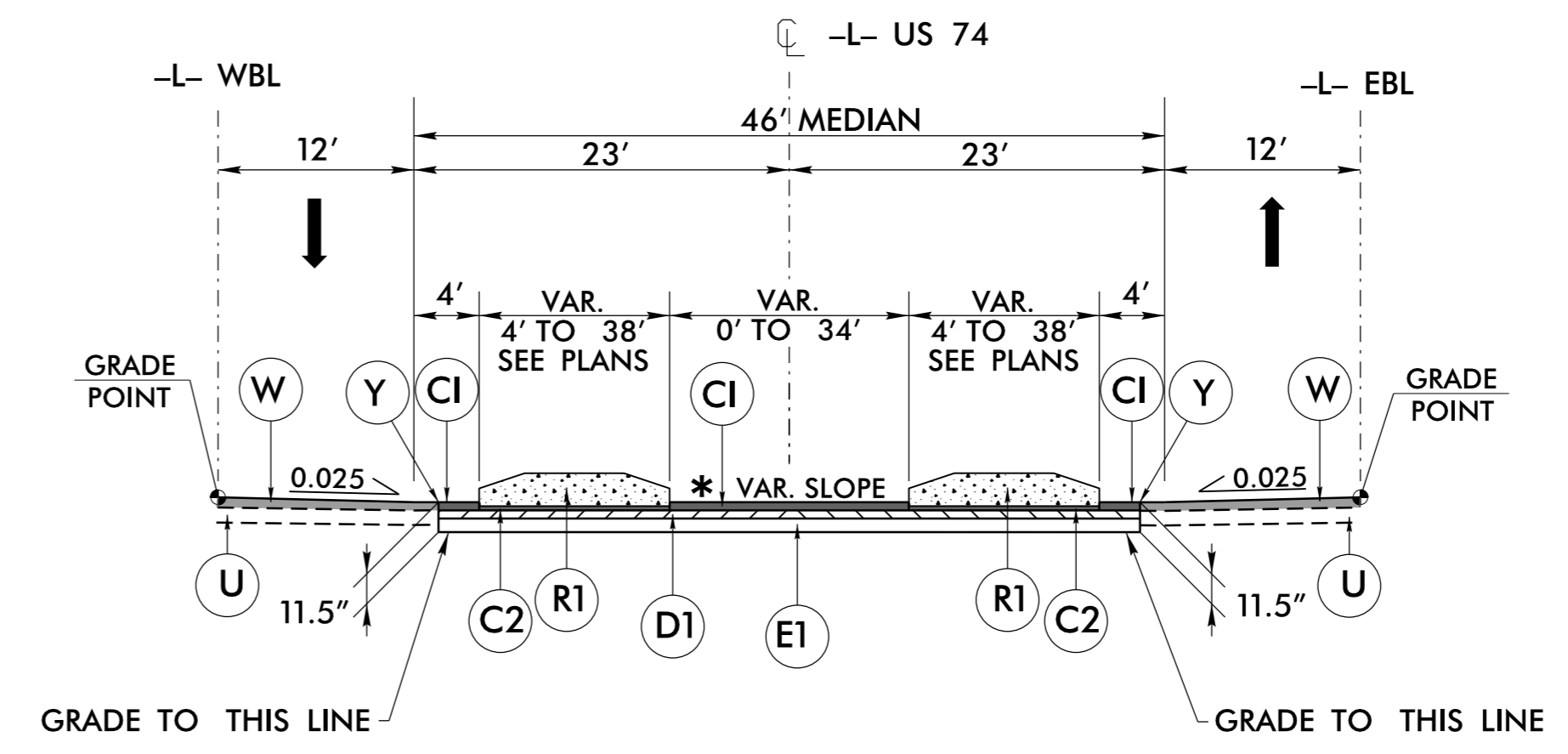
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PROJECT REFERENCE NO. R-5752	SHEET NO. 2A-2
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
ROADWAY DESIGN ENGINEER 	PAVEMENT DESIGN ENGINEER 
 <small>CDM Smith Inc. 5400 Glenwood Avenue Raleigh, NC 27612-3228 NC Reg. No. F-2725</small>	



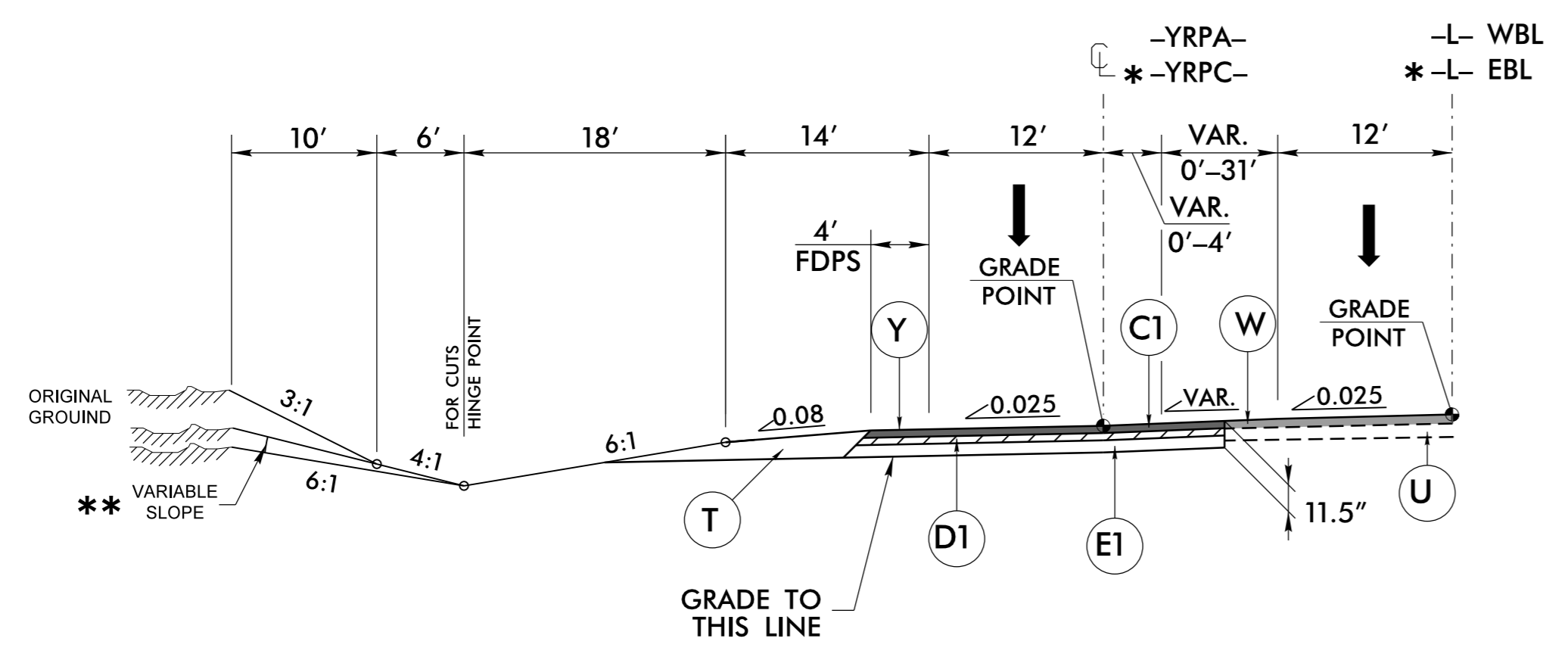
**TYPICAL SECTION NO. 1A**

USE TYPICAL SECTION NO. 1A IN CONJUNCTION WITH TYPICAL SECTION NO. 1:  
 \* MIRROR FOR -L- WBL  
 \*\* SEE CROSS SECTIONS FOR VARIABLE SLOPES  
 -L- STA. 129 + 80.87 TO STA. 131 + 99.12  
 \* -L- STA. 145 + 39.12 TO STA. 147 + 57.36



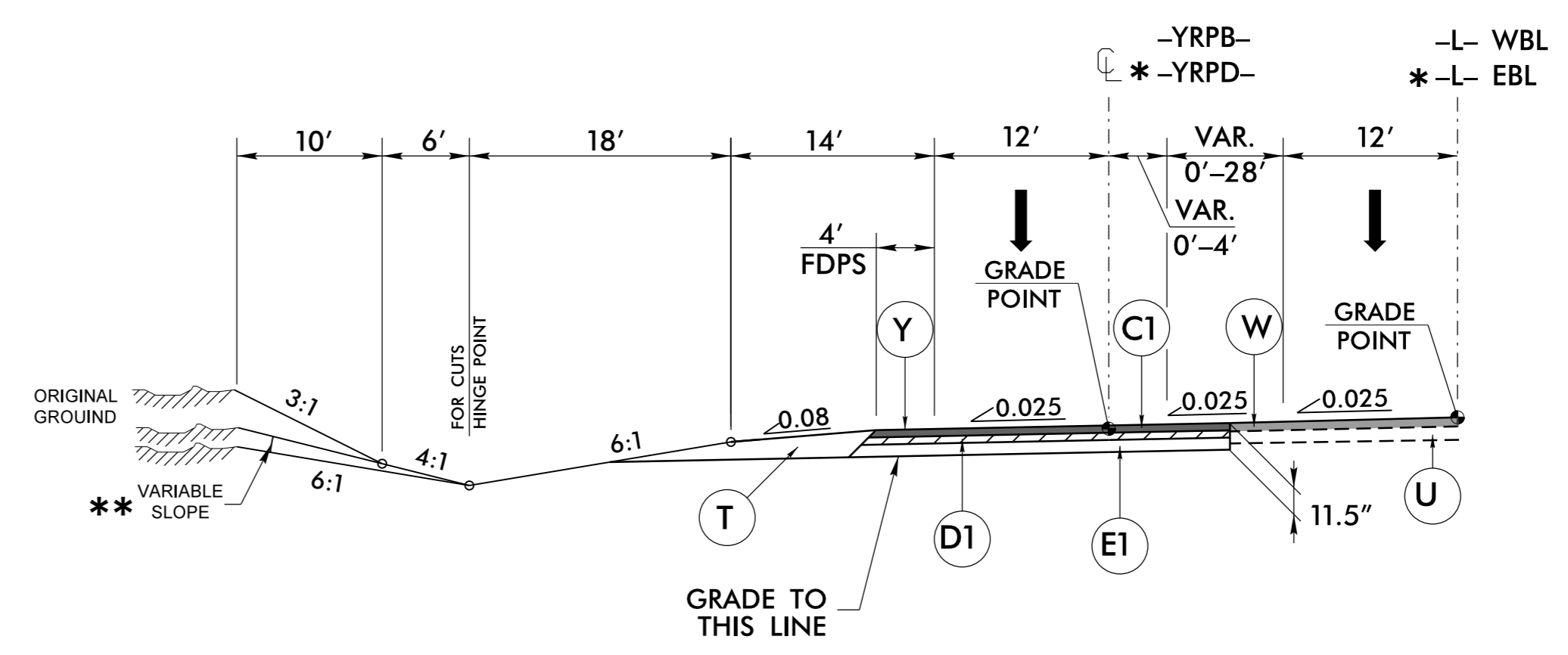
**TYPICAL SECTION NO. 1B**

USE TYPICAL SECTION NO. 1B IN CONJUNCTION WITH TYPICAL SECTION NO. 1:  
 \* SLOPE % AND DIRECTION VARIES SEE PLANS  
 NOTE: MAINTAIN AND OVERLAY EXISTING PAVEMENT WHEN POSSIBLE.  
 -L- STA. 129 + 64.12 TO STA. 130 + 69.12  
 -L- STA. 137 + 64.12 TO STA. 139 + 74.12  
 -L- STA. 146 + 69.12 TO STA. 147 + 74.12



**TYPICAL SECTION NO. 1C**

USE TYPICAL SECTION NO. 1C IN CONJUNCTION WITH TYPICAL SECTION NO. 1:  
 \* MIRROR FOR -L-EBL /-YRPC-  
 \*\* SEE CROSS SECTIONS FOR VARIABLE SLOPES.  
 -L- STA. 65 + 93.58 TO STA. 72 + 00.69/-YRPA- STA. 11 + 07.87 TO STA. 5 + 00.00  
 \* -L- STA. 35 + 43.85 TO STA. 40 + 20.92/-YRPC- STA. 5 + 00.00 TO STA. 9 + 77.76



**TYPICAL SECTION NO. 1D**

USE TYPICAL SECTION NO. 1D IN CONJUNCTION WITH TYPICAL SECTION NO. 1:  
 \* MIRROR FOR -L-EBL /-YRPD-  
 \*\* SEE CROSS SECTIONS FOR VARIABLE SLOPES.  
 -L- STA. 29 + 89.02 TO STA. 43 + 00.04/-YRPB- STA. 5 + 00.00 TO STA. 9 + 11.70  
 \* -L- STA. 67 + 82.48 TO STA. 80 + 94.73/-YRPD- STA. 9 + 12.68 TO STA. 5 + 00.00

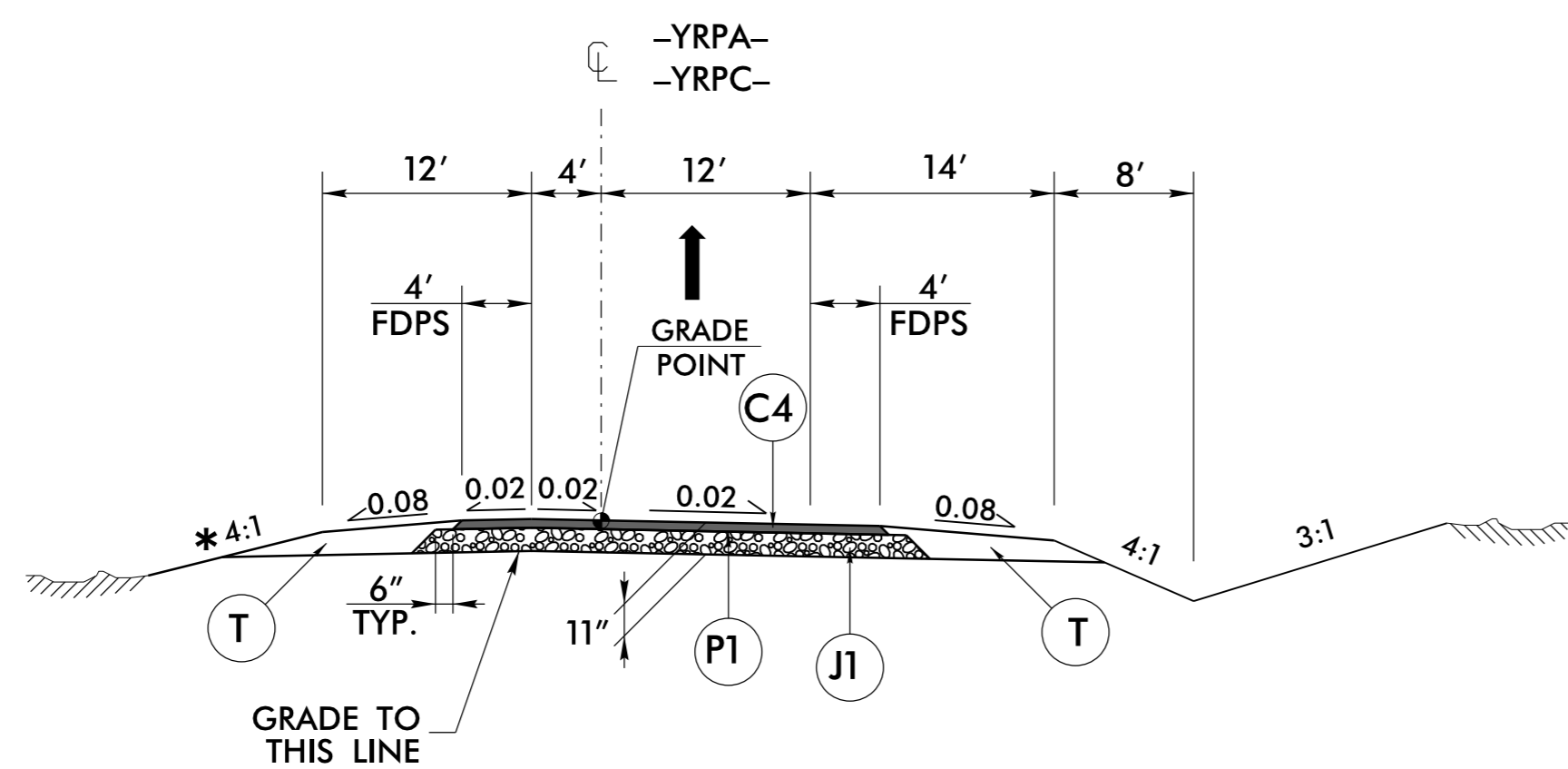
**PAVEMENT SCHEDULE**

C1	3" S9.5C
C2	1.5" S9.5C
C3	VAR. S9.5C
C4	3" S9.5B
C5	VAR. S9.5B
C6	1.5" S9.5B
D1	4" I19.0C
D2	VAR. I19.0C
E1	4.5" B25.0C
E2	VAR. B25.0C
E3	4" B25.0B
E4	VAR. B25.0B
J1	8" ABC
P1	.35 PRIME COAT
R1	5" MONO. CONC. (KEYED IN)
R2	SHOULDER BERM GUTTER (SBG)
T	EARTH MATERIAL
U	EXIST. PAVEMENT
V	INCIDENTAL MILLING
W	WEDGING
W1	WEDGING
Y	MILLED RUMBLE STRIP

PAVEMENT EDGESLOPES 1:1 UNLESS NOTED OTHERWISE

5/14/99  
invalid\_expression R5752\_Rdy\_tup.dgn

5/14/19

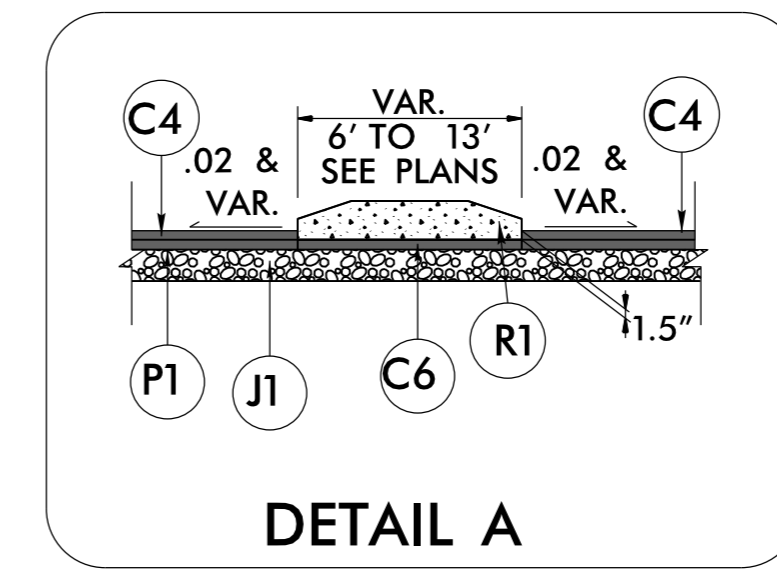


**TYPICAL SECTION NO. 2**

\* SEE CROSS SECTIONS FOR VARIABLE SLOPES.

**USE TYPICAL SECTION NO. 2**

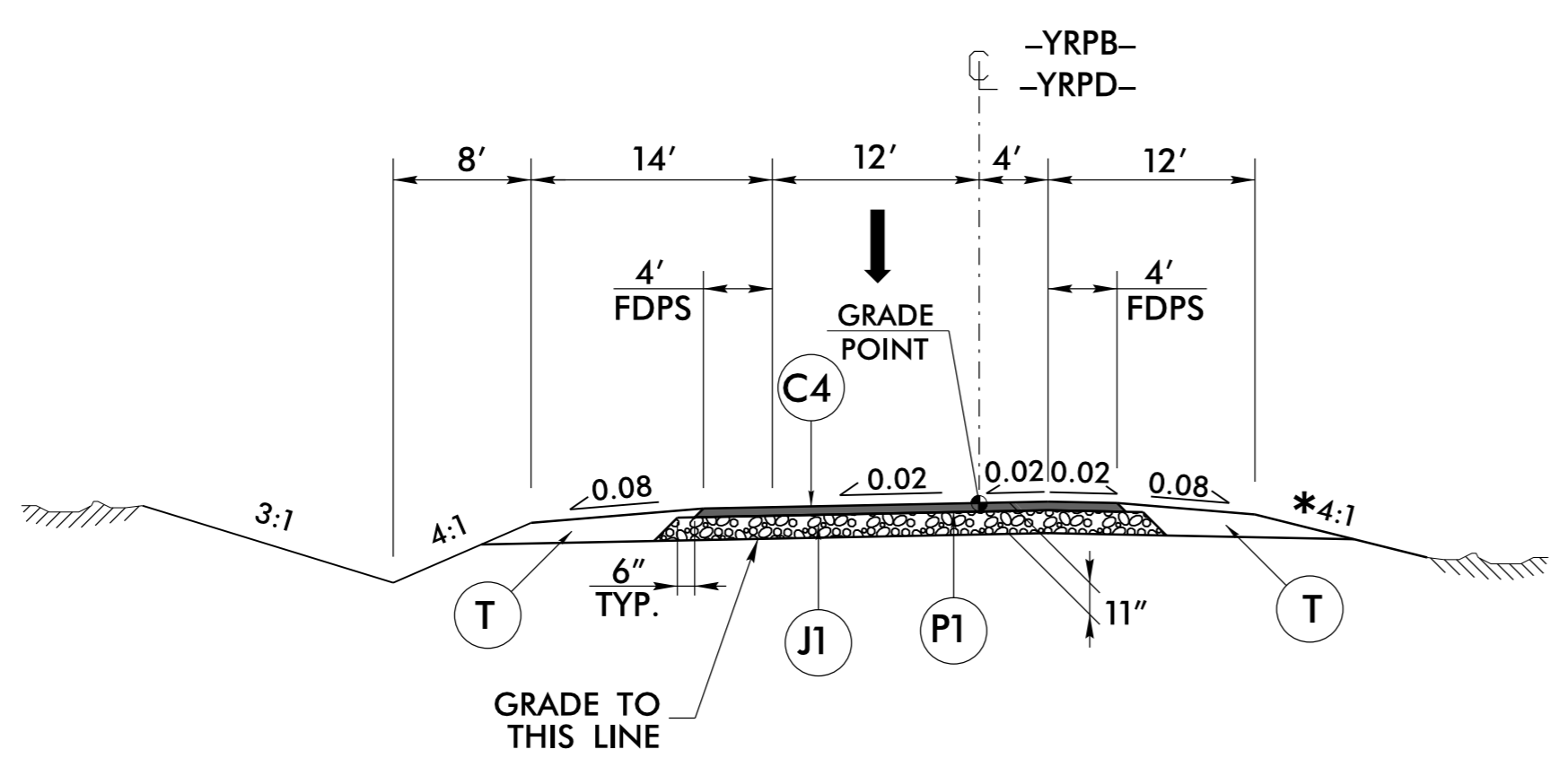
-YRPA- STA. 11+07.87 TO 25+00.74  
 -YRPC- STA. 9+77.76 TO 27+39.60



**DETAIL A**

**USE DETAIL A IN CONJUNCTION WITH TYPICAL SECTION NO. 2**

-YRPA- STA. 24+60.90 TO STA. 24+93.52  
 -YRPC- STA. 27+00.49 TO STA. 27+32.80



**TYPICAL SECTION NO. 3**

\* SEE CROSS SECTIONS FOR VARIABLE SLOPES.

**USE TYPICAL SECTION NO. 3**

-YRPB- STA. 9+11.70 TO 20+41.80  
 -YRPD- STA. 9+12.68 TO 20+74.17

PROJECT REFERENCE NO. R-5752	SHEET NO. 2A-3
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
ROADWAY DESIGN ENGINEER 	PAVEMENT DESIGN ENGINEER 

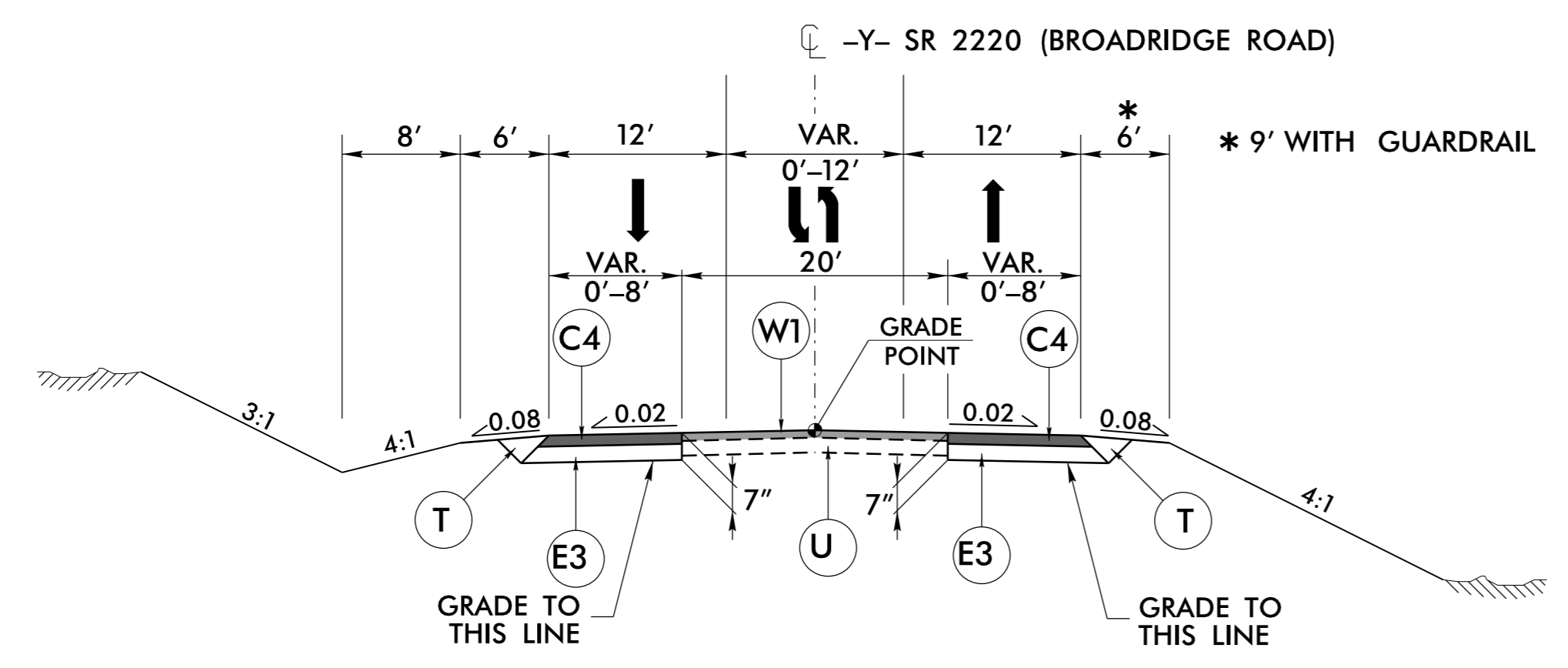
**PAVEMENT SCHEDULE**

C1	3" S9.5C
C2	1.5" S9.5C
C3	VAR. S9.5C
C4	3" S9.5B
C5	VAR. S9.5B
C6	1.5" S9.5B
D1	4" I19.0C
D2	VAR. I19.0C
E1	4.5" B25.0C
E2	VAR. B25.0C
E3	4" B25.0B
E4	VAR. B25.0B
J1	8" ABC
P1	.35 PRIME COAT
R1	5" MONO. CONC. (KEYED IN)
R2	SHOULDER BERM GUTTER (SBG)
T	EARTH MATERIAL
U	EXIST. PAVEMENT
V	INCIDENTAL MILLING
W	WEDGING
W1	WEDGING
Y	MILLED RUMBLE STRIP

PAVEMENT EDGESLOPES 1:1 UNLESS NOTED OTHERWISE

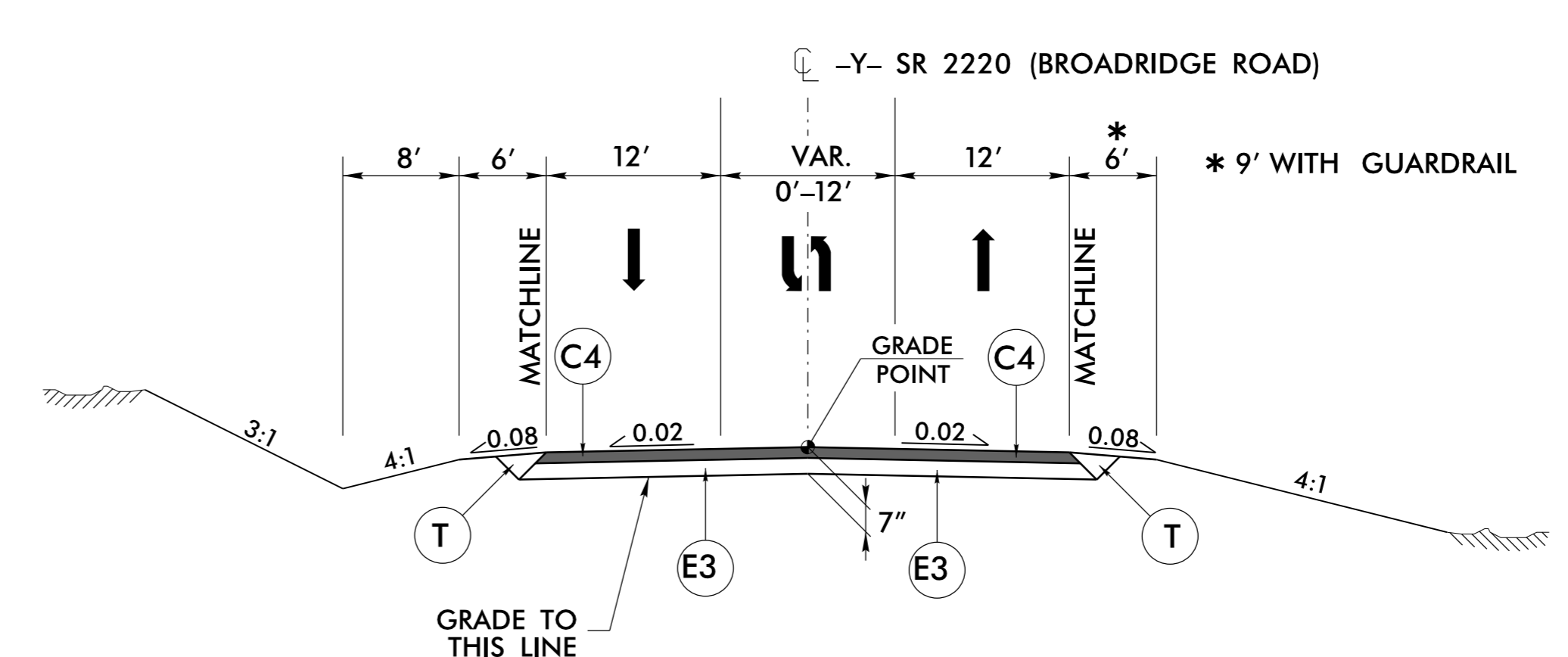


5/14/99



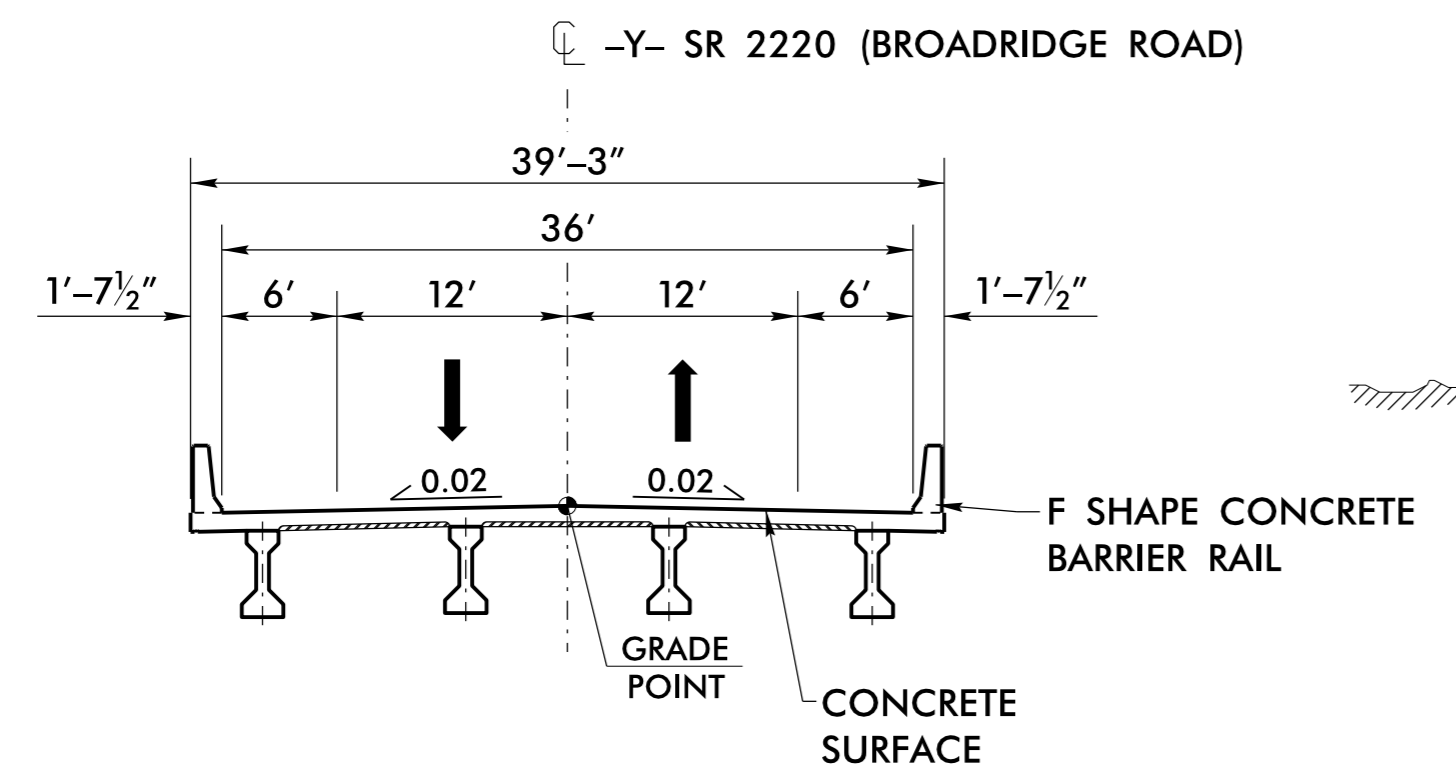
TYPICAL SECTION NO. 4

USE TYPICAL SECTION NO. 4  
 -Y- STA. 19 + 35.00 TO STA. 21 + 00.00  
 -Y- STA. 39 + 50.00 TO STA. 41 + 76.00



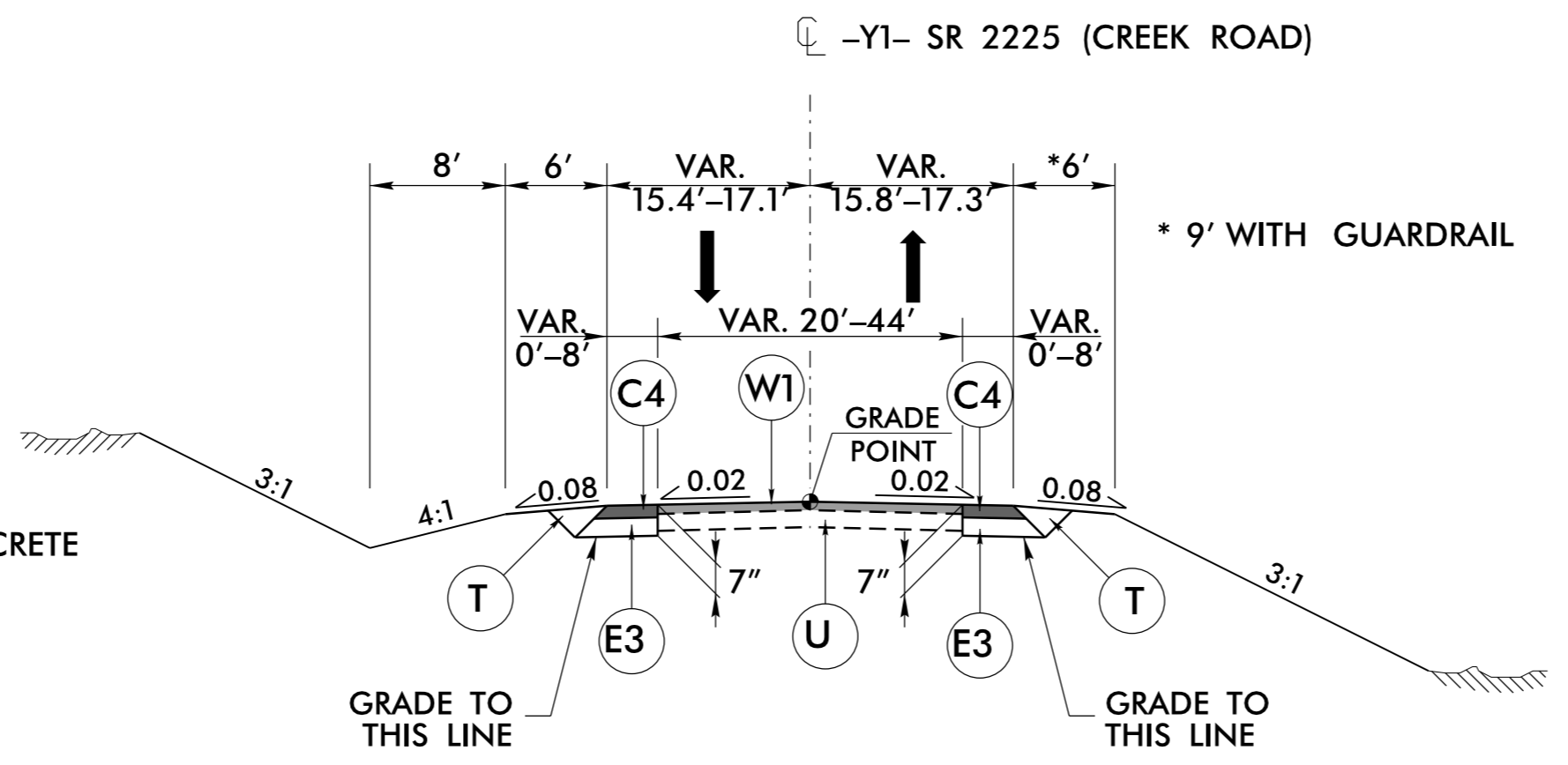
TYPICAL SECTION NO. 5

USE TYPICAL SECTION NO. 5  
 -Y- STA. 21 + 00.00 TO STA. 29 + 46.23 (BEGIN BRIDGE)  
 -Y- STA. 31 + 32.23 (END BRIDGE) TO STA. 39 + 50.00



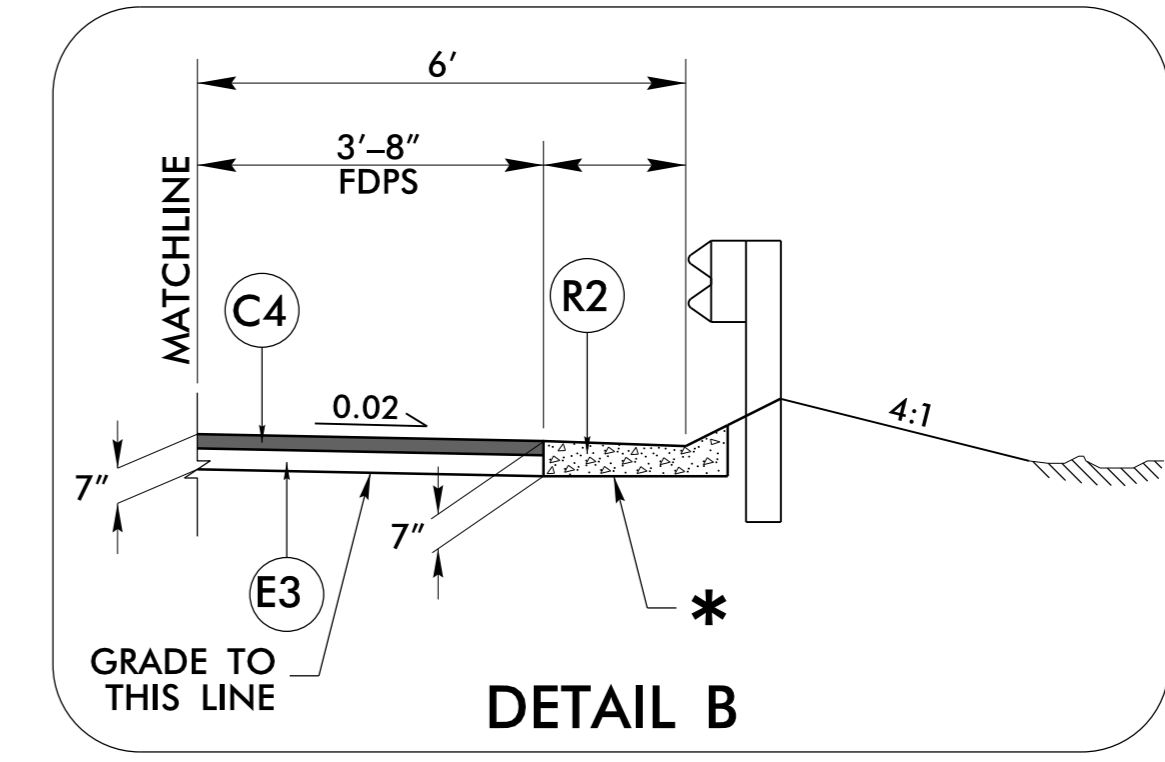
TYPICAL SECTION NO. 6

USE BRIDGE TYPICAL SECTION NO. 6  
 -Y- STA. 29 + 46.23 (BEGIN BRIDGE) TO  
 STA. 31 + 32.23 (END BRIDGE)



TYPICAL SECTION NO. 7

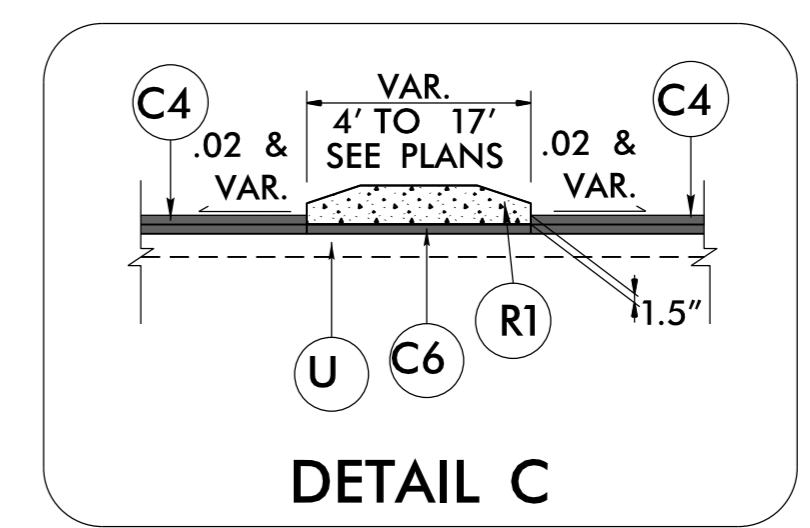
USE TYPICAL SECTION NO. 7  
 -Y1- STA. 16 + 70.00 TO STA. 17 + 63.20  
 -Y1- STA. 18 + 82.17 TO STA. 20 + 00.00



USE DETAIL B IN CONJUNCTION WITH TYPICAL SECTION NO. 5

\* SHOULDER BERM GUTTER TO BE PLACED ON SUBGRADE AT EXTRA DEPTH TO MATCH PAVEMENT STRUCTURE.

-Y- STA. 27 + 82.00 TO STA. 29 + 26.86 (RT)  
 -Y- STA. 29 + 16.00 TO STA. 29 + 38.36 (LT)  
 -Y- STA. 31 + 40.10 TO STA. 31 + 62.00 (RT)  
 -Y- STA. 31 + 51.60 TO STA. 32 + 93.00 (LT)



USE DETAIL C IN CONJUNCTION WITH TYPICAL SECTION NO. 7

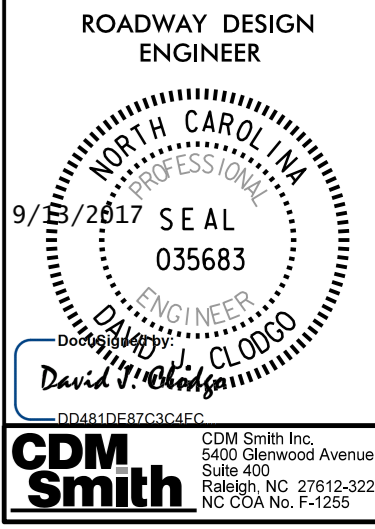
-Y1- STA. 16 + 85.69 TO STA. 17 + 65.21  
 -Y1- STA. 18 + 80.15 TO STA. 19 + 84.44

PROJECT REFERENCE NO. R-5752	SHEET NO. 2A-4
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
ROADWAY DESIGN ENGINEER 	PAVEMENT DESIGN ENGINEER 
 CDM Smith Inc. 5400 Glenwood Avenue Raleigh, NC 27612-3228 NC REG. No. P-1252	

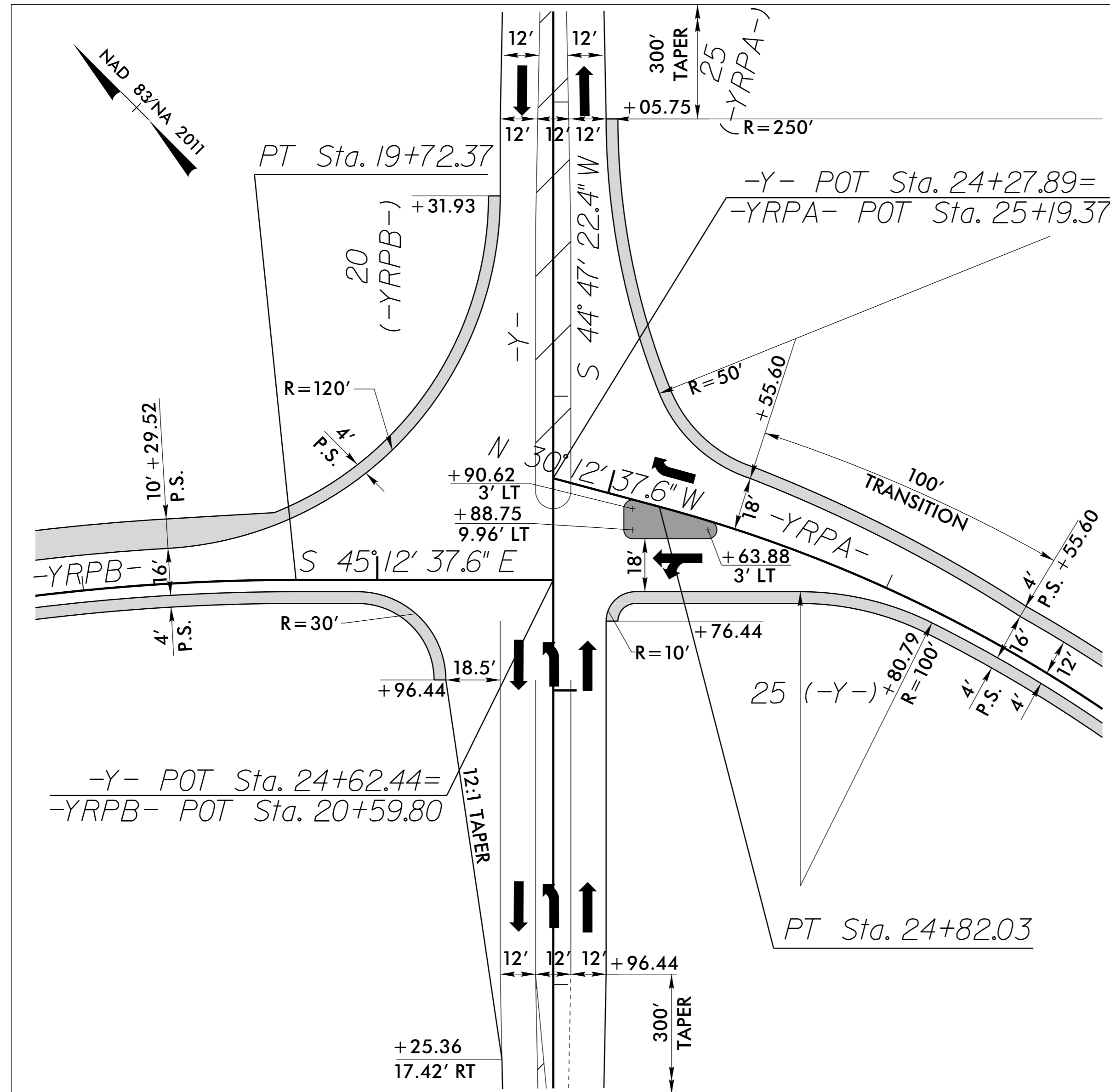
PAVEMENT SCHEDULE

C1	3" S9.5C
C2	1.5" S9.5C
C3	VAR. S9.5C
C4	3" S9.5B
C5	VAR. S9.5B
C6	1.5" S9.5B
D1	4" I19.0C
D2	VAR. I19.0C
E1	4.5" B25.0C
E2	VAR. B25.0C
E3	4" B25.0B
E4	VAR. B25.0B
J1	8" ABC
P1	.35 PRIME COAT
R1	5" MONO. CONC. (KEYED IN)
R2	SHOULDER BERM GUTTER (SBG)
T	EARTH MATERIAL
U	EXIST. PAVEMENT
V	INCIDENTAL MILLING
W	WEDGING
W1	WEDGING
Y	MILLED RUMBLE STRIP

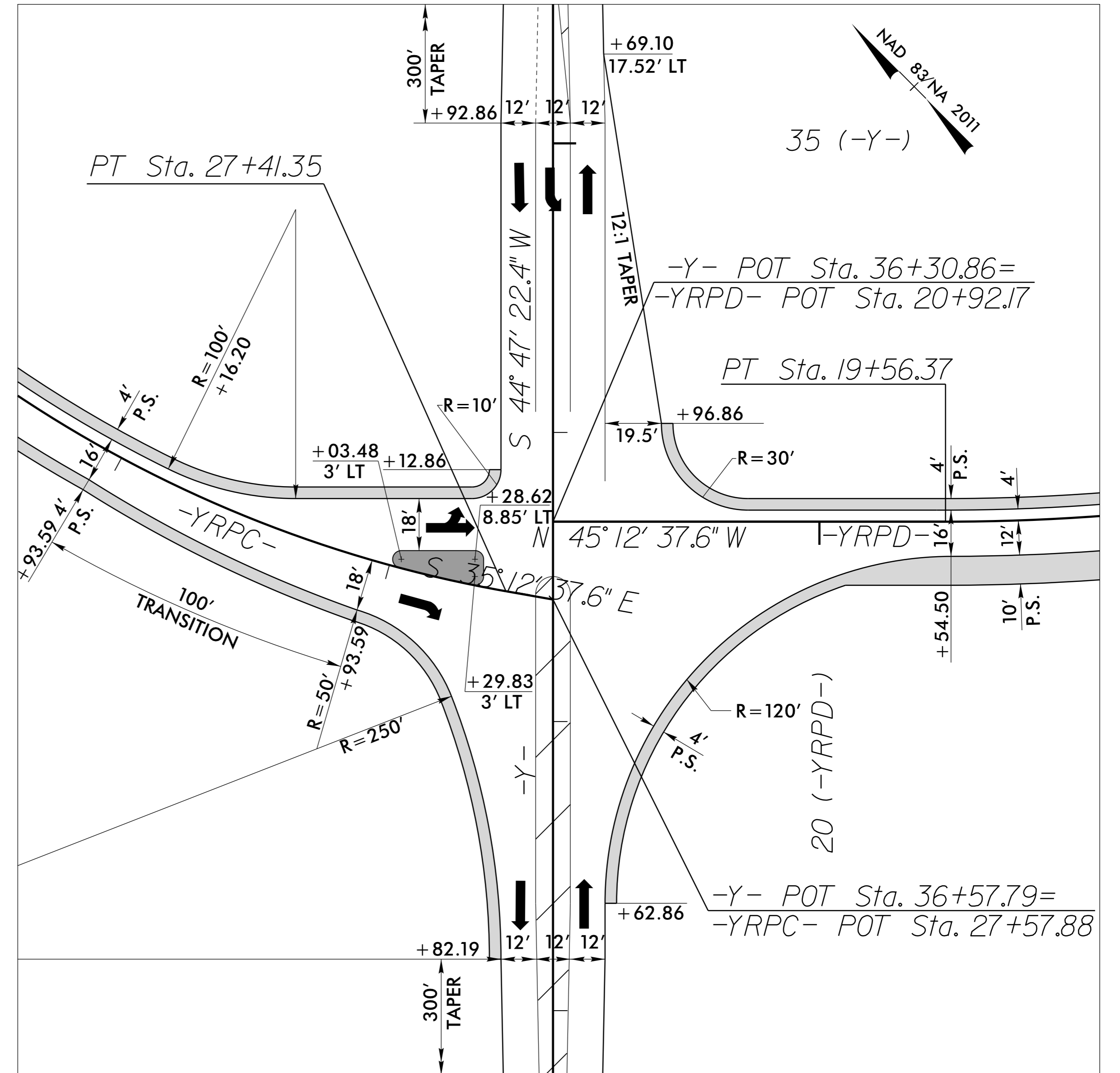
PAVEMENT EDGESLOPES 1:1 UNLESS NOTED OTHERWISE



### INTERSECTION DETAIL -Y-/YRPA-&-YRPB-

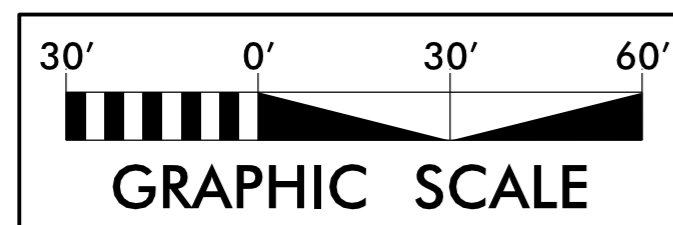


### INTERSECTION DETAIL -Y-/YRPC-&-YRPD-

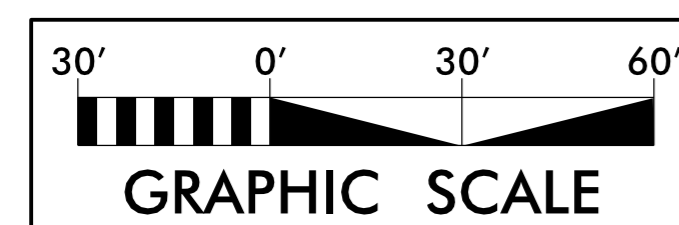
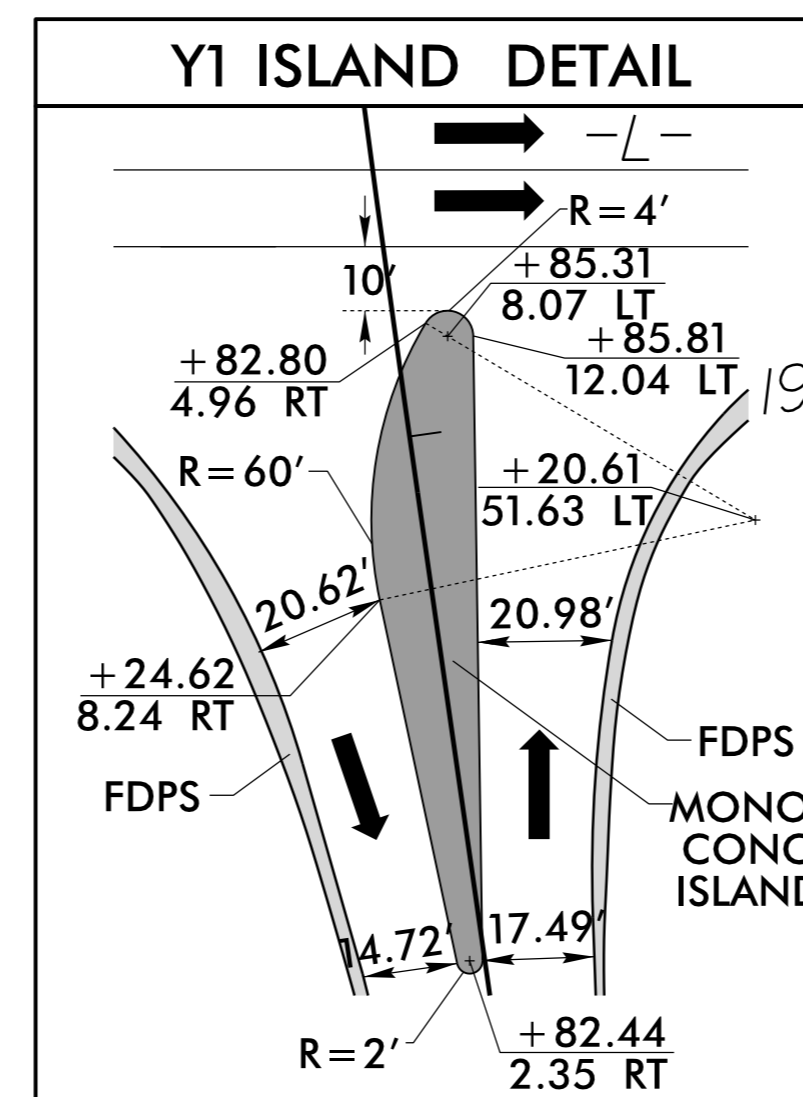
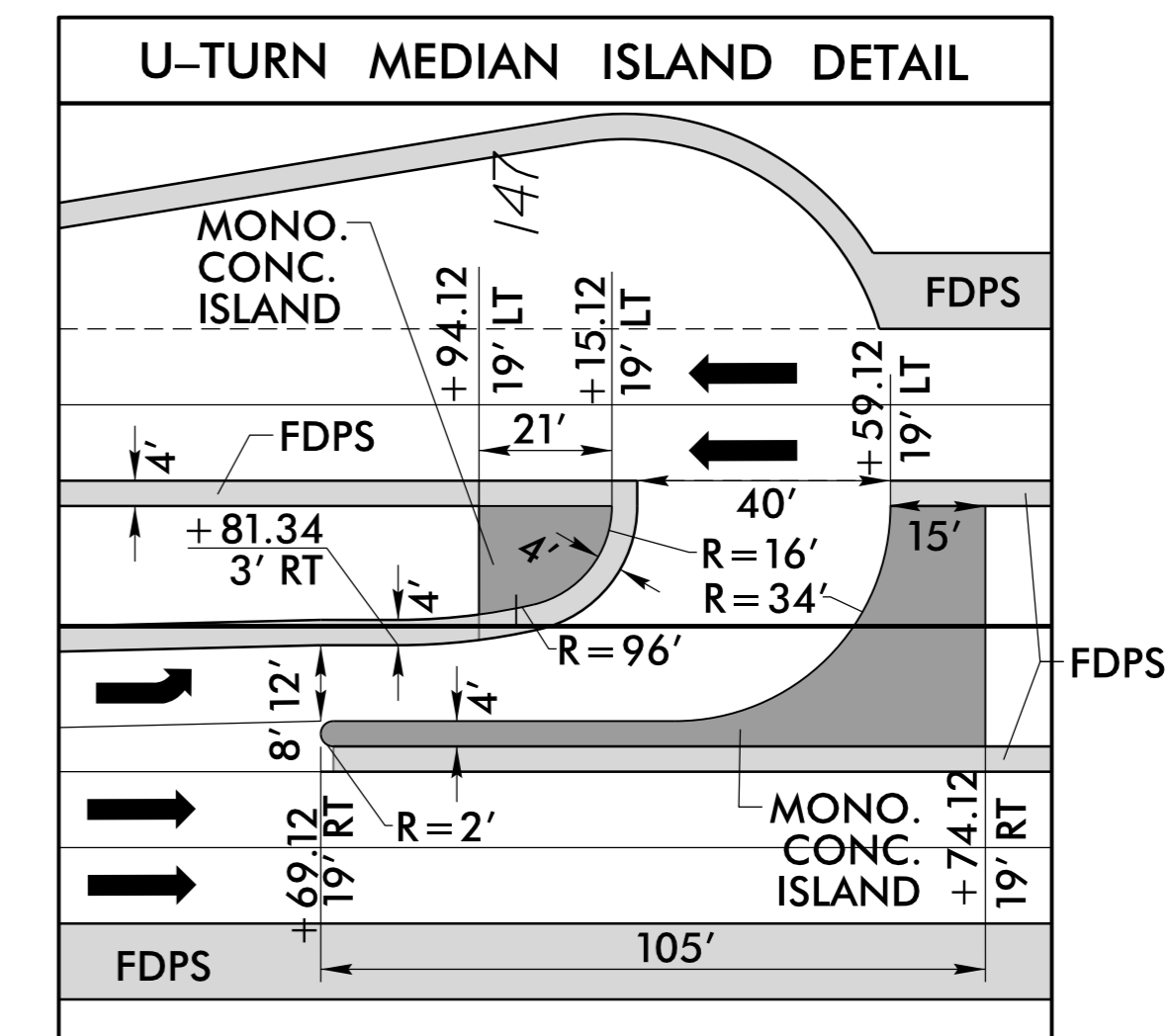
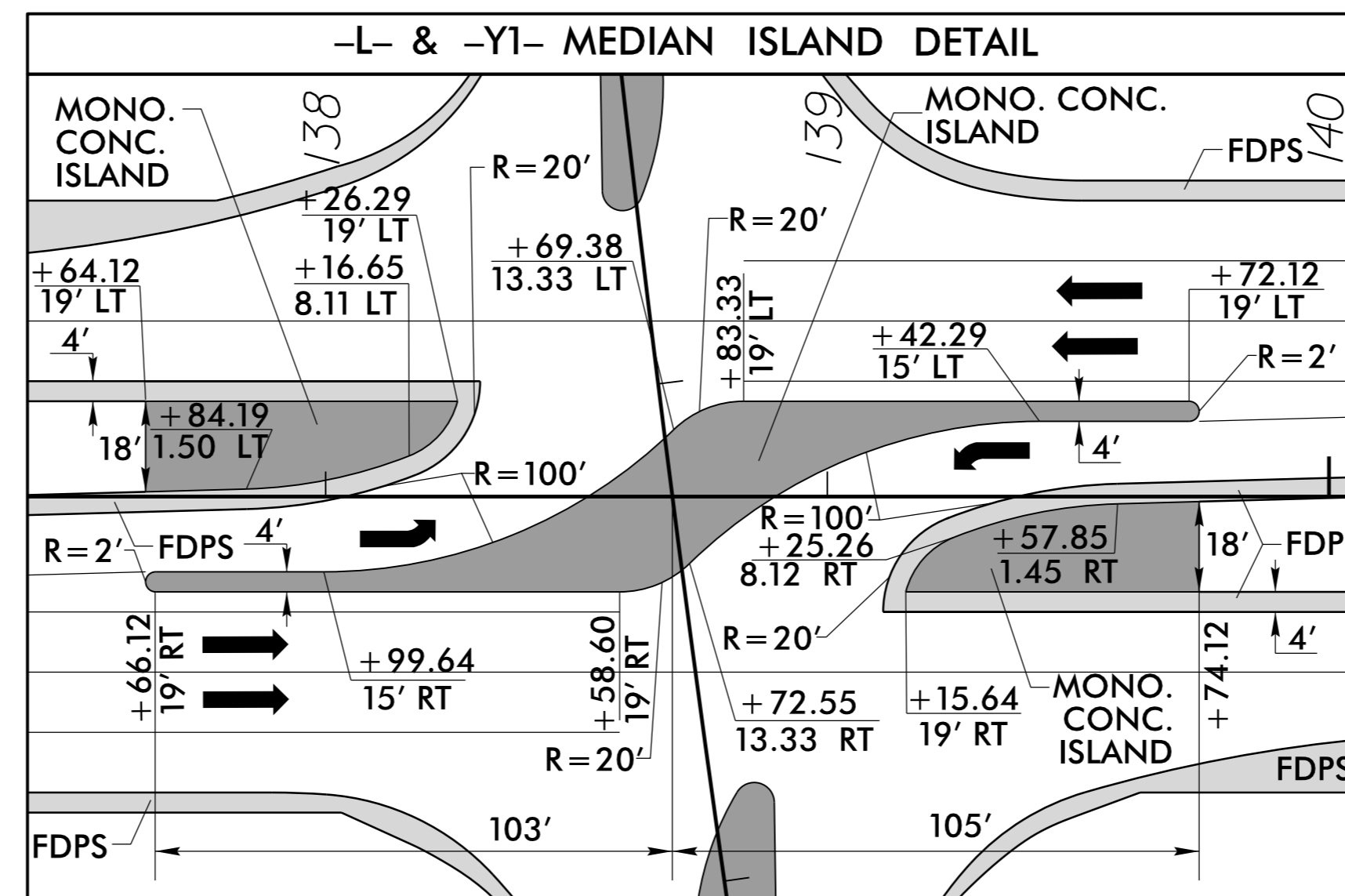
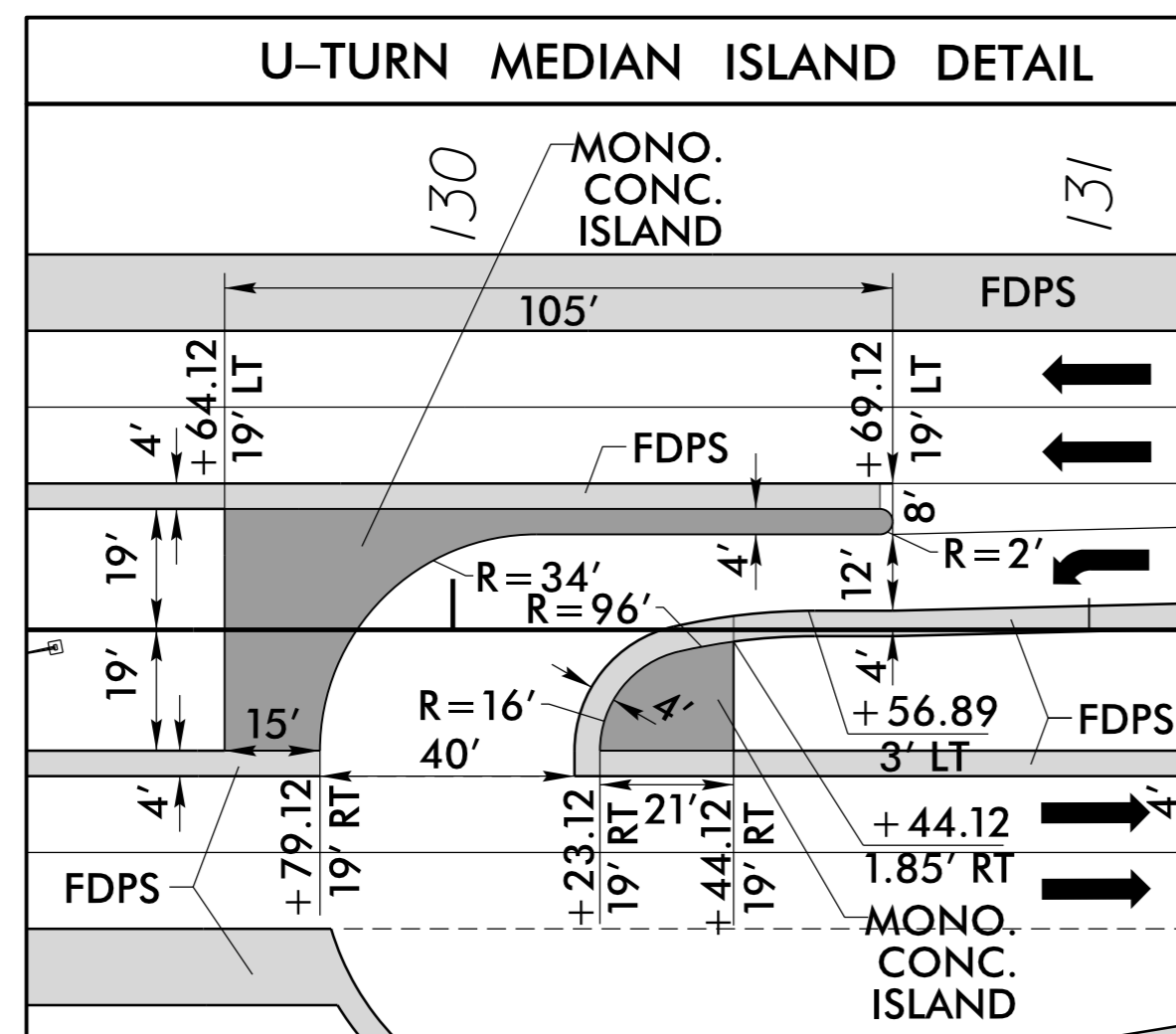
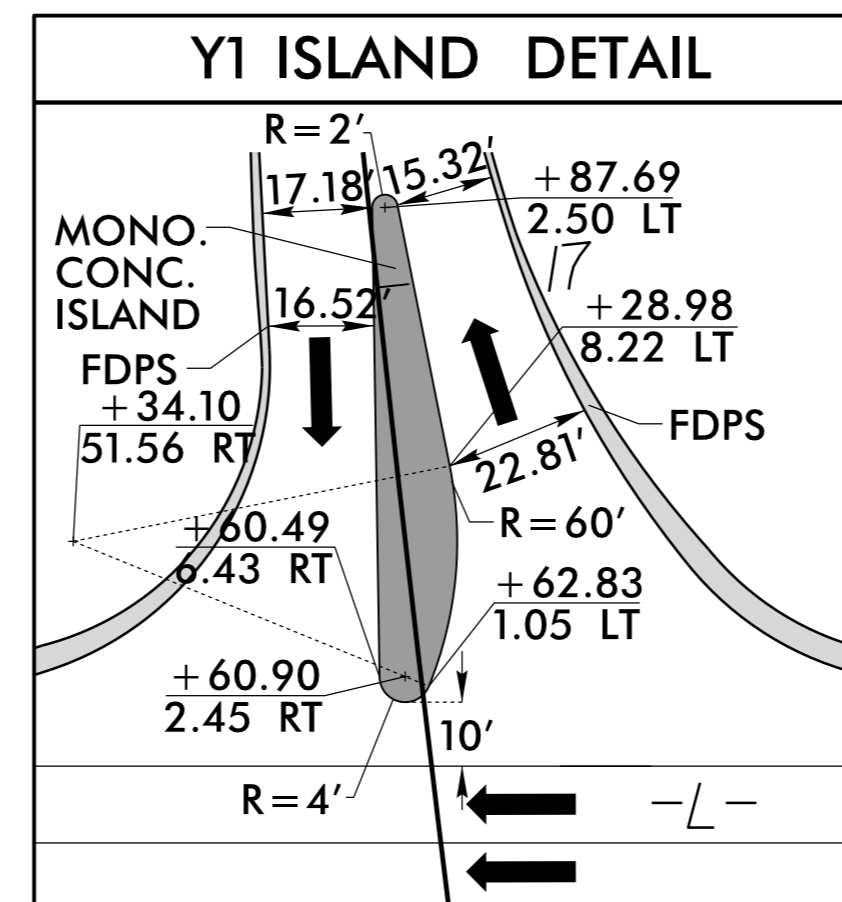
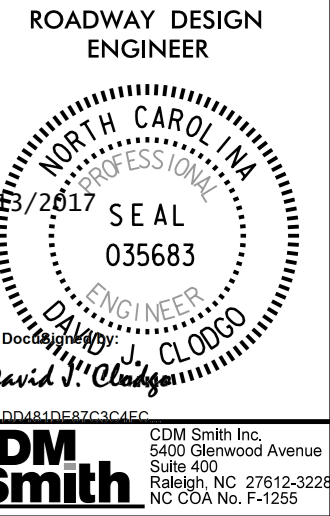


**NOTES:**

- 1) PROVIDE CUT OUT FOR SIGN INSTALLATION IN MONOLITHIC CONCRETE ISLAND. ENGINEER TO PROVIDE LOCATION OF FINAL SIGN PLACEMENT.
- 2) ALL ISLAND RADII ARE 3' UNLESS OTHERWISE NOTED.



SEE SHEET 5 FOR PLAN VIEW



**NOTE: PROVIDE CUT OUT FOR SIGN INSTALLATION IN MONOLITHIC CONCRETE ISLAND. ENGINEER TO PROVIDE LOCATION OF FINAL SIGN PLACEMENT.**

**SEE SHEETS 9 & 10 FOR PLAN VIEW**

Invalid\_xp... 2B2.dgn

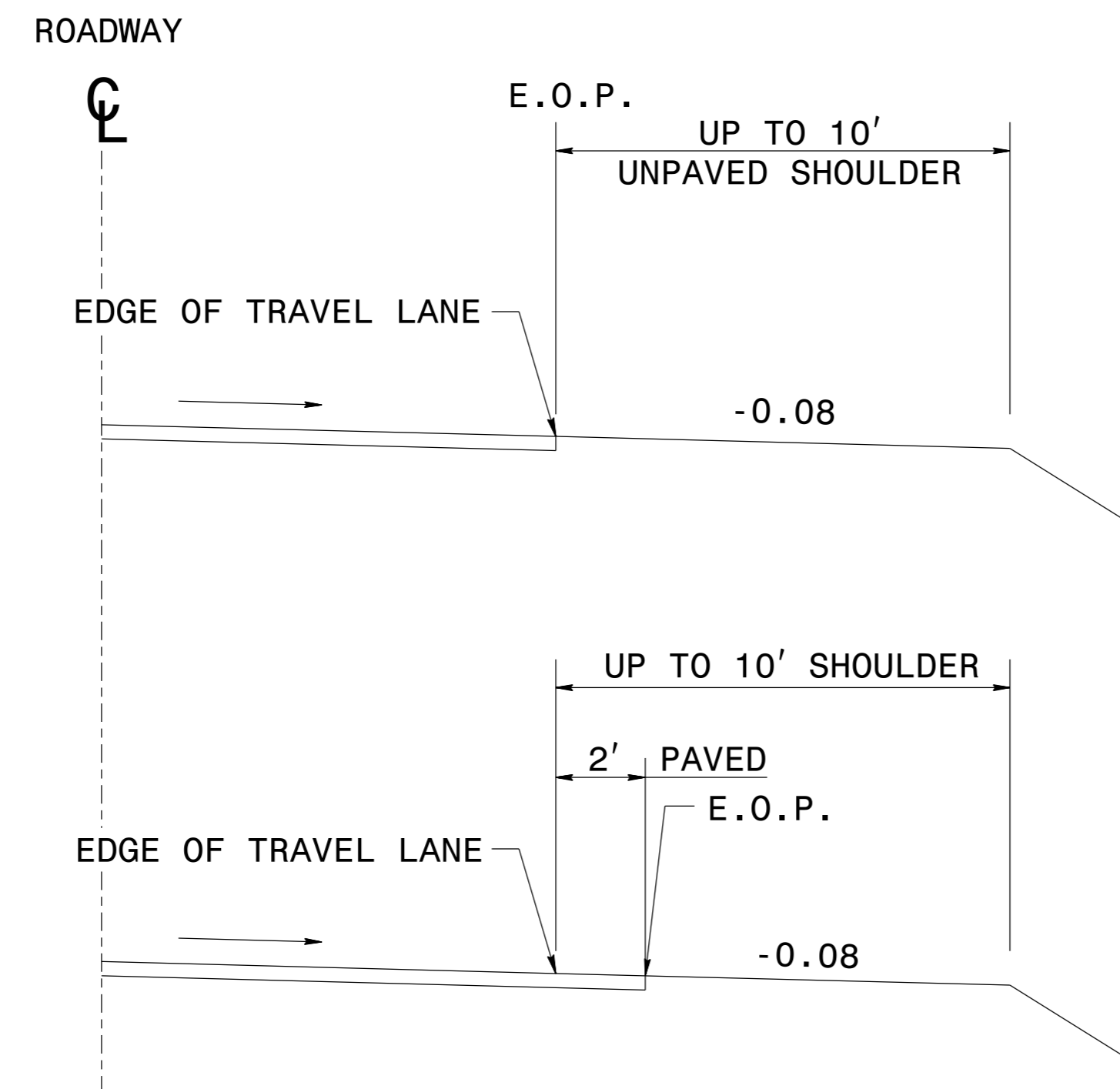
5/14/99

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

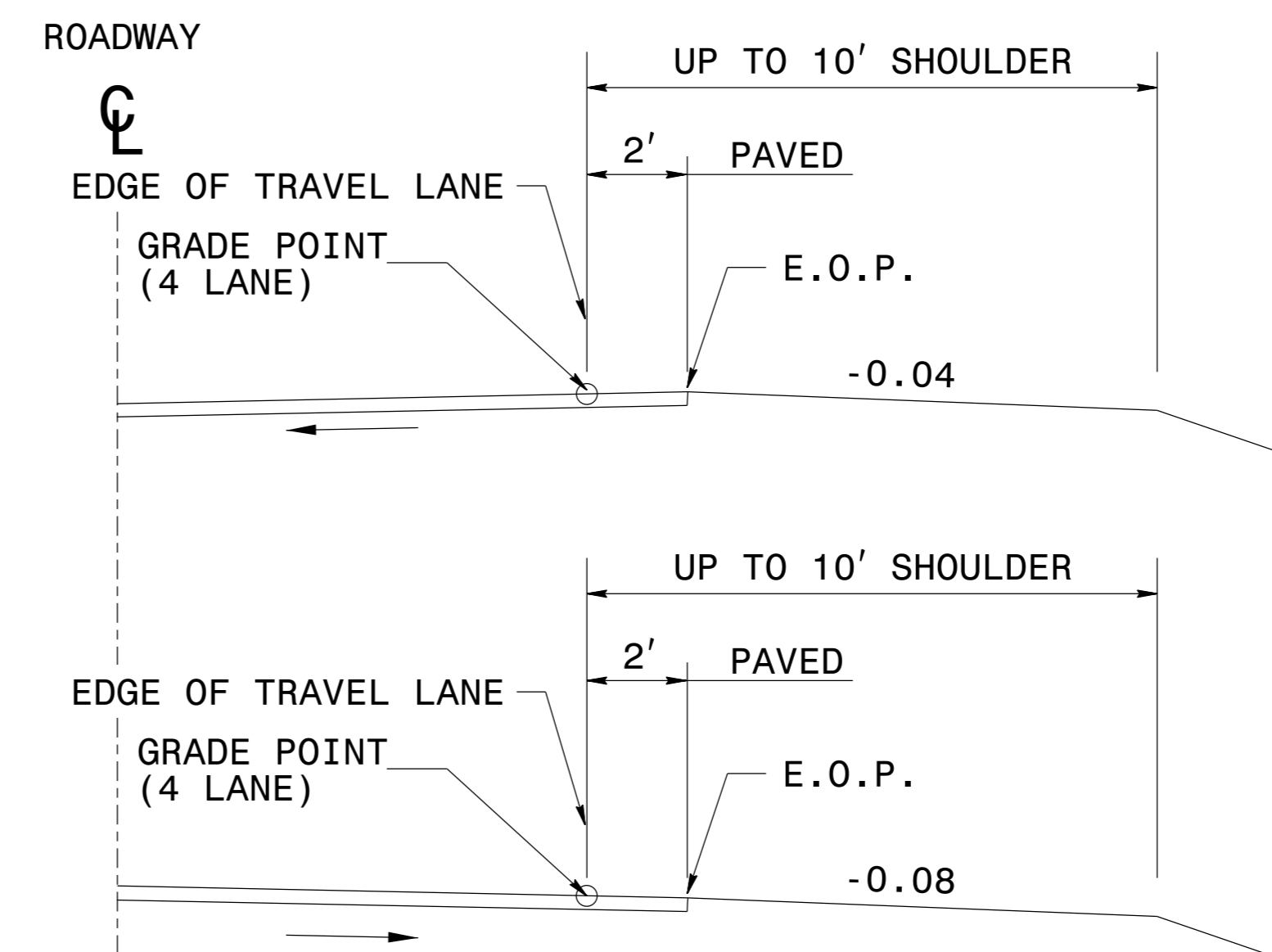
ENGLISH DETAIL DRAWING FOR METHOD OF SHOULDER CONSTRUCTION HIGH SIDE OF SUPERELEVATED CURVE METHOD I (SHOULDERS UP TO 10')

SHEET 1 OF 2 560D01

NORMAL OUTSIDE SHOULDER SLOPES

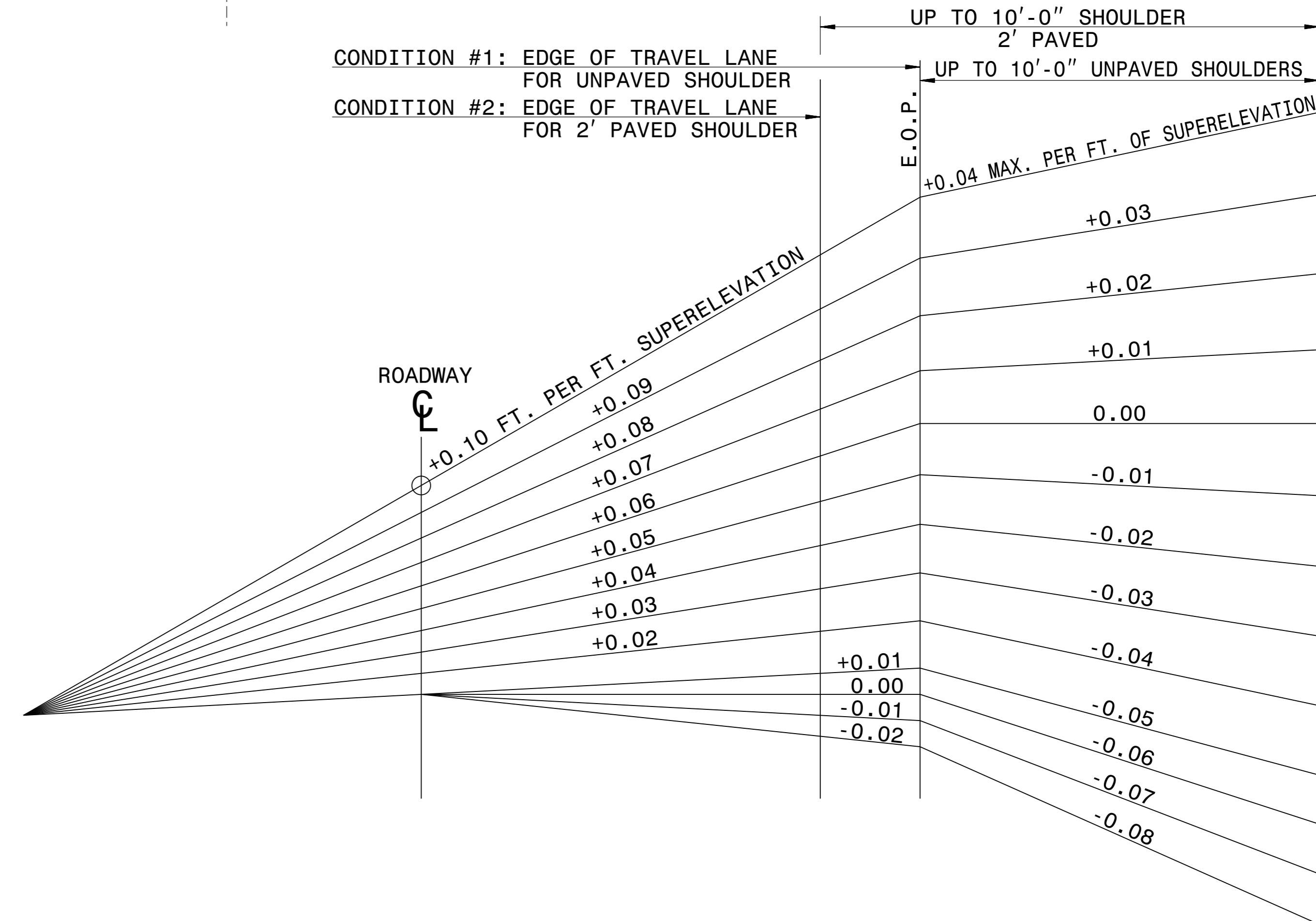


NORMAL MEDIAN SHOULDER SLOPES



CONDITION #1: EDGE OF TRAVEL LANE FOR UNPAVED SHOULDER CONDITION #2: EDGE OF TRAVEL LANE FOR 2' PAVED SHOULDER

NOTE: ON LOW SIDE OF SUPERELEVATED PAVEMENT USE NORMAL SHOULDER SLOPE UNLESS NORMAL SHOULDER SLOPE IS FLATTER THAN SUPERELEVATION, THEN USE SUPER-ELEVATION RATE ON SHOULDER. NOTE: "ROLL-OVER" ALGEBRAIC DIFFERENCE IN RATES OF CROSS SLOPE NOT TO EXCEED 0.06 AS SHOWN. IF SUPER-ELEVATION IS REVOLVED ABOUT CENTER LINE OF PAVEMENT, SAME APPLIES. ON DIVIDED ROADWAYS, GRADE POINT TO BE AT THE MEDIAN EDGE OF TRAVEL LANE.

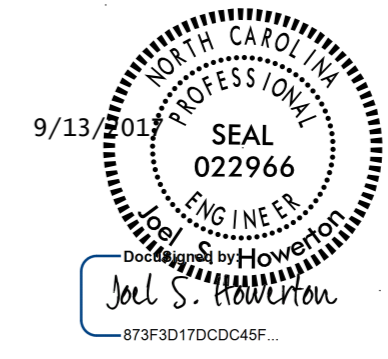


STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR METHOD OF SHOULDER CONSTRUCTION HIGH SIDE OF SUPERELEVATED CURVE METHOD I (SHOULDERS UP TO 10')

SHEET 1 OF 2 560D01

5/14/99



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

SEE PLATE FOR TITLE

ORIGINAL BY: kKempf DATE: 5-15-09 MODIFIED BY: DATE: CHECKED BY: DATE: FILE SPEC: /ericward/stds/stdstodetails/30001/0300d01.dgn

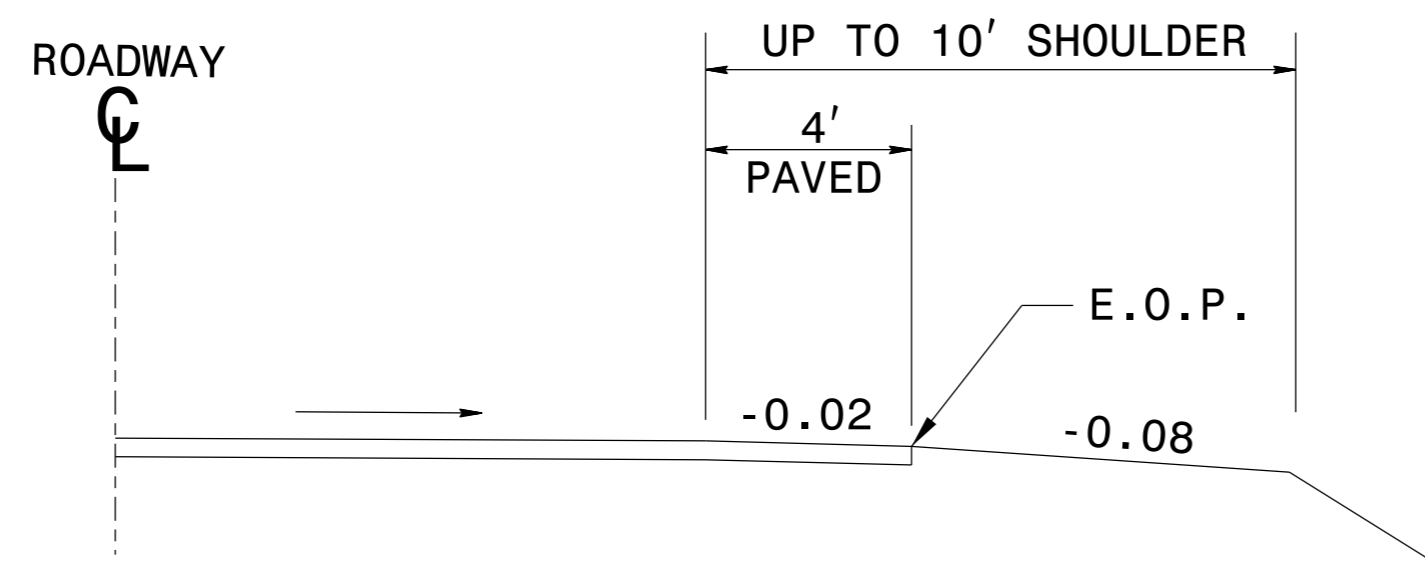
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

ENGLISH DETAIL DRAWING FOR  
**METHOD OF SHOULDER CONSTRUCTION**  
HIGH SIDE OF SUPERELEVATED CURVE  
METHOD I (SHOULDERS UP TO 10')

SHEET 2 OF 2  
**560D01**

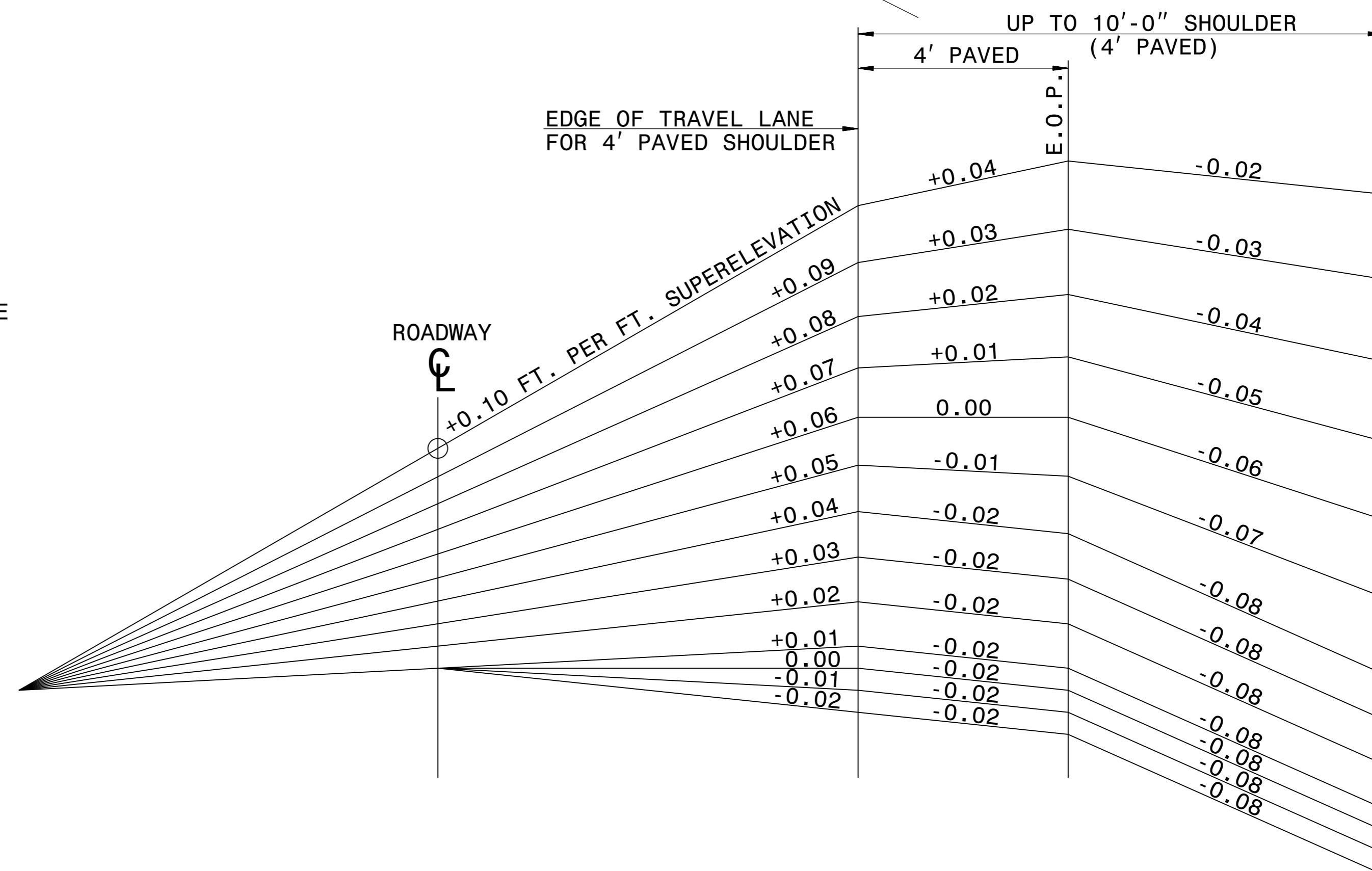
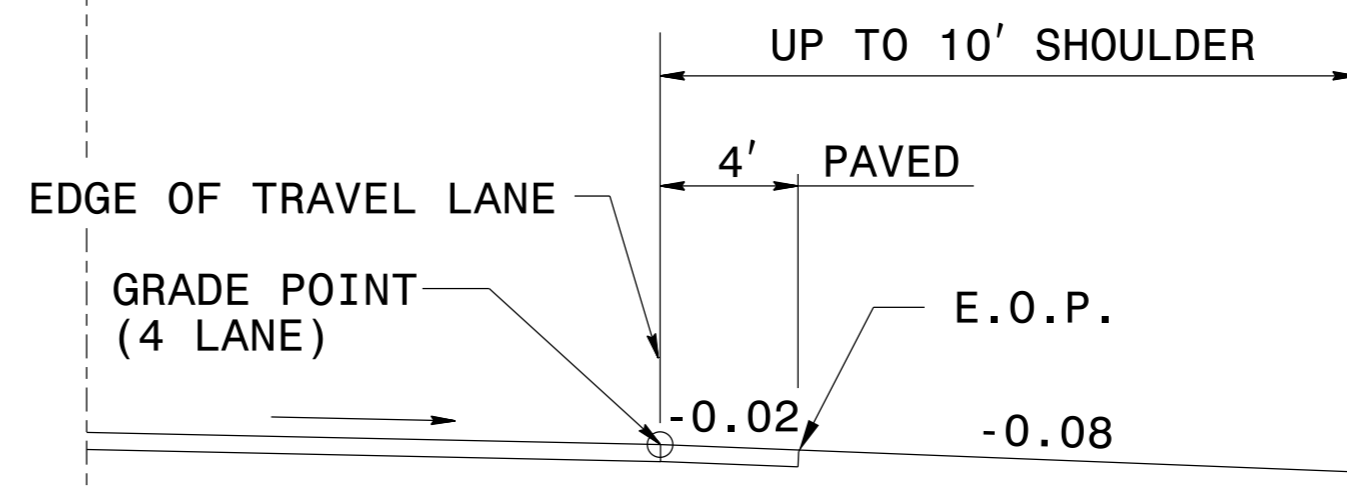
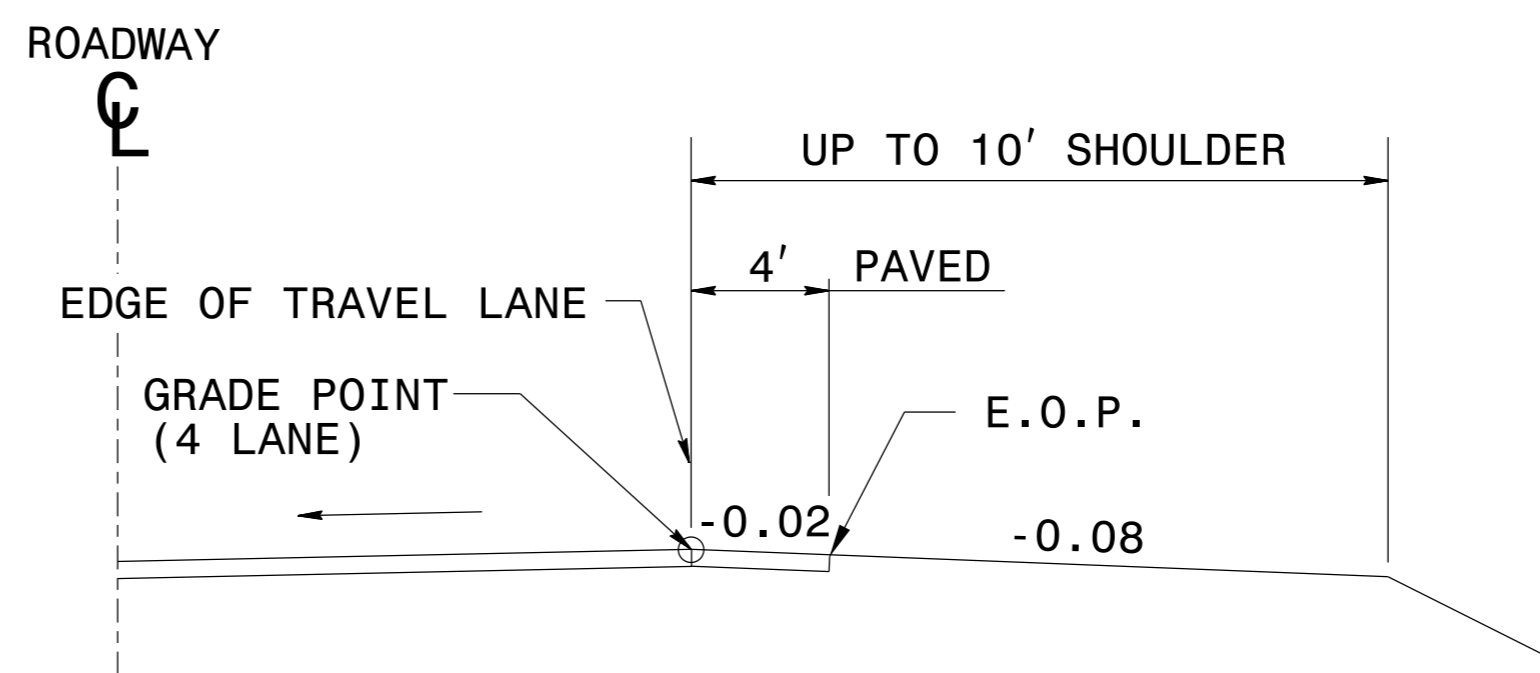
**NORMAL OUTSIDE SHOULDER SLOPES**



NOTE: ON LOW SIDE OF SUPERELEVATED PAVEMENT USE NORMAL SHOULDER SLOPE UNLESS NORMAL SHOULDER SLOPE IS FLATTER THAN SUPERELEVATION, THEN USE SUPER-ELEVATION RATE ON SHOULDER.

NOTE: "ROLL-OVER" ALGEBRAIC DIFFERENCE IN RATES OF CROSS SLOPE NOT TO EXCEED 0.06 AS SHOWN. IF SUPER-ELEVATION IS REVOLVED ABOUT CENTER LINE OF PAVEMENT, SAME APPLIES. ON DIVIDED ROADWAYS, GRADE POINT TO BE AT THE MEDIAN EDGE OF TRAVEL LANE.

**NORMAL MEDIAN SHOULDER SLOPES**



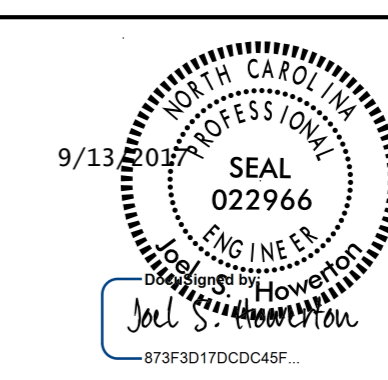
STATE OF NORTH CAROLINA  
DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR  
**METHOD OF SHOULDER CONSTRUCTION**  
HIGH SIDE OF SUPERELEVATED CURVE  
METHOD I (SHOULDERS UP TO 10')

SHEET 2 OF 2  
**560D01**

5/14/99

5/14/99



**CONTRACT STANDARDS AND DEVELOPMENT UNIT**  
Office 919-707-6950 FAX 919-250-4119  
**SEE PLATE FOR TITLE**  
ORIGINAL BY: kKempf DATE: 5-15-09  
MODIFIED BY: DATE:  
CHECKED BY: DATE:  
FILE SPEC: /pricward/stds/stdstodetails/30001/0300d01.dgn

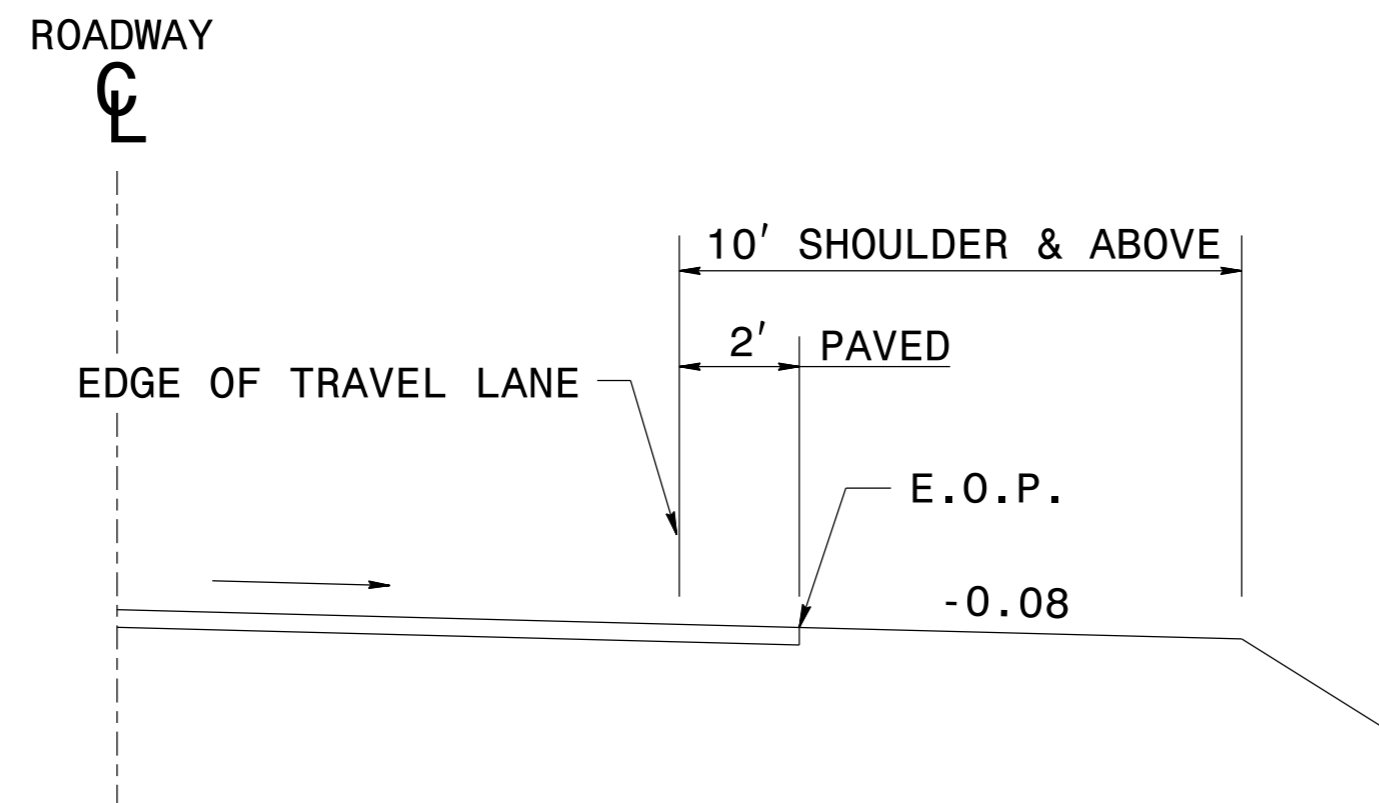
**DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED**

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

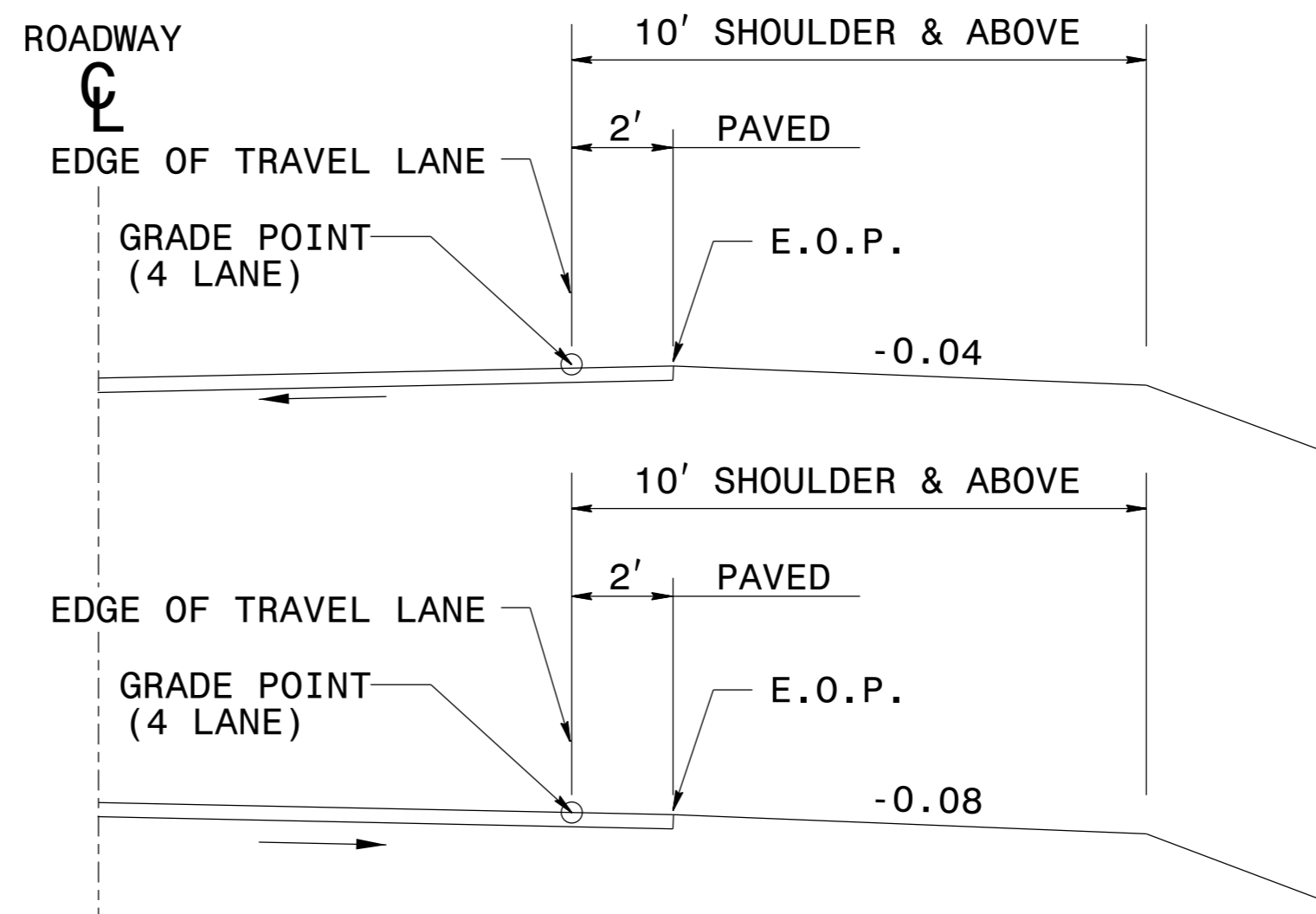
ENGLISH DETAIL DRAWING FOR METHOD OF SHOULDER CONSTRUCTION HIGH SIDE OF SUPERELEVATED CURVE METHOD II (SHOULDERS 10' AND ABOVE)

SHEET 1 OF 1 560D02

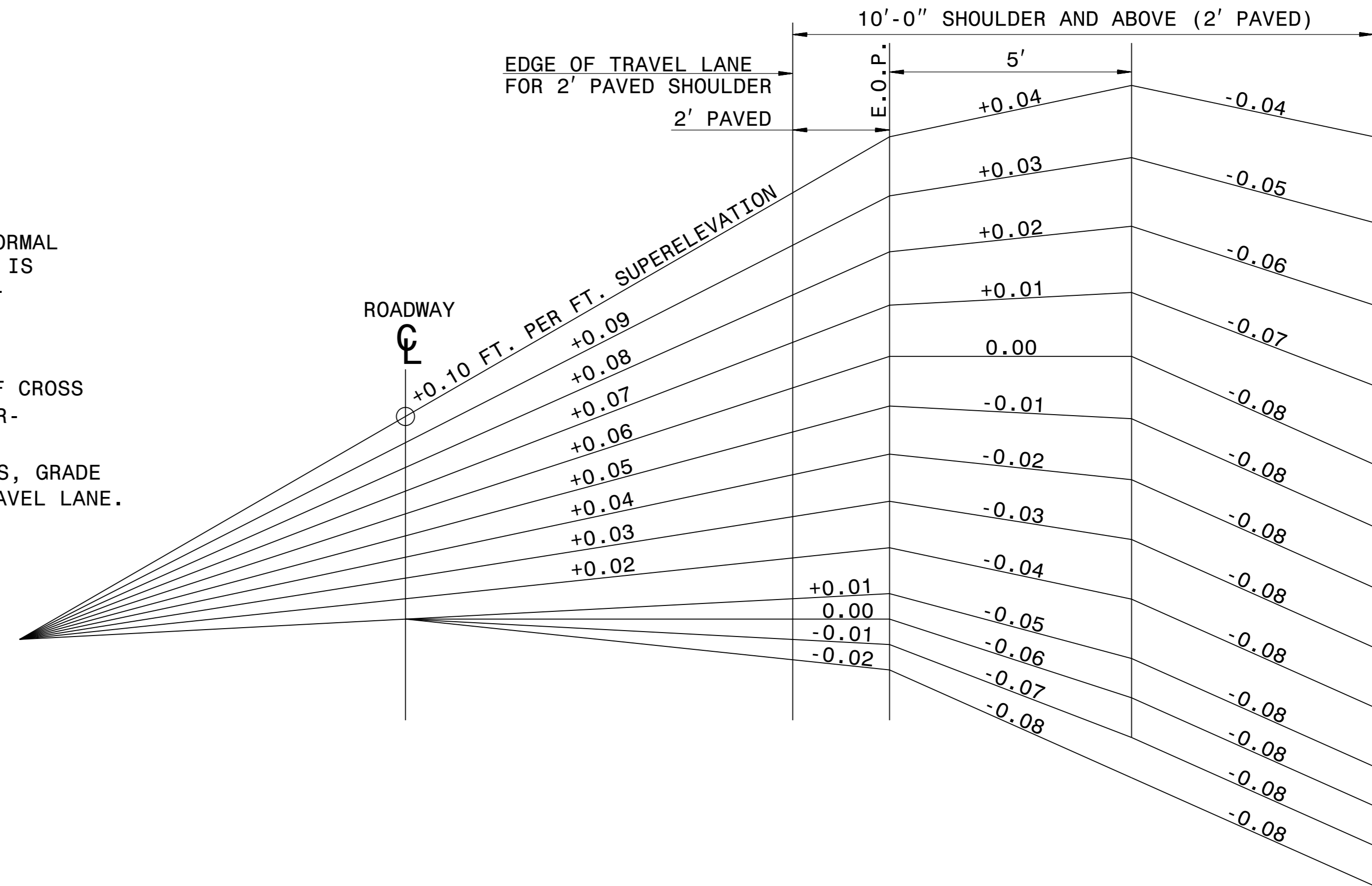
NORMAL OUTSIDE SHOULDER SLOPES



NORMAL MEDIAN SHOULDER SLOPES



NOTE: ON LOW SIDE OF SUPERELEVATED PAVEMENT USE NORMAL SHOULDER SLOPE UNLESS NORMAL SHOULDER SLOPE IS FLATTER THAN SUPERELEVATION, THEN USE SUPER-ELEVATION RATE ON SHOULDER. NOTE: "ROLL-OVER" ALGEBRAIC DIFFERENCE IN RATES OF CROSS SLOPE NOT TO EXCEED 0.06 AS SHOWN. IF SUPER-ELEVATION IS REVOLVED ABOUT CENTER LINE OF PAVEMENT, SAME APPLIES. ON DIVIDED ROADWAYS, GRADE POINT TO BE AT THE MEDIAN EDGE OF INSIDE TRAVEL LANE.

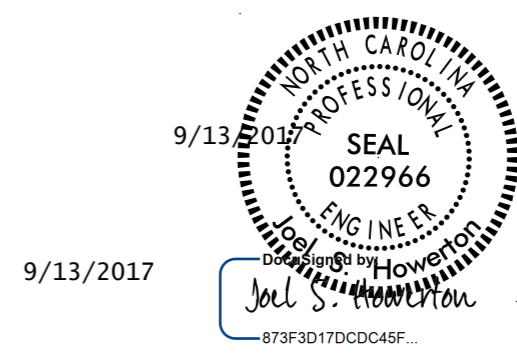


STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

ENGLISH DETAIL DRAWING FOR METHOD OF SHOULDER CONSTRUCTION HIGH SIDE OF SUPERELEVATED CURVE METHOD II (SHOULDERS 10' AND ABOVE)

SHEET 1 OF 1 560D02

\$\$\$\$\$CUTIME\$\$\$\$\$ D:\WORK\560D02\560D02.DWG\$\$\$\$\$ USER:JULIUS\$\$\$\$\$



9/13/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SEE PLATE FOR TITLE

ORIGINAL BY: KKempf DATE: 5-15-09 MODIFIED BY: DATE: CHECKED BY: DATE: FILE SPEC: /ericward/stds/stdstodetail/30001/0300d01.dgn

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

ENGLISH DETAIL DRAWING FOR  
GUIDE FOR PAVING  
SHOULDERS UNDER BRIDGES  
METHOD III

SHEET 1 OF 1  
**610D03**

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

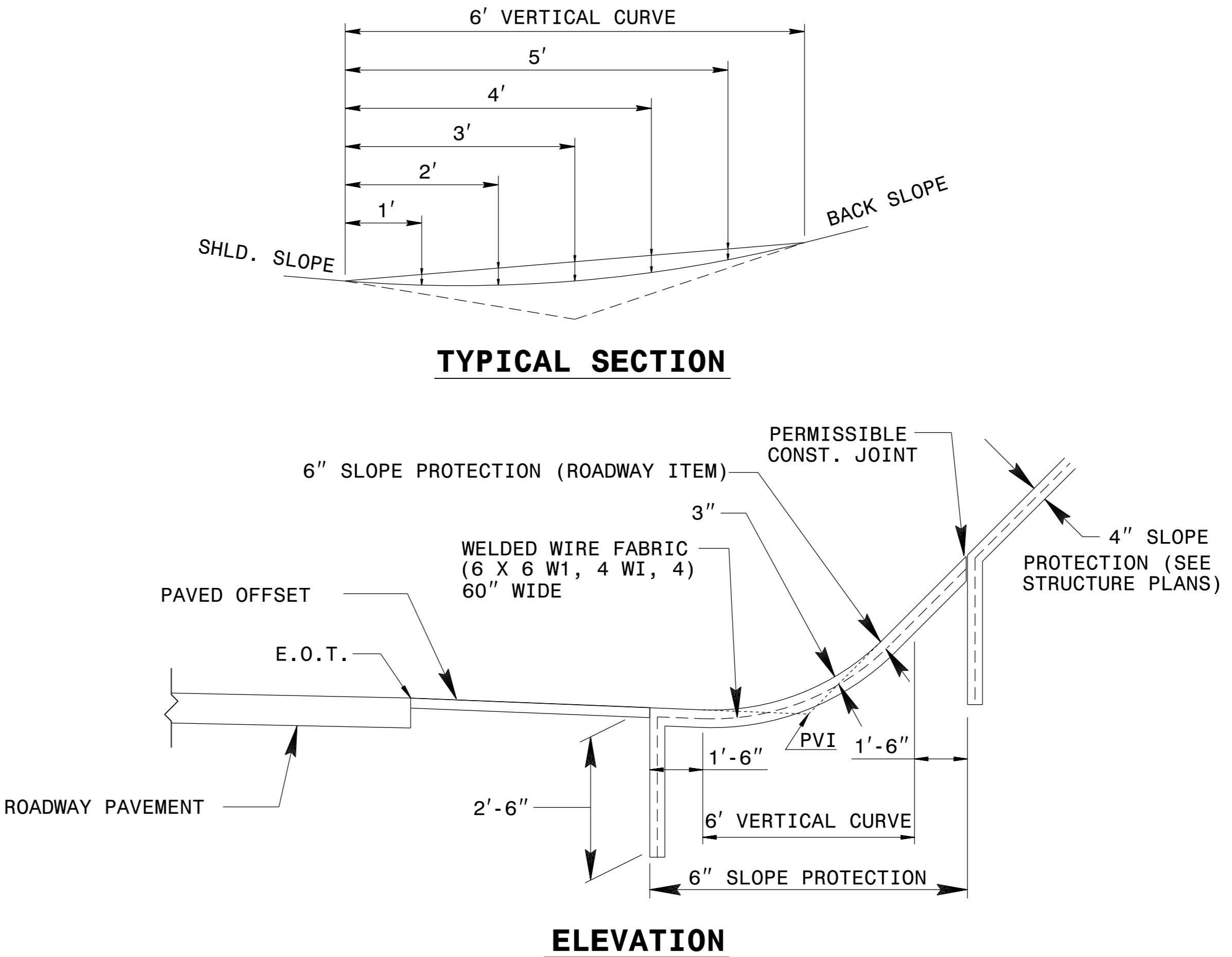
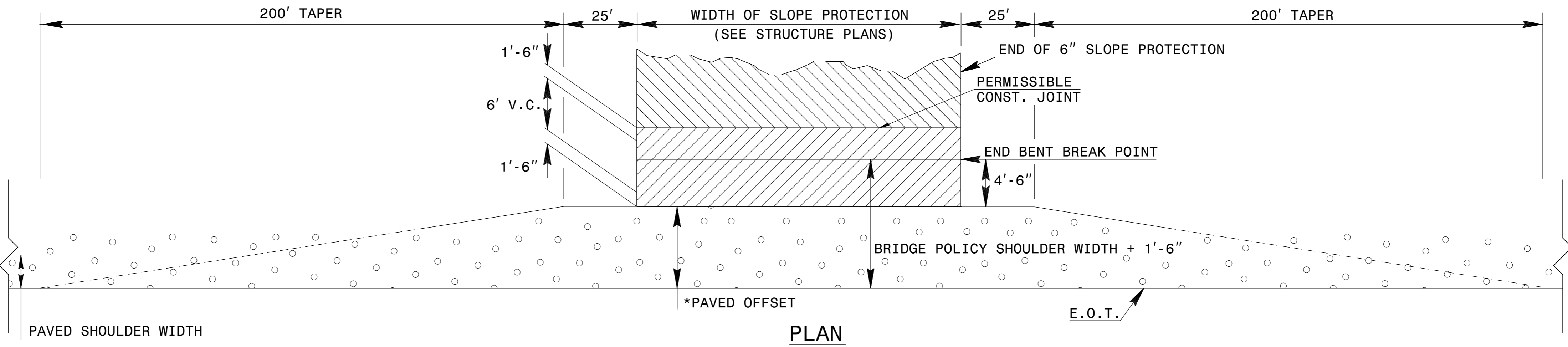
ENGLISH DETAIL DRAWING FOR  
GUIDE FOR PAVING  
SHOULDERS UNDER BRIDGES  
METHOD III

SHEET 1 OF 1  
**610D03**

HORZ. DIM.	1½:1 BACK SLOPE									
	SHOULDER SLOPE									
	.04	.03	.02	.01	.00	-.01	-.02	-.03	-.04	-.05
1'	0.26'	0.27'	0.27'	0.27'	0.28'	0.28'	0.28'	0.29'	0.30'	0.31'
2'	0.42'	0.42'	0.43'	0.44'	0.44'	0.45'	0.46'	0.46'	0.47'	0.48'
3'	0.47'	0.48'	0.49'	0.49'	0.50'	0.51'	0.52'	0.52'	0.53'	0.54'
4'	0.42'	0.42'	0.43'	0.44'	0.44'	0.45'	0.46'	0.46'	0.47'	0.48'
5'	0.26'	0.27'	0.27'	0.27'	0.28'	0.28'	0.28'	0.29'	0.30'	0.31'

HORZ. DIM.	2:1 BACK SLOPE									
	SHOULDER SLOPE									
	.04	.03	.02	.01	.00	-.01	-.02	-.03	-.04	-.05
1'	0.19'	0.20'	0.20'	0.20'	0.21'	0.21'	0.22'	0.22'	0.23'	0.23'
2'	0.31'	0.31'	0.32'	0.33'	0.33'	0.34'	0.35'	0.35'	0.36'	0.37'
3'	0.35'	0.35'	0.36'	0.37'	0.38'	0.38'	0.39'	0.40'	0.41'	0.41'
4'	0.31'	0.31'	0.32'	0.33'	0.33'	0.34'	0.35'	0.35'	0.36'	0.37'
5'	0.19'	0.20'	0.20'	0.20'	0.21'	0.21'	0.22'	0.22'	0.23'	0.23'

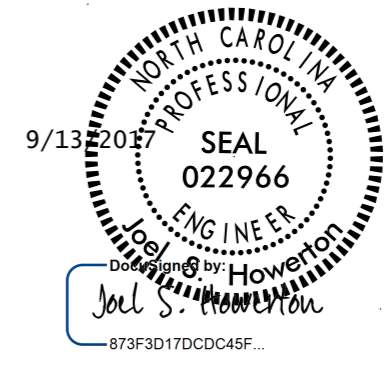
**VERTICAL CURVE OFFSET**  
(FOR 6' V.C. AT BRIDGES)



**TYPICAL SECTION**

**ELEVATION**

NOTES:  
 PAVE THE FULL WIDTH OF THE SHOULDER AS SHOWN WITH SHOULDER PAVEMENT MATERIAL AS SHOWN ON PLANS.  
 \* PAVED OFFSET BASED ON BRIDGE POLICY (SEE STRUCTURE PLANS).  
 PROTECT SLOPE WITH REINFORCED CONCRETE PAVING. CONCRETE BLOCK PAVING WILL NOT BE PERMITTED.  
 OFFSETS FOR 6' V.C. DENOTES FINISHED GRADE OF SLOPE PROTECTION.



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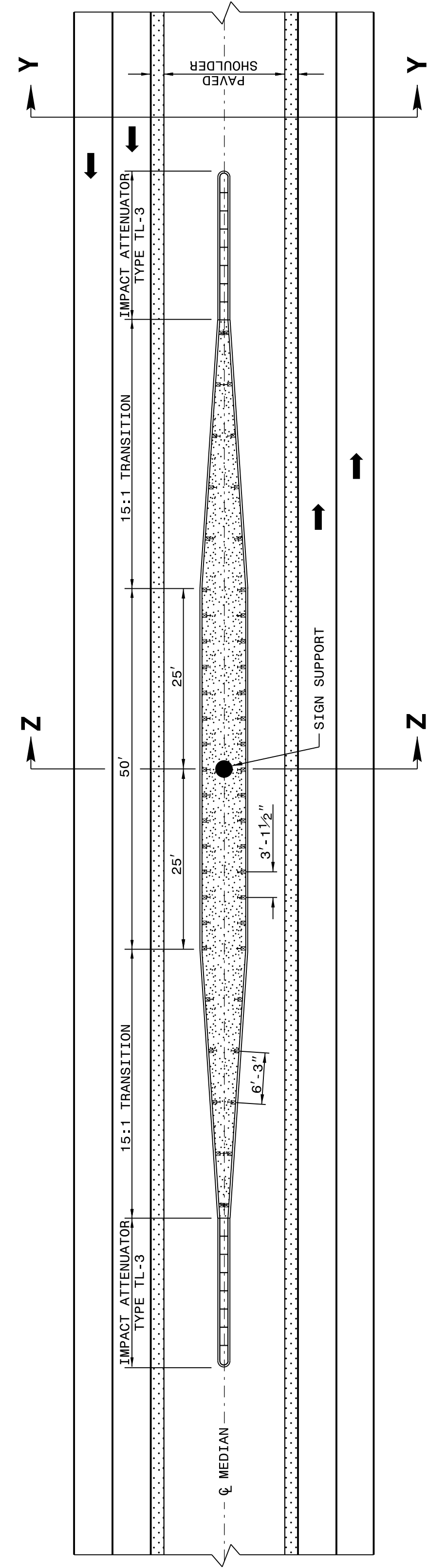
ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL PLACEMENT**

SHEET 2 OF 11  
**862D01**

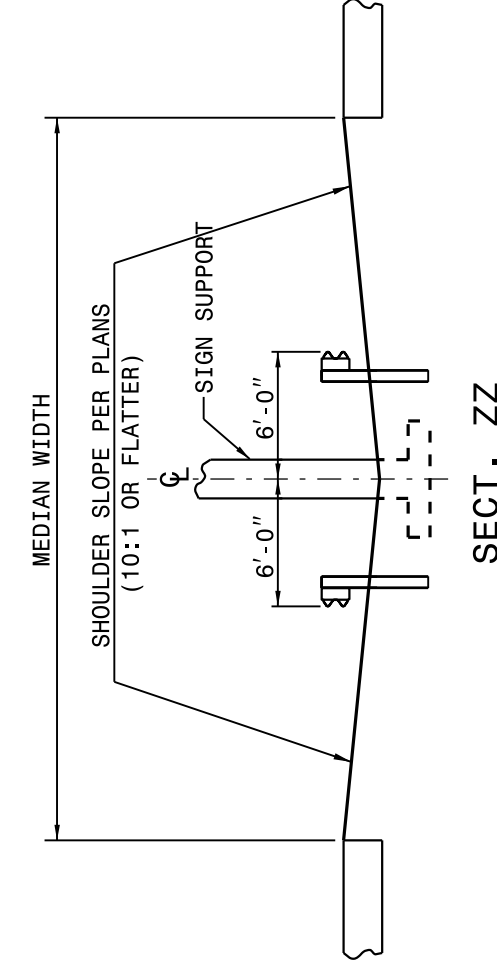
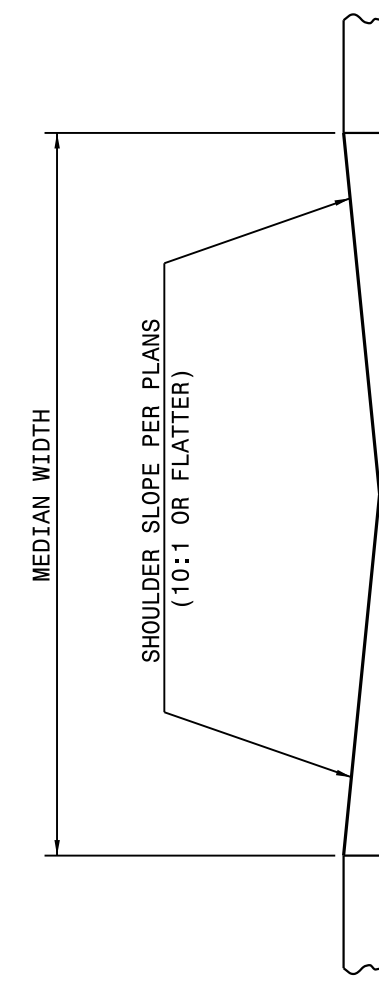
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ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL PLACEMENT**

SHEET 2 OF 11  
**862D01**



NOTE SPECIAL LAYER OF PAVEMENT .....  
 USE 3'-1 1/2" 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).

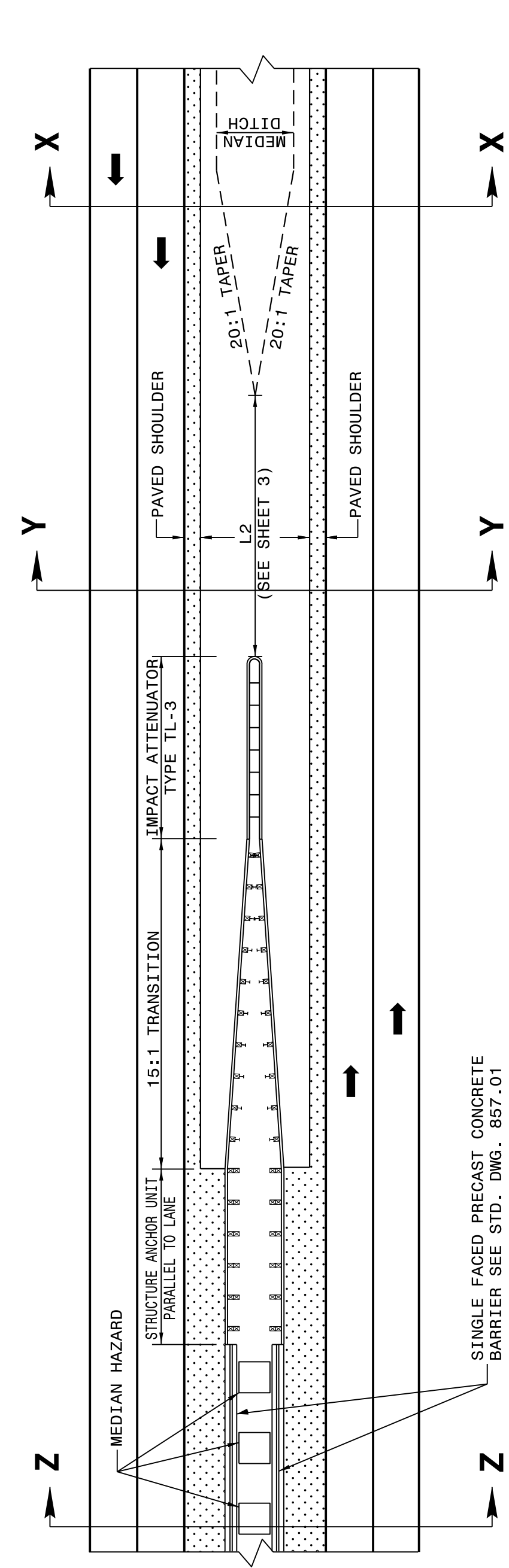


**DETAIL OF GUARDRAIL AT MEDIAN SIGN SUPPORT**

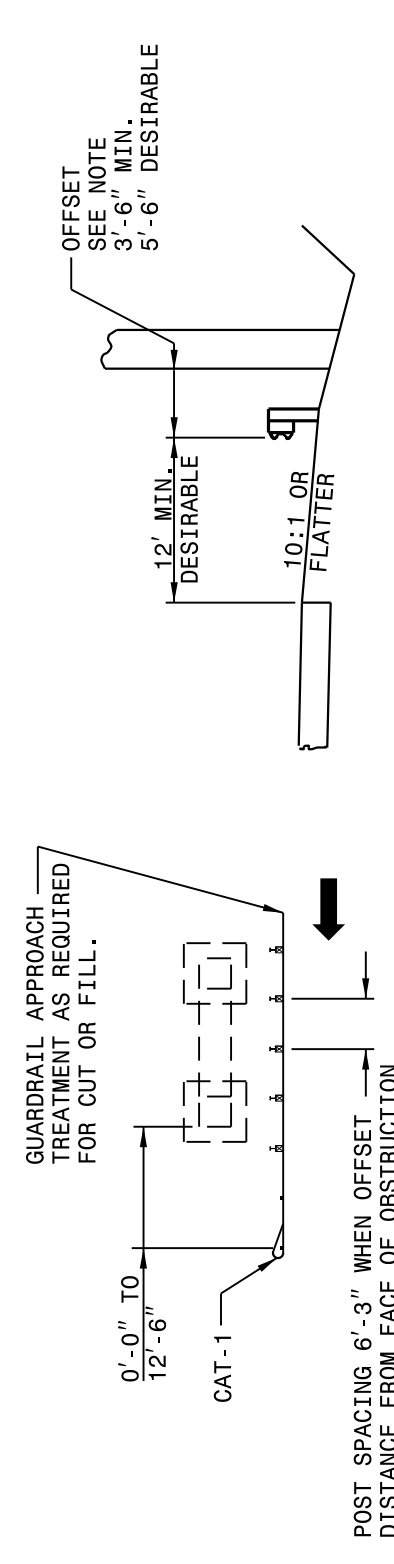
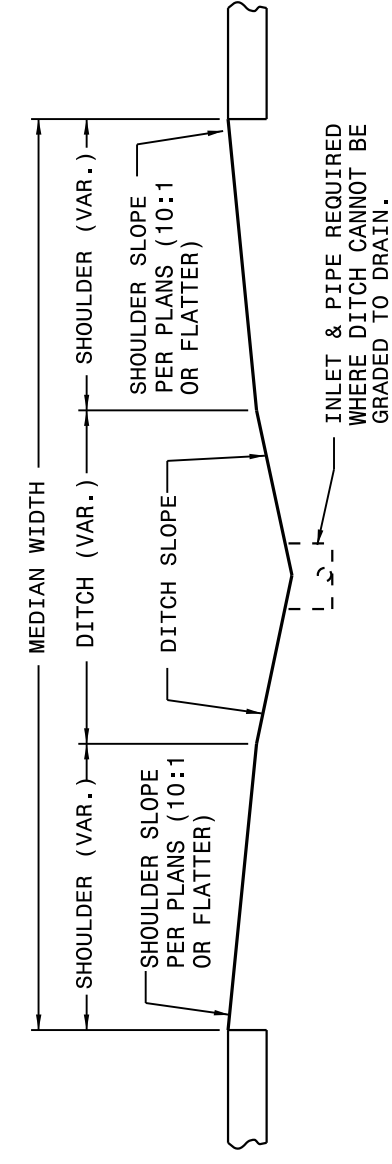
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ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL PLACEMENT**

SHEET 1 OF 11  
**862D01**



SINGLE FACED PRECAST CONCRETE BARRIER SEE STD. DWG. 857.01



NOTE: WHEN OFFSET DISTANCE FROM FACE OF OBSTRUCTION TO FACE OF GUARDRAIL IS BETWEEN 3'-6" AND 5'-6" BEGIN 3'-1 1/2" 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**

**DETAIL OF MEDIAN TREATMENT AT UNDERPASS**

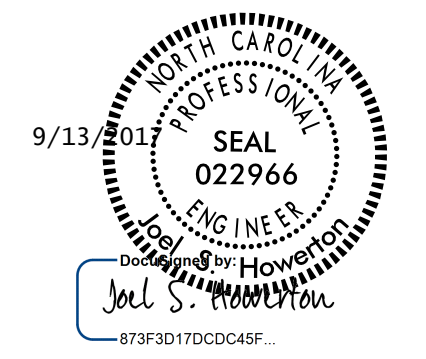
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**862D01**

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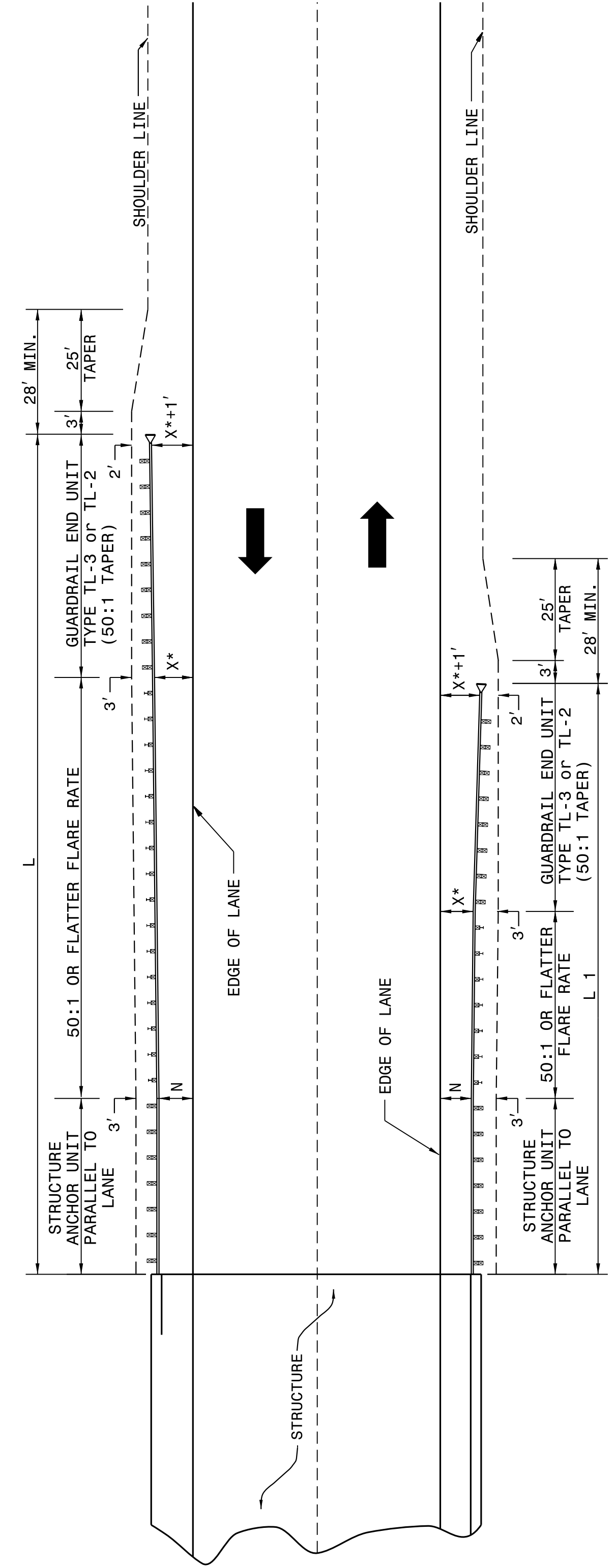
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ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL PLACEMENT**

ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL PLACEMENT**



**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	UNDER 2000
70	362.5'	382.5'	350.0'	287.5'	187.5'	175.0'
60	300.0'	287.5'	275.0'	225.0'	137.5'	100.0'
50	212.5'	212.5'	200.0'	162.5'	87.5'	75.0'
40	175.0'	150.0'	137.5'	112.5'	75.0'	75.0'
X*	8'	6'	4'	4'	8'	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

SHEET 4 OF 11  
**862D01**

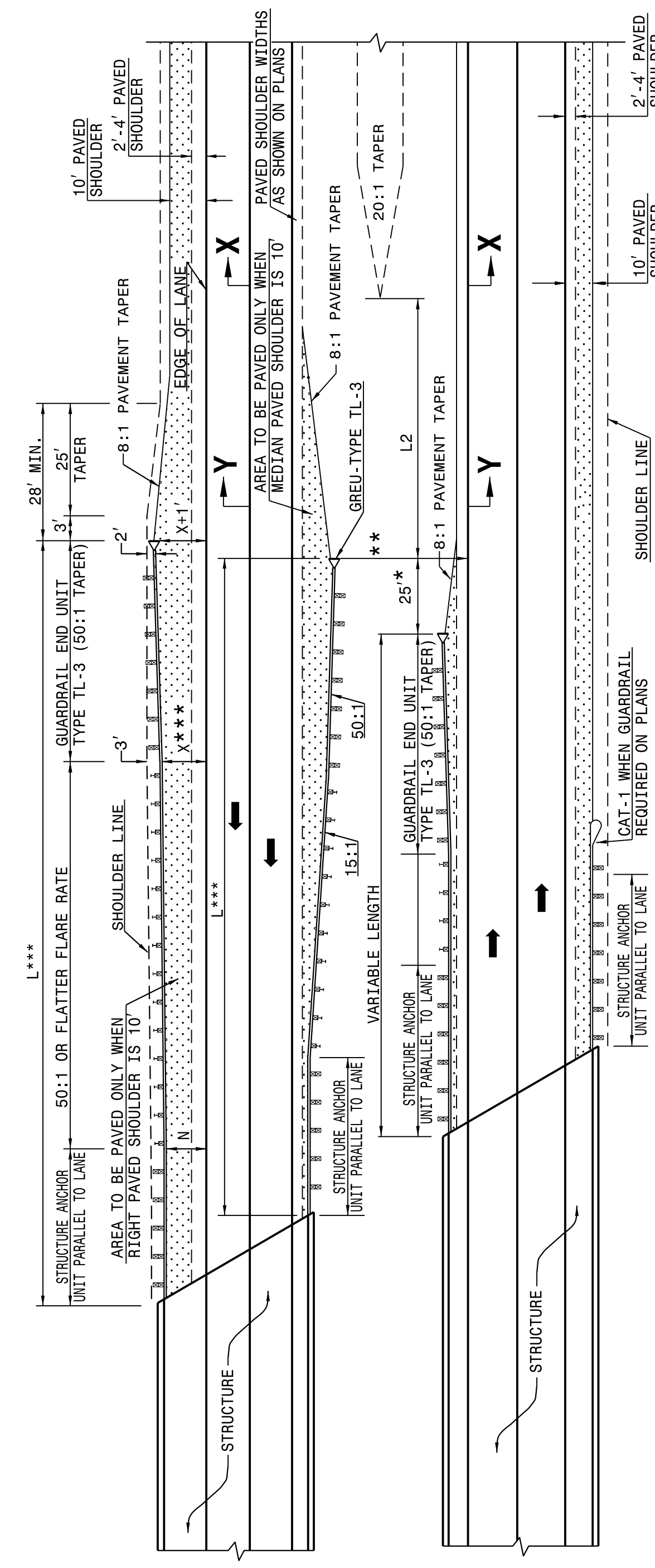
**LENGTHS AND OFFSETS FOR PROPOSED GUARDRAIL AT TWO LANE - TWO WAY LOCATIONS**

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ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL PLACEMENT**

ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL PLACEMENT**



**DIMENSIONS FOR LENGTH OF GUARDRAIL APPROACHING DUAL LANE BRIDGES**

MEDIAN WIDTH	70 MPH	60 MPH	50 MPH	-L2- 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'

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

NOTES: \* MINOR VARIATION TO THE 25'-0" DIMENSION IS PERMISSIBLE TO ACCOMMODATE 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

SHEET 3 OF 11  
**862D01**

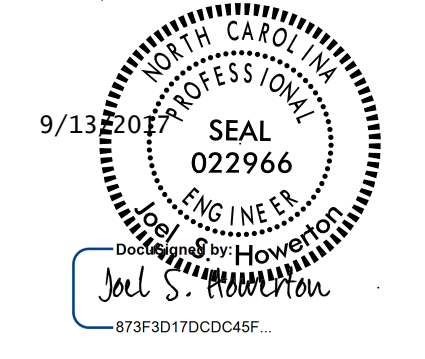
**DETAIL OF GUARDRAIL APPROACHING DUAL LANE BRIDGES**

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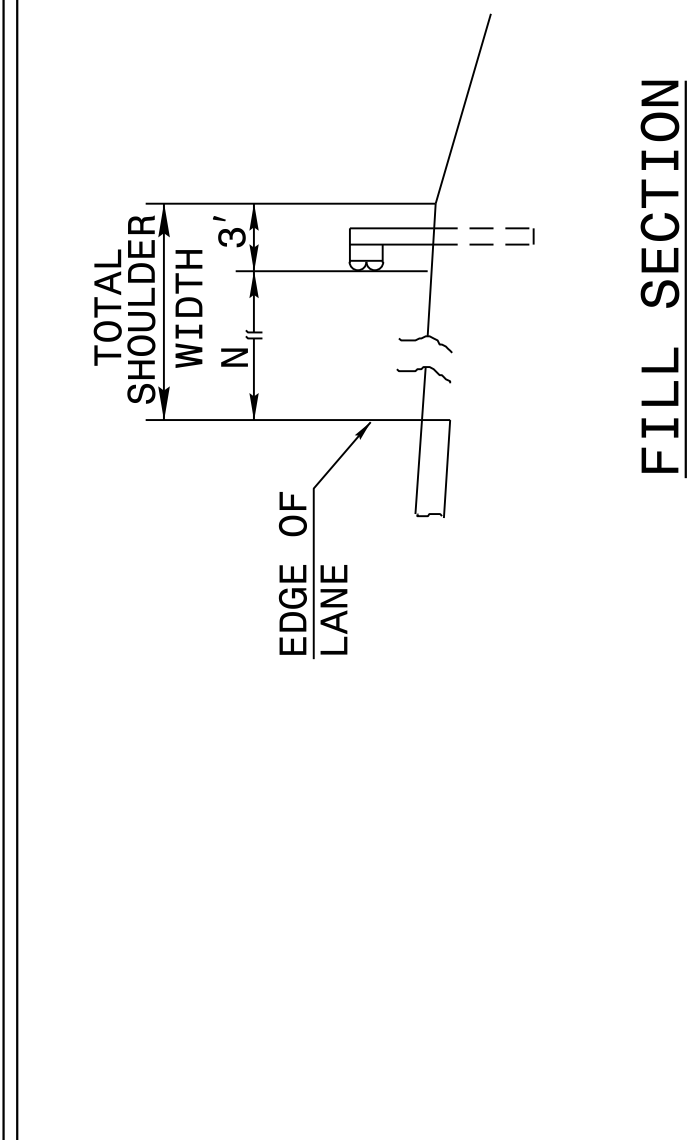


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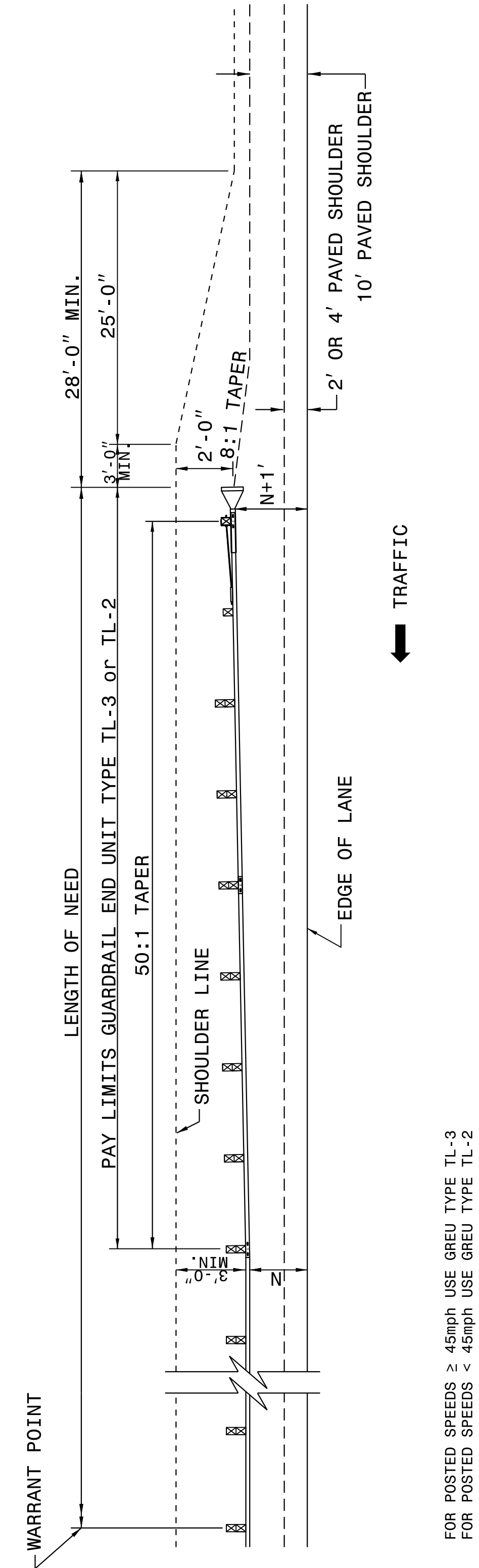
ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL PLACEMENT**

SHEET 6 OF 11  
**862D01**



**FILL 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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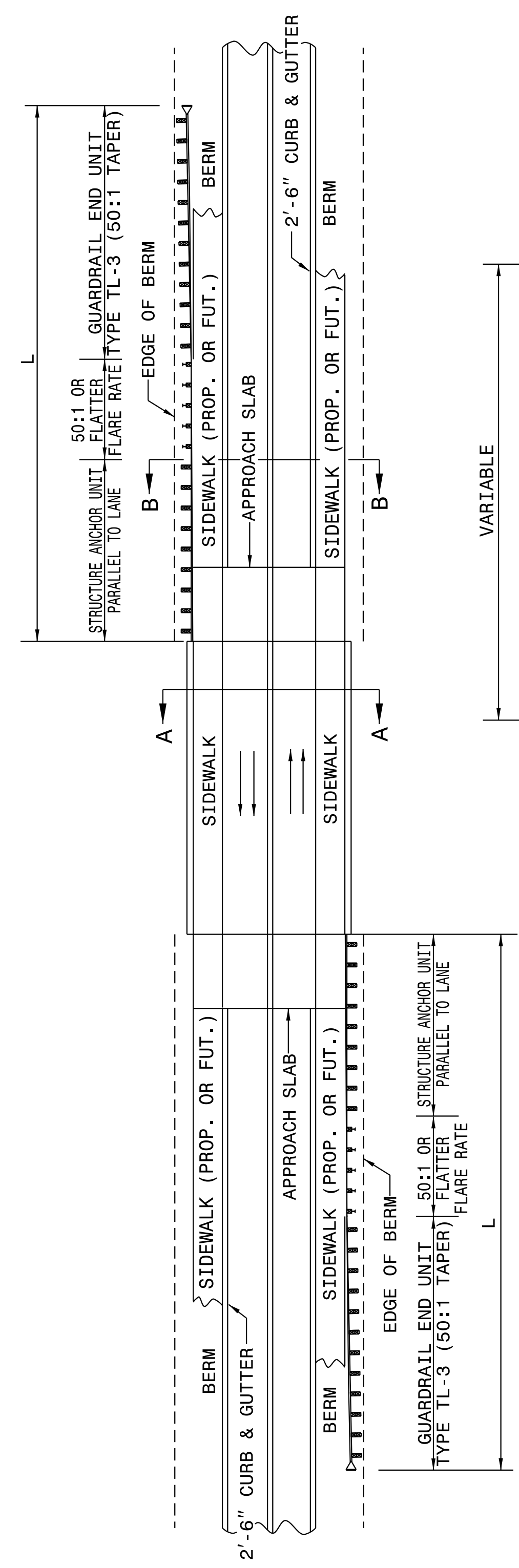
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**GUARDRAIL PLACEMENT**

SHEET 6 OF 11  
**862D01**

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ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL PLACEMENT**

SHEET 5 OF 11  
**862D01**



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

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

ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL PLACEMENT**

SHEET 5 OF 11  
**862D01**

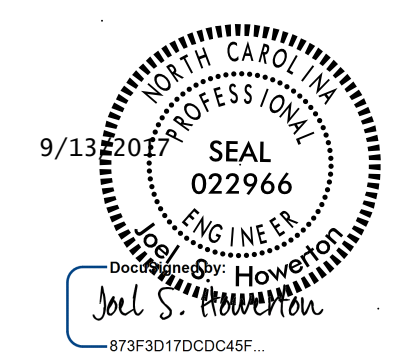
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STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.	ROADWAY DETAIL DRAWING FOR <b>GUARDRAIL PLACEMENT</b>	SHEET 8 OF 11 <b>862D01</b>
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**DETAIL-1**

**DETAIL-2**

**GUARDRAIL TREATMENT AT INTERSECTIONS**

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.	ROADWAY DETAIL DRAWING FOR <b>GUARDRAIL PLACEMENT</b>	SHEET 8 OF 11 <b>862D01</b>
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STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.	ROADWAY DETAIL DRAWING FOR <b>GUARDRAIL PLACEMENT</b>	SHEET 7 OF 11 <b>862D01</b>
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**DETAIL AT UNDERPASSES**

**DETAIL AT OVERPASSES**

**GUARDRAIL BREAK INTERVALS WITH 30' - 36' MEDIANS**

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.	ROADWAY DETAIL DRAWING FOR <b>GUARDRAIL PLACEMENT</b>	SHEET 7 OF 11 <b>862D01</b>
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**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

\* GUARDRAIL OPENING MAY BE SPACED AS CLOSE AS 350 FT. FROM STRUCTURE IF NECESSARY TO ALLOW MOWER ACCESS TO MEDIAN

\* 500' TO 5280' FROM BRIDGE

\* 500' TO 5280' FROM BRIDGE

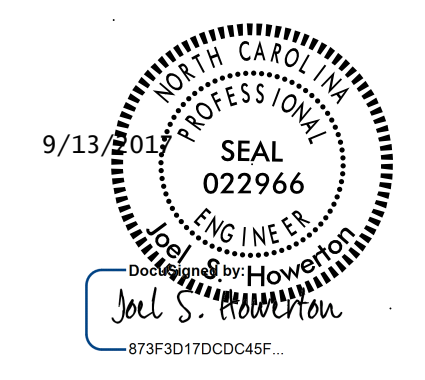
FOR POSTED SPEEDS ≥ 45mph USE GREU TYPE TL-3  
 FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2

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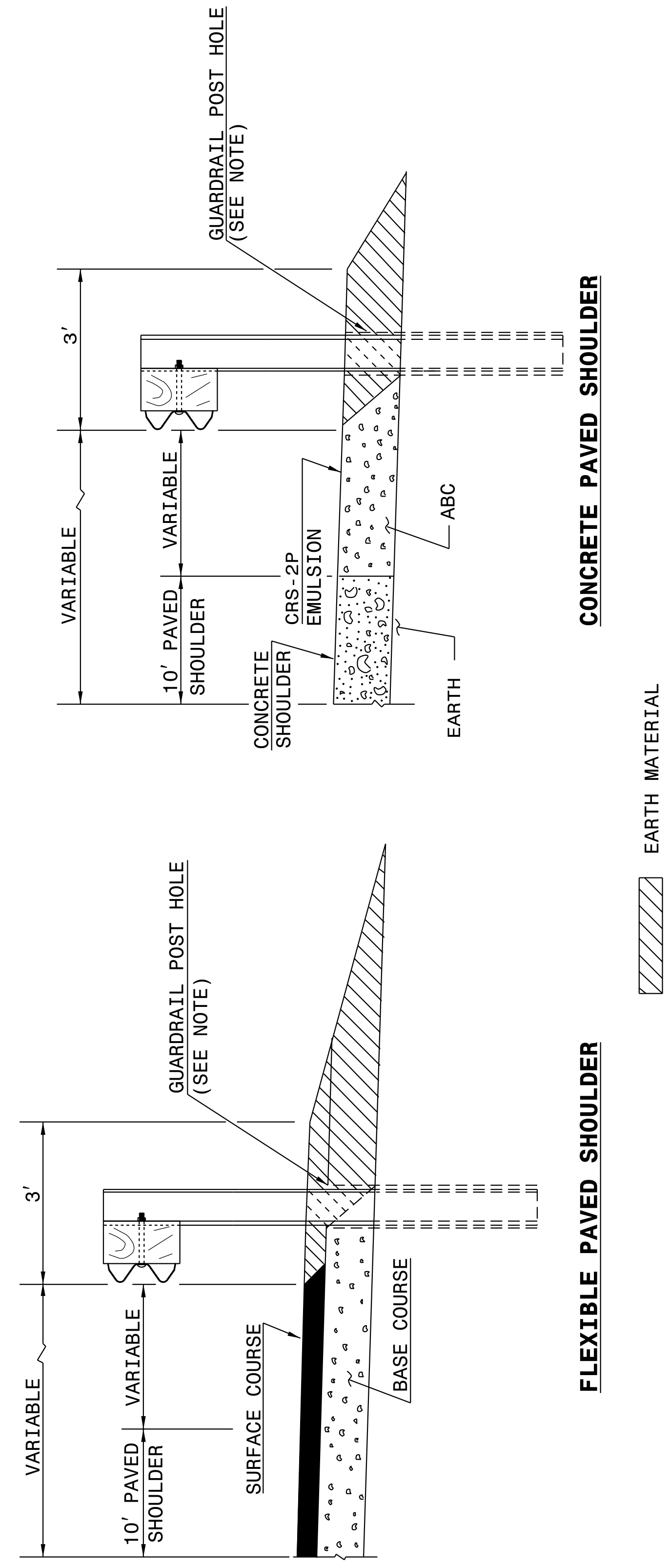


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ENGLISH DETAIL DRAWING FOR  
**GUARDRAIL PLACEMENT**

SHEET 10 OF 11  
**862D01**



**FLEXIBLE PAVED SHOULDER**

**CONCRETE PAVED SHOULDER**

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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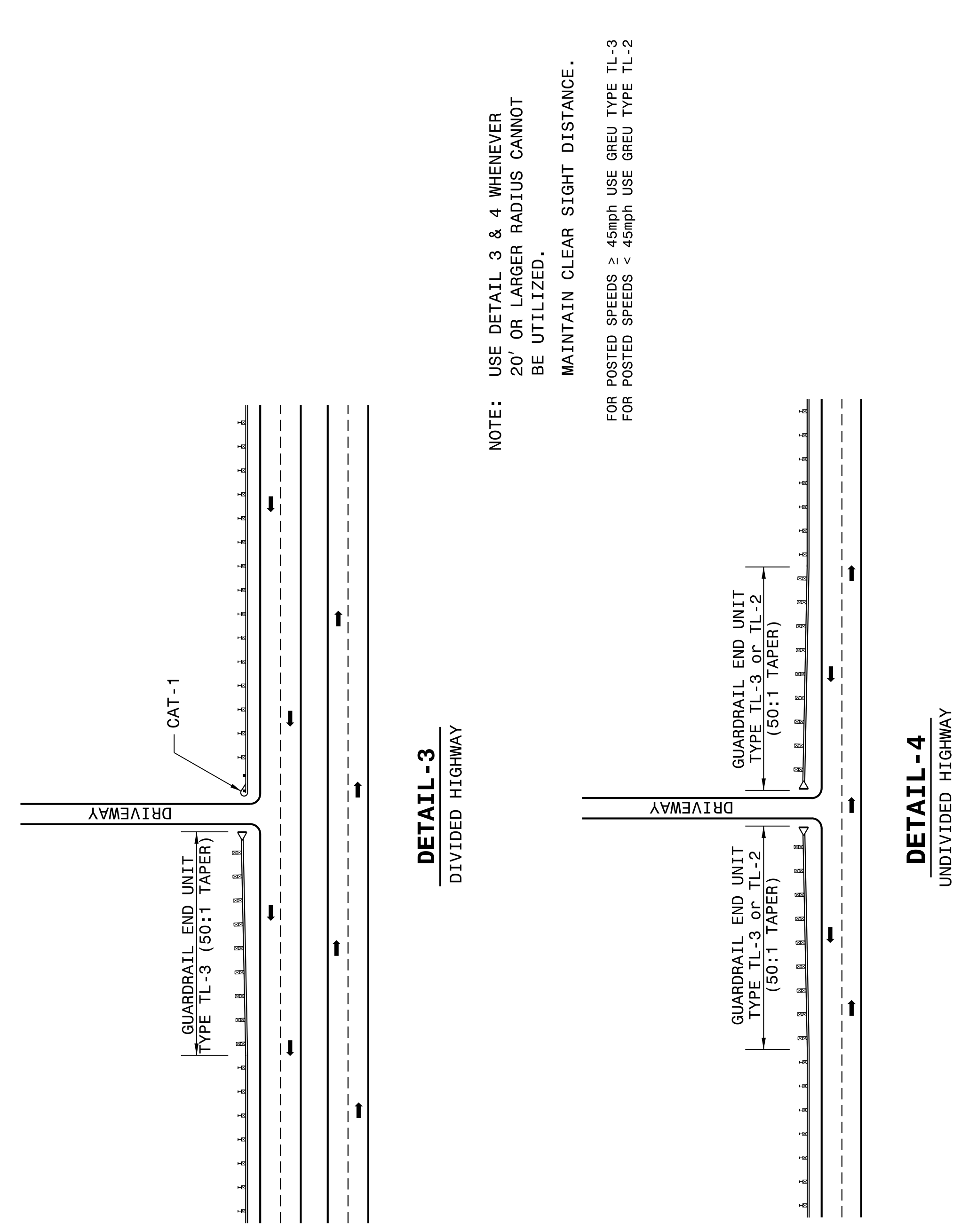
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**GUARDRAIL PLACEMENT**

SHEET 9 OF 11  
**862D01**

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ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL PLACEMENT**

SHEET 9 OF 11  
**862D01**



**DETAIL -3**  
 DIVIDED HIGHWAY

**DETAIL -4**  
 UNDIVIDED HIGHWAY

**GUARDRAIL TREATMENT AT DRIVEWAYS**

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

FOR POSTED SPEEDS  $\geq$  45mph USE GREU TYPE TL-3  
 FOR POSTED SPEEDS  $<$  45mph USE GREU TYPE TL-2

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ROADWAY DETAIL DRAWING FOR  
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SHEET 10 OF 11  
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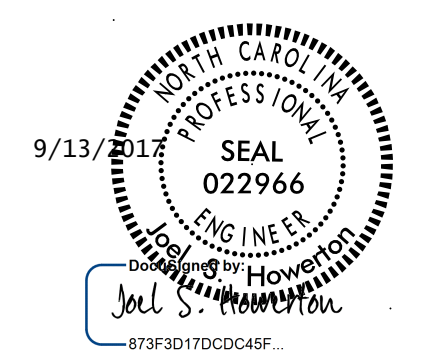
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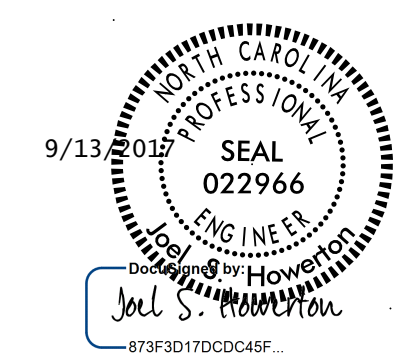
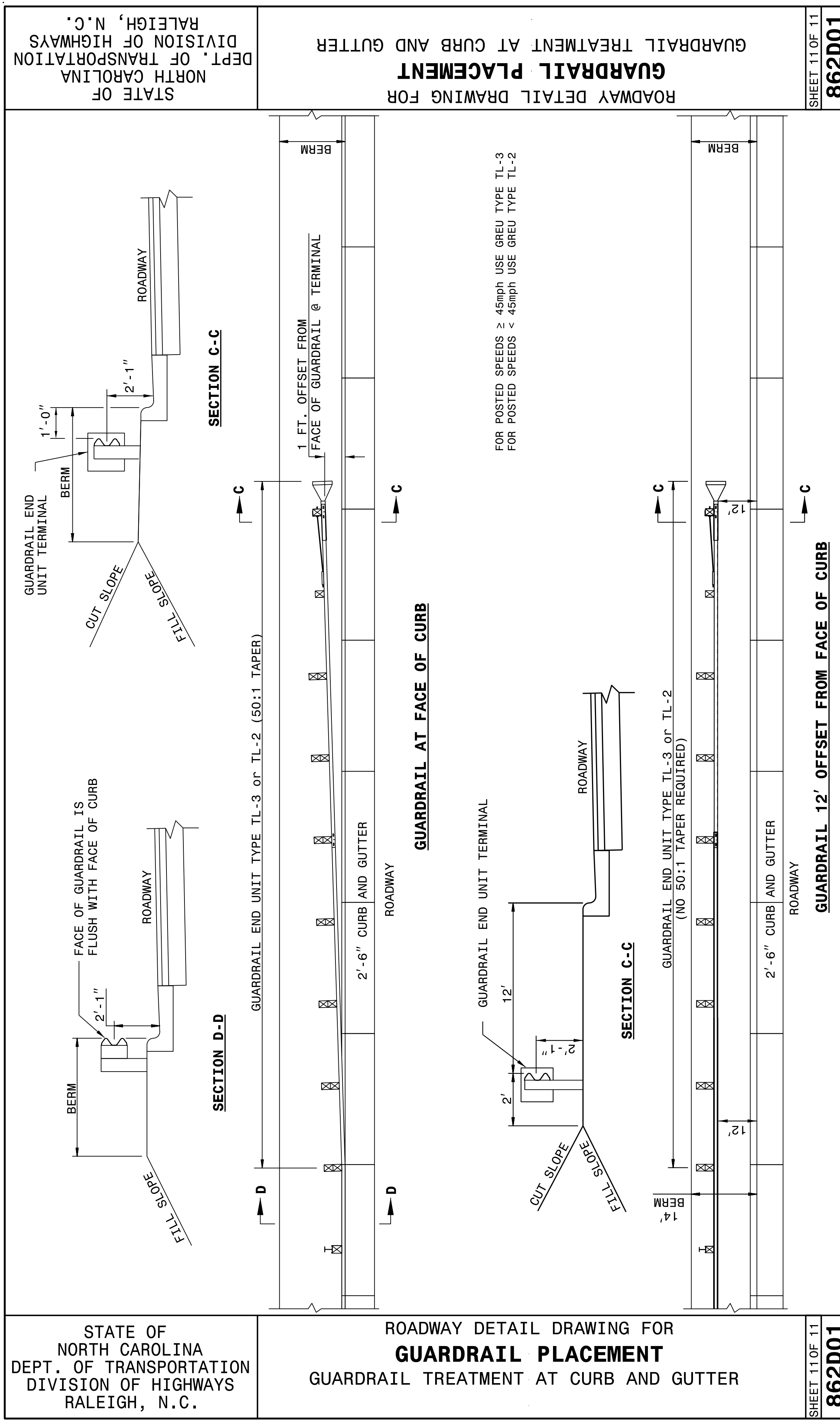
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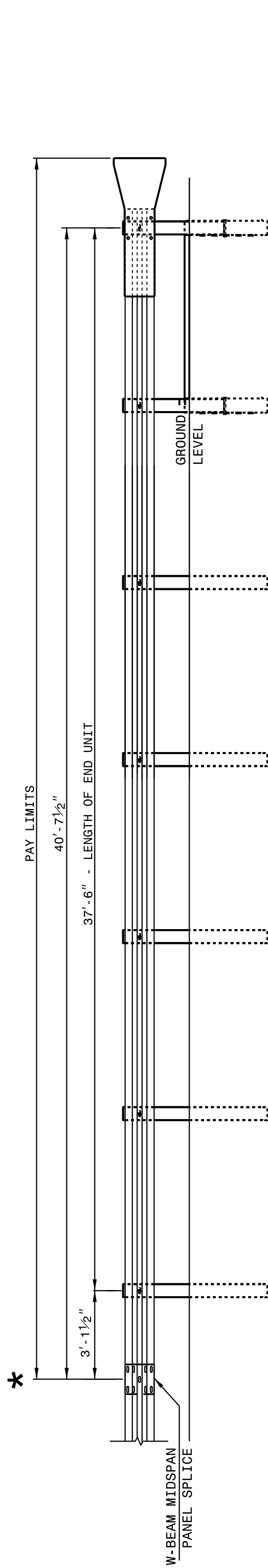
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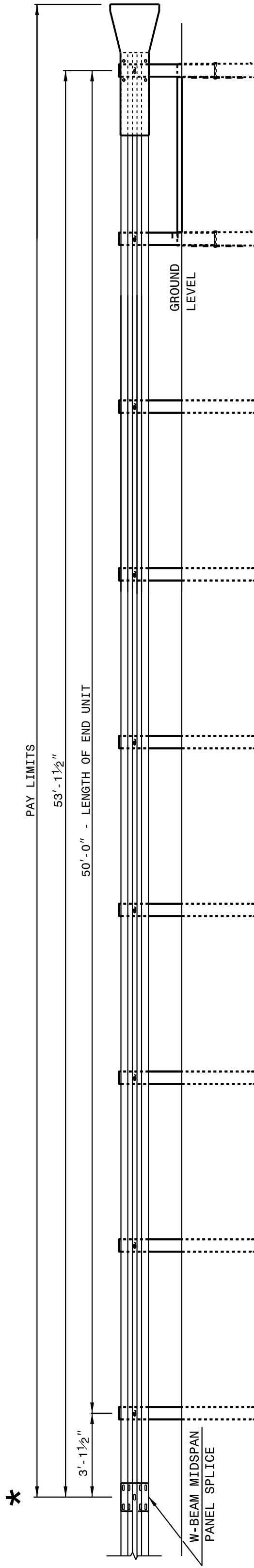
ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL INSTALLATION**

SHEET 2 OF 8  
**862D02**



**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.



**FLARED AND TANGENT  
ELEVATION VIEW**

**APPROACH END UNITS**

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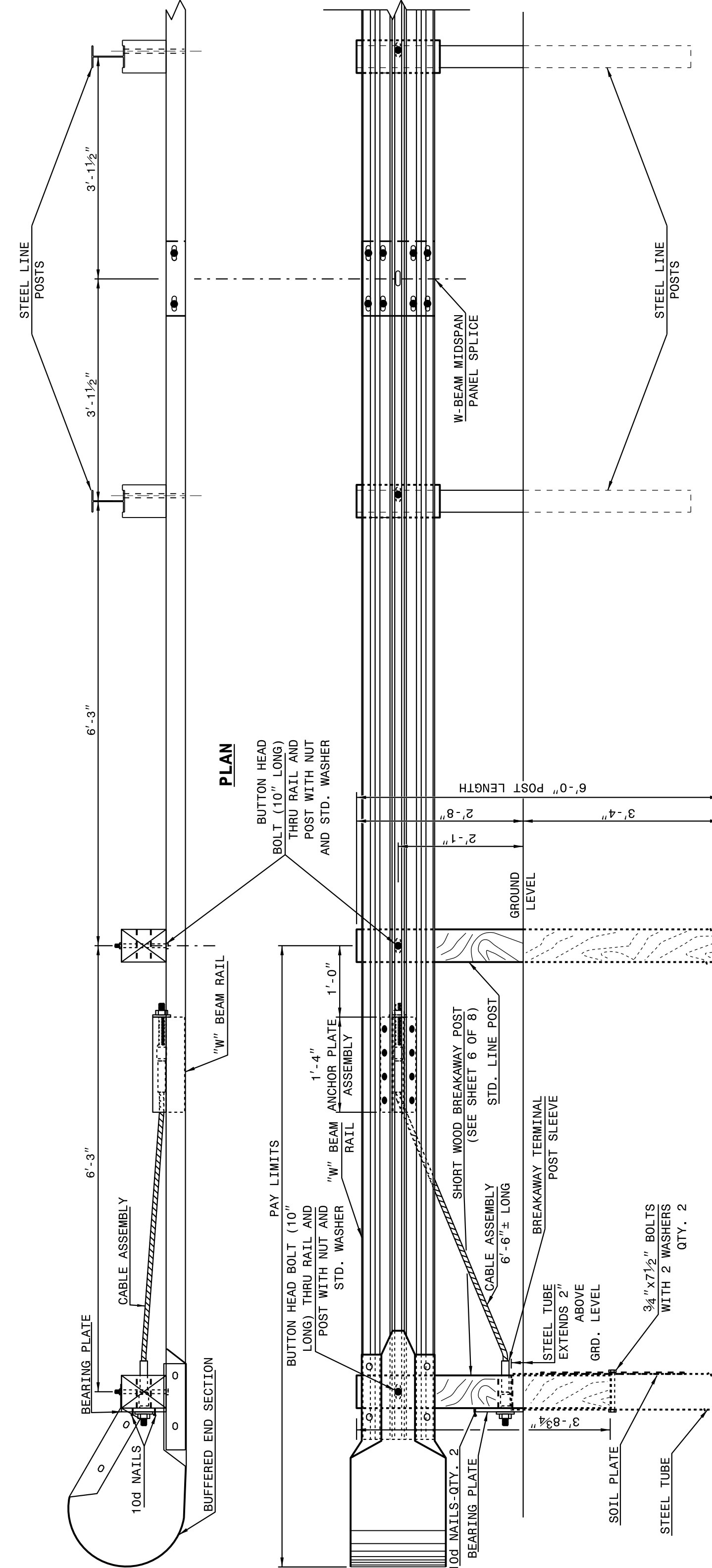
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**GUARDRAIL INSTALLATION**

SHEET 2 OF 8  
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ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL INSTALLATION**

SHEET 1 OF 8  
**862D02**



**ELEVATION**

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

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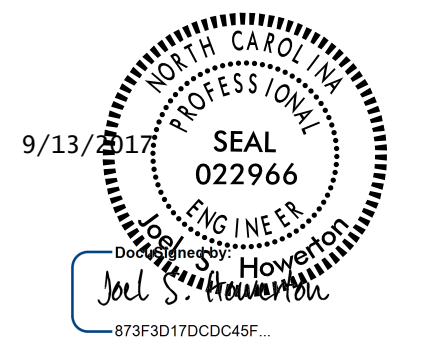
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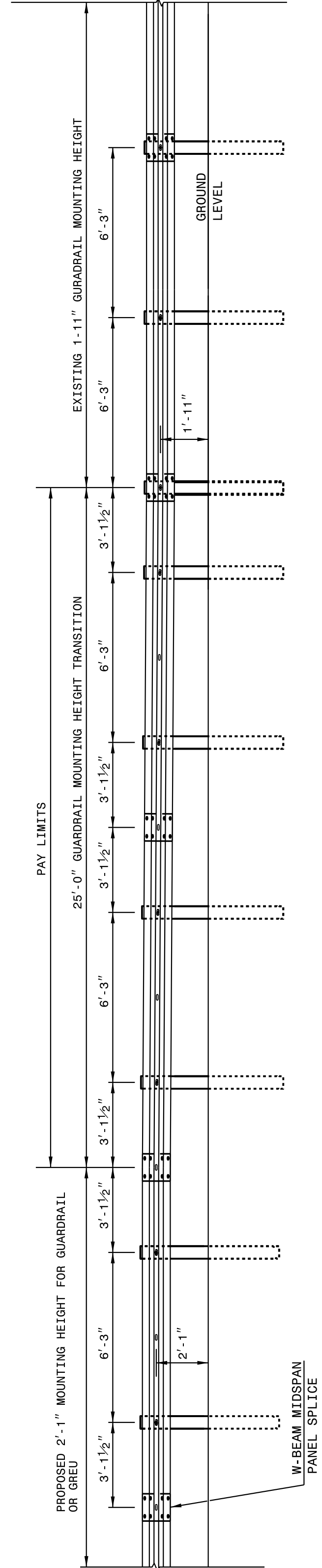
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ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL INSTALLATION**

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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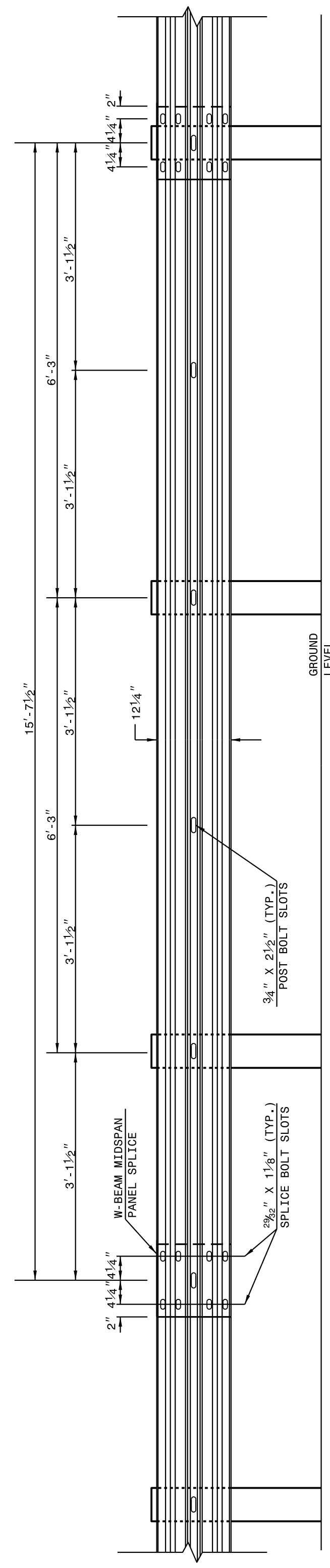
ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL INSTALLATION**

SHEET 4 OF 8  
**862D02**

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ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL INSTALLATION**

SHEET 3 OF 8  
**862D02**



**15'-7 1/2" W-BEAM GUARDRAIL PANEL**

**NOTE:** USE 5-SPACE 15'-7 1/2" W-BEAM GUARDRAIL PANEL AT THE DOWNSTREAM END OF AN END UNIT OR EXISTING GUARDRAIL THAT DOES NOT OFFSET THE W-BEAM PANEL SPLICE TO MIDSPAN

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ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL INSTALLATION**

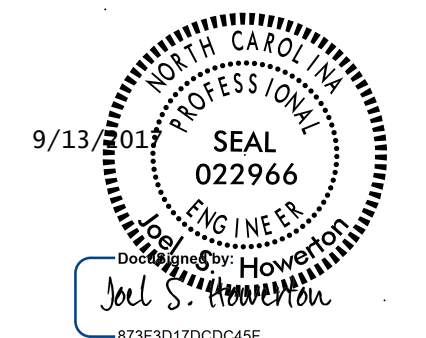
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**862D02**

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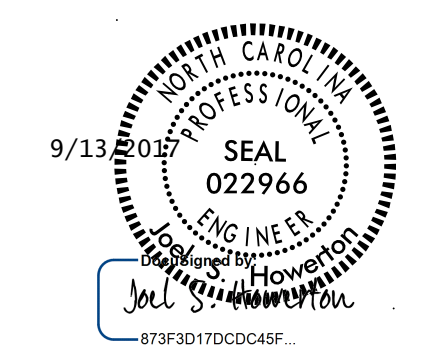
STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.	ROADWAY DETAIL DRAWING FOR <b>GUARDRAIL INSTALLATION</b>	SHEET 6 OF 8 <b>862D02</b>
<b>SYSTEM PARTS</b>		
ROADWAY DETAIL DRAWING FOR <b>GUARDRAIL INSTALLATION</b>		
SHEET 6 OF 8 <b>862D02</b>		

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<b>"W6" STEEL POST</b>		

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.	ROADWAY DETAIL DRAWING FOR <b>GUARDRAIL INSTALLATION</b>	SHEET 5 OF 8 <b>862D02</b>
<b>TYPICAL GUARDRAIL AND GUARDRAIL POST ALTERNATIVES</b>		
ROADWAY DETAIL DRAWING FOR <b>GUARDRAIL INSTALLATION</b>		
SHEET 5 OF 8 <b>862D02</b>		

STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.	ROADWAY DETAIL DRAWING FOR <b>GUARDRAIL INSTALLATION</b>	SHEET 5 OF 8 <b>862D02</b>
<b>FRONT - MID SPAN SPLICE</b>		

NOTES:  
 A - 5/8" DIA. BUTTON HEAD SPLICE BOLT 1 1/4" LONG (8 REQ. PER SPLICE JOINT).  
 B - 5/8" DIA. BUTTON HEAD BOLT 7 1/2" / 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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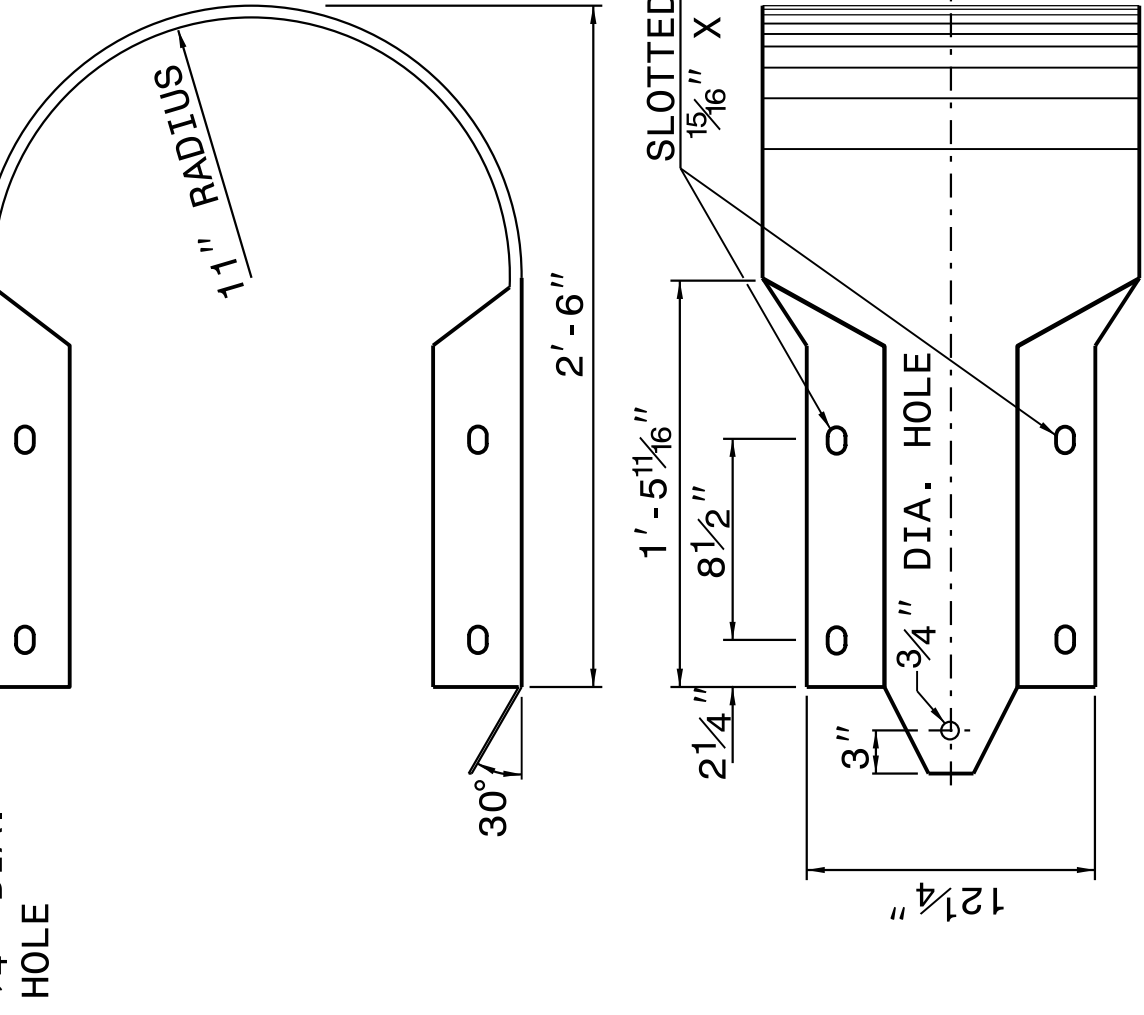
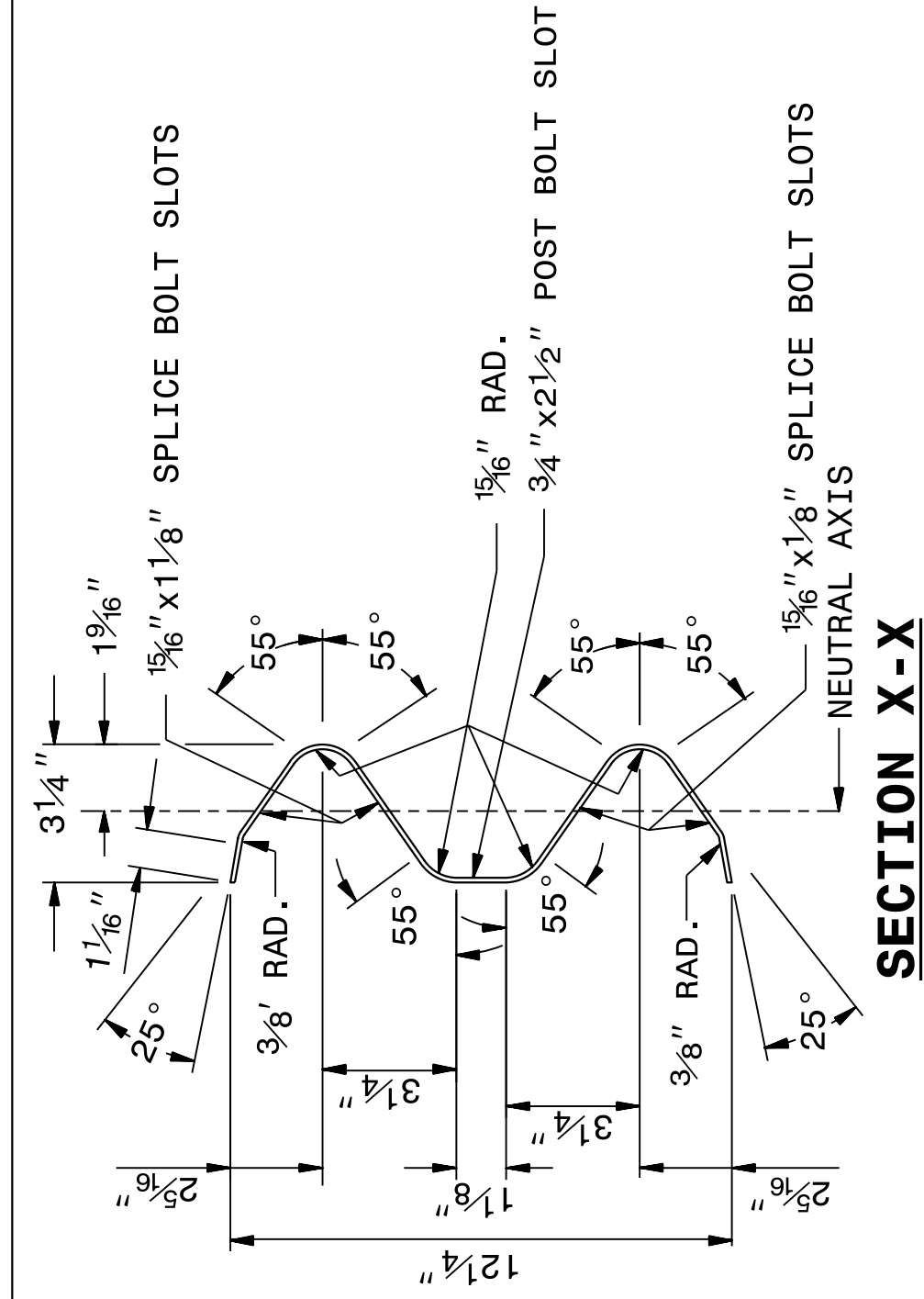


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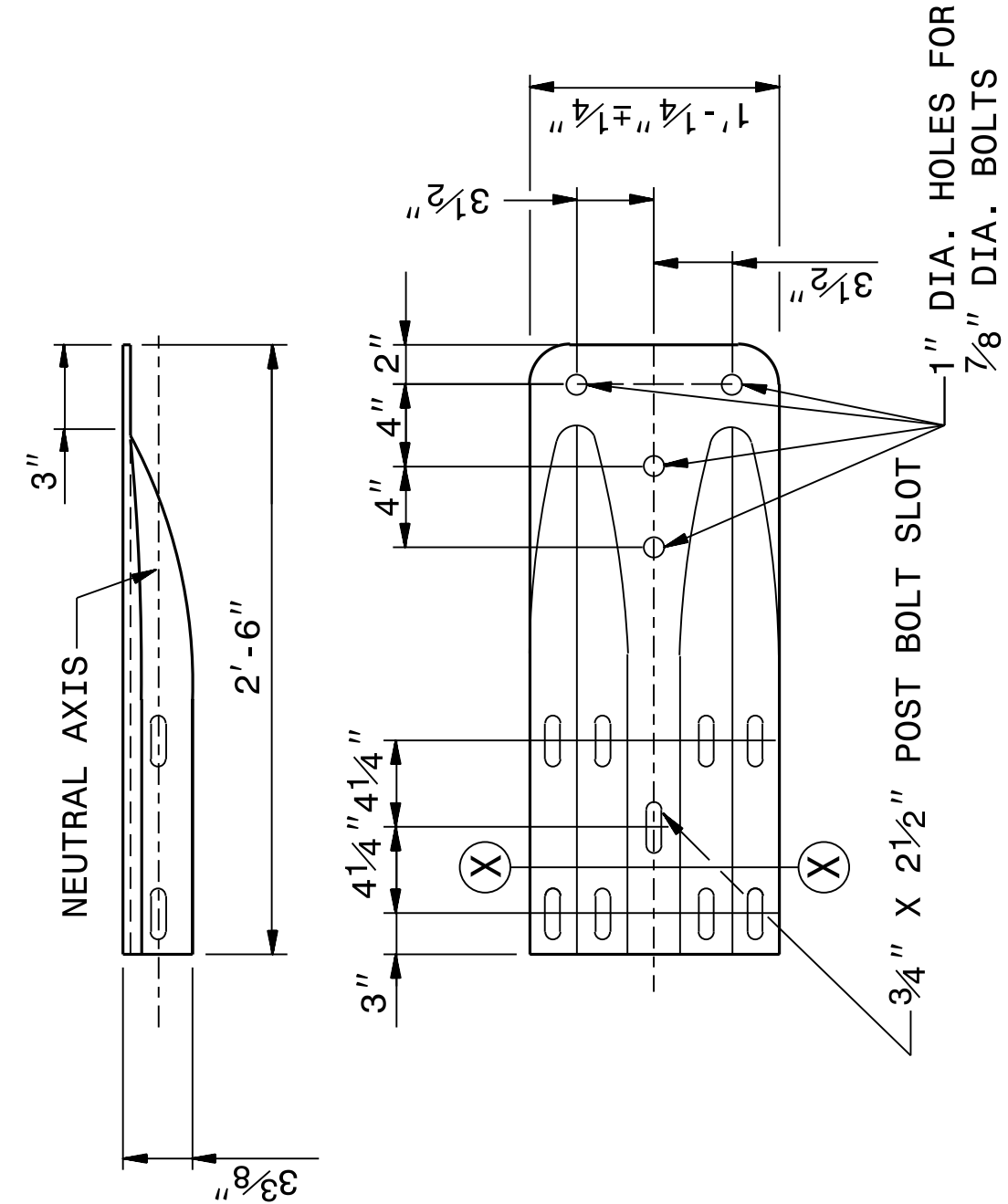
ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL INSTALLATION**

SHEET 8 OF 8  
**862D02**



**BUFFERED END SECTION**

**SECTION X-X**



**TYPICAL END SHOE**

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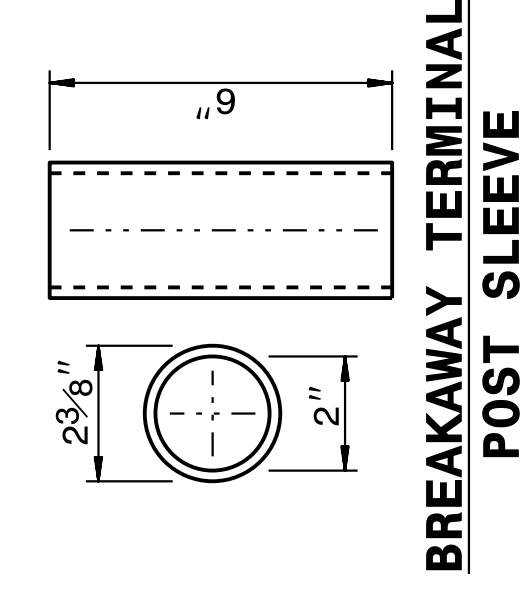
ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL INSTALLATION**

SHEET 8 OF 8  
**862D02**

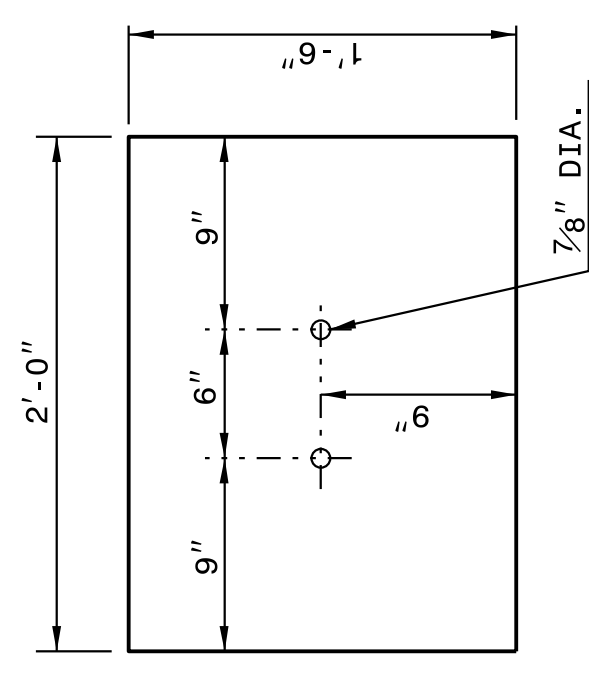
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 RALEIGH, N.C.

ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL INSTALLATION**

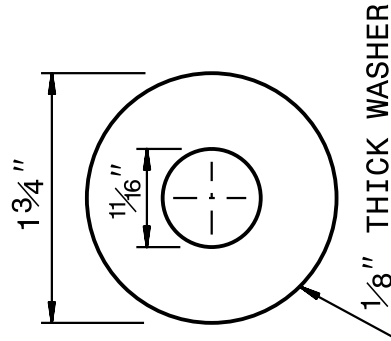
SHEET 7 OF 8  
**862D02**



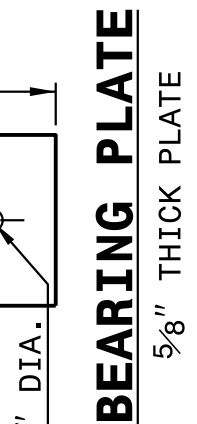
**BREAKAWAY TERMINAL POST SLEEVE**



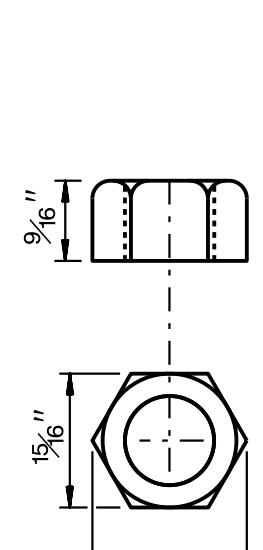
**SOIL PLATE**  
 1/4" THICK PLATE



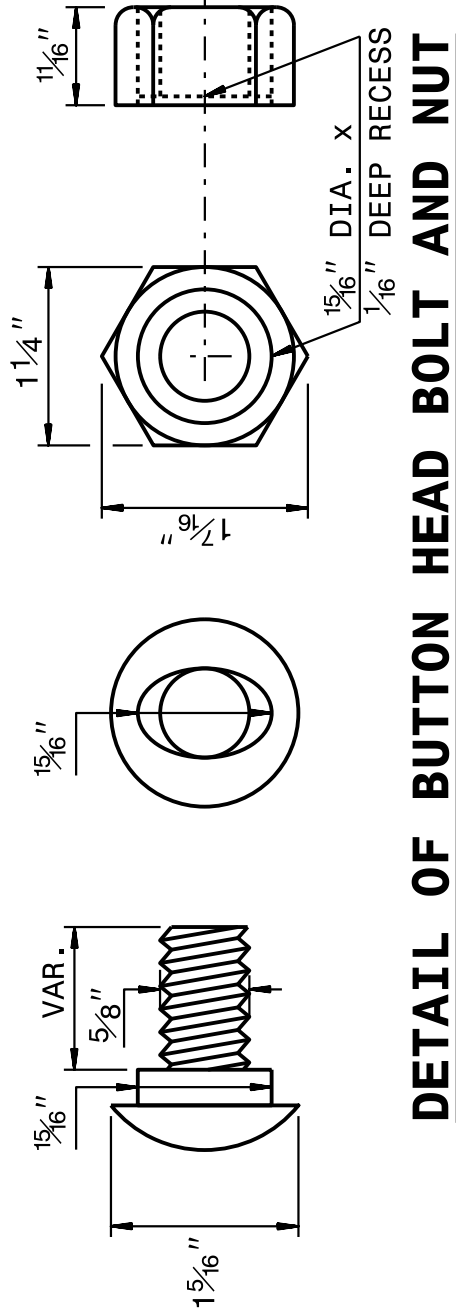
**DETAIL OF STANDARD WASHER**  
 STANDARD WASHER: TYPICAL USE UNDER NUT WITH WOOD POST



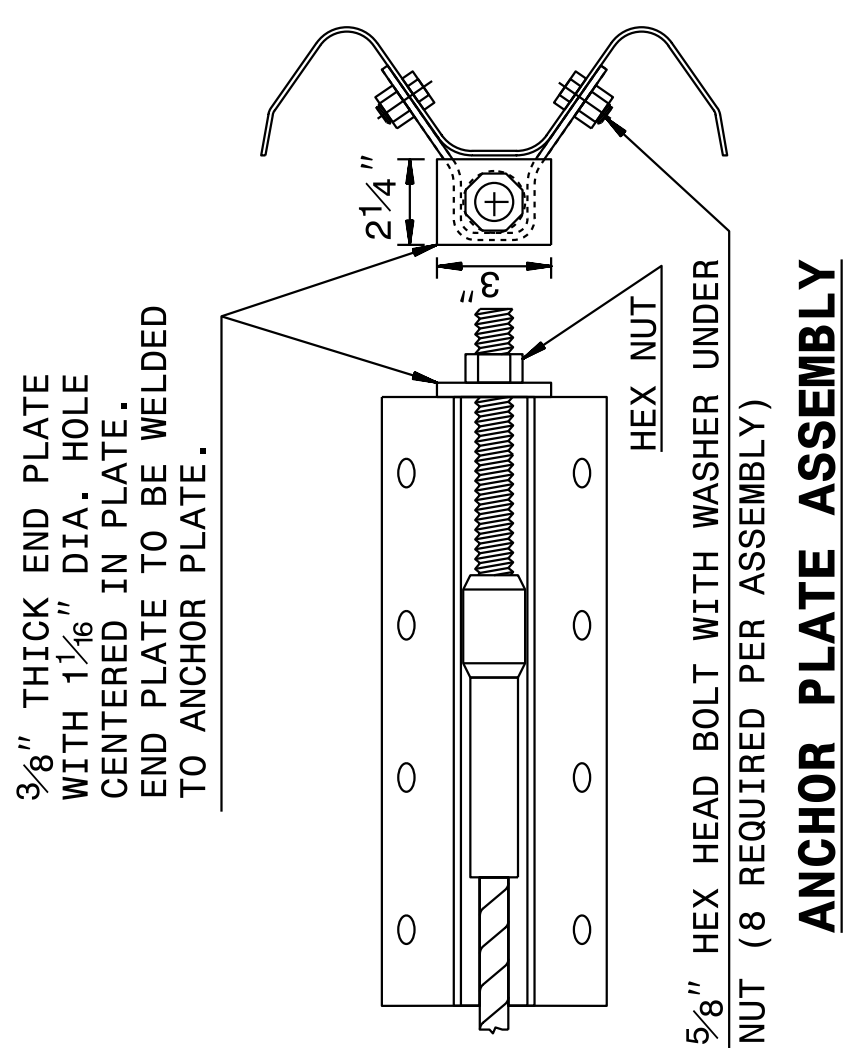
**BEARING PLATE**  
 5/8" THICK PLATE



**DETAIL OF STANDARD HEX BOLT AND NUT**



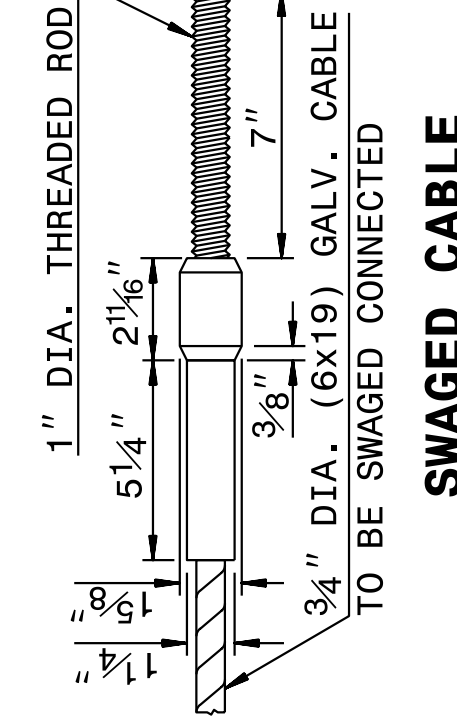
**DETAIL OF BUTTON HEAD BOLT AND NUT**



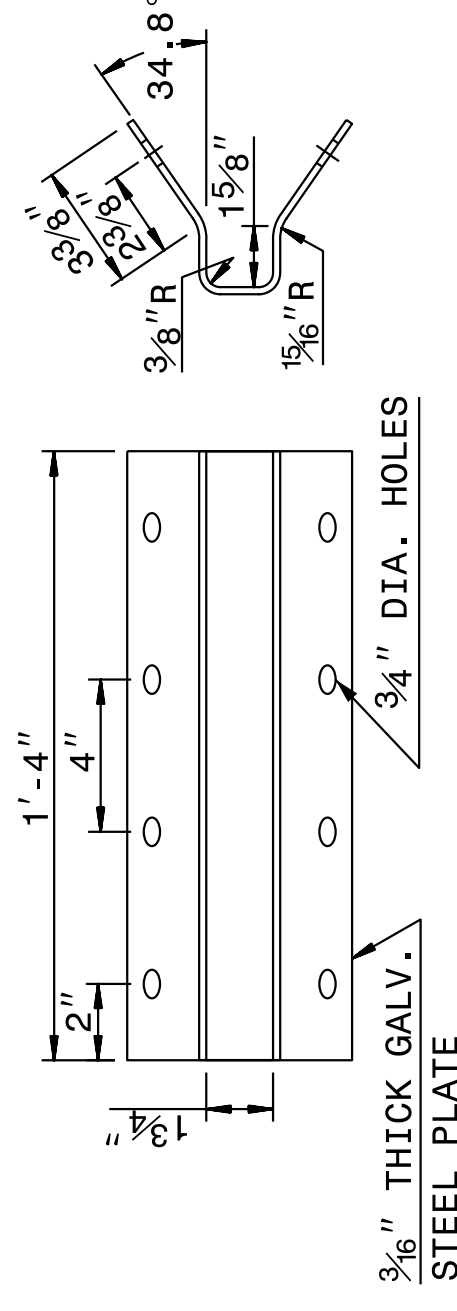
3/8" THICK END PLATE WITH 1 1/8" DIA. HOLE CENTERED IN PLATE. END PLATE TO BE WELDED TO ANCHOR PLATE.

5/8" HEX HEAD BOLT WITH WASHER UNDER NUT (8 REQUIRED PER ASSEMBLY)

**ANCHOR PLATE ASSEMBLY**



**SWAGED CABLE**



3/4" THICK GALV. STEEL PLATE

**ANCHOR PLATE**

**CABLE ASSEMBLY**

**SYSTEM PARTS - GENERAL USE**

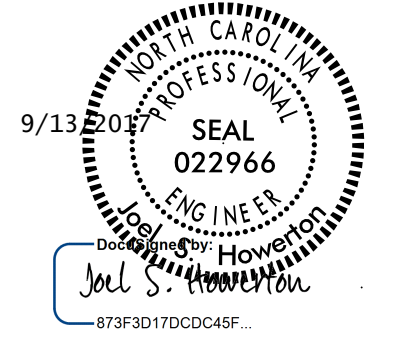
**SYSTEM PARTS**

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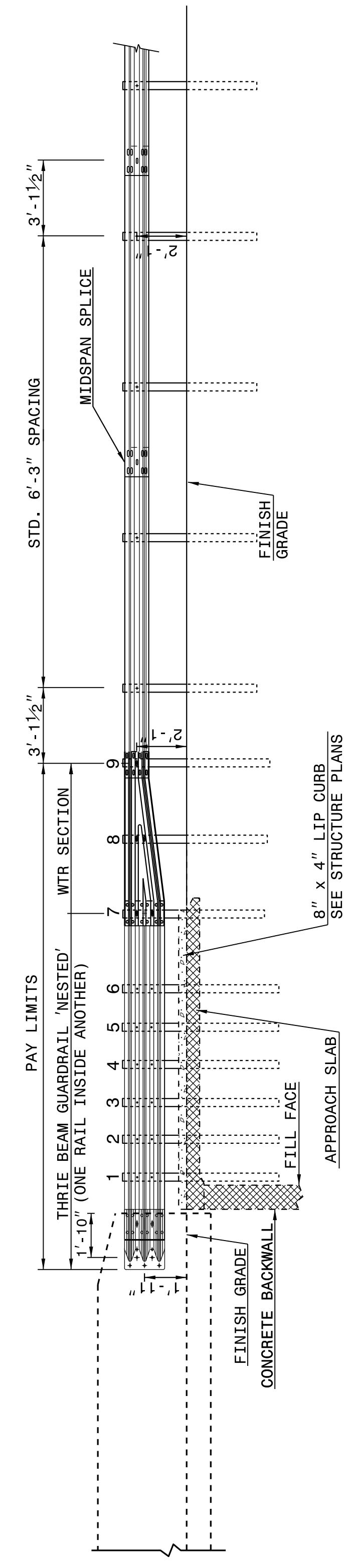
ROADWAY DETAIL DRAWING FOR  
**STRUCTURE ANCHOR UNITS**  
GUARDRAIL ANCHOR UNIT, TYPE III FOR ATTACHMENT TO  
RAIL ON BRIDGE - SUB REGIONAL TIER

SHEET 2 OF 7  
**862D03**

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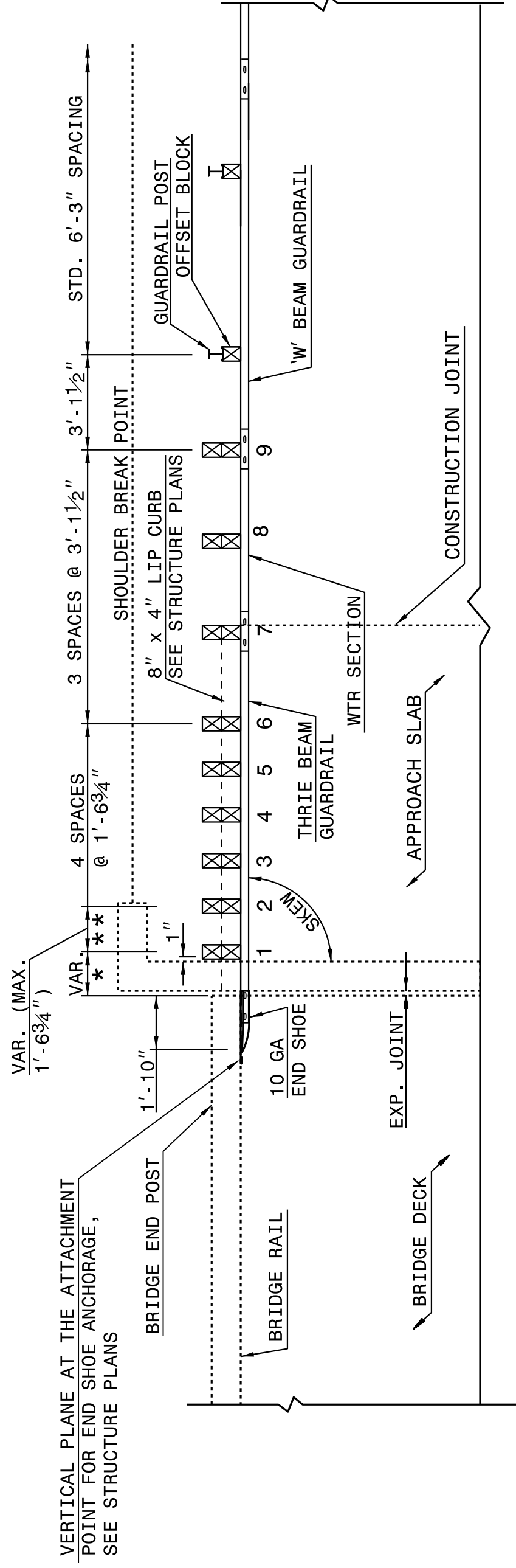
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**STRUCTURE ANCHOR UNITS**  
GUARDRAIL ANCHOR UNIT, TYPE III FOR ATTACHMENT TO  
RAIL ON BRIDGE - SUB REGIONAL TIER

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**

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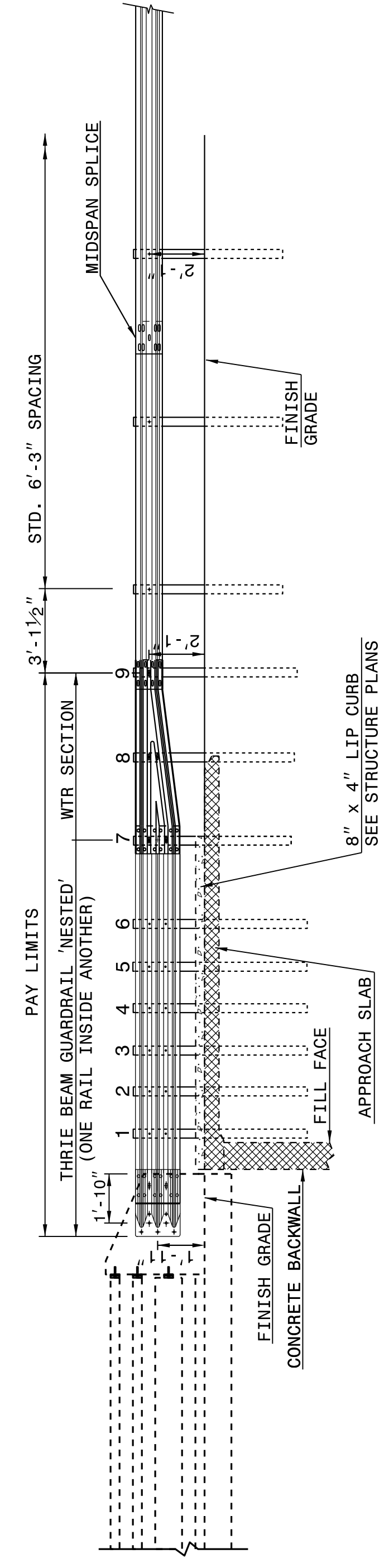
ROADWAY DETAIL DRAWING FOR  
**STRUCTURE ANCHOR UNITS**  
GUARDRAIL ANCHOR UNIT, TYPE III FOR ATTACHMENT TO RAIL ON BRIDGE

SHEET 1 OF 7  
**862D03**

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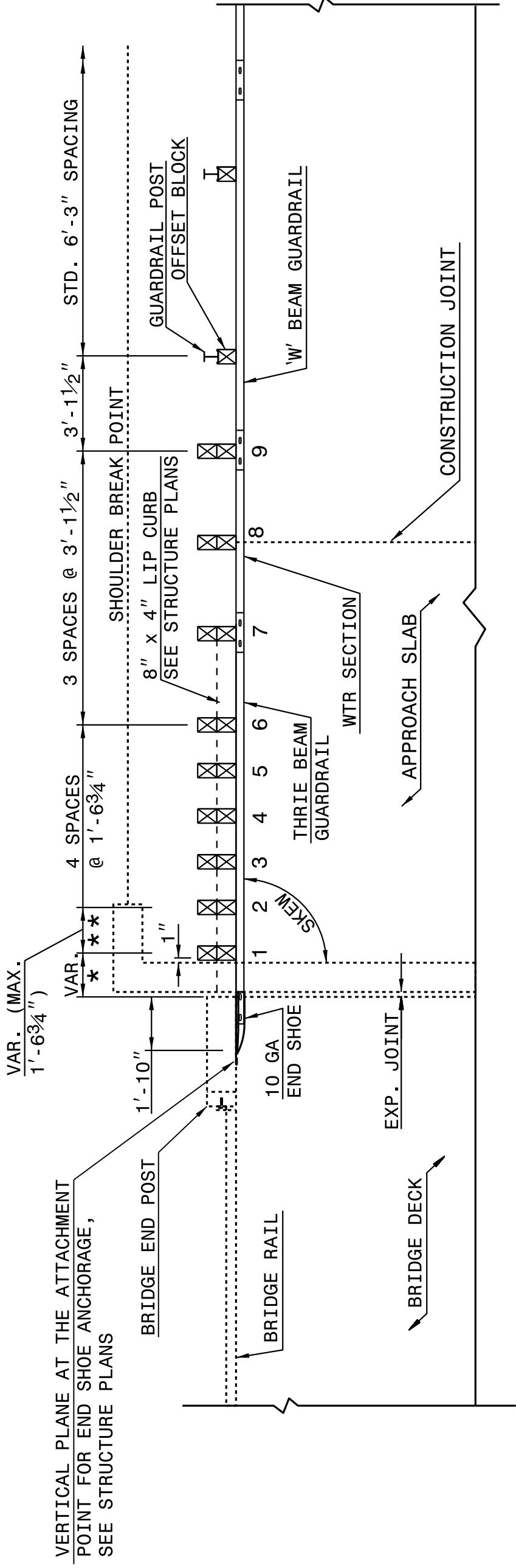
ROADWAY DETAIL DRAWING FOR  
**STRUCTURE ANCHOR UNITS**  
GUARDRAIL ANCHOR UNIT, TYPE III FOR ATTACHMENT TO RAIL ON BRIDGE

SHEET 1 OF 7  
**862D03**



**ELEVATION**

NOTE:  
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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**

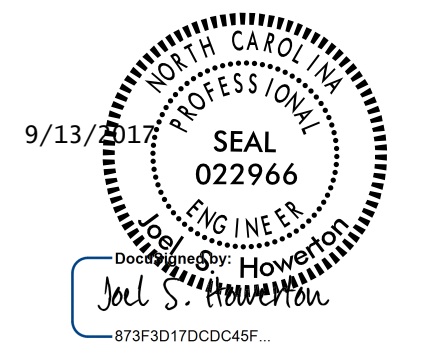
**GUARDRAIL ANCHOR UNIT, TYPE III  
FOR ATTACHMENT TO RAIL ON BRIDGE**

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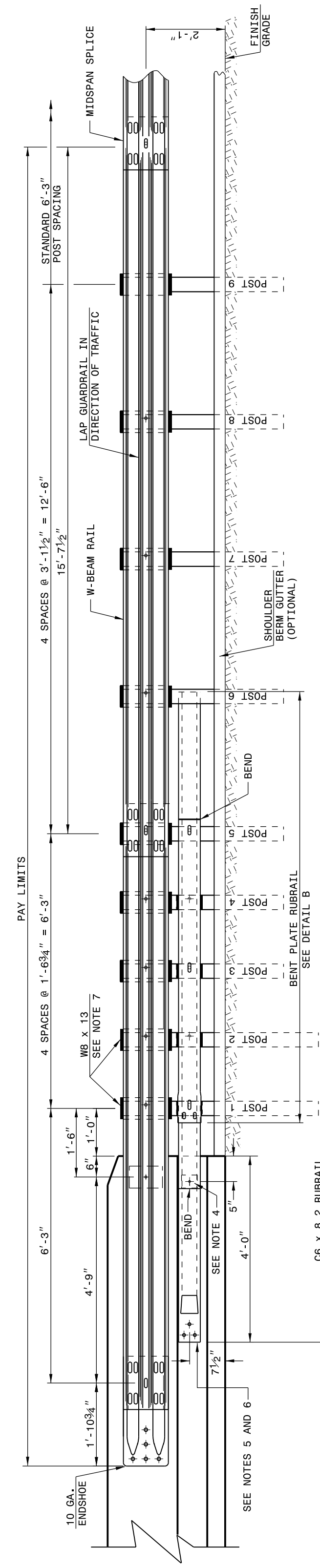


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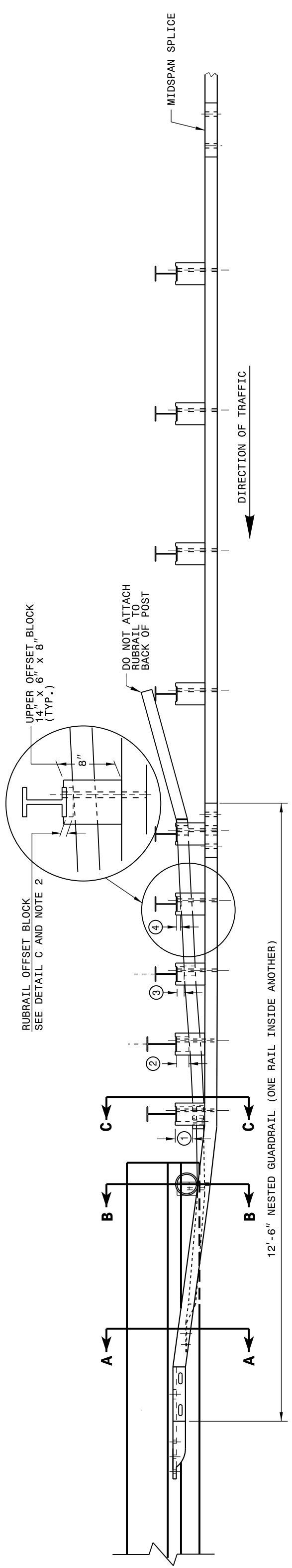
ROADWAY DETAIL DRAWING FOR  
**STRUCTURE ANCHOR UNIT**  
FOR F-SHAPE BARRIER

SHEET 4 OF 7  
**862D03**



**ELEVATION**

- GENERAL NOTES:
- POSTS 1 THROUGH 5 REQUIRE AN ADDITIONAL HOLE TO ATTACH LOWER BLOCKOUTS AND/OR RUBRAIL. RUBRAIL BLOCKOUTS LOCATED ON POSTS 1 THROUGH 4 ARE OFFSET DRILLED AND SECURED WITH 3/8" BUTTONHEAD BOLTS (SEE CHART FOR BOLT LENGTHS). SECURE RUBRAIL BLOCKOUTS TO POSTS 1 AND 4, SECURE RUBRAIL AND BLOCKOUTS TO POSTS 2 AND 3. RUBRAIL IS SECURED TO POST 5 WITH 3/8" BUTTONHEAD BOLTS. RUBRAIL IS NOT TO BE ATTACHED TO POST 6.
  - SECURE RUBRAIL AND BLOCKOUTS TO POSTS 1 AND 4 WITH 3/8" BUTTONHEAD BOLTS. RUBRAIL IS NOT TO BE ATTACHED TO POST 5 WITH 3/8" BUTTONHEAD BOLTS. RUBRAIL IS NOT TO BE ATTACHED TO POST 6 WITH 3/8" BUTTONHEAD BOLTS.
  - 5/8" x 11 1/4" LONG BUTTONHEAD BOLT AND RECTANGULAR PLATE WASHER.
  - SEE DETAIL D FOR SLOPED RUBRAIL BLOCKOUT. BLOCKOUT IS ATTACHED TO RAIL ELEMENT ONLY. USE 3/8" x 3" LAG BOLT WITH FLAT WASHER.
  - 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 END OF THE BARRIER OR BRIDGE RAIL.
  - ANCHORAGE TO 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 1/2".
  - 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).
  - ANCHORAGE TO EXISTING BRIDGE RAIL AND NEW OR EXISTING BARRIERS, ANCHOR THE W-BEAM END SHOE AND RUBRAIL AS DETAILED ON THE STRUCTURE PLANS.
  - POSTS 1 AND 2 ARE W8 x 13, 7'-6" LONG. ALL OTHER POSTS IN THE ANCHOR UNIT ARE W6 x 8.5.



**PLAN**

**GUARDRAIL ANCHOR UNIT TYPE B-77**

SHEET 4 OF 7  
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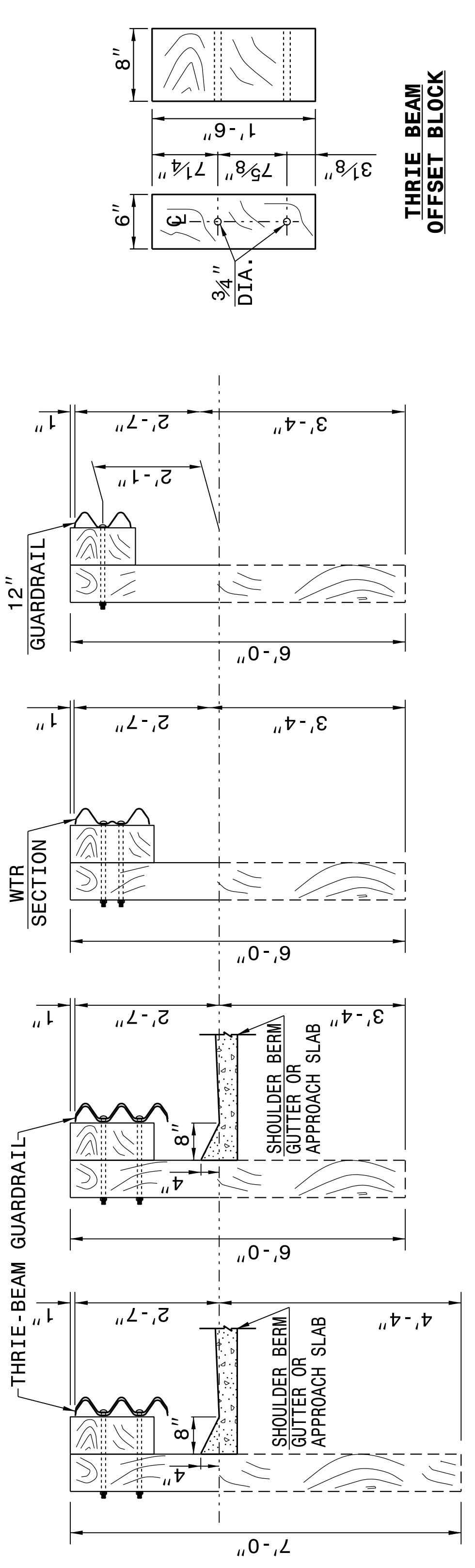
ROADWAY DETAIL DRAWING FOR  
**GUARDRAIL ANCHOR UNIT**  
GUARDRAIL ANCHOR UNIT TYPE B-77  
FOR F-SHAPE BARRIER

SHEET 4 OF 7  
**862D03**

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ROADWAY DETAIL DRAWING FOR  
**STRUCTURE ANCHOR UNITS**  
GUARDRAIL ANCHOR UNIT, TYPE III

SHEET 3 OF 7  
**862D03**



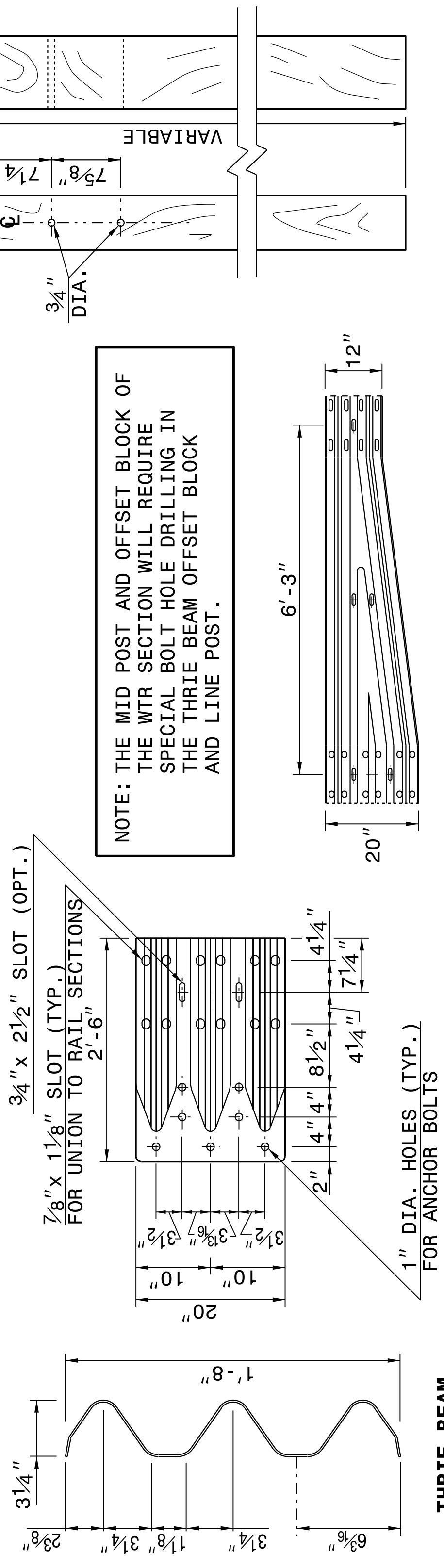
**THRIE-BEAM OFFSET BLOCK**

**SECTION OF THRIE BEAM POSTS 1 THRU 6**

**SECTION OF THRIE BEAM POST 7**

**SECTION OF WTR BEAM POST 8**

**SECTION OF WTR BEAM POST 9**



**THRIE-BEAM SECTION**

**END SHOE**

**WTR SECTION ELEVATION VIEW**

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.

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GUARDRAIL ANCHOR UNIT, TYPE III

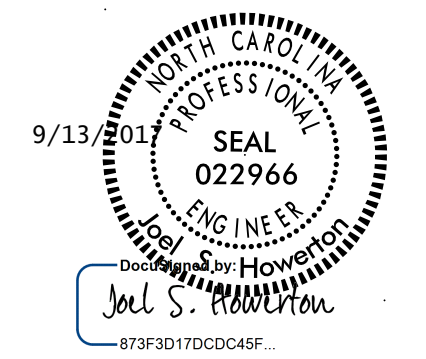
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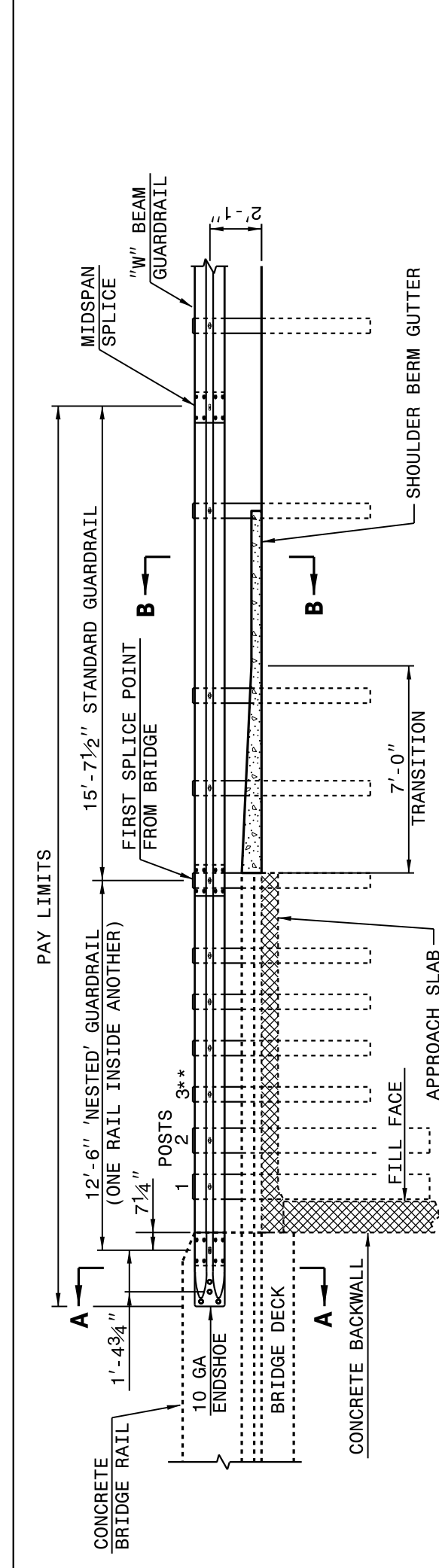
ROADWAY DETAIL DRAWING FOR  
**STRUCTURE ANCHOR UNITS**  
 GUARDRAIL ANCHOR UNIT TYPE B-83

SHEET 6 OF 7  
**862D03**

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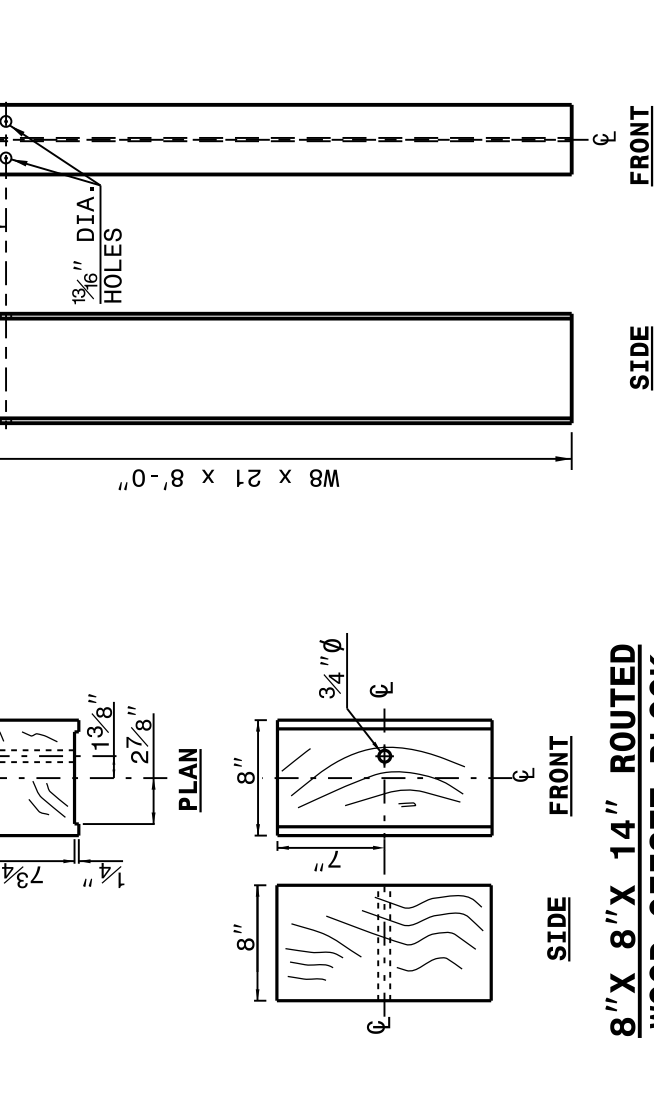
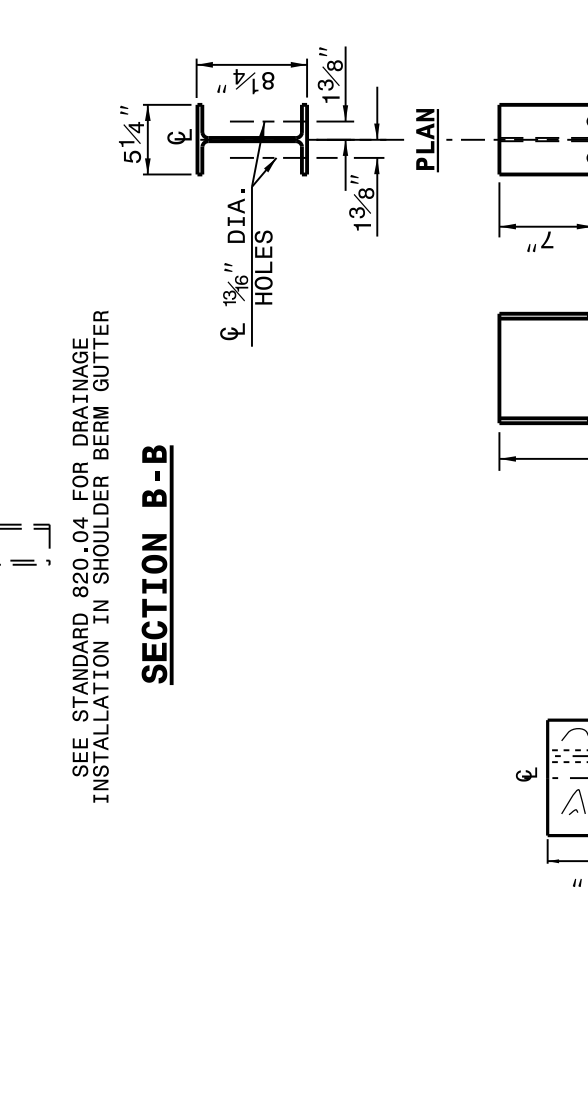
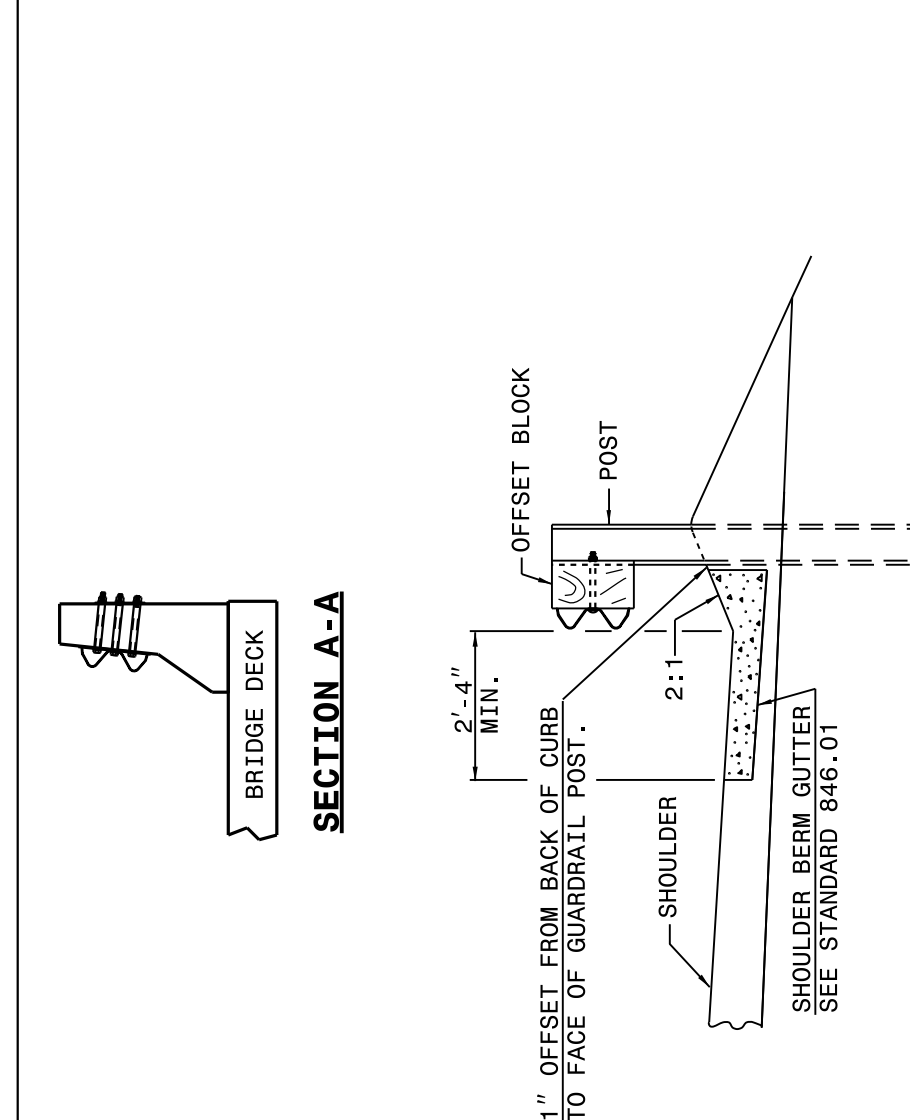
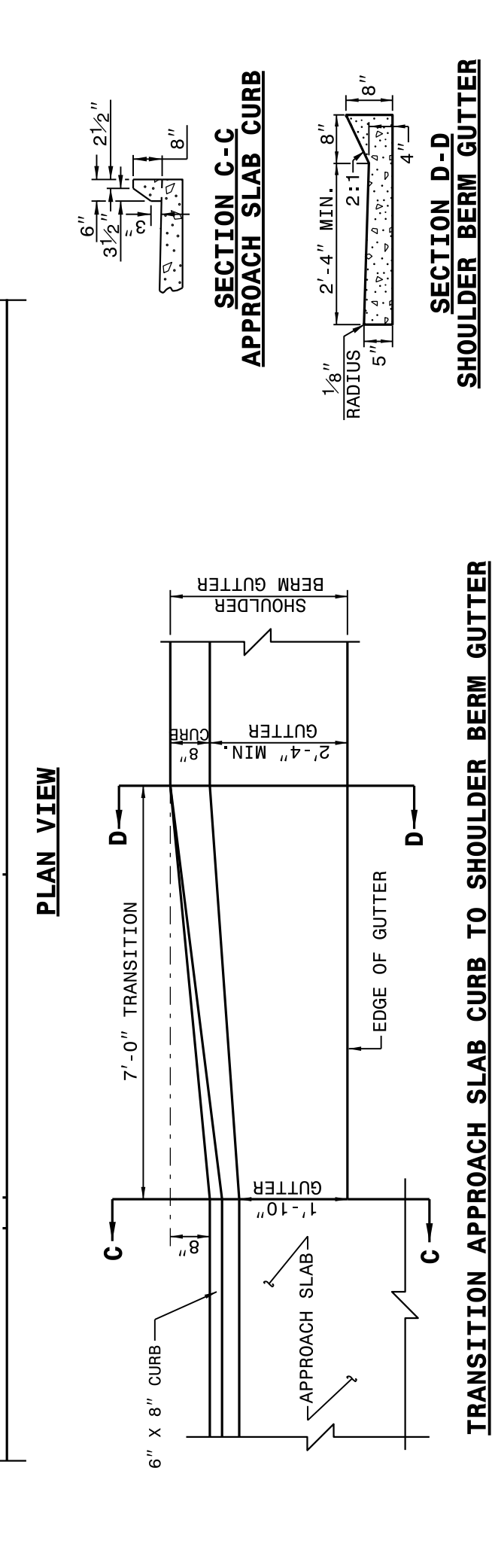
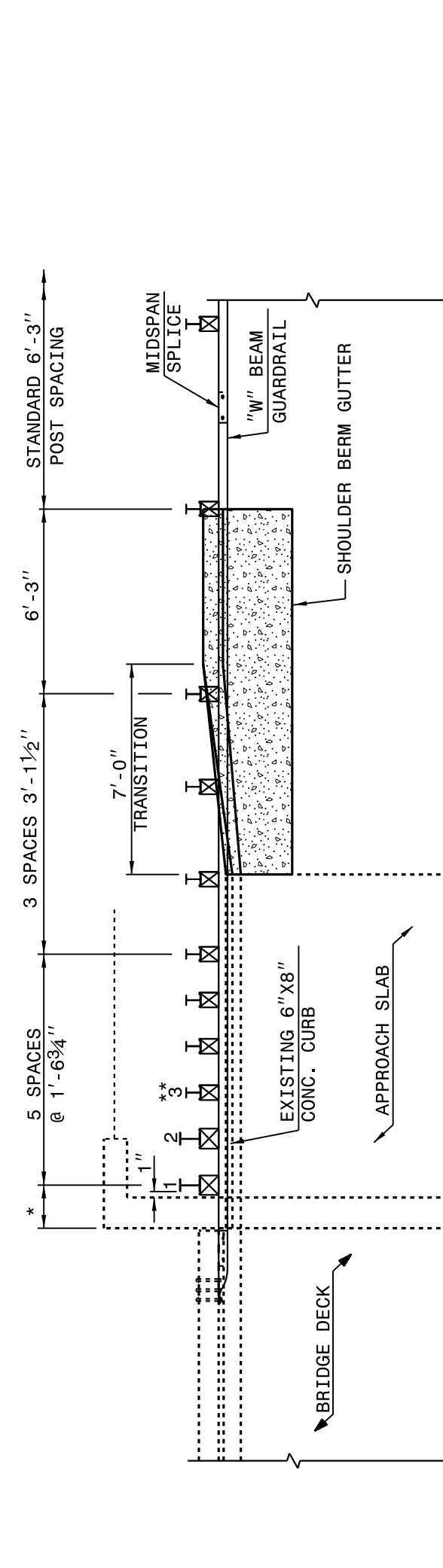
ROADWAY DETAIL DRAWING FOR  
**STRUCTURE ANCHOR UNITS**  
 GUARDRAIL ANCHOR UNIT TYPE B-83

SHEET 6 OF 7  
**862D03**



**ELEVATION VIEW**

NOTE:  
 \*\*ELIMINATE POST 3 AND SHIFT POSTS 1 & 2 ON SKEW ANGLES GREATER THAN 150° OR LESS THAN 30° UNLESS OTHERWISE DIRECTED BY THE ENGINEER.  
 \*MEASURE GUARDRAIL HEIGHT FROM THE TOP OF ADJACENT SURFACE (SHOULDER, BERM, OR GUTTER).  
 -USE NO WOOD POSTS WITHIN THE GUARDRAIL ANCHOR UNIT LIMITS.  
 -POSTS 1 AND 2 ARE TO BE 21' X 8" LONG STEEL POST AND 8" X 8" X 14" WOOD ROUTED OFFSET BLOCK.  
 -SHOULDER BERM GUTTER IS REQUIRED IF NO CURBING EXISTS THROUGH ANCHOR UNIT PAY LIMITS.  
 -ANCHOR THE W-BEAM END SHOE USING A 4 BOLT HOLD DOWN PLATE AS SHOWN IN STANDARD 862.04



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.

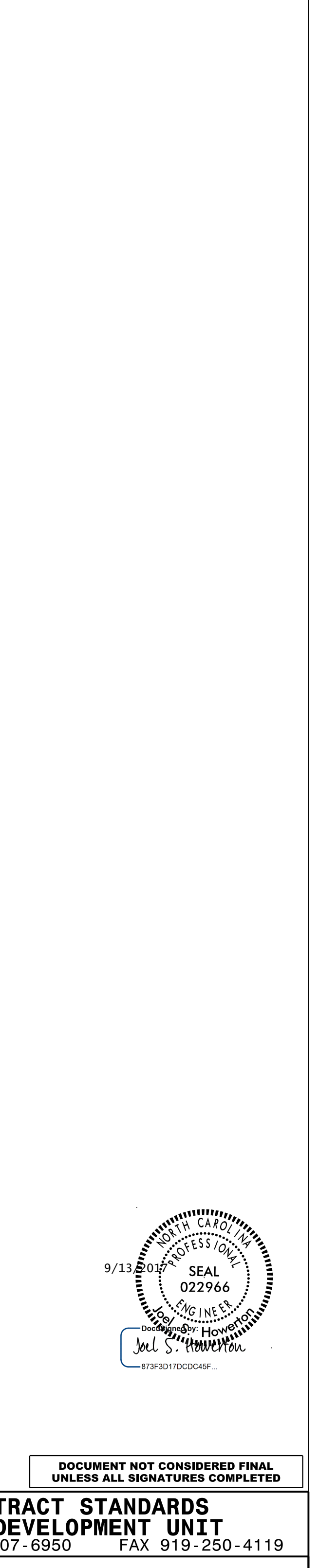
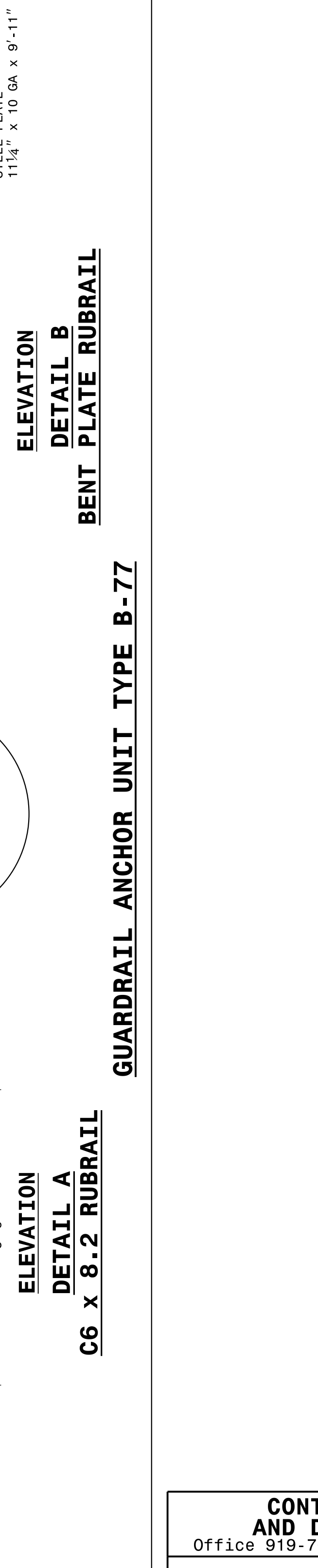
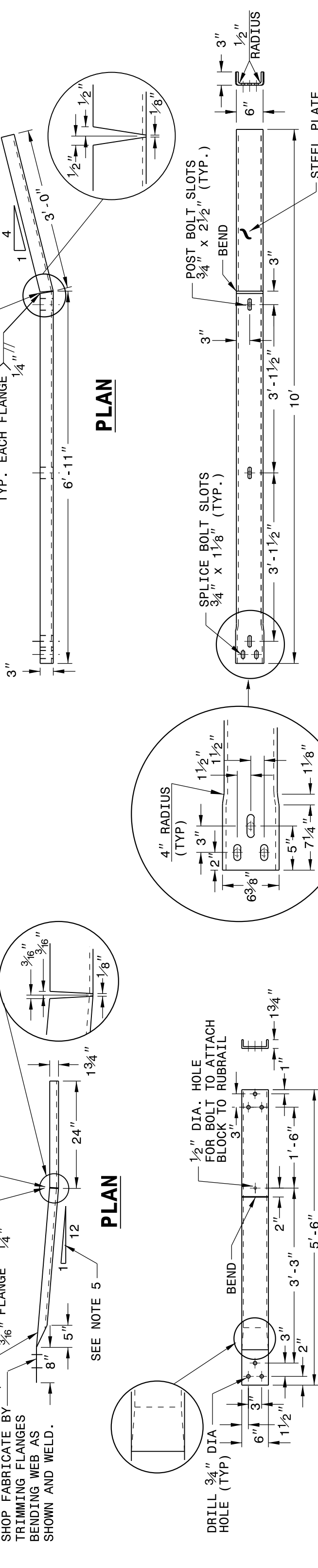
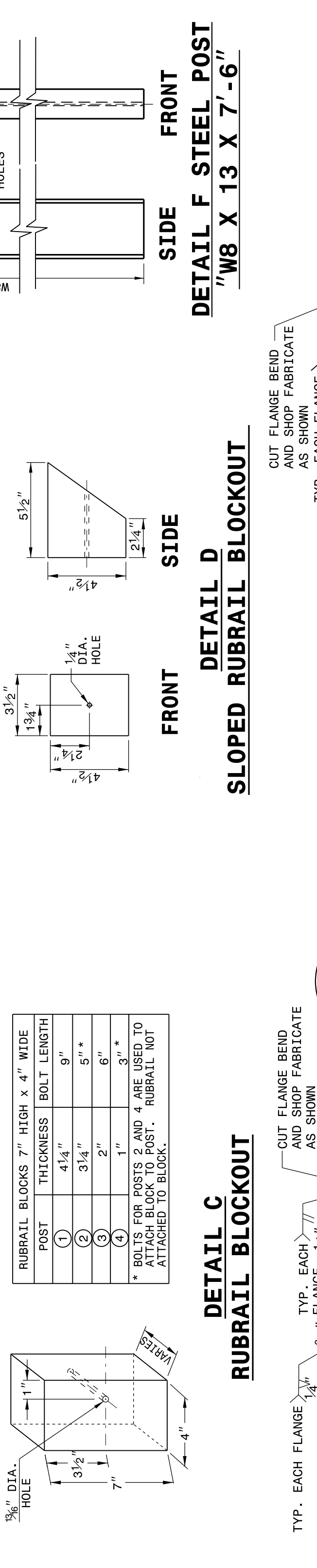
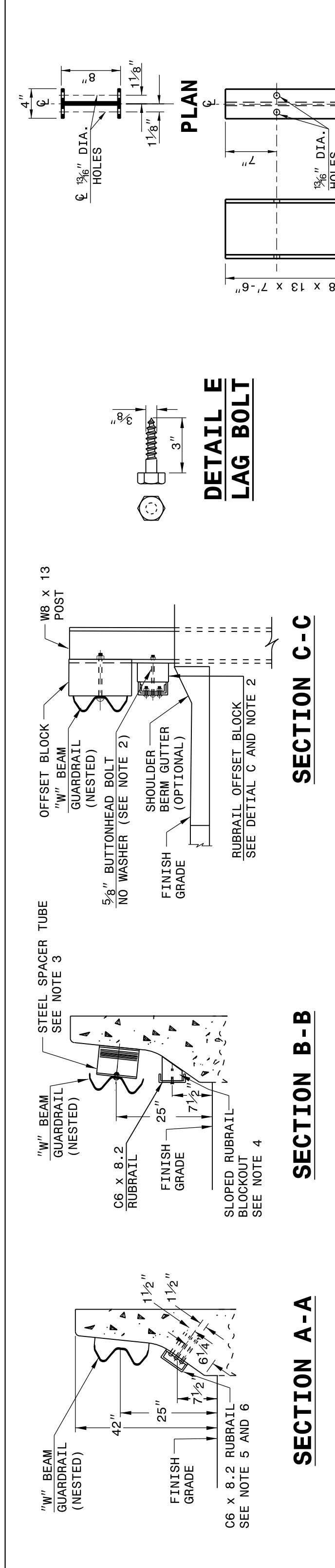
ROADWAY DETAIL DRAWING FOR  
**STRUCTURE ANCHOR UNIT**  
 GUARDRAIL ANCHOR UNIT TYPE B-77  
 FOR F-SHAPE BARRIER

SHEET 5 OF 7  
**862D03**

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**

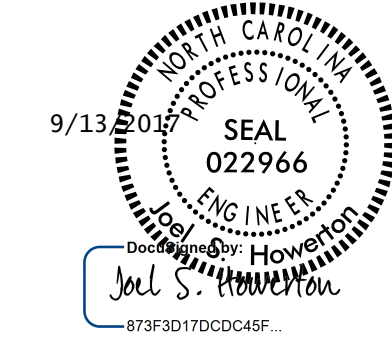


DOCUMENT NOT CONSIDERED FINAL  
 UNLESS ALL SIGNATURES COMPLETED

**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.:



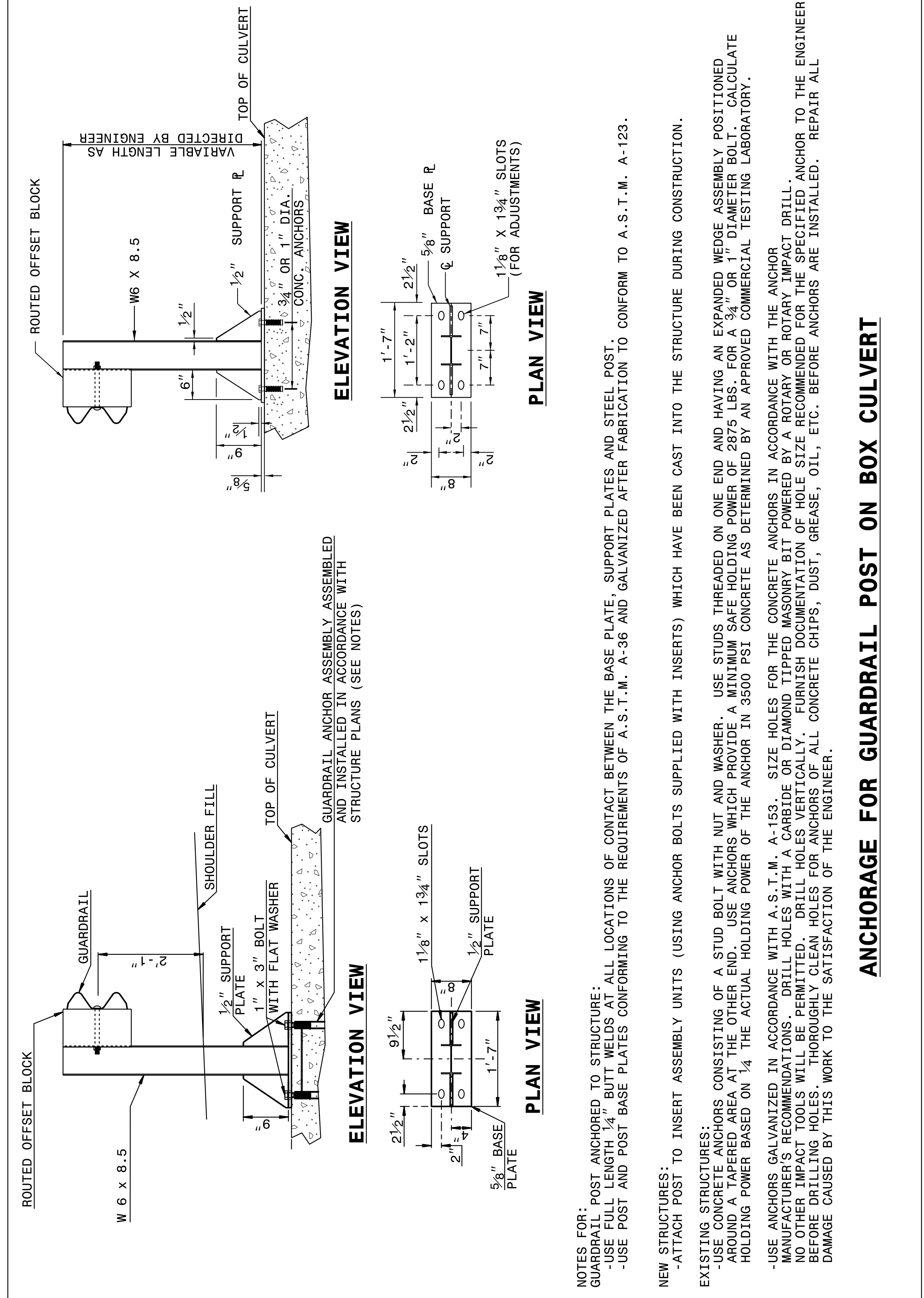
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PROJECT REFERENCE NO. R-5752	SHEET NO. 2C-18
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STATE OF NORTH CAROLINA DEPT. OF TRANSPORTATION DIVISION OF HIGHWAYS RALEIGH, N.C.

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

SHEET 7 OF 7  
862D03



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

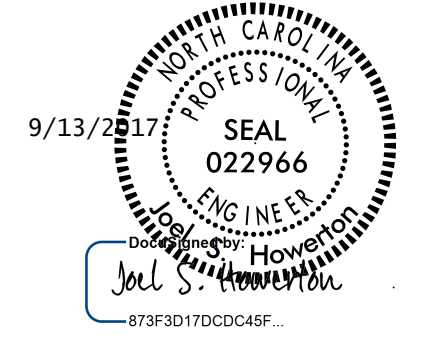
**ANCHORAGE FOR GUARDRAIL POST ON BOX CULVERT**

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.:



GEOTECHNICAL ENGINEER

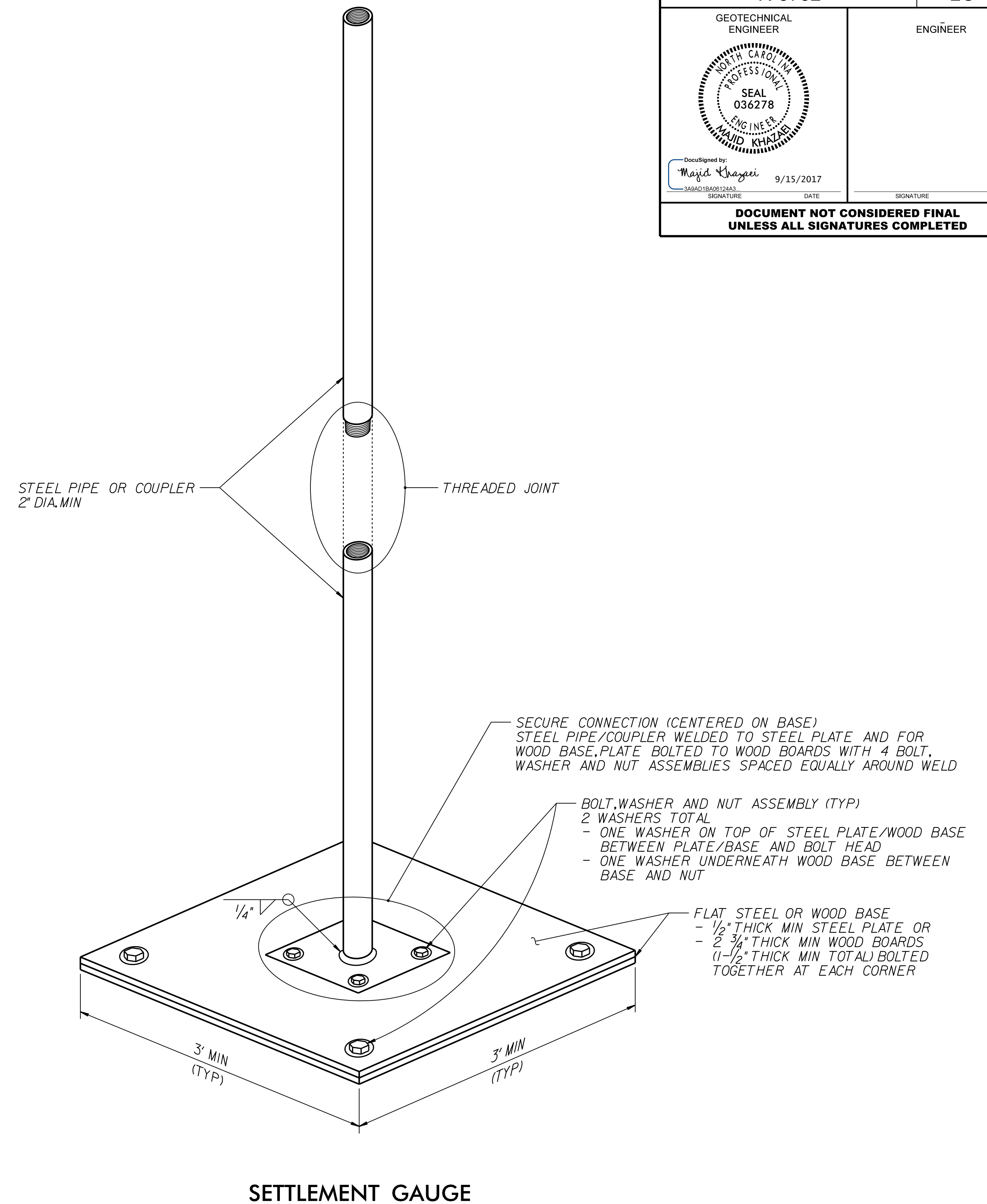
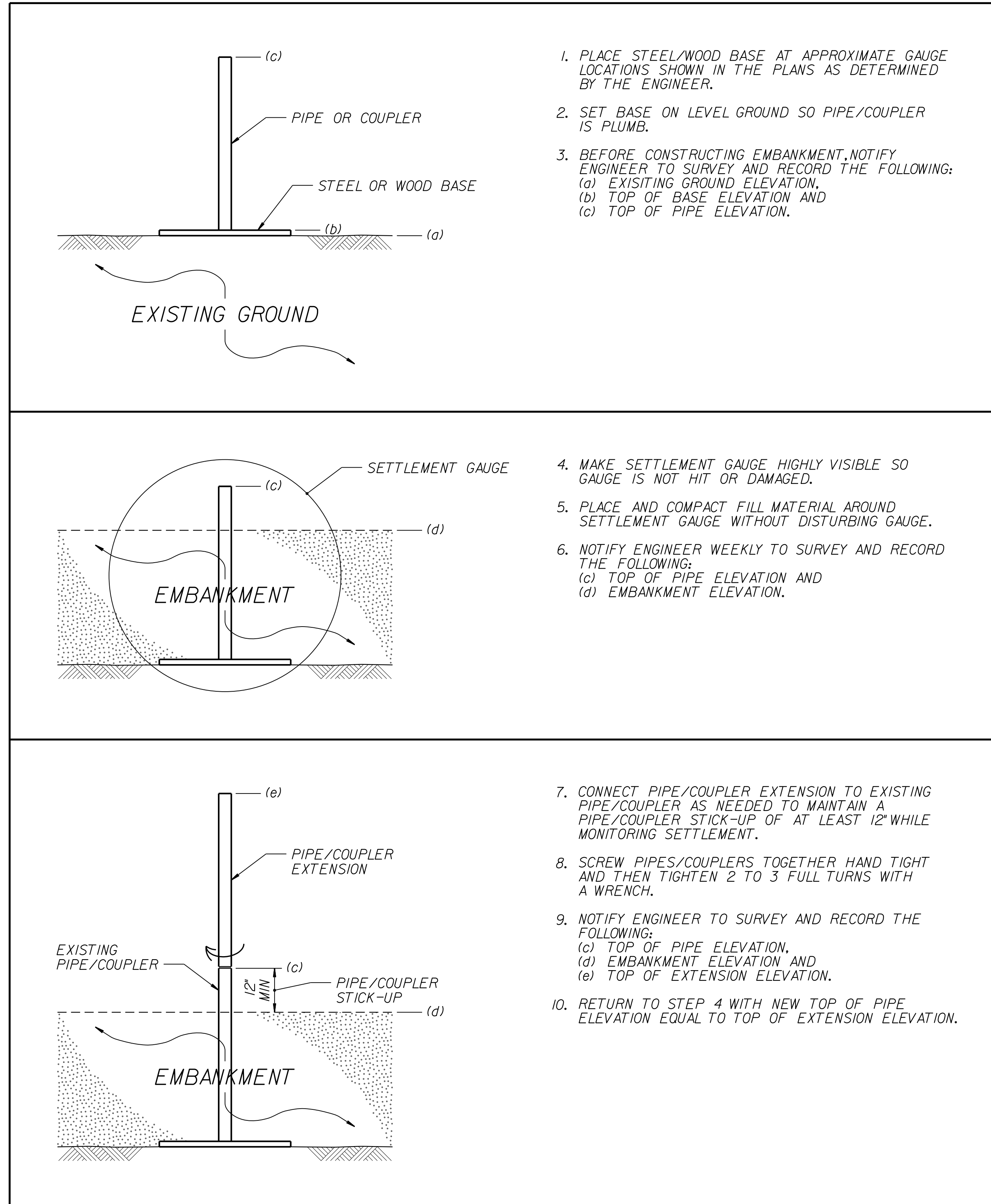
ENGINEER



DocuSigned by: *Majid Khatebi* 9/15/2017  
 348401840512443 SIGNATURE DATE

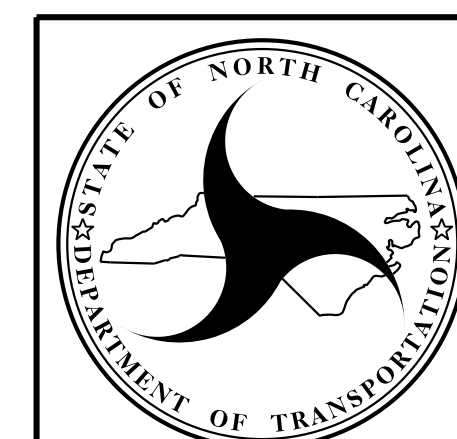
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

**EMBANKMENT MONITORING SEQUENCE**



**NOTES:**

1. SEE ROADWAY SUMMARY SHEETS FOR APPROXIMATE SETTLEMENT GAUGE LOCATIONS.
2. FOR STANDARD EMBANKMENT MONITORING, SEE EMBANKMENT SETTLEMENT GAUGES PROVISION.
3. INSTALL SETTLEMENT GAUGES AFTER CLEARING AND GRUBBING GAUGE LOCATIONS AND BEFORE CONSTRUCTING EMBANKMENTS WITH EMBANKMENT MONITORING.

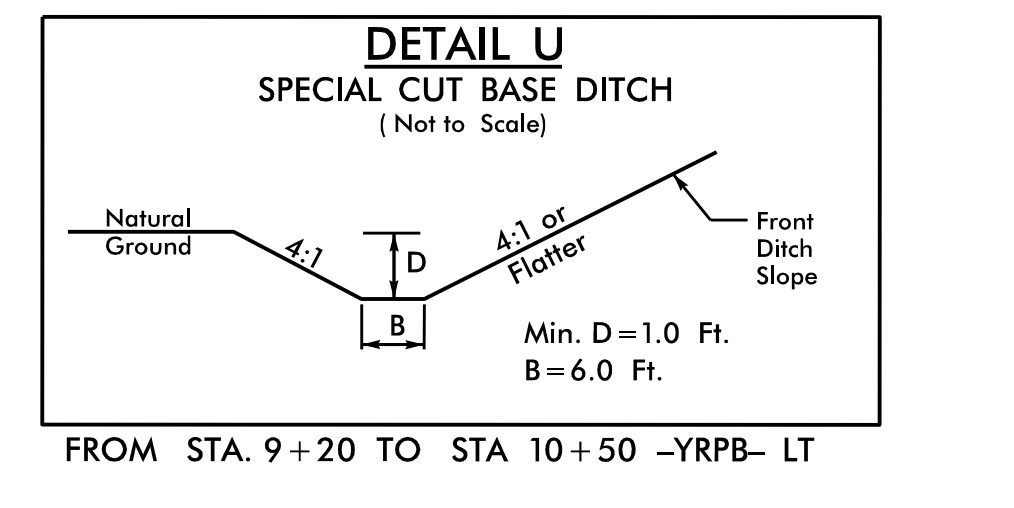
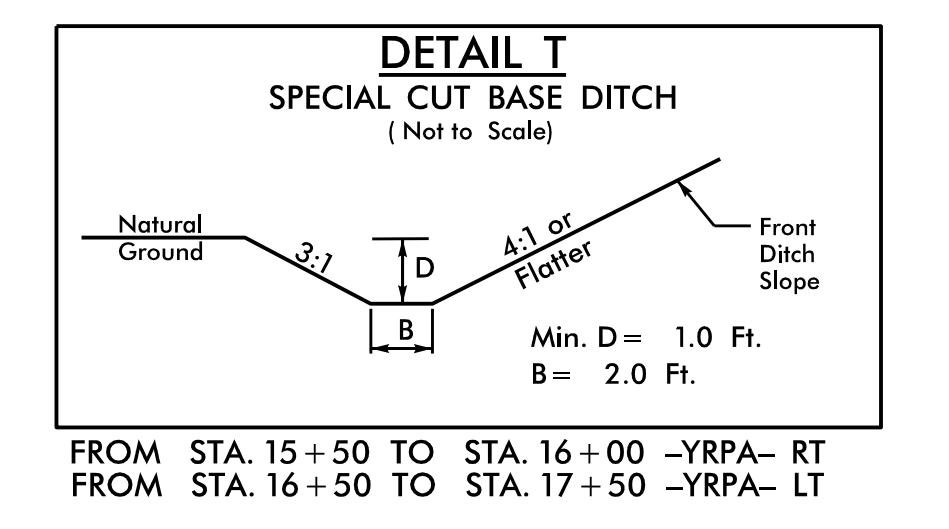
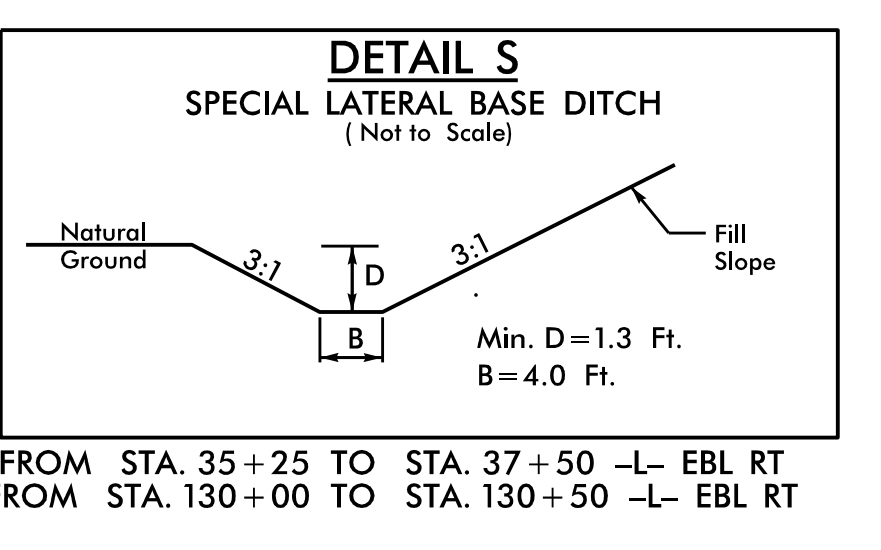
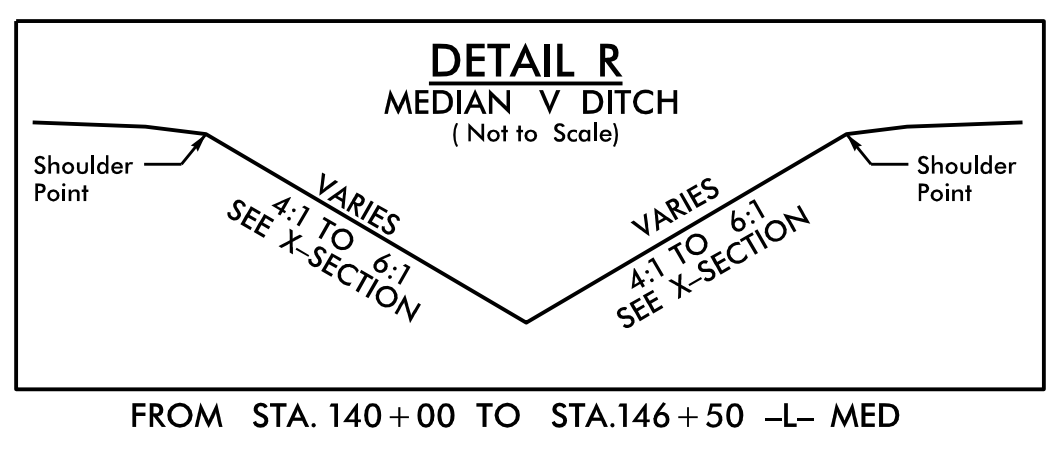
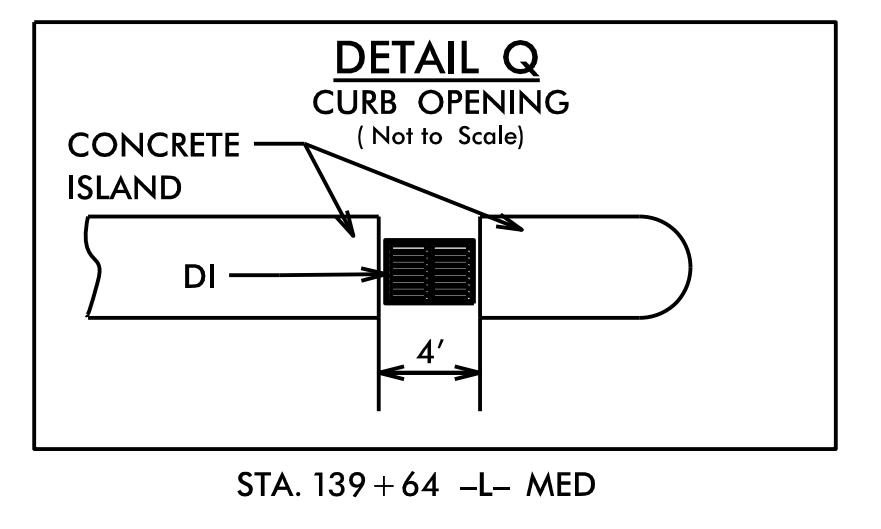
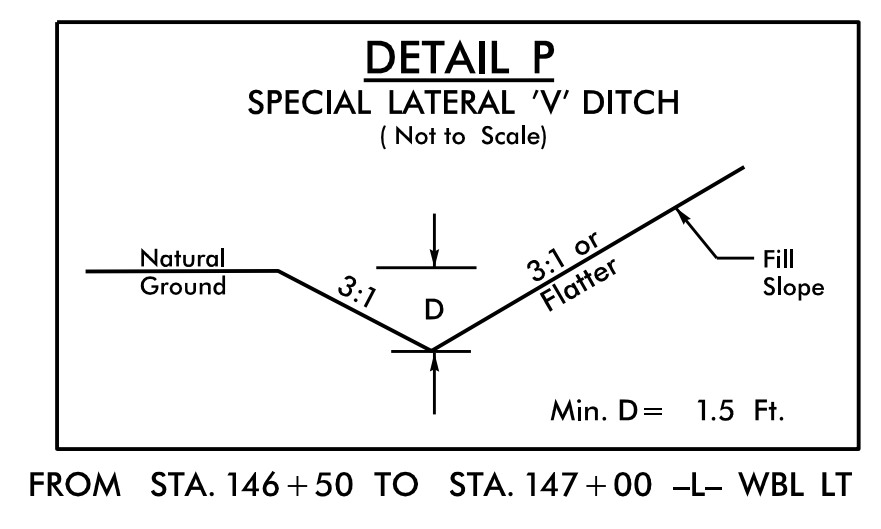
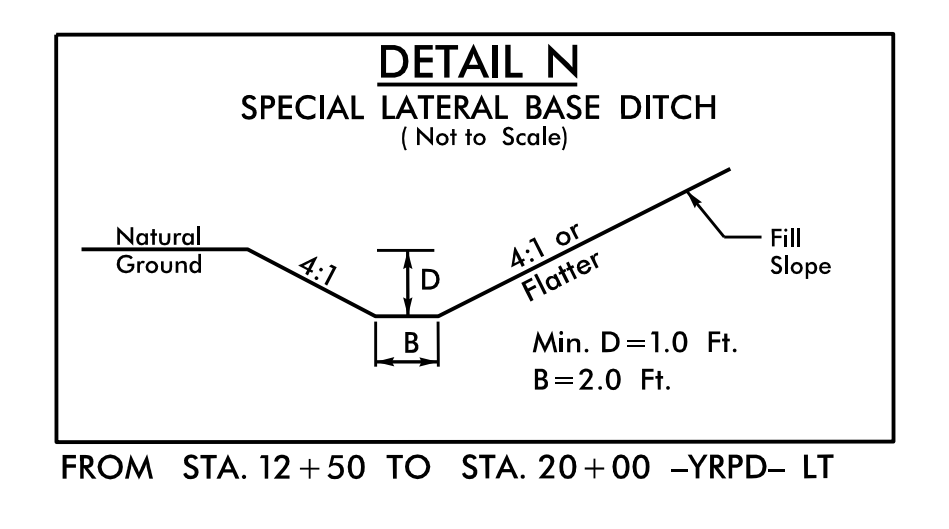
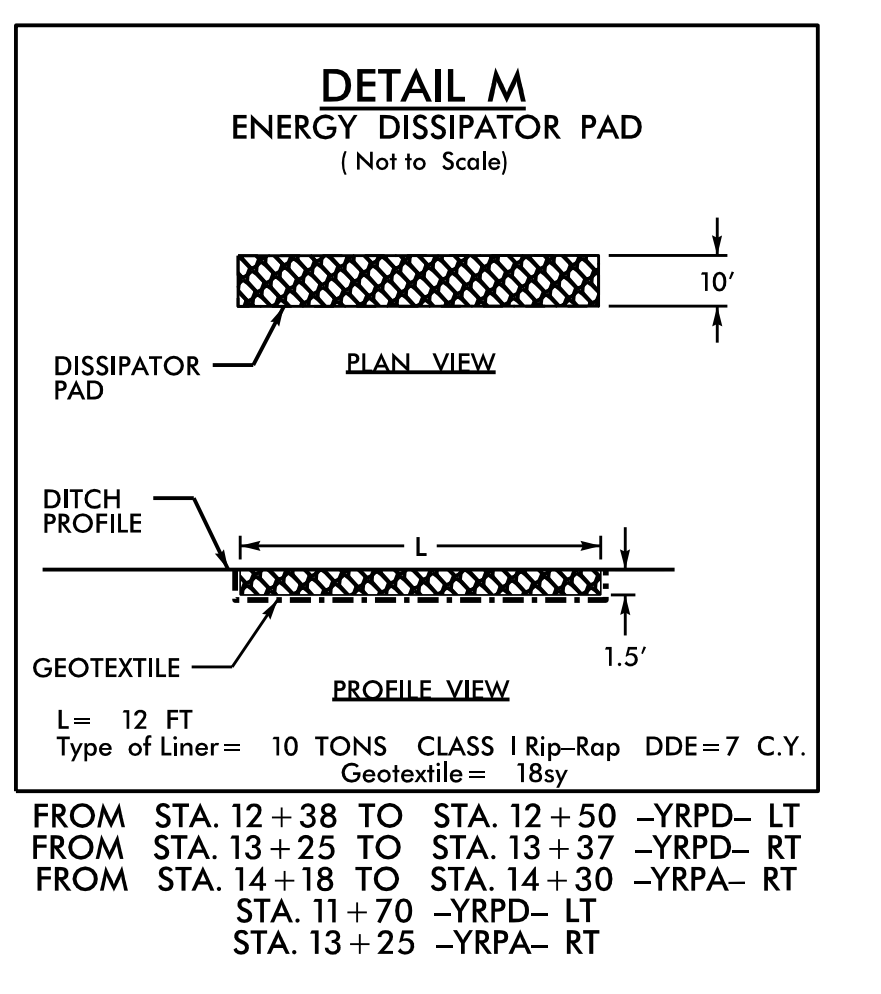
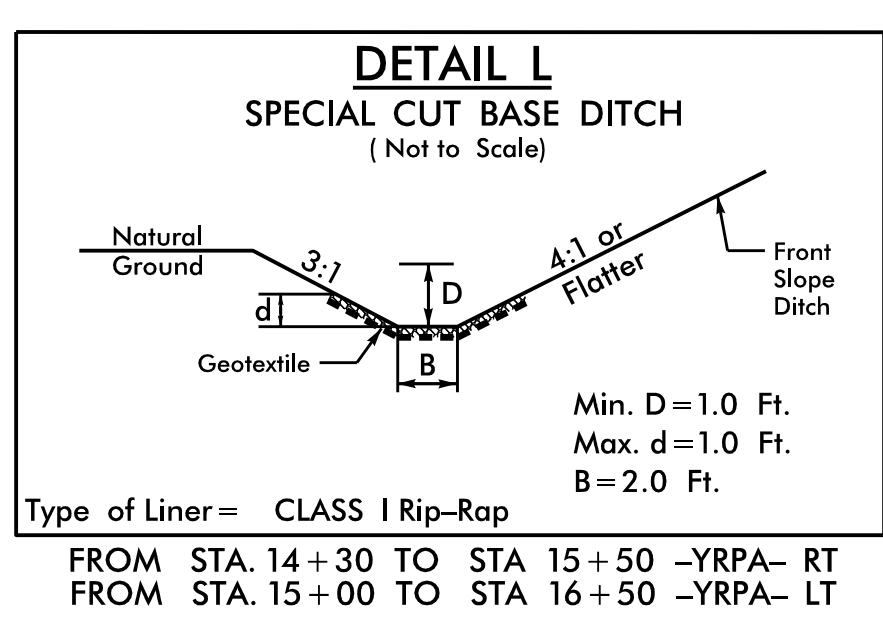
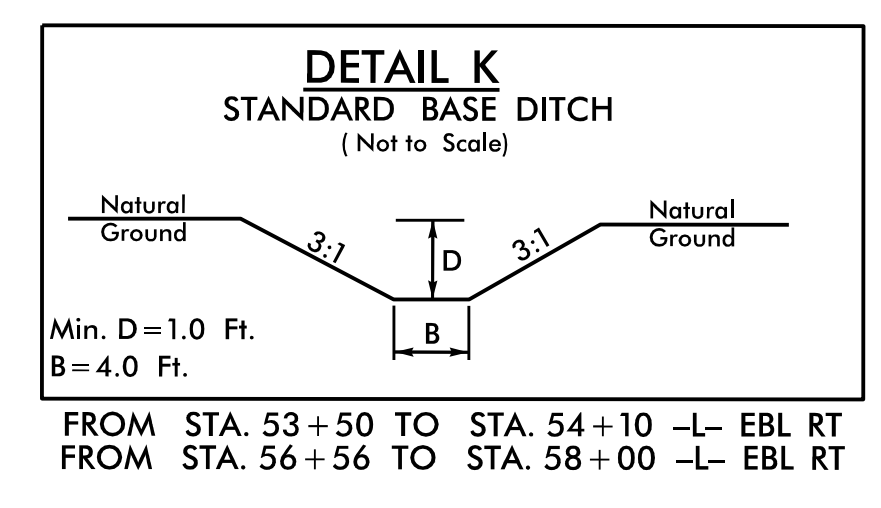
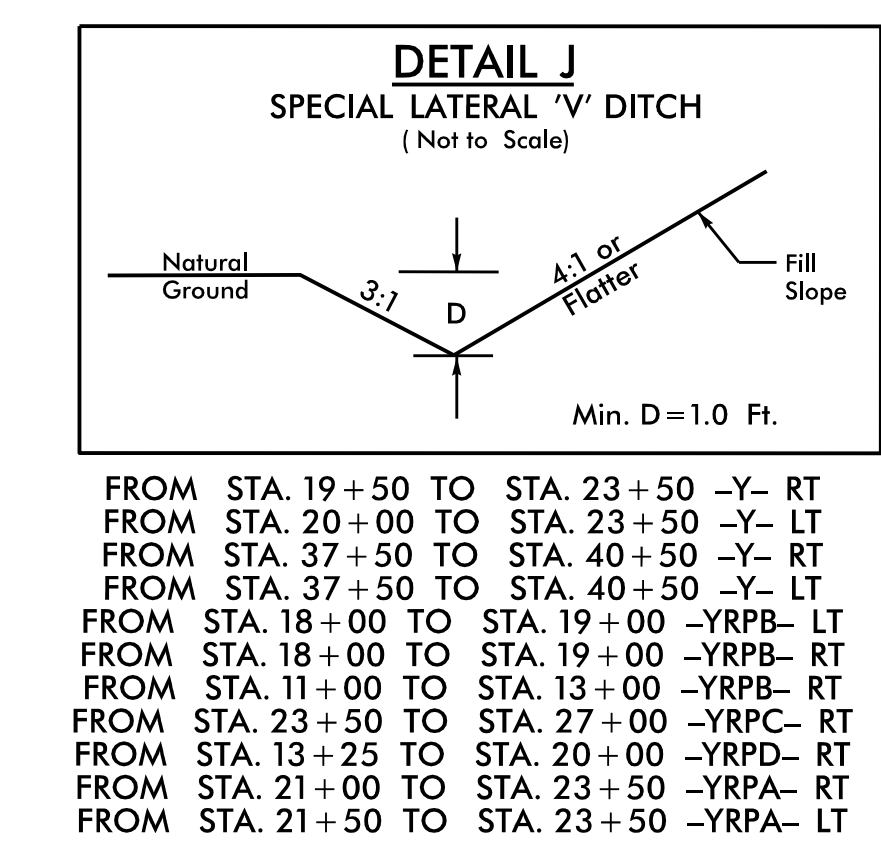
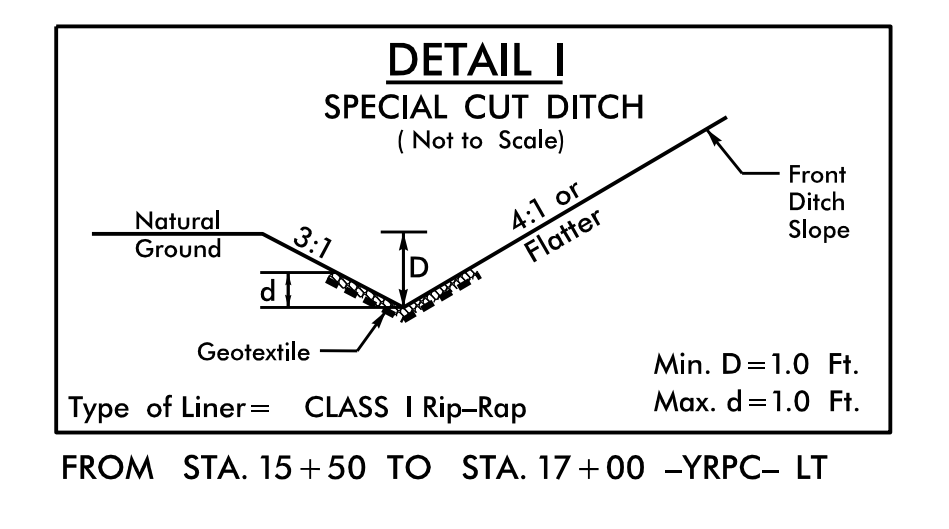
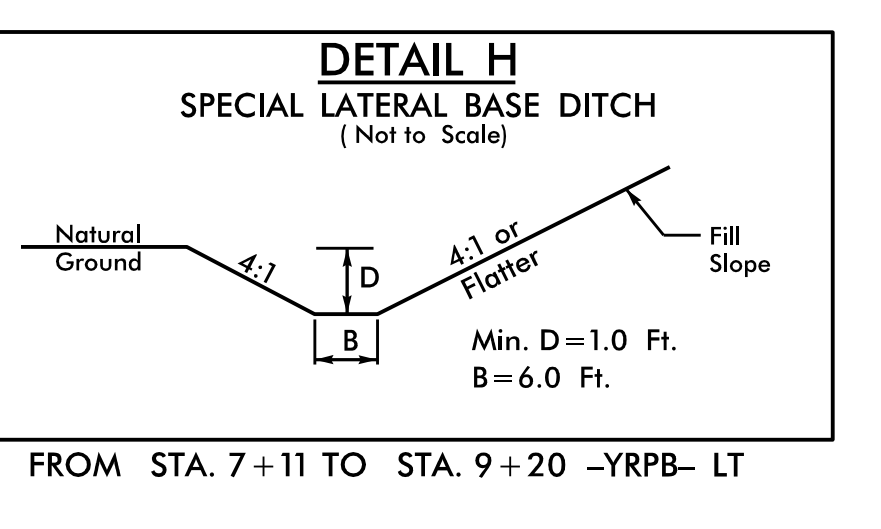
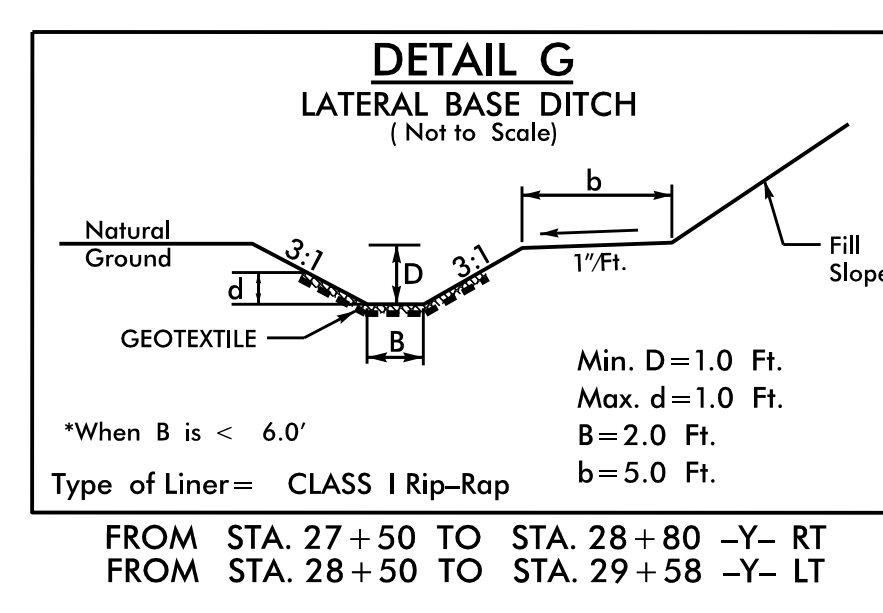
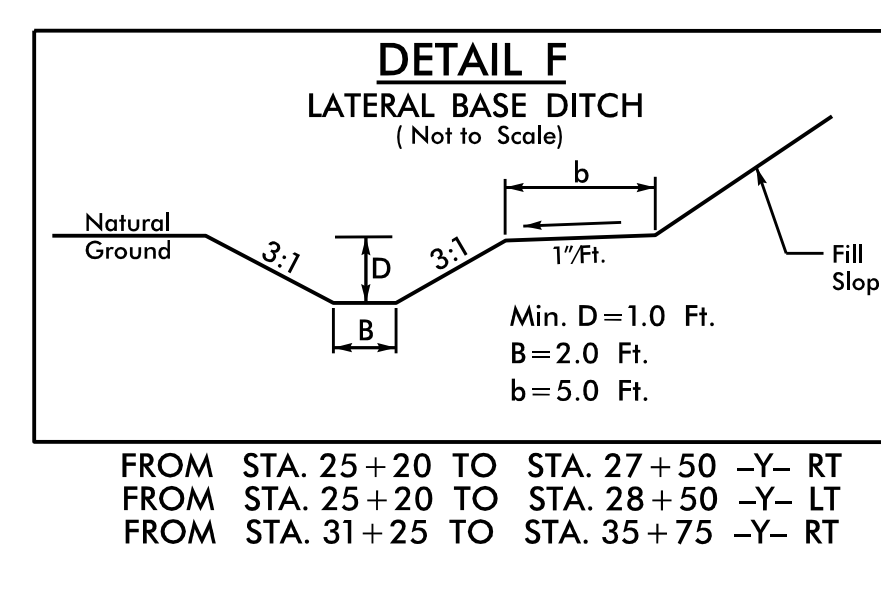
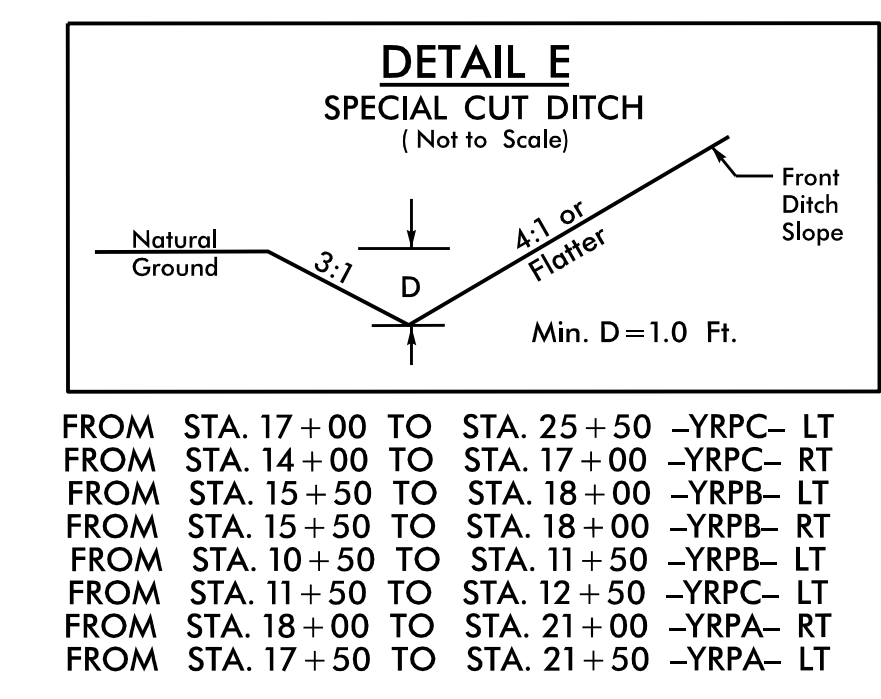
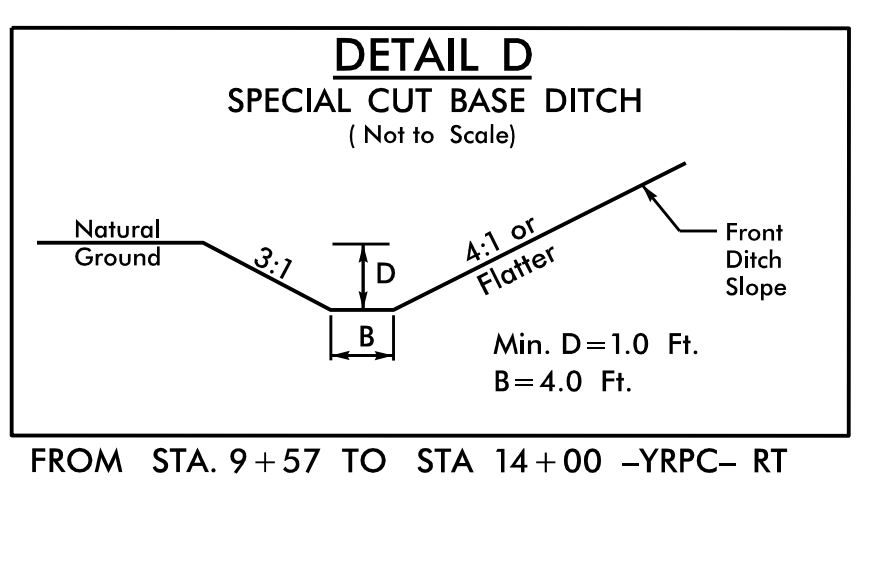
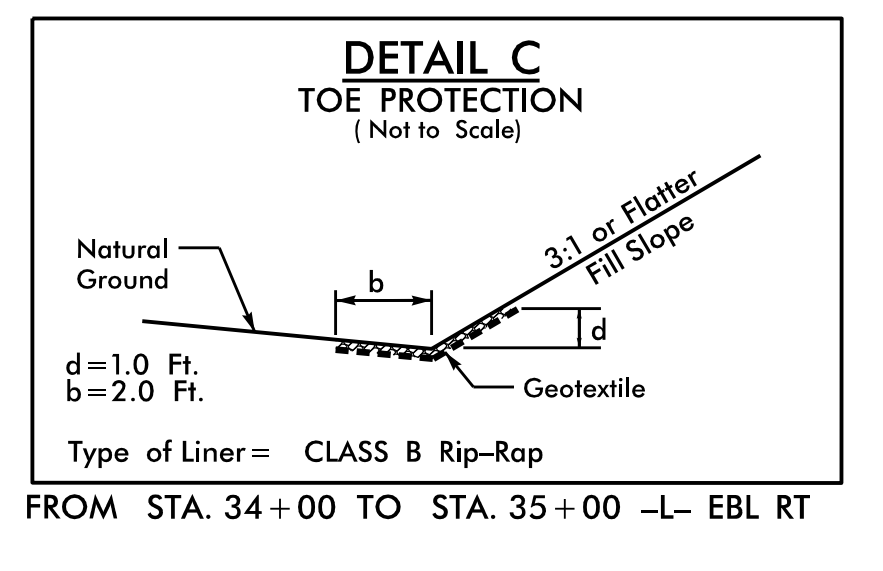
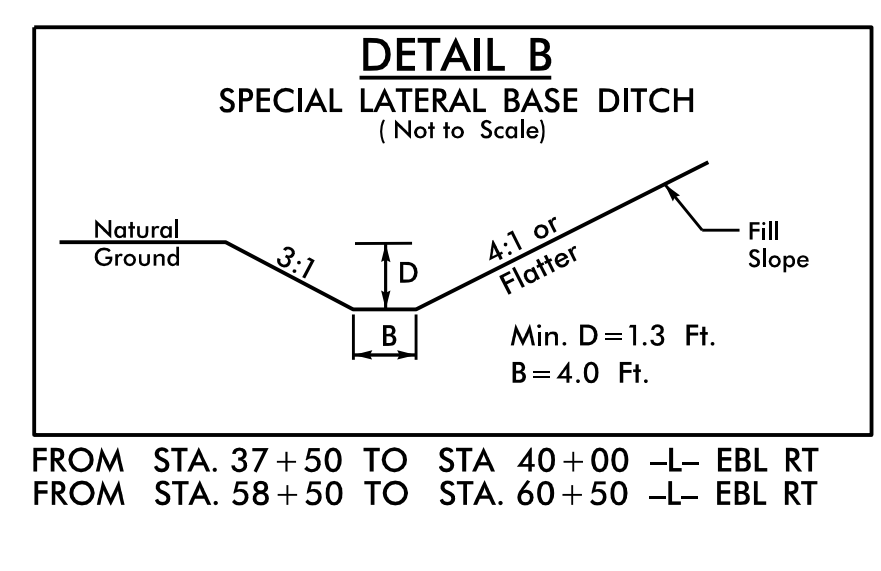
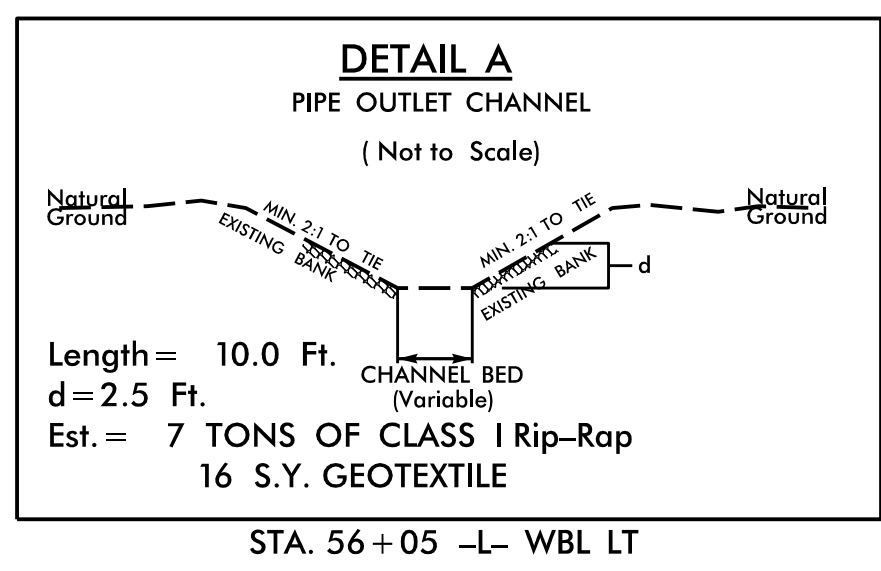
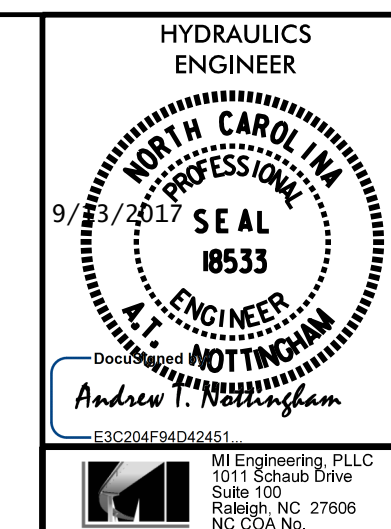


NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS

**GEOTECHNICAL  
 ENGINEERING UNIT**

STANDARD DETAIL NO. 1804.01

STANDARD  
 EMBANKMENT MONITORING



**SUMMARY OF EARTHWORK**

STATION	STATION	UNCL. EXCAV.	UNDERCUT	EMBANK. +%	BORROW	WASTE	
						SUITABLE	UNSUITABLE
-YRPA- 11+50.00	25+00.00	5,262	4,585	18,291	13,029		4,585
-YRPB- 9+50.00	20+00.00	2,321		3,738	1,417		
-YRPC- 10+00.00	27+00.00	7,523	3,150	8,444	921		3,150
-YRPD- 9+50.00	20+50.00	1,856		16,626	14,770		
SUBTOTALS:		16,962	7,735	47,098	30,136		7,735
-L-LT 129+14.00	148+24.00	756		976	220		
-L-RT 129+14.00	148+24.00	1,062		801		261	
-YI- 16+70.00	17+63.20	5		33	28		
-YI- 18+82.17	20+00.00	18		13		5	
SUBTOTALS:		1,841		1,822	247	266	
-Y- 19+35.00	29+46.23	438		40,011	39,573		
-Y- 31+32.23	41+76.00	260		40,129	39,869		
-L-LT 26+65.00	56+50.00	2,104		2,038		66	
-L-LT 56+50.00	74+50.00	666		2,450	1,784		
-L-RT 33+50.00	56+50.00	2,014		2,035	21		
-L-RT 56+50.00	84+19.00	1,177		5,459	4,282		
SUBTOTALS:		6,659		92,122	85,529	66	
TOTALS:		25,462	7,735	141,041	115,911	332	7,735
MATERIAL FOR SHOULDER CONSTRUCTION				10,738	10,738		
LOSS DUE TO CLEARING AND GRUBBING		-1,500			1,500		
WASTE IN LIEU OF BORROW					-332	-332	
SELECT GRANULAR MATERIAL IN LIEU OF BORROW				-4,625	-4,625		
ADDITIONAL UNDERCUT (CONTINGENCY)			2,500	3,125	3,125		2,500
PROJECT TOTALS:		23,962	10,235	150,227	126,316		10,235
EST. 5% TO REPLACE TOP SOIL ON BORROW PIT					6,316		
GRAND TOTALS:		23,962	10,235	150,227	132,631		10,235
SAY:		24,000	10,300		132,700		
UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE IN THE TOP 3' OF EMBANKMENT OR BACKFILL							
-YRPC- 14+25 TO 25+75 (1,750 CY) PER GEOTECH							
EST. DDE = 7,860 CY							
TOTAL SHALLOW UNDERCUT = 400 CY							
TOTAL CLASS IV SUBGRADE STABILIZATION = 800 TON							
TOTAL SELECT GRANULAR MATERIAL CLASS III = 4,700 CY							

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.

**SUMMARY OF SHOULDER BERM GUTTER**

SURVEY LINE	STATION	STATION	LENGTH
-Y- RT	27+82.00	29+26.86	144.86
-Y- LT	29+16.00	29+38.36	22.36
-Y- RT	31+40.10	31+62.00	21.90
-Y- LT	31+51.60	32+93.00	141.40
TOTAL:			330.52
SAY:			350

**SUMMARY OF BREAKING EXISTING ASPHALT PAVEMENT**

SURVEY LINE	STATION	STATION	LOCATION LT/RT/CL	YD <sup>2</sup>
-Y-	21+00.00	29+46.23	CL	2114.70
-Y-	31+32.23	39+50.00	CL	2180.06
TOTAL:				4294.76
SAY:				4300.00

**SUMMARY OF PAVEMENT REMOVAL**

SURVEY LINE	STATION	STATION	LOCATION LT/RT/CL	YD <sup>2</sup>
-L-	47+08.26	54+68.78	CL	564.61
-L-	55+44.43	63+54.75	CL	701.62
-L-	47+92.15	53+87.39	RT	89.74
-L-	57+89.89	62+00.00	LT	111.61
TOTAL:				1467.57
SAY:				1470

**SUMMARY OF CABLE GUIDERAIL**

SURVEY LINE	STATION	STATION	LENGTH	END ANCHOR UNIT	EXISTING GUIDERAIL REMOVAL	COMMENTS
-L-	45+95.50	54+02.76	808	2		
-L-	56+10.43	64+55.50	845	2		
-L-	129+14.00		25	1		
-L-	148+24.00		25	1		
-L-	129+14.00	132+52.67			339	
-L-	144+57.85	148+24.00			366	
SUBTOTAL:			1,703	6	705	
LESS TERMINAL ANCHOR UNITS: 6 @ 25 = 150					150	
GRAND TOTALS:			1,553	6	705	
SAY:			1,575	6	725	
ADDITIONAL GUIDERAIL POSTS				6		

**SUMMARY OF WOVEN WIRE FENCE**

STATION TO STATION	SIDE	A FABRIC L.F.	B END BRACE	C CORNER BRACE	D LINE BRACE	E 4" POSTS	F 5" POSTS
-L- STA 28+92.73 TO STA 38+89.02	LT	996.29	1		4	64	14
-YRPB- STA 5+00.00 TO STA 19+66.51	LT	1,466.51		1	5	95	18
-Y- STA 19+35.00 TO STA 23+55.00	RT	450.00	1		2	28	8
-L- STA 33+50.00 TO STA 35+43.85	RT	193.85	1		1	11	5
-YRPC- STA 5+00.00 TO STA 26+93.08	RT	2,193.08		2	7	142	27
-Y- STA 37+51.30 TO STA 41+52.30	RT	401.00	1		2	24	8
-Y- STA 19+35.00 TO STA 23+58.70	LT	423.70	1		2	26	8
-YRPA- STA 5+00.00 TO STA 24+52.02	RT	1,952.02		2	7	125	27
-L- STA 72+00.69 TO STA 74+50.00	LT	249.31	1		1	15	5
-Y- STA 37+47.96 TO STA 41+50.37	LT	402.41	1	1	2	23	11
-YRPD- STA 5+00.00 TO STA 19+94.75	LT	1,494.75		1	5	97	18
-L- STA 71+94.73 TO STA 84.19.00	RT	1,224.27	1		4	80	14
GRAND TOTALS:		11,447.19				729	163
SAY:		11,450				730	165
ADDITIONAL BARBED WIRE (CONTINGENCY)		500					





DL#R0002

COMPUTED BY: MOCN DATE: 08/03/2016  
CHECKED BY: ATN DATE: 08/08/2016

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS

PROJECT NO. SHEET NO.  
R-5752 3D-1

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)

Table with columns for Line & Station, Offset, Structure Number, Invert Elevation, Minimum Required Slope, Pipe Material (Side Drain, C.S., R.C. Class III, IV, V), Endwalls, Reinforced Endwalls, Drainage Structure, Quantities for Drainage Structures, Frame, Grates, and Hood, Concrete Transitional Section, and Abbreviations. Includes a SHEET TOTALS row at the bottom.



12/06/07

COMPUTED BY: AMC DATE: 2/2017  
 CHECKED BY: DJC DATE: 2/2017

STATE OF NORTH CAROLINA  
 DIVISION OF HIGHWAYS

PROJECT REFERENCE NO. SHEET NO.  
 R-5752 36-1

**SUMMARY OF SUBSURFACE DRAINAGE**

SURVEY LINE	STATION	STATION	LOCATION LT/RT/CL	DRAIN TYPE* UD/BD/SD	LF
-L-	131 + 25.00	133 + 75.00	LT/RT	UD	500
-L-	139 + 00.00	141 + 25.00	LT/RT	UD	450
-Y-	37 + 75.00	40 + 25.00	LT/RT	UD	500
-YRPB-	11 + 25.00	11 + 75.00	LT/RT	UD	100
-YRPC-	8 + 00.00	15 + 25.00	LT/RT	UD	1,450
-YRPC-	19 + 25.00	22 + 50.00	LT/RT	UD	650
CONTINGENCY				UD	1,000
TOTAL:					4,650
SAY:					4,650

\*UD = UNDERDRAIN  
 \*BD = BLIND DRAIN  
 \*SD = SUBSURFACE DRAIN

**SUMMARY OF AGGREGATE SUBGRADE/STABILIZATION**

SURVEY 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
-Y-	39 + 25.00	41 + 75.00			100	200	300		
CONTINGENCY					300	600	1,000		
TOTAL:					400	800	1,300		
SAY:					400	800	1,300		

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 SETTLEMENT GAUGES**

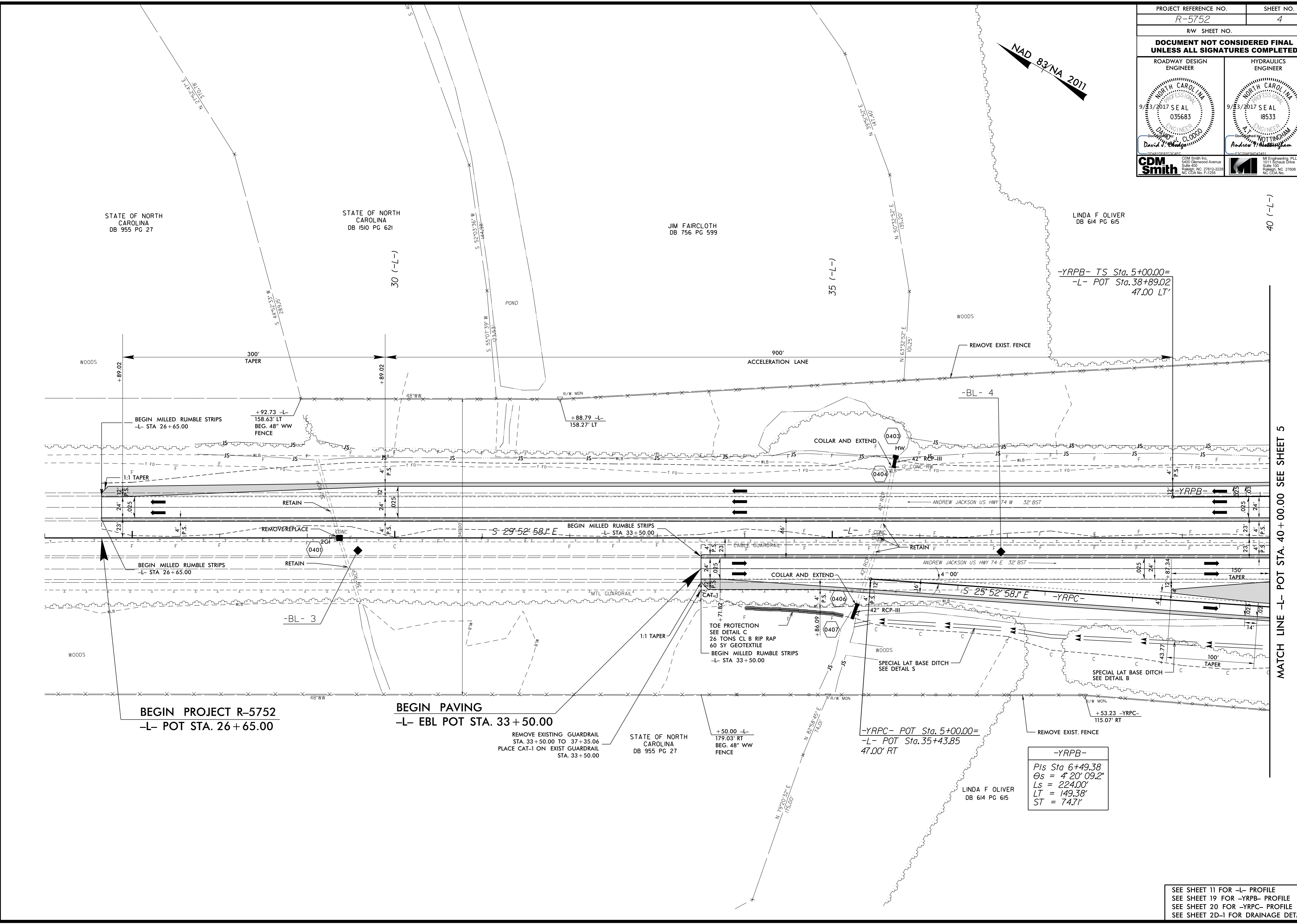
GAUGE NO.	LINE	APPROX. STATION	APPROX. OFFSET
1	-Y-	29 + 20.00	12' LT
2	-Y-	29 + 20.00	12' RT
3	-Y-	31 + 60.00	12' LT
4	-Y-	31 + 60.00	12' RT
TOTAL GAUGES (EA)			4

**SUMMARY OF BRIDGE WAITING PERIODS**

BRIDGE OVER US 74 ON SR 2220 (BROADRIDGE ROAD)	END BENT NO.	MONTHS
AFTER CONSTRUCTION TO WITHIN 2 FT OF FINISHED GRADE, WAIT BEFORE BEGINNING END BENT CONSTRUCTION	1	4
AFTER CONSTRUCTION TO WITHIN 2 FT OF FINISHED GRADE, WAIT BEFORE BEGINNING END BENT CONSTRUCTION	2	4

-SYSTIME 2006\F5752.Rdy\_psh\_361.dgn

PROJECT REFERENCE NO. <i>R-5752</i>	SHEET NO. 4
R/W SHEET NO.	
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
ROADWAY DESIGN ENGINEER 	HYDRAULICS ENGINEER 
<b>CDM Smith</b> CDM Smith Inc. 5400 Glenwood Avenue Suite 400 Raleigh, NC 27612-3228 NC CDA No. F-1255	<b>M Engineering, PLLC</b> 3111 Schmitt Drive Suite 100 Raleigh, NC 27606 NC CDA No. F-1255



-YRPB- TS Sta. 5+00.00=  
-L- POT Sta. 38+89.02  
47.00 LT'

**BEGIN PROJECT R-5752**  
-L- POT STA. 26+65.00

**BEGIN PAVING**  
-L- EBL POT STA. 33+50.00

REMOVE EXISTING GUARDRAIL  
STA. 33+50.00 TO 37+35.06  
PLACE CAT-1 ON EXIST GUARDRAIL  
STA. 33+50.00

+50.00 -L-  
179.03' RT  
BEG. 48" WW  
FENCE

-YRPC- POT Sta. 5+00.00=  
-L- POT Sta. 35+43.85  
47.00' RT

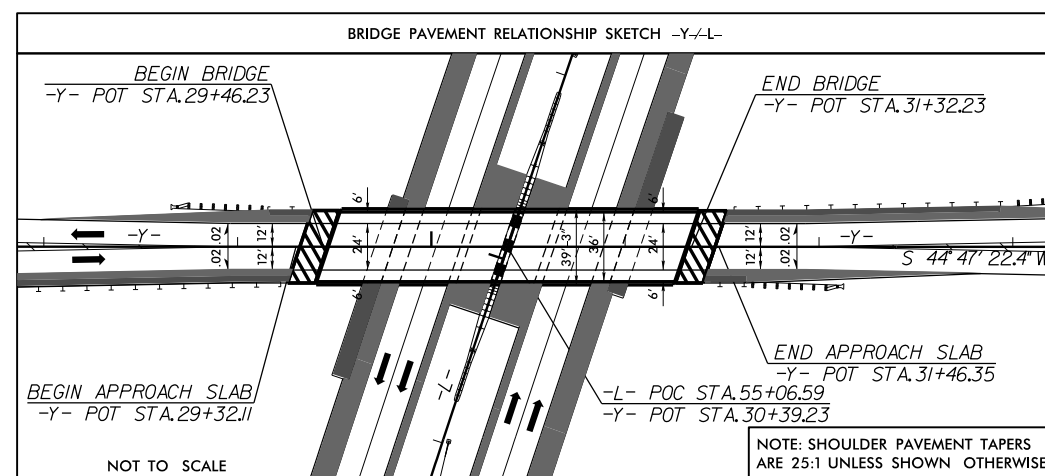
-YRPB-  
Pls Sta 6+49.38  
θs = 4° 20' 09.2"  
Ls = 224.00'  
LT = 149.38'  
ST = 74.71'

SEE SHEET 11 FOR -L- PROFILE  
SEE SHEET 19 FOR -YRPB- PROFILE  
SEE SHEET 20 FOR -YRPC- PROFILE  
SEE SHEET 2D-1 FOR DRAINAGE DETAILS

Invalid expression: USE: BFC: 02\_Rdy\_psh\_04.dgn

40 (-L-)

MATCH LINE -L- POT STA. 40+00.00 SEE SHEET 5



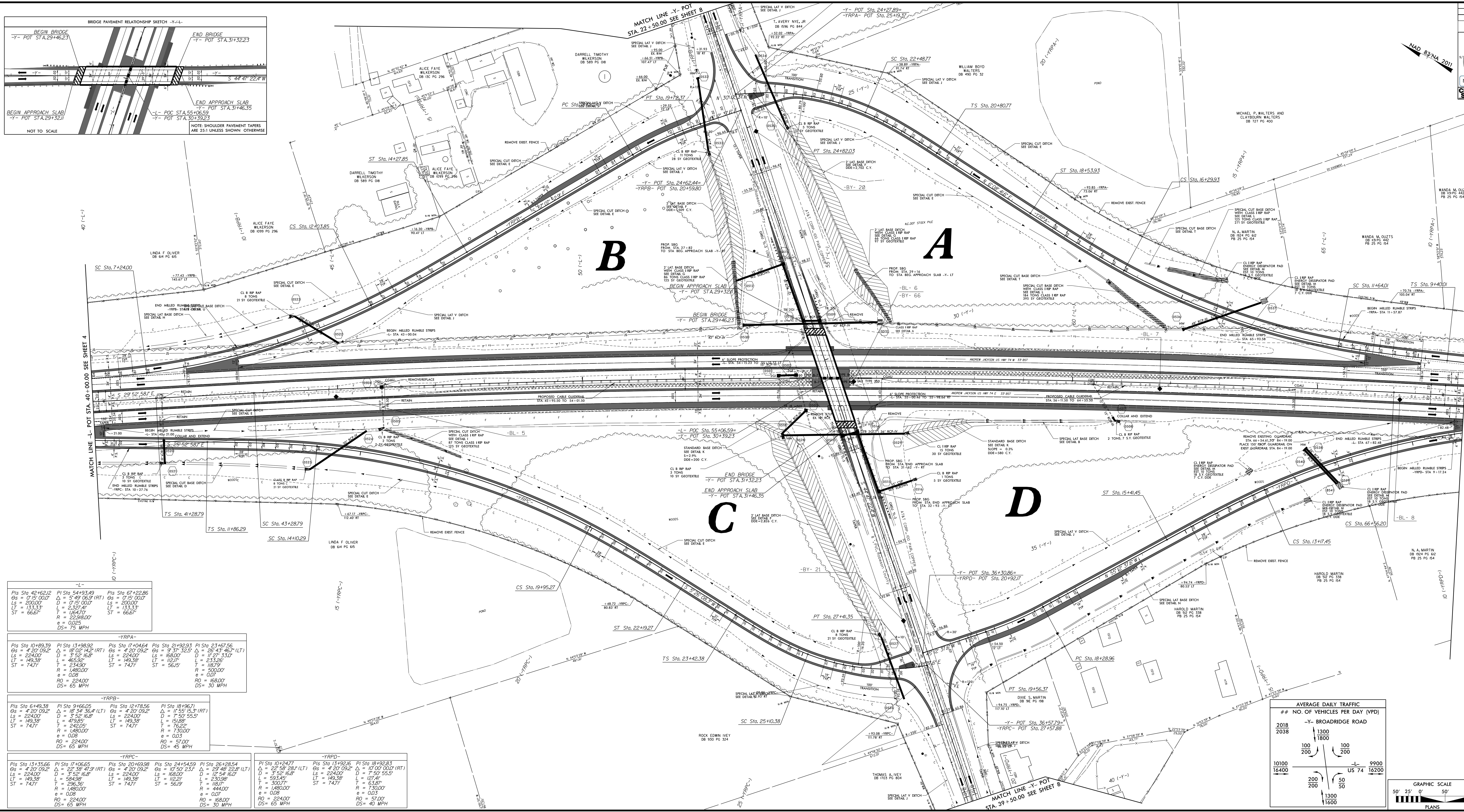
PROJECT REFERENCE NO. R-5752 SHEET NO. 5

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

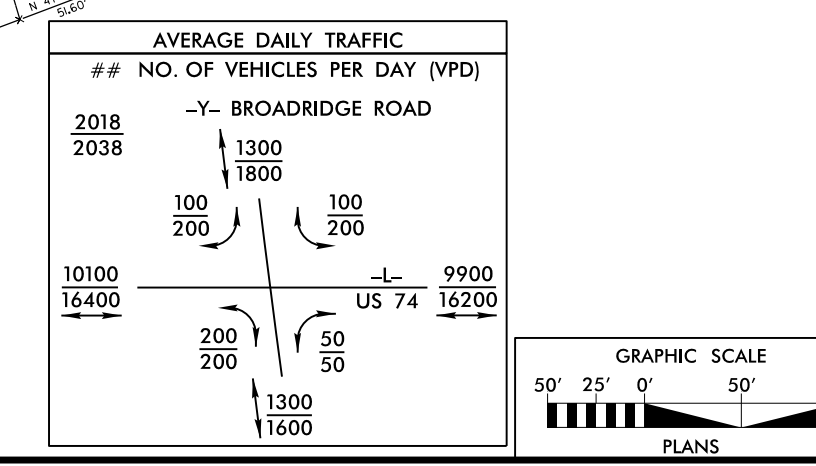
ROADWAY DESIGN ENGINEER: MICHAEL P. WALTERS AND CLAYTON W. MILTOS, DB 727 PG 400

HYDRAULICS ENGINEER: WANDA M. OLITS, DB 25 PG 54

CDM Smith



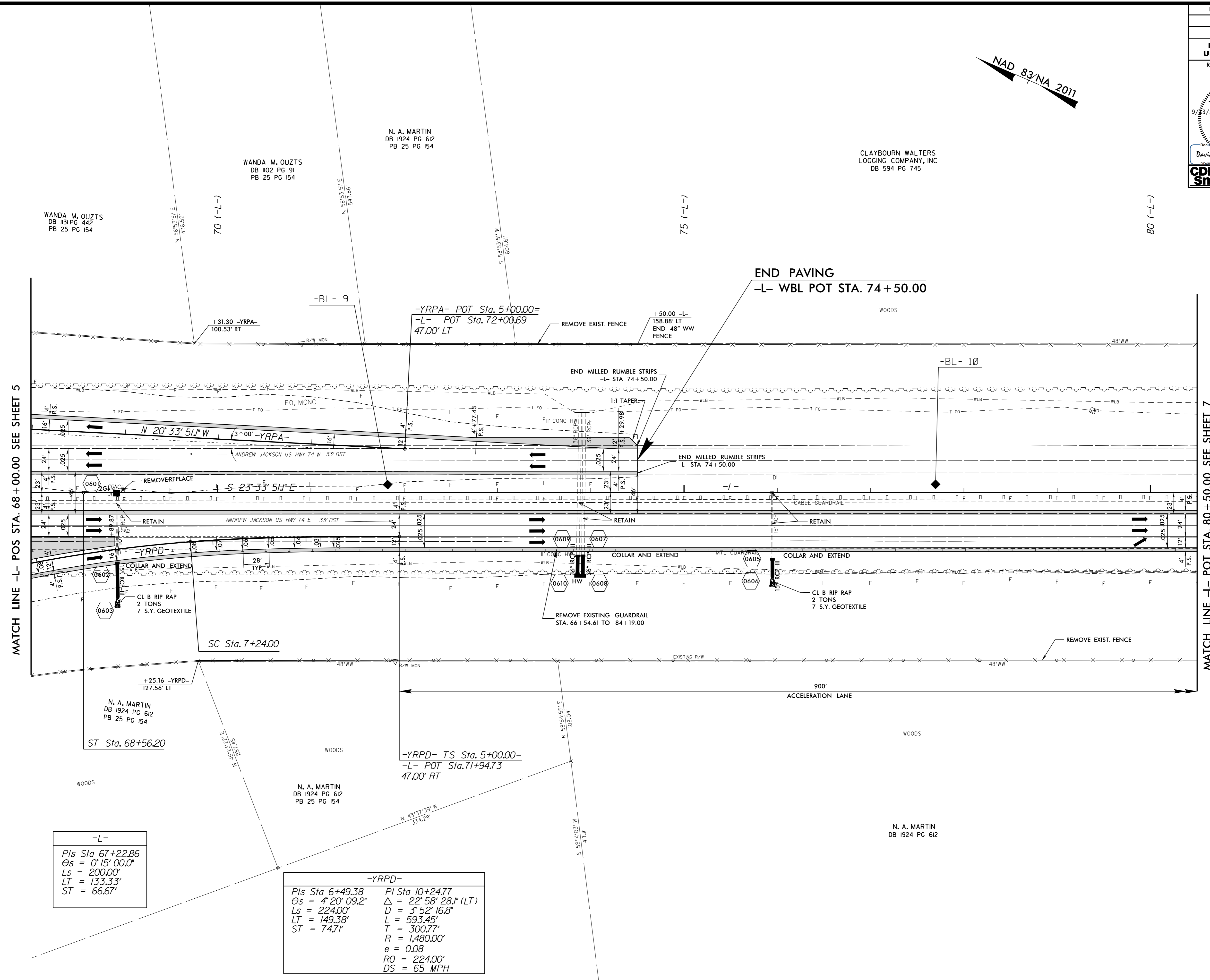
-L-		-YRPA-		-YRPB-		-YRPC-		-YRPD-	
PI Sta 42+62.12	PI Sta 54+93.49	PI Sta 67+22.86	PI Sta 10+89.39	PI Sta 13+98.96	PI Sta 17+04.64	PI Sta 21+92.93	PI Sta 23+67.56	PI Sta 10+24.77	PI Sta 13+92.16
GS = 0'15" 0.00'	GS = 5'49" 06.37' (RT)	GS = 0'15" 0.00'	GS = 4'30" 09.27'	GS = 10'02" 14.25' (RT)	GS = 4'20" 09.27'	GS = 3'35" 32.55'	GS = 25'43" 46.71' (LT)	GS = 3'52" 16.81' (LT)	GS = 4'30" 09.27'
LS = 200.00'	D = 0'15" 0.00'	LS = 200.00'	LS = 224.00'	D = 3'52" 16.81'	LS = 224.00'	LS = 168.00'	D = 17'27" 33.0'	D = 3'52" 16.81'	D = 7'50" 55.5'
LT = 133.33'	T = 164.47'	LT = 133.33'	LT = 149.38'	LT = 133.33'	LT = 133.33'	LT = 121.0'	LT = 121.0'	LT = 169.38'	LT = 169.38'
ST = 66.67'	e = 0.025	ST = 66.67'	ST = 74.71'	R = 1480.00'	R = 1480.00'	R = 1480.00'	R = 1480.00'	R = 1480.00'	R = 1480.00'
	DS = 75 MPH		DS = 65 MPH	RO = 224.00'	RO = 168.00'	RO = 168.00'	RO = 168.00'	RO = 224.00'	RO = 168.00'
			DS = 65 MPH	DS = 65 MPH	DS = 30 MPH	DS = 30 MPH	DS = 30 MPH	DS = 65 MPH	DS = 40 MPH



SEE SHEETS 12 & 13 FOR -L- PROFILE  
 SEE SHEET 18 FOR -YRPA- PROFILE  
 SEE SHEET 19 FOR -YRPB- PROFILE  
 SEE SHEET 20 FOR -YRPC- PROFILE  
 SEE SHEET 21 FOR -YRPD- PROFILE  
 SEE SHEET 22 FOR -L- PROFILE  
 SEE SHEET 23 FOR ROADWAY DETAILS  
 SEE SHEETS 51 THRU 524 FOR STRUCTURE PLANS

PROJECT REFERENCE NO. <i>R-5752</i>	SHEET NO. 6
R/W SHEET NO.	
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

NAD 83/NA 2011



MATCH LINE -L- POS STA. 68 + 00.00 SEE SHEET 5

MATCH LINE -L- POT STA. 80 + 50.00 SEE SHEET 7


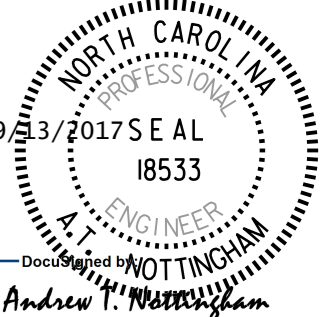

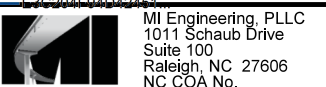
-L-  
 PIs Sta 67+22.86  
 $\theta_s = 0^\circ 15' 00.0''$   
 Ls = 200.00'  
 LT = 133.33'  
 ST = 66.67'

-YRPD-  
 PIs Sta 6+49.38      PI Sta 10+24.77  
 $\theta_s = 4^\circ 20' 09.2''$        $\Delta = 22^\circ 58' 28.1''$  (LT)  
 Ls = 224.00'      D = 3' 52' 16.8"  
 LT = 149.38'      L = 593.45'  
 ST = 74.71'      T = 300.77'  
                          R = 1,480.00'  
                          e = 0.08  
                          RO = 224.00'  
                          DS = 65 MPH

Invalid expression: J:\S:\B\631\1117\22\_Rdy\_psh\_06.dgn

SEE SHEET 14 FOR -L- PROFILE  
SEE SHEET 18 FOR -YRPA- PROFILE  
SEE SHEET 21 FOR -YRPD- PROFILE

5/14/99

PROJECT REFERENCE NO. <i>R-5752</i>	SHEET NO. <i>7</i>
R/W SHEET NO.	
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
	
 CDM Smith Inc. 5400 Glenwood Avenue Suite 400 Raleigh, NC 27612-3228 NC CDA No. P-1255	 M Engineering, PLLC 5115 Sycamore Drive Suite 100 Raleigh, NC 27608 NC CDA No.

NAD 83/NA 2011

CLAYBOURN WALTERS  
LOGGING COMPANY, INC  
DB 594 PG 745

85 (-L-)

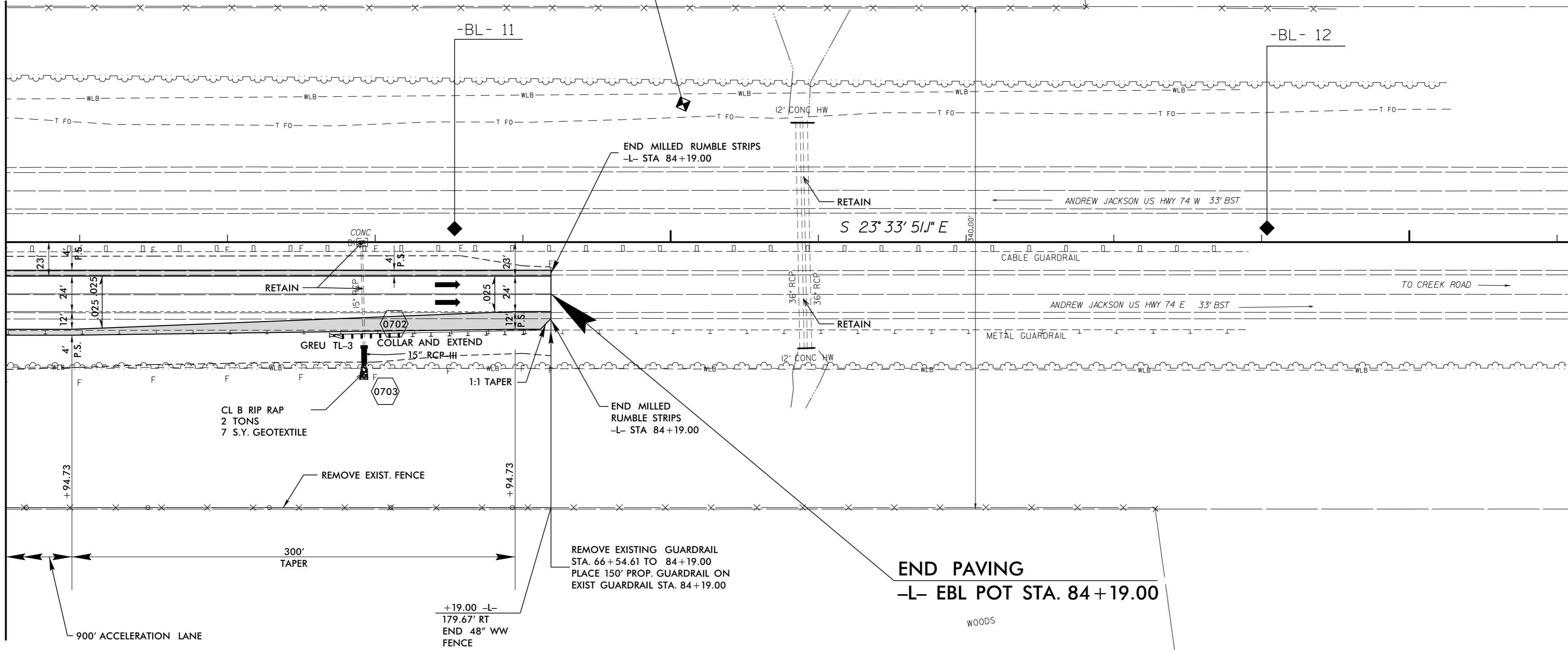
90 (-L-)

WOODS

BM#2  
-L- STA 85+08.46  
93.40' LEFT  
ELEV. 103.00'

N 88°20'51" E  
220.93'

MATCH LINE -L- POT STA. 80 + 50.00 SEE SHEET 6



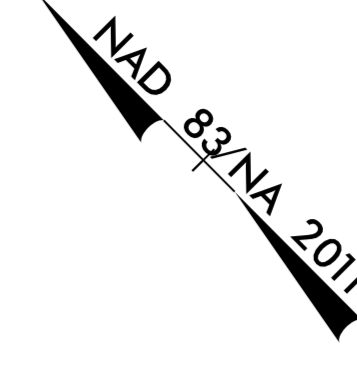
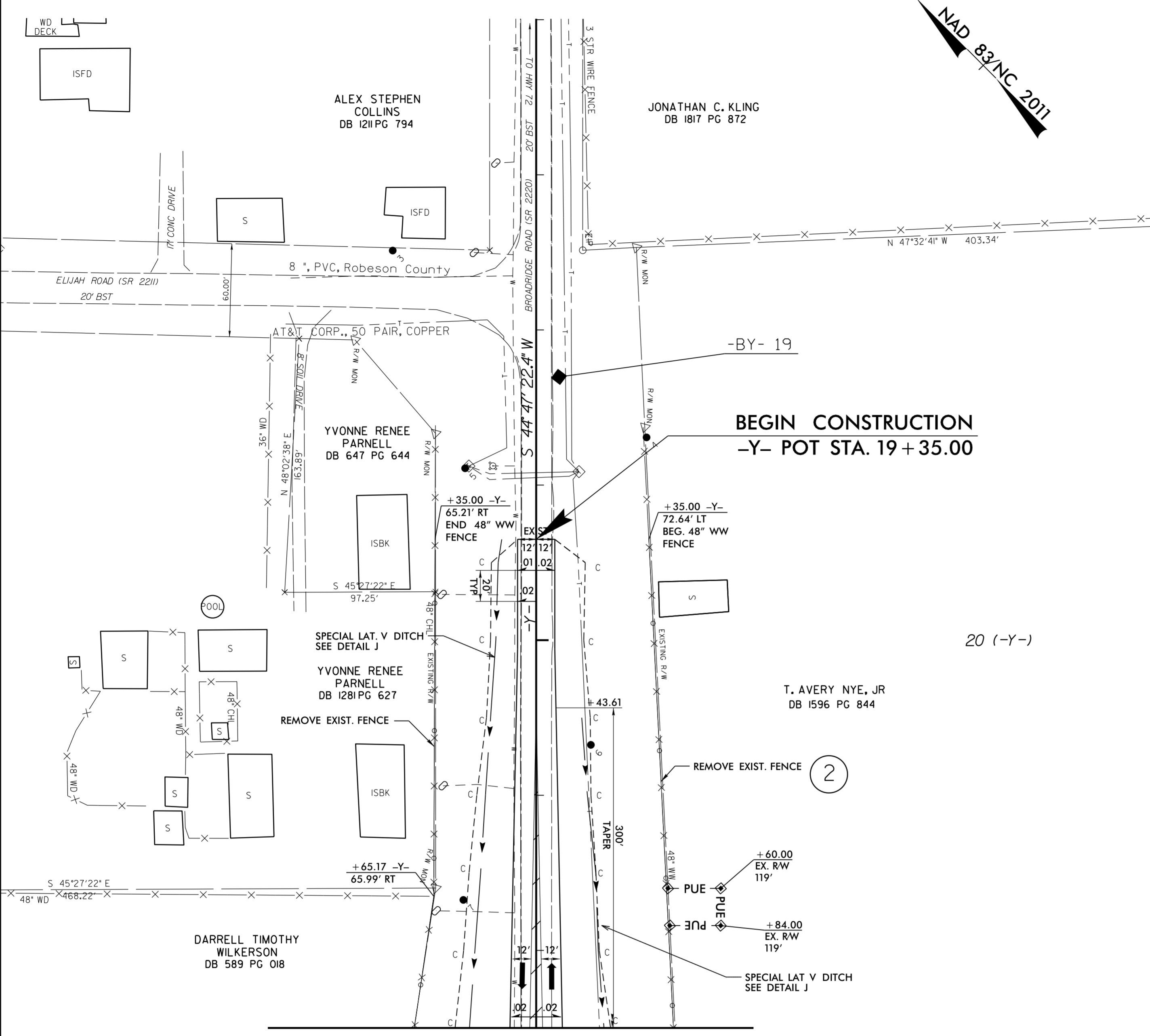
Invalid expression  
USE: BREF: 02\_Rdy\_psh\_07.dgn



8/17/19

REVISIONS

invygid: exp: rpsjston  
11:55:58 AM 8/17/19  
rel: psh\_08.dgn



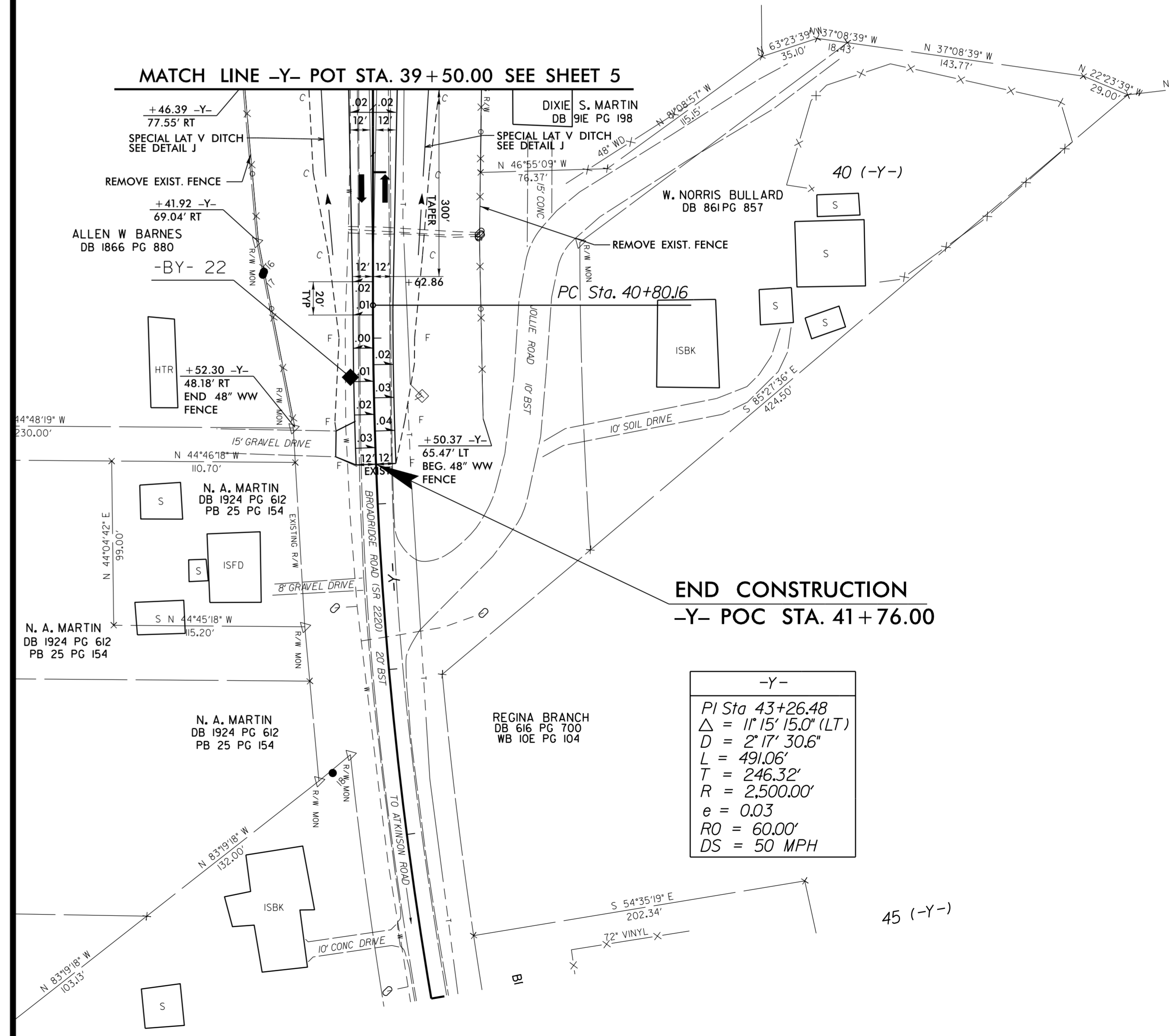
**BEGIN CONSTRUCTION**  
-Y- POT STA. 19 + 35.00

**MATCH LINE -Y- POT STA. 22 + 50.00 SEE SHEET 5**

20 (-Y-)

2

SEE SHEET 22 FOR -Y- PROFILE



**MATCHLINE -Y- POT STA. 39 + 50.00 SEE SHEET 5**

**END CONSTRUCTION**  
-Y- POC STA. 41 + 76.00

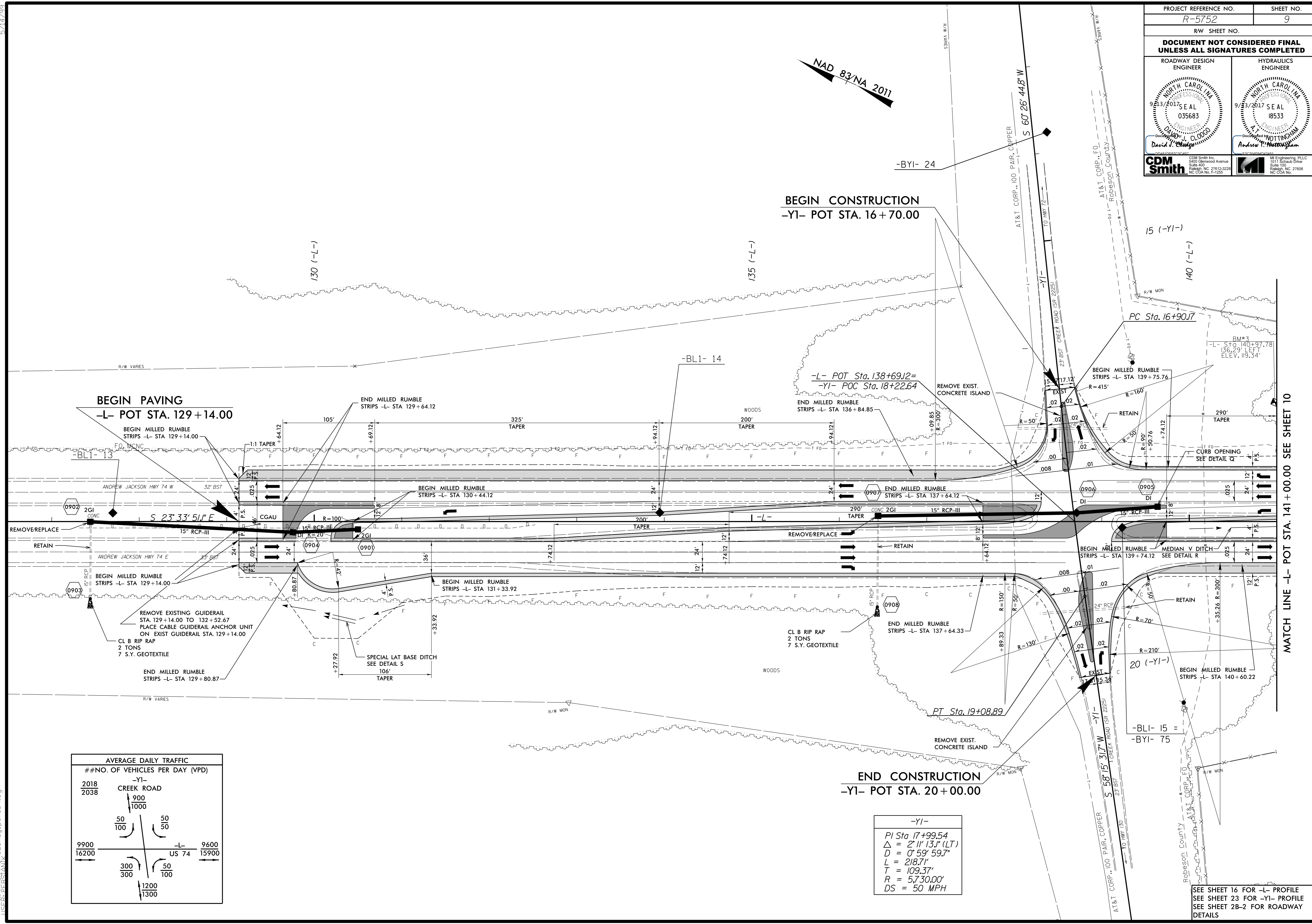
-Y-  
 PI Sta 43+26.48  
 $\Delta = 11' 15.0" (LT)$   
 $D = 2' 17.306"$   
 $L = 491.06'$   
 $T = 246.32'$   
 $R = 2,500.00'$   
 $e = 0.03$   
 $RO = 60.00'$   
 $DS = 50 MPH$

45 (-Y-)

SEE SHEET 22 FOR -Y- PROFILE

PROJECT REFERENCE NO. <i>R-5752</i>		SHEET NO. <i>8</i>	
RW SHEET NO.			
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	

PROJECT REFERENCE NO. <b>R-5752</b>	SHEET NO. <b>9</b>
RW SHEET NO.	
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
ROADWAY DESIGN ENGINEER <b>DAVID J. CLODDO</b> Professional Engineer 9/23/2017 S.E.A.L. 035683 David J. Clodd	HYDRAULICS ENGINEER <b>ANDREW W. MOTTINGHAM</b> Professional Engineer 9/23/2017 S.E.A.L. 18533 Andrew W. Mottingham
<b>CDM Smith</b> 1000 Smith Inc. 5400 Glenwood Avenue Suite 400 Raleigh, NC 27612-3228 NC CDA No. P-1255	<b>M Engineering, PLLC</b> 5115 S. Signet Drive Raleigh, NC 27608 NC CDA No.



AVERAGE DAILY TRAFFIC	
#NO. OF VEHICLES PER DAY (VPD)	
2018	-YI- CREEK ROAD
2038	900
	1000
	50
	50
9900	-L- US 74
16200	9600
	15900
	300
	300
	50
	100
	1200
	1300

-YI-
PI Sta. 17+99.54
$\Delta = 2^{\circ} 11' 13.1''$ (LT)
$D = 0^{\circ} 59' 59.7''$
$L = 218.71'$
$T = 109.37'$
$R = 5,730.00'$
$DS = 50$ MPH

MATCH LINE -L- POT STA. 141+00.00 SEE SHEET 10

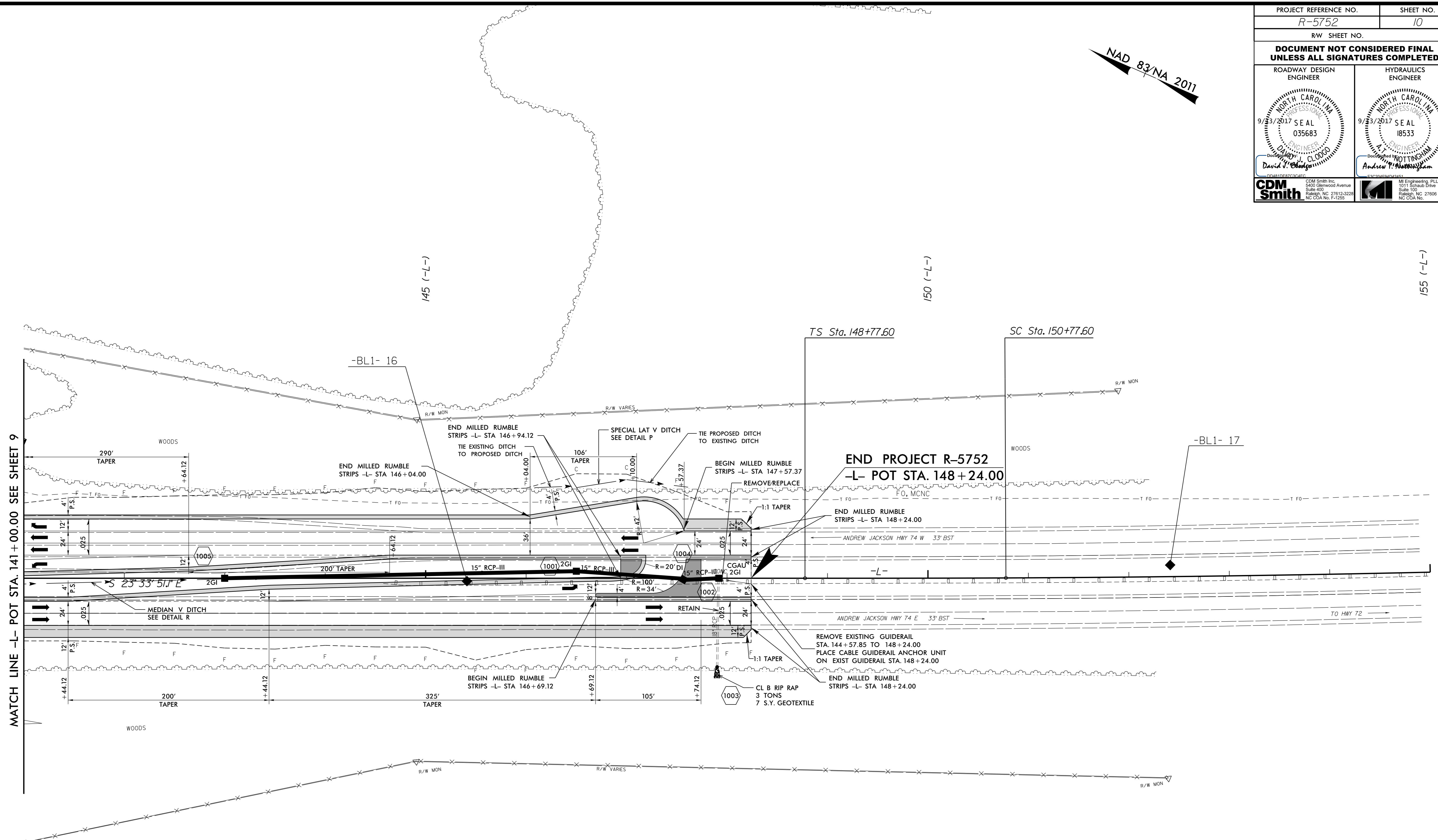
SEE SHEET 16 FOR -L- PROFILE  
SEE SHEET 23 FOR -YI- PROFILE  
SEE SHEET 28-2 FOR ROADWAY DETAILS

Invalid expression  
USE: B:\PROJECTS\22\_Rdy\_psh\_09.dgn

5/14/99

PROJECT REFERENCE NO. <i>R-5752</i>	SHEET NO. <i>10</i>
R/W SHEET NO.	
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<small>CDM Smith Inc. 5400 Glenwood Avenue Suite 400 Raleigh, NC 27612-3228 NC CDA No. P-1255</small>	<small>M Engineering, PLLC 3115 Schmitt Drive Suite 100 Raleigh, NC 27608 NC CDA No.</small>

NAD 83/NA 2011






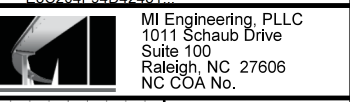
MATCH LINE -L- POT STA. 141+00.00 SEE SHEET 9

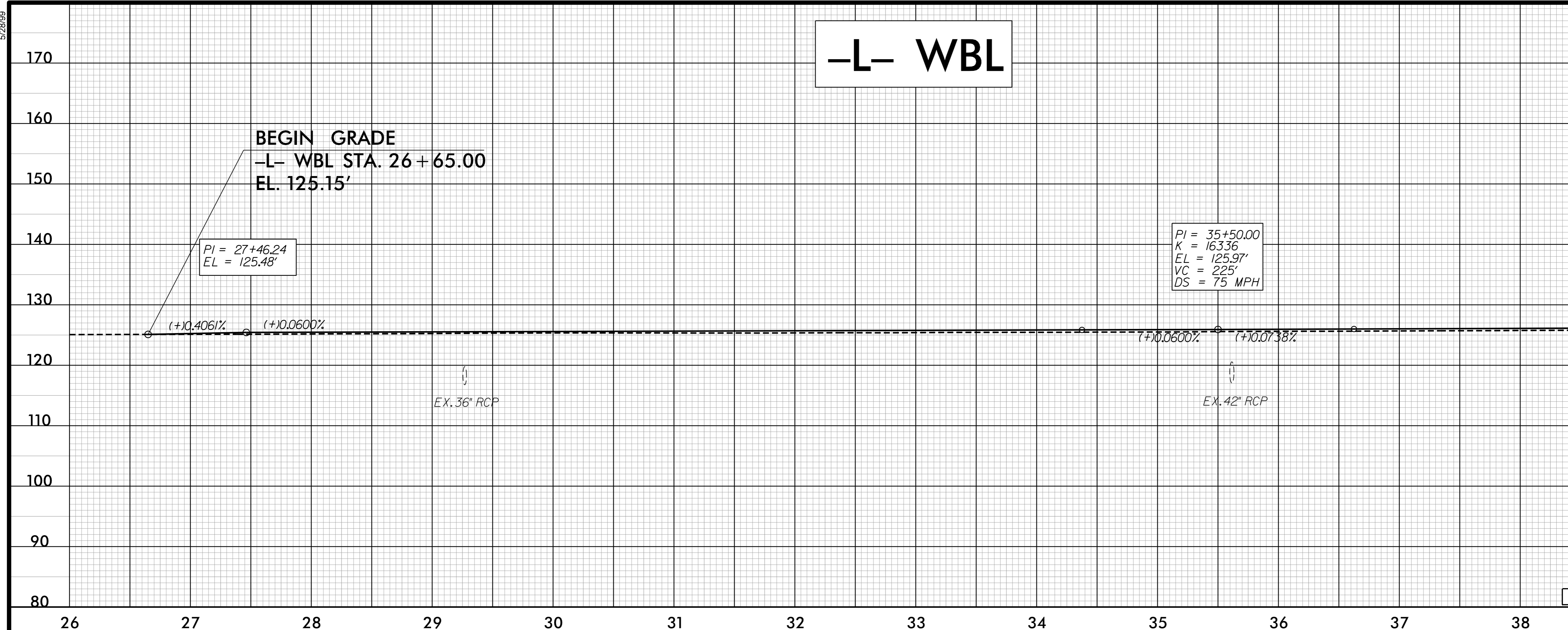
-L-	
<i>PIs Sta 150+10.94</i>	<i>PI Sta 159+27.61</i>
<i>θs = 0° 15' 00.0"</i>	<i>Δ = 4° 14' 53.3" (LT)</i>
<i>Ls = 200.00'</i>	<i>D = 0° 15' 00.0"</i>
<i>LT = 133.33'</i>	<i>L = 1,699.23'</i>
<i>ST = 66.67'</i>	<i>T = 850.00'</i>
	<i>R = 22,918.00'</i>
	<i>e = 0.025</i>
	<i>DS = 75 MPH</i>

Invalid expression used: REFTEXT2\_Rdy\_psh\_10.dgn

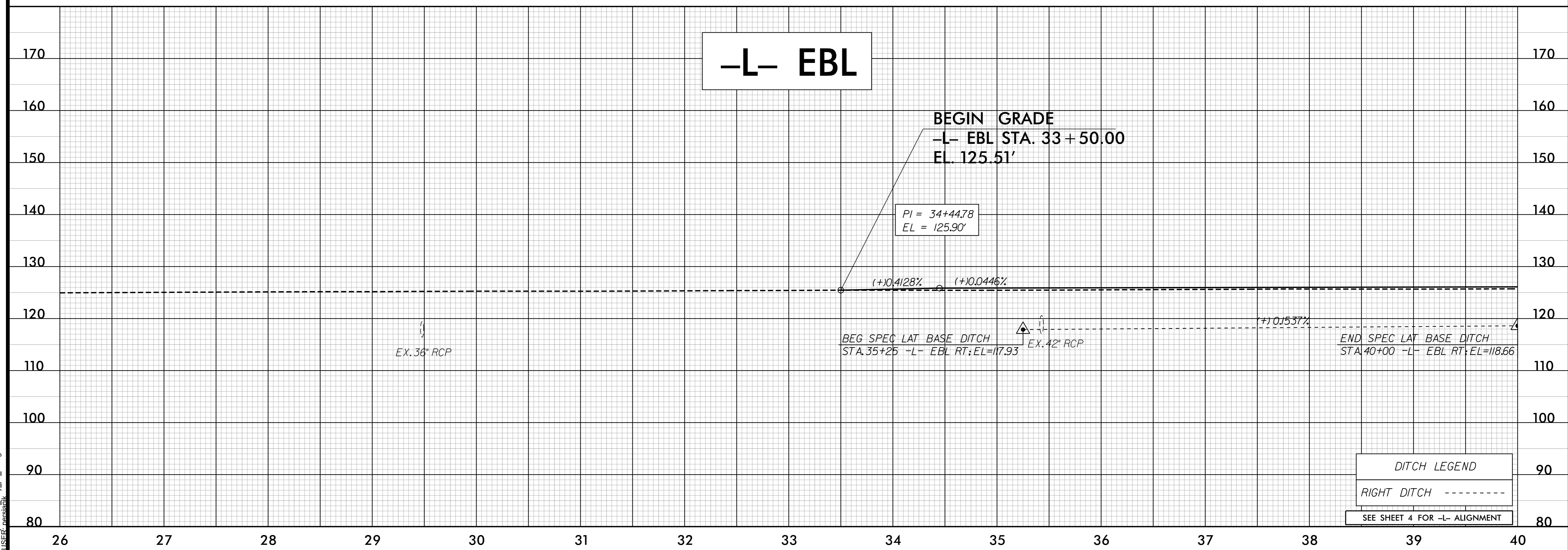
SEE SHEET 17 FOR -L- PROFILE  
SEE SHEET 2B-2 FOR ROADWAY  
DETAILS

5/28/99

PROJECT REFERENCE NO. R-5752	SHEET NO. 11
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
ROADWAY DESIGN ENGINEER 	HYDRAULICS ENGINEER 
	



SEE SHEET 4 FOR -L- ALIGNMENT



DITCH LEGEND

RIGHT DITCH - - - - -

SEE SHEET 4 FOR -L- ALIGNMENT

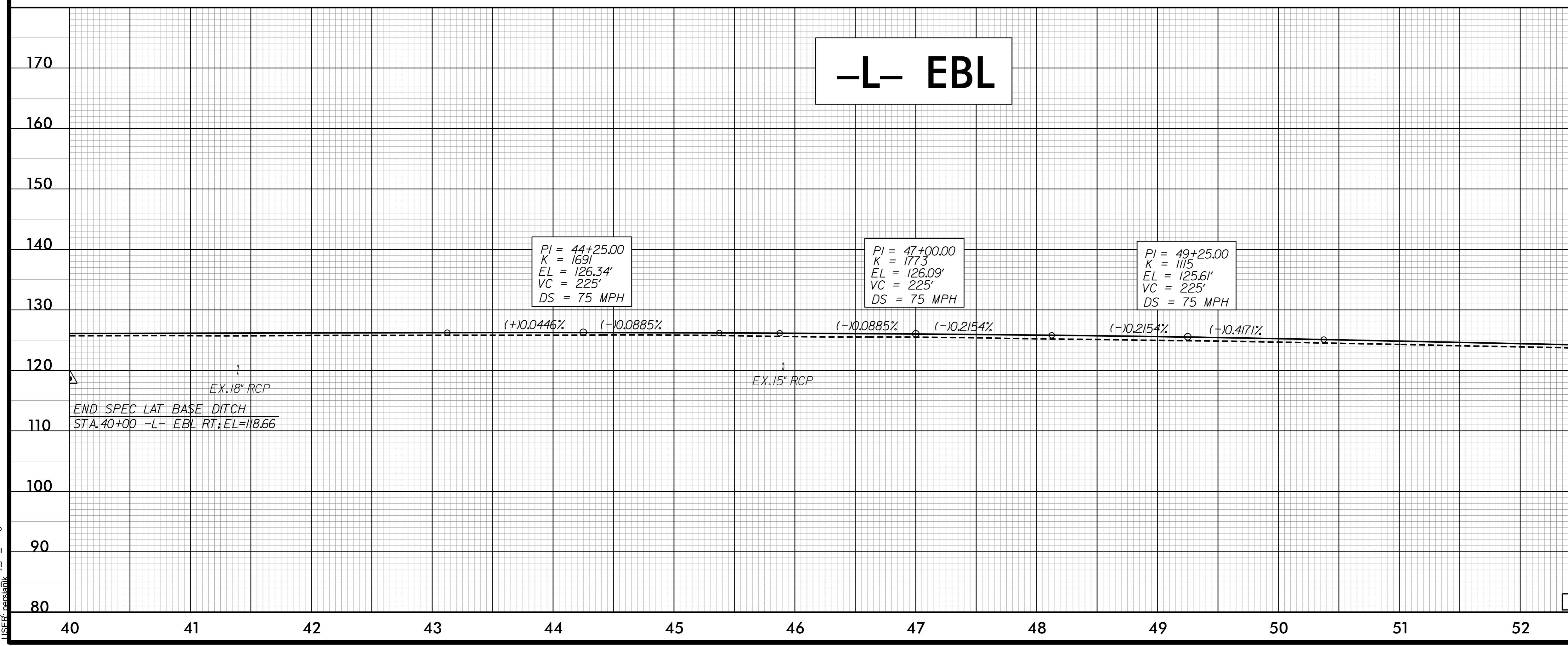
Invalid expression in SET command

5/28/99

PROJECT REFERENCE NO. R-5752		SHEET NO. 12	
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	



Invalid expression, use of non-system



5/28/99

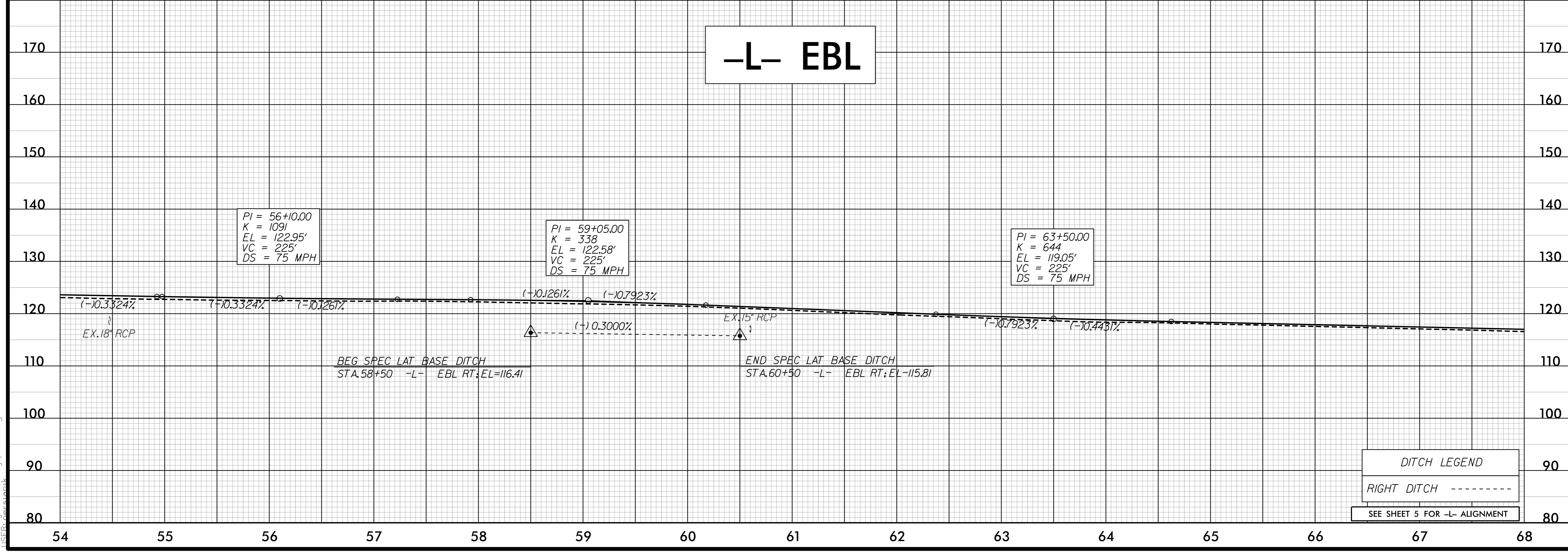
PROJECT REFERENCE NO. <i>R-5752</i>		SHEET NO. <i>13</i>	
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	

# -L- WBL



SEE SHEET 5 FOR -L- ALIGNMENT

# -L- EBL



DITCH LEGEND

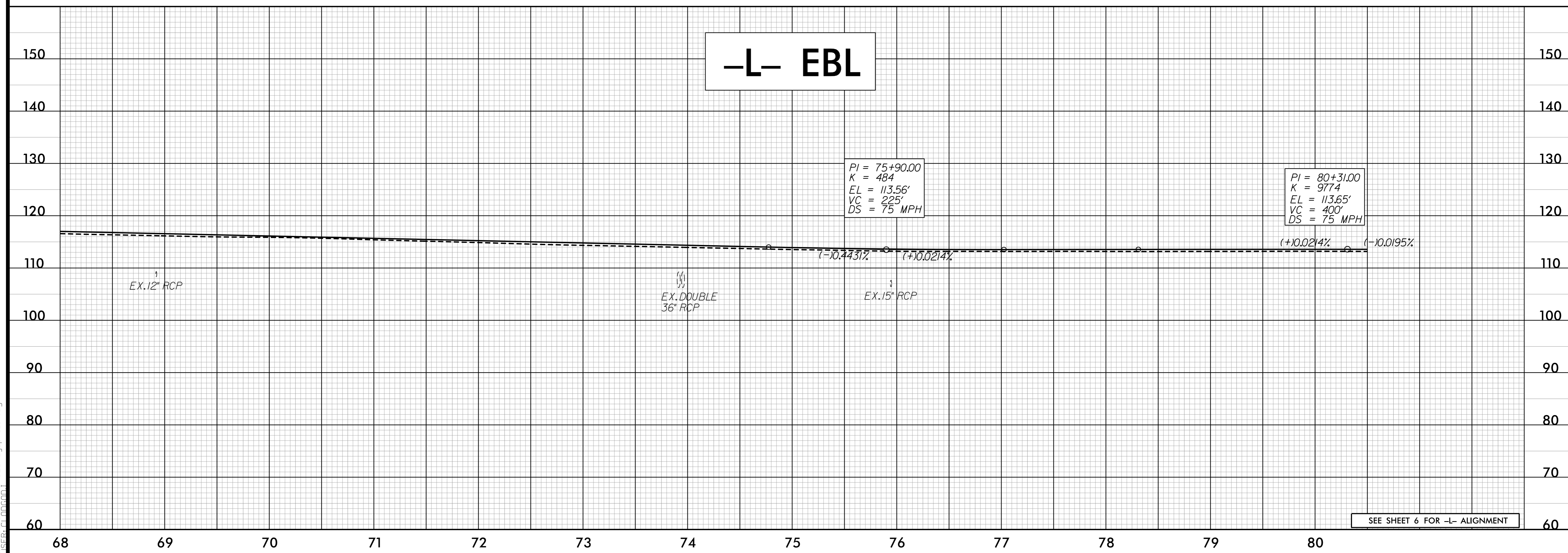
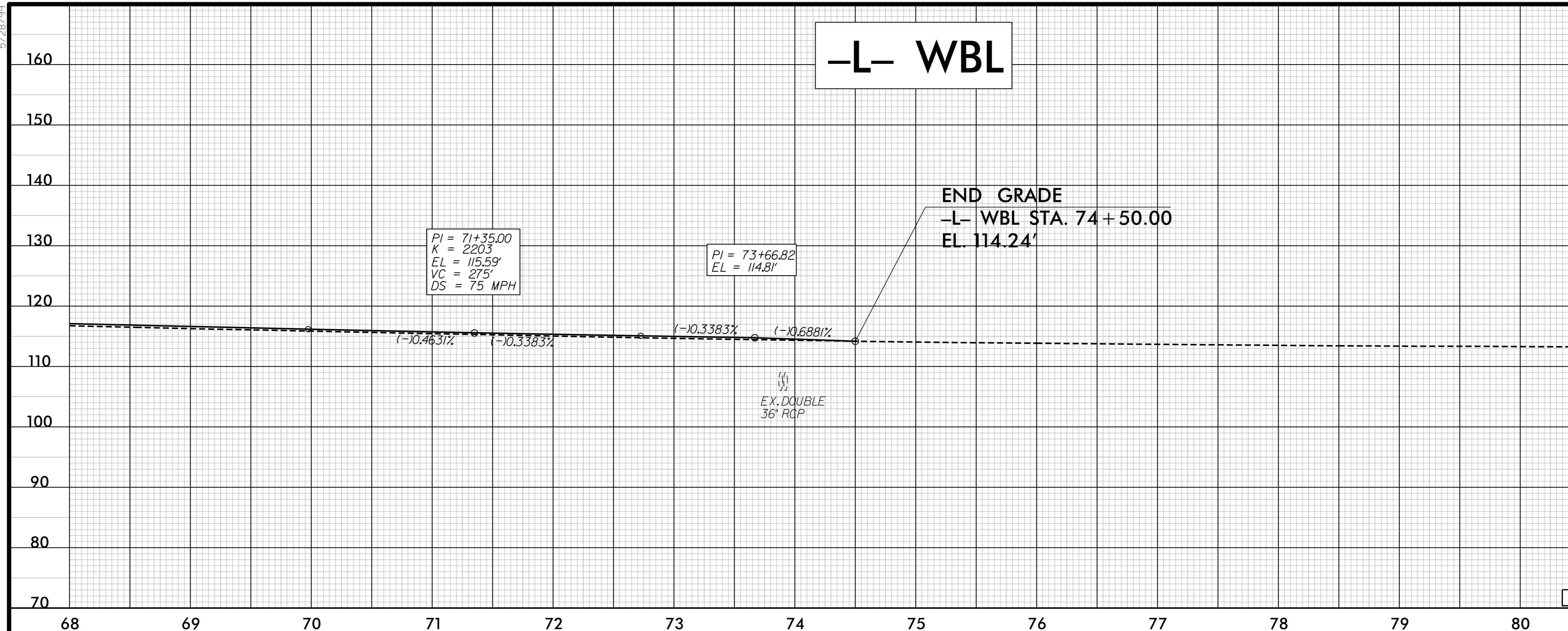
RIGHT DITCH - - - - -

SEE SHEET 5 FOR -L- ALIGNMENT

invgrid\_expression  
ITSS:FC:\XRD\BCL\114dy-pf1.13.dgn


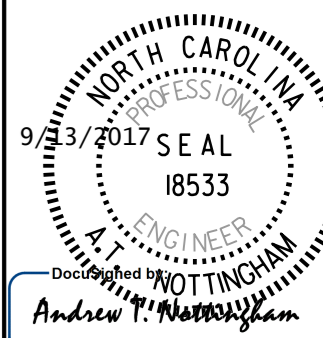


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PROJECT REFERENCE NO. R-5752	SHEET NO. 14
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	
ROADWAY DESIGN ENGINEER 	HYDRAULICS ENGINEER 
CDM Smith Inc. 3400 Glenwood Avenue Suite 400 Raleigh, NC 27603-3228 No. CDA No. F-1250	WJ Engineering, PLLC 1011 Schaub Drive Suite 100 Raleigh, NC 27608 No. CDA No.

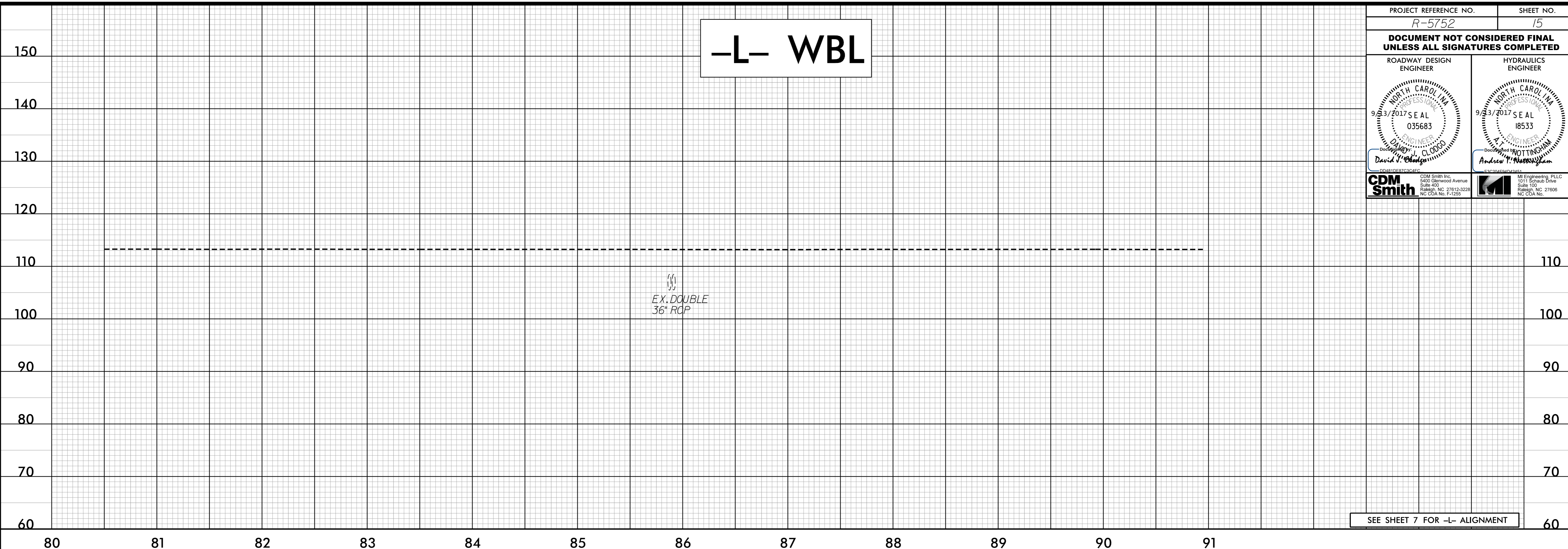


Invalid expression. Rdy\_p1\_1.dgn

5/28/99

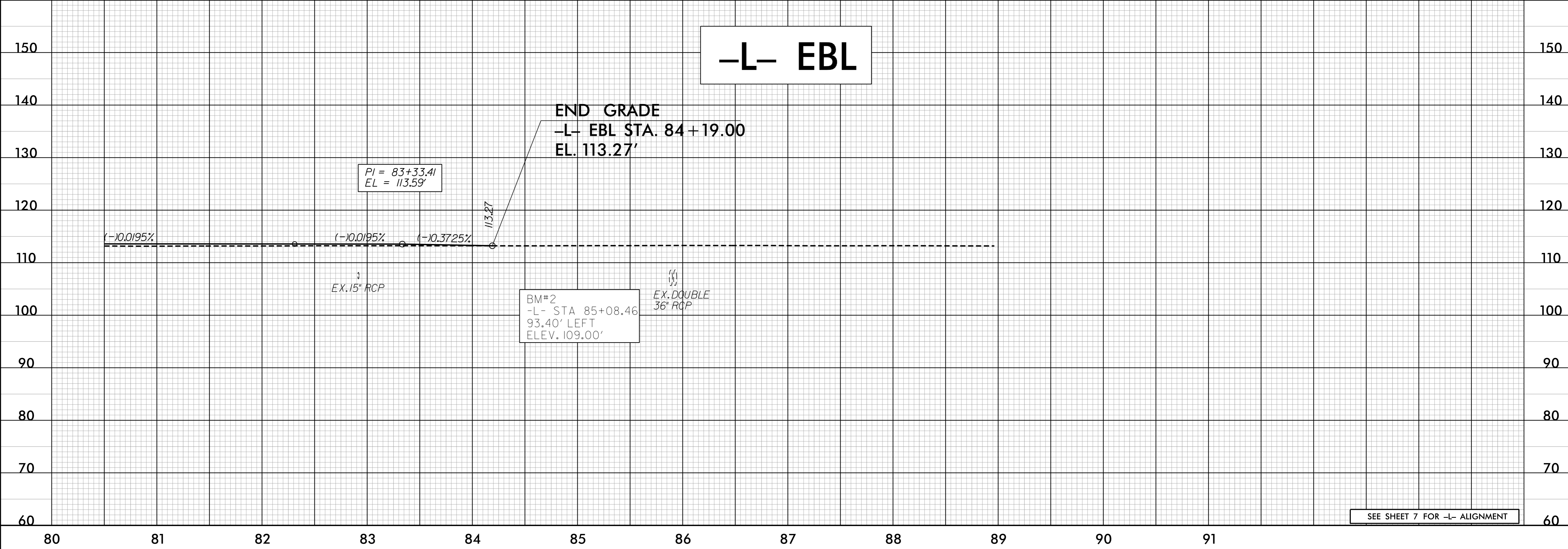
PROJECT REFERENCE NO. R-5752	SHEET NO. 15
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
ROADWAY DESIGN ENGINEER 	HYDRAULICS ENGINEER 
 CDM Smith Inc. 3400 Glenwood Avenue Suite 400 Raleigh, NC 27608 No. CDA No. F-1250	 M Engineering, PLLC 1011 Schaub Drive Suite 100 Raleigh, NC 27608 No. CDA No.

# -L- WBL



SEE SHEET 7 FOR -L- ALIGNMENT

# -L- EBL



SEE SHEET 7 FOR -L- ALIGNMENT

Invalid expression. Rdg\_p1\_15.dgn



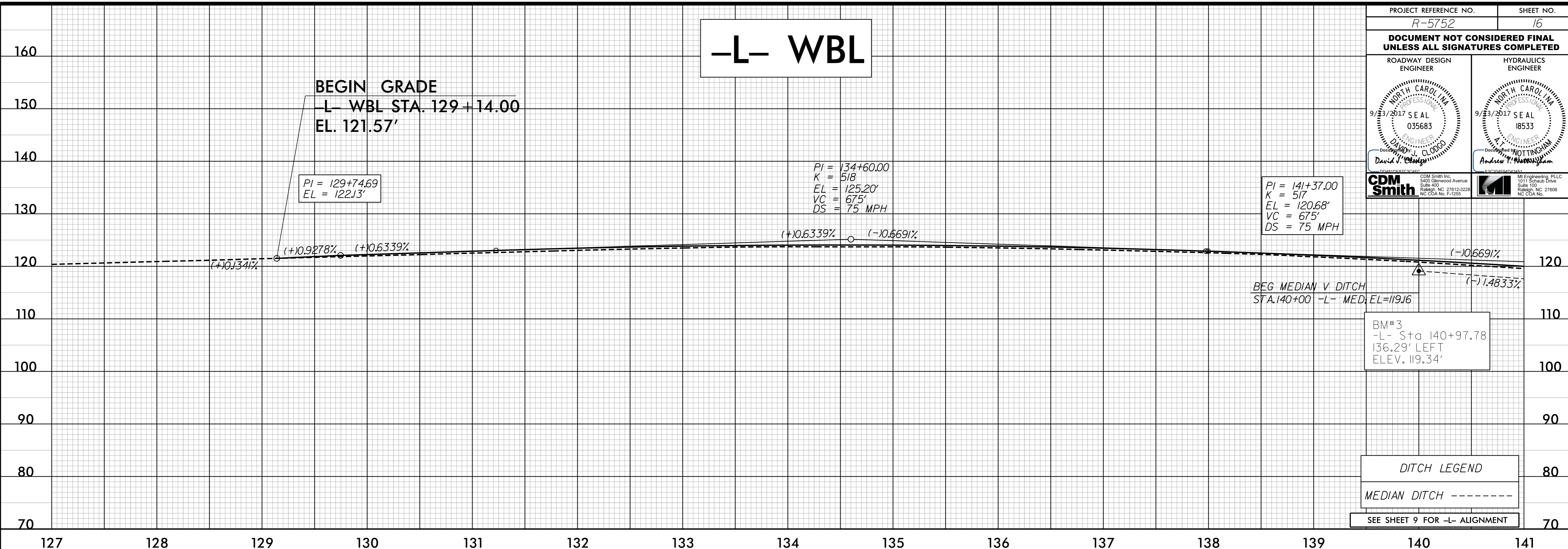
5/28/99

**DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED**

ROADWAY DESIGN ENGINEER 	HYDRAULICS ENGINEER 
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# -L- WBL

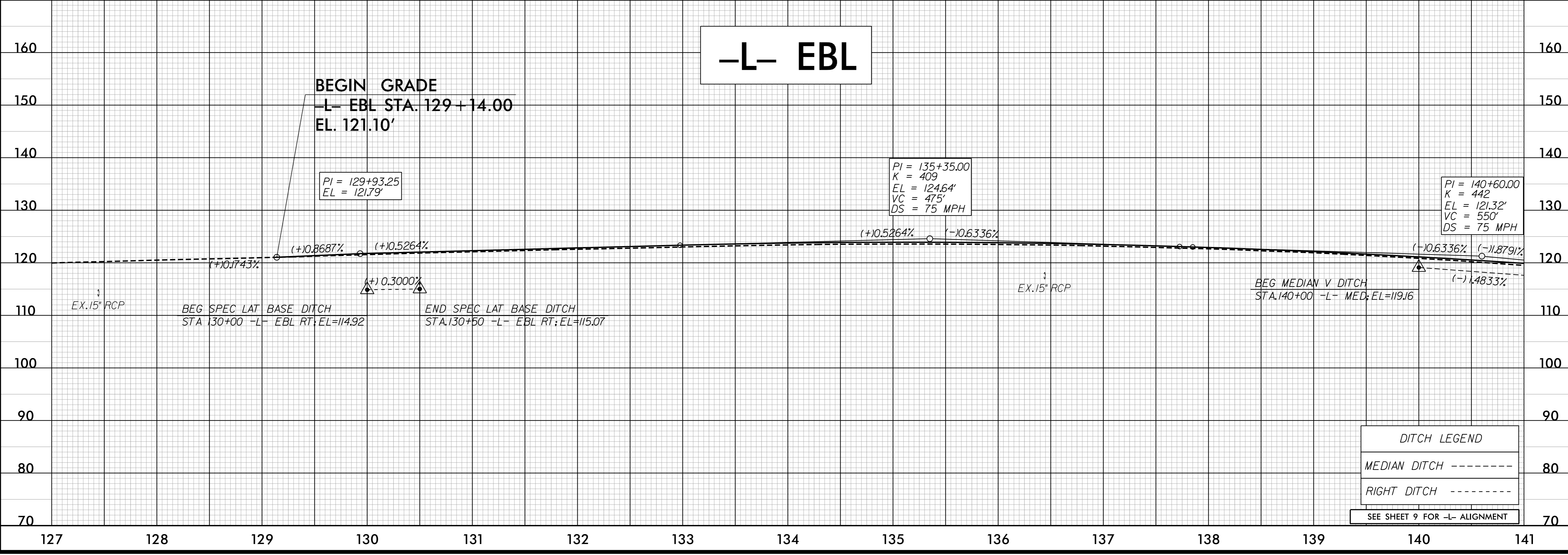


**DITCH LEGEND**

MEDIAN DITCH - - - - -

SEE SHEET 9 FOR -L- ALIGNMENT

# -L- EBL



**DITCH LEGEND**


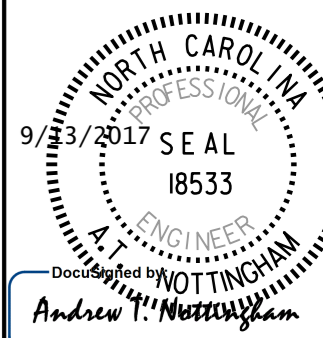


MEDIAN DITCH - - - - -

RIGHT DITCH - - - - -

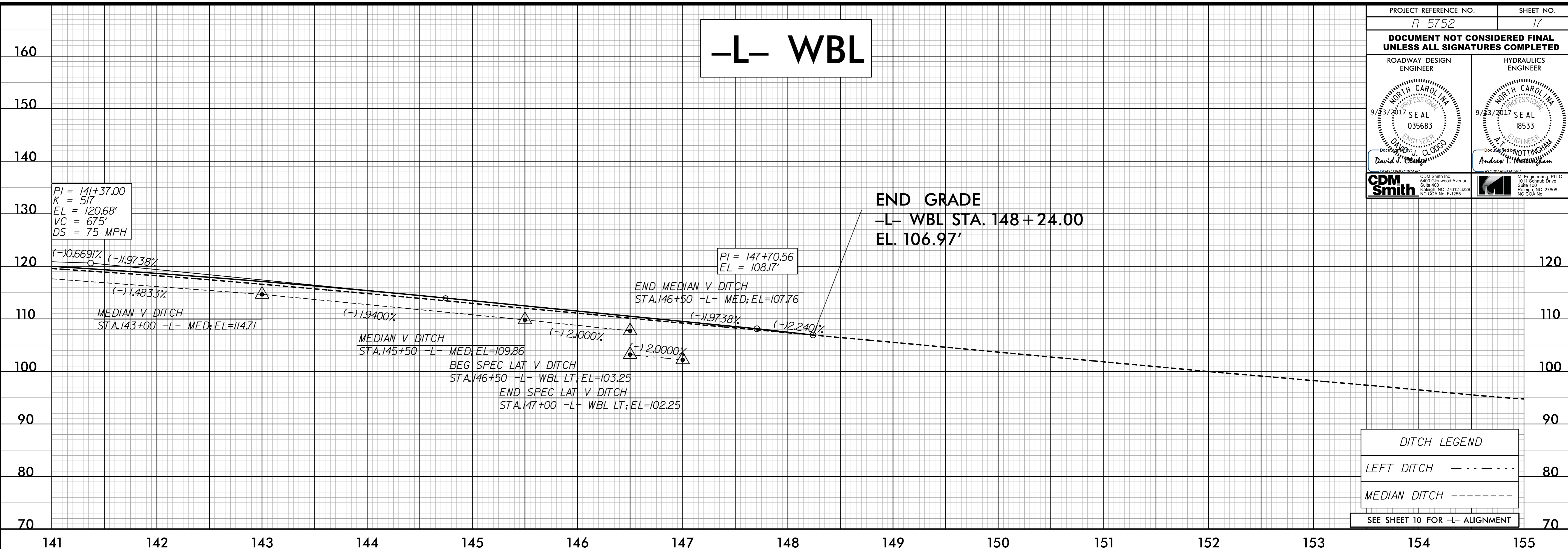
SEE SHEET 9 FOR -L- ALIGNMENT

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11:55:50 AM 5/28/99 1:16.dgn

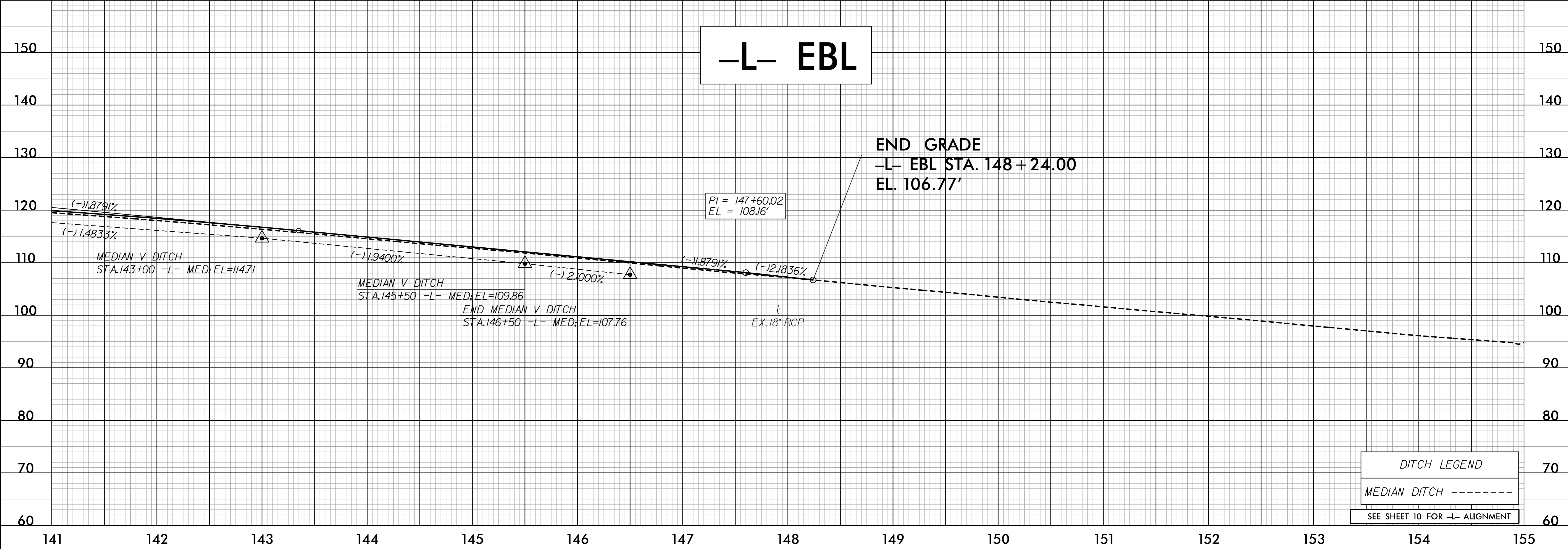
5/28/99

PROJECT REFERENCE NO. <i>R-5752</i>	SHEET NO. <i>17</i>
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
ROADWAY DESIGN ENGINEER 	HYDRAULICS ENGINEER 
	

# -L- WBL



# -L- EBL



invgrid\_expansion  
jts:fc:u:\projects\1149\p1.17.dgn

5/28/99

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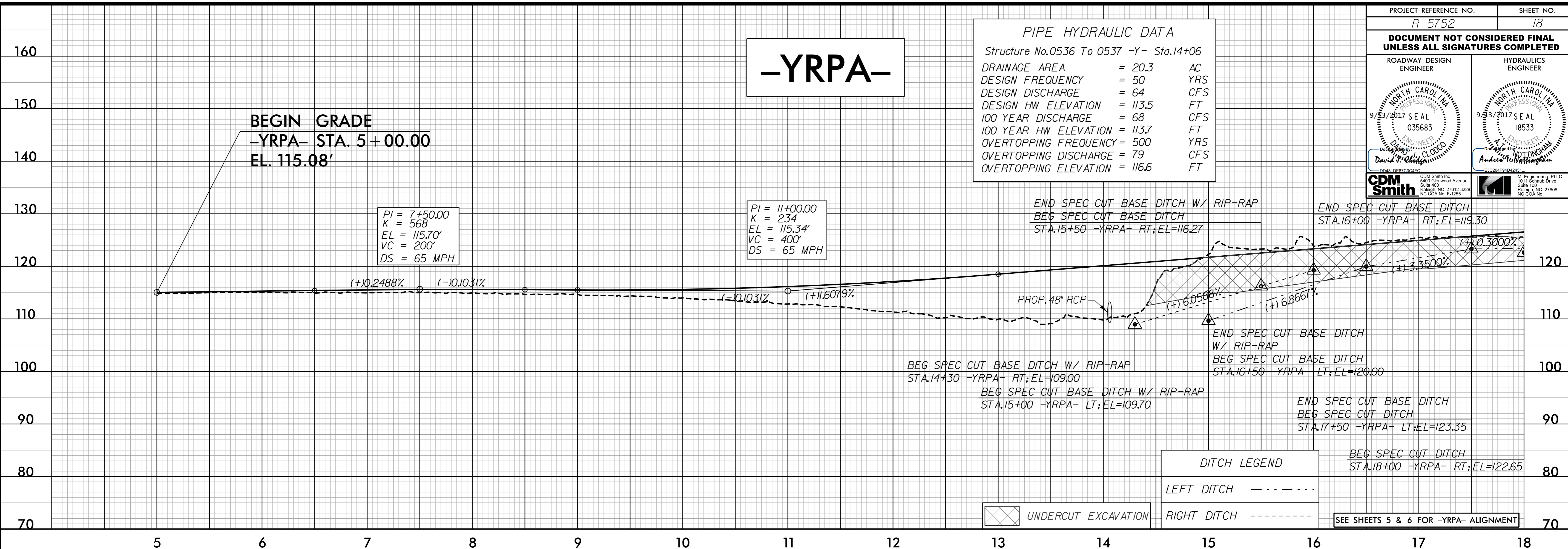
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

**PIPE HYDRAULIC DATA**  
Structure No.0536 To 0537 -Y- Sta.14+06

DRAINAGE AREA	= 20.3	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 64	CFS
DESIGN HW ELEVATION	= 113.5	FT
100 YEAR DISCHARGE	= 68	CFS
100 YEAR HW ELEVATION	= 113.7	FT
OVERTOPPING FREQUENCY	= 500	YRS
OVERTOPPING DISCHARGE	= 79	CFS
OVERTOPPING ELEVATION	= 116.6	FT

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**-YRPA-**



**DITCH LEGEND**

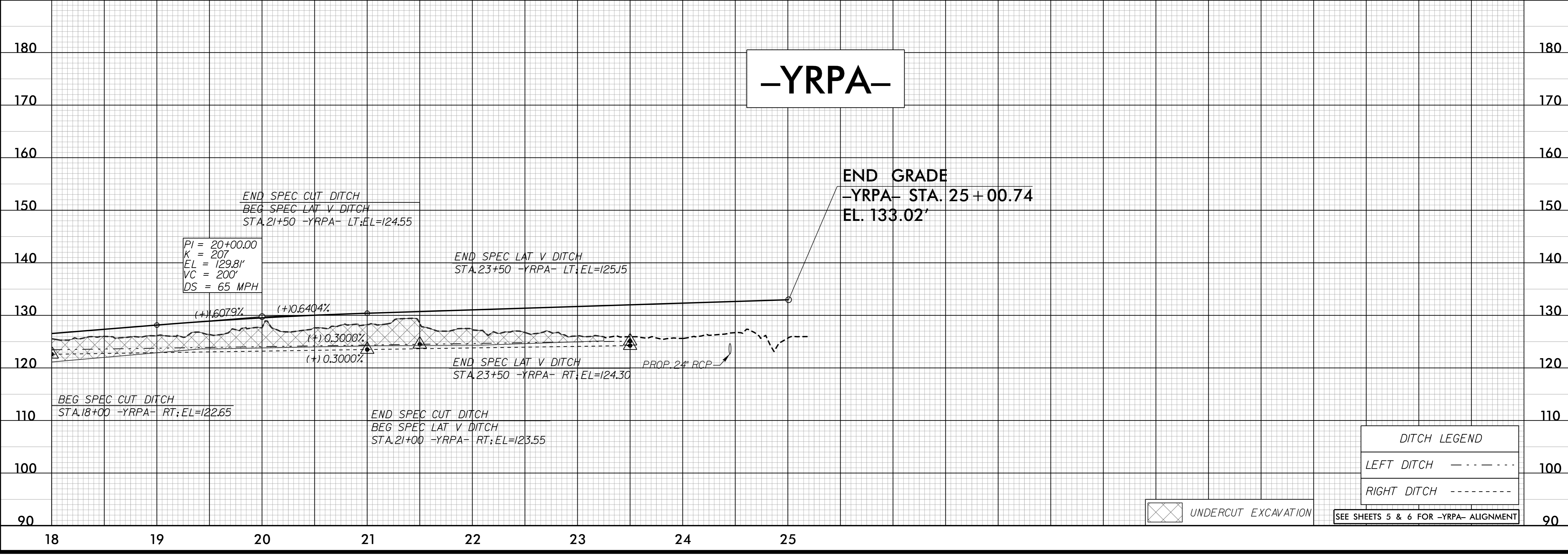
LEFT DITCH - - - - -

RIGHT DITCH - - - - -

UNDERCUT EXCAVATION

SEE SHEETS 5 & 6 FOR -YRPA- ALIGNMENT

**-YRPA-**



**DITCH LEGEND**

LEFT DITCH - - - - -

RIGHT DITCH - - - - -

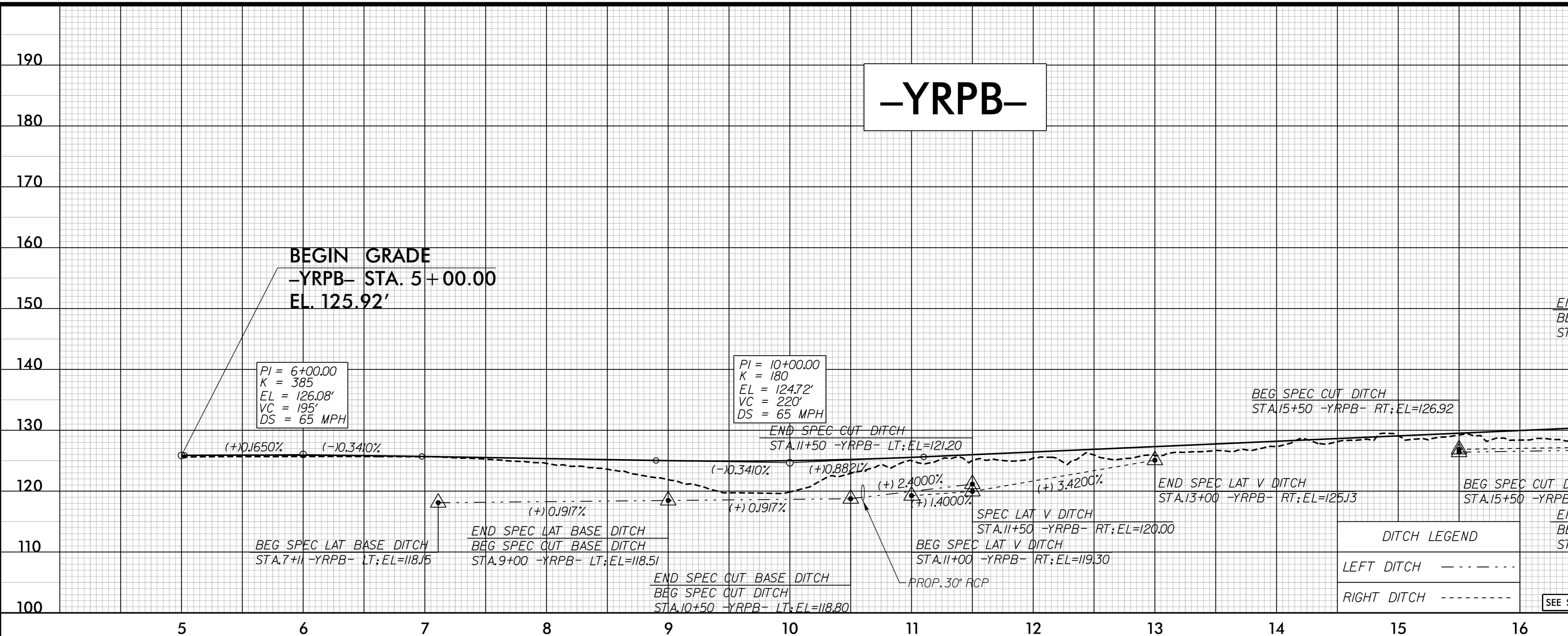
UNDERCUT EXCAVATION

SEE SHEETS 5 & 6 FOR -YRPA- ALIGNMENT

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5/28/99

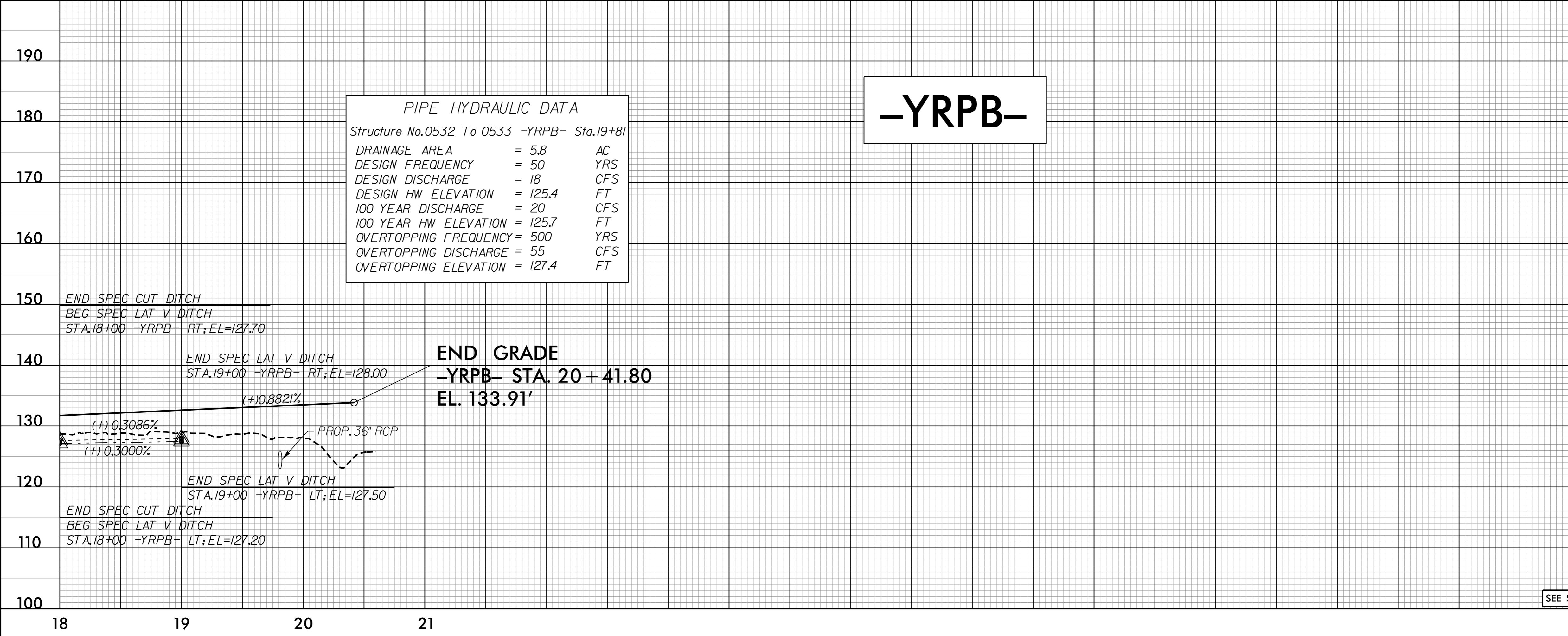
PROJECT REFERENCE NO. R-5752	SHEET NO. 19
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
ROADWAY DESIGN ENGINEER 	HYDRAULICS ENGINEER 



**PIPE HYDRAULIC DATA**

Structure No. 0532 To 0533 -YRPB- Sta. 19+81

DRAINAGE AREA	= 5.8	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 18	CFS
DESIGN HW ELEVATION	= 125.4	FT
100 YEAR DISCHARGE	= 20	CFS
100 YEAR HW ELEVATION	= 125.7	FT
OVERTOPPING FREQUENCY	= 500	YRS
OVERTOPPING DISCHARGE	= 55	CFS
OVERTOPPING ELEVATION	= 127.4	FT



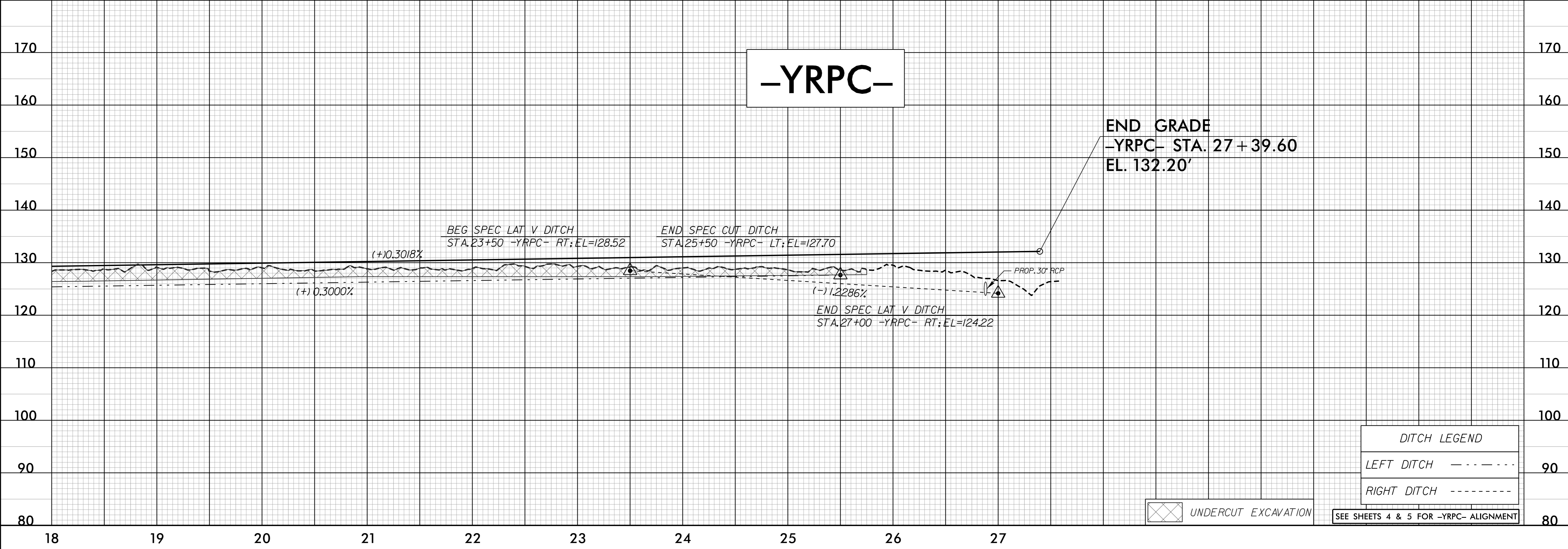
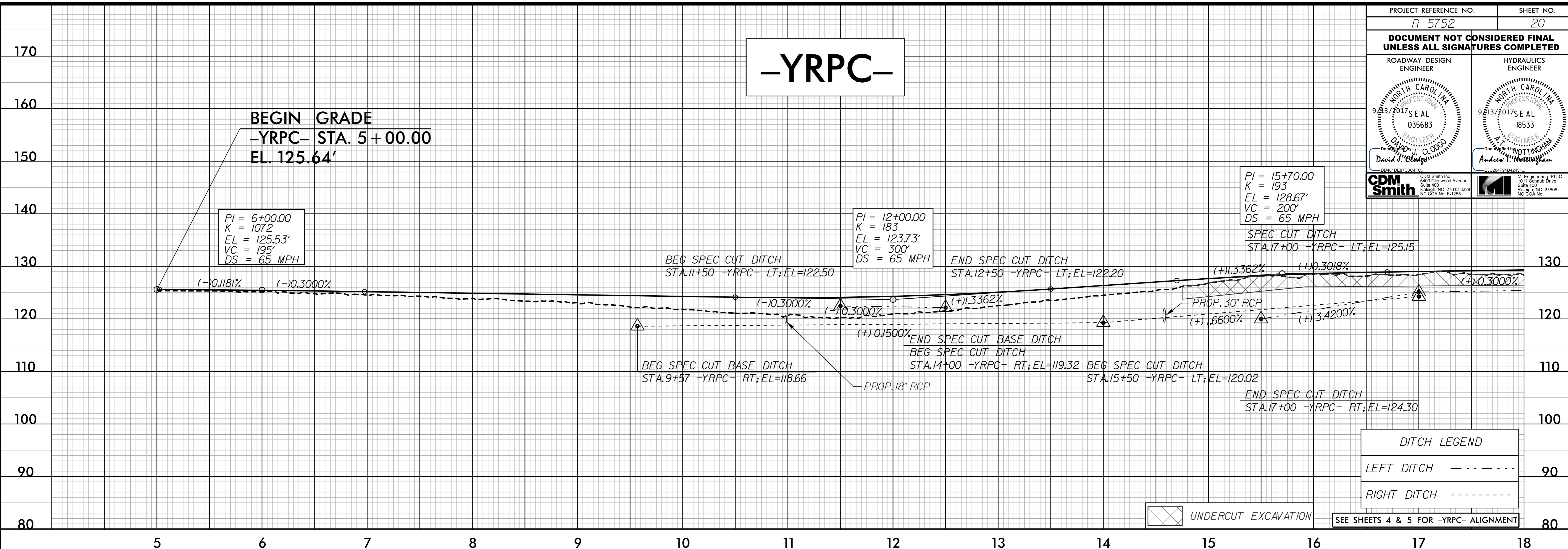
invgrid\_expression  
11:55:50 AM 5/28/99

5/28/99

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ROADWAY DESIGN ENGINEER 	HYDRAULICS ENGINEER 
-----------------------------	-------------------------

 CDM Smith Inc. 5400 Glenwood Avenue Suite 400 Raleigh, NC 27605 No. CDA No. E-1250	 M Engineering, PLLC 1011 Schaub Drive Raleigh, NC 27608 No. CDA No.
--	--



invgrid\_expression  
11:55:56 AM 5/28/99

5/28/99

**DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED**

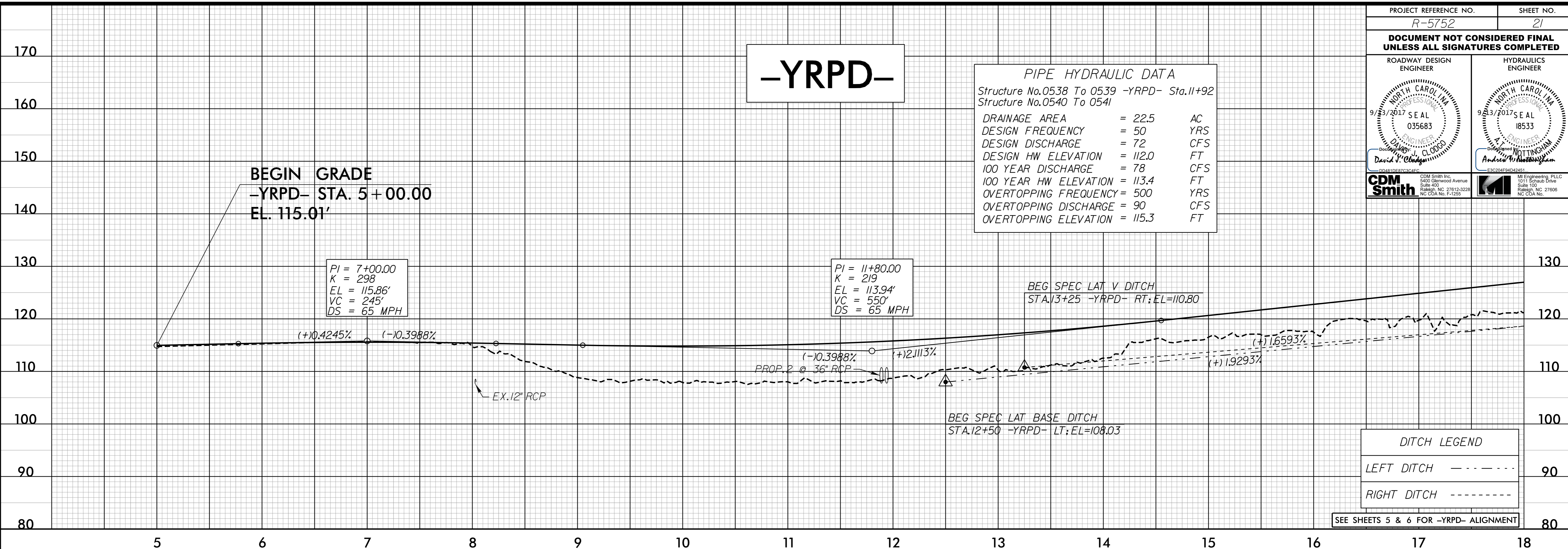
ROADWAY DESIGN ENGINEER 	HYDRAULICS ENGINEER 
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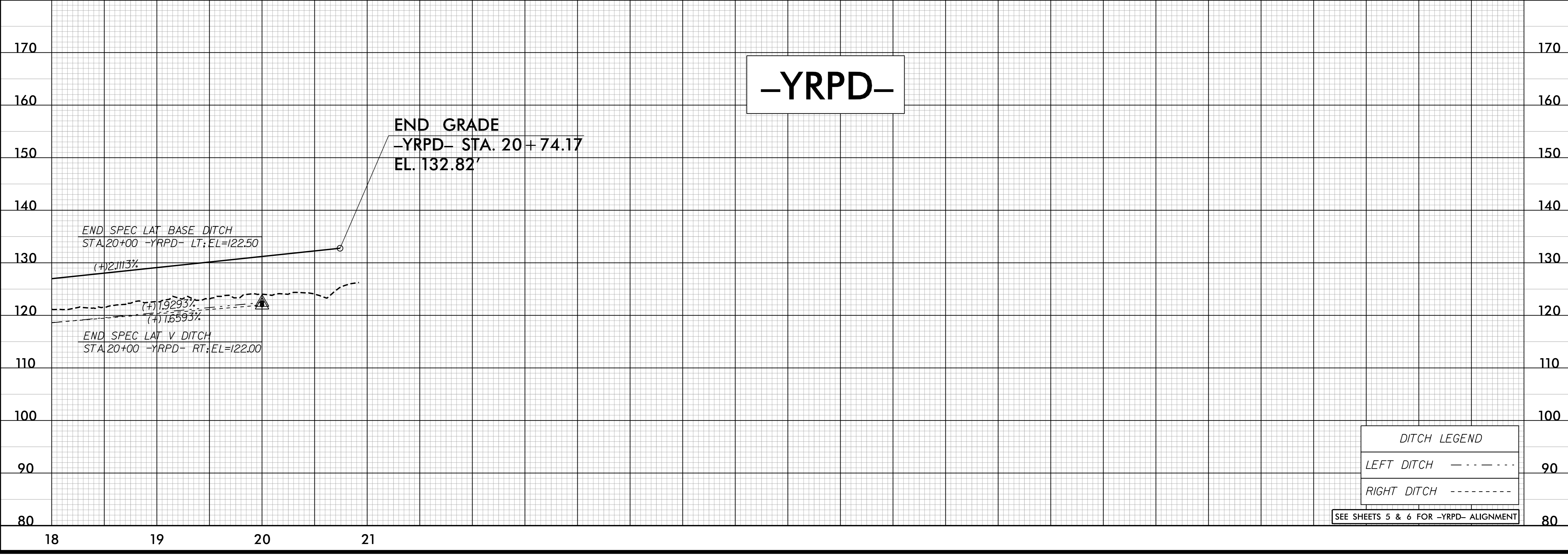
**PIPE HYDRAULIC DATA**  
Structure No.0538 To 0539 -YRPD- Sta.11+92  
Structure No.0540 To 0541

DRAINAGE AREA	= 22.5	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 72	CFS
DESIGN HW ELEVATION	= 112.0	FT
100 YEAR DISCHARGE	= 78	CFS
100 YEAR HW ELEVATION	= 113.4	FT
OVERTOPPING FREQUENCY	= 500	YRS
OVERTOPPING DISCHARGE	= 90	CFS
OVERTOPPING ELEVATION	= 115.3	FT

**-YRPD-**



**-YRPD-**



invgrid\_expansion  
11:58:50 AM 5/28/99

5/28/99

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ROADWAY DESIGN ENGINEER David J. O'Connell Professional Engineer 9/23/2017 SEAL 035683	HYDRAULICS ENGINEER Andrew R. Hittingman Professional Engineer 9/23/2017 SEAL 18533
---	--

CDM Smith 5400 Glenwood Avenue Suite 400 Raleigh, NC 27608 No. CDA No. E-1250	MJ Engineering, PLLC 1011 Schaub Drive Raleigh, NC 27608 No. CDA No.
---	---

**PIPE HYDRAULIC DATA**  
Structure No.0528 To 0529 -Y- Sta.31+60

DRAINAGE AREA	= 13.8	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 44	CFS
DESIGN HW ELEVATION	= 121.2	FT
100 YEAR DISCHARGE	= 47	CFS
100 YEAR HW ELEVATION	= 121.5	FT
OVERTOPPING FREQUENCY	= 500	YRS
OVERTOPPING DISCHARGE	= 54	CFS
OVERTOPPING ELEVATION	= 122.5	FT

**DITCH LEGEND**

LEFT DITCH - - - - -

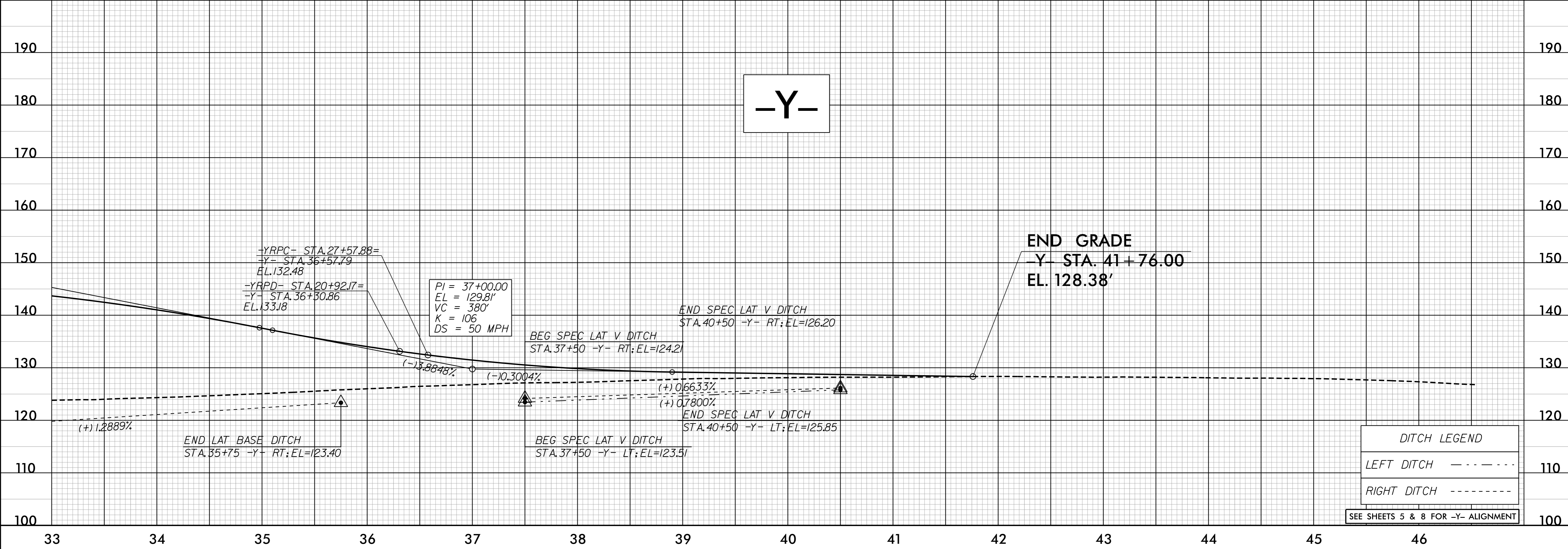
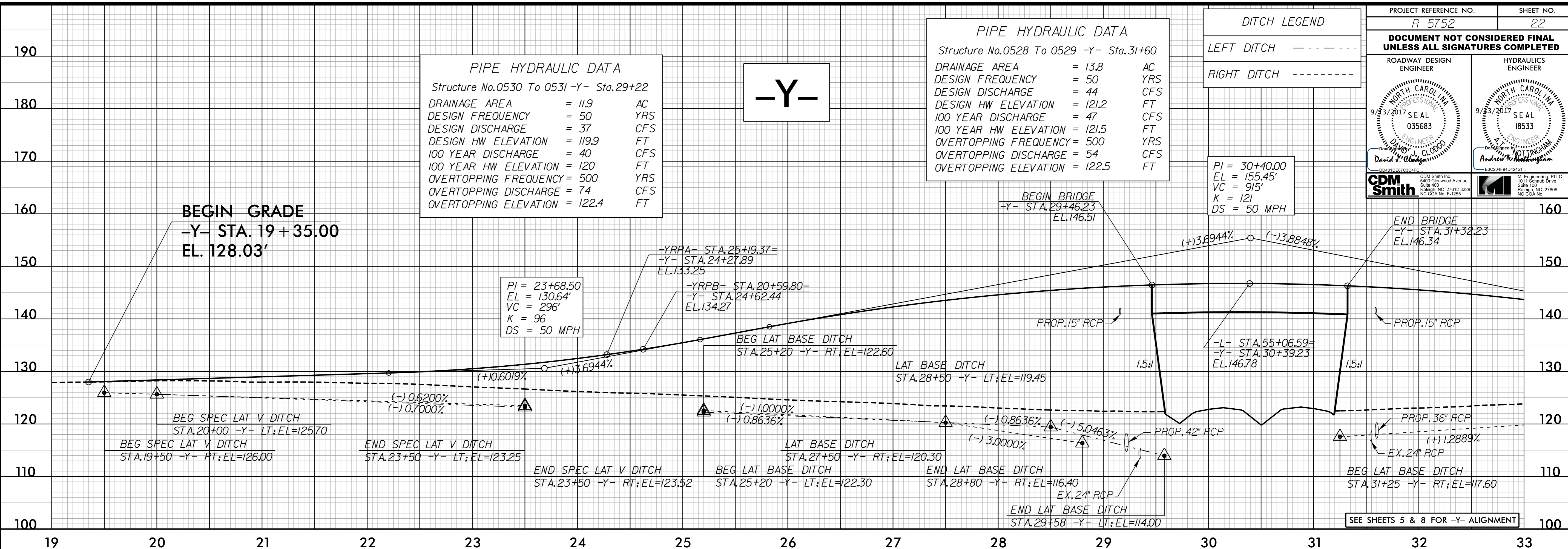
RIGHT DITCH - - - - -

PI = 30+40.00  
EL = 155.45'  
VC = 915'  
K = 121  
DS = 50 MPH

**PIPE HYDRAULIC DATA**  
Structure No.0530 To 0531 -Y- Sta.29+22

DRAINAGE AREA	= 11.9	AC
DESIGN FREQUENCY	= 50	YRS
DESIGN DISCHARGE	= 37	CFS
DESIGN HW ELEVATION	= 119.9	FT
100 YEAR DISCHARGE	= 40	CFS
100 YEAR HW ELEVATION	= 120	FT
OVERTOPPING FREQUENCY	= 500	YRS
OVERTOPPING DISCHARGE	= 74	CFS
OVERTOPPING ELEVATION	= 122.4	FT

-Y-



-Y-

**DITCH LEGEND**


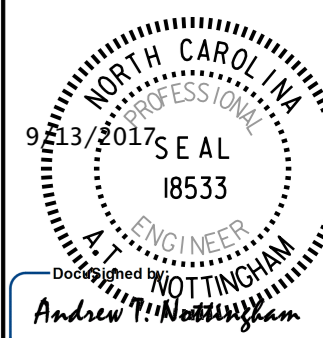


LEFT DITCH - - - - -

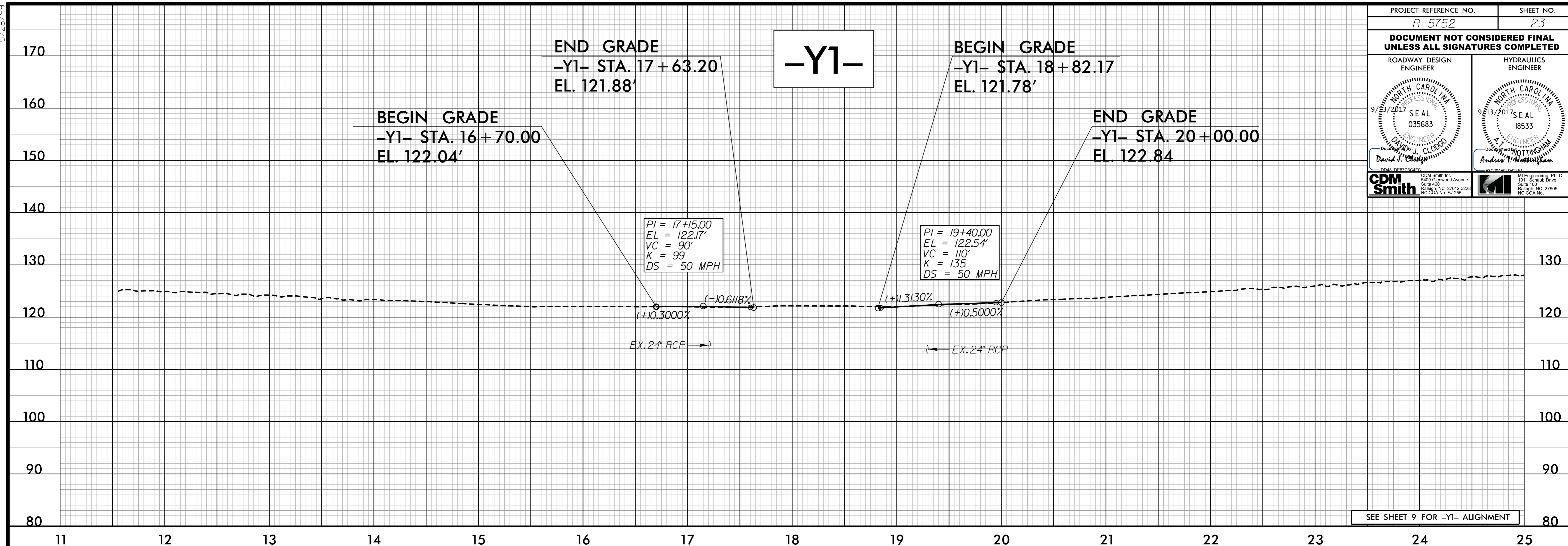
RIGHT DITCH - - - - -

SEE SHEETS 5 & 8 FOR -Y- ALIGNMENT

invgrid\_expansion  
ITS:EGOU\PC\BCL\Indy-p1.22.dgn

5/28/99

PROJECT REFERENCE NO. R-5752	SHEET NO. 23
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
ROADWAY DESIGN ENGINEER 	HYDRAULICS ENGINEER 
 CDM Smith Inc. 3400 Glenwood Avenue Suite 400 Raleigh, NC 27609 No. CDA No. F-1250	 M Engineering, PLLC 1011 Schaub Drive Suite 100 Raleigh, NC 27608 No. CDA No.



**THIS SPACE INTENTIONALLY BLANK**

Invalid expression: Rdy\_p1\_23.dgn