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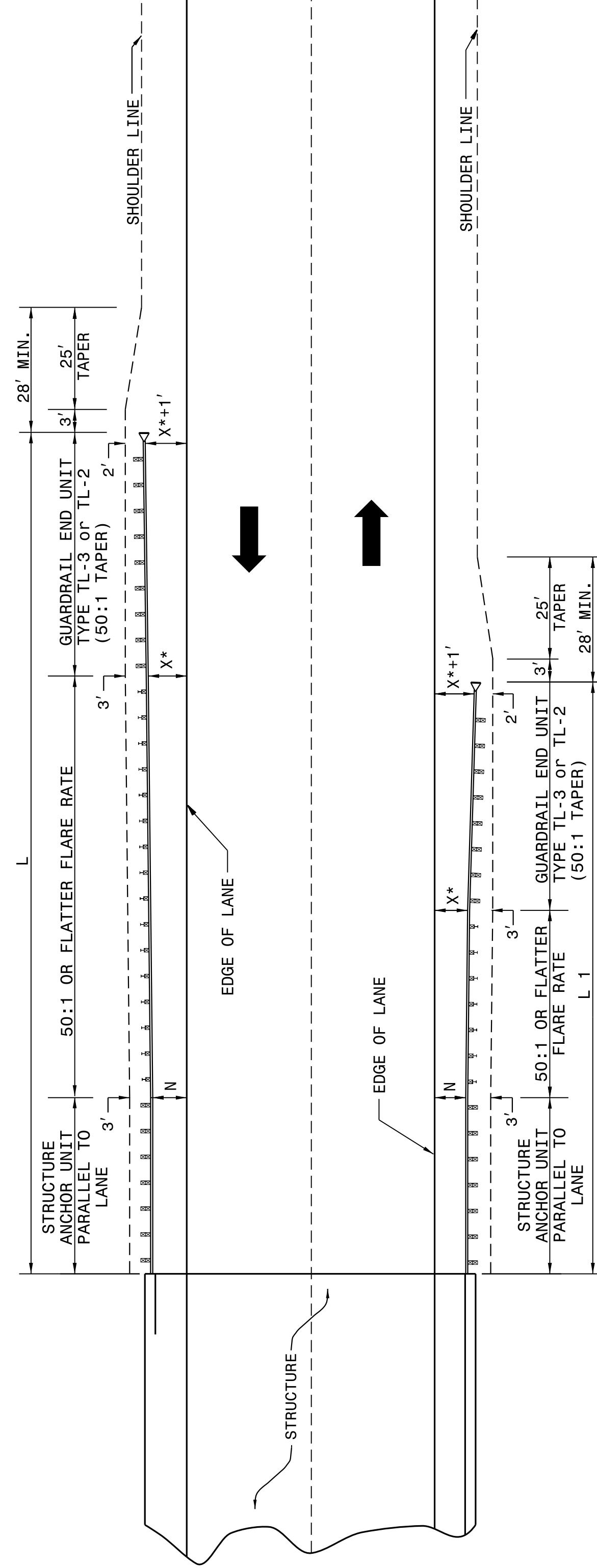
ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 4 OF 11
862D01

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ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 4 OF 11
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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

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

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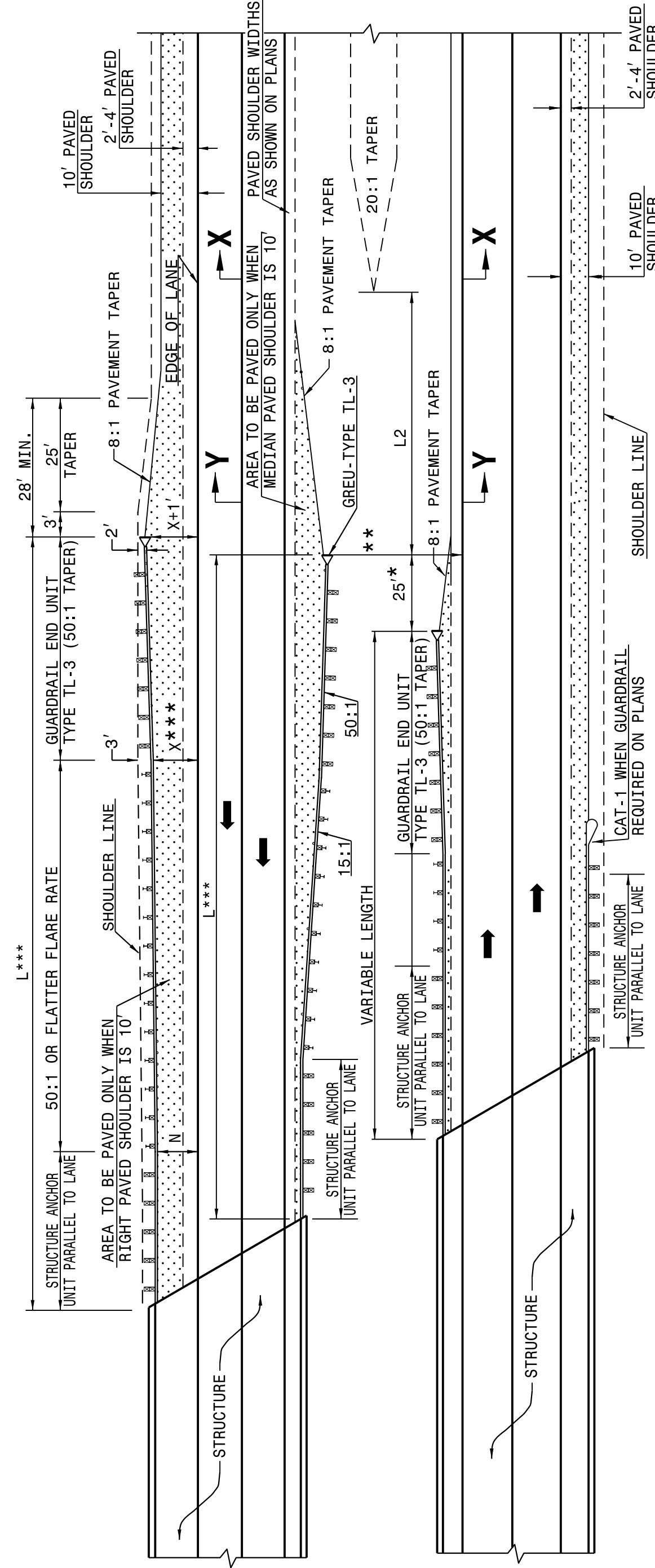
ROADWAY DETAIL DRAWING FOR
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FOR POSTED SPEEDS ≥ 45mph USE GREU TYPE TL-3
FOR POSTED SPEEDS < 45mph USE GREU TYPE TL-2

DIMENSIONS FOR LENGTH OF GUARDRAIL APPROACHING DUAL LANE BRIDGES

MEDIAN WIDTH	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'

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

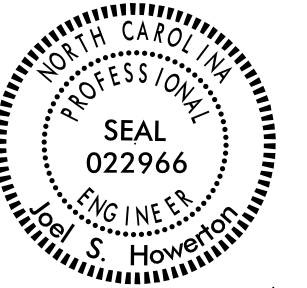
DETAIL OF GUARDRAIL APPROACHING DUAL LANE BRIDGES

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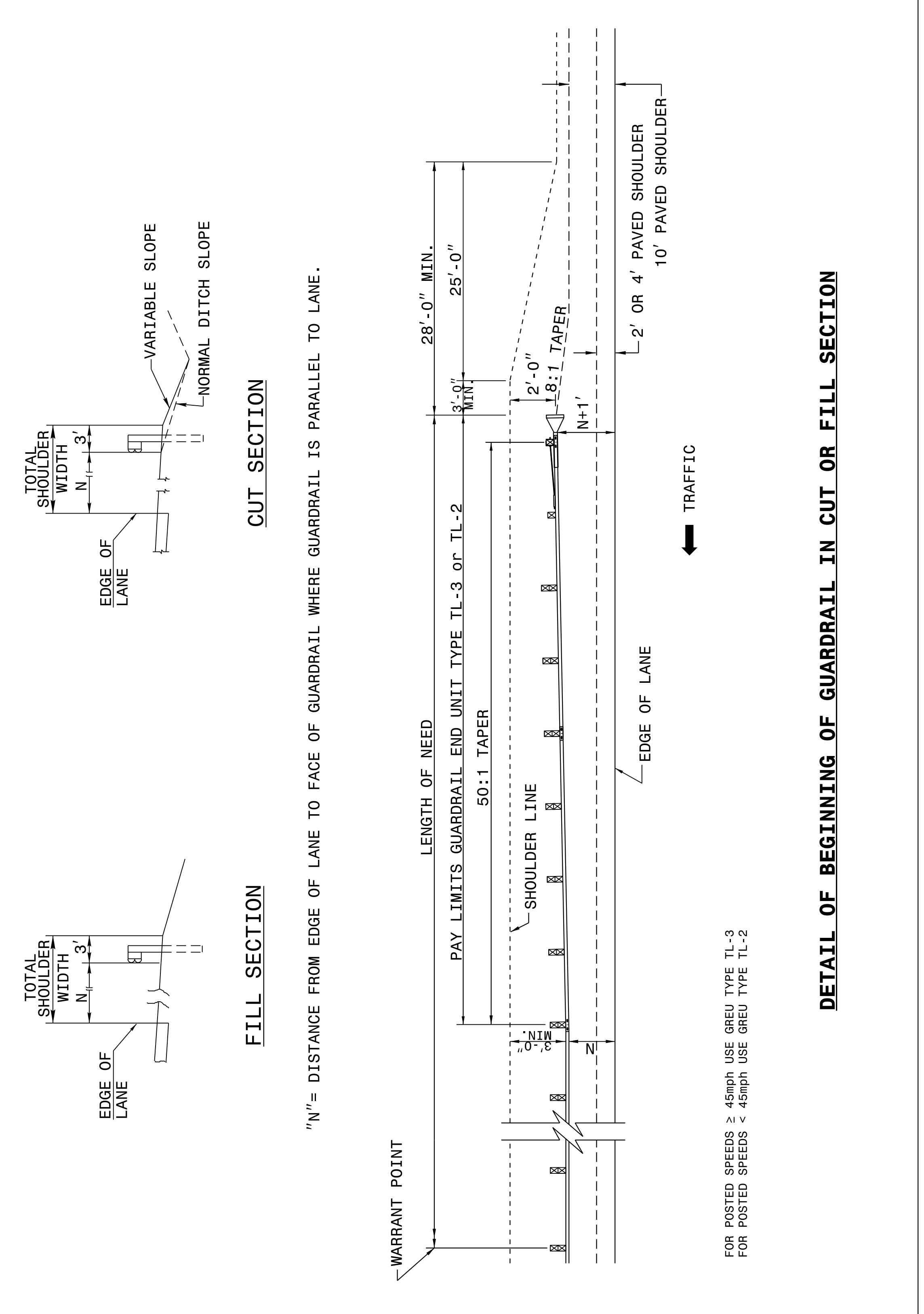
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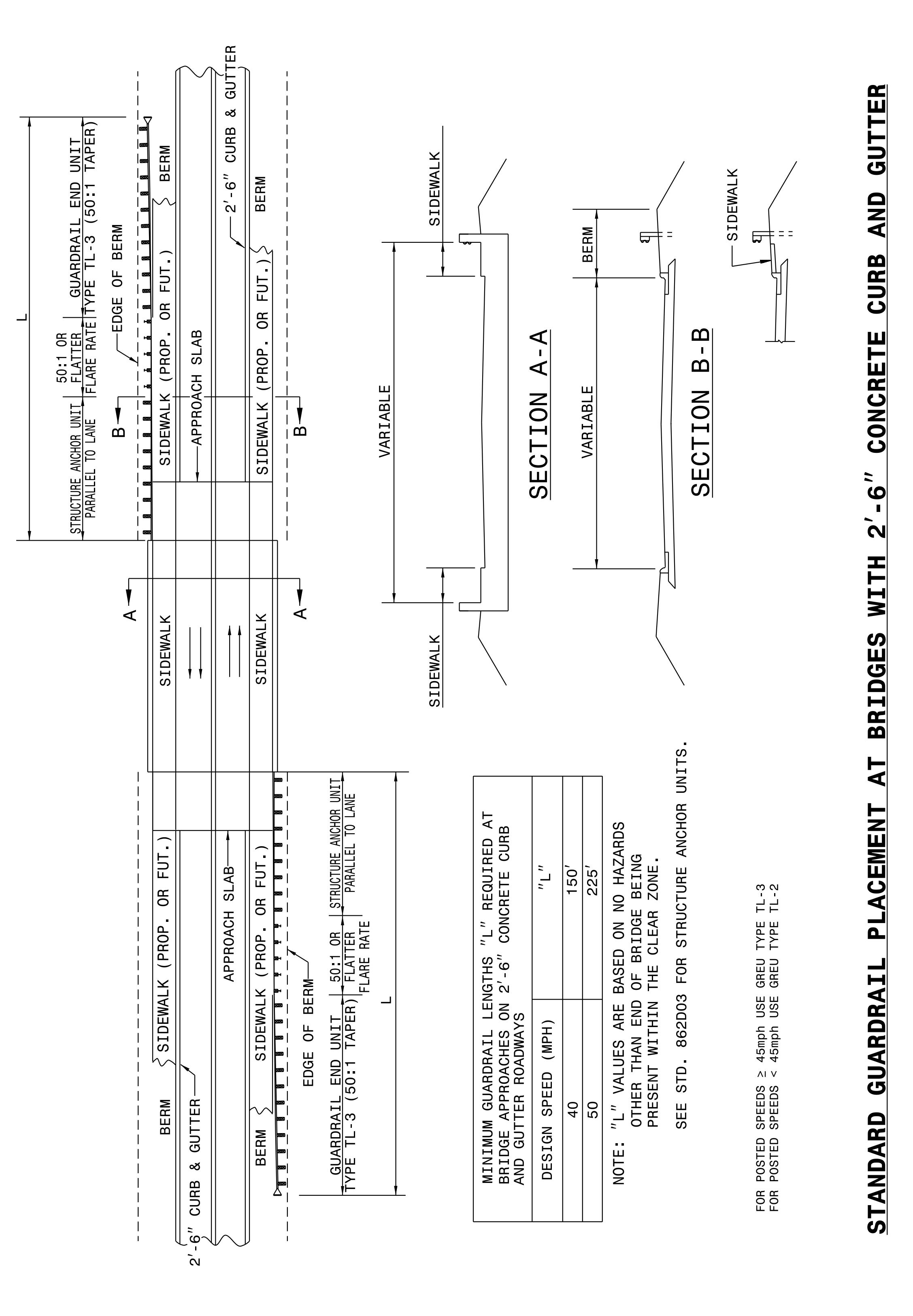
ROADWAY DETAIL DRAWING FOR
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SHEET 6 OF 11
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SHEET 6 OF 11
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ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 5 OF 11
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STANDARD GUARDRAIL PLACEMENT AT BRIDGES WITH 2'-6" CONCRETE CURB AND GUTTER

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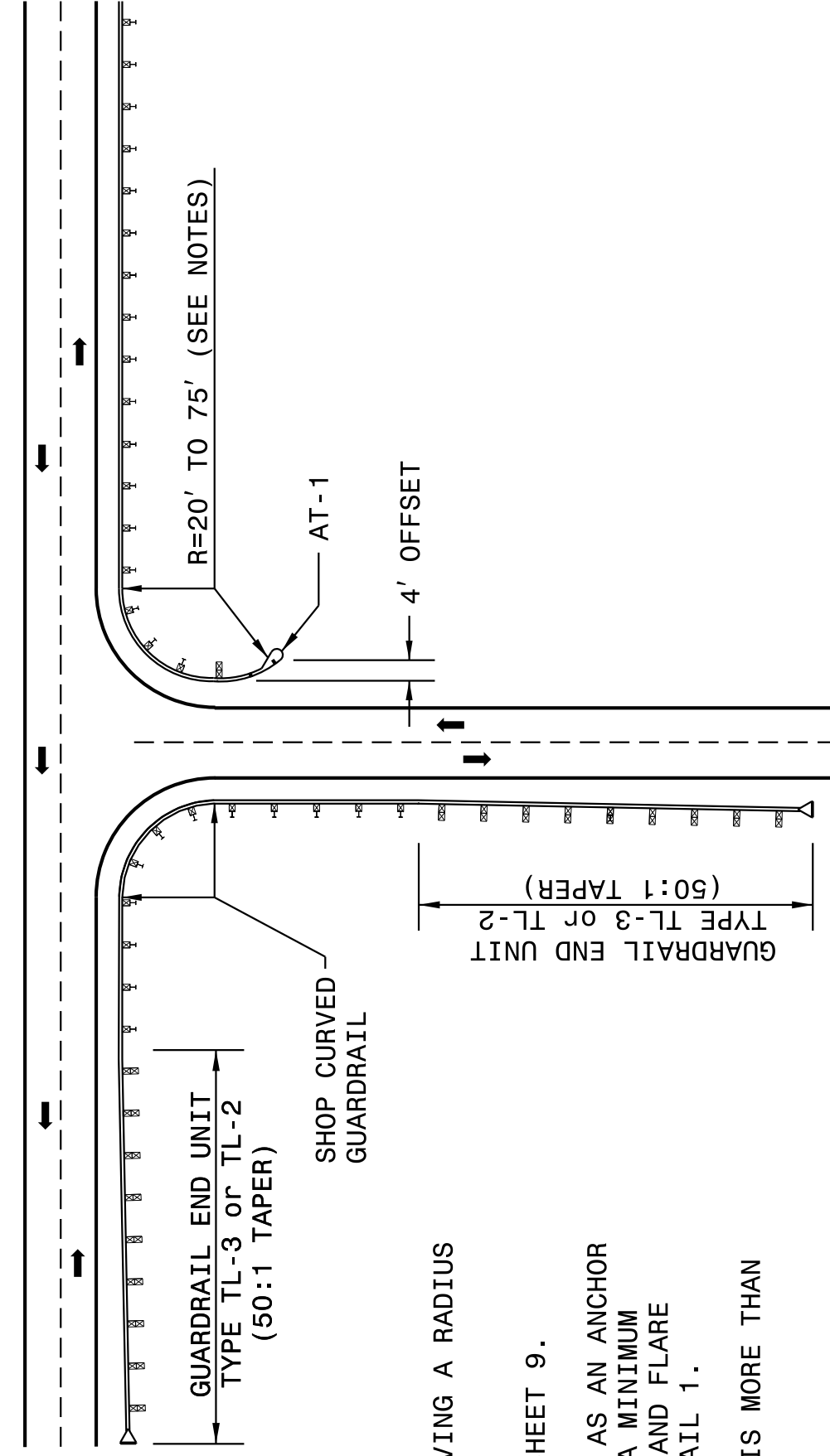
ROADWAY DETAIL DRAWING FOR
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ROADWAY DETAIL DRAWING FOR
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SHEET 8 OF 11
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DETAIL - 1

NOTES:
SHOP CURVED GUARDRAIL IS DEFINED AS HAVING A RADIUS OF 150' OR LESS.

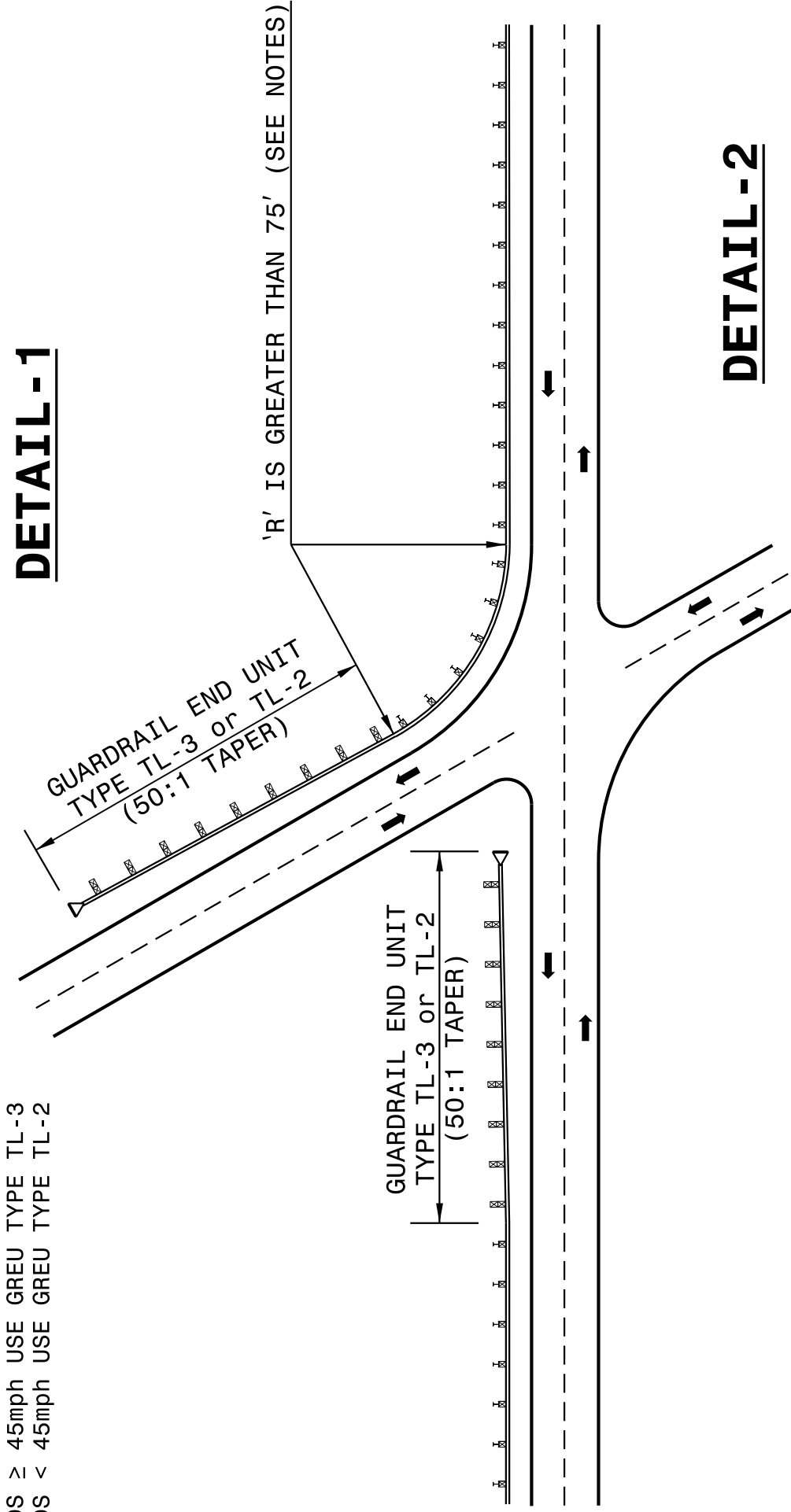
WHEN RADIUS IS LESS THAN 20' REFER TO SHEET 9.

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



DETAIL - 2

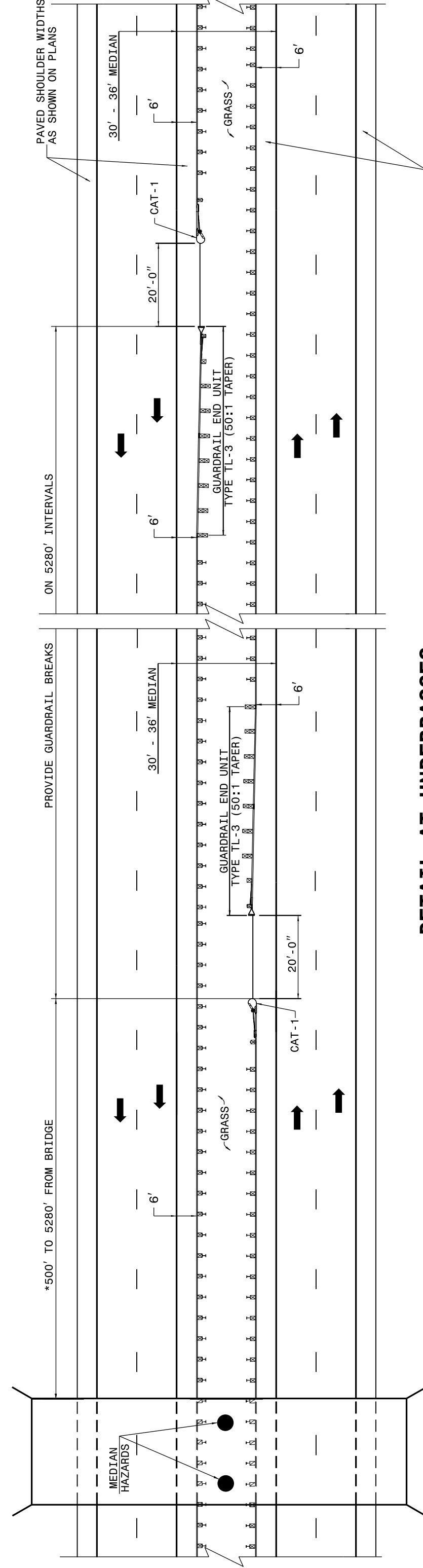
GUARDRAIL TREATMENT AT INTERSECTIONS

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ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT



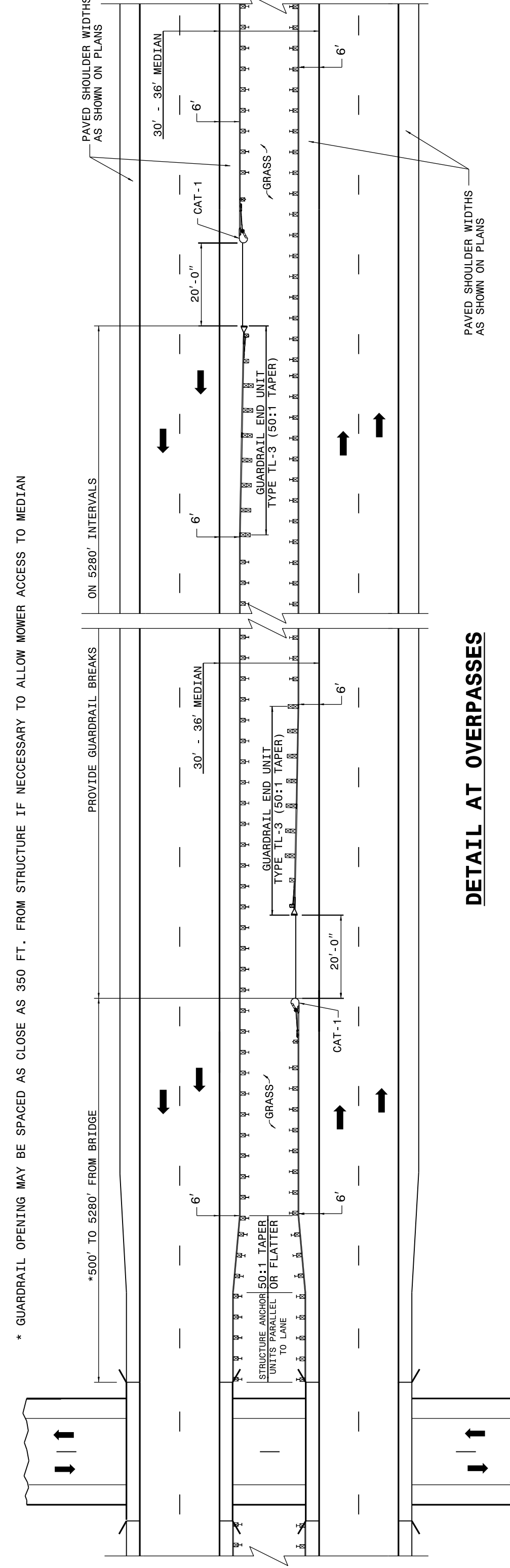
DETAIL AT UNDERPASSES

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

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DETAIL AT OVERPASSES

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

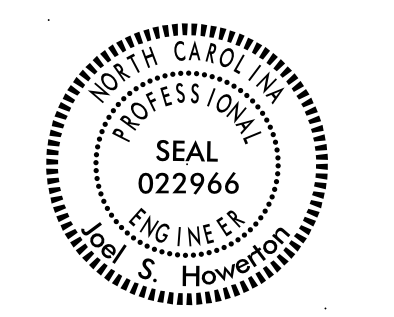
GUARDRAIL BREAK INTERVALS WITH 30' - 36' MEDIANS

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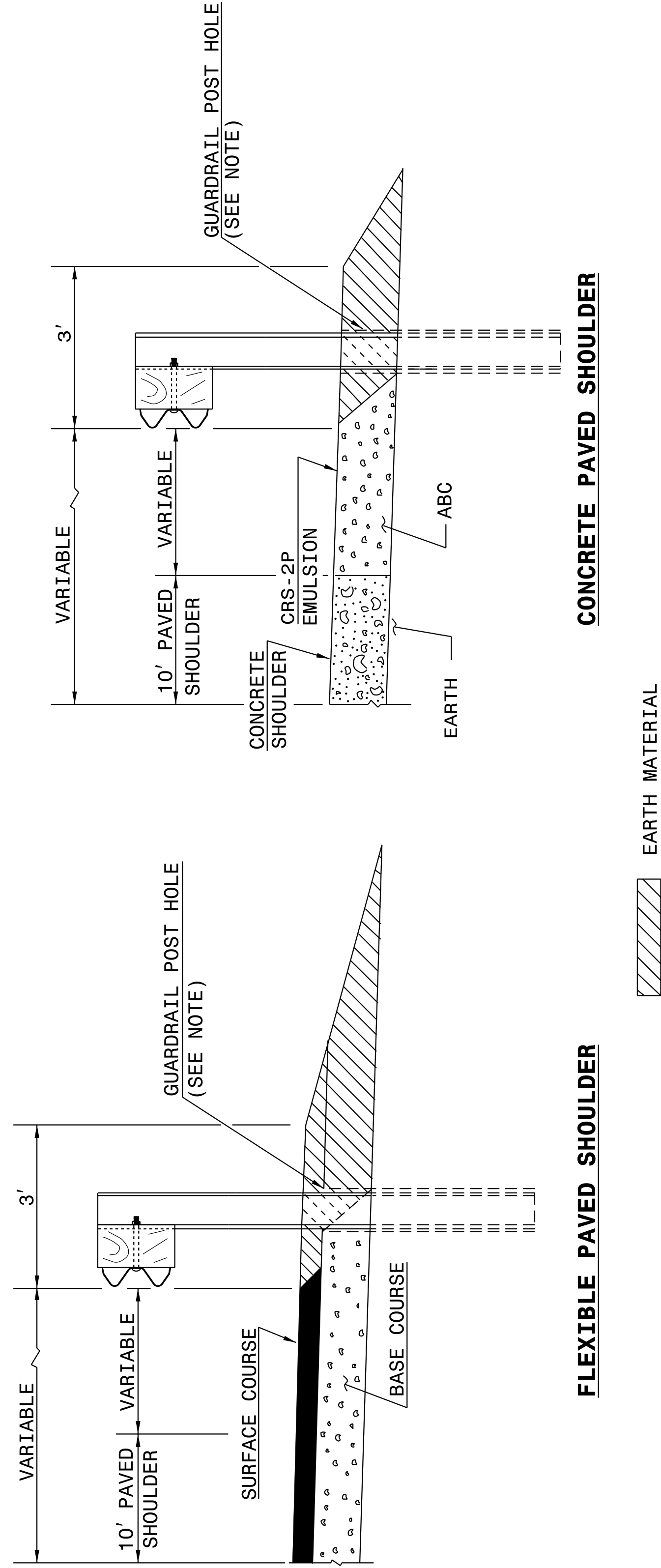


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ENGLISH DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 10 OF 11
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NOTE:
WHEN WOODEN GUARDRAIL POSTS ARE USED, DRILL HOLES THROUGH EARTH MATERIAL AND BASE COURSE. THE POST MAY THEN BE DRIVEN TO THE PROPER DEPTH. DRILL THE HOLE OF SUFFICIENT SIZE TO ACCOMMODATE THE PARTICULAR POST BEING USED. BACKFILL AND TAMP HOLES USING THE EXCAVATED MATERIAL.

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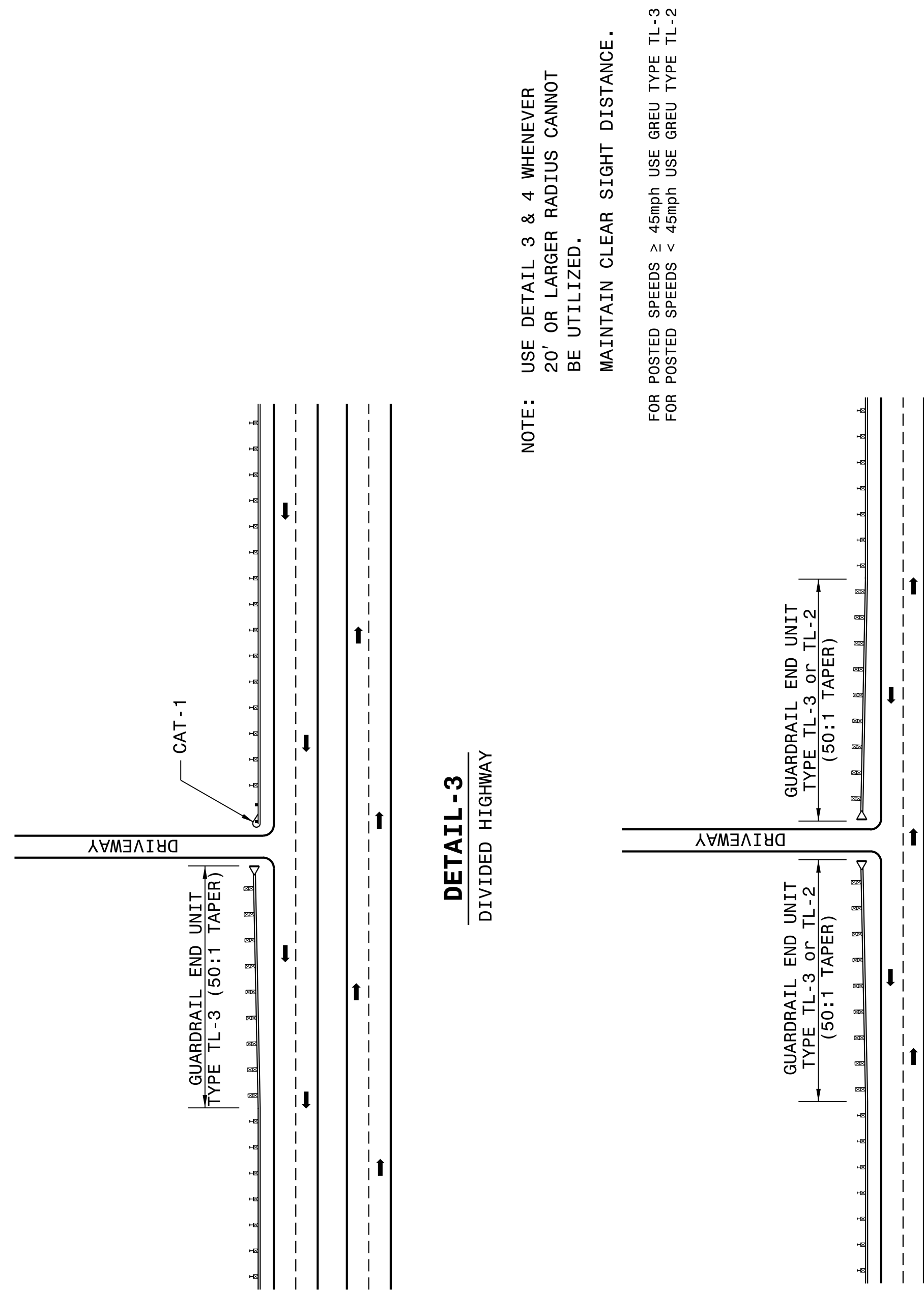
ENGLISH DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 9 OF 11
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ROADWAY DETAIL DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 9 OF 11
862D01



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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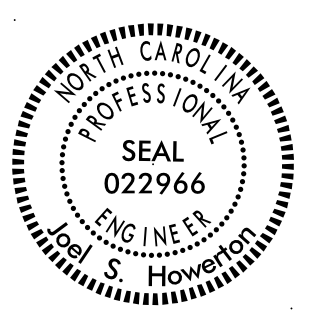
SHEET 9 OF 11
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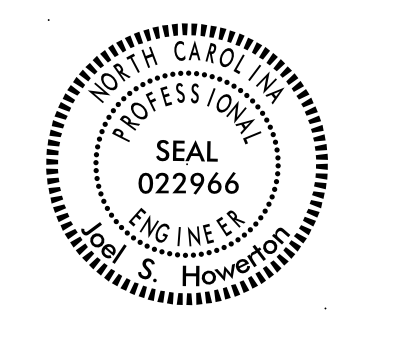
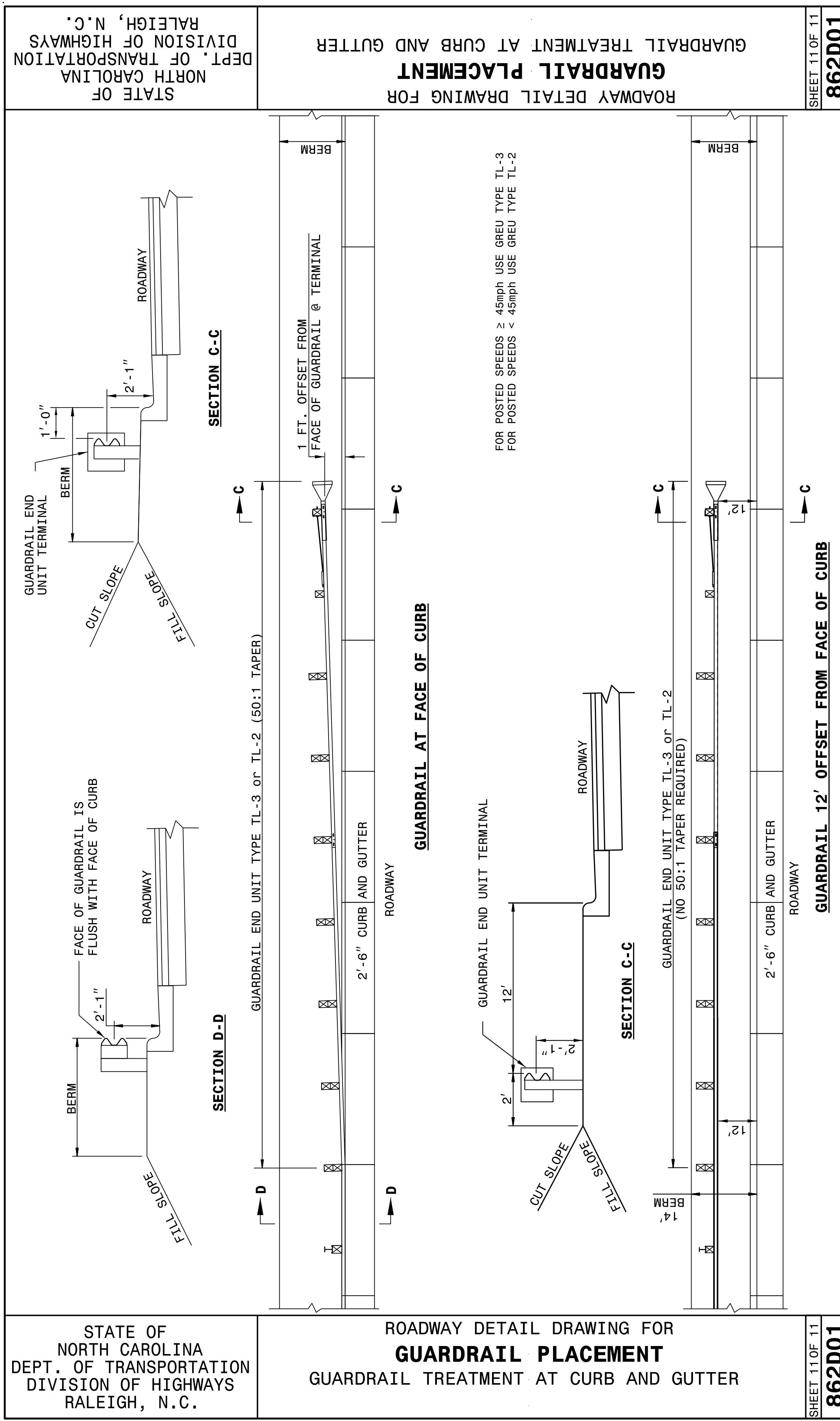
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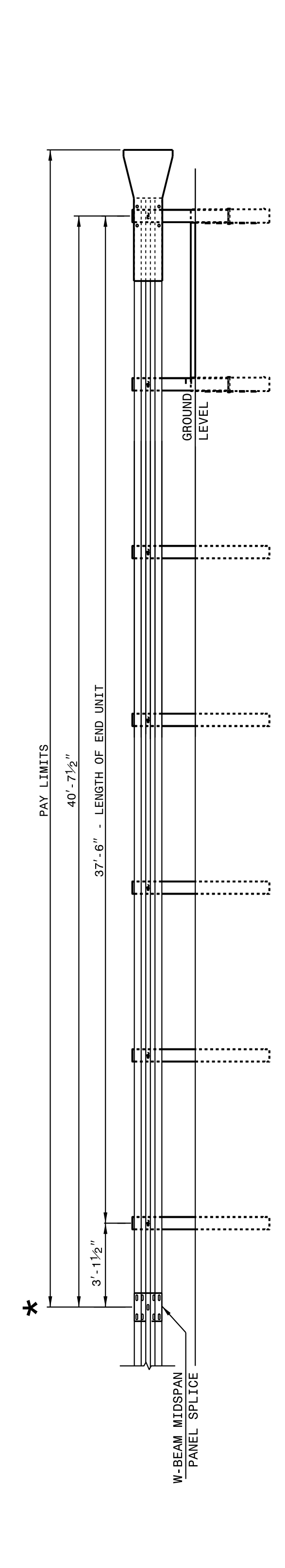
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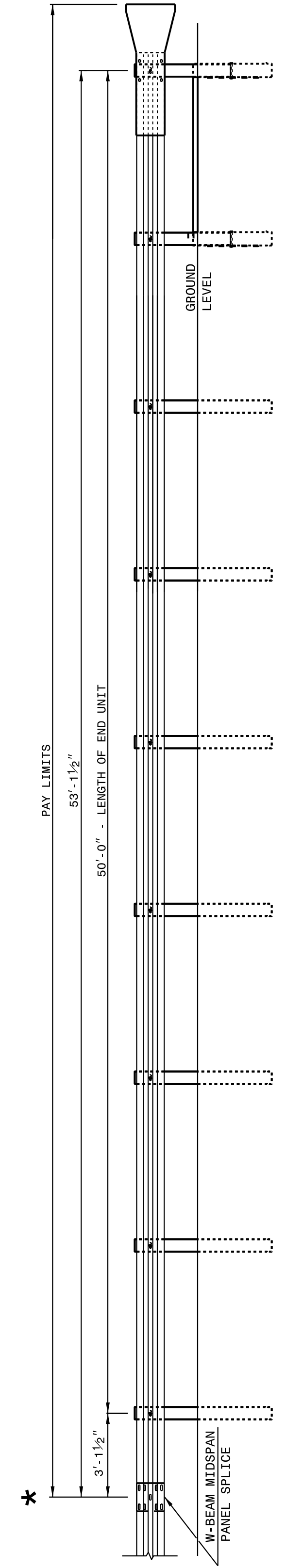
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SHEET 2 OF 8
862D02



**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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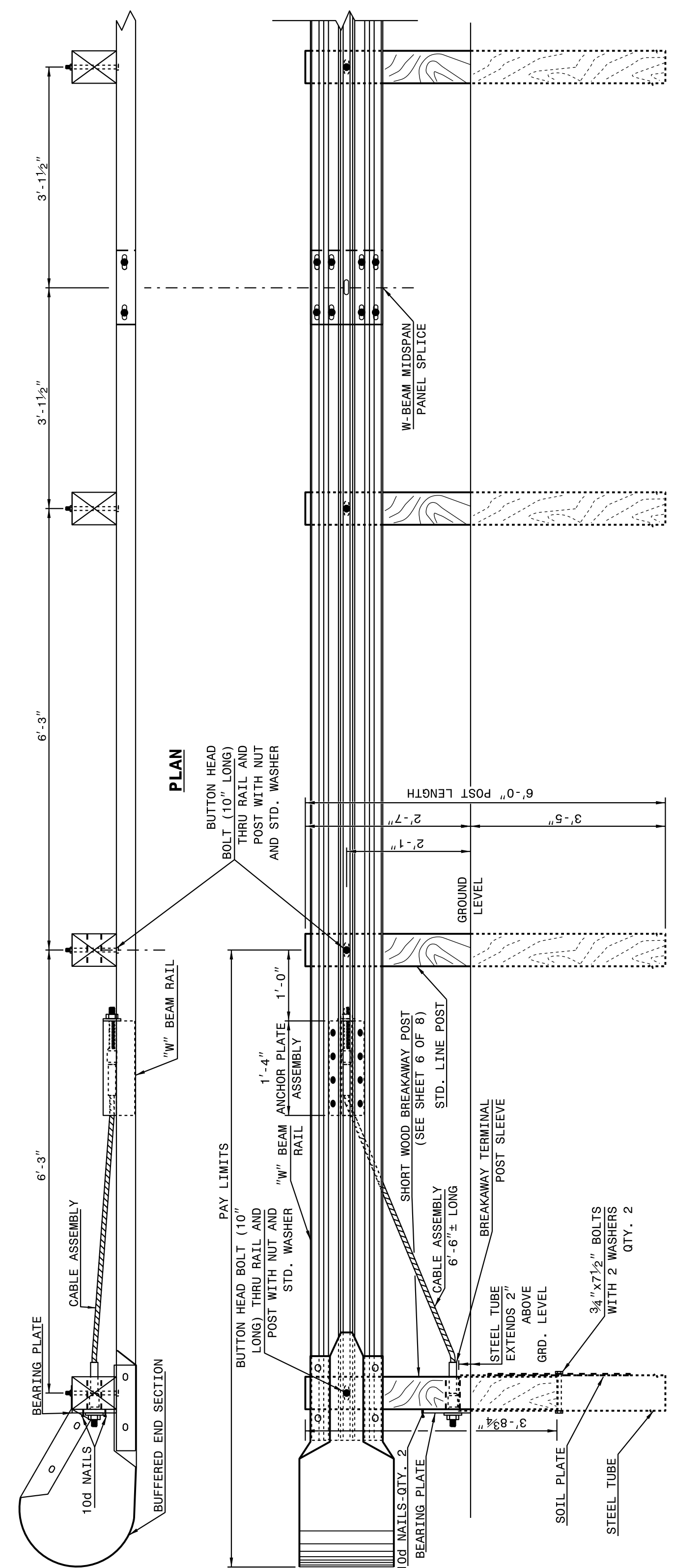
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ROADWAY DETAIL DRAWING FOR
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862D02



ELEVATION

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

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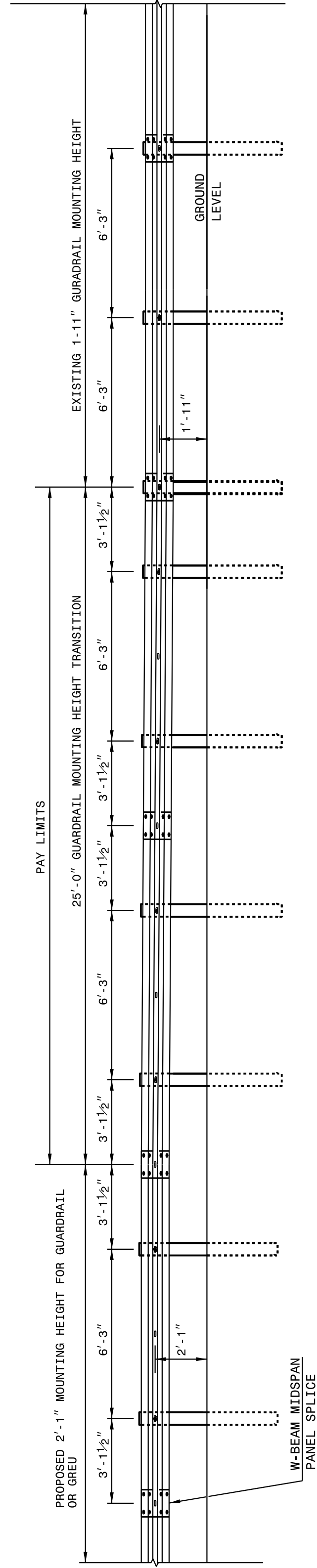
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ROADWAY DETAIL DRAWING FOR
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SHEET 4 OF 8
862D02

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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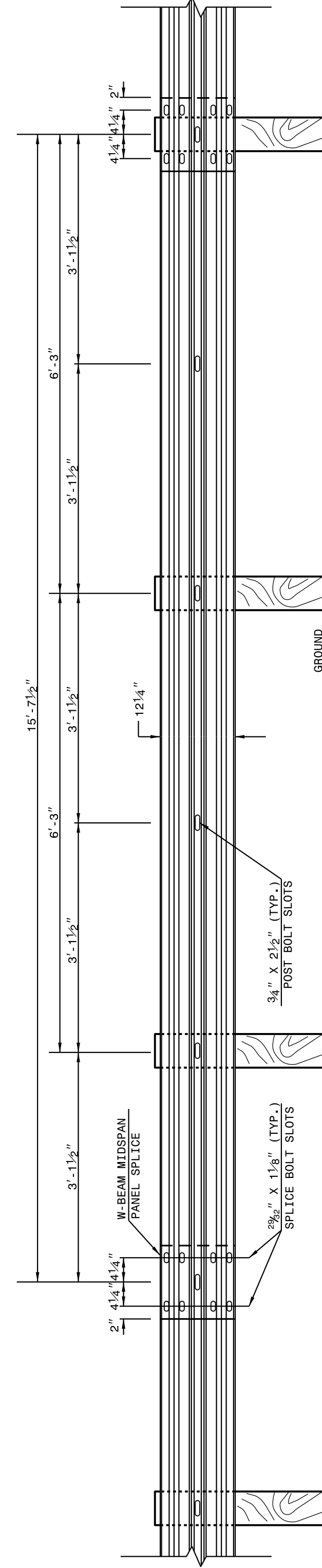
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ROADWAY DETAIL DRAWING FOR
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SHEET 3 OF 8
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15'-7 1/2" W-BEAM GUARDRAIL PANEL

NOTE: USE 6" SPACE 15'-7 1/2" W-BEAM GUARDRAIL PANEL AS THE DOWNSTREAM END OF AN END UNIT THAT DOES NOT OFFSET THE W-BEAM PANEL SPLICE TO MIDSPAN

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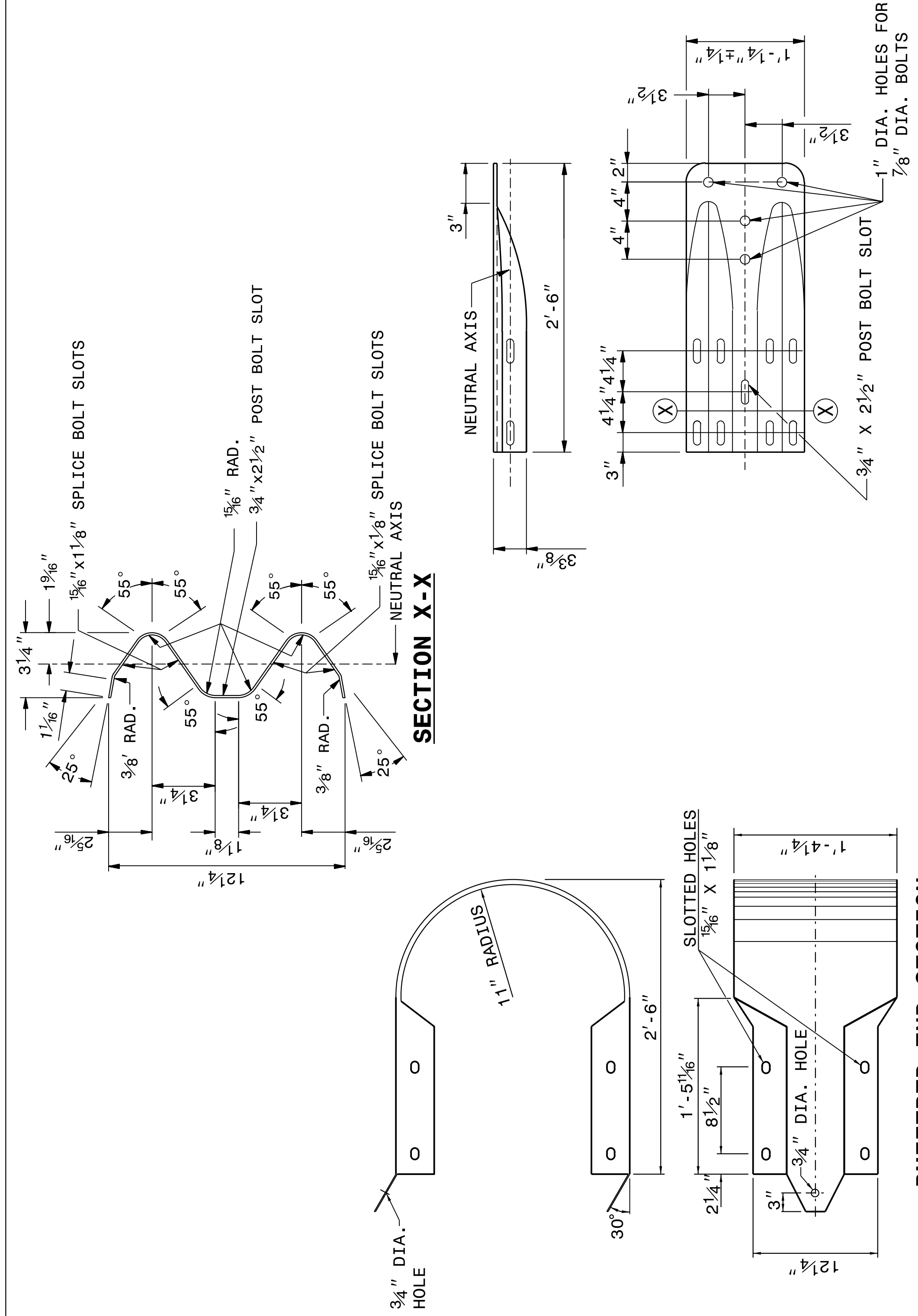
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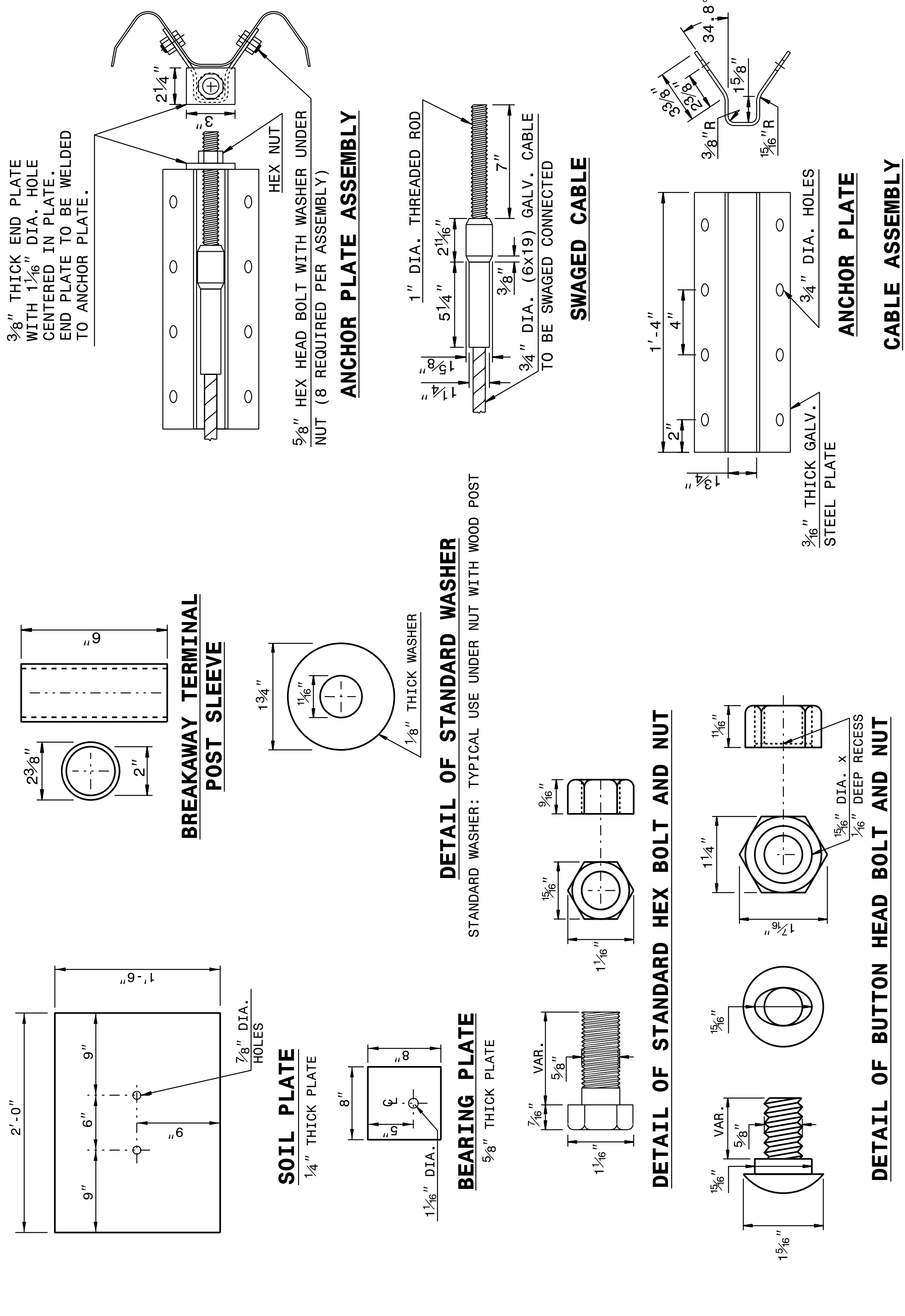
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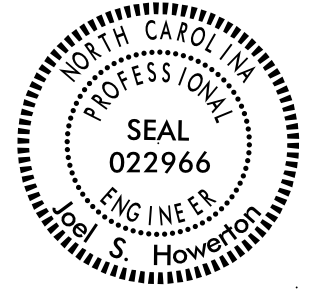
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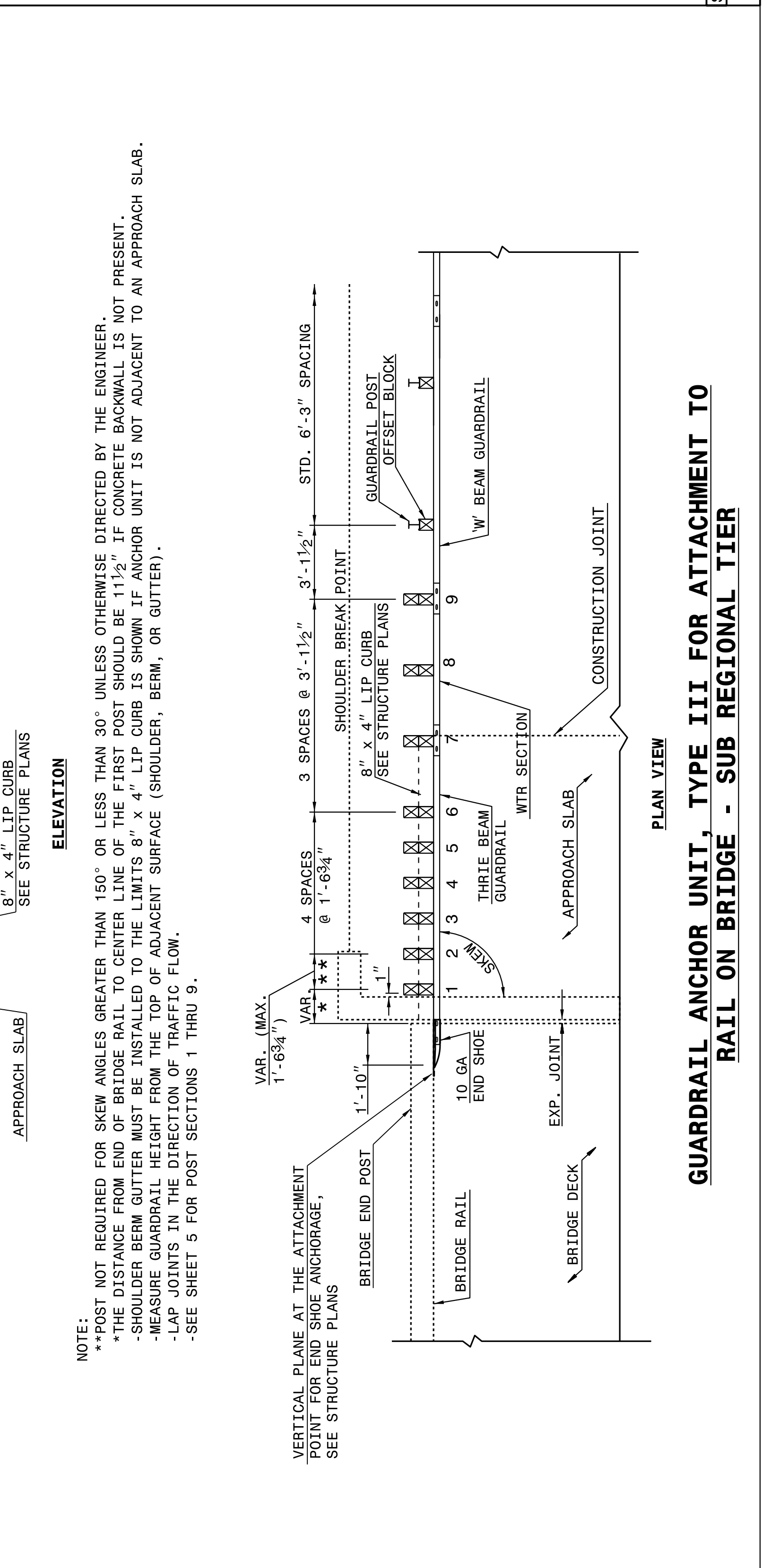
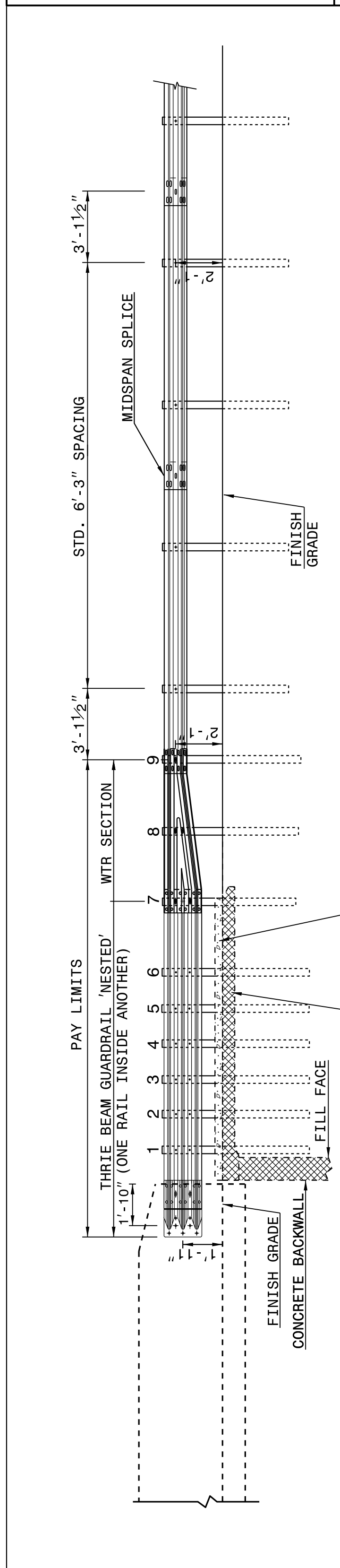


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ROADWAY DETAIL DRAWING FOR GUARDRAIL ANCHOR UNIT, TYPE III FOR ATTACHMENT TO RAIL ON BRIDGE - SUB REGIONAL TIER

SHEET 2 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 - SUB REGIONAL TIER

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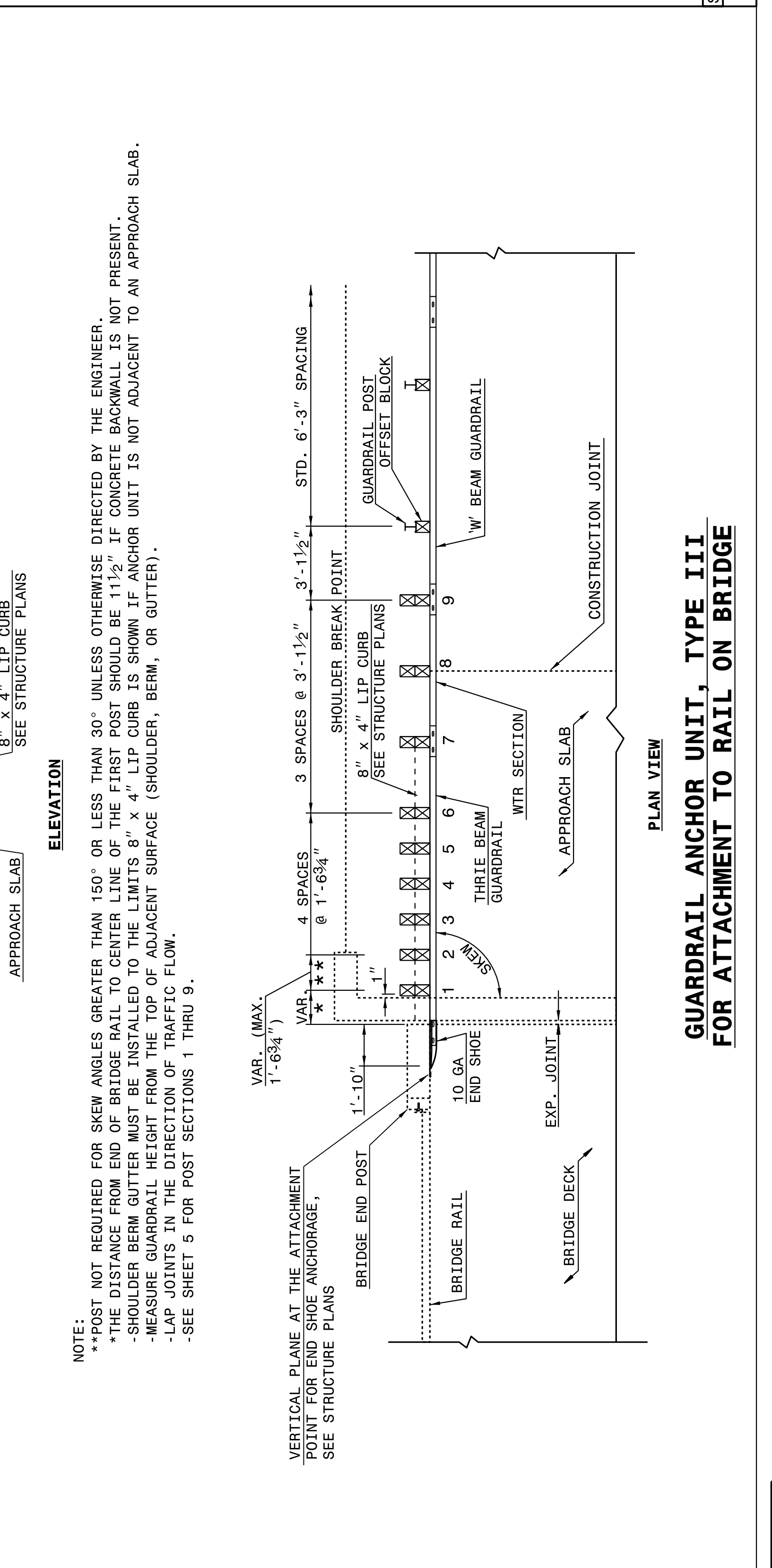
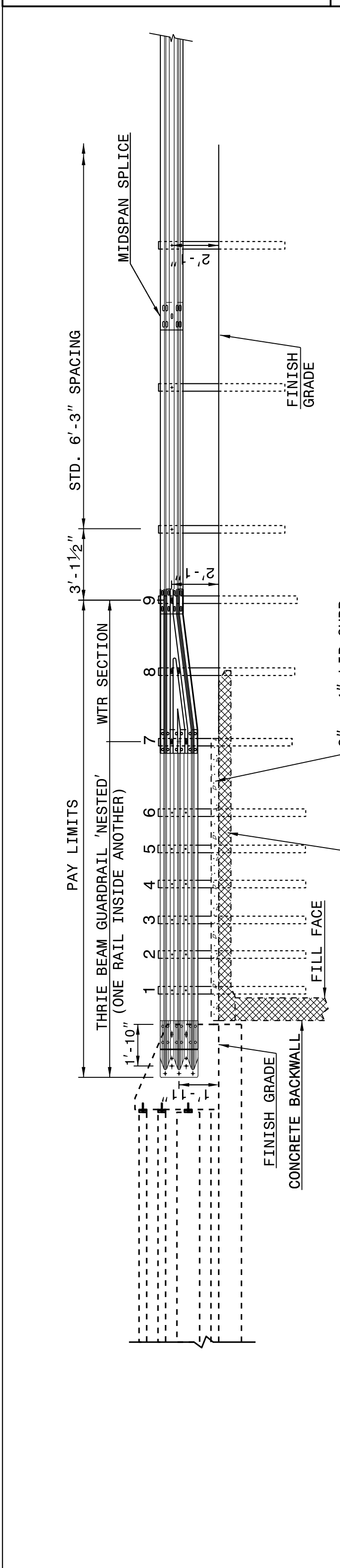
NOTE:
 **POST NOT REQUIRED FOR SKEW ANGLES GREATER THAN 150° OR LESS THAN 30° UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
 *THE DISTANCE FROM END OF BRIDGE RAIL TO CENTER LINE OF THE FIRST POST SHOULD BE 11 1/2" IF CONCRETE BACKWALL IS NOT PRESENT.
 -SHOULDER BERM GUTTER MUST BE INSTALLED TO THE LIMITS 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.

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



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

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

SHEET 1 OF 7 862D03

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 11 1/2" 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.

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

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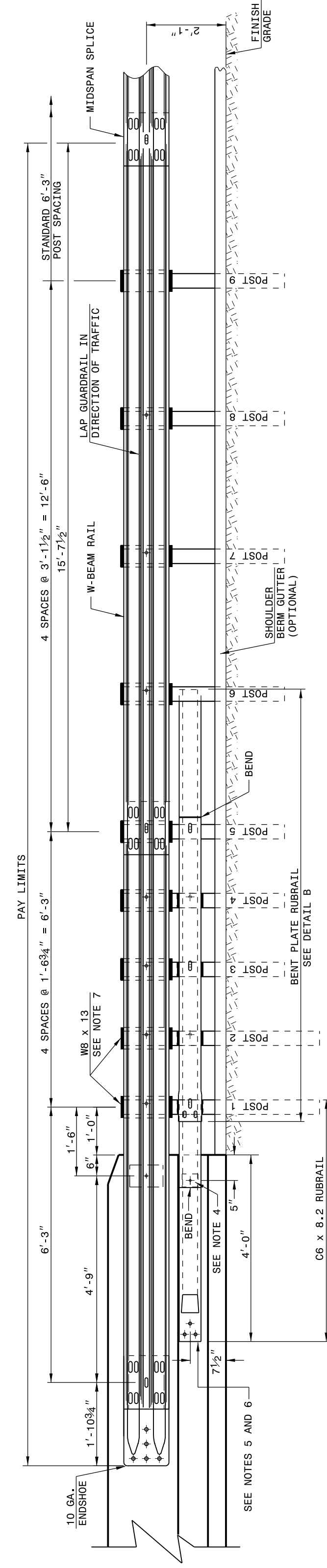


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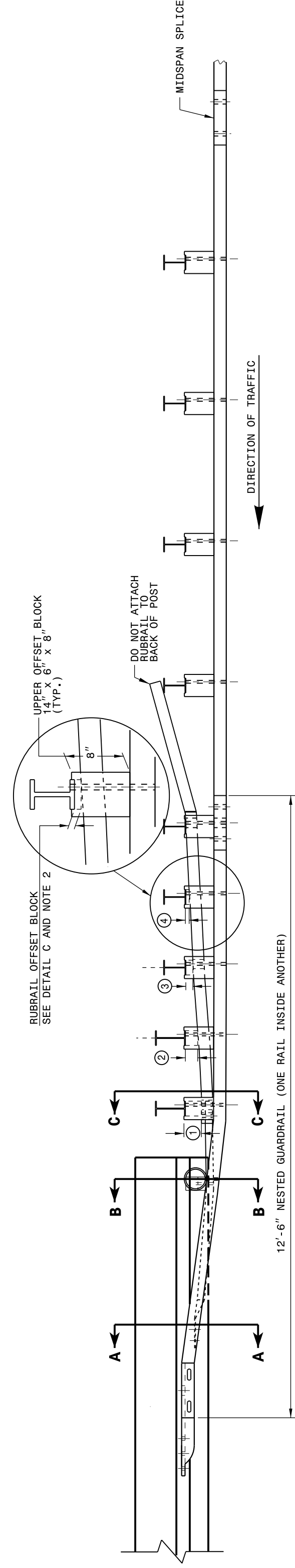
ROADWAY DETAIL DRAWING FOR
GUARDRAIL ANCHOR UNIT
 GUARDRAIL ANCHOR UNIT TYPE B-77
 FOR F-SHAPE BARRIER

SHEET 4 OF 7
862D03



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.
 - STEEL SPACER TUBE IS A SCHEDULE 40 GALVANIZED PIPE 6" INSIDE DIAMETER X 9" LONG. ATTACH TUBE TO GUARDRAIL ONLY WITH 5/8" X 1 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:
 - AT EXISTING BRIDGE RAIL AND NEW OR EXISTING BARRIERS, ANCHOR RUBRAIL USING THREE 5/8" X 6" CHEMICALLY ANCHORED BOLTS WITH WASHERS. MAXIMUM PROJECTION FOR BOLTS IS 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:
 - AT NEW 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

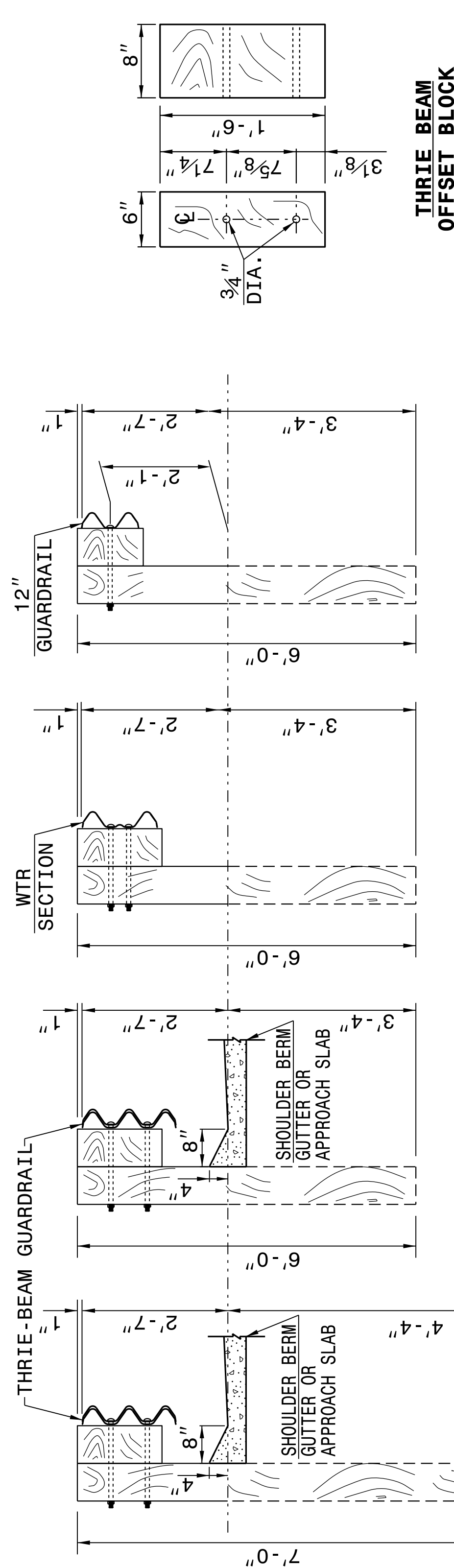
GUARDRAIL ANCHOR UNIT TYPE B-77

SHEET 4 OF 7
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ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
 GUARDRAIL ANCHOR UNIT, TYPE III

SHEET 3 OF 7
862D03

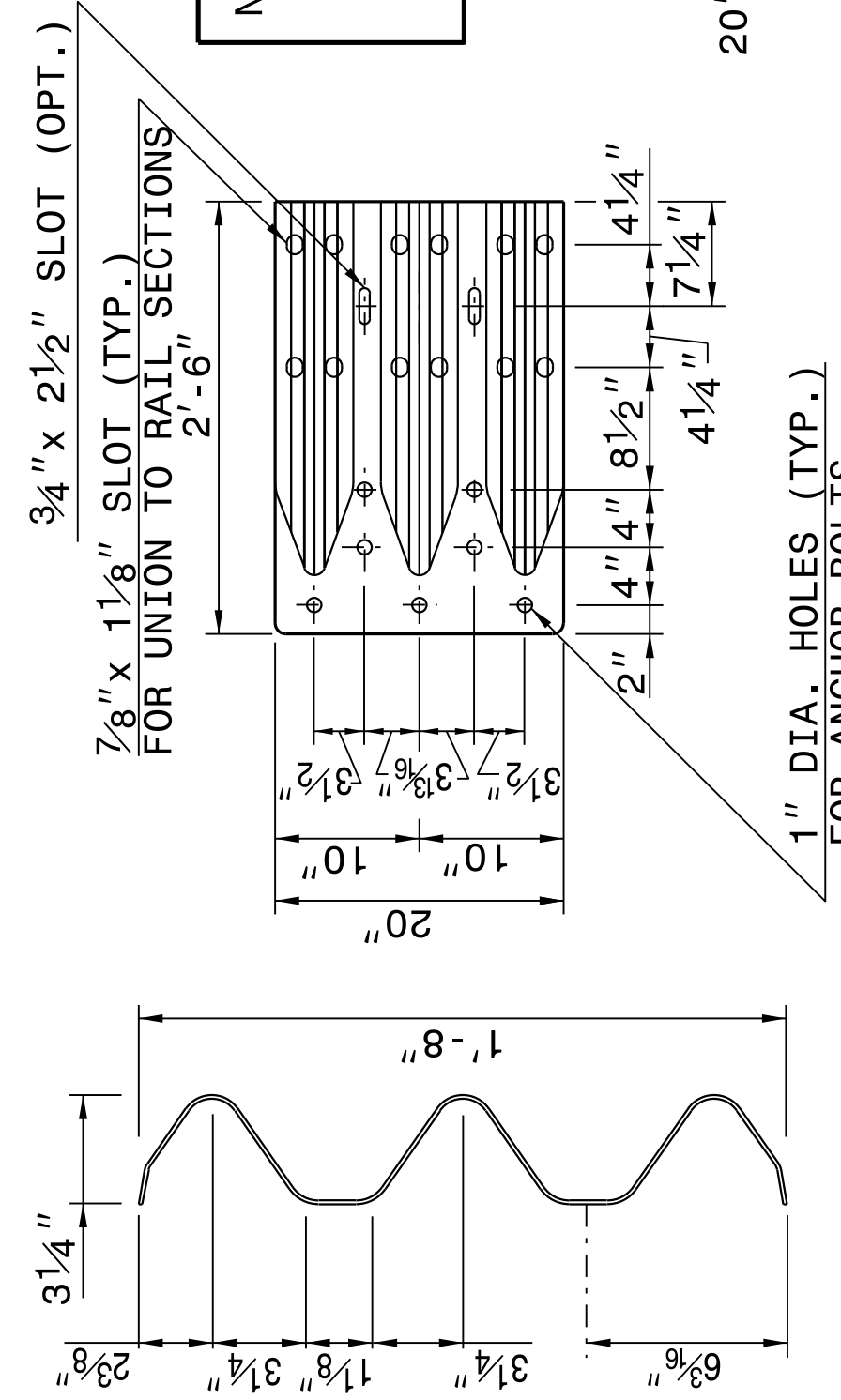


SECTION OF THRIE BEAM POSTS 1 THRU 6

SECTION OF THRIE BEAM POST 7

SECTION OF THRIE BEAM POST 8

SECTION OF THRIE BEAM POST 9



THRIE-BEAM SECTION

END SHOE

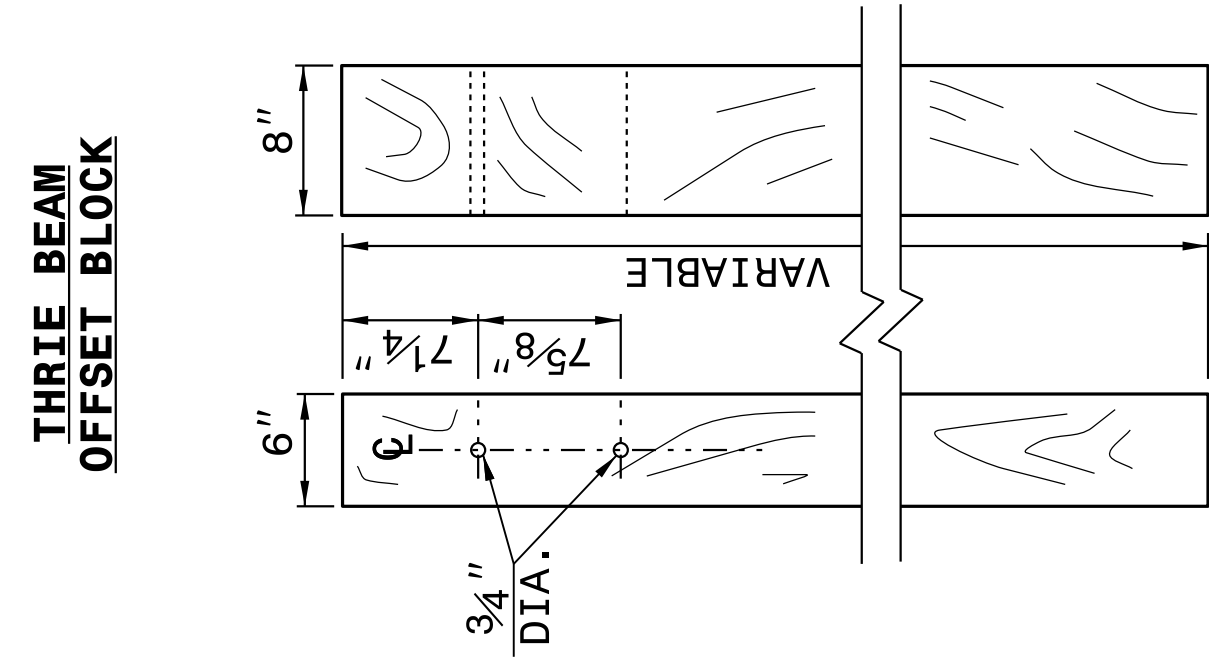
WTR SECTION ELEVATION VIEW

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

SHEET 3 OF 7
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THRIE BEAM OFFSET BLOCK

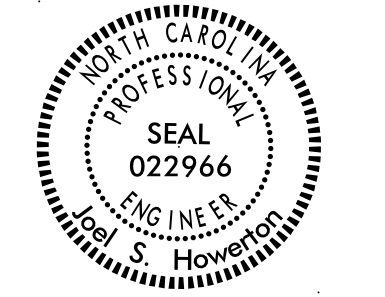
THRIE BEAM LINE POST

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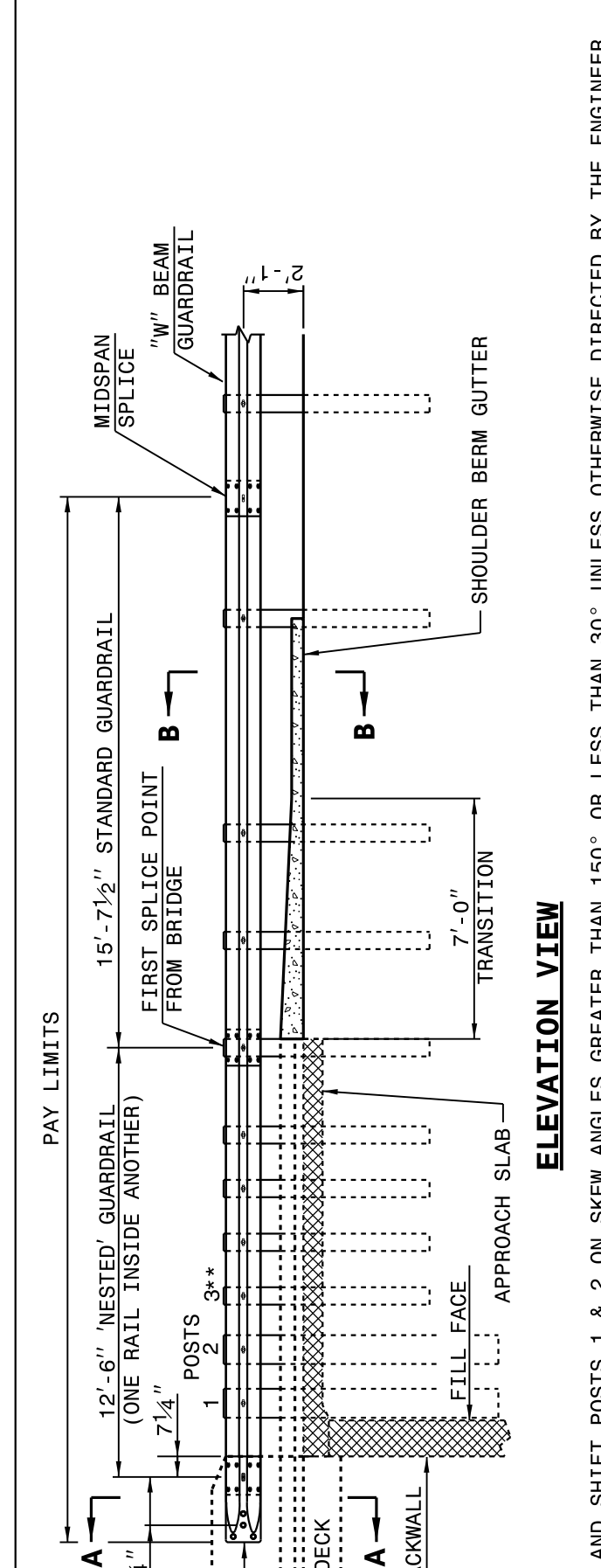
ROADWAY DETAIL DRAWING FOR
STRUCTURE ANCHOR UNITS
 GUARDRAIL ANCHOR UNIT TYPE B-83

SHEET 6 OF 7
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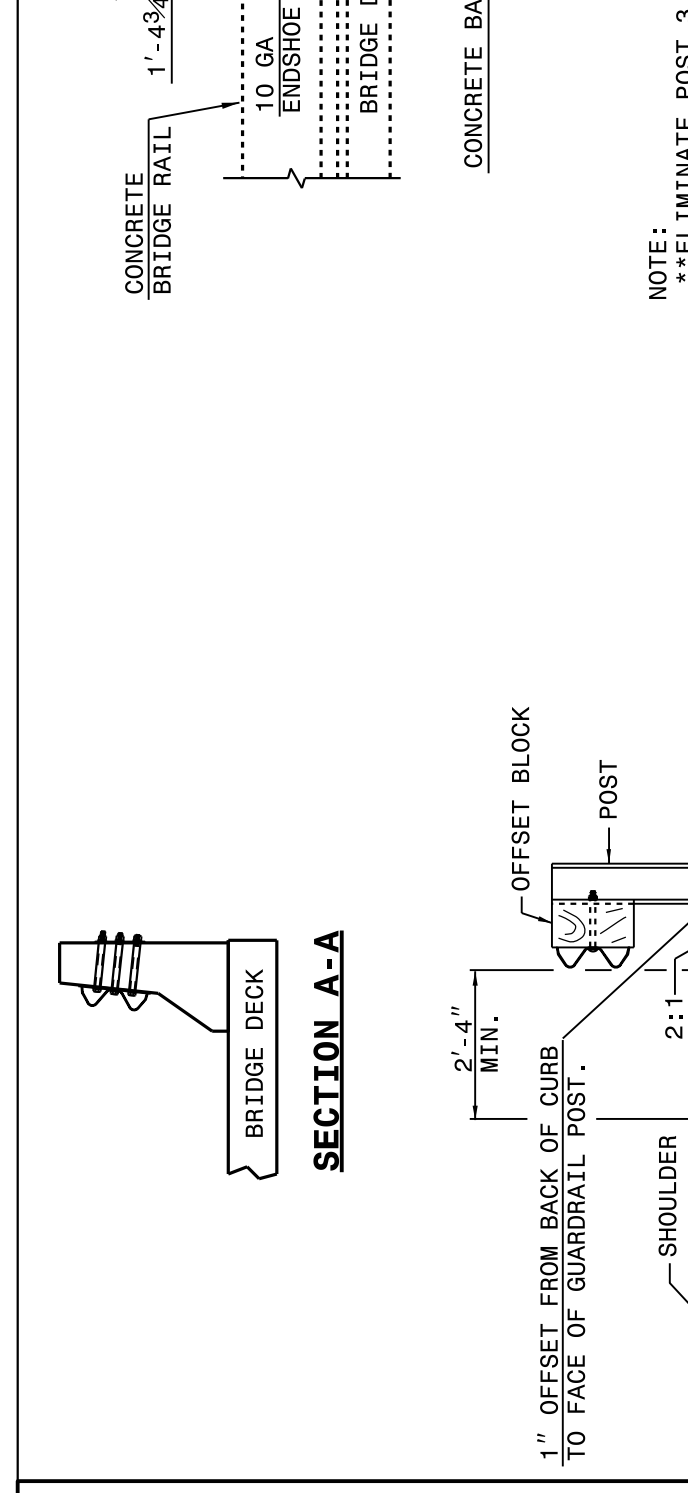
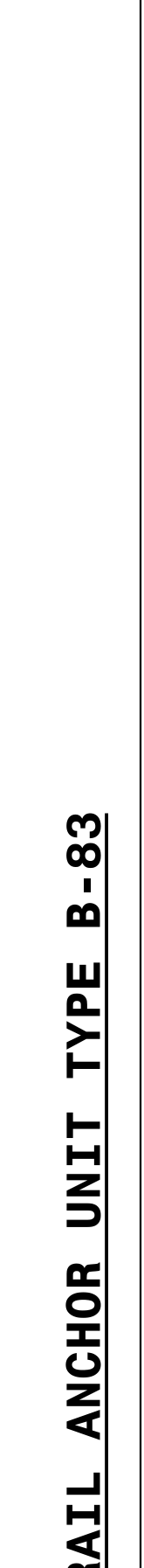
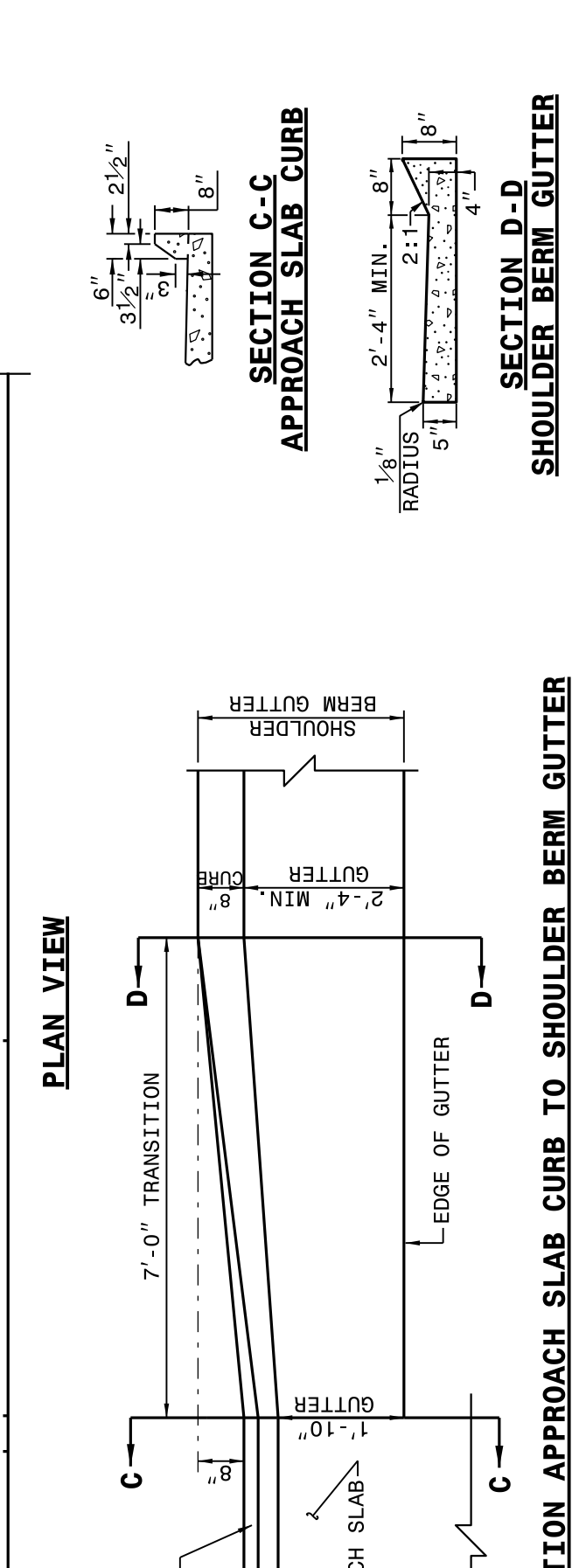
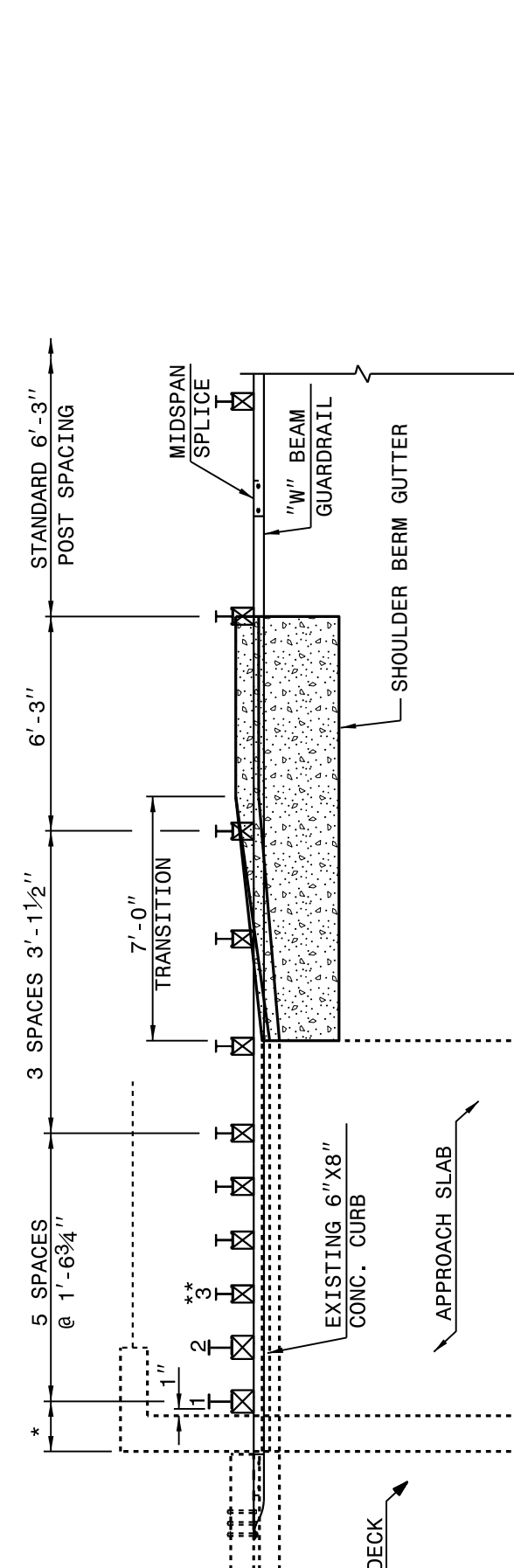
ROADWAY DETAIL DRAWING FOR
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 GUARDRAIL ANCHOR UNIT TYPE B-83

SHEET 6 OF 7
862D03

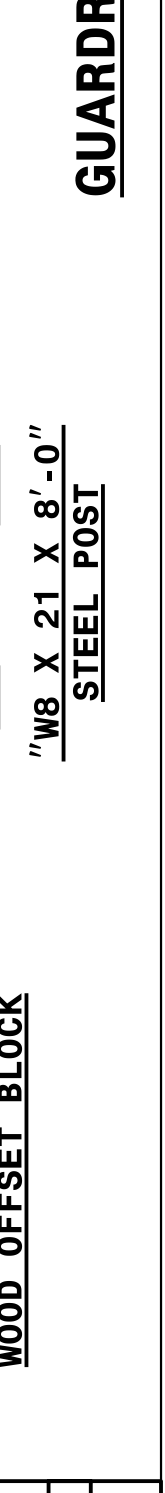
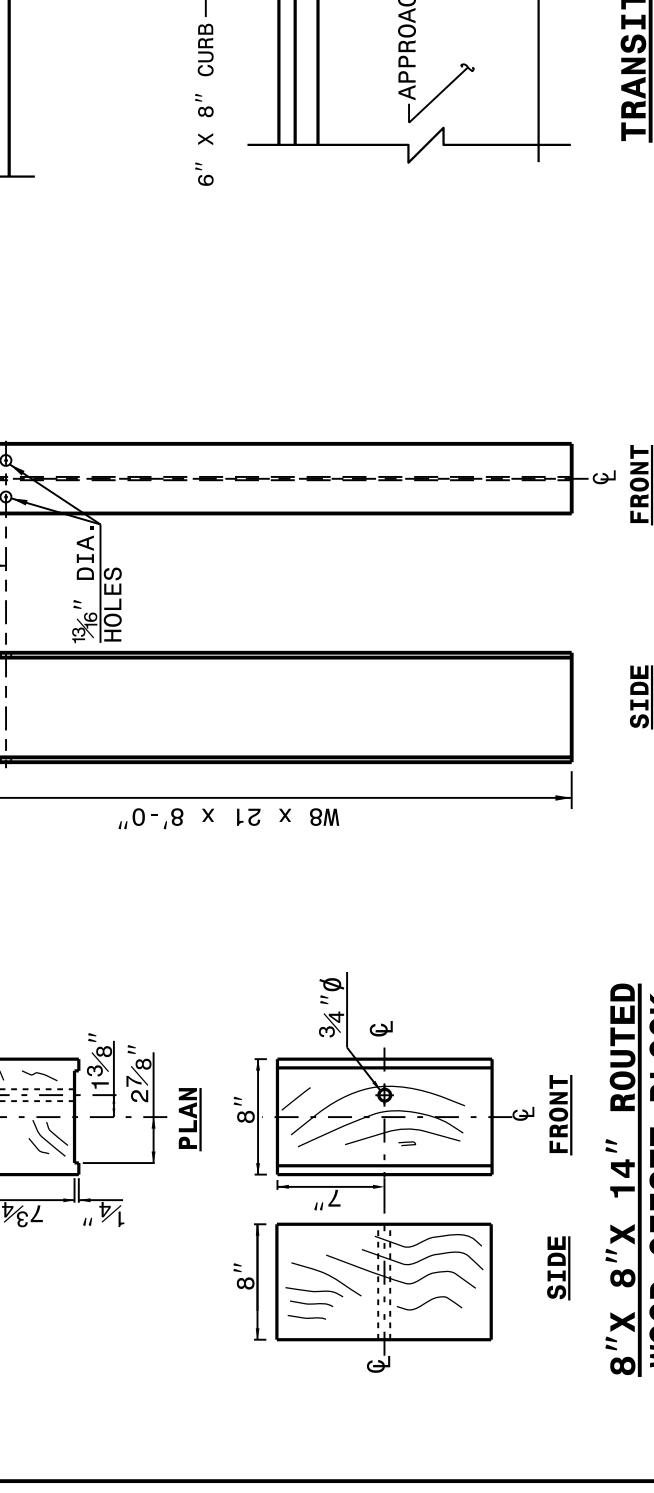
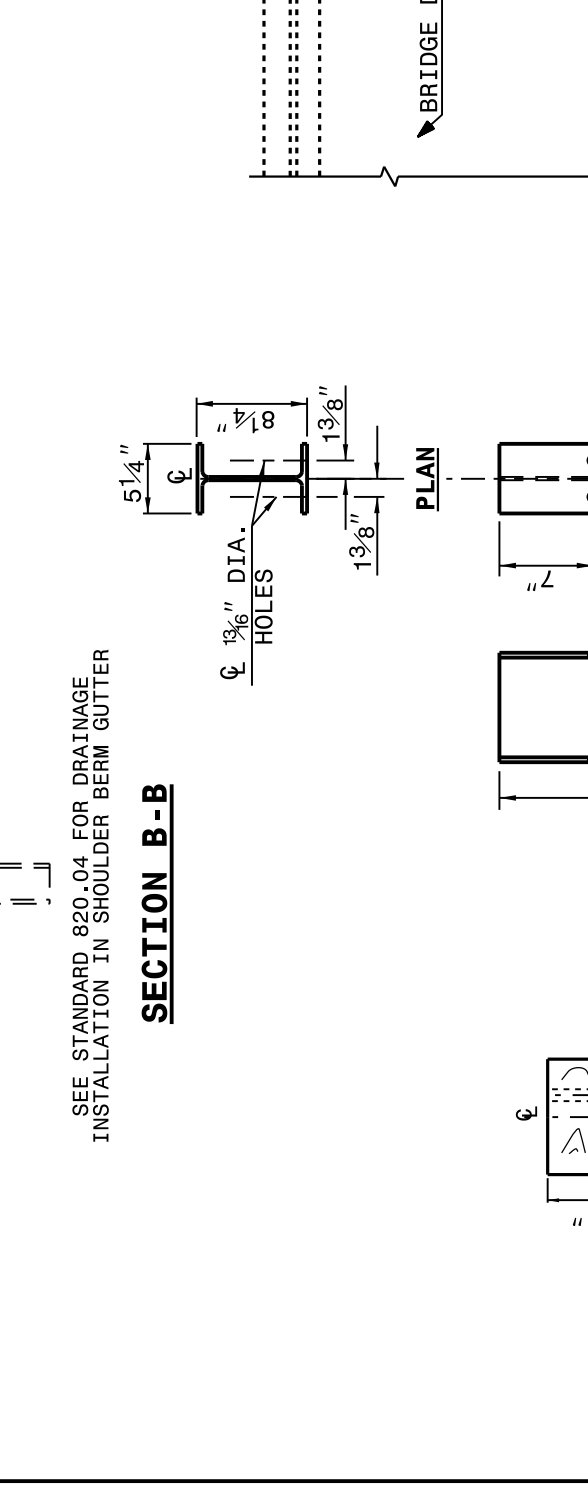


ELEVATION VIEW

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\"/>



SEE STANDARD 820.04 FOR DRAINAGE INSTALLATION IN SHOULDER BERM GUTTER



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SHEET 6 OF 7
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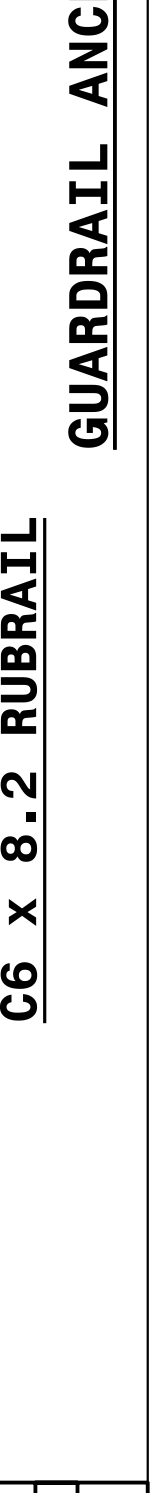
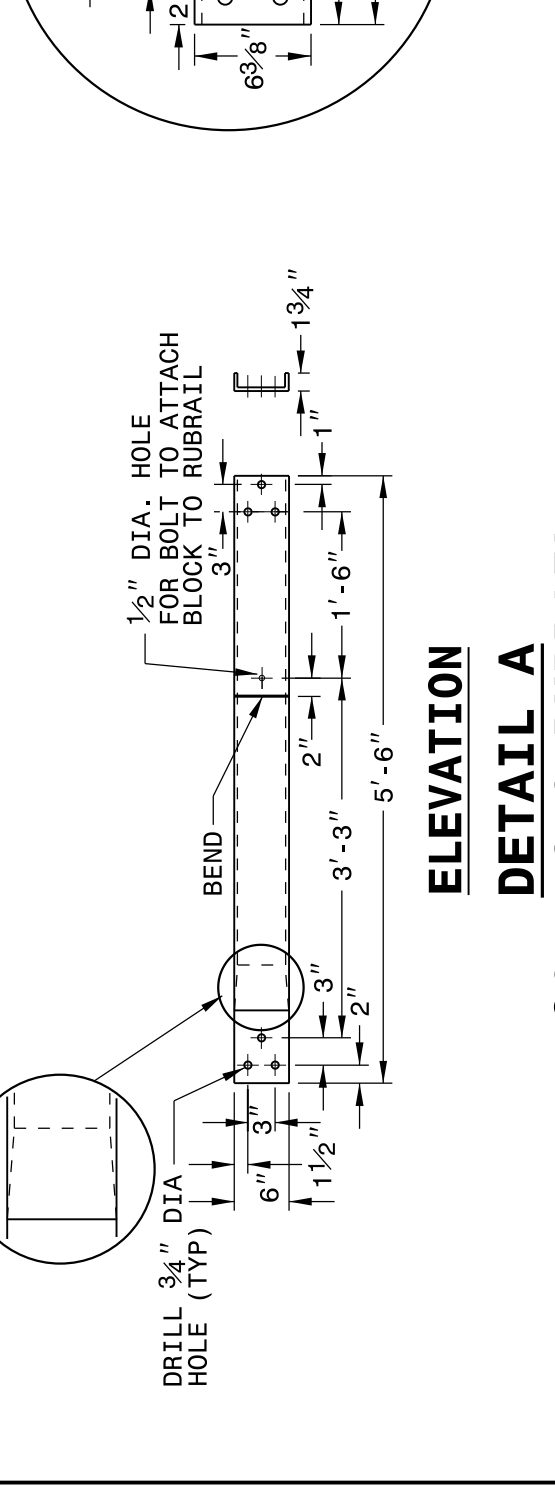
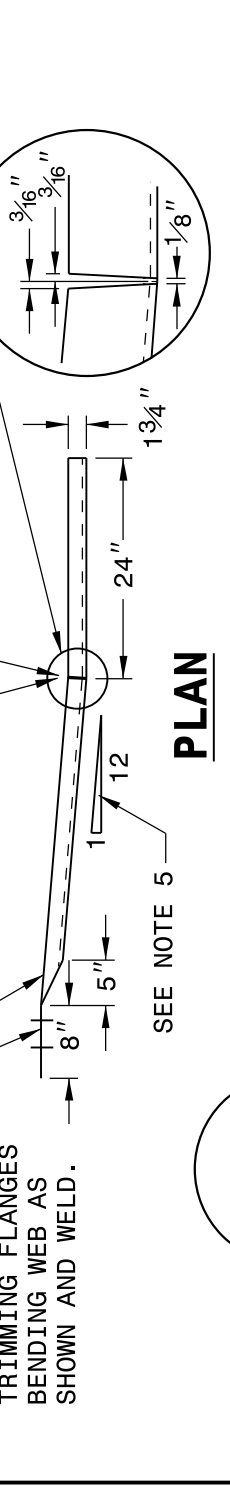
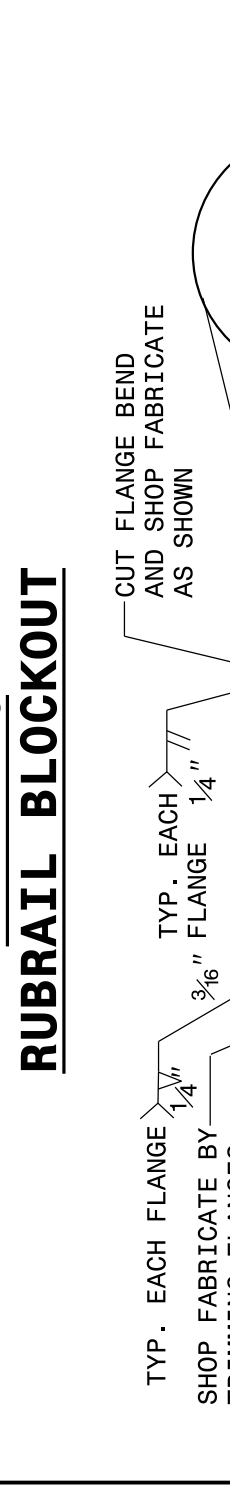
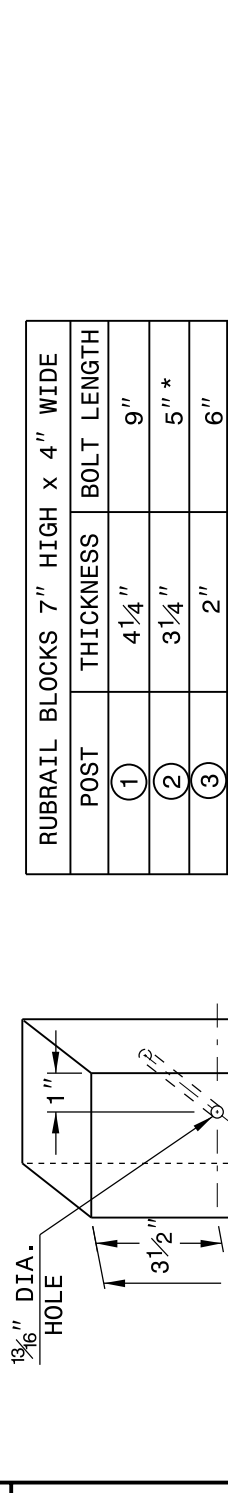
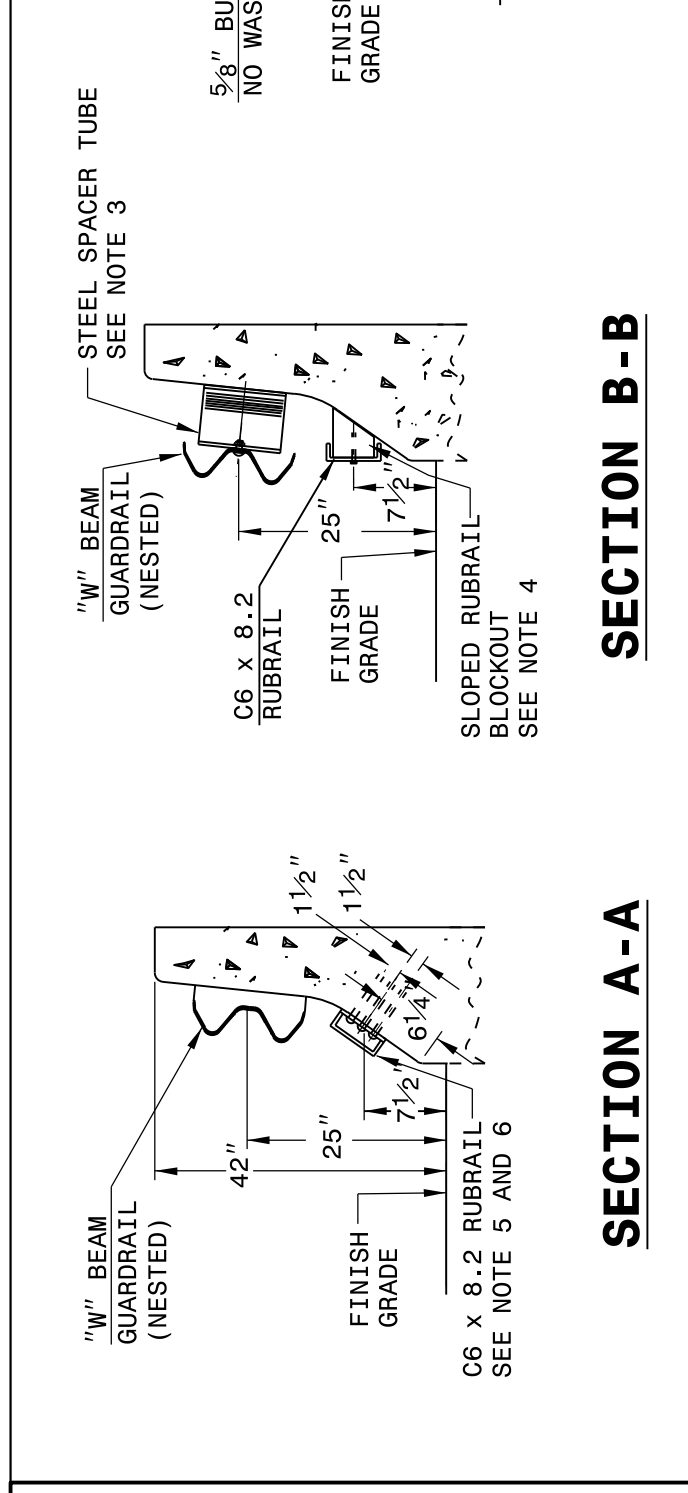
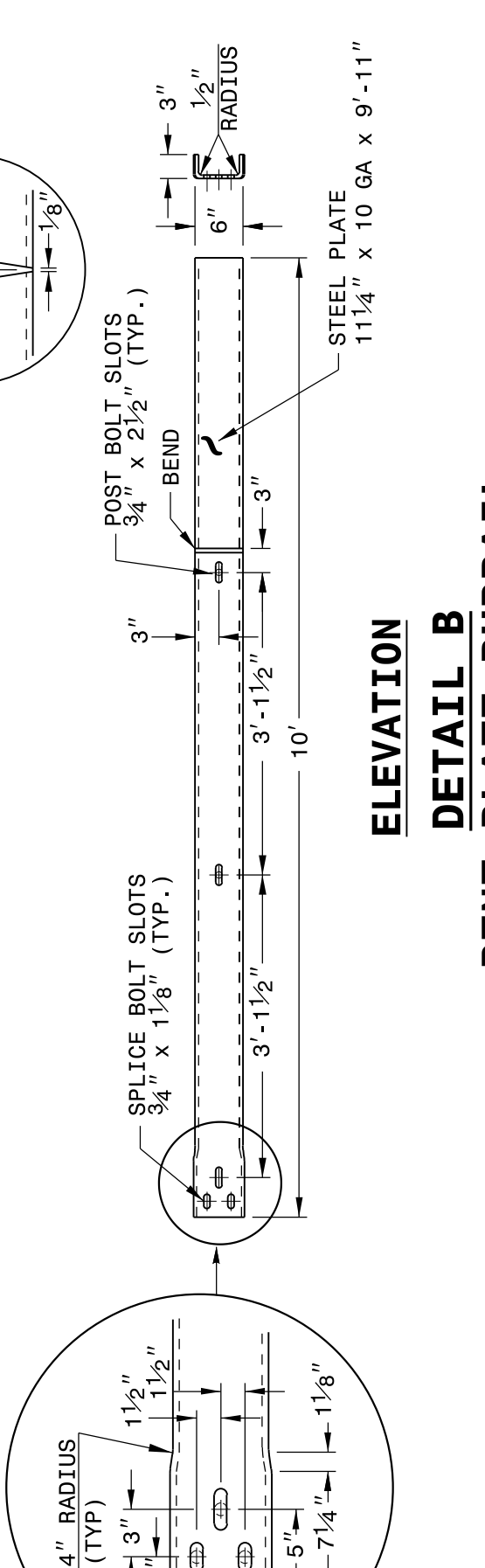
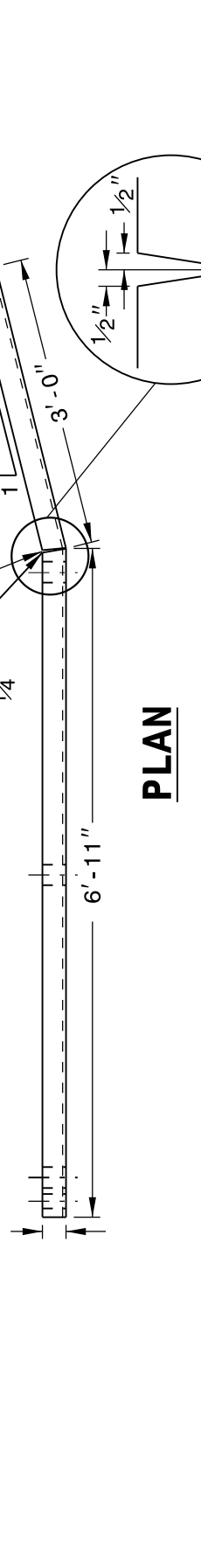
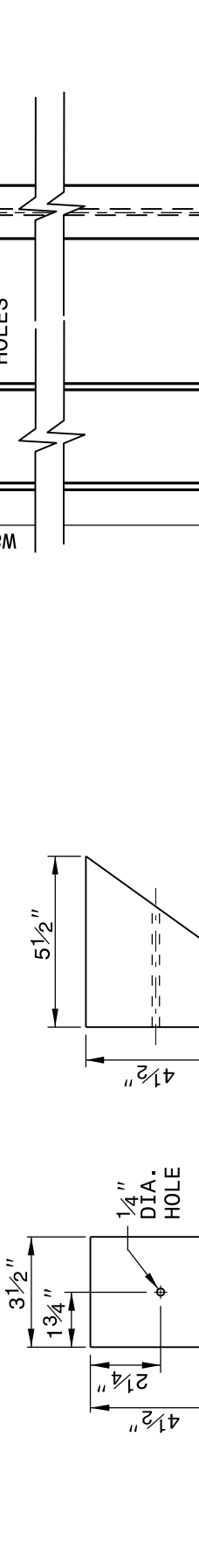
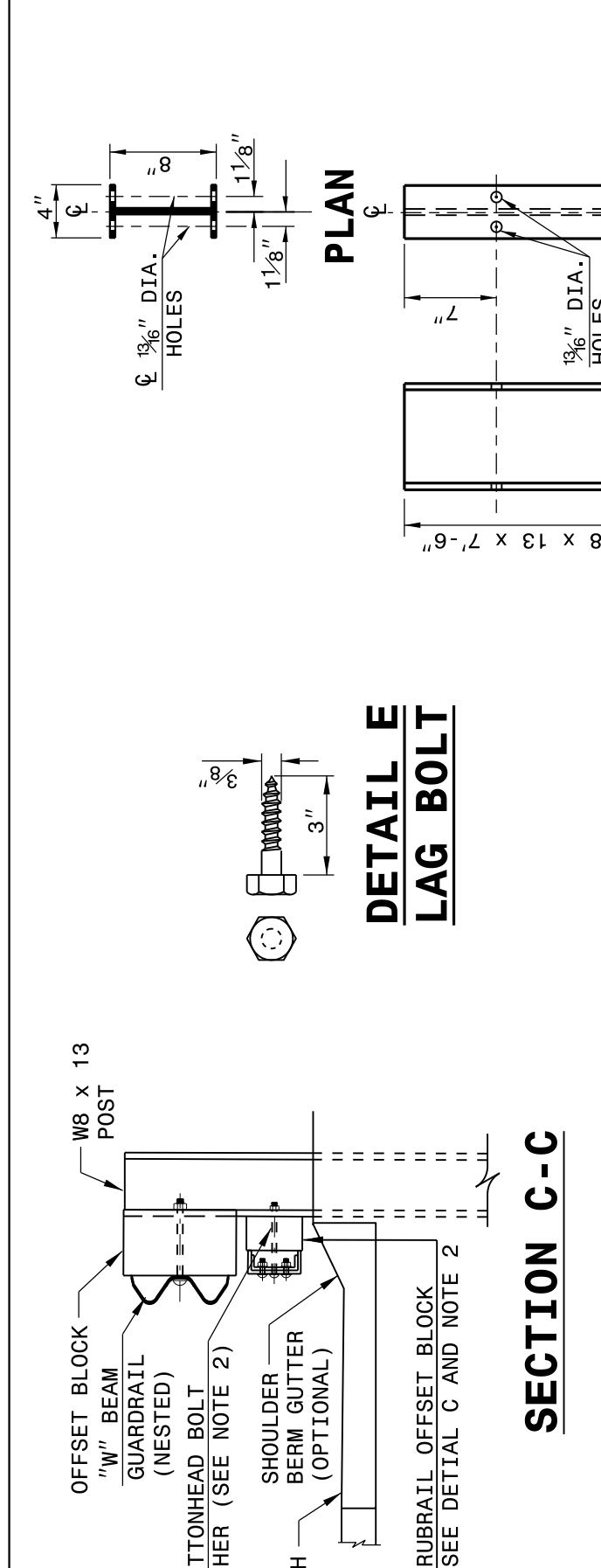
ROADWAY DETAIL DRAWING FOR
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 GUARDRAIL ANCHOR UNIT TYPE B-77
 FOR F-SHAPE BARRIER

SHEET 5 OF 7
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 FOR F-SHAPE BARRIER

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 FOR F-SHAPE BARRIER

SHEET 5 OF 7
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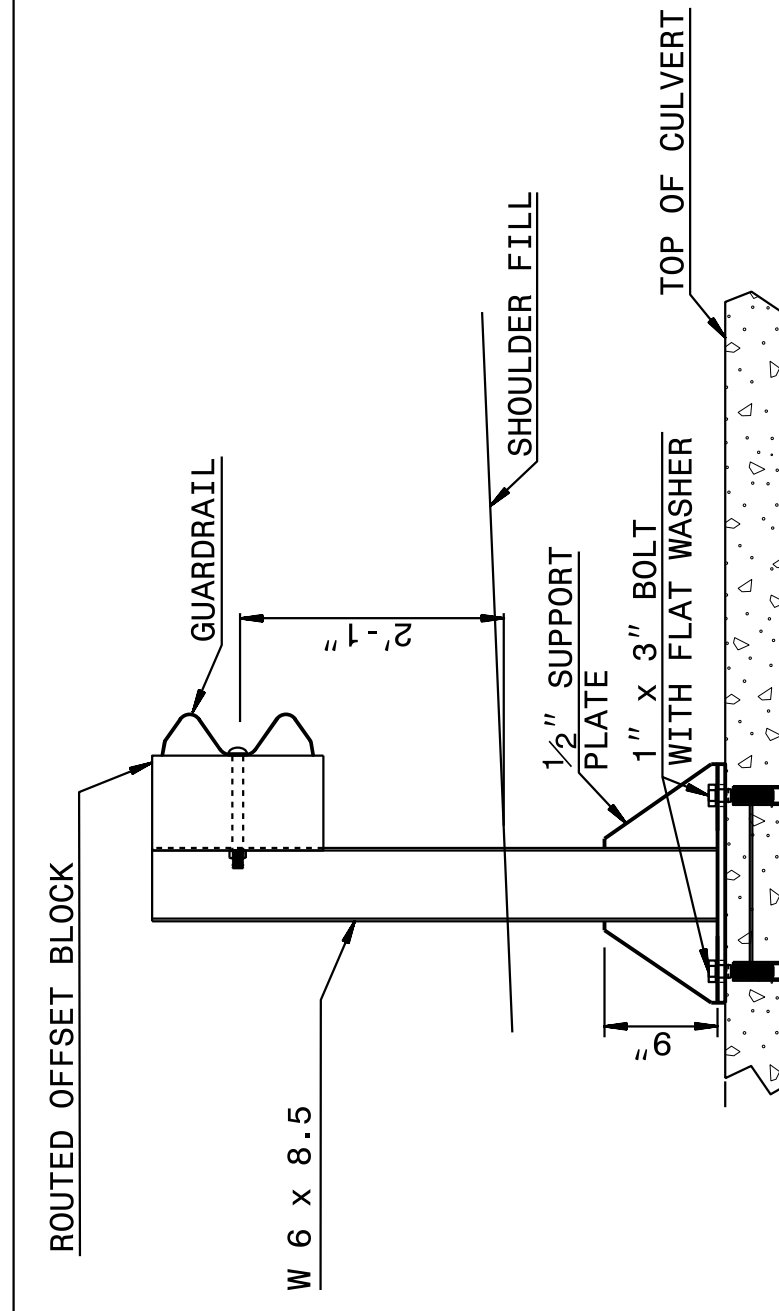


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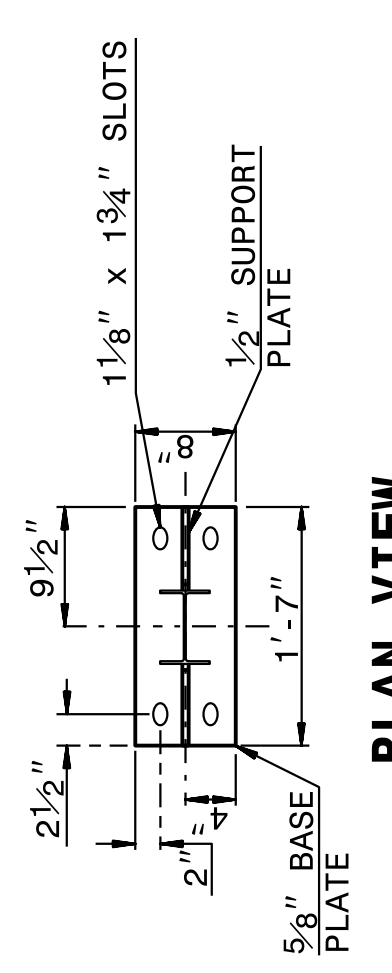
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ROADWAY DETAIL DRAWING FOR
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 ANCHORAGE FOR GUARDRAIL POST ON BOX CULVERT

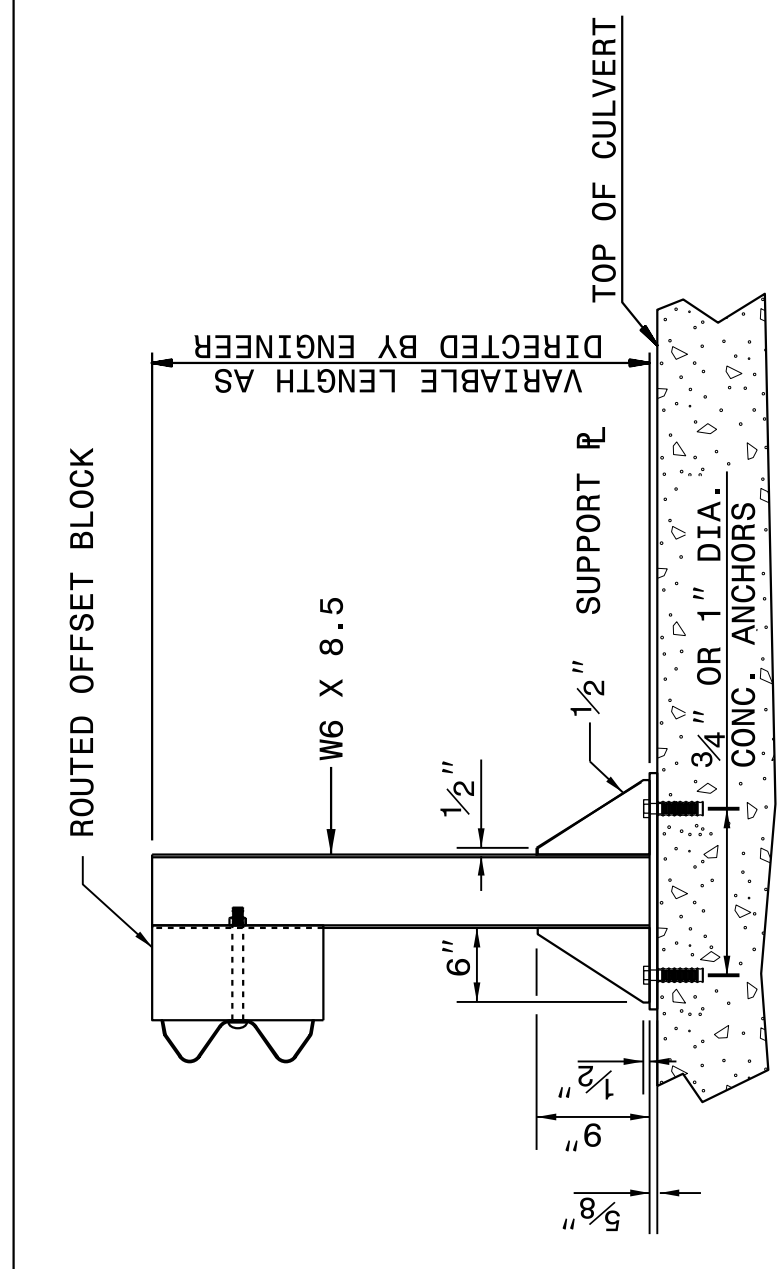
SHEET 7 OF 7
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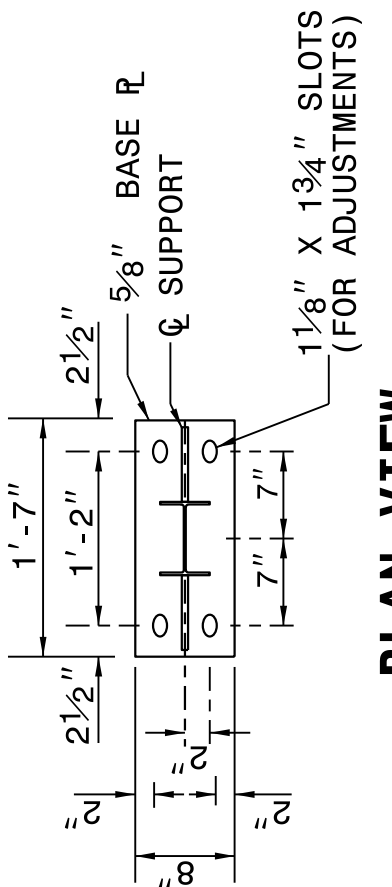
ELEVATION VIEW



PLAN VIEW



ELEVATION VIEW



PLAN VIEW

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

SHEET 7 OF 7
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NOTES FOR:
 -USE CONCRETE ANCHORS CONSISTING OF A STUD BOLT WITH NUT AND WASHER. USE STUDS THREADED ON ONE END AND HAVING AN EXPANDED WEDGE ASSEMBLY POSITIONED AROUND A TAPERED AREA AT THE OTHER END. USE ANCHORS WHICH PROVIDE A MINIMUM SAFE HOLDING POWER OF 2875 LBS. FOR A 3/4" OR 1" DIAMETER BOLT. CALCULATE HOLDING POWER BASED ON 1/4 THE ACTUAL HOLDING POWER OF THE ANCHOR IN 3500 PSI CONCRETE AS DETERMINED BY AN APPROVED COMMERCIAL TESTING LABORATORY.
 -USE ANCHORS GALVANIZED IN ACCORDANCE WITH A.S.T.M. A-153. SIZE HOLES FOR THE CONCRETE ANCHORS IN ACCORDANCE WITH THE ANCHOR MANUFACTURER'S RECOMMENDATIONS. DRILL HOLES WITH A CARBIDE OR DIAMOND TIPPED MASONRY BIT POWERED BY A ROTARY OR ROTARY IMPACT DRILL. NO OTHER IMPACT TOOLS WILL BE PERMITTED. DRILL HOLES VERTICALLY. FURNISH DOCUMENTATION OF HOLE SIZE RECOMMENDED FOR THE SPECIFIED ANCHOR TO THE ENGINEER BEFORE DRILLING HOLES. THOROUGHLY CLEAN HOLES FOR ANCHORS OF ALL CONCRETE CHIPS, DUST, GREASE, OIL, ETC. BEFORE ANCHORS ARE INSTALLED. REPAIR ALL DAMAGE CAUSED BY THIS WORK TO THE SATISFACTION OF THE ENGINEER.

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

EXISTING STRUCTURES:
 -USE CONCRETE ANCHORS CONSISTING OF A STUD BOLT WITH NUT AND WASHER. USE STUDS THREADED ON ONE END AND HAVING AN EXPANDED WEDGE ASSEMBLY POSITIONED AROUND A TAPERED AREA AT THE OTHER END. USE ANCHORS WHICH PROVIDE A MINIMUM SAFE HOLDING POWER OF 2875 LBS. FOR A 3/4" OR 1" DIAMETER BOLT. CALCULATE HOLDING POWER BASED ON 1/4 THE ACTUAL HOLDING POWER OF THE ANCHOR IN 3500 PSI CONCRETE AS DETERMINED BY AN APPROVED COMMERCIAL TESTING LABORATORY.

ANCHORAGE FOR GUARDRAIL POST ON BOX CULVERT

PROJECT REFERENCE NO.	SHEET NO.
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