

09/02/2019

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

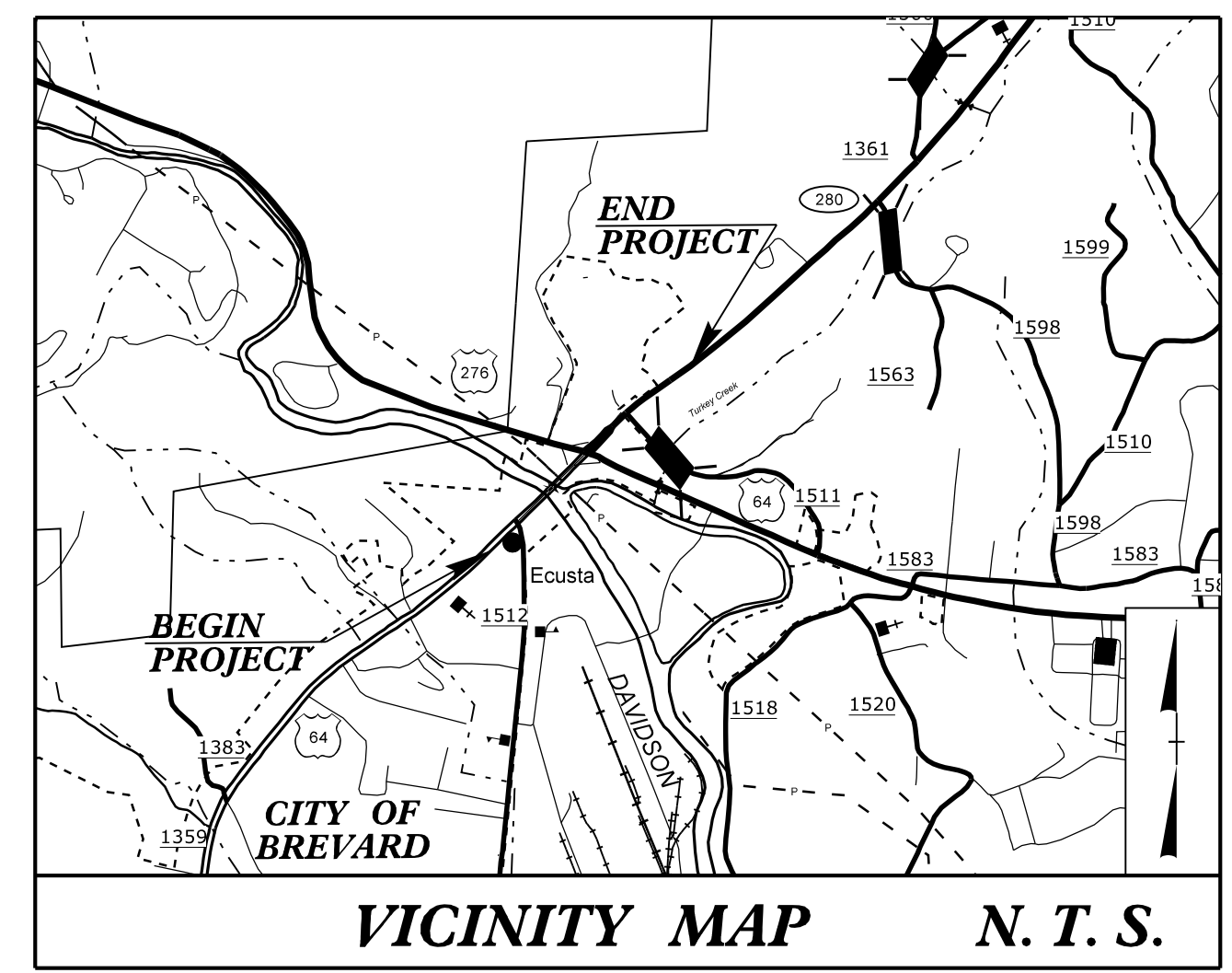
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

TRANSYLVANIA COUNTY

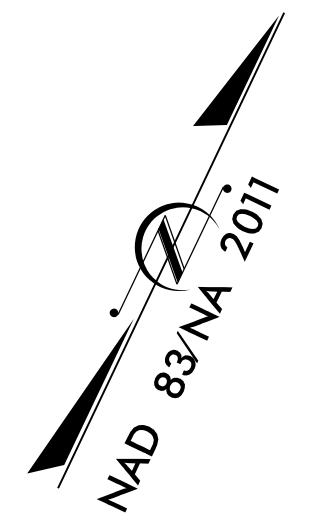
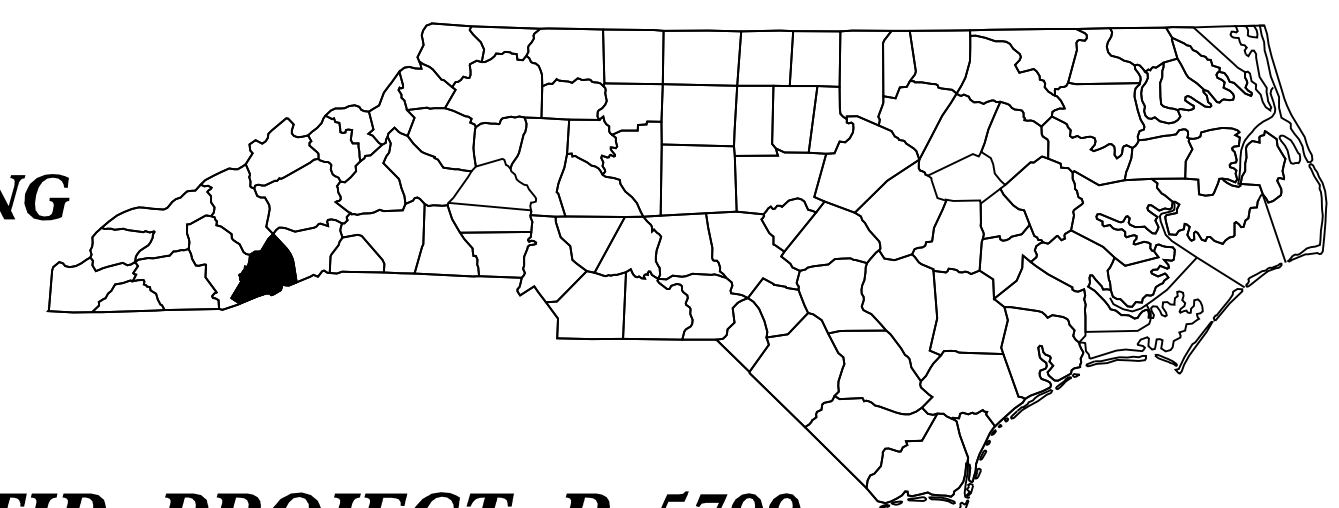
**LOCATION: INTERSECTIONS OF US 64, US 276 AND NC 280
CONSTRUCT INTERSECTION IMPROVEMENTS**

**TYPE OF WORK: GRADING, PAVING, DRAINAGE, CULVERT, RETAINING
WALLS, SIGNALS, AND SIGNING**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5799	1	
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
44984.1.1	N/A	P. E.	
44984.2.1	N/A	ROW, UTIL	
44984.3.1	N/A	CONST	
44984.3.2	N/A	LANDSCAPE	

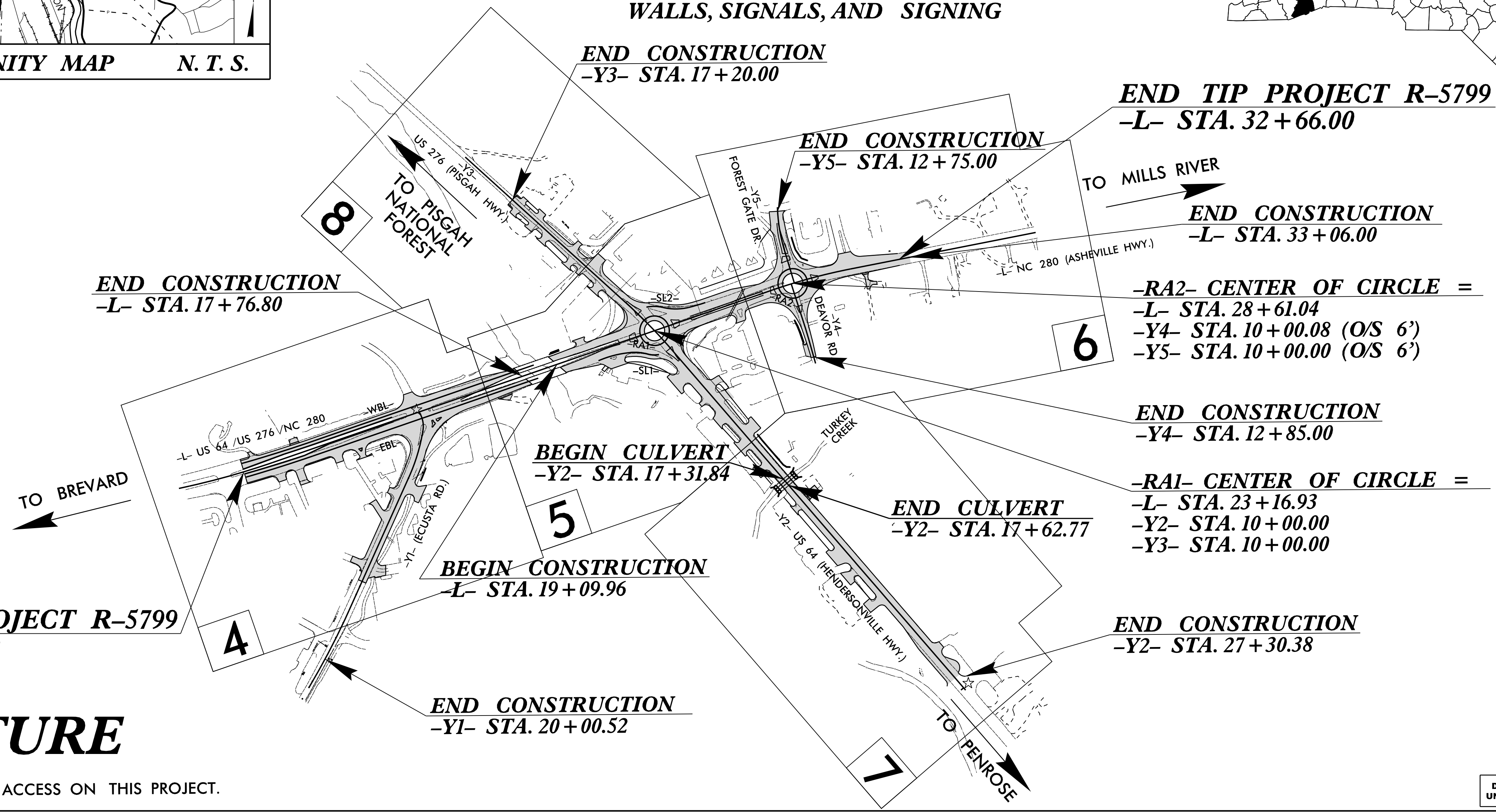


100% PLANS



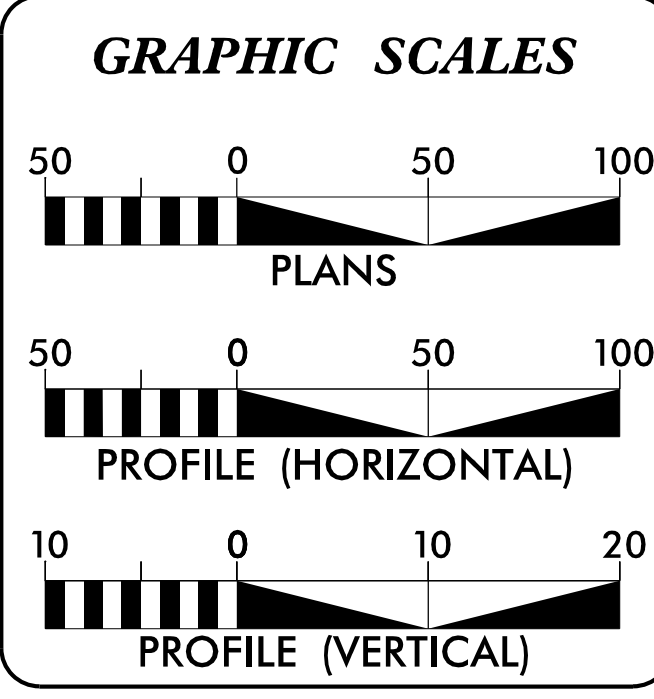
TIP PROJECT: R-5799

CONTRACT: C204856



STRUCTURE

THERE IS NO CONTROL OF ACCESS ON THIS PROJECT.



DESIGN DATA

ADT 2021 =	24,900
ADT 2041 =	30,000
K =	9 %
D =	55 %
T =	6 % *
V =	45 MPH
* TTST = 2% + DUAL 4%	
FUNC CLASS =	PRINCIPAL ARTERIAL REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-5799 =	0.461 MILES
TOTAL LENGTH TIP PROJECT R-5799 =	0.461 MILES
-L- USED TO CALCULATE PROJECT LENGTH	

PREPARED IN THE OFFICE OF:

RS&H 1520 SOUTH BOULEVARD, SUITE 200
CHARLOTTE, NC 28203
NC FIRM LICENSE No: F-0493

FOR THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: JULY 16, 2021

LETTING DATE: AUGUST 15, 2023

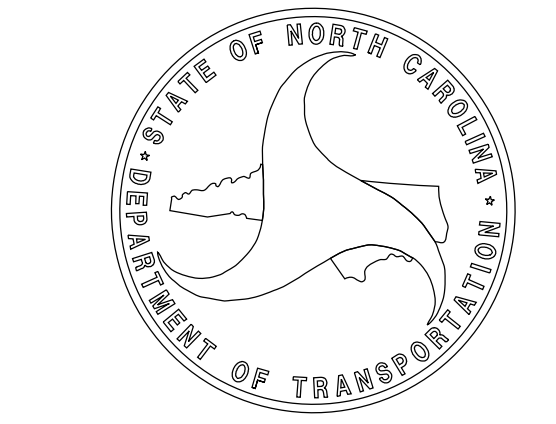
ALLISON DRAKE, PE PROJECT ENGINEER
DREW MORROW, PE PROJECT DESIGN ENGINEER
BARRY MOSTELLER NCDOT CONTACT

STRUCTURAL ENGINEER

DocuSigned by:
MATTHEW R. ACOSTA
SIGNATURE: _____
5/3/2023 P.E.

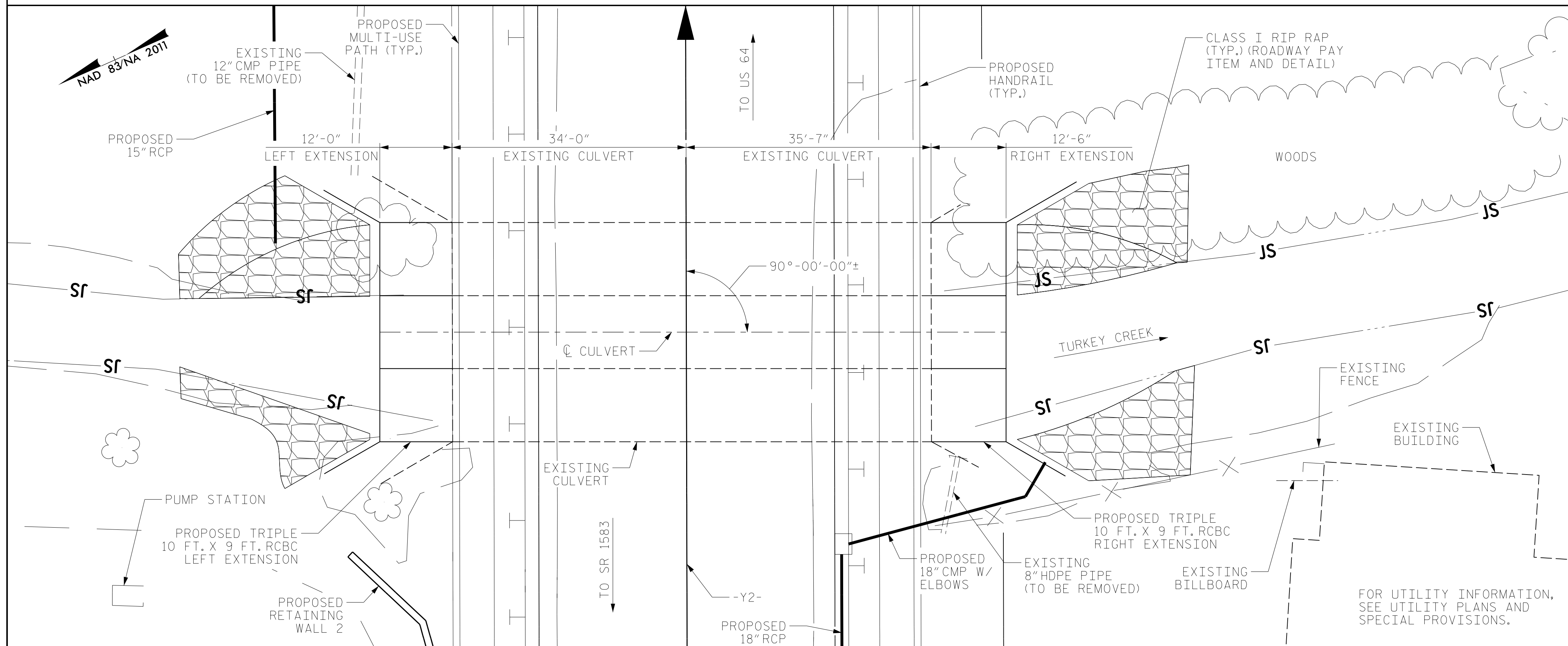
★ EXISTING SIGNAL

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



02-MAY-2023 09:41
R:\Roadway\Proj\R5799_Rdy_tsh.dgn
\$\$\$\$\$USERNAME\$\$\$\$\$

BM#2 SPIKE NAIL IN 36" WHITE OAK STUMP, -Y2- STA. 13+01.67, 132.4' RT.



LOCATION SKETCH

HYDRAULIC DATA

DESIGN DISCHARGE	= 1,700 CFS
FREQUENCY OF DESIGN DISCHARGE	= 50 YRS
DESIGN HIGH WATER ELEVATION	= 2,122.0'
DRAINAGE AREA	= 5.74 SQ MI
BASE DISCHARGE (Q100)	= 2,000 CFS
BASE HIGH WATER ELEVATION	= 2,122.8'

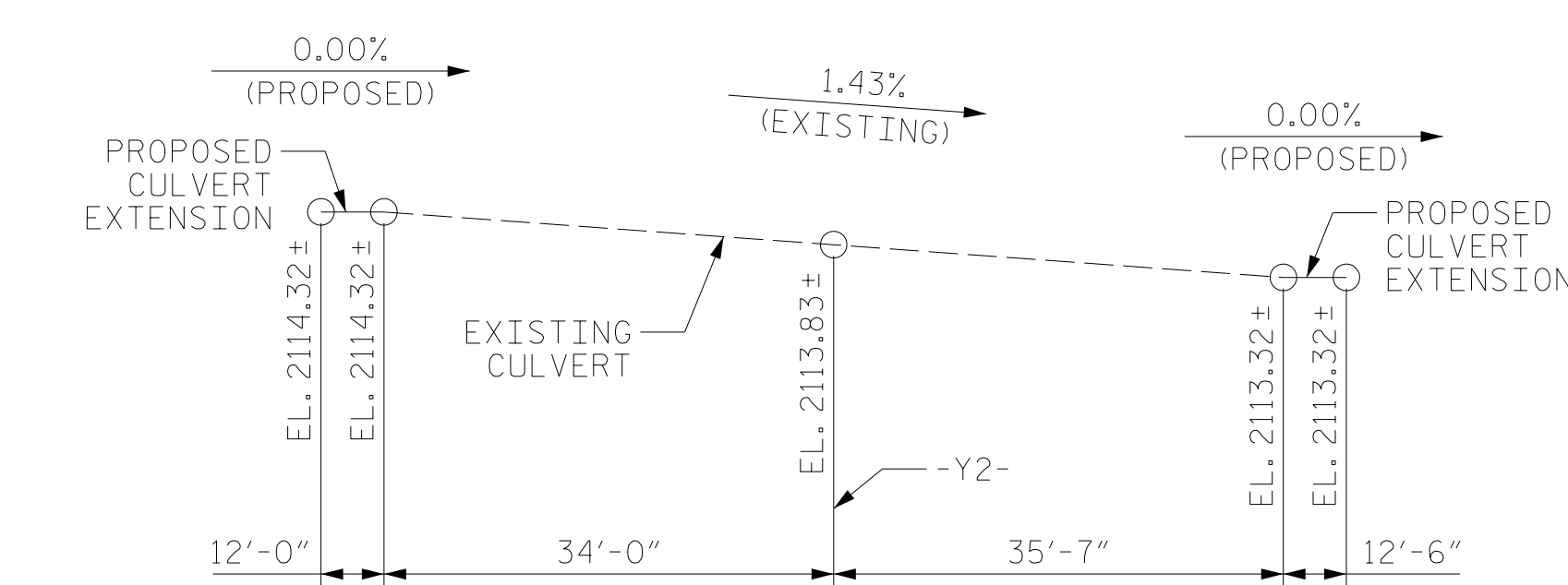
OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 3,500 CFS
FREQUENCY OF OVERTOPPING	= 500+ YRS
OVERTOPPING ELEVATION	= 2,128.2'

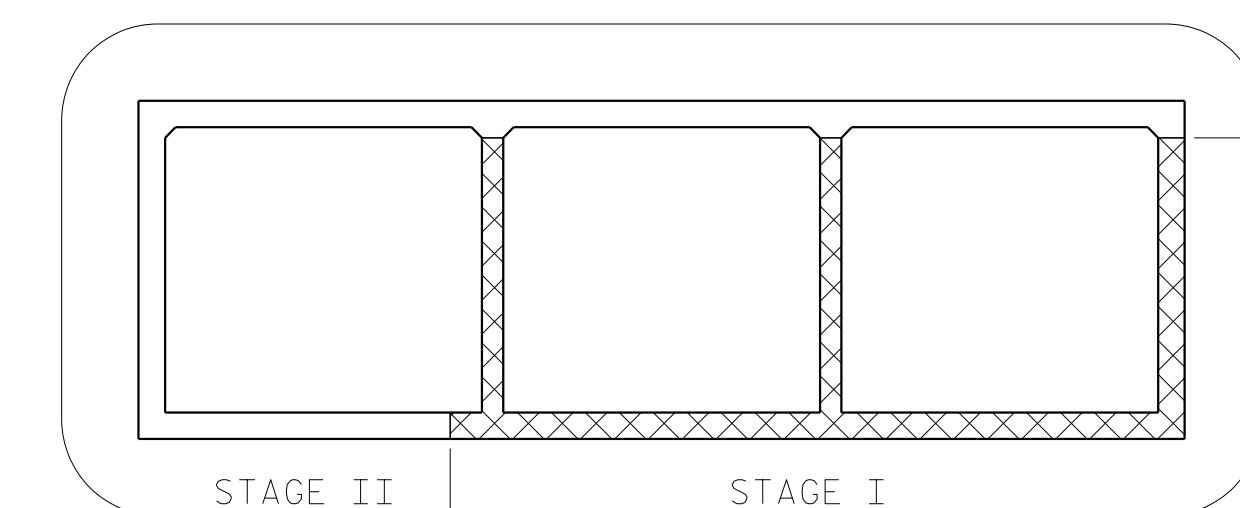
SAG @ -Y2- STA. 29+00±

GRADE DATA

GRADE POINT ELEV. @ STA. 17+47 -Y2-	= 2,129.59
CULVERT BED ELEV.	= 2,113.83
ROADWAY SLOPES	= 2:1



PROFILE ALONG CULVERT



CONSTRUCTION SEQUENCE

SECTION IS LOOKING UPSTREAM

STAGE I CONSTRUCTION
 STAGE II CONSTRUCTION

NOTES:

- ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING
- DESIGN FILL-----MIN. 4.66', MAX. 6.51'
- THESE CULVERT EXTENSIONS HAVE BEEN DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
- FOR OTHER DESIGN DATA AND GENERAL NOTES, SEE STANDARD NOTE SHEET.
- 3"Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH SPECIFICATIONS.
- CONCRETE IN STAGE 1 OR STAGE 2 CULVERT TO BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
- THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
- THE 18" DIAMETER CSP PIPE THROUGH WINGWALL 3 SHALL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE FIELD BENT OR CUT AS NECESSARY TO CLEAR PIPE.
- DOWELS SHALL BE USED TO CONNECT THE CULVERT EXTENSION TO THE EXISTING CULVERT AS SHOWN. FOR NOTE REGARDING SETTING OF DOWELS, SEE SHEET SN.
- IF APPROVED BY THE ENGINEER, THE CONTRACTOR MAY USE THE EXISTING WINGS AS TEMPORARY SHORING FOR THE CONSTRUCTION OF THE CULVERT EXTENSIONS. IN THIS CASE THE BOTTOM SLAB OF THE EXTENSION SHALL BE POURED AT LEAST 72 HOURS PRIOR TO CUTTING THE WINGS. THE WINGS MAY BE CUT EARLIER PROVIDED THE SLAB CONCRETE STRENGTH HAS REACHED A MINIMUM COMPRESSIVE STRENGTH OF 1500 PSI.

- FOR CULVERT DIVERSION DETAILS, SEE EROSION CONTROL PLANS.
- A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
- FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
- FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.
- FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
- FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.

NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED AT THE PROJECT SITE DURING CULVERT CONSTRUCTION. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. R-5799
TRANSYLVANIA COUNTY
 STATION: 17+47.31 -Y2-

SHEET 1 OF 10 EXTENDS CULVERT NO. 99

5/3/2023

RS&H

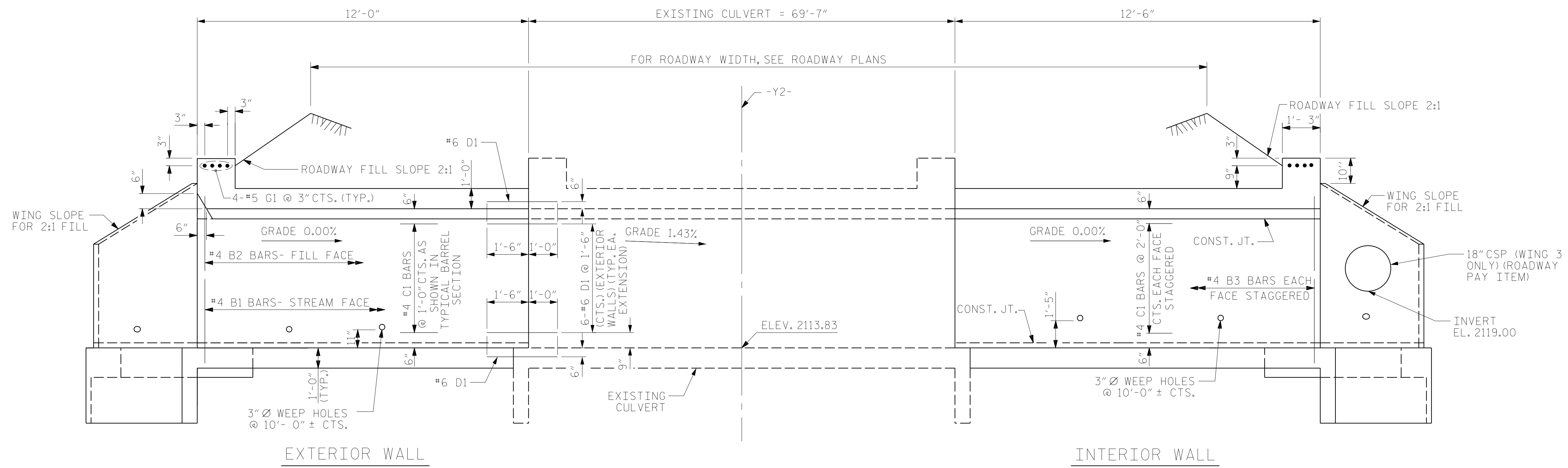
RS&H Architects-Engineers-Planners, Inc.

8521 Six Forks Road, Suite 400
 Raleigh, NC 27615
 919-926-4100 FAX 919-846-9080
 www.rsandh.com
 North Carolina License No. 50737-5403-C-28

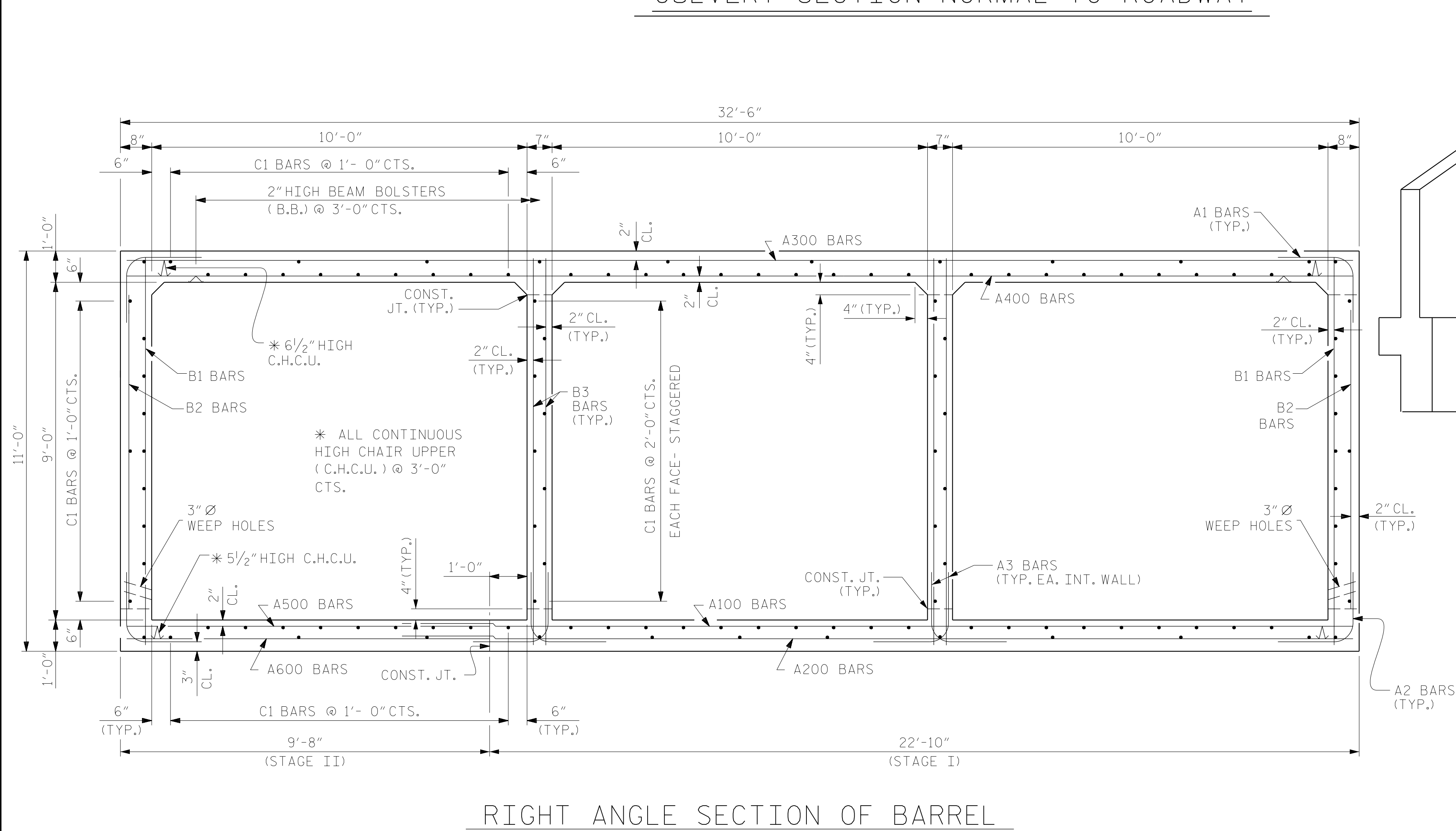
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
TRIPLE 10 FT. X 9 FT. CONCRETE BOX CULVERT LEFT AND RIGHT EXTENSIONS 90° SKEW					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
SHEET NO.					C-1
TOTAL SHEETS					10

DRAWN BY : TWL	DATE : 08/2020
CHECKED BY : MAL	DATE : 08/2020
DESIGN ENGINEER OF RECORD: MRA	DATE : 04/2023

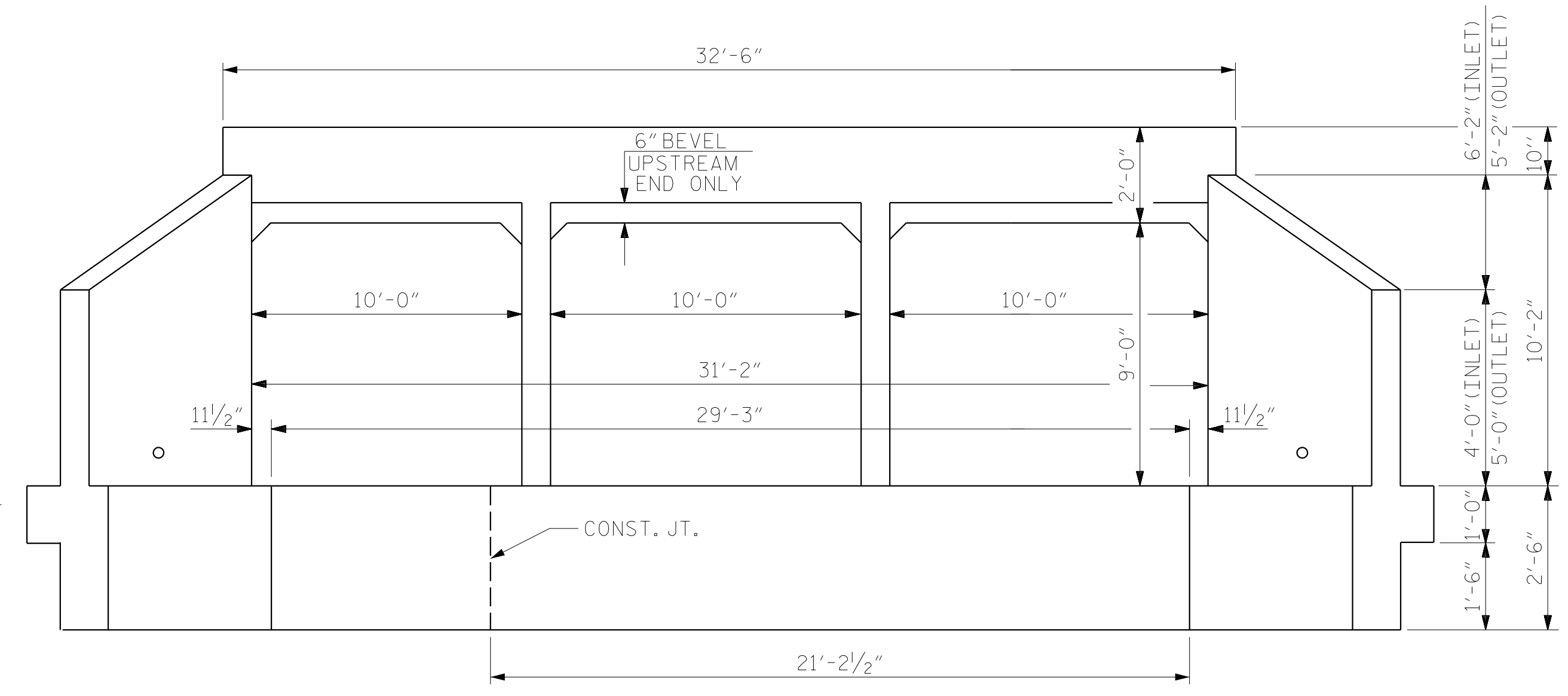
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



CULVERT SECTION NORMAL TO ROADWAY



RIGHT ANGLE SECTION OF BARREL



OUTLET END ELEVATION
(INLET END SIMILAR OPPOSITE ROTATION)

PROJECT NO. R-5799
 TRANSYLVANIA COUNTY
 STATION: 17+47.31 -Y2-

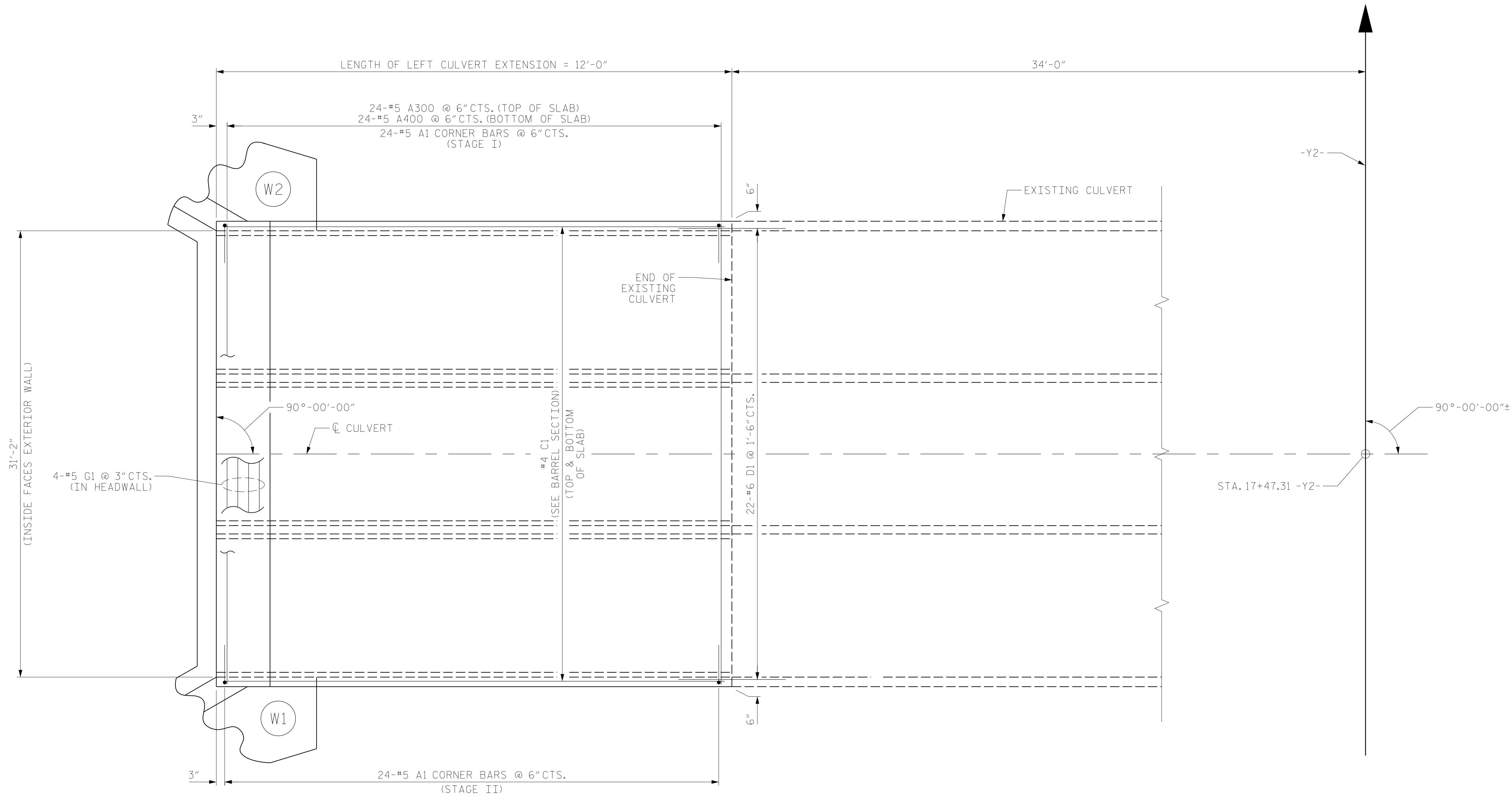
SHEET 2 OF 10

DRAWN BY: TWL DATE: 08/2020
 CHECKED BY: MAL DATE: 08/2020
 DESIGN ENGINEER OF RECORD: MRA DATE: 04/2023

LOOKING UPSTREAM
 THERE ARE 118 "C" BARS IN SECTION OF BARREL.

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
TRIPLE 10 FT. X 9 FT. CONCRETE BOX CULVERT LEFT AND RIGHT EXTENSIONS 90° SKEW					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
SHEET NO. C-2					TOTAL SHEETS 10



PLAN OF ROOF SLAB
 (ALL BARS SHOWN PLACED DURING STAGE II CONSTRUCTION U.N.O.)

PROJECT NO. R-5799
TRANSYLVANIA COUNTY
 STATION: 17+47.31 -Y2-

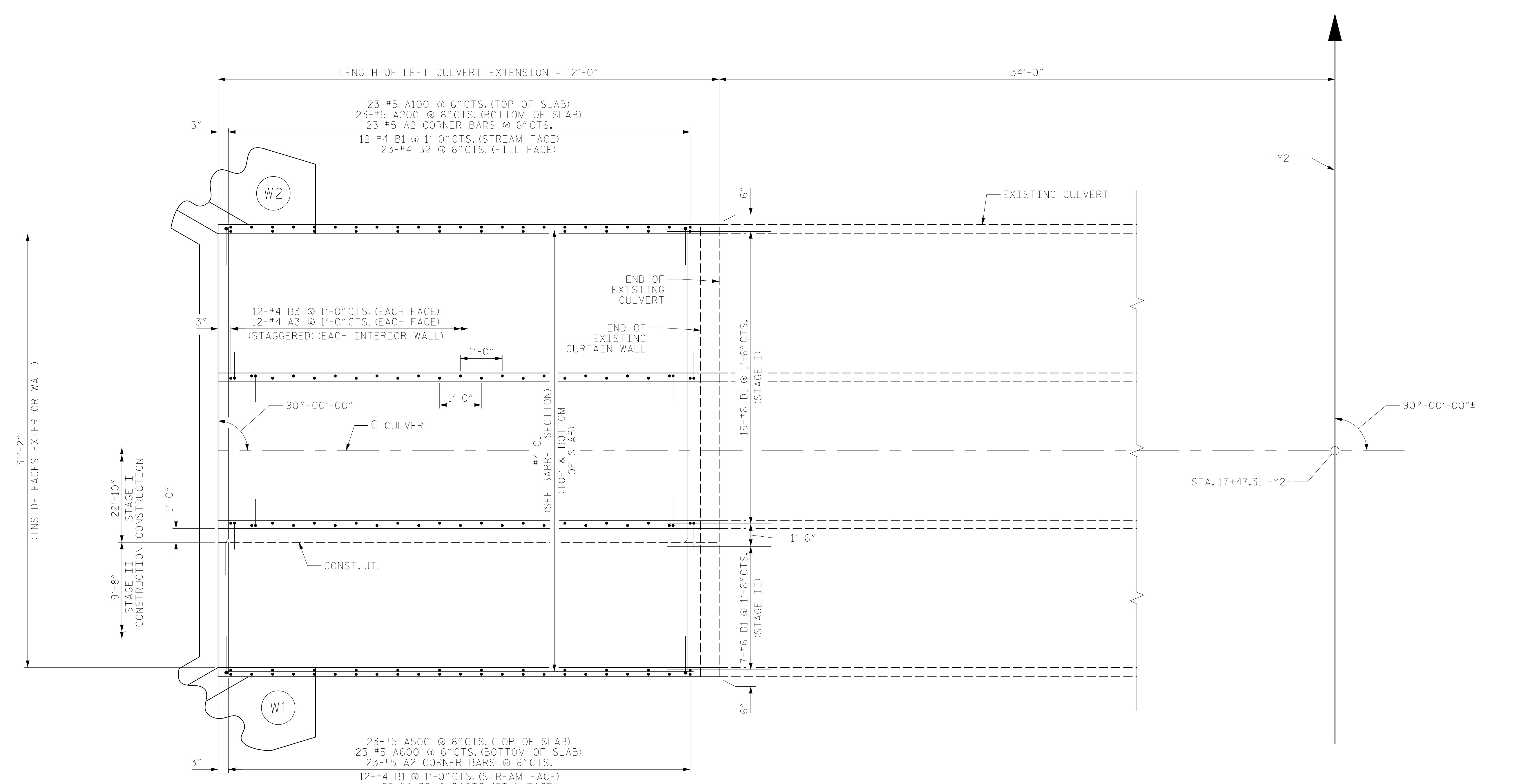
SHEET 3 OF 10

DRAWN BY : NSC DATE : 06/2020
 CHECKED BY : MAL DATE : 08/2020
 DESIGN ENGINEER OF RECORD: MRA DATE : 04/2023

4/3/2023
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 AcosTom

DOCUMENT NOT CONSIDERED
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 SIGNATURES COMPLETED

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
TRIPLE 10'-0" X 9'-0" CONCRETE BOX CULVERT 90° SKEW (LEFT EXTENSION)					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
SHEET NO.					C-3
TOTAL SHEETS					10



PLAN OF FLOOR SLAB

PROJECT NO. R-5799
TRANSYLVANIA COUNTY
 STATION: 17+47.31 -Y2-

SHEET 4 OF 10

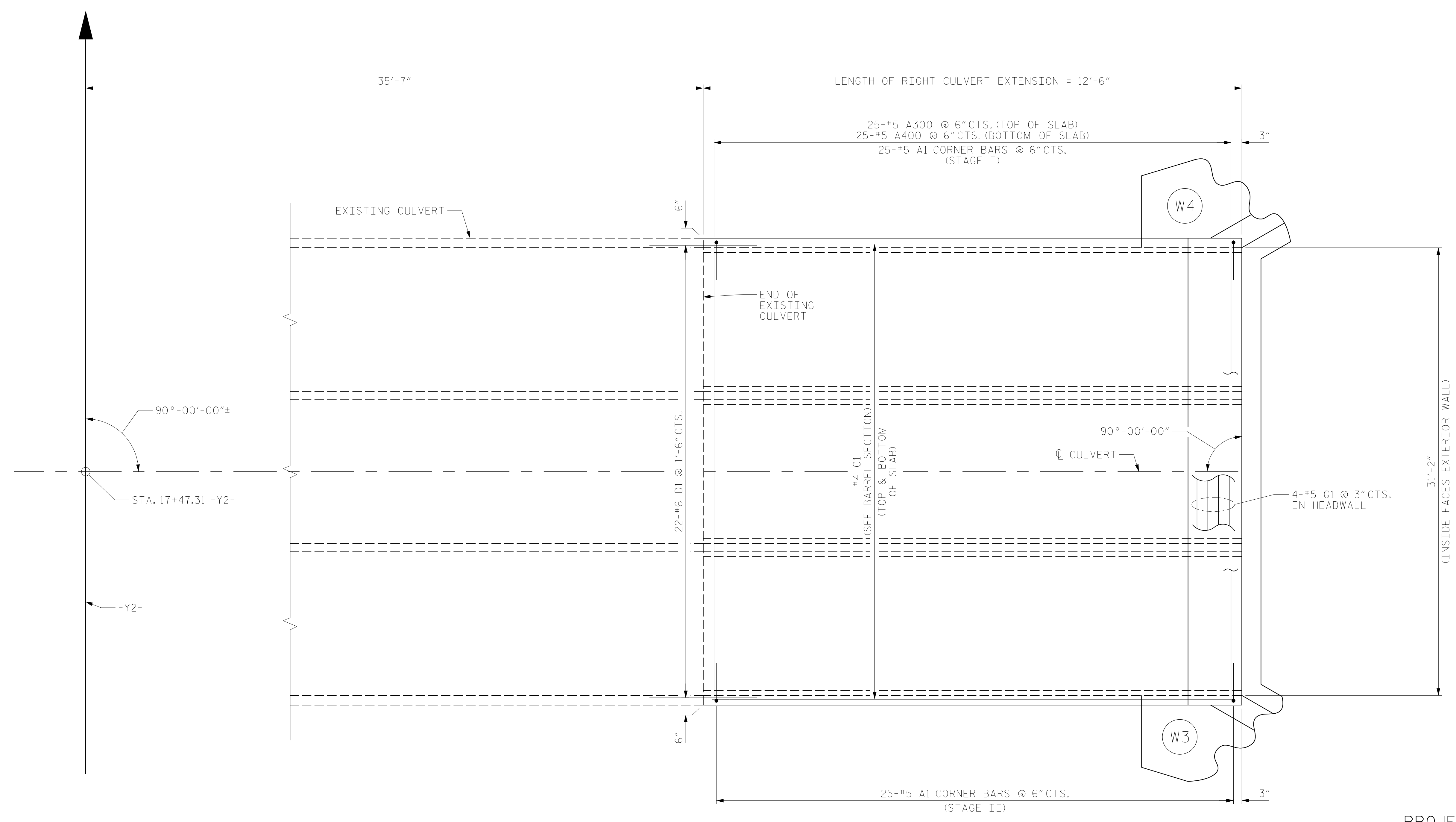
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 DESIGN ENGINEER OF RECORD: MRA DATE : 04/2023

4/3/2023
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 Acostom

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STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
TRIPLE 10'-0" X 9'-0" CONCRETE BOX CULVERT 90° SKEW (LEFT EXTENSION)					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
SHEET NO.					C-4
TOTAL SHEETS					10



PLAN OF ROOF SLAB
 (ALL BARS SHOWN PLACED DURING STAGE II CONSTRUCTION U.N.O.)

PROJECT NO. R-5799
TRANSYLVANIA COUNTY
 STATION: 17+47.31 -Y2-

SHEET 5 OF 10

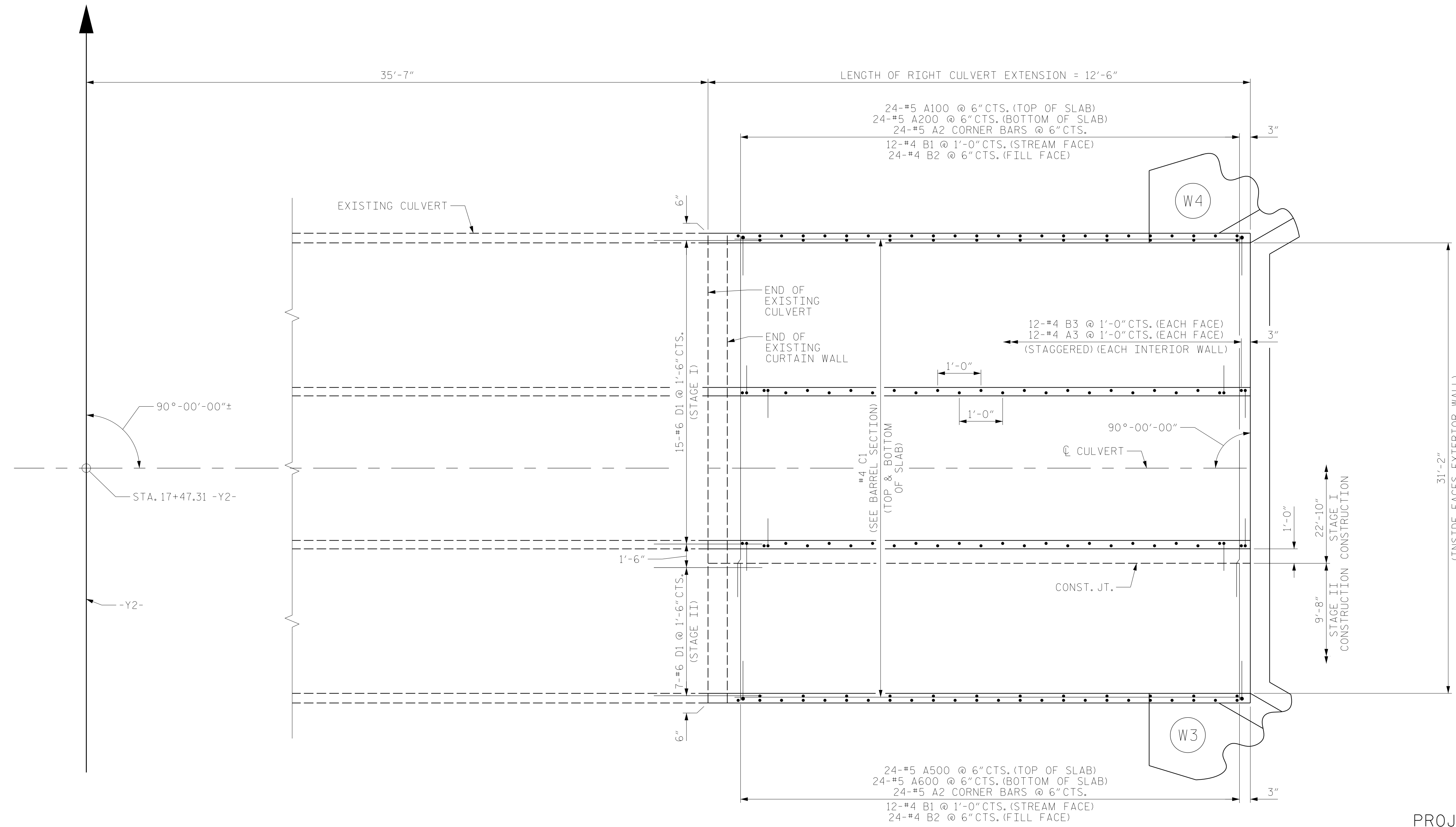
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4/3/2023
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 North Carolina License No. 50737-F-5463-C-28

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
TRIPLE 10'-0" X 9'-0" CONCRETE BOX CULVERT 90° SKEW (RIGHT EXTENSION)					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
SHEET NO.					C-5
TOTAL SHEETS					10



PLAN OF FLOOR SLAB

PROJECT NO. R-5799
TRANSYLVANIA COUNTY
 STATION: 17+47.31 -Y2-

SHEET 6 OF 10

5/3/2023

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STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

TRIPLE 10'-0" X 9'-0"
 CONCRETE BOX CULVERT
 90° SKEW
 (RIGHT EXTENSION)

DRAWN BY :	NSC	DATE :	06/2020
CHECKED BY :	MAL	DATE :	08/2020
DESIGN ENGINEER OF RECORD:	MRA	DATE :	04/2023

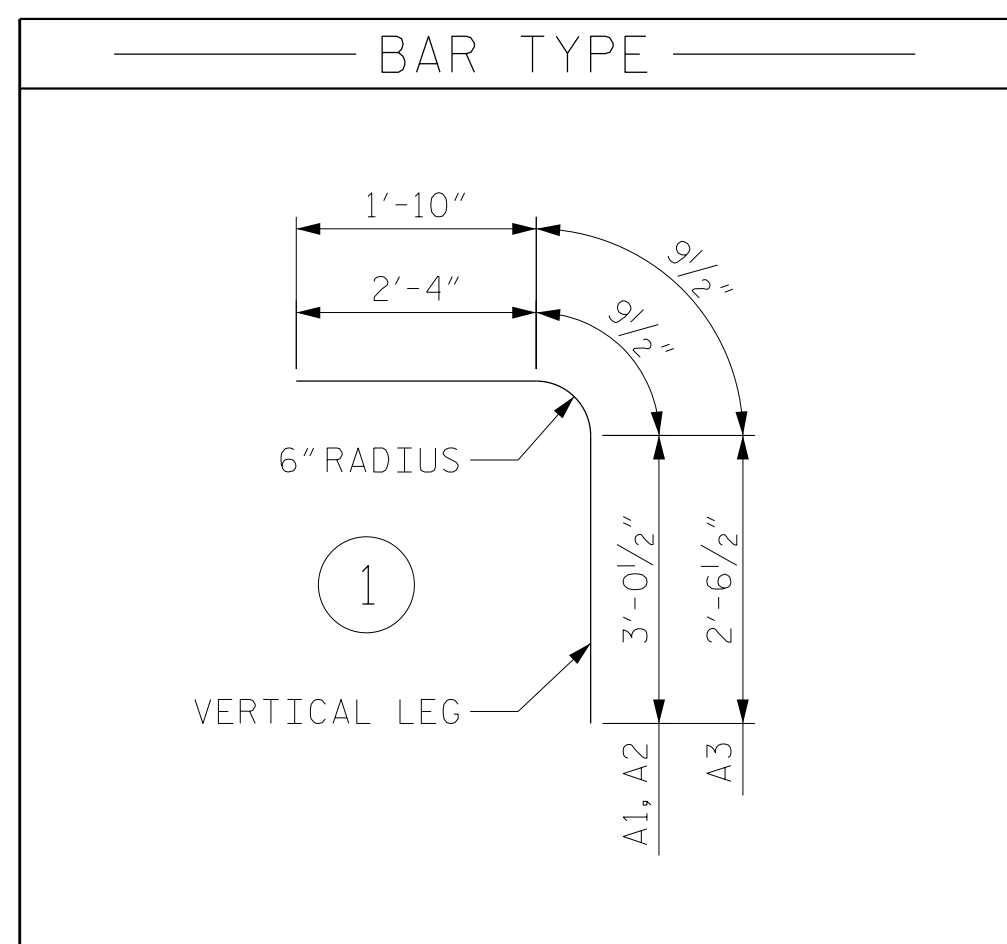
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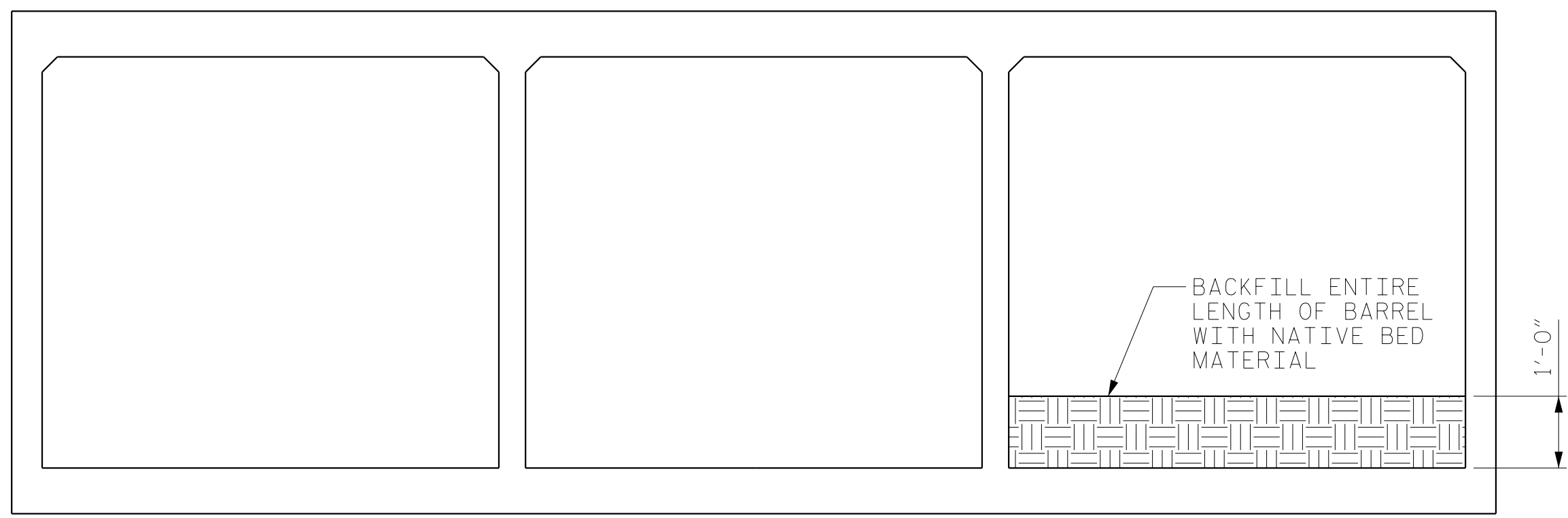
REINFORCING STEEL BAR SCHEDULE											
LEFT EXTENSION											
STAGE I						STAGE II					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	24	#5	1	6'-2"	154	A1	24	#5	1	6'-2"	154
A2	23	#5	1	6'-2"	148	A2	23	#5	1	6'-2"	148
A3	48	#4	1	5'-2"	166						
A100	23	#5	STR	25'-0"	600	A300	24	#5	STR	32'-2"	805
A200	23	#5	STR	25'-0"	600	A400	24	#5	STR	32'-2"	805
						A500	23	#5	STR	9'-6"	228
						A600	23	#5	STR	9'-6"	228
B1	12	#4	STR	10'-7"	85	B1	12	#4	STR	10'-7"	85
B2	23	#4	STR	8'-4"	128	B2	23	#4	STR	8'-4"	128
B3	48	#4	STR	10'-7"	339	B2	23	#4	STR	8'-4"	128
						C1	62	#4	STR	11'-8"	483
C1	56	#4	STR	11'-8"	436						
D1	22	#6	STR	2'-6"	83	D1	35	#6	STR	2'-6"	131
						G1	4	#5	STR	32'-2"	134
REINFORCING STEEL 2,739 LBS.						REINFORCING STEEL 3,329 LBS.					

REINFORCING STEEL BAR SCHEDULE											
RIGHT EXTENSION											
STAGE I						STAGE II					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	25	#5	1	6'-2"	161	A1	25	#5	1	6'-2"	161
A2	24	#5	1	6'-2"	154	A2	24	#5	1	6'-2"	154
A3	48	#4	1	5'-2"	166						
A100	24	#5	STR	25'-0"	626	A300	25	#5	STR	32'-2"	839
A200	24	#5	STR	25'-0"	626	A400	25	#5	STR	32'-2"	839
						A500	24	#5	STR	9'-6"	238
						A600	24	#5	STR	9'-6"	238
B1	12	#4	STR	10'-7"	85	B1	12	#4	STR	10'-7"	85
B2	24	#4	STR	8'-4"	134	B2	24	#4	STR	8'-4"	134
B3	48	#4	STR	10'-7"	339	B2	24	#4	STR	8'-4"	134
						C1	62	#4	STR	12'-2"	504
C1	56	#4	STR	12'-2"	455						
D1	22	#6	STR	2'-6"	83	D1	35	#6	STR	2'-6"	131
						G1	4	#5	STR	32'-2"	134
REINFORCING STEEL 2,829 LBS.						REINFORCING STEEL 3,457 LBS.					

TOTAL STRUCTURE QUANTITIES	
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	
LEFT EXTENSION	
STAGE I	23 TONS
STAGE II	10 TONS
TOTAL	33 TONS
RIGHT EXTENSION	
STAGE I	24 TONS
STAGE II	10 TONS
TOTAL	34 TONS
TOTAL MATERIAL	67 TONS
CLASS A CONCRETE	
BARREL @ 3.253 C.Y./FT.	
LEFT EXTENSION	
CULVERT - STAGE I	17.2 C.Y.
CULVERT - STAGE II	21.8 C.Y.
WINGS, ETC.	18.5 C.Y.
TOTAL	57.5 C.Y.
RIGHT EXTENSION	
CULVERT - STAGE I	17.9 C.Y.
CULVERT - STAGE II	22.7 C.Y.
WINGS, ETC.	17.1 C.Y.
TOTAL	57.7 C.Y.
TOTAL CONCRETE	115.2 C.Y.
REINFORCING STEEL	
BARREL	
LEFT EXTENSION	
CULVERT - STAGE I	2,739 LBS.
CULVERT - STAGE II	3,329 LBS.
WINGS, ETC.	906 LBS.
TOTAL	6,974 LBS.
RIGHT EXTENSION	
CULVERT - STAGE I	2,829 LBS.
CULVERT - STAGE II	3,457 LBS.
WINGS, ETC.	901 LBS.
TOTAL	7,187 LBS.
TOTAL STEEL	14,161 LBS.



SPlice CHART FOR "A" BARS	
SIZE	SPlice LENGTH
#5	2'-4"



BENCH DETAIL - ELEVATION
LOOKING UPSTREAM

PROJECT NO. R-5799
TRANSYLVANIA COUNTY
 STATION: 17+47.31 -Y2-

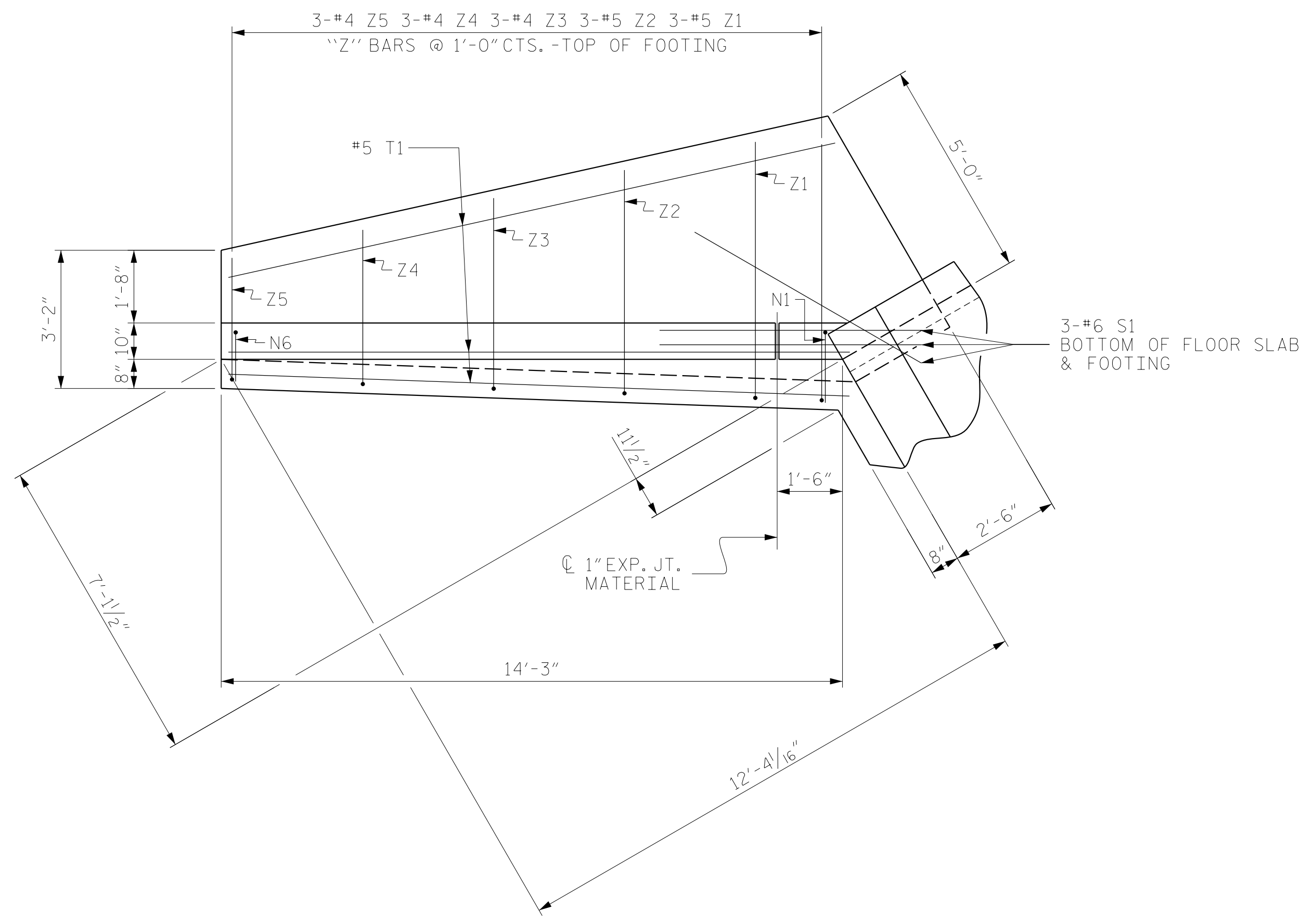
SHEET 7 OF 10

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
TRIPLE 10'-0" X 9'-0"
CONCRETE BOX CULVERT
 90° SKEW
 (LEFT AND RIGHT EXTENSIONS)

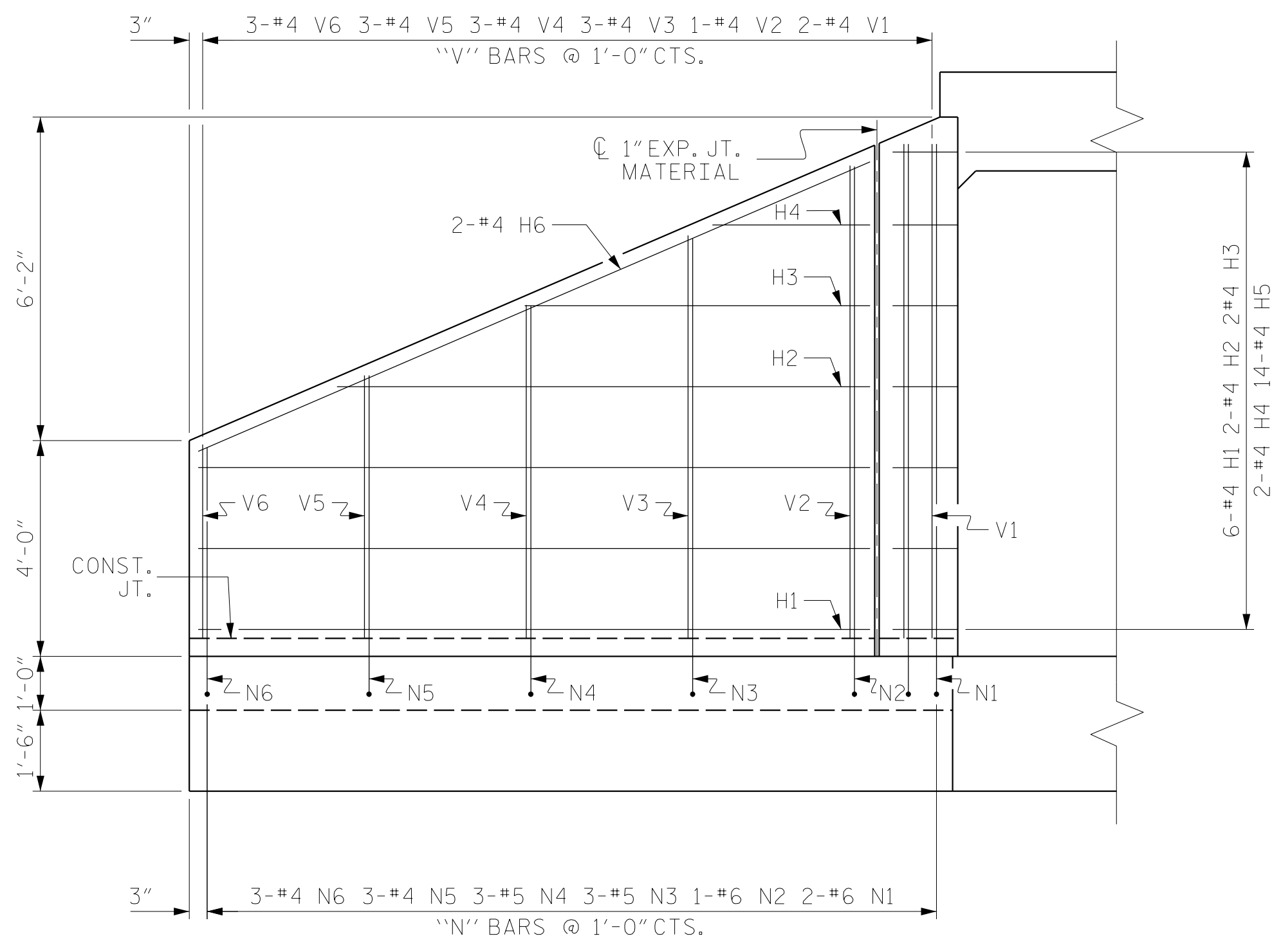
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-7
1			3			TOTAL SHEETS
2			4			10

DRAWN BY : NSC DATE : 06/2020
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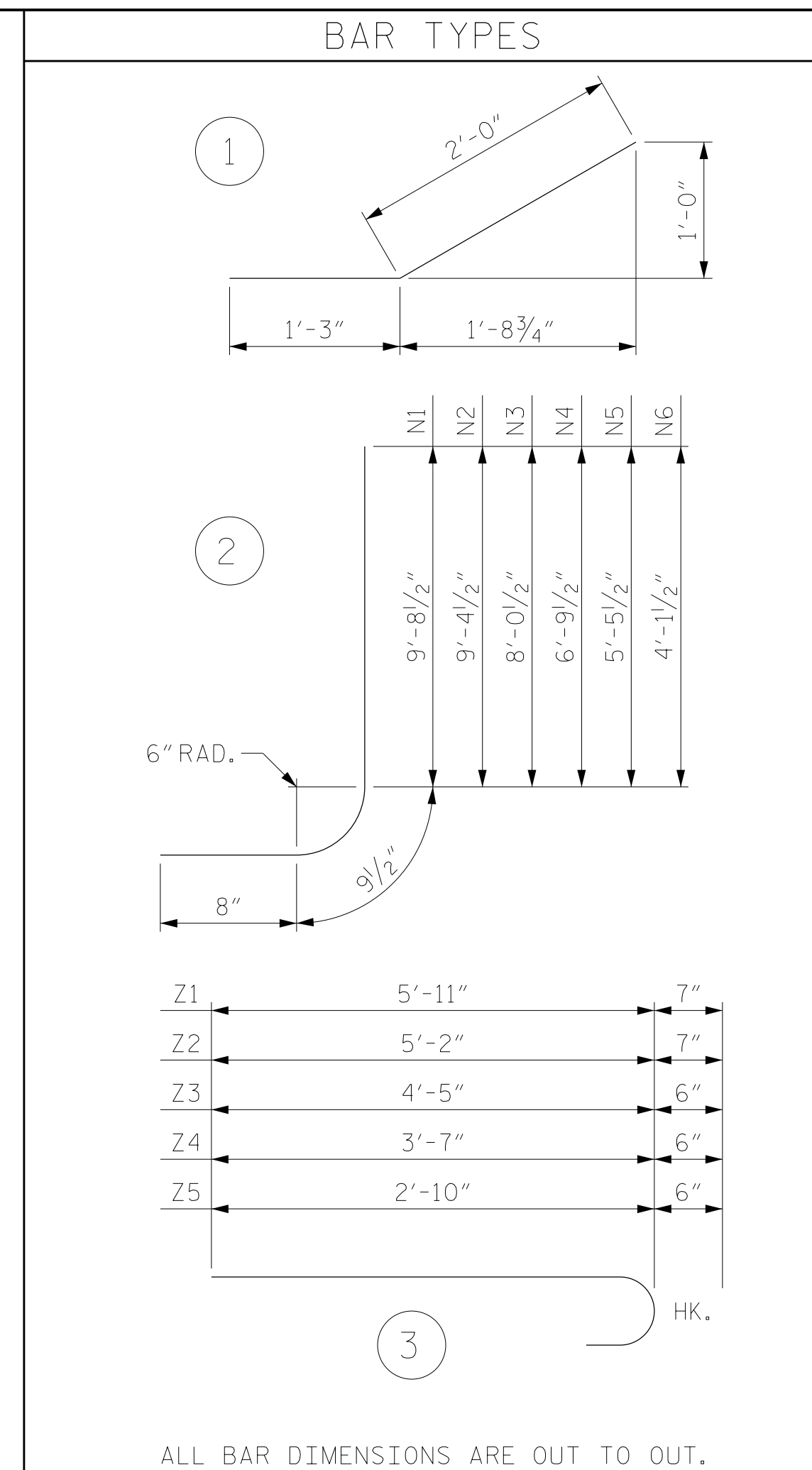
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PLAN



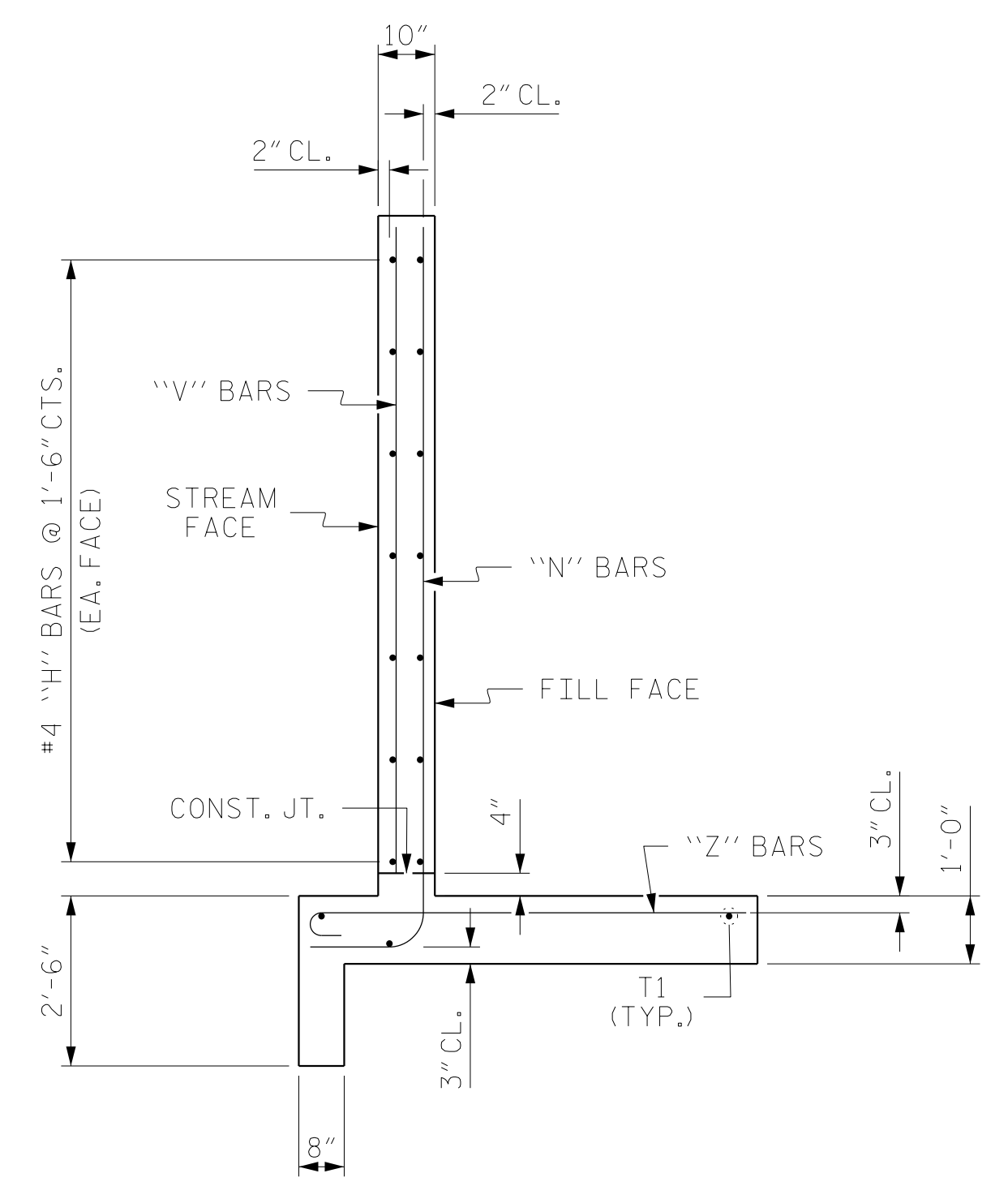
ELEVATION



ALL BAR DIMENSIONS ARE OUT TO OUT.

STAGE I BILL OF MATERIAL						STAGE II BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	6	4	STR.	12'-5"	50	H1	6	4	STR.	12'-5"	50
H2	2	4	STR.	9'-10"	13	H2	2	4	STR.	9'-10"	13
H3	2	4	STR.	6'-5"	9	H3	2	4	STR.	6'-5"	9
H4	2	4	STR.	2'-11"	4	H4	2	4	STR.	2'-11"	4
H5	14	4	1	3'-3"	30	H5	14	4	1	3'-3"	30
H6	2	4	STR.	13'-6"	18	H6	2	4	STR.	13'-6"	18
N1	2	6	2	11'-2"	34	N1	2	6	2	11'-2"	34
N2	1	6	2	10'-5"	16	N2	1	6	2	10'-5"	16
N3	3	5	2	9'-6"	30	N3	3	5	2	9'-6"	30
N4	3	5	2	8'-3"	26	N4	3	5	2	8'-3"	26
N5	3	4	2	6'-11"	14	N5	3	4	2	6'-11"	14
N6	3	4	2	5'-7"	11	N6	3	4	2	5'-7"	11
S1	3	6	STR.	6'-0"	27	S1	3	6	STR.	6'-0"	27
T1	3	5	STR.	14'-3"	45	T1	3	5	STR.	14'-3"	45
V1	2	4	STR.	9'-2"	12	V1	2	4	STR.	9'-2"	12
V2	1	4	STR.	8'-9"	6	V2	1	4	STR.	8'-9"	6
V3	3	4	STR.	7'-5"	15	V3	3	4	STR.	7'-5"	15
V4	3	4	STR.	6'-2"	12	V4	3	4	STR.	6'-2"	12
V5	3	4	STR.	4'-10"	10	V5	3	4	STR.	4'-10"	10
V6	3	4	STR.	3'-7"	7	V6	3	4	STR.	3'-7"	7
Z1	3	5	3	6'-6"	20	Z1	3	5	3	6'-6"	20
Z2	3	5	3	5'-9"	18	Z2	3	5	3	5'-9"	18
Z3	3	4	3	4'-11"	10	Z3	3	4	3	4'-11"	10
Z4	3	4	3	4'-1"	8	Z4	3	4	3	4'-1"	8
Z5	3	4	3	3'-11"	8	Z5	3	4	3	3'-11"	8
REINFORCING STEEL FOR 1 WING (W2) 453 LBS						REINFORCING STEEL FOR 1 WING (W1) 453 LBS					
CLASS A CONCRETE 1 WING 1 END CURTAIN WALL 6.6 CY 1.9 CY TOTAL 8.5 CY						CLASS A CONCRETE 1 WING 1 HEADWALL 1.5 CY 1.9 CY 1 END CURTAIN WALL 8.5 CY TOTAL 10.0 CY					

NOTE:
WING 2 SHOWN, WING 1 SIMILAR.



TYPICAL WING SECTION

PROJECT NO. R-5799
TRANSYLVANIA COUNTY
STATION: 17+47.31 -Y2-

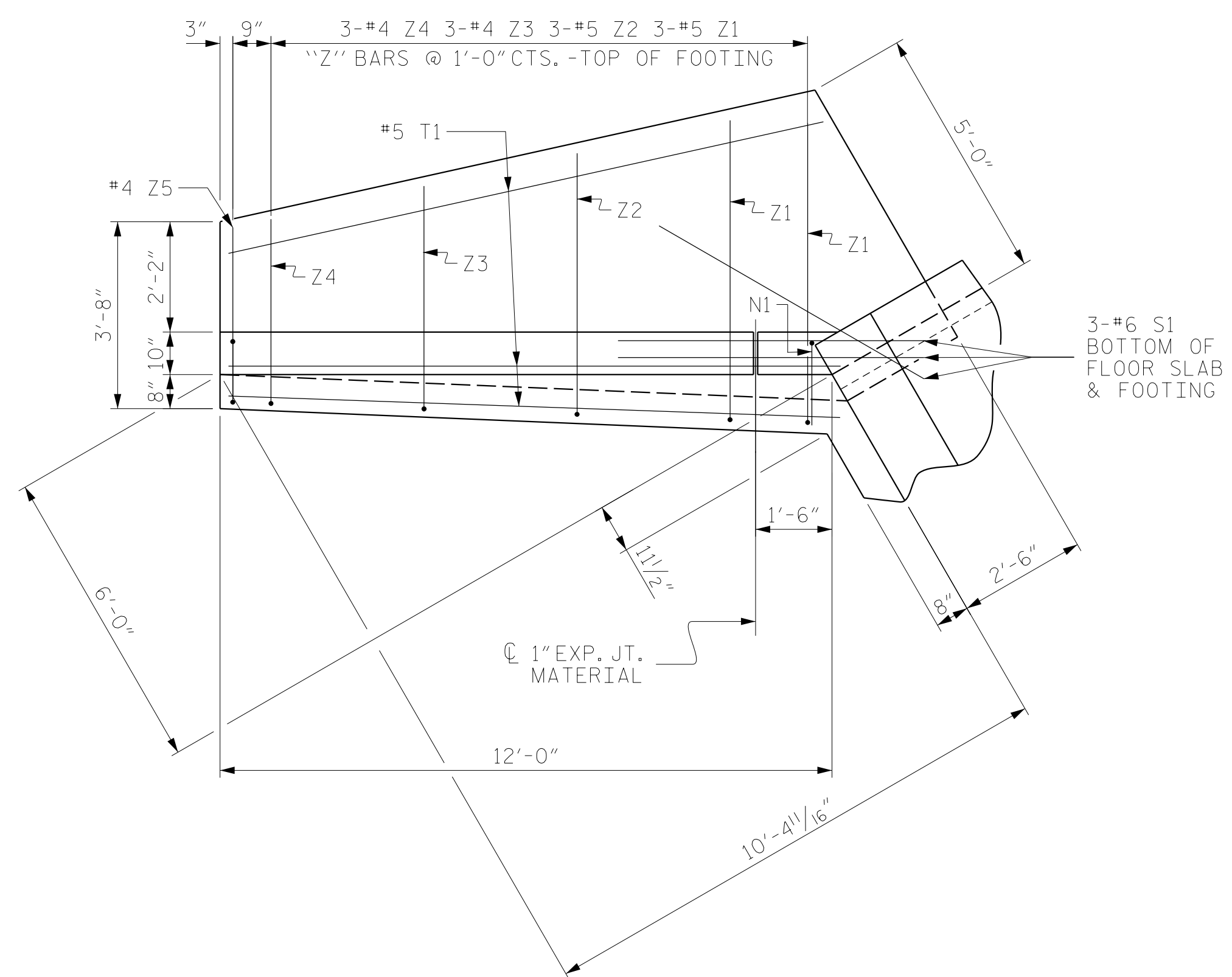
SHEET 8 OF 10

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
STANDARD INLET WINGS (W1 & W2) FOR CONCRETE BOX CULVERT					
H = 9'-0"			SLOPE = 2:1 90° SKEW		
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
SHEET NO. C-8					TOTAL SHEETS 10

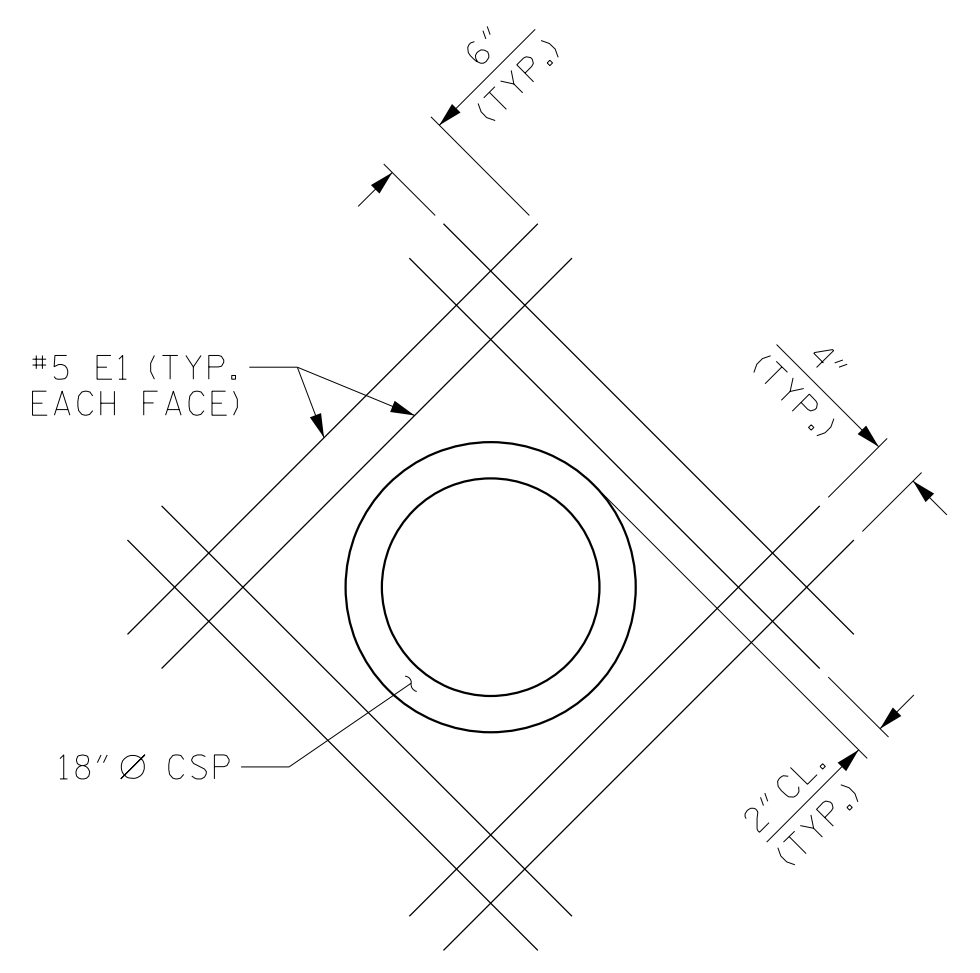
ASSEMBLED BY : TWL	DATE : 08/2020
CHECKED BY : MRA	DATE : 04/2023
DRAWN BY : CCJ 10/99	REV. 6/19 MAA/THC
CHECKED BY : RWW 03/00	

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

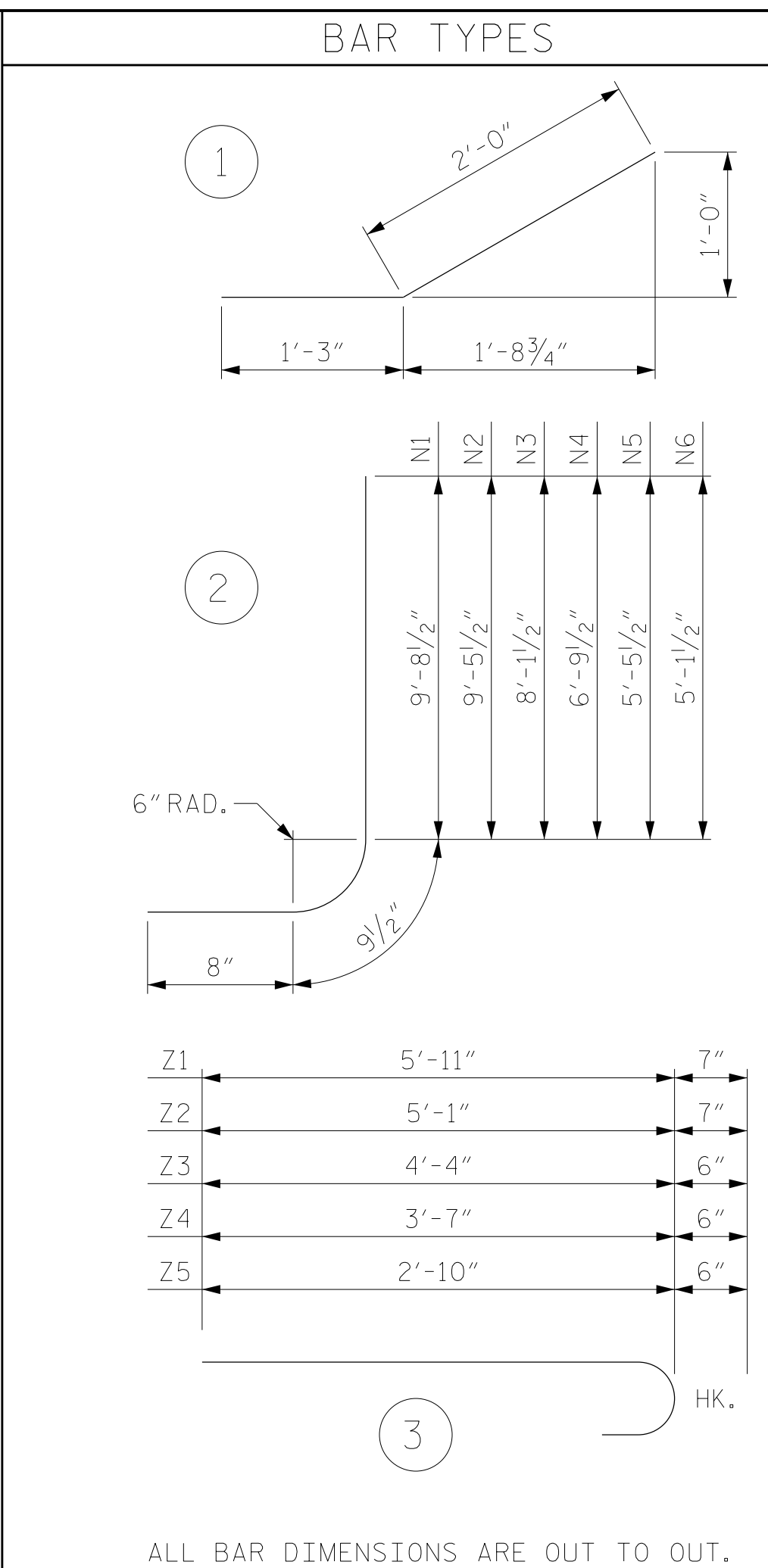
STD. NO. CW9009



PLAN



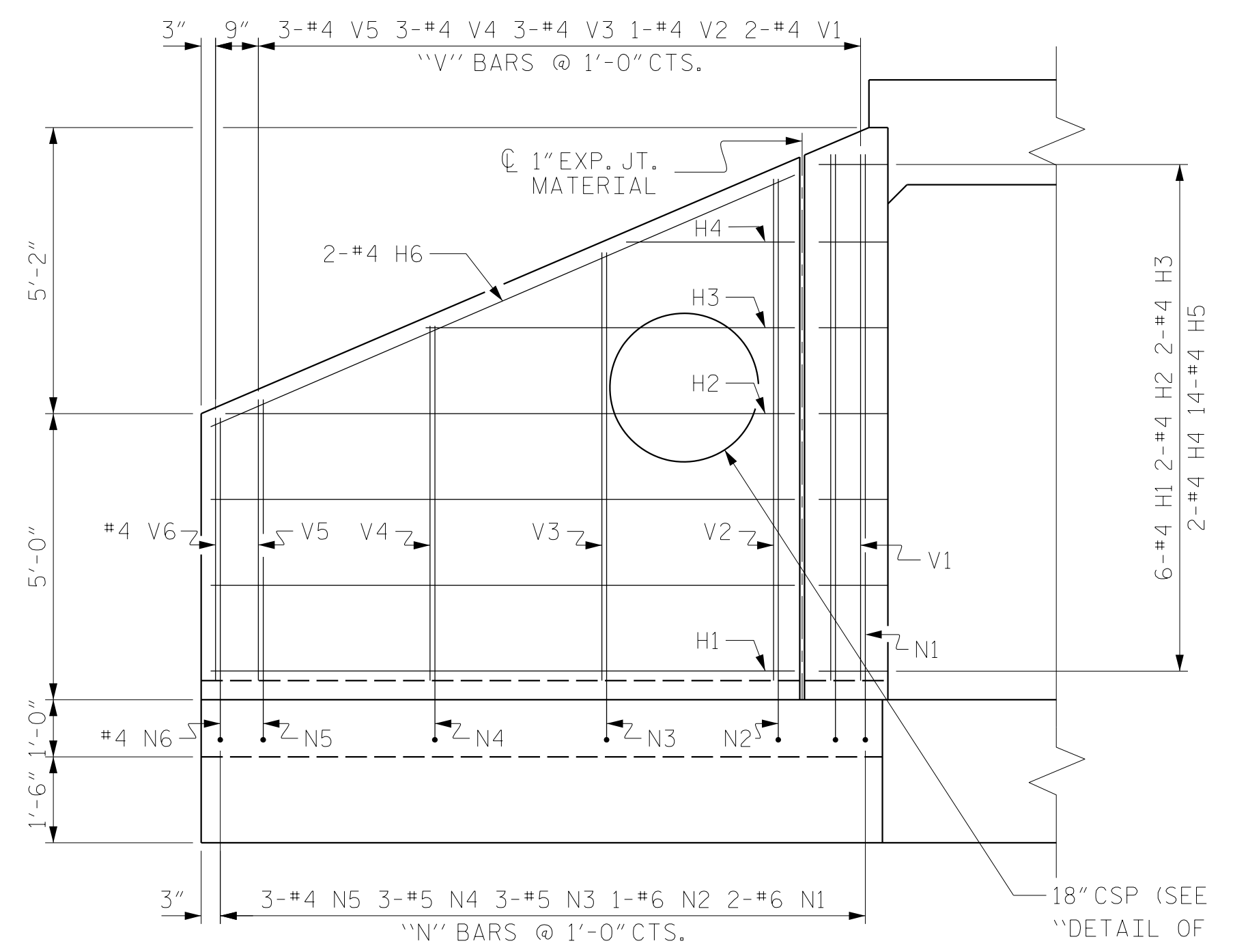
DETAIL OF REINFORCING AROUND 18" Ø PIPE



ALL BAR DIMENSIONS ARE OUT TO OUT.

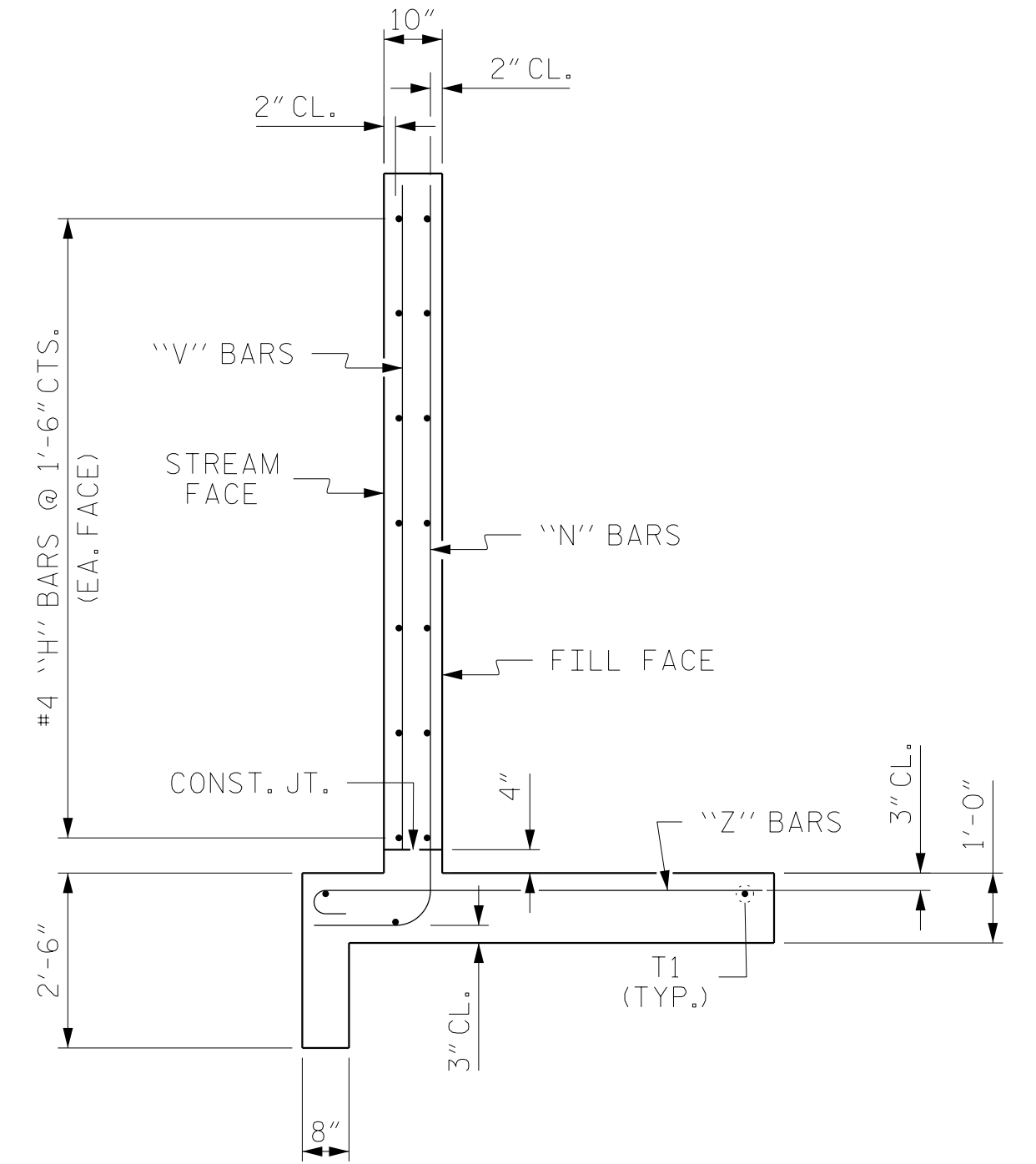
STAGE I BILL OF MATERIAL						STAGE II BILL OF MATERIAL							
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT		
H1	6	4	STR.	10'-2"	41	E1	16	5	STR.	4'-0"	67		
H2	2	4	STR.	9'-10"	13	H1	6	4	STR.	10'-2"	41		
H3	2	4	STR.	6'-5"	9	H2	2	4	STR.	9'-10"	13		
H4	2	4	STR.	2'-11"	4	H3	2	4	STR.	6'-5"	9		
H5	14	4	1	3'-3"	30	H4	2	4	STR.	2'-11"	4		
H6	2	4	STR.	11'-1"	15	H5	14	4	1	3'-3"	30		
N1	2	6	2	11'-2"	34	H6	2	4	STR.	11'-1"	15		
N2	1	6	2	10'-11"	16	N1	2	6	2	11'-2"	34		
N3	3	5	2	9'-7"	30	N2	1	6	2	10'-11"	16		
N4	3	5	2	8'-3"	26	N3	3	5	2	9'-7"	30		
N5	3	4	2	6'-11"	14	N4	3	5	2	8'-3"	26		
N6	1	4	2	6'-7"	4	N5	3	4	2	6'-11"	14		
S1	3	6	STR.	6'-0"	27	N6	1	4	2	6'-7"	4		
T1	3	5	STR.	11'-11"	37	S1	3	6	STR.	6'-0"	27		
V1	2	4	STR.	9'-2"	12	T1	3	5	STR.	11'-11"	37		
V2	1	4	STR.	8'-10"	6	V1	2	4	STR.	9'-2"	12		
V3	3	4	STR.	7'-7"	15	V2	1	4	STR.	8'-10"	6		
V4	3	4	STR.	6'-3"	13	V3	3	4	STR.	7'-7"	15		
V5	3	4	STR.	4'-11"	10	V4	3	4	STR.	6'-3"	13		
V6	1	4	STR.	4'-7"	3	V5	3	4	STR.	4'-11"	10		
Z1	3	5	3	6'-6"	20	V6	1	4	STR.	4'-7"	3		
Z2	3	5	3	5'-8"	18	Z1	3	5	3	6'-6"	20		
Z3	3	4	3	4'-10"	10	Z2	3	5	3	5'-8"	18		
Z4	3	4	3	4'-1"	8	Z3	3	4	3	4'-10"	10		
Z5	1	4	3	3'-4"	2	Z4	3	4	3	4'-1"	8		
REINFORCING STEEL FOR 1 WING (W4)						417 LBS	REINFORCING STEEL FOR 1 WING (W3)						484 LBS
CLASS A CONCRETE							CLASS A CONCRETE						
1 WING						5.9 CY	1 WING						5.9 CY
1 END CURTAIN WALL						1.9 CY	1 HEADWALL						1.5 CY
TOTAL						7.8 CY	1 END CURTAIN WALL						1.9 CY
							TOTAL						9.3 CY

NOTE:
WING 3 SHOWN, WING 4 SIMILAR.



ELEVATION

NOTE: FOR PIPE THROUGH W3, FIELD CUT AND BEND BARS AS NEEDED TO CLEAR PIPE



TYPICAL WING SECTION

PROJECT NO. R-5799
TRANSYLVANIA COUNTY
STATION: 17+47.31 -Y2-

SHEET 9 OF 10

5/3/2023

RS&H
Architects-Engineers-Planners, Inc.

8521 Six Forks Road, Suite 400
Raleigh, NC 27615
919-926-4100 FAX 919-846-9080
www.rsandh.com
North Carolina License No. 5073-F-0403-C-03

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

OUTLET WINGS (W3 & W4) FOR CONCRETE BOX CULVERT
H = 9'-0" SLOPE = 2:1
90° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-9
1			3			TOTAL SHEETS
2			4			10

DRAWN BY :	TWL	DATE :	08/2020
CHECKED BY :	MAL	DATE :	08/2020
DESIGN ENGINEER OF RECORD:	MRA	DATE :	04/2023

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						MOMENT				SHEAR						
						LIVE-LOAD FACTORS (γ _{LL})	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	1	1.23	--	1.75	1.29	1	EXTERIOR WALL	0.50	1.23	1	TOP SLAB	1.02		
	HL-93 (OPERATING)	N/A		1.60	--	1.35	1.67	1	EXTERIOR WALL	0.50	1.60	1	TOP SLAB	1.02		
	HS-20 (INVENTORY)	36.000	2	1.29	46.440	1.75	1.29	1	EXTERIOR WALL	0.50	1.29	1	TOP SLAB	1.02		
	HS-20 (OPERATING)	36.000		1.67	60.120	1.35	1.67	1	EXTERIOR WALL	0.50	1.67	1	TOP SLAB	1.02		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		1.72	23.220	1.40	1.72	1	EXTERIOR WALL	0.50	1.90	1	EXTERIOR WALL	0.98		
		SNGARBS2	20.000		1.73	34.600	1.40	1.73	1	EXTERIOR WALL	0.50	1.91	1	EXTERIOR WALL	0.98	
		SNAGRIS2	22.000		1.72	37.840	1.40	1.72	1	EXTERIOR WALL	0.50	1.93	1	EXTERIOR WALL	0.98	
		SNCOTTS3	27.250		1.53	41.693	1.40	1.61	1	EXTERIOR WALL	0.50	1.53	1	TOP SLAB	1.02	
		SNAGGRS4	34.925		1.55	54.134	1.40	1.65	1	EXTERIOR WALL	0.50	1.55	1	TOP SLAB	1.02	
		SNS5A	35.550		1.68	59.724	1.40	1.68	1	EXTERIOR WALL	0.50	1.75	1	TOP SLAB	1.02	
		SNS6A	39.950		1.58	63.121	1.40	1.65	1	EXTERIOR WALL	0.50	1.58	1	TOP SLAB	1.02	
	SNS7B	42.000	3	1.51	63.420	1.40	1.62	1	EXTERIOR WALL	0.50	1.51	1	TOP SLAB	1.02		
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		1.58	52.140	1.40	1.58	1	EXTERIOR WALL	0.50	1.86	1	EXTERIOR WALL	0.98	
		TNT4A	33.075		1.61	53.251	1.40	1.61	1	EXTERIOR WALL	0.50	1.77	1	TOP SLAB	1.02	
		TNT6A	41.600		1.59	66.144	1.40	1.71	1	EXTERIOR WALL	0.50	1.59	1	TOP SLAB	1.02	
		TNT7A	42.000		1.69	70.980	1.40	1.69	1	EXTERIOR WALL	0.50	1.70	1	TOP SLAB	1.02	
		TNT7B	42.000		1.56	65.520	1.40	1.66	1	EXTERIOR WALL	0.50	1.56	1	TOP SLAB	1.02	
		TNAGRIT4	43.000		1.59	68.370	1.40	1.59	1	EXTERIOR WALL	0.50	1.71	1	TOP SLAB	1.02	
TNAGT5A		45.000		1.62	72.900	1.40	1.62	1	EXTERIOR WALL	0.50	1.67	1	TOP SLAB	1.02		
TNAGT5B	45.000		1.53	68.850	1.40	1.53	1	TOP SLAB	0.29	1.62	1	TOP SLAB	1.02			

LOAD FACTORS:

LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
LS	1.75	--
WA	1.00	--

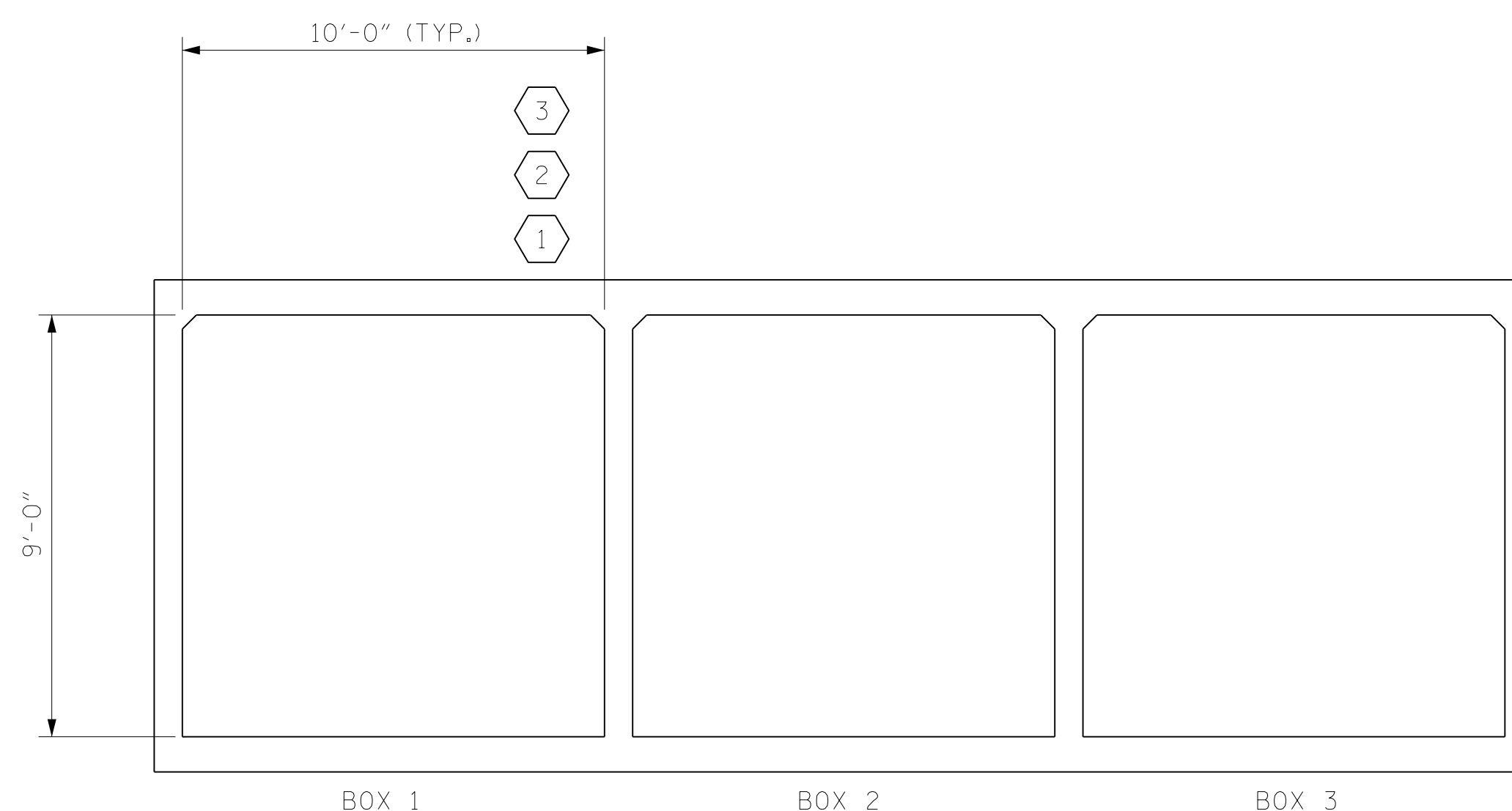
NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

COMMENTS:

- 1.
- 2.
- 3.
- 4.

#	CONTROLLING LOAD RATING
1	DESIGN LOAD RATING (HL-93)
2	DESIGN LOAD RATING (HS-20)
3	LEGAL LOAD RATING **
** SEE CHART FOR VEHICLE TYPE	



LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. R-5799
TRANSYLVANIA COUNTY
 STATION: 17+47.31 -Y2-

SHEET 10 OF 10

ASSEMBLED BY : TWL	DATE : 08/2020
CHECKED BY : MRA	DATE : 04/2023
DRAWN BY : WMC 7/11	REV. 10/1/11 MAA/GM
CHECKED BY : GM 7/11	REV. 12/1/11 MAA/THC

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH						SHEET NO. C-10
STANDARD LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS (NON-INTERSTATE TRAFFIC)						TOTAL SHEETS 10
REVISIONS						
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			
2			4			

STANDARD NOTES

DESIGN DATA:

SPECIFICATIONS	- - - - -	A.A.S.H.T.O. (CURRENT)
LIVE LOAD	- - - - -	SEE PLANS
IMPACT ALLOWANCE	- - - - -	SEE A.A.S.H.T.O.
STRESS IN EXTREME FIBER OF STRUCTURAL STEEL - AASHTO M270 GRADE 36	- -	20,000 LBS. PER SQ. IN.
- AASHTO M270 GRADE 50W	- -	27,000 LBS. PER SQ. IN.
- AASHTO M270 GRADE 50	- -	27,000 LBS. PER SQ. IN.
REINFORCING STEEL IN TENSION - GRADE 60	- - -	24,000 LBS. PER SQ. IN.
CONCRETE IN COMPRESSION	- - - - -	1,200 LBS. PER SQ. IN.
CONCRETE IN SHEAR	- - - - -	SEE A.A.S.H.T.O.
STRUCTURAL TIMBER - TREATED OR UNTREATED EXTREME FIBER STRESS	- - -	1,800 LBS. PER SQ. IN.
COMPRESSION PERPENDICULAR TO GRAIN OF TIMBER	- - - - -	375 LBS. PER SQ. IN.
EQUIVALENT FLUID PRESSURE OF EARTH	- - - - -	30 LBS. PER CU. FT. (MINIMUM)

MATERIAL AND WORKMANSHIP:

EXCEPT AS MAY OTHERWISE BE SPECIFIED ON PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE 2018 "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" OF THE N.C. DEPARTMENT OF TRANSPORTATION.

STEEL SHEET PILING FOR PERMANENT OR TEMPORARY APPLICATIONS SHALL BE HOT ROLLED.

CONCRETE:

UNLESS OTHERWISE REQUIRED ON PLANS, CLASS A CONCRETE SHALL BE USED FOR ALL PORTIONS OF ALL STRUCTURES WITH THE EXCEPTION THAT: CLASS AA CONCRETE SHALL BE USED IN BRIDGE SUPERSTRUCTURES, ABUTMENT BACKWALLS, AND APPROACH SLABS; AND CLASS B CONCRETE SHALL BE USED FOR SLOPE PROTECTION AND RIP RAP.

CONCRETE CHAMFERS:

UNLESS OTHERWISE NOTED ON THE PLANS, ALL EXPOSED CORNERS ON STRUCTURES SHALL BE CHAMFERED $\frac{3}{4}$ " WITH THE FOLLOWING EXCEPTIONS: TOP CORNERS OF CURBS MAY BE ROUNDED TO $1\frac{1}{2}$ " RADIUS WHICH IS BUILT INTO CURB FORMS; CORNERS OF TRANSVERSE FLOOR EXPANSION JOINTS SHALL BE ROUNDED WITH A $\frac{1}{4}$ " FINISHING TOOL UNLESS OTHERWISE REQUIRED ON PLANS; AND CORNERS OF EXPANSION JOINTS IN THE ROADWAY FACES AND TOPS OF CURBS AND SIDEWALKS SHALL BE ROUNDED TO A $\frac{1}{4}$ " RADIUS WITH A FINISHING STONE OR TOOL UNLESS OTHERWISE REQUIRED ON PLANS.

DOWELS:

DOWELS WHEN INDICATED ON PLANS AS FOR CULVERT EXTENSIONS, SHALL BE EMBEDDED AT LEAST 12" INTO THE OLD CONCRETE AND GROUTED INTO PLACE WITH 1:2 CEMENT MORTAR.

ALLOWANCE FOR DEAD LOAD DEFLECTION, SETTLEMENT, ETC. IN CASTING SUPERSTRUCTURES:

BRIDGES SHALL BE BUILT ON THE GRADE OR VERTICAL CURVE SHOWN ON PLANS. SLABS, CURBS AND PARAPETS SHALL CONFORM TO THE GRADE OR CURVE.

ALL DIMENSIONS WHICH ARE GIVEN IN SECTION AND ARE AFFECTED BY DEAD LOAD DEFLECTIONS ARE DIMENSIONS AT CENTER LINE OF BEARING UNLESS OTHERWISE NOTED ON PLANS. IN SETTING FORMS FOR STEEL BEAM BRIDGES AND PRESTRESSED CONCRETE GIRDER BRIDGES, ADJUSTMENTS SHALL BE MADE DUE TO THE DEAD LOAD DEFLECTIONS FOR THE ELEVATIONS SHOWN. WHERE BLOCKS ARE SHOWN OVER BEAMS FOR BUILDING UP TO THE SLAB, THE VERTICAL DIMENSIONS OF THE BLOCKS SHALL BE ADJUSTED BETWEEN BEARINGS TO COMPENSATE FOR DEAD LOAD DEFLECTIONS, VERTICAL CURVE ORDINATE, AND ACTUAL BEAM CAMBER. WHERE BOTTOM OF SLAB IS IN LINE WITH BOTTOM OF TOP FLANGES, DEPTH OF SLAB BETWEEN BEARINGS SHALL BE ADJUSTED TO COMPENSATE FOR DEAD LOAD DEFLECTION, VERTICAL CURVE ORDINATE, AND ACTUAL BEAM CAMBER.

IN SETTING FALSEWORK AND FORMS FOR REINFORCED CONCRETE SPANS, AN ALLOWANCE SHALL BE MADE FOR DEAD LOAD DEFLECTIONS, SETTLEMENT OF FALSEWORK, AND PERMANENT CAMBER WHICH SHALL BE PROVIDED FOR IN ADDITION TO THE ELEVATIONS SHOWN. AFTER REMOVAL OF THE FALSEWORK, THE FINISHED STRUCTURES SHALL CONFORM TO THE PROFILE AND ELEVATIONS SHOWN ON THE PLANS AND CONSTRUCTION ELEVATIONS FURNISHED BY THE ENGINEER.

DETAILED DRAWINGS FOR FALSEWORK OR FORMS FOR BRIDGE SUPERSTRUCTURE AND ANY STRUCTURE OR PARTS OF A STRUCTURE AS NOTED ON THE PLANS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL BEFORE CONSTRUCTION OF THE FALSEWORK OR FORMS IS STARTED.

REINFORCING STEEL:

ALL REINFORCING STEEL SHALL BE DEFORMED. DIMENSIONS RELATIVE TO PLACEMENT OF REINFORCING ARE TO CENTERS OF BARS UNLESS OTHERWISE INDICATED IN THE PLANS. DIMENSIONS ON BAR DETAILS ARE TO CENTERS OF BARS OR ARE OUT TO OUT AS INDICATED ON PLANS.

WIRE BAR SUPPORTS SHALL BE PROVIDED FOR REINFORCING STEEL WHERE INDICATED ON THE PLANS. WHEN BAR SUPPORT PIECES ARE PLACED IN CONTINUOUS LINES, THEY SHALL BE SO PLACED THAT THE ENDS OF THE SUPPORTING WIRES SHALL BE LAPPED TO LOCK LEGS ON ADJOINING PIECES.

STRUCTURAL STEEL:

AT THE CONTRACTOR'S OPTION, HE MAY SUBSTITUTE $\frac{7}{8}$ " \emptyset SHEAR STUDS FOR THE $\frac{3}{4}$ " \emptyset STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - $\frac{7}{8}$ " \emptyset STUDS FOR 4 - $\frac{3}{4}$ " \emptyset STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF $\frac{7}{8}$ " \emptyset STUDS ALONG THE BEAM AS SHOWN FOR $\frac{3}{4}$ " \emptyset STUDS BASED ON THE RATIO OF 3 - $\frac{7}{8}$ " \emptyset STUDS FOR 4 - $\frac{3}{4}$ " \emptyset STUDS. STUDS OF THE LENGTH SPECIFIED ON THE PLANS MUST BE PROVIDED. THE MAXIMUM SPACING SHALL BE 2'-0".

EXCEPT AT THE INTERIOR SUPPORTS OF CONTINUOUS BEAMS WHERE THE COVER PLATE IS IN CONTACT WITH BEARING PLATE, THE CONTRACTOR MAY, AT HIS OPTION, SUBSTITUTE FOR THE COVER PLATES DESIGNATED ON THE PLANS COVER PLATES OF THE EQUIVALENT AREA PROVIDED THESE PLATES ARE AT LEAST $\frac{3}{16}$ " IN THICKNESS AND DO NOT EXCEED A WIDTH EQUAL TO THE FLANGE WIDTH LESS 2" OR A THICKNESS EQUAL TO 2 TIMES THE FLANGE THICKNESS. THE SIZE OF FILLET WELDS SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT ANSI/AASHTO/AWS "BRIDGE WELDING CODE". ELECTROSLAG WELDING WILL NOT BE PERMITTED.

WITH THE SOLE EXCEPTION OF EDGES AT SURFACES WHICH BEAR ON OTHER SURFACES, ALL SHARP EDGES AND ENDS OF SHAPES AND PLATES SHALL BE SLIGHTLY ROUNDED BY SUITABLE MEANS TO A RADIUS OF APPROXIMATELY $\frac{1}{16}$ " INCH OR EQUIVALENT FLAT SURFACE AT A SUITABLE ANGLE PRIOR TO PAINTING, GALVANIZING, OR METALLIZING.

HANDRAILS AND POSTS:

METAL STANDARDS AND FACES OF THE CONCRETE END POSTS FOR THE METAL RAIL SHALL BE SET NORMAL TO THE GRADE OF THE CURB, UNLESS OTHERWISE SHOWN ON PLANS. THE METAL RAIL AND TOPS OF CONCRETE POSTS USED WITH THE ALUMINUM RAIL SHALL BE BUILT PARALLEL TO THE GRADE OF THE CURB.

METAL HANDRAILS SHALL BE IN ACCORDANCE WITH THE PLANS. RAILS SHALL BE AS MANUFACTURED FOR BRIDGE RAILING. CASTINGS SHALL BE OF A UNIFORM APPEARANCE. FINIS AND OTHER DEFORMATIONS RESULTING FROM CASTING OR OTHERWISE SHALL BE REMOVED IN A MANNER SO THAT A UNIFORM COLORING OF THE COMPLETED CASTING SHALL BE OBTAINED. CASTINGS WITH DISCOLORATIONS OR OF NON-UNIFORM COLORING WILL NOT BE ACCEPTED. CERTIFIED MILL REPORTS ARE REQUIRED FOR METAL RAILS AND POSTS.

SPECIAL NOTES:

GENERALLY, IN CASE OF DISCREPANCY, THIS STANDARD SHEET OF NOTES SHALL GOVERN OVER THE SPECIFICATIONS, BUT THE REMAINDER OF THE PLANS SHALL GOVERN OVER NOTES HEREON, AND SPECIAL PROVISIONS SHALL GOVERN OVER ALL. SEE SPECIFICATIONS ARTICLE 105-4.

ENGLISH

JANUARY, 1990

STD. NO. SN