09/08/99

TIP PROJECT: U-5798B

CONTRACT: C205076

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

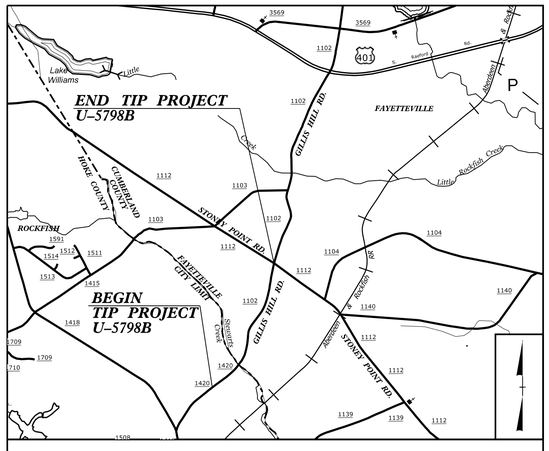
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5798B	1	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
44369.1.3	N/A	PE
44369.2.3	N/A	ROW
44369.2.4	N/A	UTL.
44369.3.3	N/A	CONST.

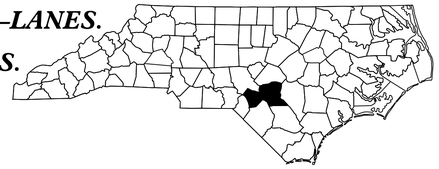
HOKE AND CUMBERLAND COUNTIES

LOCATION: SR 1102 (GILLIS HILL ROAD) FROM SR 1418 (LINDSAY ROAD) TO NORTH OF SR 1112 (STONEY POINT ROAD). WIDEN TO MULTI-LANES.

TYPE OF WORK: PAVING, GRADING, DRAINAGE, CULVERT, WALLS, AND SIGNALS.

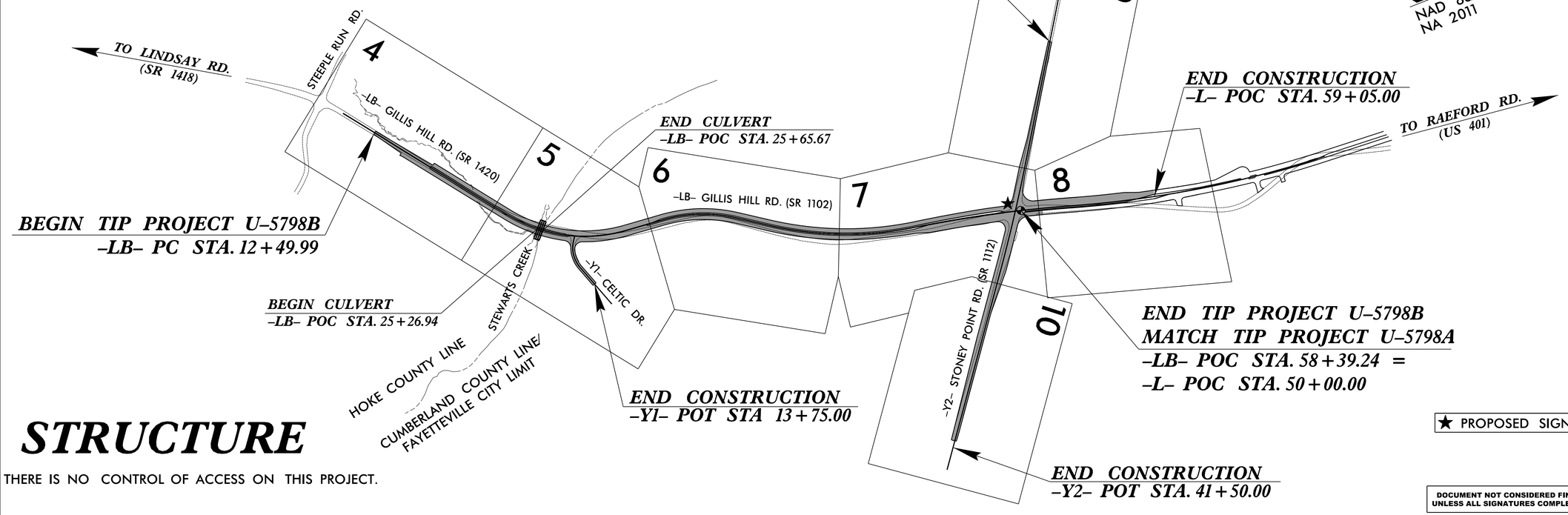


VICINITY MAP N.T.S



NAD 83/
NA 2011

BEGIN CONSTRUCTION
-Y2- POT STA. 13+00.00



BEGIN TIP PROJECT U-5798B
-LB- PC STA. 12+49.99

BEGIN CULVERT
-LB- POC STA. 25+26.94

END CULVERT
-LB- POC STA. 25+65.67

END CONSTRUCTION
-Y1- POT STA 13+75.00

END CONSTRUCTION
-L- POC STA. 59+05.00

END TIP PROJECT U-5798B
MATCH TIP PROJECT U-5798A
-LB- POC STA. 58+39.24 =
-L- POC STA. 50+00.00

★ PROPOSED SIGNAL

END CONSTRUCTION
-Y2- POT STA. 41+50.00

STRUCTURE

THERE IS NO CONTROL OF ACCESS ON THIS PROJECT.

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

DESIGN DATA

ADT 2025 = 10,800
ADT 2045 = 17,500
K = 7 %
D = 55 %
T = 3 % *
V = 50 MPH
*(TTST=1 + DUAL=2)
FUNC CLASS =
MINOR COLLECTOR
REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT U-5798B = 0.862 MILES
LENGTH CULVERT TIP PROJECT U-5798B = 0.007 MILES
TOTAL LENGTH TIP PROJECT U-5798B = 0.869 MILES

-LB- USED TO CALCULATE PROJECT LENGTH.

PREPARED IN THE OFFICE OF:
RS&H
8521 SIX FORKS ROAD, SUITE 400
RALEIGH, NC 27615
NC FIRM LICENSE No: F-0493
FOR THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

2024 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: JUNE 13, 2023

LETTING DATE: AUGUST 19, 2025

SEAN KORTOVICH, PE
PROJECT ENGINEER

DANA M. PACZEK, PE
PROJECT DESIGN ENGINEER

KHALED A. ALAKHDAR
NCDOT CONTACT

STRUCTURAL ENGINEER

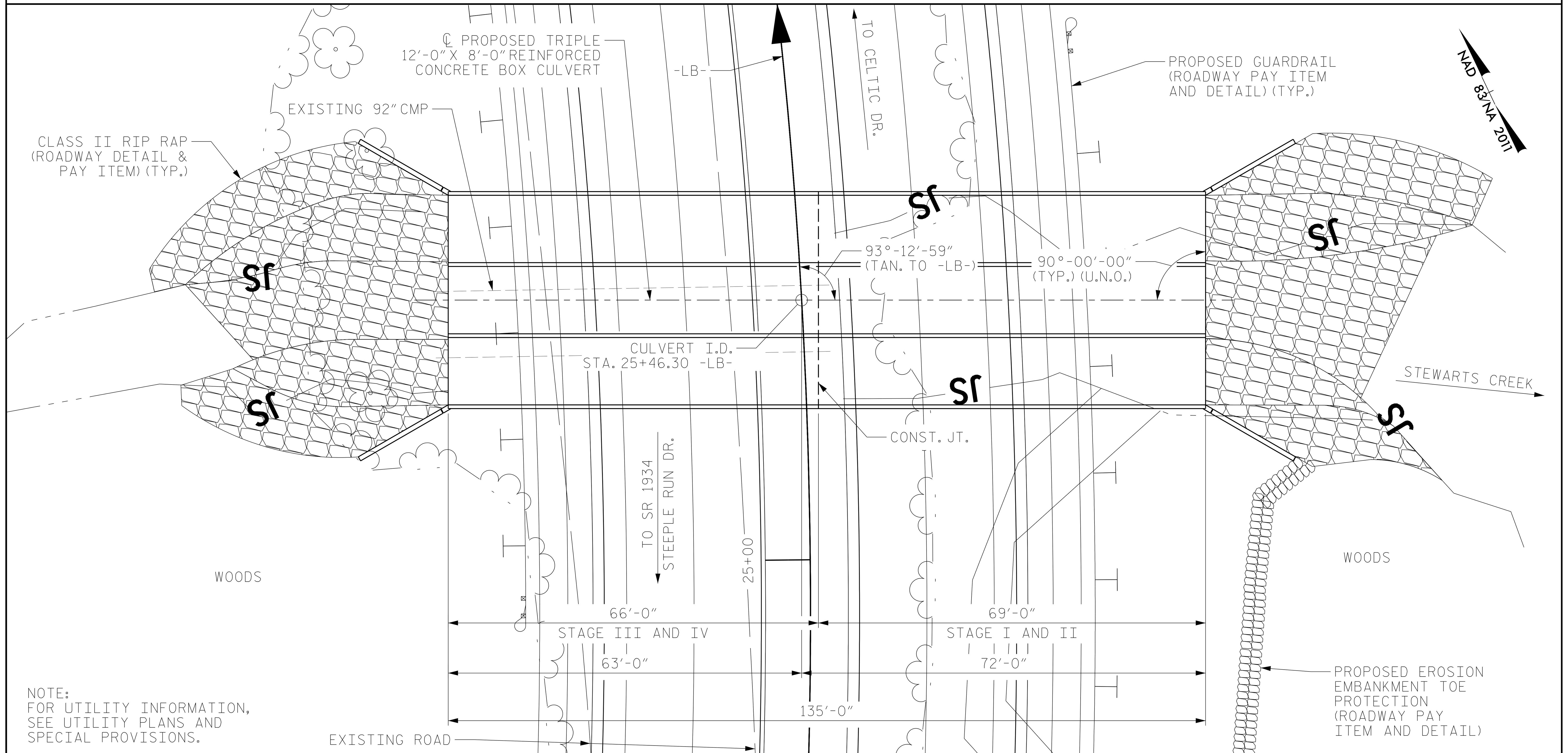
NORTH CAROLINA PROFESSIONAL SEAL 052672 ENGINEER MATTHEW E. ACOSTA

Signed by: Matthew E. Acosta 6/19/2025
SIGNATURE: P.E.

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

05-MAR-2025 14:33
R:\Roadway\Proj\U-5798B\U-5798B_Rdy_tsh.dgn
$$$$USERNAME$$$$

BM #5 BENCHTIE IN 7" DIA. PINE TREE, 143' LT. OF STA. 31+13.00 -LB-, EL. 201.80'



NOTE:
FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.

LOCATION SKETCH

NOTES

ASSUMED LIVE LOAD ---------- HL-93 OR ALTERNATE LOADING

DESIGN FILL = 7.17' MAX. AND 2.67' MIN.

CONCRETE CULVERTS TO BE POURED IN THE FOLLOWING ORDER FOR EACH STAGE:

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.

3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH SPECIFICATIONS.

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.

TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.

AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF THE EXTERIOR WALL ABOVE THE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.

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.

SEE SECTION 414 OF THE STANDARD SPECIFICATIONS FOR CULVERT EXCAVATION AND BACKFILLING.

EXCAVATE AT LEAST 1 FOOT BELOW BOTTOM OF CULVERT AND REPLACE WITH FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH ARTICLE 414-4 OF THE STANDARD SPECIFICATIONS.

FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.

FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.

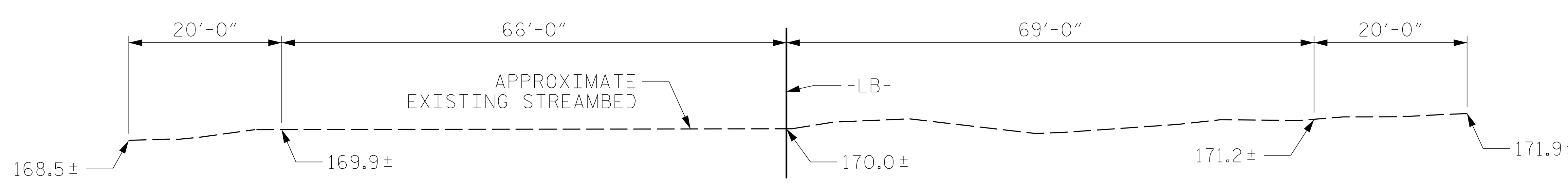
FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

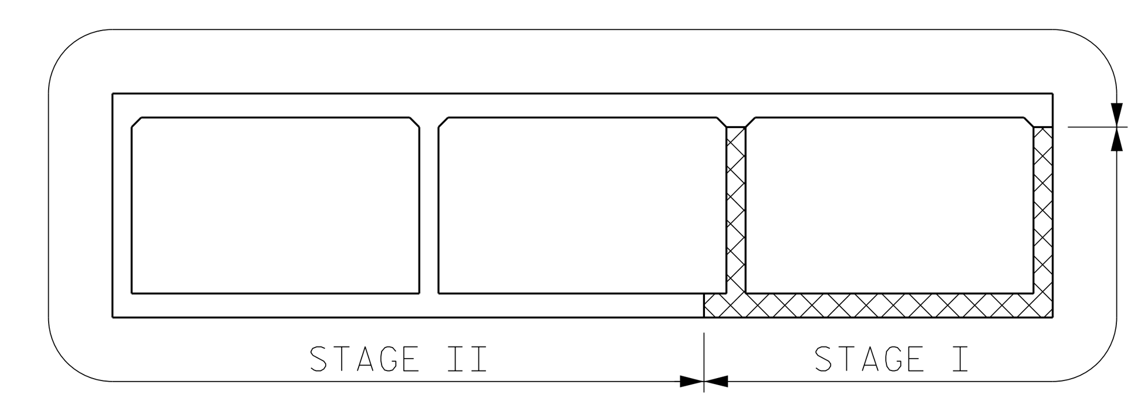
FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR GROUT OF STRUCTURES, SEE SPECIAL PROVISIONS.

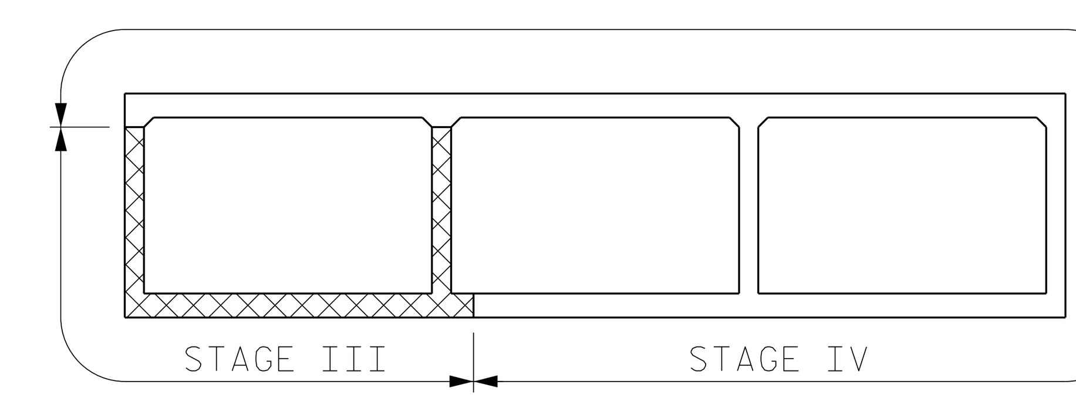
FOR OTHER DESIGN DATA AND GENERAL NOTES, SEE SHEET SN.



PROFILE ALONG ℄ CULVERT



CONSTRUCTION SEQUENCE
(SECTION LOOKING DOWNSTREAM)
STAGE I CONSTRUCTION
STAGE II CONSTRUCTION



CONSTRUCTION SEQUENCE
(SECTION LOOKING DOWNSTREAM)
STAGE III CONSTRUCTION
STAGE IV CONSTRUCTION

HYDRAULIC DATA

DESIGN DISCHARGE	= 880 CFS
FREQUENCY OF DESIGN DISCHARGE	= 25 YRS
DESIGN HIGH WATER ELEVATION	= 180.7'
DRAINAGE AREA	= 3.78 SQ MI
BASE DISCHARGE (Q100)	= 1,000 CFS
BASE HIGH WATER ELEVATION	= 182.3'

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 950 CFS
FREQUENCY OF OVERTOPPING	= 25+ YRS
* OVERTOPPING ELEVATION	= 182.0'

* SAG @ STA. 25+13.58 -LB-

GRADE DATA

GRADE POINT EL. @ STA. 25+46.30 -LB-	= 181.26'
CULVERT BED EL. @ STA. 25+46.30 -LB-	= 168.75'
ROADWAY SLOPES	= 3:1 MAX.

PROFILE DATA -LB-

P.I. = 26+30.00
EL. = 177.71'
VC = 460'
K = 57
G1 = -2.0000%
G2 = +6.1000%

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE		
BARREL @ 4.38 C.Y./FT		
STAGE I		
CULVERT	72.8	C.Y.
WING ETC.	8.3	C.Y.
TOTAL	81.1	C.Y.
STAGE II		
CULVERT	231.8	C.Y.
WING ETC.	10.4	C.Y.
TOTAL	242.2	C.Y.
STAGE III		
CULVERT	69.7	C.Y.
WING ETC.	8.3	C.Y.
TOTAL	78.0	C.Y.
STAGE IV		
CULVERT	221.8	C.Y.
WING ETC.	10.4	C.Y.
TOTAL	232.2	C.Y.
TOTAL CONCRETE	633.5	C.Y.

REINFORCING STEEL		
STAGE I		
CULVERT	13,526	LBS.
WING ETC.	503	LBS.
TOTAL	14,029	LBS.
STAGE II		
CULVERT	35,186	LBS.
WING ETC.	503	LBS.
TOTAL	35,689	LBS.
STAGE III		
CULVERT	12,950	LBS.
WING ETC.	503	LBS.
TOTAL	13,453	LBS.
STAGE IV		
CULVERT	33,680	LBS.
WING ETC.	503	LBS.
TOTAL	34,183	LBS.
TOTAL STEEL	97,354	LBS.

FOUNDATION CONDITIONING MATERIAL		
STAGE I	90	TONS
STAGE II	119	TONS
STAGE III	86	TONS
STAGE IV	114	TONS
TOTAL	409	TONS
REMOVAL OF EXISTING STRUCTURE STA. 25+46.30 -LB-		LUMP SUM
CULVERT EXCAVATION STA. 25+46.30 -LB-		LUMP SUM

HORIZONTAL CURVE DATA -LB-

P.I. STA. = 27+42.62
Δ = 47°-45'-00" (LT.)
D = 05°-43'-46.5"
L = 833.39'
T = 442.62'
R = 1000.00'
SE = 0.04

PROJECT NO. U-5798B
CUMBERLAND COUNTY
STATION: 25+46.30 -LB-

SHEET 1 OF 8

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 052672 MATTHEW R. ACOSTA
Signed By: 14D295873...
8/4/2025

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 Nos. 50073 * F-0493 * C-28

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 12'-0" X 8'-0" CONCRETE BOX CULVERT
FOR STEWARTS CREEK ON SR 1102 AND SR 1420 BETWEEN SR 1934 AND CELTIC DR.
90° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-1
1			3			TOTAL SHEETS
2			4			8

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

DRAWN BY :	NSC	DATE :	12/2023
CHECKED BY :	MRA	DATE :	12/2023
DESIGN ENGINEER OF RECORD:	MRA	DATE :	03/2025

8/4/2025
\\rsandh.com\files\Transportation\P\1031782004_U-5798 (Gillis Hill Road)_P&D\Design\Structures\CAD\Culvert\410_001_U-5798B_SMU_CU_001_250001.dgn
AcostaM

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
							LIVE-LOAD FACTORS (γ_{LL})	MOMENT				SHEAR				
								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	1.05	--	1.75	1.82	3	TOP SLAB	4.73	1.05	3	TOP SLAB	11.39	
		HL-93 (OPERATING)	N/A		1.36	--	1.35	2.37	3	TOP SLAB	4.73	1.36	3	TOP SLAB	11.39	
		HS-20 (INVENTORY)	36.000	2	1.21	43.560	1.75	2.04	3	TOP SLAB	4.73	1.21	3	TOP SLAB	11.39	
		HS-20 (OPERATING)	36.000		1.56	56.160	1.35	2.64	3	TOP SLAB	4.73	1.56	3	TOP SLAB	11.39	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		3.36	45.360	1.40	3.74	3	EXTERIOR WALL	8.63	3.36	3	TOP SLAB	11.39	
		SNGARBS2	20.000		2.83	56.600	1.40	3.60	3	EXTERIOR WALL	8.63	2.83	3	TOP SLAB	11.39	
		SNAGRIS2	22.000		2.98	65.560	1.40	3.72	3	EXTERIOR WALL	8.63	2.98	3	TOP SLAB	11.39	
		SNCOTTS3	27.250	3	1.45	39.513	1.40	2.44	3	TOP SLAB	4.73	1.45	3	TOP SLAB	11.39	
		SNAGGRS4	34.925		1.74	60.770	1.40	2.77	3	EXTERIOR WALL	8.63	1.74	3	TOP SLAB	11.39	
		SNS5A	35.550		1.64	58.302	1.40	2.72	3	EXTERIOR WALL	8.63	1.64	3	TOP SLAB	11.39	
		SNS6A	39.950		1.62	64.719	1.40	2.72	3	EXTERIOR WALL	8.63	1.62	3	TOP SLAB	11.39	
		SNS7B	42.000		1.61	67.620	1.40	2.84	3	EXTERIOR WALL	8.63	1.61	3	TOP SLAB	11.39	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.49	82.170	1.40	3.78	3	EXTERIOR WALL	8.63	2.49	3	TOP SLAB	11.39	
		TNT4A	33.075		1.73	57.220	1.40	2.80	3	EXTERIOR WALL	8.63	1.73	3	TOP SLAB	11.39	
		TNT6A	41.600		1.59	66.144	1.40	2.89	3	EXTERIOR WALL	8.63	1.59	3	TOP SLAB	11.39	
		TNT7A	42.000		1.62	68.040	1.40	2.82	3	EXTERIOR WALL	8.63	1.62	3	TOP SLAB	11.39	
		TNT7B	42.000		1.71	71.820	1.40	2.78	3	EXTERIOR WALL	8.63	1.71	3	TOP SLAB	11.39	
		TNAGRIT4	43.000		1.64	70.520	1.40	2.80	3	EXTERIOR WALL	8.63	1.64	3	TOP SLAB	11.39	
		TNAGT5A	45.000		1.62	72.900	1.40	3.06	3	TOP SLAB	12.33	1.62	3	TOP SLAB	11.39	
		TNAGT5B	45.000		1.55	69.750	1.40	2.60	3	TOP SLAB	12.33	1.55	3	TOP SLAB	11.39	
EMERGENCY VEHICLE (EV)		EV2	28.750		1.95	56.063	1.30	2.87	3	TOP SLAB	4.73	1.95	3	TOP SLAB	11.39	
		EV3	43.000	4	1.20	51.600	1.30	2.12	3	TOP SLAB	4.73	1.20	3	TOP SLAB	11.39	

LOAD FACTORS:

DESIGN LOAD RATING 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.

LOAD RATINGS FOR MAXIMUM AND MINIMUM FILL CONDITIONS HAVE BEEN EVALUATED. MINIMUM FILL CONDITION CONTROL LOAD RATINGS.

COMMENTS:

1.

2.

3.

4.

(#) CONTROLLING LOAD RATING

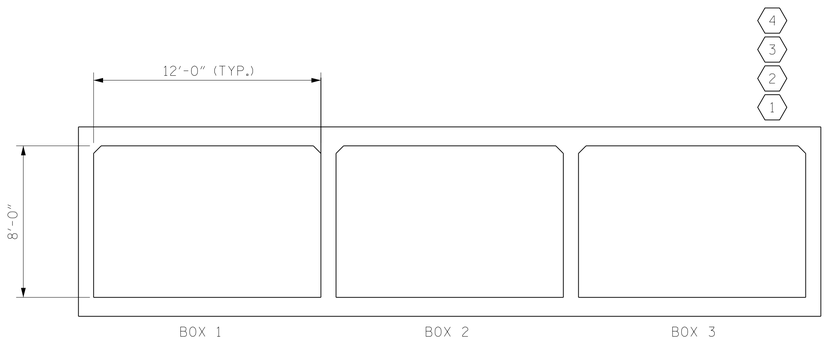
(1) DESIGN LOAD RATING (HL-93)

(2) DESIGN LOAD RATING (HS-20)

(3) LEGAL LOAD RATING **

(4) EMERGENCY VERHICLE LOAD RATING **

** SEE CHART FOR VEHICLE TYPE



LRFR SUMMARY

(LOOKING DOWNSTREAM)

PROJECT NO. U-5798B

CUMBERLAND COUNTY

STATION: 25+46.30 -LB-

SHEET 2 OF 8

6/19/2025

NORTH CAROLINA PROFESSIONAL SEAL 052672 ENGINEER MATTHEW R. ACOSTA

Signed by: Matthew R. Acosta

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 Nos. 50073 * F-0493 * C-28

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS (NON-INTERSTATE TRAFFIC)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-2
1			3			TOTAL SHEETS
2			4			8

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

DRAWN BY : NSC DATE : 12/2023
CHECKED BY : MRA DATE : 12/2023
DESIGN ENGINEER OF RECORD: MRA DATE : 03/2025

6/19/2025
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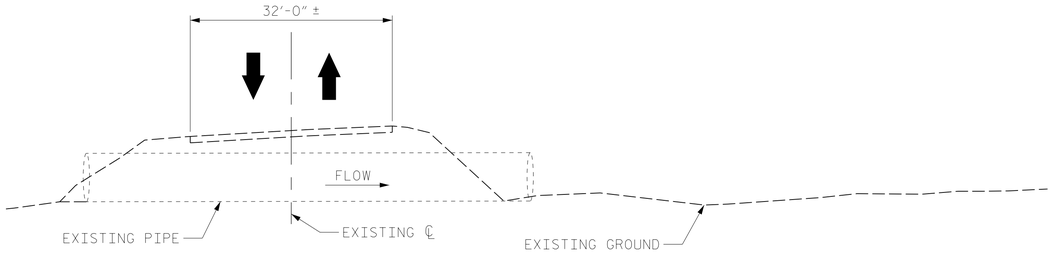
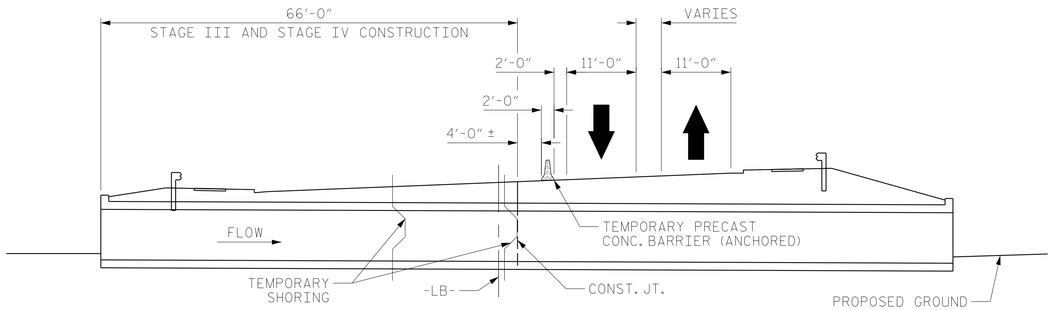
AcostaM



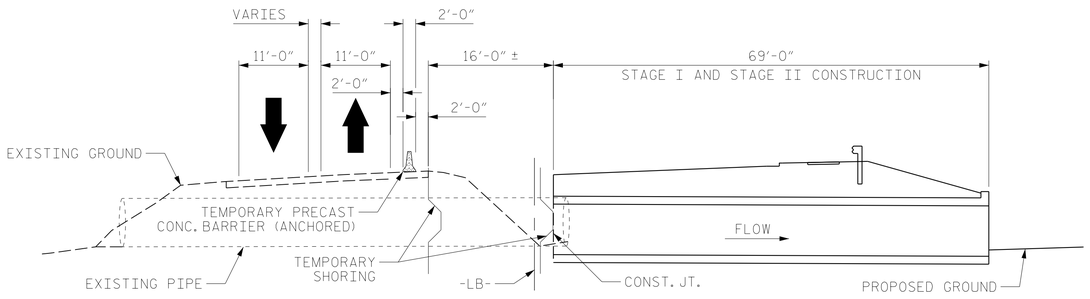
INITIAL CONDITION

(LOOKING UPSTATION)
(SECTION ALONG ℄ CULVERT)



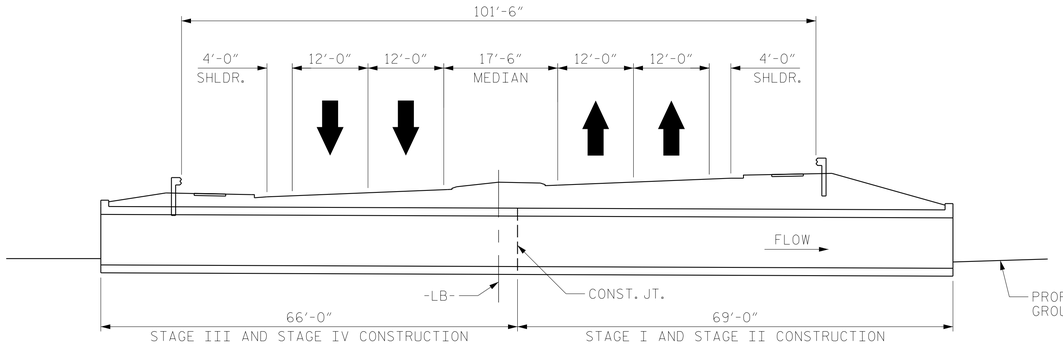
STAGE III AND STAGE IV CONSTRUCTION

(LOOKING UPSTATION)
(SECTION ALONG ℄ CULVERT)



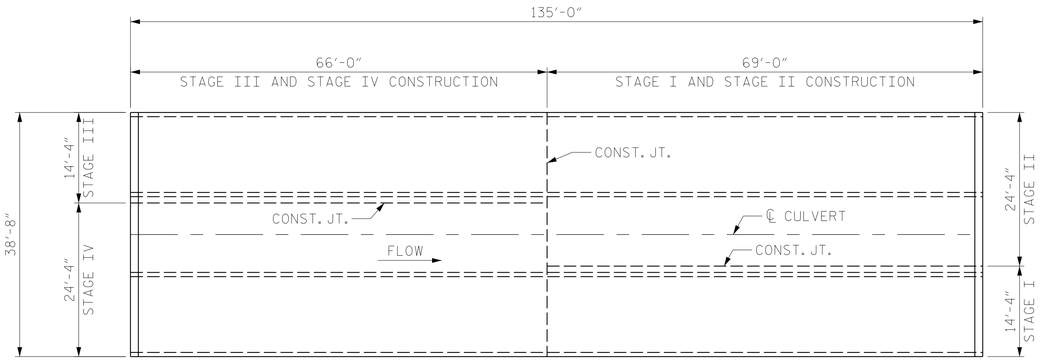
STAGE I AND STAGE II CONSTRUCTION

(LOOKING UPSTATION)
(SECTION ALONG ℄ CULVERT)



FINAL CONDITION

(LOOKING UPSTATION)
(SECTION ALONG ℄ CULVERT)



PLAN VIEW

(WINGS NOT SHOWN FOR CLARITY)

NOTES:

FOR MAINTENANCE OF TRAFFIC, SEE TRANSPORTATION MANAGEMENT PLAN.

FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.

FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE RAODWAY PLANS.

PROJECT NO. U-5798B
CUMBERLAND COUNTY
STATION: 25+46.30 -LB-

DRAWN BY :	NSC	DATE :	12/2023
CHECKED BY :	MRA	DATE :	12/2023
DESIGN ENGINEER OF RECORD:	MRA	DATE :	03/2025

6/19/2025
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AcostaM

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6/19/2025
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 052672 MATTHEW R. ACOSTA
Signed by: Matthew R. Acosta

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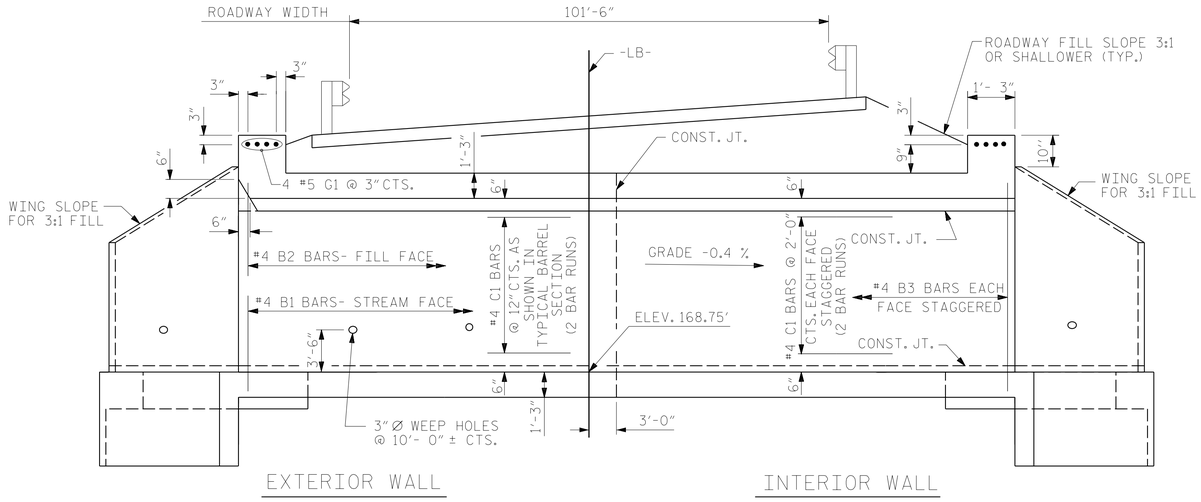
www.rsandh.com
North Carolina License Nos. 50073 ° F-0493 ° C-28

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

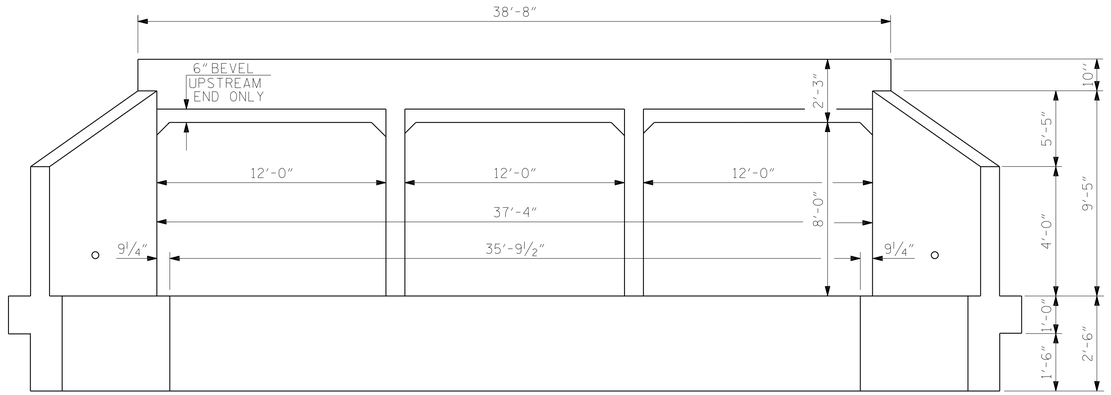
TRIPLE 12'-0" X 8'-0" CONCRETE BOX CULVERT STAGING DETAILS

90° SKEW

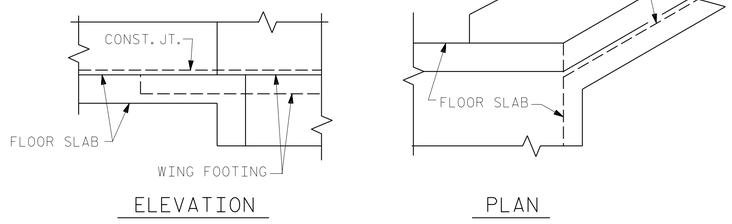
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-3
1			3			TOTAL SHEETS
2			4			8



CULVERT SECTION NORMAL TO ROADWAY

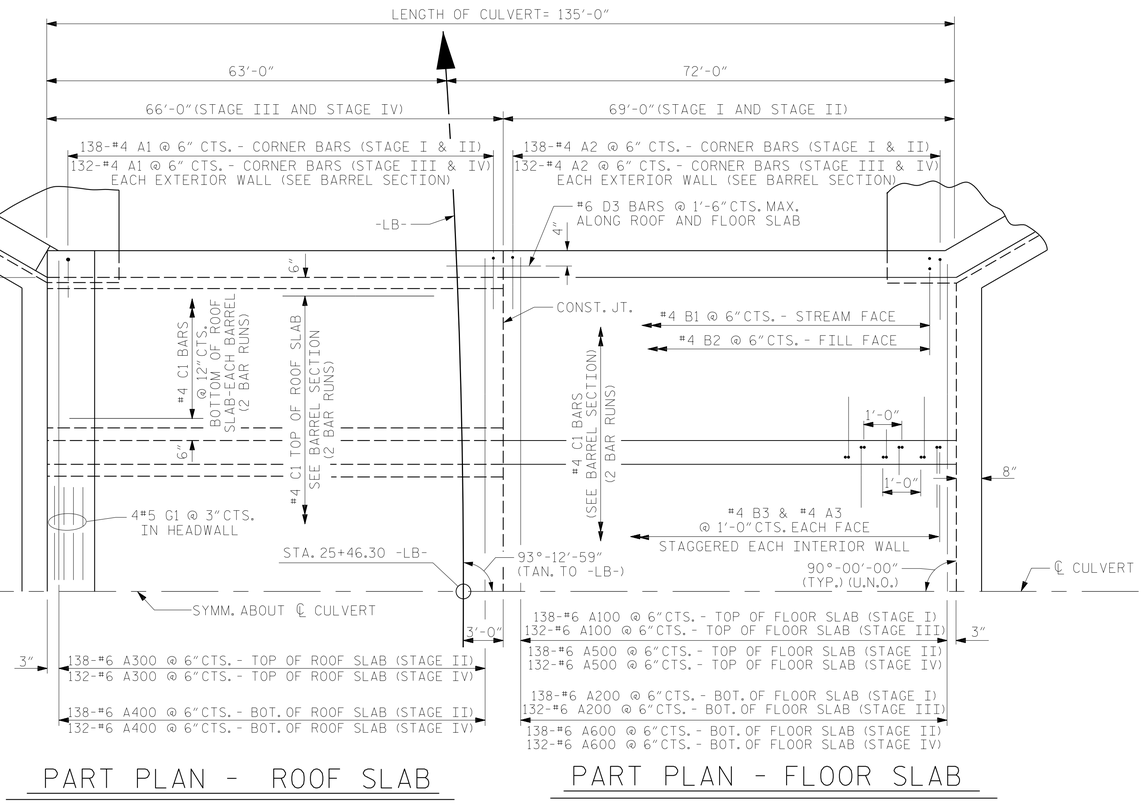


END ELEVATION



ELEVATION PLAN

CONNECTION OF WING FOOTING AND FLOOR SLAB WHEN SLAB IS THICKER THAN FOOTING



PART PLAN - ROOF SLAB PART PLAN - FLOOR SLAB

NOTE: ROOF AND FLOOR SLAB REINFORCING IS SHOWN SCHEMATICALLY PER STAGE IN 'PART PLAN - ROOF SLAB' AND 'PART PLAN - FLOOR SLAB'. FOR ADDITIONAL INFORMATION AND DETAILING OF CULVERT STAGING, SEE PLAN VIEW ON SHEET 3 OF 8.

ASSEMBLED BY :	NSC	DATE :	12/2023
CHECKED BY :	MRA	DATE :	12/2023
DRAWN BY : TSS	11/90	REV. 6/19	MAA/THC
CHECKED BY : ARB	11/90		

6/19/2025
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6/19/2025
NORTH CAROLINA PROFESSIONAL SEAL 052672 ENGINEER MATTHEW R. ACOSTA
Signed by: Matthew R. Acosta

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PROJECT NO. U-5798B
CUMBERLAND COUNTY
STATION: 25+46.30 -LB-

SHEET 4 OF 8

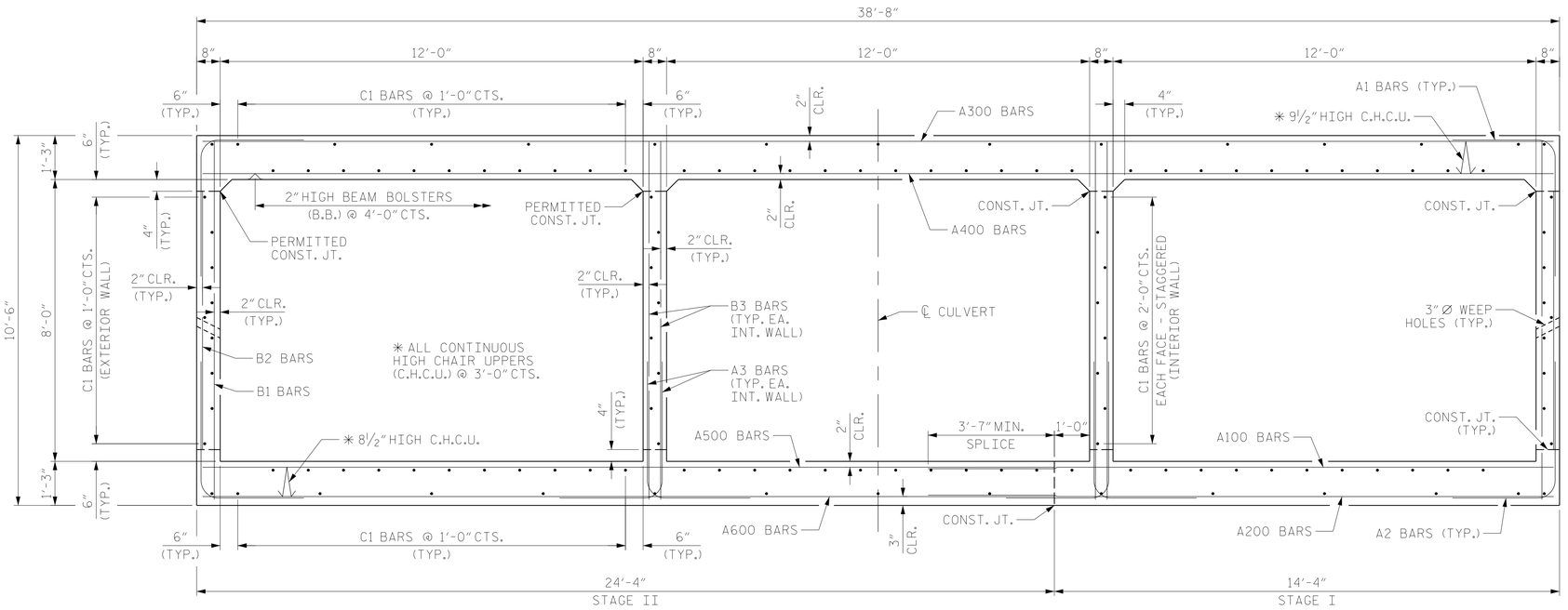
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL STANDARD

TRIPLE 12 FT. X 8 FT. CONCRETE BOX CULVERT 90° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-4
1			3			TOTAL SHEETS
2			4			8

STD. NO. CB90_3



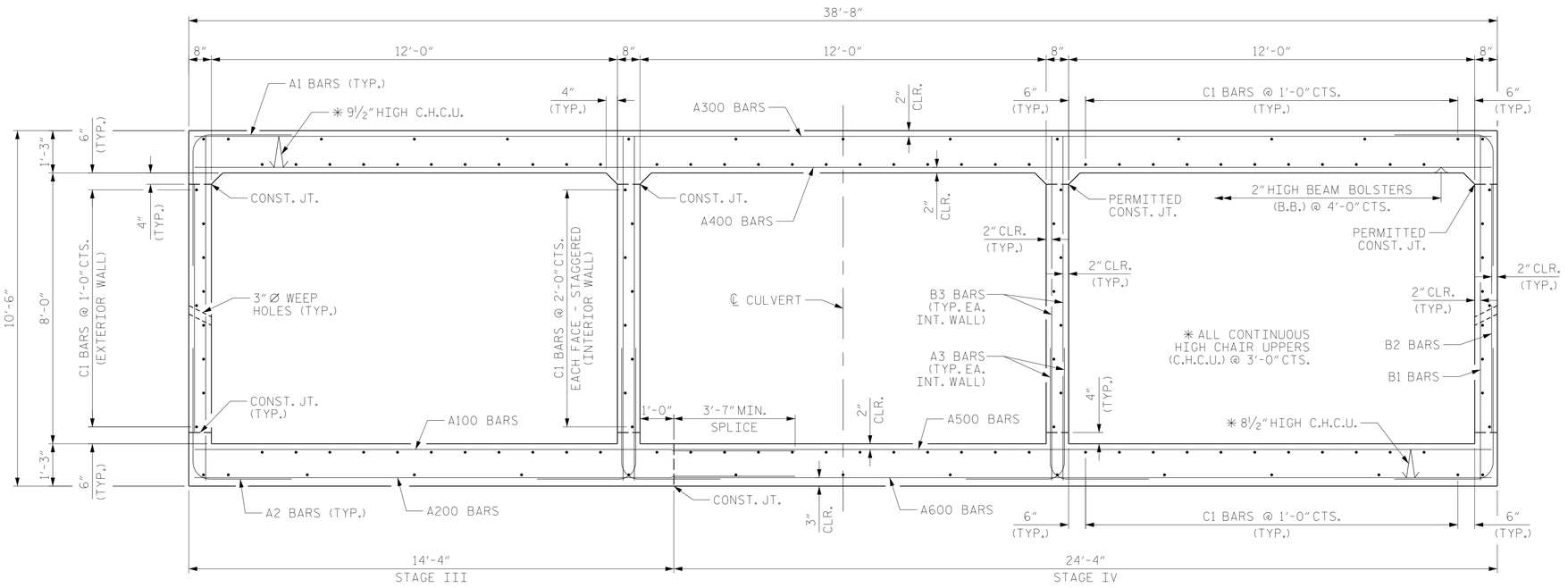
RIGHT ANGLE SECTION OF BARREL (STAGE I AND STAGE II)

(LOOKING DOWNSTREAM)
THERE ARE 132 "C" BARS IN SECTION OF BARREL.

NOTES:

THERE ARE 35 "C" BARS IN STAGE I AND STAGE III SECTION OF BARREL.

THERE ARE 97 "C" BARS IN STAGE II AND STAGE IV SECTION OF BARREL.



RIGHT ANGLE SECTION OF BARREL (STAGE III AND STAGE IV)

(LOOKING DOWNSTREAM)
THERE ARE 132 "C" BARS IN SECTION OF BARREL.

PROJECT NO. U-5798B
CUMBERLAND COUNTY
STATION: 25+46.30 -LB-

SHEET 5 OF 8

DRAWN BY : NSC DATE : 12/2023
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DESIGN ENGINEER OF RECORD: MRA DATE : 03/2025

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 12'-0" X 8'-0" CONCRETE BOX CULVERT SECTION OF BARREL

90° SKEW

REVISIONS						SHEET NO.
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1			3			TOTAL SHEETS
2			4			8

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BILL OF MATERIAL

STAGE I

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	138	#4	1	6'-7"	607
A2	138	#4	1	6'-7"	607
A3	138	#4	1	6'-7"	607
A100	138	#6	STR	17'-11"	3714
A200	138	#6	STR	17'-11"	3714
B1	138	#4	STR	10'-1"	930
B2	138	#4	STR	7'-4"	676
B3	138	#4	STR	10'-1"	930
C1	70	#4	STR	35'-7"	1664
D2	4	#6	STR	2'-10"	17
D3	16	#6	STR	2'-6"	60

REINFORCING STEEL 13,526 LBS.

SILL FOR ONE BARREL

CLASS A CONCRETE
LOW FLOW SILL 0.0 C.Y.
HIGH FLOW SILL 0.9 C.Y.
TOTAL 0.9 C.Y.

STAGE II

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	138	#4	1	6'-7"	607
A2	138	#4	1	6'-7"	607
A3	138	#4	1	6'-7"	607
A300	138	#6	STR	38'-4"	7946
A400	138	#6	STR	38'-4"	7946
A500	138	#6	STR	24'-0"	4975
A600	138	#6	STR	24'-0"	4975
B1	138	#4	STR	10'-1"	930
B2	138	#4	STR	7'-4"	676
B3	138	#4	STR	10'-1"	930
C1	194	#4	STR	35'-7"	4611
D1	4	#6	STR	1'-10"	11
D2	4	#6	STR	2'-10"	17
D3	50	#6	STR	2'-6"	188
G1	4	#5	STR	38'-4"	160

REINFORCING STEEL 35,186 LBS.

SILL FOR TWO BARRELS

CLASS A CONCRETE
LOW FLOW SILL 0.4 C.Y.
HIGH FLOW SILL 0.9 C.Y.
TOTAL 1.3 C.Y.

STAGE III

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	132	#4	1	6'-7"	580
A2	132	#4	1	6'-7"	580
A3	132	#4	1	6'-7"	580
A100	132	#6	STR	17'-11"	3552
A200	132	#6	STR	17'-11"	3552
B1	132	#4	STR	10'-1"	889
B2	132	#4	STR	7'-4"	647
B3	132	#4	STR	10'-1"	889
C1	70	#4	STR	35'-7"	1664
D2	4	#6	STR	2'-10"	17

REINFORCING STEEL 12,950 LBS.

SILL FOR ONE BARREL

CLASS A CONCRETE
LOW FLOW SILL 0.0 C.Y.
HIGH FLOW SILL 0.9 C.Y.
TOTAL 0.9 C.Y.

STAGE IV

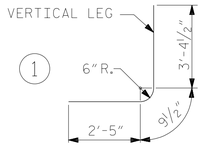
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	132	#4	1	6'-7"	580
A2	132	#4	1	6'-7"	580
A3	132	#4	1	6'-7"	580
A300	132	#6	STR	38'-4"	7600
A400	132	#6	STR	38'-4"	7600
A500	132	#6	STR	24'-0"	4758
A600	132	#6	STR	24'-0"	4758
B1	132	#4	STR	10'-1"	889
B2	132	#4	STR	7'-4"	647
B3	132	#4	STR	10'-1"	889
C1	194	#4	STR	35'-7"	4611
D1	4	#6	STR	1'-10"	11
D2	4	#6	STR	2'-10"	17
G1	4	#5	STR	38'-4"	160

REINFORCING STEEL 33,680 LBS.

SILL FOR TWO BARRELS

CLASS A CONCRETE
LOW FLOW SILL 0.4 C.Y.
HIGH FLOW SILL 0.9 C.Y.
TOTAL 1.3 C.Y.

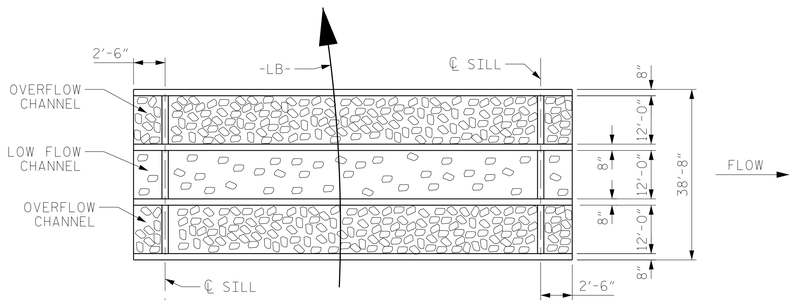
BAR TYPE



BAR DIMENSIONS ARE OUT TO OUT

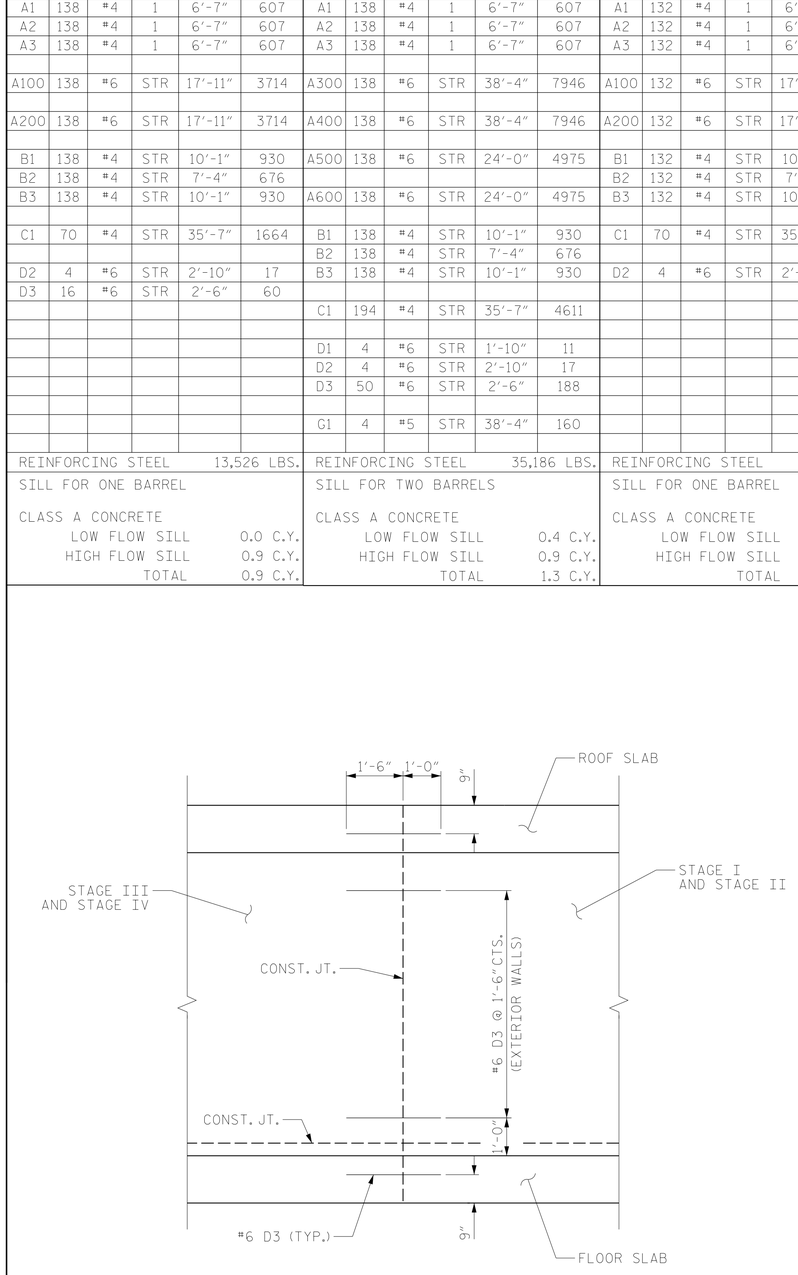
SPLICE LENGTHS CHART

SIZE	MIN. SPLICE LENGTH
#4	2'-5"
#5	3'-0"
#6	3'-7"



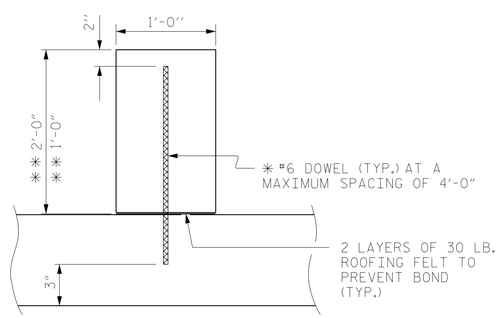
PLAN OF FLOOR SILL LAYOUT

BACKFILL ENTIRE CULVERT BED WITH NATIVE BED MATERIAL TO SILL HEIGHT



ELEVATION

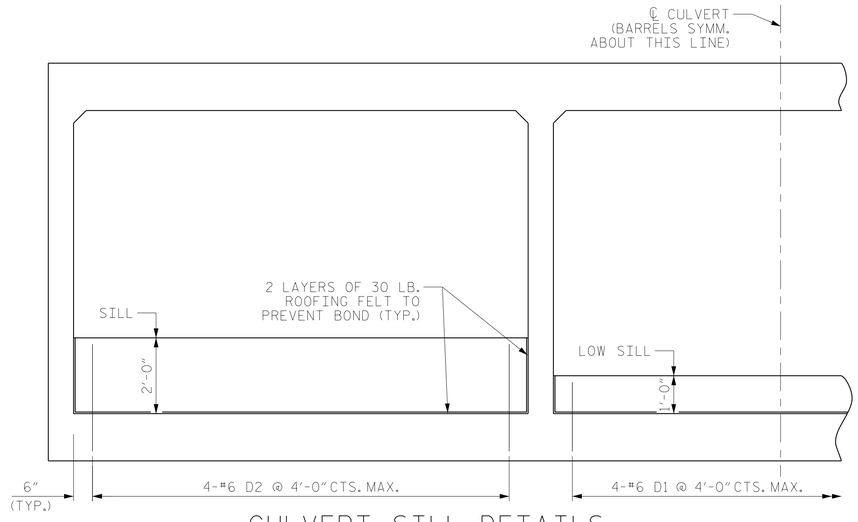
STAGED CULVERT



SECTION THROUGH SILL

* DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.

** SEE CULVERT SILL DETAILS FOR LOCATION AND HEIGHT OF SILL



CULVERT SILL DETAILS

LOOKING DOWNSTREAM

NOTES:

DOWELS SHALL BE USED TO CONNECT THE STAGE III AND STAGE IV CULVERT TO THE STAGE I AND STAGE II CULVERT AS SHOWN. FOR NOTE REGARDING SETTING OF DOWELS, SEE SHEET SN.

SILLS TO BE CONSTRUCTED AT INLET AND OUTLET AS SHOWN.

SILLS TO BE 1'-0" WIDE, CAST SEPARATELY AND ATTACHED BY DOWELS.

BACKFILL OVERFLOW BARREL AND LOW FLOW BARREL TO TOP OF SILL WITH NATIVE BED MATERIAL.

SEE "NATIVE MATERIAL SPECIFICATIONS FOR BACKFILLING" UNDER "ADDITIONAL INFORMATION AND COMPUTATIONS" OF THE CULVERT SURVEY & HYDRAULIC DESIGN REPORT.

THE ENTIRE COST OF WORK REQUIRED TO PLACE EXCAVATED OR SUPPLEMENTAL MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE LUMP SUM PRICE FOR CULVERT EXCAVATION.

PROJECT NO. U-5798B

CUMBERLAND COUNTY

STATION: 25+46.30 -LB-

SHEET 6 OF 8

DRAWN BY : NSC DATE : 12/2023
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RALEIGH

TRIPLE 12'-0" X 8'-0" CONCRETE BOX CULVERT DETAILS

90° SKEW

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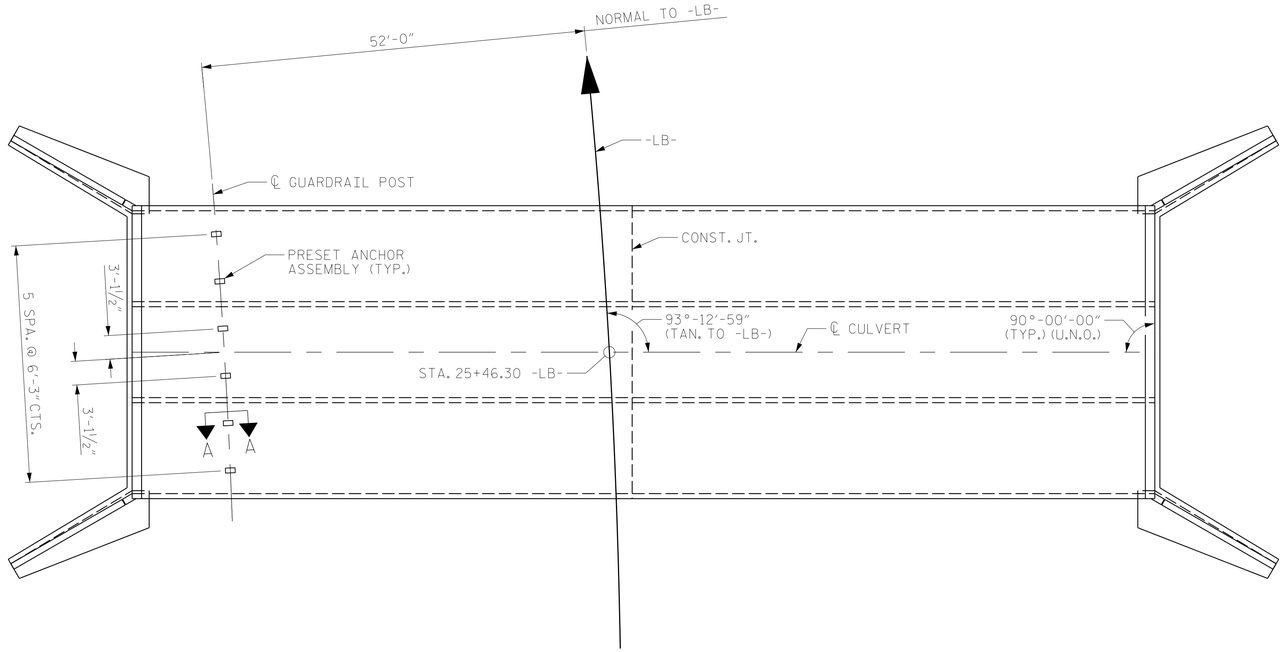
1			3			TOTAL SHEETS
2			4			8



PLAN OF CULVERT GUARDRAIL ANCHOR ASSEMBLY SPACING

NOTES

THE GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS SHALL CONSIST OF THE FOLLOWING COMPONENTS :

A. FERRULES SHALL BE MADE FROM STEEL MEETING THE REQUIREMENTS OF AASHTO M169, GRADE 12L14 AND SHALL HAVE A MINIMUM LENGTH OF THREADS OF 2½".

B. 4 - 1"Ø X 2¼" BOLTS WITH WASHERS, BOLTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A307. BOLTS AND WASHERS SHALL BE GALVANIZED. (AT THE CONTRACTOR'S OPTION, STAINLESS STEEL BOLTS AND WASHERS MAY BE USED AS AN ALTERNATE FOR THE 1"Ø X 2 ¼" GALVANIZED BOLTS AND WASHERS. THEY SHALL CONFORM TO OR EXCEED THE MECHANICAL REQUIREMENTS OF ASTM A307. THE USE OF THIS ALTERNATE SHALL BE APPROVED BY THE ENGINEER.)

C. WIRE STRUTS SHOWN IN THE GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS DETAIL ARE MINIMUM ALLOWABLE SIZE AND SHALL HAVE A MINIMUM TENSILE STRENGTH OF 100,000 P.S.I. AS AN OPTION, A 7/16"Ø WIRE STRUT WITH A MINIMUM TENSILE STRENGTH OF 90,000 PSI IS ACCEPTABLE.

GUARDRAIL ANCHOR ASSEMBLY WITH BOLTS SHALL BE ASSEMBLED IN THE SHOP. BOLT THREADS MAY BE RECUT AS NECESSARY TO INSURE FIT.

THE COST OF THE GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS COMPLETE IN PLACE, SHALL BE INCLUDED IN THE UNIT CONTRACT PRICE BID FOR CLASS "A" CONCRETE.

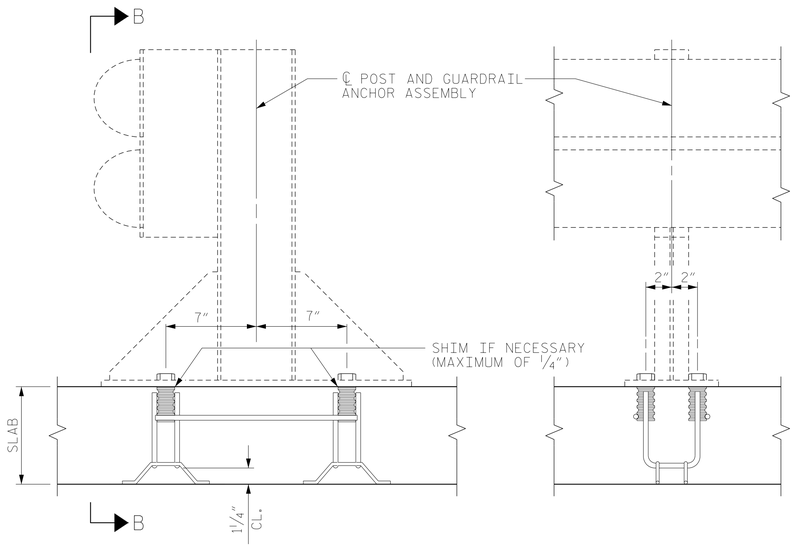
FERRULES TO BE PLUGGED DURING POURING OF SLAB AS RECOMMENDED BY THE MANUFACTURER.

AT THE CONTRACTOR'S OPTION, FERRULES WITH OPEN OR CLOSED ENDS MAY BE USED.

PAYMENT FOR GUARDRAIL, POSTS, AND POST BASE PLATES IS INCLUDED IN ROADWAY PAY ITEMS.

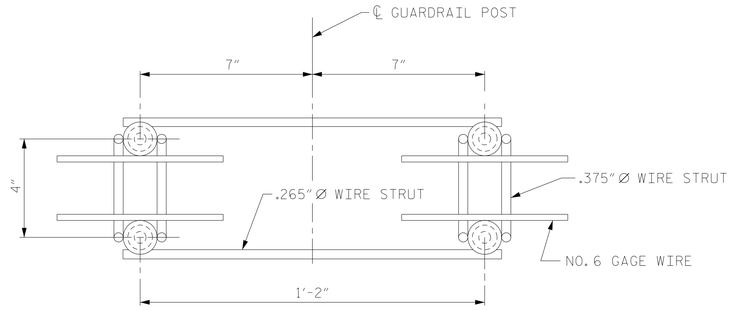
SLAB REINFORCING STEEL MAY BE SHIFTED AS NECESSARY TO CLEAR GUARDRAIL ANCHOR ASSEMBLY. CARE SHOULD BE TAKEN TO KEEP THE SHIFTING OF REINFORCING STEEL TO A MINIMUM.

THE CONTRACTOR MAY USE ADHESIVELY ANCHORED ANCHOR BOLTS IN PLACE OF GUARDRAIL ANCHOR ASSEMBLY. LEVEL TWO FIELD TESTING IS REQUIRED, AND THE YIELD LOAD OF THE 1"Ø BOLT IS 21.8 KIPS. FOR ADHESIVELY ANCHORED ANCHOR BOLTS OR DOWELS, SEE STANDARD SPECIFICATIONS.

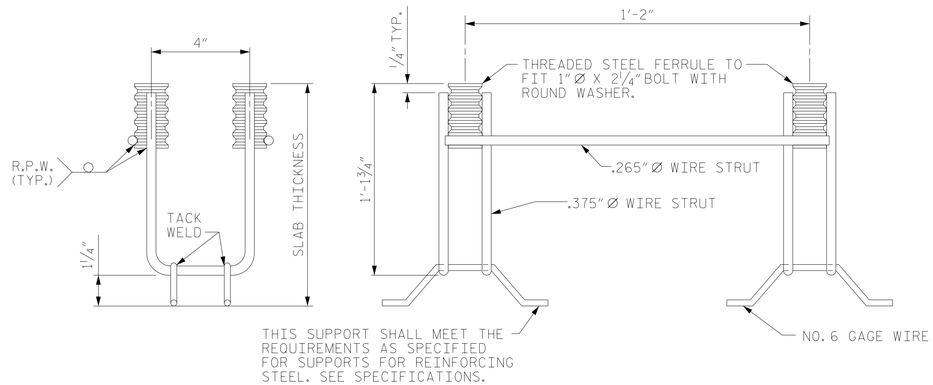


SECTION A-A

SECTION B-B



PLAN



ELEVATION

SIDE VIEW

GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS

PROJECT NO. U-5798B

CUMBERLAND COUNTY

STATION: 25+46.30 -LB-

SHEET 7 OF 8

ASSEMBLED BY : NSC		DATE : 12/2023	
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CHECKED BY : ARB 6/88	REV. 12/17	MAA/THC	
	REV. 6/19	MAA/THC	

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

ANCHORAGE DETAILS FOR GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-7
1			3			TOTAL SHEETS
2			4			8

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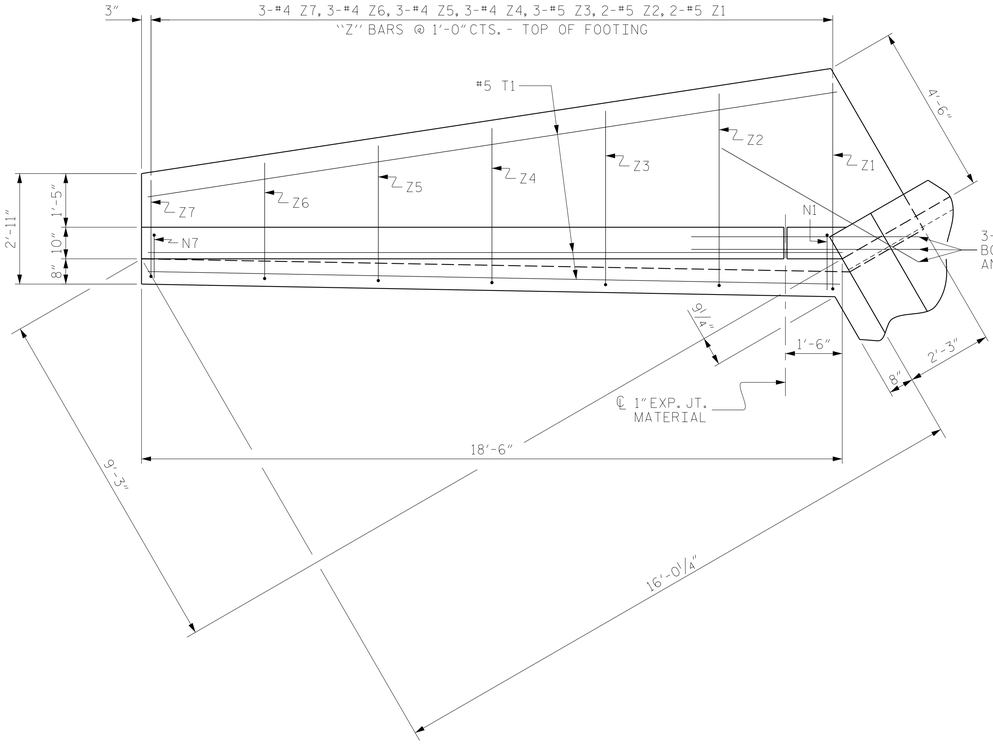
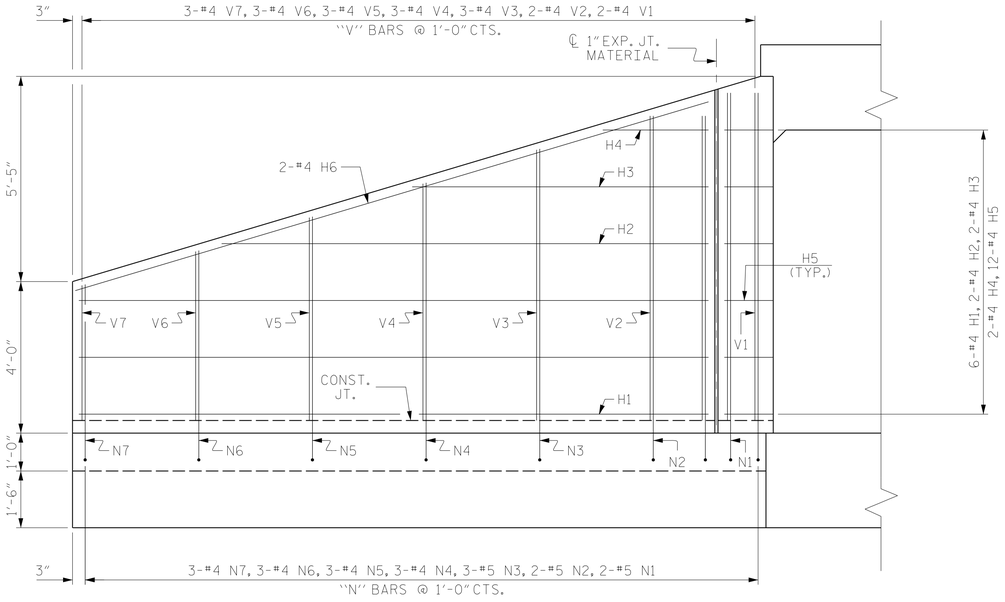
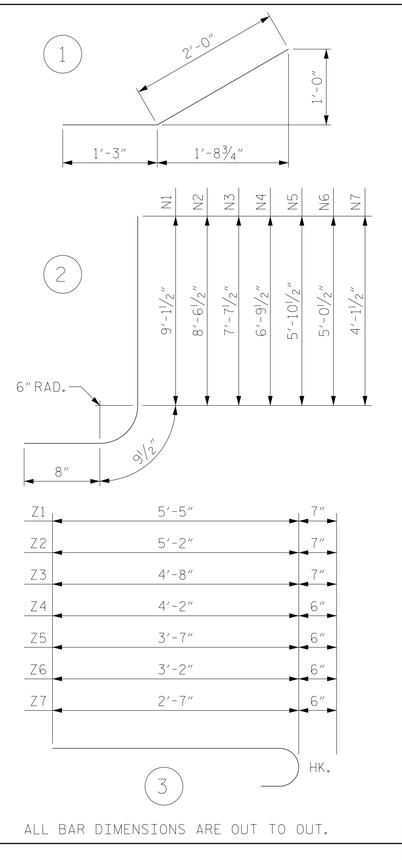


PLAN



ELEVATION

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL
STAGE I AND STAGE III (EACH STAGE)

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	6	#4	STR	16'-7"	66
H2	2	#4	STR	12'-10"	17
H3	2	#4	STR	7'-9"	10
H4	2	#4	STR	2'-9"	4
H5	12	#4	1	3'-3"	26
H6	2	#4	STR	17'-4"	23
N1	2	#5	2	10'-7"	22
N2	2	#5	2	10'-0"	21
N3	3	#5	2	9'-1"	28
N4	3	#4	2	8'-3"	17
N5	3	#4	2	7'-4"	15
N6	3	#4	2	6'-6"	13
N7	3	#4	2	5'-7"	11
S1	3	#6	STR	6'-0"	27
T1	3	#5	STR	18'-1"	57
V1	2	#4	STR	8'-6"	11
V2	2	#4	STR	7'-11"	11
V3	3	#4	STR	7'-0"	14
V4	3	#4	STR	6'-2"	12
V5	3	#4	STR	5'-3"	11
V6	3	#4	STR	4'-5"	9
V7	3	#4	STR	3'-6"	7
Z1	2	#5	3	6'-0"	13
Z2	2	#5	3	5'-9"	12
Z3	3	#5	3	5'-3"	16
Z4	3	#4	3	4'-8"	9
Z5	3	#4	3	4'-1"	8
Z6	3	#4	3	3'-8"	7
Z7	3	#4	3	3'-1"	6

REINFORCING STEEL FOR 1 WING 503 LBS.

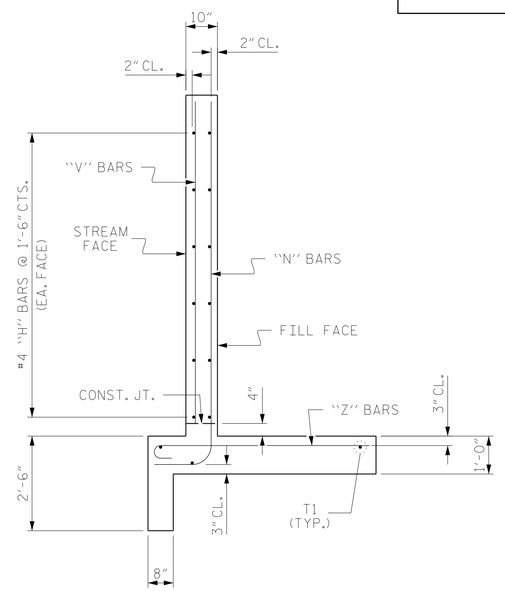
CLASS A CONCRETE
- 1 WING 7.1 CY
- 1 HEADWALL 0.0 CY
- 1 END CURTAIN WALL 1.2 CY
- TOTAL 8.3 CY

BILL OF MATERIAL
STAGE II AND STAGE IV (EACH STAGE)

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	6	#4	STR	16'-7"	66
H2	2	#4	STR	12'-10"	17
H3	2	#4	STR	7'-9"	10
H4	2	#4	STR	2'-9"	4
H5	12	#4	1	3'-3"	26
H6	2	#4	STR	17'-4"	23
N1	2	#5	2	10'-7"	22
N2	2	#5	2	10'-0"	21
N3	3	#5	2	9'-1"	28
N4	3	#4	2	8'-3"	17
N5	3	#4	2	7'-4"	15
N6	3	#4	2	6'-6"	13
N7	3	#4	2	5'-7"	11
S1	3	#6	STR	6'-0"	27
T1	3	#5	STR	18'-1"	57
V1	2	#4	STR	8'-6"	11
V2	2	#4	STR	7'-11"	11
V3	3	#4	STR	7'-0"	14
V4	3	#4	STR	6'-2"	12
V5	3	#4	STR	5'-3"	11
V6	3	#4	STR	4'-5"	9
V7	3	#4	STR	3'-6"	7
Z1	2	#5	3	6'-0"	13
Z2	2	#5	3	5'-9"	12
Z3	3	#5	3	5'-3"	16
Z4	3	#4	3	4'-8"	9
Z5	3	#4	3	4'-1"	8
Z6	3	#4	3	3'-8"	7
Z7	3	#4	3	3'-1"	6

REINFORCING STEEL FOR 1 WING 503 LBS.

CLASS A CONCRETE
- 1 WING 7.1 CY
- 1 HEADWALL 1.8 CY
- 1 END CURTAIN WALL 1.5 CY
- TOTAL 10.4 CY



TYPICAL WING SECTION

PROJECT NO. U-5798B
CUMBERLAND COUNTY
STATION: 25+46.30 -LB-

SHEET 8 OF 8

DRAWN BY : NSC DATE : 12/2023
CHECKED BY : MRA DATE : 12/2023
DESIGN ENGINEER OF RECORD: MRA DATE : 03/2025

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6/19/2025
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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR CONCRETE BOX CULVERT

H = 8'-0" SLOPE = 3:1
90° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-8
1			3			TOTAL SHEETS
2			4			8

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 2024 "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 ¾" WITH THE FOLLOWING EXCEPTIONS: TOP CORNERS OF CURBS MAY BE ROUNDED TO 1½" RADIUS WHICH IS BUILT INTO CURB FORMS; CORNERS OF TRANSVERSE FLOOR EXPANSION JOINTS SHALL BE ROUNDED WITH A ¼" 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 ¼" 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 ⅞" Ø SHEAR STUDS FOR THE ¾" Ø STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - ⅞" Ø STUDS FOR 4 - ¾" Ø STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF ⅞" Ø STUDS ALONG THE BEAM AS SHOWN FOR ¾" Ø STUDS BASED ON THE RATIO OF 3 - ⅞" Ø STUDS FOR 4 - ¾" Ø 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 5/16" 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 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. FINS 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

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