TIP PROJECT: A-0009CD

CONTRACT: C205159

CULVERTS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	A-0009CD		

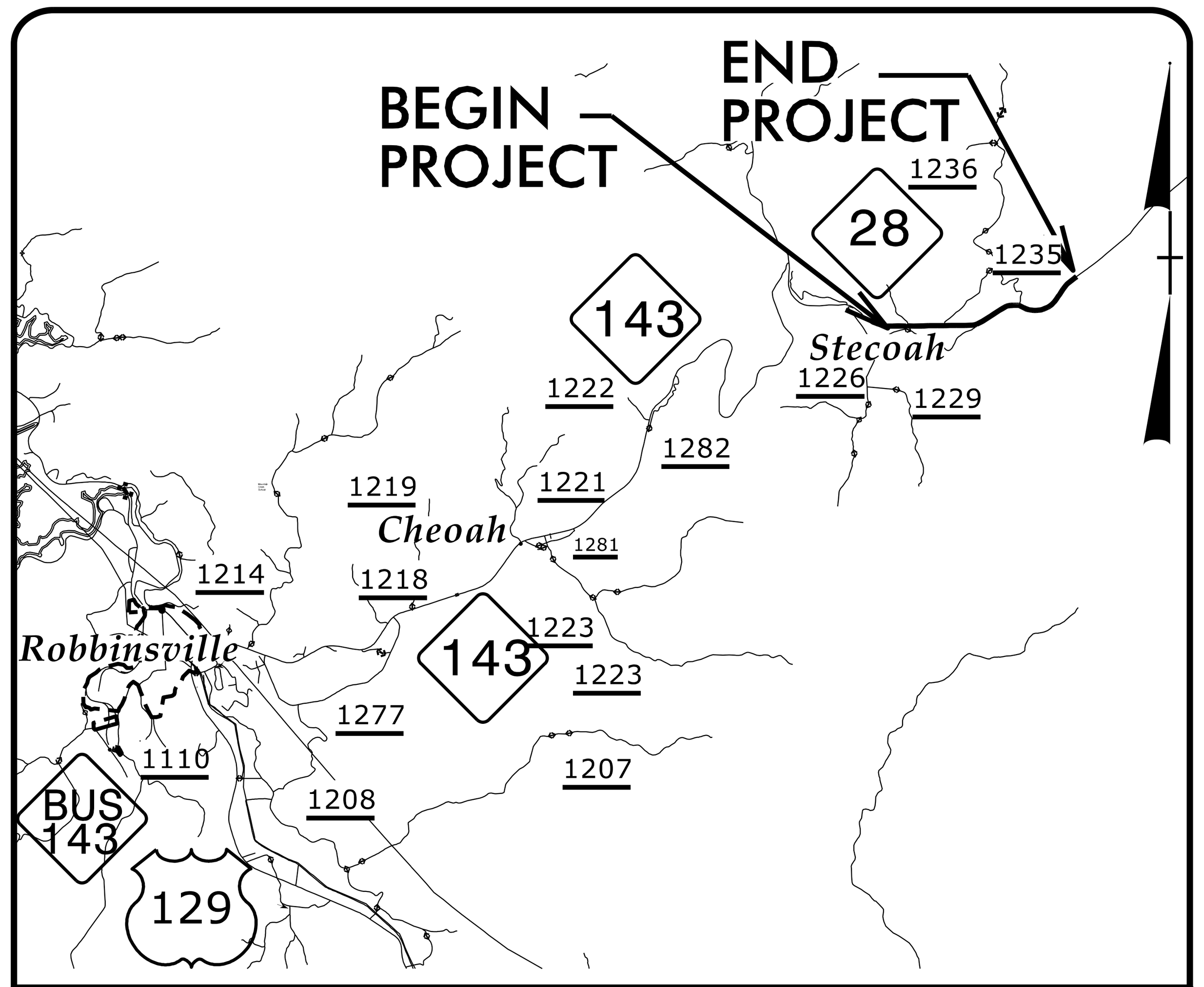
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
32572.1.15		PE
32572.3.19	0028011	CONST.

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

GRAHAM COUNTY

LOCATION: UPGRADE NC 28 FROM 0.2 MILES WEST OF SR 1228 (STECOAH RD.) TO 0.3 MILES EAST OF SR 1235 (GUNTERS GAP RD)

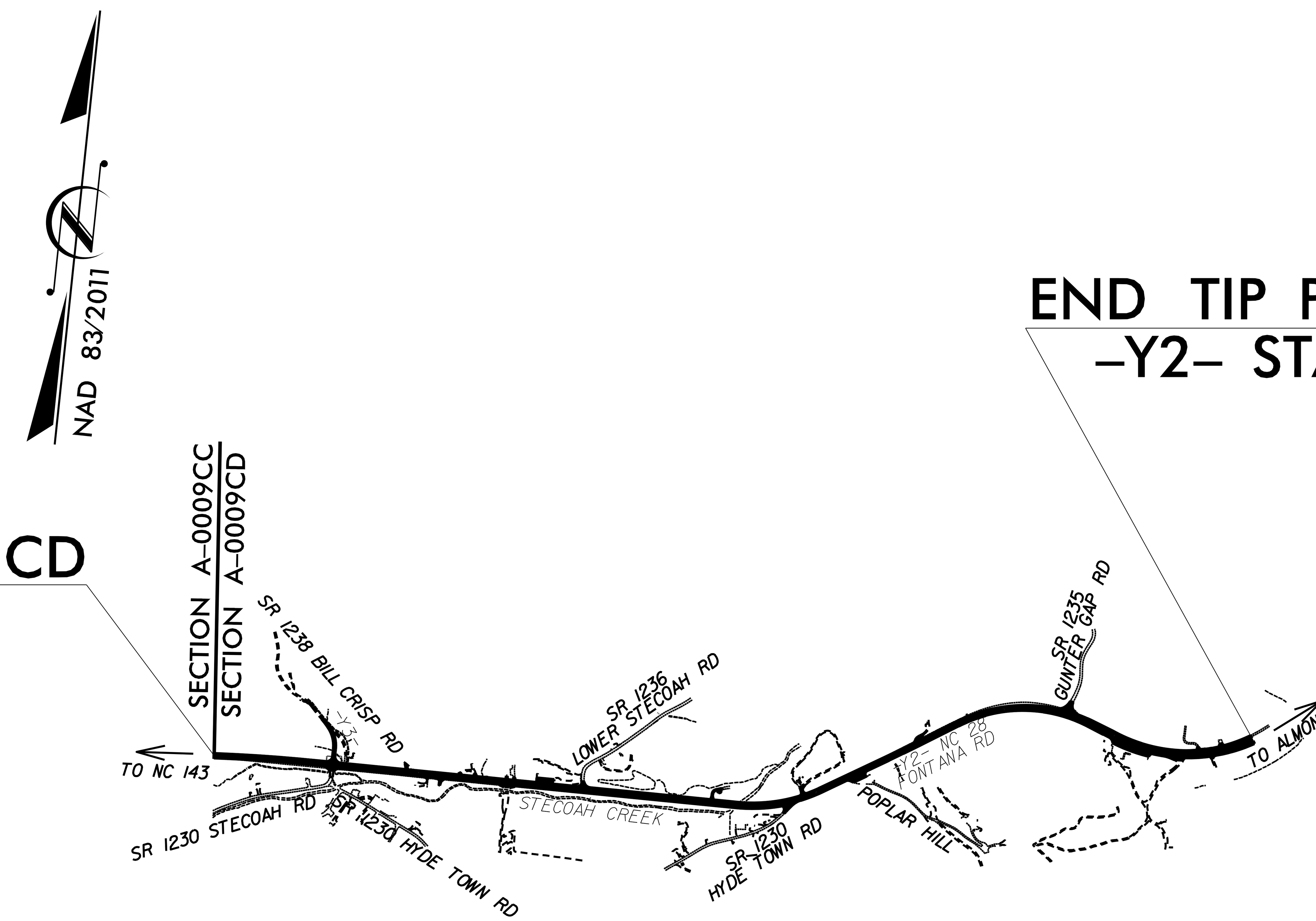
TYPE OF WORK: GRADING, PAVING, DRAINAGE, CULVERTS, & RETAINING WALLS



VICINITY MAP

BEGIN TIP PROJECT A-0009CD
-Y2- STA. 89+80.00

END TIP PROJECT A-0009CD
-Y2- STA. 169+60.00



-Y2- DESIGN DATA

ADT 2022 = 3800
ADT 2045 = 5200
K = 11 %
D = 67.5 %
T = 7 % *
V = 50 MPH
* TTST = 2% DUAL = 5%
FUNC CLASS = RURAL ARTERIAL REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT A-0009CD: = 1.511 MILES

TOTAL LENGTH TIP PROJECT A-0009CD = 1.511 MILES

NCDOT CONTACT: WANDA H. AUSTIN, PE

PLANS PREPARED BY:	*PLANS PREPARED FOR:*
TGS ENGINEERS 201 W. MARION ST SHELBY, NC 28150 PH (704) 476-0003 CORP. LICENSE NO.: C-0275	NORTH CAROLINA DEPARTMENT OF TRANSPORATION DIVISION 14 252 Webster Rd Sylva, NC 28779
LETTING DATE: MAY 19, 2026	MARC CHEEK, PE *STRUCTURES DESIGN ENGINEER*
2024 STANDARD SPECIFICATIONS	

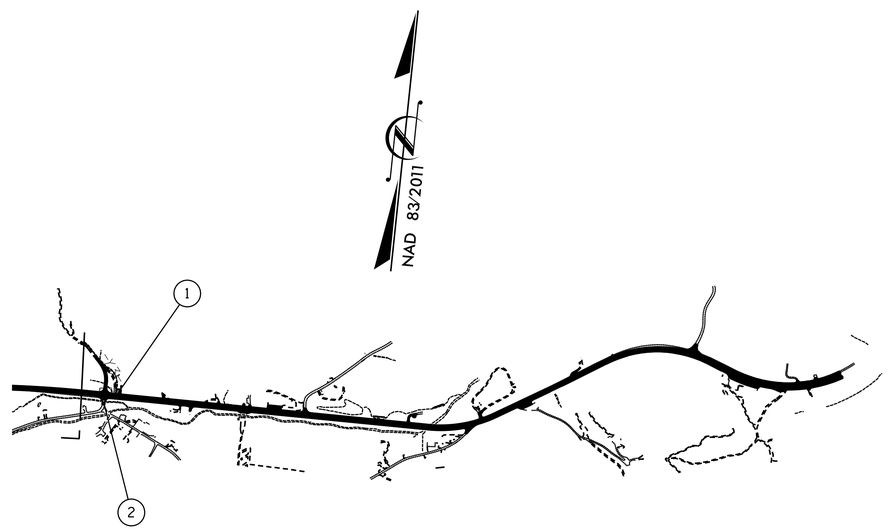
STRUCTURES DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 20125 MARSHALL G. CHEEK, JR.

2/18/2026

INDEX

STR	STATION	DESCRIPTION	SHEET NUMBERS
1	99+82.00 -Y2-	SINGLE 12 FT. X 5 FT. REINFORCED CONCRETE BOX CULVERT	C1-1 THRU C1-6
2	10+67.00 -Y3A-	DOUBLE 6 FT. X 6 FT. REINFORCED CONCRETE BOX CULVERT	C2-1 THRU C2-7
W41	146+60.00 -Y2- TO 148+80.00 -Y2-	SOIL NAIL RETAINING WALL	W41-1 THRU W41-3



NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL G. GREEK, JR.
Marshall G. Greek, Jr.
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2/18/2026

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
201 W. MARION ST STE 200
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

PROJECT NO. A-0009CD

GRAHAM COUNTY

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STRUCTURE INDEX

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

DRAWN BY : S.B. WILLIAMS DATE : 10-22
CHECKED BY : MGC DATE : 10-22

9/17/2025
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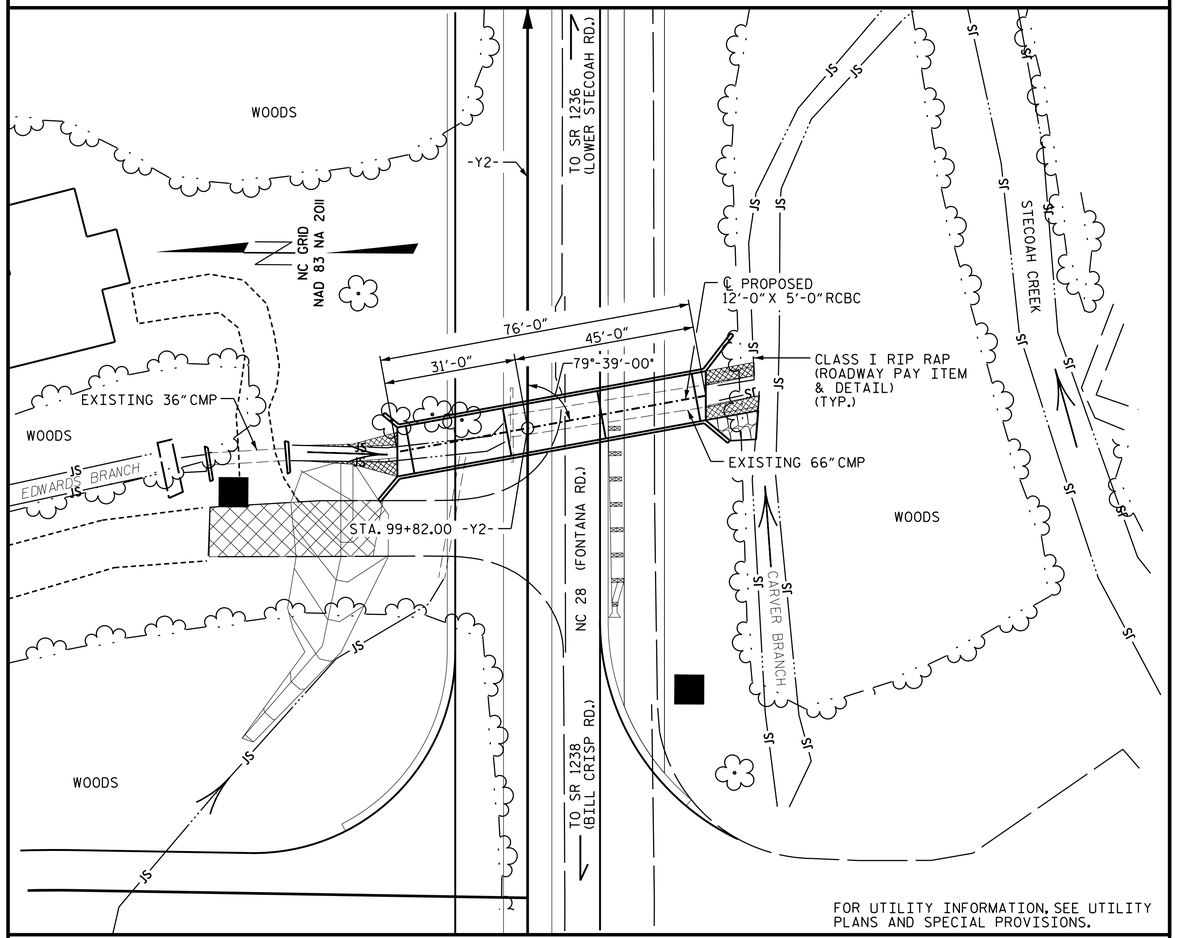
User:ZSmith

F.A. PROJECT NO. 0028011

BENCH MARK *38: SPIKE NAIL IN 6"X 6" BRIDGE BEAM; 167.93' RT OF STA. 98+81.40 -Y2-; ELEV. = 2021.11



LOCATION SKETCH

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE		
BARREL @ 1.28 CY/FT	97.3	C.Y.
WINGS, ETC.	13.9	C.Y.
SILLS	2.4	C.Y.
TOTAL	113.6	C.Y.
REINFORCING STEEL		
BARREL & SILLS	10,994	LBS.
WINGS, ETC.	744	LBS.
TOTAL	11,738	LBS.
CULVERT EXCAVATION	LUMP SUM	
FOUNDATION COND. MAT'L.	93 TONS	

ROADWAY DATA

GRADE POINT ELEV. @ STA. 99+82.00-Y2- = 2022.33
BED ELEV. @ STA. 99+82.00-Y2- = 2014.04
ROADWAY SLOPES = 2:1

HYDROGRAPHIC DATA

DESIGN DISCHARGE = 300 CFS
FREQUENCY OF DESIGN FLOOD = 50 YRS
DESIGN HIGH WATER ELEVATION = 2021.3
DRAINAGE AREA = 0.33 SQ. MI.
BASE DISCHARGE (Q100) = 370 CFS
BASE HIGH WATER ELEVATION = 2021.4

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE = 300 CFS
FREQUENCY OF OVERTOPPING FLOOD = ±50 YRS
OVERTOPPING FLOOD ELEVATION = 2021.3 ✳

✳ SHOULDER POINT ELEV @ STA. 100+50 -L-

NOTES:

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

DESIGN FILL---------- 4' MAX.; 4" MIN.

FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.

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

CONCRETE IN 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.

TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. 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 EXTERIOR WALL ABOVE 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.

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

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.

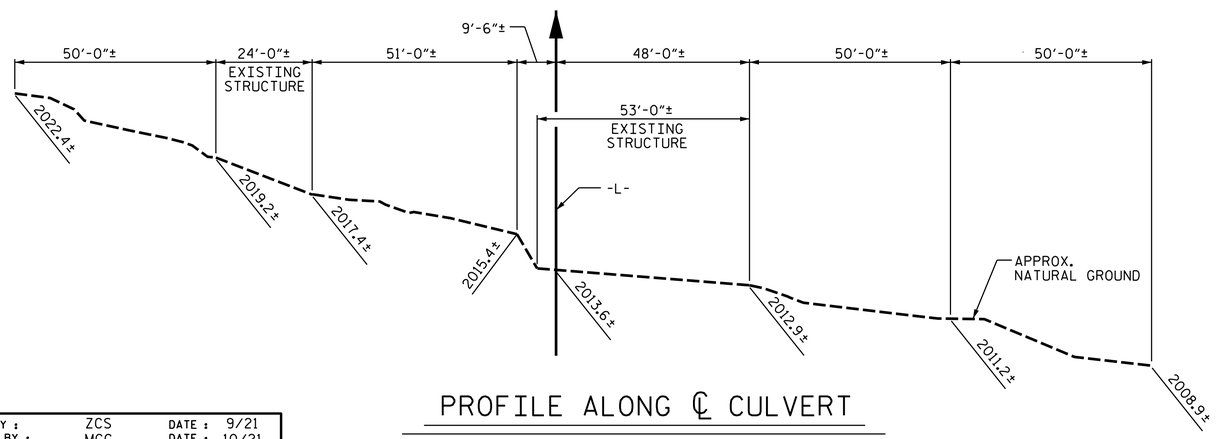
FOR TRAFFIC PHASING, SEE TRAFFIC CONTROL PLANS.

AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAIL DRAWINGS FOR A PRECAST REINFORCED CONCRETE BOX CULVERT IN LIEU OF THE CAST-IN-PLACE CULVERT SHOWN ON THE PLANS. THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIONAL PRECAST REINFORCED CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.

THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.

EXCAVATE 12 INCHES BELOW THE BOTTOM OF THE CULVERT AND REPLACE WITH FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH ARTICLE 414 OF THE STANDARD SPECIFICATIONS. FOUNDATION CONDITIONING MATERIAL SHOULD CONSIST OF SELECT MATERIAL CLASS V OR VI FOR CULVERTS.

IF REQUIRED, UNDERCUT LOOSE SOILS THAT MAY BE ENCOUNTERED BENEATH THE BOTTOM OF THE FOUNDATION CONDITIONING MATERIAL. BACKFILL UNDERCUT AREAS WITH FOUNDATION CONDITIONING MATERIAL.



PROFILE ALONG ℄ CULVERT

SAMPLE BAR REPLACEMENT	
SIZE	LENGTH
#3	6'-2"
#4	7'-4"
#5	8'-6"
#6	9'-8"
#7	10'-10"
#8	12'-0"
#9	13'-2"
#10	14'-6"
#11	15'-10"

NOTE:
SAMPLE BAR REPLACEMENT LENGTHS BASED ON 30" (SAMPLE LENGTH) PLUS TWO SPLICE LENGTHS AND f, = 60ksi.

PROJECT NO. A-0009CD
GRAHAM COUNTY
STATION: 99+82.00 -Y2-

SHEET 1 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 12 FT. x 5 FT. CONCRETE BOX CULVERT 79°-39'-00" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER
MARSHALL G. BAKER, JR.
Marshall G. Baker, Jr.
5FBCC2F3A4DC413...
2/18/2026

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
201 W. MARION ST STE 200
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-1
1			3			TOTAL SHEETS
2			4			6

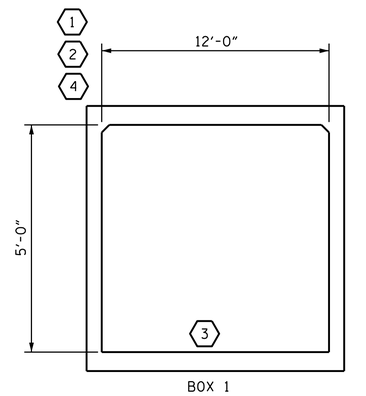
DRAWN BY :	ZCS	DATE :	9/21
CHECKED BY :	MGC	DATE :	10/21
DESIGN ENGINEER OF RECORD :	ZCS	DATE :	10/21

1/6/2026
X:\NCDOT\A-0009\Structures\A-0009CD\STR. #1 99+82.00 -Y2-\Final Plans\DGNs\411_001_A-0009CD_SMU_CU01.dgn
User:ZSmith

STR. #1

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	1.06	1	TOP SLAB	6.67	1.05	1	TOP SLAB	0.33	
		HL-93 (OPERATING)	N/A		1.36	--	1.35	1.37	1	TOP SLAB	6.67	1.36	1	TOP SLAB	0.33	
		HS-20 (INVENTORY)	36.000	2	1.09	39.24	1.75	1.10	1	TOP SLAB	6.67	1.09	1	TOP SLAB	0.33	
		HS-20 (OPERATING)	36.000		1.42	51.12	1.35	1.43	1	TOP SLAB	6.67	1.42	1	TOP SLAB	0.33	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		2.29	30.92	1.40	2.29	1	TOP SLAB	6.67	2.84	1	TOP SLAB	0.33	
		SNGARBS2	20.000		2.14	42.80	1.40	2.14	1	TOP SLAB	6.67	2.59	1	TOP SLAB	0.33	
		SNAGRIS2	22.000		2.29	50.38	1.40	2.29	1	TOP SLAB	6.67	2.84	1	TOP SLAB	0.33	
		SNCOTTS3	27.250		1.31	35.70	1.40	1.32	1	TOP SLAB	6.67	1.31	1	TOP SLAB	0.33	
		SNAGGRS4	34.925	3	1.27	44.35	1.40	1.27	1	BOTT. SLAB	6.67	1.39	1	BOTT. SLAB	0.33	
		SNS5A	35.550		1.31	46.57	1.40	1.31	1	BOTT. SLAB	6.67	1.45	1	BOTT. SLAB	0.33	
		SNS6A	39.950		1.30	51.94	1.40	1.30	1	BOTT. SLAB	6.67	1.42	1	BOTT. SLAB	0.33	
		SNS7B	42.000		1.30	54.60	1.40	1.30	1	BOTT. SLAB	6.67	1.42	1	BOTT. SLAB	0.33	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		1.62	53.46	1.40	1.62	1	BOTT. SLAB	6.67	1.80	1	BOTT. SLAB	0.33	
		TNT4A	33.075		1.57	51.93	1.40	1.57	1	TOP SLAB	6.67	1.58	1	TOP SLAB	0.33	
		TNT6A	41.600		1.36	56.58	1.40	1.36	1	BOTT. SLAB	6.67	1.47	1	TOP SLAB	0.33	
		TNT7A	42.000		1.47	61.74	1.40	1.47	1	BOTT. SLAB	6.67	1.52	1	TOP SLAB	0.33	
		TNT7B	42.000		1.32	55.44	1.40	1.32	1	BOTT. SLAB	6.67	1.43	1	BOTT. SLAB	0.33	
		TNAGRIT4	43.000		1.57	67.51	1.40	1.57	1	TOP SLAB	6.67	1.58	1	TOP SLAB	0.33	
		TNAGT5A	45.000		1.57	70.65	1.40	1.57	1	TOP SLAB	6.67	1.58	1	TOP SLAB	0.33	
		TNAGT5B	45.000		1.57	70.65	1.40	1.57	1	TOP SLAB	6.67	1.58	1	TOP SLAB	0.33	
EMERGENCY VEHICLE (EV)		EV2	28.750		1.61	46.29	1.30	1.61	1	TOP SLAB	6.67	1.75	1	TOP SLAB	0.33	
		EV3	43.000	4	1.14	49.45	1.30	1.15	1	TOP SLAB	6.67	1.14	1	TOP SLAB	0.33	



BOX 1

LRFR SUMMARY

(LOOKING DOWNSTREAM)

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.

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 VEHICLE RATING **

** SEE CHART FOR VEHICLE TYPE

PROJECT NO. A-0009CD

GRAHAM COUNTY

STATION: 99+82.00 -Y2-

SHEET 2 OF 6

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL G. CHEEK, JR.

Signature: Marshall G. Cheek, Jr.

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2/18/2026

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TGS ENGINEERS
201 W. MARION ST STE 200
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

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

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-2
1			3			TOTAL SHEETS
2			4			6

ASSEMBLED BY :	ZCS	DATE :	06/21
CHECKED BY :	MGC	DATE :	10/21
DRAWN BY : WMC	7/11	REV. 10/1/11	MAA/GM
CHECKED BY : GM	7/11	REV. 12/17	MAA/THC

11/11/2025
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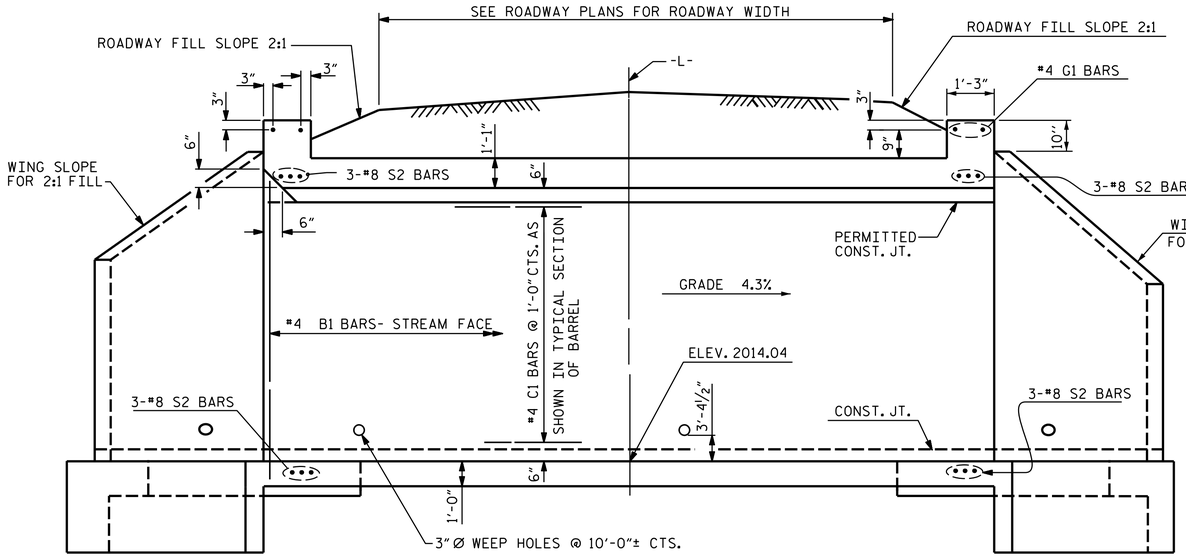
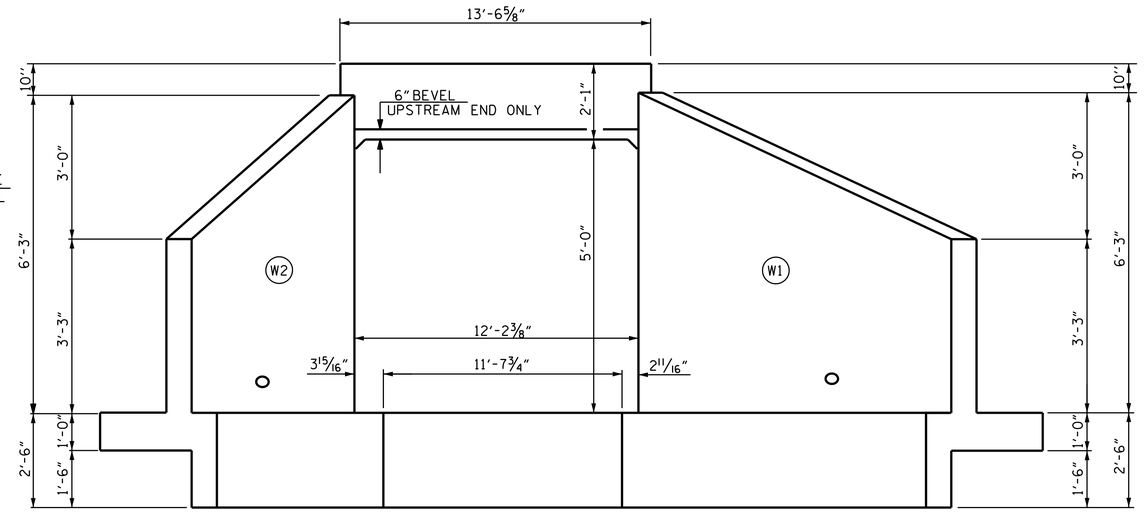
User:smassinople

STR. #1

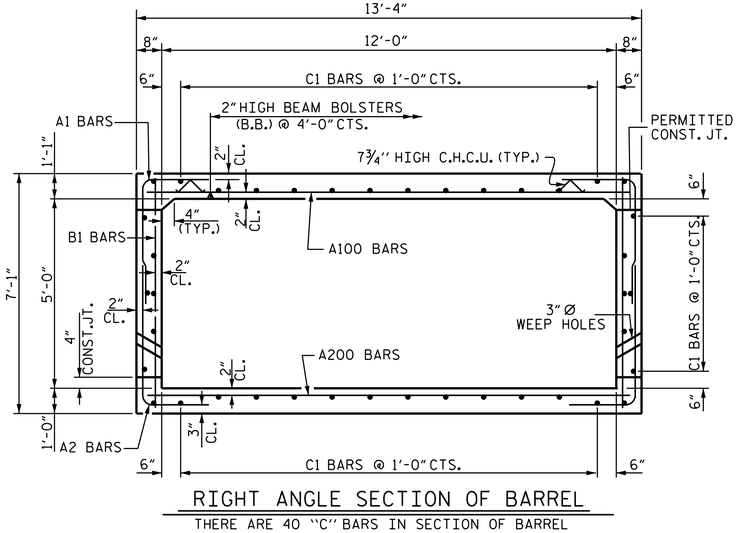
STD. NO. LRFR5



CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION NORMAL TO SKEW



RIGHT ANGLE SECTION OF BARREL

THERE ARE 40 "C" BARS IN SECTION OF BARREL

PROJECT NO. A-0009CD

GRAHAM COUNTY

STATION: 99+82.00 -Y2-

SHEET 3 OF 6

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL G. CHEEK, JR.

Marshall G. Cheek, Jr.

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2/18/2026

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TGS ENGINEERS
201 W. MARION ST STE 200
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 12 FT. X 5 FT.
CONCRETE BOX CULVERT
79°-39'-00" SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-3
1			3			TOTAL SHEETS
2			4			6

DRAWN BY :	ZCS	DATE : 06/21
CHECKED BY :	MGC	DATE : 10/21
DESIGN ENGINEER OF RECORD :	ZCS	DATE : 10/21

9/17/2025
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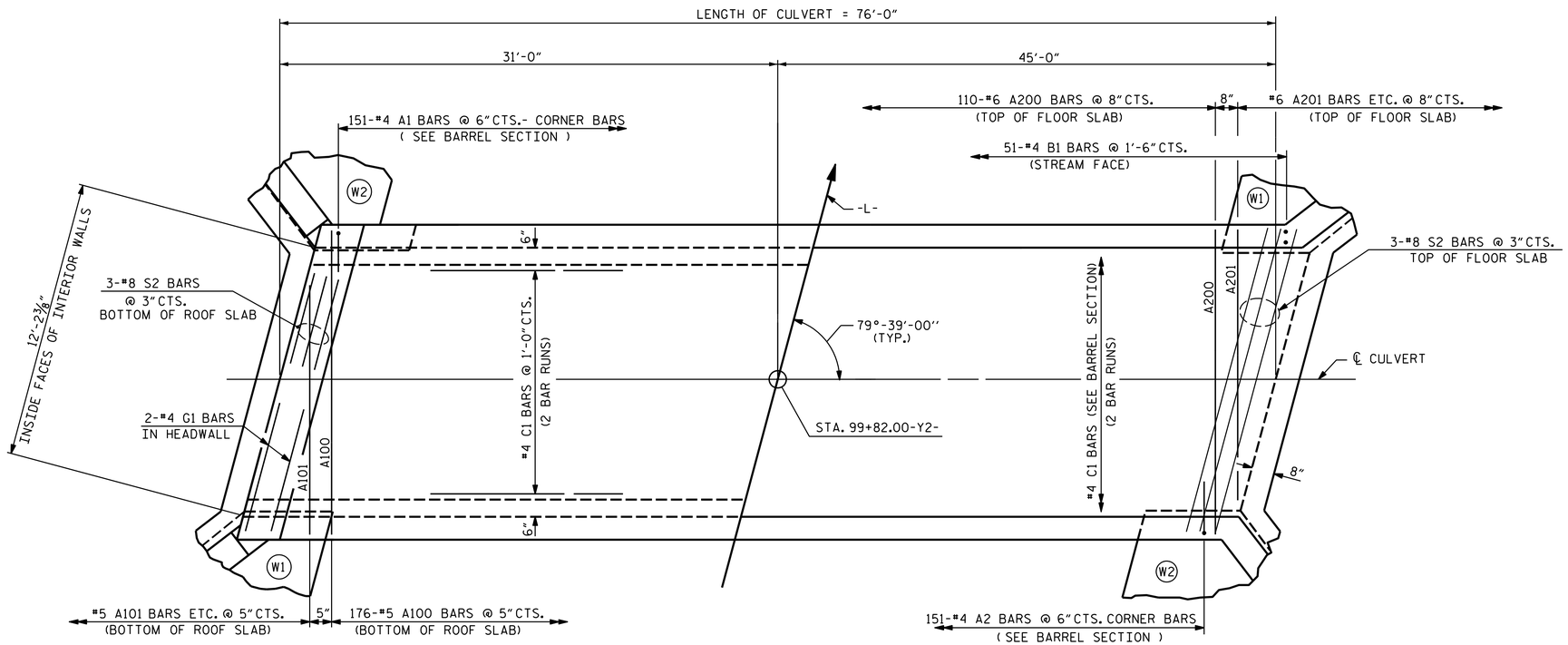

PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

PROJECT NO. A-0009CD

GRAHAM COUNTY

STATION: 99+82.00 -Y2-

SHEET 4 OF 6

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER

MARSHALL G. CHEEK, JR.

Marshall G. Cheek, Jr.

5FBCC2F3A4DC413...

2/18/2026

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201 W. MARION ST STE 200
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CORP. LICENSE NO.: C-0275

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 12 FT. X 5 FT. CONCRETE BOX CULVERT
79°-39'-00" SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-4
1			3			TOTAL SHEETS
2			4			6

STR. #1

DRAWN BY :	ZCS	DATE : 05/21
CHECKED BY :	MGC	DATE : 10/21
DESIGN ENGINEER OF RECORD:	ZCS	DATE : 10/21

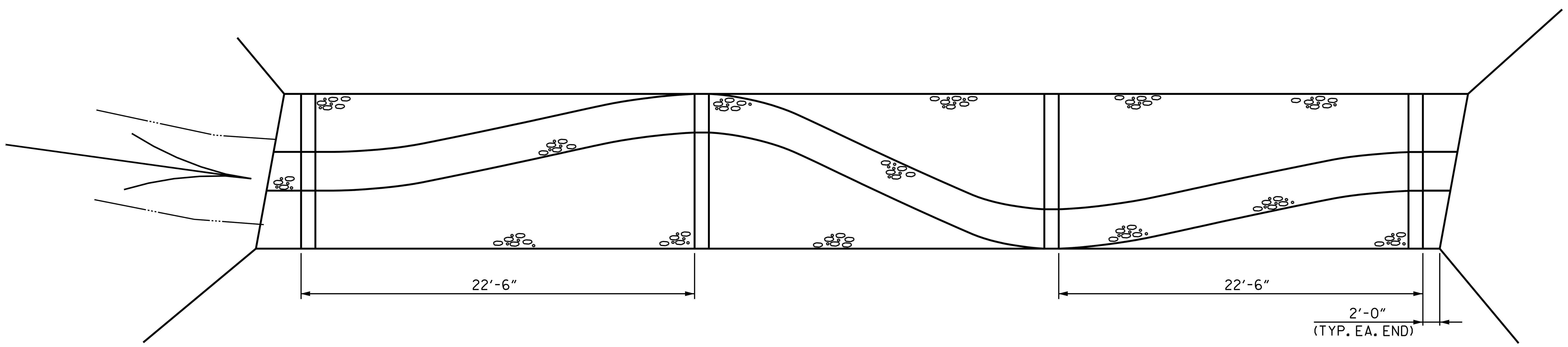
1/6/2026
X:\NCDOT\A-0009\Structures\A-0009CD\STR. #1 99+82.00 -Y2-\Final Plans\DGNs\411_007_A-0009CD_SMU_CU04.dgn
User:ZSmith

NOTES

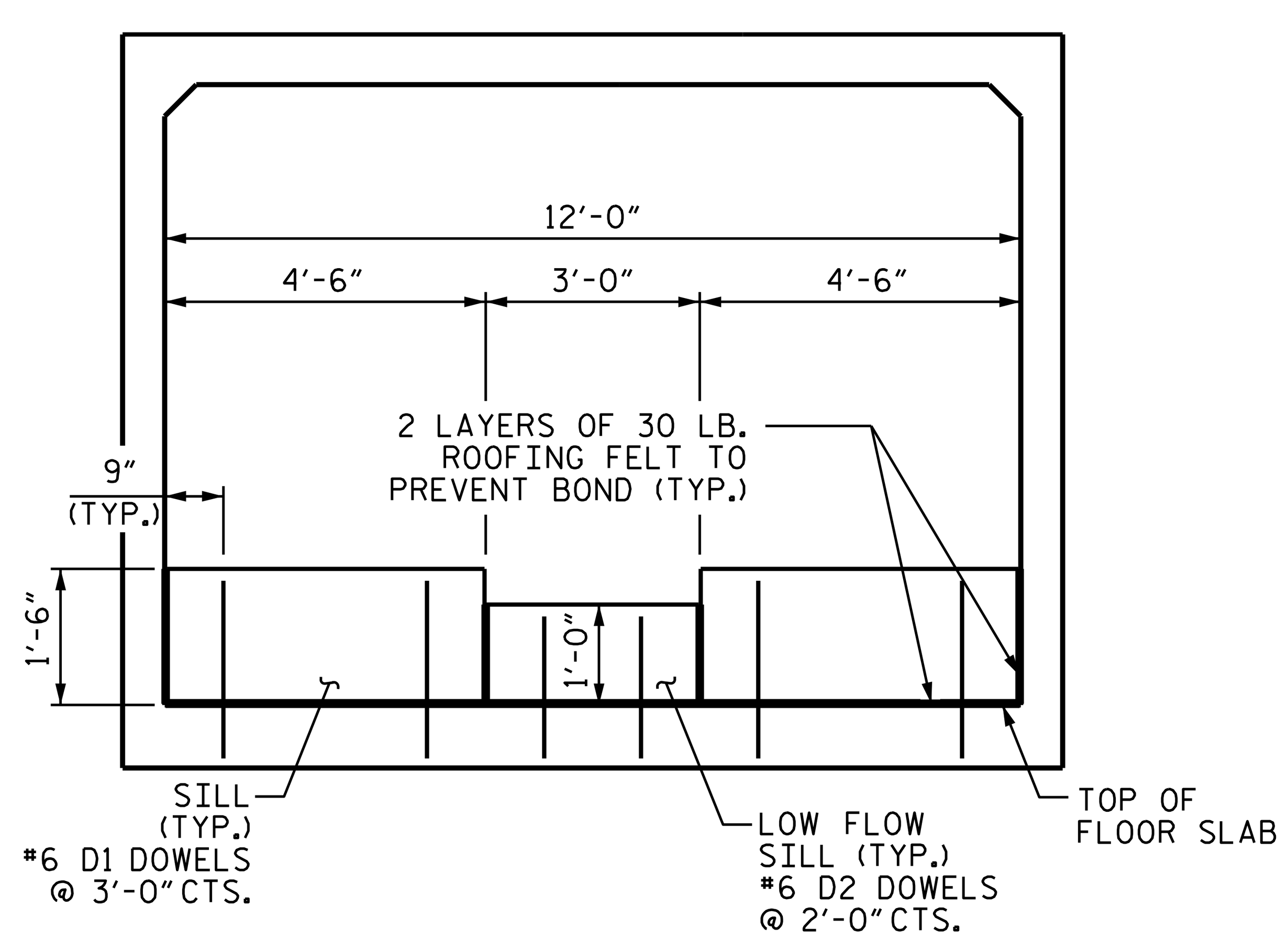
MATERIAL EXCAVATED FROM THE EXISTING BED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT. BED MATERIAL MAY BE SUPPLEMENTED WITH CLASS B RIP RAP AS NECESSARY. NATIVE MATERIAL SHOULD BE PLACED ON TOP TO PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE. BED MATERIAL IS SUBJECT TO THE APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

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

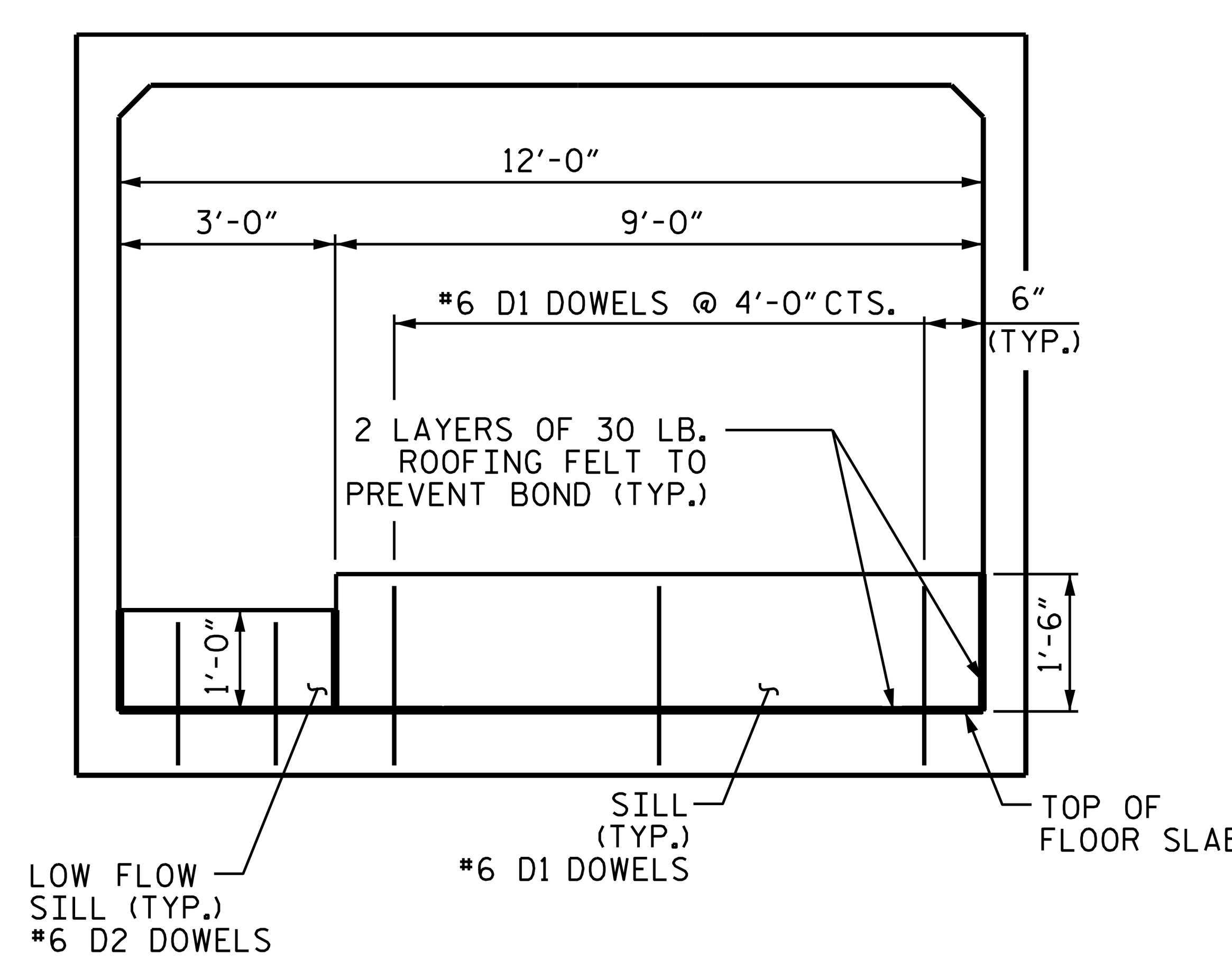
THE ENTIRE COST OF WORK REQUIRED TO CONSTRUCT THE SILLS SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.



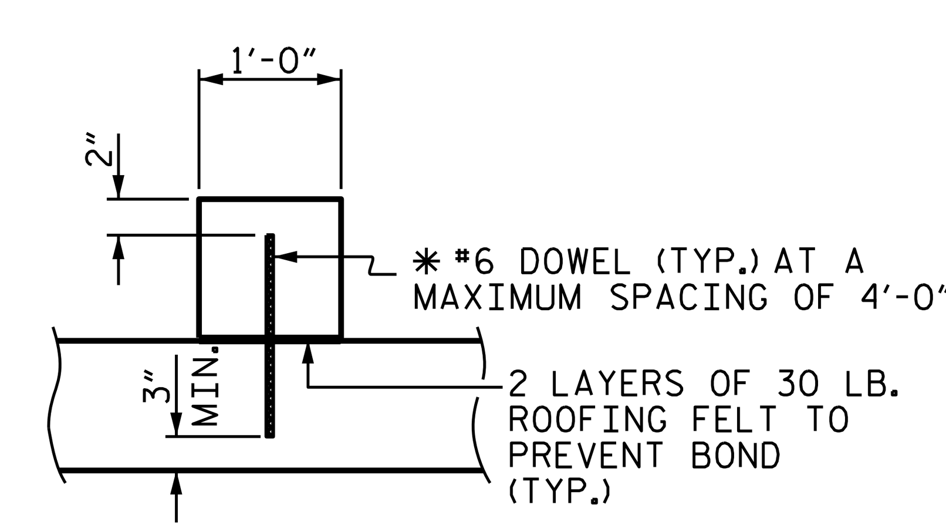
PLAN OF FLOOR SILL LAYOUT



INLET/OUTLET SILL ELEVATION



INTERNAL SILL ELEVATION

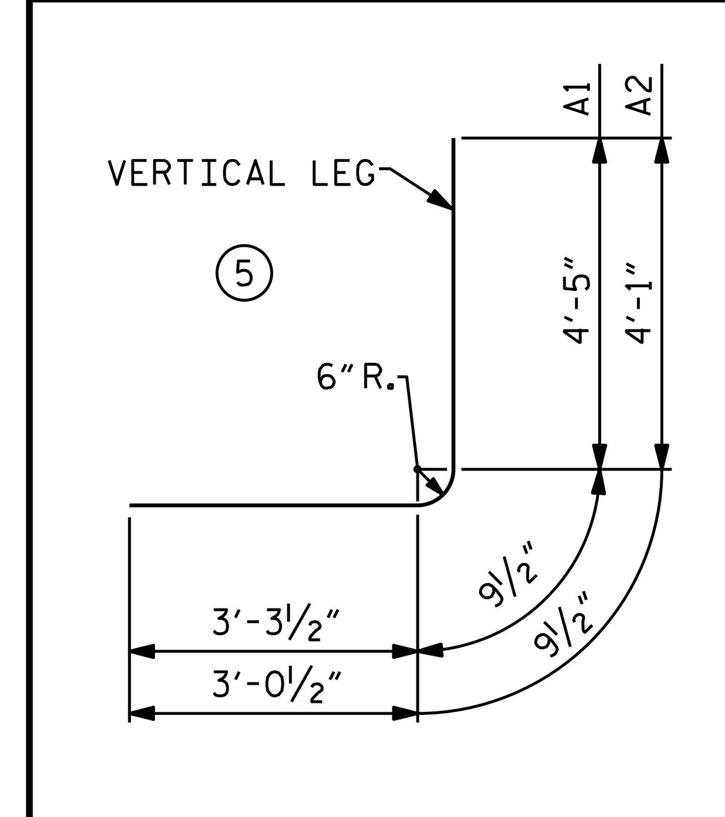


SECTION THROUGH SILL

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

SILL DETAILS

BAR TYPE



DIMENSIONS ARE OUT TO OUT

SPLICE LENGTHS CHART

BAR	SIZE	SPLICE LENGTH
"B"	#4	1'-10"
C1	#4	1'-10"

BAR SCHEDULE

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	302	#4	5	8'-6"	1715
A2	302	#4	5	7'-11"	1597
A100	176	#5	STR	12'-11"	2371
A101	2	#5	STR	11'-3"	23
A102	2	#5	STR	8'-11"	19
A103	2	#5	STR	6'-8"	14
A104	2	#5	STR	4'-4"	9
A200	110	#6	STR	12'-11"	2134
A201	2	#6	STR	10'-6"	32
A202	2	#6	STR	6'-11"	21
A203	2	#6	STR	3'-3"	10
B1	102	#4	STR	6'-8"	454
C1	80	#4	STR	38'-10"	2075
D1	14	#6	STR	2'-1"	44
D2	8	#6	STR	1'-7"	19
G1	4	#4	STR	13'-2"	35
S2	12	#8	STR	13'-2"	422

REINFORCING STEEL 10,994 LBS

PROJECT NO. A-0009CD

GRAHAM COUNTY

STATION: 99+82.00 -Y2-

SHEET 5 OF 6

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL C. CHEEK, JR.

Signed by: Marshall C. Cheek, Jr.
5FBCC2F3A4DC413...

2/18/2026

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
201 W. MARION ST STE 200
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 12 FT. X 5 FT. CONCRETE BOX CULVERT

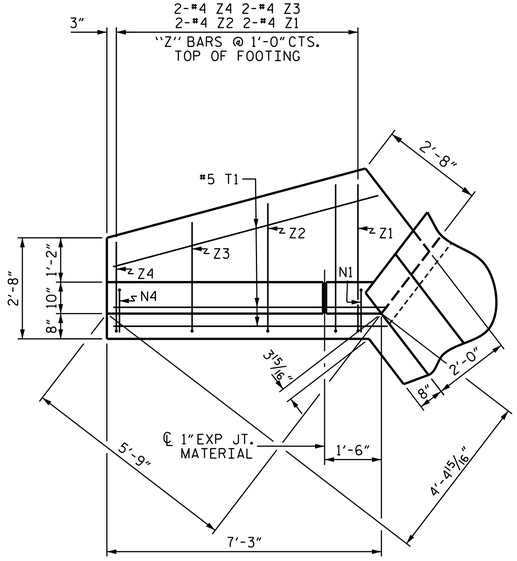
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO. C1-5
TOTAL SHEETS 6

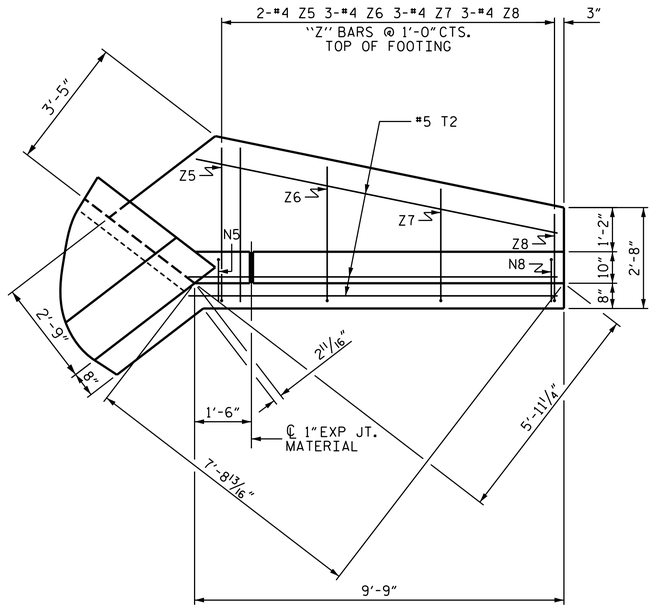
DRAWN BY :	ZCS	DATE :	09/21
CHECKED BY :	MGC	DATE :	10/21
DESIGN ENGINEER OF RECORD:	ZCS	DATE :	10/21

1/6/2026
X:\NCDOT\A-0009\Structures\A-0009CD\STR. #1 99+82.00 -Y2-\FinalPlans\DGNs\411.009.A-0009CD_SMU_CU05.dgn
User:ZSmith

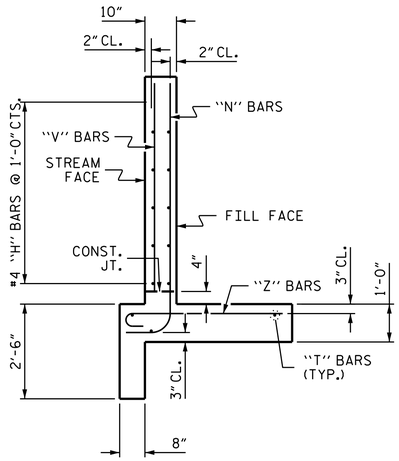
STR. #1



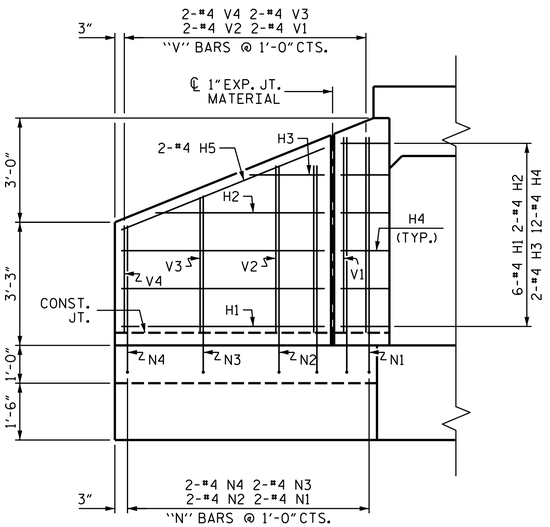
PLAN W2



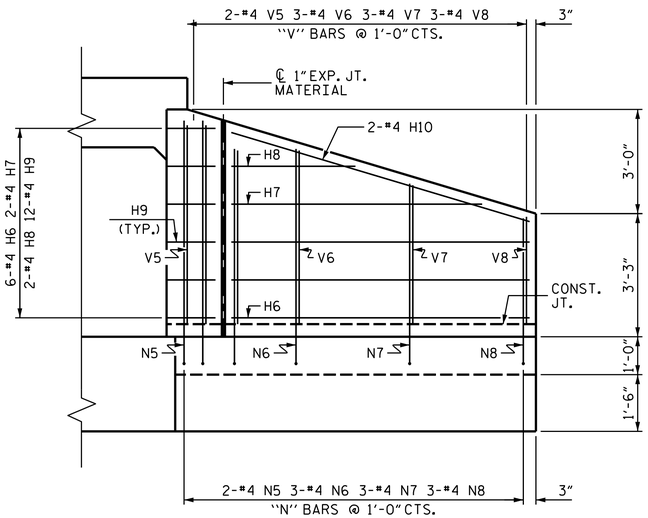
PLAN W1



TYPICAL WING SECTION

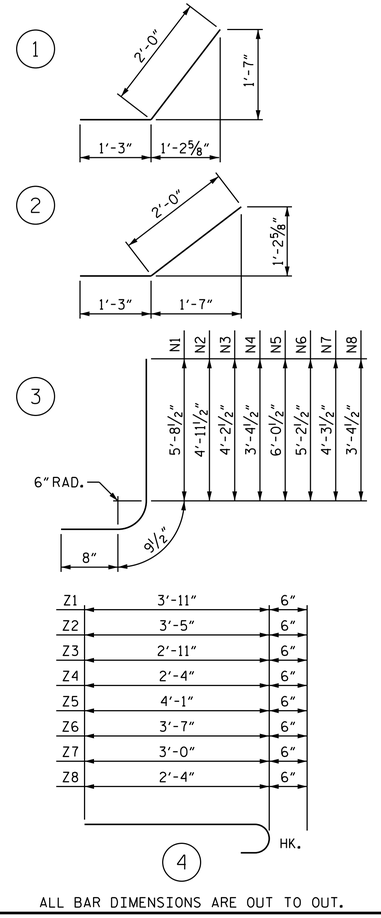


ELEVATION W2



ELEVATION W1

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	5'-4"	43
H2	4	#4	STR	4'-5"	12
H3	4	#4	STR	2'-0"	5
H4	24	#4	1	3'-3"	52
H5	4	#4	STR	5'-9"	15
H6	12	#4	STR	7'-10"	63
H7	4	#4	STR	6'-7"	18
H8	4	#4	STR	3'-3"	9
H9	24	#4	2	3'-3"	52
H10	4	#4	STR	8'-2"	22
N1	4	#4	3	7'-2"	19
N2	4	#4	3	6'-5"	17
N3	4	#4	3	5'-8"	15
N4	4	#4	3	4'-10"	13
N5	4	#4	3	7'-6"	20
N6	6	#4	3	6'-8"	27
N7	6	#4	3	5'-9"	23
N8	6	#4	3	4'-10"	19
T1	6	#5	STR	7'-3"	45
T2	6	#5	STR	9'-9"	61
V1	4	#4	STR	5'-2"	14
V2	4	#4	STR	4'-5"	12
V3	4	#4	STR	3'-7"	10
V4	4	#4	STR	2'-10"	8
V5	4	#4	STR	5'-3"	14
V6	6	#4	STR	4'-7"	18
V7	6	#4	STR	3'-8"	15
V8	6	#4	STR	2'-10"	11
Z1	4	#4	4	4'-5"	12
Z2	4	#4	4	3'-11"	10
Z3	4	#4	4	3'-5"	9
Z4	4	#4	4	2'-10"	8
Z5	4	#4	4	4'-7"	12
Z6	6	#4	4	4'-1"	16
Z7	6	#4	4	3'-6"	14
Z8	6	#4	4	2'-10"	11

REINFORCING STEEL FOR 4 WINGS	744 LBS
CLASS A CONCRETE	
4 WINGS	11.2 CY
2 HEADWALLS	1.3 CY
2 END CURTAIN WALLS	1.4 CY
TOTAL	13.9 CY

NOTE:
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.

G1 BARS IN HEADWALL ARE INCLUDED WITH THE BARREL REINFORCING STEEL.

PROJECT NO. A-0009CD
GRAHAM COUNTY
STATION: 99+82.00 -Y2-

SHEET 6 OF 6

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER
Marshall D. Smith, Jr.
2/18/2026

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
201 W. MARION ST STE 200
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD WINGS FOR CONCRETE BOX CULVERT

H = 5'-0" SLOPE = 2:1
75° SKEW

REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO. C1-6
TOTAL SHEETS 6

ASSEMBLED BY :	ZCS	DATE :	09/21
CHECKED BY :	MGC	DATE :	10/21
DRAWN BY : CCJ	12/99	REV. 6/19	MAA/THC
CHECKED BY : RWW	03/00		

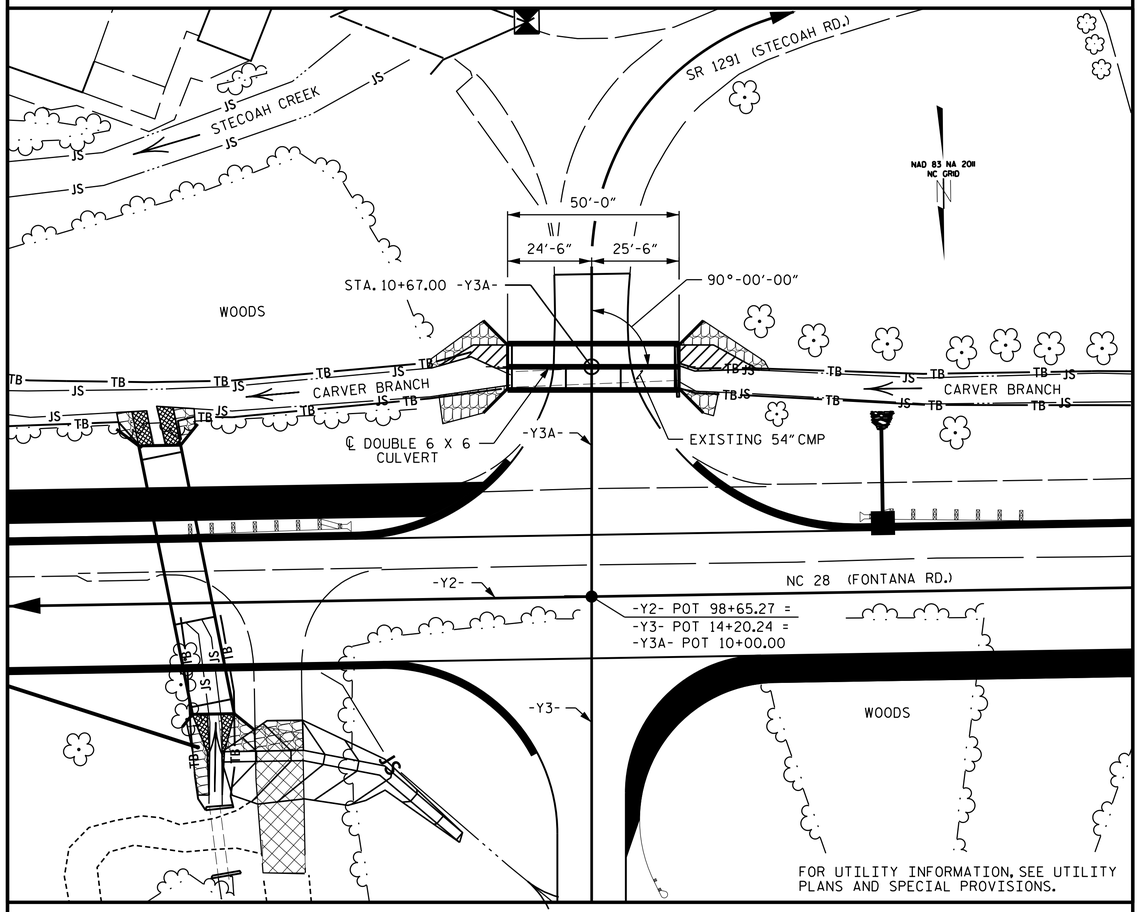
9/17/2025
X:\NCDOT\A-0009\Structures\A-0009CD\STR. #1 99+82.00 -Y2-\Final Plans\DGNs\411_011_A-0009CD_SMU_CU06.dgn
User:ZSmith

STR. #1

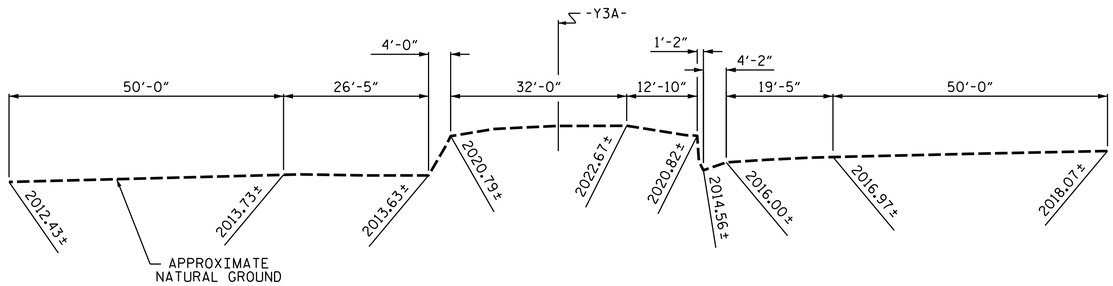
STD. NO. CW7505

F.A. PROJECT NO. : 0028011

BENCH MARK #38: SPIKE NAIL SET IN 6"X 6"BRIDGE BEAM;
43' LT OF STA. 11+45.00 -Y3A-; ELEV. 2021.11'



LOCATION SKETCH



PROFILE ALONG ℄ CULVERT

ROADWAY DATA

GRADE POINT ELEV. @ STA. 10+67.00 -Y3A- = 2022.60
BED ELEV. @ STA. 10+67.00 -Y3A- = 2013.25 ±
ROADWAY SLOPES = 3:1 MAX

HYDROGRAPHIC DATA

DESIGN DISCHARGE = 400 CFS
FREQUENCY OF DESIGN FLOOD = 25 YRS
DESIGN HIGH WATER ELEVATION = 2020.70
DRAINAGE AREA = 1.00 SQ MI
BASE DISCHARGE (Q100) = 580 CFS
BASE HIGH WATER ELEVATION = 2022.10

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE = 480 CFS
FREQUENCY OF OVERTOPPING FLOOD = 50 YRS
OVERTOPPING FLOOD ELEVATION = 2021.60 ✳

✳LOWEST HIGH POINT ON -Y3A- @ STA. 11+33

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE			
BARREL @ 1.27 CY/FT		63.5	C.Y.
WINGS, ETC.		21.9	C.Y.
SILLS		1.8	C.Y.
TOTAL		87.2	C.Y.
REINFORCING STEEL			
BARREL		8,222	LBS.
WINGS, ETC.		1,270	LBS.
TOTAL		9,492	LBS.
CULVERT EXCAVATION		LUMP SUM	
FOUNDATION COND. MAT'L.		64 TONS	

SAMPLE BAR REPLACEMENT

SIZE	LENGTH
#3	6'-2"
#4	7'-4"
#5	8'-6"
#6	9'-8"
#7	10'-10"
#8	12'-0"
#9	13'-2"
#10	14'-6"
#11	15'-10"

NOTE:
SAMPLE BAR REPLACEMENT LENGTHS BASED ON 30"(SAMPLE LENGTH) PLUS TWO SPLICE LENGTHS AND f_s = 60ksi.

NOTES:

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

DESIGN FILL---------- 2.18 MAX. 1.33 MIN.

FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.

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

CONCRETE IN 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.

AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL ABOVE 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.

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

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.

AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAIL DRAWINGS FOR A PRECAST REINFORCED CONCRETE BOX CULVERT IN LIEU OF THE CAST-IN-PLACE CULVERT SHOWN ON THE PLANS. THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIONAL PRECAST REINFORCED CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.

THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.

EXCAVATE 12 INCHES BELOW THE BOTTOM OF THE CULVERT AND REPLACE WITH FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH ARTICLE 414 OF THE STANDARD SPECIFICATIONS. FOUNDATION CONDITIONING MATERIAL SHOULD CONSIST OF SELECT MATERIAL CLASS V OR VI FOR CULVERTS.

IF REQUIRED, UNDERCUT LOOSE SOILS THAT MAY BE ENCOUNTERED BENEATH THE BOTTOM OF THE FOUNDATION CONDITIONING MATERIAL. BACKFILL UNDERCUT AREAS WITH FOUNDATION CONDITIONING MATERIAL.

PROJECT NO. A-0009CD
GRAHAM COUNTY
STATION: 10+67.00 -Y3A-

SHEET 1 OF 7

DRAWN BY : STM DATE : 01/22
CHECKED BY : MGC DATE : 01/22
DESIGN ENGINEER OF RECORD: STM DATE : 01/22

1/6/2026
X:\NCDOT\A-0009\Structures\A-0009CD\STR. #3 10+67.00 -Y2A-\Final Plans\DGNs\413_001_A-0009CD_SMU_CU01.dgn
User:ZSmith

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER Marshall G. Checkley, Jr.
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2/18/2026

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
201 W. MARION ST STE 200
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 6 FT. X 6 FT. CONCRETE BOX CULVERT 90°-00'-00" SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-1
1			3			TOTAL SHEETS
2			4			7

STR #2

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)	1.12	--	1.75	1.12	1	TOP SLAB	3.00	1.28	1	TOP SLAB	5.67	
		HL-93 (OPERATING)	N/A		1.45	--	1.35	1.45	1	TOP SLAB	3.00	1.66	1	TOP SLAB	5.67	
		HS-20 (INVENTORY)	36.000	(2)	1.02	36.72	1.75	1.02	1	TOP SLAB	3.00	1.18	1	TOP SLAB	5.67	
		HS-20 (OPERATING)	36.000		1.33	47.88	1.35	1.33	1	TOP SLAB	3.00	1.52	1	TOP SLAB	5.67	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		2.05	27.68	1.40	2.05	1	TOP SLAB	3.00	2.69	1	TOP SLAB	5.67	
		SNGARBS2	20.000		1.92	38.40	1.40	1.92	1	TOP SLAB	3.00	2.46	1	TOP SLAB	5.67	
		SNAGRIS2	22.000		2.05	45.10	1.40	2.05	1	TOP SLAB	3.00	2.69	1	TOP SLAB	5.67	
		SNCOTTS3	27.250		1.62	44.15	1.40	1.62	1	BOTTOM SLAB	6.00	1.63	1	BOTTOM SLAB	6.00	
		SNAGGRS4	34.925		1.53	53.44	1.40	1.59	1	BOTTOM SLAB	6.00	1.53	1	BOTTOM SLAB	6.00	
		SNS5A	35.550		1.53	54.39	1.40	1.59	1	BOTTOM SLAB	6.00	1.53	1	BOTTOM SLAB	6.00	
		SNS6A	39.950		1.52	60.72	1.40	1.55	1	BOTTOM SLAB	6.00	1.52	1	BOTTOM SLAB	6.00	
		SNS7B	42.000		1.52	63.84	1.40	1.55	1	BOTTOM SLAB	6.00	1.52	1	BOTTOM SLAB	6.00	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		1.86	61.38	1.40	1.93	1	BOTTOM SLAB	6.00	1.86	1	BOTTOM SLAB	6.00	
		TNT4A	33.075		1.88	62.18	1.40	1.88	1	BOTTOM SLAB	6.00	1.89	1	BOTTOM SLAB	6.00	
		TNT6A	41.600		1.64	68.22	1.40	1.66	1	BOTTOM SLAB	6.00	1.64	1	BOTTOM SLAB	6.00	
		TNT7A	42.000		1.78	74.76	1.40	1.79	1	BOTTOM SLAB	6.00	1.78	1	BOTTOM SLAB	6.00	
		TNT7B	42.000	(3)	1.52	63.84	1.40	1.56	1	BOTTOM SLAB	6.00	1.52	1	BOTTOM SLAB	6.00	
		TNAGRIT4	43.000		1.81	77.83	1.40	1.84	1	BOTTOM SLAB	6.00	1.81	1	BOTTOM SLAB	6.00	
		TNAGT5A	45.000		1.81	81.45	1.40	1.84	1	BOTTOM SLAB	6.00	1.81	1	BOTTOM SLAB	6.00	
		TNAGT5B	45.000		1.84	82.80	1.40	1.84	1	BOTTOM SLAB	6.00	1.85	1	BOTTOM SLAB	6.00	
EMERGENCY VEHICLE (EV)		EV2	28.750		1.45	41.69	1.30	1.45	1	TOP SLAB	3.00	1.67	1	TOP SLAB	5.67	
		EV3	43.000	(4)	1.41	60.63	1.30	1.41	1	BOTTOM SLAB	6.00	1.42	1	BOTTOM SLAB	6.00	

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.

COMMENTS:

1.
2.
3.
4.

(#) CONTROLLING LOAD RATING

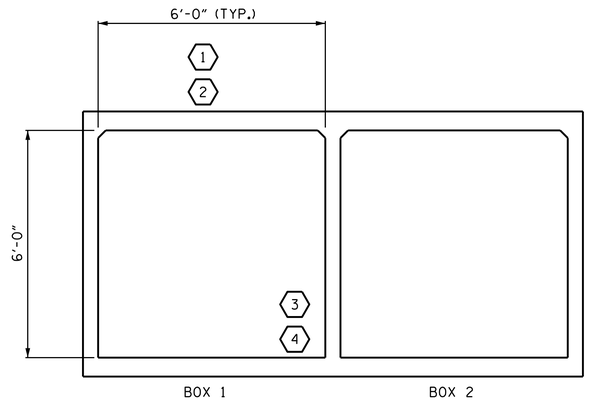
(1) DESIGN LOAD RATING (HL-93)

(2) DESIGN LOAD RATING (HS-20)

(3) LEGAL LOAD RATING **

(4) EMERGENCY VEHICLE RATING **

** SEE CHART FOR VEHICLE TYPE



LRFR SUMMARY

(LOOKING DOWNSTREAM)

PROJECT NO. A-0009CD

GRAHAM COUNTY

STATION: 10+67.00 -Y3A-

SHEET 2 OF 7

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL G. CHEEK, JR.

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2/18/2026

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
201 W. MARION ST STE 200
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

(NON-INTERSTATE TRAFFIC)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-2
1			3			TOTAL SHEETS
2			4			7

ASSEMBLED BY :	STM	DATE :	01/22
CHECKED BY :	MGC	DATE :	01/22
DRAWN BY : WMC	7/11	REV. 10/1/11	MAA/GM
CHECKED BY : GM	7/11	REV. 12/17	MAA/THC

11/11/2025
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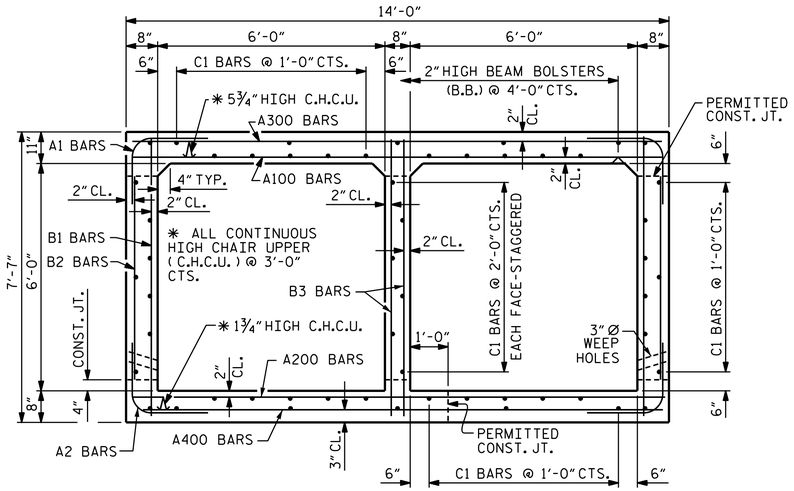
User:smassinople

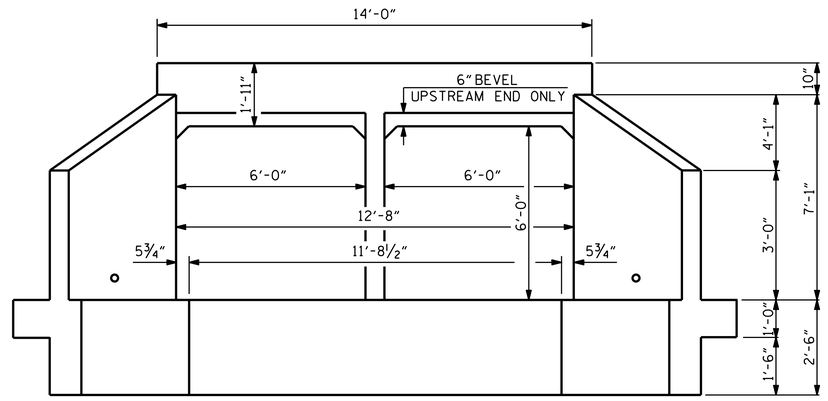
STR #2

STD. NO. LRFR5

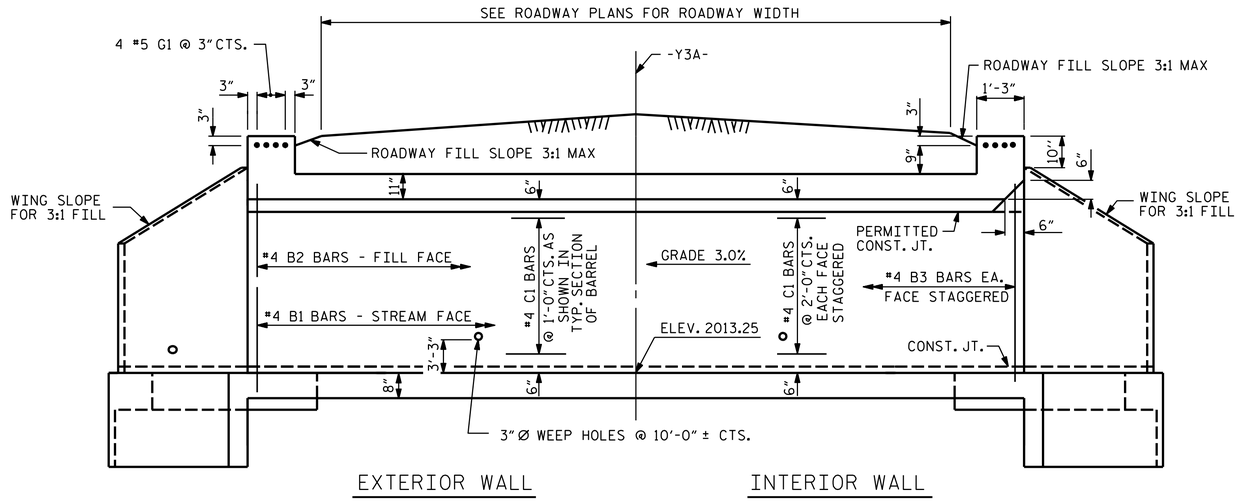


RIGHT ANGLE SECTION OF BARREL

THERE ARE 54 "C" BARS IN SECTION OF BARREL.



END ELEVATION



EXTERIOR WALL INTERIOR WALL

CULVERT SECTION NORMAL TO ROADWAY

PROJECT NO. A-0009CD

GRAHAM COUNTY

STATION: 10+67.00 -Y3A-

SHEET 3 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 6 FT. X 6 FT. CONCRETE BOX CULVERT 90°-00'-00" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL G. CHEEK, JR.

5FBCC2F3A4DC413...

2/18/2026

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
201 W. MARION ST STE 200
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-3
1			3			TOTAL SHEETS
2			4			7

DRAWN BY :	STM	DATE : 01/22
CHECKED BY :	MGC	DATE : 01/22
DESIGN ENGINEER OF RECORD :	STM	DATE : 01/22

9/17/2025
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User:ZSmith

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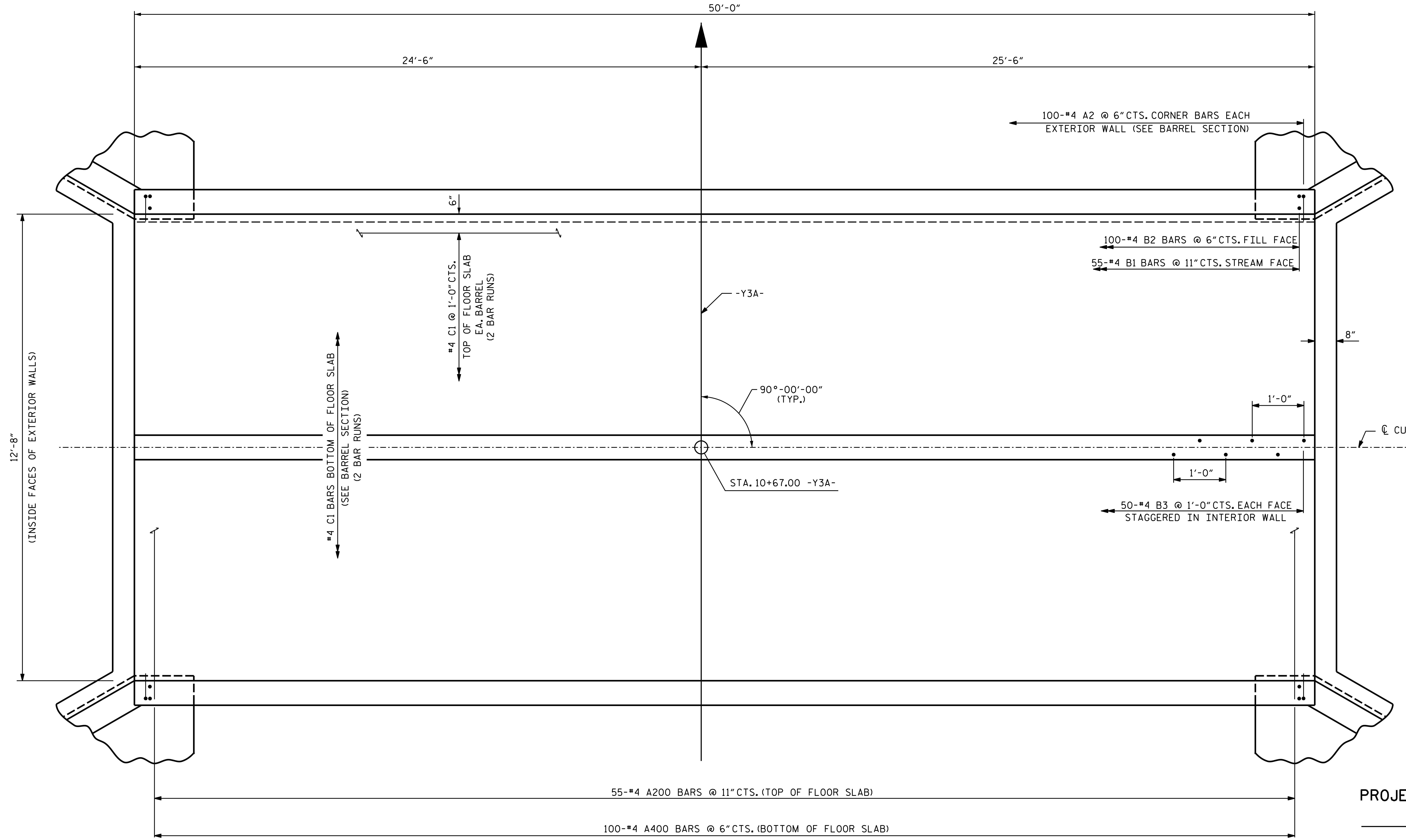

PLAN OF FLOOR SLAB

PROJECT NO. A-0009CD

GRAHAM COUNTY

STATION: 10+67.00 -Y3A-

SHEET 4 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 6 FT. X 6 FT.
CONCRETE BOX CULVERT
90°-00'-00" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER

2/18/2026

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
201 W. MARION ST STE 200
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PH (704) 476-0003
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REVISIONS						SHEET NO.
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1			3			TOTAL SHEETS
2			4			7

STR #2

DRAWN BY :	STM	DATE :	01/22
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DESIGN ENGINEER OF RECORD:	STM	DATE :	01/22

1/6/2026
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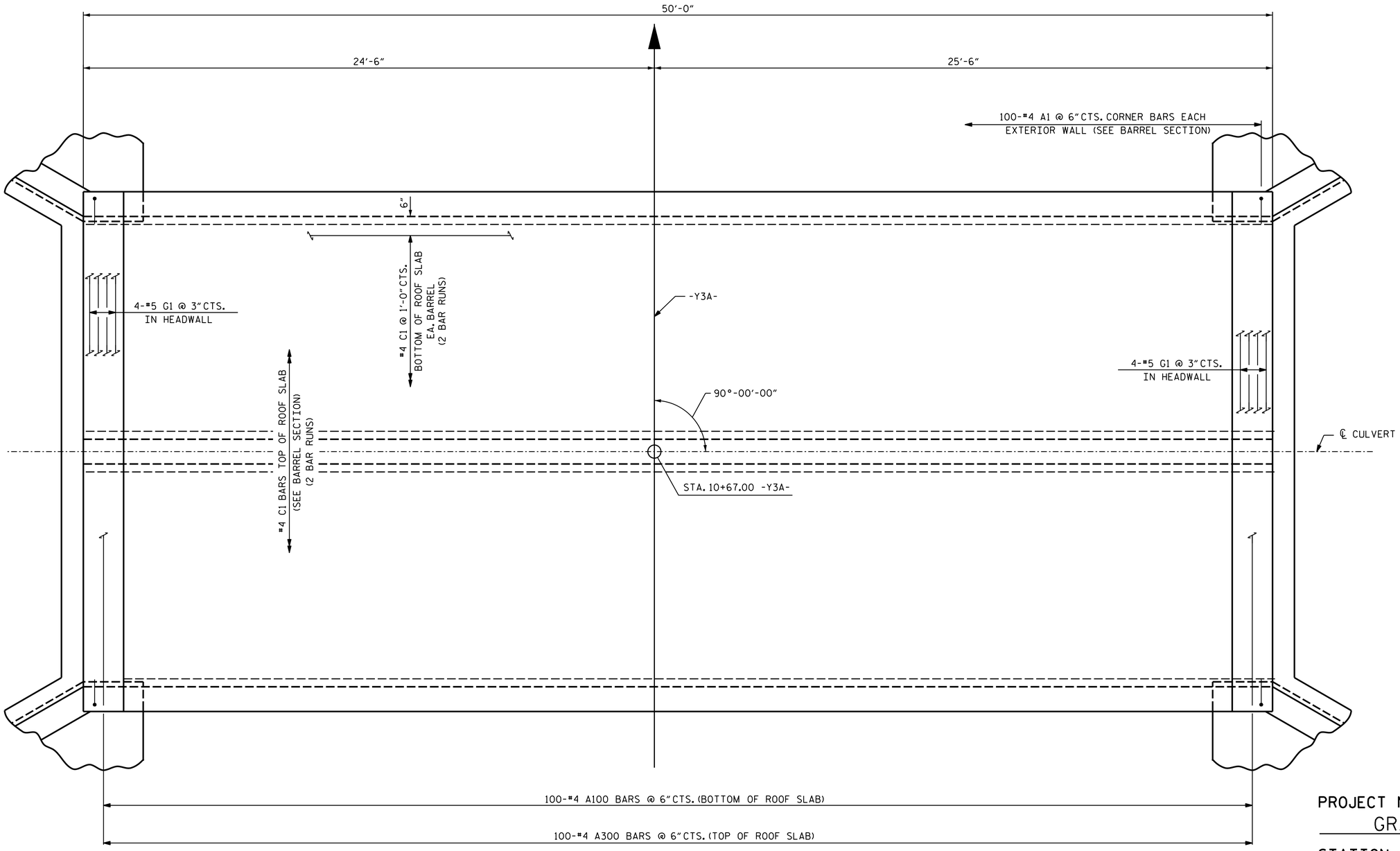

PROJECT NO. A-0009CD

GRAHAM COUNTY

STATION: 10+67.00 -Y3A-

SHEET 5 OF 7

PLAN OF ROOF SLAB

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL G. CHEEK, JR.

Marshall G. Cheek, Jr.

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2/18/2026

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TGS ENGINEERS
201 W. MARION ST STE 200
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 6 FT. X 6 FT. CONCRETE BOX CULVERT 90°-00'-00" SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-5
1			3			TOTAL SHEETS
2			4			7

DRAWN BY : STM DATE : 01/22

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DESIGN ENGINEER OF RECORD: STM DATE : 01/22

1/6/2026
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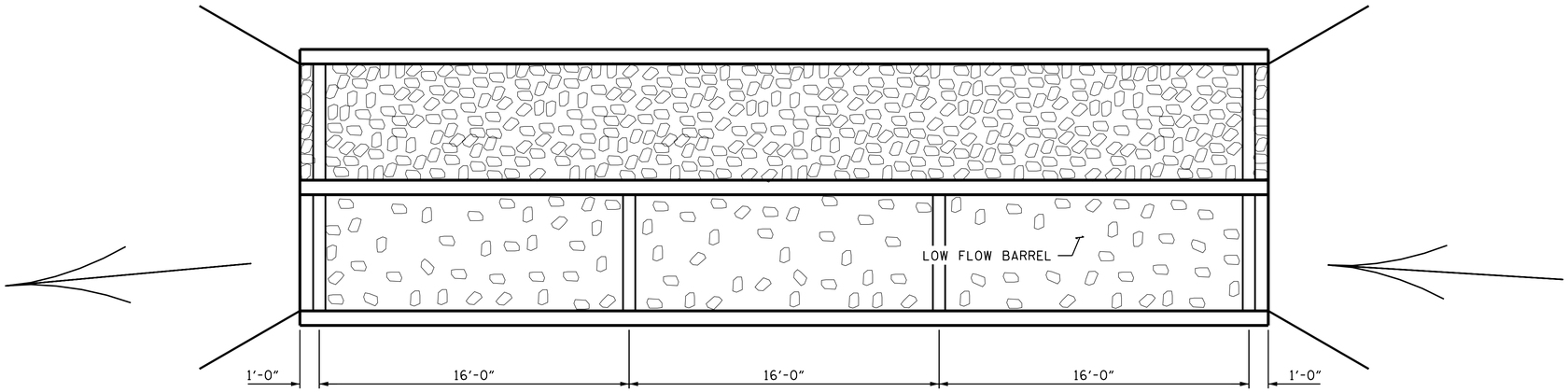
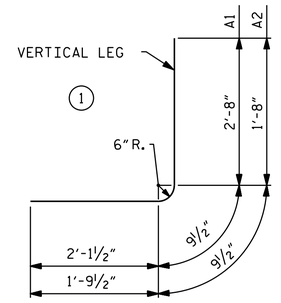


PLAN OF FLOOR SILL LAYOUT

BAR TYPE



DIMENSIONS ARE OUT TO OUT

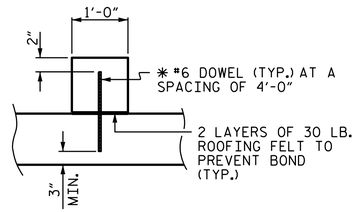
SPLICE LENGTHS CHART

BAR	SIZE	SPLICE LENGTH
"B"	#4	1'-10"
C1	#4	1'-10"
A200	#4	1'-10"
A400	#4	1'-10"

BAR SCHEDULE

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	200	#4	1	5'-7"	746
A2	200	#4	1	4'-3"	568
A100	100	#4	STR	13'-6"	902
A200	55	#4	STR	13'-6"	496
A300	100	#4	STR	13'-6"	902
A400	100	#4	STR	13'-6"	902
B1	110	#4	STR	7'-1"	520
B2	200	#4	STR	5'-4"	713
B3	100	#4	STR	7'-1"	473
C1	108	#4	STR	25'-9"	1858
D1	8	#6	STR	1'-3"	15
D2	4	#6	STR	2'-3"	14
G1	8	#5	STR	13'-6"	113

REINFORCING STEEL 8,222 LBS



SECTION THROUGH SILL

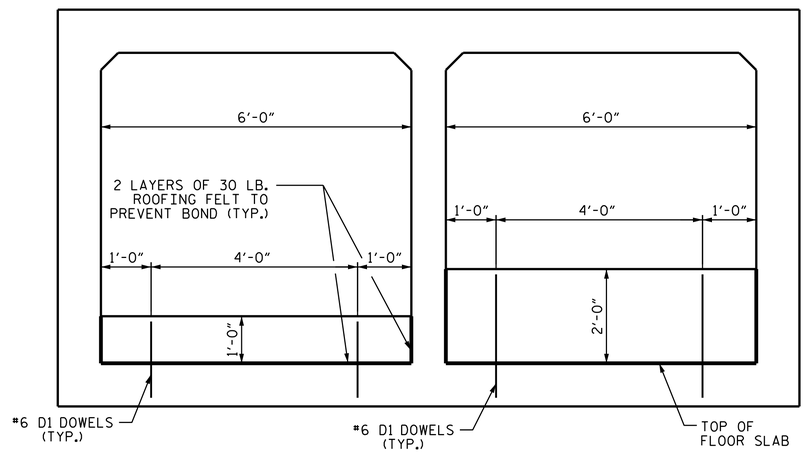
* DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.

NOTES

MATERIAL EXCAVATED FROM THE EXISTING BED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT. BED MATERIAL MAY BE SUPPLEMENTED WITH CLASS B RIP RAP AS NECESSARY. NATIVE MATERIAL SHOULD BE PLACED ON TOP TO PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE. BED MATERIAL IS SUBJECT TO THE APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

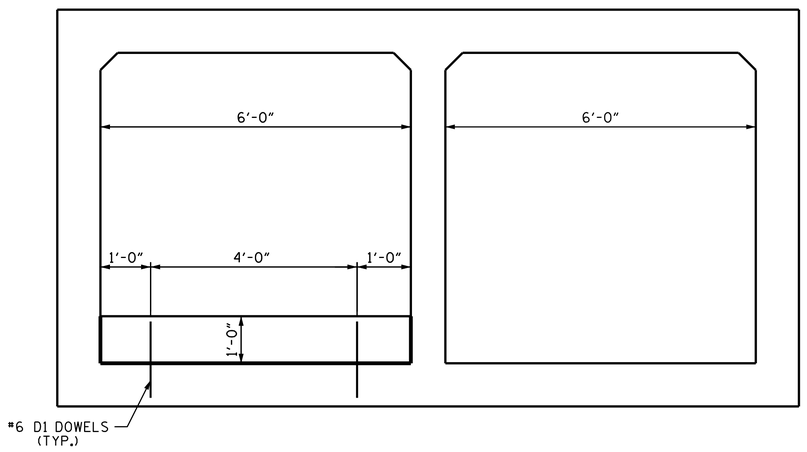
THE ENTIRE COST OF WORK REQUIRED TO PLACE EXCAVATED MATERIAL OR SUPPLEMENTAL MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR CULVERT EXCAVATION.

THE ENTIRE COST OF WORK REQUIRED TO CONSTRUCT THE SILLS SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.



INLET/OUTLET SILL ELEVATION

LOOKING DOWNSTREAM



INTERNAL SILL ELEVATION

LOOKING DOWNSTREAM

SILL DETAILS

PROJECT NO. A-0009CD

GRAHAM COUNTY

STATION: 10+67.00 -Y3A-

SHEET 6 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 6 FT. X 6 FT. CONCRETE BOX CULVERT

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER
Marshall G. Cheek, Jr.
2/18/2026

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TGS ENGINEERS
201 W. MARION ST STE 200
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

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SHEET NO. C2-6

TOTAL SHEETS 7

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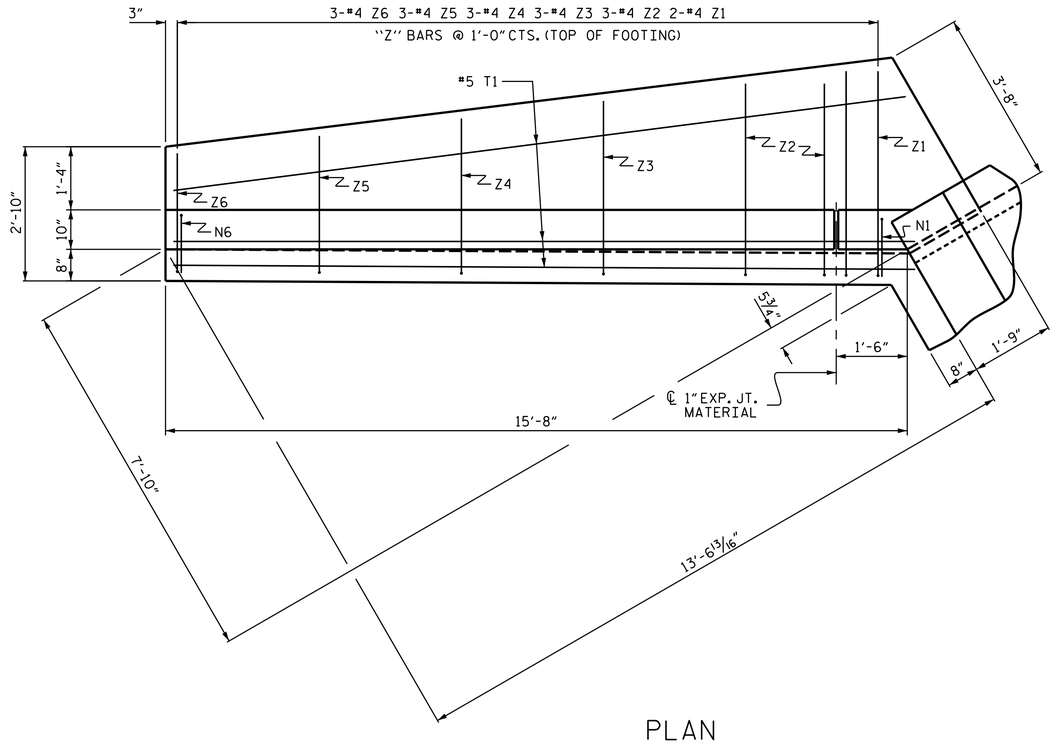
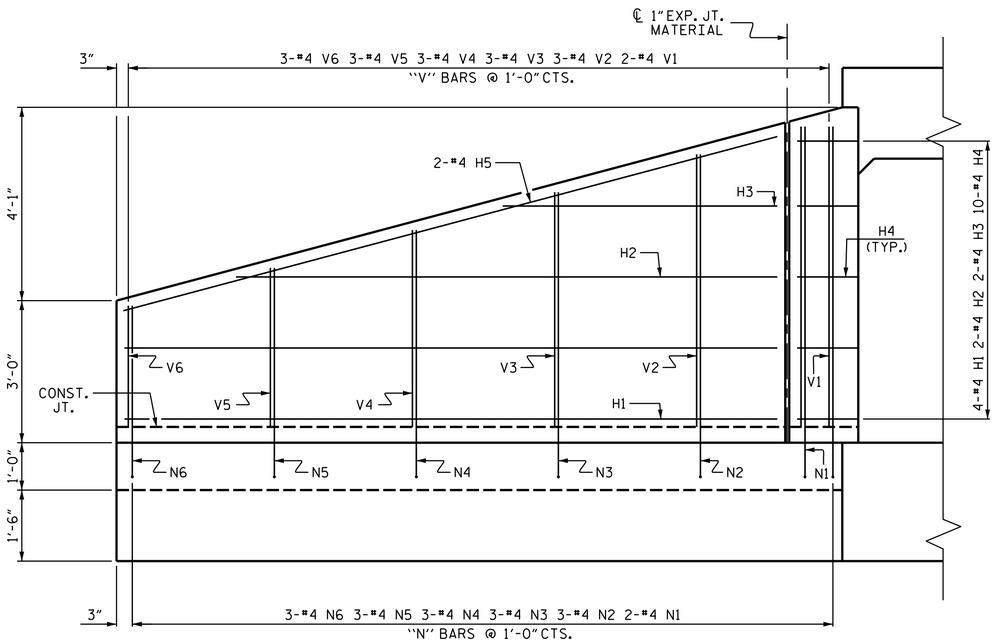


PLAN



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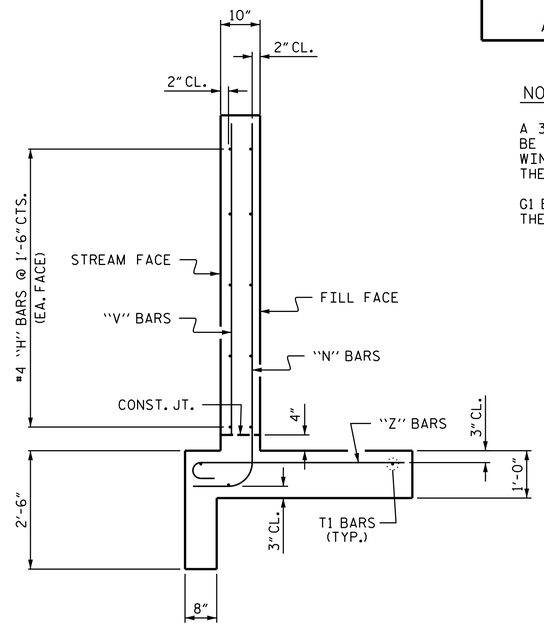
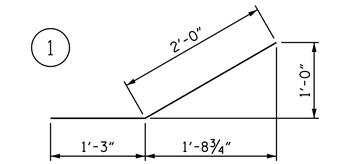
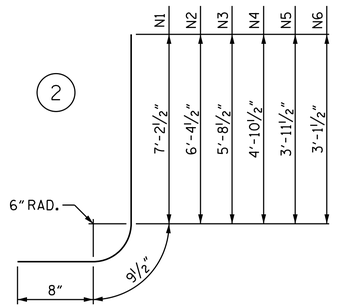
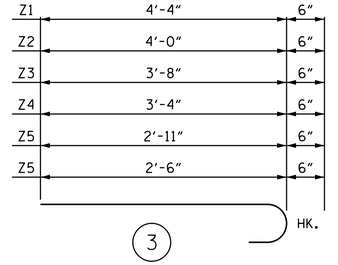


TYPICAL WING SECTION

BAR TYPES







ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	16	#4	STR	13'-9"	147
H2	8	#4	STR	11'-5"	61
H3	8	#4	STR	5'-9"	31
H4	40	#4	1	3'-3"	87
H5	8	#4	STR	14'-3"	76
N1	8	#4	2	8'-8"	46
N2	12	#4	2	7'-10"	63
N3	12	#4	2	7'-2"	57
N4	12	#4	2	6'-4"	51
N5	12	#4	2	5'-5"	43
N6	12	#4	2	4'-7"	37
T1	12	#5	STR	15'-8"	196
V1	8	#4	STR	6'-4"	34
V2	12	#4	STR	5'-7"	45
V3	12	#4	STR	4'-10"	39
V4	12	#4	STR	4'-1"	33
V5	12	#4	STR	3'-4"	27
V6	12	#4	STR	2'-6"	20
Z1	8	#4	3	4'-10"	26
Z2	12	#4	3	4'-6"	36
Z3	12	#4	3	4'-2"	33
Z4	12	#4	3	3'-10"	31
Z5	12	#4	3	3'-5"	27
Z6	12	#4	3	3'-0"	24

REINFORCING STEEL FOR 4 WINGS 1270 LBS

CLASS A CONCRETE
- 4 WINGS 19.2 CY
- 2 HEADWALLS 1.3 CY
- 2 END CURTAIN WALLS 1.4 CY
- TOTAL 22.9 CY

NOTES:

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.

G1 BARS IN HEADWALL ARE INCLUDED WITH THE BARREL REINFORCING STEEL.

PROJECT NO. A-0009CD
GRAHAM COUNTY
STATION: 10+67.00 -Y3A-

SHEET 7 OF 7

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER
Signed by: Marshall G. Cheek, Jr.
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2/18/2026

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TGS ENGINEERS
201 W. MARION ST STE 200
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR CONCRETE BOX CULVERT

H = 6'-0" SLOPE = 3:1
90° SKEW

REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO. C2-7
TOTAL SHEETS 7

STR. #2

ASSEMBLED BY :	STM	DATE : 01/22
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9/17/2025
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User:ZSmith

STANDARD NOTES

DESIGN DATA:

SPECIFICATIONS	AASHTO (CURRENT)
LIVE LOAD	SEE PLANS
IMPACT ALLOWANCE	SEE AASHTO
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 AASHTO
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" ∅ SHEAR STUDS FOR THE ¾" ∅ STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - ⅞" ∅ STUDS FOR 4 - ¾" ∅ STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF ⅞" ∅ STUDS ALONG THE BEAM AS SHOWN FOR ¾" ∅ STUDS BASED ON THE RATIO OF 3 - ⅞"∅ STUDS FOR 4 - ¾" ∅ 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" 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.