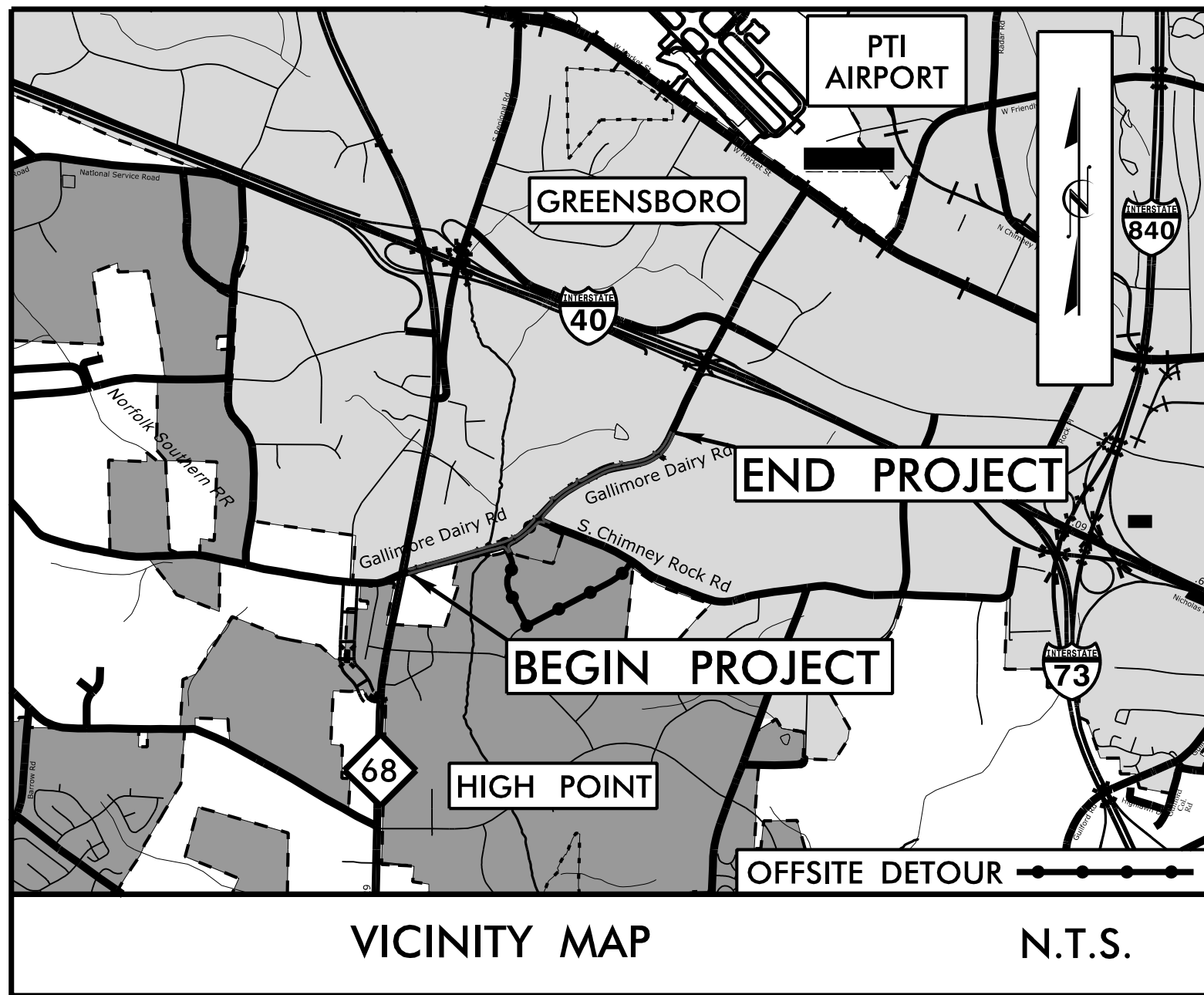


TIP PROJECT: U-4015A

CONTRACT: C204821

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-4015A		
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
35013.1.1	NA	PE	
35013.2.4	NA	R/W	
35013.2.5	NA	UTIL.	
35013.3.4	STP-1556(7)	CONST.	

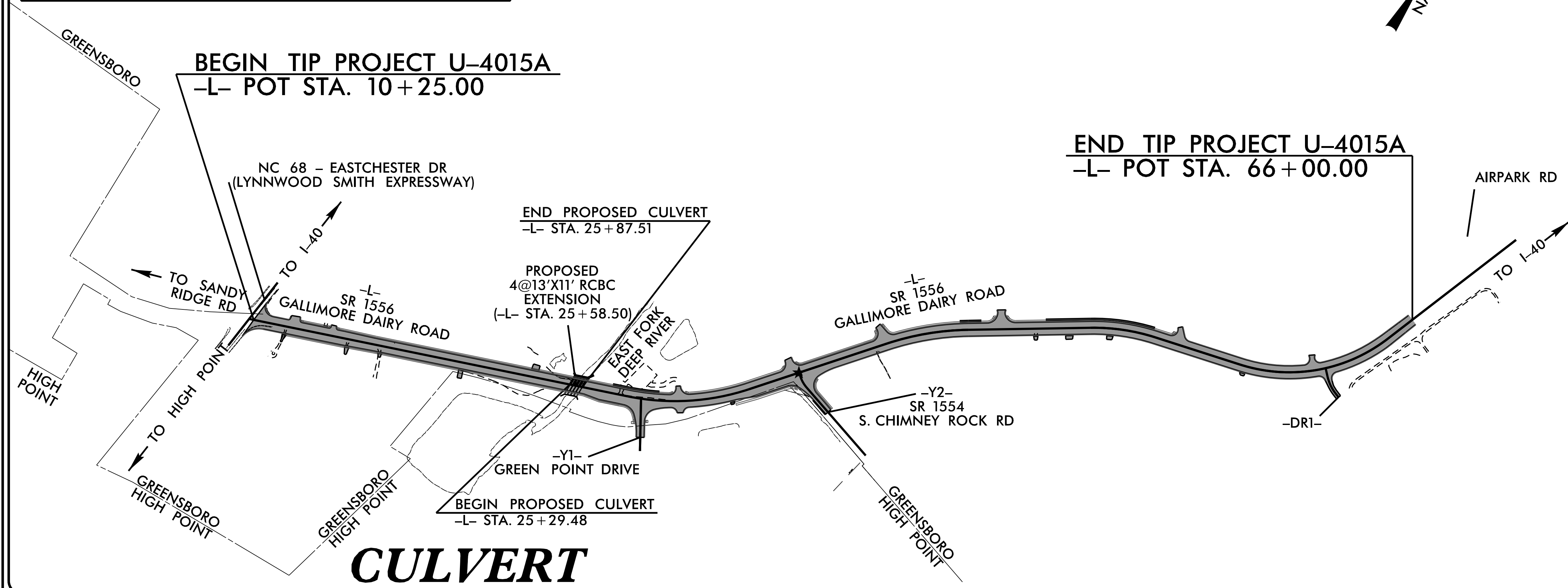
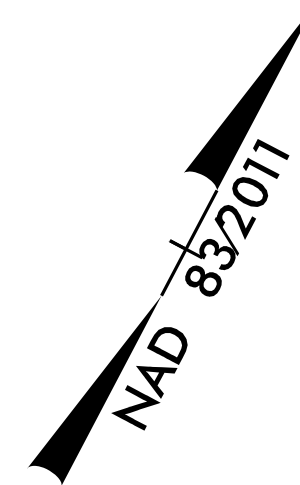
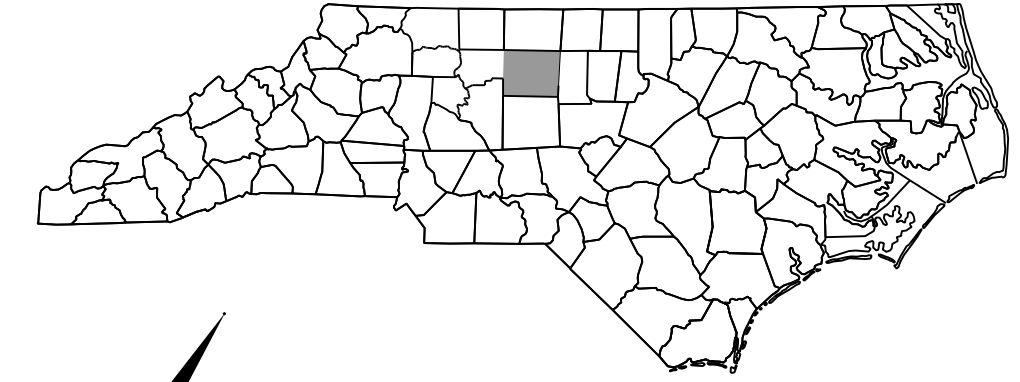


STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

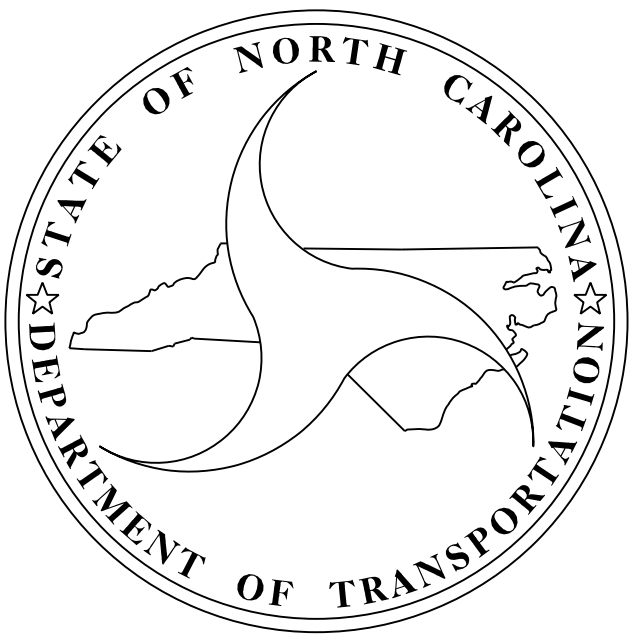
GUILFORD COUNTY

LOCATION: SR 1556 (GALLIMORE DAIRY RD.) FROM NC 68-
EASTCHESTER DR (LYNNWOOD SMITH EXPY.)
TO SOUTH OF AIRPARK RD. IN GREENSBORO

TYPE OF WORK: GRADING, DRAINAGE, PAVING,
SIGNALS, CULVERT & RETAINING WALLS



CULVERT



DESIGN DATA

ADT 2024 = 16,700
ADT 2044 = 19,400
V = 50 MPH
DHV = 10%
D = 65%
T = 6%
* TTST = 2% DUAL = 4%

FUNC CLASS =
URBAN MINOR ARTERIAL
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT U-4015A = 1.045 MILES
LENGTH STRUCTURE TIP PROJECT U-4015A = 0.011 MILES

TOTAL LENGTH TIP PROJECT U-4015A = 1.056 MILES

Prepared for the Office of:
DIVISION OF HIGHWAYS
STRUCTURES MANAGEMENT UNIT
1000 BIRCH RIDGE DR.
RALEIGH, N.C. 27610

2024 STANDARD SPECIFICATIONS

LETTING DATE :
DECEMBER 17, 2024

Scott D. Blevins, P.E.
PROJECT ENGINEER

Bruce D. Klappenbach, P.E.
PROJECT STRUCTURE ENGINEER

NCDOT CONTACT:
Hoang T. Dieu, P.E.

PLANS PREPARED BY:

RK&K
P: (919) 878-9560
8601 Six Forks Road, Forum 1 Suite 700
Raleigh, North Carolina 27615 | NC License No. F-0112

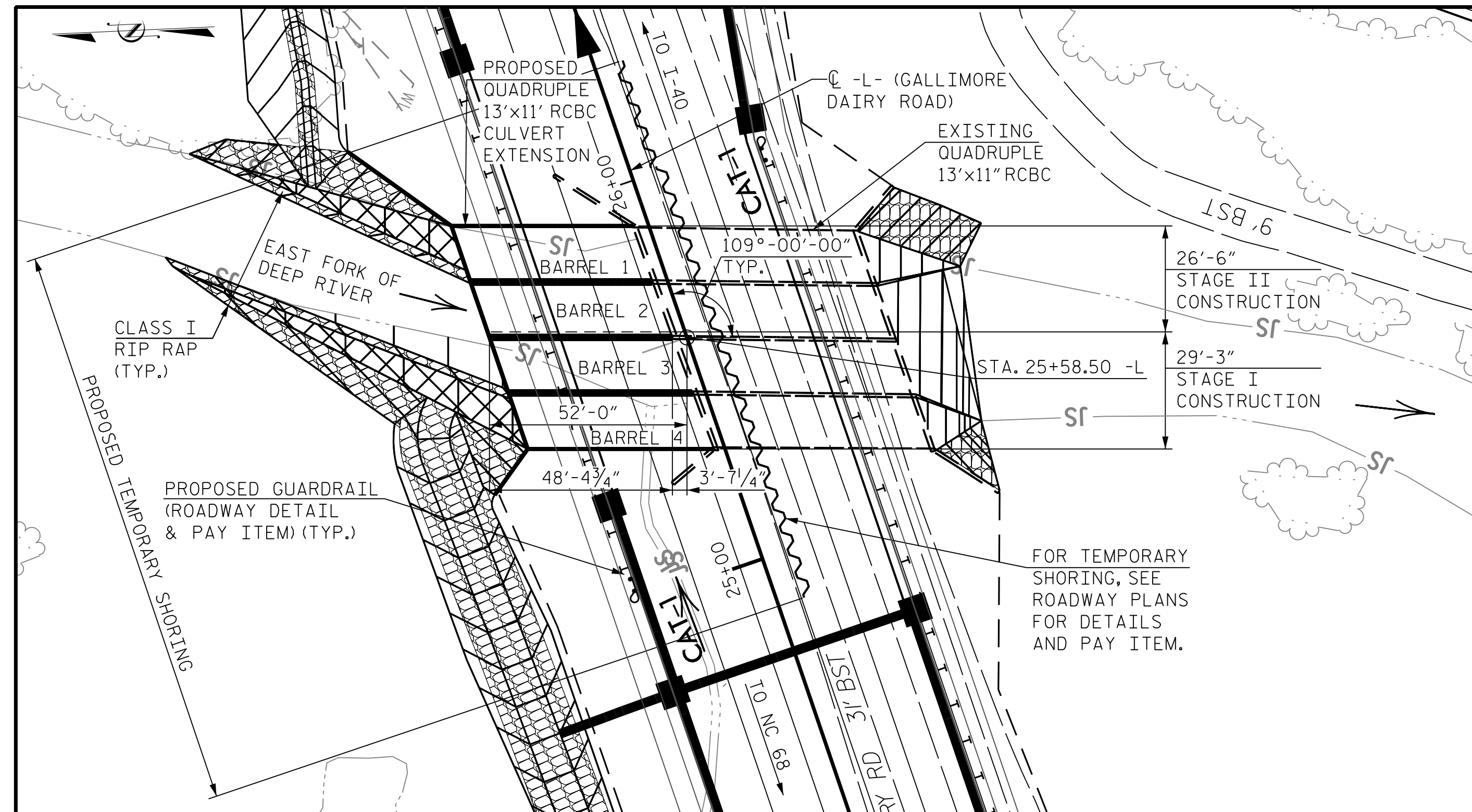
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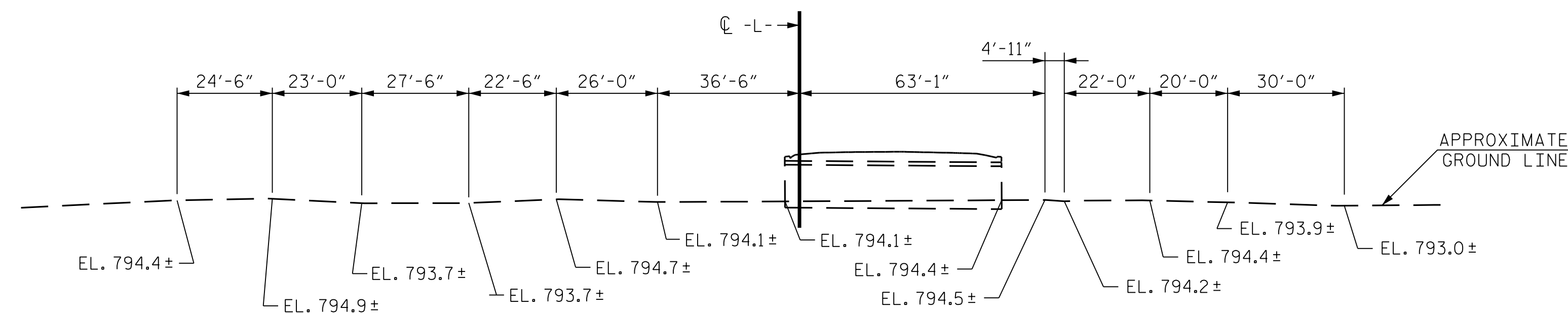
bgonfa 9/20/2024 R:\Structures\DGN\Culverts\Final\U-4015A_SMU_CU_78_TSH_400078.dgn

BM #18, ON STA. 41+05.70 -BY11-, 70' RIGHT, RR SPIKE IN BASE OF 11" PINE, N 844314, E 1718146, EL. 839.05, NAVD 88.



LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS
 GRADE POINT ELEVATION AT STA. 25+58.5 -L- = 807.86
 BED ELEVATION AT STA. 25+58.5 -L- = 792.52
 ROADWAY SLOPES = 2:1



PROFILE ALONG CULVERT

TOTAL STRUCTURE QUANTITIES			
CLASS A CONCRETE			
BARREL @	6.02	CY/FT	291.3 C.Y.
WING ETC.			33.6 C.Y.
TOTAL			324.9 C.Y.
REINFORCING STEEL			
BARREL			49,249 LBS.
WINGS ETC.			1,969 LBS.
TOTAL			51,218 LBS.
CULVERT EXCAVATION ----- LUMP SUM			
FOUNDATION CONDITIONING MATERIAL ---204 TONS			

HYDRAULIC DATA

DESIGN DISCHARGE-----4,600 C.F.S.
 FREQUENCY OF DESIGN FLOOD-----50 YR.
 DESIGN HIGH WATER ELEVATION-----804.3
 DRAINAGE AREA-----6.6 SQ. MI.
 BASE DISCHARGE (0100)-----5,427 C.F.S.
 BASE HIGH WATER ELEVATION-----805.1

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE-----5,956 C.F.S.
 FREQUENCY OF OVERTOPPING FLOOD----- < 500 YR.
 OVERTOPPING FLOOD ELEVATION-----807.5
 OVERTOPPING OCCURS AT STA. 24+75.6 -L-

NOTES:

ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING.
 DESIGN FILL----- MAX. 3.4 FT., MIN. 2.8 FT.
 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
 FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTE SHEET.

CONSTRUCTION OF CULVERT STAGING:

CONCRETE IN CULVERT TO BE POURED IN THE FOLLOWING ORDER:

STAGE I:

1. WING FOOTING, CURTAIN WALL, EDGE BEAM AND FLOOR SLAB INCLUDING 4" OF VERTICAL WALLS AND THE REMAINING PORTION OF WALLS TO THE CONSTRUCTION JOINT AND WING FOR FULL HEIGHT.

STAGE II:

2. WING FOOTING, CURTAIN WALL, EDGE BEAM AND FLOOR SLAB INCLUDING 4" OF VERTICAL WALLS AND THE REMAINING PORTION OF WALLS TO THE CONSTRUCTION JOINT AND WING FOR FULL HEIGHT.

STAGE III:

3. ROOF SLAB, EDGE BEAM AND HEADWALL.

THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN 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 THE EXTERIOR WALL AND BOTH FACES OF INTERIOR WALLS 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 WINGS COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

NO PRECAST BOX CULVERT OPTION WILL BE ALLOWED.

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

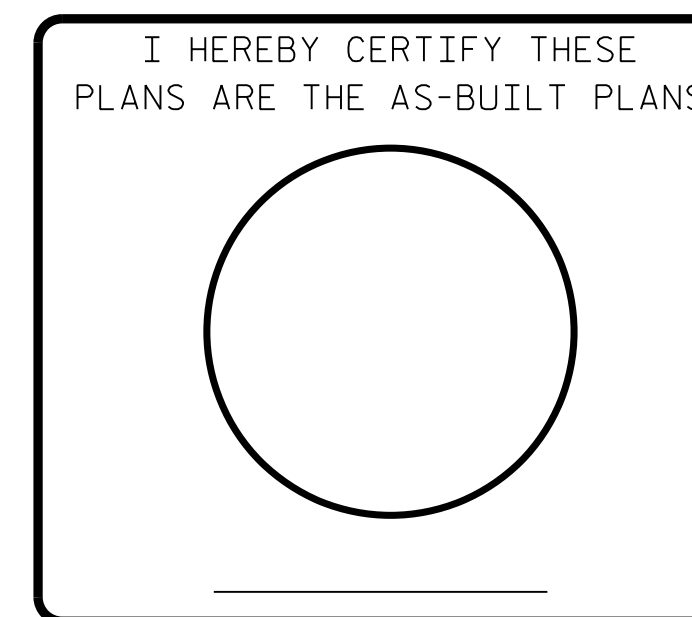
EXCAVATE A MINIMUM OF 12 INCHES BELOW CULVERT BEARING ELEVATION AND REPLACE WITH FOUNDATION CONDITIONING MATERIAL PER SECTION 414 OF THE STANDARD SPECIFICATIONS.

UNDERCUT SOFT/LOOSE SOILS THAT MAY BE ENCOUNTERED BENEATH THE BOTTOM OF THE FOUNDATION CONDITIONING MATERIAL. BACKFILL UNDERCUT AREAS WITH FOUNDATION CONDITIONING MATERIAL (SELECT MATERIAL CLASS VI).

DUE TO THE POTENTIAL FOR SHALLOW ROCK, EXCAVATION INTO ROCK SHOULD BE ANTICIPATED FOR PLACEMENT OF THE FOUNDATION CONDITIONING MATERIAL.

DOWELS SHALL BE USED TO CONNECT THE CULVERT EXTENSION TO THE EXISTING CULVERT AS SHOWN. FOR NOTE REGARDING SETTING OF DOWELS, SEE STANDARD NOTES SHEET.

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.



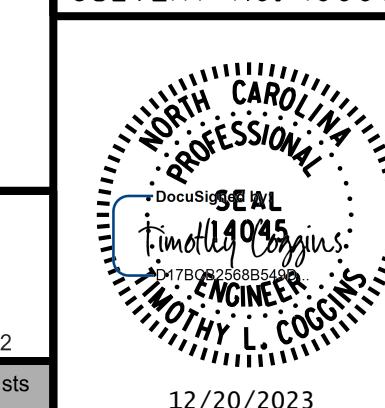
PROJECT NO. U-4015A
GUILFORD COUNTY
 STATION: 25+58.50 -L-

SHEET 1 OF 11 CULVERT NO. 0078

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

QUADRUPLE 13 FT. X 11 FT.
 CONCRETE BOX CULVERT
 EXTENSION
 109° SKEW

CULVERT NO. 400078



RK&K
 P: (919) 878-9560
 8601 Six Forks Road, Forum 1 Suite 700
 Raleigh, North Carolina 27615 | NC License No. F-0112
 Engineers | Construction Managers | Planners | Scientists
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NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO.
CU-78-1
 TOTAL SHEETS
 11

DRAWN BY : B. H. GONFA DATE : APR 2023
 CHECKED BY : R. V. KEITH DATE : APR 2023
 DESIGN ENGINEER OF RECORD : I. COGGINS DATE : APR 2023

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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 _{L1})	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	1.16	--	1.75	1.16	1	TOP SLAB (I)	6.5	1.39	1	TOP SLAB (O)	12.9	1	
	HL-93 (OPERATING)	N/A		1.51	--	1.35	1.51	1	TOP SLAB (I)	6.5	1.80	1	TOP SLAB (O)	12.9	2	
	HS-20 (INVENTORY)	36,000	②	1.28	46,080	1.75	1.28	4	TOP SLAB (O)	0.1	1.62	1	TOP SLAB (O)	12.9		
	HS-20 (OPERATING)	36,000		1.66	59,760	1.35	1.66	4	TOP SLAB (O)	0.1	2.10	1	TOP SLAB (O)	12.9		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13,500		1.26	17,010	1.40	1.26	4	EXT. WALL (I)	5.5	2.64	1	TOP SLAB (O)	12.9	
		SNGARBS2	20,000		1.26	25,200	1.40	1.26	4	EXT. WALL (I)	5.5	2.37	1	TOP SLAB (O)	12.9	
		SNAGRIS2	22,000		1.26	27,720	1.40	1.26	4	EXT. WALL (I)	5.5	2.48	1	TOP SLAB (O)	12.9	
		SNCOTTS3	27,250		1.21	32,973	1.40	1.21	4	EXT. WALL (I)	5.5	1.44	1	TOP SLAB (O)	12.9	
		SNAGGRS4	34,925		1.23	42,958	1.40	1.23	4	EXT. WALL (I)	5.5	1.62	1	TOP SLAB (O)	12.9	
		SNS5A	35,550		1.22	43,371	1.40	1.22	4	EXT. WALL (I)	5.5	1.53	1	TOP SLAB (O)	12.9	
		SNS6A	39,950		1.22	48,739	1.40	1.22	4	EXT. WALL (I)	5.5	1.54	1	TOP SLAB (O)	12.9	
		SNS7B	42,000		1.22	51,240	1.40	1.22	4	EXT. WALL (I)	5.5	1.54	1	TOP SLAB (O)	12.9	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33,000		1.26	41,580	1.40	1.26	4	EXT. WALL (I)	5.5	2.15	1	TOP SLAB (O)	12.9	
		TNT4A	33,075		1.23	40,682	1.40	1.23	4	EXT. WALL (I)	5.5	1.66	1	TOP SLAB (O)	12.9	
		TNT6A	41,600		1.23	51,168	1.40	1.23	4	EXT. WALL (I)	5.5	1.55	1	TOP SLAB (O)	12.9	
		TNT7A	42,000		1.23	51,660	1.40	1.23	4	EXT. WALL (I)	5.5	1.59	1	TOP SLAB (O)	12.9	
		TNT7B	42,000		1.23	51,660	1.40	1.23	4	EXT. WALL (I)	5.5	1.61	1	TOP SLAB (O)	12.9	
		TNAGRIT4	43,000		1.23	52,890	1.40	1.23	4	EXT. WALL (I)	5.5	1.60	1	TOP SLAB (O)	12.9	
EMERGENCY VEHICLE (EV)	TNAGT5A	45,000		1.23	55,350	1.40	1.23	4	EXT. WALL (I)	5.5	1.59	1	TOP SLAB (O)	12.9		
	TNAGT5B	45,000	③	1.12	50,400	1.40	1.12	4	TOP SLAB (O)	0.1	1.53	1	TOP SLAB (O)	12.9		
EMERGENCY VEHICLE (EV)	EV2	28.75		1.89	52,920	1.30	1.89	1	MID EXT. WALL (I)	6.5	2.60	4	TOP SLAB (O)	12.9		
	EV3	43.00	④	1.51	64,930	1.30	1.51	4	MID TOP SLAB (I)	6.5	1.77	4	TOP SLAB (O)	12.9		

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. I = INSIDE FACE
2. O = OUTSIDE FACE
3. RATING FACTORS APPLY ONLY TO THE CULVERT EXTENSION.

⑥ CONTROLLING LOAD RATING

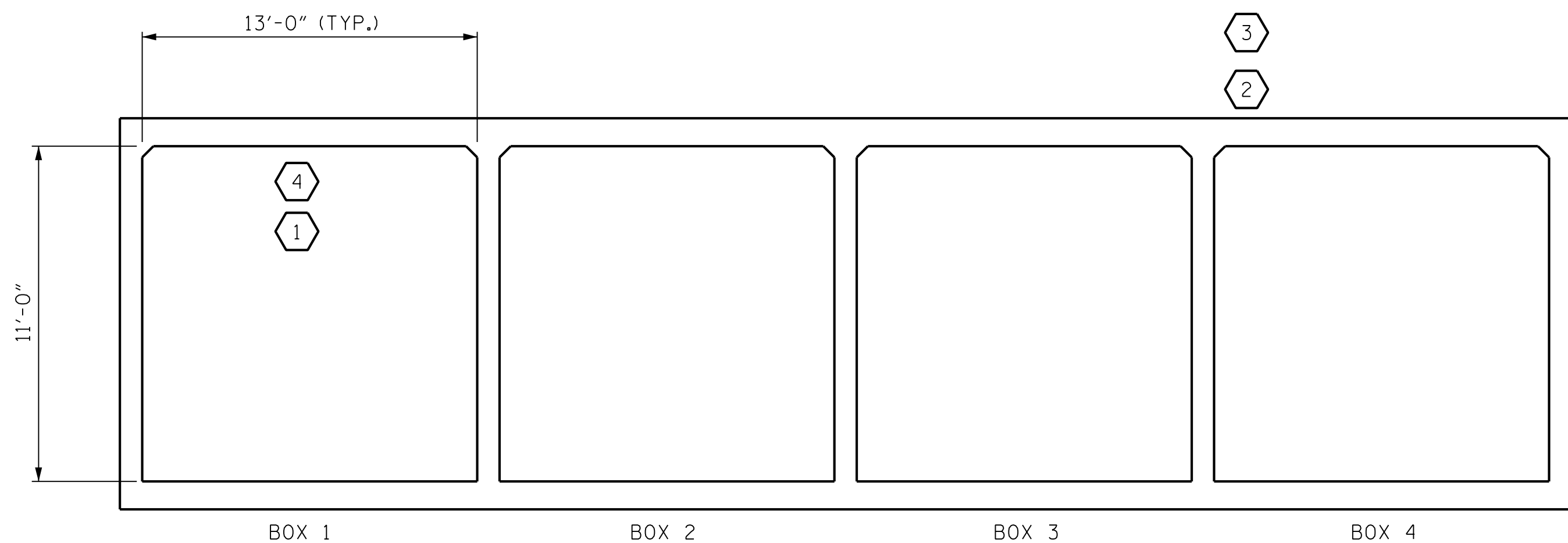
① DESIGN LOAD RATING (HL-93)

② DESIGN LOAD RATING (HS-20)

③ LEGAL LOAD RATING **

④ LEGAL LOAD RATING **

** SEE CHART FOR VEHICLE TYPE



LRFR SUMMARY (LOOKING DOWNSTREAM)

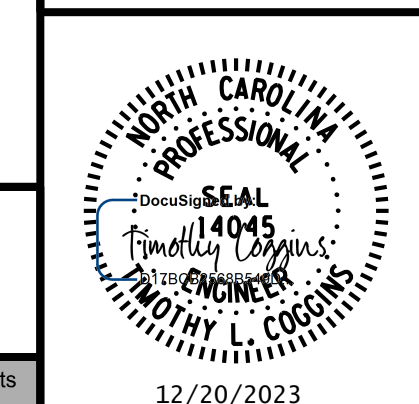
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GUILFORD COUNTY
 STATION: 25+58.50 -L-

SHEET 2 OF 11

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

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

CULVERT NO. 400078



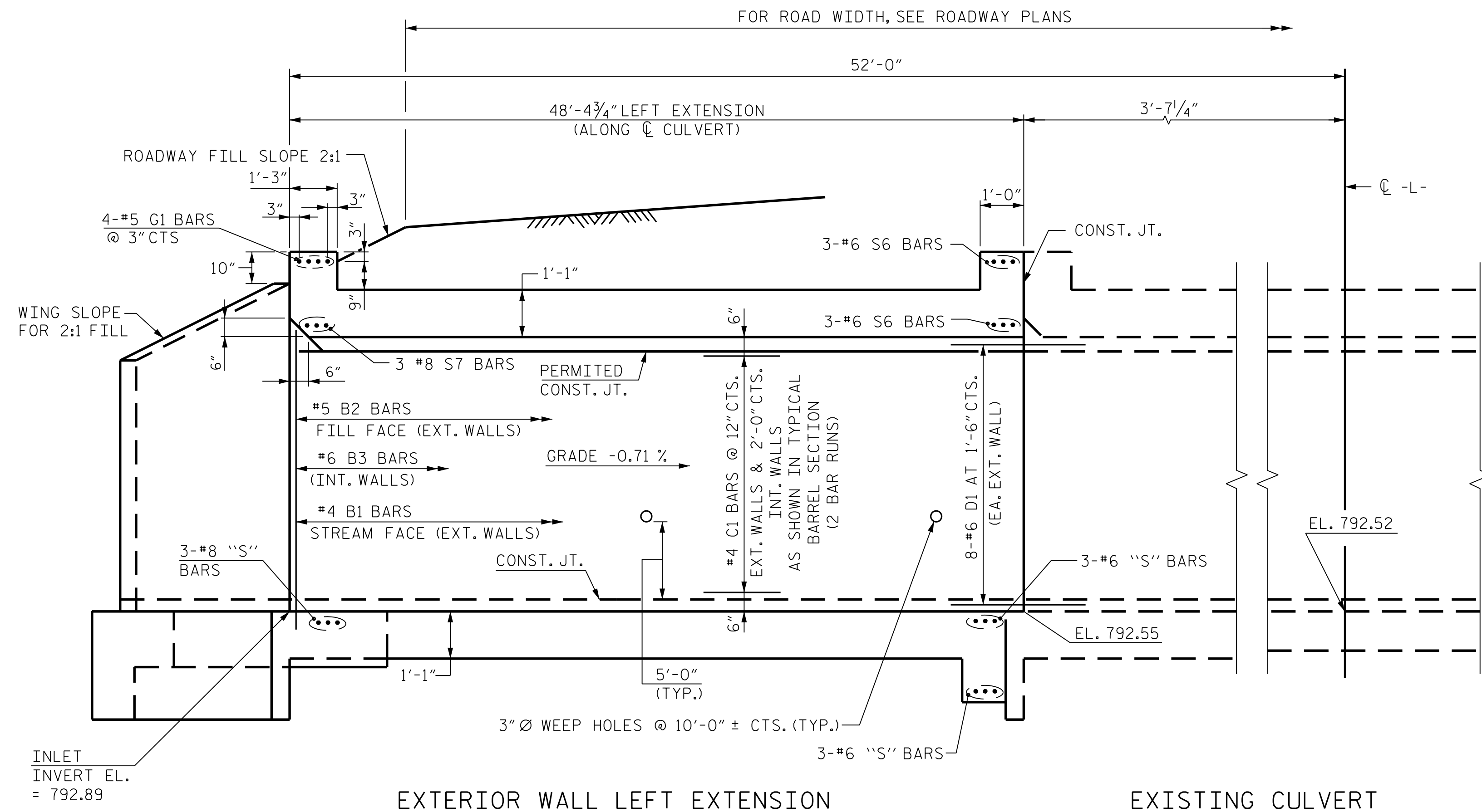
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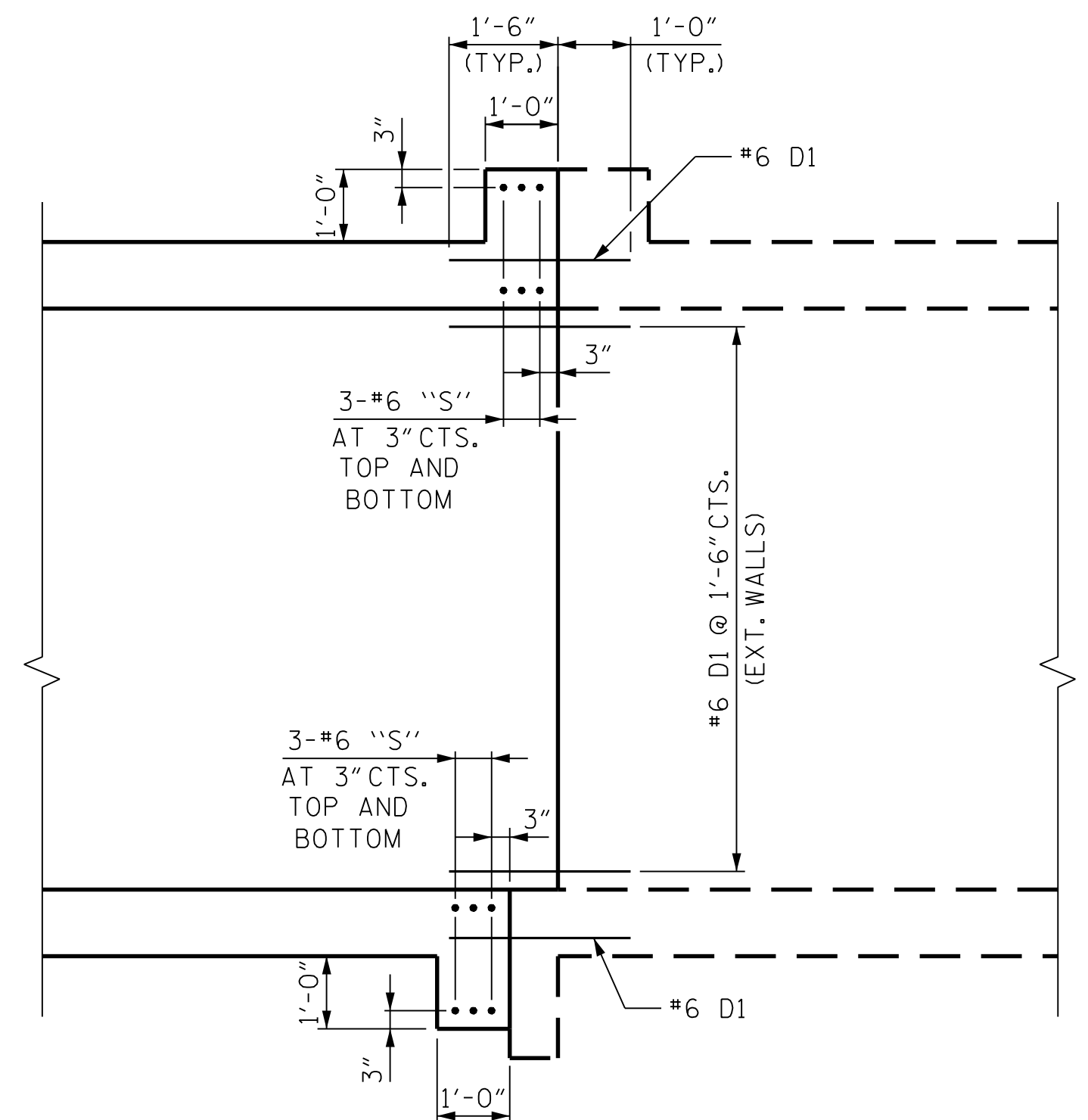
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 CHECKED BY : R. V. KEITH DATE : APR 2023
 DESIGN ENGINEER OF RECORD : I. COGGINS DATE : APR 2023



EXTERIOR WALL LEFT EXTENSION EXISTING CULVERT
CULVERT SECTION NORMAL TO ROADWAY

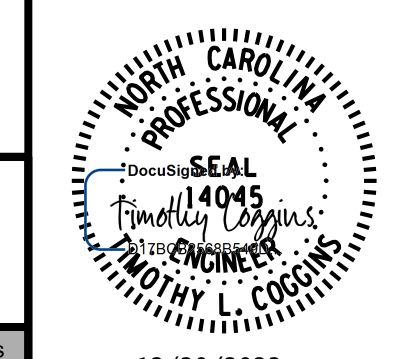


PROPOSED EXTENSION EXISTING BARREL
EDGE BEAM DETAIL

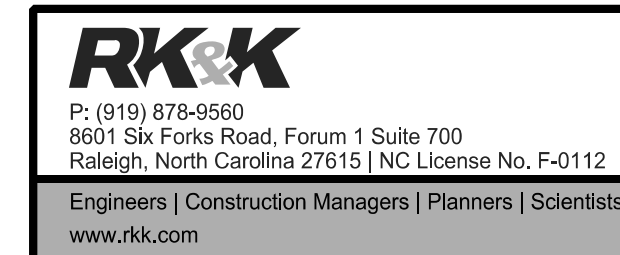
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GUILFORD COUNTY
 STATION: 25+58.50 -L-

SHEET 3 OF 11

CULVERT NO. 400078



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**QUADRUPLE 13 FT. X 11 FT.
 CONCRETE BOX CULVERT
 EXTENSION
 109° SKEW**



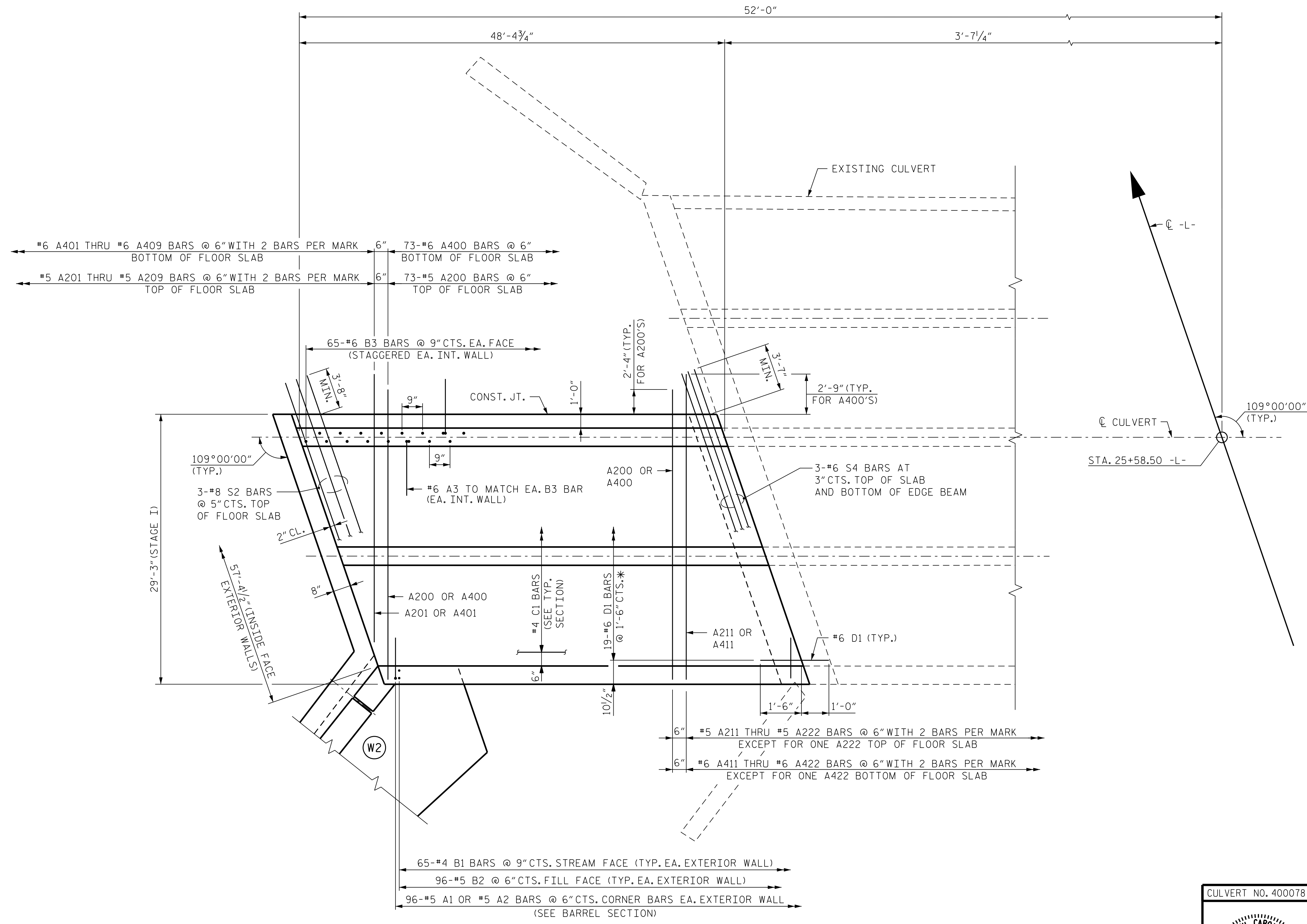
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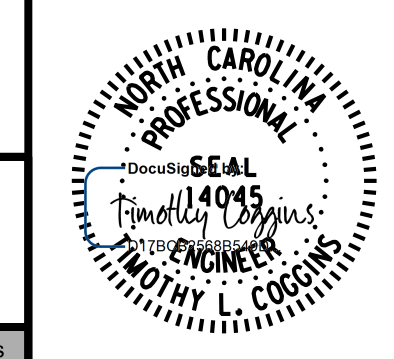


STAGE I
PLAN - FLOOR SLAB
 * SEE EDGE BEAM DETAILS

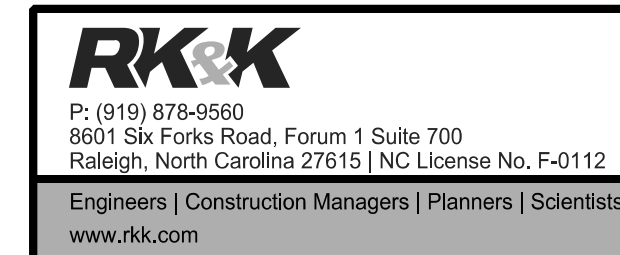
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GUILFORD COUNTY
 STATION: 25+58.50 -L-

SHEET 4 OF 11

CULVERT NO. 400078



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**QUADRUPLE 13 FT. X 11 FT.
 CONCRETE BOX CULVERT
 EXTENSION
 109° SKEW**



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2			4			11

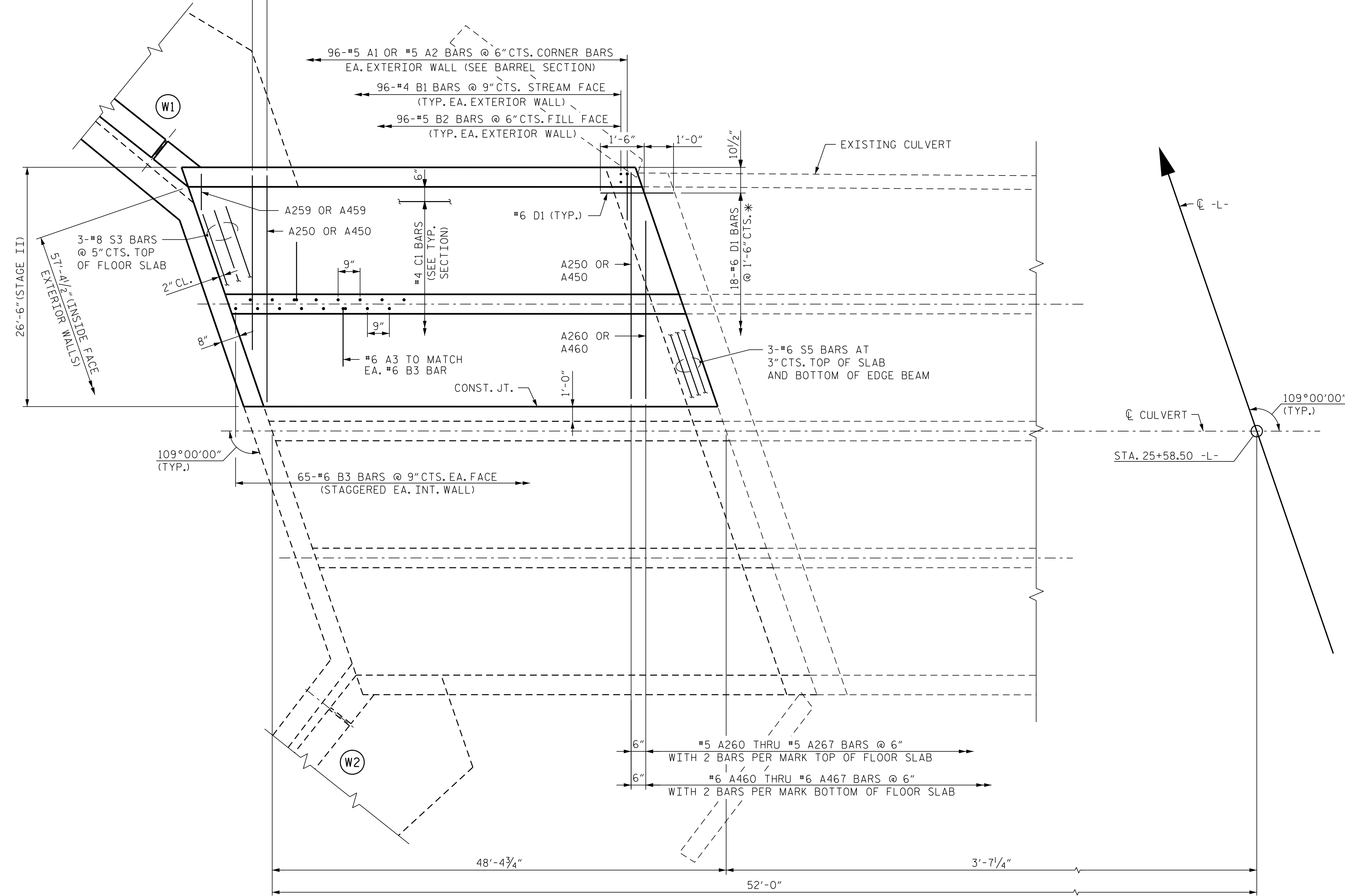
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 DESIGN ENGINEER OF RECORD : I. COGGINS DATE : APR 2023

#6 A451 THRU #6 A459 BARS @ 6" CTS. BARS PER MARK EXCEPT FOR ONE A459 BOTTOM OF FLOOR SLAB
 #5 A251 THRU #5 A259 BARS @ 6" CTS. BARS PER MARK EXCEPT FOR ONE A259 TOP OF FLOOR SLAB

79-#6 A450 BARS @ 6" CTS. BOTTOM OF FLOOR SLAB
 79-#5 A250 BARS @ 6" CTS. TOP OF FLOOR SLAB
 96-#5 A1 OR #5 A2 BARS @ 6" CTS. CORNER BARS EA. EXTERIOR WALL (SEE BARREL SECTION)
 96-#4 B1 BARS @ 9" CTS. STREAM FACE (TYP. EA. EXTERIOR WALL)
 96-#5 B2 BARS @ 6" CTS. FILL FACE (TYP. EA. EXTERIOR WALL)

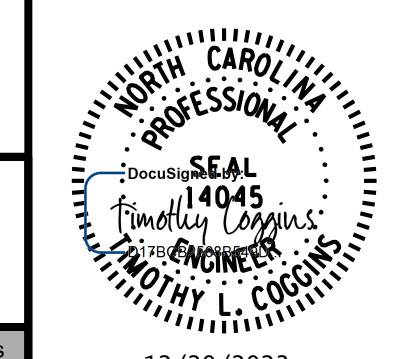


STAGE II
 PLAN - FLOOR SLAB
 * SEE EDGE BEAM DETAILS

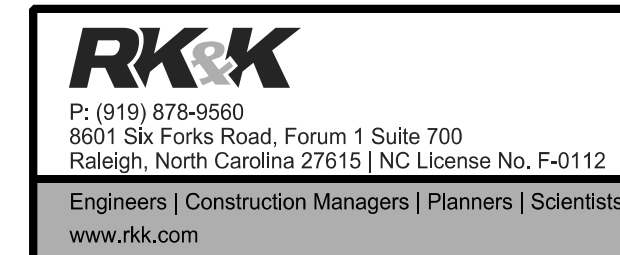
PROJECT NO. U-4015A
GUILFORD COUNTY
 STATION: 25+58.50 -L-

SHEET 5 OF 11

CULVERT NO. 400078



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 QUADRUPLE 13 FT. X 11 FT.
 CONCRETE BOX CULVERT
 EXTENSION
 109° SKEW

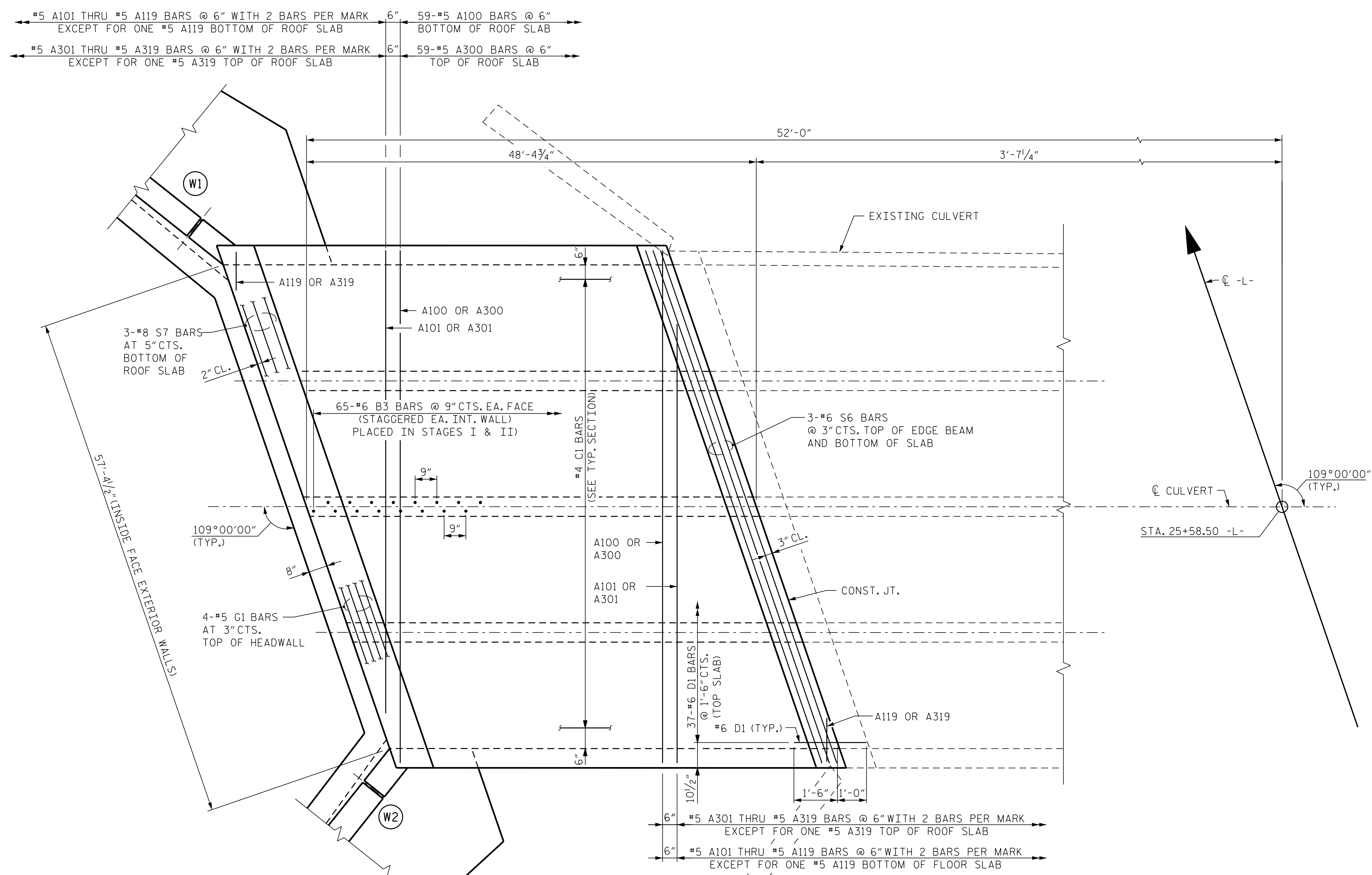


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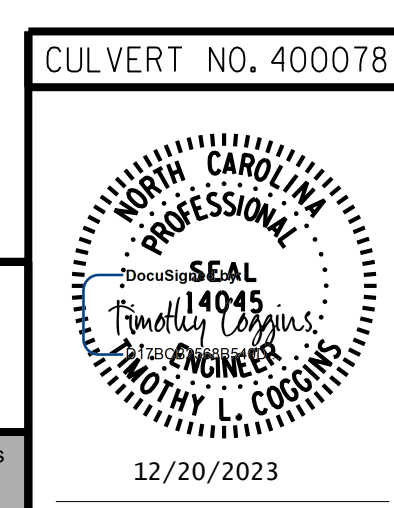
DRAWN BY : B.H. GONFA DATE : APR 2023
 CHECKED BY : R.V. KEITH DATE : APR 2023
 DESIGN ENGINEER OF RECORD : T. COGGINS DATE : APR 2023



STAGE III
PLAN - ROOF SLAB
 * SEE EDGE BEAM DETAIL

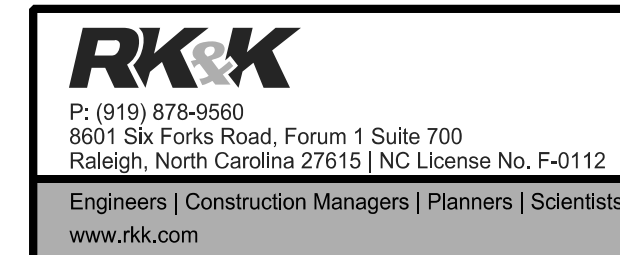
PROJECT NO. U-4015A
GUILFORD COUNTY
 STATION: 25+58.50 -L-

SHEET 6 OF 11



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**QUADRUPLE 13 FT. X 11 FT.
 CONCRETE BOX CULVERT
 EXTENSION
 109° SKEW**

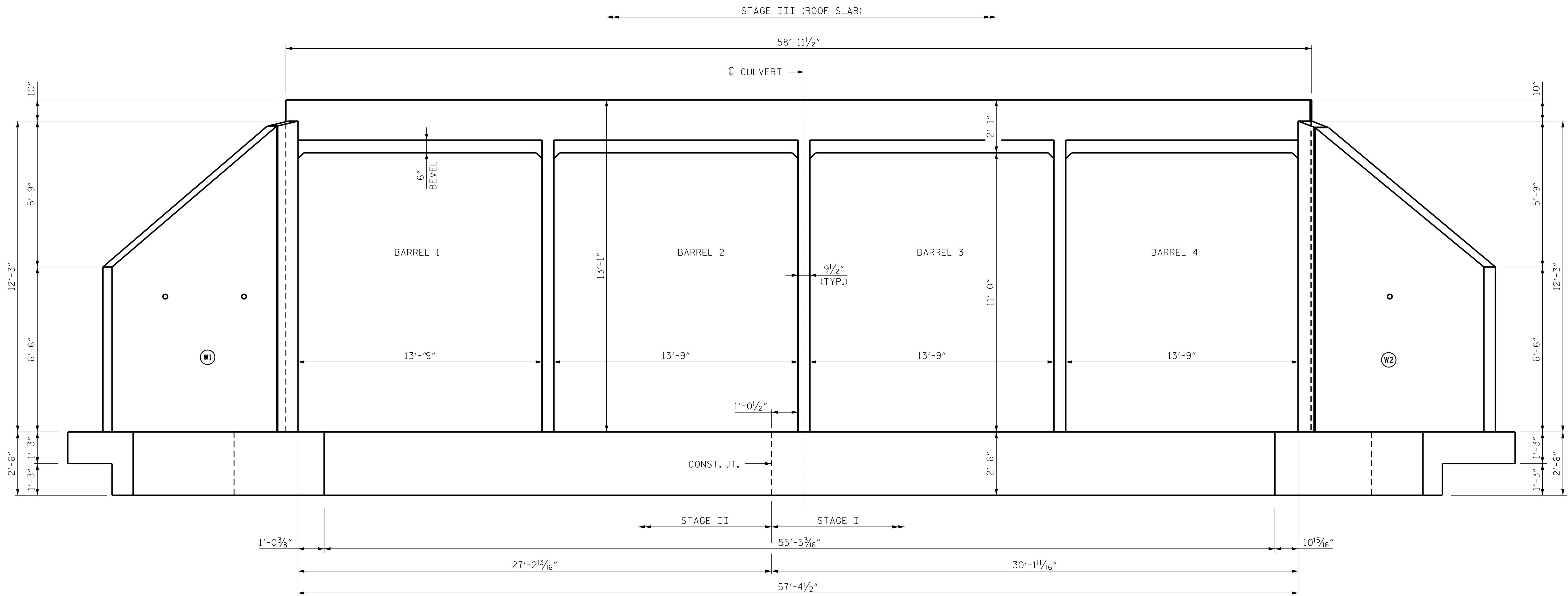


REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	CU_78-6	
1			3			TOTAL SHEETS	
2			4			11	

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DRAWN BY : B. H. GONFA DATE : APR 2023
 CHECKED BY : R. V. KEITH DATE : APR 2023
 DESIGN ENGINEER OF RECORD : I. COGGINS DATE : APR 2023

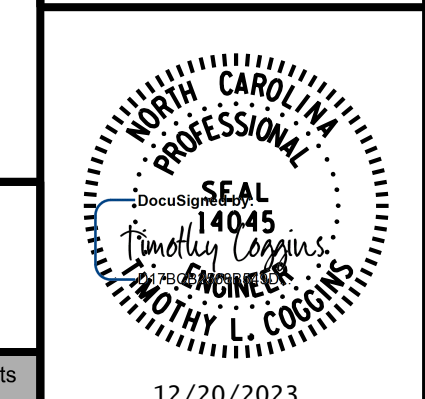


INLET END ELEVATION NORMAL TO SKEW

PROJECT NO. U-4015A
 GUILFORD COUNTY
 STATION: 25+58.50 -L-

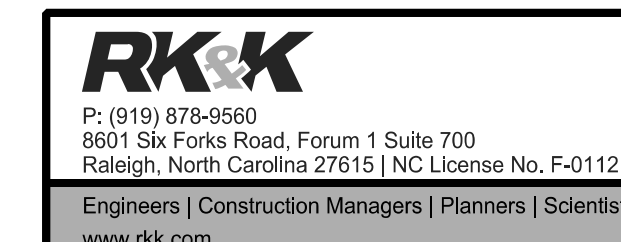
SHEET 7 OF 11

CULVERT NO. 400078



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

QUADRUPLE 13 FT. X 11 FT.
 CONCRETE BOX CULVERT
 EXTENSION ELEVATION
 109° SKEW

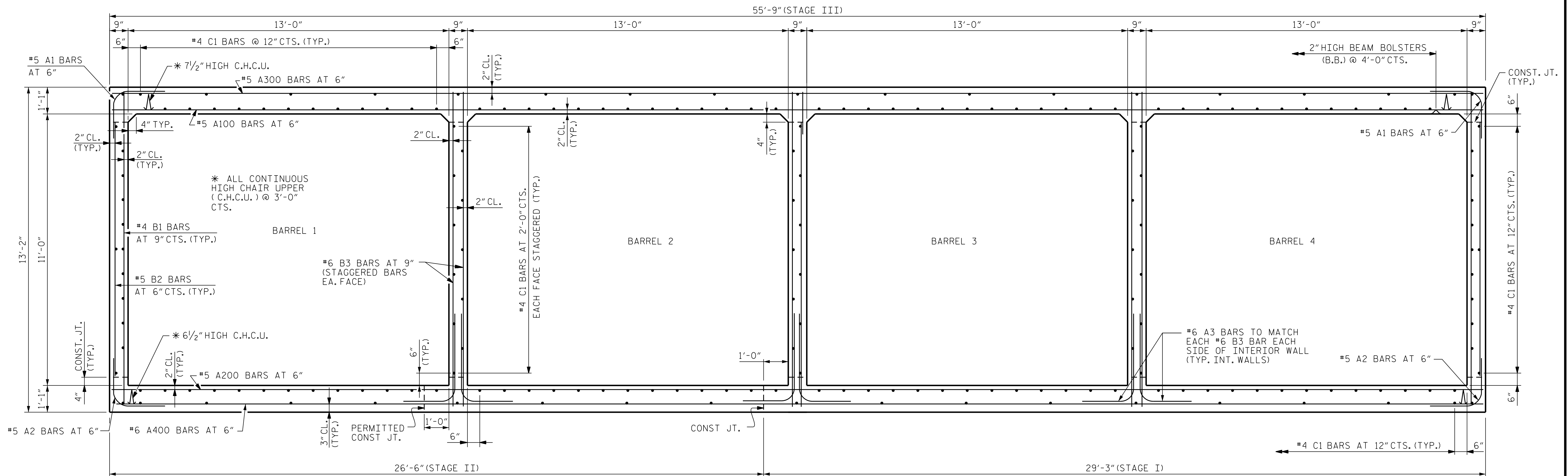


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NO.	BY:	DATE:	NO.	BY:	DATE:	CU-78-7
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2			4			11

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 CHECKED BY : R. V. KEITH DATE : APR 2023
 DESIGN ENGINEER OF RECORD : T. COGGINS DATE : APR 2023



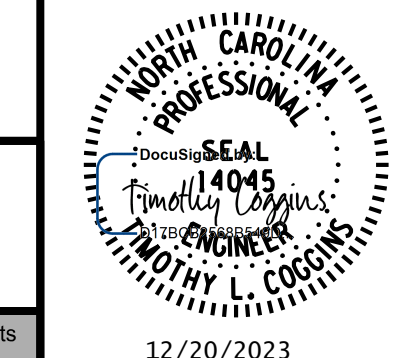
RIGHT ANGLE SECTION OF BARREL

THERE ARE 197 "C1" BARS IN SECTION OF BARREL.

PROJECT NO. U-4015A
 GUILFORD COUNTY
 STATION: 25+58.50 -L-

SHEET 8 OF 11

CULVERT NO. 400078



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

QUADRUPLE 13 FT. X 11 FT.
 CONCRETE BOX CULVERT
 EXTENSION
 109° SKEW

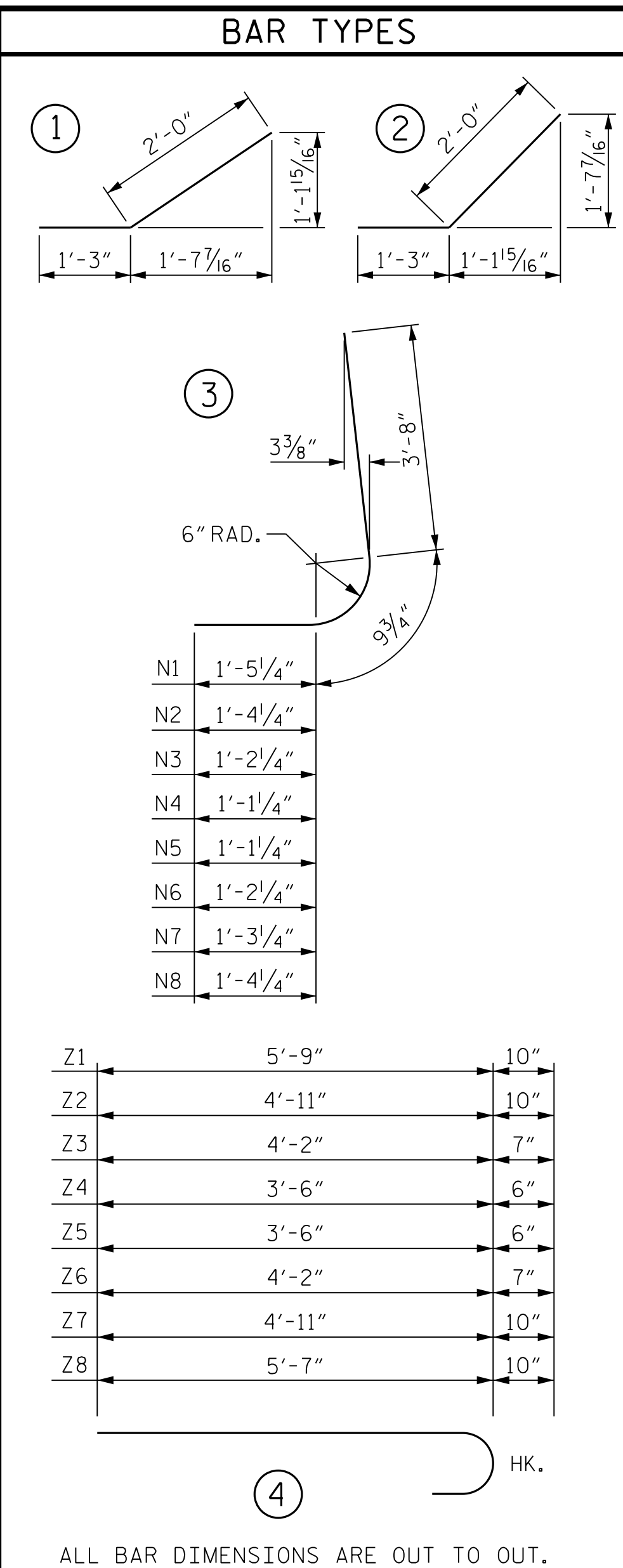


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NO.	BY:	DATE:	NO.	BY:	DATE:	CU_78-8	
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2			4			11	

DRAWN BY : B. H. GONFA DATE : APR 2023
 CHECKED BY : R. V. KEITH DATE : APR 2023
 DESIGN ENGINEER OF RECORD : T. COGGINS DATE : APR 2023

11/13/2023 R:\Structures\DN\Cuiver\ts\Final\U-4015A_SMU_CU_78-9_400078.dgn



BILL OF MATERIAL (STAGE I)

BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	
H6	12	#4	STR. 12'-10"	103	
H7	4	#4	STR. 10'-4"	28	
H8	4	#4	STR. 5'-5"	14	
H9	5	#4	STR. 13'-11"	46	
H10	24	#4	2	52	
N1	5	#6	3	5'-11"	44
N2	5	#5	3	5'-10"	30
N3	5	#5	3	5'-8"	30
N4	4	#4	3	5'-7"	15
S1	3	#6	STR. 6'-0"	27	
T2	4	#4	STR. 14'-9"	39	
V1	4	#5	STR. 11'-6"	48	
V2	4	#5	STR. 10'-11"	46	
V3	6	#5	STR. 9'-7"	60	
V4	6	#4	STR. 8'-6"	34	
V5	6	#4	STR. 7'-3"	29	
V6	6	#4	STR. 6'-0"	24	
Z1	5	#7	4	6'-7"	67
Z2	5	#7	4	5'-9"	59
Z3	5	#5	4	4'-9"	25
Z4	4	#4	4	4'-0"	11

REINFORCING STEEL FOR 1 WING 831 LBS

CLASS A CONCRETE
1 WING 9.6 CY
EDGE BEAM 1.2 CY
END CURTAIN WALL 1.8 CY
TOTAL 12.6 CY

BILL OF MATERIAL (STAGE II)

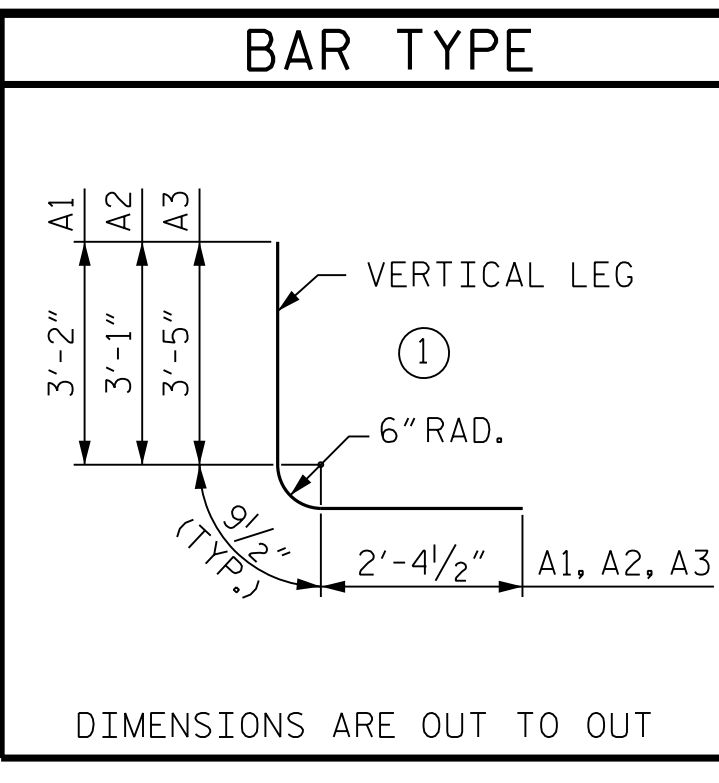
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	
H1	12	#4	STR. 19'-0"	152	
H2	4	#4	STR. 15'-4"	41	
H3	4	#4	STR. 8'-5"	22	
H4	5	#4	STR. 19'-9"	66	
H5	24	#4	1	3'-3"	52
N5	6	#4	3	5'-7"	22
N6	7	#5	3	5'-8"	41
N7	7	#5	3	5'-9"	42
N8	7	#6	3	5'-10"	61
S1	3	#6	STR. 6'-0"	27	
T1	4	#4	STR. 20'-11"	56	
V1	4	#5	STR. 11'-6"	48	
V7	8	#5	STR. 10'-7"	88	
V8	8	#5	STR. 9'-5"	79	
V9	8	#4	STR. 8'-4"	45	
V10	8	#4	STR. 7'-2"	38	
V11	8	#4	STR. 6'-0"	32	
Z5	6	#4	4	4'-0"	16
Z6	7	#5	4	4'-9"	35
Z7	7	#7	4	5'-9"	82
Z8	7	#7	4	6'-6"	93

REINFORCING STEEL FOR 1 WING 1,138 LBS

CLASS A CONCRETE
1 WING 13.5 CY
EDGE BEAM 1.0 CY
END CURTAIN WALL 1.6 CY
TOTAL 16.1 CY

CLASS A CONCRETE FOR STAGE III
1 HEADWALL 2.7 CY
1 EDGE BEAM 2.2 CY
TOTAL 4.9 CY

DRAWN BY : B. H. GONFA DATE : APR 2023
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DESIGN ENGINEER OF RECORD : I. COGGINS DATE : APR 2023



SPLICE LENGTHS

BAR	SIZE	SPLICE LENGTHS
A100	#5	2'-4"
A200	#5	2'-4"
A300	#5	2'-4"
A400	#6	2'-9"
B1	#4	1'-10"
B2	#5	2'-4"
B3	#6	2'-9"
C1	#4	2'-5"
"S"	#6	3'-7"
"S"	#8	3'-8"

BILL OF MATERIAL (STAGE I)

BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	
A1	96	#5	1	6'-4"	634
A2	96	#5	1	6'-3"	626
A3	260	#6	1	6'-7"	2,571
A200	73	#5	STR. 31'-5"	2,392	
A201	2	#5	STR. 28'-6"	59	
A202	2	#5	STR. 25'-7"	53	
A203	2	#5	STR. 22'-8"	47	
A204	2	#5	STR. 19'-6"	41	
A205	2	#5	STR. 16'-11"	35	
A206	2	#5	STR. 14'-0"	29	
A207	2	#5	STR. 11'-1"	23	
A208	2	#5	STR. 8'-2"	17	
A209	2	#5	STR. 5'-3"	11	
A211	2	#5	STR. 32'-2"	67	
A212	2	#5	STR. 29'-3"	61	
A213	2	#5	STR. 26'-4"	55	
A214	2	#5	STR. 23'-5"	49	
A215	2	#5	STR. 20'-6"	43	
A216	2	#5	STR. 17'-8"	37	
A217	2	#5	STR. 14'-9"	31	
A218	2	#5	STR. 11'-10"	25	
A219	2	#5	STR. 8'-11"	19	
A220	2	#5	STR. 6'-0"	13	
A221	2	#5	STR. 3'-1"	6	
A222	1	#5	STR. 1'-8"	2	
A400	73	#6	STR. 31'-10"	3,490	
A401	2	#6	STR. 28'-11"	87	
A402	2	#6	STR. 26'-0"	78	
A403	2	#6	STR. 23'-1"	69	
A404	2	#6	STR. 20'-3"	61	
A405	2	#6	STR. 17'-4"	52	
A406	2	#6	STR. 14'-5"	43	
A407	2	#6	STR. 11'-6"	35	
A408	2	#6	STR. 8'-7"	26	
A409	2	#6	STR. 5'-8"	17	
A411	2	#6	STR. 32'-2"	97	
A412	2	#6	STR. 29'-3"	88	
A413	2	#6	STR. 26'-4"	79	
A414	2	#6	STR. 23'-5"	70	
A415	2	#6	STR. 20'-6"	62	
A416	2	#6	STR. 17'-8"	53	
A417	2	#6	STR. 14'-9"	44	
A418	2	#6	STR. 11'-10"	36	
A419	2	#6	STR. 8'-11"	27	
A420	2	#6	STR. 6'-0"	18	
A421	2	#6	STR. 3'-1"	9	
A422	1	#6	STR. 1'-8"	3	
B1	65	#4	STR. 12'-9"	554	
B2	96	#5	STR. 10'-2"	1,018	
B3	260	#6	STR. 12'-9"	4,979	
D1	27	#6	STR. 2'-6"	101	
C1	142	#4	STR. 25'-4"	2,403	
S2	3	#8	STR. 34'-6"	276	
S4	6	#6	STR. 34'-6"	311	

REINFORCING STEEL 15,490 LBS.

CLASS A CONCRETE 80.1 CY

BILL OF MATERIAL (STAGE II)

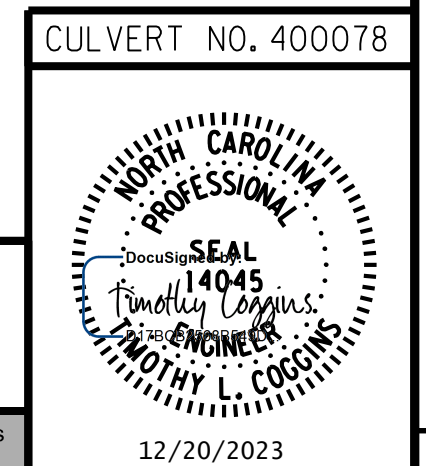
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	
A1	96	#5	1	6'-4"	634
A2	96	#5	1	6'-3"	626
A3	130	#6	1	6'-7"	1,285
A250	79	#5	STR. 26'-4"	2,170	
A251	2	#5	STR. 23'-5"	49	
A252	2	#5	STR. 20'-6"	43	
A253	2	#5	STR. 17'-8"	37	
A254	2	#5	STR. 14'-9"	31	
A255	2	#5	STR. 11'-9"	25	
A256	2	#5	STR. 8'-11"	19	
A257	2	#5	STR. 6'-0"	13	
A258	2	#5	STR. 3'-1"	6	
A259	1	#5	STR. 1'-8"	2	
A260	2	#5	STR. 23'-5"	49	
A261	2	#5	STR. 20'-6"	43	
A262	2	#5	STR. 17'-7"	37	
A263	2	#5	STR. 14'-8"	31	
A264	2	#5	STR. 11'-9"	25	
A265	2	#5	STR. 8'-11"	19	
A266	2	#5	STR. 6'-0"	13	
A267	2	#5	STR. 3'-1"	6	
A450	79	#6	STR. 26'-4"	3,125	
A451	2	#6	STR. 23'-5"	70	
A452	2	#6	STR. 20'-6"	62	
A453	2	#6	STR. 17'-8"	53	
A454	2	#6	STR. 14'-9"	44	
A455	2	#6	STR. 11'-9"	35	
A456	2	#6	STR. 8'-11"	27	
A457	2	#6	STR. 6'-0"	18	
A458	2	#6	STR. 3'-1"	9	
A459	1	#6	STR. 1'-8"	3	
A460	2	#6	STR. 23'-5"	70	
A461	2	#6	STR. 20'-6"	62	
A462	2	#6	STR. 17'-7"	53	
A463	2	#6	STR. 14'-8"	44	
A464	2	#6	STR. 11'-9"	35	
A465	2	#6	STR. 8'-11"	27	
A466	2	#6	STR. 6'-0"	18	
A467	2	#6	STR. 3'-1"	9	
B1	65	#4	STR. 12'-9"	554	
B2	96	#5	STR. 10'-2"	1,018	
B3	130	#6	STR. 12'-9"	2,490	
C1	114	#4	STR. 25'-4"	1,929	
D1	26	#6	STR. 2'-6"	98	
S3	3	#8	STR. 27'-10"	223	
S5	6	#6	STR. 27'-10"	251	

REINFORCING STEEL 12,627 LBS.

CLASS A CONCRETE 111.4 CY

FOUNDATION CONDITIONING MATERIAL

STAGE	WEIGHT
STAGE I	107
STAGE II	97
TOTAL	204



PROJECT NO. U-4015A
GUILFORD COUNTY
STATION: 25+58.50 -L-

SHEET 9 OF 11

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
QUADRUPLE 13 FT. X 11 FT.
CONCRETE BOX CULVERT
EXTENSION
WINGS AND BARRELS
BILL OF MATERIALS

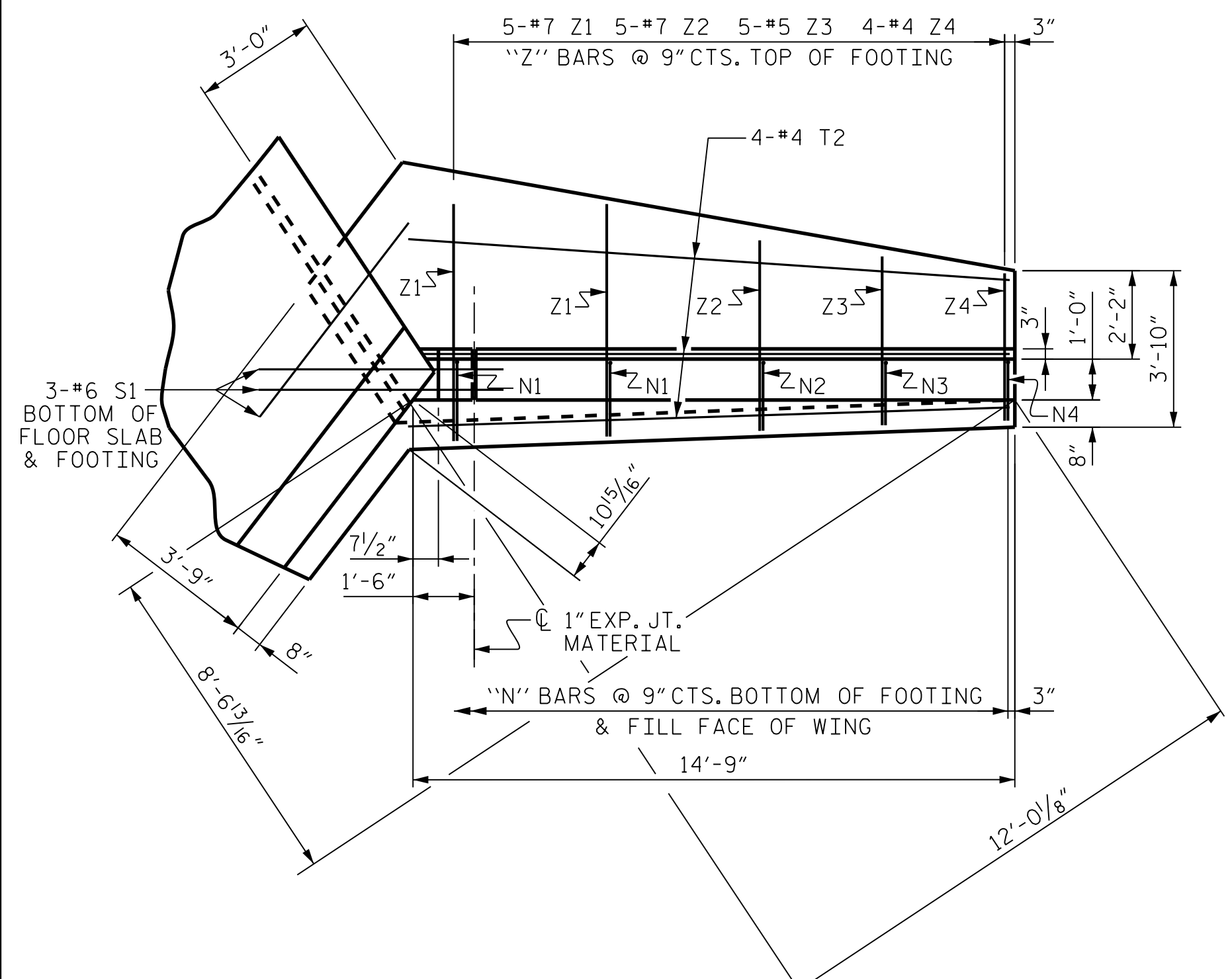
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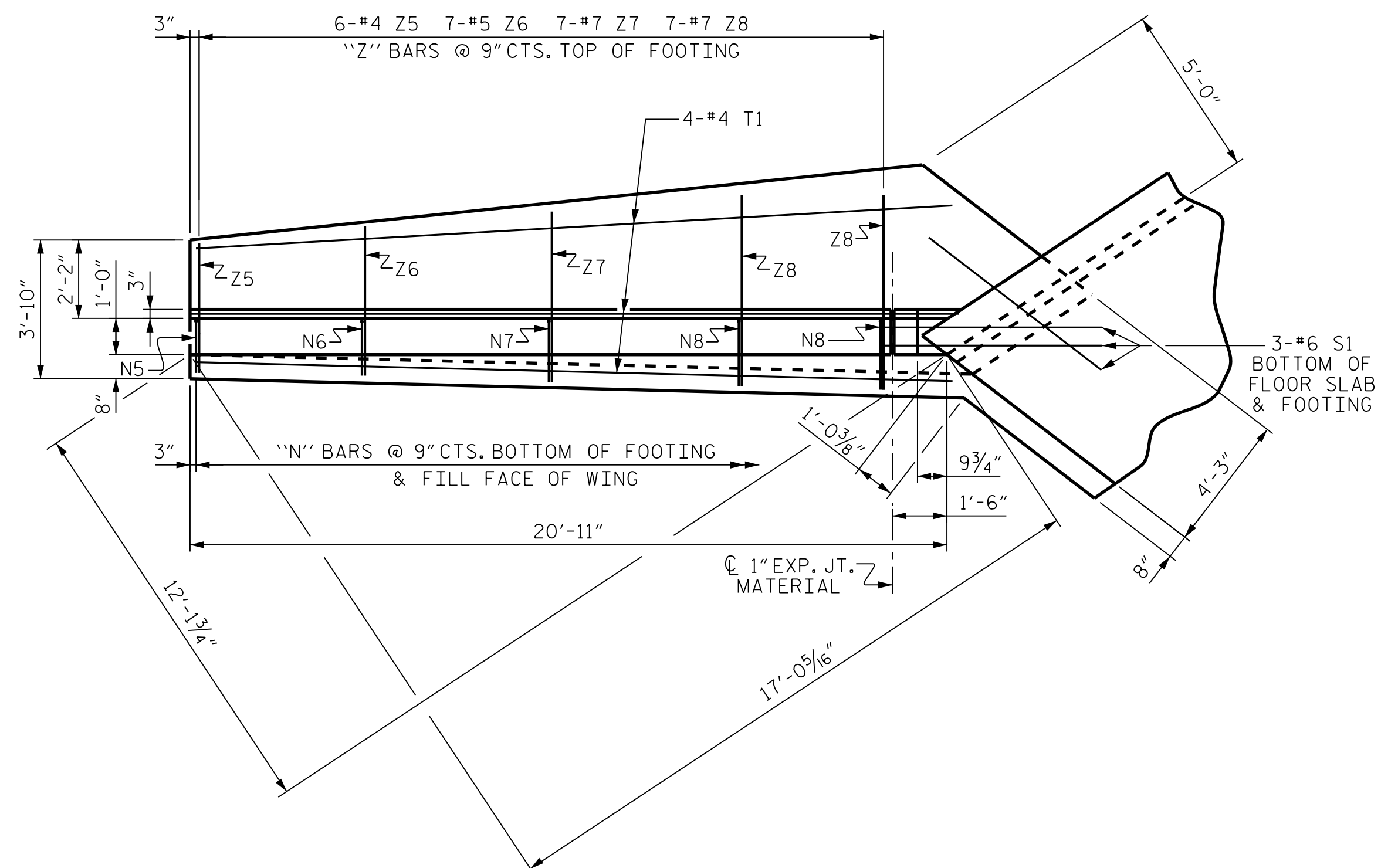
SHEET NO. **CU-78-9**
TOTAL SHEETS 11

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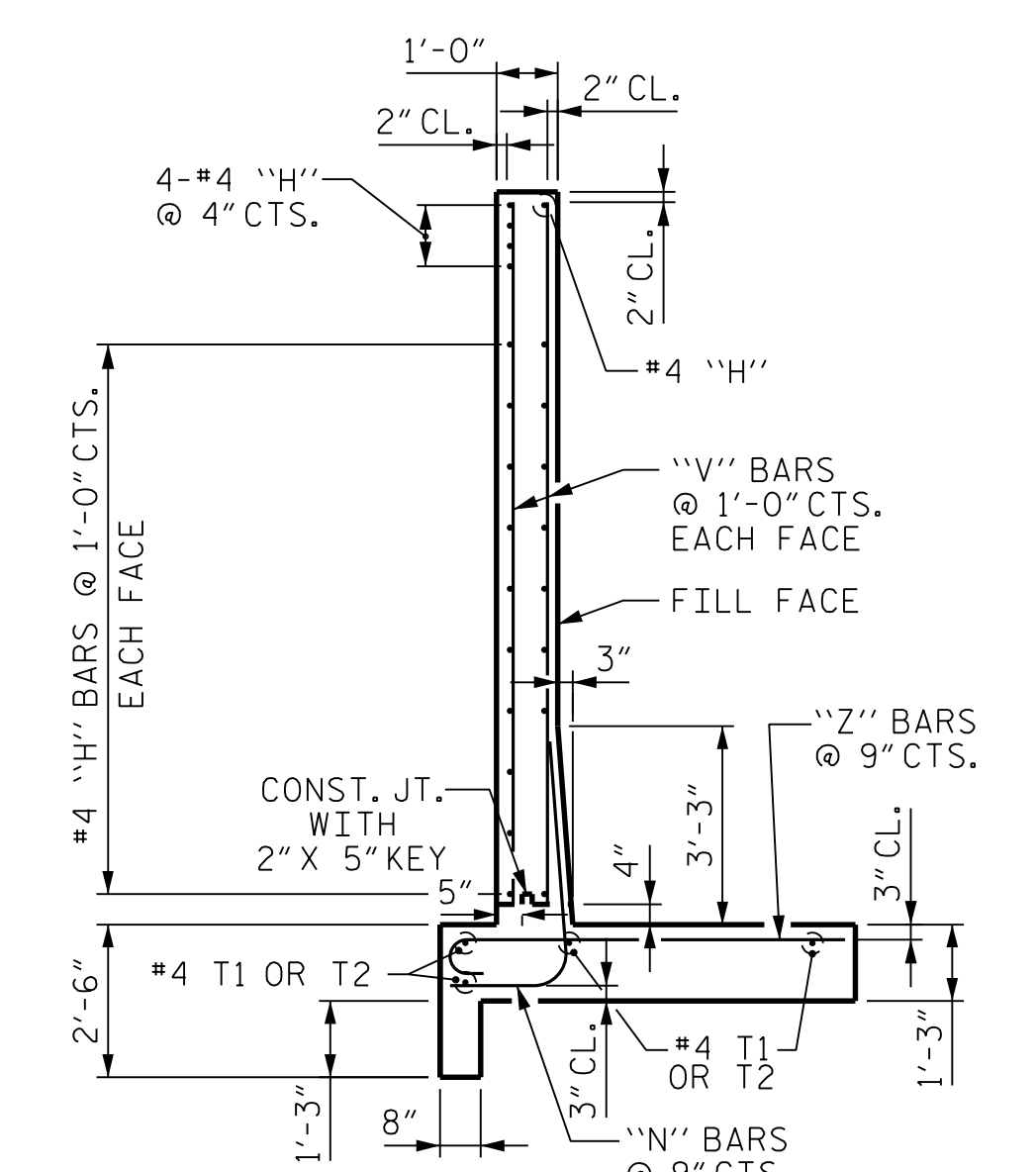
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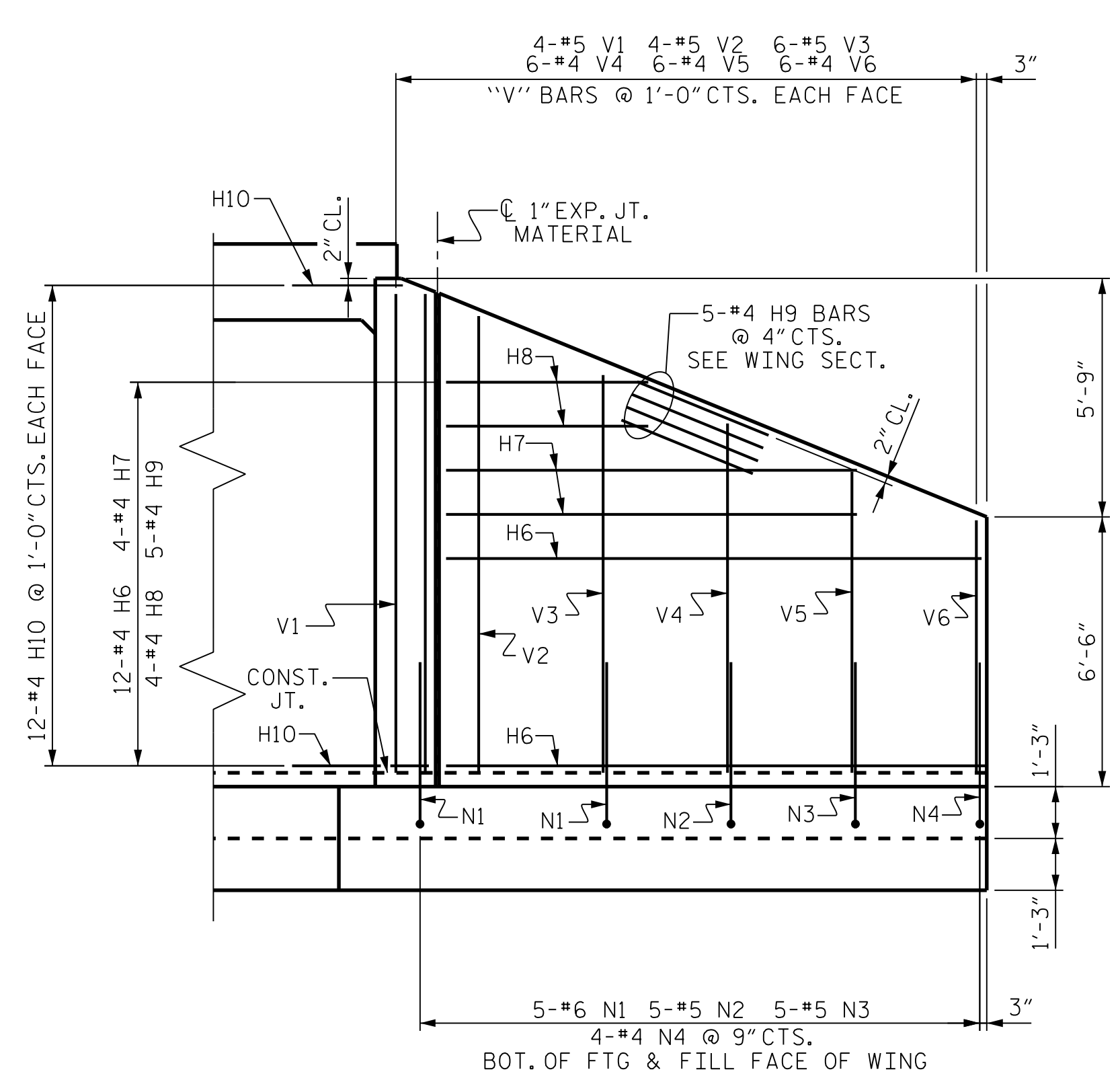
PLAN - W2
(STAGE I)



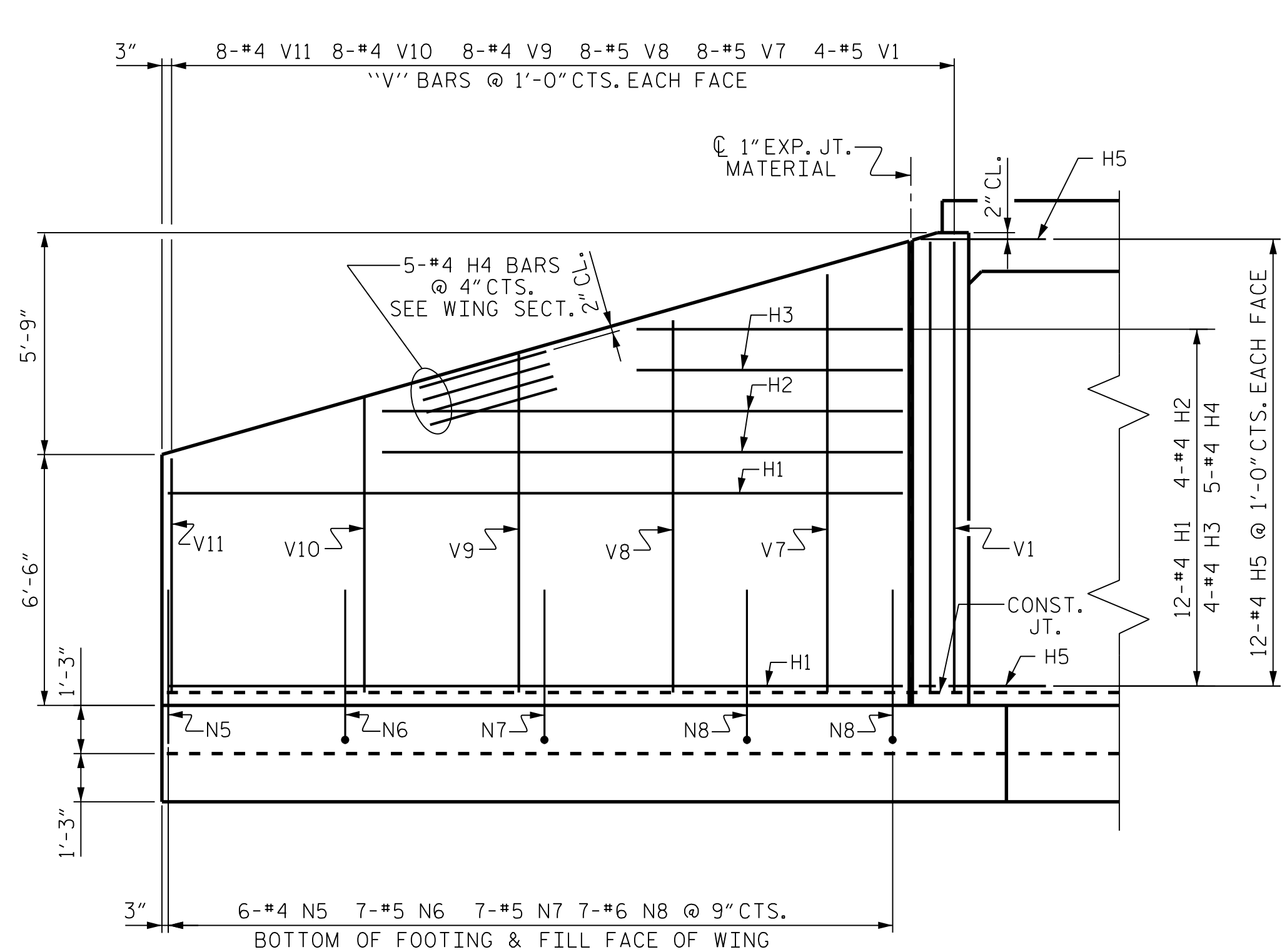
PLAN - W1
(STAGE II)



TYPICAL WING SECTION



ELEVATION - W2
(STAGE I)

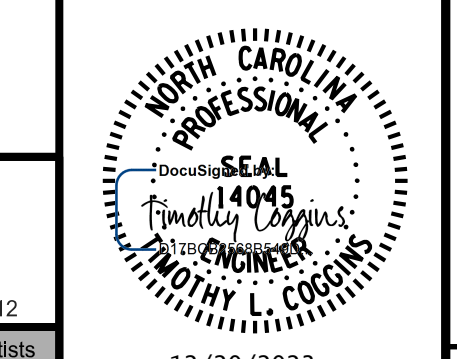


ELEVATION - W1
(STAGE II)

PROJECT NO. U-4015A
GUILFORD COUNTY
STATION: 25+58.50 -L-

SHEET 10 OF 11

CULVERT NO. 400078



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

QUADRUPLE 13 FT. X 11 FT.
CONCRETE BOX CULVERT
EXTENSION
109° SKEW



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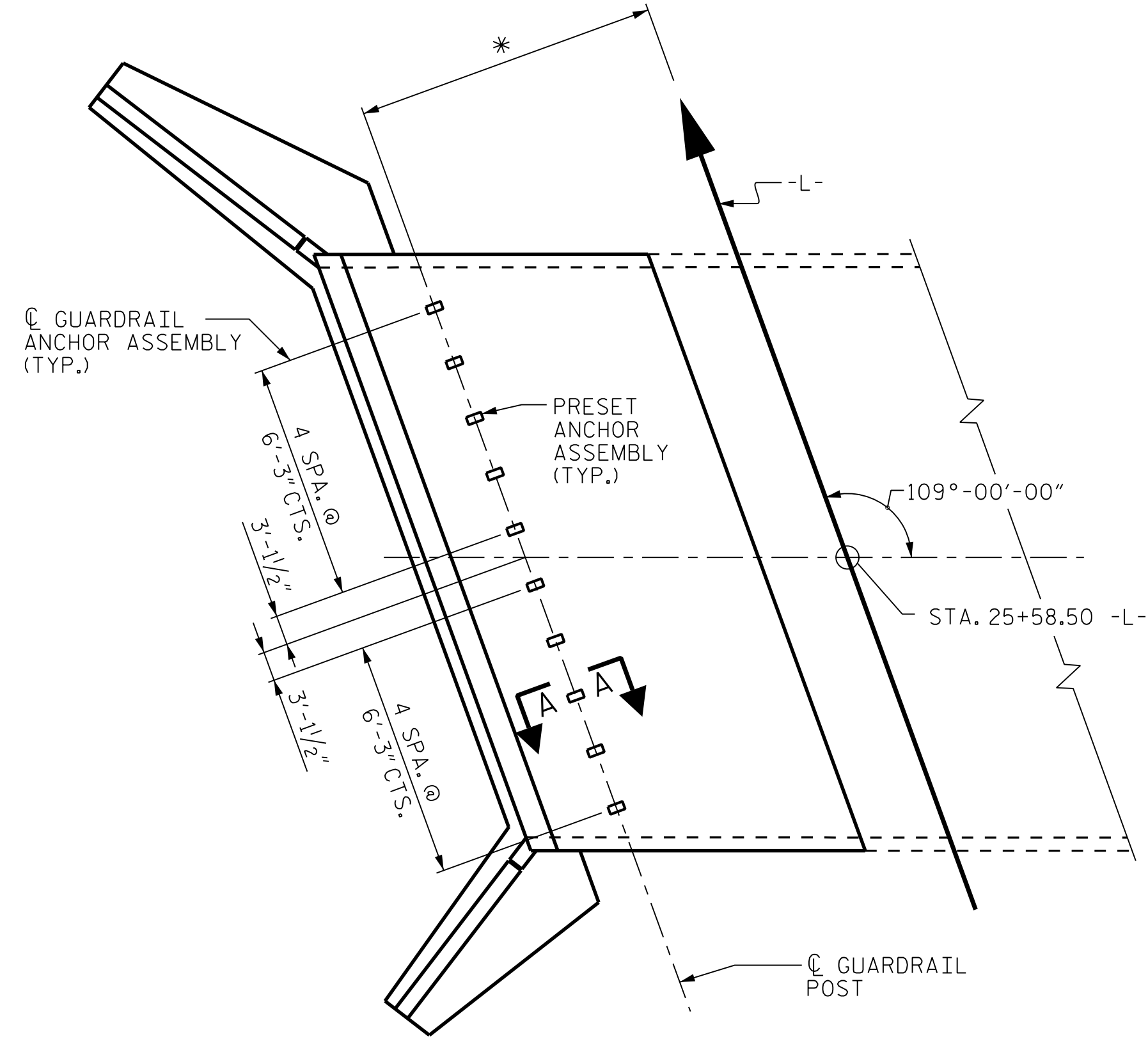
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DRAWN BY : B. H. GONFA DATE : APR 2023
CHECKED BY : R. V. KEITH DATE : APR 2023
DESIGN ENGINEER OF RECORD : T. COGGINS DATE : APR 2023

* THIS DIMENSION TO BE FURNISHED BY THE ENGINEER.



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 2 1/2".
 - B. 4 - 1" Ø X 2 1/4" 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 1/4" 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.

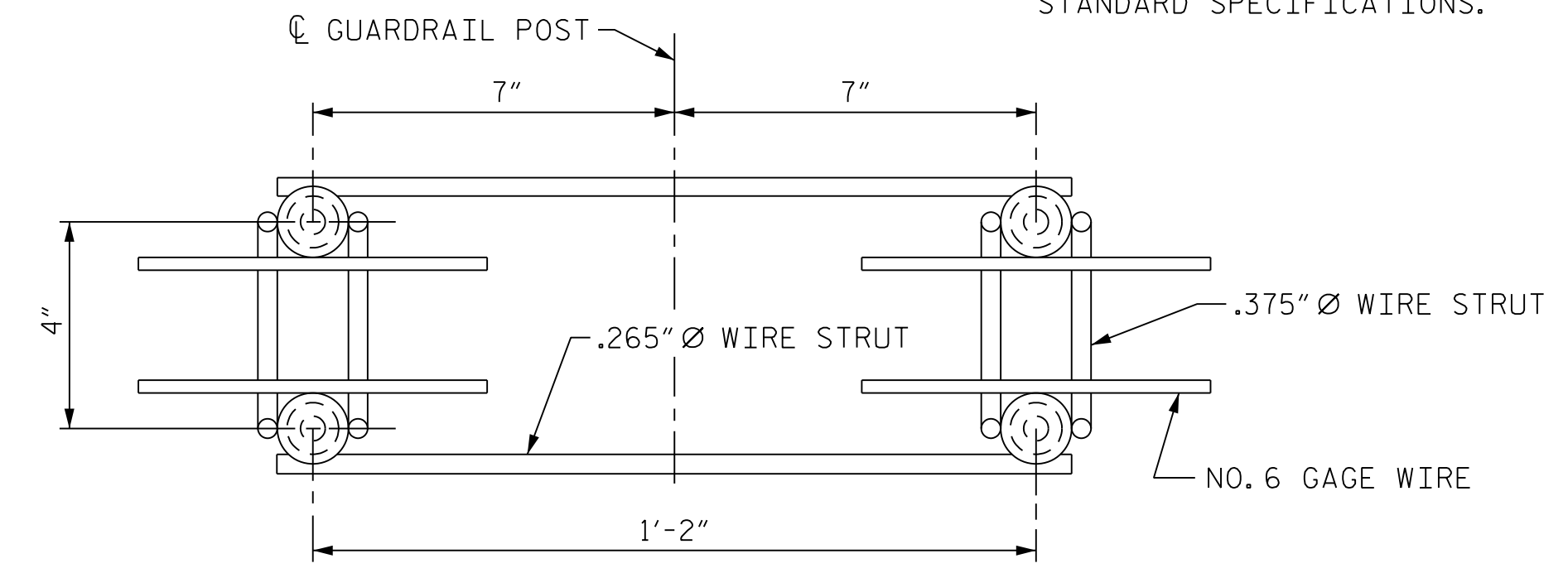
FERRULES TO BE PLUGGED DURING POURING OF SLAB AS RECOMMENDED BY THE MANUFACTURER.

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

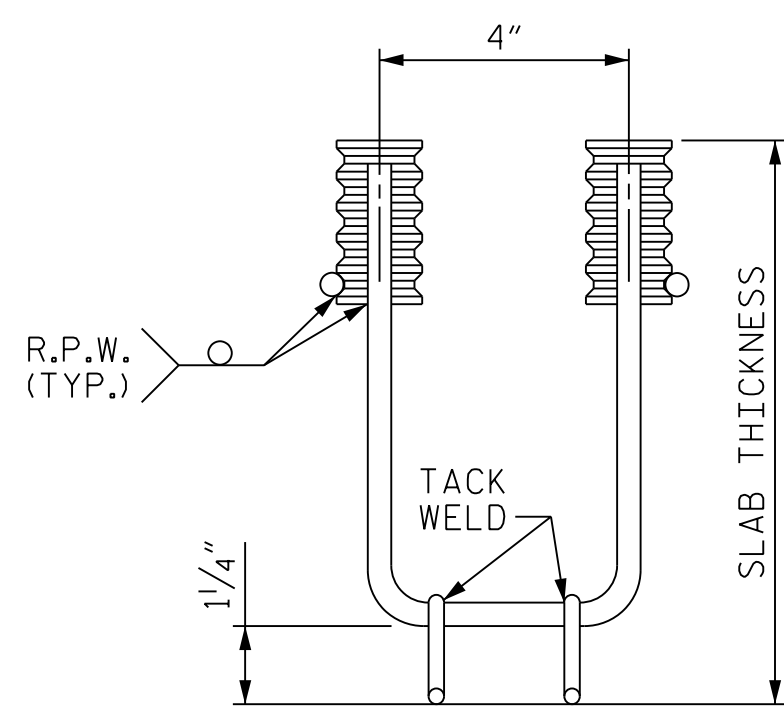
PAYMENT FOR GUARDRAIL, POSTS, AND POST BASE PLATES IS INCLUDED IN ROADWAY PAY ITEMS.

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.

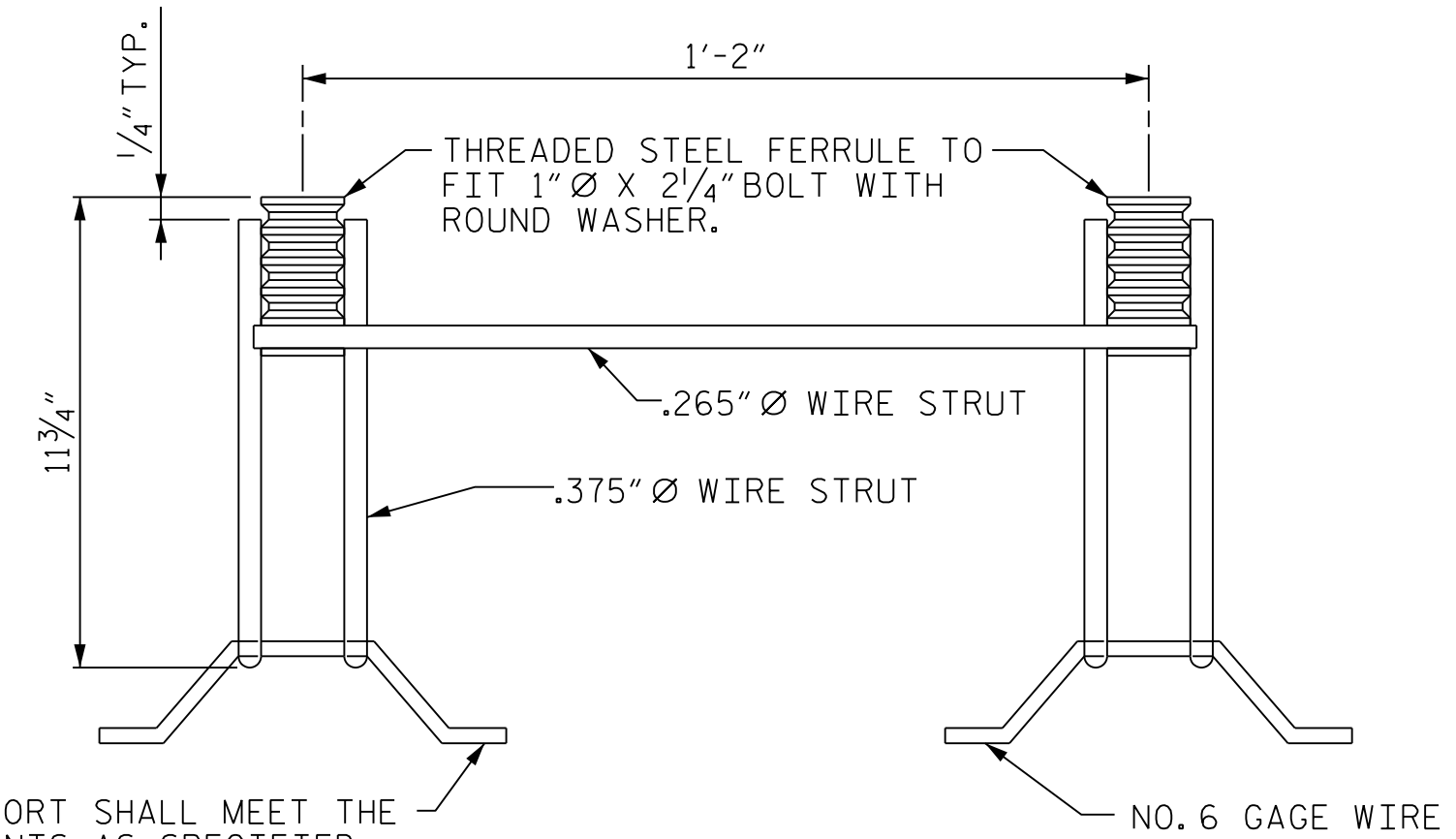


PLAN

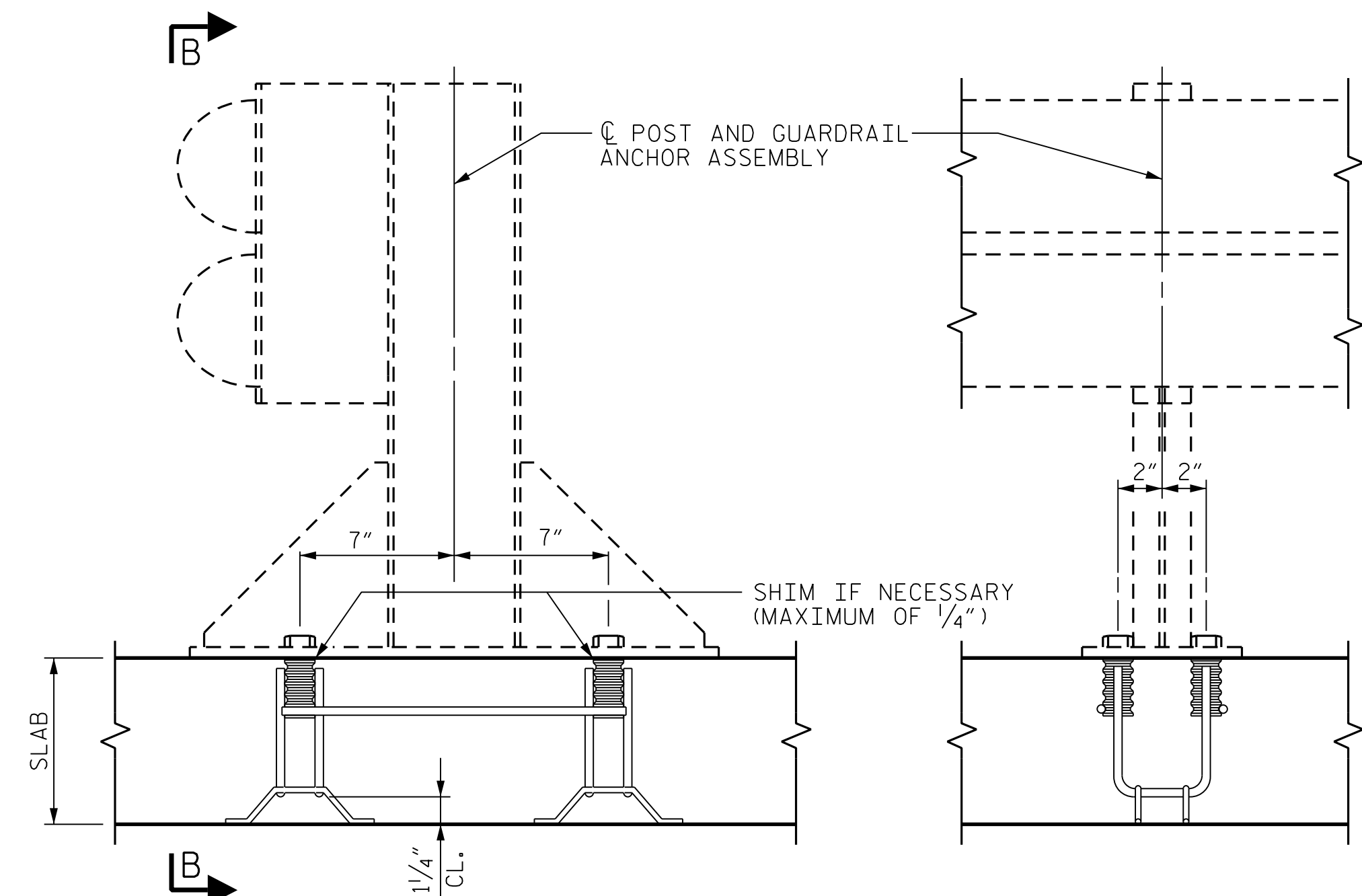


ELEVATION

THIS SUPPORT SHALL MEET THE REQUIREMENTS AS SPECIFIED FOR SUPPORTS FOR REINFORCING STEEL. SEE SPECIFICATIONS.



SIDE VIEW



SECTION A-A

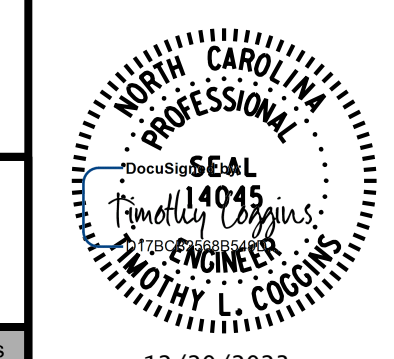
SECTION B-B

GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS

PROJECT NO. U-4015A
 GUILFORD COUNTY
 STATION: 25+58.50 -L-

SHEET 11 OF 11

CULVERT NO. 400078



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STANDARD
 ANCHORAGE DETAILS FOR
 GUARDRAIL ANCHOR ASSEMBLY
 FOR CULVERTS

ASSEMBLED BY : B. H. GONFA	DATE : APR. 2023
CHECKED BY : T. L. COGGINS	DATE : APR. 2023
DESIGN ENGINEER OF RECORD : T. L. COGGINS	DATE : APR. 2023
DRAWN BY : FCJ 6/88	REV. 10/11/11 MAA/GM
CHECKED BY : ARB 6/88	REV. 12/17 MAA/THC
	REV. 6/19 MAA/THC

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	CU-78-11
1			3			TOTAL SHEETS
2			4			11

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 UNLESS ALL SIGNATURES COMPLETED

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 $\frac{3}{4}$ " 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 $\frac{5}{16}$ " 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 $\frac{1}{16}$ " 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. 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.