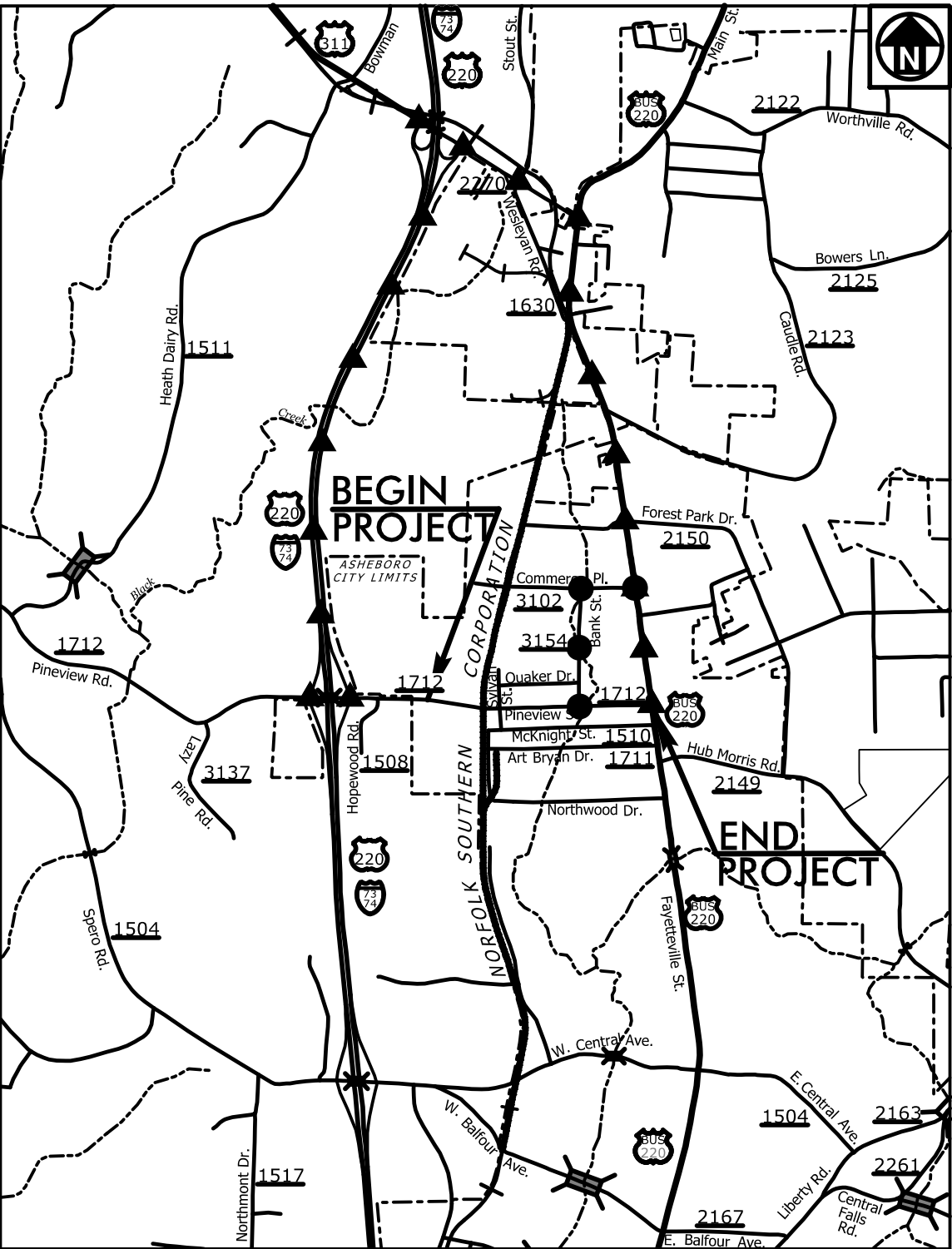


09/08/2019

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



VICINITY MAP (NOT TO SCALE)
DETOUR ROUTE - CULVERT
DETOUR ROUTE - RR & UTL

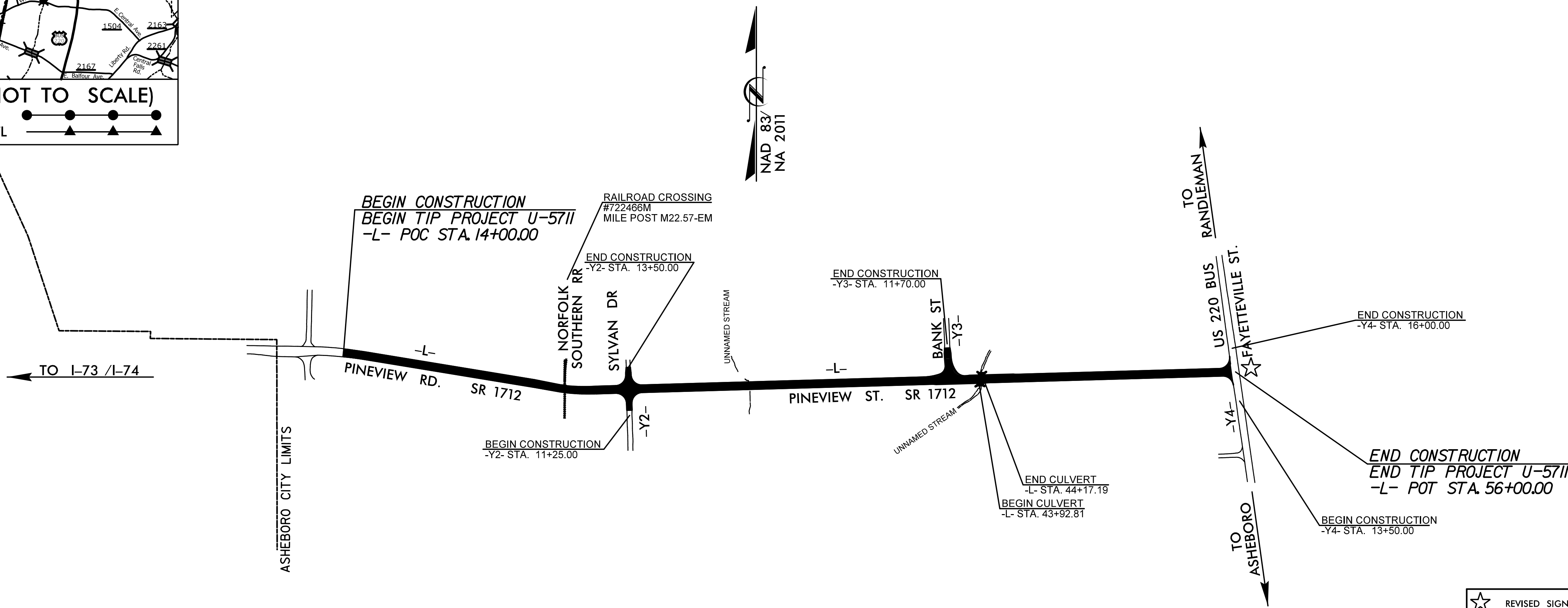
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

RANDOLPH COUNTY

LOCATION: SR 1712 (PINEVIEW ROAD/STREET) FROM WEST OF
SYLVAN DRIVE TO US 220 BUSINESS IN ASHEBORO

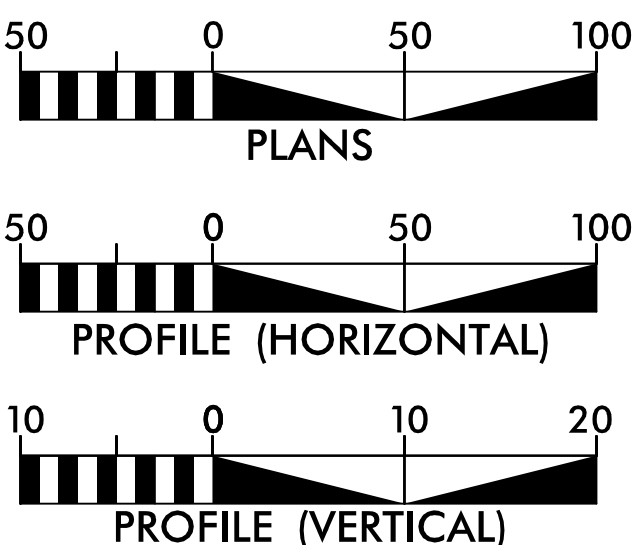
TYPE OF WORK: DRAINAGE, GRADING, PAVING, SIGNALS, AND CULVERT

STRUCTURE PLANS



★ REVISED SIGNAL

GRAPHIC SCALES



DESIGN DATA

ADT 2026 = 7,310
ADT 2046 = 8,870
K = 10 %
D = 70 %
T = 10 % *
V = 40 MPH
* TTST = 5% DUAL 5%
FUNC CLASS =
URBAN MAJOR COLLECTOR
R-R-R GUIDE

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT U-5711 = 0.790 MI
LENGTH STRUCTURE TIP PROJECT U-5711 = 0.005 MI
TOTAL LENGTH TIP PROJECT U-5711 = 0.795 MI

Prepared In the Office of WGI for

DIVISION 8

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

2024 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
AUGUST 31, 2018

LETTING DATE:
SEPTEMBER 15, 2026

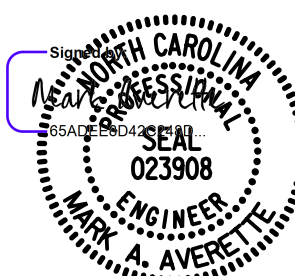
NCDOT CONTACT:

TIM JORDAN, PE
PROJECT ENGINEER

JAMES R. RICE, PE
HYDRAULIC PROJECT ENGINEER

JEFFREY L. TEAGUE, PE

ENGINEER



8/4/2026 | 4:24 AM PDT

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

PLANS PREPARED BY:



5640 Dillard Drive, Suite 200
Cary, NC 27518

LICENSURE NO. C-4434

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS AND FLOOR SLAB OF PHASE I INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE PHASE I WALLS AND WINGS FULL HEIGHT.
3. WING FOOTINGS AND FLOOR SLAB OF PHASE II INCLUDING 4" OF VERTICAL WALL.
4. THE REMAINING PORTION OF PHASE II WALL AND WINGS FULL HEIGHT FOLLOWED BY THE ROOF SLAB, HEADWALLS, AND SILLS.

THE 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. 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.

REMOVAL OF THE EXISTING CM PIPES SHALL BE PERFORMED IN A MANNER THAT PREVENTS DEBRIS FROM FALLING INTO THE WATER. THE CONTRACTOR SHALL SUBMIT DEMOLITION PLANS FOR REVIEW AND REMOVE THE PIPES IN ACCORDANCE WITH ARTICLE 402-2 OF THE STANDARD SPECIFICATIONS.

THE EXISTING STRUCTURE CONSISTS OF 3 LINES OF 103"X 71"CM PIPE ARCH @ 60'-0"IN LENGTH ALONG CENTERLINE. THE EXISTING STRUCTURE, WHICH IS LOCATED AT THE SITE OF THE PROPOSED STRUCTURE AND SHALL BE REMOVED.

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

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

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.

CULVERT MUST BE CAST-IN-PLACE, PRECAST OPTION WILL NOT BE ALLOWED.

FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.

THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS (360,000 KG) OF REINFORCING STEEL, ONE 30 INCH (760 MM) SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS (360,000 KG) OF REINFORCING STEEL, TWO 30 INCH (760 MM) 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 SPliced 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.



CONSTRUCTION PHASING

LOOKING DOWNSTREAM

DRAWN BY: T. BANKOVICH DATE: 8-22
 CHECKED BY: J.A. BATTS DATE: 8-22
 DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 9-25

TOTAL STRUCTURE QUANTITIES		
REMOVAL OF EXISTING STRUCTURE		LUMP SUM
BOX CULVERT EXCAVATION		LUMP SUM
FOUNDATION CONDITIONING MATERIAL		122 TONS
CLASS A CONCRETE		
BARREL @	2.774 CY/FT	158.8 C.Y.
HEADWALLS		2.4 C.Y.
SILLS		2.7 C.Y.
WING ETC.		22.8 C.Y.
TOTAL		186.7 C.Y.
REINFORCING STEEL		
BARREL		25,909 LBS.
WINGS ETC.		1,336 LBS.
TOTAL		27,245 LBS.

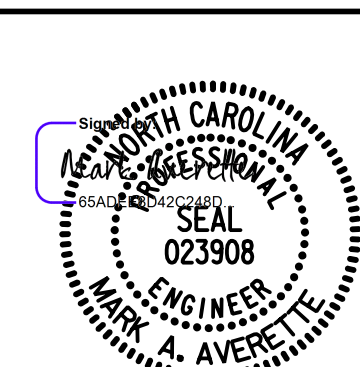
PHASE I STRUCTURE QUANTITIES			PHASE II STRUCTURE QUANTITIES		
REMOVAL OF EXISTING STRUCTURE_____		LUMP SUM	REMOVAL OF EXISTING STRUCTURE_____		LUMP SUM
BOX CULVERT EXCAVATION_____		LUMP SUM	BOX CULVERT EXCAVATION_____		LUMP SUM
FOUNDATION CONDITIONING MATERIAL_____		66 TONS	FOUNDATION CONDITIONING MATERIAL_____		56 TONS
CLASS A CONCRETE			CLASS A CONCRETE		
BARREL @_____	0.904 CY/FT_____	51.8 C.Y.	BARREL @_____	1.870 CY/FT_____	107.0 C.Y.
WING ETC._____		11.6 C.Y.	HEADWALLS_____		2.4 C.Y.
TOTAL_____		63.4 C.Y.	SILLS_____		2.7 C.Y.
REINFORCING STEEL			WING ETC._____		
BARREL_____		10,173 LBS.	TOTAL_____		125.7 C.Y.
WINGS ETC._____		668 LBS.	REINFORCING STEEL		
TOTAL_____		10,805 LBS.	BARREL_____		15,772 LBS.
SAMPLE BAR			WINGS ETC._____		668 LBS.
			TOTAL_____		16,440 LBS.

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 $f_y = 60$ ksi.



LICENSE NO. C-4434



8/4/2026 | 4:24 AM PDT

PROJECT NO. U-5711
RANDOLPH COUNTY
 STATION: 44+05.00 -L-

SHEET 1 OF 7 REPLACES CULVERT P483

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

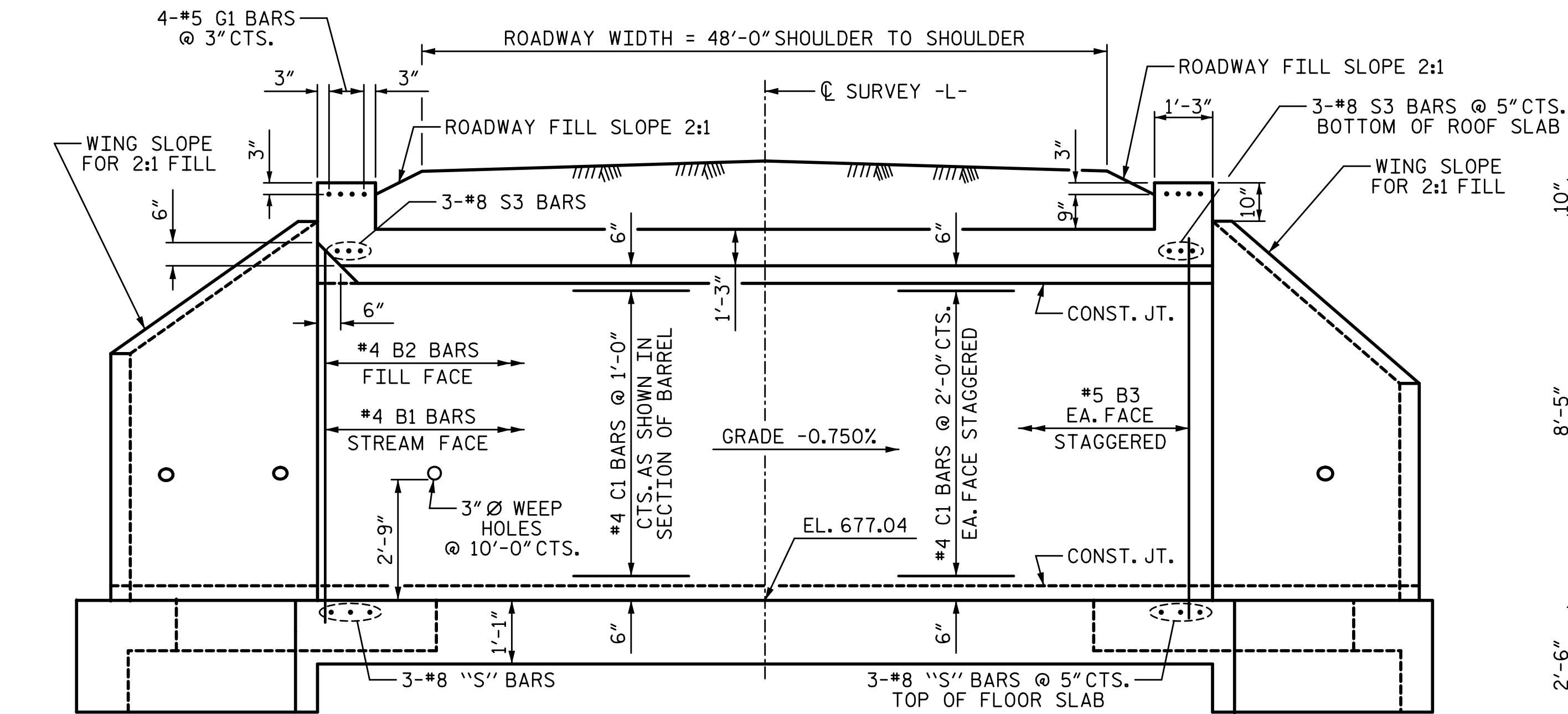
DOUBLE 12 FT. X 7 FT.
CONCRETE BOX CULVERT

100° SKEW

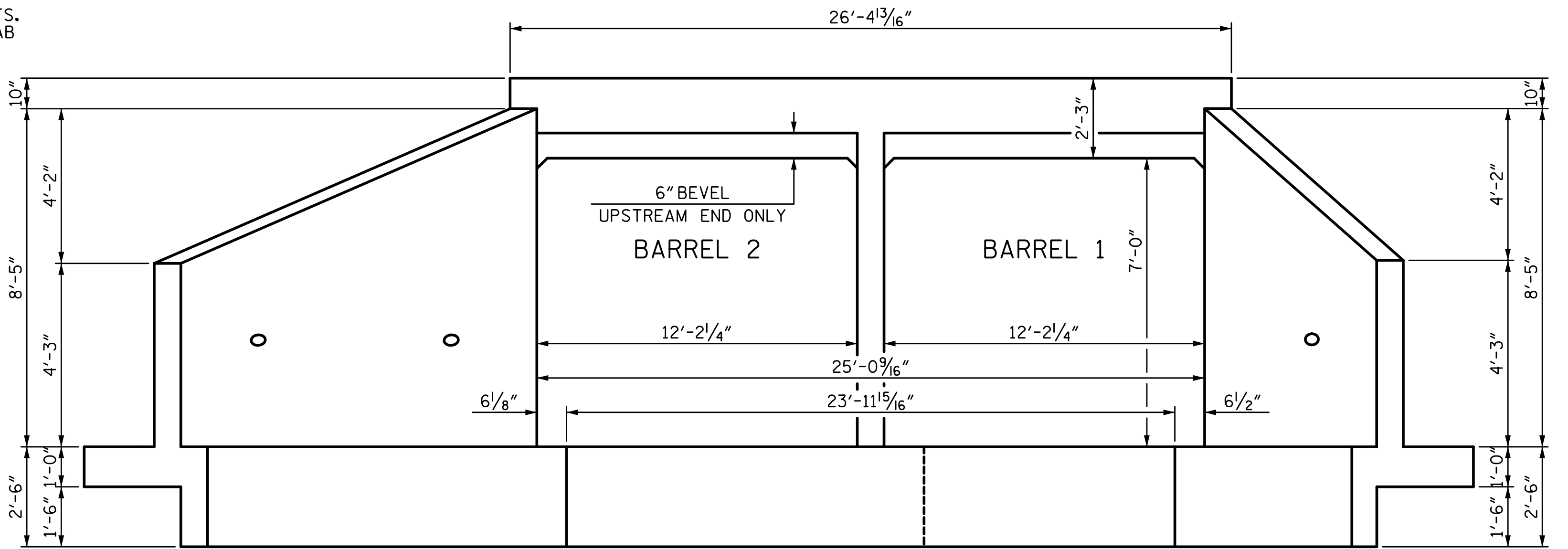
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2			4			

**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

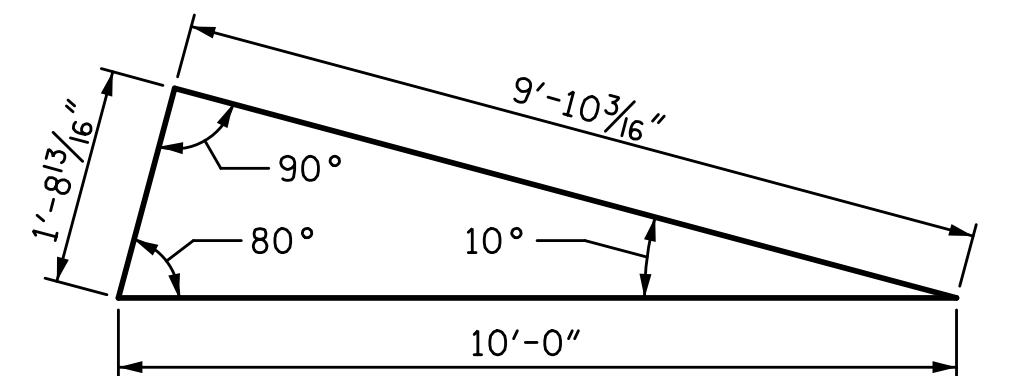
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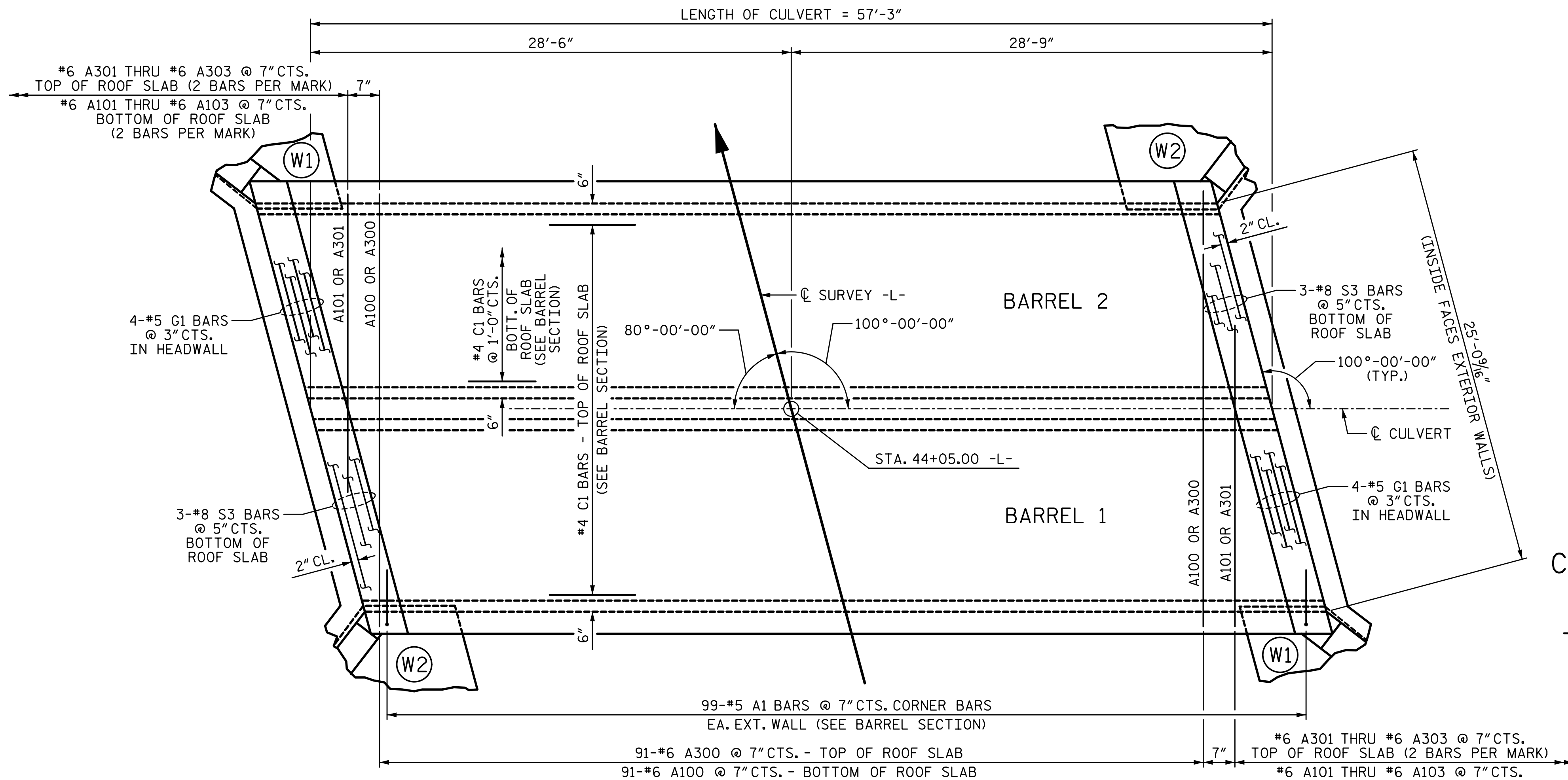
EXTERIOR WALL INTERIOR WALL
CULVERT SECTION NORMAL TO ROADWAY
(CONCRETE SILLS NOT SHOWN)



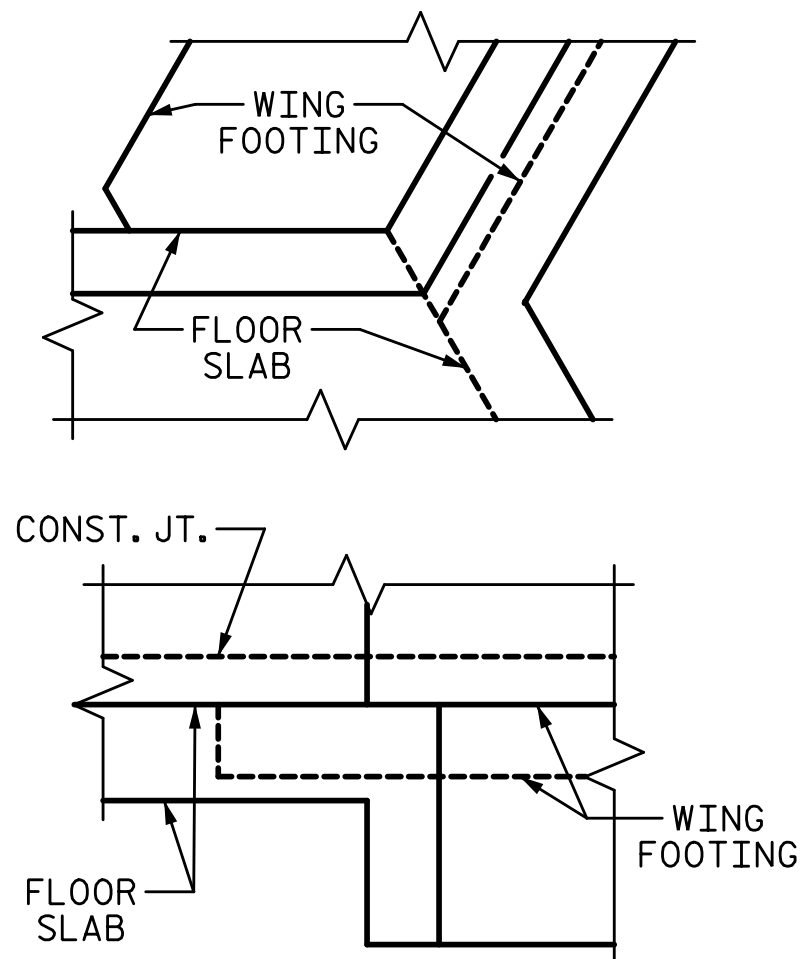
PHASE I PHASE II
END ELEVATION
LOOKING DOWNSTREAM



SKEW TRIANGLE



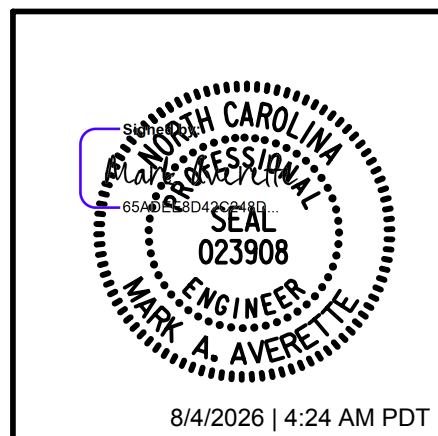
PLAN OF ROOF SLAB
C1 BARS ARE 2 BAR RUNS



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

PROJECT NO. U-5711
RANDOLPH COUNTY
STATION: 44+05.00 -L-

SHEET 2 OF 7

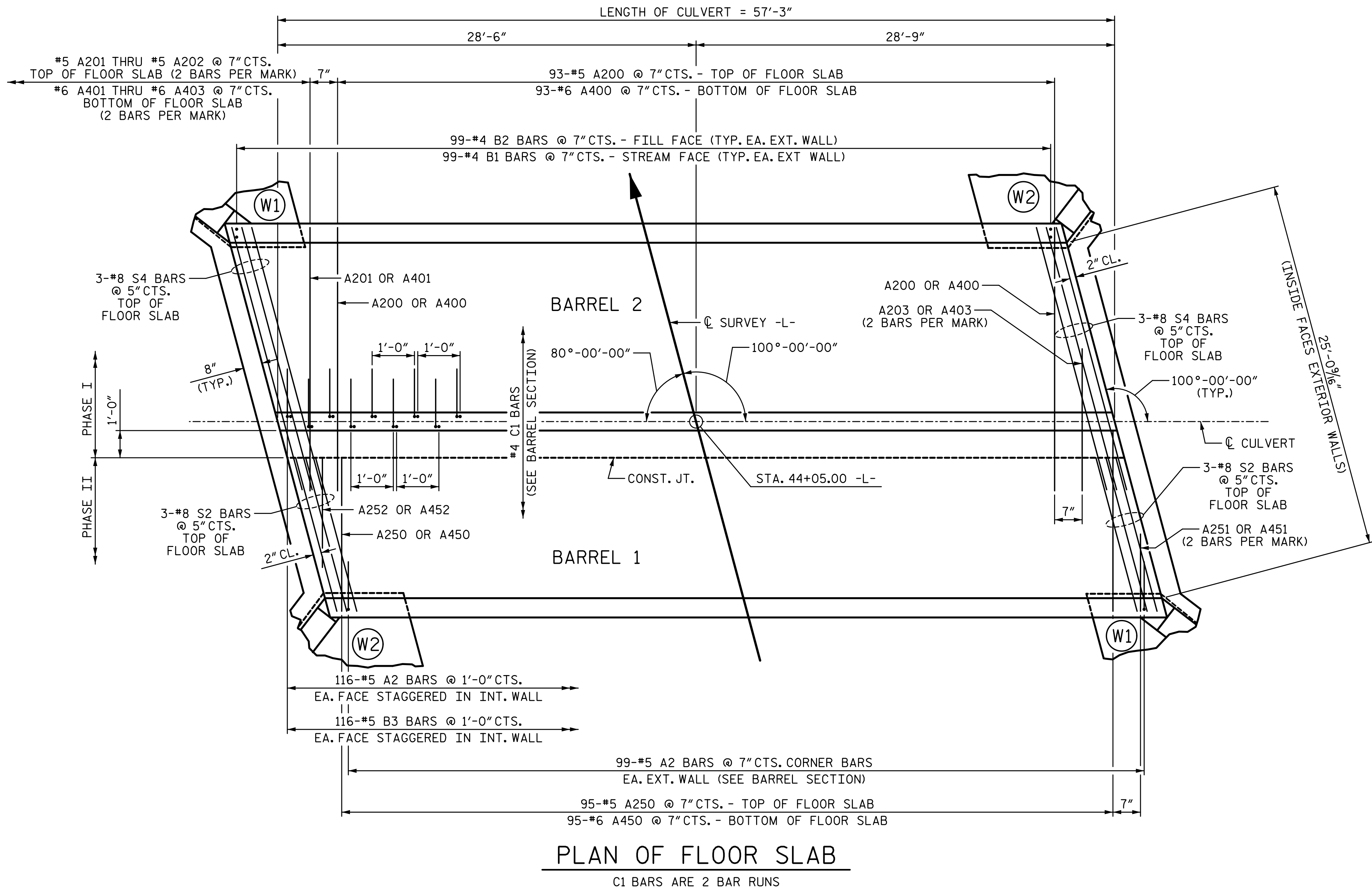


STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
DOUBLE 12 FT. X 7 FT. CONCRETE BOX CULVERT					
100° SKEW					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
SHEET NO.					TOTAL SHEETS
C-2					7

DRAWN BY: T. BANKOVICH DATE: 8-22
CHECKED BY: J.A. BATTS DATE: 8-22
DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 9-25

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PROJECT NO. U-5711
RANDOLPH COUNTY
STATION: 44+05.00 -L-

SHEET 3 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 12 FT. X 7 FT.
CONCRETE BOX CULVERT

100° SKEW

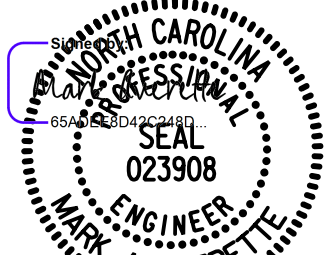
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2			4			TOTAL SHEETS 7



5640 Dillard Drive, Suite 200
Cary, NC 27518

LICENSURE NO. C-4434

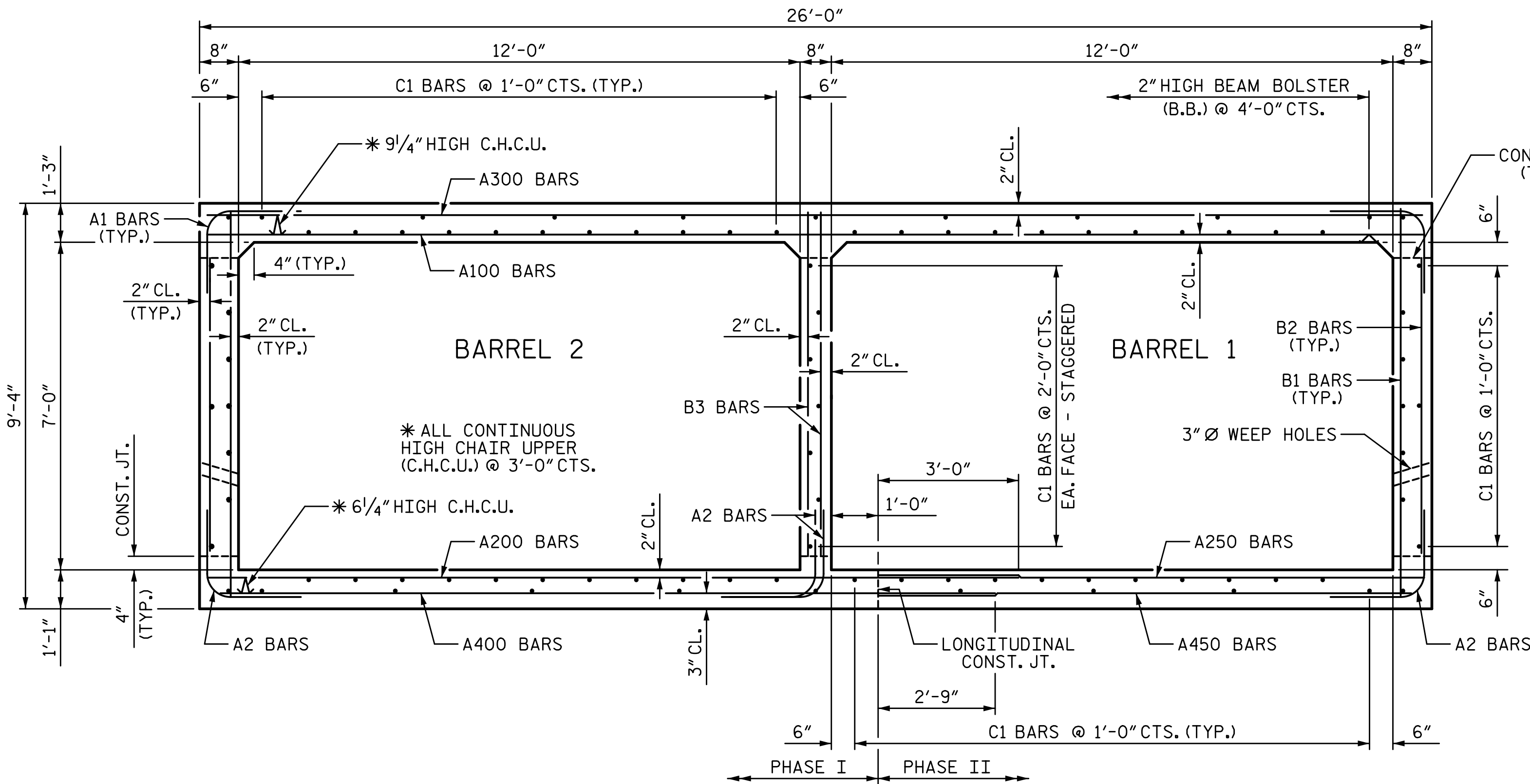


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UNLESS ALL SIGNATURES COMPLETED

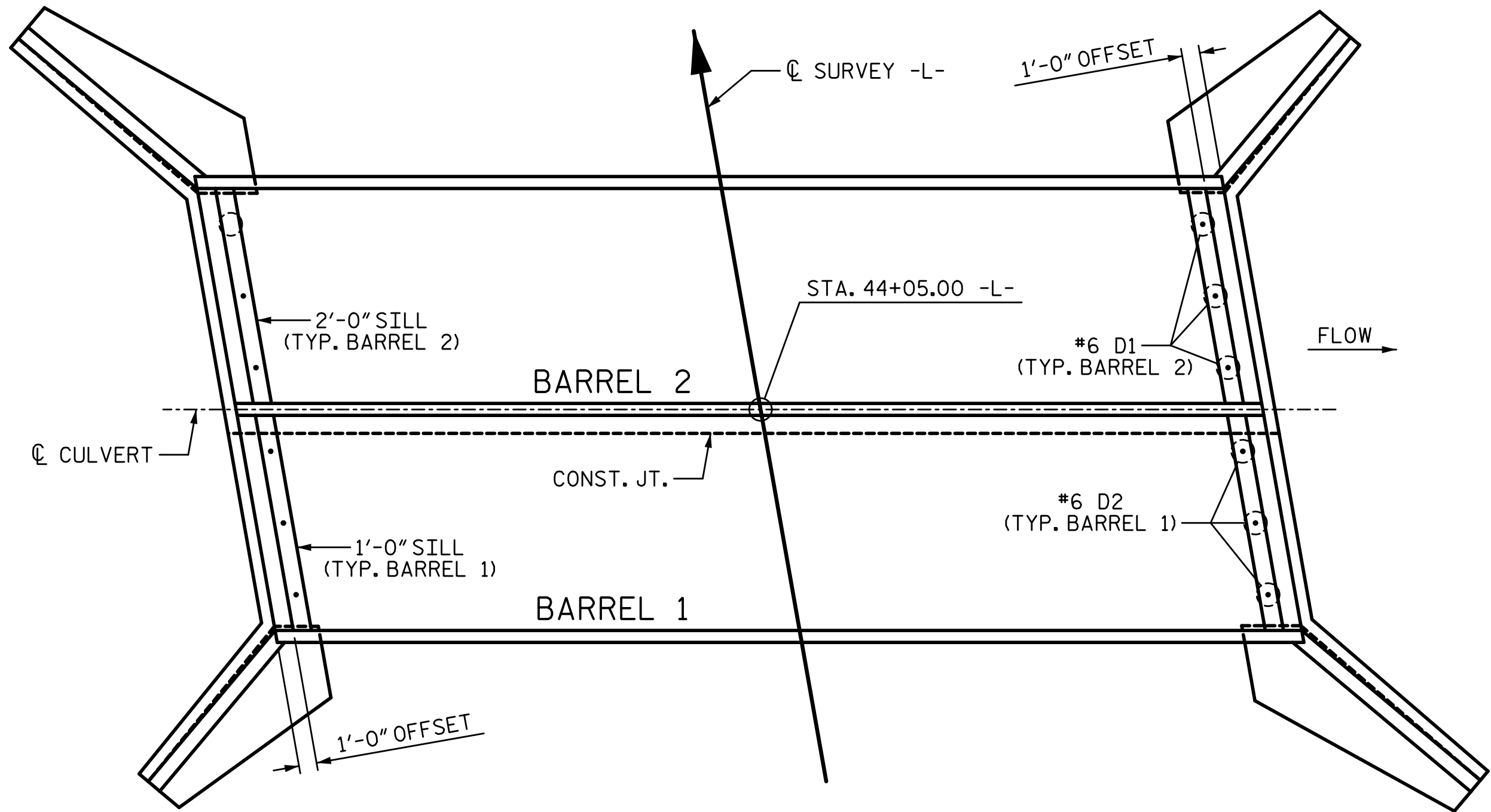
DRAWN BY: T. BANKOVICH DATE: 8-22
CHECKED BY: J.A. BATTS DATE: 8-22
DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 9-25

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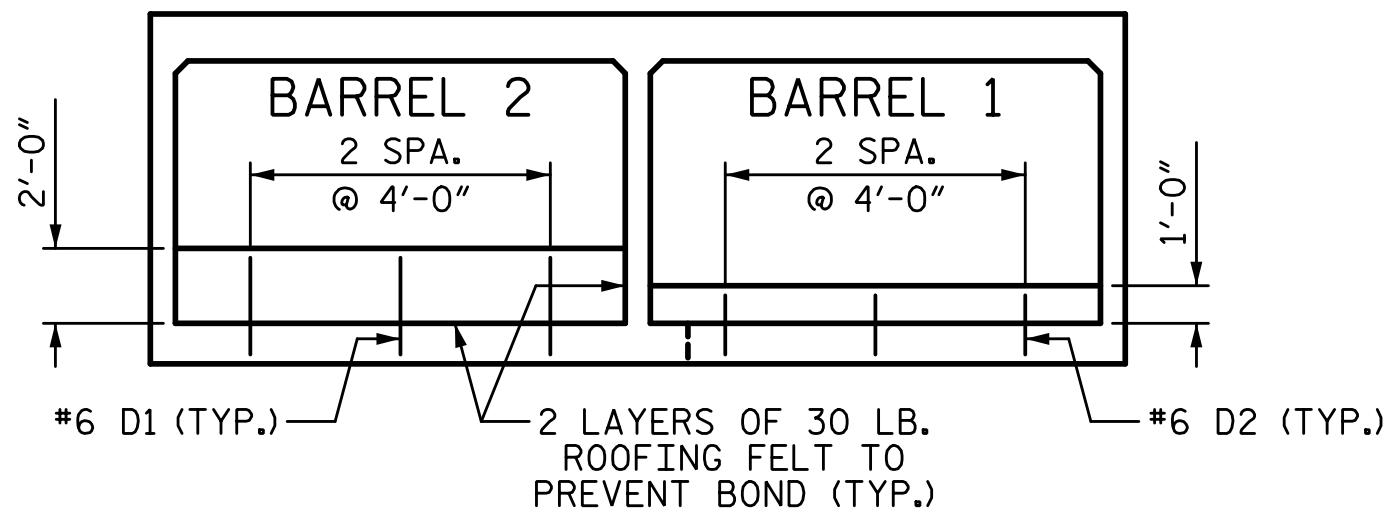


RIGHT ANGLE SECTION OF BARREL

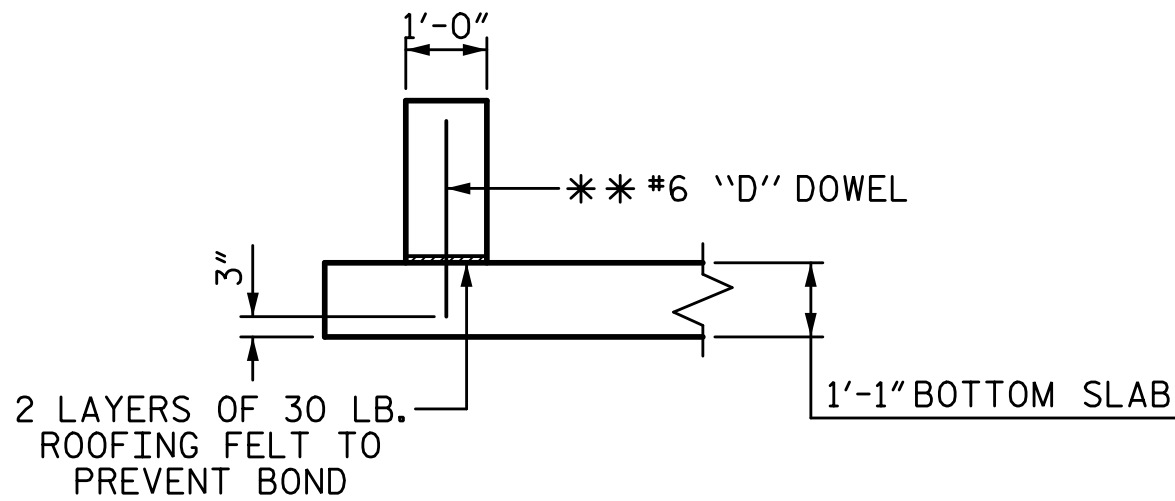
(THERE ARE 89 "C" BARS IN SECTION OF BARREL)
("C1" BARS ARE 2 BAR RUNS)



FLOOR PLAN
(SHOWING PLACEMENT OF SILLS)



ELEVATION - LOOKING DOWNSTREAM



SECTION THROUGH SILL

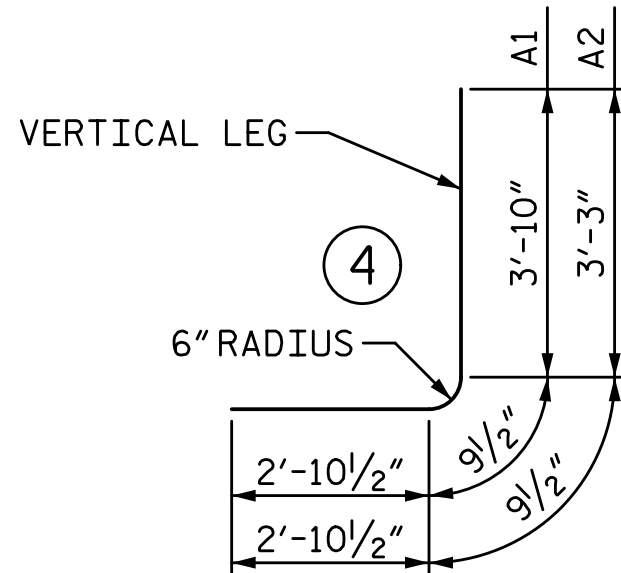
**DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.

CULVERT SILL DETAILS

NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED OR FLOODPLAIN AT THE PROJECT SITE DURING CONSTRUCTION. ONLY MATERIAL THAT IS EXCAVATED FROM THE STREAM BED MAY BE USED TO LINE THE LOW FLOW CULVERT BARREL. RIP RAP MAY BE USED TO SUPPLEMENT NATIVE MATERIAL IN THE HIGH FLOW BARREL(S). IF RIP RAP IS USED TO LINE THE HIGH FLOW CULVERT BARREL(S), NATIVE MATERIAL SHOULD BE PLACED ON TOP TO FILL VOIDS AND PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

DRAWN BY: T. BANKOVICH DATE: 8-22
CHECKED BY: J.A. BATTS DATE: 8-22
DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 9-25

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT

SPLICE CHART

- #4 B1 SPLICE LENGTH = 1'-10"
- #4 C1 SPLICE LENGTH = 2'-5"
- #5 A200/A250 SPLICE LENGTH = 3'-0"
- #6 A400/A450 SPLICE LENGTH = 2'-9"
- #8 S2/S4 SPLICE LENGTH = 4'-9"

BILL OF MATERIAL

PHASE I

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	99	#5	4	7'-6"	774
A2	215	#5	4	6'-11"	1551
A200	93	#5	STR	17'-3"	1673
A201	2	#5	STR	11'-8"	24
A202	2	#5	STR	5'-0"	10
A203	2	#5	STR	11'-0"	23
A400	93	#6	STR	17'-3"	2410
A401	2	#6	STR	11'-8"	35
A402	2	#6	STR	5'-0"	15
A403	2	#6	STR	11'-9"	35

B1	99	#4	STR	8'-11"	590
B2	99	#4	STR	6'-4"	419
B3	116	#5	STR	7'-9"	938
C1	66	#4	STR	29'-8"	1308
D1	6	#6	STR	2'-8"	24
S4	6	#8	STR	19'-3"	308
TOTAL REINFORCING STEEL					10137 LB

CLASS A CONCRETE BREAKDOWN

BARREL	51.8 CY
--------	---------

BILL OF MATERIAL

PHASE II

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	99	#5	4	7'-6"	774
A2	99	#5	4	6'-11"	714
A100	91	#6	STR	25'-7"	3497
A101	4	#6	STR	18'-3"	110
A102	4	#6	STR	11'-8"	70
A103	4	#6	STR	5'-0"	30
A250	95	#5	STR	11'-5"	1131
A251	2	#5	STR	5'-0"	10
A252	1	#5	STR	8'-1"	8

A300	91	#6	STR	25'-7"	3497
A301	4	#6	STR	18'-3"	110
A302	4	#6	STR	11'-8"	70
A303	4	#6	STR	5'-0"	30
A450	95	#6	STR	11'-5"	1629
A451	2	#6	STR	5'-0"	15
A452	1	#6	STR	8'-1"	12
B1	99	#4	STR	8'-11"	590
B2	99	#4	STR	6'-4"	419
C1	112	#4	STR	29'-8"	2220
D2	6	#6	STR	1'-8"	15

TOTAL REINFORCING STEEL					15772 LB
CLASS A CONCRETE BREAKDOWN					
BARREL	107.0 CY				
SILLS	2.7 CY				

PROJECT NO. U-5711
RANDOLPH COUNTY
STATION: 44+05.00 -L-

SHEET 4 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 12 FT. X 7 FT.
CONCRETE BOX CULVERT

100° SKEW

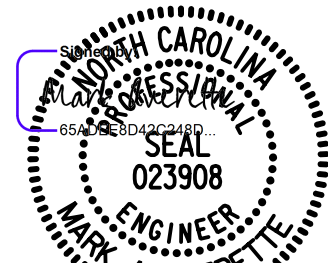
REVISIONS

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2			4			TOTAL SHEETS 7



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Cary, NC 27518

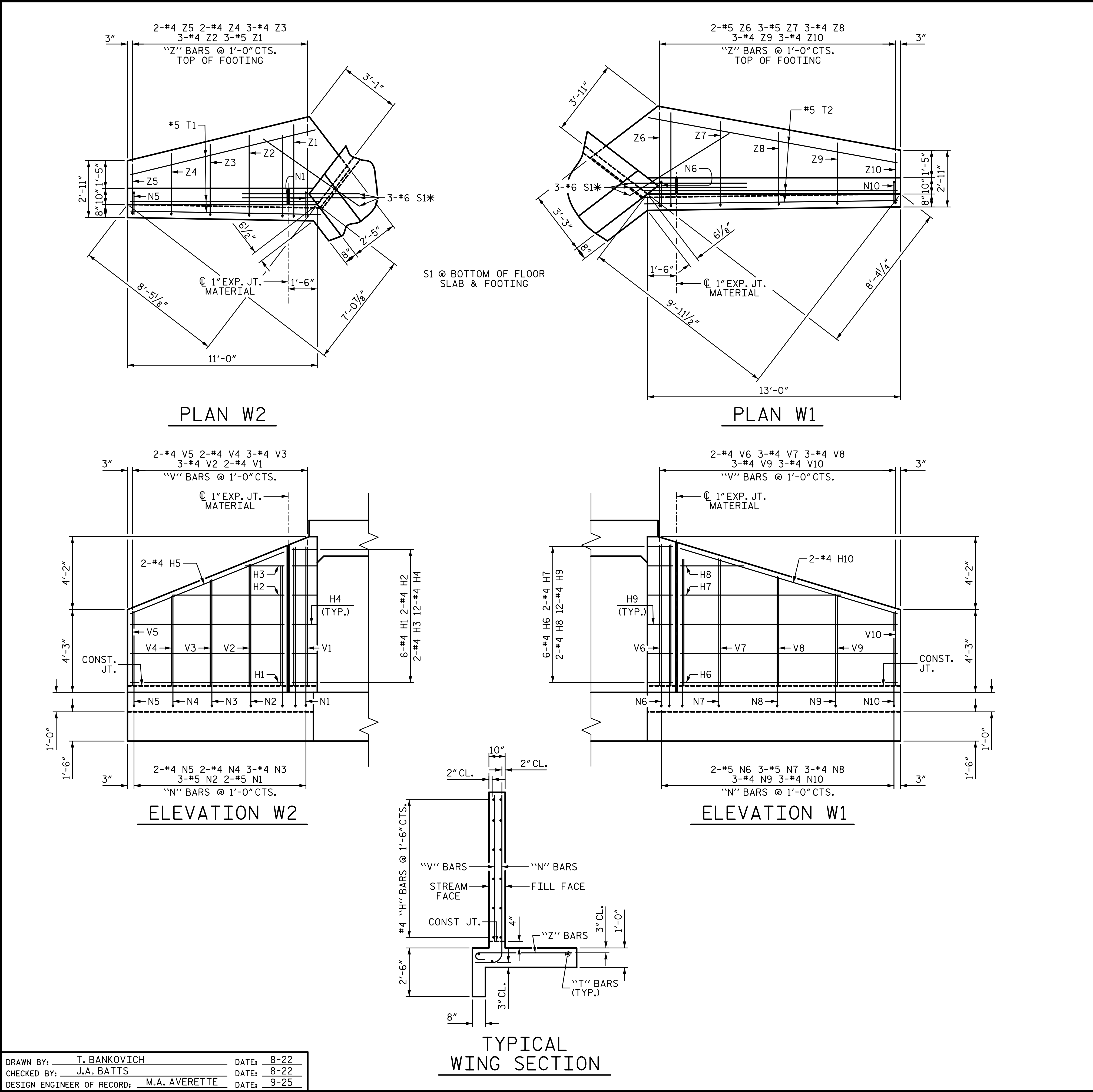
LICENSURE NO. C-4434



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BAR TYPES

①

2'-0"

1'-3"

1'-3 7/16"

1'-6 3/8"

②

2'-0"

1'-3"

1'-6 3/8"

1'-3 7/16"

③

6" RAD.

8"

9 1/2"

N1

N2

N3

N4

N5

N6

N7

N8

N9

N10

7'-8 1/2"

7'-0 1/2"

5'-10 1/2"

5'-2 1/2"

4'-4 1/2"

7'-9 1/2"

7'-1 1/2"

6'-2 1/2"

5'-3 1/2"

4'-4 1/2"

Z1

Z2

Z3

Z4

Z5

Z6

Z7

Z8

Z9

Z10

4'-7"

3'-9"

3'-4"

3'-0"

2'-7"

4'-10"

4'-4"

3'-9"

3'-2"

2'-7"

7"

6"

6"

6"

6"

7"

7"

6"

6"

④

HK.

ALL BAR DIMENSIONS ARE OUT TO OUT

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	6	#4	STR	9'-2"	37
H2	2	#4	STR	7'-0"	9
H3	2	#4	STR	3'-0"	4
H4	12	#4	1	3'-3"	26
H5	2	#4	STR	9'-10"	13
H6	6	#4	STR	11'-1"	44
H7	2	#4	STR	8'-2"	11
H8	2	#4	STR	3'-3"	4
H9	12	#4	2	3'-3"	26
H10	2	#4	STR	11'-7"	15
N1	2	#5	3	9'-2"	19
N2	3	#5	3	8'-6"	27
N3	3	#4	3	7'-4"	15
N4	2	#4	3	6'-8"	9
N5	2	#4	3	5'-10"	8
N6	2	#5	3	9'-3"	19
N7	3	#5	3	8'-7"	27
N8	3	#4	3	7'-8"	15
N9	3	#4	3	6'-9"	14
N10	3	#4	3	5'-10"	12
S1	6	#6	STR	6'-0"	54
T1	3	#5	STR	11'-0"	34
T2	3	#5	STR	13'-0"	41
V1	2	#4	STR	7'-1"	9
V2	3	#4	STR	6'-6"	13
V3	3	#4	STR	5'-4"	11
V4	2	#4	STR	4'-7"	6
V5	2	#4	STR	3'-10"	5
V6	2	#4	STR	7'-3"	10
V7	3	#4	STR	6'-6"	13
V8	3	#4	STR	5'-7"	11
V9	3	#4	STR	4'-8"	9
V10	3	#4	STR	3'-10"	8
Z1	3	#5	4	5'-2"	16
Z2	3	#4	4	4'-3"	9
Z3	3	#4	4	3'-10"	8
Z4	2	#4	4	3'-6"	5
Z5	2	#4	4	3'-1"	4
Z6	2	#5	4	5'-5"	11
Z7	3	#5	4	4'-11"	15
Z8	3	#4	4	4'-3"	9
Z9	3	#4	4	3'-8"	7
Z10	3	#4	4	3'-1"	6

PHASE I	
CLASS A CONCRETE	
2 WINGS	9.9 CY
2 END CURTAIN WALLS	1.7 CY
PHASE I TOTAL	11.6 CY
PHASE II	
CLASS A CONCRETE	
2 WINGS	9.9 CY
2 END CURTAIN WALLS	1.3 CY
2 HEADWALLS	2.4 CY
PHASE II TOTAL	13.6 CY

TOTAL REINFORCING STEEL FOR 2 WINGS EACH PHASE	
	668 LB

PROJECT NO. U-5711

RANDOLPH COUNTY

STATION: 44+05.00 -L-

SHEET 5 OF 7

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

RALEIGH

WINGS FOR CONCRETE BOX CULVERT

H = 7'-0"

SLOPE = 2:1

100° SKEW

REVISIONS

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

SHEET NO. C-5

TOTAL SHEETS 7

WGI

5640 Dillard Drive, Suite 200

Cary, NC 27518

LICENSURE NO. C-4434

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STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

RALEIGH

WINGS FOR CONCRETE BOX CULVERT

H = 7'-0"

SLOPE = 2:1

100° SKEW

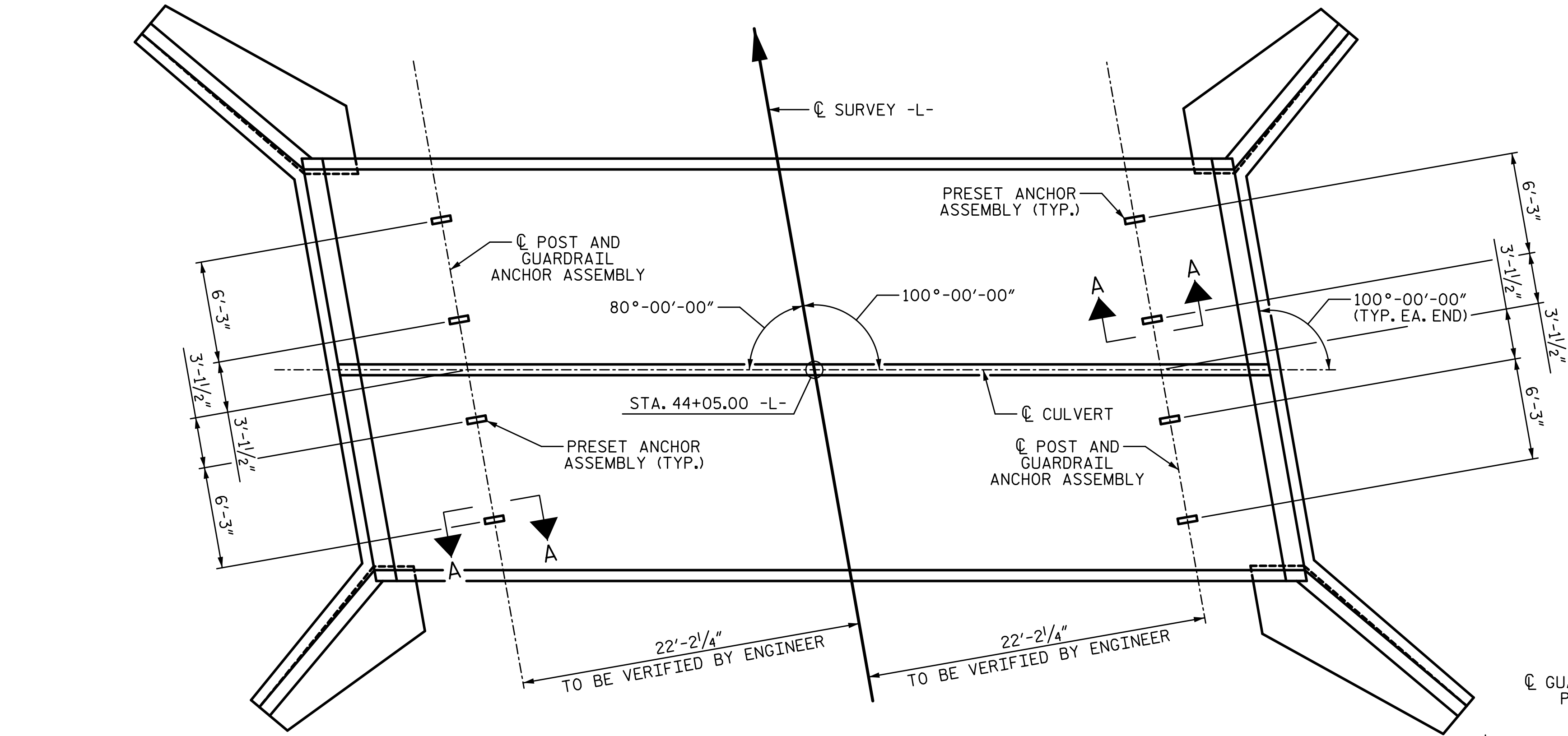
REVISIONS

NO.	BY:	DATE:	NO.	BY:	DATE:
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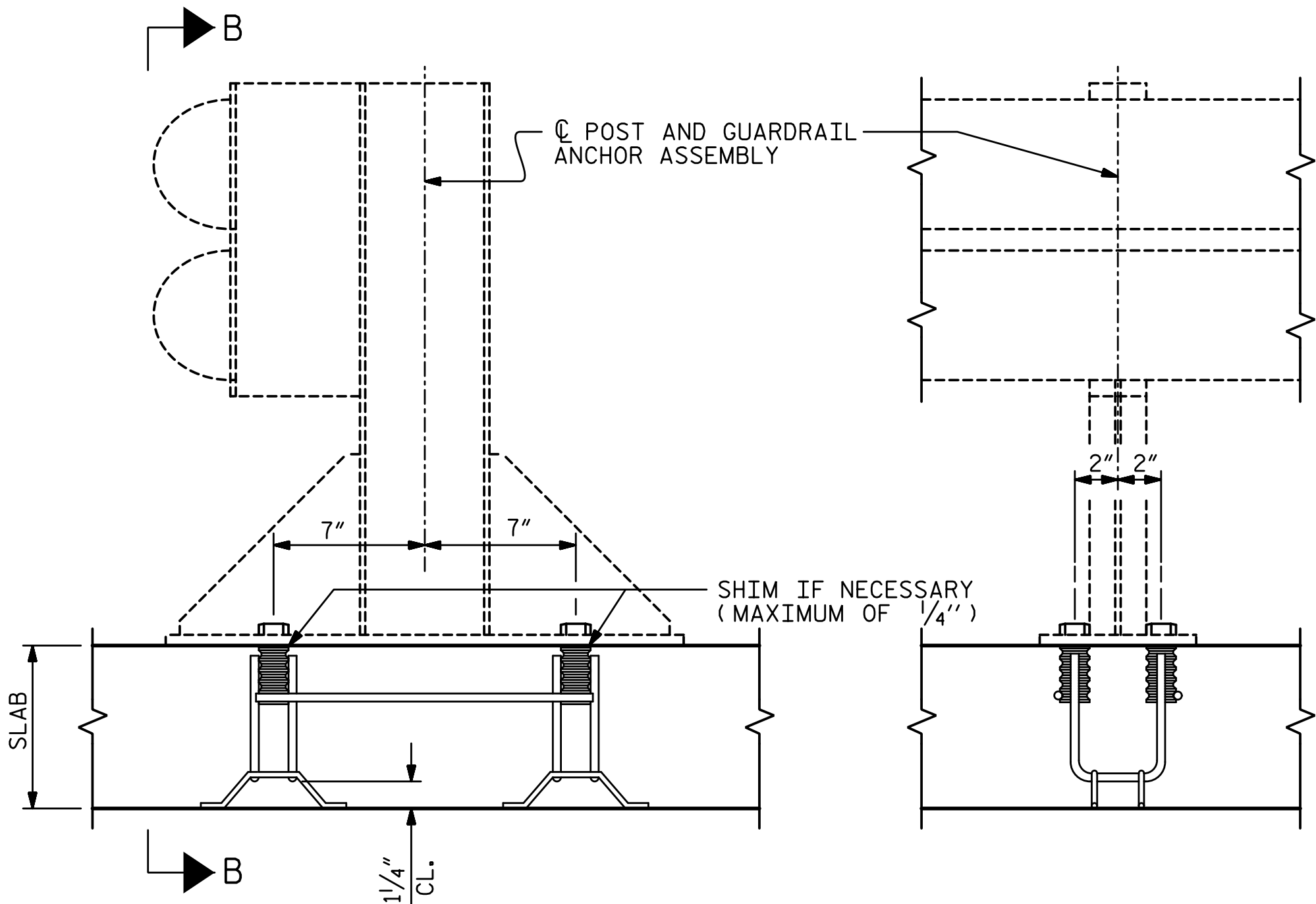
SHEET NO. C-5

TOTAL SHEETS 7

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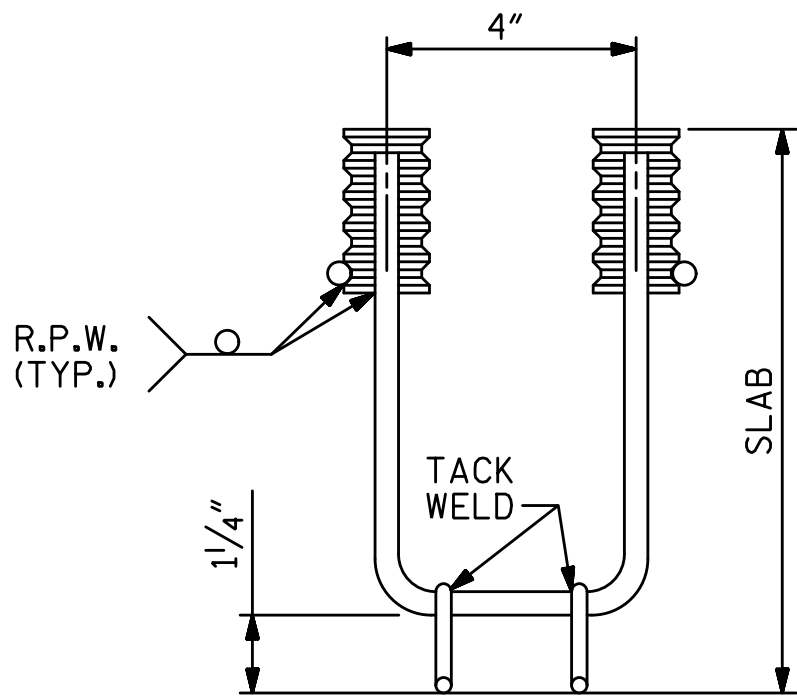


PLAN
(SHOWING GUARDRAIL ANCHOR ASSEMBLY SPACING)



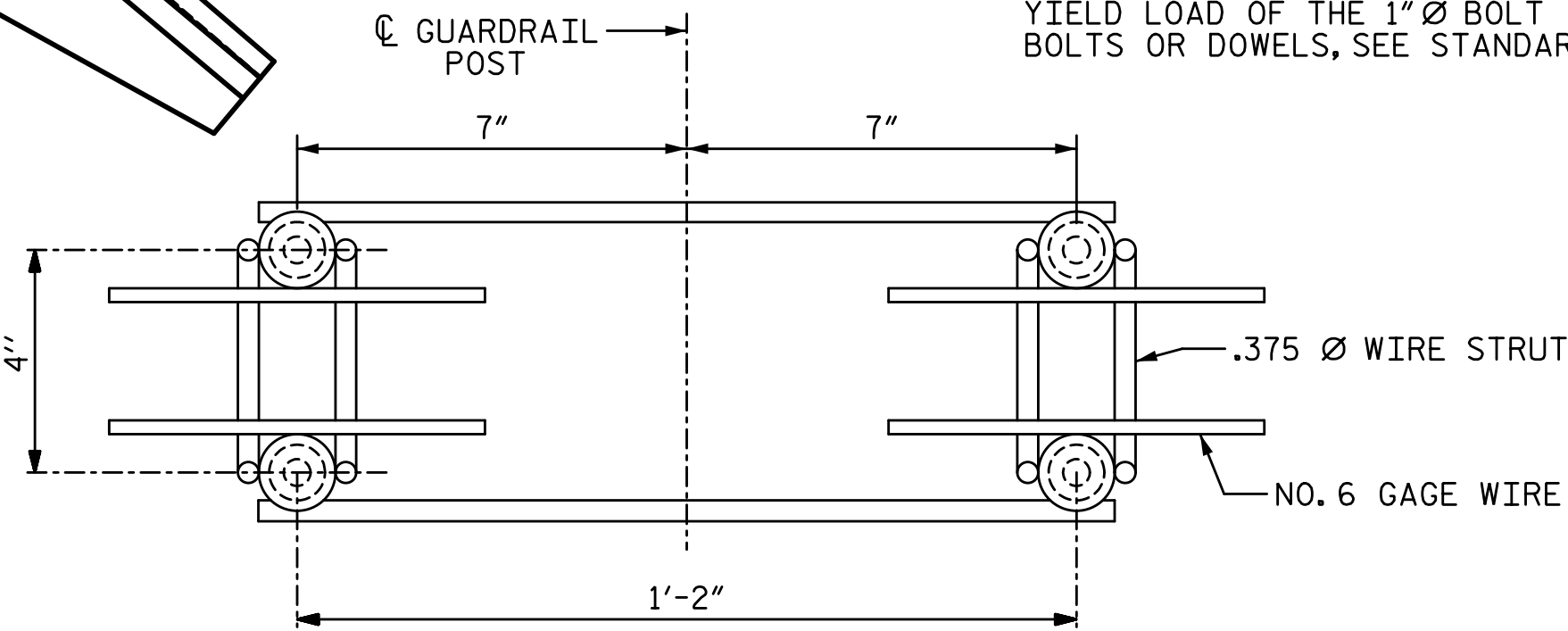
SECTION A-A

SECTION B-B

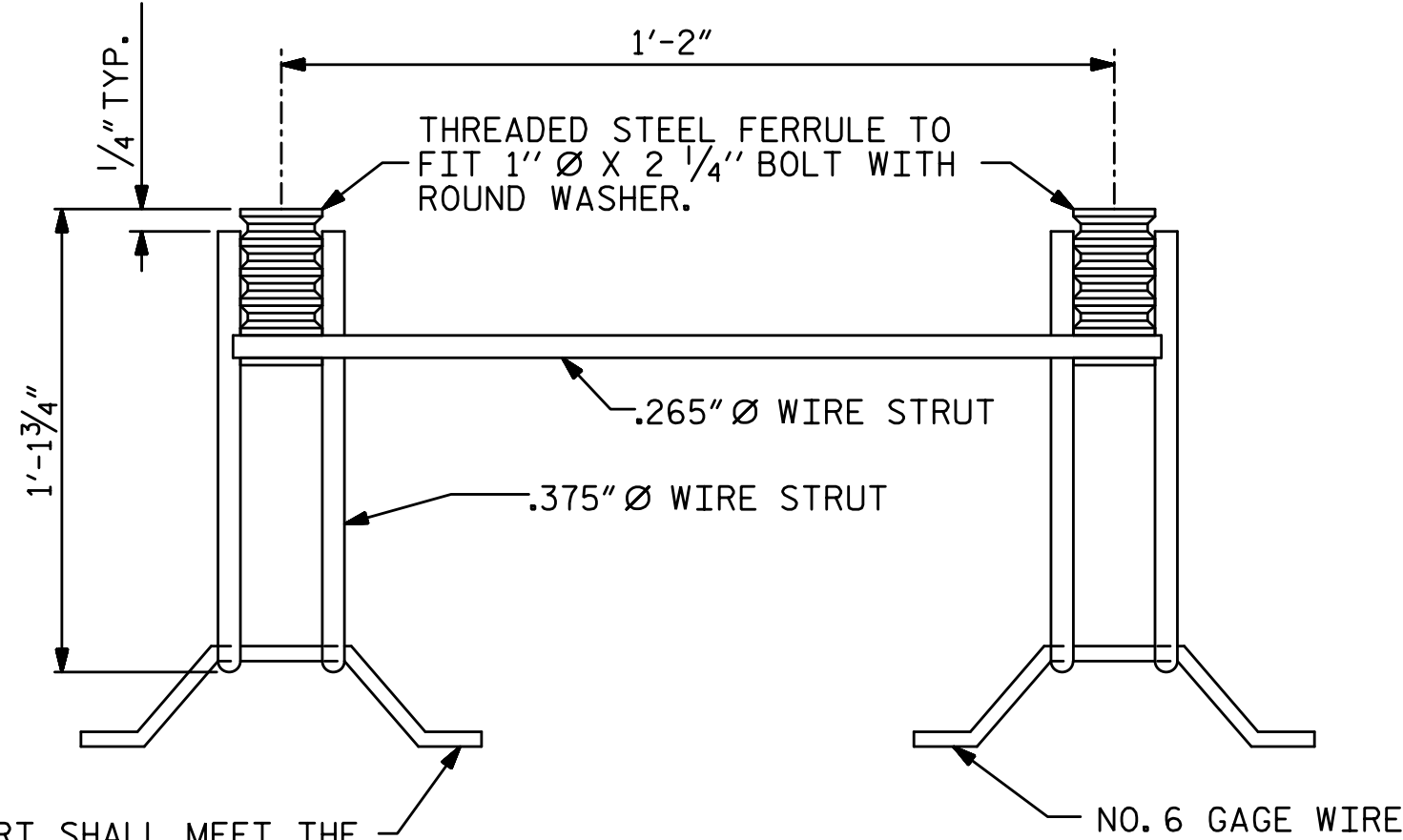


ELEVATION

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



PLAN



SIDE VIEW

GUARDRAIL ANCHOR
ASSEMBLY FOR CULVERTS

NOTES:

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

- FERRULES SHALL BE MADE FROM STEEL MEETING THE REQUIREMENTS OF AASHTO M169, GRADE 12L14 AND SHALL HAVE A MINIMUM LENGTH OF THREADS OF $2\frac{1}{2}$ ".
- 4 - $1'' \text{ } \varnothing \times 2\frac{1}{4}''$ 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 $1'' \text{ } \varnothing \times 2\frac{1}{4}''$ 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.)
- 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 $\frac{1}{16}'' \text{ } \varnothing$ 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 $1'' \text{ } \varnothing$ BOLT IS 21.8 KIPS. FOR ADHESIVELY ANCHORED ANCHOR BOLTS OR DOWELS, SEE STANDARD SPECIFICATIONS.

PROJECT NO. U-5711
RANDOLPH COUNTY
STATION: 44+05.00 -L-

SHEET 6 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

ANCHORAGE DETAILS
FOR GUARDRAIL
ANCHOR ASSEMBLY
FOR CULVERTS

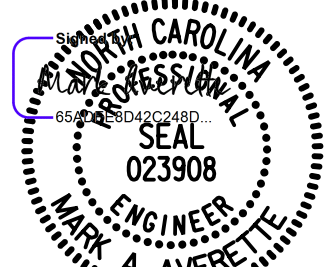
REVISIONS

NO.	BY:	DATE:	NO.	BY:	DATE:	SHEET NO.
1			3			C-6
2			4			TOTAL SHEETS 7



5640 Dillard Drive, Suite 200
Cary, NC 27518

LICENSURE NO. C-4434



8/4/2026 | 4:24 AM PDT

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UNLESS ALL SIGNATURES COMPLETED

DRAWN BY: T. BANKOVICH DATE: 8-22
CHECKED BY: J.A. BATTS DATE: 8-22
DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 9-25

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

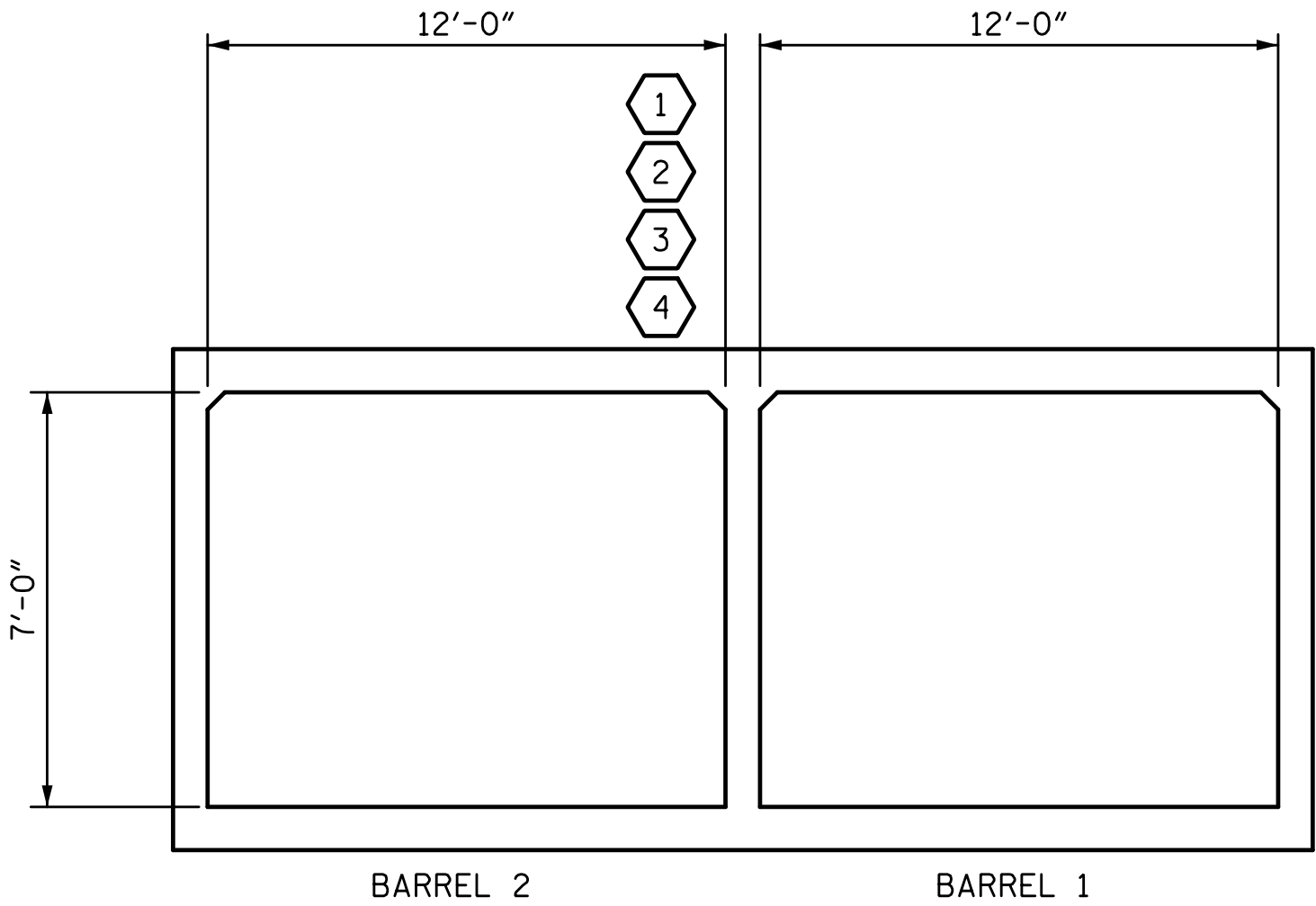
LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
LS	1.75	--
WA	1.00	--

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

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

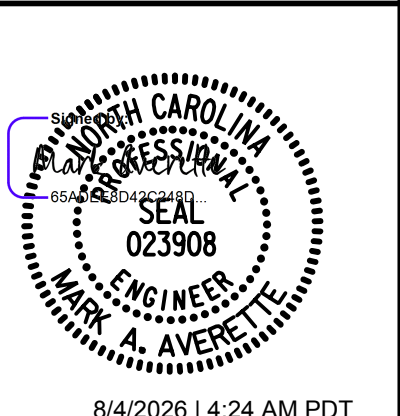
LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS																
LEVEL	VEHICLE	WEIGHT (W) (TONS)	#	MINIMUM RATING FACTORS (RF)	TONS = W × RF	STRENGTH I LIMIT STATE									COMMENT NUMBER	
						LIVE-LOAD FACTORS (γ_{LL})	MOMENT				SHEAR					
							RATING FACTOR	BARREL NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BARREL NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)		
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	1	1.23	- -	1.75	1.47	1	ROOF SLAB - RIGHT	12.00	1.23	1	ROOF SLAB - RIGHT	11.06		
	HL-93 (OPERATING)	N/A		1.59	- -	1.35	1.91	1	ROOF SLAB - RIGHT	12.00	1.59	1	ROOF SLAB - RIGHT	11.06		
	HS-20 (INVENTORY)	36.000	2	1.28	46.1	1.75	1.47	1	ROOF SLAB - RIGHT	12.00	1.28	1	ROOF SLAB - RIGHT	11.06		
	HS-20 (OPERATING)	36.000		1.66	59.7	1.35	1.91	1	ROOF SLAB - RIGHT	12.00	1.66	1	ROOF SLAB - RIGHT	11.06		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		2.72	36.7	1.40	2.79	1	ROOF SLAB - MIDDLE	4.73	2.72	1	ROOF SLAB - RIGHT	11.06		
		SNGARBS2	20.000		2.46	49.2	1.40	2.61	1	ROOF SLAB - MIDDLE	4.73	2.46	1	ROOF SLAB - RIGHT	11.06	
		SNAGRIS2	22.000		2.58	56.8	1.40	2.67	1	ROOF SLAB - RIGHT	12.00	2.58	1	ROOF SLAB - RIGHT	11.06	
		SNCOTTS3	27.250	3	1.44	39.2	1.40	1.73	1	ROOF SLAB - MIDDLE	4.73	1.44	1	ROOF SLAB - RIGHT	11.06	
		SNAGGRS4	34.925		1.70	59.4	1.40	1.91	1	FLOOR SLAB - RIGHT	12.00	1.70	1	ROOF SLAB - RIGHT	11.06	
		SNS5A	35.550		1.63	57.9	1.40	1.87	1	FLOOR SLAB - RIGHT	12.00	1.63	1	ROOF SLAB - RIGHT	11.06	
		SNS6A	39.950		1.59	63.5	1.40	1.83	1	FLOOR SLAB - RIGHT	12.00	1.59	1	ROOF SLAB - RIGHT	11.06	
		SNS7B	42.000		1.56	65.5	1.40	1.85	1	FLOOR SLAB - RIGHT	12.00	1.56	1	ROOF SLAB - RIGHT	11.06	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.14	70.6	1.40	2.14	1	FLOOR SLAB - RIGHT	12.00	2.17	1	ROOF SLAB - RIGHT	11.06	
		TNT4A	33.075		1.66	54.9	1.40	2.06	1	ROOF SLAB - MIDDLE	4.73	1.66	1	ROOF SLAB - RIGHT	11.06	
		TNT6A	41.600		1.61	67.0	1.40	1.89	1	FLOOR SLAB - RIGHT	12.00	1.61	1	ROOF SLAB - RIGHT	11.06	
		TNT7A	42.000		1.65	69.3	1.40	1.80	1	FLOOR SLAB - RIGHT	12.00	1.65	1	ROOF SLAB - RIGHT	11.06	
		TNT7B	42.000		1.62	68.0	1.40	1.88	1	FLOOR SLAB - RIGHT	12.00	1.62	1	ROOF SLAB - RIGHT	11.06	
		TNAGRIT4	43.000		1.61	69.2	1.40	1.66	1	FLOOR SLAB - RIGHT	12.00	1.61	1	ROOF SLAB - RIGHT	11.06	
TNAGT5A		45.000		1.61	72.5	1.40	1.84	1	ROOF SLAB - RIGHT	12.00	1.61	1	ROOF SLAB - RIGHT	11.06		
TNAGT5B		45.000		1.57	70.7	1.40	1.57	1	ROOF SLAB - RIGHT	12.00	1.57	1	ROOF SLAB - RIGHT	11.06		
EMERGENCY VEHICLE (EV)	EV2	28.750		1.83	52.6	1.30	1.90	1	ROOF SLAB - RIGHT	12.00	1.83	1	ROOF SLAB - RIGHT	11.06		
	EV3	43.000	4	1.21	52.0	1.30	1.31	1	FLOOR SLAB - RIGHT	12.00	1.21	1	ROOF SLAB - RIGHT	11.06		



LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. U-5711
RANDOLPH COUNTY
STATION: 44+05.00 -L-

SHEET 7 OF 7



STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH						SHEET NO. C-7		
LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS (NON-INTERSTATE TRAFFIC)						TOTAL SHEETS 7		
REVISIONS								
NO.	BY:	DATE:	NO.	BY:	DATE:			
1			3					
2			4					

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

DRAWN BY: T. BANKOVICH	DATE: 8-22
CHECKED BY: J.A. BATTS	DATE: 8-22
DESIGN ENGINEER OF RECORD: M.A. AVERETTE	DATE: 9-25

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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 3/4" WITH THE FOLLOWING EXCEPTIONS: TOP CORNERS OF CURBS MAY BE ROUNDED TO 1-1/2" RADIUS WHICH IS BUILT INTO CURB FORMS; CORNERS OF TRANSVERSE FLOOR EXPANSION JOINTS SHALL BE ROUNDED WITH A 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 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 7/8" Ø SHEAR STUDS FOR THE 3/4" Ø STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - 7/8" Ø STUDS FOR 4 - 3/4" Ø STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF 7/8" Ø STUDS ALONG THE BEAM AS SHOWN FOR 3/4" Ø STUDS BASED ON THE RATIO OF 3 - 7/8" Ø STUDS FOR 4 - 3/4" 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. 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.