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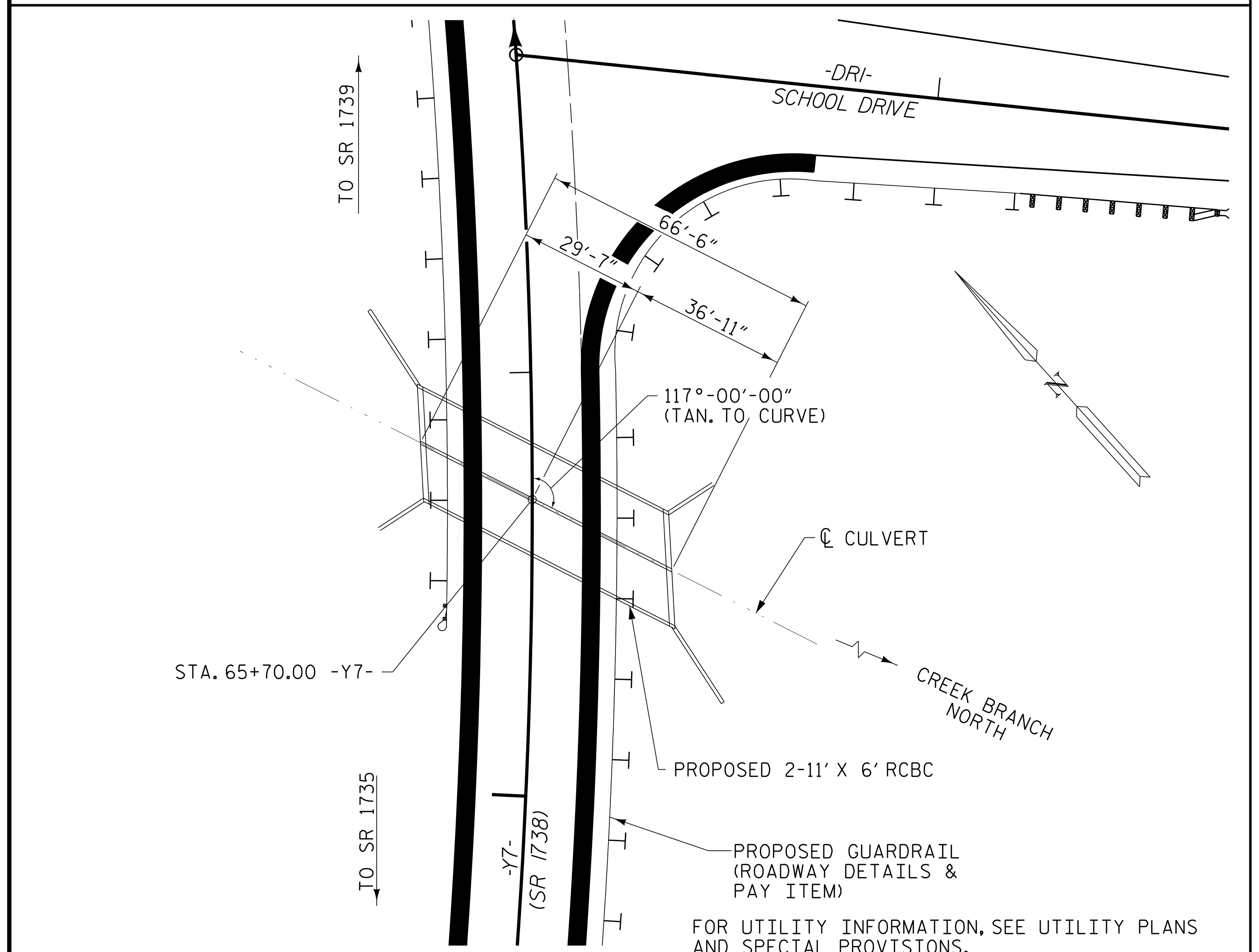
BM: BM#17 - RR SPIKE IN 14" PINE 93' LT OF -Y7- STA. 71+55



LOCATION SKETCH

GRADE DATA

GRADE POINT ELEV. @ STA. 65+70.00 -Y7- = 61.33
BED ELEV. @ STA. 65+70.00 -Y7- = 51.73
ROADWAY SLOPES 3:1

HYDRAULIC DATA

DESIGN DISCHARGE = 310 C.F.S.
FREQUENCY OF DESIGN FLOOD = 25 YRS.
DESIGN HIGH WATER ELEVATION = 57.0 FT
DRAINAGE AREA = 1.5 SQ. MI.
BASE DISCHARGE (Q100) = 480 C.F.S.
BASE HIGH WATER ELEVATION = 58.1 FT

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE = 480 C.F.S
FREQUENCY OF OVERTOPPING FLOOD = 100 YRS.
OVERTOPPING FLOOD ELEVATION = 57.6 FT

PROPOSED OVERTOPPING OCCURS AT STA. 44+00 -Y7-

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE		
BARREL @ 2.230 CY/FT	148.3	C.Y.
WINGS, ETC.	31.9	C.Y.
TOTAL	180.2	C.Y.
REINFORCING STEEL		
BARREL	29789	LBS.
WINGS	1747	LBS.
TOTAL	31536	LBS.
CULVERT EXCAVATION STA. 65+70.00 -Y7-		LUMP SUM
FOUNDATION COND. MAT'L.		131.3 TONS

NOTES

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

DESIGN FILL----------------- 4.42 FT. (MAX.), 2.58 FT. (MIN.)

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 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.

STEEL IN THE BOTTOM SLAB MAY BE SPLICED AT THE PERMITTED CONSTRUCTION JOINT AT THE CONTRACTOR'S OPTION. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.

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

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.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

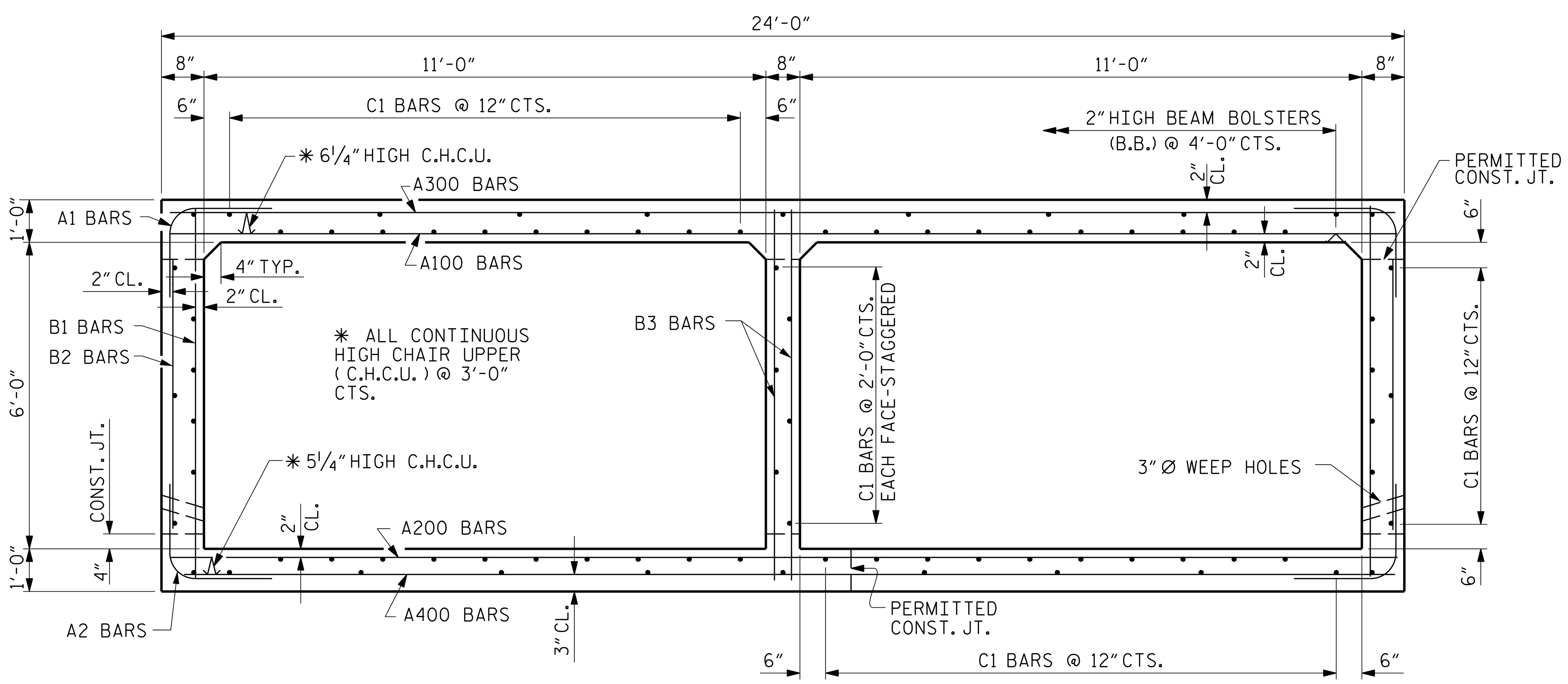
FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOUNDATION NOTES

THE REINFORCED BOX CULVERT SHALL BE PLACED ON THE STANDARD 1.0 FOOT BLANKET OF FOUNDATION CONDITIONING MATERIAL. SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.

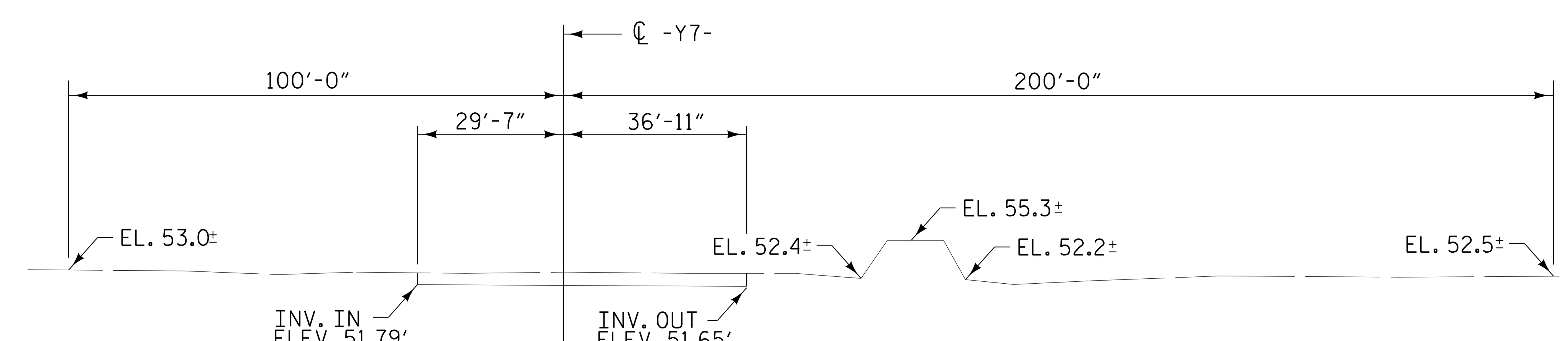
REMOVE ANY STUMPS OR ROOT MATS BENEATH THE CULVERT AND FILL THE UNDERCUT AREAS WITH FOUNDATION CONDITIONING MATERIAL.

A CAMBER IS NOT REQUIRED FOR CONSTRUCTION OF THE CULVERT.



RIGHT ANGLE SECTION OF BARREL

THERE ARE 82 "C" BARS IN SECTION OF BARREL.



PROFILE ALONG ℄ CULVERT

I HEREBY CERTIFY THESE PLANS
ARE THE AS-BUILT PLANS

PLANS PREPARED BY:

NV5
NV5 ENGINEERS & CONSULTANTS, INC.
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NORTH CAROLINA PROFESSIONAL ENGINEER L. KEVIN AUSTIN 028661
DocuSigned by: L. Kevin Austin
4/11/2022

PROJECT NO. R-5819
COLUMBUS COUNTY
STATION: 65+70.00 -Y7-

SHEET 1 OF 7 STRUCTURE NO. C-230423

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 11 FT. X 6 FT. CONCRETE BOX CULVERT 117° SKEW

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

DRAWN BY :	J. A. PANDOLI	DATE :	2/22
CHECKED BY :	L. K. AUSTIN	DATE :	2/22
DESIGN ENGINEER OF RECORD:	L. K. AUSTIN	DATE :	2/22

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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: LIVE-LOAD FACTORS (γ_{LL})	MOMENT: RATING FACTOR	MOMENT: BOX NO.	MOMENT: ELEMENT TYPE	MOMENT: DISTANCE FROM LEFT END OF ELEMENT (ft)	SHEAR: RATING FACTOR	SHEAR: BOX NO.	SHEAR: ELEMENT TYPE	SHEAR: DISTANCE FROM LEFT END OF ELEMENT (ft)	COMMENT NUMBER
DESIGN LOAD RATING		HL-93 (INVENTORY)	N/A	1	1.26	--	1.75	1.95	1	TOP SLAB	4.667	1.26	2	TOP SLAB	0.333	•
		HL-93 (OPERATING)	N/A	•	1.63	--	1.35	2.52	1	TOP SLAB	4.667	1.63	2	TOP SLAB	0.333	
		HS-20 (INVENTORY)	36.000	2	1.32	47:52	1.75	2.03	1	TOP SLAB	4.667	1.32	2	TOP SLAB	0.333	
		HS-20 (OPERATING)	36.000	•	1.71	61:56	1.35	2.63	1	TOP SLAB	4.667	1.71	2	TOP SLAB	0.333	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500	•	2.43	32:81	1.40	3.66	1	TOP SLAB	4.667	2.43	2	TOP SLAB	0.333	
		SNGARBS2	20.000	•	2.26	45:20	1.40	3.25	1	BOTTOM SLAB	0.333	2.26	2	TOP SLAB	0.333	
		SNAGRIS2	22.000	•	2.37	52:14	1.40	3.08	1	BOTTOM SLAB	0.333	2.37	2	TOP SLAB	0.333	
		SNCOTTS3	27.250	3	1.45	39:51	1.40	2.27	1	TOP SLAB	4.667	1.45	2	TOP SLAB	0.333	
		SNAGGRS4	34.925	•	1.75	61:12	1.40	2.02	1	BOTTOM SLAB	0.333	1.75	2	TOP SLAB	0.333	
		SNS5A	35.550	•	1.63	57:95	1.40	2.05	1	BOTTOM SLAB	0.333	1.63	2	TOP SLAB	0.333	
		SNS6A	39.950	•	1.60	63:92	1.40	2.08	1	BOTTOM SLAB	0.333	1.60	2	TOP SLAB	0.333	
		SNS7B	42.000	•	1.60	67:20	1.40	2.00	1	BOTTOM SLAB	0.333	1.60	2	TOP SLAB	0.333	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000	•	1.94	64:02	1.40	2.23	1	BOTTOM SLAB	0.333	1.94	2	BOTTOM SLAB	0.333	
		TNT4A	33.075	•	1.65	54:57	1.40	2.34	1	BOTTOM SLAB	0.333	1.65	2	TOP SLAB	0.333	
		TNT6A	41.600	•	1.60	66:56	1.40	2.07	1	BOTTOM SLAB	0.333	1.60	2	TOP SLAB	0.333	
		TNT7A	42.000	•	1.61	67:62	1.40	2.02	1	BOTTOM SLAB	0.333	1.61	2	TOP SLAB	0.333	
		TNT7B	42.000	•	1.64	68:88	1.40	2.11	1	BOTTOM SLAB	0.333	1.64	2	TOP SLAB	0.333	
		TNAGRIT4	43.000	•	1.60	68:80	1.40	2.01	1	BOTTOM SLAB	0.333	1.60	2	TOP SLAB	0.333	
		TNAGT5A	45.000	•	1.60	72:00	1.40	2.09	1	BOTTOM SLAB	0.333	1.60	2	TOP SLAB	0.333	
		TNAGT5B	45.000	•	1.54	69:30	1.40	1.79	1	BOTTOM SLAB	0.333	1.54	2	BOTTOM SLAB	0.333	

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:

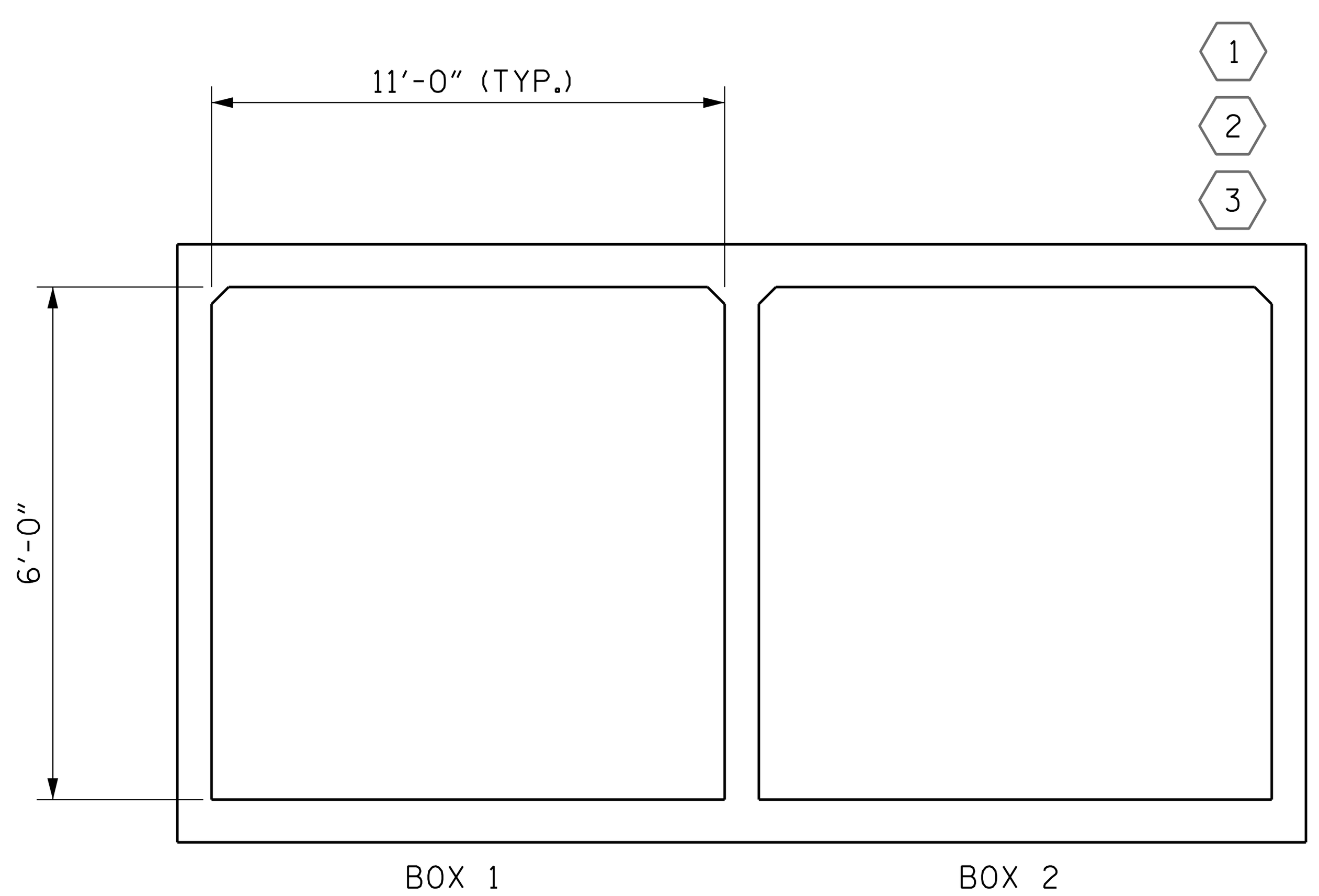
RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

COMMENTS:

1.
2.
3.
4.

CONTROLLING LOAD RATING

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



LRFR SUMMARY

(LOOKING DOWNSTREAM)

PLANS PREPARED BY:

NV5

NV5 ENGINEERS & CONSULTANTS, INC.
3300 REGENCY PARKWAY, SUITE 100
CARY, NC 27518
P: 919.851.1912 www.NV5.com
NC License # F-1333
formerly CALYX Engineers & Consultants

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL — KEVIN AUSTIN

4/11/2022

PROJECT NO. R-5819

COLUMBUS COUNTY

STATION: 65+70.00 -Y7-

SHEET 2 OF 7

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:	C-2
1			3			TOTAL SHEETS
2			4			7

STD. NO. LRFR5

ASSEMBLED BY : JAP		DATE : 2/22
CHECKED BY : LKA		DATE : 2/22
DRAWN BY : WMC 7/11	REV. 10/1/11	MAA/GM
CHECKED BY : GM 7/11	REV. 12/17	MAA/THC

4/8/2022
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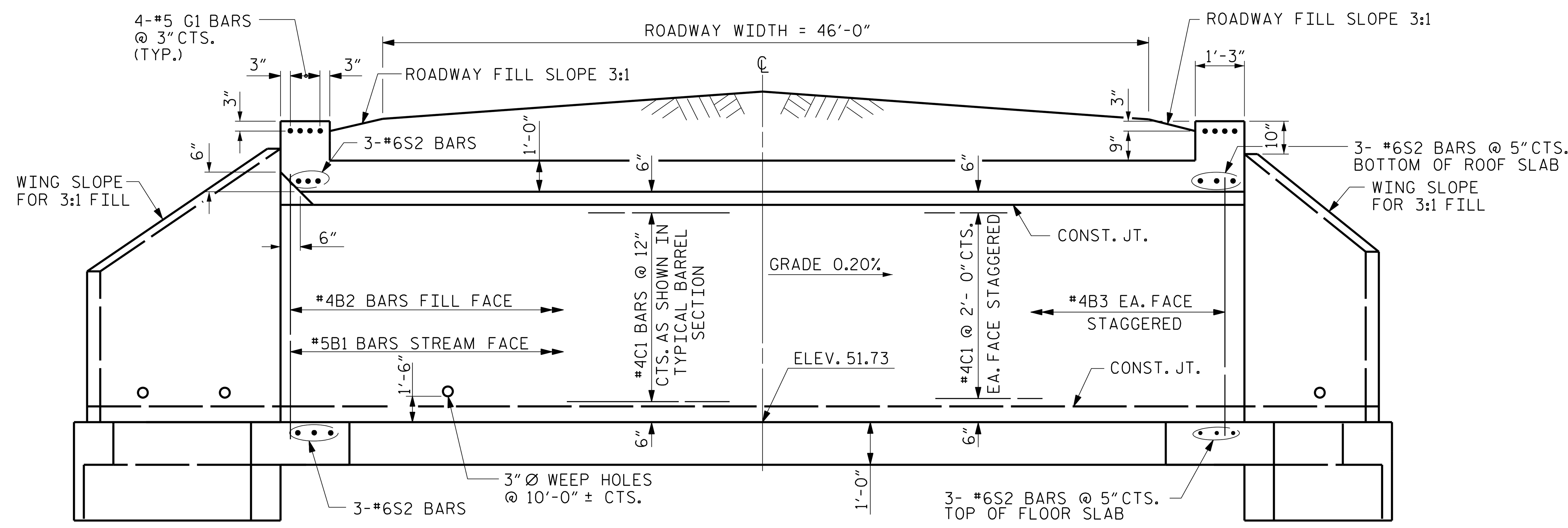
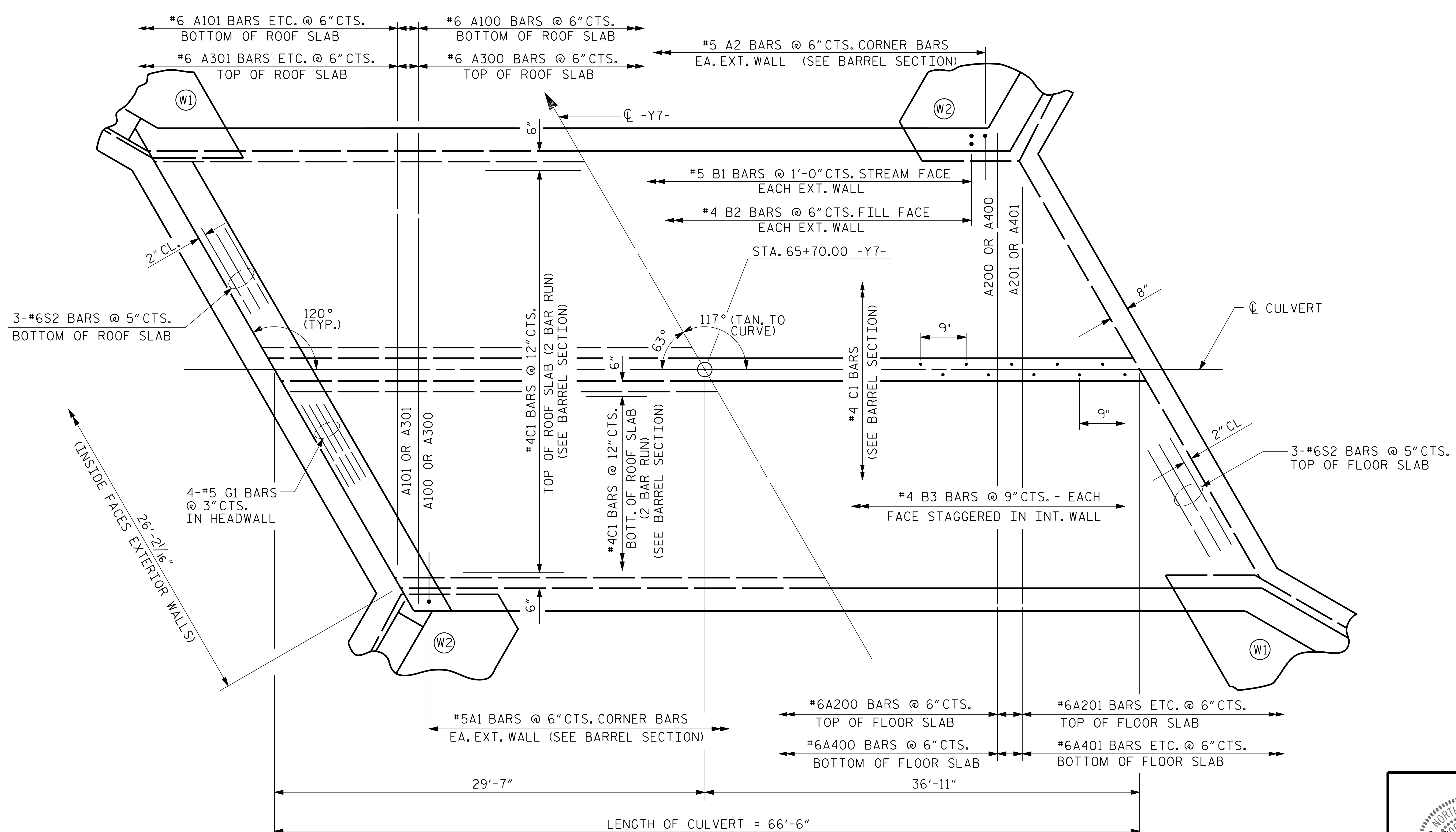


EXTERIOR WALL

INTERIOR WALL

CULVERT SECTION NORMAL TO ROADWAY

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS



PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

PLANS PREPARED BY:

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PROJECT NO. R-5819

COLUMBUS COUNTY

STATION: 65+70.00 -Y7-

SHEET 3 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL STANDARD

DOUBLE 11 FT. X. 6 FT. CONCRETE BOX CULVERT 117° SKEW

NORTH CAROLINA PROFESSIONAL ENGINEER 018661 L. KEVIN AUSTIN
DocuSigned by: L. Kevin Austin
4/11/2022

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

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DESIGN ENGINEER OF RECORD:	L. K. AUSTIN	DATE :	2/22

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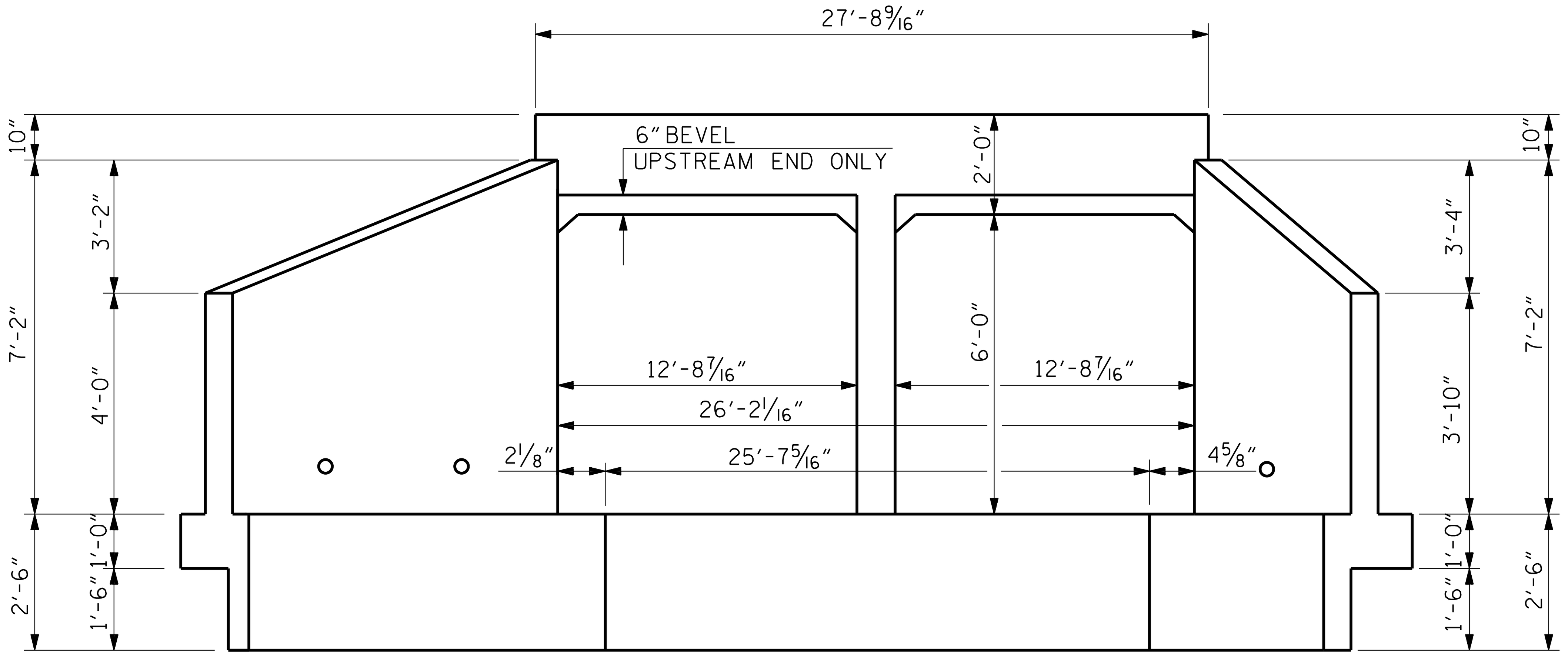
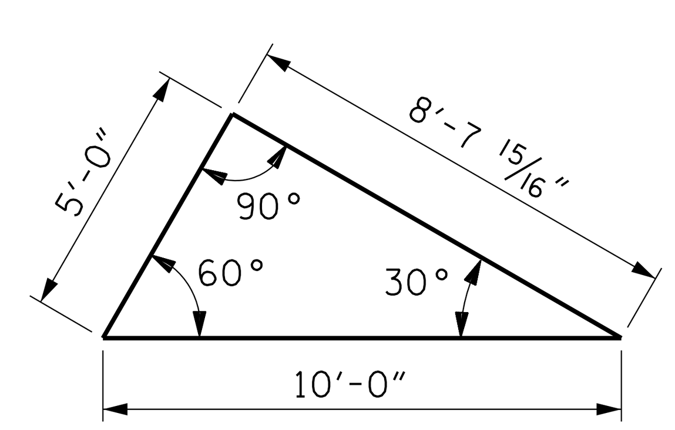


END ELEVATION NORMAL TO SKEW



SKEW TRIANGLE

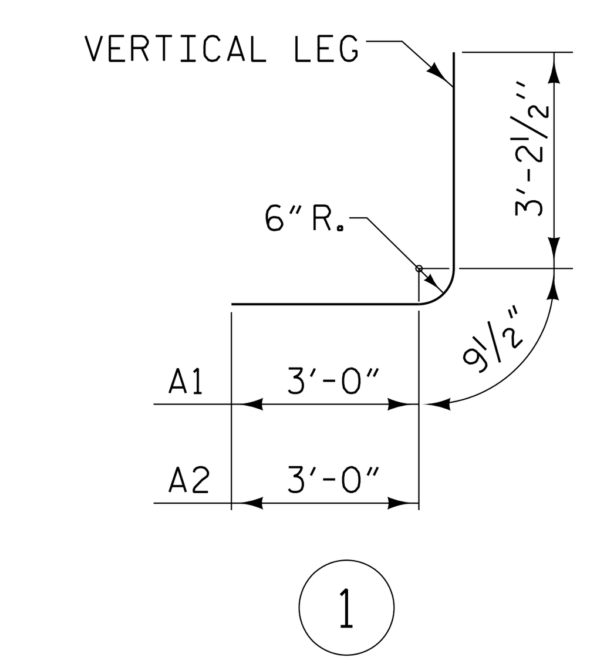
BILL OF MATERIAL FOR BOX CULVERT

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A100	105	#6	STR	23'-8"	3732
A101	4	#6	STR	22'-4"	134
A102	4	#6	STR	20'-7"	124
A103	4	#6	STR	18'-10"	113
A104	4	#6	STR	17'-1"	103
A105	4	#6	STR	15'-4"	92
A106	4	#6	STR	13'-8"	82
A107	4	#6	STR	11'-11"	72
A108	4	#6	STR	10'-2"	61
A109	4	#6	STR	8'-5"	51
A110	4	#6	STR	6'-8"	40
A111	4	#6	STR	5'-0"	30
A112	4	#6	STR	3'-3"	20
A113	4	#6	STR	1'-6"	9
A200	105	#6	STR	23'-8"	3732
A201	4	#6	STR	22'-4"	134
A202	4	#6	STR	20'-7"	124
A203	4	#6	STR	18'-10"	113
A204	4	#6	STR	17'-1"	103
A205	4	#6	STR	15'-4"	92
A206	4	#6	STR	13'-8"	82
A207	4	#6	STR	11'-11"	72
A208	4	#6	STR	10'-2"	61
A209	4	#6	STR	8'-5"	51
A210	4	#6	STR	6'-8"	40
A211	4	#6	STR	5'-0"	30
A212	4	#6	STR	3'-3"	20
A213	4	#6	STR	1'-6"	9
A300	105	#6	STR	23'-8"	3732
A301	4	#6	STR	22'-4"	134
A302	4	#6	STR	20'-7"	124
A303	4	#6	STR	18'-10"	113
A304	4	#6	STR	17'-1"	103
A305	4	#6	STR	15'-4"	92
A306	4	#6	STR	13'-8"	82
A307	4	#6	STR	11'-11"	72
A308	4	#6	STR	10'-2"	61
A309	4	#6	STR	8'-5"	51
A310	4	#6	STR	6'-8"	40
A311	4	#6	STR	5'-0"	30
A312	4	#6	STR	3'-3"	20
A313	4	#6	STR	1'-6"	9

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A400	105	#6	STR	23'-8"	3732
A401	4	#6	STR	22'-4"	134
A402	4	#6	STR	20'-7"	124
A403	4	#6	STR	18'-10"	113
A404	4	#6	STR	17'-1"	103
A405	4	#6	STR	15'-4"	92
A406	4	#6	STR	13'-8"	82
A407	4	#6	STR	11'-11"	72
A408	4	#6	STR	10'-2"	61
A409	4	#6	STR	8'-5"	51
A410	4	#6	STR	6'-8"	40
A411	4	#6	STR	5'-0"	30
A412	4	#6	STR	3'-3"	20
A413	4	#6	STR	1'-6"	9
A1	262	#5	1	7'-0"	1913
A2	262	#5	1	7'-0"	1913
B1	132	#5	STR	7'-8"	1056
B2	262	#4	STR	5'-0"	875
B3	176	#4	STR	7'-8"	901
C1	164	#4	STR	34'-4"	3761
G1	8	#5	STR	27'-3"	227
S2	12	#6	STR	27'-3"	491

TOTAL REINFORCING STEEL 29789 LBS.

BAR TYPE



ALL BAR DIMENSIONS ARE OUT TO OUT

SPLICE LENGTH CHART

BAR	SIZE	SPLICE LENGTH
C1	#4	2'-5"

PROJECT NO. R-5819

COLUMBUS COUNTY

STATION: 65+70.00 -Y7-

SHEET 4 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

END ELEVATION AND BILL OF MATERIAL FOR BOX CULVERT

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

SHEET NO. C-4
TOTAL SHEETS 7

PLANS PREPARED BY:

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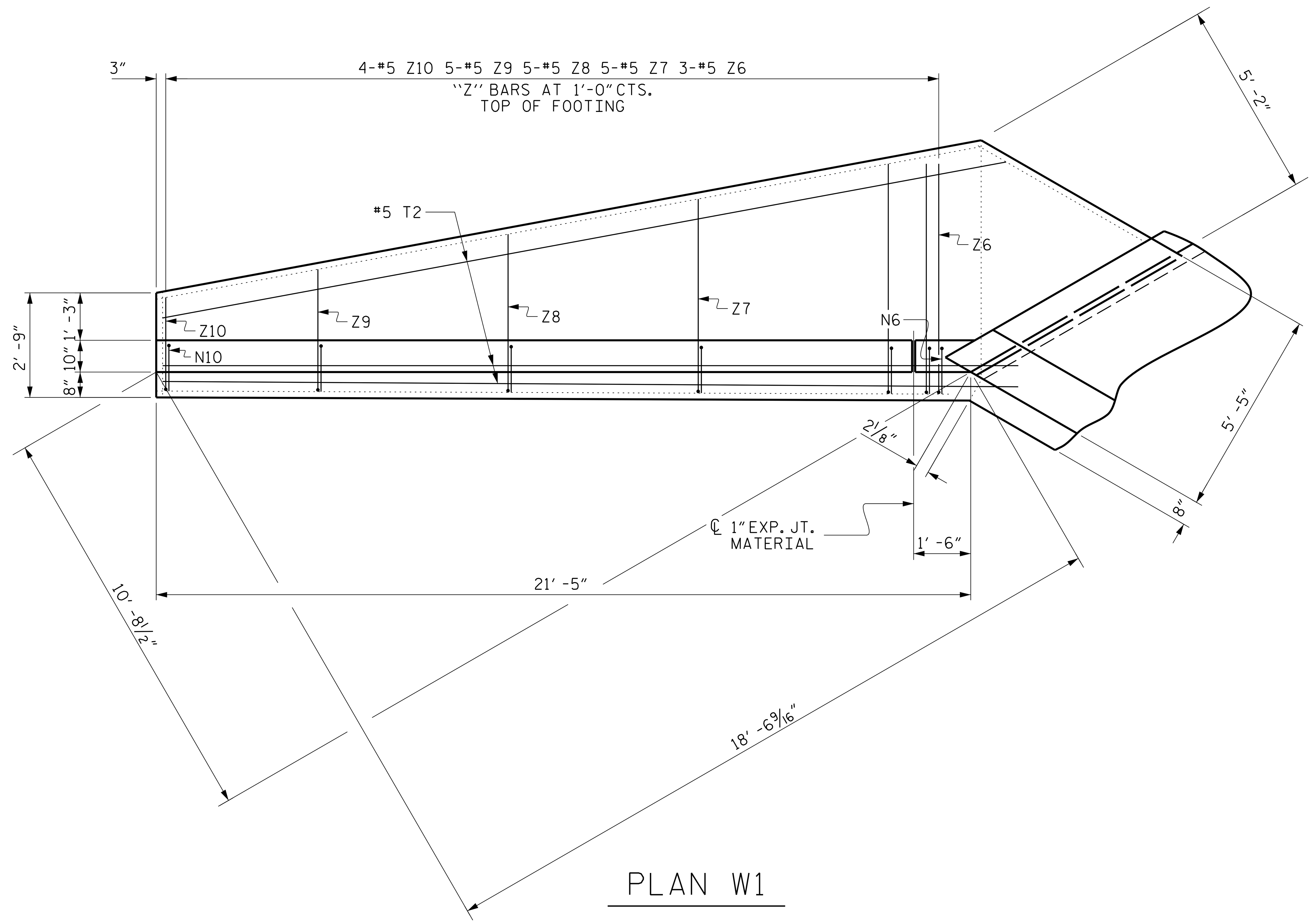
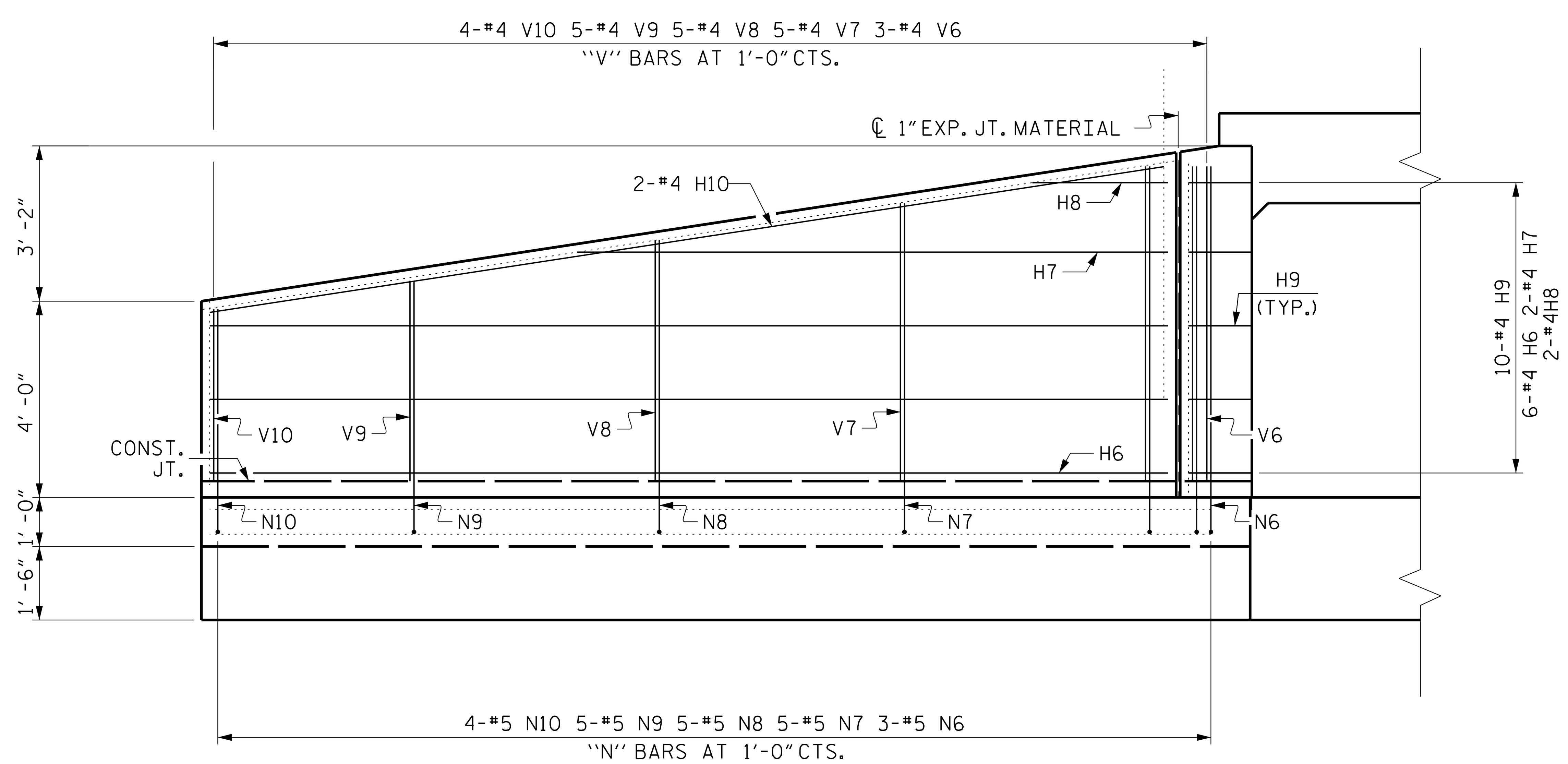
4/11/2022

DRAWN BY : J. A. PANDOLI DATE : 2/22
CHECKED BY : L. K. AUSTIN DATE : 2/22
DESIGN ENGINEER OF RECORD: L. K. AUSTIN DATE : 2/22



PLAN W1



ELEVATION W1

PROJECT NO. R-5819

COLUMBUS COUNTY

STATION: 65+70.00 -Y7-

SHEET 5 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR CONCRETE BOX CULVERT

H = 6'-0" SLOPE = 3:1

120° SKEW

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

PLANS PREPARED BY:

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DocuSigned by: L. Kevin Austin
4/11/2022

DRAWN BY :	J. A. PANDOLI	DATE :	2/22
CHECKED BY :	L. K. AUSTIN	DATE :	2/22
DESIGN ENGINEER OF RECORD:	L. K. AUSTIN	DATE :	2/22

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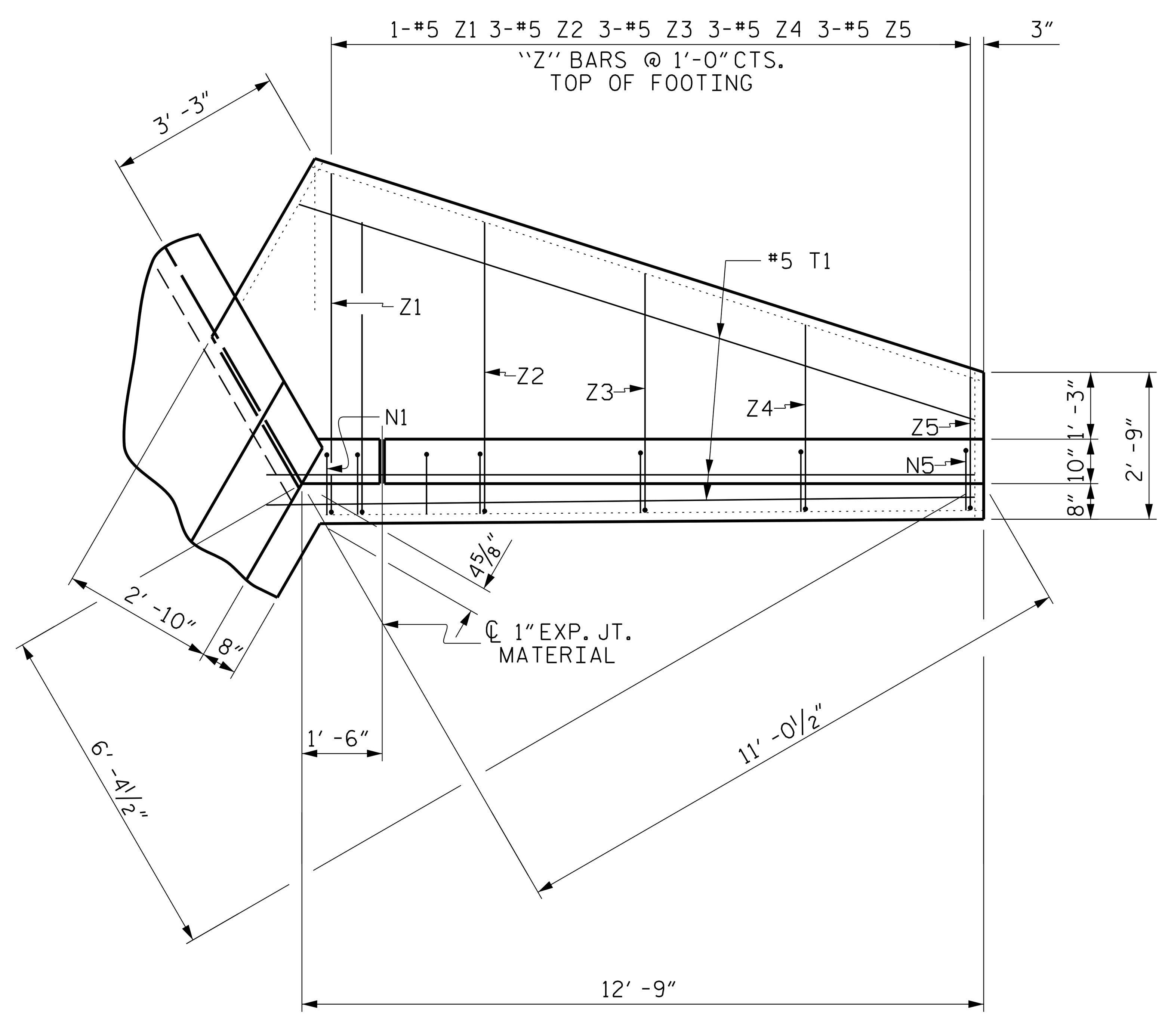
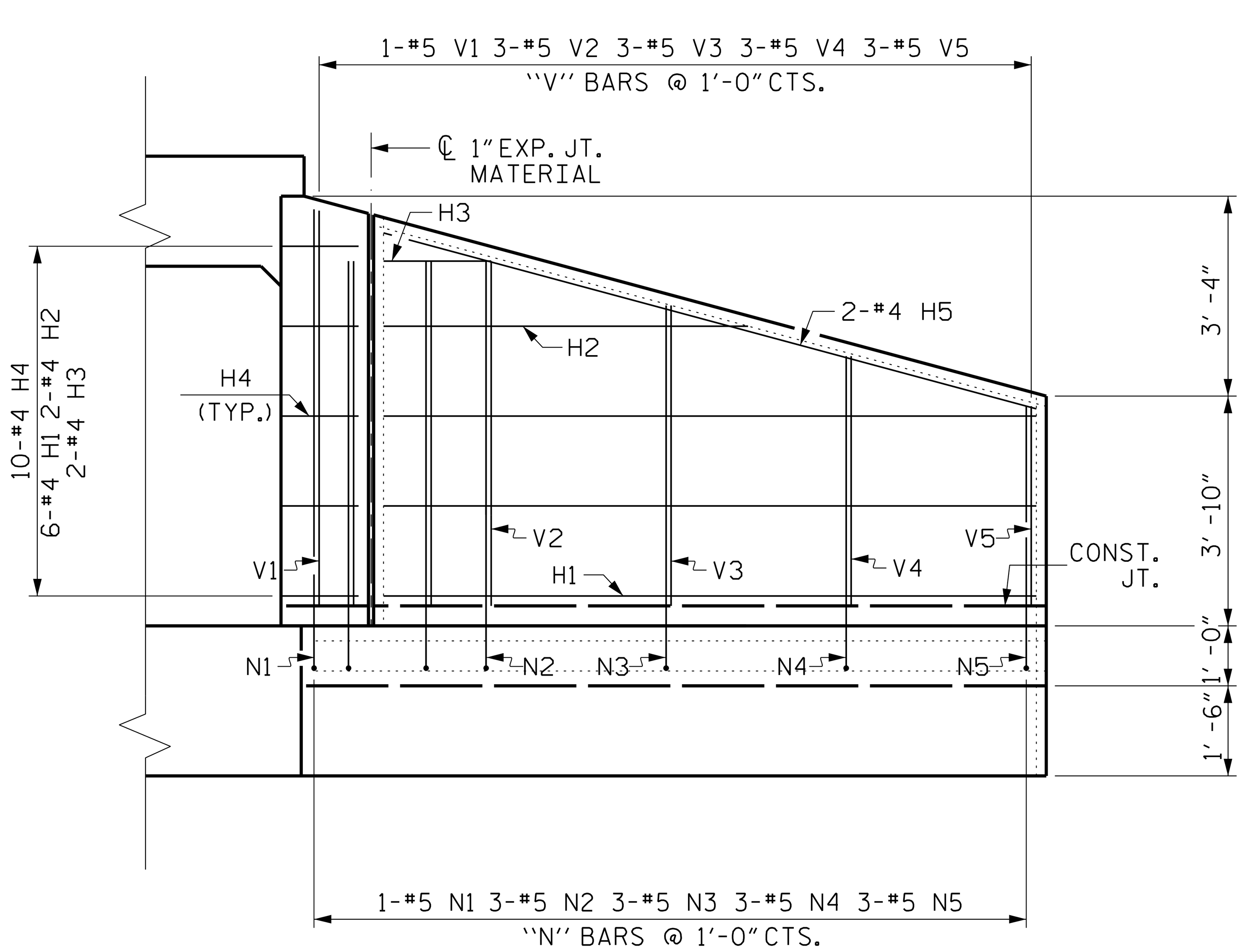
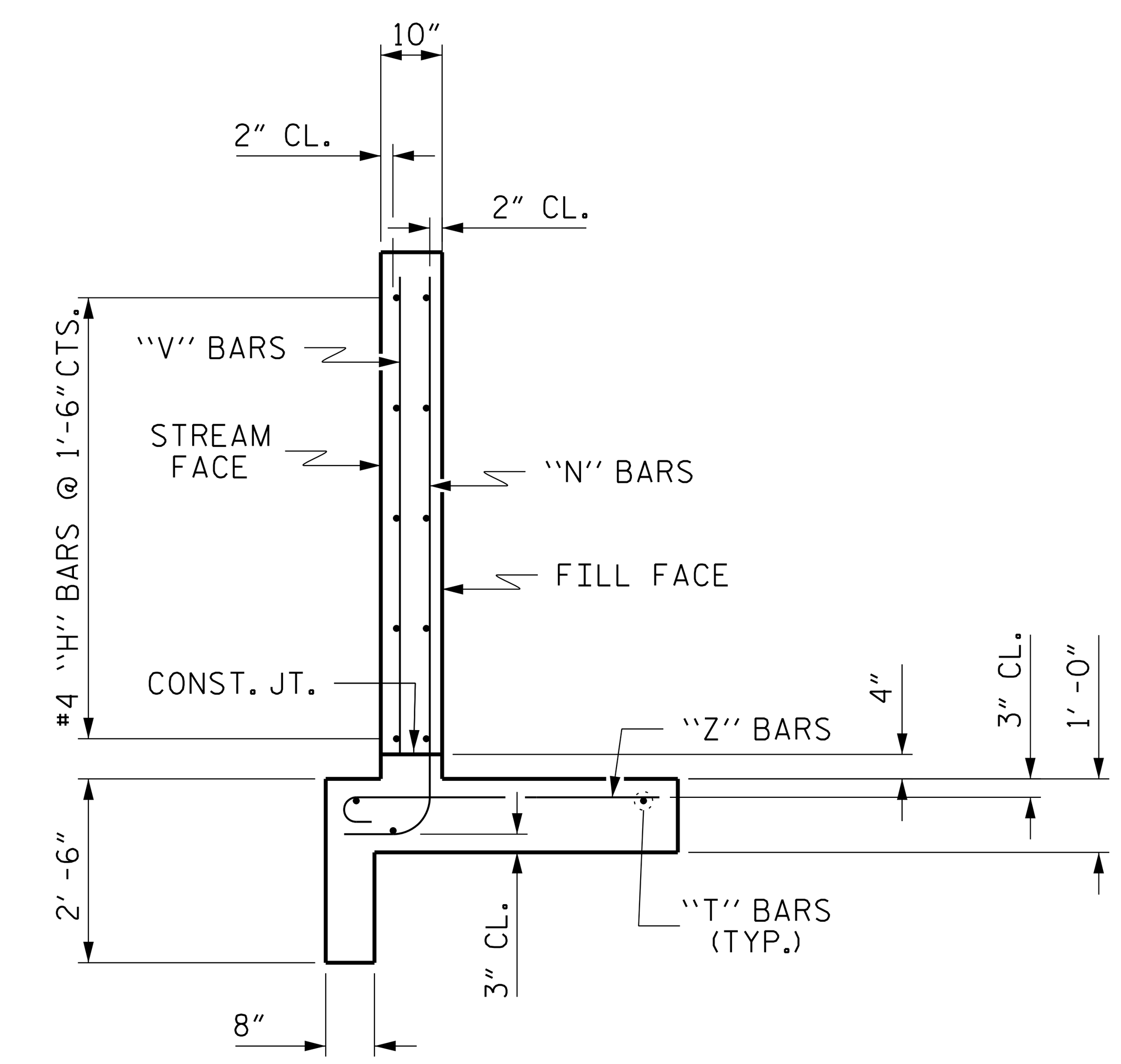


PLAN W2

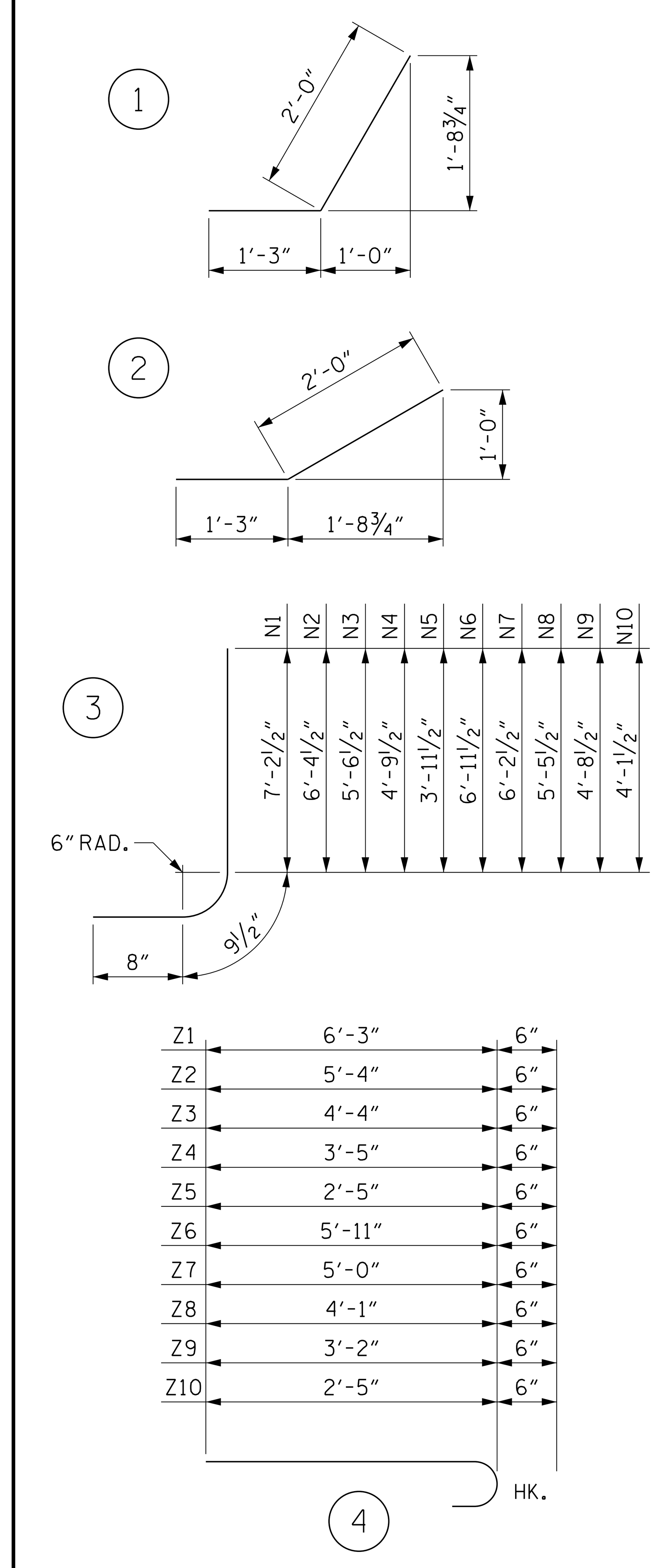


ELEVATION W2



TYPICAL WING SECTION

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	10'-10"	87
H2	4	#4	STR	6'-0"	16
H3	4	#4	STR	1'-10"	5
H4	20	#4	1	3'-3"	43
H5	4	#4	STR	11'-3"	30
H6	12	#4	STR	19'-6"	156
H7	4	#4	STR	12'-0"	32
H8	4	#4	STR	2'-3"	6
H9	20	#4	2	3'-3"	43
H10	4	#4	STR	19'-9"	53
N1	2	#5	3	8'-8"	18
N2	6	#5	3	7'-10"	49
N3	6	#5	3	7'-0"	44
N4	6	#5	3	6'-3"	39
N5	6	#5	3	5'-5"	34
N6	6	#5	3	8'-5"	53
N7	10	#5	3	7'-8"	80
N8	10	#5	3	6'-11"	72
N9	10	#5	3	6'-2"	64
N10	8	#5	3	5'-7"	47
T1	6	#5	STR	13'-0"	81
T2	6	#5	STR	22'-3"	139
V1	2	#4	STR	6'-7"	9
V2	6	#4	STR	5'-9"	23
V3	6	#4	STR	5'-0"	20
V4	6	#4	STR	4'-2"	17
V5	6	#4	STR	3'-4"	13
V6	6	#4	STR	6'-5"	26
V7	10	#4	STR	5'-8"	38
V8	10	#4	STR	4'-11"	33
V9	10	#4	STR	4'-1"	27
V10	8	#4	STR	3'-6"	19
Z1	2	#5	4	6'-9"	14
Z2	6	#5	4	5'-10"	37
Z3	6	#5	4	4'-10"	30
Z4	6	#5	4	3'-11"	25
Z5	6	#5	4	2'-11"	18
Z6	6	#5	4	6'-5"	40
Z7	10	#5	4	5'-6"	57
Z8	10	#5	4	4'-7"	48
Z9	10	#5	4	3'-8"	38
Z10	8	#5	4	2'-11"	24

REINFORCING STEEL FOR 4 WINGS — 1747 LBS

CLASS A CONCRETE
- 4 WINGS — 24.9 CY
- 2 HEADWALLS — 2.6 CY
- 2 END CURTAIN WALLS — 4.4 CY
- TOTAL — 31.9 CY

PROJECT NO. R-5819
COLUMBUS COUNTY
STATION: 65+70.00 -Y7-

SHEET 6 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR CONCRETE BOX CULVERT

H = 6'-0" SLOPE = 3:1
120° SKEW

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

PLANS PREPARED BY:
NV5 ENGINEERS & CONSULTANTS, INC.
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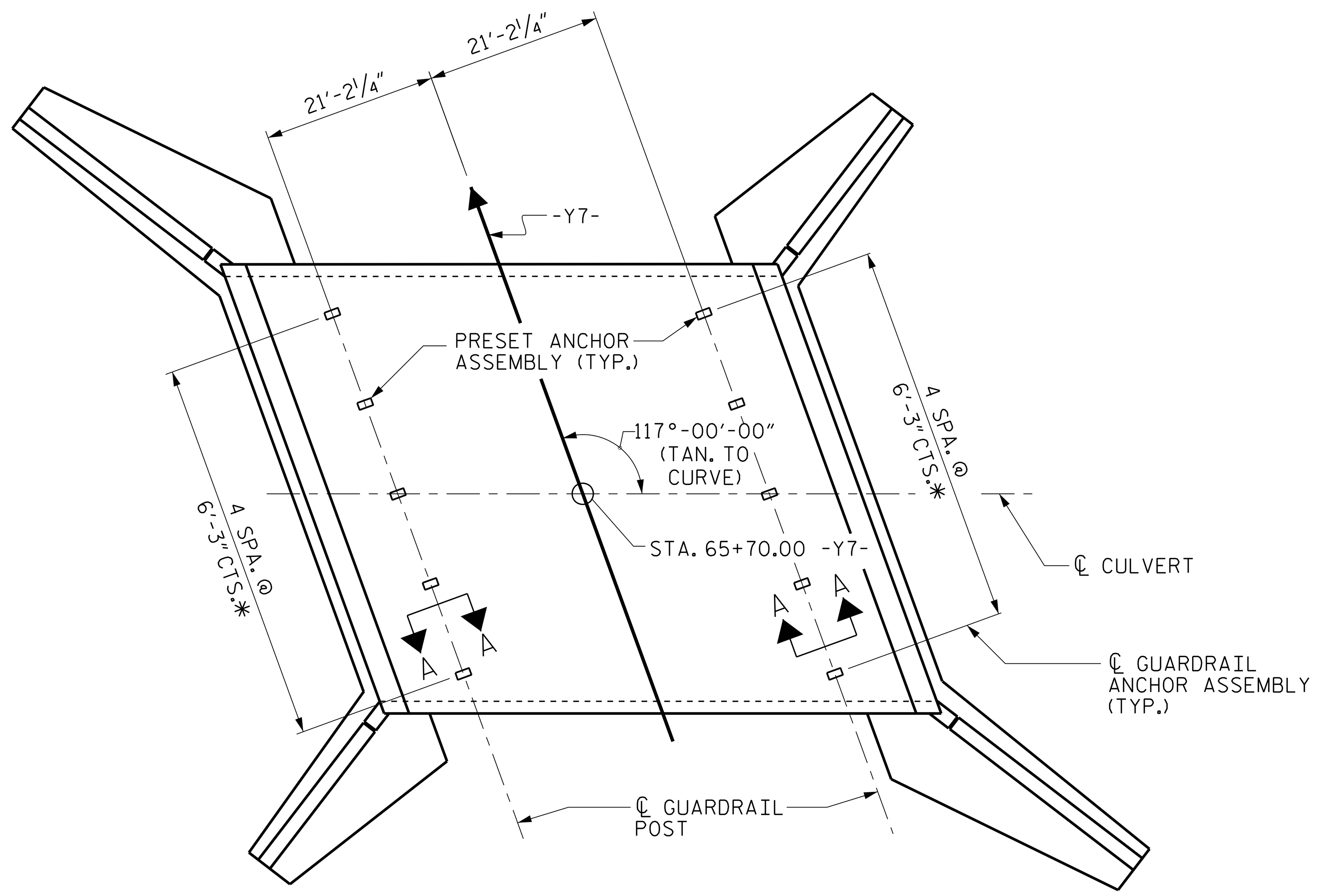
NC License # F-1333
formerly CALYX Engineers & Consultants

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 019661 L. KEVIN AUSTIN
DocuSigned by: L. Kevin Austin
4/11/2022

DRAWN BY : J. A. PANDOLI DATE : 2/22
CHECKED BY : L. K. AUSTIN DATE : 2/22
DESIGN ENGINEER OF RECORD: L. K. AUSTIN DATE : 2/22



PLAN OF CULVERT GUARDRAIL ANCHOR ASSEMBLY SPACING

* DISTANCES ARE ALONG THE ARC

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.

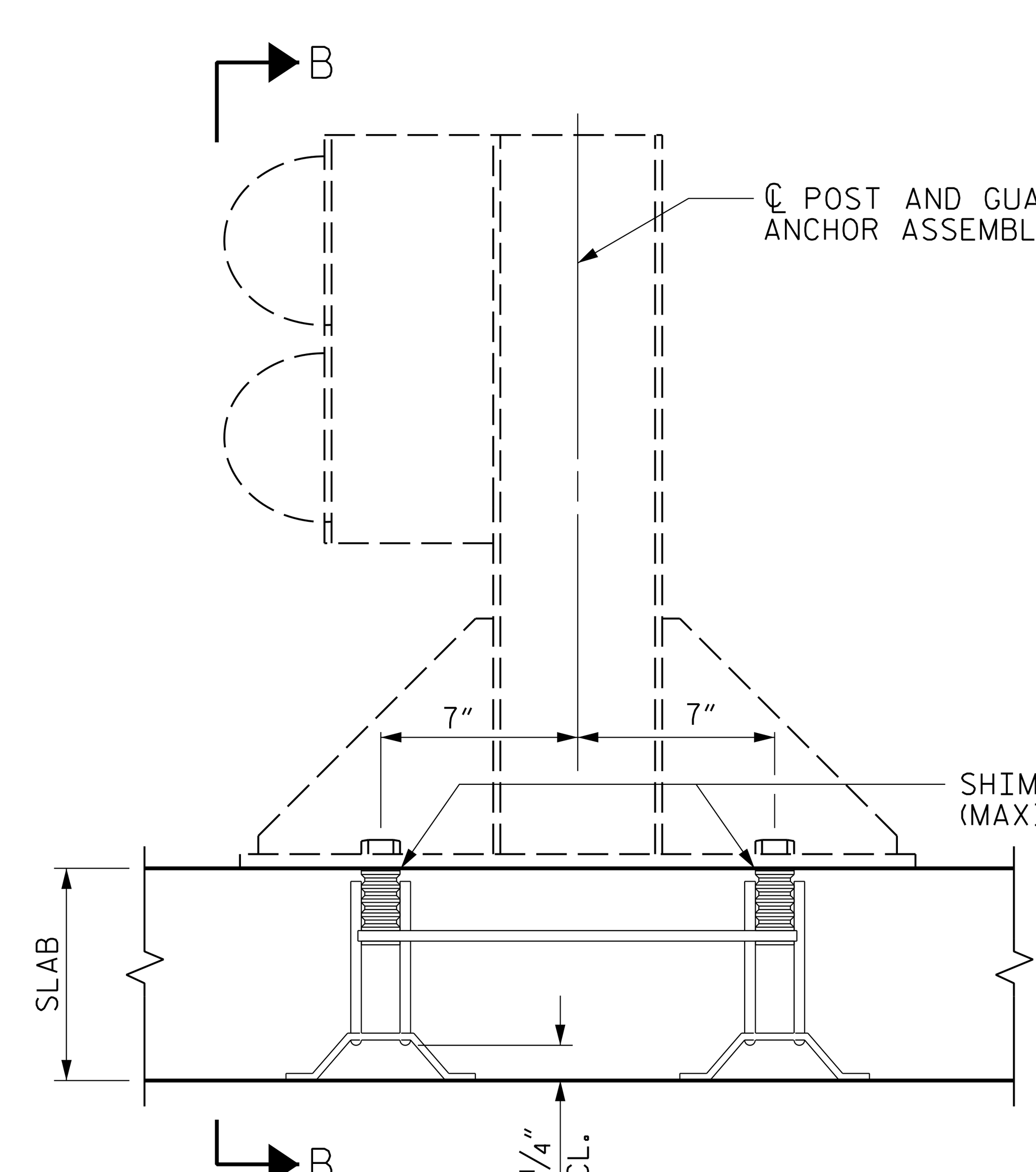
FERRULES TO BE PLUGGED DURING POURING OF SLAB AS RECOMMENDED BY THE MANUFACTURER.

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

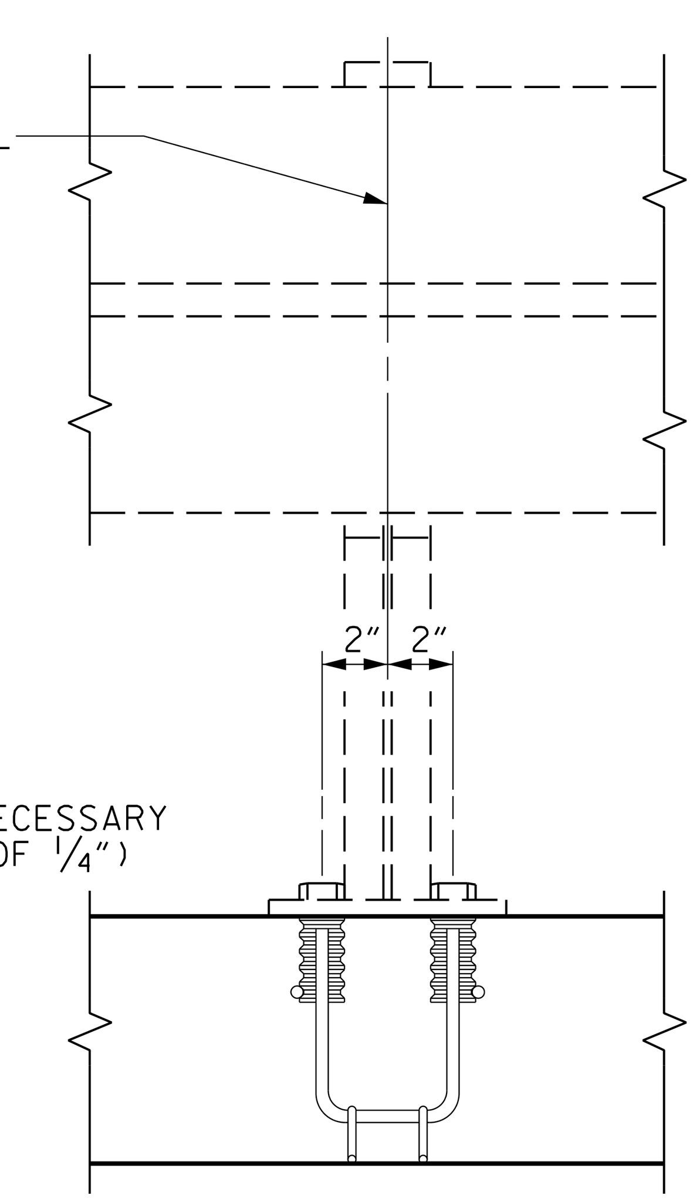
PAYMENT FOR GUARDRAIL, POSTS, AND POST BASE PLATES IS INCLUDED IN ROADWAY PAY ITEMS.

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.

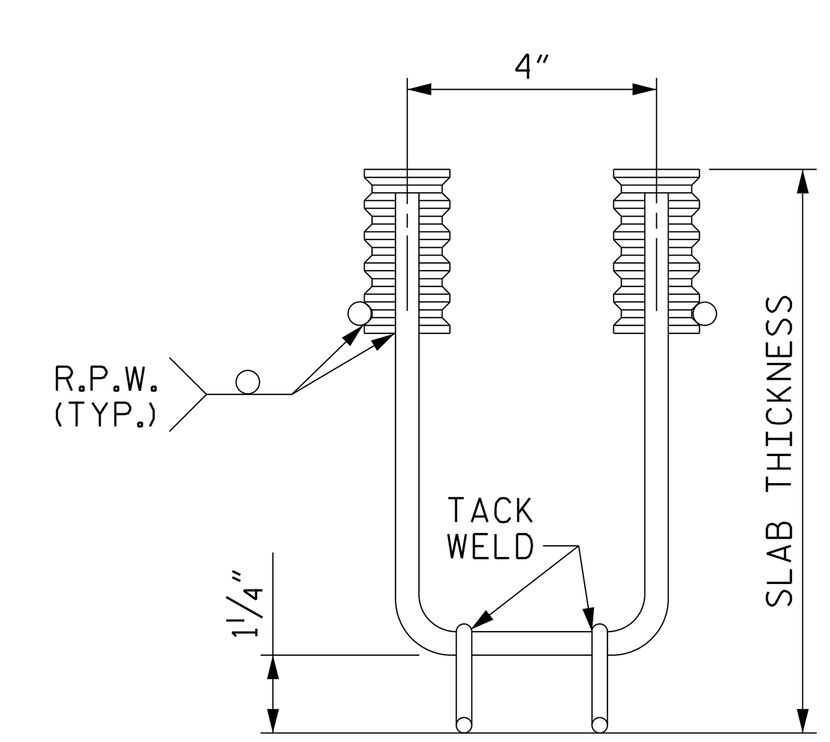
THE CONTRACTOR MAY USE ADHESIVELY ANCHORED ANCHOR BOLTS IN PLACE OF GUARDRAIL ANCHOR ASSEMBLY. LEVEL TWO FIELD TESTING IS REQUIRED, AND THE YIELD LOAD OF THE 1" Ø BOLT IS 21.8 KIPS. FOR ADHESIVELY ANCHORED ANCHOR BOLTS OR DOWELS, SEE STANDARD SPECIFICATIONS.



SECTION A-A

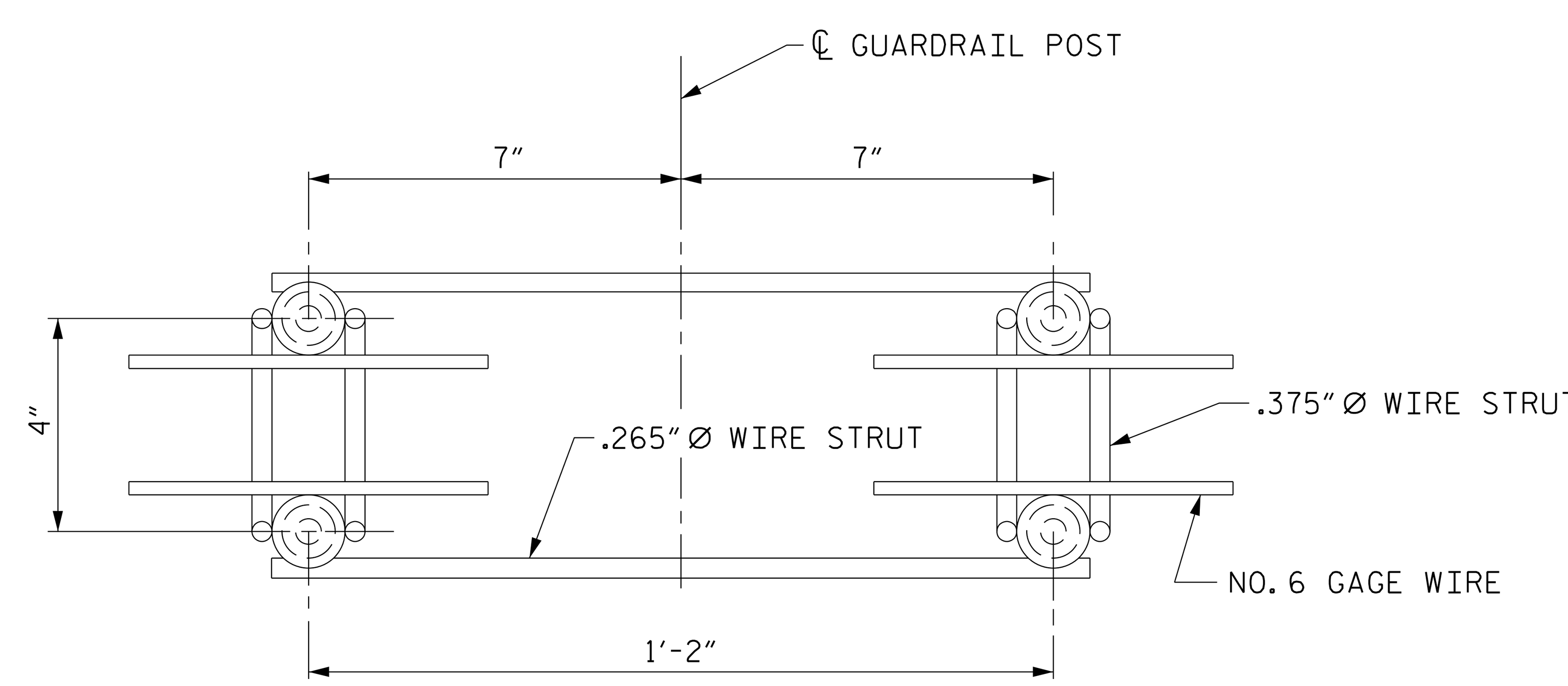


SECTION B-B

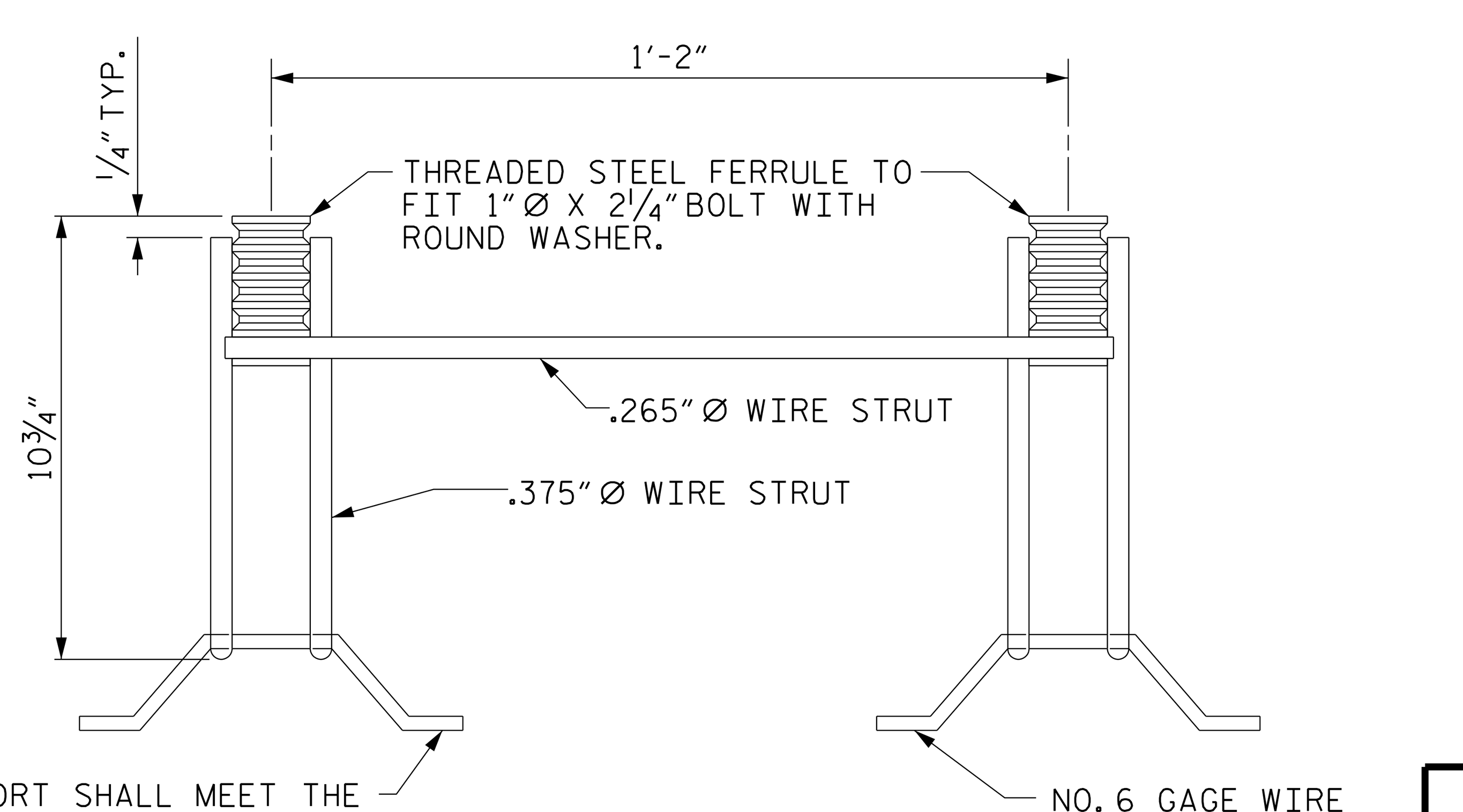


ELEVATION

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



PLAN



SIDE VIEW

GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS

PLANS PREPARED BY:

NV5

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PROJECT NO. R-5819

COLUMBUS COUNTY

STATION: 65+70.00 -Y7-

SHEET 7 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

ANCHORAGE DETAILS FOR GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS

NORTH CAROLINA PROFESSIONAL SEAL 028061 ENGINEER KEVIN AUSTIN
L. Kevin Austin
4/11/2022

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

ASSEMBLED BY : JAP	DATE : 2/22		
CHECKED BY : LKA	DATE : 2/22		
DRAWN BY : FCJ 6/88	REV. 10/1/11	MAA/GM	
CHECKED BY : ARB 6/88	REV. 12/17	MAA/THC	
	REV. 6/19	MAA/THC	

STANDARD NOTES

DESIGN DATA:

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

MATERIAL AND WORKMANSHIP:

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

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

CONCRETE:

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

CONCRETE CHAMFERS:

UNLESS OTHERWISE NOTED ON THE PLANS, ALL EXPOSED CORNERS ON STRUCTURES SHALL BE CHAMFERED ¾" WITH THE FOLLOWING EXCEPTIONS: TOP CORNERS OF CURBS MAY BE ROUNDED TO 1½" RADIUS WHICH IS BUILT INTO CURB FORMS; CORNERS OF TRANSVERSE FLOOR EXPANSION JOINTS SHALL BE ROUNDED WITH A ¼" FINISHING TOOL UNLESS OTHERWISE REQUIRED ON PLANS; AND CORNERS OF EXPANSION JOINTS IN THE ROADWAY FACES AND TOPS OF CURBS AND SIDEWALKS SHALL BE ROUNDED TO A ¼" RADIUS WITH A FINISHING STONE OR TOOL UNLESS OTHERWISE REQUIRED ON PLANS.

DOWELS:

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

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

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

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

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

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

REINFORCING STEEL:

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

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

STRUCTURAL STEEL:

AT THE CONTRACTOR'S OPTION, HE MAY SUBSTITUTE ⅞" Ø SHEAR STUDS FOR THE ¾" Ø STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - ⅞" Ø STUDS FOR 4 - ¾" Ø STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF ⅞" Ø STUDS ALONG THE BEAM AS SHOWN FOR ¾" Ø STUDS BASED ON THE RATIO OF 3 - ⅞" Ø STUDS FOR 4 - ¾" Ø STUDS. STUDS OF THE LENGTH SPECIFIED ON THE PLANS MUST BE PROVIDED. THE MAXIMUM SPACING SHALL BE 2'-0".

EXCEPT AT THE INTERIOR SUPPORTS OF CONTINUOUS BEAMS WHERE THE COVER PLATE IS IN CONTACT WITH BEARING PLATE, THE CONTRACTOR MAY, AT HIS OPTION, SUBSTITUTE FOR THE COVER PLATES DESIGNATED ON THE PLANS COVER PLATES OF THE EQUIVALENT AREA PROVIDED THESE PLATES ARE AT LEAST 5/16" IN THICKNESS AND DO NOT EXCEED A WIDTH EQUAL TO THE FLANGE WIDTH LESS 2" OR A THICKNESS EQUAL TO 2 TIMES THE FLANGE THICKNESS. THE SIZE OF FILLET WELDS SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT ANSI/AASHTO/AWS "BRIDGE WELDING CODE". ELECTROSLAG WELDING WILL NOT BE PERMITTED.

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

HANDRAILS AND POSTS:

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

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

SPECIAL NOTES:

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

ENGLISH

JANUARY, 1990

REV. 6-16-95 EEM (c) RGW REV. 5-7-03 RWW (c) JTE REV. 10-1-11 MAA (c) GM
REV. 8-16-99 RWW (c) LES REV. 5-1-06 TLA (c) GM REV. 12-17 MAA (c) THC
21-FEB-2019 11:17
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