

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
 DESIGN FILL = 20.17 FT.
 FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.
 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
 CONCRETE IN THE 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.
 TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
 STEEL IN THE BOTTOM SLAB MAY BE SPICED AT THE PERMITTED CONSTRUCTION JOINT AT THE CONTRACTOR'S OPTION. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES WILL BE PAID FOR BY THE CONTRACTOR.
 PIPE PENETRATING THROUGH WINGWALL W2 SHALL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE CUT OR BENT AS NECESSARY TO CLEAR THE PIPE. ADDITIONAL REINFORCING STEEL SHALL BE PLACED AROUND THE WALL OPENING AS DETAILED IN THE PLANS.
 NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
 FOR CULVERT EXCAVATION, SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.
 THE REINFORCED CONCRETE BOX CULVERT SHALL BE PLACED ON THE STANDARD 1.0 FOOT BLANKET OF FOUNDATION CONDITIONING MATERIAL SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.
 UNDERCUT SOFT/VERY LOOSE SOILS THAT MAY BE ENCOUNTERED BENEATH THE BOTTOM OF THE FOUNDATIONS. BACKFILL UNDERCUT AREAS WITH FOUNDATION CONDITIONING MATERIAL. SEE DETAIL SHEETS 2G-1 AND 2G-2 FOR LOCATION AND PROFILE VIEWS. UNDERCUT QUANTITY IS ESTIMATED AT 1,780 CUBIC YARDS. UNDERCUT OUTSIDE THE THE EDGE OF THE CULVERT FOOTING WILL EQUAL THE DEPTH OF UNDERCUT (SEE DETAIL).

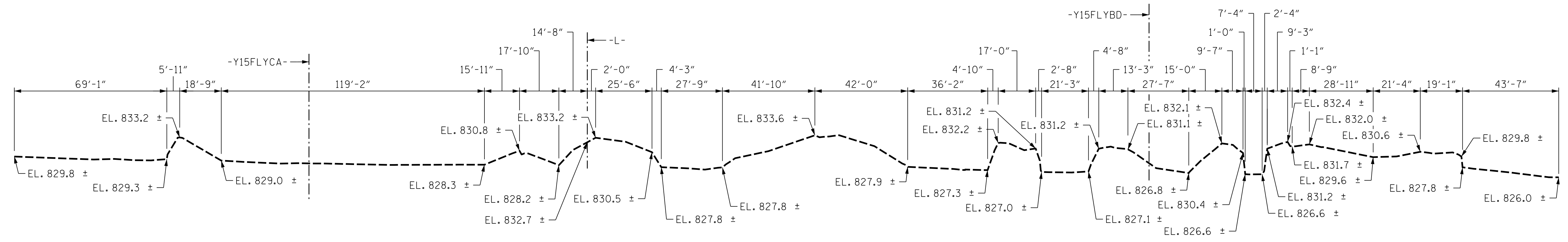
DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON THE WING SHEETS.
 A 3 FOOT STRIP OF GEOTEXTILE SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
 THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO THE VARIOUS PAY ITEMS.
 FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
 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.
 AT THE CONTRACTOR'S OPTION, HE MAY SPlice THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL AND BOTH FACES OF THE 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.
 DETAILED DRAWINGS FOR FALSEWORK AND FORMS FOR THIS DOUBLE BARREL 12 FT X 10 FT CONCRETE BOX CULVERT SHALL BE SUBMITTED. SEE SHEET SN.

ROADWAY DATA

GRADE POINT ELEV. @ STATION 768+62.23 -L-	= 855.81
BED ELEV. @ STATION 768+62.23 -L-	= 827.53
ROADWAY SLOPES	= 2:1 MIN

LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS



PROFILE ALONG CULVERT

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 768+62.23 -L-
 SHEET 1 OF 11 BRIDGE NO. 749

HYDRAULIC DATA

DESIGN DISCHARGE	= 1430 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEVATION	= 836.9
DRAINAGE AREA	= 2.32 SQ. MI.
BASE DISCHARGE (Q100)	= 1630 CFS
BASE HIGH WATER ELEVATION	= 837.7

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 4300 CFS
FREQUENCY OF OVERTOPPING FLOOD	= >500 YR.
OVERTOPPING FLOOD ELEVATION	= 853.7

TOTAL STRUCTURE QUANTITIES

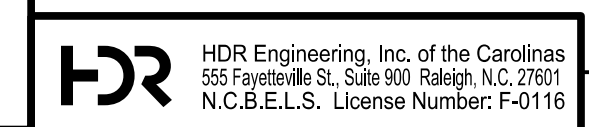
CLASS A CONCRETE	BARREL @ 4.700 C.Y./FT. 2652.4 C.Y.
HEADWALLS AND SILLS	8.1 C.Y.
WINGS ETC.	124.5 C.Y.
TOTAL	2785.0 C.Y.
REINFORCING STEEL	BARREL, HEADWALLS & SILL 464,160 LBS.
WINGS	15,222 LBS.
TOTAL	479,382 LBS.
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	4610 TONS

SAMPLE BAR REPLACEMENT

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

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

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS



10/11/2021

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STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

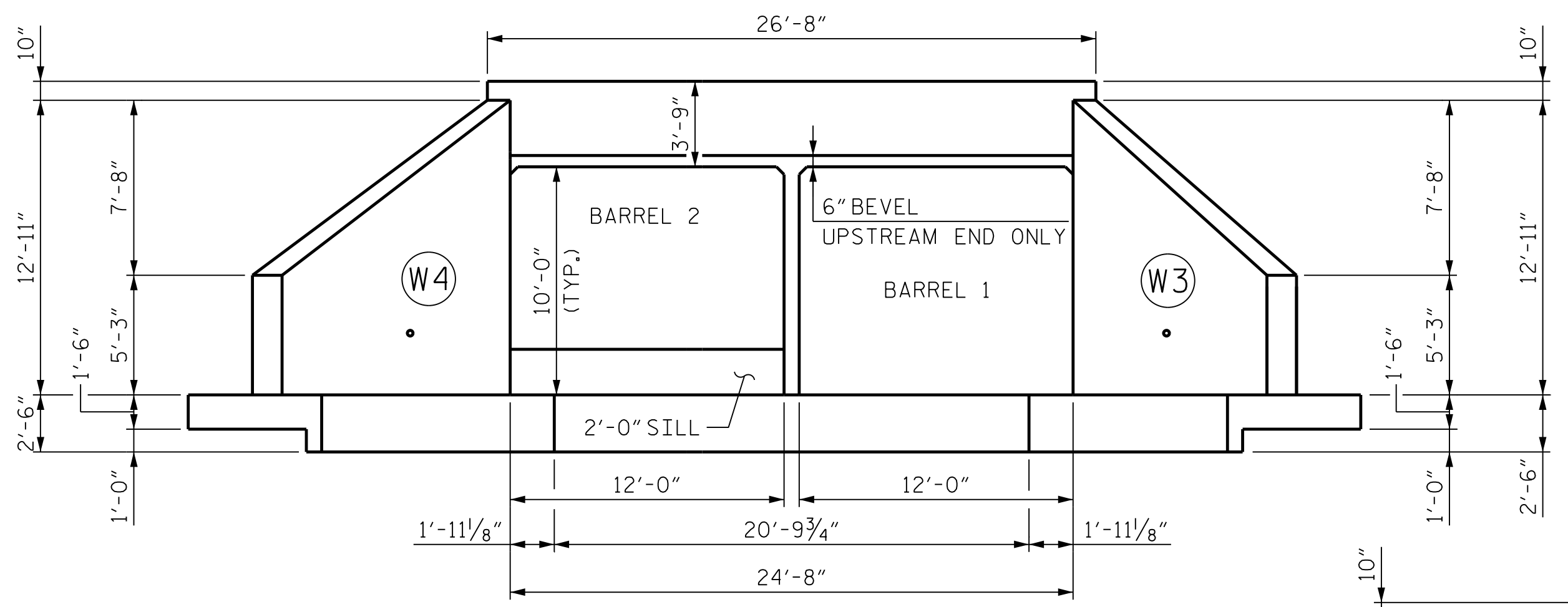
**DOUBLE BARREL
 12 FT. X 10 FT.
 CONCRETE BOX CULVERT
 60°45'00" SKEW**

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

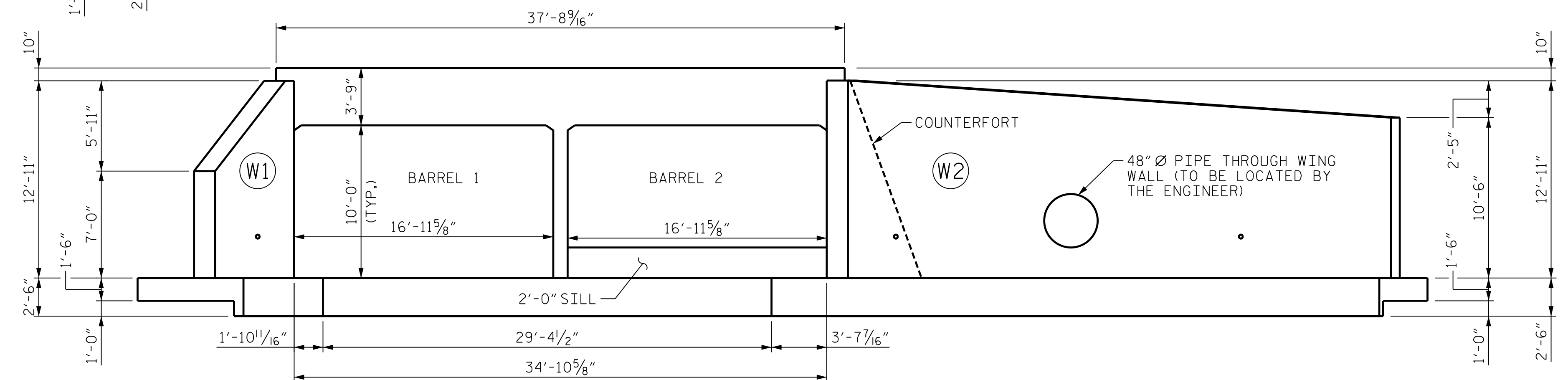
SHEET NO. C1-1
 TOTAL SHEETS 11

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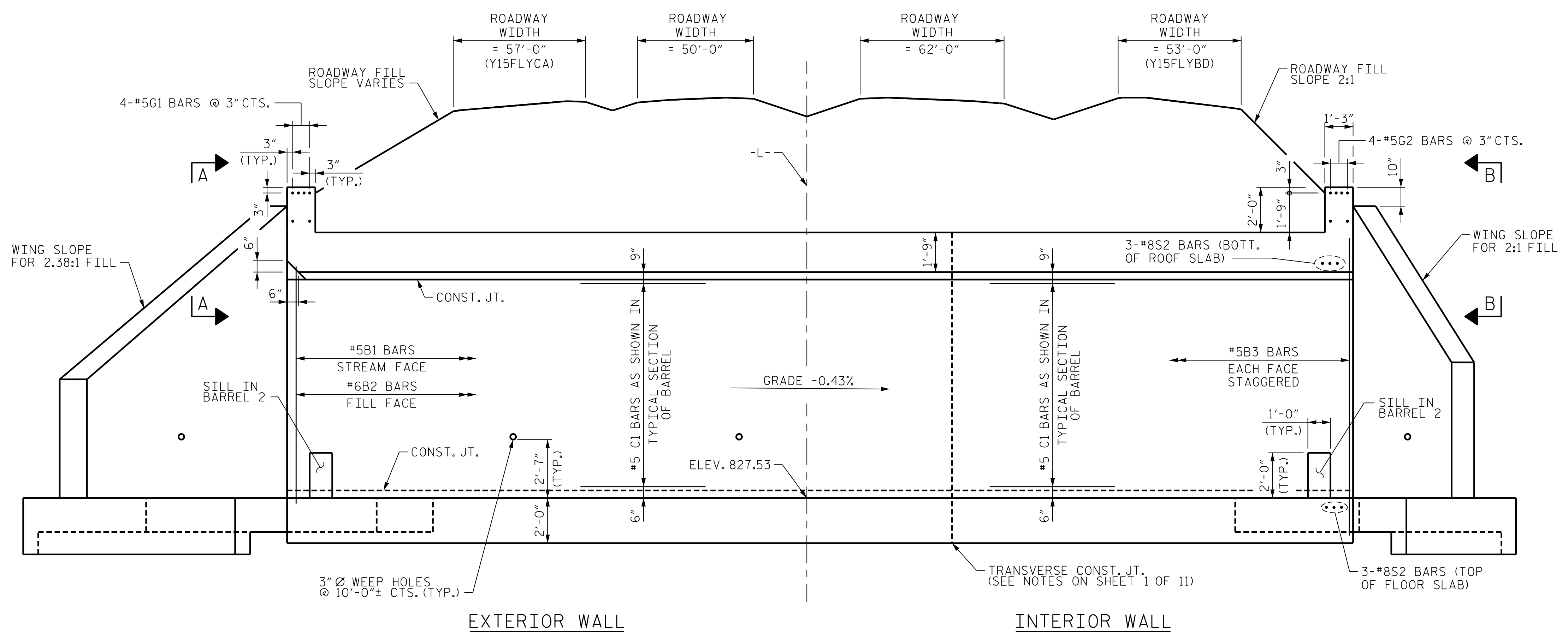
NOTE
FOR VIEWS A-A AND B-B, SEE SHEET 6 OF 11



INLET END ELEVATION NORMAL TO SKEW



OUTLET END ELEVATION NORMAL TO SKEW



CULVERT SECTION NORMAL TO ROADWAY

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 768+62.23 -L-
 SHEET 2 OF 11

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**DOUBLE BARREL
 12 FT. X 10 FT.
 CONCRETE BOX CULVERT
 60° 45' 00" SKEW**

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

Dominic A. Coletti 10/11/2021
 NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29589
 DOMINIC A. COLETTI

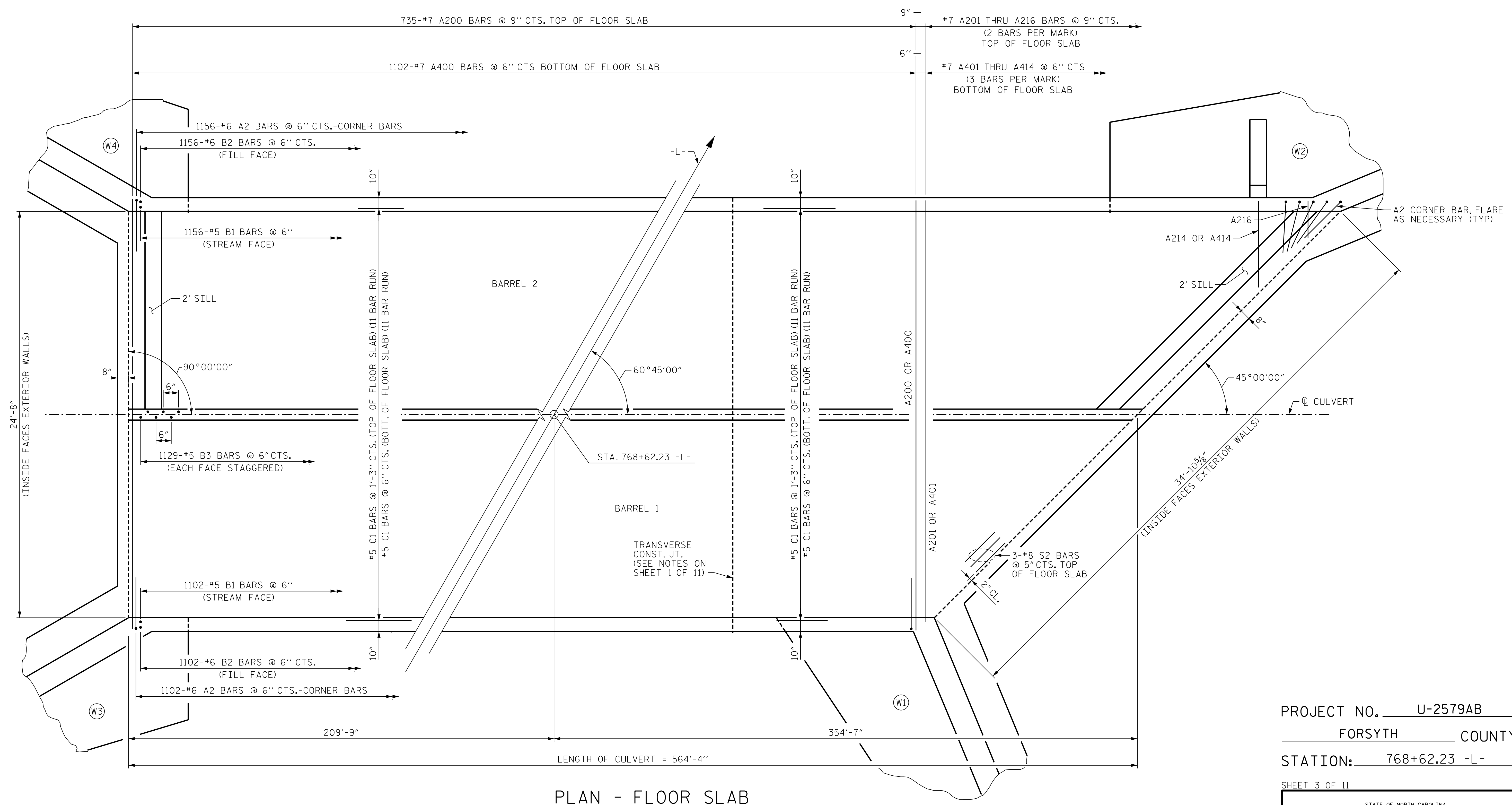
HDR HDR Engineering, Inc. of the Carolinas
 555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
 N.C.B.E.L.S. License Number: F-0116

**DOCUMENT NOT CONSIDERED FINAL
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DES CHK: <u>R. TURNAGE</u>	DATE: <u>09/19</u>	CHK BY: <u>R. TURNAGE</u>	DATE: <u>09/19</u>

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PLAN - FLOOR SLAB

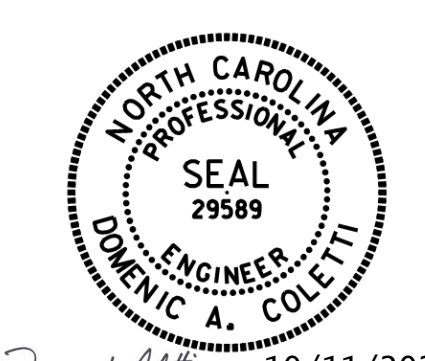
PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 768+62.23 -L-
 SHEET 3 OF 11

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE BARREL
12 FT. X 10 FT.
CONCRETE BOX CULVERT
60°45'00" SKEW

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

SHEET NO. CI-3
 TOTAL SHEETS 11

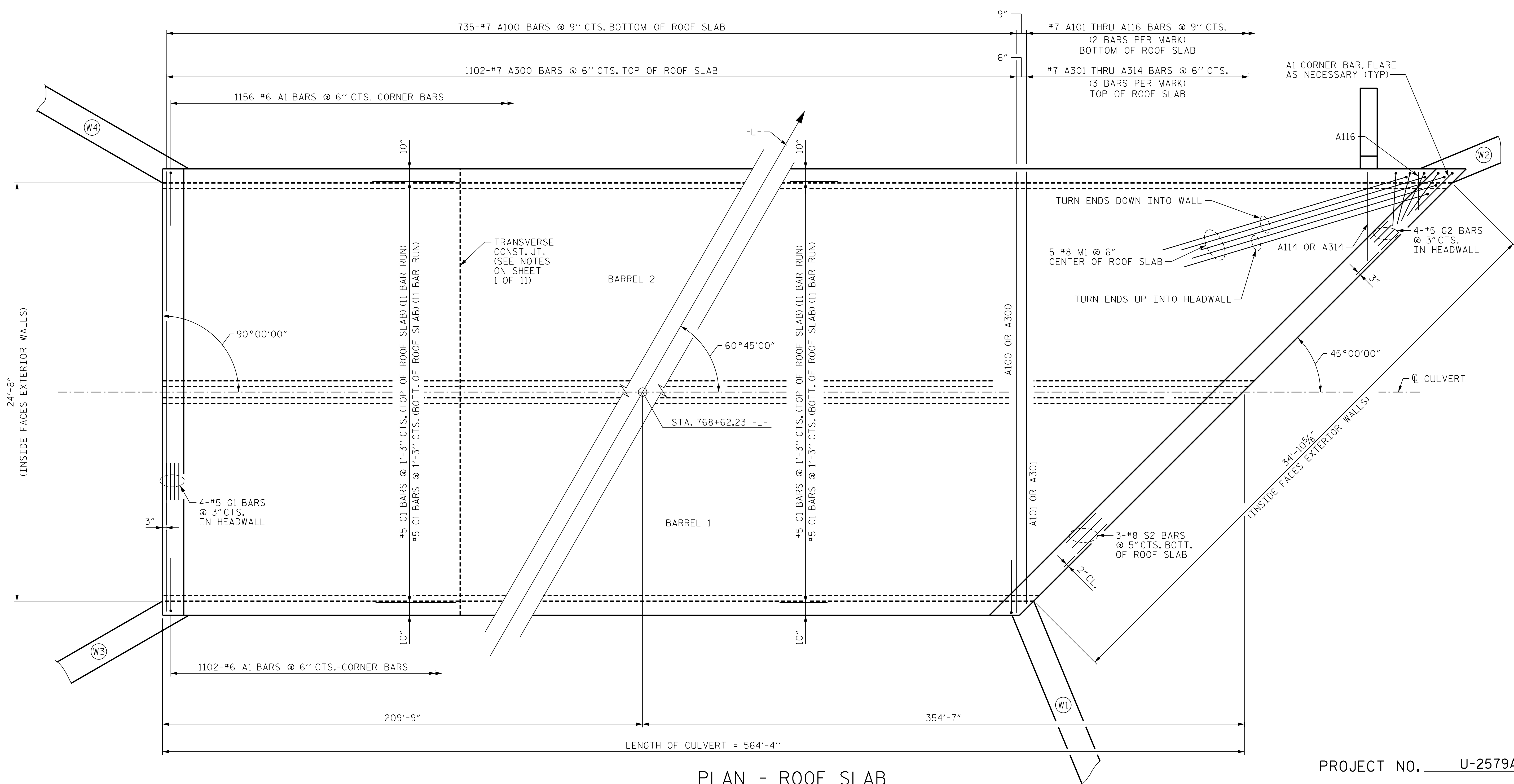


10/11/2021
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 UNLESS ALL SIGNATURES COMPLETED

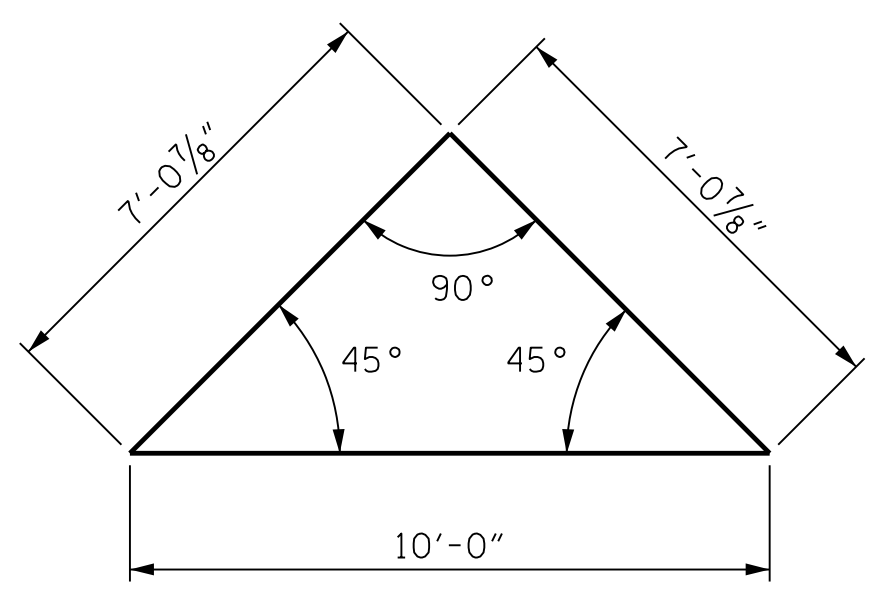


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DES CHK: R. TURNAGE	DATE: 09/19	CHK BY: R. TURNAGE	DATE: 09/19

PLOT DRIVER: NCDOT_STRUCTURES_DEFAULT_PLOTTER.plt
 USER: PETERSON DATE: 5/20/2021
 FILE: ... \PLAN VIEW (FLOOR)



PLAN - ROOF SLAB



SKIEW TRIANGLE

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 768+62.23 -L-
 SHEET 4 OF 11

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 DOUBLE BARREL
 12 FT. X 10 FT.
 CONCRETE BOX CULVERT
 60°45'00" SKEW



10/11/2021

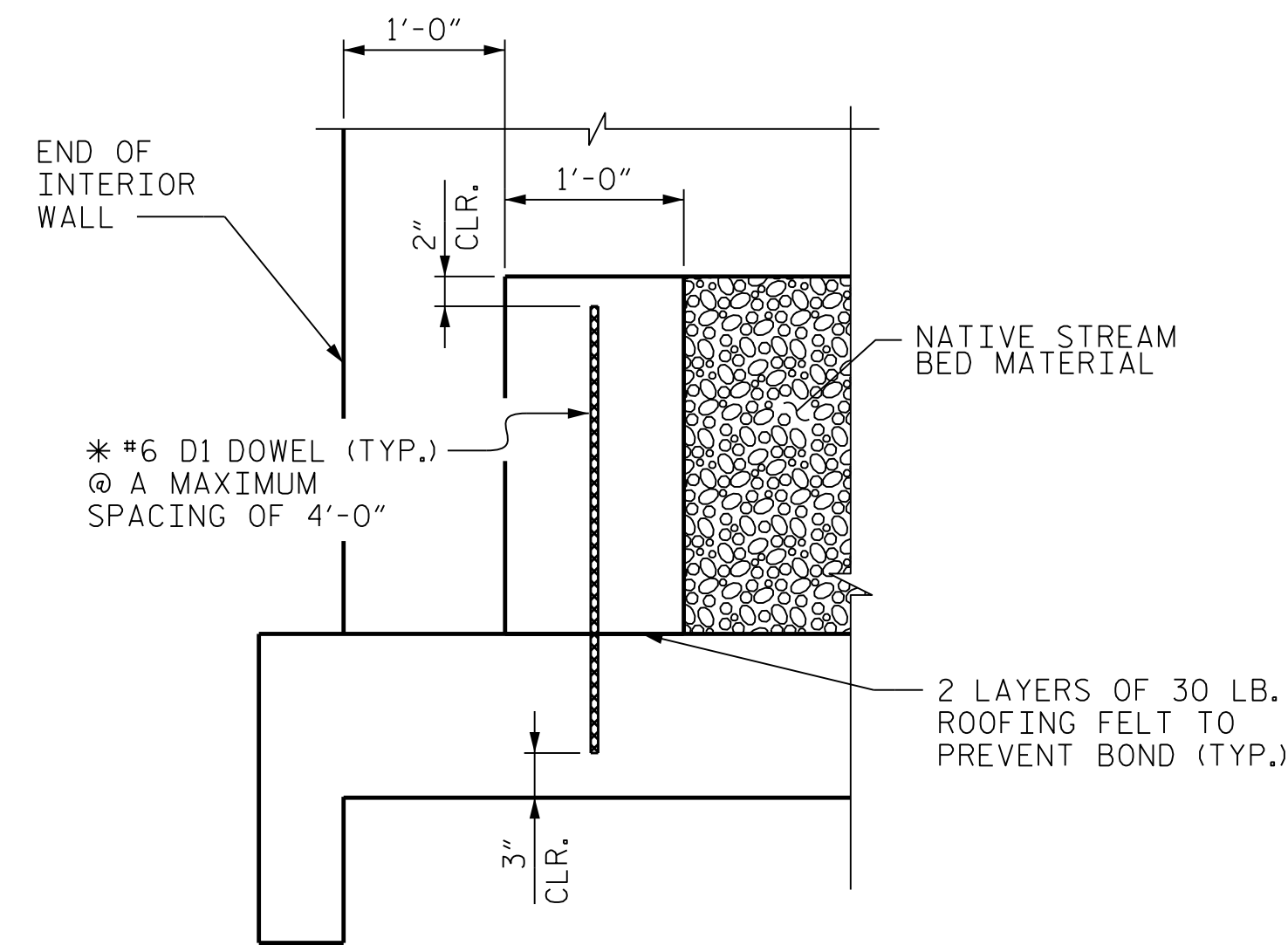
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DES CHK: R. TURNAGE	DATE: 09/19	CHK BY: R. TURNAGE	DATE: 09/19

HDR Engineering, Inc. of the Carolinas
 555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
 N.C.B.E.L.S. License Number: F-0116

DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED

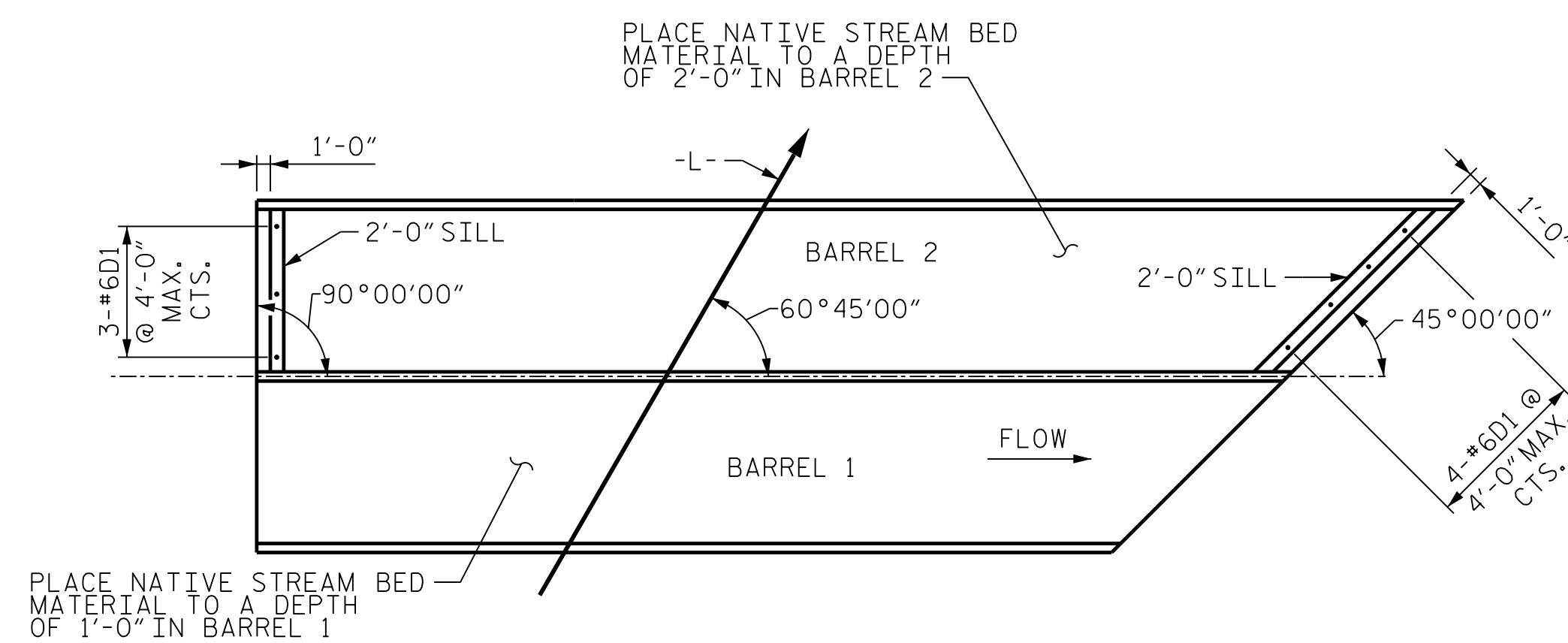
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2			4		

SHEET NO. CI-4
 TOTAL SHEETS 11

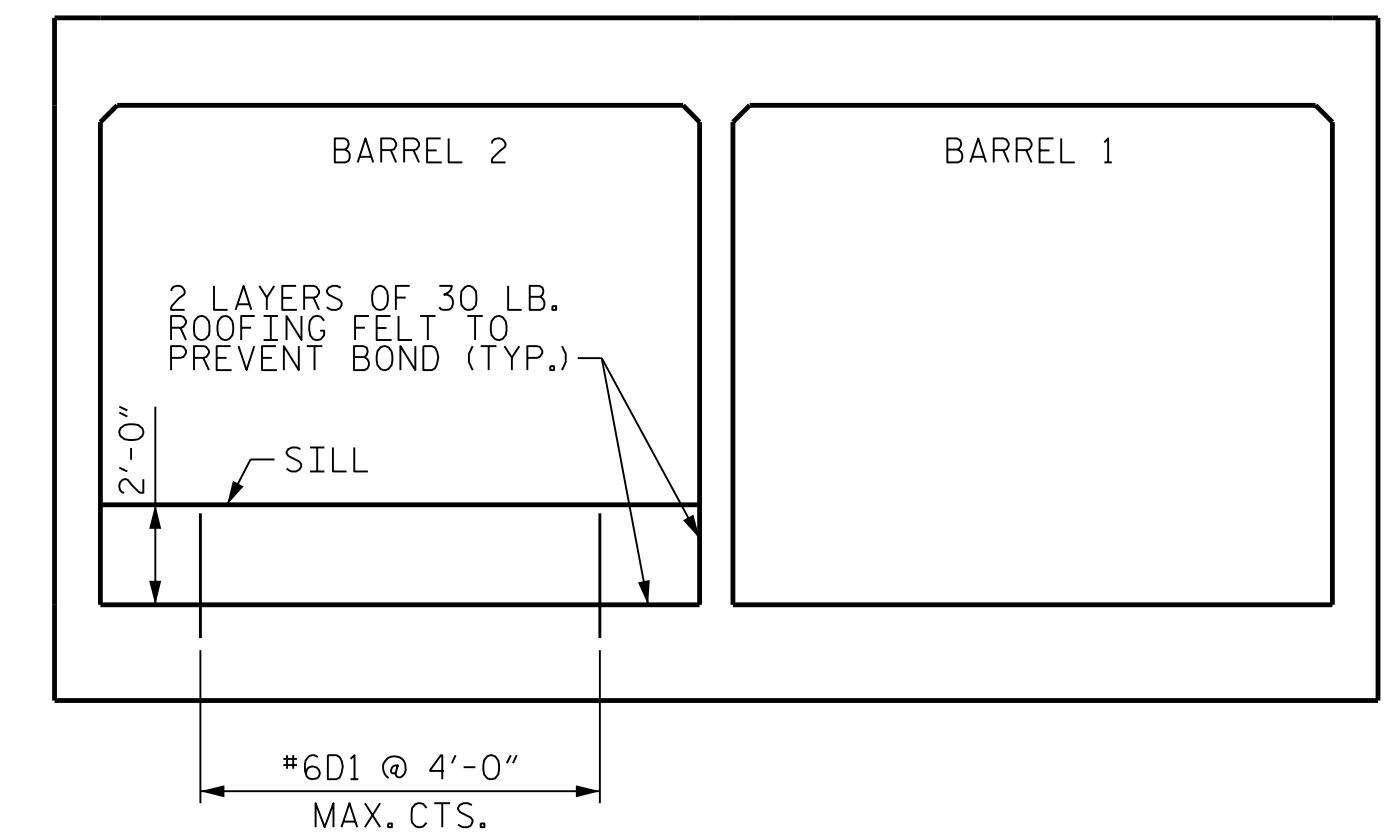


SECTION THROUGH SILL

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



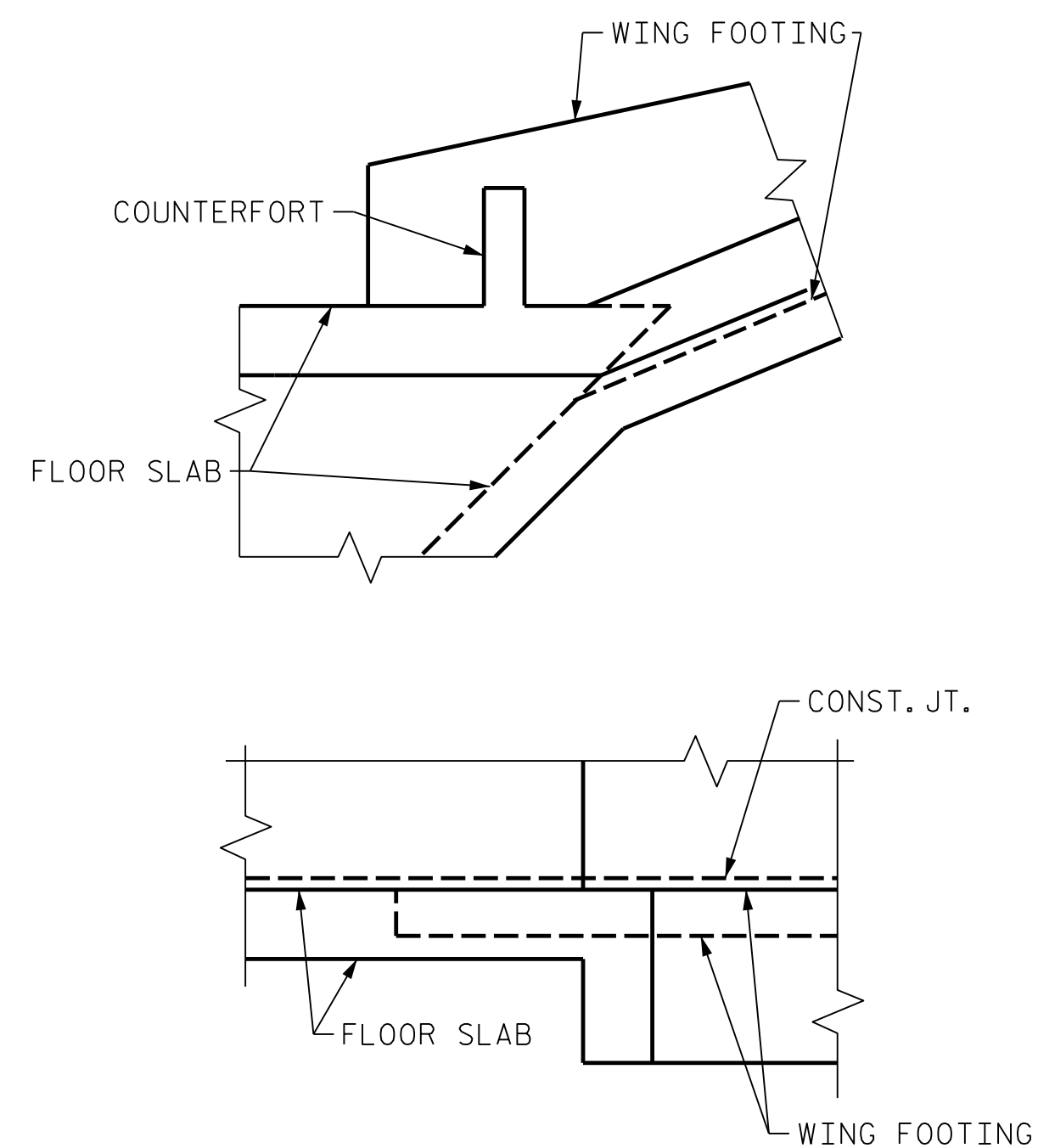
PLAN VIEW SHOWING SILL LOCATIONS



ELEVATION - LOOKING DOWNSTREAM

CULVERT SILL DETAILS

THE CONTRACTOR SHALL FILL THE PROPOSED CULVERT WITH NATIVE BED MATERIAL AS INDICATED IN THE PLANS. EXISTING BED MATERIAL SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AS DIRECTED BY THE ENGINEER. THE BED MATERIAL MAY BE SUPPLEMENTED WITH CLASS B RIP RAP IF NEEDED. PAYMENT SHALL BE INCLUDED IN THE LUMP SUM PAY ITEM FOR CULVERT EXCAVATION.



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

PROJECT NO. U-2579AB
FORSYTH COUNTY
STATION: 768+62.23 -L-

SHEET 5 OF 11

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
DOUBLE BARREL
12 FT. X 10 FT.
CONCRETE BOX CULVERT
60°45'00" SKEW



10/11/2021

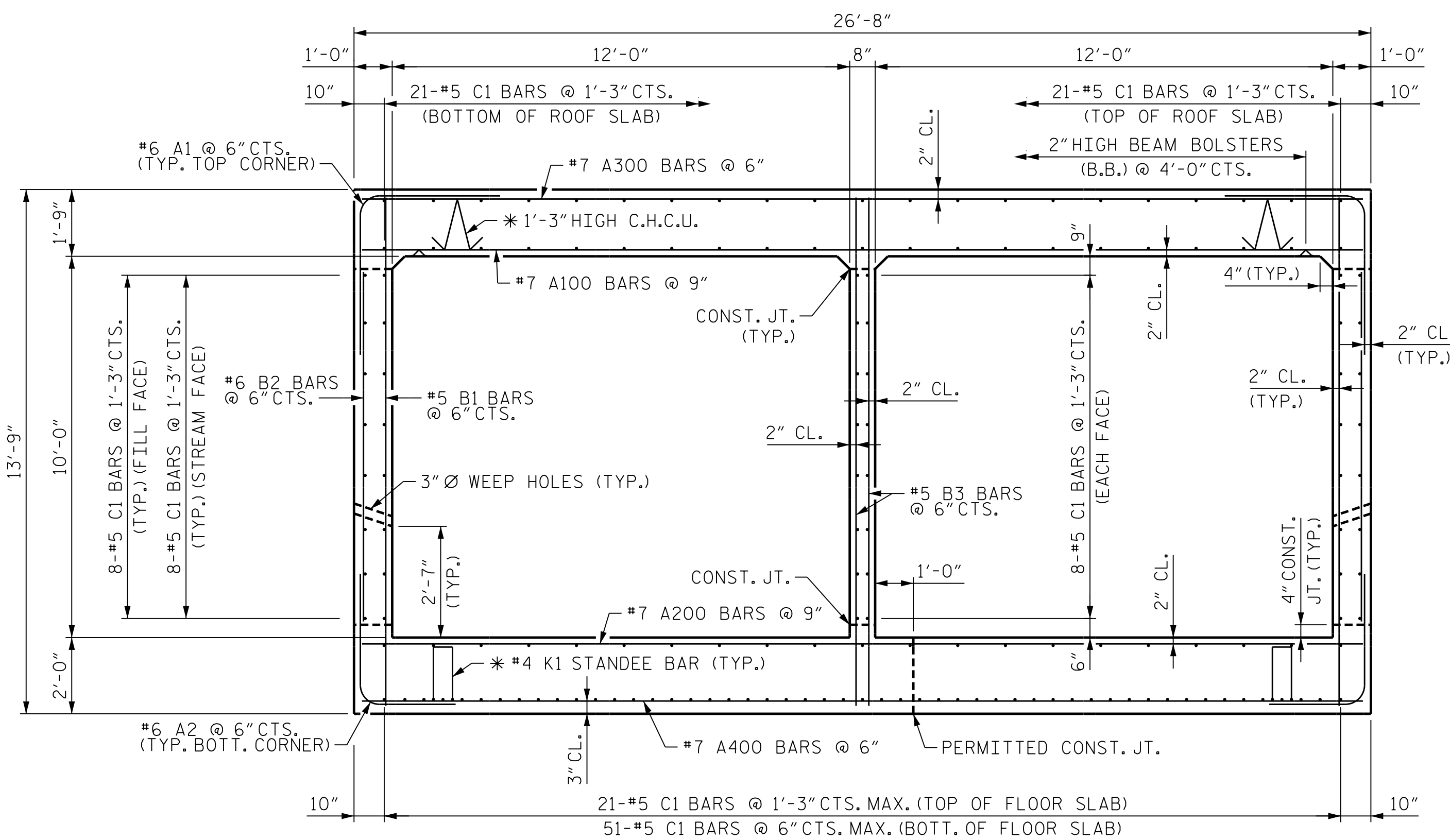
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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

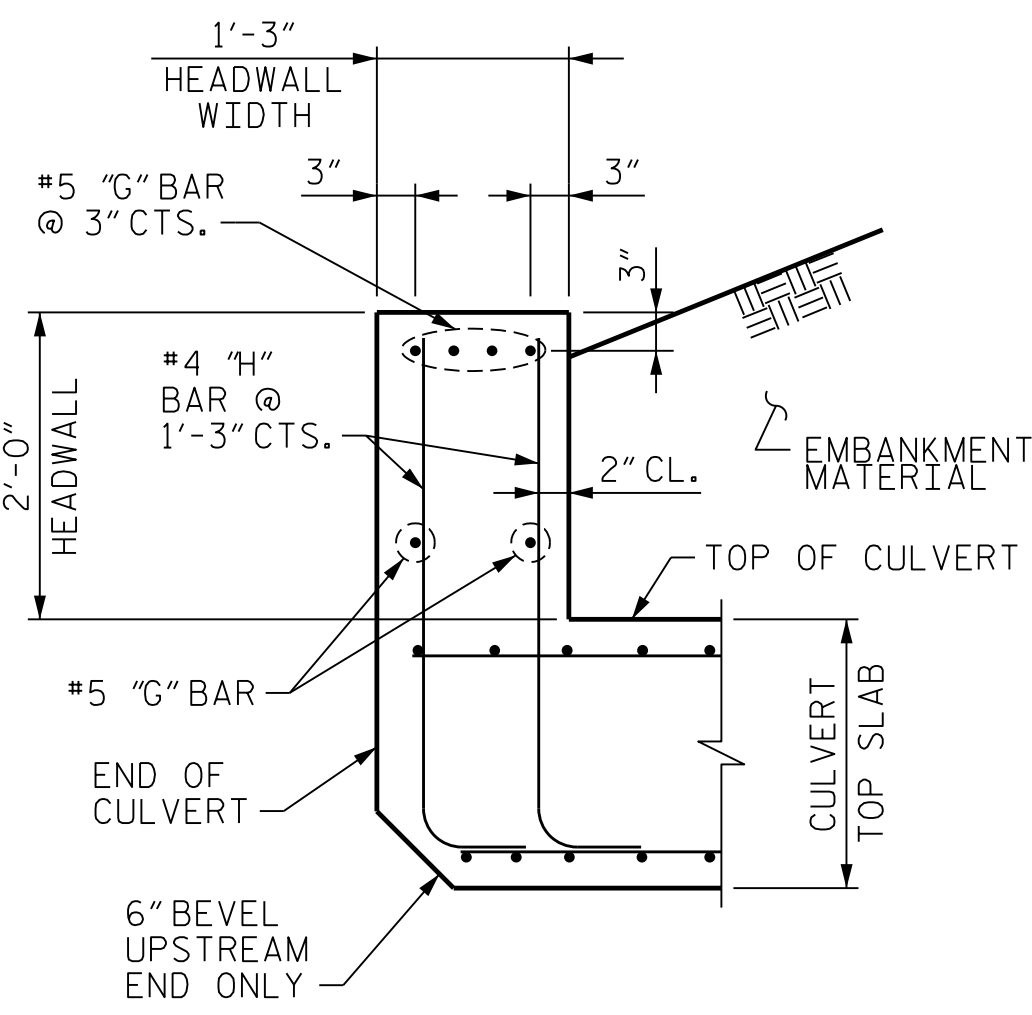
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DES BY: T. MCALEENAN	DATE: 09/19	DWG BY: T. MCALEENAN	DATE: 09/19
DES CHK: R. TURNAGE	DATE: 09/19	CHK BY: R. TURNAGE	DATE: 09/19

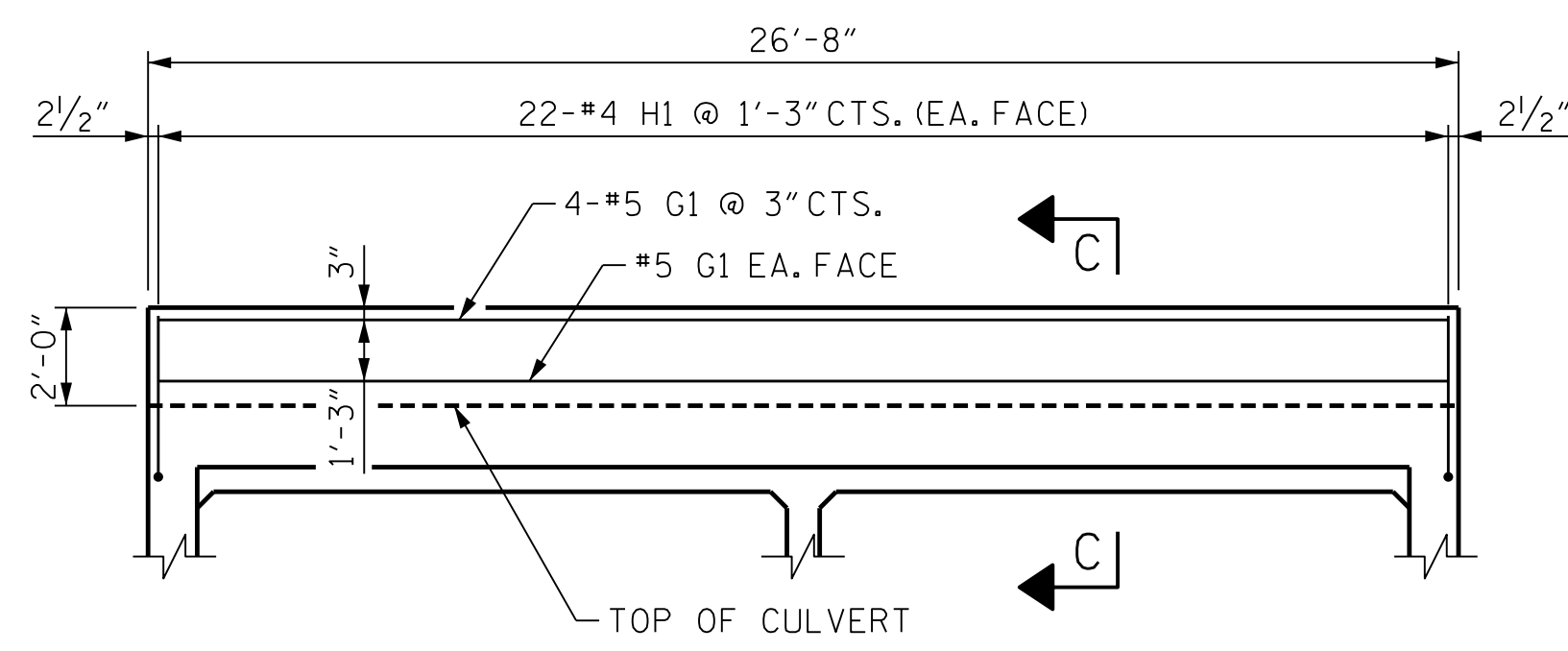


RIGHT ANGLE SECTION OF BARREL

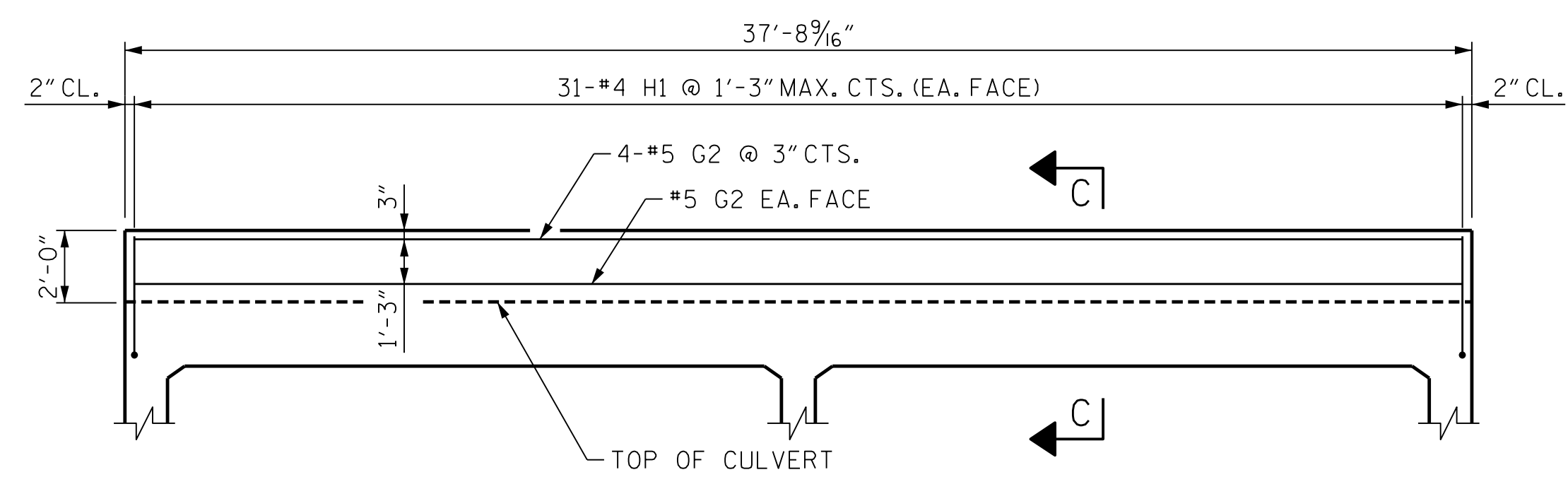
THERE ARE 162 "C" BARS IN SECTION
 * ALL CONTINUOUS HIGH CHAIR UPPER (C.H.C.U.) AND STANDEE BARS @ 3'-0" CTS.



SECTION C-C



VIEW A-A

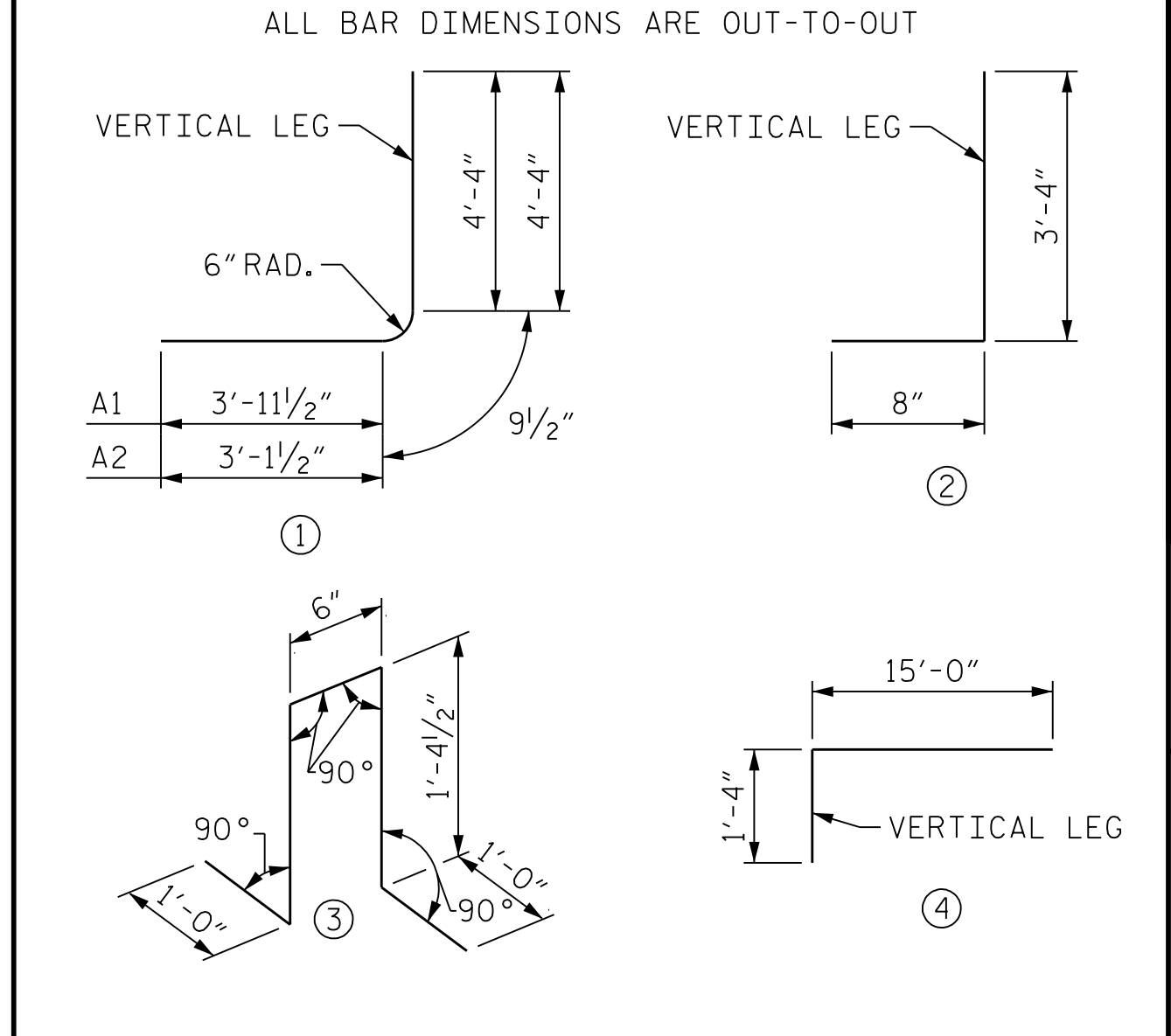


VIEW B-B

REINFORCING STEEL BAR SCHEDULE

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	2258	# 6	1	9' - 1"	30806	A300	1102	# 7	STR	26' - 3"	59128
A2	2258	# 6	1	8' - 3"	27980	A301	3	# 7	STR	24' - 9"	152
A100	735	# 7	STR	26' - 3"	39436	A302	3	# 7	STR	23' - 3"	143
A101	2	# 7	STR	24' - 9"	101	A303	3	# 7	STR	21' - 9"	133
A102	2	# 7	STR	23' - 3"	95	A304	3	# 7	STR	20' - 3"	124
A103	2	# 7	STR	21' - 9"	89	A305	3	# 7	STR	18' - 9"	115
A104	2	# 7	STR	20' - 3"	83	A306	3	# 7	STR	17' - 3"	106
A105	2	# 7	STR	18' - 9"	77	A307	3	# 7	STR	15' - 9"	97
A106	2	# 7	STR	17' - 3"	71	A308	3	# 7	STR	14' - 3"	87
A107	2	# 7	STR	15' - 9"	64	A309	3	# 7	STR	12' - 9"	78
A108	2	# 7	STR	14' - 3"	58	A310	3	# 7	STR	11' - 3"	69
A109	2	# 7	STR	12' - 9"	52	A311	3	# 7	STR	9' - 9"	60
A110	2	# 7	STR	11' - 3"	46	A312	3	# 7	STR	8' - 3"	51
A111	2	# 7	STR	9' - 9"	40	A313	3	# 7	STR	6' - 9"	41
A112	2	# 7	STR	8' - 3"	34	A314	3	# 7	STR	5' - 3"	32
A113	2	# 7	STR	6' - 9"	28	A400	1102	# 7	STR	26' - 3"	59128
A114	2	# 7	STR	5' - 3"	21	A401	3	# 7	STR	24' - 9"	152
A115	2	# 7	STR	3' - 9"	15	A402	3	# 7	STR	23' - 3"	143
A116	2	# 7	STR	2' - 3"	9	A403	3	# 7	STR	21' - 9"	133
A200	735	# 7	STR	26' - 3"	39436	A404	3	# 7	STR	20' - 3"	124
A201	2	# 7	STR	24' - 9"	101	A405	3	# 7	STR	18' - 9"	115
A202	2	# 7	STR	23' - 3"	95	A406	3	# 7	STR	17' - 3"	106
A203	2	# 7	STR	21' - 9"	89	A407	3	# 7	STR	15' - 9"	97
A204	2	# 7	STR	20' - 3"	83	A408	3	# 7	STR	14' - 3"	87
A205	2	# 7	STR	18' - 9"	77	A409	3	# 7	STR	12' - 9"	78
A206	2	# 7	STR	17' - 3"	71	A410	3	# 7	STR	11' - 3"	69
A207	2	# 7	STR	15' - 9"	64	A411	3	# 7	STR	9' - 9"	60
A208	2	# 7	STR	14' - 3"	58	A412	3	# 7	STR	8' - 3"	51
A209	2	# 7	STR	12' - 9"	52	A413	3	# 7	STR	6' - 9"	41
A210	2	# 7	STR	11' - 3"	46	A414	3	# 7	STR	5' - 3"	32
A211	2	# 7	STR	9' - 9"	40						
A212	2	# 7	STR	8' - 3"	34	B1	2258	# 5	STR	13' - 4"	31401
A213	2	# 7	STR	6' - 9"	28	B2	2258	# 6	STR	9' - 2"	31089
A214	2	# 7	STR	5' - 3"	21	B3	2258	# 5	STR	13' - 4"	31401
A215	2	# 7	STR	3' - 9"	15						
A216	2	# 7	STR	2' - 3"	9						
						C1	1782	# 5	STR	55' - 3"	102689
						D1	7	# 6	STR	3' - 7"	38
						G1	6	# 5	STR	26' - 3"	164
						G2	6	# 5	STR	37' - 2"	233
						H1	53	# 4	2	4' - 0"	142
						K1	1692	# 4	3	5' - 3"	5934
						M1	5	# 8	4	16' - 4"	218
						S2	6	# 8	STR	37' - 2"	595

BAR TYPES



BAR	SIZE	SPLICE
B1, B3	#5	2'-4"
C1	#5	3'-0"
S2	#8	4'-9"
A200-A214	#7	4'-2"
A400-A414	#7	3'-2"



PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 768+62.23 -L-
 SHEET 6 OF 11

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**DOUBLE BARREL
 12 FT. X 10 FT.
 CONCRETE BOX CULVERT
 60° 45' 00" SKEW**

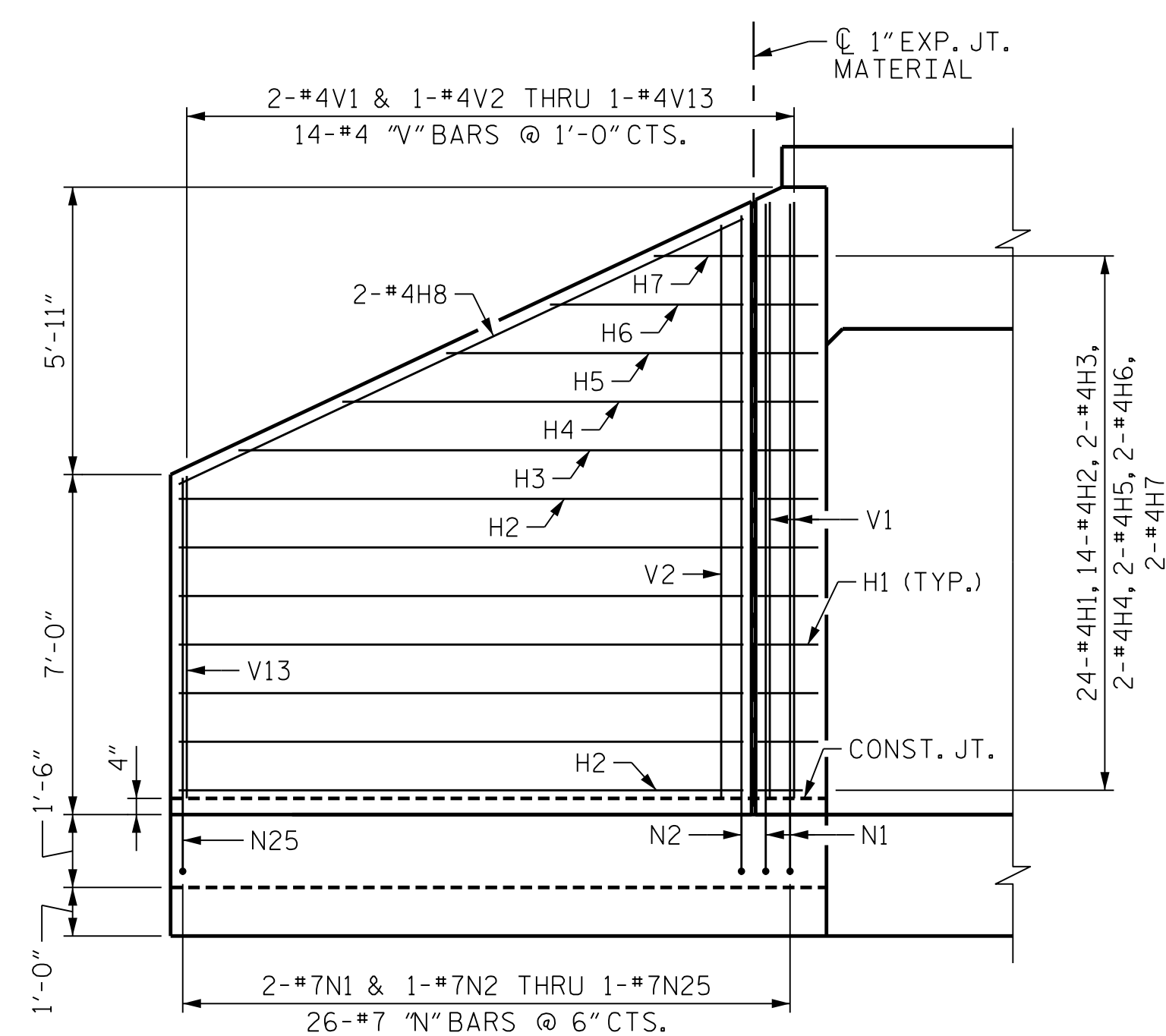
REVISIONS						SHEET NO. CI-6	
NO.	BY:	DATE:	NO.	BY:	DATE:	TOTAL SHEETS 11	
1			3				
2			4				

PLOT DRIVER: NCDOT STRUCTURES DEFAULT PLOTTER.plt
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 FILE: ... \BILL OF MATERIALS (BARREL)
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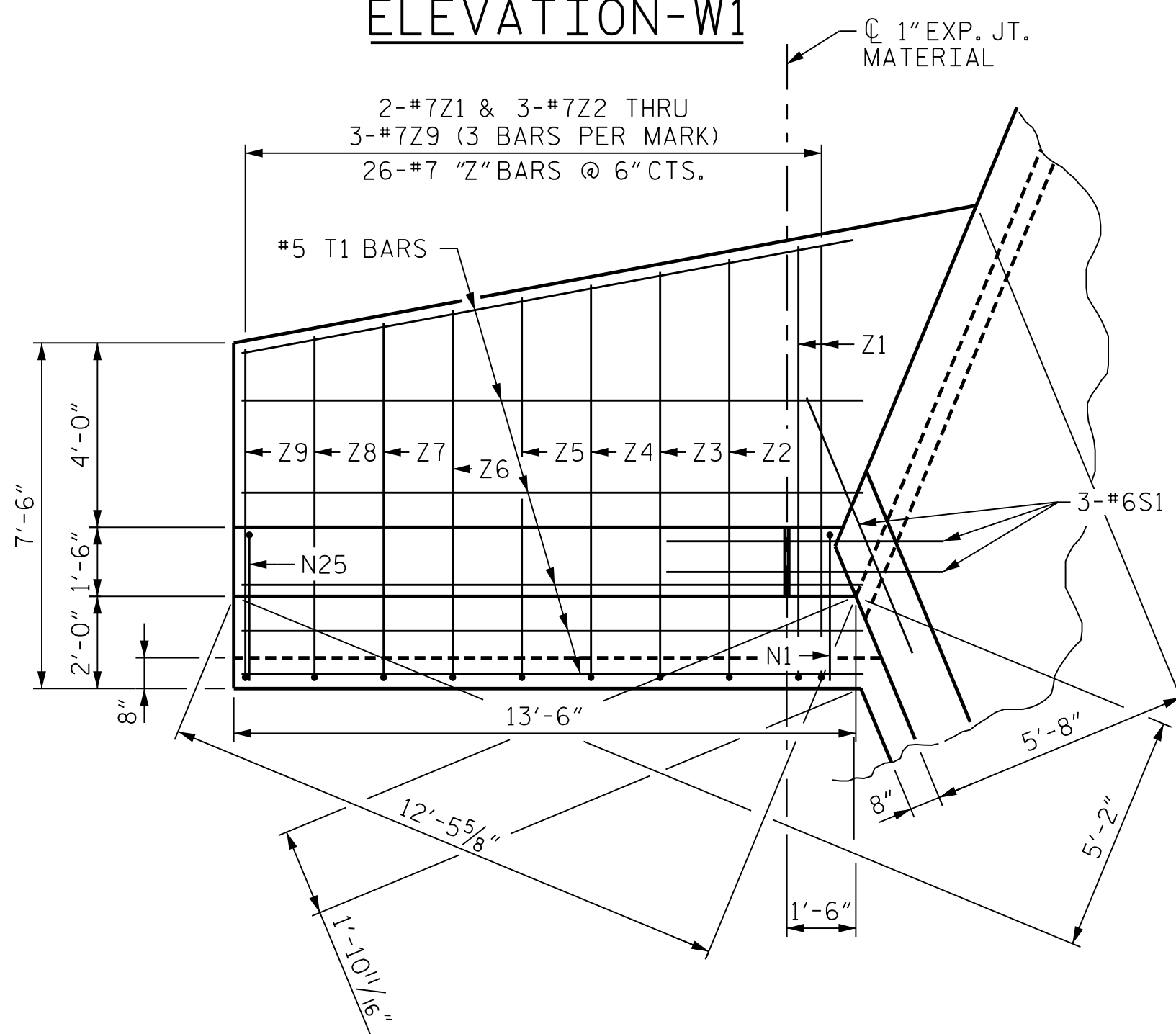
DES BY: T. MCALEENAN DATE: 09/19 DWG BY: T. MCALEENAN DATE: 09/19
 DES CHK: R. TURNAGE DATE: 09/19 CHK BY: R. TURNAGE DATE: 09/19



10/11/2021
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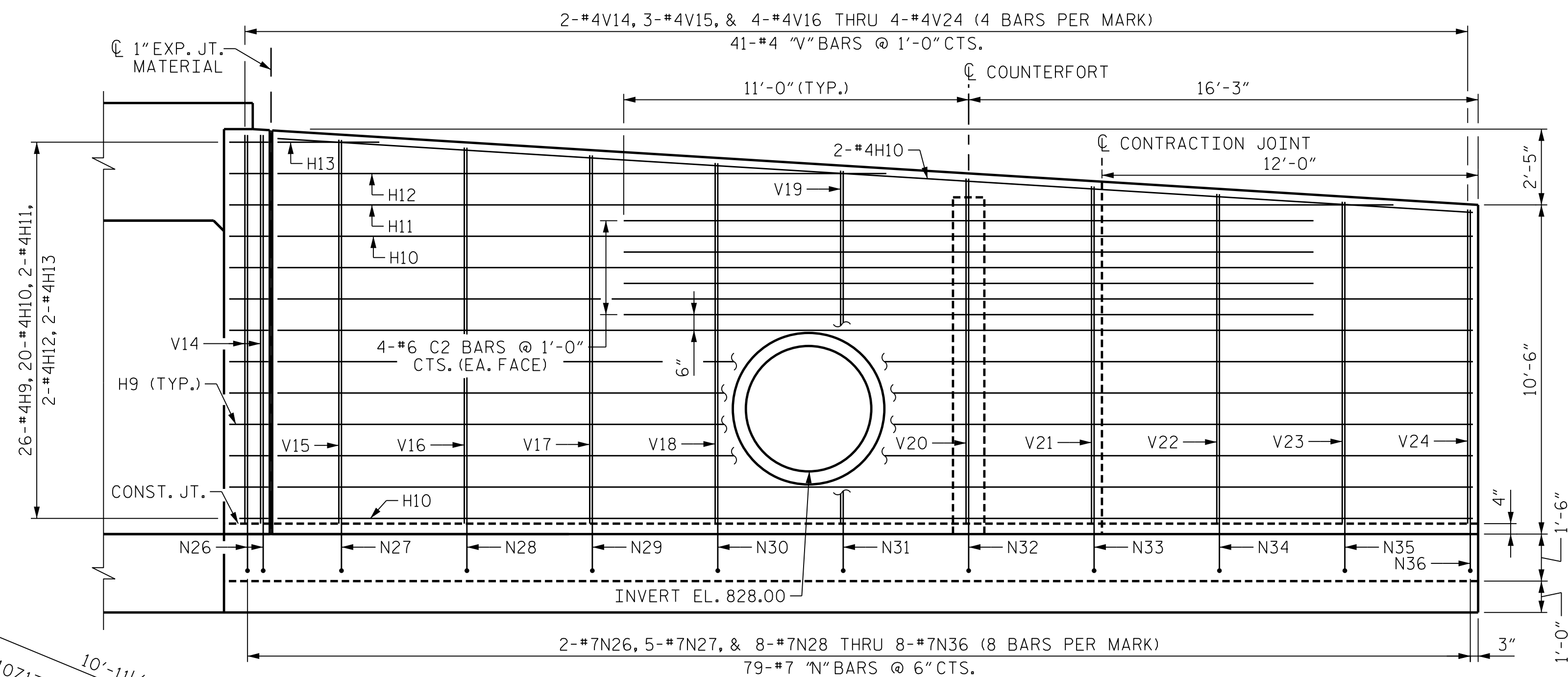


ELEVATION-W1



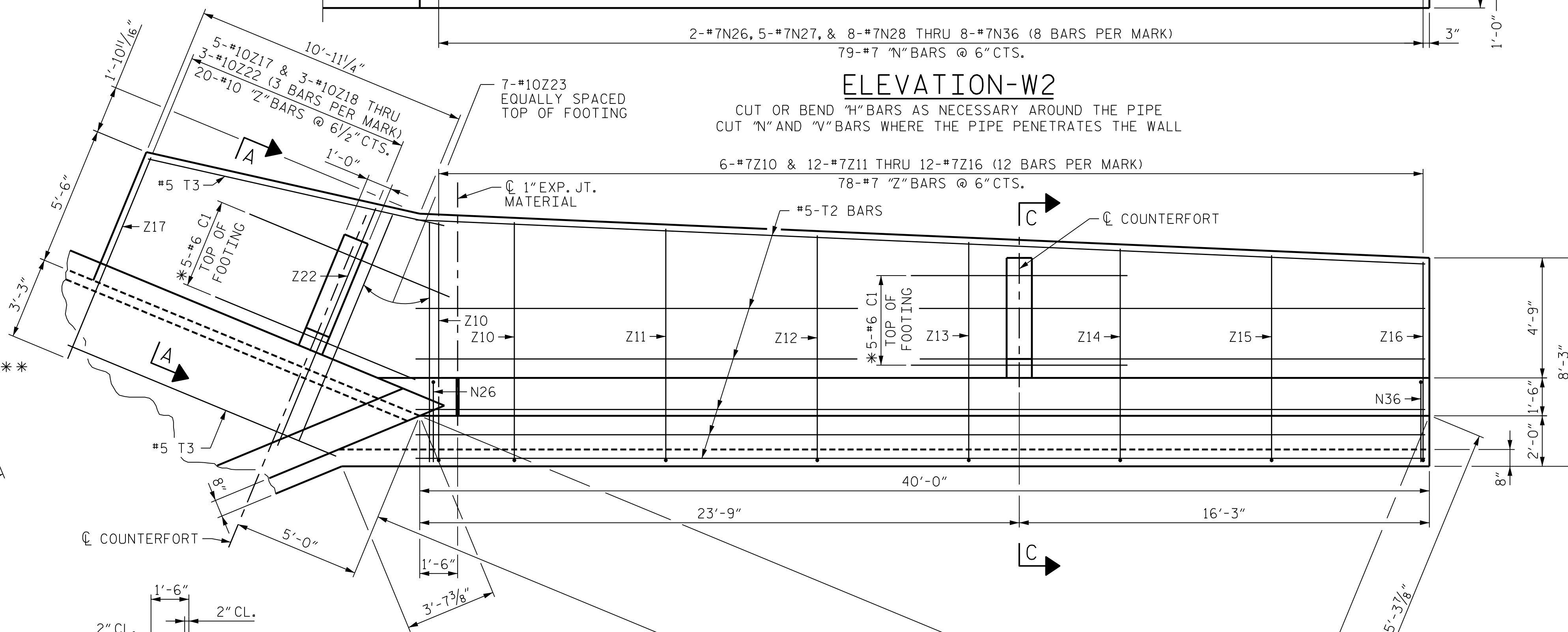
PLAN-W1

** BOTTOM OF FLOOR SLAB AND FOOTING



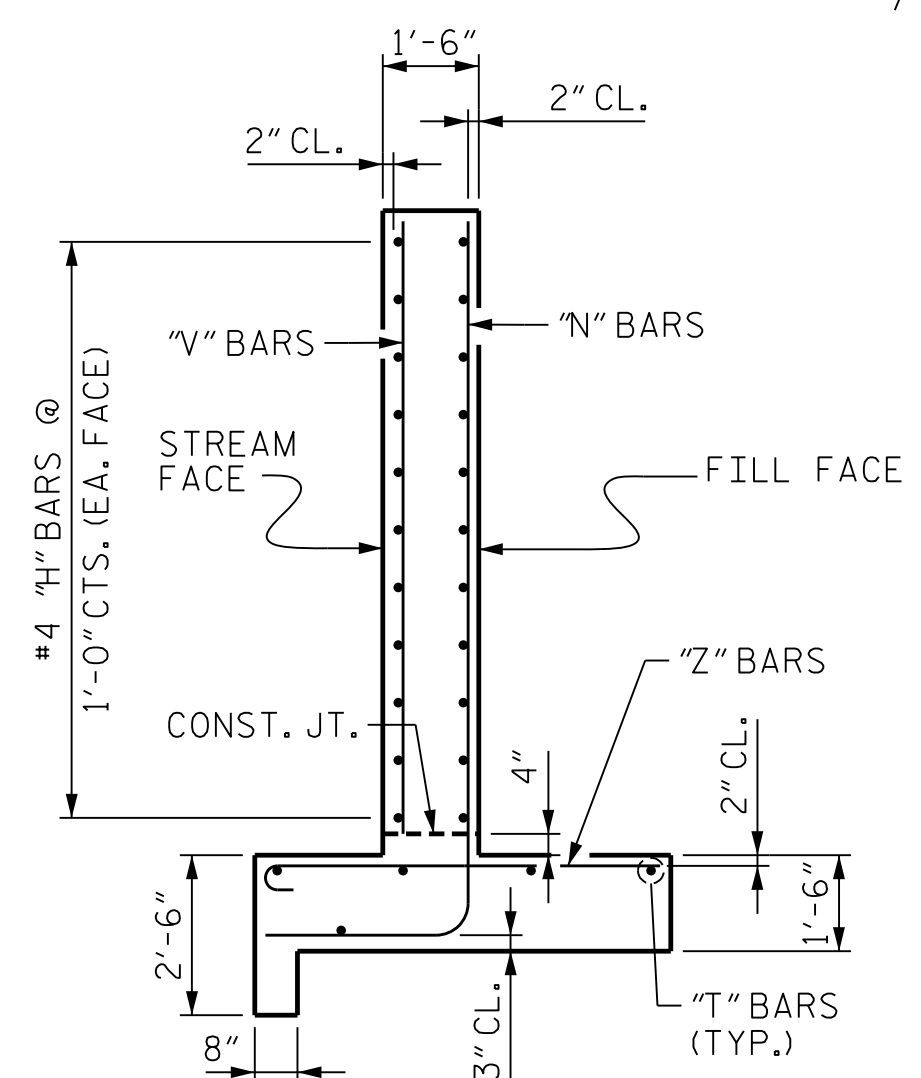
ELEVATION-W2

CUT OR BEND "H" BARS AS NECESSARY AROUND THE PIPE
CUT "N" AND "V" BARS WHERE THE PIPE PENETRATES THE WALL



PLAN-W2

* CENTER ALL #6 C1 BARS ON COUNTERFORT



TYPICAL WING SECTION

NOTES

FOR SECTIONS A-A AND C-C, SEE SHEET 8 OF 11.

FOR DETAIL OF REINFORCING AROUND 48" Ø PIPE, SEE SHEET 8 OF 11.



10/11/2021

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 768+62.23 -L-

SHEET 7 OF 11

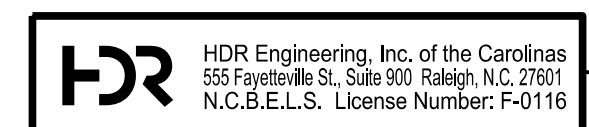
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

WINGS FOR
 CONCRETE BOX CULVERT
 45° SKEW

REVISIONS						SHEET NO. CI-7 TOTAL SHEETS 11
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			
2			4			

PLOT DRIVER: NCDOT STRUCTURES DEFAULT PLOTTER.plt
 USER: PETERSON DATE: 5/20/2021
 FILE: ... \WINGWALL VIEWS

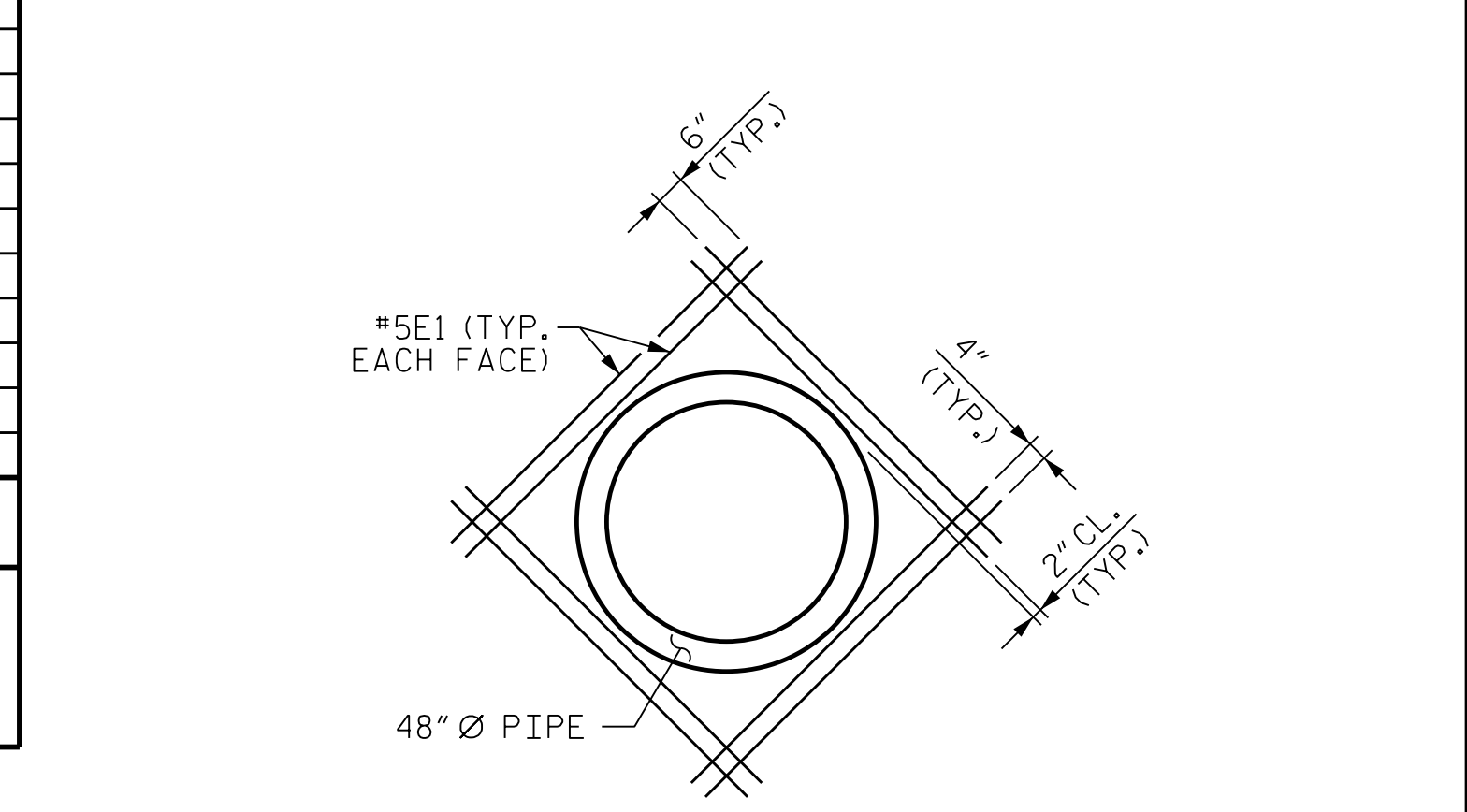
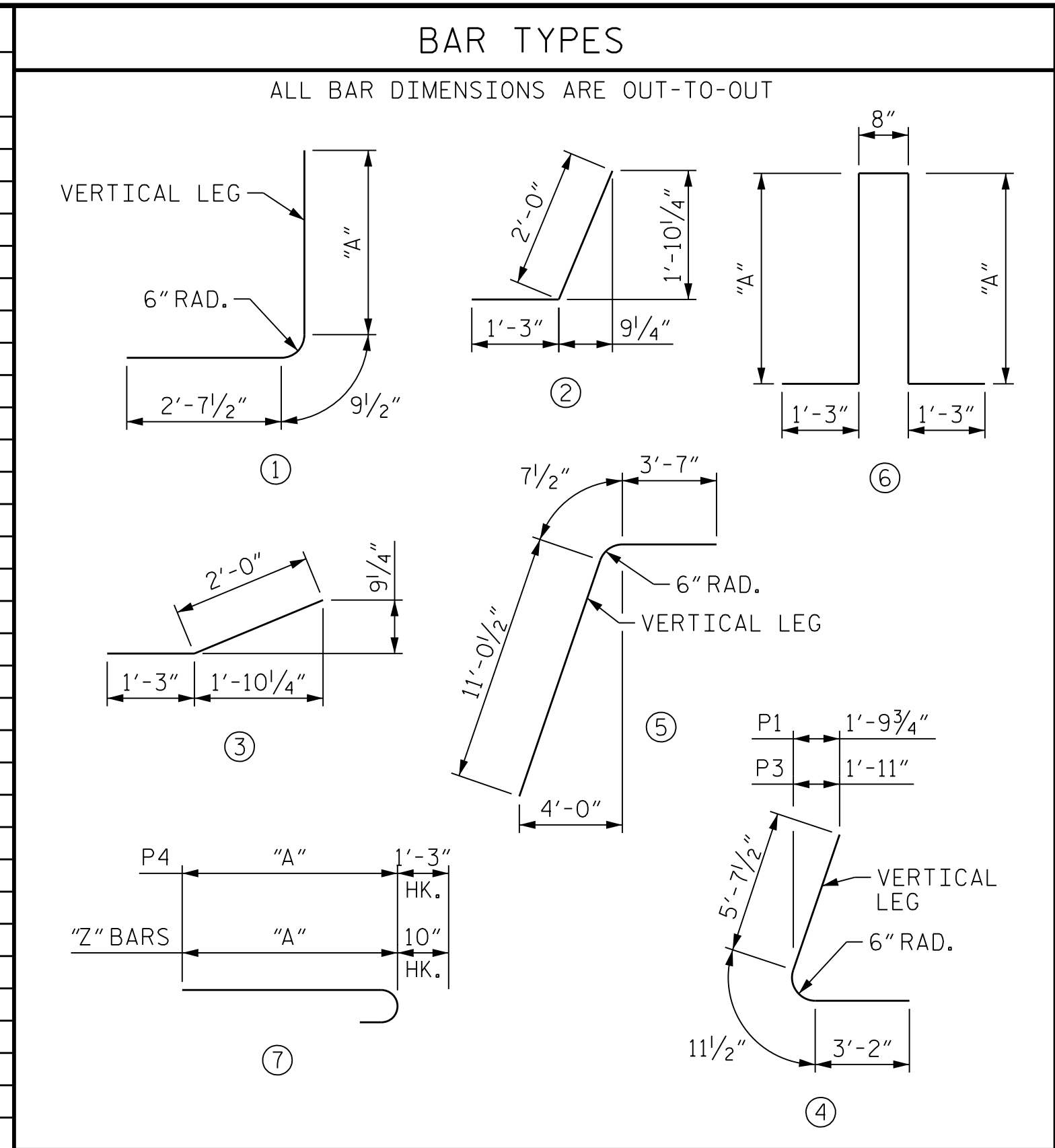
DES BY: T. MCALEENAN	DATE: 09/19	DWG BY: T. MCALEENAN	DATE: 09/19
DES CHK: R. TURNAGE	DATE: 09/19	CHK BY: R. TURNAGE	DATE: 09/19



DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED

REINFORCING BAR SCHEDULE FOR WINGWALLS W1 AND W2

BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT
B1	4	# 4	STR	-	11' - 0"	29	N29	8	# 7	1	12' - 10"	16' - 3"	266	V10	1	# 4	STR	-	8' - 0"	5
C1	17	# 6	STR	-	10' - 0"	255	N30	8	# 7	1	12' - 7"	16' - 0"	262	V11	1	# 4	STR	-	7' - 7"	5
C2	8	# 6	STR	-	22' - 0"	264	N31	8	# 7	1	12' - 4"	15' - 9"	258	V12	1	# 4	STR	-	6' - 8"	4
E1	16	# 5	STR	-	6' - 10"	114	N32	8	# 7	1	12' - 1"	15' - 6"	253	V13	1	# 4	STR	-	12' - 5"	17
H1	24	# 4	2	-	3' - 3"	52	N33	8	# 7	1	11' - 10"	15' - 3"	249	V14	2	# 4	STR	-	12' - 3"	25
H2	14	# 4	STR	-	11' - 8"	109	N34	8	# 7	1	11' - 7"	15' - 0"	245	V15	3	# 4	STR	-	12' - 0"	32
H3	2	# 4	STR	-	10' - 5"	14	N35	8	# 7	1	11' - 4"	14' - 9"	241	V16	4	# 4	STR	-	11' - 9"	31
H4	2	# 4	STR	-	8' - 3"	11	N36	8	# 7	1	11' - 1"	14' - 6"	237	V17	4	# 4	STR	-	11' - 6"	31
H5	2	# 4	STR	-	6' - 2"	8	P1	2	# 9	4	-	9' - 9"	66	V18	4	# 4	STR	-	11' - 3"	30
H6	2	# 4	STR	-	4' - 0"	5	P2	2	# 9	5	-	15' - 3"	104	V19	4	# 4	STR	-	11' - 0"	29
H7	2	# 4	STR	-	1' - 11"	3	P3	2	# 9	4	-	9' - 9"	66	V20	4	# 4	STR	-	10' - 9"	28
H8	2	# 4	STR	-	12' - 10"	17	P4	2	# 9	7	11' - 6"	12' - 9"	87	V21	4	# 4	STR	-	10' - 6"	28
H9	26	# 4	3	-	3' - 3"	56	S1	3	# 4	STR	-	6' - 0"	27	V22	4	# 4	STR	-	10' - 3"	27
H10	22	# 4	STR	-	38' - 2"	561	S2	1	# 4	6	4' - 9"	12' - 8"	8	V23	4	# 4	STR	-	10' - 0"	27
H11	2	# 4	STR	-	35' - 7"	48	S3	1	# 4	6	4' - 5"	12' - 0"	8	V24	2	# 4	STR	-	6' - 1"	8
H12	2	# 4	STR	-	19' - 5"	26	S4	1	# 4	6	4' - 1"	11' - 4"	8	V25	2	# 4	STR	-	10' - 6"	14
H13	2	# 4	STR	-	3' - 3"	4	S5	1	# 4	6	3' - 8"	10' - 6"	7	V79	2	# 4	STR	-	4' - 0"	5
N1	2	# 7	1	13' - 2"	16' - 7"	68	S6	1	# 4	6	3' - 4"	9' - 10"	7	V80	2	# 4	STR	-	8' - 10"	12
N2	1	# 7	1	12' - 11"	16' - 4"	33	S7	1	# 4	6	3' - 0"	9' - 2"	6	Z1	2	# 7	7	9' - 5"	10' - 3"	42
N3	1	# 7	1	12' - 8"	16' - 1"	33	S8	1	# 4	6	2' - 9"	8' - 8"	6	Z2	3	# 7	7	9' - 2"	10' - 0"	61
N4	1	# 7	1	12' - 6"	15' - 11"	33	S9	1	# 4	6	2' - 4"	7' - 10"	5	Z3	3	# 7	7	8' - 11"	9' - 9"	60
N5	1	# 7	1	12' - 3"	15' - 8"	32	S10	1	# 4	6	2' - 0"	7' - 2"	5	Z4	3	# 7	7	8' - 7"	9' - 5"	58
N6	1	# 7	1	12' - 0"	15' - 5"	32	S11	1	# 4	6	1' - 8"	6' - 6"	4	Z5	3	# 7	7	8' - 4"	9' - 2"	56
N7	1	# 7	1	11' - 9"	15' - 2"	31	S12	1	# 4	6	4' - 10"	12' - 10"	9	Z6	3	# 7	7	8' - 1"	8' - 11"	55
N8	1	# 7	1	11' - 6"	14' - 11"	30	S13	1	# 4	6	4' - 5"	12' - 0"	8	Z7	3	# 7	7	7' - 9"	8' - 7"	53
N9	1	# 7	1	11' - 4"	14' - 9"	30	S14	1	# 4	6	4' - 1"	11' - 4"	8	Z8	3	# 7	7	7' - 6"	8' - 4"	51
N10	1	# 7	1	11' - 1"	14' - 6"	30	S15	1	# 4	6	3' - 9"	10' - 8"	7	Z9	3	# 7	7	7' - 3"	8' - 1"	50
N11	1	# 7	1	10' - 10"	14' - 3"	29	S16	1	# 4	6	3' - 4"	9' - 10"	7	Z10	6	# 7	7	9' - 6"	10' - 4"	127
N12	1	# 7	1	10' - 7"	14' - 0"	29	S17	1	# 4	6	3' - 0"	9' - 2"	6	Z11	12	# 7	7	9' - 3"	10' - 1"	247
N13	1	# 7	1	10' - 4"	13' - 9"	28	S18	1	# 4	6	2' - 7"	8' - 4"	6	Z12	12	# 7	7	9' - 0"	9' - 10"	241
N14	1	# 7	1	10' - 1"	13' - 6"	28	S19	1	# 4	6	2' - 3"	7' - 8"	5	Z13	12	# 7	7	8' - 8"	9' - 6"	233
N15	1	# 7	1	9' - 11"	13' - 4"	27	S20	1	# 4	6	1' - 11"	7' - 0"	5	Z14	12	# 7	7	8' - 5"	9' - 3"	227
N16	1	# 7	1	9' - 8"	13' - 1"	27	S21	1	# 4	6	1' - 6"	6' - 2"	4	Z15	12	# 7	7	8' - 2"	9' - 0"	221
N17	1	# 7	1	9' - 5"	12' - 10"	26	T1	6	# 5	STR	-	13' - 6"	84	Z16	12	# 7	7	7' - 11"	8' - 9"	215
N18	1	# 7	1	9' - 2"	12' - 7"	26	T2	6	# 5	STR	-	40' - 0"	250	Z17	5	# 10	STR	-	8' - 8"	186
N19	1	# 7	1	8' - 11"	12' - 4"	25	T3	2	# 5	STR	-	13' - 2"	27	Z18	3	# 10	STR	-	9' - 1"	117
N20	1	# 7	1	8' - 9"	12' - 2"	25	V1	2	# 4	STR	-	12' - 1"	16	Z19	3	# 10	STR	-	9' - 4"	120
N21	1	# 7	1	8' - 6"	11' - 11"	24	V2	1	# 4	STR	-	11' - 8"	8	Z20	3	# 10	STR	-	9' - 8"	125
N22	1	# 7	1	8' - 3"	11' - 8"	24	V3	1	# 4	STR	-	11' - 3"	8	Z21	3	# 10	STR	-	10' - 0"	129
N23	1	# 7	1	8' - 0"	11' - 5"	23	V4	1	# 4	STR	-	10' - 9"	7	Z22	3	# 10	STR	-	10' - 3"	132
N24	1	# 7	1	7' - 9"	11' - 2"	23	V5	1	# 4	STR	-	10' - 4"	7	Z23	7	# 10	STR	-	9' - 7"	289
N25	1	# 7	1	7' - 7"	11' - 0"	22	V6	1	# 4	STR	-	9' - 10"	7	REINFORCING STEEL FOR BARREL AND WINGS						9,205 LBS
N26	2	# 7	1	13' - 6"	16' - 11"	69	V7	1	# 4	STR	-	9' - 5"	6	CLASS A CONCRETE						
N27	5	# 7	1	13' - 4"	16' - 9"	171	V8	1	# 4	STR	-	8' - 11"	6	2 WINGWALLS						67.4 C.Y.
N28	8	# 7	1	13' - 1"	16' - 6"	270	V9	1	# 4	STR	-	8' - 6"	6	1 END CURTAIN WALL						1.8 C.Y.
													TOTAL						69.2 C.Y.	



DETAIL OF REINFORCING AROUND 48" Ø PIPE

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 768+62.23 -L-
 SHEET 8 OF 11

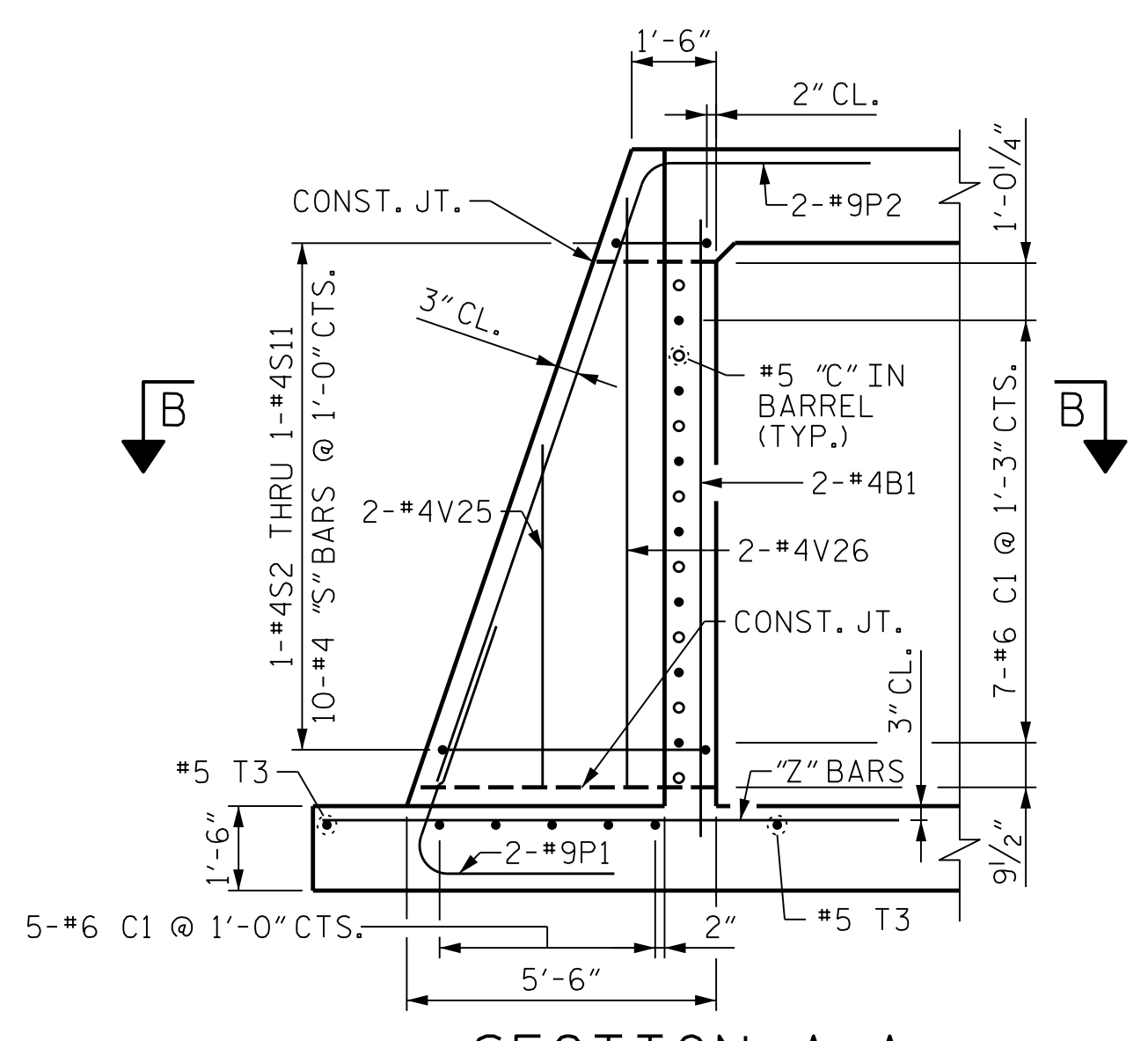
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

WINGS FOR CONCRETE BOX CULVERT
 45° SKEW



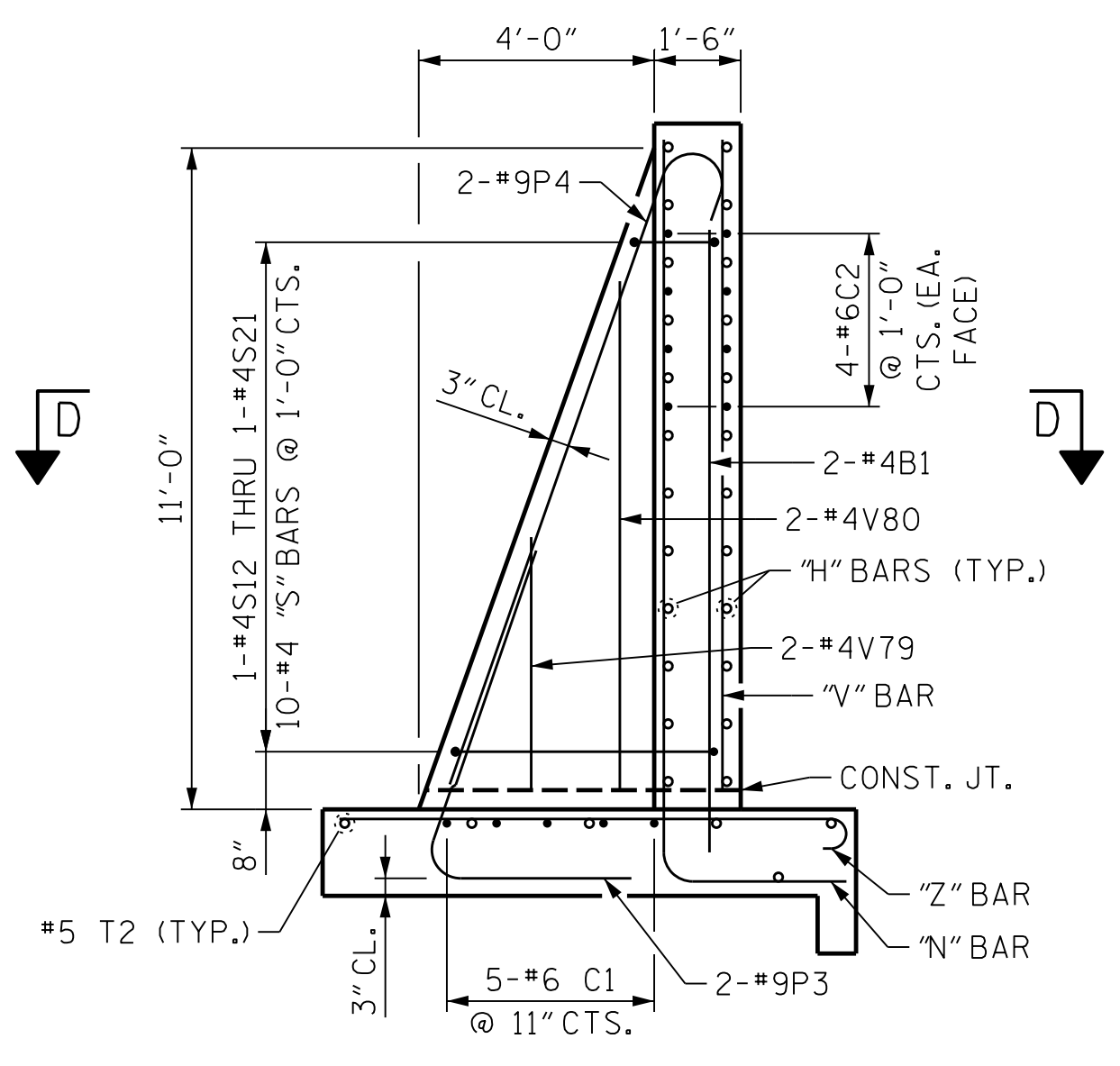
10/11/2021

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

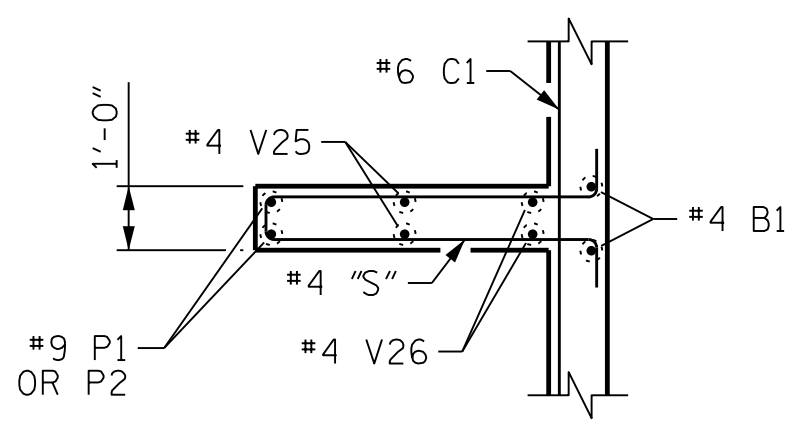


SECTION A-A

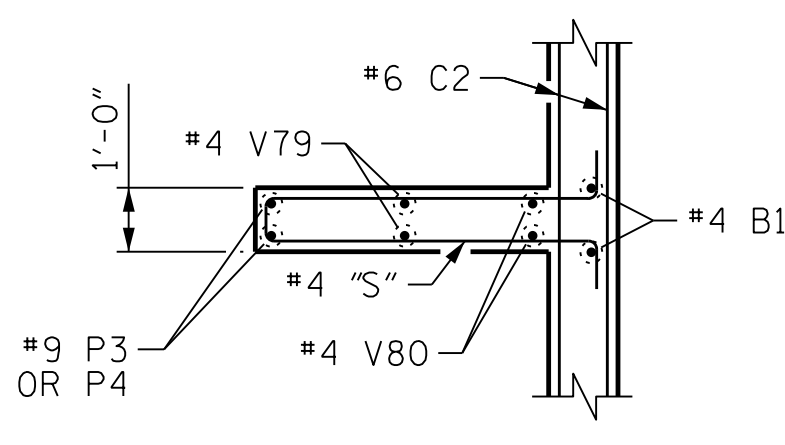
STANDARD REINFORCING STEEL IN BARREL NOT SHOWN



SECTION C-C



SECTION B-B



SECTION D-D

STANDARD WINGWALL BARS NOT SHOWN

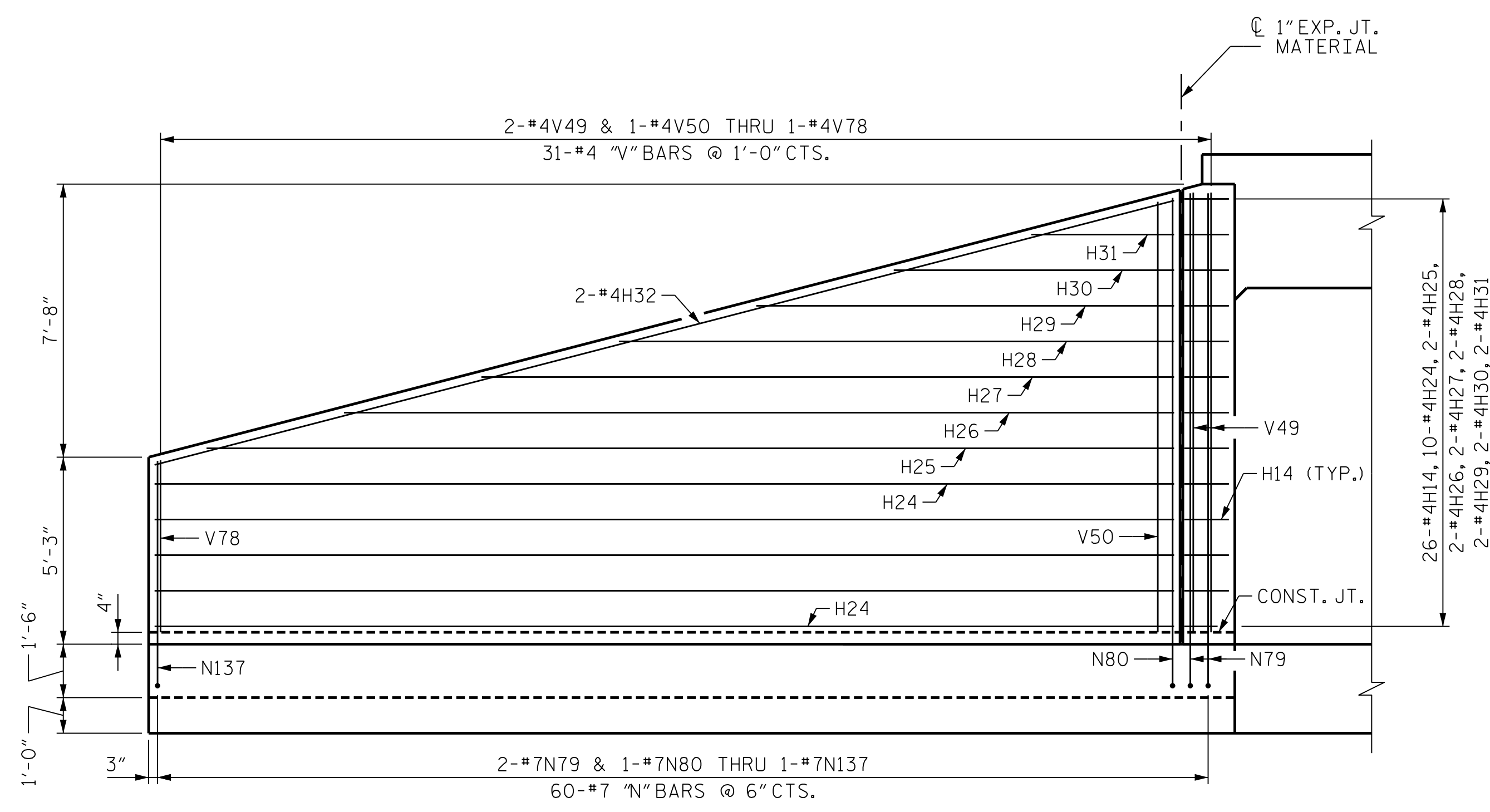
DES BY: T. MCALEENAN	DATE: 09/19	DWG BY: T. MCALEENAN	DATE: 09/19
DES CHK: R. TURNAGE	DATE: 09/19	CHK BY: R. TURNAGE	DATE: 09/19

HDR Engineering, Inc. of the Carolinas
 555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
 N.C.B.E.L.S. License Number: P-0116

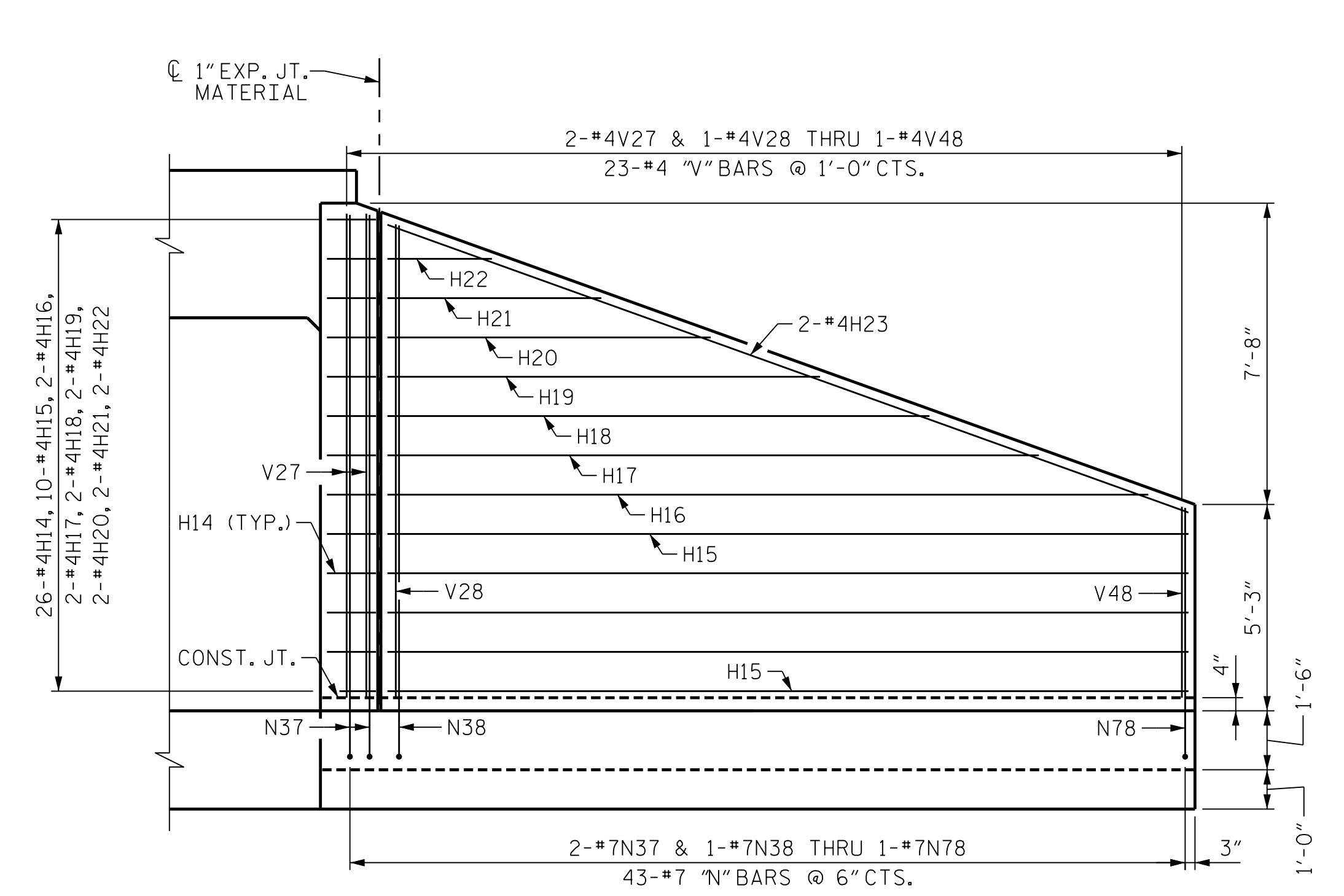
DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED

PLOT DRIVER: NCDOT STRUCTURES DEFAULT PLOTTER.PHT
 USER: PPRETOSO
 DATE: 5/20/2021
 TIME: 9:55:01 AM
 FILE: ... \BILL OF MATERIALS (WINGS 1 & 2)

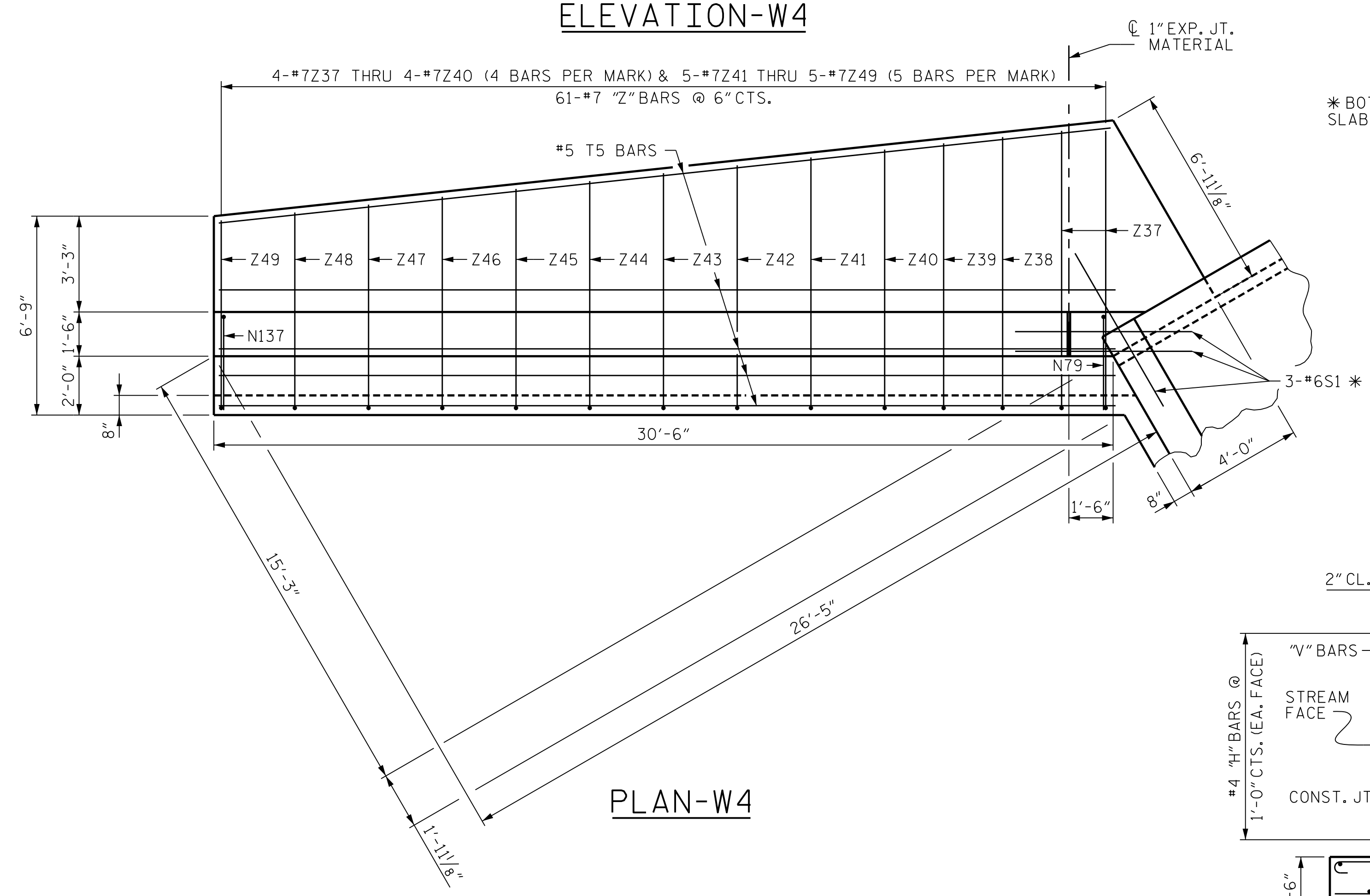
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 USER: PPRETOSO DATE: 5/20/2021 TIME: 9:55:09 AM
 FILE: ... \N\INGWALL VIEWS



ELEVATION-W4

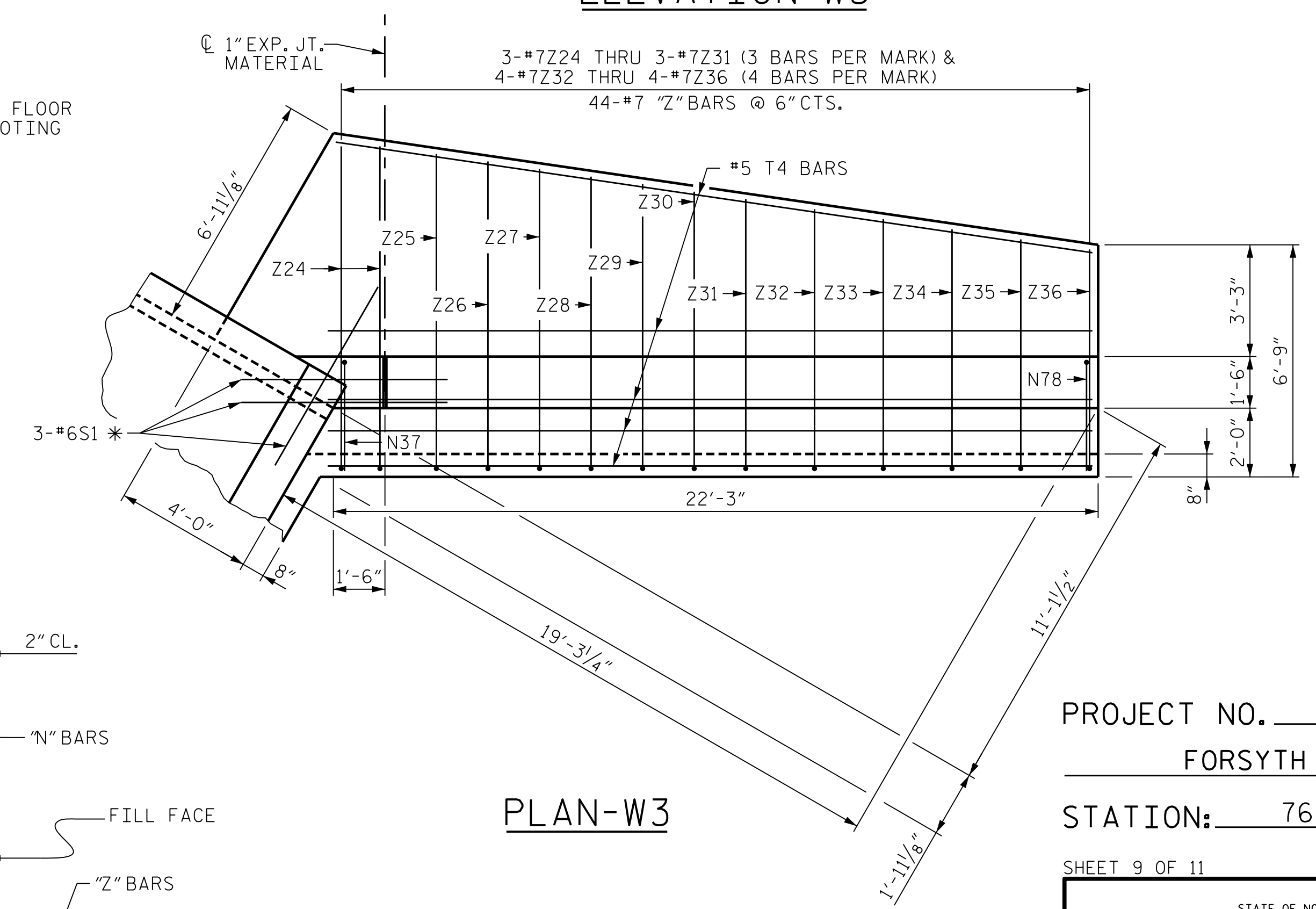


ELEVATION-W3

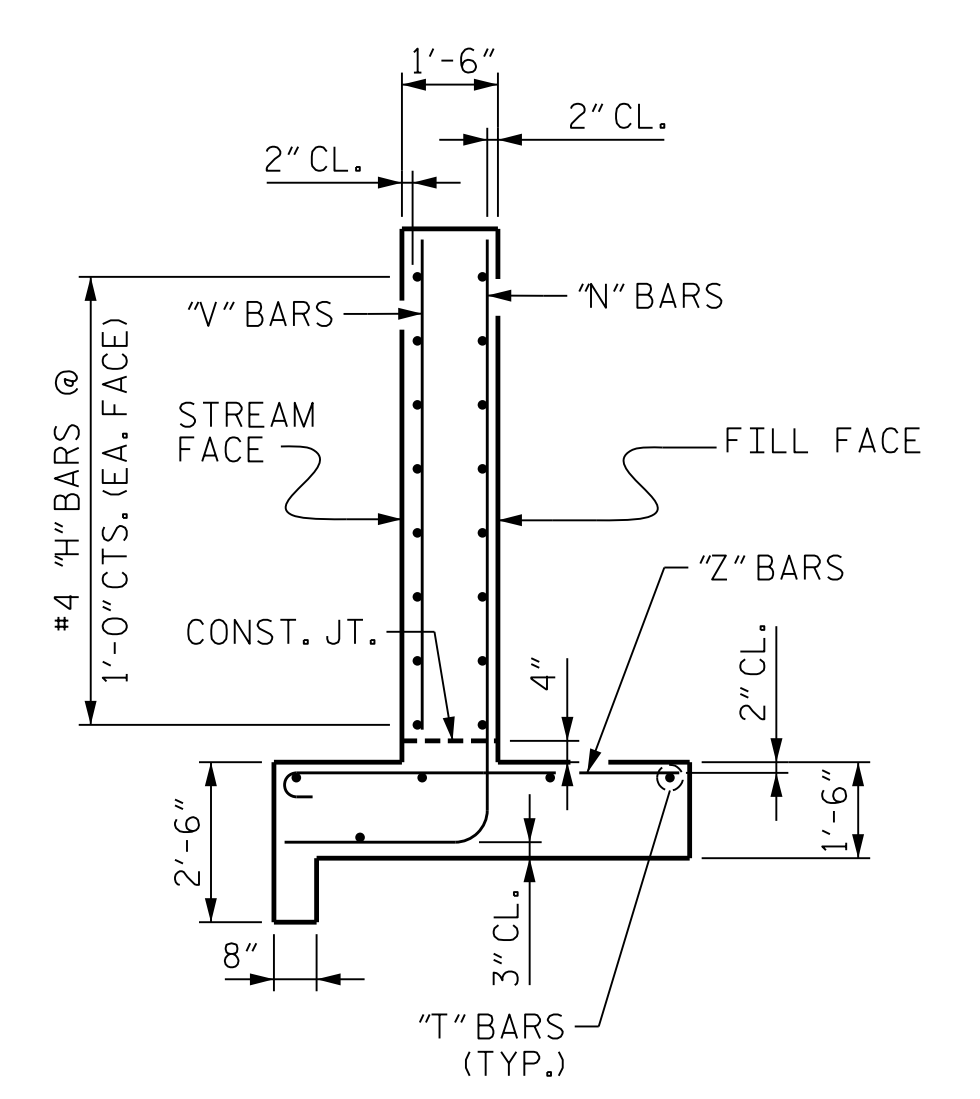


PLAN-W4

* BOTTOM OF FLOOR SLAB AND FOOTING

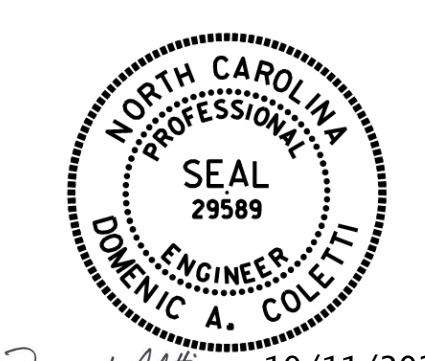


PLAN-W3



TYPICAL WING SECTION

PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 768+62.23 -L-
 SHEET 9 OF 11



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**WINGS FOR
 CONCRETE BOX CULVERT
 90° SKEW**

DES BY: T. MCALEENAN	DATE: 09/19	DWG BY: T. MCALEENAN	DATE: 09/19
DES CHK: R. TURNAGE	DATE: 09/19	CHK BY: R. TURNAGE	DATE: 09/19



10/11/2021
 DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED

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

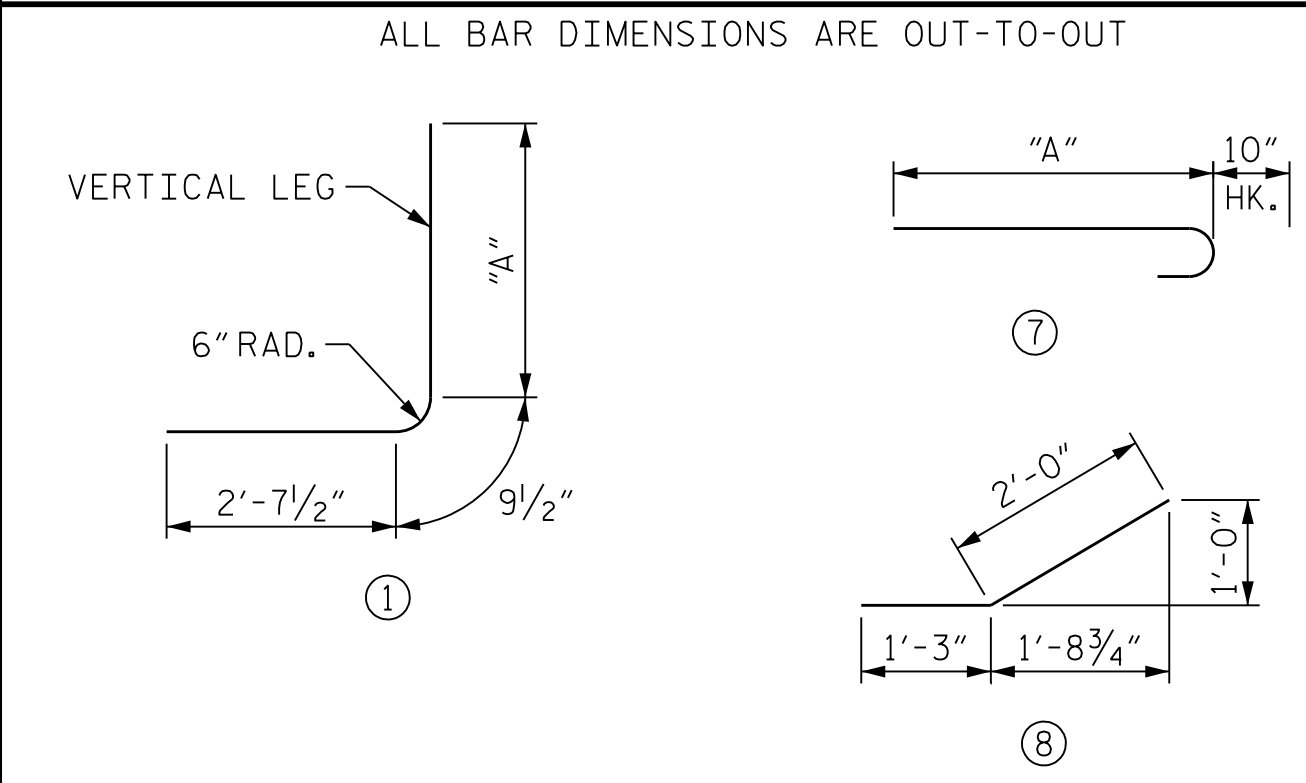
SHEET NO. CI-9
TOTAL SHEETS 11

REINFORCING BAR SCHEDULE FOR WINGWALLS W3 AND W4

Table with 20 columns: BAR, NO., SIZE, TYPE, DIM "A", LENGTH, WEIGHT, BAR, NO., SIZE, TYPE, DIM "A", LENGTH, WEIGHT, BAR, NO., SIZE, TYPE, DIM "A", LENGTH, WEIGHT. Lists various reinforcing bars (H14-H32, N37-N90, N110-N137, S1, T4, T5, V27-V45, V46-V49, V50-V59, V60-V74, Z24-Z49) with their respective dimensions and weights.

REINFORCING STEEL FOR WINGS 6,017 LBS
CLASS A CONCRETE 2 WINGWALLS 54.0 C.Y.
1 END CURTAIN WALL 1.3 C.Y.
TOTAL 55.3 C.Y.

BAR TYPES



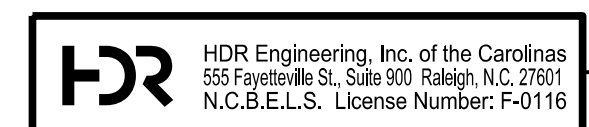
PROJECT NO. U-2579AB
FORSYTH COUNTY
STATION: 768+62.23 -L-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
WINGS FOR CONCRETE BOX CULVERT
90° SKEW



10/11/2021

DES BY: T. MCALEENAN DATE: 09/19
DES CHK: R. TURNAGE DATE: 09/19
DWG BY: T. MCALEENAN DATE: 09/19
CHK BY: R. TURNAGE DATE: 09/19



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Table with 4 columns: NO., BY, DATE, NO., BY, DATE. Shows revision 3 and 4.

SHEET NO. C1-10
TOTAL SHEETS 11

PLOT DRIVER: NCDOT STRUCTURES DEFAULT PLOTTER.plt
PENTABLE: NCDOT STRUCTURES DEFAULT PEN.tbl
USER: PPETERSO DATE: 5/20/2021 TIME: 9:55:19 AM
FILE: ...BILL OF MATERIALS (WINGS 3 & 4)

LOAD AND RESISTANCE FACTOR RATING (LRFR)
SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						LIVE-LOAD FACTORS (γ _{LL})	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	①	2.75	--	1.75	9.56	1	TOP SLAB	5.62	2.75	1	EXT WALL	2.72		
	HL-93 (OPERATING)	N/A		3.56	--	1.35	12.39	1	TOP SLAB	5.62	3.56	1	EXT WALL	2.72		
	HS-20 (INVENTORY)	36.000	②	2.75	99.0	1.75	9.56	1	TOP SLAB	5.62	2.75	1	EXT WALL	2.72		
	HS-20 (OPERATING)	36.000		3.56	128.2	1.35	12.39	1	TOP SLAB	5.62	3.56	1	EXT WALL	2.72		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SH	12.500	③	3.43	42.9	1.40	21.86	1	EXT WALL	6.94	3.43	1	EXT WALL	2.72	
		S3C	21.500	③	3.43	73.7	1.40	16.26	1	TOP SLAB	5.62	3.43	1	EXT WALL	2.72	
		S3A	22.750	③	3.43	78.0	1.40	15.32	1	TOP SLAB	5.62	3.43	1	EXT WALL	2.72	
		S4A	26.750	③	3.43	91.8	1.40	14.31	1	TOP SLAB	5.62	3.43	1	EXT WALL	2.72	
		S5A	30.500	③	3.43	104.6	1.40	12.58	1	TOP SLAB	5.62	3.43	1	EXT WALL	2.72	
		S6A	34.500	③	3.43	118.3	1.40	11.57	1	TOP SLAB	5.62	3.43	1	EXT WALL	2.72	
		S7B	38.500	③	3.43	132.1	1.40	11.68	1	TOP SLAB	5.62	3.43	1	EXT WALL	2.72	
		S7A	40.000	③	3.43	137.2	1.40	11.57	1	TOP SLAB	5.62	3.43	1	EXT WALL	2.72	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	T4A	28.250	③	3.43	96.9	1.40	13.74	1	TOP SLAB	5.62	3.43	1	EXT WALL	2.72	
		T5B	32.000	③	3.43	109.8	1.40	12.96	1	TOP SLAB	5.62	3.43	1	EXT WALL	2.72	
		T6A	36.000	③	3.43	123.5	1.40	11.68	1	TOP SLAB	5.62	3.43	1	EXT WALL	2.72	
		T7A	40.000	③	3.43	137.2	1.40	11.48	1	TOP SLAB	5.62	3.43	1	EXT WALL	2.72	
	T7B	40.000	③	3.43	137.2	1.40	12.17	1	TOP SLAB	5.62	3.43	1	EXT WALL	2.72		

LOAD FACTORS:

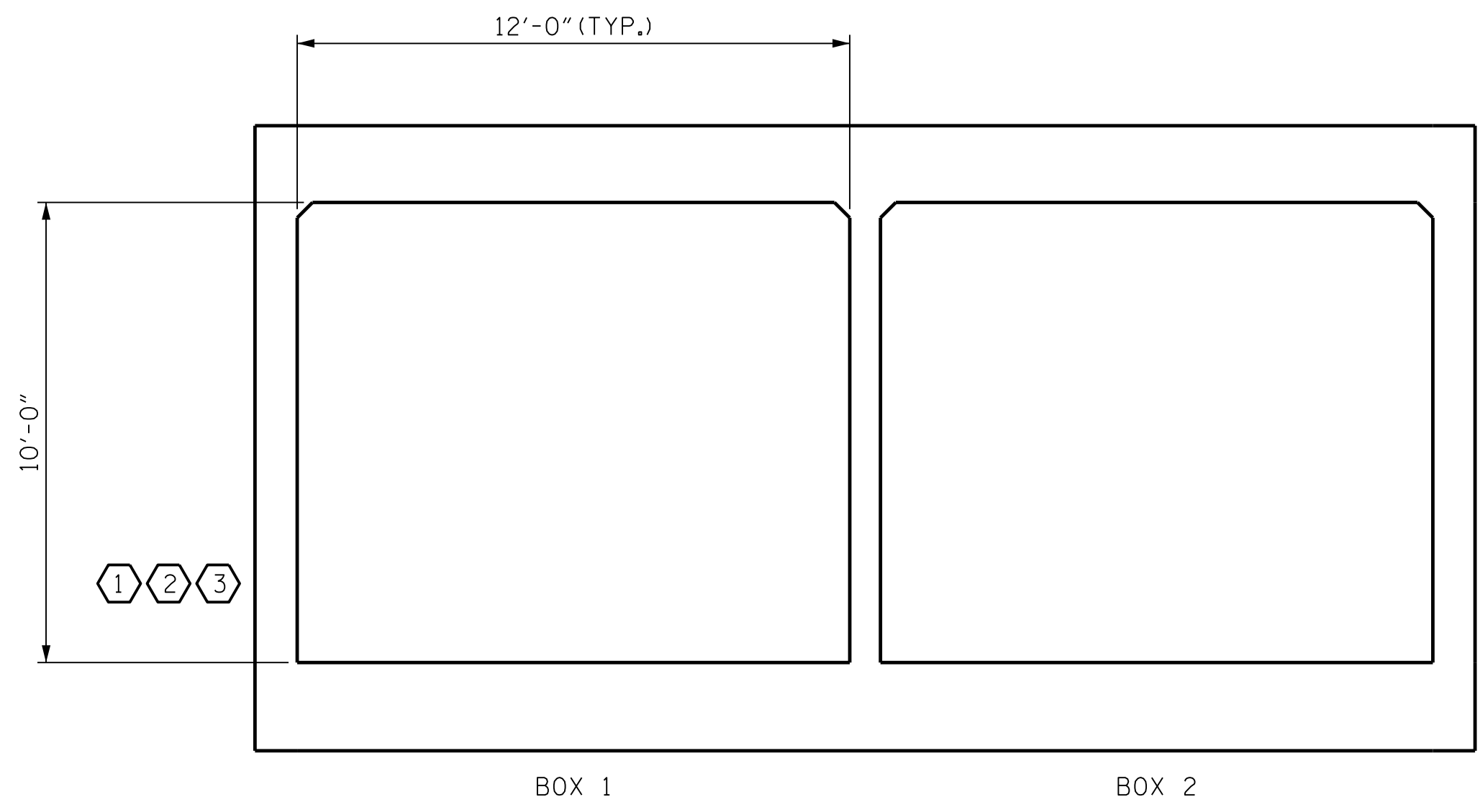
DESIGN LOAD RATING FACTORS

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	--

NOTES:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
LL SURCHARGE DEPTH = 2.00 FT.
WHERE ELEMENT TYPE EQUALS "WALL", DISTANCE MEASURED FROM BOTTOM OF BOTTOM SLAB.

⊕	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 DOWN STREAM)

PROJECT NO. U-2579AB
FORSYTH COUNTY
STATION: 768+62.23 -L-
SHEET 11 OF 11

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

LRFR SUMMARY FOR
REINFORCED CONCRETE
BOX CULVERTS
(INTERSTATE TRAFFIC)



10/11/2021

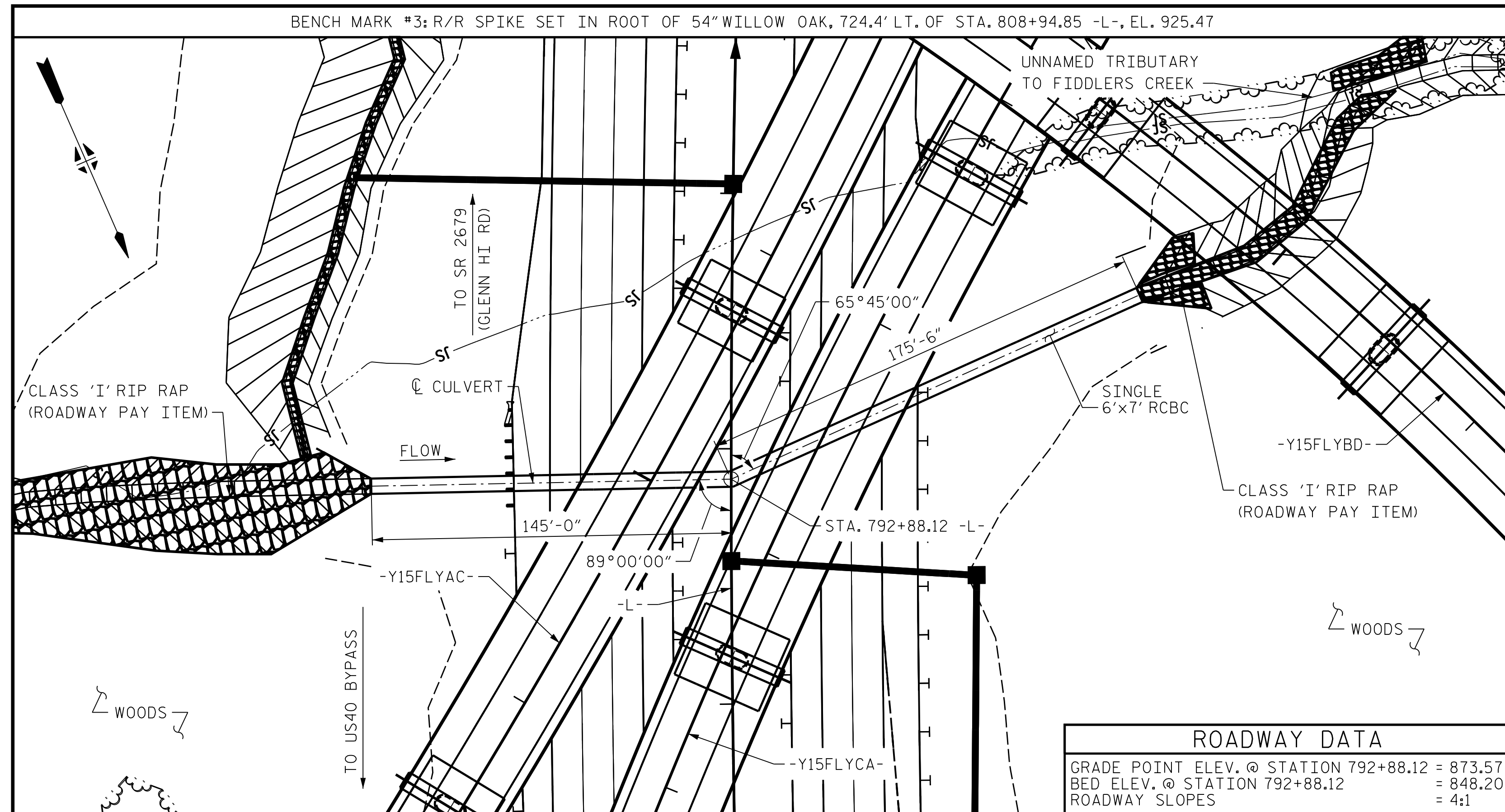
REVISIONS						SHEET NO. C1-11 TOTAL SHEETS 11
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			
2			4			

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555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

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UNLESS ALL SIGNATURES COMPLETED

PLOT DRIVER: NCDOT_STRUCTURES_DEFAULT_PLOTTER.plt PENTABLE: NCDOT_STRUCTURES_DEFAULT_PEN.tbl
USER: PETERSON DATE: 5/20/2021 TIME: 9:55:34 AM
FILE: ...RATING_SUMMARY

DES BY: <u>T. MCALEENAN</u>	DATE: <u>09/19</u>	DWG BY: <u>T. MCALEENAN</u>	DATE: <u>09/19</u>
DES CHK: <u>R. TURNAGE</u>	DATE: <u>09/19</u>	CHK BY: <u>R. TURNAGE</u>	DATE: <u>09/19</u>



ROADWAY DATA	
GRADE POINT ELEV. @ STATION 792+88.12	= 873.57
BED ELEV. @ STATION 792+88.12	= 848.20
ROADWAY SLOPES	= 4:1

LOCATION SKETCH
FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS

HYDRAULIC DATA	
DESIGN DISCHARGE	= 180 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEVATION	= 857.3
DRAINAGE AREA	= 0.09 SQ. MI.
BASE DISCHARGE (Q100)	= 200 CFS
BASE HIGH WATER ELEVATION	= 857.6

OVERTOPPING FLOOD DATA	
OVERTOPPING DISCHARGE	= 490 CFS
FREQUENCY OF OVERTOPPING FLOOD	= >500 YR.
OVERTOPPING FLOOD ELEVATION	= 871.0

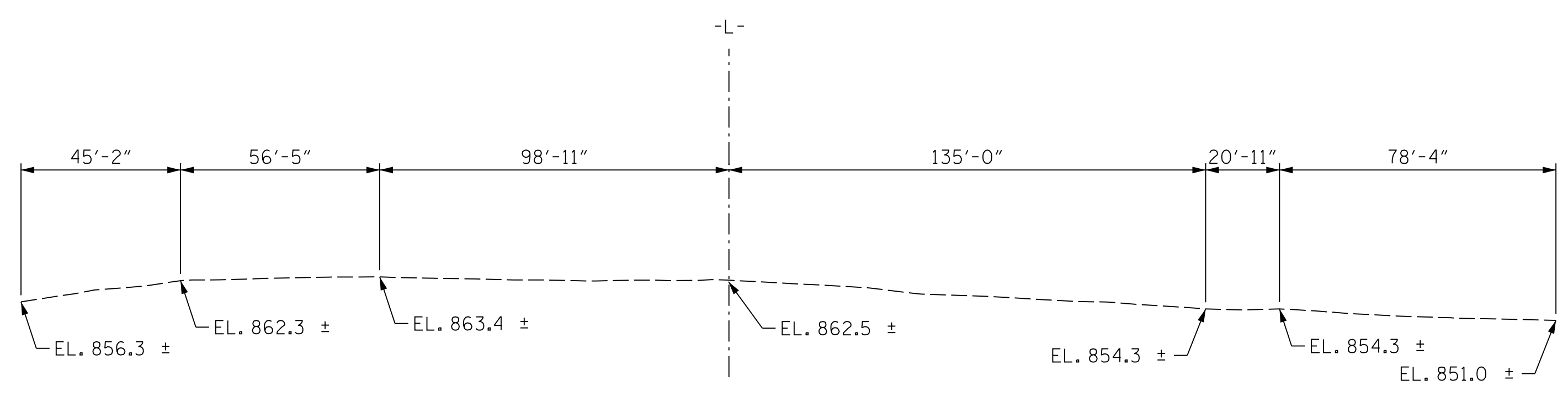
TOTAL STRUCTURE QUANTITIES	
CLASS A CONCRETE	
BARREL @ 0.949 C.Y./FT.	304.0 C.Y.
WINGS ETC.	56.8 C.Y.
SILLS/BAFFLES	3.8 C.Y.
TOTAL	364.6 C.Y.
REINFORCING STEEL	
BARREL, HEADWALLS, SILLS, & BAFFLES	60,518 LBS.
WINGS	5,323 LBS.
TOTAL	65,841 LBS.
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	260 TONS
GEOTEXTILE FOR DRAINAGE	1020 SY

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.

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
DESIGN FILL = 19.76'
FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTE SHEET.
3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
CONCRETE IN THE 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 THE WING SHEETS.
TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FEET. LOCATION OF THE JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
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 PLANS, THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIONAL PRECAST REINFORCING CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.
A 3 FOOT STRIP OF GEOTEXTILE SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO THE VARIOUS PAY ITEMS.
FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
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.
AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
FOR BOX CULVERT EXCAVATION, SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.
THE REINFORCED CONCRETE BOX CULVERT SHALL BE PLACED ON THE STANDARD 1.0 FOOT BLANKET OF THE FOUNDATION CONDITIONING MATERIAL.
INSTALL TYPE 2 GEOTEXTILE ON THE SIDES AND TOP OF THE CULVERT FOR ITS ENTIRE LENGTH. OVERLAP GEOTEXTILES A MINIMUM OF 18 INCHES. ESTIMATED TYPE 2 GEOTEXTILE QUANTITY - 1,020 SYDS.
THE REINFORCED CONCRETE BOX CULVERT SHALL BE CONSTRUCTED WITH 3 INCHES OF CAMBER TO ACCOUNT FOR ANTICIPATED SETTLEMENT.



PROFILE ALONG CULVERT

PROJECT NO. U-2579AB
FORSYTH COUNTY
STATION: 792+88.12 -L-

SHEET 1 OF 6

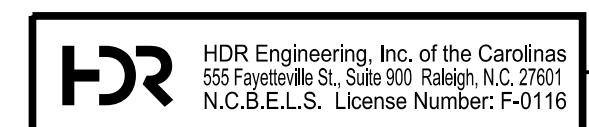
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

**SINGLE BARREL
6 FT. X 7 FT.
CONCRETE BOX CULVERT
89°/65°45'00" SKEW**



10/11/2021

DES BY: T. MCALEENAN	DATE: 11/19	DWG BY: T. MCALEENAN	DATE: 11/19
DES CHK: R. TURNAGE	DATE: 11/19	CHK BY: R. TURNAGE	DATE: 11/19



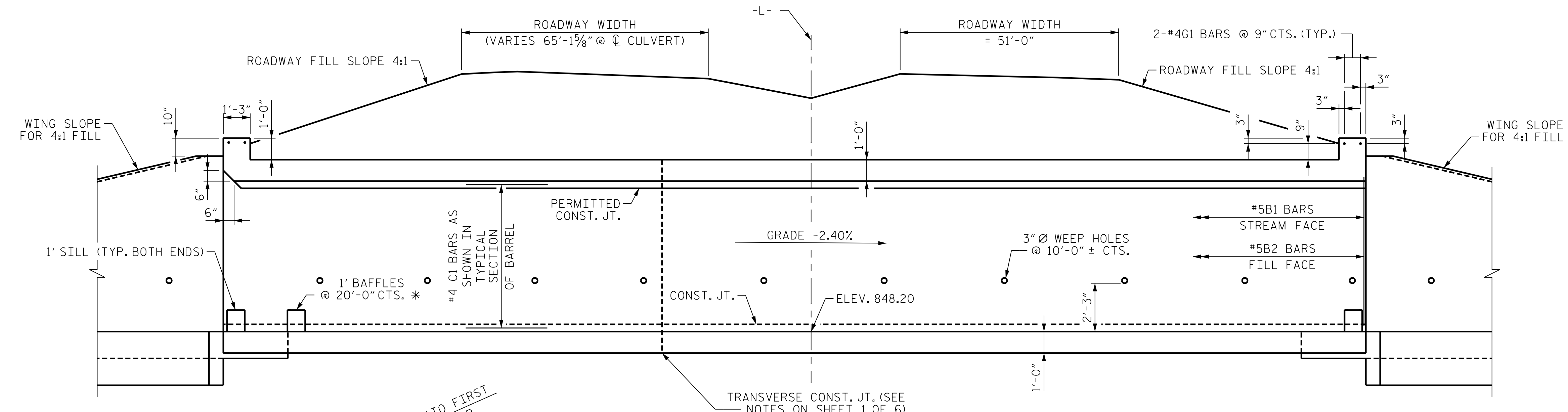
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

REVISIONS		SHEET NO. C2-1	
NO.	DATE	NO.	DATE
1		3	
2		4	

TOTAL SHEETS 6

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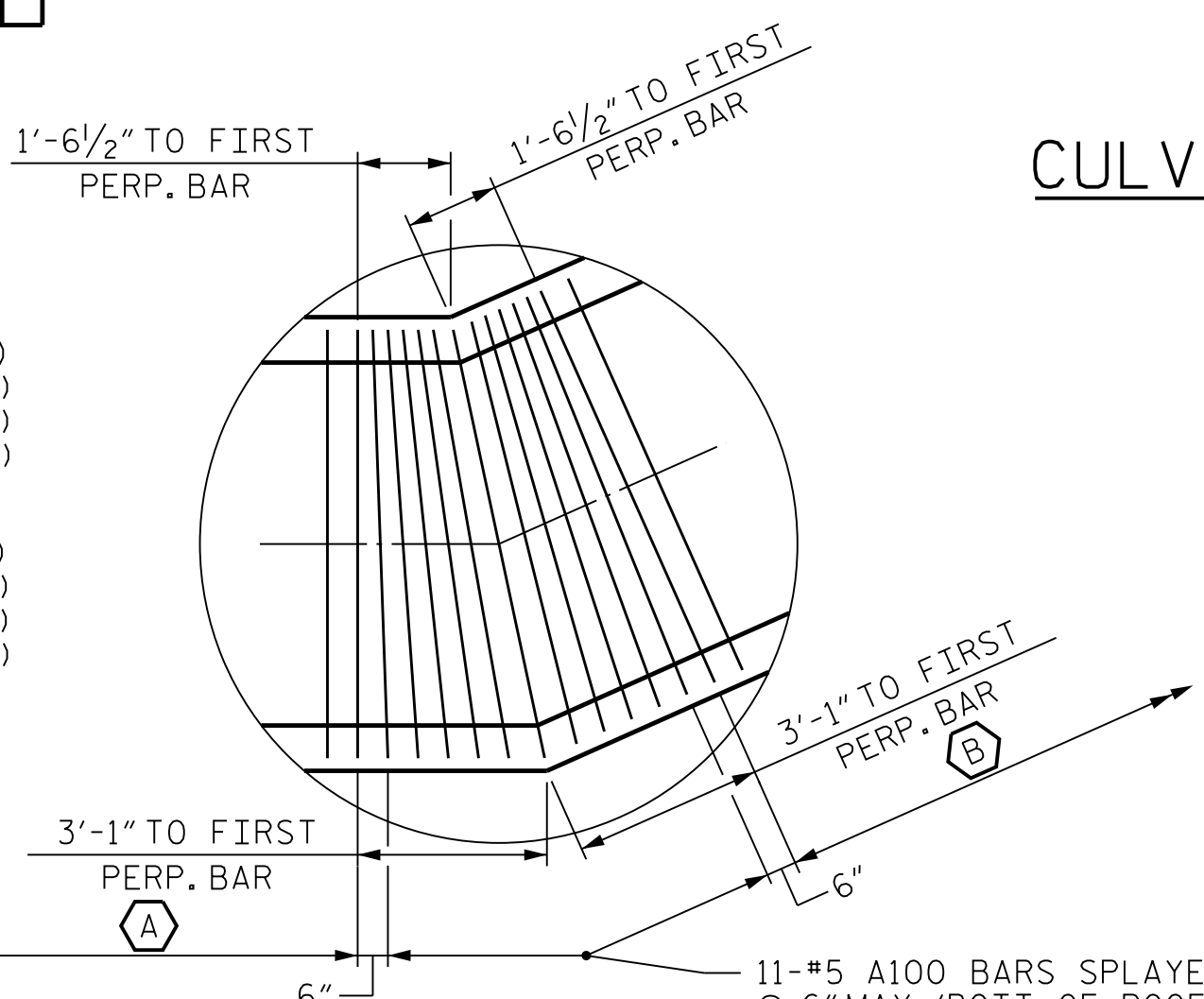


CULVERT SECTION NORMAL TO ROADWAY

* ONLY THE FIRST BAFFLE SHOWN FOR CLARITY

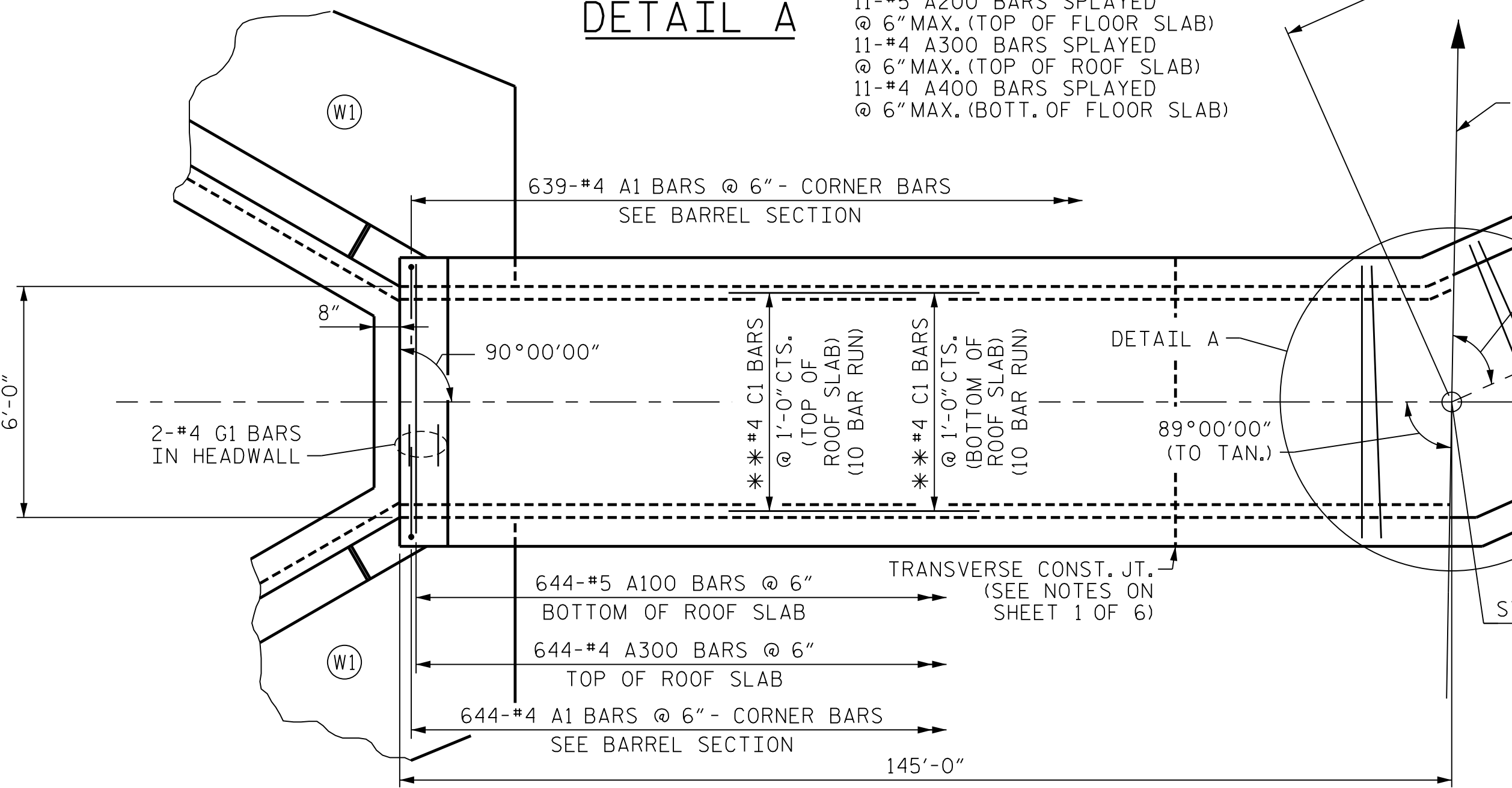
- A** 286-#5 A100 @ 6" CTS. (BOTT. OF ROOF SLAB)
- 286-#5 A200 @ 6" CTS. (TOP OF FLOOR SLAB)
- 286-#4 A300 @ 6" CTS. (TOP OF FLOOR SLAB)
- 286-#4 A400 @ 6" CTS. (BOTT. OF ROOF SLAB)

- B** 347-#5 A100 @ 6" CTS. (BOTT. OF ROOF SLAB)
- 347-#5 A200 @ 6" CTS. (TOP OF FLOOR SLAB)
- 347-#4 A300 @ 6" CTS. (TOP OF FLOOR SLAB)
- 347-#4 A400 @ 6" CTS. (BOTT. OF ROOF SLAB)



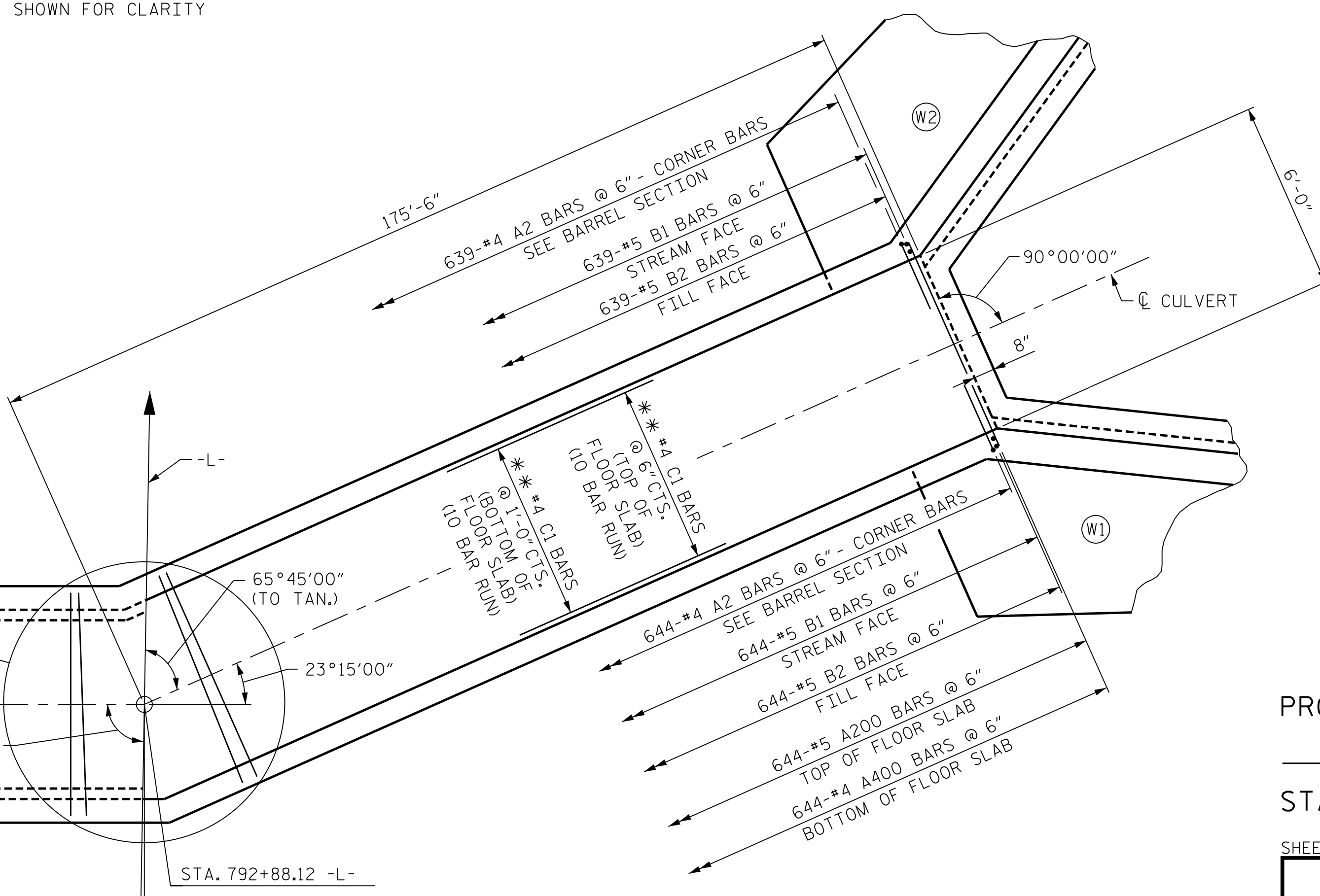
DETAIL A

- 11-#5 A100 BARS SPLAYED @ 6" MAX. (BOTT. OF ROOF SLAB)
- 11-#5 A200 BARS SPLAYED @ 6" MAX. (TOP OF FLOOR SLAB)
- 11-#4 A300 BARS SPLAYED @ 6" MAX. (TOP OF ROOF SLAB)
- 11-#4 A400 BARS SPLAYED @ 6" MAX. (BOTT. OF FLOOR SLAB)



PART PLAN - ROOF SLAB

** FIELD BEND THE C1 BARS AS NECESSARY FOR THE BEND IN THE CULVERT



PART PLAN - FLOOR SLAB

PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 792+88.12 -L-
 SHEET 2 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**SINGLE BARREL
 6 FT. X 7 FT.
 CONCRETE BOX CULVERT
 89°/65°45'00" SKEW**



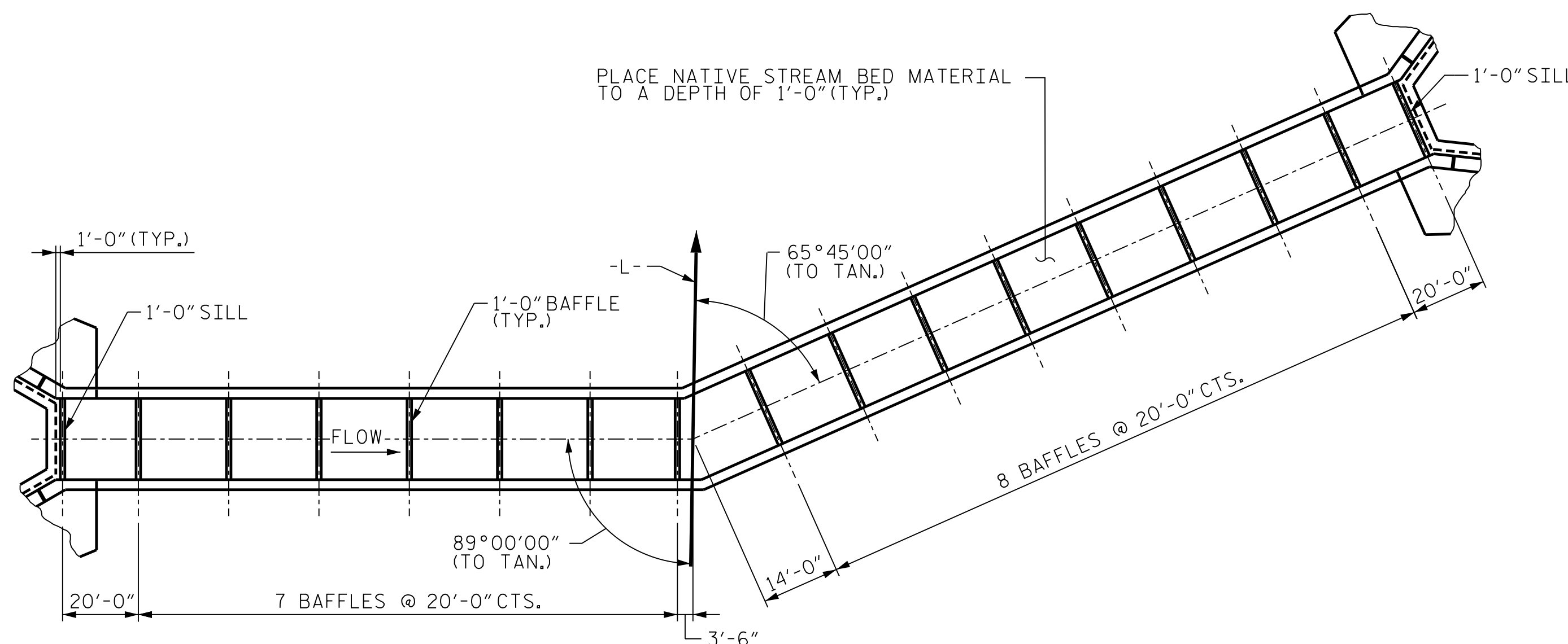
REVISIONS						SHEET NO. C2-2 TOTAL SHEETS 6
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			
2			4			

HDR HDR Engineering, Inc. of the Carolinas
 555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
 N.C.B.E.L.S. License Number: F-0116

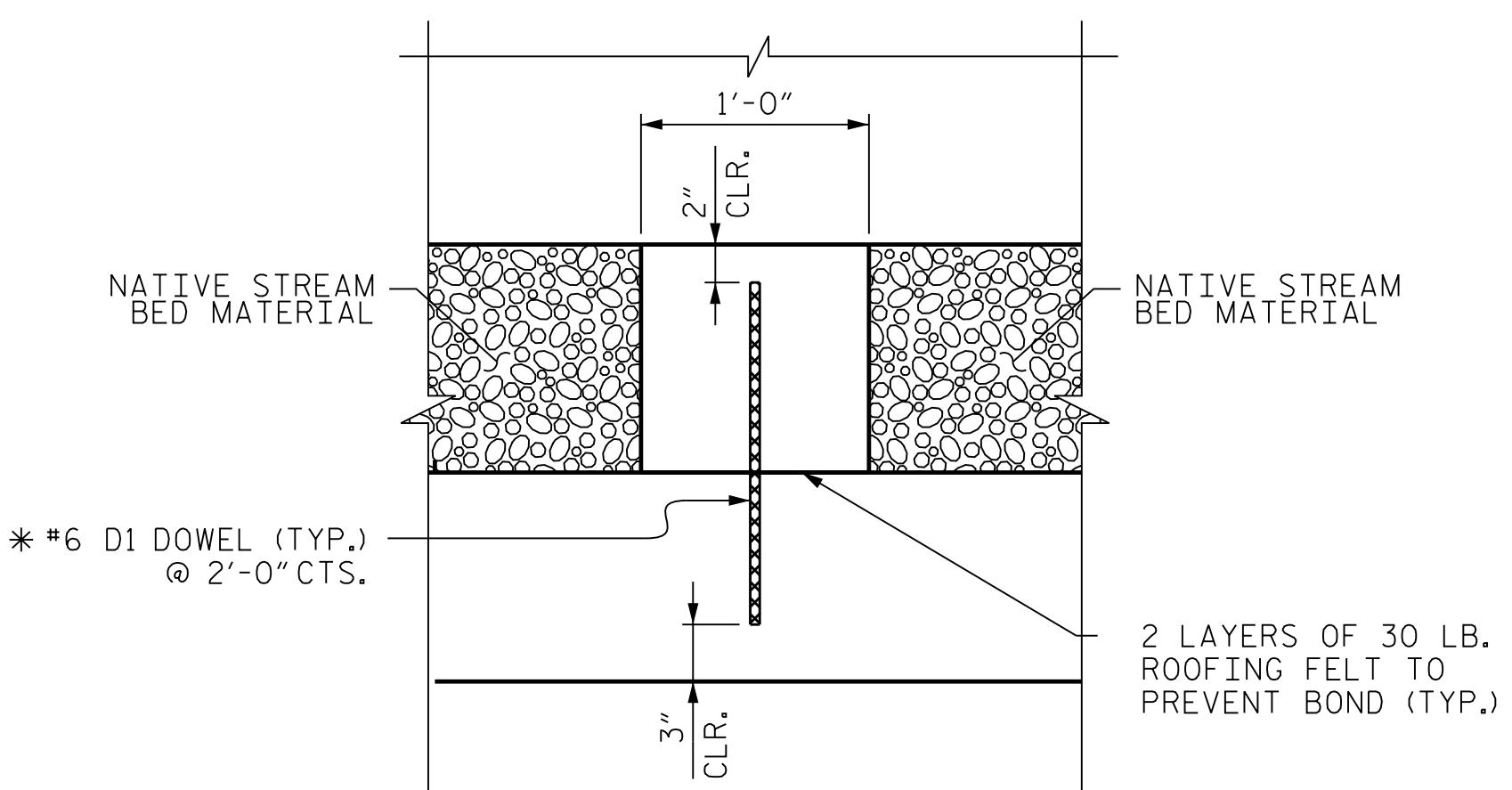
10/11/2021

DOCUMENT NOT CONSIDERED FINAL
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PLOT DRIVER: NCDOT...
 USER: PETERSON...
 DATE: 10/11/2021
 FILE: ...PLAN AND ELEVATION

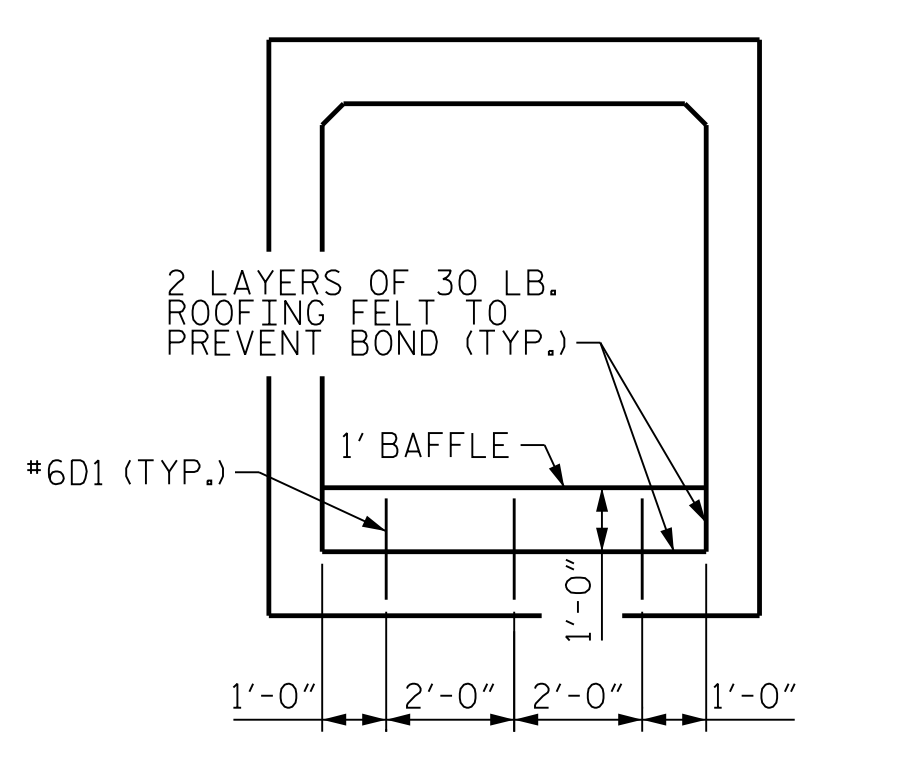


PLAN VIEW SHOWING SILL AND BAFFLE LOCATIONS

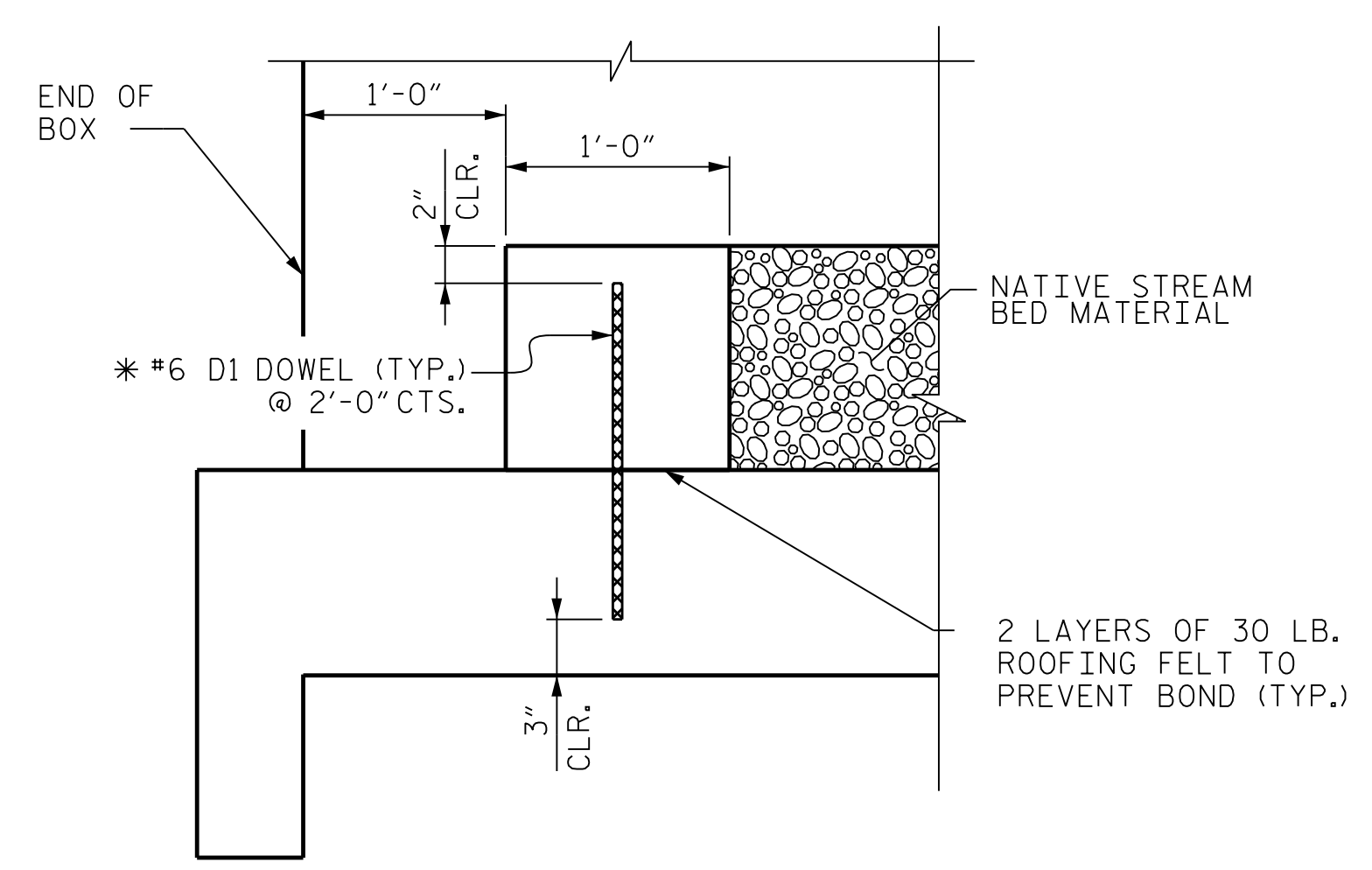


SECTION THROUGH BAFFLE

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



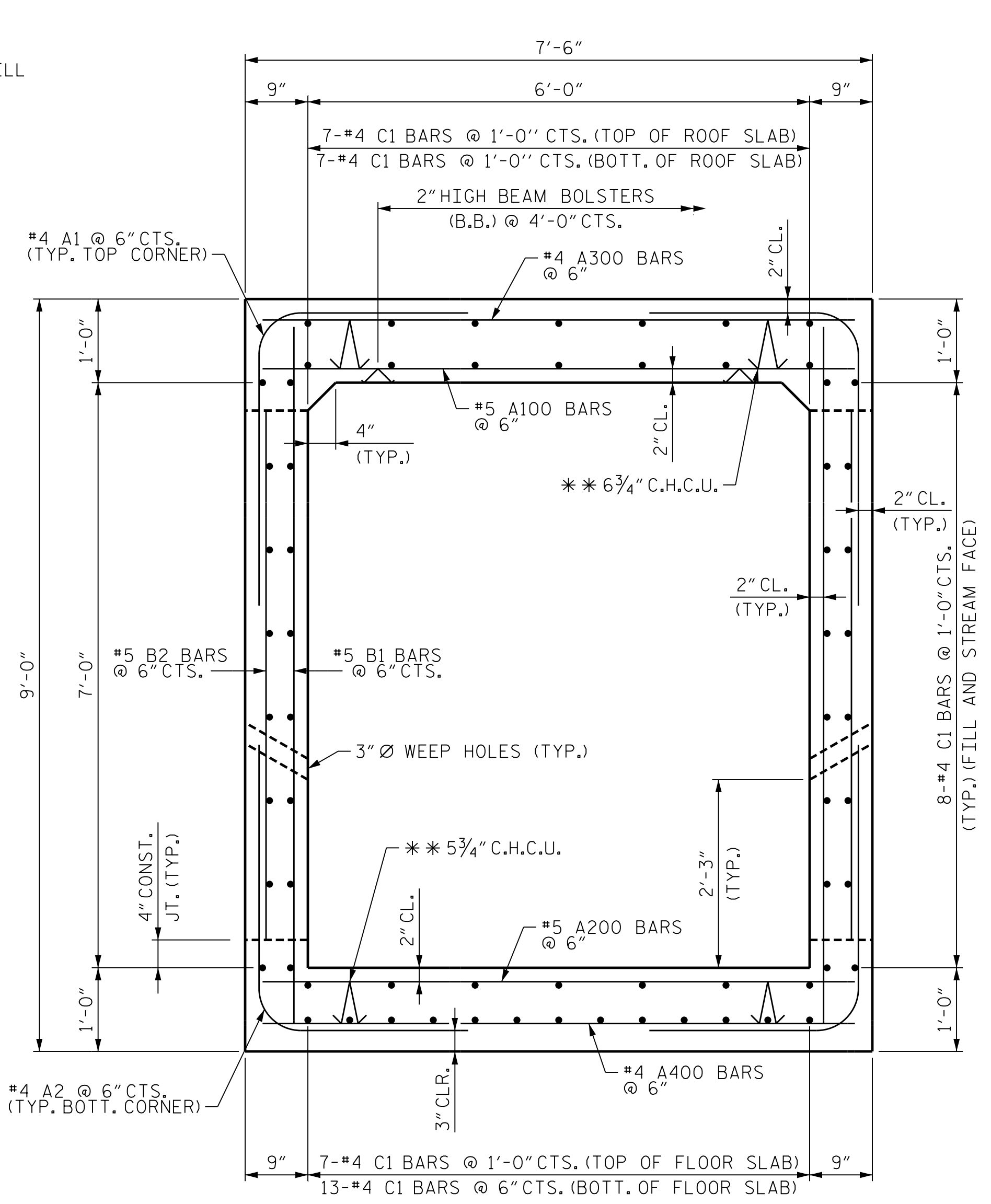
CROSS SECTION AT BAFFLE



SECTION THROUGH SILL

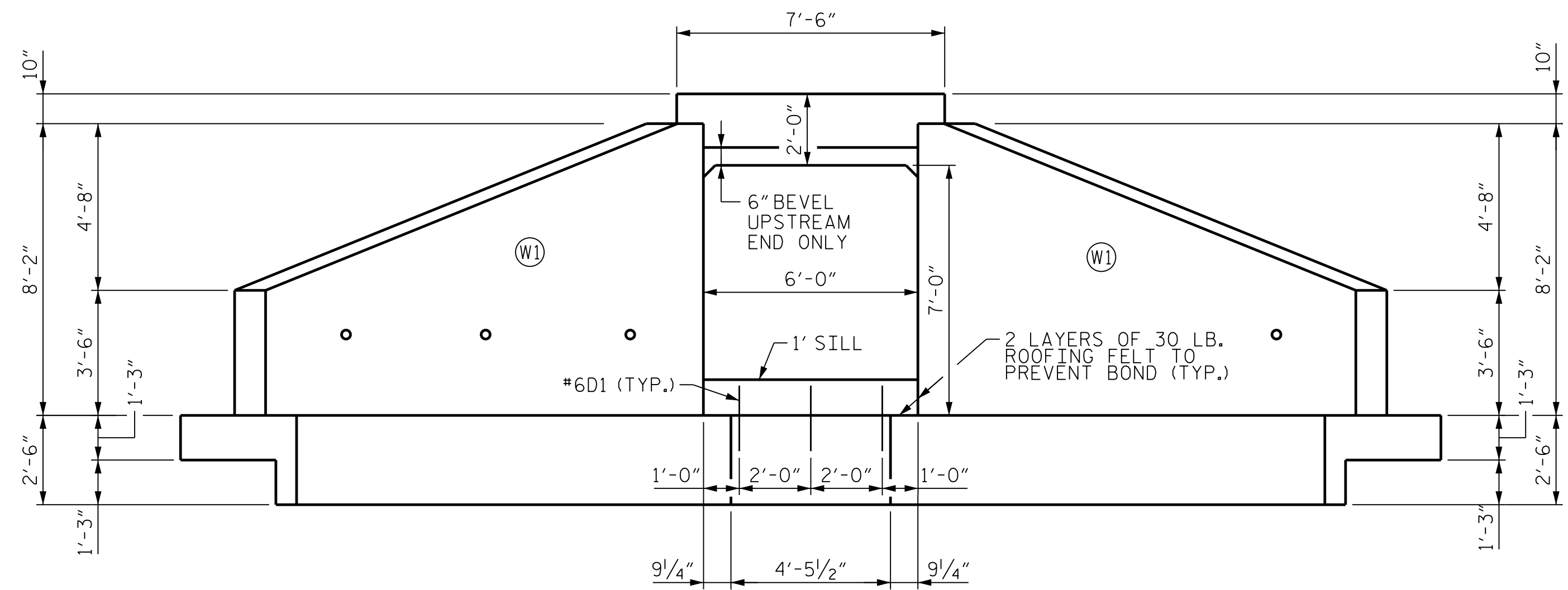
* DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.

CULVERT SILL AND BAFFLE DETAILS



RIGHT ANGLE SECTION OF BARREL

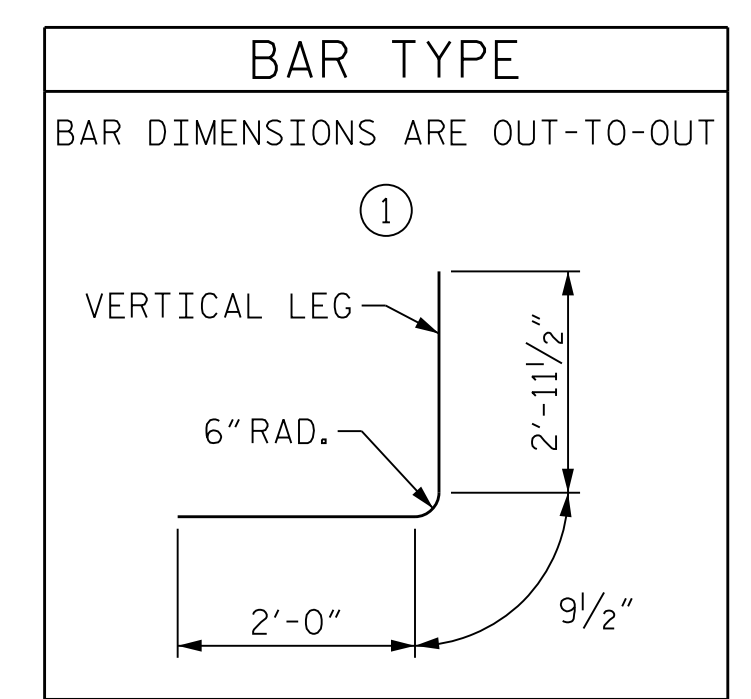
THERE ARE 66 "C" BARS IN SECTION OF BARREL
 ** ALL CONTINUOUS HIGH CHAIR UPPER (C.H.C.U.) @ 3'-0" CTS.



END ELEVATION

(INLET END SHOWN, OUTLET END SIMILAR)

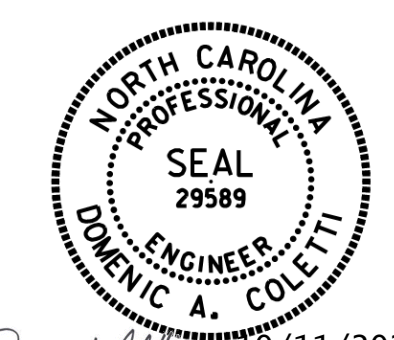
REINFORCING STEEL BAR SCHEDULE					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	1283	#4	1	5'-9"	4928
A2	1283	#4	1	5'-9"	4928
A100	644	#5	STR	7'-1"	4758
A200	644	#5	STR	7'-1"	4758
A300	644	#4	STR	7'-1"	3047
A400	644	#4	STR	7'-1"	3047
B1	1283	#5	STR	8'-7"	11486
B2	1283	#5	STR	6'-2"	8252
C1	660	#4	STR	34'-5"	15174
D1	51	#6	STR	1'-7"	121
G1	4	#4	STR	7'-1"	19
REINFORCING STEEL					60,518 LBS
CLASS A CONCRETE					
CULVERT					304.0 C.Y.
SILLS & BAFFLES					3.8 C.Y.
TOTAL					307.8 C.Y.



SPLICE LENGTH CHART		
BAR	SIZE	SPLICE LENGTH
B1	#5	2'-4"
C1	#4	2'-5"

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 792+88.12 -L-
 SHEET 3 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE BARREL
 6 FT. X 7 FT.
 CONCRETE BOX CULVERT
 89°/65°45'00" SKEW



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

PLOT DRIVER: NCDOT.pdf_color_eng-50dpi
 USER: PPRETORSO DATE: 10/11/2021
 FILE: ... \CROSS SECTION AND BAR LIST
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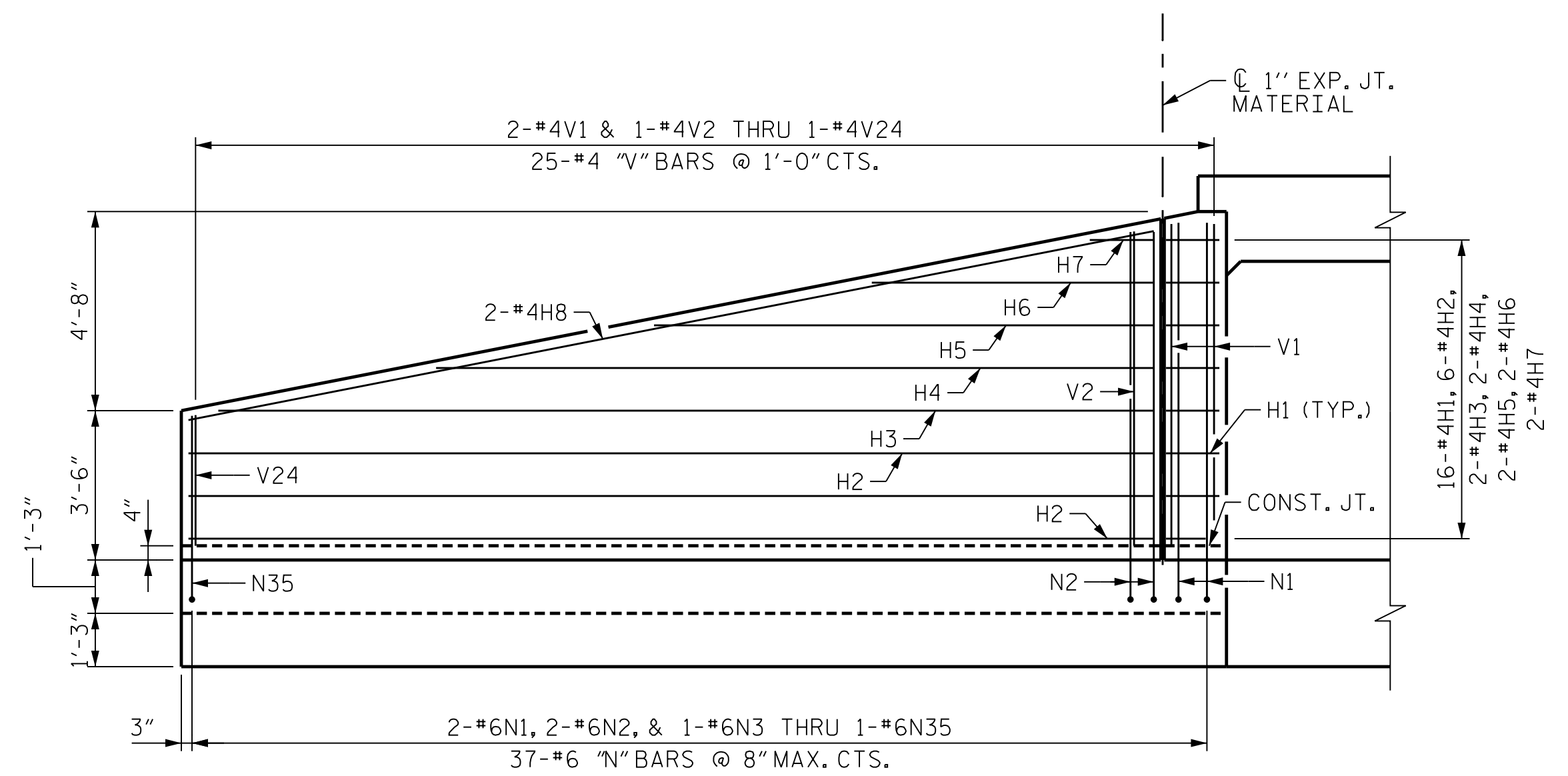
DES BY: T. MCALEENAN	DATE: 11/19	DWG BY: T. MCALEENAN	DATE: 11/19
DES CHK: R. TURNAGE	DATE: 11/19	CHK BY: R. TURNAGE	DATE: 11/19



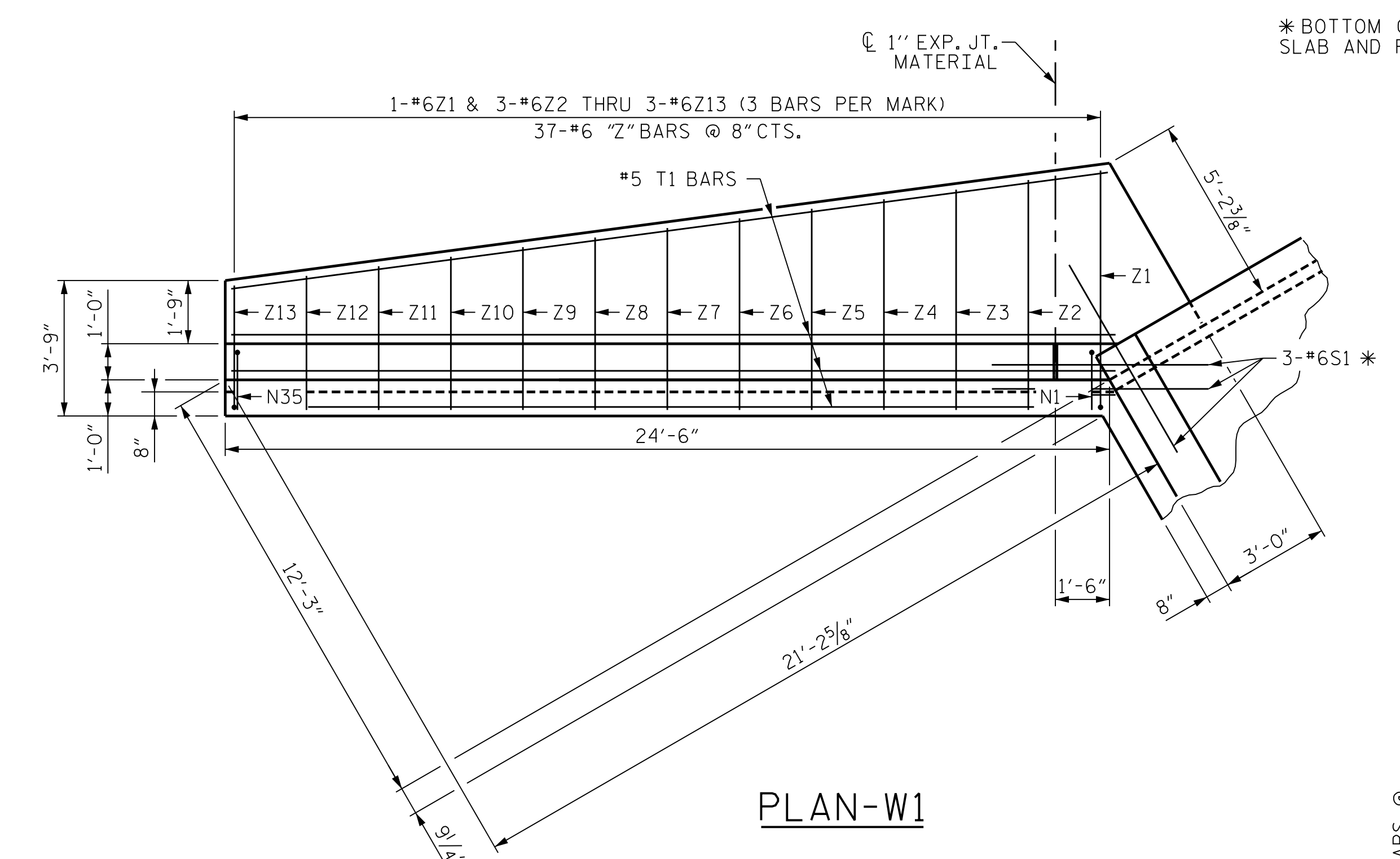
10/11/2021
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SHEET NO. C2-3
 TOTAL SHEETS 6

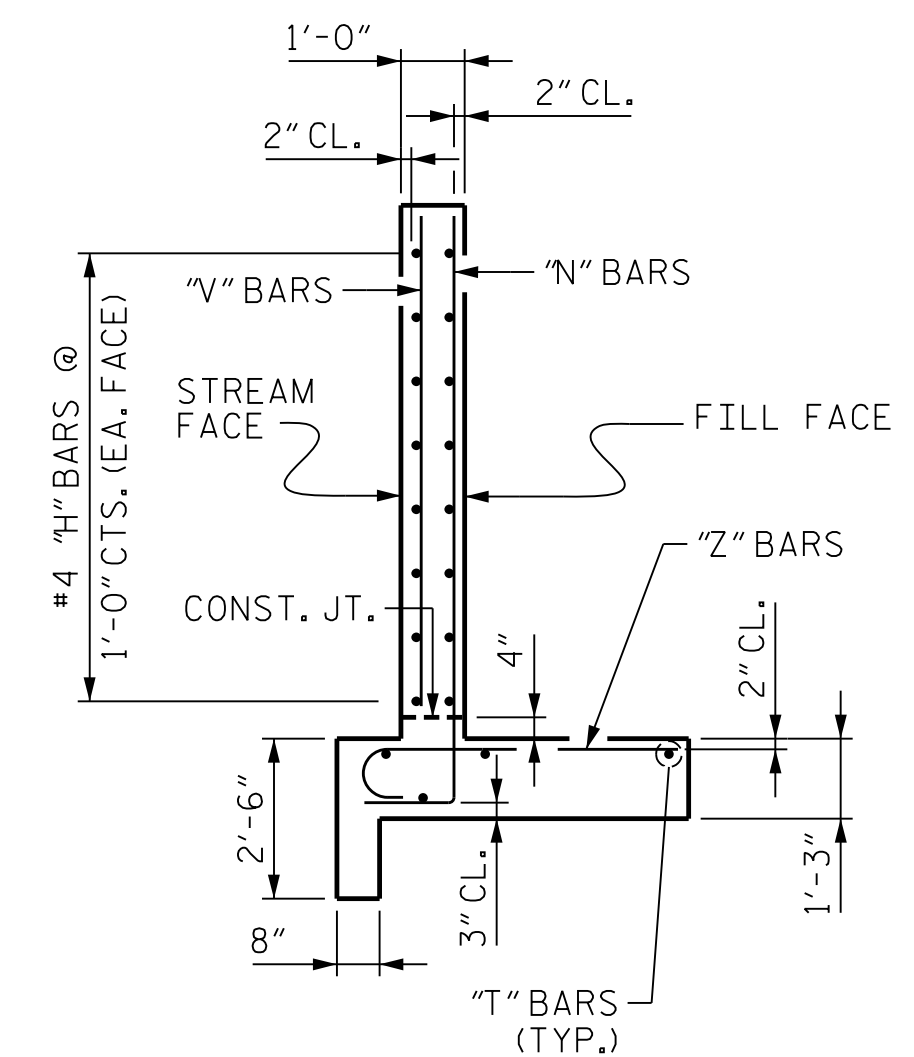
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 PENTABLE: NCDOT STRUCTURES DEFAULT PEN.tbl
 TIME: 8:08:14 AM



ELEVATION-W1



PLAN-W1

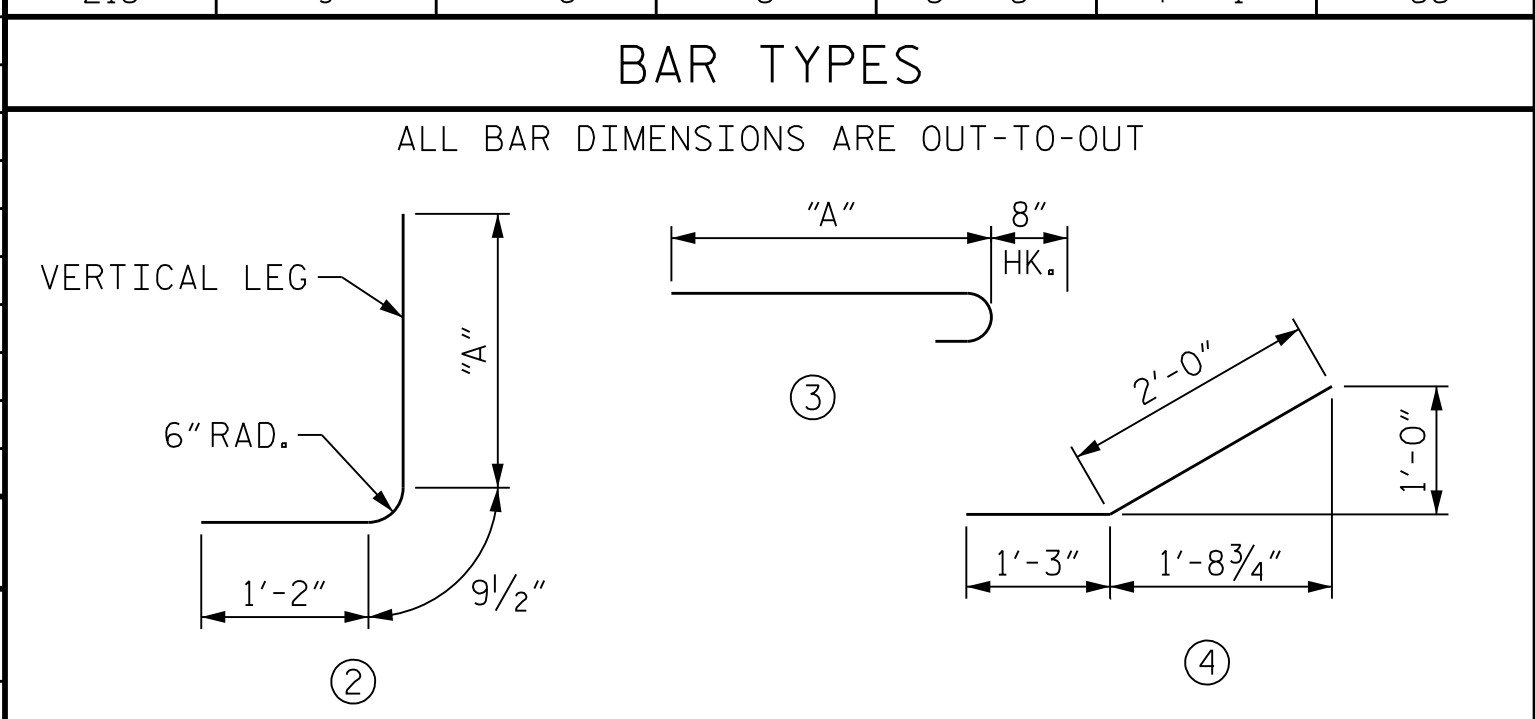


TYPICAL WING SECTION

REINFORCING BAR SCHEDULE

BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT
H1	48	# 4	4	-	3' - 3"	104	V1	6	# 4	STR	-	7' - 6"	30
H2	18	# 4	STR	-	22' - 7"	272	V2	3	# 4	STR	-	7' - 4"	15
H3	6	# 4	STR	-	21' - 11"	88	V3	3	# 4	STR	-	7' - 2"	14
H4	6	# 4	STR	-	16' - 10"	67	V4	3	# 4	STR	-	6' - 11"	14
H5	6	# 4	STR	-	11' - 8"	47	V5	3	# 4	STR	-	6' - 9"	14
H6	6	# 4	STR	-	6' - 7"	26	V6	3	# 4	STR	-	6' - 7"	13
H7	6	# 4	STR	-	1' - 6"	6	V7	3	# 4	STR	-	6' - 4"	13
H8	6	# 4	STR	-	23' - 0"	92	V8	3	# 4	STR	-	6' - 2"	12
N1	6	# 6	2	8' - 3 1/2"	10' - 3"	92	V9	3	# 4	STR	-	6' - 0"	12
N2	6	# 6	2	8' - 0 1/2"	10' - 0"	90	V10	3	# 4	STR	-	5' - 9"	12
N3	3	# 6	2	7' - 11 1/2"	9' - 11"	45	V11	3	# 4	STR	-	5' - 7"	11
N4	3	# 6	2	7' - 9 1/2"	9' - 9"	44	V12	3	# 4	STR	-	5' - 5"	11
N5	3	# 6	2	7' - 8 1/2"	9' - 8"	44	V13	3	# 4	STR	-	5' - 2"	10
N6	3	# 6	2	7' - 6 1/2"	9' - 6"	43	V14	3	# 4	STR	-	5' - 0"	10
N7	3	# 6	2	7' - 5 1/2"	9' - 5"	42	V15	3	# 4	STR	-	4' - 9"	10
N8	3	# 6	2	7' - 3 1/2"	9' - 3"	42	V16	3	# 4	STR	-	4' - 7"	9
N9	3	# 6	2	7' - 2 1/2"	9' - 2"	41	V17	3	# 4	STR	-	4' - 5"	9
N10	3	# 6	2	7' - 0 1/2"	9' - 0"	41	V18	3	# 4	STR	-	4' - 2"	8
N11	3	# 6	2	6' - 10 1/2"	8' - 10"	40	V19	3	# 4	STR	-	4' - 0"	8
N12	3	# 6	2	6' - 9 1/2"	8' - 9"	39	V20	3	# 4	STR	-	3' - 10"	8
N13	3	# 6	2	6' - 7 1/2"	8' - 7"	39	V21	3	# 4	STR	-	3' - 7"	7
N14	3	# 6	2	6' - 6 1/2"	8' - 6"	38	V22	3	# 4	STR	-	3' - 5"	7
N15	3	# 6	2	6' - 4 1/2"	8' - 4"	38	V23	3	# 4	STR	-	3' - 3"	7
N16	3	# 6	2	6' - 3 1/2"	8' - 3"	37	V24	3	# 4	STR	-	3' - 0"	6
N17	3	# 6	2	6' - 1 1/2"	8' - 1"	36	Z1	3	# 6	3	6' - 7"	7' - 3"	33
N18	3	# 6	2	5' - 11 1/2"	7' - 11"	36	Z2	9	# 6	3	6' - 4"	7' - 0"	95
N19	3	# 6	2	5' - 10 1/2"	7' - 10"	35	Z3	9	# 6	3	6' - 1"	6' - 9"	91
N20	3	# 6	2	5' - 8 1/2"	7' - 8"	35	Z4	9	# 6	3	5' - 10"	6' - 6"	88
N21	3	# 6	2	5' - 7 1/2"	7' - 7"	34	Z5	9	# 6	3	5' - 7"	6' - 3"	84
N22	3	# 6	2	5' - 5 1/2"	7' - 5"	33	Z6	9	# 6	3	5' - 3"	5' - 11"	80
N23	3	# 6	2	5' - 4 1/2"	7' - 4"	33	Z7	9	# 6	3	5' - 0"	5' - 8"	77
N24	3	# 6	2	5' - 2 1/2"	7' - 2"	32	Z8	9	# 6	3	4' - 9"	5' - 5"	73
N25	3	# 6	2	5' - 0 1/2"	7' - 0"	32	Z9	9	# 6	3	4' - 6"	5' - 2"	70
N26	3	# 6	2	4' - 11 1/2"	6' - 11"	31	Z10	9	# 6	3	4' - 3"	4' - 11"	66
N27	3	# 6	2	4' - 9 1/2"	6' - 9"	30	Z11	9	# 6	3	4' - 0"	4' - 8"	63
N28	3	# 6	2	4' - 8 1/2"	6' - 8"	30	Z12	9	# 6	3	3' - 8"	4' - 4"	59
N29	3	# 6	2	4' - 6 1/2"	6' - 6"	29	Z13	9	# 6	3	3' - 5"	4' - 1"	55
N30	3	# 6	2	4' - 5 1/2"	6' - 5"	29							
N31	3	# 6	2	4' - 3 1/2"	6' - 3"	28							
N32	3	# 6	2	4' - 2 1/2"	6' - 2"	28							
N33	3	# 6	2	4' - 0 1/2"	6' - 0"	27							
N34	3	# 6	2	3' - 10 1/2"	5' - 10"	26							
N35	3	# 6	2	3' - 9 1/2"	5' - 9"	26							
S1	9	# 6	STR	-	6' - 0"	81							
T1	12	# 5	STR	-	24' - 6"	307							

QUANTITIES	
REINFORCING STEEL FOR 3 WINGS	3639 LBS.
CLASS A CONCRETE	37.5 C.Y.
3 WINGS	0.4 C.Y.
1 HEADWALL	0.4 C.Y.
1 END CURTAIN WALL	0.4 C.Y.
TOTAL	38.3 C.Y.



PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 792+88.12 -L-
 SHEET 4 OF 6



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
WINGS FOR CONCRETE BOX CULVERT 90° SKEW

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

DATE: 10/11/2021
 SHEET NO. C2-4
 TOTAL SHEETS 6

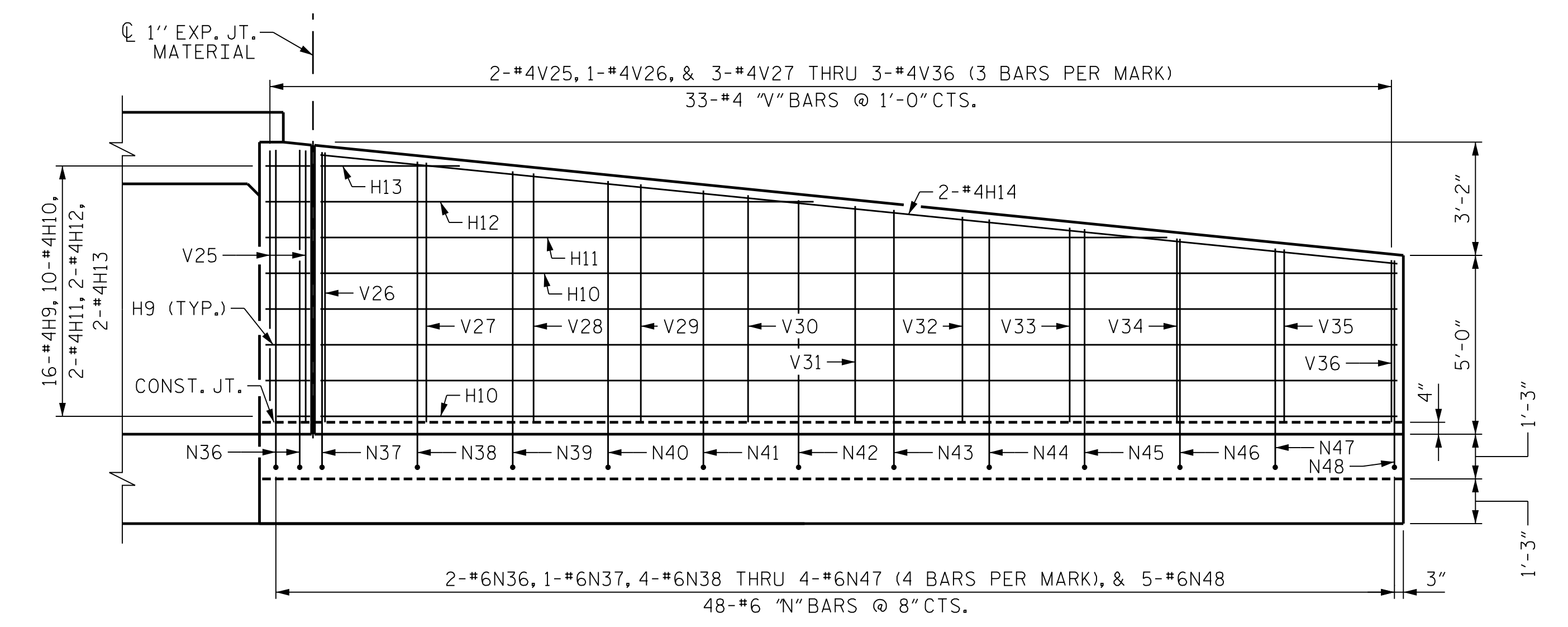
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DES CHK: <u>R. TURNAGE</u>	DATE: <u>11/19</u>	CHK BY: <u>R. TURNAGE</u>	DATE: <u>11/19</u>



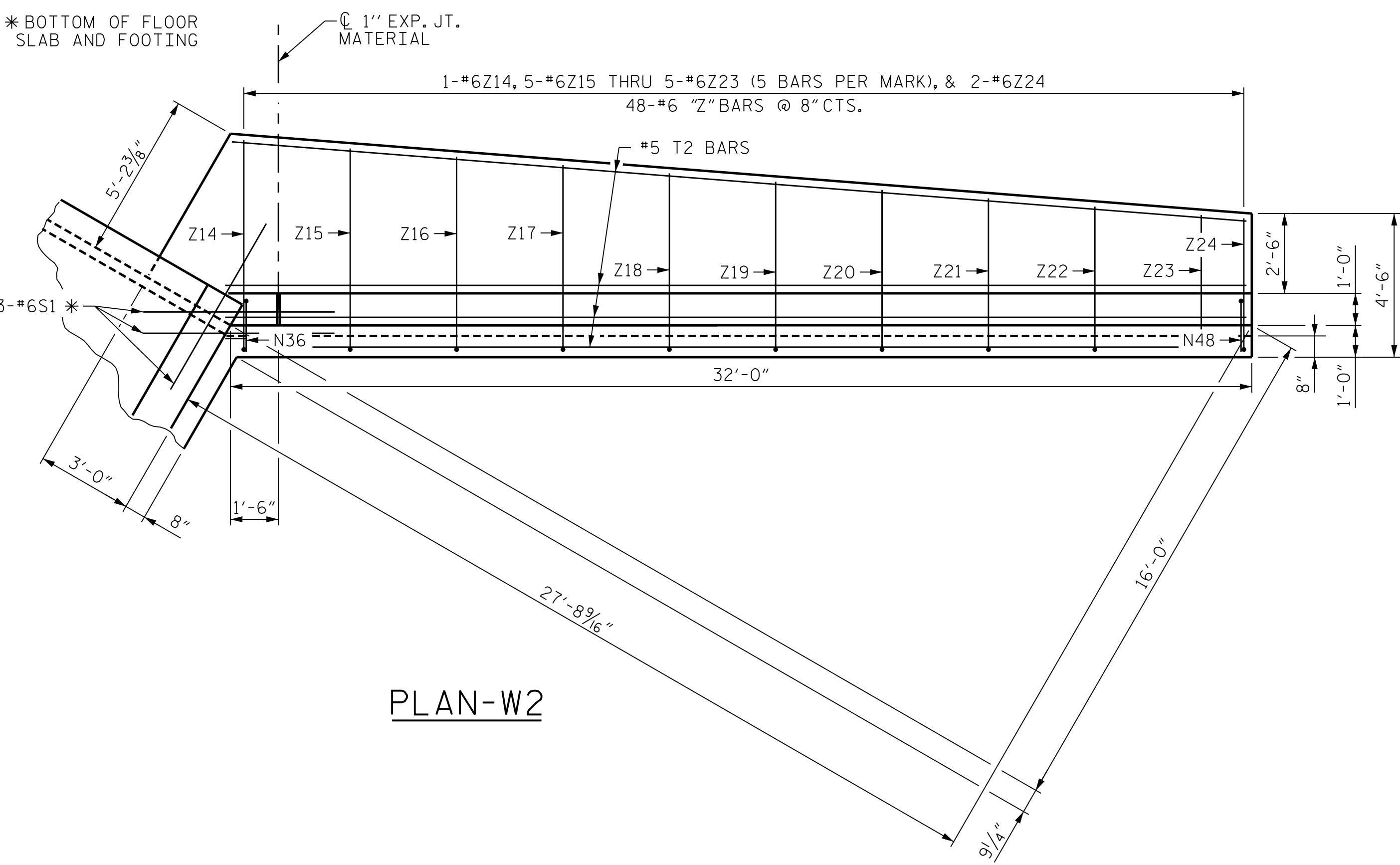
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REINFORCING BAR SCHEDULE

BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT
H9	16	# 4	4	-	3' - 3"	35	V25	2	# 4	STR	-	7' - 7"	10
H10	10	# 4	STR	-	30' - 1"	201	V26	1	# 4	STR	-	7' - 6"	5
H11	2	# 4	STR	-	23' - 8"	32	V27	3	# 4	STR	-	7' - 3"	15
H12	2	# 4	STR	-	13' - 9"	18	V28	3	# 4	STR	-	6' - 11"	14
H13	2	# 4	STR	-	3' - 11"	5	V29	3	# 4	STR	-	6' - 8"	13
H14	2	# 4	STR	-	30' - 3"	40	V30	3	# 4	STR	-	6' - 4"	13
							V31	3	# 4	STR	-	6' - 0"	12
N36	2	# 6	2	8' - 4 1/2"	10' - 4"	31	V32	3	# 4	STR	-	5' - 9"	12
N37	1	# 6	2	8' - 3 1/2"	10' - 3"	15	V33	3	# 4	STR	-	5' - 5"	11
N38	4	# 6	2	8' - 0 1/2"	10' - 0"	60	V34	3	# 4	STR	-	5' - 1"	10
N39	4	# 6	2	7' - 8 1/2"	9' - 8"	58	V35	3	# 4	STR	-	4' - 10"	10
N40	4	# 6	2	7' - 5 1/2"	9' - 5"	57	V36	3	# 4	STR	-	4' - 6"	9
N41	4	# 6	2	7' - 2 1/2"	9' - 2"	55							
N42	4	# 6	2	6' - 11 1/2"	8' - 11"	54	Z14	1	# 6	3	6' - 7"	7' - 3"	11
N43	4	# 6	2	6' - 8 1/2"	8' - 8"	52	Z15	5	# 6	3	6' - 4"	7' - 0"	53
N44	4	# 6	2	6' - 4 1/2"	8' - 4"	50	Z16	5	# 6	3	6' - 1"	6' - 9"	51
N45	4	# 6	2	6' - 1 1/2"	8' - 1"	49	Z17	5	# 6	3	5' - 10"	6' - 6"	49
N46	4	# 6	2	5' - 10 1/2"	7' - 10"	47	Z18	5	# 6	3	5' - 7"	6' - 3"	47
N47	4	# 6	2	5' - 7 1/2"	7' - 7"	46	Z19	5	# 6	3	5' - 4"	6' - 0"	45
N48	5	# 6	2	5' - 3 1/2"	7' - 3"	54	Z20	5	# 6	3	5' - 1"	5' - 9"	43
							Z21	5	# 6	3	4' - 9"	5' - 5"	41
S1	3	# 6	STR	-	6' - 0"	27	Z22	5	# 6	3	4' - 6"	5' - 2"	39
							Z23	5	# 6	3	4' - 3"	4' - 11"	37
T2	4	# 5	STR	-	31' - 10"	133	Z24	2	# 6	3	4' - 2"	4' - 10"	15



ELEVATION-W2

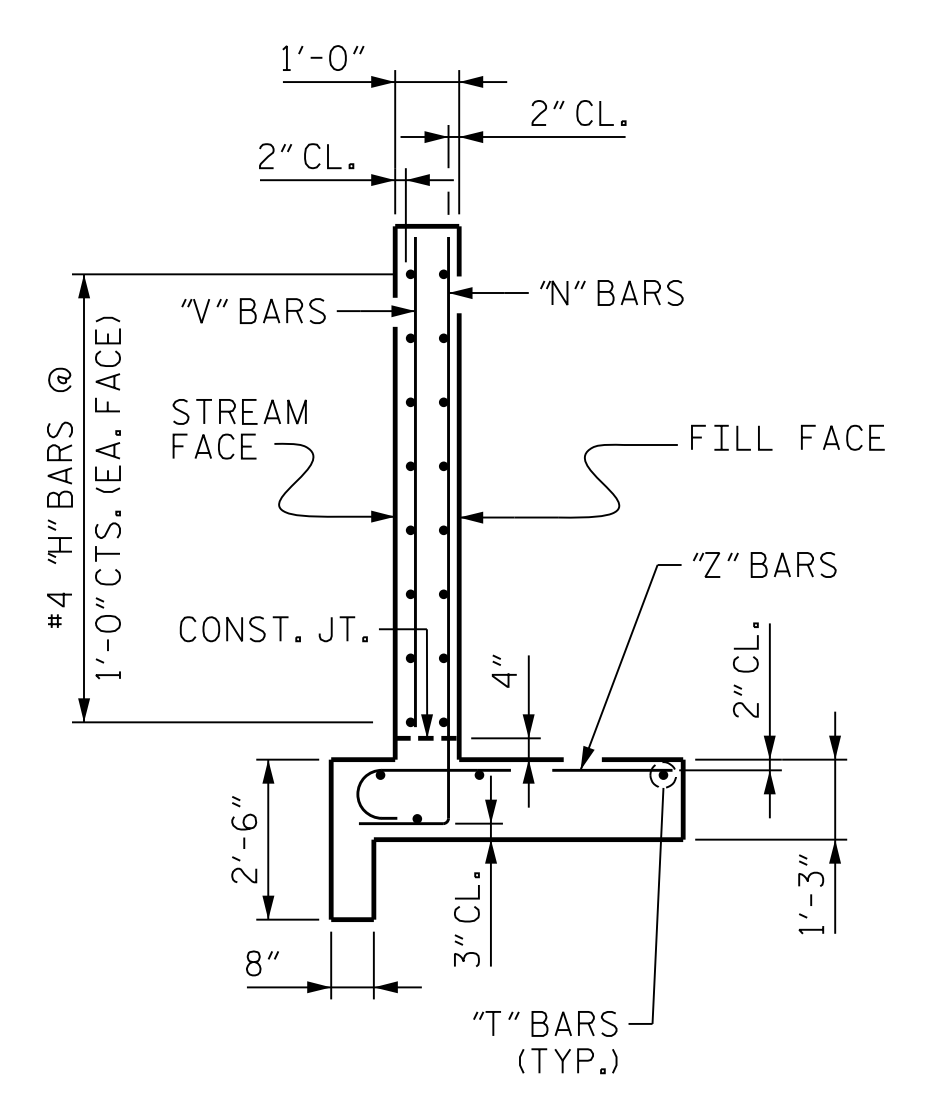
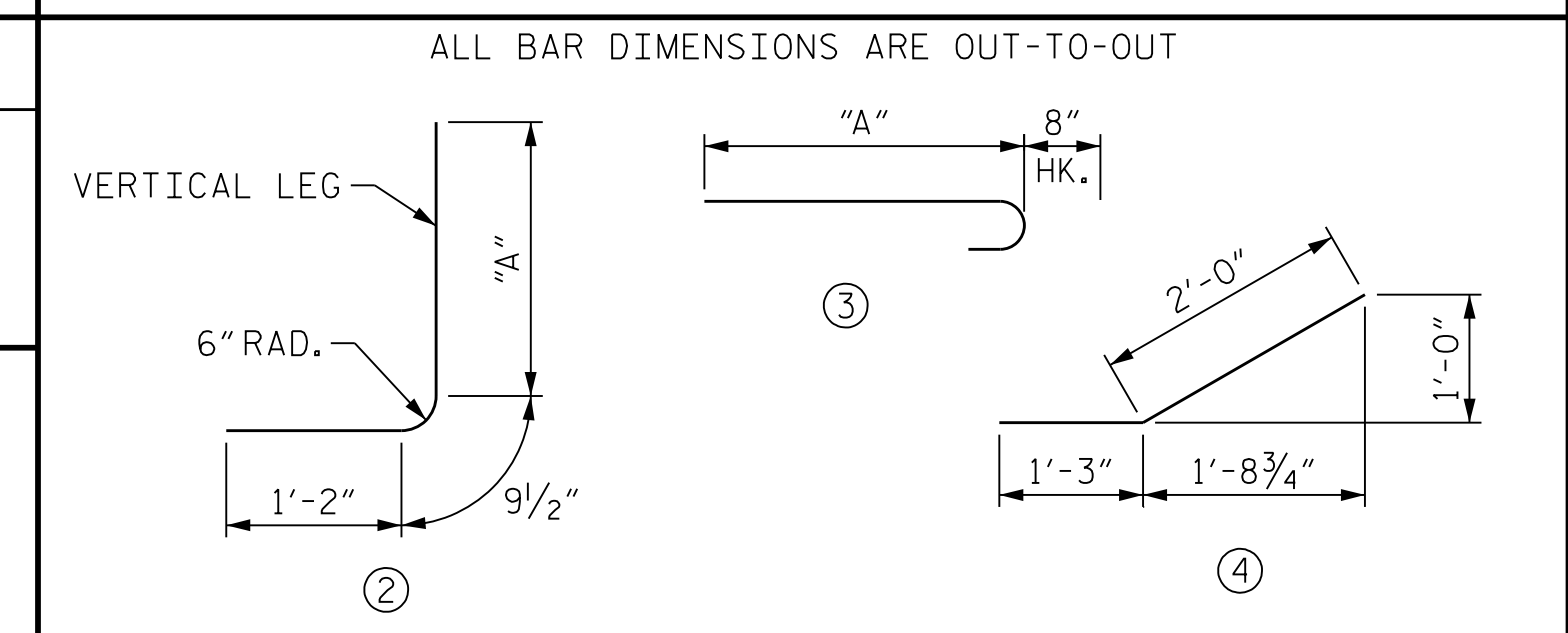


PLAN-W2

QUANTITIES

REINFORCING STEEL FOR 1 WING	1684 LBS.
CLASS A CONCRETE	17.7 C.Y.
1 WING	0.4 C.Y.
1 HEADWALL	0.4 C.Y.
1 END CURTAIN WALL	0.4 C.Y.
TOTAL	18.5 C.Y.

BAR TYPES



TYPICAL WING SECTION

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 792+88.12 -L-
 SHEET 5 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
WINGS FOR CONCRETE BOX CULVERT 90° SKEW



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



10/11/2021
 DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED

PLOT DRIVER: NCDOT...
 USER: PETERSON...
 DATE: 10/11/2021...
 FILE: ...\WINGWALL 2 VIEWS

DES BY: T. MCALEENAN	DATE: 11/19	DWG BY: T. MCALEENAN	DATE: 11/19
DES CHK: R. TURNAGE	DATE: 11/19	CHK BY: R. TURNAGE	DATE: 11/19

SHEET NO. C2-5
 TOTAL SHEETS 6

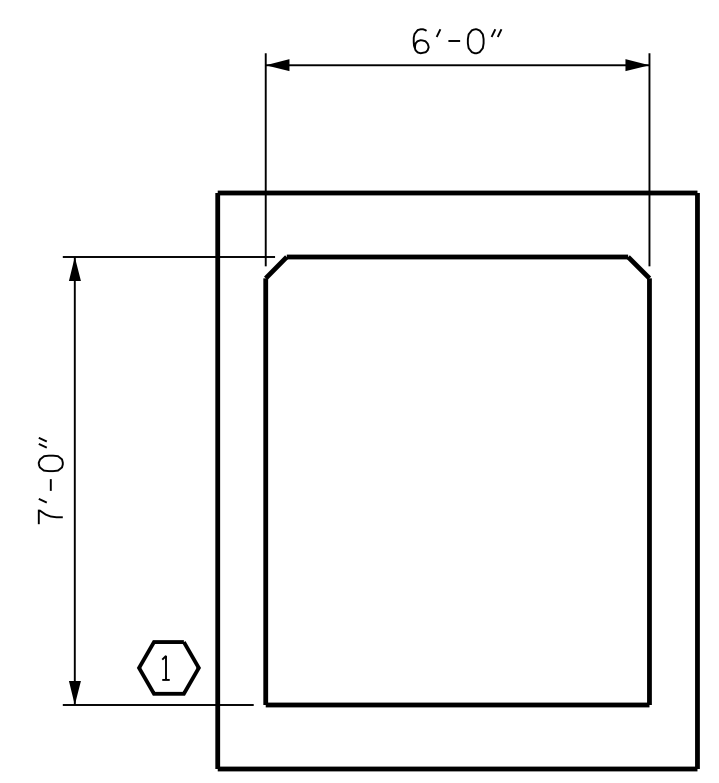
LOAD FACTORS:

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
WA	1.00	--

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS										
	CONTROLLING LOAD RATING	MINIMUM RATING FACTOR (RF)	STRENGTH I LIMIT STATE							
			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)
PERMANENT LOAD RATING	1	1.36	1.39	1	BOTTOM SLAB	3.75	1.36	1	EXTERIOR WALL	1.54

NOTES:
 RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
 THE EFFECTS OF LIVE LOAD ON DESIGN AND LOAD RATING MAY BE NEGLECTED FOR CULVERTS WITH CERTAIN FILL DEPTHS DESCRIBED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
 CULVERTS WITH NEGLIGIBLE LIVE LOAD SHOULD BE LOAD RATED FOR PERMANENT LOADS ONLY IN ACCORDANCE WITH THE AASHTO MANUAL FOR BRIDGE EVALUATION.

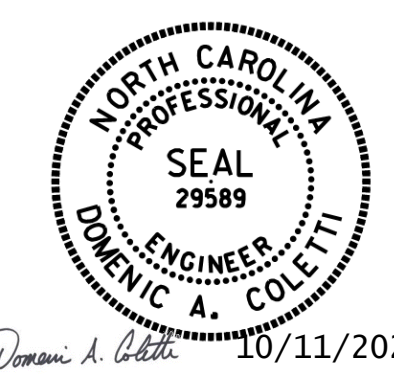


LRFR SUMMARY
(LOOKING DOWN STREAM)

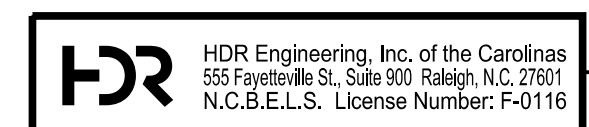
PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 792+88.12 -L-
 SHEET 6 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

LRFR SUMMARY FOR
 REINFORCED CONCRETE
 BOX CULVERTS
 (DEEP FILLS)



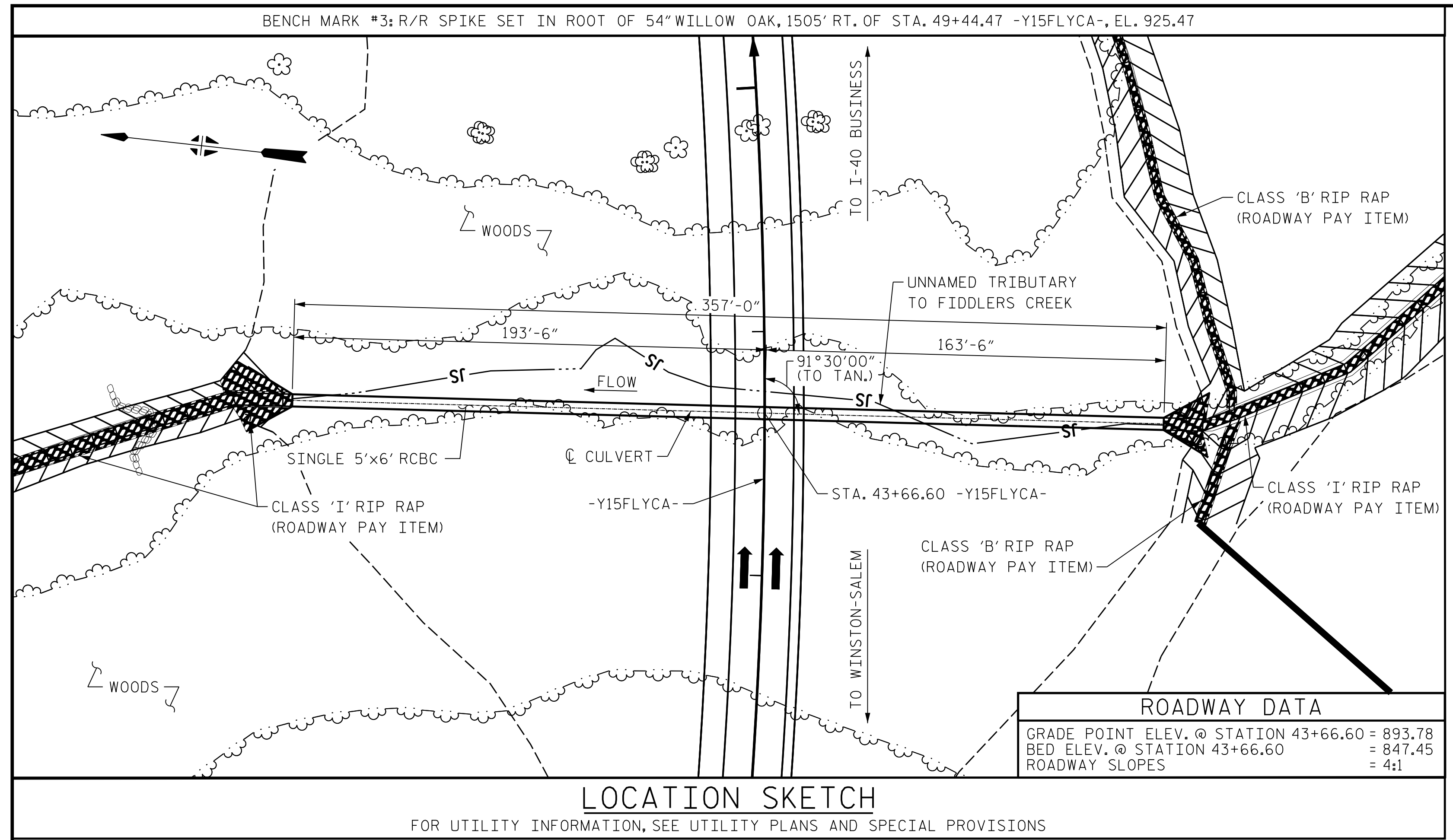
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-6
1			3			TOTAL SHEETS
2			4			6



10/11/2021
 DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED

PLOT DRIVER: NCDOT_pdf_color_eng-50.ppt
 USER: PPETERSO DATE: 10/11/2021
 FILE: ...RATING SUMMARY

DES BY: T. MCALEENAN	DATE: 11/19	DWG BY: T. MCALEENAN	DATE: 11/19
DES CHK: R. TURNAGE	DATE: 11/19	CHK BY: R. TURNAGE	DATE: 11/19

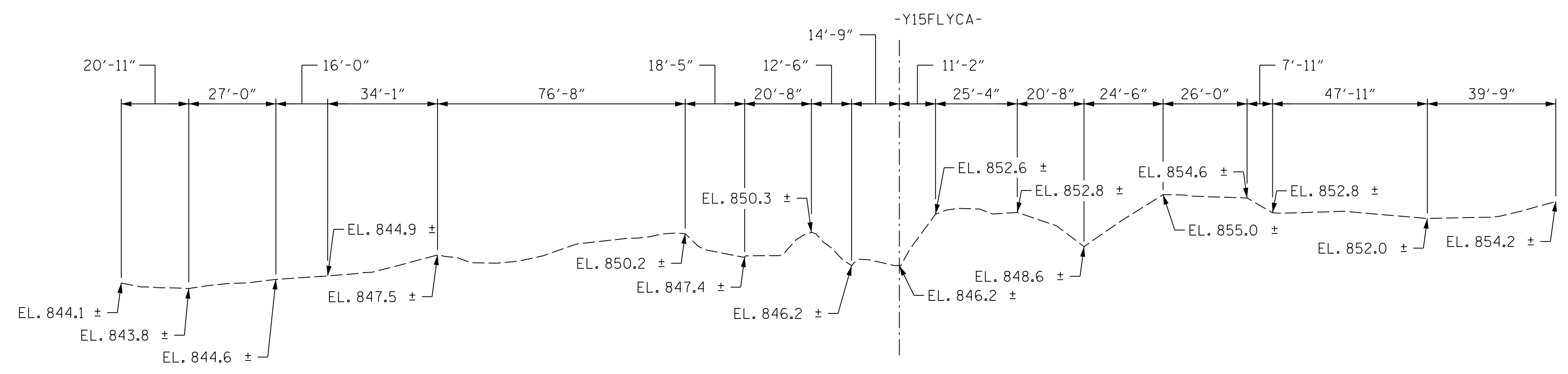


LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS

TOTAL STRUCTURE QUANTITIES	
CLASS A CONCRETE	
BARREL @ 0.889 C.Y./FT.	317.3 C.Y.
WINGS ETC.	33.8 C.Y.
TOTAL	351.1 C.Y.
REINFORCING STEEL	
BARREL, HEADWALLS	51,823 LBS.
WINGS	3,623 LBS.
TOTAL	55,446 LBS.
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	269 TONS
GEOTEXTILE FOR DRAINAGE	980 SY

HYDRAULIC DATA	
DESIGN DISCHARGE	= 150 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEVATION	= 856.7
DRAINAGE AREA	= 0.06 SQ. MI.
BASE DISCHARGE (Q100)	= 160 CFS
BASE HIGH WATER ELEVATION	= 856.9
OVERTOPPING FLOOD DATA	
OVERTOPPING DISCHARGE	= 575 CFS
FREQUENCY OF OVERTOPPING FLOOD	= >500 YR.
OVERTOPPING FLOOD ELEVATION	= 884.5



PROFILE ALONG CULVERT

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

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

NOTES

- ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
- DESIGN FILL = 40.35'
- FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTE SHEET.
- 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN THE 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 THE WING SHEETS.
- TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
- A 3 FOOT STRIP OF GEOTEXTILE SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO THE VARIOUS PAY ITEMS.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
- 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.
- AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- FOR BOX CULVERT EXCAVATION, SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.
- THE REINFORCED CONCRETE BOX CULVERT SHALL BE PLACED ON THE STANDARD 1.0 FOOT BLANKET OF FOUNDATION CONDITIONING MATERIAL.
- INSTALL TYPE 2 GEOTEXTILE ON THE SIDES AND TOP OF THE CULVERT FOR ITS ENTIRE LENGTH. OVERLAP GEOTEXTILES A MINIMUM OF 18 INCHES. ESTIMATED TYPE 2 GEOTEXTILE QUANTITY - 980 SYDS.
- THE REINFORCED CONCRETE BOX CULVERT SHALL BE CONSTRUCTED WITH 6 INCHES OF CAMBER TO ACCOUNT FOR ANTICIPATED SETTLEMENT.

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 43+66.60 -Y15FLYCA-
 SHEET 1 OF 5

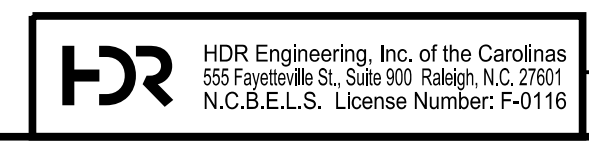


10/11/2021

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**SINGLE BARREL
 5 FT. X 6 FT.
 CONCRETE BOX CULVERT
 91°30'00" SKEW**

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

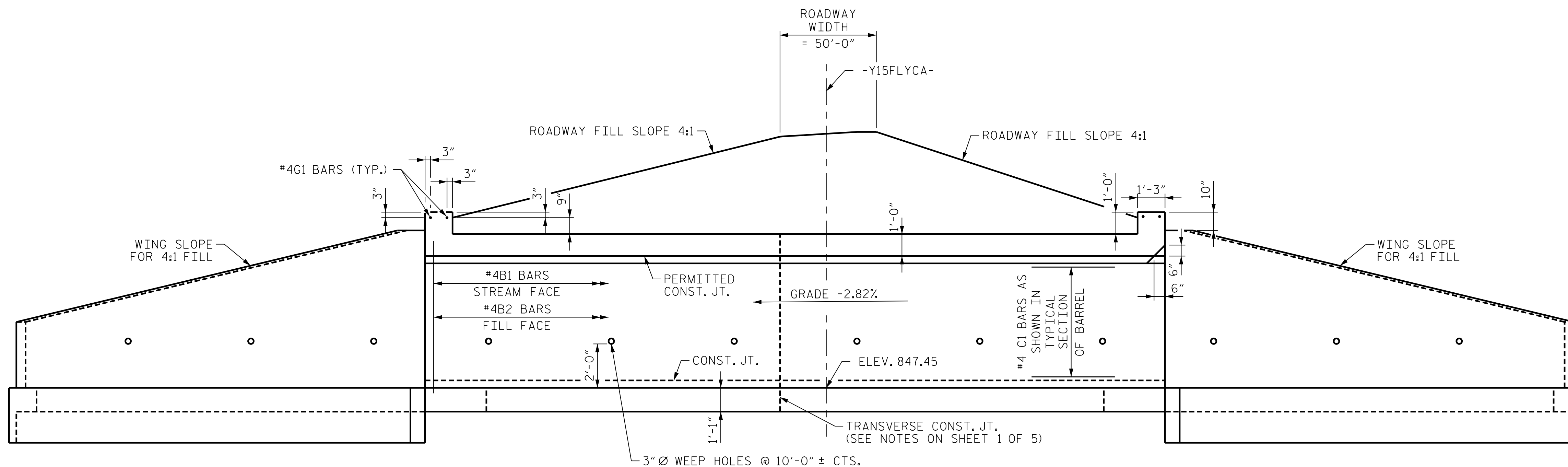
SHEET NO. C3-1
 TOTAL SHEETS 5



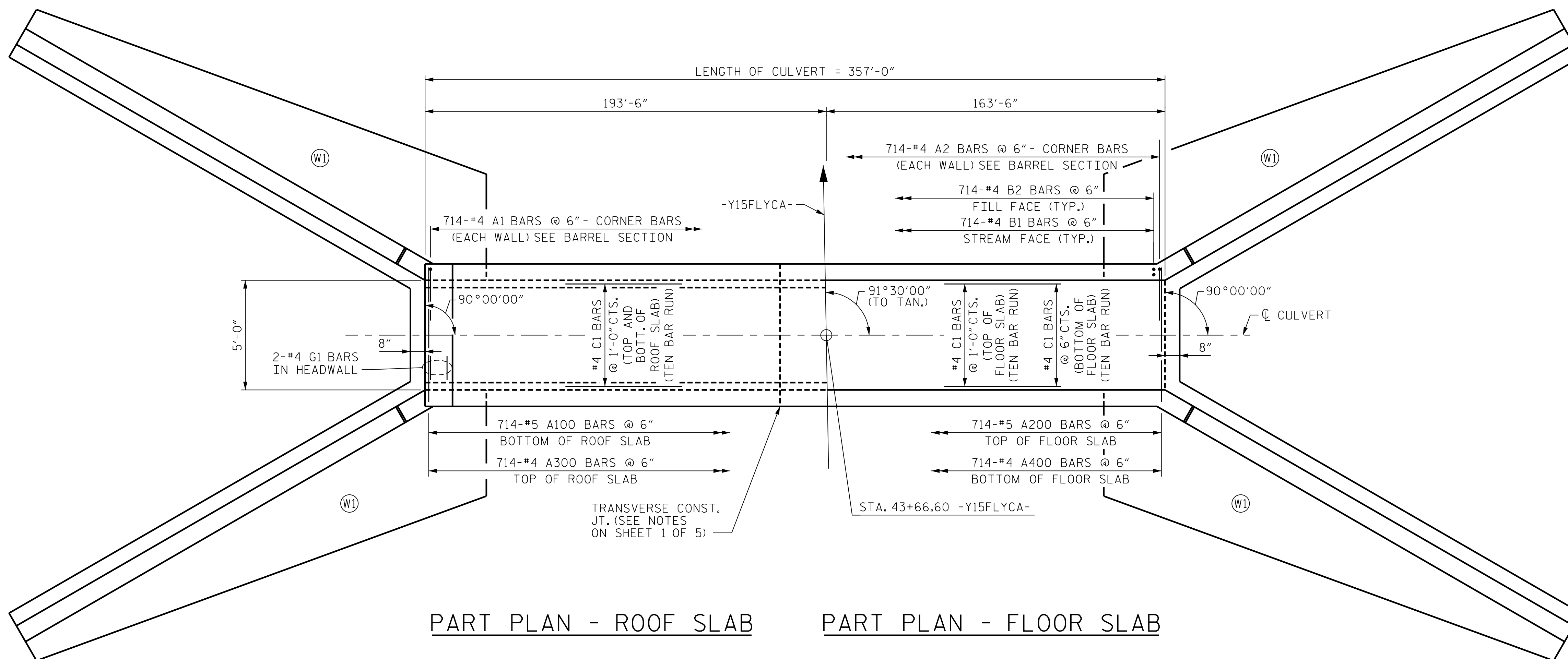
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DES BY: T. MCALEENAN	DATE: 10/19	DWG BY: T. MCALEENAN	DATE: 10/19
DES CHK: R. TURNAGE	DATE: 10/19	CHK BY: R. TURNAGE	DATE: 10/19



CULVERT SECTION NORMAL TO ROADWAY



PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 43+66.60 -Y15FLYCA-

SHEET 2 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE BARREL
 5 FT. X 6 FT.
 CONCRETE BOX CULVERT
 91°30'00" SKEW



10/11/2021

DES BY: T. MCALEENAN	DATE: 08/19	DWG BY: T. MCALEENAN	DATE: 08/19
DES CHK: R. TURNAGE	DATE: 08/19	CHK BY: R. TURNAGE	DATE: 08/19



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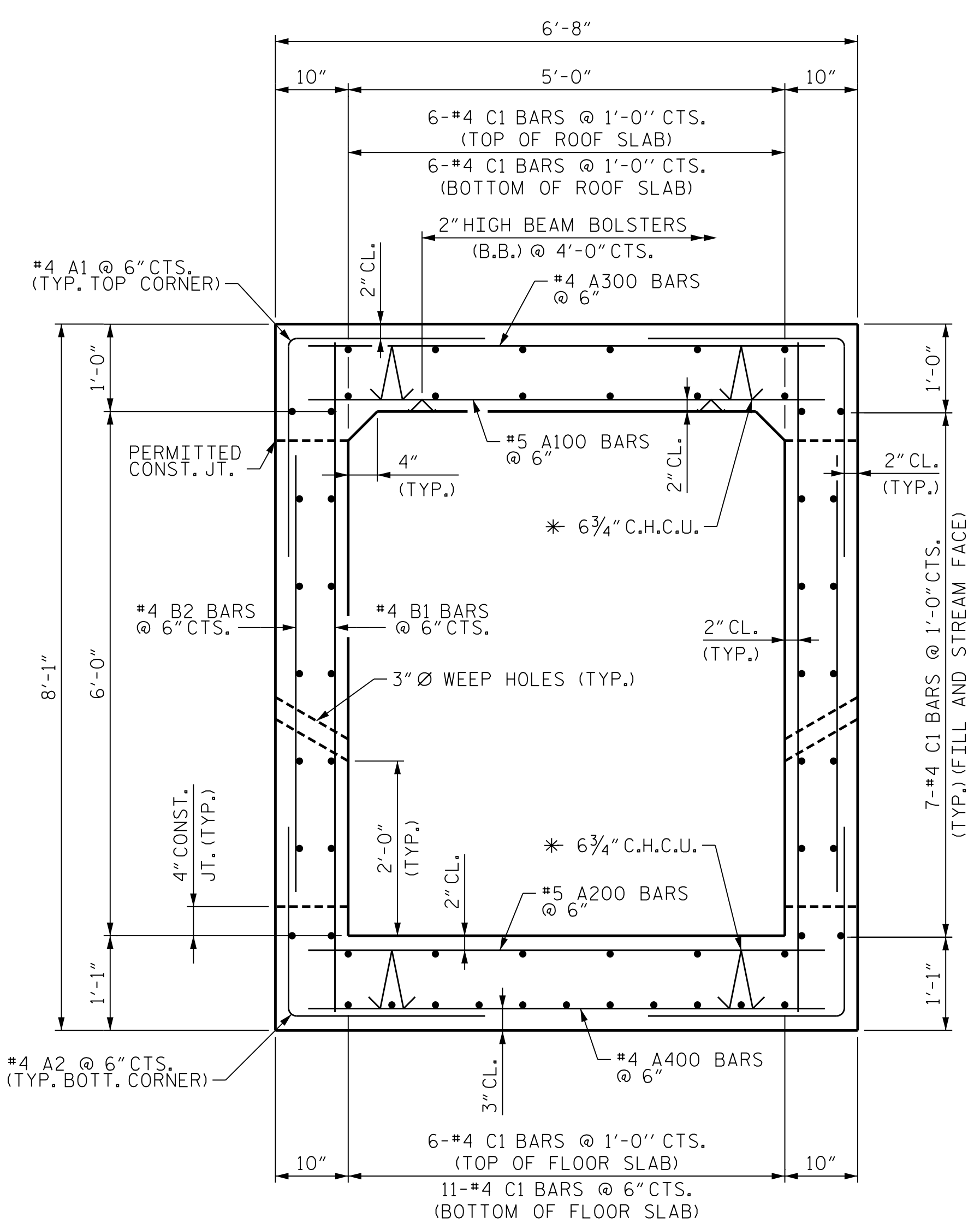
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1			3		
2			4		

SHEET NO. C3-2
 TOTAL SHEETS 5

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 FILE: ...PLAN AND ELEVATION

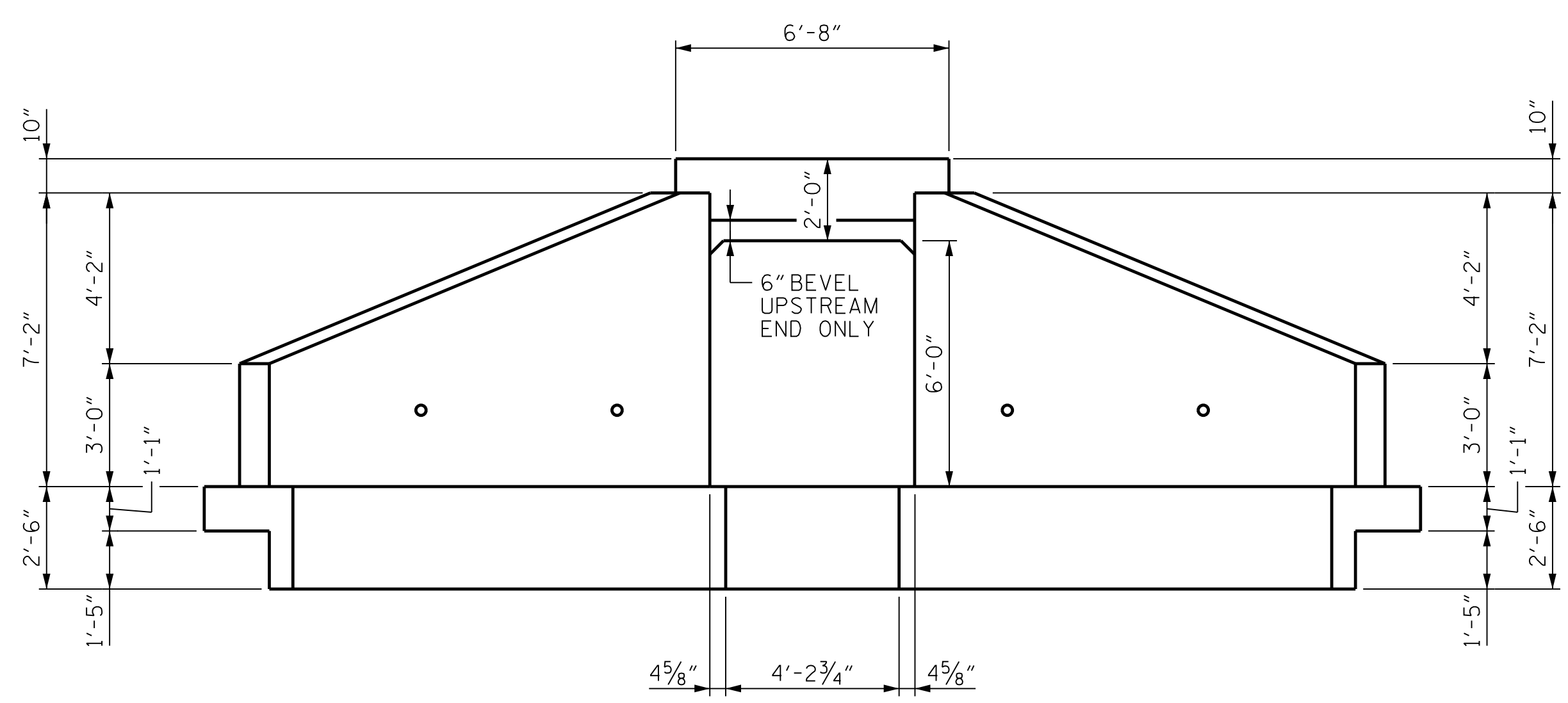
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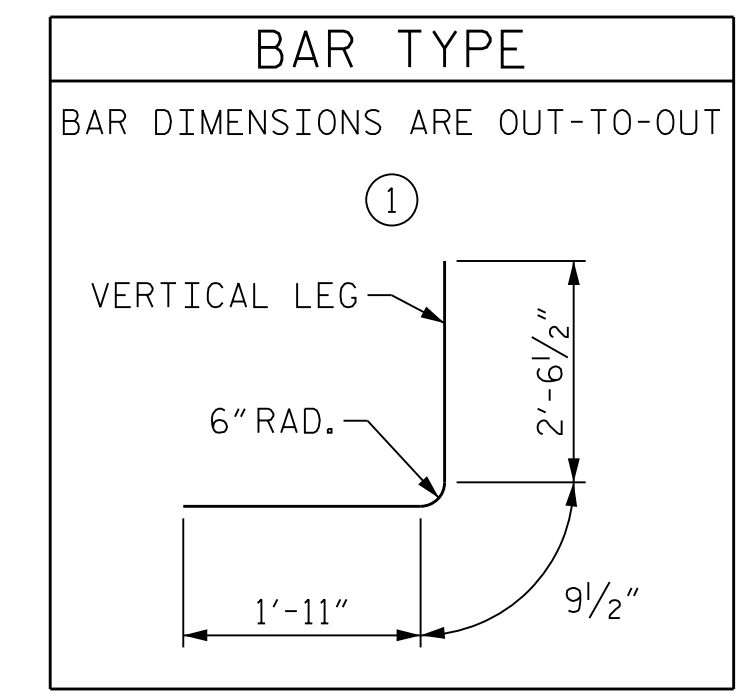
RIGHT ANGLE SECTION OF BARREL

THERE ARE 57 "C" BARS IN SECTION OF BARREL
 * ALL CONTINUOUS HIGH CHAIR UPPER (C.H.C.U.) @ 3'-0" CTS.



END ELEVATION

REINFORCING STEEL BAR SCHEDULE					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	1428	#4	1	5'-3"	5008
A2	1428	#4	1	5'-3"	5008
A100	714	#5	STR	6'-3"	4654
A200	714	#5	STR	6'-3"	4654
A300	714	#4	STR	6'-3"	2981
A400	714	#4	STR	6'-3"	2981
B1	1428	#4	STR	7'-8"	7313
B2	1428	#4	STR	5'-0"	4770
C1	570	#4	STR	37'-11"	14437
G1	4	#4	STR	6'-4"	17
REINFORCING STEEL				51,823 LBS	
CLASS A CONCRETE				CULVERT	
				317.3 C.Y.	

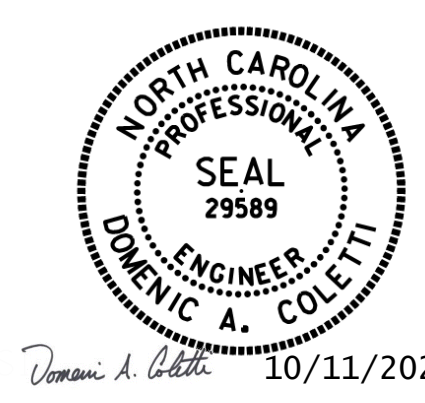


SPLICE LENGTH CHART		
BAR	SIZE	SPLICE LENGTH
B1	#4	1'-10"
C1	#4	2'-5"

PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 43+66.60 -Y15FLYCA-
 SHEET 3 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

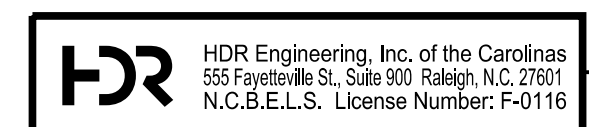
**SINGLE BARREL
 5 FT. X 6 FT.
 CONCRETE BOX CULVERT
 91°30'00" SKEW**



10/11/2021

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

SHEET NO. C3-3
 TOTAL SHEETS 5

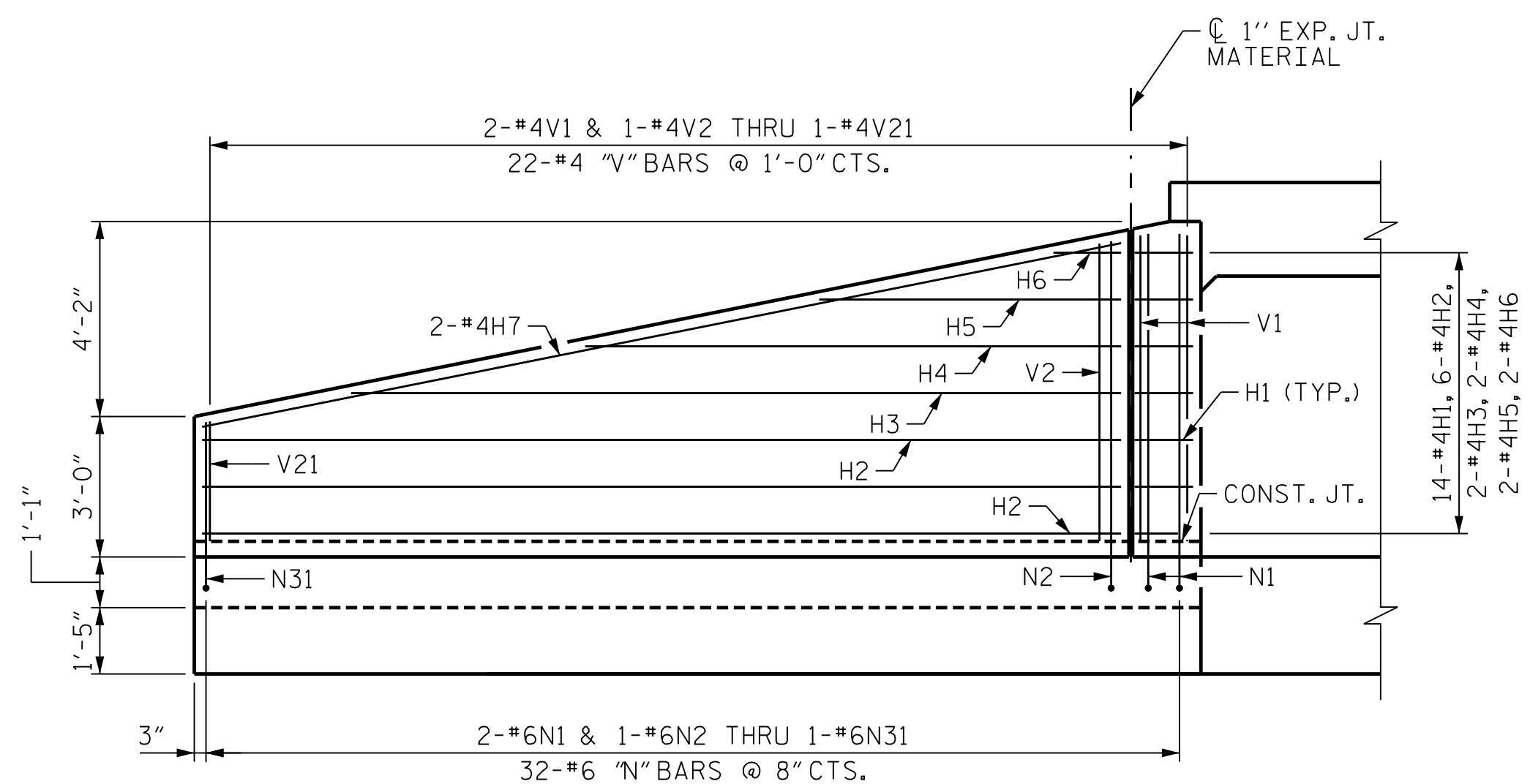


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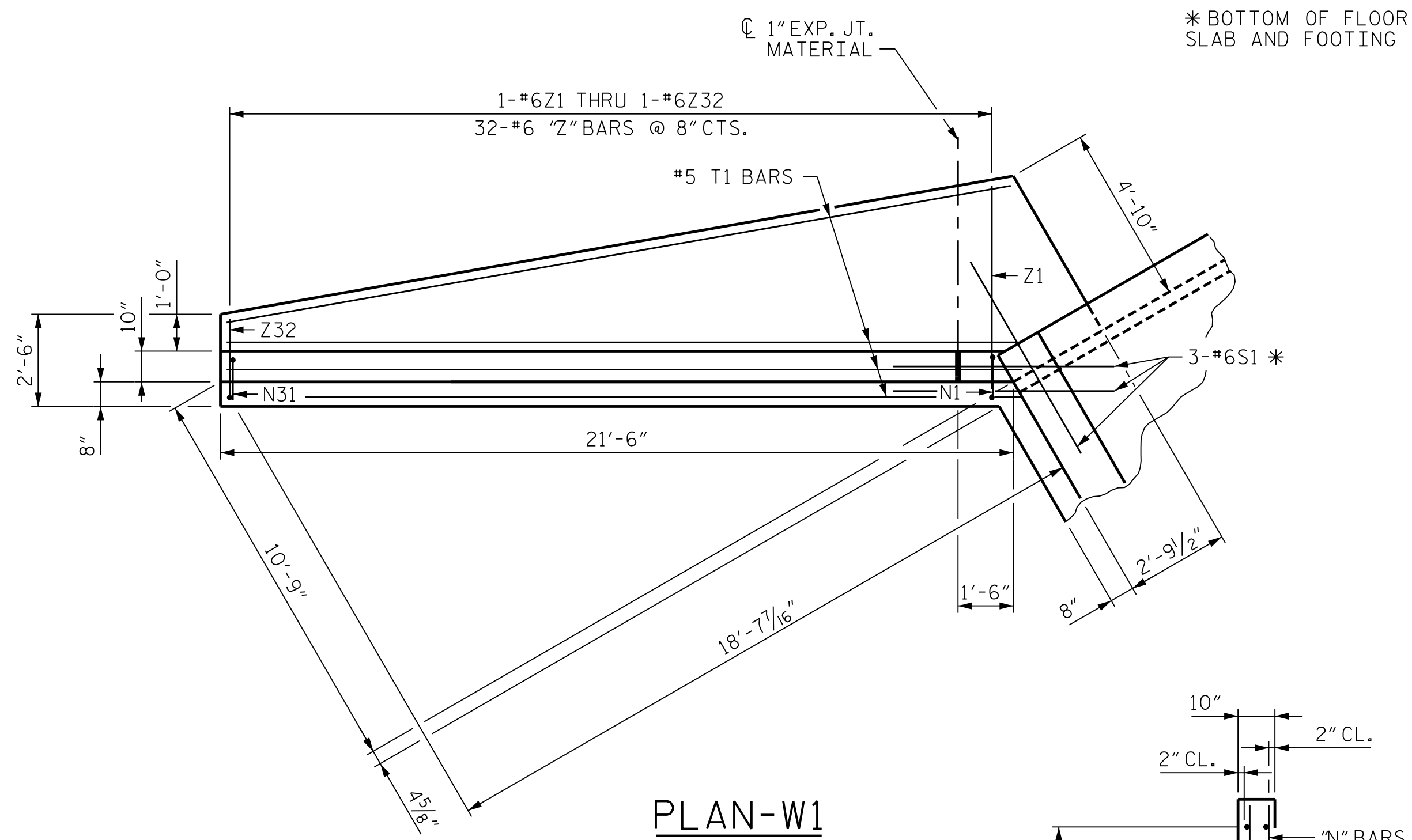
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 FILE: ... \CROSS SECTION AND BAR LIST

DES BY: T. MCALEENAN	DATE: 10/19	DWG BY: T. MCALEENAN	DATE: 10/19
DES CHK: R. TURNAGE	DATE: 10/19	CHK BY: R. TURNAGE	DATE: 10/19

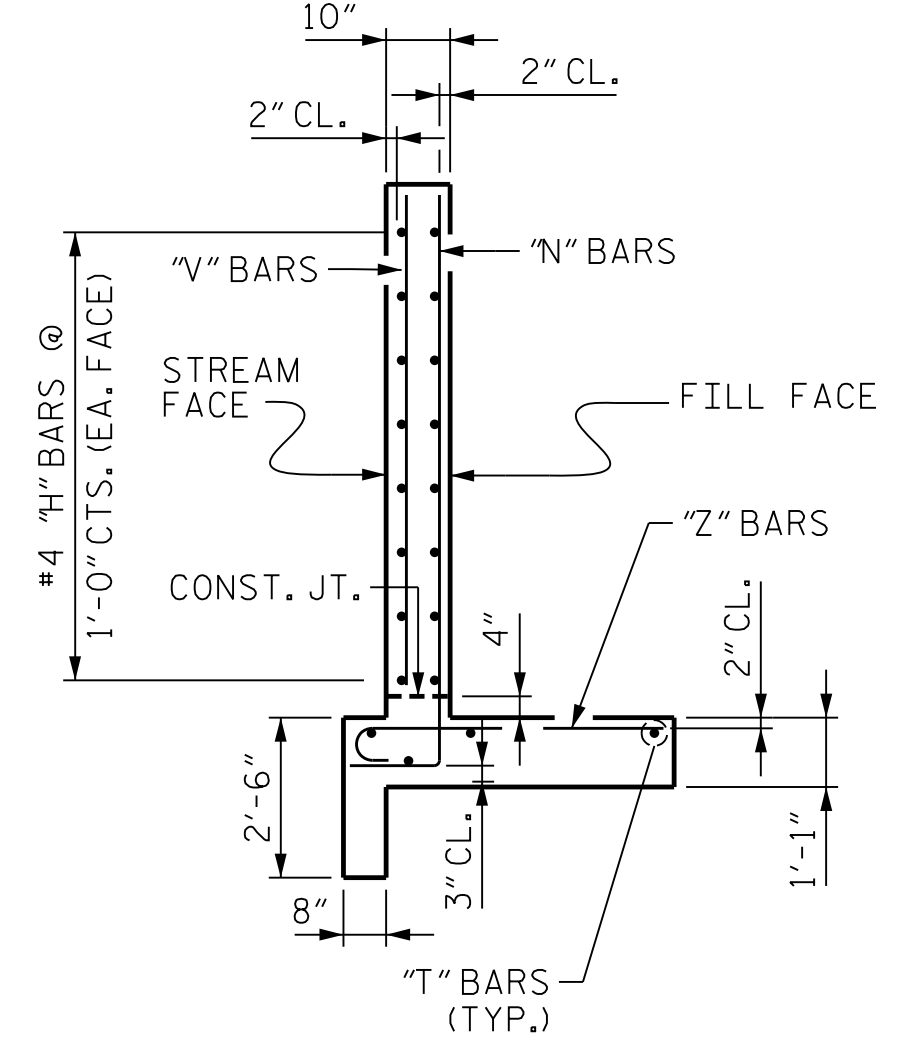
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ELEVATION-W1



PLAN-W1

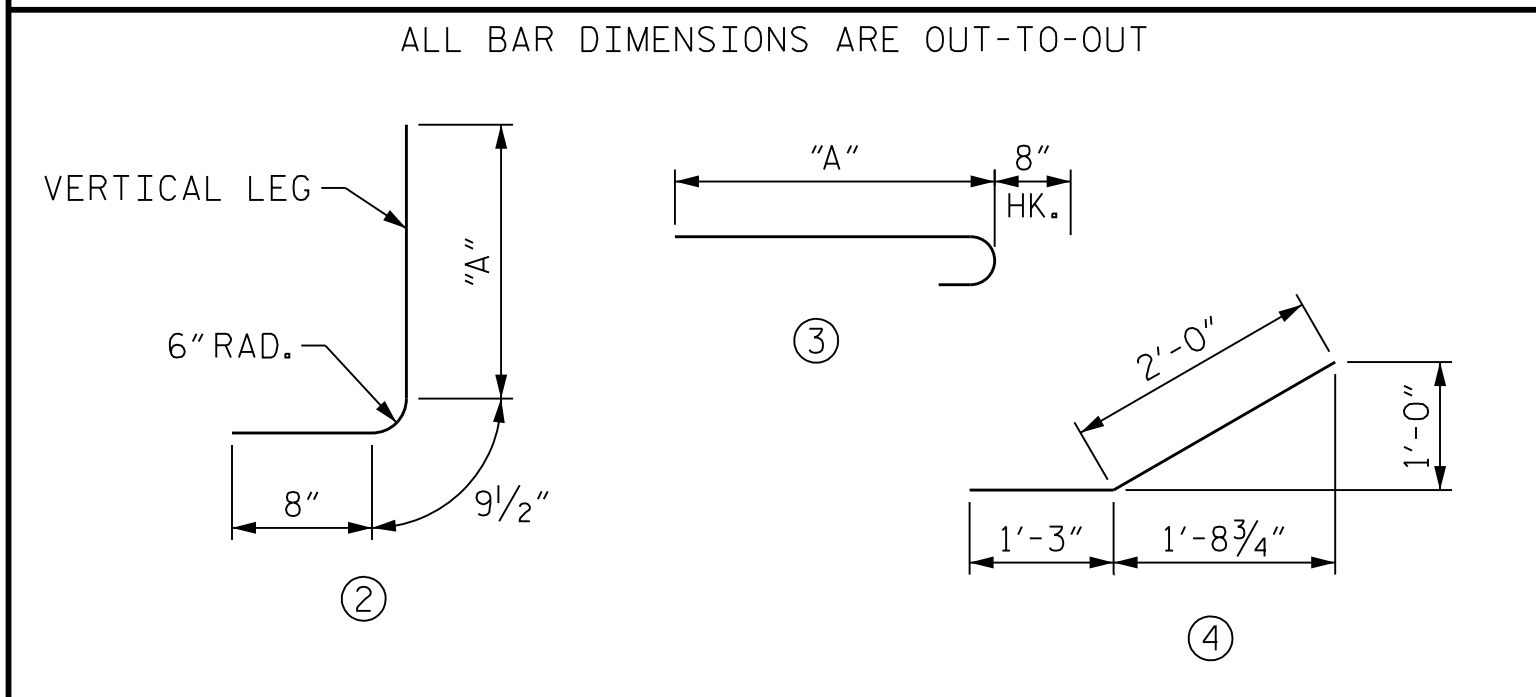


TYPICAL WING SECTION

REINFORCING BAR SCHEDULE

BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT
H1	56	# 4	4	-	3' - 3"	122	V1	8	# 4	STR	-	6' - 6"	35
H2	24	# 4	STR	-	19' - 7"	314	V2	4	# 4	STR	-	6' - 4"	17
H3	8	# 4	STR	-	16' - 5"	88	V3	4	# 4	STR	-	6' - 2"	16
H4	8	# 4	STR	-	11' - 5"	61	V4	4	# 4	STR	-	5' - 11"	16
H5	8	# 4	STR	-	6' - 5"	34	V5	4	# 4	STR	-	5' - 9"	15
H6	8	# 4	STR	-	1' - 5"	8	V6	4	# 4	STR	-	5' - 7"	15
H7	8	# 4	STR	-	20' - 0"	107	V7	4	# 4	STR	-	5' - 4"	14
							V8	4	# 4	STR	-	5' - 2"	14
N1	8	# 6	2	7' - 0 1/2"	8' - 6"	103	V9	4	# 4	STR	-	4' - 11"	13
N2	4	# 6	2	6' - 10 1/2"	8' - 4"	50	V10	4	# 4	STR	-	4' - 9"	13
N3	4	# 6	2	6' - 9 1/2"	8' - 3"	49	V11	4	# 4	STR	-	4' - 7"	12
N4	4	# 6	2	6' - 7 1/2"	8' - 1"	49	V12	4	# 4	STR	-	4' - 4"	12
N5	4	# 6	2	6' - 5 1/2"	7' - 11"	48	V13	4	# 4	STR	-	4' - 2"	11
N6	4	# 6	2	6' - 4 1/2"	7' - 10"	47	V14	4	# 4	STR	-	3' - 11"	11
N7	4	# 6	2	6' - 2 1/2"	7' - 8"	46	V15	4	# 4	STR	-	3' - 9"	10
N8	4	# 6	2	6' - 1 1/2"	7' - 7"	45	V16	4	# 4	STR	-	3' - 7"	10
N9	4	# 6	2	5' - 11 1/2"	7' - 5"	45	V17	4	# 4	STR	-	3' - 4"	9
N10	4	# 6	2	5' - 9 1/2"	7' - 3"	44	V18	4	# 4	STR	-	3' - 2"	8
N11	4	# 6	2	5' - 8 1/2"	7' - 2"	43	V19	4	# 4	STR	-	2' - 11"	8
N12	4	# 6	2	5' - 6 1/2"	7' - 0"	42	V20	4	# 4	STR	-	2' - 9"	7
N13	4	# 6	2	5' - 5 1/2"	6' - 11"	41	V21	4	# 4	STR	-	2' - 7"	7
N14	4	# 6	2	5' - 3 1/2"	6' - 9"	41							
N15	4	# 6	2	5' - 1 1/2"	6' - 7"	40	Z1	4	# 6	3	5' - 9"	6' - 5"	39
N16	4	# 6	2	5' - 0 1/2"	6' - 6"	39	Z2	4	# 6	3	5' - 7"	6' - 3"	38
N17	4	# 6	2	4' - 10 1/2"	6' - 4"	38	Z3	4	# 6	3	5' - 6"	6' - 2"	37
N18	4	# 6	2	4' - 9 1/2"	6' - 3"	37	Z4	4	# 6	3	5' - 4"	6' - 0"	36
N19	4	# 6	2	4' - 7 1/2"	6' - 1"	37	Z5	4	# 6	3	5' - 3"	5' - 11"	36
N20	4	# 6	2	4' - 5 1/2"	5' - 11"	36	Z6	4	# 6	3	5' - 2"	5' - 10"	35
N21	4	# 6	2	4' - 4 1/2"	5' - 10"	35	Z7	4	# 6	3	5' - 0"	5' - 8"	34
N22	4	# 6	2	4' - 2 1/2"	5' - 8"	34	Z8	4	# 6	3	4' - 11"	5' - 7"	34
N23	4	# 6	2	4' - 1 1/2"	5' - 7"	33	Z9	4	# 6	3	4' - 9"	5' - 5"	33
N24	4	# 6	2	3' - 11 1/2"	5' - 5"	33	Z10	4	# 6	3	4' - 8"	5' - 4"	32
N25	4	# 6	2	3' - 9 1/2"	5' - 3"	32	Z11	4	# 6	3	4' - 7"	5' - 3"	31
N26	4	# 6	2	3' - 8 1/2"	5' - 2"	31	Z12	4	# 6	3	4' - 5"	5' - 1"	31
N27	4	# 6	2	3' - 6 1/2"	5' - 0"	30	Z13	4	# 6	3	4' - 4"	5' - 0"	30
N28	4	# 6	2	3' - 5 1/2"	4' - 11"	29	Z14	4	# 6	3	4' - 2"	4' - 10"	29
N29	4	# 6	2	3' - 3 1/2"	4' - 9"	29	Z15	4	# 6	3	4' - 1"	4' - 9"	29
N30	4	# 6	2	3' - 1 1/2"	4' - 7"	28	Z16	4	# 6	3	4' - 0"	4' - 8"	28
N31	4	# 6	2	3' - 0 1/2"	4' - 6"	27	Z17	4	# 6	3	3' - 10"	4' - 6"	27
							Z18	4	# 6	3	3' - 9"	4' - 5"	27
S1	12	# 6	STR	-	6' - 0"	108	Z19	4	# 6	3	3' - 8"	4' - 4"	26
							Z20	4	# 6	3	3' - 6"	4' - 2"	25
T1	16	# 5	STR	-	21' - 7"	360	Z21	4	# 6	3	3' - 5"	4' - 1"	25
							Z22	4	# 6	3	3' - 3"	3' - 11"	24
							Z23	4	# 6	3	3' - 2"	3' - 10"	23
							Z24	4	# 6	3	3' - 1"	3' - 9"	23
							Z25	4	# 6	3	2' - 11"	3' - 7"	22
							Z26	4	# 6	3	2' - 10"	3' - 6"	21
							Z27	4	# 6	3	2' - 8"	3' - 4"	20
							Z28	4	# 6	3	2' - 7"	3' - 3"	20
							Z29	4	# 6	3	2' - 6"	3' - 2"	19
							Z30	4	# 6	3	2' - 4"	3' - 0"	18
							Z31	4	# 6	3	2' - 3"	2' - 11"	18
							Z32	4	# 6	3	2' - 1"	2' - 9"	17

BAR TYPES



QUANTITIES

REINFORCING STEEL FOR 4 WINGS	3623 LBS.
CLASS A CONCRETE	
4 WINGS	32.7 C.Y.
2 HEADWALL	0.6 C.Y.
2 END CURTAIN WALL	0.5 C.Y.
TOTAL	33.8 C.Y.

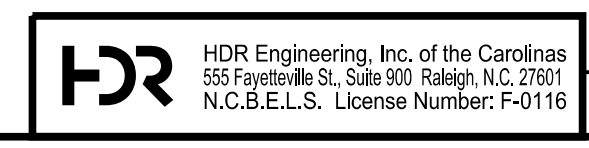
PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 43+66.60 -Y15FLYCA-
 SHEET 4 OF 5



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
WINGS FOR CONCRETE BOX CULVERT 90° SKEW

REVISIONS						SHEET NO. C3-4
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 5
2			4			

DES BY: T. MCALEENAN	DATE: 10/19	DWG BY: T. MCALEENAN	DATE: 10/19
DES CHK: R. TURNAGE	DATE: 10/19	CHK BY: R. TURNAGE	DATE: 10/19



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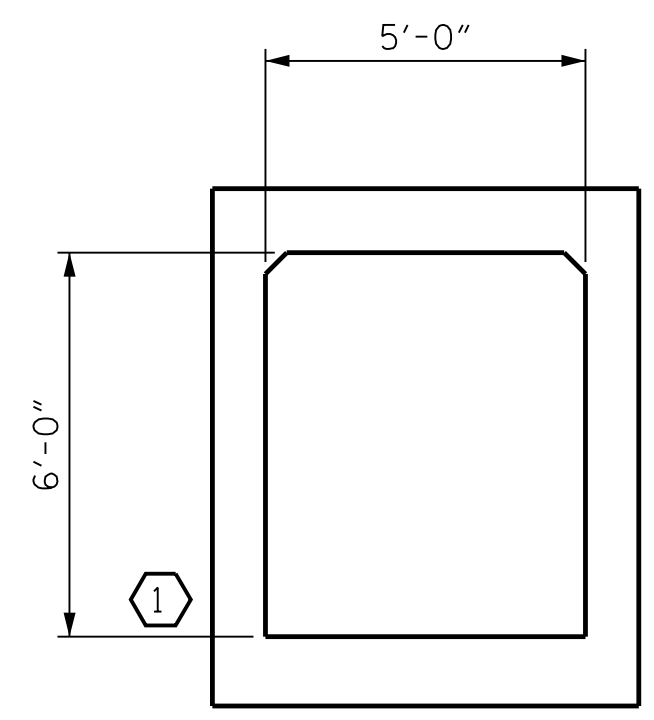
LOAD FACTORS:

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
WA	1.00	--

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS										
	CONTROLLING LOAD RATING	MINIMUM RATING FACTOR (RF)	STRENGTH I LIMIT STATE							
			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)
PERMANENT LOAD RATING	1	1.08	1.11	1	BOTTOM SLAB	3.33	1.08	1	EXTERIOR WALL	1.68

NOTES:
 RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
 THE EFFECTS OF LIVE LOAD ON DESIGN AND LOAD RATING MAY BE NEGLECTED FOR CULVERTS WITH CERTAIN FILL DEPTHS DESCRIBED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
 CULVERTS WITH NEGLIGIBLE LIVE LOAD SHOULD BE LOAD RATED FOR PERMANENT LOADS ONLY IN ACCORDANCE WITH THE AASHTO MANUAL FOR BRIDGE EVALUATION.



LRFR SUMMARY
(LOOKING DOWN STREAM)

PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 43+66.60 -Y15FLYCA-
 SHEET 5 OF 5

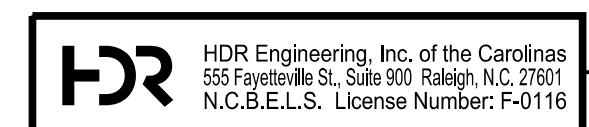
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

LRFR SUMMARY FOR
 REINFORCED CONCRETE
 BOX CULVERTS
 (DEEP FILLS)



Dominic A. Coletti 10/11/2021

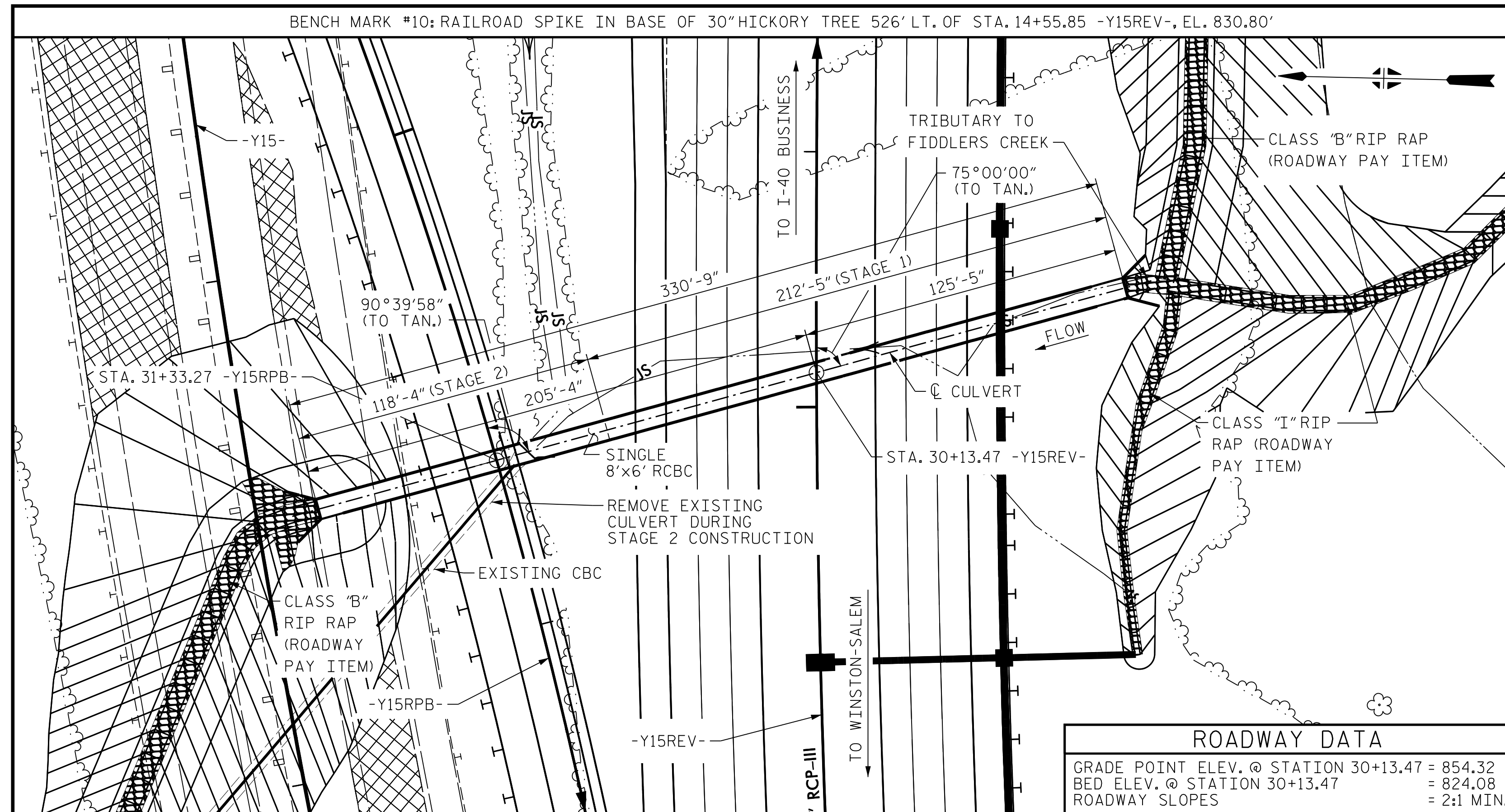
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NO.	BY:	DATE:	NO.	BY:	DATE:	TOTAL SHEETS 5
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2			4			



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DES BY: <u>T. MCALEENAN</u>	DATE: <u>10/19</u>	DWG BY: <u>T. MCALEENAN</u>	DATE: <u>10/19</u>
DES CHK: <u>R. TURNAGE</u>	DATE: <u>10/19</u>	CHK BY: <u>R. TURNAGE</u>	DATE: <u>10/19</u>

PLOT DRIVER: NCDOT_pdf_color_eng-50.ppt
 USER: PPETERSO DATE: 10/17/2021
 FILE: ...RATING SUMMARY



LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS

ROADWAY DATA	
GRADE POINT ELEV. @ STATION 30+13.47	= 854.32
BED ELEV. @ STATION 30+13.47	= 824.08
ROADWAY SLOPES	= 2:1 MIN.

HYDRAULIC DATA	
DESIGN DISCHARGE	= 370 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEVATION	= 831.24
DRAINAGE AREA	= 0.33 SQ. MI.
BASE DISCHARGE (Q100)	= 430 CFS
BASE HIGH WATER ELEVATION	= 831.93

OVERTOPPING FLOOD DATA	
OVERTOPPING DISCHARGE	= 1380 CFS
FREQUENCY OF OVERTOPPING FLOOD	= >500 YR.
OVERTOPPING FLOOD ELEVATION	= 851.93

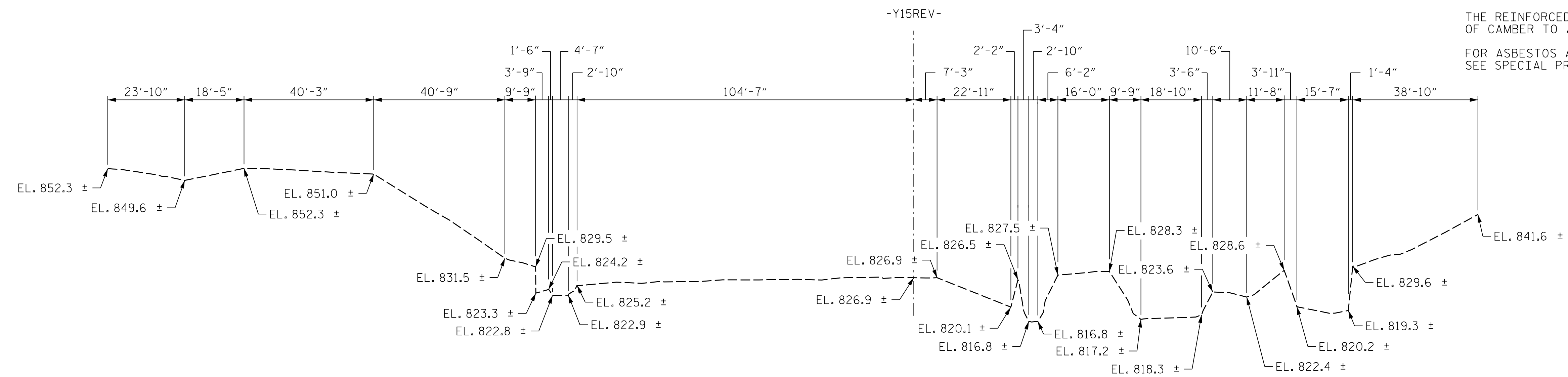
TOTAL STRUCTURE QUANTITIES	
CLASS A CONCRETE	
BARREL @ 1.078 C.Y./FT.	356.6 C.Y.
WINGS ETC.	22.6 C.Y.
TOTAL	379.2 C.Y.
REINFORCING STEEL	
BARREL, HEADWALLS	76,421 LBS.
WINGS	2,263 LBS.
TOTAL	78,684 LBS.
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	311 TONS
REMOVAL OF EXISTING STRUCTURE	LUMP SUM
GEOTEXTILE FOR DRAINAGE	990 SY
ASBESTOS ASSESSMENT	LUMP SUM

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 fy = 60 ksi.

NOTES

- ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
- DESIGN FILL = 26.33'
- FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTE SHEET.
- 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN THE 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 THE WING SHEETS.
- TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- A 3 FOOT STRIP OF GEOTEXTILE SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO THE VARIOUS PAY ITEMS.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
- 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.
- AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.
- TRAFFIC AND STREAM FLOW SHALL BE MAINTAINED THROUGH ALL STAGES OF CONSTRUCTION. THE CULVERT SHALL BE CONSTRUCTED IN STAGES AS SHOWN IN THE PLANS, AND IN ACCORDANCE WITH THE TRANSPORTATION MANAGEMENT PLAN (TMP).
- CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR APPROVAL A DETAILED DEMOLITION PLAN FOR THE REMOVAL OF THE EXISTING CULVERT PER SECTION 402 OF THE STANDARD SPECIFICATIONS AND AS INDICATED ON THE PLANS.
- FOR BOX CULVERT EXCAVATION, SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.
- THE REINFORCED CONCRETE BOX CULVERT SHALL BE PLACED ON THE STANDARD 1.0 FOOT BLANKET OF FOUNDATION CONDITIONING MATERIAL.
- INSTALL TYPE 2 GEOTEXTILE ON THE SIDES AND TOP OF THE CULVERT FOR ITS ENTIRE LENGTH. OVERLAP GEOTEXTILES A MINIMUM OF 18 INCHES. ESTIMATED TYPE 2 GEOTEXTILE QUANTITY - 990 SYDS.
- THE REINFORCED CONCRETE BOX CULVERT SHALL BE CONSTRUCTED WITH 4 INCHES OF CAMBER TO ACCOUNT FOR ANTICIPATED SETTLEMENT.
- FOR ASBESTOS ASSESSMENT FOR BRIDGE DEMOLITION AND RENOVATION ACTIVITIES, SEE SPECIAL PROVISIONS.



PROFILE ALONG CULVERT

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 30+13.47 -Y15REV-
 SHEET 1 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**SINGLE BARREL
 8 FT. X 6 FT.
 CONCRETE BOX CULVERT
 75° SKEW**

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

10/11/2021

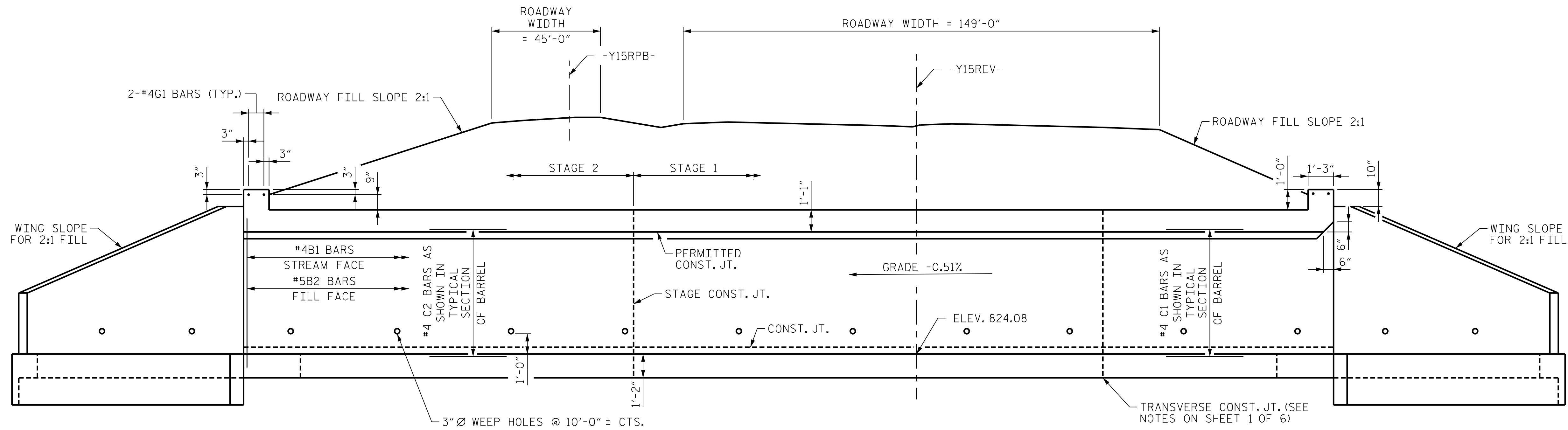
DR
 HDR Engineering, Inc. of the Carolinas
 555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
 N.C.B.E.L.S. License Number: F-0116

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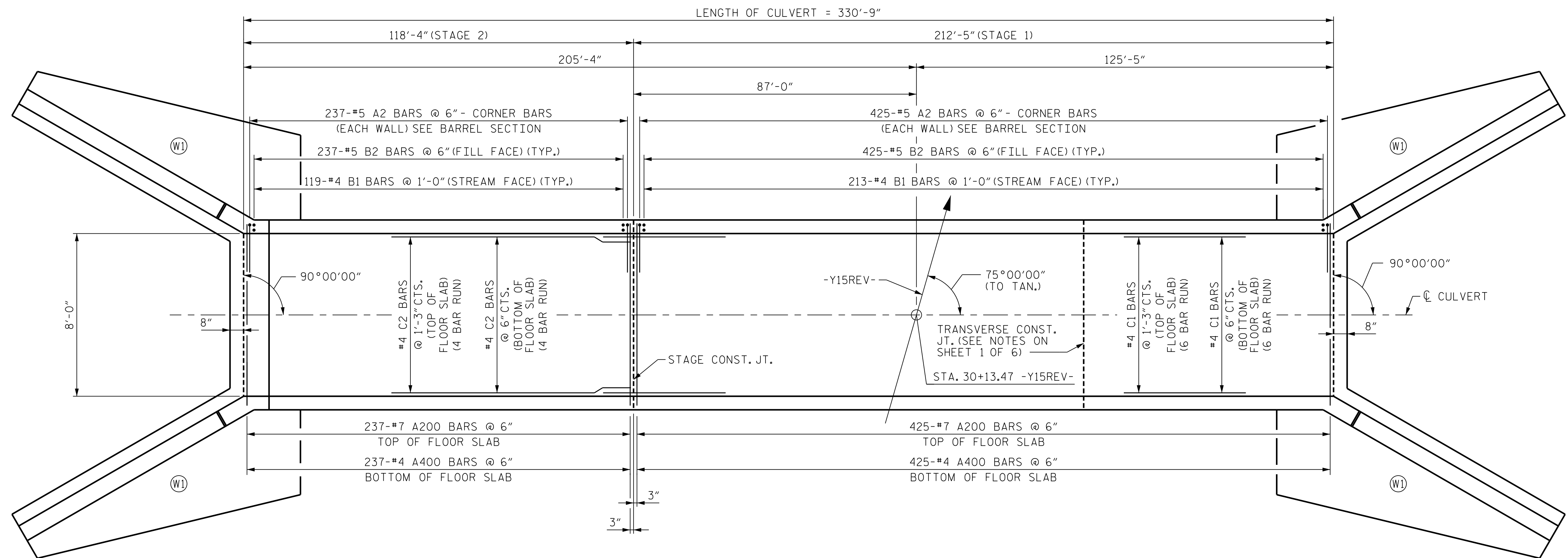
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 TOTAL SHEETS 6

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DES BY: T. MCALEENAN	DATE: 11/19	DWG BY: T. MCALEENAN	DATE: 11/19
DES CHK: R. TURNAGE	DATE: 11/19	CHK BY: R. TURNAGE	DATE: 11/19



CULVERT SECTION NORMAL TO ROADWAY

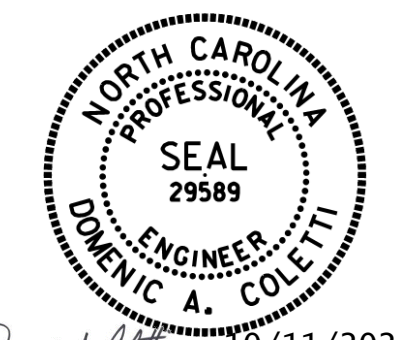


PLAN - FLOOR SLAB

PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 30+13.47 -Y15REV-
 SHEET 2 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

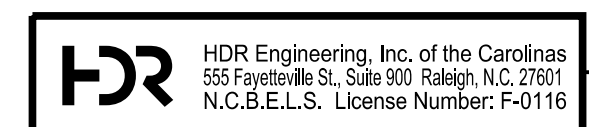
**SINGLE BARREL
 8 FT. X 6 FT.
 CONCRETE BOX CULVERT
 75° SKEW**



10/11/2021

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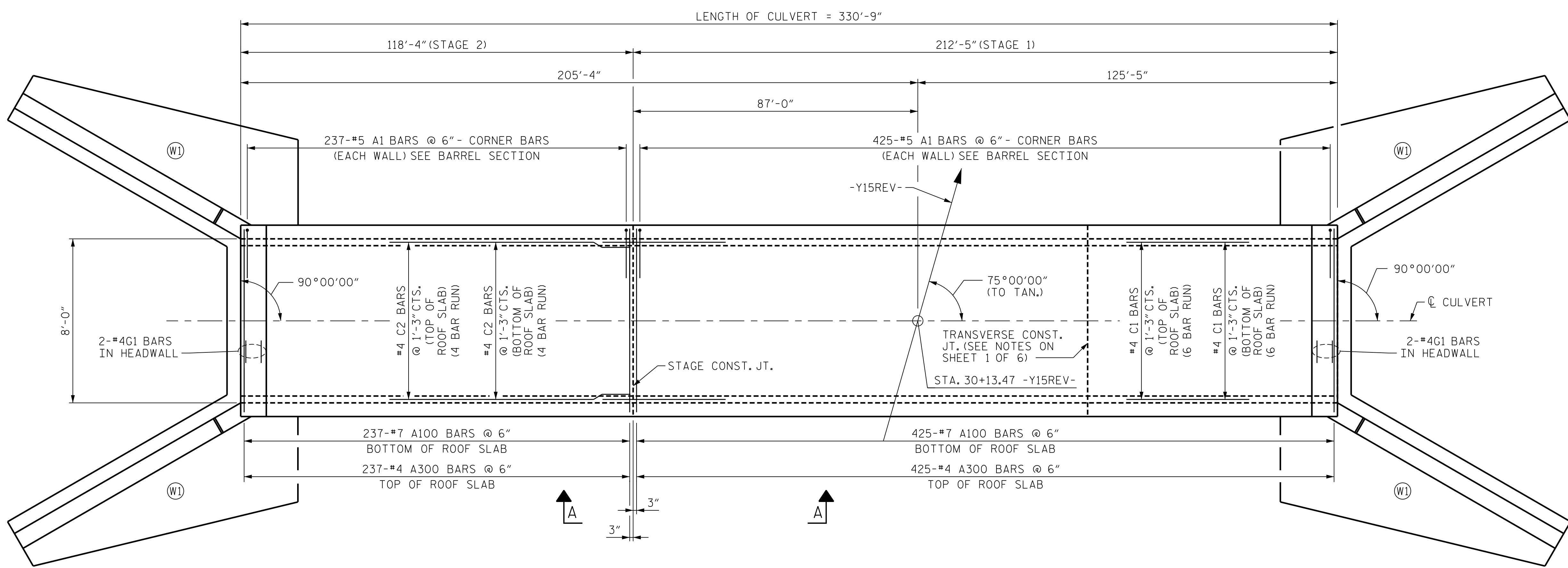
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DES CHK: R. TURNAGE	DATE: 11/19	CHK BY: R. TURNAGE	DATE: 11/19



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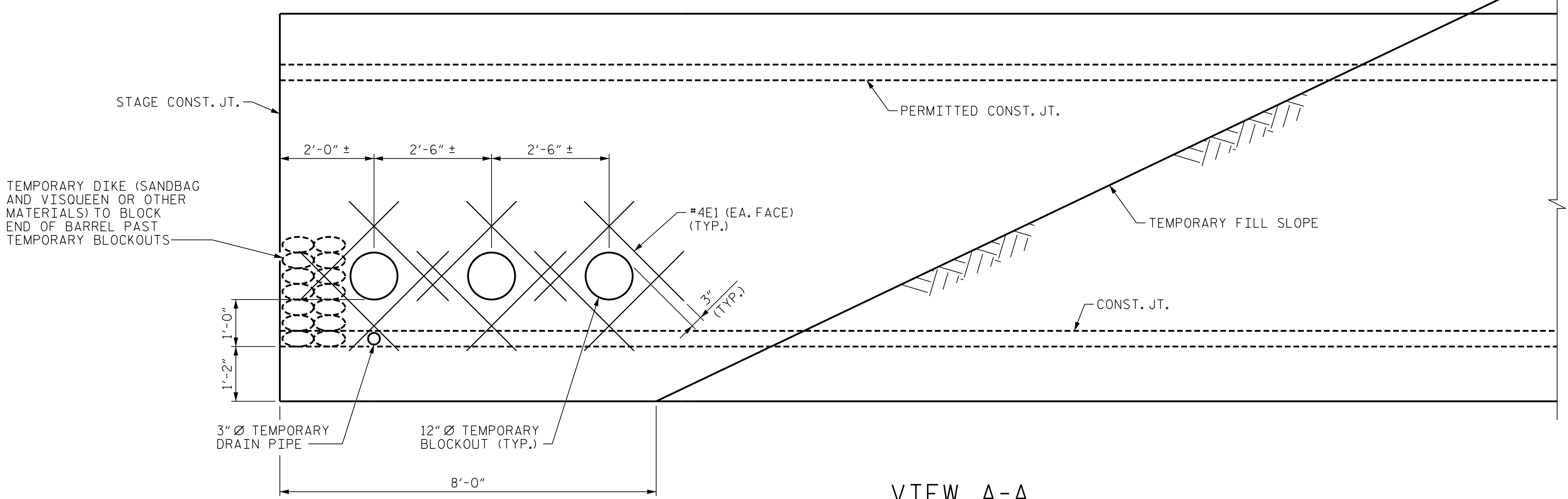
SHEET NO. C4-2
 TOTAL SHEETS 6



PLAN - ROOF SLAB

OPTIONAL TEMPORARY DRAIN DETAIL NOTES

1. THE OPTIONAL TEMPORARY DRAIN DETAIL IS INTENDED TO FACILITATE DIVERSION OF FLOW AROUND THE STAGE 2 WORK AREA USING 3 EA. 12" Ø DRAIN PIPES, WHICH WILL ACCOMMODATE THE FLOW ASSOCIATED WITH A 2-YEAR RECURRENCE INTERVAL STORM EVENT. IF A STORM EVENT MORE SEVERE THAN THE 2-YEAR EVENT IS FORECAST, SUSPEND CONSTRUCTION AND SECURE THE STAGE 2 WORK AREA. THE CONTRACTOR MAY SUBMIT AN ALTERNATE PLAN TO ADDRESS THE REQUIREMENT TO MAINTAIN FLOW DURING ALL STAGES OF CONSTRUCTION, SUBJECT TO REVIEW BY THE ENGINEER.
2. SEE EROSION CONTROL PLANS FOR ADDITIONAL DETAILS.
3. THE 3" Ø TEMPORARY PIPE DRAIN AND 12" Ø TEMPORARY BLOCKOUTS ARE TO BE FILLED WITH CLASS A CONCRETE AFTER STAGE 2 OF THE CULVERT IS COMPLETE AND HAS ACHIEVED A DESIGN STRENGTH OF 2400 PSI. ROUGHEN THE INSIDE SURFACE OF THE BLOCKOUTS AND APPLY AN APPROVED BONDING AGENT PRIOR TO FILLING WITH CLASS A CONCRETE.



VIEW A-A
OPTIONAL TEMPORARY DRAIN DETAIL
CUT OR BEND BARREL REINFORCING BARS AS NECESSARY FOR THE 12" Ø BLOCKOUTS

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 30+13.47 -Y15REV-
 SHEET 3 OF 6



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

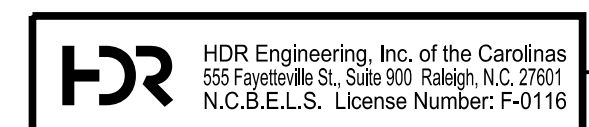
**SINGLE BARREL
 8 FT. X 6 FT.
 CONCRETE BOX CULVERT
 75° SKEW**

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

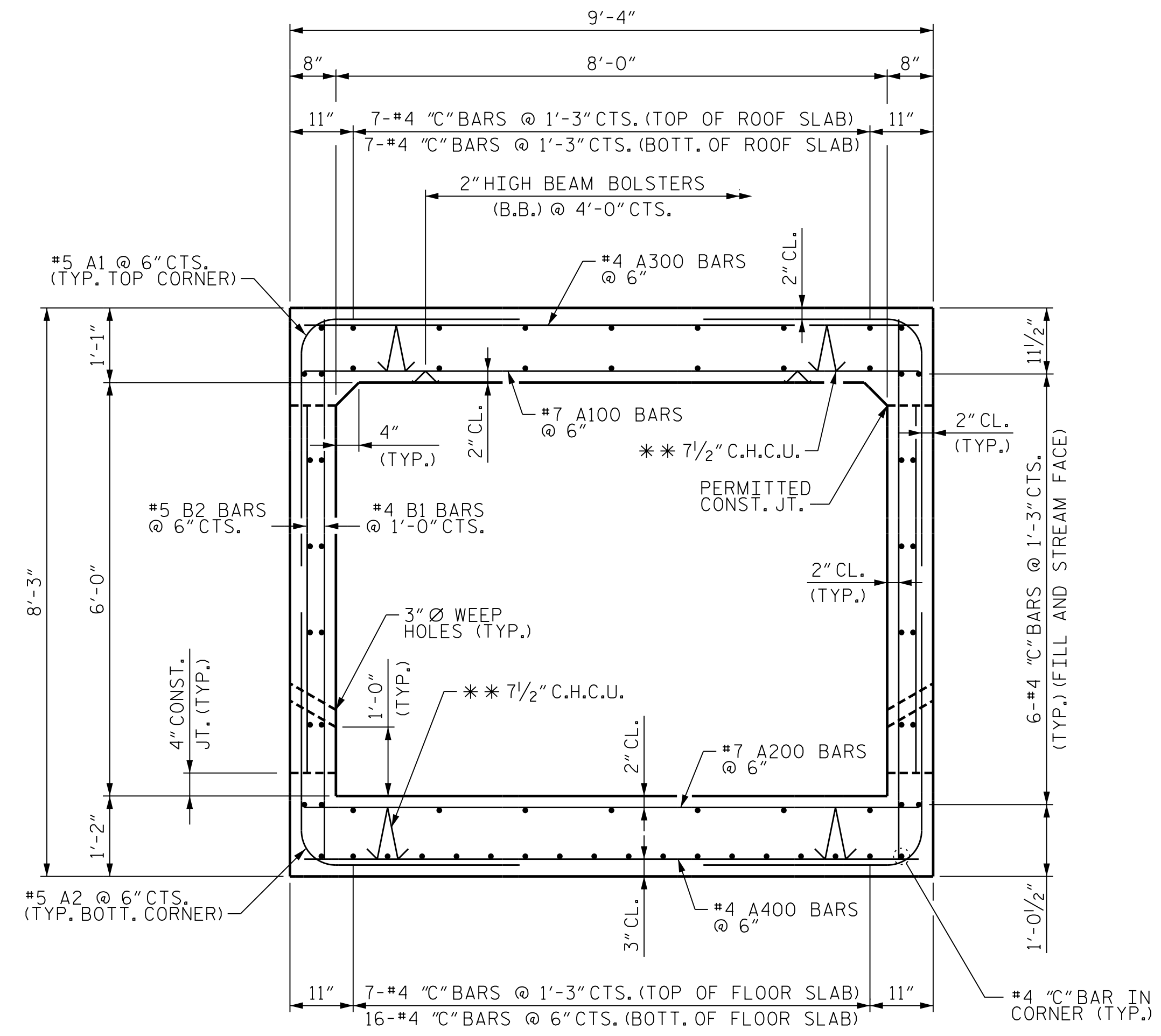
SHEET NO. C4-3
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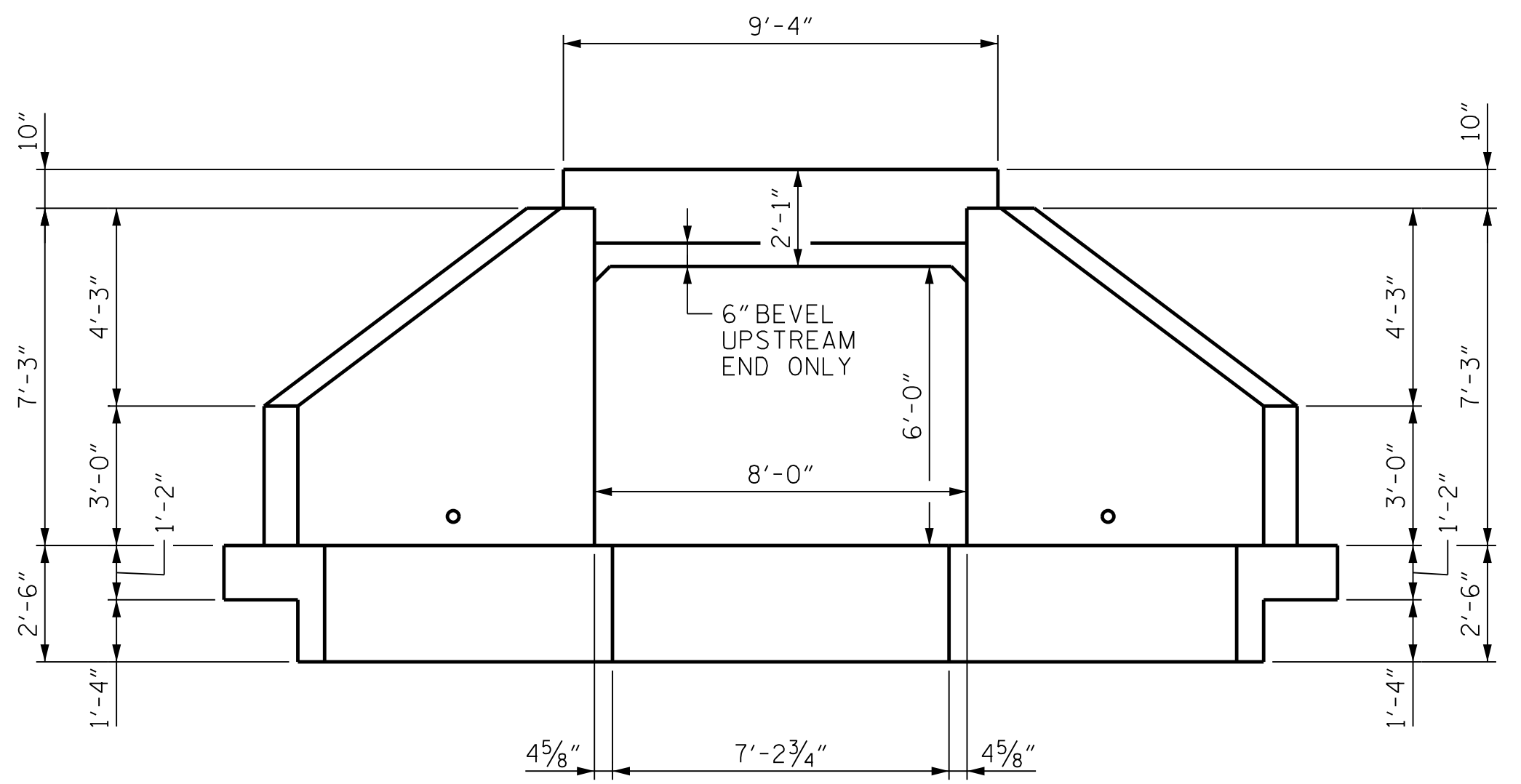
DES BY: <u>T. MCALEENAN</u>	DATE: <u>11/19</u>	DWG BY: <u>T. MCALEENAN</u>	DATE: <u>11/19</u>
DES CHK: <u>R. TURNAGE</u>	DATE: <u>11/19</u>	CHK BY: <u>R. TURNAGE</u>	DATE: <u>11/19</u>



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RIGHT ANGLE SECTION OF BARREL
THERE ARE 65 "C" BARS IN SECTION OF BARREL
** ALL CONTINUOUS HIGH CHAIR UPPER (C.H.C.U.) @ 3'-0" CTS.



END ELEVATION

REINFORCING STEEL BAR SCHEDULE STAGE 1

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	850	#5	1	6'-8"	5910
A2	850	#5	1	6'-8"	5910
A100	425	#7	STR	8'-11"	7746
A200	425	#7	STR	8'-11"	7746
A300	425	#4	STR	8'-11"	2531
A400	425	#4	STR	8'-11"	2531
B1	426	#4	STR	7'-10"	2229
B2	850	#5	STR	5'-2"	4581
C1	390	#4	STR	37'-10"	9856
E1	24	#4	STR	3'-0"	48
G1	2	#4	STR	9'-0"	12

REINFORCING STEEL (STAGE 1) 49,100 LBS

REINFORCING STEEL BAR SCHEDULE STAGE 2

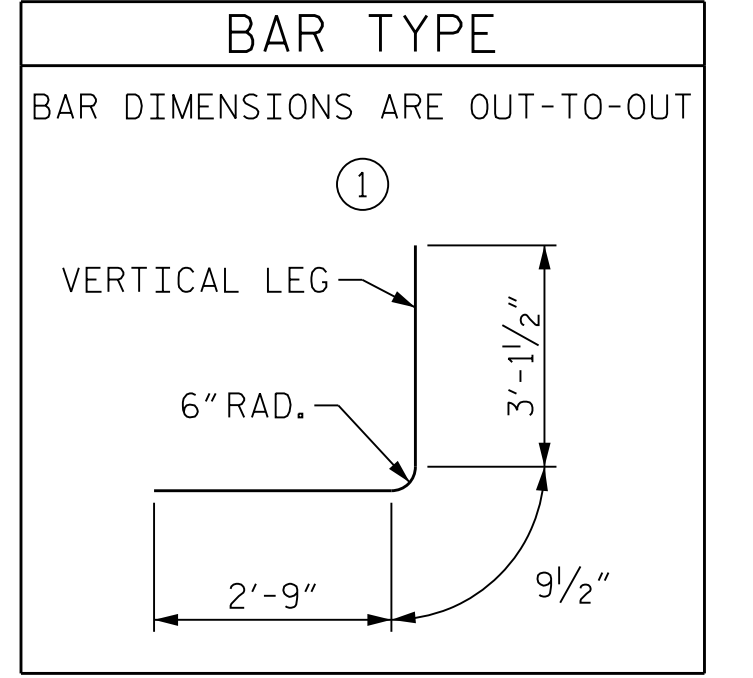
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	474	#5	1	6'-8"	3296
A2	474	#5	1	6'-8"	3296
A100	237	#7	STR	8'-11"	4319
A200	237	#7	STR	8'-11"	4319
A300	237	#4	STR	8'-11"	1412
A400	237	#4	STR	8'-11"	1412
B1	238	#4	STR	7'-10"	1245
B2	474	#5	STR	5'-2"	2554
C2	260	#4	STR	31'-5"	5456
G1	2	#4	STR	9'-0"	12

REINFORCING STEEL (STAGE 2) 27,321 LBS

CLASS A CONCRETE		
STAGE 1		229.0 C.Y.
STAGE 2		127.6 C.Y.
TOTAL		356.6 C.Y.

SPLICE LENGTH CHART

BAR	SIZE	SPLICE LENGTH
B1	#4	1'-10"
C1, C2	#4	2'-5"



PROJECT NO. U-2579AB
FORSYTH COUNTY
STATION: 30+13.47 -Y15REV-
SHEET 4 OF 6

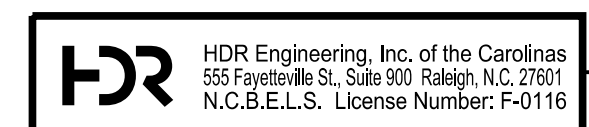


10/11/2021

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

**SINGLE BARREL
8 FT. X 6 FT.
CONCRETE BOX CULVERT
75° SKEW**

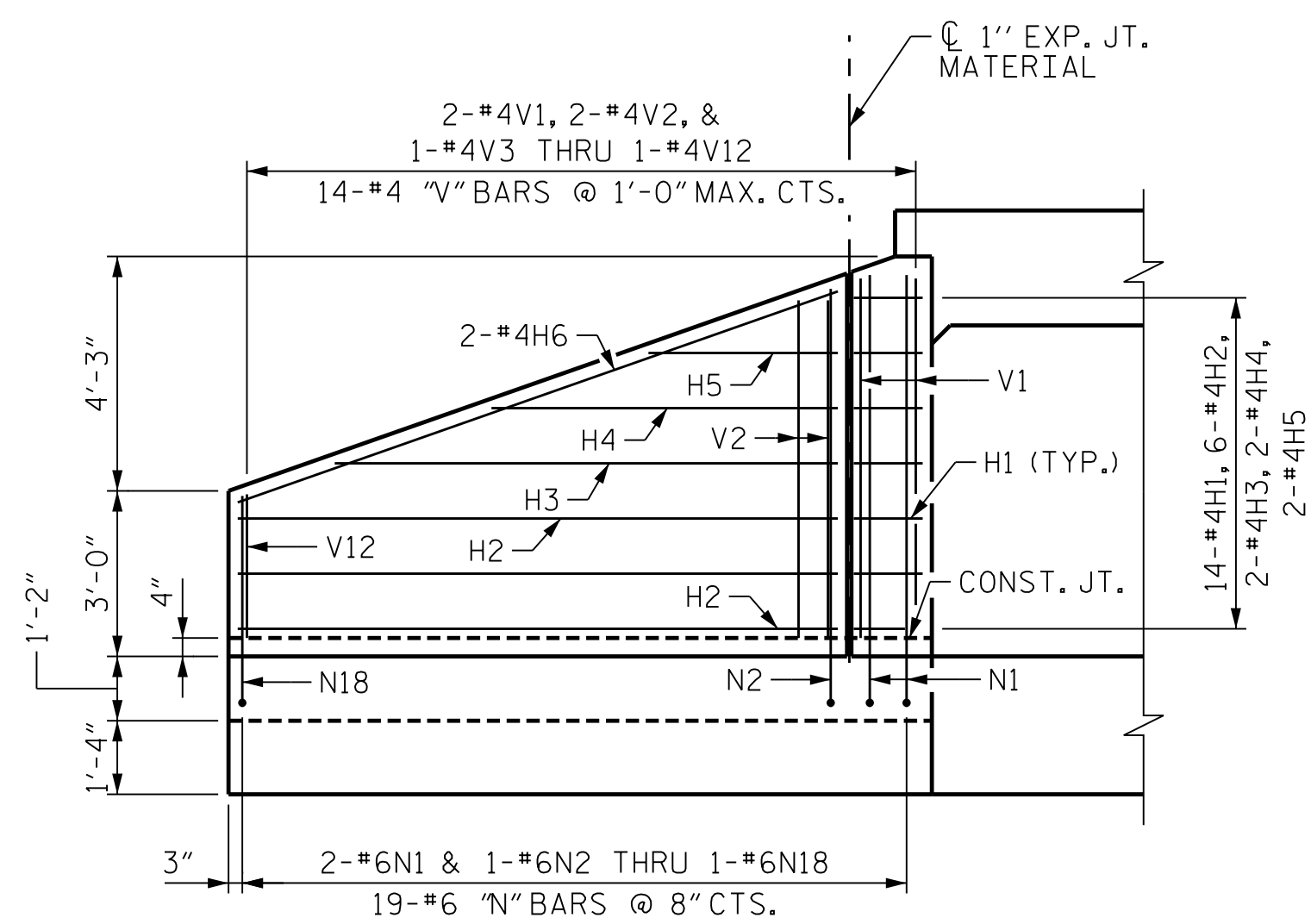
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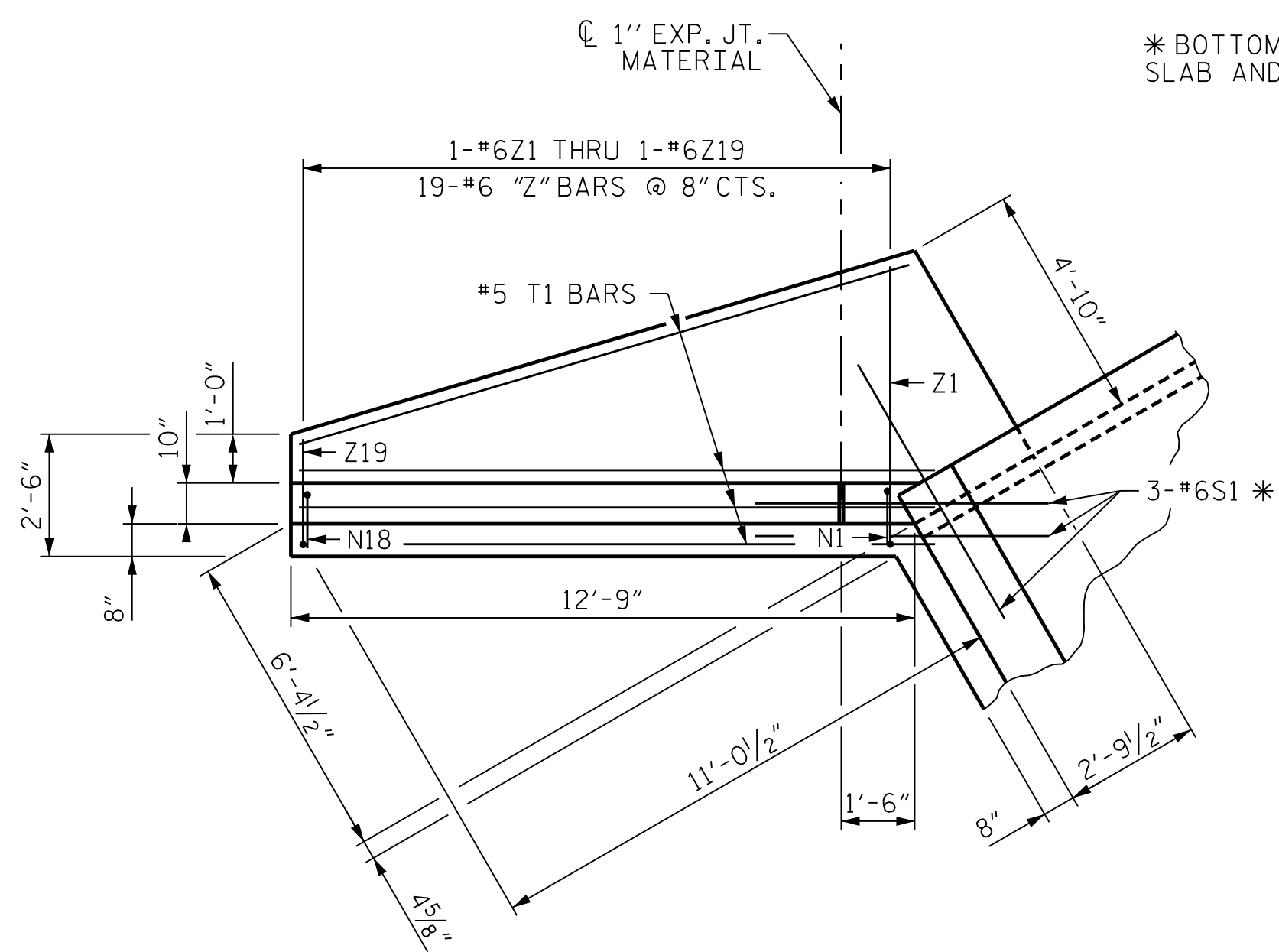
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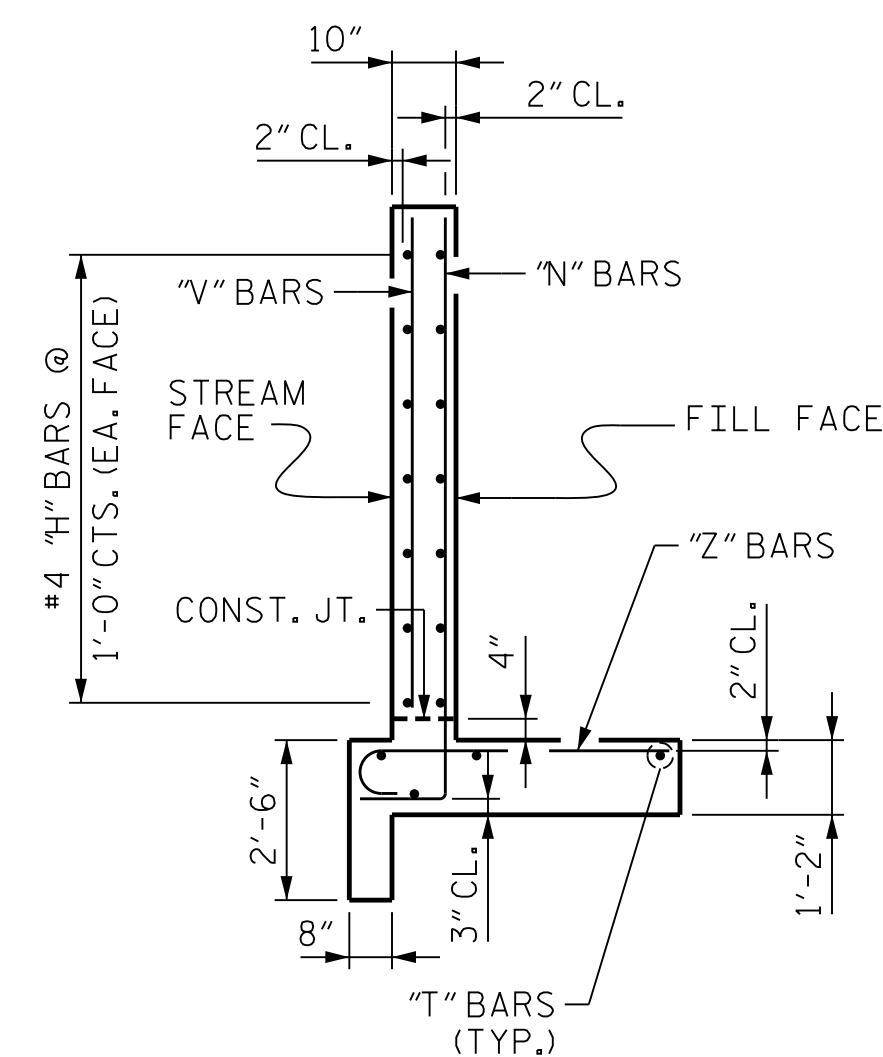
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DES CHK: R. TURNAGE	DATE: 11/19	CHK BY: R. TURNAGE	DATE: 11/19



ELEVATION-W1



PLAN-W1



TYPICAL WING SECTION

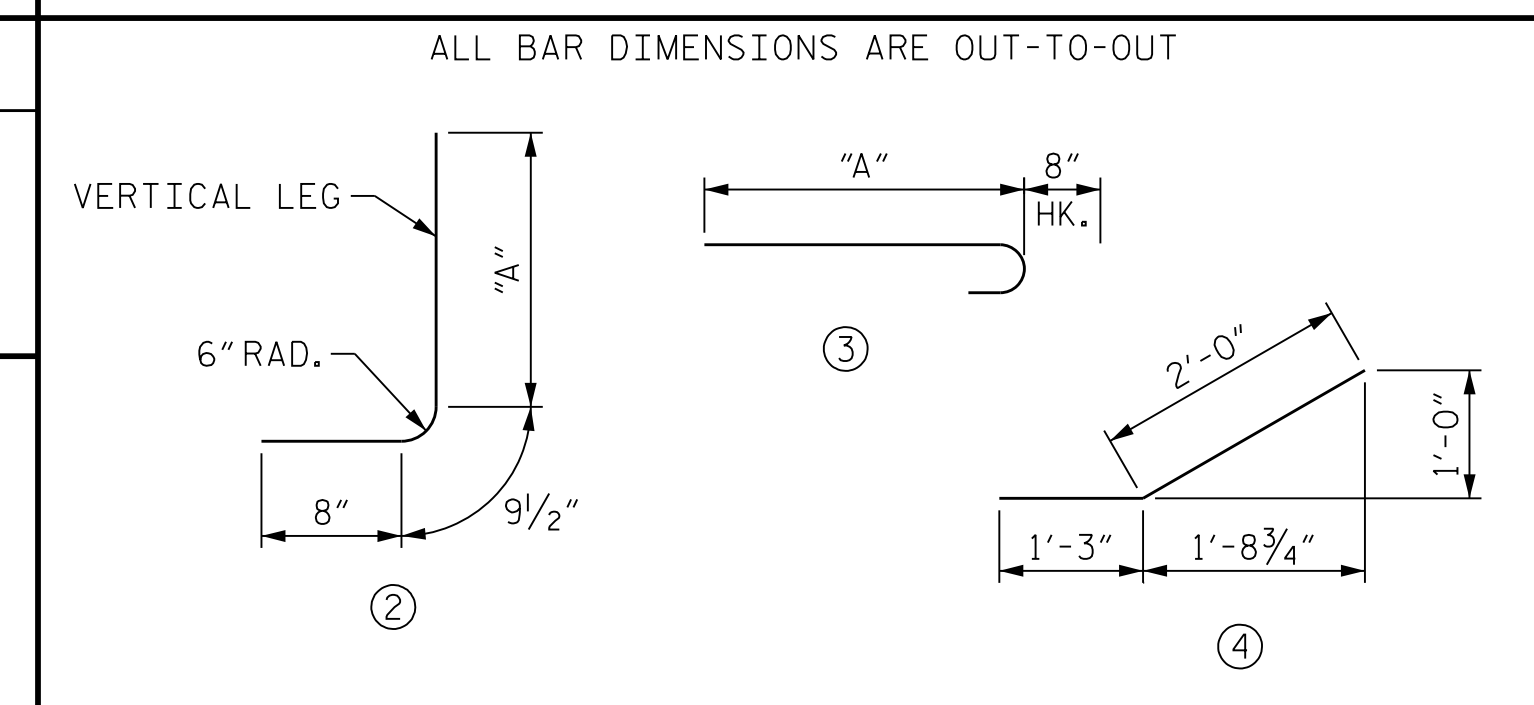
REINFORCING BAR SCHEDULE

BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT
H1	56	# 4	4	-	3' - 3"	122	V1	8	# 4	STR	-	6' - 6"	35
H2	24	# 4	STR	-	10' - 10"	174	V2	8	# 4	STR	-	6' - 1"	33
H3	8	# 4	STR	-	9' - 1"	49	V3	4	# 4	STR	-	5' - 9"	15
H4	8	# 4	STR	-	6' - 3"	33	V4	4	# 4	STR	-	5' - 5"	14
H5	8	# 4	STR	-	3' - 5"	18	V5	4	# 4	STR	-	5' - 1"	14
H6	8	# 4	STR	-	11' - 6"	61	V6	4	# 4	STR	-	4' - 8"	12
							V7	4	# 4	STR	-	4' - 4"	12
N1	8	# 6	2	7' - 2 1/2"	8' - 8"	104	V8	4	# 4	STR	-	4' - 0"	11
N2	4	# 6	2	6' - 11 1/2"	8' - 5"	51	V9	4	# 4	STR	-	3' - 8"	10
N3	4	# 6	2	6' - 8 1/2"	8' - 2"	49	V10	4	# 4	STR	-	3' - 3"	9
N4	4	# 6	2	6' - 6 1/2"	8' - 0"	48	V11	4	# 4	STR	-	2' - 11"	8
N5	4	# 6	2	6' - 3 1/2"	7' - 9"	47	V12	4	# 4	STR	-	2' - 7"	7
N6	4	# 6	2	6' - 0 1/2"	7' - 6"	45							
N7	4	# 6	2	5' - 9 1/2"	7' - 3"	44	Z1	4	# 6	3	5' - 8"	6' - 4"	38
N8	4	# 6	2	5' - 6 1/2"	7' - 0"	42	Z2	4	# 6	3	5' - 6"	6' - 2"	37
N9	4	# 6	2	5' - 3 1/2"	6' - 9"	41	Z3	4	# 6	3	5' - 3"	5' - 11"	36
N10	4	# 6	2	5' - 1 1/2"	6' - 7"	40	Z4	4	# 6	3	5' - 1"	5' - 9"	35
N11	4	# 6	2	4' - 10 1/2"	6' - 4"	38	Z5	4	# 6	3	4' - 10"	5' - 6"	33
N12	4	# 6	2	4' - 7 1/2"	6' - 1"	37	Z6	4	# 6	3	4' - 8"	5' - 4"	32
N13	4	# 6	2	4' - 4 1/2"	5' - 10"	35	Z7	4	# 6	3	4' - 6"	5' - 2"	31
N14	4	# 6	2	4' - 1 1/2"	5' - 7"	34	Z8	4	# 6	3	4' - 3"	4' - 11"	30
N15	4	# 6	2	3' - 11 1/2"	5' - 5"	33	Z9	4	# 6	3	4' - 1"	4' - 9"	29
N16	4	# 6	2	3' - 8 1/2"	5' - 2"	31	Z10	4	# 6	3	3' - 11"	4' - 7"	28
N17	4	# 6	2	3' - 5 1/2"	4' - 11"	30	Z11	4	# 6	3	3' - 8"	4' - 4"	26
N18	4	# 6	2	3' - 2 1/2"	4' - 8"	28	Z12	4	# 6	3	3' - 6"	4' - 2"	25
							Z13	4	# 6	3	3' - 4"	4' - 0"	24
S1	12	# 6	STR	-	6' - 0"	108	Z14	4	# 6	3	3' - 1"	3' - 9"	23
							Z15	4	# 6	3	2' - 11"	3' - 7"	22
T1	16	# 5	STR	-	13' - 0"	217	Z16	4	# 6	3	2' - 9"	3' - 5"	21
							Z17	4	# 6	3	2' - 6"	3' - 2"	19
							Z18	4	# 6	3	2' - 4"	3' - 0"	18
							Z19	4	# 6	3	2' - 2"	2' - 10"	17

QUANTITIES

REINFORCING STEEL FOR 4 WINGS	2263 LBS.
CLASS A CONCRETE 4 WINGS	20.8 C.Y.
2 HEADWALLS	0.9 C.Y.
2 END CURTAIN WALLS	0.9 C.Y.
TOTAL	22.6 C.Y.

BAR TYPES



PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 30+13.47 -Y15REV-

SHEET 5 OF 6



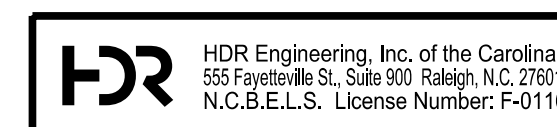
10/11/2021

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 WINGS FOR
 CONCRETE BOX CULVERT
 90° SKEW

REVISIONS

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

SHEET NO. C4-5
 TOTAL SHEETS 6



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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 USER: PPETERSO DATE: 10/11/2021
 FILE: ... \WINGWALL 1 VIEWS

DES BY: T. MCALEENAN DATE: 11/19
 DWG BY: T. MCALEENAN DATE: 11/19
 DES CHK: R. TURNAGE DATE: 11/19
 CHK BY: R. TURNAGE DATE: 11/19

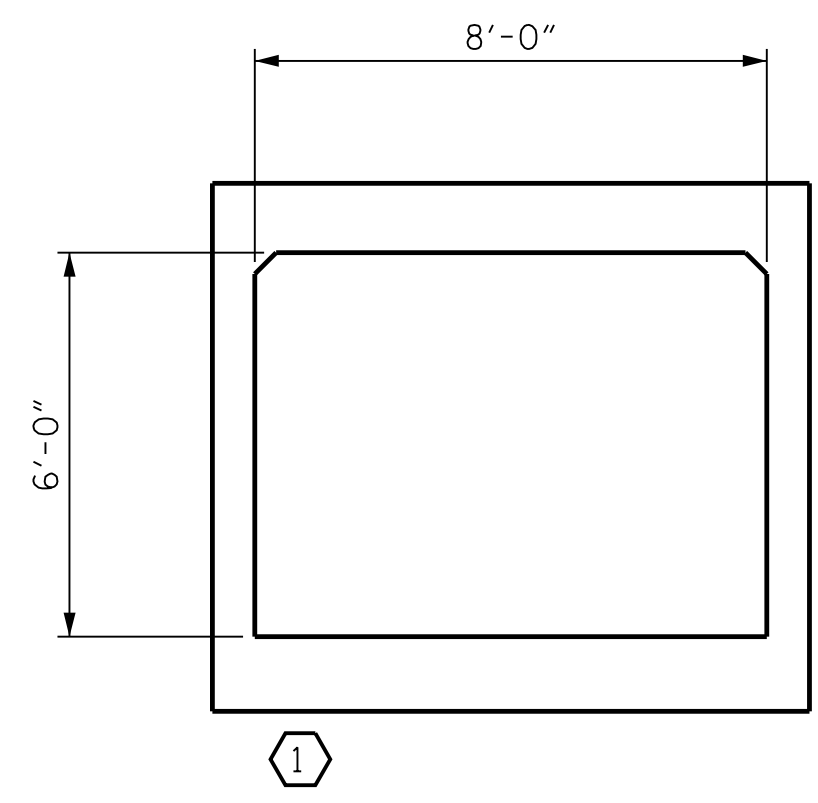
PLOT DRIVER: NCDOT_pdot_pdf_color_eng-50.ppt
 USER: PPETERSO DATE: 10/17/2021
 FILE: ...RATING SUMMARY

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
WA	1.00	--

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS										
	CONTROLLING LOAD RATING	MINIMUM RATING FACTOR (RF)	STRENGTH I LIMIT STATE							
			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)
PERMANENT LOAD RATING	1	1.11	1.25	1	EXERIOR WALL	7.17	1.11	1	BOTTOM SLAB	1.50

NOTES:
 RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
 THE EFFECTS OF LIVE LOAD ON DESIGN AND LOAD RATING MAY BE NEGLECTED FOR CULVERTS WITH CERTAIN FILL DEPTHS DESCRIBED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
 CULVERTS WITH NEGLIGIBLE LIVE LOAD SHOULD BE LOAD RATED FOR PERMANENT LOADS ONLY IN ACCORDANCE WITH THE AASHTO MANUAL FOR BRIDGE EVALUATION.

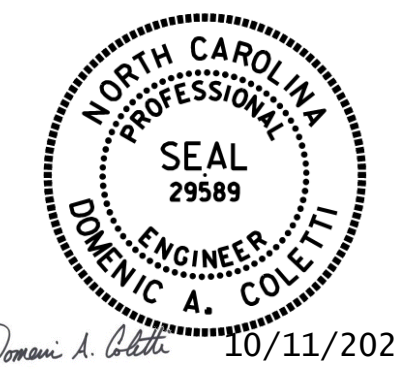


LRFR SUMMARY
 (LOOKING DOWN STREAM)

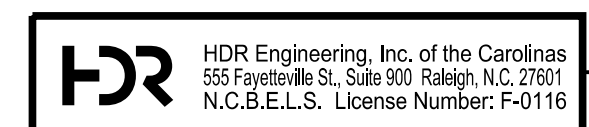
PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 30+13.47 -Y15REV-
 SHEET 6 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS
 (DEEP FILLS)

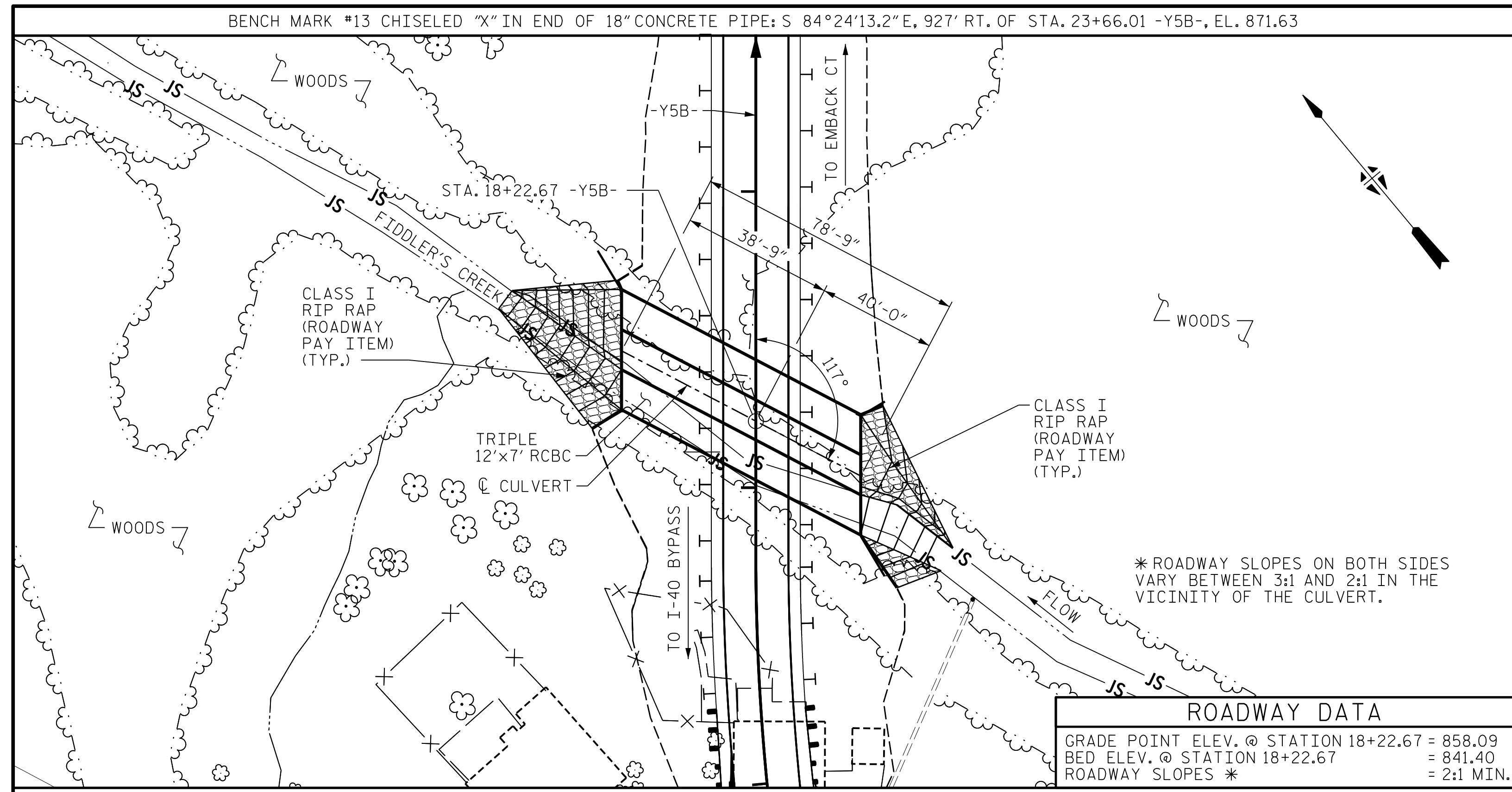


DES BY: <u>T. MCALEENAN</u>	DATE: <u>11/19</u>	DWG BY: <u>T. MCALEENAN</u>	DATE: <u>11/19</u>
DES CHK: <u>R. TURNAGE</u>	DATE: <u>11/19</u>	CHK BY: <u>R. TURNAGE</u>	DATE: <u>11/19</u>



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISIONS						SHEET NO. C4-6 TOTAL SHEETS 6
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			
2			4			



ROADWAY DATA	
GRADE POINT ELEV. @ STATION 18+22.67	= 858.09
BED ELEV. @ STATION 18+22.67	= 841.40
ROADWAY SLOPES *	= 2:1 MIN.

LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS

TOTAL STRUCTURE QUANTITIES	
CLASS A CONCRETE	
BARREL @ 4.165 C.Y./FT.	328.0 C.Y.
WINGS ETC.	49.6 C.Y.
SILLS	4.0 C.Y.
TOTAL	381.6
REINFORCING STEEL	
BARREL, HEADWALLS & SILL	54,083 LBS.
WINGS	3,872 LBS.
TOTAL	57,955 LBS.
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	474 TONS
RIP RAP, CLASS A	70 TONS
RIP RAP, CLASS B	70 TONS

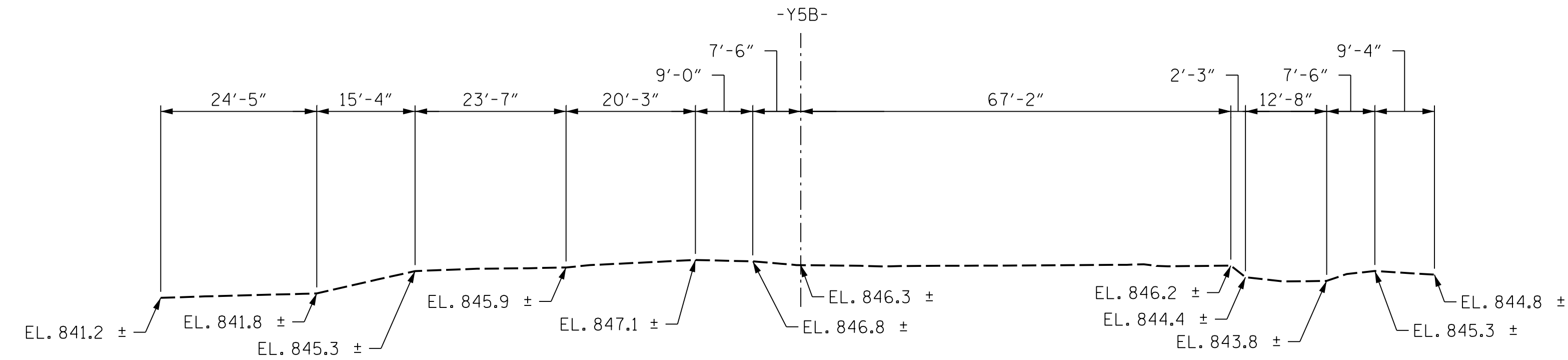
HYDRAULIC DATA	
DESIGN DISCHARGE	= 1020 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEVATION	= 847.4
DRAINAGE AREA	= 1.03 SQ. MI.
BASIC DISCHARGE (Q100)	= 1190 CFS
BASIC HIGH WATER ELEVATION	= 847.9
OVERTOPPING FLOOD DATA	
OVERTOPPING DISCHARGE	= 2465 CFS
FREQUENCY OF OVERTOPPING FLOOD	= >500 YR.
OVERTOPPING FLOOD ELEVATION	= 849.9

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 fy = 60 ksi.

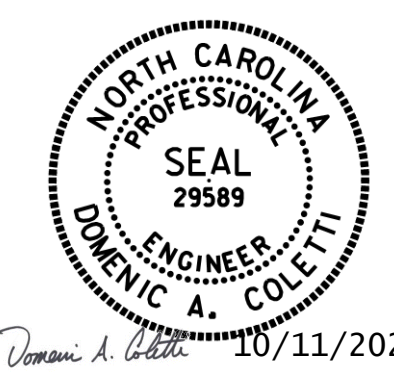
NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
 DESIGN FILL = 10.43'
 FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTE SHEET.
 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
 CONCRETE IN THE 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 THE WING SHEETS.
 TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
 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 WILL 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 PLANS. THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIONAL PRECAST REINFORCING CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.
 A 3 FOOT STRIP OF GEOTEXTILE SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
 THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO THE VARIOUS PAY ITEMS.
 FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
 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.
 AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL AND BOTH FACES OF THE 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.
 FOR CULVERT EXCAVATION, SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.
 THE REINFORCED CONCRETE BOX CULVERT SHALL BE PLACED ON THE STANDARD 2.0 FOOT BLANKET OF FOUNDATION CONDITIONING MATERIAL SEE SECTION 414 OF THE STANDARD
 IF SOFT/VERY LOOSE SOILS ARE ENCOUNTERED BENEATH THE BOTTOM OF THE FOUNDATION CONDITIONING MATERIALS, REMOVE AS MUCH MATERIAL AS NECESSARY AND WORK IN CLASS A OR CLASS B RIPRAP TO STABILIZE THE SUBGRADE. REFER TO OPERATIONS ENGINEER FOR SPECIFIC RECOMMENDATIONS. RIPRAP ESTIMATED QUANTITY = 140 TONS.



PROFILE ALONG CULVERT

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS



PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 18+22.67 -Y5B-
 SHEET 1 OF 9 BRIDGE NO. 750

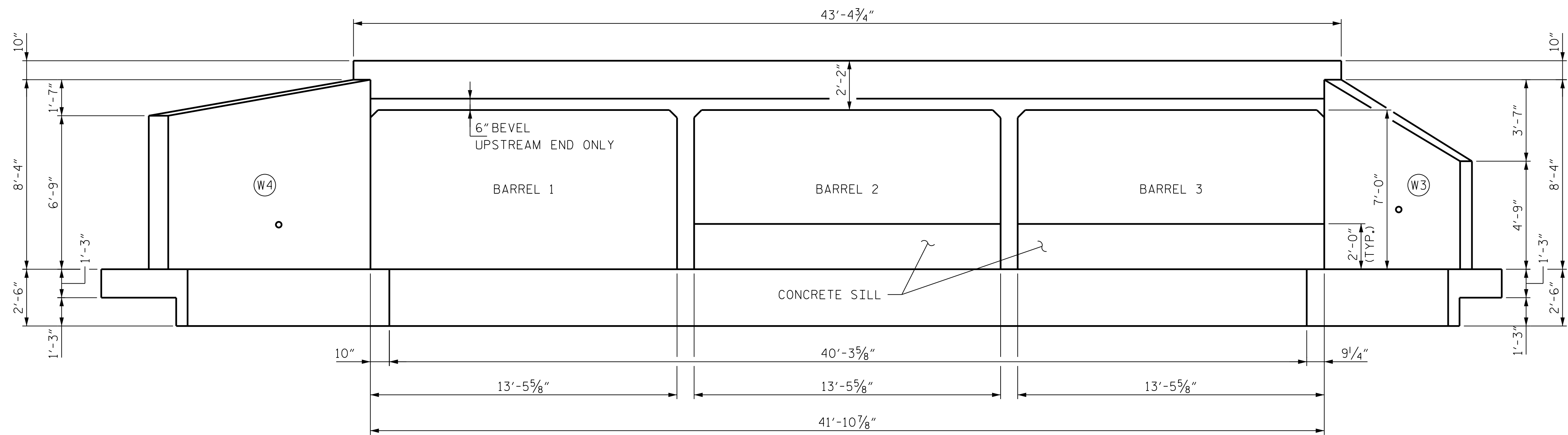
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
TRIPLE BARREL 12 FT. X 7 FT. CONCRETE BOX CULVERT 117° SKEW					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
					SHEET NO. C5-1 TOTAL SHEETS 9

DES BY: T. MCALEENAN	DATE: 07/19	DWG BY: T. MCALEENAN	DATE: 07/19
DES CHK: R. TURNAGE	DATE: 07/19	CHK BY: R. TURNAGE	DATE: 07/19

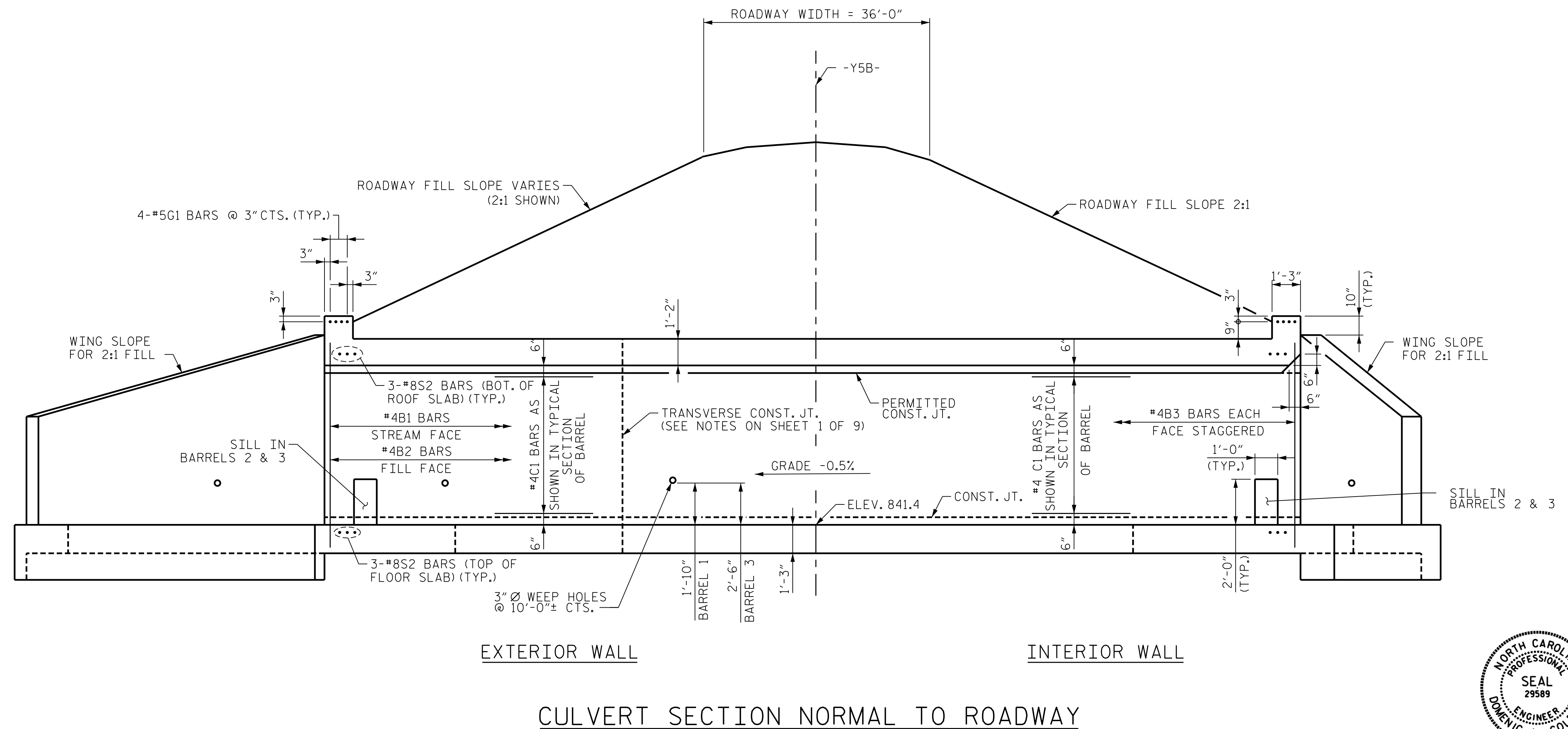
HDR Engineering, Inc. of the Carolinas
 555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
 N.C.B.E.L.S. License Number: F-0116

DOCUMENT NOT CONSIDERED FINAL
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PLOT DRIVER: NCDOT_STRUCTURES_DEFAULT_PLOTTER.plt
 PENTABLE: NCDOT_STRUCTURES_DEFAULT_PEN.tbl
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 DATE: 5/20/2021
 TIME: 11:46:38 AM
 FILE: ... \GENERAL DRAWING LOCATION SKETCH



END ELEVATION NORMAL TO SKEW
(INLET END SHOWN, OUTLET END SIMILAR)



CULVERT SECTION NORMAL TO ROADWAY

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 18+22.67 -Y5B-
 SHEET 2 OF 9

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**TRIPLE BARREL
 12 FT. X 7 FT.
 CONCRETE BOX CULVERT
 117° SKEW**

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

DOMINIC A. COLETTI
 PROFESSIONAL ENGINEER
 SEAL
 29589
 10/11/2021

PLOT DRIVER: NCDOT STRUCTURES DEFAULT PLOTTER.pht
 USER: PETERSO DATE: 5/20/2021
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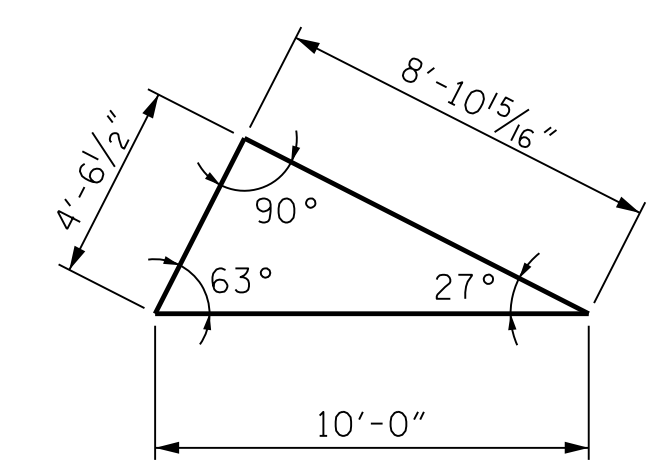
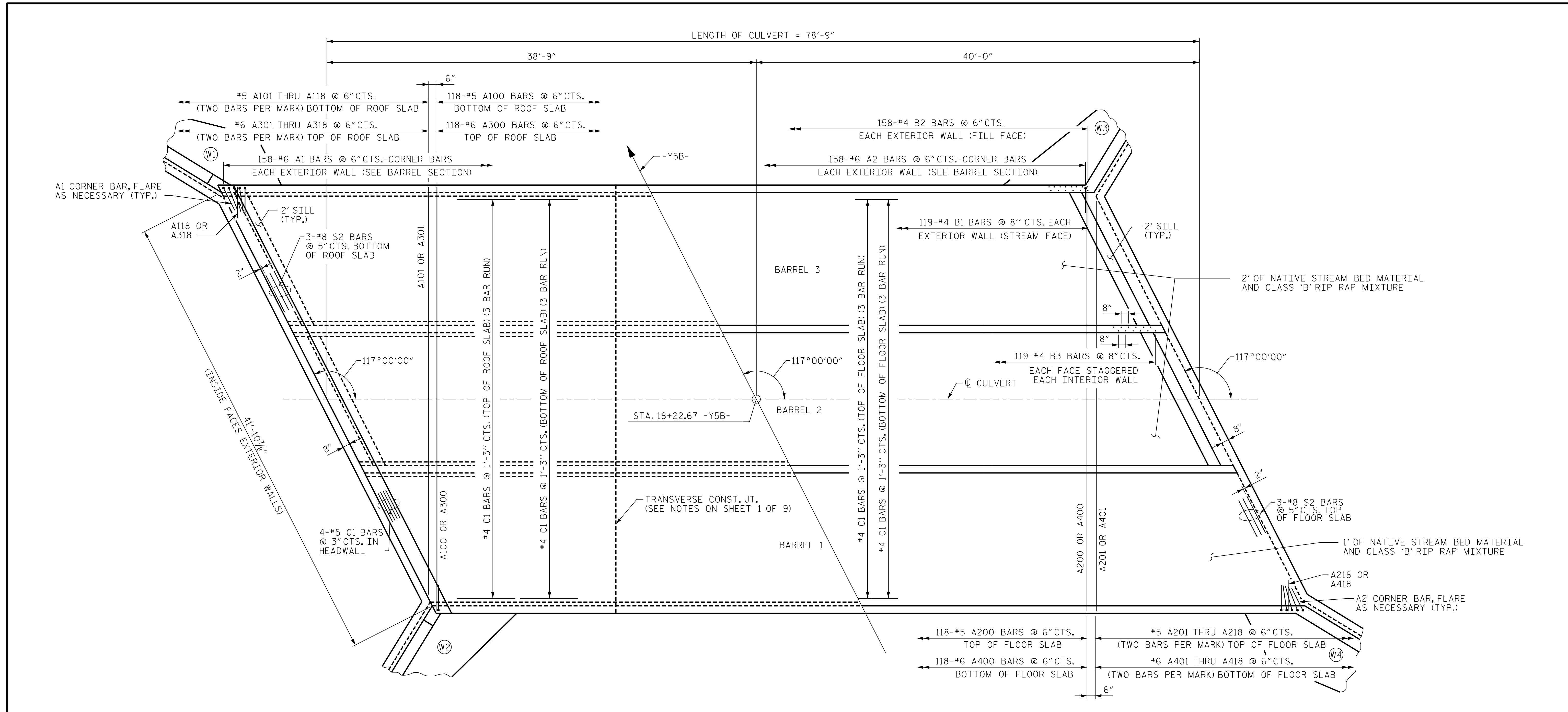
DES BY: <u>T. MCALEENAN</u>	DATE: <u>07/19</u>	DWG BY: <u>T. MCALEENAN</u>	DATE: <u>07/19</u>
DES CHK: <u>R. TURNAGE</u>	DATE: <u>07/19</u>	CHK BY: <u>R. TURNAGE</u>	DATE: <u>07/19</u>

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 N.C.B.E.L.S. License Number: F-0116

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SHEET NO. C5-2
 TOTAL SHEETS 9

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 USER: PPRETOSO DATE: 5/20/2021 TIME: 10:29:08 AM
 FILE: ...PLAN VIEW



SKIEW TRIANGLE

PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 18+22.67 -Y5B-

SHEET 3 OF 9

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

**TRIPLE BARREL
12 FT. X 7 FT.
CONCRETE BOX CULVERT
117° SKEW**

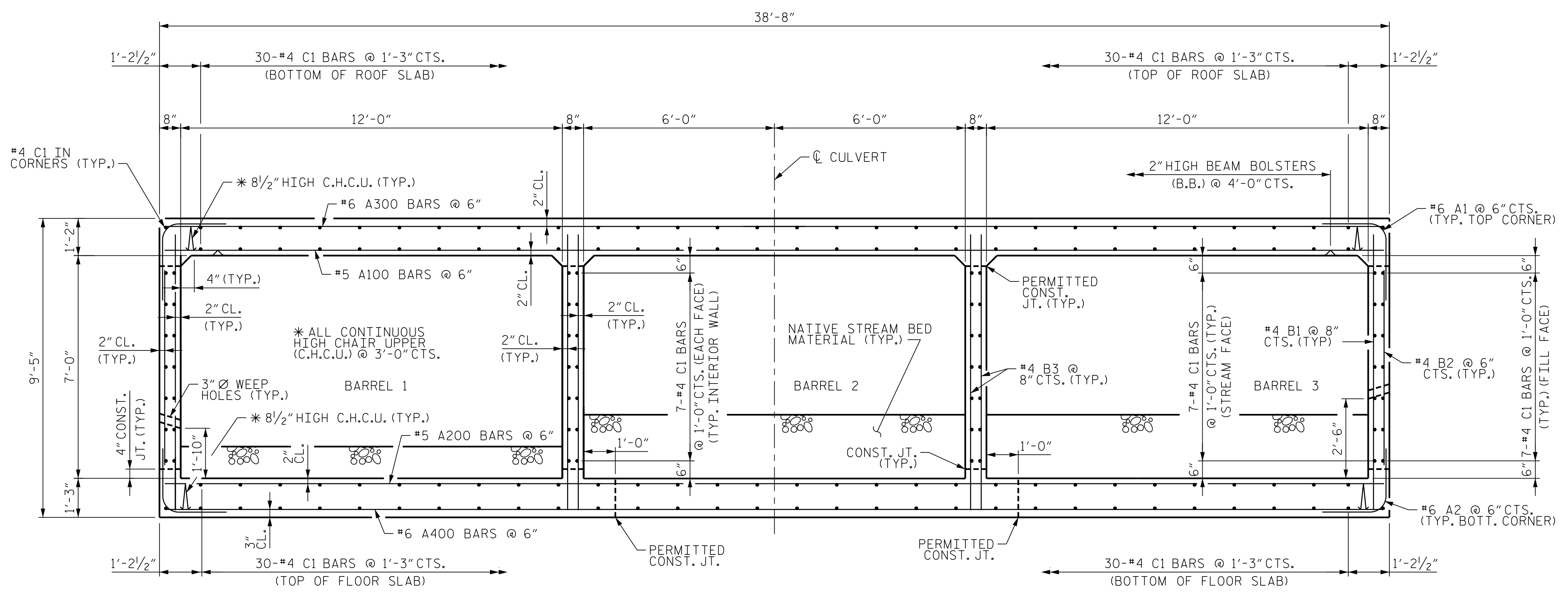
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO. C5-3
TOTAL SHEETS 9

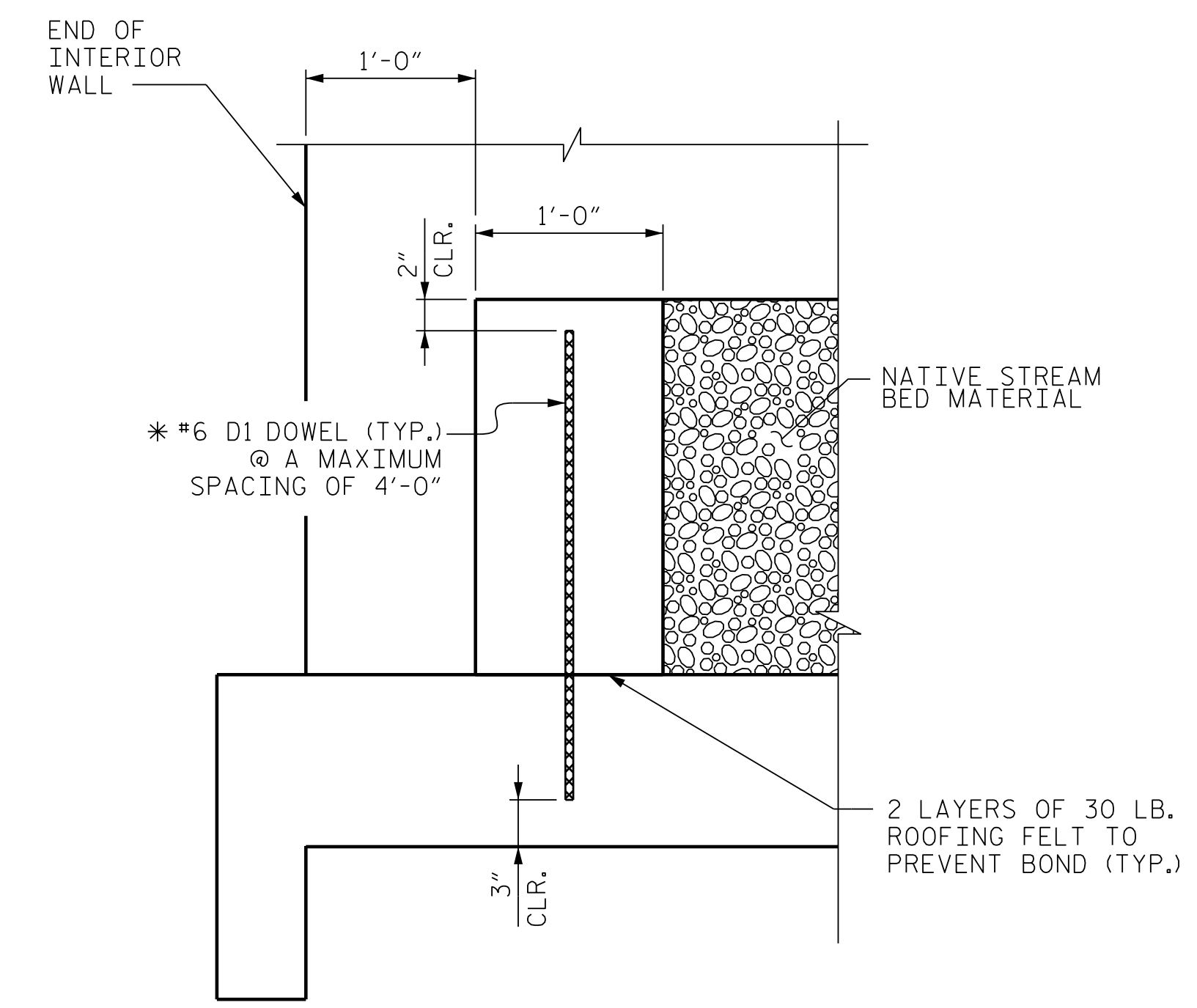
DES BY: T. MCALEENAN	DATE: 07/19	DWG BY: T. MCALEENAN	DATE: 07/19
DES CHK: R. TURNAGE	DATE: 07/19	CHK BY: R. TURNAGE	DATE: 07/19



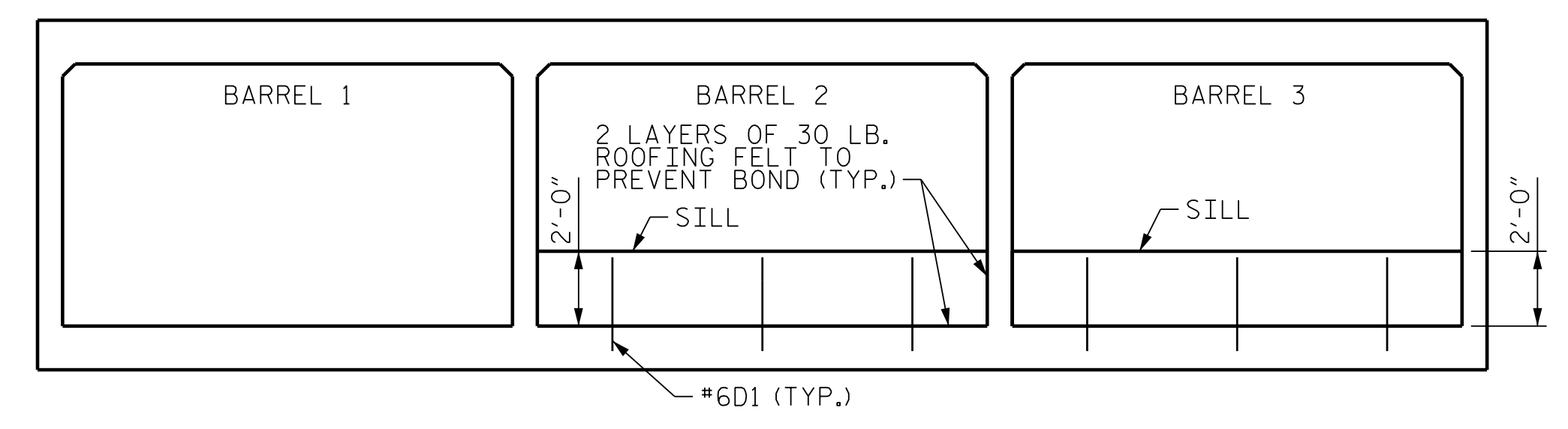
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



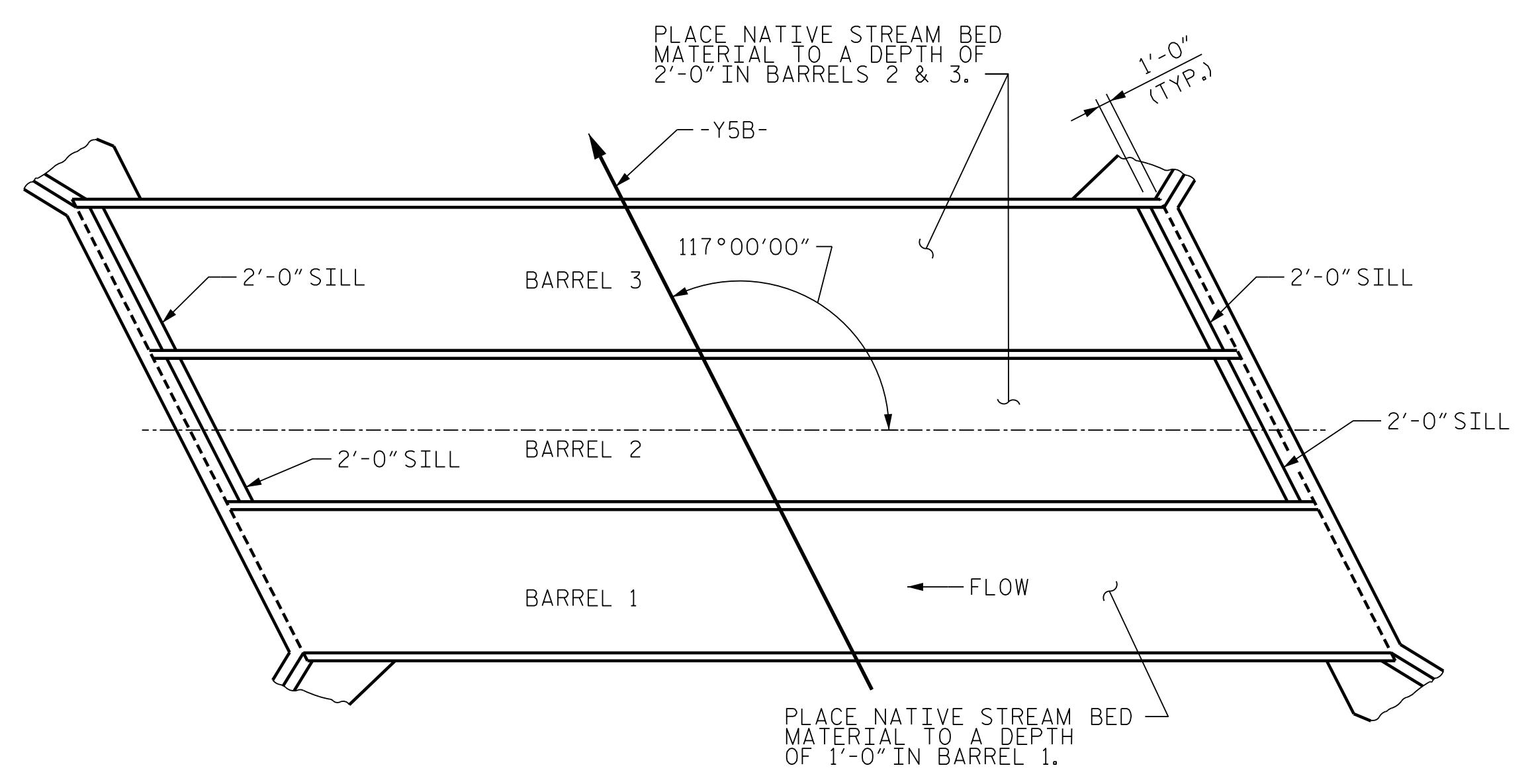
RIGHT ANGLE SECTION OF BARREL
(LOOKING DOWNSTREAM)
THERE ARE 180 "C" BARS IN SECTION



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



ELEVATION - LOOKING DOWNSTREAM

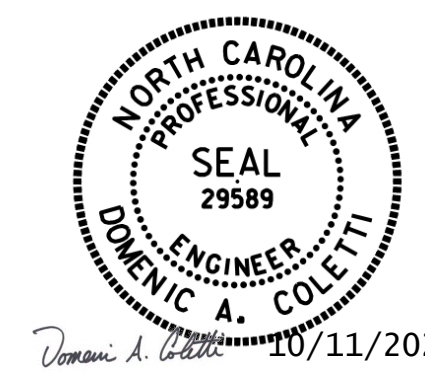


PLAN VIEW SHOWING SILL LOCATIONS

CULVERT SILL DETAILS

THE CONTRACTOR SHALL FILL THE PROPOSED CULVERT WITH NATIVE BED MATERIAL AS INDICATED IN THE PLANS. EXISTING BED MATERIAL SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AS DIRECTED BY THE ENGINEER. THE BED MATERIAL MAY BE SUPPLEMENTED WITH CLASS B RIP RAP IF NEEDED. PAYMENT SHALL BE INCLUDED IN THE LUMP SUM PAY ITEM FOR CULVERT EXCAVATION.

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 18+22.67 -Y5B-
 SHEET 4 OF 9



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
TRIPLE BARREL
12 FT. X 7 FT.
CONCRETE BOX CULVERT
117°SKEW

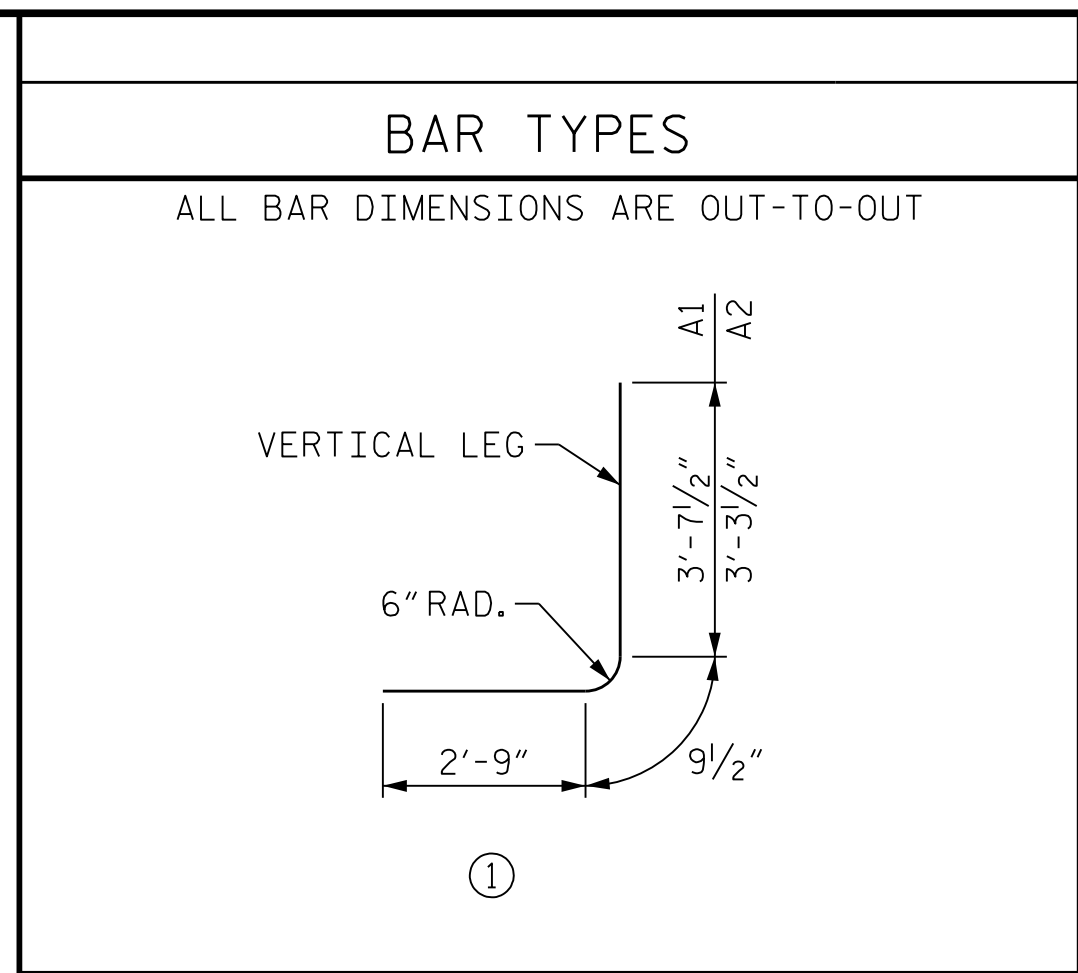
REVISIONS						SHEET NO. C5-4 TOTAL SHEETS 9
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			
2			4			

DES BY: <u>T. MCALEENAN</u>	DATE: <u>07/19</u>	DWG BY: <u>T. MCALEENAN</u>	DATE: <u>07/19</u>
DES CHK: <u>R. TURNAGE</u>	DATE: <u>07/19</u>	CHK BY: <u>R. TURNAGE</u>	DATE: <u>07/19</u>

HDR HDR Engineering, Inc. of the Carolinas
 555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
 N.C.B.E.L.S. License Number: F-0116

10/11/2021
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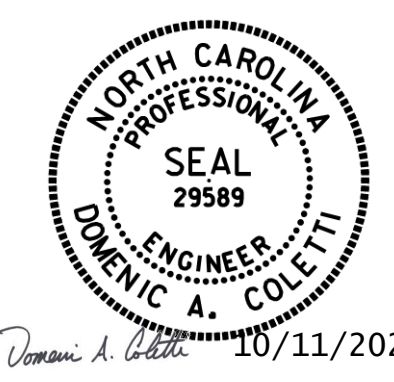
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 USER: PETERSO DATE: 5/20/2021
 FILE: ...BILL OF MATERIALS - BARREL
 PENTABLE: NCDOT STRUCTURES DEFAULT PEN.tbl
 TIME: 10:29:27 AM



SPLICE LENGTH CHART		
BAR	SIZE	SPLICE
B1, B3	#4	1'-10"
C1	#4	2'-5"
S2	#8	4'-9"
A200-A218	#5	3'-0"
A400-A418	#6	2'-9"

BILL OF MATERIAL											
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	316	# 6	1	7' - 2"	3402	A400	118	# 6	STR	38' - 3"	6779
A2	316	# 6	1	6' - 10"	3243	A401	4	# 6	STR	36' - 2"	217
A100	118	# 5	STR	38' - 3"	4708	A402	4	# 6	STR	34' - 2"	205
A101	4	# 5	STR	36' - 2"	151	A403	4	# 6	STR	32' - 3"	194
A102	4	# 5	STR	34' - 2"	143	A404	4	# 6	STR	30' - 3"	182
A103	4	# 5	STR	32' - 3"	135	A405	4	# 6	STR	28' - 4"	170
A104	4	# 5	STR	30' - 3"	126	A406	4	# 6	STR	26' - 4"	158
A105	4	# 5	STR	28' - 4"	118	A407	4	# 6	STR	24' - 5"	147
A106	4	# 5	STR	26' - 4"	110	A408	4	# 6	STR	22' - 5"	135
A107	4	# 5	STR	24' - 5"	102	A409	4	# 6	STR	20' - 6"	123
A108	4	# 5	STR	22' - 5"	94	A410	4	# 6	STR	18' - 6"	111
A109	4	# 5	STR	20' - 6"	86	A411	4	# 6	STR	16' - 6"	99
A110	4	# 5	STR	18' - 6"	77	A412	4	# 6	STR	14' - 7"	88
A111	4	# 5	STR	16' - 6"	69	A413	4	# 6	STR	12' - 7"	76
A112	4	# 5	STR	14' - 7"	61	A414	4	# 6	STR	10' - 8"	64
A113	4	# 5	STR	12' - 7"	52	A415	4	# 6	STR	8' - 8"	52
A114	4	# 5	STR	10' - 8"	45	A416	4	# 6	STR	6' - 9"	41
A115	4	# 5	STR	8' - 8"	36	A417	4	# 6	STR	4' - 9"	29
A116	4	# 5	STR	6' - 9"	28	A418	4	# 6	STR	2' - 10"	17
A117	4	# 5	STR	4' - 9"	20						
A118	4	# 5	STR	2' - 10"	12	B1	238	# 4	STR	8' - 11"	1418
A200	118	# 5	STR	38' - 3"	4708	B2	316	# 4	STR	6' - 0"	1267
A201	4	# 5	STR	36' - 2"	151	B3	476	# 4	STR	8' - 11"	2835
A202	4	# 5	STR	34' - 2"	143						
A203	4	# 5	STR	32' - 3"	135	C1	540	# 4	STR	27' - 9"	10010
A204	4	# 5	STR	30' - 3"	126						
A205	4	# 5	STR	28' - 4"	118	D1	12	# 6	STR	2' - 10"	51
A206	4	# 5	STR	26' - 4"	110						
A207	4	# 5	STR	24' - 5"	102	G1	8	# 5	STR	43' - 0"	359
A208	4	# 5	STR	22' - 5"	94						
A209	4	# 5	STR	20' - 6"	86	S2	12	# 8	STR	43' - 0"	1378
A210	4	# 5	STR	18' - 6"	77	REINFORCING STEEL FOR BARREL AND WINGS					54,083 LBS
A211	4	# 5	STR	16' - 6"	69	CLASS A CONCRETE CULVERT 4 SILLS					328.0 C.Y. 4.0 C.Y.
A212	4	# 5	STR	14' - 7"	61	TOTAL					332.0 C.Y.
A213	4	# 5	STR	12' - 7"	52						
A214	4	# 5	STR	10' - 8"	45						
A215	4	# 5	STR	8' - 8"	36						
A216	4	# 5	STR	6' - 9"	28						
A217	4	# 5	STR	4' - 9"	20						
A218	4	# 5	STR	2' - 10"	12						
A300	118	# 6	STR	38' - 3"	6779						
A301	4	# 6	STR	36' - 2"	217						
A302	4	# 6	STR	34' - 2"	205						
A303	4	# 6	STR	32' - 3"	194						
A304	4	# 6	STR	30' - 3"	182						
A305	4	# 6	STR	28' - 4"	170						
A306	4	# 6	STR	26' - 4"	158						
A307	4	# 6	STR	24' - 5"	147						
A308	4	# 6	STR	22' - 5"	135						
A309	4	# 6	STR	20' - 6"	123						
A310	4	# 6	STR	18' - 6"	111						
A311	4	# 6	STR	16' - 6"	99						
A312	4	# 6	STR	14' - 7"	88						
A313	4	# 6	STR	12' - 7"	76						
A314	4	# 6	STR	10' - 8"	64						
A315	4	# 6	STR	8' - 8"	52						
A316	4	# 6	STR	6' - 9"	41						
A317	4	# 6	STR	4' - 9"	29						
A318	4	# 6	STR	2' - 10"	17						

PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 18+22.67 -Y5B-
 SHEET 5 OF 9



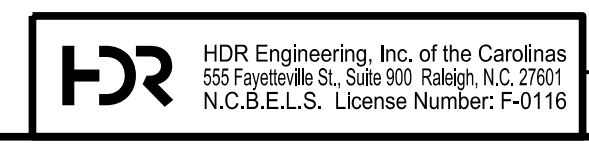
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**TRIPLE BARREL
 12 FT. X 7 FT.
 CONCRETE BOX CULVERT
 117° SKEW**

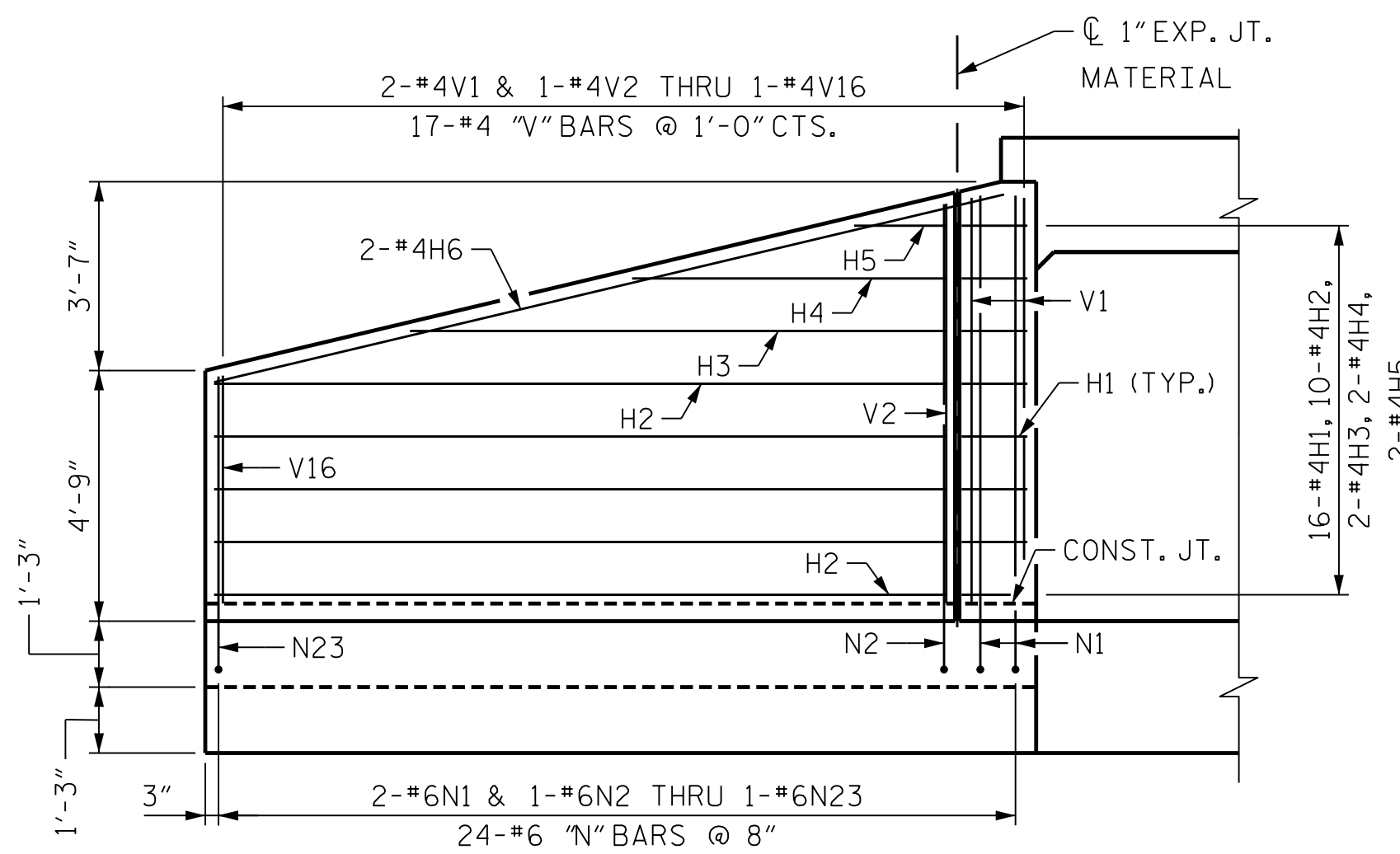
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SHEET NO. C5-5
TOTAL SHEETS 9

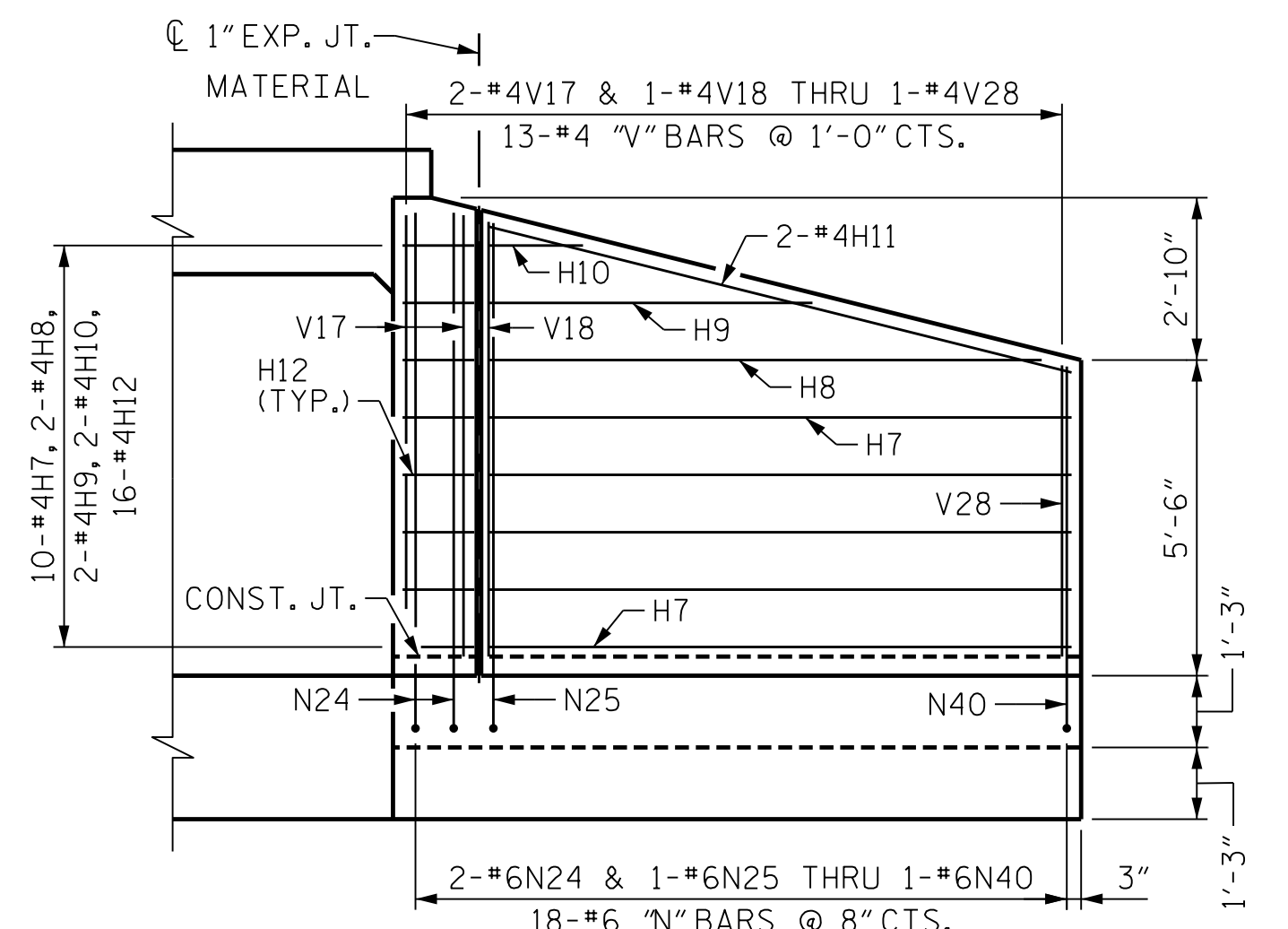
DES BY: <u>T. MCALEENAN</u>	DATE: <u>07/19</u>	DWG BY: <u>T. MCALEENAN</u>	DATE: <u>07/19</u>
DES CHK: <u>R. TURNAGE</u>	DATE: <u>07/19</u>	CHK BY: <u>R. TURNAGE</u>	DATE: <u>07/19</u>



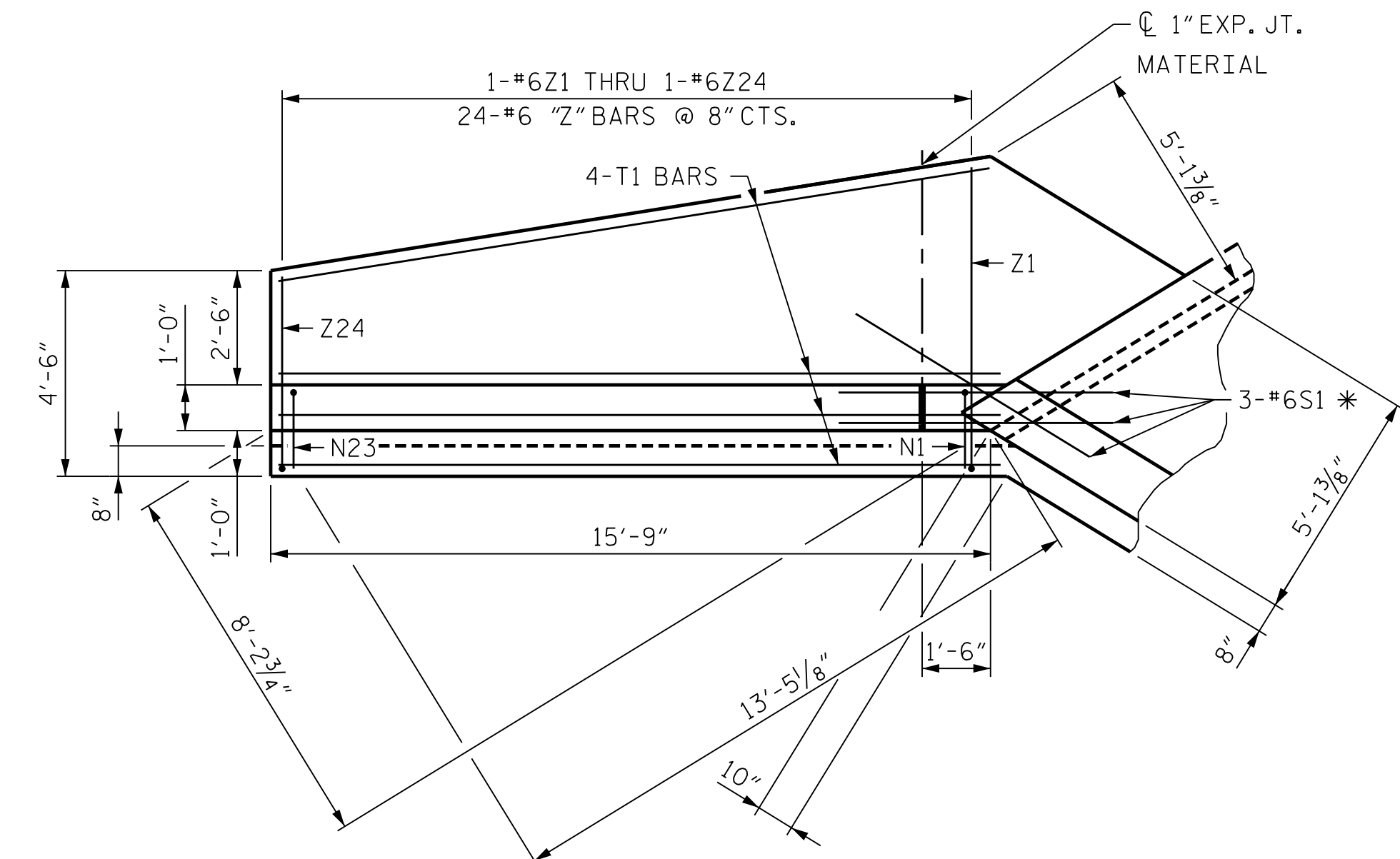
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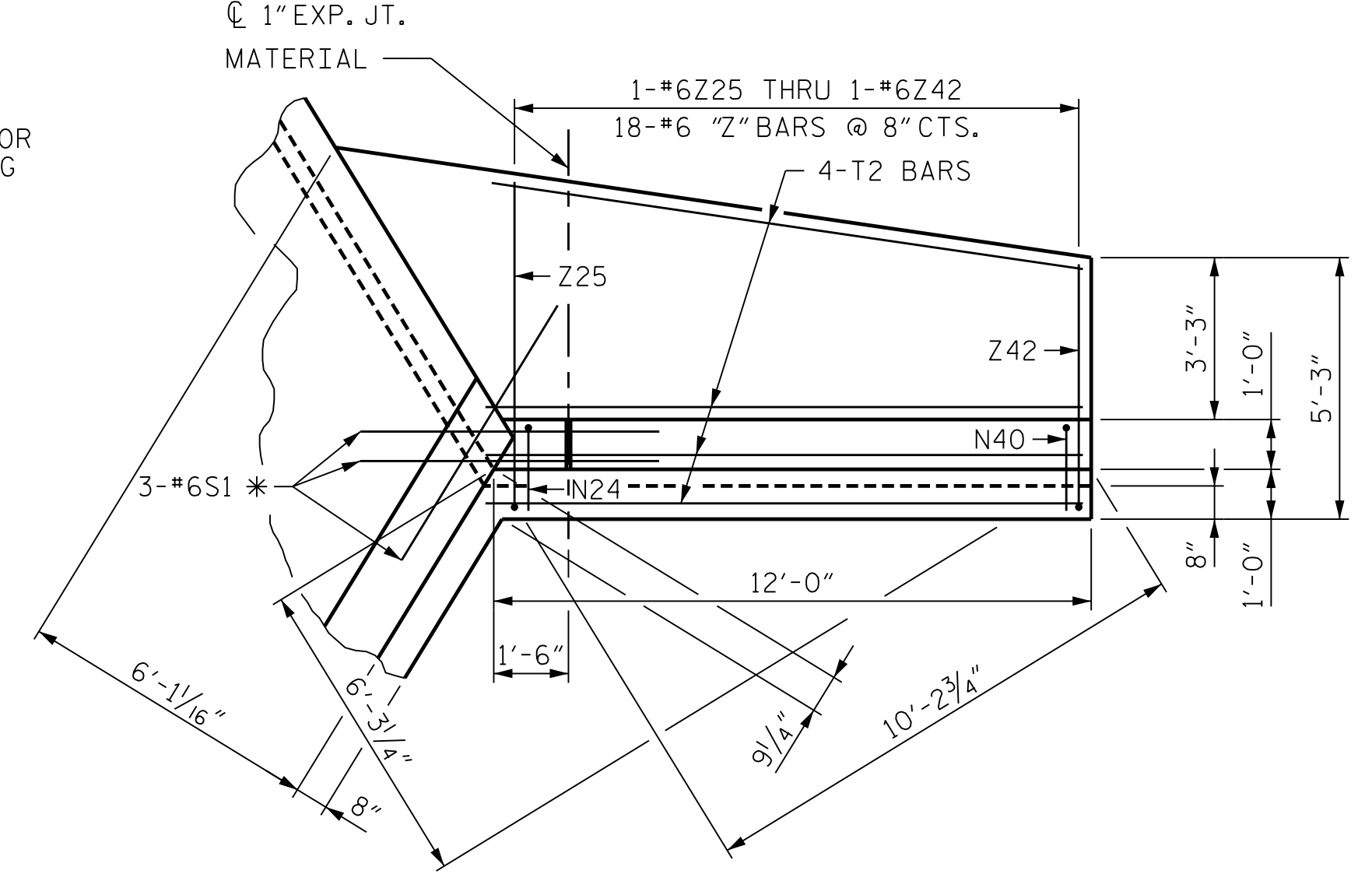
ELEVATION-W1



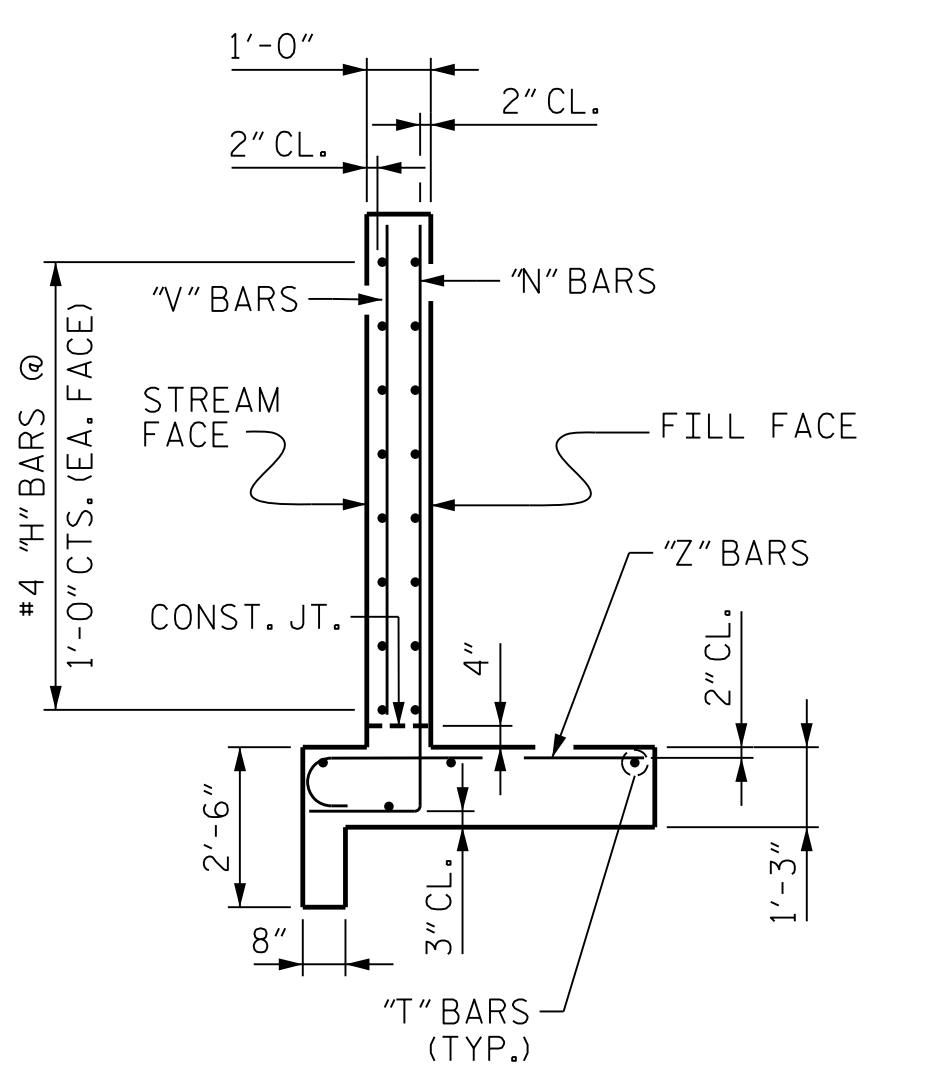
ELEVATION-W2



PLAN-W1



PLAN-W2

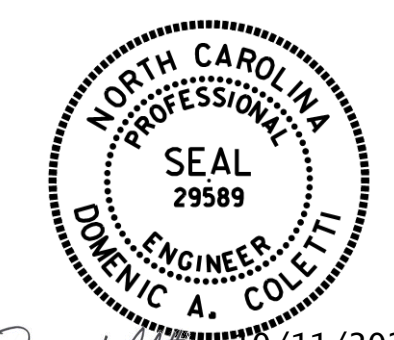


TYPICAL WING SECTION

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 18+22.67 -Y5B-
 SHEET 6 OF 9

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

WINGS FOR
 CONCRETE BOX
 CULVERT



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

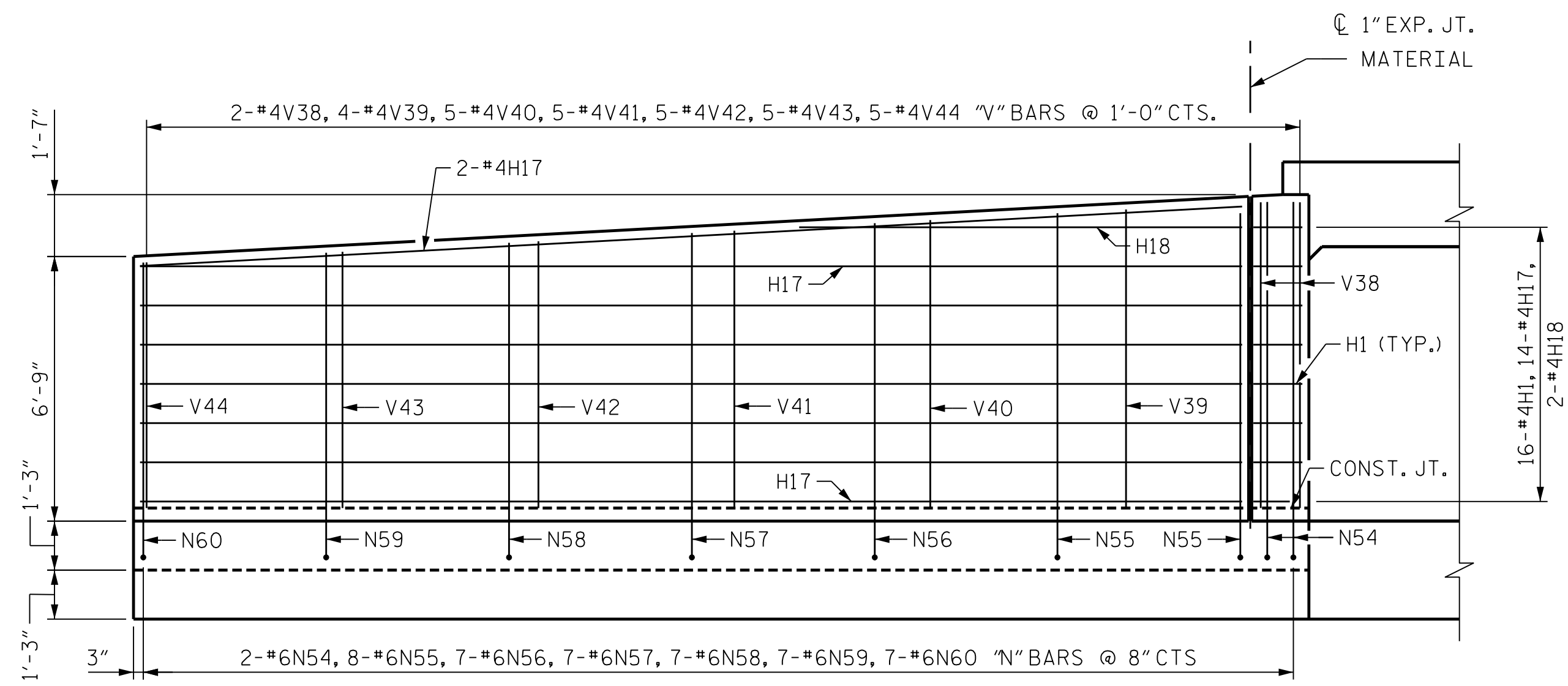
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DES BY: T. MCALEENAN	DATE: 07/19	DWG BY: T. MCALEENAN	DATE: 07/19
DES CHK: R. TURNAGE	DATE: 07/19	CHK BY: R. TURNAGE	DATE: 07/19

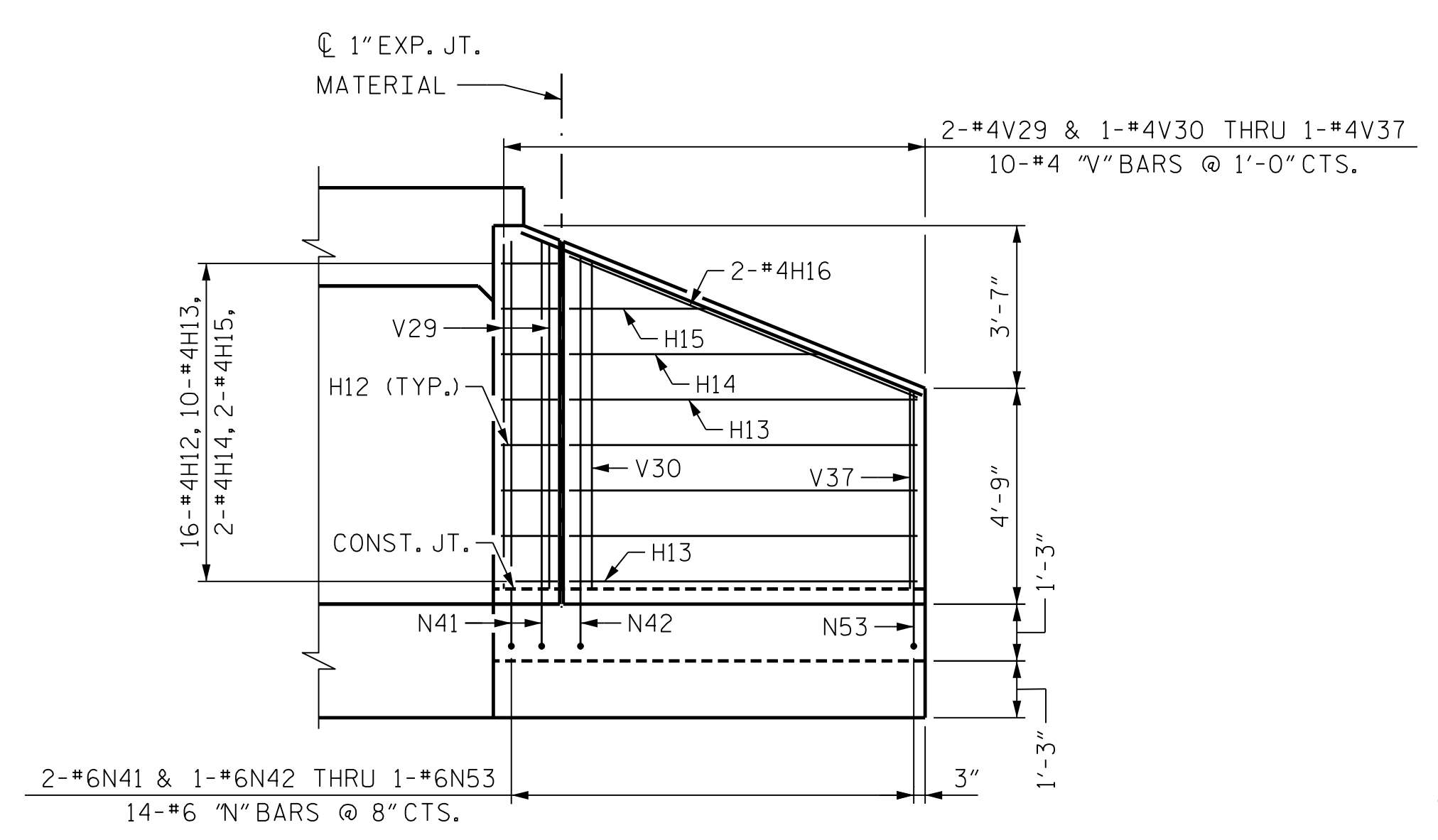
HDR HDR Engineering, Inc. of the Carolinas
 555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
 N.C.B.E.L.S. License Number: F-0116

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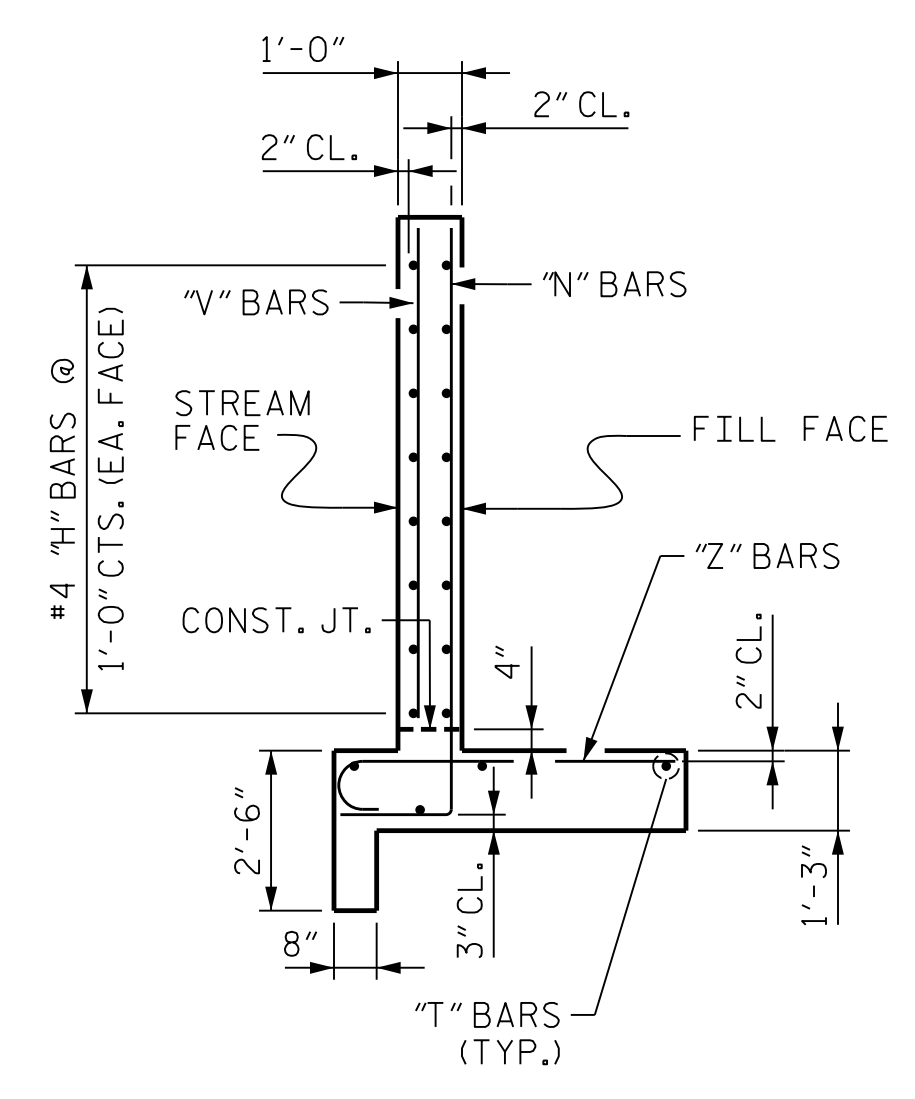
SHEET NO. C5-6
 TOTAL SHEETS 9



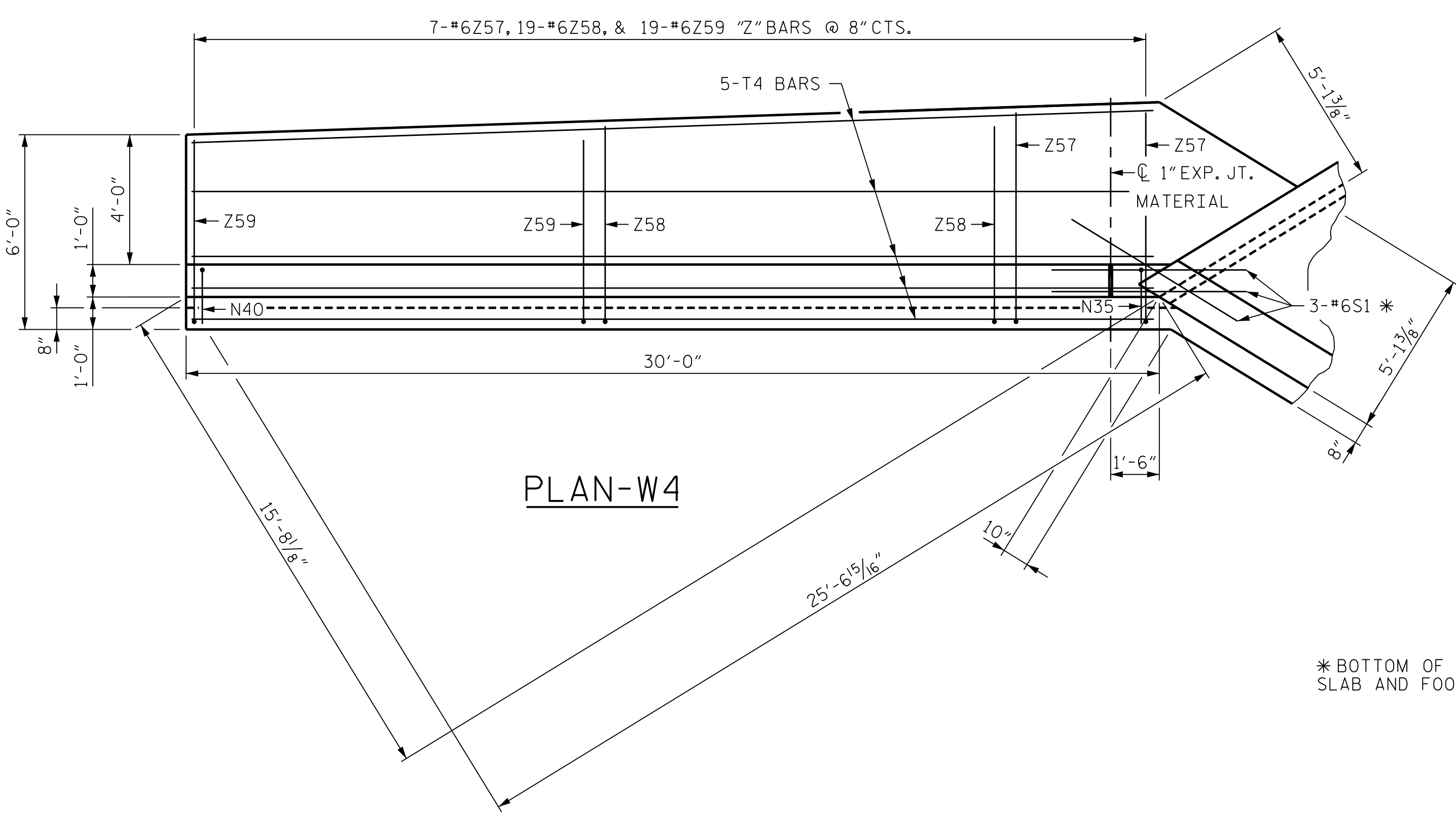
ELEVATION-W4



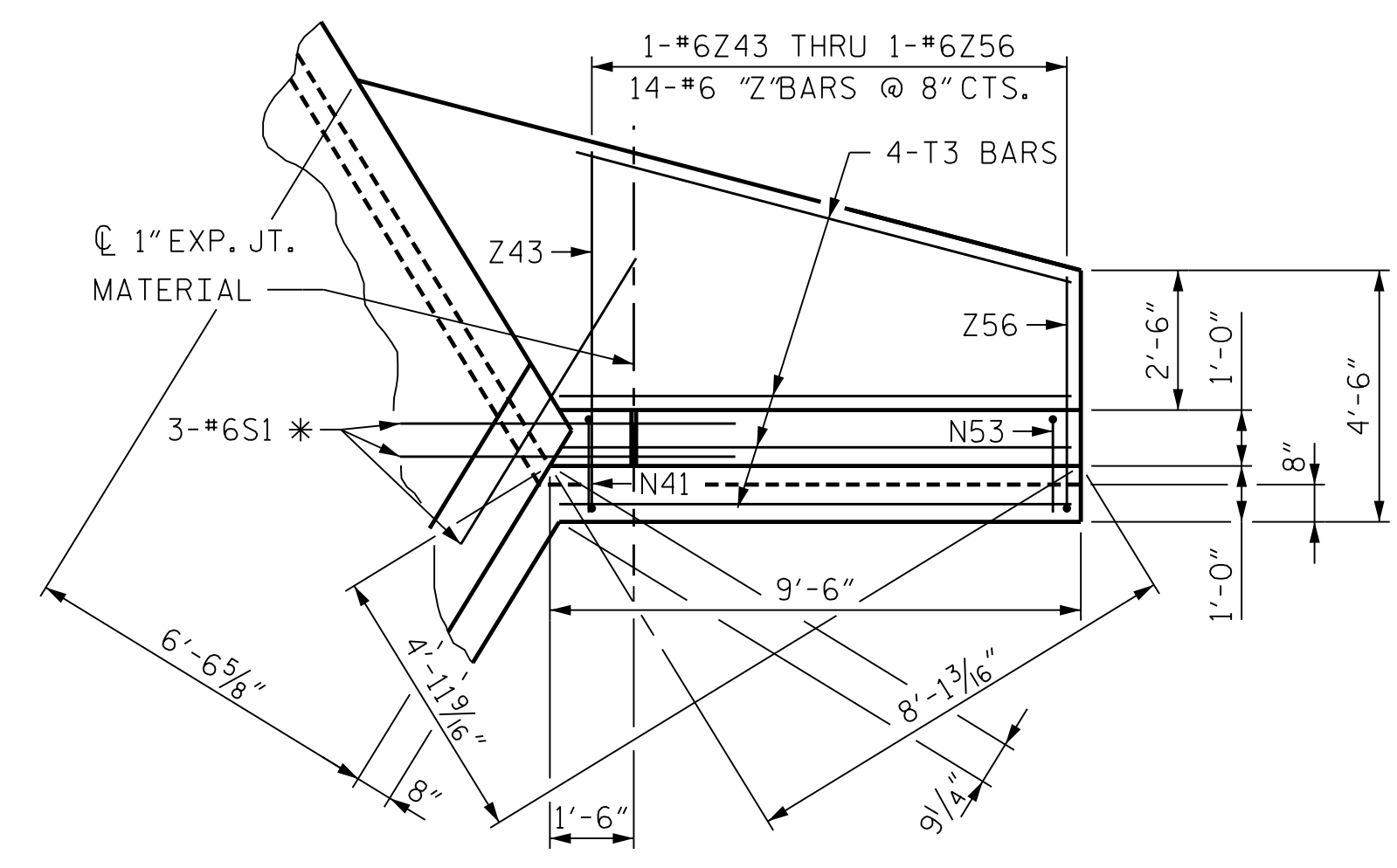
ELEVATION-W3



TYPICAL WING SECTION



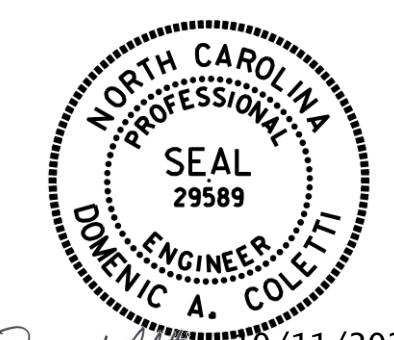
PLAN-W4



PLAN-W3

* BOTTOM OF FLOOR SLAB AND FOOTING

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 18+22.67 -Y5B-
 SHEET 7 OF 9



10/11/2021

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

WINGS FOR CONCRETE BOX CULVERT

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

SHEET NO. C5-7
 TOTAL SHEETS 9

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DES BY: T. MCALEENAN	DATE: 07/19	DWG BY: T. MCALEENAN	DATE: 07/19
DES CHK: R. TURNAGE	DATE: 07/19	CHK BY: R. TURNAGE	DATE: 07/19



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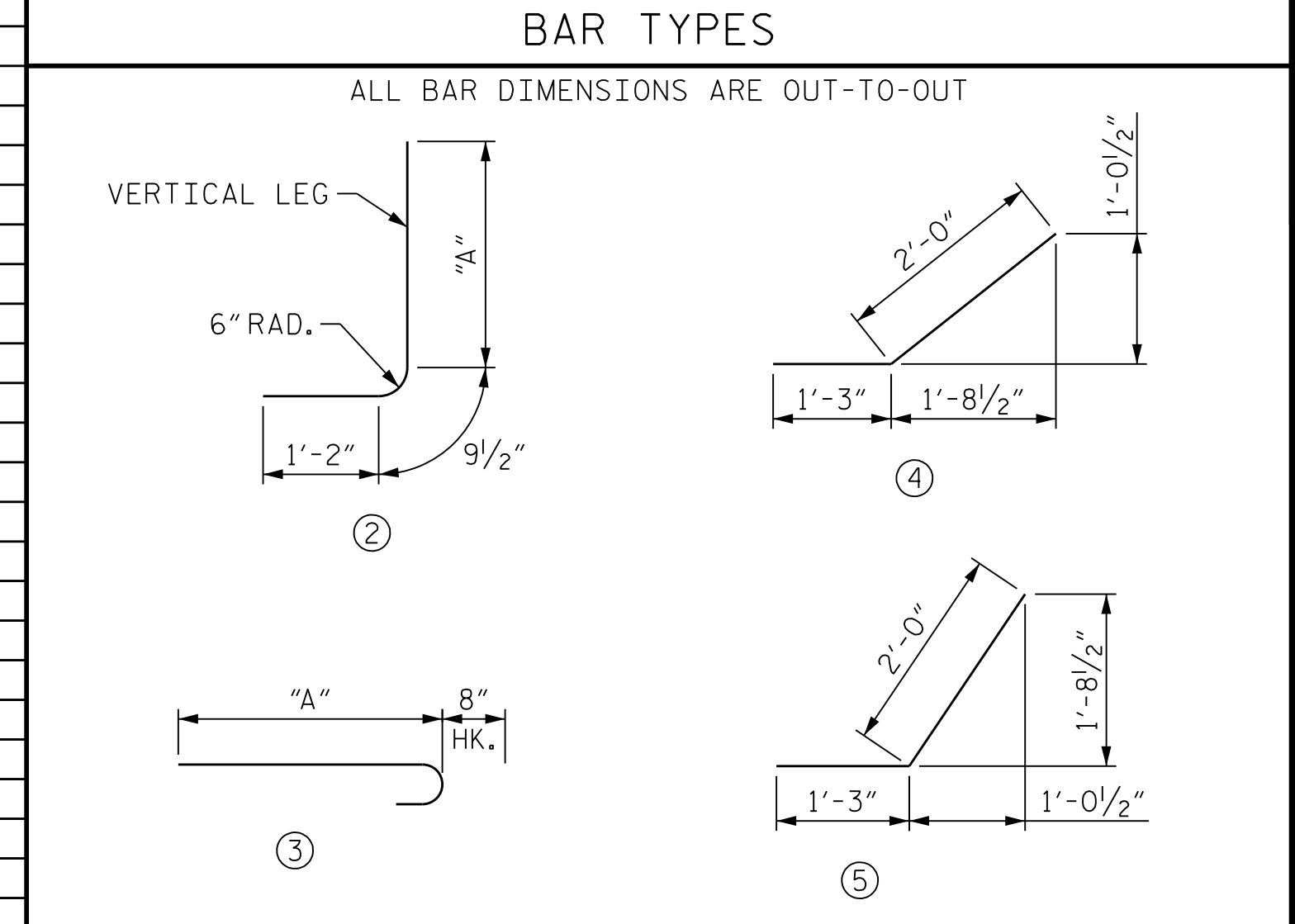
REINFORCING BAR SCHEDULE FOR WINGWALLS W1 AND W2

Table with columns: BAR, NO., SIZE, TYPE, DIM "A", LENGTH, WEIGHT. Contains bar schedules for W1, W2, and W3/W4.

REINFORCING BAR SCHEDULE FOR WINGWALLS W3 AND W4

Table with columns: BAR, NO., SIZE, TYPE, DIM "A", LENGTH, WEIGHT. Contains bar schedules for W3 and W4.

REINFORCING STEEL FOR 2 WINGS 2,310 LBS
CLASS A CONCRETE 2 WINGS 24.4 C.Y.
1 HEADWALL 2.0 C.Y.
1 END CURTAIN WALL 2.5 C.Y.
TOTAL 28.9 C.Y.



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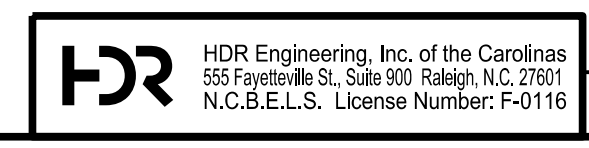
REINFORCING STEEL FOR 2 WINGS 1,562 LBS
CLASS A CONCRETE 2 WINGS 16.2 C.Y.
1 HEADWALL 2.0 C.Y.
1 END CURTAIN WALL 2.5 C.Y.
TOTAL 20.7 C.Y.

PROJECT NO. U-2579AB
FORSYTH COUNTY
STATION: 18+22.67 -Y5B-
SHEET 8 OF 9



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
WINGS FOR CONCRETE BOX CULVERT

DES BY: T. MCALEENAN DATE: 07/19
DES CHK: R. TURNAGE DATE: 07/19
DWG BY: T. MCALEENAN DATE: 07/19
CHK BY: R. TURNAGE DATE: 07/19



REVISIONS
NO. BY DATE
1 3 10/11/2021
2 4

SHEET NO. C5-8
TOTAL SHEETS 9

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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 _{LL})	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (FT)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (FT)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	①	1.34	--	1.75	1.34	1	TOP SLAB	5.40	1.79	1	TOP SLAB	11.80		
	HL-93 (OPERATING)	N/A		1.74	--	1.35	1.74	1	TOP SLAB	5.40	2.31	1	TOP SLAB	11.80		
	HS-20 (INVENTORY)	36.000	②	1.40	50.4	1.75	1.40	1	TOP SLAB	5.40	1.86	1	TOP SLAB	11.80		
	HS-20 (OPERATING)	36.000		1.81	65.2	1.35	1.81	1	TOP SLAB	5.40	2.41	1	TOP SLAB	11.80		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		2.86	38.6	1.40	2.86	1	TOP SLAB	5.40	3.79	1	TOP SLAB	11.80	
		SNGARBS2	20.000		2.68	53.6	1.40	2.68	1	TOP SLAB	5.40	3.55	1	TOP SLAB	11.80	
		SNAGRIS2	22.000		2.86	62.9	1.40	2.86	1	TOP SLAB	5.40	3.79	1	TOP SLAB	11.80	
		SNCOTTS3	27.250	③	1.67	45.5	1.40	1.67	1	TOP SLAB	5.40	2.23	1	TOP SLAB	11.80	
		SNAGGRS4	34.925		2.41	84.2	1.40	2.41	1	TOP SLAB	5.40	3.19	1	TOP SLAB	11.80	
		SNS5A	35.550		2.84	101.0	1.40	2.84	1	TOP SLAB	5.40	3.77	1	TOP SLAB	11.80	
		SNS6A	39.950		1.99	79.5	1.40	1.99	1	TOP SLAB	5.40	2.65	1	TOP SLAB	11.80	
		SNS7B	42.000		1.99	83.6	1.40	1.99	1	TOP SLAB	5.40	2.65	1	TOP SLAB	11.80	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.50	82.5	1.40	2.50	1	TOP SLAB	5.40	3.32	1	TOP SLAB	11.80	
		TNT4A	33.075		1.99	65.8	1.40	1.99	1	TOP SLAB	5.40	2.65	1	TOP SLAB	11.80	
		TNT6A	41.600		2.87	119.4	1.40	2.87	1	TOP SLAB	5.40	3.81	1	TOP SLAB	11.80	
		TNT7A	42.000		3.00	126.0	1.40	3.00	1	TOP SLAB	5.40	3.97	1	TOP SLAB	11.80	
		TNT7B	42.000		1.99	83.6	1.40	1.99	1	TOP SLAB	5.40	2.65	1	TOP SLAB	11.80	
		TNAGRIT4	43.000		1.99	85.6	1.40	1.99	1	TOP SLAB	5.40	2.65	1	TOP SLAB	11.80	
TNAGT5A	45.000		1.99	89.6	1.40	1.99	1	TOP SLAB	5.40	2.65	1	TOP SLAB	11.80			
TNAGT5B	45.000		1.99	89.6	1.40	1.99	1	TOP SLAB	5.40	2.65	1	TOP SLAB	11.80			

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	--

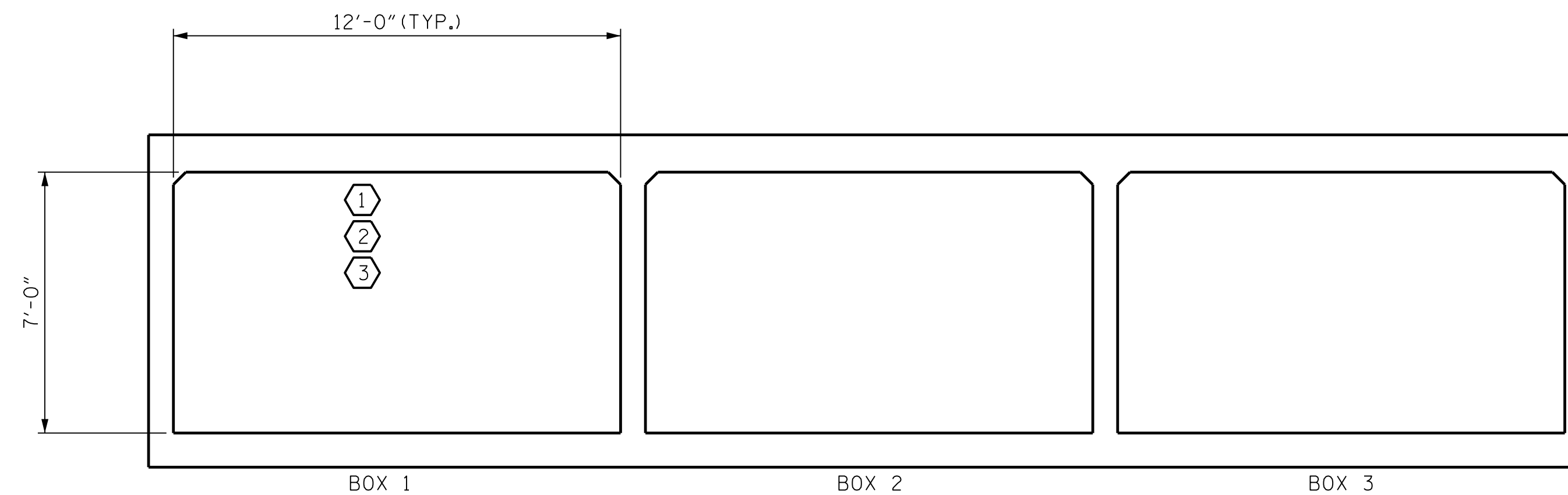
NOTES:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

LL SURCHARGE DEPTH = 2.15 FT.

WHERE ELEMENT TYPE EQUALS "WALL", DISTANCE MEASURED FROM BOTTOM OF BOTTOM SLAB.

#	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 DOWN STREAM)

PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 18+22.67 -Y5B-

SHEET 9 OF 9

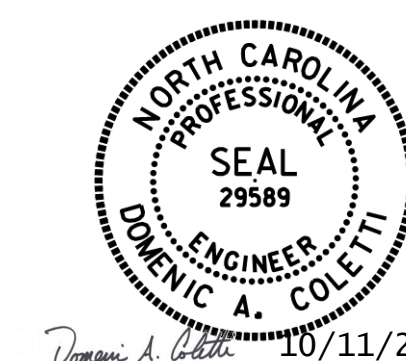
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

(NON-INTERSTATE TRAFFIC)

REVISIONS					
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1			3		
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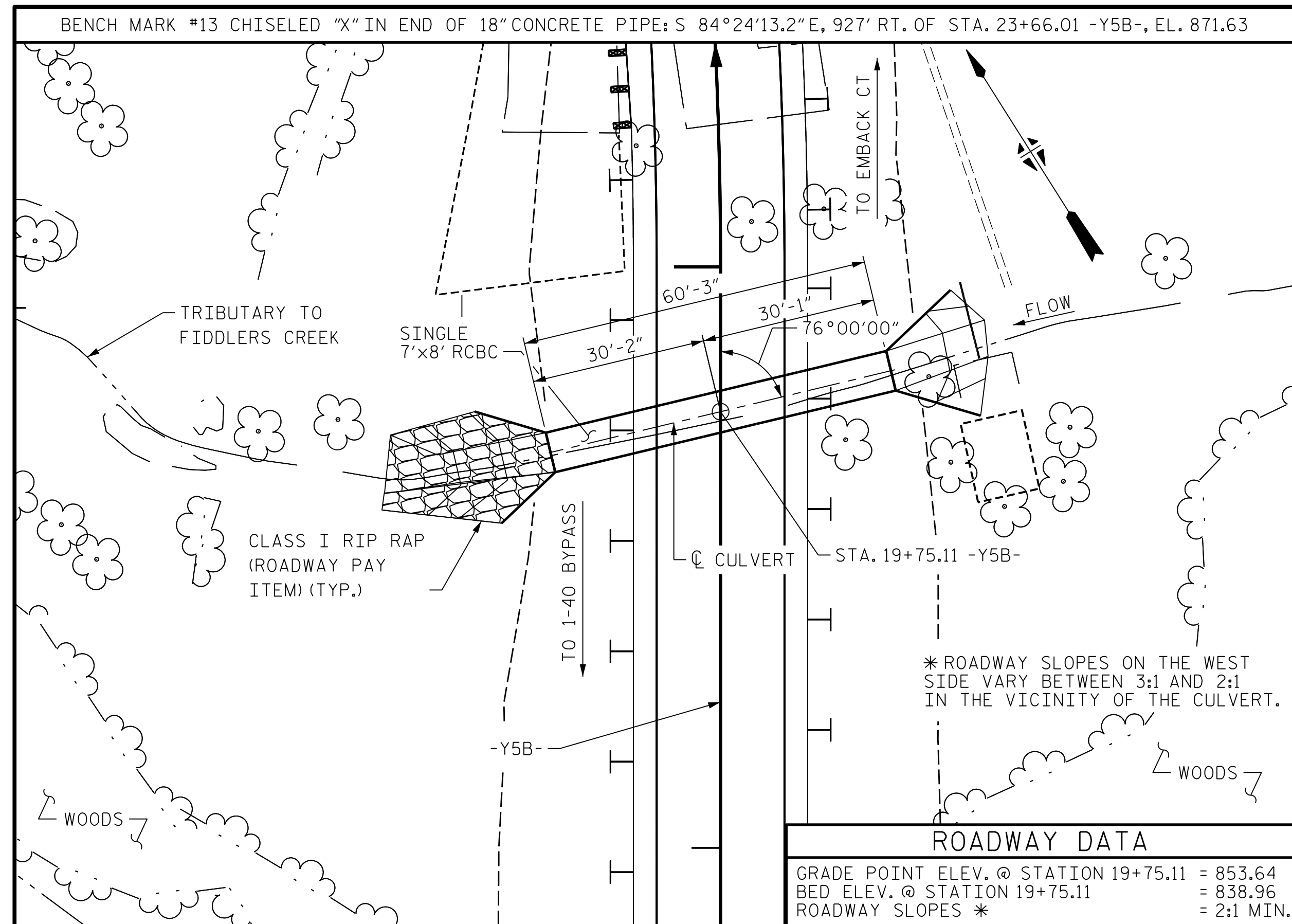
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TOTAL SHEETS 9



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DES BY: <u>T. MCALEENAN</u>	DATE: <u>07/19</u>	DWG BY: <u>T. MCALEENAN</u>	DATE: <u>07/19</u>
DES CHK: <u>R. TURNAGE</u>	DATE: <u>07/19</u>	CHK BY: <u>R. TURNAGE</u>	DATE: <u>07/19</u>

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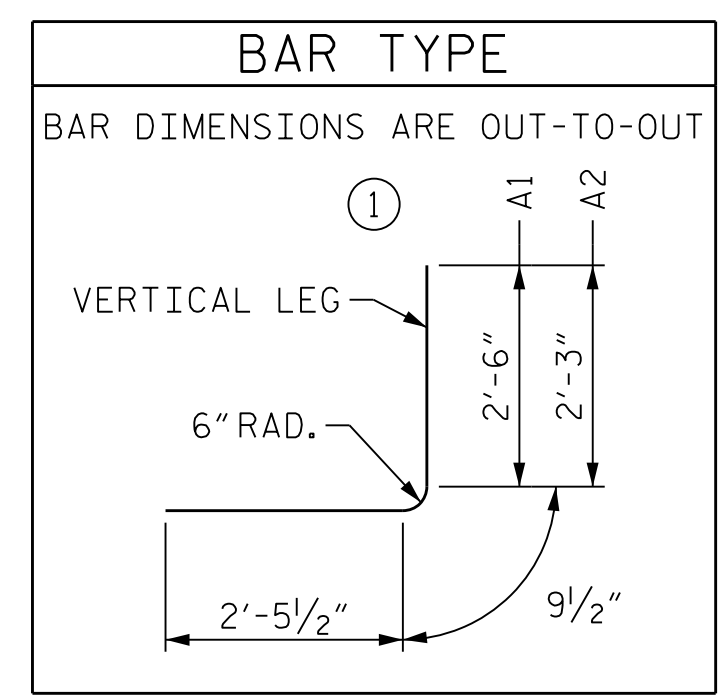


LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS

REINFORCING STEEL BAR SCHEDULE

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	242	4	1	5'-9"	930
A2	242	4	1	5'-6"	889
A100	121	5	STR	7'-11"	999
A200	121	6	STR	7'-11"	1439
A300	61	4	STR	7'-11"	323
A400	61	4	STR	7'-11"	323
B1	242	5	STR	8'-11"	2251
B2	242	5	STR	7'-0"	1767
C1	136	4	STR	31'-2"	2831
G1	4	4	STR	8'-0"	22
REINFORCING STEEL					11,774 LBS
CLASS A CONCRETE CULVERT					48.8 C.Y.
TOTAL					48.8 C.Y.



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.

SPLICE LENGTH CHART

BAR	SIZE	SPLICE LENGTH
B1	#5	2'-4"
C1	#4	2'-5"

NOTES

- ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
- DESIGN FILL = 6.75'
- FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTE SHEET.
- 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN THE 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 THE WING SHEETS.
- 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 PLANS. THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIONAL PRECAST REINFORCING CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.
- A 3 FOOT STRIP OF GEOTEXTILE SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO THE VARIOUS PAY ITEMS.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
- 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.

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

FOR CULVERT EXCAVATION, SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.

THE REINFORCED CONCRETE BOX CULVERT SHALL BE PLACED ON THE STANDARD 2.0 FOOT BLANKET OF FOUNDATION CONDITIONING MATERIAL SEE SECTION 414 OF THE STANDARD SPECIFICATIONS

IF SOFT/VERY LOOSE SOILS ARE ENCOUNTERED BENEATH THE BOTTOM OF THE FOUNDATION CONDITIONING MATERIALS, REMOVE AS MUCH MATERIAL AS NECESSARY AND WORK IN CLASS A OR CLASS B RIPRAP TO STABILIZE THE SUBGRADE. REFER TO OPERATIONS ENGINEER FOR SPECIFIC RECOMMENDATIONS. RIPRAP ESTIMATED QUANTITY = 30 TONS.

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

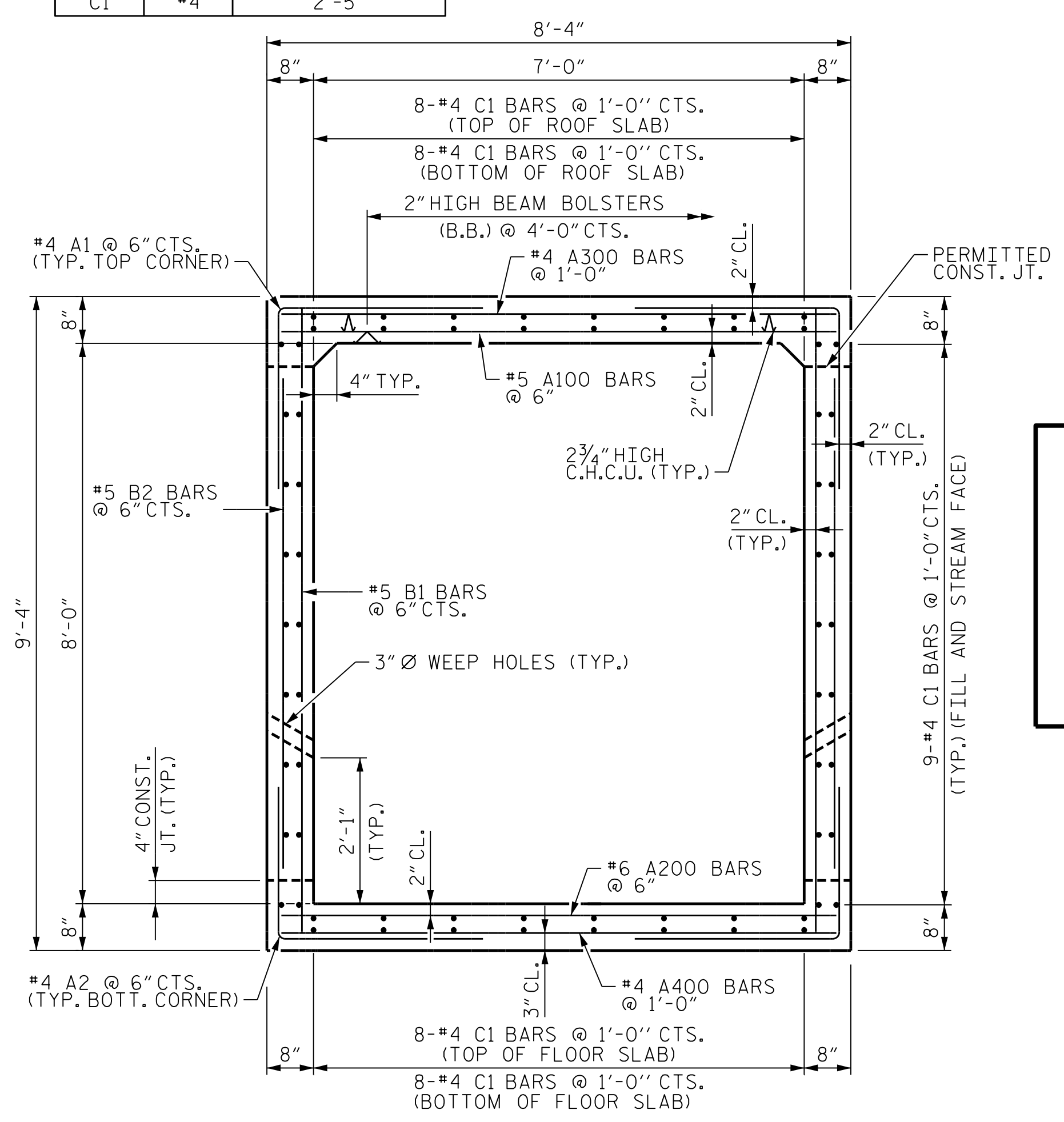
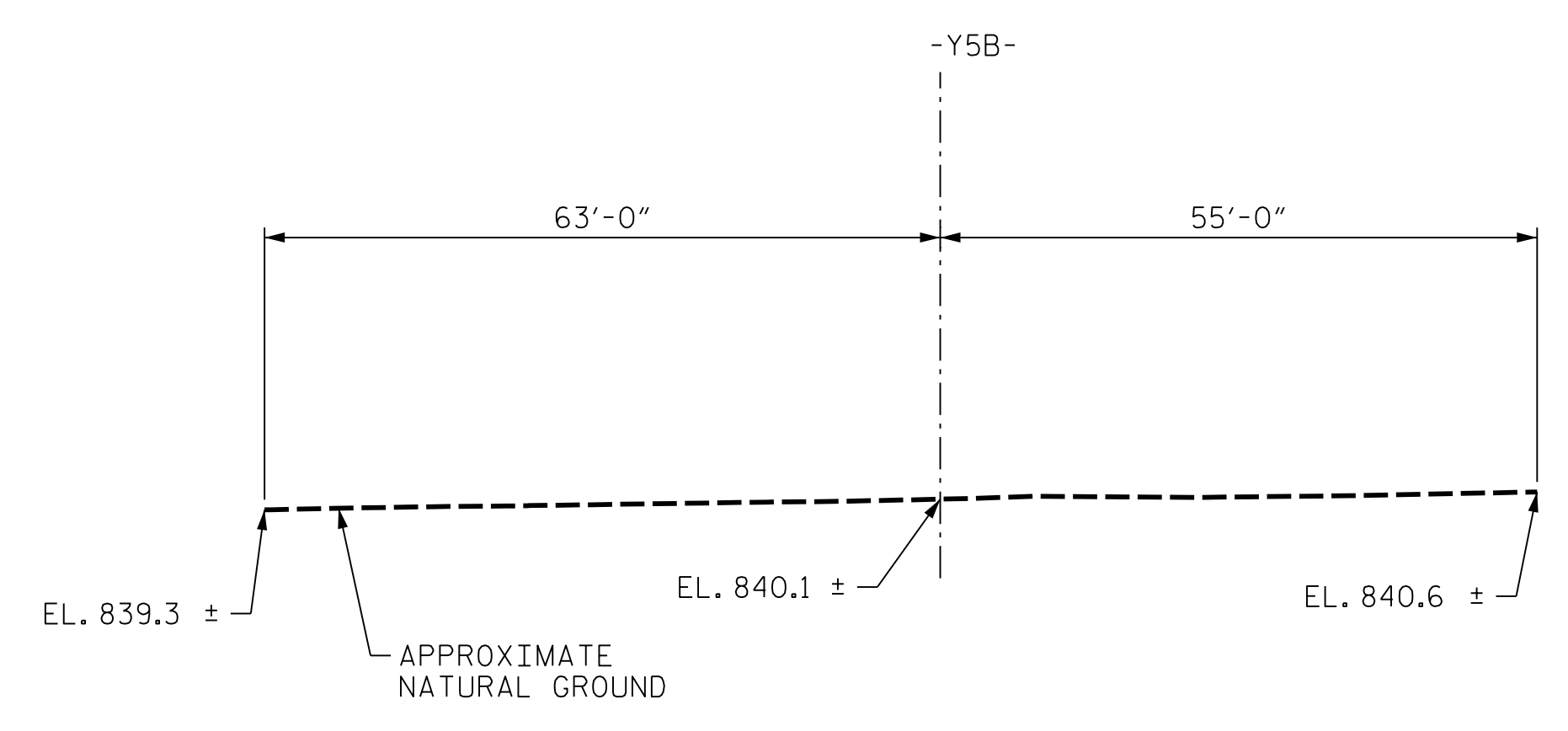
PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 19+75.11 -Y5B-
 SHEET 1 OF 5

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
BARREL @ 0.811 C.Y./FT.	48.8 C.Y.
WINGS ETC.	31.6 C.Y.
TOTAL	80.4 C.Y.
REINFORCING STEEL	
BARREL, HEADWALLS	11,774 LBS.
WINGS	2,975 LBS.
TOTAL	14,749 LBS.
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	105 TONS
RIP RAP, CLASS A	15 TONS
RIP RAP, CLASS B	15 TONS

HYDRAULIC DATA

DESIGN DISCHARGE	= 1020 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEVATION	= 847.4
DRAINAGE AREA	= 0.44 SQ. MI.
BASE DISCHARGE (Q100)	= 1190 CFS
BASE HIGH WATER ELEVATION	= 847.9
OVERTOPPING FLOOD DATA	
OVERTOPPING DISCHARGE	= 2465 CFS
FREQUENCY OF OVERTOPPING FLOOD	= >500 YR.
OVERTOPPING FLOOD ELEVATION	= 849.9

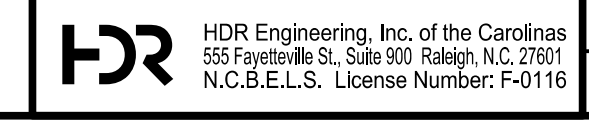


RIGHT ANGLE SECTION OF BARREL

THERE ARE 68 "C" BARS IN SECTION OF BARREL

PLOT DRIVER: NCDOT STRUCTURES DEFAULT PLOTTER.pht
 USER: PETERSO
 DATE: 5/20/2021
 TIME: 10:45:19 AM
 FILE: ... \GENERAL DRAWING LOCATION SKETCH

DES BY: T. MCALEENAN	DATE: 08/19	DWG BY: T. MCALEENAN	DATE: 08/19
DES CHK: R. TURNAGE	DATE: 08/19	CHK BY: R. TURNAGE	DATE: 08/19



10/11/2021

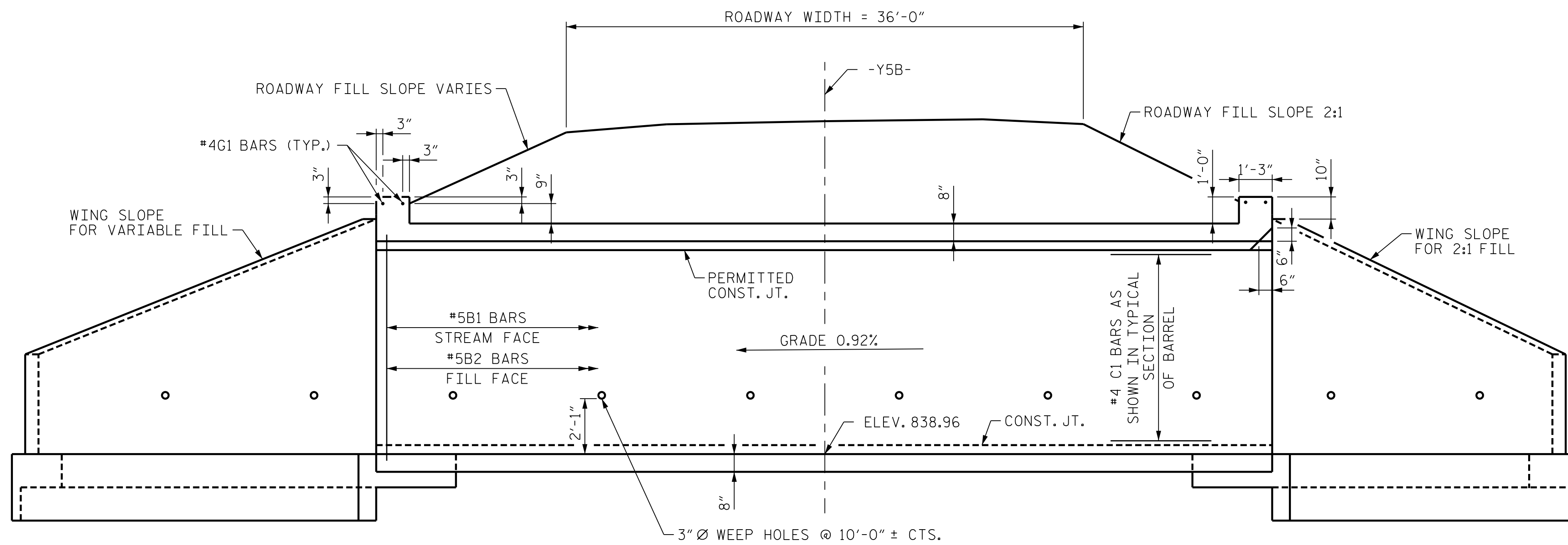
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

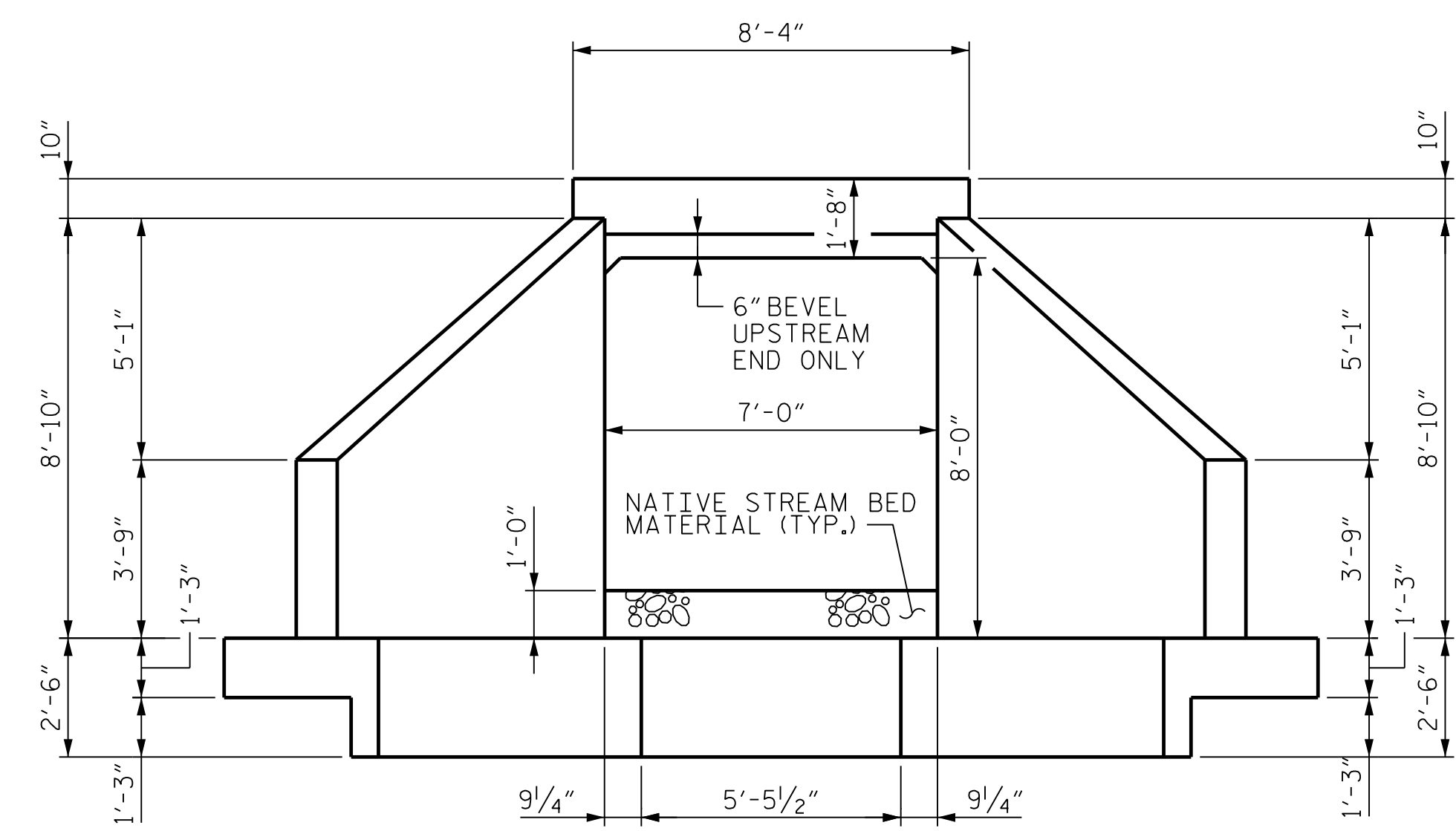
**SINGLE BARREL
 7 FT. X 8 FT.
 CONCRETE BOX CULVERT
 76° SKEW**

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

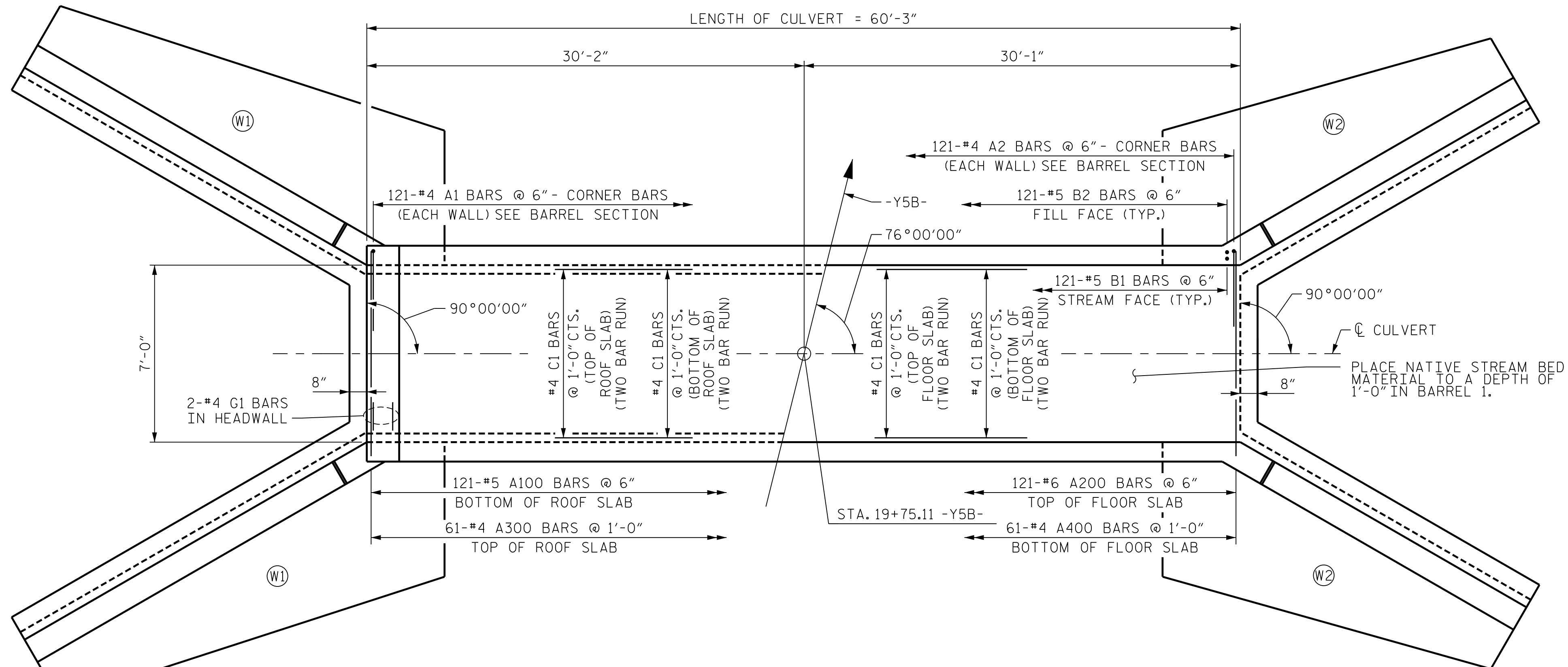
SHEET NO. C6-1
 TOTAL SHEETS 5



CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION



PART PLAN - ROOF SLAB PART PLAN - FLOOR SLAB

THE CONTRACTOR SHALL FILL THE PROPOSED CULVERT WITH NATIVE STREAM BED MATERIAL TO A DEPTH OF 1 FOOT, EXISTING BED MATERIAL SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AS DIRECTED BY THE ENGINEER, THE BED MATERIAL MAY BE SUPPLEMENTED WITH CLASS B RIP RAP IF NEEDED. PAYMENT SHALL BE INCLUDED IN THE LUMP SUM PAY ITEM FOR CULVERT EXCAVATION.

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 19+75.11 -Y5B-

SHEET 2 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE BARREL
 7 FT. X 8 FT.
 CONCRETE BOX CULVERT
 76° SKEW

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

DOMINIC A. COLETTI
 10/11/2021

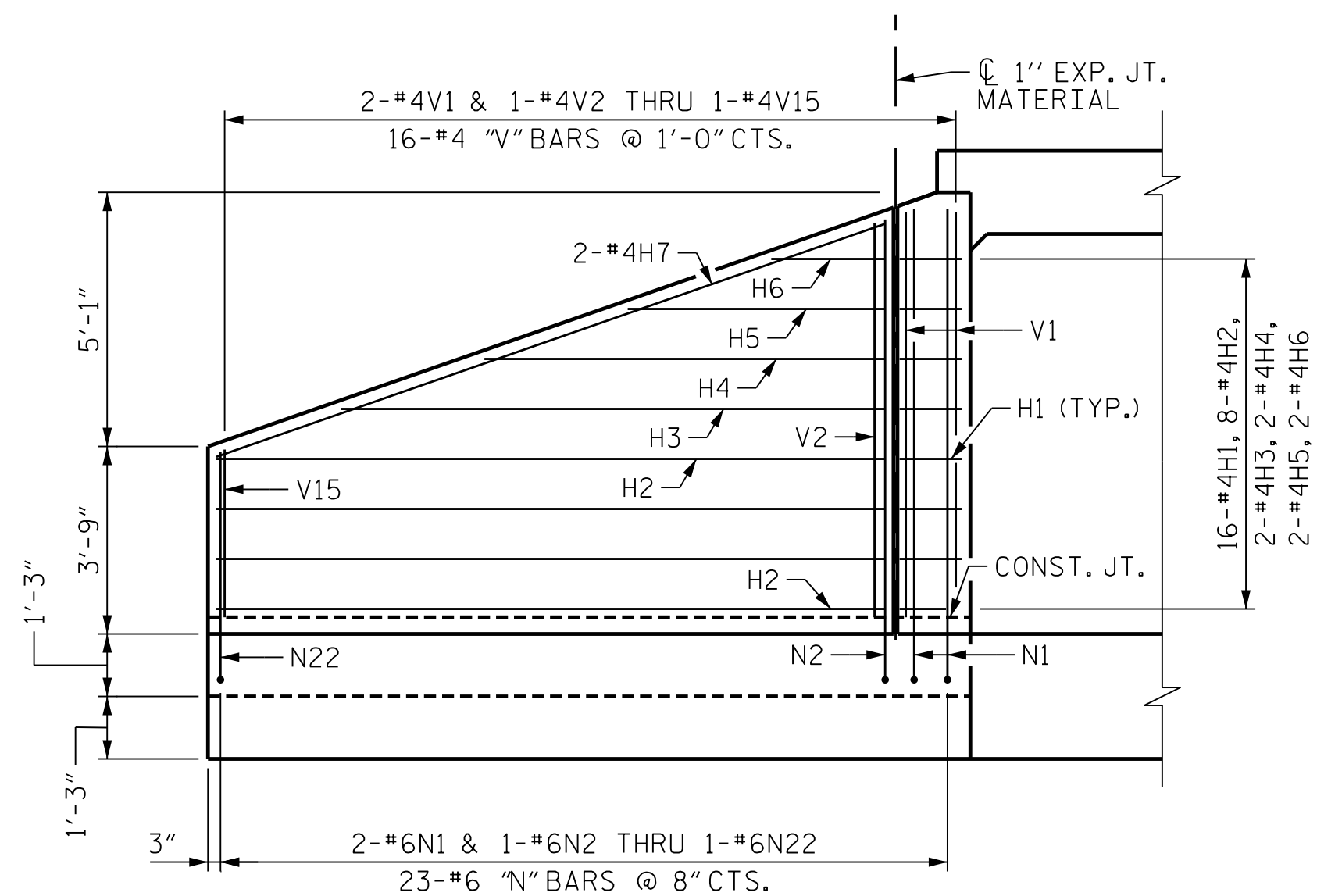
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 USER: PPRETOSO DATE: 5/20/2021 TIME: 10:33:33 AM
 FILE: ...ELEVATION VIEWS

DES BY: T. MCALEENAN	DATE: 08/19	DWG BY: T. MCALEENAN	DATE: 08/19
DES CHK: R. TURNAGE	DATE: 08/19	CHK BY: R. TURNAGE	DATE: 08/19

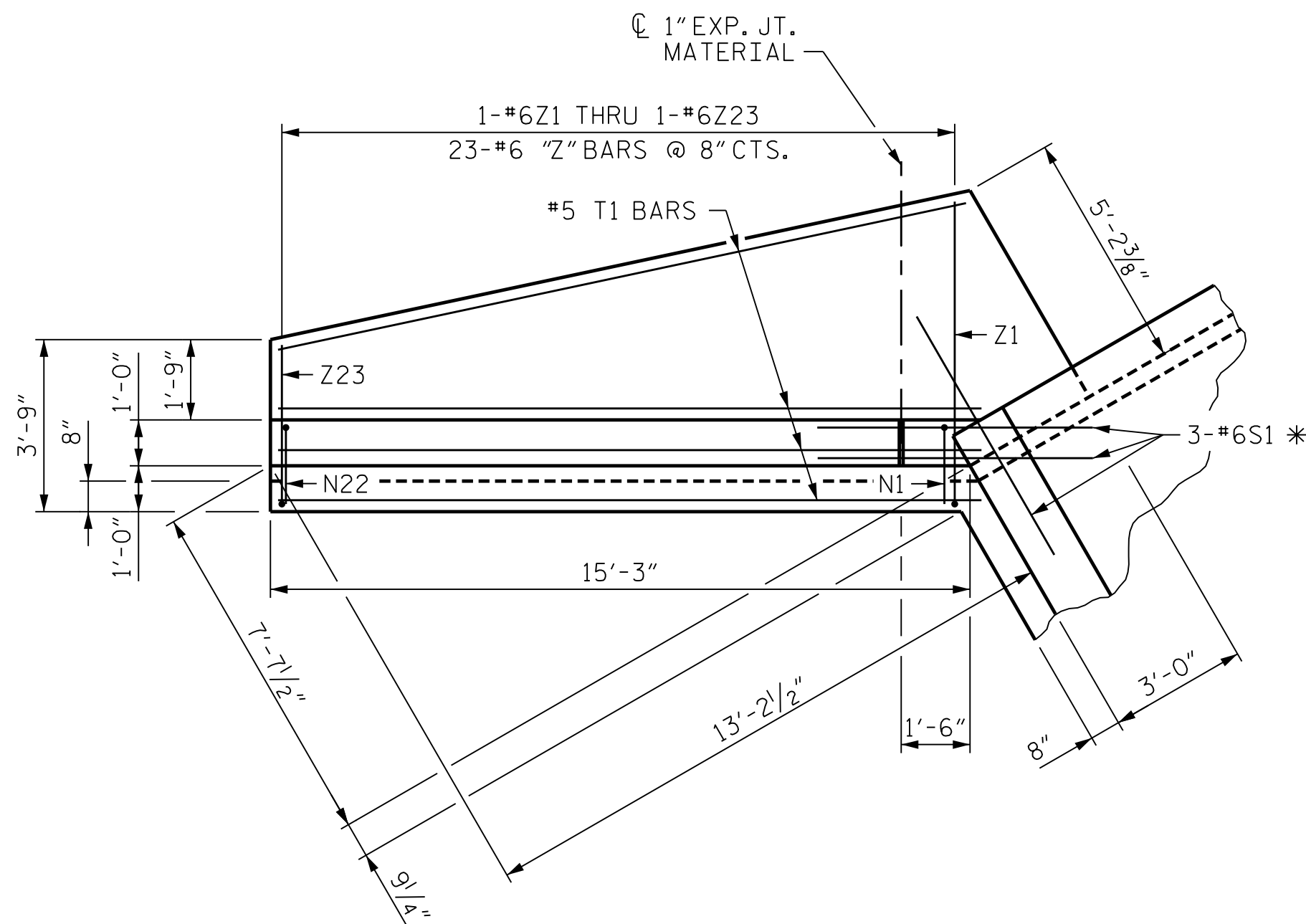
HDR HDR Engineering, Inc. of the Carolinas
 555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
 N.C.B.E.L.S. License Number: F-0116

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SHEET NO. C6-2
 TOTAL SHEETS 5

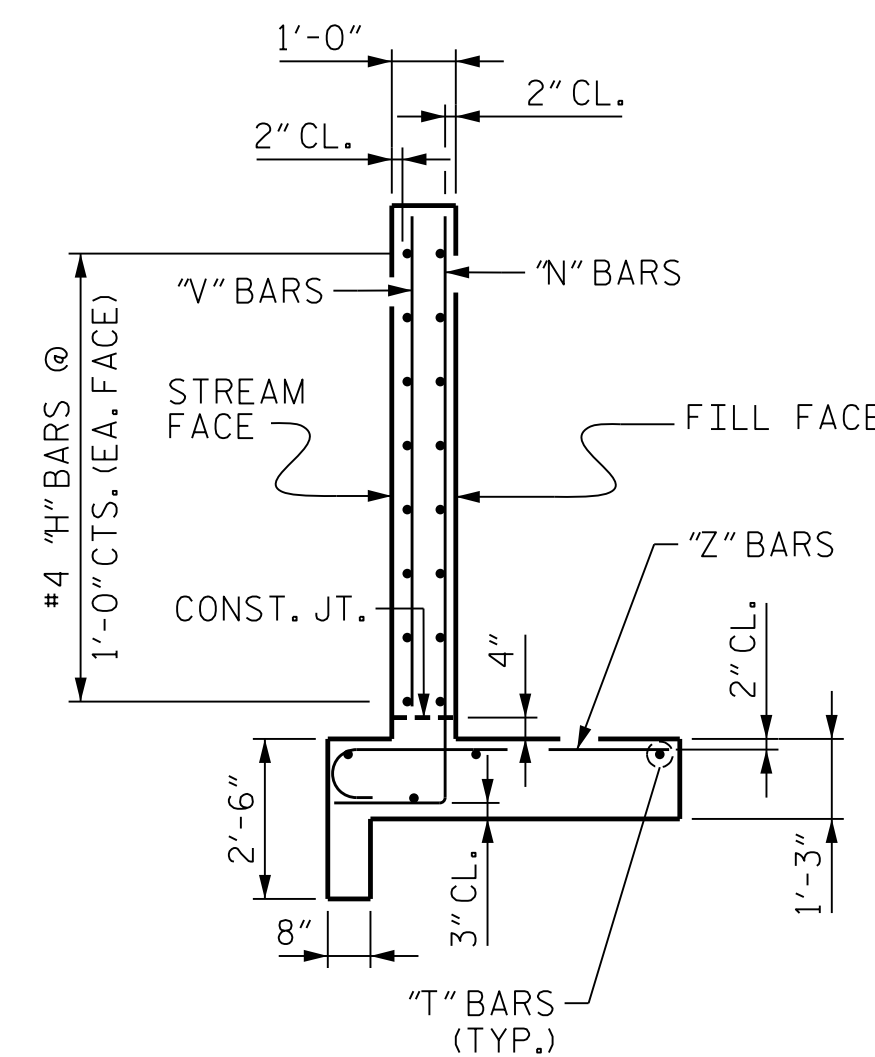


ELEVATION-W1



PLAN-W1

* BOTTOM OF FLOOR SLAB AND FOOTING



TYPICAL WING SECTION

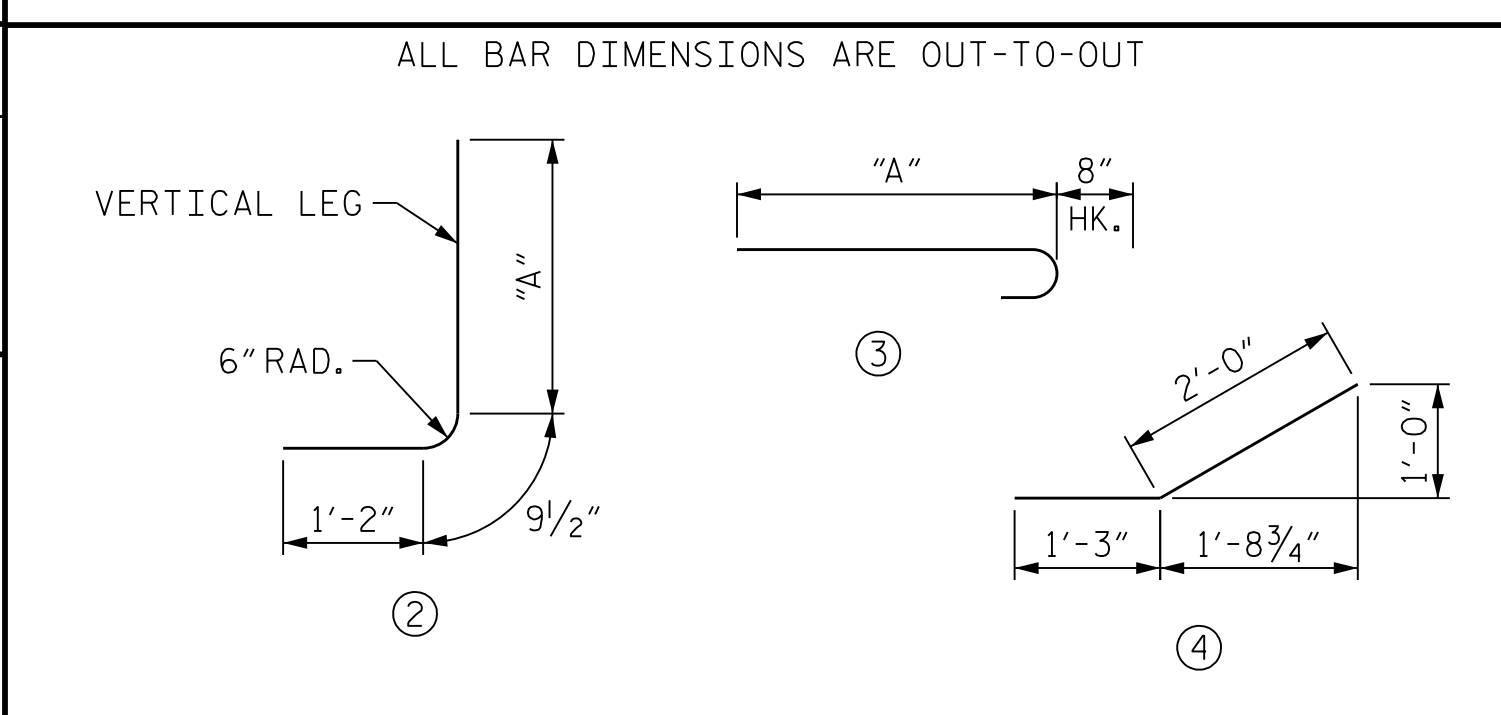
REINFORCING BAR SCHEDULE

BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT
H1	32	# 4	4	-	3' - 3"	69	V1	4	# 4	STR	-	8' - 1"	22
H2	16	# 4	STR	-	13' - 5"	143	V2	2	# 4	STR	-	7' - 11"	11
H3	4	# 4	STR	-	10' - 11"	29	V3	2	# 4	STR	-	7' - 6"	10
H4	4	# 4	STR	-	8' - 0"	21	V4	2	# 4	STR	-	7' - 2"	10
H5	4	# 4	STR	-	5' - 2"	14	V5	2	# 4	STR	-	6' - 10"	9
H6	4	# 4	STR	-	2' - 3"	6	V6	2	# 4	STR	-	6' - 6"	9
H7	4	# 4	STR	-	14' - 2"	38	V7	2	# 4	STR	-	6' - 2"	8
							V8	2	# 4	STR	-	5' - 10"	8
N1	4	# 6	2	8' - 10 1/2"	10' - 10"	65	V9	2	# 4	STR	-	5' - 5"	7
N2	2	# 6	2	8' - 8 1/2"	10' - 8"	32	V10	2	# 4	STR	-	5' - 1"	7
N3	2	# 6	2	8' - 5 1/2"	10' - 5"	31	V11	2	# 4	STR	-	4' - 9"	6
N4	2	# 6	2	8' - 2 1/2"	10' - 2"	31	V12	2	# 4	STR	-	4' - 5"	6
N5	2	# 6	2	7' - 11 1/2"	9' - 11"	30	V13	2	# 4	STR	-	4' - 1"	5
N6	2	# 6	2	7' - 9 1/2"	9' - 9"	29	V14	2	# 4	STR	-	3' - 8"	5
N7	2	# 6	2	7' - 6 1/2"	9' - 6"	29	V15	2	# 4	STR	-	3' - 4"	4
N8	2	# 6	2	7' - 3 1/2"	9' - 3"	28	Z1	2	# 6	3	6' - 7"	7' - 3"	22
N9	2	# 6	2	7' - 0 1/2"	9' - 0"	27	Z2	2	# 6	3	6' - 5"	7' - 1"	21
N10	2	# 6	2	6' - 10 1/2"	8' - 10"	27	Z3	2	# 6	3	6' - 4"	7' - 0"	21
N11	2	# 6	2	6' - 7 1/2"	8' - 7"	26	Z4	2	# 6	3	6' - 2"	6' - 10"	21
N12	2	# 6	2	6' - 4 1/2"	8' - 4"	25	Z5	2	# 6	3	6' - 0"	6' - 8"	20
N13	2	# 6	2	6' - 1 1/2"	8' - 1"	24	Z6	2	# 6	3	5' - 11"	6' - 7"	20
N14	2	# 6	2	5' - 10 1/2"	7' - 10"	24	Z7	2	# 6	3	5' - 9"	6' - 5"	19
N15	2	# 6	2	5' - 8 1/2"	7' - 8"	23	Z8	2	# 6	3	5' - 7"	6' - 3"	19
N16	2	# 6	2	5' - 5 1/2"	7' - 5"	22	Z9	2	# 6	3	5' - 6"	6' - 2"	19
N17	2	# 6	2	5' - 2 1/2"	7' - 2"	22	Z10	2	# 6	3	5' - 4"	6' - 0"	18
N18	2	# 6	2	4' - 11 1/2"	6' - 11"	21	Z11	2	# 6	3	5' - 2"	5' - 10"	18
N19	2	# 6	2	4' - 9 1/2"	6' - 9"	20	Z12	2	# 6	3	5' - 0"	5' - 8"	17
N20	2	# 6	2	4' - 6 1/2"	6' - 6"	20	Z13	2	# 6	3	4' - 11"	5' - 7"	17
N21	2	# 6	2	4' - 3 1/2"	6' - 3"	19	Z14	2	# 6	3	4' - 9"	5' - 5"	16
N22	2	# 6	2	4' - 1 1/2"	6' - 1"	18	Z15	2	# 6	3	4' - 7"	5' - 3"	16
							Z16	2	# 6	3	4' - 6"	5' - 2"	16
							Z17	2	# 6	3	4' - 4"	5' - 0"	15
S1	6	# 6	STR	-	6' - 0"	54	Z18	2	# 6	3	4' - 2"	4' - 10"	15
							Z19	2	# 6	3	4' - 0"	4' - 8"	14
T1	8	# 5	STR	-	15' - 4"	128	Z20	2	# 6	3	3' - 11"	4' - 7"	14
							Z21	2	# 6	3	3' - 9"	4' - 5"	13
							Z22	2	# 6	3	3' - 7"	4' - 3"	13
							Z23	2	# 6	3	3' - 6"	4' - 2"	13

QUANTITIES

REINFORCING STEEL FOR 2 WINGS	1619 LBS.
CLASS A CONCRETE	16.4 C.Y.
2 WINGS	0.4 C.Y.
1 HEADWALL	0.3 C.Y.
1 END CURTAIN WALL	
TOTAL	17.1 C.Y.

BAR TYPES



PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 19+75.11 -Y5B-

SHEET 3 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 WINGS FOR
 CONCRETE BOX CULVERT
 90° SKEW



10/11/2021

REVISIONS

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

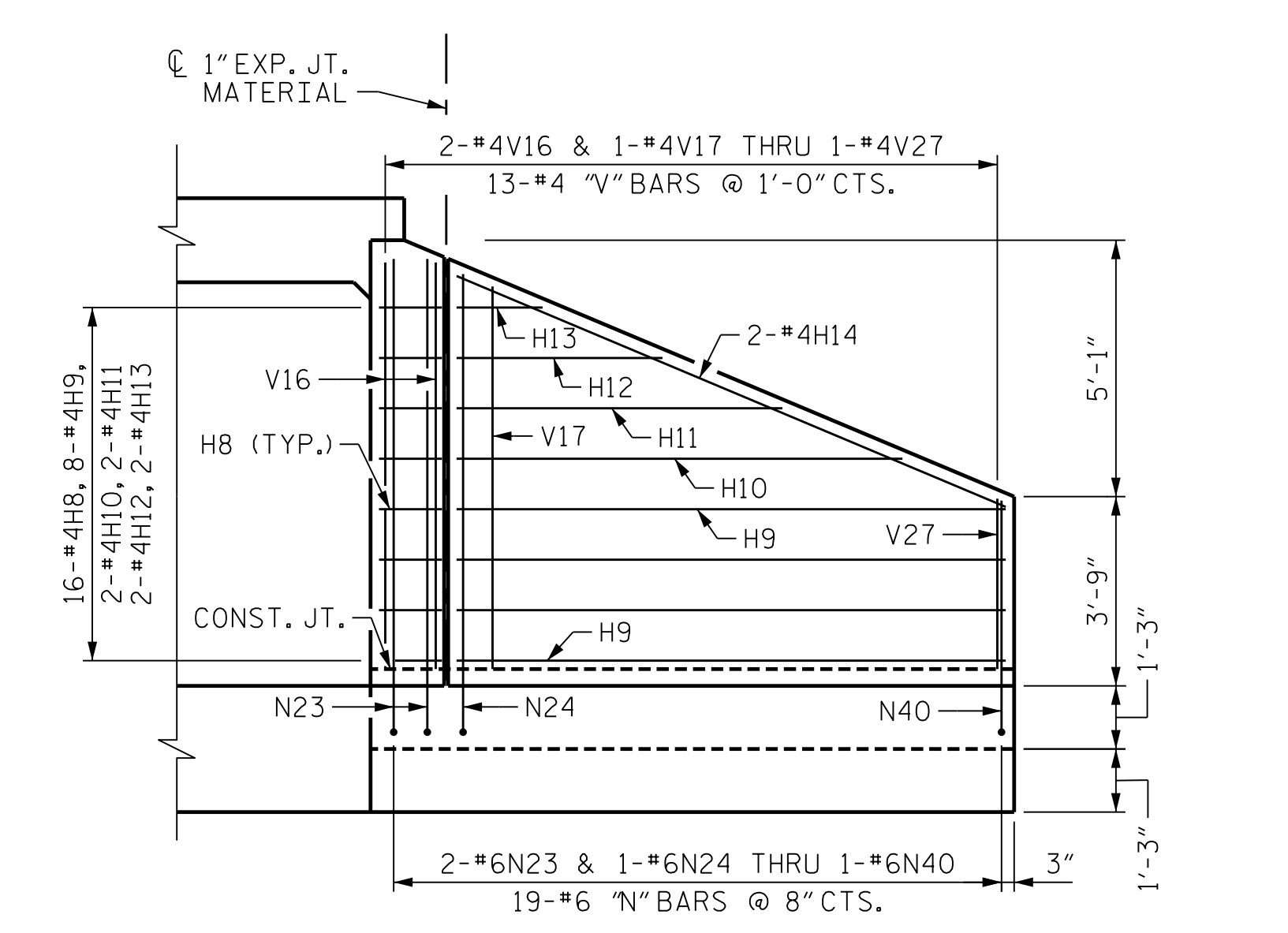
SHEET NO. C6-3
 TOTAL SHEETS 5



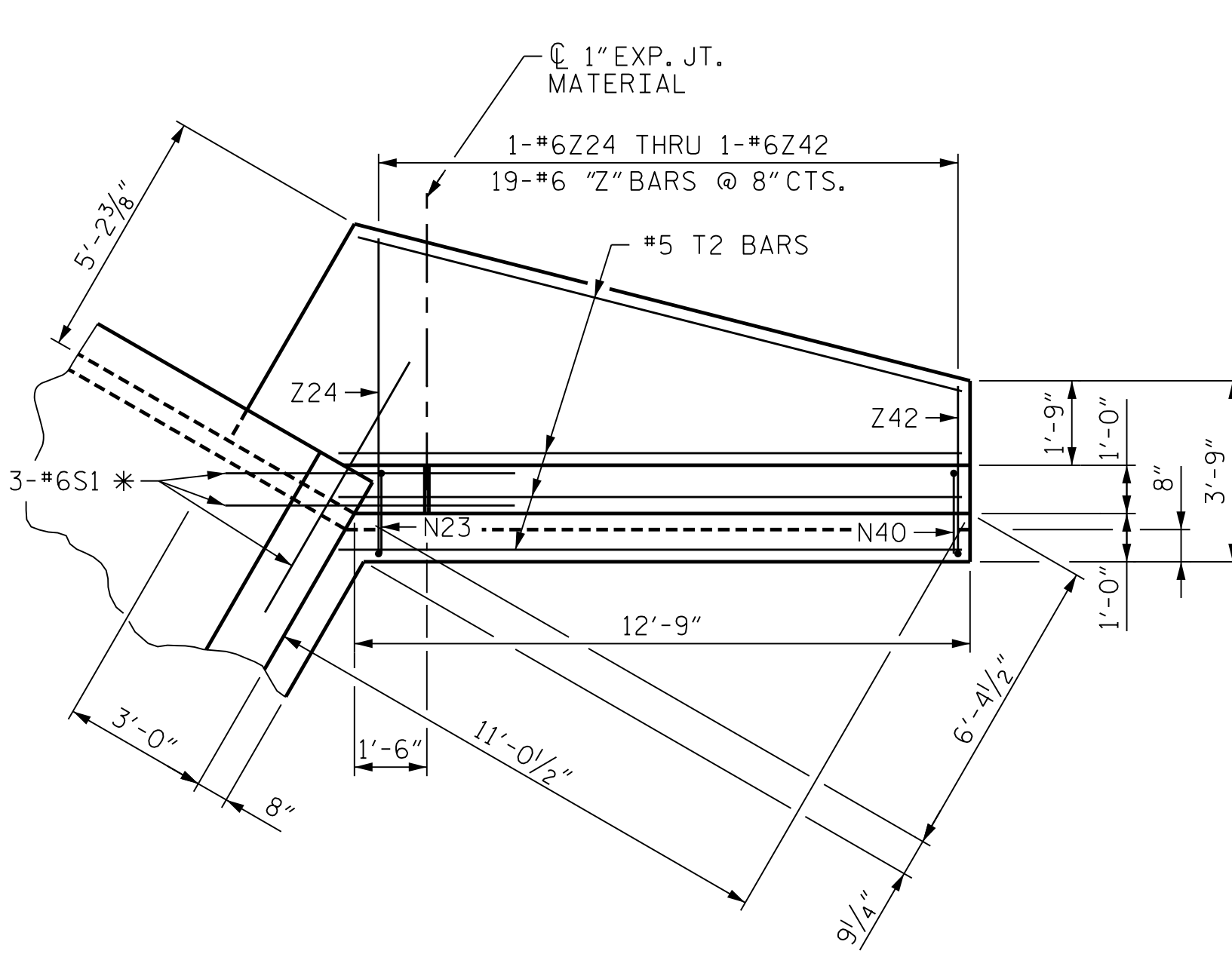
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PLOT DRIVER: NCDOT STRUCTURES DEFAULT PLOTTER.plt
 USER: PPRETERO
 DATE: 5/20/2021
 TIME: 10:33:42 AM
 FILE: ... \WINGWALL VIEWS

DES BY: T. MCALEENAN	DATE: 08/19	DWG BY: T. MCALEENAN	DATE: 08/19
DES CHK: R. TURNAGE	DATE: 08/19	CHK BY: R. TURNAGE	DATE: 08/19



ELEVATION-W2



PLAN-W2

* BOTTOM OF FLOOR SLAB AND FOOTING

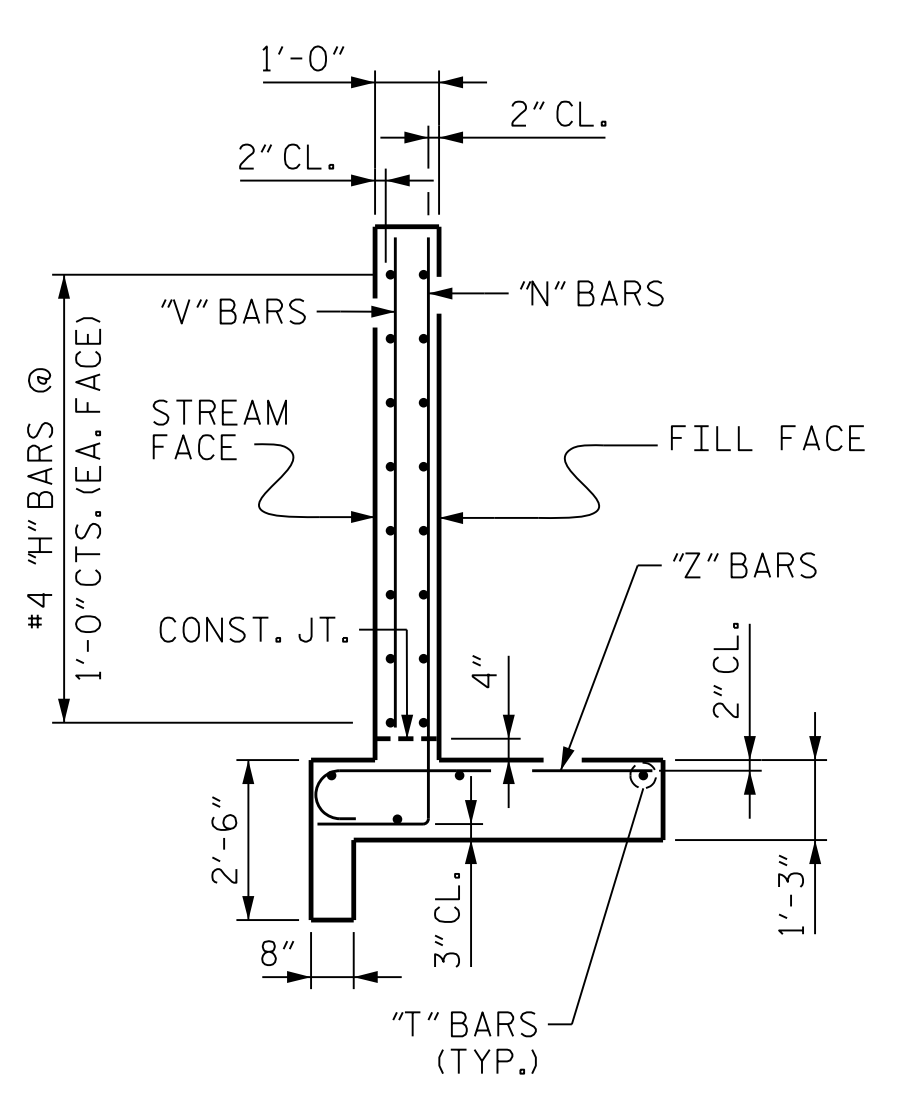
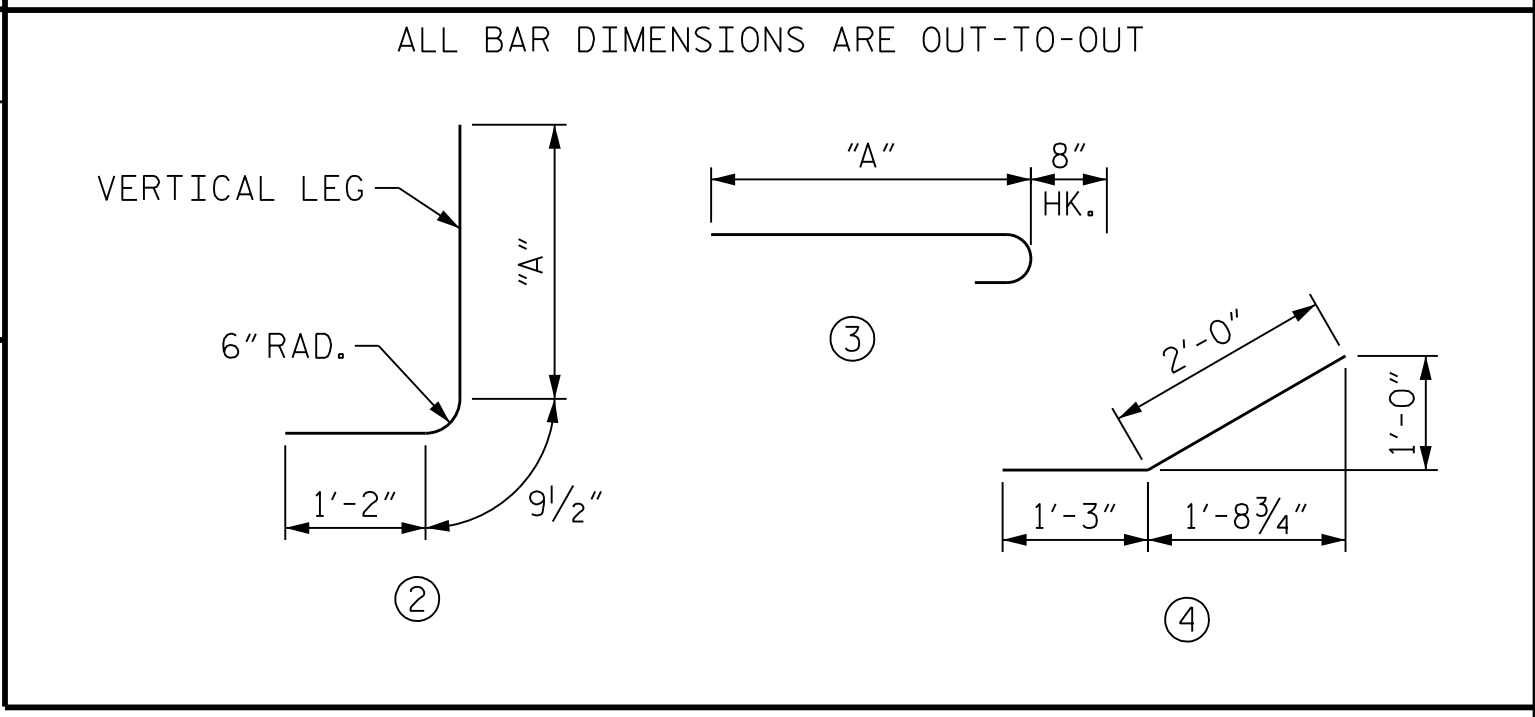
REINFORCING BAR SCHEDULE

BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT
H8	32	# 4	4	-	3' - 3"	69	V16	4	# 4	STR	-	8' - 1"	22
H9	16	# 4	STR	-	10' - 11"	117	V17	2	# 4	STR	-	7' - 7"	10
H10	4	# 4	STR	-	8' - 10"	24	V18	2	# 4	STR	-	7' - 2"	10
H11	4	# 4	STR	-	6' - 5"	17	V19	2	# 4	STR	-	6' - 9"	9
H12	4	# 4	STR	-	4' - 1"	11	V20	2	# 4	STR	-	6' - 4"	8
H13	4	# 4	STR	-	1' - 8"	4	V21	2	# 4	STR	-	5' - 11"	8
H14	4	# 4	STR	-	11' - 10"	32	V22	2	# 4	STR	-	5' - 6"	7
							V23	2	# 4	STR	-	5' - 1"	7
N23	4	# 6	2	8' - 10 1/2"	10' - 10"	65	V24	2	# 4	STR	-	4' - 8"	6
N24	2	# 6	2	8' - 6 1/2"	10' - 6"	32	V25	2	# 4	STR	-	4' - 3"	6
N25	2	# 6	2	8' - 3 1/2"	10' - 3"	31	V26	2	# 4	STR	-	3' - 10"	5
N26	2	# 6	2	7' - 11 1/2"	9' - 11"	30	V27	2	# 4	STR	-	3' - 5"	5
N27	2	# 6	2	7' - 8 1/2"	9' - 8"	29							
N28	2	# 6	2	7' - 5 1/2"	9' - 5"	28	Z24	2	# 6	3	6' - 6"	7' - 2"	22
N29	2	# 6	2	7' - 1 1/2"	9' - 1"	27	Z25	2	# 6	3	6' - 4"	7' - 0"	21
N30	2	# 6	2	6' - 10 1/2"	8' - 10"	27	Z26	2	# 6	3	6' - 2"	6' - 10"	21
N31	2	# 6	2	6' - 7 1/2"	8' - 7"	26	Z27	2	# 6	3	6' - 0"	6' - 8"	20
N32	2	# 6	2	6' - 3 1/2"	8' - 3"	25	Z28	2	# 6	3	5' - 10"	6' - 6"	20
N33	2	# 6	2	6' - 0 1/2"	8' - 0"	24	Z29	2	# 6	3	5' - 8"	6' - 4"	19
N34	2	# 6	2	5' - 9 1/2"	7' - 9"	23	Z30	2	# 6	3	5' - 6"	6' - 2"	19
N35	2	# 6	2	5' - 5 1/2"	7' - 5"	22	Z31	2	# 6	3	5' - 4"	6' - 0"	18
N36	2	# 6	2	5' - 2 1/2"	7' - 2"	22	Z32	2	# 6	3	5' - 2"	5' - 10"	18
N37	2	# 6	2	4' - 10 1/2"	6' - 10"	21	Z33	2	# 6	3	5' - 0"	5' - 8"	17
N38	2	# 6	2	4' - 7 1/2"	6' - 7"	20	Z34	2	# 6	3	4' - 10"	5' - 6"	17
N39	2	# 6	2	4' - 4 1/2"	6' - 4"	19	Z35	2	# 6	3	4' - 8"	5' - 4"	16
N40	2	# 6	2	4' - 1 1/2"	6' - 1"	18	Z36	2	# 6	3	4' - 6"	5' - 2"	16
							Z37	2	# 6	3	4' - 4"	5' - 0"	15
S1	6	# 6	STR	-	6' - 0"	54	Z38	2	# 6	3	4' - 2"	4' - 10"	15
							Z39	2	# 6	3	4' - 0"	4' - 8"	14
T2	8	# 5	STR	-	12' - 11"	108	Z40	2	# 6	3	3' - 10"	4' - 6"	14
							Z41	2	# 6	3	3' - 8"	4' - 4"	13
							Z42	2	# 6	3	3' - 6"	4' - 2"	13

QUANTITIES

REINFORCING STEEL FOR 2 WINGS	1356 LBS.
CLASS A CONCRETE 2 WINGS	13.8 C.Y.
1 HEADWALL	0.4 C.Y.
1 END CURTAIN WALL	0.3 C.Y.
TOTAL	14.5 C.Y.

BAR TYPES



TYPICAL WING SECTION

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 19+75.11 -Y5B-

SHEET 4 OF 5

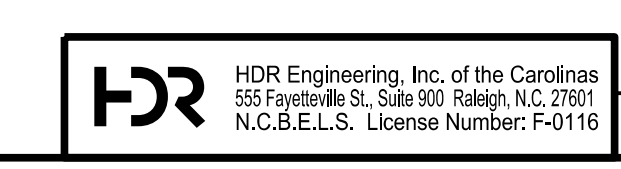
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 WINGS FOR
 CONCRETE BOX CULVERT
 90° SKEW



10/11/2021

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

SHEET NO. C6-4
 TOTAL SHEETS 5



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PLOT DRIVER: NCDOT STRUCTURES DEFAULT PLOTTER.plt
 USER: PPRETOSO DATE: 5/20/2021
 FILE: ... \WINGWALL VIEWS 2

DES BY: T. MCALEENAN	DATE: 08/19	DWG BY: T. MCALEENAN	DATE: 08/19
DES CHK: R. TURNAGE	DATE: 08/19	CHK BY: R. TURNAGE	DATE: 08/19

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						LIVE-LOAD FACTORS (γ _{LL})	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (FT)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (FT)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	①	1.86	--	1.75	1.95	1	TOP SLAB	4.17	1.86	1	BOTTOM SLAB	1.15		
	HL-93 (OPERATING)	N/A		2.41	--	1.35	2.53	1	TOP SLAB	4.17	2.41	1	BOTTOM SLAB	1.15		
	HS-20 (INVENTORY)	36.000	②	1.94	69.8	1.75	2.03	1	TOP SLAB	4.17	1.94	1	BOTTOM SLAB	1.15		
	HS-20 (OPERATING)	36.000		2.51	90.4	1.35	2.63	1	TOP SLAB	4.17	2.51	1	BOTTOM SLAB	1.15		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		3.61	48.7	1.40	3.78	1	TOP SLAB	4.17	3.61	1	BOTTOM SLAB	1.15		
		SNGARBS2	20.000		3.38	67.6	1.40	3.54	1	TOP SLAB	4.17	3.38	1	BOTTOM SLAB	1.15	
		SNAGRIS2	22.000		3.61	79.4	1.40	3.78	1	TOP SLAB	4.17	3.61	1	BOTTOM SLAB	1.15	
		SNCOTTS3	27.250		2.33	63.5	1.40	2.44	1	TOP SLAB	4.17	2.33	1	BOTTOM SLAB	1.15	
		SNAGGRS4	34.925	③	2.11	73.7	1.40	2.11	1	TOP SLAB	4.17	2.23	1	BOTTOM SLAB	1.15	
		SNS5A	35.550		2.25	80.0	1.40	2.25	1	TOP SLAB	4.17	2.45	1	BOTTOM SLAB	1.15	
		SNS6A	39.950		2.21	88.3	1.40	2.21	1	TOP SLAB	4.17	2.22	1	BOTTOM SLAB	1.15	
		SNS7B	42.000		2.21	92.8	1.40	2.21	1	TOP SLAB	4.17	2.22	1	BOTTOM SLAB	1.15	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		3.61	119.1	1.40	3.78	1	TOP SLAB	4.17	3.61	1	BOTTOM SLAB	1.15	
		TNT4A	33.075		2.77	91.6	1.40	2.90	1	TOP SLAB	4.17	2.77	1	BOTTOM SLAB	1.15	
		TNT6A	41.600		2.21	91.9	1.40	2.21	1	TOP SLAB	4.17	2.36	1	BOTTOM SLAB	1.15	
		TNT7A	42.000		2.38	100.0	1.40	2.38	1	TOP SLAB	4.17	2.53	1	BOTTOM SLAB	1.15	
		TNT7B	42.000		2.22	93.2	1.40	2.22	1	TOP SLAB	4.17	2.23	1	BOTTOM SLAB	1.15	
		TNAGRIT4	43.000		2.77	119.1	1.40	2.90	1	TOP SLAB	4.17	2.77	1	BOTTOM SLAB	1.15	
TNAGT5A	45.000		2.77	124.7	1.40	2.90	1	TOP SLAB	4.17	2.77	1	BOTTOM SLAB	1.15			
TNAGT5B	45.000		2.77	124.7	1.40	2.90	1	TOP SLAB	4.17	2.77	1	BOTTOM SLAB	1.15			

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

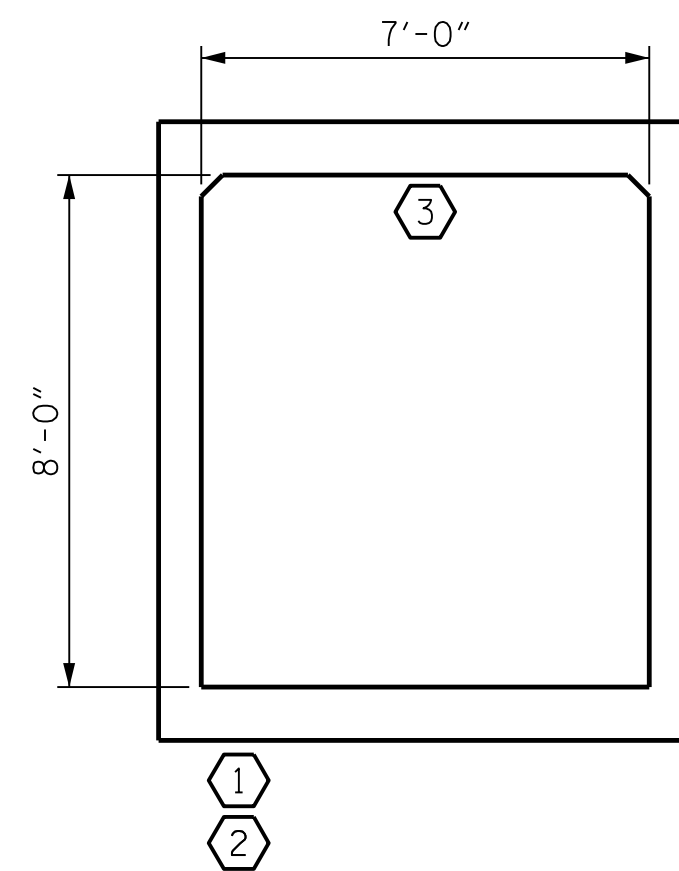
LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
LS	1.75	--
WA	1.00	--

NOTES:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

LL SURCHARGE DEPTH = 2.39 FT.

#	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 DOWN STREAM)

PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 19+75.11 -Y5B-

SHEET 5 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

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



10/11/2021

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C6-5
1			3			TOTAL SHEETS
2			4			5

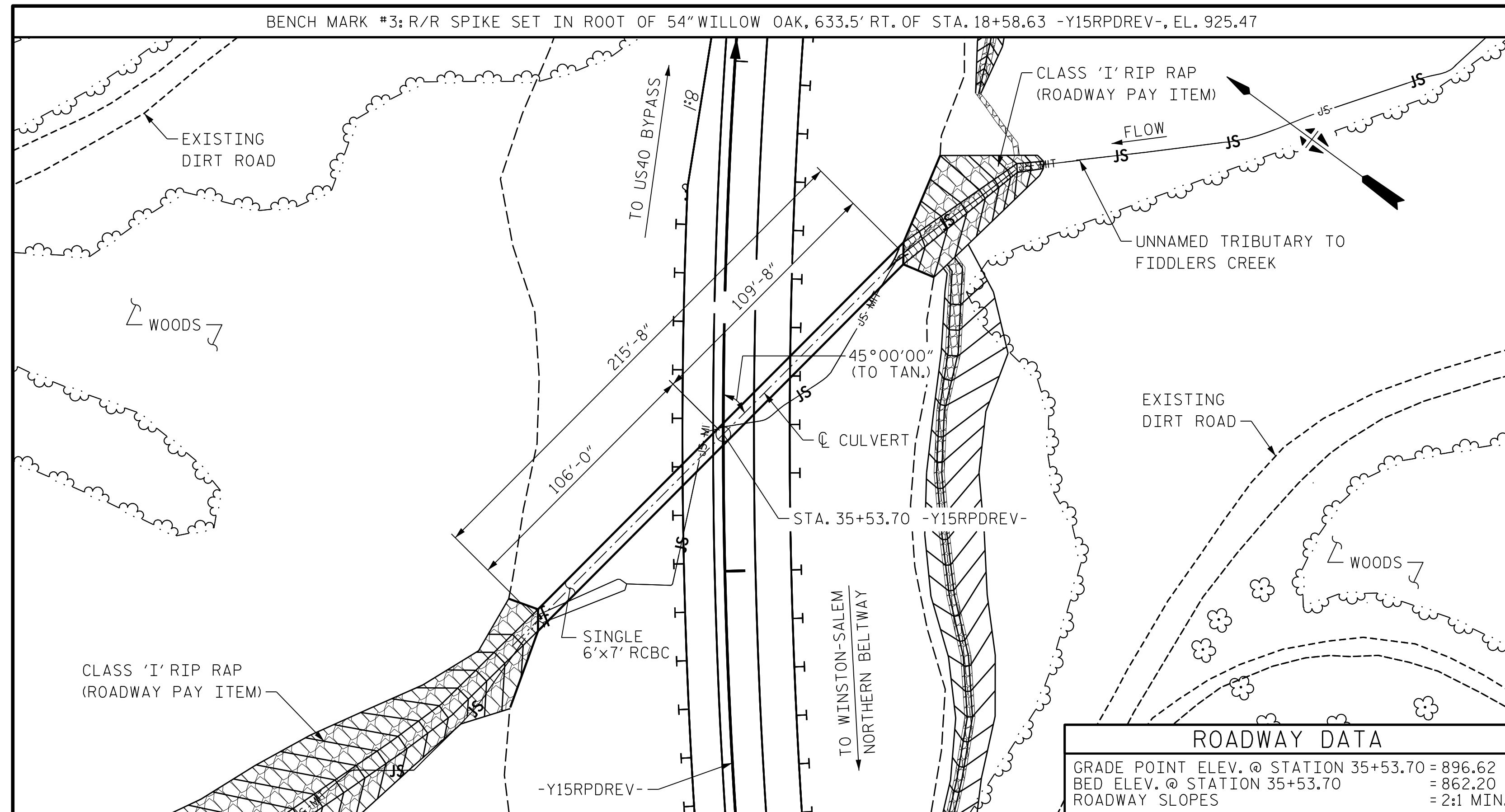


**DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED**

STD. NO. LRFR5

PLOT DRIVER: NCDOT_STRUCTURES_DEFAULT_PLOTTER.plt PENTABLE: NCDOT_STRUCTURES_DEFAULT_PEN.tbl
 USER: PETERSO DATE: 5/20/2021 TIME: 10:34:00 AM
 FILE: ...RATING_SUMMARY

DES BY: <u>T. MCALEENAN</u>	DATE: <u>08/19</u>	DWG BY: <u>T. MCALEENAN</u>	DATE: <u>08/19</u>
DES CHK: <u>R. TURNAGE</u>	DATE: <u>08/19</u>	CHK BY: <u>R. TURNAGE</u>	DATE: <u>08/19</u>



LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS

ROADWAY DATA

GRADE POINT ELEV. @ STATION 35+53.70	= 896.62
BED ELEV. @ STATION 35+53.70	= 862.20
ROADWAY SLOPES	= 2:1 MIN.

HYDRAULIC DATA

DESIGN DISCHARGE	= 180 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEVATION	= 869.4
DRAINAGE AREA	= 0.09 SQ. MI.
BASE DISCHARGE (Q100)	= 200 CFS
BASE HIGH WATER ELEVATION	= 869.7

OVERTOPPING FLOOD DATA

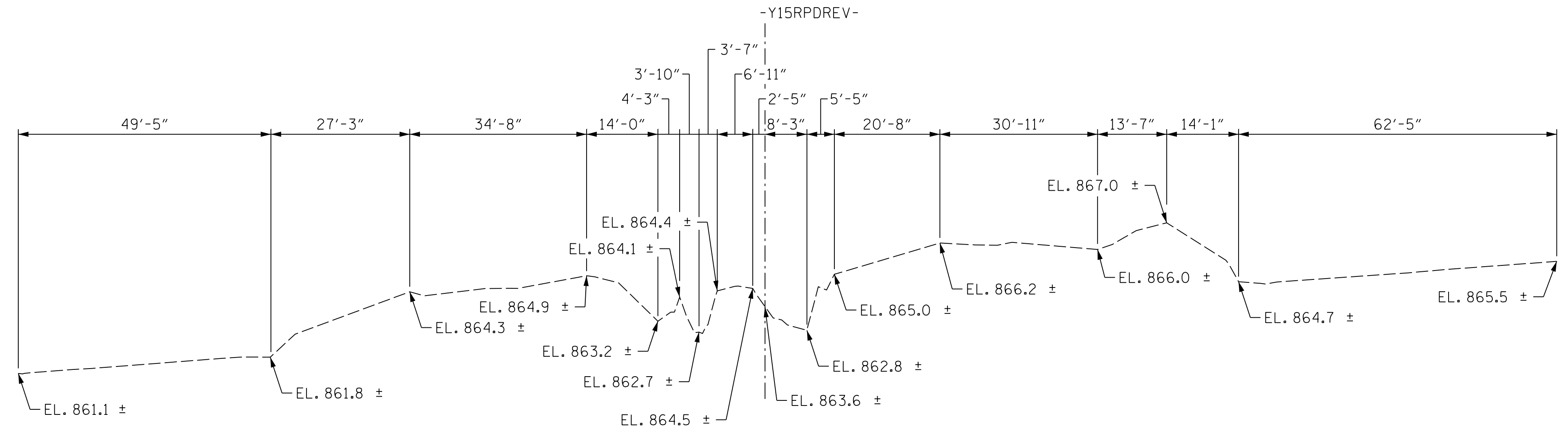
OVERTOPPING DISCHARGE	= 840 CFS
FREQUENCY OF OVERTOPPING FLOOD	= >500 YR.
OVERTOPPING FLOOD ELEVATION	= 892.4

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
BARREL @ 1.004 C.Y./FT.	216.6 C.Y.
WINGS ETC.	43.8 C.Y.
SILLS/BAFFLES	2.4 C.Y.
TOTAL	262.8 C.Y.
REINFORCING STEEL	
BARREL, HEADWALLS, SILLS, & BAFFLES	43,361 LBS.
WINGS	3,962 LBS.
TOTAL	47,323 LBS.
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	178 TONS

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
 DESIGN FILL = 27.65'
 FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTE SHEET.
 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
 CONCRETE IN THE 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 THE WING SHEETS.
 TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
 AT THE CONTRACTOR'S OPTION HE MAY 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 PLANS. THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIONAL PRECAST REINFORCING CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.
 A 3 FOOT STRIP OF GEOTEXTILE SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
 THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO THE VARIOUS PAY ITEMS.
 FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
 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.



PROFILE ALONG CULVERT

SAMPLE BAR REPLACEMENT

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

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

PROJECT NO. U-2579AB
FORSYTH COUNTY
 STATION: 35+53.70 -Y15RPDREV-
 SHEET 1 OF 6



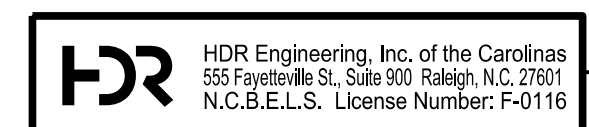
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**SINGLE BARREL
 6 FT. X 7 FT.
 CONCRETE BOX CULVERT
 45° SKEW**

REVISIONS

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

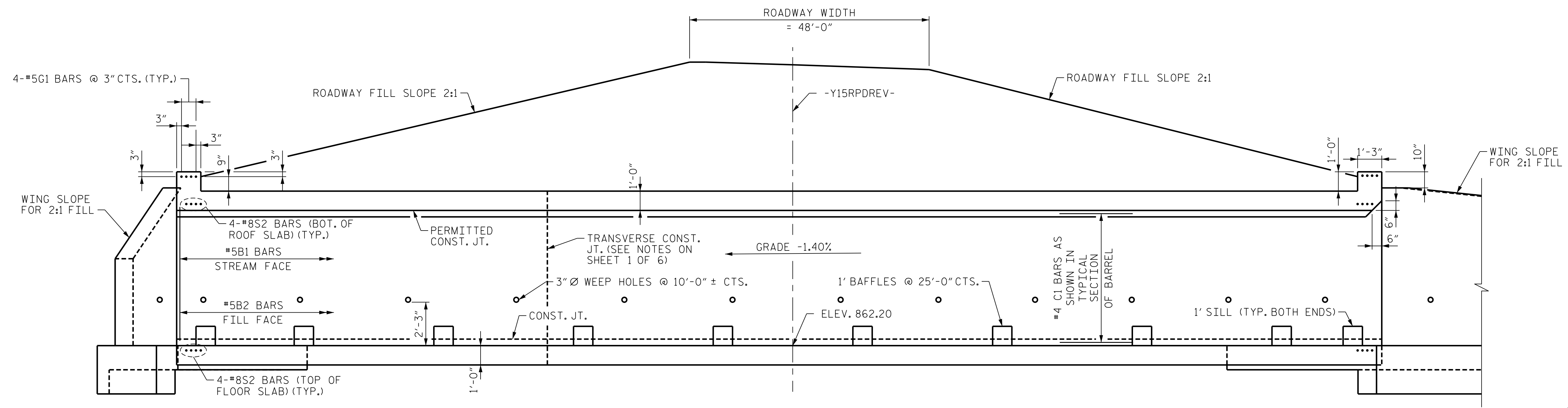
SHEET NO. C7-1
 TOTAL SHEETS 6

DES BY: <u>T. MCALEENAN</u>	DATE: <u>11/19</u>	DWG BY: <u>T. MCALEENAN</u>	DATE: <u>11/19</u>
DES CHK: <u>R. TURNAGE</u>	DATE: <u>11/19</u>	CHK BY: <u>R. TURNAGE</u>	DATE: <u>11/19</u>

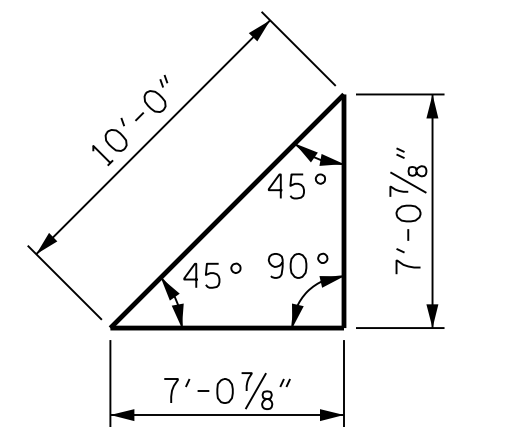


**DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED**

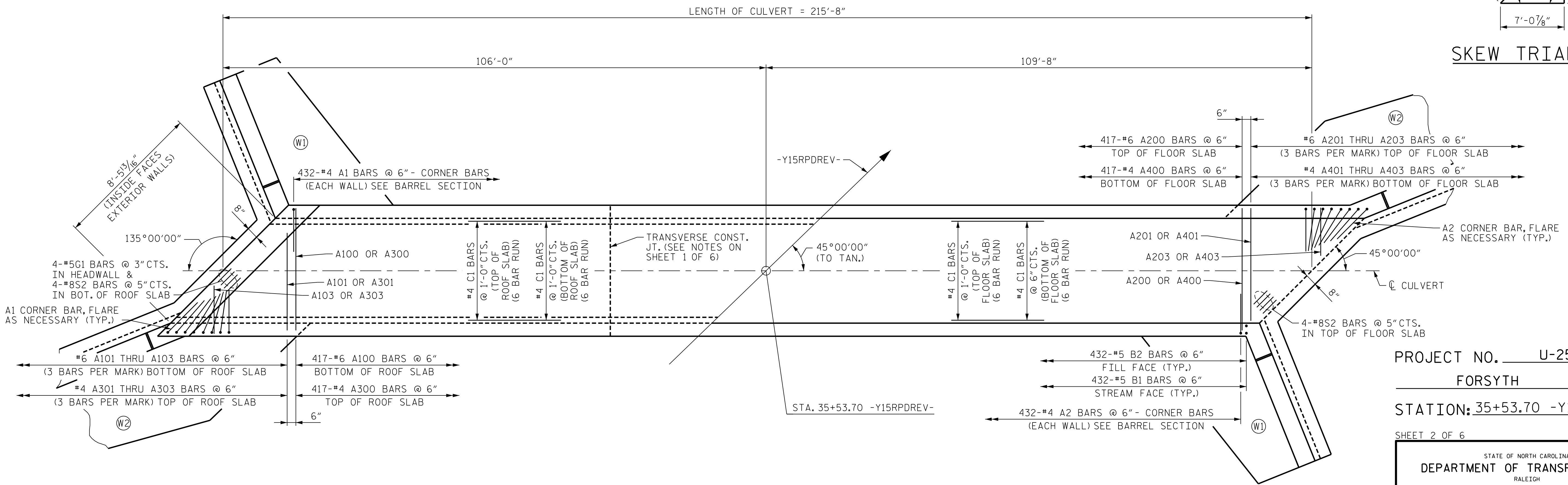
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 DATE: 5/20/2021
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CULVERT SECTION NORMAL TO ROADWAY



SKEW TRIANGLE



PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 35+53.70 -Y15RPDREV-
 SHEET 2 OF 6



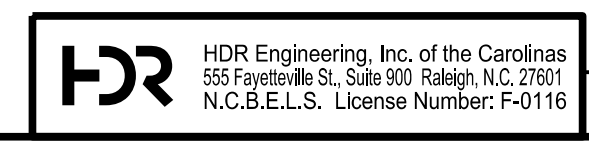
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE BARREL
 6 FT. X 7 FT.
 CONCRETE BOX CULVERT
 45° SKEW

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

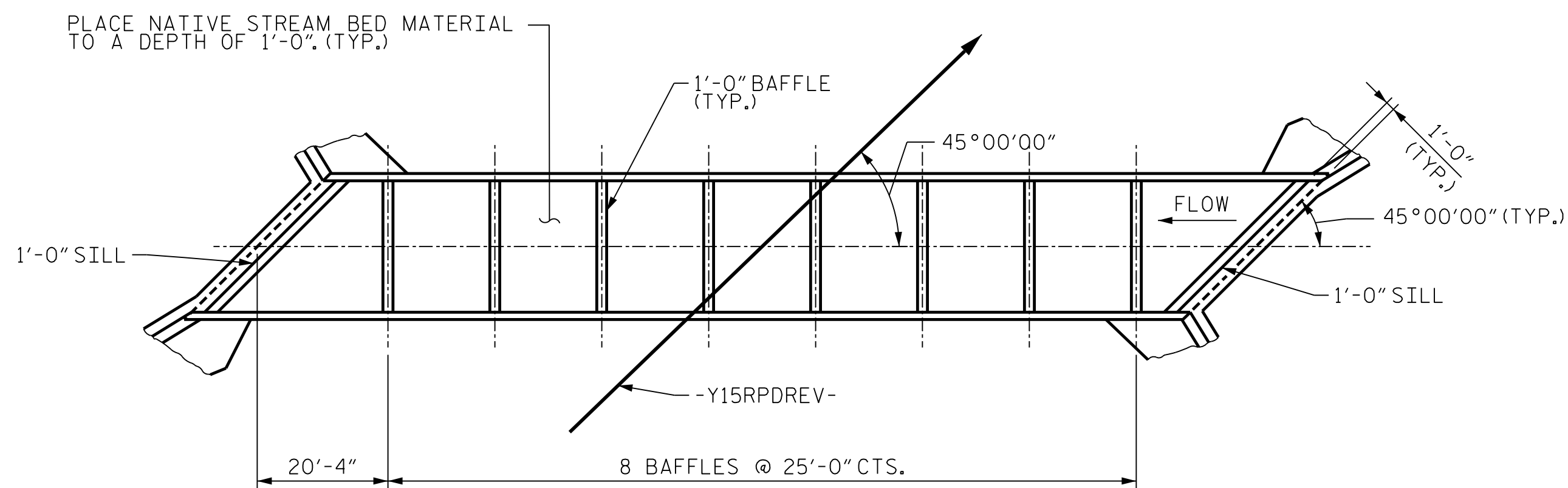
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 USER: PETERSON DATE: 5/20/2021
 FILE: ...PLAN AND ELEVATION

DES BY: T. MCALEENAN	DATE: 11/19	DWG BY: T. MCALEENAN	DATE: 11/19
DES CHK: R. TURNAGE	DATE: 11/19	CHK BY: R. TURNAGE	DATE: 11/19

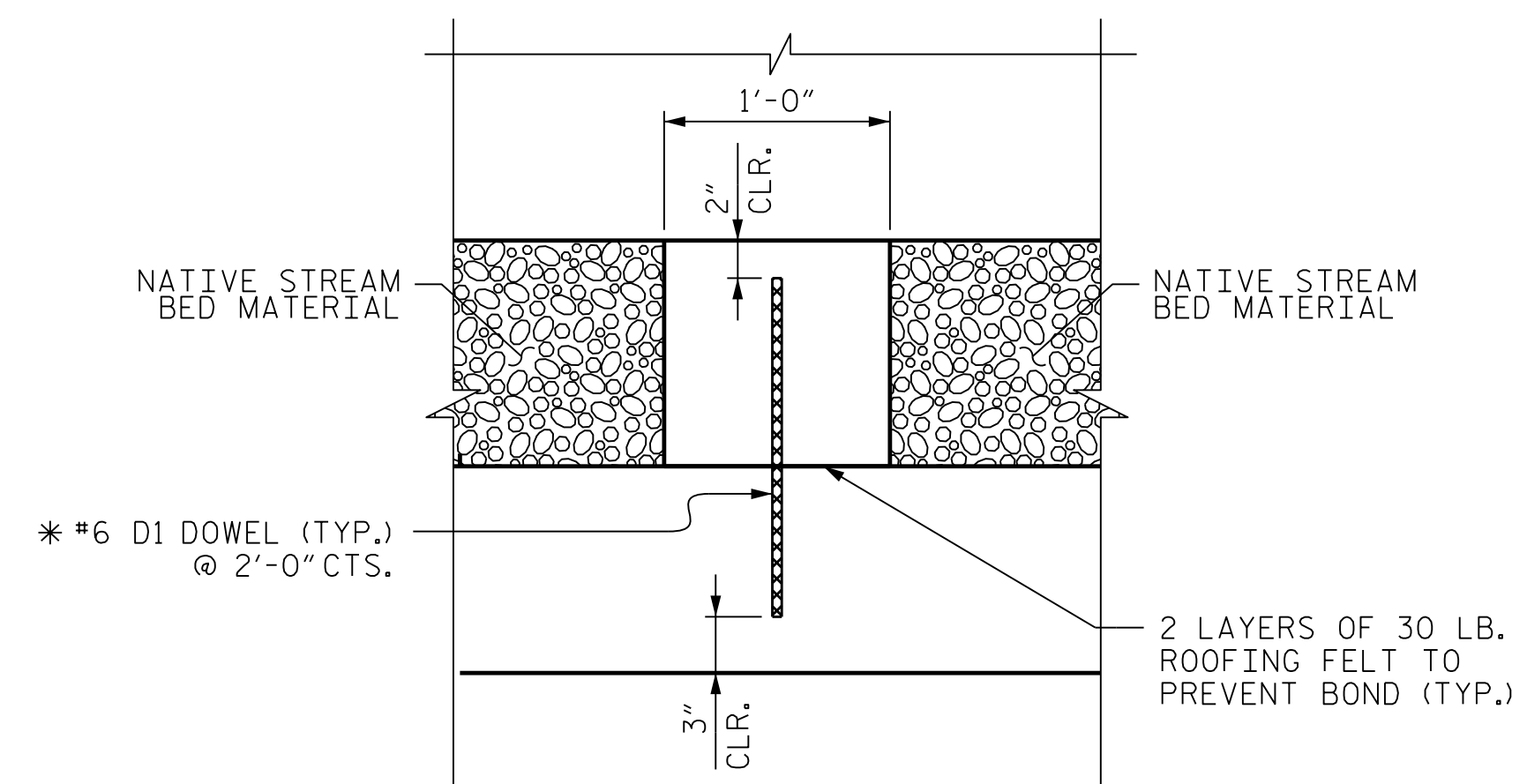


DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED

SHEET NO. CT-2
TOTAL SHEETS 6

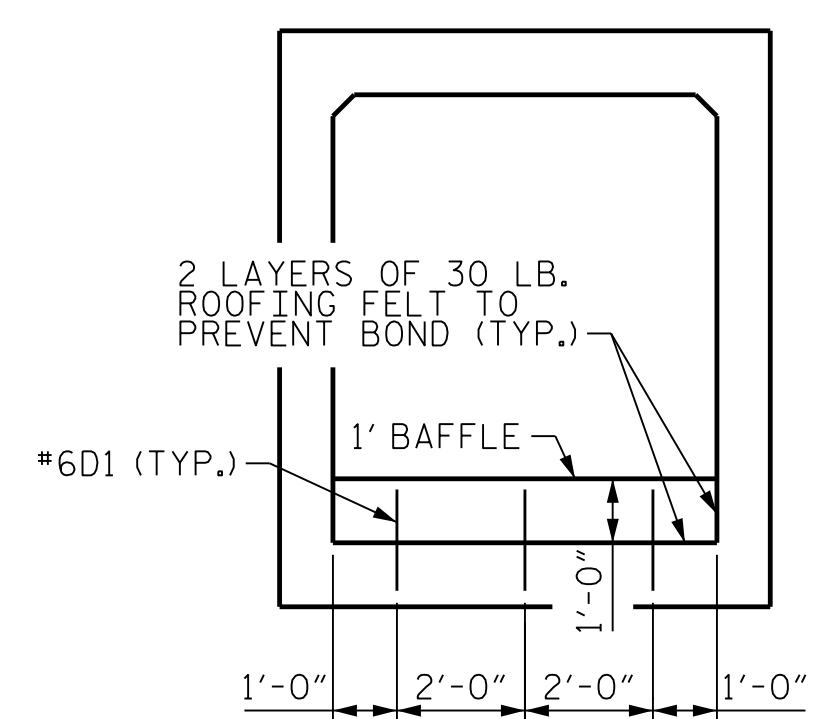


PLAN VIEW SHOWING SILL AND BAFFLE LOCATIONS

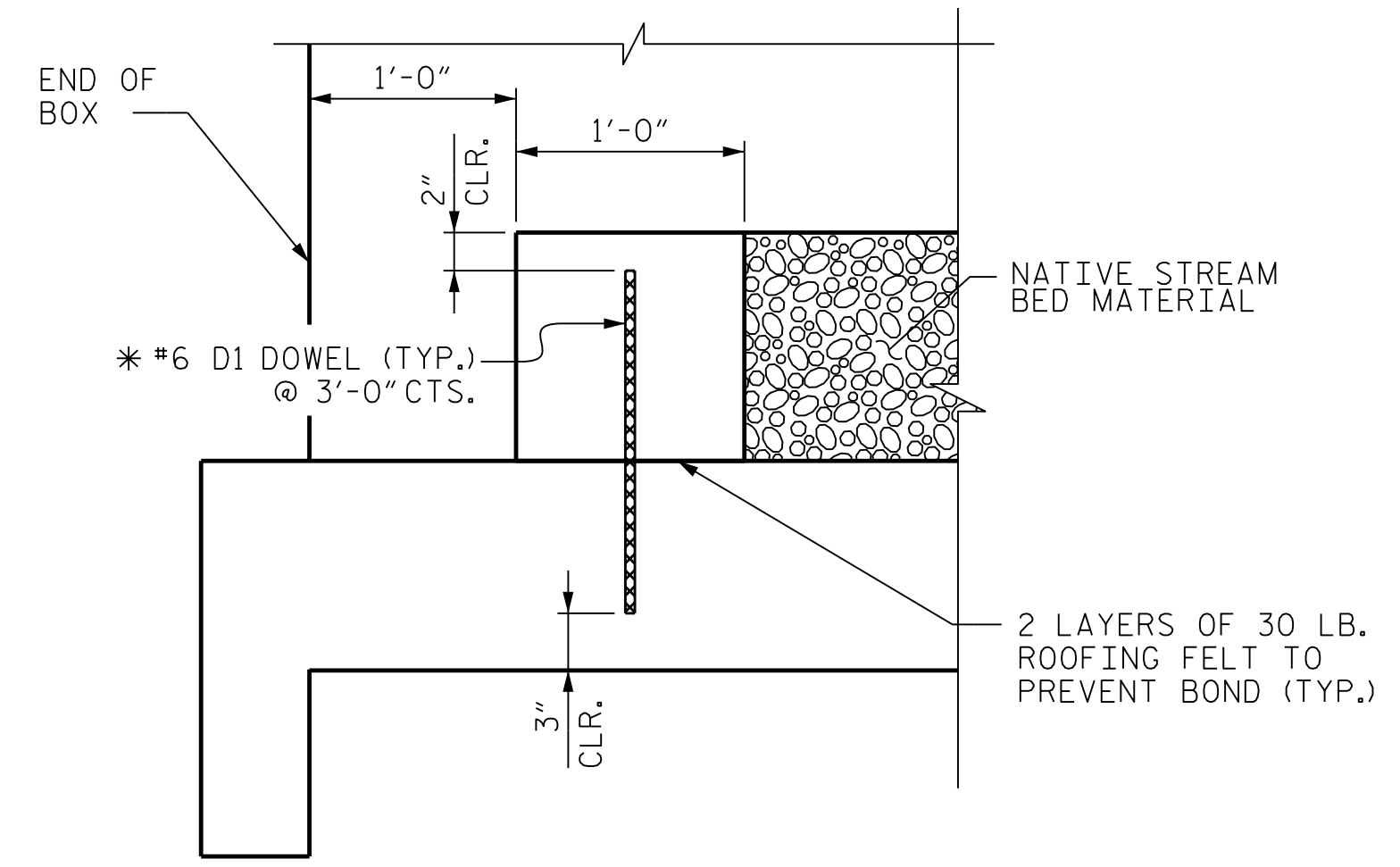


SECTION THROUGH BAFFLE

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



CROSS SECTION AT BAFFLE

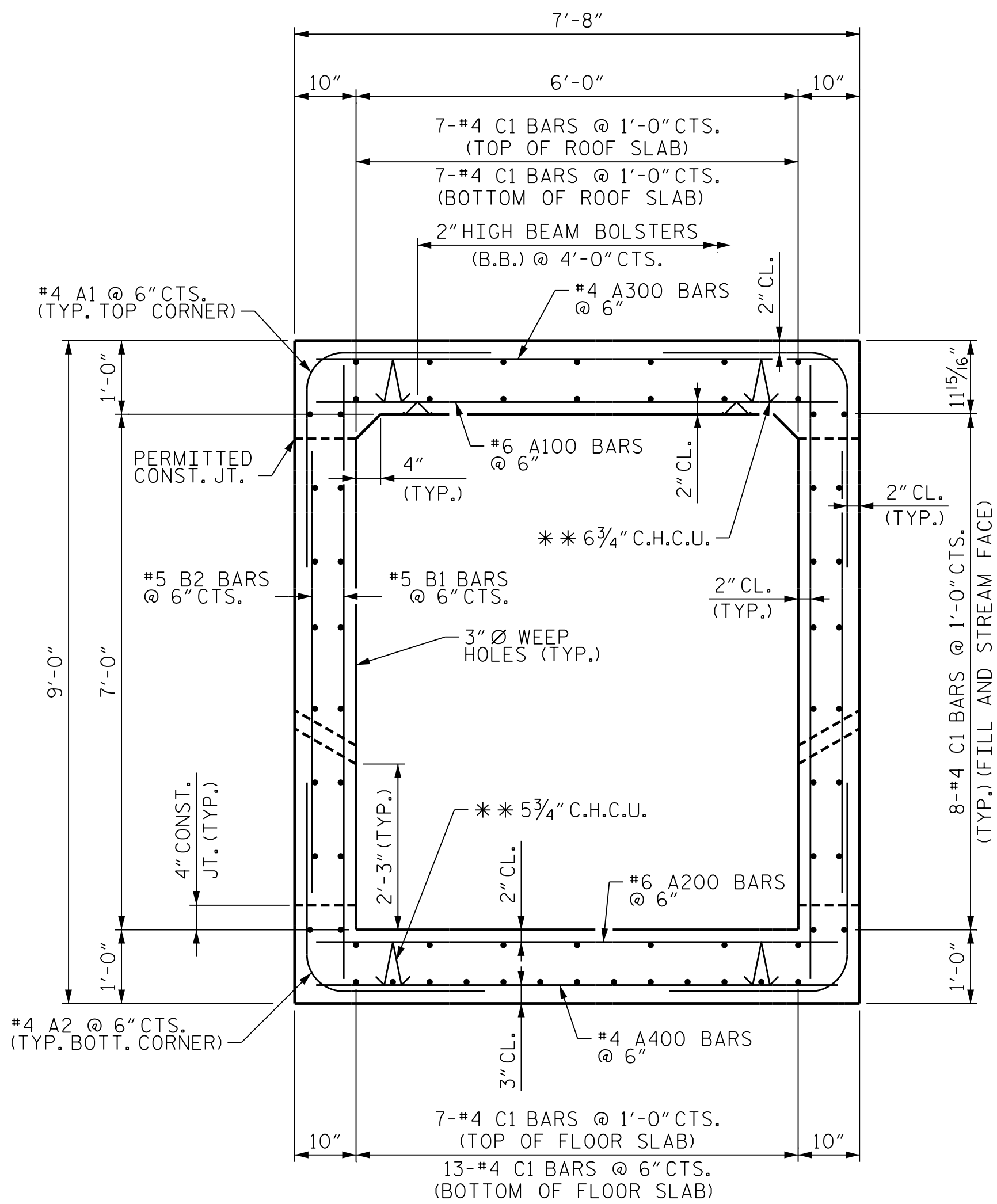


SECTION THROUGH SILL

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

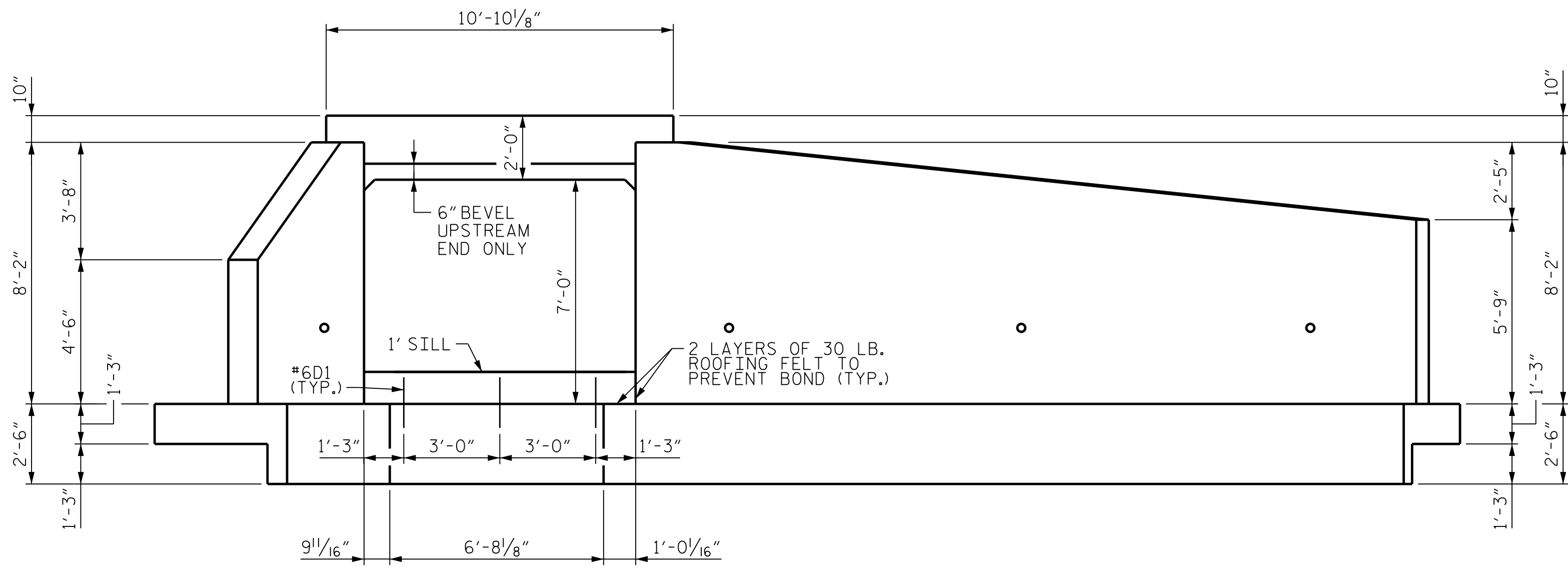
CULVERT SILL AND BAFFLE DETAILS

THE CONTRACTOR SHALL FILL THE PROPOSED CULVERT WITH NATIVE STREAM BED MATERIAL TO A DEPTH OF 1 FOOT. EXISTING BED MATERIAL SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AS DIRECTED BY THE ENGINEER. THE BED MATERIAL MAY BE SUPPLEMENTED WITH CLASS B RIP RAP IF NEEDED. PAYMENT SHALL BE INCLUDED IN THE LUMP SUM PAY ITEM FOR CULVERT EXCAVATION.



RIGHT ANGLE SECTION OF BARREL

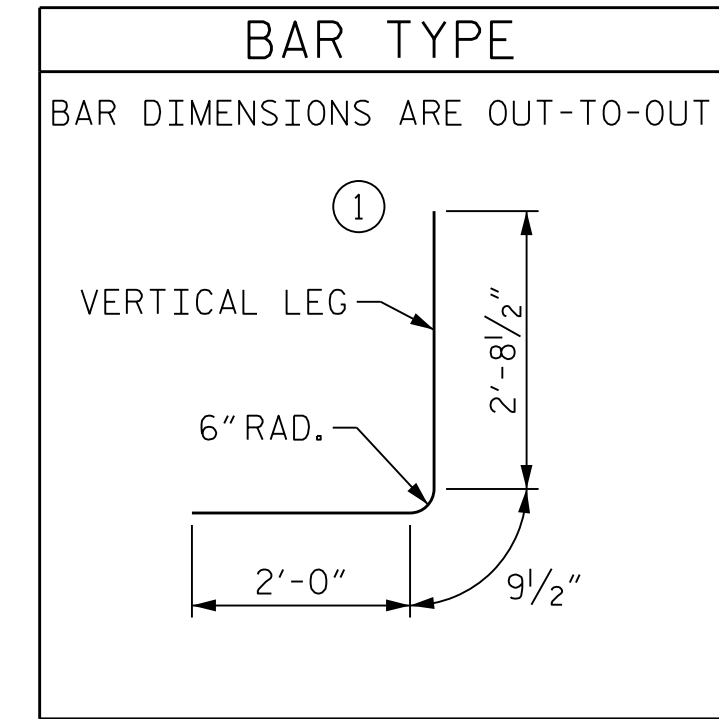
THERE ARE 66 "C" BARS IN SECTION OF BARREL
 ** ALL CONTINUOUS HIGH CHAIR UPPER (C.H.C.U.) @ 3'-0" CTS.



END ELEVATION NORMAL TO SKEW

(LOOKING DOWNSTREAM)

REINFORCING STEEL BAR SCHEDULE					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	864	#4	1	5'-6"	3174
A2	864	#4	1	5'-6"	3174
A100	417	#6	STR	7'-3"	4541
A101	6	#6	STR	5'-9"	52
A102	6	#6	STR	4'-3"	38
A103	6	#6	STR	2'-9"	25
A200	417	#6	STR	7'-3"	4541
A201	6	#6	STR	5'-9"	52
A202	6	#6	STR	4'-3"	38
A203	6	#6	STR	2'-9"	25
A300	417	#4	STR	7'-3"	2020
A301	6	#4	STR	5'-9"	23
A302	6	#4	STR	4'-3"	17
A303	6	#4	STR	2'-9"	11
A400	417	#4	STR	7'-3"	2020
A401	6	#4	STR	5'-9"	23
A402	6	#4	STR	4'-3"	17
A403	6	#4	STR	2'-9"	11
B1	864	#5	STR	8'-4"	7510
B2	864	#5	STR	6'-0"	5407
C1	396	#4	STR	38'-0"	10052
D1	30	#6	STR	1'-7"	71
G1	8	#5	STR	10'-2"	85
S2	16	#8	STR	10'-2"	434
REINFORCING STEEL					43,361 LBS
CLASS A CONCRETE					
CULVERT					216.6 C.Y.
SILLS & BAFFLES					2.4 C.Y.
TOTAL					219.0 C.Y.



SPlice LENGTH CHART		
BAR	SIZE	SPlice LENGTH
B1	#5	2'-4"
C1	#4	2'-5"

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 35+53.70 -Y15RPDEV-
 SHEET 3 OF 6

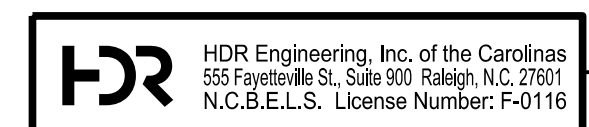


STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE BARREL
 6 FT. X 7 FT.
 CONCRETE BOX CULVERT
 45° SKEW

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

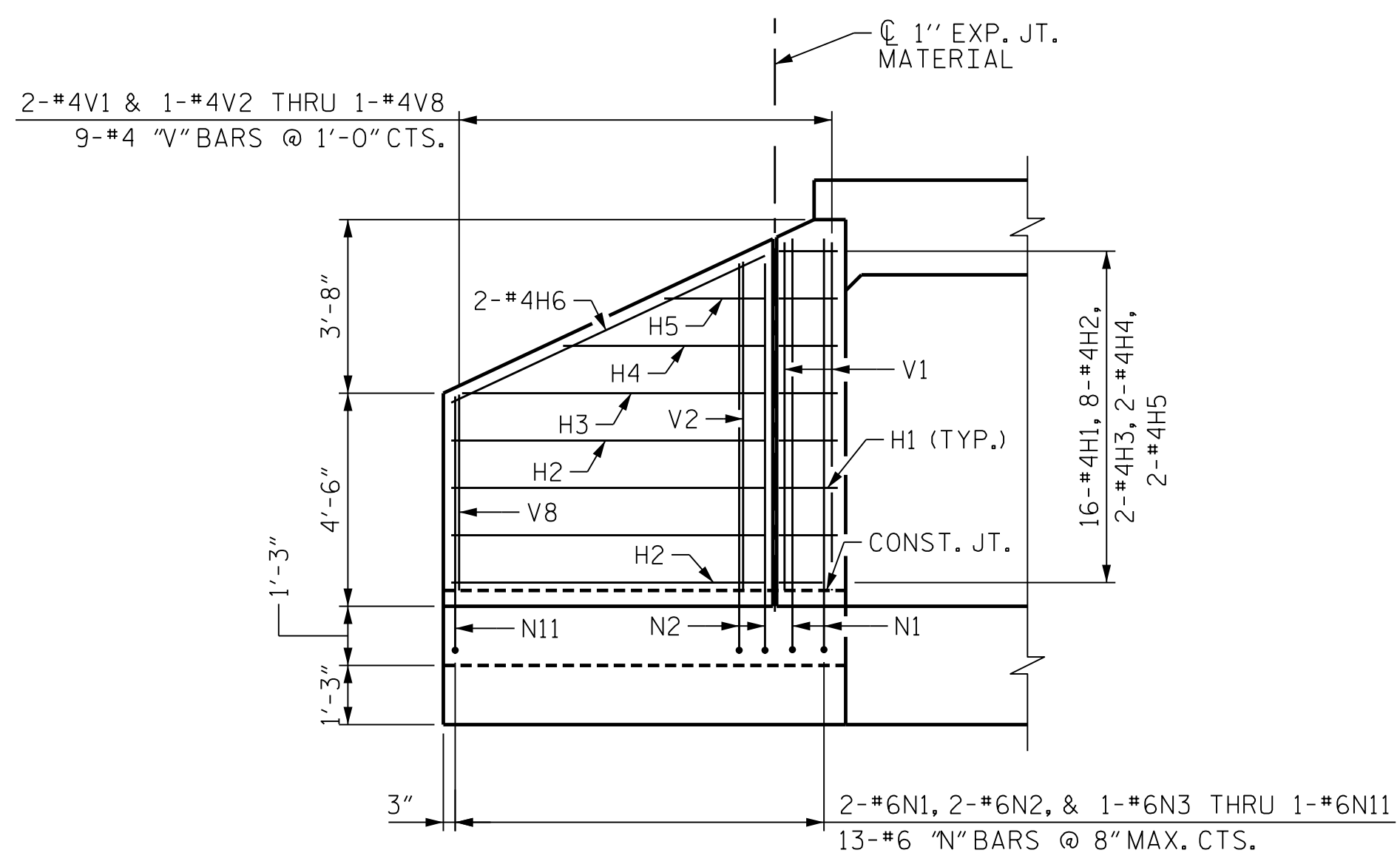
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 USER: PPRETOSO DATE: 5/20/2021 TIME: 10:36:58 AM
 FILE: ... \CROSS SECTION AND BAR LIST

DES BY: T. MCALEENAN	DATE: 11/19	DWG BY: T. MCALEENAN	DATE: 11/19
DES CHK: R. TURNAGE	DATE: 11/19	CHK BY: R. TURNAGE	DATE: 11/19

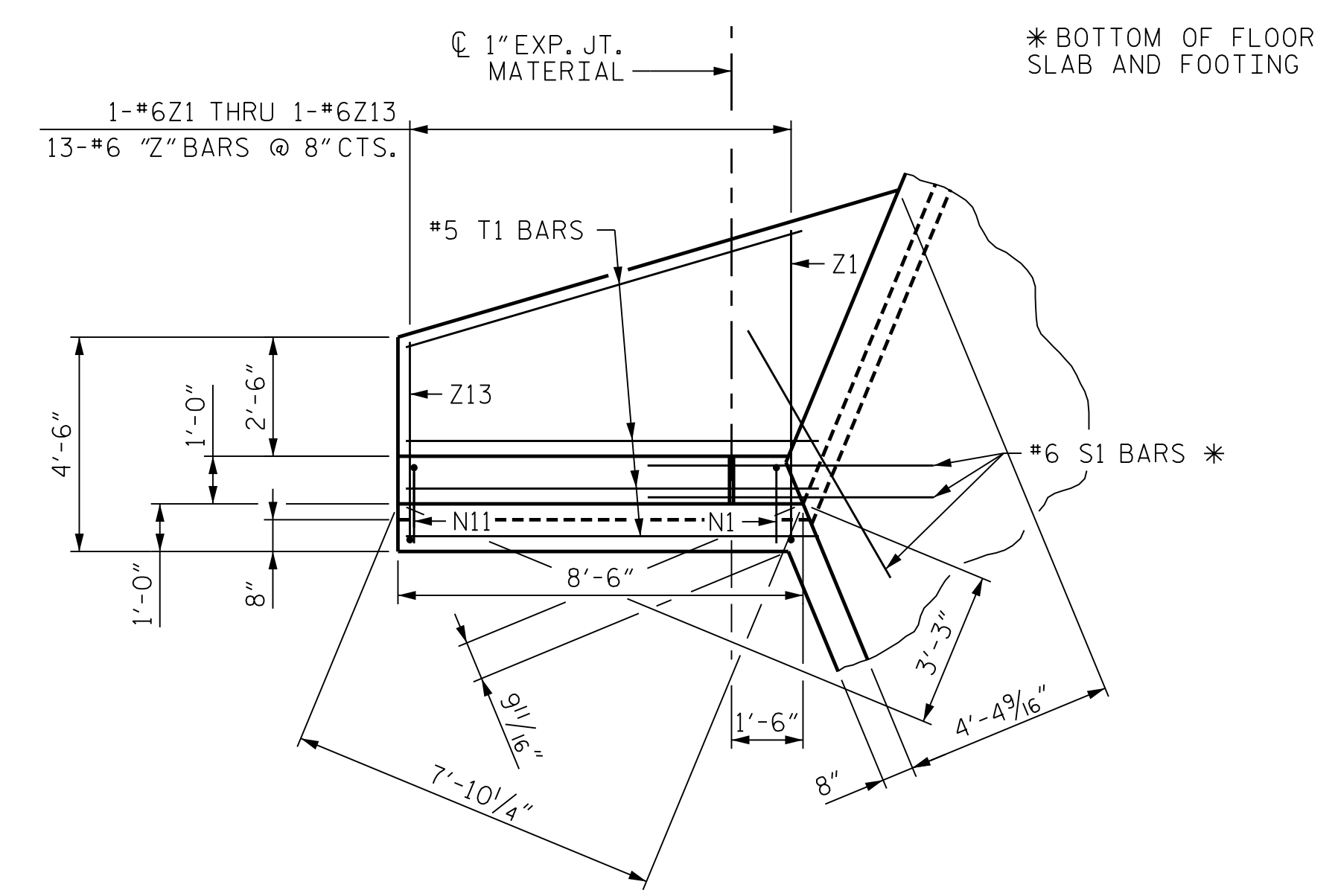


DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED

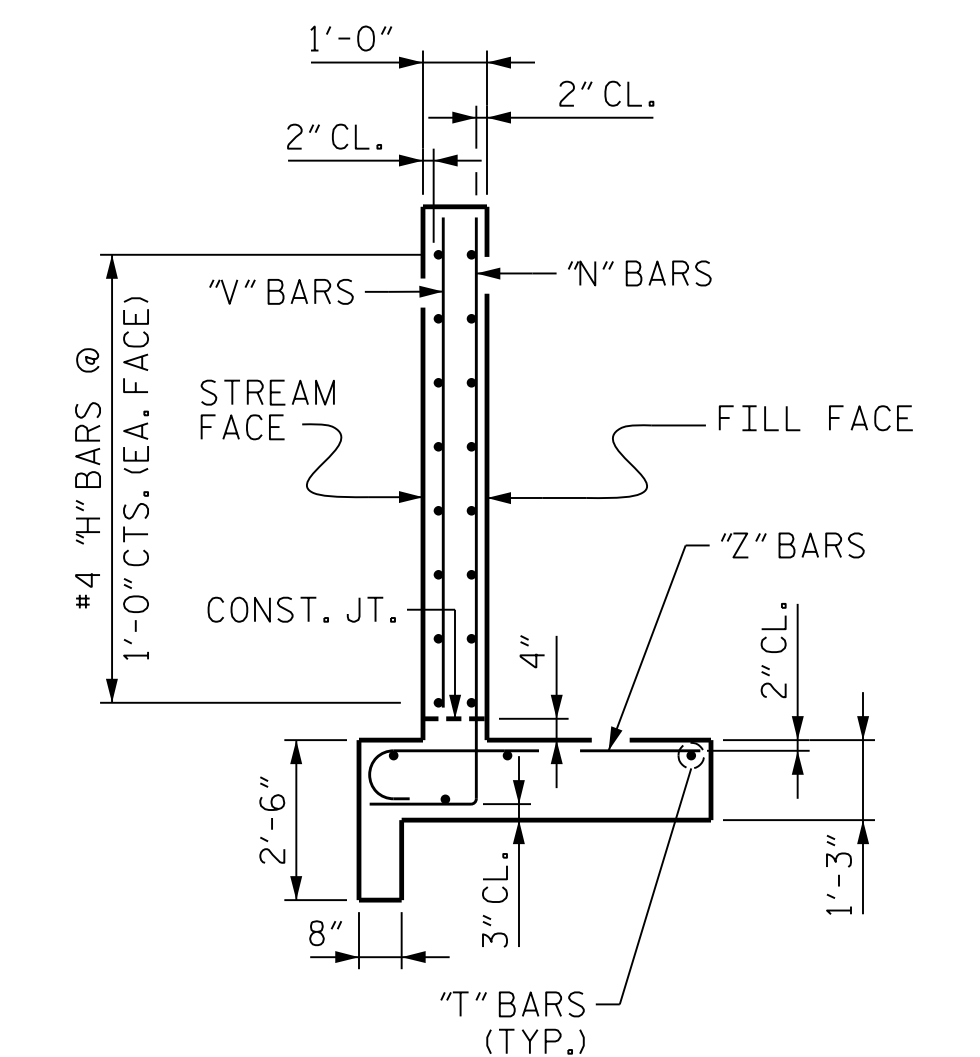
SHEET NO. C7-3
 TOTAL SHEETS 6



ELEVATION-W1



PLAN-W1



TYPICAL WING SECTION

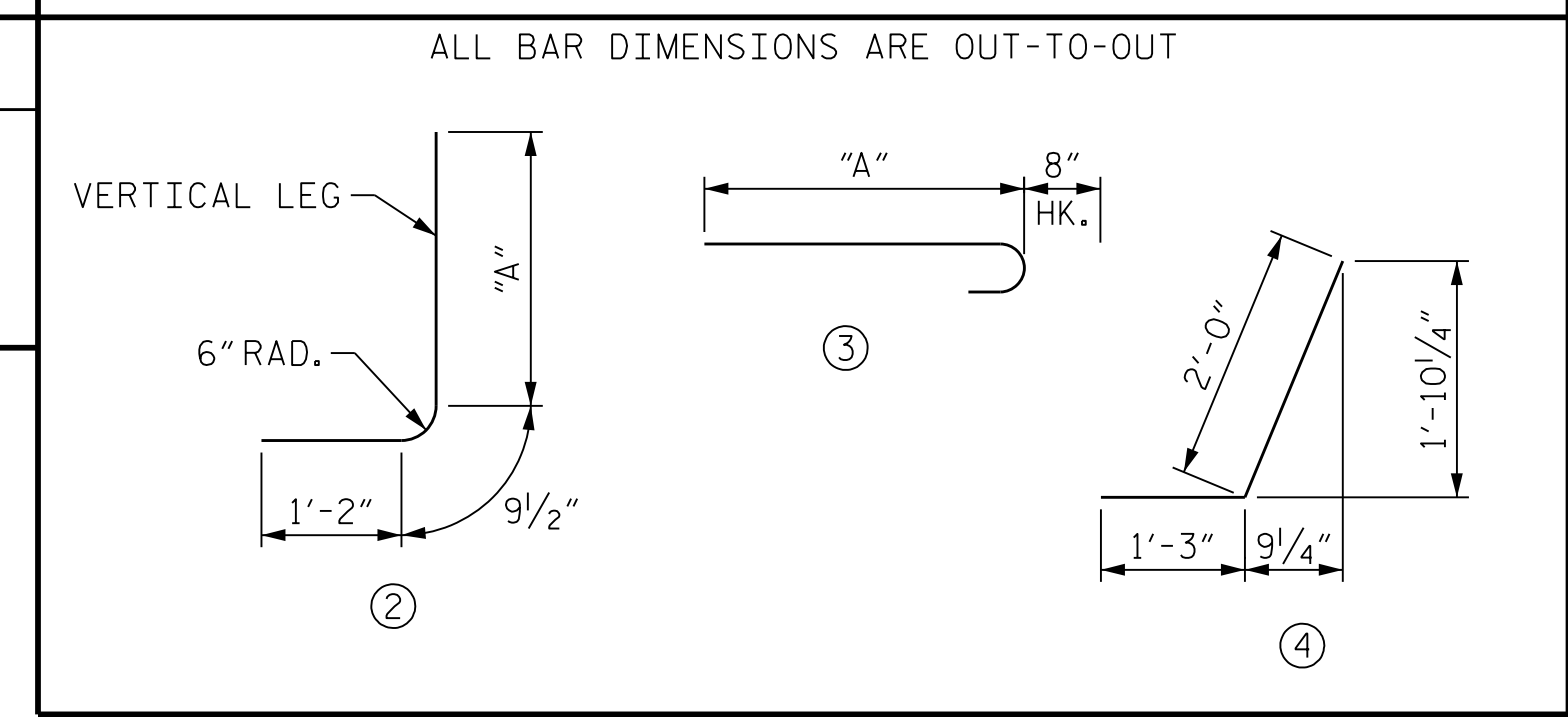
REINFORCING BAR SCHEDULE

BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT
H1	32	# 4	4	-	3' - 3"	69	V1	4	# 4	STR	-	7' - 4"	20
H2	16	# 4	STR	-	6' - 7"	70	V2	2	# 4	STR	-	6' - 11"	9
H3	4	# 4	STR	-	6' - 5"	17	V3	2	# 4	STR	-	6' - 6"	9
H4	4	# 4	STR	-	4' - 3"	11	V4	2	# 4	STR	-	6' - 0"	8
H5	4	# 4	STR	-	2' - 1"	6	V5	2	# 4	STR	-	5' - 6"	7
H6	4	# 4	STR	-	7' - 4"	20	V6	2	# 4	STR	-	5' - 1"	7
							V7	2	# 4	STR	-	4' - 7"	6
							V8	2	# 4	STR	-	4' - 1"	5
N1	4	# 6	2	8' - 2 1/2"	10' - 2"	61	Z1	2	# 6	3	6' - 7"	7' - 3"	22
N2	4	# 6	2	7' - 8 1/2"	9' - 8"	58	Z2	2	# 6	3	6' - 4"	7' - 0"	21
N3	2	# 6	2	7' - 4 1/2"	9' - 4"	28	Z3	2	# 6	3	6' - 2"	6' - 10"	21
N4	2	# 6	2	7' - 1 1/2"	9' - 1"	27	Z4	2	# 6	3	6' - 0"	6' - 8"	20
N5	2	# 6	2	6' - 9 1/2"	8' - 9"	26	Z5	2	# 6	3	5' - 9"	6' - 5"	19
N6	2	# 6	2	6' - 5 1/2"	8' - 5"	25	Z6	2	# 6	3	5' - 7"	6' - 3"	19
N7	2	# 6	2	6' - 1 1/2"	8' - 1"	24	Z7	2	# 6	3	5' - 5"	6' - 1"	18
N8	2	# 6	2	5' - 10 1/2"	7' - 10"	24	Z8	2	# 6	3	5' - 2"	5' - 10"	18
N9	2	# 6	2	5' - 6 1/2"	7' - 6"	23	Z9	2	# 6	3	5' - 0"	5' - 8"	17
N10	2	# 6	2	5' - 2 1/2"	7' - 2"	22	Z10	2	# 6	3	4' - 10"	5' - 6"	17
N11	2	# 6	2	4' - 10 1/2"	6' - 10"	21	Z11	2	# 6	3	4' - 7"	5' - 3"	16
							Z12	2	# 6	3	4' - 5"	5' - 1"	15
S1	6	# 6	STR	-	6' - 0"	54	Z13	2	# 6	3	4' - 3"	4' - 11"	15
T1	8	# 5	STR	-	8' - 8"	72							

QUANTITIES

REINFORCING STEEL FOR 2 WINGS	967 LBS.
CLASS A CONCRETE	10.1 C.Y.
2 WINGS	0.5 C.Y.
1 HEADWALL	0.5 C.Y.
1 END CURTAIN WALL	0.5 C.Y.
TOTAL	11.1 C.Y.

BAR TYPES



PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 35+53.70 -Y15RPDREV-
 SHEET 4 OF 6

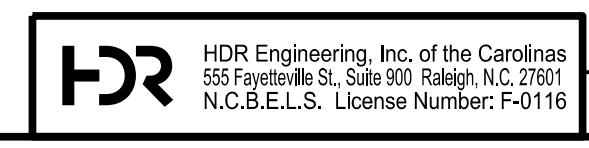


STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 WINGS FOR
 CONCRETE BOX CULVERT
 135° SKEW

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

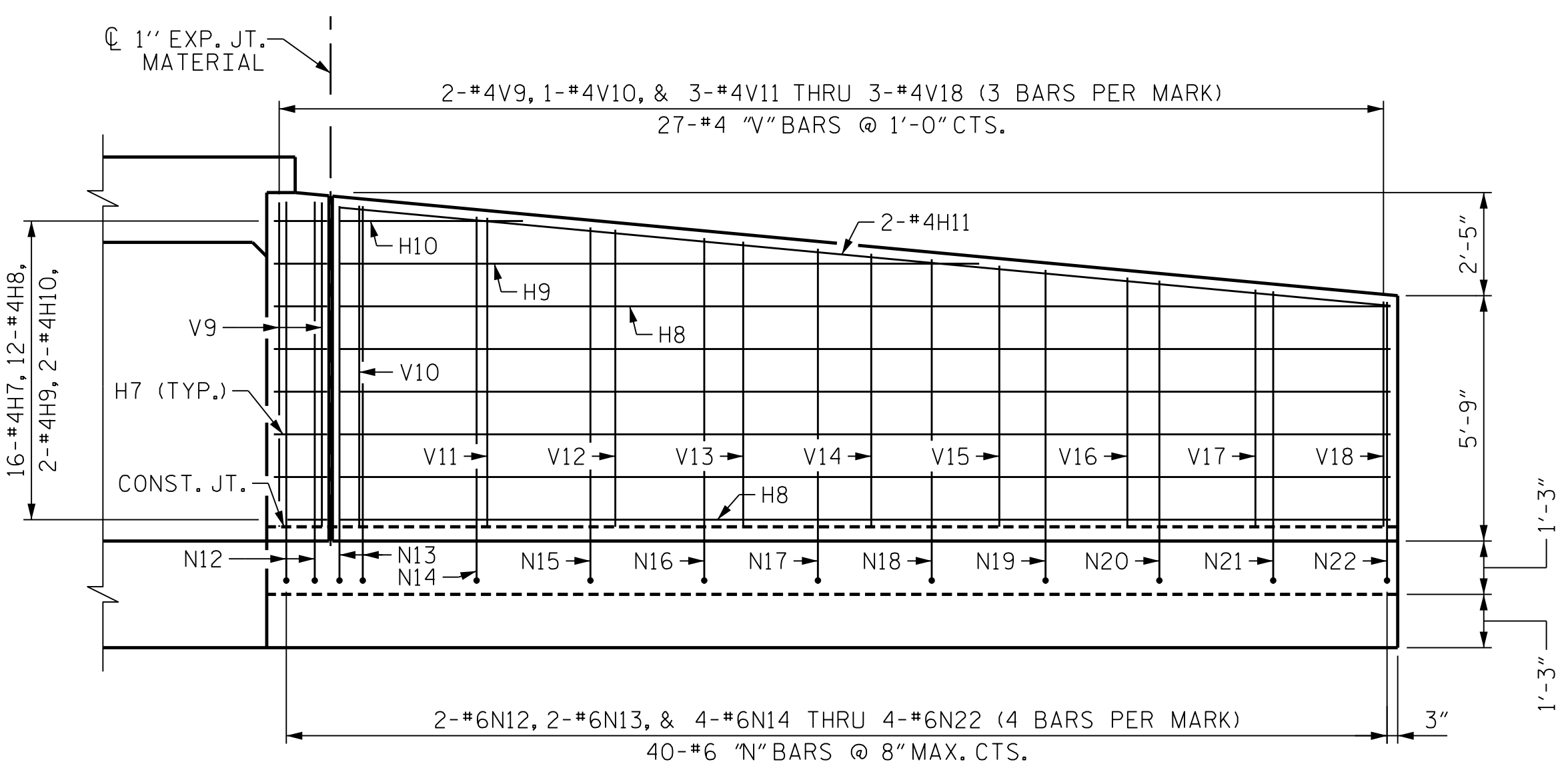
SHEET NO. C7-4
 TOTAL SHEETS 6

DES BY: T. MCALEENAN	DATE: 11/19	DWG BY: T. MCALEENAN	DATE: 11/19
DES CHK: R. TURNAGE	DATE: 11/19	CHK BY: R. TURNAGE	DATE: 11/19

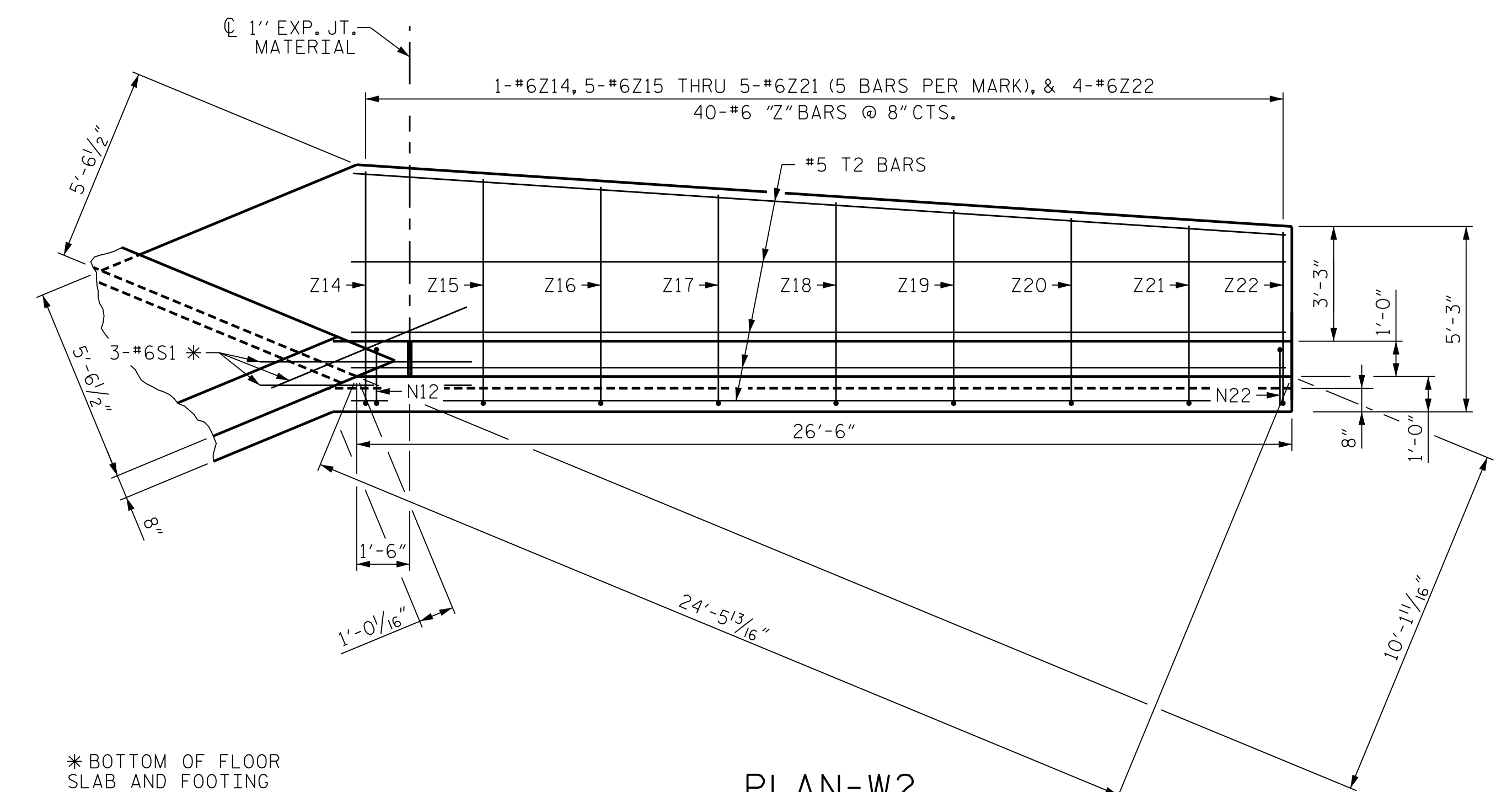


DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED

PLOT DRIVER: NCDOT STRUCTURES DEFAULT PLOTTER.ppt
 USER: PETERSON DATE: 5/20/2021
 FILE: ... \WINGWALL VIEWS



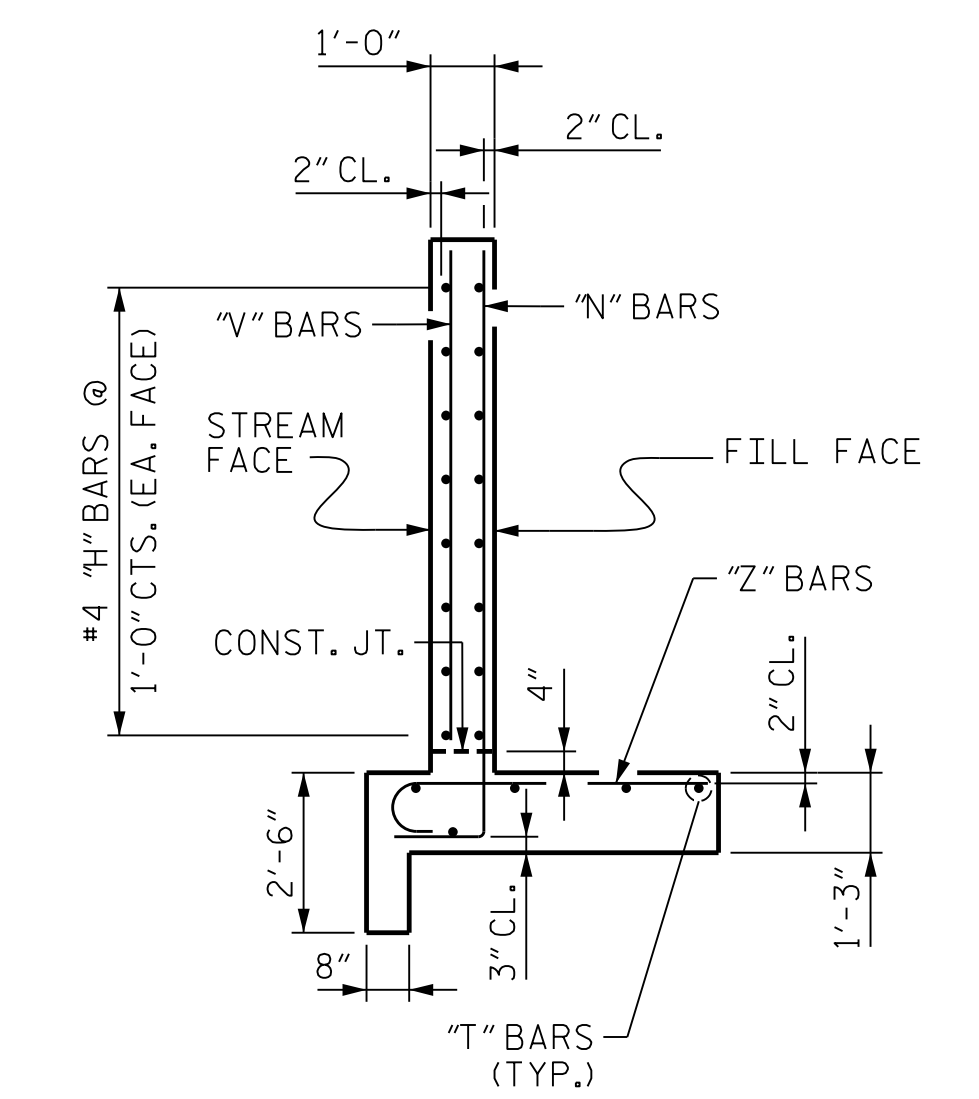
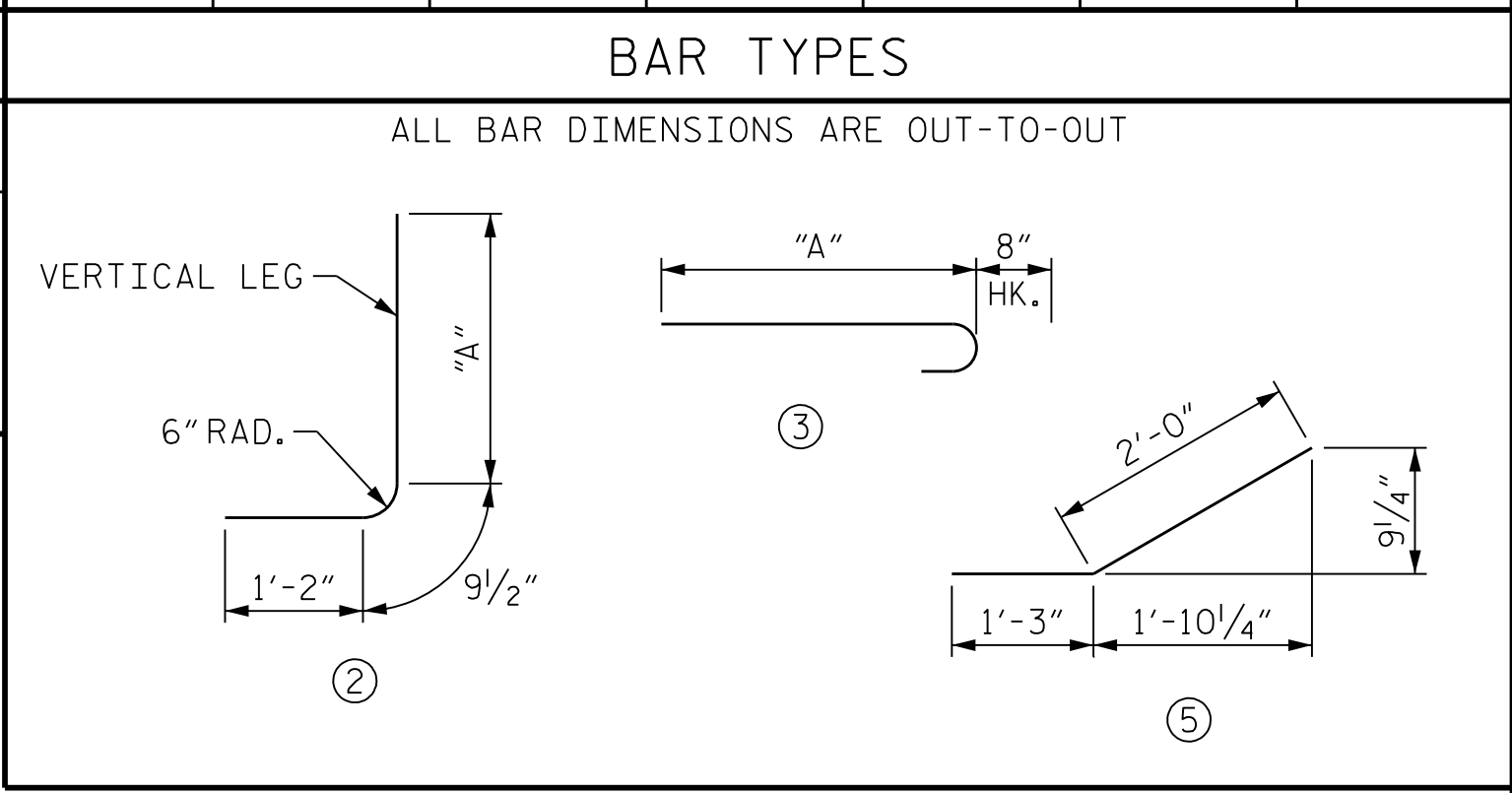
ELEVATION-W2



PLAN-W2

REINFORCING BAR SCHEDULE													
BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	DIM "A"	LENGTH	WEIGHT
H7	32	# 4	5	-	3' - 3"	69	V9	4	# 4	STR	-	7' - 7"	20
H8	24	# 4	STR	-	24' - 7"	394	V10	2	# 4	STR	-	7' - 6"	10
H9	4	# 4	STR	-	16' - 10"	45	V11	6	# 4	STR	-	7' - 3"	29
H10	4	# 4	STR	-	4' - 11"	13	V12	6	# 4	STR	-	6' - 11"	28
H11	4	# 4	STR	-	24' - 8"	66	V13	6	# 4	STR	-	6' - 8"	27
							V14	6	# 4	STR	-	6' - 4"	25
N12	4	# 6	2	8' - 4 1/2"	10' - 4"	62	V15	6	# 4	STR	-	6' - 1"	24
N13	4	# 6	2	8' - 2 1/2"	10' - 2"	61	V16	6	# 4	STR	-	5' - 10"	23
N14	8	# 6	2	7' - 11 1/2"	9' - 11"	119	V17	6	# 4	STR	-	5' - 6"	22
N15	8	# 6	2	7' - 8 1/2"	9' - 8"	116	V18	6	# 4	STR	-	5' - 3"	21
N16	8	# 6	2	7' - 5 1/2"	9' - 5"	113							
N17	8	# 6	2	7' - 2 1/2"	9' - 2"	110	Z14	2	# 6	3	6' - 8"	7' - 4"	22
N18	8	# 6	2	6' - 11 1/2"	8' - 11"	107	Z15	10	# 6	3	6' - 5"	7' - 1"	106
N19	8	# 6	2	6' - 8 1/2"	8' - 8"	104	Z16	10	# 6	3	6' - 2"	6' - 10"	103
N20	8	# 6	2	6' - 5 1/2"	8' - 5"	101	Z17	10	# 6	3	6' - 0"	6' - 8"	100
N21	8	# 6	2	6' - 2 1/2"	8' - 2"	98	Z18	10	# 6	3	5' - 9"	6' - 5"	96
N22	8	# 6	2	5' - 11 1/2"	7' - 11"	95	Z19	10	# 6	3	5' - 6"	6' - 2"	93
							Z20	10	# 6	3	5' - 4"	6' - 0"	90
S1	6	# 6	STR	-	6' - 0"	54	Z21	10	# 6	3	5' - 1"	5' - 9"	86
T2	10	# 5	STR	-	26' - 6"	276	Z22	8	# 6	3	4' - 11"	5' - 7"	67

QUANTITIES	
REINFORCING STEEL FOR 2 WING	2995 LBS.
CLASS A CONCRETE	31.7 C.Y.
2 WINGS	0.5 C.Y.
1 HEADWALL	0.5 C.Y.
1 END CURTAIN WALL	0.5 C.Y.
TOTAL	32.7 C.Y.



TYPICAL WING SECTION

PROJECT NO. U-2579AB
 FORSYTH COUNTY
 STATION: 35+53.70 -Y15RPDREV-
 SHEET 5 OF 6

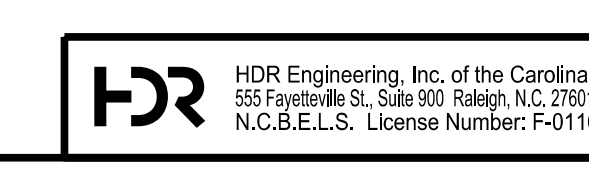


STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 WINGS FOR
 CONCRETE BOX CULVERT
 45° SKEW

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

PLOT DRIVER: NCDOT STRUCTURES DEFAULT PLOTTER.pht
 USER: PETERSON DATE: 5/20/2021
 FILE: ... \WINGWALL 2 VIEWS

DES BY: T. MCALEENAN	DATE: 11/19	DWG BY: T. MCALEENAN	DATE: 11/19
DES CHK: R. TURNAGE	DATE: 11/19	CHK BY: R. TURNAGE	DATE: 11/19



DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED

SHEET NO. C7-5
 TOTAL SHEETS 6

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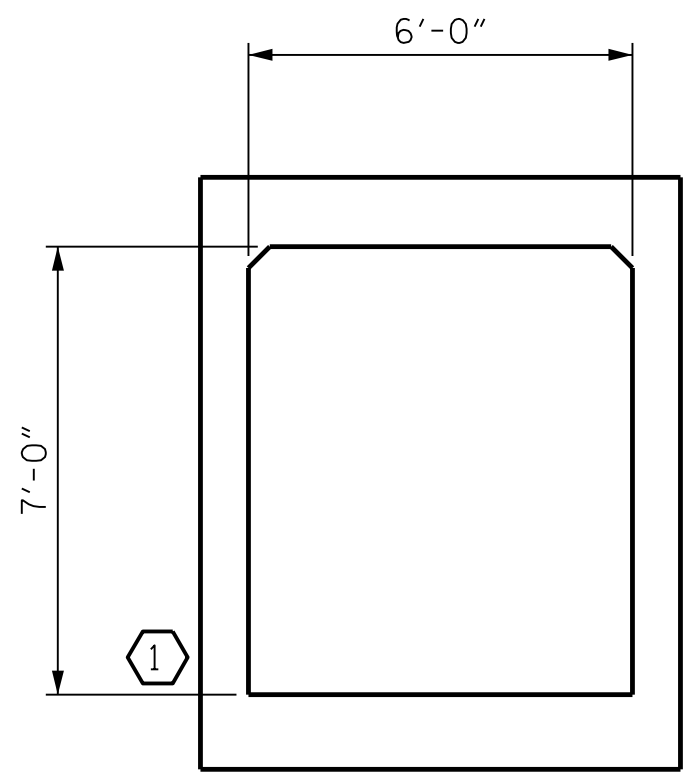
LOAD FACTORS: _____

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
WA	1.00	--

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS										
	CONTROLLING LOAD RATING	MINIMUM RATING FACTOR (RF)	STRENGTH I LIMIT STATE							
			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)
PERMANENT LOAD RATING	1	1.11	1.11	1	EXTERIOR WALL	1.00	1.17	1	BOTTOM SLAB	1.55

NOTES:
 RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
 THE EFFECTS OF LIVE LOAD ON DESIGN AND LOAD RATING MAY BE NEGLECTED FOR CULVERTS WITH CERTAIN FILL DEPTHS DESCRIBED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
 CULVERTS WITH NEGLIGIBLE LIVE LOAD SHOULD BE LOAD RATED FOR PERMANENT LOADS ONLY IN ACCORDANCE WITH THE AASHTO MANUAL FOR BRIDGE EVALUATION.



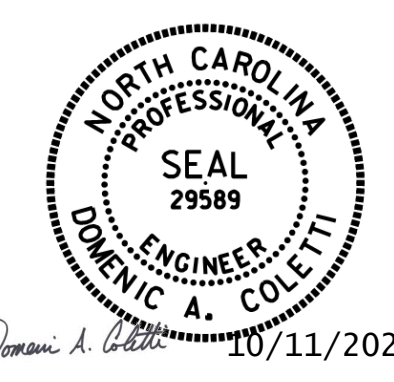
LRFR SUMMARY
(LOOKING DOWN STREAM)

PROJECT NO. U-2579AB

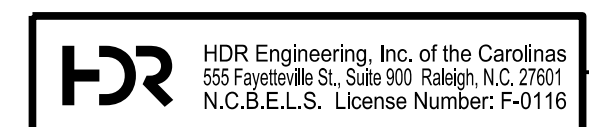
 FORSYTH COUNTY
 STATION: 35+53.70 -Y15RPDREV-
 SHEET 6 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS
 (DEEP FILLS)



DES BY: T. MCALEENAN	DATE: 11/19	DWG BY: T. MCALEENAN	DATE: 11/19
DES CHK: R. TURNAGE	DATE: 11/19	CHK BY: R. TURNAGE	DATE: 11/19



DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED

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

SHEET NO. C7-6
 TOTAL SHEETS 6

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 $\frac{3}{4}$ " WITH THE FOLLOWING EXCEPTIONS: TOP CORNERS OF CURBS MAY BE ROUNDED TO $\frac{1}{2}$ " 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 $\frac{1}{8}$ " \emptyset SHEAR STUDS FOR THE $\frac{3}{4}$ " \emptyset STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - $\frac{1}{8}$ " \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 $\frac{1}{8}$ " \emptyset STUDS ALONG THE BEAM AS SHOWN FOR $\frac{3}{4}$ " \emptyset STUDS BASED ON THE RATIO OF 3 - $\frac{1}{8}$ " \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 $\frac{3}{16}$ " 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 $\frac{1}{16}$ " 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.

ENGLISH

JANUARY, 1990

STD. NO. SN