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HYDRAULIC DATA:

DESIGN DISCHARGE = 310 CFS
 FREQUENCY OF DESIGN FLOOD = 50 YEAR
 DESIGN HIGH WATER ELEVATION = 771.90
 DRAINAGE AREA = 0.34 SQ. MI.
 BASE DISCHARGE (Q 100) = 340 CFS
 BASE HIGH WATER ELEVATION = 771.99

OVERTOPPING FLOOD DATA:

OVERTOPPING DISCHARGE = 1360 CFS
 FREQUENCY OF OVERTOPPING FLOOD = 500+ YEAR
 OVERTOPPING FLOOD ELEVATION = 809.10 **
 ** OVERTOPPING OCCURS AT ROADWAY
 STA. 369+30.00 -L- ±, APPROXIMATELY
 125' LT. OF -L- AT THE DRAINAGE DIVIDE

HORIZONTAL CURVE DATA

PIs STA. 364+79.63 -L-	PI STA. 371+91.62 -L-	PIs STA. 378+88.90 -L-
θs = 4°-11'-58.9"	Δ = 22°-35'-02.6"(LT.)	θs = 4°-11'-58.9"
Ls = 420.00'	D = 1°-59'-59.5"	Ls = 420.00'
LT = 280.08'	L = 1129.29'	LT = 280.08'
ST = 140.07'	T = 572.07'	ST = 140.07'
	R = 2865.00'	

GRADE DATA:

GRADE POINT EL. @ STA. 364+68.00 -L- = EL. 844.04
 BED EL. @ STA. 364+68.00 -L- = 760.54
 ROADWAY SLOPE 2:1

TOTAL STRUCTURE QUANTITIES	
CLASS A CONCRETE	
BARREL @ _____	2.482 CY/FT 1200.7 C.Y.
SILLS AND BAFFLES _____	7.4 C.Y.
WINGS ETC. _____	24.4 C.Y.
TOTAL _____	1232.5 C.Y.
REINFORCING STEEL	
BARREL _____	167,476 LBS.
WINGS ETC. _____	1,547 LBS.
TOTAL _____	169,023 LBS.
CULVERT EXCAVATION _____	LUMP SUM
FOUNDATION CONDITIONING MATERIAL _____	506 TONS

PROJECT NO. U-2525C
GUILFORD COUNTY
 STATION: 364+68.00 -L-

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 8 FT. X 8 FT.
 CONCRETE BOX CULVERT

68° SKEW

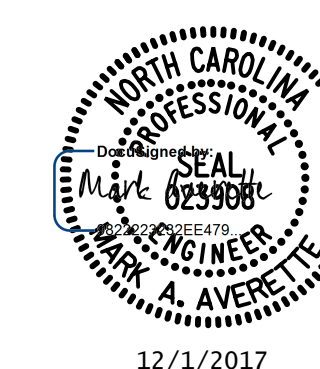
REVISIONS

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

SHEET NO.
 C1-2
 TOTAL SHEETS
 6

PLANS PREPARED BY:

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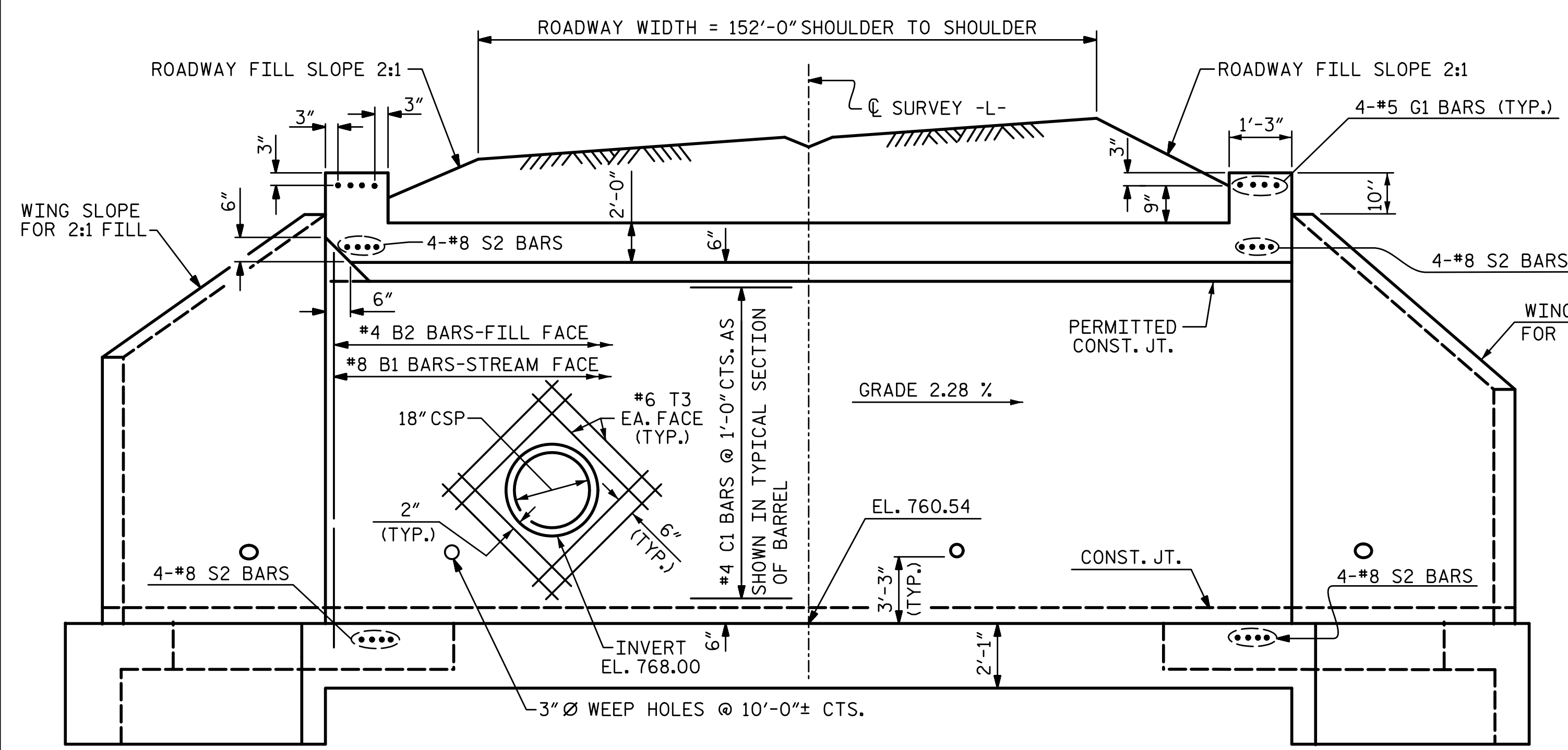


12/1/2017

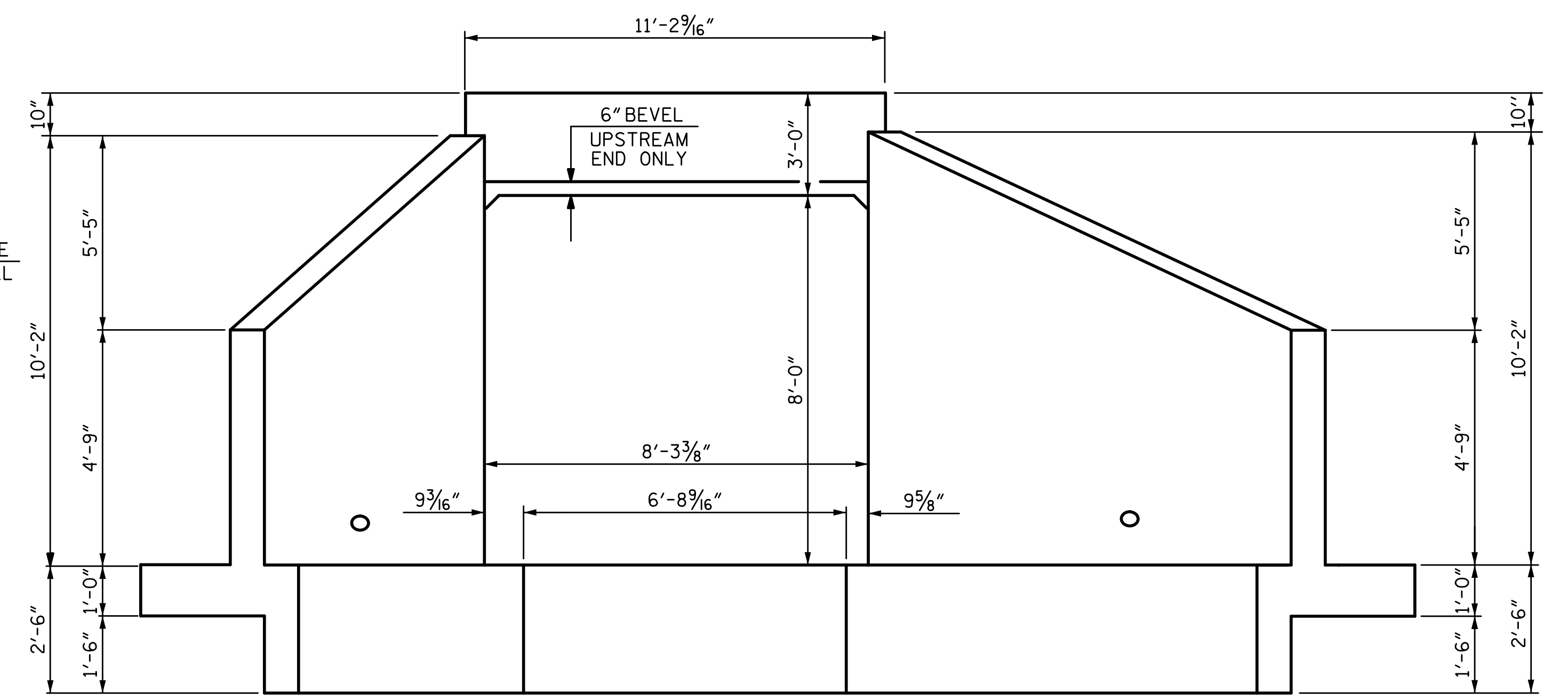
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 CHECKED BY: M.A. AVERETTE DATE: 10-17
 DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 10-17

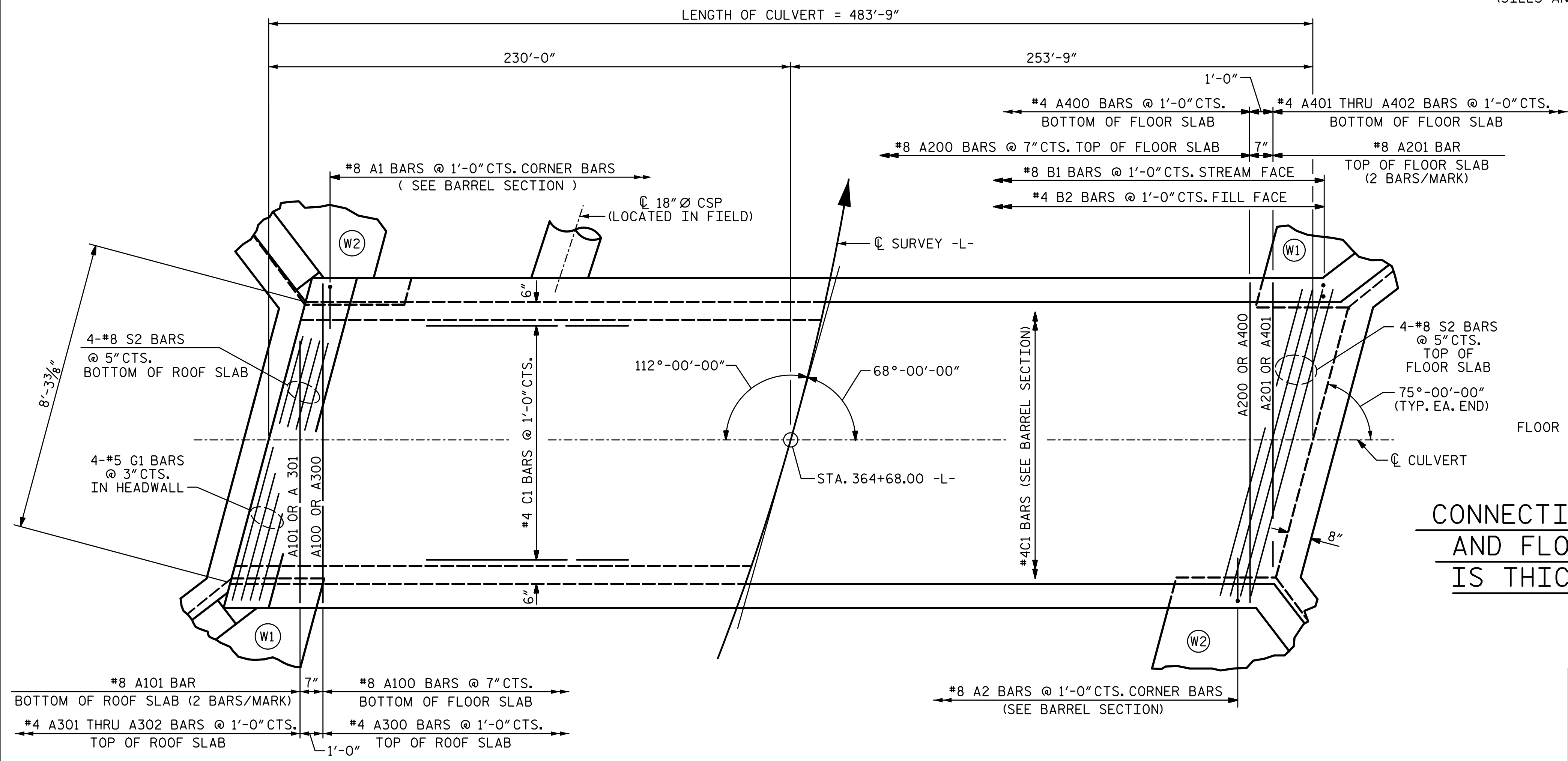
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CULVERT SECTION NORMAL TO ROADWAY
(SILLS AND BAFFLES NOT SHOWN FOR CLARITY)



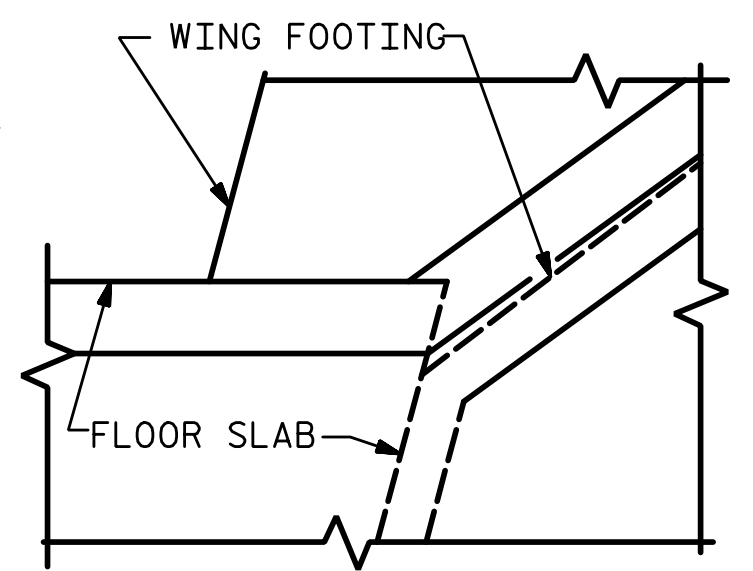
END ELEVATION NORMAL TO SKEW
(SILLS AND BAFFLES NOT SHOWN, SEE SHEET 4 FOR DETAILS)



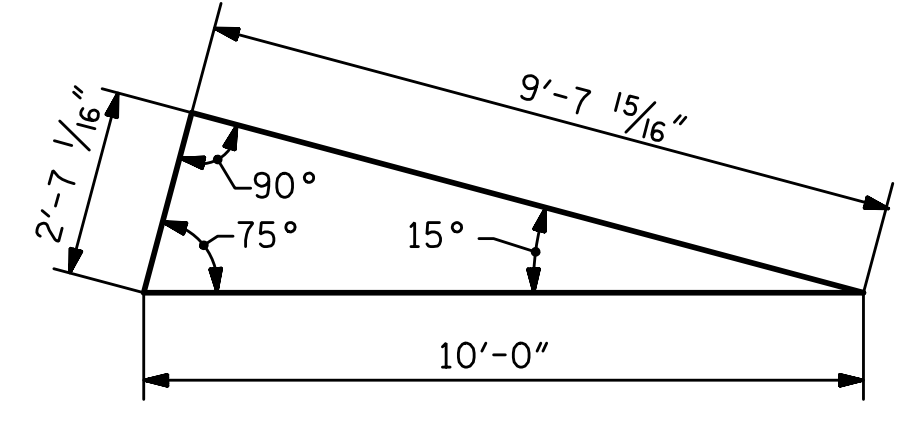
PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

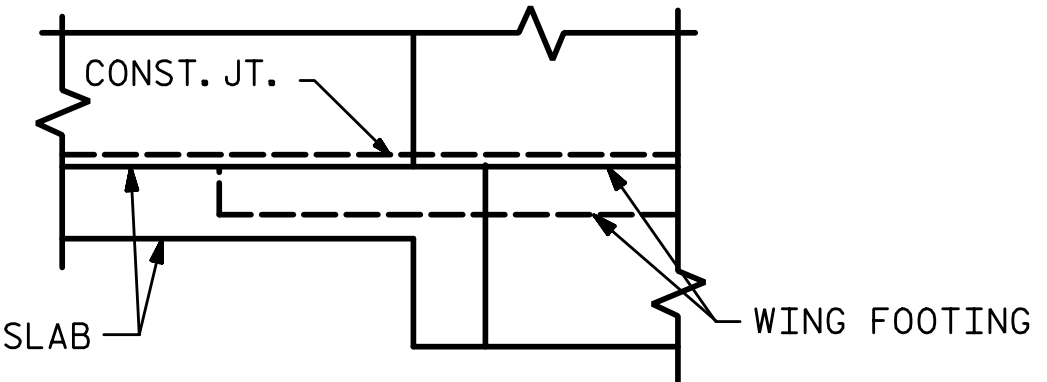
(SILLS AND BAFFLES NOT SHOWN FOR CLARITY)



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



SKEW TRIANGLE



DETAIL

PROJECT NO. U-2525C
GUILFORD COUNTY
STATION: 364+68.00 -L-

DRAWN BY: R. SEALEY DATE: 10-17
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C1 BARS ARE 18 BAR RUNS

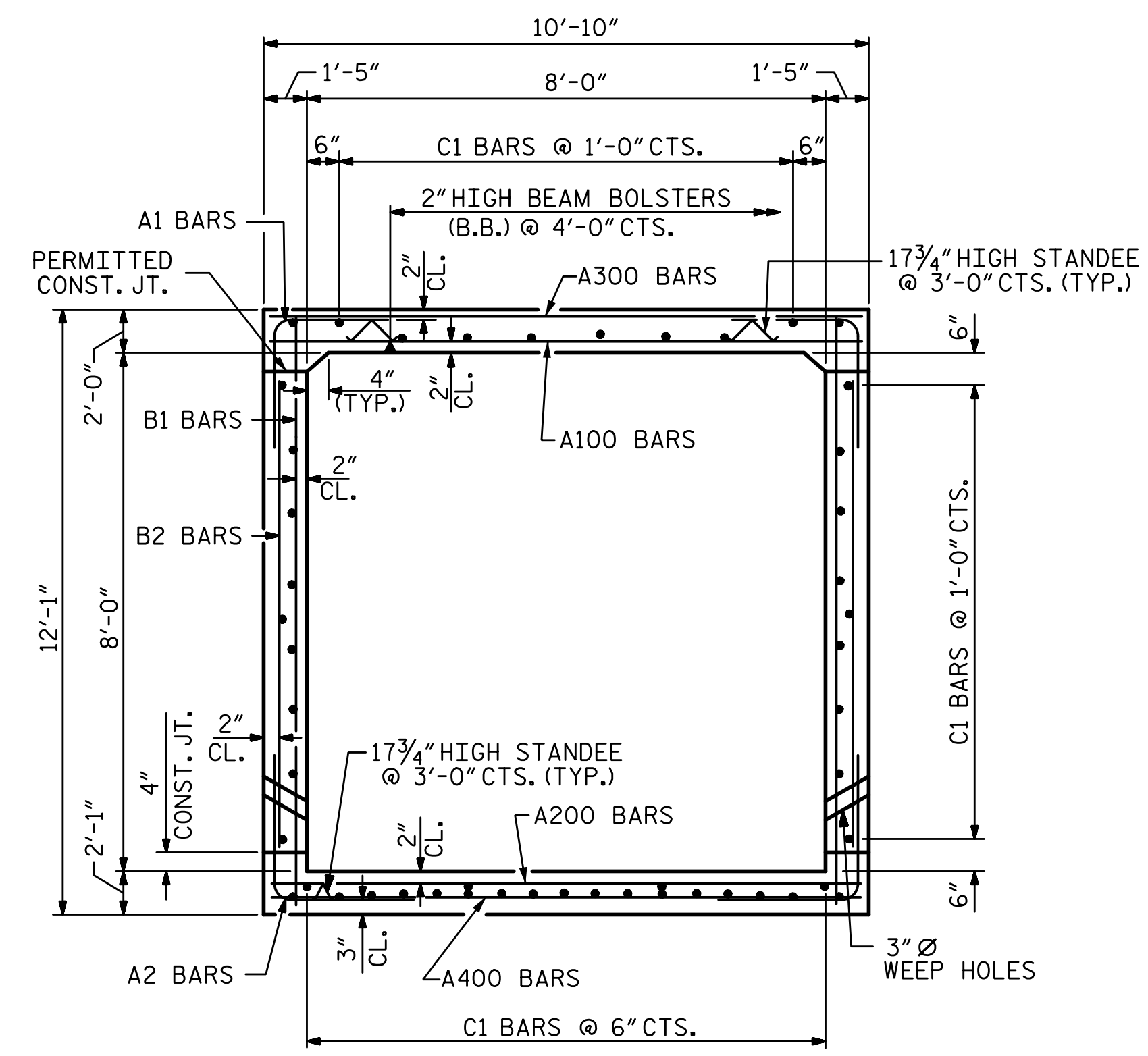
PLANS PREPARED BY:
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5640 Dillard Drive
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LICENSURE NO. C-2521



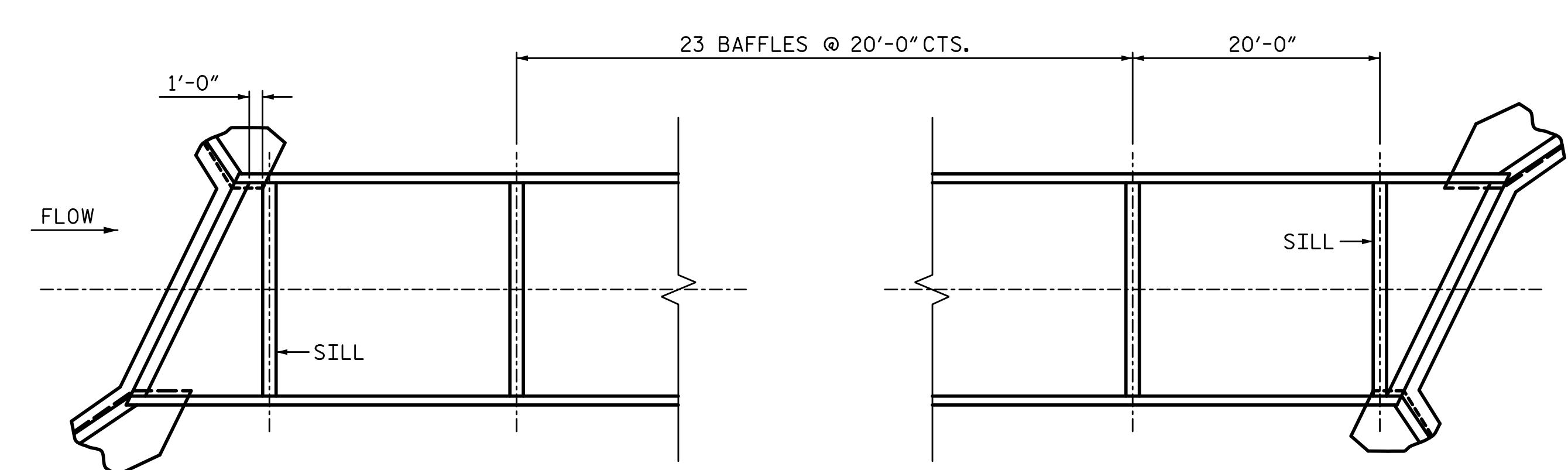
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
SINGLE 8 FT. X 8 FT. CONCRETE BOX CULVERT					
68° SKEW					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
					SHEET NO. C1-3 TOTAL SHEETS 6

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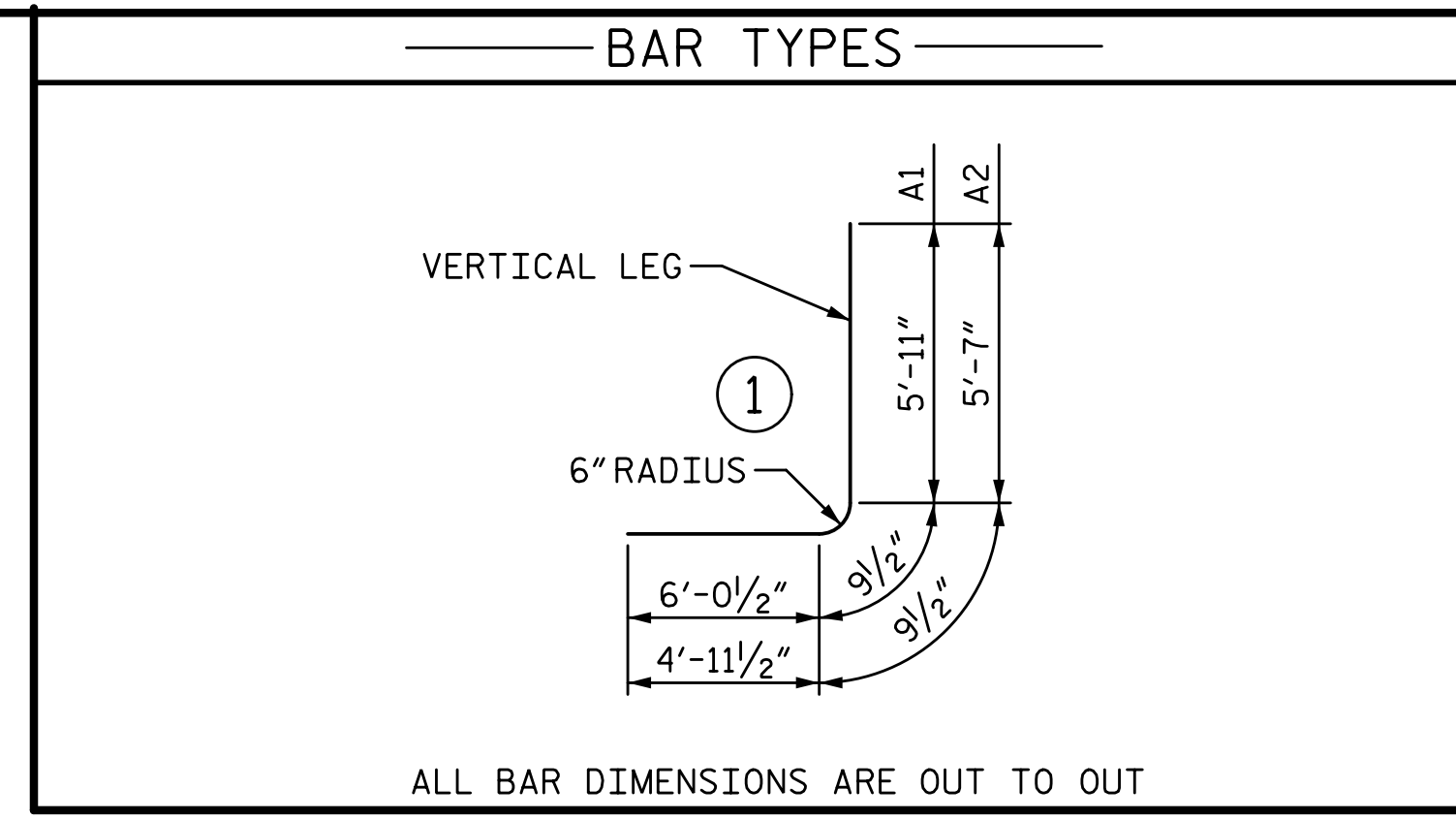
RIGHT ANGLE SECTION OF BARREL
(THERE ARE 49 C1 BARS IN SECTION OF BARREL)



FLOOR PLAN
(SHOWING PLACEMENT OF SILLS AND BAFFLES)

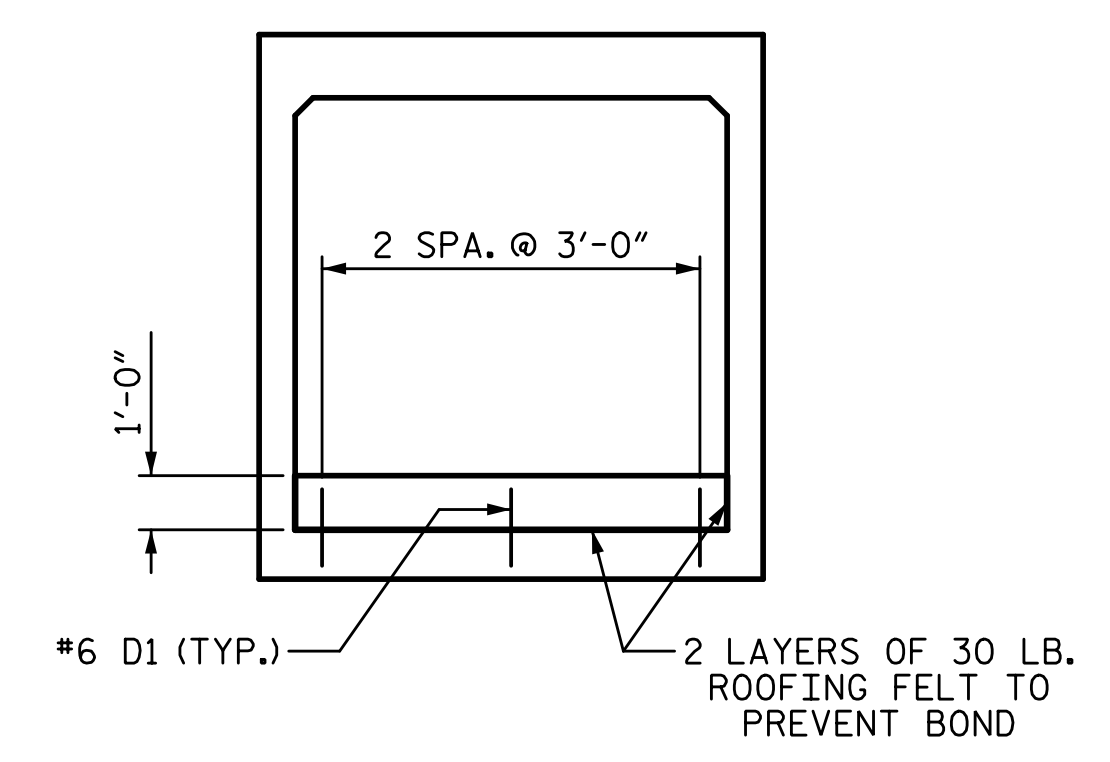
CULVERT SILL AND BAFFLE DETAILS

BACKFILL BETWEEN SILLS/BAFFLES WITH NATIVE MATERIAL FLUSH WITH THE TOP OF THE SILL/BAFFLES. NATIVE MATERIAL CONSIST OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED AT THE PROJECT SITE DURING CONSTRUCTION. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

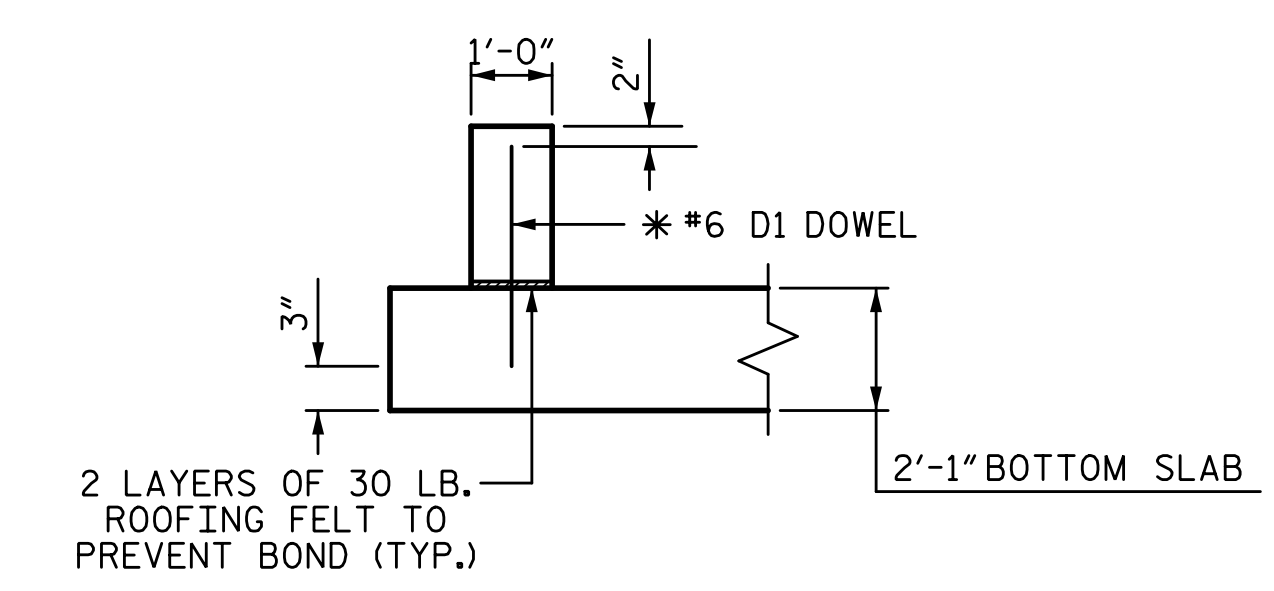


ALL BAR DIMENSIONS ARE OUT TO OUT

SPLICE CHART	
#8 B1 SPLICE LENGTH = 3'-8"	
#4 C1 SPLICE LENGTH = 1'-11"	



ELEVATION - LOOKING DOWNSTREAM



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

BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	968	#8	1	12'-9"	32953
A2	968	#8	1	11'-4"	29292
A100	825	#8	STR	10'-5"	22945
A101	4	#8	STR	5'-8"	61
A200	825	#8	STR	10'-5"	22945
A201	4	#8	STR	5'-8"	61
A300	481	#4	STR	10'-5"	3347
A301	2	#4	STR	6'-3"	8
A302	2	#4	STR	2'-7"	3
A400	481	#4	STR	10'-5"	3347
A401	2	#4	STR	6'-3"	8
A402	2	#4	STR	2'-7"	3
B1	968	#8	STR	11'-7"	29938
B2	968	#4	STR	7'-4"	4742
C1	882	#4	STR	28'-8"	16890
D1	75	#6	STR	2'-8"	300
G1	8	#5	STR	10'-9"	90
S2	16	#8	STR	10'-9"	459
T3	16	#6	STR	3'-6"	84
TOTAL REINFORCING STEEL					167476 LB
CLASS A CONCRETE BREAKDOWN					
BARREL					1200.7 CY
SILLS AND BAFFLES					7.4 CY

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GUILFORD COUNTY
 STATION: 364+68.00 -L-

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SINGLE 8 FT. X 8 FT. CONCRETE BOX CULVERT

68° SKEW

REVISIONS					
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2			4		

SHEET NO. C1-4
 TOTAL SHEETS 6

PLANS PREPARED BY:

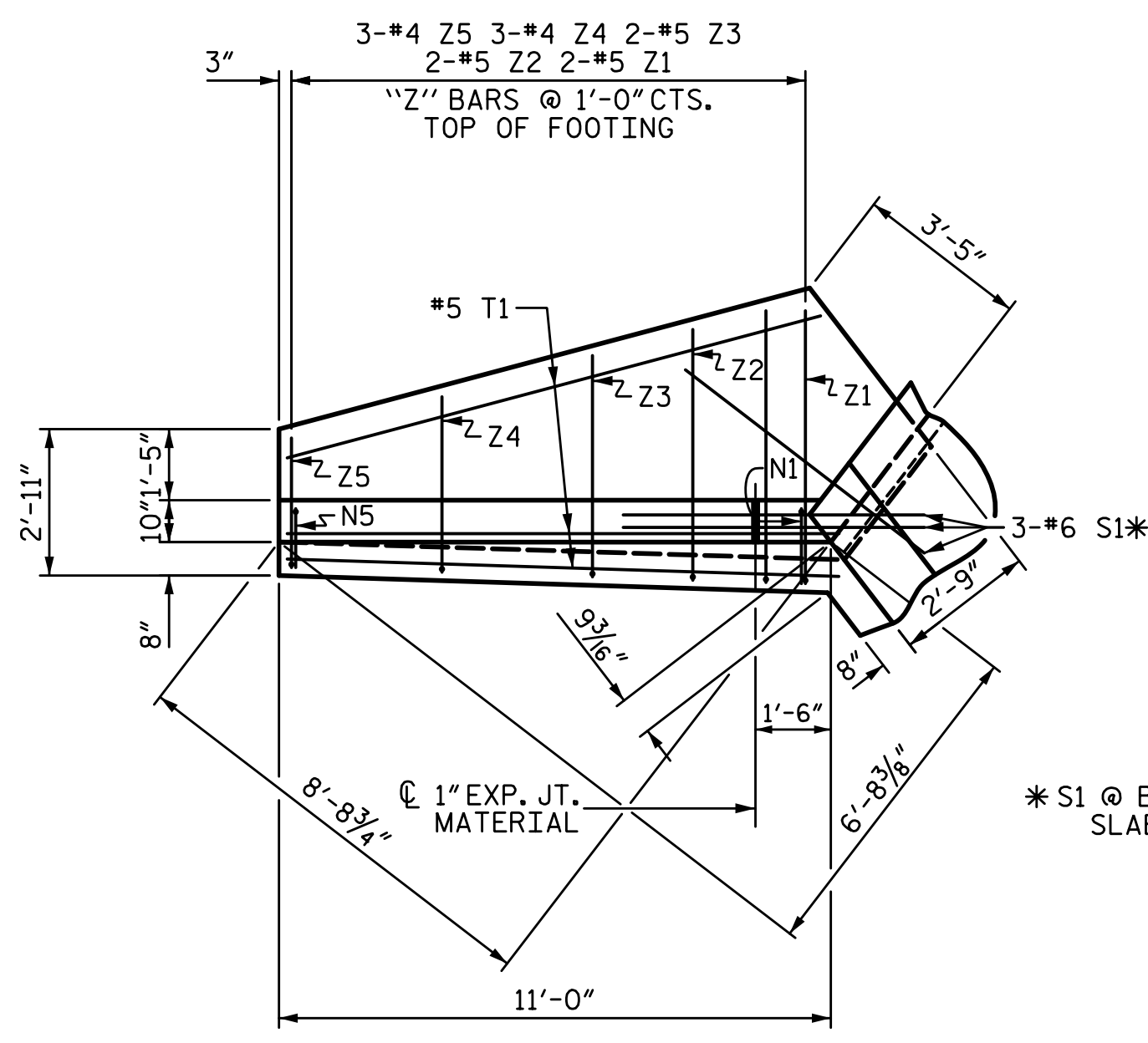
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 LICENSURE NO. C-2521

MARK A. AVERETTE
 NORTH CAROLINA PROFESSIONAL ENGINEER
 12/1/2017

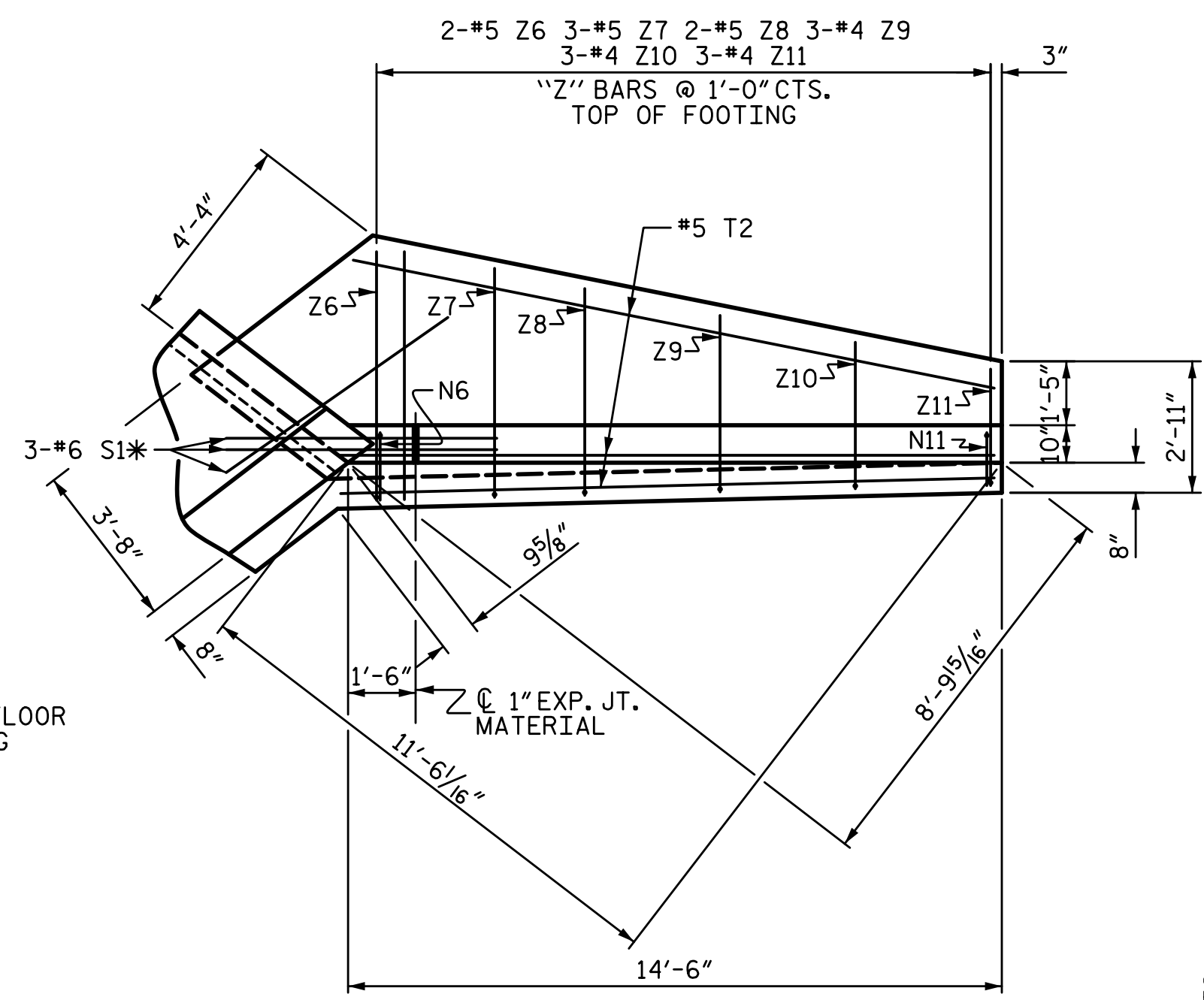
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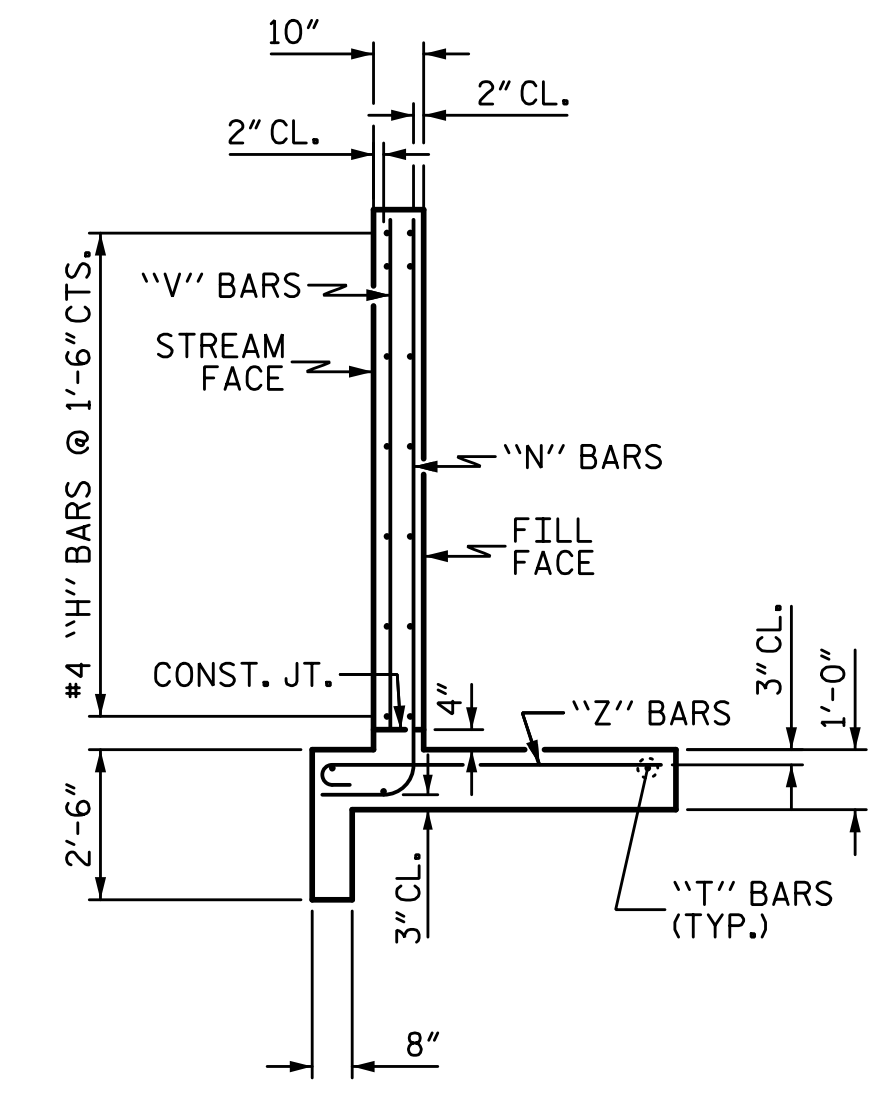
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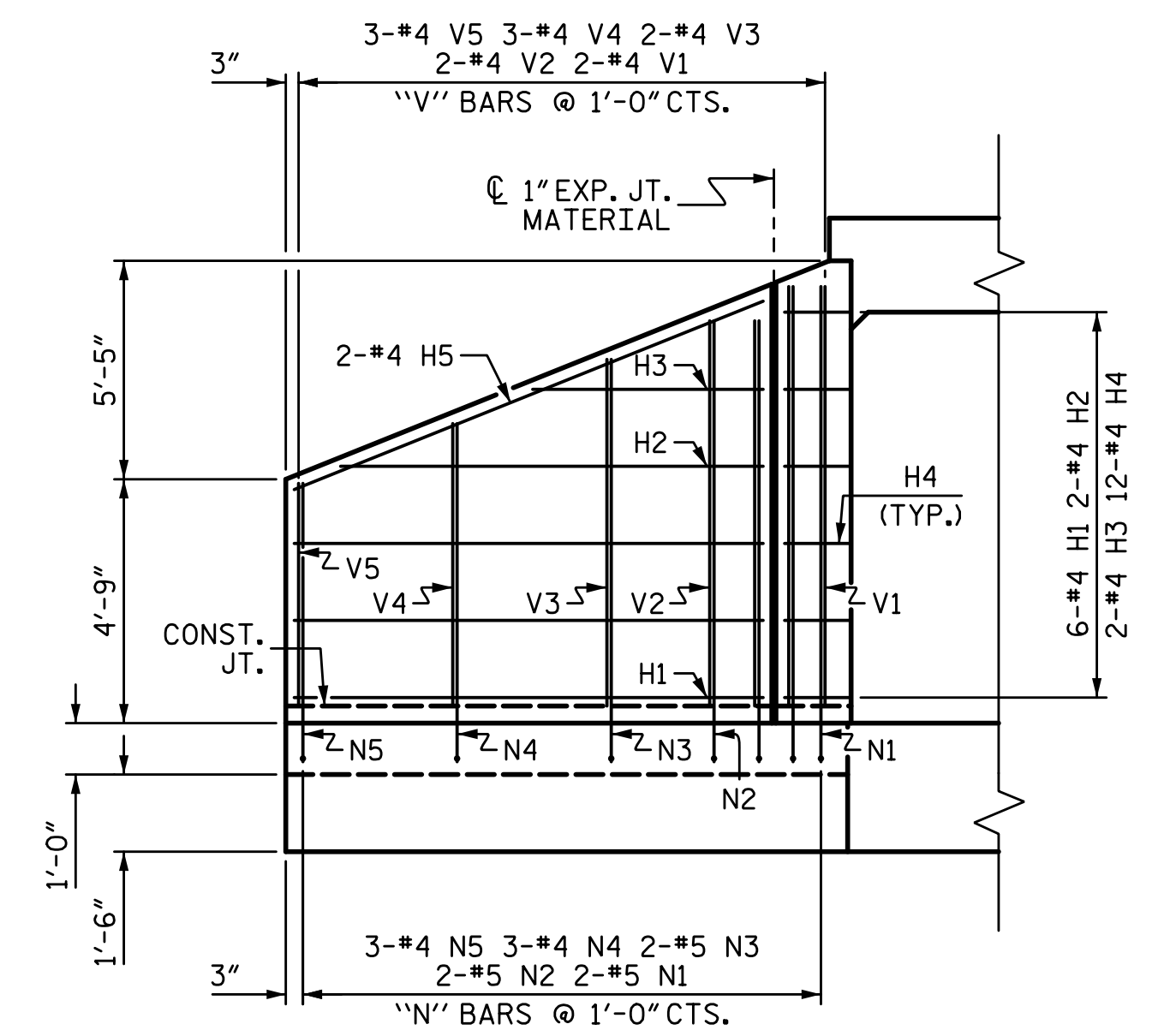
PLAN W2



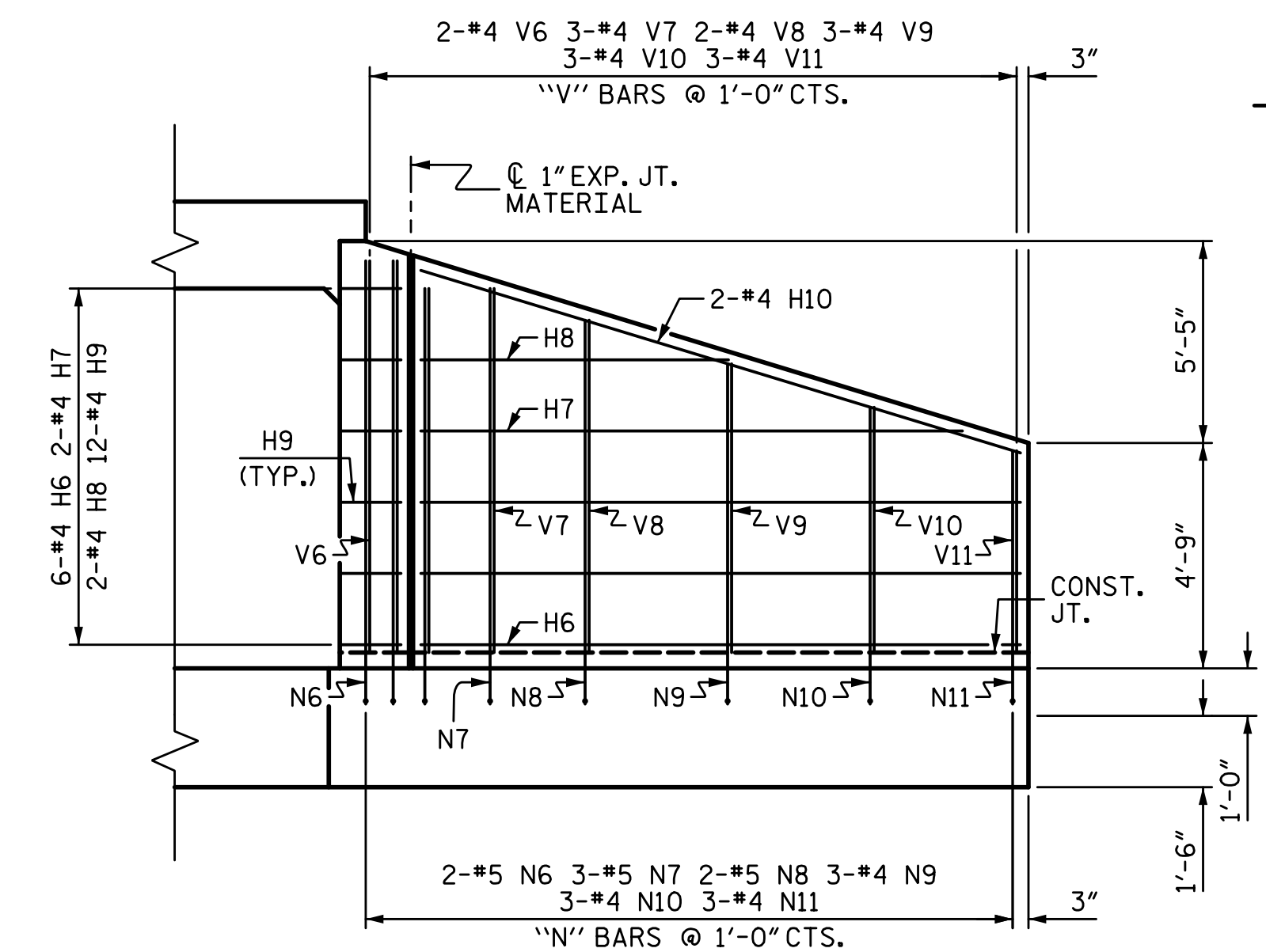
PLAN W1



TYPICAL WING SECTION



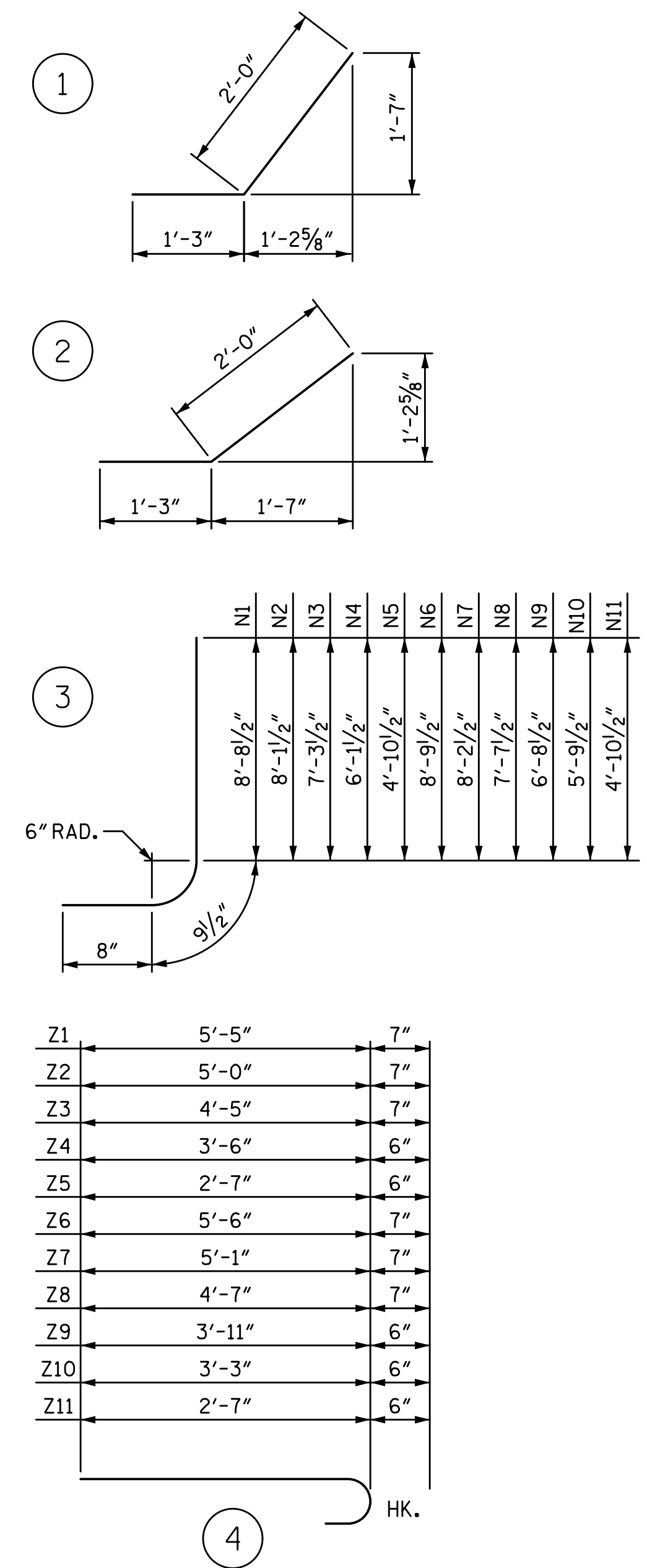
ELEVATION W2



ELEVATION W1

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.



Z1	5'-5"	7"
Z2	5'-0"	7"
Z3	4'-5"	7"
Z4	3'-6"	6"
Z5	2'-7"	6"
Z6	5'-6"	7"
Z7	5'-1"	7"
Z8	4'-7"	7"
Z9	3'-11"	6"
Z10	3'-3"	6"
Z11	2'-7"	6"

BILL OF MATERIAL

BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	9'-1"	73
H2	4	#4	STR	8'-2"	22
H3	4	#4	STR	4'-5"	12
H4	24	#4	1	3'-3"	52
H5	4	#4	STR	9'-10"	26
H6	12	#4	STR	12'-7"	101
H7	4	#4	STR	11'-4"	30
H8	4	#4	STR	6'-5"	17
H9	24	#4	2	3'-3"	52
H10	4	#4	STR	13'-2"	35
N1	4	#5	3	10'-2"	42
N2	4	#5	3	9'-7"	40
N3	4	#5	3	8'-9"	37
N4	6	#4	3	7'-7"	30
N5	6	#4	3	6'-4"	25
N6	4	#5	3	10'-3"	43
N7	6	#5	3	9'-8"	60
N8	4	#5	3	9'-1"	38
N9	6	#4	3	8'-2"	33
N10	6	#4	3	7'-3"	29
N11	6	#4	3	6'-4"	25
S1	12	#6	STR	6'-0"	108
T1	6	#5	STR	11'-0"	69
T2	6	#5	STR	14'-6"	91
V1	4	#4	STR	8'-2"	22
V2	4	#4	STR	7'-6"	20
V3	4	#4	STR	6'-9"	18
V4	6	#4	STR	5'-6"	22
V5	6	#4	STR	4'-4"	17
V6	4	#4	STR	8'-3"	22
V7	6	#4	STR	7'-8"	31
V8	4	#4	STR	7'-0"	19
V9	6	#4	STR	6'-1"	24
V10	6	#4	STR	5'-2"	21
V11	6	#4	STR	4'-3"	17
Z1	4	#5	4	6'-0"	25
Z2	4	#5	4	5'-7"	23
Z3	4	#5	4	5'-0"	21
Z4	6	#4	4	4'-0"	16
Z5	6	#4	4	3'-1"	12
Z6	4	#5	4	6'-1"	25
Z7	6	#5	4	5'-8"	35
Z8	4	#5	4	5'-2"	22
Z9	6	#4	4	4'-5"	18
Z10	6	#4	4	3'-9"	15
Z11	6	#4	4	3'-1"	12
REINFORCING STEEL FOR 4 WINGS					1547 LBS
CLASS A CONCRETE					
4 WINGS					22.6 CY
2 HEADWALLS					1.0 CY
2 END CURTAIN WALLS					0.8 CY
TOTAL					24.4 CY

PROJECT NO. U-2525C
GUILFORD COUNTY
 STATION: 364+68.00 -L-

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

WINGS FOR CONCRETE BOX CULVERT
 H = 8'-0" SLOPE = 2:1
 75° SKEW

PLANS PREPARED BY:
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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 (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	N/A	N/A	1.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HL-93 (OPERATING)	N/A		N/A	N/A	1.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HS-20 (INVENTORY)	36.000	②	N/A	N/A	1.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HS-20 (OPERATING)	36.000		N/A	N/A	1.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SH	12.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S3C	21.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S3A	22.750		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S4A	26.750		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S5A	30.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S6A	34.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S7B	38.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S7A	40.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	TRUCK TRACTOR SEMI-TRAILER (TTST)	T4A	28.250		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T5B	32.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T6A	36.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T7A	40.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T7B	40.000		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		PERMANENT LOAD		④	1.01	N/A	N/A	1.09	1	BOT. SLAB-MID.	4.71	1.01	1	EXT. WALL TOP	7.95

LOAD FACTORS:

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

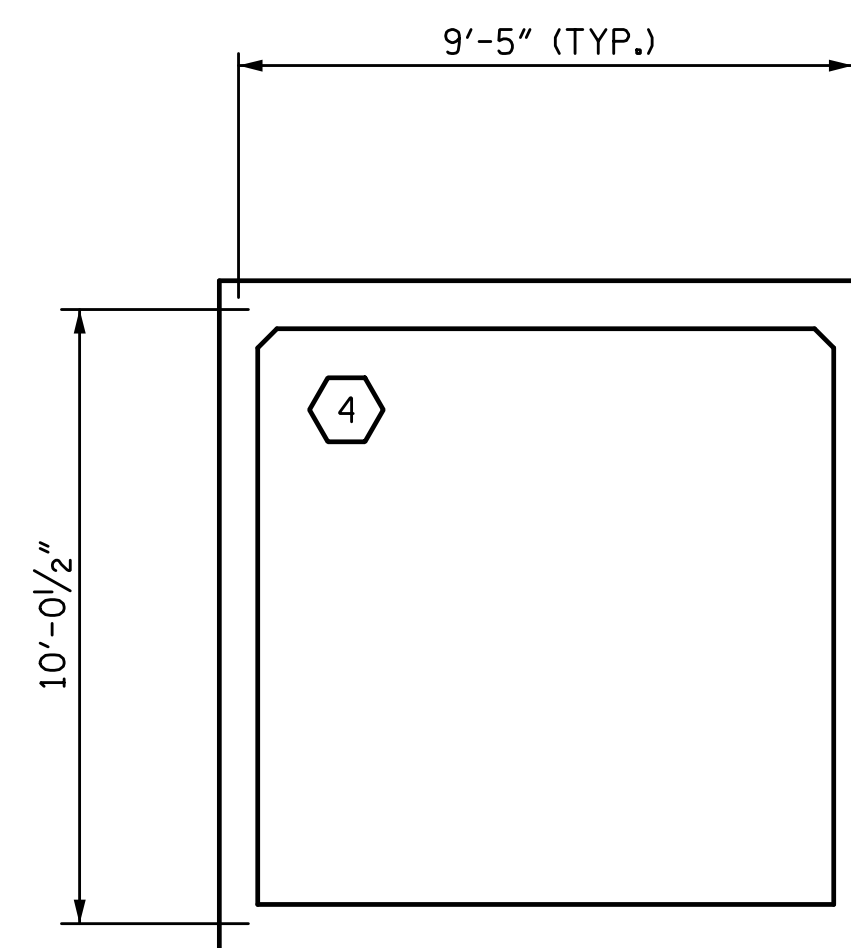
NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM CENTERLINE OF ELEMENT.

COMMENTS:

- EFFECTS OF LIVE LOAD MAY BE NEGLECTED ACCORDING TO AASHTO LRFD 3.6.1.2.6A (DESIGN FILL = 78'-0")
- CULVERTS WITH DEEP FILLS SHOULD BE EVALUATED FOR THE EFFECTS OF PERMANENT LOADS ONLY ACCORDING TO "THE MANUAL FOR BRIDGE EVALUATION 6A.5.12.10.3A"

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

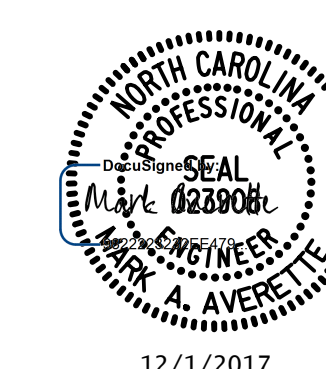


LRFR SUMMARY
(LOOKING DOWNSTREAM)

DRAWN BY: R. SEALEY DATE: 10-17
 CHECKED BY: M.A. AVERETTE DATE: 10-17
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GUILFORD COUNTY
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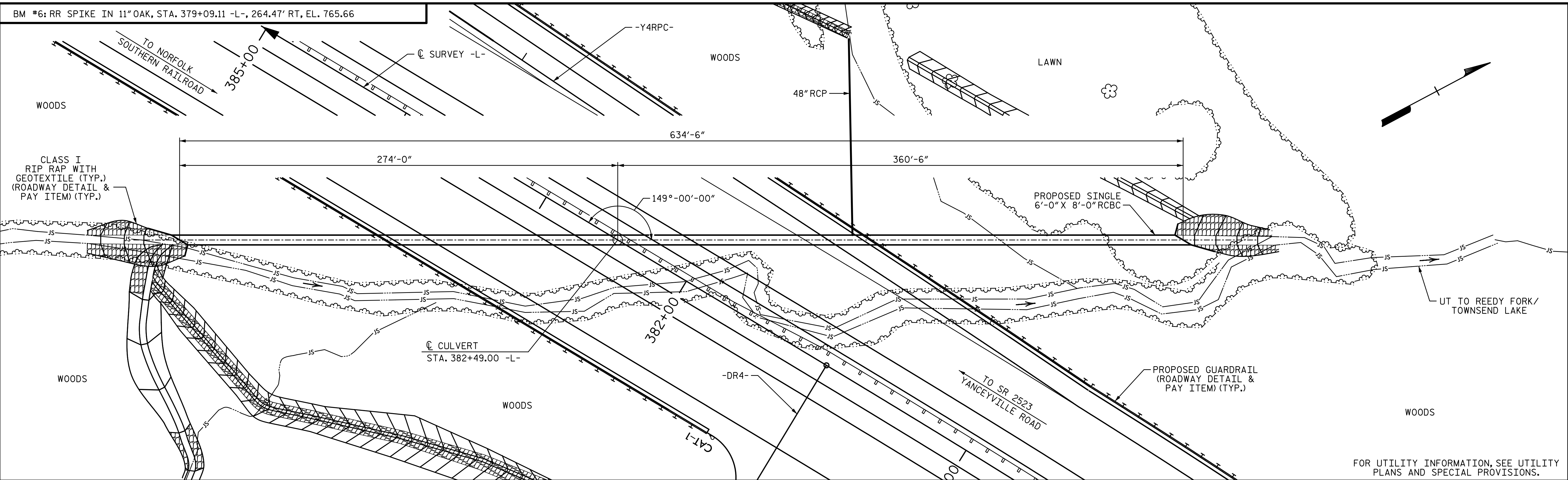
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**LRFR SUMMARY FOR
 REINFORCED CONCRETE
 BOX CULVERTS**

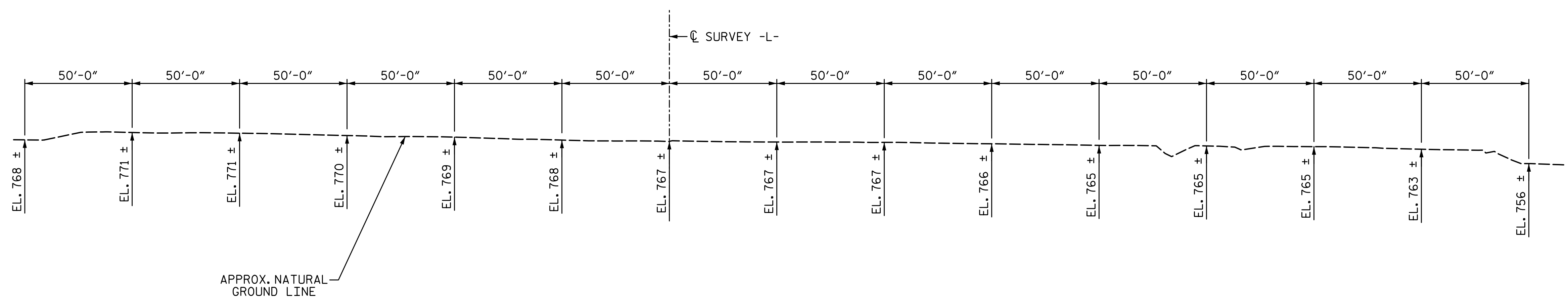
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1			3			TOTAL SHEETS
2			4			6

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LOCATION SKETCH



PROFILE ALONG CULVERT

PROJECT NO. U-2525C
GUILFORD COUNTY
 STATION: 382+49.00 -L-

CULVERT NO. 401265

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**SINGLE 6 FT. X 8 FT.
 CONCRETE BOX CULVERT**

149° SKEW

PLANS PREPARED BY:
SEALEY & ASSOCIATES
 ENGINEERS
 5640 Dillard Drive
 Suite 200
 Cary, NC 27518
 (919) 852-0468
 (919) 852-0538 (Fax)
 www.simpsonengr.com
 LICENSURE NO. C-2521



11/16/2017

DRAWN BY: R. SEALEY DATE: 11-17
 CHECKED BY: M.A. AVERETTE DATE: 11-17
 DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 11-17

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

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HYDRAULIC DATA:	
DESIGN DISCHARGE	= 230 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YEAR
DESIGN HIGH WATER ELEVATION	= 772.30
DRAINAGE AREA	= 0.24 SQ. MI.
BASE DISCHARGE (Q 100)	= 260 CFS
BASE HIGH WATER ELEVATION	= 772.85
OVERTOPPING FLOOD DATA:	
OVERTOPPING DISCHARGE	= 810 CFS
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YEAR
OVERTOPPING FLOOD ELEVATION	= 802.00 **
** OVERTOPPING OCCURS AT ROADWAY	
STA. 377+75.00 -L- ±, APPROXIMATELY	
110' LT. OF -L- AT THE DRAINAGE DIVIDE	

HORIZONTAL CURVE DATA		
PIs STA. 364+79.63 -L-	PI STA. 371+91.62 -L-	PIs STA. 378+88.90 -L-
θs = 4°-11'-58.9"	Δ = 22°-35'-02.6" (LT.)	θs = 4°-11'-58.9"
Ls = 420.00'	D = 1°-59'-59.5"	Ls = 420.00'
LT = 280.08'	L = 1129.29'	LT = 280.08'
ST = 140.07'	T = 572.07'	ST = 140.07'
	R = 2865.00'	

GRADE DATA:
GRADE POINT EL. @ STA. 382+49.00 -L- = EL. 811.76
BED EL. @ STA. 382+49.00 -L- = 761.99
ROADWAY SLOPE 2:1

TOTAL STRUCTURE QUANTITIES	
CLASS A CONCRETE	
BARREL @ _____ 1.506 CY/FT _____	955.6 C.Y.
SILLS AND BAFFLES _____	5.8 C.Y.
WINGS ETC. _____	31.0 C.Y.
TOTAL _____	992.4 C.Y.
REINFORCING STEEL	
BARREL _____	112,100 LBS.
WINGS ETC. _____	1,876 LBS.
TOTAL _____	113,976 LBS.
CULVERT EXCAVATION _____	LUMP SUM
FOUNDATION CONDITIONING MATERIAL _____	560 TONS

NOTES:

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

DESIGN FILL----- 44'-6"

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.

2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.

THE ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.

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

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

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.

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

TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINT SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.

THE 48" Ø RCP THROUGH THE SIDEWALL OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE FIELD BENT AS NECESSARY TO CLEAR PIPE.

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PLANS PREPARED BY:

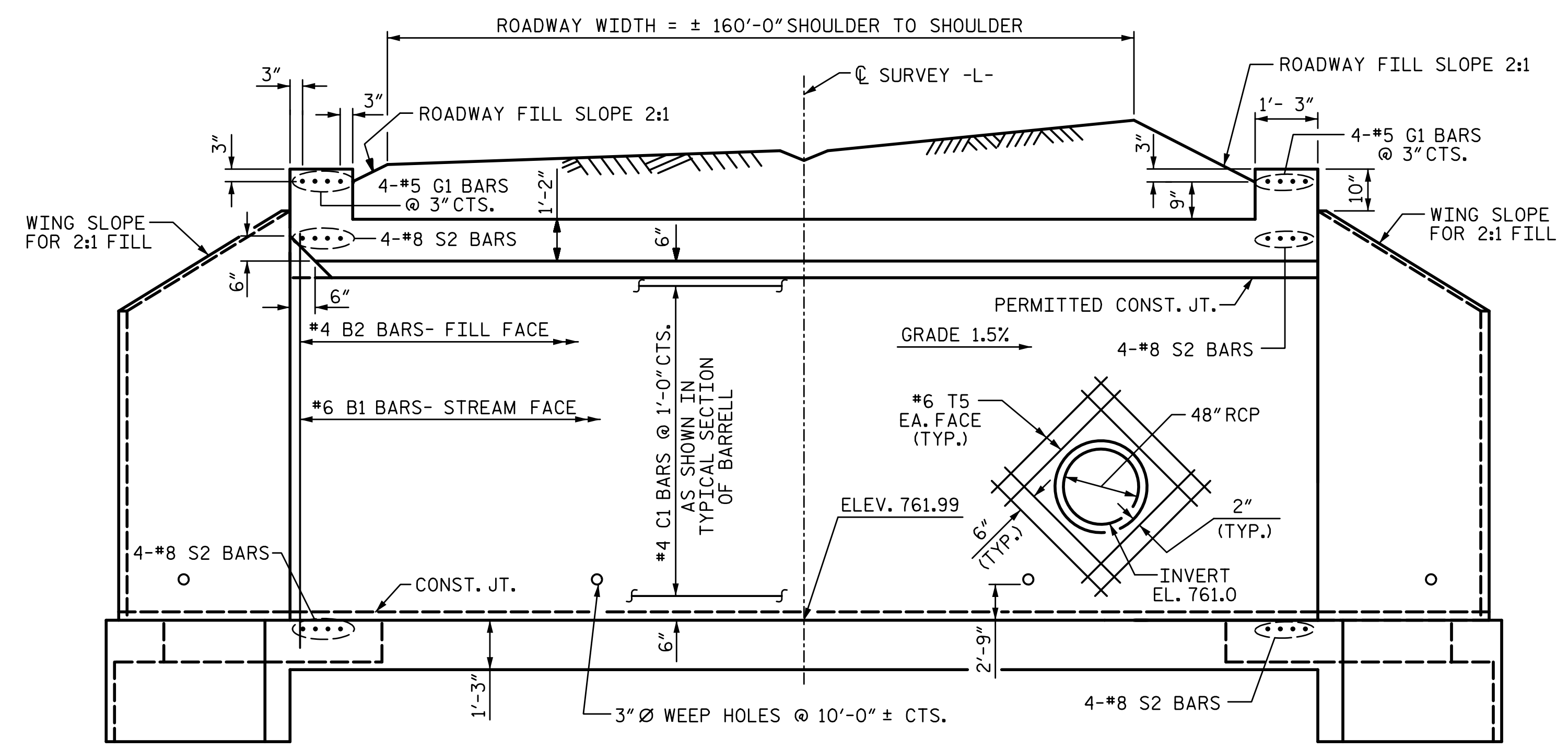
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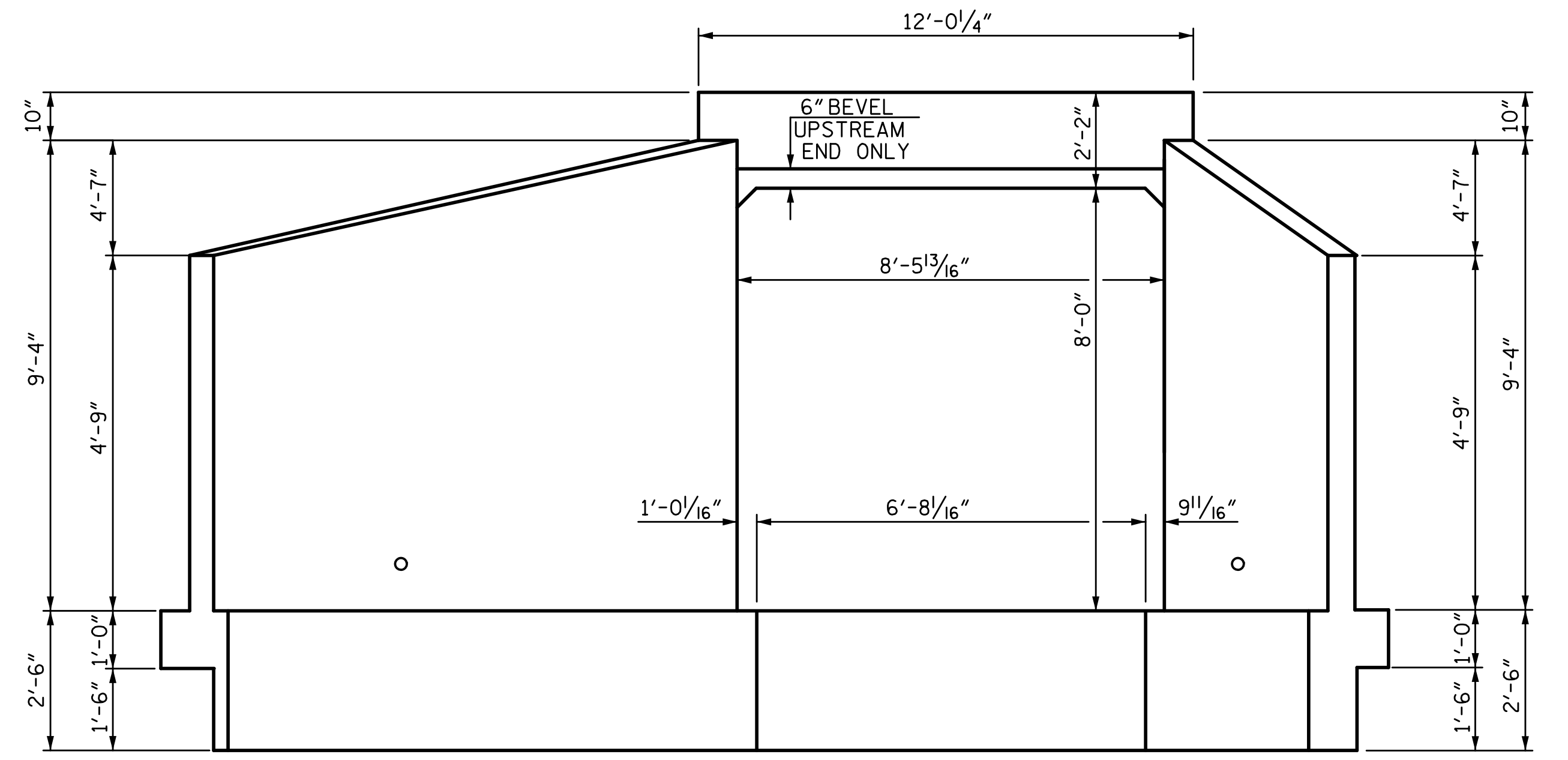
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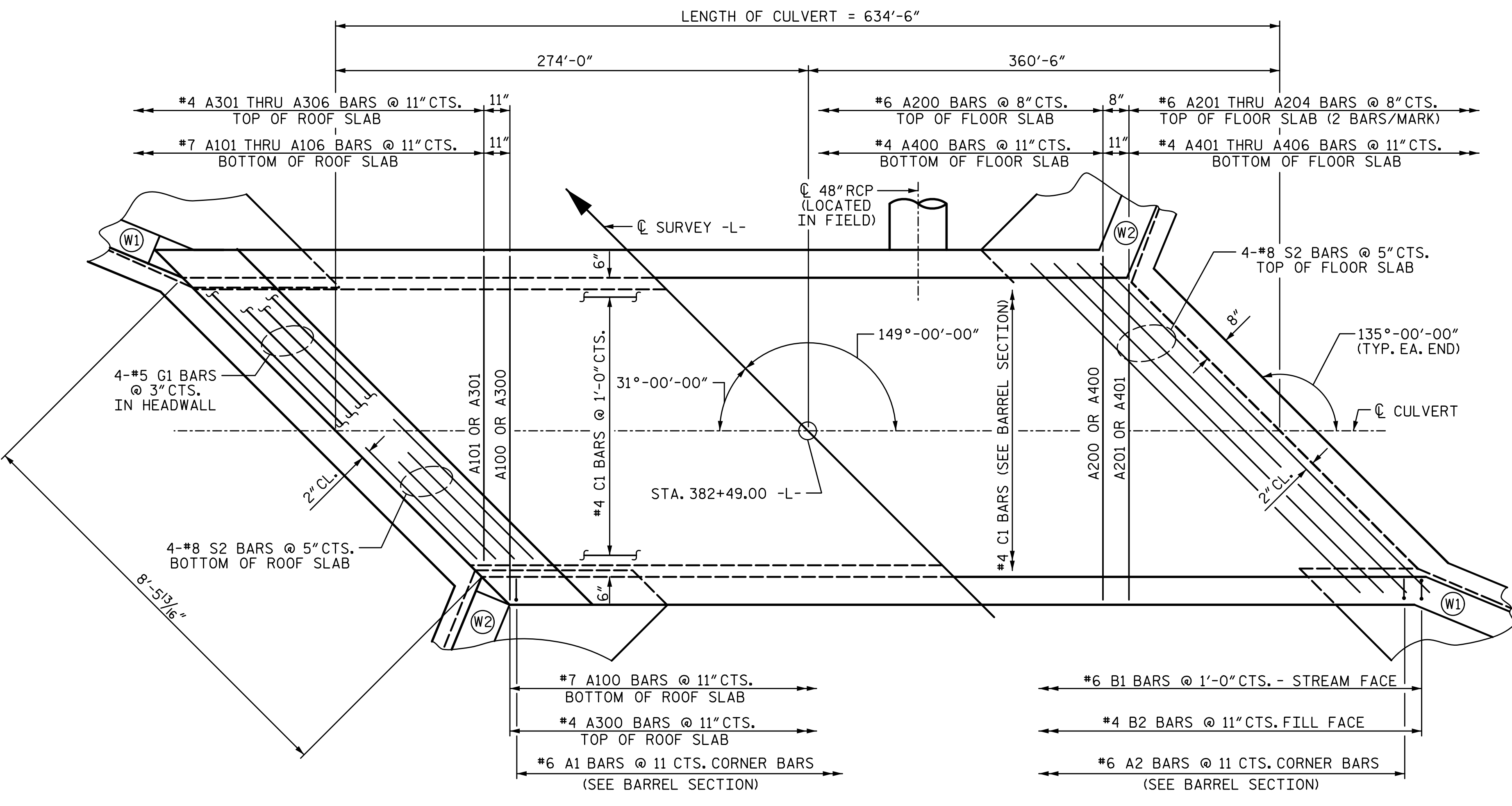
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CULVERT SECTION NORMAL TO ROADWAY
(SILLS AND BAFFLES NOT SHOWN FOR CLARITY)



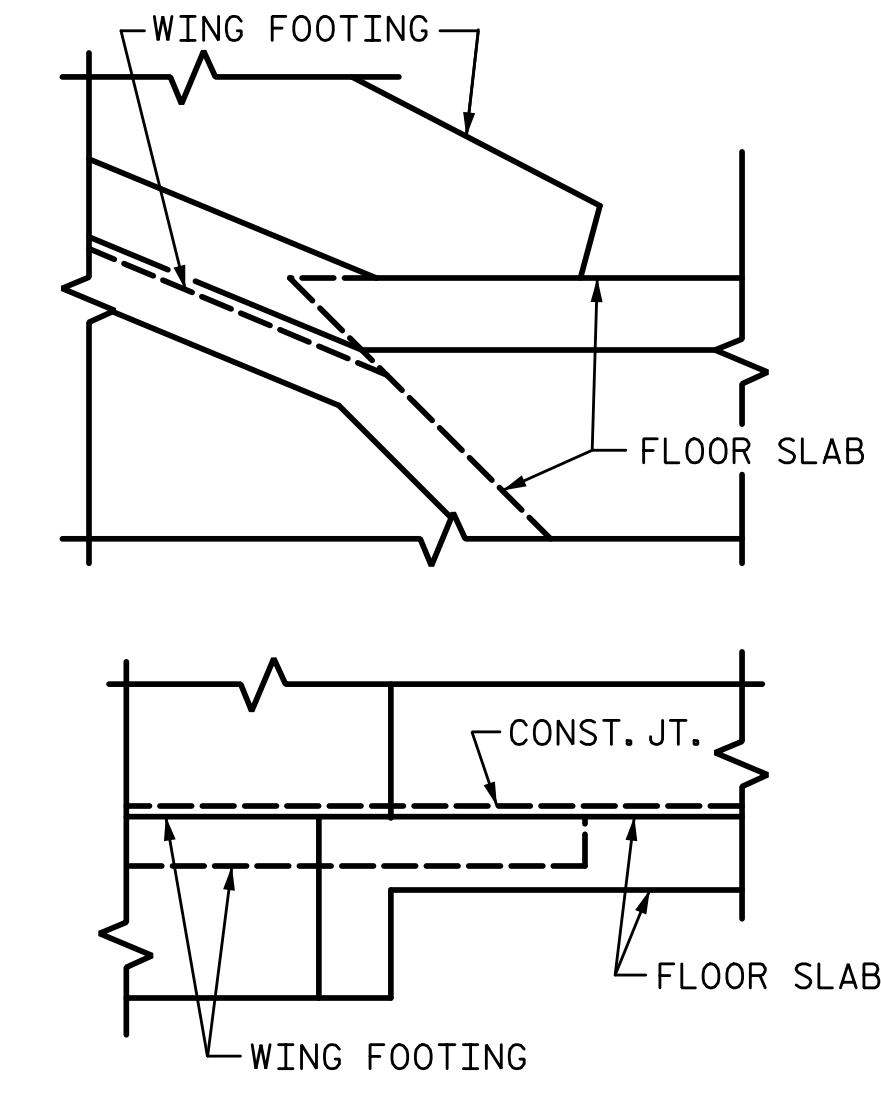
END ELEVATION NORMAL TO SKEW
(SILLS AND BAFFLES NOT SHOWN, SEE SHEET 4 FOR DETAILS)



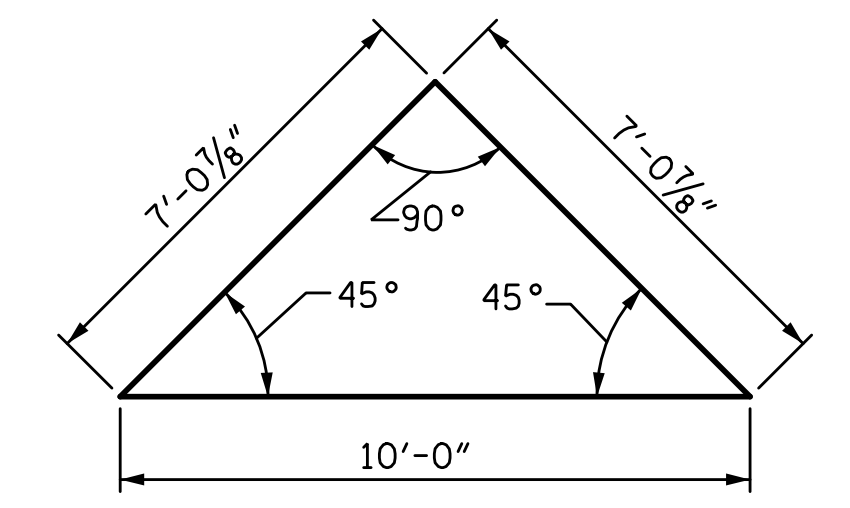
PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

C1 BARS ARE 23 BAR RUNS



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



SKEW TRIANGLE

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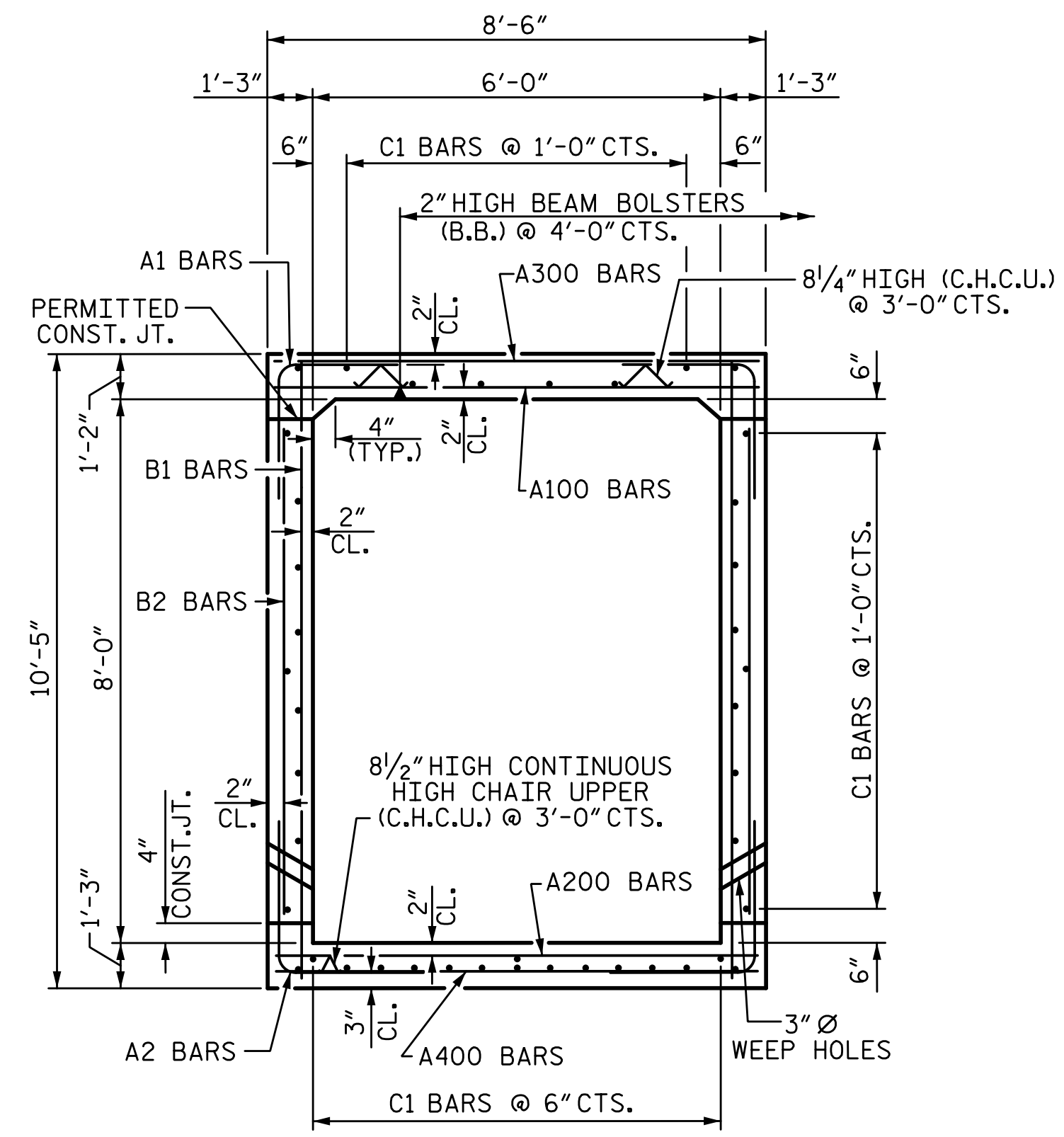
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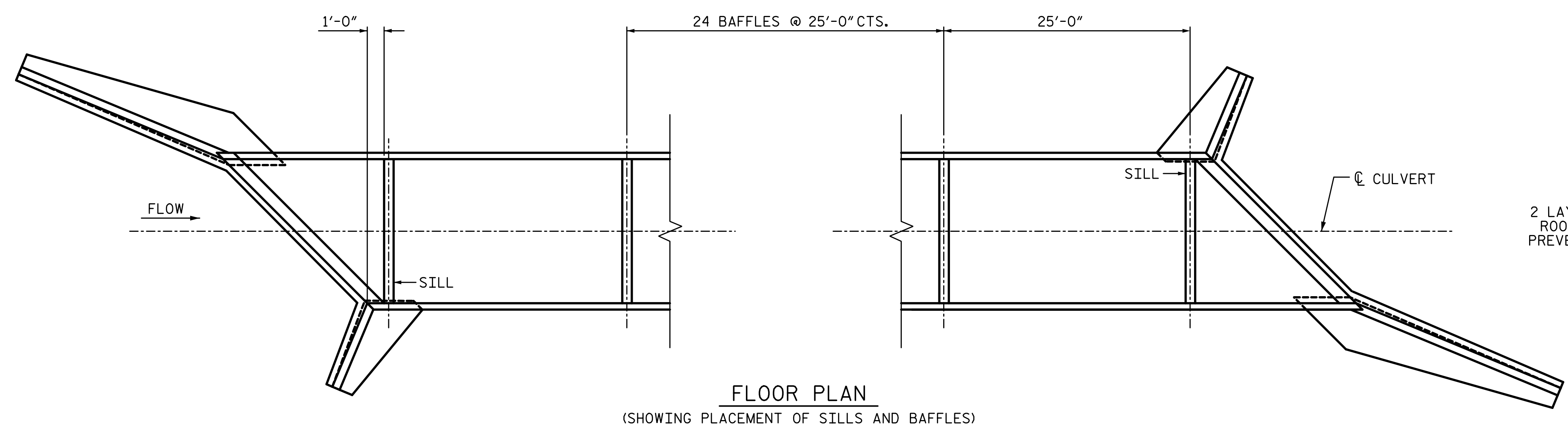
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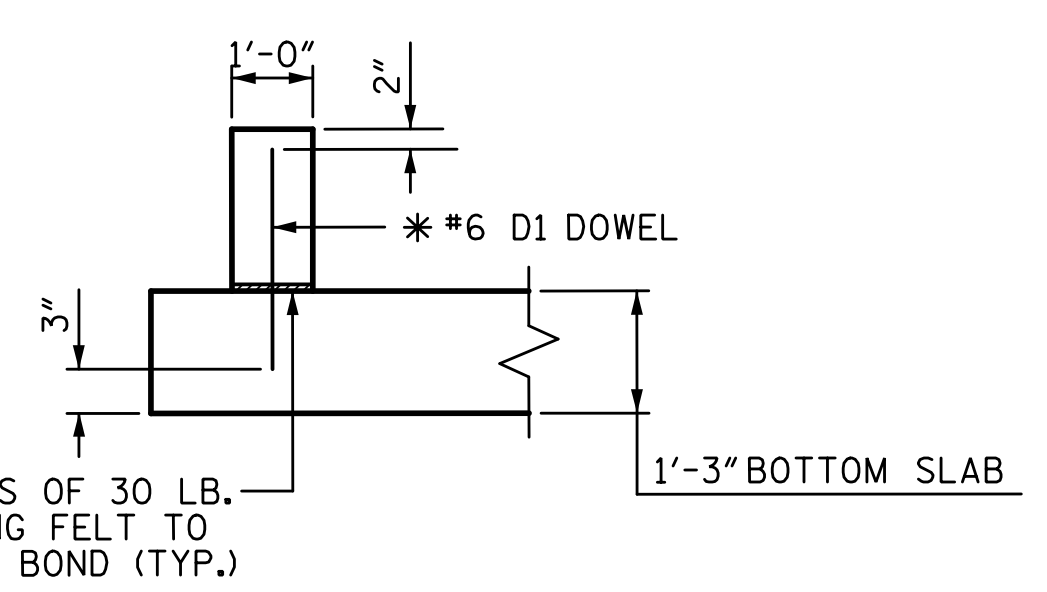
RIGHT ANGLE SECTION OF BARREL
(THERE ARE 42 C1 BARS IN SECTION OF BARREL)



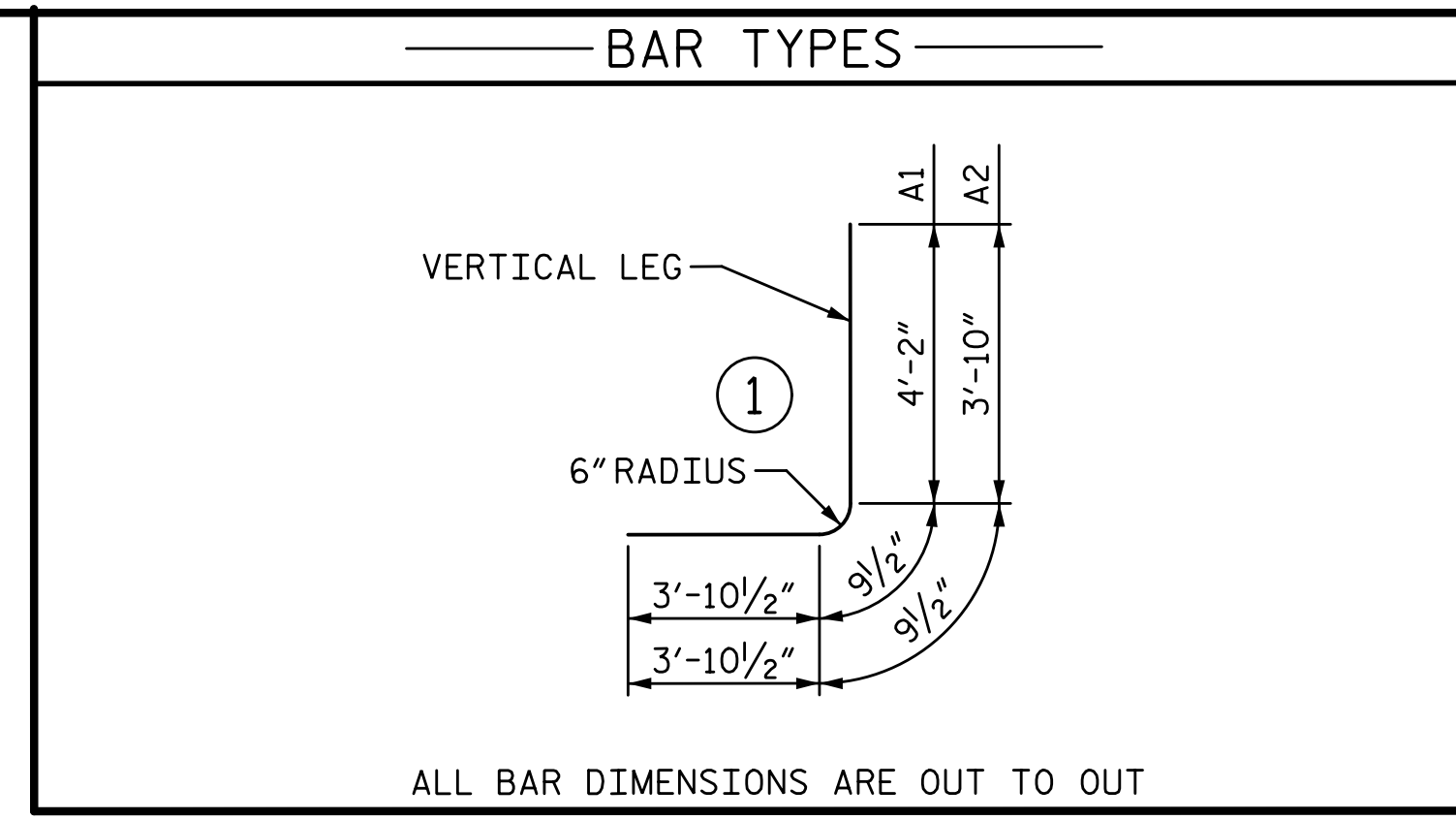
FLOOR PLAN
(SHOWING PLACEMENT OF SILLS AND BAFFLES)

CULVERT SILL AND BAFFLE DETAILS

BACKFILL BETWEEN SILLS/BAFFLES WITH NATIVE MATERIAL FLUSH WITH THE TOP OF THE SILL/BAFFLES. NATIVE MATERIAL CONSIST OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED AT THE PROJECT SITE DURING CONSTRUCTION. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

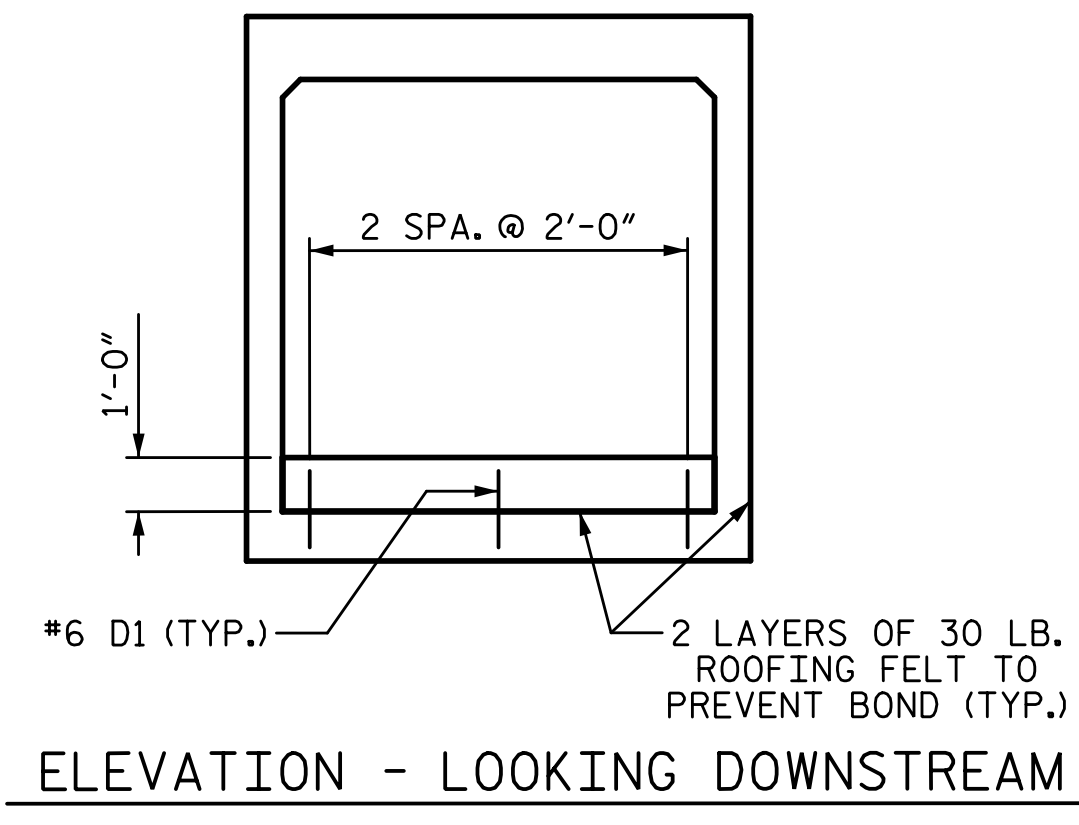


SECTION THROUGH SILL AND BAFFLE
*DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.



ALL BAR DIMENSIONS ARE OUT TO OUT

SPLICE CHART	
#6 B1 SPLICE LENGTH =	2'-9"
#4 C1 SPLICE LENGTH =	1'-11"



ELEVATION - LOOKING DOWNSTREAM

BILL OF MATERIAL						
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	
A1	1386	#6	1	8'-10"	18389	
A2	1386	#6	1	8'-6"	17695	
A100	683	#7	STR	8'-1"	11285	
A101	2	#7	STR	7'-2"	29	
A102	2	#7	STR	6'-3"	26	
A103	2	#7	STR	5'-4"	22	
A104	2	#7	STR	4'-5"	18	
A105	2	#7	STR	3'-6"	14	
A106	2	#7	STR	2'-7"	11	
A200	939	#6	STR	8'-1"	11401	
A201	4	#6	STR	6'-9"	41	
A202	4	#6	STR	5'-5"	33	
A203	4	#6	STR	4'-1"	25	
A204	4	#6	STR	2'-9"	17	
A300	683	#4	STR	8'-1"	3688	
A301	2	#4	STR	7'-2"	10	
A302	2	#4	STR	6'-3"	8	
A303	2	#4	STR	5'-4"	7	
A304	2	#4	STR	4'-5"	6	
A305	2	#4	STR	3'-6"	5	
A306	2	#4	STR	2'-7"	3	
A400	683	#4	STR	8'-1"	3688	
A401	2	#4	STR	7'-2"	10	
A402	2	#4	STR	6'-3"	8	
A403	2	#4	STR	5'-4"	7	
A404	2	#4	STR	4'-5"	6	
A405	2	#4	STR	3'-6"	5	
A406	2	#4	STR	2'-7"	3	
B1	1270	#6	STR	9'-11"	18917	
B2	1386	#4	STR	7'-4"	6790	
C1	966	#4	STR	29'-5"	18982	
D1	78	#6	STR	1'-10"	215	
G1	8	#5	STR	11'-7"	97	
S2	16	#8	STR	11'-7"	495	
T5	16	#6	STR	6'-0"	144	
TOTAL REINFORCING STEEL					112100 LB	
CLASS A CONCRETE BREAKDOWN						
BARREL					955.6 CY	
SILLS AND BAFFLES					5.8 CY	

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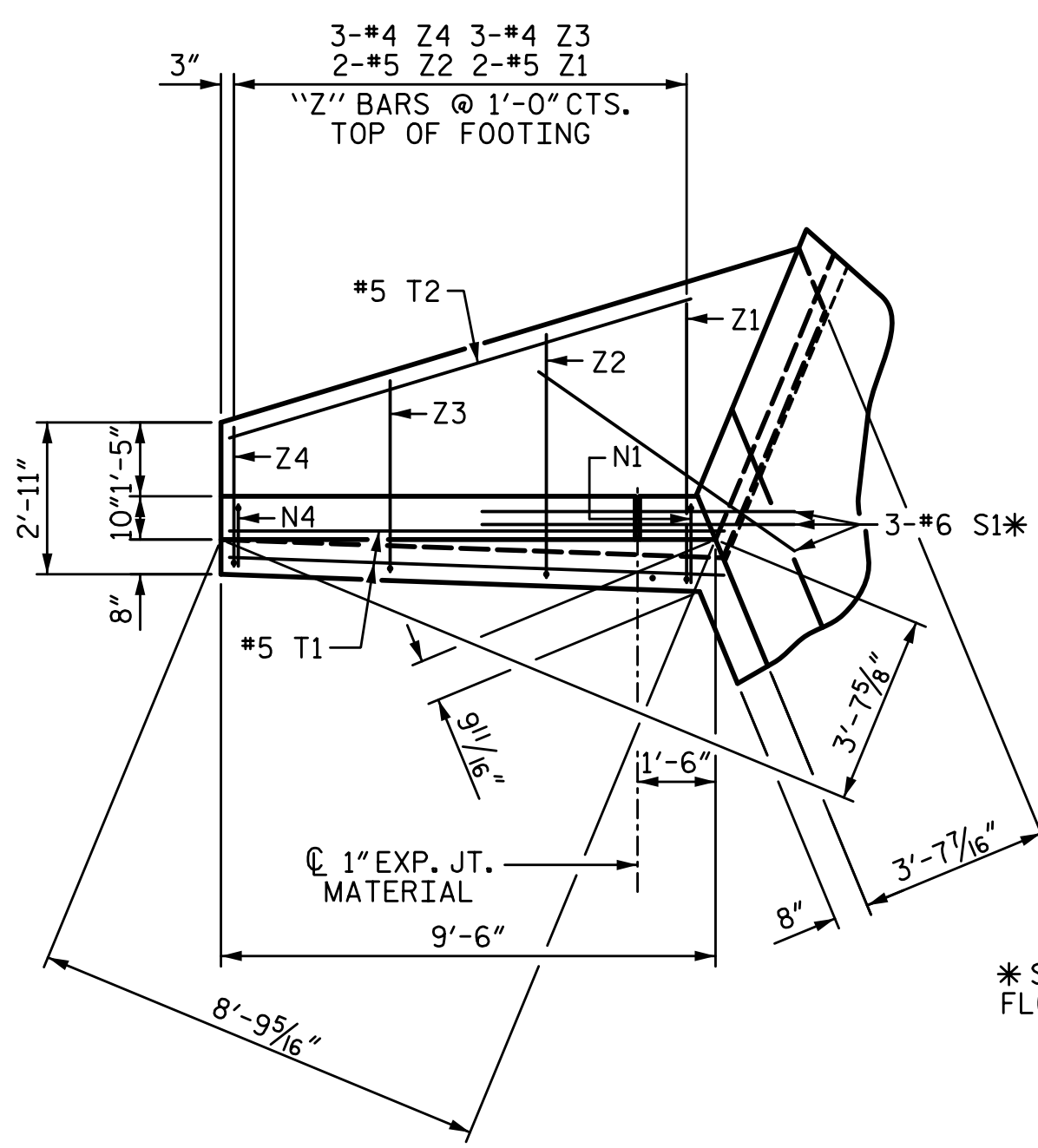
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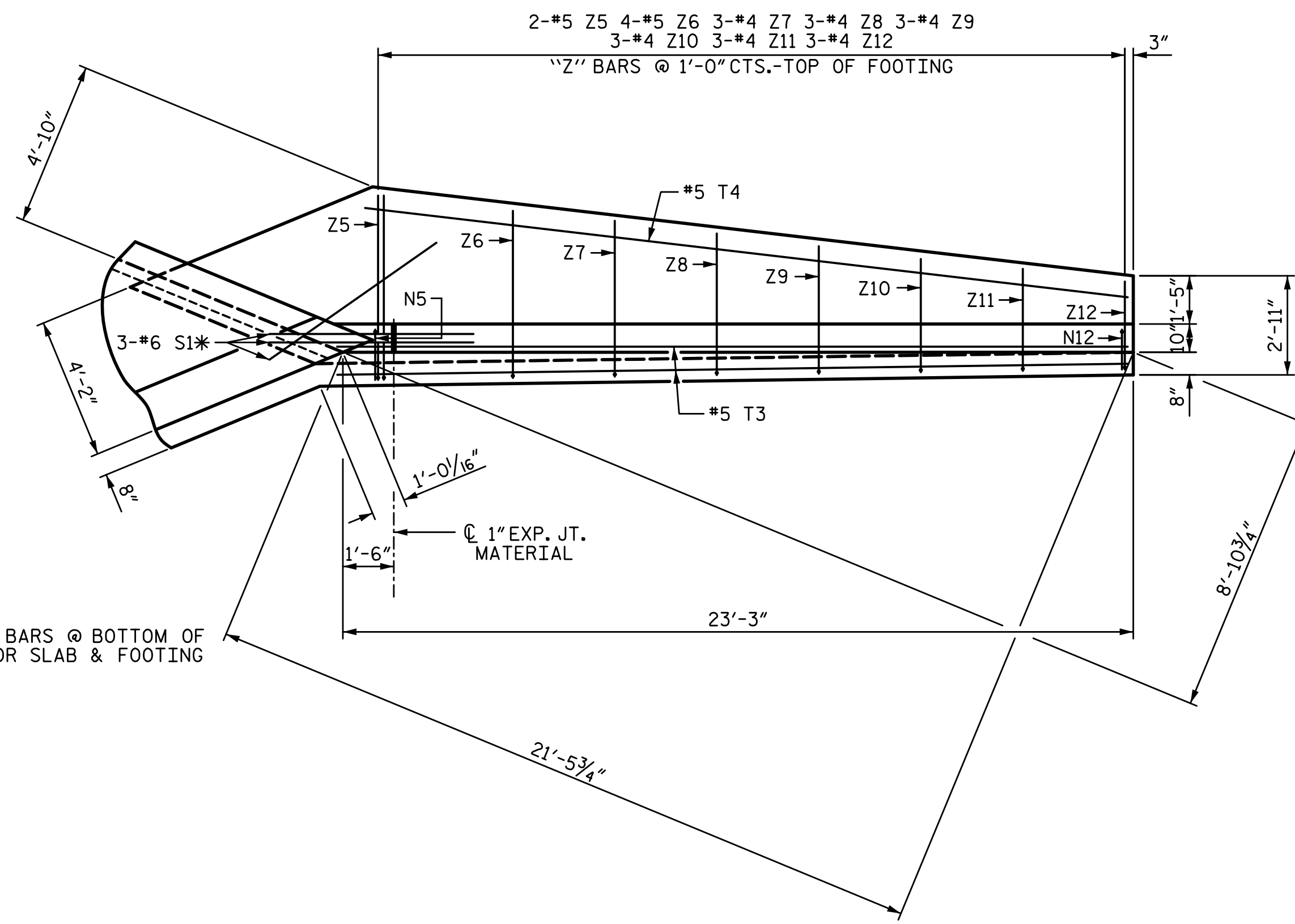
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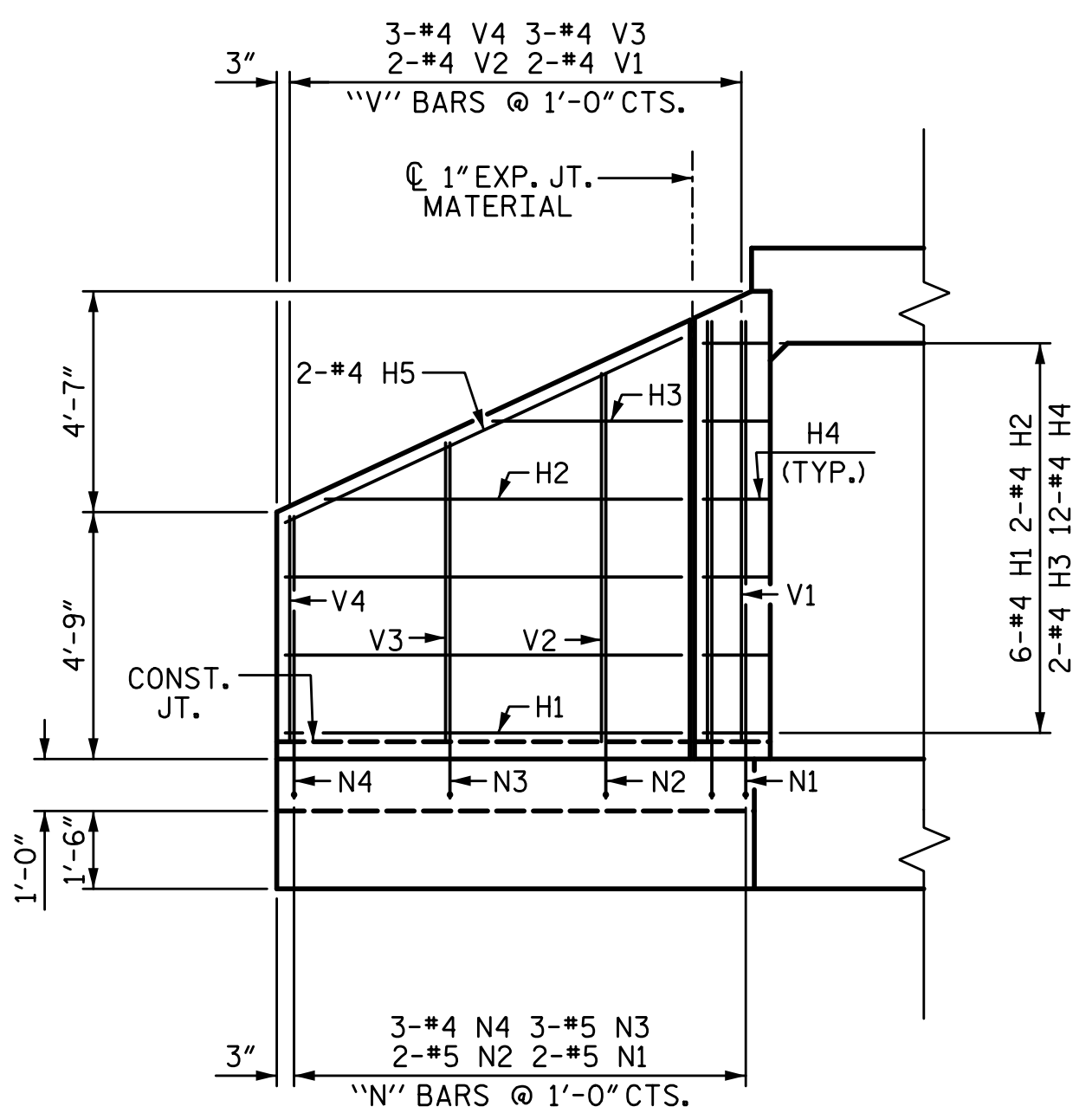
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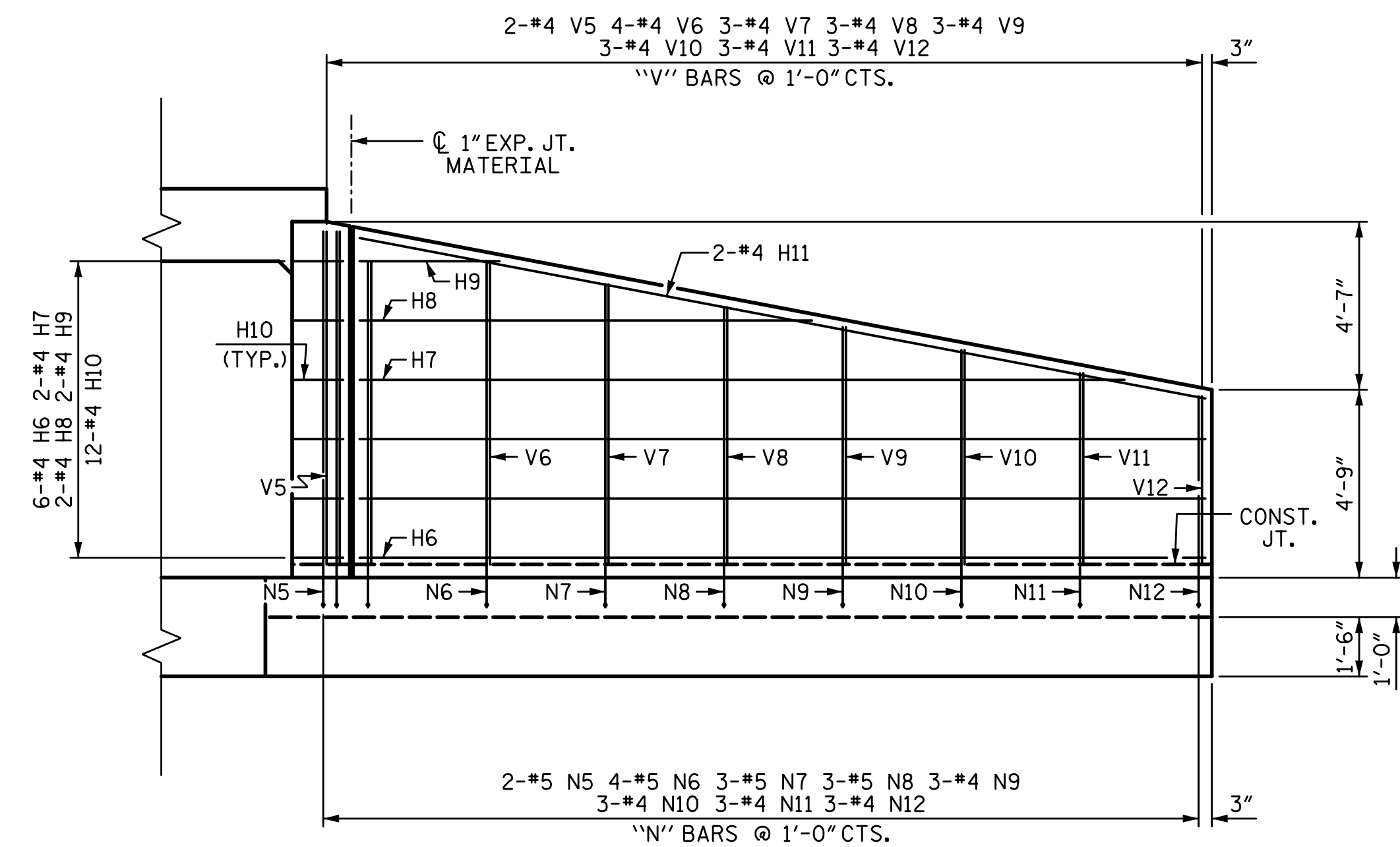
PLAN W2



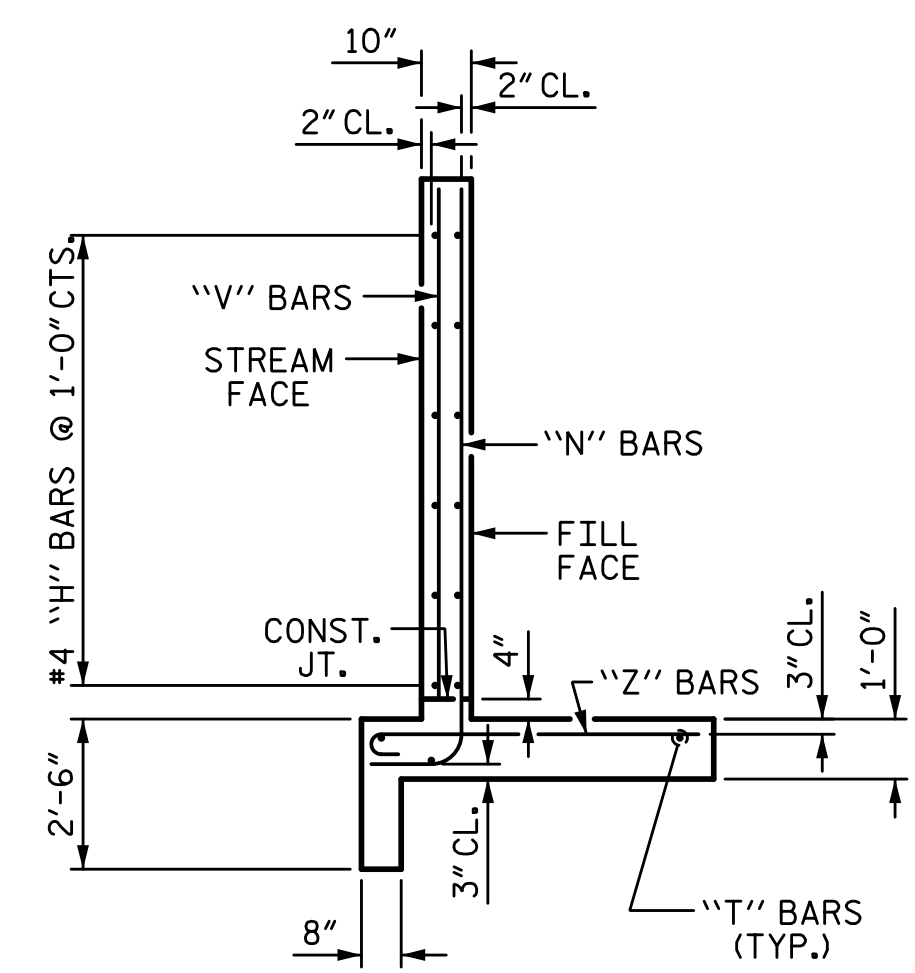
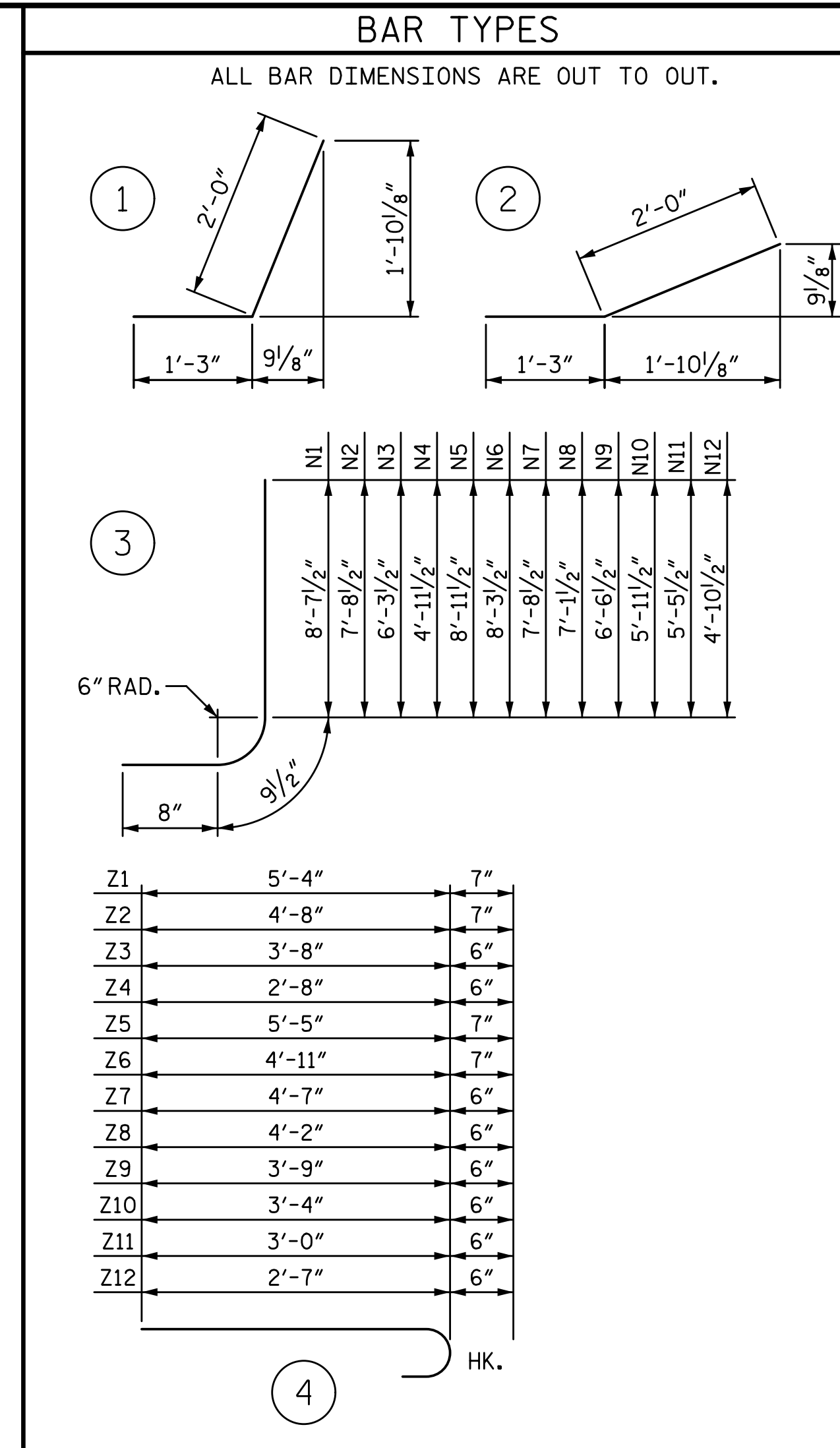
PLAN W1



ELEVATION W2



ELEVATION W1



TYPICAL WING SECTION

BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	7'-7"	61
H2	4	#4	STR	6'-10"	18
H3	4	#4	STR	3'-7"	10
H4	24	#4	1	3'-3"	52
H5	4	#4	STR	8'-5"	22
H6	12	#4	STR	21'-4"	171
H7	4	#4	STR	19'-4"	52
H8	4	#4	STR	11'-5"	31
H9	4	#4	STR	3'-6"	9
H10	24	#4	2	3'-3"	52
H11	4	#4	STR	21'-9"	58
N1	4	#5	3	10'-1"	42
N2	4	#5	3	9'-2"	38
N3	6	#5	3	7'-9"	48
N4	6	#4	3	6'-5"	26
N5	4	#5	3	10'-5"	43
N6	8	#5	3	9'-9"	81
N7	6	#5	3	9'-2"	57
N8	6	#5	3	8'-7"	54
N9	6	#4	3	8'-0"	32
N10	6	#4	3	7'-5"	30
N11	6	#4	3	6'-11"	28
N12	6	#4	3	6'-4"	25
S1	12	#6	STR	6'-0"	108
T1	4	#5	STR	9'-6"	40
T2	2	#5	STR	9'-3"	19
T3	4	#5	STR	23'-3"	97
T4	2	#5	STR	22'-7"	47
V1	4	#4	STR	8'-1"	22
V2	4	#4	STR	7'-1"	19
V3	6	#4	STR	5'-9"	23
V4	6	#4	STR	4'-4"	17
V5	4	#4	STR	8'-5"	22
V6	8	#4	STR	7'-8"	41
V7	6	#4	STR	7'-1"	28
V8	6	#4	STR	6'-6"	26
V9	6	#4	STR	6'-0"	24
V10	6	#4	STR	5'-5"	22
V11	6	#4	STR	4'-10"	19
V12	6	#4	STR	4'-3"	17
Z1	4	#5	4	5'-11"	25
Z2	4	#5	4	5'-3"	22
Z3	6	#4	4	4'-2"	17
Z4	6	#4	4	3'-2"	13
Z5	4	#5	4	6'-0"	25
Z6	8	#5	4	5'-6"	46
Z7	6	#4	4	5'-1"	20
Z8	6	#4	4	4'-8"	19
Z9	6	#4	4	4'-3"	17
Z10	6	#4	4	3'-10"	15
Z11	6	#4	4	3'-6"	14
Z12	6	#4	4	3'-1"	12
REINFORCING STEEL FOR 4 WINGS					1876 LBS
CLASS A CONCRETE					
4 WINGS					29.1 CY
2 HEADWALLS					1.1 CY
2 END CURTAIN WALLS					0.8 CY
TOTAL					31.0 CY

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WINGS FOR CONCRETE BOX CULVERT
 H = 8'-0" SLOPE = 2:1
 135° SKEW

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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 (%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	N/A	N/A	1.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HL-93 (OPERATING)	N/A		N/A	N/A	1.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HS-20 (INVENTORY)	36.000	②	N/A	N/A	1.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HS-20 (OPERATING)	36.000		N/A	N/A	1.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SH		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S3C	21.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S3A	22.750		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S4A	26.750		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S5A	30.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S6A	34.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S7B	38.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S7A	40.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	TRUCK TRACTOR SEMI-TRAILER (TTST)	T4A	28.250		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T5B	32.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T6A	36.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T7A	40.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T7B	40.000		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		PERMANENT LOAD		④	1.06	N/A	N/A	1.10	1	BOT. SLAB-MID.	3.63	1.06	1	BOT. SLAB LT.	1.53

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

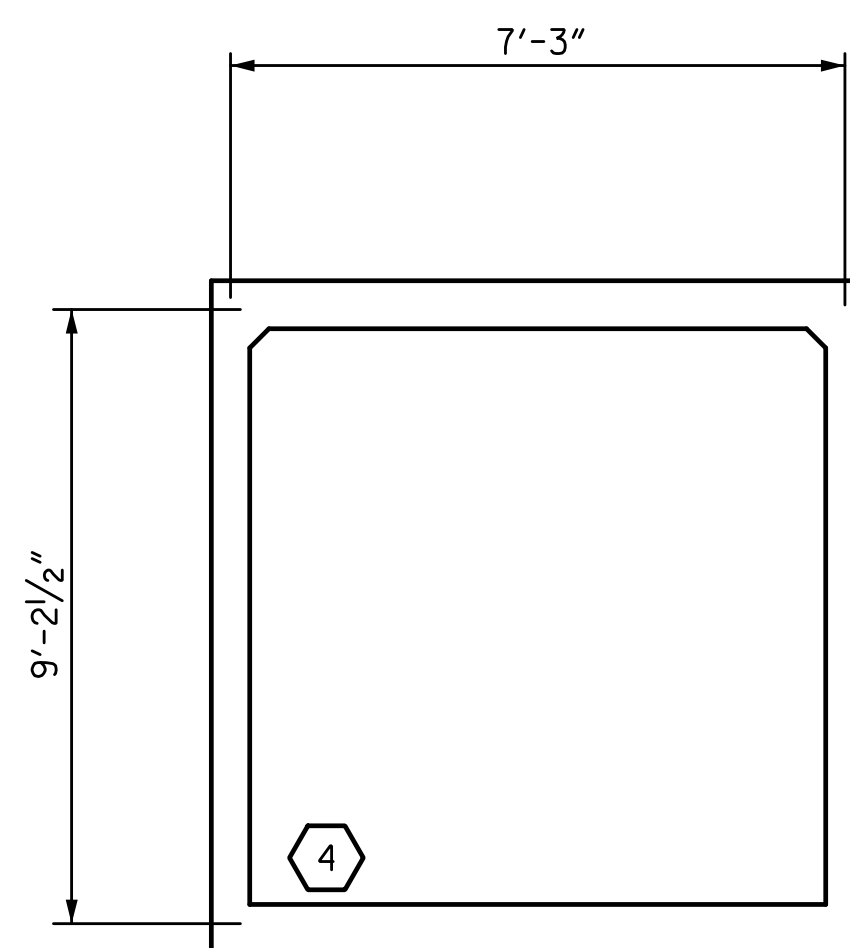
NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM CENTERLINE OF ELEMENT.

COMMENTS:

- EFFECTS OF LIVE LOAD MAY BE NEGLECTED ACCORDING TO AASHTO LRFD 3.6.1.2.6A (DESIGN FILL = 44.5')
- CULVERTS WITH DEEP FILLS SHOULD BE EVALUATED FOR THE EFFECTS OF PERMANENT LOADS ONLY ACCORDING TO "THE MANUAL FOR BRIDGE EVALUATION 6A.5.12.10.3A"

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

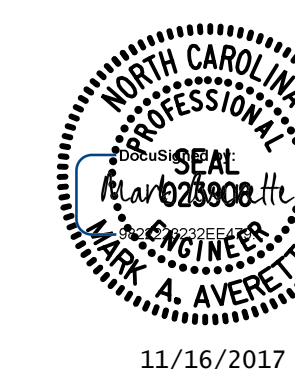


LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. U-2525C
GUILFORD COUNTY
STATION: 382+49.00 -L-

DRAWN BY: R. SEALEY DATE: 11-17
CHECKED BY: M.A. AVERETTE DATE: 11-17
DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 11-17

PLANS PREPARED BY:
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www.simpsonengr.com
[LICENSURE NO. C-2521]



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

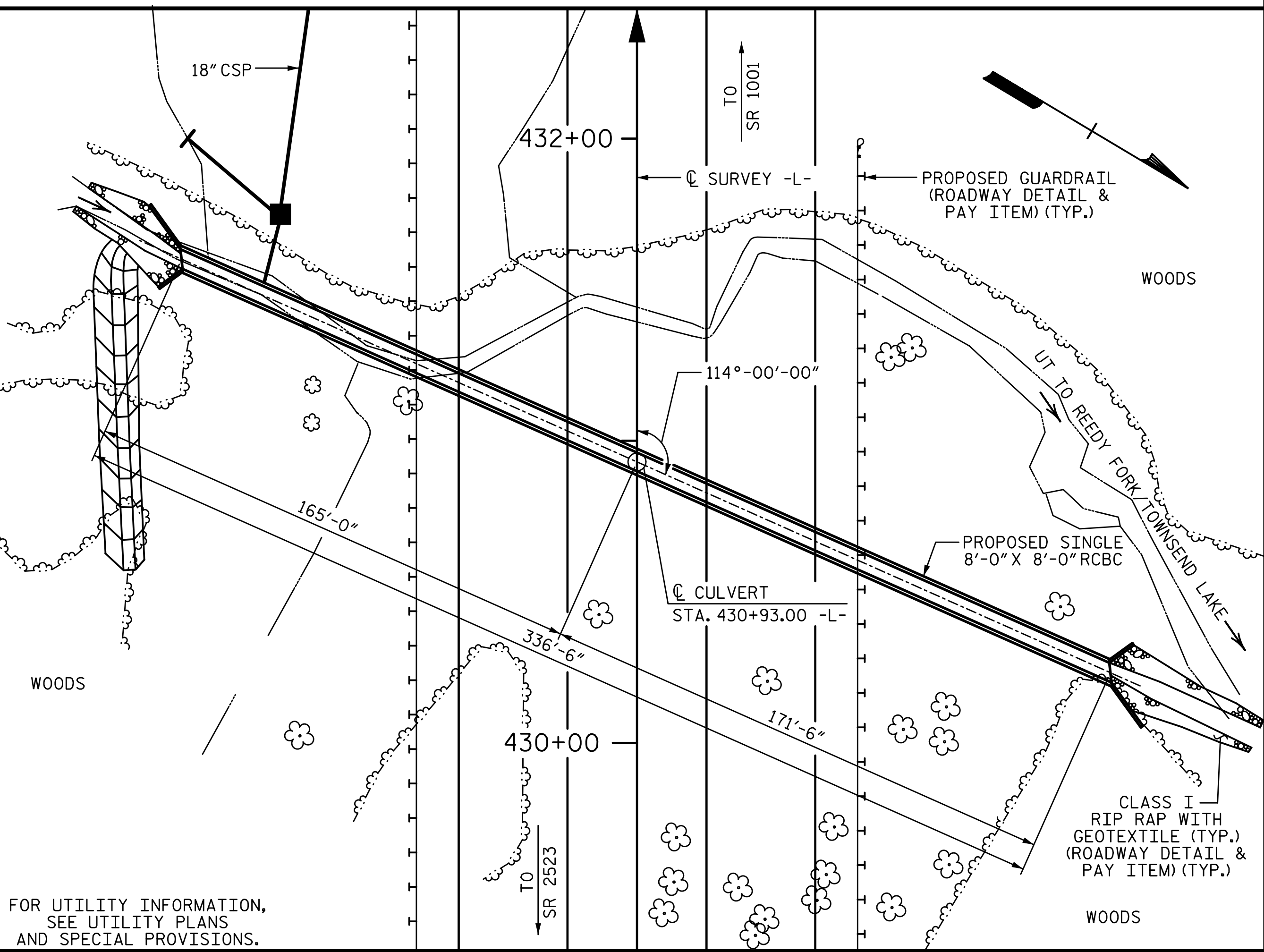
(INTERSTATE TRAFFIC)

REVISIONS

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

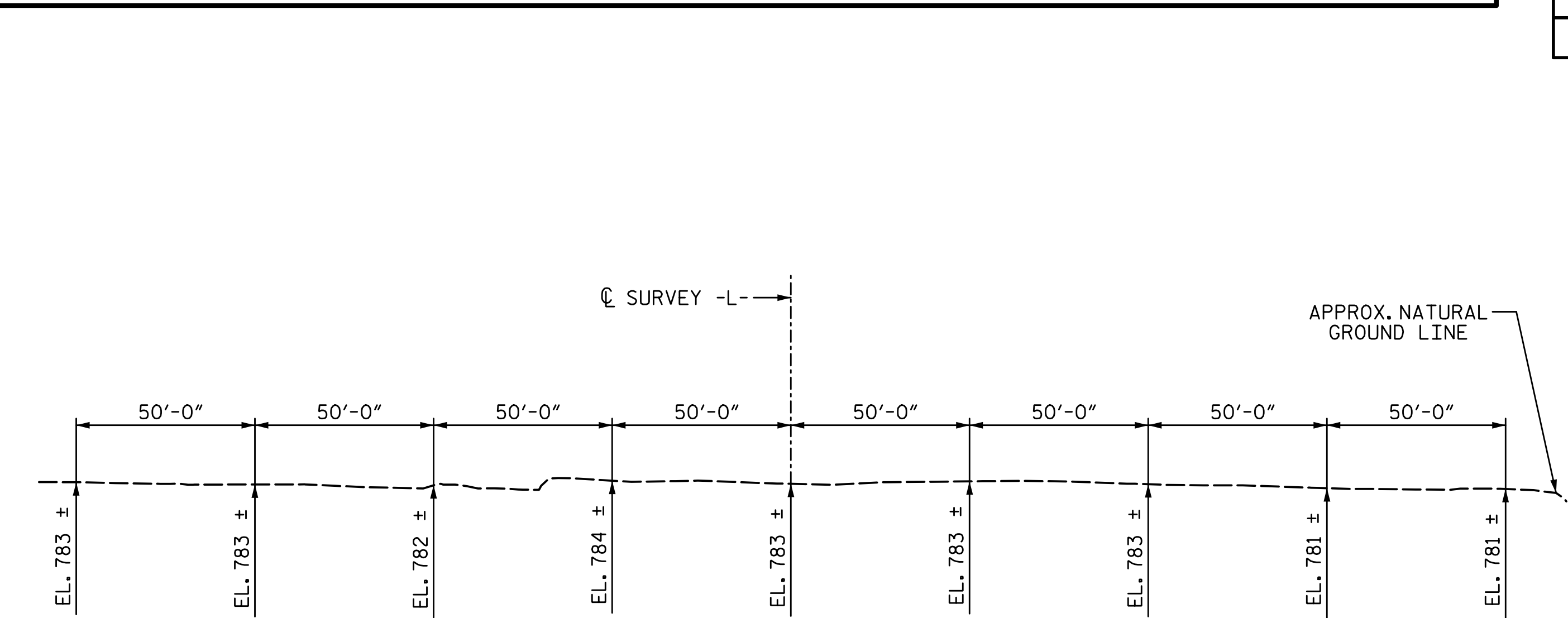
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BM #9 RR SPIKE IN 20" POPLAR, STA. 431+66.12 -L-, 221.02' RT., EL. 816.23



FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.

LOCATION SKETCH



PROFILE ALONG CULVERT

DRAWN BY: S.D. COOPER DATE: 9-17
 CHECKED BY: M.A. AVERETTE DATE: 9-17
 DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 9-17

HYDRAULIC DATA:

DESIGN DISCHARGE	= 190 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YEAR
DESIGN HIGH WATER ELEVATION	= 787.50
DRAINAGE AREA	= 0.18 SQ. MI.
BASE DISCHARGE (Q 100)	= 210 CFS
BASE HIGH WATER ELEVATION	= 787.85

OVERTOPPING FLOOD DATA:

OVERTOPPING DISCHARGE	= 260+ CFS
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YEAR
OVERTOPPING FLOOD ELEVATION	= 821.40 **
** OVERTOPPING OCCURS AT ROADWAY STA. 424+50.00 -L- IN PROPOSED DITCHLINE	

GRADE DATA:

GRADE POINT EL. @ STA. 430+93.00 -L-	= EL. 829.31
BED EL. @ STA. 430+93.00 -L-	= 779.98
ROADWAY SLOPE 2:1	

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE		
BARREL @	1.812 CY/FT	609.7 C.Y.
SILLS AND BAFFLES		2.2 C.Y.
WINGS, ETC.		26.3 C.Y.
TOTAL		638.2 C.Y.
REINFORCING STEEL		
BARREL		87,615 LBS.
WINGS, ETC.		1,661 LBS.
TOTAL		89,276 LBS.
CULVERT EXCAVATION		LUMP SUM
FOUNDATION CONDITIONING MATERIAL		1,020 TONS

NOTES:

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

DESIGN FILL----- 39'-3" (MIN.) AND 41'-6" (MAX.)

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.

THE ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.

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

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

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.

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

TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.

THE 18" Ø CSP THROUGH THE SIDEWALL OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE FIELD BENT AS NECESSARY TO CLEAR PIPE.

THE REINFORCED CONCRETE BOX CULVERT SHALL BE CONSTRUCTED WITH 2 INCHES OF CAMBER TO ACCOUNT FOR ANTICIPATED SETTLEMENT.

NO WORK SHALL BE DONE ON THE CULVERT AT STA. 430+93.00 -L- UNTIL THE AREA OF THE BOX CULVERT HAS BEEN UNDERCUT UP TO 3 FEET AND UNSUITABLE MATERIAL REPLACED WITH FOUNDATION CONDITIONING MATERIAL, PROPERLY COMPACTED TO THE ELEVATION OF THE BOTTOM OF THE PROPOSED FLOOR SLAB. THE LIMITS OF THIS UNDERCUT EXCAVATION SHALL BE AT LEAST THE LIMITS OF THE BOX CULVERT INCLUDING THE WINGS AS DIRECTED BY THE ENGINEER. NO SEPARATE PAYMENT WILL BE MADE FOR ANY TEMPORARY SHEETING, UNDERCUT, OR UNSUITABLE MATERIAL REPLACEMENT AS REQUIRED TO CONSTRUCT THE PROPOSED CULVERT. PAYMENT IS INCLUDED IN THE LUMP SUM PRICE FOR CULVERT EXCAVATION AND THE FOUNDATION CONDITIONING MATERIAL PAY ITEM.

PROJECT NO. U-2525C
GUILFORD COUNTY
 STATION: 430+93.00 -L-

CULVERT NO. 401266

PLANS PREPARED BY:
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 LICENSURE NO. C-2521



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 8 FT. X 8 FT. CONCRETE BOX CULVERT

114° SKEW

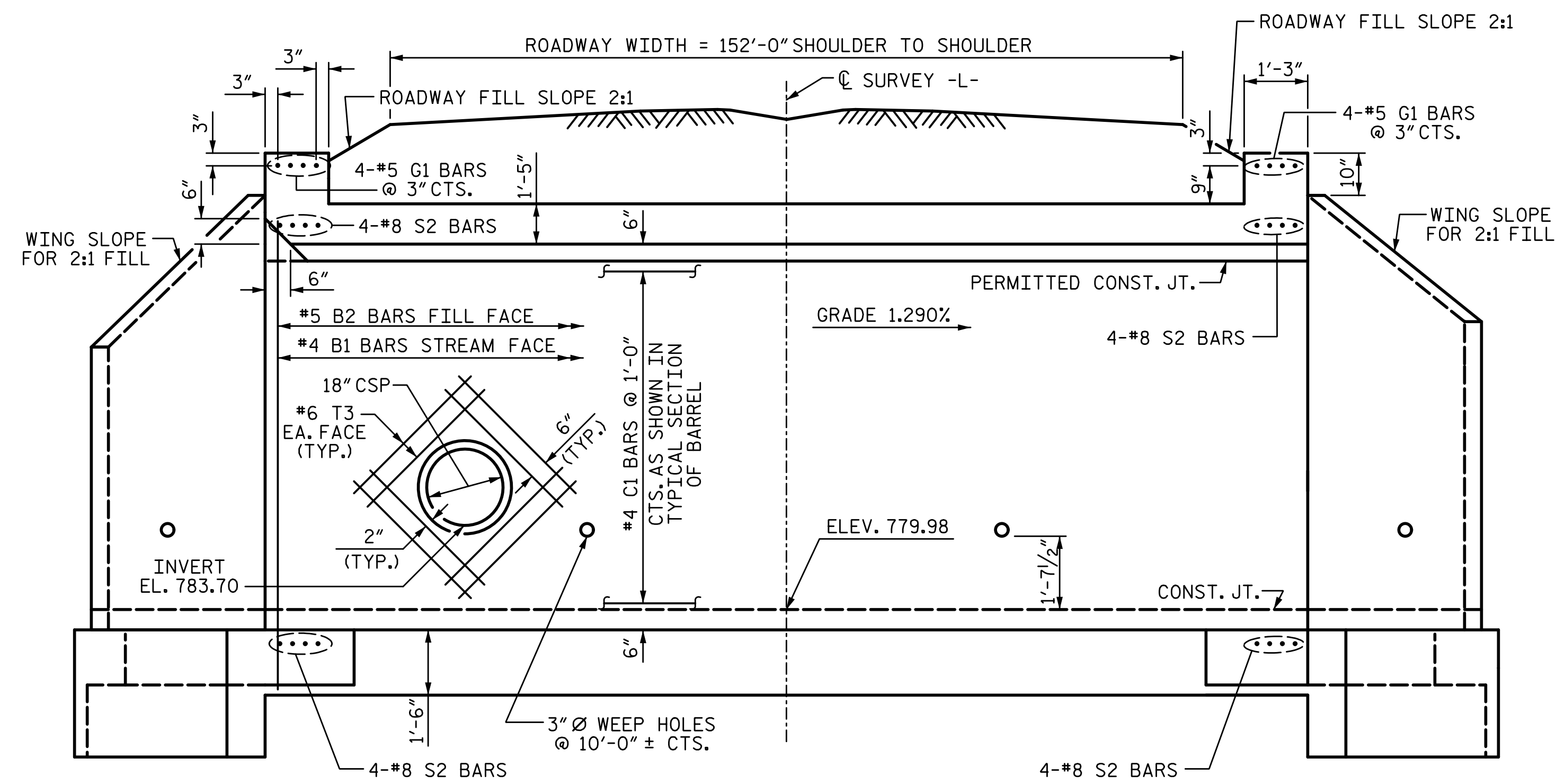
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SHEET NO. C3-1
 TOTAL SHEETS 5

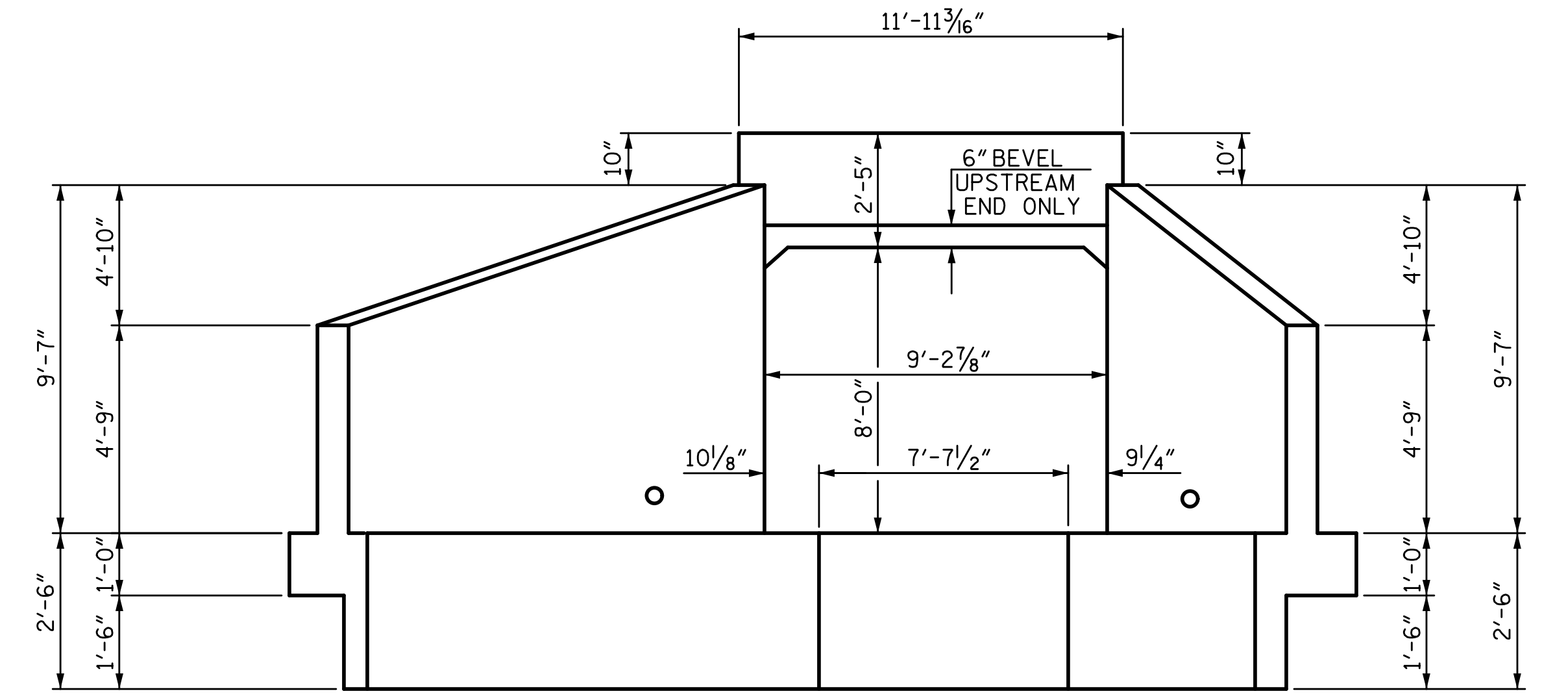
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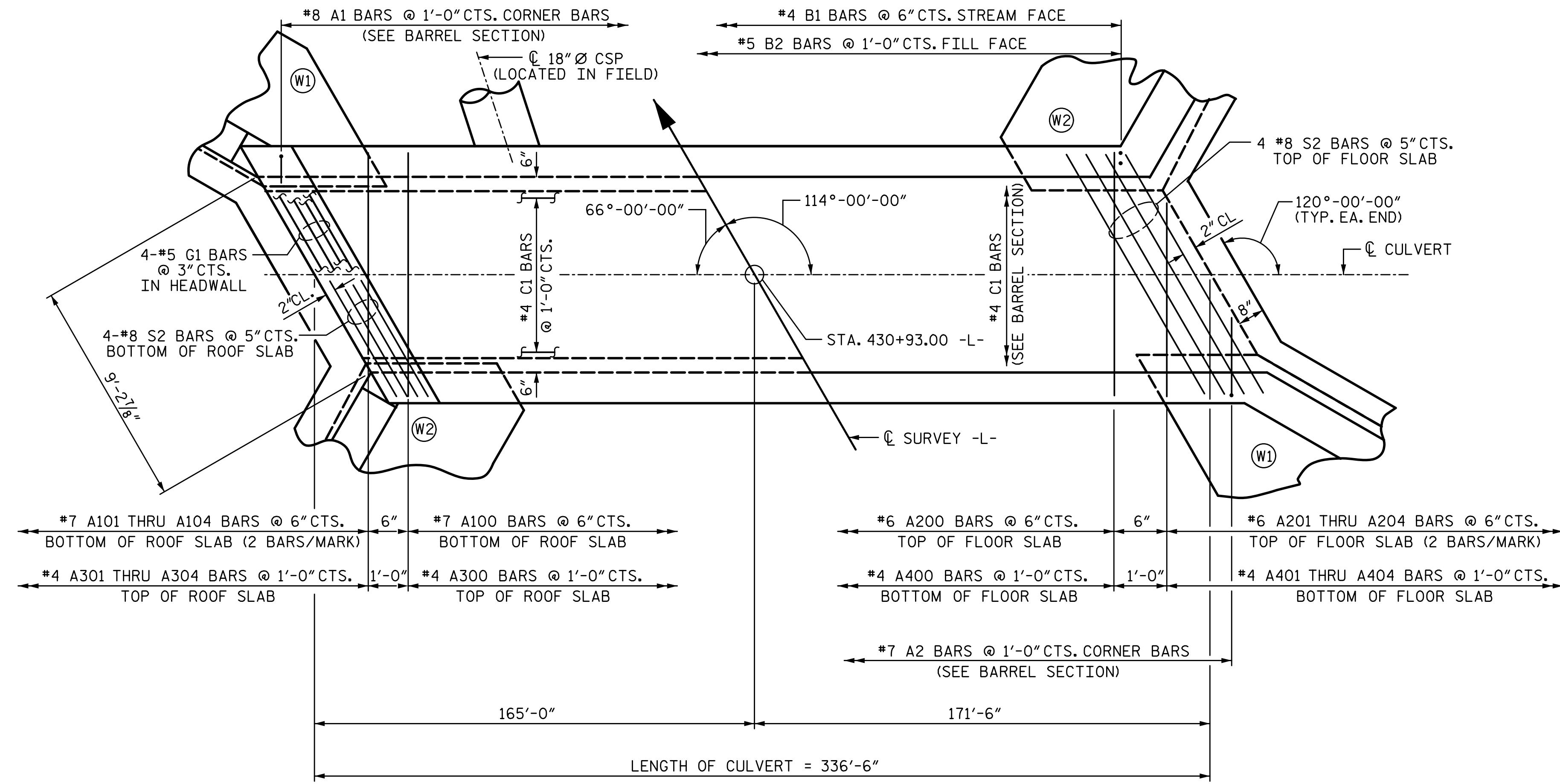
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CULVERT SECTION NORMAL TO ROADWAY
(SILLS AND BAFFLES NOT SHOWN FOR CLARITY)



END ELEVATION NORMAL TO SKEW
(SILLS AND BAFFLES NOT SHOWN, SEE SHEET 3 FOR DETAILS)

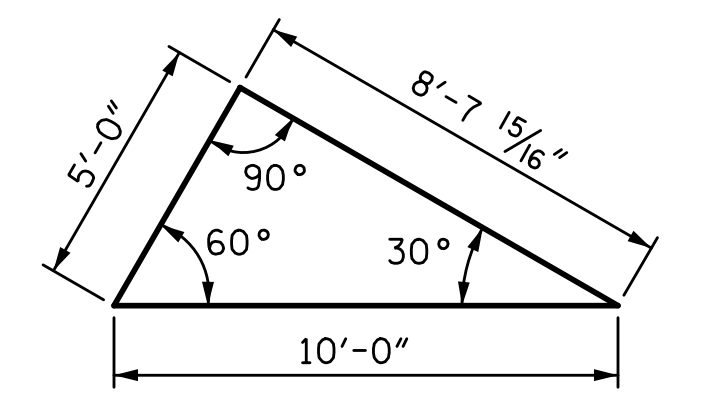
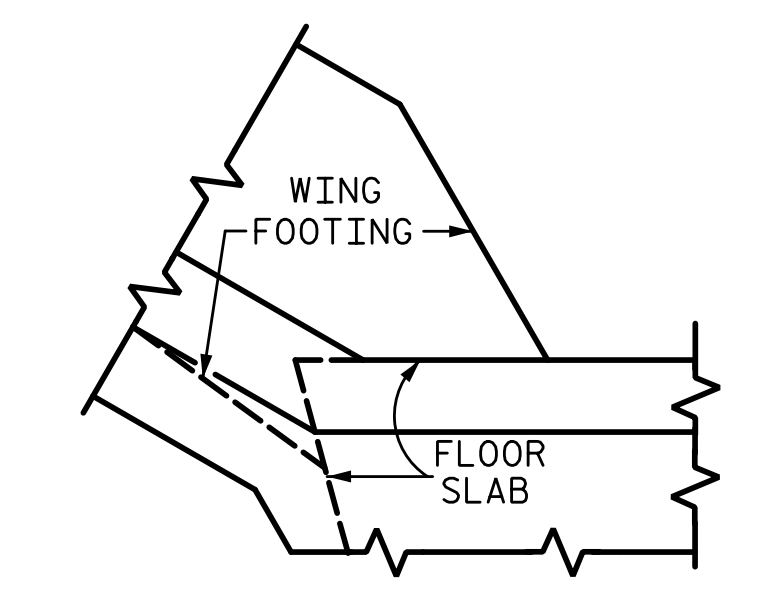


PART PLAN - ROOF SLAB

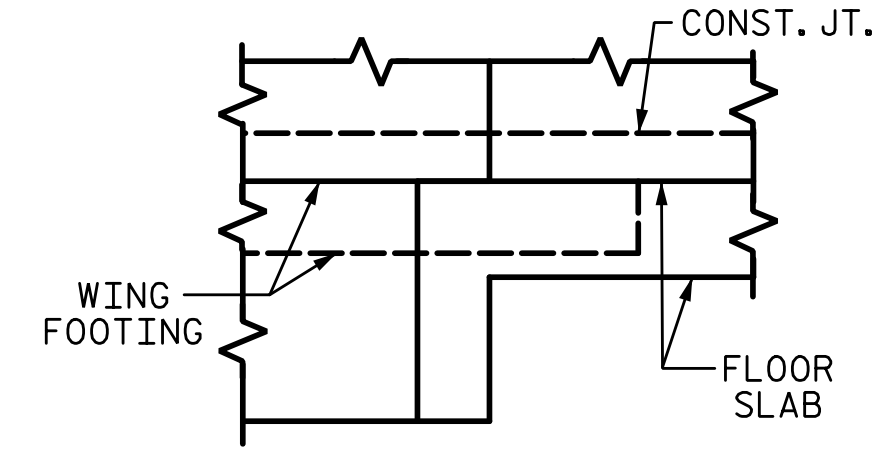
PART PLAN - FLOOR SLAB

(SILLS AND BAFFLES NOT SHOWN FOR CLARITY)

C1 BARS ARE 13 BAR RUNS



SKEW TRIANGLE



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

PROJECT NO. U-2525C
GUILFORD COUNTY
STATION: 430+93.00 -L-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 8 FT. X 8 FT. CONCRETE BOX CULVERT

114° SKEW

PLANS PREPARED BY:
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LICENSURE NO. C-2521

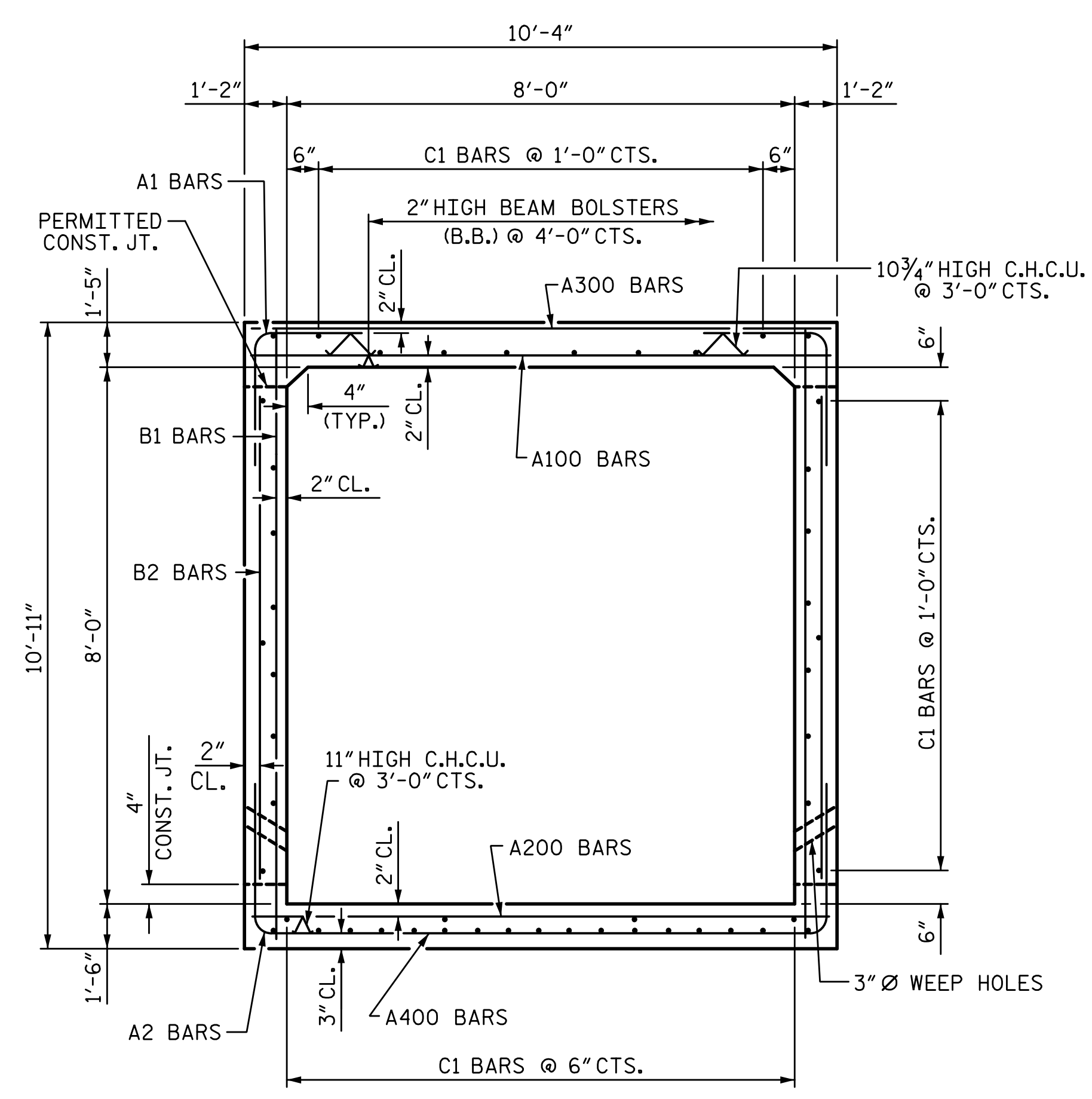


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NO.	BY:	DATE:	NO.	BY:	DATE:	C3-2
1			3			TOTAL SHEETS
2			4			5

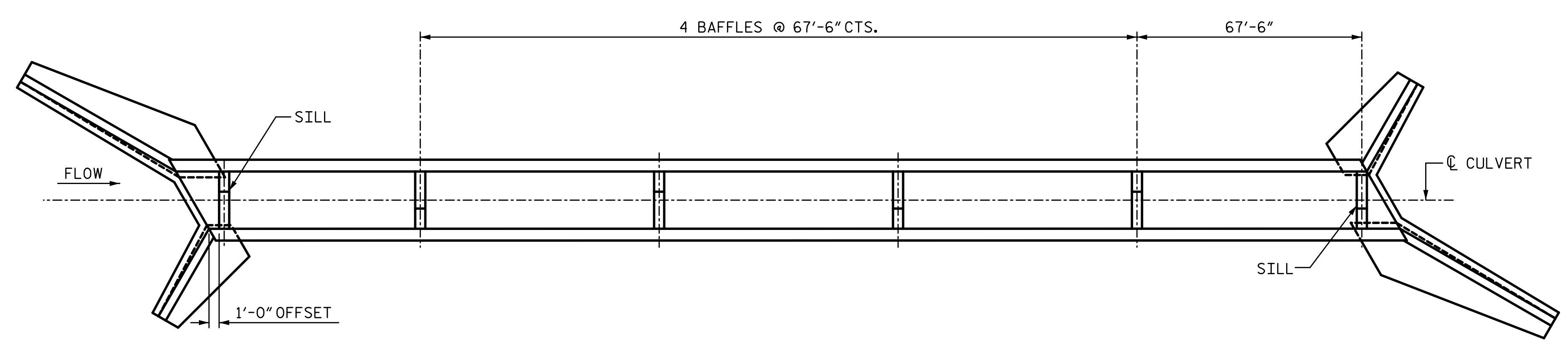
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DRAWN BY: S.D. COOPER DATE: 9-17
CHECKED BY: M.A. AVERETTE DATE: 9-17
DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 9-17

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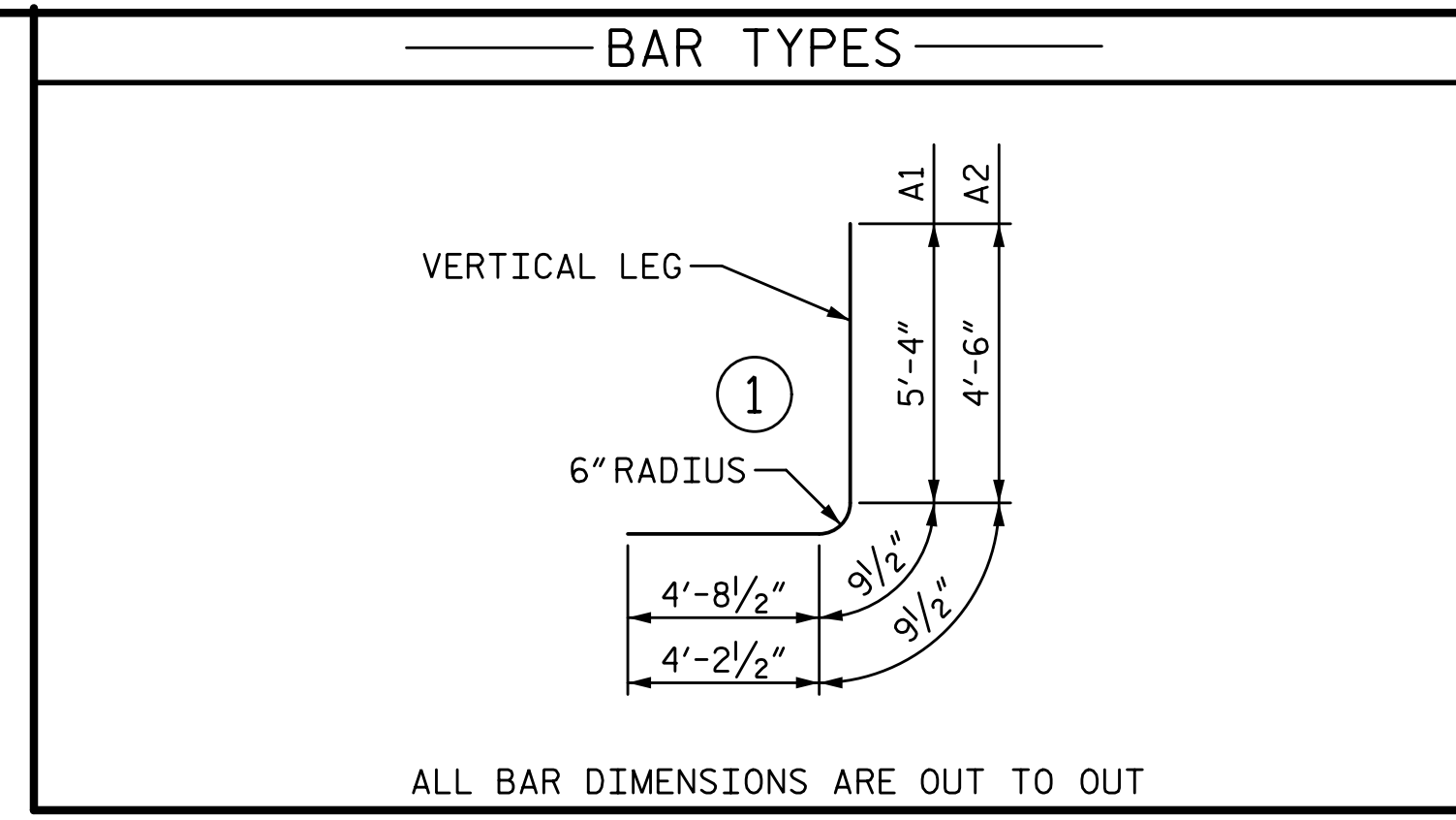
RIGHT ANGLE SECTION OF BARREL
(THERE ARE 49 C1 BARS IN SECTION OF BARREL)



FLOOR PLAN
(SHOWING PLACEMENT OF SILLS AND BAFFLES WITH ALTERNATING HIGH SIDE/LOW SIDE OF SILLS AND BAFFLES).

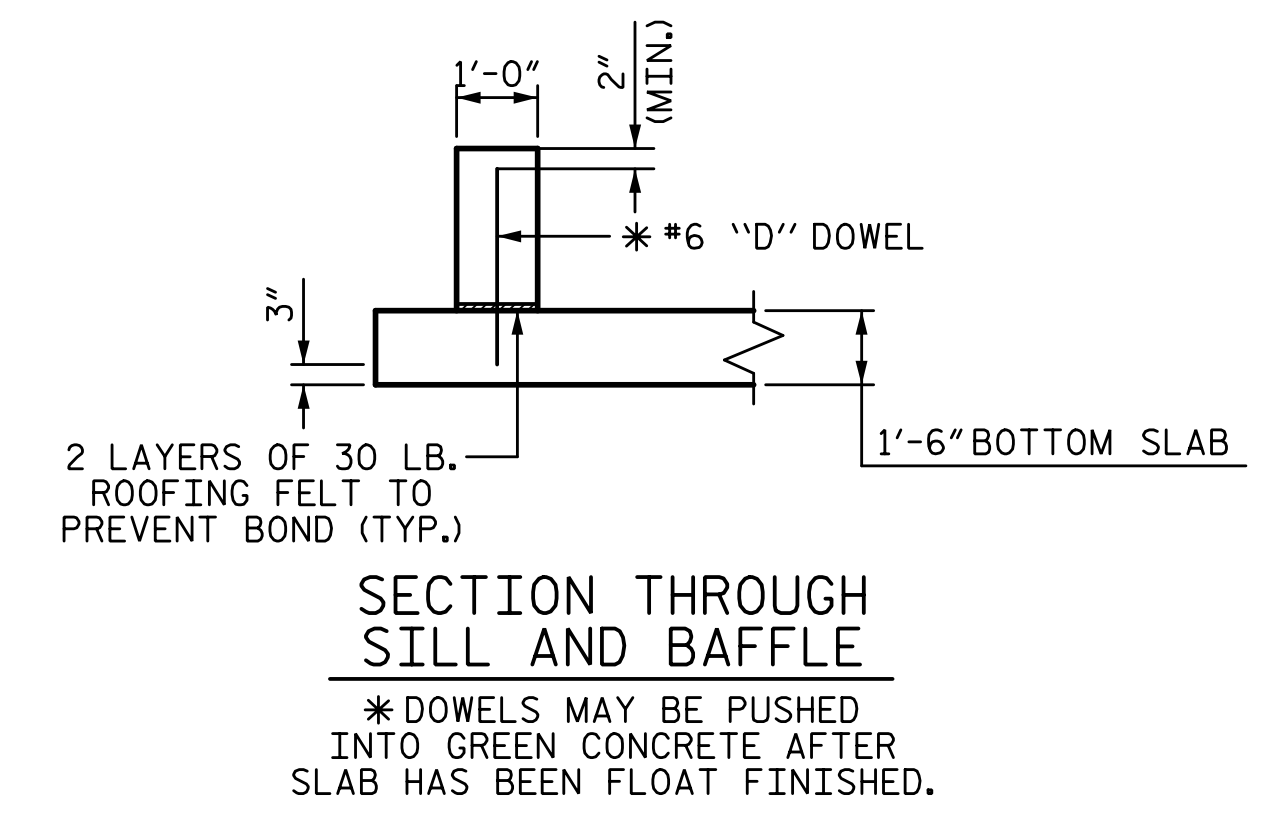
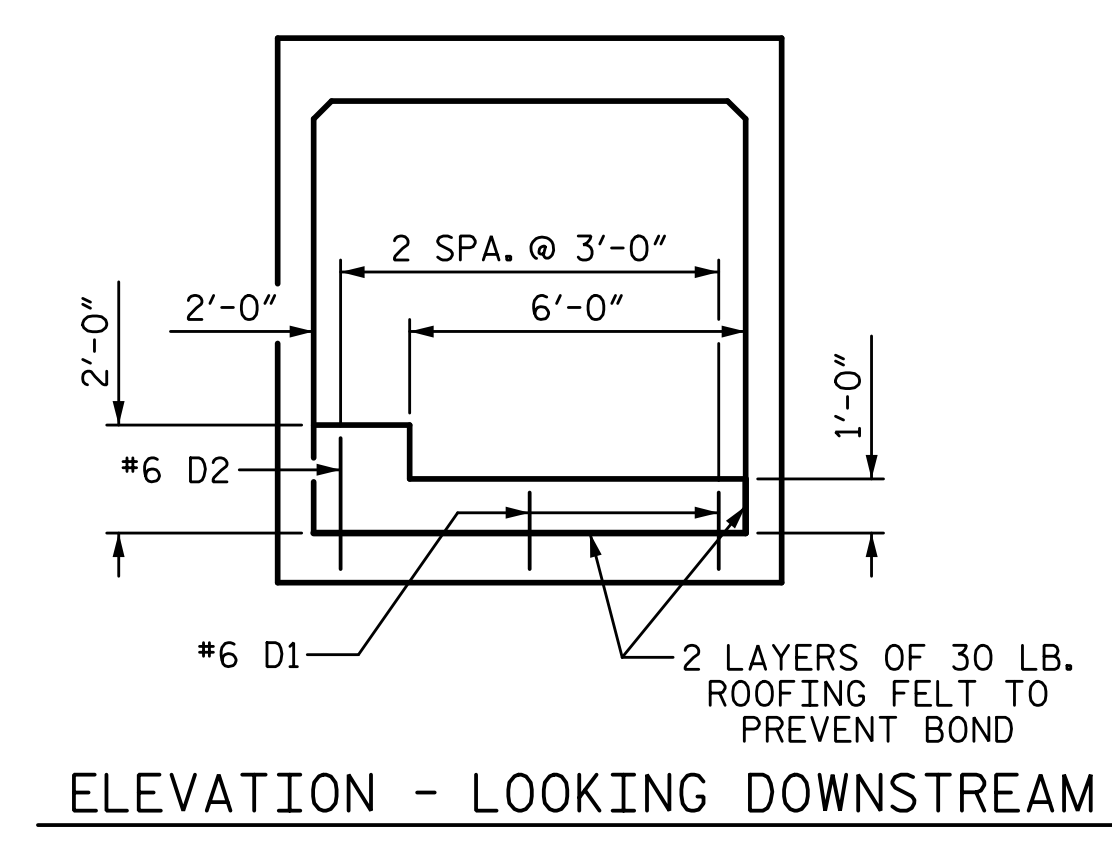
CULVERT SILL AND BAFFLE DETAILS

NATIVE MATERIAL BETWEEN SILLS/BAFFLES IN THE CULVERT SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED AT THE PROJECT SITE DURING CULVERT CONSTRUCTION. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.



SPLICE CHART

#4 B1 SPLICE LENGTH = 1'-10"
#4 C1 SPLICE LENGTH = 1'-11"



BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	674	#8	1	10'-10"	19495
A2	674	#7	1	9'-6"	13088
A100	661	#7	STR	9'-11"	13398
A101	4	#7	STR	8'-1"	66
A102	4	#7	STR	6'-4"	52
A103	4	#7	STR	4'-8"	38
A104	4	#7	STR	2'-11"	24
A200	661	#6	STR	9'-11"	9846
A201	4	#6	STR	8'-1"	49
A202	4	#6	STR	6'-4"	38
A203	4	#6	STR	4'-8"	28
A204	4	#6	STR	2'-11"	18
A300	331	#4	STR	9'-11"	2193
A301	2	#4	STR	8'-1"	11
A302	2	#4	STR	6'-4"	8
A303	2	#4	STR	4'-8"	6
A304	2	#4	STR	2'-11"	4
A400	331	#4	STR	9'-11"	2193
A401	2	#4	STR	8'-1"	11
A402	2	#4	STR	6'-4"	8
A403	2	#4	STR	4'-8"	6
A404	2	#4	STR	2'-11"	4
B1	1346	#4	STR	10'-5"	9366
B2	674	#5	STR	7'-4"	5155
C1	637	#4	STR	27'-8"	11773
D1	12	#6	STR	2'-1"	38
D2	6	#6	STR	3'-1"	28
G1	8	#5	STR	11'-6"	96
S2	16	#8	STR	11'-6"	491
T3	16	#6	STR	3'-6"	84
TOTAL REINFORCING STEEL					87615 LB
CLASS A CONCRETE BREAKDOWN					
BARREL					609.7 CY
SILLS AND BAFFLES					2.2 CY

PROJECT NO. U-2525C
GUILFORD COUNTY
 STATION: 430+93.00 -L-

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 8 FT. X 8 FT. CONCRETE BOX CULVERT

114° SKEW

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

PLANS PREPARED BY:

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 LICENSURE NO. C-2521

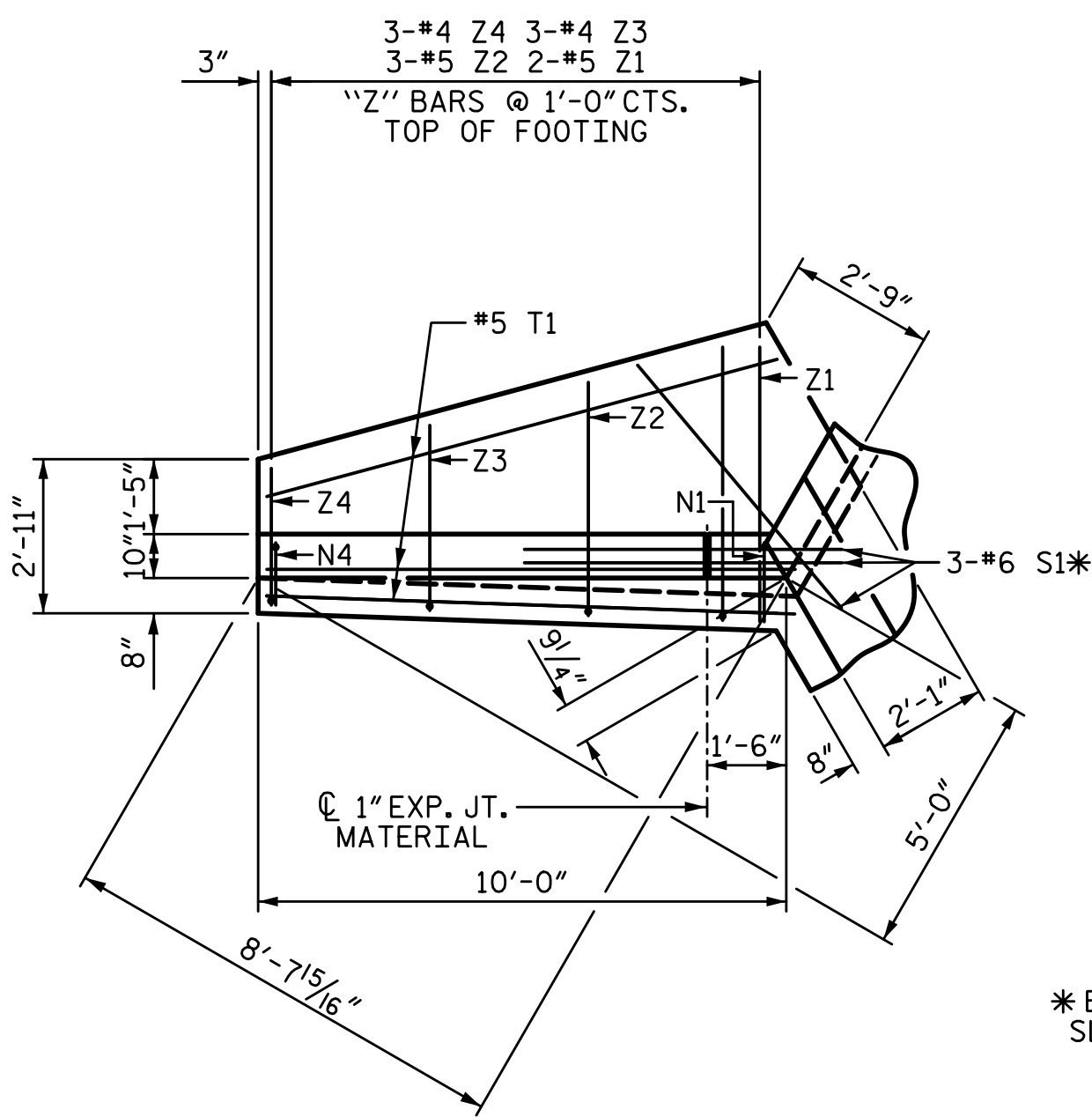
10/25/2017

MARK A. AVERETTE
 PROFESSIONAL ENGINEER
 SEAL 025908

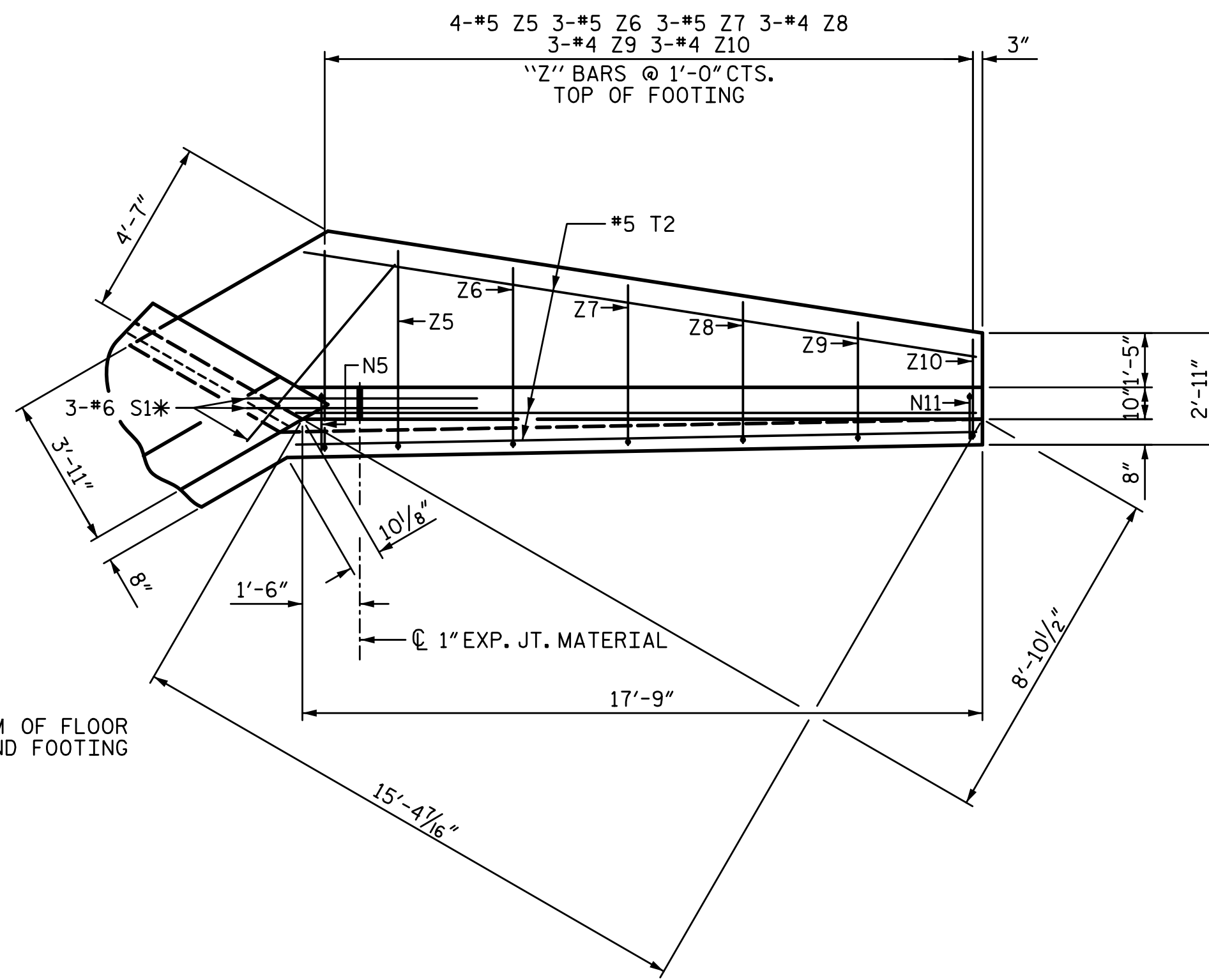
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DRAWN BY: S.D. COOPER DATE: 9-17
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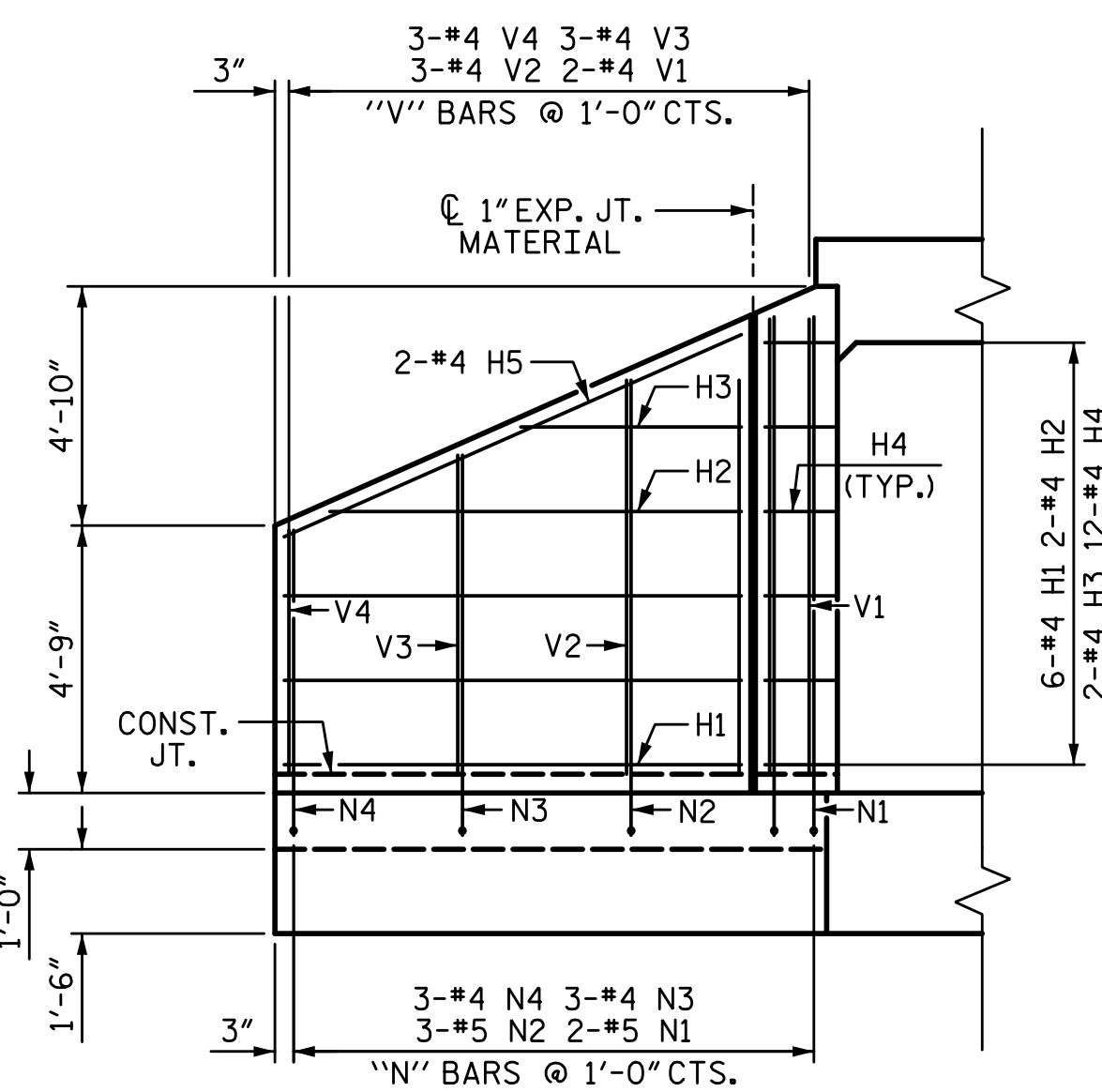
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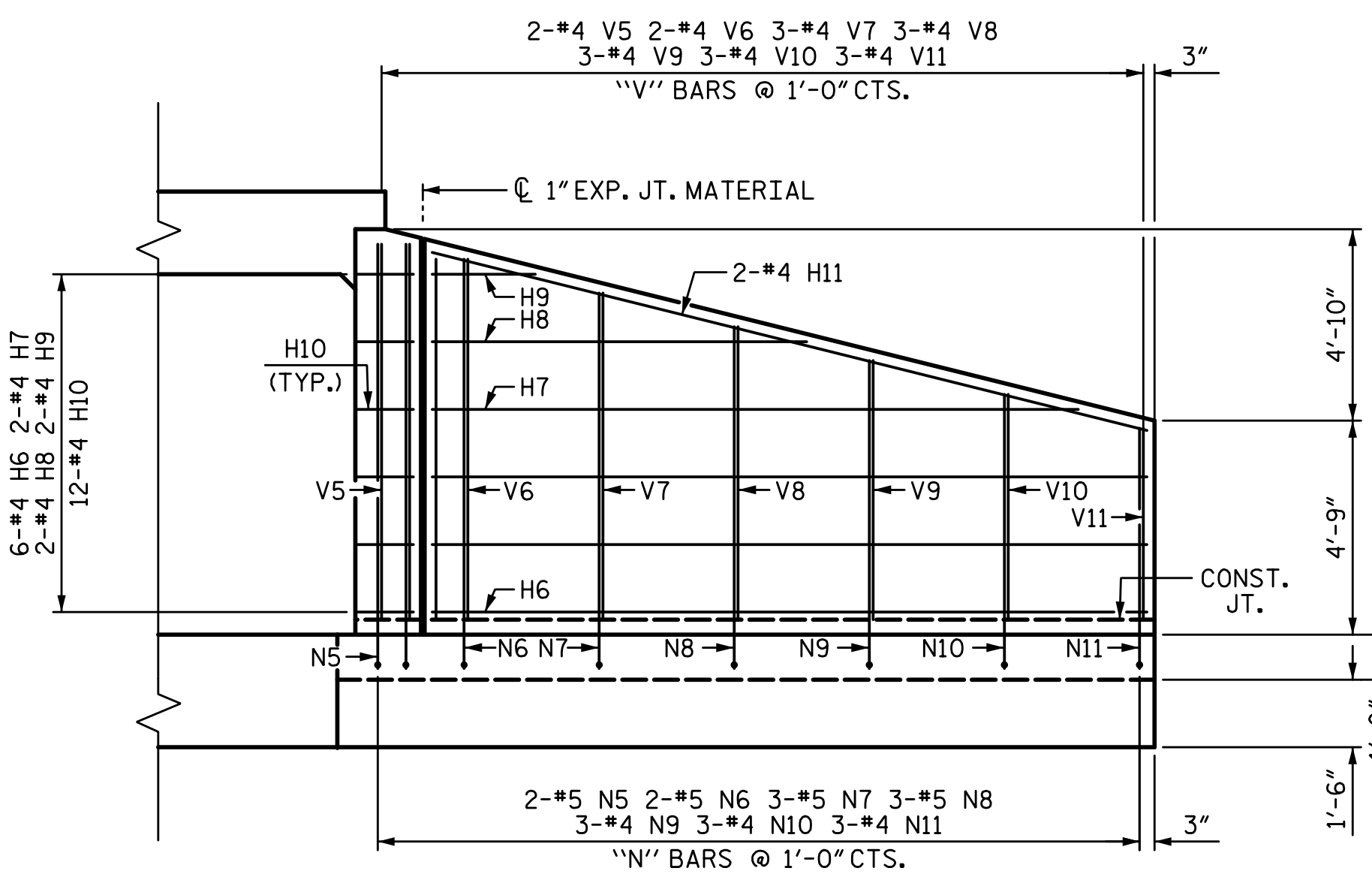
PLAN W2



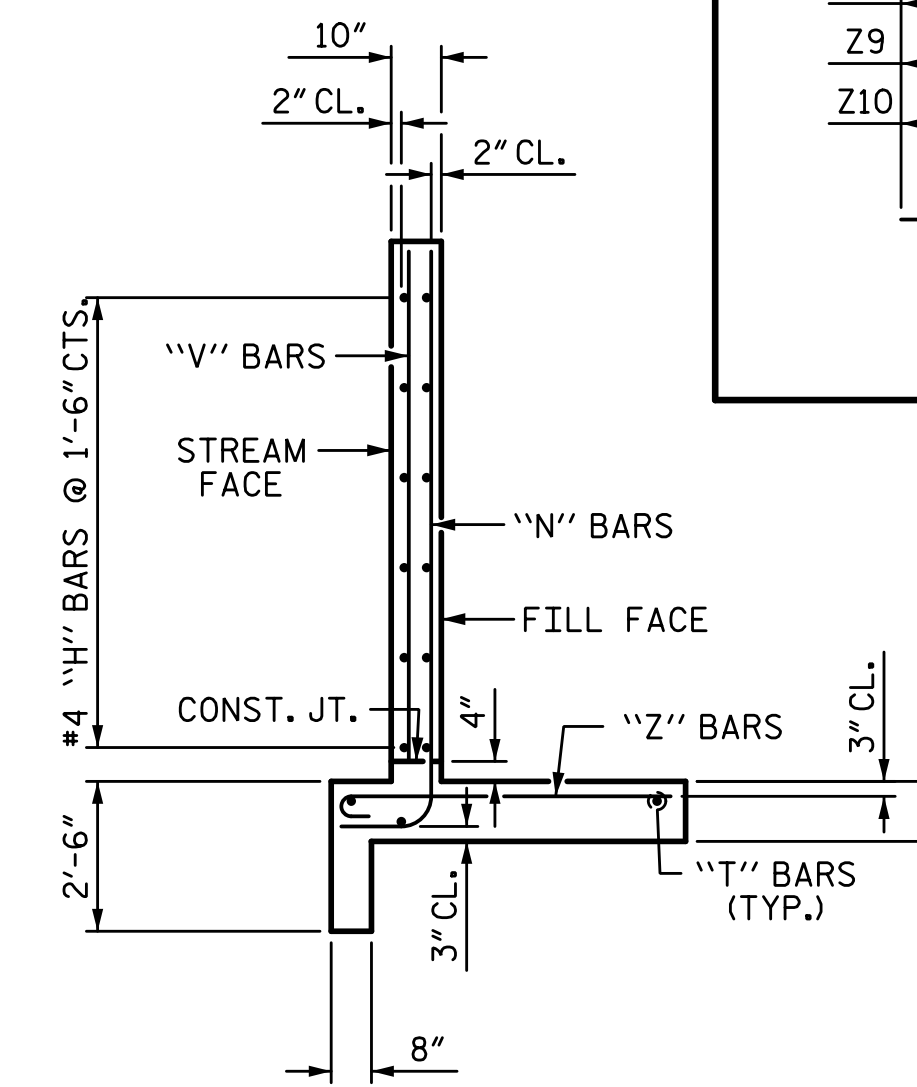
PLAN W1



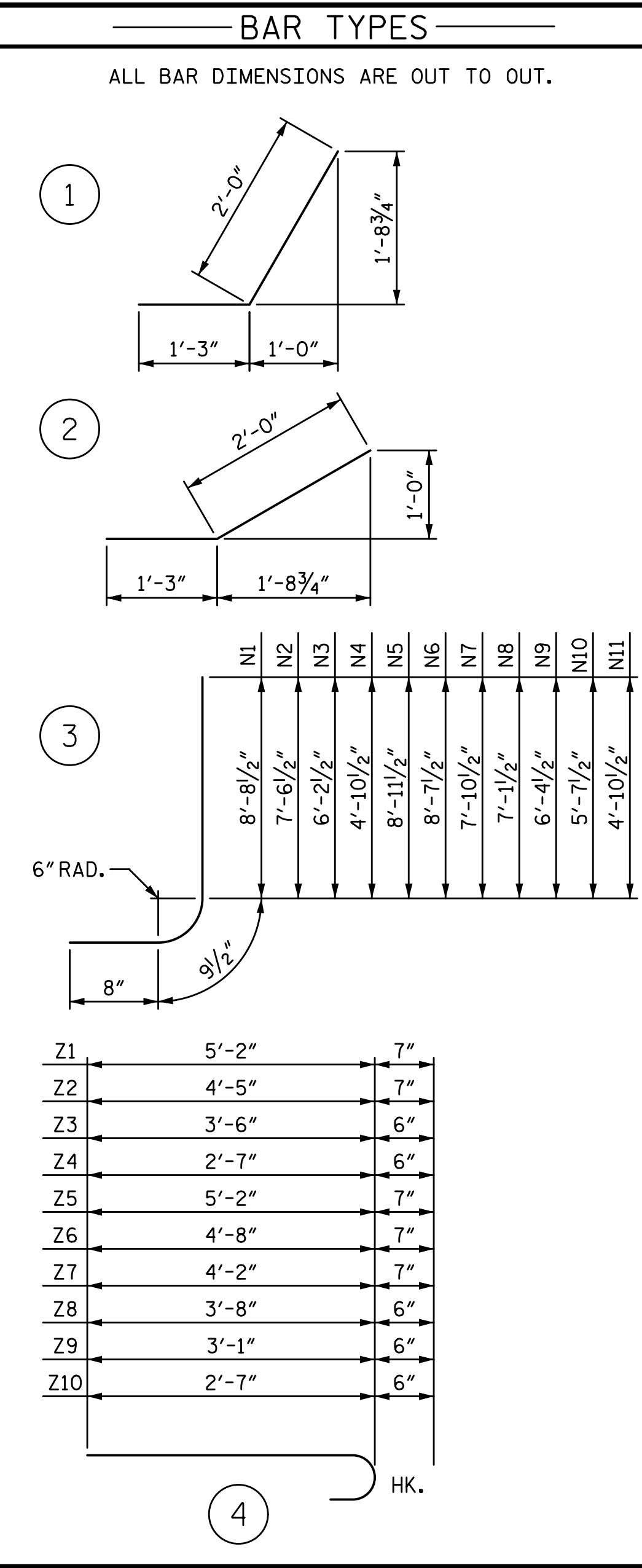
ELEVATION W2



ELEVATION W1



TYPICAL WING SECTION



BILL OF MATERIAL					
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	
H1	12	#4	STR	8'-1"	65
H2	4	#4	STR	7'-3"	19
H3	4	#4	STR	3'-11"	10
H4	24	#4	1	3'-3"	52
H5	4	#4	STR	8'-10"	24
H6	12	#4	STR	15'-10"	127
H7	4	#4	STR	14'-4"	38
H8	4	#4	STR	8'-3"	22
H9	4	#4	STR	2'-3"	6
H10	24	#4	2	3'-3"	52
H11	4	#4	STR	16'-4"	44
N1	4	#5	3	10'-2"	42
N2	6	#5	3	9'-0"	56
N3	6	#4	3	7'-8"	31
N4	6	#4	3	6'-4"	25
N5	4	#5	3	10'-5"	43
N6	4	#5	3	10'-1"	42
N7	6	#5	3	9'-4"	58
N8	6	#5	3	8'-7"	54
N9	6	#4	3	7'-10"	31
N10	6	#4	3	7'-1"	28
N11	6	#4	3	6'-4"	25
S1	12	#6	STR	6'-0"	108
T1	6	#5	STR	10'-0"	63
T2	6	#5	STR	17'-9"	111
V1	4	#4	STR	8'-1"	22
V2	6	#4	STR	7'-0"	28
V3	6	#4	STR	5'-8"	23
V4	6	#4	STR	4'-4"	17
V5	4	#4	STR	8'-4"	22
V6	4	#4	STR	8'-0"	21
V7	6	#4	STR	7'-3"	29
V8	6	#4	STR	6'-6"	26
V9	6	#4	STR	5'-9"	23
V10	6	#4	STR	5'-0"	20
V11	6	#4	STR	4'-3"	17
Z1	4	#5	4	5'-9"	24
Z2	6	#5	4	5'-0"	31
Z3	6	#4	4	4'-0"	16
Z4	6	#4	4	3'-1"	12
Z5	8	#5	4	5'-9"	48
Z6	6	#5	4	5'-3"	33
Z7	6	#5	4	4'-9"	30
Z8	6	#4	4	4'-2"	17
Z9	6	#4	4	3'-7"	14
Z10	6	#4	4	3'-1"	12
REINFORCING STEEL					1661 LBS
FOR 4 WINGS					
CLASS A CONCRETE					
4 WINGS					24.3 CY
2 HEADWALLS					1.1 CY
2 END CURTAIN WALLS					0.9 CY
TOTAL					26.3 CY

PROJECT NO. U-2525C
 GUILFORD COUNTY
 STATION: 430+93.00 -L-

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**WINGS FOR
 CONCRETE BOX CULVERT**
 H = 8'-0" SLOPE = 2:1
 120° SKEW

REVISIONS					
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1			3		
2			4		

SHEET NO. C3-4
 TOTAL SHEETS 5

PLANS PREPARED BY:
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MARK A. AVERETTE
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 LICENSE NO. 023908
 10/25/2017

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DRAWN BY: S.D. COOPER DATE: 9-17
 CHECKED BY: M.A. AVERETTE DATE: 9-17
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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 (%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	N/A	N/A	1.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HL-93 (OPERATING)	N/A		N/A	N/A	1.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HS-20 (INVENTORY)	36.000	②	N/A	N/A	1.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HS-20 (OPERATING)	36.000		N/A	N/A	1.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SH		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S3C	21.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S3A	22.750		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S4A	26.750		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S5A	30.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S6A	34.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S7B	38.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S7A	40.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	TRUCK TRACTOR SEMI-TRAILER (TTST)	T4A	28.250		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T5B	32.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T6A	36.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T7A	40.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T7B	40.000		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		PERMANENT LOAD		④	1.00	N/A	N/A	1.00	1	BOT. SLAB-MID.	4.58	1.01	1	EXT. WALL BOT.	1.61

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

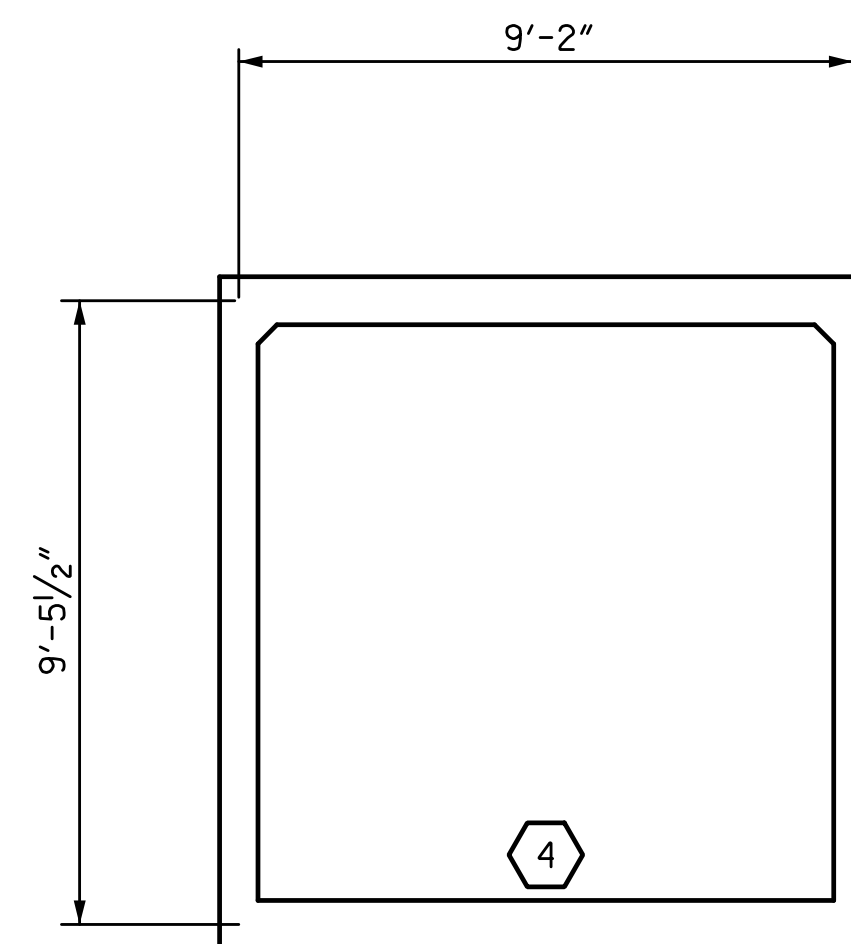
NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM CENTERLINE OF ELEMENT.

COMMENTS:

- EFFECTS OF LIVE LOAD MAY BE NEGLECTED ACCORDING TO AASHTO LRFD 3.6.1.2.6A (DESIGN FILL = 41.50')
- CULVERTS WITH DEEP FILLS SHOULD BE EVALUATED FOR THE EFFECTS OF PERMANENT LOADS ONLY ACCORDING TO "THE MANUAL FOR BRIDGE EVALUATION 6A.5.12.10.3A"

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

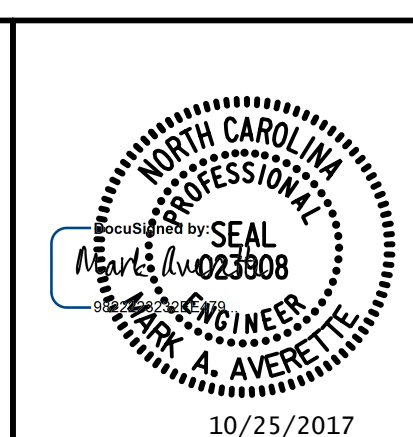


LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. U-2525C
GUILFORD COUNTY
STATION: 430+93.00 -L-

DRAWN BY: S.D. COOPER DATE: 9-17
CHECKED BY: M.A. AVERETTE DATE: 9-17
DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 9-17

PLANS PREPARED BY:
SIMPSON ENGINEERS & ASSOCIATES
5640 Dillard Drive
Suite 200
Cary, NC 27518
(919) 852-0468
(919) 852-0598 (Fax)
www.simpsonengr.com
LICENSURE NO. C-2521

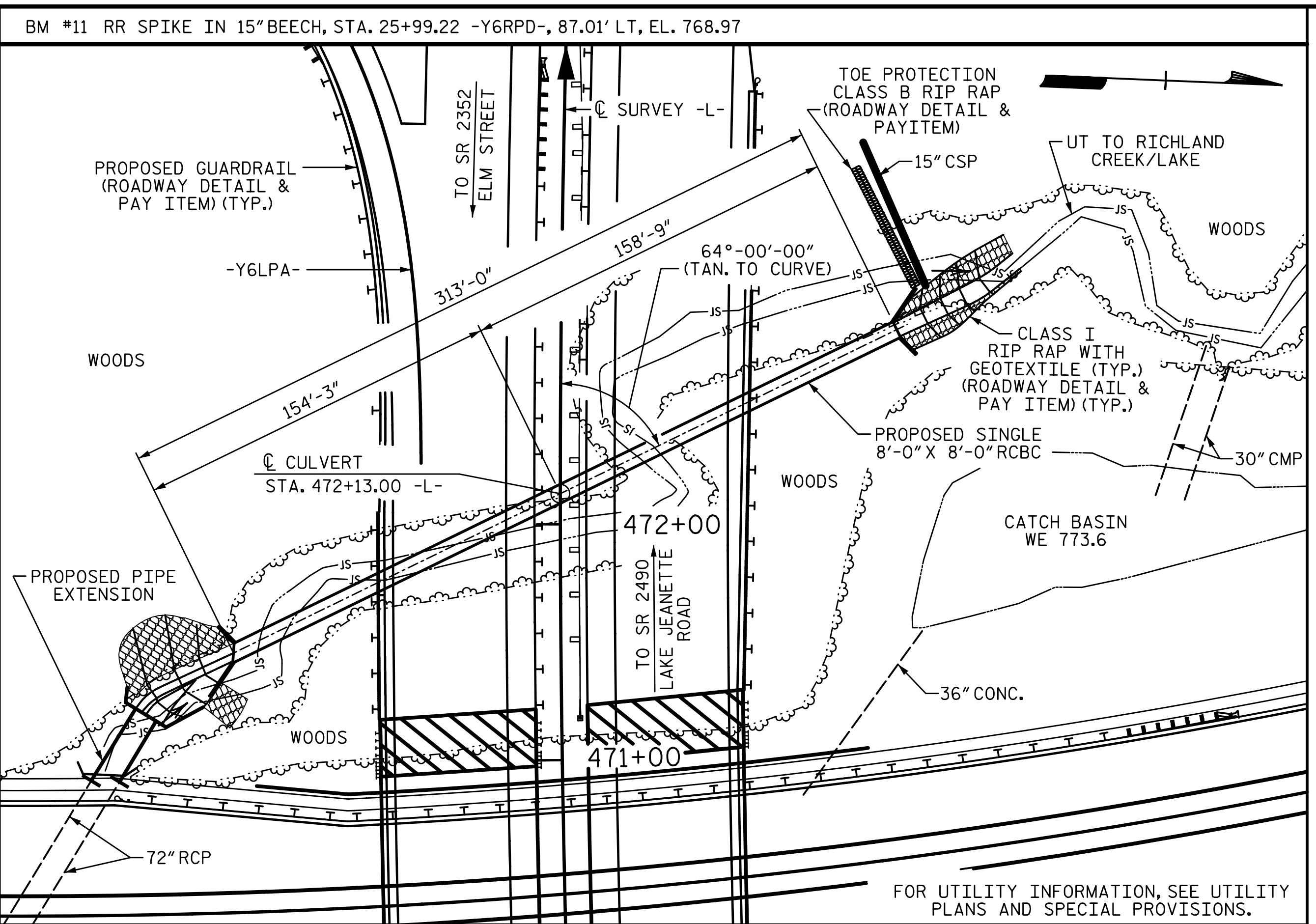


STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

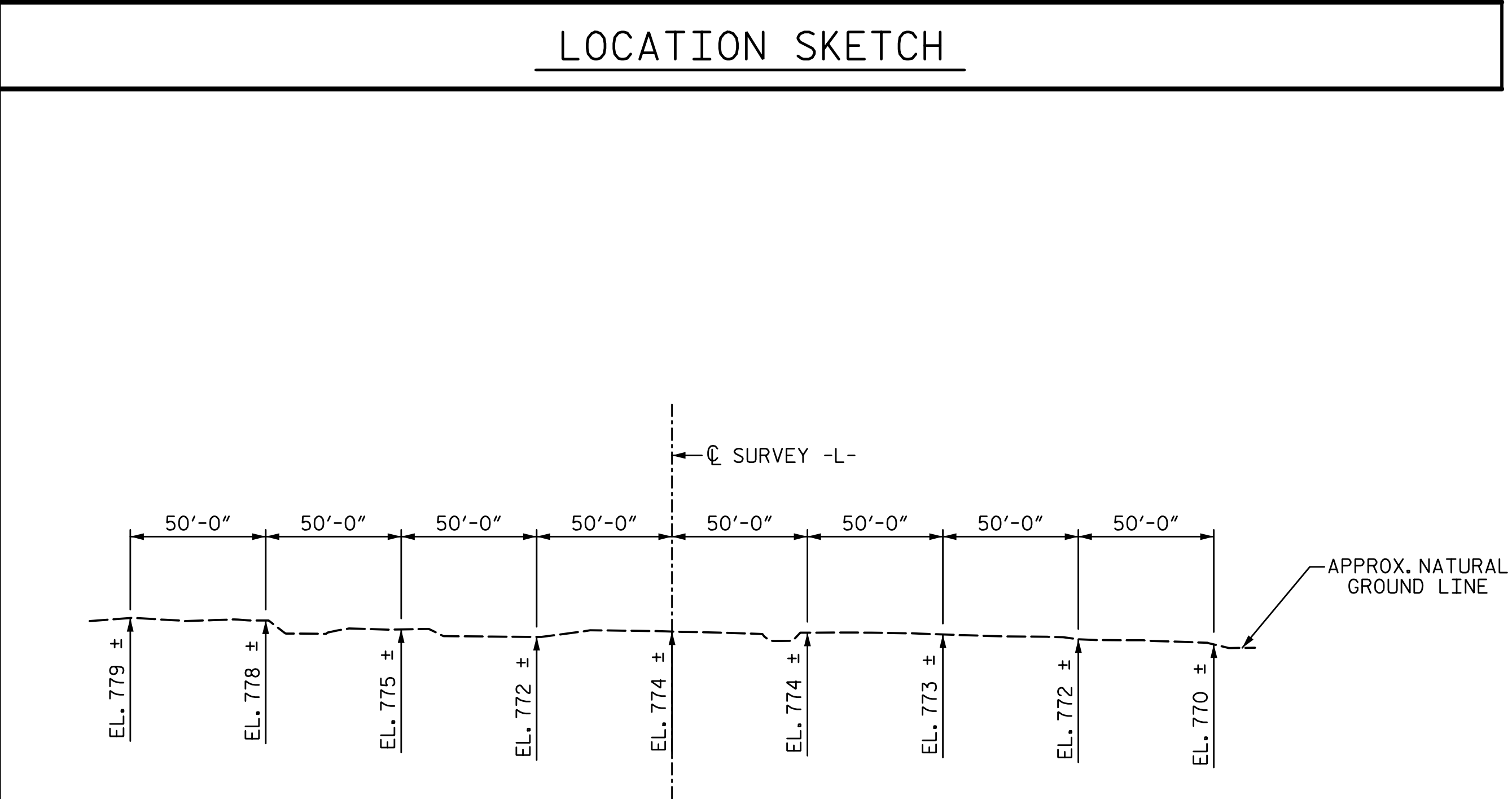
**LRFR SUMMARY FOR
REINFORCED CONCRETE
BOX CULVERTS**
(INTERSTATE TRAFFIC)

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

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



LOCATION SKETCH



PROFILE ALONG CULVERT

HYDRAULIC DATA:

DESIGN DISCHARGE	= 250 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YEAR
DESIGN HIGH WATER ELEVATION	= 779.10
DRAINAGE AREA	= 0.24 SQ. MI.
BASE DISCHARGE (Q 100)	= 280 CFS
BASE HIGH WATER ELEVATION	= 779.47

OVERTOPPING FLOOD DATA:

OVERTOPPING DISCHARGE	= 790 CFS
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YEAR
OVERTOPPING FLOOD ELEVATION	= 789.20 **
** OVERTOPPING OCCURS AT ROADWAY STA. 23+00.00 -Y6- AT THE SHOULDER POINT	

HORIZONTAL CURVE DATA

PIs STA. 435+13.54 -L-	PI STA. 469+05.74 -L-	PIs STA. 499+07.20 -L-
$\theta_s = 0^\circ-45'-50.2''$	$\Delta = 47^\circ-49'-31.5''$ (RT.)	$\theta_s = 0^\circ-45'-50.2''$
$L_s = 200.00'$	$D = 0^\circ-45'-50.2''$	$L_s = 200.00'$
$LT = 133.33'$	$L = 6260.33'$	$LT = 133.33'$
$ST = 66.67'$	$T = 3325.53'$	$ST = 66.67'$
	$R = 7500.00'$	

GRADE DATA:

GRADE POINT EL. @ STA. 472+13.00 -L- = EL. 809.51
BED EL. @ STA. 472+13.00 -L- = 770.71
ROADWAY SLOPE 2:1

NOTES:

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

DESIGN FILL----- 31'-9".

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.

THE ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.

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

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

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.

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

TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.

NO WORK SHALL BE DONE ON THE CULVERT AT STA. 472+13.00 -L- UNTIL THE AREA OF THE BOX CULVERT HAS BEEN UNDERCUT UP TO 3 FEET AND UNSUITABLE MATERIAL REPLACED WITH FOUNDATION CONDITIONING MATERIAL, PROPERLY COMPACTED TO THE ELEVATION OF THE BOTTOM OF THE PROPOSED FLOOR SLAB. THE LIMITS OF THIS UNDERCUT EXCAVATION SHALL BE AT LEAST THE LIMITS OF THE BOX CULVERT INCLUDING THE WINGS AS DIRECTED BY THE ENGINEER. NO SEPARATE PAYMENT WILL BE MADE FOR ANY TEMPORARY SHEETING, UNDERCUT, OR UNSUITABLE MATERIAL REPLACEMENT AS REQUIRED TO CONSTRUCT THE PROPOSED CULVERT. PAYMENT IS INCLUDED IN THE LUMP SUM PRICE FOR CULVERT EXCAVATION AND THE FOUNDATION CONDITIONING MATERIAL PAY ITEM.

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
BARREL @ 1.523 CY/FT	476.6 C.Y.
SILLS AND BAFFLES	4.1 C.Y.
WINGS ETC.	26.3 C.Y.
TOTAL	507.0 C.Y.
REINFORCING STEEL	
BARREL	67,547 LBS.
WINGS ETC.	1,661 LBS.
TOTAL	69,208 LBS.
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	927 TONS

PROJECT NO. U-2525C
GUILFORD COUNTY
 STATION: 472+13.00 -L-

CULVERT NO. 401267

PLANS PREPARED BY:
SEALEY & ASSOCIATES
 ENGINEERS
 5640 Dillard Drive
 Suite 200
 Cary, NC 27518
 (919) 852-0468
 (919) 852-0538 (Fax)
 www.slmpsonengr.com
 LICENSURE NO. C-2521



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 8 FT. X 8 FT. CONCRETE BOX CULVERT

64° SKEW

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

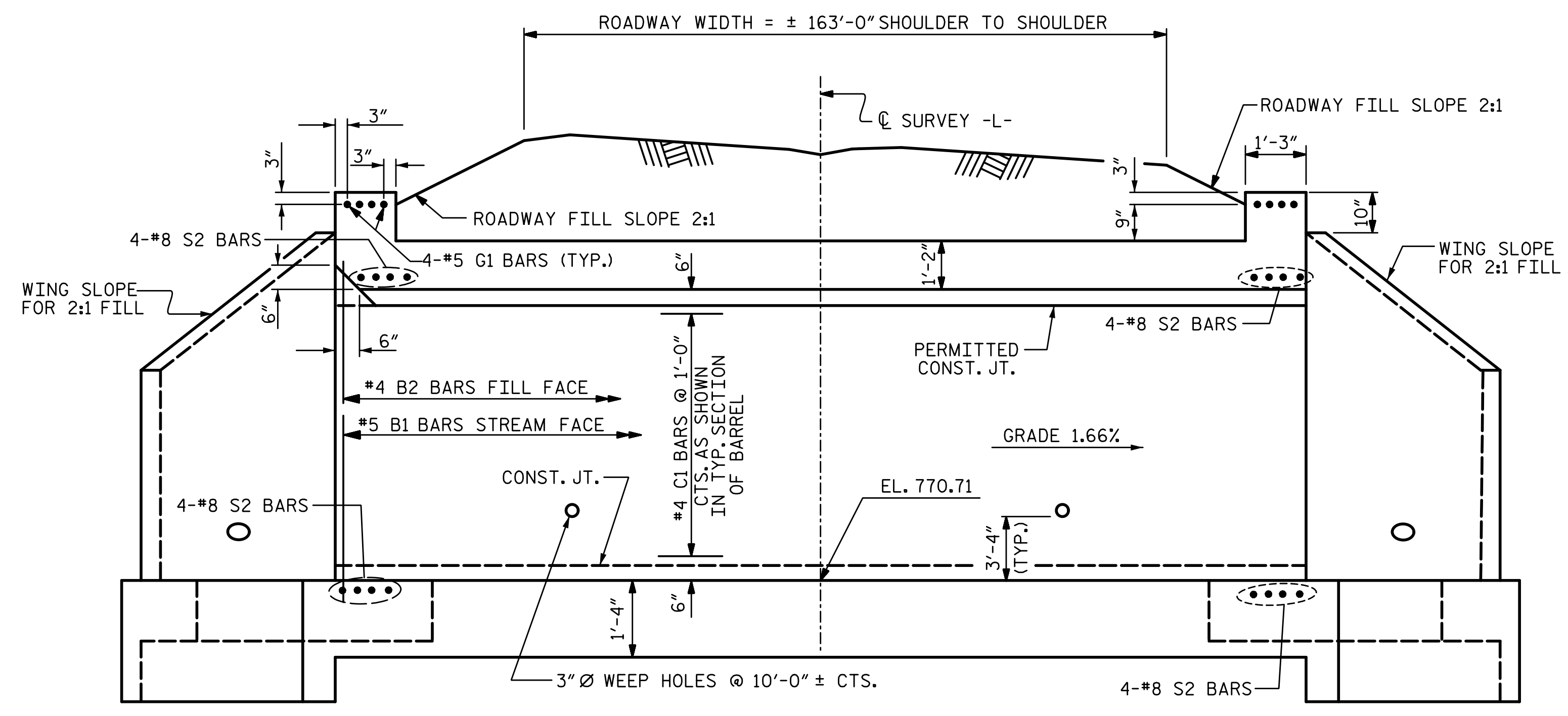
SHEET NO. C4-1
 TOTAL SHEETS 5

DRAWN BY: R. SEALEY DATE: 9-17
 CHECKED BY: M.A. AVERETTE DATE: 9-17
 DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 9-17

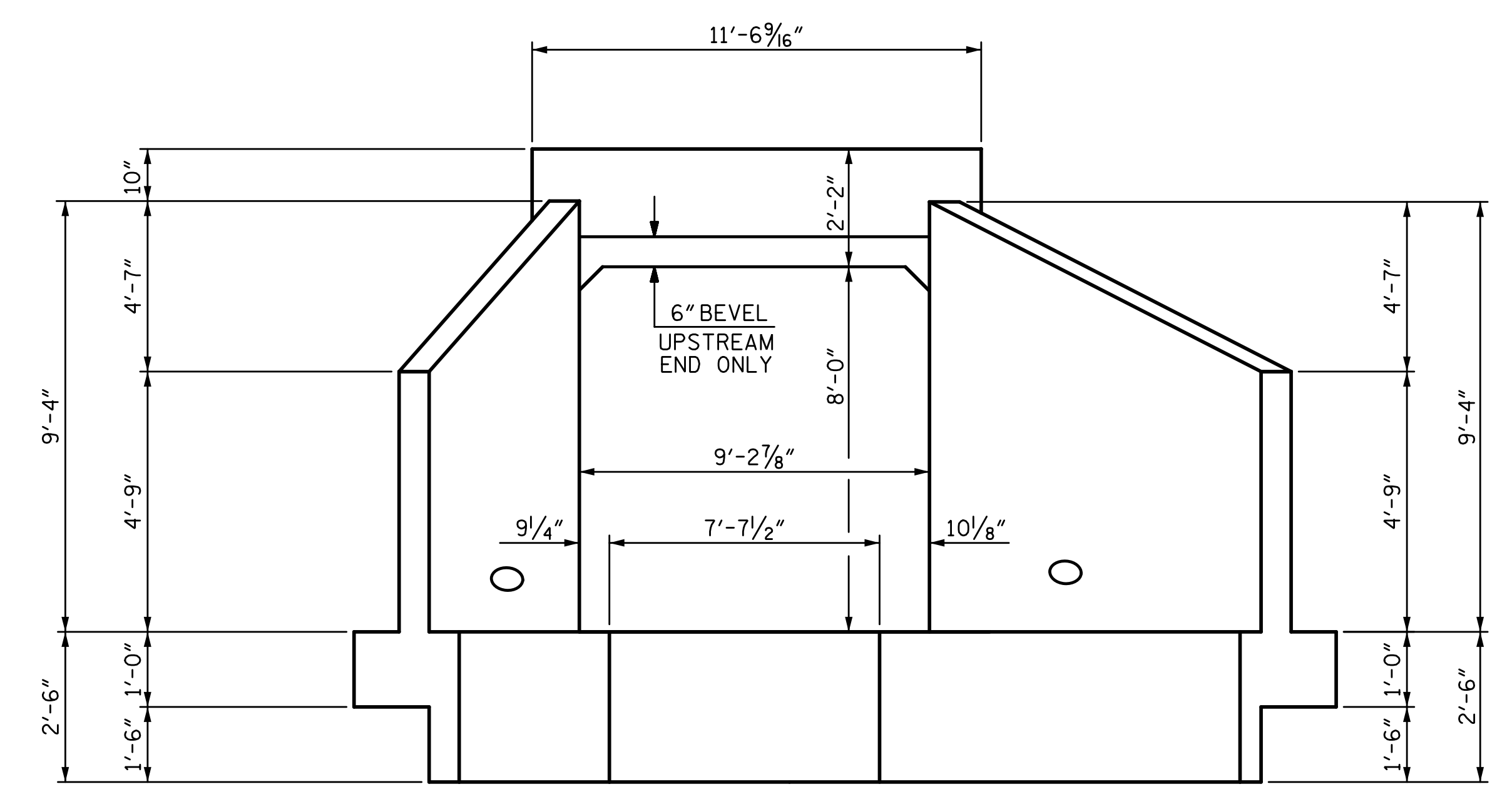
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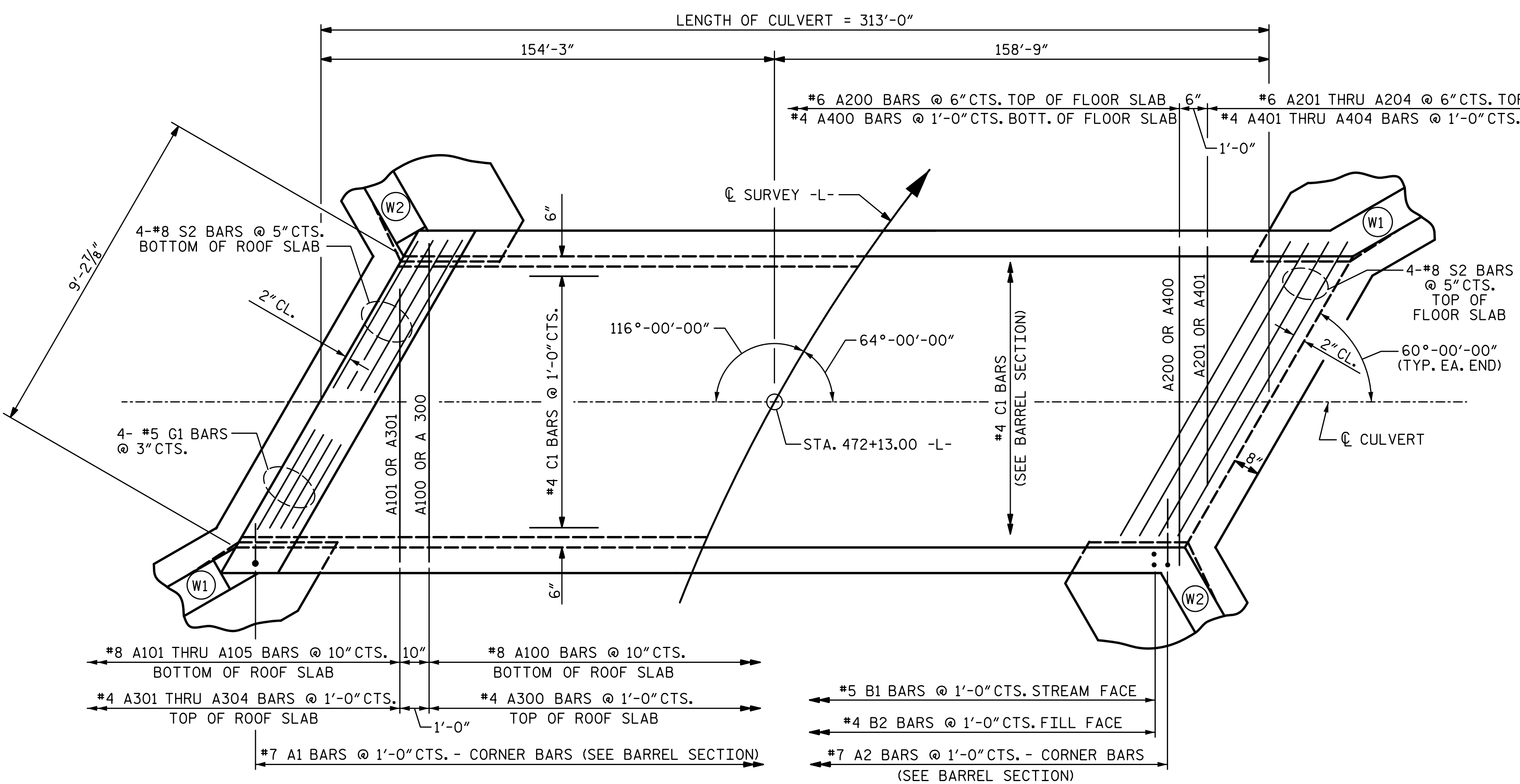
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CULVERT SECTION NORMAL TO ROADWAY
(SILLS AND BAFFLES NOT SHOWN FOR CLARITY)



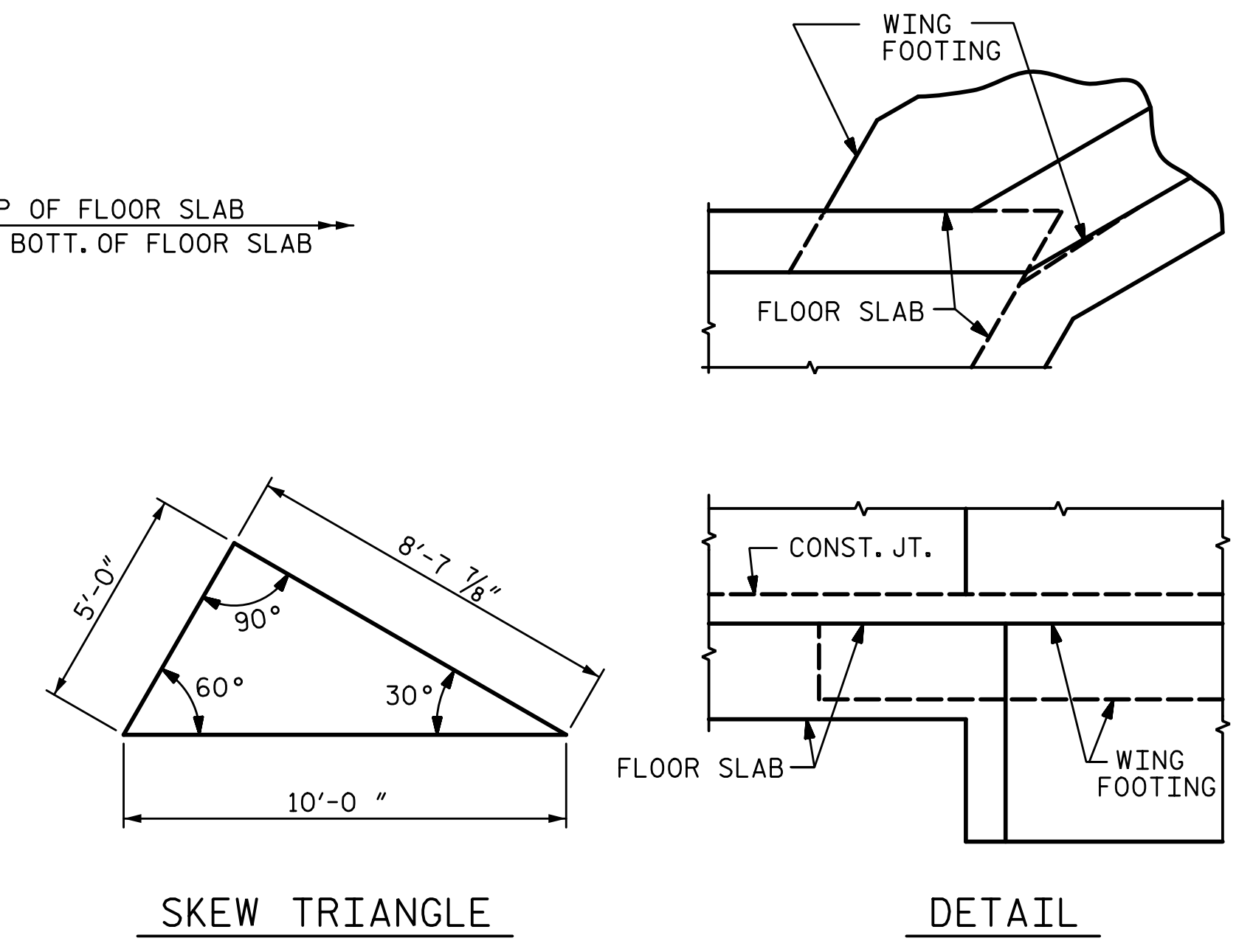
END ELEVATION NORMAL TO SKEW
(SILLS AND BAFFLES NOT SHOWN, SEE SHEET 3 FOR DETAILS)



PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB
(SILLS AND BAFFLES NOT SHOWN FOR CLARITY)

C1 BARS ARE 12 BAR RUNS

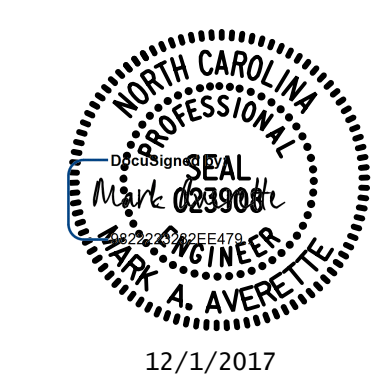


CONNECTION OF WING FOOTING AND FLOOR SLAB WHEN SLAB IS THICKER THAN FOOTING

PROJECT NO. U-2525C
GUILFORD COUNTY
 STATION: 472+13.00 -L-

DRAWN BY: R. SEALEY DATE: 9-17
 CHECKED BY: M.A. AVERETTE DATE: 9-17
 DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 9-17

PLANS PREPARED BY:
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 (919) 852-0538 (Fax)
 www.simpsonengr.com
 LICENSURE NO. C-2521



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 8 FT. X 8 FT. CONCRETE BOX CULVERT

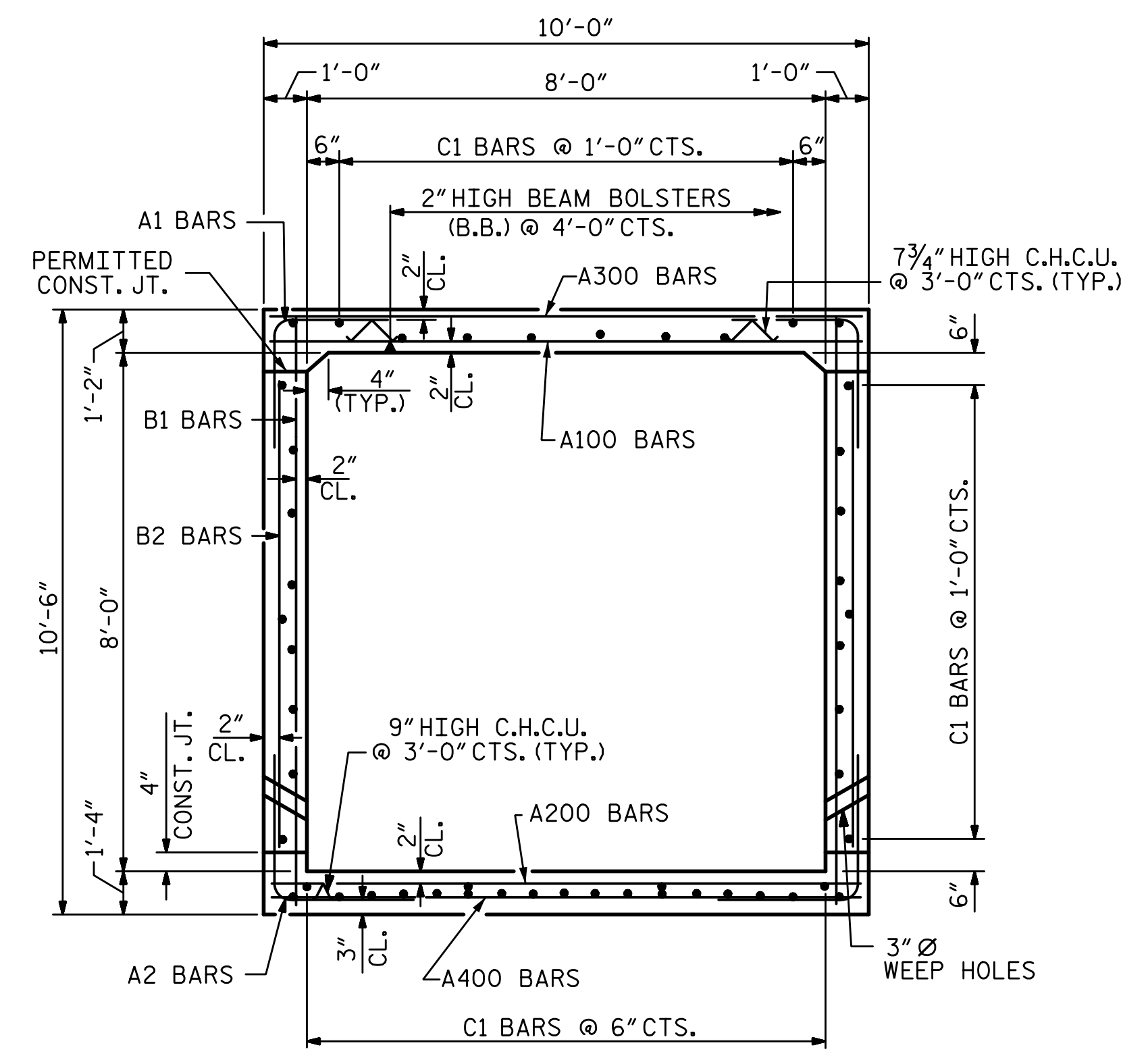
64° SKEW

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

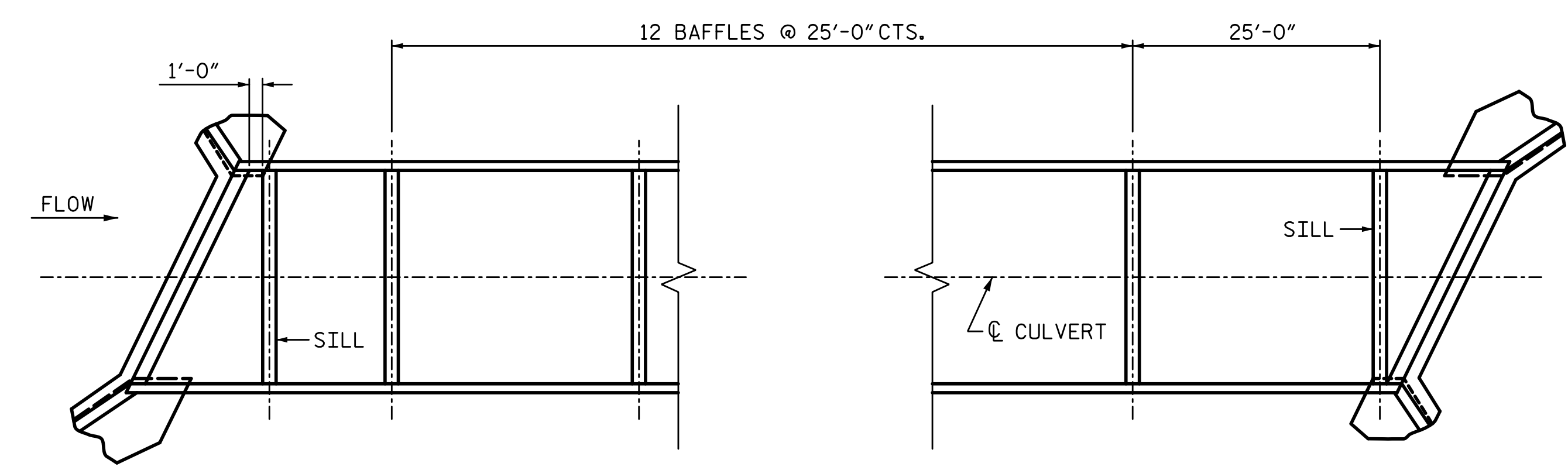
SHEET NO. C4-2
 TOTAL SHEETS 5

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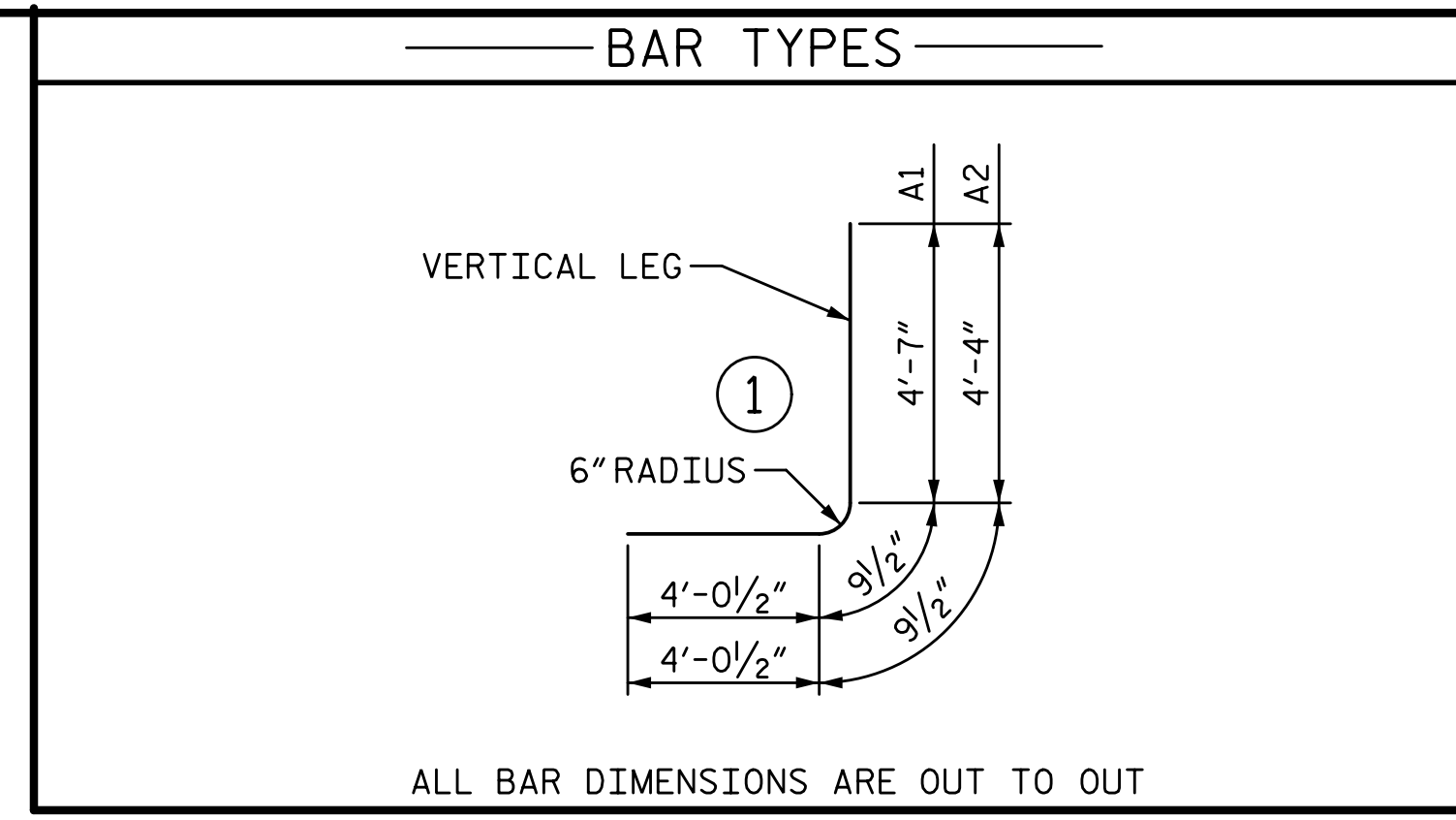
RIGHT ANGLE SECTION OF BARREL
(THERE ARE 49 C1 BARS IN SECTION OF BARREL)



FLOOR PLAN
(SHOWING PLACEMENT OF SILLS AND BAFFLES)

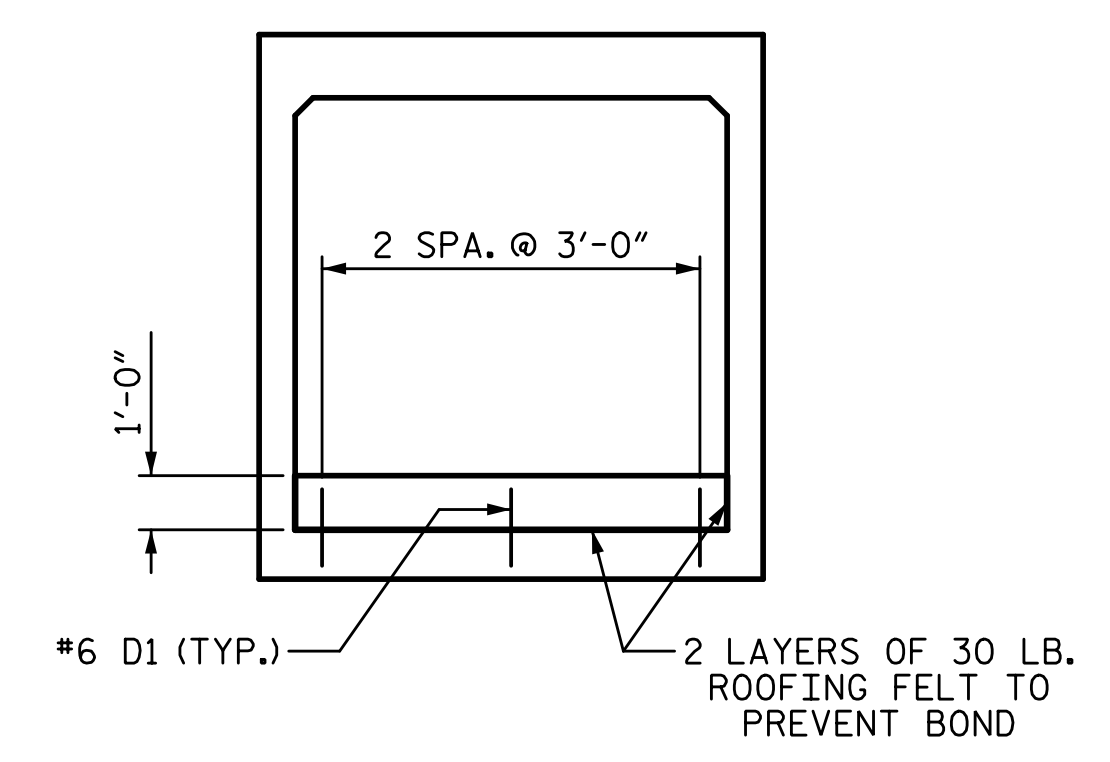
CULVERT SILL AND BAFFLE DETAILS

BACKFILL BETWEEN SILLS/BAFFLES WITH NATIVE MATERIAL FLUSH WITH THE TOP OF THE SILL/BAFFLES. NATIVE MATERIAL CONSIST OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED AT THE PROJECT SITE DURING CONSTRUCTION. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

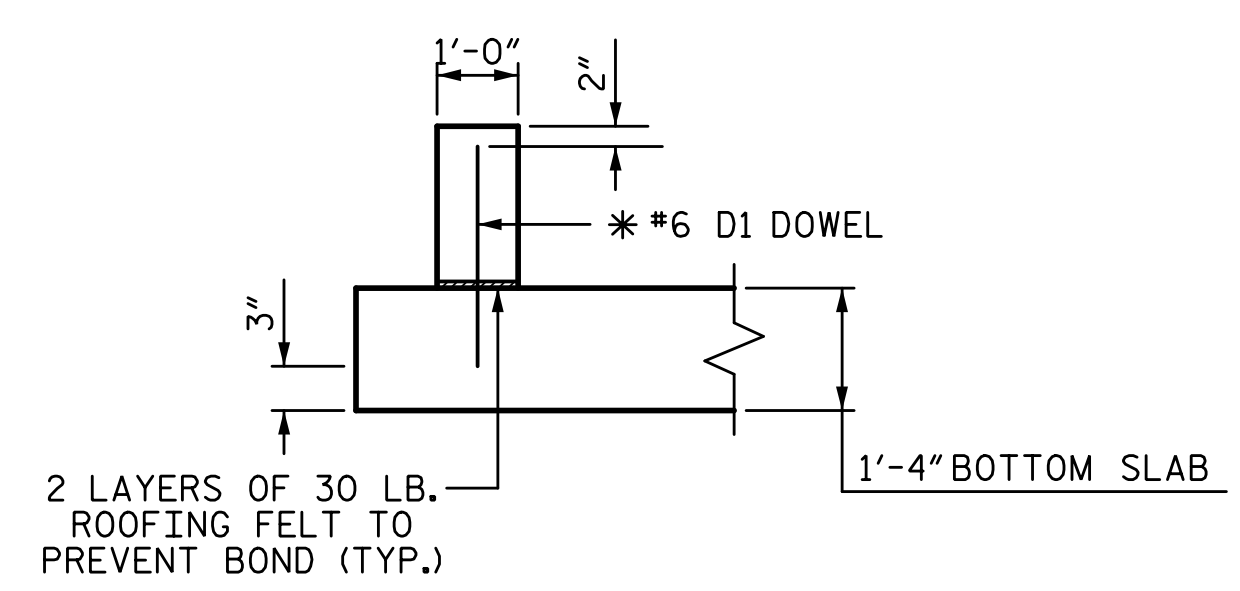


ALL BAR DIMENSIONS ARE OUT TO OUT

SPLICE CHART	
#5 B1 SPLICE LENGTH = 2'-3"	
#4 C1 SPLICE LENGTH = 1'-11"	



ELEVATION - LOOKING DOWNSTREAM



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

BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	626	#7	1	9'-5"	12049
A2	626	#7	1	9'-2"	11729
A100	369	#8	STR	9'-7"	9442
A101	2	#8	STR	8'-1"	43
A102	2	#8	STR	6'-7"	35
A103	2	#8	STR	5'-2"	28
A104	2	#8	STR	3'-9"	20
A105	2	#8	STR	2'-3"	12
A200	615	#6	STR	9'-7"	8852
A201	4	#6	STR	7'-9"	47
A202	4	#6	STR	6'-0"	36
A203	4	#6	STR	4'-4"	26
A204	4	#6	STR	2'-7"	16
A300	308	#4	STR	9'-7"	1972
A301	2	#4	STR	7'-9"	10
A302	2	#4	STR	6'-0"	8
A303	2	#4	STR	4'-4"	6
A304	2	#4	STR	2'-7"	3
A400	308	#4	STR	9'-7"	1972
A401	2	#4	STR	7'-9"	10
A402	2	#4	STR	6'-0"	8
A403	2	#4	STR	4'-4"	6
A404	2	#4	STR	2'-7"	3
B1	626	#5	STR	10'-0"	6529
B2	626	#4	STR	7'-4"	3067
C1	588	#4	STR	27'-10"	10932
D1	42	#6	STR	1'-11"	121
G1	8	#5	STR	11'-1"	92
S2	16	#8	STR	11'-1"	473
TOTAL REINFORCING STEEL					67547 LB
CLASS A CONCRETE BREAKDOWN					
BARREL					476.6 CY
SILLS AND BAFFLES					4.1 CY

PROJECT NO. U-2525C
GUILFORD COUNTY
 STATION: 472+13.00 -L-

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
SINGLE 8 FT. X 8 FT. CONCRETE BOX CULVERT					
64° SKEW					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

PLANS PREPARED BY:
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 (919) 852-0468
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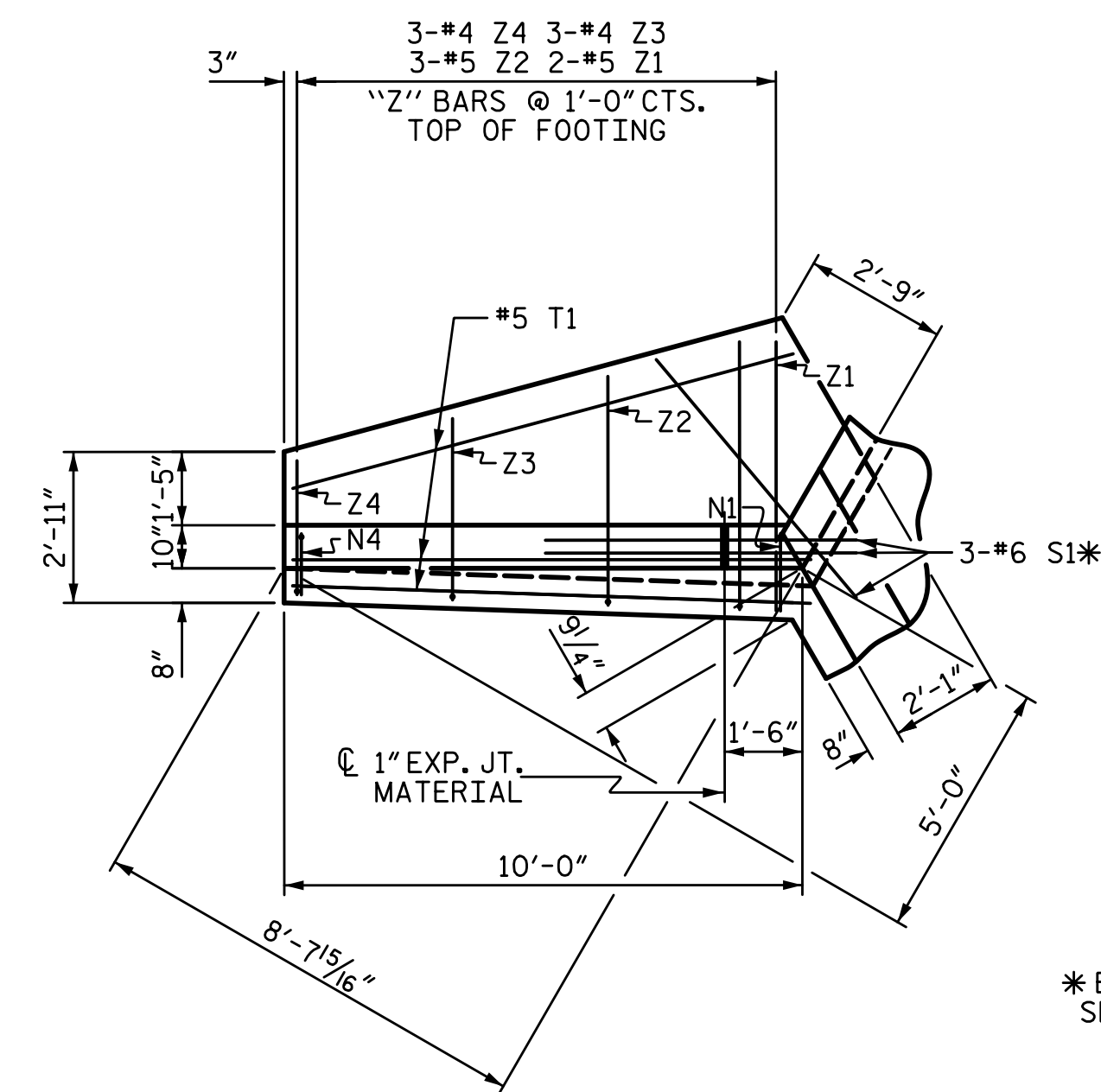


DRAWN BY: R. SEALEY DATE: 9-17
 CHECKED BY: M.A. AVERETTE DATE: 9-17
 DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 9-17

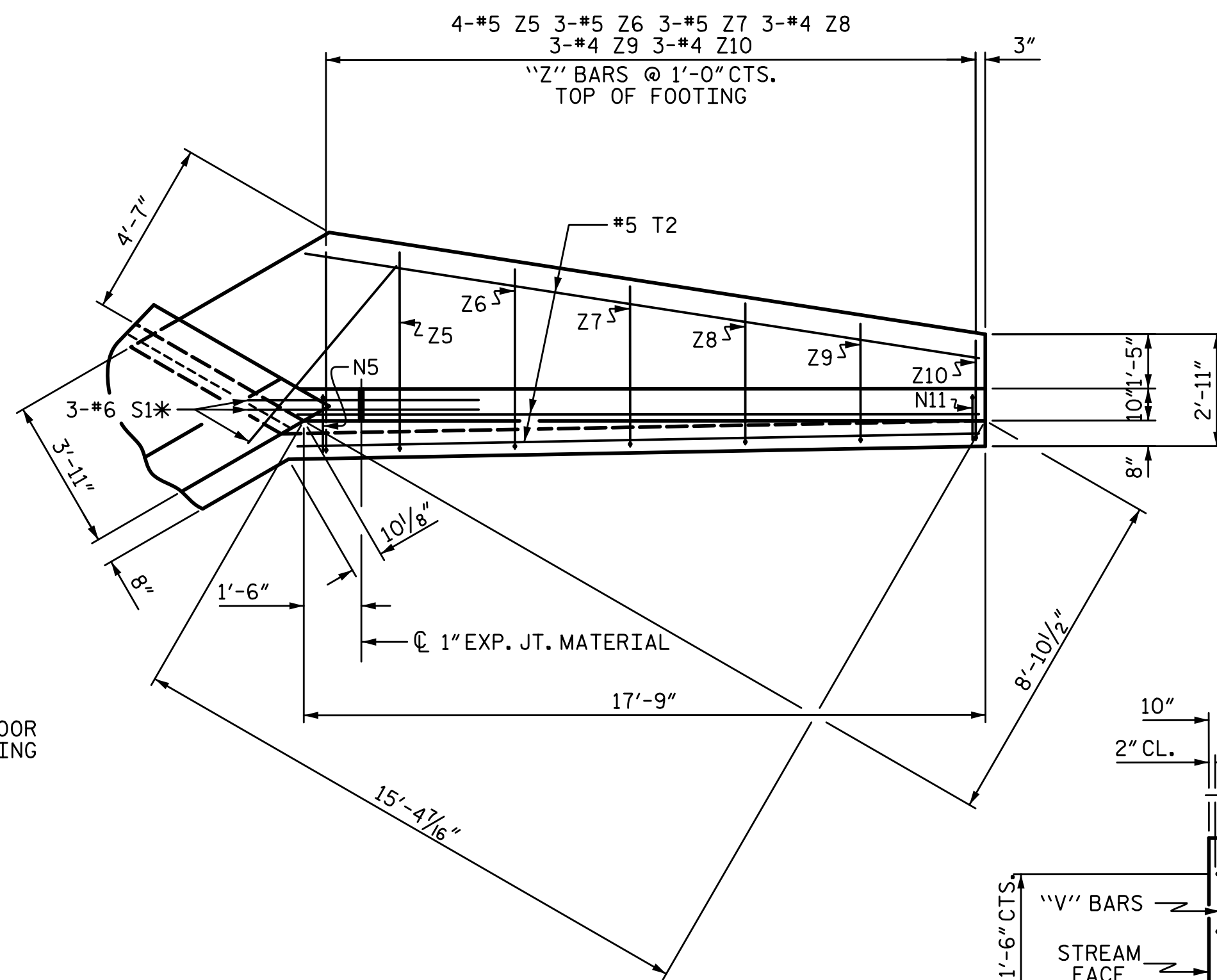
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SHEET NO.
C4-3
 TOTAL SHEETS
5

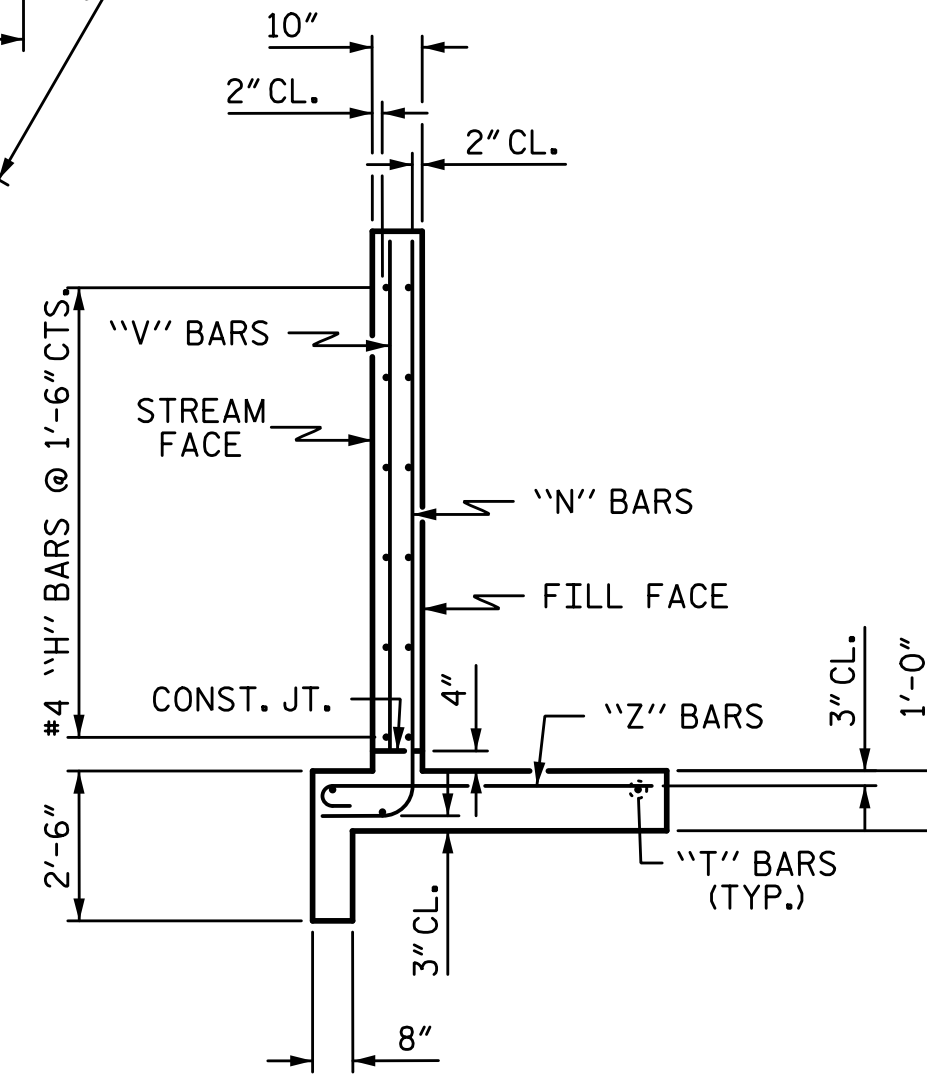
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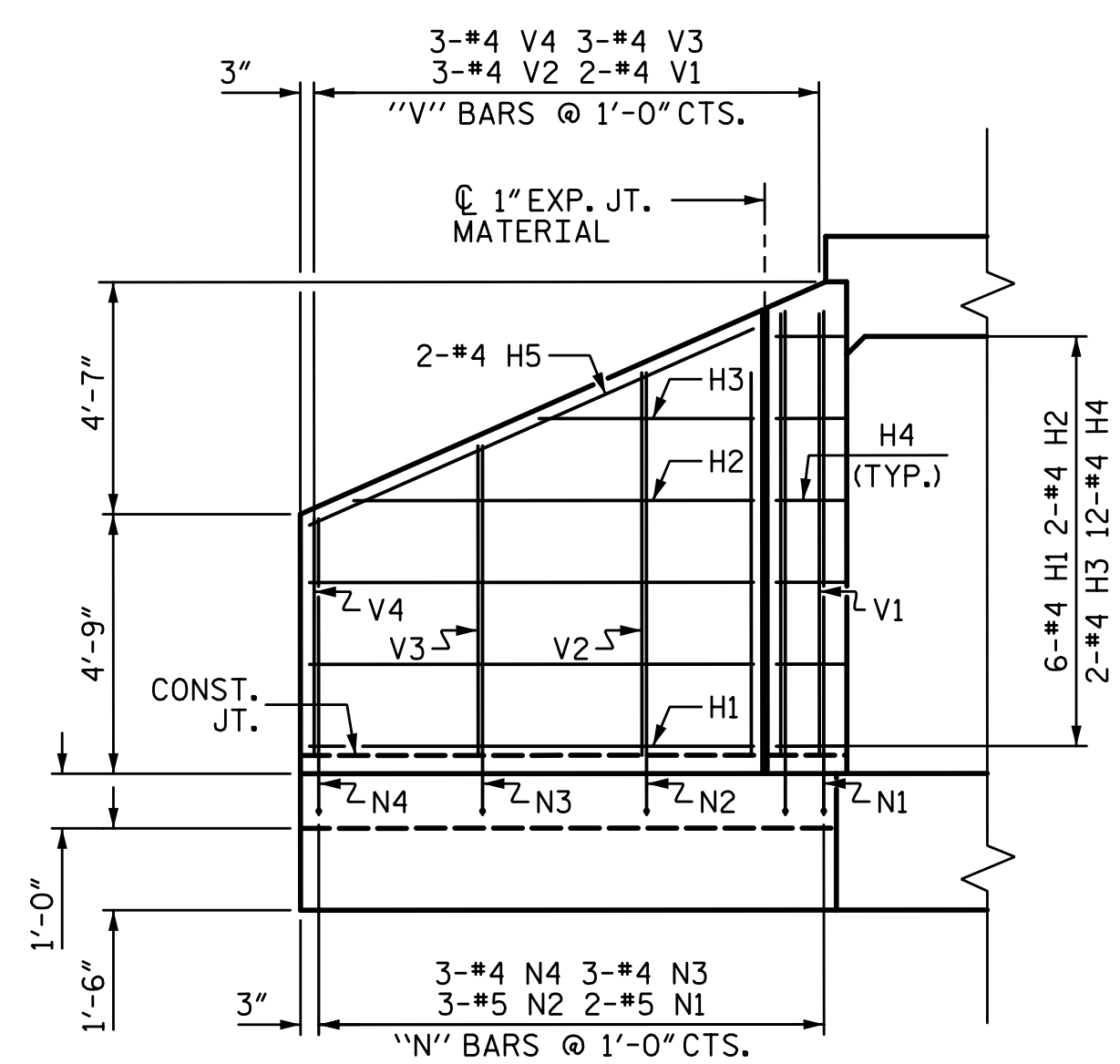
PLAN W2



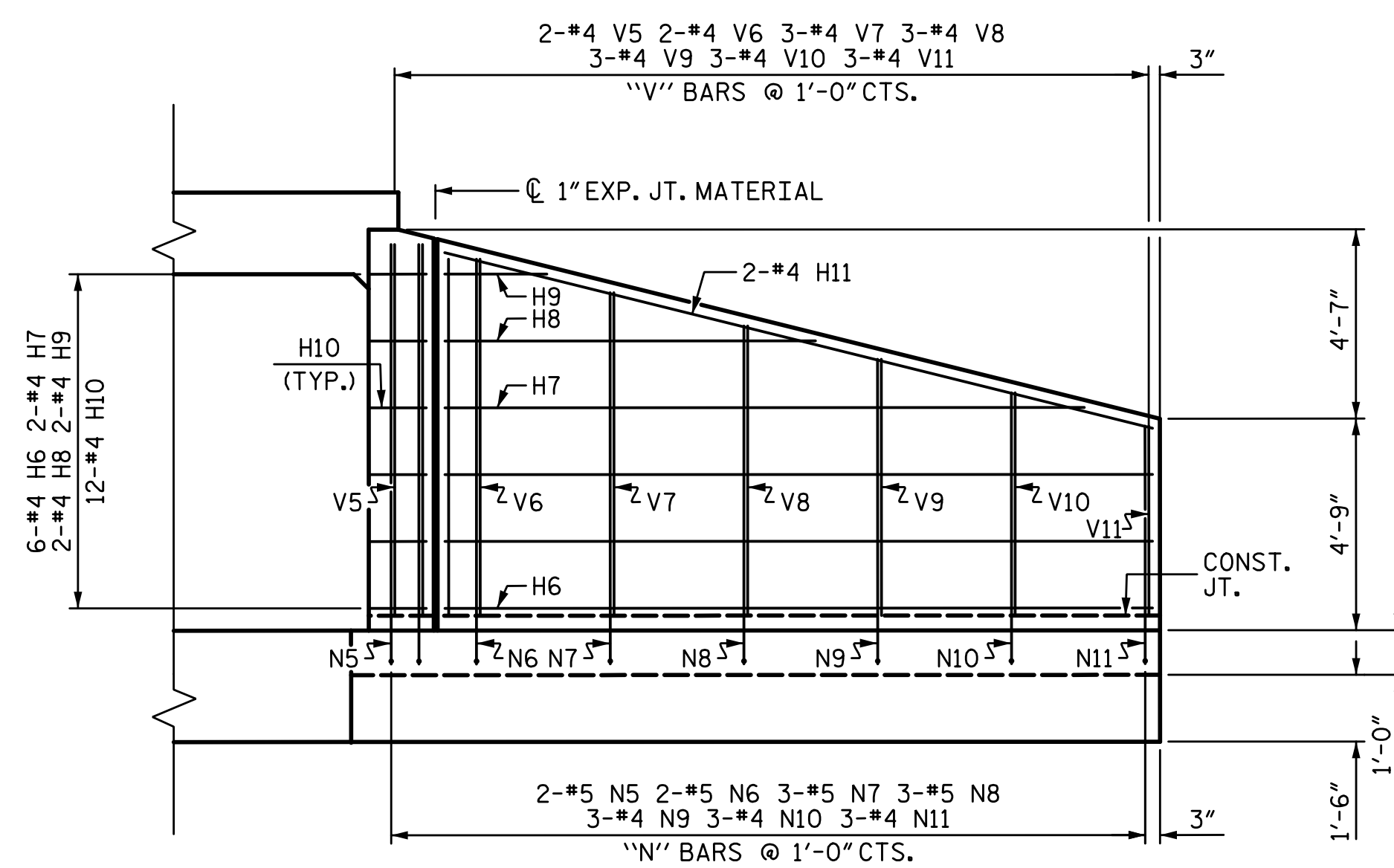
PLAN W1



TYPICAL WING SECTION



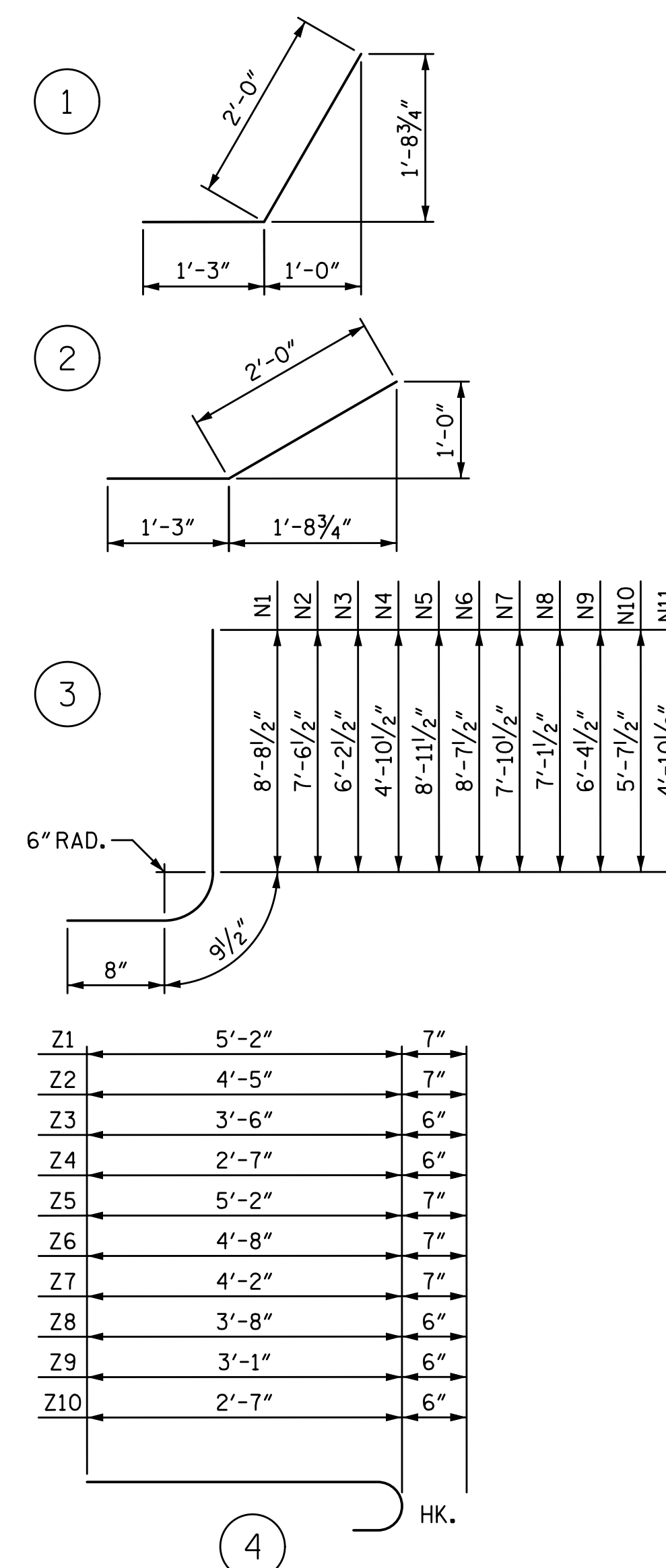
ELEVATION W2



ELEVATION W1

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.



BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	8'-1"	65
H2	4	#4	STR	7'-3"	19
H3	4	#4	STR	3'-11"	10
H4	24	#4	1	3'-3"	52
H5	4	#4	STR	8'-10"	24
H6	12	#4	STR	15'-10"	127
H7	4	#4	STR	14'-4"	38
H8	4	#4	STR	8'-3"	22
H9	4	#4	STR	2'-3"	6
H10	24	#4	2	3'-3"	52
H11	4	#4	STR	16'-4"	44
N1	4	#5	3	10'-2"	42
N2	6	#5	3	9'-0"	56
N3	6	#4	3	7'-8"	31
N4	6	#4	3	6'-4"	25
N5	4	#5	3	10'-5"	43
N6	4	#5	3	10'-1"	42
N7	6	#5	3	9'-4"	58
N8	6	#5	3	8'-7"	54
N9	6	#4	3	7'-10"	31
N10	6	#4	3	7'-1"	28
N11	6	#4	3	6'-4"	25
S1	12	#6	STR	6'-0"	108
T1	6	#5	STR	10'-0"	63
T2	6	#5	STR	17'-9"	111
V1	4	#4	STR	8'-1"	22
V2	6	#4	STR	7'-0"	28
V3	6	#4	STR	5'-8"	23
V4	6	#4	STR	4'-4"	17
V5	4	#4	STR	8'-4"	22
V6	4	#4	STR	8'-0"	21
V7	6	#4	STR	7'-3"	29
V8	6	#4	STR	6'-6"	26
V9	6	#4	STR	5'-9"	23
V10	6	#4	STR	5'-0"	20
V11	6	#4	STR	4'-3"	17
Z1	4	#5	4	5'-9"	24
Z2	6	#5	4	5'-0"	31
Z3	6	#4	4	4'-0"	16
Z4	6	#4	4	3'-1"	12
Z5	8	#5	4	5'-9"	48
Z6	6	#5	4	5'-3"	33
Z7	6	#5	4	4'-9"	30
Z8	6	#4	4	4'-2"	17
Z9	6	#4	4	3'-7"	14
Z10	6	#4	4	3'-1"	12
REINFORCING STEEL					1661 LBS
FOR 4 WINGS					
CLASS A CONCRETE					
4 WINGS					24.3 CY
2 HEADWALLS					1.1 CY
2 END CURTAIN WALLS					0.9 CY
TOTAL					26.3 CY

PROJECT NO. U-2525C
 GUILFORD COUNTY
 STATION: 472+13.00 -L-

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

WINGS FOR
 CONCRETE BOX CULVERT
 H = 8'-0" SLOPE = 2:1
 60° SKEW

PLANS PREPARED BY:

SEMPSON
 ENGINEERS
 & ASSOCIATES
 5640 Dillard Drive
 Suite 200
 Cary, NC 27518
 (919) 852-0468
 (919) 852-0598 (Fax)
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12/1/2017

REVISIONS

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2			4		

SHEET NO.

C4-4
 TOTAL SHEETS
 5

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DRAWN BY: R. SEALEY DATE: 9-17
 CHECKED BY: M.A. AVERETTE DATE: 9-17
 DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 9-17

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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	
						MOMENT				SHEAR					
						LIVE-LOAD FACTORS (%LL)	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	N/A	N/A	1.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HL-93 (OPERATING)	N/A		N/A	N/A	1.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HS-20 (INVENTORY)	36.000	②	N/A	N/A	1.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HS-20 (OPERATING)	36.000		N/A	N/A	1.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SH	12.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S3C	21.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S3A	22.750		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S4A	26.750		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S5A	30.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S6A	34.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S7B	38.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S7A	40.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	TRUCK TRACTOR SEMI-TRAILER (TTST)	T4A	28.250		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T5B	32.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T6A	36.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T7A	40.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T7B	40.000		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		PERMANENT LOAD		④	1.02			1.07	1	BOT. SLAB-MID.	4.5	1.02	1	EXT. WALL BOT.	8

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

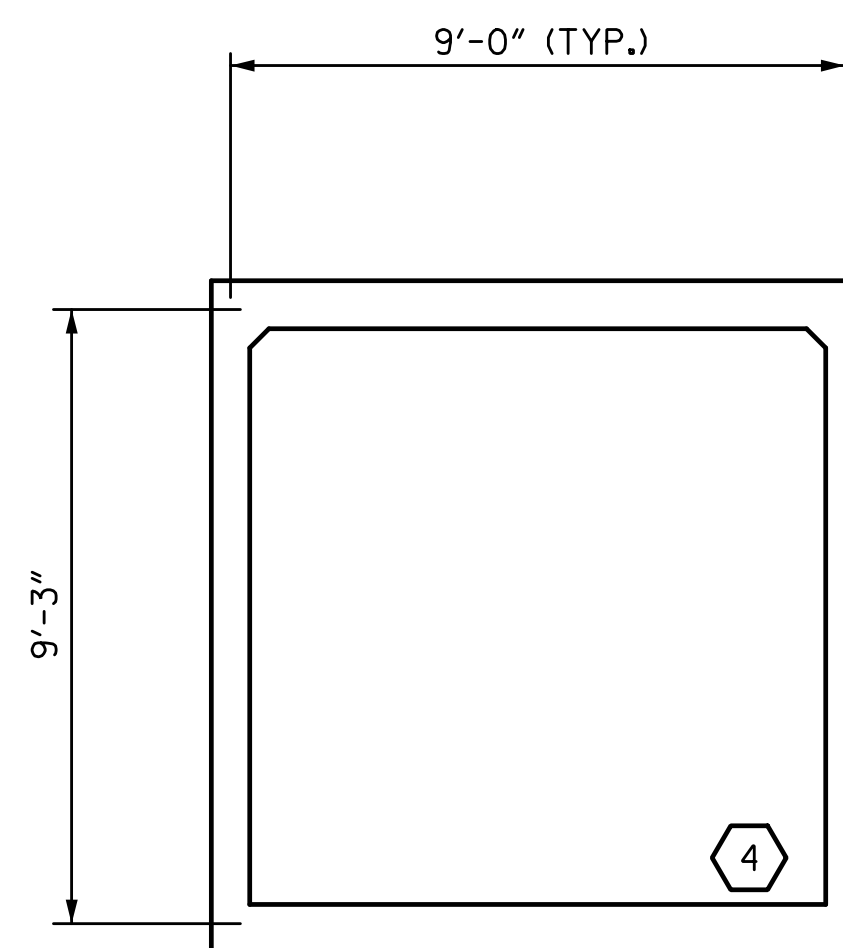
NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM CENTERLINE OF ELEMENT.

COMMENTS:

- EFFECTS OF LIVE LOAD MAY BE NEGLECTED ACCORDING TO AASHTO LRFD 3.6.1.2.6A (DESIGN FILL = 31'-9")
- CULVERTS WITH DEEP FILLS SHOULD BE EVALUATED FOR THE EFFECTS OF PERMANENT LOADS ONLY ACCORDING TO "THE MANUAL FOR BRIDGE EVALUATION 6A.5.12.10.3A"

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



BOX 1

LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. U-2525C
GUILFORD COUNTY
STATION: 472+13.00 -L-

DRAWN BY: R. SEALEY DATE: 9-17
CHECKED BY: M.A. AVERETTE DATE: 9-17
DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 9-17

PLANS PREPARED BY:
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LICENSURE NO. C-2521



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

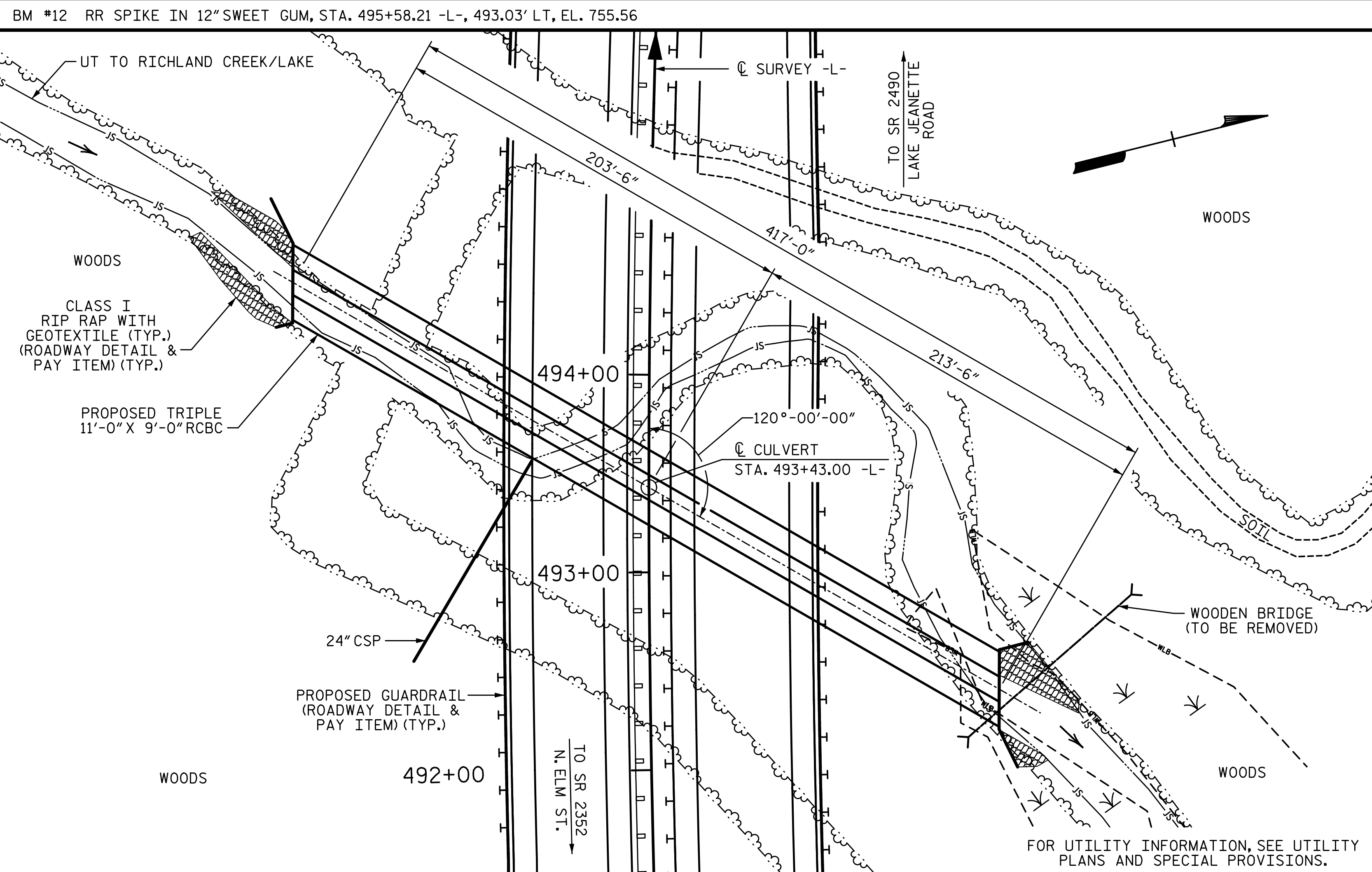
LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

(INTERSTATE TRAFFIC)

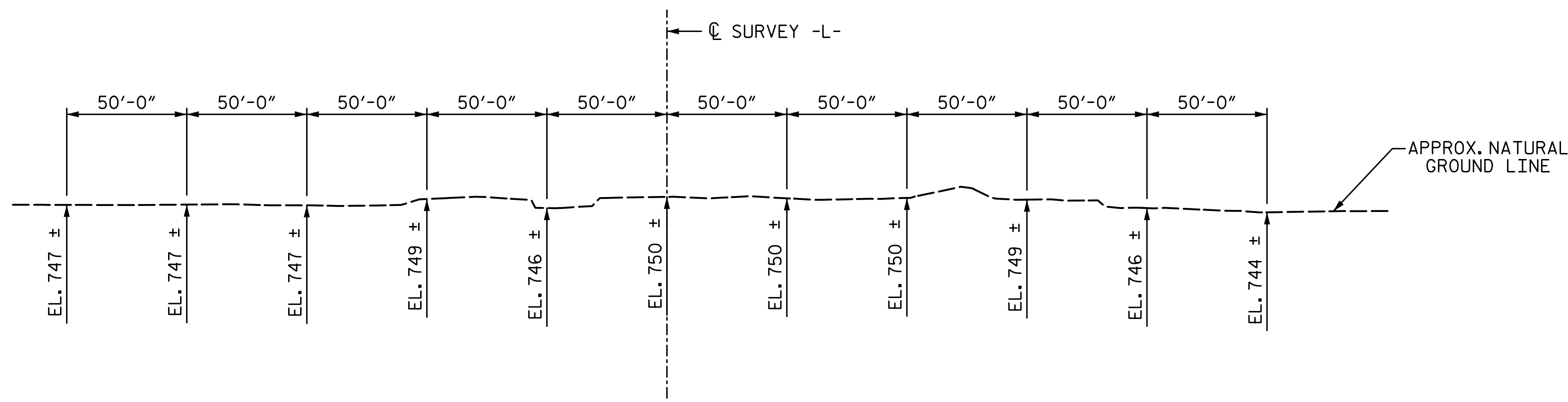
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NO.	BY:	DATE:	NO.	BY:	DATE:	SHEET NO.
1			3			C4-5
2			4			TOTAL SHEETS 5

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LOCATION SKETCH



PROFILE ALONG CULVERT

NOTES:

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

DESIGN FILL----- 54'-0".

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.

2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.

THE ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.

STEEL IN THE BOTTOM OF THE 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 SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL AND BOTH FACES OF INTERIOR WALLS ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.

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

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

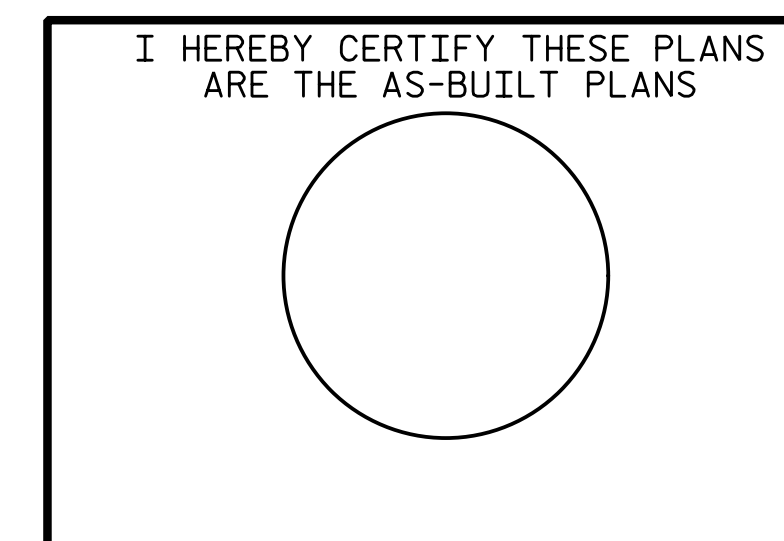
A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.

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

TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINT SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.

THE 24" Ø CSP THROUGH THE SIDEWALL OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE FIELD BENT AS NECESSARY TO CLEAR PIPE.

NO WORK SHALL BE DONE ON THE CULVERT AT STA. 493+43.00 -L- UNTIL THE AREA OF THE BOX CULVERT HAS BEEN UNDERCUT AT THE DISCRETION OF THE ENGINEER AND UNSUITABLE MATERIAL REPLACED WITH FOUNDATION CONDITIONING MATERIAL, PROPERLY COMPACTED TO THE ELEVATION OF THE BOTTOM OF THE PROPOSED FLOOR SLAB. THE LIMITS OF THIS UNDERCUT EXCAVATION SHALL BE IN AREAS WHERE THE CULVERT CROSSES THE EXISTING STREAM CHANNEL AS DIRECTED BY THE ENGINEER. NO SEPARATE PAYMENT WILL BE MADE FOR ANY TEMPORARY SHEETING, UNDERCUT, OR UNSUITABLE MATERIAL REPLACEMENT AS REQUIRED TO CONSTRUCT THE PROPOSED CULVERT. PAYMENT IS INCLUDED IN THE LUMP SUM PRICE FOR CULVERT EXCAVATION AND THE FOUNDATION CONDITIONING MATERIAL PAY ITEM.



PROJECT NO. U-2525C
GUILFORD COUNTY
 STATION: 493+43.00 -L-

CULVERT NO. 401268

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

TRIPLE 11 FT. X 9 FT.
 CONCRETE BOX CULVERT

120° SKEW

REVISIONS

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

SHEET NO.
 C5-1
 TOTAL SHEETS
 7

PLANS PREPARED BY:

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LICENSURE NO. C-2521



12/15/2017

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DRAWN BY: R. SEALEY DATE: 10-17
 CHECKED BY: M.A. AVERETTE DATE: 10-17
 DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 10-17

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HYDRAULIC DATA:

DESIGN DISCHARGE = 1200 CFS
 FREQUENCY OF DESIGN FLOOD = 50 YEAR
 DESIGN HIGH WATER ELEVATION = 753.8
 DRAINAGE AREA = 1.75 SQ. MI.
 BASE DISCHARGE (Q 100) = 1300 CFS
 BASE HIGH WATER ELEVATION = 754.18

OVERTOPPING FLOOD DATA:

OVERTOPPING DISCHARGE = 1700 CFS
 FREQUENCY OF OVERTOPPING FLOOD = 500+ YEAR
 OVERTOPPING FLOOD ELEVATION = 801.30 **
 ** OVERTOPPING OCCURS AT ROADWAY
 STA. 487+00.00 -L- ±, APPROXIMATELY
 730' LT. OF -L- AT THE DRAINAGE DIVIDE

HORIZONTAL CURVE DATA

PIs STA. 435+13.54 -L- PI STA. 469+05.74 -L- PIs STA. 499+07.20 -L-
 $\theta_s = 0^\circ-45'-50.2''$ $\Delta = 47^\circ-49'-31.4''$ (RT.) $\theta_s = 0^\circ-45'-50.2''$
 Ls = 200.00' D = 0°-45'-50.2" Ls = 200.00'
 LT = 133.33' L = 6260.33' LT = 133.33'
 ST = 66.67' T = 3325.53' ST = 66.67'
 R = 7500.00'

GRADE DATA:

GRADE POINT EL. @ STA. 494+43.00 -L- = EL. 806.51
 BED EL. @ STA. 494+43.00 -L- = 744.77
 ROADWAY SLOPE 2:1

TOTAL STRUCTURE QUANTITIES		
CLASS A CONCRETE		
BARREL @ _____	9.661 CY/FT	4028.5 C.Y.
SILLS _____		3.7 C.Y.
WINGS ETC. _____		40.1 C.Y.
TOTAL _____		4072.3 C.Y.
REINFORCING STEEL		
BARREL _____		404,133 LBS.
WINGS ETC. _____		2,148 LBS.
TOTAL _____		406,281 LBS.
CULVERT EXCAVATION _____		LUMP SUM
FOUNDATION CONDITIONING MATERIAL _____		1535 TONS

PROJECT NO. U-2525C
GUILFORD COUNTY
 STATION: 493+43.00 -L-

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

TRIPLE 11 FT. X 9 FT.
 CONCRETE BOX CULVERT

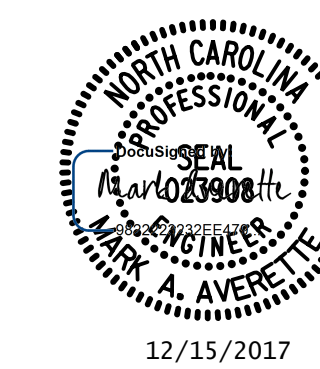
120° SKEW

REVISIONS

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1			3			C5-2
2			4			TOTAL SHEETS 7

PLANS PREPARED BY:

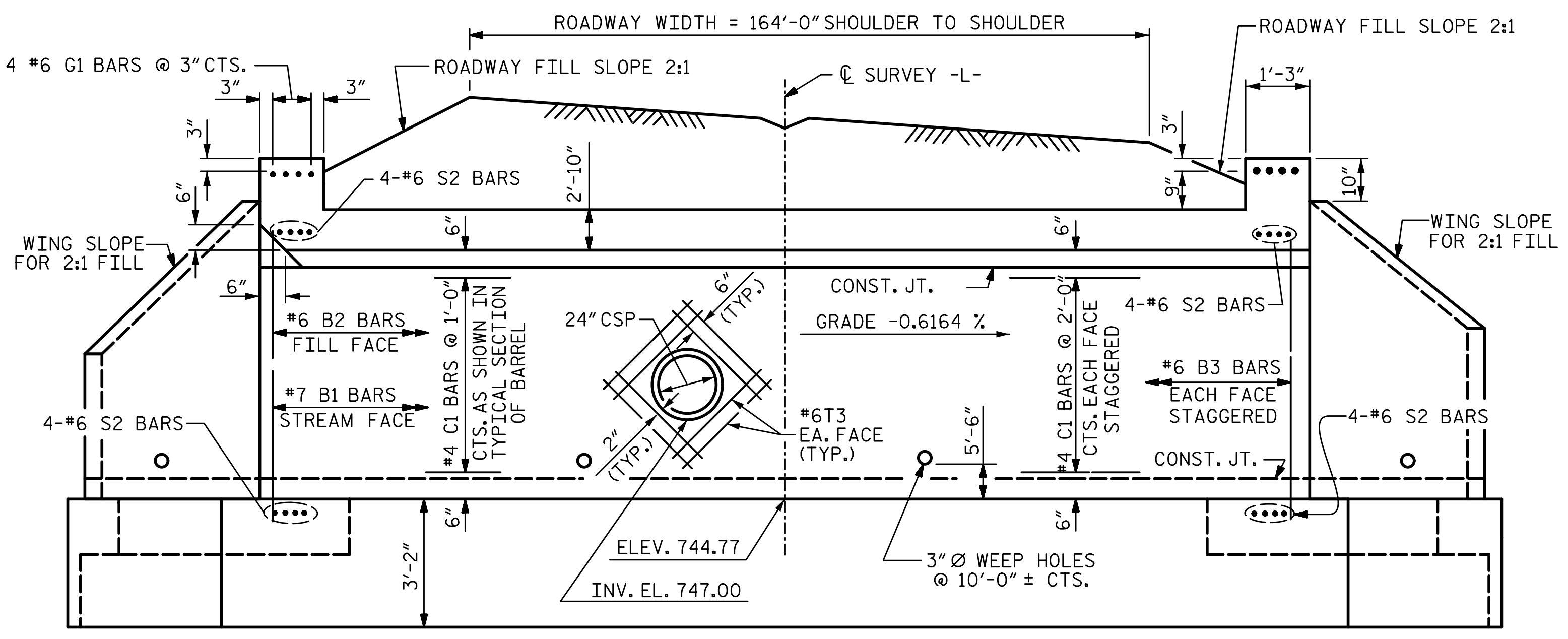
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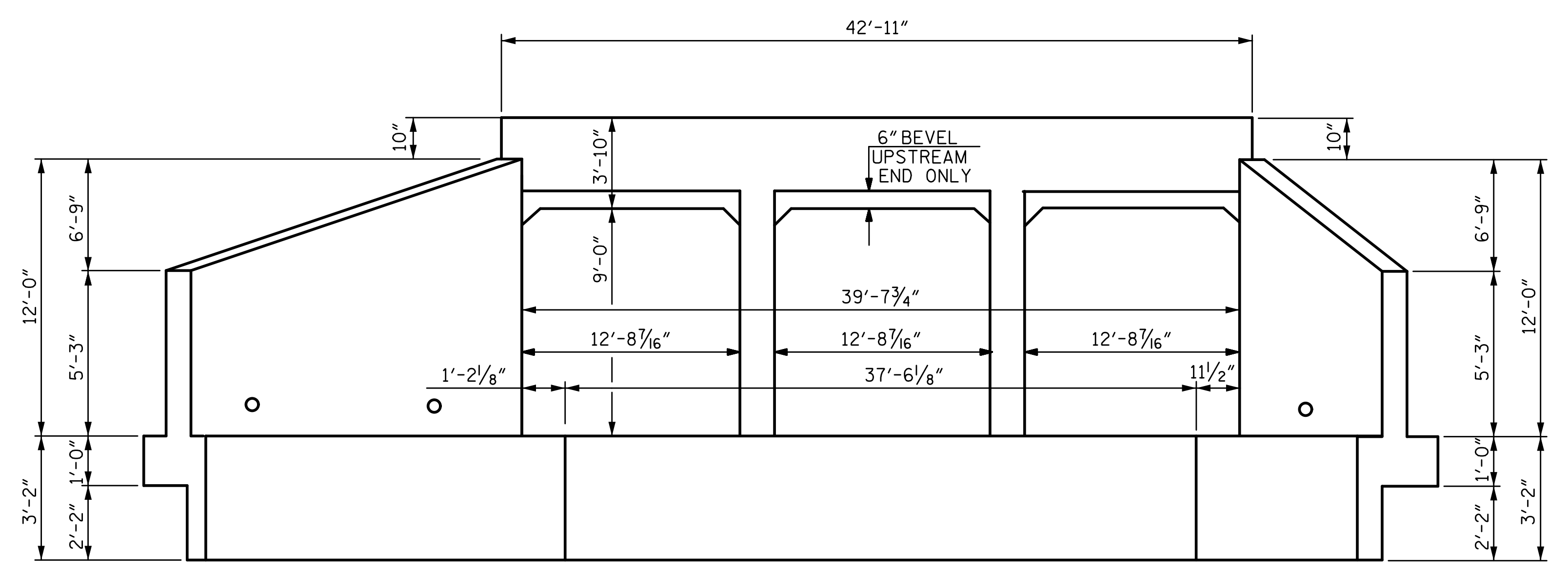
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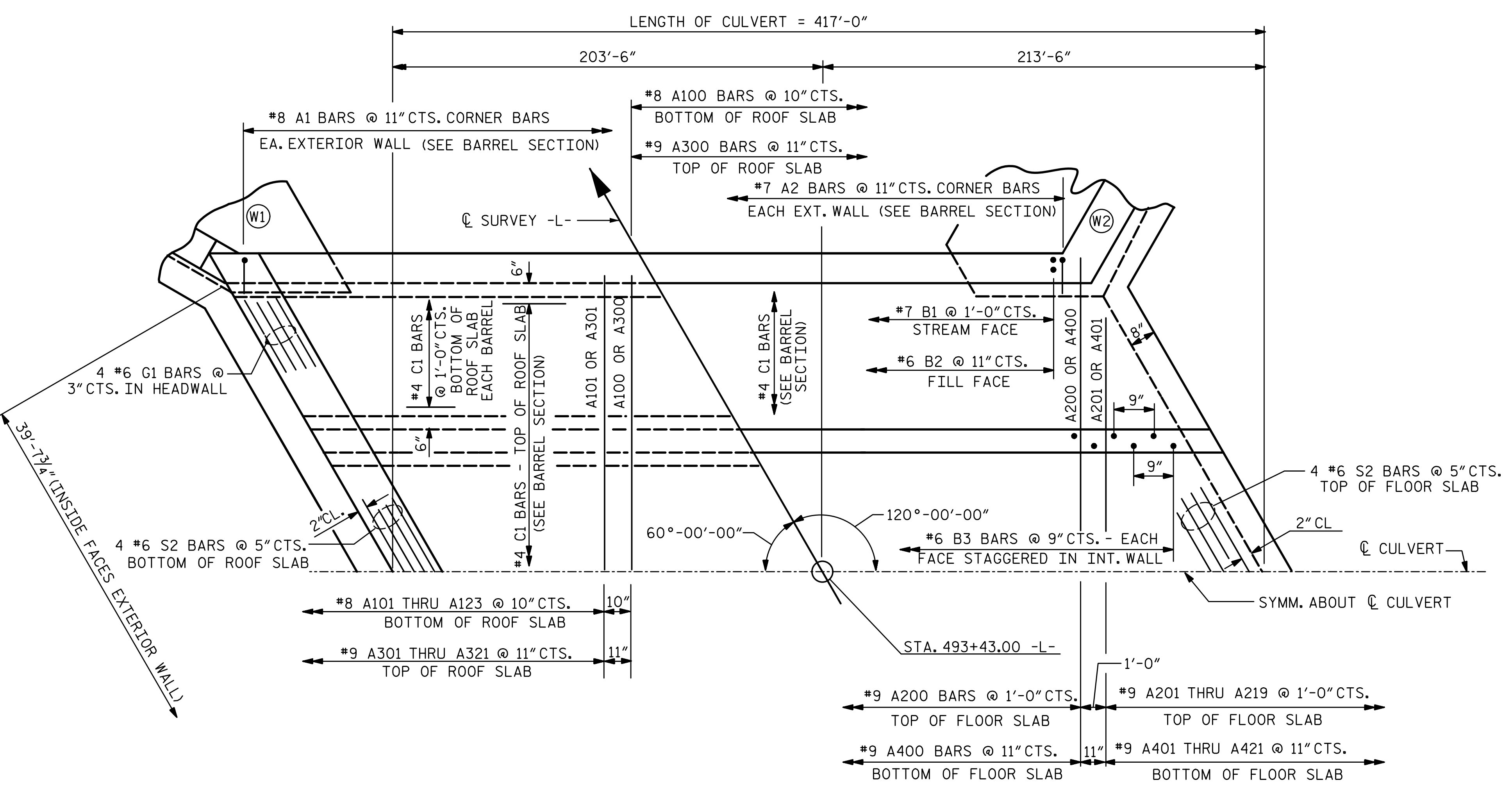
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CULVERT SECTION NORMAL TO ROADWAY
(SILLS NOT SHOWN FOR CLARITY)

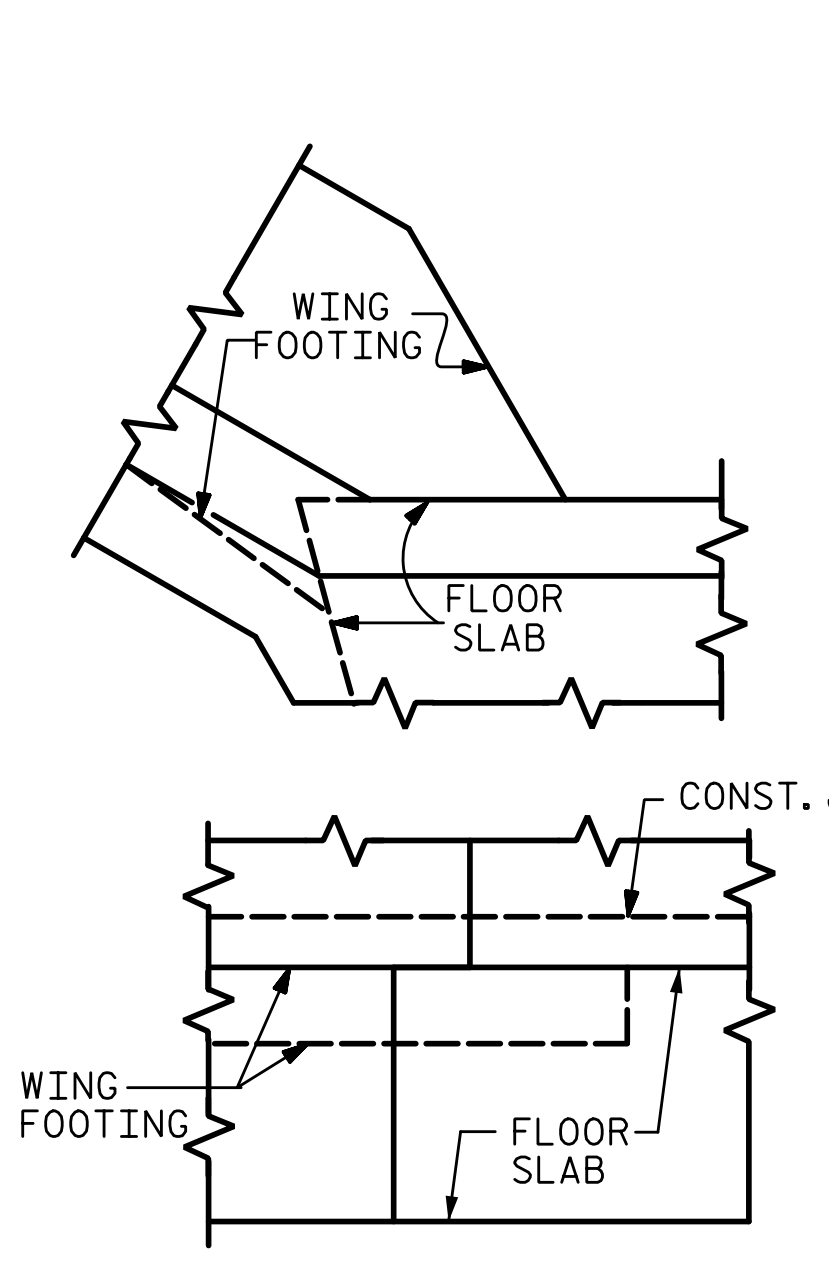


END ELEVATION NORMAL TO SKEW
(SILLS NOT SHOWN FOR CLARITY)

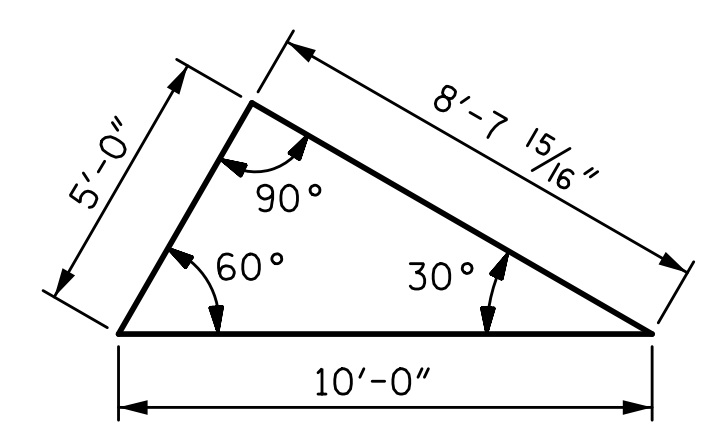


PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB
(SILLS NOT SHOWN FOR CLARITY)



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



SKEW TRIANGLE

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. U-2525C
GUILFORD COUNTY
 STATION: 493+43.00 -L-

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11/16/2017

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

TRIPLE 11 FT. X 9 FT. CONCRETE BOX CULVERT

120° SKEW

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

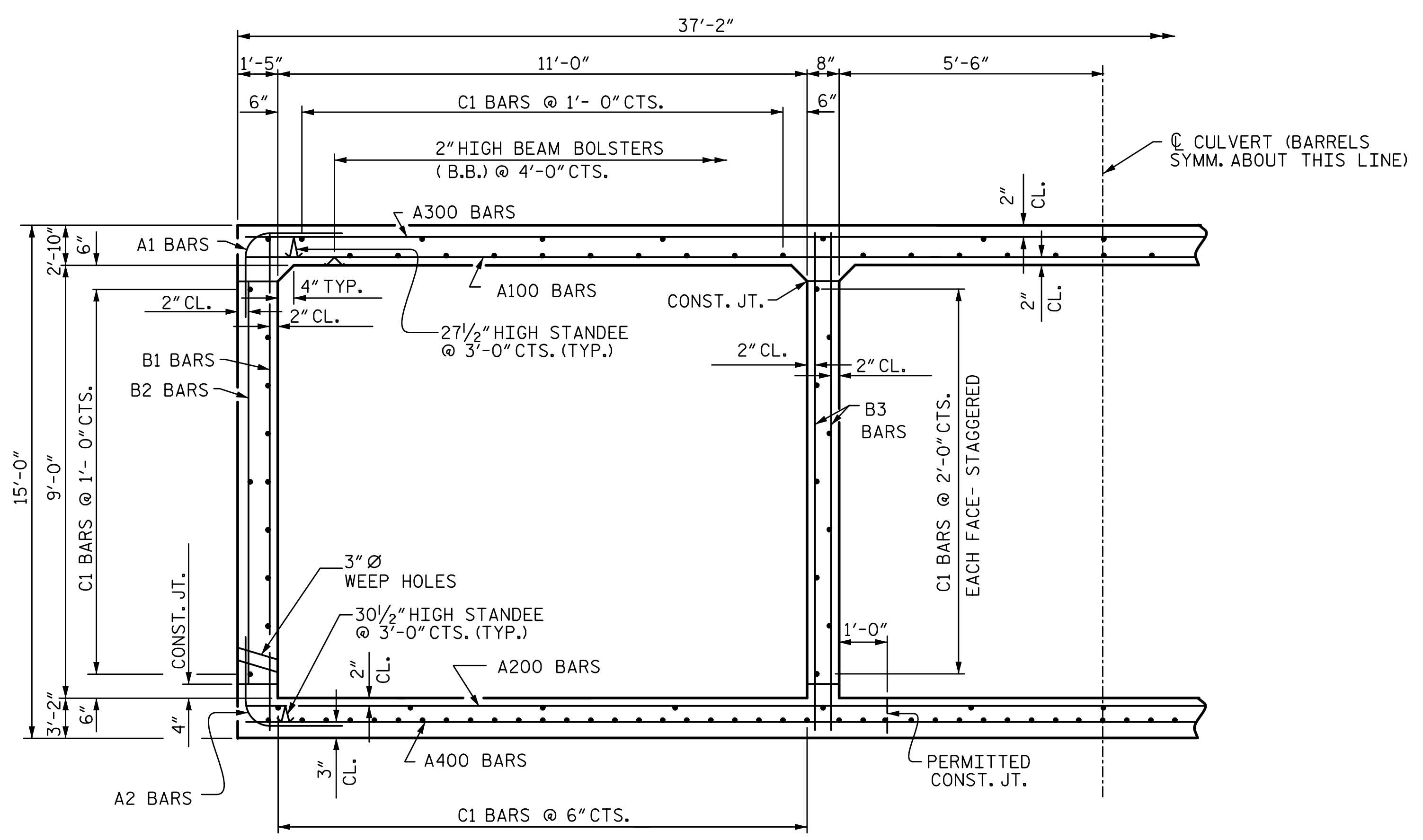
C5-3
 TOTAL SHEETS: 7

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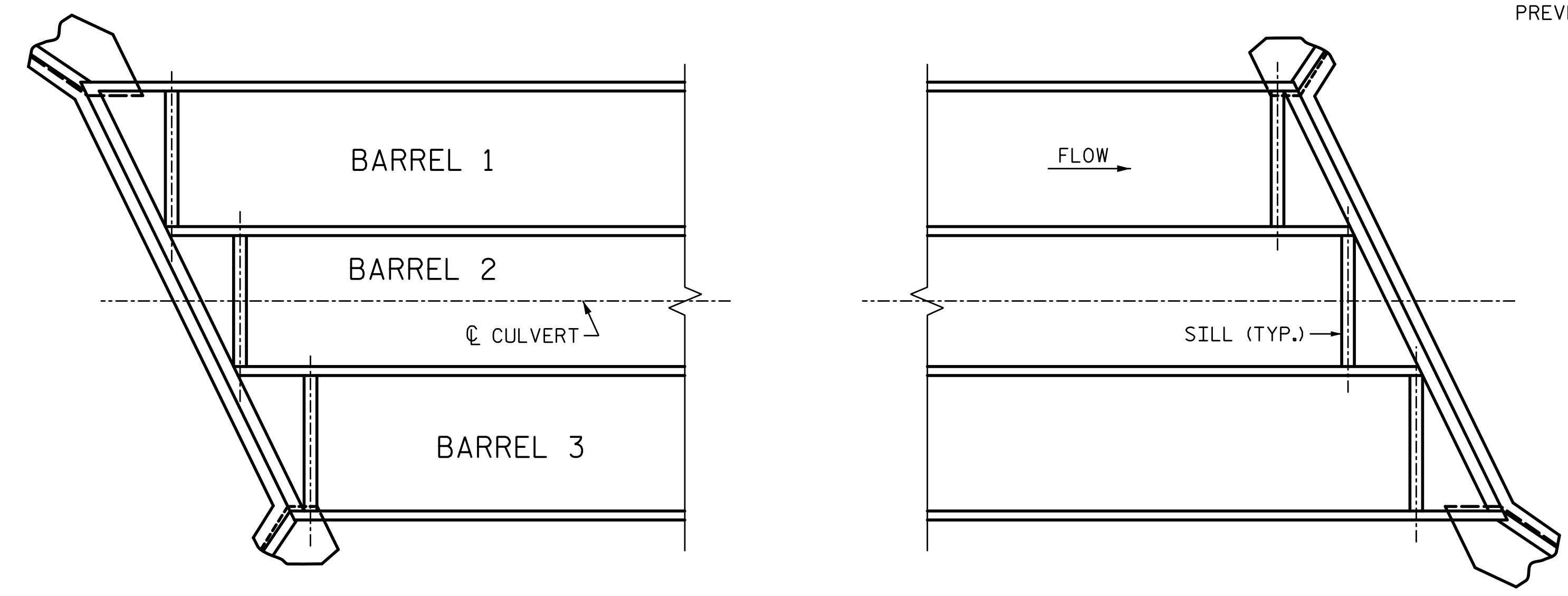
C1 BARS ARE 15 BAR RUNS

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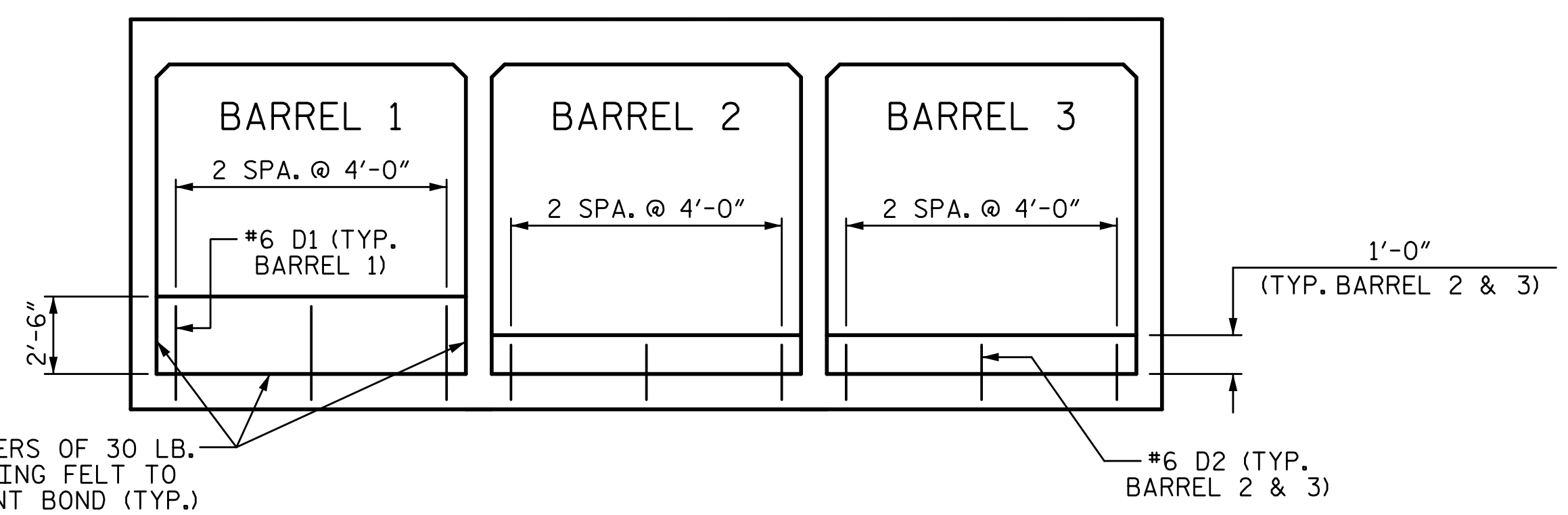
RIGHT ANGLE SECTION OF BARREL
(THERE ARE 166 C1 BARS IN SECTION OF BARREL)



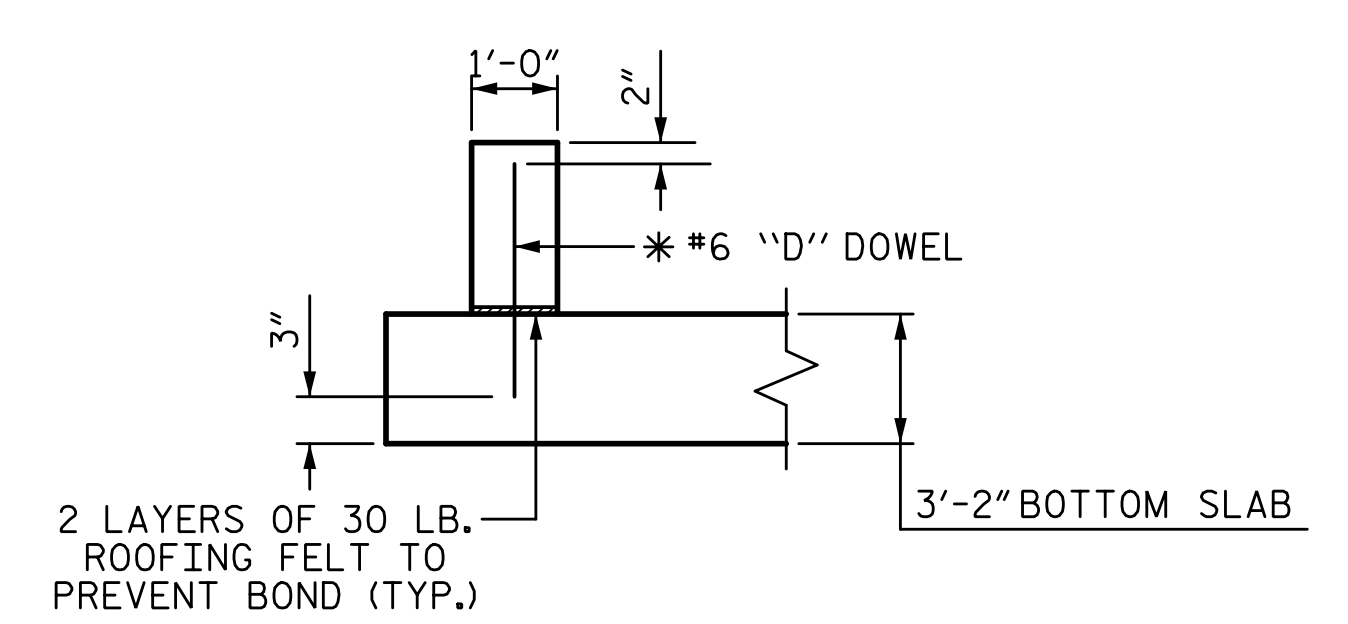
FLOOR PLAN
(SHOWING PLACEMENT OF SILLS)

CULVERT SILL DETAILS

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



ELEVATION - LOOKING DOWNSTREAM



SECTION THROUGH SILL

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

PROJECT NO. U-2525C
GUILFORD COUNTY
 STATION: 493+43.00 -L-

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

TRIPLE 11 FT. X 9 FT. CONCRETE BOX CULVERT

120° SKEW

REVISIONS				SHEET NO.
NO.	BY:	DATE:	NO.	DATE:
1			3	
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TOTAL SHEETS: 7

PLANS PREPARED BY:
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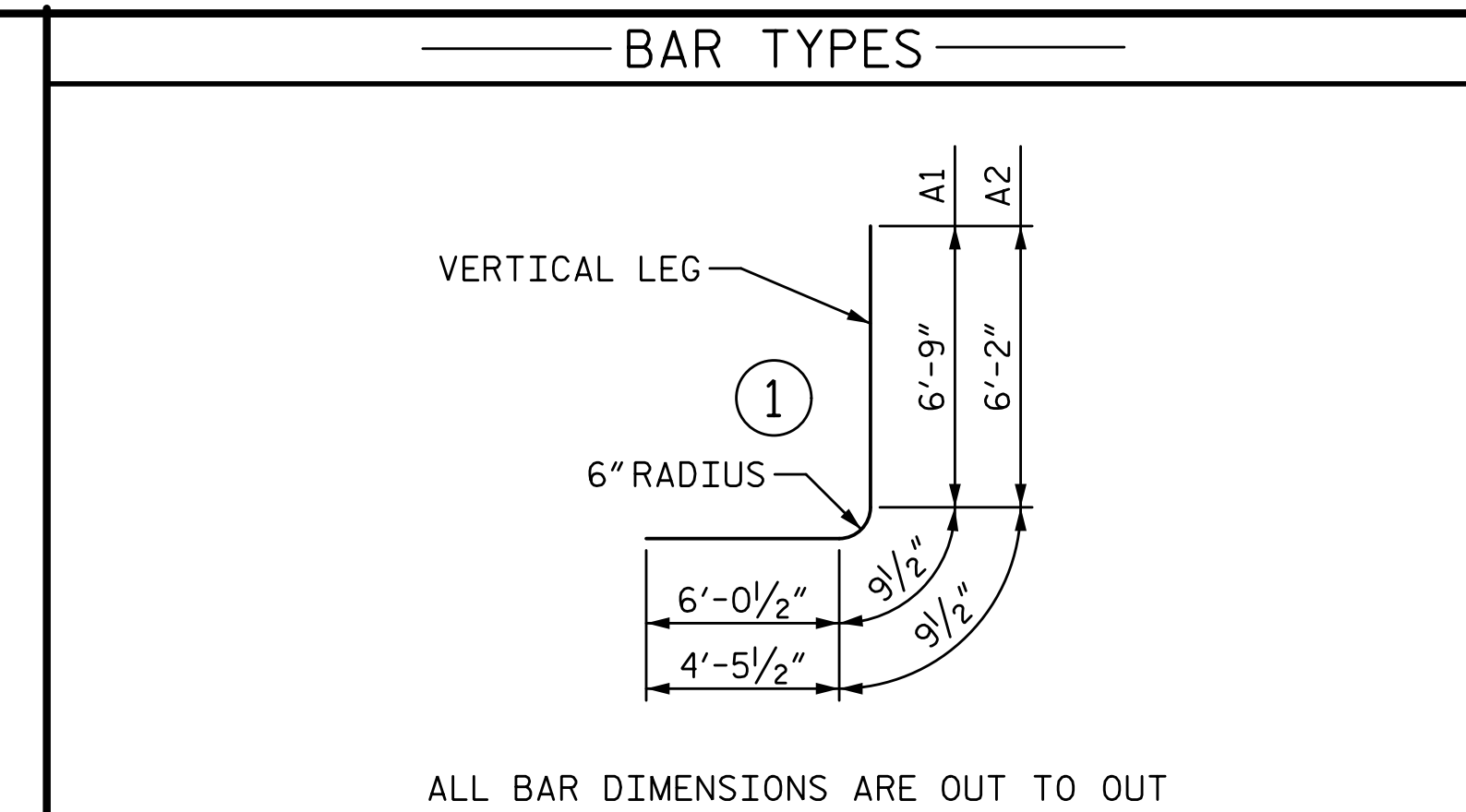
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BILL OF MATERIAL						BILL OF MATERIAL						BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	910	#8	1	13'-7"	33003	A218	2	#9	STR	5'-6"	37	A420	2	#9	STR	4'-11"	33
A2	910	#7	1	11'-5"	21236	A219	2	#9	STR	3'-9"	26	A421	2	#9	STR	3'-4"	23
A100	475	#8	STR	36'-9"	46608	A300	432	#9	STR	36'-9"	53978	B1	834	#7	STR	14'-6"	24718
A101	2	#8	STR	35'-3"	188	A301	2	#9	STR	35'-1"	239	B2	910	#6	STR	8'-4"	11390
A102	2	#8	STR	33'-9"	180	A302	2	#9	STR	33'-6"	228	B3	2224	#6	STR	14'-6"	48436
A103	2	#8	STR	32'-4"	173	A303	2	#9	STR	31'-11"	217						
A104	2	#8	STR	30'-11"	165	A304	2	#9	STR	30'-4"	206	C1	2490	#4	STR	29'-7"	49206
A105	2	#8	STR	29'-5"	157	A305	2	#9	STR	28'-9"	196						
A106	2	#8	STR	28'-0"	150	A306	2	#9	STR	27'-2"	185	D1	6	#6	STR	5'-3"	47
A107	2	#8	STR	26'-7"	142	A307	2	#9	STR	25'-7"	174	D2	12	#6	STR	3'-9"	68
A108	2	#8	STR	25'-1"	134	A308	2	#9	STR	23'-11"	163						
A109	2	#8	STR	23'-8"	126	A309	2	#9	STR	22'-4"	152	G1	8	#6	STR	42'-7"	512
A110	2	#8	STR	22'-3"	119	A310	2	#9	STR	20'-9"	141						
A111	2	#8	STR	20'-9"	111	A311	2	#9	STR	19'-2"	130	S2	16	#6	STR	42'-7"	1023
A112	2	#8	STR	19'-4"	103	A312	2	#9	STR	17'-7"	120						
A113	2	#8	STR	17'-11"	96	A313	2	#9	STR	16'-0"	109	T3	16	#6	STR	3'-9"	90
A114	2	#8	STR	16'-5"	88	A314	2	#9	STR	14'-5"	98						
A115	2	#8	STR	15'-0"	80	A315	2	#9	STR	12'-10"	87	TOTAL REINFORCING STEEL		404133 LB			
A116	2	#8	STR	13'-7"	73	A316	2	#9	STR	11'-3"	77	CLASS A CONCRETE BREAKDOWN					
A117	2	#8	STR	12'-1"	65	A317	2	#9	STR	9'-8"	66	BARREL		4028.5 CY			
A118	2	#8	STR	10'-8"	57	A318	2	#9	STR	8'-1"	55	SILLS		3.7 CY			
A119	2	#8	STR	9'-3"	49	A319	2	#9	STR	6'-6"	44						
A120	2	#8	STR	7'-9"	41	A320	2	#9	STR	4'-11"	33						
A121	2	#8	STR	6'-4"	34	A321	2	#9	STR	3'-4"	23						
A122	2	#8	STR	4'-11"	26												
A123	2	#8	STR	3'-6"	19	A400	432	#9	STR	36'-9"	53978						
						A401	2	#9	STR	35'-1"	239						
A200	396	#9	STR	36'-9"	49480	A402	2	#9	STR	33'-6"	228						
A201	2	#9	STR	34'-11"	237	A403	2	#9	STR	31'-11"	217						
A202	2	#9	STR	33'-2"	226	A404	2	#9	STR	30'-4"	206						
A203	2	#9	STR	31'-6"	214	A405	2	#9	STR	28'-9"	196						
A204	2	#9	STR	29'-9"	202	A406	2	#9	STR	27'-2"	185						
A205	2	#9	STR	28'-0"	190	A407	2	#9	STR	25'-7"	174						
A206	2	#9	STR	26'-3"	179	A408	2	#9	STR	23'-11"	163						
A207	2	#9	STR	24'-6"	167	A409	2	#9	STR	22'-4"	152						
A208	2	#9	STR	22'-10"	155	A410	2	#9	STR	20'-9"	141						
A209	2	#9	STR	21'-1"	143	A411	2	#9	STR	19'-2"	130						
A210	2	#9	STR	19'-4"	131	A412	2	#9	STR	17'-7"	120						
A211	2	#9	STR	17'-7"	120	A413	2	#9	STR	16'-0"	109						
A212	2	#9	STR	15'-10"	108	A414	2	#9	STR	14'-5"	98						
A213	2	#9	STR	14'-2"	96	A415	2	#9	STR	12'-10"	87						
A214	2	#9	STR	12'-5"	84	A416	2	#9	STR	11'-3"	77						
A215	2	#9	STR	10'-8"	73	A417	2	#9	STR	9'-8"	66						
A216	2	#9	STR	8'-11"	61	A418	2	#9	STR	8'-1"	55						
A217	2	#9	STR	7'-3"	49	A419	2	#9	STR	6'-6"	44						



SPLICE CHART

- #7 B1 SPLICE LENGTH = 3'-2"
- #6 B3 SPLICE LENGTH = 2'-9"
- #4 C1 SPLICE LENGTH = 1'-11"
- #9 A200 SPLICE LENGTH = 7'-0"
- #9 A400 SPLICE LENGTH = 5'-0"

PROJECT NO. U-2525C
GUILFORD COUNTY
 STATION: 493+43.00 -L-

PLANS PREPARED BY:
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 5640 Dilford Drive
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 (919) 852-0468
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 LICENSURE NO. C-2521



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**TRIPLE 11 FT. X 9 FT.
 CONCRETE BOX CULVERT**

120° SKEW

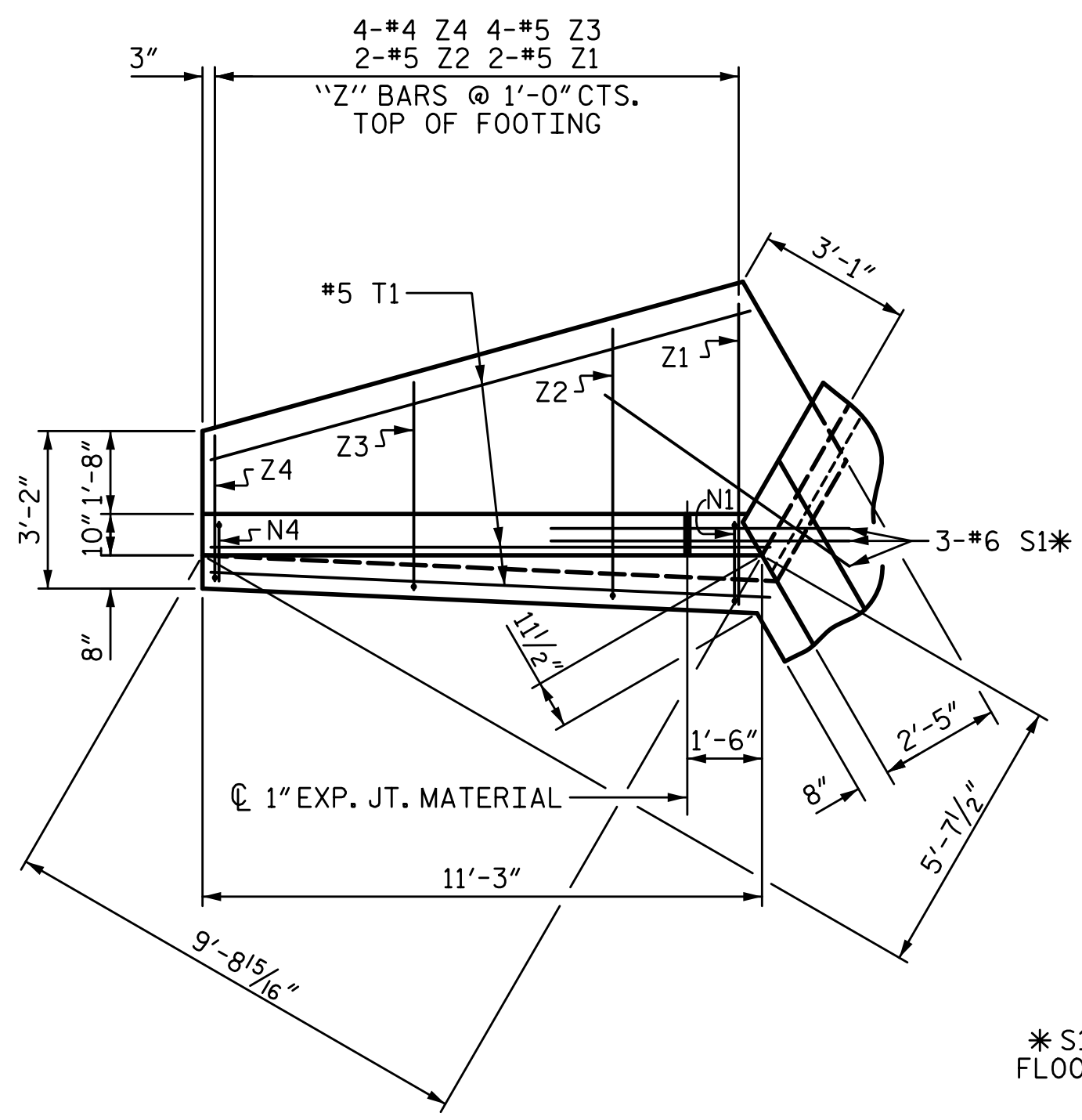
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C5-5
TOTAL SHEETS
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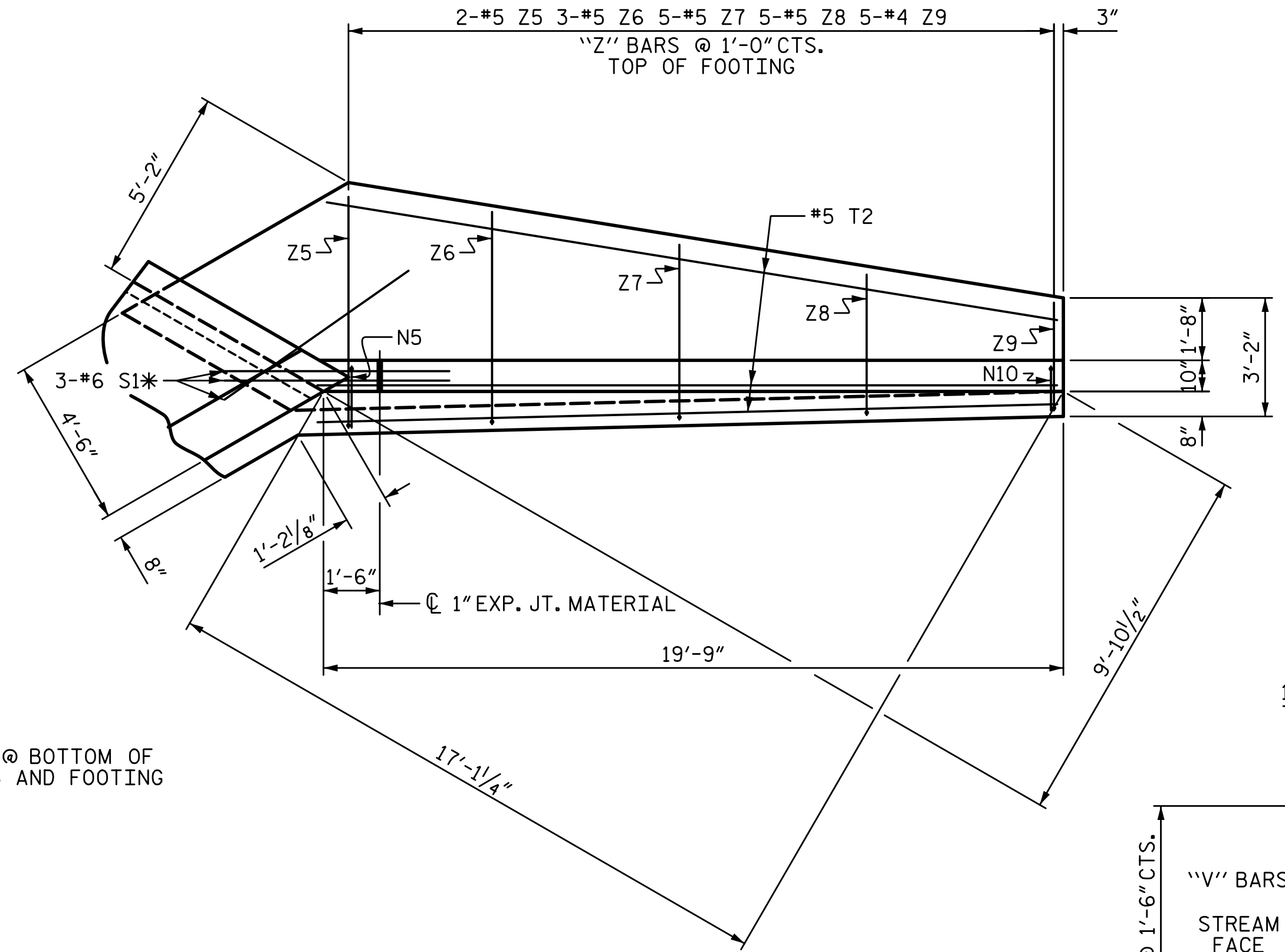
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 CHECKED BY: M.A. AVERETTE DATE: 10-17
 DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 10-17

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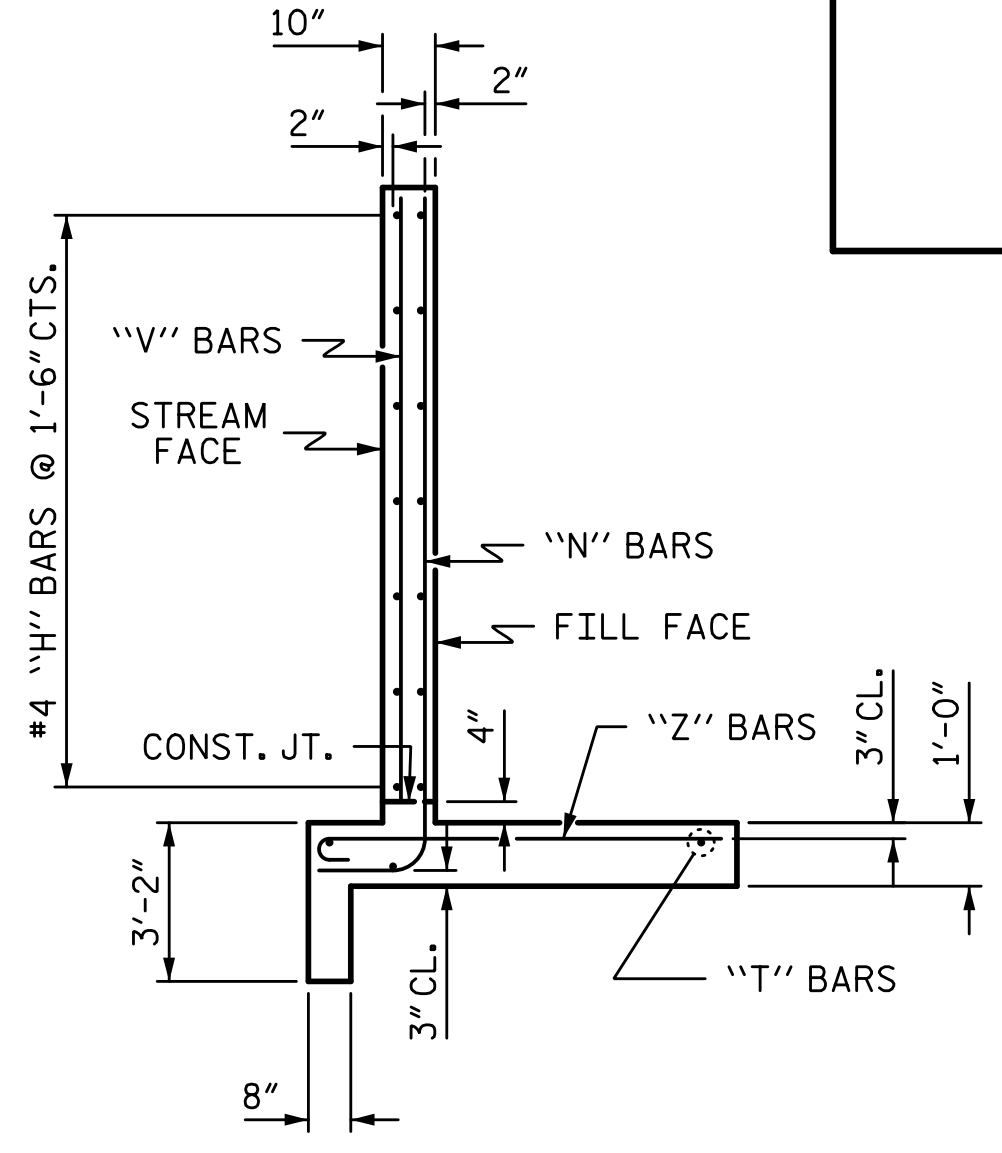
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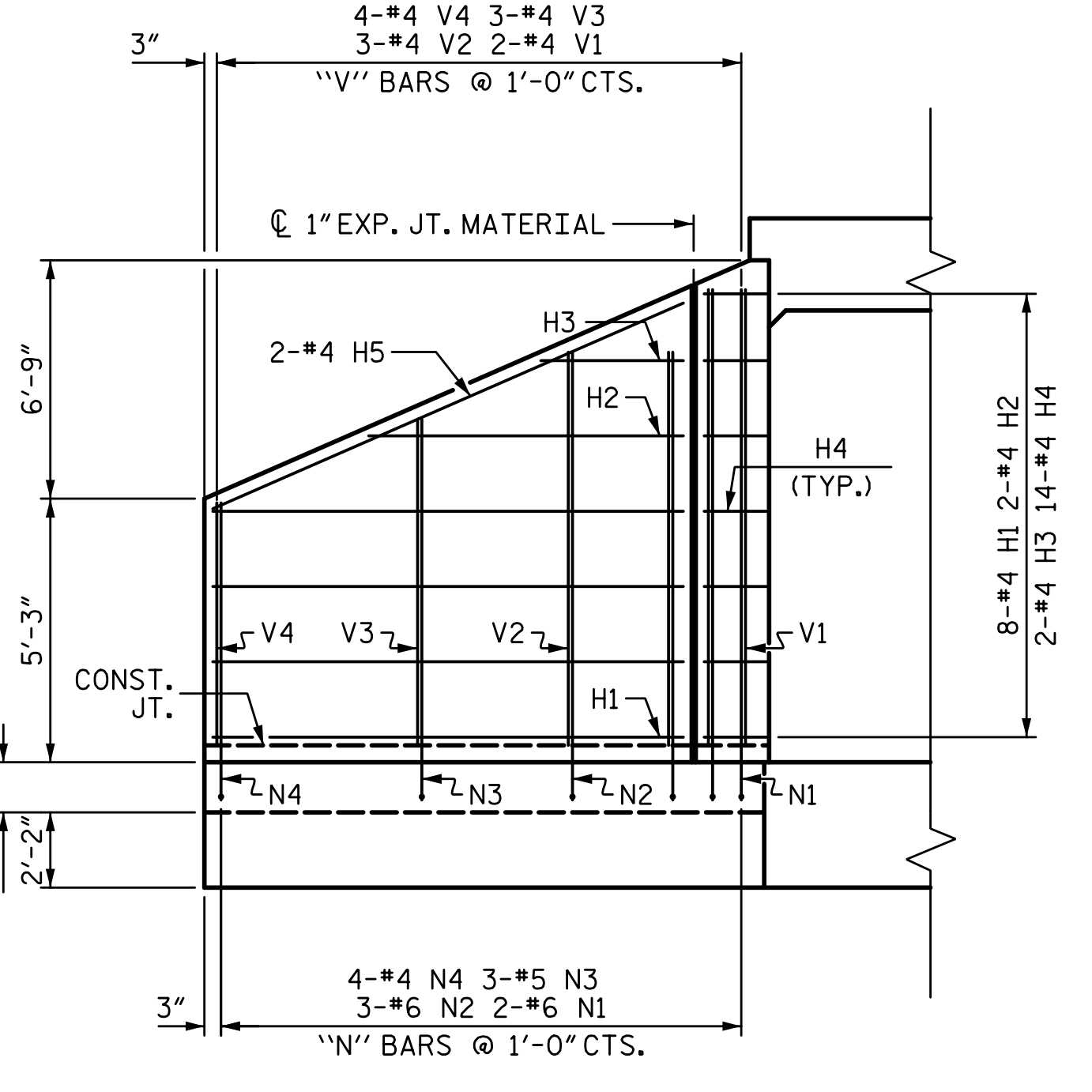
PLAN W2



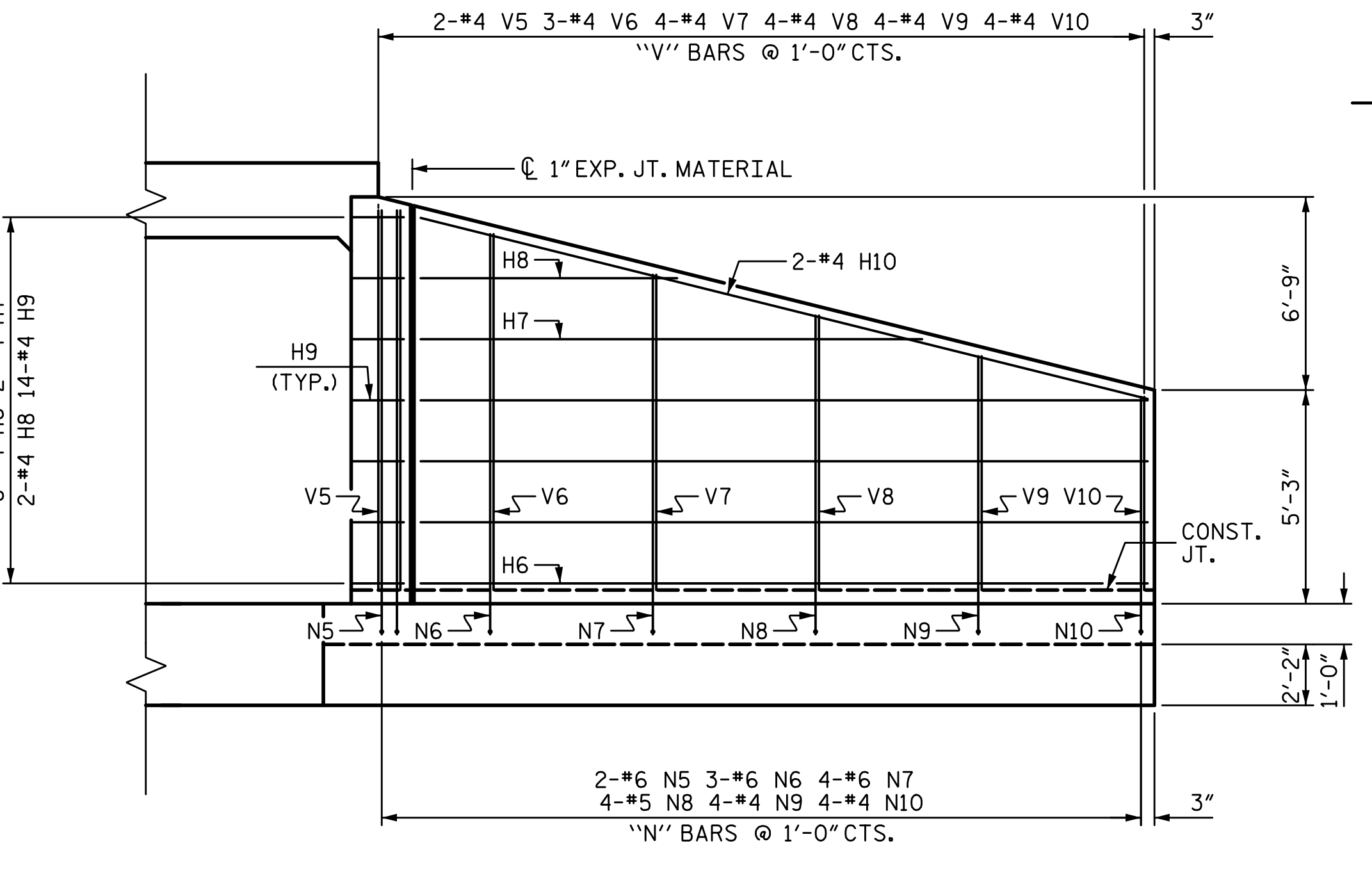
PLAN W1



TYPICAL WING SECTION

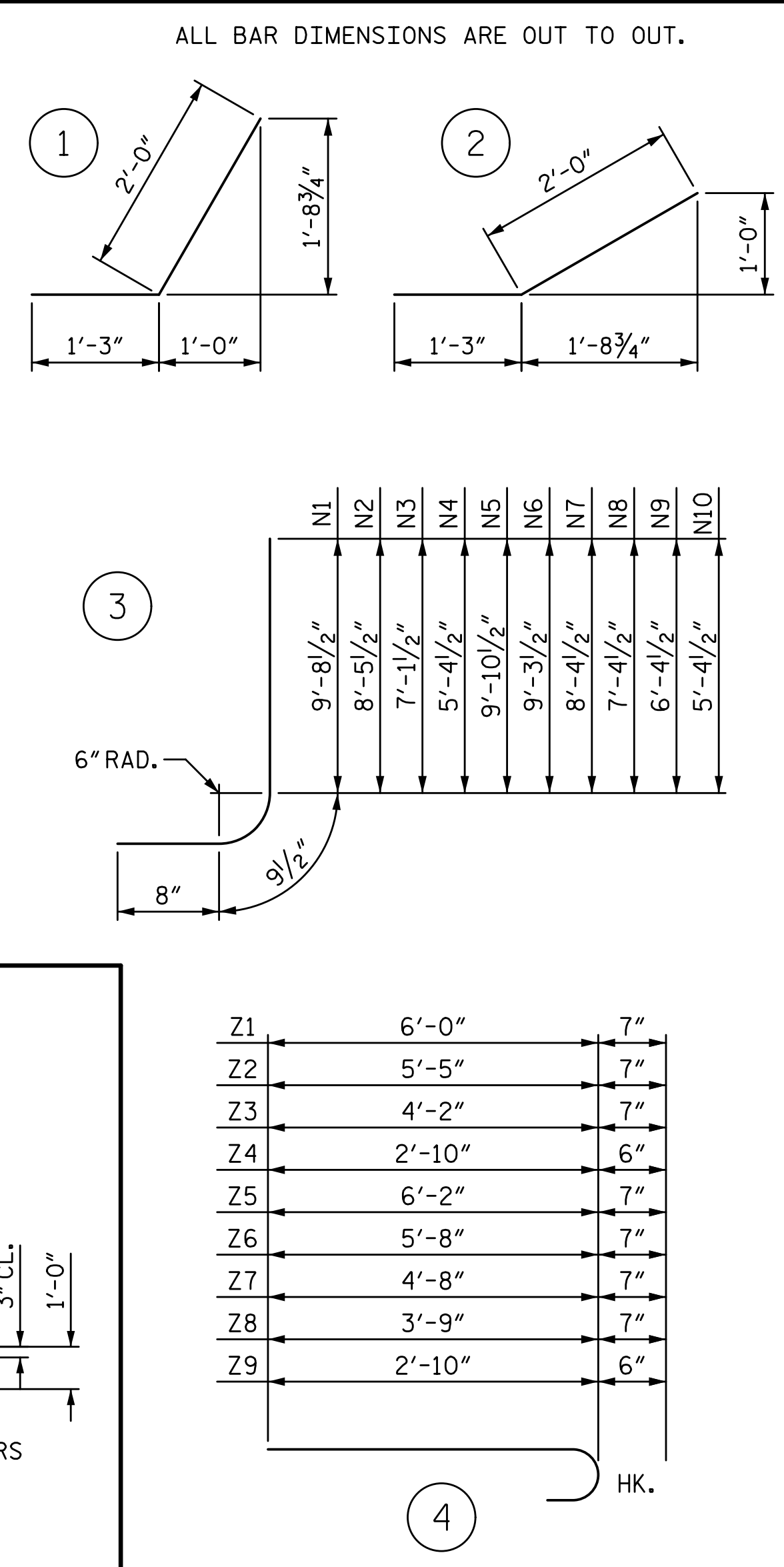


ELEVATION W2



ELEVATION W1

BAR TYPES



BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	16	#4	STR	9'-4"	100
H2	4	#4	STR	6'-3"	17
H3	4	#4	STR	2'-10"	8
H4	28	#4	1	3'-3"	61
H5	4	#4	STR	10'-2"	27
H6	16	#4	STR	17'-10"	191
H7	4	#4	STR	12'-4"	33
H8	4	#4	STR	6'-3"	17
H9	28	#4	2	3'-3"	61
H10	4	#4	STR	18'-5"	49
N1	4	#6	3	11'-2"	67
N2	6	#6	3	9'-11"	89
N3	6	#5	3	8'-7"	54
N4	8	#4	3	6'-10"	37
N5	4	#6	3	11'-4"	68
N6	6	#6	3	10'-9"	97
N7	8	#6	3	9'-10"	118
N8	8	#5	3	8'-10"	74
N9	8	#4	3	7'-10"	42
N10	8	#4	3	6'-10"	37
S1	12	#6	STR	6'-0"	108
T1	6	#5	STR	11'-3"	70
T2	6	#5	STR	19'-9"	124
V1	4	#4	STR	9'-1"	24
V2	6	#4	STR	7'-10"	31
V3	6	#4	STR	6'-6"	26
V4	8	#4	STR	4'-10"	26
V5	4	#4	STR	9'-4"	25
V6	6	#4	STR	8'-9"	35
V7	8	#4	STR	7'-9"	41
V8	8	#4	STR	6'-9"	36
V9	8	#4	STR	5'-9"	31
V10	8	#4	STR	4'-9"	25
Z1	4	#5	4	6'-7"	27
Z2	4	#5	4	6'-0"	25
Z3	8	#5	4	4'-9"	40
Z4	8	#4	4	3'-4"	18
Z5	4	#5	4	6'-9"	28
Z6	6	#5	4	6'-3"	39
Z7	10	#5	4	5'-3"	55
Z8	10	#5	4	4'-4"	45
Z9	10	#4	4	3'-4"	22
REINFORCING STEEL				2148 LBS	
FOR 4 WINGS					
CLASS A CONCRETE					
4 WINGS				30.2	CY
2 HEADWALLS				4.0	CY
2 END CURTAIN WALLS				5.9	CY
TOTAL				40.1	CY

PROJECT NO. U-2525C
 GUILFORD COUNTY
 STATION: 493+43.00 -L-

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
WINGS FOR CONCRETE BOX CULVERT
 H = 9'-0" SLOPE = 2:1
 120° SKEW

DRAWN BY: R. SEALEY DATE: 10-17
 CHECKED BY: M.A. AVERETTE DATE: 10-17
 DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 10-17

PLANS PREPARED BY:
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11/16/2017

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C5-6
TOTAL SHEETS
7

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

LEVEL	VEHICLE	WEIGHT (TONS)	CONTROLLING LOAD RATING	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER	
						MOMENT				SHEAR					
						LIVE-LOAD FACTORS (%LL)	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	N/A	N/A	1.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HL-93 (OPERATING)	N/A		N/A	N/A	1.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HS-20 (INVENTORY)	36.000	②	N/A	N/A	1.75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	HS-20 (OPERATING)	36.000		N/A	N/A	1.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SH	12.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S3C	21.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S3A	22.750		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S4A	26.750		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S5A	30.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S6A	34.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S7B	38.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		S7A	40.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	TRUCK TRACTOR SEMI-TRAILER (TTST)	T4A	28.250		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T5B	32.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T6A	36.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		T7A	40.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	T7B	40.000		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
PERMANENT LOAD			④	1.03			1.03	1	INT. WALL-MID.	4.8	1.09	1	TOP SLAB RT.	9.3	2

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

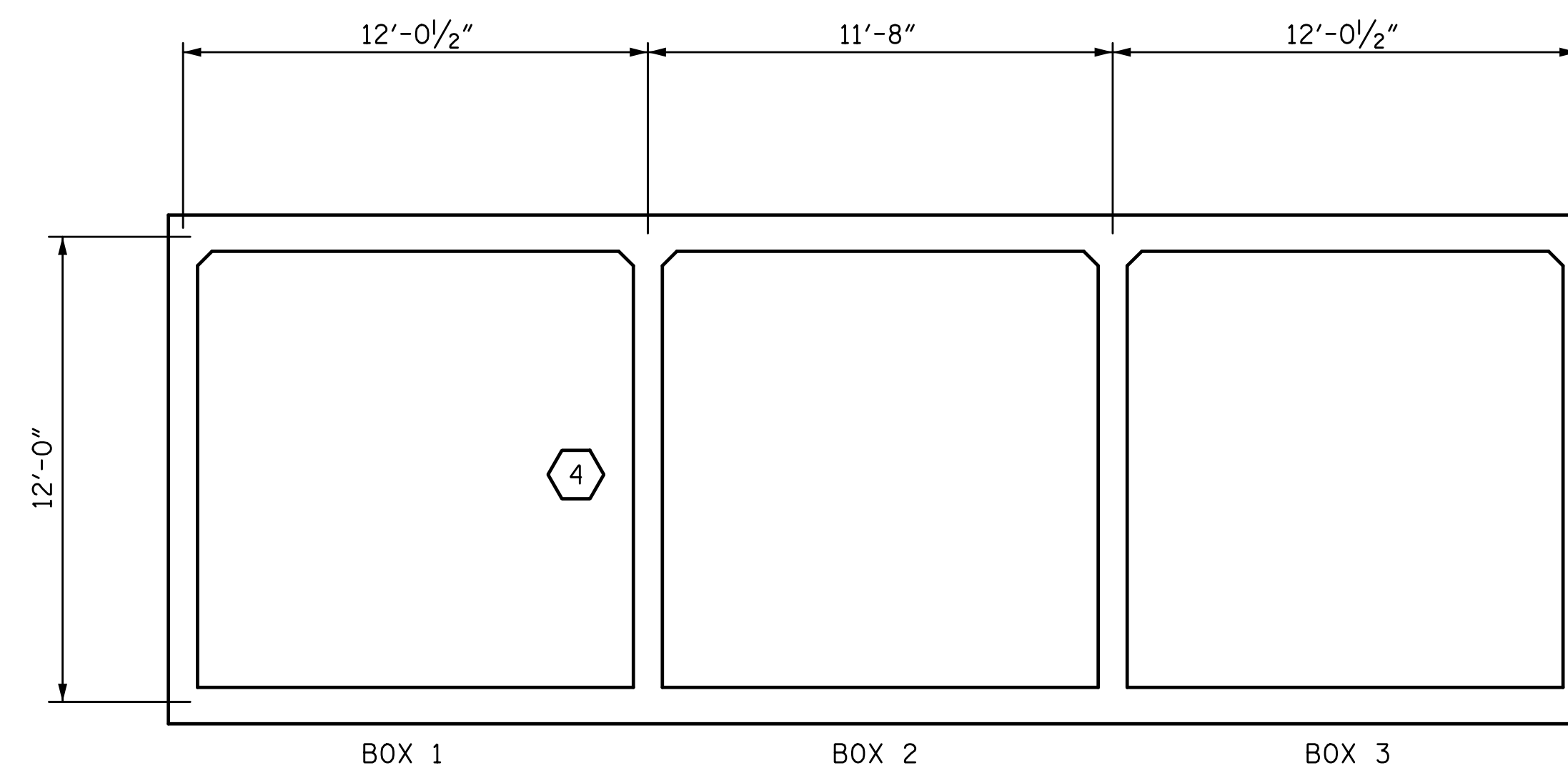
NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM CENTERLINE OF ELEMENT.

COMMENTS:

- EFFECTS OF LIVE LOAD MAY BE NEGLECTED ACCORDING TO AASHTO LRFD 3.6.1.2.6A (DESIGN FILL = 54'-0")
- CULVERTS WITH DEEP FILLS SHOULD BE EVALUATED FOR THE EFFECTS OF PERMANENT LOADS ONLY ACCORDING TO "THE MANUAL FOR BRIDGE EVALUATION 6A.5.12.10.3A"

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



LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. U-2525C
GUILFORD COUNTY
STATION: 493+43.00 -L-

DRAWN BY: R. SEALEY DATE: 10-17
CHECKED BY: M.A. AVERETTE DATE: 10-17
DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 10-17

PLANS PREPARED BY:
SIMPSON ENGINEERS & ASSOCIATES
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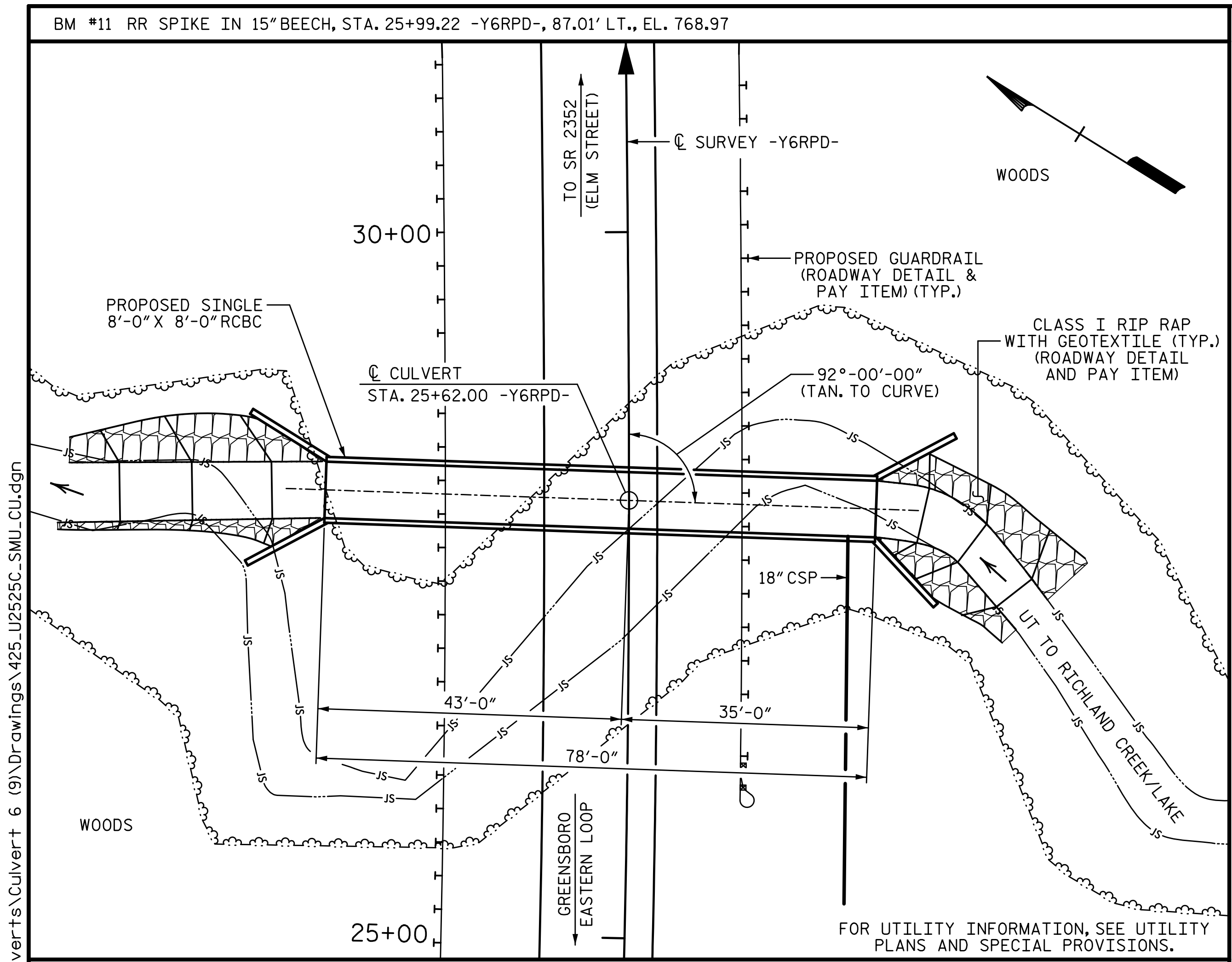
11/16/2017

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
**LRFR SUMMARY FOR
REINFORCED CONCRETE
BOX CULVERTS**
(INTERSTATE TRAFFIC)

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

TOTAL SHEETS	7
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UNLESS ALL SIGNATURES COMPLETED**



LOCATION SKETCH

HYDRAULIC DATA:

DESIGN DISCHARGE	= 290 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YEAR
DESIGN HIGH WATER ELEVATION	= 771.40
DRAINAGE AREA	= 0.28 SQ. MI.
BASE DISCHARGE (Q 100)	= 310 CFS
BASE HIGH WATER ELEVATION	= 771.68

OVERTOPPING FLOOD DATA:

OVERTOPPING DISCHARGE	= 1020 CFS
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YEAR
OVERTOPPING FLOOD ELEVATION	= 781.40 **
** OVERTOPPING OCCURS AT ROADWAY STA. 26+35.00 -Y6RPD- AT THE SHOULDER POINT	

GRADE DATA:

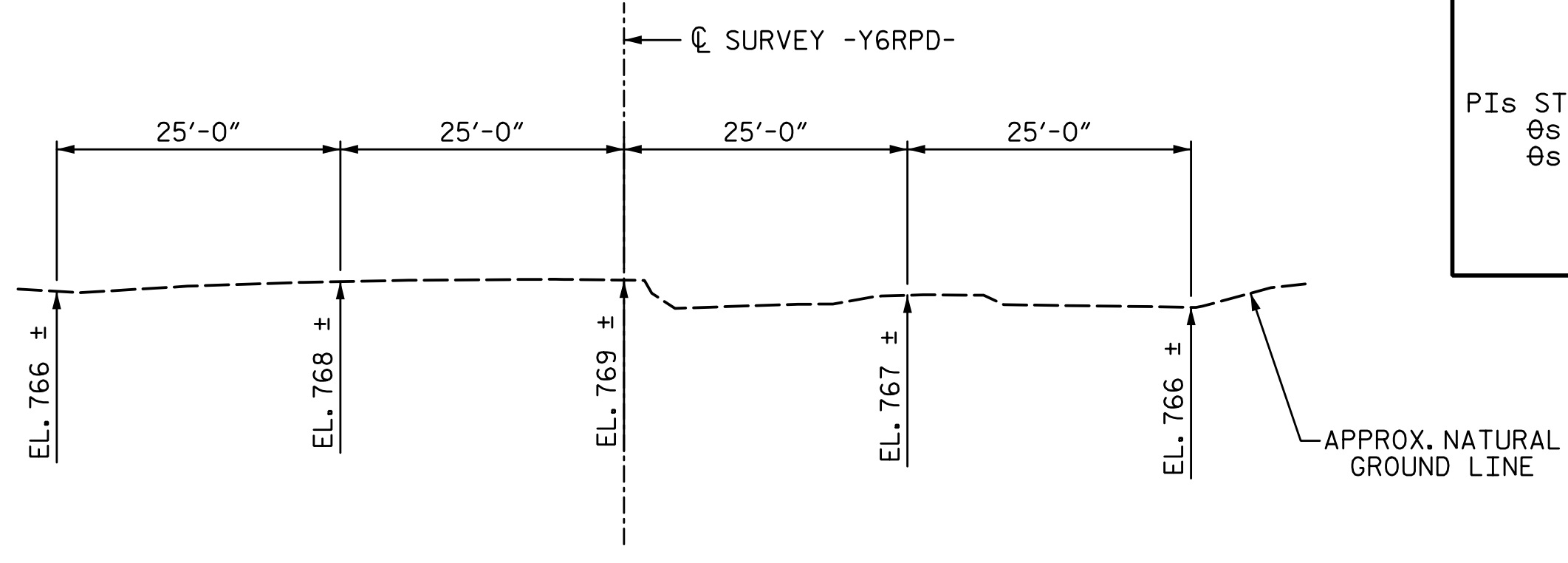
GRADE POINT EL. @ STA. 25+62.00 -Y6RPD-	= EL. 781.49
BED EL. @ STA. 25+62.00 -Y6RPD-	= 764.47
ROADWAY SLOPE 2:1	

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE		
BARREL @	1.033 CY/FT	80.6 C.Y.
SILLS AND BAFFLES		1.2 C.Y.
WINGS ETC.		23.1 C.Y.
TOTAL		104.9 C.Y.
REINFORCING STEEL		
BARREL		11,286 LBS.
WINGS ETC.		1,453 LBS.
TOTAL		12,739 LBS.
CULVERT EXCAVATION		LUMP SUM
FOUNDATION CONDITIONING MATERIAL		74 TONS

HORIZONTAL CURVE DATA

PIs STA. 11+12.68 -Y6RPD-	PI STA. 18+55.67 -Y6RPD-	PIs STA. 25+39.02 -Y6RPD-
$\theta_s = 0^\circ-43'-38.8''$	$\Delta = 36^\circ-52'-12.6''$ (LT.)	$\theta_s = 2^\circ-42'-26.0''$
$\theta_s = 2^\circ-42'-26.7''$	$D = 2^\circ-51'-53.2''$	$L_s = 189.00'$
$L_s = 189.00'$	$L = 1287.01'$	$LT = 126.01'$
$LT = 112.68'$	$T = 666.67'$	$ST = 63.01'$
$ST = 76.37'$	$R = 2000.00'$	



PROFILE ALONG CULVERT

NOTES:

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

DESIGN FILL----- 7'-6" (MIN. AND 9'-6" (MAX.)

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.

THE ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.

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

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

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

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.

TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.

THE 18" CSP THROUGH THE SIDEWALL OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE FIELD BENT AS NECESSARY TO CLEAR PIPE.

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

NO WORK SHALL BE DONE ON THE CULVERT AT STA. 25+62.00 -Y6RPD- UNTIL THE AREA OF THE BOX CULVERT HAS BEEN UNDERCUT UP TO 1 FOOT AND UNSUITABLE MATERIAL REPLACED WITH FOUNDATION CONDITIONING MATERIAL, PROPERLY COMPACTED TO THE ELEVATION OF THE BOTTOM OF THE PROPOSED FLOOR SLAB. THE LIMITS OF THIS UNDERCUT EXCAVATION SHALL BE AT LEAST THE LIMITS OF THE BOX CULVERT INCLUDING THE WINGS AS DIRECTED BY THE ENGINEER. NO SEPARATE PAYMENT WILL BE MADE FOR ANY TEMPORARY SHEETING, UNDERCUT, OR UNSUITABLE MATERIAL REPLACEMENT AS REQUIRED TO CONSTRUCT THE PROPOSED CULVERT. PAYMENT IS INCLUDED IN THE LUMP SUM PRICE FOR CULVERT EXCAVATION AND THE FOUNDATION CONDITIONING MATERIAL PAY ITEM.

PROJECT NO. U-2525C
GUILFORD COUNTY
 STATION: 25+62.00 -Y6RPD-

CULVERT NO. 401269

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 8 FT. X 8 FT. CONCRETE BOX CULVERT

92° SKEW

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

SHEET NO. C6-1
 TOTAL SHEETS 5

PLANS PREPARED BY:

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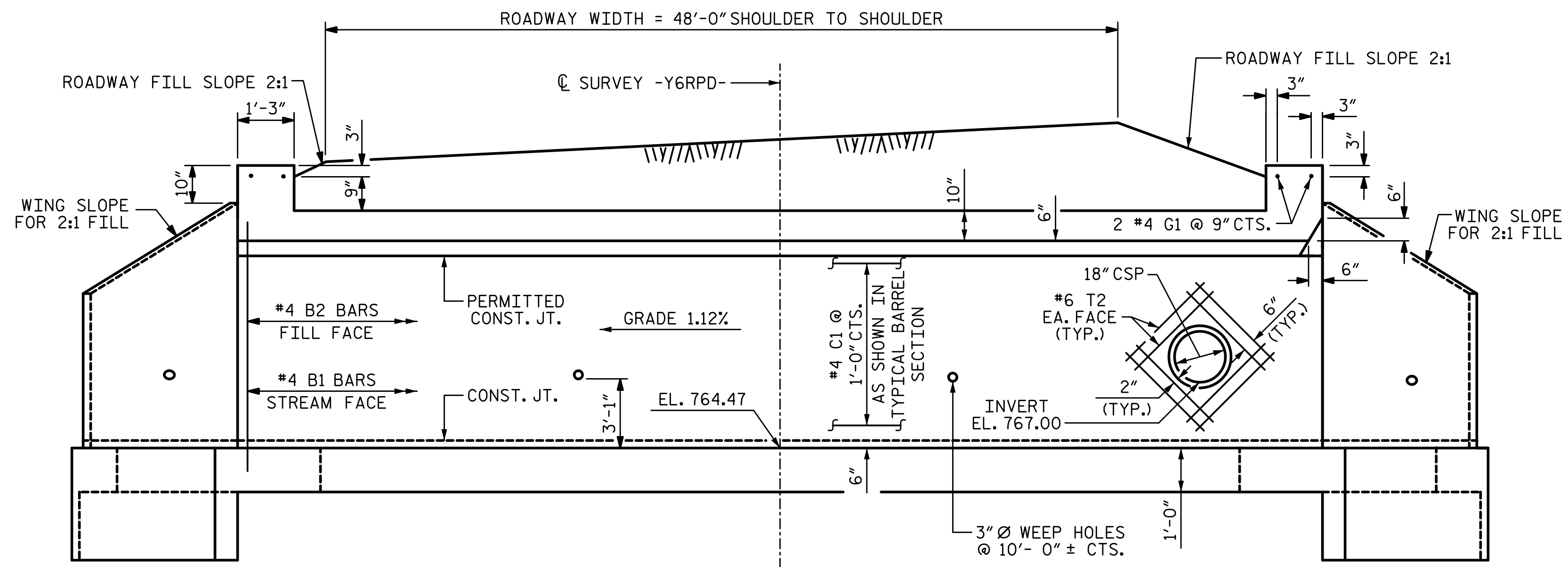


DRAWN BY: T. BANKOVICH DATE: 9-17
 CHECKED BY: M.A. AVERETTE DATE: 9-17
 DESIGN ENGINEER OF RECORD: M.A. AVERETTE DATE: 9-17

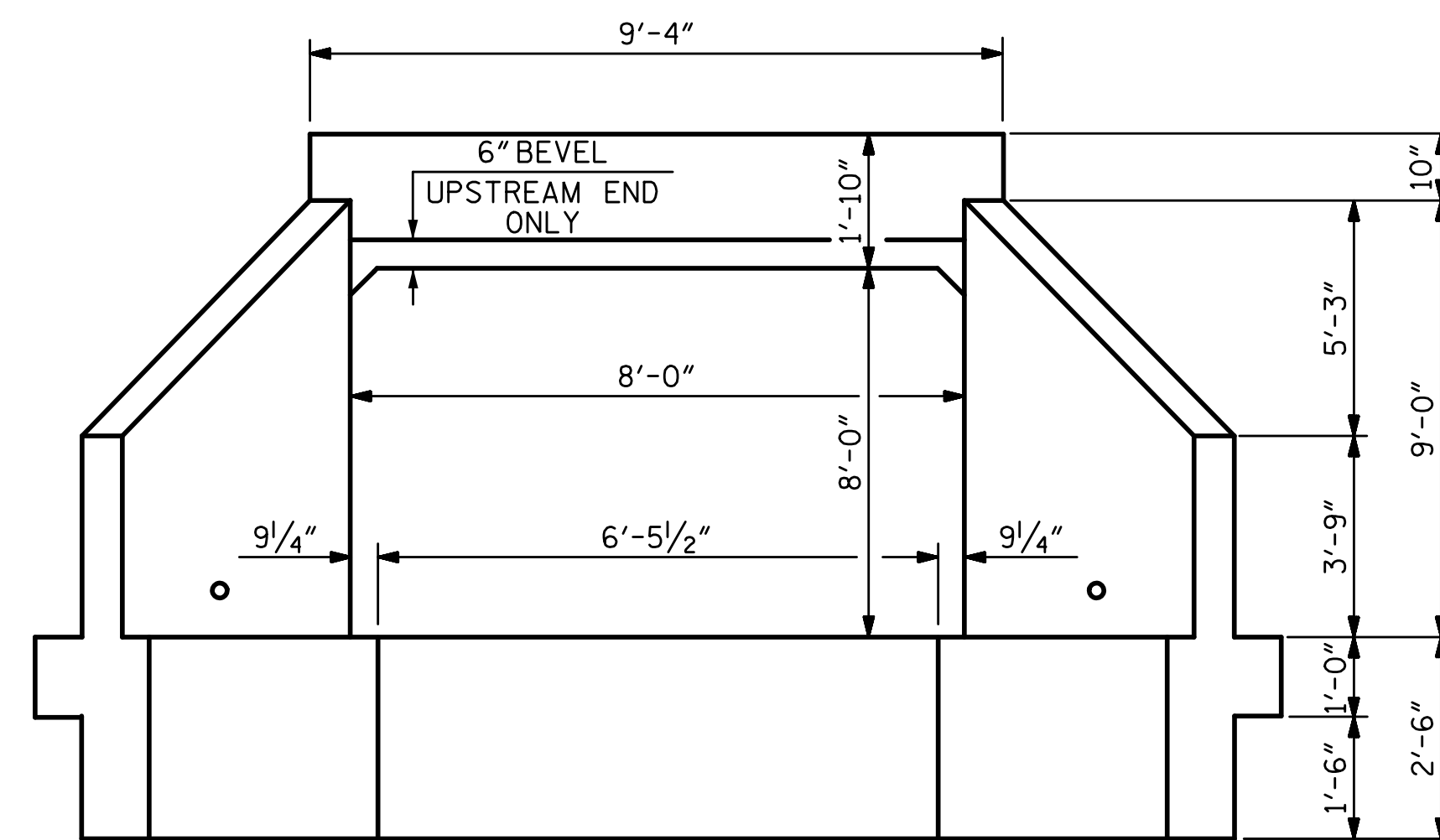
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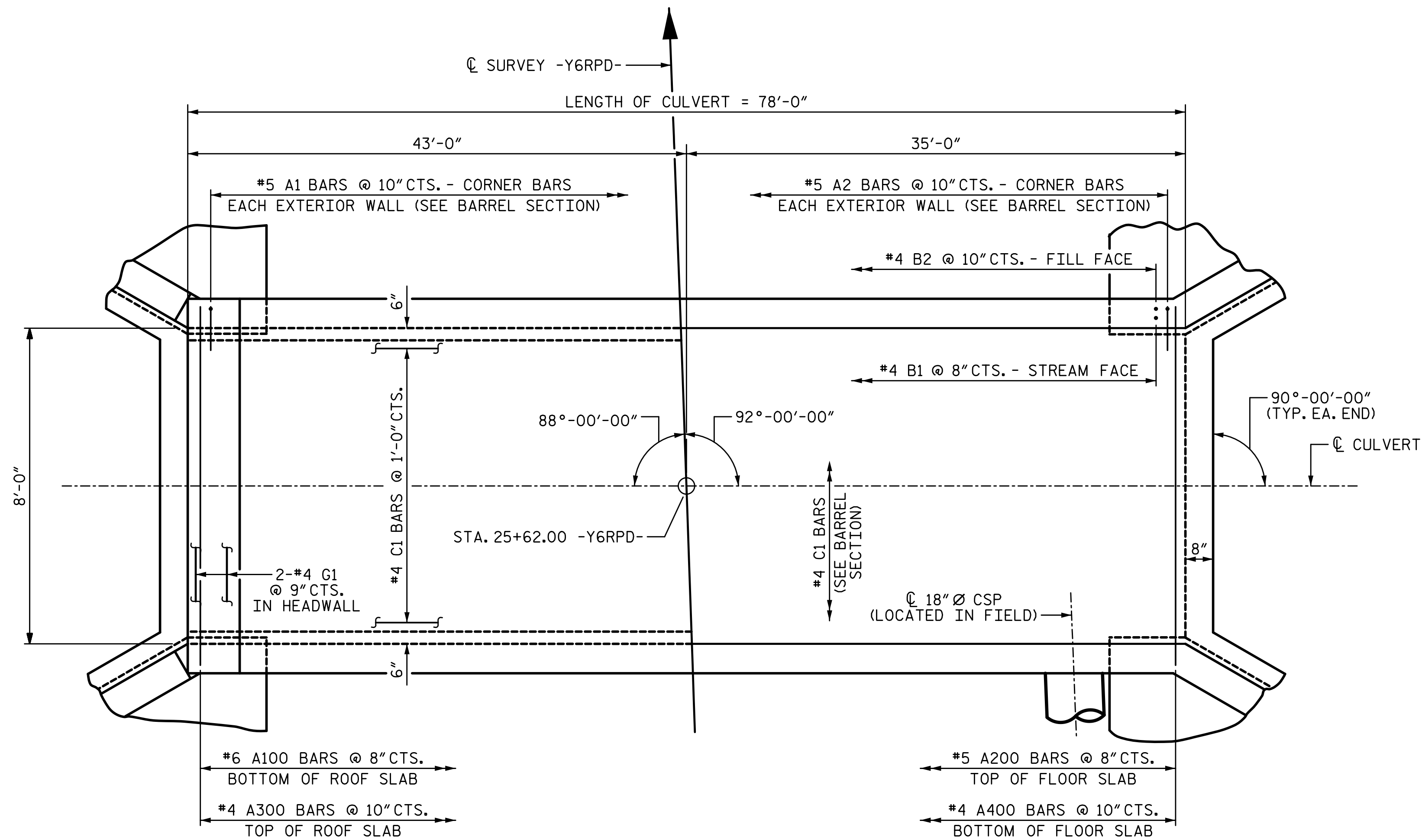
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CULVERT SECTION NORMAL TO ROADWAY
(SILLS AND BAFFLES NOT SHOWN FOR CLARITY)



END ELEVATION - NORMAL TO SKEW
(SILLS AND BAFFLES NOT SHOWN, SEE SHEET 3 FOR DETAILS)



PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

(SILLS AND BAFFLES NOT SHOWN FOR CLARITY)

C1 BARS ARE 3 BAR RUNS

PROJECT NO. U-2525C
GUILFORD COUNTY
STATION: 25+62.00 -Y6RPD-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

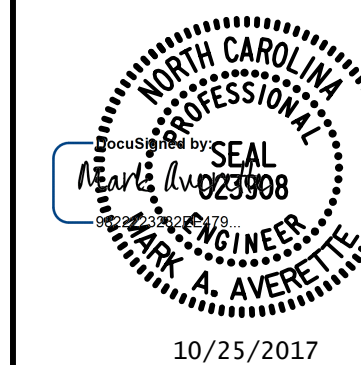
**SINGLE 8 FT. X 8 FT.
CONCRETE BOX CULVERT**

92° SKEW

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

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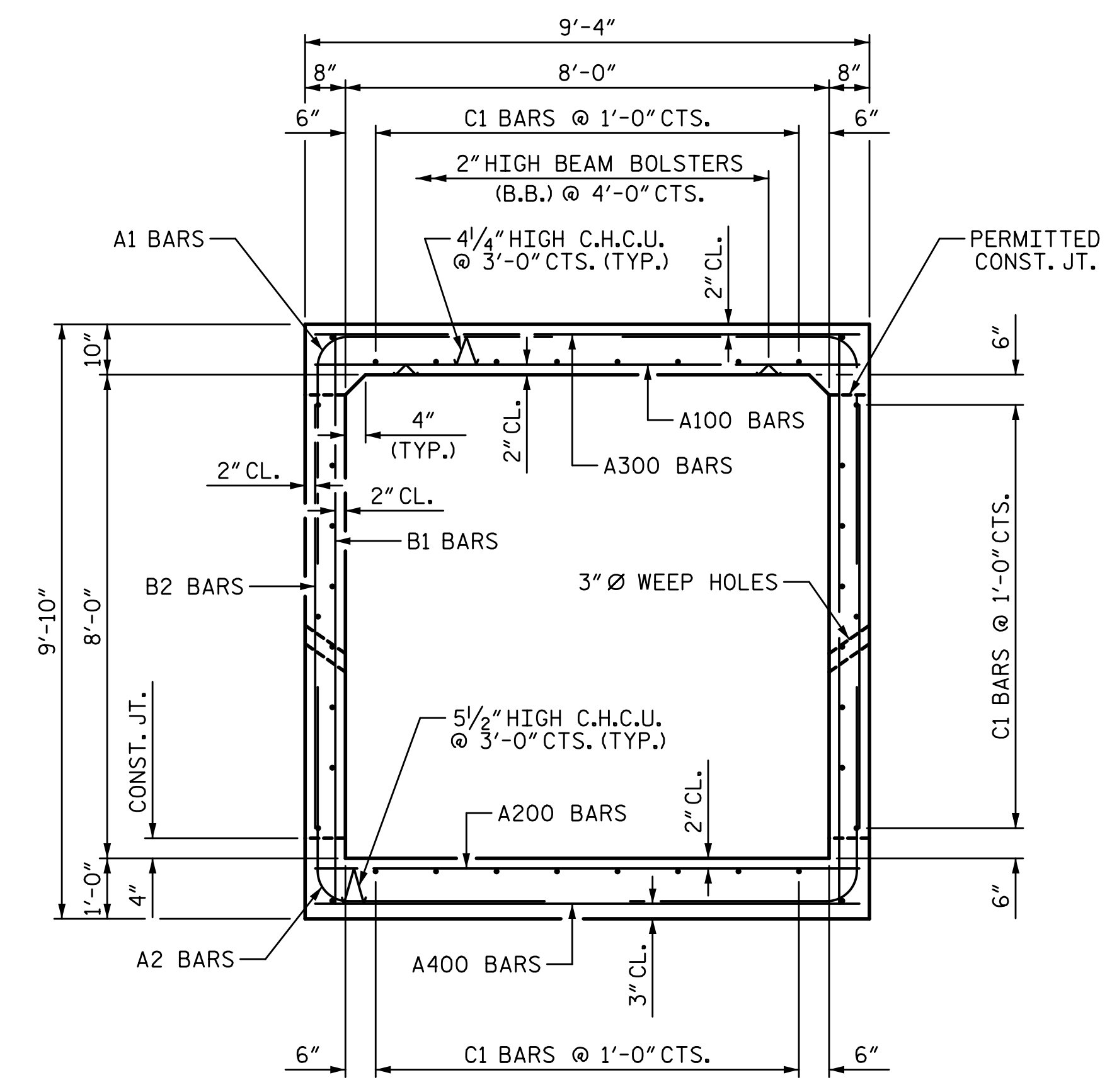


10/25/2017

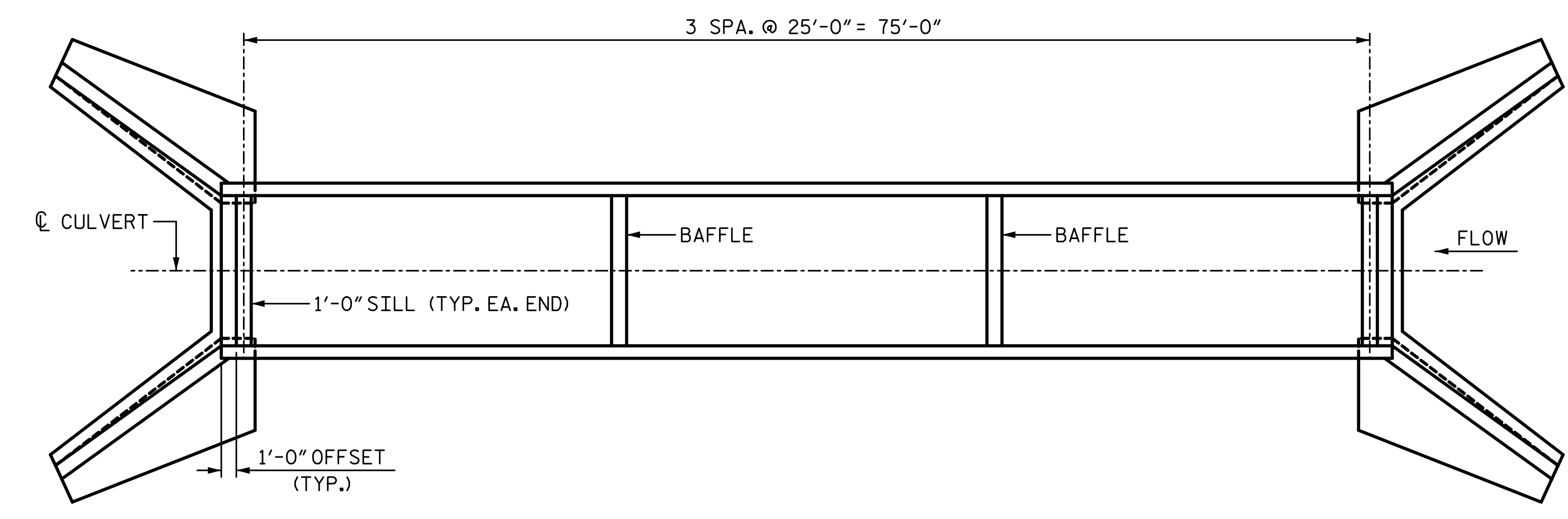
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RIGHT ANGLE SECTION OF BARREL
(THERE ARE 38 C1 BARS IN SECTION OF BARREL)

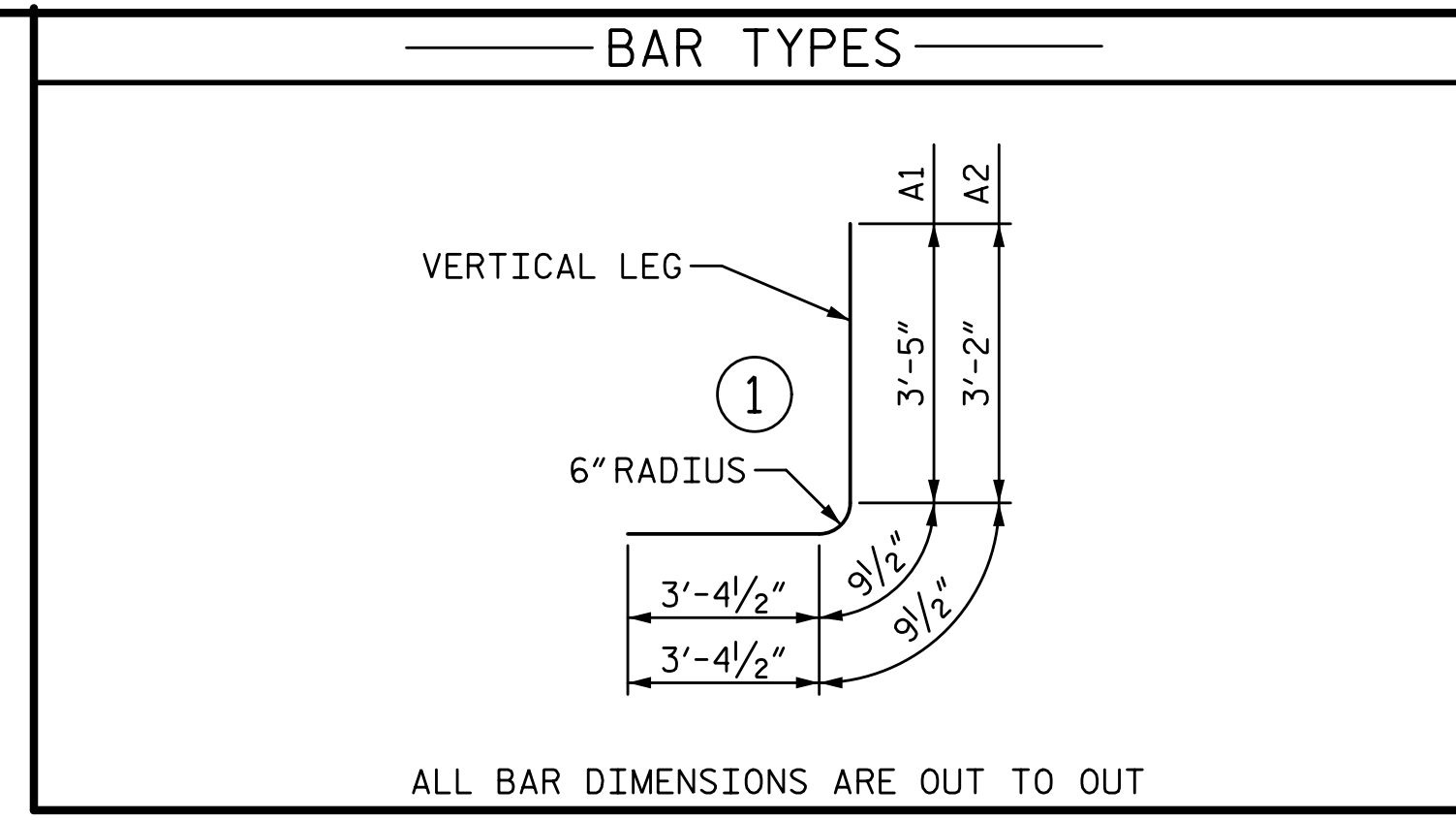


FLOOR PLAN
(SHOWING PLACEMENT OF SILLS AND BAFFLES)

CULVERT SILL AND BAFFLE DETAILS

BACKFILL BETWEEN SILLS/BAFFLES WITH NATIVE MATERIAL FLUSH WITH THE TOP OF THE SILL/BAFFLES. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED AT THE PROJECT SITE DURING CONSTRUCTION. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

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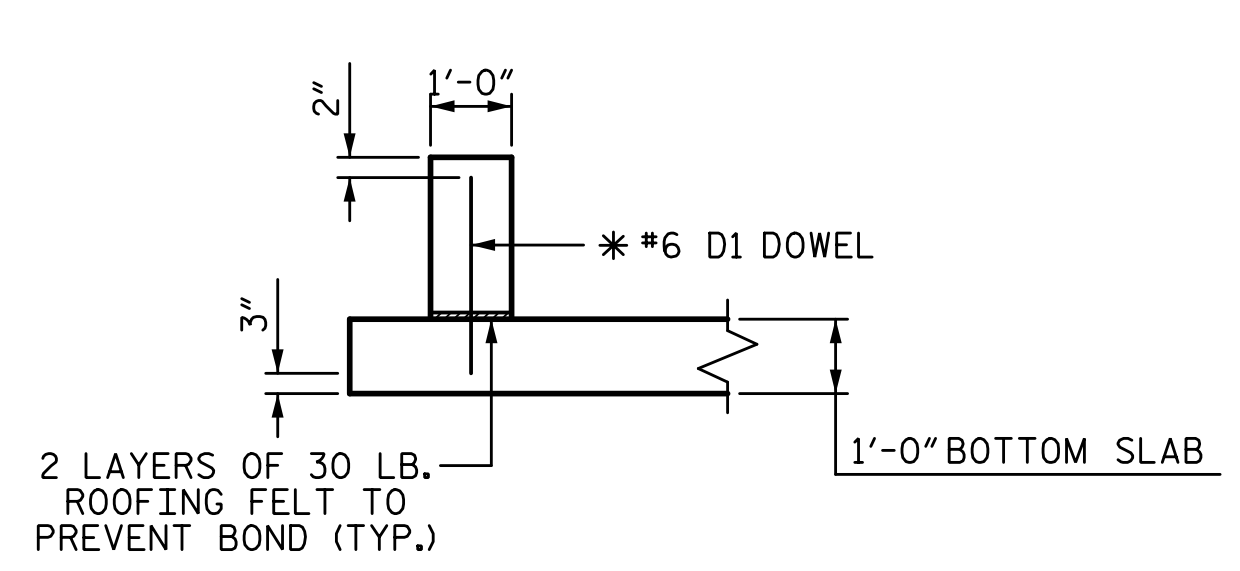
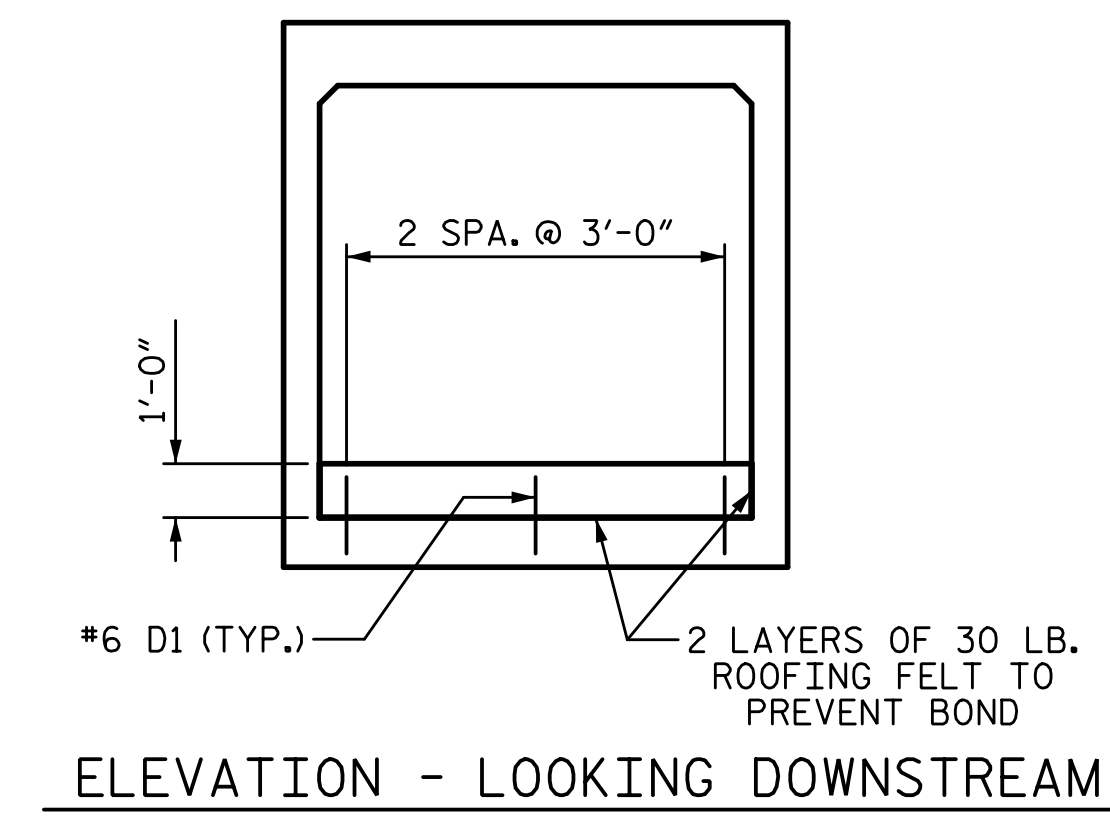


ALL BAR DIMENSIONS ARE OUT TO OUT

SPLICE CHART

#4 B1 SPLICE LENGTH = 1'-10"
#4 C1 SPLICE LENGTH = 1'-11"

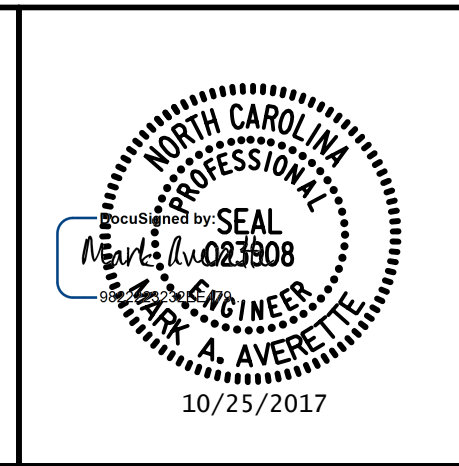
BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	188	#5	1	7'-7"	1487
A2	188	#5	1	7'-4"	1438
A100	117	#6	STR	8'-11"	1567
A200	117	#5	STR	8'-11"	1088
A300	94	#4	STR	8'-11"	560
A400	94	#4	STR	8'-11"	560
B1	234	#4	STR	9'-4"	1459
B2	188	#4	STR	7'-4"	921
C1	114	#4	STR	27'-2"	2069
D1	12	#6	STR	1'-7"	29
G1	4	#4	STR	8'-11"	24
T2	16	#6	STR	3'-6"	84
TOTAL REINFORCING STEEL					11286 LB
CLASS A CONCRETE BREAKDOWN					
BARREL					80.6 CY
SILLS AND BAFFLES					1.2 CY



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

PROJECT NO. U-2525C
GUILFORD COUNTY
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PLANS PREPARED BY:
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LICENSURE NO. C-2521



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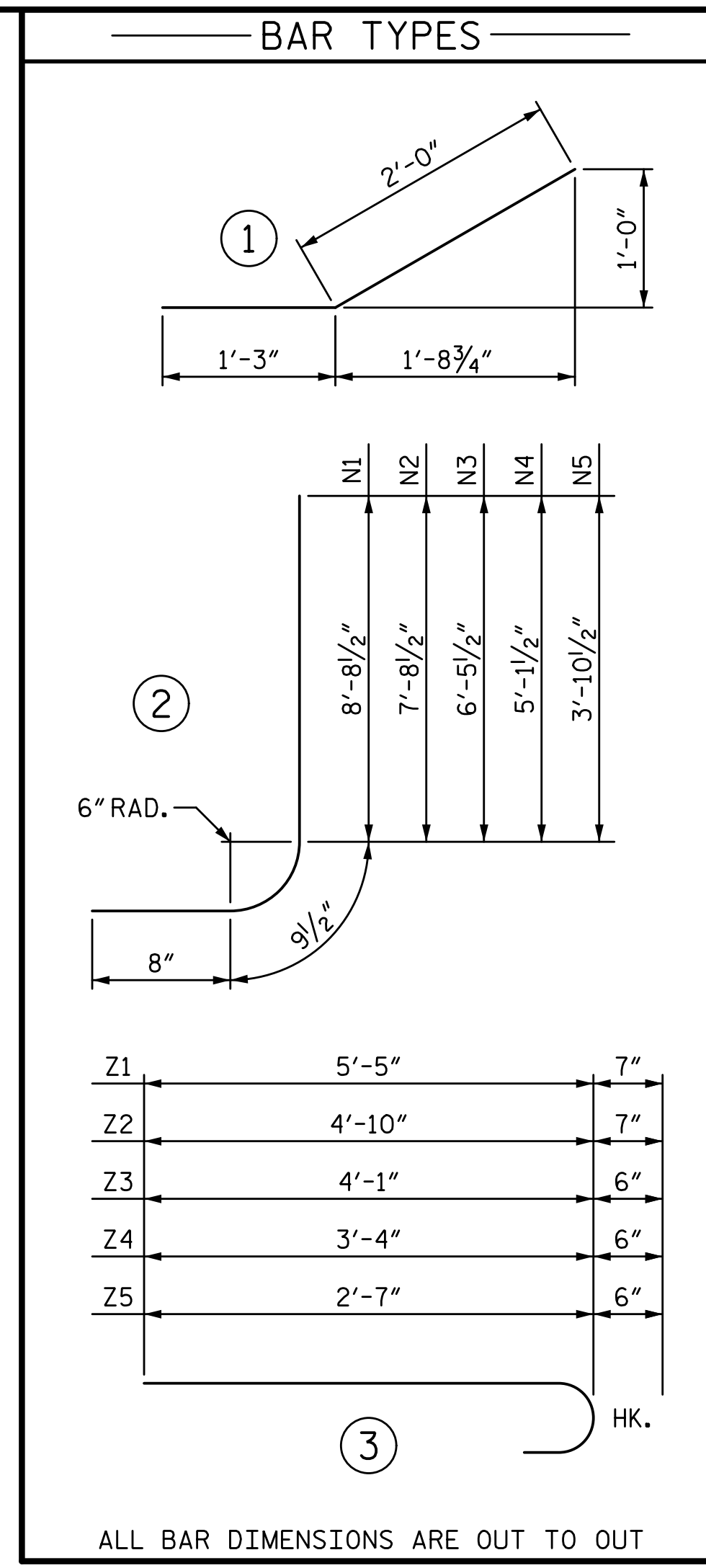
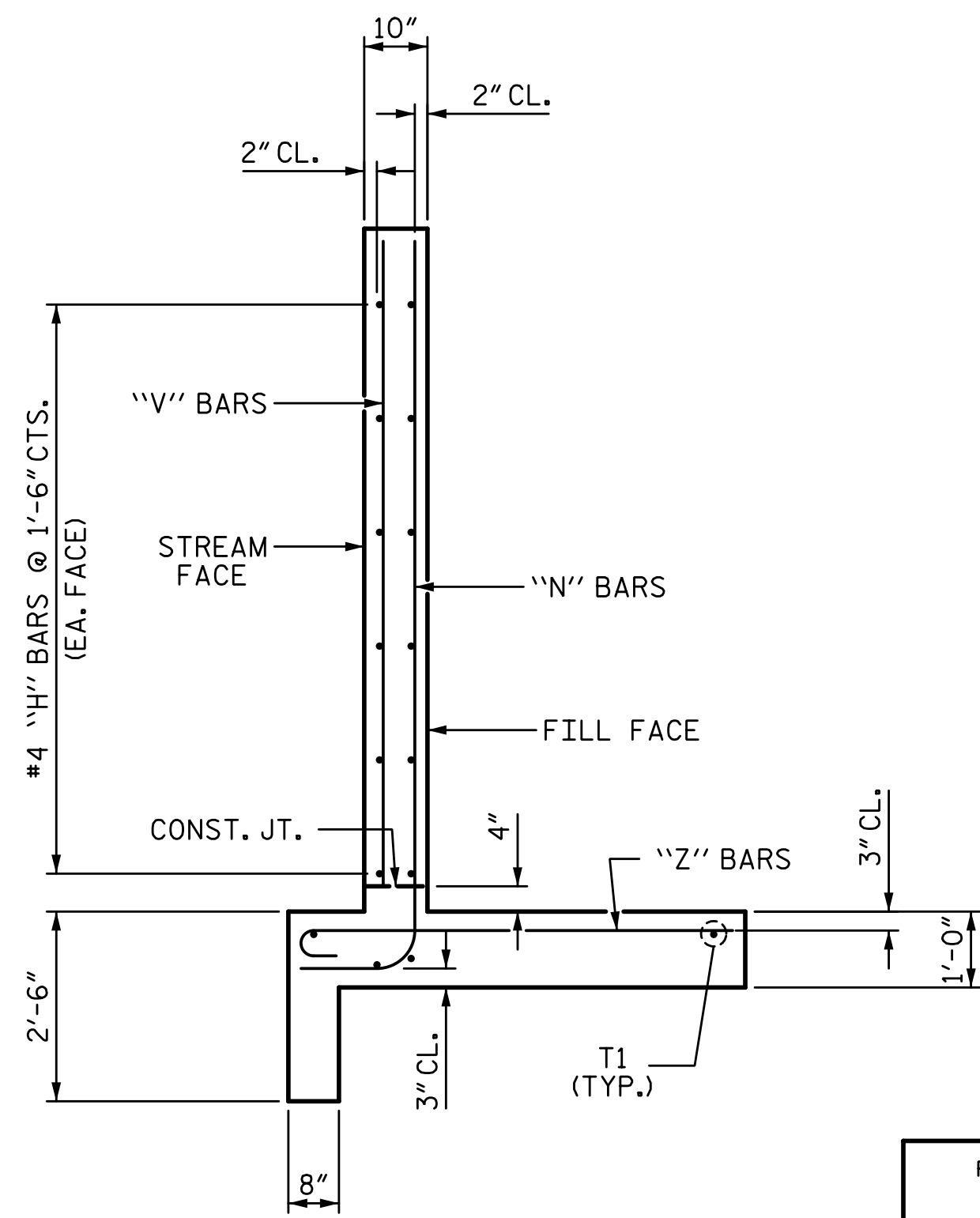
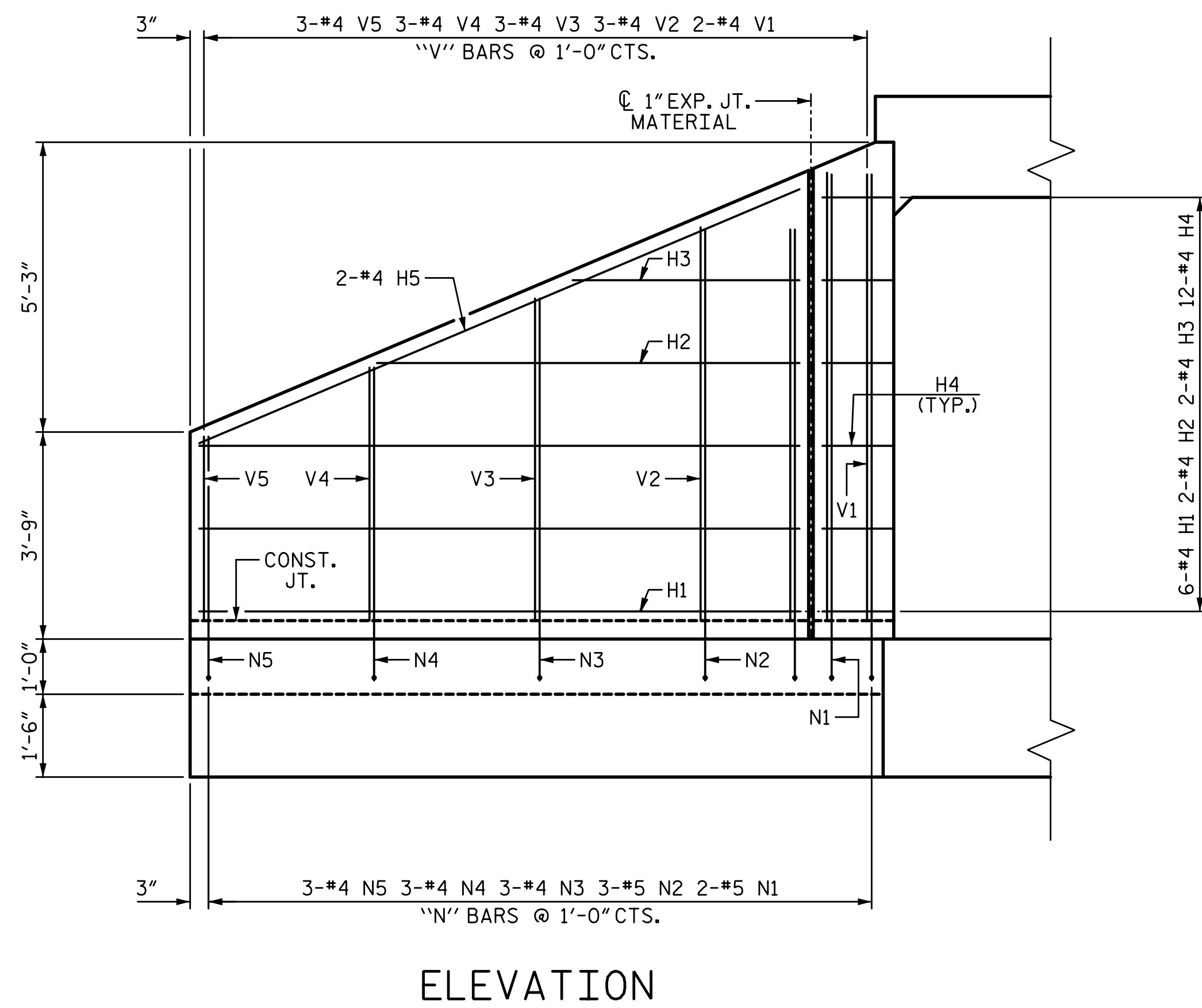
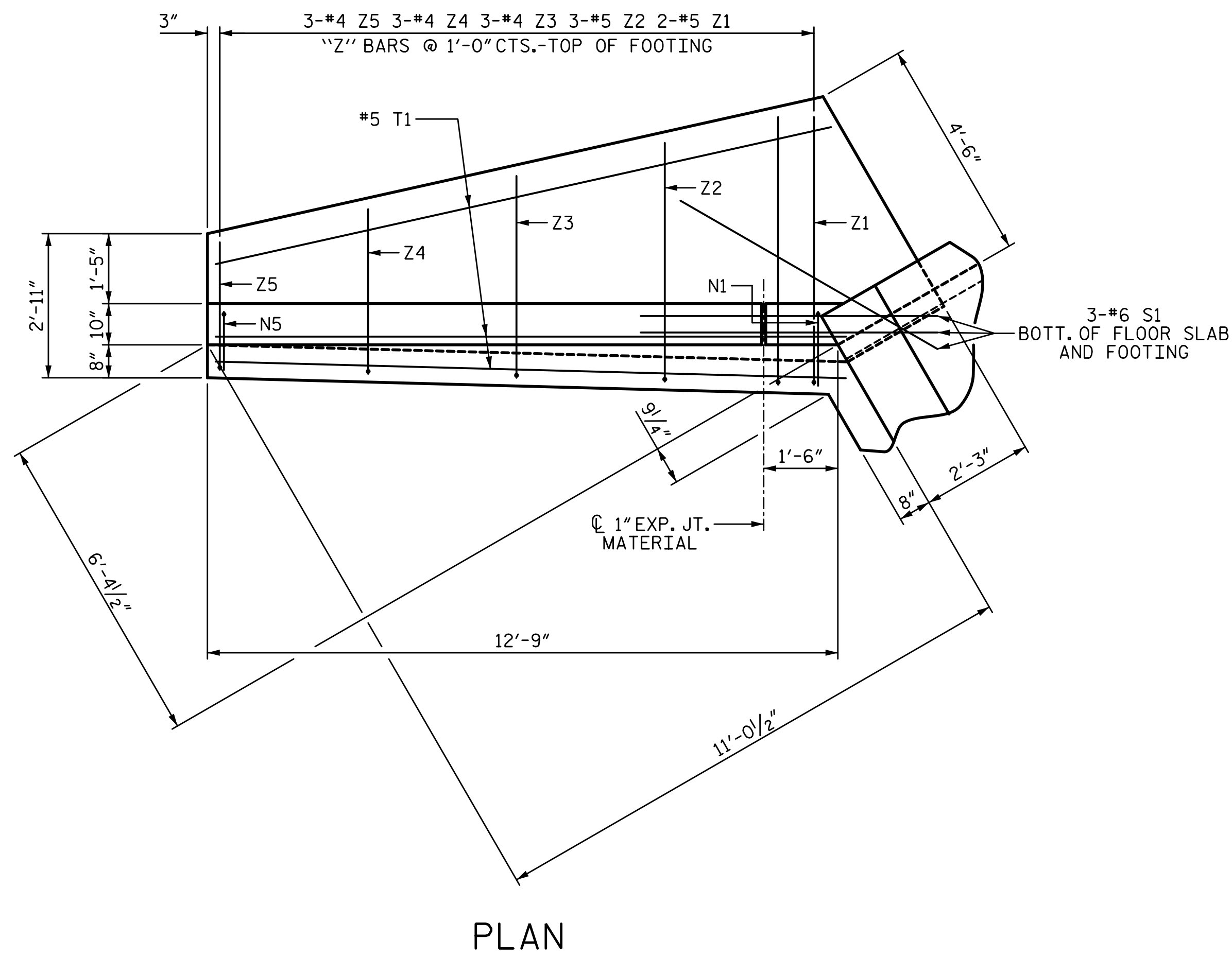
SINGLE 8 FT. X 8 FT. CONCRETE BOX CULVERT

92° SKEW

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

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BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	24	#4	STR	10'-10"	174
H2	8	#4	STR	7'-8"	41
H3	8	#4	STR	4'-1"	22
H4	48	#4	1	3'-3"	104
H5	8	#4	STR	11'-9"	63
N1	8	#5	2	10'-2"	85
N2	12	#5	2	9'-2"	115
N3	12	#4	2	7'-11"	63
N4	12	#4	2	6'-7"	53
N5	12	#4	2	5'-4"	43
S1	12	#6	STR	6'-0"	108
T1	12	#5	STR	12'-9"	160
V1	8	#4	STR	8'-1"	43
V2	12	#4	STR	7'-1"	57
V3	12	#4	STR	5'-10"	47
V4	12	#4	STR	4'-7"	37
V5	12	#4	STR	3'-4"	27
Z1	8	#5	3	6'-0"	50
Z2	12	#5	3	5'-5"	68
Z3	12	#4	3	4'-7"	37
Z4	12	#4	3	3'-10"	31
Z5	12	#4	3	3'-1"	25
REINFORCING STEEL FOR 4 WINGS					1453 LBS
CLASS A CONCRETE					
4 WINGS					21.4 CY
2 HEADWALLS					0.9 CY
2 END CURTAIN WALLS					0.8 CY
TOTAL					23.1 CY

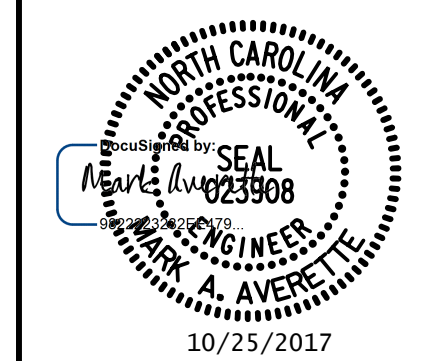
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WINGS FOR CONCRETE BOX CULVERT
 H = 8'-0" SLOPE = 2:1

90° SKEW

PLANS PREPARED BY:
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2			4			5

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

LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						LIVE-LOAD FACTORS (γ _{L1})	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	①	1.63	--	1.75	1.63	1	BOT SLAB - MID	4.333	2.74	1	TOP SLAB - LT	0.933		
	HL-93 (OPERATING)	N/A		2.11	--	1.35	2.11	1	BOT SLAB - MID	4.333	3.55	1	TOP SLAB - LT	0.933		
	HS-20 (INVENTORY)	36.000	②	1.82	65.5	1.75	1.82	1	BOT SLAB - MID	4.333	3.04	1	TOP SLAB - LT	0.933		
	HS-20 (OPERATING)	36.000		1.82	65.5	1.35	1.82	1	BOT SLAB - MID	4.333	3.04	1	TOP SLAB - LT	0.933		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		2.93	39.6	1.40	2.93	1	EXT WALL - TOP	8.500	4.09	1	EXT WALL - BOT	0.980		
		SNGARBS2	20.000		2.78	55.6	1.40	2.78	1	BOT SLAB - MID	4.333	4.09	1	EXT WALL - BOT	0.980	
		SNAGRIS2	22.000		2.93	64.5	1.40	2.93	1	EXT WALL - TOP	8.500	4.09	1	EXT WALL - BOT	0.980	
		SNCOTTS3	27.250		1.90	51.8	1.40	1.90	1	BOT SLAB - MID	4.333	3.21	1	TOP SLAB - LT	0.933	
		SNAGGRS4	34.925		1.77	61.8	1.40	1.77	1	BOT SLAB - MID	4.333	2.77	1	TOP SLAB - RT	7.733	
		SNS5A	35.550		1.90	67.5	1.40	1.90	1	BOT SLAB - MID	4.333	2.98	1	TOP SLAB - LT	0.933	
		SNS6A	39.950		1.75	69.9	1.40	1.75	1	BOT SLAB - MID	4.333	2.85	1	TOP SLAB - LT	0.933	
		SNS7B	42.000	③	1.74	73.1	1.40	1.74	1	BOT SLAB - MID	4.333	2.85	1	TOP SLAB - LT	0.933	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.75	90.8	1.40	2.75	1	EXT WALL - TOP	8.500	4.09	1	EXT WALL - BOT	0.980	
		TNT4A	33.075		2.21	73.1	1.40	2.21	1	BOT SLAB - MID	4.333	3.82	1	TOP SLAB - LT	0.933	
		TNT6A	41.600		1.83	76.1	1.40	1.83	1	BOT SLAB - MID	4.333	2.92	1	TOP SLAB - LT	0.933	
		TNT7A	42.000		2.05	86.1	1.40	2.05	1	BOT SLAB - MID	4.333	3.12	1	TOP SLAB - LT	0.933	
		TNT7B	42.000		1.79	75.2	1.40	1.79	1	BOT SLAB - MID	4.333	2.87	1	TOP SLAB - LT	0.933	
		TNAGRIT4	43.000		2.15	92.5	1.40	2.15	1	BOT SLAB - MID	4.333	3.72	1	TOP SLAB - LT	0.933	
TNAGT5A	45.000		2.16	97.2	1.40	2.16	1	BOT SLAB - MID	4.333	3.74	1	TOP SLAB - LT	0.933			
TNAGT5B	45.000		2.08	93.6	1.40	2.08	1	BOT SLAB - MID	4.333	3.59	1	TOP SLAB - LT	0.933			

LOAD FACTORS:

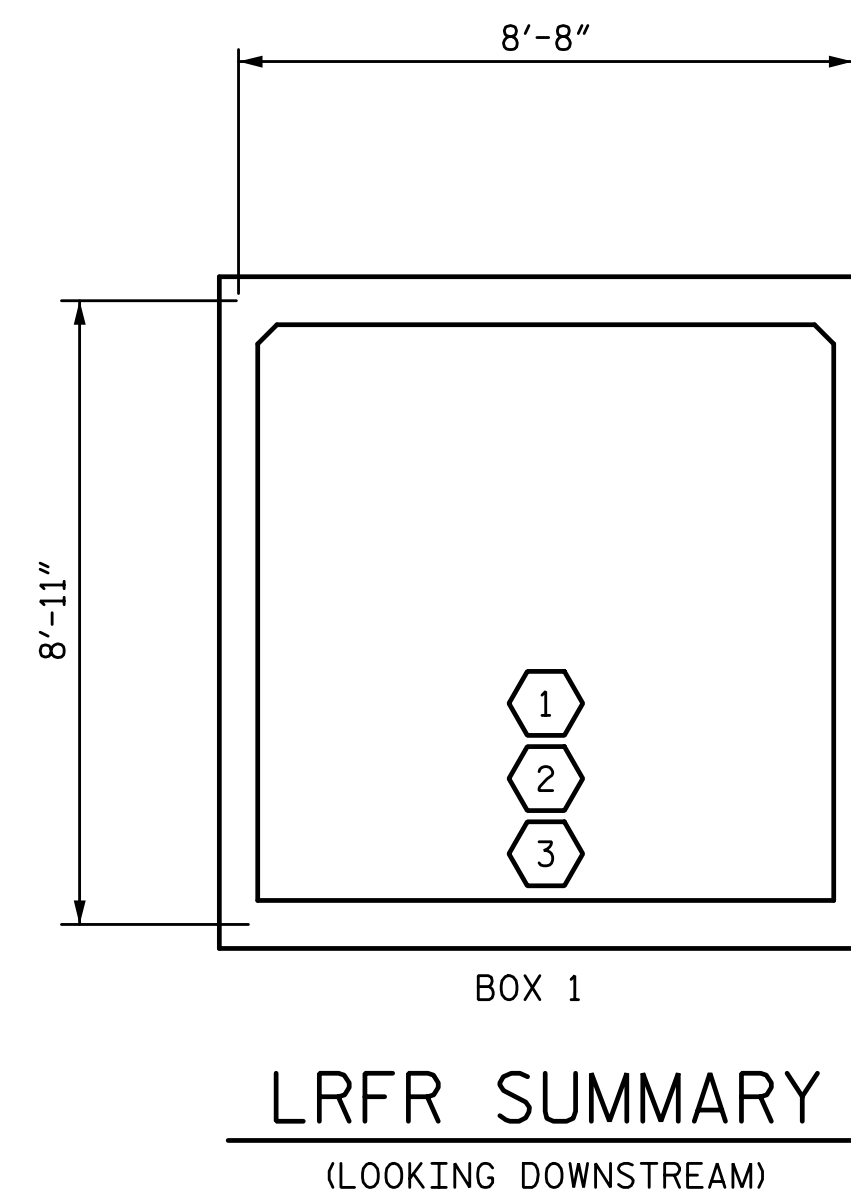
DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM CENTERLINE OF ELEMENT.

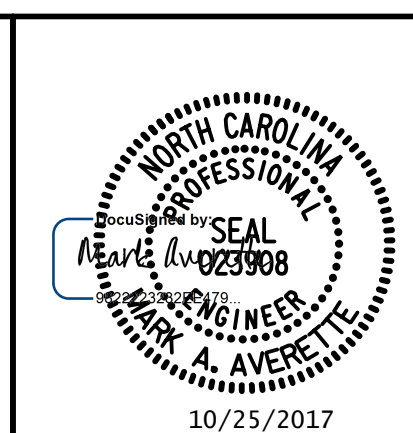
#	CONTROLLING LOAD RATING
①	DESIGN LOAD RATING (HL-93)
②	DESIGN LOAD RATING (HS-20)
③	LEGAL LOAD RATING **
	** SEE CHART FOR VEHICLE TYPE



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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

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

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S6-5
1			3			TOTAL SHEETS
2			4			5

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STANDARD NOTES

DESIGN DATA:

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

MATERIAL AND WORKMANSHIP:

EXCEPT AS MAY OTHERWISE BE SPECIFIED ON PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE 2012 "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" OF THE N. C. DEPARTMENT OF TRANSPORTATION.

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

CONCRETE:

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

CONCRETE CHAMFERS:

UNLESS OTHERWISE NOTED ON THE PLANS, ALL EXPOSED CORNERS ON STRUCTURES SHALL BE CHAMFERED 3/4" WITH THE FOLLOWING EXCEPTIONS: TOP CORNERS OF CURBS MAY BE ROUNDED TO 1-1/2" RADIUS WHICH IS BUILT INTO CURB FORMS; CORNERS OF TRANSVERSE FLOOR EXPANSION JOINTS SHALL BE ROUNDED WITH A 1/4" FINISHING TOOL UNLESS OTHERWISE REQUIRED ON PLANS; AND CORNERS OF EXPANSION JOINTS IN THE ROADWAY FACES AND TOPS OF CURBS AND SIDEWALKS SHALL BE ROUNDED TO A 1/4" RADIUS WITH A FINISHING STONE OR TOOL UNLESS OTHERWISE REQUIRED ON PLANS.

DOWELS:

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

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

BRIDGES SHALL BE BUILT ON THE GRADE OR VERTICAL CURVE SHOWN ON PLANS. SLABS, CURBS AND PARAPETS SHALL CONFORM TO THE GRADE OR CURVE.
ALL DIMENSIONS WHICH ARE GIVEN IN SECTION AND ARE AFFECTED BY DEAD LOAD DEFLECTIONS ARE DIMENSIONS AT CENTER LINE OF BEARING UNLESS OTHERWISE NOTED ON PLANS. IN SETTING FORMS FOR STEEL BEAM BRIDGES AND PRESTRESSED CONCRETE GIRDER BRIDGES, ADJUSTMENTS SHALL BE MADE DUE TO THE DEAD LOAD DEFLECTIONS FOR THE ELEVATIONS SHOWN. WHERE BLOCKS ARE SHOWN OVER BEAMS FOR BUILDING UP TO THE SLAB, THE VERTICAL DIMENSIONS OF THE BLOCKS SHALL BE ADJUSTED BETWEEN BEARINGS TO COMPENSATE FOR DEAD LOAD DEFLECTIONS, VERTICAL CURVE ORDINATE, AND ACTUAL BEAM CAMBER. WHERE BOTTOM OF SLAB IS IN LINE WITH BOTTOM OF TOP FLANGES, DEPTH OF SLAB BETWEEN BEARINGS SHALL BE ADJUSTED TO COMPENSATE FOR DEAD LOAD DEFLECTION, VERTICAL CURVE ORDINATE, AND ACTUAL BEAM CAMBER.
IN SETTING FALSEWORK AND FORMS FOR REINFORCED CONCRETE SPANS, AN ALLOWANCE SHALL BE MADE FOR DEAD LOAD DEFLECTIONS, SETTLEMENT OF FALSEWORK, AND PERMANENT CAMBER WHICH SHALL BE PROVIDED FOR IN ADDITION TO THE ELEVATIONS SHOWN. AFTER REMOVAL OF THE FALSEWORK, THE FINISHED STRUCTURES SHALL CONFORM TO THE PROFILE AND ELEVATIONS SHOWN ON THE PLANS AND CONSTRUCTION ELEVATIONS FURNISHED BY THE ENGINEER.
DETAILED DRAWINGS FOR FALSEWORK OR FORMS FOR BRIDGE SUPERSTRUCTURE AND ANY STRUCTURE OR PARTS OF A STRUCTURE AS NOTED ON THE PLANS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL BEFORE CONSTRUCTION OF THE FALSEWORK OR FORMS IS STARTED.

REINFORCING STEEL:

ALL REINFORCING STEEL SHALL BE DEFORMED. DIMENSIONS RELATIVE TO PLACEMENT OF REINFORCING ARE TO CENTERS OF BARS UNLESS OTHERWISE INDICATED IN THE PLANS. DIMENSIONS ON BAR DETAILS ARE TO CENTERS OF BARS OR ARE OUT TO OUT AS INDICATED ON PLANS.
WIRE BAR SUPPORTS SHALL BE PROVIDED FOR REINFORCING STEEL WHERE INDICATED ON THE PLANS. WHEN BAR SUPPORT PIECES ARE PLACED IN CONTINUOUS LINES, THEY SHALL BE SO PLACED THAT THE ENDS OF THE SUPPORTING WIRES SHALL BE LAPPED TO LOCK LEGS ON ADJOINING PIECES.

STRUCTURAL STEEL:

AT THE CONTRACTOR'S OPTION, HE MAY SUBSTITUTE 7/8" Ø SHEAR STUDS FOR THE 3/4" Ø STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - 7/8" Ø STUDS FOR 4 - 3/4" Ø STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF 7/8" Ø STUDS ALONG THE BEAM AS SHOWN FOR 3/4" Ø STUDS BASED ON THE RATIO OF 3 - 7/8" Ø STUDS FOR 4 - 3/4" Ø STUDS. STUDS OF THE LENGTH SPECIFIED ON THE PLANS MUST BE PROVIDED. THE MAXIMUM SPACING SHALL BE 2'-0".
EXCEPT AT THE INTERIOR SUPPORTS OF CONTINUOUS BEAMS WHERE THE COVER PLATE IS IN CONTACT WITH BEARING PLATE, THE CONTRACTOR MAY, AT HIS OPTION, SUBSTITUTE FOR THE COVER PLATES DESIGNATED ON THE PLANS COVER PLATES OF THE EQUIVALENT AREA PROVIDED THESE PLATES ARE AT LEAST 5/16" IN THICKNESS AND DO NOT EXCEED A WIDTH EQUAL TO THE FLANGE WIDTH LESS 2" OR A THICKNESS EQUAL TO 2 TIMES THE FLANGE THICKNESS. THE SIZE OF FILLET WELDS SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT ANSI/AASHTO/AWS "BRIDGE WELDING CODE". ELECTROSLAG WELDING WILL NOT BE PERMITTED.
WITH THE SOLE EXCEPTION OF EDGES AT SURFACES WHICH BEAR ON OTHER SURFACES, ALL SHARP EDGES AND ENDS OF SHAPES AND PLATES SHALL BE SLIGHTLY ROUNDED BY SUITABLE MEANS TO A RADIUS OF APPROXIMATELY 1/16 INCH OR EQUIVALENT FLAT SURFACE AT A SUITABLE ANGLE PRIOR TO PAINTING, GALVANIZING, OR METALLIZING.

HANDRAILS AND POSTS:

METAL STANDARDS AND FACES OF THE CONCRETE END POSTS FOR THE METAL RAIL SHALL BE SET NORMAL TO THE GRADE OF THE CURB, UNLESS OTHERWISE SHOWN ON PLANS. THE METAL RAIL AND TOPS OF CONCRETE POSTS USED WITH THE ALUMINUM RAIL SHALL BE BUILT PARALLEL TO THE GRADE OF THE CURB.
METAL HANDRAILS SHALL BE IN ACCORDANCE WITH THE PLANS. RAILS SHALL BE AS MANUFACTURED FOR BRIDGE RAILING. CASTINGS SHALL BE OF A UNIFORM APPEARANCE. FINIS AND OTHER DEFORMATIONS RESULTING FROM CASTING OR OTHERWISE SHALL BE REMOVED IN A MANNER SO THAT A UNIFORM COLORING OF THE COMPLETED CASTING SHALL BE OBTAINED. CASTINGS WITH DISCOLORATIONS OR OF NON-UNIFORM COLORING WILL NOT BE ACCEPTED. CERTIFIED MILL REPORTS ARE REQUIRED FOR METAL RAILS AND POSTS.

SPECIAL NOTES:

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

ENGLISH

JANUARY, 1990

STD. NO. SN