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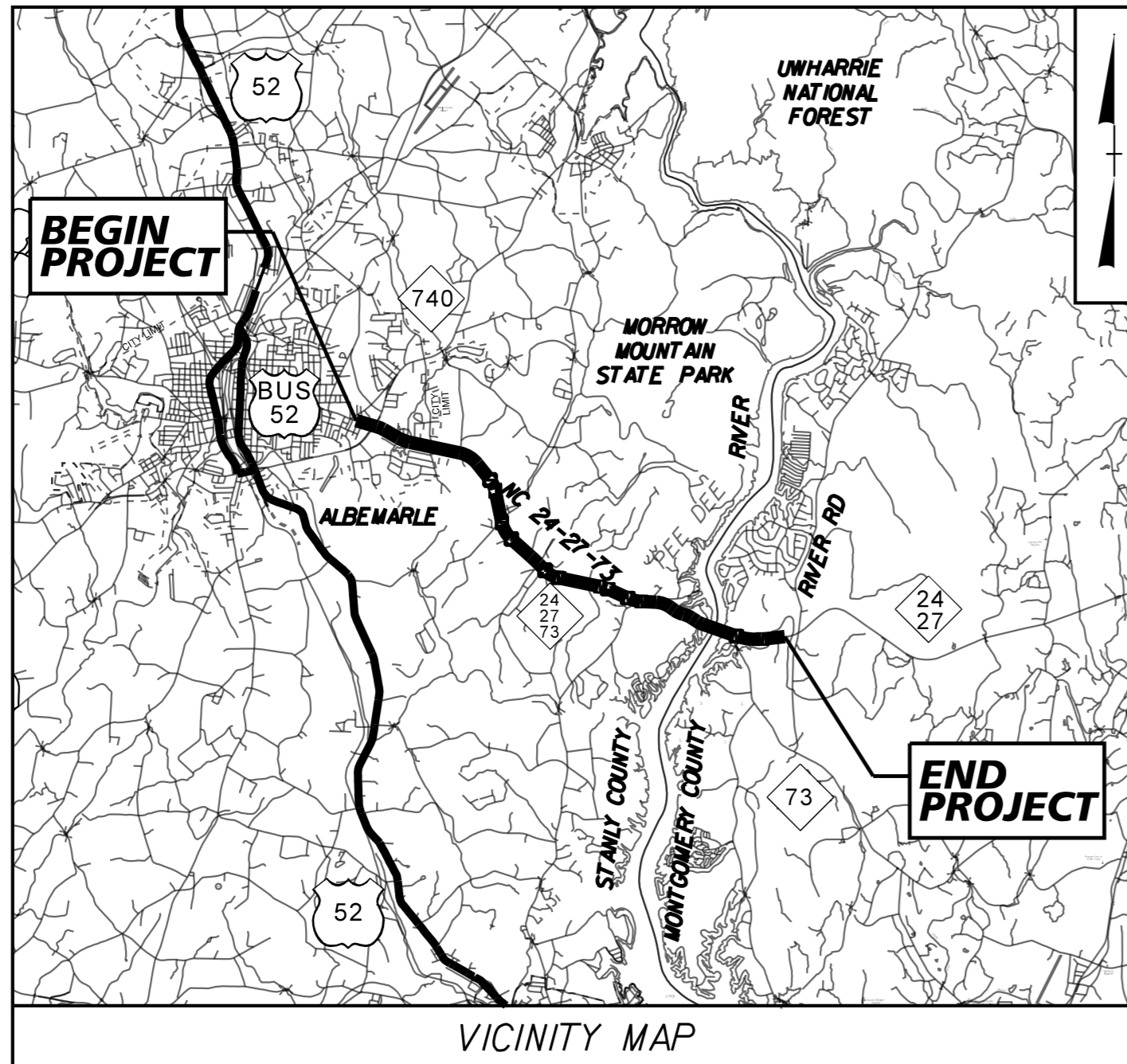
TIP PROJECT: R-2530B

CONTRACT: C204181

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

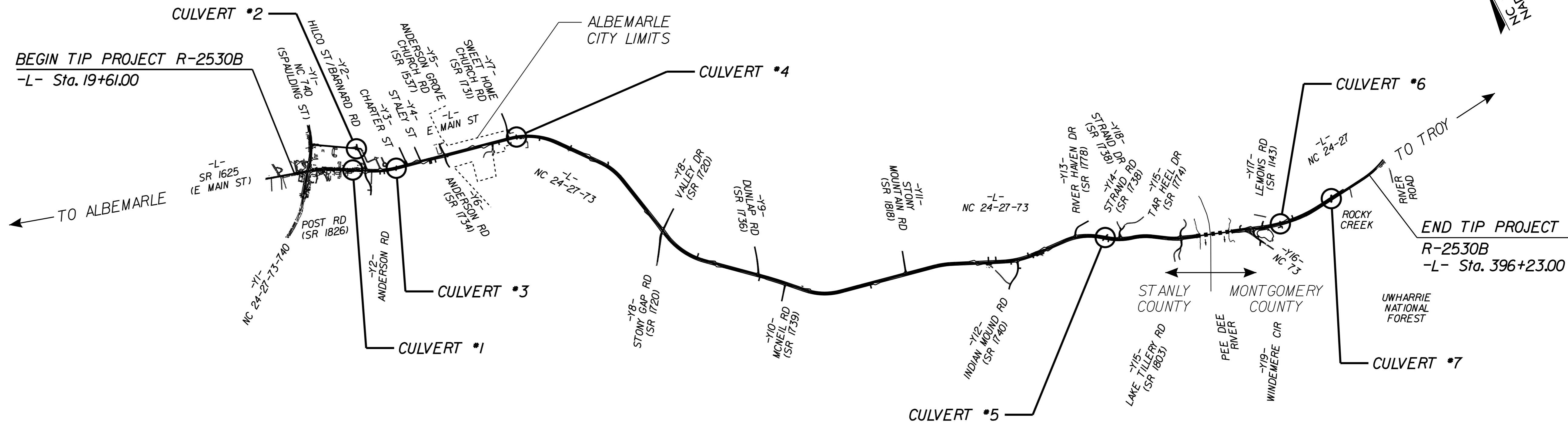
STANLY & MONTGOMERY COUNTIES

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2530B		
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34446.1.6		P.E.	
34446.2.5	STBG-0024(083)	R/W	
34446.2.6	STBG-0024(083)	UTL	
34446.3.4	STBG-0024(083)	CONST.	

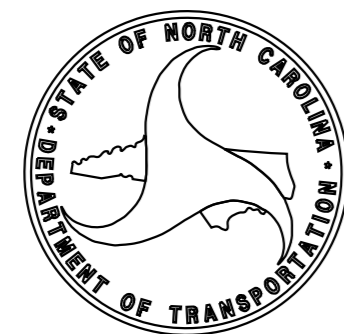


LOCATION: NC 24-27 FROM NC 740 IN ALBEMARLE TO EAST OF THE PEE DEE RIVER

TYPE OF WORK: GRADING, DRAINAGE, PAVING, SIGNALS, CULVERTS, AND RETAINING WALLS



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DESIGN DATA

AADT 2019 =	16,400
AADT 2039 =	21,500
K =	9%
D =	55%
T =	10%*
V =	50/60 MPH

* (TTST 4% + DUAL 6%)

FUNCTIONAL CLASSIFICATION:
URBAN/RURAL ARTERIAL
REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-2530B	=	6.908 MILES
LENGTH STRUCTURE TIP PROJECT B-4974	=	0.225 MILES
TOTAL LENGTH TIP PROJECT R-2530B	=	7.133 MILES

PLANS PREPARED FOR THE NCDOT BY:

Kimley»Horn

2018 STANDARD SPECIFICATIONS

LETTING DATE:
OCTOBER 15, 2019

ANDREW L. PHILLIPS, P.E.
PROJECT ENGINEER

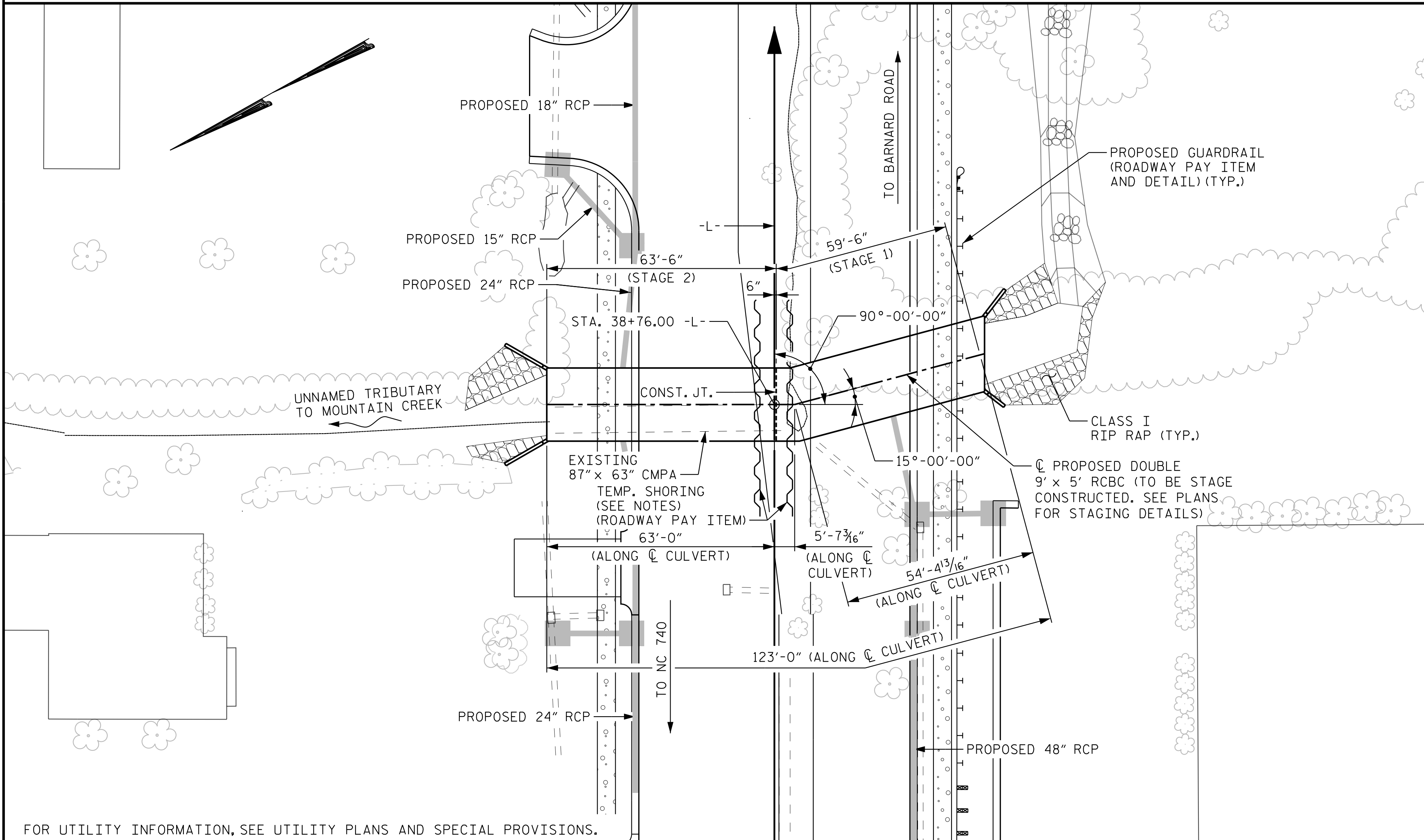
PATRICK D. COOKSEY, P.E.
PROJECT DESIGN ENGINEER

BENCHMARK: BM#5, -L- STA. 36+37.12, OFFSET 118.20' RT., EL. 559.85', CHISELED 'X' IN PARKING LOT CURB

F.A. PROJECT NO. STBG-0024(083)

NOTES

- ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING.
- DESIGN FILL ----- 3.2 FT.
- FOR OTHER DESIGN DATA AND GENERAL NOTES, SEE SHEET SN.
- 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN STAGE 1 OR STAGE 2 CULVERT TO BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS, CURTAIN WALLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
- THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
- THE 24" Ø R.C. PIPES AND 48" Ø R.C. PIPE 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 SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACES OF THE EXTERIOR WALLS AND BOTH FACES OF INTERIOR WALLS ABOVE THE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- STEEL IN THE BOTTOM SLAB MAY BE SPLICED AT THE PERMITTED CONSTRUCTION JOINT AT THE CONTRACTOR'S OPTION. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES WILL BE PAID FOR BY THE CONTRACTOR.
- AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAILED 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.
- AFTER SERVING AS A TEMPORARY STRUCTURE THE EXISTING 87" X 63" CORRUGATED METAL PIPE ARCH LOCATED AT THE SAME LOCATION AS THE PROPOSED CULVERT SHALL BE REMOVED. THE EXISTING STRUCTURE IS PRESENTLY NOT POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE STRUCTURE DETERIORATE DURING CONSTRUCTION OF THE PROPOSED CULVERT, A LOAD LIMIT MAY BE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
- FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE ROADWAY PLANS.
- TRAFFIC ON NC 24/27/73 SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS SHOWN ON THESE PLANS AS DIRECTED BY THE ENGINEER.
- 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.



FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.

LOCATION SKETCH

ROADWAY DATA

GRADE POINT ELEV. @ STA 38+76.00 -L- = 558.33'
 BED ELEVATION @ STA 38+76.00 = 549.80'
 ROADWAY SLOPES VARIES

HYDRAULIC DATA

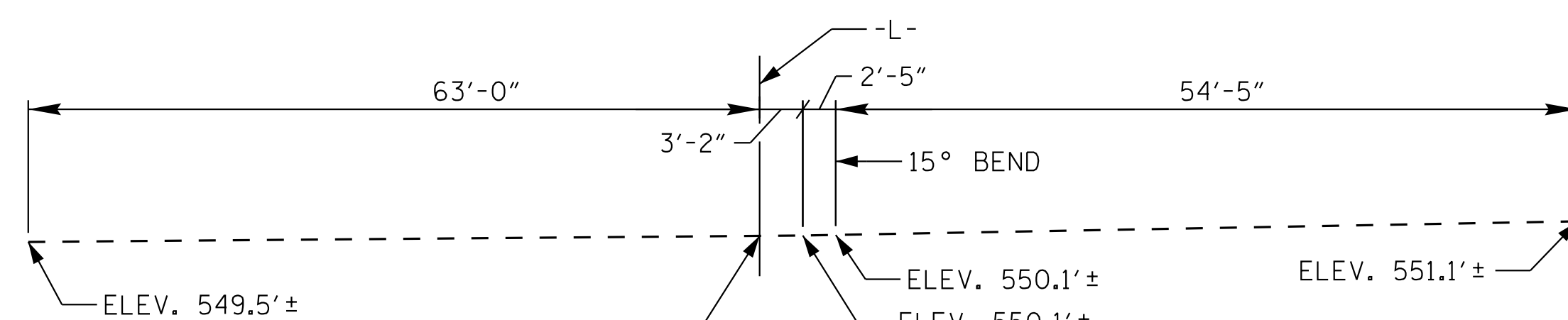
DESIGN DISCHARGE ----- 360 CFS
 FREQUENCY OF DESIGN FLOOD ----- 50 YR.
 DESIGN HIGH WATER ELEVATION ----- 555.1 FT.
 DRAINAGE AREA ----- 0.19 SQ. MI.
 BASE DISCHARGE (Q100) ----- 390 CFS
 BASE HIGH WATER ELEVATION ----- 555.4 FT.

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE ----- >420 CFS
 FREQUENCY OF OVERTOPPING FLOOD --- >50 YR.
 OVERTOPPING FLOOD ELEVATION ----- 558.1 FT.

TOTAL STRUCTURE QUANTITIES

STAGE 1		STAGE 2	
CLASS A CONCRETE			
BARREL @ 2.050 CY/FT	122.0 C.Y.	BARREL @ 2.050 CY/FT	130.2 C.Y.
WINGS ETC.	10.0 C.Y.	WINGS ETC.	13.2 C.Y.
TOTAL	132.0 C.Y.	TOTAL	143.4 C.Y.
REINFORCING STEEL			
BARREL	16,970 LBS.	BARREL	17,639 LBS.
WINGS ETC.	375 LBS.	WINGS ETC.	563 LBS.
TOTAL	17,345 LBS.	TOTAL	18,202 LBS.
FOUNDATION CONDITIONING MATERIAL		FOUNDATION CONDITIONING MATERIAL	
102 TONS		109 TONS	
CULVERT EXCAVATION STA. 38+76.00 -L-		LUMP SUM	
REMOVAL OF EXISTING STRUCTURE STA. 38+76.00 -L-		LUMP SUM	



PROFILE ALONG CULVERT

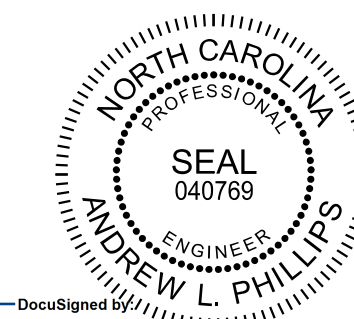
ELEVATIONS TAKEN ALONG CENTERLINE CHANNEL

SAMPLE BAR REPLACEMENT

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

NOTE:
 SAMPLE BAR REPLACEMENT LENGTHS
 BASED ON 30" (SAMPLE LENGTH) PLUS
 TWO SPLICE LENGTHS AND $f_y = 60\text{ksi}$.

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DocuSigned by:
 Andrew L. Phillips
 12/20/2018
 28889A8AD40403

Kimley»Horn
 421 Fayetteville Street, Suite 600
 Raleigh, NC 27601-1772
 Phone (919) 677-2000 NC LICENSE # F-0102

PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 38+76.00 -L-

SHEET 1 OF 10

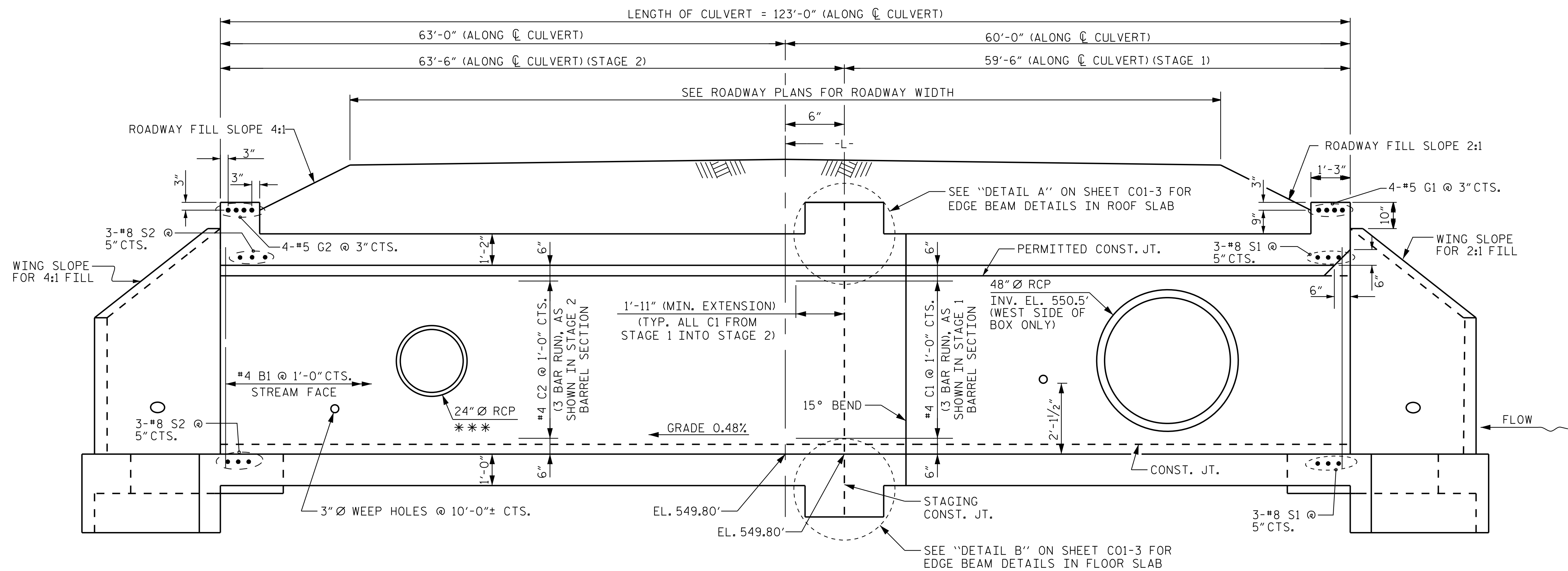
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

DOUBLE 9 FT. X 5 FT.
 CONCRETE BOX CULVERT
 90° SKEW

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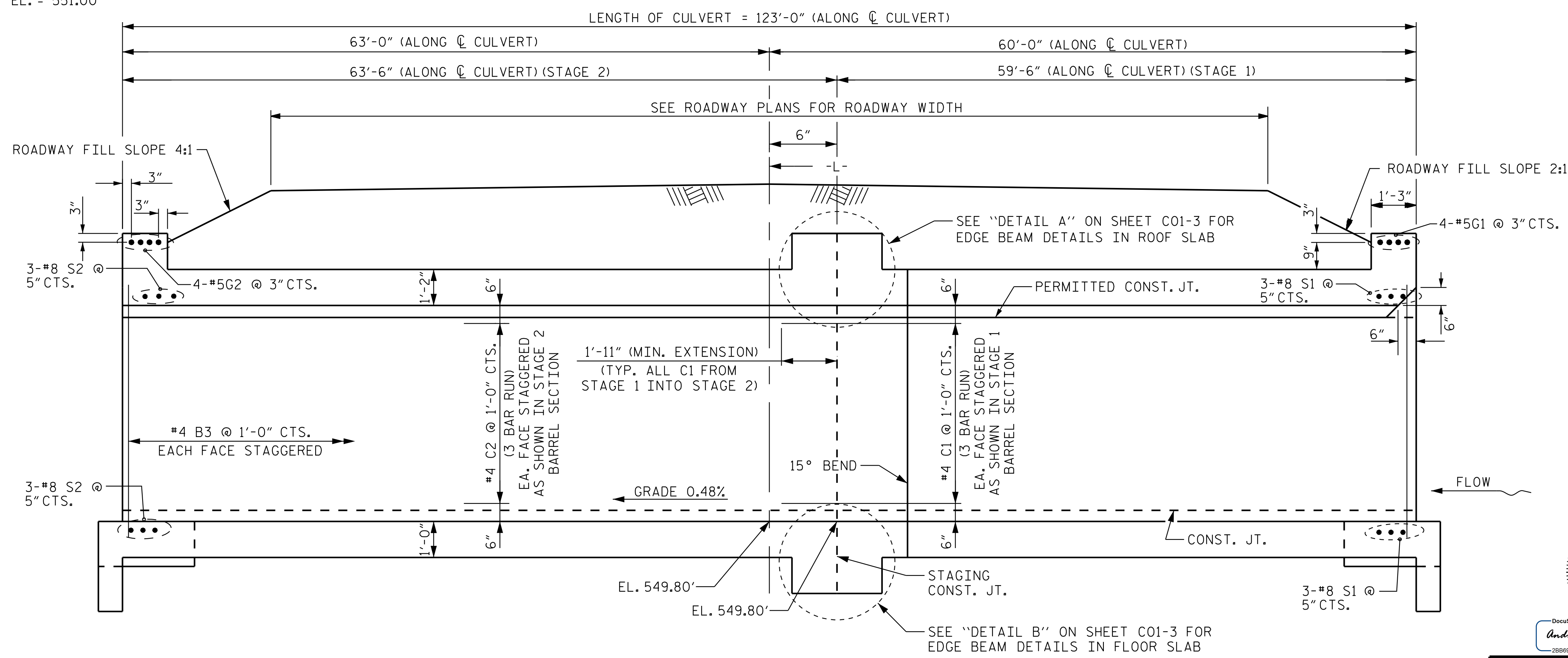
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DRAWN BY: D. D. LOWERY DATE: 12/18
 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18



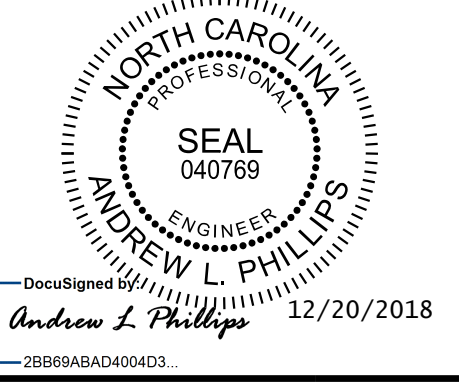
*** 24" Ø RCP INTO EAST SIDE OF BOX
INVERT EL. = 551.50'
24" Ø RCP INTO WEST SIDE OF BOX
INVERT EL. = 551.00'

CULVERT SECTION NORMAL TO ROADWAY - EXTERIOR WALL
FOR APPROXIMATE PLAN VIEW LOCATIONS OF R.C. PIPES, SEE SHEET C01-1.



CULVERT SECTION NORMAL TO ROADWAY - INTERIOR WALL

PROJECT NO. R-2530B
STANLY COUNTY
STATION: 38+76.00 -L-
SHEET 2 OF 10



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
**DOUBLE 9 FT. X 5 FT.
CONCRETE BOX CULVERT
90° SKEW**

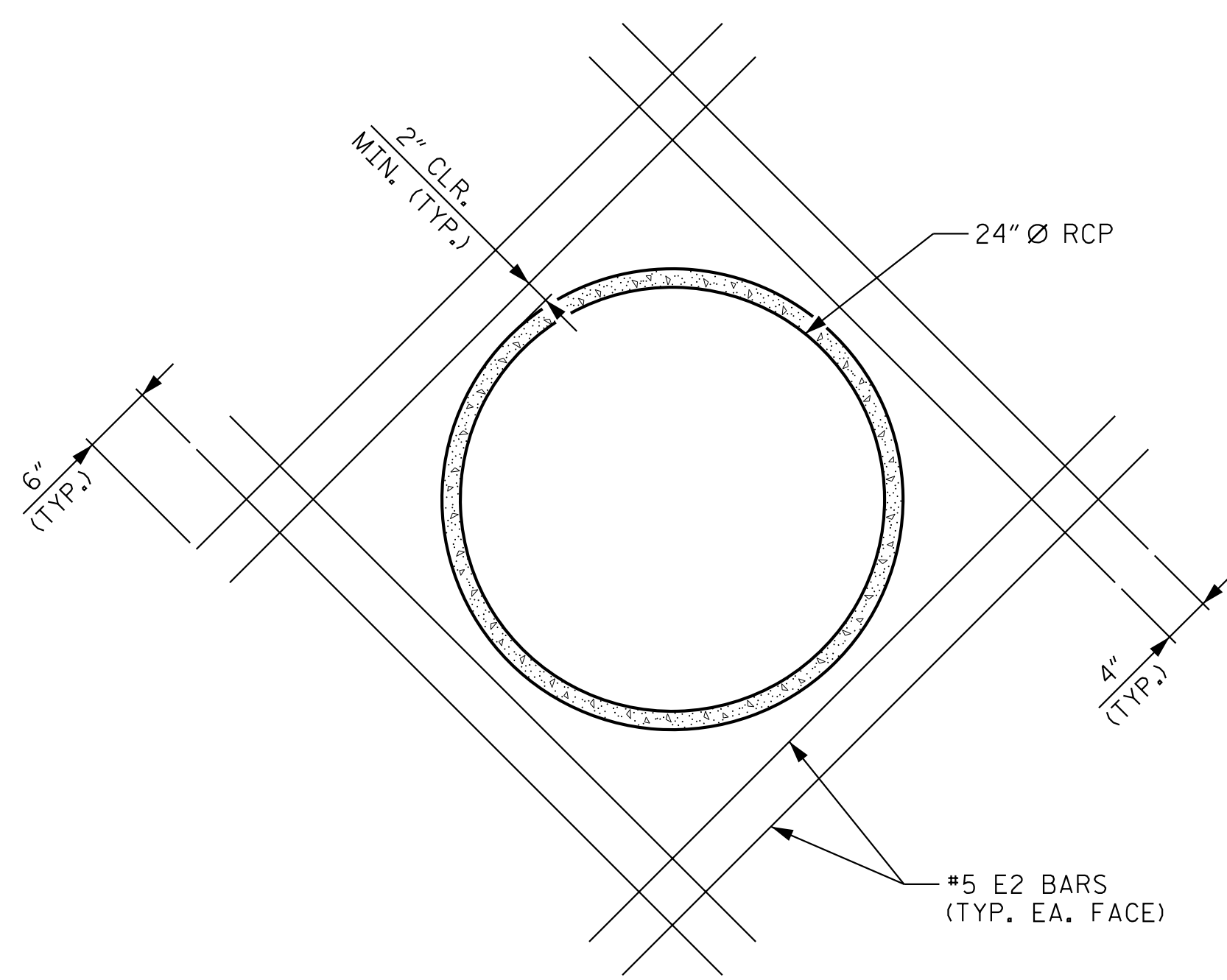
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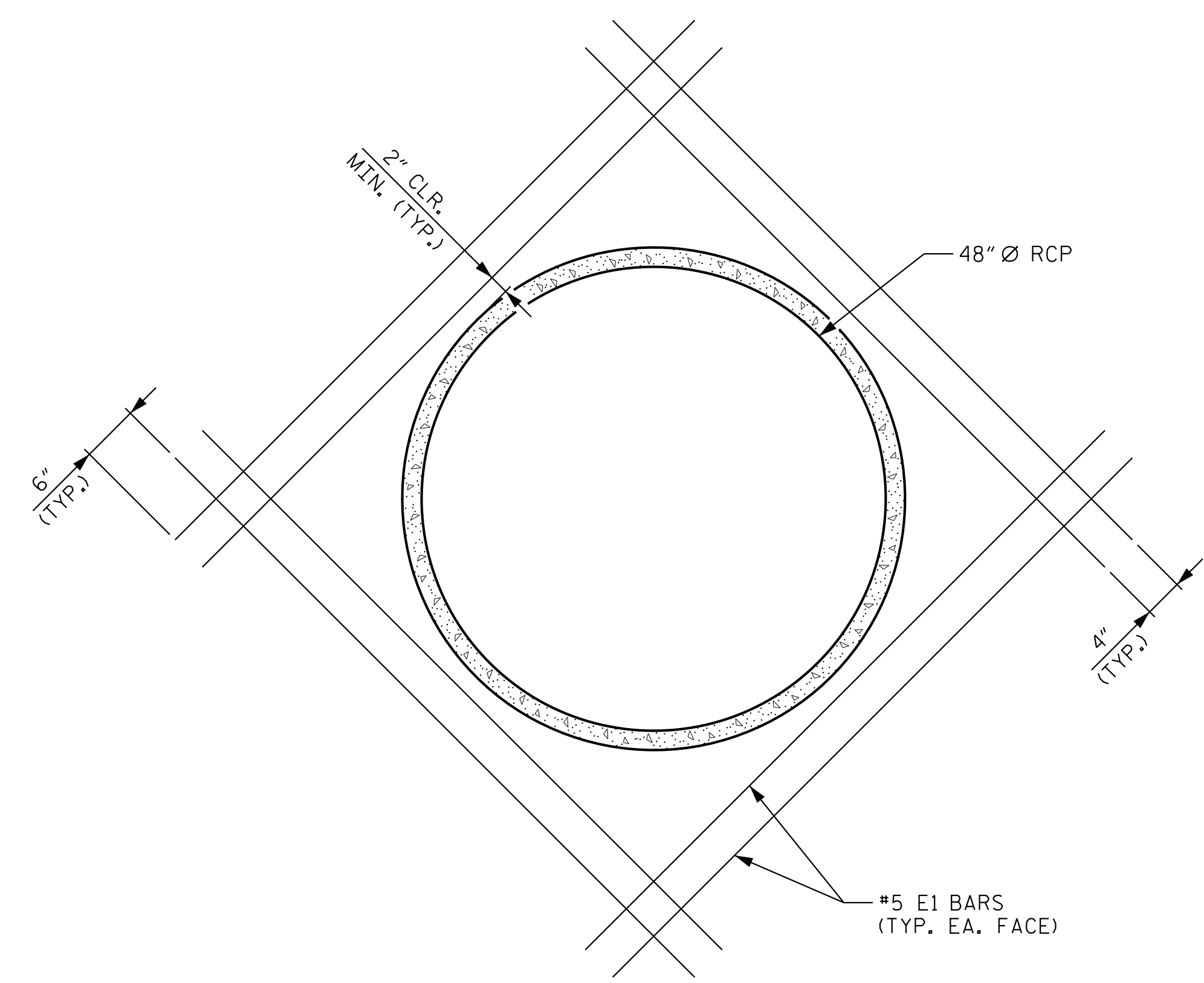
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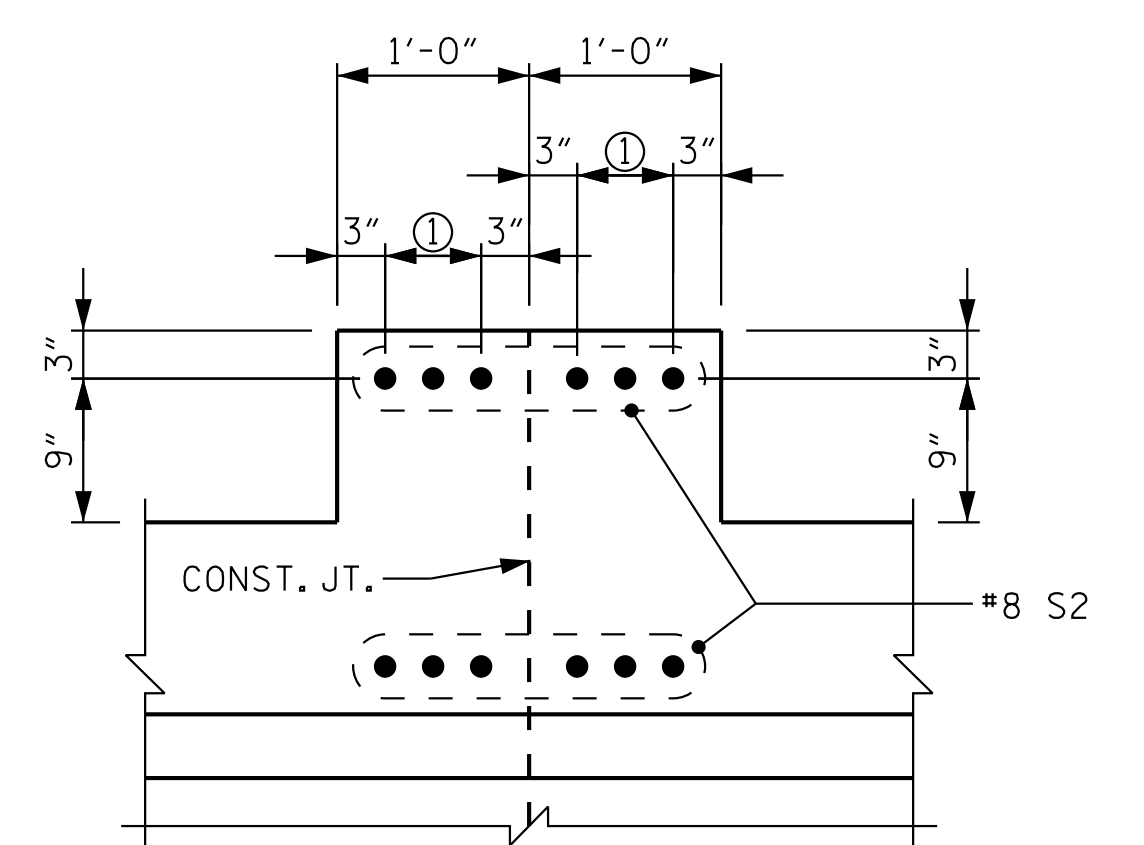


DETAIL OF REINFORCING AROUND
24" DIA. RCP

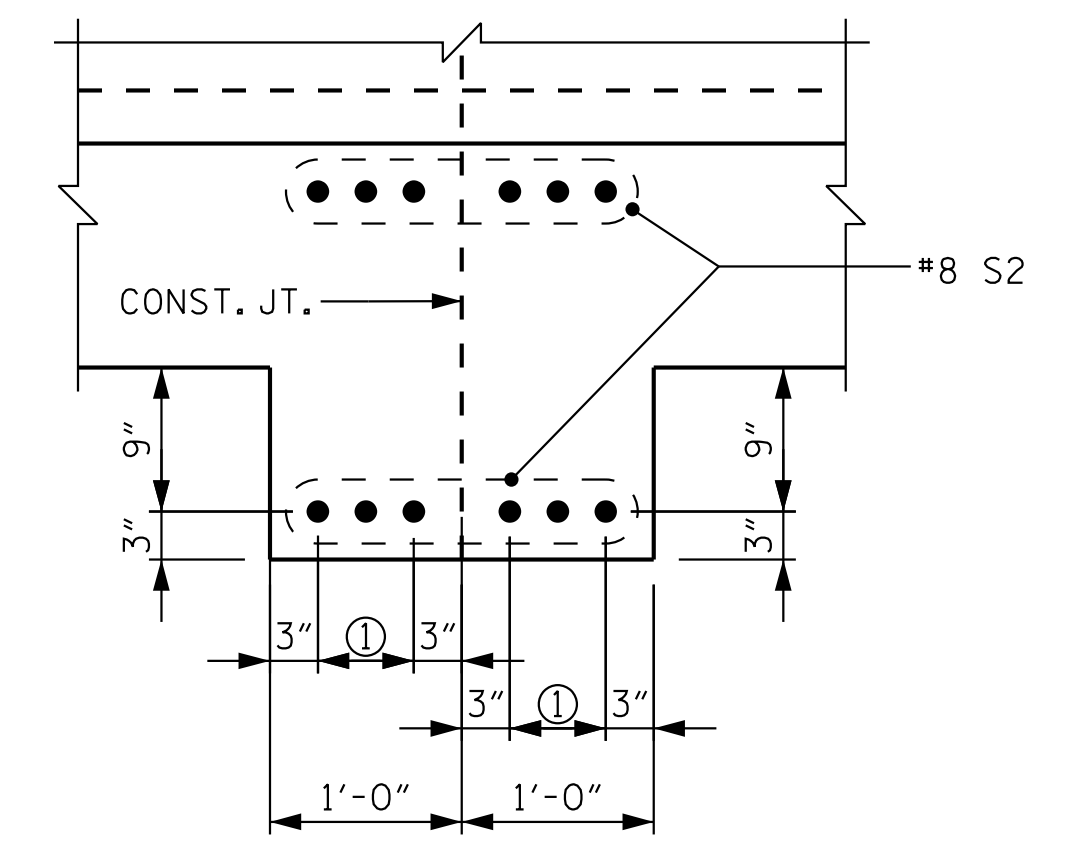


DETAIL OF REINFORCING AROUND
48" DIA. RCP

E1 BARS MAY BE SHIFTED SLIGHTLY OR FIELD BENT SLIGHTLY AS NECESSARY TO MAINTAIN CLEARANCES AND AVOID "A" BARS.



DETAIL A
① 2 SPA. @ 3"



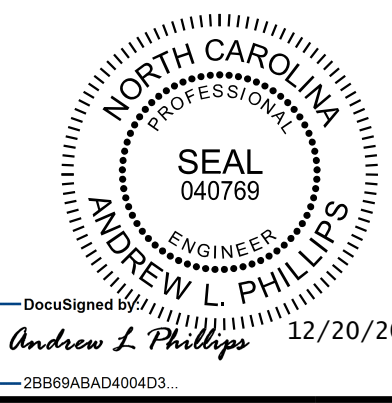
DETAIL B
① 2 SPA. @ 3"

PROJECT NO. R-2530B
STANLY COUNTY
STATION: 38+76.00 -L-

SHEET 3 OF 10

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 9 FT. X 5 FT.
CONCRETE BOX CULVERT
90° SKEW



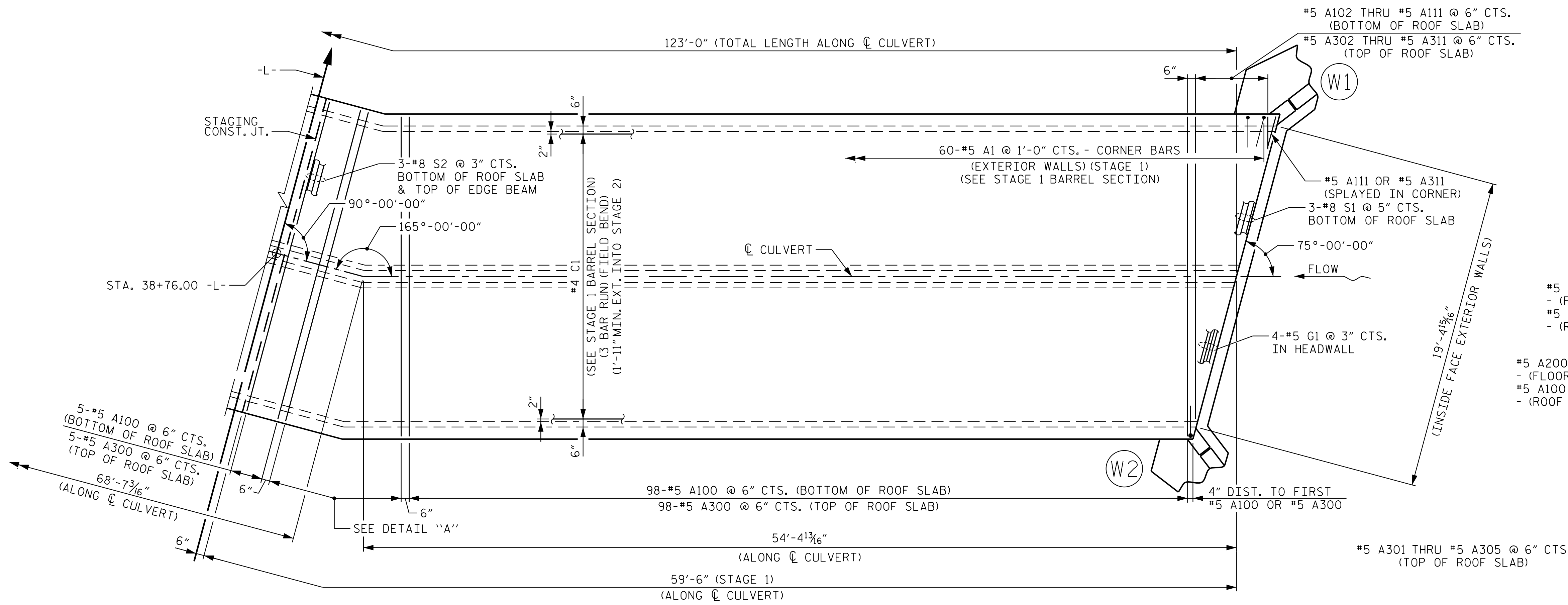
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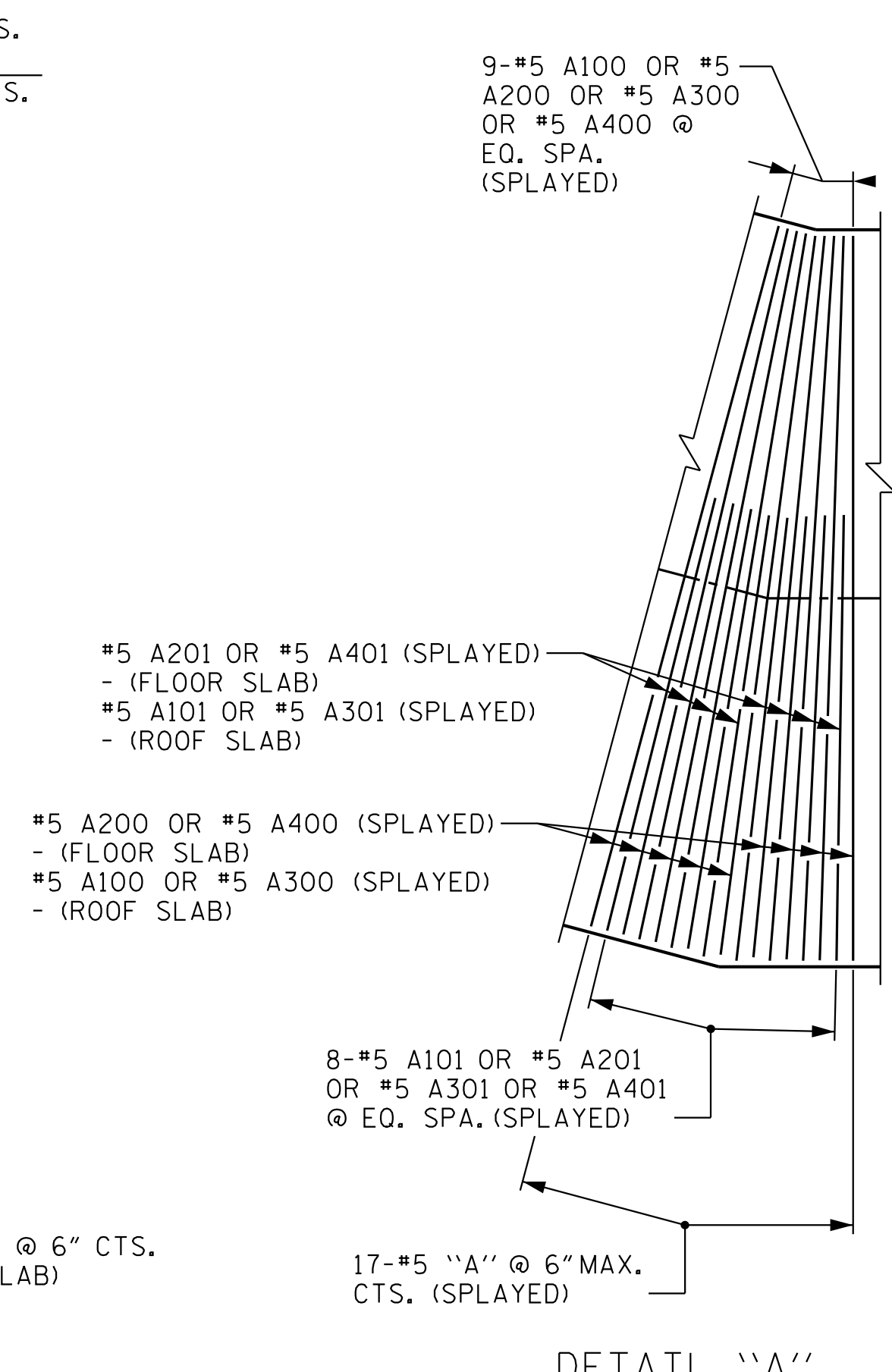
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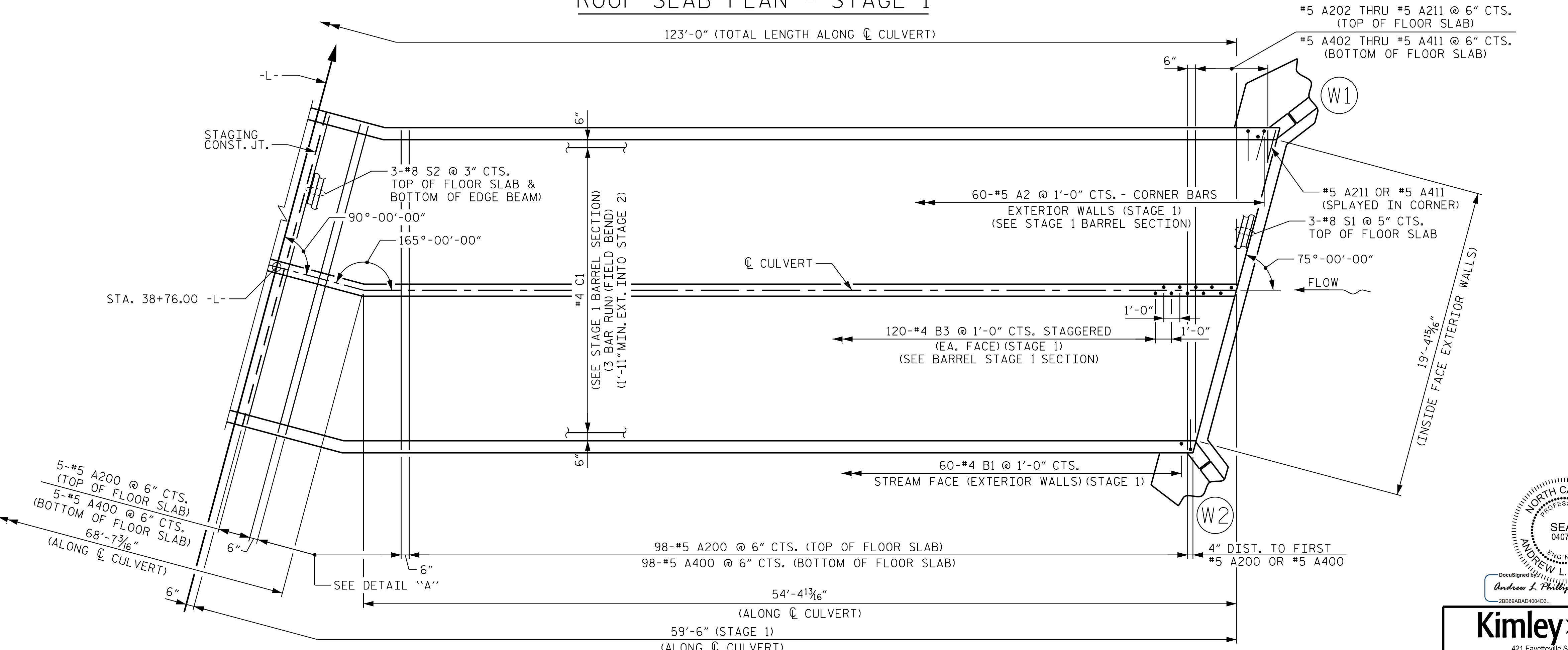
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DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18



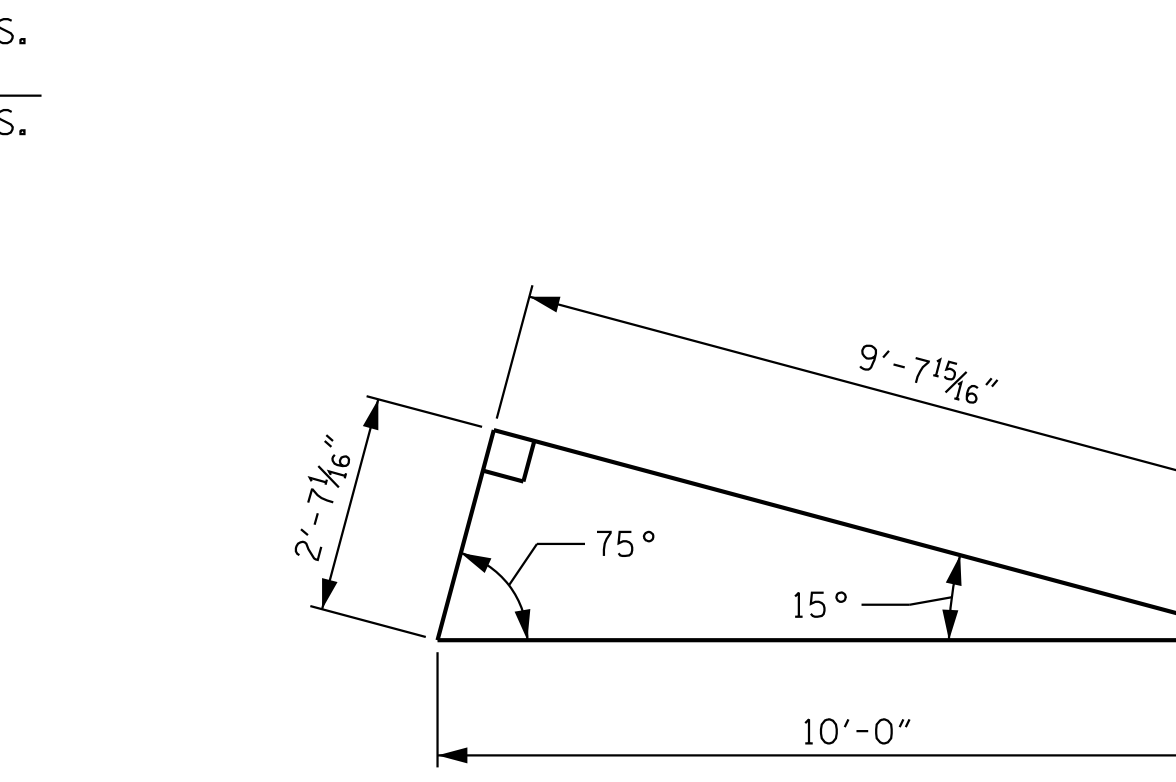
ROOF SLAB PLAN - STAGE 1



DETAIL "A"



FLOOR SLAB PLAN - STAGE 1

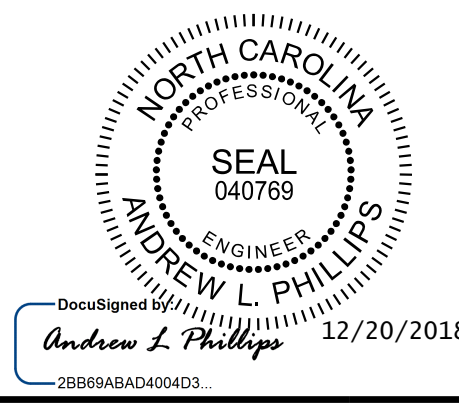


SKEW TRIANGLE

PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 38+76.00 -L-

SHEET 4 OF 10

STATE OF NORTH CAROLINA
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 RALEIGH
 STAGE 1
 DOUBLE 9 FT. X 5 FT.
 CONCRETE BOX CULVERT
 90° SKEW



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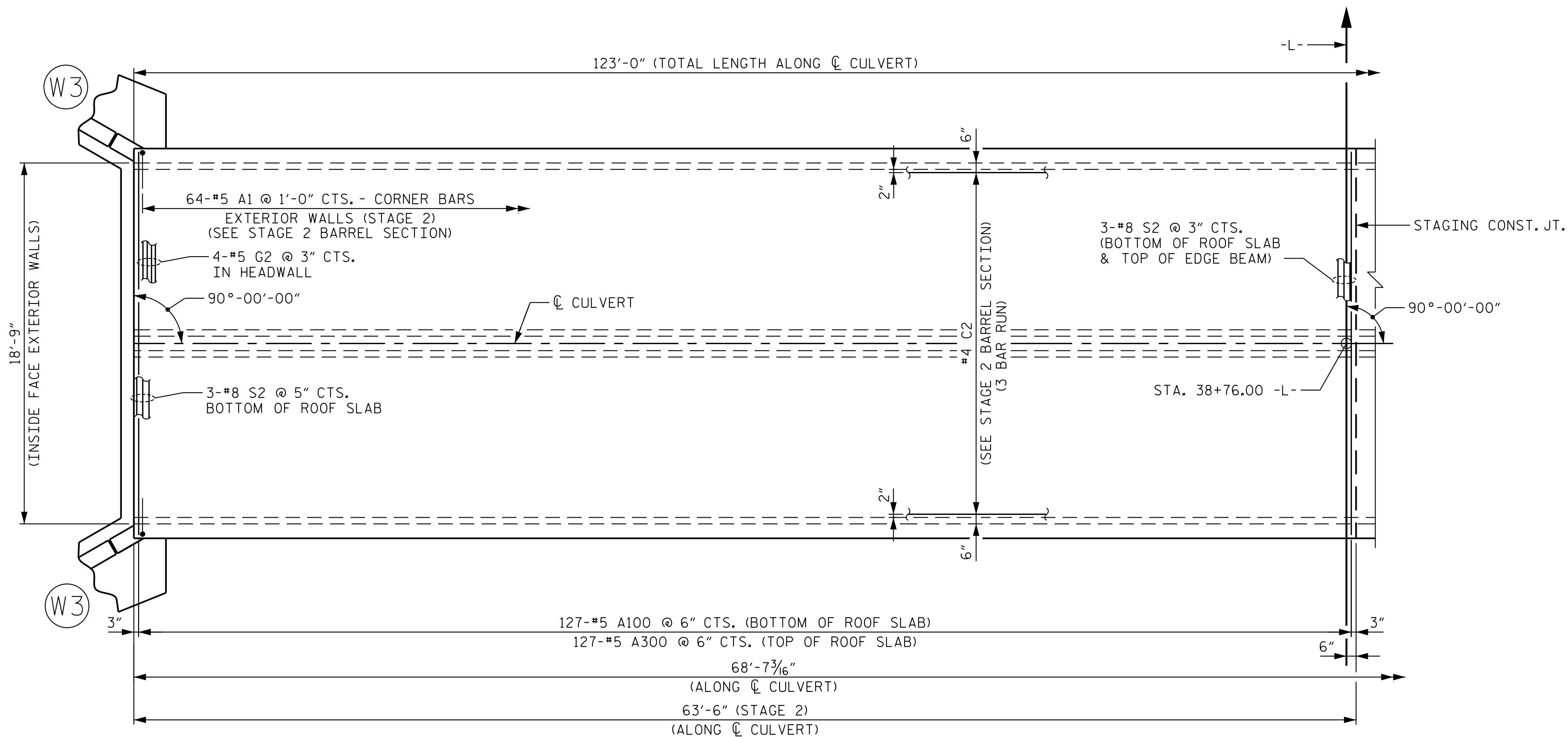
NOTE: FOR S3 BARS IN THE FLOOR SLAB & WING FOOTINGS, SEE SHEET CO1-8.

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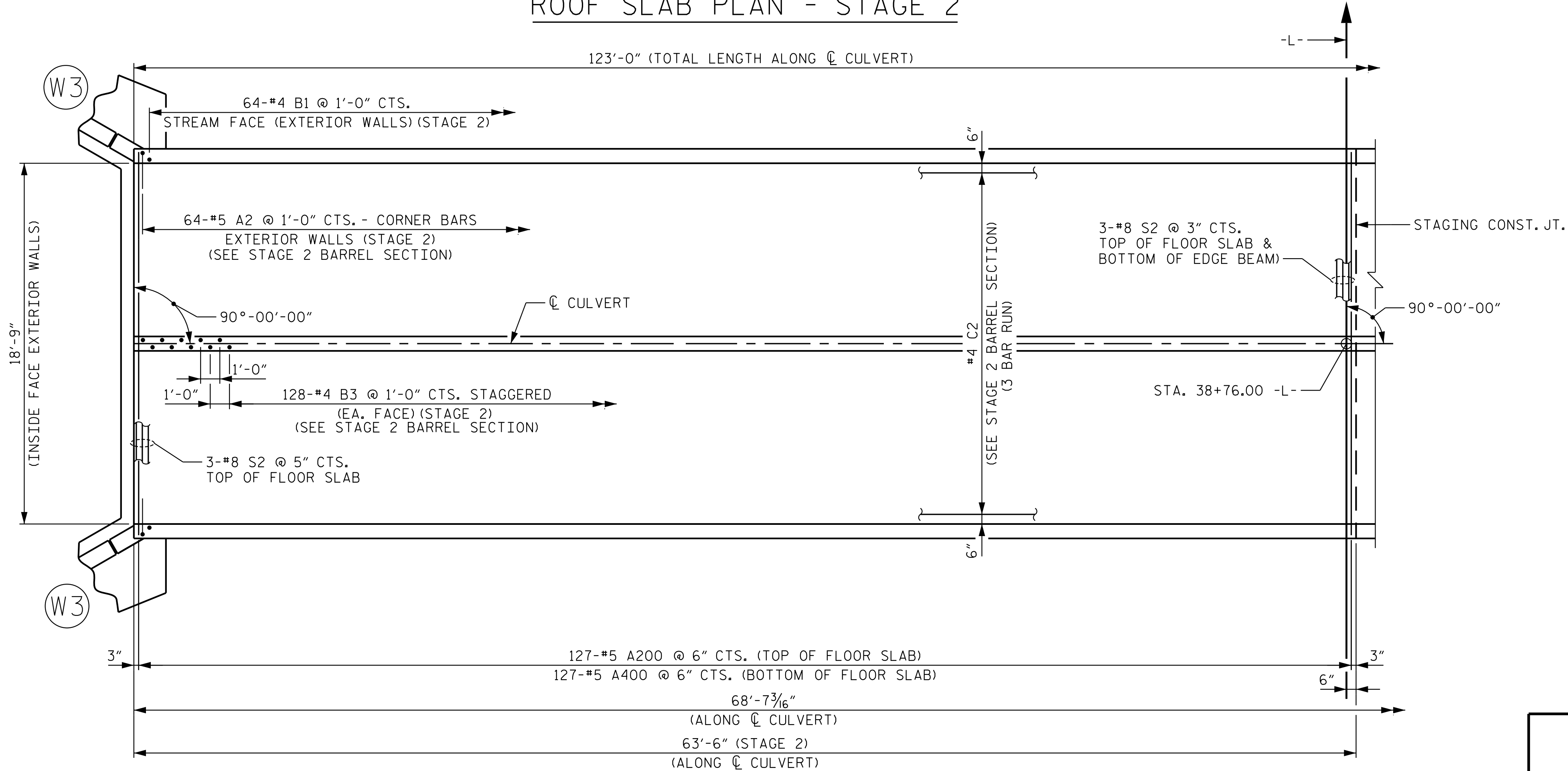
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FLOW ←



ROOF SLAB PLAN - STAGE 2

FLOW ←



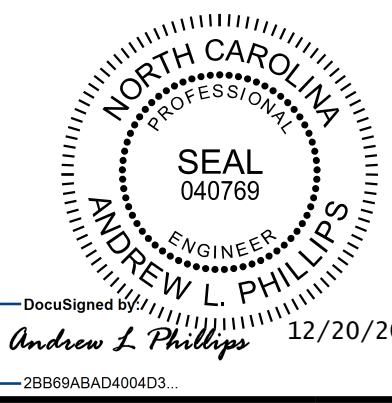
FLOOR SLAB PLAN - STAGE 2

NOTE: FOR S4 BARS IN THE FLOOR SLAB & WING FOOTINGS, SEE SHEET C01-9.

PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 38+76.00 -L-

SHEET 5 OF 10

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STAGE 2
 DOUBLE 9 FT. X 5 FT.
 CONCRETE BOX CULVERT
 90° SKEW



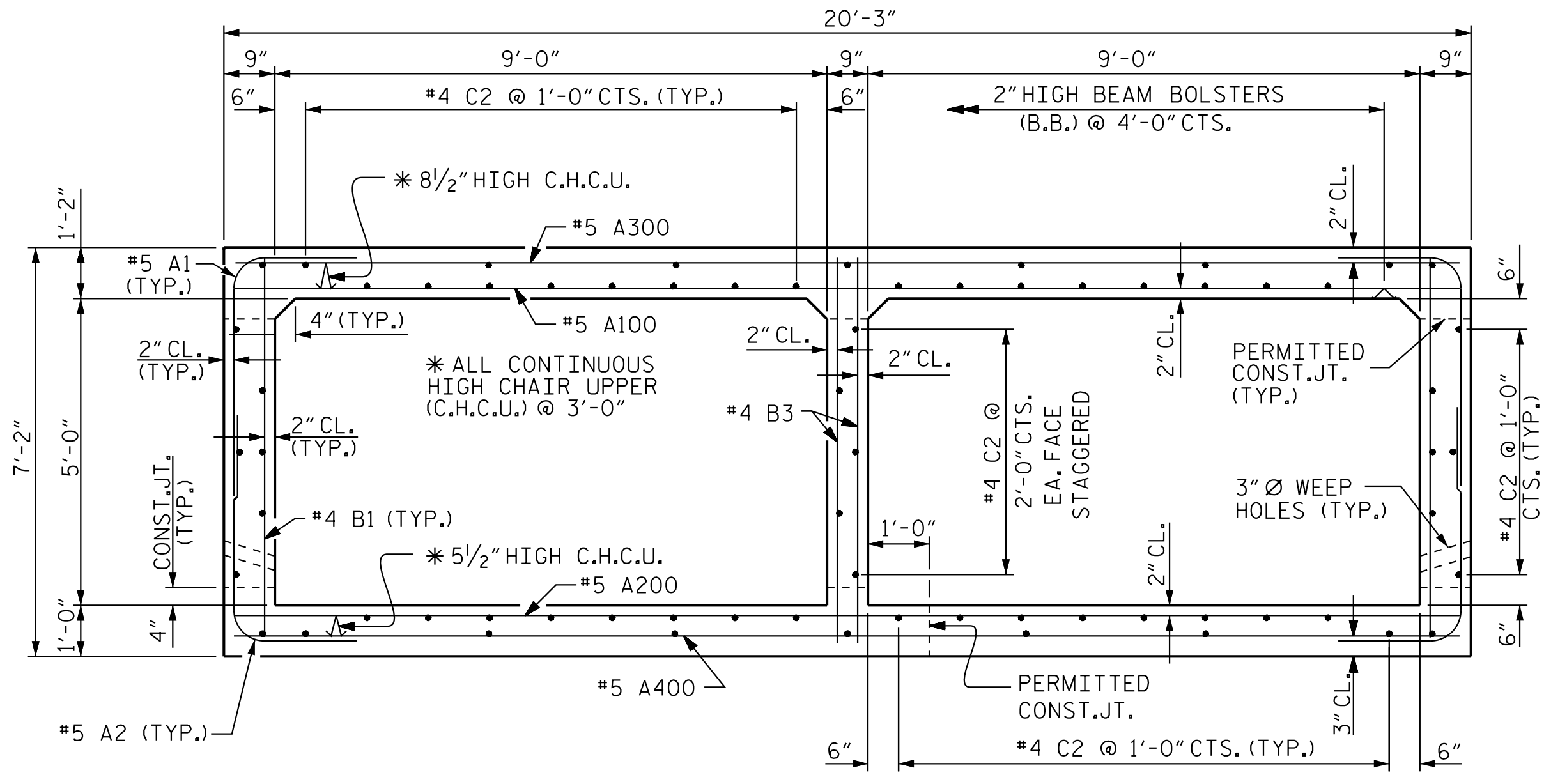
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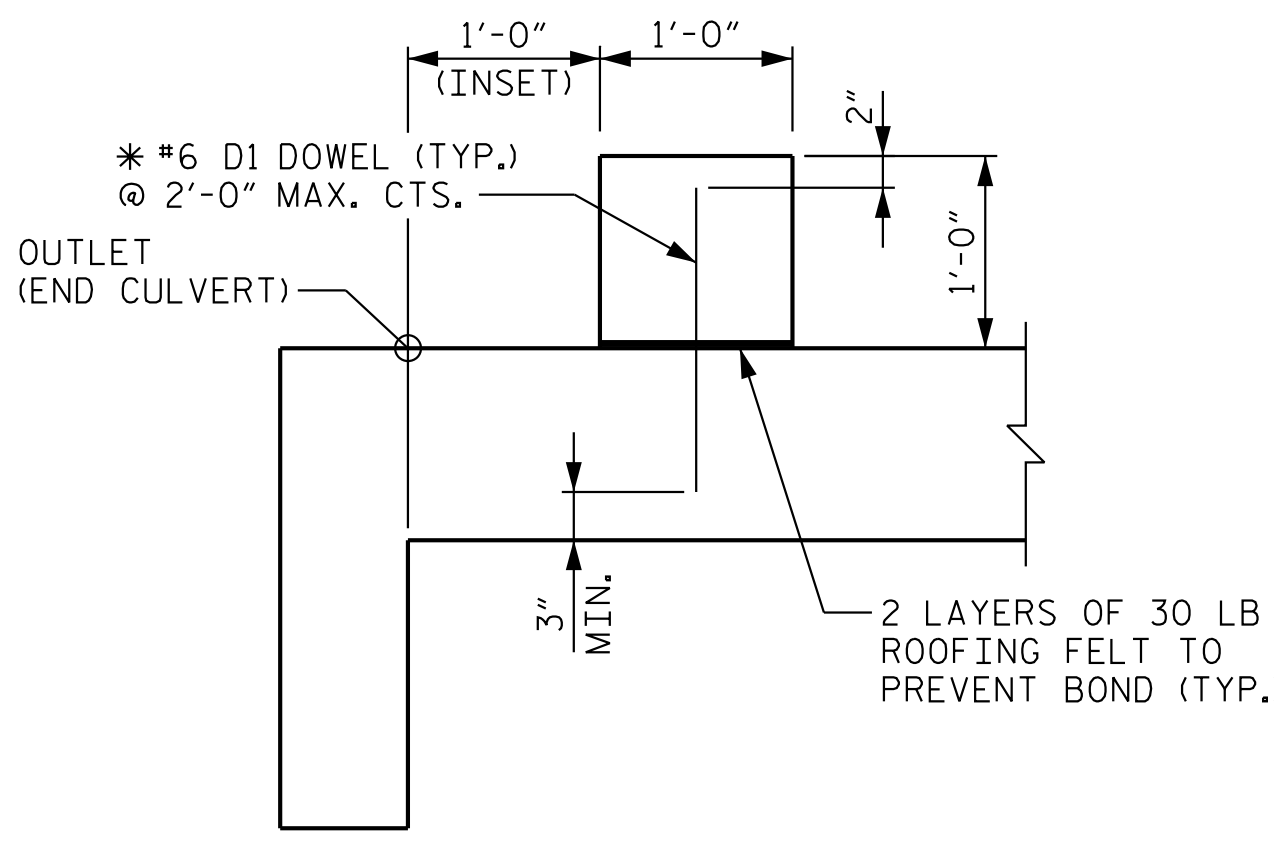
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 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18



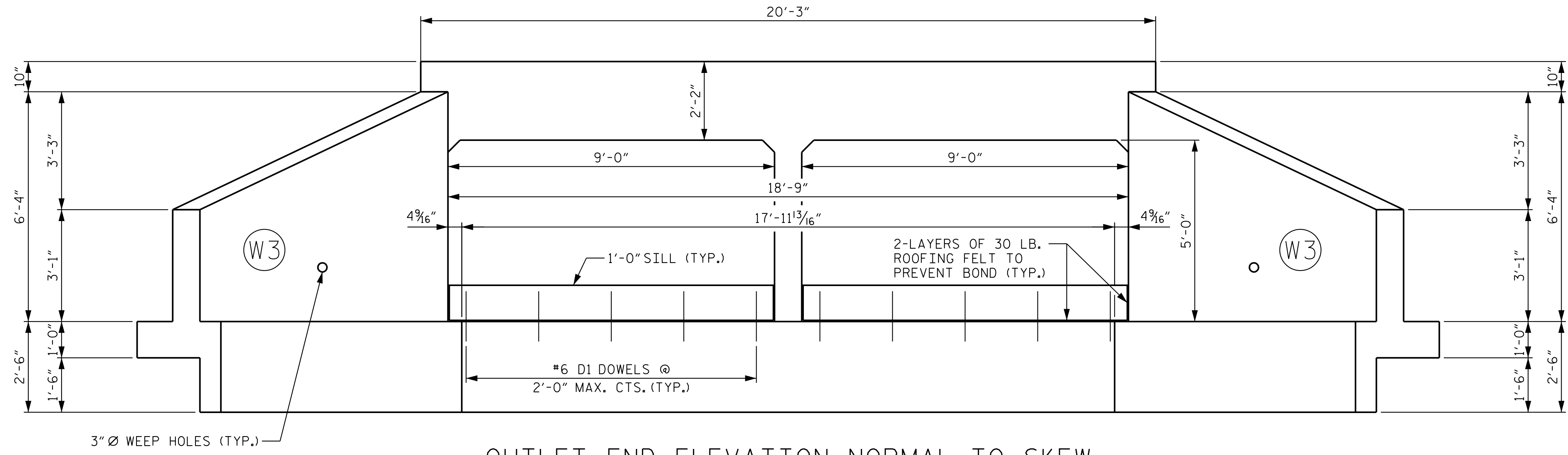
RIGHT ANGLE SECTION OF BARREL - STAGE 2

THERE ARE 67 C2 BARS IN SECTION OF BARREL.



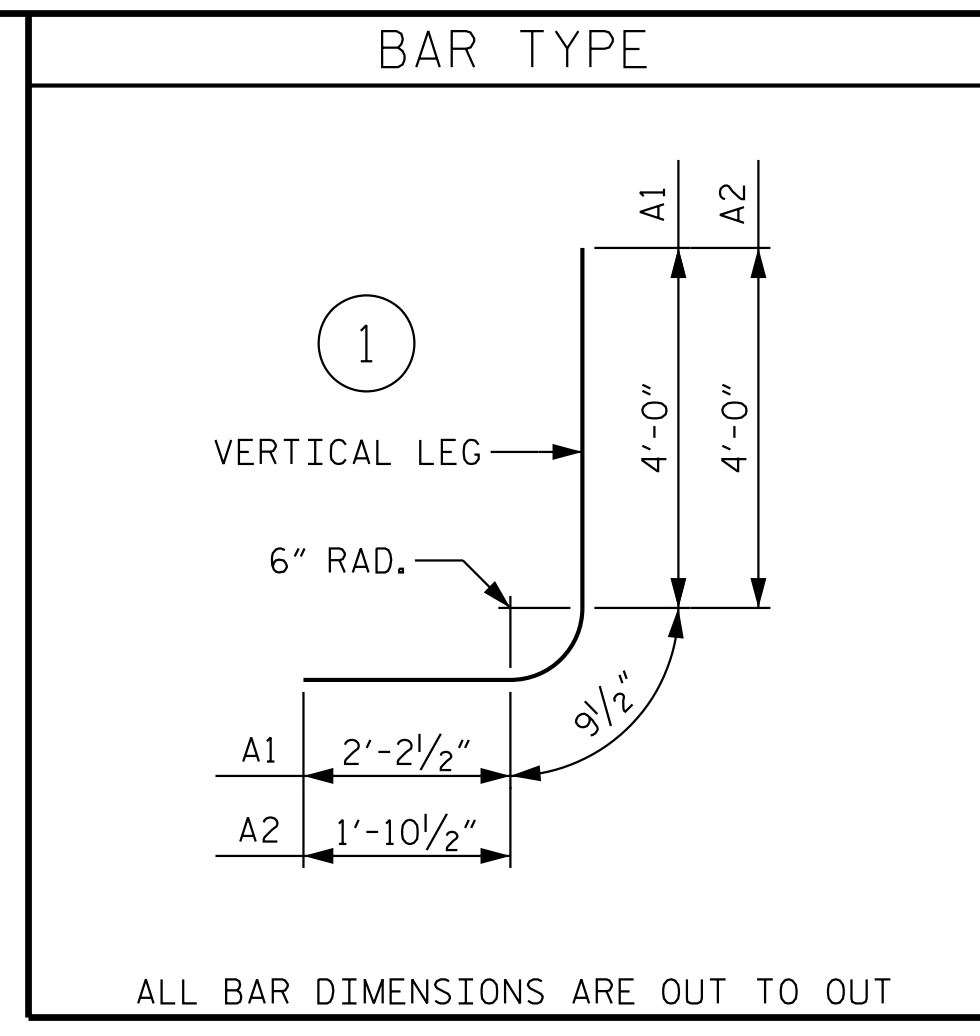
SECTION THROUGH SILL

* DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.
NOTE: 1'-0" SILLS ARE TO BE CAST NORMAL TO CULVERT WALLS.



OUTLET END ELEVATION NORMAL TO SKEW

STAGE 2

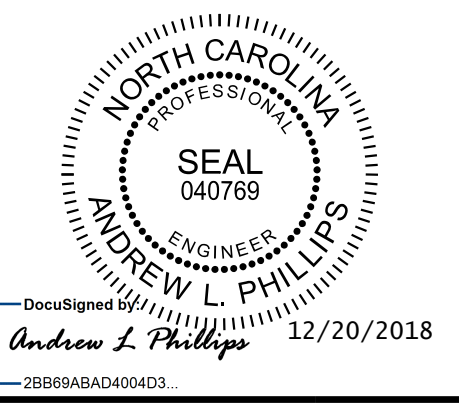


BILL OF MATERIAL					
STAGE 2					
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	
A1	128	5	1	7'-0"	935
A2	128	5	1	6'-8"	890
A100	127	5	STR	19'-10"	2,627
A200	127	5	STR	19'-10"	2,627
A300	127	5	STR	19'-10"	2,627
A400	127	5	STR	19'-10"	2,627
B1	120	4	STR	6'-8"	534
B3	120	4	STR	6'-8"	534
C2	201	4	STR	22'-5"	3,010
D1	10	6	STR	1'-7"	24
E2	32	4	STR	4'-6"	96
G2	4	5	STR	19'-10"	83
S2	18	8	STR	19'-10"	953
REINFORCING STEEL					LBS. 17,639

STAGE 2 QUANTITIES	
CLASS A CONCRETE	
BARREL @ 2.050 C.Y./FT.	130.2 C.Y.
WINGS, ETC.	11.0 C.Y.
SILLS	0.7 C.Y.
EDGE BEAMS	1.5 C.Y.
TOTAL	143.4 C.Y.
REINFORCING STEEL	
BARREL, SILLS & EDGE BEAMS	17,639 LBS.
WINGS, ETC.	563 LBS.
TOTAL	18,202 LBS.

BAR SIZE	SPLICE LENGTH
#5 A200	2'-2"
#5 A400	2'-2"
#4 B1	1'-5"
#4 B3	1'-5"
#4 C1	1'-11"

PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 38+76.00 -L-
 SHEET 7 OF 10



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STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
STAGE 2
DOUBLE 9 FT. X 5 FT.
CONCRETE BOX CULVERT
90° SKEW

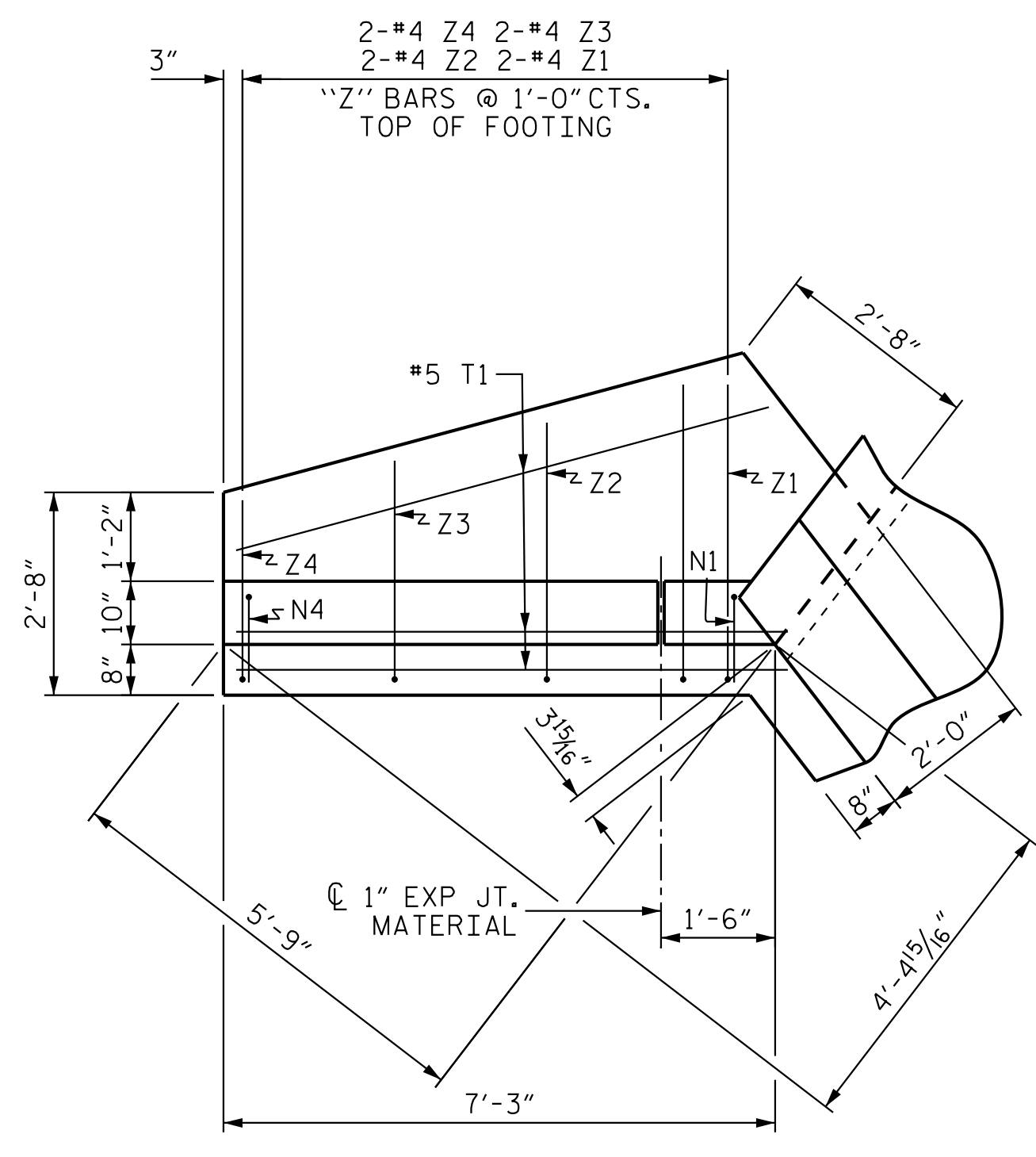
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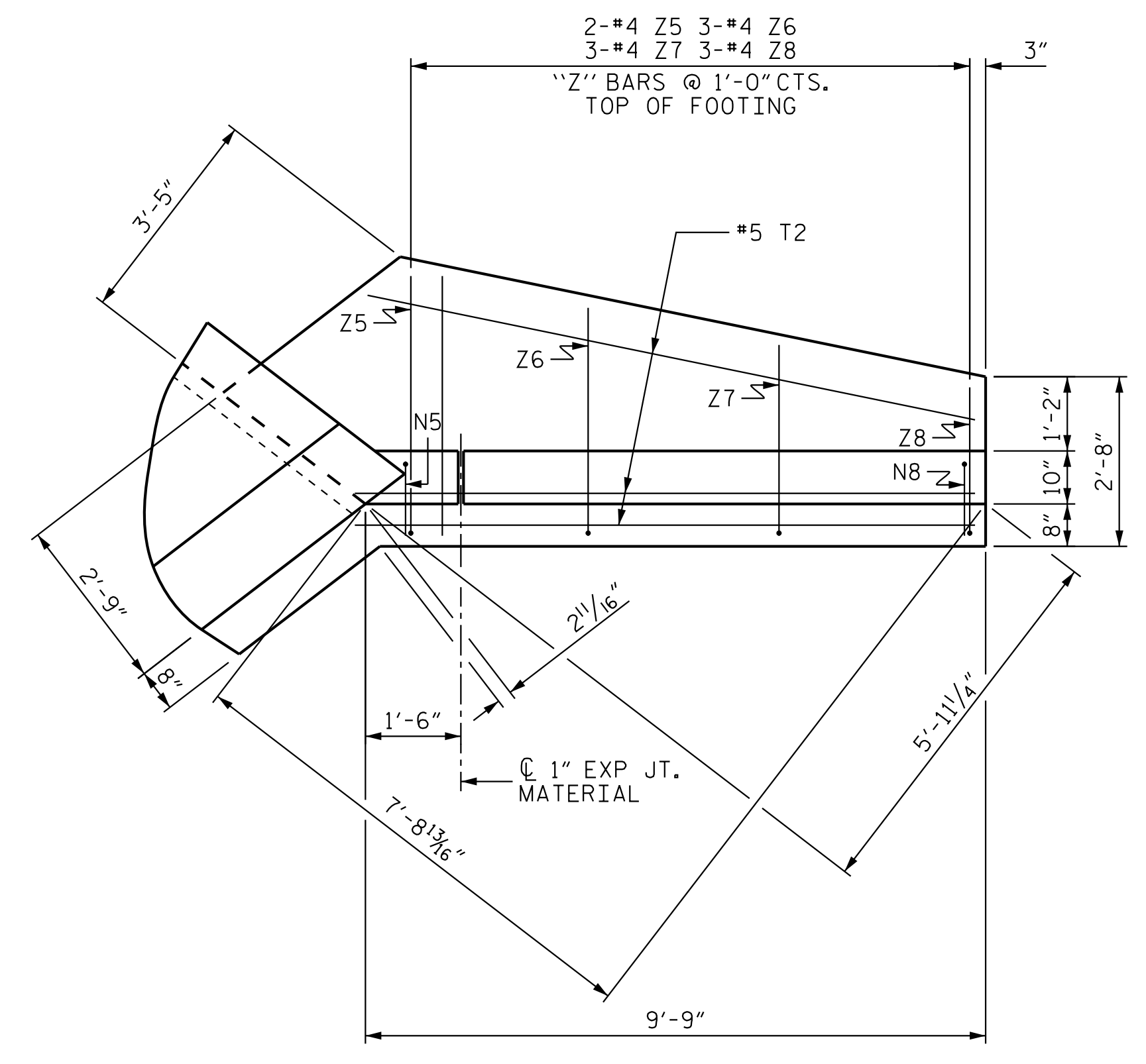
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 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

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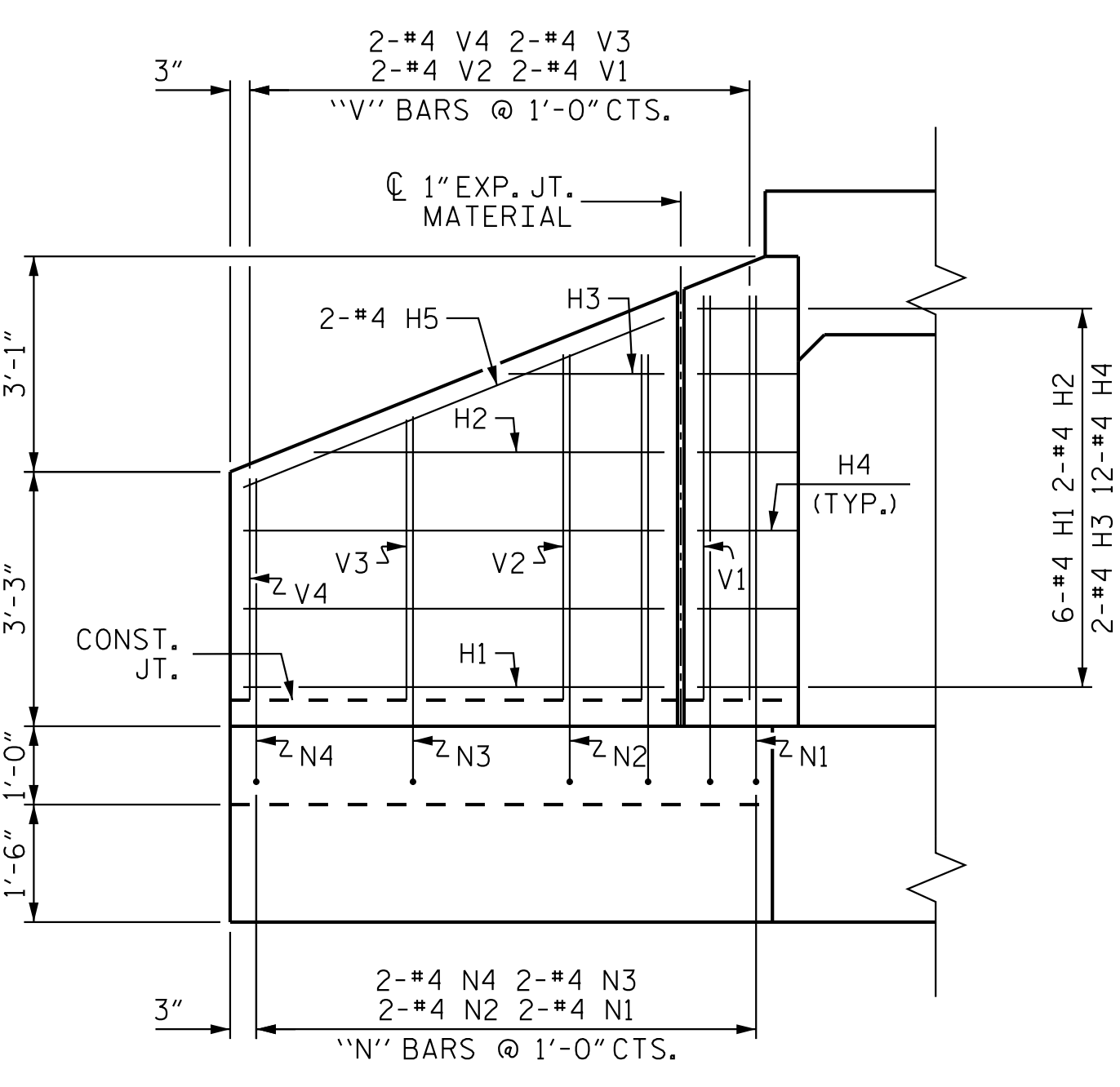
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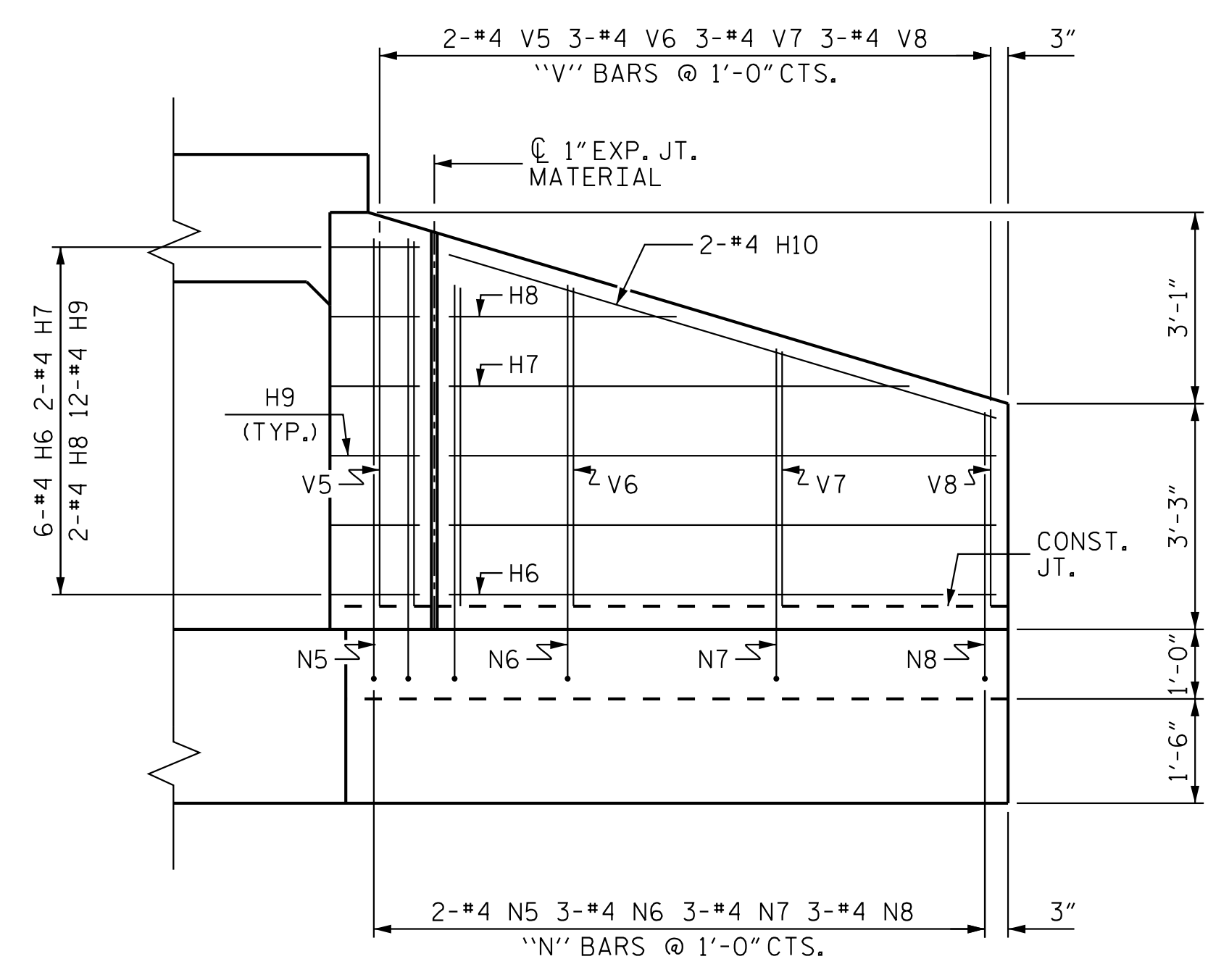
PLAN W2



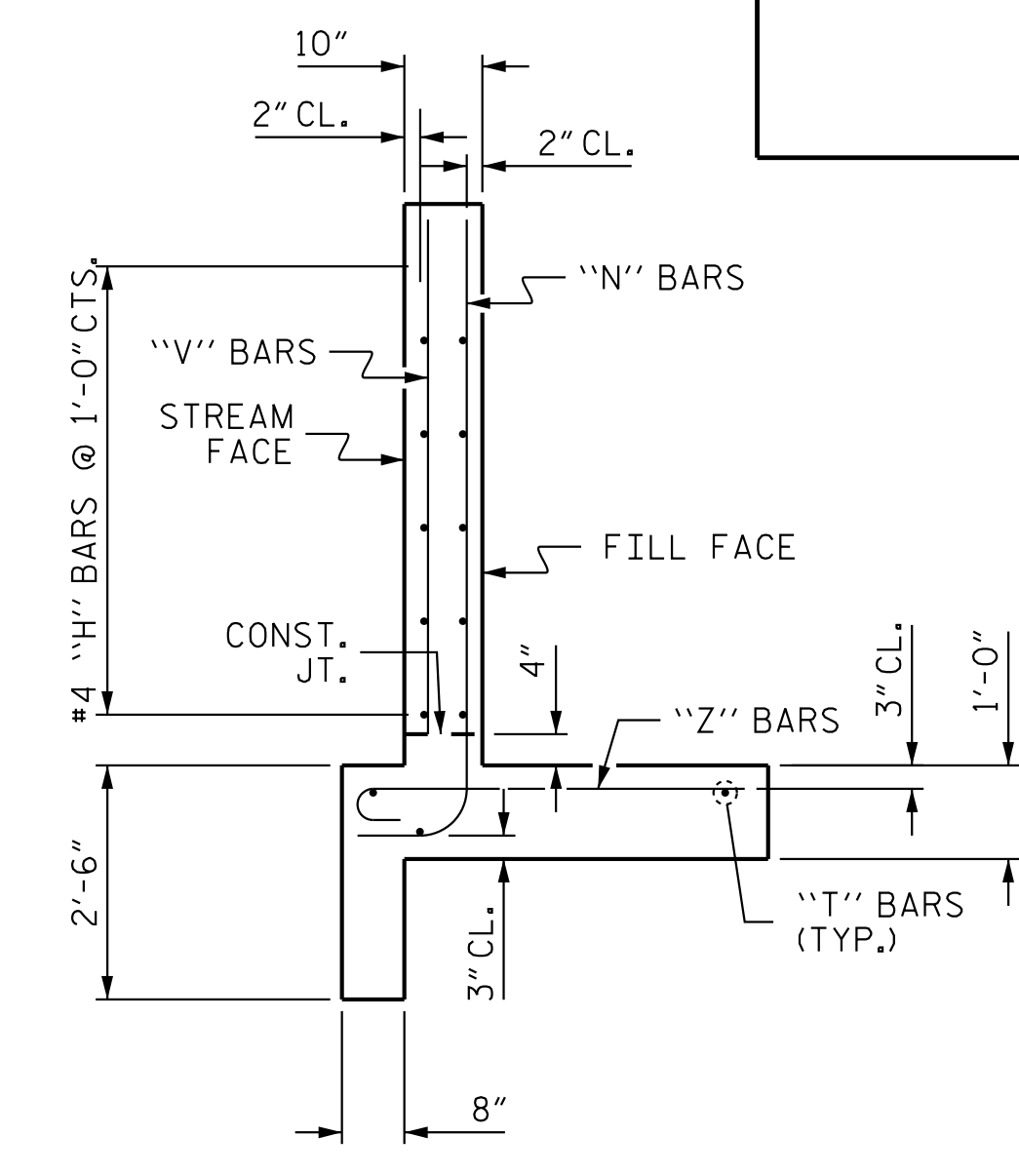
PLAN W1



ELEVATION W2



ELEVATION W1



TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.

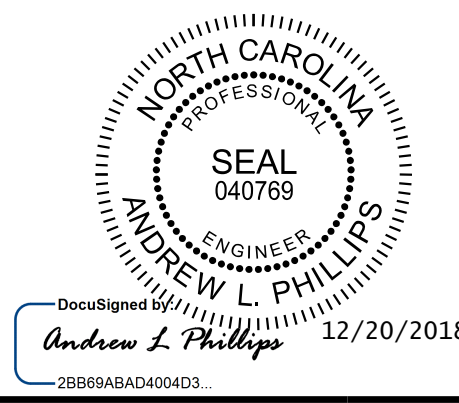
1.

2.

3.

4.

BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	6	#4	STR	5'-4"	21
H2	2	#4	STR	4'-5"	6
H3	2	#4	STR	2'-0"	3
H4	12	#4	1	3'-3"	26
H5	2	#4	STR	5'-9"	8
H6	6	#4	STR	7'-10"	31
H7	2	#4	STR	6'-7"	9
H8	2	#4	STR	3'-3"	4
H9	12	#4	2	3'-3"	26
H10	2	#4	STR	8'-2"	11
N1	2	#4	3	7'-2"	10
N2	2	#4	3	6'-5"	9
N3	2	#4	3	5'-8"	8
N4	2	#4	3	4'-10"	6
N5	2	#4	3	7'-4"	10
N6	3	#4	3	6'-8"	13
N7	3	#4	3	5'-9"	12
N8	3	#4	3	4'-10"	10
T1	3	#5	STR	7'-3"	23
T2	3	#5	STR	9'-9"	31
V1	2	#4	STR	5'-2"	7
V2	2	#4	STR	4'-5"	6
V3	2	#4	STR	3'-7"	5
V4	2	#4	STR	2'-10"	4
V5	2	#4	STR	5'-3"	7
V6	3	#4	STR	4'-7"	9
V7	3	#4	STR	3'-8"	7
V8	3	#4	STR	2'-10"	6
Z1	2	#4	4	4'-5"	6
Z2	2	#4	4	3'-11"	5
Z3	2	#4	4	3'-5"	5
Z4	2	#4	4	2'-10"	4
Z5	2	#4	4	4'-7"	6
Z6	3	#4	4	4'-1"	8
Z7	3	#4	4	3'-6"	7
Z8	3	#4	4	2'-10"	6
REINFORCING STEEL				375	LBS
FOR 2 WINGS					
CLASS A CONCRETE					
2 WINGS				5.6	CY
1 HEADWALLS				1.0	CY
1 END CURTAIN WALLS				1.2	CY
TOTAL				7.8	CY



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SHEET 8 OF 10

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**STANDARD WINGS
 FOR STAGE 1
 CONCRETE BOX CULVERT**
 H = 5'-0" SLOPE = 2:1
 75° OR 105° SKEW

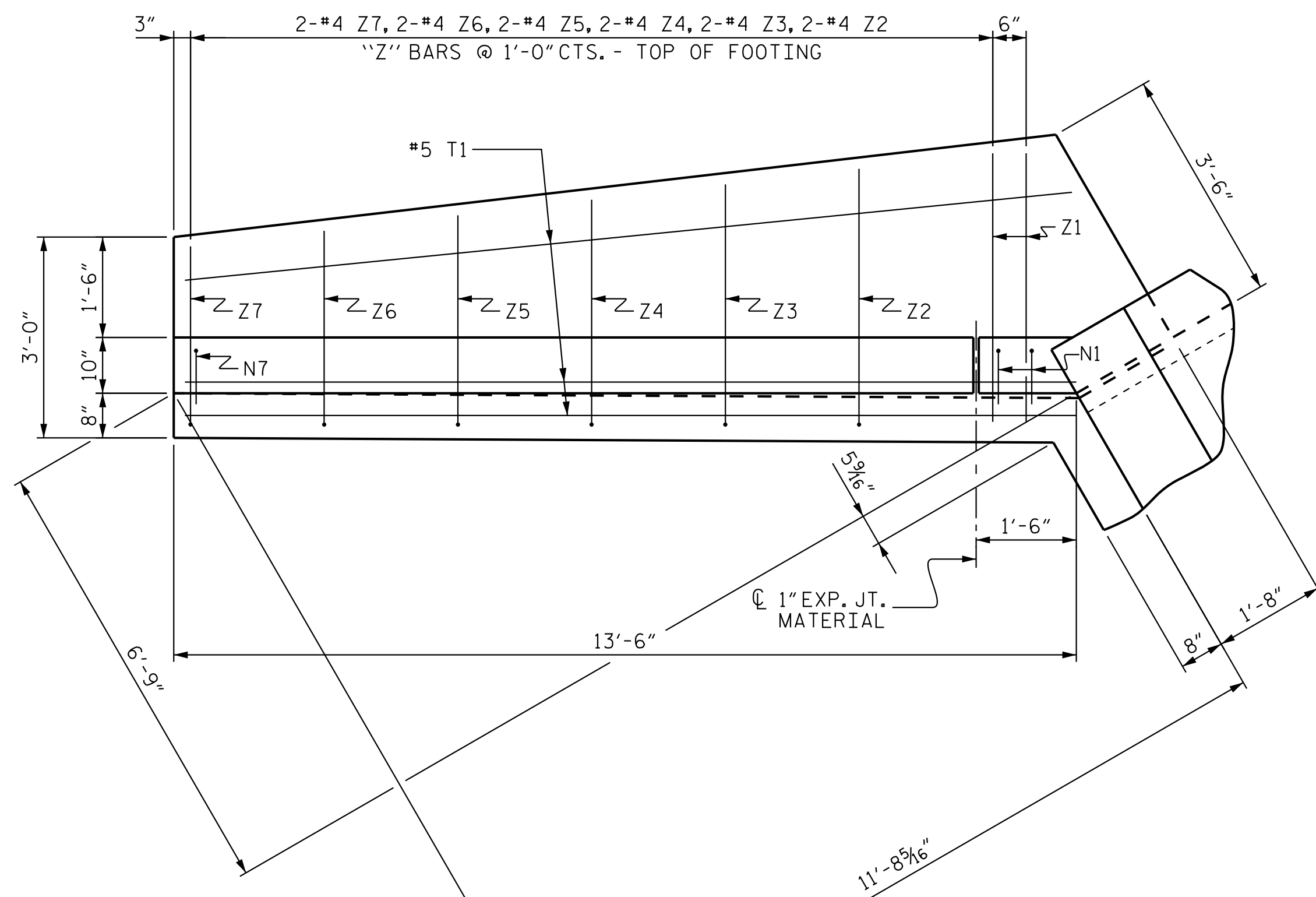
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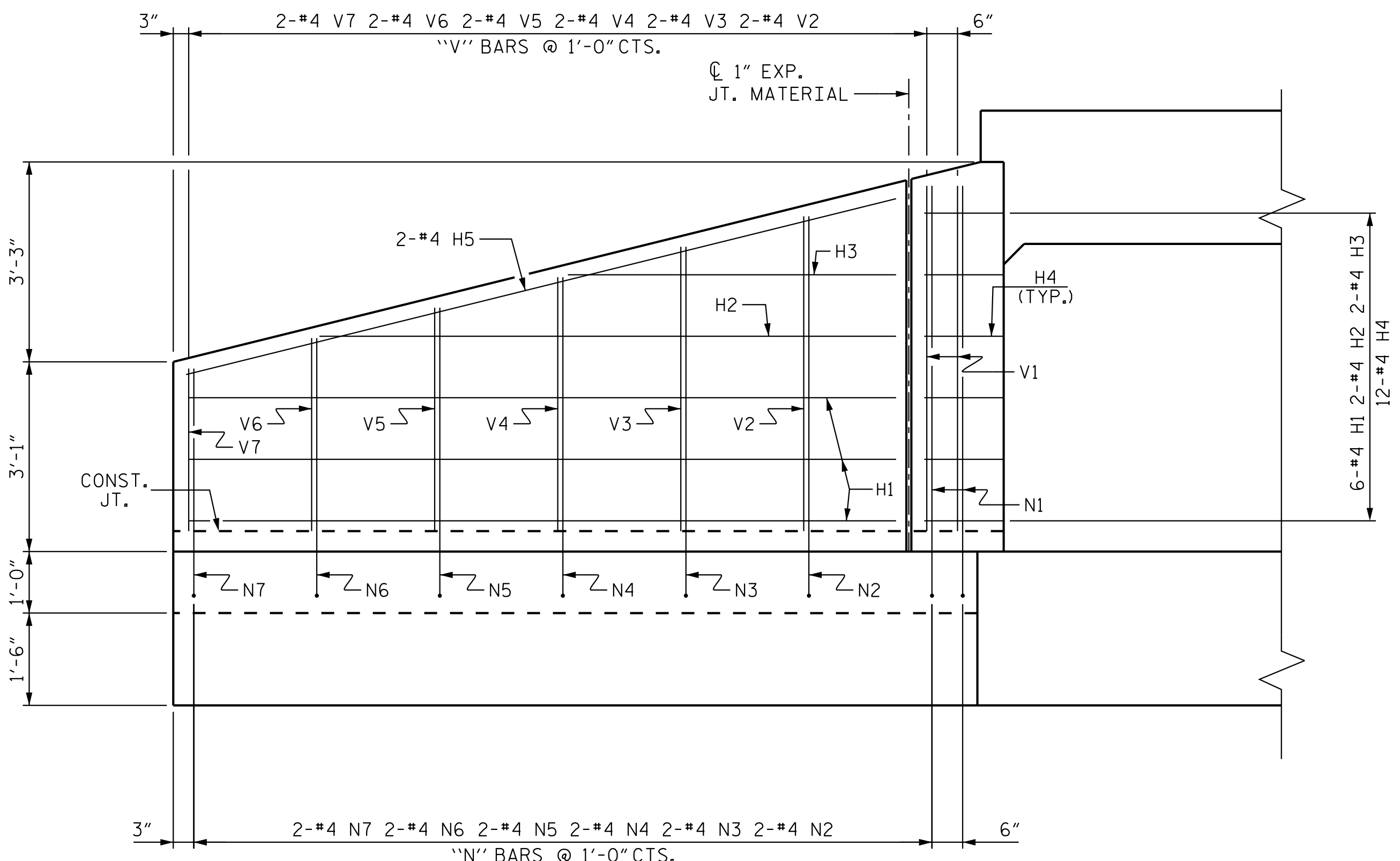
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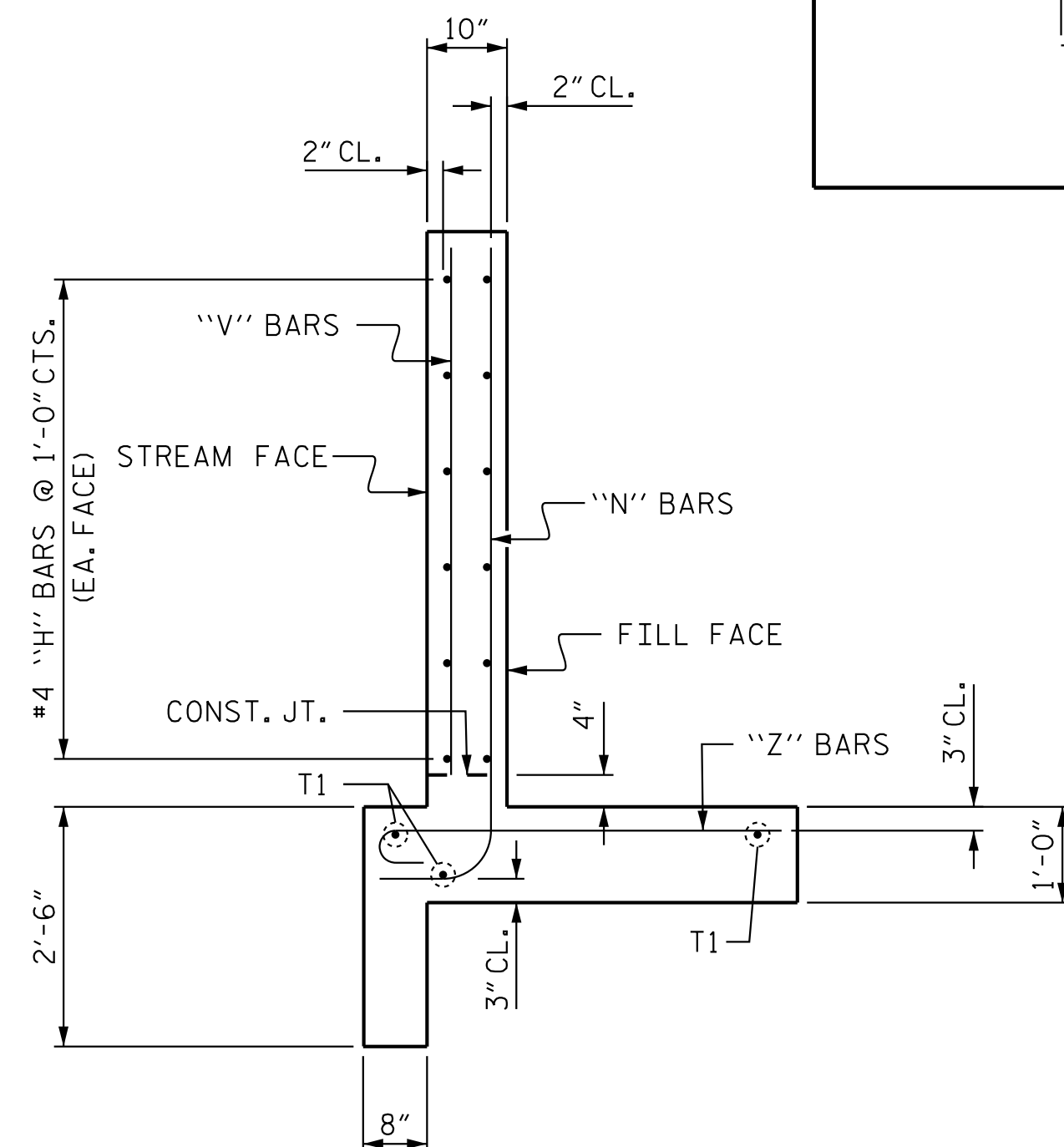
ASSEMBLED BY : D. D. LOWERY	DATE : 12/18
CHECKED BY : P. D. COOKSEY	DATE : 12/18
DRAWN BY : CCJ 12/99	
CHECKED BY : RWW 03/00	



PLAN W3



ELEVATION W3



TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.

①

②

③

BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	4	STR	11'-7"	93
H2	4	4	STR	9'-4"	25
H3	4	4	STR	5'-4"	14
H4	24	4	1	3'-3"	52
H5	4	4	STR	11'-11"	32
N1	4	4	2	7'-7"	20
N2	4	4	2	7'-1"	19
N3	4	4	2	6'-7"	18
N4	4	4	2	6'-1"	16
N5	4	4	2	5'-8"	15
N6	4	4	2	5'-2"	14
N7	4	4	2	4'-8"	12
T1	6	5	STR	13'-6"	84
V1	4	4	STR	5'-7"	15
V2	4	4	STR	5'-1"	14
V3	4	4	STR	4'-7"	12
V4	4	4	STR	4'-1"	11
V5	4	4	STR	3'-7"	10
V6	4	4	STR	3'-1"	8
V7	4	4	STR	2'-7"	7
Z1	4	4	3	4'-7"	12
Z2	4	4	3	4'-4"	12
Z3	4	4	3	4'-1"	11
Z4	4	4	3	3'-10"	10
Z5	4	4	3	3'-7"	10
Z6	4	4	3	3'-5"	9
Z7	4	4	3	3'-2"	8

REINFORCING STEEL	563 LBS
FOR 2 WINGS	
CLASS A CONCRETE	
2 WINGS	9.0 CY
1 HEADWALL	0.9 CY
1 END CURTAIN WALL	1.1 CY
TOTAL	11.0 CY

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DRAWN BY: D. D. LOWERY DATE: 12/18
 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

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SHEET 9 OF 10

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**OUTLET WING DETAILS
 FOR STAGE 2
 CONCRETE BOX CULVERT**
 H = 5'-0" SLOPE = 3:1
 90° SKEW

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LOAD FACTORS: _____

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

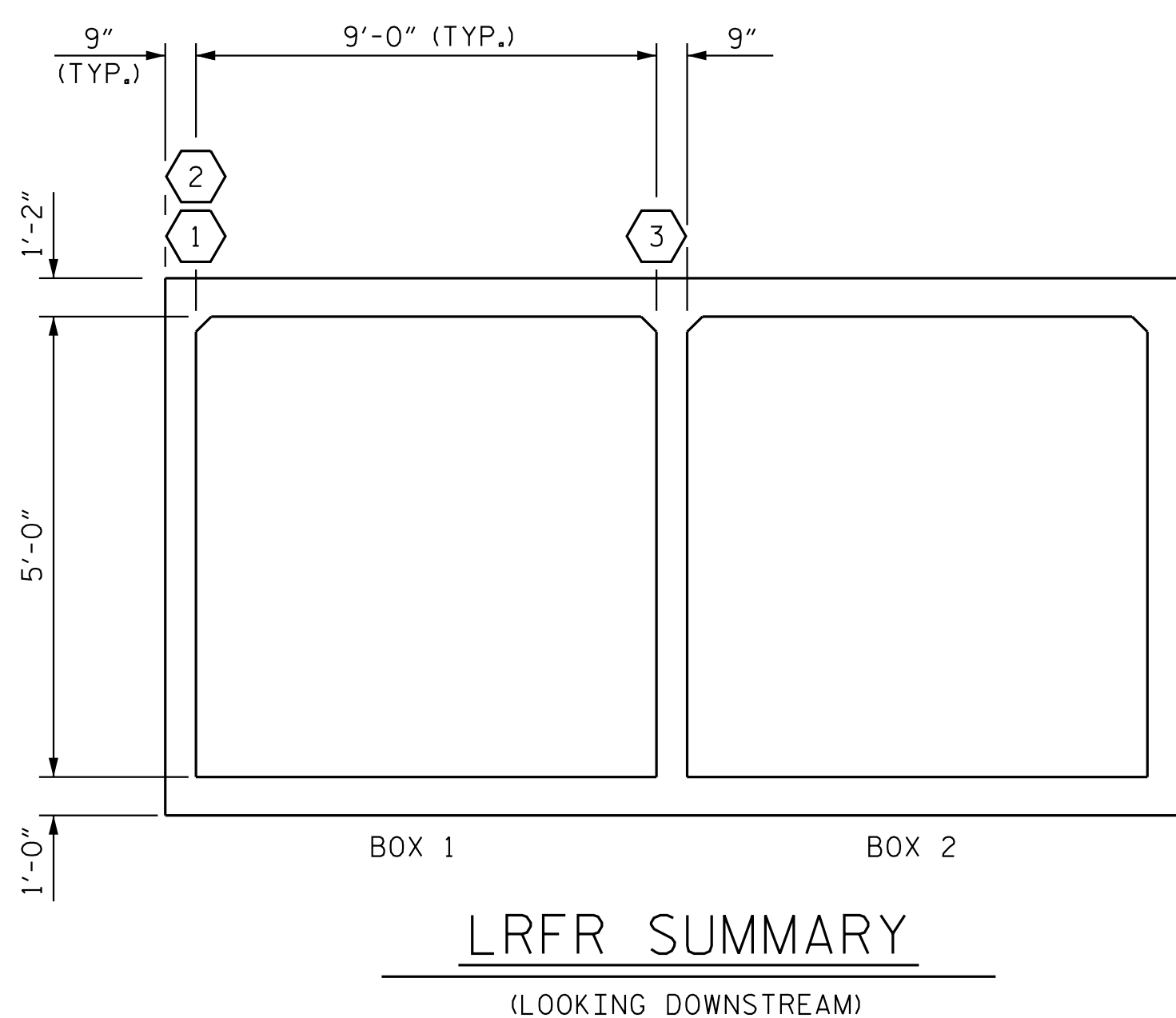
LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						LIVE-LOAD FACTORS (γ _{LL})	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	①	1.21	--	1.75	1.30	1	BOTTOM SLAB	10.13	1.21	1	TOP SLAB	0.75		
	HL-93 (OPERATING)	N/A		1.57	--	1.35	1.68	1	BOTTOM SLAB	10.13	1.57	1	TOP SLAB	0.75		
	HS-20 (INVENTORY)	36.000	②	1.33	47.88	1.75	1.49	1	BOTTOM SLAB	10.13	1.33	1	TOP SLAB	0.75		
	HS-20 (OPERATING)	36.000		1.73	62.28	1.35	1.94	1	BOTTOM SLAB	10.13	1.73	1	TOP SLAB	0.75		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		2.86	38.61	1.40	2.86	1	EXT WALL	0.38	3.00	1	TOP SLAB	0.75		
		SNGARBS2	20.000		2.70	54.00	1.40	2.70	1	EXT WALL	0.38	2.72	1	TOP SLAB	0.75	
		SNAGRIS2	22.000		2.72	59.84	1.40	2.72	1	BOTTOM SLAB	10.13	2.99	1	TOP SLAB	0.75	
		SNCOTTS3	27.250	③	1.45	39.51	1.40	1.75	1	EXT WALL	0.38	1.45	1	TOP SLAB	9.75	
		SNAGGRS4	34.925		1.73	60.42	1.40	1.73	1	BOTTOM SLAB	10.13	2.04	1	TOP SLAB	9.75	
		SNS5A	35.550		1.81	64.35	1.40	1.91	1	BOTTOM SLAB	10.13	1.81	1	TOP SLAB	9.75	
		SNS6A	39.950		1.79	71.51	1.40	1.79	1	BOTTOM SLAB	10.13	1.80	1	TOP SLAB	9.75	
		SNS7B	42.000		1.79	75.18	1.40	1.79	1	BOTTOM SLAB	10.13	1.80	1	TOP SLAB	9.75	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		1.91	63.03	1.40	1.91	1	BOTTOM SLAB	10.13	2.78	1	BOTTOM SLAB	9.75	
		TNT4A	33.075		1.87	61.85	1.40	2.05	1	EXT WALL	0.38	1.87	1	TOP SLAB	9.75	
		TNT6A	41.600		1.83	76.13	1.40	1.91	1	BOTTOM SLAB	10.13	1.83	1	TOP SLAB	9.75	
		TNT7A	42.000		1.86	78.12	1.40	1.86	1	BOTTOM SLAB	10.13	1.78	1	TOP SLAB	9.75	
		TNT7B	42.000		1.78	74.76	1.40	2.03	1	BOTTOM SLAB	10.13	1.78	1	TOP SLAB	9.75	
		TNAGRIT4	43.000		1.85	79.55	1.40	1.87	1	BOTTOM SLAB	10.13	1.85	1	TOP SLAB	9.75	
	TNAGT5A	45.000		1.77	79.65	1.40	1.77	1	BOTTOM SLAB	10.13	1.84	1	TOP SLAB	9.75		
	TNAGT5B	45.000		1.46	65.70	1.40	1.46	1	BOTTOM SLAB	10.13	1.81	1	TOP SLAB	9.75		

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	--

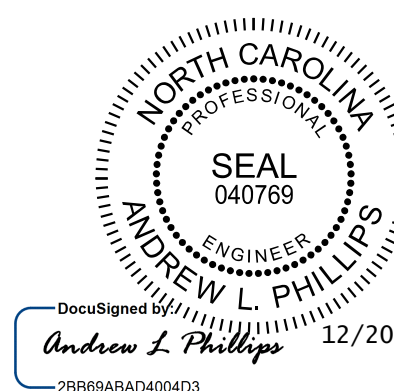
NOTE:
RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM THE EXTERIOR EDGE OF EXTERIOR WALL.

#	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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SHEET 10 OF 10



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

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C01-10
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2			4			10

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STD. NO. LRFR5

12/20/2018 K:\BIDI_Structures\Culvert\NC\0101036489 - B-2530B\Cad\Drawn\Culvert-1\11-019_R2530B_SML_CU_010.dgn

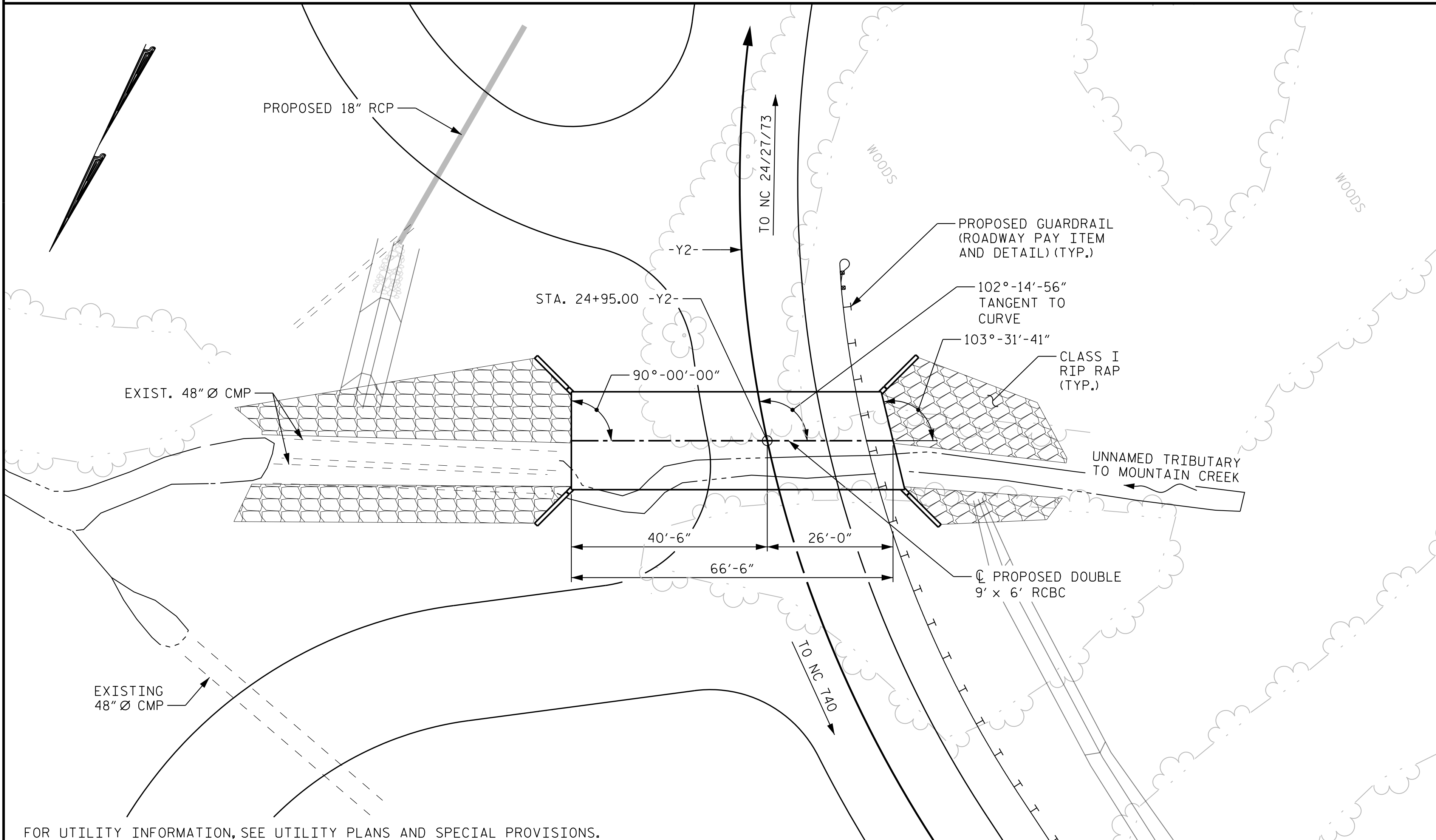
ASSEMBLED BY : D. D. LOWERY	DATE : 12/18
CHECKED BY : P. D. COOKSEY	DATE : 12/18
DRAWN BY : WMC 7/11	REV. 10/1/11 MAA/GM
CHECKED BY : GM 7/11	REV. 12/17 MAA/THC

BENCHMARK: BM#6, -Y2- STA. 24+67.61, OFFSET 200.21' LT., EL. 554.99', PAINTED FLANGE BOLT ON FH

F.A. PROJECT NO. STBG-0024(083)

NOTES

- ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING.
- DESIGN FILL ----- 3.1 FT.
- FOR OTHER DESIGN DATA AND GENERAL NOTES, SEE SHEET SN.
- 3"Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN CULVERT TO BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS, CURTAIN WALLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
- THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
- AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACES OF THE EXTERIOR WALLS AND BOTH FACES OF INTERIOR WALLS ABOVE THE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- STEEL IN THE BOTTOM SLAB MAY BE SPLICED AT THE PERMITTED CONSTRUCTION JOINT AT THE CONTRACTOR'S OPTION. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES WILL BE PAID FOR BY THE CONTRACTOR.
- AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAILED 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.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
- 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.
- BED MATERIAL PLACED BETWEEN SILLS IN THE CULVERT SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL BETWEEN THE LOWER SILLS. THE MATERIAL SHALL BE NATIVE MATERIAL OR CLASS A RIP RAP TO SILL HEIGHT. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED OR FLOODPLAIN AT THE PROJECT SITE DURING CULVERT CONSTRUCTION. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS. CLASS A RIP RAP MAY BE USED TO SUPPLEMENT THE NATIVE MATERIAL. IF RIP RAP IS USED, NATIVE MATERIAL SHOULD BE PLACED ON TOP TO FILL VOIDS AND PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE.
- 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.



LOCATION SKETCH

HYDRAULIC DATA

DESIGN DISCHARGE ----- 390 CFS
 FREQUENCY OF DESIGN FLOOD ----- 25 YR.
 DESIGN HIGH WATER ELEVATION ----- 551.9 FT.
 DRAINAGE AREA ----- 0.24 SQ. MI.
 BASE DISCHARGE (Q100) ----- 440 CFS
 BASE HIGH WATER ELEVATION ----- 552.2 FT.

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE ----- >490 CFS
 FREQUENCY OF OVERTOPPING FLOOD ----- 500+ YR.
 OVERTOPPING FLOOD ELEVATION ----- 555.0 FT.
 OVERTOPPING EXCEEDS 500 YR FLOOD EVENT

ROADWAY DATA

GRADE POINT ELEV. @ STA 24+95.00 -Y2- = 555.68'
 BED ELEVATION @ STA 24+95.00 -Y2- = 546.40'
 ROADWAY SLOPES VARIES

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE			
BARREL @	2.133	CY/FT	141.9
WINGS ETC.	27.3		C.Y.
TOTAL	169.2		C.Y.

REINFORCING STEEL			
BARREL	18,701		LBS.
WINGS ETC.	2,753		LBS.
TOTAL	21,454		LBS.

FOUNDATION CONDITIONING MATERIAL 114 TONS

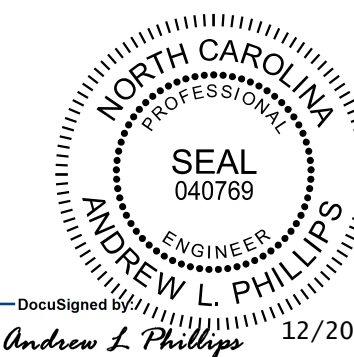
CULVERT EXCAVATION STA. 24+95.00 -Y2- LUMP SUM

REMOVAL OF EXISTING STRUCTURE STA. 24+95.00 -Y2- LUMP SUM

SAMPLE BAR REPLACEMENT

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

NOTE: SAMPLE BAR REPLACEMENT LENGTHS BASED ON 30" (SAMPLE LENGTH) PLUS TWO SPLICE LENGTHS AND $f_y = 60\text{ksi}$.



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SHEET 1 OF 7

STATE OF NORTH CAROLINA
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DOUBLE 9 FT. X 6 FT.
 CONCRETE BOX CULVERT
 102° SKEW

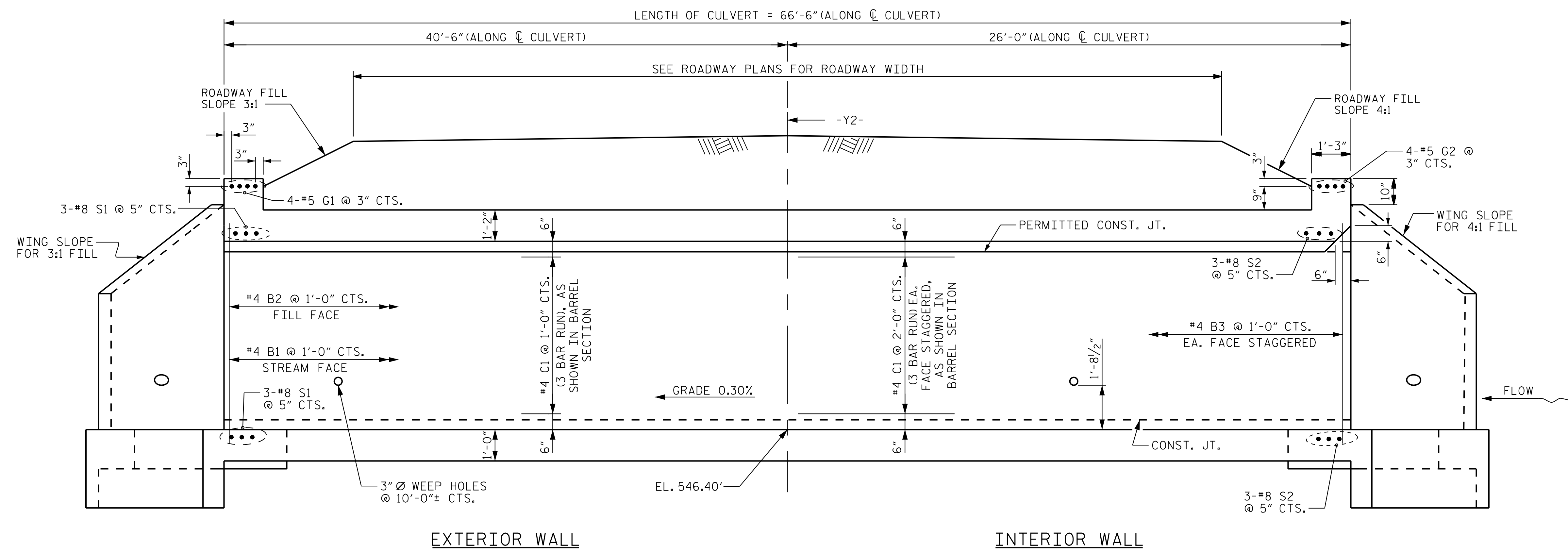
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NO.	BY:	DATE:	NO.	BY:	DATE:	C02-1
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2			4			7

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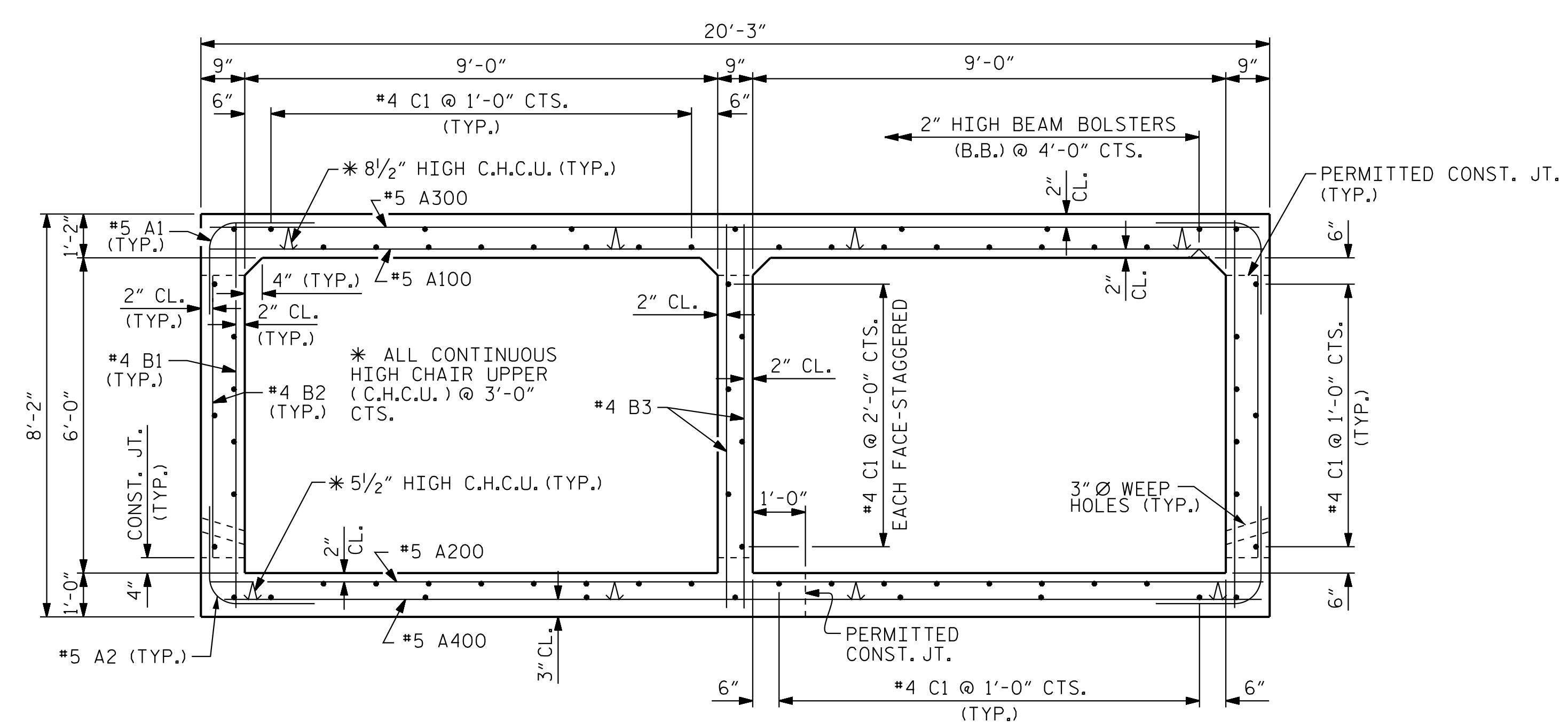
DRAWN BY: D. D. LOWERY DATE: 12/18
 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

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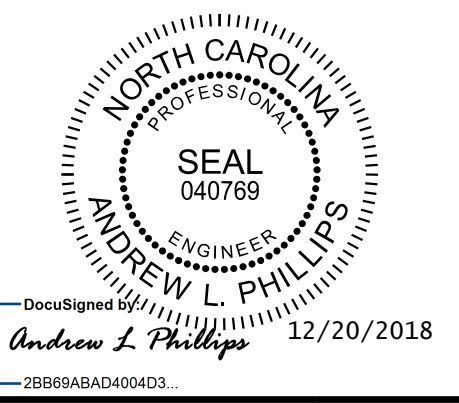


CULVERT SECTION NORMAL TO ROADWAY



RIGHT ANGLE SECTION OF BARREL
THERE ARE 70 C1 BARS IN SECTION OF BARREL.

PROJECT NO. R-2530B
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 STATION: 24+95.00 -Y2-
 SHEET 2 OF 7



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 DOUBLE 9 FT. X 6 FT.
 CONCRETE BOX CULVERT
 102° SKEW

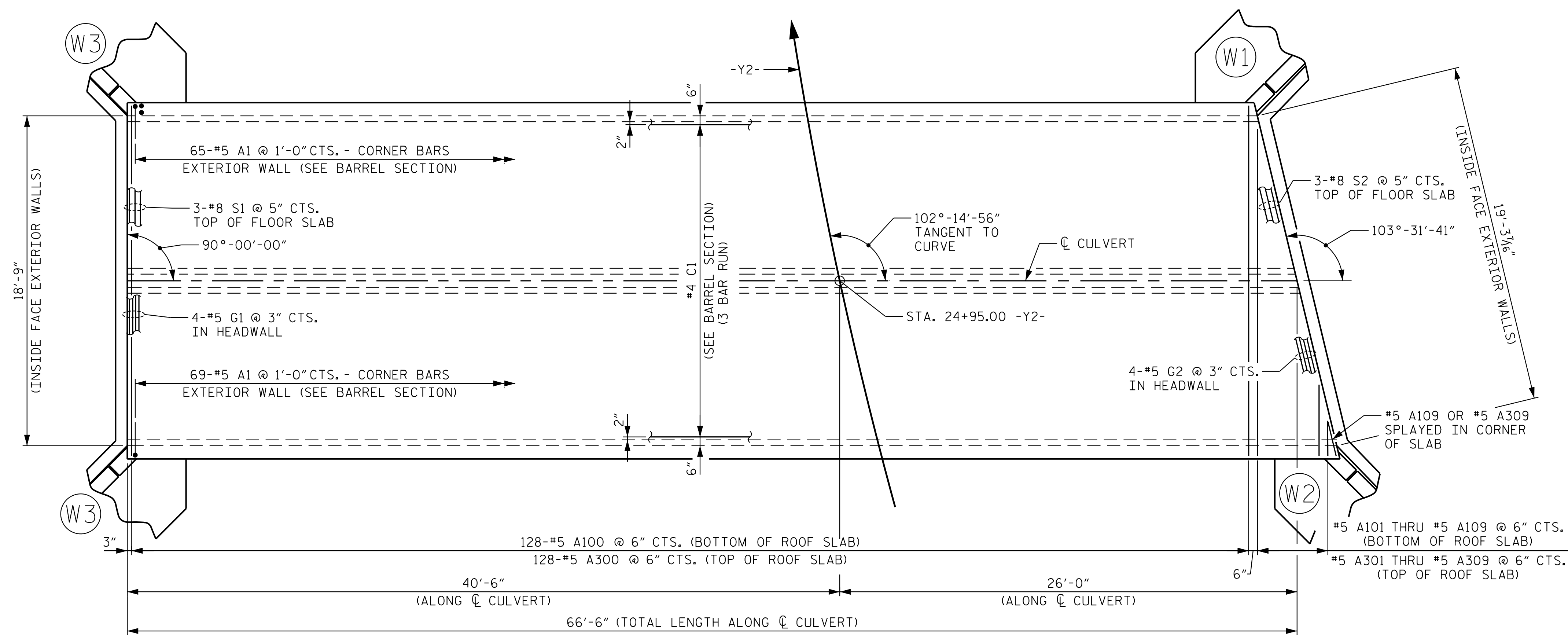
Kimley»Horn
 421 Fayetteville Street, Suite 600
 Raleigh, NC 27601-1772
 Phone (919) 677-2000 NC LICENSE # F-0102

DRAWN BY: D. D. LOWERY DATE: 12/18
 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

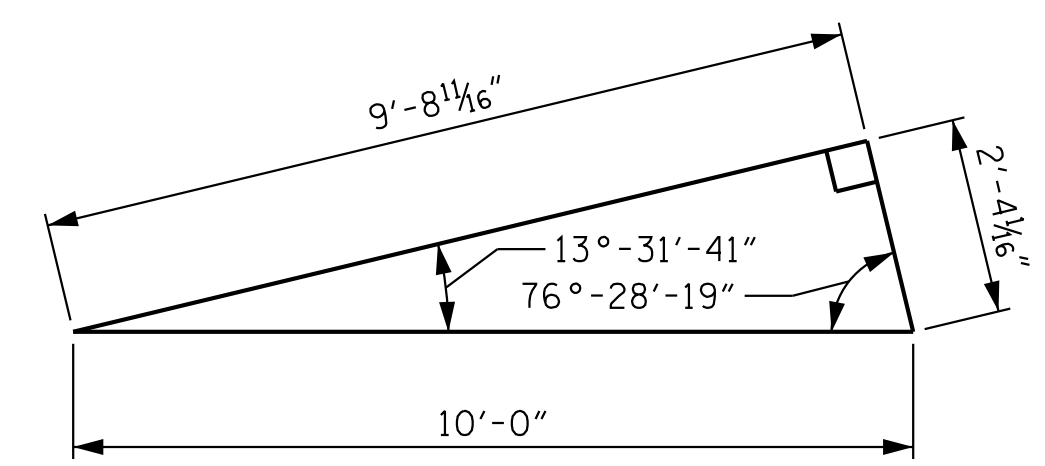
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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C02-2
1			3			TOTAL SHEETS
2			4			7

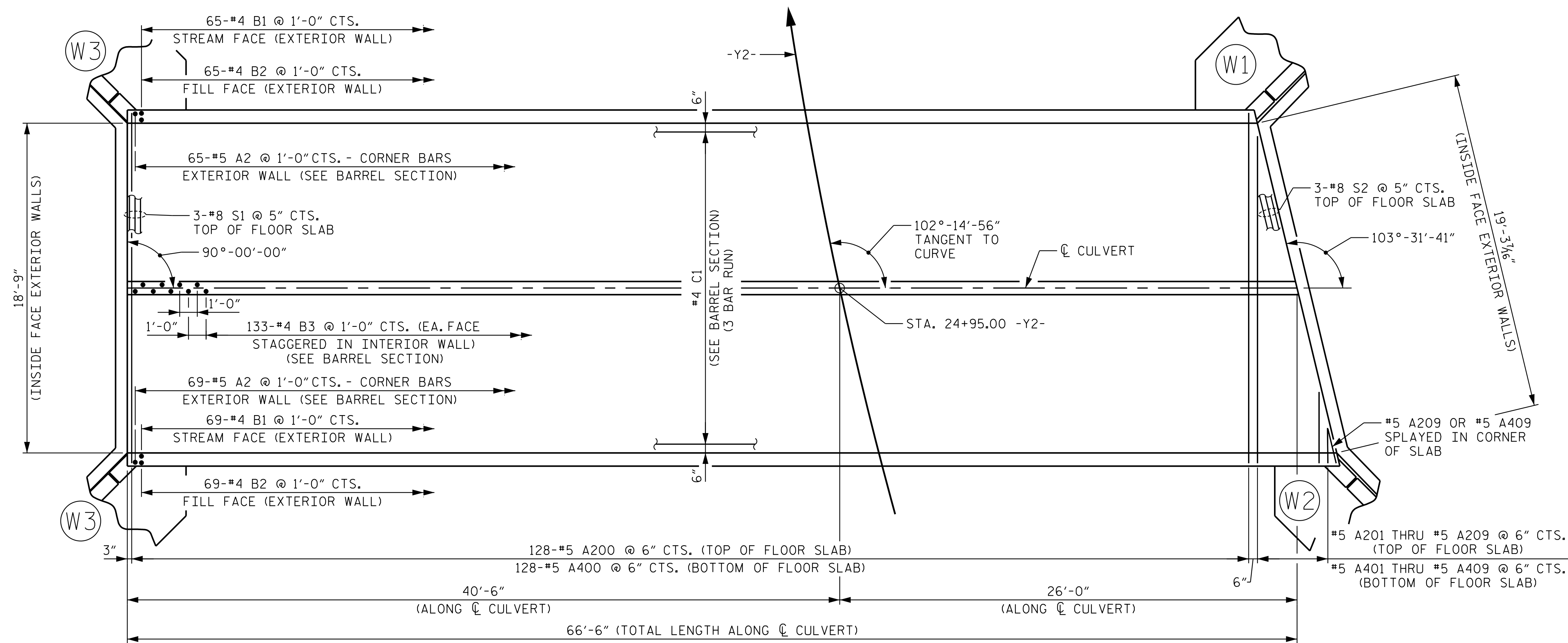
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ROOF SLAB PLAN



SKEW TRIANGLE

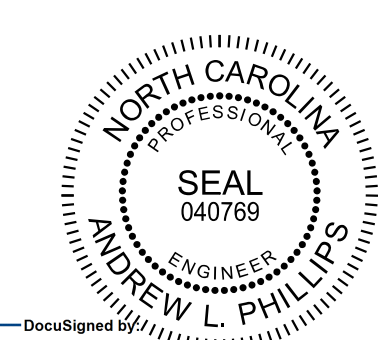


FLOOR SLAB PLAN

NOTE: FOR S3 BARS IN THE FLOOR SLAB & WING FOOTINGS, SEE SHEETS C02-5 & C02-6.

PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 24+95.00 -Y2-

SHEET 3 OF 7



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 DOUBLE 9 FT. X 6 FT.
 CONCRETE BOX CULVERT
 102° SKEW

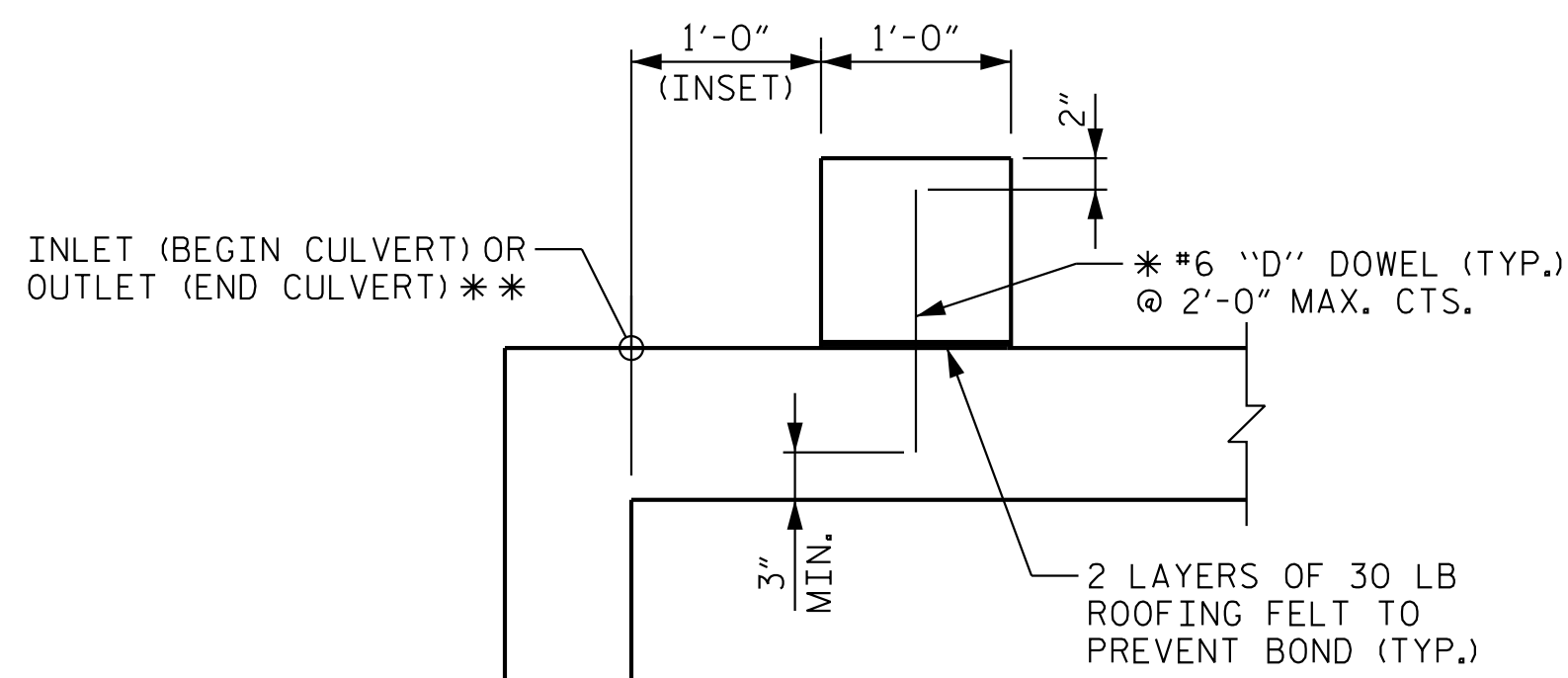
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2			4			7

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 12/20/2018

DRAWN BY: D. D. LOWERY DATE: 12/18
 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

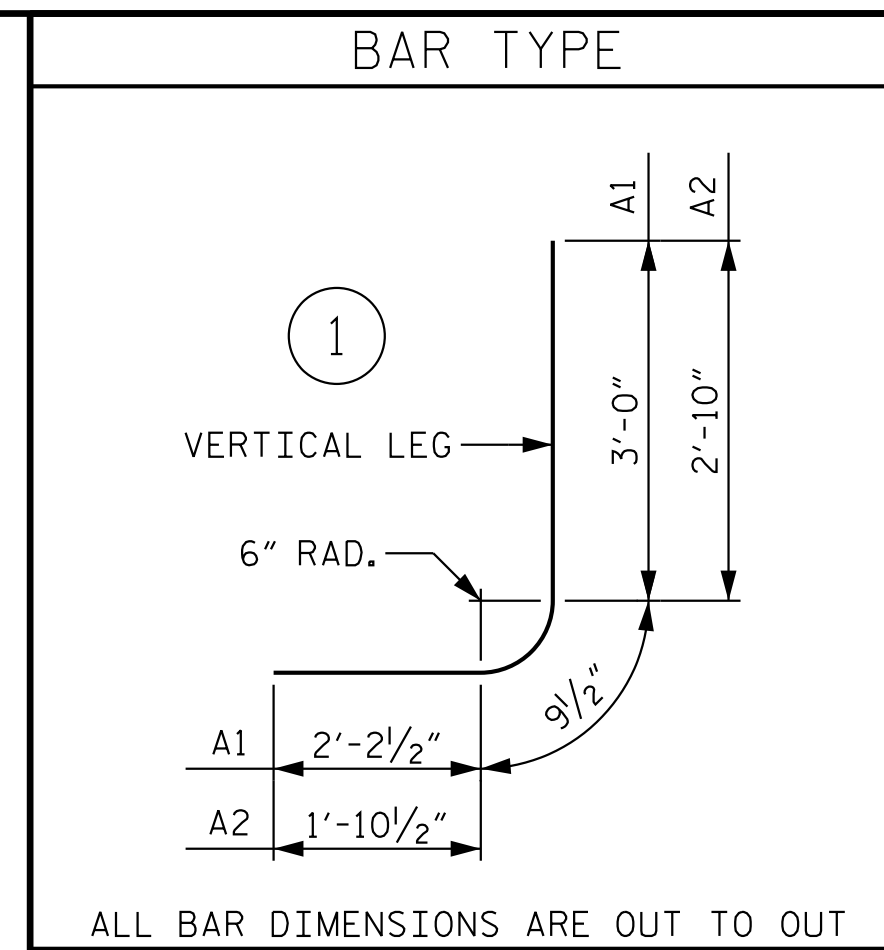


SECTION THROUGH SILL

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

** OUTLET VIEW (END CULVERT) SHOWN, INLET VIEW (BEGIN CULVERT) SIMILAR.

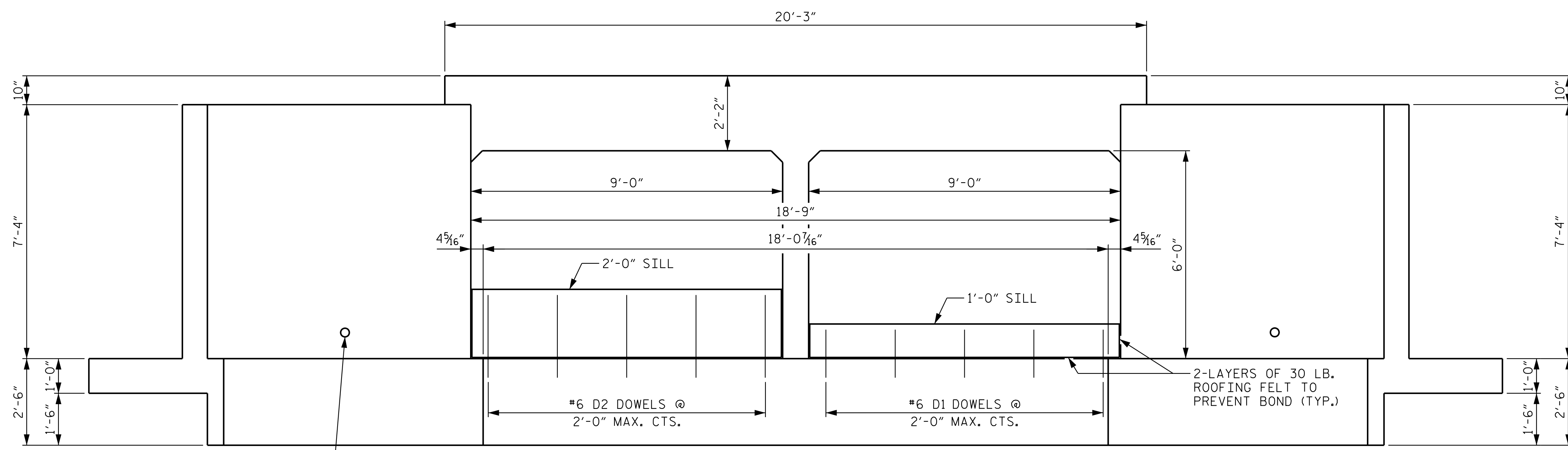
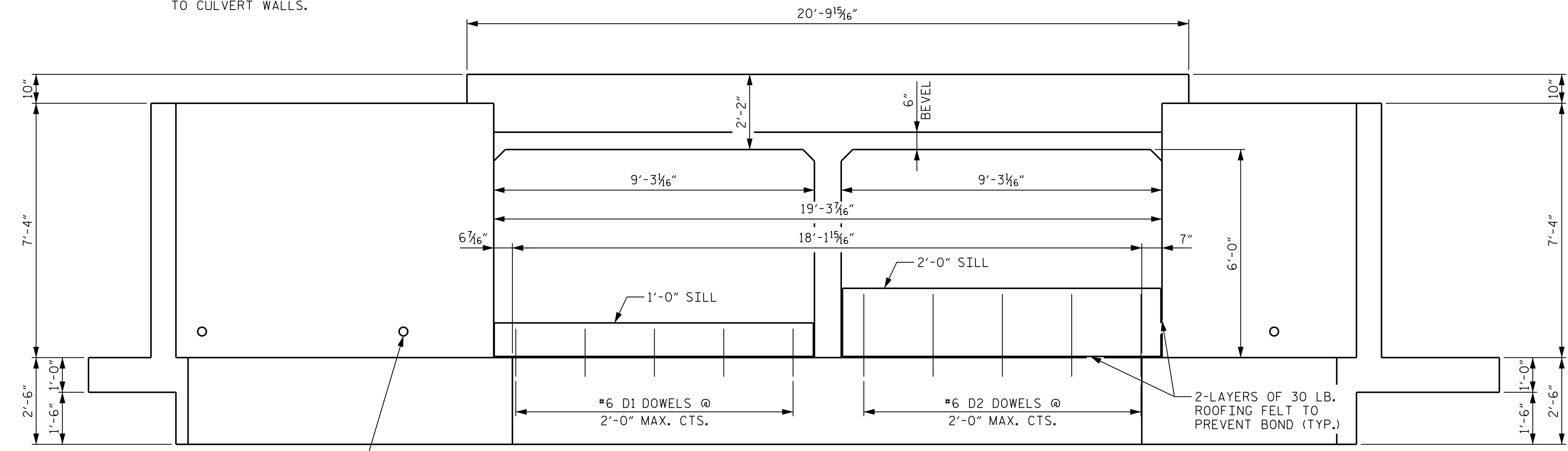
NOTE: 1'-0" & 2'-0" SILLS ARE TO BE CAST NORMAL TO CULVERT WALLS.



BILL OF MATERIAL						BILL OF MATERIAL					
BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	134	5	1	6'-0"	1,677	A300	128	5	STR	19'-10"	2,648
A2	134	5	1	5'-6"	1,537	A301	1	5	STR	18'-7"	19
A100	128	5	STR	19'-10"	2,648	A302	1	5	STR	16'-6"	17
A101	1	5	STR	18'-7"	19	A303	1	5	STR	14'-5"	15
A102	1	5	STR	16'-6"	17	A304	1	5	STR	12'-4"	13
A103	1	5	STR	14'-5"	15	A305	1	5	STR	10'-3"	11
A104	1	5	STR	12'-4"	13	A306	1	5	STR	8'-2"	9
A105	1	5	STR	10'-3"	11	A307	1	5	STR	6'-1"	6
A106	1	5	STR	8'-2"	9	A308	1	5	STR	4'-0"	4
A107	1	5	STR	6'-1"	6	A309	2	5	STR	2'-0"	4
A108	1	5	STR	4'-0"	4	A400	128	5	STR	19'-10"	2,648
A109	2	5	STR	2'-0"	4	A401	1	5	STR	18'-7"	19
A200	128	5	STR	19'-10"	2,648	A402	1	5	STR	16'-6"	17
A201	1	5	STR	18'-7"	19	A403	1	5	STR	14'-5"	15
A202	1	5	STR	16'-6"	17	A404	1	5	STR	12'-4"	13
A203	1	5	STR	14'-5"	15	A405	1	5	STR	10'-3"	11
A204	1	5	STR	12'-4"	13	A406	1	5	STR	8'-2"	9
A205	1	5	STR	10'-3"	11	A407	1	5	STR	6'-1"	6
A206	1	5	STR	8'-2"	9	A408	1	5	STR	4'-0"	4
A207	1	5	STR	6'-1"	6	A409	2	5	STR	2'-0"	4
A208	1	5	STR	4'-0"	4	B1	134	4	STR	7'-8"	686
A209	2	5	STR	2'-0"	4	B2	134	4	STR	5'-4"	477
						B3	133	4	STR	7'-8"	681

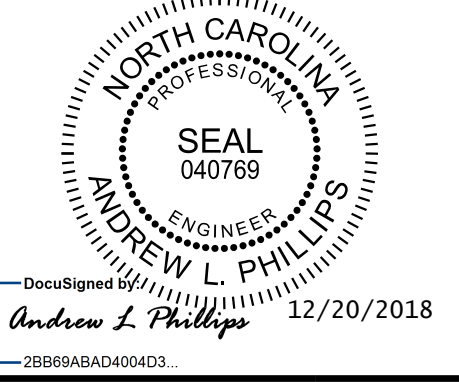
BAR SIZE	SPLICE LENGTH
#5 A200	2'-2"
#5 A400	2'-2"
#4 B1	1'-5"
#4 B3	1'-5"
#4 C1	1'-11"

REINFORCING STEEL	LBS.
C1	210
D1	10
D2	10
G1	4
G2	4
S1	6
S2	6
TOTAL	18,701



TOTAL QUANTITIES	
CLASS A CONCRETE	
BARREL @ 2.133 C.Y./FT.	141.9 C.Y.
WINGS, ETC.	25.3 C.Y.
SILLS	2.0 C.Y.
TOTAL	169.2 C.Y.
REINFORCING STEEL	
BARREL & SILLS	18,701 LBS.
WINGS, ETC.	2,753 LBS.
TOTAL	21,454 LBS.

PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 24+95.00 -Y2-
 SHEET 4 OF 7



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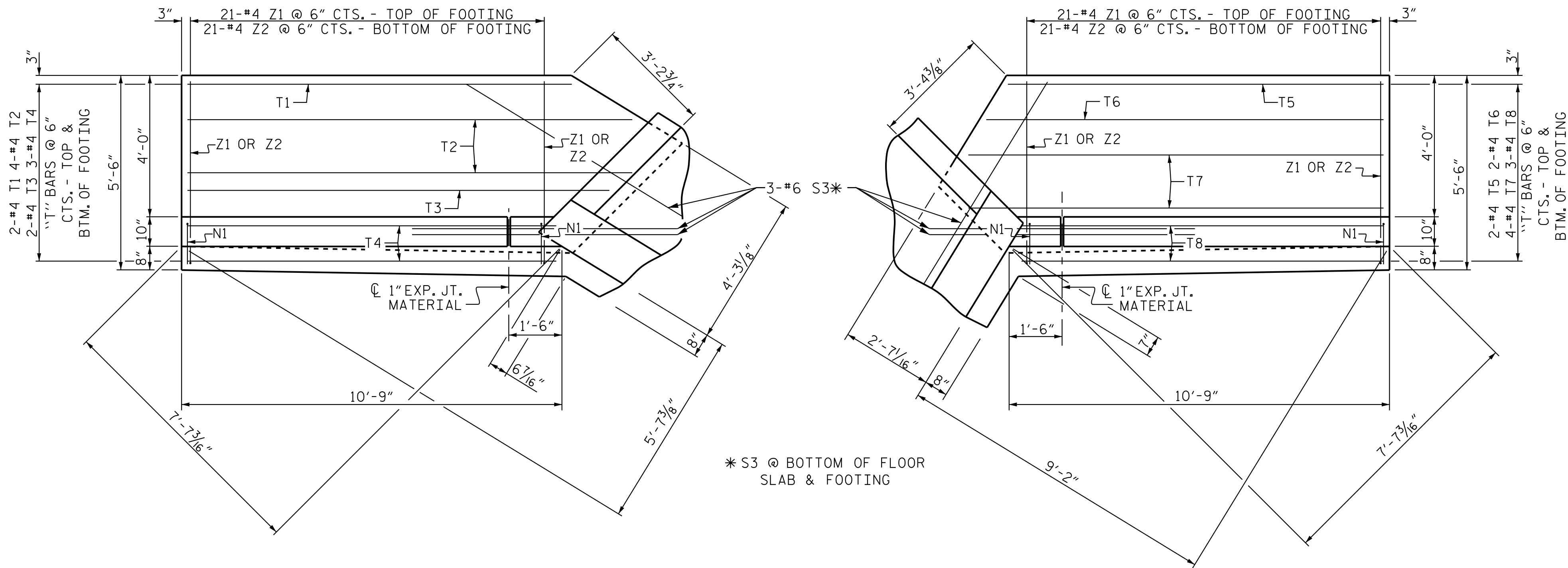
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 DOUBLE 9 FT. X 6 FT.
 CONCRETE BOX CULVERT
 102° SKEW

REVISIONS						SHEET NO.
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2			4			7

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DRAWN BY: D. D. LOWERY DATE: 12/18
 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

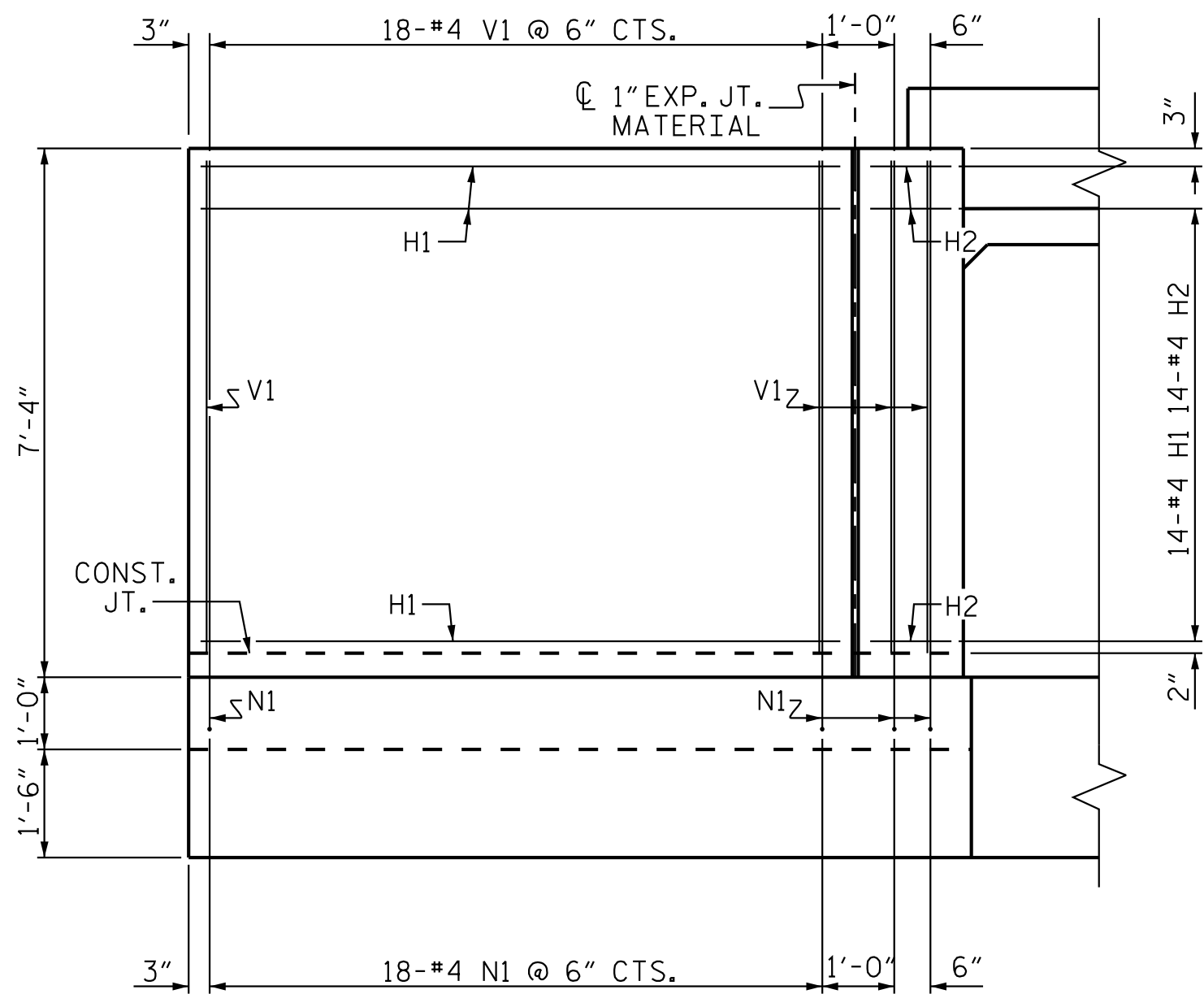
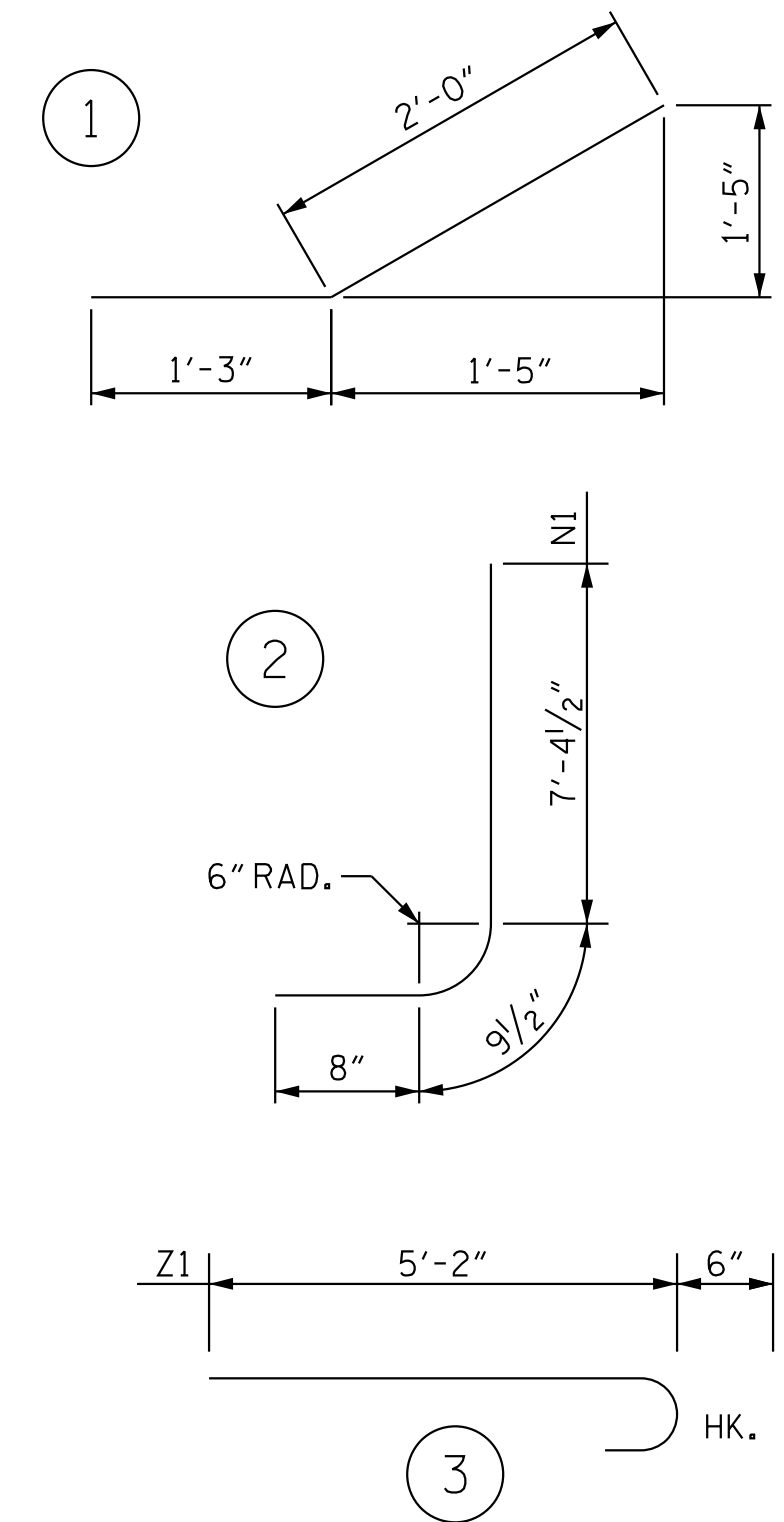


PLAN W2

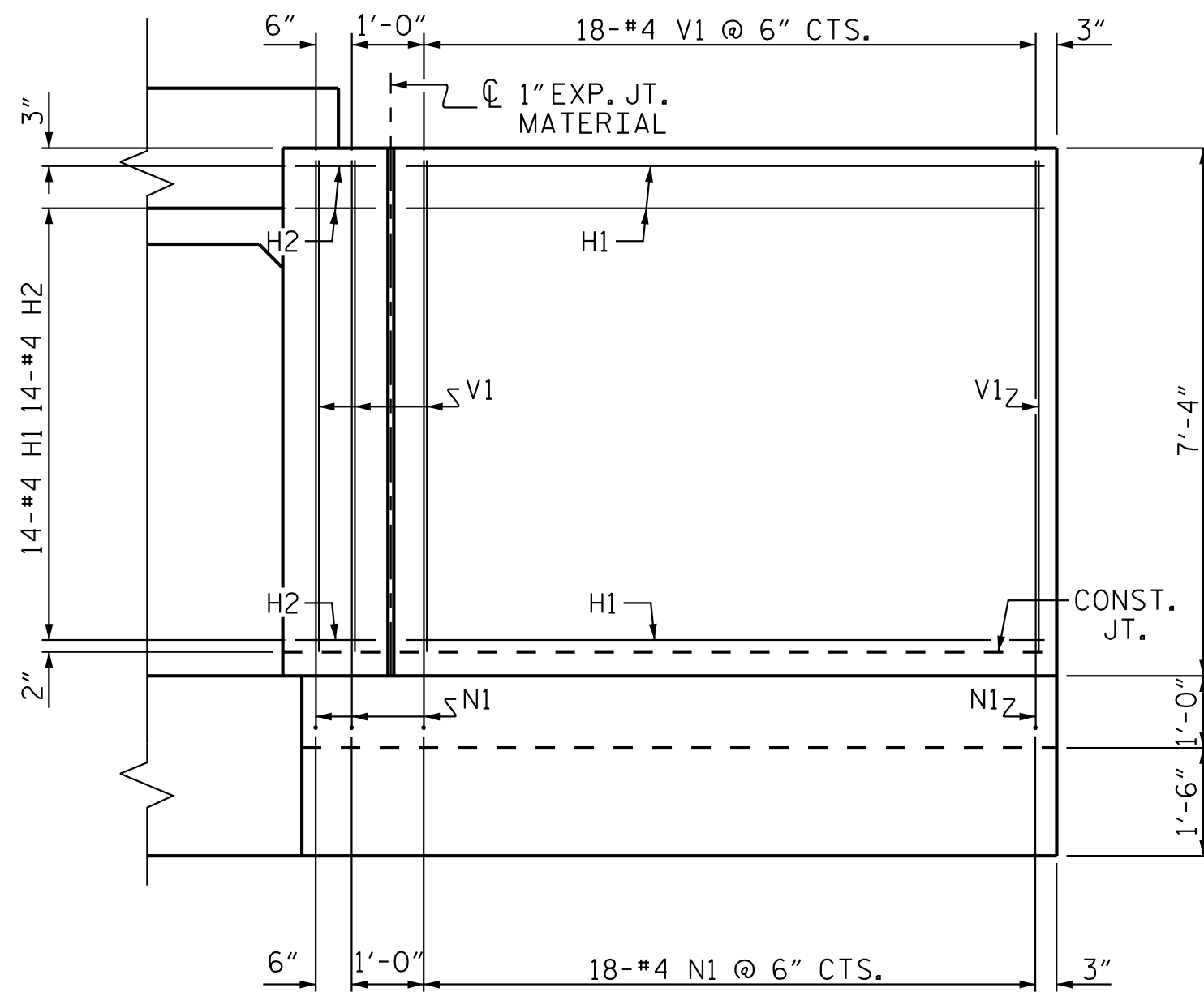
PLAN W1

* S3 @ BOTTOM OF FLOOR SLAB & FOOTING

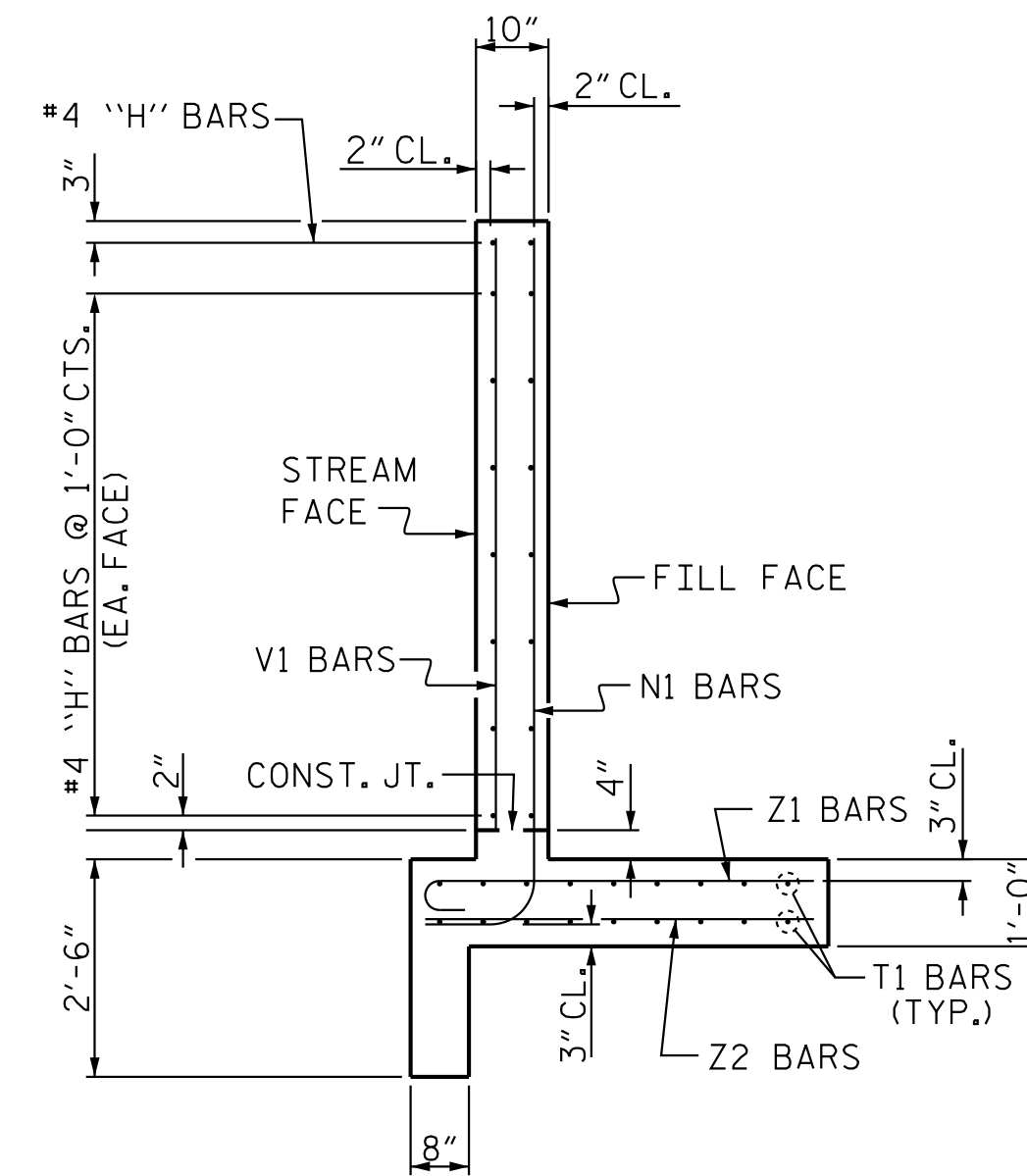
BAR TYPES		BILL OF MATERIAL				
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	
H1	32	4	STR	8'-10"	189	
H2	32	4	1	3'-3"	69	
N1	40	4	2	8'-10"	236	
S3	6	6	STR	7'-6"	68	
T1	4	4	STR	10'-10"	29	
T2	8	4	STR	12'-6"	67	
T3	4	4	STR	11'-11"	32	
T4	6	4	STR	10'-5"	42	
T5	4	4	STR	10'-7"	28	
T6	4	4	STR	11'-2"	30	
T7	8	4	STR	11'-8"	62	
T8	6	4	STR	10'-2"	41	
V1	40	4	STR	6'-10"	183	
Z1	42	4	3	5'-8"	159	
Z2	42	4	STR	5'-2"	145	
REINFORCING STEEL FOR 2 WINGS				1,380 LBS		
CLASS A CONCRETE						
2 WINGS				10.7 CY		
1 HEADWALL				1.0 CY		
1 END CURTAIN WALL				1.1 CY		
TOTAL				12.8 CY		



ELEVATION W2



ELEVATION W1

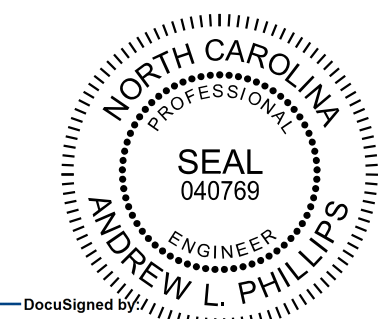


TYPICAL WING SECTION

PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 24+95.00 -Y2-

SHEET 5 OF 7

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
INLET WING (W1 & W2) DETAILS FOR CONCRETE BOX CULVERT H = 6'-0" SLOPE = 4:1 103° SKEW					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
SHEET NO. C02-5					TOTAL SHEETS 7

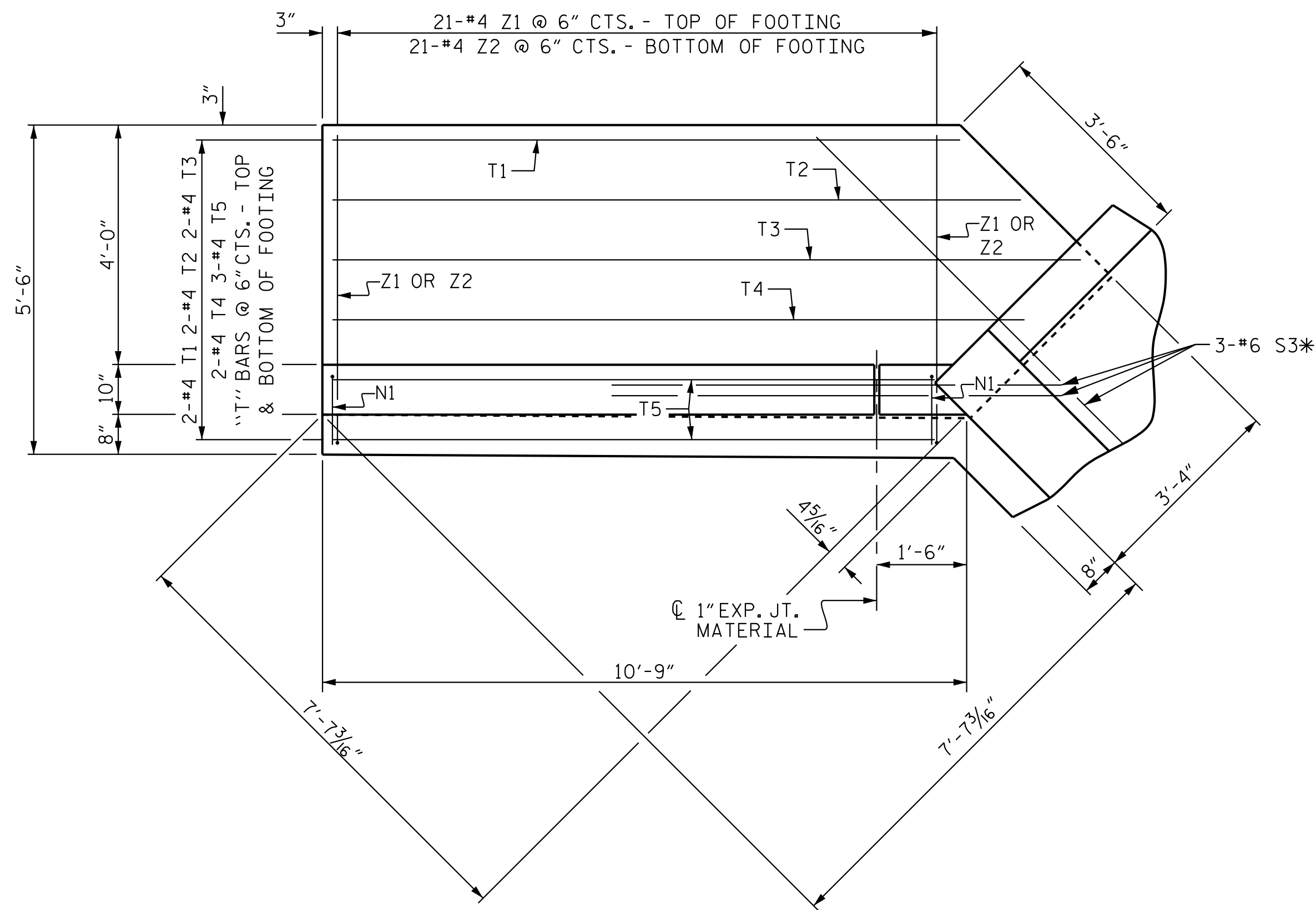


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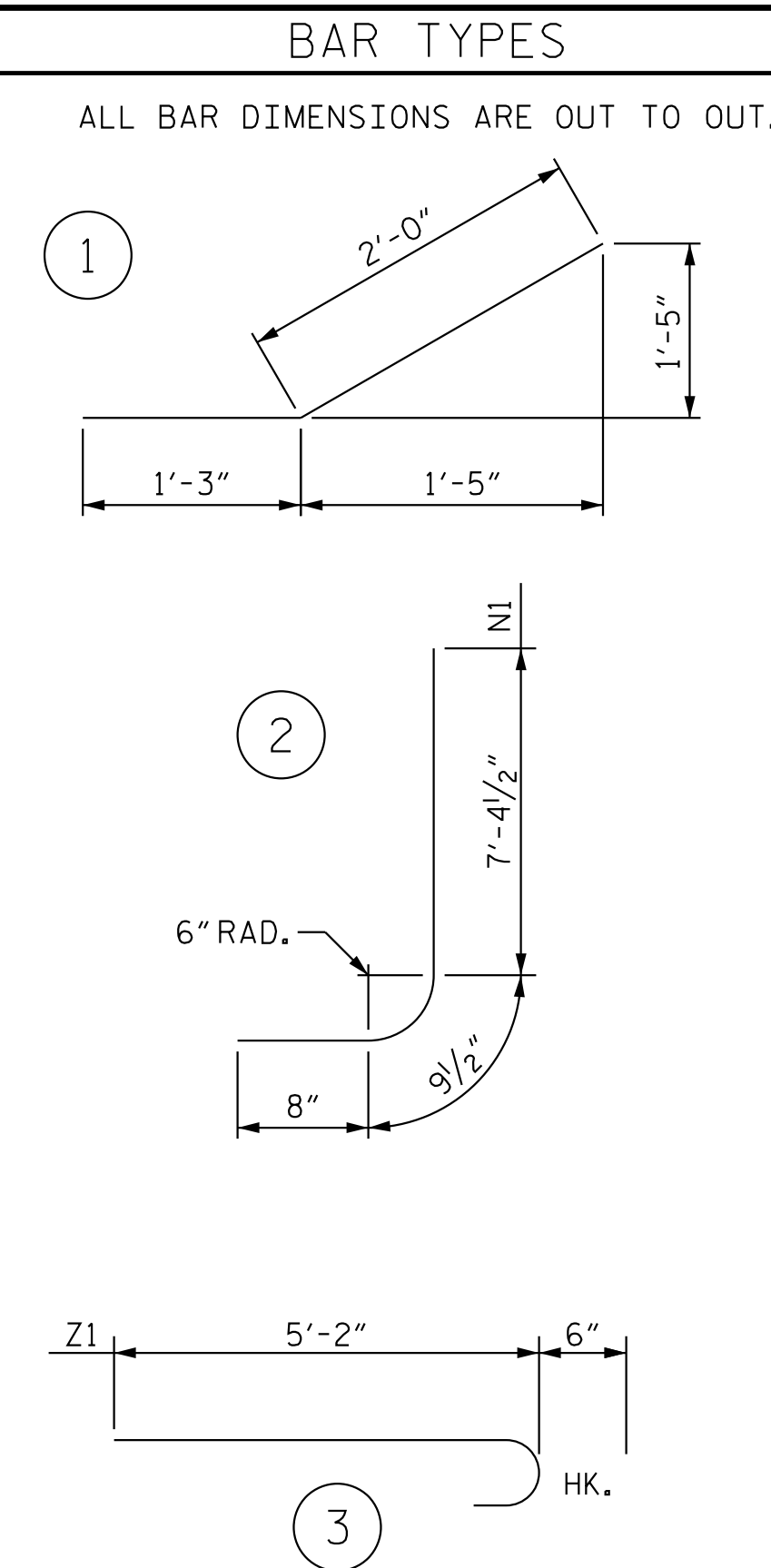
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DRAWN BY: D. D. LOWERY DATE: 12/18
 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

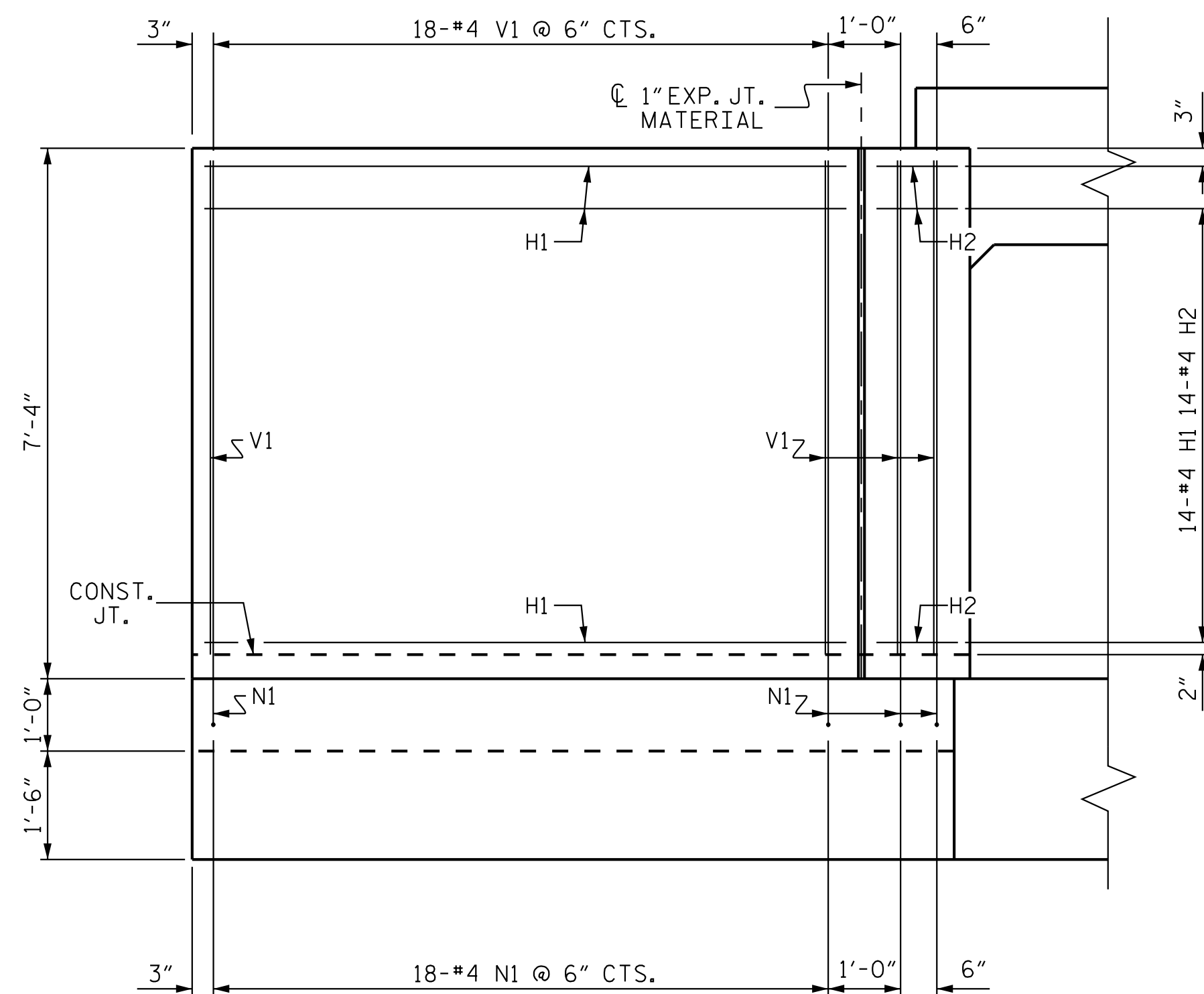


PLAN W3

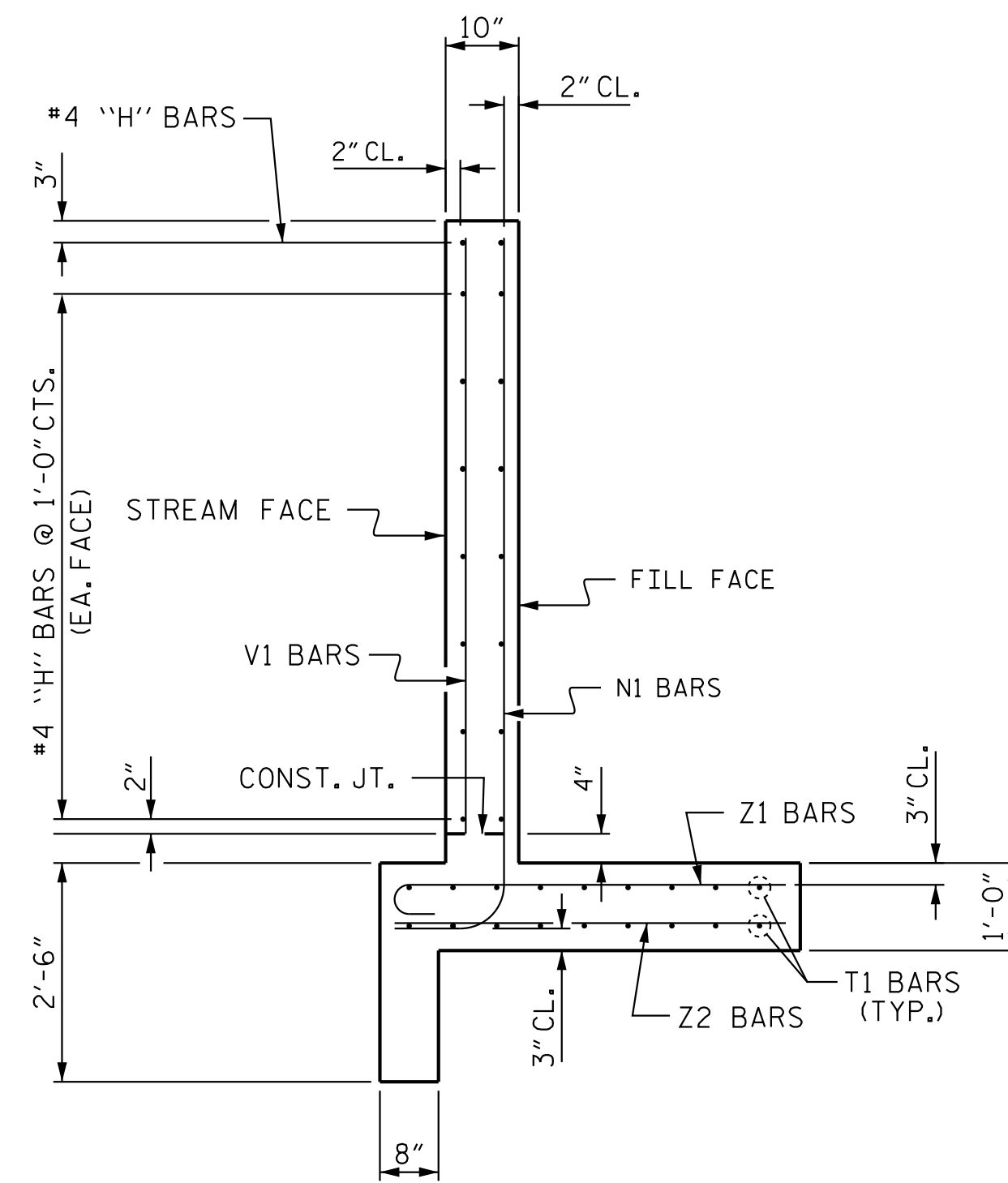
* S3 @ BOTTOM OF FLOOR SLAB & FOOTING



BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	32	4	STR	8'-10"	189
H2	32	4	1	3'-3"	69
N1	40	4	2	8'-10"	236
S3	6	6	STR	7'-6"	68
T1	8	4	STR	10'-5"	56
T2	8	4	STR	11'-5"	61
T3	8	4	STR	12'-5"	66
T4	8	4	STR	11'-6"	61
T5	12	4	STR	10'-0"	80
V1	40	4	STR	6'-10"	183
Z1	42	4	3	5'-8"	159
Z2	42	4	STR	5'-2"	145
REINFORCING STEEL FOR 2 WINGS					1,373 LBS
CLASS A CONCRETE					
2 WINGS					10.5 CY
1 HEADWALL					0.9 CY
1 END CURTAIN WALL					1.1 CY
TOTAL					12.5 CY



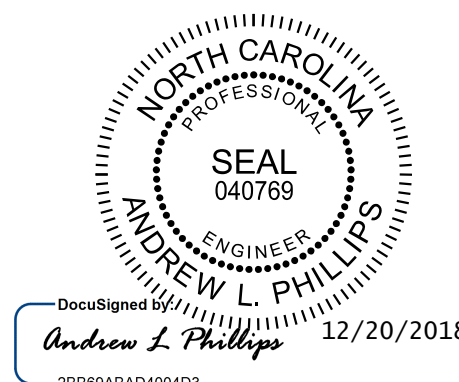
ELEVATION W3



TYPICAL WING SECTION

PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 24+95.00 -Y2-

SHEET 6 OF 7



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STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**OUTLET WING (W3)
 DETAILS FOR
 CONCRETE BOX CULVERT**
 H = 6'-0" SLOPE = 3:1
 90° SKEW

REVISIONS						SHEET NO.
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DRAWN BY: D. D. LOWERY DATE: 12/18
 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

LOAD FACTORS: _____

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

LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						LIVE-LOAD FACTORS (γ _{LL})	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	①	1.19	--	1.75	1.27	1	BOTTOM SLAB	10.13	1.19	1	TOP SLAB	0.75		
	HL-93 (OPERATING)	N/A		1.55	--	1.35	1.65	1	BOTTOM SLAB	10.13	1.55	1	TOP SLAB	0.75		
	HS-20 (INVENTORY)	36.000	②	1.31	47.16	1.75	1.46	1	BOTTOM SLAB	10.13	1.31	1	TOP SLAB	0.75		
	HS-20 (OPERATING)	36.000		1.70	61.20	1.35	1.90	1	BOTTOM SLAB	10.13	1.70	1	TOP SLAB	0.75		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		2.75	37.13	1.40	2.75	1	EXT WALL	0.38	2.96	1	TOP SLAB	0.75		
		SNGARBS2	20.000		2.61	52.20	1.40	2.61	1	EXT WALL	0.38	2.67	1	TOP SLAB	0.75	
		SNAGRIS2	22.000		2.66	58.52	1.40	2.66	1	BOTTOM SLAB	10.13	2.94	1	TOP SLAB	0.75	
		SNCOTTS3	27.250		1.44	39.24	1.40	1.73	1	EXT WALL	0.38	1.44	1	TOP SLAB	9.75	
		SNAGGRS4	34.925		1.69	59.02	1.40	1.69	1	BOTTOM SLAB	10.13	2.04	1	TOP SLAB	9.75	
		SNS5A	35.550		1.80	63.99	1.40	1.87	1	BOTTOM SLAB	10.13	1.80	1	TOP SLAB	9.75	
		SNS6A	39.950		1.75	69.91	1.40	1.75	1	BOTTOM SLAB	10.13	1.79	1	TOP SLAB	9.75	
		SNS7B	42.000		1.75	73.50	1.40	1.75	1	BOTTOM SLAB	10.13	1.79	1	TOP SLAB	9.75	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		1.87	61.71	1.40	1.87	1	BOTTOM SLAB	10.13	2.71	1	BOTTOM SLAB	9.75	
		TNT4A	33.075		1.87	61.85	1.40	2.01	1	EXT WALL	0.38	1.87	1	TOP SLAB	9.75	
		TNT6A	41.600		1.82	75.71	1.40	1.86	1	BOTTOM SLAB	10.13	1.82	1	TOP SLAB	9.75	
		TNT7A	42.000		1.82	76.44	1.40	1.82	1	BOTTOM SLAB	10.13	1.87	1	TOP SLAB	9.75	
		TNT7B	42.000		1.77	74.34	1.40	1.99	1	BOTTOM SLAB	10.13	1.77	1	TOP SLAB	9.75	
		TNAGRIT4	43.000		1.83	78.69	1.40	1.83	1	BOTTOM SLAB	10.13	1.84	1	TOP SLAB	9.75	
TNAGT5A	45.000		1.73	77.85	1.40	1.73	1	BOTTOM SLAB	10.13	1.83	1	TOP SLAB	9.75			
TNAGT5B	45.000		③	1.42	63.90	1.40	1.42	1	BOTTOM SLAB	10.13	1.80	1	TOP SLAB	9.75		

DESIGN LOAD RATING FACTORS

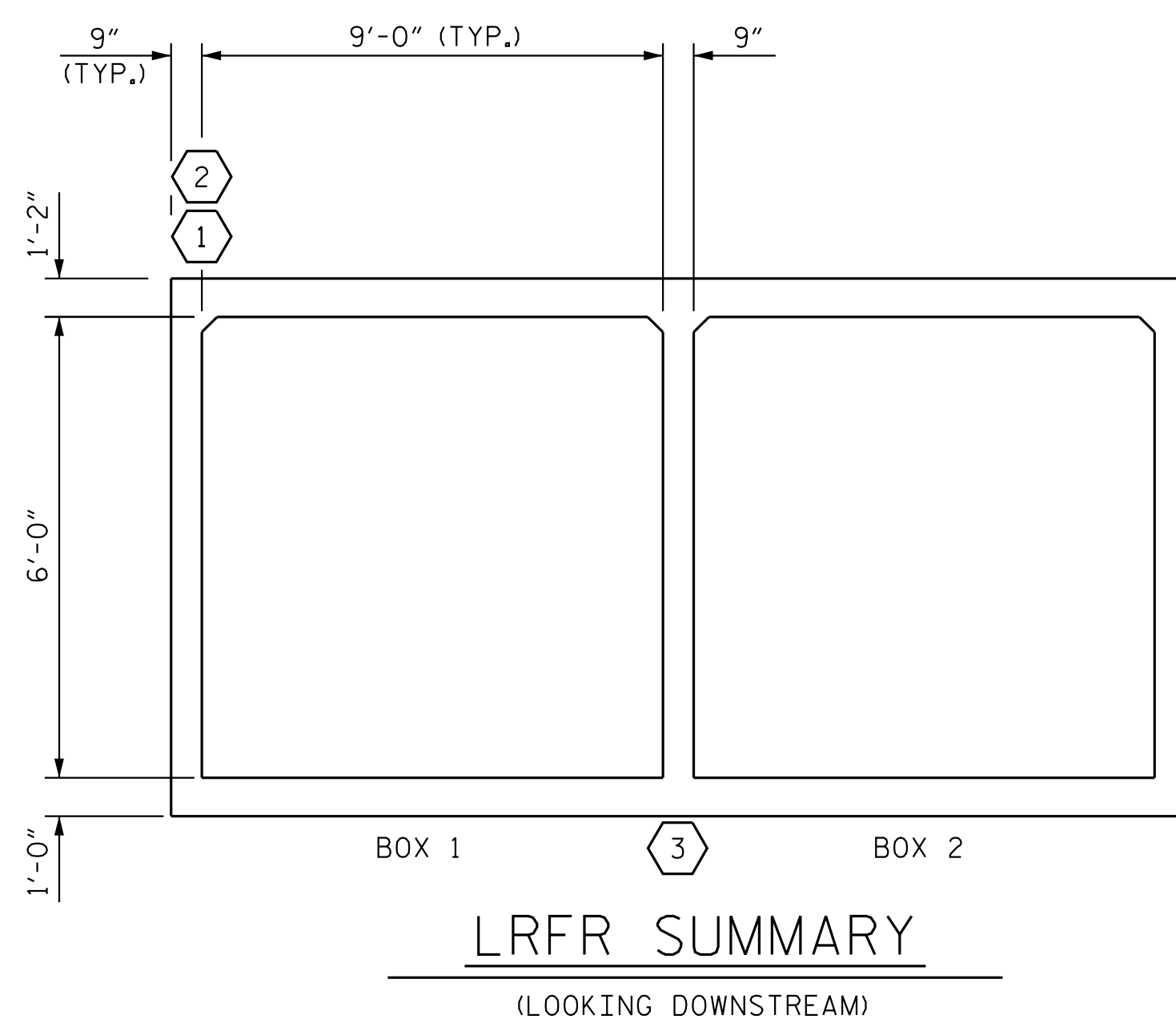
LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
LS	1.75	--
WA	1.00	--

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

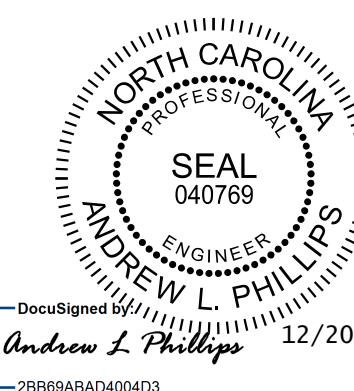
DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM THE EXTERIOR EDGE OF EXTERIOR WALL.

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



PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 24+95.00 -Y2-

SHEET 7 OF 7



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

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C02-7
1			3			TOTAL SHEETS
2			4			7

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This document, together with the concepts and designs presented herein, is an integral part of the contract for the project. It is to be used only for the project and not for any other purpose without the written authorization and approval of Kimley-Horn and Associates, Inc. It shall be without liability to Kimley-Horn and Associates, Inc.

STD. NO. LRFR5

12/20/2018 K:\BIDI_Structures\Culvert\NC\01036489 - B-2530B\Cad\Drawings\Culvert-2\12-013-R2530B-SMJ-CUL-007.dgn

ASSEMBLED BY : P. D. COOKSEY	DATE : 12/18
CHECKED BY : A. L. PHILLIPS	DATE : 12/18
DRAWN BY : WMC 7/11	REV. 10/1/11 MAA/GM
CHECKED BY : GM 7/11	REV. 12/17 MAA/THC

BENCHMARK: BM#8, -L- STA. 50+11.70, OFFSET 55.84' LT., EL. 566.11', RR SPIKE IN BASE OF POWER POLE

F.A. PROJECT NO. STBG-0024(083)

NOTES

ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING.
 DESIGN FILL ----- 8.2 FT.
 FOR OTHER DESIGN DATA AND GENERAL NOTES, SEE SHEET SN.
 3"Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.

CONCRETE IN STAGE 1 OR STAGE 2 CULVERT TO BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS, CURTAIN WALLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.

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

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

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

AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAILED 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.

AFTER SERVING AS A TEMPORARY STRUCTURE THE EXISTING 6'-0" X 6'-0" RCBC LOCATED AT THE SAME LOCATION AS THE PROPOSED CULVERT SHALL BE REMOVED. THE EXISTING STRUCTURE IS PRESENTLY NOT POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE STRUCTURE DETERIORATE DURING CONSTRUCTION OF THE PROPOSED CULVERT, A LOAD LIMIT MAY BE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.

THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.

FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE ROADWAY PLANS.

TRAFFIC ON NC 24/27/73 SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS SHOWN ON THESE PLANS AS DIRECTED BY THE ENGINEER.

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

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

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

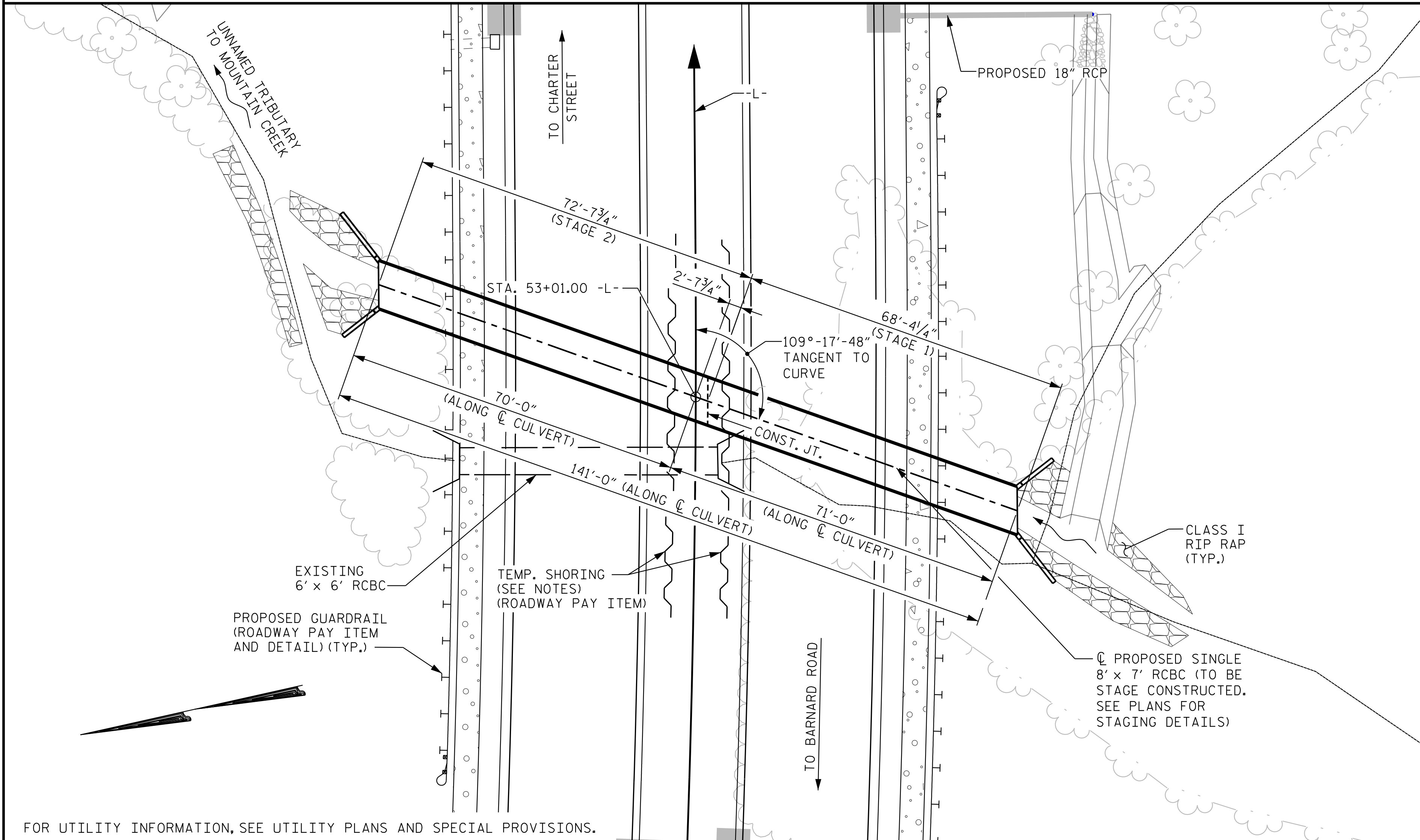
FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.

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.



FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.

LOCATION SKETCH

TOTAL STRUCTURE QUANTITIES			
STAGE 1		STAGE 2	
CLASS A CONCRETE			
BARREL @ 1.097	CY/FT 75.0	C.Y.	
WINGS ETC.	11.1	C.Y.	
TOTAL	86.1	C.Y.	
REINFORCING STEEL			
BARREL	12,076	LBS.	
WINGS ETC.	638	LBS.	
TOTAL	12,714	LBS.	
FOUNDATION CONDITIONING MATERIAL		65 TONS	
CULVERT EXCAVATION STA. 53+01.00 -L-		LUMP SUM	
REMOVAL OF EXISTING STRUCTURE STA. 53+01.00 -L-		LUMP SUM	
FOUNDATION CONDITIONING MATERIAL		69 TONS	

HYDRAULIC DATA

DESIGN DISCHARGE ----- 420 CFS
 FREQUENCY OF DESIGN FLOOD ----- 50 YR.
 DESIGN HIGH WATER ELEVATION ----- 554.8 FT.
 DRAINAGE AREA ----- 0.41 SQ. MI.
 BASE DISCHARGE (0100) ----- 450 CFS
 BASE HIGH WATER ELEVATION ----- 555.3 FT.

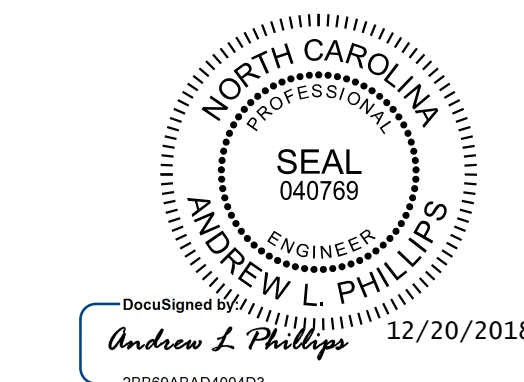
OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE ----- >510 CFS
 FREQUENCY OF OVERTOPPING FLOOD --- >500 YR.
 OVERTOPPING FLOOD ELEVATION ----- 559.2 FT.

SAMPLE BAR REPLACEMENT

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

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



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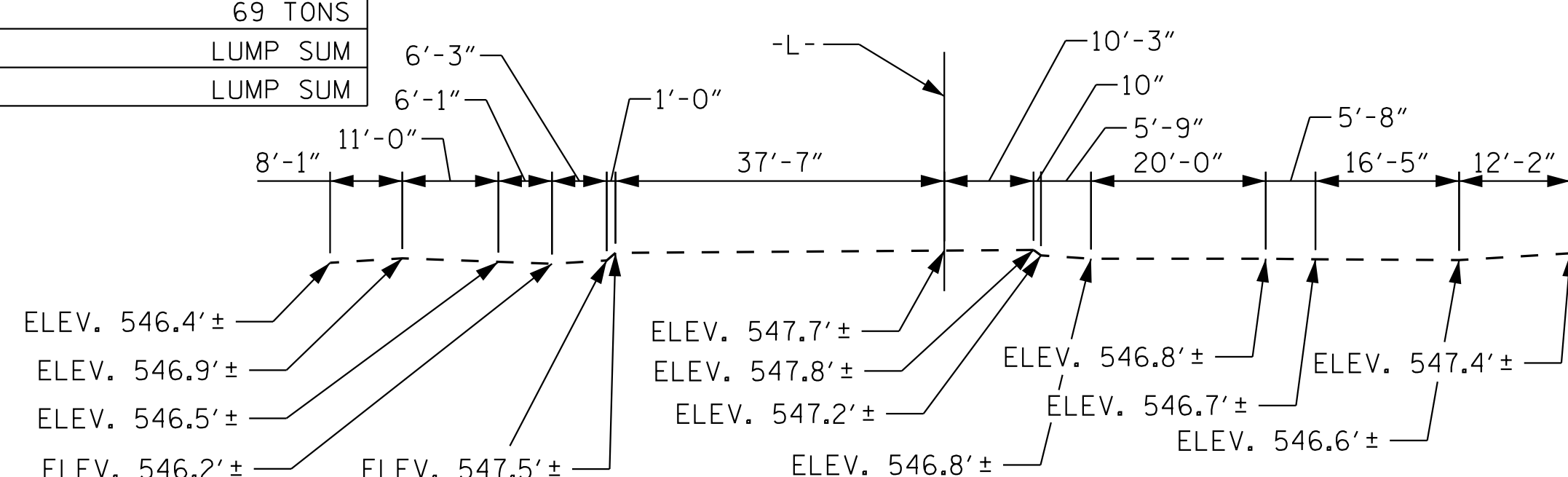
SHEET 1 OF 7

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 8 FT. X 7 FT.
 CONCRETE BOX CULVERT
 109° SKEW

REVISIONS						SHEET NO.
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1			3			TOTAL SHEETS
2			4			7

ROADWAY DATA	
GRADE POINT ELEV. @ STA 53+01.00 -L-	= 559.92'
BED ELEVATION @ STA 53+01.00 -L-	= 546.10'
ROADWAY SLOPES	2:1



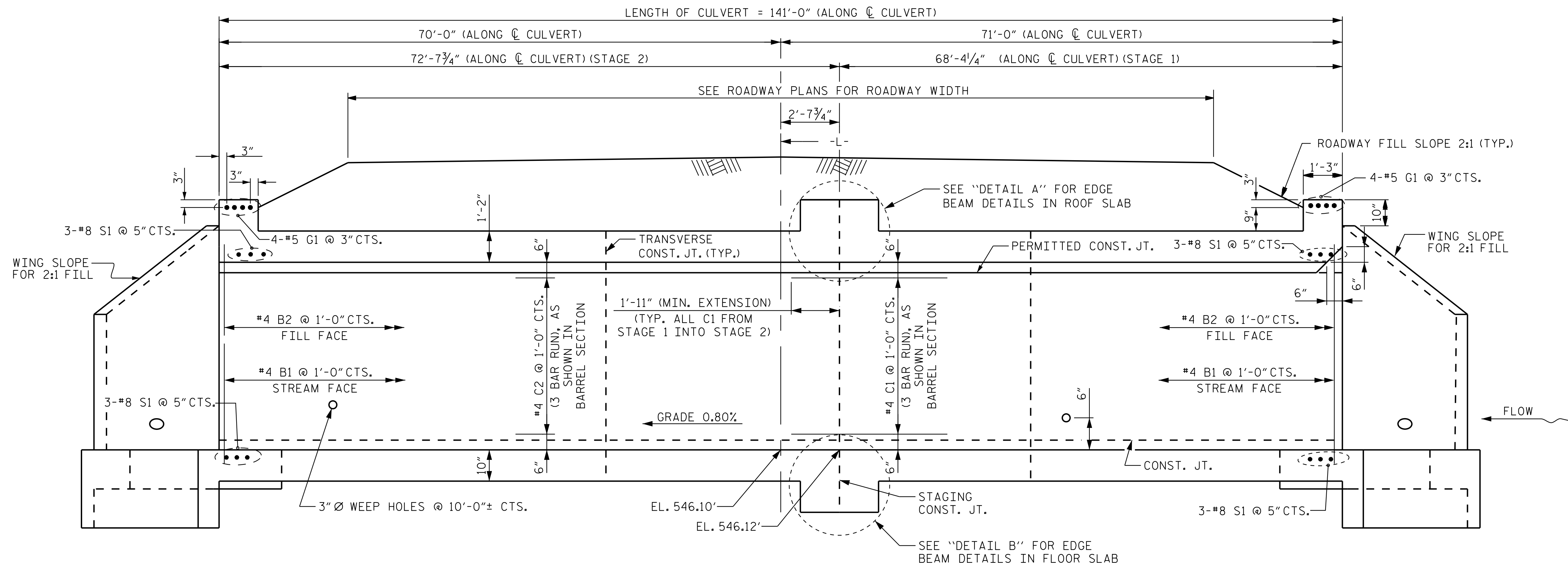
PROFILE ALONG C CULVERT

ELEVATIONS TAKEN ALONG CENTERLINE CHANNEL

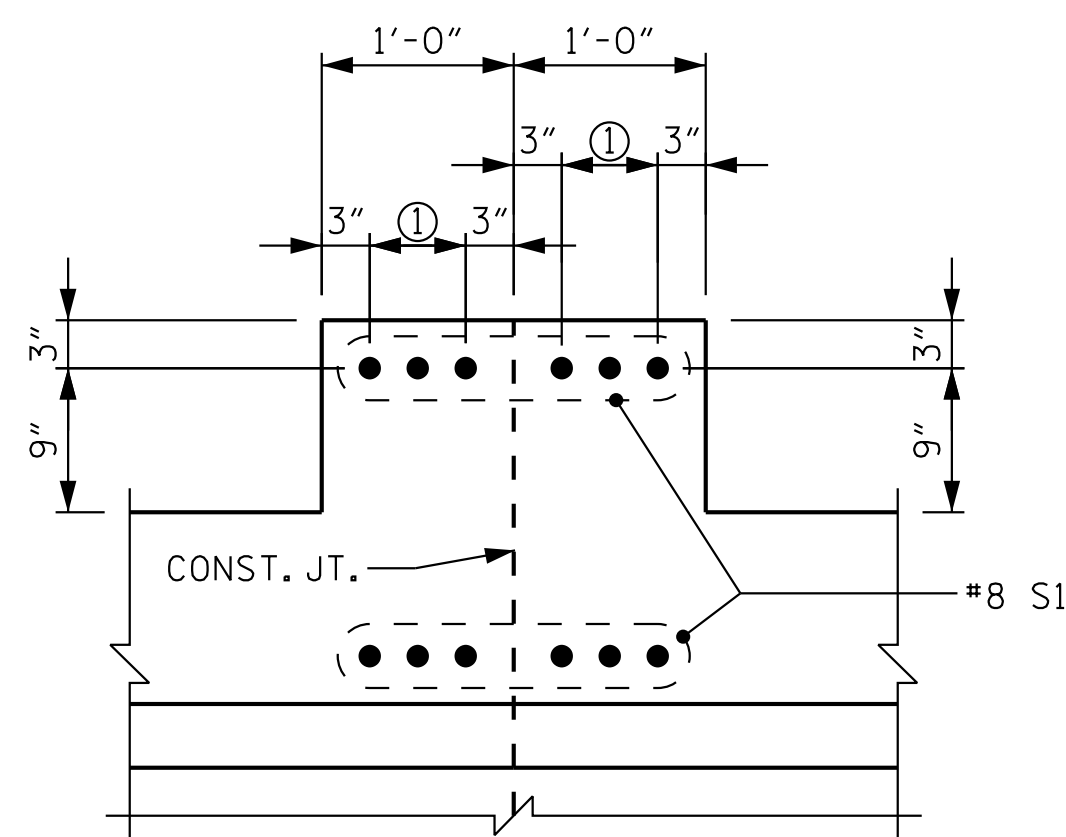
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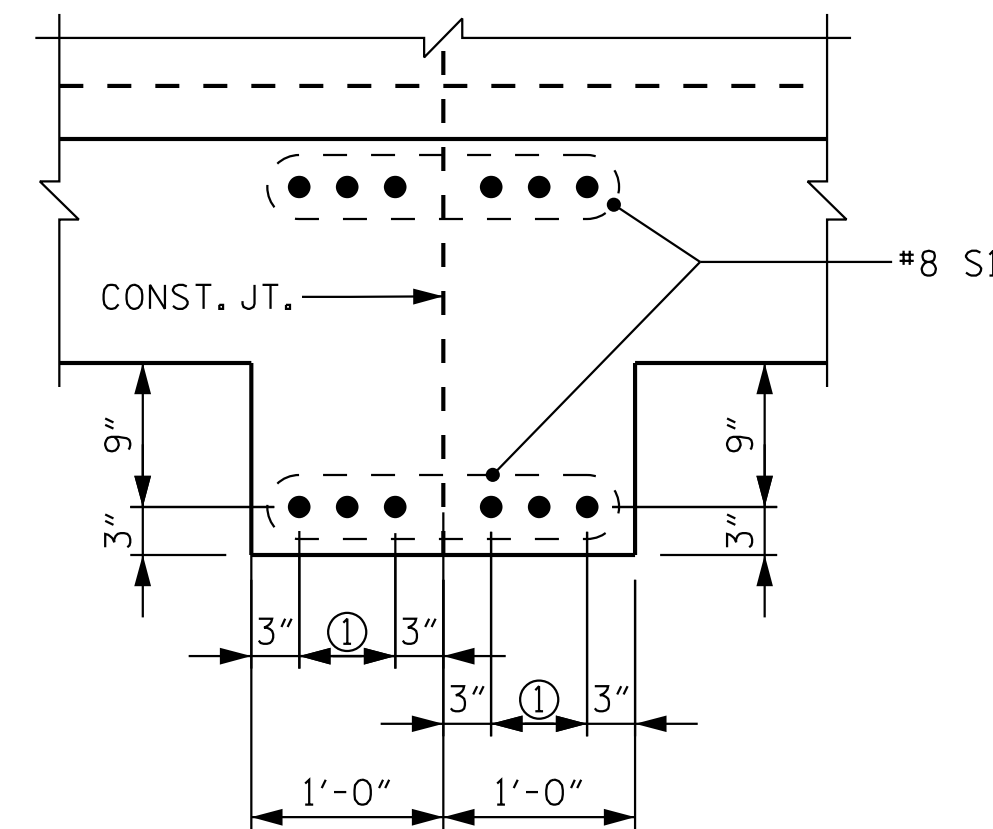
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CULVERT SECTION NORMAL TO ROADWAY



DETAIL A
① 2 SPA. @ 3"



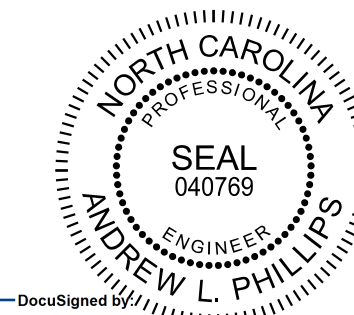
DETAIL B
① 2 SPA. @ 3"

PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 53+01.00 -L-

SHEET 2 OF 7

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 8 FT. X 7 FT.
 CONCRETE BOX CULVERT
 109° SKEW



DocuSigned by:
 Andrew L. Phillips
 12/20/2018

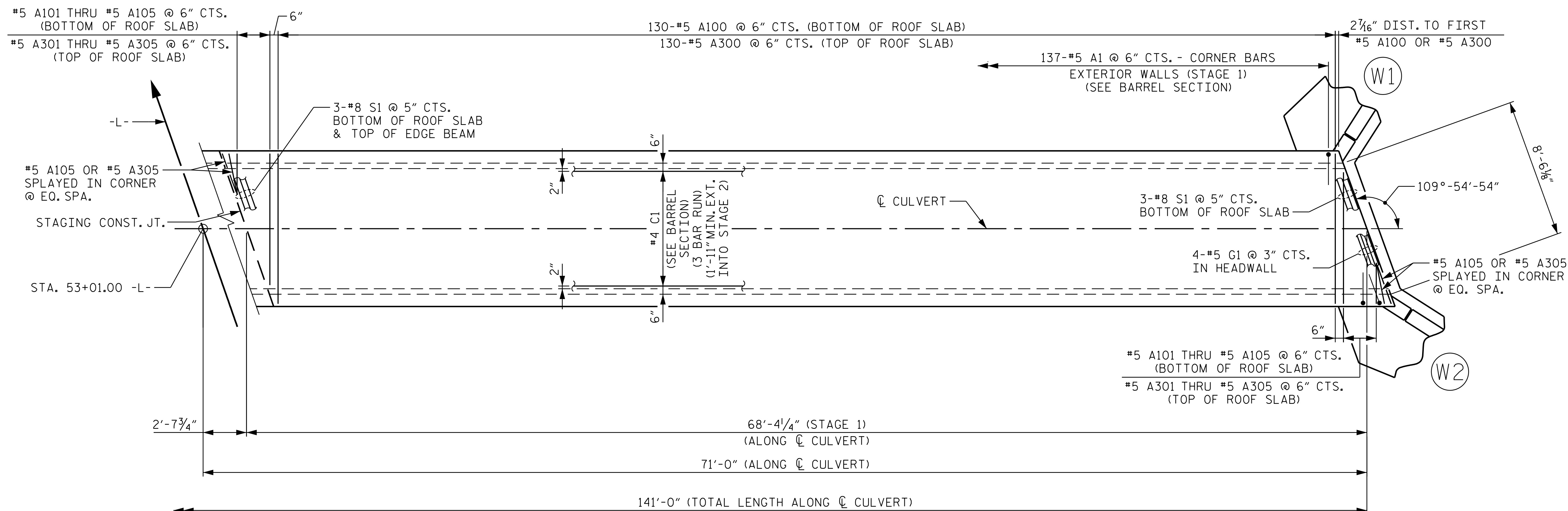
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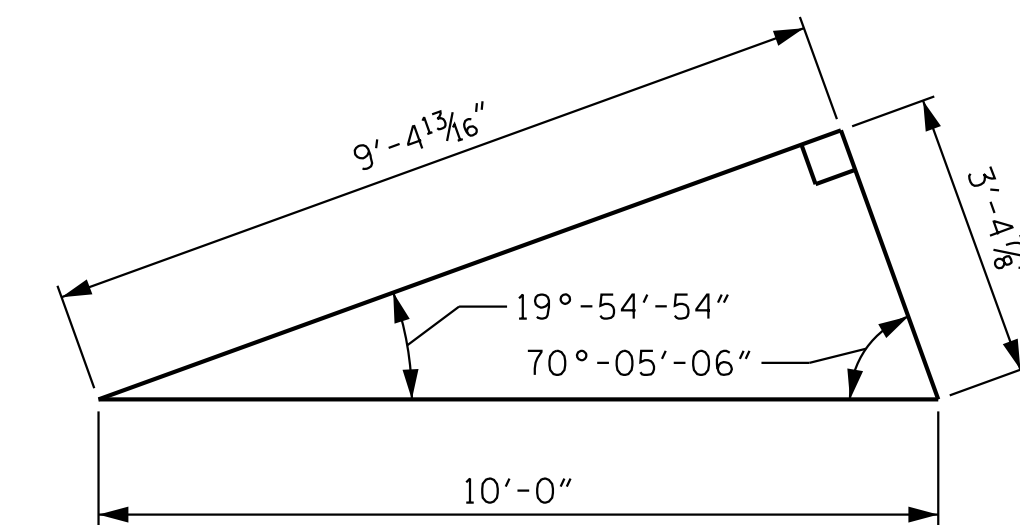
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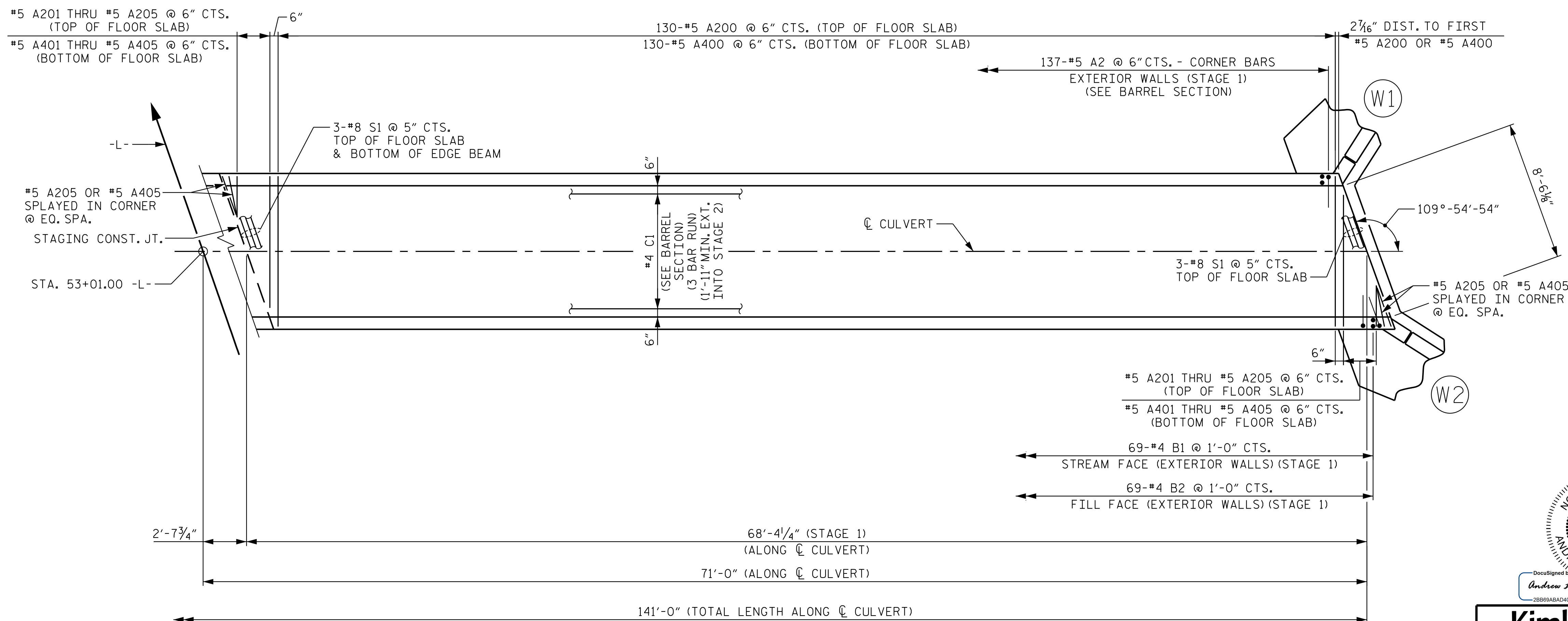
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ROOF SLAB PLAN - STAGE 1



SKEW TRIANGLE



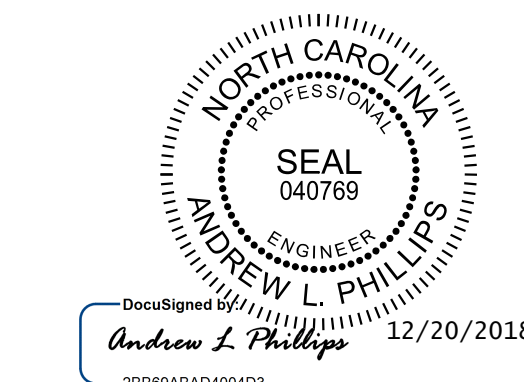
FLOOR SLAB PLAN - STAGE 1

NOTE: FOR S2 BARS IN THE FLOOR SLAB & WING FOOTINGS, SEE SHEET CO3-6.

PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 53+01.00 -L-

SHEET 3 OF 7

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
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 STAGE 1
 SINGLE 8 FT. X 7 FT.
 CONCRETE BOX CULVERT
 109° SKEW



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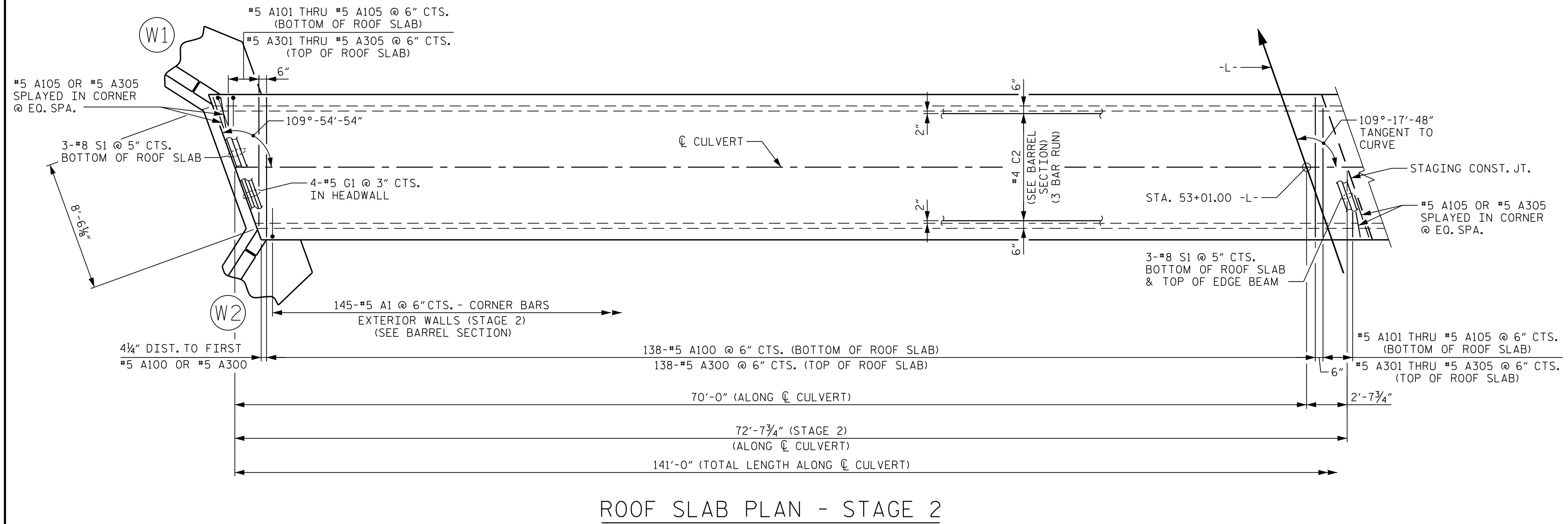
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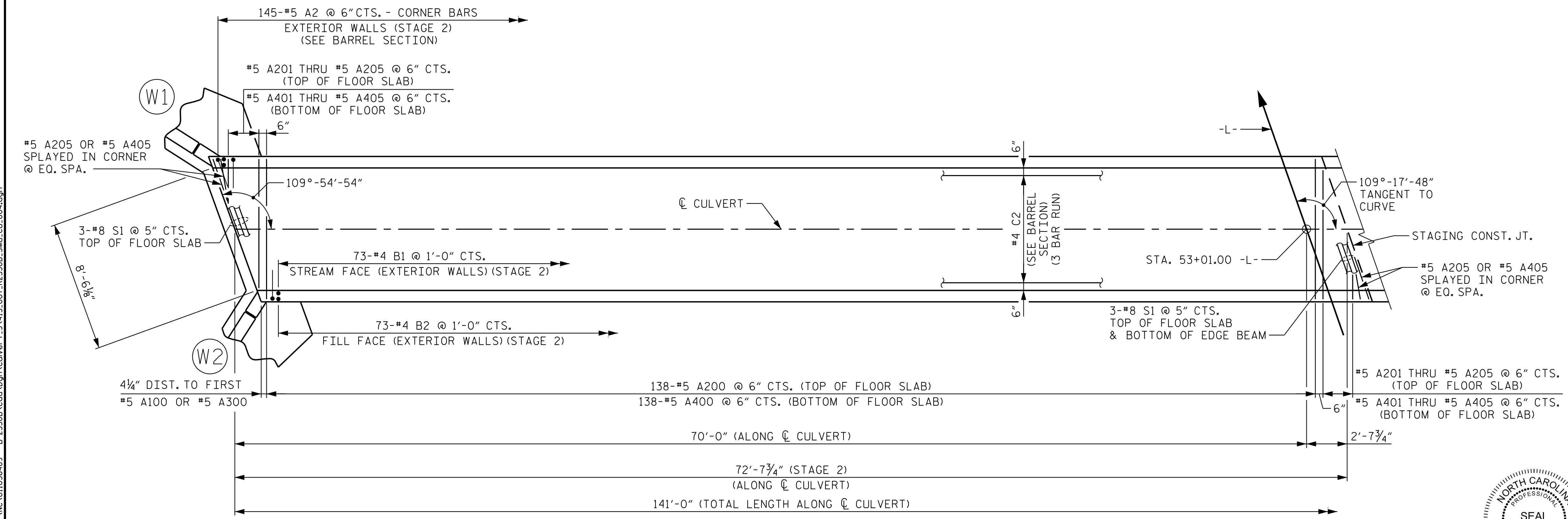
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NOTE

SEE SHEET C03-3 FOR SKEW TRIANGLE.



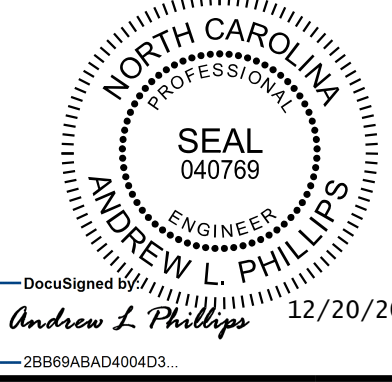
ROOF SLAB PLAN - STAGE 2



FLOOR SLAB PLAN - STAGE 2

NOTE: FOR S2 BARS IN THE FLOOR SLAB & WING FOOTINGS, SEE SHEET C03-6.

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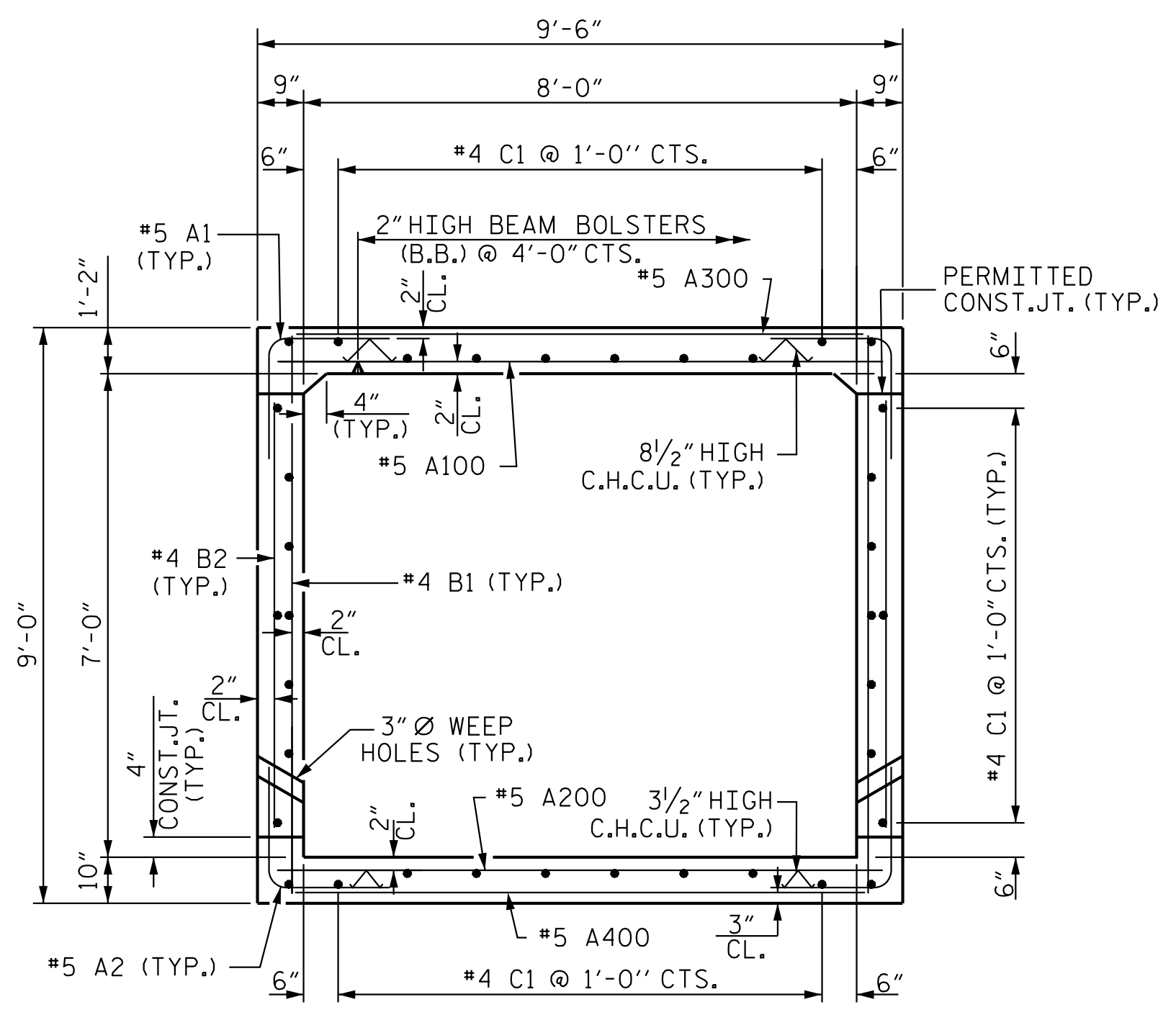
STATE OF NORTH CAROLINA
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 RALEIGH
STAGE 2
 SINGLE 8 FT. X 7 FT.
 CONCRETE BOX CULVERT
 109° SKEW

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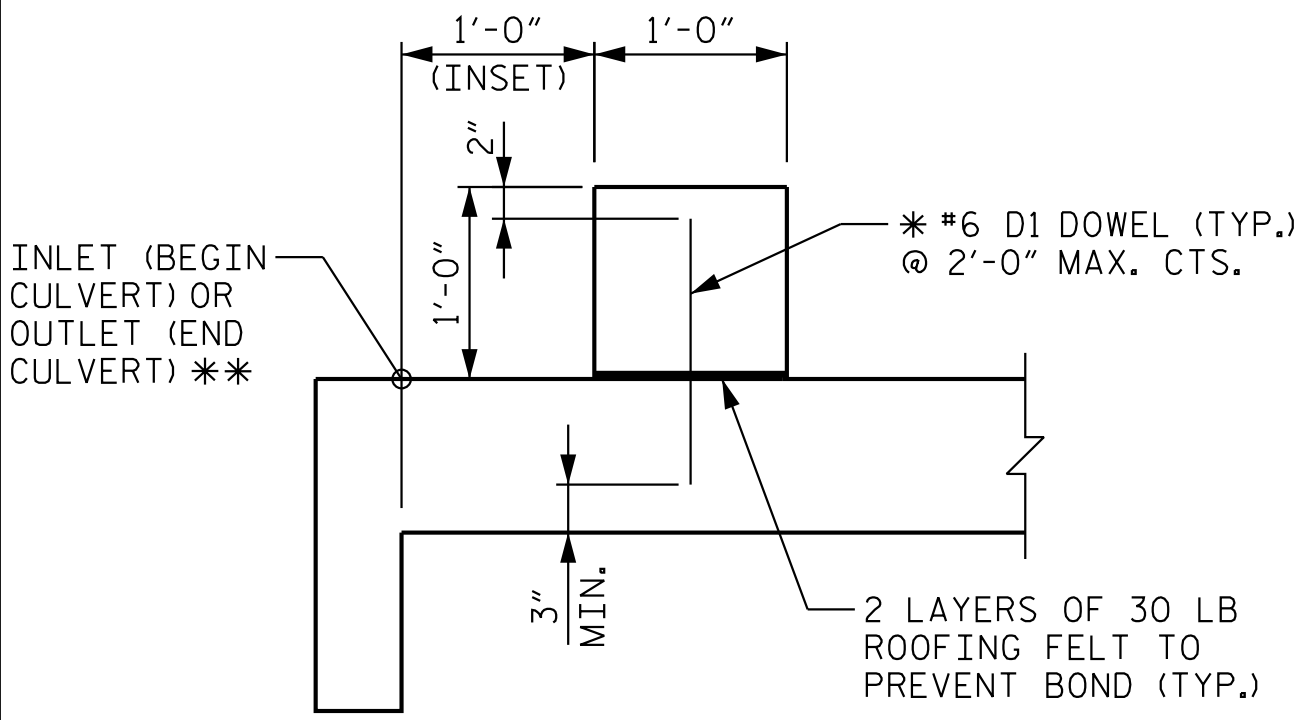
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RIGHT ANGLE SECTION OF BARREL
THERE ARE 36 "C" BARS IN SECTION OF BARREL

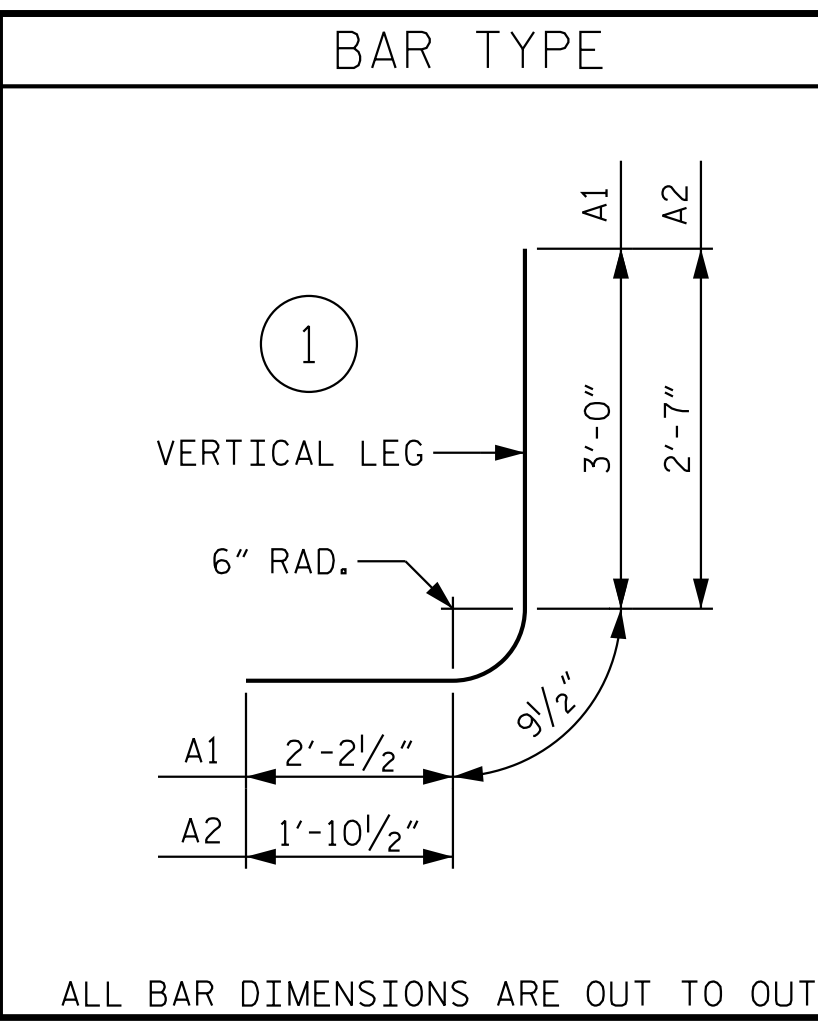


SECTION THROUGH SILL
* DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.
** OUTLET (END CULVERT) SHOWN, INLET (BEGIN CULVERT) SIMILAR
NOTE: 1'-0" SILL IS TO BE CAST NORMAL TO CULVERT WALLS.

STAGE 1 QUANTITIES		
CLASS A CONCRETE		
BARREL @ 1.097 C.Y./FT.	75.0	C.Y.
WINGS, ETC.	10.0	C.Y.
SILLS	0.3	C.Y.
EDGE BEAMS	0.8	C.Y.
TOTAL	86.1	C.Y.
REINFORCING STEEL		
BARREL, SILLS & EDGE BEAMS	12,076	LBS.
WINGS, ETC.	638	LBS.
TOTAL	12,714	LBS.

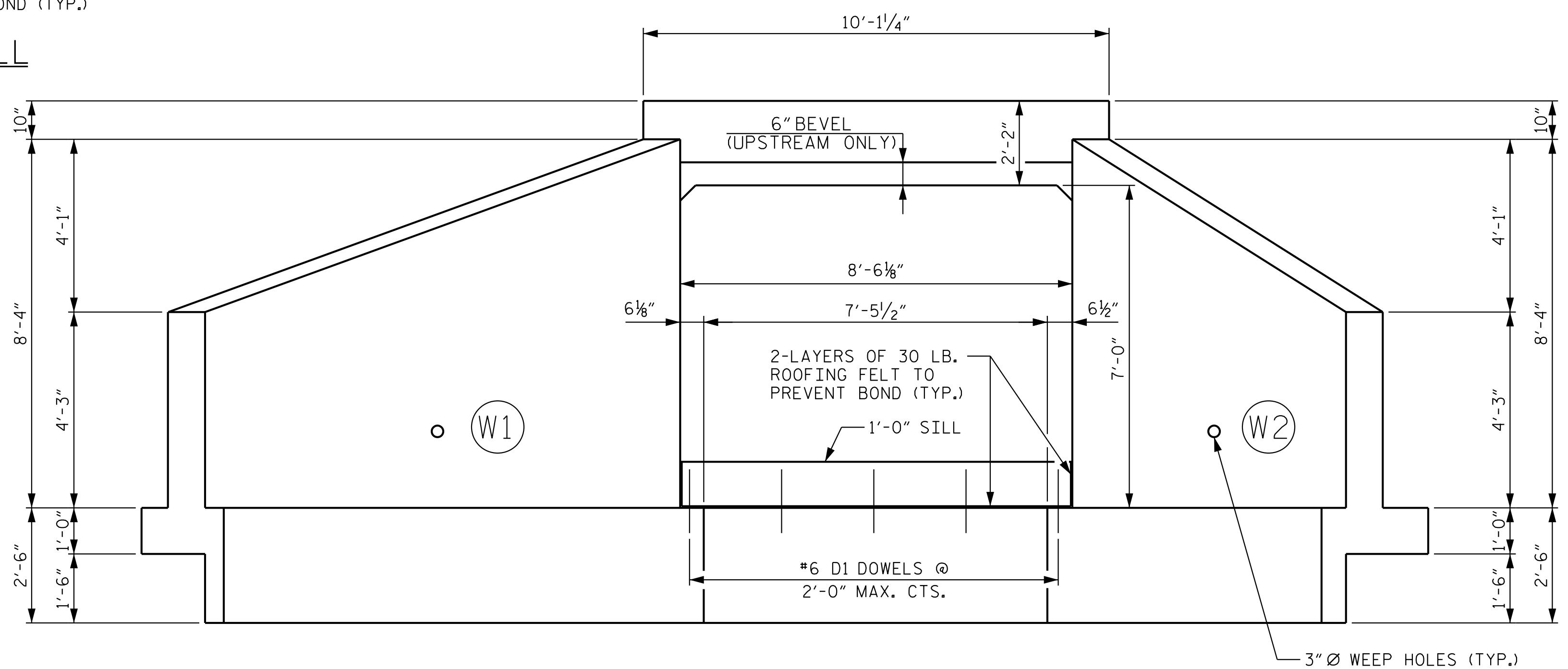
STAGE 2 QUANTITIES		
CLASS A CONCRETE		
BARREL @ 1.097 C.Y./FT.	79.7	C.Y.
WINGS, ETC.	10.0	C.Y.
SILLS	0.3	C.Y.
EDGE BEAMS	0.8	C.Y.
TOTAL	90.8	C.Y.
REINFORCING STEEL		
BARREL, SILLS & EDGE BEAMS	12,727	LBS.
WINGS, ETC.	639	LBS.
TOTAL	13,366	LBS.

		BILL OF MATERIAL													
		STAGE 1					STAGE 2								
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	
A1	274	5	1	6'-0"	1,715	A1	290	5	1	6'-0"	1,815				
A2	274	5	1	5'-3"	1,500	A2	290	5	1	5'-3"	1,588				
A100	130	5	STR	9'-1"	1,232	A100	138	5	STR	9'-1"	1,307				
A101	2	5	STR	8'-0"	17	A101	2	5	STR	8'-5"	18				
A102	2	5	STR	6'-7"	14	A102	2	5	STR	7'-0"	15				
A103	2	5	STR	5'-3"	11	A103	2	5	STR	5'-8"	12				
A104	2	5	STR	3'-10"	8	A104	2	5	STR	4'-3"	9				
A105	6	5	STR	2'-6"	16	A105	6	5	STR	2'-11"	18				
A200	130	5	STR	9'-1"	1,232	A200	138	5	STR	9'-1"	1,307				
A201	2	5	STR	8'-0"	17	A201	2	5	STR	8'-5"	18				
A202	2	5	STR	6'-7"	14	A202	2	5	STR	7'-0"	15				
A203	2	5	STR	5'-3"	11	A203	2	5	STR	5'-8"	12				
A204	2	5	STR	3'-10"	8	A204	2	5	STR	4'-3"	9				
A205	6	5	STR	2'-6"	16	A205	6	5	STR	2'-11"	18				
A300	130	5	STR	9'-1"	1,232	A300	138	5	STR	9'-1"	1,307				
A301	2	5	STR	8'-0"	17	A301	2	5	STR	8'-5"	18				
A302	2	5	STR	6'-7"	14	A302	2	5	STR	7'-0"	15				
A303	2	5	STR	5'-3"	11	A303	2	5	STR	5'-8"	12				
A304	2	5	STR	3'-10"	8	A304	2	5	STR	4'-3"	9				
A305	6	5	STR	2'-6"	16	A305	6	5	STR	2'-11"	18				
A400	130	5	STR	9'-1"	1,232	A400	138	5	STR	9'-1"	1,307				
A401	2	5	STR	8'-0"	17	A401	2	5	STR	8'-5"	18				
A402	2	5	STR	6'-7"	14	A402	2	5	STR	7'-0"	15				
A403	2	5	STR	5'-3"	11	A403	2	5	STR	5'-8"	12				
A404	2	5	STR	3'-10"	8	A404	2	5	STR	4'-3"	9				
A405	6	5	STR	2'-6"	16	A405	6	5	STR	2'-11"	18				
B1	138	4	STR	8'-6"	784	B1	146	4	STR	8'-6"	829				
B2	138	4	STR	6'-4"	584	B2	146	4	STR	6'-4"	618				
C1	108	4	STR	24'-8"	1,780	C1	108	4	STR	25'-6"	1,840				
D1	5	6	STR	1'-5"	11	D1	5	6	STR	1'-5"	11				
G1	4	5	STR	9'-9"	41	G1	4	5	STR	9'-9"	41				
S1	18	8	STR	9'-9"	469	S1	18	8	STR	9'-9"	469				
REINFORCING STEEL				LBS.	12,076	REINFORCING STEEL				LBS.	12,727				

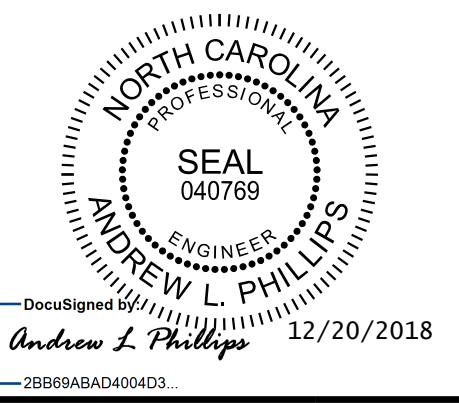


ALL BAR DIMENSIONS ARE OUT TO OUT

BAR SIZE	SPLICE LENGTH
#4 B1	1'-5"
#4 C1 & #4 C2	1'-11"



END ELEVATION NORMAL TO SKEW



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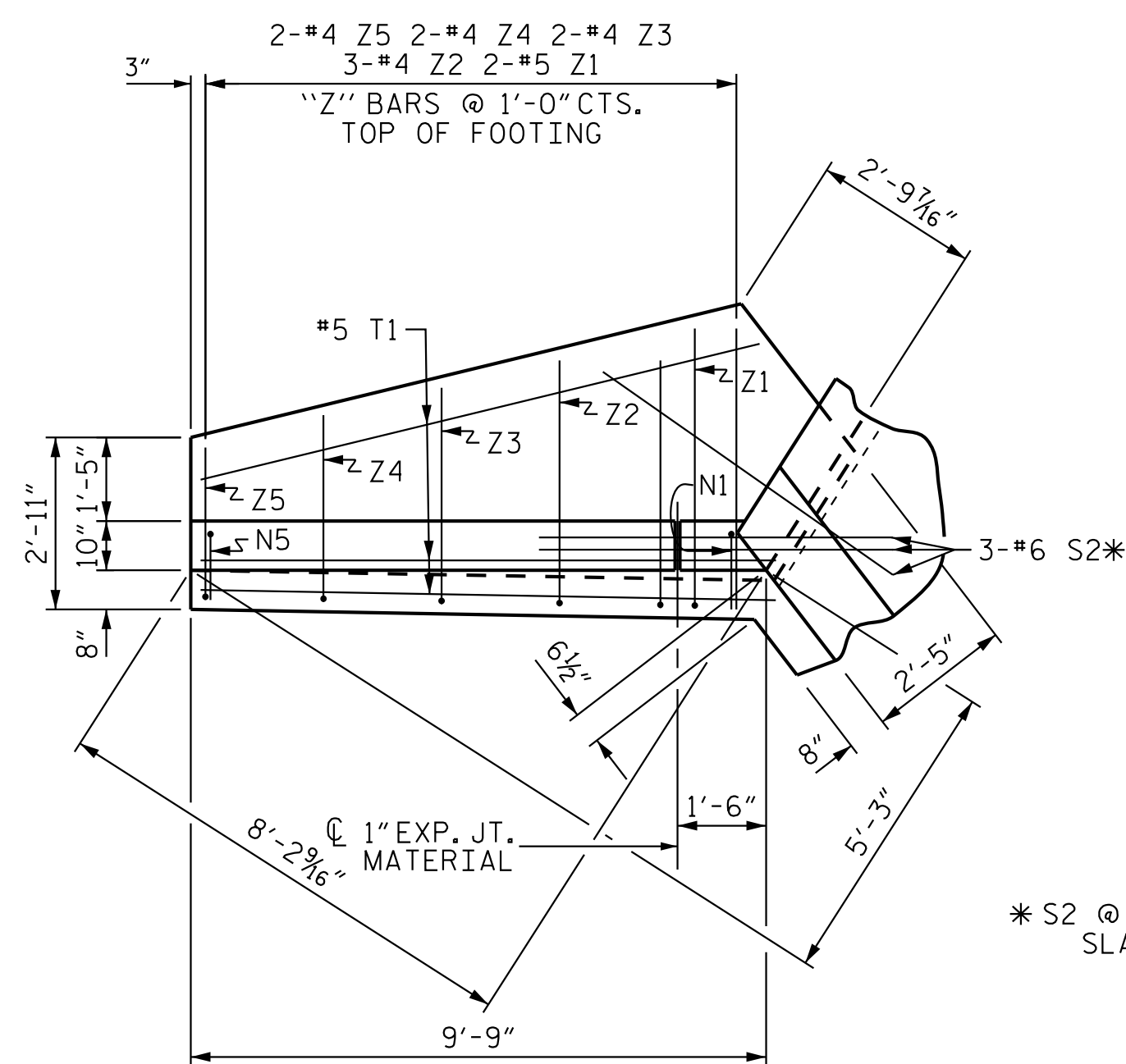
SHEET 5 OF 7
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RALEIGH
SINGLE 8 FT. X 7 FT.
CONCRETE BOX CULVERT
109° SKEW

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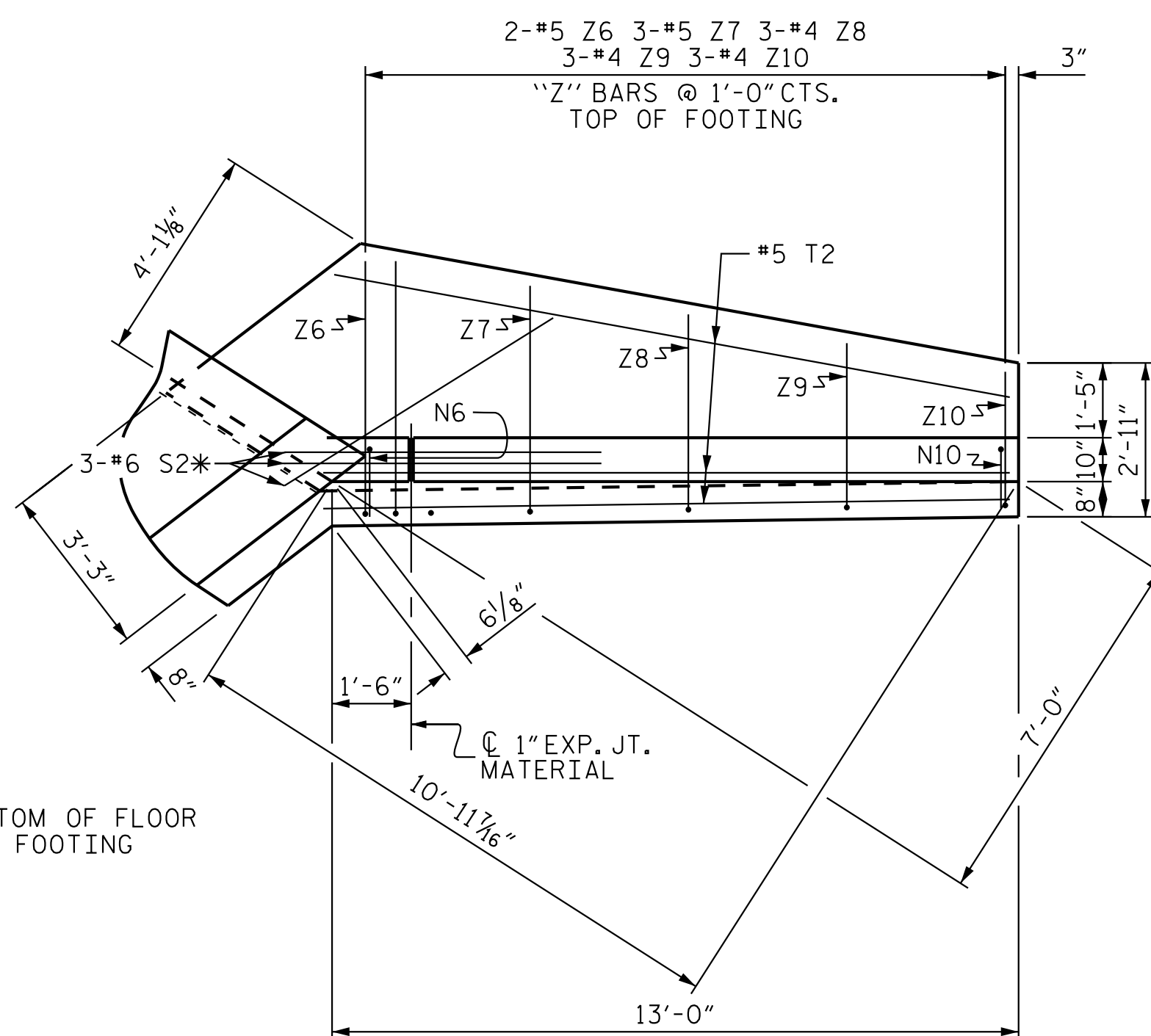
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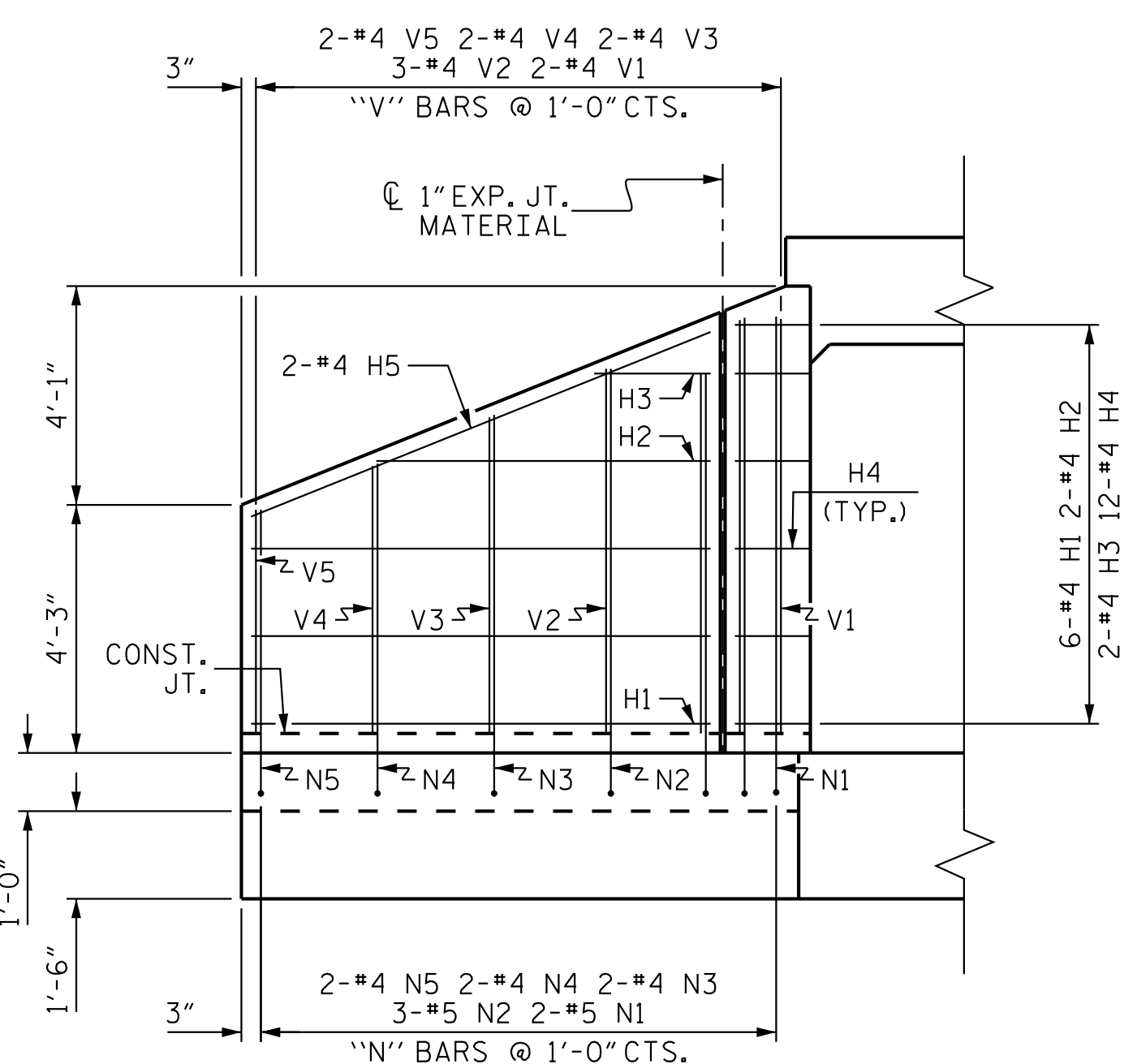
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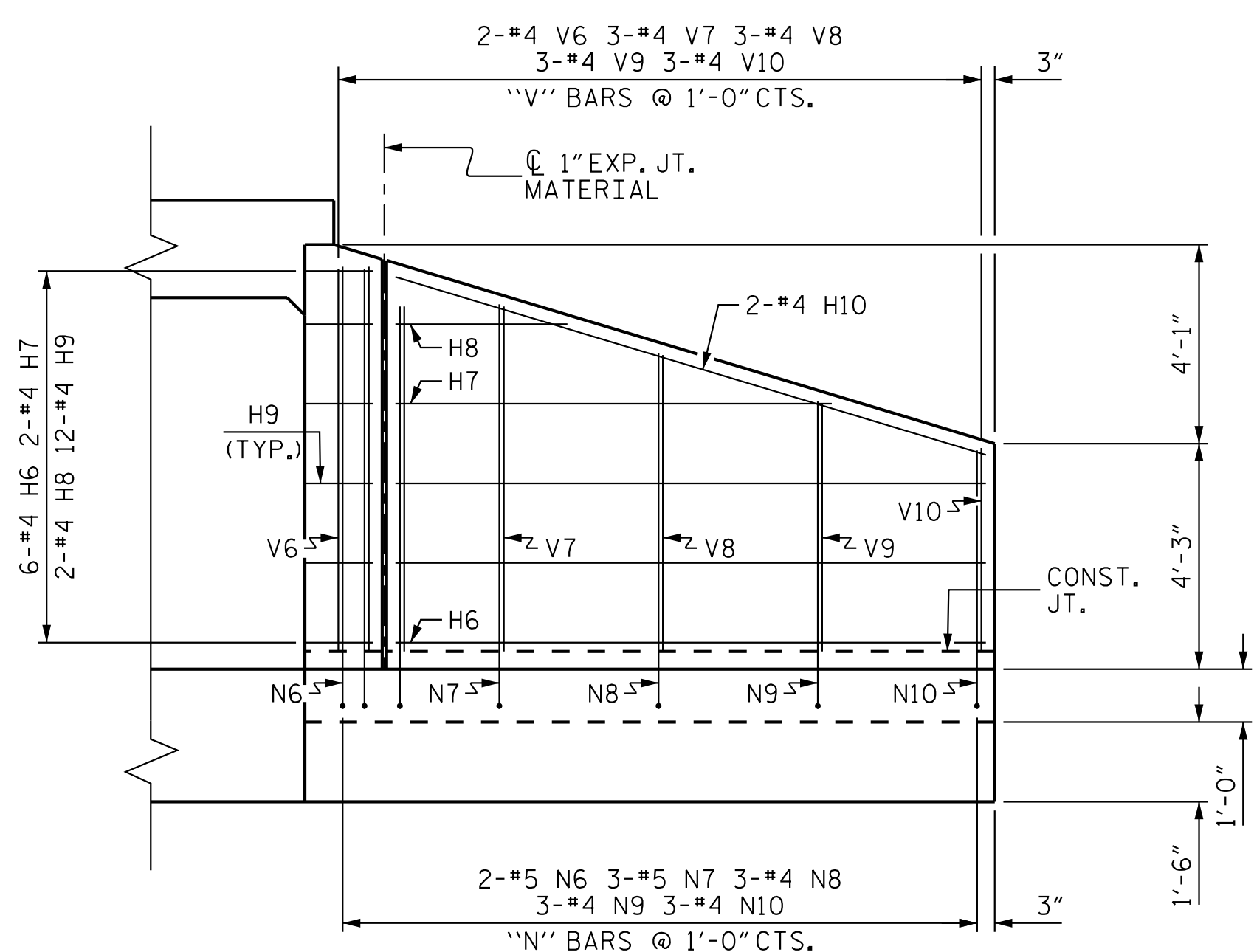
PLAN W2



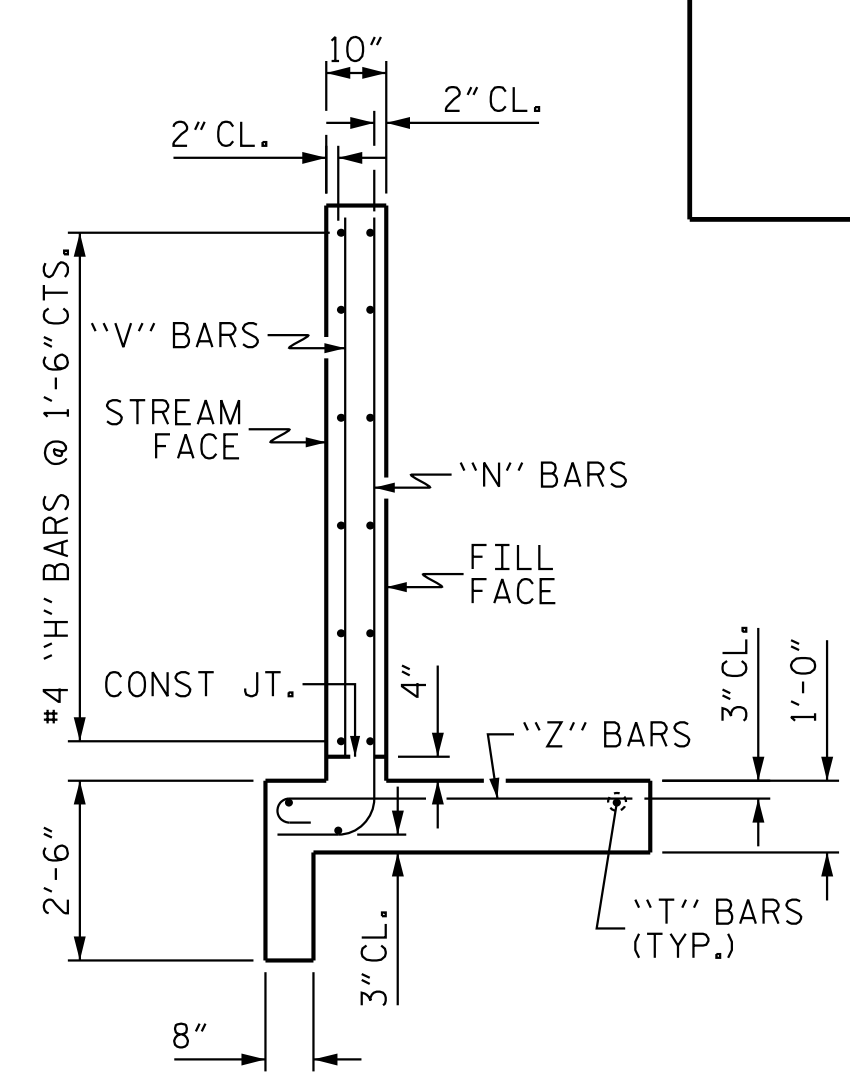
PLAN W1



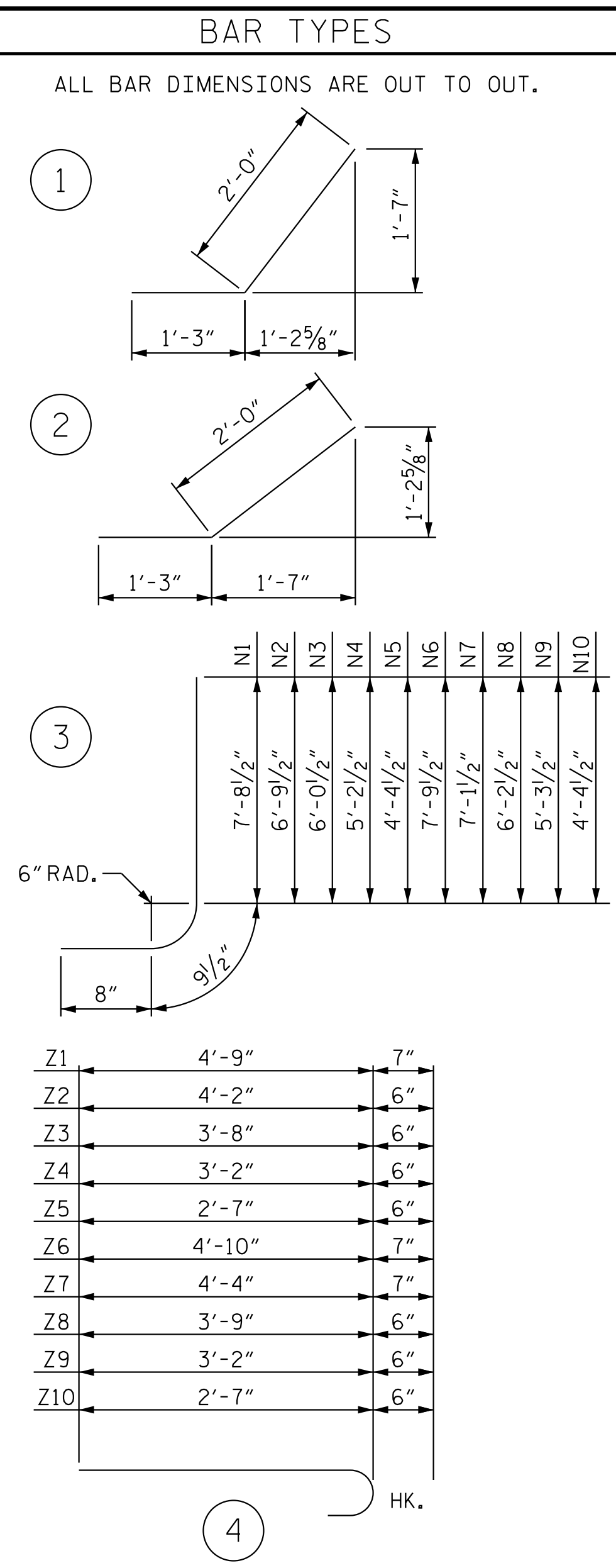
ELEVATION W2



ELEVATION W1



TYPICAL WING SECTION

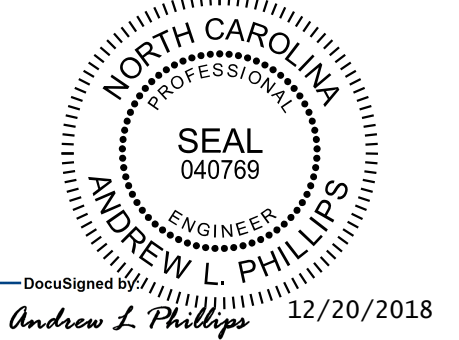


BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	7'-10"	63
H2	4	#4	STR	5'-8"	15
H3	4	#4	STR	2'-0"	5
H4	24	#4	1	3'-3"	52
H5	4	#4	STR	8'-5"	22
H6	12	#4	STR	11'-1"	89
H7	4	#4	STR	8'-2"	22
H8	4	#4	STR	3'-3"	9
H9	24	#4	2	3'-3"	52
H10	4	#4	STR	11'-7"	31
N1	4	#5	3	9'-2"	38
N2	6	#5	3	8'-3"	52
N3	4	#4	3	7'-6"	20
N4	4	#4	3	6'-8"	18
N5	4	#4	3	5'-10"	16
N6	4	#5	3	9'-3"	39
N7	6	#5	3	8'-7"	54
N8	6	#4	3	7'-8"	31
N9	6	#4	3	6'-9"	27
N10	6	#4	3	5'-10"	23
S2	12	#6	STR	6'-0"	108
T1	6	#5	STR	9'-9"	61
T2	6	#5	STR	13'-0"	81
V1	4	#4	STR	7'-1"	19
V2	6	#4	STR	6'-3"	25
V3	4	#4	STR	5'-5"	14
V4	4	#4	STR	4'-7"	12
V5	4	#4	STR	3'-10"	10
V6	4	#4	STR	7'-3"	19
V7	6	#4	STR	6'-6"	26
V8	6	#4	STR	5'-7"	22
V9	6	#4	STR	4'-8"	19
V10	6	#4	STR	3'-10"	15
Z1	4	#5	4	5'-4"	22
Z2	6	#4	4	4'-8"	19
Z3	4	#4	4	4'-2"	11
Z4	4	#4	4	3'-8"	10
Z5	4	#4	4	3'-1"	8
Z6	4	#5	4	5'-5"	23
Z7	6	#5	4	4'-11"	31
Z8	6	#4	4	4'-3"	17
Z9	6	#4	4	3'-8"	15
Z10	6	#4	4	3'-1"	12

REINFORCING STEEL FOR 4 WINGS	1277 LBS
CLASS A CONCRETE	
4 WINGS	18.2 CY
2 HEADWALLS	0.9 CY
2 END CURTAIN WALLS	0.9 CY
TOTAL	20.0 CY

PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 53+01.00 -L-

SHEET 6 OF 7



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 421 Fayetteville Street, Suite 600
 Raleigh, NC 27601-1772
 Phone (919) 677-2000 NC LICENSE # F-0102

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
STANDARD WINGS FOR CONCRETE BOX CULVERT
 H = 7'-0" SLOPE = 2:1
 109° SKEW

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

SHEET NO. **C03-6**
 TOTAL SHEETS 7

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ASSEMBLED BY : D. D. LOWERY DATE : 12/18
 CHECKED BY : P. D. COOKSEY DATE : 12/18
 DRAWN BY : CCJ 12/99
 CHECKED BY : RWW 03/00

LOAD FACTORS: _____

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

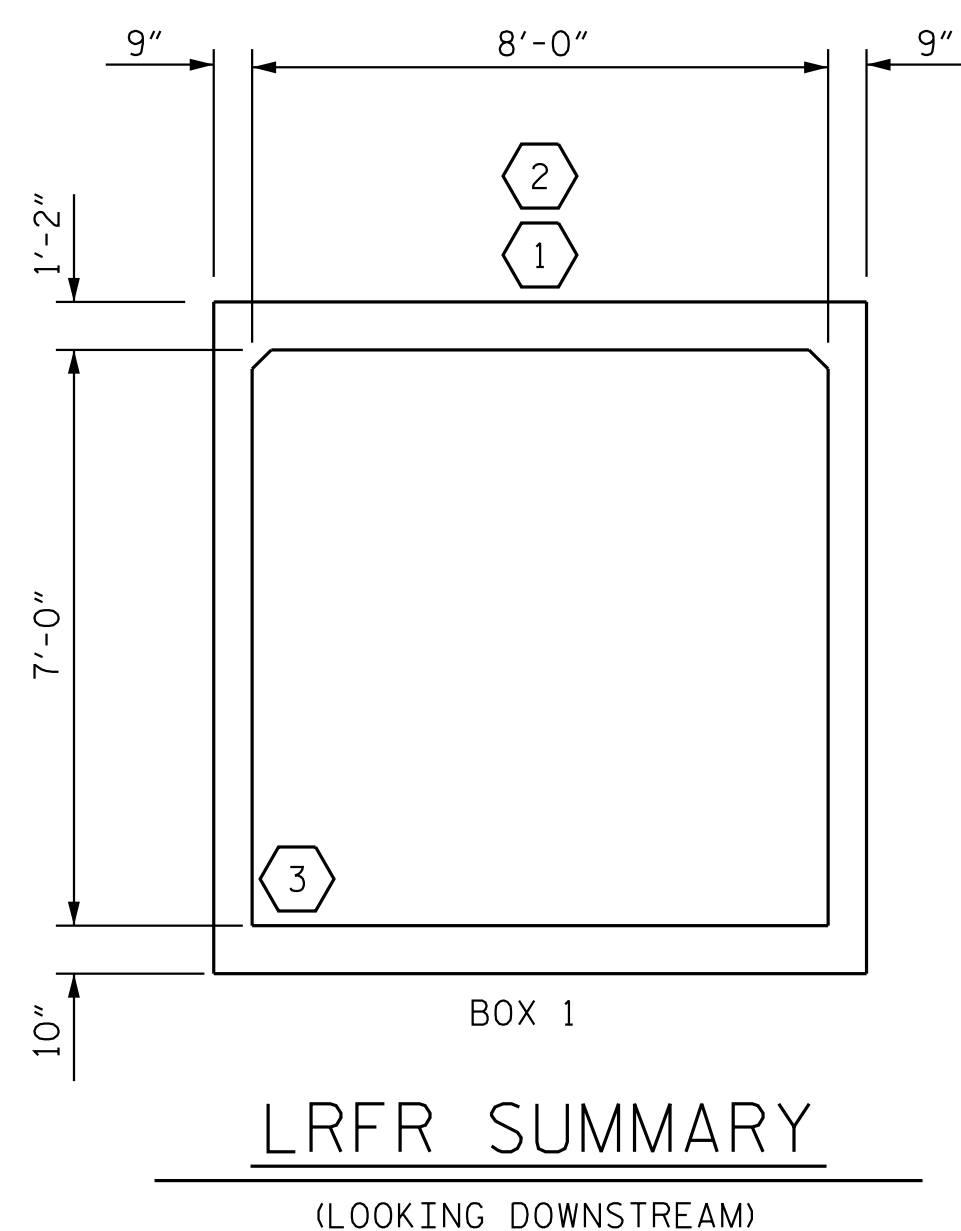
LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						LIVE-LOAD FACTORS (γ _{LL})	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	①	1.35	--	1.75	1.35	1	TOP SLAB	4.75	1.66	1	TOP SLAB	0.75		
	HL-93 (OPERATING)	N/A		1.75	--	1.35	1.75	1	TOP SLAB	4.75	2.15	1	TOP SLAB	0.75		
	HS-20 (INVENTORY)	36.000	②	1.44	51.84	1.75	1.44	1	TOP SLAB	4.75	1.81	1	TOP SLAB	0.75		
	HS-20 (OPERATING)	36.000		1.87	67.32	1.35	1.87	1	TOP SLAB	4.75	2.35	1	TOP SLAB	0.75		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		2.62	35.37	1.40	2.62	1	TOP SLAB	4.75	3.83	1	TOP SLAB	0.75		
		SNGARBS2	20.000		2.45	49.00	1.40	2.45	1	TOP SLAB	4.75	3.50	1	TOP SLAB	0.75	
		SNAGRIS2	22.000		2.62	57.64	1.40	2.62	1	TOP SLAB	4.75	3.83	1	TOP SLAB	0.75	
		SNCOTTS3	27.250		1.82	49.60	1.40	1.82	1	BOTTOM SLAB	4.75	1.89	1	BOTTOM SLAB	0.75	
		SNAGGRS4	34.925	③	1.70	59.37	1.40	1.75	1	BOTTOM SLAB	4.75	1.70	1	BOTTOM SLAB	0.75	
		SNS5A	35.550		1.85	65.77	1.40	1.85	1	BOTTOM SLAB	4.75	1.86	1	BOTTOM SLAB	0.75	
		SNS6A	39.950		1.85	73.91	1.40	1.85	1	BOTTOM SLAB	4.75	1.86	1	BOTTOM SLAB	0.75	
		SNS7B	42.000		1.85	77.70	1.40	1.85	1	BOTTOM SLAB	4.75	1.86	1	BOTTOM SLAB	0.75	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.62	86.46	1.40	2.62	1	TOP SLAB	4.75	3.83	1	TOP SLAB	0.75	
		TNT4A	33.075		2.17	71.77	1.40	2.17	1	BOTTOM SLAB	4.75	2.39	1	BOTTOM SLAB	0.75	
		TNT6A	41.600		1.86	77.38	1.40	1.86	1	BOTTOM SLAB	4.75	1.88	1	BOTTOM SLAB	0.75	
		TNT7A	42.000		2.02	84.84	1.40	2.02	1	BOTTOM SLAB	4.75	2.12	1	BOTTOM SLAB	0.75	
		TNT7B	42.000		1.86	78.12	1.40	1.86	1	BOTTOM SLAB	4.75	1.86	1	BOTTOM SLAB	0.75	
		TNAGRIT4	43.000		2.17	93.31	1.40	2.17	1	BOTTOM SLAB	4.75	2.39	1	BOTTOM SLAB	0.75	
TNAGT5A	45.000		2.17	97.65	1.40	2.17	1	BOTTOM SLAB	4.75	2.39	1	BOTTOM SLAB	0.75			
TNAGT5B	45.000		2.17	97.65	1.40	2.17	1	BOTTOM SLAB	4.75	2.39	1	BOTTOM SLAB	0.75			

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	--

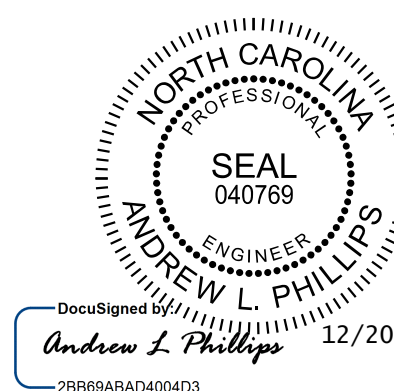
NOTE:
RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM THE EXTERIOR EDGE OF EXTERIOR WALL.

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



PROJECT NO. R-2530B
STANLY COUNTY
STATION: 53+01.00 -L-

SHEET 7 OF 7



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

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C03-7
1			3			TOTAL SHEETS
2			4			7

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STD. NO. LRFR5

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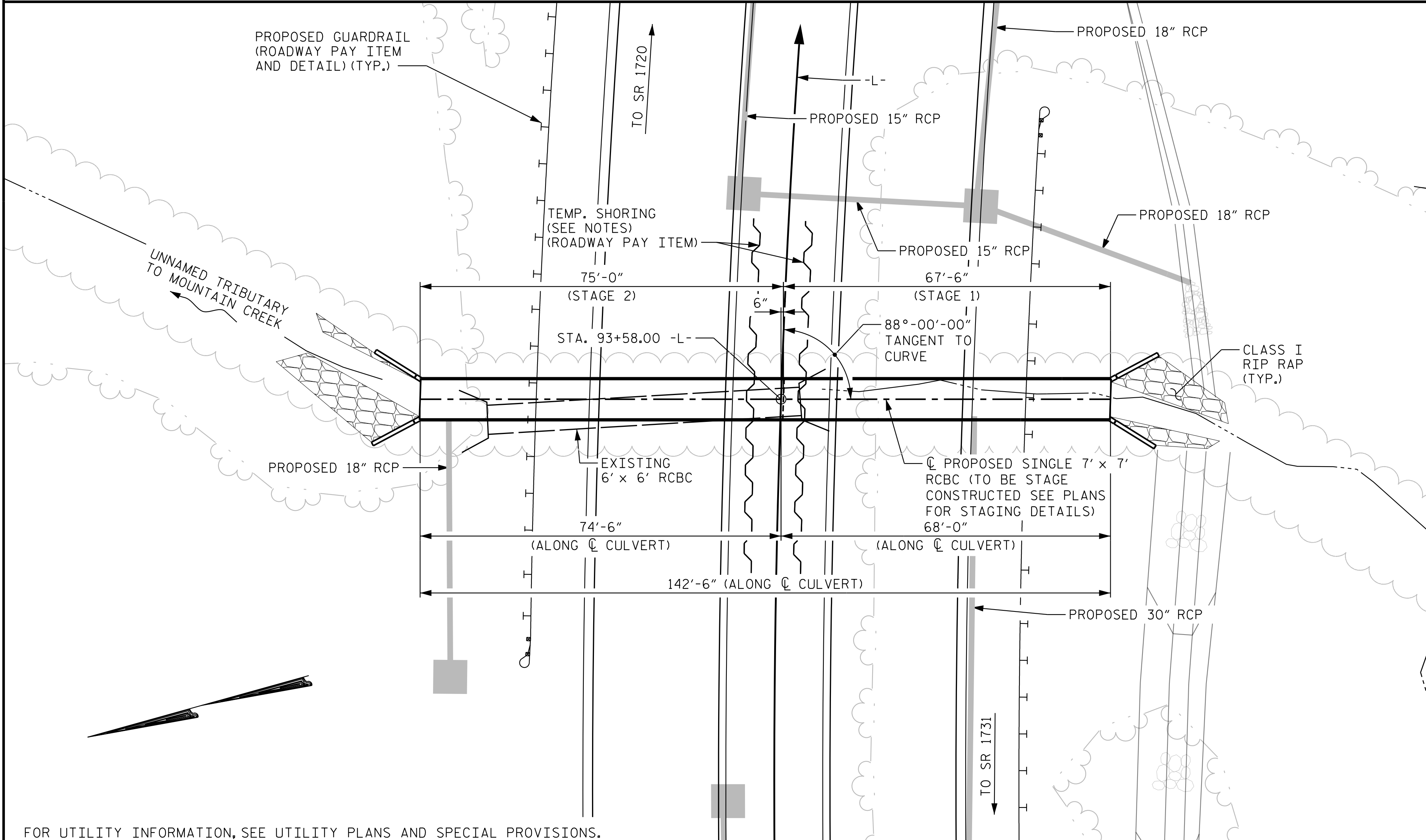
ASSEMBLED BY : D.D. LOWERY	DATE : 12/18
CHECKED BY : P.D. COOKSEY	DATE : 12/18
DRAWN BY : WMC 7/11	REV. 10/1/11 MAA/GM
CHECKED BY : GM 7/11	REV. 12/17 MAA/THC

BENCHMARK: BM#15, -L- STA. 95+98.92, OFFSET 55.33' LT., EL. 555.50', PAINTED FLANGE BOLT ON FH

F.A. PROJECT NO. STBG-0024(083)

NOTES

ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING.
 DESIGN FILL ----- 11.5 FT.
 FOR OTHER DESIGN DATA AND GENERAL NOTES, SEE SHEET SN.
 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
 CONCRETE IN STAGE 1 OR STAGE 2 CULVERT TO BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS, CURTAIN WALLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
 THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
 DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
 THE 18" Ø R.C. PIPES AND 30" Ø R.C. PIPE 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 SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACES OF THE EXTERIOR WALLS AND BOTH FACES OF INTERIOR WALLS ABOVE THE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
 AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAILED 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.
 AFTER SERVING AS A TEMPORARY STRUCTURE THE EXISTING 6'-0" X 6'-0" RCBC LOCATED AT THE SAME LOCATION AS THE PROPOSED CULVERT SHALL BE REMOVED. THE EXISTING STRUCTURE IS PRESENTLY NOT POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE STRUCTURE DETERIORATE DURING CONSTRUCTION OF THE PROPOSED CULVERT, A LOAD LIMIT MAY BE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.
 THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
 FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE ROADWAY PLANS.
 TRAFFIC ON NC 24/27/73 SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS SHOWN ON THESE PLANS AS DIRECTED BY THE ENGINEER.
 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 THE POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.



FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.

LOCATION SKETCH

TOTAL STRUCTURE QUANTITIES

STAGE 1		STAGE 2	
CLASS A CONCRETE		CLASS A CONCRETE	
BARREL @ 0.970 CY/FT	65.5 C.Y.	BARREL @ 0.970 CY/FT	72.8 C.Y.
WINGS ETC.	10.2 C.Y.	WINGS ETC.	10.2 C.Y.
TOTAL	75.7 C.Y.	TOTAL	83.0 C.Y.
REINFORCING STEEL		REINFORCING STEEL	
BARREL	11,419 LBS.	BARREL	12,554 LBS.
WINGS ETC.	576 LBS.	WINGS ETC.	575 LBS.
TOTAL	11,995 LBS.	TOTAL	13,129 LBS.
FOUNDATION CONDITIONING MATERIAL	59 TONS	FOUNDATION CONDITIONING MATERIAL	66 TONS
CULVERT EXCAVATION STA. 93+58.00 -L-		LUMP SUM	
REMOVAL OF EXISTING STRUCTURE STA. 93+58.00 -L-		LUMP SUM	

HYDRAULIC DATA

DESIGN DISCHARGE ----- 300 CFS
 FREQUENCY OF DESIGN FLOOD ----- 50 YR.
 DESIGN HIGH WATER ELEVATION ----- 542.5 FT.
 DRAINAGE AREA ----- 0.27 SQ. MI.
 BASE DISCHARGE (0100) ----- 320 CFS
 BASE HIGH WATER ELEVATION ----- 542.7 FT.

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE ----- >360 CFS
 FREQUENCY OF OVERTOPPING FLOOD --- 500+ YR.
 OVERTOPPING FLOOD ELEVATION ----- 548.9 FT.

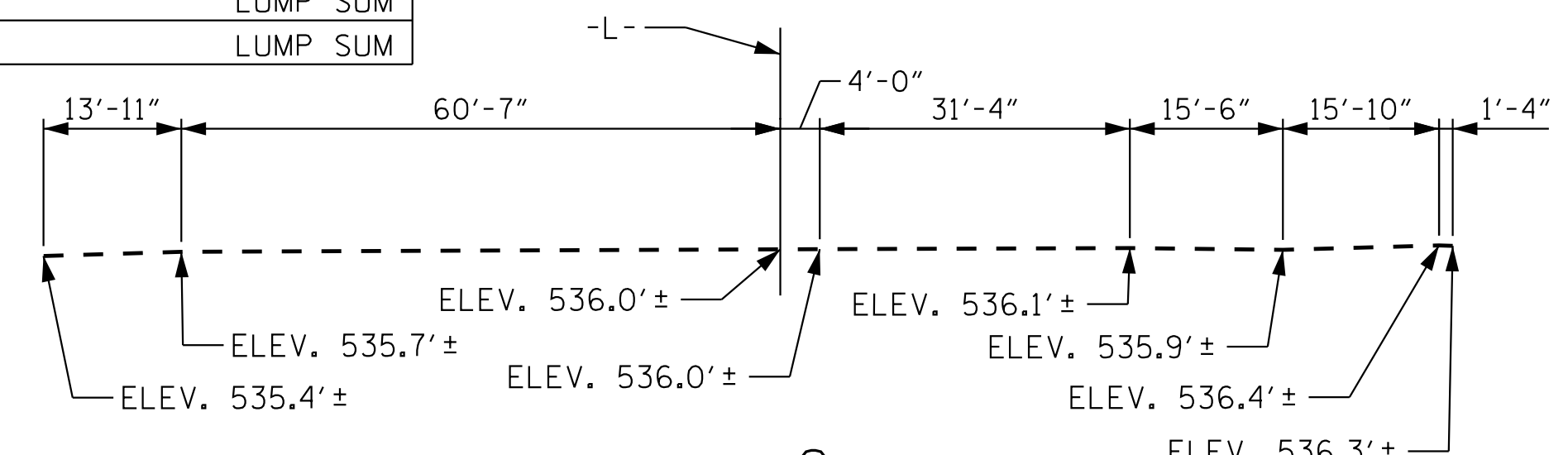
SAMPLE BAR REPLACEMENT

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

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

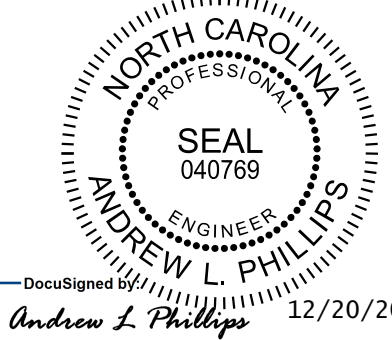
ROADWAY DATA

GRADE POINT ELEV. @ STA 93+58.00 -L- = 550.79'
 BED ELEVATION @ STA 93+58.00 -L- = 534.80'
 ROADWAY SLOPES 2:1



PROFILE ALONG CULVERT

ELEVATIONS TAKEN ALONG CENTERLINE CHANNEL



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SHEET 1 OF 7

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

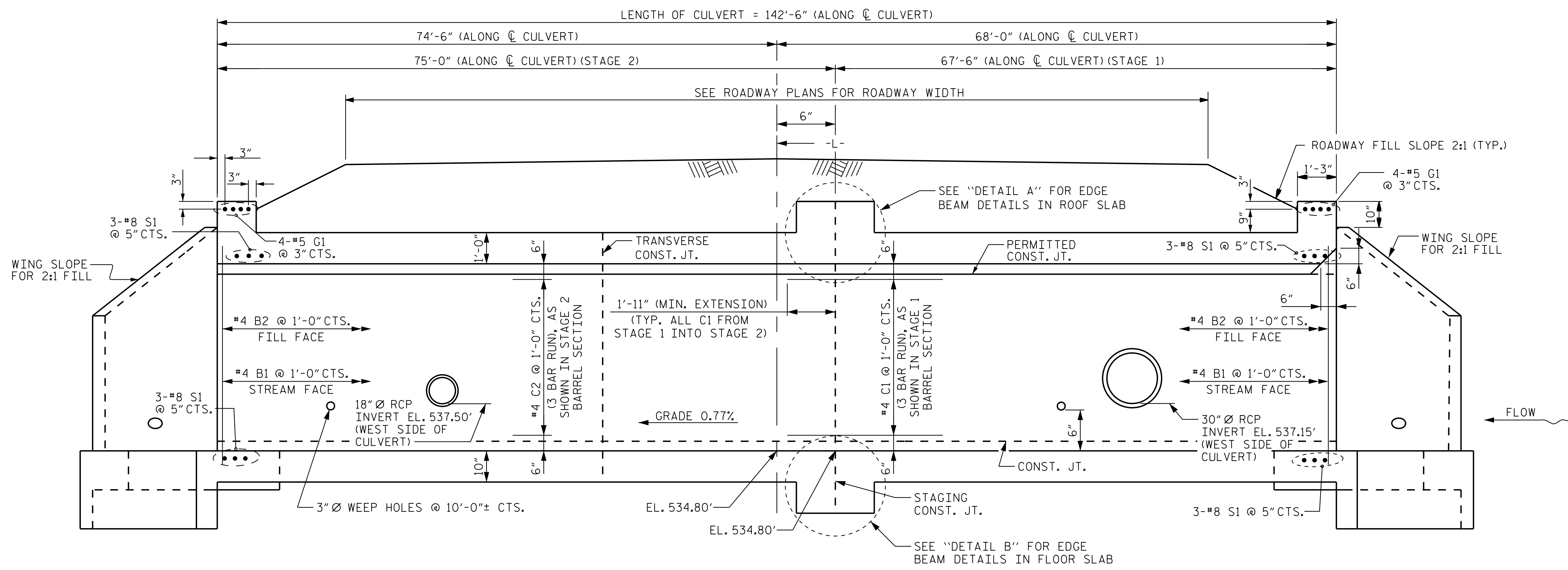
SINGLE 7 FT. X 7 FT.
 CONCRETE BOX CULVERT
 88° SKEW

REVISIONS						SHEET NO.
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1			3			TOTAL SHEETS
2			4			7

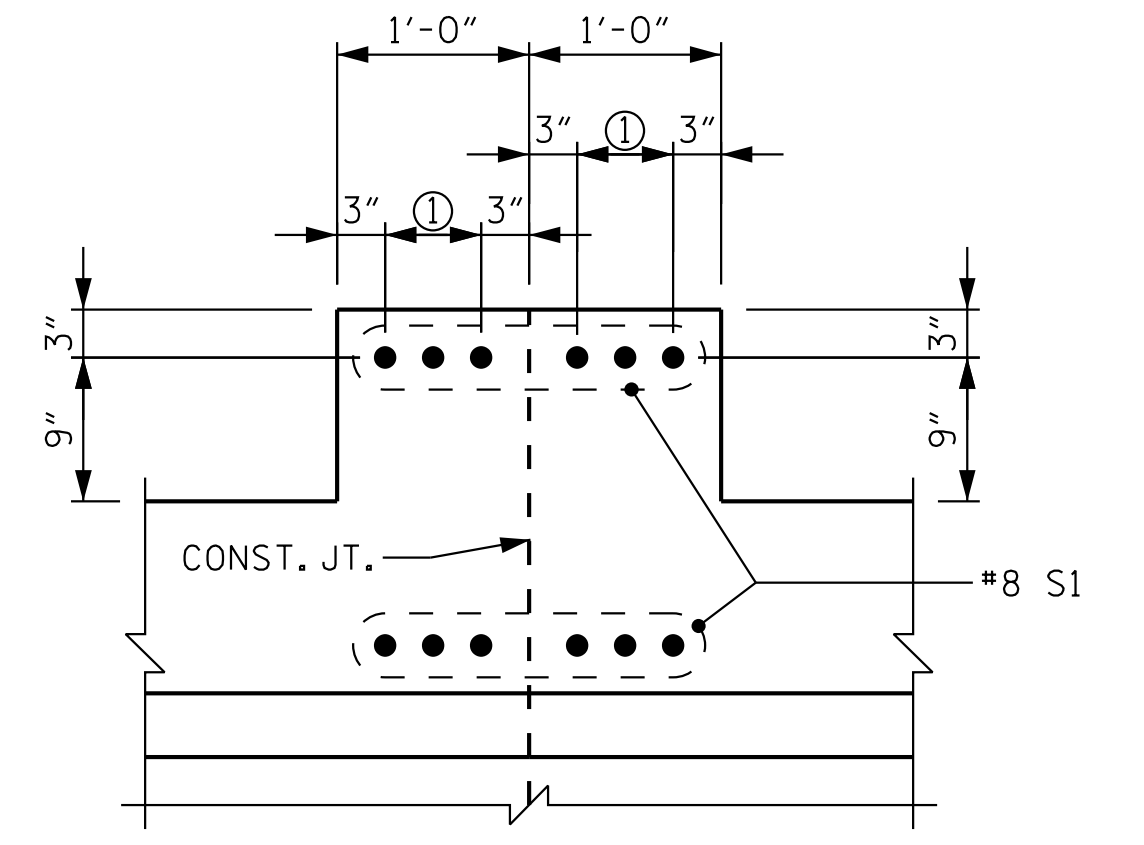
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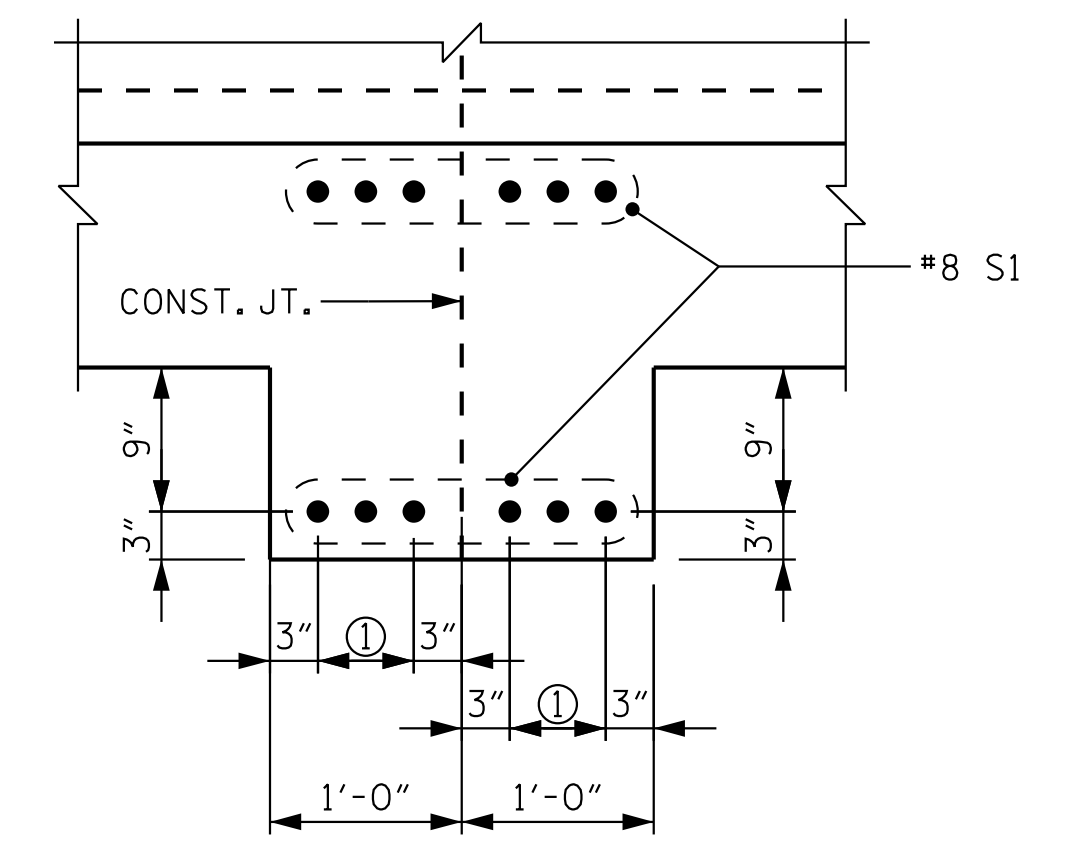
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 CHECKED BY: P.D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A.L. PHILLIPS DATE: 12/18



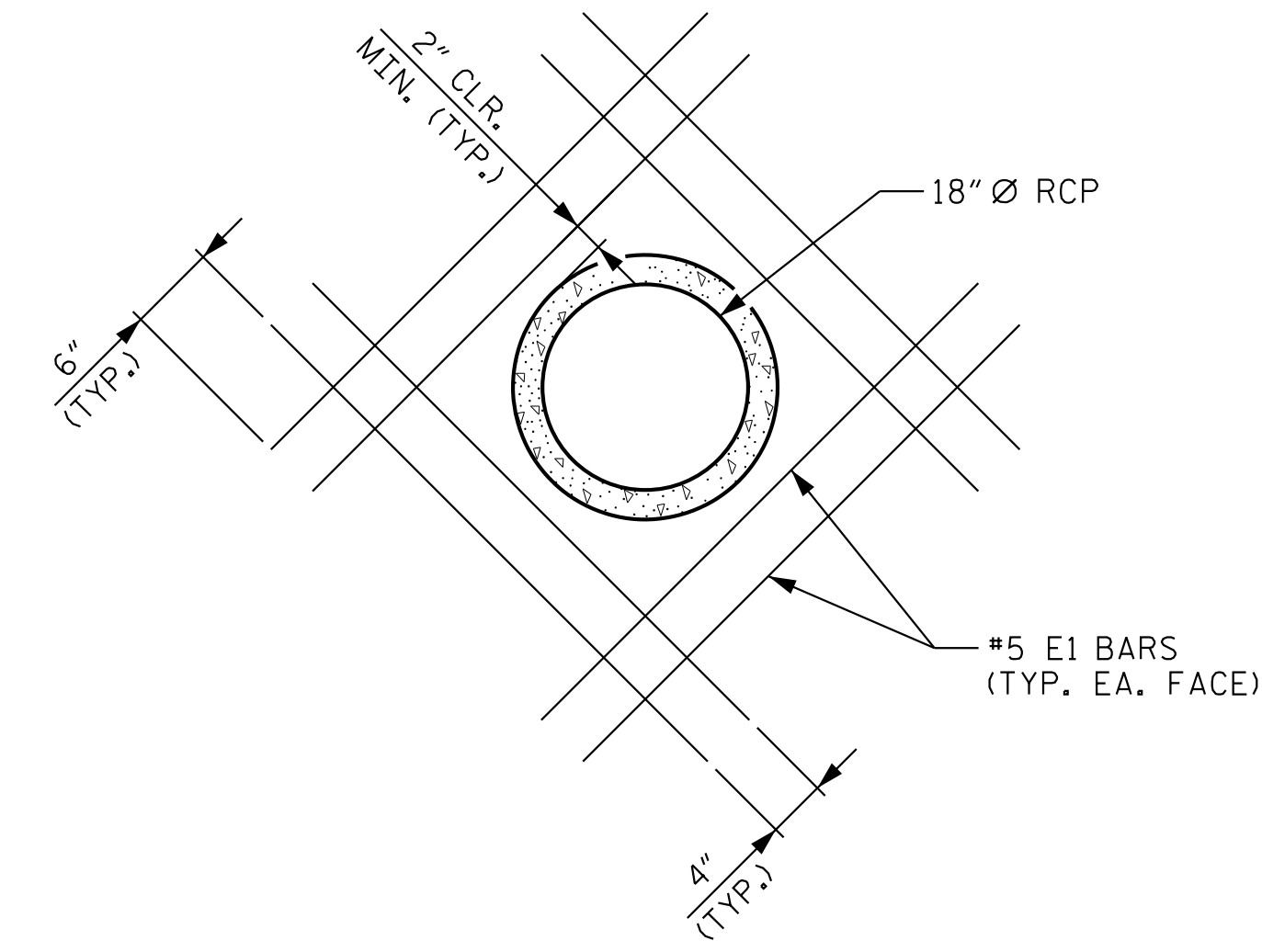
CULVERT SECTION NORMAL TO ROADWAY
FOR APPROXIMATE PLAN VIEW LOCATIONS OF R.C. PIPES, SEE SHEET C04-1.



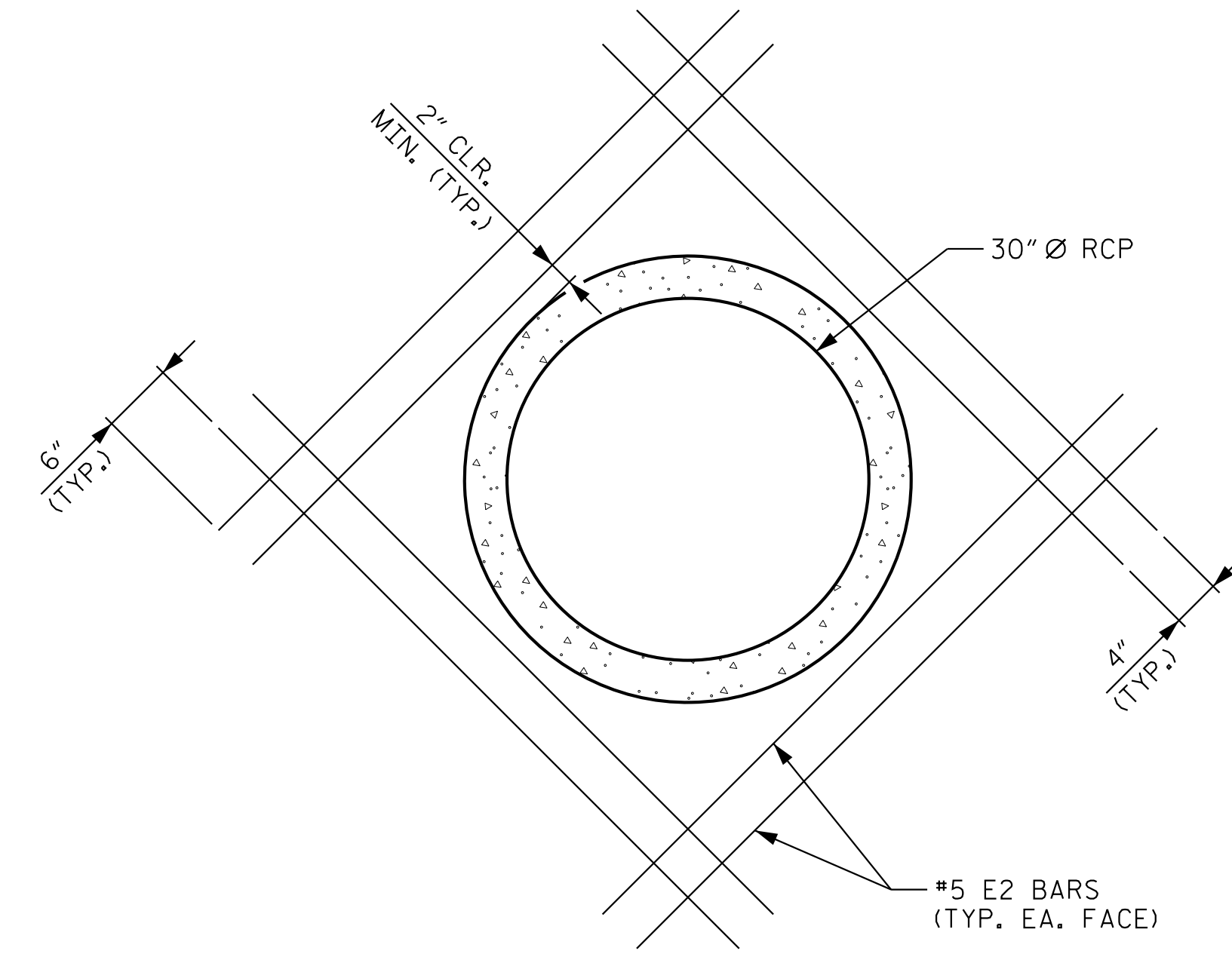
DETAIL A
① 2 SPA. @ 3"



DETAIL B
① 2 SPA. @ 3"

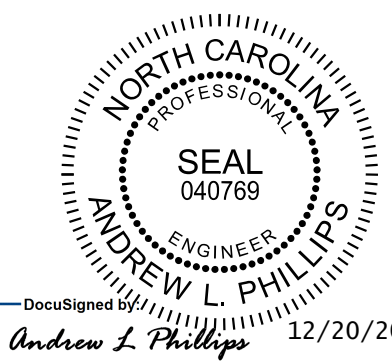


DETAIL OF REINFORCING AROUND 18" DIA. RCP



DETAIL OF REINFORCING AROUND 30" DIA. RCP

PROJECT NO. R-2530B
STANLY COUNTY
STATION: 93+58.00 -L-
SHEET 2 OF 7



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RALEIGH

SINGLE 7 FT. X 7 FT. CONCRETE BOX CULVERT
88° SKEW

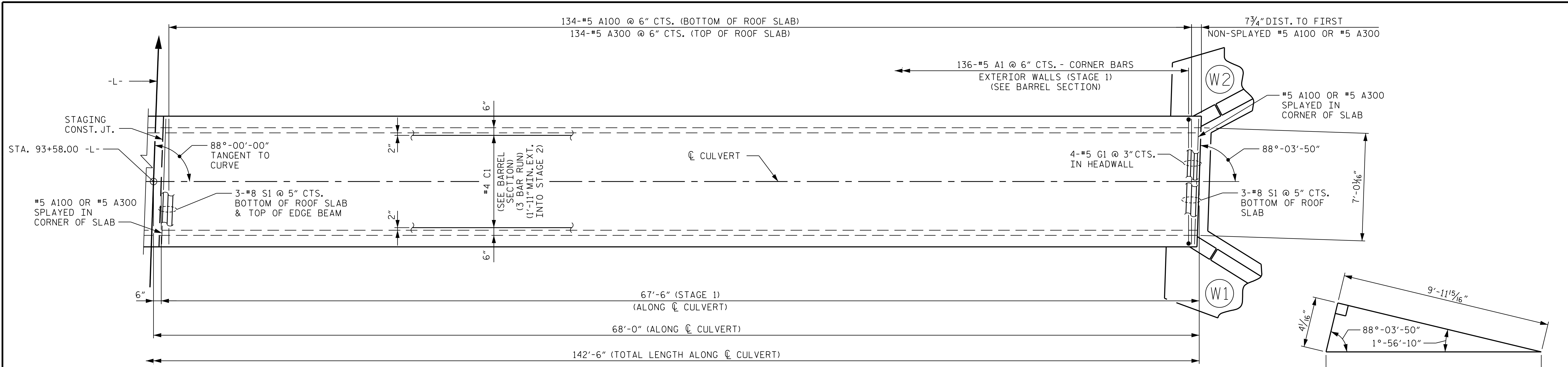
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1			3			TOTAL SHEETS
2			4			7

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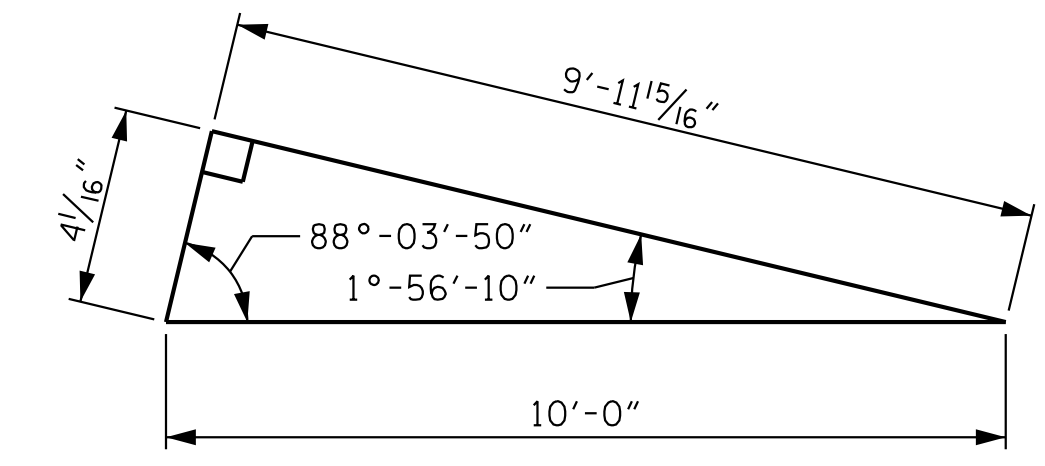
DRAWN BY: D.D. LOWERY DATE: 12/18
CHECKED BY: P.D. COOKSEY DATE: 12/18
DESIGN ENGINEER OF RECORD: A.L. PHILLIPS DATE: 12/18

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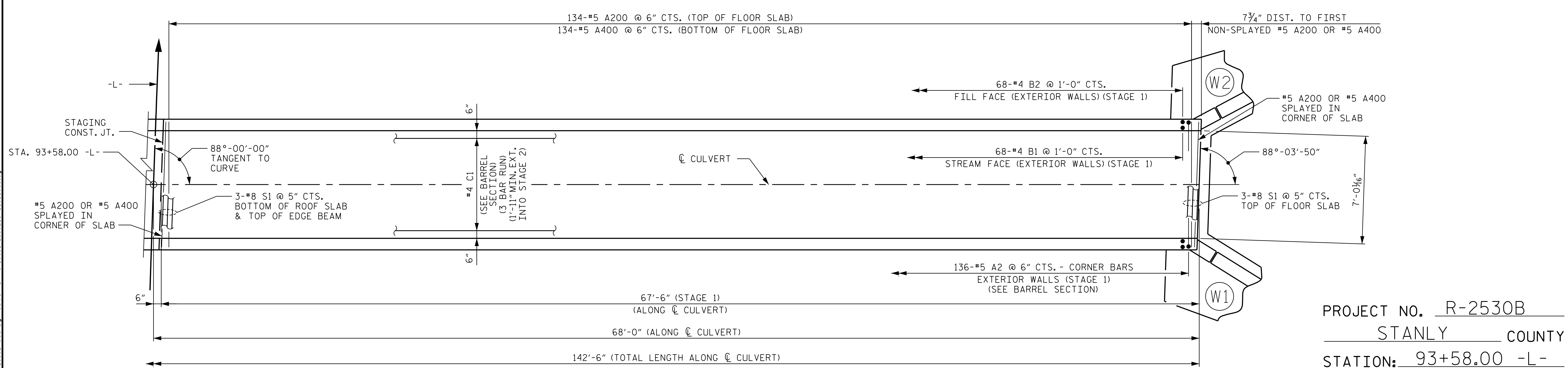
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ROOF SLAB PLAN - STAGE 1



SKEW TRIANGLE



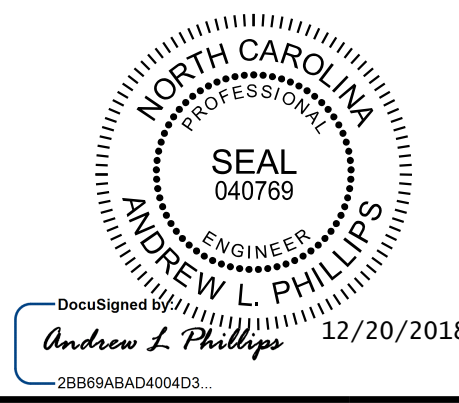
FLOOR SLAB PLAN - STAGE 1

NOTE: FOR S2 BARS IN THE FLOOR SLAB & WING FOOTINGS, SEE SHEET C04-6.

PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 93+58.00 -L-

SHEET 3 OF 7

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
STAGE 1
 SINGLE 7 FT. X 7 FT.
 CONCRETE BOX CULVERT
 88° SKEW



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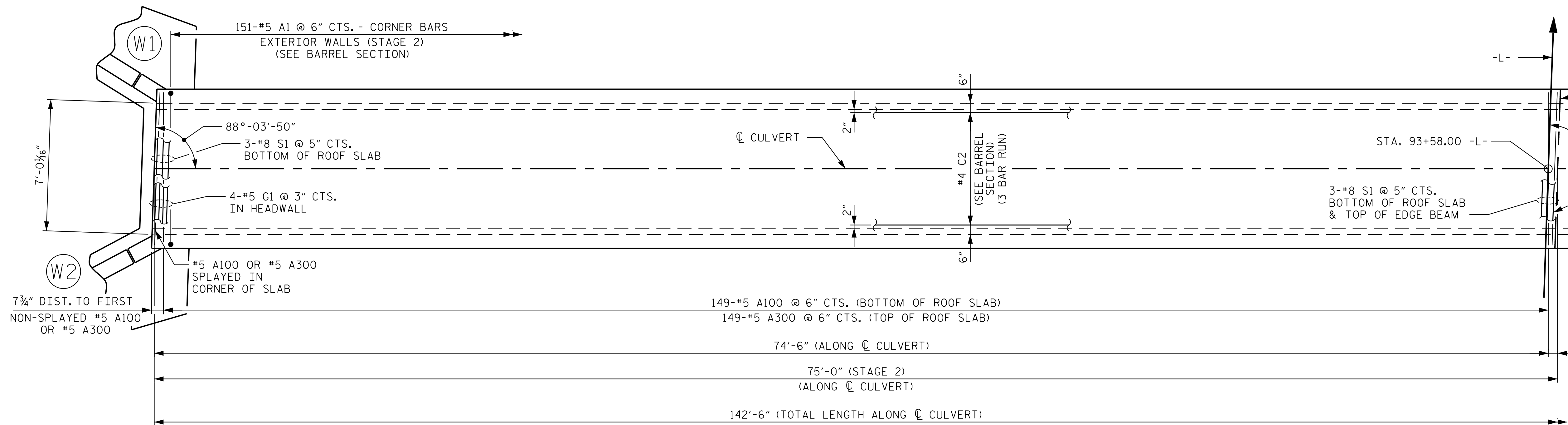
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1			3			TOTAL SHEETS
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 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

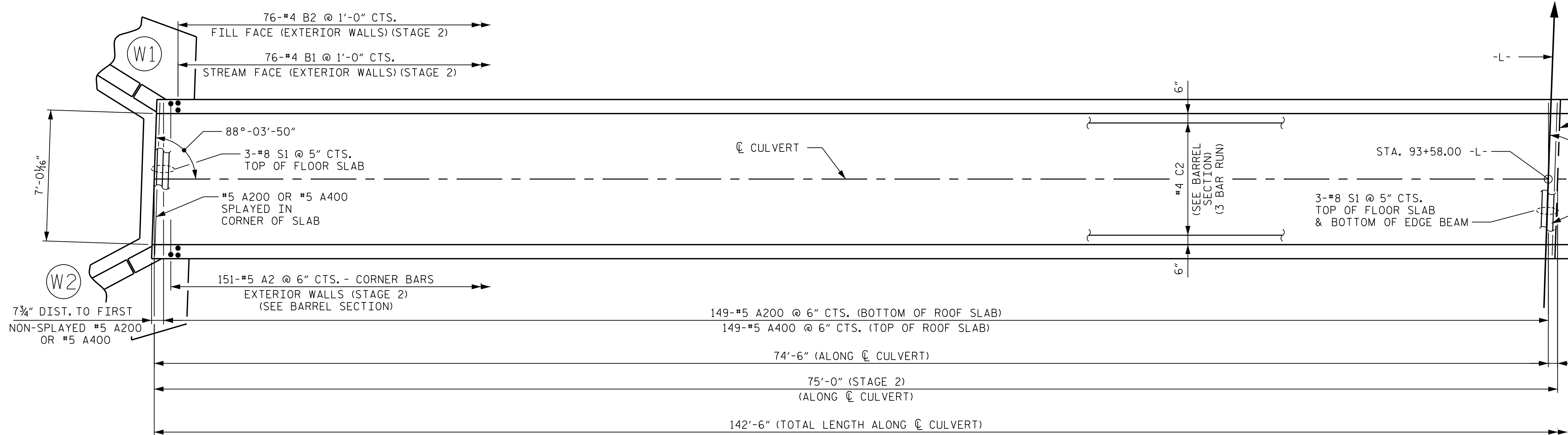
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ROOF SLAB PLAN - STAGE 2



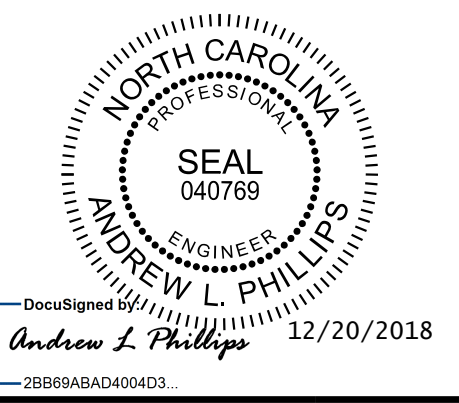
FLOOR SLAB PLAN - STAGE 2

NOTE: FOR S2 BARS IN THE FLOOR SLAB & WING FOOTINGS, SEE SHEET C04-6.

NOTE
SEE SHEET C04-3 FOR SKEW TRIANGLE.

PROJECT NO. R-2530B
STANLY COUNTY
STATION: 93+58.00 -L-

SHEET 4 OF 7



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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
STAGE 2
SINGLE 7 FT. X 7 FT.
CONCRETE BOX CULVERT
88° SKEW

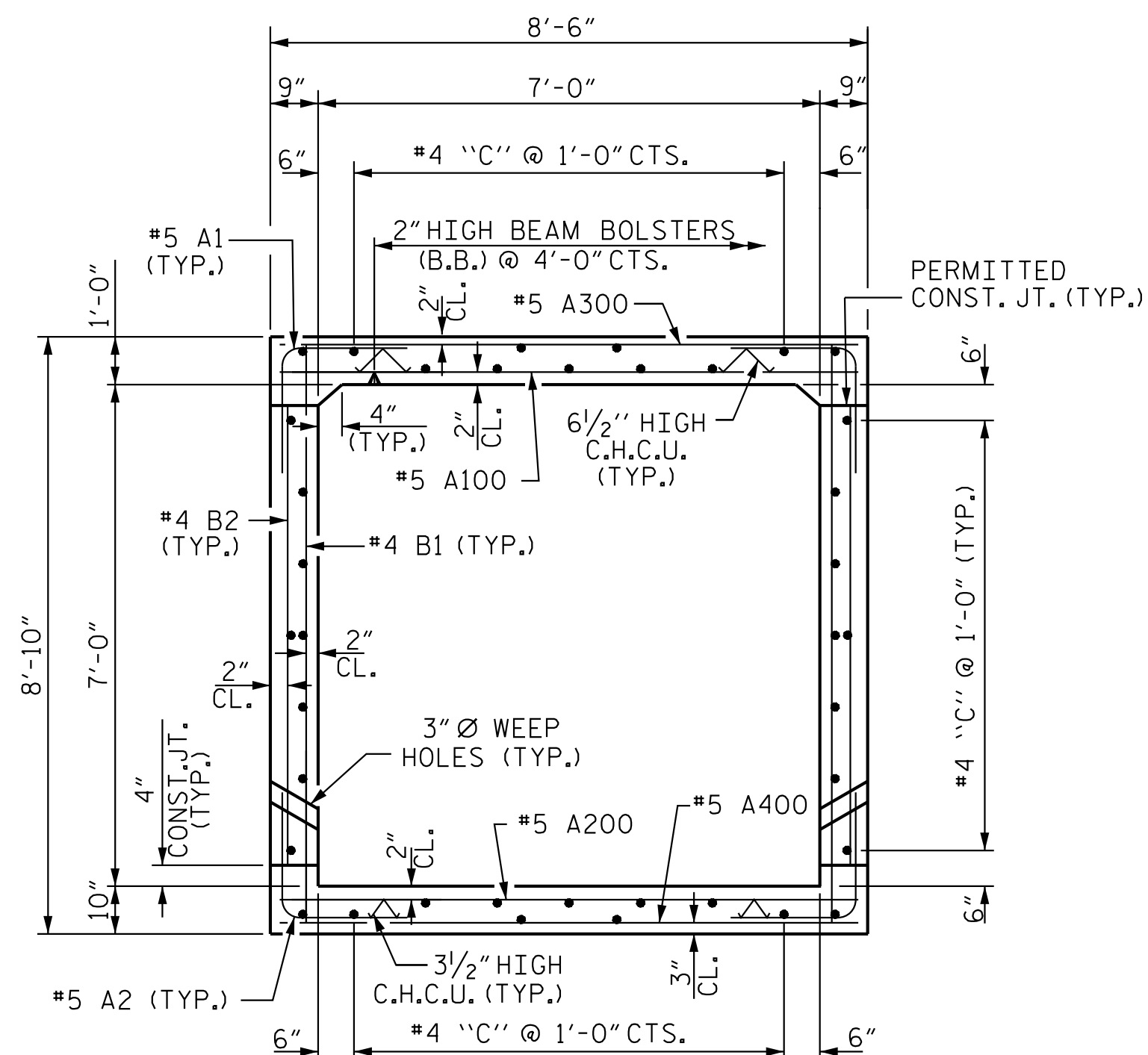
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NO.	BY:	DATE:	NO.	BY:	DATE:	C04-4
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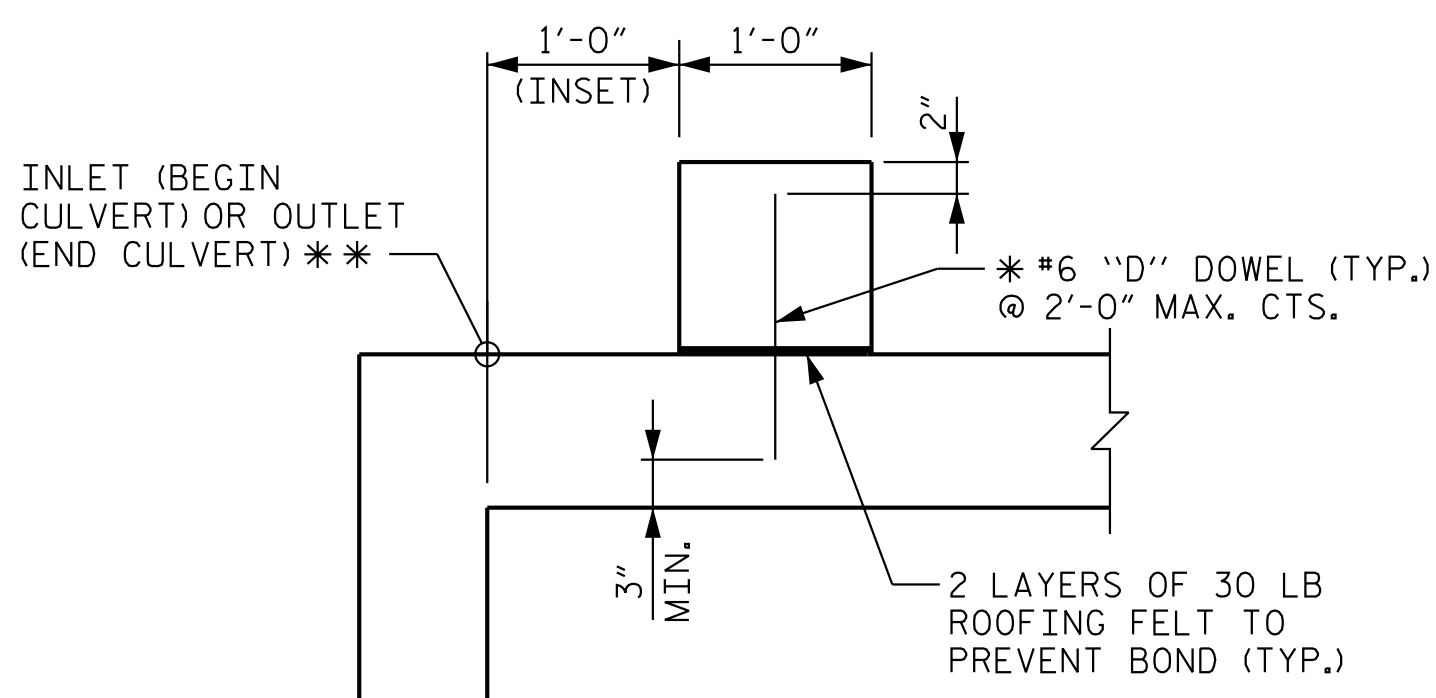
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CHECKED BY: P. D. COOKSEY DATE: 12/18
DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

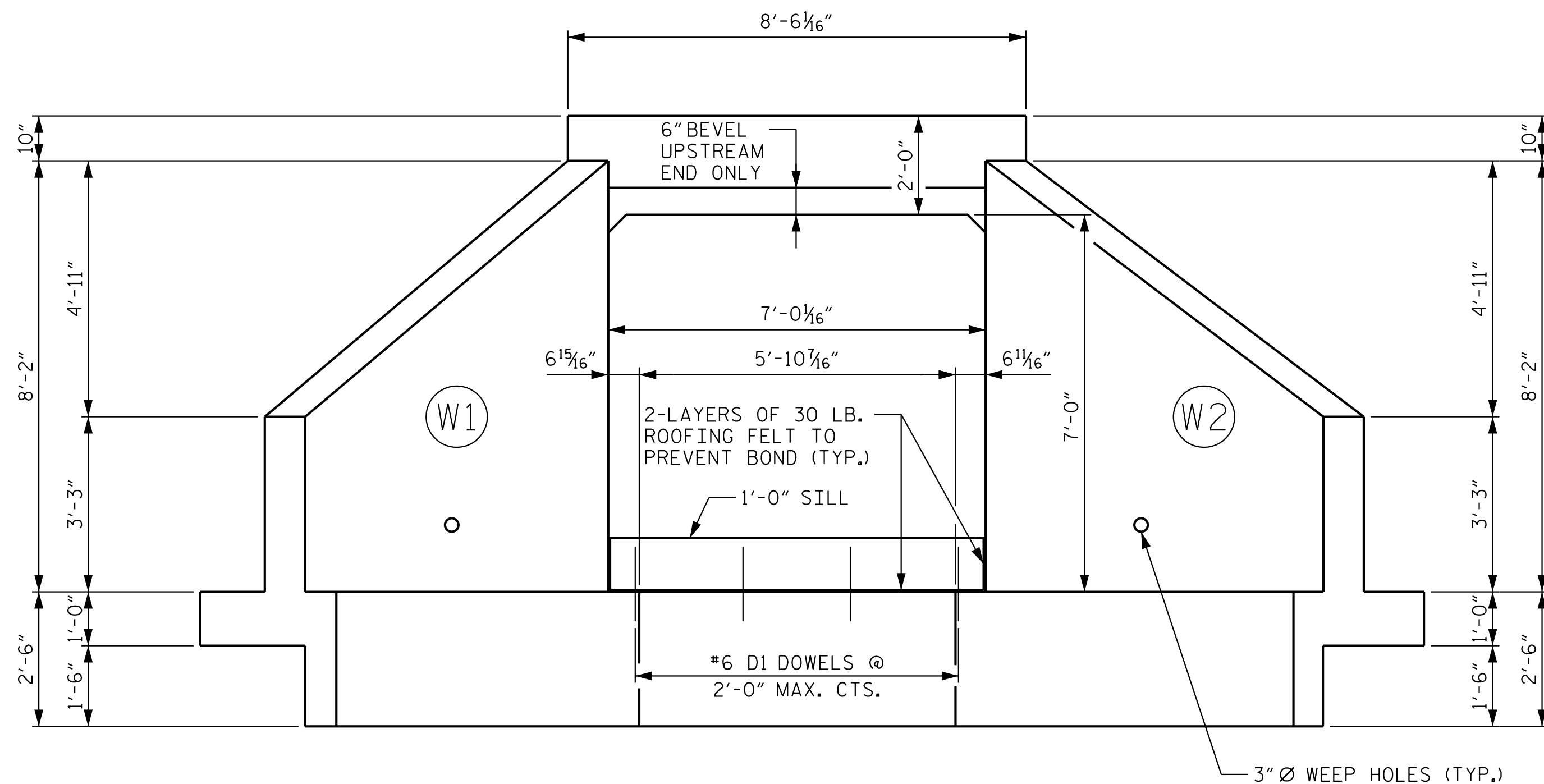


RIGHT ANGLE SECTION OF BARREL
THERE ARE 38 "C" BARS IN SECTION OF BARREL

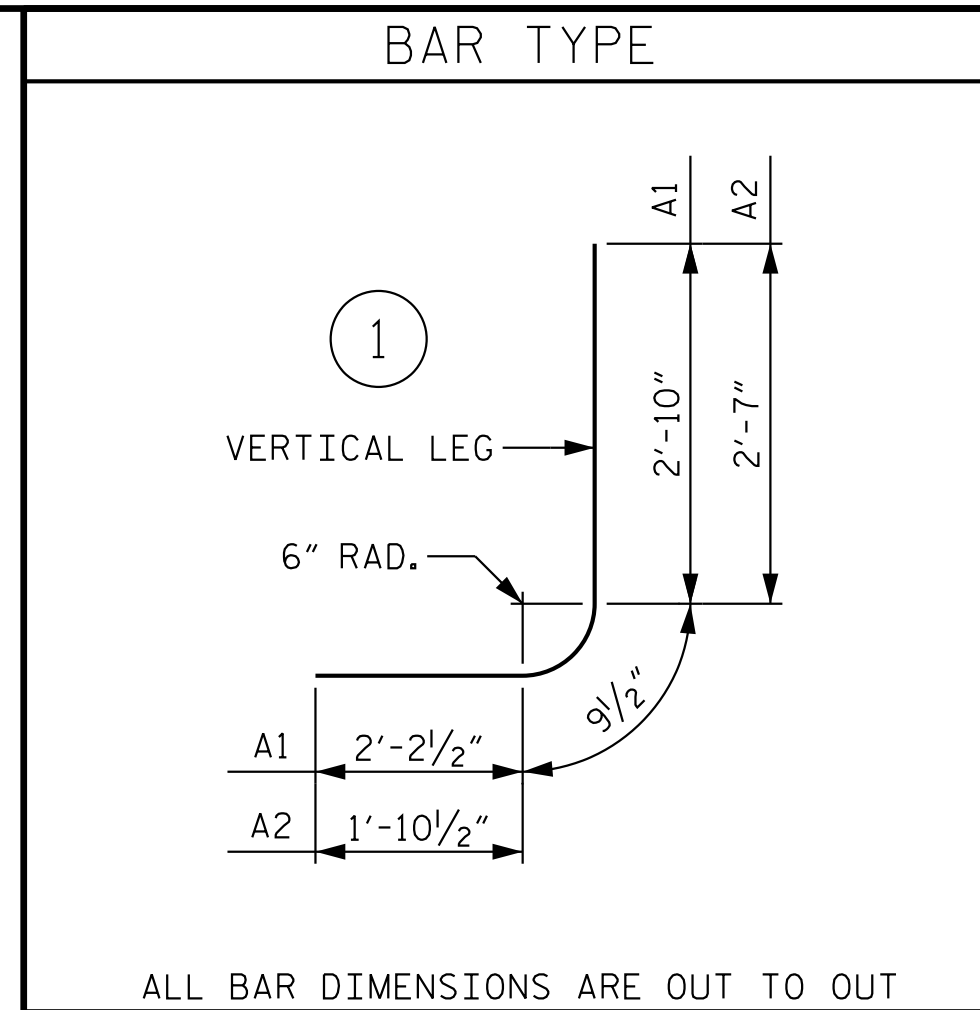


SECTION THROUGH SILL

* DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.
 ** OUTLET VIEW (END CULVERT) SHOWN, INLET VIEW (BEGIN CULVERT) SIMILAR.
 NOTE: 1'-0" SILL IS TO BE CAST NORMAL TO CULVERT WALLS.



END ELEVATION NORMAL TO SKEW



ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

STAGE 1					STAGE 2						
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	SIZE	TYPE	LENGTH	WEIGHT		
A1	272	5	1	5'-10"	1,655	A1	302	5	1	5'-10"	1,837
A2	272	5	1	5'-3"	1,489	A2	302	5	1	5'-3"	1,654
A100	136	5	STR	8'-1"	1,147	A100	151	5	STR	8'-1"	1,273
A200	136	5	STR	8'-1"	1,147	A200	151	5	STR	8'-1"	1,273
A300	136	5	STR	8'-1"	1,147	A300	151	5	STR	8'-1"	1,273
A400	136	5	STR	8'-1"	1,147	A400	151	5	STR	8'-1"	1,273
B1	136	4	STR	8'-4"	757	B1	152	4	STR	8'-4"	846
B2	136	4	STR	6'-4"	575	B2	152	4	STR	6'-4"	643
C1	114	4	STR	24'-6"	1,866	C2	114	4	STR	26'-4"	2,005
D1	4	6	STR	1'-5"	9	D1	4	6	STR	1'-5"	9
E1	16	4	STR	5'-1"	54	E2	16	4	STR	3'-11"	42
G1	4	5	STR	8'-2"	34	G1	4	5	STR	8'-2"	34
S1	18	8	STR	8'-2"	392	S1	18	8	STR	8'-2"	392
REINFORCING STEEL				LBS.	11,419	REINFORCING STEEL				LBS.	12,554

STAGE 1 QUANTITIES		
CLASS A CONCRETE		
BARREL @ 0.970 C.Y./FT.	65.5	C.Y.
WINGS, ETC.	9.3	C.Y.
SILLS	0.3	C.Y.
EDGE BEAMS	0.6	C.Y.
TOTAL	75.7	C.Y.
REINFORCING STEEL		
BARREL, SILLS & EDGE BEAMS	11,419	LBS.
WINGS, ETC.	576	LBS.
TOTAL	11,995	LBS.

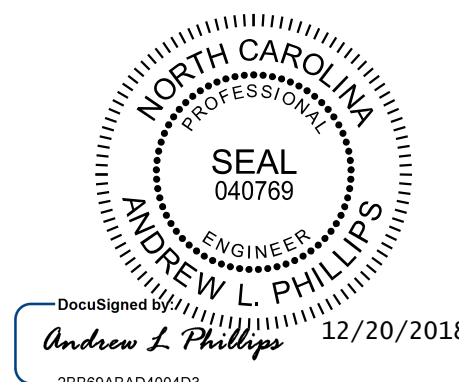
STAGE 2 QUANTITIES		
CLASS A CONCRETE		
BARREL @ 0.970 C.Y./FT.	72.8	C.Y.
WINGS, ETC.	9.3	C.Y.
SILLS	0.3	C.Y.
EDGE BEAMS	0.6	C.Y.
TOTAL	83.0	C.Y.
REINFORCING STEEL		
BARREL, SILLS & EDGE BEAMS	12,554	LBS.
WINGS, ETC.	575	LBS.
TOTAL	13,129	LBS.

BAR SIZE	SPLICE LENGTH
#4 B1	1'-5"
#4 C1 OR #4 C2	1'-11"

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 CHECKED BY: P.D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A.L. PHILLIPS DATE: 12/18

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STANLY COUNTY
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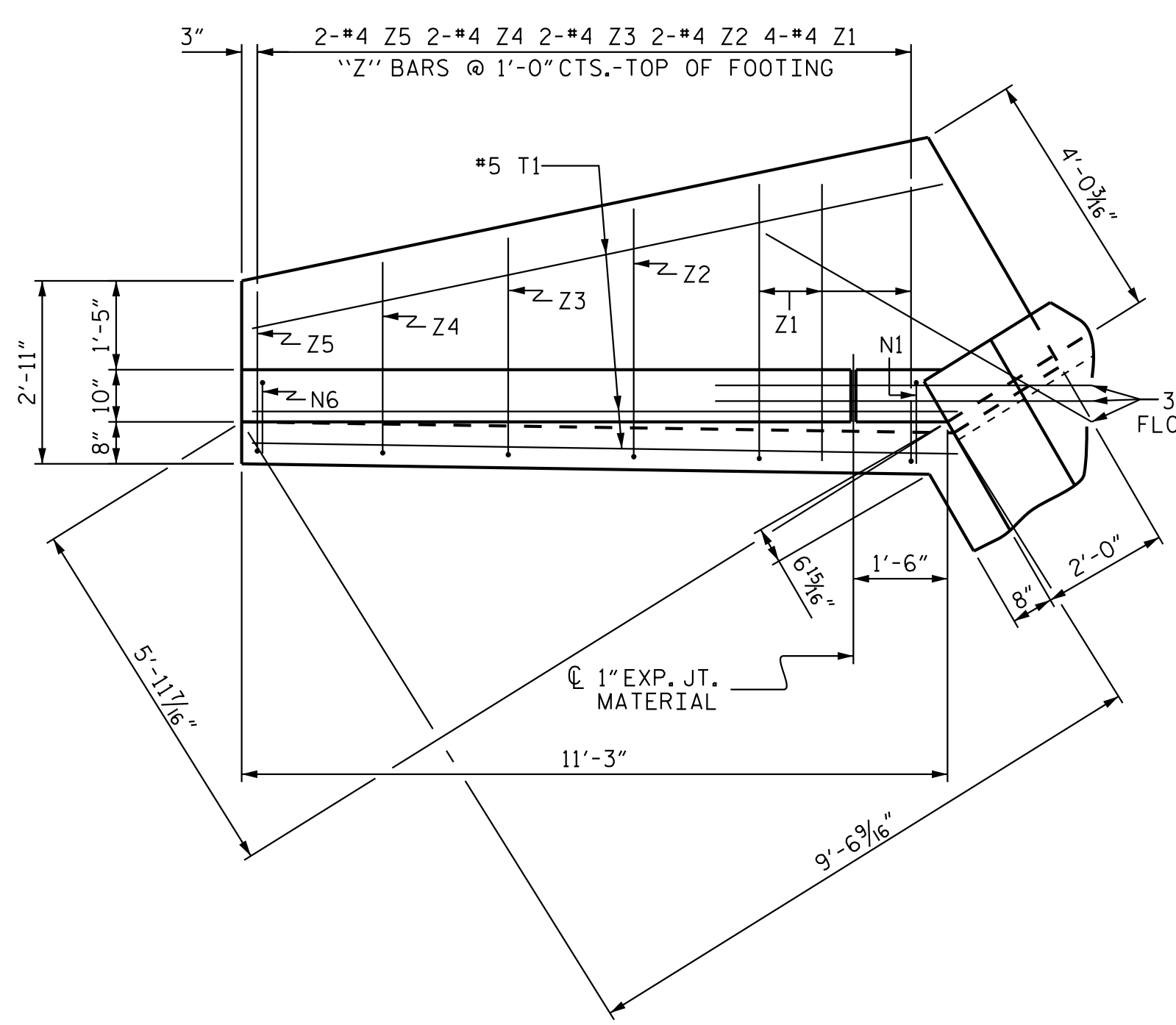
SHEET 5 OF 7

STATE OF NORTH CAROLINA
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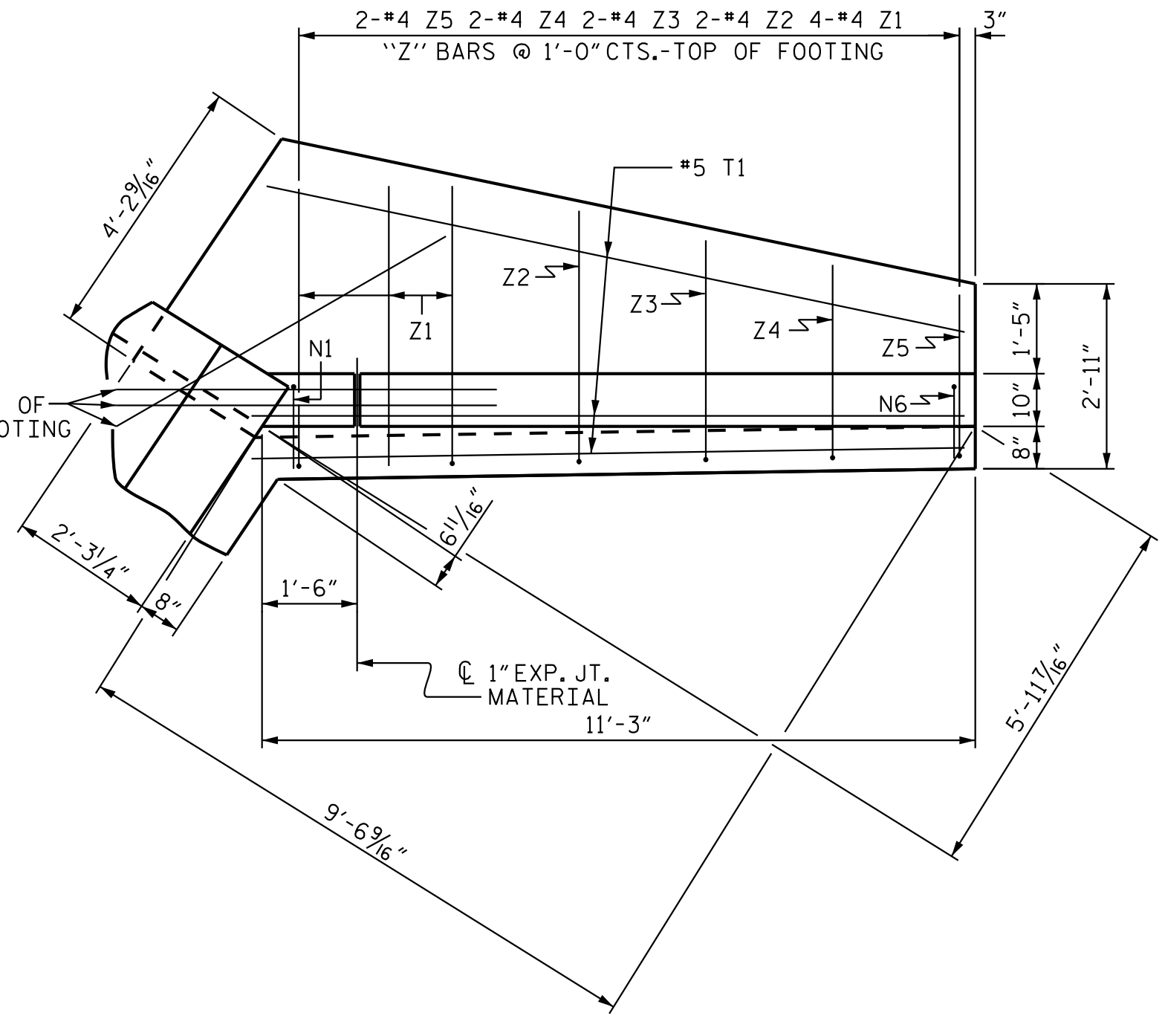
**SINGLE 7 FT. X 7 FT.
CONCRETE BOX CULVERT
88° SKEW**

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

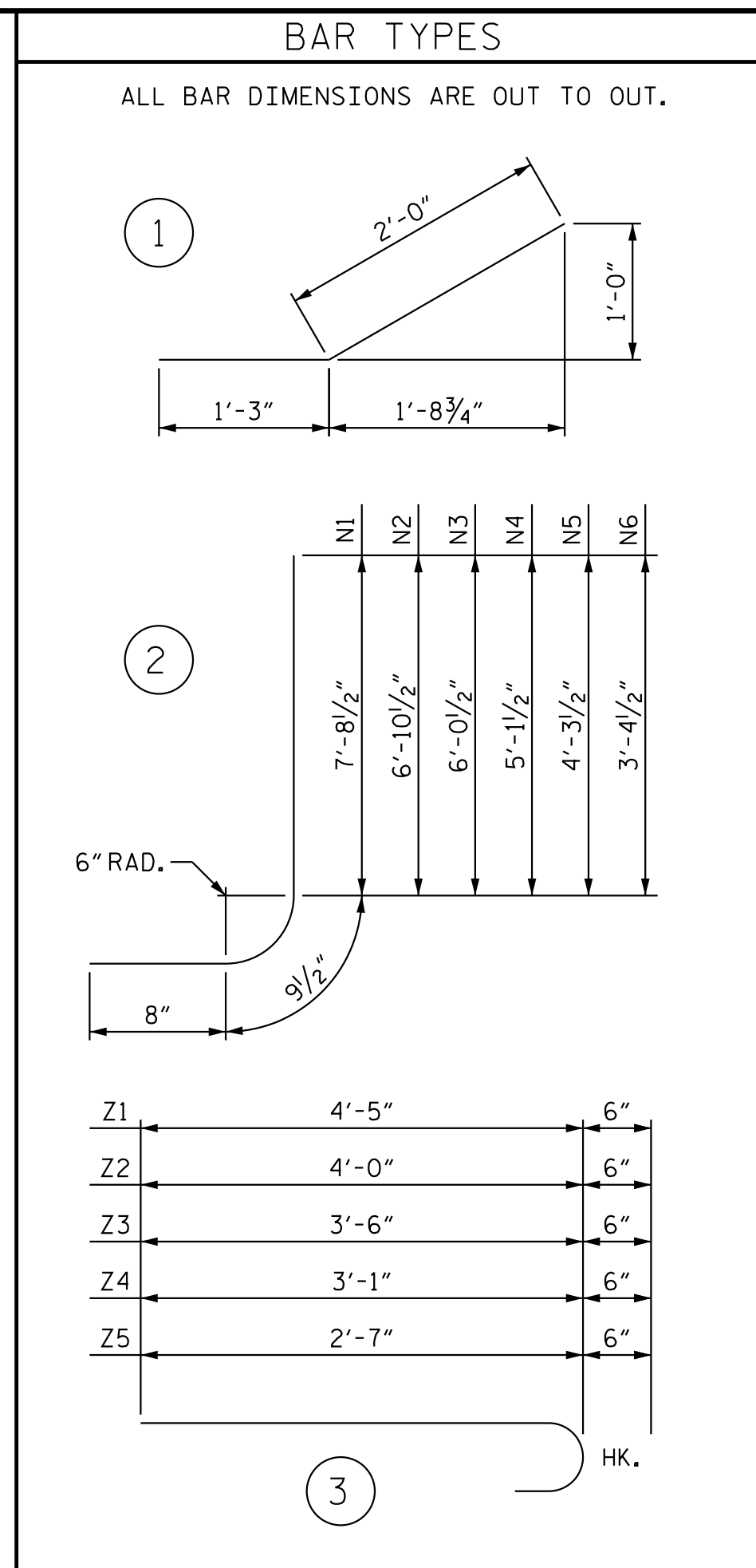
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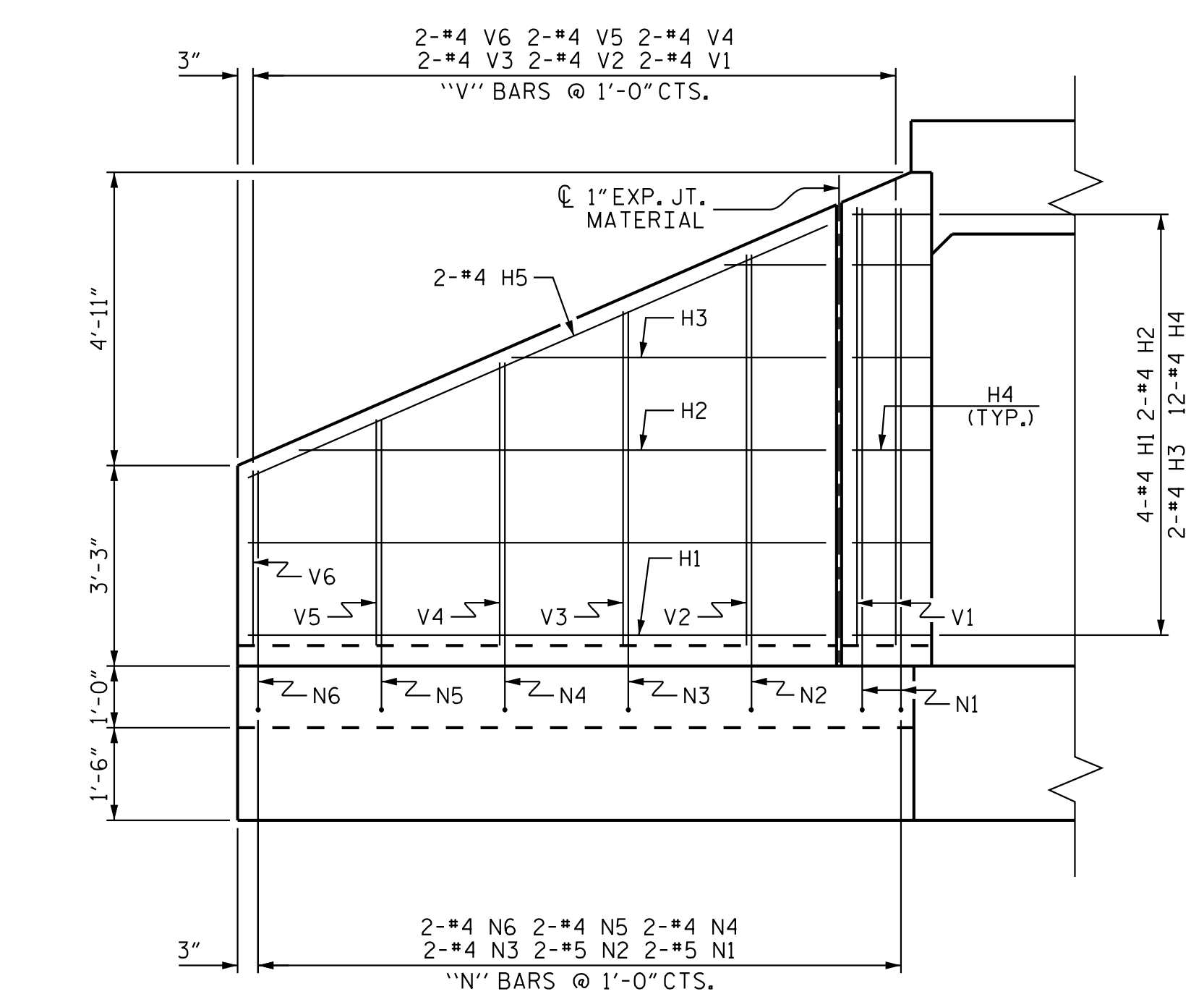
PLAN W1



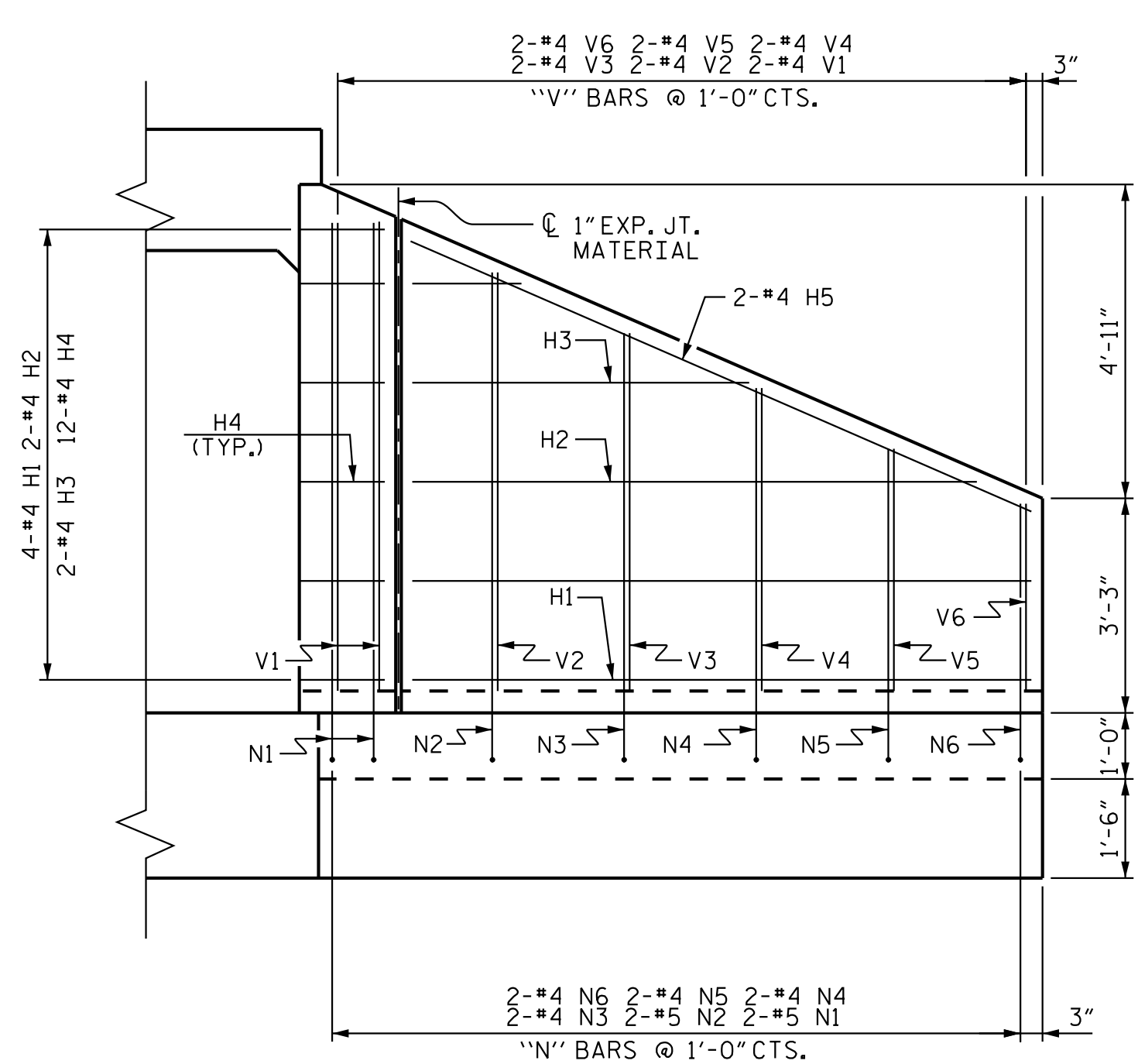
PLAN W2



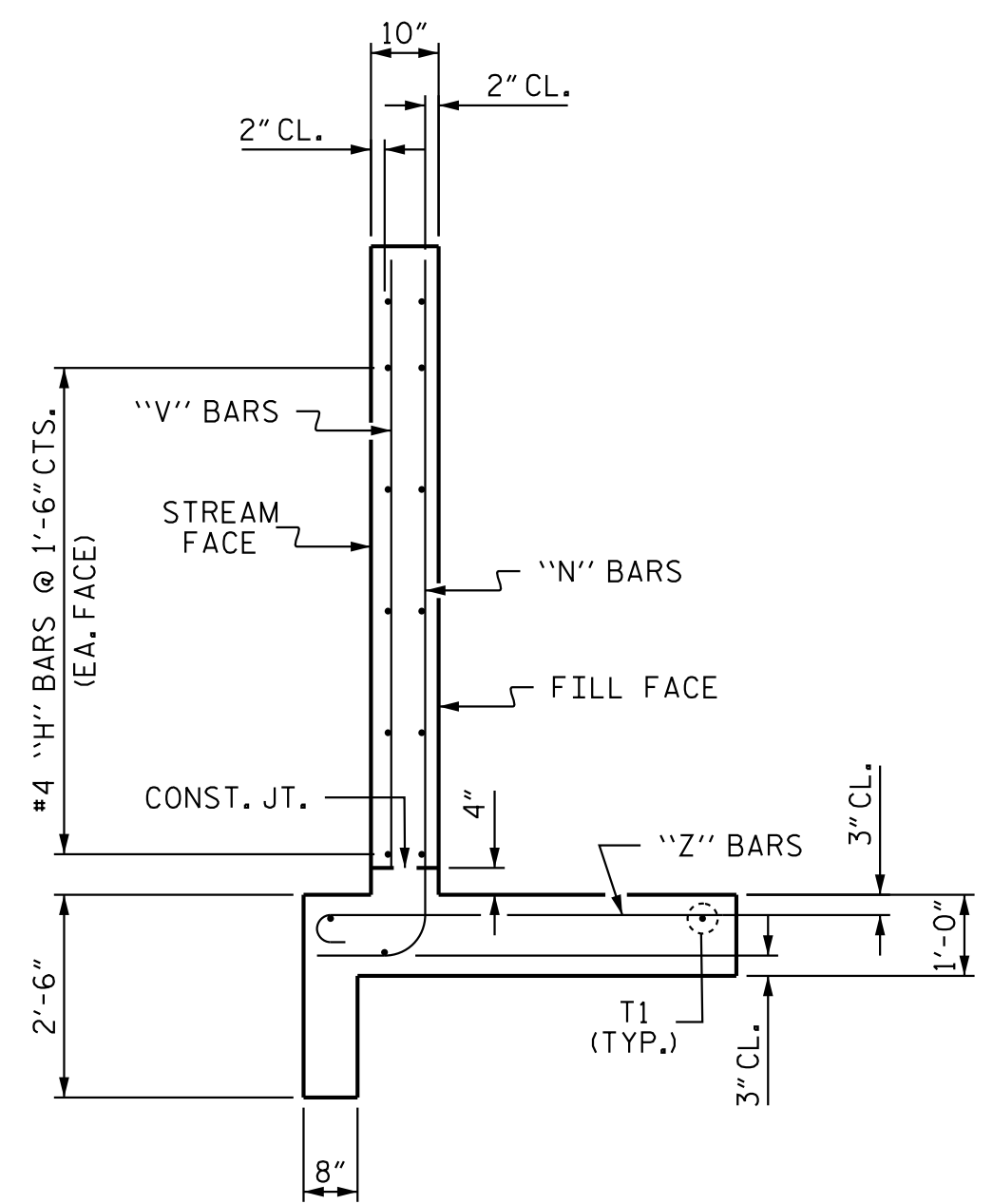
BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	16	#4	STR	9'-4"	100
H2	8	#4	STR	8'-6"	45
H3	8	#4	STR	5'-1"	27
H4	48	#4	1	3'-3"	104
H5	8	#4	STR	10'-3"	55
N1	8	#5	2	9'-2"	76
N2	8	#5	2	8'-4"	70
N3	8	#4	2	7'-6"	40
N4	8	#4	2	6'-7"	35
N5	8	#4	2	5'-9"	31
N6	8	#4	2	4'-10"	26
S2	12	#6	STR	6'-0"	108
T1	12	#5	STR	11'-3"	141
V1	8	#4	STR	7'-1"	38
V2	8	#4	STR	6'-4"	34
V3	8	#4	STR	5'-5"	29
V4	8	#4	STR	4'-7"	24
V5	8	#4	STR	3'-8"	20
V6	8	#4	STR	2'-10"	15
Z1	16	#4	3	4'-11"	53
Z2	8	#4	3	4'-6"	24
Z3	8	#4	3	4'-0"	21
Z4	8	#4	3	3'-7"	19
Z5	8	#4	3	3'-1"	16
TOTAL REINFORCING STEEL FOR 4 WINGS				1151	LBS
CLASS A CONCRETE					
4 WINGS				17.1	CY
2 HEADWALLS				0.8	CY
2 END CURTAIN WALLS				0.7	CY
TOTAL				18.6	CY



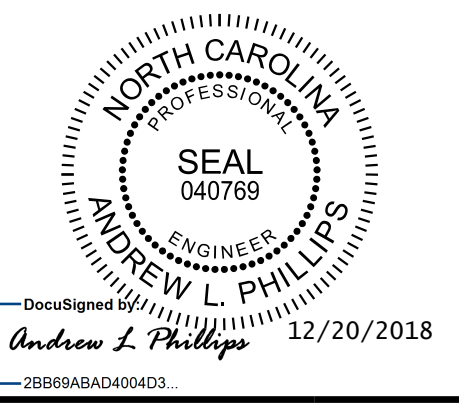
ELEVATION W1



ELEVATION W2



TYPICAL WING SECTION



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SHEET 6 OF 7
 STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
WING DETAILS FOR CONCRETE BOX CULVERT
 H = 7'-0" SLOPE = 2:1
 88° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C04-6
1			3			TOTAL SHEETS
2			4			7

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 CHECKED BY: P.D. COOKSEY DATE: 12/18
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LOAD FACTORS:

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS															
LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER	
						LIVE-LOAD FACTORS (γ _{LL})	MOMENT				SHEAR				
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A		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		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)	SNSH	13.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		SNGARBS2	20.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		SNAGRIS2	22.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		SNCOTTS3	27.250		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		SNAGGRS4	34.925		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		SNS5A	35.550		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		SNS6A	39.950		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
	SNS7B	42.000		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)	TNAGRIT3	33.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		TNT4A	33.075		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		TNT6A	41.600		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		TNT7A	42.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		TNT7B	42.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		TNAGRIT4	43.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
TNAGT5A		45.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
TNAGT5B	45.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1		
PERMANENT LOADS		N/A	4	1.56	N/A	N/A	1.79	1	BOTTOM SLAB	8.13	1.56	1	BOTTOM SLAB	0.75	2

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.

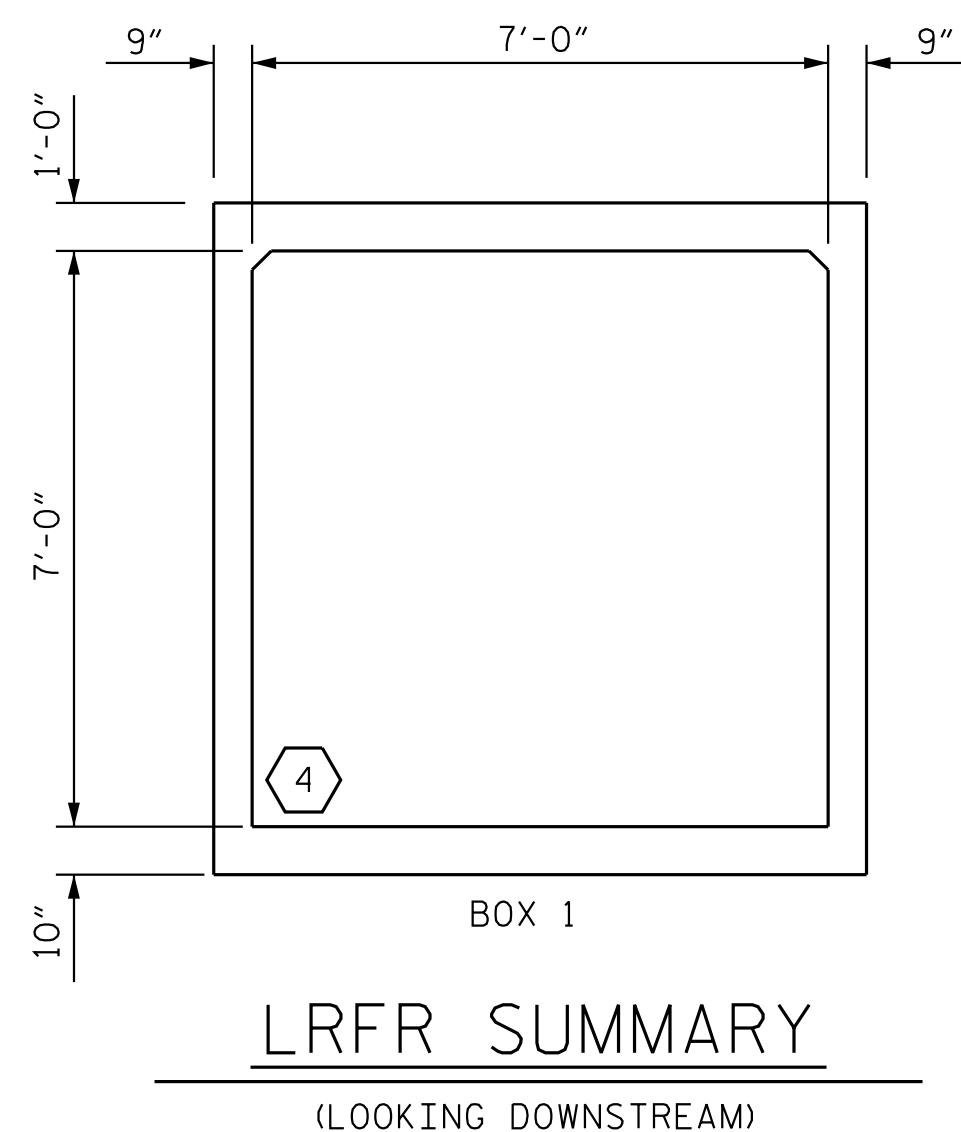
DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM THE EXTERIOR EDGE OF EXTERIOR WALL.

COMMENTS:

1. EFFECTS OF LIVE LOAD MAY BE NEGLECTED ACCORDING TO AASHTO LRFD 3.6.1.2.6A (DESIGN FILL = 10.5')

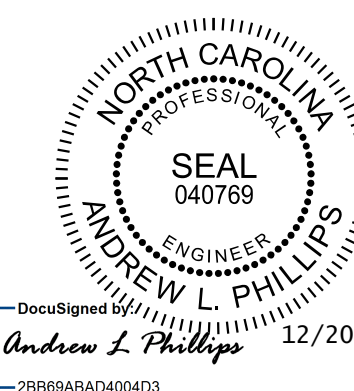
2. CULVERTS WITH DEEP FILLS SHOULD BE EVALUATED FOR THE EFFECTS OF PERMANENT LOADS ONLY ACCORDING TO "THE MANUAL FOR BRIDGE EVALUATION 6A.5.12.10.3A"

#	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	



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SHEET 7 OF 7



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

REVISIONS						SHEET NO.
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STD. NO. LRFR5

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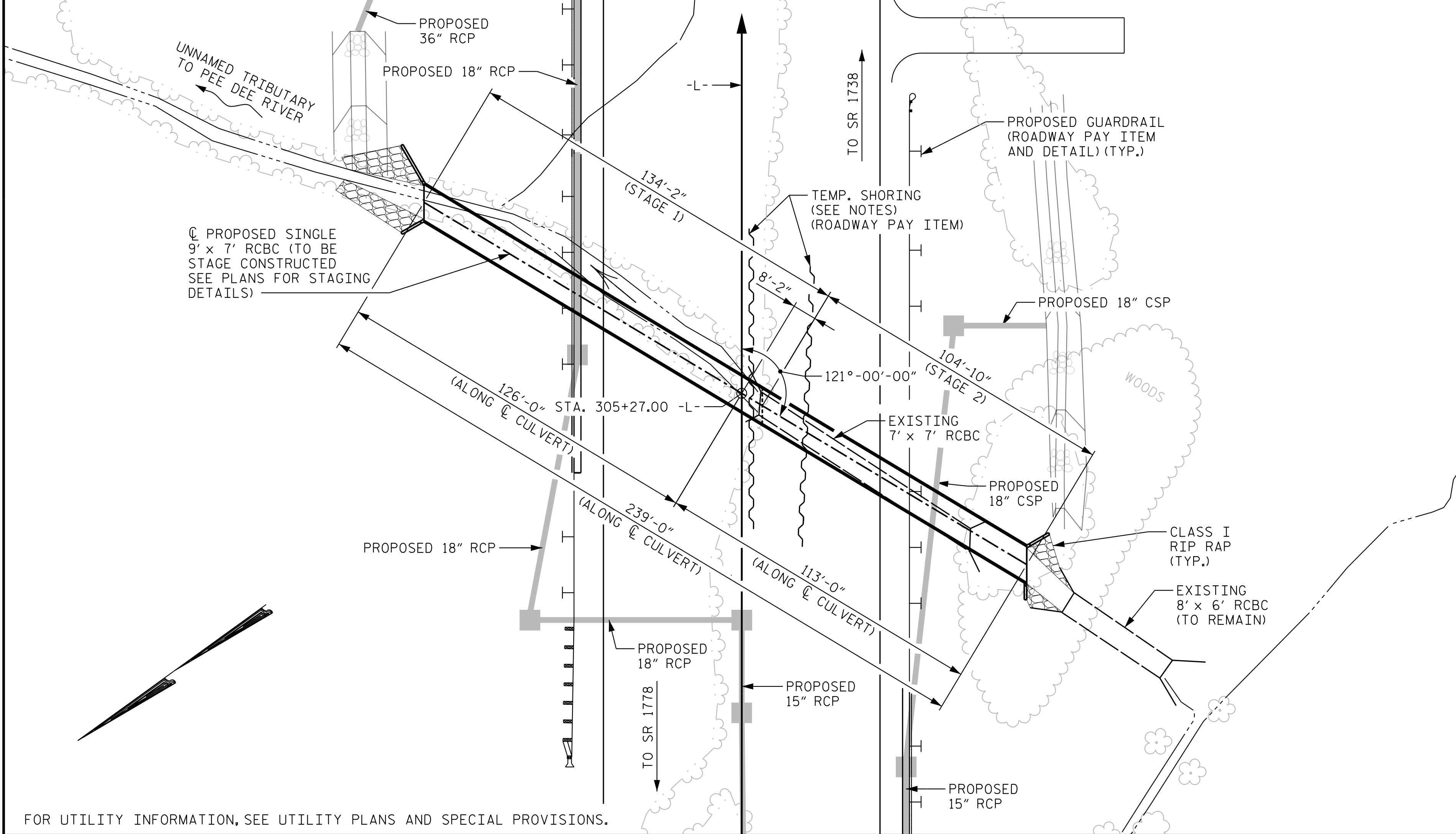
ASSEMBLED BY : D. D. LOWERY	DATE : 12/18
CHECKED BY : P. D. COOKSEY	DATE : 12/18
DRAWN BY : WMC 7/11	REV. 10/1/11 MAA/GM
CHECKED BY : GM 7/11	REV. 12/17 MAA/THC

BENCHMARK: BM#40, -L- STA. 306+11.62, OFFSET 90.34' RT., EL. 305.85', RR SPIKE IN BASE 40" SYCAMORE

F.A. PROJECT NO. STBG-0024(083)

NOTES

- ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING.
- DESIGN FILL ----- 24.3 FT.
- FOR OTHER DESIGN DATA AND GENERAL NOTES, SEE SHEET SN.
- 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN STAGE 1 OR STAGE 2 CULVERT TO BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS, CURTAIN WALLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
- THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
- AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACES OF THE EXTERIOR WALLS ABOVE THE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS' EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- AFTER SERVING AS A TEMPORARY STRUCTURE THE EXISTING 6'-0" X 6'-0" RCBC LOCATED AT THE SAME LOCATION AS THE PROPOSED CULVERT SHALL BE REMOVED. THE EXISTING STRUCTURE IS PRESENTLY NOT POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE STRUCTURE DETERIORATE DURING CONSTRUCTION OF THE PROPOSED CULVERT, A LOAD LIMIT MAY BE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
- FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE ROADWAY PLANS.
- TRAFFIC ON NC 24/27/73 SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS SHOWN ON THESE PLANS AS DIRECTED BY THE ENGINEER.
- TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
- A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
- NO LOW FLOW SILLS/Baffles WILL BE REQUIRED AT UPSTREAM AND DOWNSTREAM CULVERT FACE AS CULVERT WILL NOT BE BURIED DUE TO PRESENCE OF ROCK IN STREAM BED. DO NOT SET ELEVATION OF HIGH SILLS/Baffles ABOVE BANK FILL. CLASS B RIP RAP SILLS/Baffles IN THE CULVERT SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL. EXISTING CHANNEL CONSISTS OF ROCK THEREFORE EXCAVATED NATIVE MATERIAL IS NOT ANTICIPATED FROM THE STREAM BED AT THE PROJECT SITE DURING CONSTRUCTION. CULVERT SHOULD BE BACK FILLED WITH CLASS B RIP RAP TO SILL/Baffle HEIGHT.



FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.

LOCATION SKETCH

TOTAL STRUCTURE QUANTITIES

STAGE 1		STAGE 2	
CLASS A CONCRETE			
BARREL @ 1.609	CY/FT 215.9	C.Y.	BARREL @ 1.609
WINGS ETC.	12.8	C.Y.	WINGS ETC.
TOTAL	228.7	C.Y.	TOTAL
REINFORCING STEEL			
BARREL	37,400	LBS.	BARREL
WINGS ETC.	660	LBS.	WINGS ETC.
TOTAL	38,060	LBS.	TOTAL
FOUNDATION CONDITIONING MATERIAL		FOUNDATION CONDITIONING MATERIAL	
142 TONS		111 TONS	
CULVERT EXCAVATION STA. 305+27.00 -L-		LUMP SUM	
REMOVAL OF EXISTING STRUCTURE STA. 305+27.00 -L-		LUMP SUM	

ROADWAY DATA

GRADE POINT ELEV. @ STA 305+27.00 -L- = 320.19'
 BED ELEVATION @ STA 305+27.00 -L- = 290.10'
 ROADWAY SLOPES 2:1

HYDRAULIC DATA

DESIGN DISCHARGE ----- 330 CFS
 FREQUENCY OF DESIGN FLOOD ----- 50 YR.
 DESIGN HIGH WATER ELEVATION ----- 298.0 FT.
 DRAINAGE AREA ----- 0.43 SQ. MI.
 BASE DISCHARGE (Q100) ----- 380 CFS
 BASE HIGH WATER ELEVATION ----- 298.5 FT.

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE ----- >550 CFS
 FREQUENCY OF OVERTOPPING FLOOD --- 500+ YR.
 OVERTOPPING FLOOD ELEVATION ----- 320.2 FT.

SAMPLE BAR REPLACEMENT

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

NOTE:
 SAMPLE BAR REPLACEMENT LENGTHS BASED ON 30" (SAMPLE LENGTH) PLUS TWO SPLICE LENGTHS AND $f_y = 60\text{ksi}$.



DocuSigned by: Andrew L. Phillips 12/20/2018

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STANLY COUNTY
 STATION: 305+27.00 -L-

SHEET 1 OF 9

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 9 FT. X 7 FT.
 CONCRETE BOX CULVERT
 121° SKEW

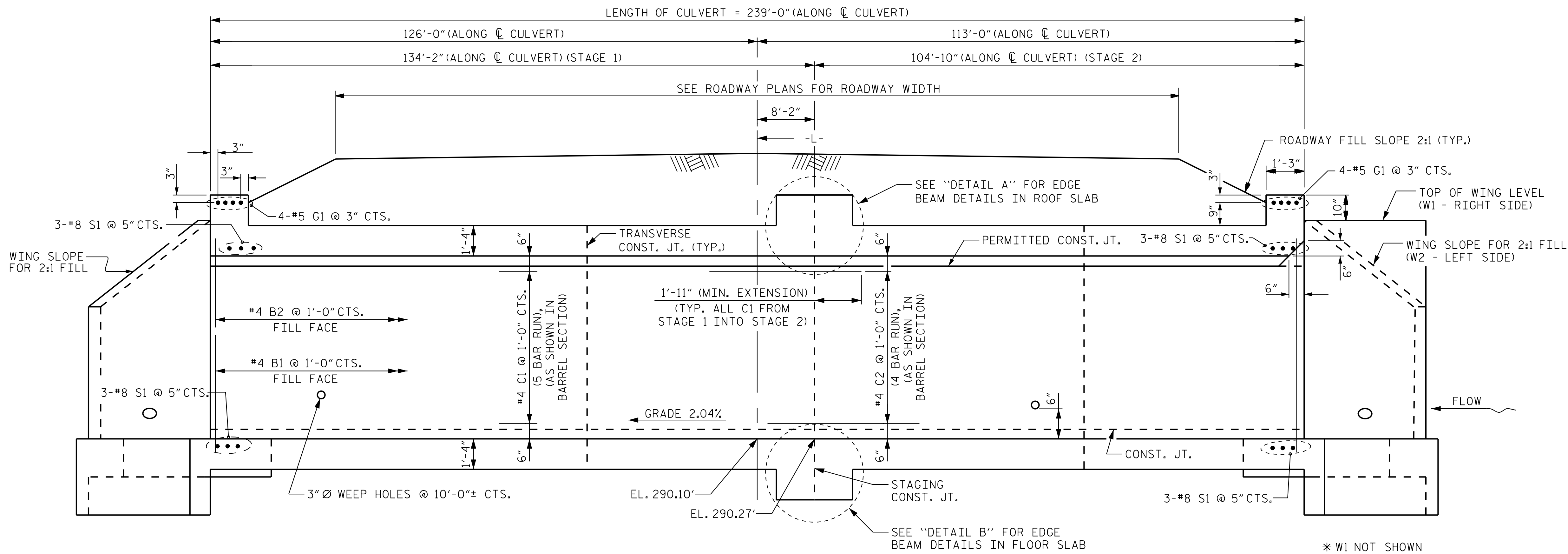
REVISIONS				SHEET NO.	
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1			3		
2			4		

TOTAL SHEETS 9

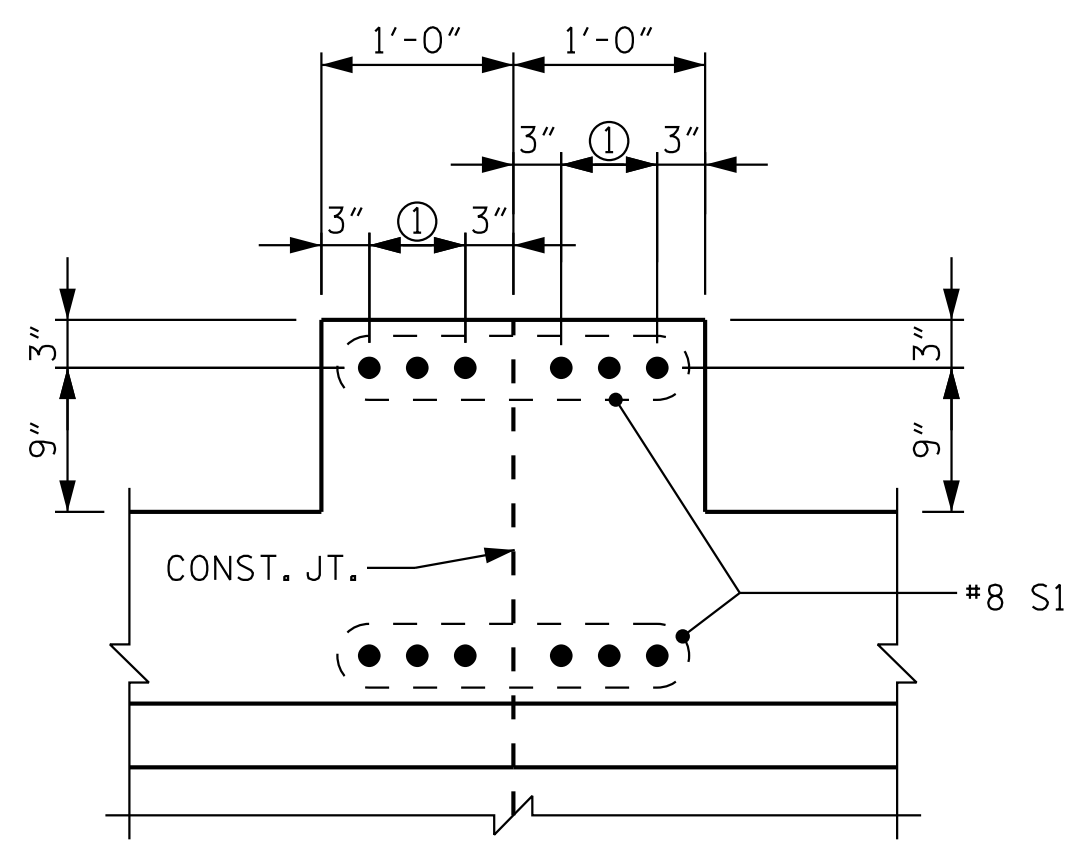
DRAWN BY: D. D. LOWERY DATE: 12/18
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 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

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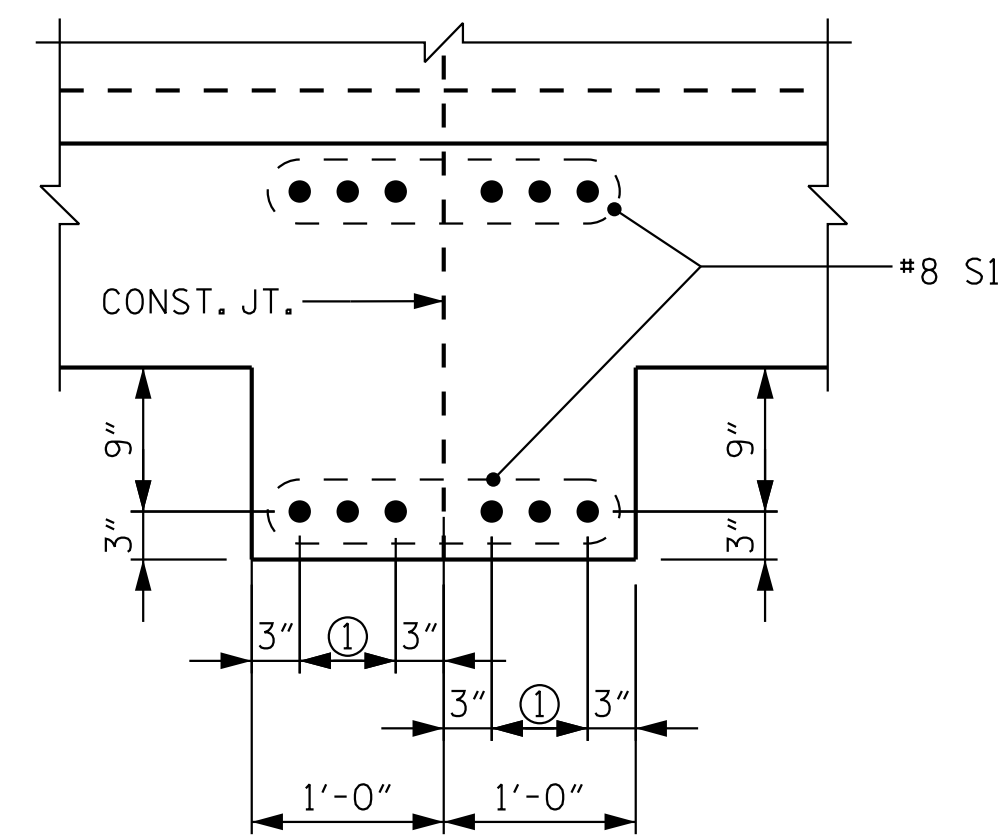
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CULVERT SECTION NORMAL TO ROADWAY



DETAIL A
① 2 SPA. @ 3"



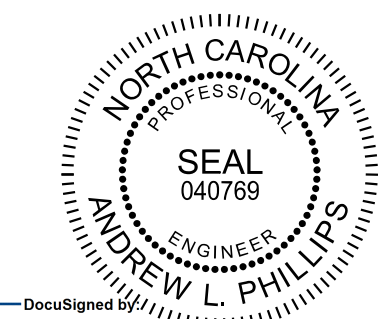
DETAIL B
① 2 SPA. @ 3"

PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 305+27.00 -L-

SHEET 2 OF 9

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 9 FT. X 7 FT.
 CONCRETE BOX CULVERT
 121° SKEW



DocuSigned by:
 Andrew L. Phillips 12/20/2018
 2889ABAD4004D3

Kimley»Horn
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 Raleigh, NC 27601-1772
 Phone (919) 677-2000 NC LICENSE # F-0102

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C05-2
1			3			TOTAL SHEETS
2			4			9

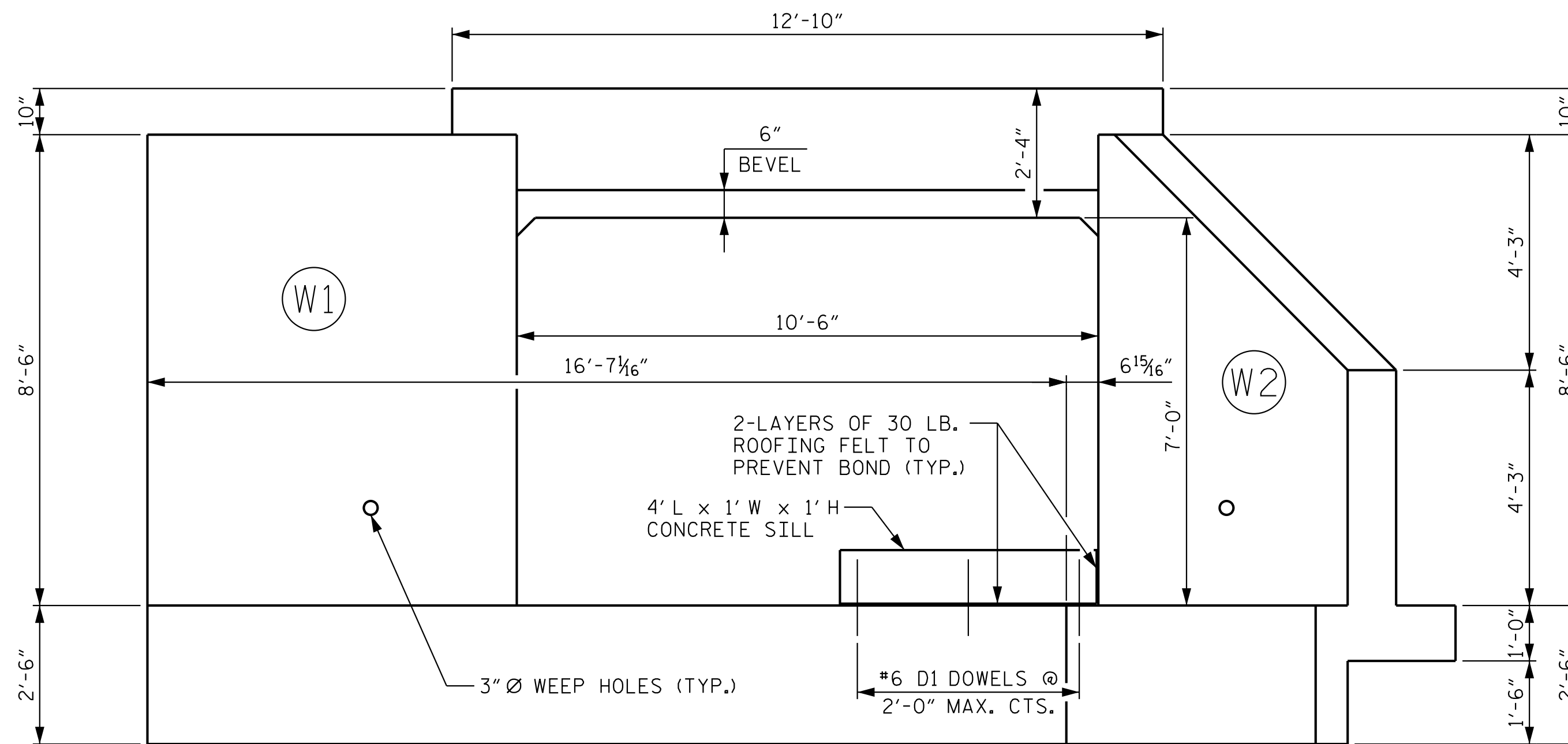
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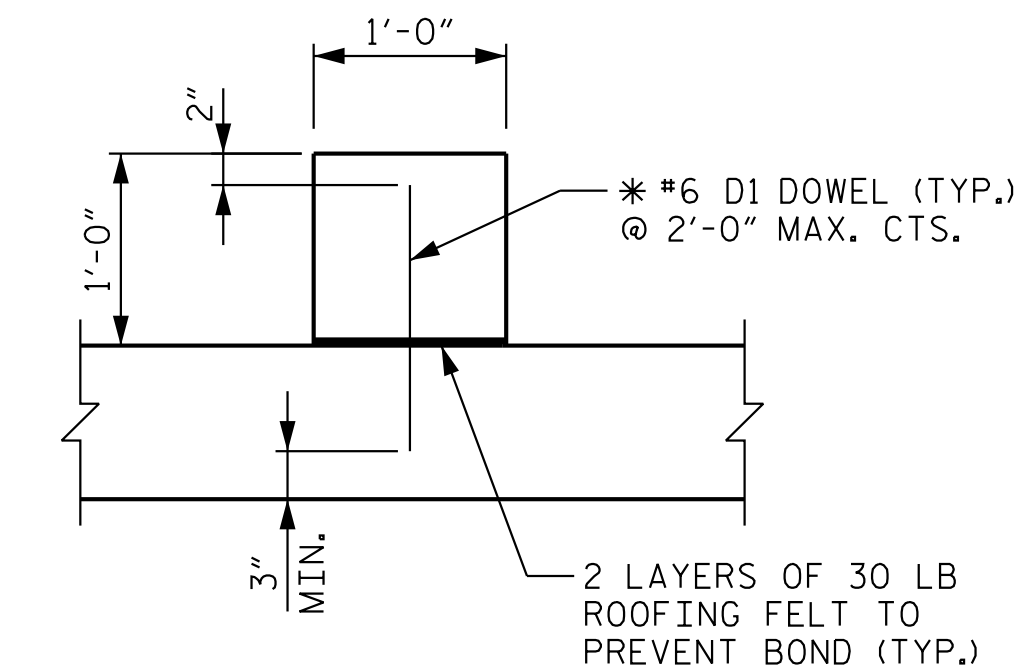
DRAWN BY: D.D. LOWERY DATE: 12/18
 CHECKED BY: P.D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A.L. PHILLIPS DATE: 12/18

NOTES

FOR ADDITIONAL INFORMATION AND LOCATION OF BAFFLES / SILLS, SEE SHEET C05-6.

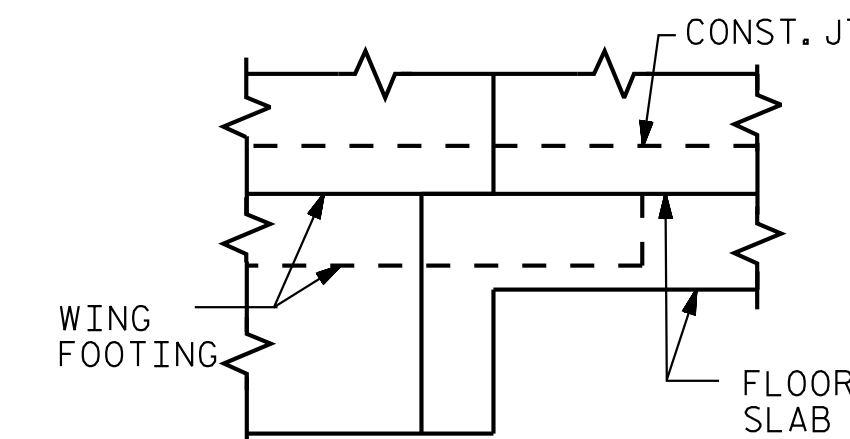
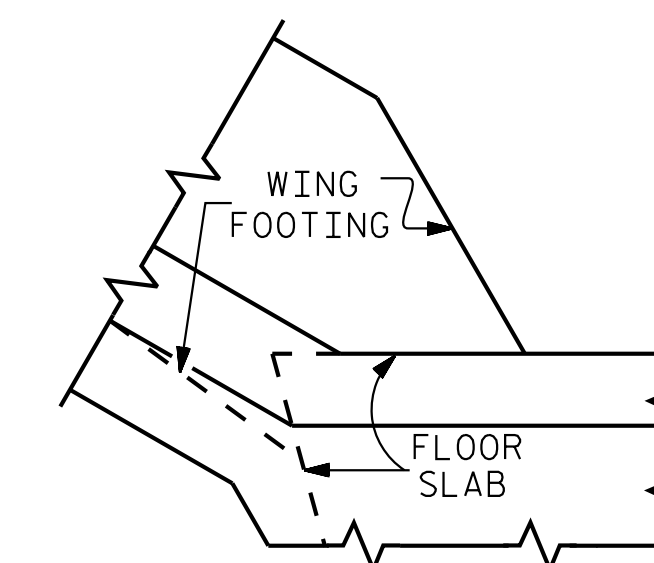


END ELEVATION NORMAL TO SKEW - INLET



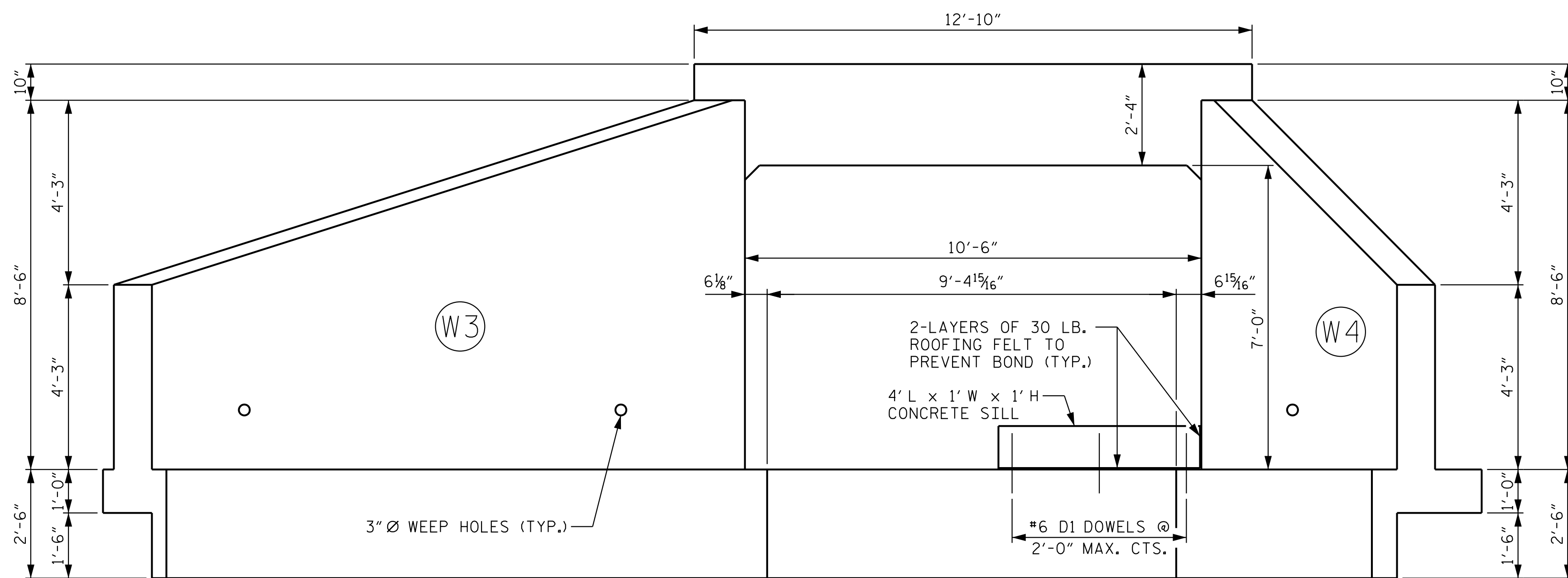
SECTION THROUGH SILL/BAFFLE

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



DETAIL

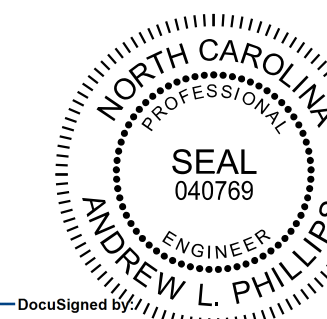
CONNECTION OF WING FOOTING AND FLOOR SLAB WHEN SLAB IS THICKER THAN FOOTING



END ELEVATION NORMAL TO SKEW - OUTLET

PROJECT NO. R-2530B
STANLY COUNTY
 STATION: 305+27.00 -L-

SHEET 3 OF 9



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STATE OF NORTH CAROLINA
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 RALEIGH

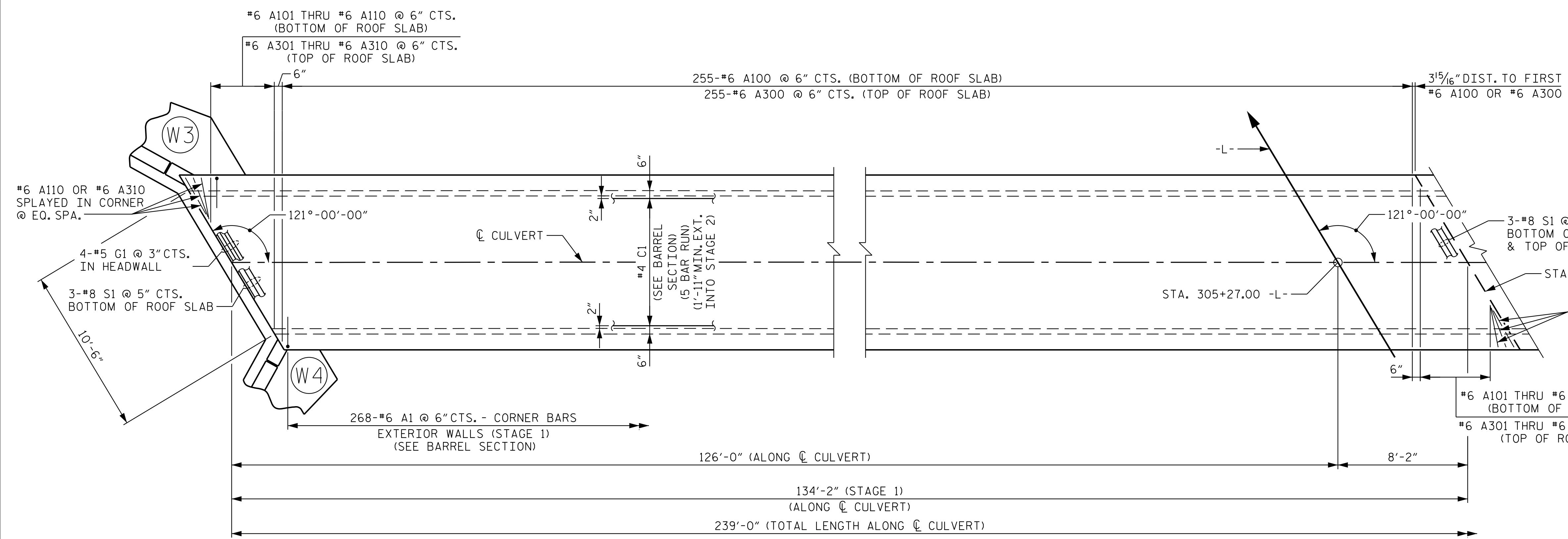
SINGLE 9 FT. X 7 FT.
 CONCRETE BOX CULVERT
 121° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C05-3
1			3			TOTAL SHEETS
2			4			9

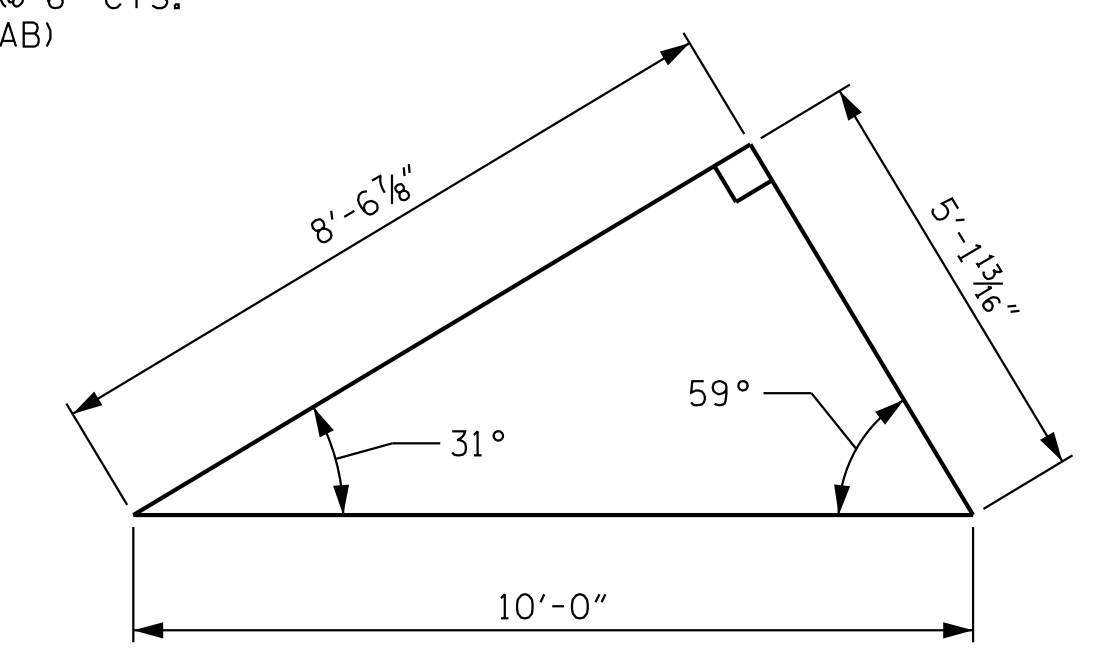
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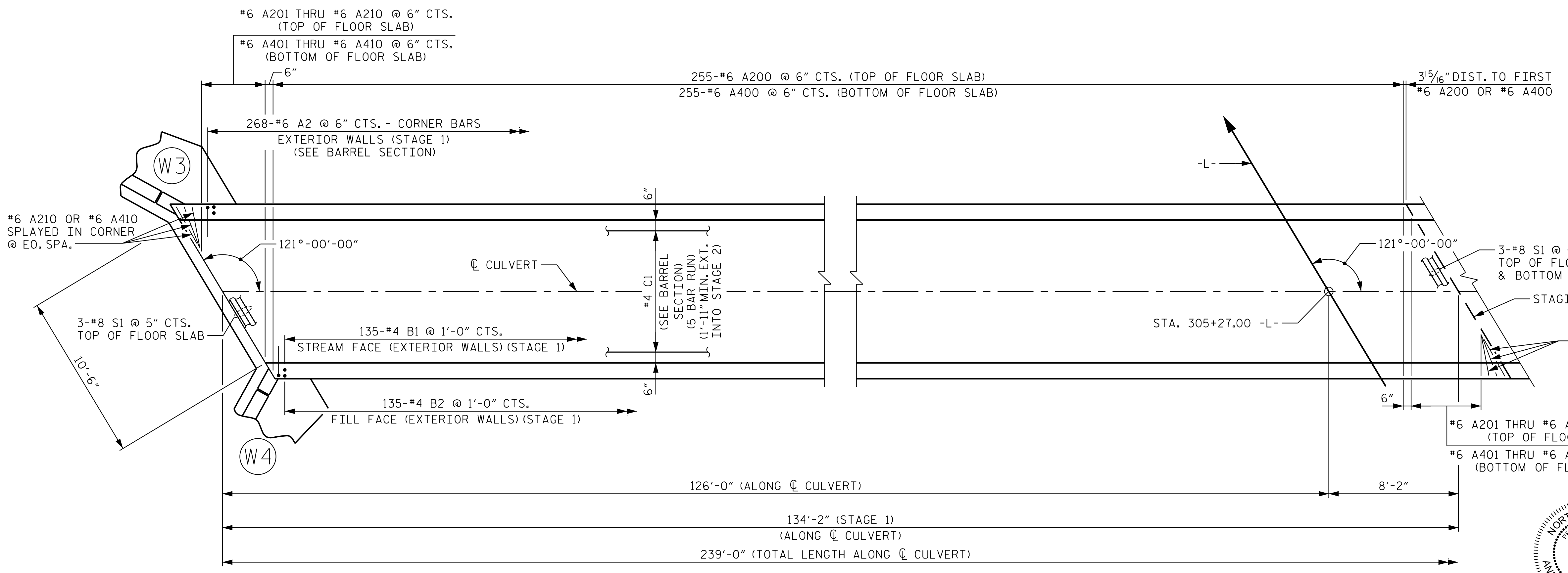
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 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18



ROOF SLAB PLAN - STAGE 1

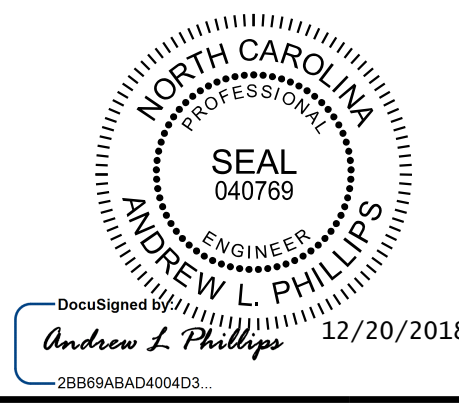


SKEW TRIANGLE



FLOOR SLAB PLAN - STAGE 1

NOTE: FOR S2 BARS IN THE FLOOR SLAB & WING FOOTINGS, SEE SHEET C05-7.



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SHEET 4 OF 9

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

STAGE 1
 SINGLE 9 FT. X 7 FT.
 CONCRETE BOX CULVERT
 121° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C05-4
1			3			TOTAL SHEETS
2			4			9

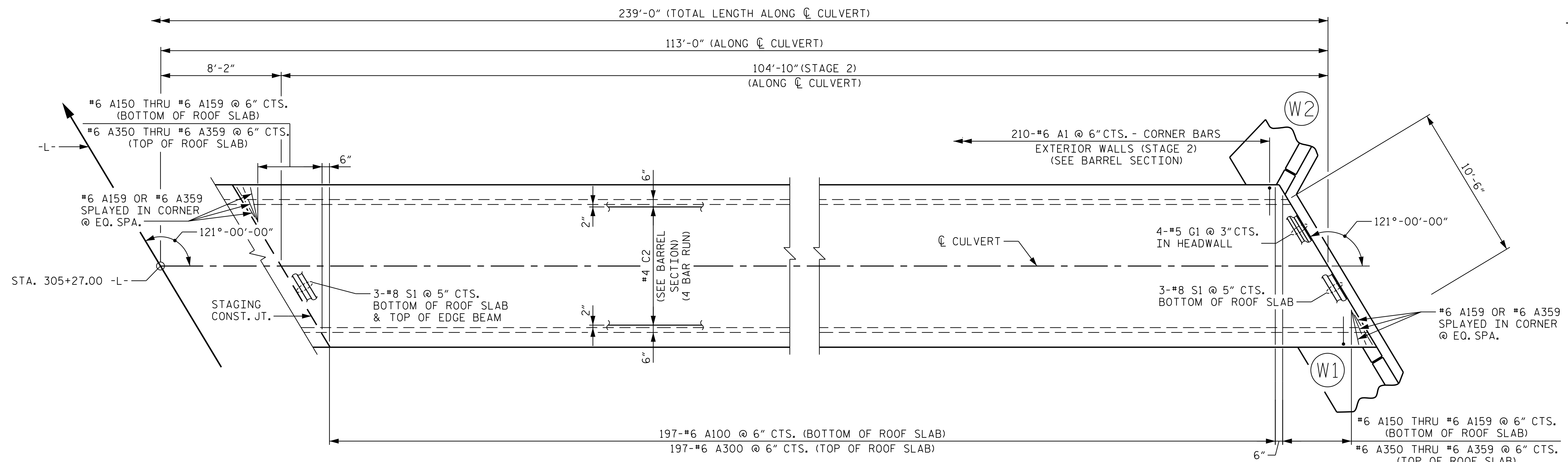
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 CHECKED BY: P. D. COOKSEY DATE: 12/18
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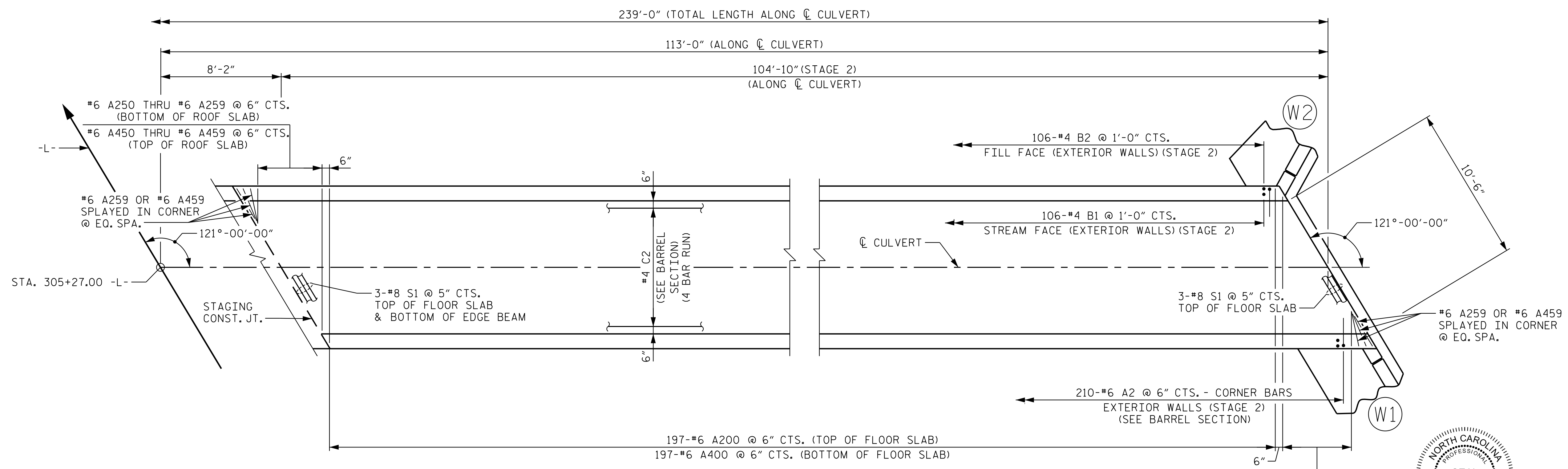
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NOTE
SEE SHEET C05-4 FOR SKEW TRIANGLE.



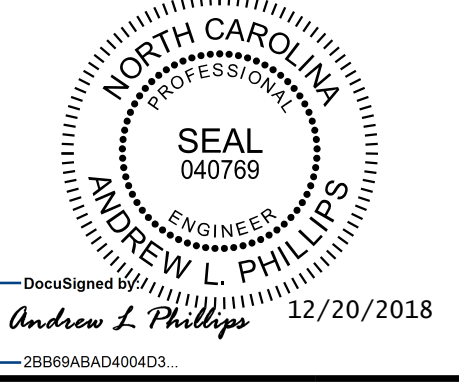
ROOF SLAB PLAN - STAGE 2



FLOOR SLAB PLAN - STAGE 2

NOTE: FOR S2 BARS IN THE FLOOR SLAB & WING FOOTINGS, SEE SHEET C05-8.

PROJECT NO. R-2530B
STANLY COUNTY
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SHEET 5 OF 9



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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
STAGE 2
SINGLE 9 FT. X 7 FT.
CONCRETE BOX CULVERT
121° SKEW

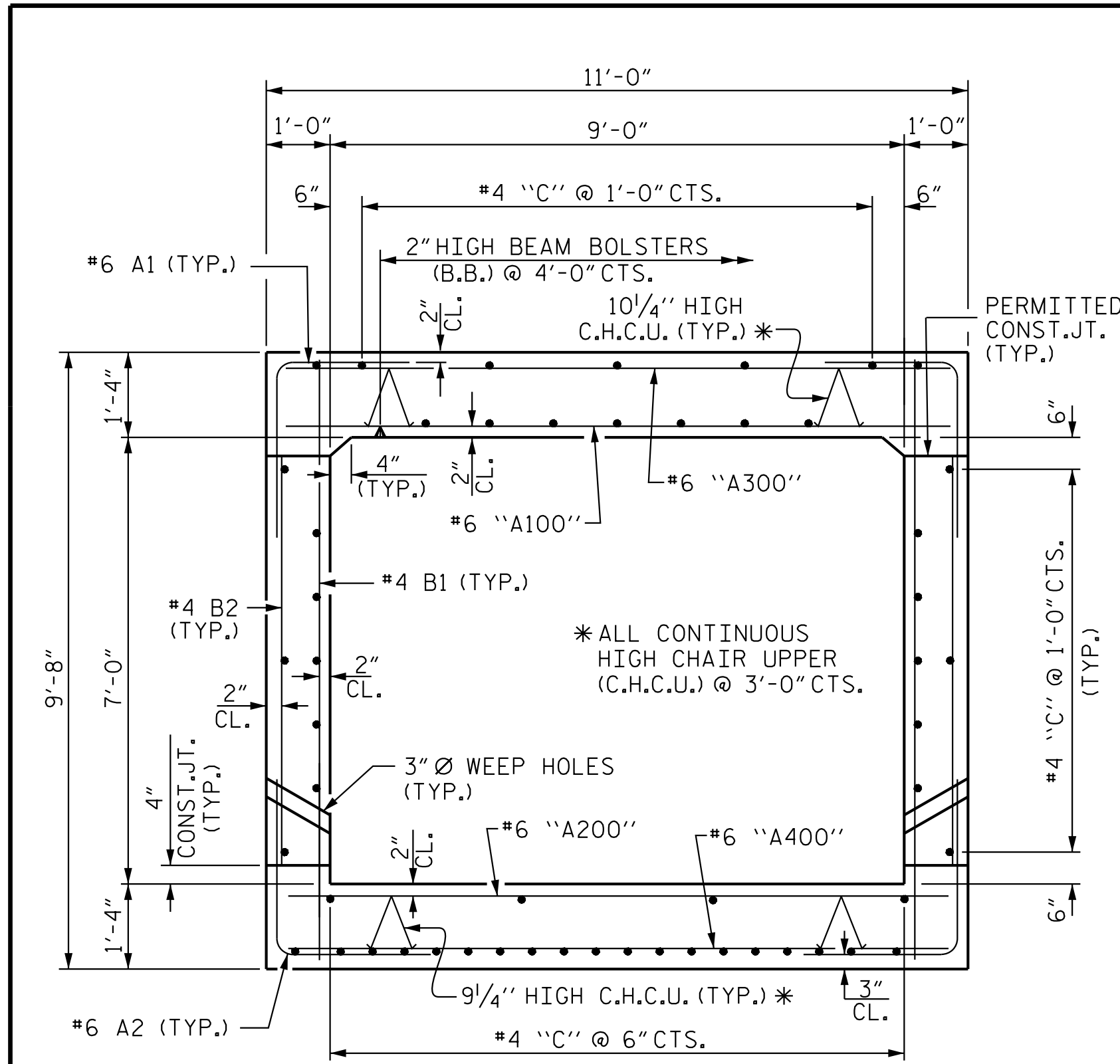
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NO.	BY:	DATE:	NO.	BY:	DATE:	C05-5
1			3			TOTAL SHEETS
2			4			9

12/20/2018 K:\BID1-Structures\Culvert\NC\0101036489 - B-2530B\Cad\Drawn\Culvert_5_V15_009_R2530B_SMU_CU_005.dgn

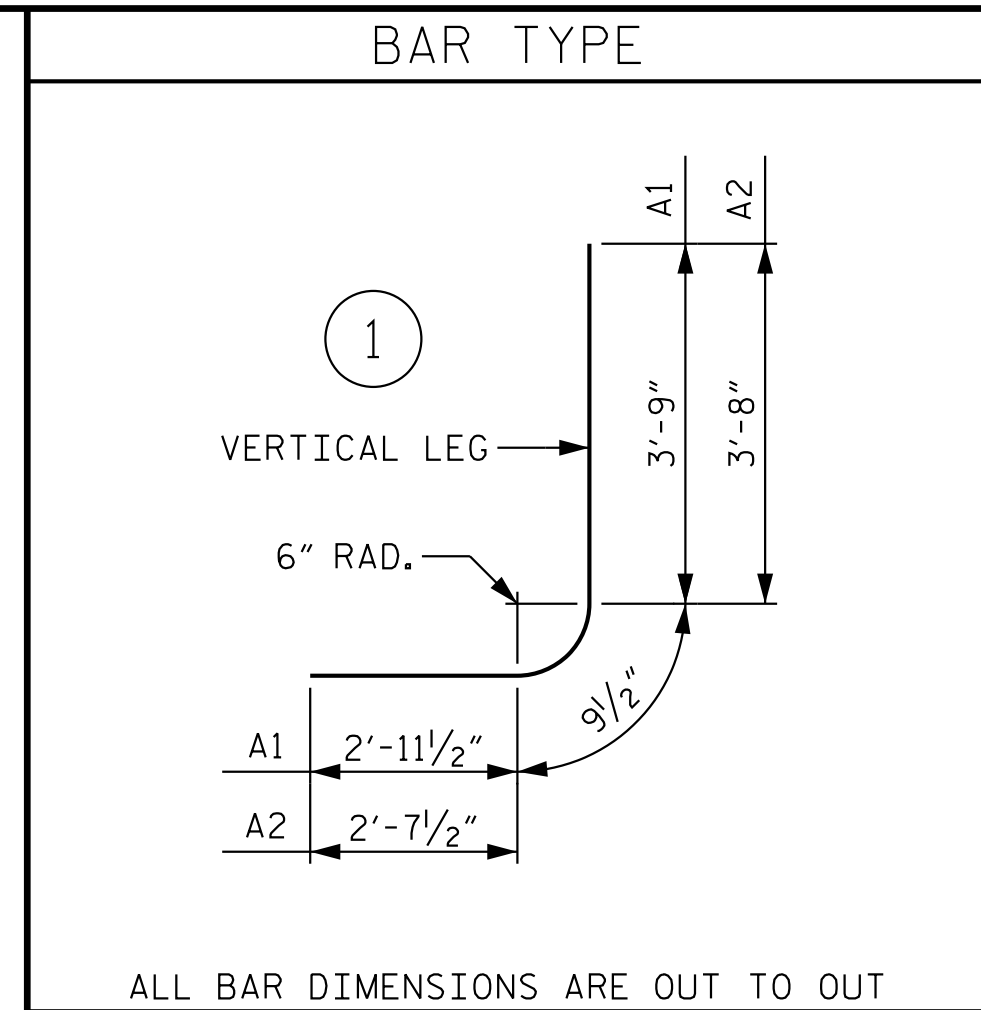
DRAWN BY: D. D. LOWERY DATE: 12/18
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DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

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RIGHT ANGLE SECTION OF BARREL
THERE ARE 53 "C" BARS IN SECTION OF BARREL



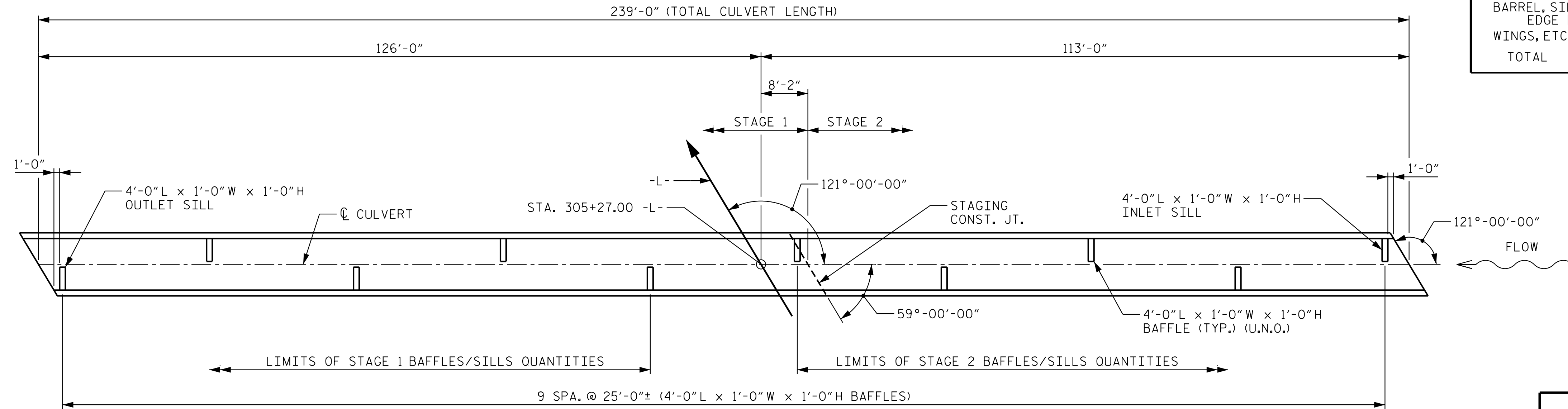
ALL BAR DIMENSIONS ARE OUT TO OUT

STAGE 1										STAGE 2																	
BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT				
A1	536	6	1	7'-6"	6,038	A400	255	6	STR	10'-7"	4,054	A1	420	6	1	7'-6"	4,731	A400	197	6	STR	10'-7"	3,132				
A2	536	6	1	7'-1"	5,703	A401	2	6	STR	10'-1"	30	A2	420	6	1	7'-1"	4,468	A450	2	6	STR	9'-10"	30				
A100	255	6	STR	10'-7"	4,054	A402	2	6	STR	9'-3"	28	A100	197	6	STR	10'-7"	3,132	A451	2	6	STR	9'-0"	27				
A101	2	6	STR	10'-1"	30	A403	2	6	STR	8'-5"	25	A101	197	6	STR	10'-7"	3,132	A452	2	6	STR	8'-2"	25				
A102	2	6	STR	9'-3"	28	A404	2	6	STR	7'-7"	23	A102	197	6	STR	10'-7"	3,132	A453	2	6	STR	7'-4"	22				
A103	2	6	STR	8'-5"	25	A405	2	6	STR	6'-9"	20	A103	197	6	STR	10'-7"	3,132	A454	2	6	STR	6'-6"	20				
A104	2	6	STR	7'-7"	23	A406	2	6	STR	5'-11"	18	A104	197	6	STR	10'-7"	3,132	A455	2	6	STR	5'-8"	17				
A105	2	6	STR	6'-9"	20	A407	2	6	STR	5'-1"	15	A105	197	6	STR	10'-7"	3,132	A456	2	6	STR	4'-10"	15				
A106	2	6	STR	5'-11"	18	A408	2	6	STR	4'-3"	13	A106	197	6	STR	10'-7"	3,132	A457	2	6	STR	4'-10"	15				
A107	2	6	STR	5'-1"	15	A409	2	6	STR	3'-5"	10	A107	197	6	STR	10'-7"	3,132	A458	2	6	STR	3'-2"	10				
A108	2	6	STR	4'-3"	13	A410	8	6	STR	2'-7"	31	A108	197	6	STR	10'-7"	3,132	A459	8	6	STR	2'-4"	28				
A109	2	6	STR	3'-5"	10	B1	270	4	STR	9'-2"	1,653	A109	197	6	STR	10'-7"	3,132	B1	212	4	STR	9'-2"	1,298				
A110	8	6	STR	2'-7"	31	B2	270	4	STR	6'-4"	1,142	A110	197	6	STR	10'-7"	3,132	B2	212	4	STR	6'-4"	897				
A200	255	6	STR	10'-7"	4,054	C1	265	4	STR	28'-10"	5,104	A200	197	6	STR	10'-7"	3,132	C2	212	4	STR	27'-9"	3,930				
A201	2	6	STR	10'-1"	30	A201	2	6	STR	9'-10"	30	A201	197	6	STR	10'-7"	3,132	A250	2	6	STR	9'-10"	30				
A202	2	6	STR	9'-3"	28	D1	15	6	STR	1'-11"	43	A202	197	6	STR	10'-7"	3,132	A251	2	6	STR	9'-0"	27				
A203	2	6	STR	8'-5"	25	A203	2	6	STR	8'-2"	25	A203	197	6	STR	10'-7"	3,132	A252	2	6	STR	8'-2"	25				
A204	2	6	STR	7'-7"	23	G1	4	5	STR	12'-5"	52	A204	197	6	STR	10'-7"	3,132	A253	2	6	STR	7'-4"	22				
A205	2	6	STR	6'-9"	20	A205	2	6	STR	7'-4"	22	A205	197	6	STR	10'-7"	3,132	A254	2	6	STR	6'-6"	20				
A206	2	6	STR	5'-11"	18	A206	2	6	STR	6'-6"	20	A206	197	6	STR	10'-7"	3,132	A255	2	6	STR	5'-8"	17				
A207	2	6	STR	5'-1"	15	A207	2	6	STR	5'-8"	17	A207	197	6	STR	10'-7"	3,132	A256	2	6	STR	4'-10"	15				
A208	2	6	STR	4'-3"	13	A208	2	6	STR	4'-10"	15	A208	197	6	STR	10'-7"	3,132	A257	2	6	STR	4'-0"	12				
A209	2	6	STR	3'-5"	10	A209	2	6	STR	4'-0"	12	A209	197	6	STR	10'-7"	3,132	A258	2	6	STR	3'-2"	10				
A210	8	6	STR	2'-7"	31	A210	2	6	STR	3'-2"	10	A210	197	6	STR	10'-7"	3,132	A259	8	6	STR	2'-4"	28				
A300	255	6	STR	10'-7"	4,054	A300	2	6	STR	2'-4"	28	A300	197	6	STR	10'-7"	3,132										
A301	2	6	STR	10'-1"	30	A301	2	6	STR	9'-10"	30	A301	197	6	STR	10'-7"	3,132										
A302	2	6	STR	9'-3"	28	A302	2	6	STR	9'-0"	27	A302	197	6	STR	10'-7"	3,132										
A303	2	6	STR	8'-5"	25	A303	2	6	STR	8'-2"	25	A303	197	6	STR	10'-7"	3,132										
A304	2	6	STR	7'-7"	23	A304	2	6	STR	7'-4"	22	A304	197	6	STR	10'-7"	3,132										
A305	2	6	STR	6'-9"	20	A305	2	6	STR	6'-6"	20	A305	197	6	STR	10'-7"	3,132										
A306	2	6	STR	5'-11"	18	A306	2	6	STR	5'-8"	17	A306	197	6	STR	10'-7"	3,132										
A307	2	6	STR	5'-1"	15	A307	2	6	STR	5'-8"	17	A307	197	6	STR	10'-7"	3,132										
A308	2	6	STR	4'-3"	13	A308	2	6	STR	4'-10"	15	A308	197	6	STR	10'-7"	3,132										
A309	2	6	STR	3'-5"	10	A309	2	6	STR	4'-0"	12	A309	197	6	STR	10'-7"	3,132										
A310	8	6	STR	2'-7"	31	A310	2	6	STR	3'-2"	10	A310	197	6	STR	10'-7"	3,132										
REINFORCING STEEL												LBS.	37,400	REINFORCING STEEL												LBS.	29,368

BAR SIZE	SPLICE LENGTH
#4 B1	1'-5"
#4 C1 & #4 C2	1'-11"

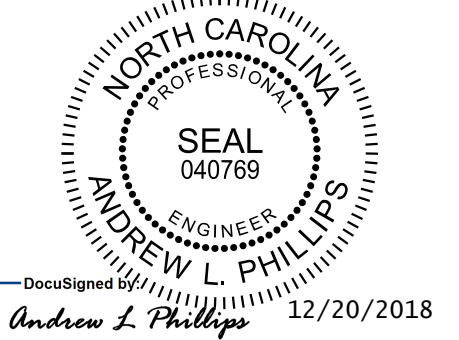
STAGE 1 QUANTITIES		
CLASS A CONCRETE	BARREL @ 1.609 C.Y./FT.	215.9 C.Y.
WINGS, ETC.		11.1 C.Y.
SILLS/BAFFLES		0.7 C.Y.
EDGE BEAMS		1.0 C.Y.
TOTAL		228.7 C.Y.
REINFORCING STEEL	BARREL, SILLS/BAFFLES & EDGE BEAMS	37,400 LBS.
WINGS, ETC.		660 LBS.
TOTAL		38,060 LBS.

STAGE 2 QUANTITIES		
CLASS A CONCRETE	BARREL @ 1.609 C.Y./FT.	168.7 C.Y.
WINGS, ETC.		8.0 C.Y.
SILLS/BAFFLES		0.7 C.Y.
EDGE BEAMS		1.0 C.Y.
TOTAL		178.4 C.Y.
REINFORCING STEEL	BARREL, SILLS/BAFFLES & EDGE BEAMS	29,368 LBS.
WINGS, ETC.		494 LBS.
TOTAL		29,862 LBS.



PLAN VIEW SHOWING SILL/BAFFLE LOCATIONS
(U.N.O. - UNLESS NOTED OTHERWISE)

DRAWN BY: D.D. LOWERY DATE: 12/18
 CHECKED BY: P.D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A.L. PHILLIPS DATE: 12/18



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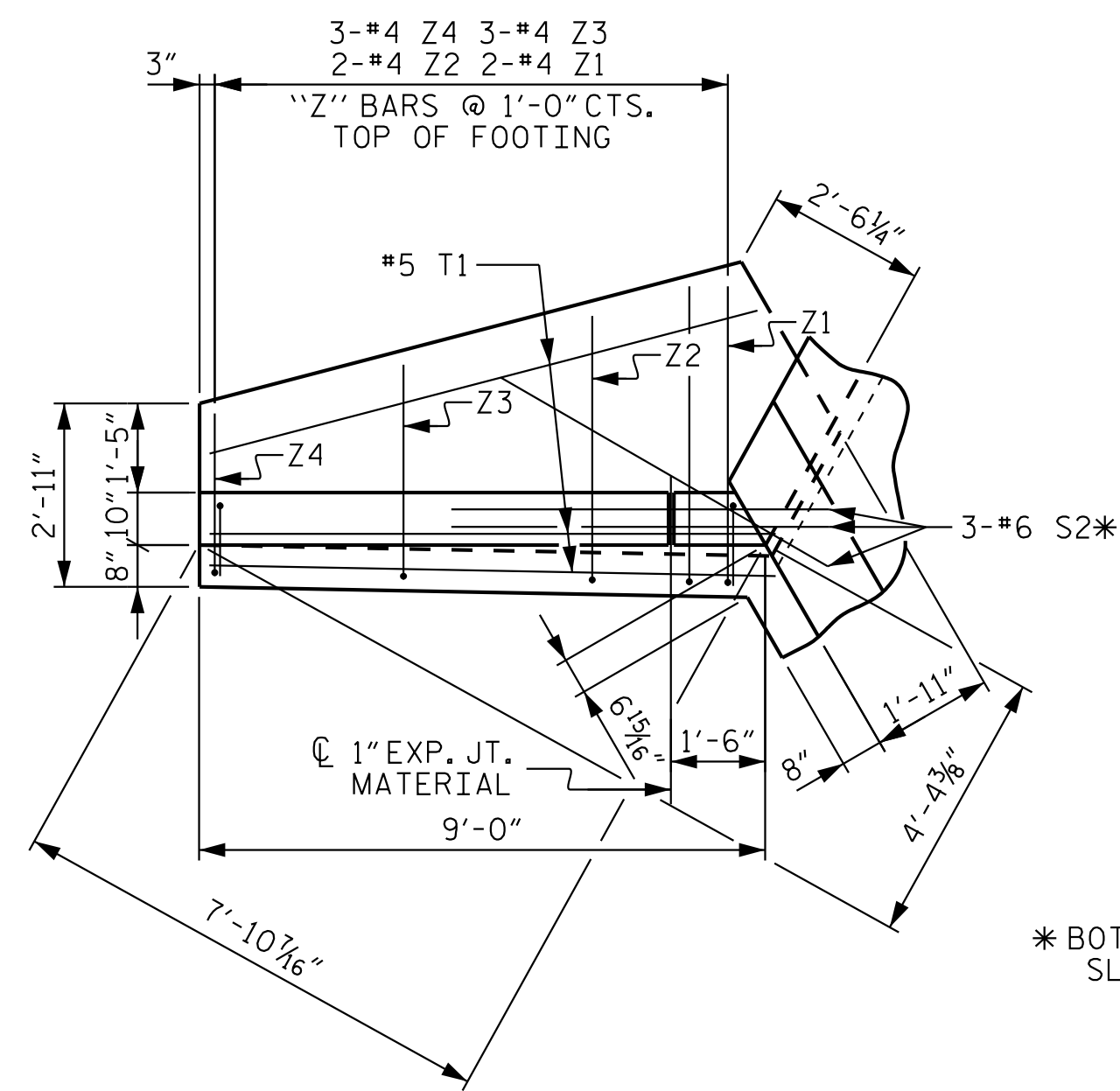
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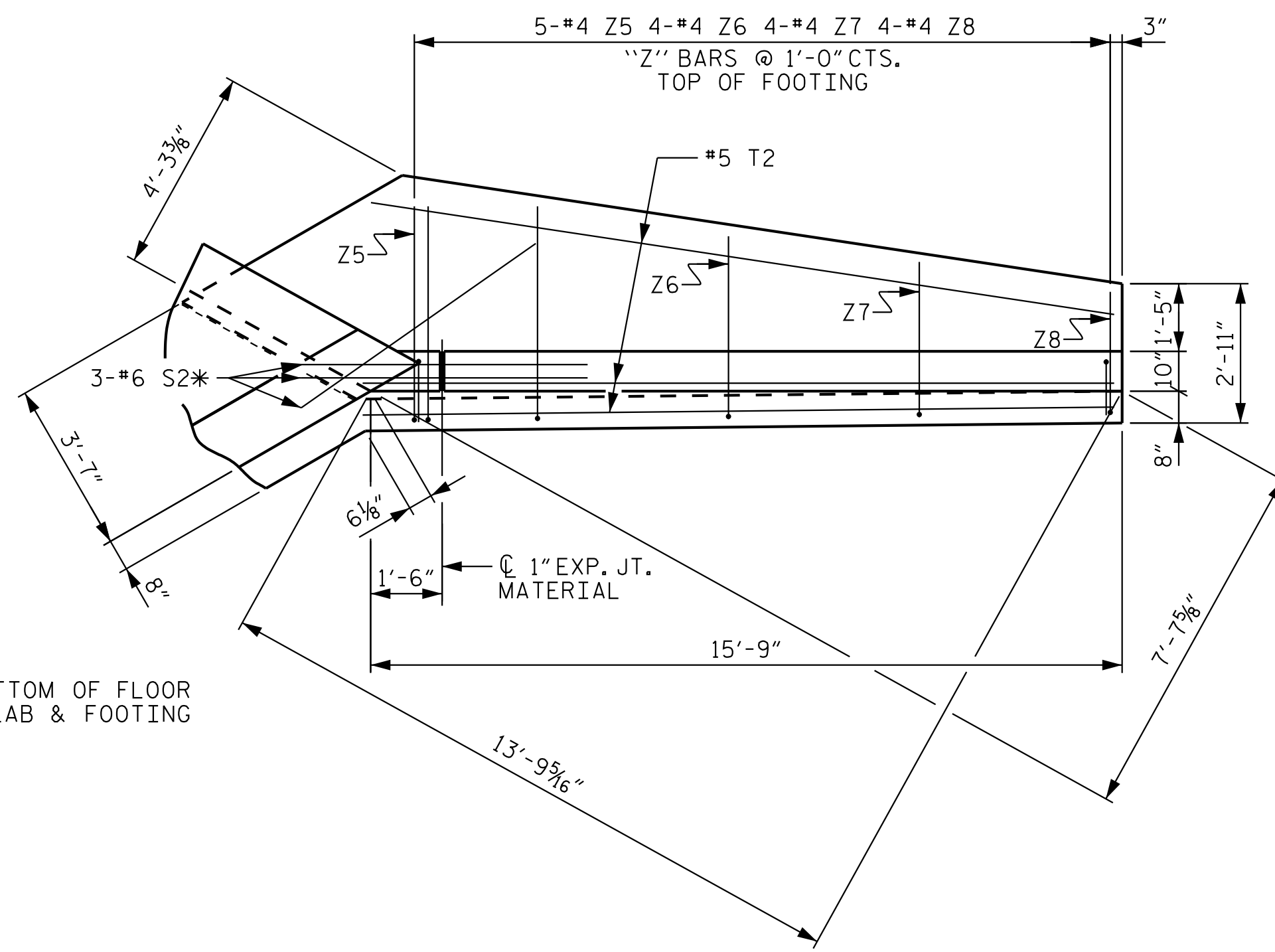
SHEET 6 OF 9

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
SINGLE 9 FT. X 7 FT. CONCRETE BOX CULVERT 121° SKEW					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

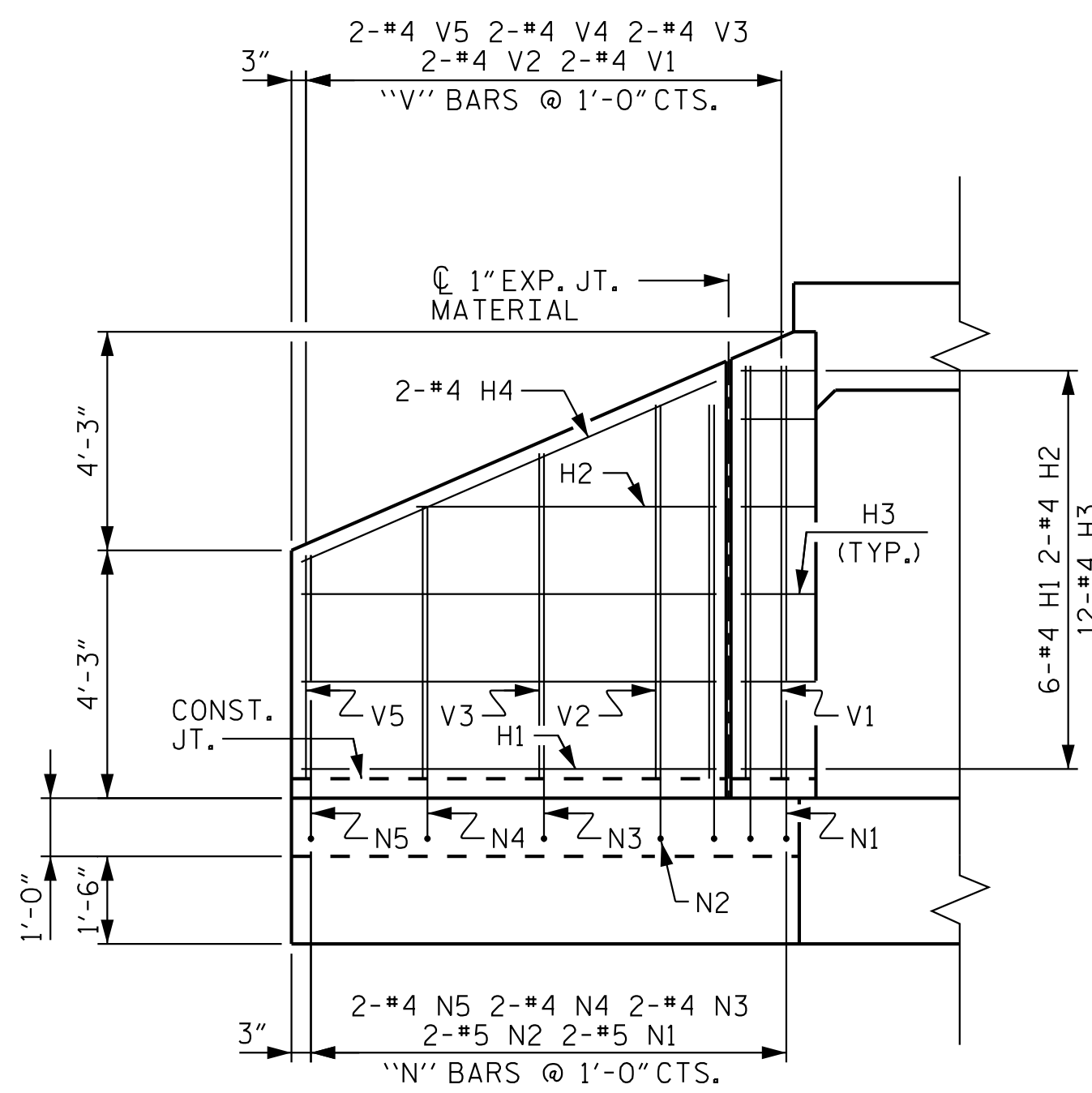
SHEET NO. C05-6			
TOTAL SHEETS 9			



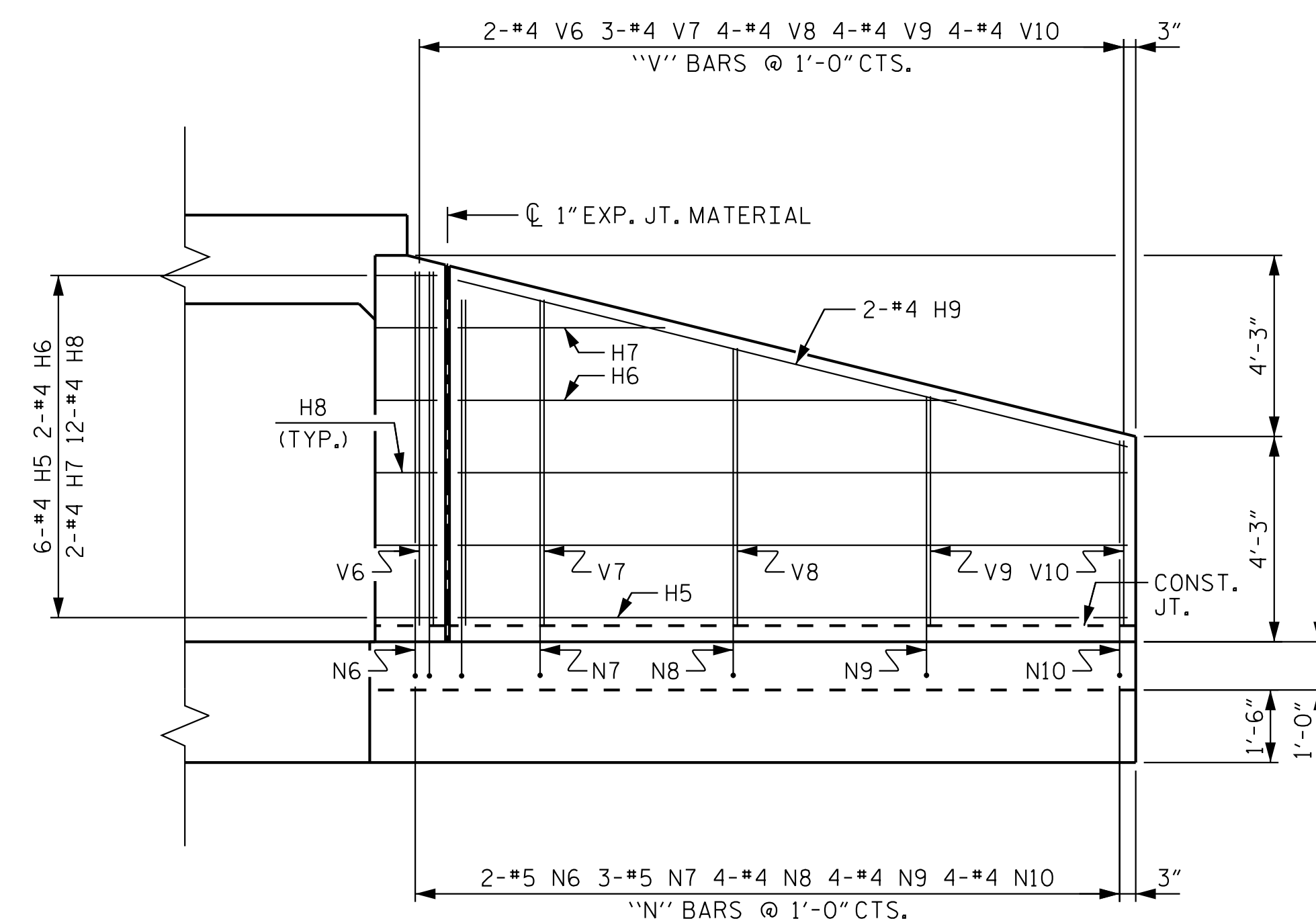
PLAN W4



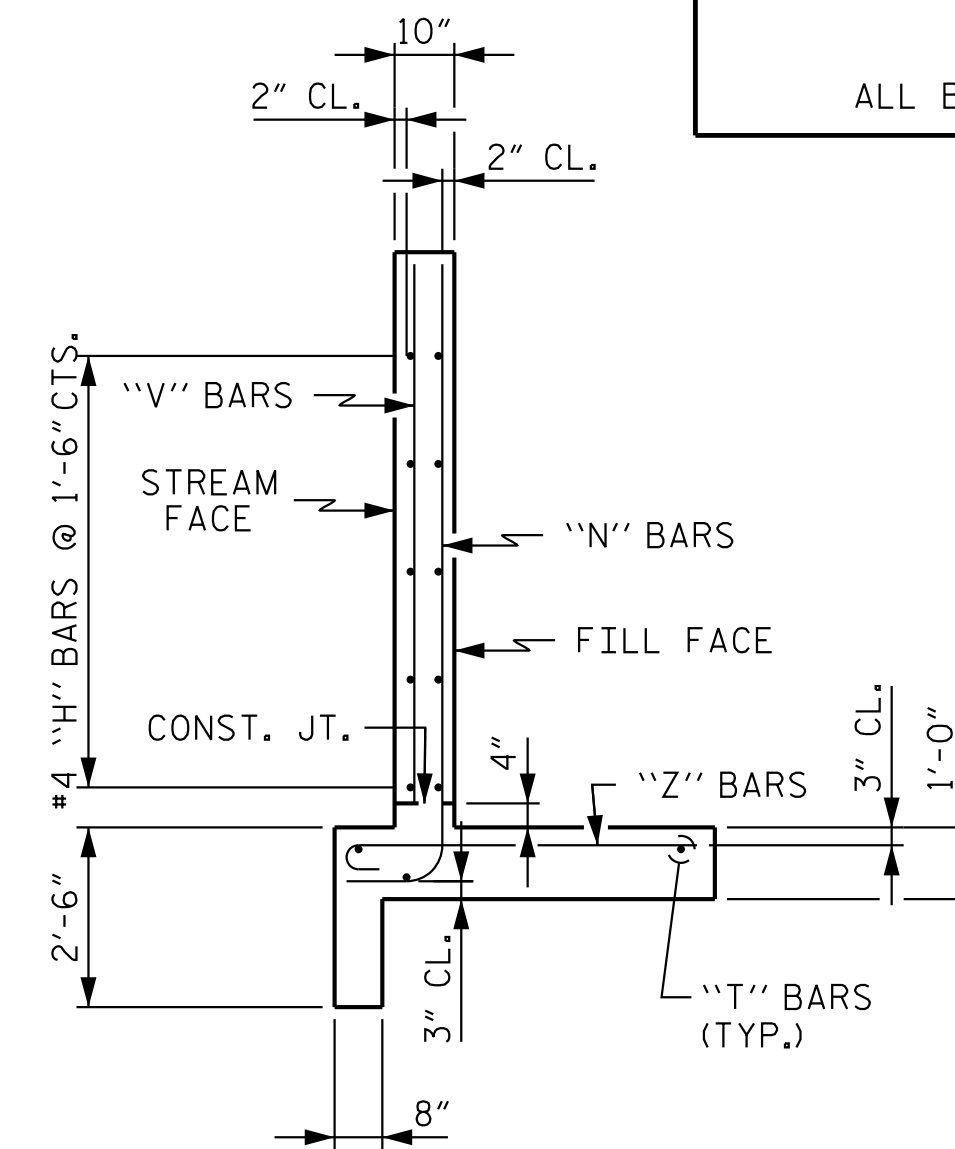
PLAN W3



ELEVATION W4

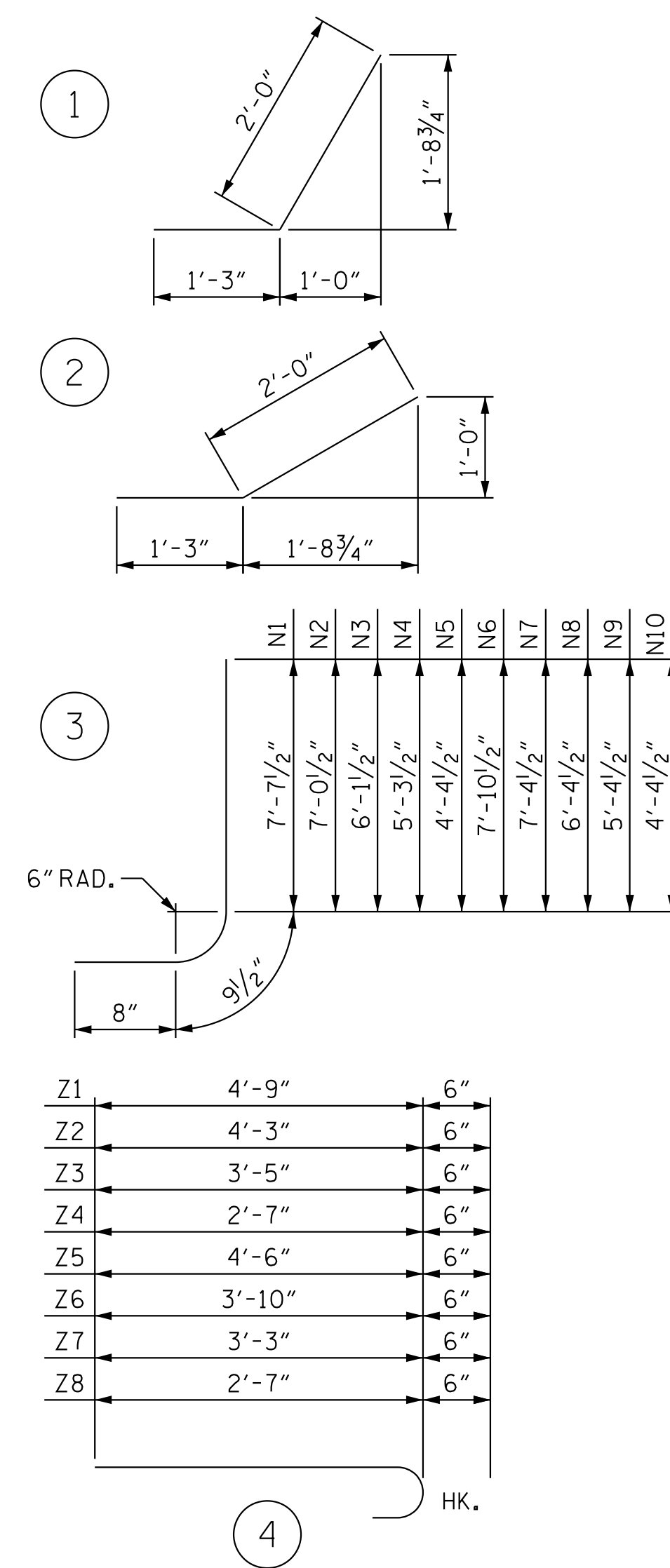


ELEVATION W3



TYPICAL WING SECTION

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT

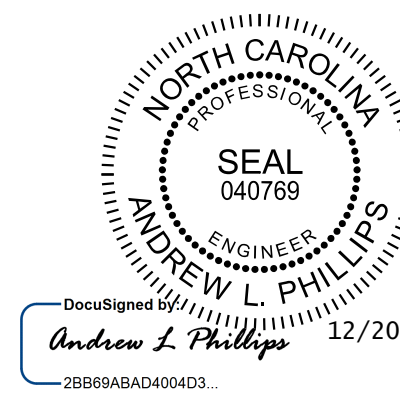
BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	6	#4	STR	7'-1"	28
H2	2	#4	STR	5'-2"	7
H3	12	#4	1	3'-3"	26
H4	2	#4	STR	7'-9"	10
H5	6	#4	STR	13'-10"	55
H6	2	#4	STR	10'-4"	14
H7	2	#4	STR	4'-3"	6
H8	12	#4	2	3'-3"	26
H9	2	#4	STR	14'-3"	19
N1	2	#5	3	9'-1"	19
N2	2	#5	3	8'-6"	18
N3	2	#4	3	7'-7"	10
N4	2	#4	3	6'-9"	9
N5	2	#4	3	5'-10"	8
N6	2	#5	3	9'-4"	19
N7	3	#5	3	8'-10"	28
N8	4	#4	3	7'-10"	21
N9	4	#4	3	6'-10"	18
N10	4	#4	3	5'-10"	16
S2	6	#6	STR	6'-0"	54
T1	3	#5	STR	9'-0"	28
T2	3	#5	STR	15'-9"	49
V1	2	#4	STR	7'-1"	9
V2	2	#4	STR	6'-5"	9
V3	2	#4	STR	5'-7"	7
V4	2	#4	STR	4'-8"	6
V5	2	#4	STR	3'-10"	5
V6	2	#4	STR	7'-4"	10
V7	3	#4	STR	6'-9"	14
V8	4	#4	STR	5'-9"	15
V9	4	#4	STR	4'-9"	13
V10	4	#4	STR	3'-10"	10
Z1	2	#4	4	5'-3"	7
Z2	2	#4	4	4'-9"	6
Z3	3	#4	4	3'-11"	8
Z4	3	#4	4	3'-1"	6
Z5	5	#4	4	5'-0"	17
Z6	4	#4	4	4'-4"	12
Z7	4	#4	4	3'-9"	10
Z8	4	#4	4	3'-1"	8
REINFORCING STEEL					660 LBS
FOR 2 WINGS					
CLASS A CONCRETE					
2 WINGS					9.9 CY
1 HEADWALLS					0.6 CY
1 END CURTAIN WALLS					0.6 CY
TOTAL					11.1 CY

PROJECT NO. R-2530B
 STANLY COUNTY
 STATION: 305+27.00 -L-

SHEET 7 OF 9

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 OUTLET WING DETAILS
 FOR STAGE 1
 CONCRETE BOX CULVERT
 H = 7'-0" SLOPE = 2:1
 121° SKEW



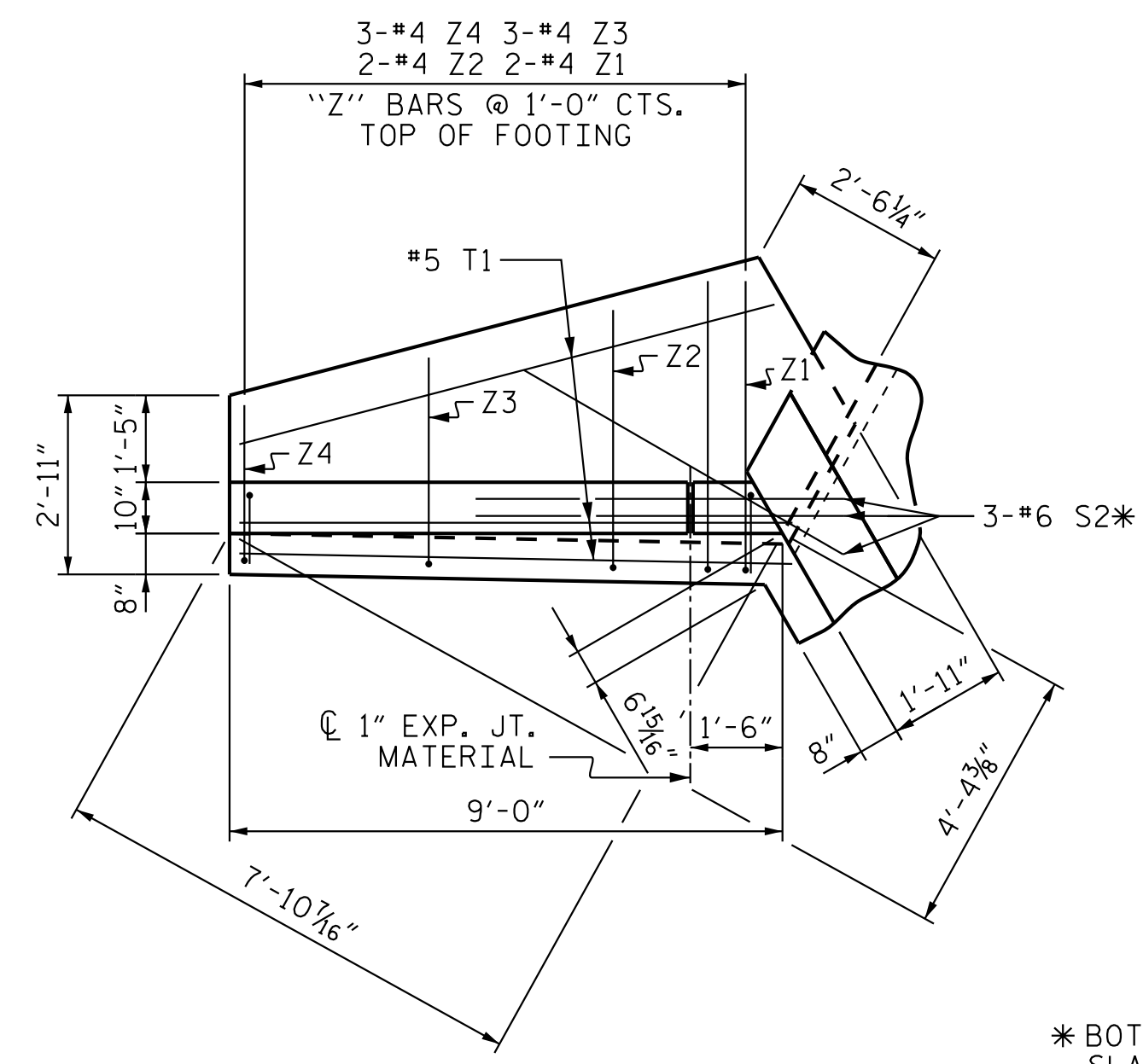
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 Raleigh, NC 27601-1772
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2			4			9

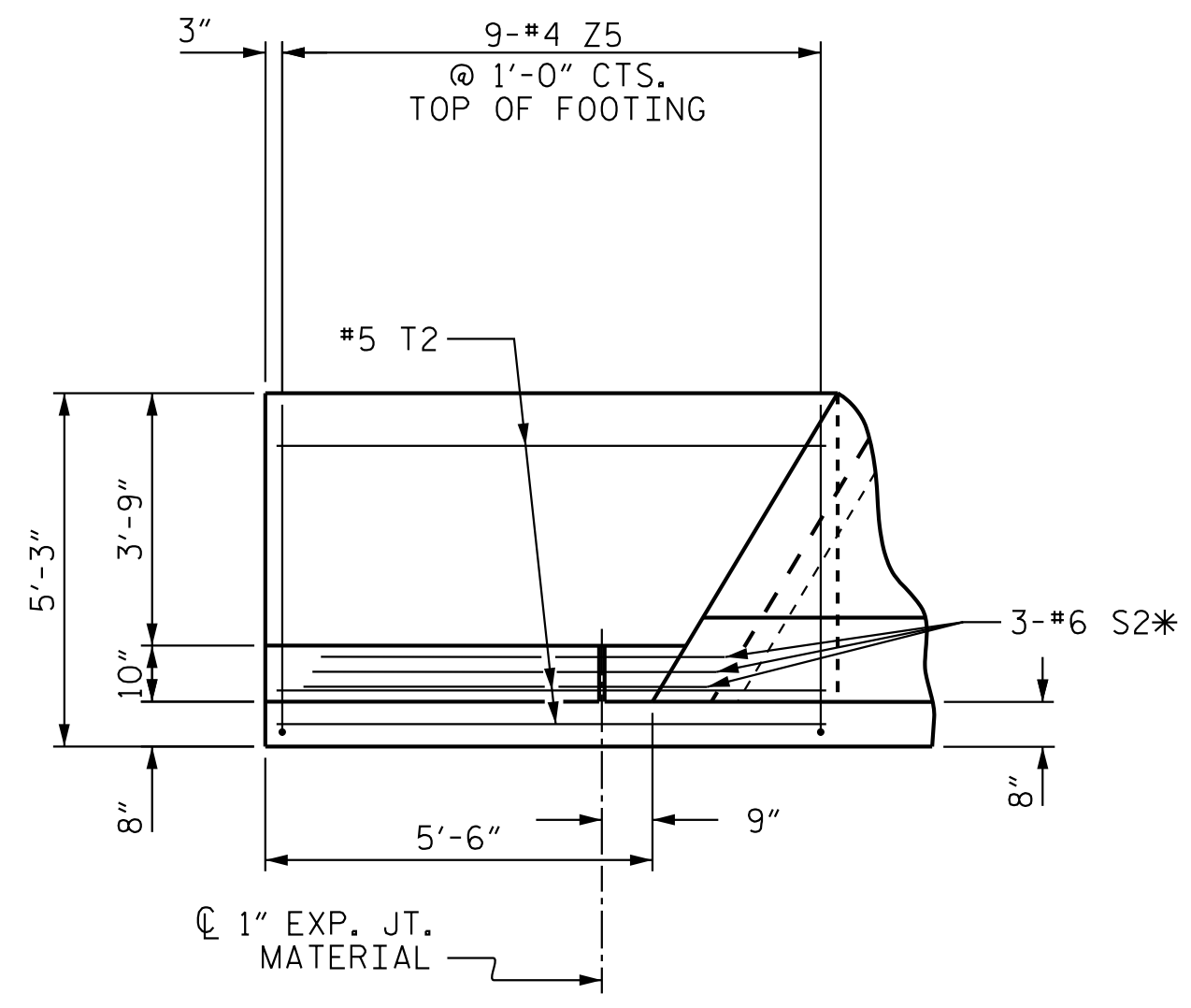
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DRAWN BY: D.D. LOWERY DATE: 12/18
 CHECKED BY: P.D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A.L. PHILLIPS DATE: 12/18

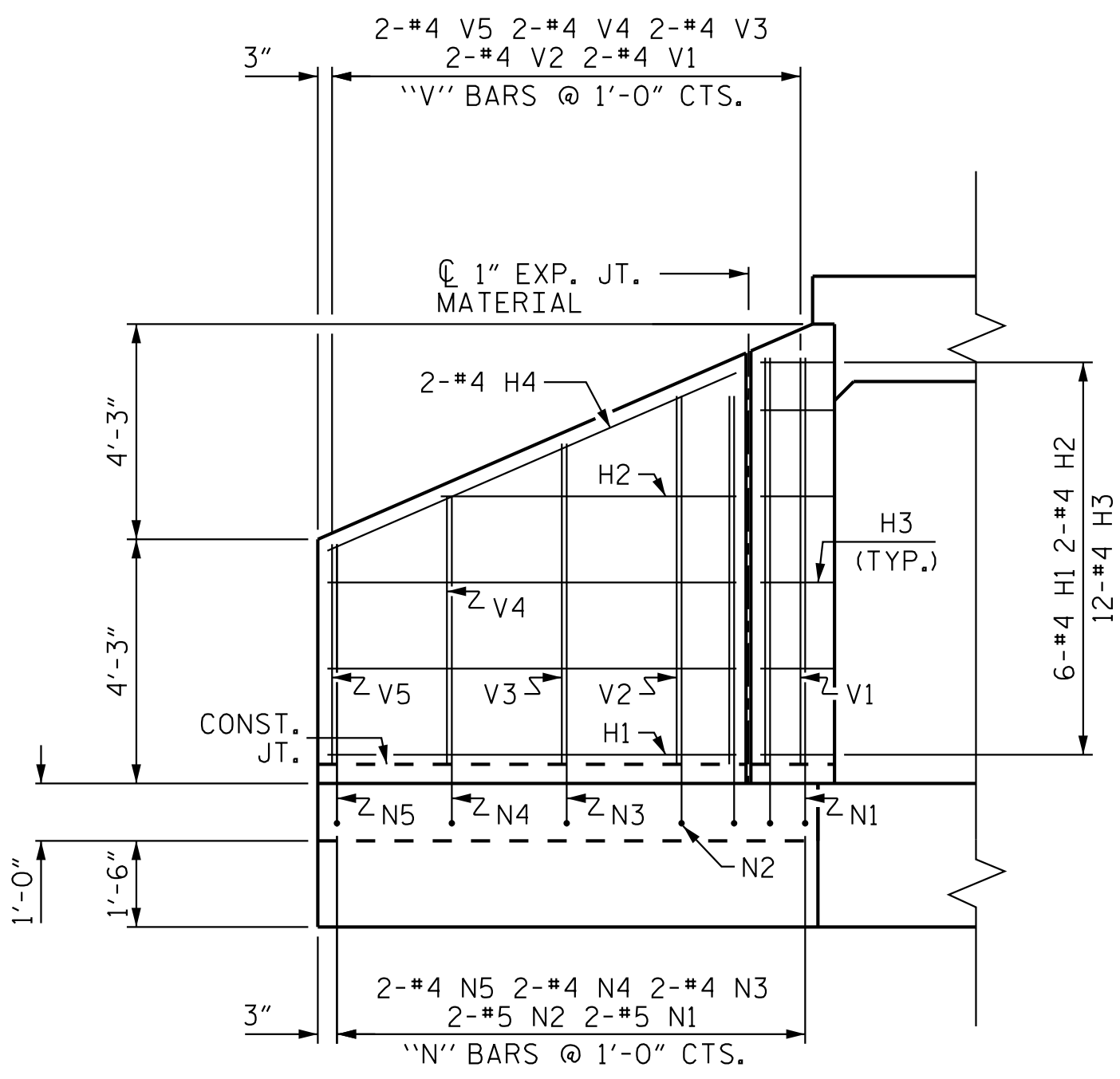


PLAN W2

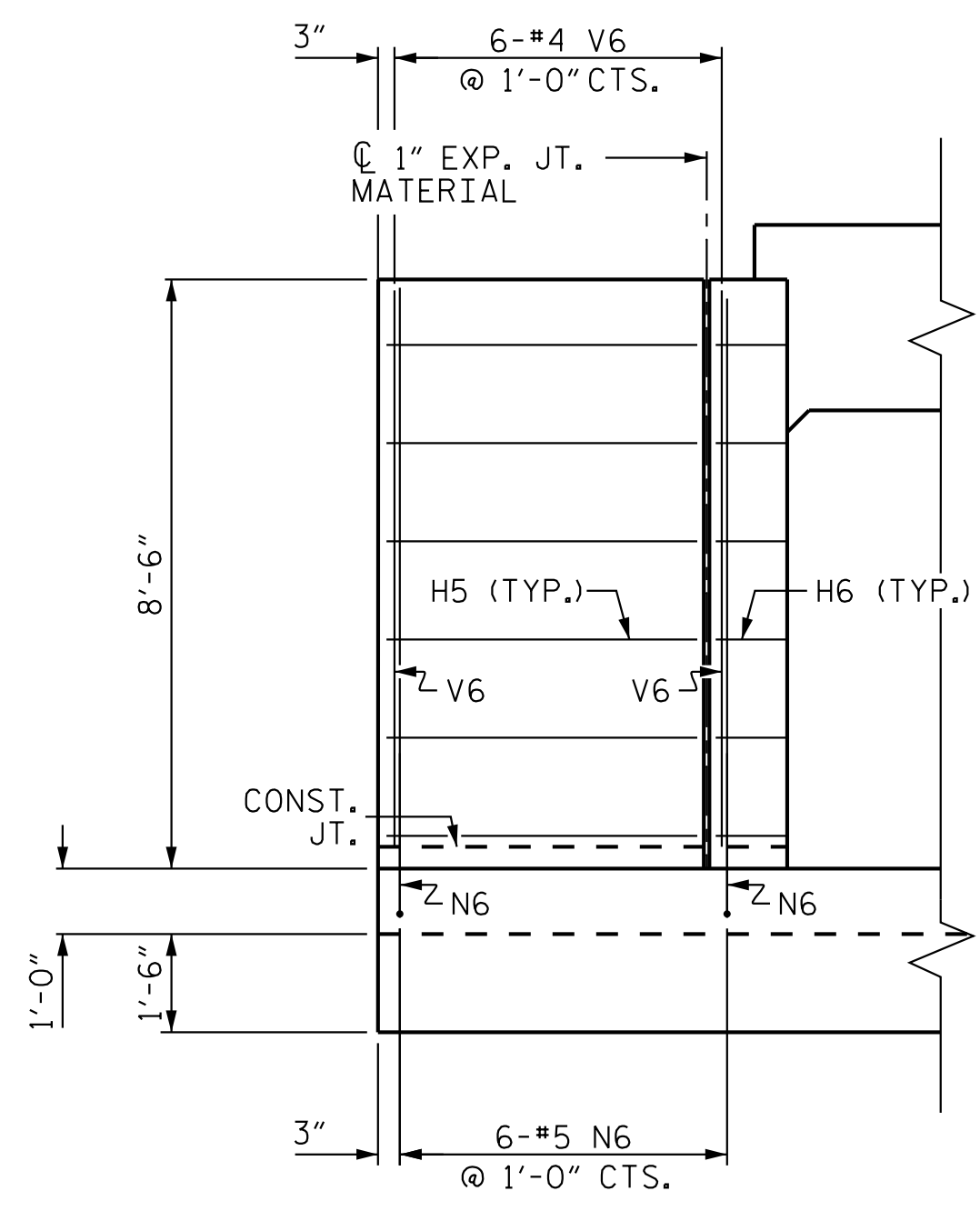


PLAN W1

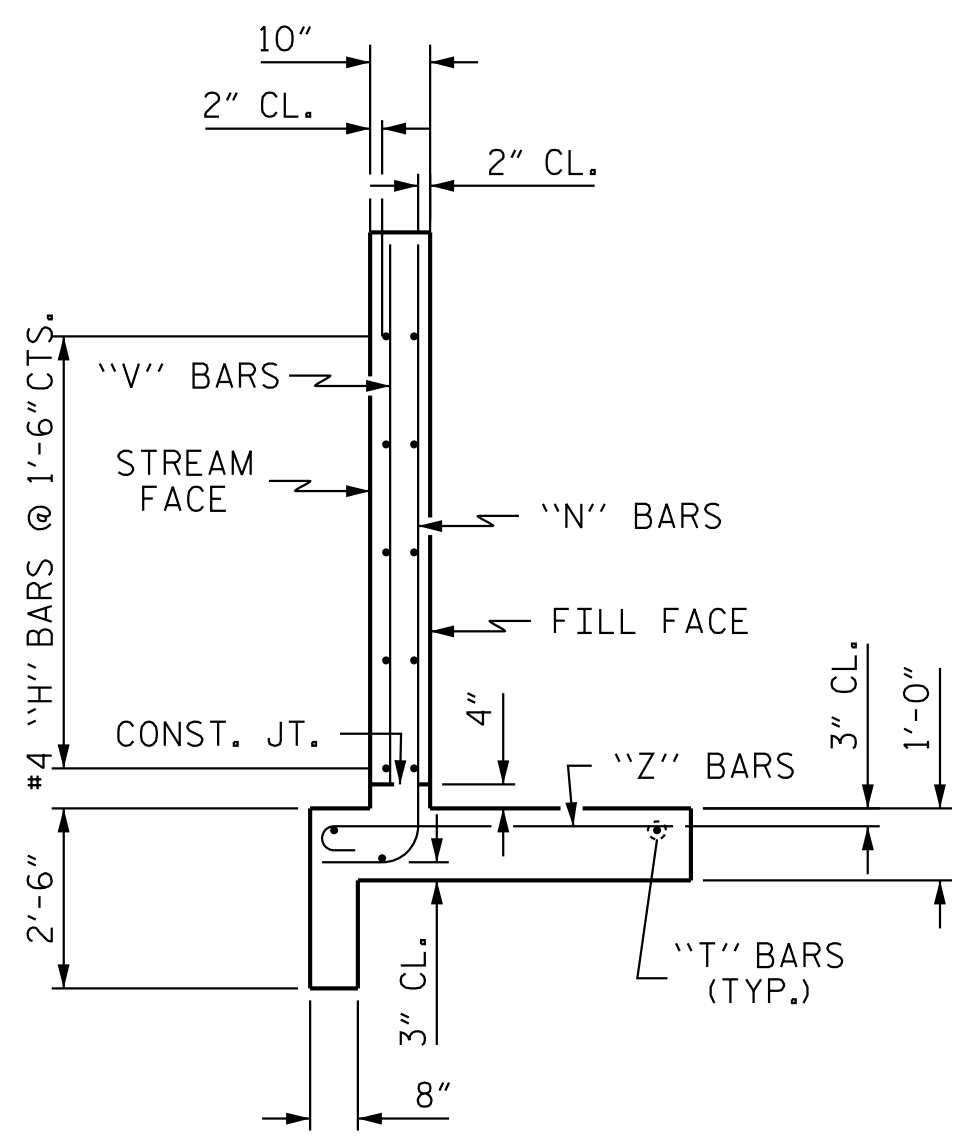
* BOTTOM OF FLOOR SLAB & FOOTING



ELEVATION W2



ELEVATION W1



BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	6	4	STR	7'-1"	28
H2	2	4	STR	5'-2"	7
H3	12	4	1	3'-3"	26
H4	2	4	STR	7'-9"	10
H5	12	4	STR	4'-4"	35
H6	12	4	1	3'-3"	26
N1	2	5	2	9'-1"	19
N2	2	5	2	8'-6"	18
N3	2	4	2	7'-7"	10
N4	2	4	2	6'-9"	9
N5	2	4	2	5'-10"	8
N6	6	5	2	10'-0"	63
S2	6	6	STR	6'-0"	54
T1	3	5	STR	9'-0"	28
T2	3	5	STR	7'-10"	25
V1	2	4	STR	7'-1"	9
V2	2	4	STR	6'-5"	9
V3	2	4	STR	5'-7"	7
V4	2	4	STR	4'-8"	6
V5	2	4	STR	3'-10"	5
V6	6	4	STR	8'-0"	32
Z1	2	4	3	5'-3"	7
Z2	2	4	3	4'-9"	6
Z3	3	4	3	3'-11"	8
Z4	3	4	3	3'-1"	6
Z5	9	4	3	5'-5"	33
REINFORCING STEEL FOR 2 WINGS				494	LBS
CLASS A CONCRETE					
2 WINGS				6.9	CY
1 HEADWALLS				0.6	CY
1 END CURTAIN WALLS				0.5	CY
TOTAL				8.0	CY

K:\BIDI_Structures\Calver\NC\01036489 - B-2530B\Cad\Drawings\5-VIS-015-R2530B-SMJ.CUI.008.dgn

DRAWN BY: D.D. LOWERY DATE: 12/18
 CHECKED BY: P.D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A.L. PHILLIPS DATE: 12/18

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SHEET 8 OF 9

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2			4			9

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM THE EXTERIOR EDGE OF EXTERIOR WALL.

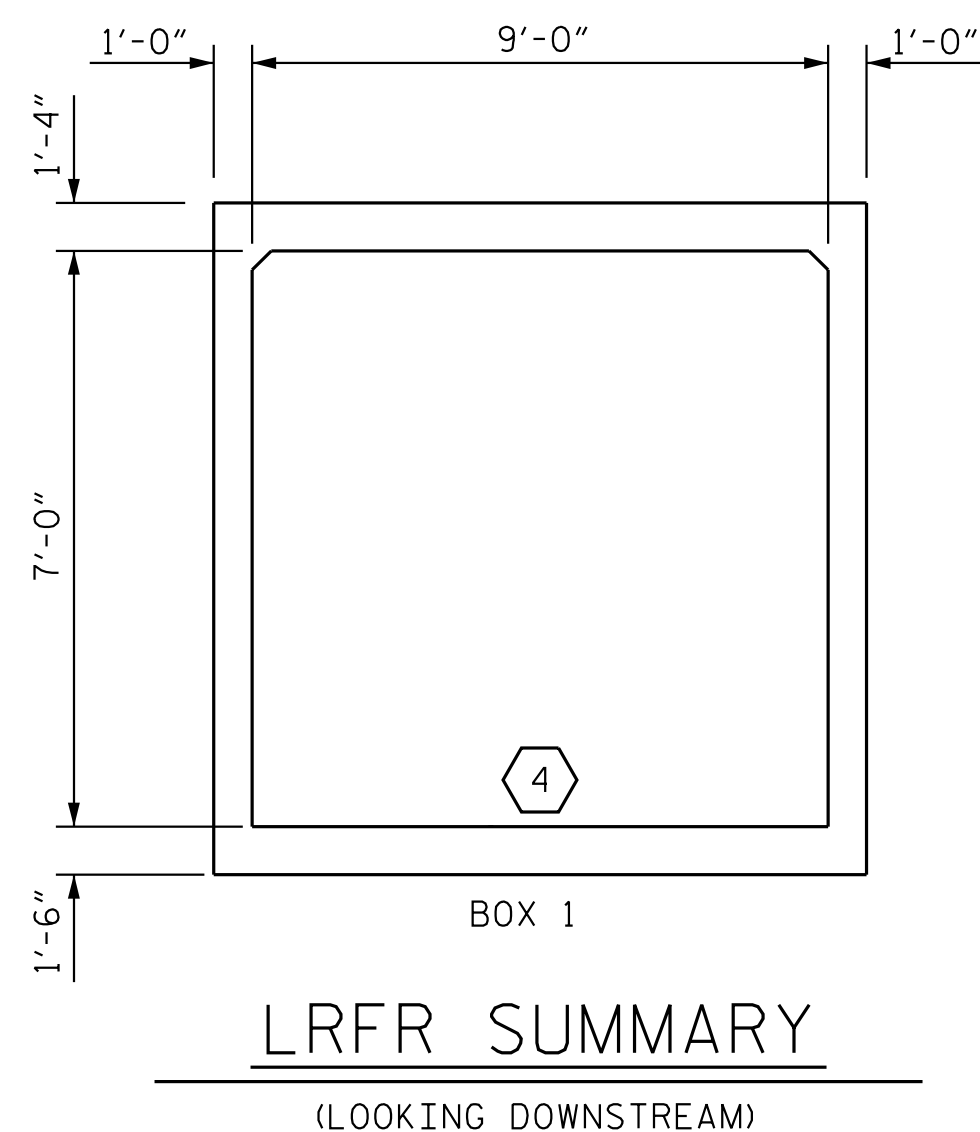
COMMENTS:

1. EFFECTS OF LIVE LOAD MAY BE NEGLECTED ACCORDING TO AASHTO LRFD 3.6.1.2.6A (DESIGN FILL = 23')

2. 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"

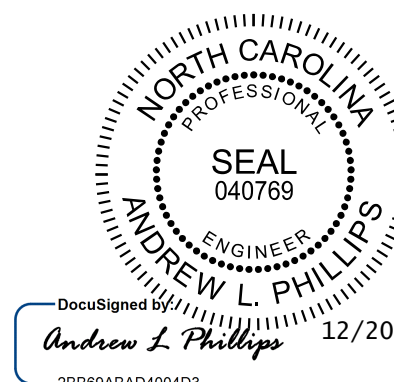
LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS																
LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						LIVE-LOAD FACTORS (γ _{LL})	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A		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		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)	SNSH	13.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
		SNGARBS2	20.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
		SNAGRIS2	22.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
		SNCOTTS3	27.250		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
		SNAGGRS4	34.925		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
		SNS5A	35.550		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
		SNS6A	39.950		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
	SNS7B	42.000		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)	TNAGRIT3	33.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		TNT4A	33.075		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		TNT6A	41.600		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		TNT7A	42.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		TNT7B	42.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		TNAGRIT4	43.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
TNAGT5A		45.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
TNAGT5B	45.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1		
PERMANENT LOADS		N/A	4	1.22	N/A	N/A	1.22	1	BOTTOM SLAB	5.50	1.27	1	BOTTOM SLAB	1.00	2	

#	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	



PROJECT NO. R-2530B
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SHEET 9 OF 9



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

REVISIONS						SHEET NO.
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STD. NO. LRFR5

12/20/2018 K:\BIDI_Structures\Culvert\NC\01036489 - B-2530B\Cad\Drawn\Culvert_5_V15_017_R2530B_SML_CUL_009.dgn

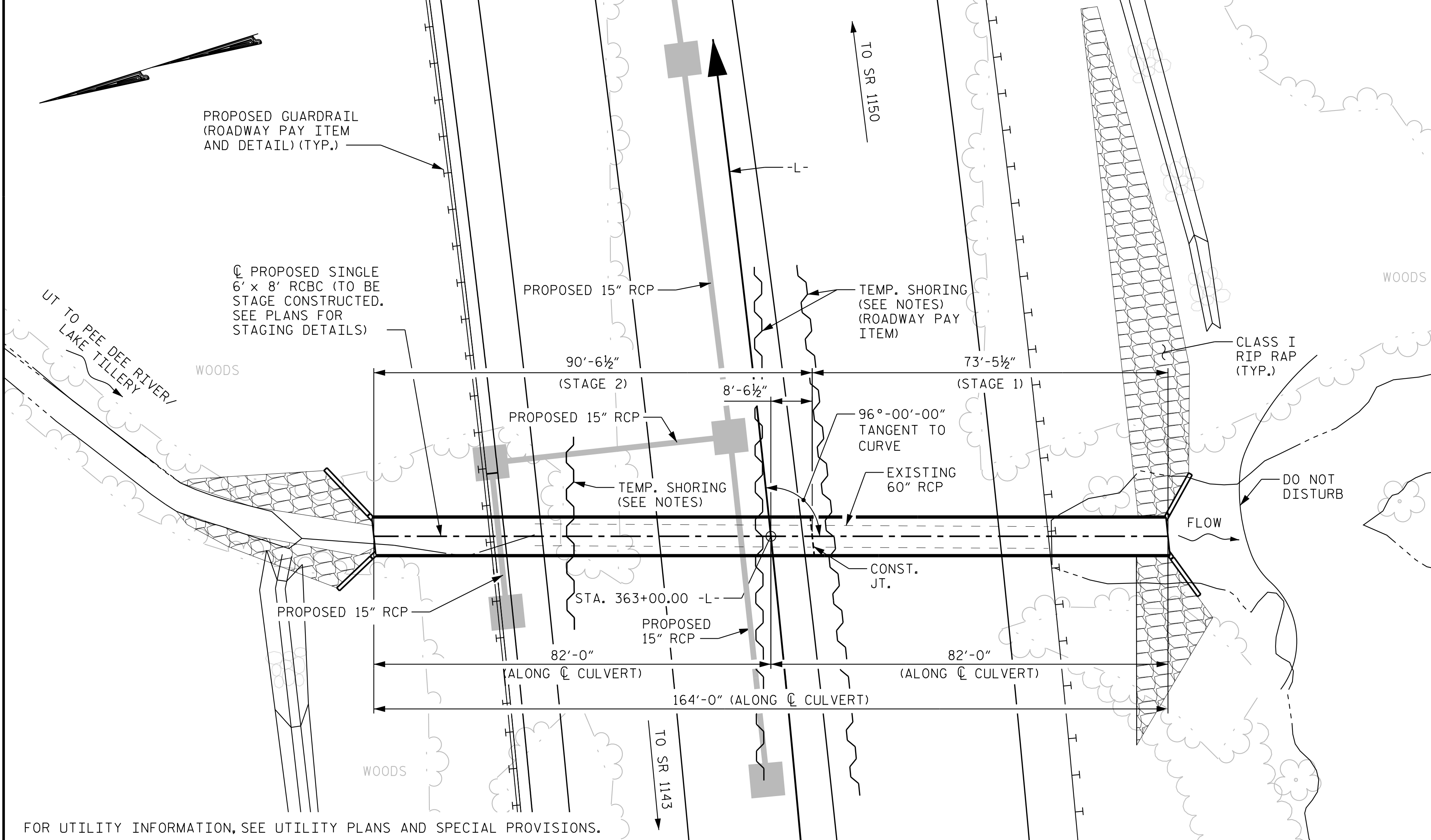
ASSEMBLED BY : D. D. LOWERY	DATE : 12/18
CHECKED BY : P. D. COOKSEY	DATE : 12/18
DRAWN BY : WMC 7/11	REV. 10/1/11 MAA/GM
CHECKED BY : GM 7/11	REV. 12/17 MAA/THC

BENCHMARK: BM#47, -L- STA. 359+03.27, OFFSET 55.17' RT., EL. 292.23', RR SPIKE IN BASE 24" TULIP POPLAR

F.A. PROJECT NO. STBG-0024(083)

NOTES

- ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING.
- DESIGN FILL ----- 15.0 FT.
- FOR OTHER DESIGN DATA AND GENERAL NOTES, SEE SHEET SN.
- 3"Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN STAGE 1 OR STAGE 2 CULVERT TO BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS, CURTAIN WALLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
- THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
- AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACES OF THE EXTERIOR WALLS ABOVE THE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- AFTER SERVING AS A TEMPORARY STRUCTURE THE EXISTING 60" RCP LOCATED AT THE SAME LOCATION AS THE PROPOSED CULVERT SHALL BE REMOVED. THE EXISTING STRUCTURE IS PRESENTLY NOT POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE STRUCTURE DETERIORATE DURING CONSTRUCTION OF THE PROPOSED CULVERT, A LOAD LIMIT MAY BE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
- FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE ROADWAY PLANS.
- TRAFFIC ON NC 24/27/73 SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS SHOWN ON THESE PLANS AS DIRECTED BY THE ENGINEER.
- TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
- A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
- 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.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.



LOCATION SKETCH

TOTAL STRUCTURE QUANTITIES			
STAGE 1		STAGE 2	
CLASS A CONCRETE			
BARREL @ 1.140	CY/FT 83.7	C.Y.	
WINGS ETC.	10.9	C.Y.	
TOTAL	94.6	C.Y.	
REINFORCING STEEL			
BARREL	12,172	LBS.	
WINGS ETC.	756	LBS.	
TOTAL	12,928	LBS.	
FOUNDATION CONDITIONING MATERIAL			
	62 TONS		77 TONS
CULVERT EXCAVATION STA. 363+00.00 -L-		LUMP SUM	
REMOVAL OF EXISTING STRUCTURE STA. 363+00.00 -L-		LUMP SUM	

HYDRAULIC DATA	
DESIGN DISCHARGE	-----190 CFS
FREQUENCY OF DESIGN FLOOD	-----50 YR.
DESIGN HIGH WATER ELEVATION	-----281.1 FT.
DRAINAGE AREA	-----0.22 SQ. MI.
BASE DISCHARGE (Q100)	-----220 CFS
BASE HIGH WATER ELEVATION	-----281.7 FT.
OVERTOPPING FLOOD DATA	
OVERTOPPING DISCHARGE	----->300 CFS
FREQUENCY OF OVERTOPPING FLOOD	---500+ YR.
OVERTOPPING FLOOD ELEVATION	-----296.1 FT.

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

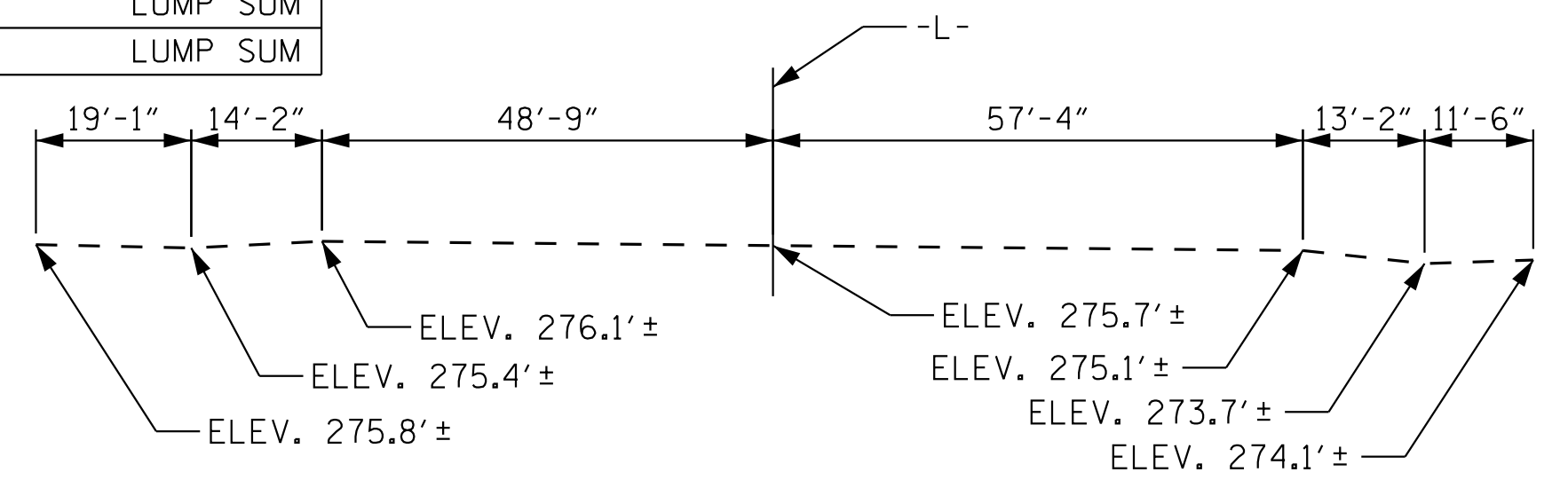


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PROJECT NO. R-2530B
MONTGOMERY COUNTY
 STATION: 363+00.00 -L-

SHEET 1 OF 8
 STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE 6 FT. X 8 FT.
 CONCRETE BOX CULVERT
 96° SKEW

ROADWAY DATA	
GRADE POINT ELEV. @ STA 363+00.00 -L-	= 296.64'
BED ELEVATION @ STA 363+00.00 -L-	= 275.40'
ROADWAY SLOPES VARIES	



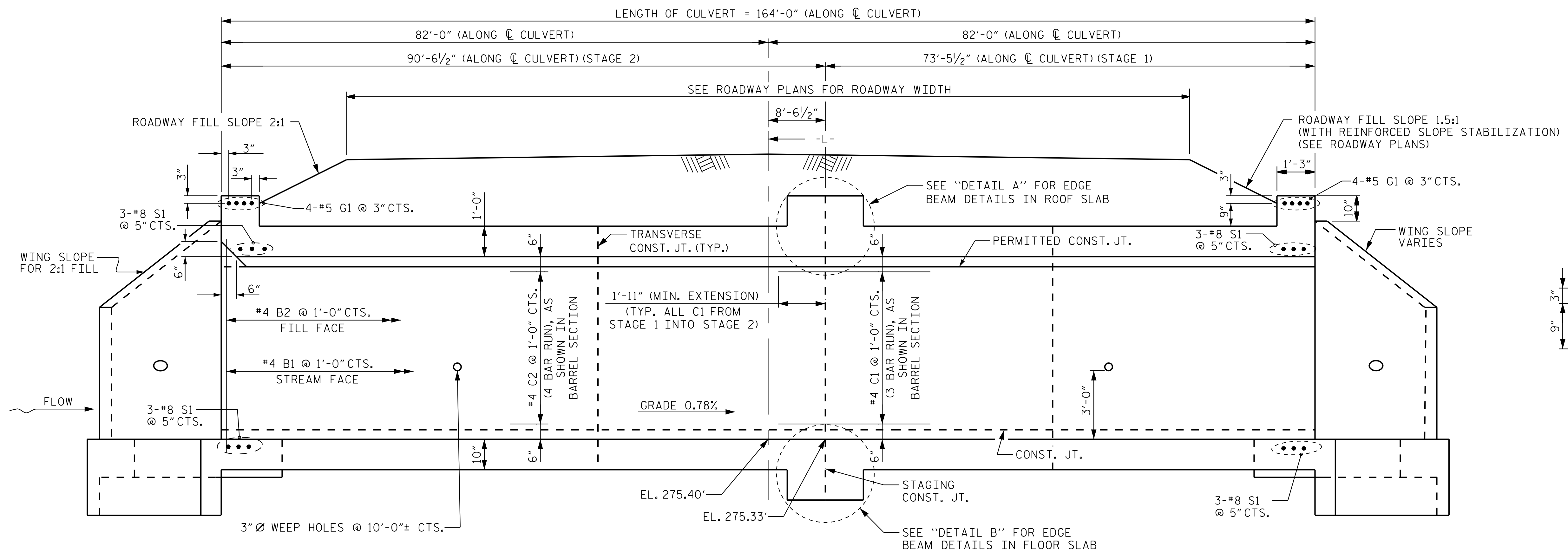
PROFILE ALONG CULVERT
 ELEVATIONS TAKEN ALONG CENTERLINE CHANNEL

DRAWN BY: D. D. LOWERY DATE: 12/18
 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

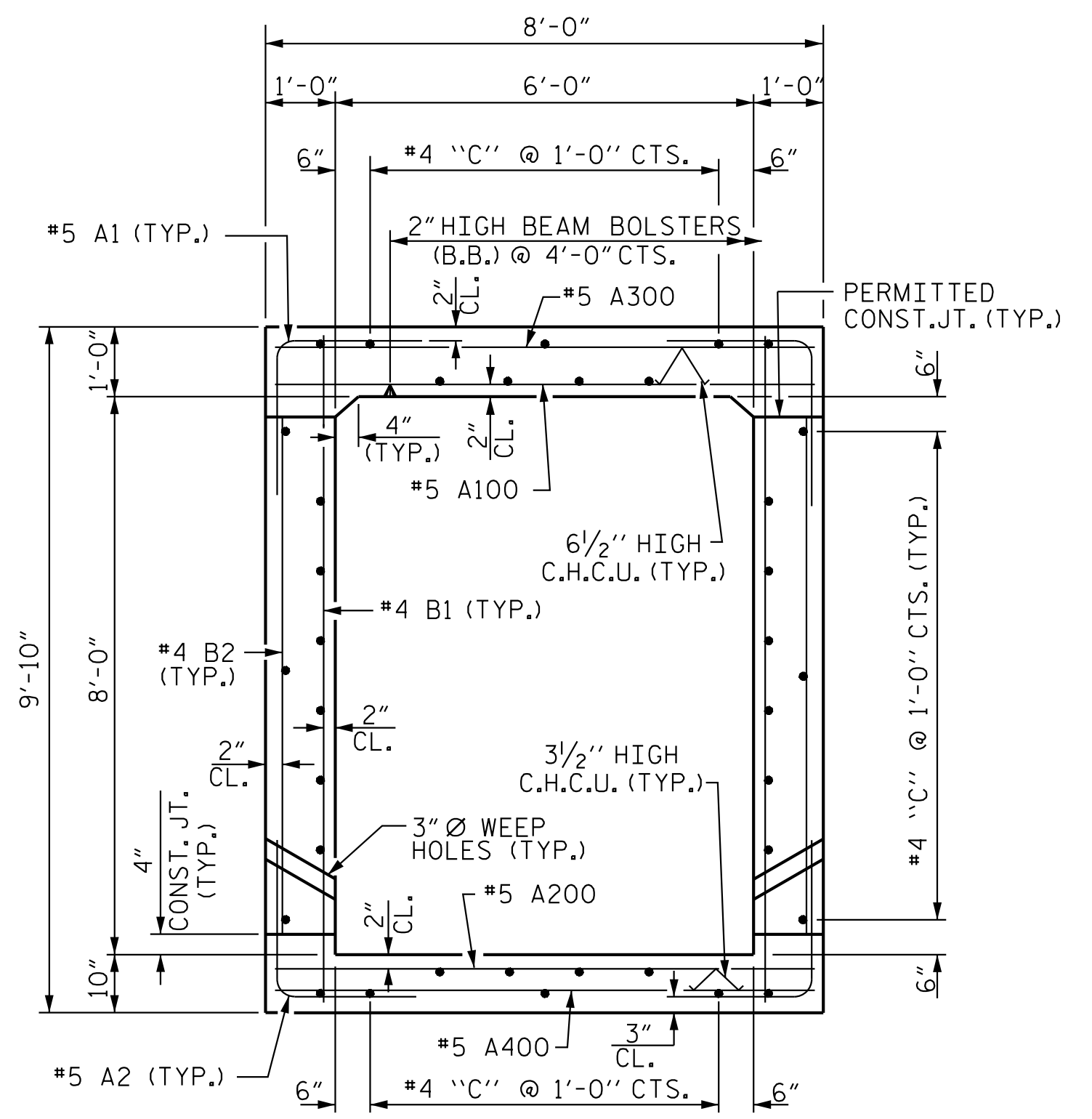
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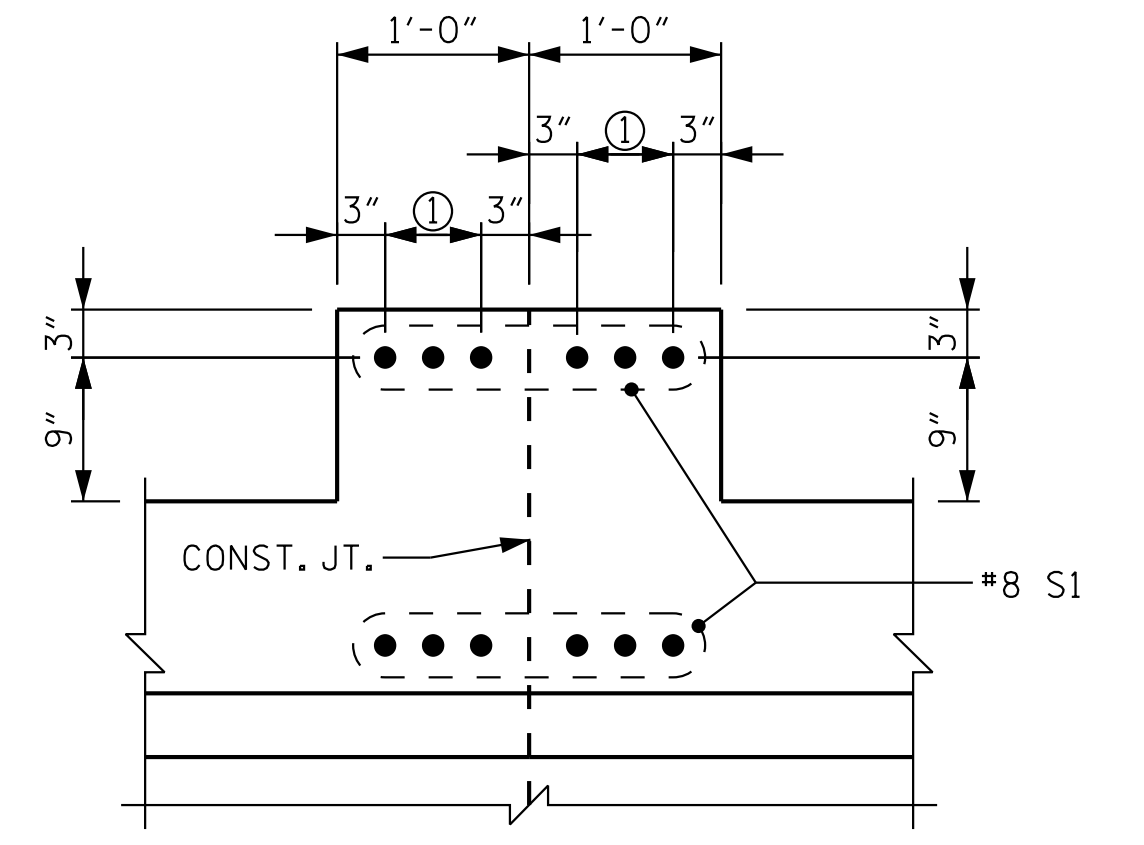
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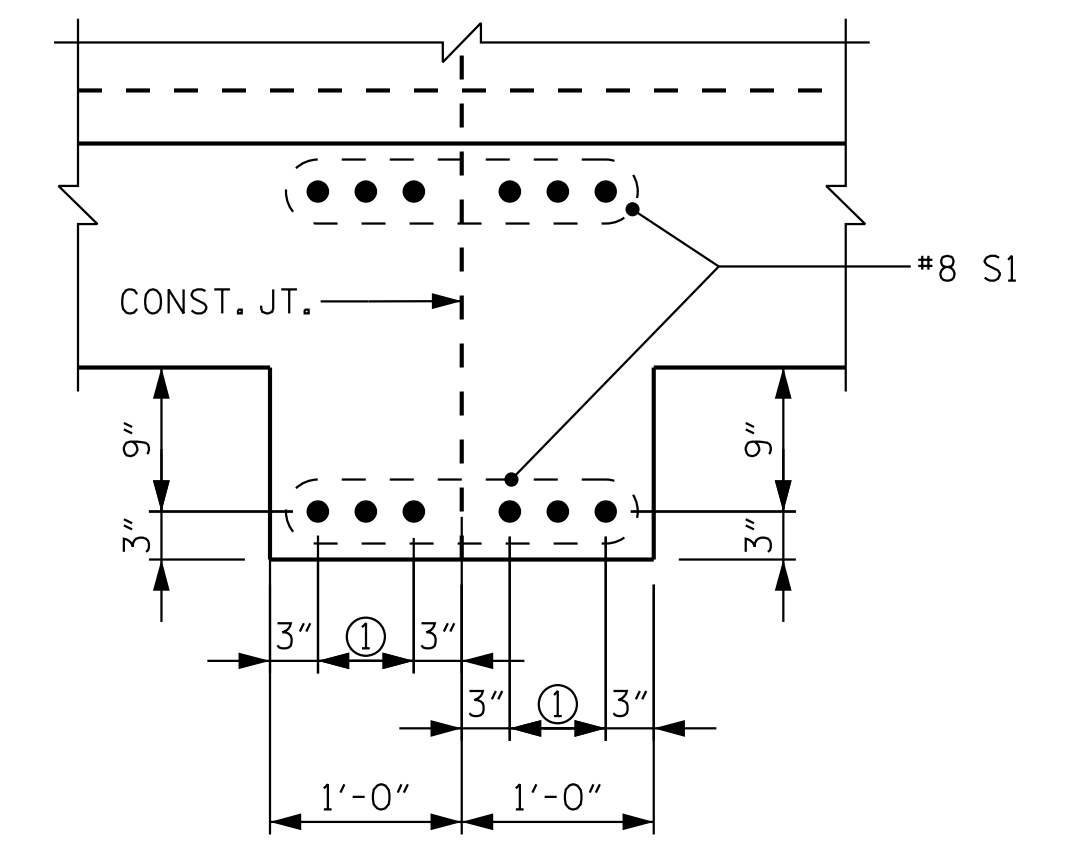
CULVERT SECTION NORMAL TO ROADWAY



RIGHT ANGLE SECTION OF BARREL
THERE ARE 36 "C" BARS IN SECTION OF BARREL



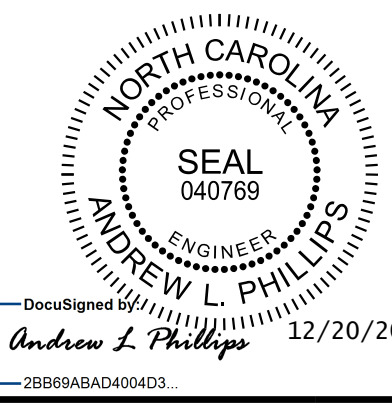
DETAIL A
① 2 SPA. @ 3"



DETAIL B
① 2 SPA. @ 3"

PROJECT NO. R-2530B
MONTGOMERY COUNTY
 STATION: 363+00.00 -L-

SHEET 2 OF 8



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 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE 6 FT. X 8 FT.
 CONCRETE BOX CULVERT
 96° SKEW

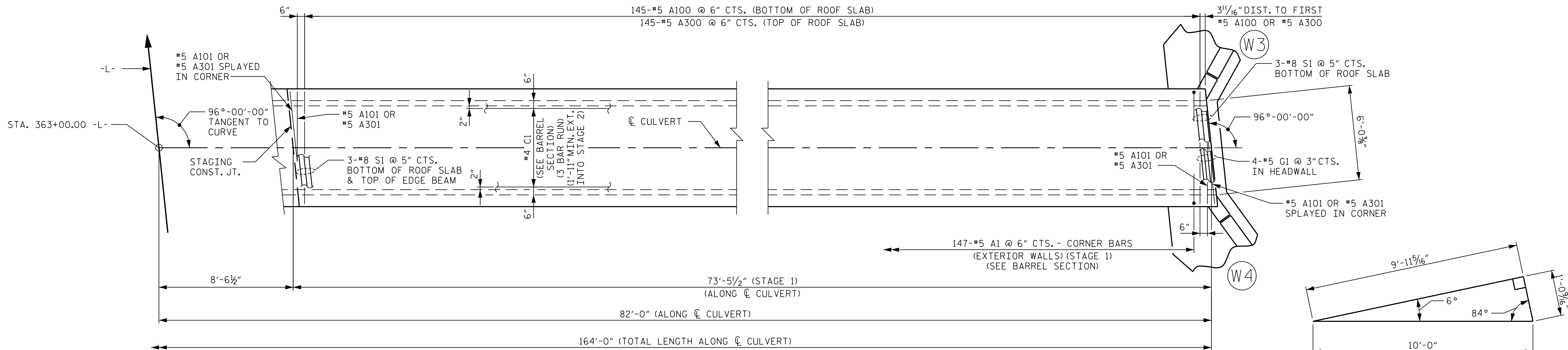
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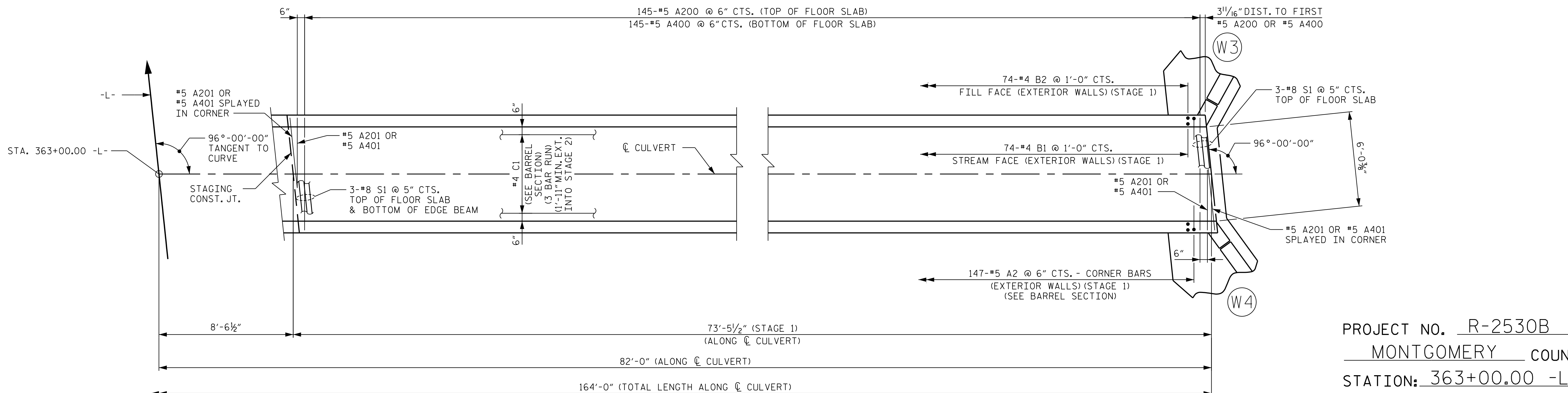
DRAWN BY: D. D. LOWERY DATE: 12/18
 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

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ROOF SLAB PLAN - STAGE 1

SKIEW TRIANGLE



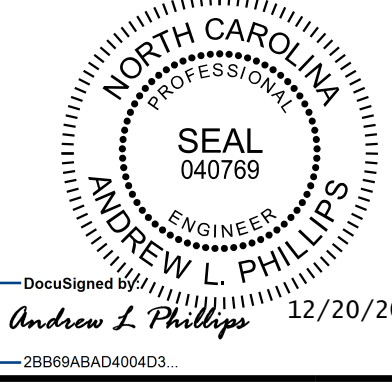
FLOOR SLAB PLAN - STAGE 1

NOTE: FOR S2 BARS IN THE FLOOR SLAB & WING FOOTINGS, SEE SHEET C06-7.

PROJECT NO. R-2530B
MONTGOMERY COUNTY
 STATION: 363+00.00 -L-

SHEET 3 OF 8

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STAGE 1
 SINGLE 6 FT. X 8 FT.
 CONCRETE BOX CULVERT
 96° SKEW



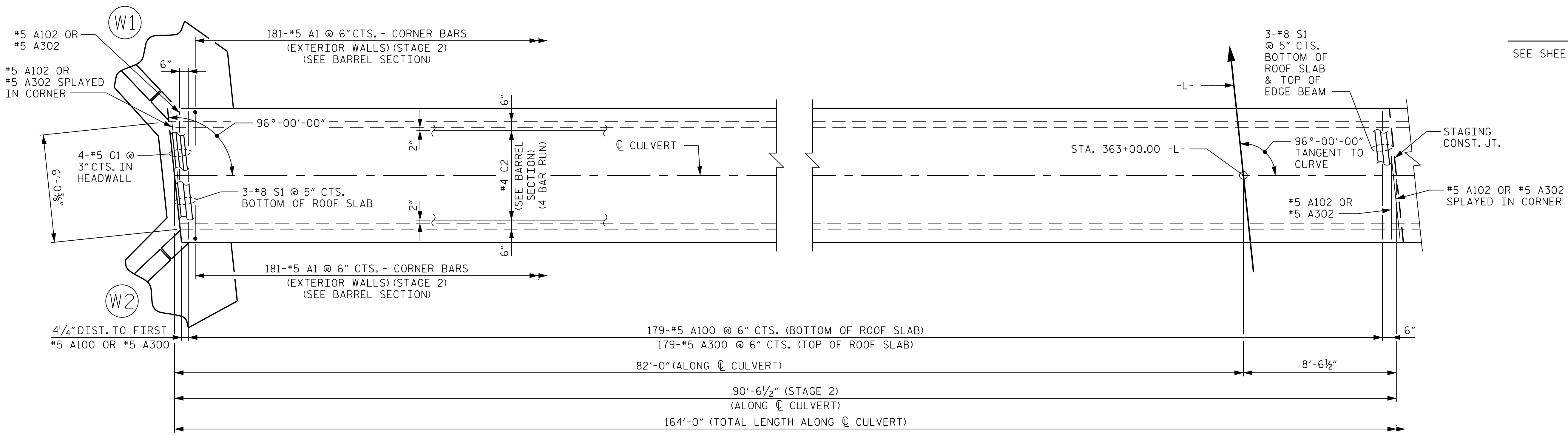
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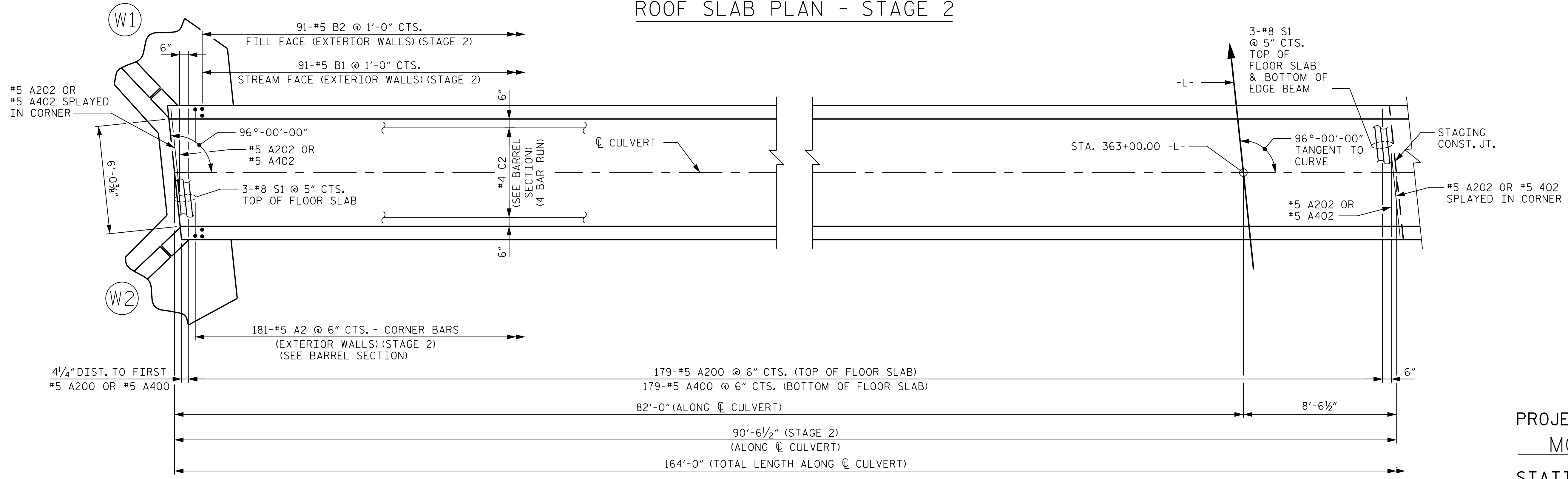
DRAWN BY: D. D. LOWERY DATE: 12/18
 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

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NOTE
SEE SHEET C06-3 FOR SKEW TRIANGLE.

ROOF SLAB PLAN - STAGE 2

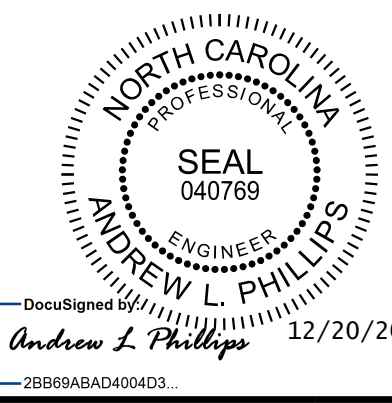


FLOOR SLAB PLAN - STAGE 2

NOTE: FOR S2 BARS IN THE FLOOR SLAB & WING FOOTINGS, SEE SHEET C06-6.

PROJECT NO. R-2530B
MONTGOMERY COUNTY
STATION: 363+00.00 -L-

SHEET 4 OF 8



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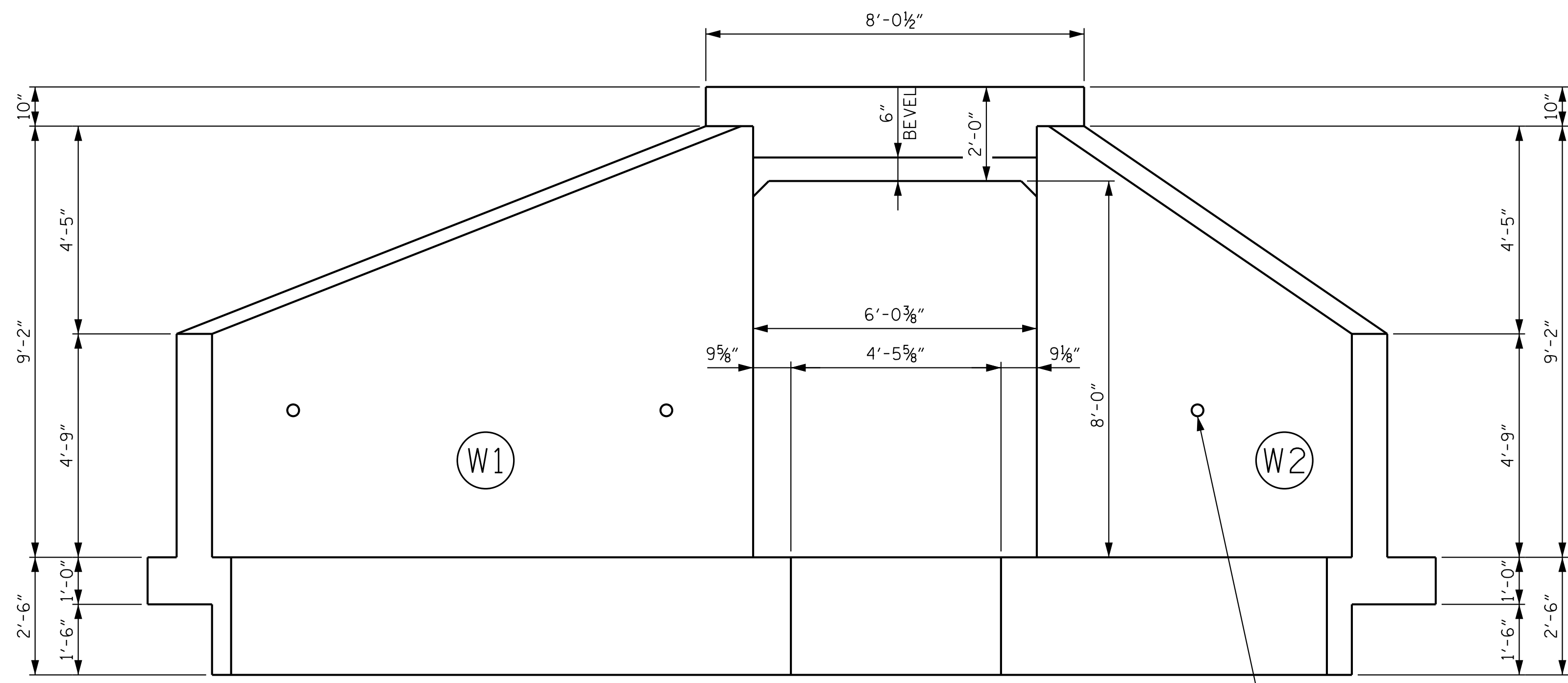
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
STAGE 2
SINGLE 6 FT. X 8 FT.
CONCRETE BOX CULVERT
96° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C06-4
1			3			TOTAL SHEETS
2			4			8

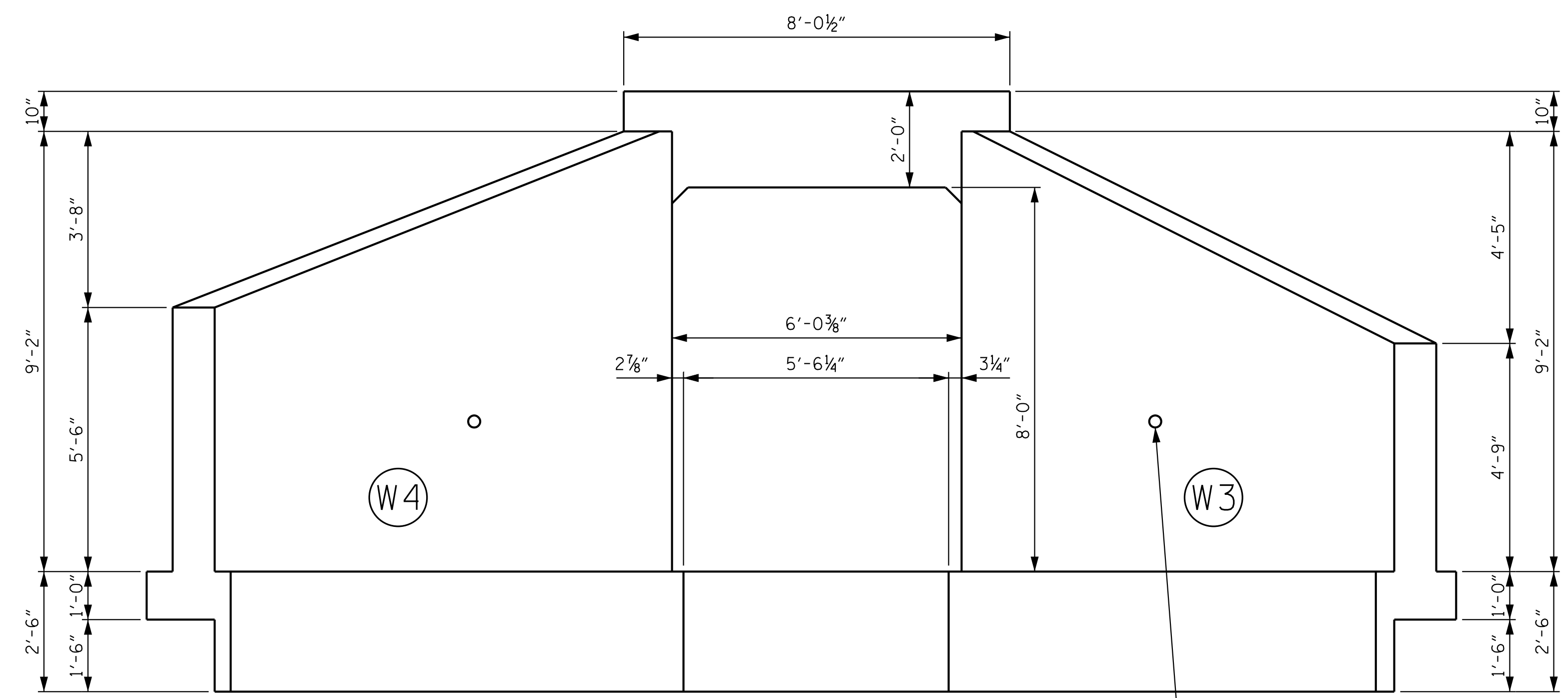
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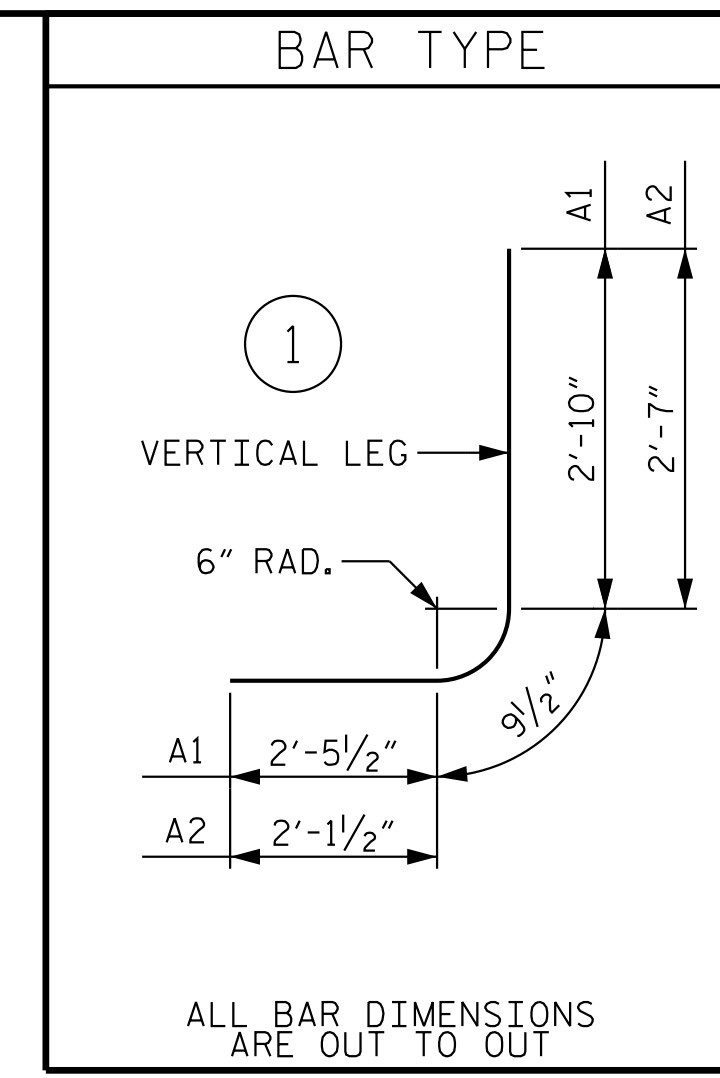
DRAWN BY: D. D. LOWERY DATE: 12/18
CHECKED BY: P. D. COOKSEY DATE: 12/18
DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18



END ELEVATION NORMAL TO SKEW - INLET
(STAGE 2)



END ELEVATION NORMAL TO SKEW - OUTLET
(STAGE 1)



BAR SIZE	SPLICE LENGTH
#4 B1	1'-5"
#4 C1 OR #4 C2	1'-11"

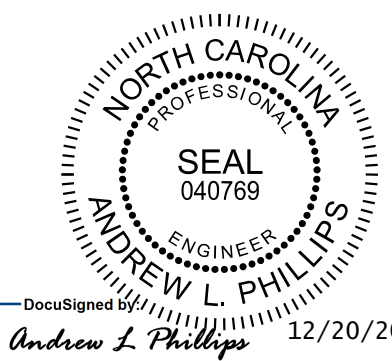
ALL BAR DIMENSIONS ARE OUT TO OUT

		BILL OF MATERIAL									
		STAGE 1					STAGE 2				
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	294	5	1	6'-1"	1,865	A1	362	5	1	6'-1"	2,297
A2	294	5	1	5'-6"	1,687	A2	362	5	1	5'-6"	2,077
A100	145	5	STR	7'-7"	1,147	A100	179	5	STR	7'-7"	1,416
A101	4	5	STR	4'-4"	18	A102	4	5	STR	4'-10"	20
A200	145	5	STR	7'-7"	1,147	A200	179	5	STR	7'-7"	1,416
A201	4	5	STR	4'-4"	18	A202	4	5	STR	4'-10"	20
A300	145	5	STR	7'-7"	1,147	A300	179	5	STR	7'-7"	1,416
A301	4	5	STR	4'-4"	18	A302	4	5	STR	4'-10"	20
A400	145	5	STR	7'-7"	1,147	A400	179	5	STR	7'-7"	1,416
A401	4	5	STR	4'-4"	18	A402	4	5	STR	4'-10"	20
B1	148	4	STR	9'-4"	923	B1	182	4	STR	9'-4"	1,135
B2	148	4	STR	7'-4"	725	B2	182	4	STR	7'-4"	892
C1	108	4	STR	26'-6"	1,912	C1	144	4	STR	24'-2"	2,325
G1	4	5	STR	7'-8"	32	G1	4	5	STR	7'-8"	32
S1	18	8	STR	7'-8"	368	S1	18	8	STR	7'-8"	368
REINFORCING STEEL					LBS. 12,172	REINFORCING STEEL					LBS. 14,870

STAGE 1 QUANTITIES				STAGE 2 QUANTITIES			
CLASS A CONCRETE				CLASS A CONCRETE			
BARREL @ 1,140 C.Y./FT.	83.7 C.Y.			BARREL @ 1,140 C.Y./FT.	103.2 C.Y.		
WINGS, ETC.	10.3 C.Y.			WINGS, ETC.	12.1 C.Y.		
EDGE BEAMS	0.6 C.Y.			EDGE BEAMS	0.6 C.Y.		
TOTAL	94.6 C.Y.			TOTAL	115.9 C.Y.		
REINFORCING STEEL				REINFORCING STEEL			
BARREL & EDGE BEAMS	12,172 LBS.			BARREL & EDGE BEAMS	14,870 LBS.		
WINGS, ETC.	756 LBS.			WINGS, ETC.	774 LBS.		
TOTAL	12,928 LBS.			TOTAL	15,644 LBS.		

PROJECT NO. R-2530B
MONTGOMERY COUNTY
 STATION: 363+00.00 -L-

SHEET 5 OF 8



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STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE 6 FT. X 8 FT.
 CONCRETE BOX CULVERT
 96° SKEW

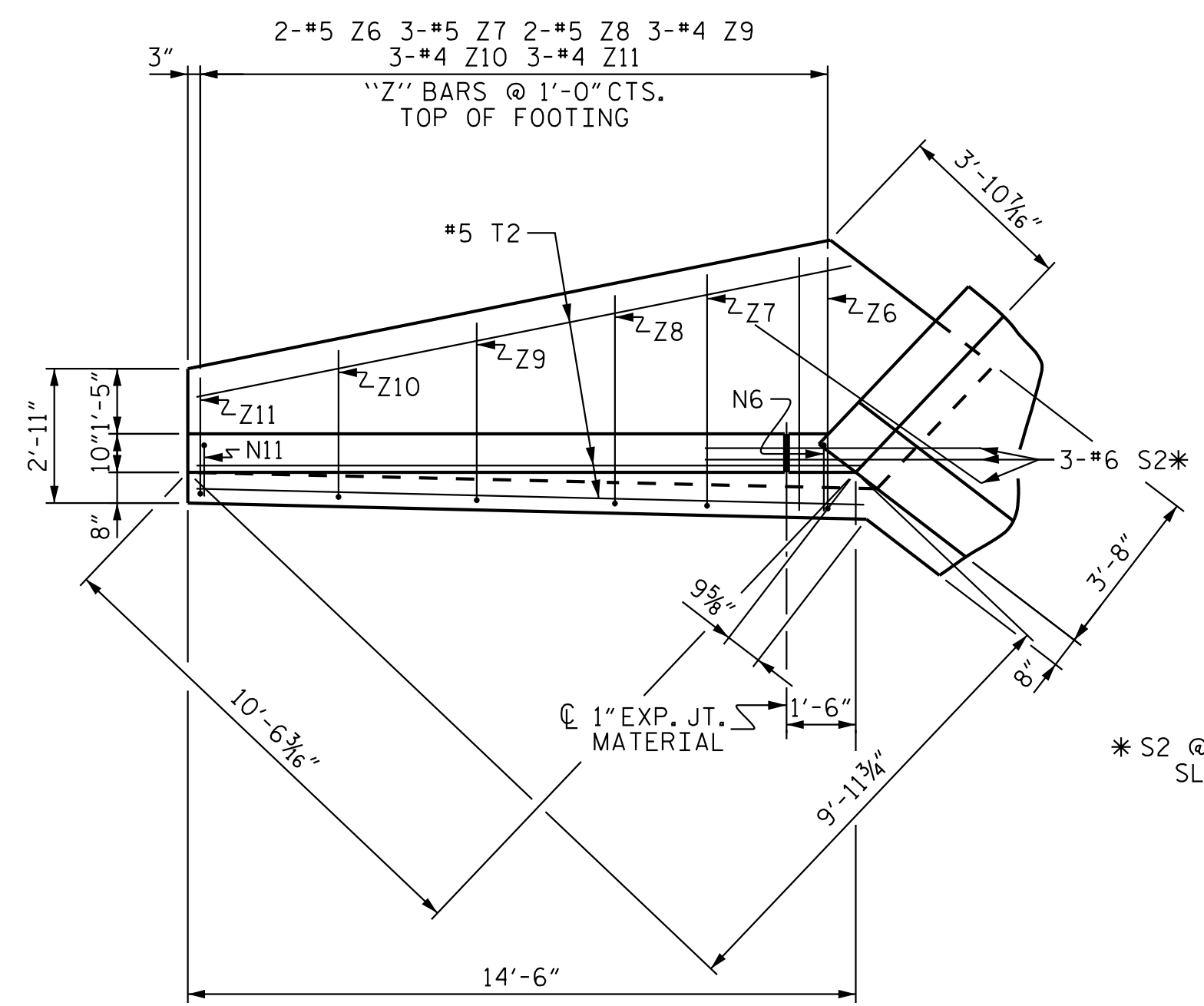
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C06-5
1			3			TOTAL SHEETS
2			4			8

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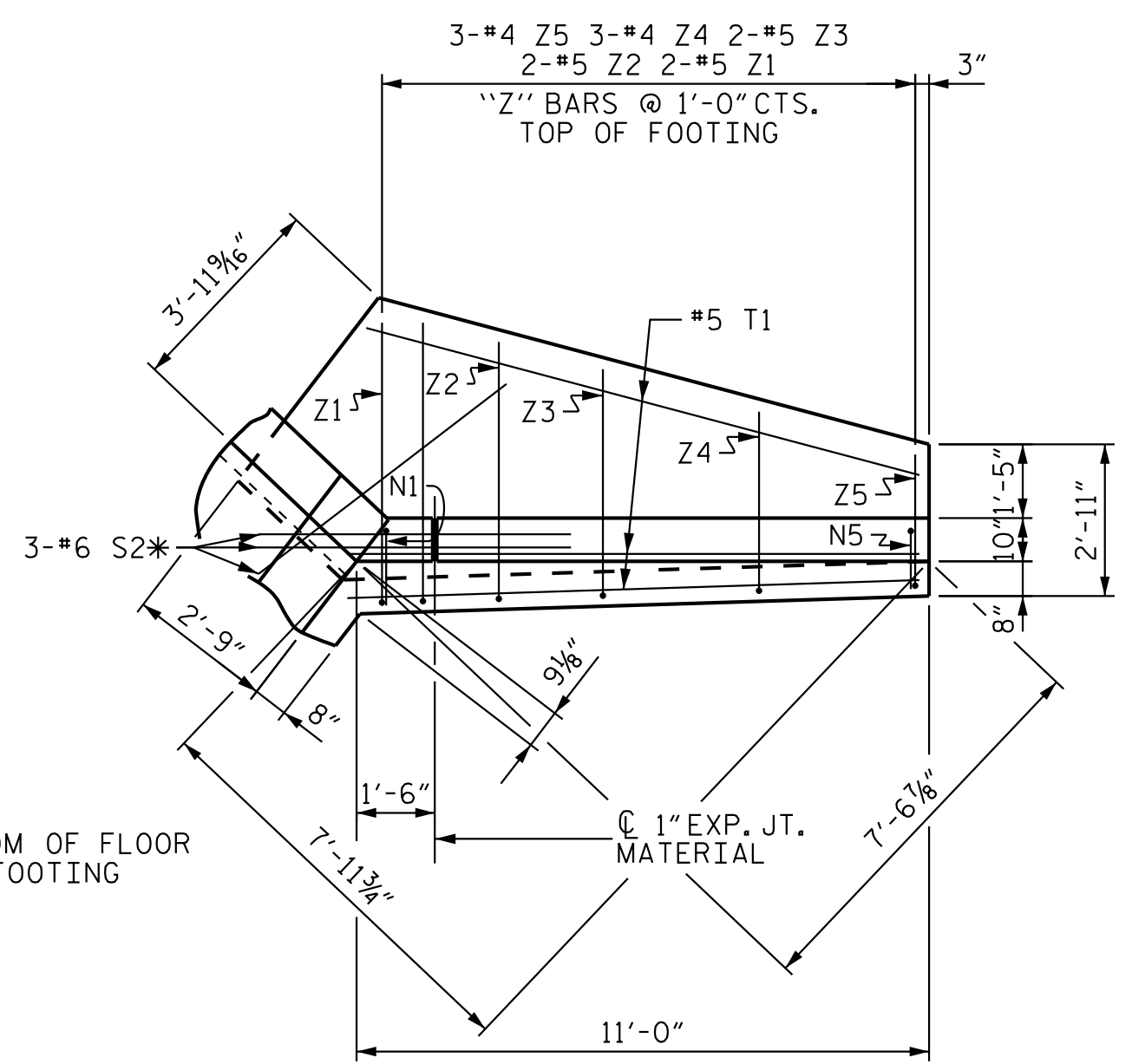
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DRAWN BY: D. D. LOWERY DATE: 12/18
 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

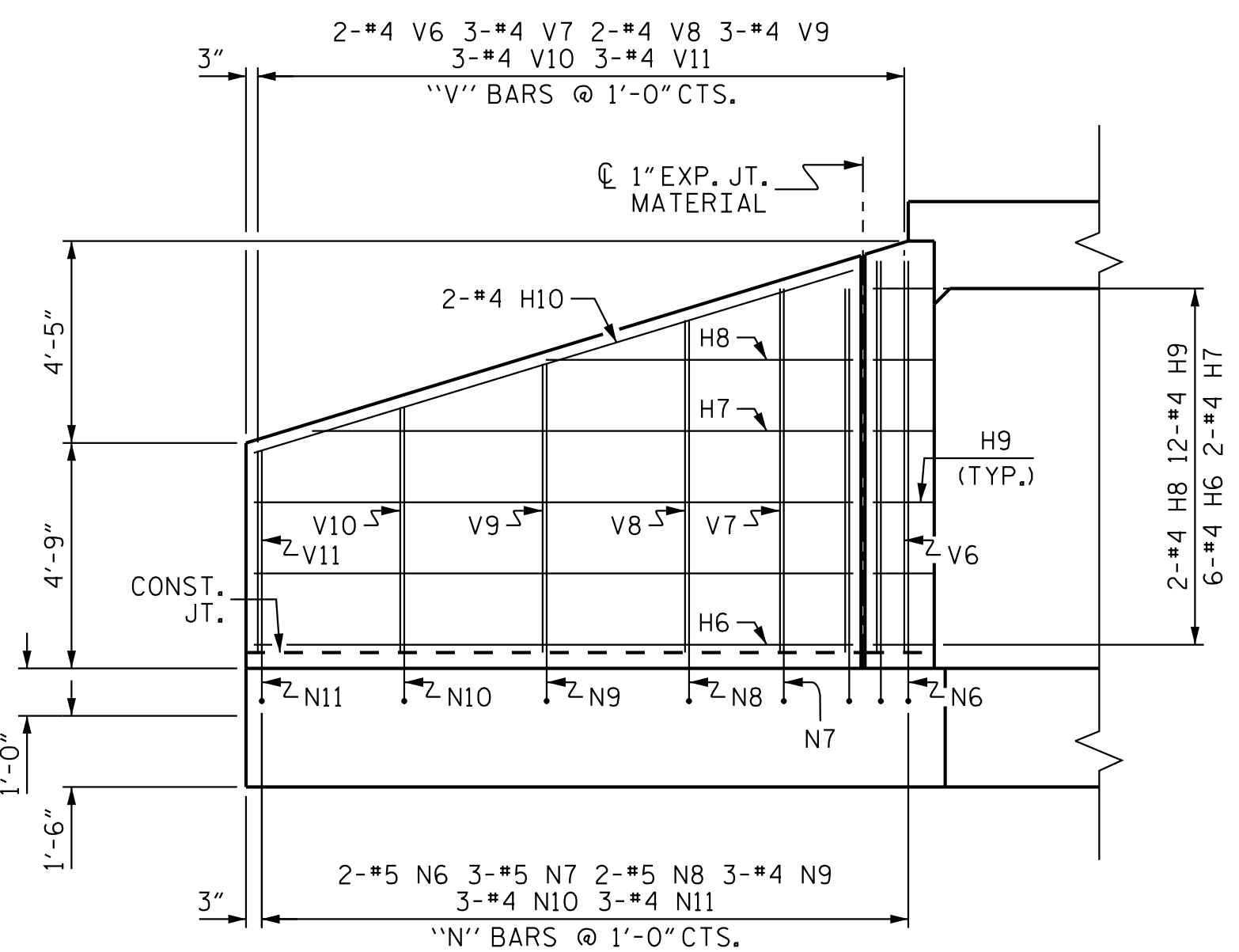
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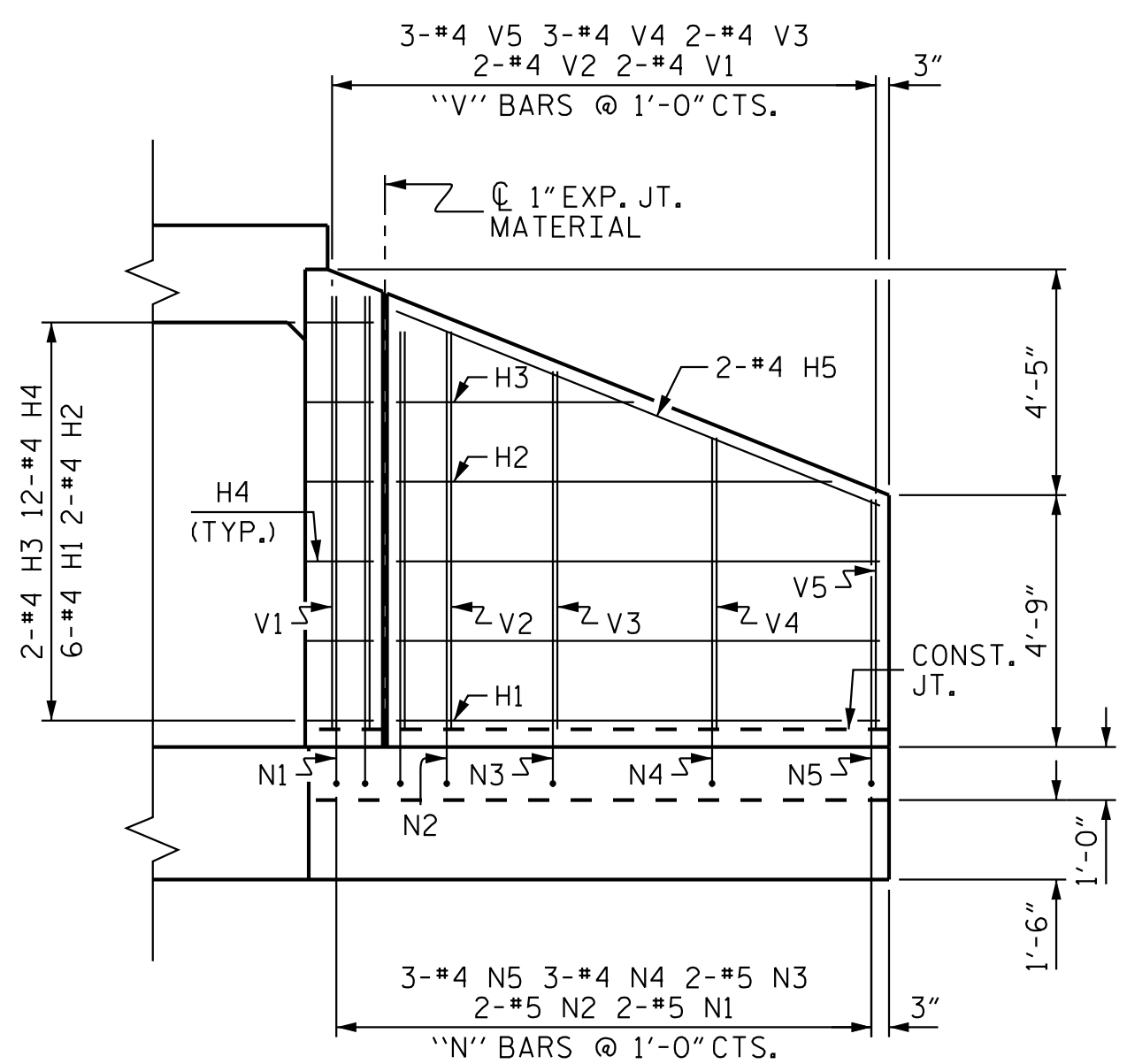
PLAN W1



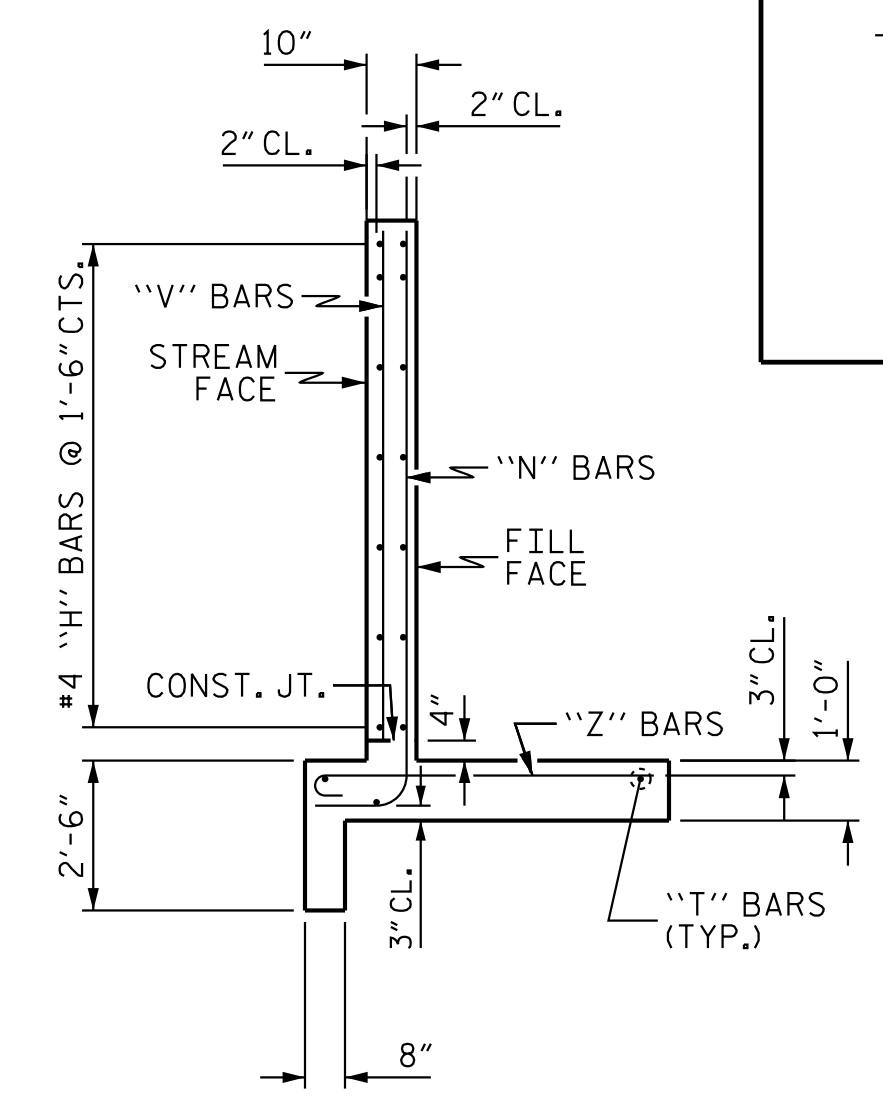
PLAN W2



ELEVATION W1



ELEVATION W2



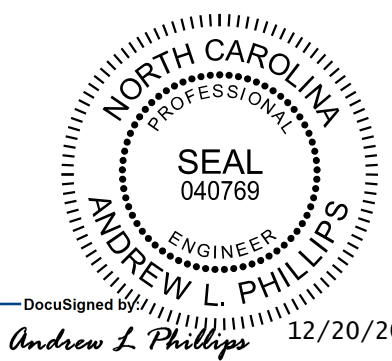
TYPICAL WING SECTION

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.	SIZE	TYPE	LENGTH	WEIGHT	
H1	6	#4	STR	9'-1"	37
H2	2	#4	STR	8'-2"	11
H3	2	#4	STR	4'-5"	6
H4	12	#4	1	3'-3"	26
H5	2	#4	STR	9'-10"	13
H6	6	#4	STR	12'-7"	51
H7	2	#4	STR	11'-4"	15
H8	2	#4	STR	6'-5"	9
H9	12	#4	2	3'-3"	26
H10	2	#4	STR	13'-2"	18
N1	2	#5	3	10'-2"	21
N2	2	#5	3	9'-7"	20
N3	2	#5	3	8'-9"	19
N4	3	#4	3	7'-7"	15
N5	3	#4	3	6'-4"	13
N6	2	#5	3	10'-3"	22
N7	3	#5	3	9'-8"	30
N8	2	#5	3	9'-1"	19
N9	3	#4	3	8'-2"	17
N10	3	#4	3	7'-3"	15
N11	3	#4	3	6'-4"	13
S2	6	#6	STR	6'-0"	54
T1	3	#5	STR	11'-0"	35
T2	3	#5	STR	14'-6"	46
V1	2	#4	STR	8'-2"	11
V2	2	#4	STR	7'-6"	10
V3	2	#4	STR	6'-9"	9
V4	3	#4	STR	5'-6"	11
V5	3	#4	STR	4'-4"	9
V6	2	#4	STR	8'-3"	11
V7	3	#4	STR	7'-8"	16
V8	2	#4	STR	7'-0"	10
V9	3	#4	STR	6'-1"	12
V10	3	#4	STR	5'-2"	11
V11	3	#4	STR	4'-3"	9
Z1	2	#5	4	6'-0"	12
Z2	2	#5	4	5'-7"	12
Z3	2	#5	4	5'-0"	11
Z4	3	#4	4	4'-0"	8
Z5	3	#4	4	3'-1"	6
Z6	2	#5	4	6'-1"	13
Z7	3	#5	4	5'-8"	18
Z8	2	#5	4	5'-2"	11
Z9	3	#4	4	4'-5"	9
Z10	3	#4	4	3'-9"	8
Z11	3	#4	4	3'-1"	6
REINFORCING STEEL FOR 2 WINGS				774	LBS
CLASS A CONCRETE					
2 WINGS				11.4	CY
1 HEADWALL				0.4	CY
1 END CURTAIN WALL				0.3	CY
TOTAL				12.1	CY



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PROJECT NO. R-2530B
MONTGOMERY COUNTY
 STATION: 363+00.00 -L-

SHEET 6 OF 8

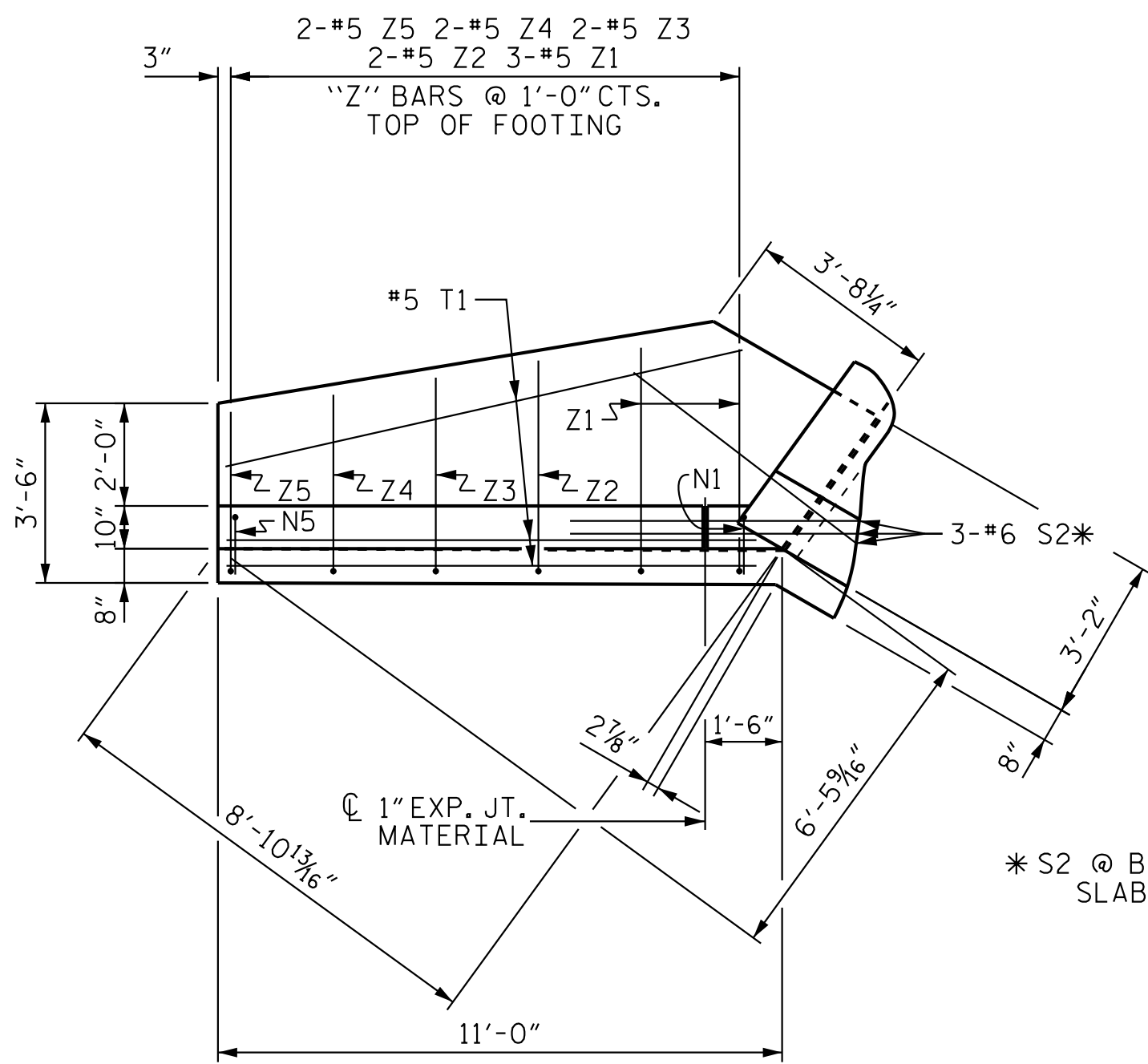
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**INLET WING DETAILS
 FOR STAGE 2
 CONCRETE BOX CULVERT**
 H = 8'-0" SLOPE = 2:1
 96° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C06-6
1			3			TOTAL SHEETS
2			4			8

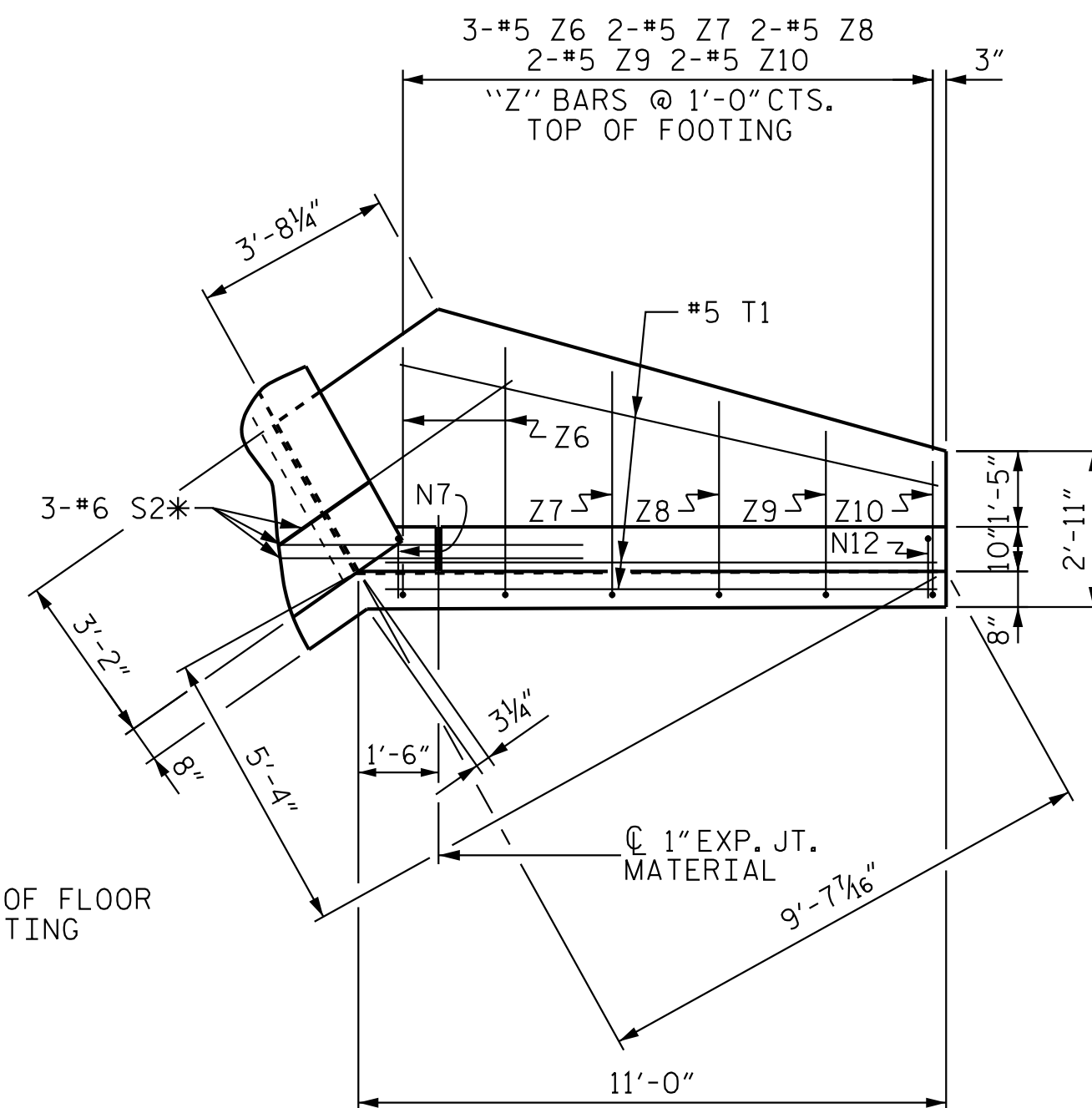
DRAWN BY: D. D. LOWERY DATE: 12/18
 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

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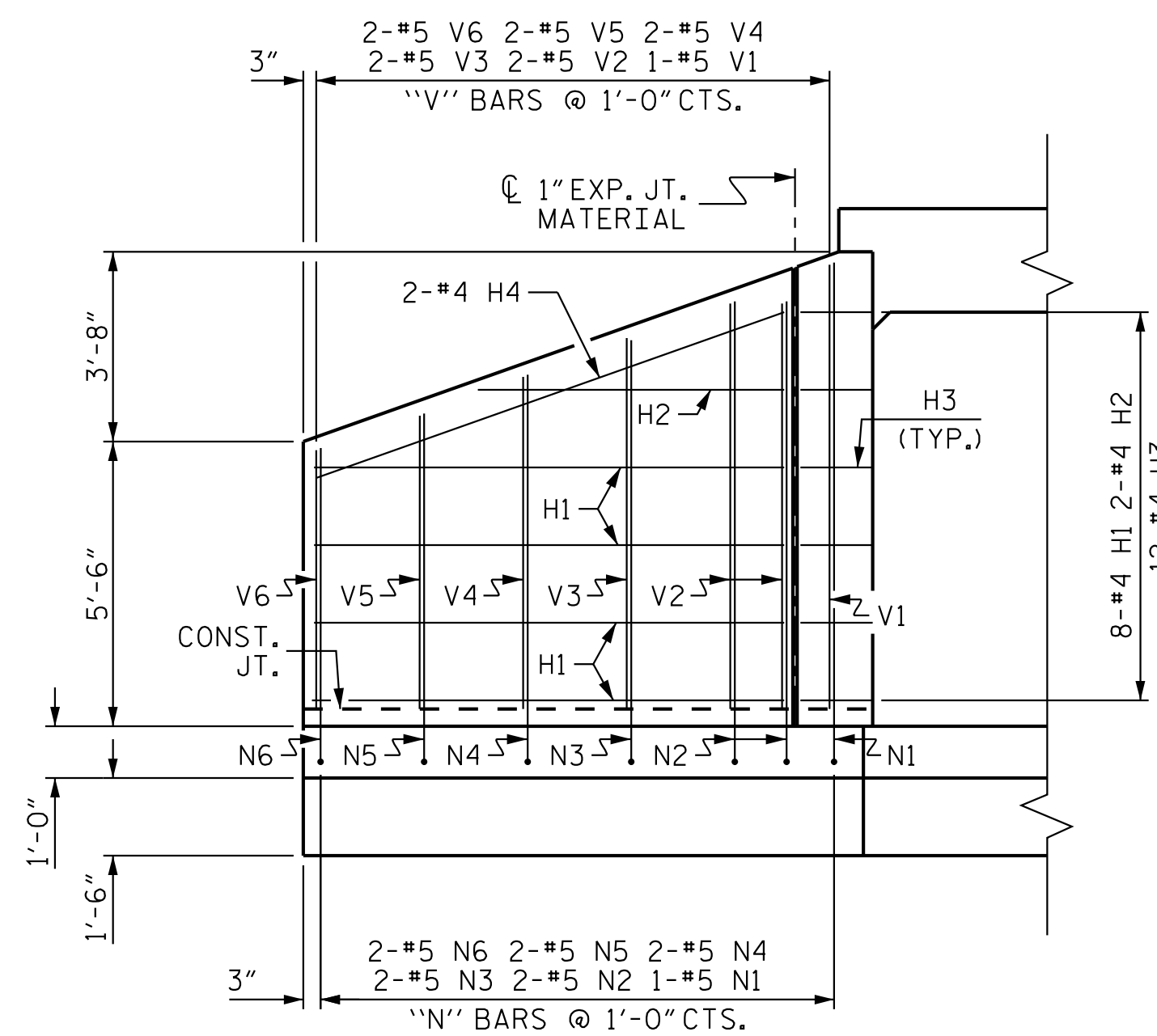
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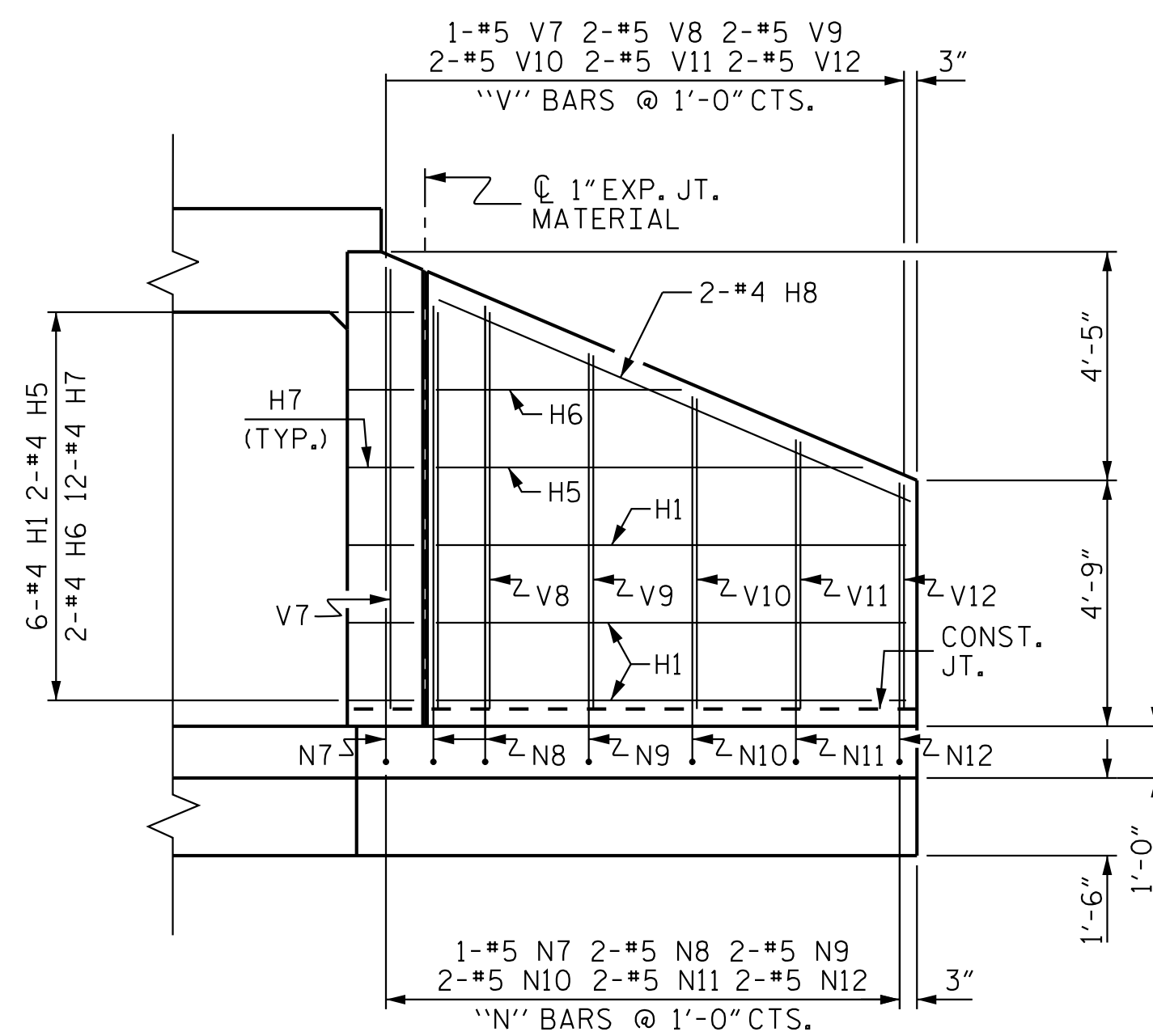
PLAN W4



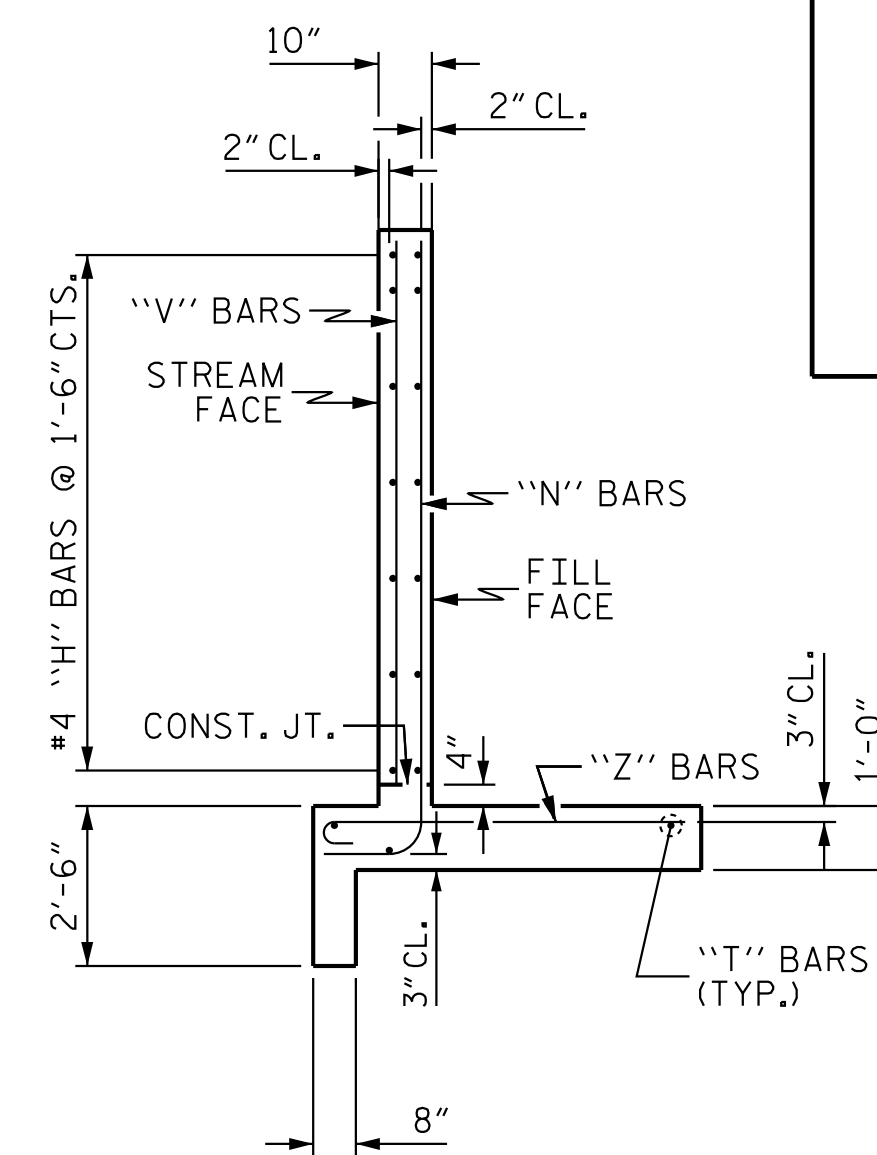
PLAN W3



ELEVATION W4



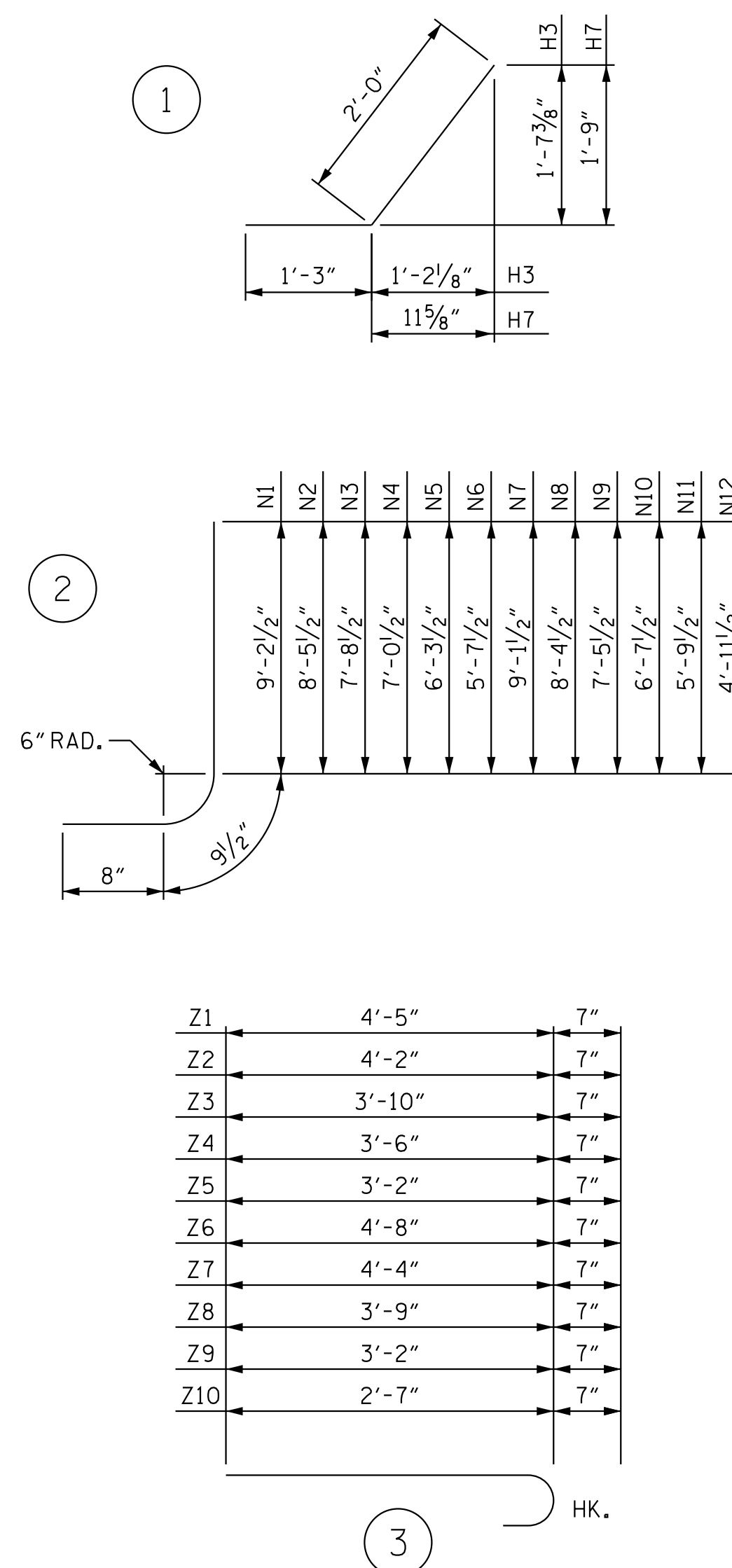
ELEVATION W3



TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.



BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	14	4	STR	9'-1"	85
H2	2	4	STR	6'-0"	8
H3	12	4	1	3'-3"	26
H4	2	4	STR	9'-7"	13
H5	2	4	STR	8'-3"	11
H6	2	4	STR	4'-9"	6
H7	12	4	1	3'-3"	26
H8	2	4	STR	9'-11"	13
N1	1	5	2	10'-8"	11
N2	2	5	2	9'-11"	21
N3	2	5	2	9'-2"	19
N4	2	5	2	8'-6"	18
N5	2	5	2	7'-9"	16
N6	2	5	2	7'-1"	15
N7	1	5	2	10'-7"	11
N8	2	5	2	9'-10"	21
N9	2	5	2	8'-11"	19
N10	2	5	2	8'-1"	17
N11	2	5	2	7'-3"	15
N12	2	5	2	6'-5"	13
S2	6	6	STR	6'-0"	54
T1	6	5	STR	11'-0"	69
V1	1	5	STR	8'-7"	9
V2	2	5	STR	7'-10"	16
V3	2	5	STR	7'-2"	15
V4	2	5	STR	6'-5"	13
V5	2	5	STR	5'-8"	12
V6	2	5	STR	5'-0"	10
V7	1	5	STR	8'-6"	9
V8	2	5	STR	7'-8"	16
V9	2	5	STR	6'-10"	14
V10	2	5	STR	6'-0"	13
V11	2	5	STR	5'-2"	11
V12	2	5	STR	4'-4"	9
Z1	3	5	3	5'-0"	16
Z2	2	5	3	4'-9"	10
Z3	2	5	3	4'-5"	9
Z4	2	5	3	4'-1"	9
Z5	2	5	3	3'-9"	8
Z6	3	5	3	5'-3"	16
Z7	2	5	3	4'-11"	10
Z8	2	5	3	4'-4"	9
Z9	2	5	3	3'-9"	8
Z10	2	5	3	3'-2"	7

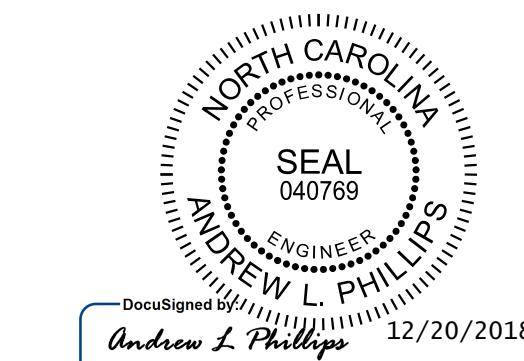
REINFORCING STEEL FOR 2 WINGS	756 LBS
CLASS A CONCRETE 2 WINGS	9.6 CY
1 HEADWALL	0.4 CY
1 END CURTAIN WALL	0.3 CY
TOTAL	10.3 CY

PROJECT NO. R-2530B
MONTGOMERY COUNTY
 STATION: 363+00.00 -L-

SHEET 7 OF 8

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
OUTLET WING DETAILS FOR STAGE 1 CONCRETE BOX CULVERT
 H = 8'-0" SLOPE = 1.5:1
 96° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C06-7
1			3			TOTAL SHEETS
2			4			8



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 12/20/2018

DRAWN BY: D. D. LOWERY DATE: 12/18
 CHECKED BY: P. D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

LOAD FACTORS:

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS																
LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						LIVE-LOAD FACTORS (γ _{LL})	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A		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		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)	SNSH	13.500		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
		SNGARBS2	20.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
		SNAGRIS2	22.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
		SNCOTTS3	27.250		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
		SNAGGRS4	34.925		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
		SNS5A	35.550		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
		SNS6A	39.950		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
	SNS7B	42.000		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)	TNAGRIT3	33.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		TNT4A	33.075		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		TNT6A	41.600		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
		TNT7A	42.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
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		TNAGRIT4	43.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
TNAGT5A		45.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	
TNAGT5B	45.000		N/A	N/A	1.40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1		
PERMANENT LOADS		N/A	4	1.35	N/A	N/A	1.35	1	BOTTOM SLAB	0.50	1.41	1	BOTTOM SLAB	1.00	2	

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.

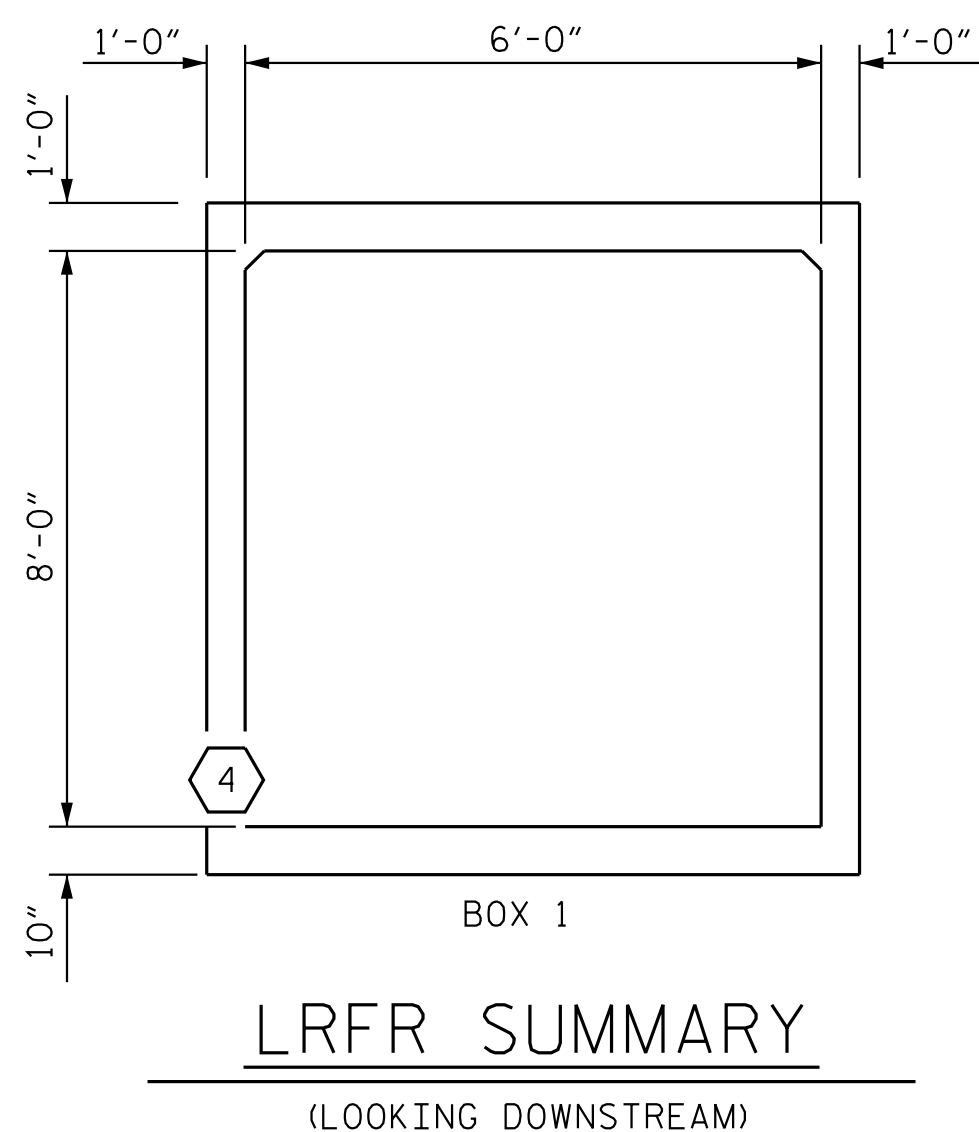
DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM THE EXTERIOR EDGE OF EXTERIOR WALL.

COMMENTS:

1. EFFECTS OF LIVE LOAD MAY BE NEGLECTED ACCORDING TO AASHTO LRFD 3.6.1.2.6A (DESIGN FILL = 14.0')

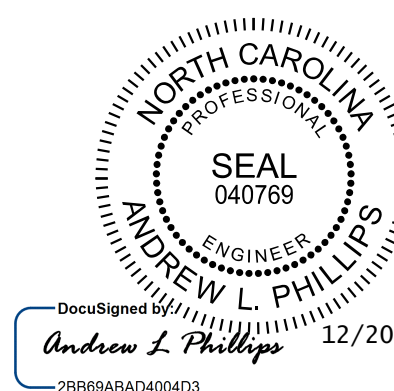
2. CULVERTS WITH DEEP FILLS SHOULD BE EVALUATED FOR THE EFFECTS OF PERMANENT LOADS ONLY ACCORDING TO "THE MANUAL FOR BRIDGE EVALUATION 6A.5.12.10.3A"

#	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	



PROJECT NO. R-2530B
MONTGOMERY COUNTY
 STATION: 363+00.00 -L-

SHEET 8 OF 8



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

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C06-8
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2			4			8

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STD. NO. LRFR5

K:\BIDI_Structures\Culvert\NC\0101036489 - B-2530B\Cad\Drawings\Culvert.dwg, 12/20/2018, 10:16:01 AM, P. D. COOKSEY

ASSEMBLED BY : D. D. LOWERY	DATE : 12/18
CHECKED BY : P. D. COOKSEY	DATE : 12/18
DRAWN BY : WMC 7/11	REV. 10/1/11 MAA/GM
CHECKED BY : GM 7/11	REV. 12/17 MAA/THC

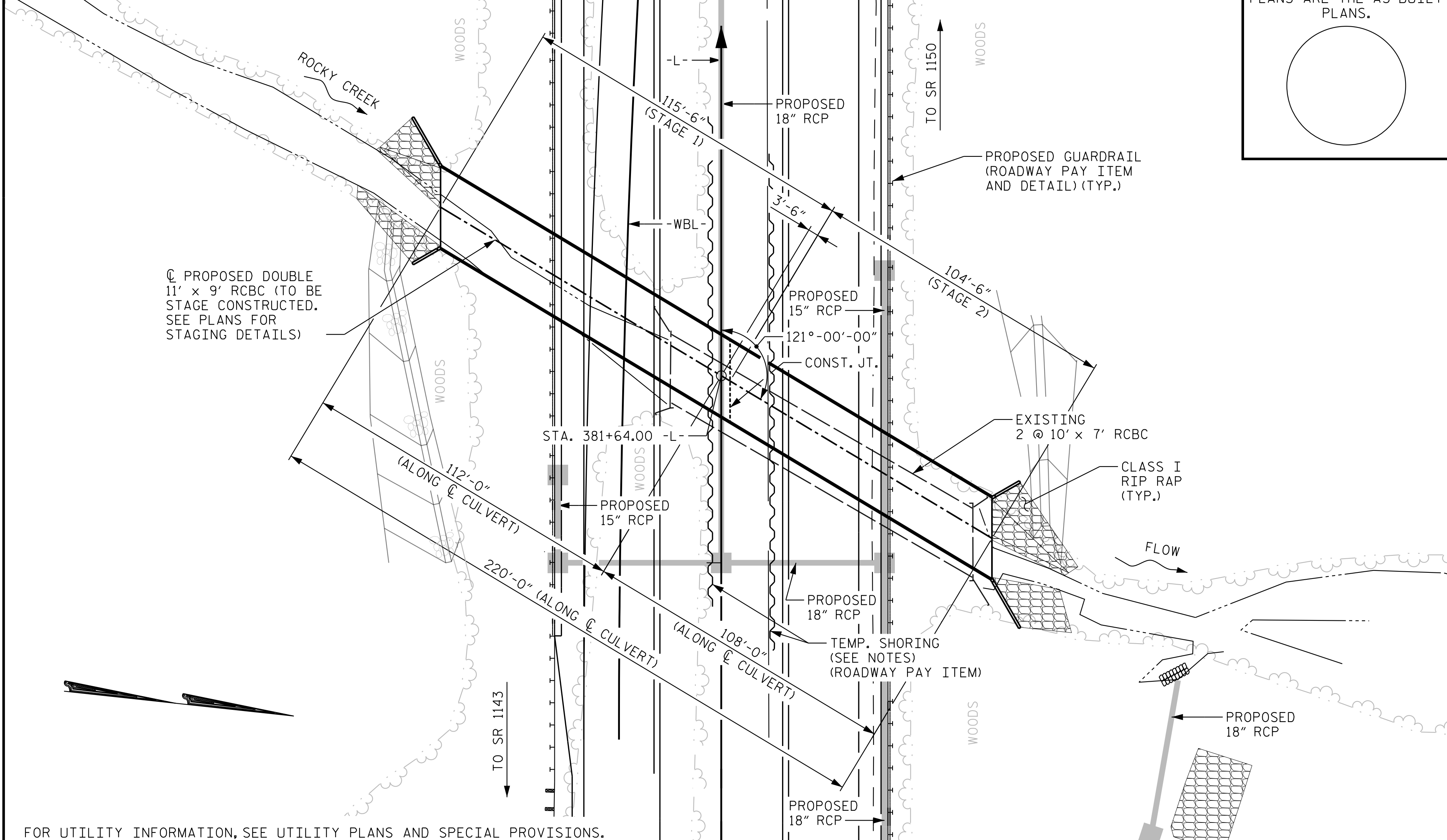
BENCHMARK: BM#48, -L- STA. 372+36.42, OFFSET 10.33' LT., EL. 314.38', RR SPIKE IN BASE 18" OAK

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS.

F.A. PROJECT NO. STBG-0024(083)

NOTES

- ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING.
- DESIGN FILL ----- 20.2 FT.
- FOR OTHER DESIGN DATA AND GENERAL NOTES, SEE SHEET SN.
- 3"Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN STAGE 1 OR STAGE 2 CULVERT TO BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS, CURTAIN WALLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
- THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
- AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACES OF THE EXTERIOR WALLS AND BOTH FACES OF INTERIOR WALLS ABOVE THE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- STEEL IN THE BOTTOM SLAB MAY BE SPLICED AT THE PERMITTED CONSTRUCTION JOINT AT THE CONTRACTOR'S OPTION. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES WILL BE PAID FOR BY THE CONTRACTOR.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- AFTER SERVING AS A TEMPORARY STRUCTURE THE EXISTING DOUBLE 10' X 7' REINFORCED CONCRETE BOX CULVERT LOCATED AT THE SAME LOCATION AS THE PROPOSED CULVERT SHALL BE REMOVED. THE EXISTING STRUCTURE IS PRESENTLY NOT POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE STRUCTURE DETERIORATE DURING CONSTRUCTION OF THE PROPOSED CULVERT, A LOAD LIMIT MAY BE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
- FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE ROADWAY PLANS.
- TRAFFIC ON NC 24/27/73 SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS SHOWN ON THESE PLANS AS DIRECTED BY THE ENGINEER.
- TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
- A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.



FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.

LOCATION SKETCH

ROADWAY DATA

GRADE POINT ELEV. @ STA 381+64.00 -L- = 334.99'
 BED ELEVATION @ STA 381+64.00 -L- = 306.89'
 ROADWAY SLOPES 2:1

HYDRAULIC DATA

DESIGN DISCHARGE -----1400 CFS
 FREQUENCY OF DESIGN FLOOD -----50 YR.
 DESIGN HIGH WATER ELEVATION-----316.5 FT.
 DRAINAGE AREA -----3.48 SQ. MI.
 BASE DISCHARGE (Q100) -----1600 CFS
 BASE HIGH WATER ELEVATION -----317.8 FT.

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE -----3700 CFS
 FREQUENCY OF OVERTOPPING FLOOD --->500YR.
 OVERTOPPING FLOOD ELEVATION -----331.3 FT.

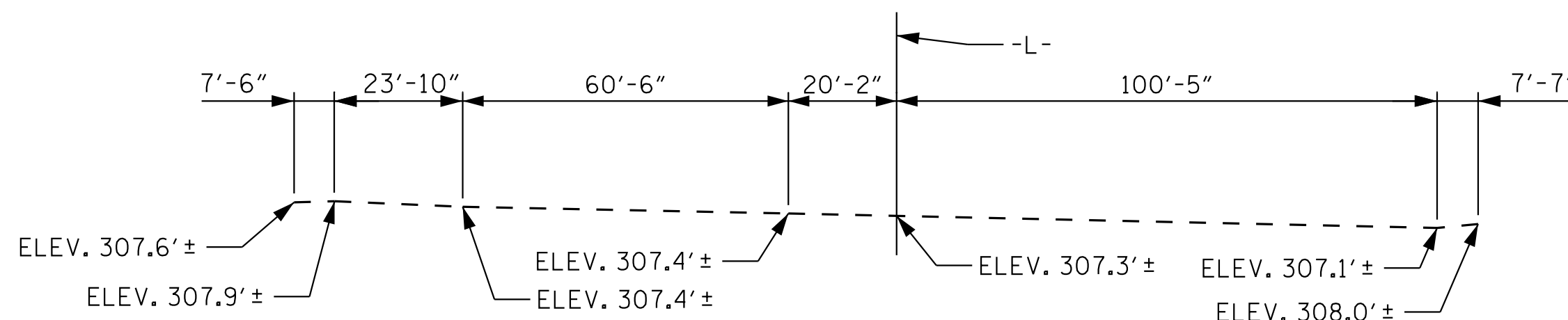
TOTAL STRUCTURE QUANTITIES

STAGE 1			STAGE 2		
CLASS A CONCRETE					
BARREL @	4.133	CY/FT	477.4	C.Y.	
WINGS ETC.			21.2	C.Y.	
TOTAL			498.6	C.Y.	
REINFORCING STEEL					
BARREL			62,312	LBS.	
WINGS ETC.			1,074	LBS.	
TOTAL			63,386	LBS.	
FOUNDATION CONDITIONING MATERIAL					
			234	TONS	
CULVERT EXCAVATION STA. 381+64.00 -L-					
				LUMP SUM	
REMOVAL OF EXISTING STRUCTURE STA. 381+64.00 -L-					
				LUMP SUM	

SAMPLE BAR REPLACEMENT

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

NOTE:
 SAMPLE BAR REPLACEMENT LENGTHS
 BASED ON 30" (SAMPLE LENGTH) PLUS
 TWO SPLICE LENGTHS AND $f_y = 60\text{ksi}$.

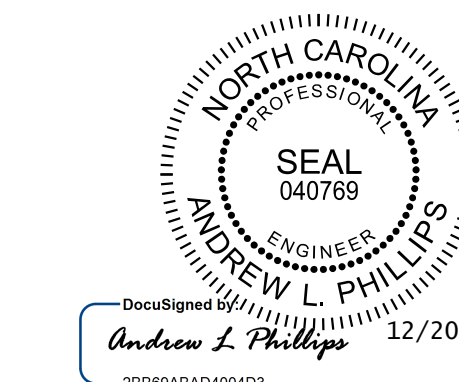


PROFILE ALONG CULVERT

ELEVATIONS TAKEN ALONG CENTERLINE CHANNEL

DRAWN BY: D.D. LOWERY DATE: 12/18
 CHECKED BY: P.D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A.L. PHILLIPS DATE: 12/18

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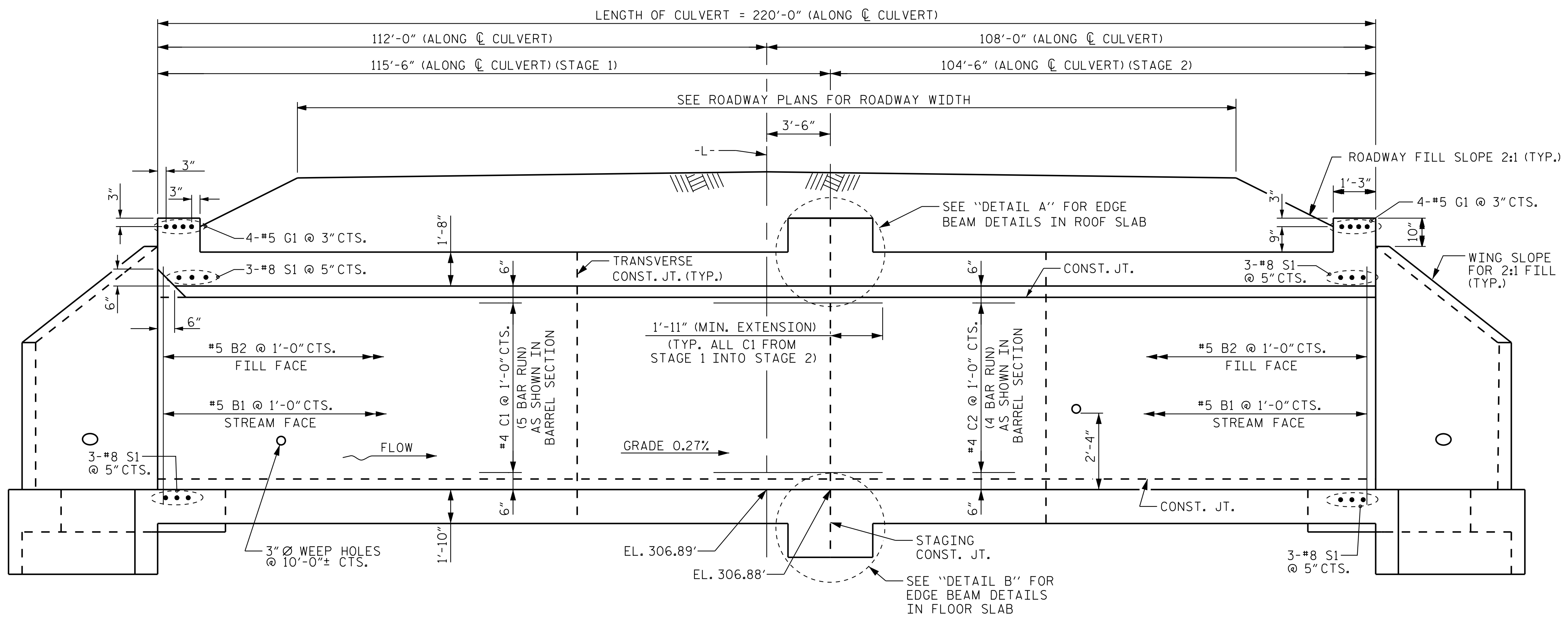
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 MONTGOMERY COUNTY
 STATION: 381+64.00 -L-

SHEET 1 OF 11 REPLACES STRUCTURE 267

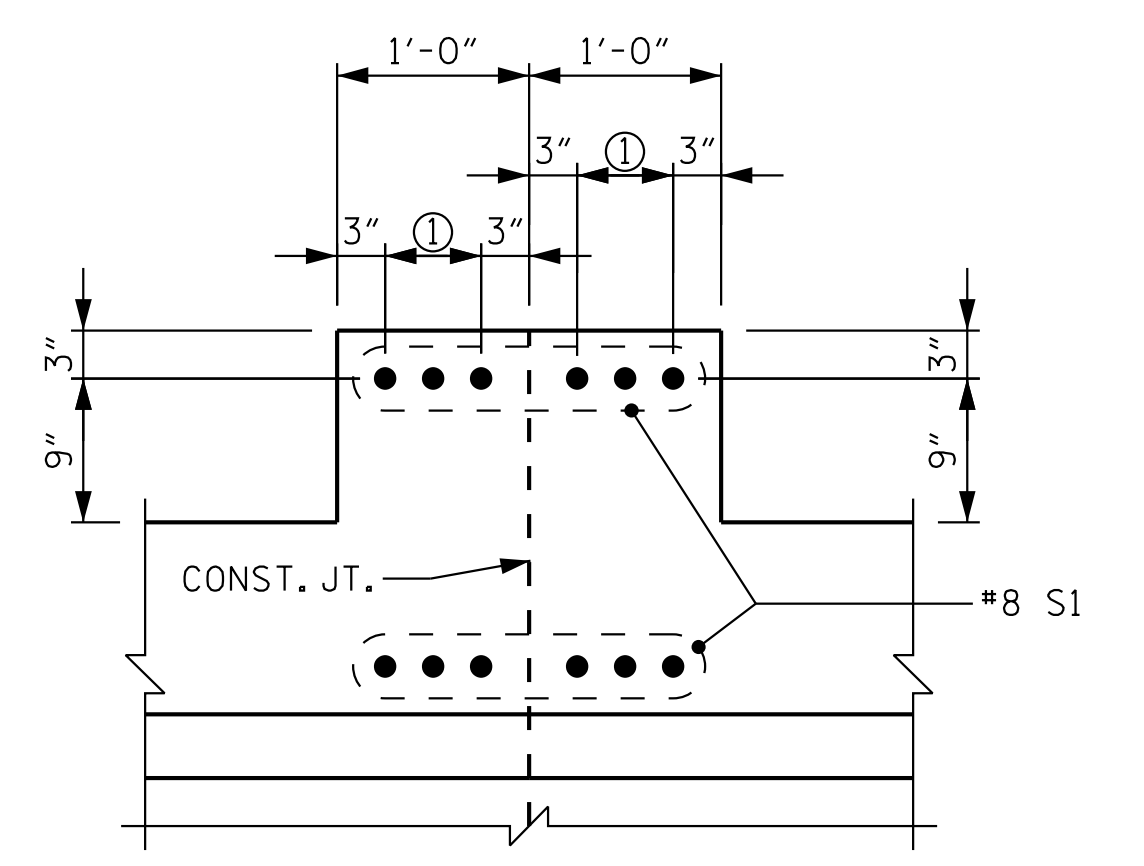
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

DOUBLE 11 FT. X 9 FT.
 CONCRETE BOX CULVERT
 121° SKEW

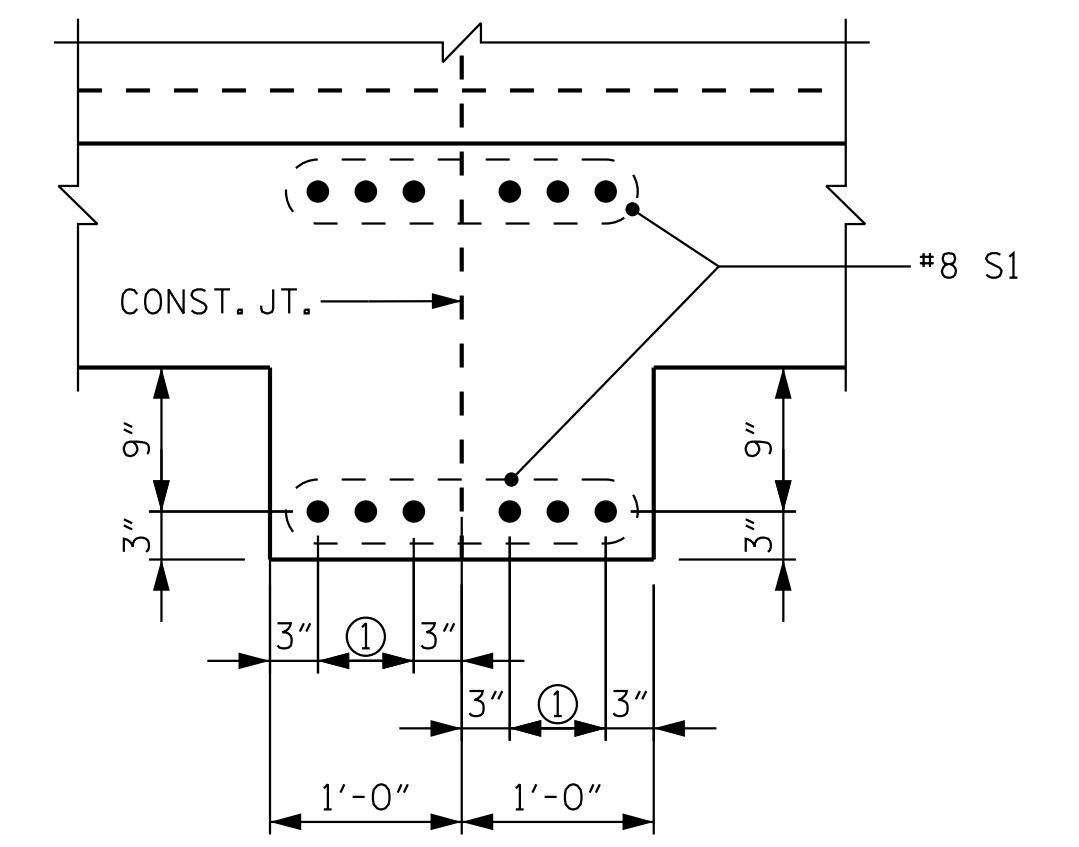
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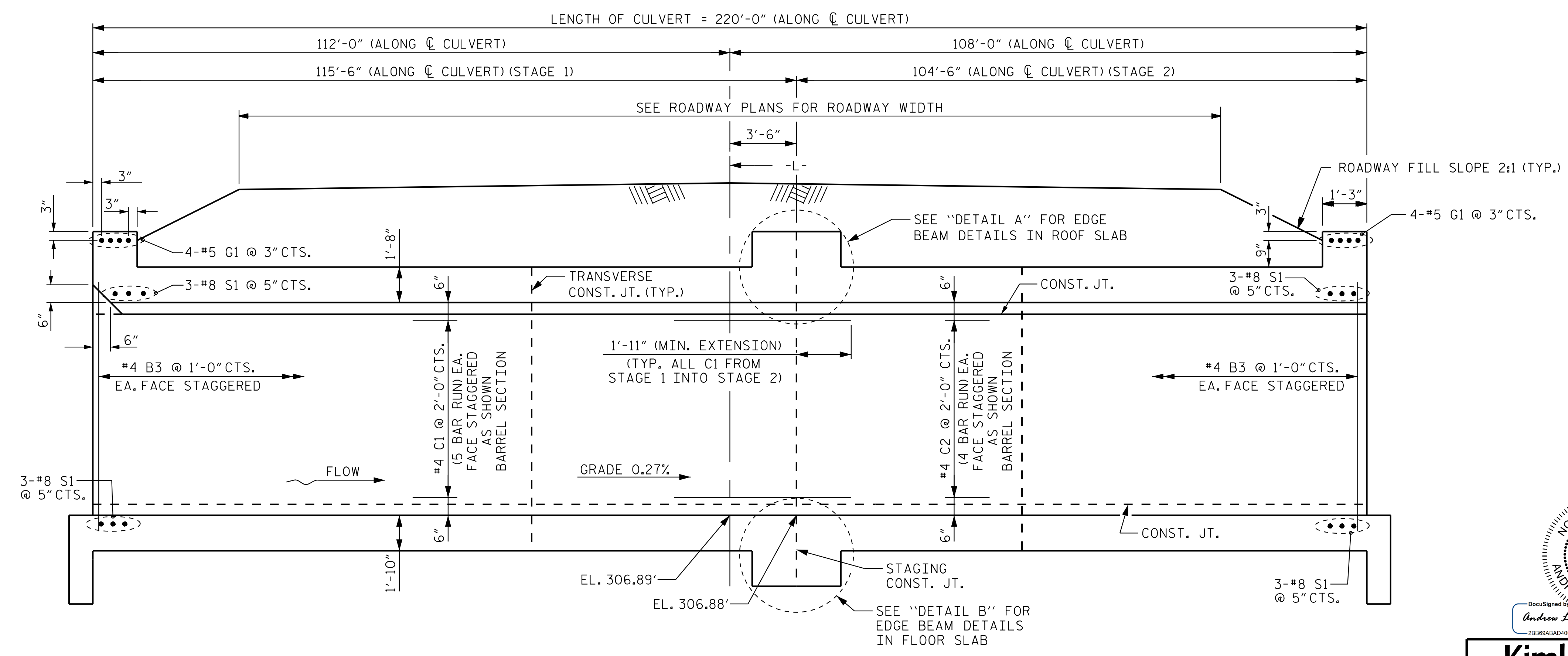
CULVERT SECTION NORMAL TO ROADWAY - EXTERIOR WALL



DETAIL A
① 2 SPA. @ 3"



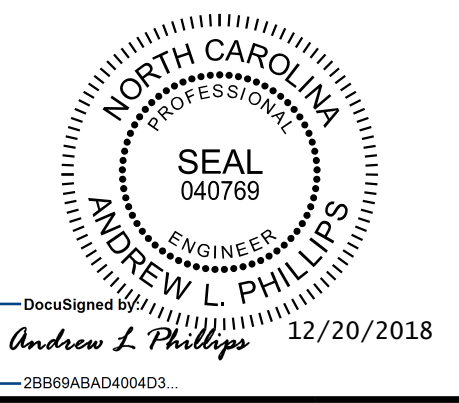
DETAIL B
① 2 SPA. @ 3"



CULVERT SECTION NORMAL TO ROADWAY - INTERIOR WALL

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SHEET 2 OF 11



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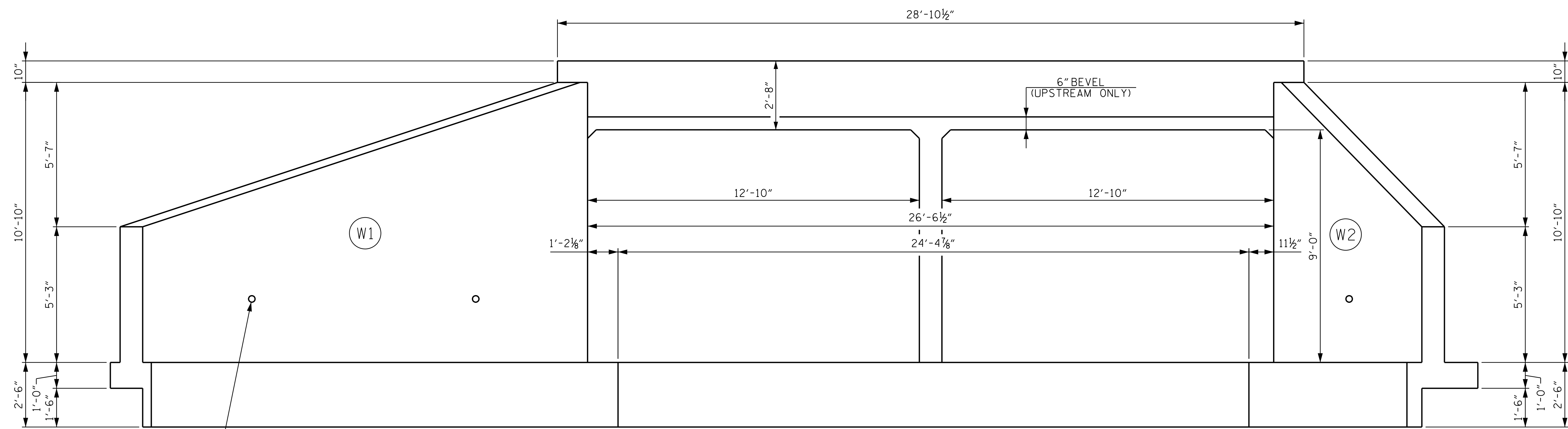
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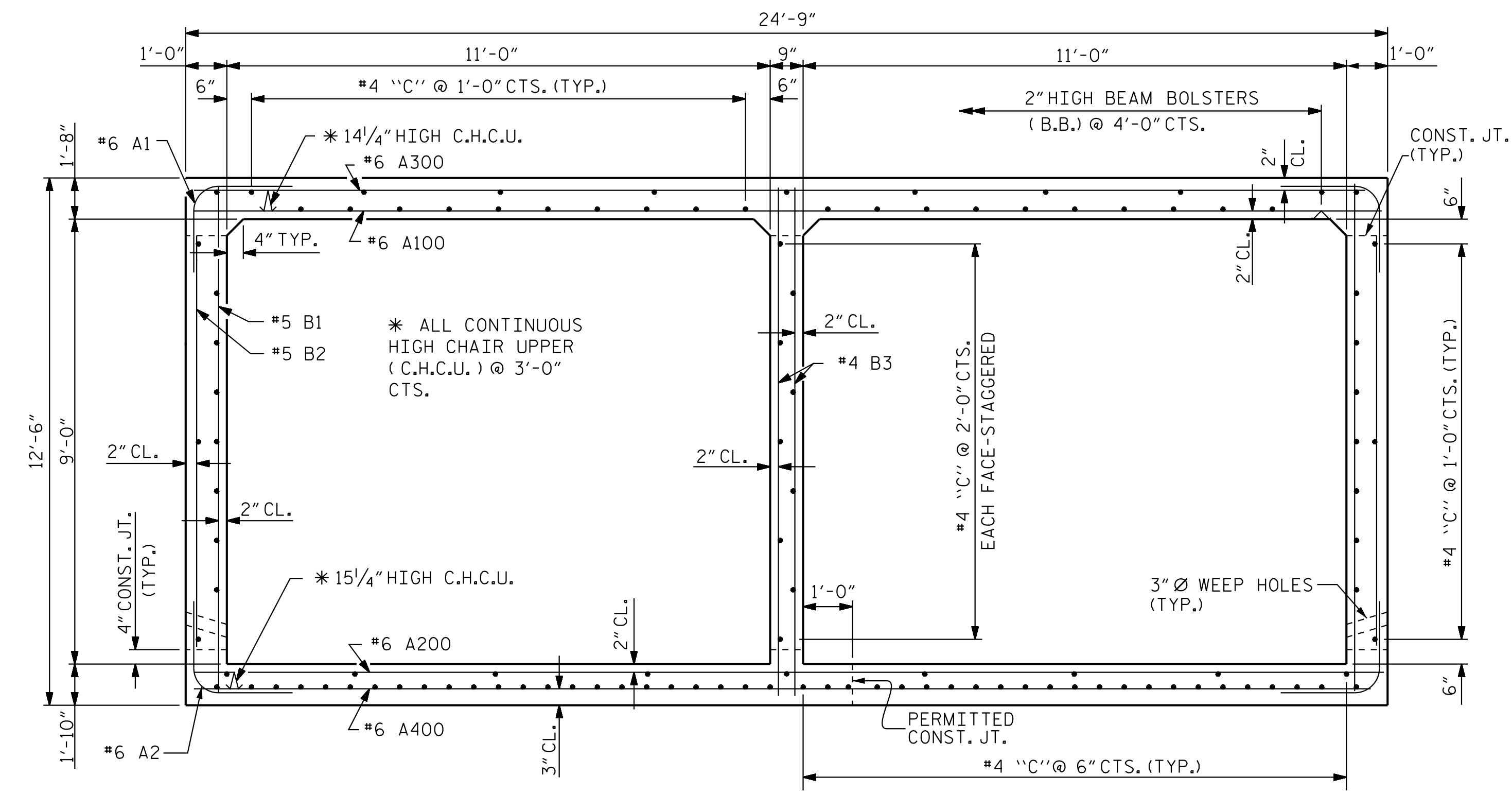
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 12/20/2018

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 DESIGN ENGINEER OF RECORD: A.L. PHILLIPS DATE: 12/18



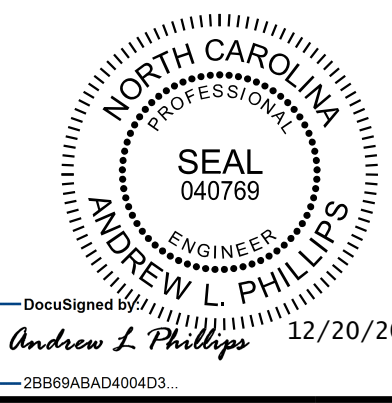
3" Ø WEEP HOLES (TYP.)

END ELEVATION NORMAL TO SKEW
FOR SILL DETAILS, SEE SHEET C07-8 & C07-9.



RIGHT ANGLE SECTION OF BARREL
THERE ARE 115 "C" BARS IN SECTION OF BARREL.

PROJECT NO. R-2530B
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SHEET 3 OF 11



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DEPARTMENT OF TRANSPORTATION
RALEIGH

**DOUBLE 11 FT. X 9 FT.
CONCRETE BOX CULVERT
121° SKEW**

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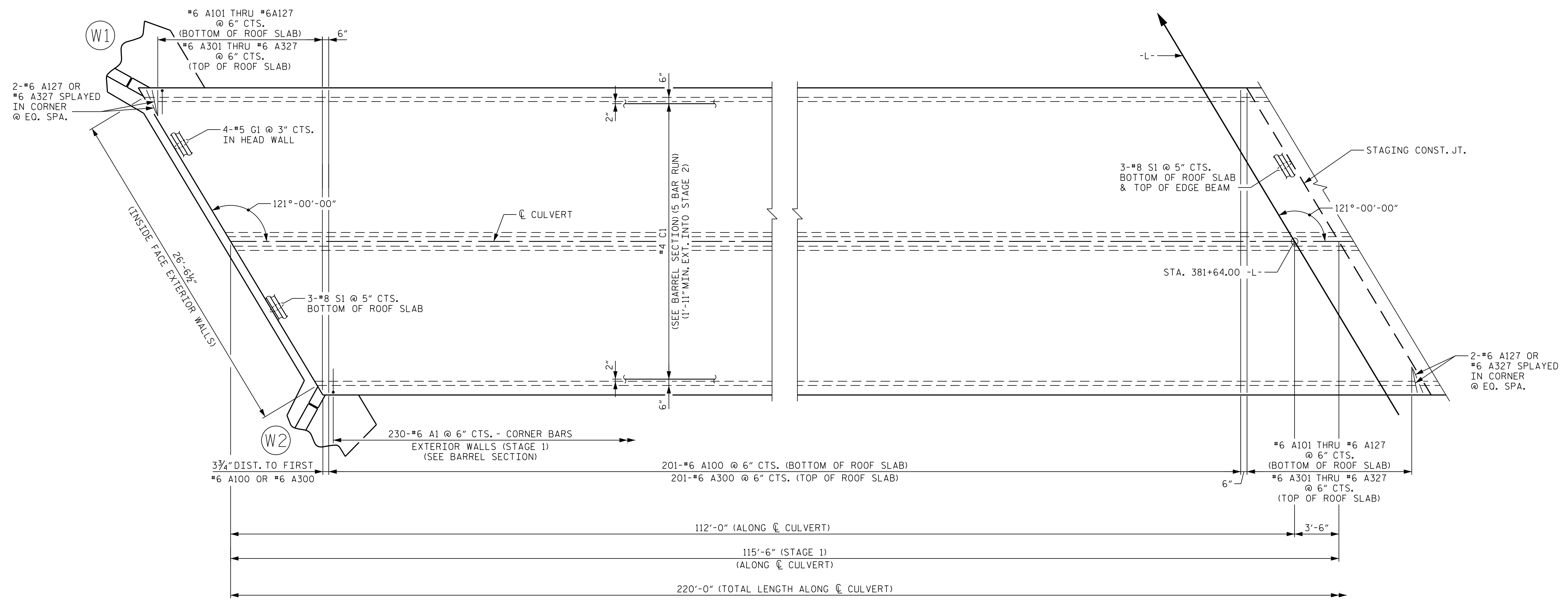
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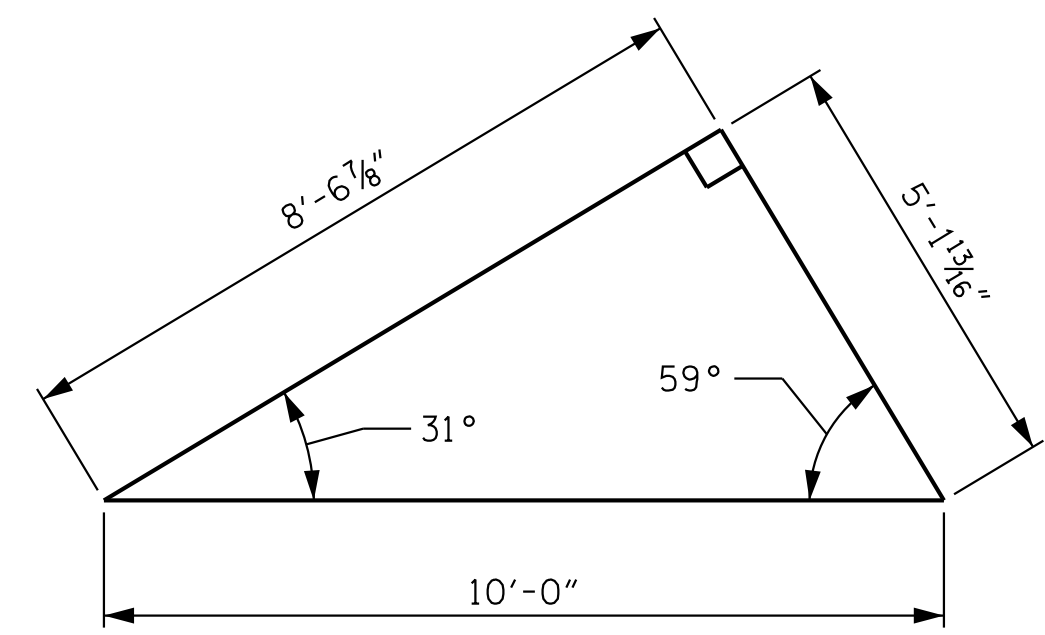
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ROOF SLAB PLAN - STAGE 1

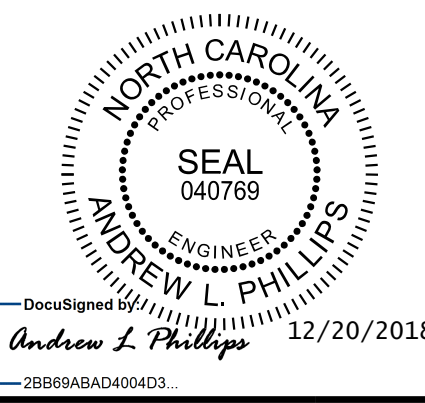


SKEW TRIANGLE

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MONTGOMERY COUNTY
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SHEET 4 OF 11

STATE OF NORTH CAROLINA
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 STAGE 1
 DOUBLE 11 FT. X 9 FT.
 CONCRETE BOX CULVERT
 121° SKEW



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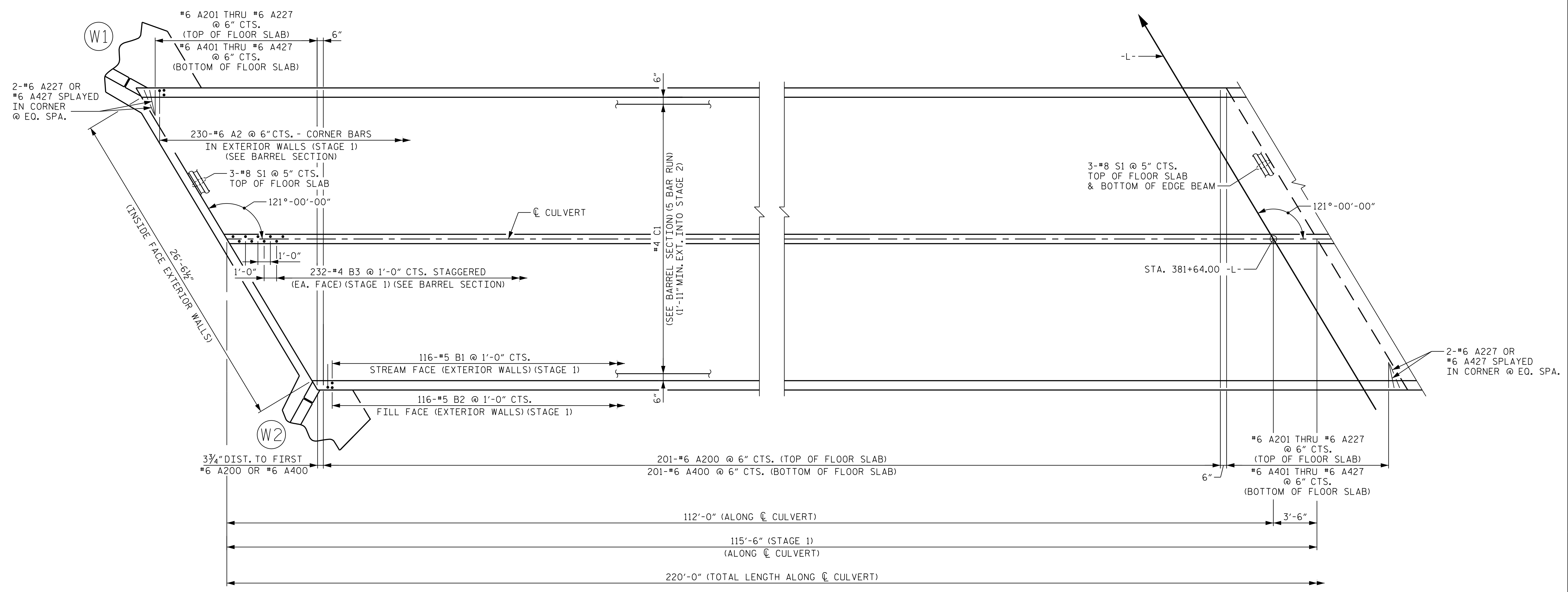
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NOTE
SEE SHEET C07-4 FOR SKEW TRIANGLE.

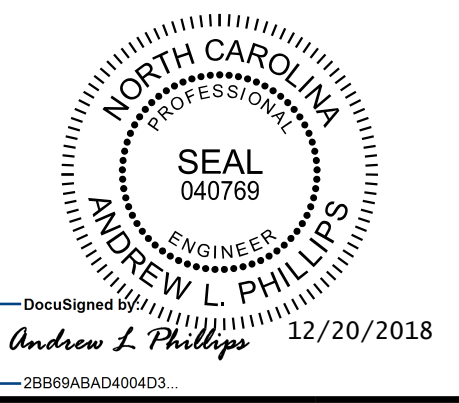


FLOOR SLAB PLAN - STAGE 1

NOTE: FOR S2 BARS IN THE FLOOR SLAB & WING FOOTINGS, SEE SHEET C07-10.

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MONTGOMERY COUNTY
STATION: 381+64.00 -L-

SHEET 5 OF 11



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DEPARTMENT OF TRANSPORTATION
RALEIGH
STAGE 1
DOUBLE 11 FT. X 9 FT.
CONCRETE BOX CULVERT
121° SKEW

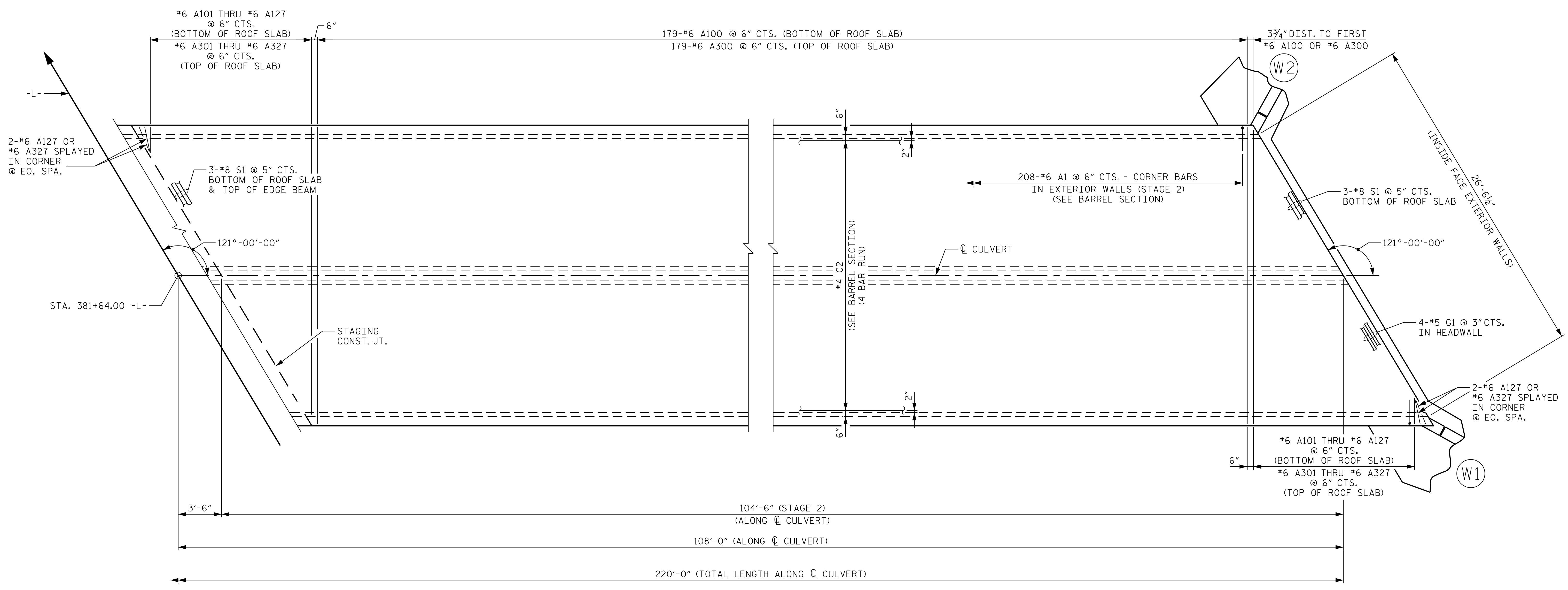
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DESIGN ENGINEER OF RECORD: A. L. PHILLIPS DATE: 12/18

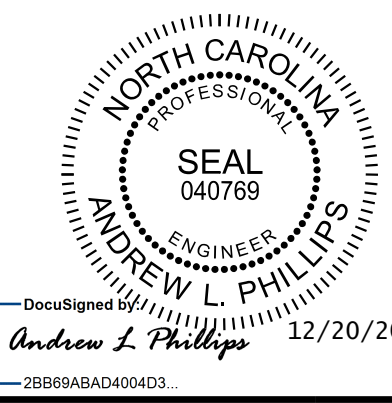
NOTE
SEE SHEET C07-4 FOR SKEW TRIANGLE.



ROOF SLAB PLAN - STAGE 2

PROJECT NO. R-2530B
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STATION: 381+64.00 -L-

SHEET 6 OF 11



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STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STAGE 2
 DOUBLE 11 FT. X 9 FT.
 CONCRETE BOX CULVERT
 121° SKEW

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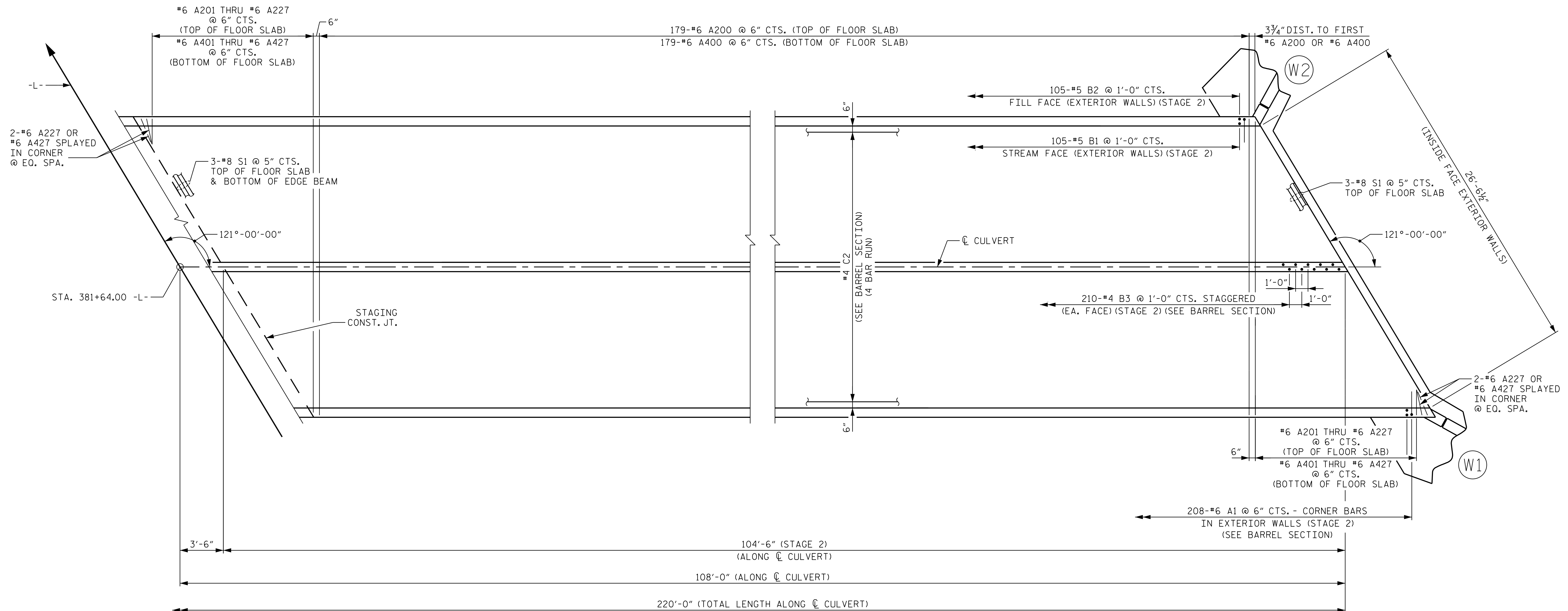
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NOTE

SEE SHEET C07-4 FOR SKEW TRIANGLE.



FLOOR SLAB PLAN - STAGE 2

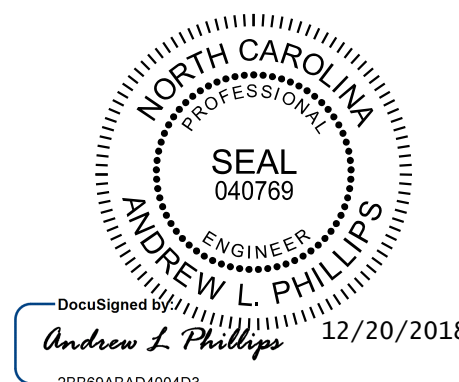
NOTE: FOR S2 BARS IN THE FLOOR SLAB & WING FOOTINGS, SEE SHEET C07-10.

NOTE: FOR S2 BARS IN THE FLOOR SLAB & WING FOOTINGS, SEE SHEET C07-10.

PROJECT NO. R-2530B
MONTGOMERY COUNTY
 STATION: 381+64.00 -L-

SHEET 7 OF 11

STATE OF NORTH CAROLINA
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STAGE 2
 DOUBLE 11 FT. X 9 FT.
 CONCRETE BOX CULVERT
 121° SKEW



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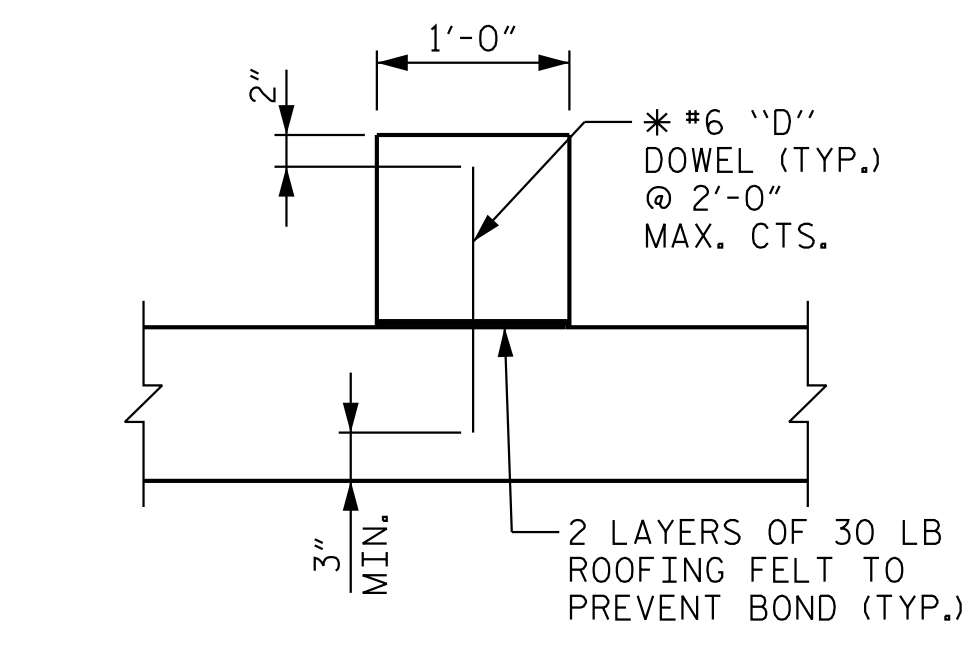
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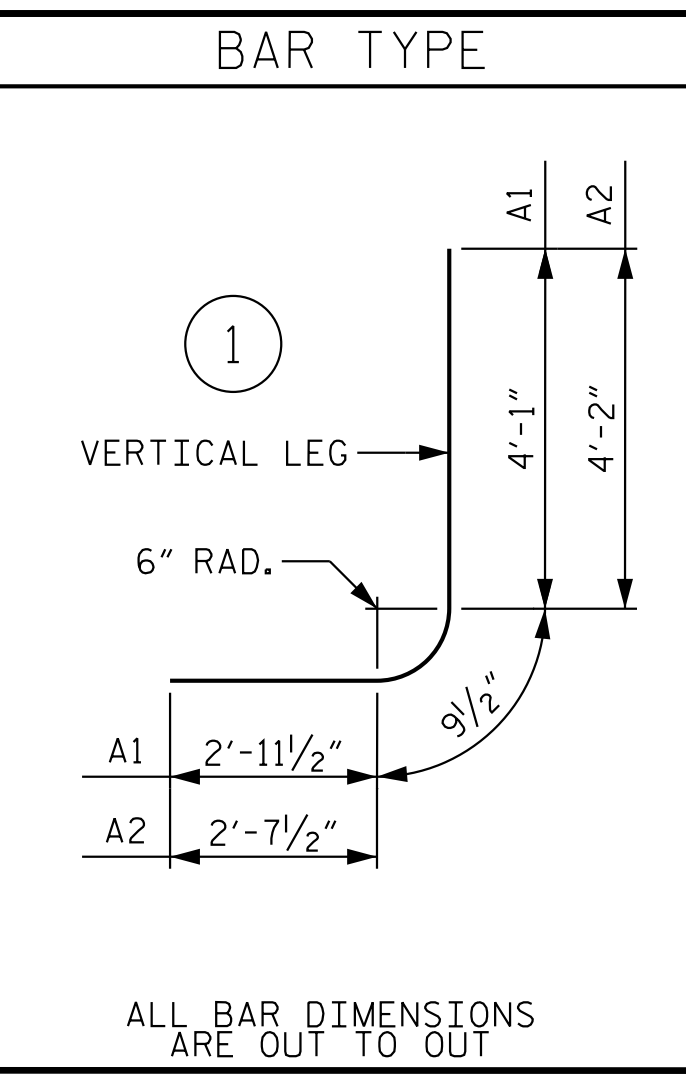
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SECTION THROUGH SILL

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

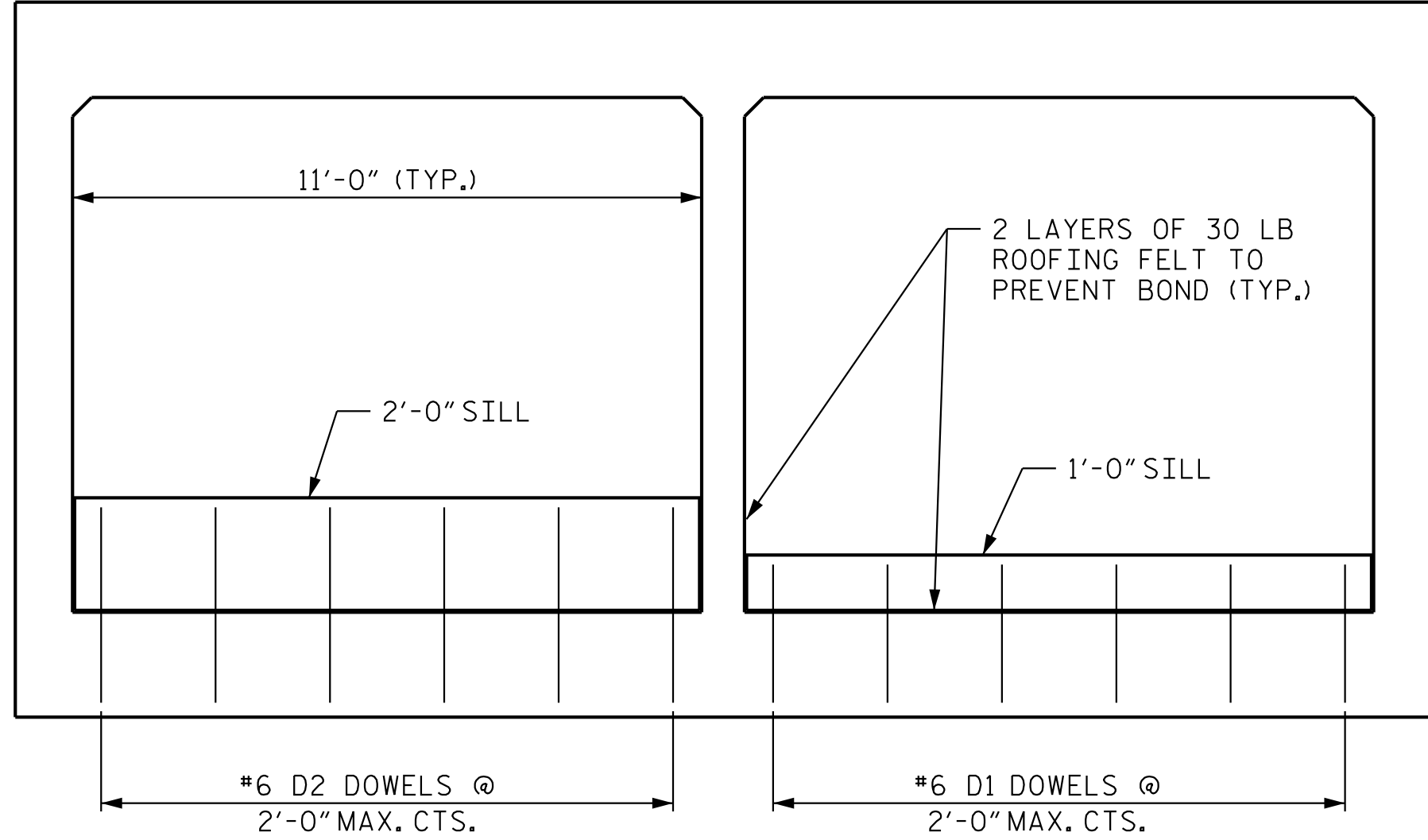


ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

STAGE 1

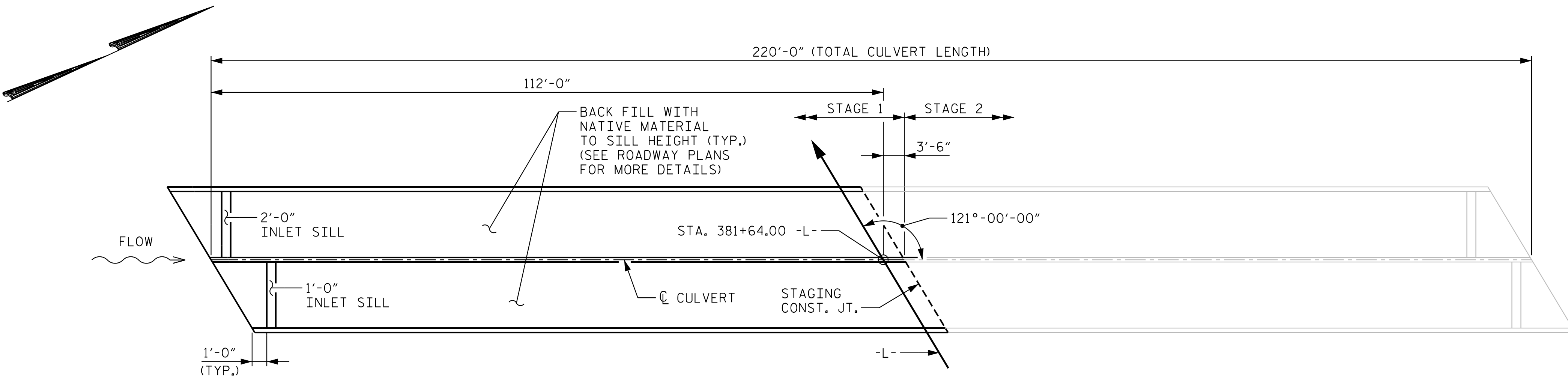
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A2	460	6	1	7'-7"	5,239	A207	2	6	STR	18'-11"	57	A316	2	6	STR	11'-5"	34	A425	2	6	STR	3'-11"	12
A100	201	6	STR	24'-4"	7,346	A208	2	6	STR	18'-1"	54	A317	2	6	STR	10'-7"	32	A426	2	6	STR	3'-1"	9
A101	2	6	STR	23'-11"	72	A209	2	6	STR	17'-3"	52	A318	2	6	STR	9'-9"	29	A427	6	6	STR	2'-3"	20
A102	2	6	STR	23'-1"	69	A210	2	6	STR	16'-5"	49	A319	2	6	STR	8'-11"	27						
A103	2	6	STR	22'-3"	67	A211	2	6	STR	15'-7"	47	A320	2	6	STR	8'-1"	24	B1	232	5	STR	12'-0"	2,904
A104	2	6	STR	21'-5"	64	A212	2	6	STR	14'-9"	44	A321	2	6	STR	7'-3"	22	B2	232	5	STR	8'-4"	2,016
A105	2	6	STR	20'-7"	62	A213	2	6	STR	13'-11"	42	A322	2	6	STR	6'-5"	19	B3	232	4	STR	12'-0"	1,860
A106	2	6	STR	19'-9"	59	A214	2	6	STR	13'-1"	39	A323	2	6	STR	5'-7"	17						
A107	2	6	STR	18'-11"	57	A215	2	6	STR	12'-3"	37	A324	2	6	STR	4'-9"	14	C1	575	4	STR	25'-2"	9,667
A108	2	6	STR	18'-1"	54	A216	2	6	STR	11'-5"	34	A325	2	6	STR	3'-11"	12						
A109	2	6	STR	17'-3"	52	A217	2	6	STR	10'-7"	32	A326	2	6	STR	3'-1"	9	D1	6	6	STR	2'-5"	22
A110	2	6	STR	16'-5"	49	A218	2	6	STR	9'-9"	29	A327	6	6	STR	2'-3"	20	D2	6	6	STR	3'-5"	31
A111	2	6	STR	15'-7"	47	A219	2	6	STR	8'-11"	27												
A112	2	6	STR	14'-9"	44	A220	2	6	STR	8'-1"	24	A400	201	6	STR	24'-4"	7,346	G1	4	5	STR	28'-5"	119
A113	2	6	STR	13'-11"	42	A221	2	6	STR	7'-3"	22	A401	2	6	STR	23'-11"	72						
A114	2	6	STR	13'-1"	39	A222	2	6	STR	6'-5"	19	A402	2	6	STR	23'-1"	69	S1	18	8	STR	28'-5"	1,366
A115	2	6	STR	12'-3"	37	A223	2	6	STR	5'-7"	17	A403	2	6	STR	22'-3"	67						
A116	2	6	STR	11'-5"	34	A224	2	6	STR	4'-9"	14	A404	2	6	STR	21'-5"	64						
A117	2	6	STR	10'-7"	32	A225	2	6	STR	3'-11"	12	A405	2	6	STR	20'-7"	62						
A118	2	6	STR	9'-9"	29	A226	2	6	STR	3'-1"	9	A406	2	6	STR	19'-9"	59						
A119	2	6	STR	8'-11"	27	A227	6	6	STR	2'-3"	20	A407	2	6	STR	18'-11"	57						
A120	2	6	STR	8'-1"	24						A408	2	6	STR	18'-1"	54							
A121	2	6	STR	7'-3"	22	A300	201	6	STR	24'-4"	7,346	A409	2	6	STR	17'-3"	52						
A122	2	6	STR	6'-5"	19	A301	2	6	STR	23'-11"	72	A410	2	6	STR	16'-5"	49						
A123	2	6	STR	5'-7"	17	A302	2	6	STR	23'-1"	69	A411	2	6	STR	15'-7"	47						
A124	2	6	STR	4'-9"	14	A303	2	6	STR	22'-3"	67	A412	2	6	STR	14'-9"	44						
A125	2	6	STR	3'-11"	12	A304	2	6	STR	21'-5"	64	A413	2	6	STR	13'-11"	42						
A126	2	6	STR	3'-1"	9	A305	2	6	STR	20'-7"	62	A414	2	6	STR	13'-1"	39						
A127	6	6	STR	2'-3"	20	A306	2	6	STR	19'-9"	59	A415	2	6	STR	12'-3"	37						
					A307	2	6	STR	18'-11"	57	A416	2	6	STR	11'-5"	34							
A200	201	6	STR	24'-4"	7,346	A308	2	6	STR	18'-1"	54	A417	2	6	STR	10'-7"	32						
A201	2	6	STR	23'-11"	72	A309	2	6	STR	17'-3"	52	A418	2	6	STR	9'-9"	29						
A202	2	6	STR	23'-1"	69	A310	2	6	STR	16'-5"	49	A419	2	6	STR	8'-11"	27						
A203	2	6	STR	22'-3"	67	A311	2	6	STR	15'-7"	47	A420	2	6	STR	8'-1"	24						
A204	2	6	STR	21'-5"	64	A312	2	6	STR	14'-9"	44	A421	2	6	STR	7'-3"	22						
A205	2	6	STR	20'-7"	62	A313	2	6	STR	13'-11"	42	A422	2	6	STR	6'-5"	19						
					A314	2	6	STR	13'-1"	39	A423	2	6	STR	5'-7"	17							
																			REINFORCING STEEL	LBS.	62,312		



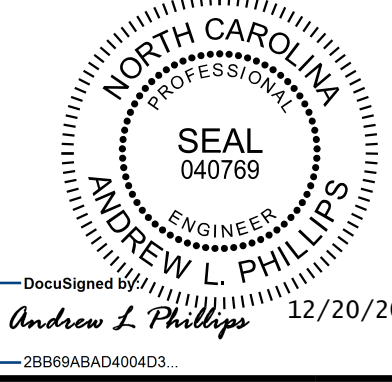
**ELEVATION
CULVERT SILL DETAILS - INLET**
(LOOKING DOWNSTREAM)

BAR SIZE	SPLICE LENGTH
#6 A200	2'-9"
#6 A400	2'-9"
#5 B1	1'-9"
#4 B3	1'-5"
#4 C1	1'-11"

STAGE 1 QUANTITIES	
CLASS A CONCRETE	
BARREL @ 4.133 C.Y./FT.	477.4 C.Y.
WINGS, ETC.	17.9 C.Y.
SILLS	1.2 C.Y.
EDGE BEAMS	2.1 C.Y.
TOTAL	498.6 C.Y.
REINFORCING STEEL	
BARREL, SILLS & EDGE BEAMS	62,312 LBS.
WINGS, ETC.	1,074 LBS.
TOTAL	63,386 LBS.



PLAN VIEW SHOWING SILL LOCATIONS - STAGE 1



Kimley»Horn
421 Fayetteville Street, Suite 600
Raleigh, NC 27601-1772
Phone (919) 677-2000 NC LICENSE # F-0102

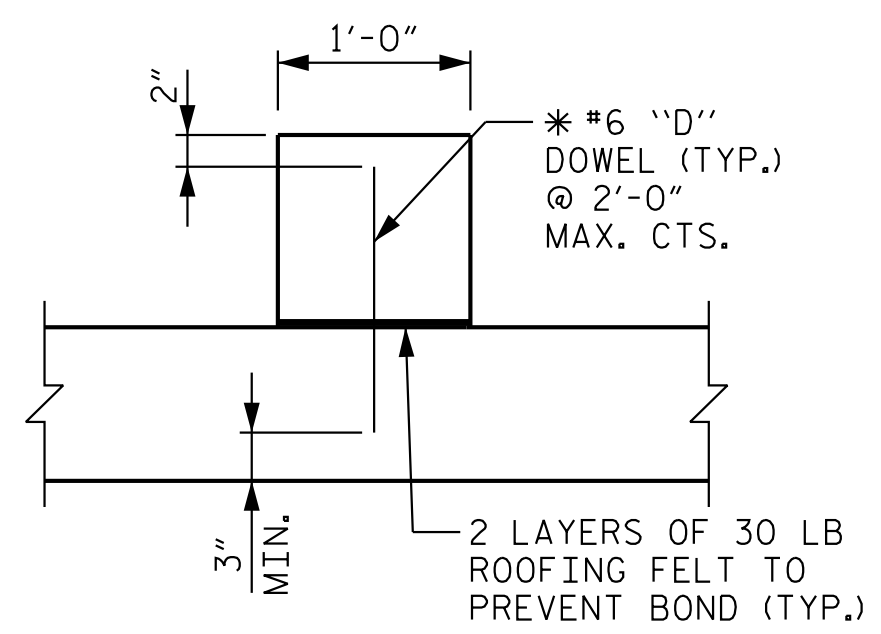
PROJECT NO. R-2530B
MONTGOMERY COUNTY
STATION: 381+64.00 -L-

SHEET 8 OF 11
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
**STAGE 1
DOUBLE 11 FT. X 9 FT.
CONCRETE BOX CULVERT
121° SKEW**

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C07-8
1			3			TOTAL SHEETS
2			4			11

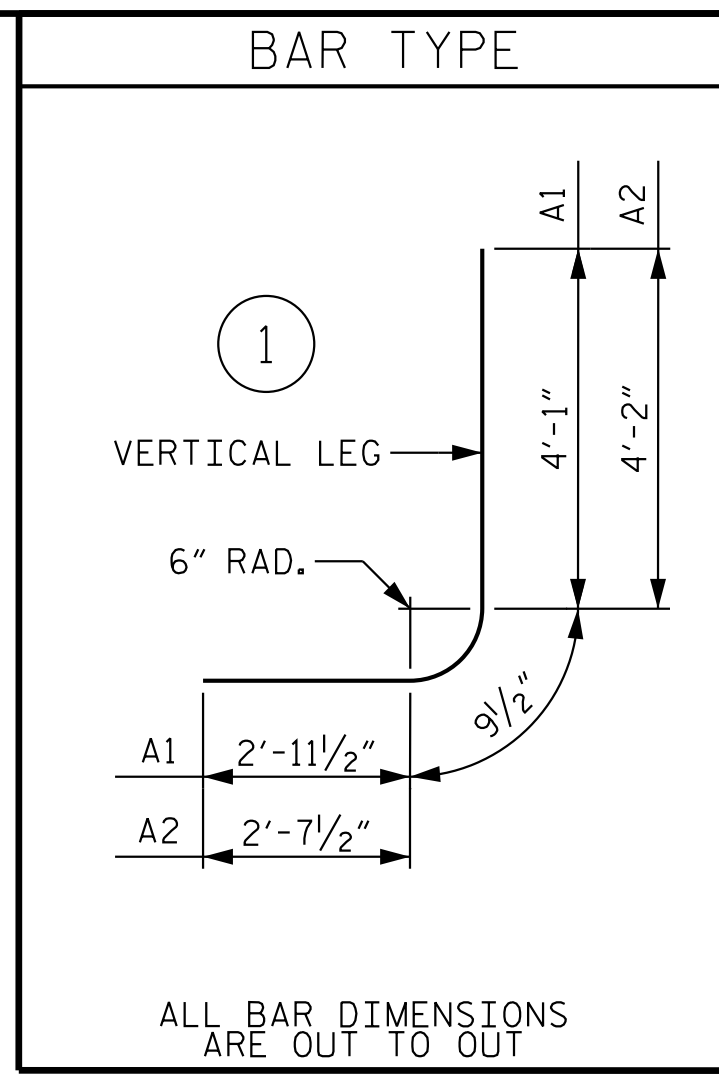
**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

DRAWN BY: D.D. LOWERY DATE: 12/18
CHECKED BY: P.D. COOKSEY DATE: 12/18
DESIGN ENGINEER OF RECORD: A.L. PHILLIPS DATE: 12/18

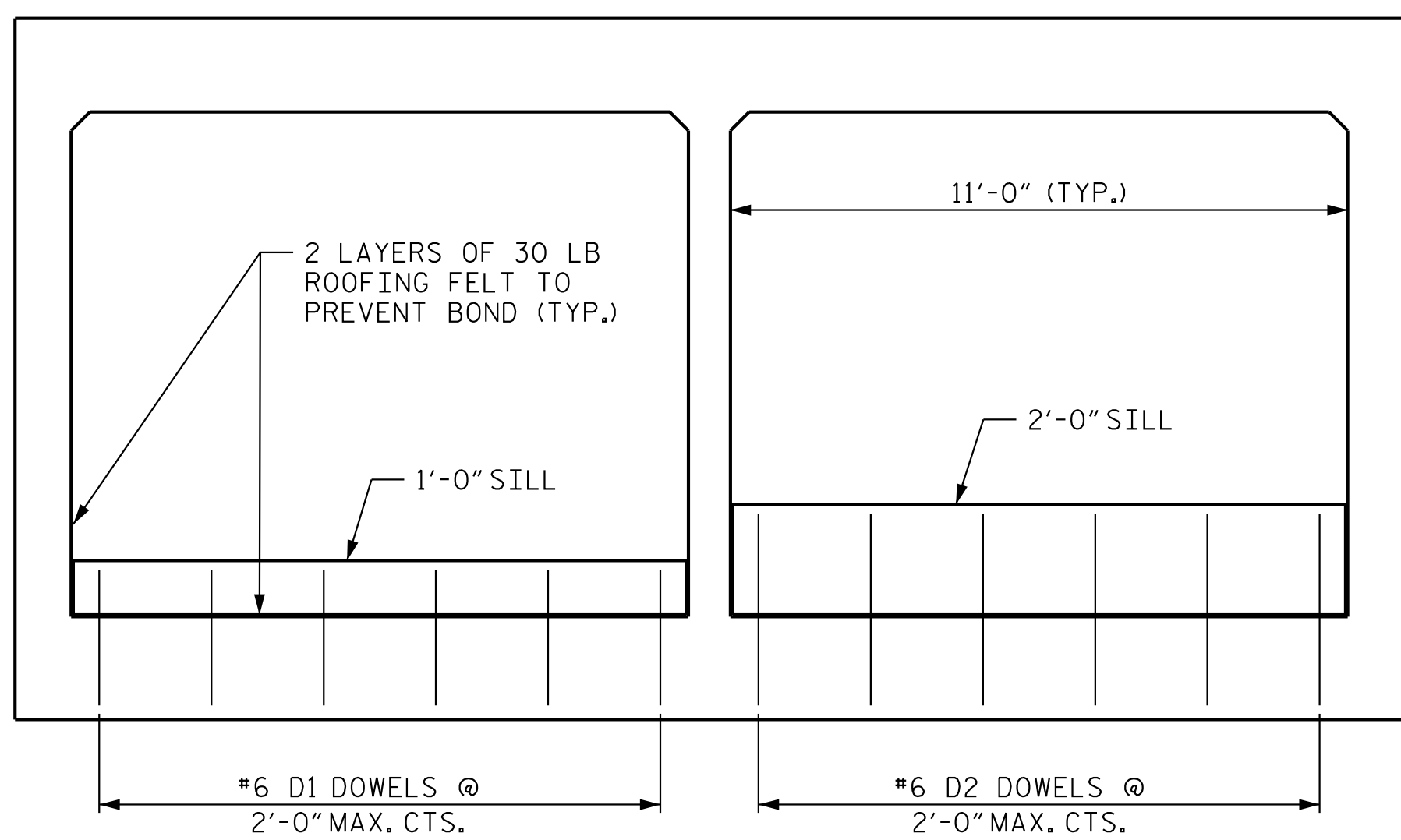


SECTION THROUGH SILL

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



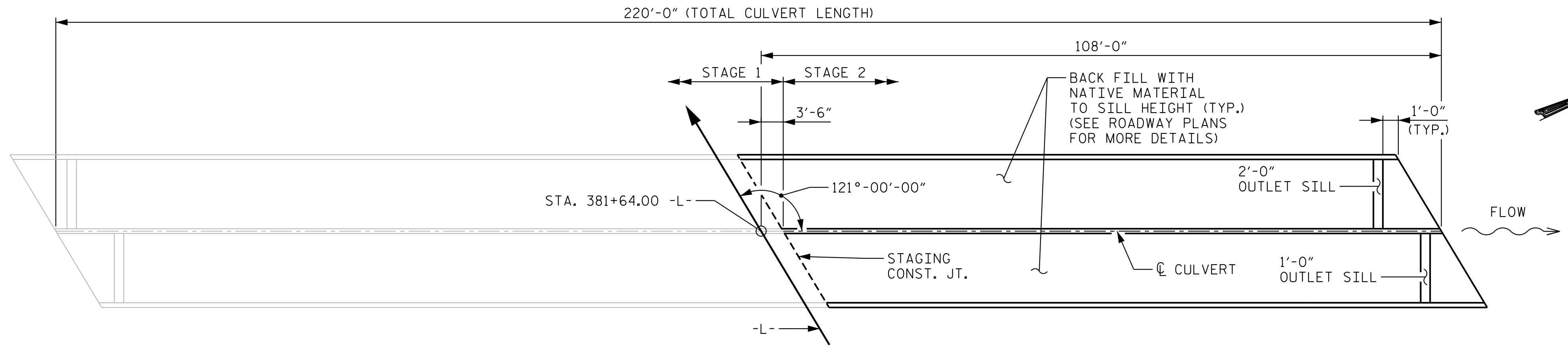
BILL OF MATERIAL																									
STAGE 2																									
BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT		
A1	416	6	1	7'-10"	4,895	A206	2	6	STR	19'-9"	59	A315	2	6	STR	12'-3"	37	A424	2	6	STR	4'-9"	14		
A2	416	6	1	7'-7"	4,738	A207	2	6	STR	18'-11"	57	A316	2	6	STR	11'-5"	34	A425	2	6	STR	3'-11"	12		
A100	179	6	STR	24'-4"	6,542	A208	2	6	STR	18'-1"	54	A317	2	6	STR	10'-7"	32	A426	2	6	STR	3'-1"	9		
A101	2	6	STR	23'-11"	72	A209	2	6	STR	17'-3"	52	A318	2	6	STR	9'-9"	29	A427	6	6	STR	2'-3"	20		
A102	2	6	STR	23'-1"	69	A210	2	6	STR	16'-5"	49	A319	2	6	STR	8'-11"	27	B1	210	5	STR	12'-0"	2,628		
A103	2	6	STR	22'-3"	67	A211	2	6	STR	15'-7"	47	A320	2	6	STR	8'-1"	24	B2	210	5	STR	8'-4"	1,825		
A104	2	6	STR	21'-5"	64	A212	2	6	STR	14'-9"	44	A321	2	6	STR	7'-3"	22	B3	210	4	STR	12'-0"	1,683		
A105	2	6	STR	20'-7"	62	A213	2	6	STR	13'-11"	42	A322	2	6	STR	6'-5"	19	C2	460	4	STR	27'-8"	8,501		
A106	2	6	STR	19'-9"	59	A214	2	6	STR	13'-1"	39	A323	2	6	STR	5'-7"	17	D1	6	6	STR	2'-5"	22		
A107	2	6	STR	18'-11"	57	A215	2	6	STR	12'-3"	37	A324	2	6	STR	4'-9"	14	D2	6	6	STR	3'-5"	31		
A108	2	6	STR	18'-1"	54	A216	2	6	STR	11'-5"	34	A325	2	6	STR	3'-11"	12								
A109	2	6	STR	17'-3"	52	A217	2	6	STR	10'-7"	32	A326	2	6	STR	3'-1"	9								
A110	2	6	STR	16'-5"	49	A218	2	6	STR	9'-9"	29	A327	6	6	STR	2'-3"	20								
A111	2	6	STR	15'-7"	47	A219	2	6	STR	8'-11"	27														
A112	2	6	STR	14'-9"	44	A220	2	6	STR	8'-1"	24	A400	179	6	STR	24'-4"	6,542	G1	4	5	STR	28'-5"	119		
A113	2	6	STR	13'-11"	42	A221	2	6	STR	7'-3"	22	A401	2	6	STR	23'-11"	72								
A114	2	6	STR	13'-1"	39	A222	2	6	STR	6'-5"	19	A402	2	6	STR	23'-1"	69	S1	18	8	STR	28'-5"	1,366		
A115	2	6	STR	12'-3"	37	A223	2	6	STR	5'-7"	17	A403	2	6	STR	22'-3"	67								
A116	2	6	STR	11'-5"	34	A224	2	6	STR	4'-9"	14	A404	2	6	STR	21'-5"	64								
A117	2	6	STR	10'-7"	32	A225	2	6	STR	3'-11"	12	A405	2	6	STR	20'-7"	62								
A118	2	6	STR	9'-9"	29	A226	2	6	STR	3'-1"	9	A406	2	6	STR	19'-9"	59								
A119	2	6	STR	8'-11"	27	A227	6	6	STR	2'-3"	20	A407	2	6	STR	18'-11"	57								
A120	2	6	STR	8'-1"	24	A228	2	6	STR	2'-3"	20	A408	2	6	STR	18'-1"	54								
A121	2	6	STR	7'-3"	22	A300	179	6	STR	24'-4"	6,542	A409	2	6	STR	17'-3"	52								
A122	2	6	STR	6'-5"	19	A301	2	6	STR	23'-11"	72	A410	2	6	STR	16'-5"	49								
A123	2	6	STR	5'-7"	17	A302	2	6	STR	23'-1"	69	A411	2	6	STR	15'-7"	47								
A124	2	6	STR	4'-9"	14	A303	2	6	STR	22'-3"	67	A412	2	6	STR	14'-9"	44								
A125	2	6	STR	3'-11"	12	A304	2	6	STR	21'-5"	64	A413	2	6	STR	13'-11"	42								
A126	2	6	STR	3'-1"	9	A305	2	6	STR	20'-7"	62	A414	2	6	STR	13'-1"	39								
A127	6	6	STR	2'-3"	20	A306	2	6	STR	19'-9"	59	A415	2	6	STR	12'-3"	37								
						A307	2	6	STR	18'-11"	57	A416	2	6	STR	11'-5"	34								
A200	179	6	STR	24'-4"	6,542	A308	2	6	STR	18'-1"	54	A417	2	6	STR	10'-7"	32								
A201	2	6	STR	23'-11"	72	A309	2	6	STR	17'-3"	52	A418	2	6	STR	9'-9"	29								
A202	2	6	STR	23'-1"	69	A310	2	6	STR	16'-5"	49	A419	2	6	STR	8'-11"	27								
A203	2	6	STR	22'-3"	67	A311	2	6	STR	15'-7"	47	A420	2	6	STR	8'-1"	24								
A204	2	6	STR	21'-5"	64	A312	2	6	STR	14'-9"	44	A421	2	6	STR	7'-3"	22								
A205	2	6	STR	20'-7"	62	A313	2	6	STR	13'-11"	42	A422	2	6	STR	6'-5"	19								
						A314	2	6	STR	13'-1"	39	A423	2	6	STR	5'-7"	17								
																		REINFORCING STEEL	LBS.	56,268					



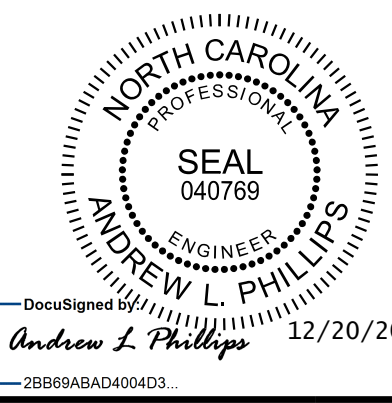
ELEVATION CULVERT SILL DETAILS - OUTLET
(LOOKING UPSTREAM)

BAR SIZE	SPLICE LENGTH
#6 A200	2'-9"
#6 A400	2'-9"
#5 B1	1'-9"
#4 B3	1'-5"
#4 C1	1'-11"

STAGE 2 QUANTITIES	
CLASS A CONCRETE	
BARREL @ 4.133 C.Y./FT.	431.9 C.Y.
WINGS, ETC.	18.0 C.Y.
SILLS	1.2 C.Y.
EDGE BEAMS	2.1 C.Y.
TOTAL	453.2 C.Y.
REINFORCING STEEL	
BARREL, SILLS & EDGE BEAMS	56,268 LBS.
WINGS, ETC.	1,074 LBS.
TOTAL	57,342 LBS.



PLAN VIEW SHOWING SILL LOCATIONS - STAGE 2



Kimley»Horn
421 Fayetteville Street, Suite 600
Raleigh, NC 27601-1772
Phone (919) 677-2000 NC LICENSE # F-0102

PROJECT NO. R-2530B
MONTGOMERY COUNTY
STATION: 381+64.00 -L-

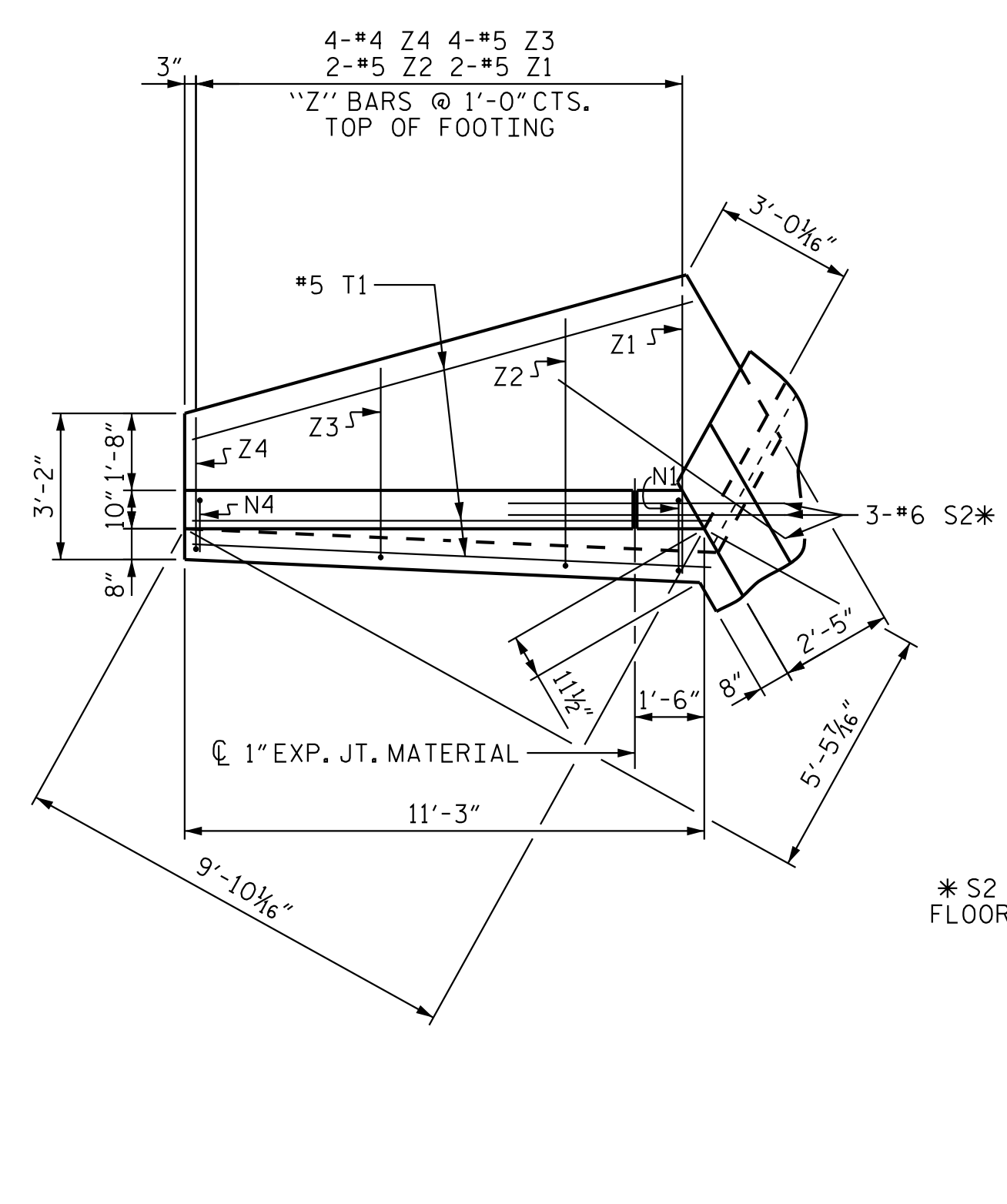
SHEET 9 OF 11
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
STAGE 2
DOUBLE 11 FT. X 9 FT.
CONCRETE BOX CULVERT
121° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C07-9
1			3			TOTAL SHEETS
2			4			11

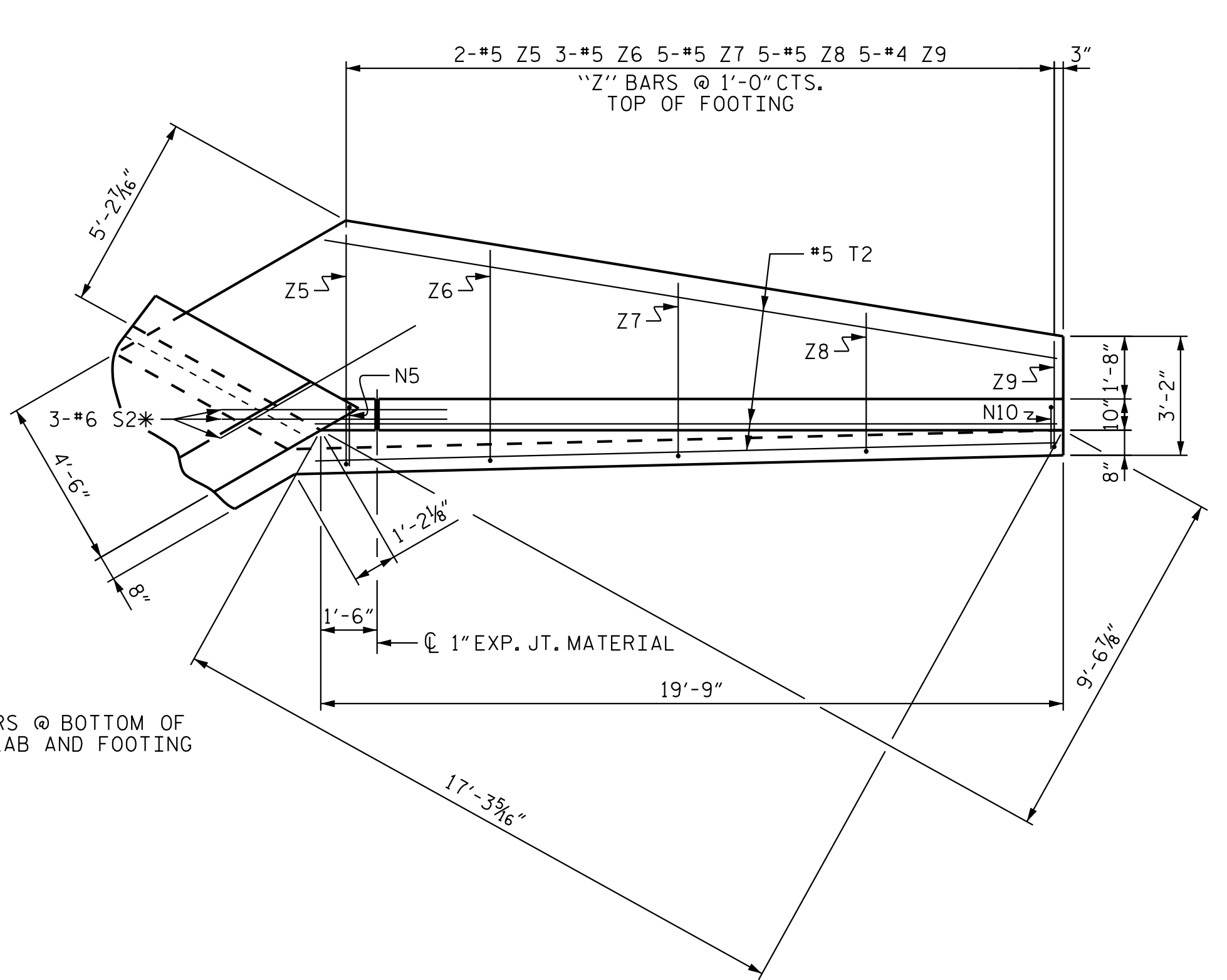
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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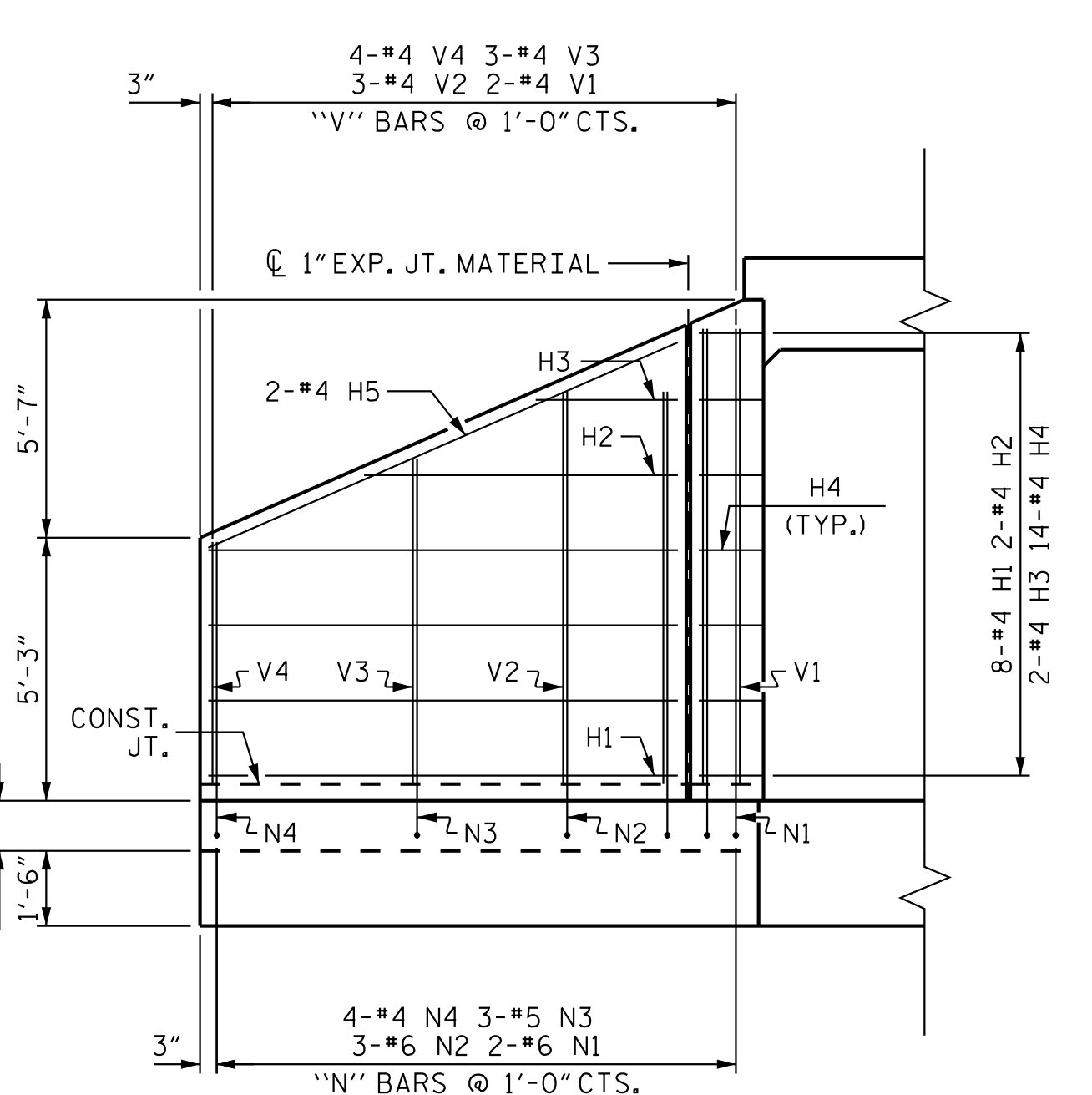
DRAWN BY: D.D. LOWERY DATE: 12/18
CHECKED BY: P.D. COOKSEY DATE: 12/18
DESIGN ENGINEER OF RECORD: A.L. PHILLIPS DATE: 12/18



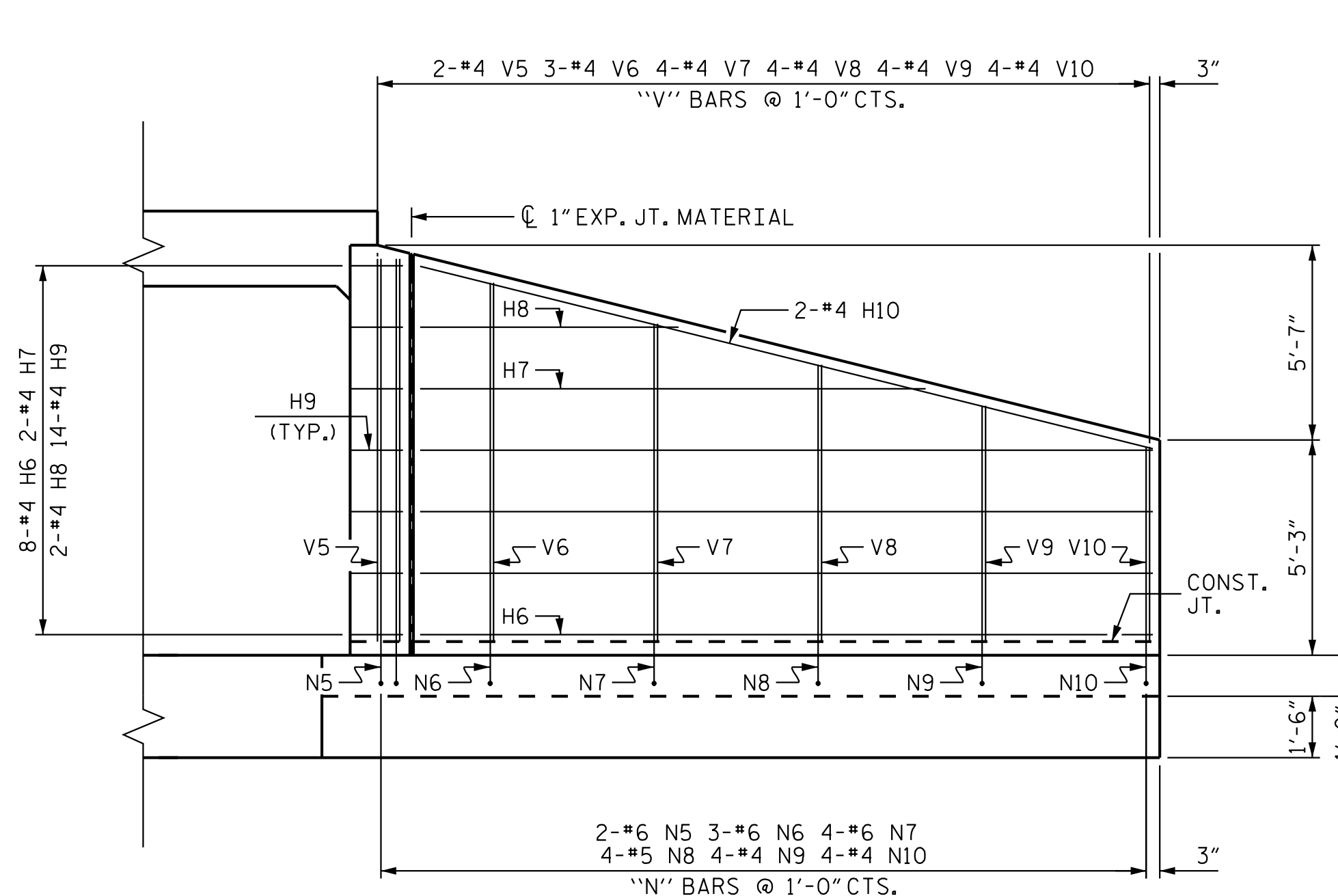
PLAN W2



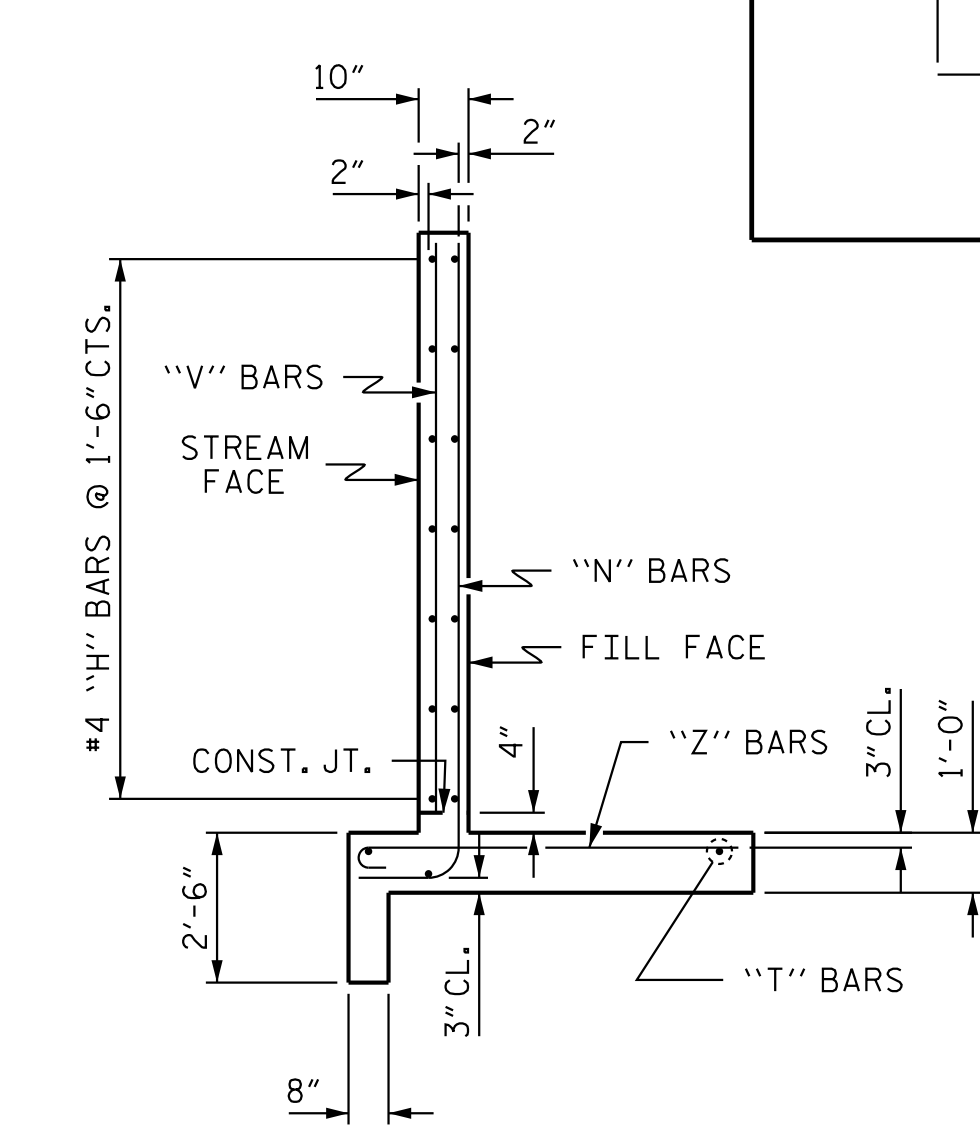
PLAN W1



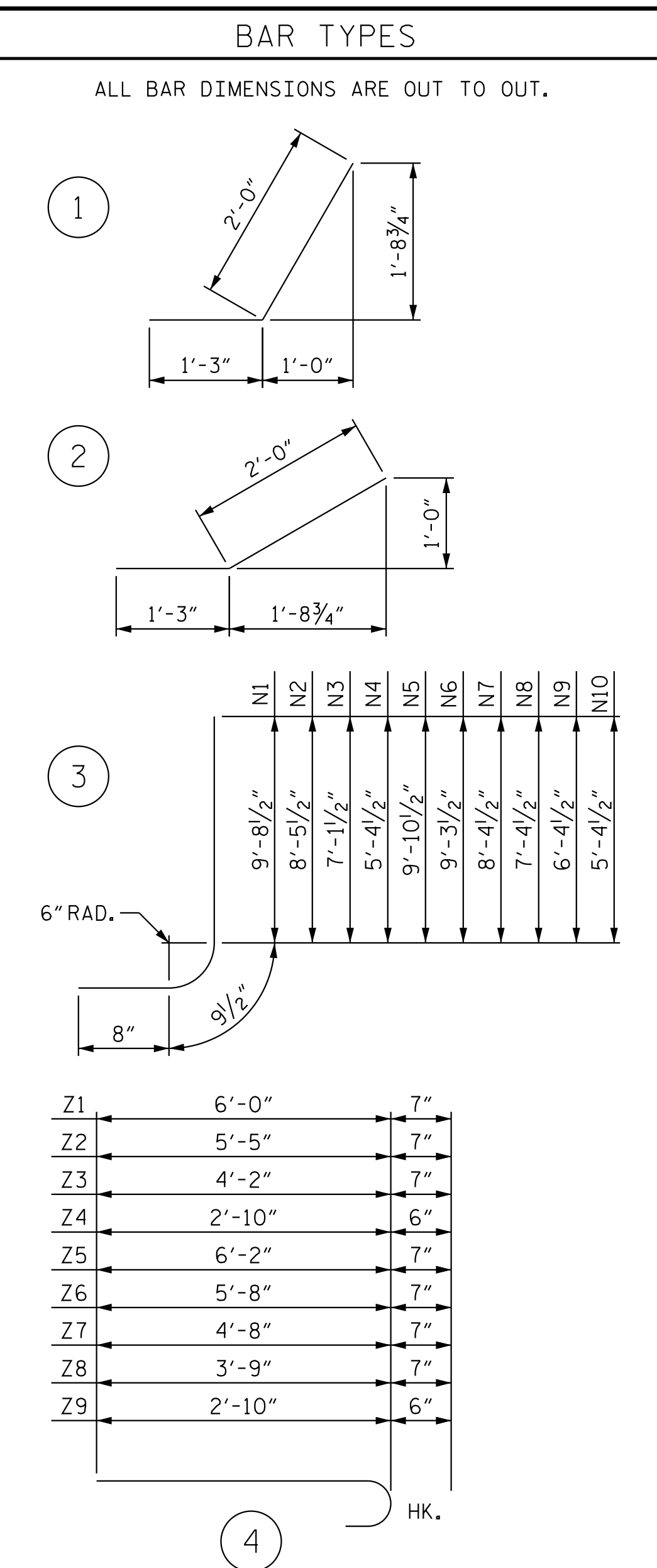
ELEVATION W2



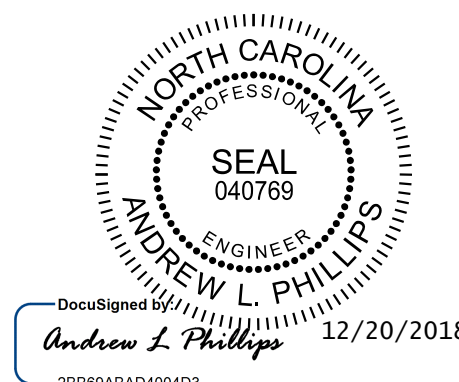
ELEVATION W1



TYPICAL WING SECTION



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
S2	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 FOR 4 WINGS					2148 LBS
CLASS A CONCRETE					
4 WINGS					30.2 CY
2 HEADWALLS					2.7 CY
2 END CURTAIN WALLS					3.0 CY
TOTAL					35.9 CY



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 421 Fayetteville Street, Suite 600
 Raleigh, NC 27601-1772
 Phone (919) 677-2000 NC LICENSE # F-0102

PROJECT NO. R-2530B
MONTGOMERY COUNTY
 STATION: 381+64.00 -L-

SHEET 10 OF 11
 STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
WING DETAILS FOR CONCRETE BOX CULVERT
 H = 9'-0" SLOPE = 2:1
 121° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C07-10
1			3			TOTAL SHEETS
2			4			11

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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 12/20/2018

DRAWN BY: D.D. LOWERY DATE: 12/18
 CHECKED BY: P.D. COOKSEY DATE: 12/18
 DESIGN ENGINEER OF RECORD: A.L. PHILLIPS DATE: 12/18

LOAD FACTORS: _____

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

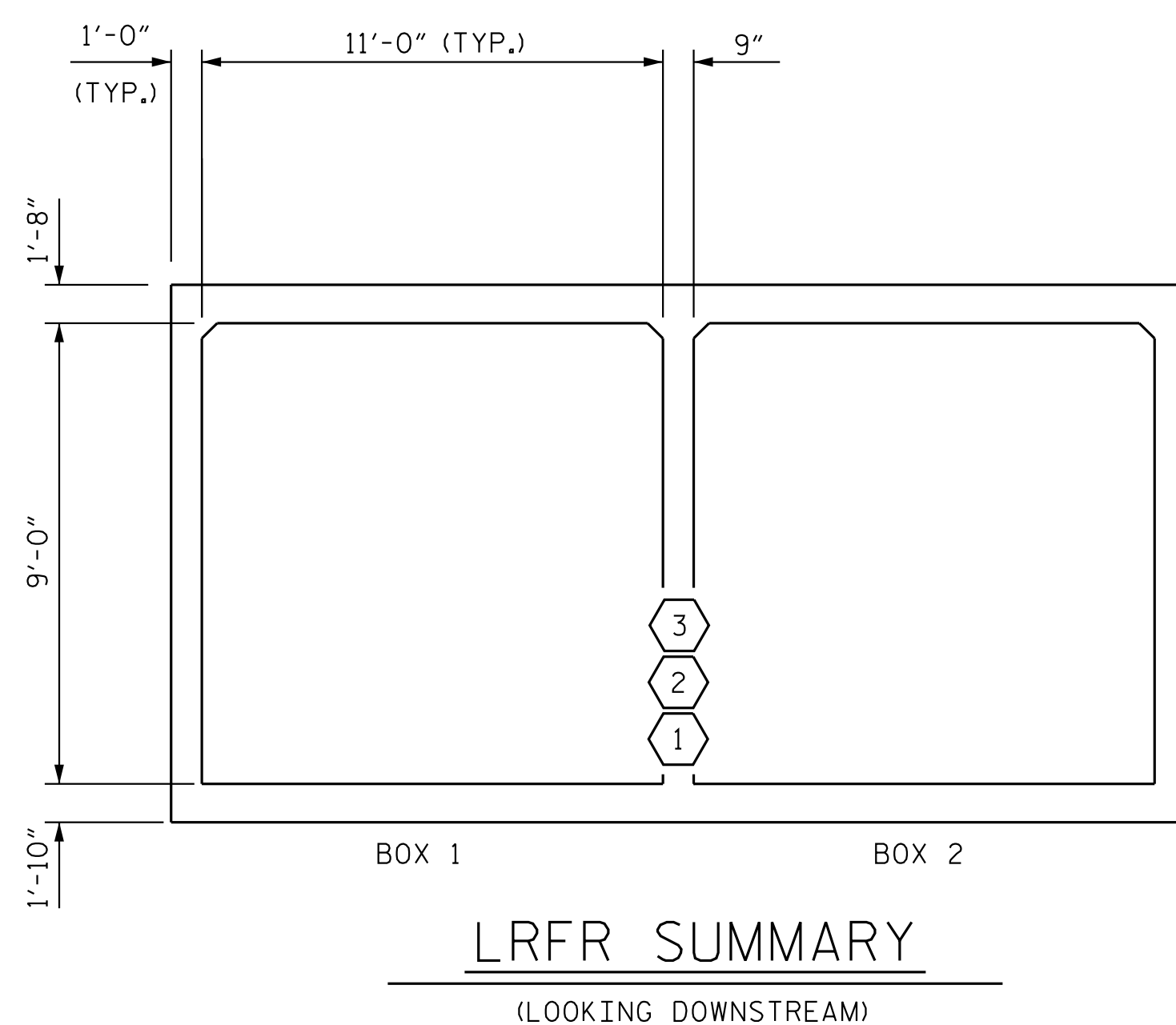
LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						LIVE-LOAD FACTORS (γ _{LL})	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	①	2.78	--	1.75	2.78	1	BOTTOM SLAB	12.38	5.06	1	TOP SLAB	12.00		
	HL-93 (OPERATING)	N/A		3.60	--	1.35	3.60	1	BOTTOM SLAB	12.38	6.55	1	TOP SLAB	12.00		
	HS-20 (INVENTORY)	36.000	②	3.59	129.24	1.75	3.59	1	BOTTOM SLAB	12.38	6.22	1	TOP SLAB	12.00		
	HS-20 (OPERATING)	36.000		4.66	167.76	1.35	4.66	1	BOTTOM SLAB	12.38	8.06	1	TOP SLAB	12.00		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		9.20	124.20	1.40	9.20	1	BOTTOM SLAB	12.38	18.03	1	TOP SLAB	12.00		
		SNGARBS2	20.000		7.17	143.40	1.40	7.17	1	BOTTOM SLAB	12.38	12.40	1	TOP SLAB	12.00	
		SNAGRIS2	22.000		6.93	152.46	1.40	6.93	1	BOTTOM SLAB	12.38	11.35	1	TOP SLAB	12.00	
		SNCOTTS3	27.250		4.48	122.08	1.40	4.48	1	BOTTOM SLAB	12.38	8.86	1	TOP SLAB	12.00	
		SNAGGRS4	34.925		3.92	136.91	1.40	3.92	1	BOTTOM SLAB	12.38	7.35	1	TOP SLAB	12.00	
		SNS5A	35.550		3.85	136.87	1.40	3.85	1	BOTTOM SLAB	12.38	7.63	1	TOP SLAB	12.00	
		SNS6A	39.950		3.63	145.02	1.40	3.63	1	BOTTOM SLAB	12.38	7.15	1	TOP SLAB	12.00	
		SNS7B	42.000		3.43	144.06	1.40	3.43	1	BOTTOM SLAB	12.38	6.76	1	TOP SLAB	12.00	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		4.48	147.84	1.40	4.48	1	BOTTOM SLAB	12.38	8.41	1	TOP SLAB	12.00	
		TNT4A	33.075		4.50	148.84	1.40	4.50	1	BOTTOM SLAB	12.38	8.81	1	TOP SLAB	12.00	
		TNT6A	41.600		3.71	154.34	1.40	3.71	1	BOTTOM SLAB	12.38	7.45	1	TOP SLAB	12.00	
		TNT7A	42.000		3.81	160.02	1.40	3.81	1	BOTTOM SLAB	12.38	7.37	1	TOP SLAB	12.00	
		TNT7B	42.000		3.94	165.48	1.40	3.94	1	BOTTOM SLAB	12.38	8.00	1	TOP SLAB	12.00	
		TNAGRIT4	43.000		3.73	160.39	1.40	3.73	1	BOTTOM SLAB	12.38	7.35	1	TOP SLAB	12.00	
	TNAGT5A	45.000		3.49	157.05	1.40	3.49	1	BOTTOM SLAB	12.38	7.25	1	TOP SLAB	12.00		
	TNAGT5B	45.000	③	3.41	153.45	1.40	3.41	1	BOTTOM SLAB	12.38	6.21	1	TOP SLAB	12.00		

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	--

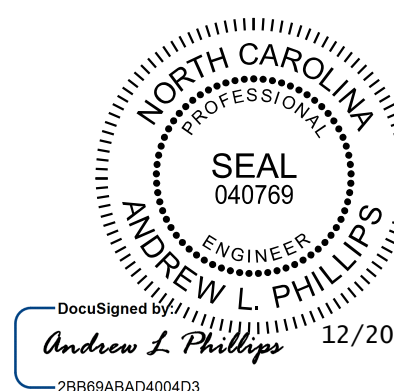
NOTE:
RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM THE EXTERIOR EDGE OF EXTERIOR WALL.

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



PROJECT NO. R-2530B
MONTGOMERY COUNTY
STATION: 381+64.00 -L-

SHEET 11 OF 11



Kimley»Horn
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Raleigh, NC 27601-1772
Phone (919) 677-2000 NC LICENSE # F-0102

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

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C07-11
1			3			TOTAL SHEETS
2			4			11

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

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STD. NO. LRFR5

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ASSEMBLED BY : D. D. LOWERY	DATE : 12/18
CHECKED BY : P. D. COOKSEY	DATE : 12/18
DRAWN BY : WMC 7/11	REV. 10/1/11 MAA/GM
CHECKED BY : GM 7/11	REV. 12/17 MAA/THC

STANDARD NOTES

DESIGN DATA:

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

MATERIAL AND WORKMANSHIP:

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

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

CONCRETE:

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

CONCRETE CHAMFERS:

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

DOWELS:

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

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

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

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

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

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

REINFORCING STEEL:

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

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

STRUCTURAL STEEL:

AT THE CONTRACTOR'S OPTION, HE MAY SUBSTITUTE $\frac{7}{8}$ " \emptyset SHEAR STUDS FOR THE $\frac{3}{4}$ " \emptyset STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - $\frac{7}{8}$ " \emptyset STUDS FOR 4 - $\frac{3}{4}$ " \emptyset STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF $\frac{7}{8}$ " \emptyset STUDS ALONG THE BEAM AS SHOWN FOR $\frac{3}{4}$ " \emptyset STUDS BASED ON THE RATIO OF 3 - $\frac{7}{8}$ " \emptyset STUDS FOR 4 - $\frac{3}{4}$ " \emptyset STUDS. STUDS OF THE LENGTH SPECIFIED ON THE PLANS MUST BE PROVIDED. THE MAXIMUM SPACING SHALL BE 2'-0".

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

WITH THE SOLE EXCEPTION OF EDGES AT SURFACES WHICH BEAR ON OTHER SURFACES, ALL SHARP EDGES AND ENDS OF SHAPES AND PLATES SHALL BE SLIGHTLY ROUNDED BY SUITABLE MEANS TO A RADIUS OF APPROXIMATELY $\frac{1}{16}$ 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