

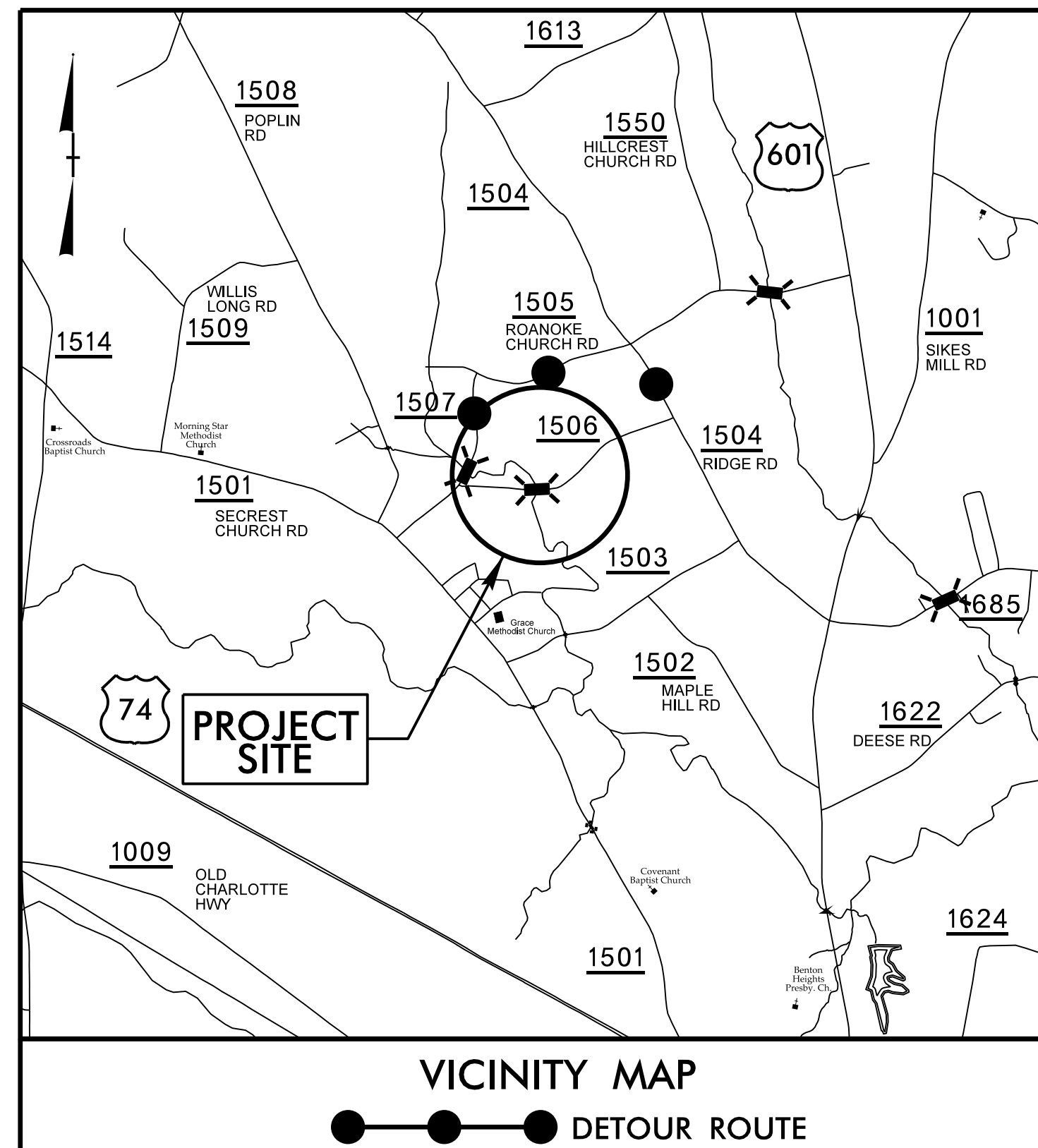
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**TIP PROJECT: B-5370**

**CONTRACT: C204063**



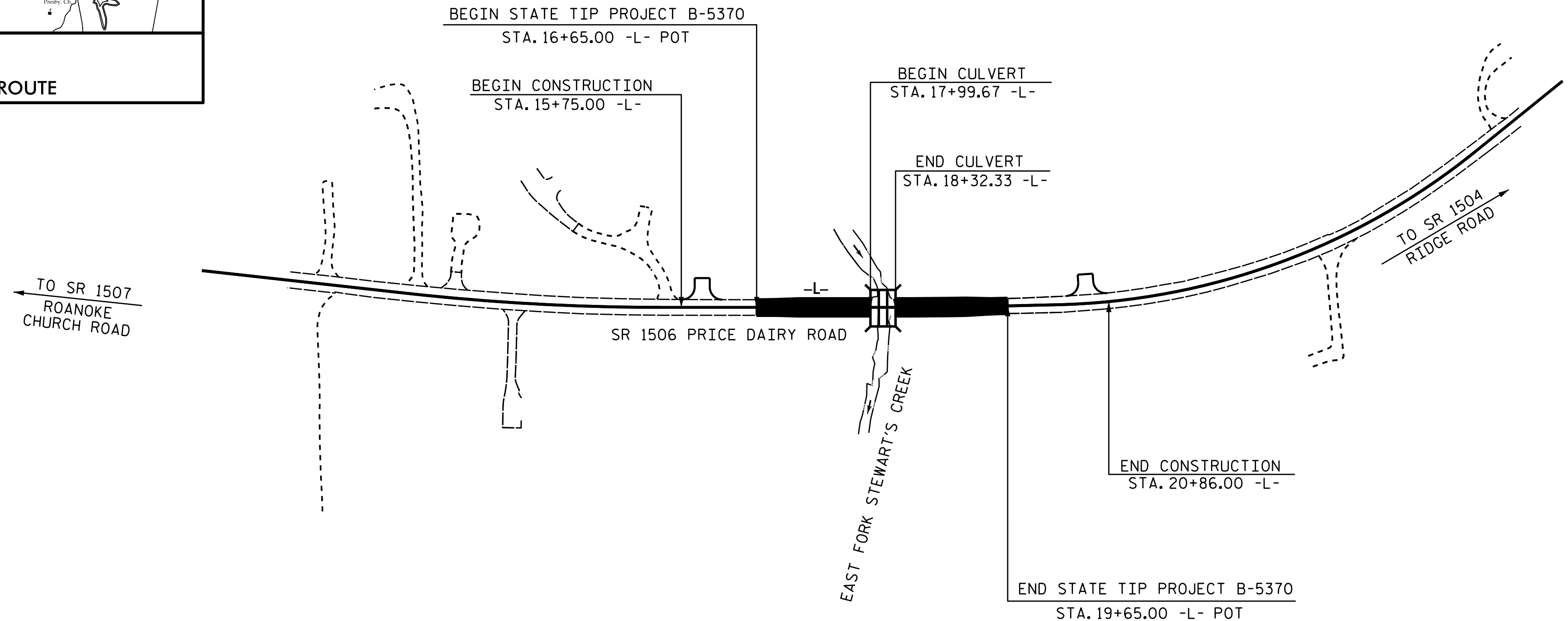
STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

# UNION COUNTY

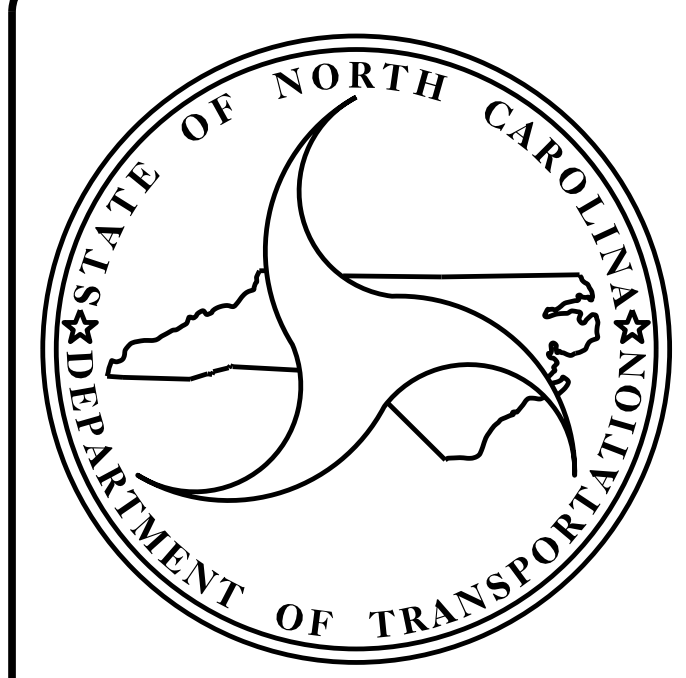
**LOCATION: BRIDGE NO. 444 ON SR 1506 (PRICE DAIRY RD)  
OVER EAST FORK STEWART'S CREEK**

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5370		
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
46085.1.1	BRZ-1506(3)	P.E.	
46085.2.1		RW, UTIL.	
46085.3.1		CONST.	



## CULVERT



**DESIGN DATA**

ADT 2018 =	345
ADT 2038 =	527
K =	12 %
D =	55 %
T =	21 % *
V =	50 MPH
* (TTST = 6% DUAL = 15%)	
FUNC. CLASS. =	LOCAL SUB-REGIONAL TIER

**PROJECT LENGTH**

LENGTH OF ROADWAY TIP PROJECT B-5370	=	0.051 MILES
LENGTH OF STRUCTURE TIP PROJECT B-5370	=	0.006 MILES
TOTAL LENGTH OF TIP PROJECT B-5370	=	0.057 MILES

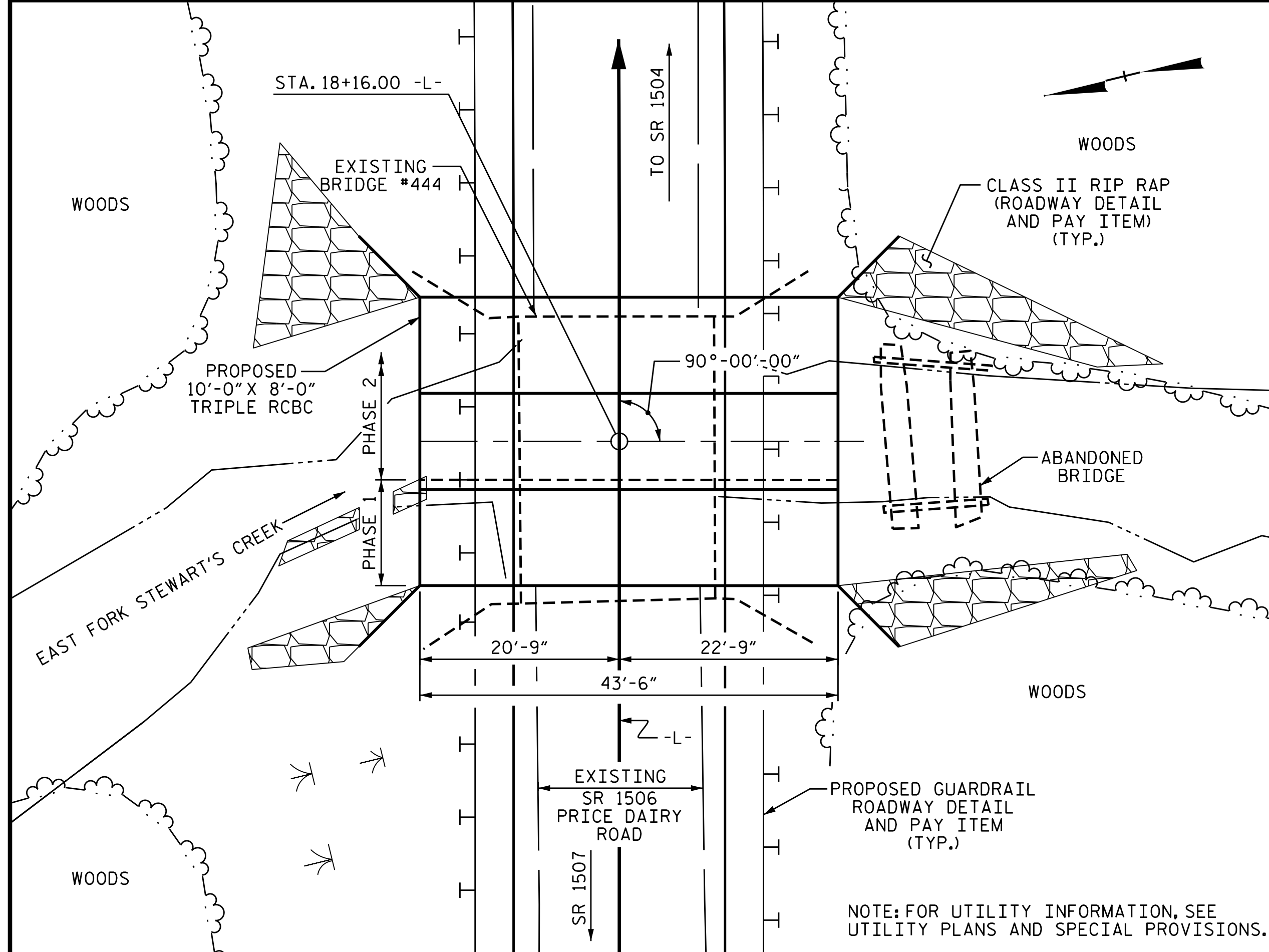
Prepared In the Office of:  
**DIVISION OF HIGHWAYS**  
STRUCTURES MANAGEMENT UNIT  
1000 BIRCH RIDGE DR.  
RALEIGH, N.C. 27610

2018 STANDARD SPECIFICATIONS

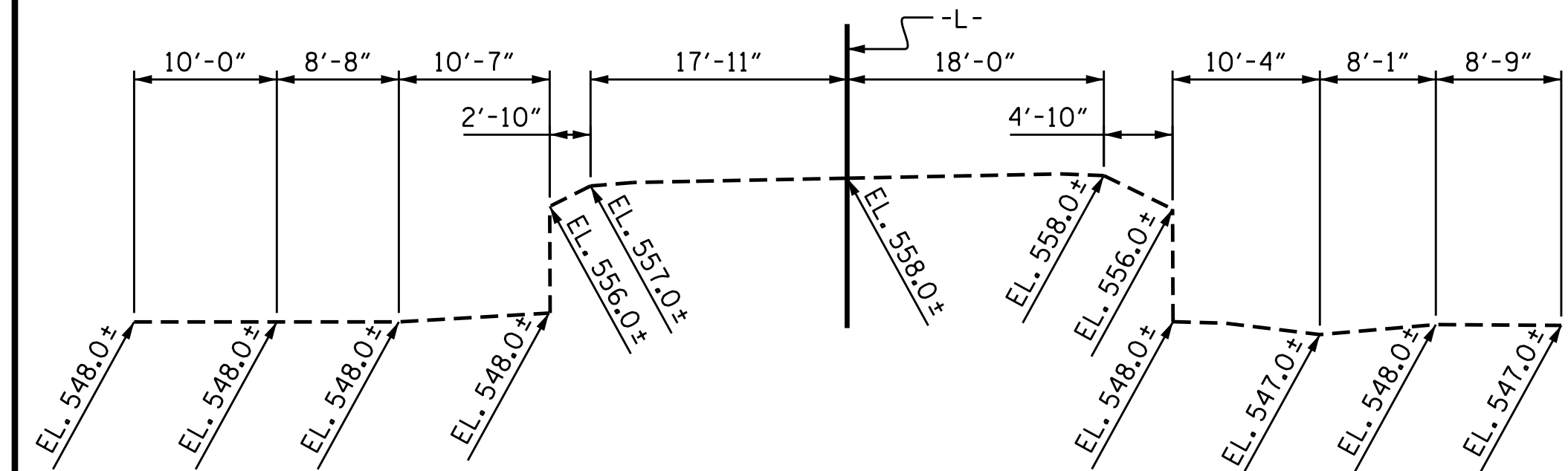
**LETTING DATE :**  
FEBRUARY 20, 2018

**A. KEITH PASCHAL, P.E.**  
PROJECT ENGINEER

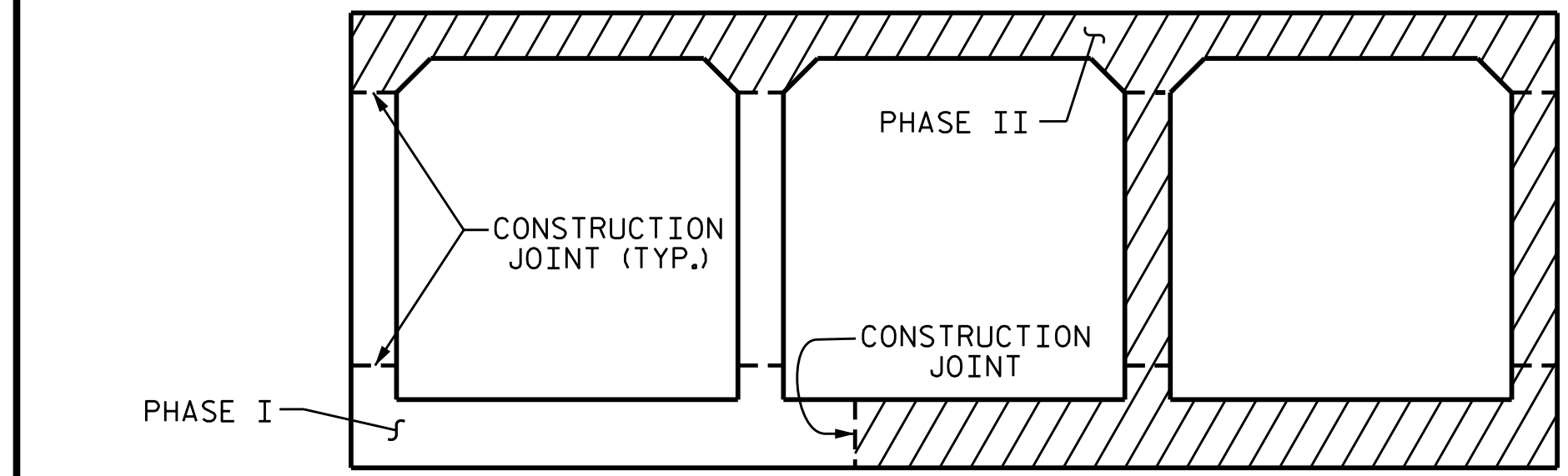
**BENCHMARK #2: RR SPIKE IN BASE OF POWER POLE, 36' LT. OF STA 16+76.96 -L-, EL. 561.65**



**LOCATION SKETCH**



**PROFILE ALONG CULVERT**



**CONSTRUCTION PHASING**

LOOKING UPSTREAM

DRAWN BY : H. T. BARBOUR DATE : 2-10-17  
 CHECKED BY : M. POOLE DATE : 3-17  
 DESIGN ENGINEER OF RECORD: G. KOUCHEKI DATE : 12-17

18-DEC-2017 15:02 R:\Structures\Final Plans\410.001.B5370.SMU.CU.001.890444.dgn kpaschal

**NOTES**

ASSUMED LIVE LOAD = HL - 93 OR ALTERNATE LOADING.  
 DESIGN FILL---2.70 (MIN.), 3.64 (MAX.)  
 FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.  
 3"Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.  
 CONCRETE IN PHASE I CULVERT TO BE POURED IN THE FOLLOWING ORDER:  
 1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF PHASE I VERTICAL WALLS.  
 2. THE REMAINING PORTIONS OF PHASE I WALLS AND PHASE I WING FULL HEIGHT.  
 3. PHASE I SILLS.  
 CONCRETE IN PHASE II CULVERT TO BE POURED IN THE FOLLOWING ORDER:  
 1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF PHASE II VERTICAL WALLS.  
 2. THE REMAINING PORTIONS OF PHASE II WALLS AND PHASE II WING FULL HEIGHT, FOLLOWED BY ROOF SLAB AND HEADWALLS.  
 3. PHASE II SILLS.  
 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 FACE OF EXTERIOR WALL AND BOTH FACES OF INTERIOR WALLS ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.  
 AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAIL DRAWINGS FOR A PRECAST REINFORCED CONCRETE BOX CULVERT IN LIEU OF THE CAST-IN-PLACE CULVERT SHOWN ON THE PLANS. THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIONAL PRECAST REINFORCED CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.

FOR CULVERT DIVERSION DETAILS & PAY ITEM, SEE EROSION CONTROL PLANS.  
 FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.  
 FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.  
 FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.  
 FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.  
 FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.  
 INASMUCH AS THE PAINT SYSTEM ON THE EXISTING STRUCTURAL STEEL CONTAINS LEAD, THE CONTRACTOR'S ATTENTION IS DIRECTED TO ARTICLE 107-1 OF THE STANDARD SPECIFICATIONS. ANY COSTS RESULTING FROM COMPLIANCE WITH APPLICABLE STATE OR FEDERAL REGULATIONS PERTAINING TO HANDLING OF MATERIALS CONTAINING LEAD BASED PAINT SHALL BE INCLUDED IN THE BID PRICE FOR "REMOVAL OF EXISTING STRUCTURE."  
 THE EXISTING STRUCTURE CONSISTING OF ONE SPAN @ 30'-6" WITH A TIMBER DECK WITH 2" ASPHALT WEARING SURFACE ON 9 LINES OF W14 X 30 I-BEAMS @ 2'-4" CENTERS; WITH A CLEAR ROADWAY WIDTH OF 19'-2" ON END BENTS WITH TIMBER CAPS ON POST AND SILLS AND TIMBER BULKHEADS AND LOCATED AT THE SITE OF THE PROPOSED STRUCTURE SHALL BE REMOVED. IN ADDITION, THE ABANDONED BRIDGE ADJACENT TO BRIDGE No. 444 SHALL BE REMOVED. THIS REMOVAL SHALL BE PAID FOR UNDER THE CONTRACT LUMP SUM PRICE BID FOR "REMOVAL OF EXISTING STRUCTURE".  
 THE SUBSTRUCTURE OF THE EXISTING BRIDGE No. 444 AND THE ABANDONED BRIDGE INDICATED ON THE PLANS IS FROM THE BEST INFORMATION AVAILABLE. SINCE THIS INFORMATION IS SHOWN FOR THE CONVENIENCE OF THE CONTRACTOR, THE CONTRACTOR SHALL HAVE NO CLAIM WHATSOEVER AGAINST THE DEPARTMENT OF TRANSPORTATION FOR ANY DELAYS OR ADDITIONAL COST INCURRED BASED ON DIFFERENCES BETWEEN THE EXISTING BRIDGE SUBSTRUCTURE SHOWN ON THE PLANS AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.  
 REMOVAL OF THE EXISTING BRIDGE SHALL BE PERFORMED IN A MANNER THAT PREVENTS DEBRIS FROM FALLING INTO THE WATER. THE CONTRACTOR SHALL SUBMIT DEMOLITION PLANS FOR REVIEW AND REMOVE THE BRIDGE IN ACCORDANCE WITH ARTICLE 402-2 OF THE STANDARD SPECIFICATIONS.  
 FOR BOX CULVERT EXCAVATION, SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.  
 THE REINFORCED CONCRETE BOX CULVERT SHALL BE PLACED ON THE STANDARD 12-INCH BLANKET OF FOUNDATION CONDITIONING MATERIAL.  
 THE REQUIRED BEARING CAPACITY AT THE BASE OF THE CULVERT IS 2 TSF. THE REQUIRED BEARING CAPACITY SHALL BE VERIFIED.  
 FOR ASBESTOS ASSESSMENT FOR BRIDGE DEMOLITION AND RENOVATION ACTIVITIES, SEE SPECIAL PROVISIONS

PHASE I STRUCTURE QUANTITIES		PHASE II STRUCTURE QUANTITIES	
	LUMP SUM		LUMP SUM
CULVERT EXCAVATION		CULVERT EXCAVATION	
FOUNDATION CONDITIONING MATERIAL	50 TONS	FOUNDATION CONDITIONING MATERIAL	69 TONS
CLASS A CONCRETE		CLASS A CONCRETE	
BARREL	31.4 C.Y.	BARREL	104.4 C.Y.
WINGS, ETC.	18.4 C.Y.	WINGS, ETC.	23.1 C.Y.
TOTAL	49.8 C.Y.	TOTAL	127.5 C.Y.
REINFORCING STEEL		REINFORCING STEEL	
BARREL	4641 LBS.	BARREL	12667 LBS.
WINGS, ETC.	1215 LBS.	WINGS, ETC.	1215 LBS.
TOTAL	5856 LBS.	TOTAL	13882 LBS.

TOTAL STRUCTURE QUANTITIES	
REMOVAL OF EXISTING STRUCTURE	LUMP SUM
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	
PHASE I	50 TONS
PHASE II	69 TONS
TOTAL	119 TONS
CLASS A CONCRETE	
BARREL @ 3.121 CY/FT	135.8 C.Y.
WINGS, ETC.	41.5 C.Y.
TOTAL	177.3 C.Y.
REINFORCING STEEL	
BARREL	17308 LBS.
WINGS, ETC.	2430 LBS.
TOTAL	19738 LBS.
ASBESTOS ASSESSMENT	LUMP SUM

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

**HYDRAULIC DATA**

DESIGN DISCHARGE = 1200 CFS  
 FREQUENCY OF DESIGN FLOOD = 25 YRS.  
 DESIGN HIGH WATER ELEVATION = 555.8  
 DRAINAGE AREA = 3.6 SQ. MI.  
 BASE DISCHARGE (Q100) = 1690 CFS  
 BASE HIGH WATER ELEVATION = 558.33

**OVERTOPPING FLOOD DATA**

OVERTOPPING DISCHARGE = 1618 CFS  
 FREQUENCY OF OVERTOPPING FLOOD = 100± YRS.  
 OVERTOPPING FLOOD ELEVATION = 558.1 \*  
 \* SAG @ STA. 18+02.00

**GRADE DATA**

GRADE POINT ELEVATION @ STA. 18+16.00 -L- = 557.81  
 BED ELEVATION @ STA. 18+16.00 -L- = 546.70  
 ROADWAY FILL SLOPES = 2:1



PROJECT NO. B-5370  
 UNION COUNTY  
 STATION: 18+16.00 -L-

SHEET 1 OF 8 REPLACES BRIDGE #444

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
**TRIPLE 10 FT. X 8 FT. CONCRETE BOX CULVERT**  
 90°-00'-00" SKEW

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						MOMENT				SHEAR						
						LIVE-LOAD FACTORS (γ <sub>LL</sub> )	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	1.01	--	1.75	1.37	1	TOP SLAB	4.27	1.01	1	TOP SLAB	9.46		
	HL-93 (OPERATING)	N/A		1.30	--	1.35	1.78	1	TOP SLAB	4.27	1.30	1	TOP SLAB	9.46		
	HS-20 (INVENTORY)	36.00	②	1.21	43.39	1.75	1.47	1	TOP SLAB	4.27	1.21	1	TOP SLAB	9.46		
	HS-20 (OPERATING)	36.00		1.56	56.25	1.35	1.90	1	TOP SLAB	4.27	1.56	1	TOP SLAB	9.46		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.50		2.20	29.74	1.40	2.67	1	TOP SLAB	4.53	2.20	1	TOP SLAB	9.46	
		SNGARBS2	20.00		2.05	41.07	1.40	2.50	1	TOP SLAB	4.53	2.05	1	TOP SLAB	9.46	
		SNAGRIS2	22.00		2.20	48.30	1.40	2.67	1	TOP SLAB	4.53	2.20	1	TOP SLAB	9.46	
		SNCOTTS3	27.25	③	1.26	34.38	1.40	1.71	1	TOP SLAB	4.27	1.26	1	TOP SLAB	9.46	
		SNAGGRS4	34.93		1.62	56.58	1.40	2.15	1	TOP SLAB	4.53	1.62	1	TOP SLAB	9.46	
		SNS5A	35.55		1.44	51.03	1.40	2.04	1	TOP SLAB	4.53	1.44	1	TOP SLAB	9.46	
		SNS6A	39.95		1.43	56.99	1.40	2.00	1	BOTTOM SLAB	9.87	1.43	1	BOTTOM SLAB	9.79	
		SNS7B	42.00		1.36	56.96	1.40	1.90	1	BOTTOM SLAB	9.87	1.36	1	BOTTOM SLAB	9.79	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.00		1.73	57.03	1.40	2.45	1	BOTTOM SLAB	9.87	1.73	1	BOTTOM SLAB	9.79	
		TNT4A	33.08		1.51	49.94	1.40	2.04	1	TOP SLAB	4.27	1.51	1	TOP SLAB	9.46	
		TNT6A	41.60		1.41	58.79	1.40	1.97	1	BOTTOM SLAB	9.87	1.41	1	BOTTOM SLAB	9.79	
		TNT7A	42.00		1.43	59.91	1.40	2.04	1	BOTTOM SLAB	9.87	1.43	1	BOTTOM SLAB	9.79	
		TNT7B	42.00		1.43	59.91	1.40	2.01	1	TOP SLAB	4.53	1.43	1	BOTTOM SLAB	9.79	
		TNAGRIT4	43.00		1.33	57.28	1.40	1.93	1	BOTTOM SLAB	9.87	1.33	1	BOTTOM SLAB	9.79	
TNAGT5A	45.00		1.27	56.94	1.40	1.80	1	BOTTOM SLAB	9.87	1.27	1	BOTTOM SLAB	9.79			
TNAGT5B	45.00		1.27	56.94	1.40	1.78	1	BOTTOM SLAB	9.87	1.27	1	BOTTOM SLAB	9.79			

**LOAD FACTORS:**

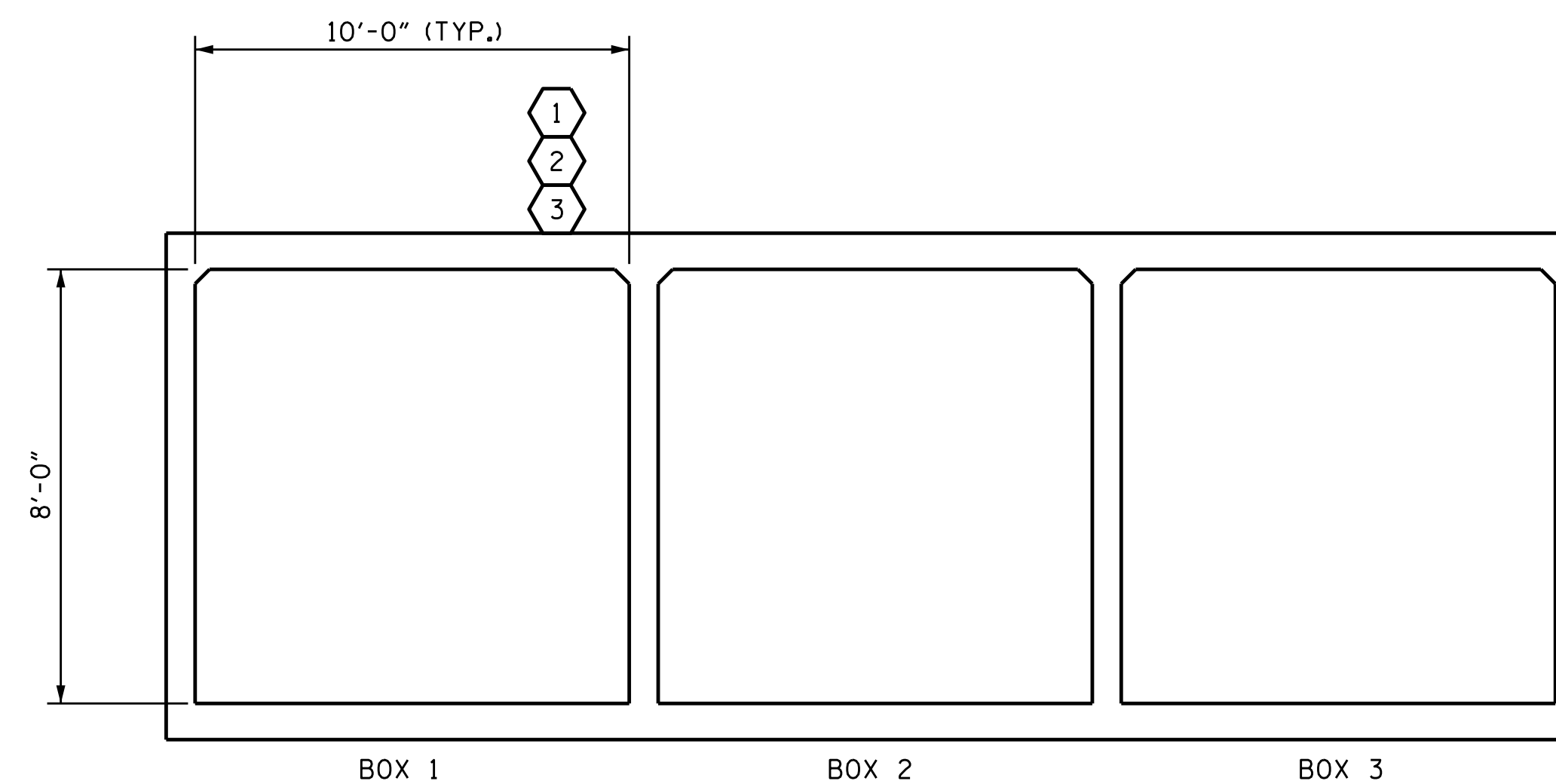
DESIGN LOAD RATING FACTORS

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

**NOTE:**

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

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



**LRFR SUMMARY**  
(LOOKING DOWNSTREAM)

PROJECT NO. B-5370  
UNION COUNTY  
 STATION: 18+16.00 -L-

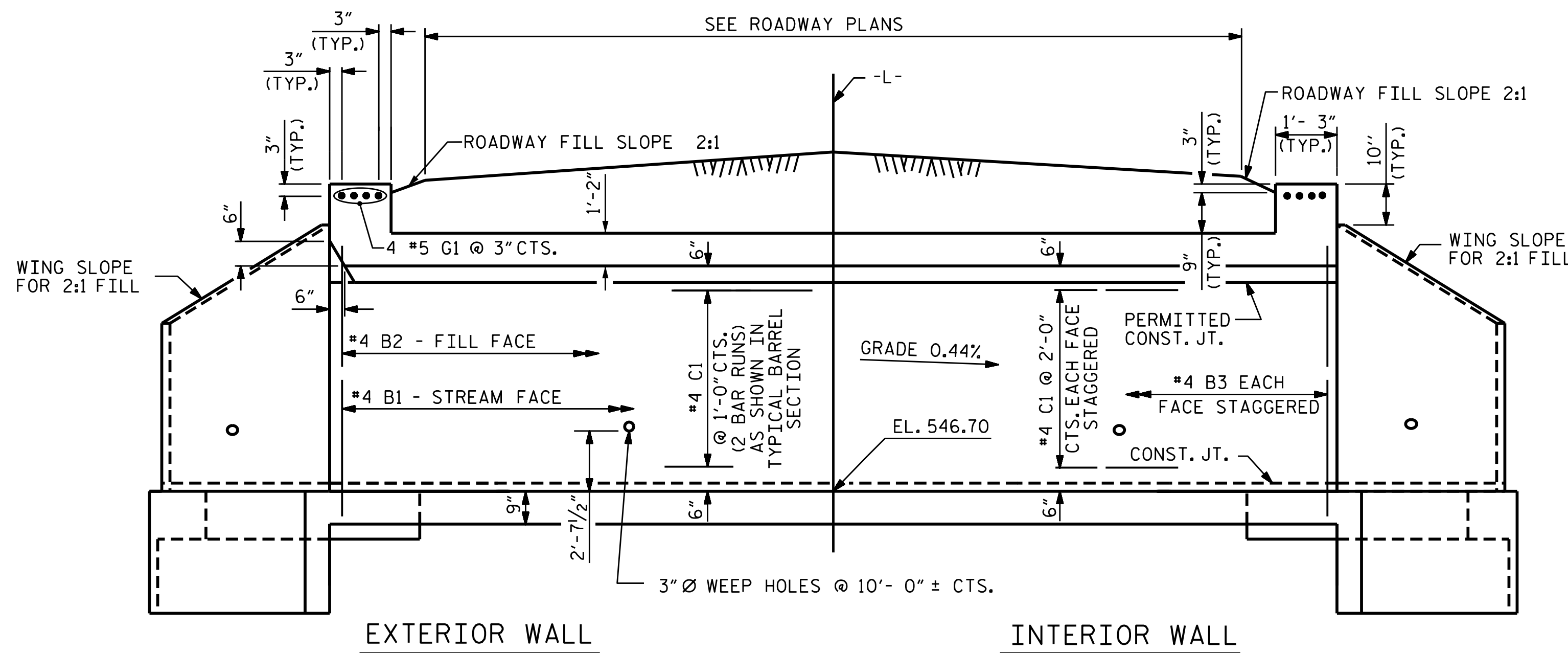
SHEET 2 OF 8



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

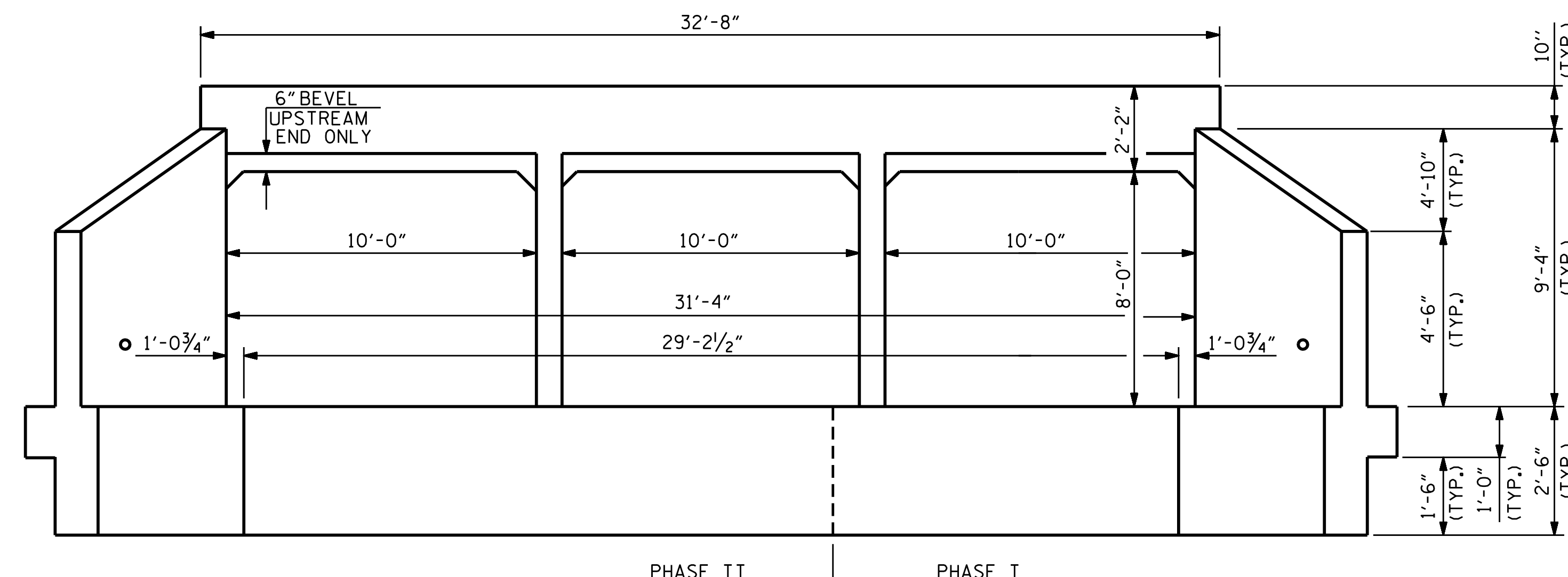
ASSEMBLED BY :	H. T. BARBOUR	DATE :	12/20/2016
CHECKED BY :	M. POOLE	DATE :	1/17
DRAWN BY :	WMC	7/11	REV. 10/1/11
CHECKED BY :	GM	7/11	MAA/GM

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

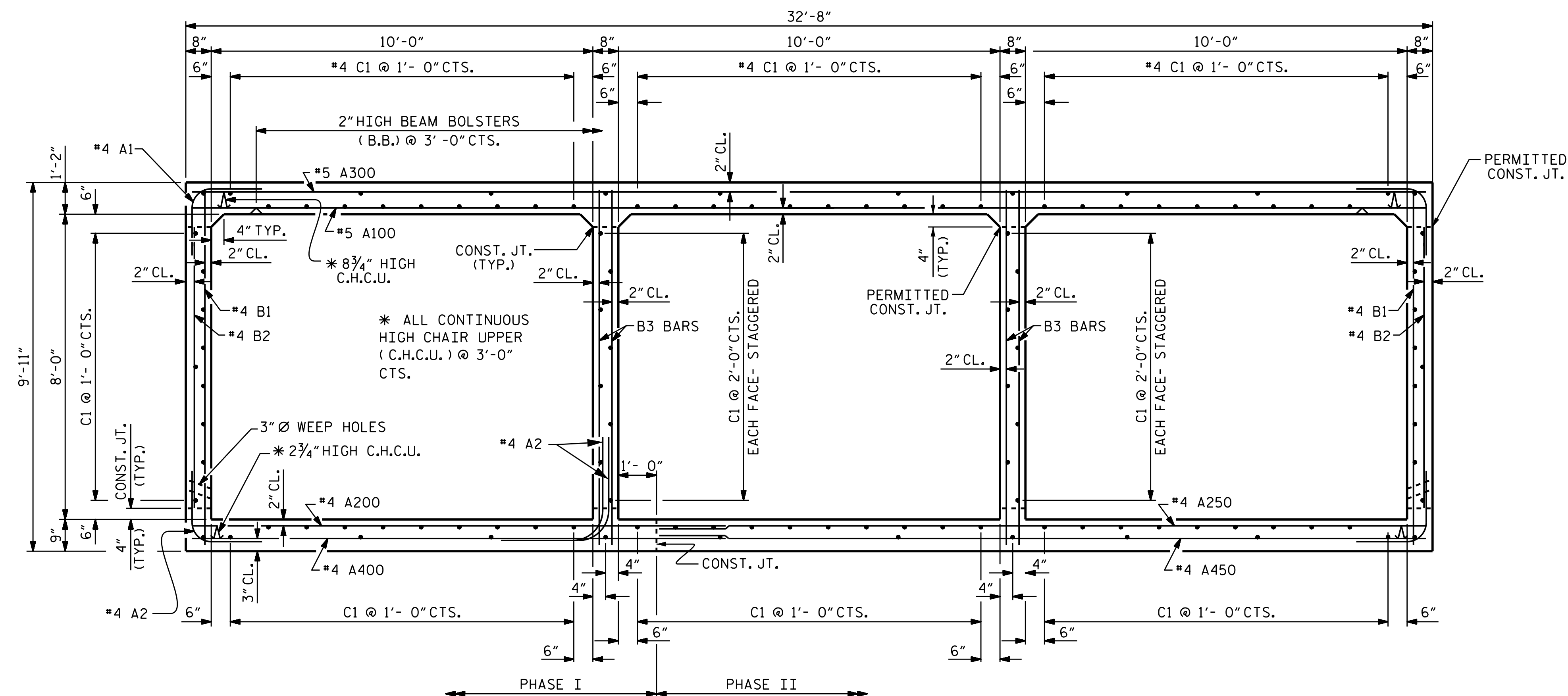


EXTERIOR WALL INTERIOR WALL

**CULVERT SECTION NORMAL TO ROADWAY**



**END ELEVATION**  
(LOOKING DOWNSTREAM)



**RIGHT ANGLE SECTION OF BARREL**

THERE ARE 114 "C" BARS IN SECTION OF BARREL.

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. B-5370  
UNION COUNTY  
 STATION: 18+16.00 -L-  
 SHEET 3 OF 8

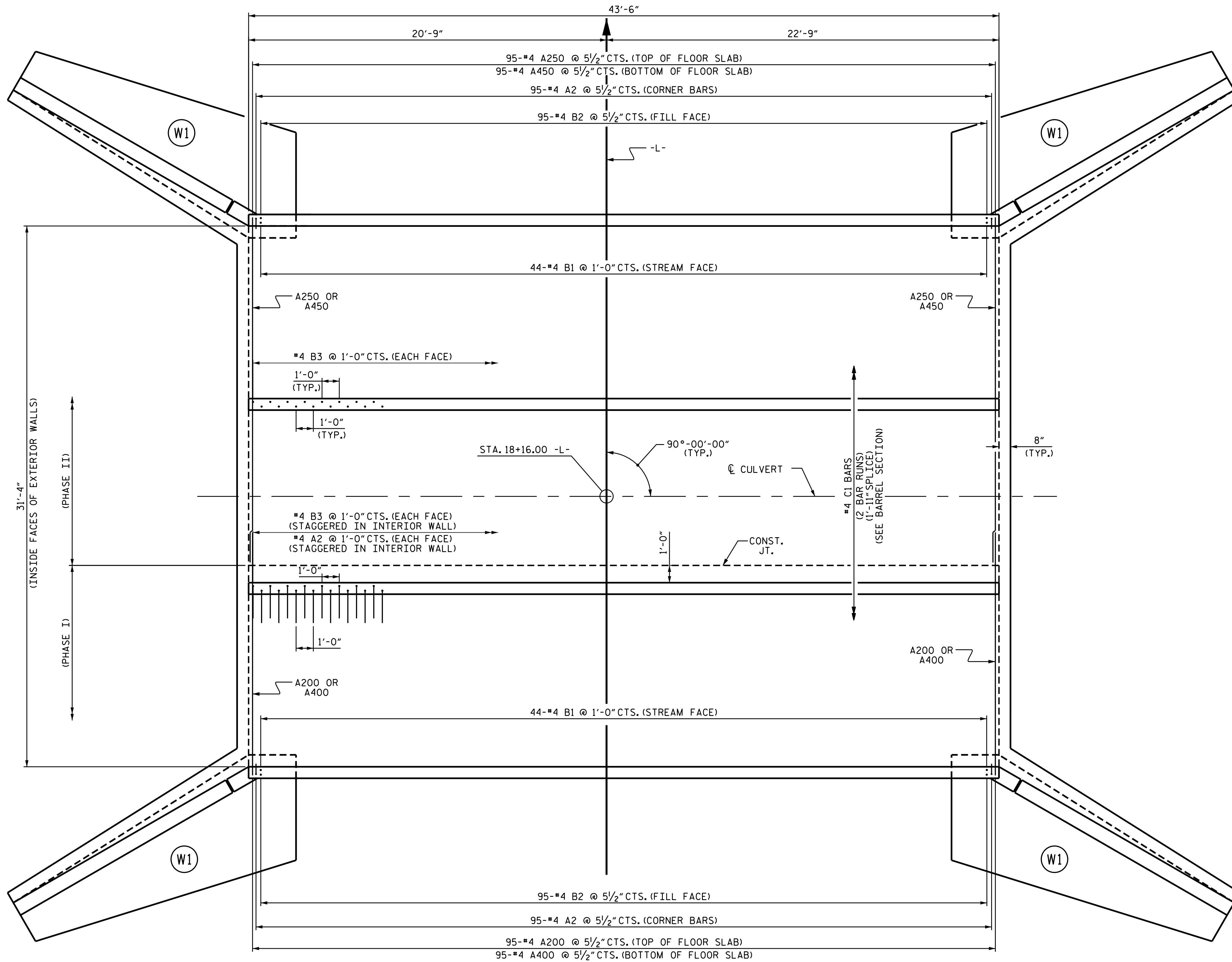


STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 TRIPLE 10 FT. X 8 FT.  
 CONCRETE BOX CULVERT  
 90°-00'-00" SKEW

DRAWN BY : H. T. BARBOUR DATE : 2-10-17  
 CHECKED BY : M. POOLE DATE : 3-17

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 SIGNATURES COMPLETED

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



PLAN OF FLOOR SLAB

PROJECT NO. B-5370  
UNION COUNTY  
 STATION: 18+16.00 -L-

SHEET 4 OF 8

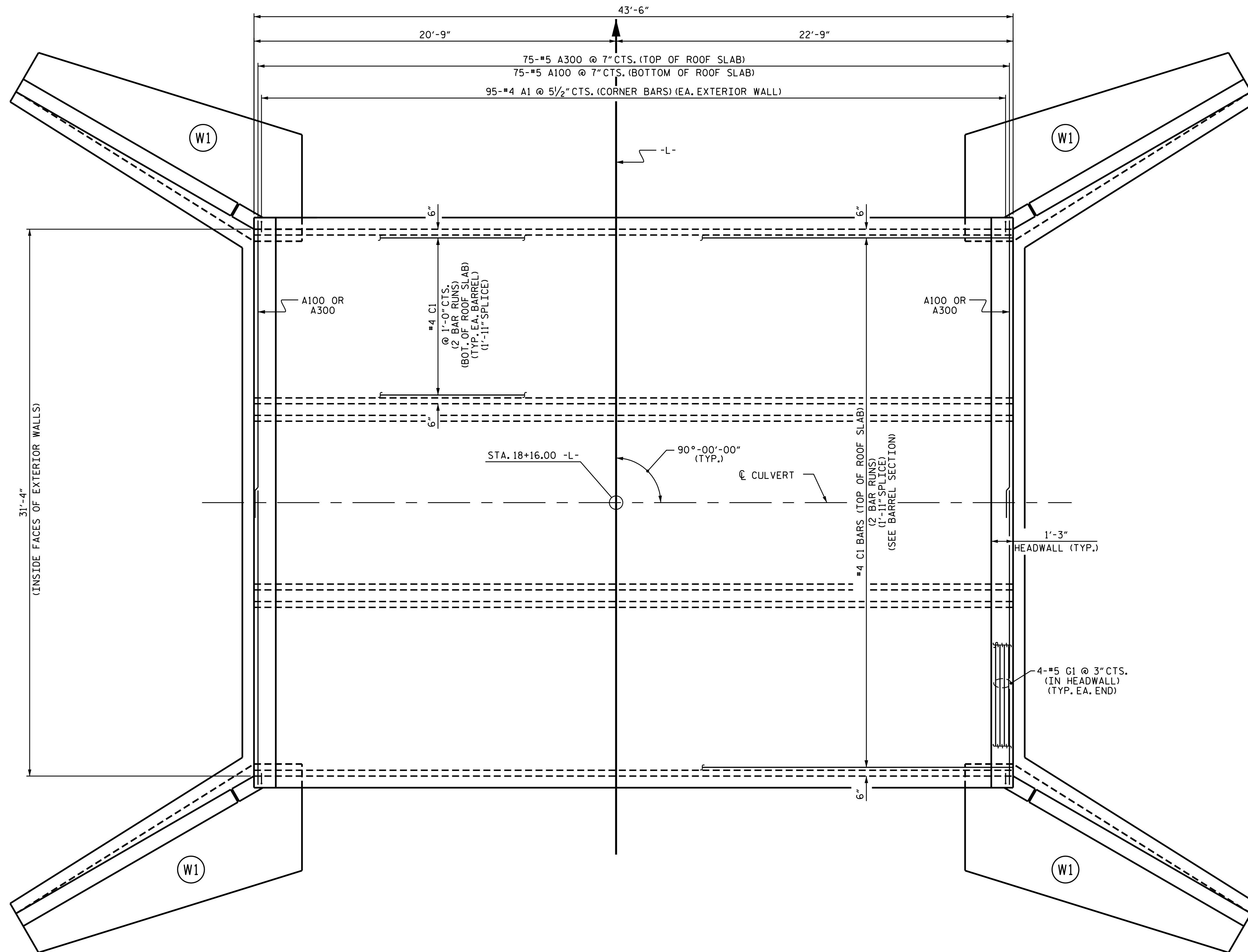


STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 TRIPLE 10 FT. X 8 FT.  
 CONCRETE BOX CULVERT  
 90°-00'-00" SKEW

DRAWN BY : H. T. BARBOUR DATE : 2-14-17  
 CHECKED BY : M. POOLE DATE : 3-17  
 DESIGN ENGINEER OF RECORD: G. KOUCHEKI DATE : 12-17

DOCUMENT NOT CONSIDERED  
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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-4
1			3			TOTAL SHEETS
2			4			8



PLAN OF ROOF SLAB

PROJECT NO. B-5370  
UNION COUNTY  
 STATION: 18+16.00 -L-

SHEET 5 OF 8



DocuSigned by:  
 A Keith Paschal 12/20/2017  
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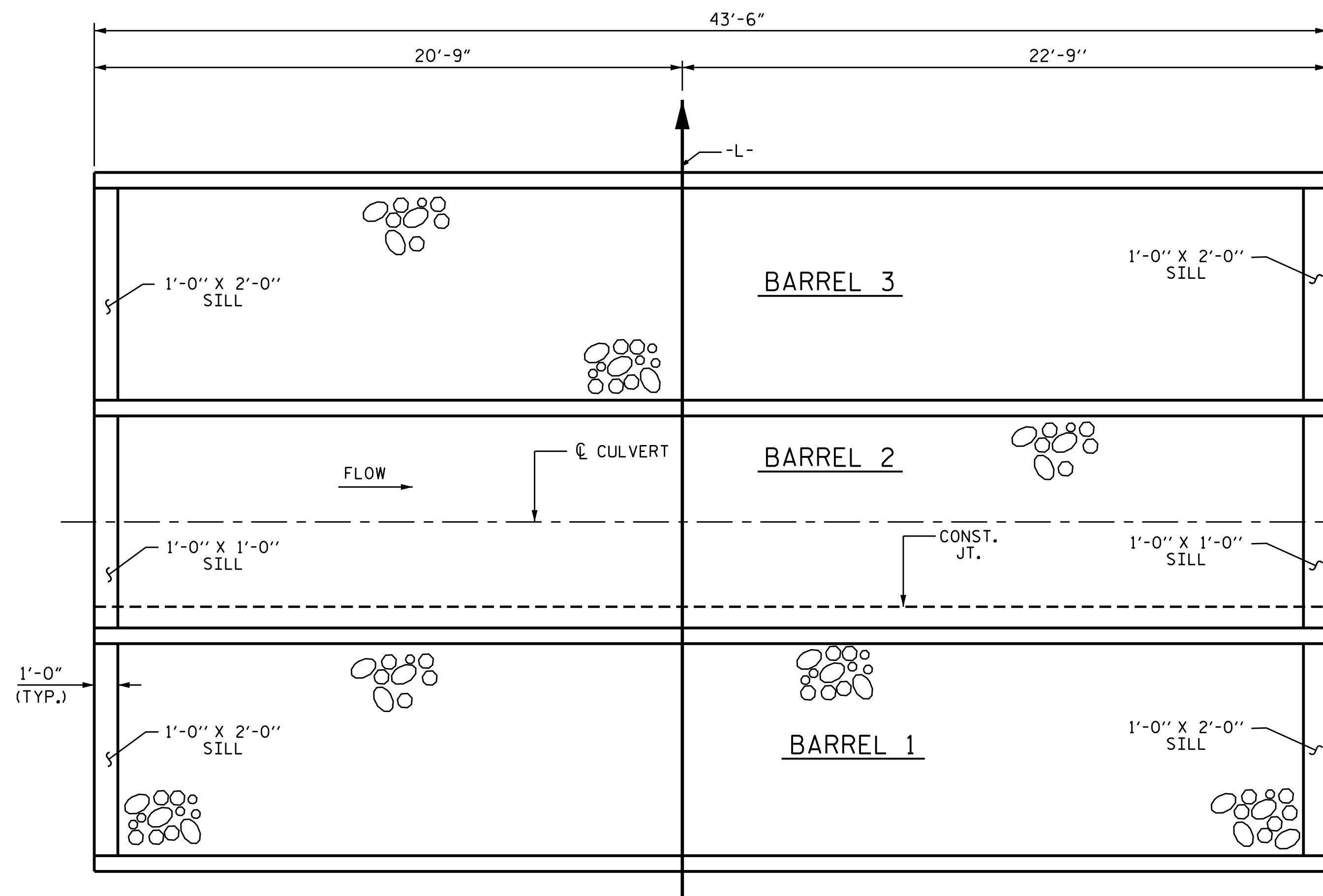
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
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 TRIPLE 10 FT. X 8 FT.  
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DRAWN BY : H. T. BARBOUR DATE : 2-14-17  
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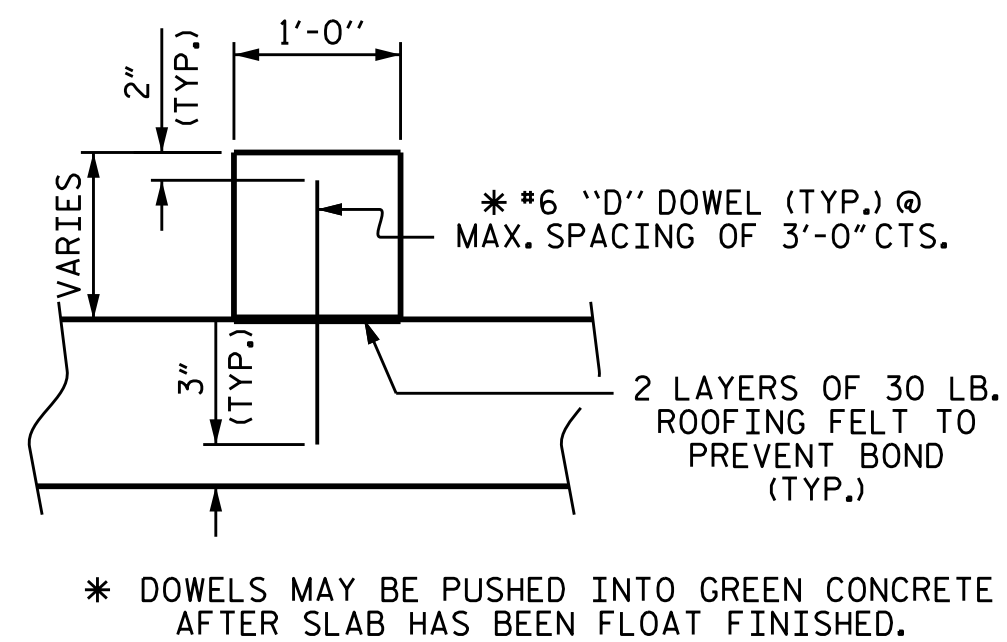
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 kpaschal

DOCUMENT NOT CONSIDERED  
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 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-5
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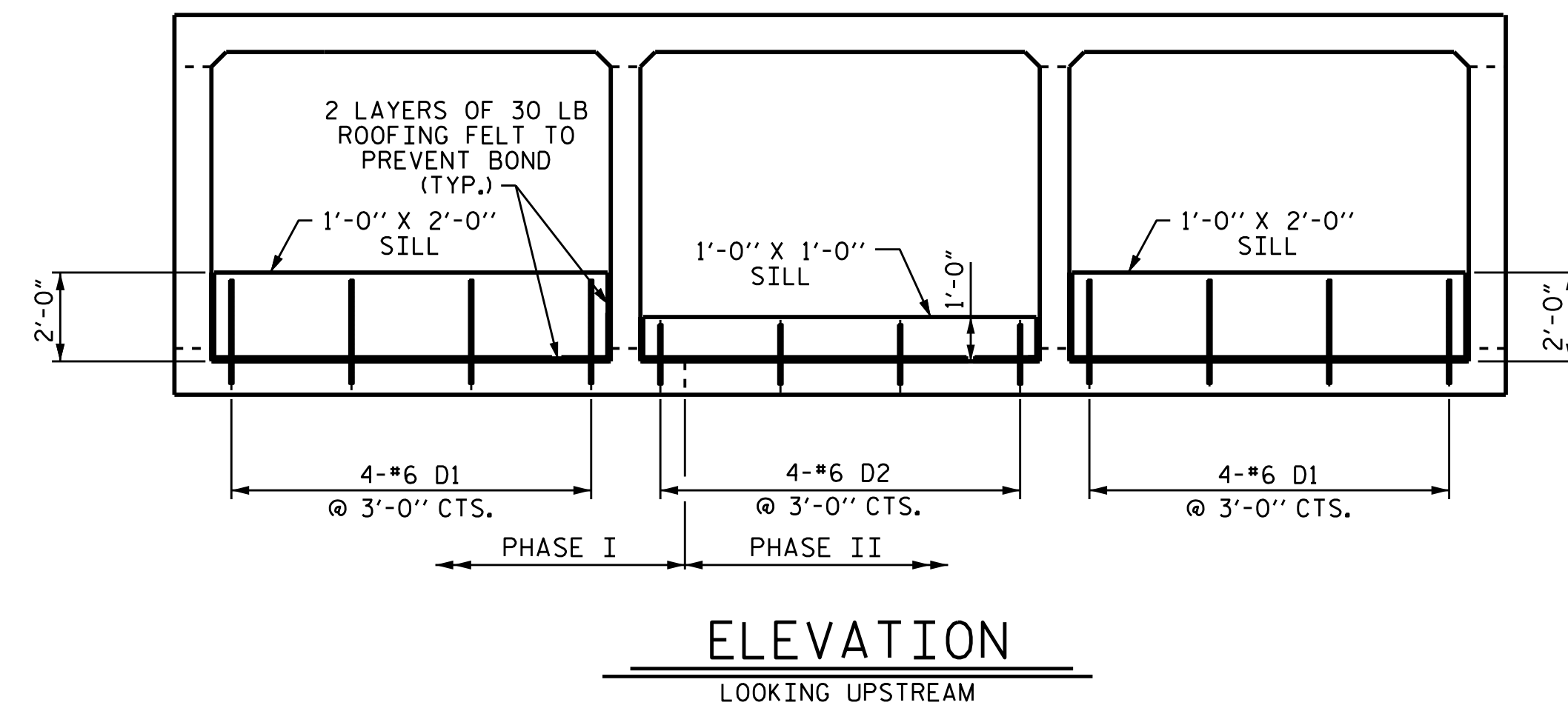
PLAN OF FLOOR SILL LAYOUT



SECTION THRU SILL

BAR TYPE		REINFORCING BAR SCHEDULE									
		PHASE I					PHASE II				
		BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE
A2	183	#4	1	4'-7"	560	A1	190	#4	1	5'-5"	687
A200	95	#4	STR.	14'-1"	894	A2	95	#4	1	4'-7"	291
A400	95	#4	STR.	14'-1"	894	A100	75	#5	STR.	32'-4"	2529
B1	44	#4	STR.	9'-5"	277	A250	95	#4	STR.	20'-0"	1269
B2	95	#4	STR.	7'-4"	465	A300	75	#5	STR.	32'-4"	2529
B3	88	#4	STR.	9'-5"	554	A450	95	#4	STR.	20'-0"	1269
C1	64	#4	STR.	22'-8"	969	B1	44	#4	STR.	9'-5"	277
D1	8	#6	STR.	2'-4"	28	B2	95	#4	STR.	7'-4"	465
REINFORCING STEEL					4641 LBS.	B3	88	#4	STR.	9'-5"	554
REINFORCING STEEL					4641 LBS.	C1	164	#4	STR.	22'-8"	2483
REINFORCING STEEL					4641 LBS.	G1	8	#5	STR.	32'-4"	270
REINFORCING STEEL					4641 LBS.	D1	8	#6	STR.	2'-4"	28
REINFORCING STEEL					4641 LBS.	D2	8	#6	STR.	1'-4"	16
REINFORCING STEEL					4641 LBS.	REINFORCING STEEL					12667 LBS.

SPLICE CHART		
BAR	SIZE	SPLICE LENGTH
A200	#4	1'-9"
A250	#4	1'-9"
A400	#4	1'-9"
A450	#4	1'-9"
B1	#4	1'-5"
B3	#4	1'-5"
C1	#4	1'-11"



ELEVATION

LOOKING UPSTREAM

NOTES

MATERIAL EXCAVATED FROM THE EXISTING BED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AS SHOWN IN THE "PLAN OF FLOOR SILL LAYOUT". THE MATERIAL SHALL BE NATURAL STONE WITH A GRADATION SIZE SIMILAR TO THAT OF CLASS B RIP RAP. BED MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

THE STOCKPILED MATERIAL SHALL BE PLACED LEVEL WITH THE TOP OF THE SILLS.

BED MATERIAL SHALL BE SUPPLEMENTED BY CLASS B RIP RAP AS NECESSARY.

THE ENTIRE COST OF WORK REQUIRED TO PLACE EXCAVATED OR SUPPLEMENTAL MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR CULVERT EXCAVATION.

THE ENTIRE COST OF WORK REQUIRED TO CONSTRUCT THE SILLS SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.

PROJECT NO. B-5370  
 UNION COUNTY  
 STATION: 18+16.00 -L-

SHEET 6 OF 8



DocuSigned by:  
 A Keith Paschal 12/20/2017

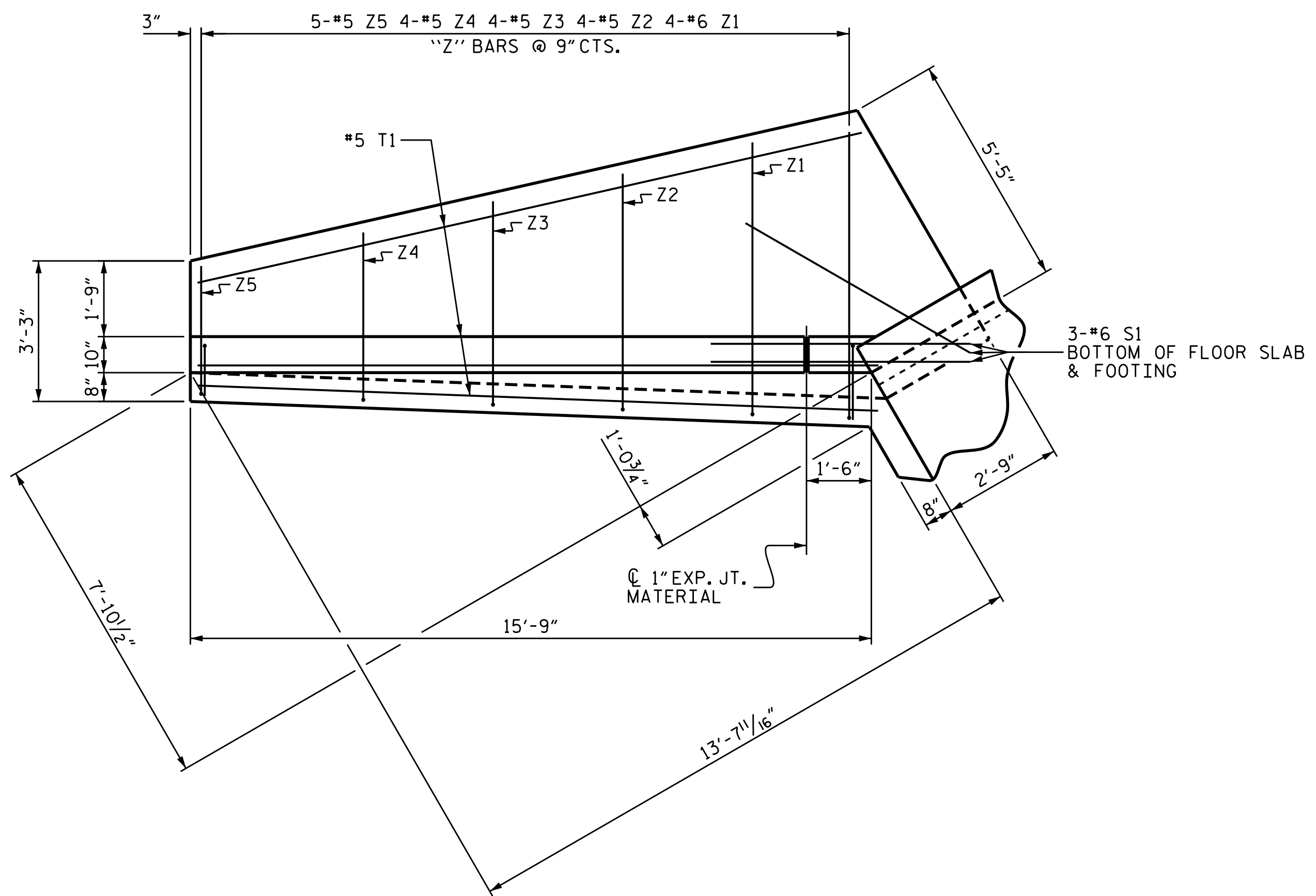
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 TRIPLE 10 FT. X 8 FT.  
 CONCRETE BOX CULVERT  
 90°-00'-00" SKEW

DRAWN BY : H.T. BARBOUR DATE : 2-14-17  
 CHECKED BY : M. POOLE DATE : 3-17  
 DESIGN ENGINEER OF RECORD: G. KOUCHEKI DATE : 12-17

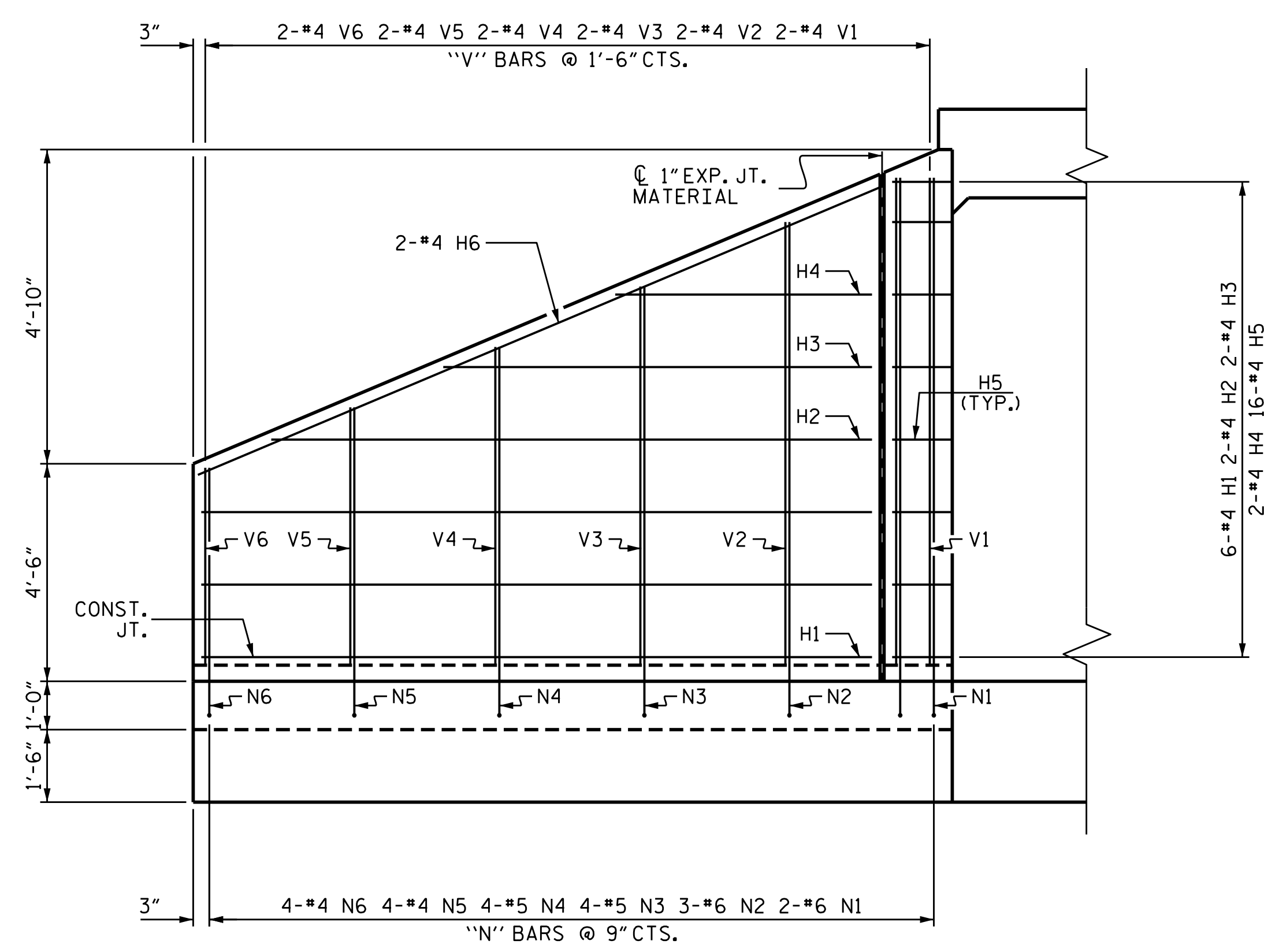
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NO.	BY:	DATE:	NO.	BY:	DATE:	C-6
1			3			TOTAL SHEETS
2			4			8

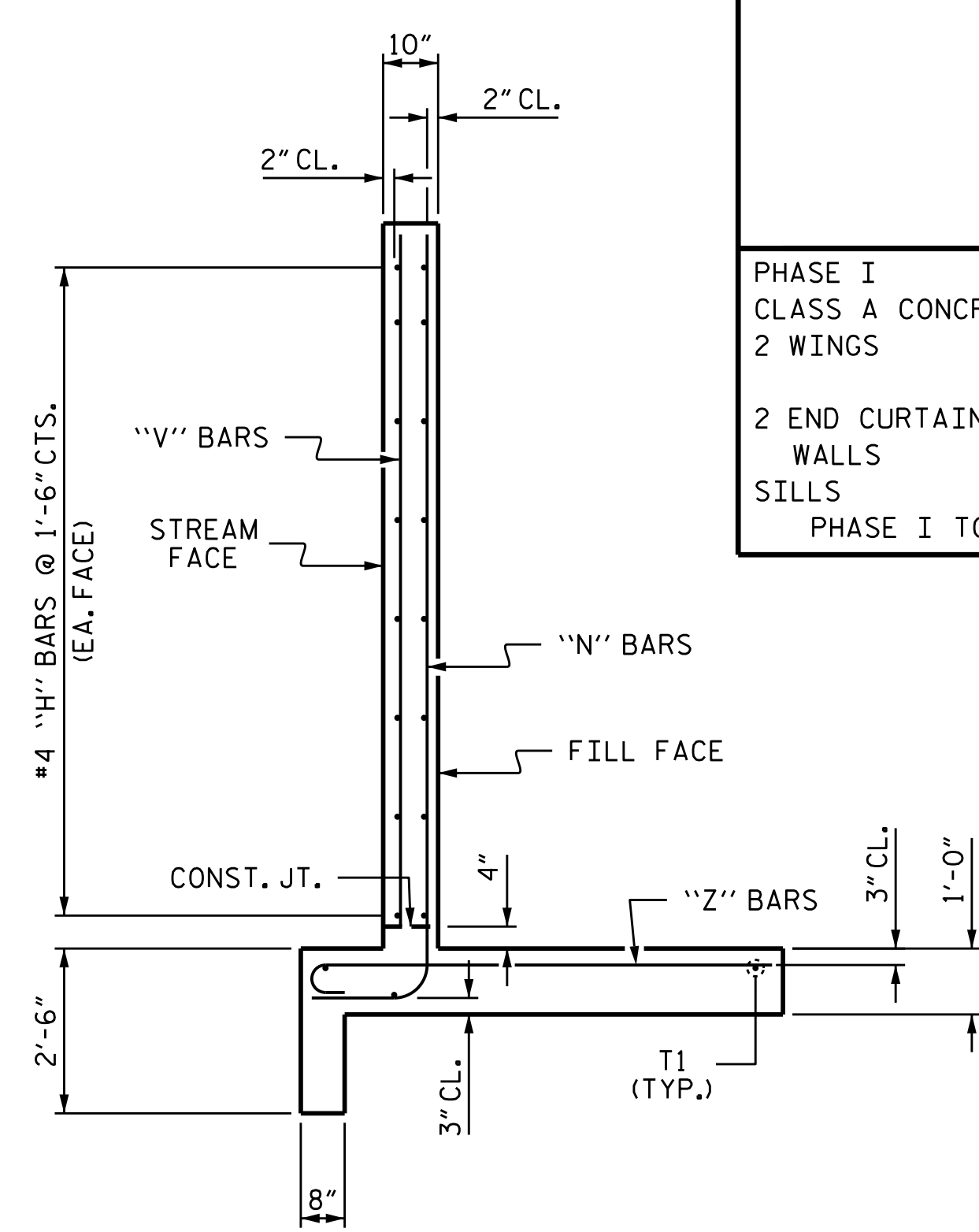




PLAN



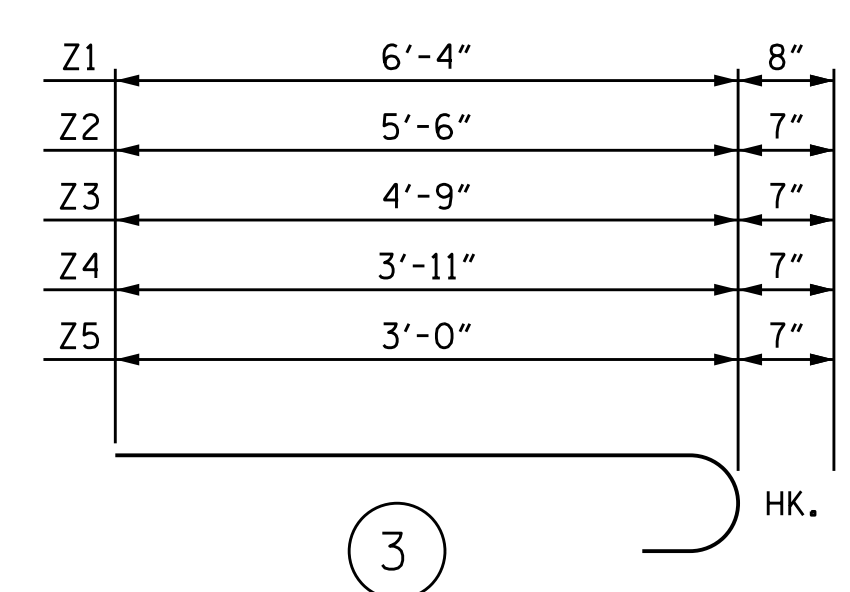
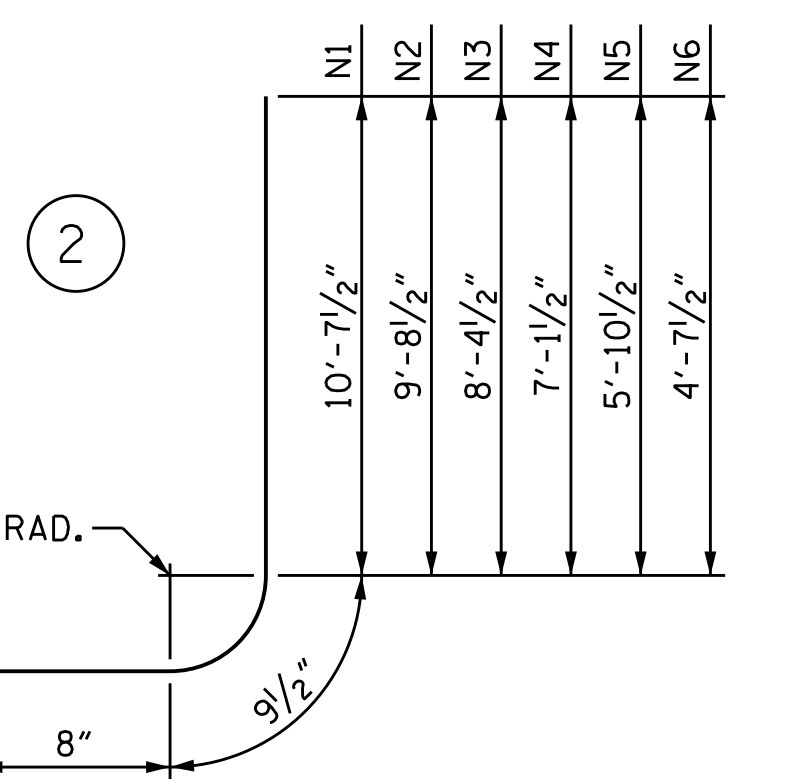
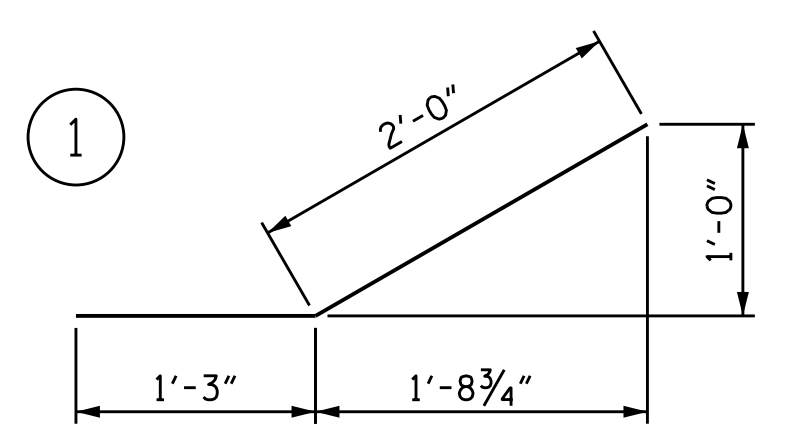
ELEVATION



TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.



BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	13'-10"	111
H2	4	#4	STR	12'-5"	33
H3	4	#4	STR	8'-10"	24
H4	4	#4	STR	5'-4"	14
H5	32	#4	1	3'-3"	69
H6	4	#4	STR	15'-5"	41
N1	4	#6	2	12'-1"	73
N2	6	#6	2	11'-2"	101
N3	8	#5	2	9'-10"	82
N4	8	#5	2	8'-7"	72
N5	8	#4	2	7'-4"	39
N6	8	#4	2	6'-1"	33
S1	6	#6	STR	6'-0"	54
T1	6	#5	STR	15'-9"	99
V1	4	#4	STR	10'-1"	27
V2	4	#4	STR	9'-2"	24
V3	4	#4	STR	7'-10"	21
V4	4	#4	STR	6'-7"	18
V5	4	#4	STR	5'-4"	14
V6	4	#4	STR	4'-1"	11
Z1	8	#6	3	7'-0"	84
Z2	8	#5	3	6'-1"	51
Z3	8	#5	3	5'-4"	45
Z4	8	#5	3	4'-6"	38
Z5	10	#5	3	3'-7"	37

REINFORCING STEEL FOR 2 WINGS 1215 LBS.

NOTE  
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.

PHASE I		PHASE II	
CLASS A CONCRETE		CLASS A CONCRETE	
2 WINGS	15.6 CY	2 WINGS	15.6 CY
2 END CURTAIN WALLS	1.3 CY	2 HEADWALLS	3.0 CY
SILLS	1.5 CY	2 END CURTAIN WALLS	2.3 CY
PHASE I TOTAL	18.4 CY	SILLS	2.2 CY
		PHASE II TOTAL	23.1 CY

PROJECT NO. B-5370  
UNION COUNTY  
STATION: 18+16.00 -L-

SHEET 7 OF 8  
STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
STANDARD WINGS  
FOR  
CONCRETE BOX CULVERT  
H = 10'-0" SLOPE = 2:1  
90° SKEW



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

ASSEMBLED BY : H. T. BARBOUR DATE : 2-14-17  
CHECKED BY : M. POOLE DATE : 3-17  
DRAWN BY : CCJ 10/99  
CHECKED BY : RWW 03/00

18-DEC-2017 14:45  
E:\TIP\Projects-B\B5370\Structures\Final Plans\410\_03\_B5370\_SMU.CW.007\_890444.dgn  
kpaschal

STD. NO. CW9010

NOTES

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

- A. FERRULES SHALL BE MADE FROM STEEL MEETING THE REQUIREMENTS OF AASHTO M169, GRADE 12L14 AND SHALL HAVE A MINIMUM LENGTH OF THREADS OF 2 1/2".
- B. 4 - 1" Ø X 2 1/4" BOLTS WITH WASHERS, BOLTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A307. BOLTS AND WASHERS SHALL BE GALVANIZED. (AT THE CONTRACTOR'S OPTION, STAINLESS STEEL BOLTS AND WASHERS MAY BE USED AS AN ALTERNATE FOR THE 1" Ø X 2 1/4" GALVANIZED BOLTS AND WASHERS, THEY SHALL CONFORM TO OR EXCEED THE MECHANICAL REQUIREMENTS OF ASTM A307. THE USE OF THIS ALTERNATE SHALL BE APPROVED BY THE ENGINEER.)
- C. WIRE STRUTS SHOWN IN THE GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS DETAIL ARE MINIMUM ALLOWABLE SIZE AND SHALL HAVE A MINIMUM TENSILE STRENGTH OF 100,000 P.S.I. AS AN OPTION, A 7/16" Ø WIRE STRUT WITH A MINIMUM TENSILE STRENGTH OF 90,000 PSI IS ACCEPTABLE.

GUARDRAIL ANCHOR ASSEMBLY WITH BOLTS SHALL BE ASSEMBLED IN THE SHOP. BOLT THREADS MAY BE RECUT AS NECESSARY TO INSURE FIT.

THE COST OF THE GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS COMPLETE IN PLACE, SHALL BE INCLUDED IN THE UNIT CONTRACT PRICE BID FOR CLASS "A" CONCRETE.

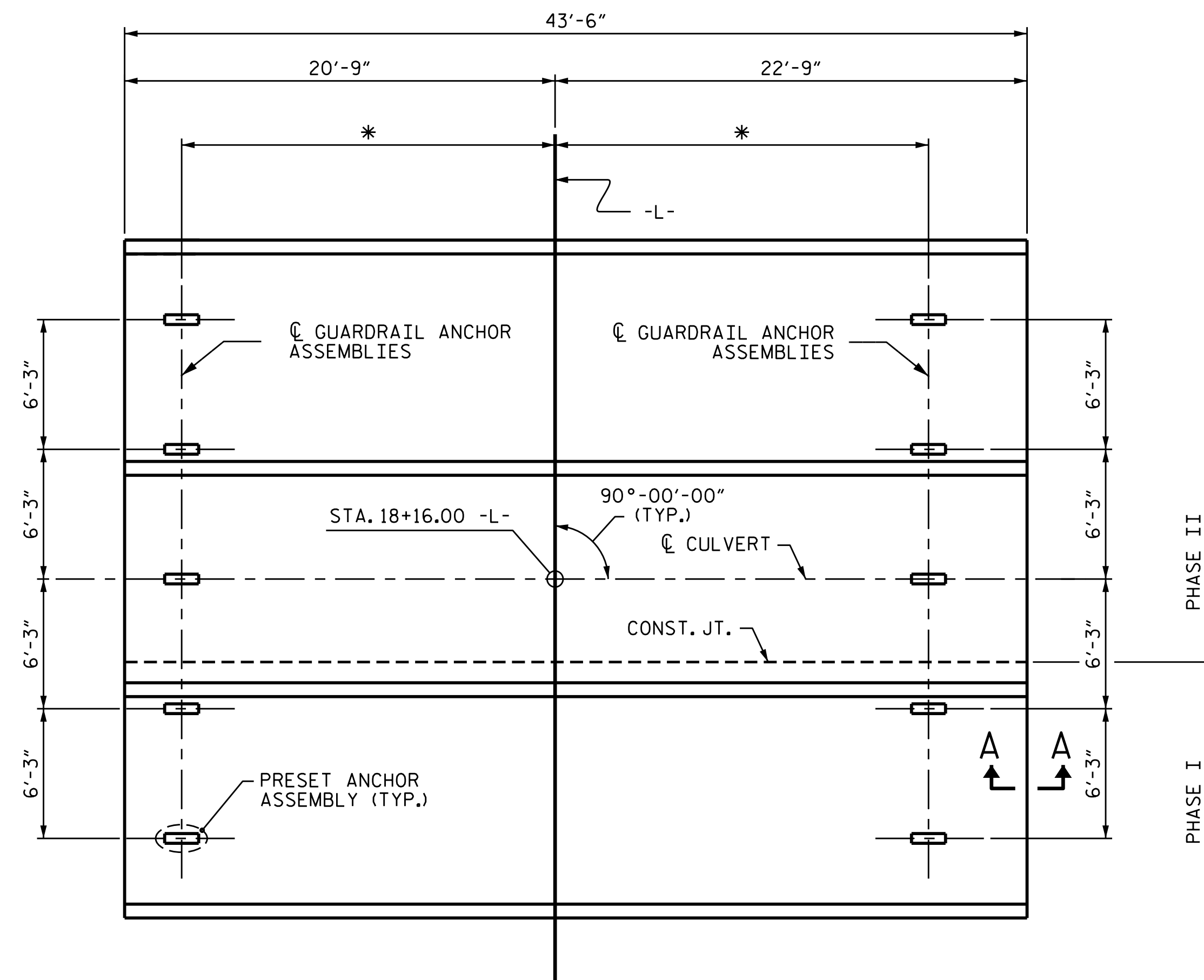
FERRULES TO BE PLUGGED DURING POURING OF SLAB AS RECOMMENDED BY THE MANUFACTURER.

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

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

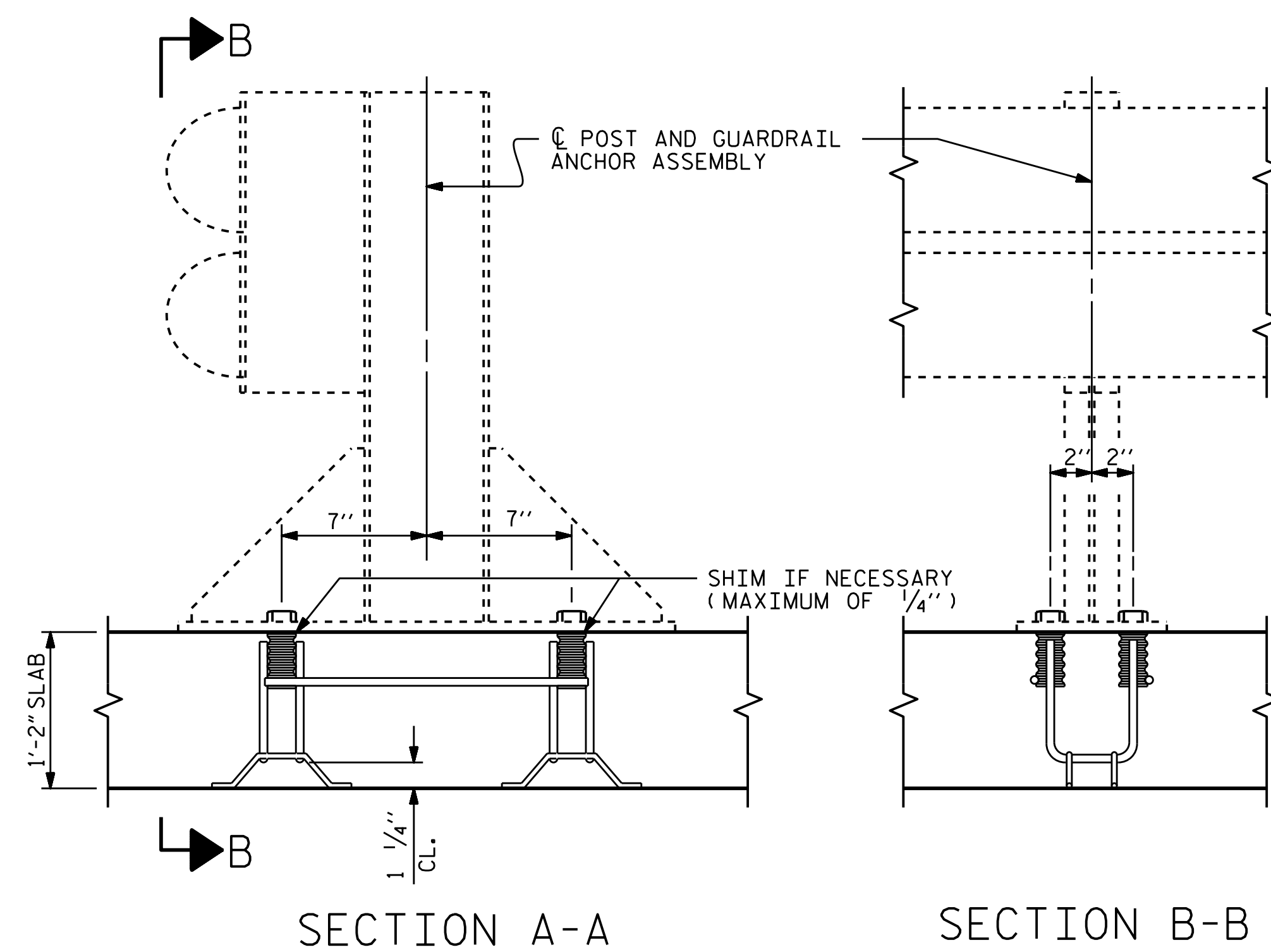
SLAB REINFORCING STEEL MAY BE SHIFTED AS NECESSARY TO CLEAR GUARDRAIL ANCHOR ASSEMBLY. CARE SHOULD BE TAKEN TO KEEP THE SHIFTING OF REINFORCING STEEL TO A MINIMUM.

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



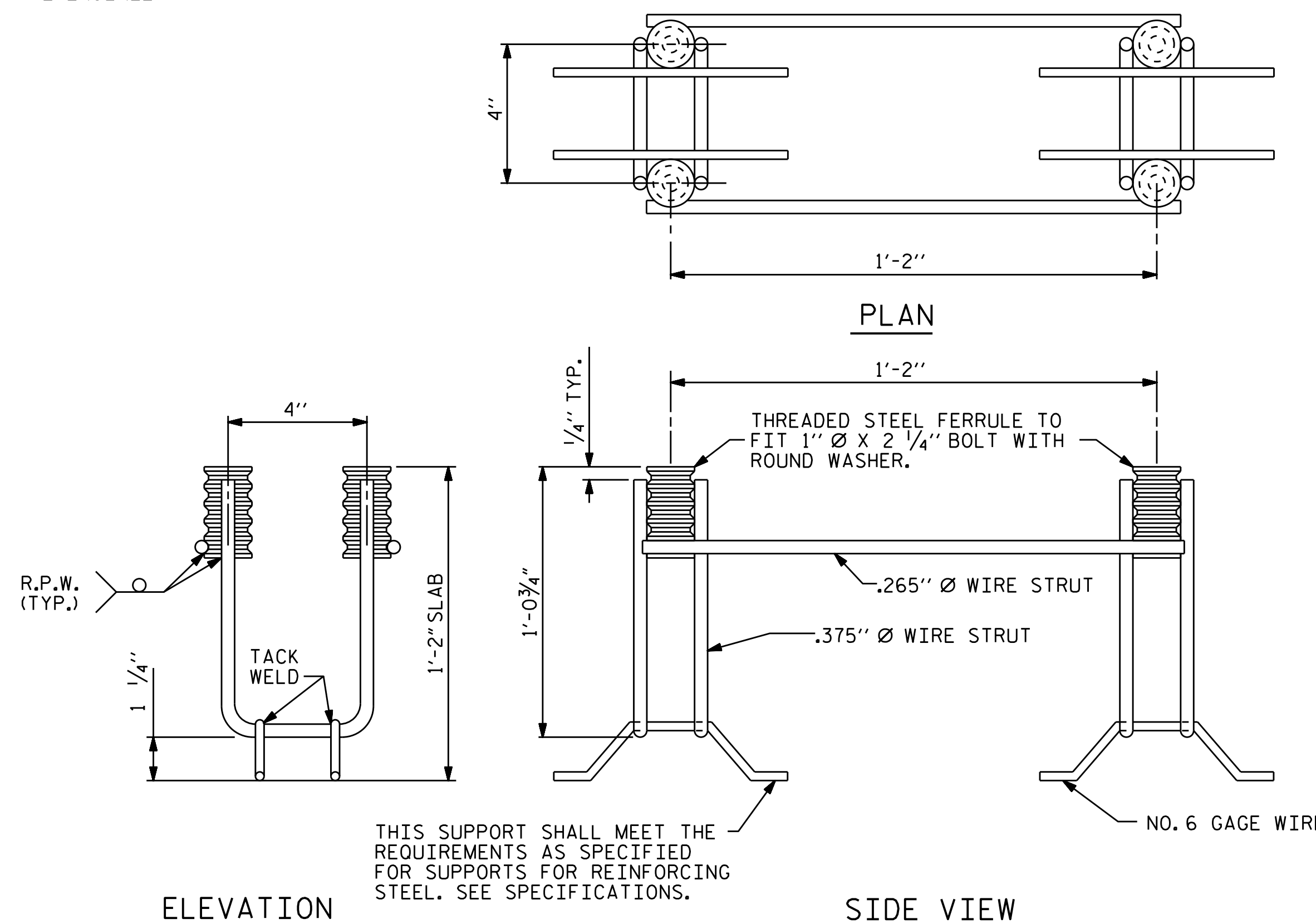
PLAN

SHOWING : GUARDRAIL ANCHOR ASSEMBLY SPACING.  
\* THESE DIMENSIONS TO BE FURNISHED BY THE ENGINEER



SECTION A-A

SECTION B-B



ELEVATION

SIDE VIEW

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

GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS

PROJECT NO. B-5370  
UNION COUNTY  
STATION: 18+16.00 -L-

SHEET 8 OF 8



DocuSigned by:  
A Keith Paschal 12/20/2017

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
STANDARD  
ANCHORAGE DETAILS FOR  
GUARDRAIL ANCHOR ASSEMBLY  
FOR CULVERTS

ASSEMBLED BY : H. T. BARBOUR	DATE : 2-14-17
CHECKED BY : M. POOLE	DATE : 3-17
DRAWN BY : FCJ 6/88	REV. 5/7/03 RWW/JTE
CHECKED BY : ARB 6/88	REV. 5/1/06R KMM/GM
	REV. 10/1/11 MAA/GM

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SIGNATURES COMPLETED

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