

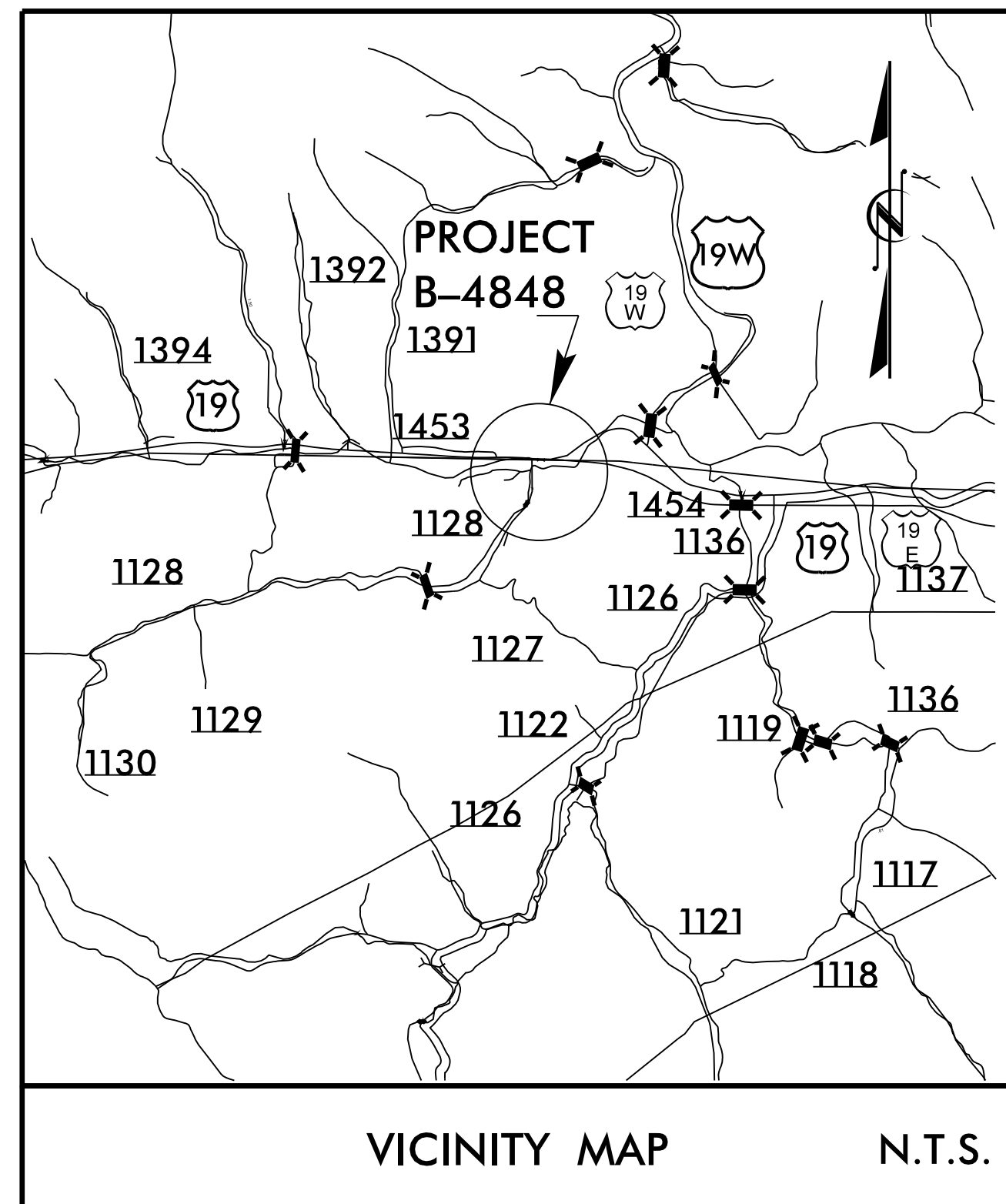
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TIP PROJECT: B-4848

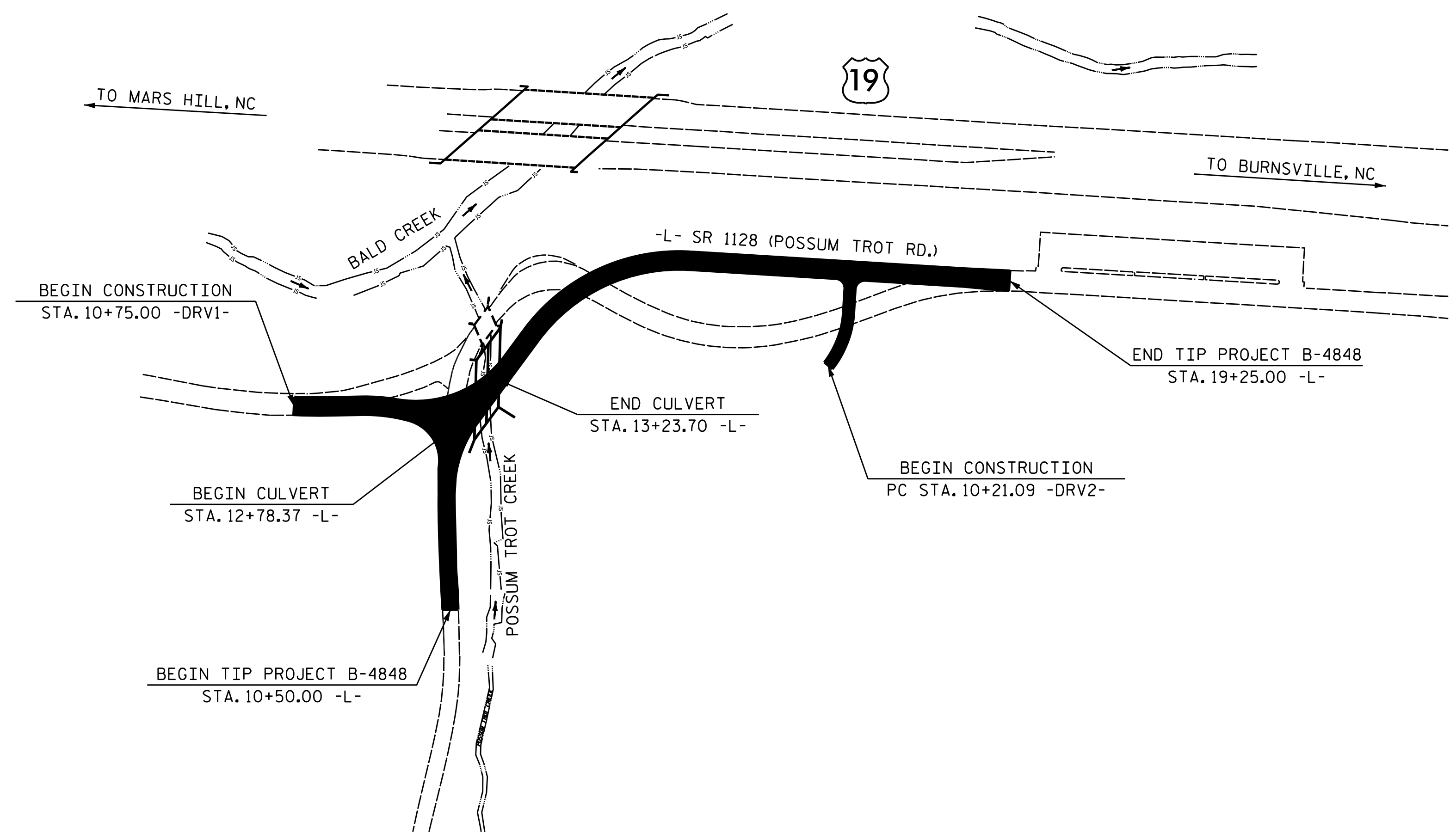
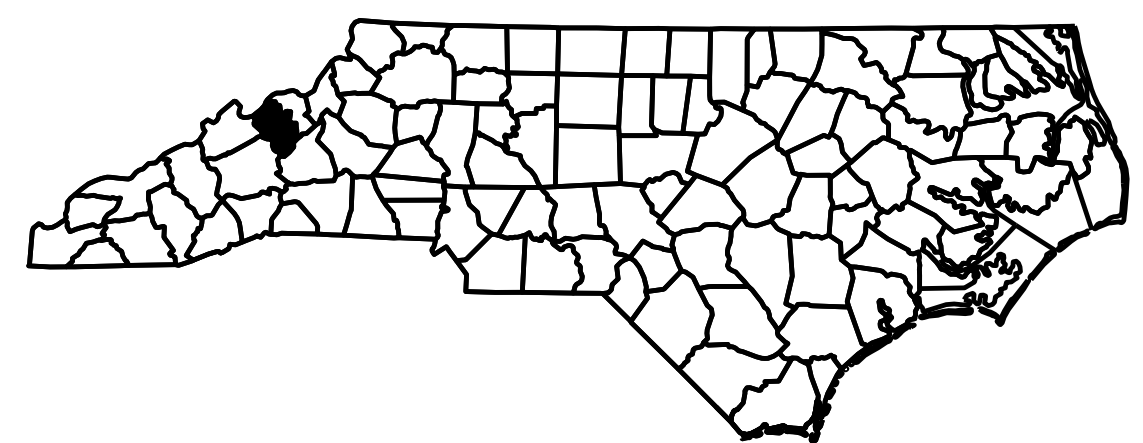
CONTRACT: C204011



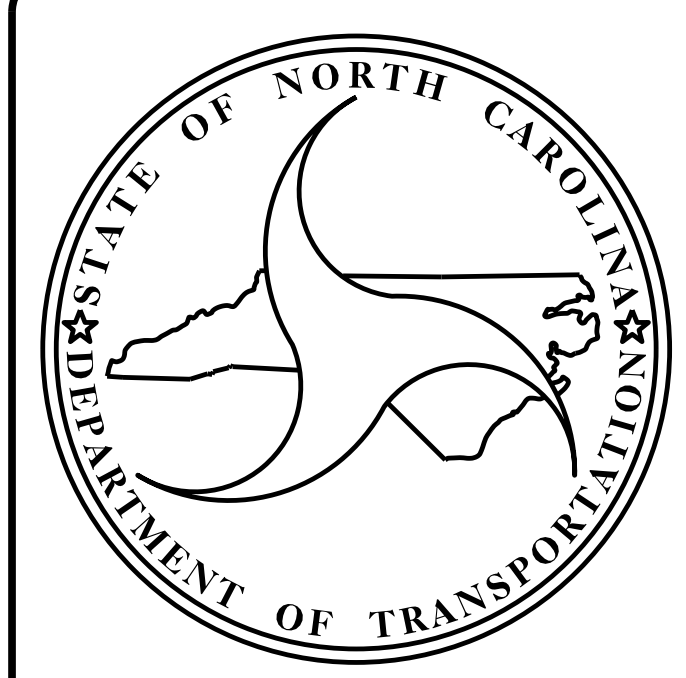
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
YANCEY COUNTY

**LOCATION: REPLACE BRIDGE 3 OVER POSSUM TROT CREEK
ON SR 1128**
TYPE OF WORK: GRADING, PAVING, DRAINAGE AND CULVERT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4848		
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
38618.1.2	BRZ-1128(7)	PE	
38618.2.1		RW & UTILITIES	
38618.3.1		CONST.	



CULVERT



DESIGN DATA

ADT 2018 =	1274
ADT 2040 =	1600
K =	10 %
D =	55 %
T =	10 % *
V =	25 MPH
* TTST 1% DUAL 9%	
FUNC CLASS =	LOCAL

PROJECT LENGTH

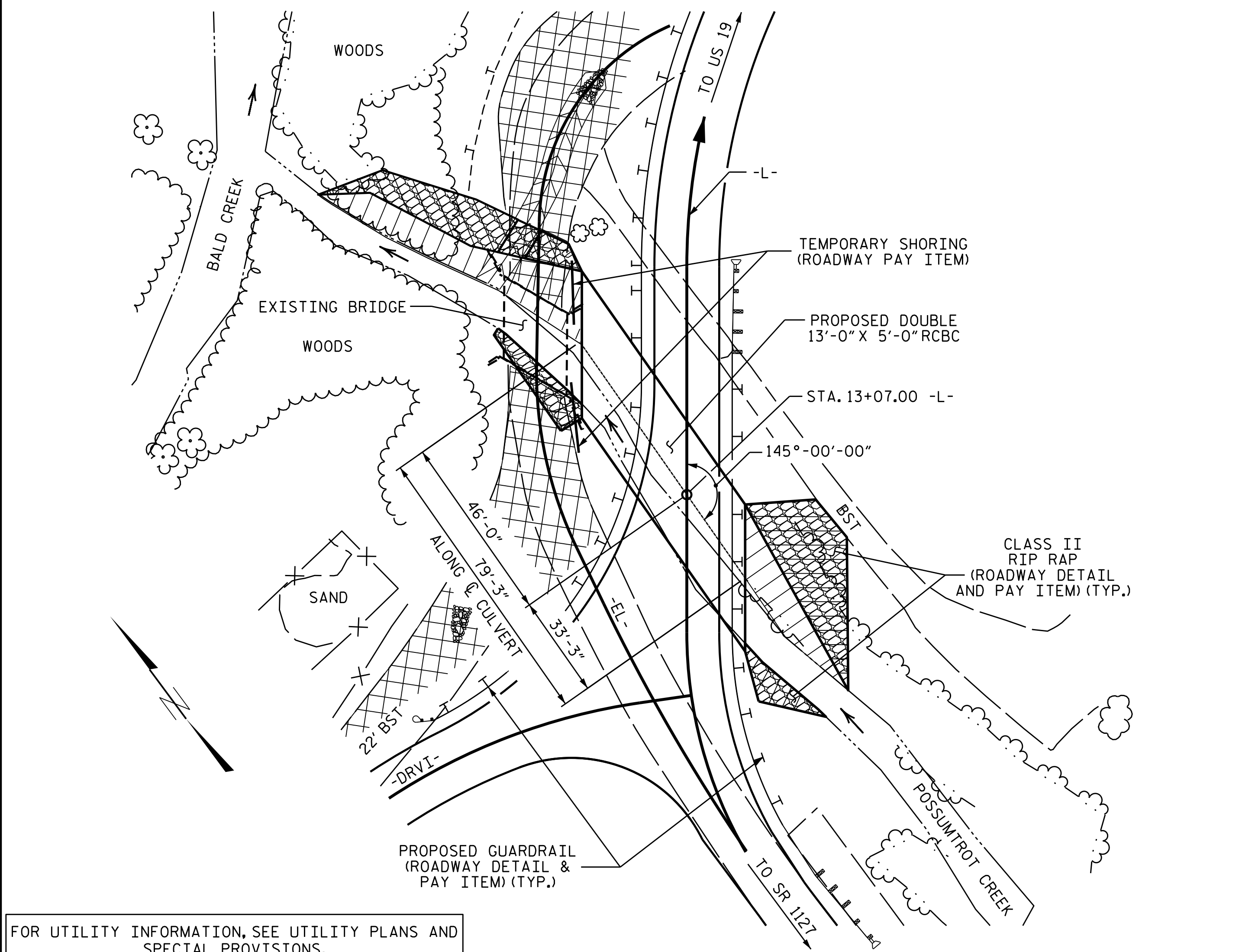
LENGTH OF ROADWAY TIP NO. B-4848 =	0.158 MILE
LENGTH OF STRUCTURE TIP NO. B-4848 =	0.008 MILE
TOTAL LENGTH OF TIP NO. B-4848 =	0.166 MILE

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

2018 STANDARD SPECIFICATIONS

<p>LETTING DATE :</p> <p style="text-align: center;">JANUARY 16, 2018</p>	<p>A. KEITH PASCHAL, PE. <small>PROJECT ENGINEER</small></p> <hr/> <p>AMBER M. LEE, PE. <small>PROJECT DESIGN ENGINEER</small></p>
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NOTES



LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.

ASSUMED LIVE LOAD -----HL-93 OR ALTERNATE LOADING.
 MAXIMUM DESIGN FILL----- 5.18'
 MINIMUM DESIGN FILL----- 2.09'
 FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTE SHEET.
 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.

CONCRETE IN CULVERT TO BE POURED IN THE FOLLOWING ORDER:

- STAGE I
1. INLET WING FOOTINGS, CURTAIN WALLS, SILLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
 2. THE REMAINING PORTIONS OF THE WALLS AND INLET WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.

- STAGE II
1. OUTLET WINGS.

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.

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

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

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

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

AFTER SERVING AS A TEMPORARY STRUCTURE THE EXISTING STRUCTURE CONSISTING OF SINGLE SPAN, 1 @ 26'-8", WITH A CLEAR ROADWAY WIDTH OF 19'-4 1/2" AND 4" X 8" TIMBER DECK AND 1 1/2" ASPHALT WEARING SURFACE ON 19 LINE I-BEAMS AT 1'-0" CTS, WITH A SUBSTRUCTURE CONSISTING OF YOUNT MASONRY AND LOCATED AT THE SITE OF THE PROPOSED STRUCTURE SHALL BE REMOVED. THE EXISTING STRUCTURE IS PRESENTLY NOT POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE BRIDGE DETERIORATE DURING CONSTRUCTION OF THE PROPOSED STRUCTURE, A LOAD LIMIT MAY BE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.

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 AT STATION 13+07.00 -L-."

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 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.

FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.

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 EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

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

FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

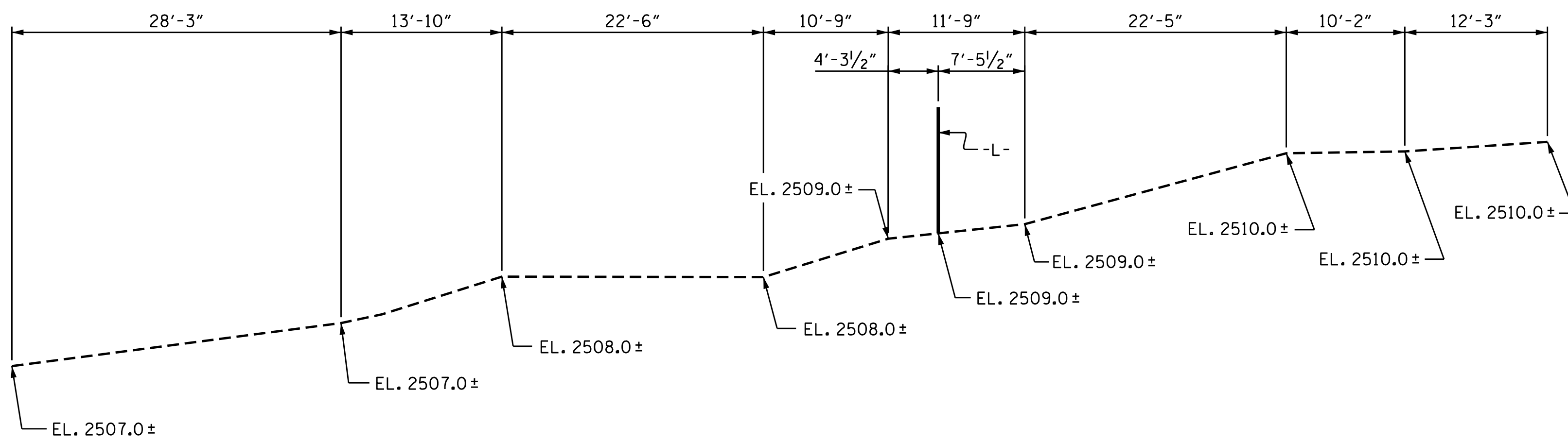
THE CONTRACTOR'S ATTENTION SHOULD BE DRAWN TO THE FACT THAT THE OUTLET END WINGS CANNOT BE CONSTRUCTED UNTIL THE TEMPORARY SHORING IS REMOVED. THE STEEL IN THE CULVERT FLOOR SLAB THAT EXTENDS INTO THE WINGS MAY BE FIELD BENT AS NECESSARY.

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

THE REINFORCED CONCRETE BOX CULVERT SHALL BE PLACED ON THE STANDARD 1.0 FOOT BLANKET OF FOUNDATION CONDITIONING MATERIAL.

THE REQUIRED BEARING CAPACITY AT THE BASE OF THE CULVERT IS 1 TSF. THE REQUIRED BEARING CAPACITY SHALL BE VERIFIED.

FOR ASBESTOS ASSESSMENT FOR BRIDGE DEMOLITION AND RENOVATION ACTIVITIES, SEE SPECIAL PROVISIONS.



PROFILE ALONG CULVERT

HYDRAULIC DATA

DESIGN DISCHARGE	= 900 CFS
FREQUENCY OF DESIGN FLOOD	= 25 YRS.
DESIGN HIGH WATER ELEVATION	= 2515.7
DRAINAGE AREA	= 3.0 SQ. MI.
BASE DISCHARGE (Q100)	= 1300 CFS
BASE HIGH WATER ELEVATION	= 2516.42

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 1925 CFS
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YRS.
OVERTOPPING FLOOD ELEVATION	= 2516.44

GRADE DATA

GRADE POINT ELEVATION @ STA. 13+07.00 -L-	= 2516.68'
BED ELEVATION @ STA. 13+07.00 -L-	= 2508.31'
ROADWAY FILL SLOPES	= 2:1



DocuSigned by:
A. Keith Paschal
F88A0D0B2FC48F
11/18/2017



DocuSigned by:
Amber M. Lee
B048A8AF2FAD484
11/20/2017

PROJECT NO. B-4848
YANCEY COUNTY
 STATION: 13+07.00 -L-

SHEET 1 OF 6 REPLACES BRIDGE NO. 3

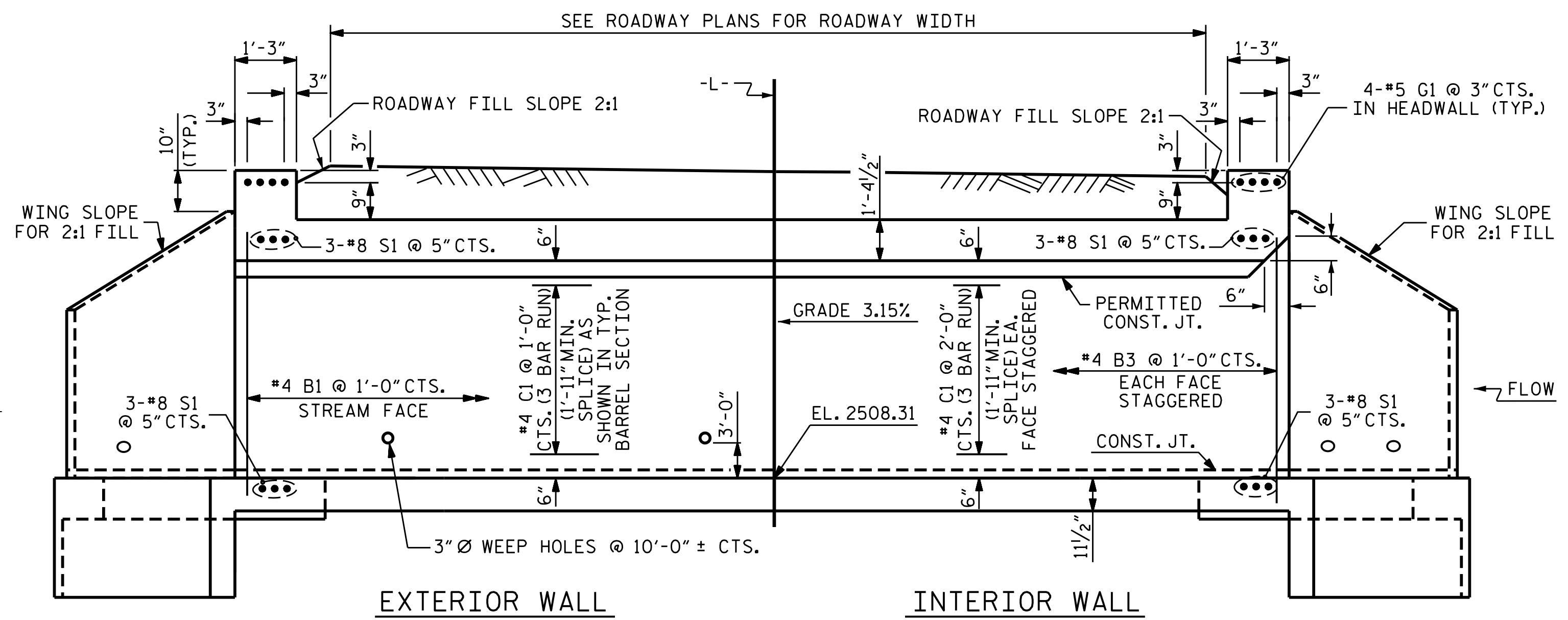
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

DOUBLE 13 FT. X 5 FT.
 CONCRETE BOX CULVERT
 145° SKEW

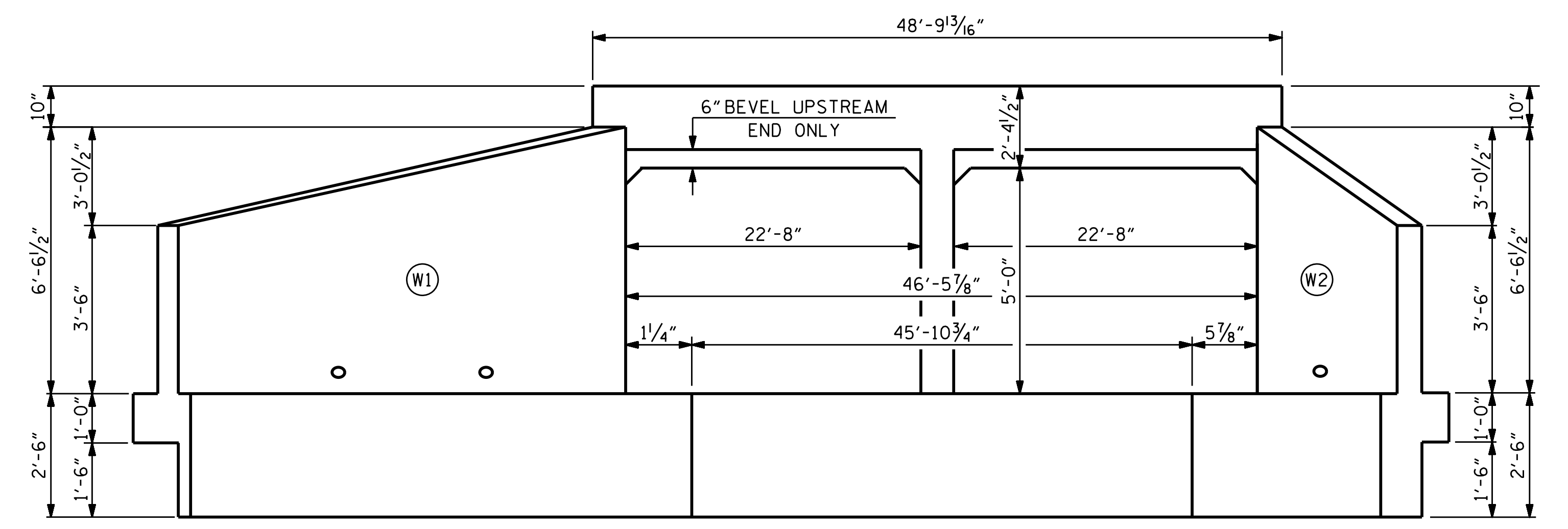
DRAWN BY : A. SORSENGINH DATE : 11/2016
 CHECKED BY : H. T. BARBOUR DATE : 11/2016
 DESIGN ENGINEER OF RECORD: A. SORSENGINH DATE : 11/2016

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

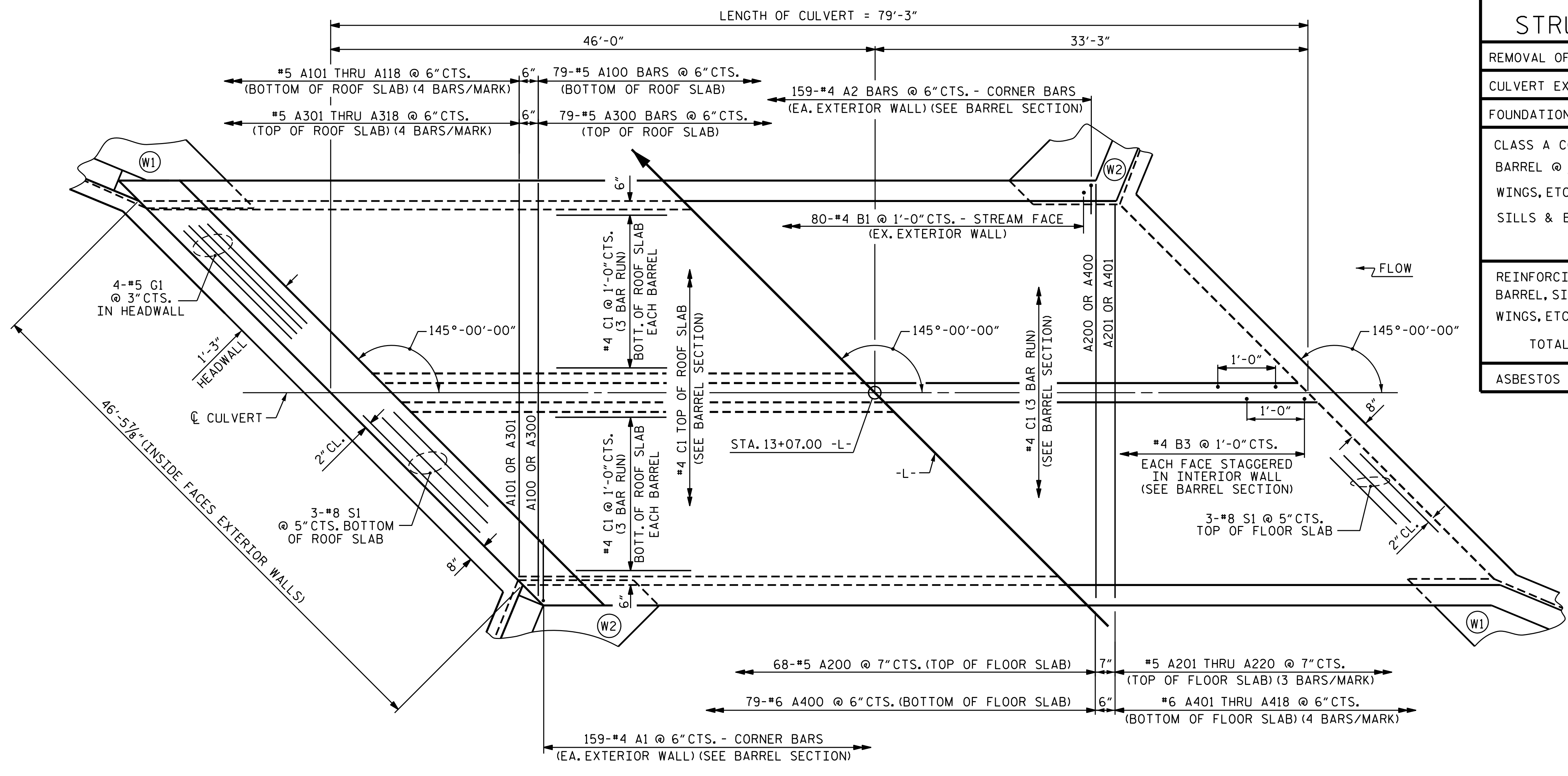
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			C-1
2			4			TOTAL SHEETS 6



EXTERIOR WALL
INTERIOR WALL
CULVERT SECTION NORMAL TO ROADWAY



INLET END ELEVATION NORMAL TO HEADWALL



PART PLAN - ROOF SLAB
PART PLAN - FLOOR SLAB

TOTAL STRUCTURE QUANTITIES		
REMOVAL OF EXISTING STRUCTURE	LUMP	SUM
CULVERT EXCAVATION	LUMP	SUM
FOUNDATION CONDITIONING MATERIAL	179	TONS
CLASS A CONCRETE		
BARREL @ 2.798	CY/FT	221.7 C.Y.
WINGS, ETC.		25.0 C.Y.
SILLS & BAFFLES		3.9 C.Y.
TOTAL		250.6 C.Y.
REINFORCING STEEL		
BARREL, SILLS & BAFFLES	29,982	LBS.
WINGS, ETC.	976	LBS.
TOTAL	30,958	LBS.
ASBESTOS ASSESSMENT	LUMP	SUM

PROJECT NO. B-4848
YANCEY COUNTY
STATION: 13+07.00 -L-
SHEET 2 OF 6



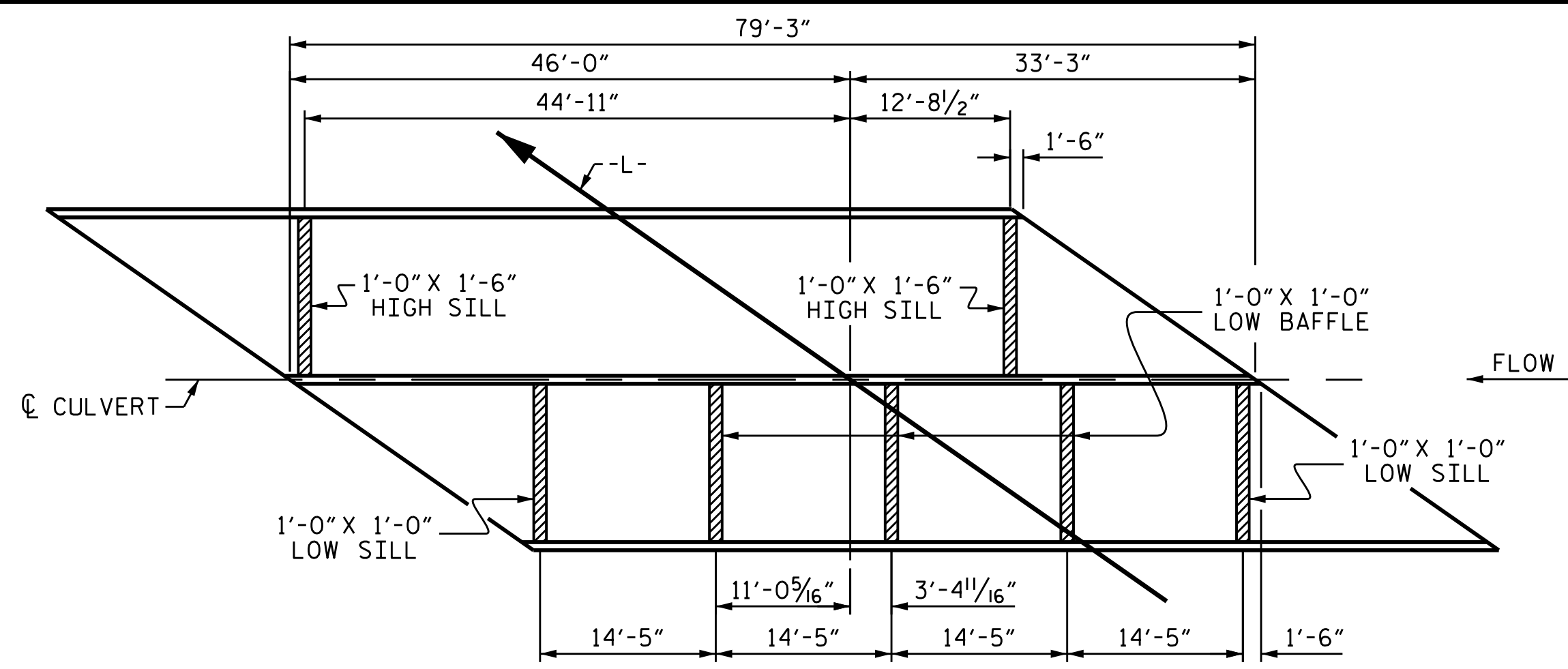
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
**DOUBLE 13 FT. X 5 FT. CONCRETE BOX CULVERT
145° SKEW**

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

11-19-99 BY M.M. CHECKED BY R.W.W.
REDRAWN NOV/1990 BY D.P.D. CHECKED BY M.A.J.

ASSEMBLED BY : A. SORSENGINH	DATE : 11/2016	SPECIAL
CHECKED BY : H. I. BARBOUR	DATE : 11/2016	
DRAWN BY : RALPH D. UNDERWOOD	DATE : APR. 1972	STANDARD
CHECKED BY : HASON A. JUDEH	DATE : MAY 1972	



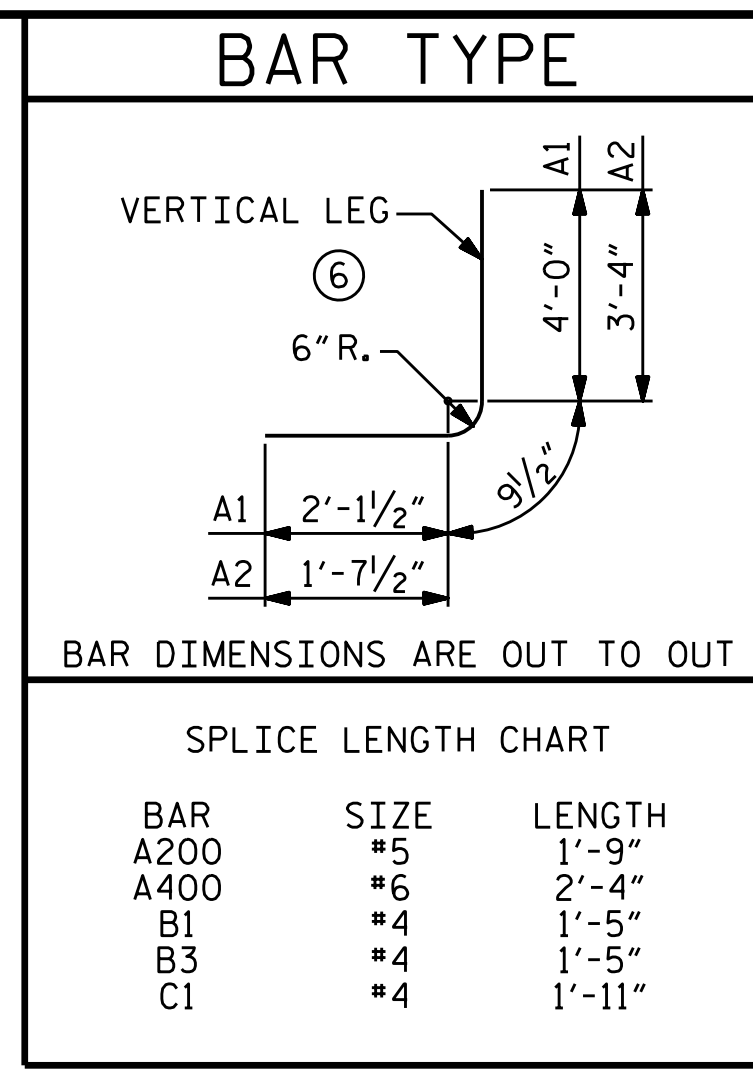
PLAN OF SILL & BAFFLE LOCATIONS

NOTES

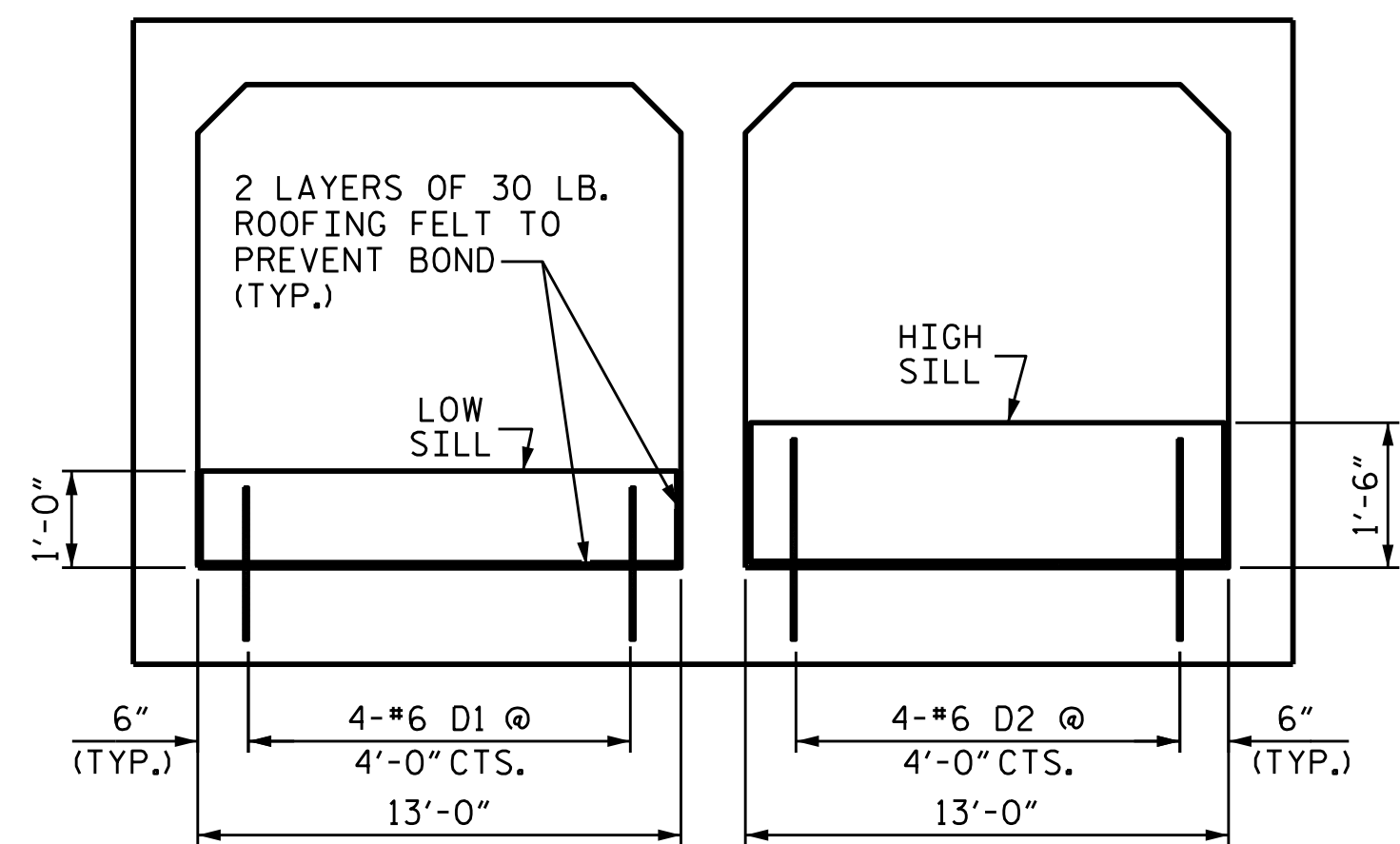
NATIVE MATERIAL CONSIST OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED OR FLOODPLAIN AT THE PROJECT SITE DURING CONSTRUCTION. ONLY MATERIAL THAT IS EXCAVATED FROM THE STREAM BED MAY BE USED TO LINE THE LOW FLOW CULVERT BARREL. RIP RAP MAY BE USED TO SUPPLEMENT NATIVE MATERIAL IN THE HIGH FLOW BARREL.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

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

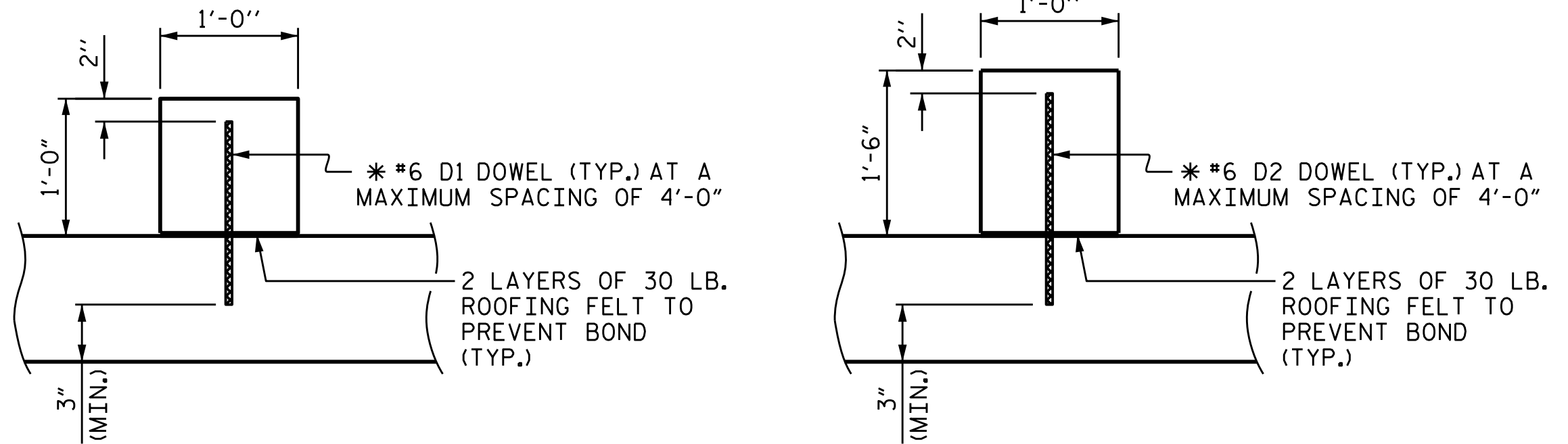
THE ENTIRE COST OF WORK REQUIRED TO CONSTRUCT THE SILLS & BAFFLES SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.



REINFORCING BAR SCHEDULE											
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	SIZE	TYPE	LENGTH	WEIGHT		
A1	318	#4	6	6'-11"	1469	A200	68	#5	STR	27'-7"	1956
A2	318	#4	6	5'-9"	1221	A201	6	#5	STR	26'-4"	165
A100	79	#5	STR	27'-7"	2273	A202	6	#5	STR	25'-2"	157
A101	8	#5	STR	26'-2"	218	A203	6	#5	STR	23'-11"	150
A102	8	#5	STR	24'-9"	207	A204	6	#5	STR	22'-8"	142
A103	8	#5	STR	23'-5"	195	A205	6	#5	STR	21'-6"	135
A104	8	#5	STR	22'-0"	184	A206	6	#5	STR	20'-3"	127
A105	8	#5	STR	20'-7"	172	A207	6	#5	STR	19'-0"	119
A106	8	#5	STR	19'-2"	160	A208	6	#5	STR	17'-9"	111
A107	8	#5	STR	17'-9"	148	A209	6	#5	STR	16'-7"	104
A108	8	#5	STR	16'-5"	137	A210	6	#5	STR	15'-4"	96
A109	8	#5	STR	15'-0"	125	A211	6	#5	STR	14'-1"	88
A110	8	#5	STR	13'-7"	113	A212	6	#5	STR	12'-11"	81
A111	8	#5	STR	12'-2"	102	A213	6	#5	STR	11'-8"	73
A112	8	#5	STR	10'-9"	90	A214	6	#5	STR	10'-5"	65
A113	8	#5	STR	9'-5"	79	A215	6	#5	STR	9'-2"	57
A114	8	#5	STR	8'-0"	67	A216	6	#5	STR	8'-0"	50
A115	8	#5	STR	6'-7"	55	A217	6	#5	STR	6'-9"	42
A116	8	#5	STR	5'-2"	43	A218	6	#5	STR	5'-6"	34
A117	8	#5	STR	3'-9"	31	A219	6	#5	STR	4'-4"	27
A118	8	#5	STR	2'-5"	20	A220	6	#5	STR	3'-1"	19
A300	79	#5	STR	27'-7"	2273	A400	79	#6	STR	27'-7"	3273
A301	8	#5	STR	26'-2"	218	A401	8	#6	STR	26'-2"	314
A302	8	#5	STR	24'-9"	207	A402	8	#6	STR	24'-9"	297
A303	8	#5	STR	23'-5"	195	A403	8	#6	STR	23'-5"	281
A304	8	#5	STR	22'-0"	184	A404	8	#6	STR	22'-0"	264
A305	8	#5	STR	20'-7"	172	A405	8	#6	STR	22'-0"	264
A306	8	#5	STR	19'-2"	160	A406	8	#6	STR	20'-7"	247
A307	8	#5	STR	17'-9"	148	A407	8	#6	STR	20'-7"	247
A308	8	#5	STR	16'-5"	137	A408	8	#6	STR	19'-2"	230
A309	8	#5	STR	15'-0"	125	A409	8	#6	STR	19'-2"	230
A310	8	#5	STR	13'-7"	113	A410	8	#6	STR	17'-9"	213
A311	8	#5	STR	12'-2"	102	A411	8	#6	STR	16'-5"	197
A312	8	#5	STR	10'-9"	90	A412	8	#6	STR	15'-0"	180
A313	8	#5	STR	9'-5"	79	A413	8	#6	STR	13'-7"	163
A314	8	#5	STR	8'-0"	67	A414	8	#6	STR	12'-2"	146
A315	8	#5	STR	6'-7"	55	A415	8	#6	STR	10'-9"	129
A316	8	#5	STR	5'-2"	43	A416	8	#6	STR	10'-9"	129
A317	8	#5	STR	3'-9"	31	A417	8	#6	STR	9'-5"	113
A318	8	#5	STR	2'-5"	20	A418	8	#6	STR	9'-5"	113
B1	160	#4	STR	6'-10"	730	A419	8	#6	STR	8'-0"	96
B3	160	#4	STR	6'-10"	730	A420	8	#6	STR	8'-0"	96
C1	261	#4	STR	27'-8"	4824	A421	8	#6	STR	6'-7"	79
D1	20	#6	STR	1'-6"	45	A422	8	#6	STR	6'-7"	79
D2	8	#6	STR	2'-0"	24	A423	8	#6	STR	5'-2"	62
G1	8	#5	STR	48'-2"	402	A424	8	#6	STR	5'-2"	62
S1	12	#8	STR	48'-2"	1543	A425	8	#6	STR	3'-9"	45
REINFORCING STEEL = 29,982 LBS											



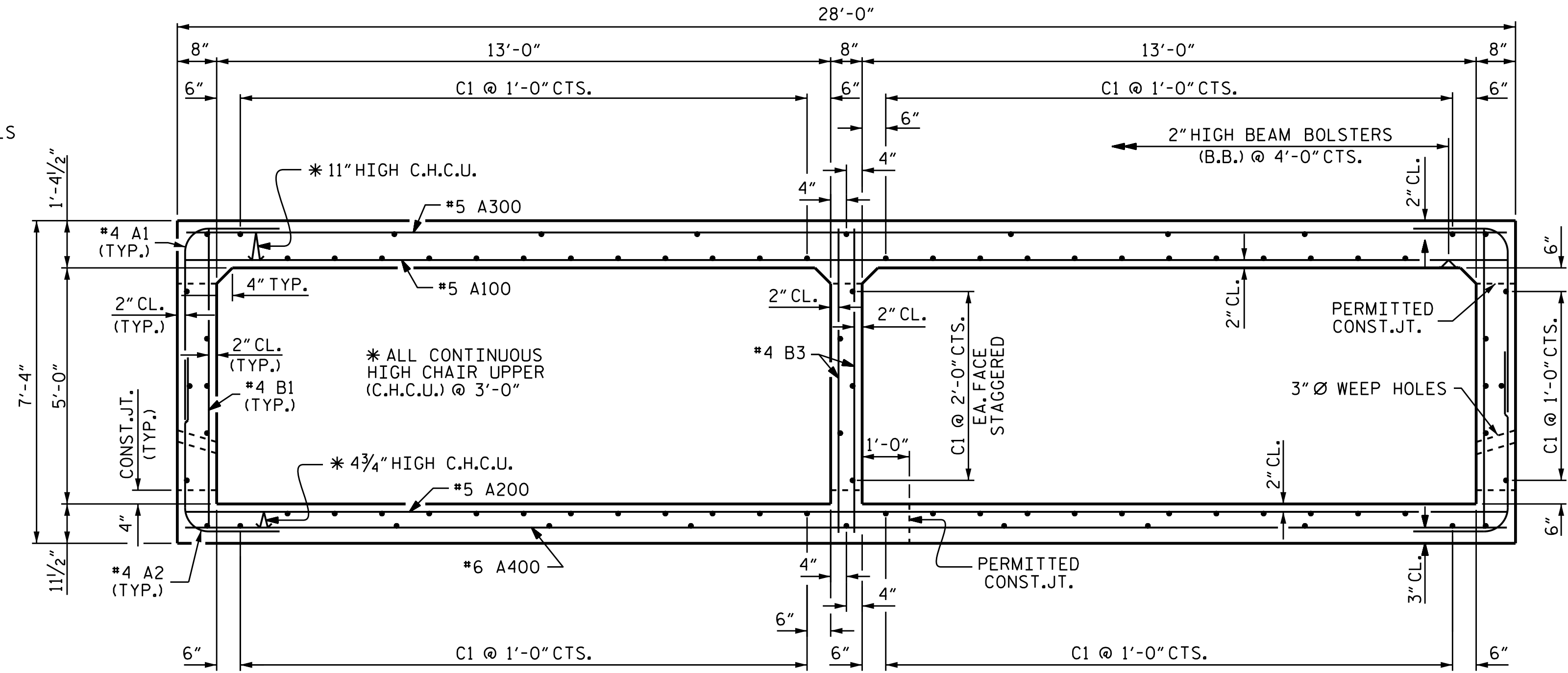
ELEVATION (LOOKING DOWNSTREAM)



SECTION THROUGH 1'-0" SILL & BAFFLE SECTION THROUGH 1'-6" SILL

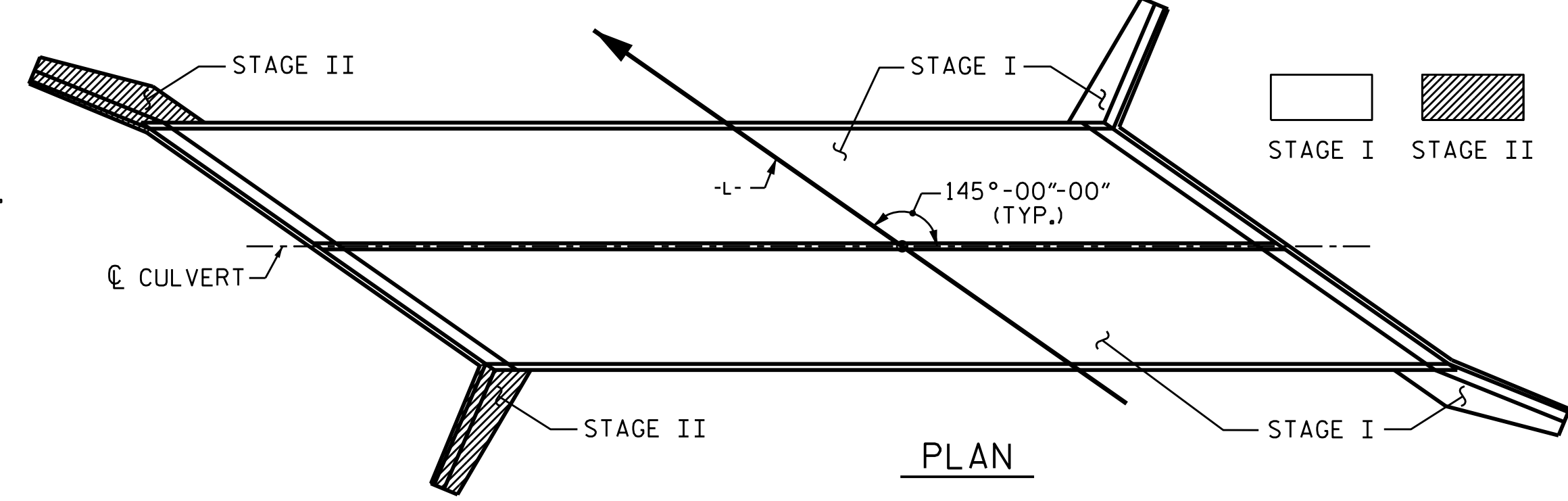
CULVERT SILL DETAILS

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



RIGHT ANGLE SECTION OF BARREL

THERE ARE 87 C1 BARS IN SECTION OF BARREL. (LOOKING DOWNSTREAM)



CONSTRUCTION SEQUENCE

PROJECT NO. B-4848
YANCEY COUNTY
STATION: 13+07.00 -L-

SHEET 3 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
DOUBLE 13 FT X 5 FT
CONCRETE BOX CULVERT
145° SKEW

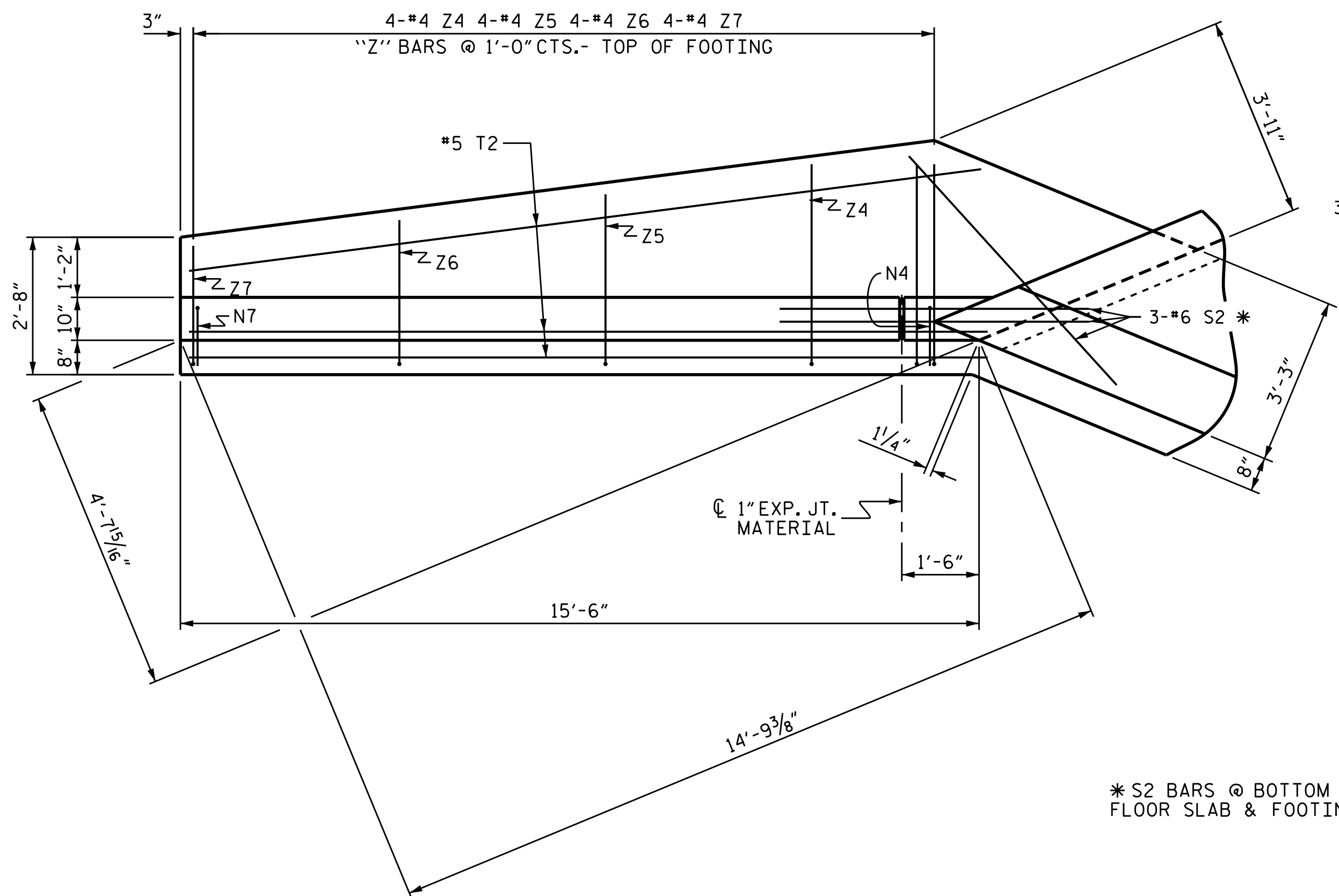


DocuSigned by:
Amber M. Lee
B0485A2FAD484
11/20/2017

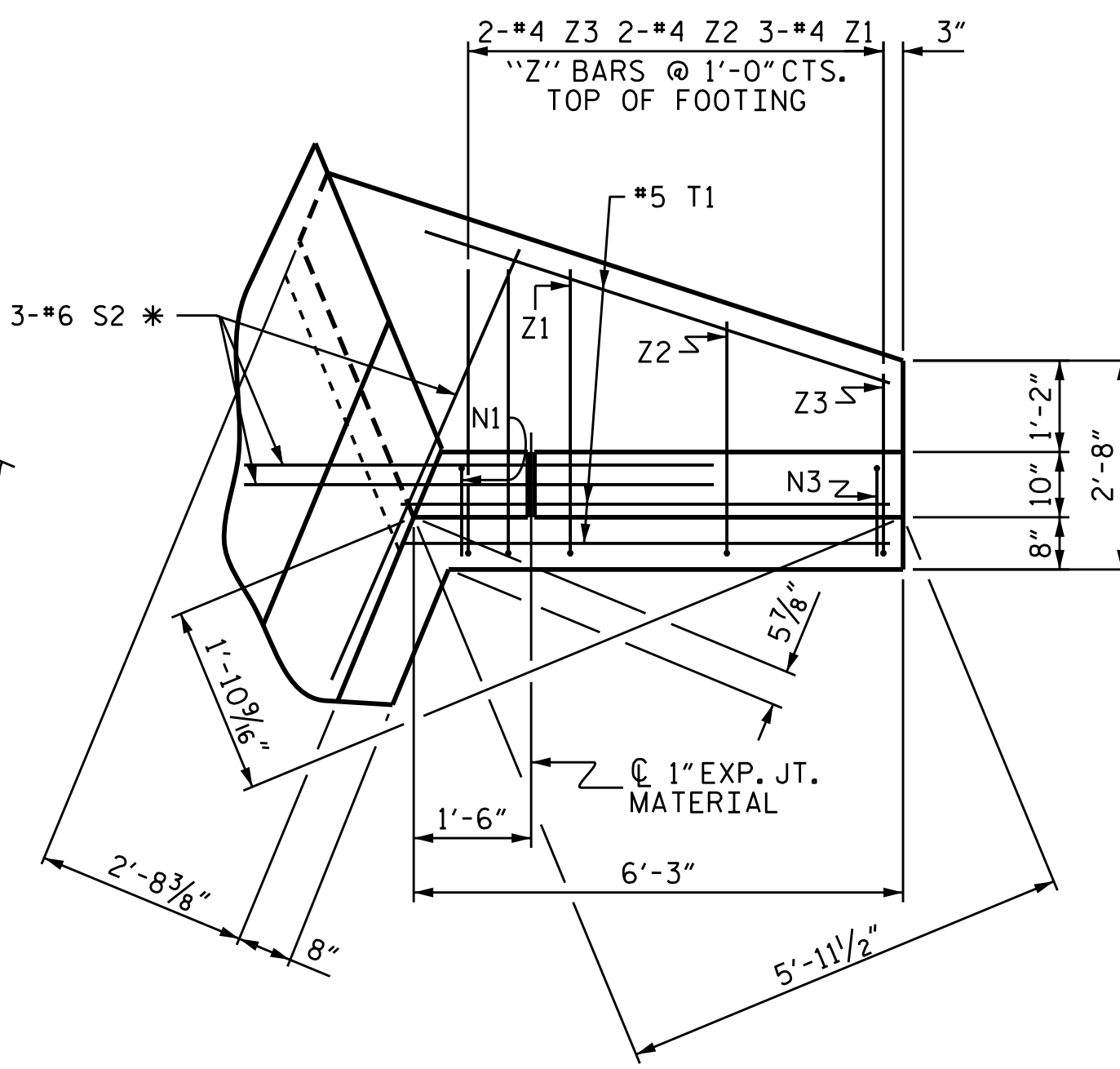
ASSEMBLED BY: A. SORSENGINH DATE: 11/2016
CHECKED BY: H.T. BARBOUR DATE: 11/2016

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

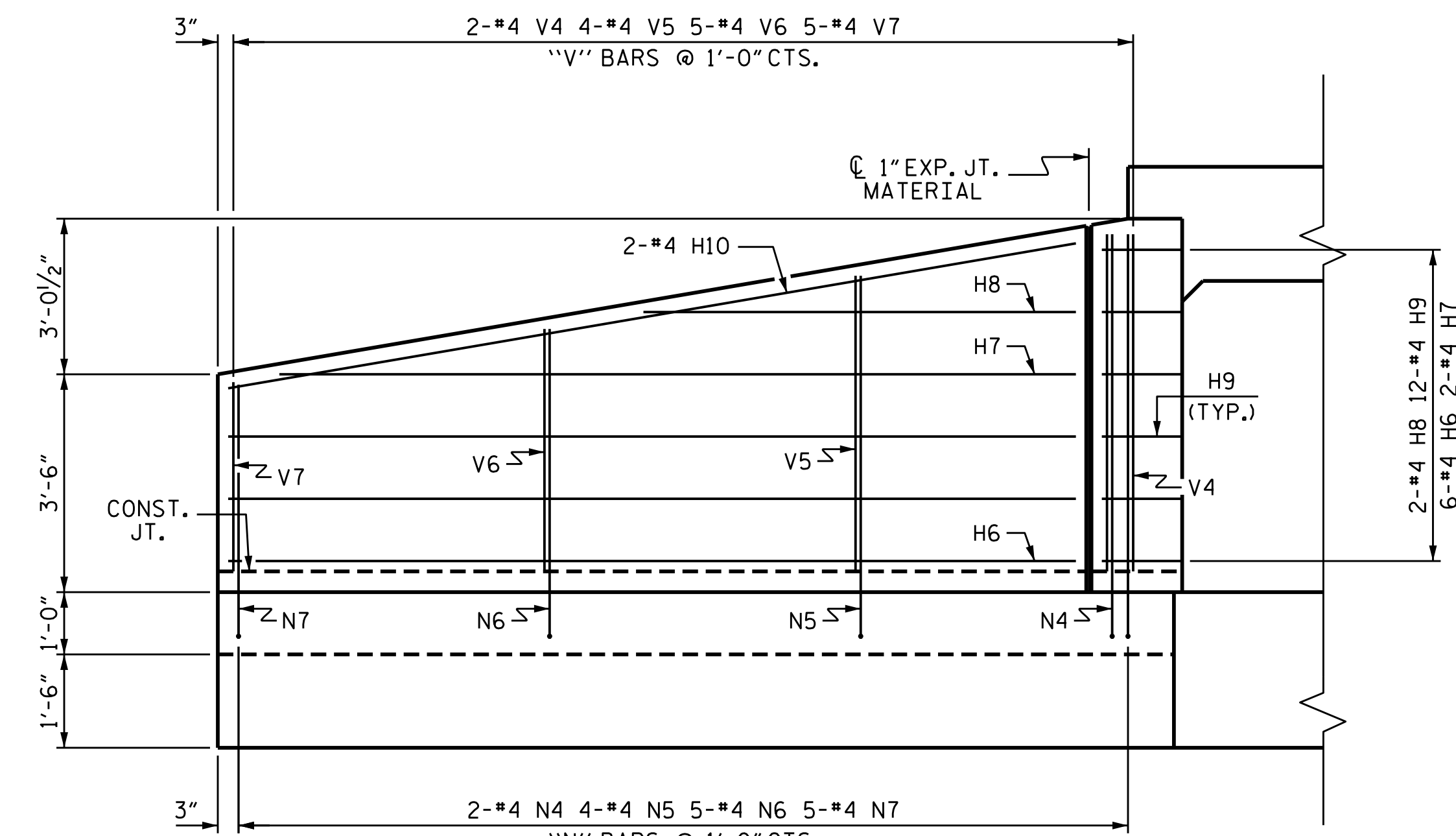


PLAN W1

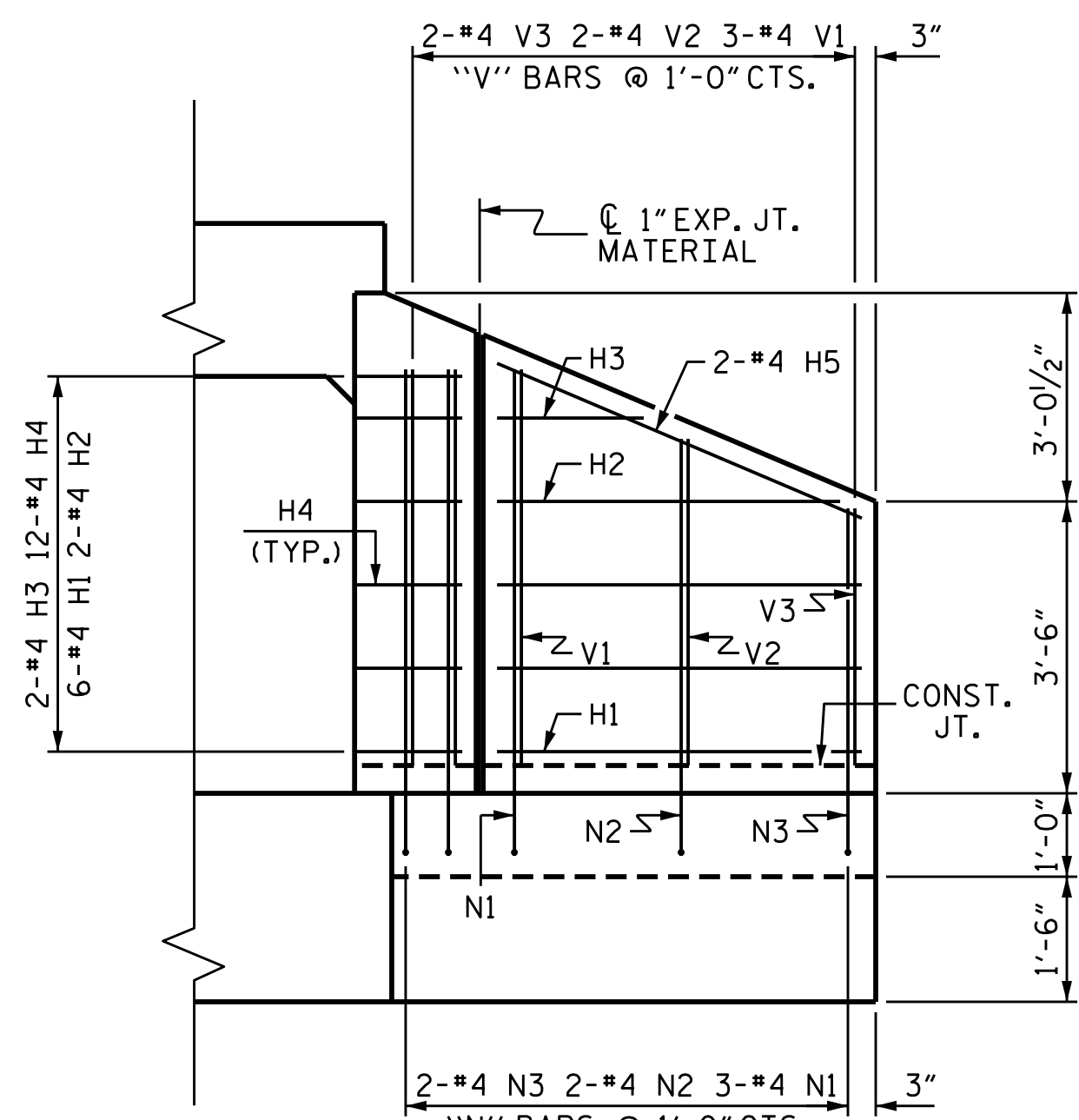


PLAN W2

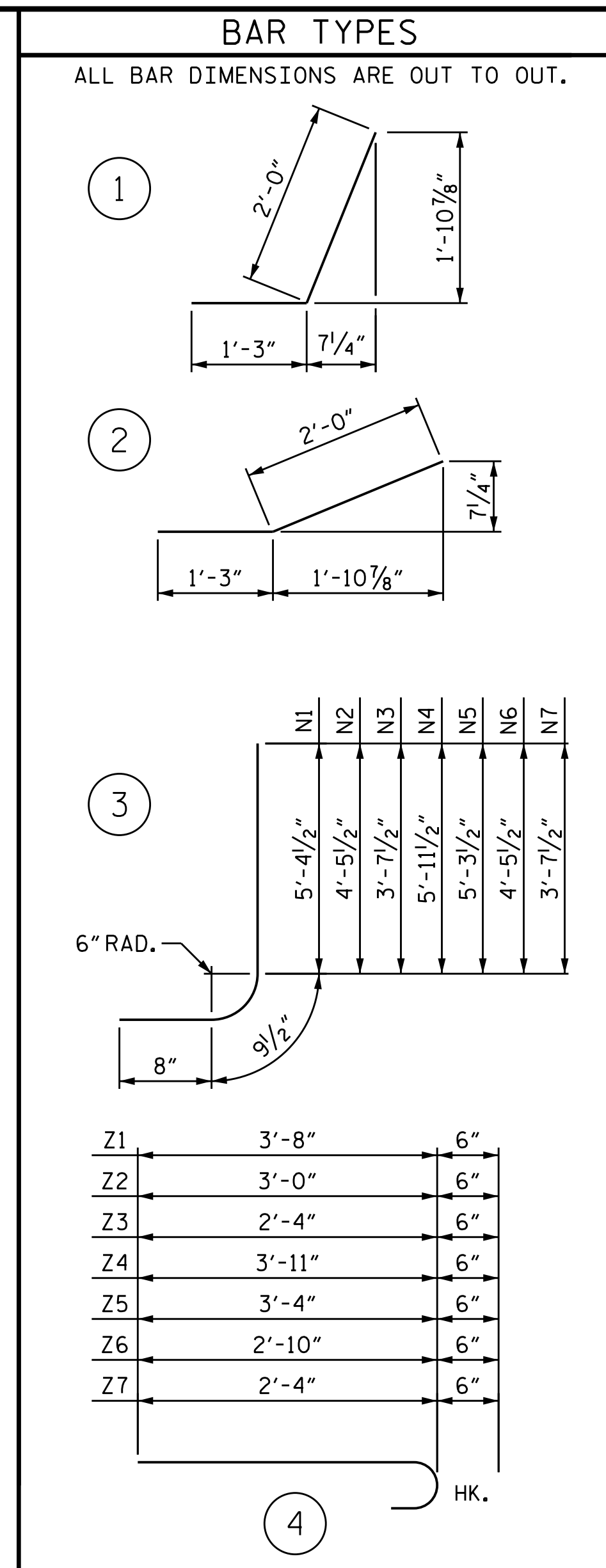
* S2 BARS @ BOTTOM OF FLOOR SLAB & FOOTING



ELEVATION W1

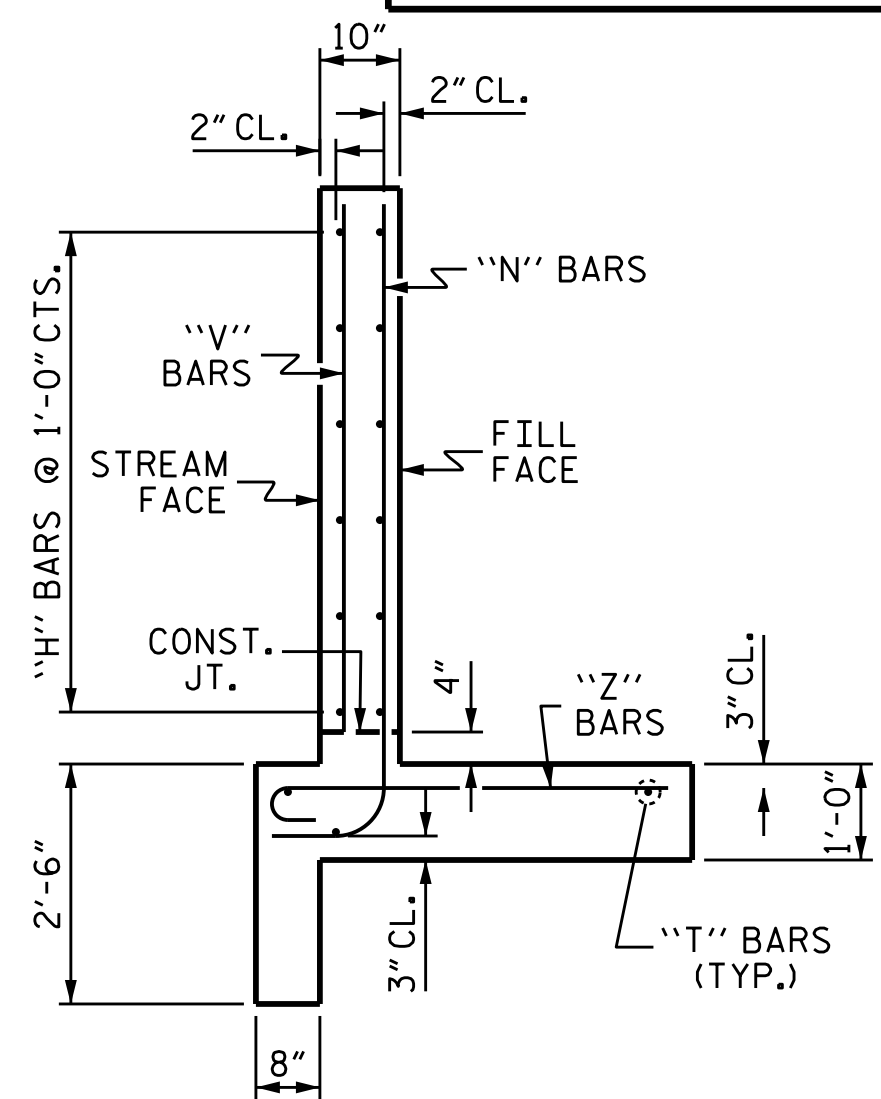


ELEVATION W2



Z1	3'-8"	6"
Z2	3'-0"	6"
Z3	2'-4"	6"
Z4	3'-11"	6"
Z5	3'-4"	6"
Z6	2'-10"	6"
Z7	2'-4"	6"

BILL OF MATERIAL FOR TWO WINGS					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	6	#4	STR	4'-4"	17
H2	2	#4	STR	4'-1"	5
H3	2	#4	STR	1'-9"	2
H4	12	#4	1	3'-3"	26
H5	2	#4	STR	4'-9"	6
H6	6	#4	STR	13'-7"	54
H7	2	#4	STR	12'-9"	17
H8	2	#4	STR	6'-11"	9
H9	12	#4	2	3'-3"	26
H10	4	#4	STR	13'-9"	18
N1	3	#4	3	6'-10"	14
N2	2	#4	3	5'-11"	8
N3	2	#4	3	5'-1"	7
N4	2	#4	3	7'-5"	10
N5	4	#4	3	6'-9"	18
N6	5	#4	3	5'-11"	20
N7	5	#4	3	5'-1"	17
S2	3	#6	STR	6'-0"	27
T1	3	#5	STR	6'-3"	20
T2	3	#5	STR	15'-6"	49
V1	3	#4	STR	4'-9"	10
V2	2	#4	STR	3'-11"	5
V3	2	#4	STR	3'-1"	4
V4	2	#4	STR	5'-5"	7
V5	4	#4	STR	4'-9"	13
V6	5	#4	STR	3'-10"	13
V7	5	#4	STR	3'-0"	10
Z1	3	#4	4	4'-2"	8
Z2	2	#4	4	3'-6"	5
Z3	2	#4	4	2'-10"	4
Z4	4	#4	4	4'-5"	12
Z5	4	#4	4	3'-10"	10
Z6	4	#4	4	3'-4"	9
Z7	4	#4	4	2'-10"	8
REINFORCING STEEL FOR 2 WINGS				488	LBS
CLASS A CONCRETE 2 WINGS				7.4	CY
1 HEADWALLS				2.3	CY
1 END CURTAIN WALLS				2.8	CY
TOTAL				12.5	CY



TYPICAL WING SECTION

SEE GENERAL DRAWING NOTES CONCERNING CONSTRUCTION OF OUTLET WINGS.

PROJECT NO. B-4848
YANCEY COUNTY
STATION: 13+07.00 -L-

SHEET 4 OF 6



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
STANDARD WINGS
FOR
CONCRETE BOX CULVERT
H = 5'-0" SLOPE = 2:1
145° SKEW

ASSEMBLED BY : A. SORSENGINH DATE : 11/2016
CHECKED BY : H. T. BARBOUR DATE : 11/2016
DRAWN BY : CCJ 01/00
CHECKED BY : RWW 03/00

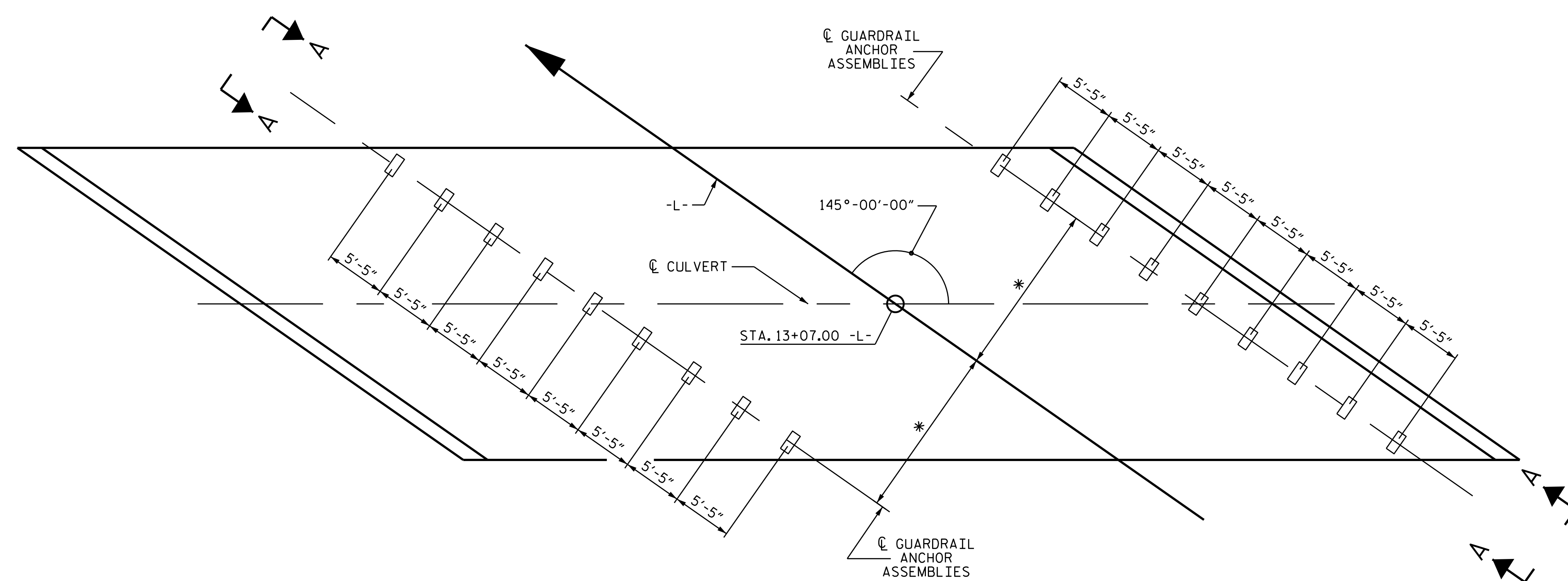
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-4
1			3			TOTAL SHEETS
2			4			6

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STD. NO. CW4505

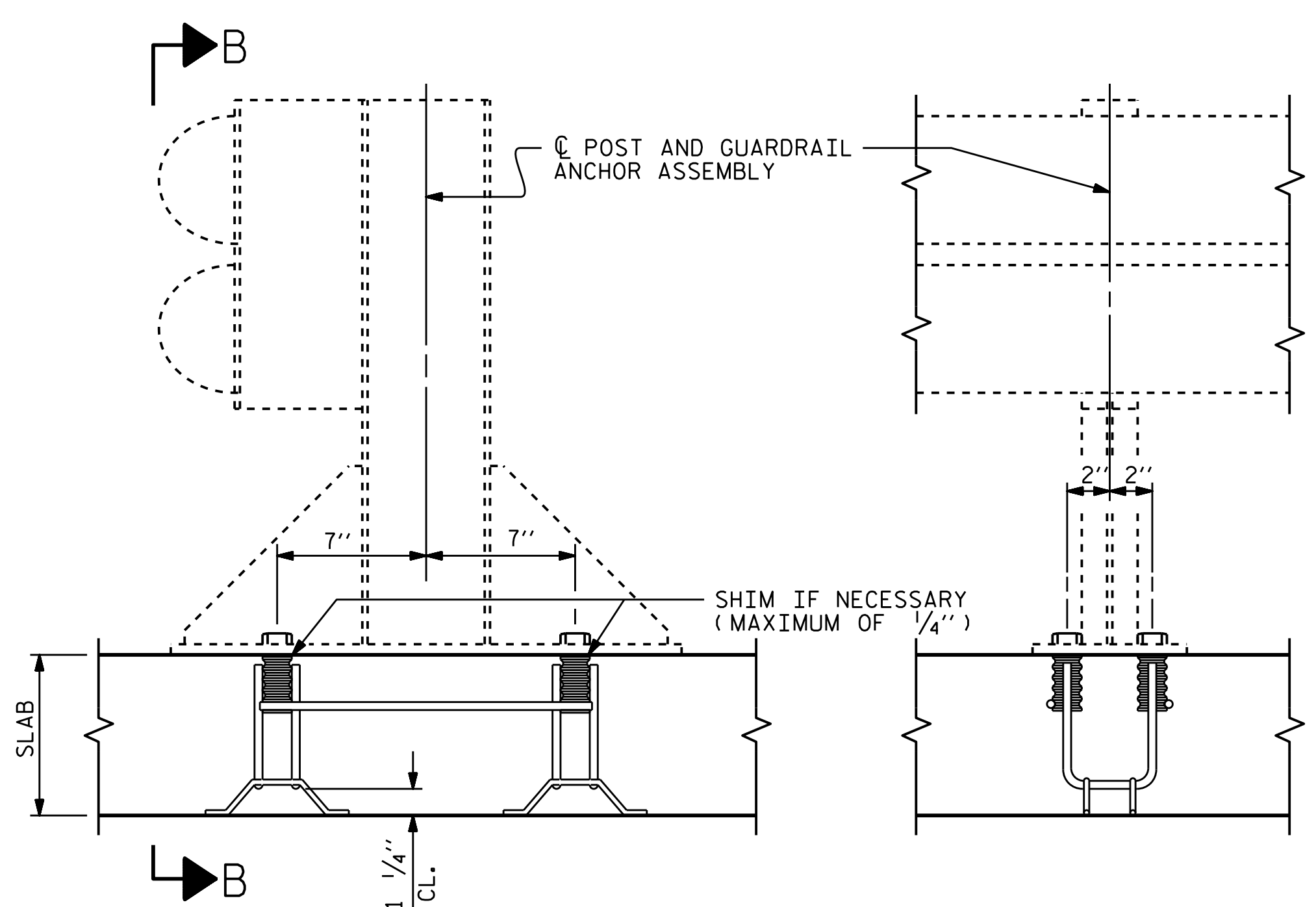
NOTES

- 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 1/16" 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.



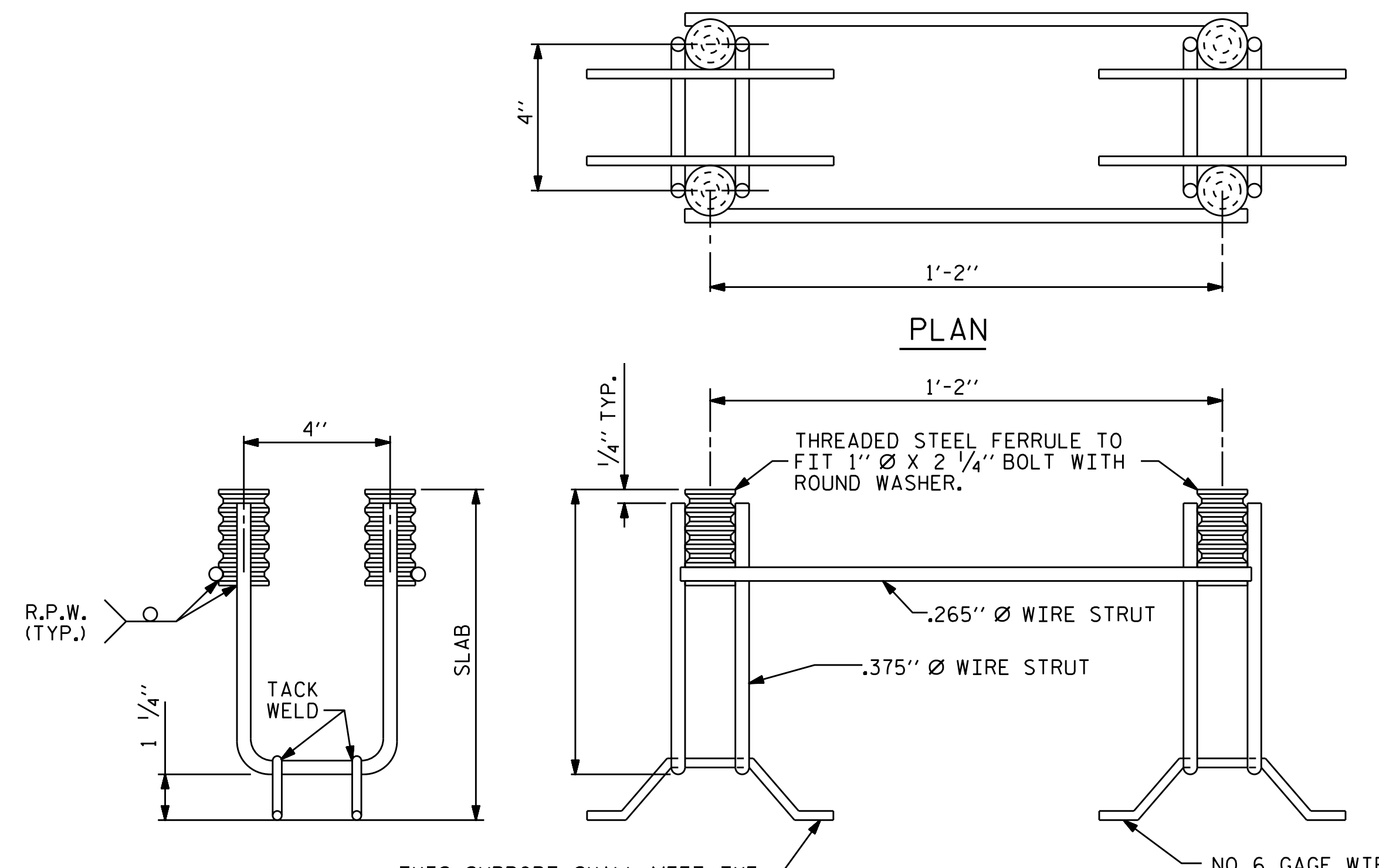
PLAN

THE LOCATION OF THE GUARDRAIL ANCHORAGE ASSEMBLIES SHALL BE VERIFIED BY THE ENGINEER.
 * THESE DIMENSIONS TO BE DETERMINED 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-4848
 YANCEY COUNTY
 STATION: 13+07.00 -L-

SHEET 5 OF 6



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

ASSEMBLED BY : A. SORSENGINH	DATE : 11/2016
CHECKED BY : H. T. BARBOUR	DATE : 11/2016
DRAWN BY : FCJ	6/88
CHECKED BY : ARB	6/88
REV. 5/7/03	RWW/JTE
REV. 5/1/06R	KMM/GM
REV. 10/1/11	MAA/GM

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-5
1			3			TOTAL SHEETS
2			4			6

**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 _{LL})	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	①	1.32	--	1.75	1.35	1	TOP SLAB	5.47	1.32	1	BOTTOM SLAB	12.64		
	HL-93 (OPERATING)	N/A		1.71	--	1.35	1.75	1	TOP SLAB	5.47	1.71	1	BOTTOM SLAB	12.64		
	HS-20 (INVENTORY)	36.00	②	1.32	47.53	1.75	1.52	1	TOP SLAB	5.47	1.32	1	BOTTOM SLAB	12.64		
	HS-20 (OPERATING)	36.00		1.71	61.61	1.35	1.96	1	TOP SLAB	5.47	1.71	1	BOTTOM SLAB	12.64		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.50		2.78	37.49	1.40	2.78	1	TOP SLAB	5.47	3.87	1	BOTTOM SLAB	12.64	
		SNGARBS2	20.00		2.60	51.92	1.40	2.60	1	TOP SLAB	5.47	2.64	1	BOTTOM SLAB	12.64	
		SNAGRIS2	22.00		2.41	52.97	1.40	2.77	1	TOP SLAB	5.47	2.41	1	BOTTOM SLAB	12.64	
		SNCOTTS3	27.25		1.69	45.96	1.40	1.69	1	TOP SLAB	5.47	1.92	1	BOTTOM SLAB	12.64	
		SNAGGRS4	34.93		1.51	52.88	1.40	1.92	1	TOP SLAB	5.81	1.51	1	BOTTOM SLAB	12.64	
		SNS5A	35.55		1.49	52.92	1.40	1.86	1	TOP SLAB	5.47	1.49	1	BOTTOM SLAB	12.64	
		SNS6A	39.95		1.33	53.02	1.40	1.86	1	TOP SLAB	5.47	1.33	1	BOTTOM SLAB	12.64	
		SNS7B	42.00		1.39	58.57	1.40	1.92	1	TOP SLAB	5.47	1.39	1	BOTTOM SLAB	12.64	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.00		1.61	53.26	1.40	2.60	1	BOTTOM SLAB	12.98	1.61	1	BOTTOM SLAB	12.64	
		TNT4A	33.08		1.60	52.81	1.40	2.01	1	TOP SLAB	5.47	1.60	1	BOTTOM SLAB	12.64	
		TNT6A	41.60		1.46	60.90	1.40	2.01	1	TOP SLAB	5.47	1.46	1	BOTTOM SLAB	12.64	
		TNT7A	42.00		1.33	55.91	1.40	2.15	1	TOP SLAB	5.47	1.33	1	BOTTOM SLAB	12.64	
		TNT7B	42.00		1.33	55.74	1.40	1.89	1	TOP SLAB	5.47	1.33	1	BOTTOM SLAB	12.64	
		TNAGRIT4	43.00		1.23	53.07	1.40	1.92	1	TOP SLAB	5.47	1.23	1	BOTTOM SLAB	12.64	
TNAGT5A	45.00		1.23	55.54	1.40	1.97	1	TOP SLAB	5.47	1.23	1	BOTTOM SLAB	12.64			
TNAGT5B	45.00		③	1.21	54.48	1.40	1.96	1	BOTTOM SLAB	12.98	1.21	1	BOTTOM SLAB	12.64		

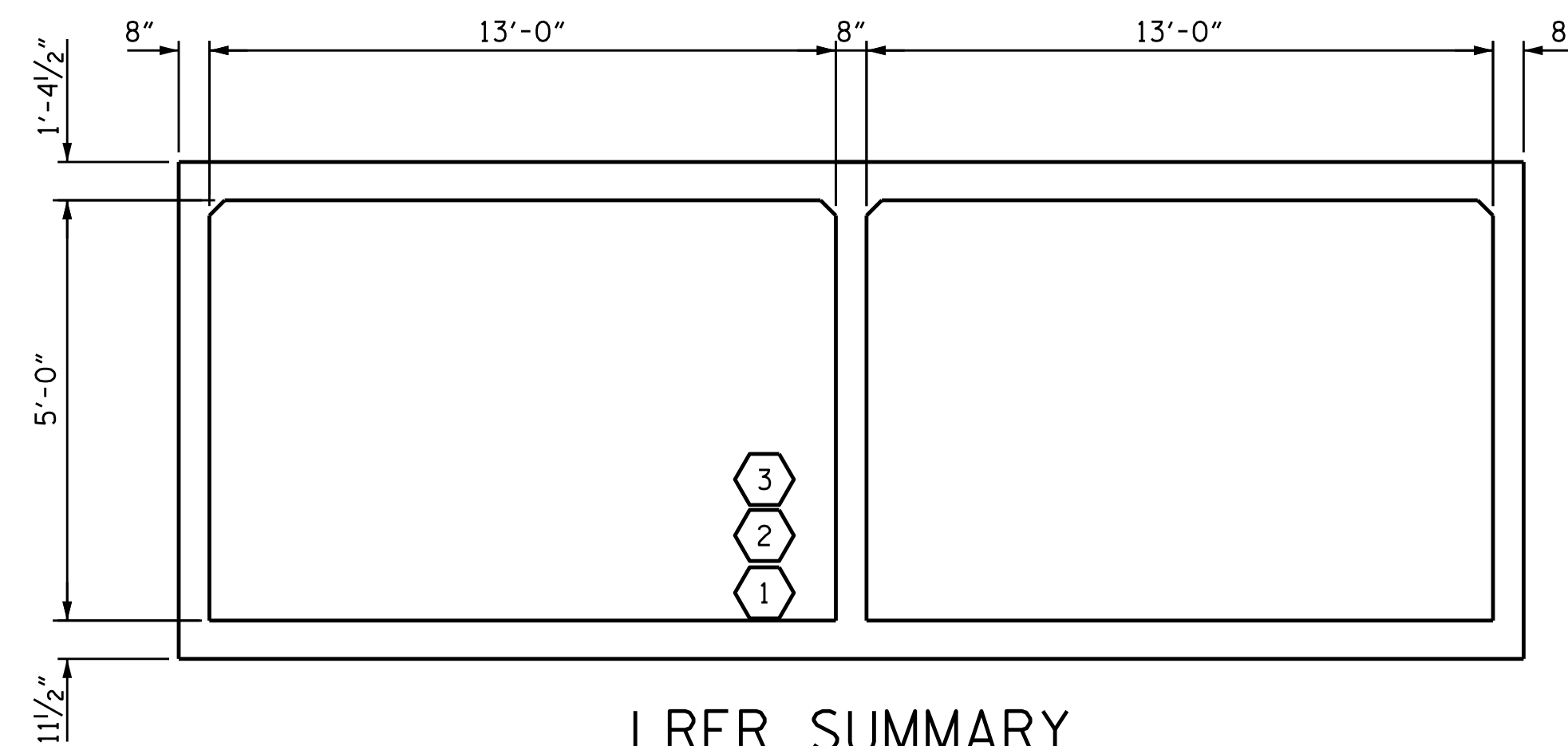
LOAD FACTORS:

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	0.50 OR 0.90
ES	1.35	0.50 OR 0.90
LS	1.75	--
WA	1.00	--

NOTE:

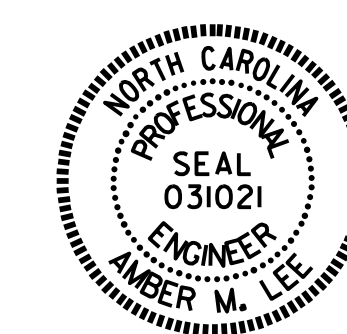
RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

①	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. B-4848
YANCEY COUNTY
 STATION: 13+07.00 -L-

SHEET 6 OF 6



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

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

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 FINAL UNLESS ALL
 SIGNATURES COMPLETED

ASSEMBLED BY : A. SORSENGINH	DATE : 11/20/16
CHECKED BY : H. T. BARBOUR	DATE : 11/20/16
DRAWN BY : WMC	7/11
CHECKED BY : GM	7/11
REV. 10/11/11	MAA/GM

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

DOWELS:

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

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

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

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

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

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

REINFORCING STEEL:

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

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

STRUCTURAL STEEL:

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

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

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

HANDRAILS AND POSTS:

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

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

SPECIAL NOTES:

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

ENGLISH

JANUARY, 1990

STD. NO. SN