

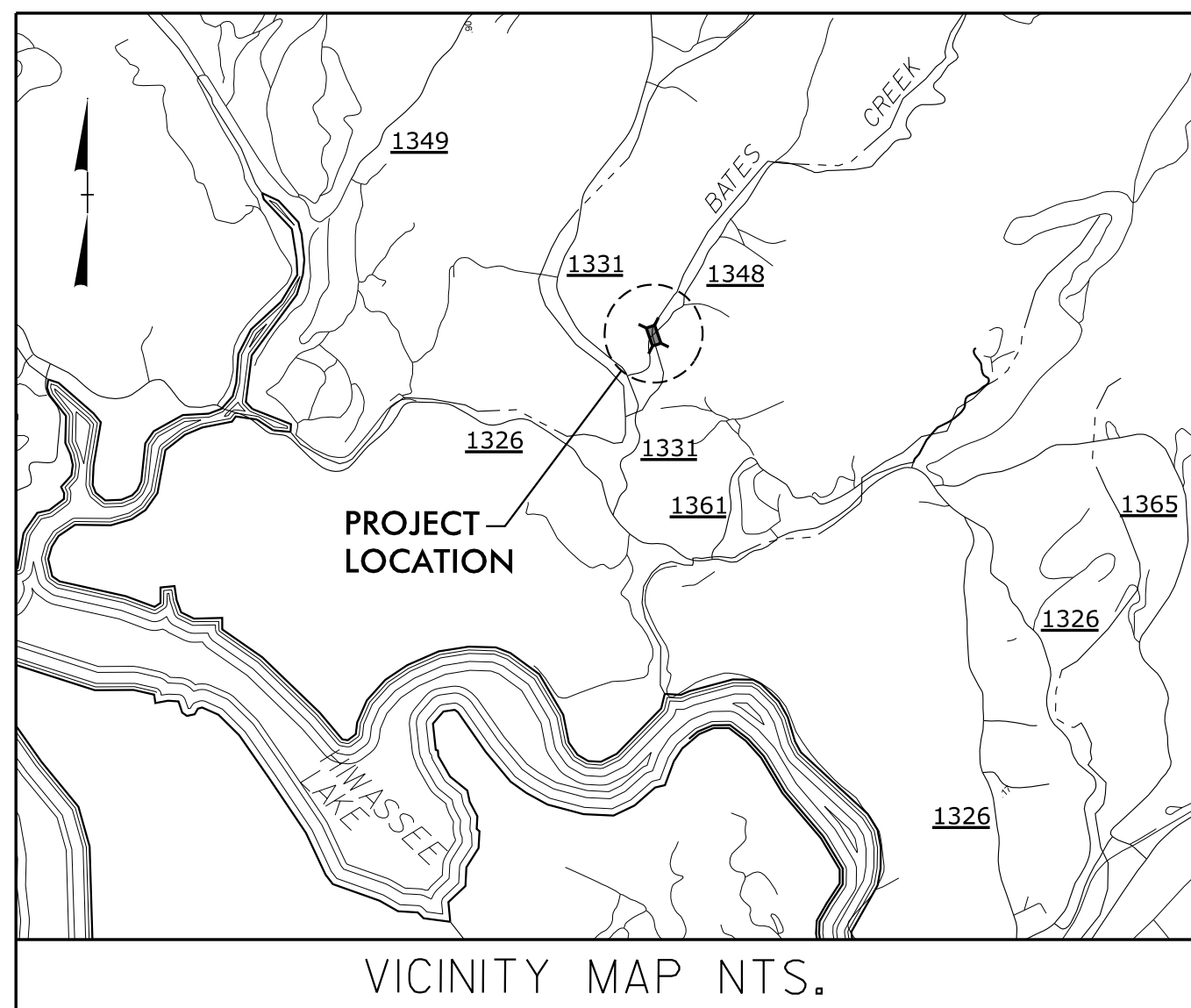
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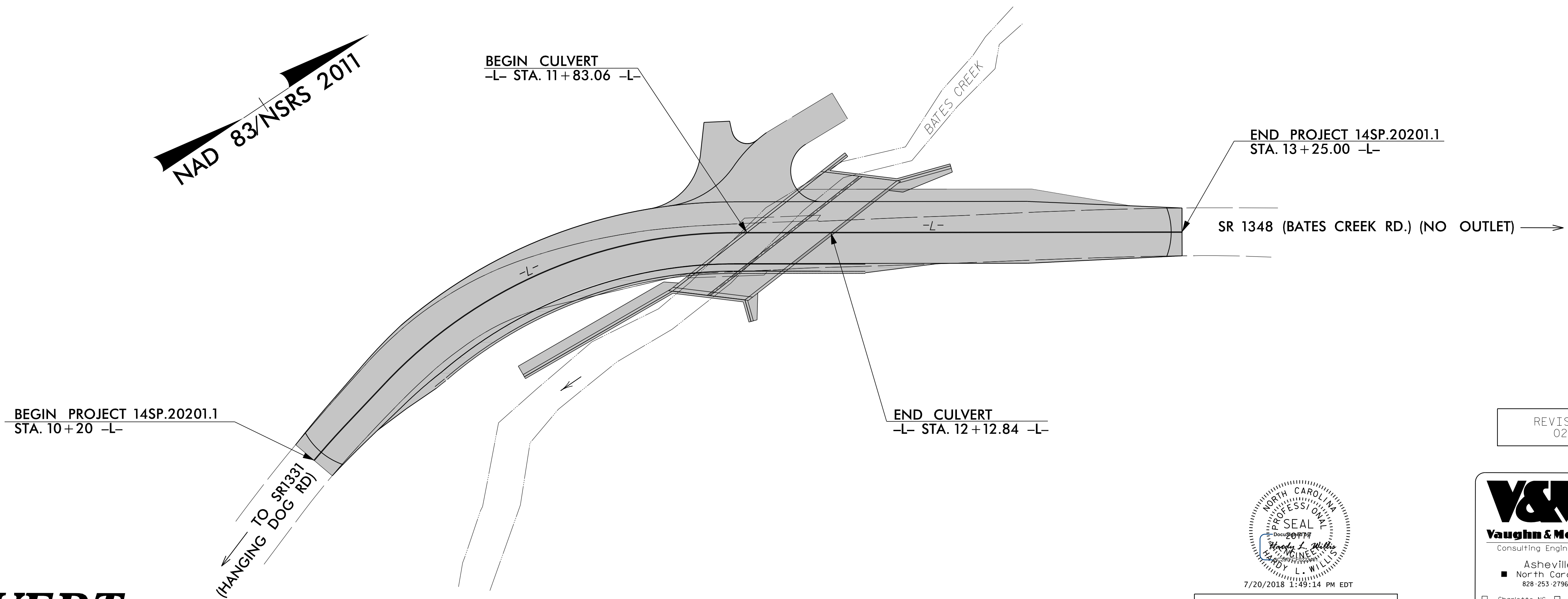
CONTRACT: DN00134 PROJ. NO.: 14SP.20201.1

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	14SP.20201.1	0	11
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
14SP.20201.1	N/A	P.E.	
14SP.20201.1	N/A	RW & UTIL.	
14SP.20221.1	N/A	CONST.	



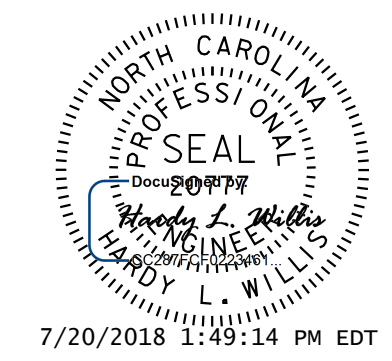
STATE OF NORTH CAROLINA
 DIVISION OF HIGHWAYS
CHEROKEE COUNTY

**REPLACES BRIDGE 163 OVER BATES CREEK
 ON SR 1348 (BATES CREEK RD.) BETWEEN
 SR 1331 (HANGING DOG RD.) AND
 FRED KILLIAN RD.**



CULVERT

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02/03/17



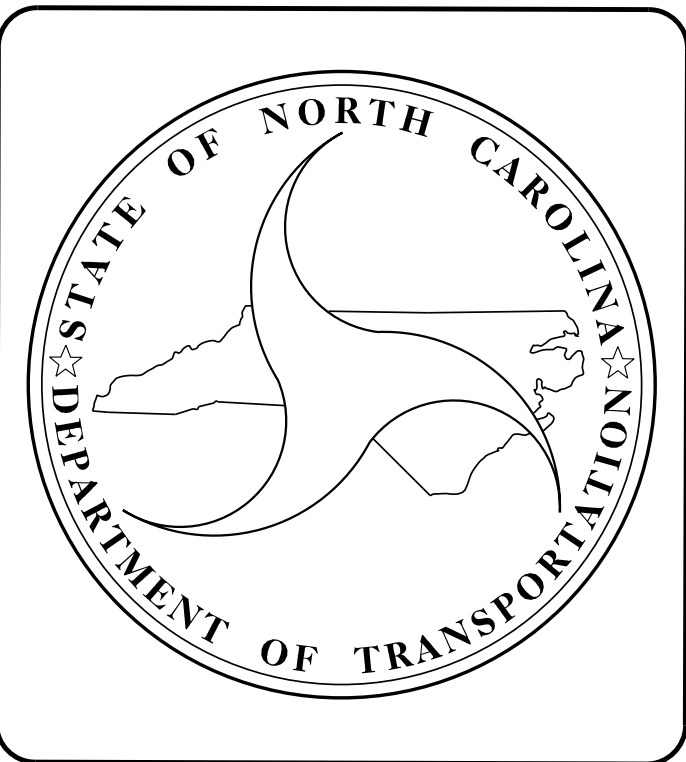
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DESIGN DATA

ADT 2011 = 270
 ADT 2031 = 500

V = 25 MPH

FUNC CLASS =
 LOCAL
 SUBREGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY PROJECT 14SP.20201.1 = 0.052 MI.
 LENGTH STRUCTURE PROJECT 14SP.20201.1 = 0.006 MI.
 TOTAL LENGTH PROJECT 14SP.20201.1 = 0.058 MI.

Prepared in the Office of:
VAUGHN & MELTON
 1318-F PATTON AVE.
 ASHEVILLE, NC, 28806
 FOR THE NORTH CAROLINA DIVISION OF HIGHWAYS

2018 STANDARD SPECIFICATIONS

LETTING DATE :
 AUGUST 14, 2018

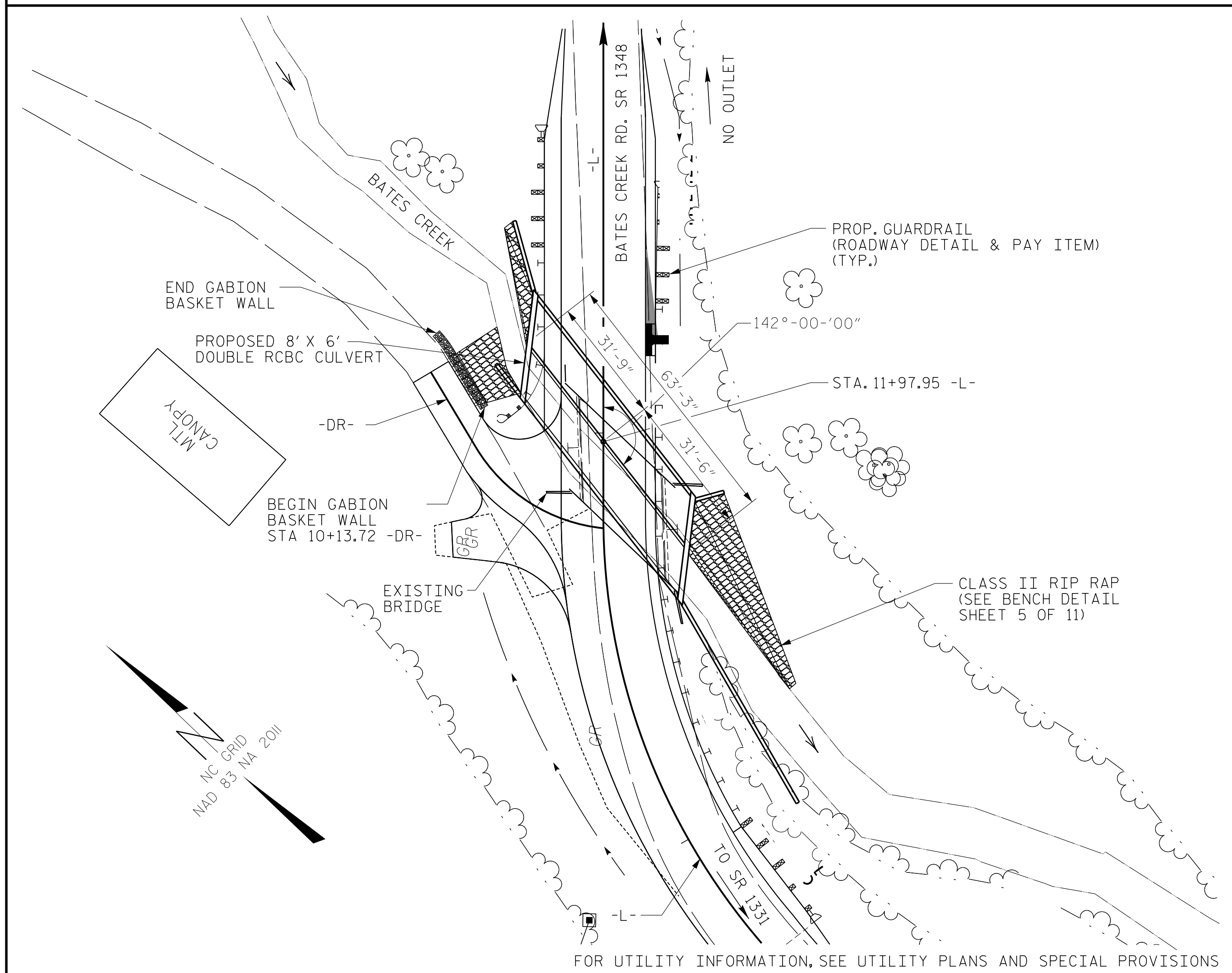
HARDY L. WILLIS, PE
 PROJECT ENGINEER

RYAN SHIPMAN, E.I
 PROJECT DESIGN ENGINEER

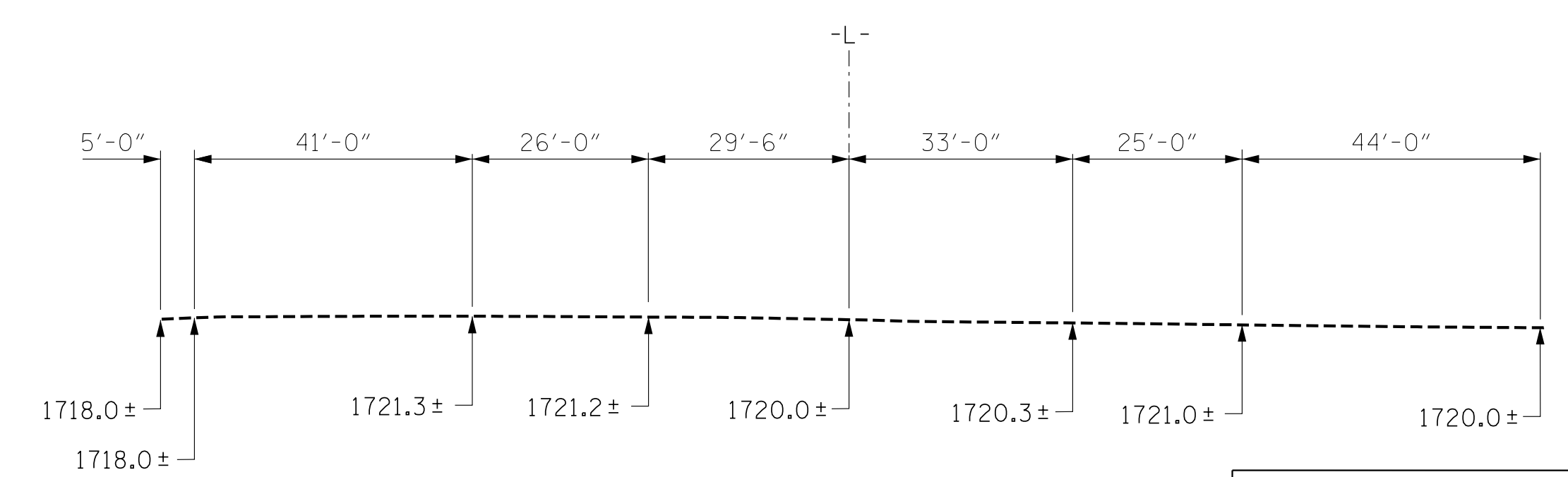
STRUCTURES MANAGEMENT UNIT
 1000 BIRCH RIDGE DR.
 RALEIGH, N.C. 27610

DIVISION OF HIGHWAYS
 STATE OF NORTH CAROLINA

BM #1: 8" SPIKE IN BASE OF 26" RED OAK, 33.00' LEFT OF -L- STA. 5+54.00
 N 534869.72, E 489980.97 EL. 1741.00



— LOCATION SKETCH —



ROADWAY DATA

GRADE POINT ELEV. @ STATION 11+97.95 -L- = 1727.16
 BED ELEV. @ STATION 11+97.95 -L- = 1718.49
 ROADWAY SLOPES 2%:

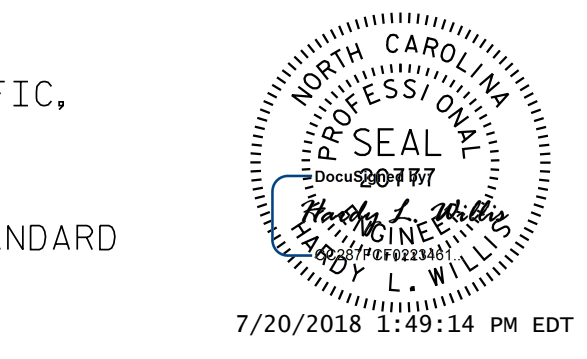
PROFILE ALONG CULVERT

HYDRAULIC DATA	
DESIGN DISCHARGE	= 550 CFS
DESIGN FREQUENCY	= 25 YRS
DESIGN HW ELEVATION	= 1724.6 FT
DRAINAGE AREA	= 1.64 SQ. MI.
BASE DISCHARGE	= 800 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 1727.19 FT

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OVERTOPPING FLOOD DATA	
OVERTOPPING DISCHARGE	= 750 CFS
OVERTOPPING FREQUENCY	= 50 YRS
OVERTOPPING ELEVATION	= 1727.0 FT
W.S. ELEVATION AT DATE OF SURVEY	= 1720.1 FT
	DATE: 11/14/2013



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 ENG. OF RECORD: RTS DATE: 02/2016

PROJECT NO. 14SP.20201.1
 CHEROKEE COUNTY
 STATION: 11+97.95 -L-
 SHEET 1 OF 11 REPLACE BRIDGE No. 163

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

GENERAL DRAWING
 DOUBLE BARREL
 8' X 6' RCBC
 ALONG BATES CREEK
 ON SR 1348 (BATES CREEK ROAD)
 NEAR INTERSECTION WITH PEAR LANE

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

NOTES

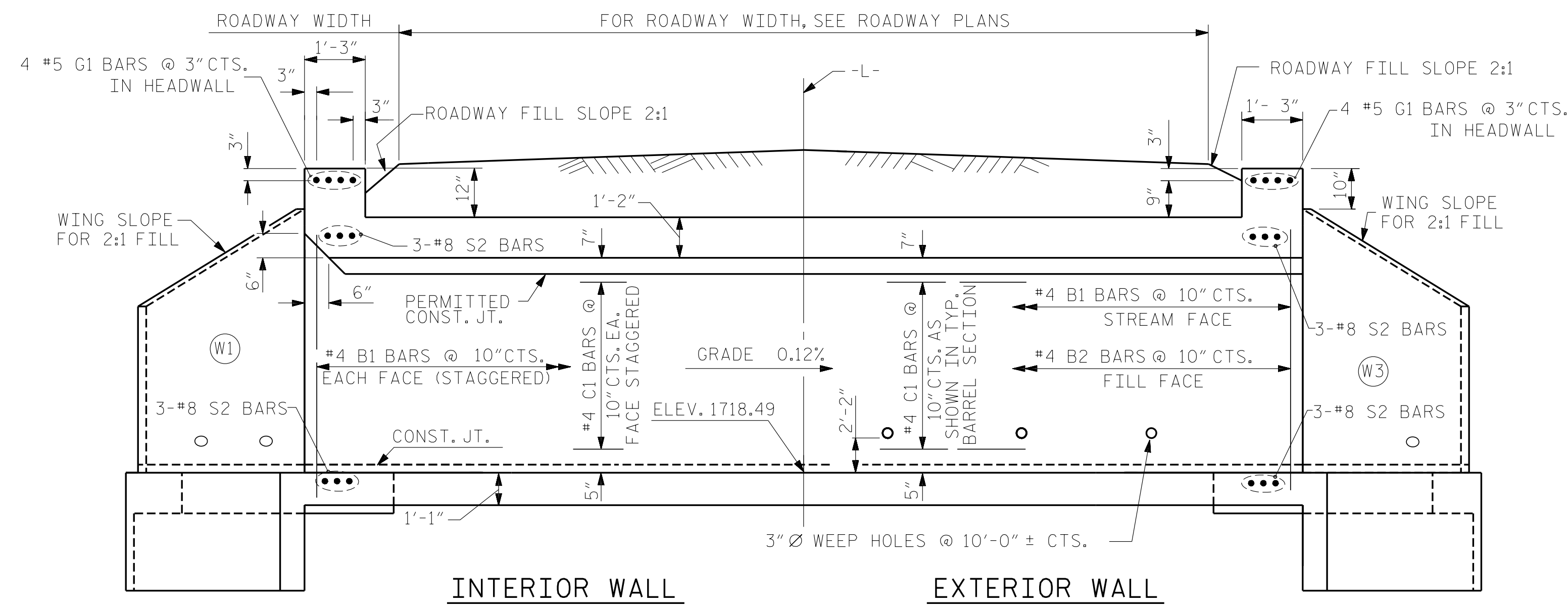
ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING.
 DESIGN FILL ----- MAX.=3.00' MIN.=2.38'
 FOR OTHER DESIGN DATA AND GENERAL NOTES, SEE STANDARD NOTES SHEET SN.
 THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
 CONCRETE IN CULVERT SHALL BE POURED IN THE FOLLOWING ORDER:
 1. WINGS FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
 FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC MANAGEMENT PLANS.
 FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
 FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
 FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
 FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.
 TEMPORARY SHORING WILL BE REQUIRED. SEE STANDARD DRAWING NO. 1801.01 FOR STANDARD TEMPORARY SHORING.
 NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
 THE EXISTING STRUCTURE CONSISTING OF SINGLE SPAN 25'-6"; CLEAR ROADWAY WIDTH OF 19'-0" TIMBER FLOOR ON STEEL BEAMS; END BENTS CONSISTING OF TIMBER CAPS ON TIMBER POSTS AND CONCRETE SILLS AND LOCATED AT THE PROPOSED STRUCTURE SITE SHALL BE REMOVED. THE EXISTING BRIDGE IS PRESENTLY POSTED FOR LOAD LIMIT.
 AT THE CONTRACTOR'S OPTION HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF THE EXTERIOR WALLS AND BOTH FACES OF THE INTERIOR WALL ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
 FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLAN.
 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.
 STEEL IN THE BOTTOM SLAB MAY BE SPLICED AT THE PERMITTED, CONSTRUCTION JOINT AT THE CONTRACOR'S OPTION. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES WILL BE PAID FOR BY THE CONTRACTOR.
 FOR GABION BASKET WALL, SEE SPECIAL PROVISIONS.
 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.
 3" Ø WEEP HOLES INDICATED SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.

THE EXISTING 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 SHOWN ON THE PLANS AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.
 REMOVAL OF THE EXISTING BRIDGE SHALL BE PERFORMED SO AS NOT TO ALLOW DEBRIS TO FALL INTO THE WATER. THE CONTRACTOR SHALL REMOVE THE BRIDGE AND SUBMIT PLANS FOR DEMOLITION IN ACCORDANCE WITH ARTICLE 402-2 OF THE STANDARD SPECIFICATIONS.
 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'.
 FOR ASBESTOS ASSESSMENT FOR BRIDGE DEMOLITION AND RENOVATION ACTIVITIES, SEE SPECIAL PROVISIONS.
 DIMENSIONS FOR THE WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEETS.

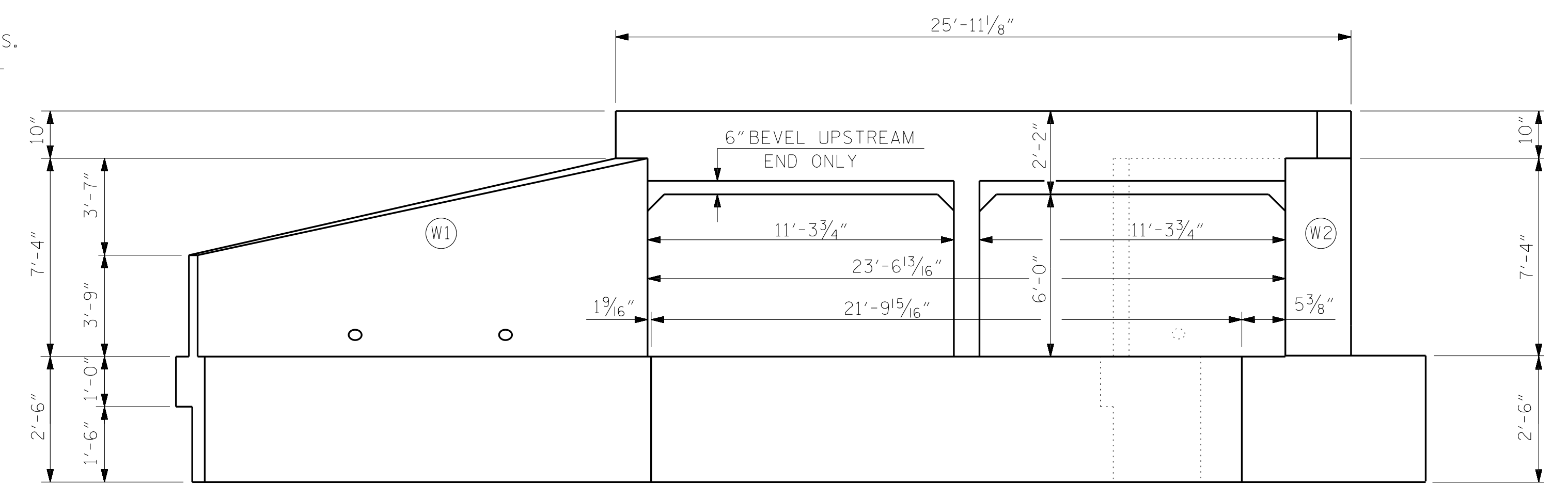
FOUNDATION NOTES

EXCAVATE 1 FOOT BELOW CULVERT AND FOOTINGS AND REPLACE WITH FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH ARTICLE 414-4 OF THE STANDARD SPECIFICATIONS.
 CULVERT EXCAVATION LUMP SUM PAY ITEM SHALL INCLUDE A MINIMUM OF 50 C.Y. OF ROCK EXCAVATION.

TOTAL STRUCTURE QUANTITIES	
REMOVAL OF EXISTING STRUCTURE	LUMP SUM
ASBESTOS ASSESSMENT	LUMP SUM
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	100.0 TONS
GABION BASKET WALL	96 SF
CLASS A CONCRETE	
BARREL @ 2.07 CY/FT	130.9 C.Y.
WINGS, SILLS, ETC.	48.3 C.Y.
TOTAL	179.2 C.Y.
REINFORCING STEEL	
BARREL	17,168 LBS.
WINGS ETC.	4,172 LBS.
TOTAL	21,340 LBS.
CLASS II RIP RAP (2'-0" THICK)	47 TONS
GEOTEXTILE FOR DRAINAGE	72 SY

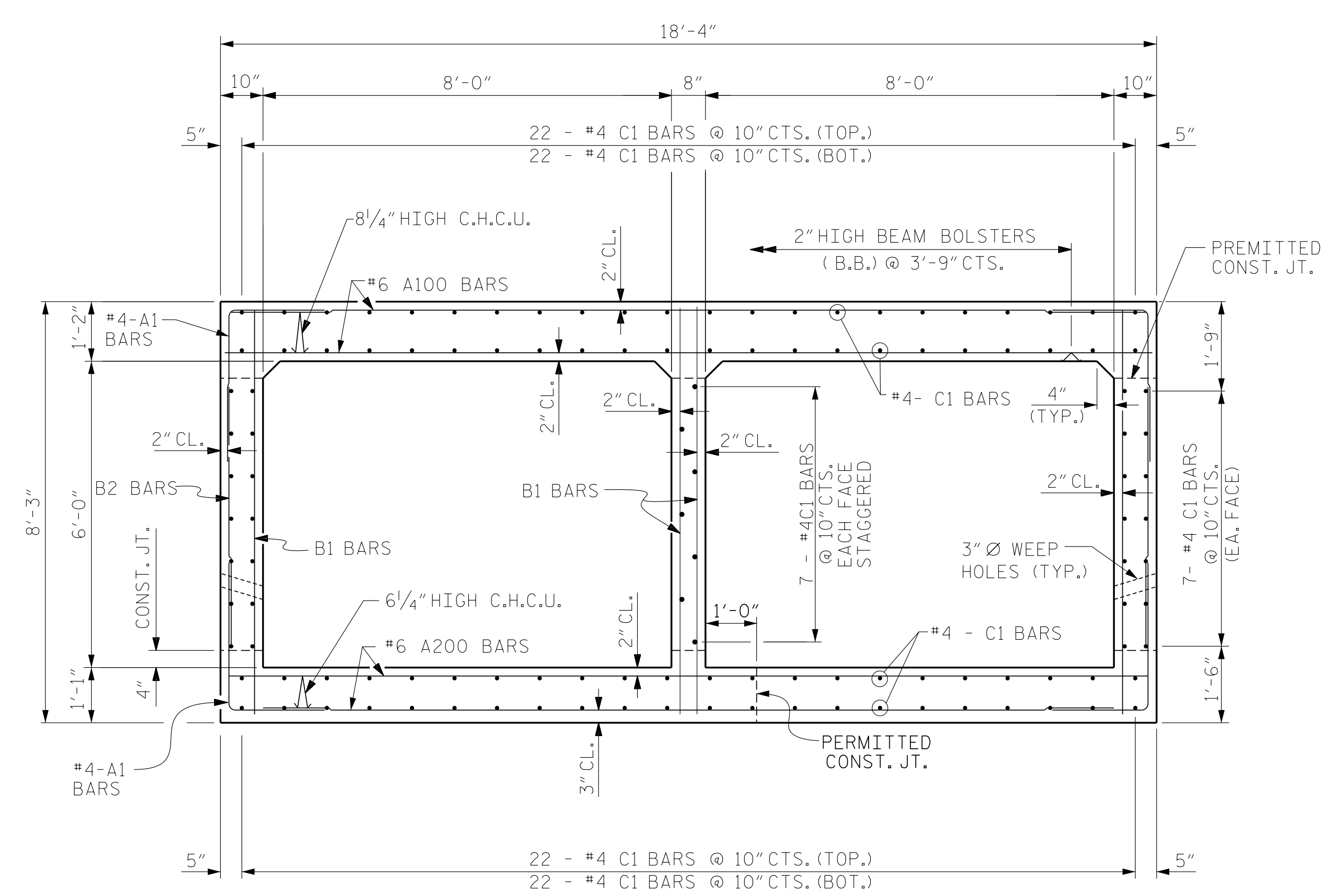


CULVERT SECTION NORMAL TO ROADWAY



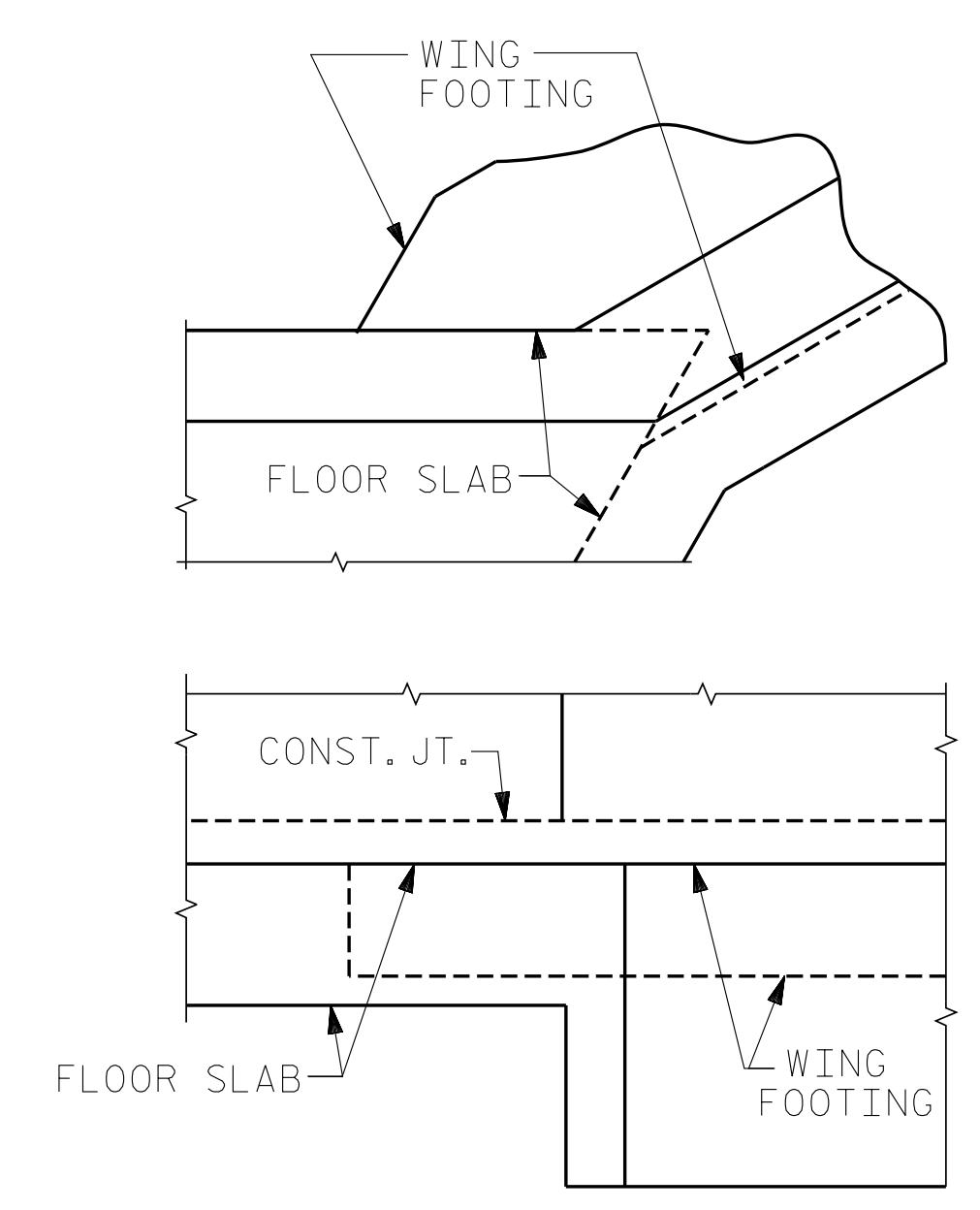
END ELEVATION NORMAL TO SKEW

UPSTREAM END SHOWN, DOWNSTREAM END SIMILAR.

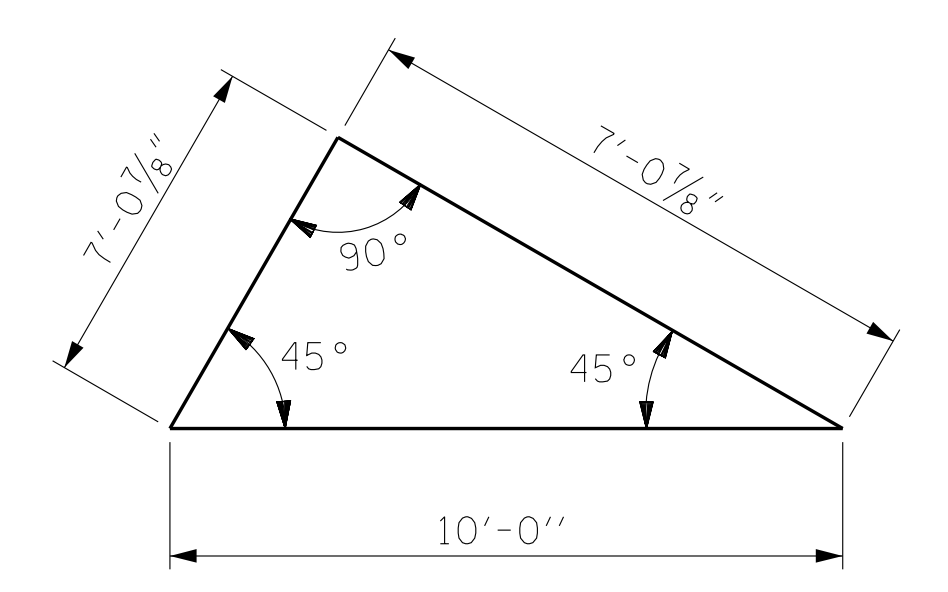


RIGHT ANGLE SECTION OF BARREL

THERE ARE 123 "C" BARS IN SECTION OF BARREL.



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



SKEW TRIANGLE

PROJECT NO. 14SP.20201.1
CHEROKEE COUNTY
STATION: 11+97.95 -L-

SHEET 2 OF 11

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE BARREL
8' X 6' RCBC
ALONG BATES CREEK
ON SR 1348 (BATES CREEK ROAD)
NEAR INTERSECTION WITH PEAR LANE

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PROFESSIONAL SEAL
NORTH CAROLINA
REGISTERED PROFESSIONAL ENGINEER
No. 14499
Name: HARDY L. WILLIAMS
Date: 7/20/2018 11:49:14 PM EDT

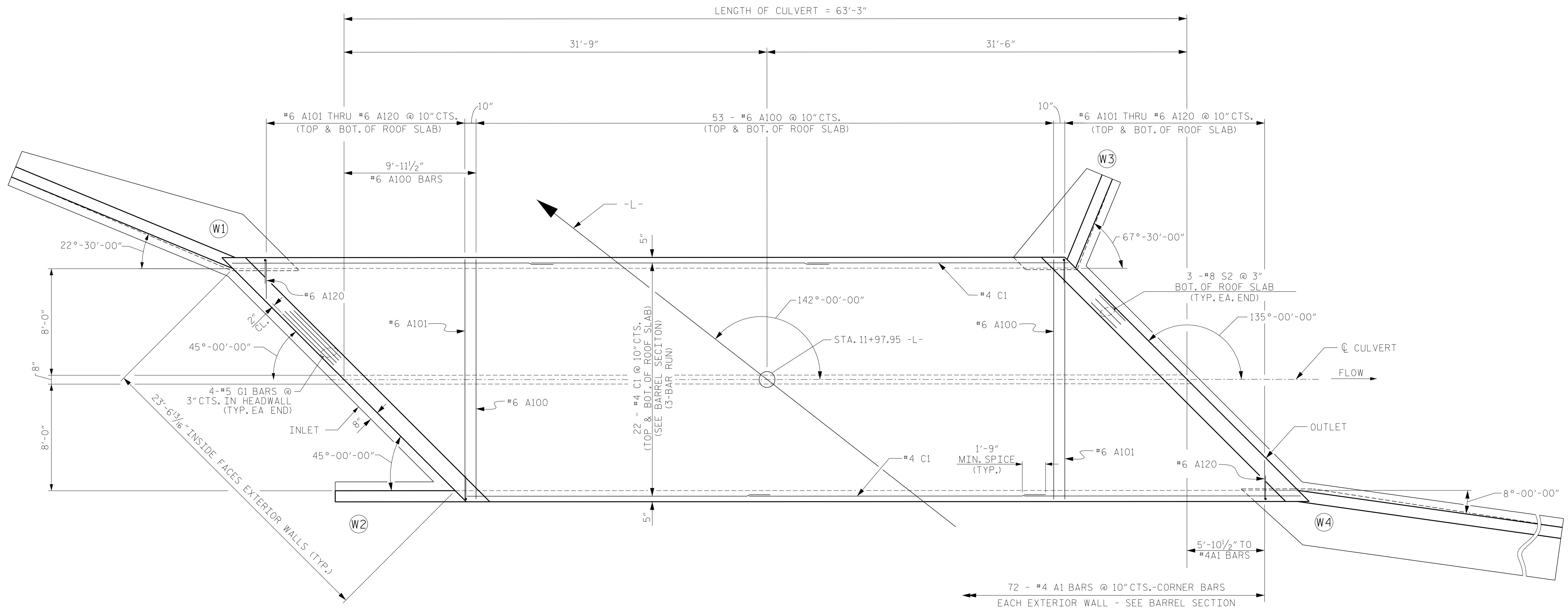
REVISIONS					SHEET NO.
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1			3		
2			4		

C-2
TOTAL SHEETS 11

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

ENG. OF RECORD: RYAN T. SHIPMAN
ASSEMBLED BY: ARTHUR WILLIAMS DATE: FEB. 2016
CHECKED BY: HARDY L. WILLIAMS DATE: FEB. 2016
DRAWN BY: RALPH D. UNDERWOOD DATE: APR. 1972
CHECKED BY: HASON A. JUDEH DATE: MAY 1972

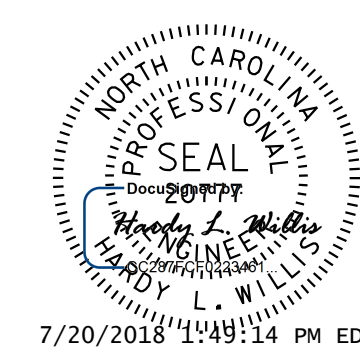
SPECIAL
STANDARD



ROOF SLAB PLAN

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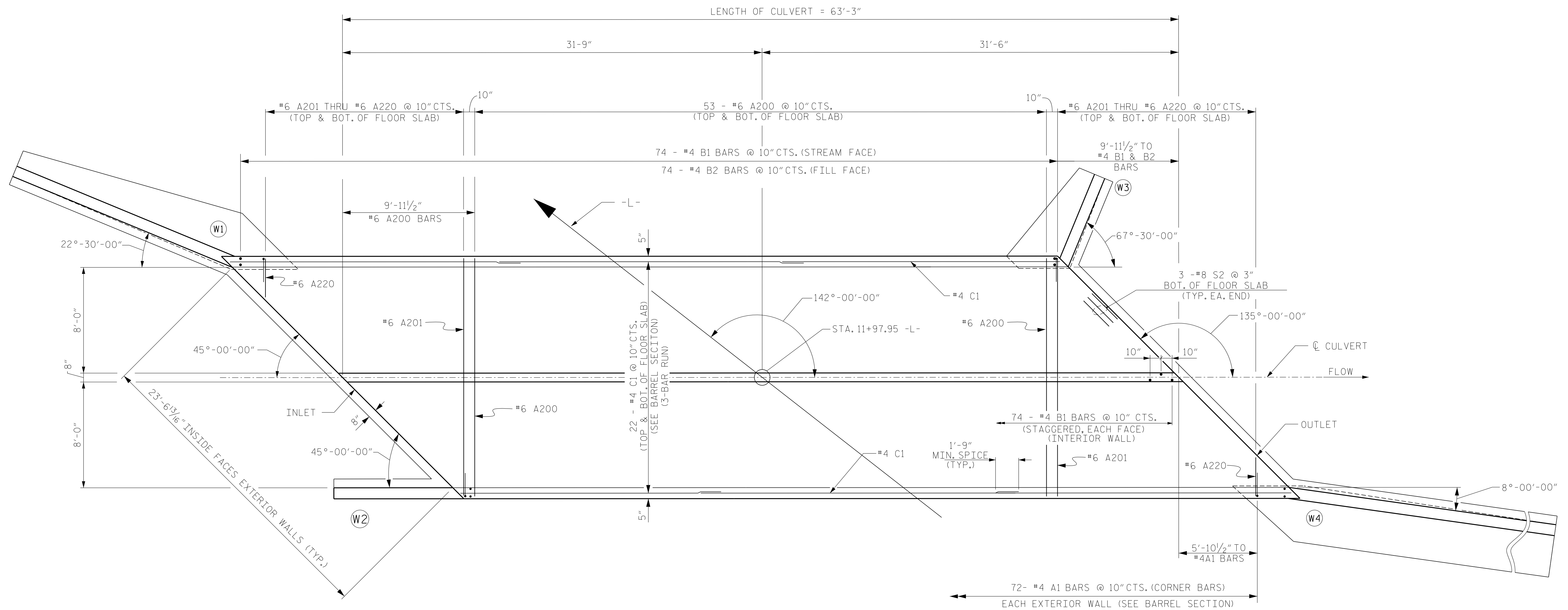
SHEET 3 OF 11

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE BARREL
8' X 6' RCBC
ALONG BATES CREEK
ON SR 1348 (BATES CREEK ROAD)
NEAR INTERSECTION WITH PEAR LANE

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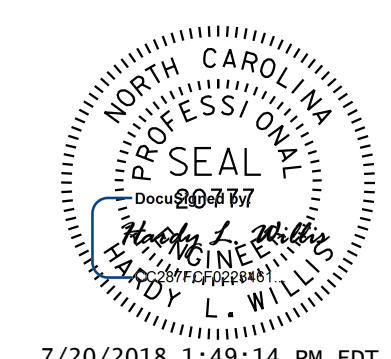


FLOOR SLAB PLAN

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RALEIGH

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NEAR INTERSECTION WITH PEAR LANE

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1			3			TOTAL SHEETS	11
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BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	288	4	1	6'-6"	1250
A100	106	6	STR.	18'-0"	2866
A101	4	6	STR.	17'-10"	107
A102	4	6	STR.	17'-0"	102
A103	4	6	STR.	16'-2"	97
A104	4	6	STR.	15'-4"	92
A105	4	6	STR.	14'-6"	87
A106	4	6	STR.	13'-8"	82
A107	4	6	STR.	12'-10"	77
A108	4	6	STR.	12'-0"	72
A109	4	6	STR.	11'-2"	67
A110	4	6	STR.	10'-4"	62
A111	4	6	STR.	9'-6"	57
A112	4	6	STR.	8'-8"	52
A113	4	6	STR.	7'-10"	47
A114	4	6	STR.	7'-0"	42
A115	4	6	STR.	6'-2"	37
A116	4	6	STR.	5'-4"	32
A117	4	6	STR.	4'-6"	27
A118	4	6	STR.	3'-8"	22
A119	4	6	STR.	2'-10"	17
A120	4	6	STR.	2'-0"	12
A200	106	6	STR.	18'-0"	2866
A201	4	6	STR.	17'-10"	107
A202	4	6	STR.	17'-0"	102
A203	4	6	STR.	16'-2"	97
A204	4	6	STR.	15'-4"	92
A205	4	6	STR.	14'-6"	87
A206	4	6	STR.	13'-8"	82
A207	4	6	STR.	12'-10"	77
A208	4	6	STR.	12'-0"	72
A209	4	6	STR.	11'-2"	67
A210	4	6	STR.	10'-4"	62
A211	4	6	STR.	9'-6"	57
A212	4	6	STR.	8'-8"	52
A213	4	6	STR.	7'-10"	47
A214	4	6	STR.	7'-0"	42
A215	4	6	STR.	6'-2"	37
A216	4	6	STR.	5'-4"	32
A217	4	6	STR.	4'-6"	27
A218	4	6	STR.	3'-8"	22
A219	4	6	STR.	2'-10"	17
A220	4	6	STR.	2'-0"	12

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
B1	222	4	STR.	7'-10"	1162
B2	148	4	STR.	5'-0"	494
C1	369	4	STR.	22'-3"	5484
D1	6	6	STR.	2'-8"	24
D2	9	6	STR.	1'-8"	23
G1	8	5	STR.	25'-5"	212
S2	6	8	STR.	25'-5"	407

SPLICE LENGTH CHART	
BAR SIZE	SPLICE LENGTH
#4	1'-9"
#5	2'-2"
#6	2'-9"

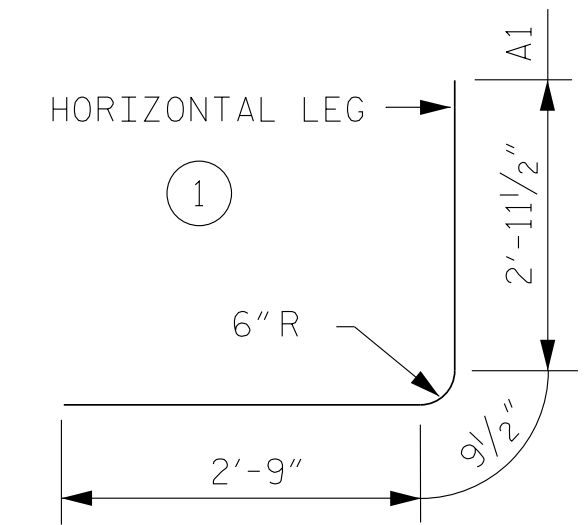
TOTAL REINFORCING STEEL: 17,168 LB.

CLASS A CONCRETE

CULVERT BARREL 130.9 C.Y.

SILLS 2.8 C.Y.

BAR TYPES



BAR DIMENSIONS ARE OUT TO OUT.

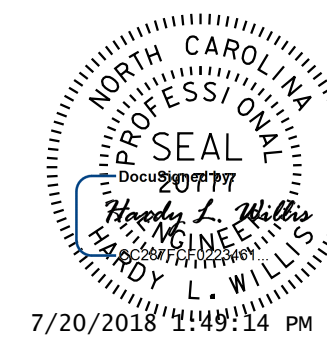
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STATION: 11+97.95 -L-

SHEET 6 OF 11

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RALEIGH

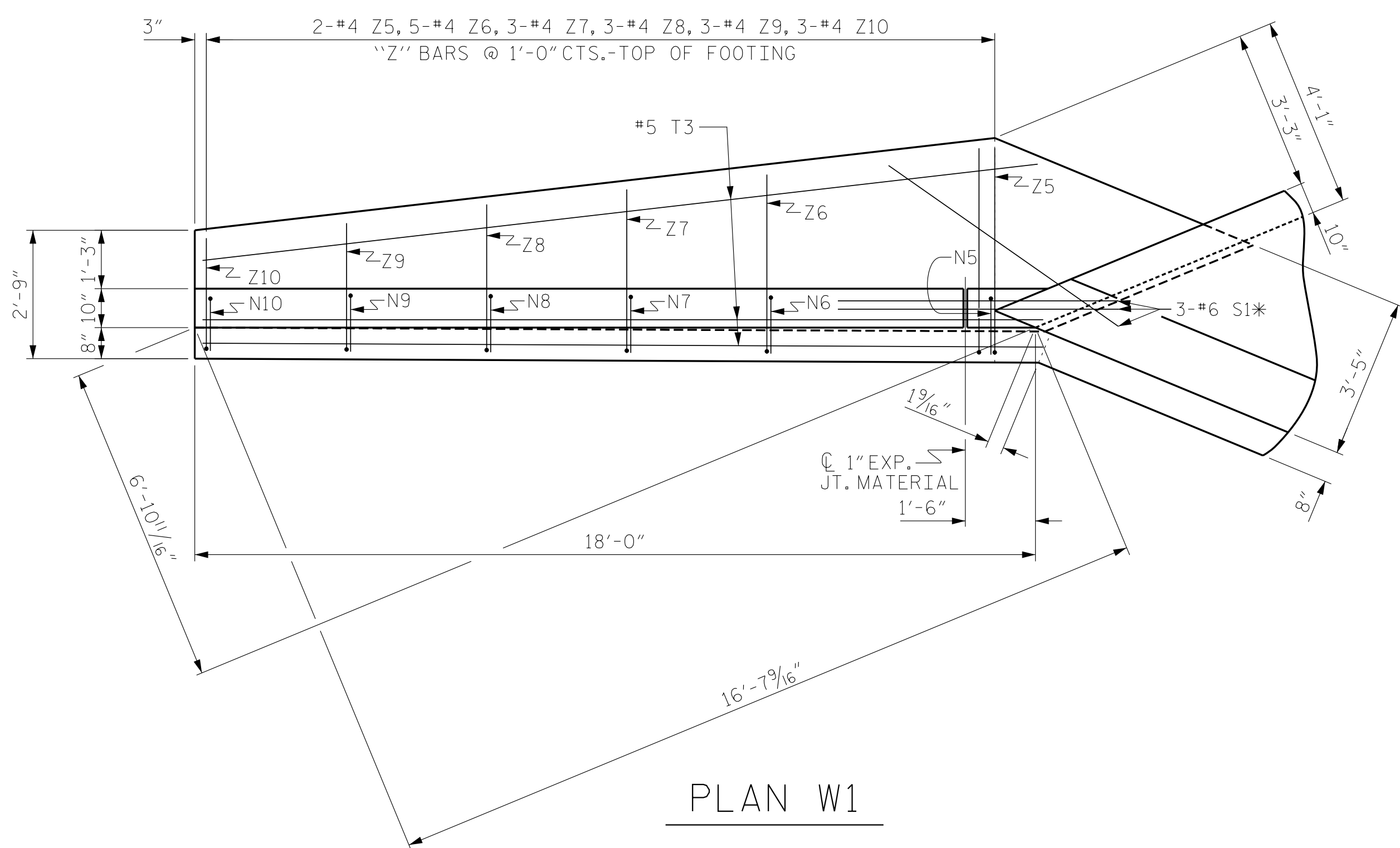
DOUBLE BARREL
8' X 6' RCBC
ALONG BATES CREEK
ON SR 1348 (BATES CREEK ROAD)
NEAR INTERSECTION WITH PEAR LANE

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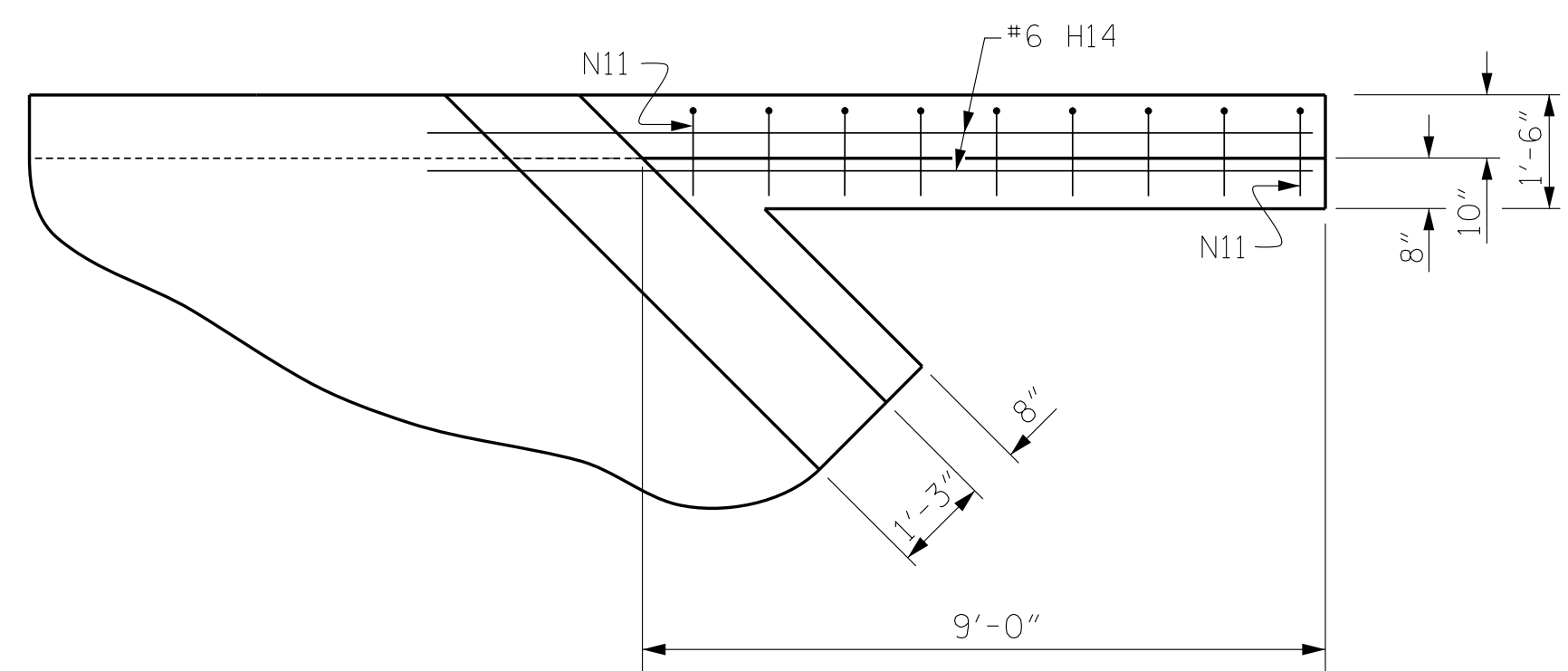
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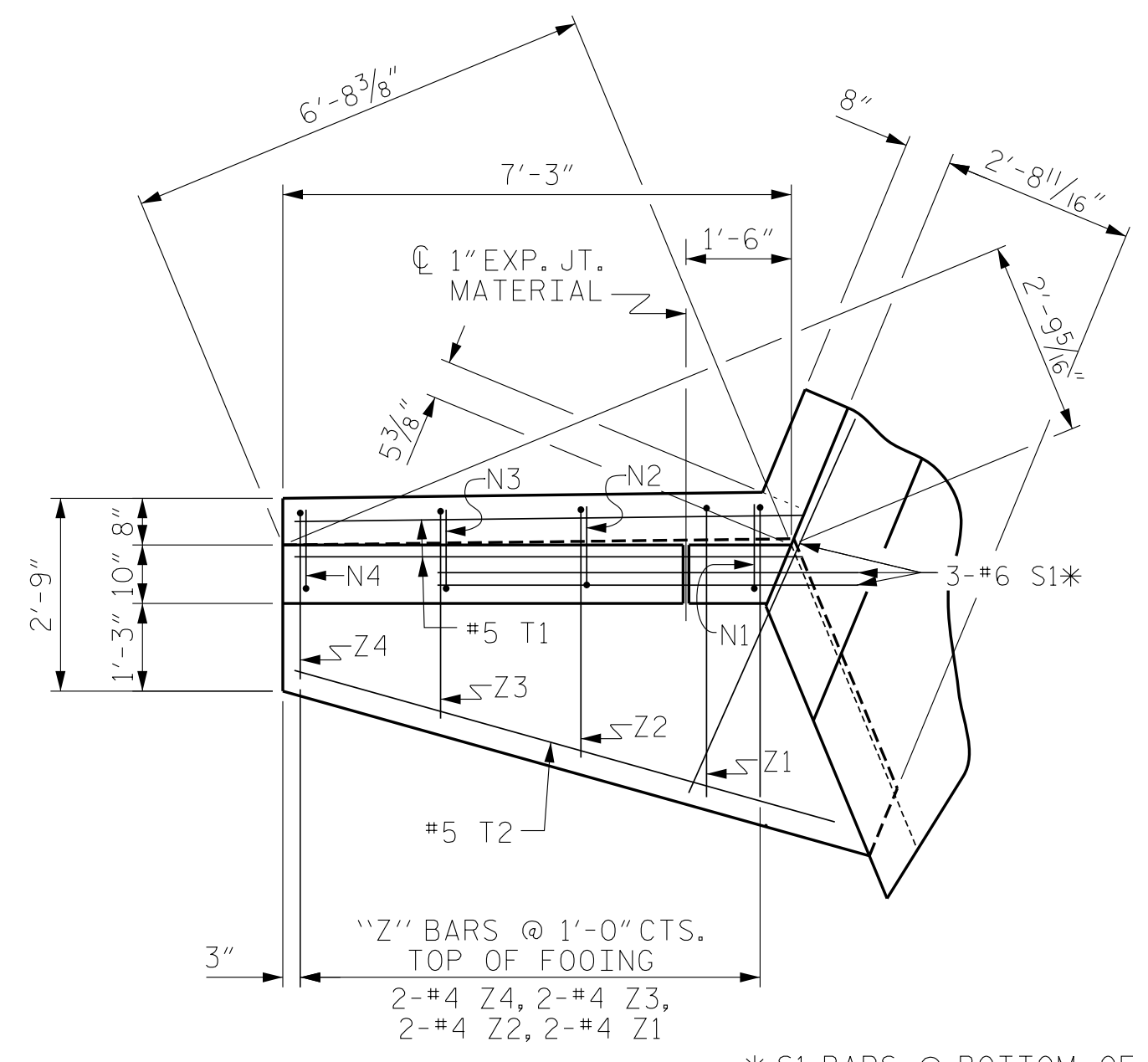
SHEET NO.
C-6
TOTAL SHEETS
11



PLAN W1

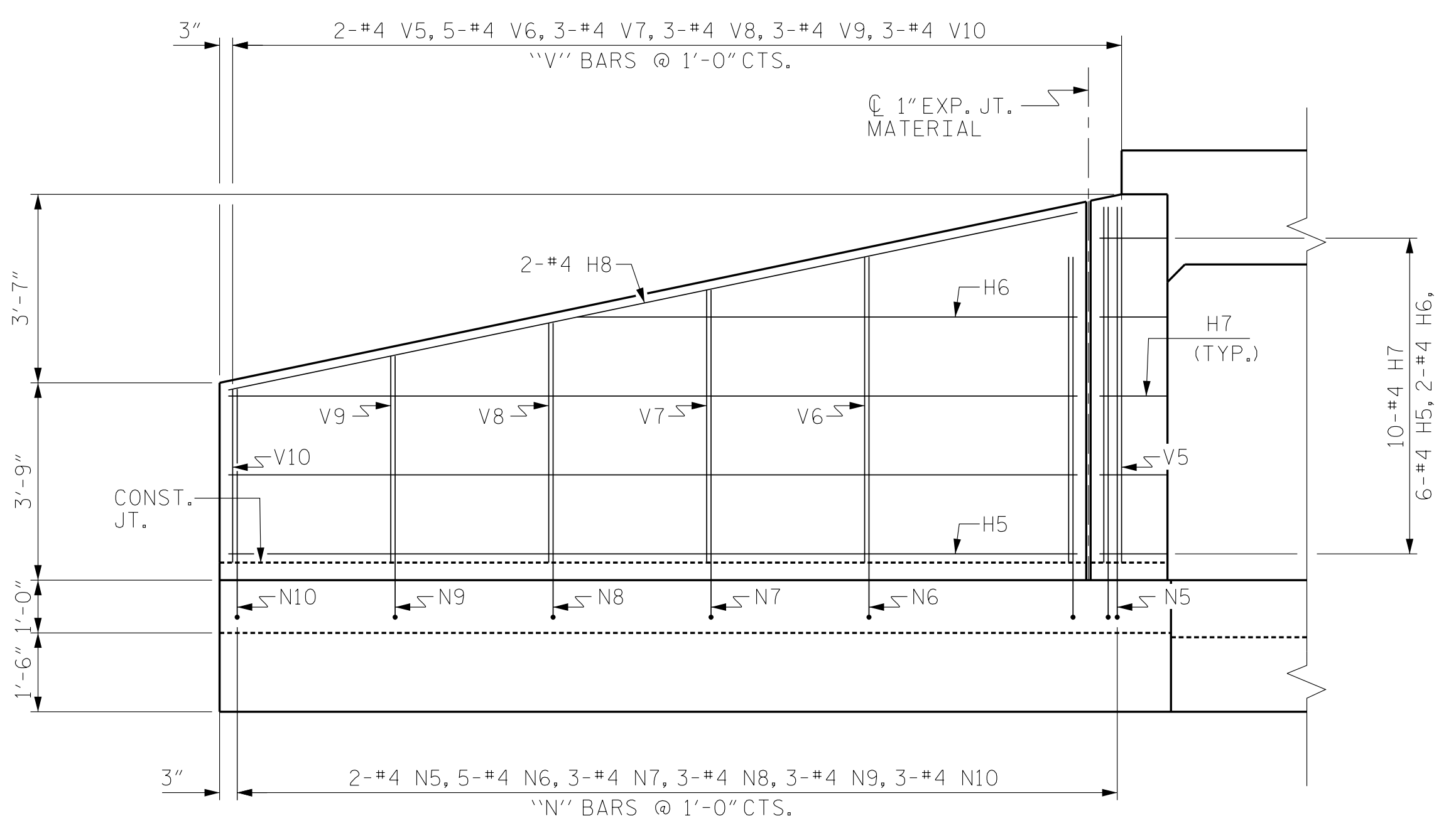


PLAN W2

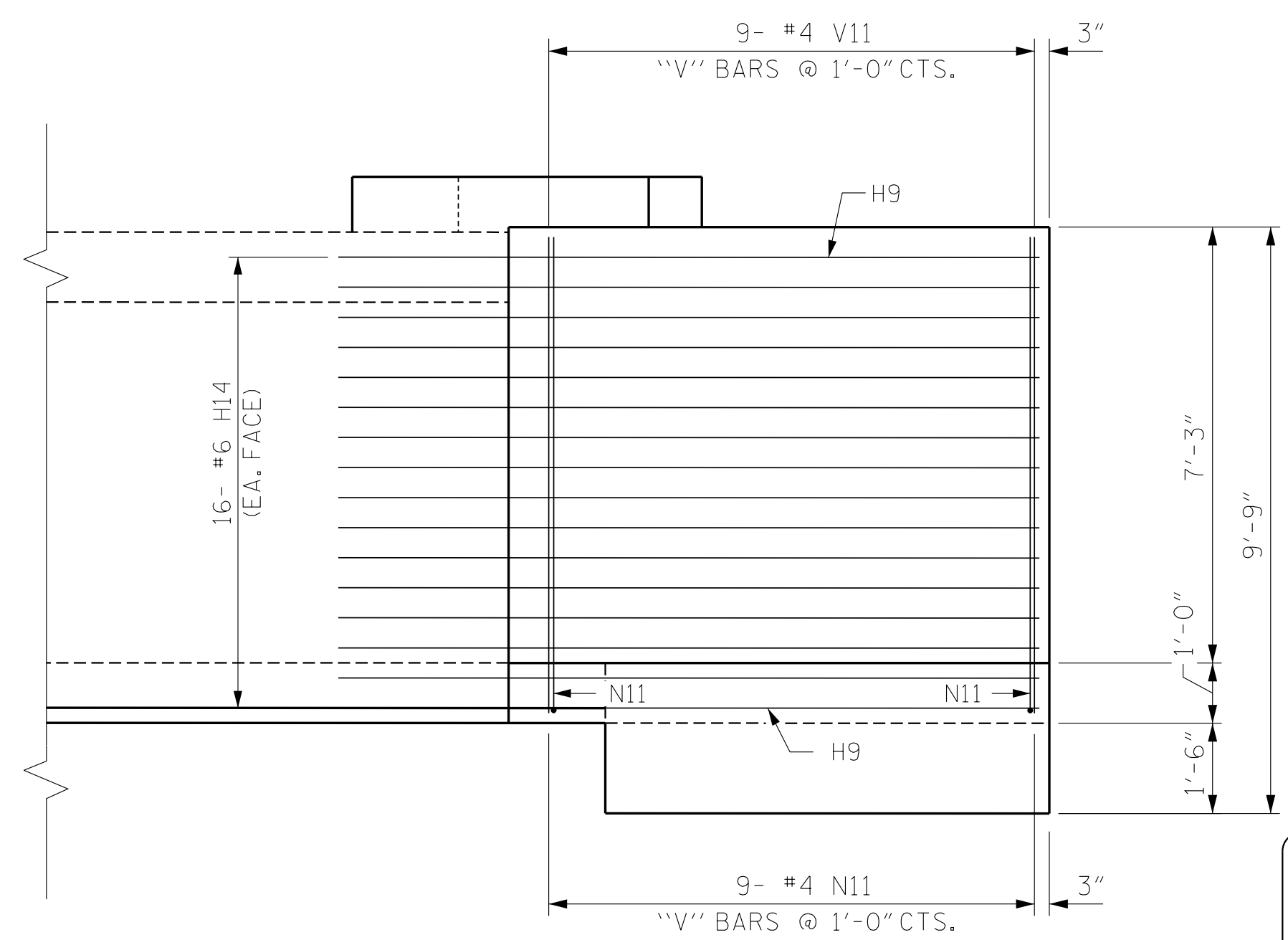


PLAN W3

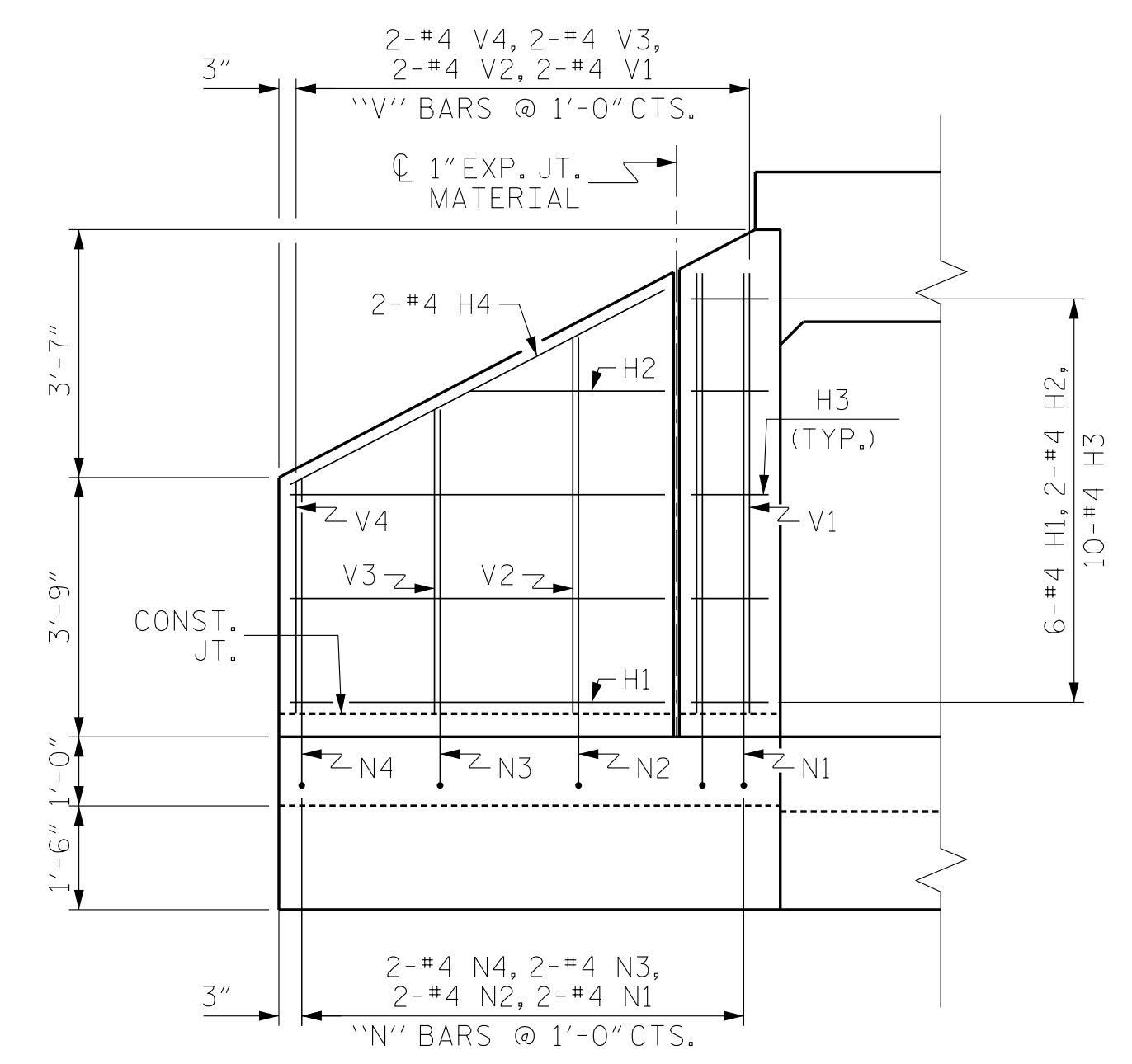
* S1 BARS @ BOTTOM OF FLOOR SLAB & FOOTING



ELEVATION W1



ELEVATION W2



ELEVATION W3

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PROJECT NO. 14SP.20201.1
CHEROKEE COUNTY

STATION: 11+97.95 -L-

SHEET 7 OF 11

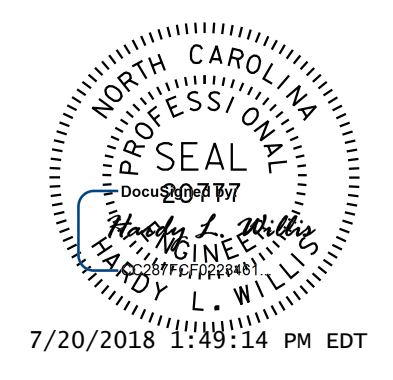
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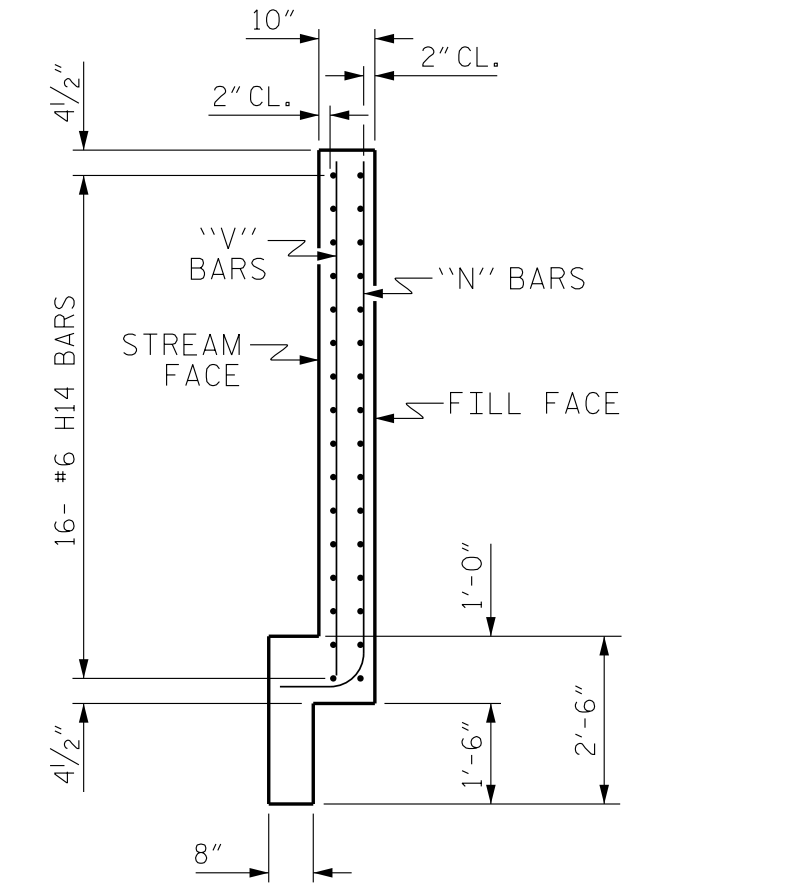
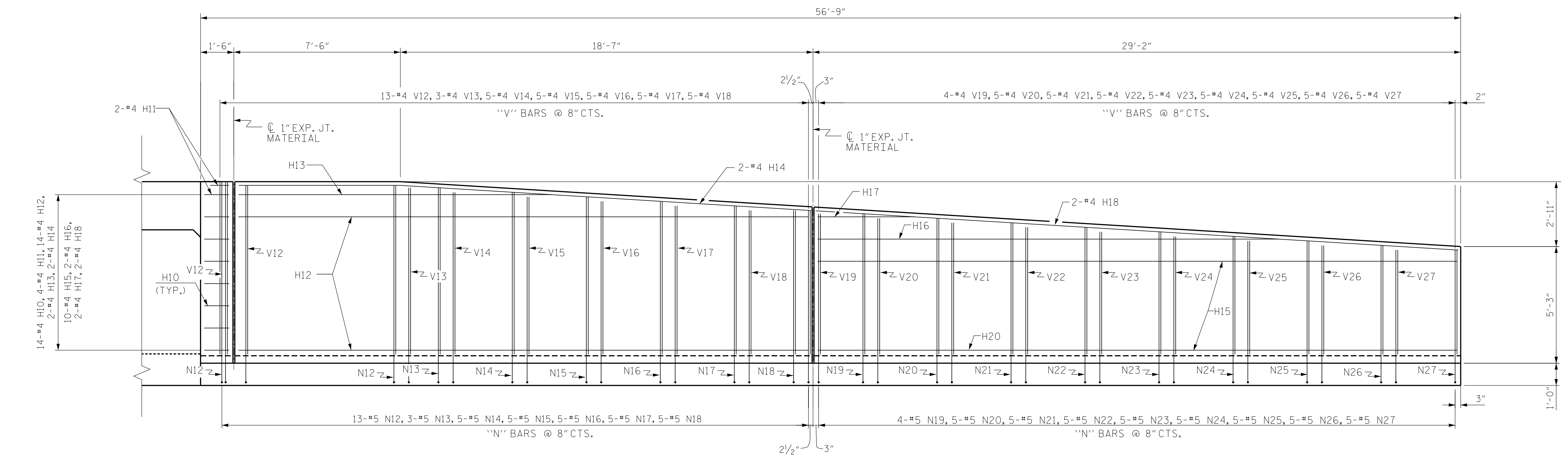
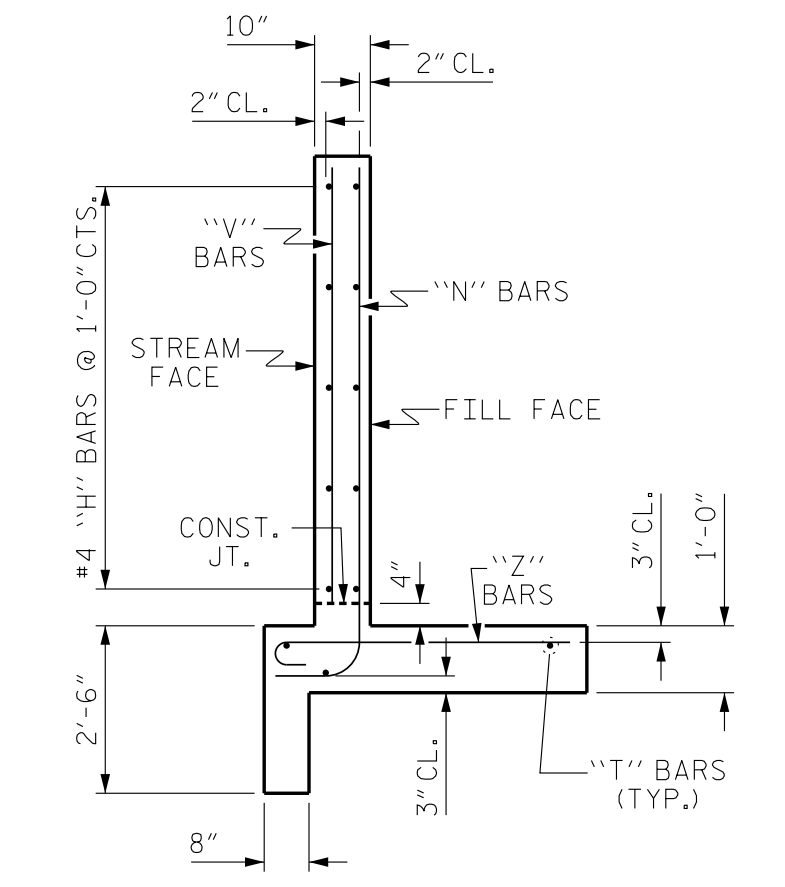
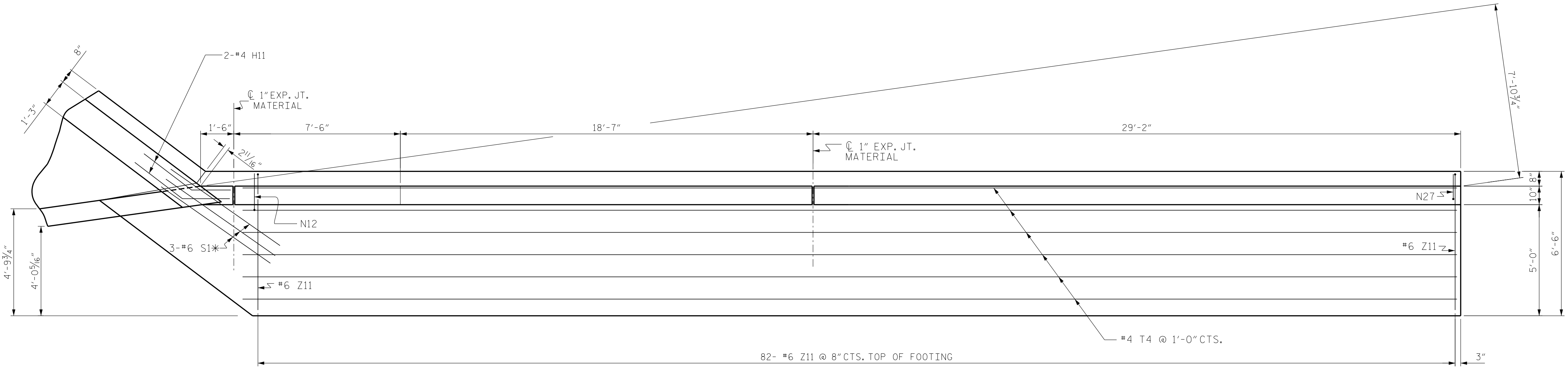
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WING DETAILS
FOR
CONCRETE BOX CULVERT
H = 6'-0" SLOPE = 2:1
45° OR 135° SKEW



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1			3			TOTAL SHEETS 11
2			4			



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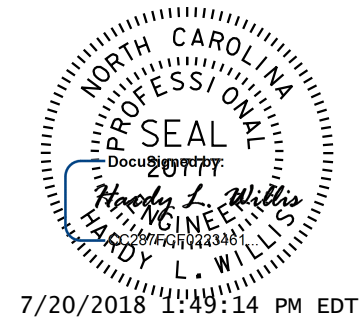
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 RALEIGH

WING DETAILS
 FOR
 CONCRETE BOX CULVERT
 H = 6'-0" SLOPE = 2:1
 45° OR 135° SKEW

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

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	6	#4	STR	5'-4"	21
H2	2	#4	STR	2'-9"	4
H3	10	#4	1	3'-3"	22
H4	2	#4	STR	6'-1"	8
H5	6	#4	STR	16'-1"	64
H6	2	#4	STR	9'-6"	13
H7	10	#4	2	3'-3"	22
H8	2	#4	STR	16'-5"	22
H9	32	#6	STR	11'-8"	561
H10	14	#4	2	3'-3"	30
H11	4	#4	1	4'-1"	11
H12	14	#4	STR	25'-8"	240
H13	2	#4	STR	14'-1"	19
H14	2	#4	STR	25'-8"	34
H15	10	#4	STR	28'-9"	192
H16	2	#4	STR	20'-9"	28
H17	2	#4	STR	4'-4"	6
H18	2	#4	STR	28'-10"	39
N1	2	#4	3	8'-4"	11
N2	2	#4	3	7'-5"	10
N3	2	#4	3	6'-4"	8
N4	2	#4	3	5'-4"	7
N5	2	#4	3	8'-9"	12
N6	5	#4	3	7'-9"	26
N7	3	#4	3	7'-2"	14
N8	3	#4	3	6'-7"	13
N9	3	#4	3	5'-11"	12
N10	3	#4	3	5'-4"	11
N11	9	#4	3	8'-9"	53
N12	13	#5	3	9'-8"	131
N13	3	#5	3	9'-7"	30
N14	5	#5	3	9'-5"	49
N15	5	#5	3	9'-2"	48
N16	5	#5	3	8'-11"	47
N17	5	#5	3	8'-9"	46
N18	5	#5	3	8'-7"	45
N19	4	#5	3	8'-5"	35
N20	5	#5	3	8'-2"	43
N21	5	#5	3	8'-0"	42
N22	5	#5	3	7'-9"	40
N23	5	#5	3	7'-7"	40
N24	5	#5	3	7'-5"	39
N25	5	#5	3	7'-2"	37
N26	5	#5	3	7'-0"	37
N27	5	#5	3	6'-9"	35

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
V1	2	#4	STR	6'-4"	8
V2	2	#4	STR	5'-5"	7
V3	2	#4	STR	4'-4"	6
V4	2	#4	STR	3'-4"	4
V5	2	#4	STR	6'-9"	9
V6	5	#4	STR	5'-9"	19
V7	3	#4	STR	5'-2"	10
V8	3	#4	STR	4'-6"	9
V9	3	#4	STR	3'-11"	8
V10	3	#4	STR	3'-3"	7
V11	9	#4	STR	7'-10"	47
V12	13	#4	STR	7'-6"	65
V13	3	#4	STR	7'-4"	15
V14	5	#4	STR	7'-2"	24
V15	5	#4	STR	6'-11"	23
V16	5	#4	STR	6'-9"	23
V17	5	#4	STR	6'-7"	22
V18	5	#4	STR	6'-4"	21
V19	4	#4	STR	6'-2"	16
V20	5	#4	STR	5'-11"	20
V21	5	#4	STR	5'-9"	19
V22	5	#4	STR	5'-7"	19
V23	5	#4	STR	5'-4"	18
V24	5	#4	STR	5'-2"	17
V25	5	#4	STR	5'-0"	17
V26	5	#4	STR	4'-9"	16
V27	5	#4	STR	4'-6"	15
Z1	2	#4	4	4'-8"	6
Z2	2	#4	4	4'-1"	5
Z3	2	#4	4	3'-6"	5
Z4	2	#4	4	2'-11"	4
Z5	2	#4	4	4'-11"	7
Z6	5	#4	4	4'-4"	14
Z7	3	#4	4	4'-0"	8
Z8	3	#4	4	3'-8"	7
Z9	3	#4	4	3'-3"	7
Z10	3	#4	4	2'-11"	6
Z11	82	#6	4	6'-10"	842

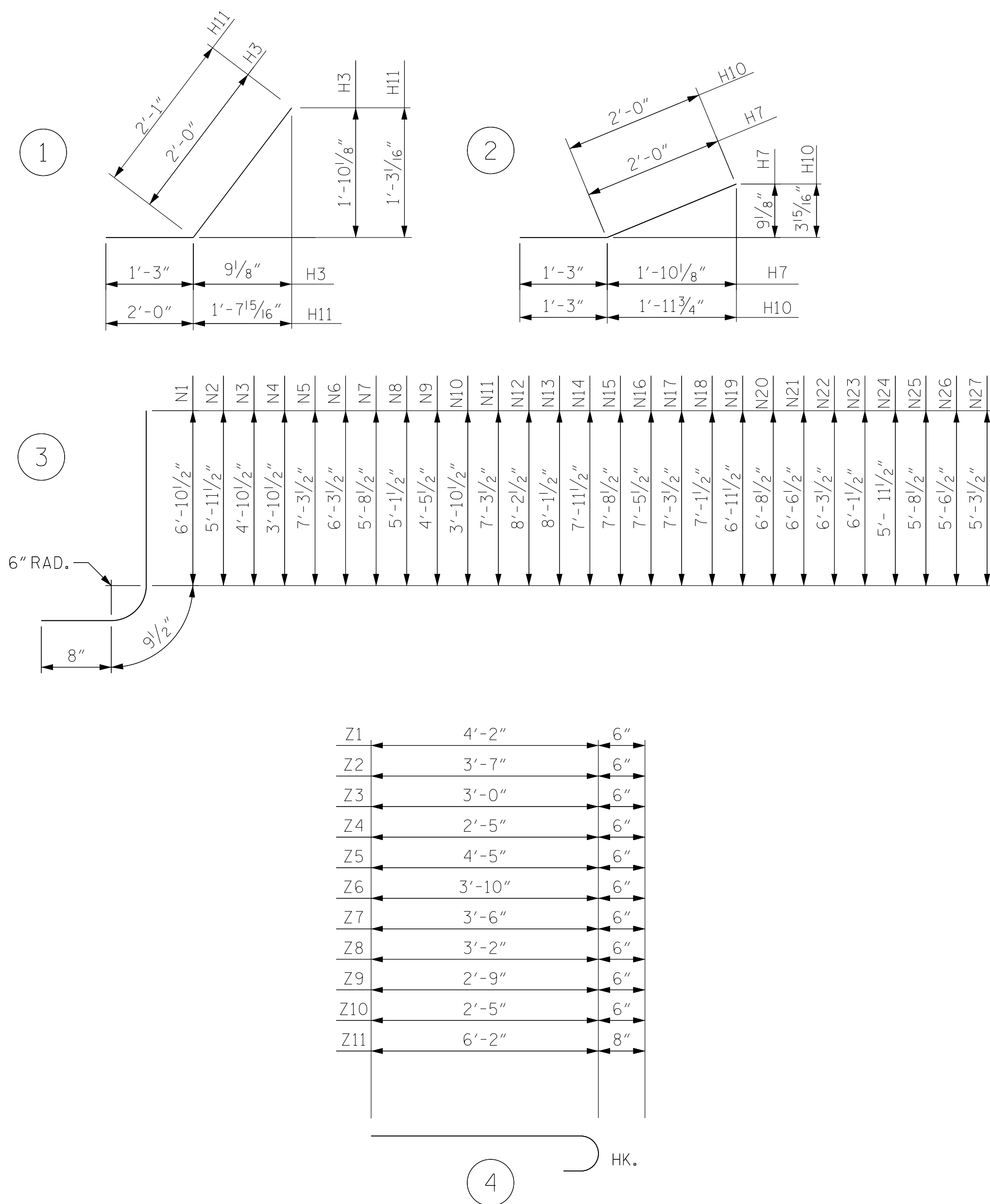
SPLICE LENGTH CHART

BAR SIZE	SPLICE LENGTH
#4	1'-9"
#5	2'-2"
#6	2'-9"

REINFORCING STEEL 4172 LBS
FOR 4 WINGS

CLASS A CONCRETE	
4 WINGS	37.0 CY
2 HEADWALLS	2.4 CY
2 END CURTAIN WALLS	6.1 CY
TOTAL	45.5 CY

BAR TYPES



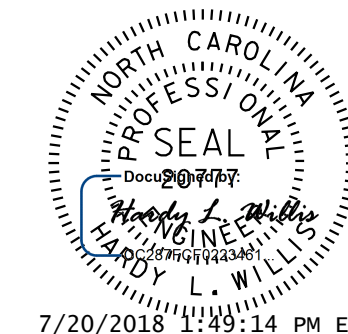
ALL BAR DIMENSIONS ARE OUT TO OUT.

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SHEET 9 OF 11

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STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**WING DETAILS
 FOR
 CONCRETE BOX CULVERT**
 H = 6'-0" SLOPE = 2:1
 45° OR 135° SKEW

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

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.

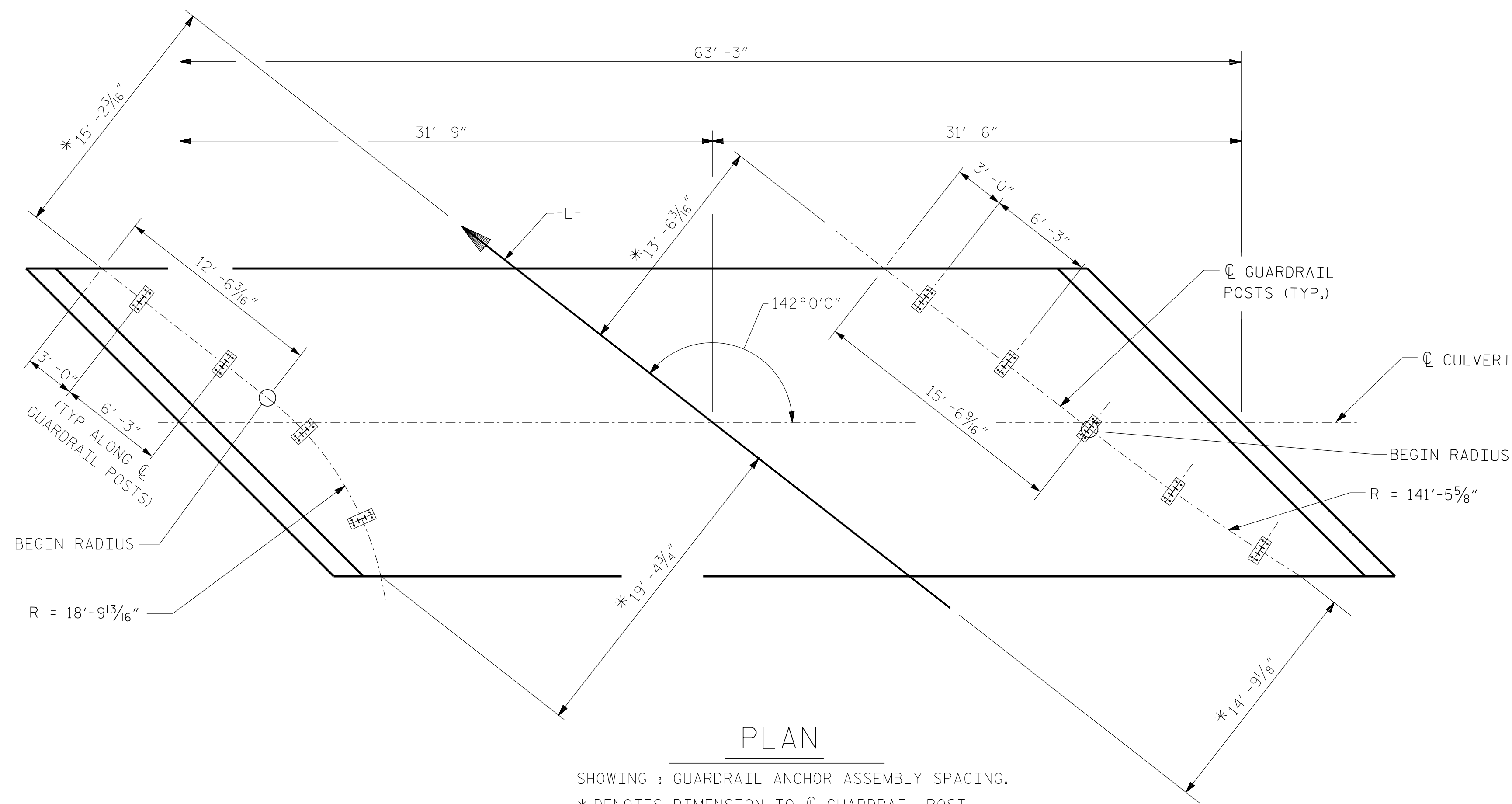
FERRULES TO BE PLUGGED DURING POURING OF SLAB AS RECOMMENDED BY THE MANUFACTURER.

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

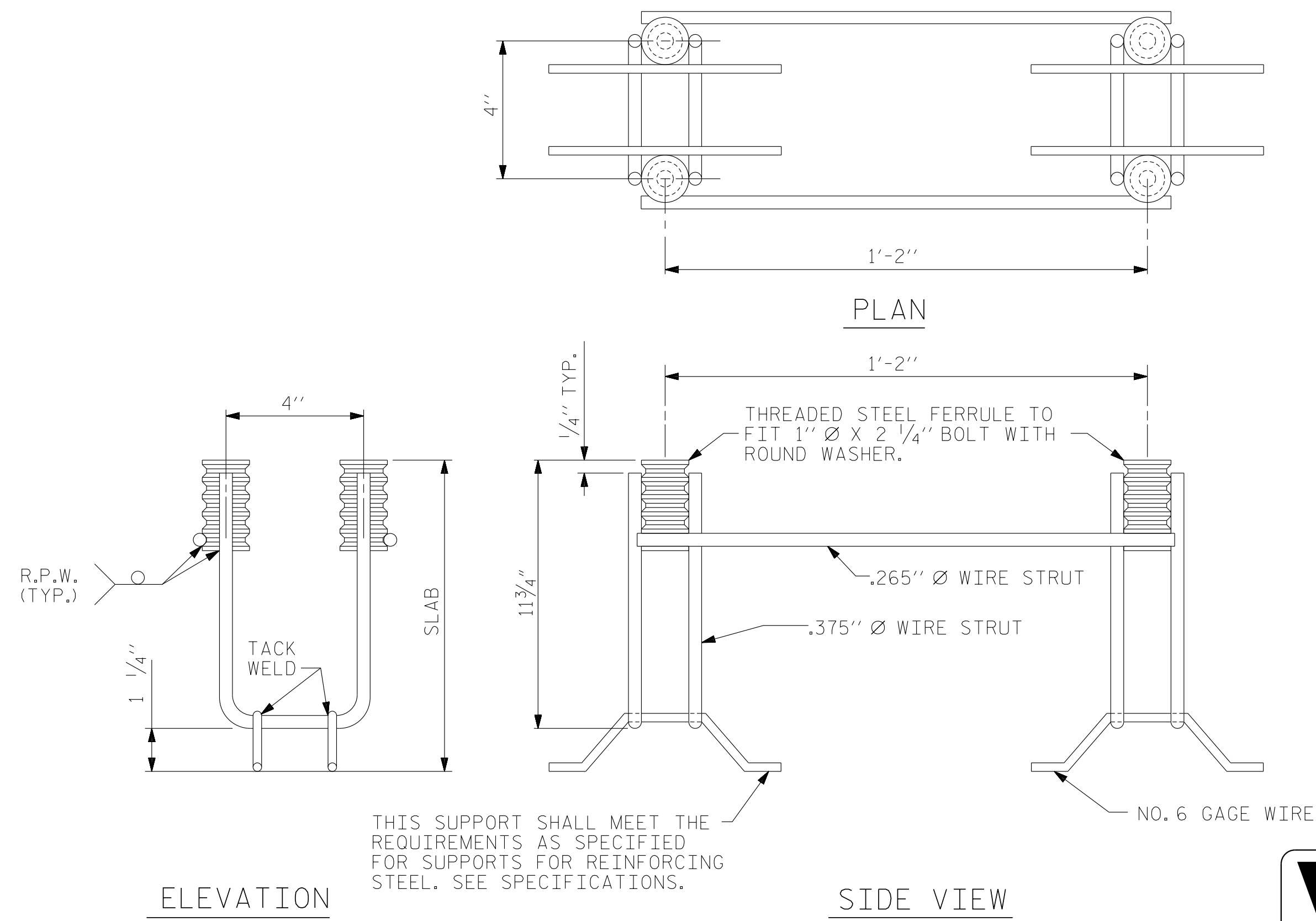
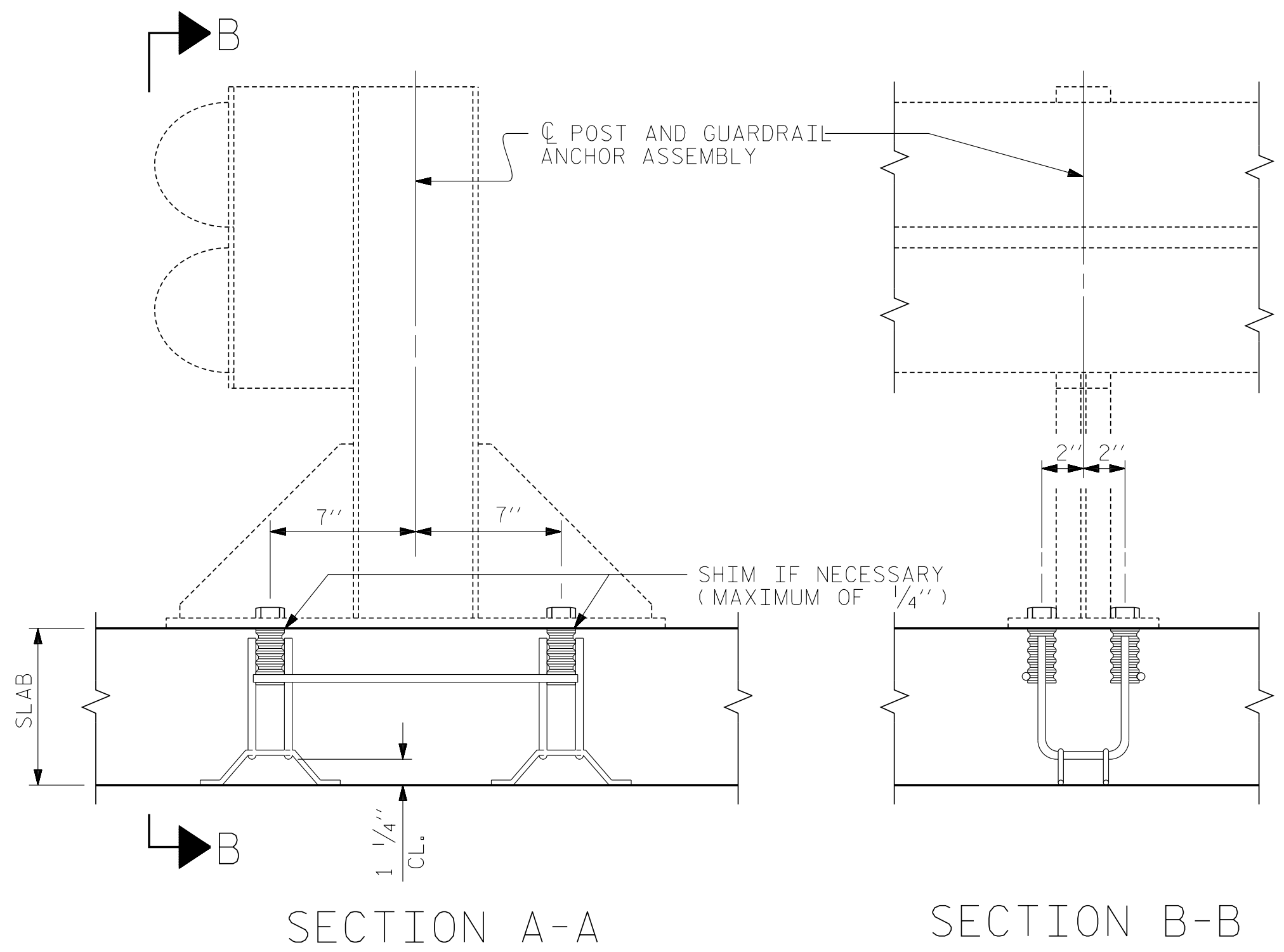
PAYMENT FOR GUARDRAIL, POSTS, AND POST BASE PLATES IS INCLUDED IN ROADWAY PAY ITEMS.

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.



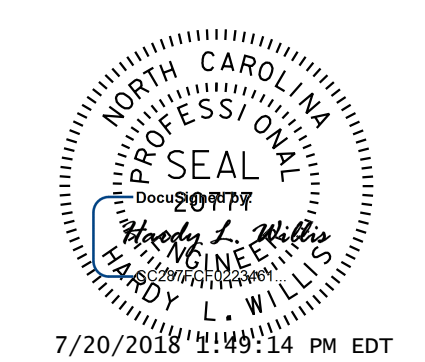
PLAN
SHOWING : GUARDRAIL ANCHOR ASSEMBLY SPACING.
* DENOTES DIMENSION TO CL GUARDRAIL POST.
THESE DIMENSIONS SHALL BE FIELD VERIFIED BY THE ENGINEER.



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

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SHEET 10 OF 11

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
STANDARD					
ANCHORAGE DETAILS FOR GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
SHEET NO.					TOTAL SHEETS
C-10					11

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ASSEMBLED BY : AW	DATE : 2/16
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DRAWN BY : FCJ 6/88	REV. 7/10/01 LES/RDR
CHECKED BY : ARB 6/88	REV. 5/1/03 RWW/JTE
	REV. 5/1/06R KMM/GM

GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS

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

LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						LIVE-LOAD FACTORS (LL)	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	①	1.01	--	1.75	1.42	1	BOTTOM SLAB	8.42	1.01	1	TOP SLAB	7.64		
	HL-93 (OPERATING)	N/A		1.31	--	1.35	1.84	1	BOTTOM SLAB	8.42	1.31	1	TOP SLAB	7.64	.	
	HS-20 (INVENTORY)	36.000	②	1.06	38.16	1.75	1.48	1	BOTTOM SLAB	8.42	1.06	1	TOP SLAB	7.64	.	
	HS-20 (OPERATING)	36.000	.	1.37	49.32	1.35	1.92	1	BOTTOM SLAB	8.42	1.37	1	TOP SLAB	7.64	.	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13,500	.	2.64	35.64	1.40	3.82	1	BOTTOM SLAB	8.42	2.63	1	TOP SLAB	7.64	.
		SNGARBS2	20,000	.	2.47	49.40	1.40	3.58	1	BOTTOM SLAB	8.42	2.47	1	TOP SLAB	7.64	.
		SNAGRIS2	22,000	.	2.64	58.08	1.40	3.82	1	BOTTOM SLAB	8.42	2.63	1	TOP SLAB	7.64	.
		SNCOTTS3	27,250	.	1.16	31.61	1.40	1.69	1	BOTTOM SLAB	8.42	1.16	1	TOP SLAB	7.64	.
		SNAGGRS4	34,925	.	1.53	55.44	1.40	2.22	1	BOTTOM SLAB	8.42	1.52	1	TOP SLAB	7.64	.
		SNS5A	35,550	.	1.38	49.06	1.40	2.01	1	BOTTOM SLAB	8.42	1.38	1	TOP SLAB	7.64	.
		SNS6A	39,950	.	1.38	55.13	1.40	2.01	1	BOTTOM SLAB	8.42	1.38	1	TOP SLAB	7.64	.
	SNS7B	42,000	.	1.38	57.96	1.40	2.01	1	BOTTOM SLAB	8.42	1.38	1	TOP SLAB	7.64	.	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33,000	.	2.64	87.12	1.40	3.82	1	BOTTOM SLAB	8.42	2.63	1	TOP SLAB	7.64	.
		TNT4A	33,075	.	1.38	45.64	1.40	2.01	1	BOTTOM SLAB	8.42	1.38	1	TOP SLAB	7.64	.
		TNT6A	41,600	.	1.38	57.41	1.40	2.01	1	BOTTOM SLAB	8.42	1.38	1	TOP SLAB	7.64	.
		TNT7A	42,000	.	1.38	57.96	1.40	2.01	1	BOTTOM SLAB	8.42	1.38	1	TOP SLAB	7.64	.
		TNT7B	42,000	.	1.38	57.96	1.40	2.01	1	BOTTOM SLAB	8.42	1.38	1	TOP SLAB	7.64	.
		TNAGRIT4	43,000	.	1.38	59.34	1.40	2.01	1	BOTTOM SLAB	8.42	1.38	1	TOP SLAB	7.64	.
TNAGT5A		45,000	.	1.38	62.10	1.40	2.01	1	BOTTOM SLAB	8.42	1.38	1	TOP SLAB	7.64	.	
TNAGT5B	45,000	③	1.38	62.10	1.40	2.01	1	BOTTOM SLAB	8.42	1.38	1	TOP SLAB	7.64	.		

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

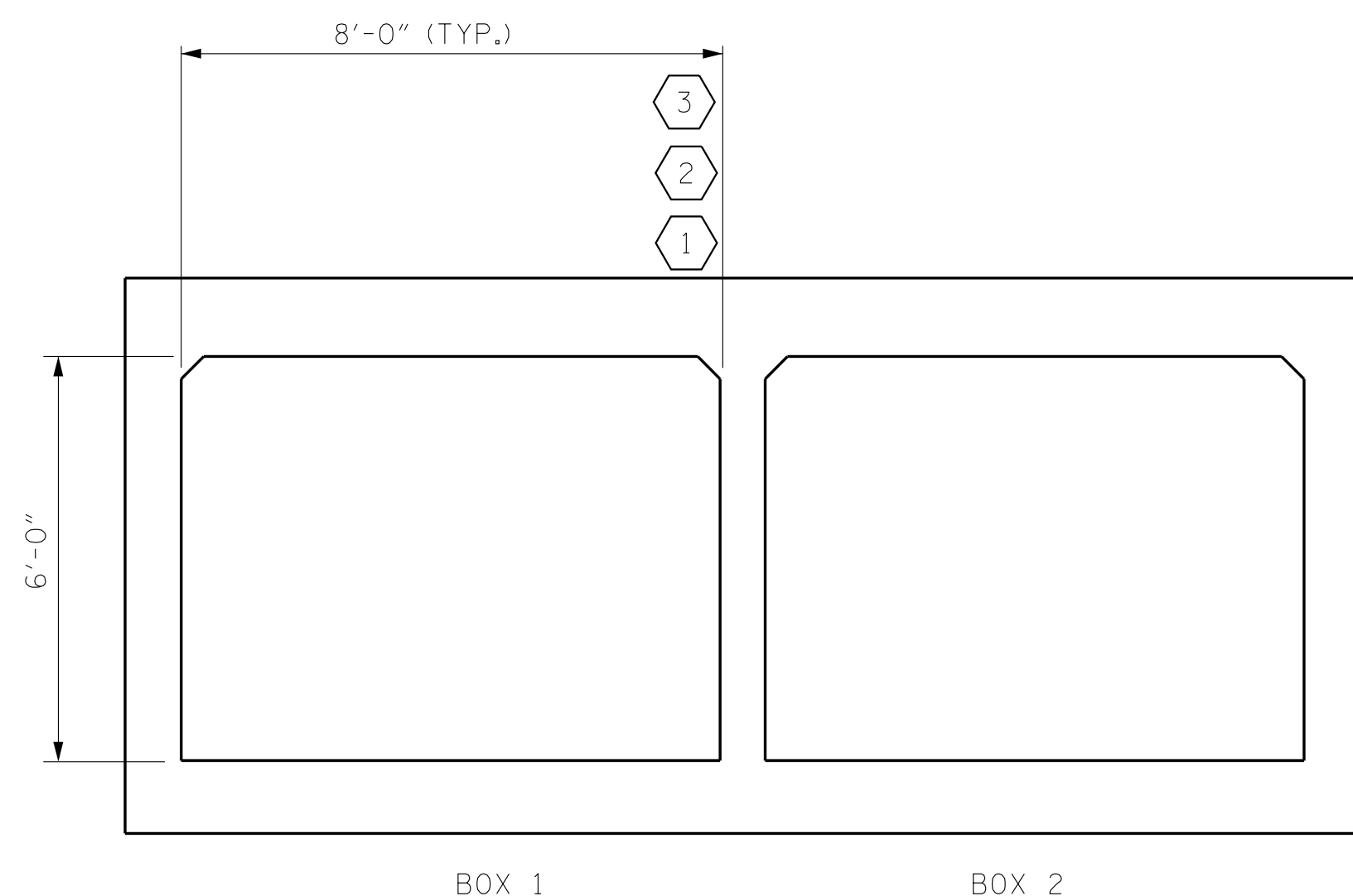
NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

COMMENTS:

- 1.
- 2.
- 3.
- 4.

⊕	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)

ENG. OF RECORD: RYAN T. SHIPMAN			
ASSEMBLED BY : AW	DATE : 10/14		
CHECKED BY : HLW	DATE : 10/14		
DRAWN BY : WMC 7/11	REV. 10/1/11	MAA/GM	
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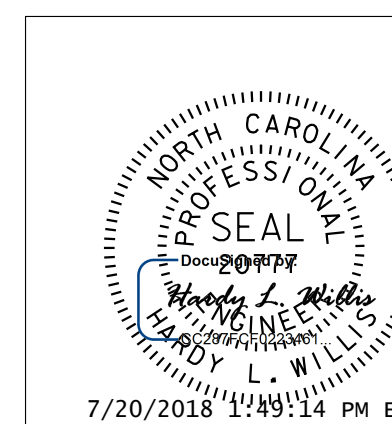
SHEET 11 OF 11

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

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

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02/03/17

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2			4			11

STD. NO. LRFR5

STANDARD NOTES

DESIGN DATA:

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

MATERIAL AND WORKMANSHIP:

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

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

CONCRETE:

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

CONCRETE CHAMFERS:

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

DOWELS:

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

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

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

REINFORCING STEEL:

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

STRUCTURAL STEEL:

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

HANDRAILS AND POSTS:

METAL STANDARDS AND FACES OF THE CONCRETE END POSTS FOR THE METAL RAIL SHALL BE SET NORMAL TO THE GRADE OF THE CURB, UNLESS OTHERWISE SHOWN ON PLANS. THE METAL RAIL AND TOPS OF CONCRETE POSTS USED WITH THE ALUMINUM RAIL SHALL BE BUILT PARALLEL TO THE GRADE OF THE CURB. METAL HANDRAILS SHALL BE IN ACCORDANCE WITH THE PLANS. RAILS SHALL BE AS MANUFACTURED FOR BRIDGE RAILING. CASTINGS SHALL BE OF A UNIFORM APPEARANCE. FINS 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.

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