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TIP PROJECT: SS-4914BO

CONTRACT: DN00378

STATE OF NORTH CAROLINA

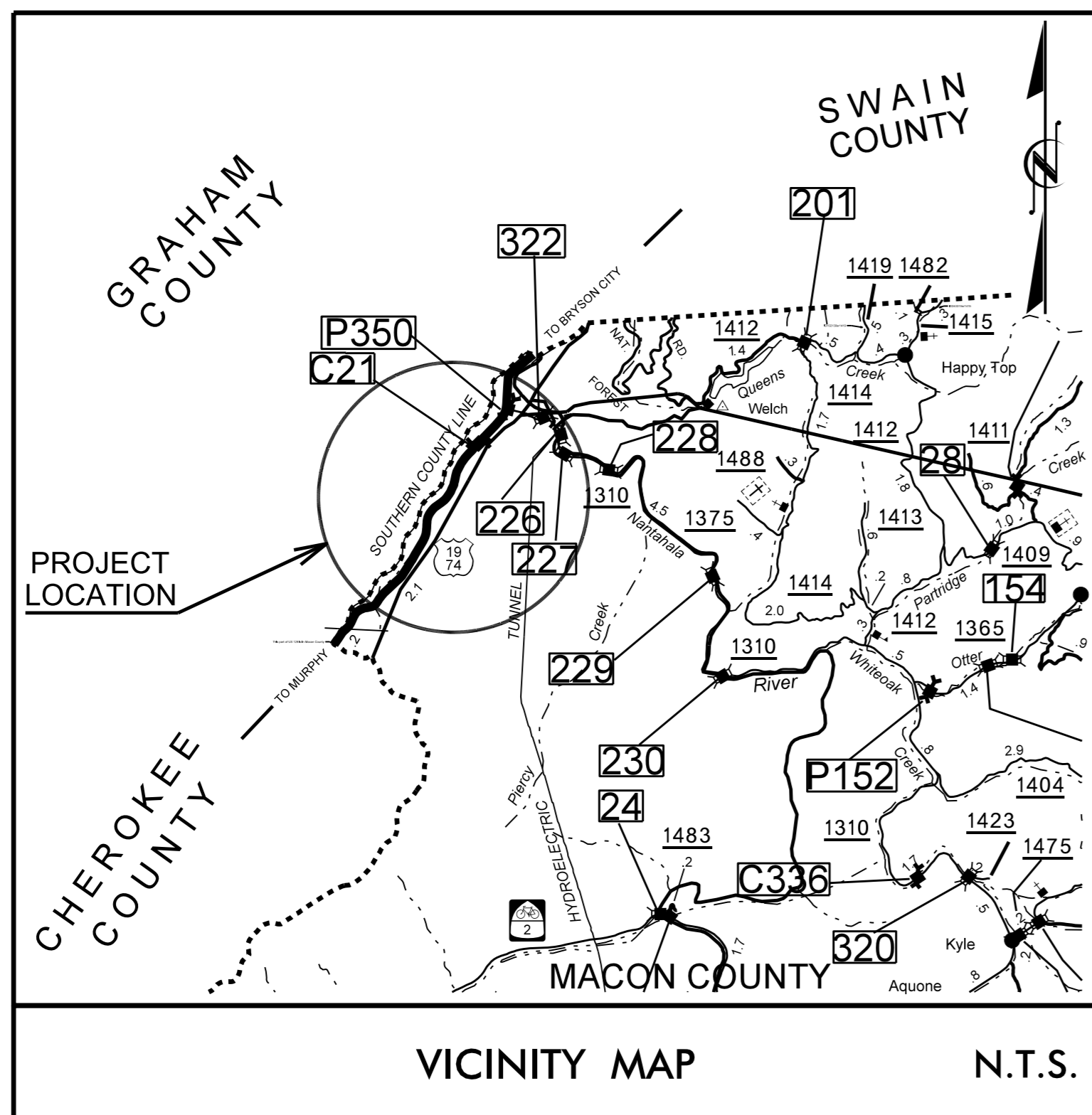
DIVISION OF HIGHWAYS

MACON COUNTY

LOCATION: U.S. HWY 19 /74 OVER LAURAL BRANCH NEAR MACON/CHEROKEE COUNTY LINE

TYPE OF WORK: GRADING, PAVING, BOX CULVERT EXTENSION, GUARDRAIL INSTALLATION

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SS-4914BO		
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
43936.1.FS1	N/A	P.E.	
43936.2.1	N/A	R/W, UTIL.	
43936.3.1	N/A	CONST.	



BEGIN PROJECT
STA. 10+00.00 -L- POT

END PROJECT
STA. 24+10.00 -L- POT

CULVERT

DESIGN DATA

ADT (2015) = 5,200
 T = 8 % **
 * V = 55 MPH
 ** (TTST 4 %, DUAL 4 %)

FUNC CLASS=THROUGHFARE
 STATEWIDE TIER

PROJECT LENGTH

LENGTH TIP PROJECT: SS-4914BO = 0.27 MILES
 TOTAL LENGTH TIP PROJECT: SS-4914BO = 0.27 MILES

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

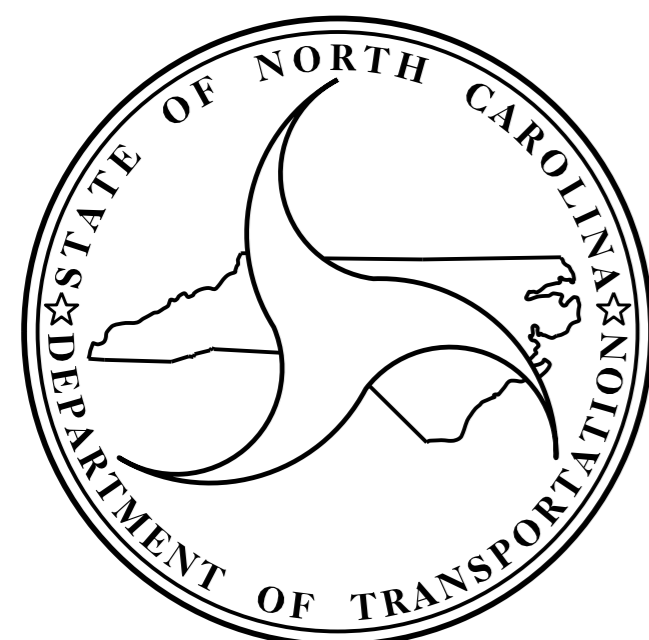
2012 STANDARD SPECIFICATIONS

LETTING DATE :

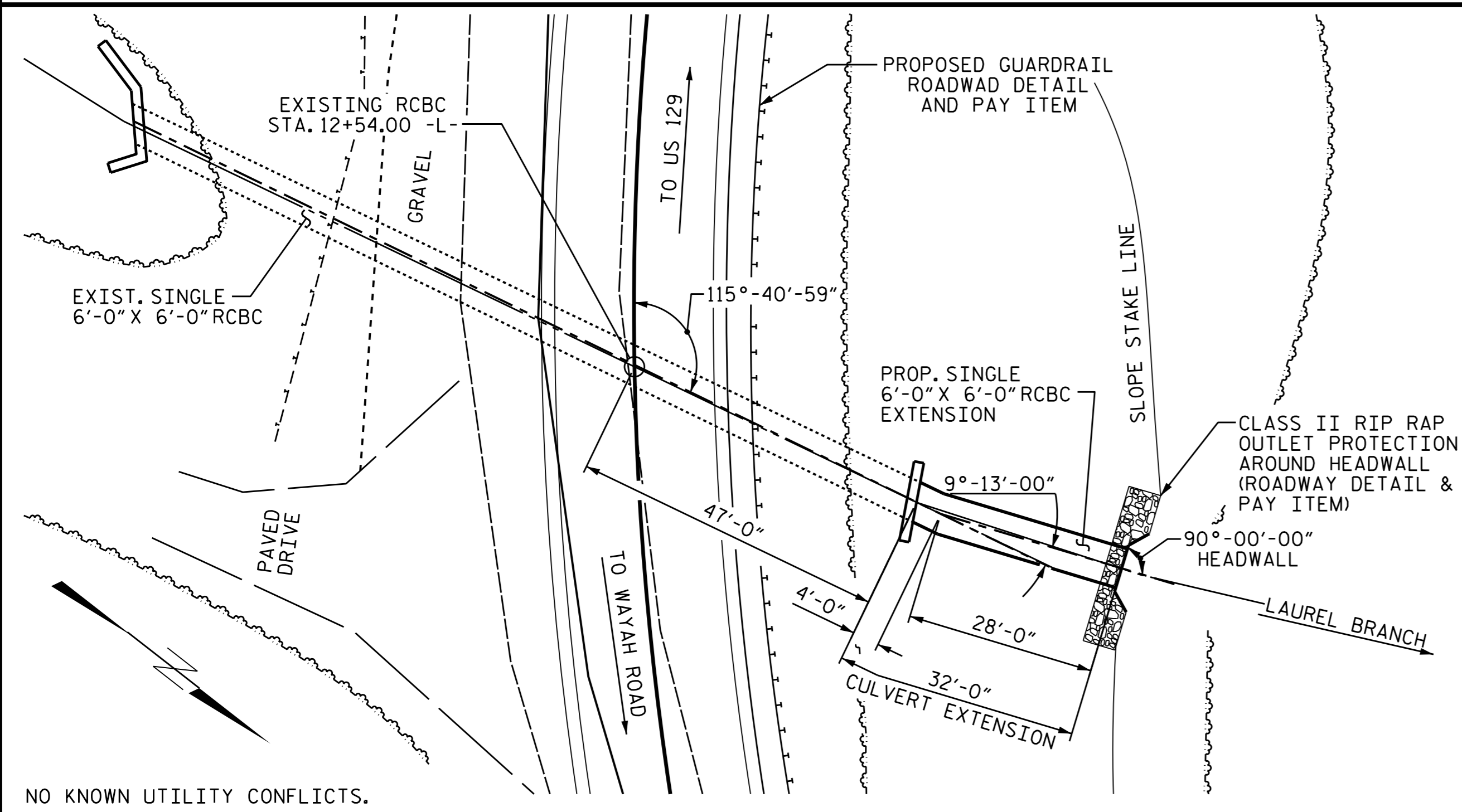
JULY 28, 2016

 D. R. CALHOUN, P.E.
 PROJECT ENGINEER

 W. S. ARAFAT, P.E.
 PROJECT DESIGN ENGINEER



T.B.M. #2: 8" SPIKE SET IN SW SIDE OF 24" Ø POPLAR TREE 1'-0"± ABOVE GROUND
 LOCATED SOUTH SIDE OF HWY 19, 15.5' SOUTH EAST OF EXISTING ROCK SIGN,
 EL. 2523.9810 N. 580023.5590 E. 598122.6520



NO KNOWN UTILITY CONFLICTS.

LOCATION SKETCH

HYDRAULIC DATA

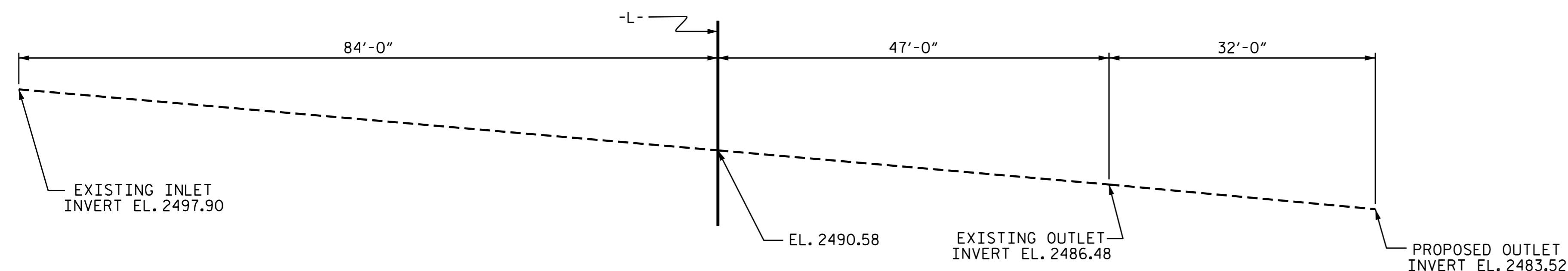
DESIGN DISCHARGE ----- = N/A
 FREQUENCY OF DESIGN FLOOD ----- = N/A
 DESIGN HIGH WATER ELEVATION = N/A.
 DRAINAGE AREA ----- = N/A SQ.
 BASE DISCHARGE (Q100) ----- = N/A
 BASE HIGH WATER ELEVATION = N/A

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE ----- = N/A.
 FREQUENCY OF OVERTOPPING FLOOD ----- = N/A
 OVERTOPPING FLOOD ELEVATION = N/A

ROADWAY DATA

GRADE POINT ELEV. @ STATION 12+54.00 -L- = 2528.38
 BED ELEV. @ STATION 12+54.00 -L- = 2490.58
 ROADWAY SLOPES = 1/2:1



PROFILE ALONG CULVERT

DRAWN BY : H. T. BARBOUR DATE : 4-28-16
 CHECKED BY : V. X. NGUYEN DATE : 5-9-16
 DESIGN ENGINEER OF RECORD: A. M. LEE DATE : 6-16

NOTES

IF APPROVED BY THE ENGINEER, THE CONTRACTOR MAY USE THE EXISTING WINGS AS TEMPORARY SHORING FOR THE CONSTRUCTION OF THE CULVERT EXTENSION. IN THIS CASE, THE BOTTOM SLAB OF THE EXTENSION SHALL BE POURED AT LEAST 72 HOURS PRIOR TO CUTTING THE WINGS. THE WINGS MAY BE CUT EARLIER PROVIDED THE SLAB CONCRETE STRENGTH HAS REACHED A MINIMUM COMPRESSIVE STRENGTH OF 1500 PSI.

DOWELS SHALL BE USED TO CONNECT THE CULVERT EXTENSION TO THE EXISTING CULVERT AS SHOWN. FOR NOTE REGARDING SETTING OF DOWELS, SEE SHEET SN.

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.

ASSUMED LIVE LOAD = HL 93 OR ALTERNATE LOADING.

DESIGN FILL----- MAX. 18.0 FT. MIN. 2.0 FT.

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

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

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

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

FOR TEMPORARY STREAM DIVERSION, SEE ROADWAY PLANS.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
BARREL @ .674	CY/FT 21.6 C.Y.
WING ETC.	8.0 C.Y.
TOTAL	29.6 C.Y.
REINFORCING STEEL	
BARREL	3167 LBS.
WINGS ETC.	396 LBS.
TOTAL	3563 LBS.
CULVERT EXCAVATION	LUMP SUM
FOUNDATION COND. MAT'L.	26 TONS

SPLICE CHART

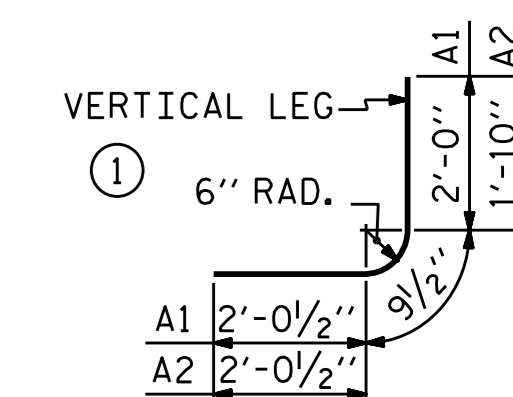
BAR	SIZE	SPLICE LENGTH
B1	#4	1'-5"
C1	#4	1'-11"

REINFORCING BAR SCHEDULE

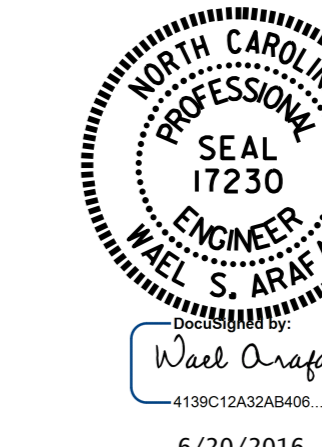
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	85	#4	1	4'-10"	274
A2	85	#5	1	4'-8"	414
A100	64	#4	STR.	6'-11"	296
A101	1	#4	STR.	5'-5"	4
A102	1	#4	STR.	3'-7"	2
A103	1	#4	STR.	1'-9"	1
A200	64	#5	STR.	6'-11"	462
A201	1	#5	STR.	5'-5"	6
A202	1	#5	STR.	3'-7"	4
A203	1	#5	STR.	1'-9"	2
B1	63	#4	STR.	6'-10"	288
B2	85	#4	STR.	5'-4"	303
C1	76	#4	STR.	17'-0"	863
D1	20	#6	STR.	2'-6"	75
F1	9	#4	STR.	7'-0"	42
G1	2	#5	STR.	7'-0"	15
S1	6	#8	STR.	7'-3"	116

REINFORCING STEEL 3167 LBS.

BAR TYPE



BAR DIMENSIONS ARE OUT TO OUT



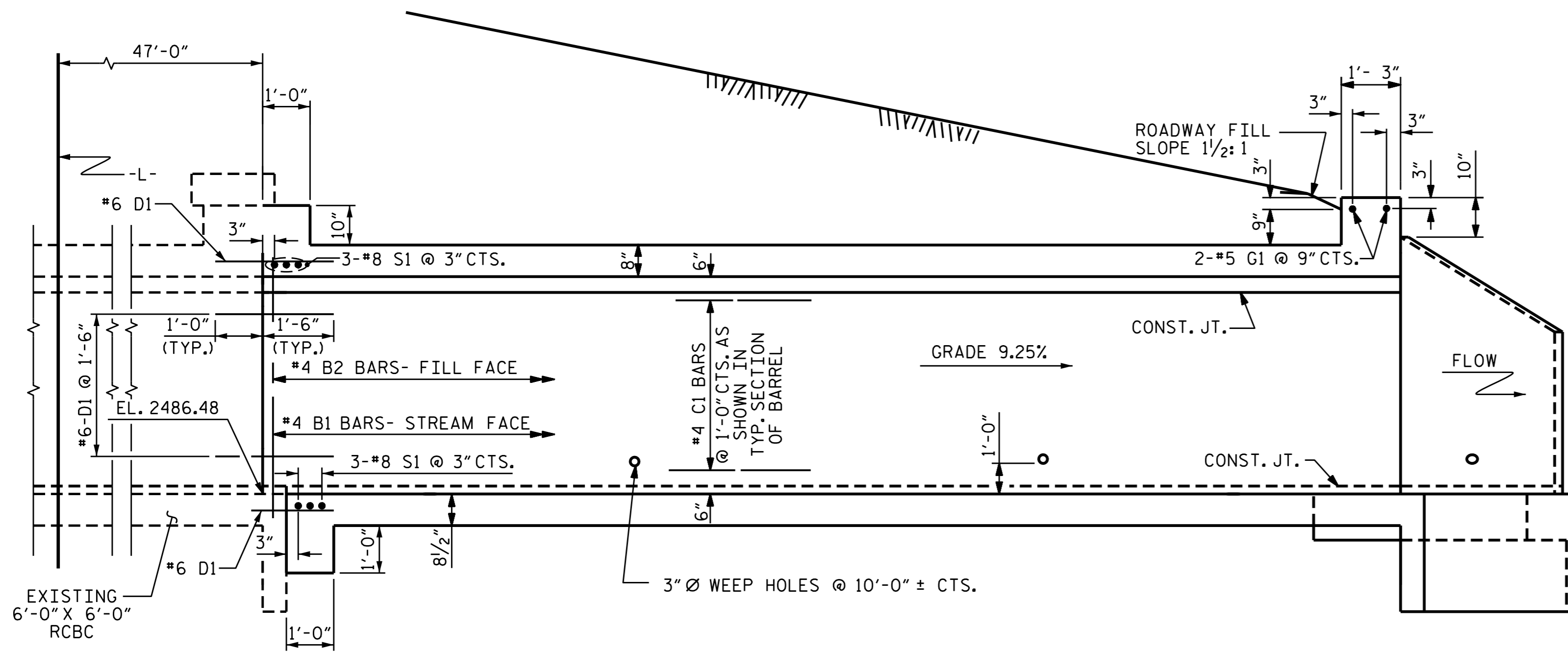
PROJECT NO. SS-4914B0
 MACON COUNTY
 STATION: 12+54.00 -L-

SHEET 1 OF 6

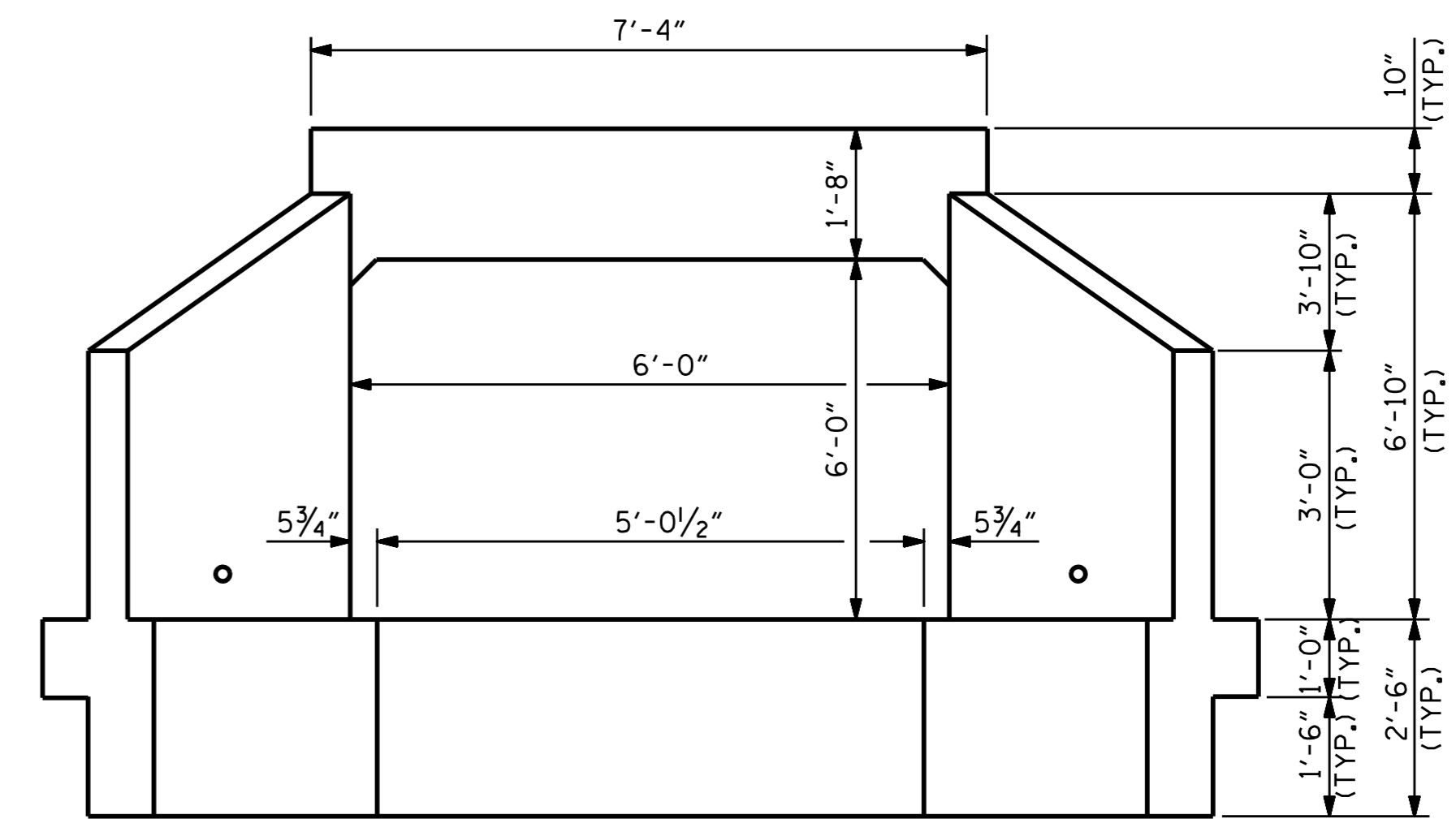
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE 6 FT. X 6 FT.
 CONCRETE BOX CULVERT
 90°-00'-00" SKEW
 (RIGHT EXTENSION)

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

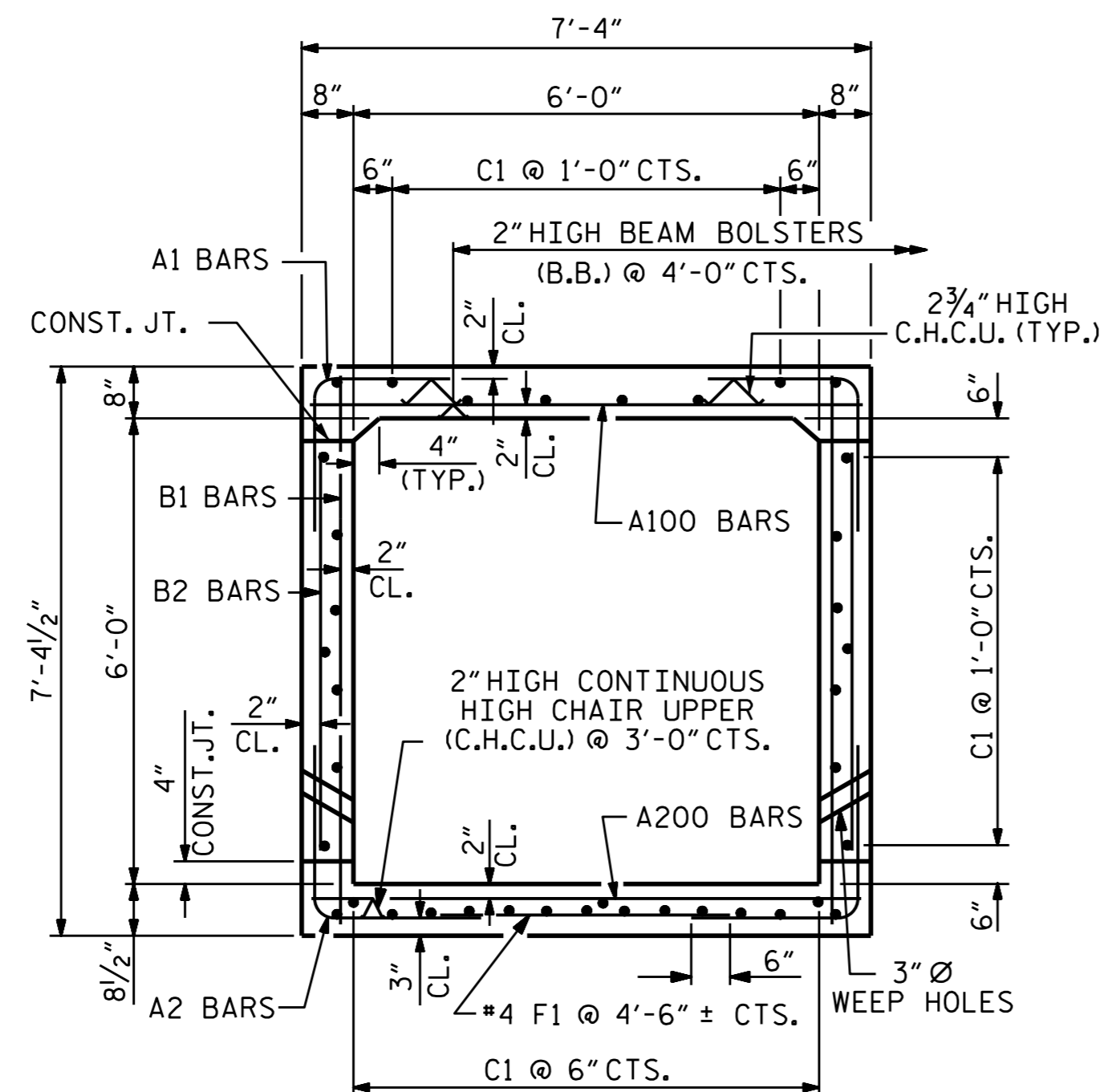
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	TOTAL SHEETS
1			3			C-1
2			4			6



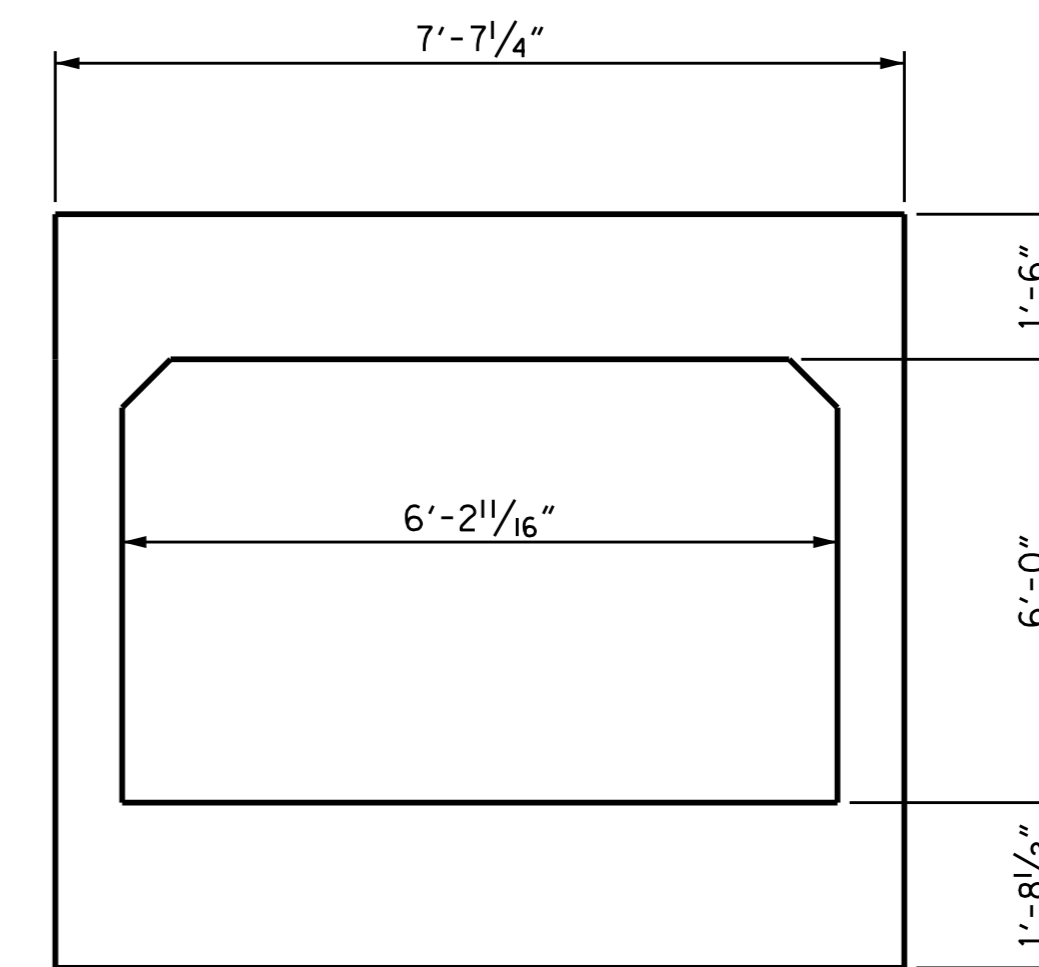
CULVERT SECTION NORMAL TO ROADWAY



OUTLET END ELEVATION



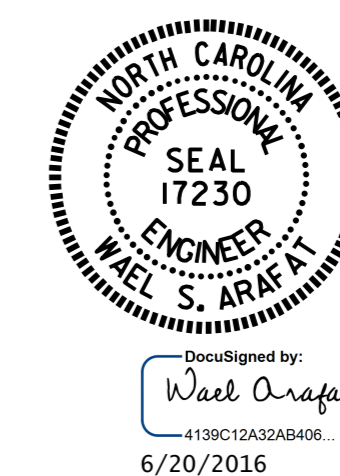
RIGHT ANGLE SECTION OF BARREL
 THERE ARE 38 "C" BARS IN SECTION OF BARREL



INLET END ELEVATION

PROJECT NO. SS-4914B0
MACON COUNTY
 STATION: 12+54.00 -L-

SHEET 2 OF 6



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE 6 FT. X 6 FT.
 CONCRETE BOX CULVERT
 90°-00'-00" SKEW
 (RIGHT EXTENSION)

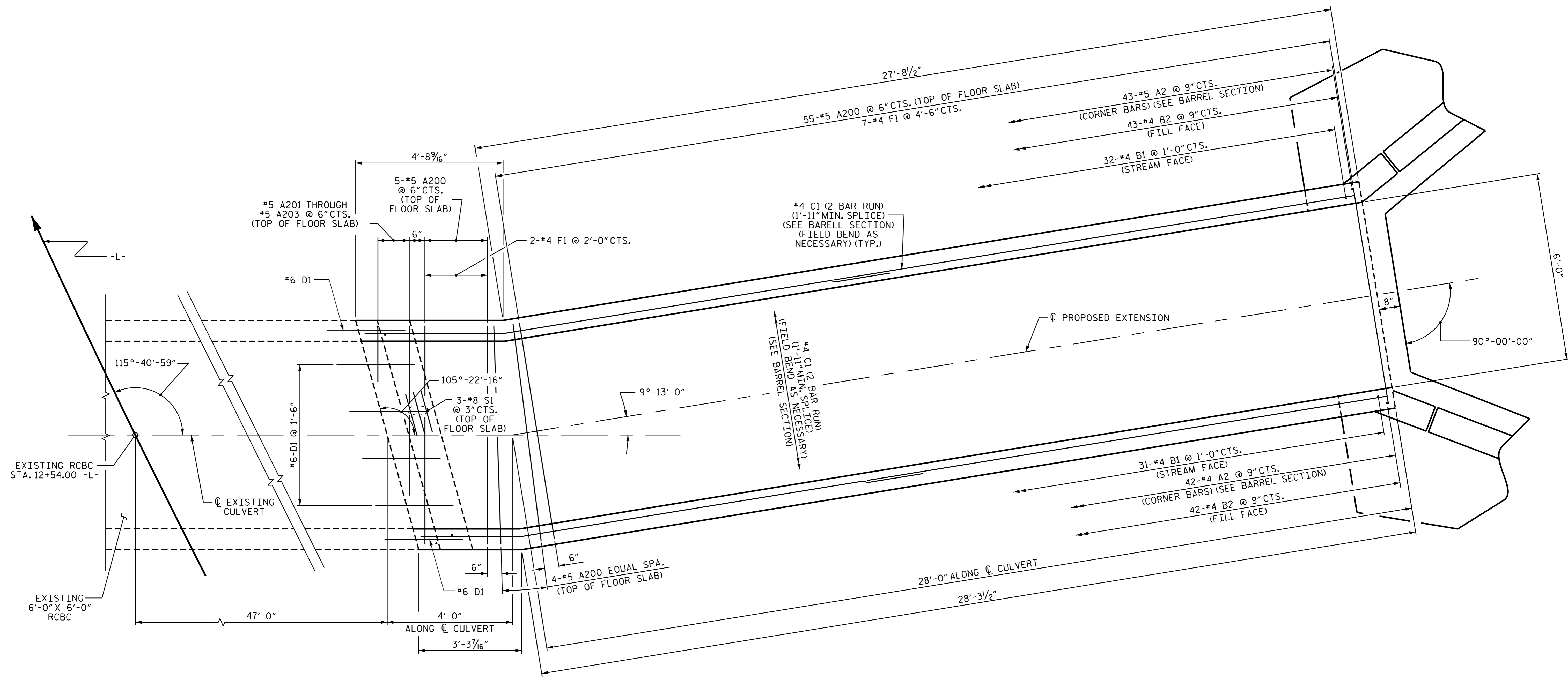
DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

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

C-2
 TOTAL SHEETS
 6

REVISED 8-28-92 BY E.L.R. CHECKED BY G.R.P.
 REVISED 8-22-89 BY A.R.B. CHECKED BY C.R.K.
 REDRAWN 8-22-1989
 REVISED 11-19-99 BY M.M. CHECKED BY R.W.W.

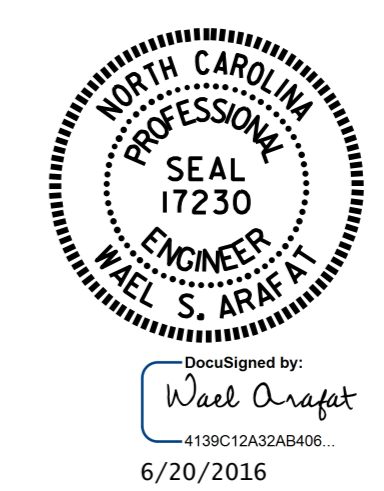
ASSEMBLED BY : <u>H.T. BARBOUR</u> DATE : <u>4-27-16</u>	SPECIAL
CHECKED BY : <u>V.X. NGUYEN</u> DATE : <u>5-9-16</u>	
DRAWN BY : <u>R. WRIGHT</u> DATE : <u>AUG. 1989</u>	STANDARD
CHECKED BY : <u>A.R. BISSETTE</u> DATE : <u>AUG. 1989</u>	



PLAN OF FLOOR SLAB

PROJECT NO. SS-4914B0
MACON COUNTY
 STATION: 12+54.00 -L-

SHEET 3 OF 6



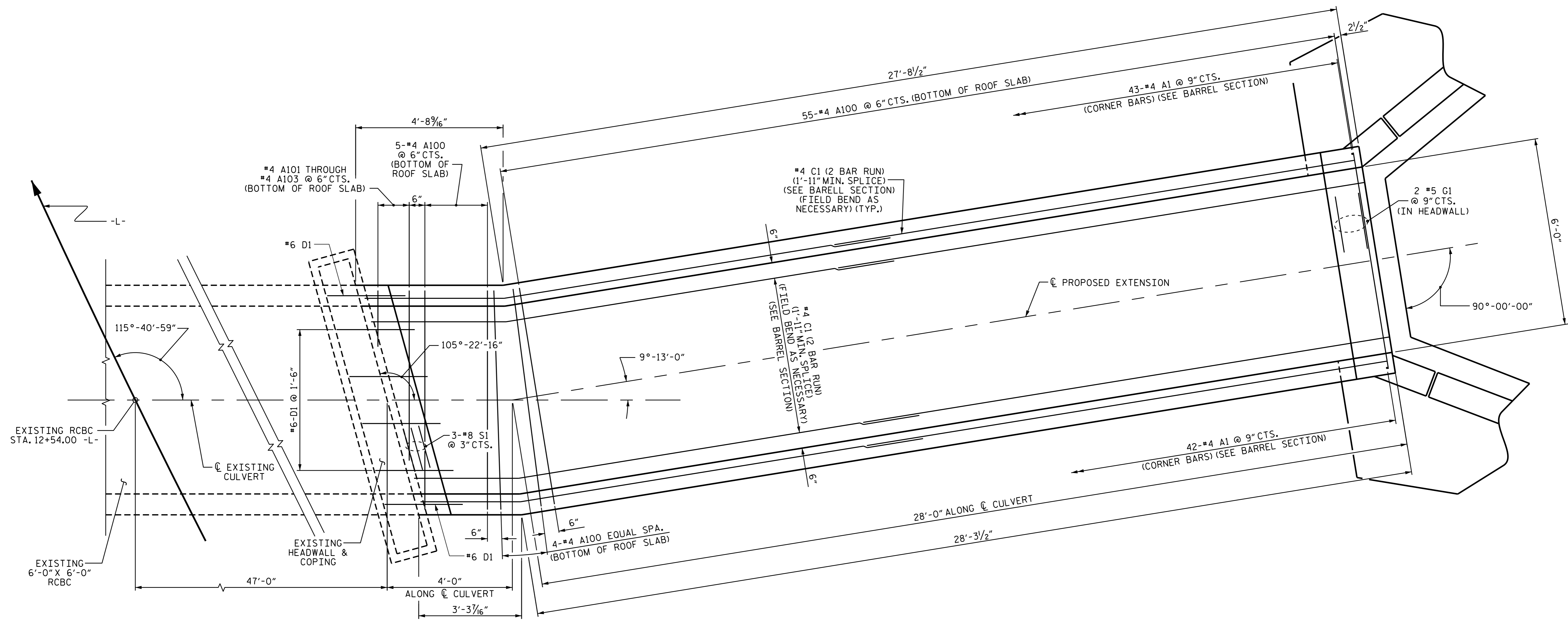
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**SINGLE 6 FT. X 6 FT.
 CONCRETE BOX CULVERT
 90°-00'-00" SKEW
 (RIGHT EXTENSION)**

DRAWN BY : H. T. BARBOUR DATE : 4-27-16
 CHECKED BY : V. X. NGUYEN DATE : 5-9-15
 DESIGN ENGINEER OF RECORD: A. M. LEE DATE : 6-19

DOCUMENT NOT CONSIDERED
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 SIGNATURES COMPLETED

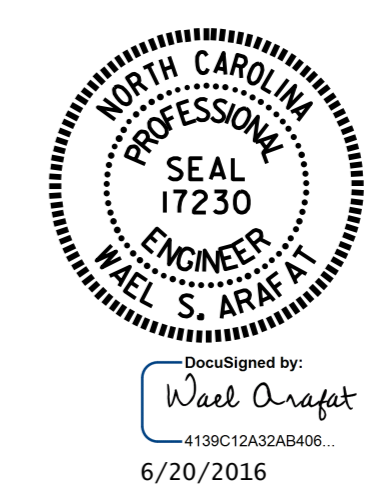
REVISIONS						SHEET NO. C-3 TOTAL SHEETS 6
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			
2			4			



PLAN OF ROOF SLAB

PROJECT NO. SS-4914B0
MACON COUNTY
 STATION: 12+54.00 -L-

SHEET 4 OF 6



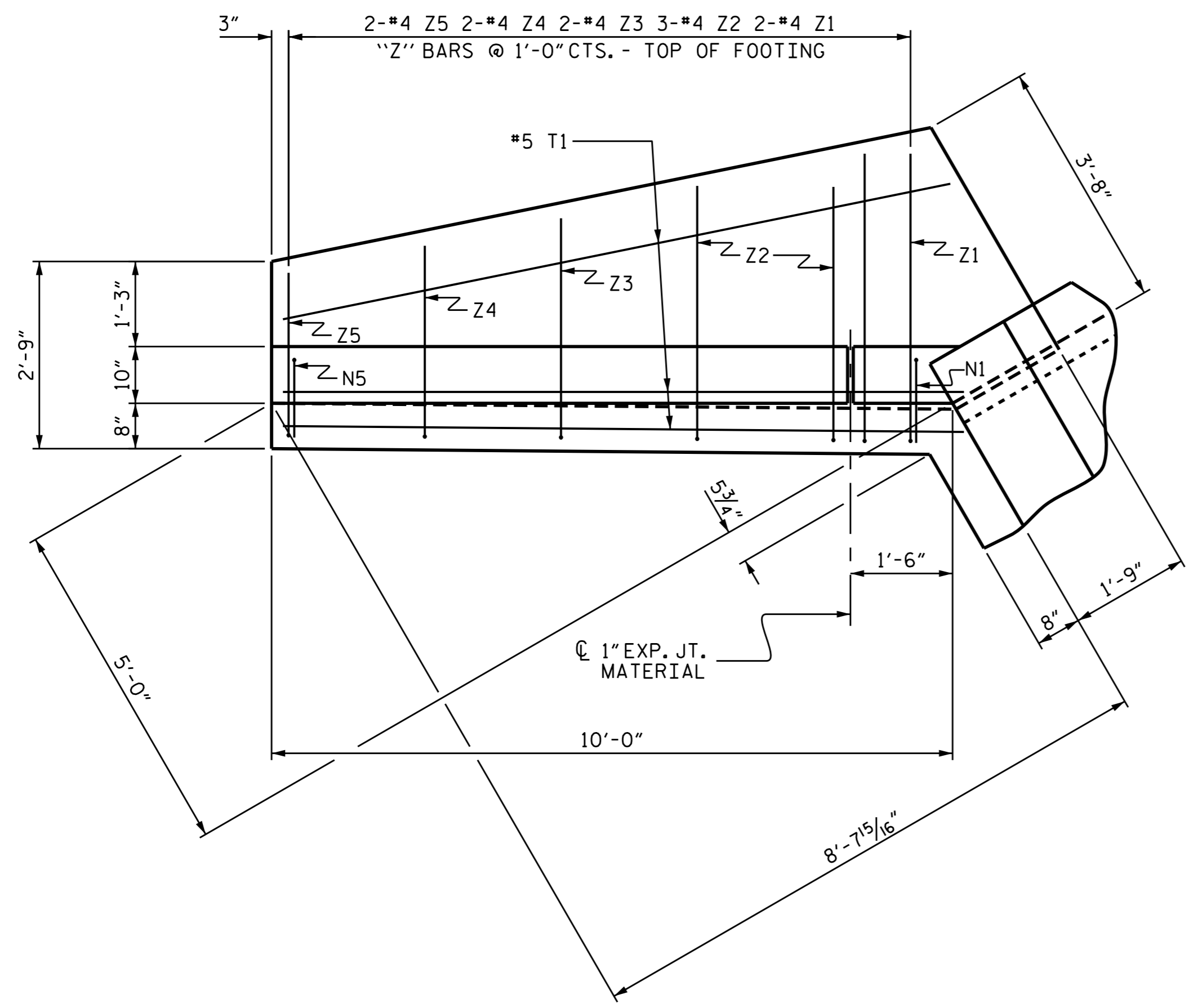
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**SINGLE 6 FT. X 6 FT.
 CONCRETE BOX CULVERT
 90°-00'-00" SKEW
 (RIGHT EXTENSION)**

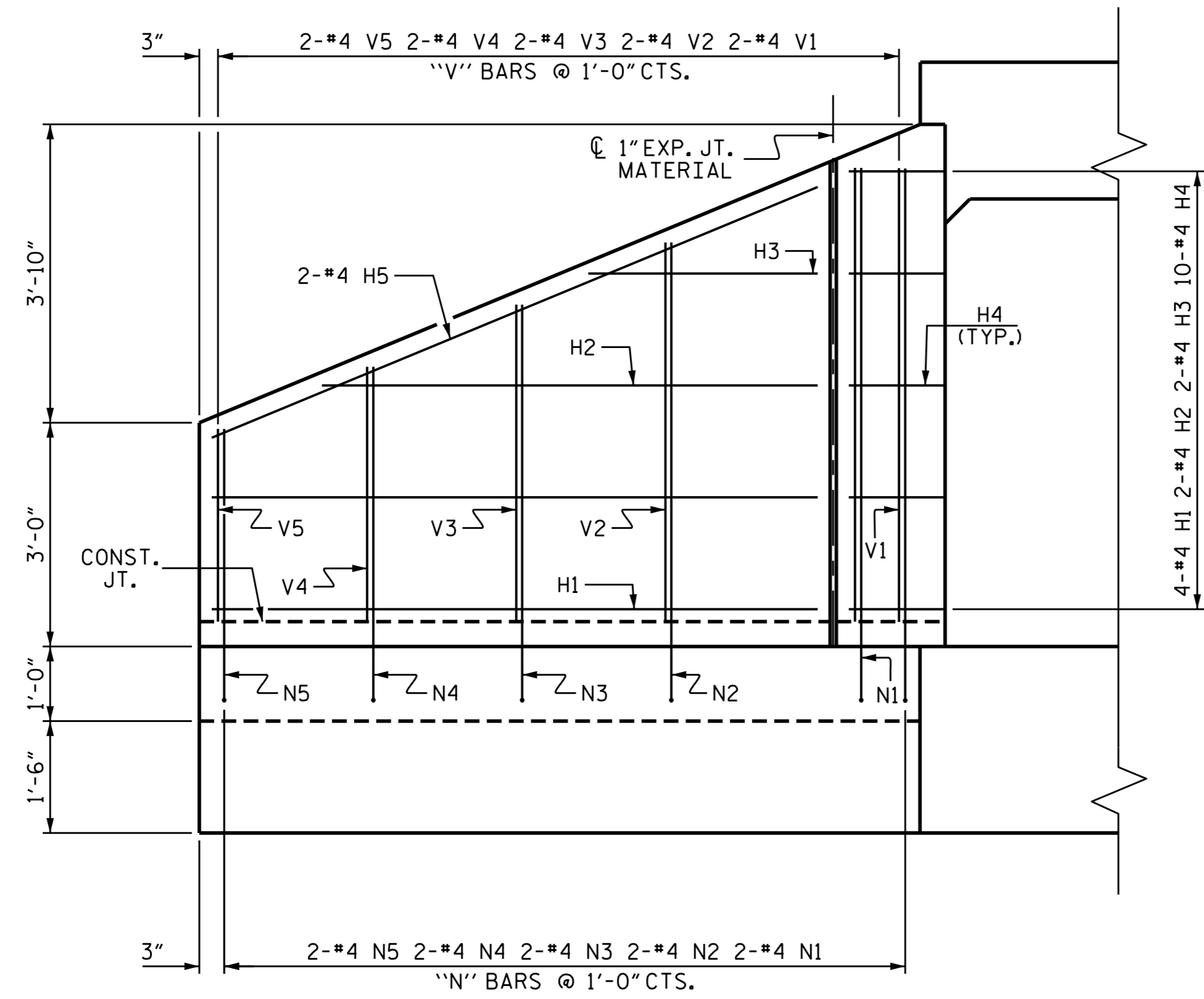
DRAWN BY : H. T. BARBOUR DATE : 4-27-16
 CHECKED BY : V. X. NGUYEN DATE : 5-9-16
 DESIGN ENGINEER OF RECORD: A. M. LEE DATE : 6-19

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

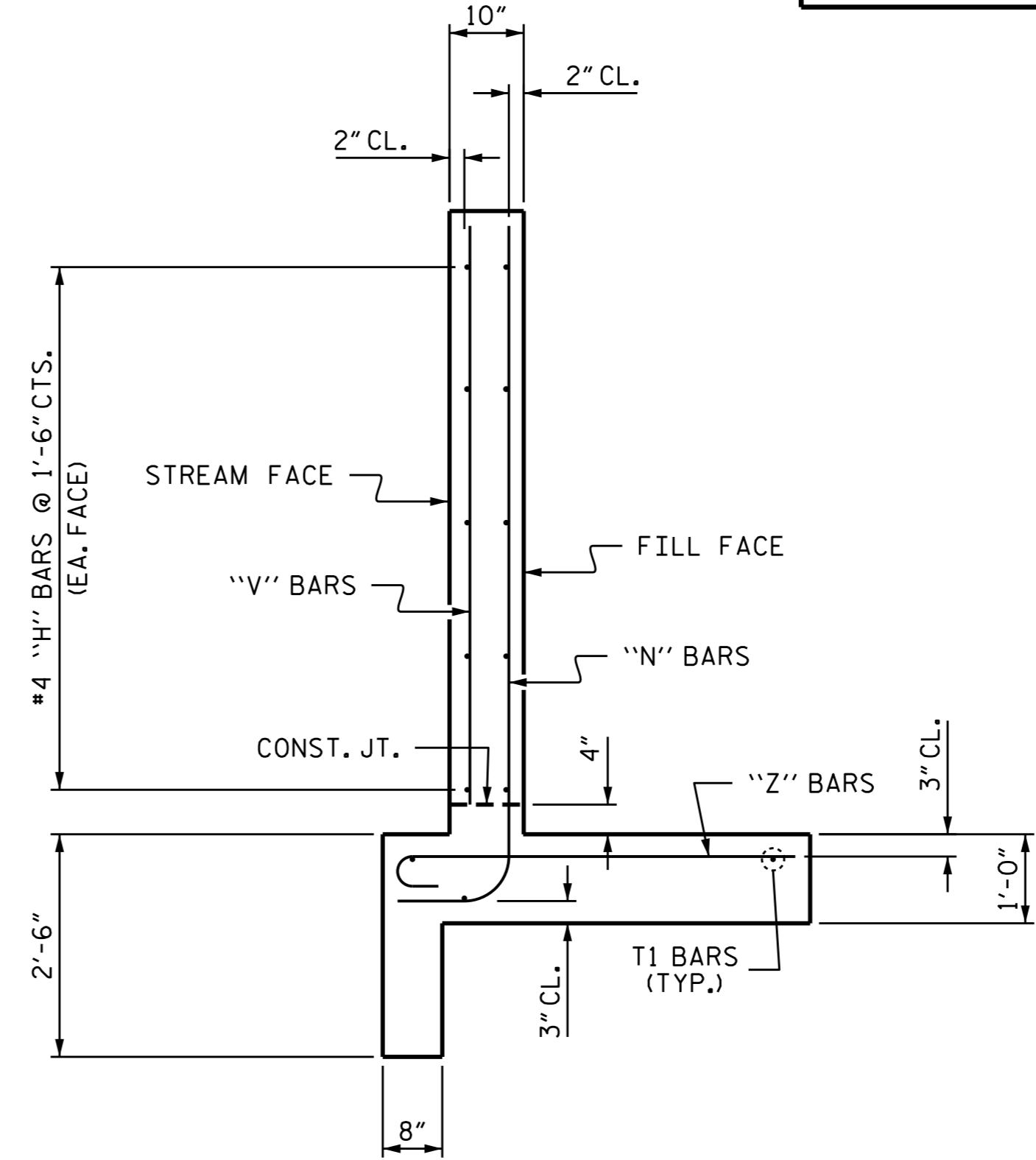
REVISIONS						SHEET NO. C-4 TOTAL SHEETS 6
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			
2			4			



PLAN



ELEVATION



TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.

Z1	4'-3"	6"
Z2	3'-9"	6"
Z3	3'-3"	6"
Z4	2'-10"	6"
Z5	2'-5"	6"

BILL OF MATERIAL

BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	8	#4	STR	8'-1"	43
H2	4	#4	STR	6'-8"	18
H3	4	#4	STR	3'-1"	8
H4	20	#4	1	3'-3"	43
H5	4	#4	STR	8'-9"	23
N1	4	#4	2	8'-2"	22
N2	4	#4	2	7'-1"	19
N3	4	#4	2	6'-3"	17
N4	4	#4	2	5'-5"	14
N5	4	#4	2	4'-7"	12
T1	6	#5	STR	10'-0"	63
V1	4	#4	STR	6'-1"	16
V2	4	#4	STR	5'-1"	14
V3	4	#4	STR	4'-3"	11
V4	4	#4	STR	3'-5"	9
V5	4	#4	STR	2'-7"	7
Z1	4	#4	3	4'-9"	13
Z2	6	#4	3	4'-3"	17
Z3	4	#4	3	3'-9"	10
Z4	4	#4	3	3'-4"	9
Z5	4	#4	3	2'-11"	8

REINFORCING STEEL FOR 2 WINGS 396 LBS

CLASS A CONCRETE

2 WINGS	6.9	CY
1 HEADWALL	0.3	CY
END CURTAIN WALL	0.3	CY
2 EDGE BEAMS	0.5	CY
TOTAL	8.0	CY

ASSEMBLED BY : H. T. BARBOUR DATE : 4-21-16
 CHECKED BY : V. X. NGUYEN DATE : 5-9-16
 DRAWN BY : CCJ 10/99
 CHECKED BY : RWW 03/00

PROJECT NO. SS-4914B0
MACON COUNTY
 STATION: 12+54.00 -L-
 SHEET 5 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

WINGS FOR CONCRETE BOX CULVERT
 H = 6'-0" SLOPE = 2:1
 90° SKEW

DESIGNED BY: *Wael Arafat*
 6/20/2016

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SHEET NO. C-5
 TOTAL SHEETS 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 (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	2.47	--	1.75	2.47	1	TOP SLAB	3.33	2.79	1	BOTTOM SLAB	0.84		
	HL-93 (OPERATING)	N/A		3.21	--	1.35	3.21	1	TOP SLAB	3.33	3.62	1	BOTTOM SLAB	0.84		
	HS-20 (INVENTORY)	36.000	②	3.75	134.90	1.75	3.75	1	TOP SLAB	3.33	3.90	1	BOTTOM SLAB	0.84		
	HS-20 (OPERATING)	36.000		4.86	174.87	1.35	4.86	1	TOP SLAB	3.33	5.05	1	BOTTOM SLAB	0.84		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		6.78	91.53	1.40	6.78	1	TOP SLAB	3.33	7.14	1	BOTTOM SLAB	0.84	
		SNGARBS2	20.000		6.40	127.96	1.40	6.40	1	TOP SLAB	3.33	6.70	1	BOTTOM SLAB	0.84	
		SNAGRIS2	22.000		6.78	149.15	1.40	6.78	1	TOP SLAB	3.33	7.14	1	BOTTOM SLAB	0.84	
		SNCOTTS3	27.250	③	3.09	84.27	1.40	3.09	1	TOP SLAB	3.33	3.49	1	BOTTOM SLAB	0.84	
		SNAGGRS4	34.925		4.06	141.73	1.40	4.06	1	TOP SLAB	3.33	4.59	1	BOTTOM SLAB	0.84	
		SNS5A	35.550		3.67	130.31	1.40	3.67	1	TOP SLAB	3.33	4.12	1	BOTTOM SLAB	0.84	
		SNS6A	39.950		3.67	146.44	1.40	3.67	1	TOP SLAB	3.33	4.12	1	BOTTOM SLAB	0.84	
		SNS7B	42.000		3.67	153.96	1.40	3.67	1	TOP SLAB	3.33	4.12	1	BOTTOM SLAB	0.84	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		6.78	223.73	1.40	6.78	1	TOP SLAB	3.33	7.14	1	BOTTOM SLAB	0.84	
		TNT4A	33.075		3.67	121.24	1.40	3.67	1	TOP SLAB	3.33	4.12	1	BOTTOM SLAB	0.84	
		TNT6A	41.600		3.67	152.49	1.40	3.67	1	TOP SLAB	3.33	4.12	1	BOTTOM SLAB	0.84	
		TNT7A	42.000		3.67	153.96	1.40	3.67	1	TOP SLAB	3.33	4.12	1	BOTTOM SLAB	0.84	
		TNT7B	42.000		3.67	153.96	1.40	3.67	1	TOP SLAB	3.33	4.12	1	BOTTOM SLAB	0.84	
		TNAGRIT4	43.000		3.50	150.35	1.40	3.50	1	TOP SLAB	3.33	3.97	1	BOTTOM SLAB	0.84	
		TNAGT5A	45.000		3.58	161.06	1.40	3.58	1	TOP SLAB	3.33	4.02	1	BOTTOM SLAB	0.84	
		TNAGT5B	45.000		3.67	164.95	1.40	3.67	1	TOP SLAB	3.33	4.12	1	BOTTOM SLAB	0.84	

LOAD FACTORS:

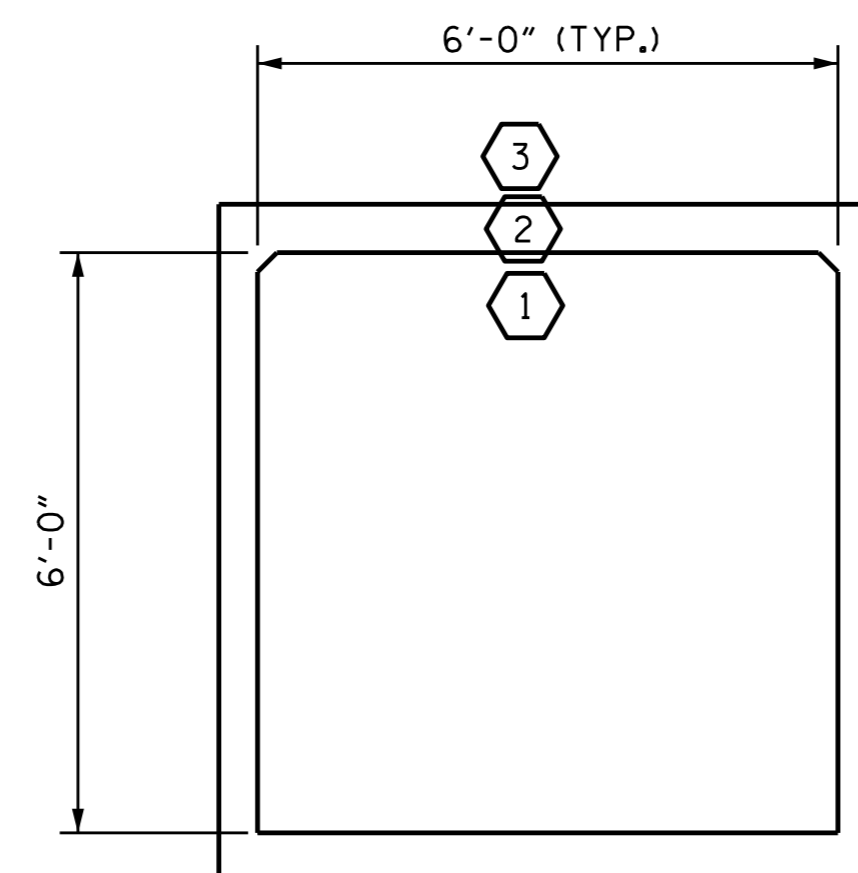
DESIGN LOAD RATING FACTORS

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.

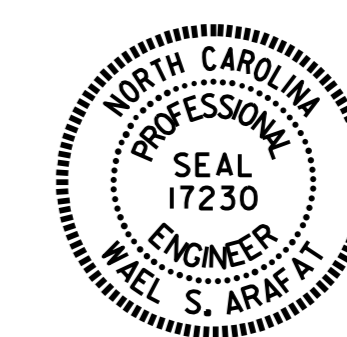
③	CONTROLLING LOAD RATING
①	DESIGN LOAD RATING (HL-93)
②	DESIGN LOAD RATING (HS-20)
③	LEGAL LOAD RATING **
** SEE CHART FOR VEHICLE TYPE	



LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. SS-4914B0
MACON COUNTY
STATION: 12+54.00 -L-

SHEET 6 OF 6



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

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

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

SHEET NO.
C-6
TOTAL SHEETS
6

ASSEMBLED BY : H. T. BARBOUR DATE : 4-28-16
CHECKED BY : V. X. NGUYEN DATE : 5-9-16
DRAWN BY : WMC 7/11 REV. 10/1/11 MAA/GM
CHECKED BY : CM 7/11

