

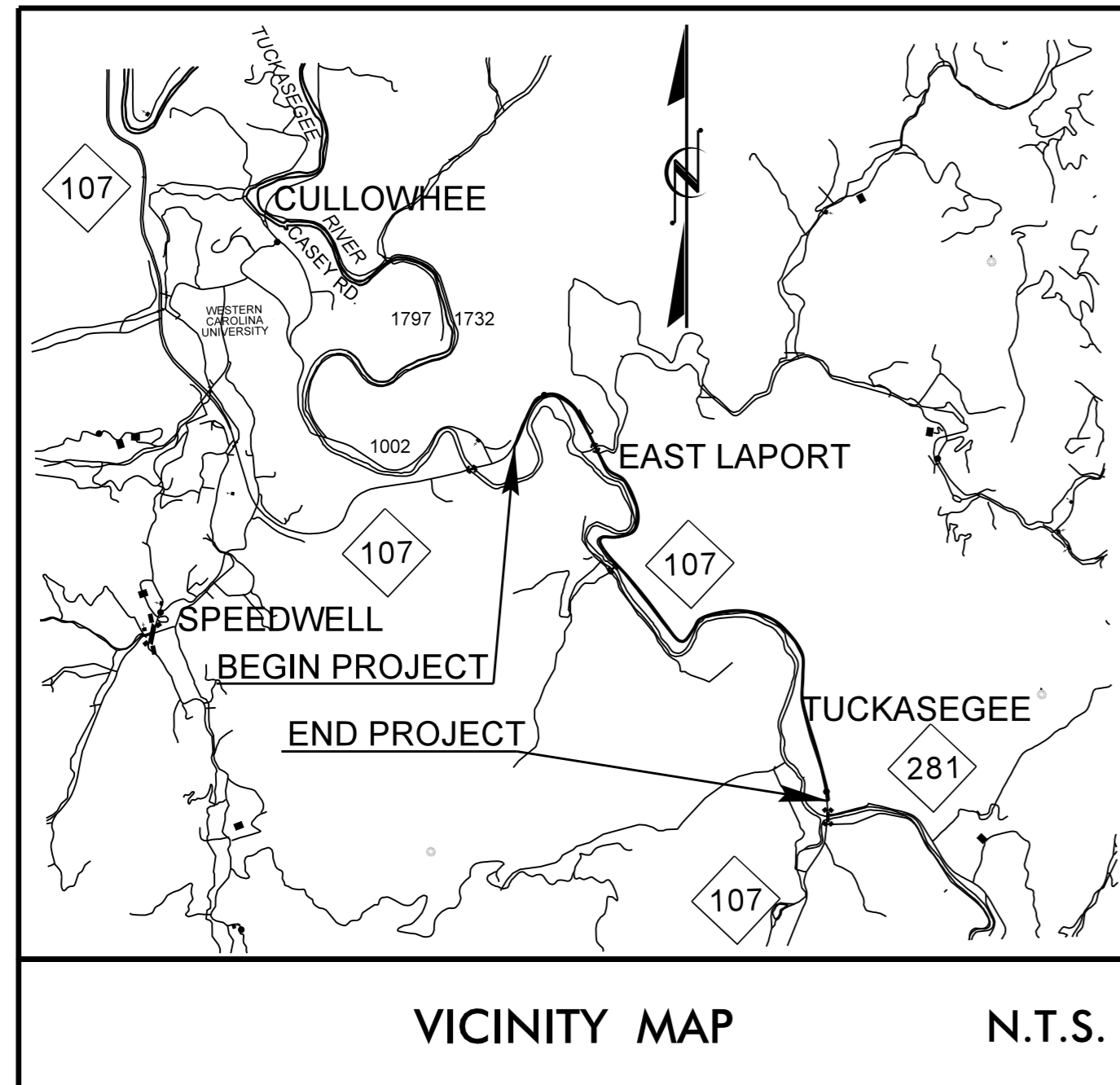
**This electronic collection of documents is provided
for the convenience of the user
and is Not a Certified Document –**

**The documents contained herein were originally issued
and sealed by the individuals whose names and license
numbers appear on each page, on the dates appearing
with their signature on that page.**

**This file or an individual page
shall not be considered a certified document.**

TIP PROJECT: R-4753

CONTRACT: C203825

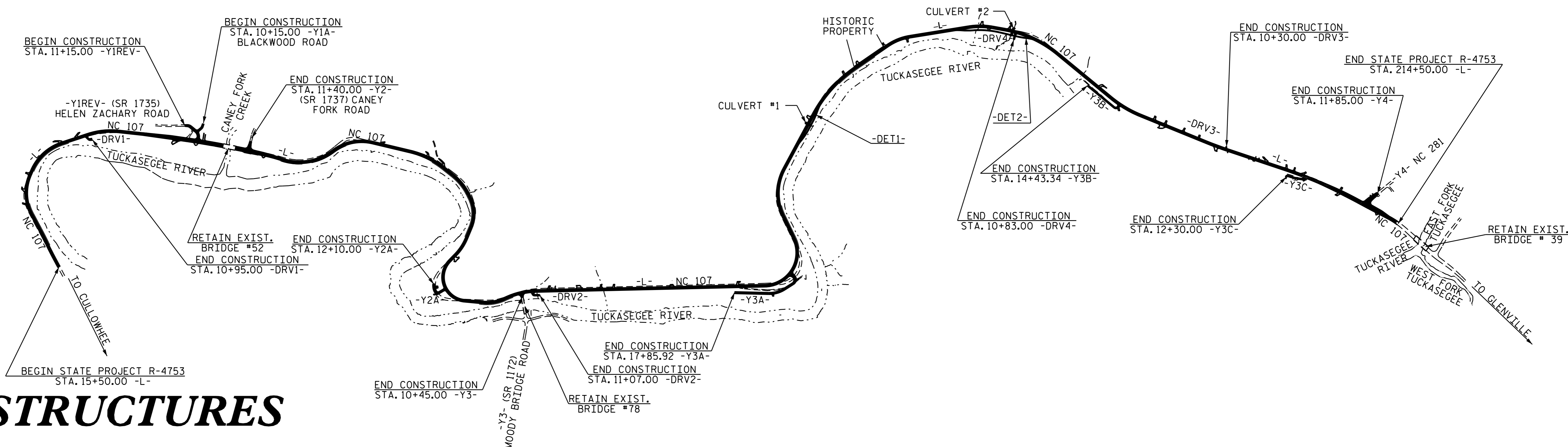


STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
JACKSON COUNTY

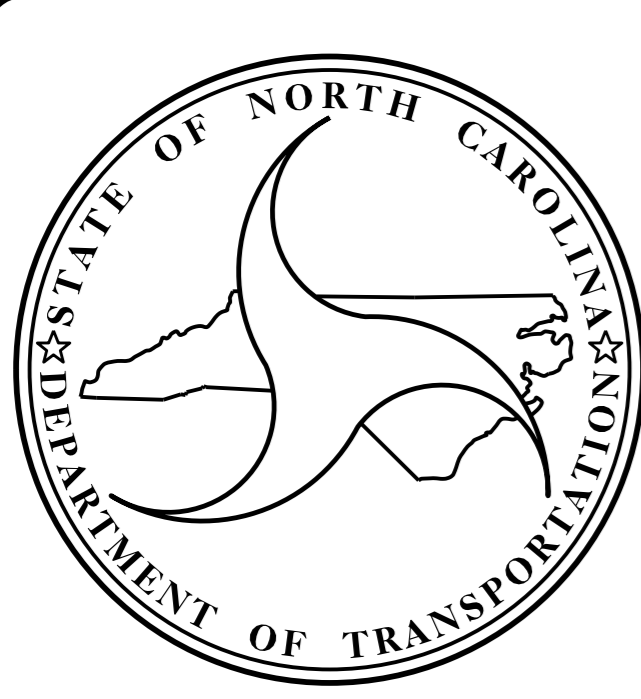
LOCATION: NC 107 FROM NORTH OF SR 1002 TO NC 281

TYPE OF WORK: GRADING, DRAINAGE, PAVING, RETAINING WALLS & CULVERTS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-4753		
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
39999.1.1	STP-0107(10)	P.E.	
39999.2.FR2	STP-0107(10)	R/W & UTILITIES	
39999.3.3	STP-0107(10)	CONST.	



STRUCTURES



DESIGN DATA

ADT 2016 =	6270
ADT 2035 =	8800
K =	10 %
D =	60 %
T =	9 % *
V =	40 MPH
* (TTST 2 %, DUAL 7 %)	
FUNC CLASS =	MINOR COLLECTOR
REGIONAL TIER	

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-4753 =	3.743 MILES
LENGTH EXISTING STRUCTURE #52 =	0.026 MILES
TOTAL LENGTH TIP PROJECT R-4753 =	3.769 MILES

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

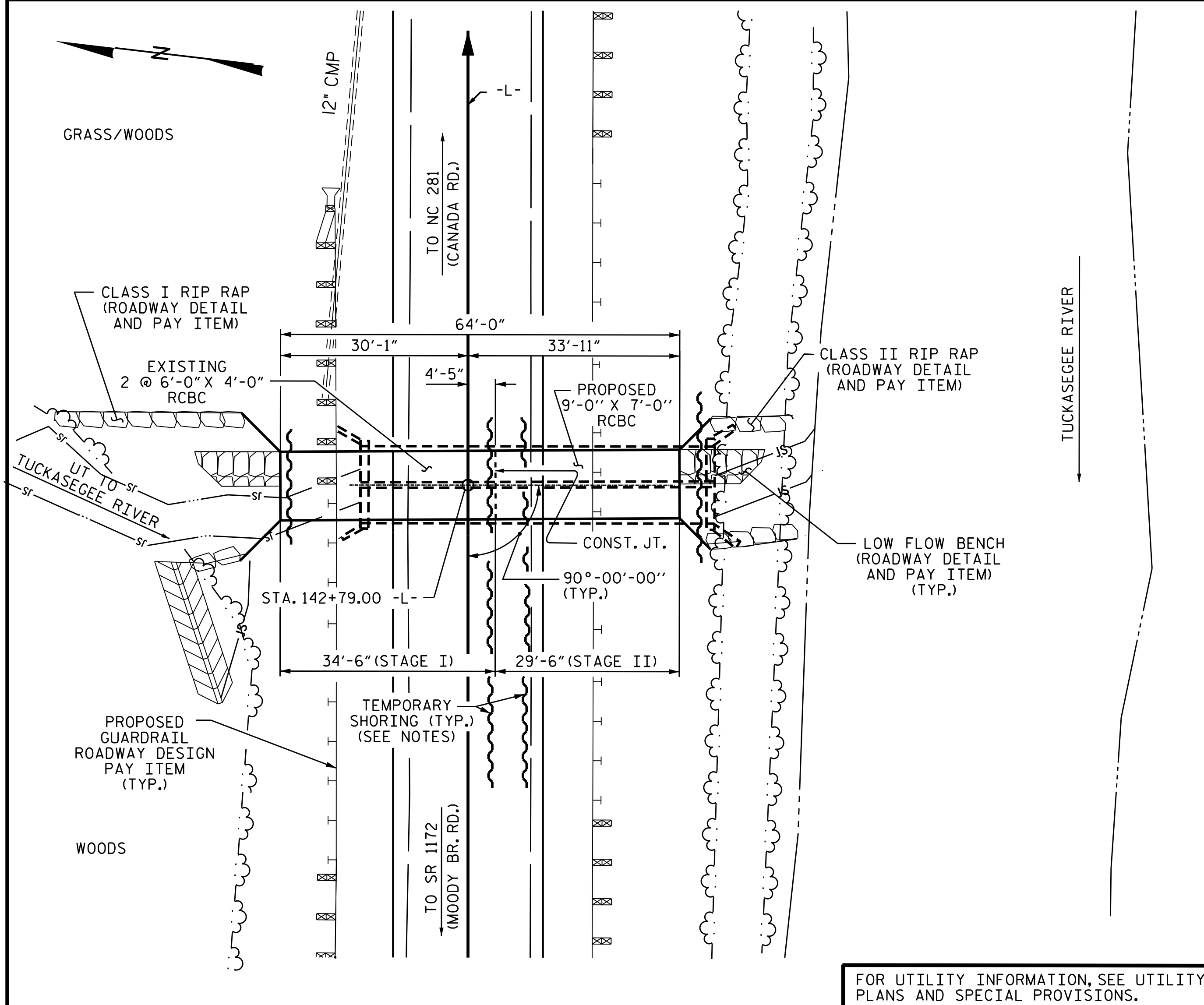
2012 STANDARD SPECIFICATIONS

LETTING DATE :
DECEMBER 20, 2016

PROJECT ENGINEER

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

BENCHMARK: (BL31) STA. 143+00.21 -L-, 16.85 FT. LEFT, EL. 2134.53 NAVD 88,
(N 584155.654 E 767157.083) NCDOT MONUMENT SET IN SHOULDER.



LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.

NOTES

- ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
- DESIGN FILL = 4.34 FT. MIN. AND 5.85 FT. MAX.
- FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.
- 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN STAGE I CULVERTS TO BE POURED IN THE FOLLOWING ORDER:
1. WING FOOTINGS, CURTAIN WALL AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
- 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB, HEADWALL AND SILLS.
- CONCRETE IN STAGE II CULVERTS TO BE POURED IN THE FOLLOWING ORDER:
1. WING FOOTINGS, CURTAIN WALL AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
- 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB, HEADWALL AND 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.
- AFTER SERVING AS A TEMPORARY STRUCTURE, THE EXISTING DOUBLE 6' X 4' X 38' LONG RCBC AND LOCATED AT THE PROPOSED CULVERT SHALL BE REMOVED. THE EXISTING STRUCTURE IS PRESENTLY NOT POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE STRUCTURE DETERIORATE DURING CONSTRUCTION OF THE PROPOSED STRUCTURE, A LOAD LIMIT MAYBE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.
- 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.
- 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.
- TRAFFIC ON NC 107 SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS SHOWN ON THESE PLANS AND/OR AS DIRECTED BY THE ENGINEER.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE BARS FROM WHICH THE SAMPLES ARE TAKEN MUST THEN BE SPLICED WITH REPLACEMENT BARS OF THE SIZE AND LENGTH OF THE SAMPLE, PLUS A MINIMUM LAP SPLICE OF THIRTY BAR DIAMETERS. PAYMENT FOR THE SAMPLES OF REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION 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 FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
- FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, 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.
FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.

ROADWAY DATA

GRADE POINT ELEV. @ STATION 142+79.00 -L- ----	=	2136.09
BED ELEV. @ STATION 142+79.00 -L- ----	=	2123.60
ROADWAY SLOPES -----	=	2 : 1

HYDRAULIC DATA

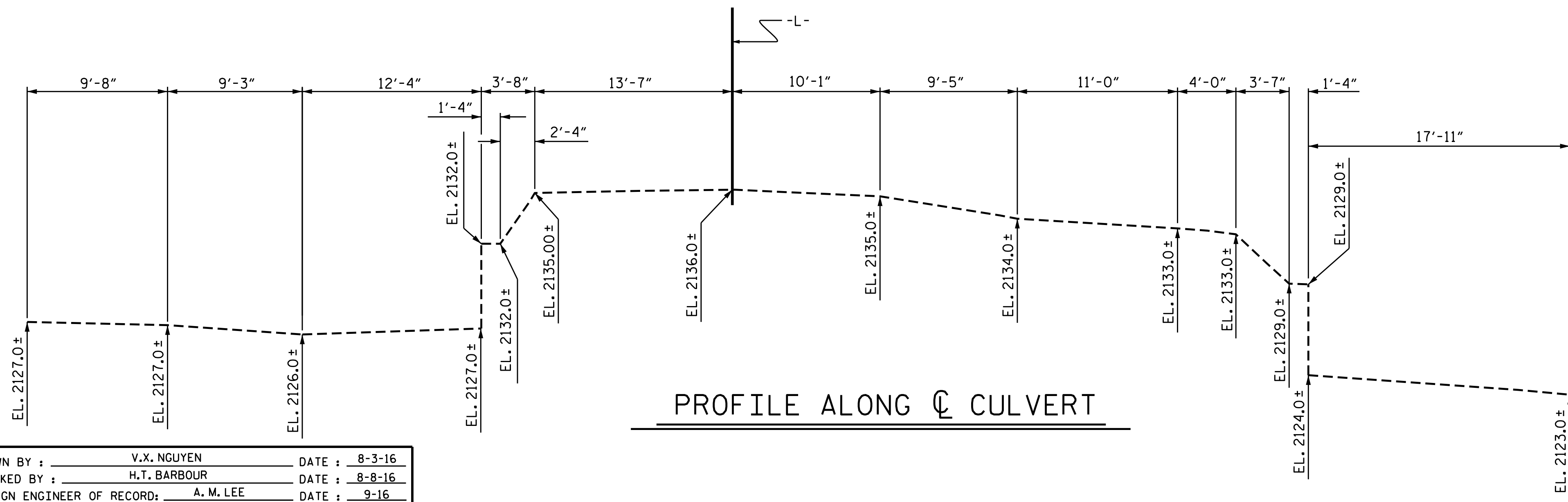
DESIGN DISCHARGE -----	=	290 C.F.S.
FREQUENCY OF DESIGN FLOOD -----	=	50 YEARS
DESIGN HIGH WATER ELEVATION -----	=	2131.0
DRAINAGE AREA -----	=	200 AC.
BASE DISCHARGE (Q100) -----	=	350 C.F.S.
BASE HIGH WATER ELEVATION -----	=	2132.1

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE -----	=	630 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD -----	=	500 YEARS+
OVERTOPPING FLOOD ELEVATION -----	=	2135.8 @ STA. 141+97.00 -L-

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
STAGE I	40.8 C.Y.
STAGE II	35.9 C.Y.
TOTAL	76.7 C.Y.
REINFORCING STEEL	
STAGE I	5,364 LBS.
STAGE II	4,569 LBS.
TOTAL	9,933 LBS.
FOUNDATION CONDITIONING MATERIAL	
STAGE I	35.0 TONS
STAGE II	29.0 TONS
TOTAL	64.0 TONS
CULVERT EXCAVATION	LUMP SUM



DRAWN BY : V.X. NGUYEN DATE : 8-3-16
CHECKED BY : H.T. BARBOUR DATE : 8-8-16
DESIGN ENGINEER OF RECORD: A. M. LEE DATE : 9-16



Designed by
Wael Arafat 10/12/2016
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

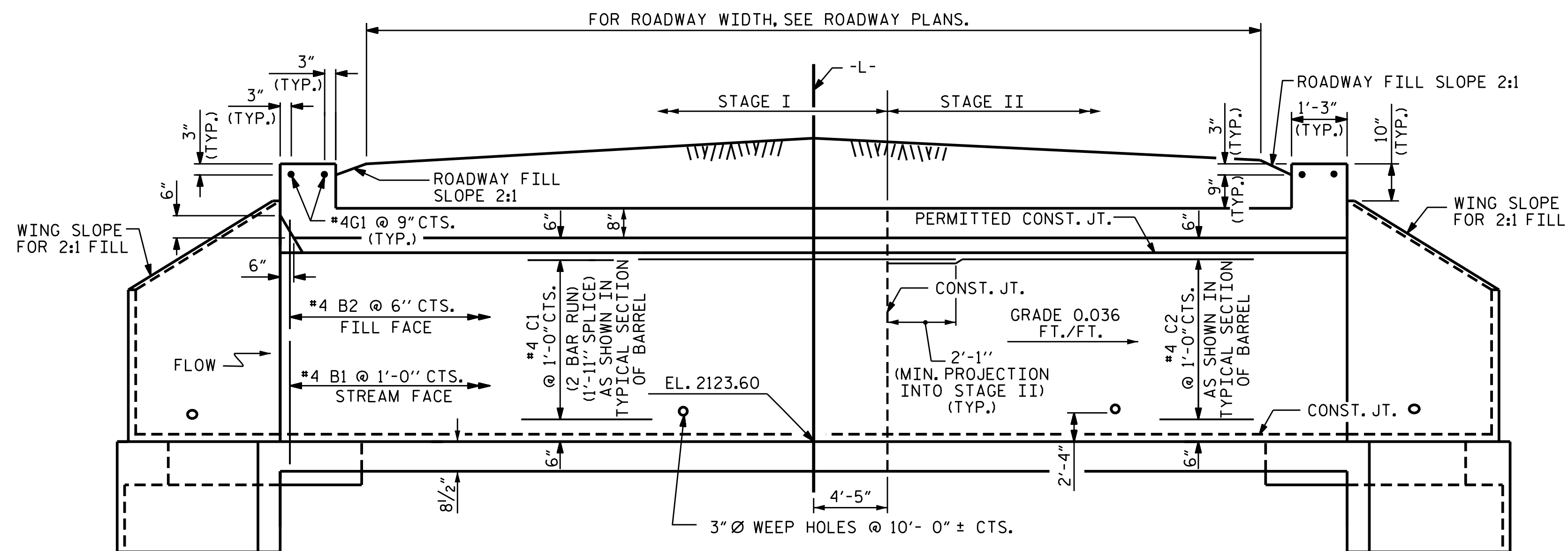
PROJECT NO. R-4753
JACKSON COUNTY
STATION: 142+79.00 -L-

SHEET 1 OF 7

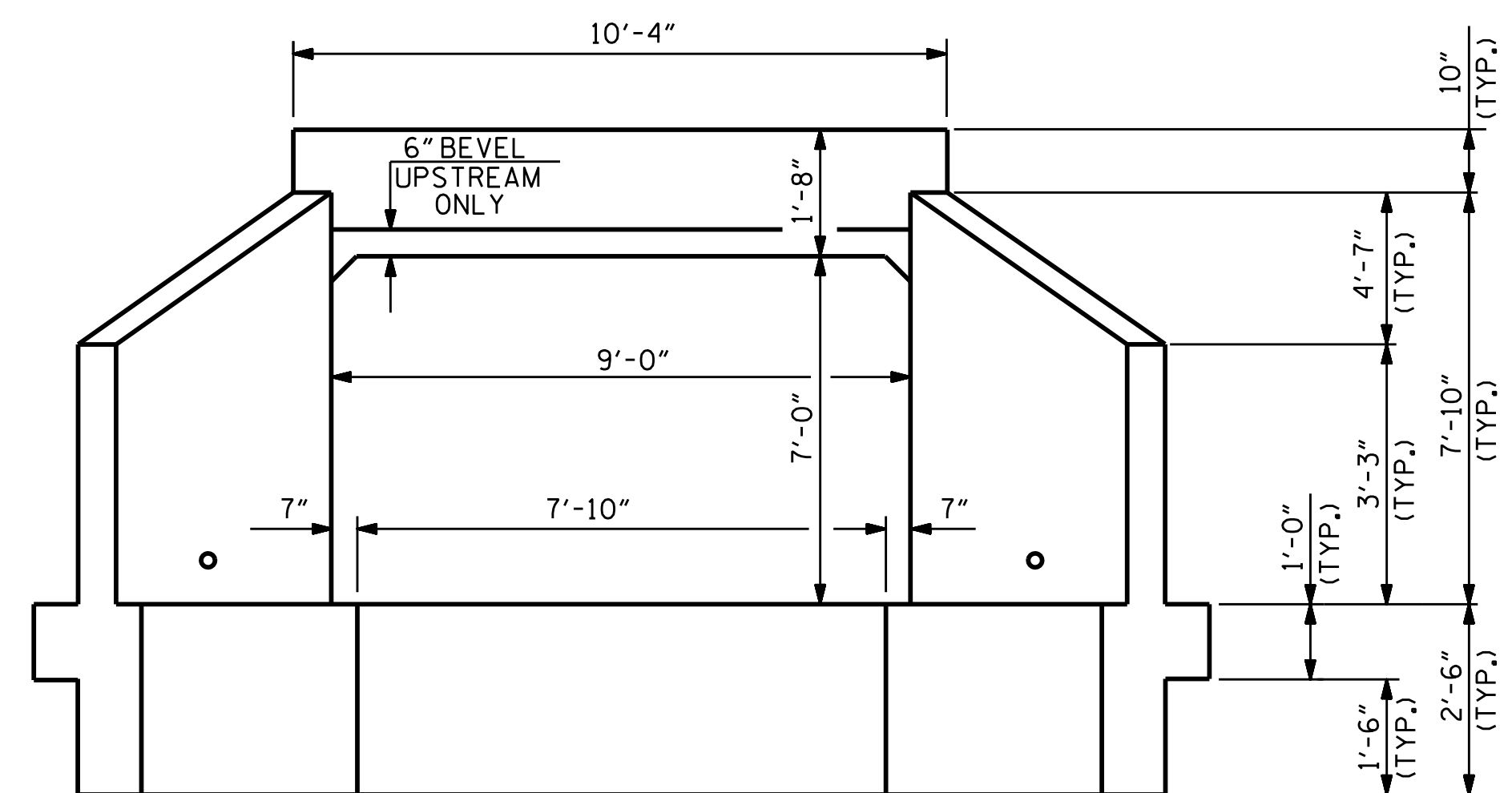
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 9 FT. X 7 FT. CONCRETE BOX CULVERT
90°-00'-00" SKEW

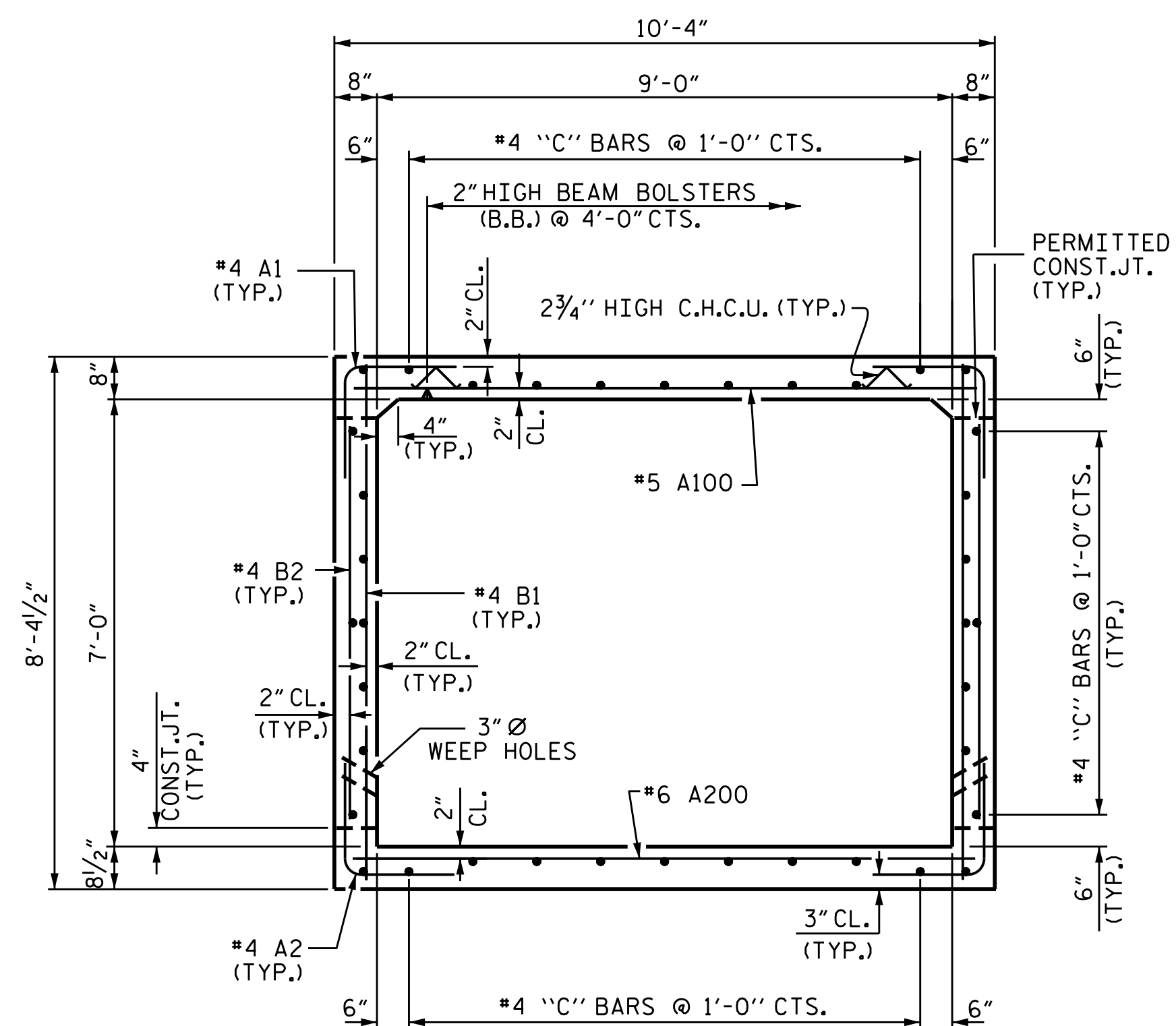
REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-1	
1			3			TOTAL SHEETS	
2			4			14	



CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION



RIGHT ANGLE SECTION OF BARREL

THERE ARE 38 'C' BARS IN SECTION OF BARREL

PROJECT NO. R-4753
JACKSON COUNTY
 STATION: 142+79.00 -L-

SHEET 2 OF 7



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE 9 FT. X 7 FT.
 CONCRETE BOX CULVERT
 90°-00'-00" SKEW

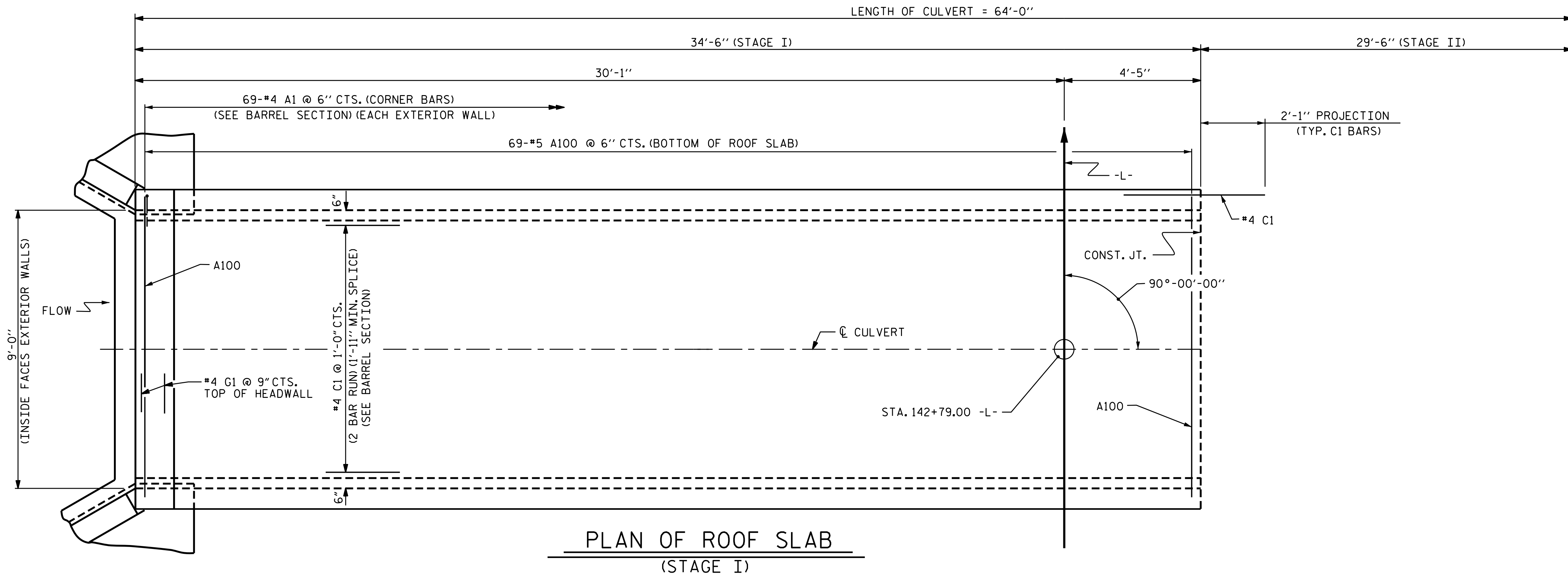
DRAWN BY: V.X. NGUYEN DATE: 8-3-16
 CHECKED BY: H.T. BARBOUR DATE: 8-8-16
 DESIGN ENGINEER OF RECORD: A.M. LEE DATE: 9-16

Documented by:
 Wael Arafat 10/12/2016
 4139C12A32A8406

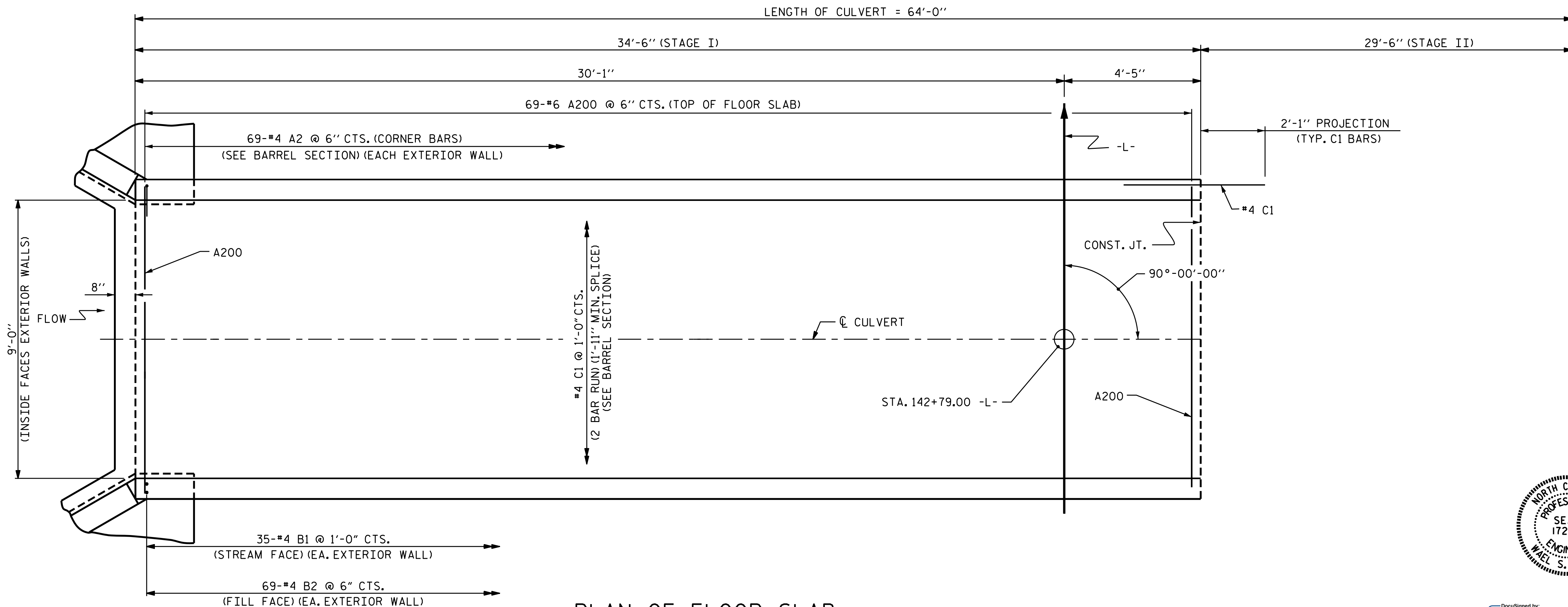
DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-2	
1			3			TOTAL	14
2			4			SHEETS	

CULVERT #1



PLAN OF ROOF SLAB
(STAGE I)

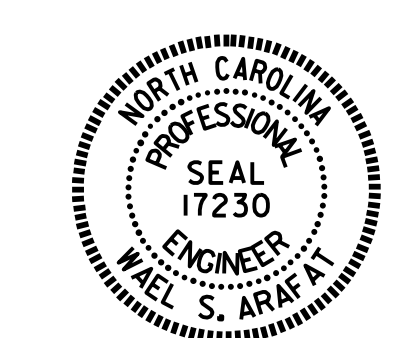


PLAN OF FLOOR SLAB
(STAGE I)

STAGE I STRUCTURE QUANTITIES	
CLASS A CONCRETE	
BARREL @ .876 CY/FT	30.2 C.Y.
SILLS/BAFFLES	1.0 C.Y.
WINGS ETC.	9.6 C.Y.
TOTAL	40.8 C.Y.
REINFORCING STEEL	
BARREL	4,788 LBS.
WINGS ETC.	576 LBS.
TOTAL	5,364 LBS.
FOUNDATION CONDITIONING MATERIAL	35.0 TONS

PROJECT NO. R-4753
JACKSON COUNTY
 STATION: 142+79.00 -L-

SHEET 3 OF 7

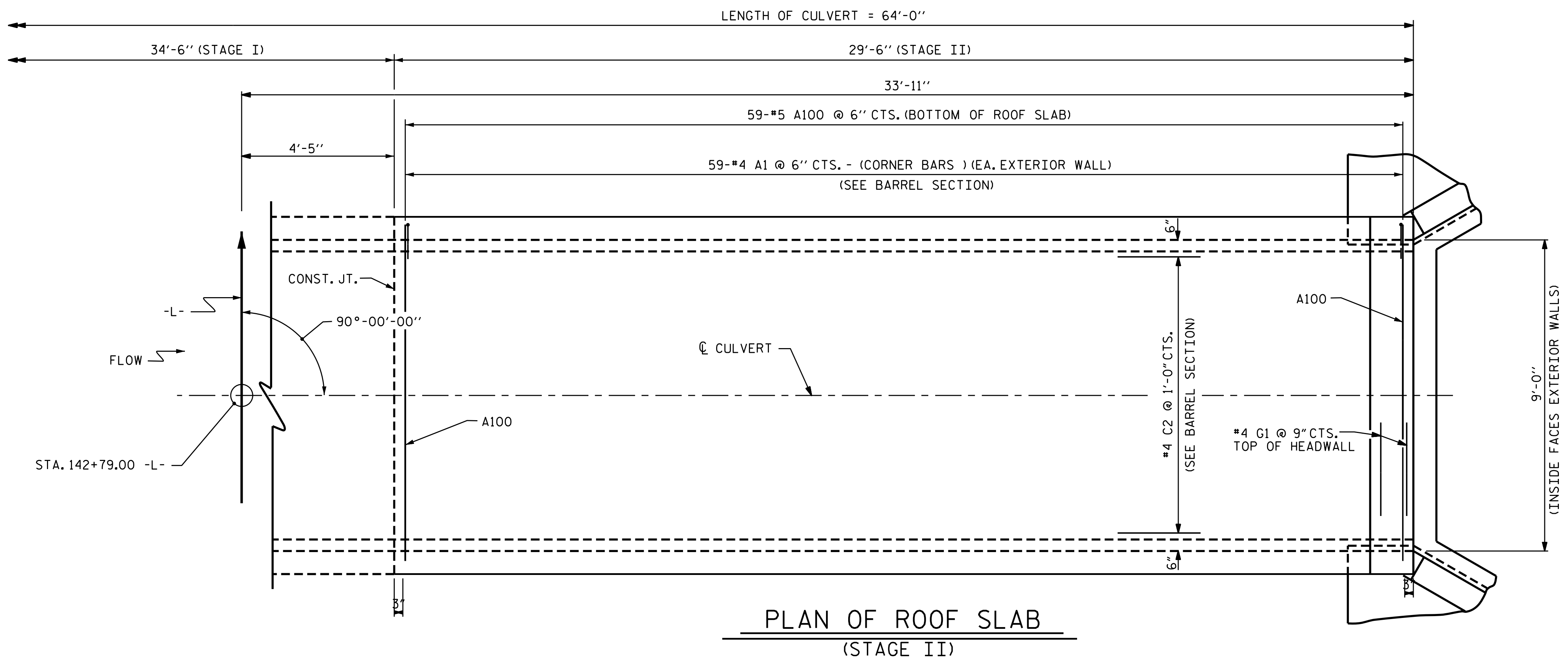


STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE 9 FT. X 7 FT.
 CONCRETE BOX CULVERT
 90°-00'-00" SKEW
 STAGE I

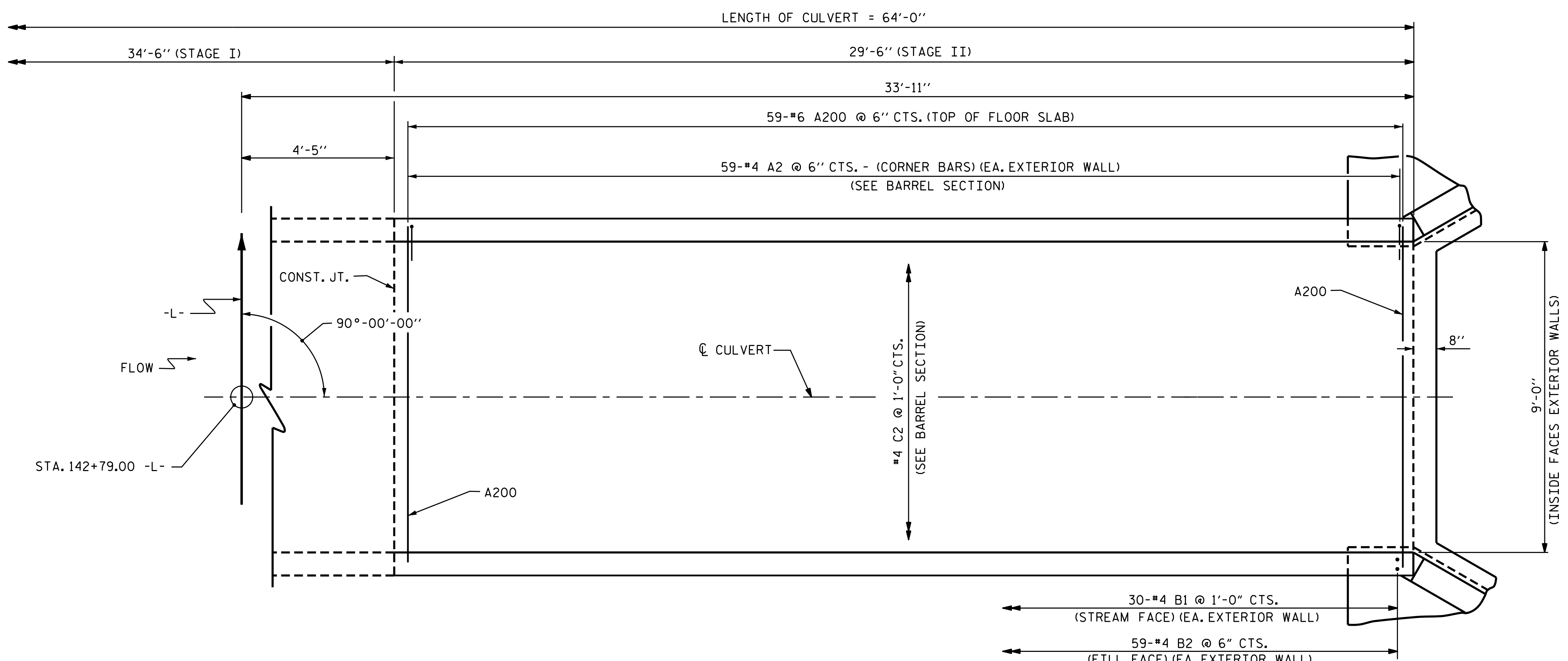
DRAWN BY: V.X. NGUYEN DATE: 8-3-16
 CHECKED BY: H.T. BARBOUR DATE: 8-8-16
 DESIGN ENGINEER OF RECORD: A. M. LEE DATE: 9-16

DocuSigned by:
 Wael Arafat 10/12/2016
 DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-3	
1			3			TOTAL SHEETS	
2			4			14	



PLAN OF ROOF SLAB
(STAGE II)



PLAN OF FLOOR SLAB
(STAGE II)

STAGE II STRUCTURE QUANTITIES	
CLASS A CONCRETE	
BARREL @ .876 CY/FT.	25.8 C.Y.
SILLS	0.5 C.Y.
WINGS ETC.	9.6 C.Y.
TOTAL	35.9 C.Y.
REINFORCING STEEL	
BARREL	3,993 LBS.
WINGS ETC.	576 LBS.
TOTAL	4,569 LBS.
FOUNDATION CONDITIONING MATERIAL	29.0 TONS

PROJECT NO. R-4753
JACKSON COUNTY
 STATION: 142+79.00 -L-

SHEET 4 OF 7

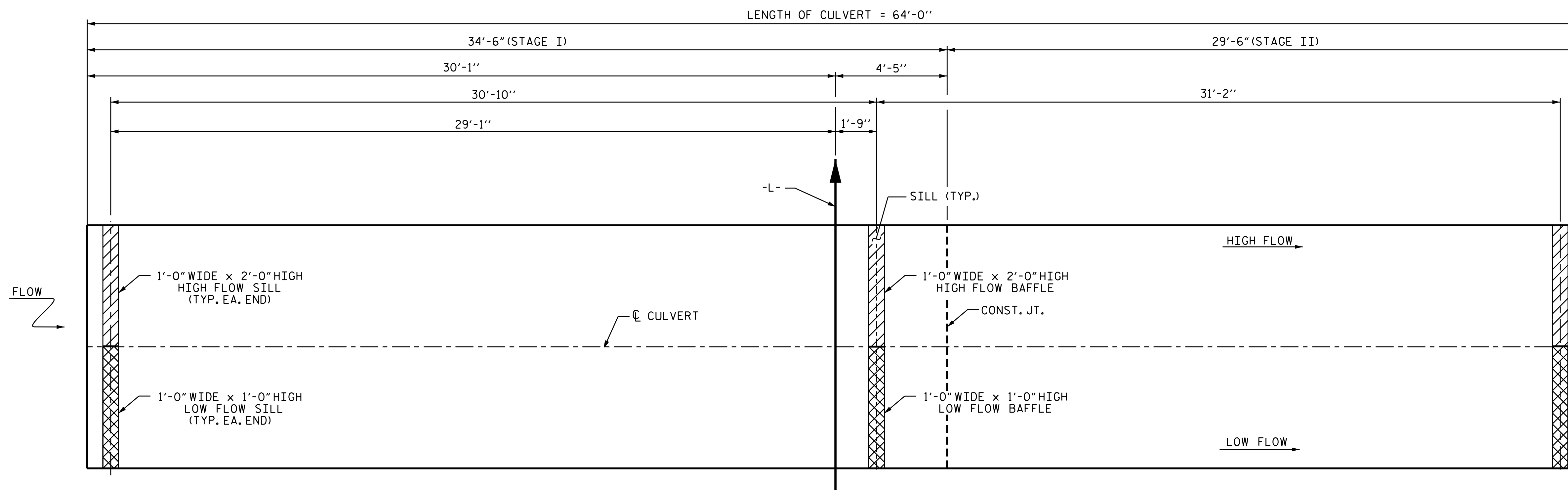


STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE 9 FT. X 7 FT.
 CONCRETE BOX CULVERT
 90°-00'-00" SKEW
 STAGE II

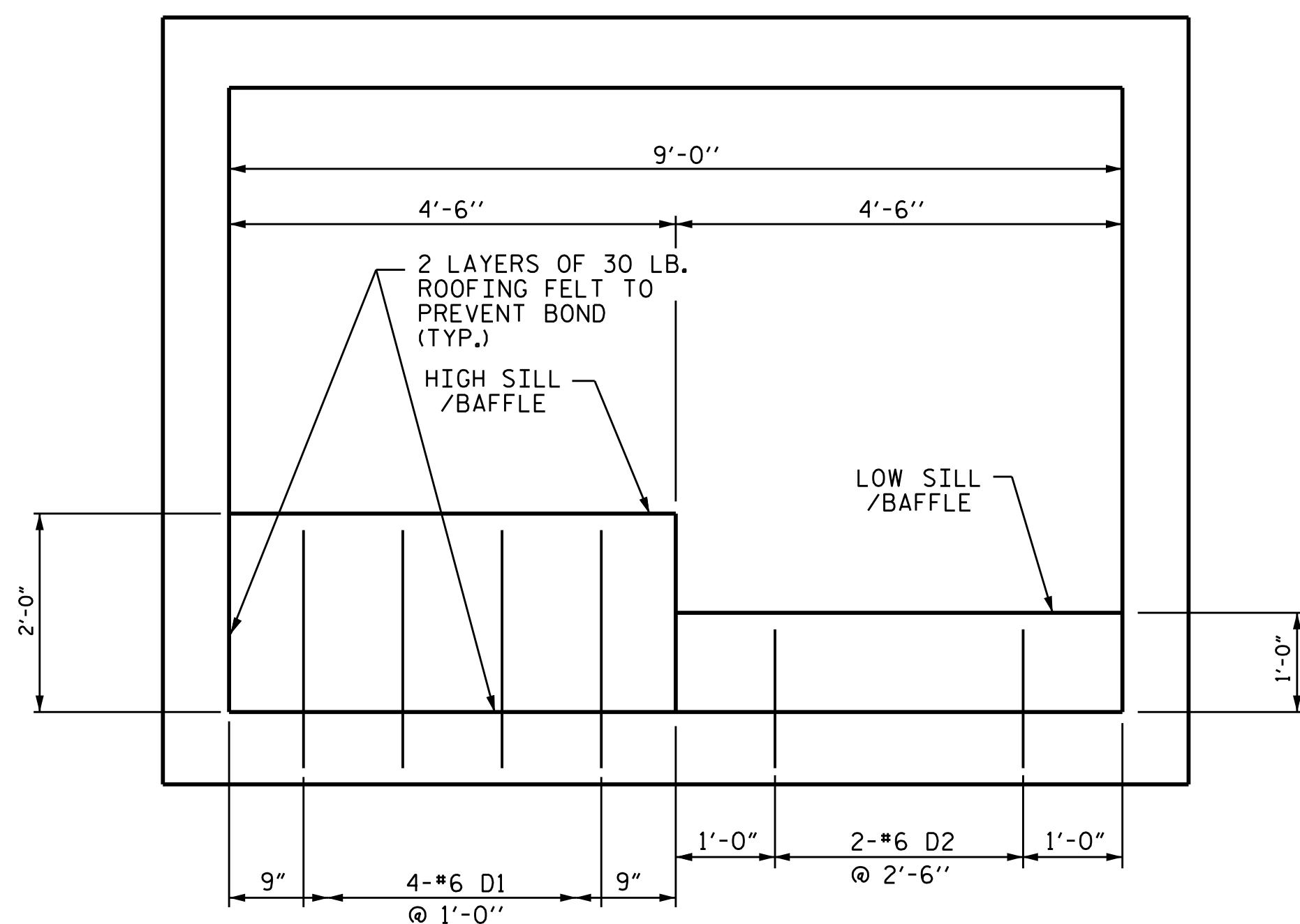
DRAWN BY : V.X. NGUYEN DATE : 8-3-16
 CHECKED BY : H.T. BARBOUR DATE : 8-8-16
 DESIGN ENGINEER OF RECORD: A. M. LEE DATE : 9-16

DocuSigned by:
 Wael Arafat 10/12/2016
 DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

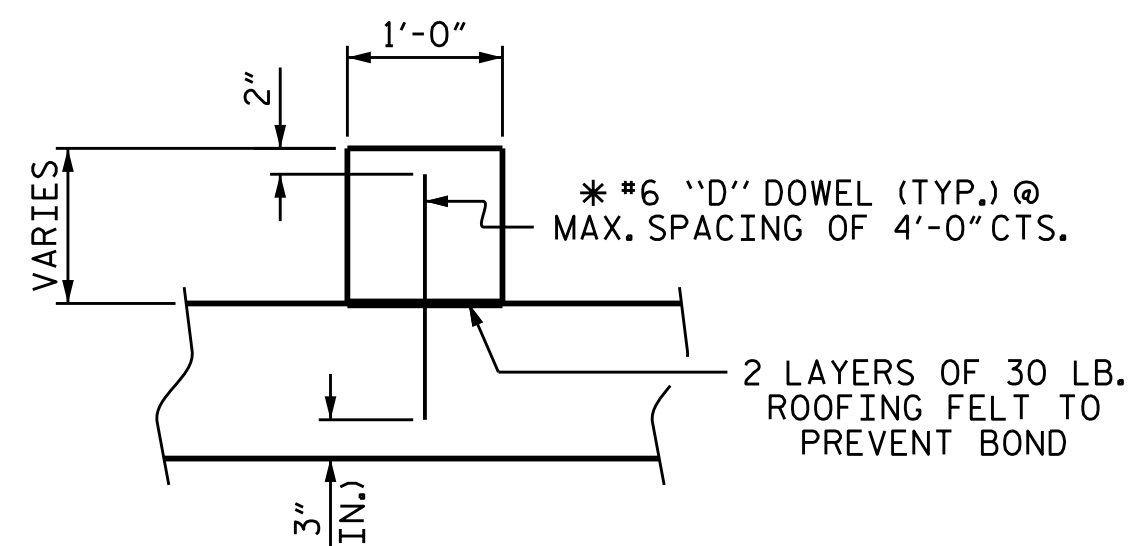
REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-4	
1			3			TOTAL SHEETS	
2			4			14	



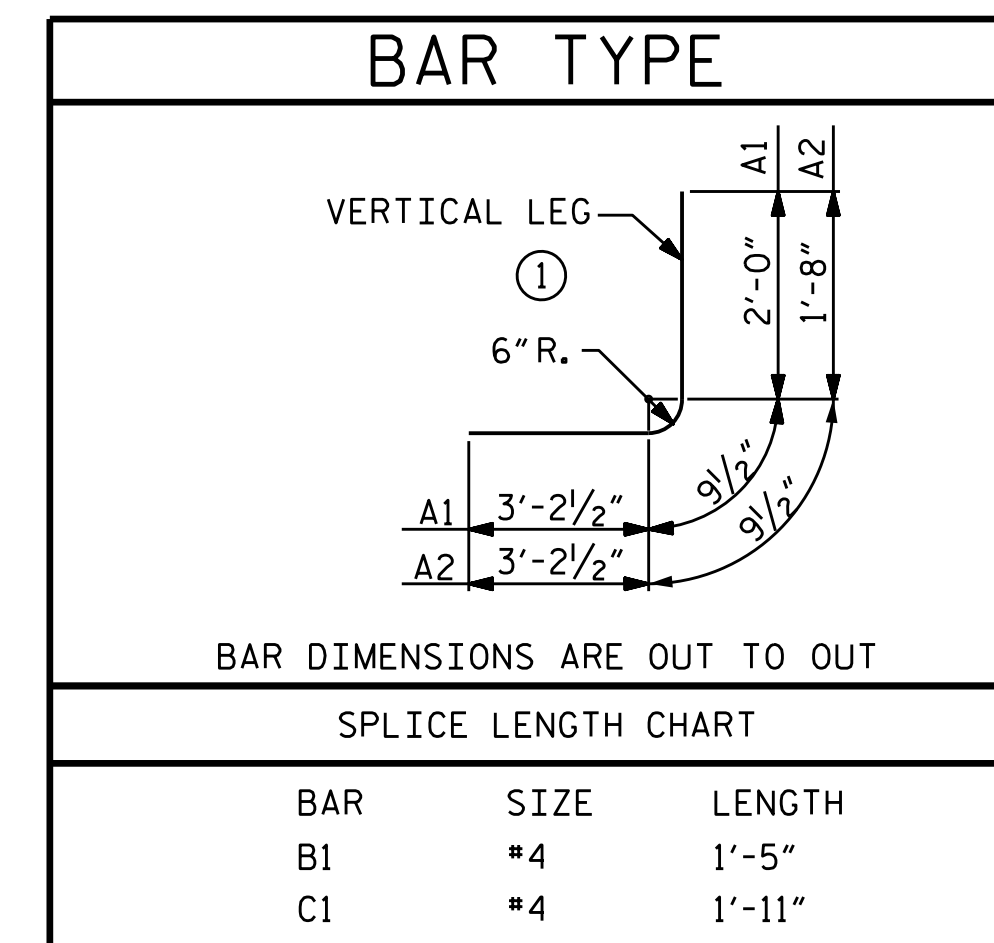
PLAN OF SILL/BAFFLE LOCATIONS
(STAGE I & II)



ELEVATION
CULVERT SILL DETAILS
(LOOKING DOWNSTREAM)



SECTION THRU SILL/BAFFLE



NOTES

MATERIAL EXCAVATED FROM THE EXISTING BED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AND SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL AS SHOWN. THE MATERIAL SHALL BE NATURAL STONE WITH A GRADATION SIZE SIMILAR TO THAT OF CLASS B RIP RAP. STONES LARGER THAN 6 INCHES SHALL NOT BE PLACED WITHIN THE LOW FLOW CHANNEL. BED MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER, AND MAY BE SUBJECT TO PERMIT CONDITIONS.

THE STOCKPILED MATERIAL SHALL BE PLACED TO PROVIDE A DEPTH OF 1 FOOT IN LOW FLOW CHANNEL, AND 2 FEET IN THE HIGH FLOW CHANNEL.

THE TOP OF BED MATERIAL IN THE LOW FLOW CHANNEL SHOULD MATCH THE STREAM BED ELEVATION.

BED MATERIAL SHALL BE SUPPLEMENTED BY CLASS B RIP RAP AS NECESSARY IN THE HIGH FLOW CHANNEL ONLY.

THE ENTIRE COST OF WORK REQUIRED TO PLACE THE EXCAVATED 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.

BAR SCHEDULE

STAGE I

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	138	#4	1	6'-0"	553
A2	138	#4	1	5'-8"	522
A100	69	#5	STR	9'-11"	714
A200	69	#6	STR	9'-11"	1028
B1	70	#4	STR	7'-10"	366
B2	138	#4	STR	6'-4"	584
C1	76	#4	STR	19'-2"	973
D1	8	#6	STR	2'-3"	27
D2	4	#6	STR	1'-3"	8
G1	2	#4	STR	10'-0"	13

REINFORCING STEEL = 4788 LBS.

BAR SCHEDULE

STAGE II

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	118	#4	1	6'-0"	473
A2	118	#4	1	5'-8"	447
A100	59	#5	STR	9'-11"	610
A200	59	#6	STR	9'-11"	879
B1	60	#4	STR	7'-10"	314
B2	118	#4	STR	6'-4"	499
C2	38	#4	STR	29'-2"	740
D1	4	#6	STR	2'-3"	14
D2	2	#6	STR	1'-3"	4
G1	2	#4	STR	10'-0"	13

REINFORCING STEEL = 3993 LBS.

PROJECT NO. R-4753
JACKSON COUNTY
STATION: 142+79.00 -L-

SHEET 5 OF 7



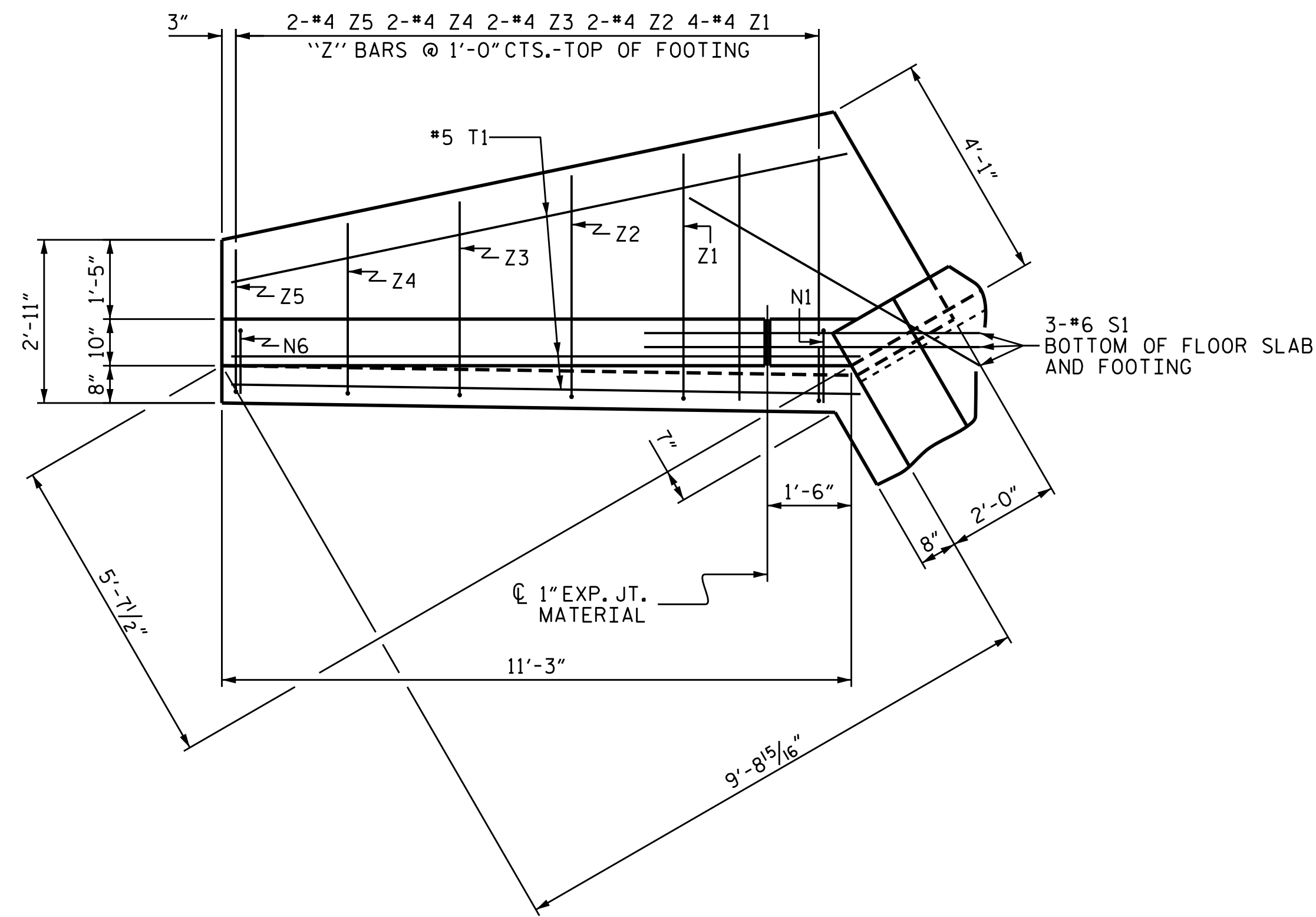
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
SINGLE 9 FT. X 7 FT.
CONCRETE BOX CULVERT
90°-00'-00" SKEW

DRAWN BY: V.X. NGUYEN DATE: 8-3-16
CHECKED BY: H.T. BARBOUR DATE: 8-8-16
DESIGN ENGINEER OF RECORD: A.M. LEE DATE: 9-16

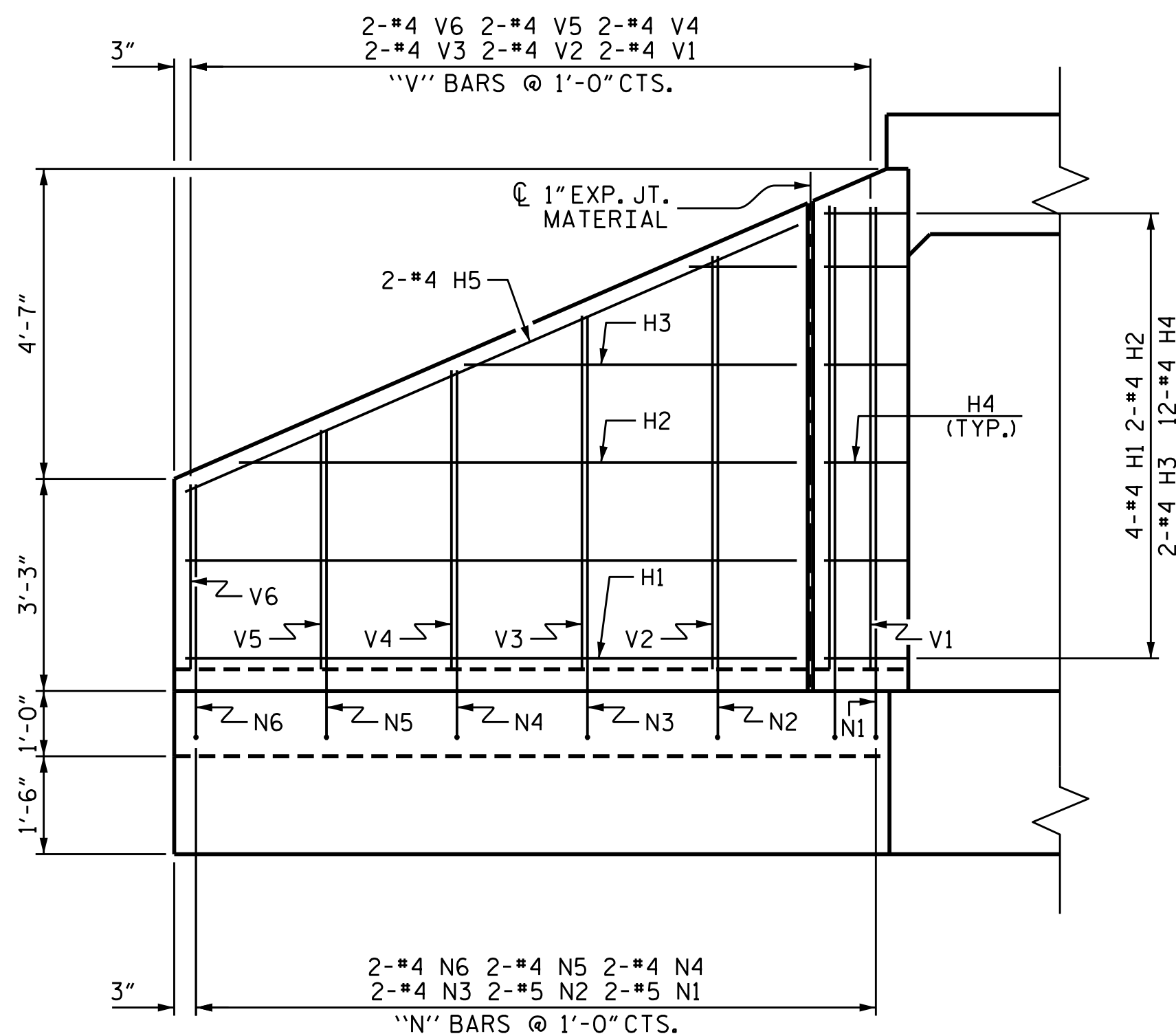
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

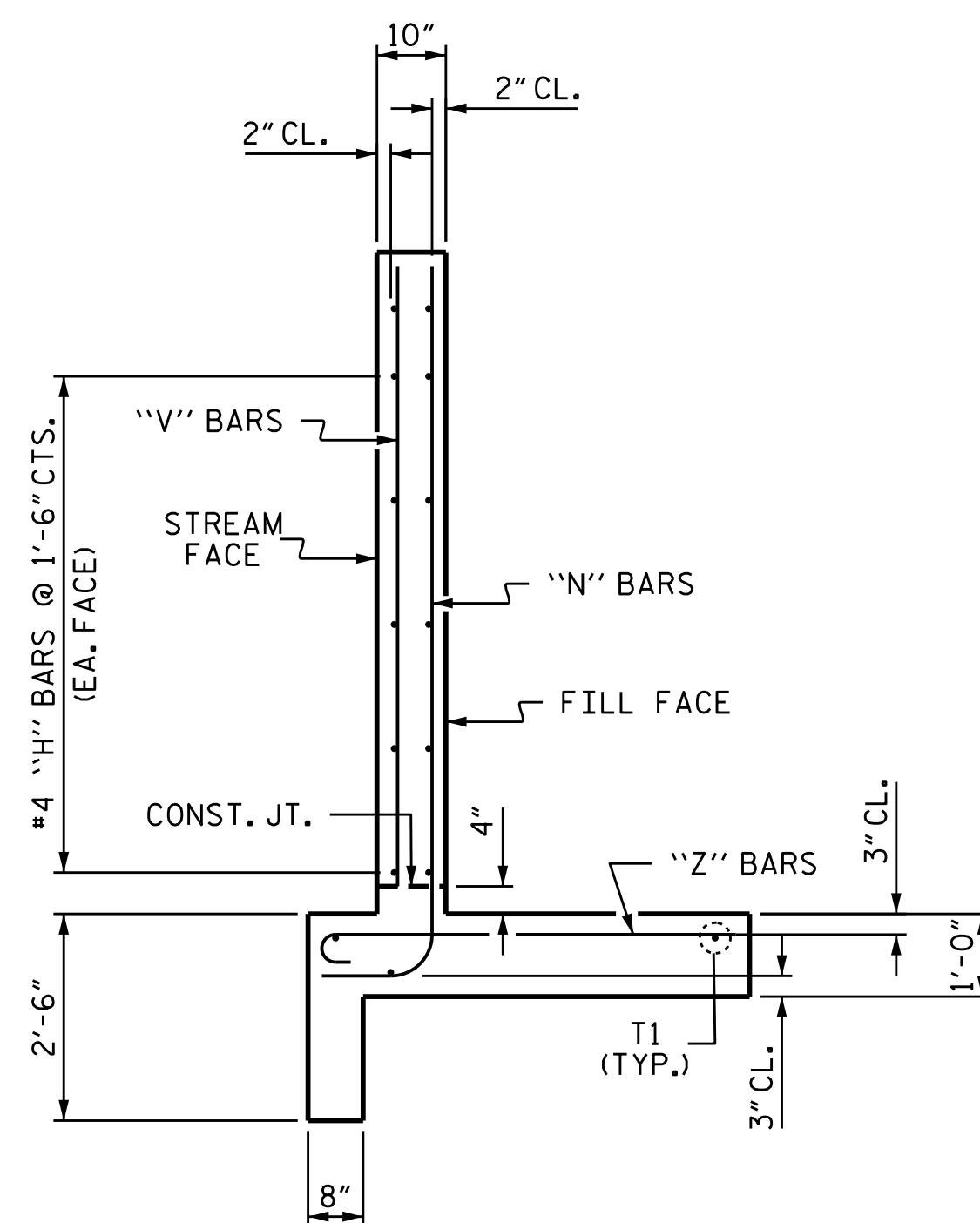
C-5
TOTAL SHEETS 14



PLAN



ELEVATION



TYPICAL WING SECTION

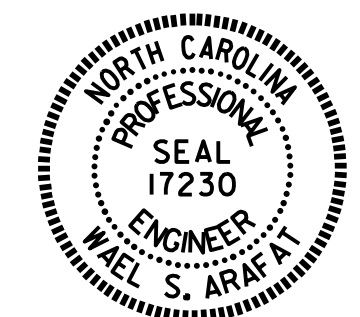
BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL					
STAGE I OR STAGE II					
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	
H1	8	#4	STR	9'-4"	50
H2	4	#4	STR	8'-6"	23
H3	4	#4	STR	5'-1"	14
H4	24	#4	1	3'-3"	52
H5	4	#4	STR	10'-3"	27
N1	4	#5	2	9'-2"	38
N2	4	#5	2	8'-4"	35
N3	4	#4	2	7'-6"	20
N4	4	#4	2	6'-7"	18
N5	4	#4	2	5'-9"	15
N6	4	#4	2	4'-10"	13
S1	6	#6	STR	6'-0"	54
T1	6	#5	STR	11'-3"	70
V1	4	#4	STR	7'-1"	19
V2	4	#4	STR	6'-4"	17
V3	4	#4	STR	5'-5"	14
V4	4	#4	STR	4'-7"	12
V5	4	#4	STR	3'-8"	10
V6	4	#4	STR	2'-10"	8
Z1	8	#4	3	4'-11"	26
Z2	4	#4	3	4'-6"	12
Z3	4	#4	3	4'-0"	11
Z4	4	#4	3	3'-7"	10
Z5	4	#4	3	3'-1"	8
TOTAL REINFORCING STEEL FOR 2 WINGS				576	LBS.
CLASS A CONCRETE					
2 WINGS				8.6	CY
1 HEADWALL				0.5	CY
1 END CURTAIN WALL				0.5	CY
TOTAL				9.6	CY

ASSEMBLED BY : V.X. NGUYEN DATE : 8-3-16
 CHECKED BY : H.T. BARBOUR DATE : 8-8-16
 DRAWN BY : CCJ 10/99
 CHECKED BY : RWW 03/00

DocuSigned by:
 Wheel Orafit 10/12/2016
 DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED



PROJECT NO. R-4753
JACKSON COUNTY
 STATION: 142+79.00 -L-

SHEET 6 OF 7
 STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
CONCRETE BOX CULVERT
 STAGE I OR STAGE II
 H = 7'-0" SLOPE = 2:1
 90°-00'-00" SKEW

REVISIONS						TOTAL SHEETS
NO.	BY:	DATE:	NO.	BY:	DATE:	14
1			3			
2			4			

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 (VLL)	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	1.06	--	1.75	1.06	1	TOP SLAB	4.83	1.17	1	BOTTOM SLAB	8.82		
	HL-93 (OPERATING)	N/A		1.37	--	1.35	1.37	1	TOP SLAB	4.83	1.52	1	BOTTOM SLAB	8.82		
	HS-20 (INVENTORY)	36.00	②	1.28	45.97	1.75	1.28	1	TOP SLAB	4.83	1.51	1	TOP SLAB	0.81		
	HS-20 (OPERATING)	36.00		1.66	59.60	1.35	1.66	1	TOP SLAB	4.83	1.96	1	TOP SLAB	0.81		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		2.32	31.32	1.40	2.32	1	TOP SLAB	4.83	2.75	1	TOP SLAB	0.81		
		SNGARBS2	20.00		2.17	43.35	1.40	2.17	1	TOP SLAB	4.83	2.57	1	TOP SLAB	0.81	
		SNAGRIS2	22.00		2.32	51.04	1.40	2.32	1	TOP SLAB	4.83	2.75	1	TOP SLAB	0.81	
		SNCOTTS3	27.25	③	1.32	35.95	1.40	1.32	1	TOP SLAB	4.83	1.46	1	BOTTOM SLAB	0.84	
		SNAGGRS4	34.93		1.72	60.00	1.40	1.72	1	TOP SLAB	4.83	1.72	1	BOTTOM SLAB	0.84	
		SNS5A	35.56		1.57	55.83	1.40	1.57	1	TOP SLAB	4.83	1.71	1	BOTTOM SLAB	0.84	
		SNS6A	39.95		1.57	62.74	1.40	1.57	1	TOP SLAB	4.83	1.71	1	BOTTOM SLAB	0.84	
		SNS7B	42.00		1.57	65.96	1.40	1.57	1	TOP SLAB	4.83	1.71	1	BOTTOM SLAB	0.84	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.00		2.32	76.56	1.40	2.32	1	TOP SLAB	4.83	2.75	1	TOP SLAB	0.81	
		TNT4A	33.08		1.57	51.94	1.40	1.57	1	TOP SLAB	4.83	1.75	1	BOTTOM SLAB	0.84	
		TNT6A	41.60		1.57	65.19	1.40	1.57	1	TOP SLAB	4.83	1.68	1	BOTTOM SLAB	8.82	
		TNT7A	42.00		1.57	65.81	1.40	1.57	1	TOP SLAB	4.83	1.75	1	BOTTOM SLAB	0.84	
		TNT7B	42.00		1.57	65.96	1.40	1.57	1	TOP SLAB	4.83	1.72	1	BOTTOM SLAB	0.84	
		TNAGRIT4	43.00		1.50	64.46	1.40	1.50	1	TOP SLAB	4.83	1.67	1	BOTTOM SLAB	0.84	
TNAGT5A	45.00		1.53	68.95	1.40	1.53	1	TOP SLAB	4.83	1.71	1	BOTTOM SLAB	0.84			
TNAGT5B	45.00		1.57	70.51	1.40	1.57	1	TOP SLAB	4.83	1.75	1	BOTTOM SLAB	0.84			

LOAD FACTORS:

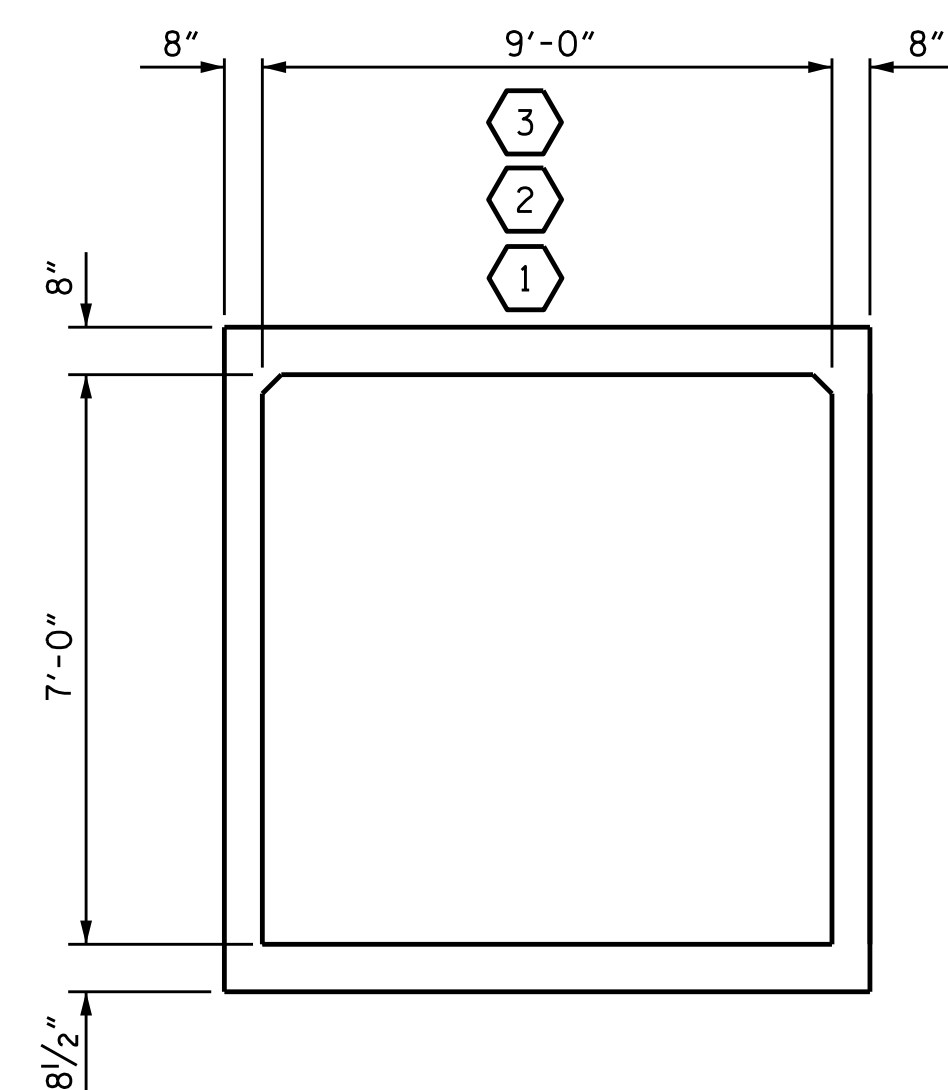
DESIGN LOAD RATING FACTORS

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.

#	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. R-4753
JACKSON COUNTY
 STATION: 142+79.00 -L-

SHEET 7 OF 7



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

ASSEMBLED BY : V.X. NGUYEN DATE : 8-4-16
 CHECKED BY : H.T. BARBOUR DATE : 8-8-16

DRAWN BY : WMC 7/11 REV. 10/1/11 MAA/GM
 CHECKED BY : GM 7/11

DESIGN ENGINEER OF RECORD:
 A. M. LEE DATE : 9-16

DocuSigned by:
 Wael Arafat 10/12/2016

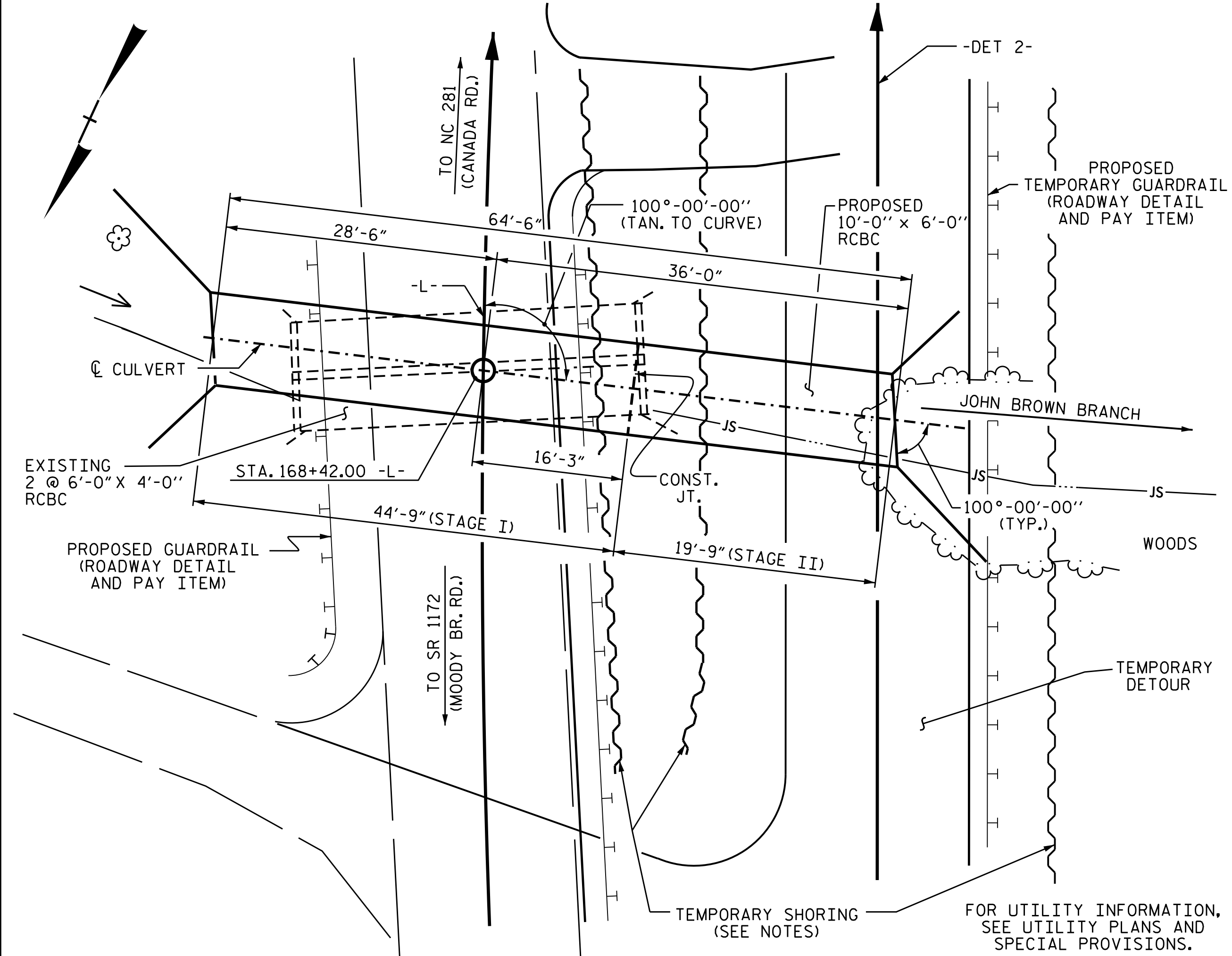
DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-7
1			3			TOTAL SHEETS
2			4			14

CULVERT #1

BENCHMARK: (BL36) (N 582713.461, E 769297.153), STA. 170+73 -L-, 30' LEFT. NCDOT
 MONUMENT SET IN SHOULDER, EL. 2159.17'

F. A. PROJECT NO.: STP-0107(10)



LOCATION SKETCH

ROADWAY DATA

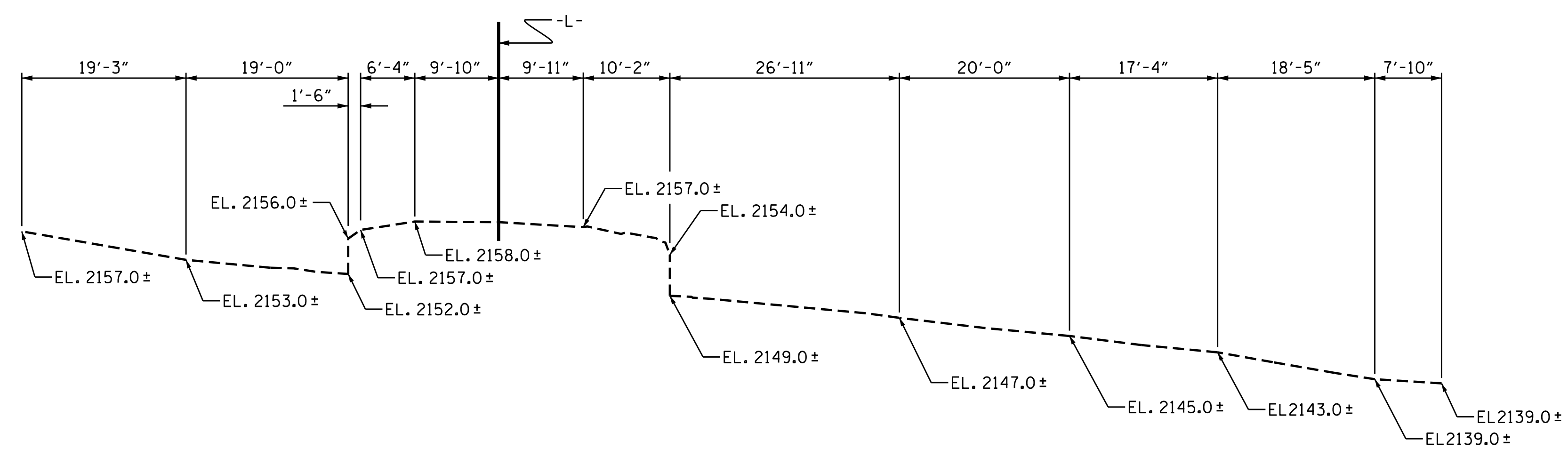
GRADE POINT EL. @ STA. 168+42.00 -L- ----- = 2158.90'
 BED EL. @ STA. 168+42.00 -L- ----- = 2149.07'
 ROADWAY SLOPES ----- = VARIES

HYDRAULIC DATA

DESIGN DISCHARGE ----- = 280 C.F.S.
 FREQUENCY OF DESIGN FLOOD ----- = 50 YEARS
 DESIGN HIGH WATER ELEVATION ----- = 2156.6
 DRAINAGE AREA ----- = 225 AC.
 BASE DISCHARGE (Q100) ----- = 330 C.F.S.
 BASE HIGH WATER ELEVATION ----- = 2157.2

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE ----- = 500 C.F.S.
 FREQUENCY OF OVERTOPPING FLOOD ----- = 500 YEARS
 OVERTOPPING FLOOD ELEVATION ----- = 2159.2
 @ STA. 168+42.00 -L-



PROFILE ALONG CULVERT

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
 DESIGN FILL = 2.83 FT. MIN. AND 4.34 FT. MAX.
 FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.
 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
 CONCRETE IN STAGE I CULVERT TO BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS, CURTAIN WALL AND FLOOR SLAB INCLUDING 4" OF VERTICAL WALLS.
 2. THE REMAINING PORTIONS OF WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB, HEADWALL, SILLS AND BAFFLES.
 CONCRETE IN STAGE II CULVERT TO BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS, CURTAIN WALL AND FLOOR SLAB INCLUDING 4" OF VERTICAL WALLS.
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB, HEADWALL, SILLS AND BAFFLES.
 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 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 CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.
 FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
 FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
 FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
 FOR CRANE SAFETY, 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.
 THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE BARS FROM WHICH THE SAMPLES ARE TAKEN MUST THEN BE SPLICED WITH REPLACEMENT BARS OF THE SIZE AND LENGTH OF THE SAMPLE, PLUS A MINIMUM LAP SPLICE OF THIRTY BAR DIAMETERS. PAYMENT FOR THE SAMPLES OF REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
 A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
 TRAFFIC ON NC 107 SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS SHOWN ON THESE PLANS AND/OR AS DIRECTED BY THE ENGINEER.
 AFTER SERVING AS A TEMPORARY STRUCTURE, THE EXISTING DOUBLE 6' X 4' X 38' LONG RCBC AND LOCATED AT THE PROPOSED CULVERT SHALL BE REMOVED. THE EXISTING STRUCTURE IS PRESENTLY NOT POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE STRUCTURE DETERIORATE DURING CONSTRUCTION OF THE PROPOSED STRUCTURE, A LOAD LIMIT MAY BE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
STAGE I	51.0 C.Y.
STAGE II	27.2 C.Y.
TOTAL	78.2 C.Y.
REINFORCING STEEL	
STAGE I	7,552 LBS.
STAGE II	3,705 LBS.
TOTAL	11,257 LBS.
CULVERT EXCAVATION LUMP SUM	
FOUNDATION CONDITIONING MATERIAL	
STAGE I	48 TONS
STAGE II	21 TONS
TOTAL	69 TONS

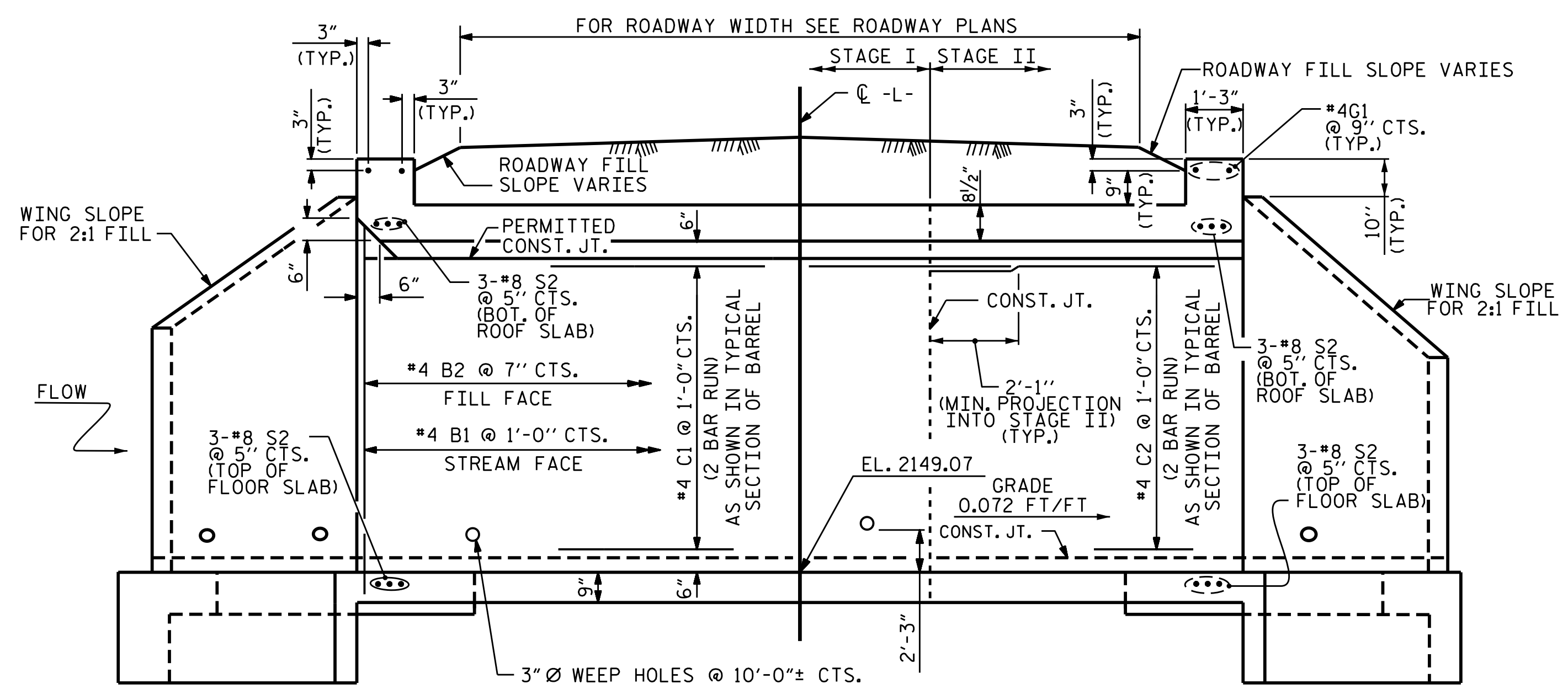
PROJECT NO. R-4753
JACKSON COUNTY
 STATION: 168+42.00 -L-

SHEET 1 OF 7
 STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE 10 FT. X 6 FT.
 CONCRETE BOX CULVERT
 100°-00'-00" SKEW

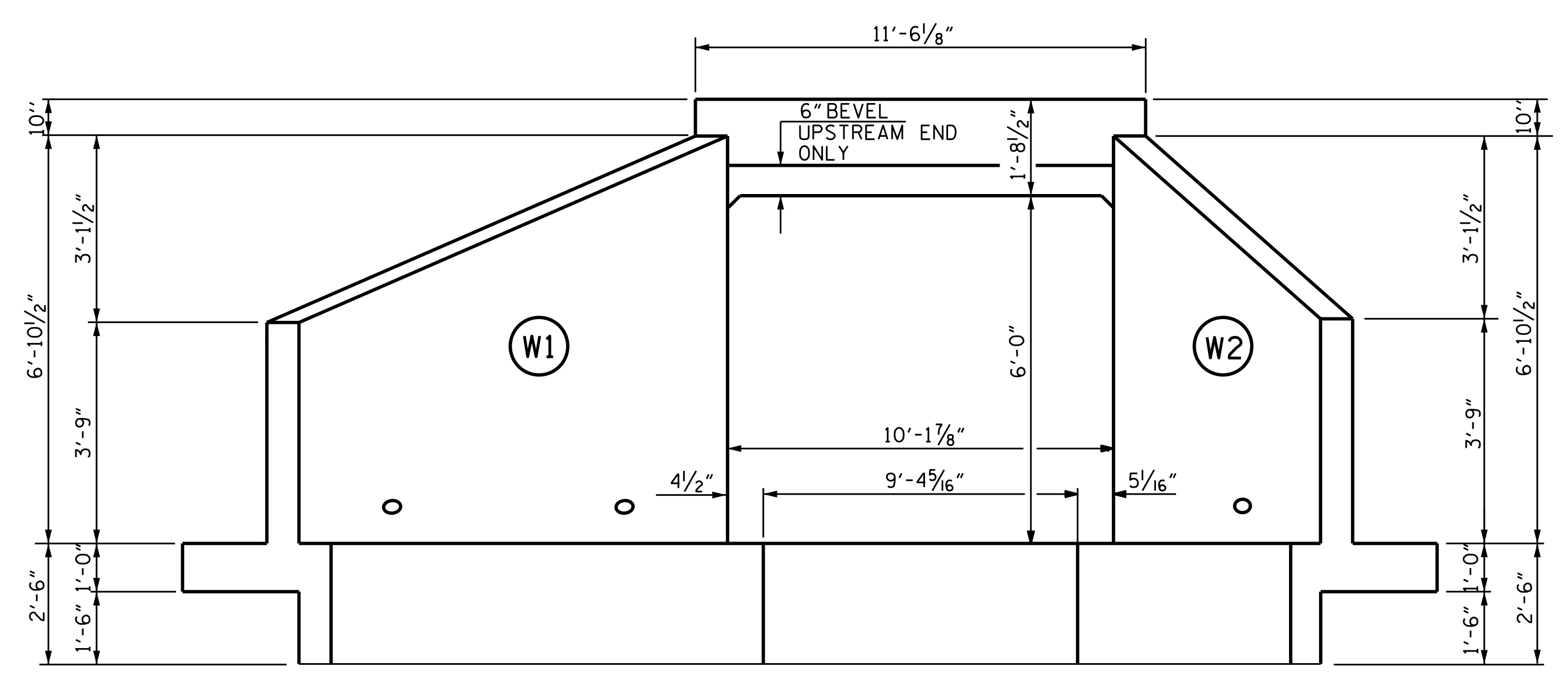


DRAWN BY : E.C.PHELPS/VXN DATE : 8-5-16
 CHECKED BY : H.T. BARBOUR DATE : 8-8-16
 DESIGN ENGINEER OF RECORD : A. M. LEE DATE : 9-16

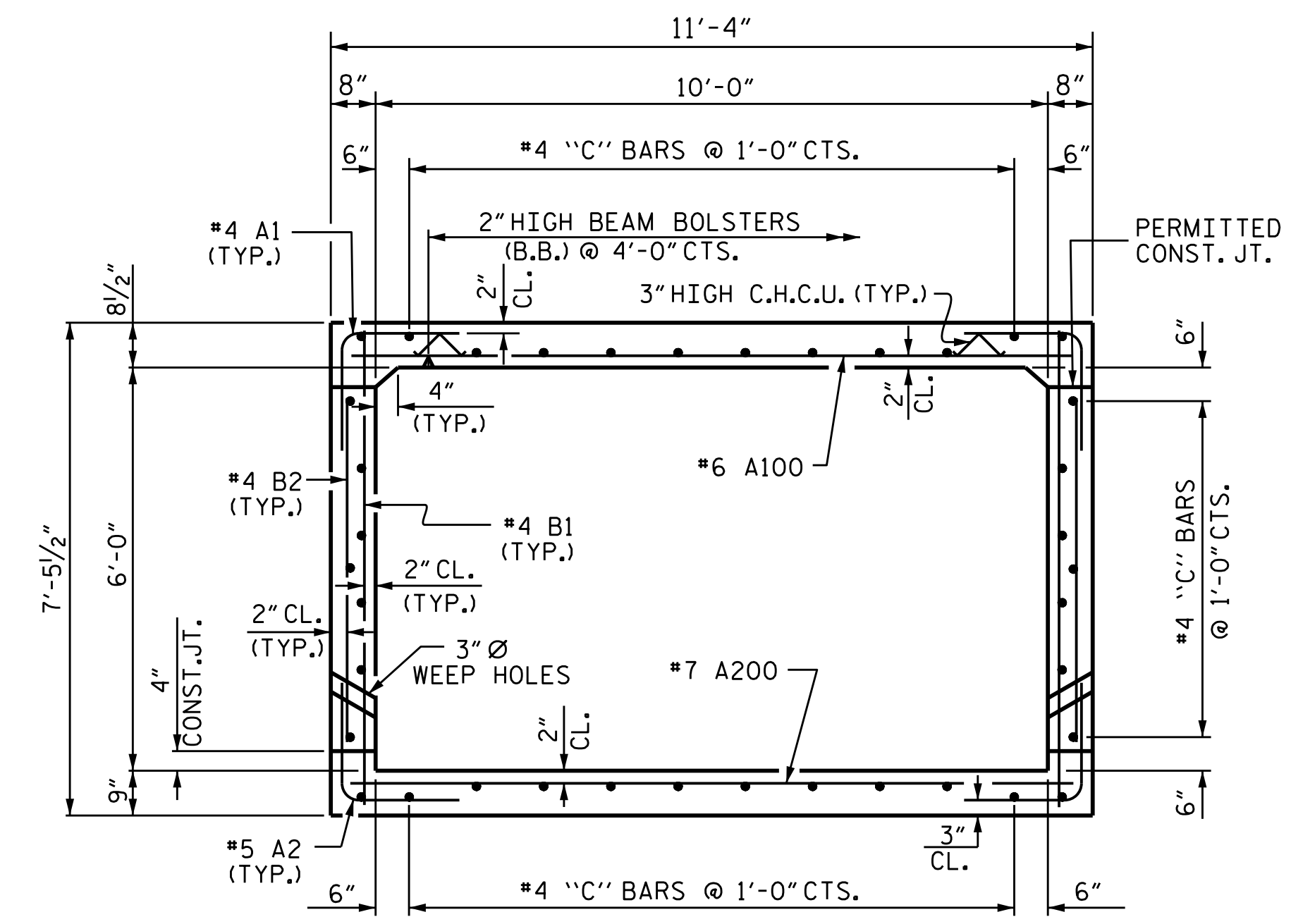
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED		REVISIONS		SHEET NO. C-8		
NO.	BY:	DATE:	NO.	BY:	DATE:	TOTAL SHEETS
1			3			14
2			4			



CULVERT SECTION NORMAL TO ROADWAY



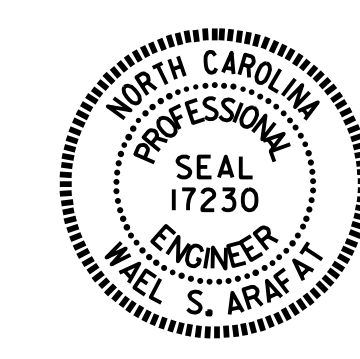
END ELEVATION NORMAL TO SKEW
 (LOOKING DOWN STREAM)



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

PROJECT NO. R-4753
JACKSON COUNTY
 STATION: 168+42.00 -L-

SHEET 2 OF 7

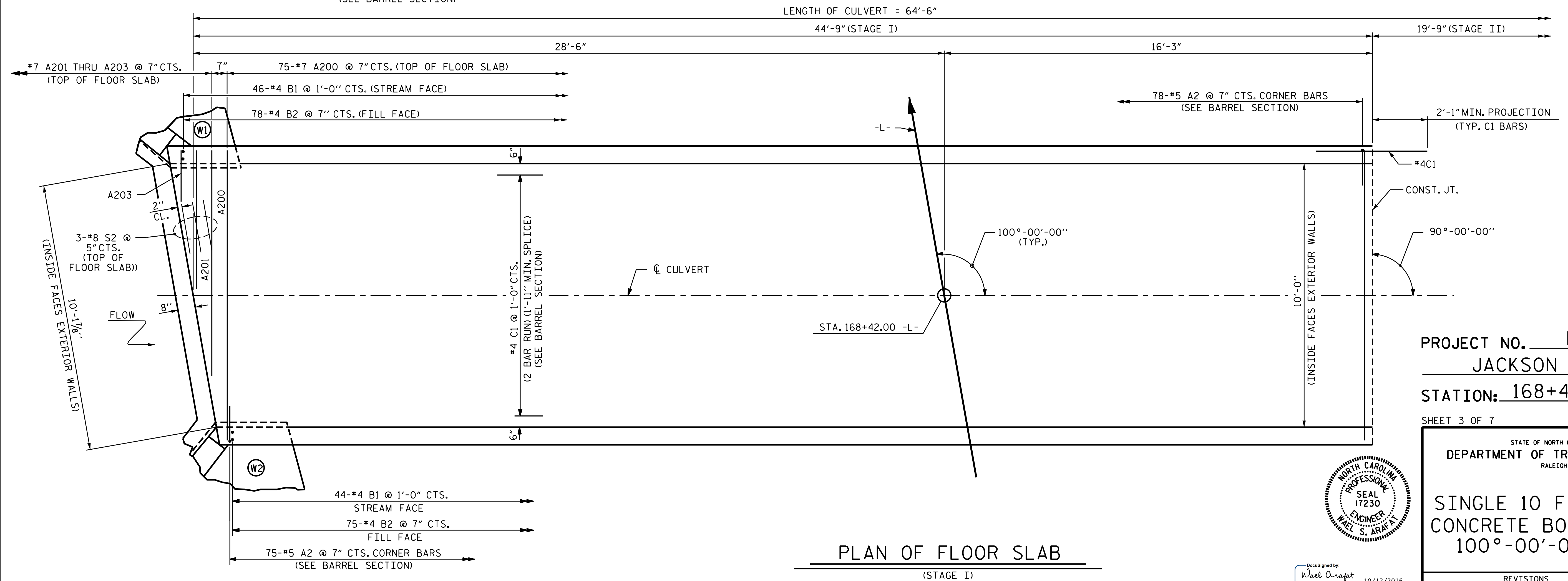
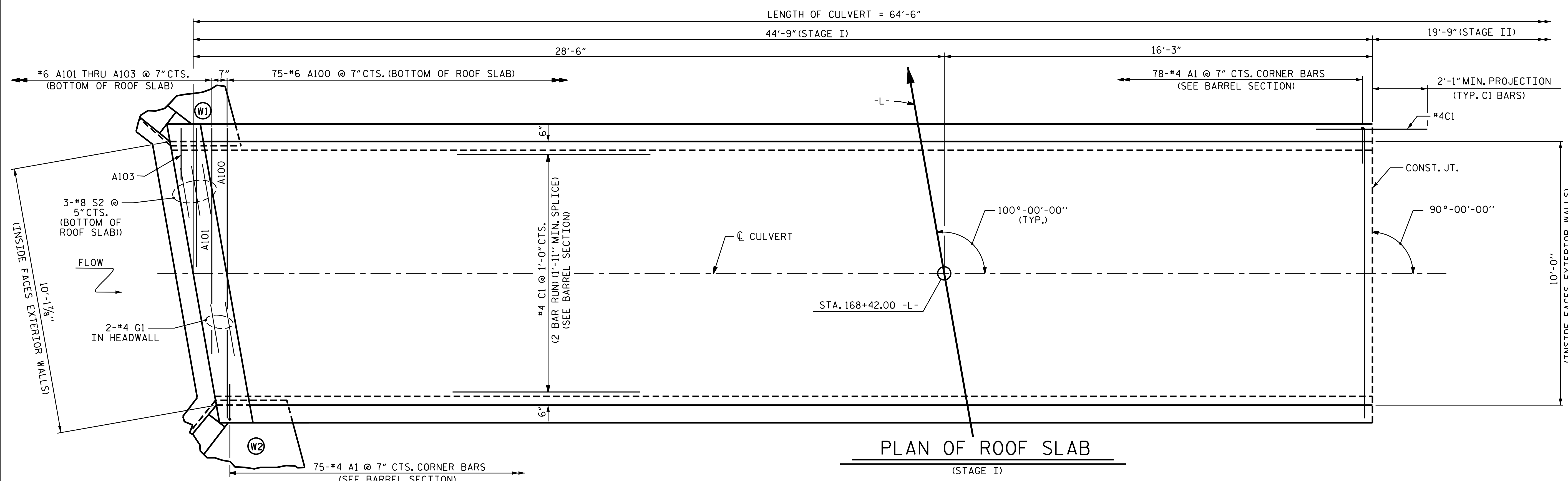


STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE 10 FT. X 6 FT.
 CONCRETE BOX CULVERT
 100°-00'-00" SKEW

DRAWN BY : E.C.PHELPS/VXN DATE : 8-5-16
 CHECKED BY : H.T. BARBOUR DATE : 8-8-16
 DESIGN ENGINEER OF RECORD: A. M. LEE DATE : 9-16

DocuSigned by:
 Waal Arafat
 10/12/2016
 DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO. C-9
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 14
2			4			



PROJECT NO. R-4753
JACKSON COUNTY
 STATION: 168+42.00 -L-

SHEET 3 OF 7



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

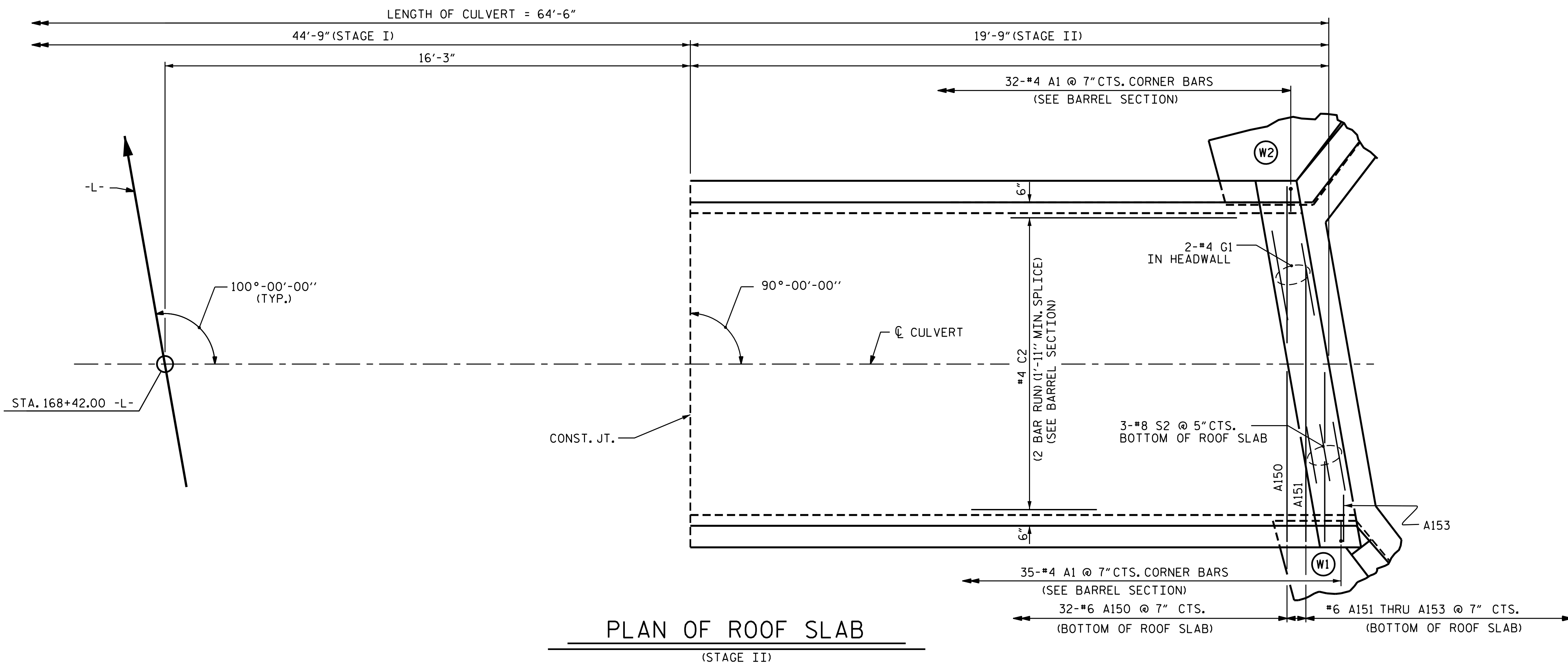
SINGLE 10 FT. X 6 FT.
 CONCRETE BOX CULVERT
 100°-00'-00" SKEW

DRAWN BY: E.C.PHELPS/VXN DATE: 8-5-16
 CHECKED BY: H.T. BARBOUR DATE: 8-8-16
 DESIGN ENGINEER OF RECORD: A. M. LEE DATE: 9-16

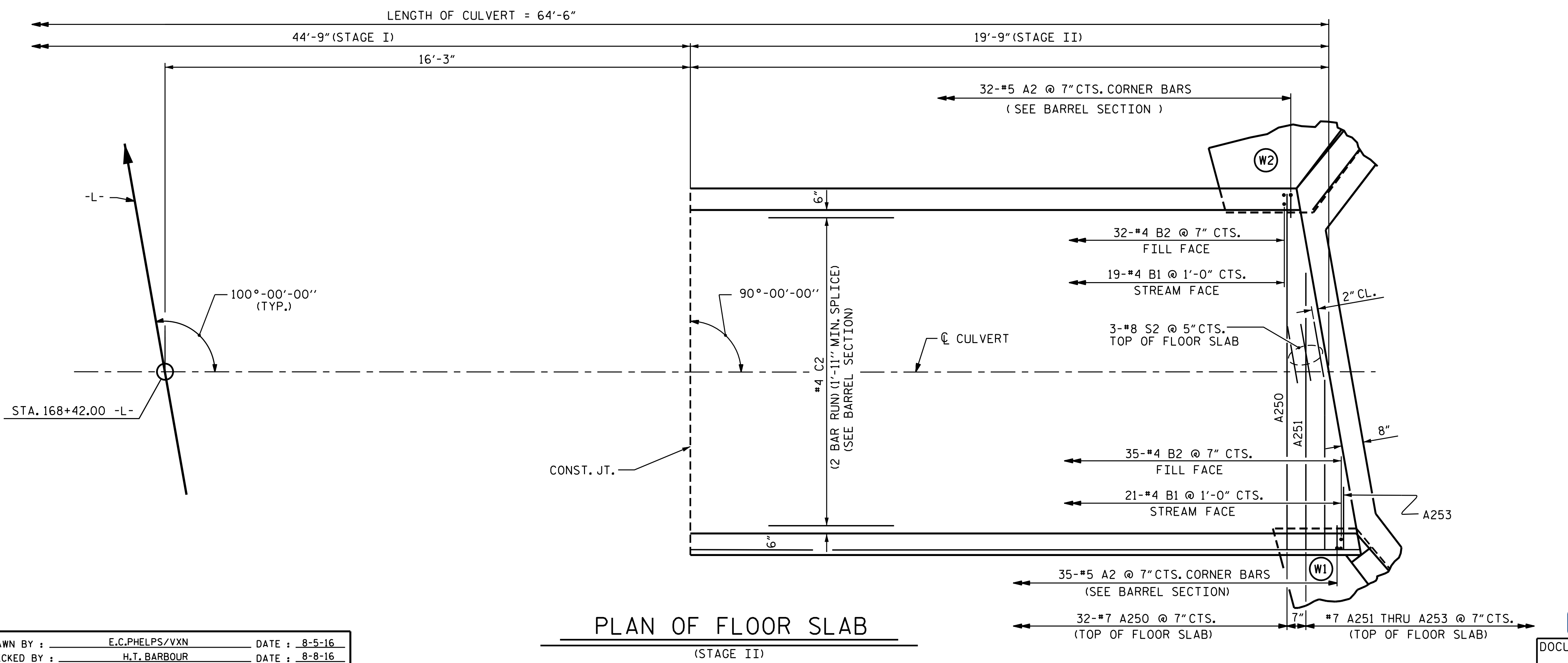
Documented by: Wael Arafat 10/12/2016
 4139C12A32AB406

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-10	
1			3			TOTAL SHEETS	14
2			4				



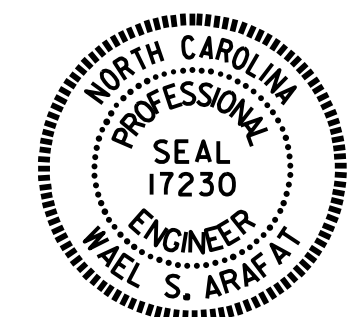
PLAN OF ROOF SLAB
(STAGE II)



PLAN OF FLOOR SLAB
(STAGE II)

PROJECT NO. R-4753
JACKSON COUNTY
 STATION: 168+42.00 -L-

SHEET 4 OF 7



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE 10 FT. X 6 FT.
 CONCRETE BOX CULVERT
 100°-00'-00" SKEW

DRAWN BY : E.C.PHELPS/VXN DATE : 8-5-16
 CHECKED BY : H.T. BARBOUR DATE : 8-8-16
 DESIGN ENGINEER OF RECORD: A. M. LEE DATE : 9-16

DocuSigned by:
 Wael Arafat 10/12/2016
 DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-11	
1			3			TOTAL SHEETS	
2			4			14	

NOTES

MATERIAL EXCAVATED FROM THE EXISTING BED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AND SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL AS SHOWN. THE MATERIAL SHALL BE NATURAL STONE WITH A GRADATION SIZE SIMILAR TO THAT OF CLASS B RIP RAP. STONES LARGER THAN 6 INCHES SHALL NOT BE PLACED WITHIN THE LOW FLOW CHANNEL. BED MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER, AND MAY BE SUBJECT TO PERMIT CONDITIONS.

THE STOCKPILED MATERIAL SHALL BE PLACED TO PROVIDE A DEPTH OF 1 FOOT IN LOW FLOW CHANNEL, AND 1'-6" FEET IN THE HIGH FLOW CHANNEL.

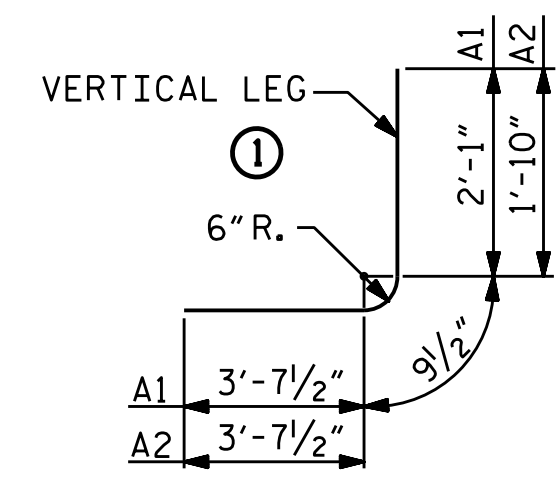
THE TOP OF BED MATERIAL IN THE LOW FLOW CHANNEL SHOULD MATCH THE STREAM BED ELEVATION.

BED MATERIAL SHALL BE SUPPLEMENTED BY CLASS B RIP RAP AS NECESSARY IN THE HIGH FLOW CHANNEL ONLY.

THE ENTIRE COST OF WORK REQUIRED TO PLACE THE EXCAVATED 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.

BAR TYPE



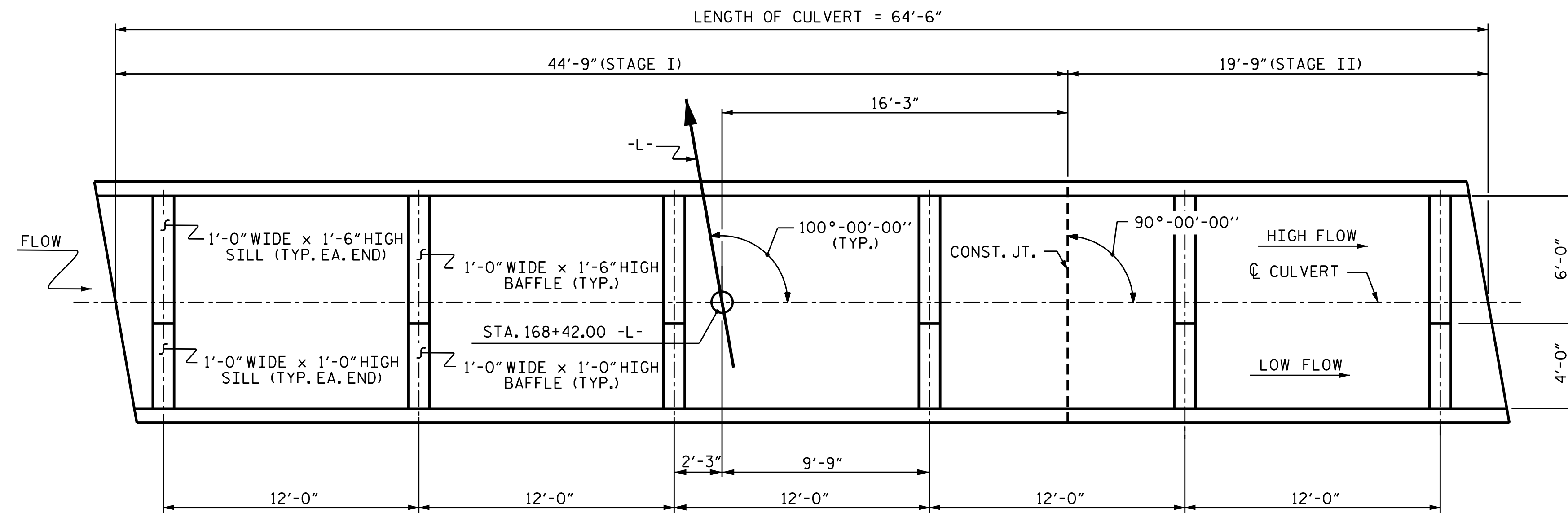
BAR DIMENSIONS ARE OUT TO OUT

SPLICE CHART

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

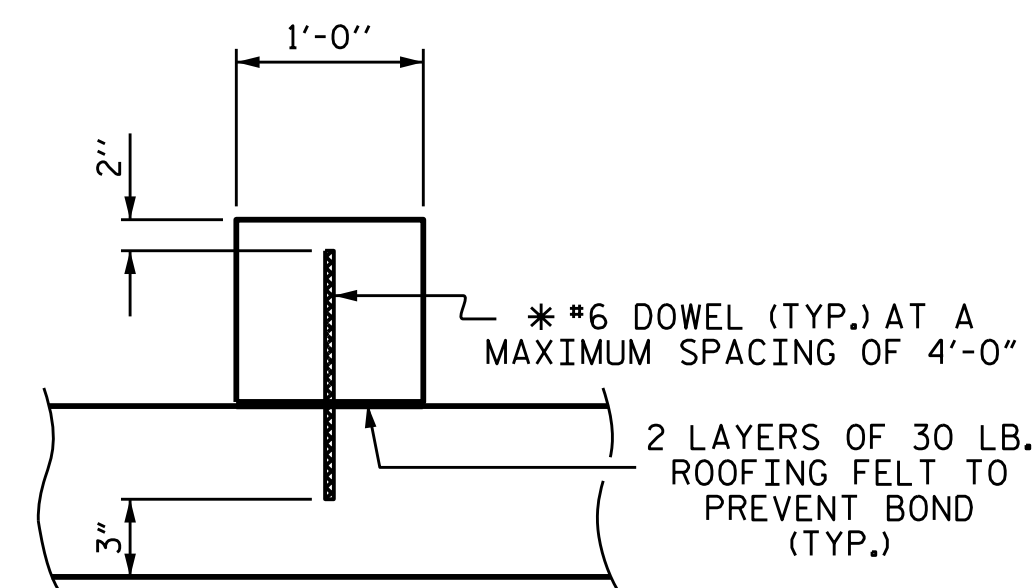
BAR SCHEDULE

STAGE I						STAGE II					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	153	#4	1	6'-6"	664	A1	67	#4	1	6'-6"	291
A2	153	#5	1	6'-3"	997	A2	67	#5	1	6'-3"	437
A100	75	#6	STR	10'-11"	1230	A150	32	#6	STR	10'-11"	525
A101	1	#6	STR	8'-6"	13	A151	1	#6	STR	9'-0"	14
A102	1	#6	STR	5'-2"	8	A152	1	#6	STR	5'-8"	9
A103	1	#6	STR	1'-11"	3	A153	1	#6	STR	2'-4"	4
A200	75	#7	STR	10'-11"	1674	A250	32	#7	STR	10'-11"	714
A201	1	#7	STR	8'-6"	17	A251	1	#7	STR	9'-0"	18
A202	1	#7	STR	5'-2"	11	A252	1	#7	STR	5'-8"	12
A203	1	#7	STR	1'-11"	4	A253	1	#7	STR	2'-4"	5
B1	90	#4	STR	6'-11"	416	B1	40	#4	STR	6'-11"	185
B2	153	#4	STR	5'-4"	545	B2	67	#4	STR	5'-4"	239
C1	76	#4	STR	24'-10"	1261	C2	76	#4	STR	11'-2"	567
D1	12	#6	STR	1'-10"	33	D1	6	#6	STR	1'-10"	17
D2	8	#6	STR	1'-4"	16	D2	4	#6	STR	1'-4"	8
G1	2	#4	STR	11'-2"	15	G1	2	#4	STR	11'-2"	15
S2	6	#8	STR	11'-2"	179	S2	6	#8	STR	11'-2"	179
REINFORCING STEEL = 7,086 LBS						REINFORCING STEEL = 3,239 LBS					



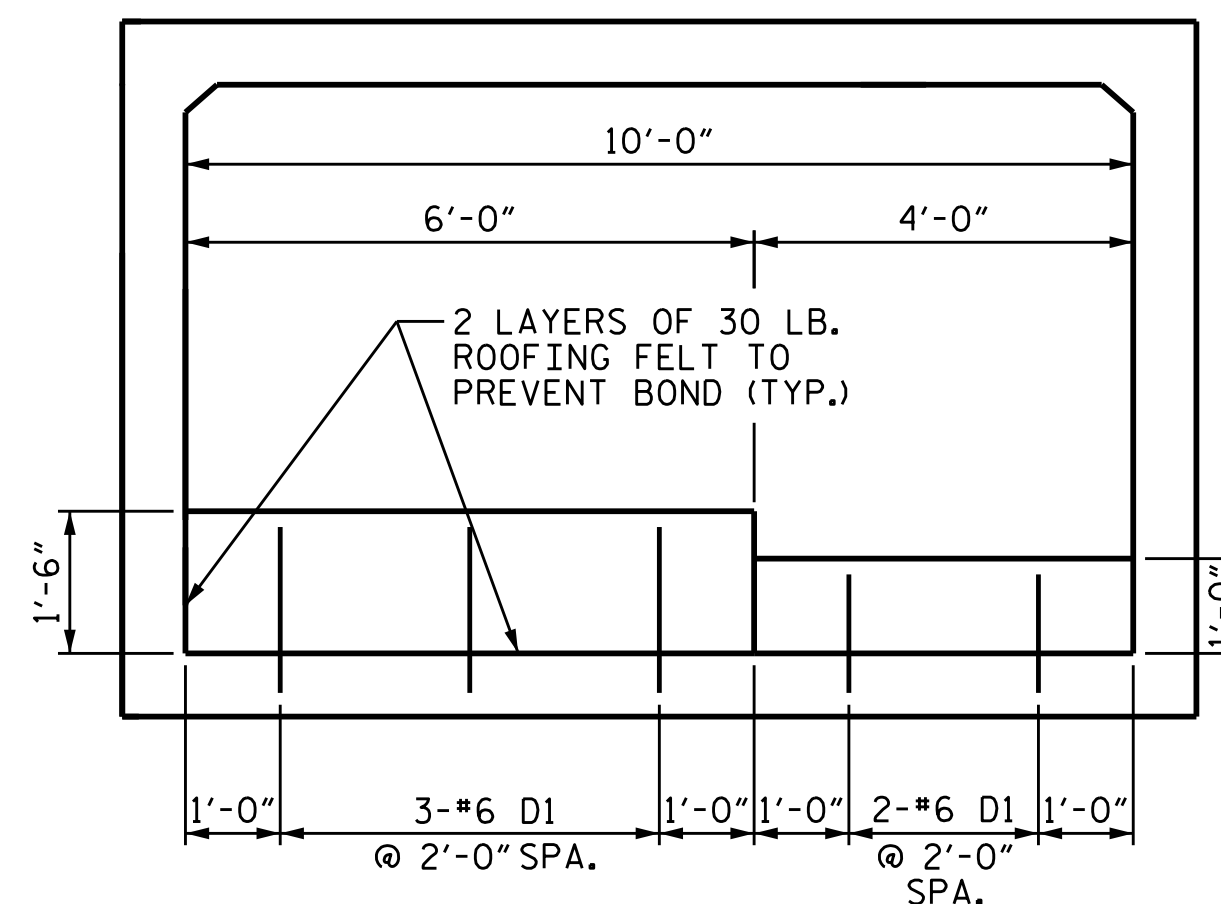
PLAN VIEW SHOWING SILL/BAFFLE LOCATIONS

STAGE I STRUCTURE QUANTITIES		STAGE II STRUCTURE QUANTITIES	
CLASS A CONCRETE		CLASS A CONCRETE	
BARREL @ 0.913 CY/FT	40.9 C.Y.	BARREL @ 0.913 CY/FT	18.0 C.Y.
WINGS ETC.	8.2 C.Y.	WINGS ETC.	8.2 C.Y.
SILLS/BAFFLES	1.9 C.Y.	SILLS/BAFFLES	1.0 C.Y.
TOTAL	51.0 C.Y.	TOTAL	27.2 C.Y.
REINFORCING STEEL		REINFORCING STEEL	
BARREL	7,086 LBS.	BARREL	3,239 LBS.
WING ETC.	466 LBS.	WING ETC.	466 LBS.
TOTAL	7,552 LBS.	TOTAL	3,705 LBS.
CULVERT EXCAVATION	LUMP SUM	CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	48 TONS	FOUNDATION CONDITIONING MATERIAL	21 TONS



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

SECTION THROUGH SILL/BAFFLE



**ELEVATION
(LOOKING DOWNSTREAM)**

CULVERT SILL/BAFFLE DETAILS

PROJECT NO. R-4753
JACKSON COUNTY
 STATION: 168+42.00 -L-

SHEET 5 OF 7



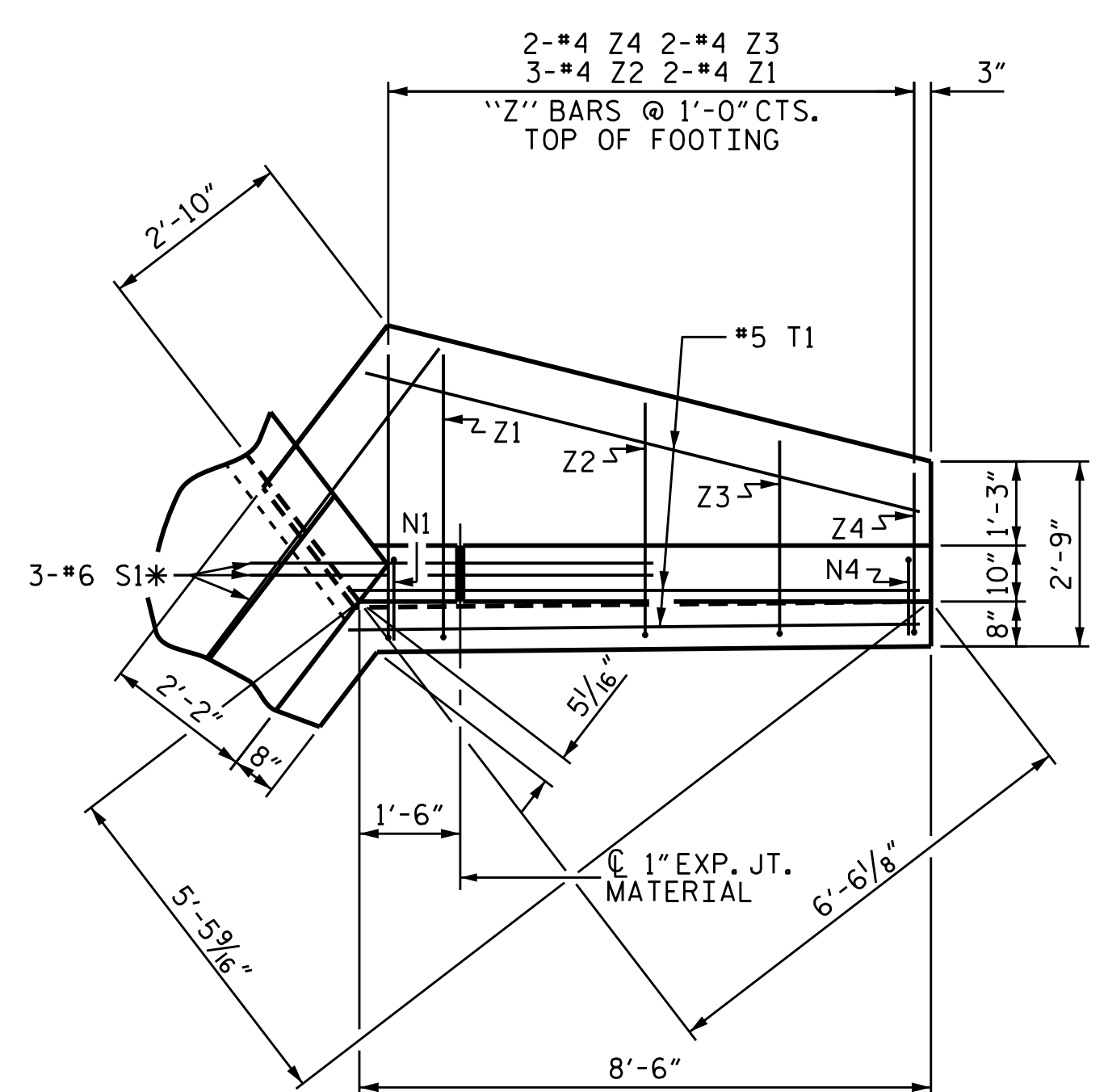
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**SINGLE 10 FT. X 6 FT.
 CONCRETE BOX CULVERT
 100°-00'-00" SKEW**

DRAWN BY :	E.C.PHELPS/VXN	DATE :	8-5-16
CHECKED BY :	H.T. BARBOUR	DATE :	8-8-16
DESIGN ENGINEER OF RECORD:	A. M. LEE	DATE :	9-16

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

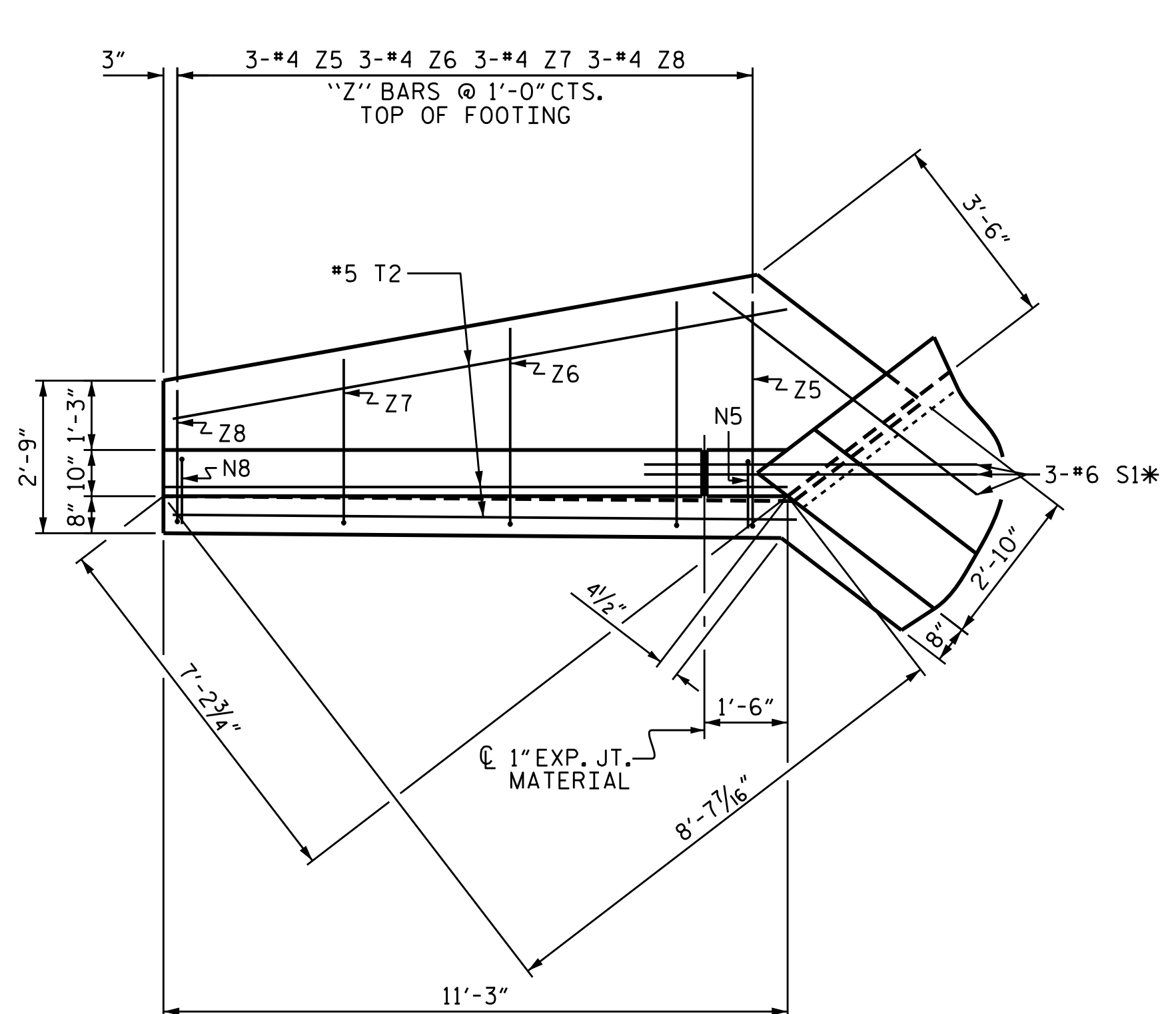
REVISIONS				SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

TOTAL SHEETS 14

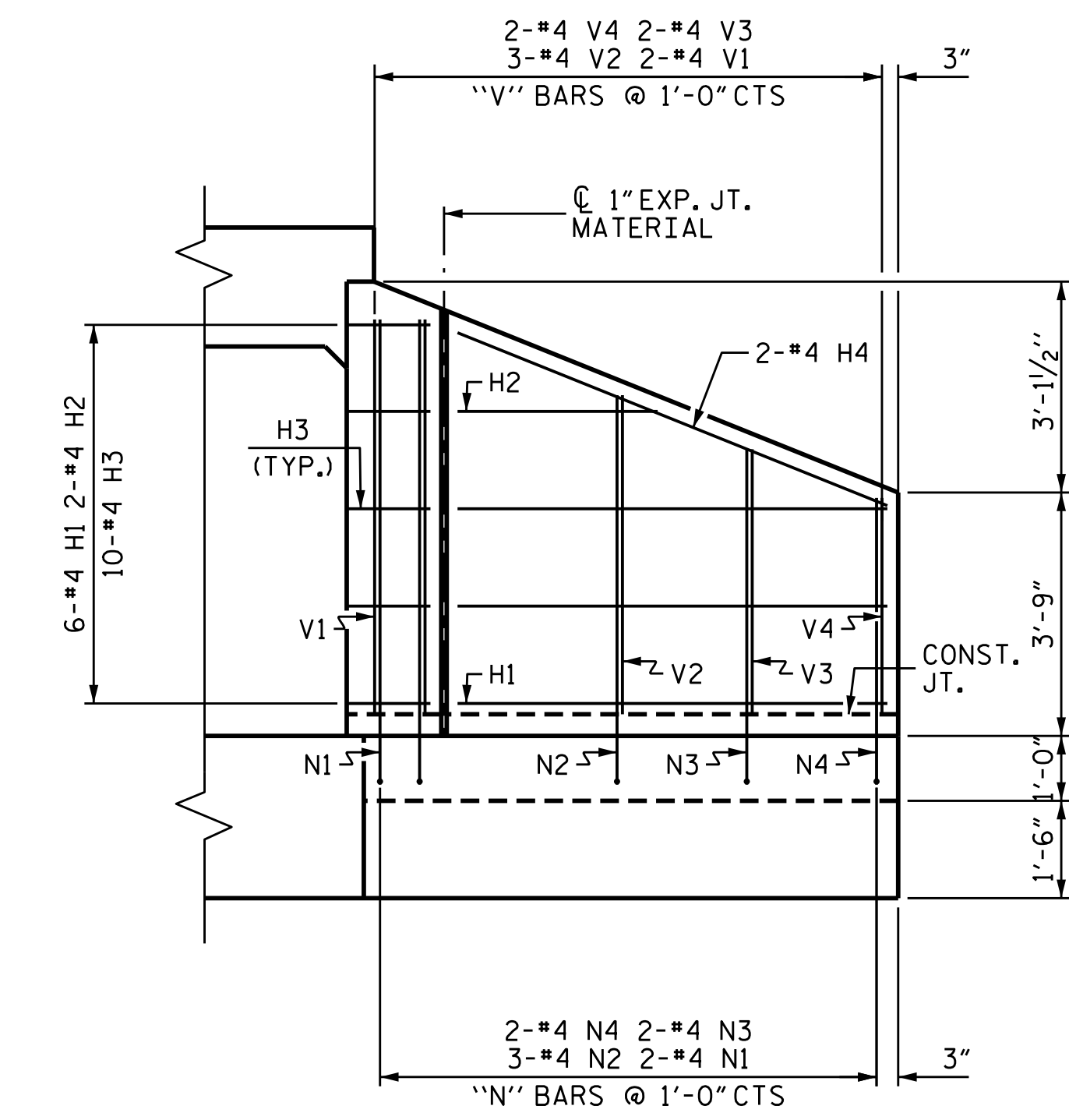


PLAN W2

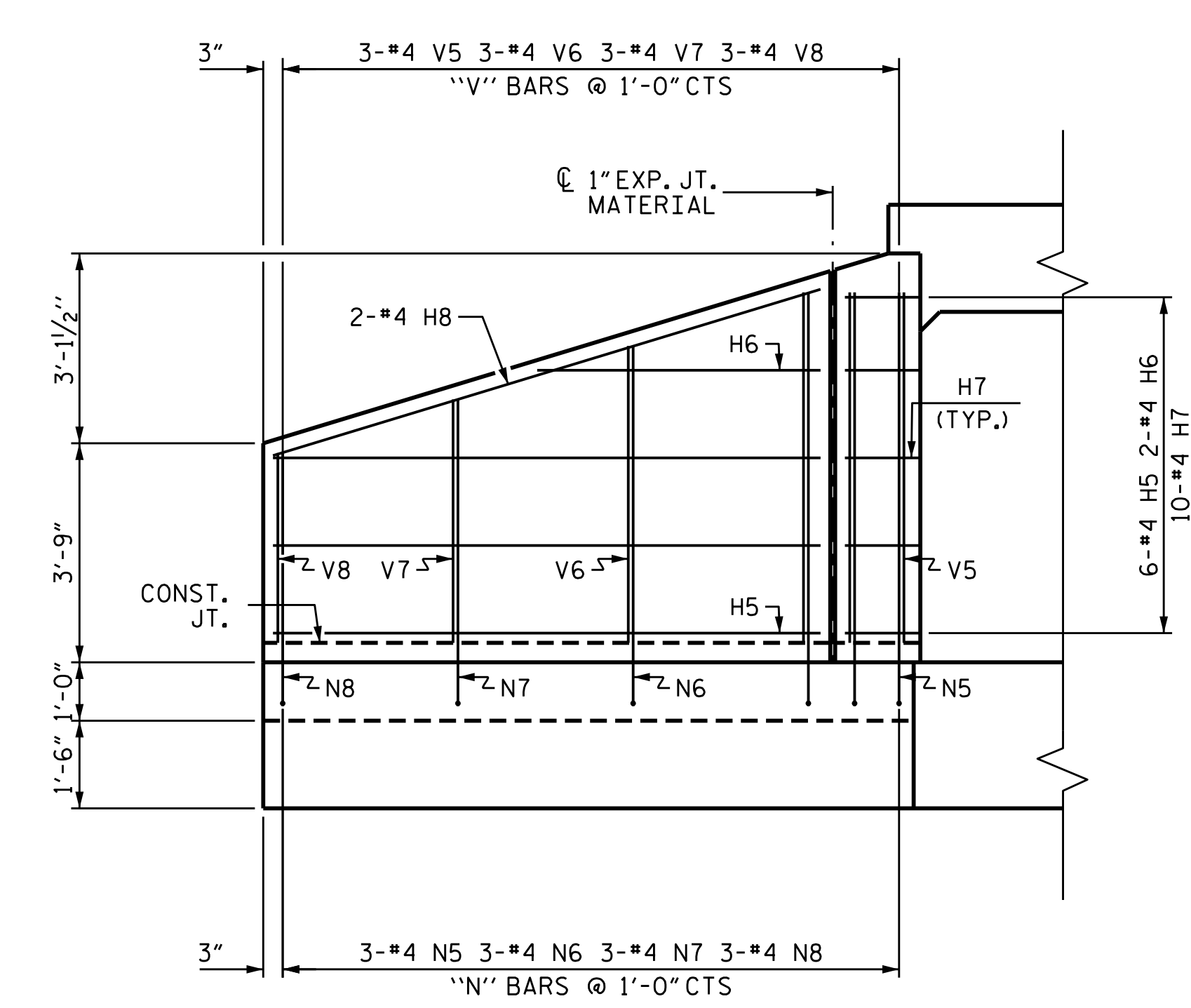
* S1 @ BOTTOM OF FLOOR SLAB & FOOTING



PLAN W1

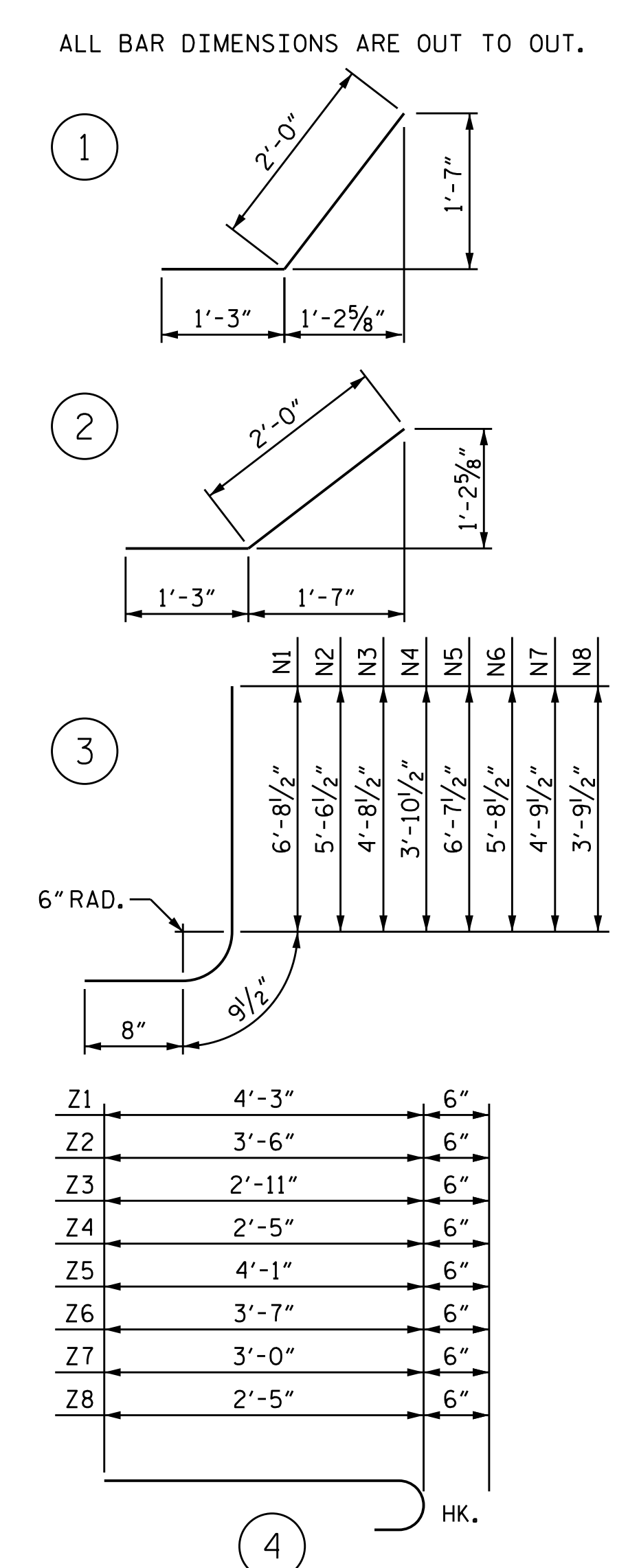


ELEVATION W2



ELEVATION W1

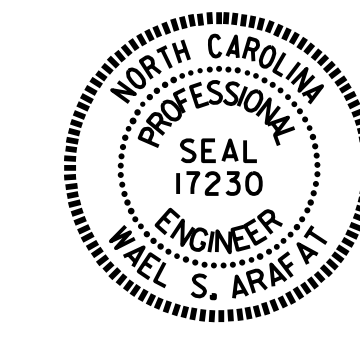
BAR TYPES		BILL OF MATERIAL			
STAGE I OR STAGE II					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	6	#4	STR	6'-7"	26
H2	2	#4	STR	3'-1"	4
H3	10	#4	1	3'-3"	22
H4	2	#4	STR	7'-1"	9
H5	6	#4	STR	9'-4"	37
H6	2	#4	STR	4'-10"	6
H7	10	#4	2	3'-3"	22
H8	2	#4	STR	9'-9"	13
N1	2	#4	3	8'-2"	11
N2	3	#4	3	7'-0"	14
N3	2	#4	3	6'-2"	8
N4	2	#4	3	5'-4"	7
N5	3	#4	3	8'-1"	16
N6	3	#4	3	7'-2"	14
N7	3	#4	3	6'-3"	13
N8	3	#4	3	5'-3"	11
S1	6	#6	STR	6'-0"	54
T1	3	#5	STR	8'-6"	27
T2	3	#5	STR	11'-3"	35
V1	2	#4	STR	6'-1"	8
V2	3	#4	STR	4'-11"	10
V3	2	#4	STR	4'-1"	5
V4	2	#4	STR	3'-4"	4
V5	3	#4	STR	6'-0"	12
V6	3	#4	STR	5'-1"	10
V7	3	#4	STR	4'-2"	8
V8	3	#4	STR	3'-3"	7
Z1	2	#4	4	4'-9"	6
Z2	3	#4	4	4'-0"	8
Z3	2	#4	4	3'-5"	5
Z4	2	#4	4	2'-11"	4
Z5	3	#4	4	4'-7"	9
Z6	3	#4	4	4'-1"	8
Z7	3	#4	4	3'-6"	7
Z8	3	#4	4	2'-11"	6
REINFORCING STEEL FOR 2 WINGS					466 LBS
CLASS A CONCRETE					
2 WINGS					7.1 CY
1 HEADWALL					0.5 CY
1 END CURTAIN WALL					0.6 CY
TOTAL					8.2 CY



TYPICAL WING SECTION

PROJECT NO. R-4753
JACKSON COUNTY
 STATION: 168+42.00 -L-

SHEET 6 OF 7



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
WINGS FOR CONCRETE BOX CULVERT
 H = 6'-0" SLOPE = 2:1
 100°-00'-00" SKEW
 STAGE I OR II

ASSEMBLED BY : E.C. PHELPS/VXN DATE : 8/5/16
 CHECKED BY : H.T. BARBOUR DATE : 8/8/16
 DRAWN BY : CCJ 12/99
 CHECKED BY : RWW 03/00

DocuSigned by:
 Wael Arafa
 4190C12A328A906 10/12/2016
 DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

TOTAL SHEETS: 14

CULVERT #2

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

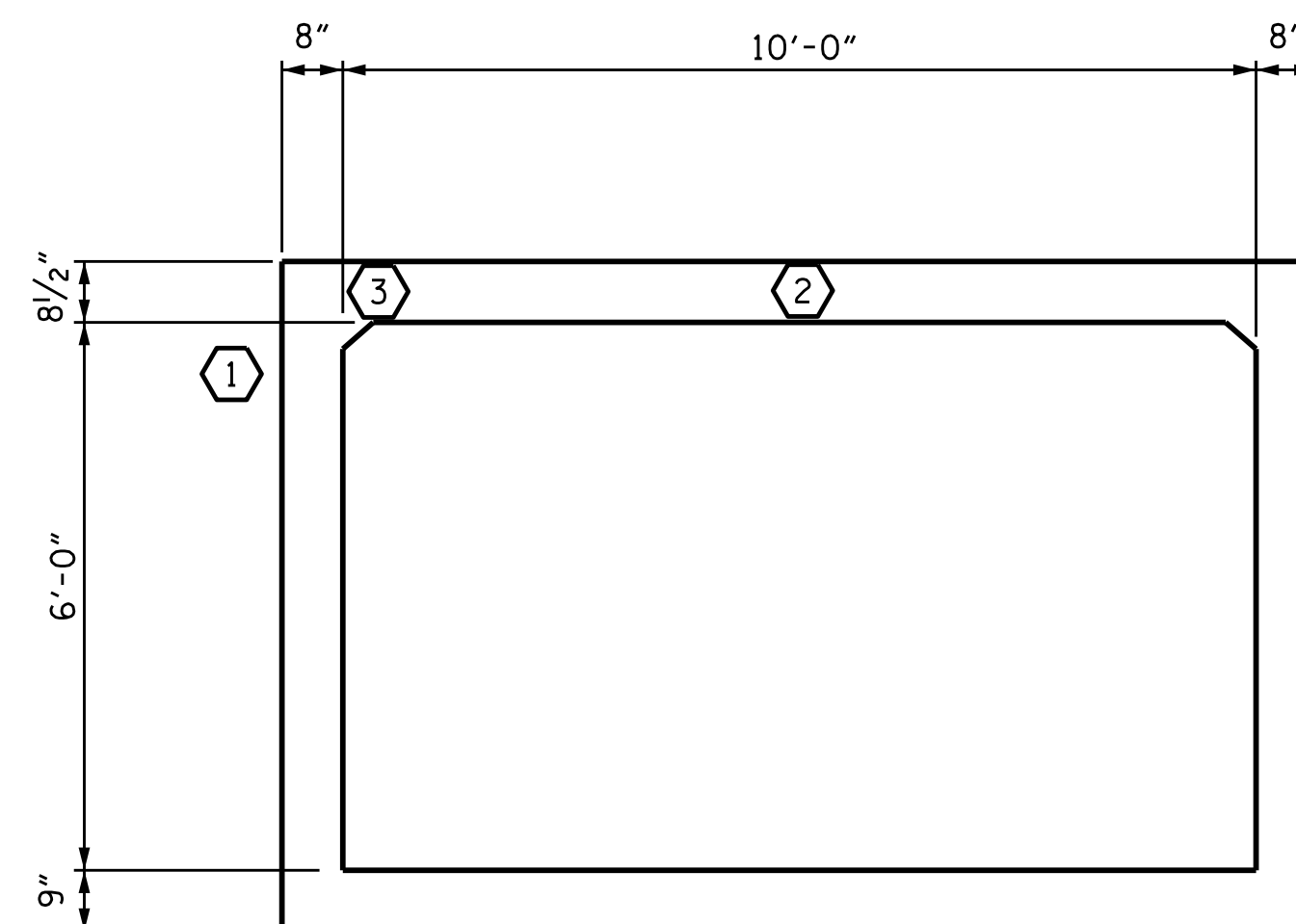
LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						LIVE-LOAD FACTORS (γ _{LL})	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	①	1.00	--	1.75	1.00	1	TOP CORNER WALL	0.67	1.00	1	TOP SLAB	0.84		
	HL-93 (OPERATING)	N/A		1.30	--	1.35	1.30	1	TOP CORNER WALL	0.67	1.30	1	TOP SLAB	0.84		
	HS-20 (INVENTORY)	36.000	②	1.08	39.00	1.75	1.08	1	TOP SLAB	5.33	1.18	1	TOP SLAB	0.84		
	HS-20 (OPERATING)	36.000		1.40	50.56	1.35	1.40	1	TOP SLAB	5.33	1.53	1	TOP SLAB	0.84		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		1.96	26.52	1.40	1.96	1	TOP SLAB	5.33	2.15	1	TOP SLAB	0.84	
		SNGARBS2	20.000		1.84	36.77	1.40	1.84	1	TOP SLAB	5.33	2.01	1	TOP SLAB	0.84	
		SNAGRIS2	22.000		1.96	43.22	1.40	1.96	1	TOP SLAB	5.33	2.15	1	TOP SLAB	0.84	
		SNCOTTS3	27.250	③	1.21	33.04	1.40	1.21	1	TOP CORNER WALL	0.67	1.26	1	TOP SLAB	0.84	
		SNAGGRS4	34.925		1.39	48.66	1.40	1.52	1	TOP CORNER WALL	0.67	1.39	1	BOTTOM SLAB	9.79	
		SNS5A	35.550		1.40	49.90	1.40	1.40	1	TOP CORNER WALL	0.67	1.44	1	BOTTOM SLAB	9.79	
		SNS6A	39.950		1.40	56.08	1.40	1.40	1	TOP CORNER WALL	0.67	1.44	1	BOTTOM SLAB	9.79	
		SNS7B	42.000		1.40	58.95	1.40	1.40	1	TOP CORNER WALL	0.67	1.44	1	BOTTOM SLAB	9.79	
	TRUCK TRACTOR SEMI-TRAILER (TTS)	TNAGRIT3	33.000		1.96	64.83	1.40	1.96	1	TOP SLAB	5.33	2.12	1	BOTTOM SLAB	0.87	
		TNT4A	33.075		1.41	46.73	1.40	1.41	1	TOP CORNER WALL	0.67	1.50	1	TOP SLAB	0.84	
		TNT6A	41.600		1.40	58.29	1.40	1.41	1	TOP CORNER WALL	0.67	1.40	1	BOTTOM SLAB	9.79	
		TNT7A	42.000		1.41	59.39	1.40	1.41	1	TOP CORNER WALL	0.67	1.49	1	TOP SLAB	9.82	
		TNT7B	42.000		1.41	59.34	1.40	1.41	1	TOP CORNER WALL	0.67	1.45	1	BOTTOM SLAB	9.79	
		TNAGRIT4	43.000		1.36	58.27	1.40	1.36	1	TOP CORNER WALL	0.67	1.43	1	TOP SLAB	0.84	
TNAGT5A	45.000		1.39	62.47	1.40	1.39	1	TOP CORNER WALL	0.67	1.46	1	TOP SLAB	9.82			
TNAGT5B	45.000		1.41	63.63	1.40	1.41	1	TOP CORNER WALL	0.67	1.50	1	TOP 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	--

#	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. R-4753
JACKSON COUNTY
 STATION: 168+42.00 -L-

SHEET 7 OF 7



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

ASSEMBLED BY : E.C. PHELPS/V.X.N. DATE : 8-5-16
 CHECKED BY : H.T. BARBOUR DATE : 8-8-16

DRAWN BY : WMC 7/11
 CHECKED BY : GM 7/11

DESIGN ENGINEER OF RECORD:
A.M. LEE DATE : 9-16

DocuSigned by:
 Wael Arafa 10/12/2016

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-14
1			3			TOTAL SHEETS
2			4			14

CULVERT #2

