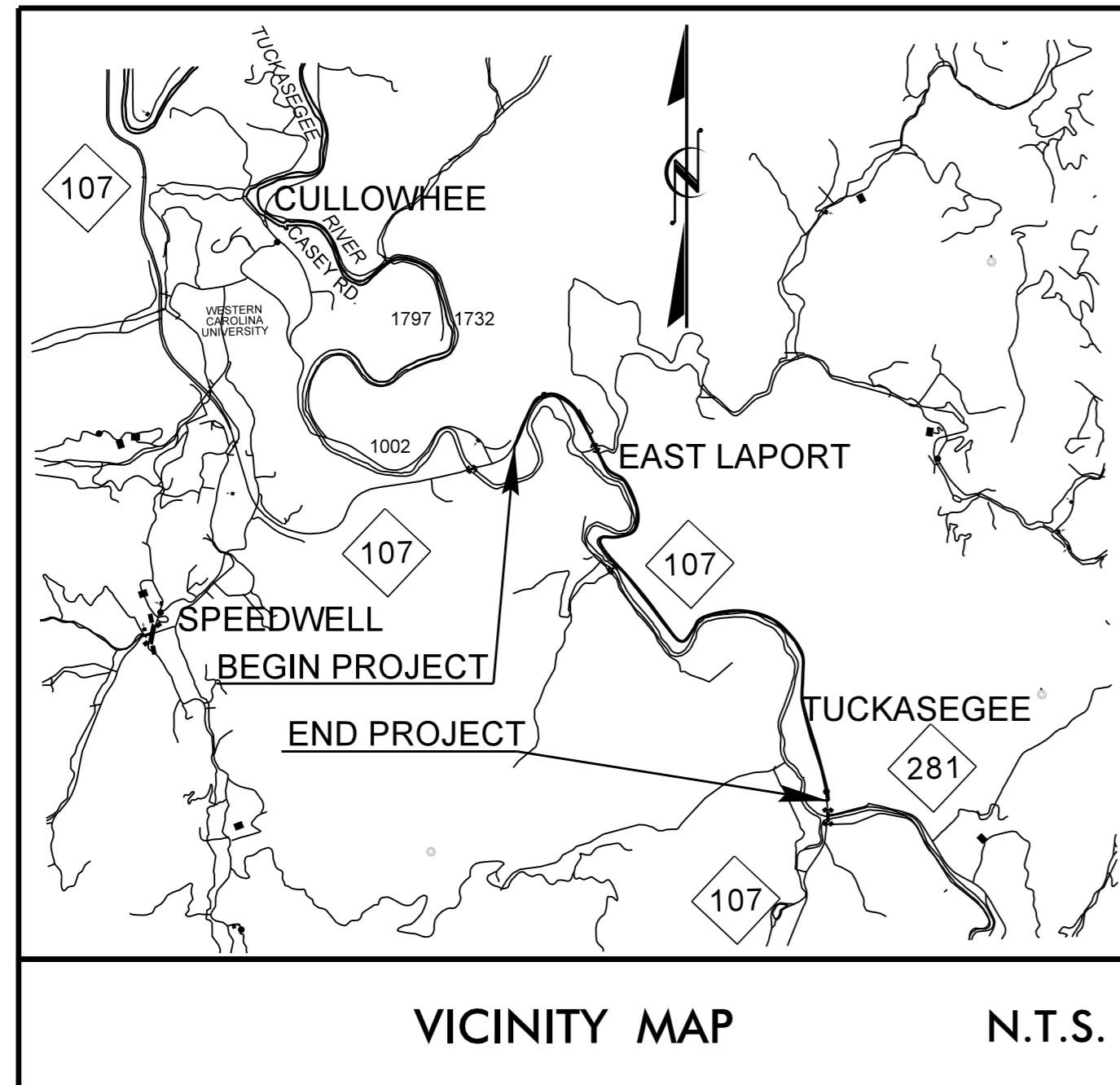


TIP PROJECT: R-4753

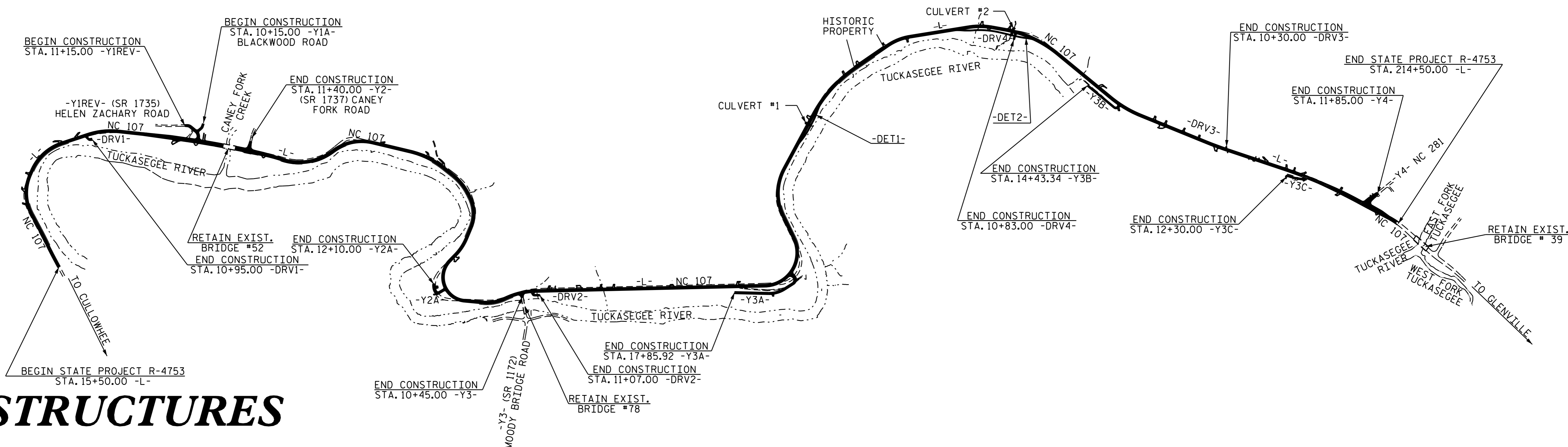
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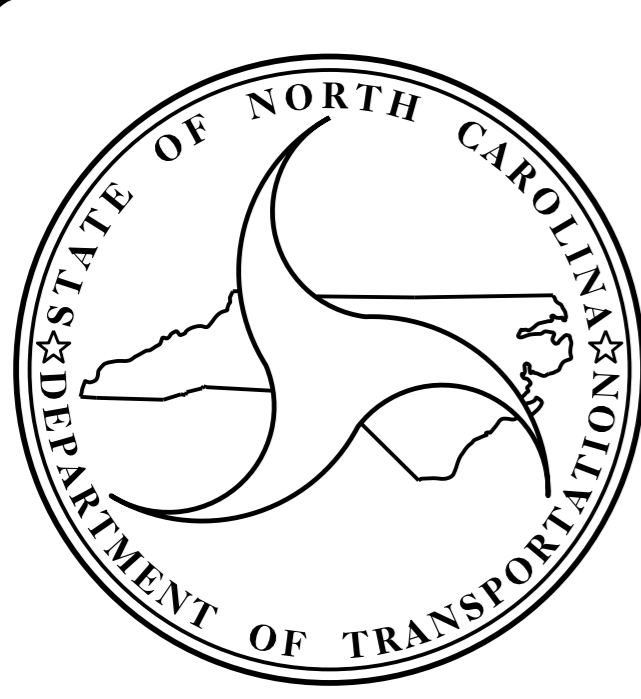
STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS  
**JACKSON COUNTY**

**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
<b>TOTAL LENGTH TIP PROJECT R-4753 =</b>	<b>3.769 MILES</b>

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

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2012 STANDARD SPECIFICATIONS

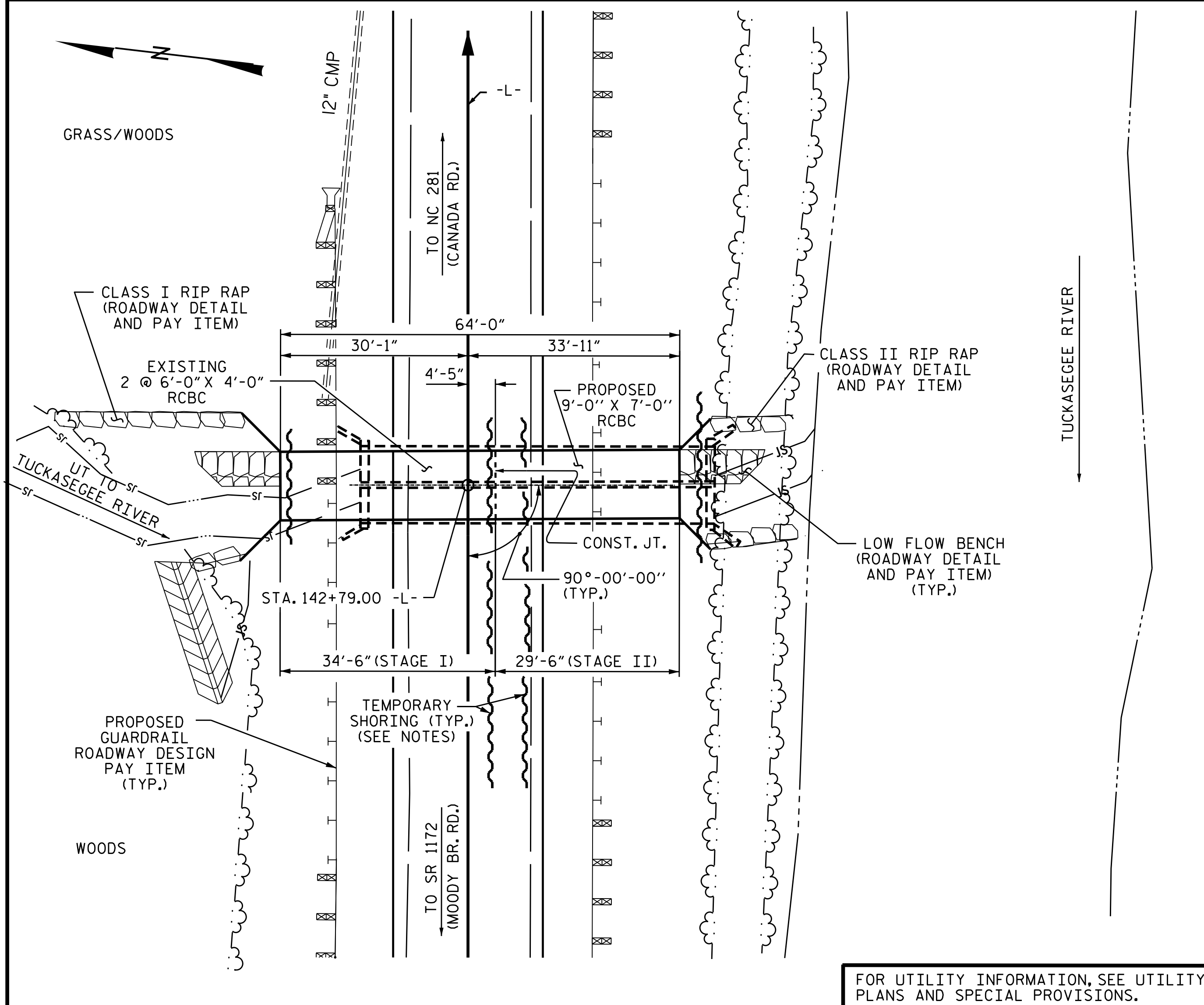
**LETTING DATE :**  
JANUARY 17, 2017

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

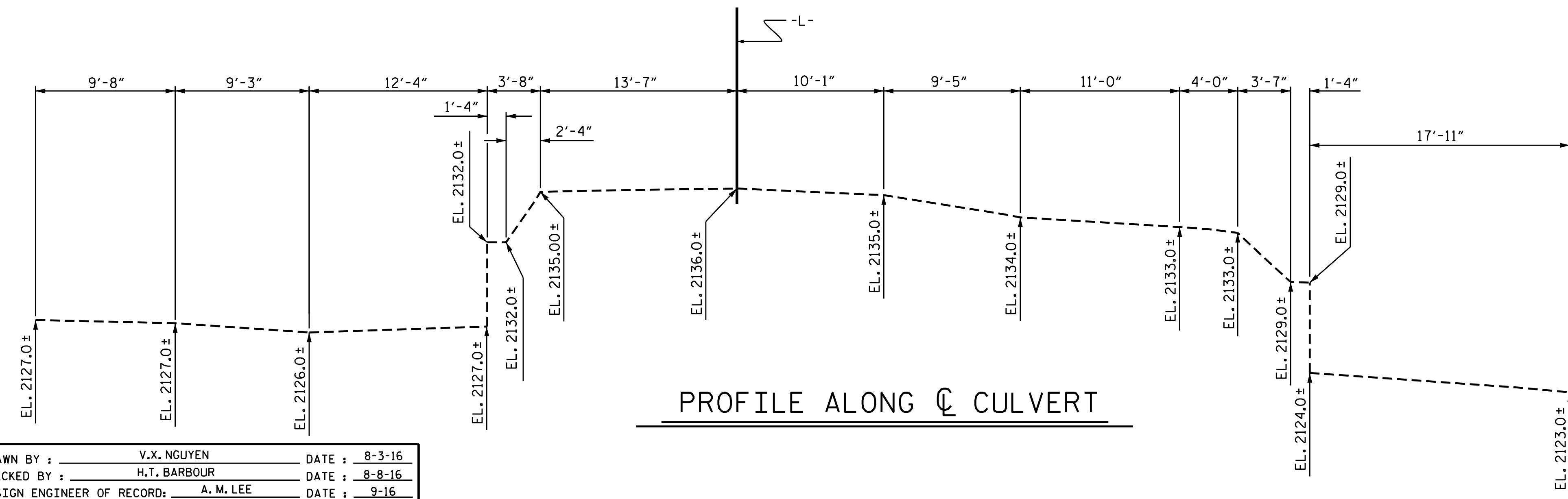
DESIGN DISCHARGE -----	=	290 C.F.S.
FREQUENCY OF DESIGN FLOOD -----	=	50 YEARS
DESIGN HIGH WATER ELEVATION -----	=	2131.0
DRAINAGE AREA -----	=	200 AC.
BASE DISCHARGE (Q100) -----	=	350 C.F.S.
BASE HIGH WATER ELEVATION -----	=	2132.1

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



PROFILE ALONG CULVERT

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

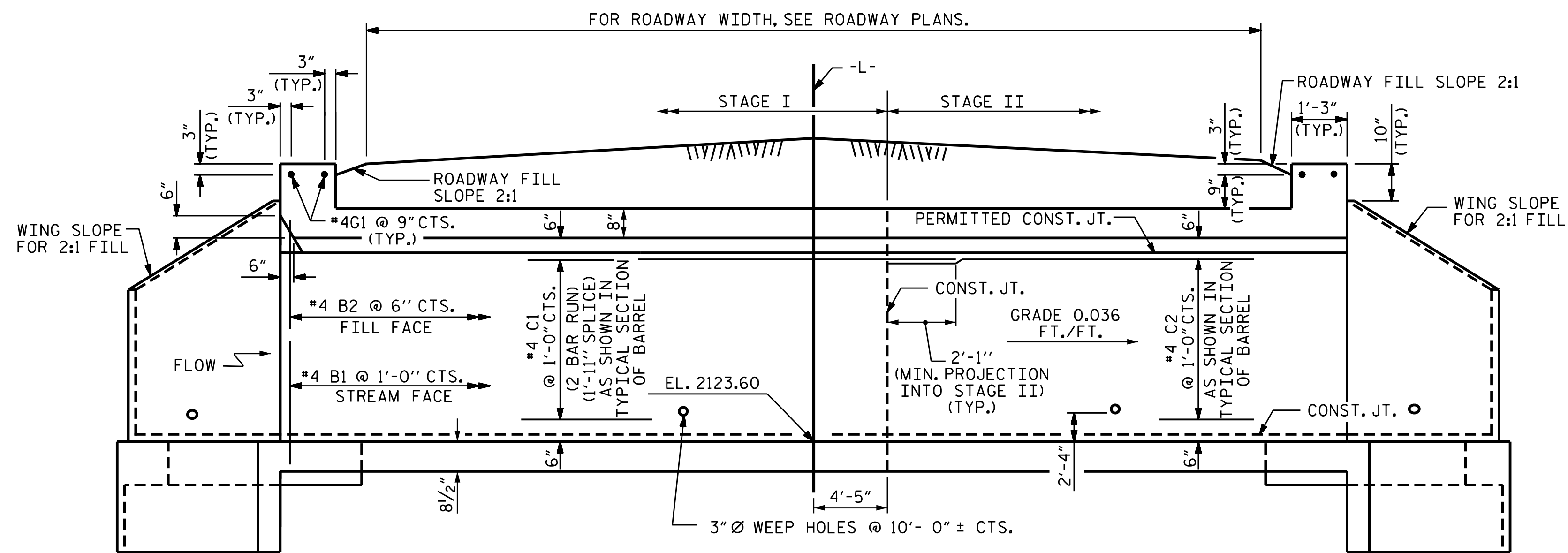
PROJECT NO. R-4753  
JACKSON COUNTY  
STATION: 142+79.00 -L-

SHEET 1 OF 7

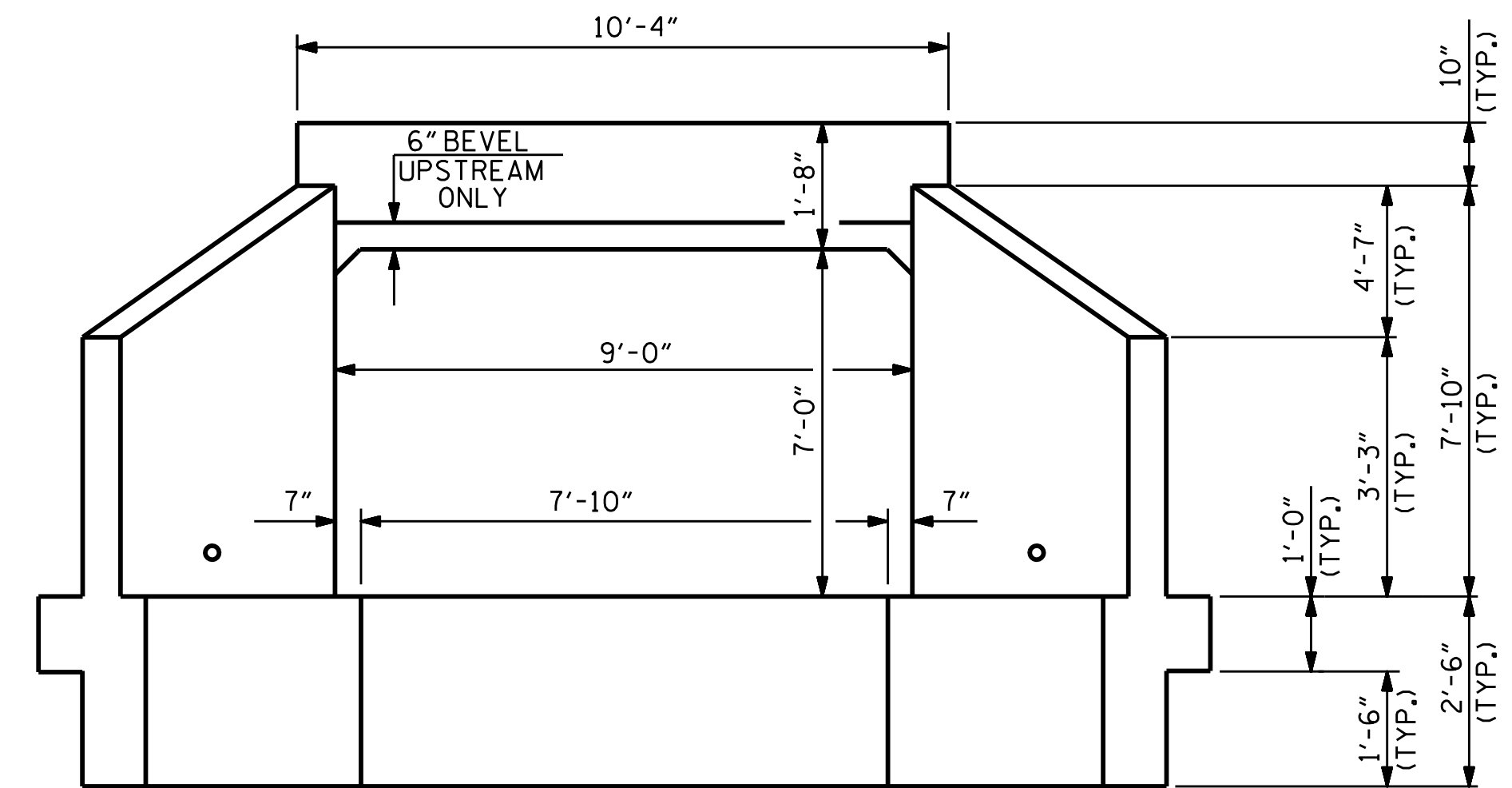
STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

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

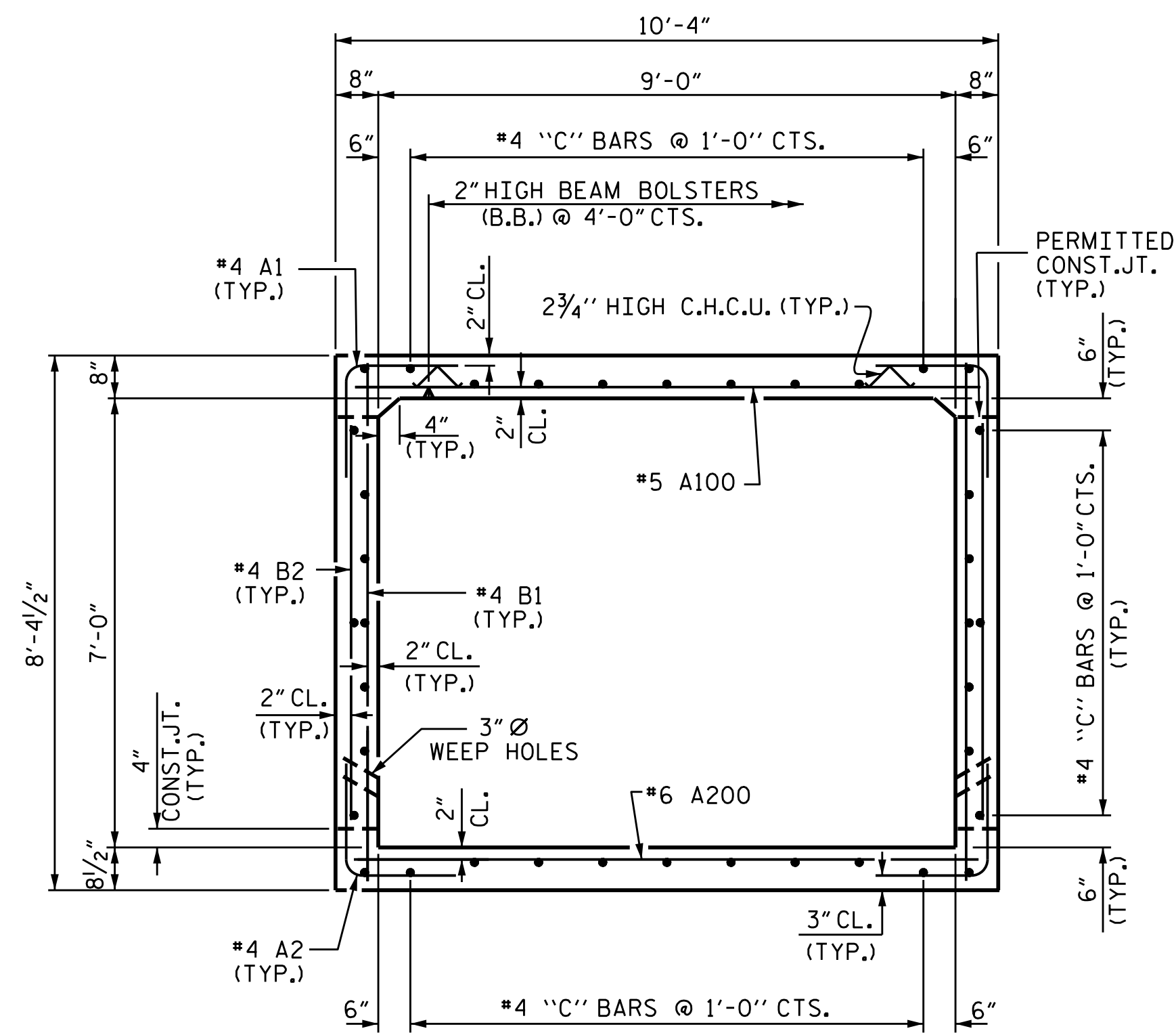
REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-1	
1			3			TOTAL SHEETS	
2			4			14	



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

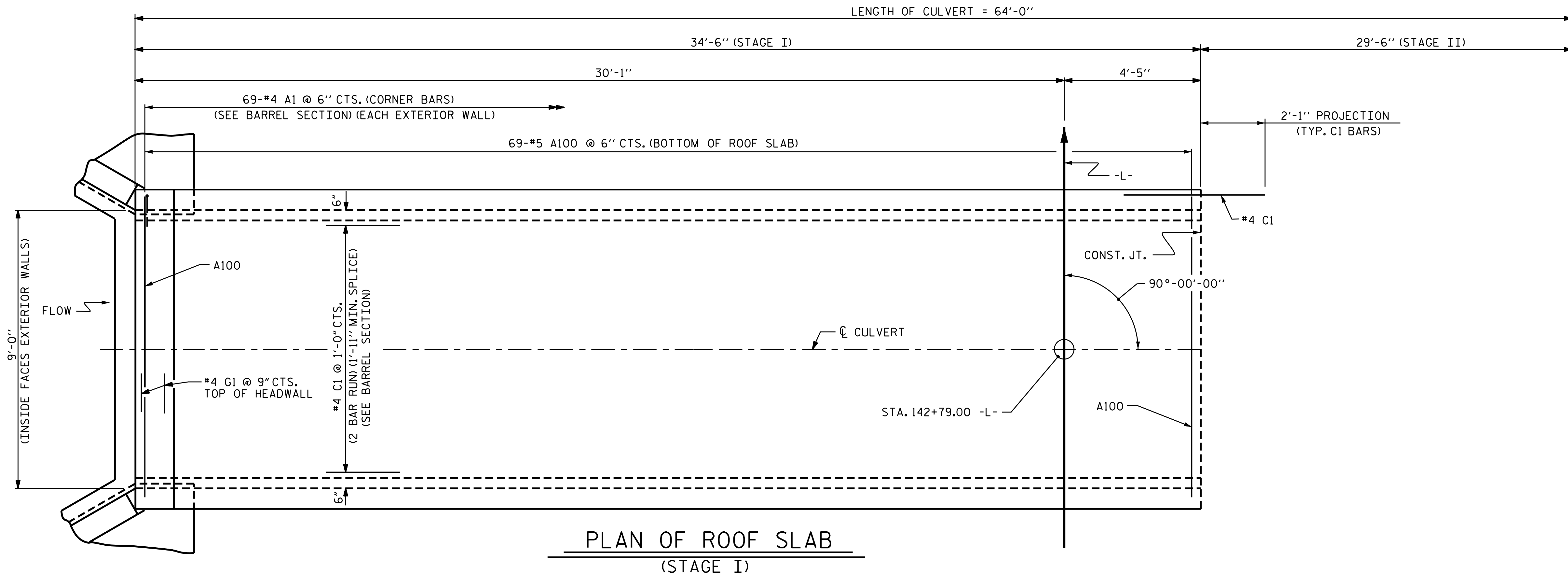
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 CHECKED BY: H.T. BARBOUR DATE: 8-8-16  
 DESIGN ENGINEER OF RECORD: A.M. LEE DATE: 9-16

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

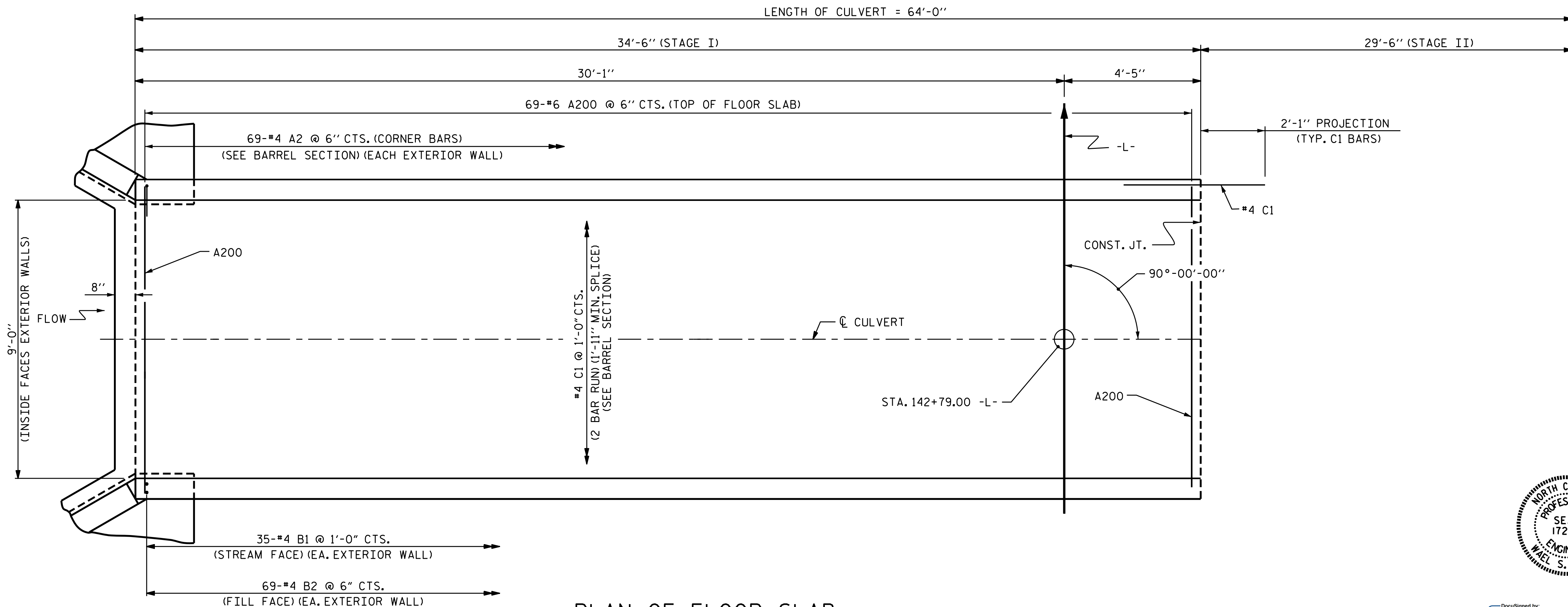
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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-2
1			3			TOTAL SHEETS
2			4			14

CULVERT #1



PLAN OF ROOF SLAB  
(STAGE I)

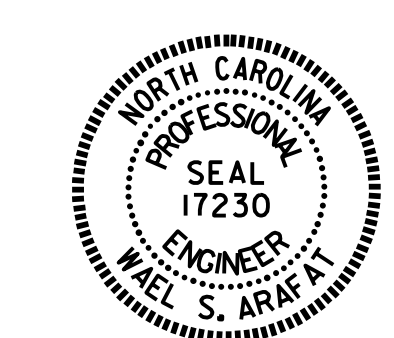


PLAN OF FLOOR SLAB  
(STAGE I)

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

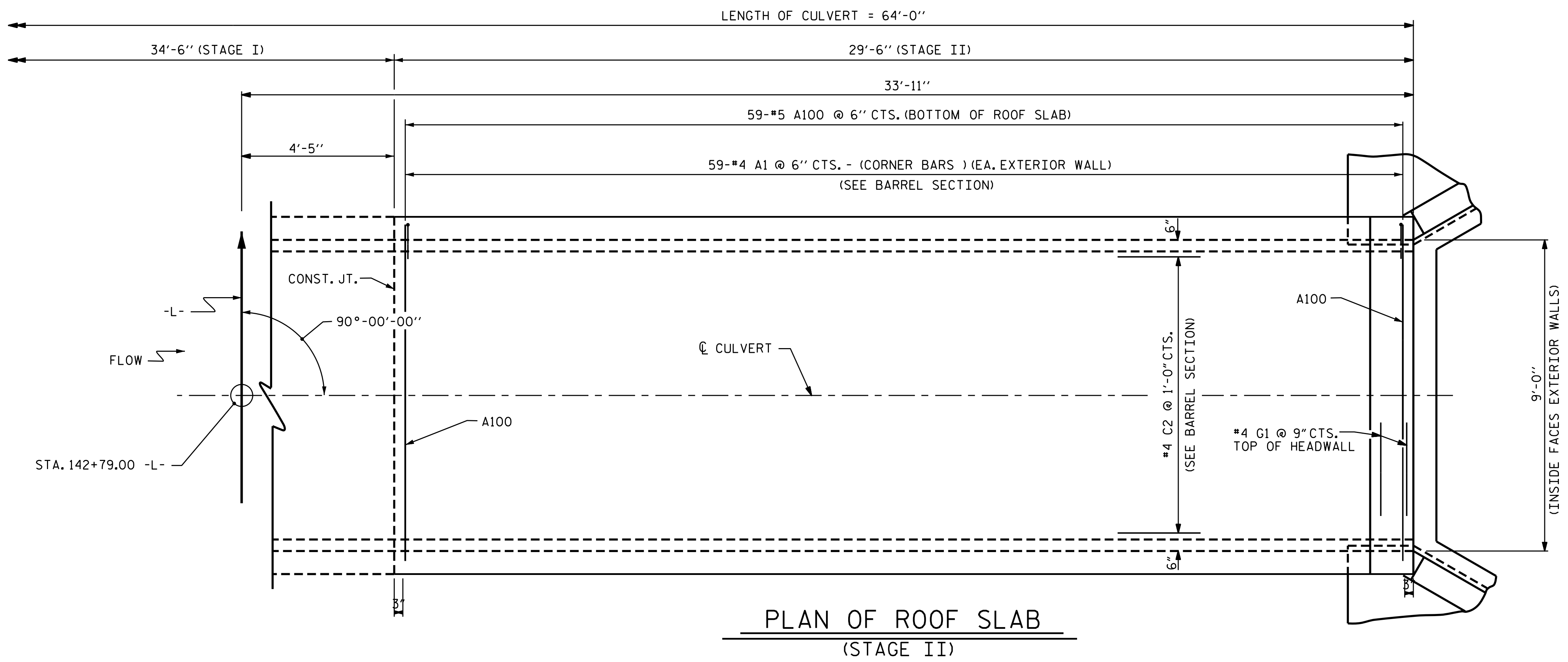


STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 SINGLE 9 FT. X 7 FT.  
 CONCRETE BOX CULVERT  
 90°-00'-00" SKEW  
 STAGE I

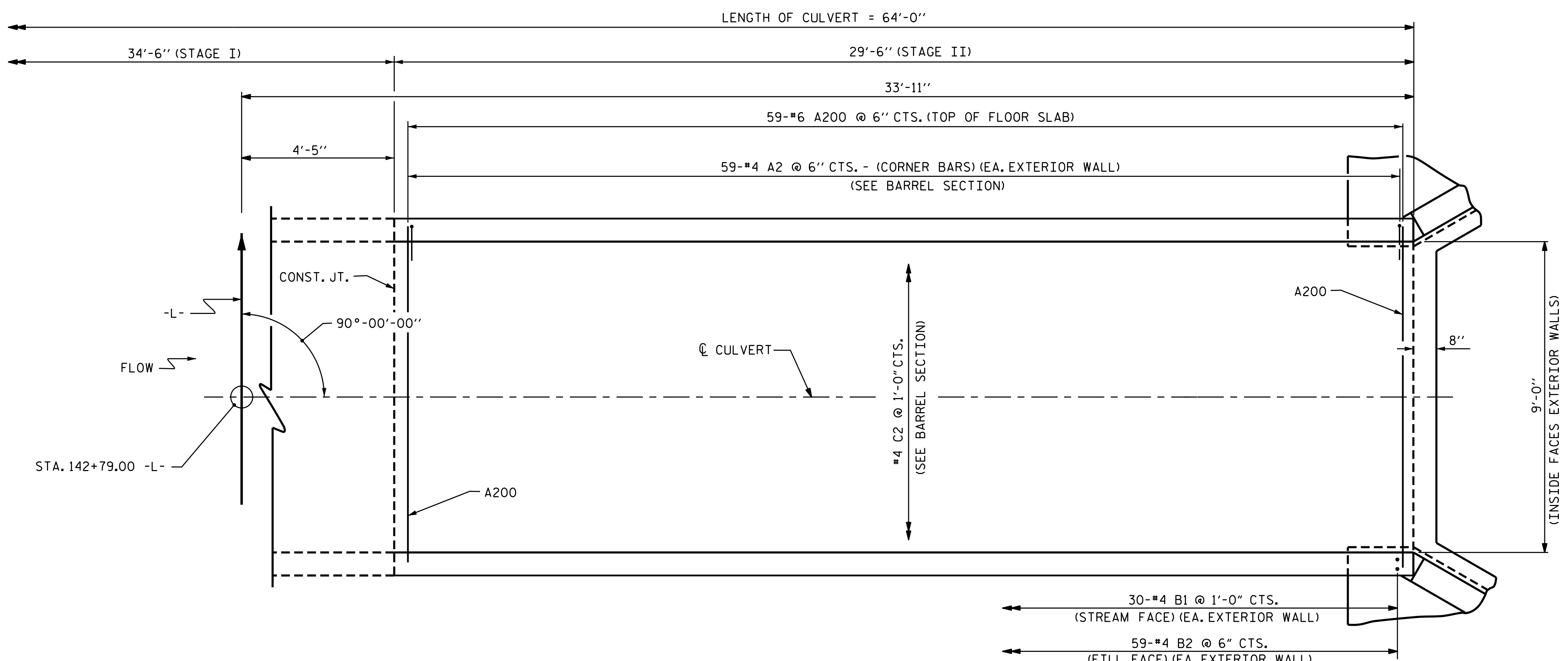
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 CHECKED BY: H.T. BARBOUR DATE: 8-8-16  
 DESIGN ENGINEER OF RECORD: A. M. LEE DATE: 9-16

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	14
2			4				



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

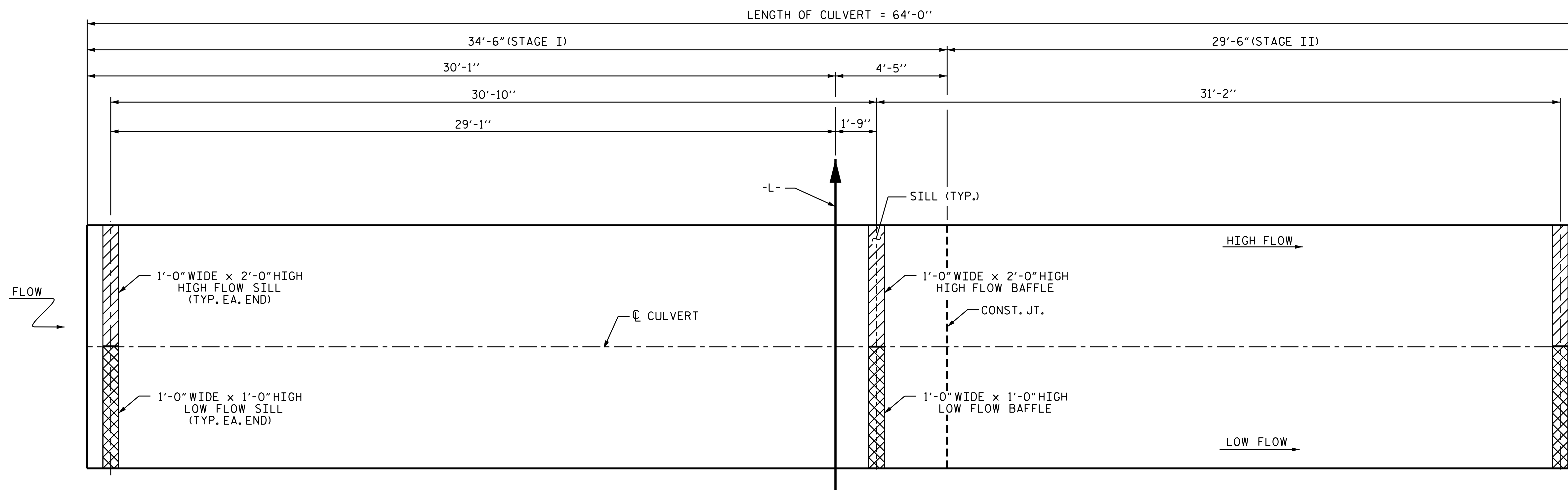


STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 SINGLE 9 FT. X 7 FT.  
 CONCRETE BOX CULVERT  
 90°-00'-00" SKEW  
 STAGE II

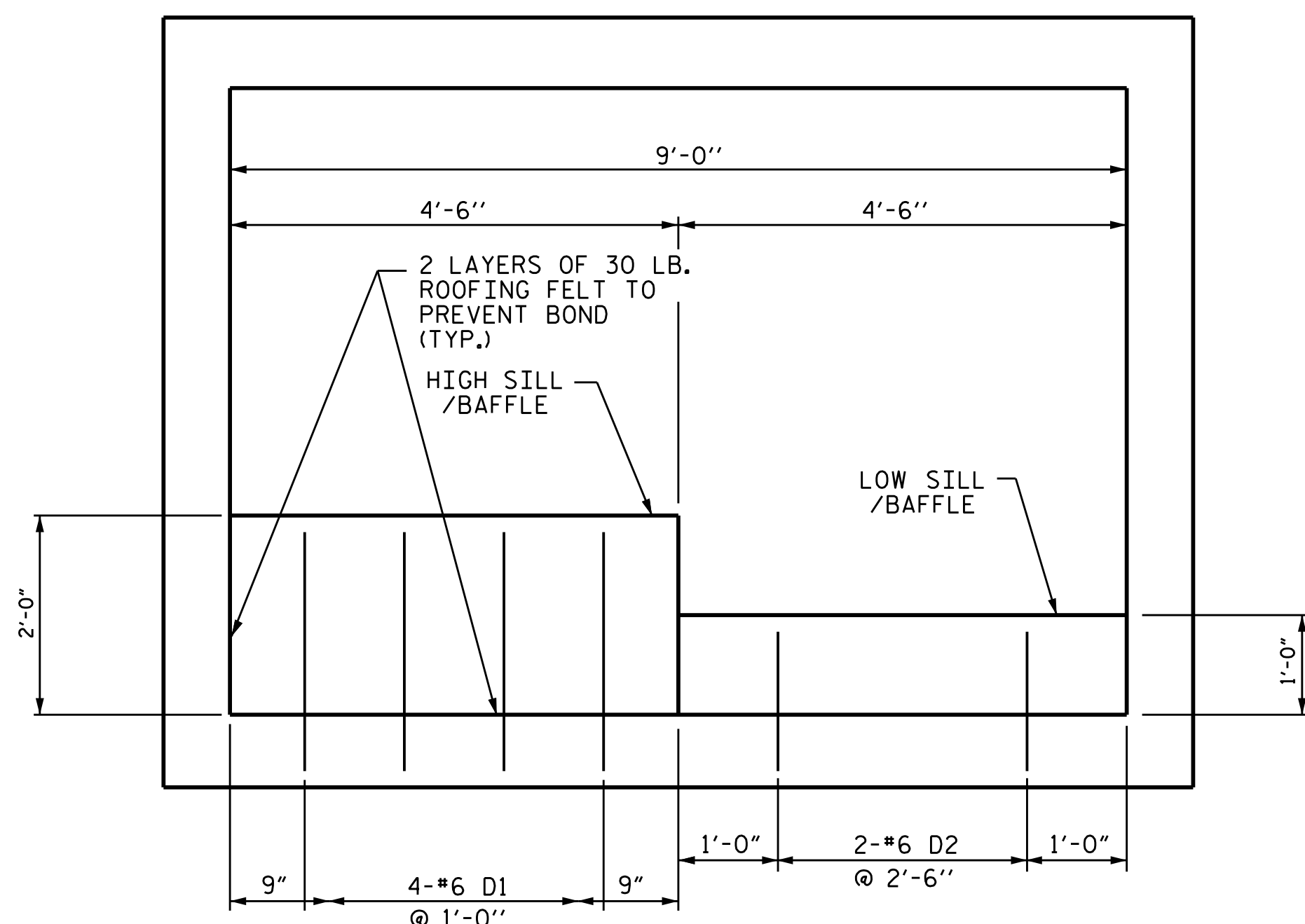
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 CHECKED BY : H.T. BARBOUR DATE : 8-8-16  
 DESIGN ENGINEER OF RECORD: A. M. LEE DATE : 9-16

DocuSigned by:  
 Wael Arafat 10/12/2016  
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 SIGNATURES COMPLETED

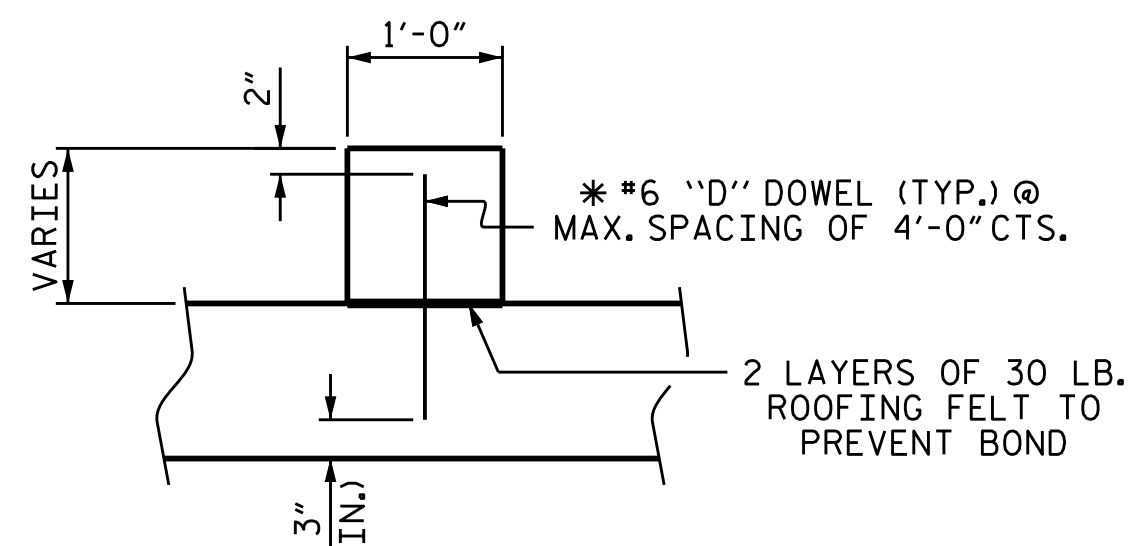
REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-4	
1			3			TOTAL SHEETS	14
2			4				



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

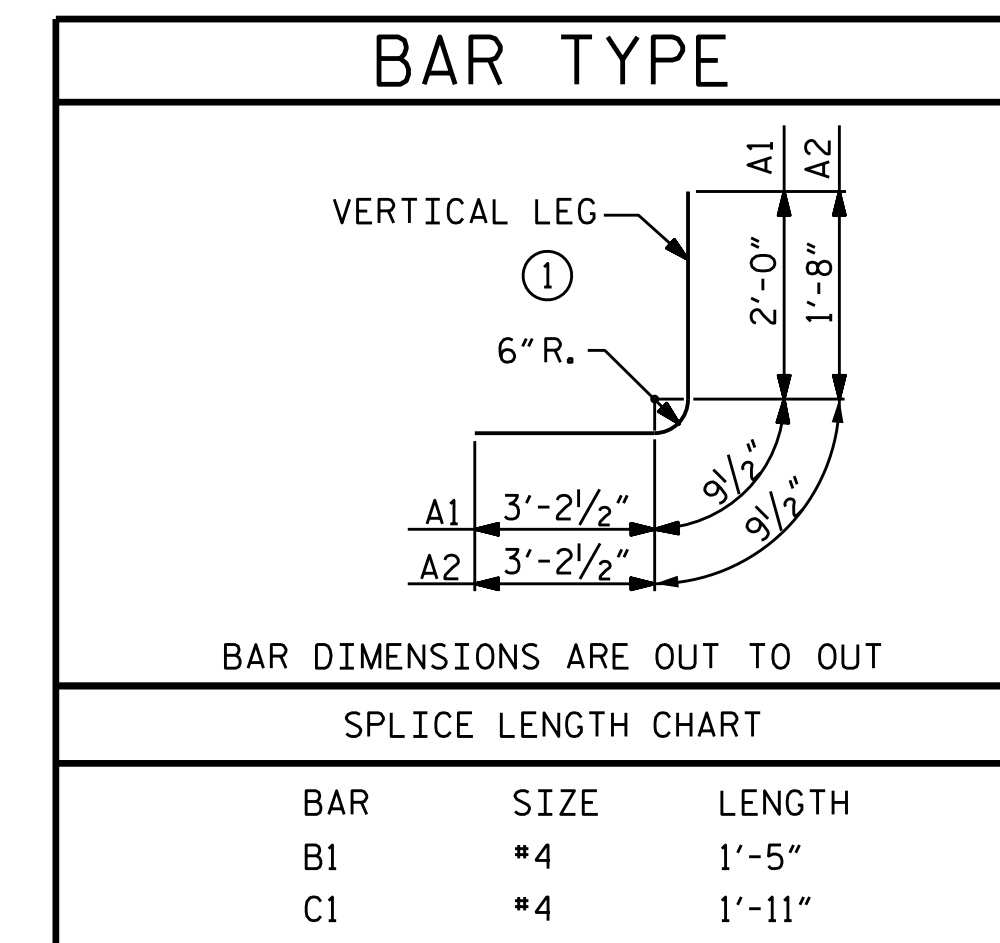


ELEVATION  
CULVERT SILL DETAILS  
(LOOKING DOWNSTREAM)



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

SECTION THRU SILL/BAFFLE



BAR TYPE

BAR DIMENSIONS ARE OUT TO OUT

SPLICE LENGTH CHART

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

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



Designed by:  
Nael Arafat  
119010A22AB006  
10/18/2016

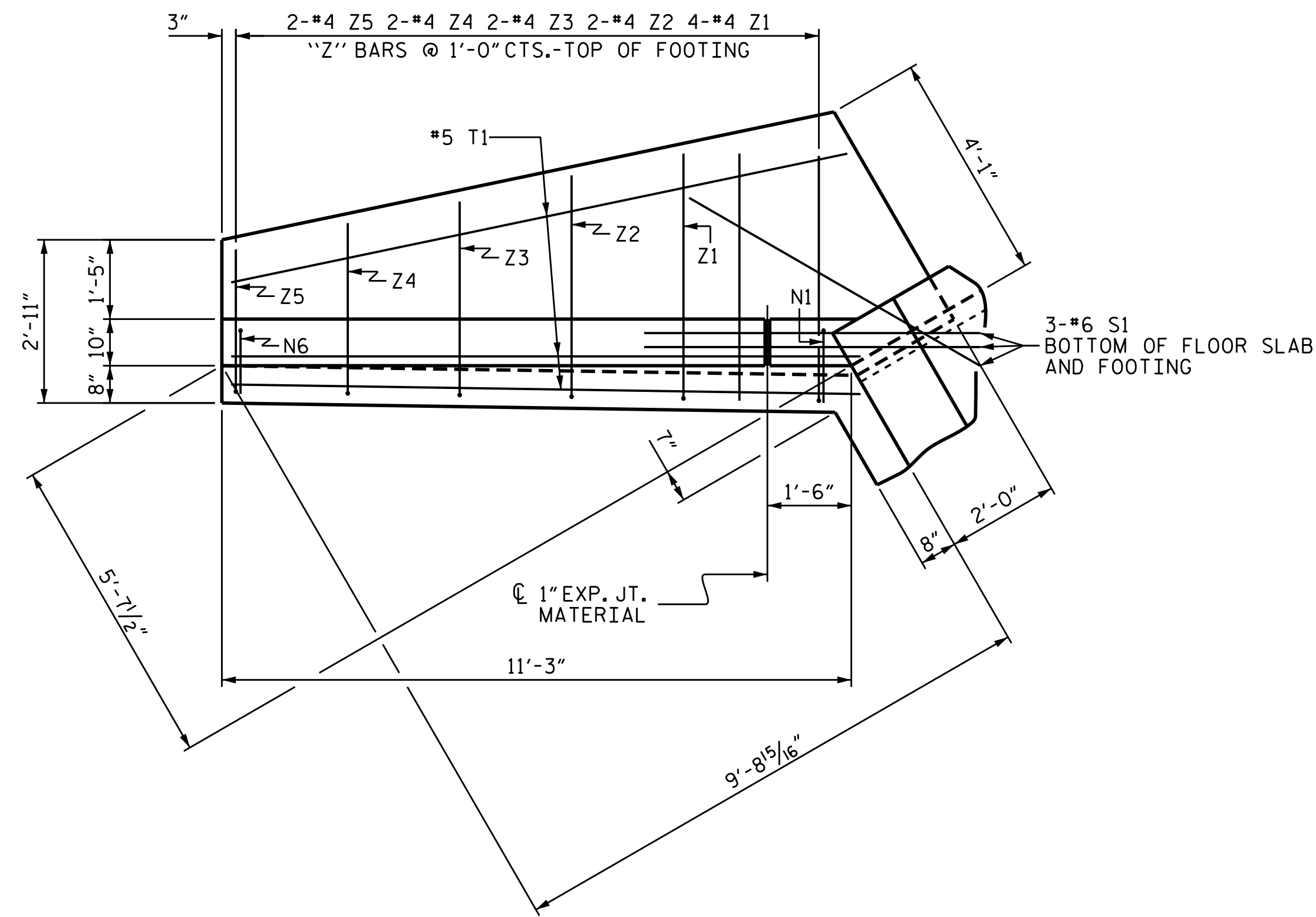
REVISIONS

NO.	BY:	DATE:	NO.	BY:	DATE:
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2			4		

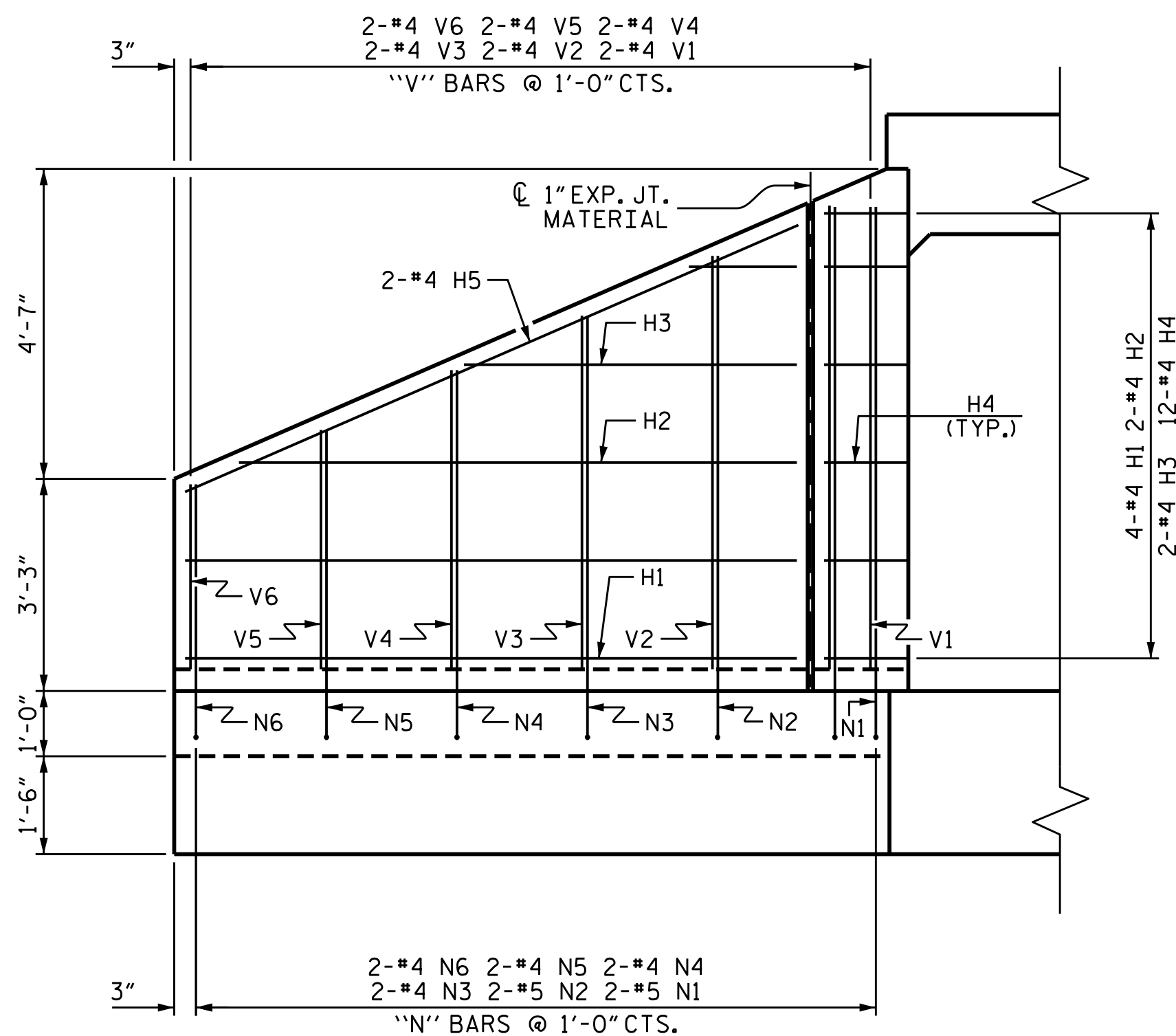
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C-5  
TOTAL SHEETS  
14

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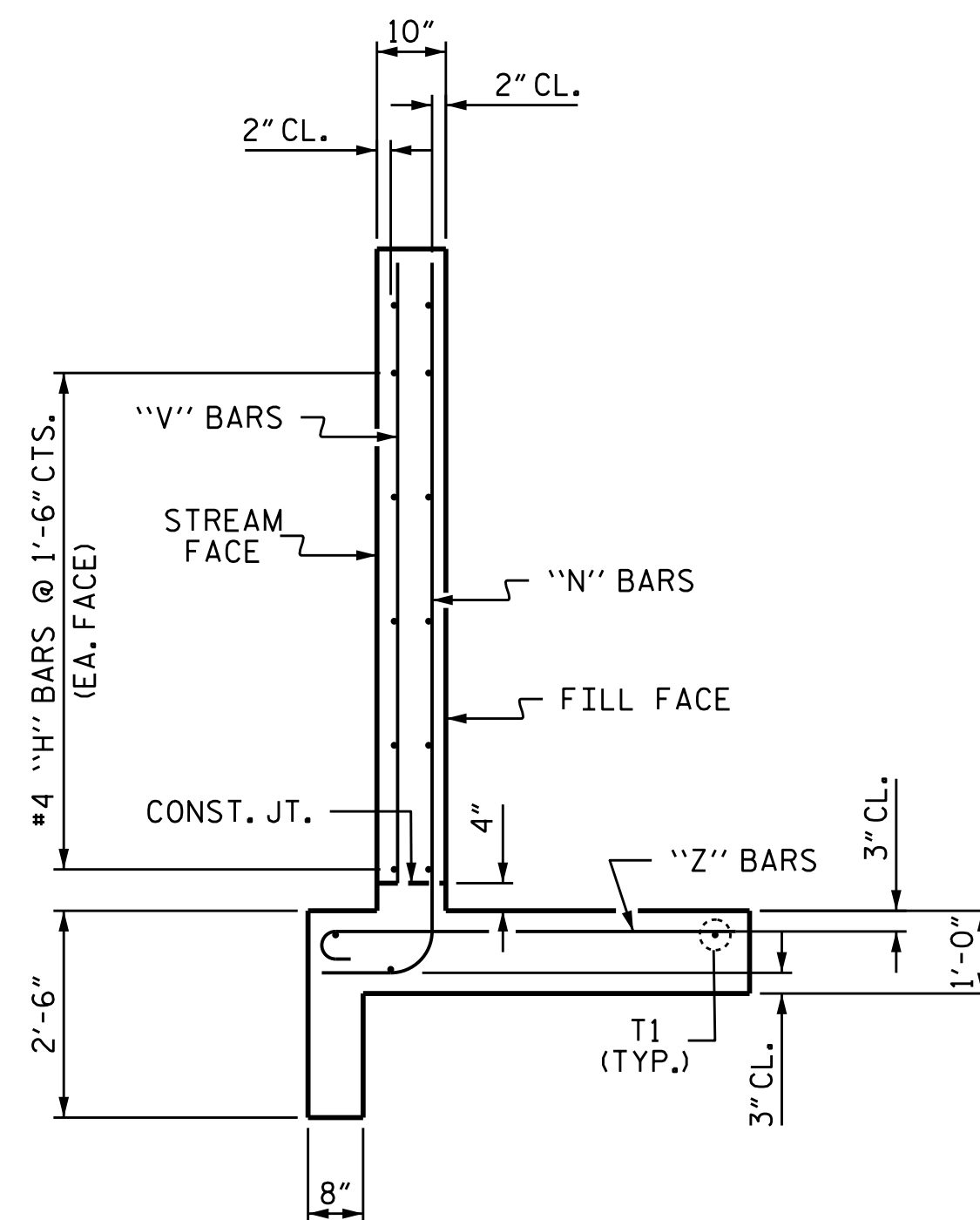
DRAWN BY: V.X. NGUYEN DATE: 8-3-16  
CHECKED BY: H.T. BARBOUR DATE: 8-8-16  
DESIGN ENGINEER OF RECORD: A.M. LEE DATE: 9-16



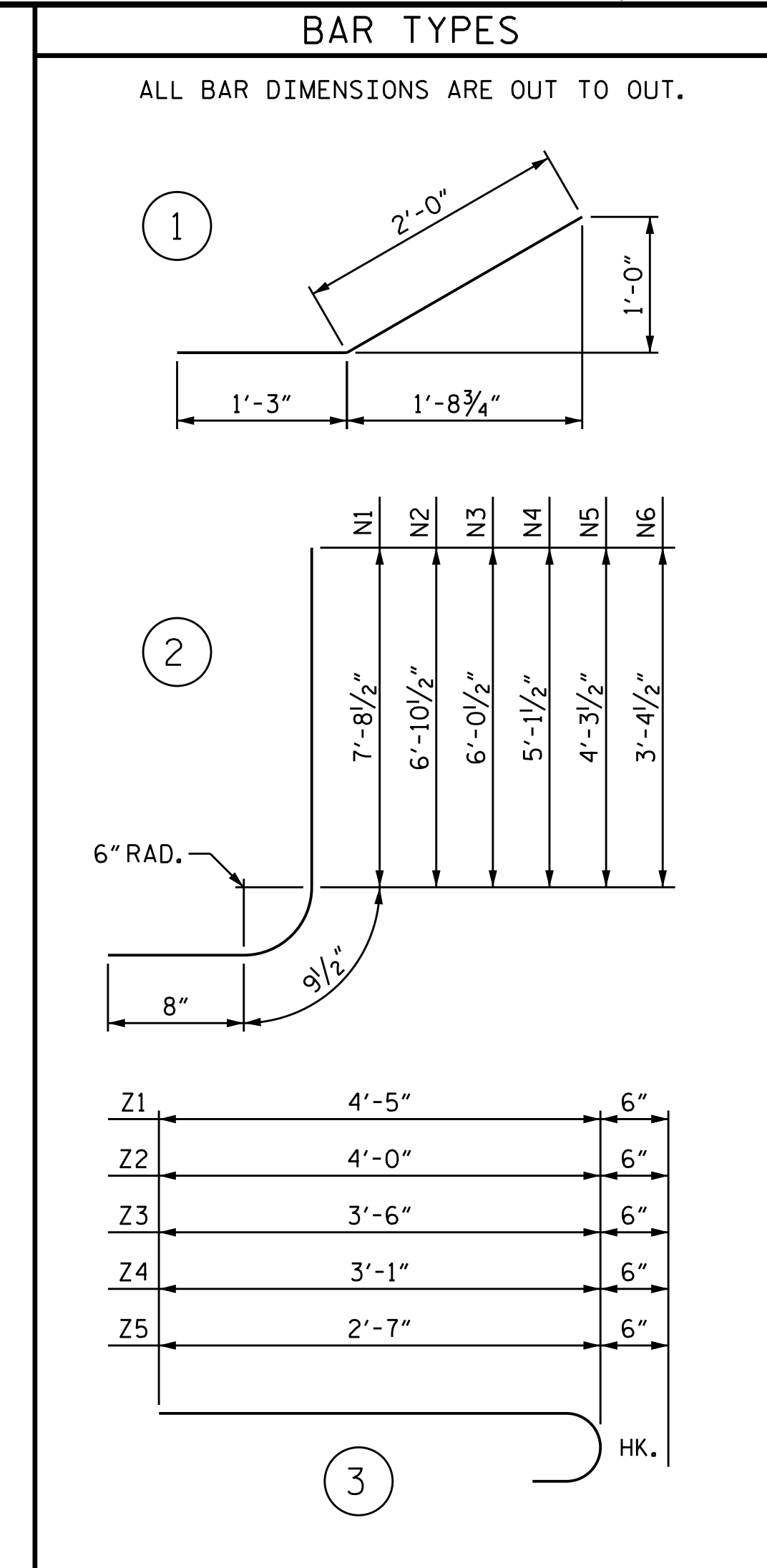
PLAN



ELEVATION



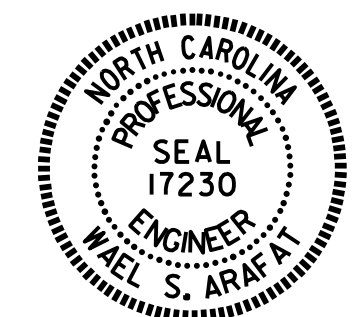
TYPICAL WING SECTION



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 (LL)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	1	1.06	--	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:

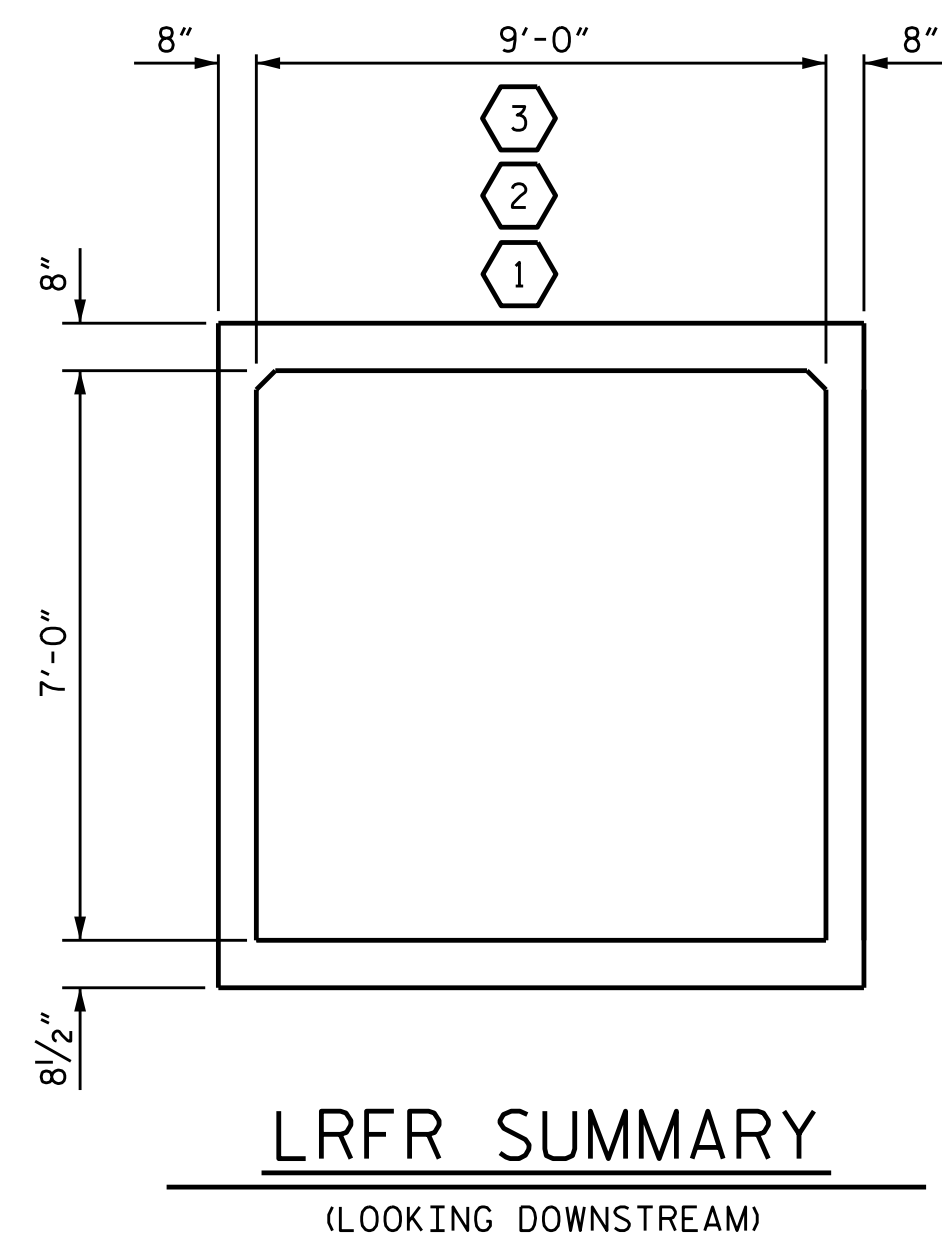
#### DESIGN LOAD RATING FACTORS

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	



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 Arafeh 10/12/2016

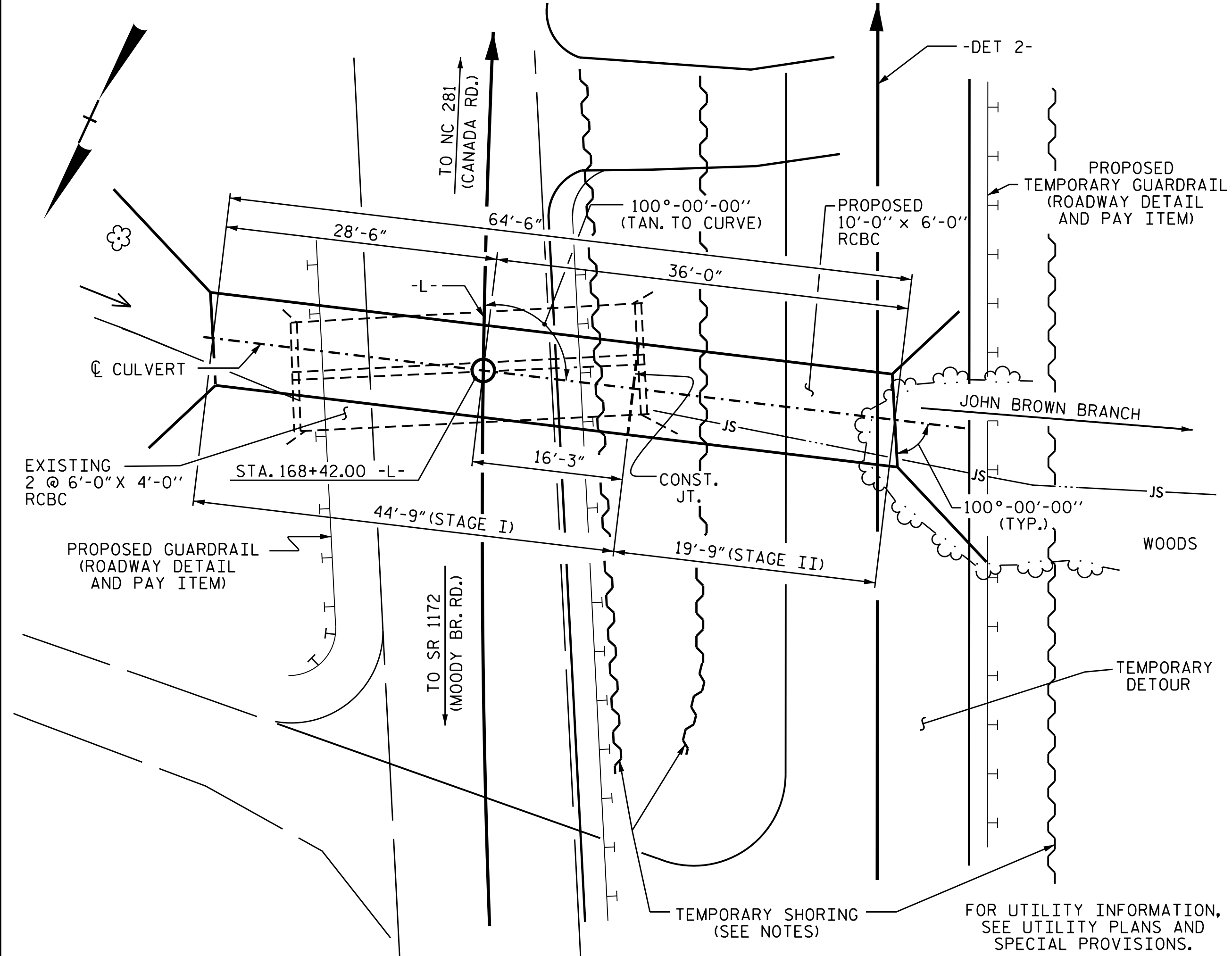
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 SIGNATURES COMPLETED

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



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**

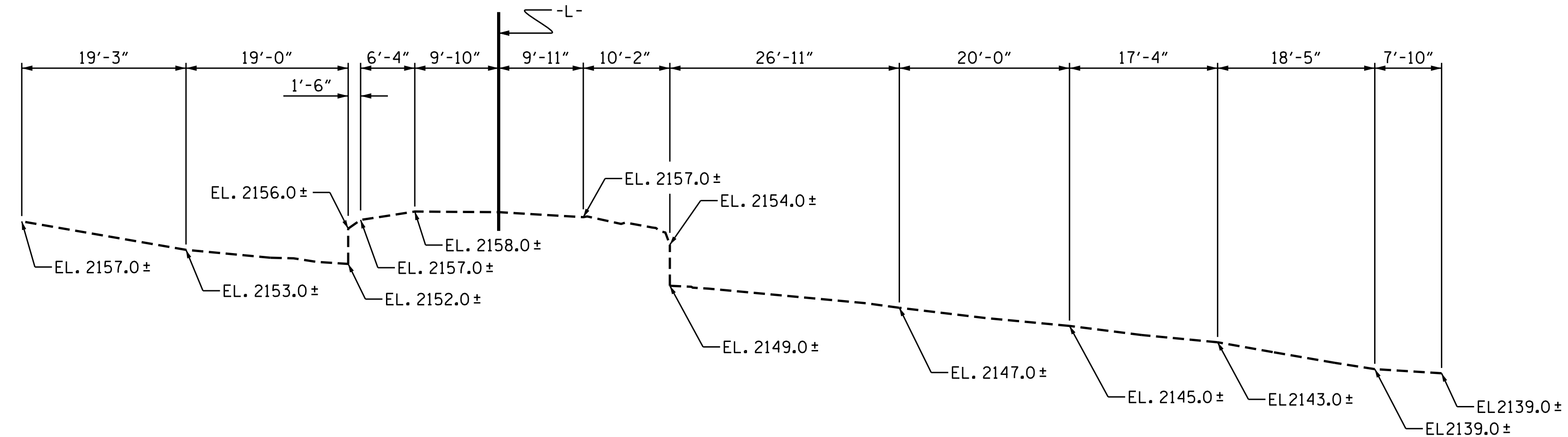
GRADE POINT EL. @ STA. 168+42.00 -L- = 2158.90'  
 BED EL. @ STA. 168+42.00 -L- = 2149.07'  
 ROADWAY SLOPES = VARIES

**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

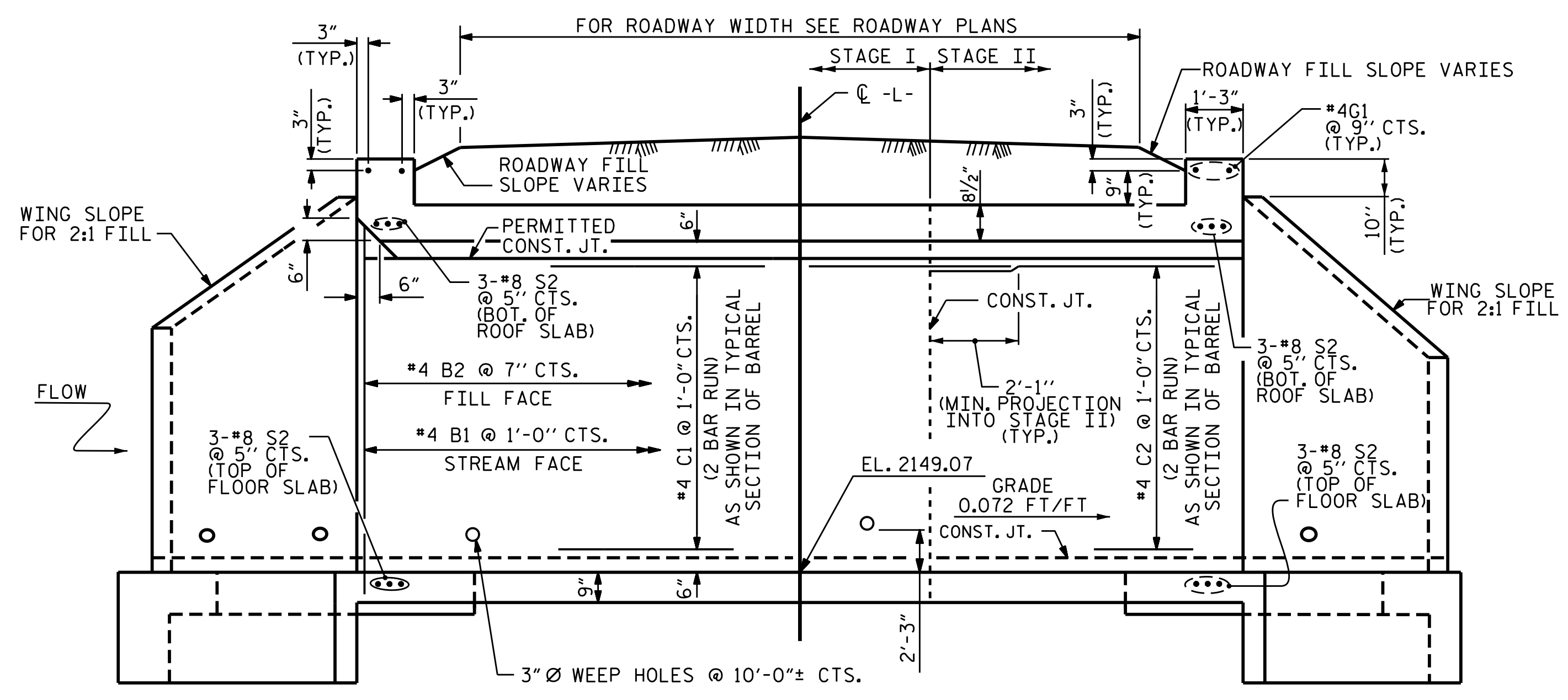
PROJECT NO. R-4753  
JACKSON COUNTY  
 STATION: 168+42.00 -L-

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

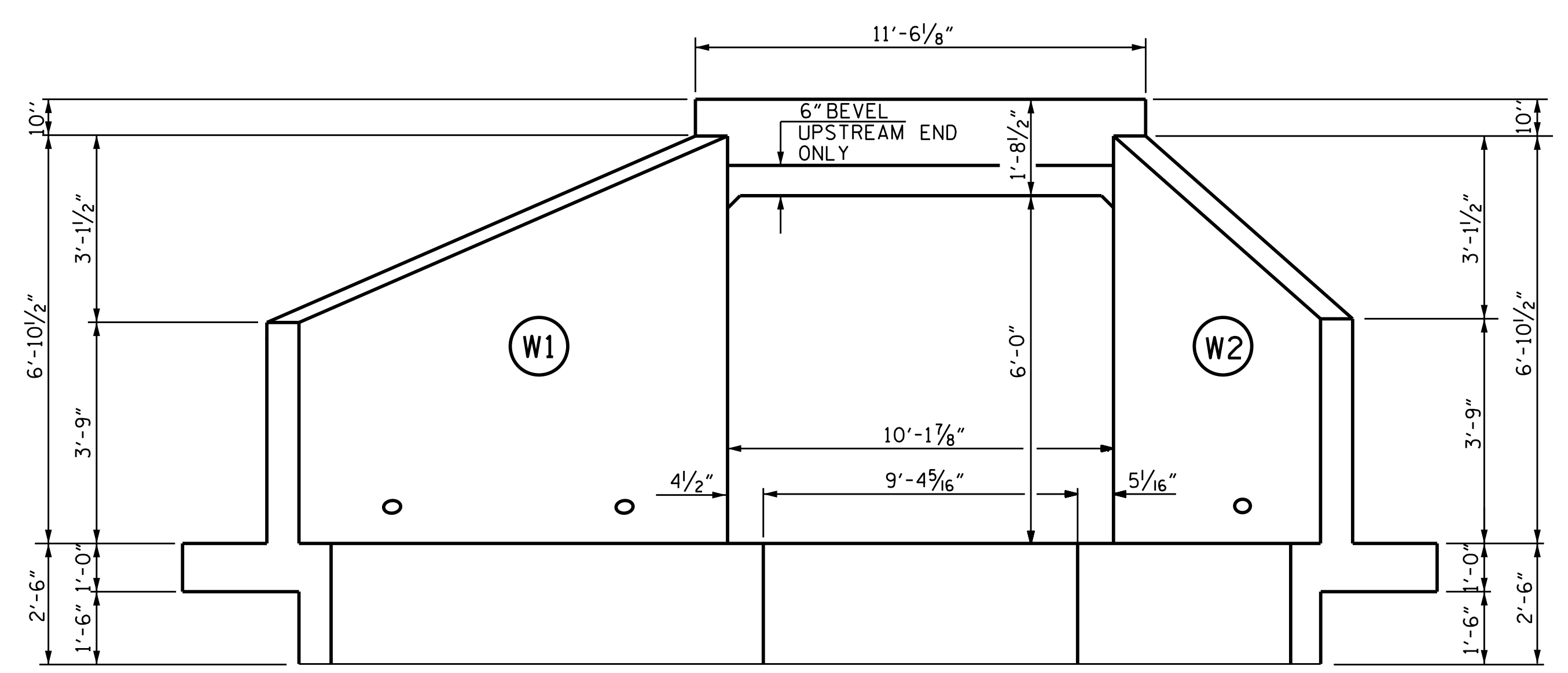


DRAWN BY: E.C.PHELPS/VXN DATE: 8-5-16  
 CHECKED BY: H.T. BARBOUR DATE: 8-8-16  
 DESIGN ENGINEER OF RECORD: A. M. LEE DATE: 9-16

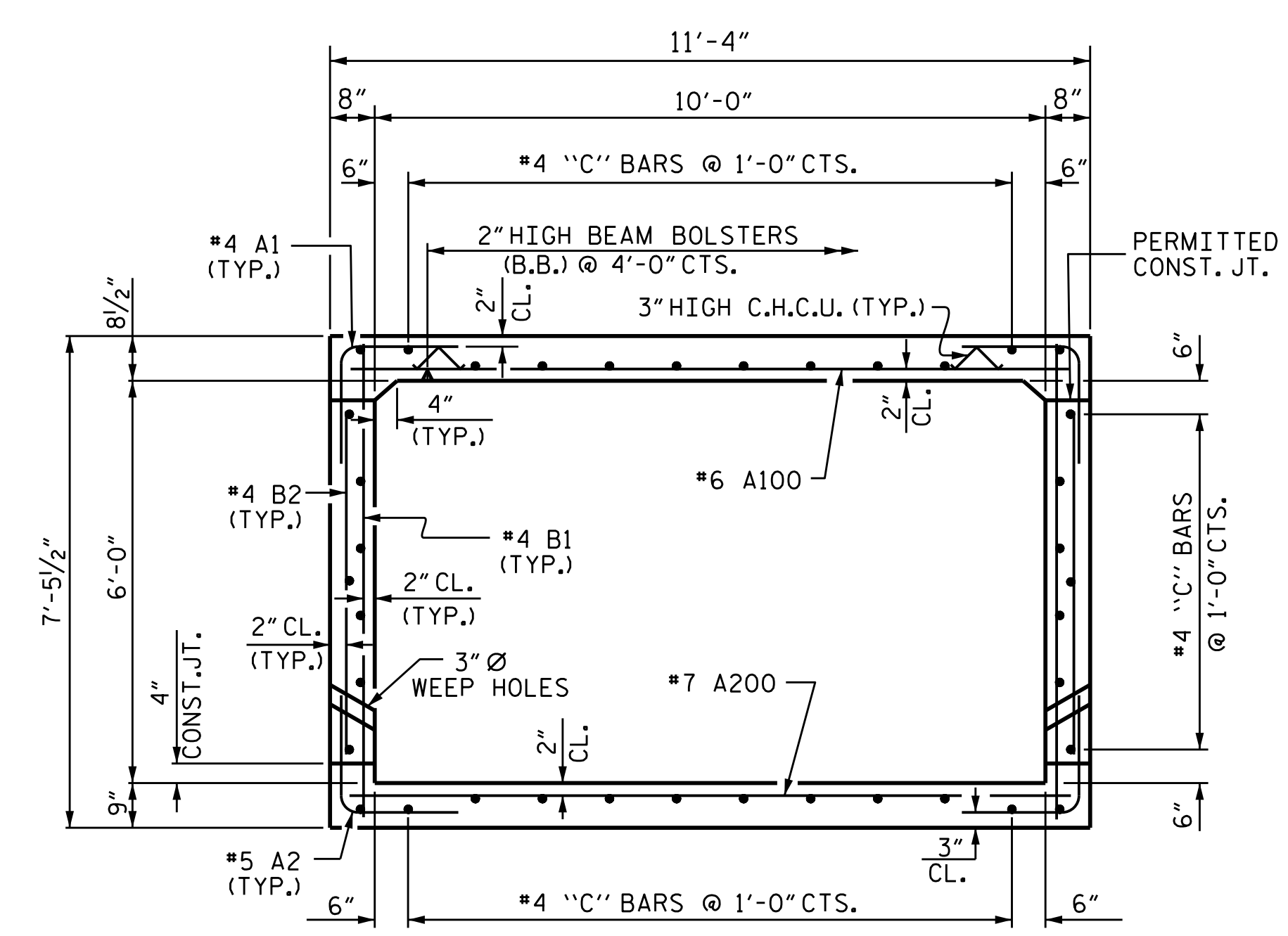
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REVISIONS						TOTAL SHEETS 14
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1			3			
2			4			



CULVERT SECTION NORMAL TO ROADWAY



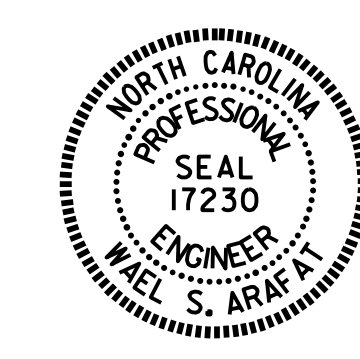
END ELEVATION NORMAL TO SKEW  
 (LOOKING DOWN STREAM)



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

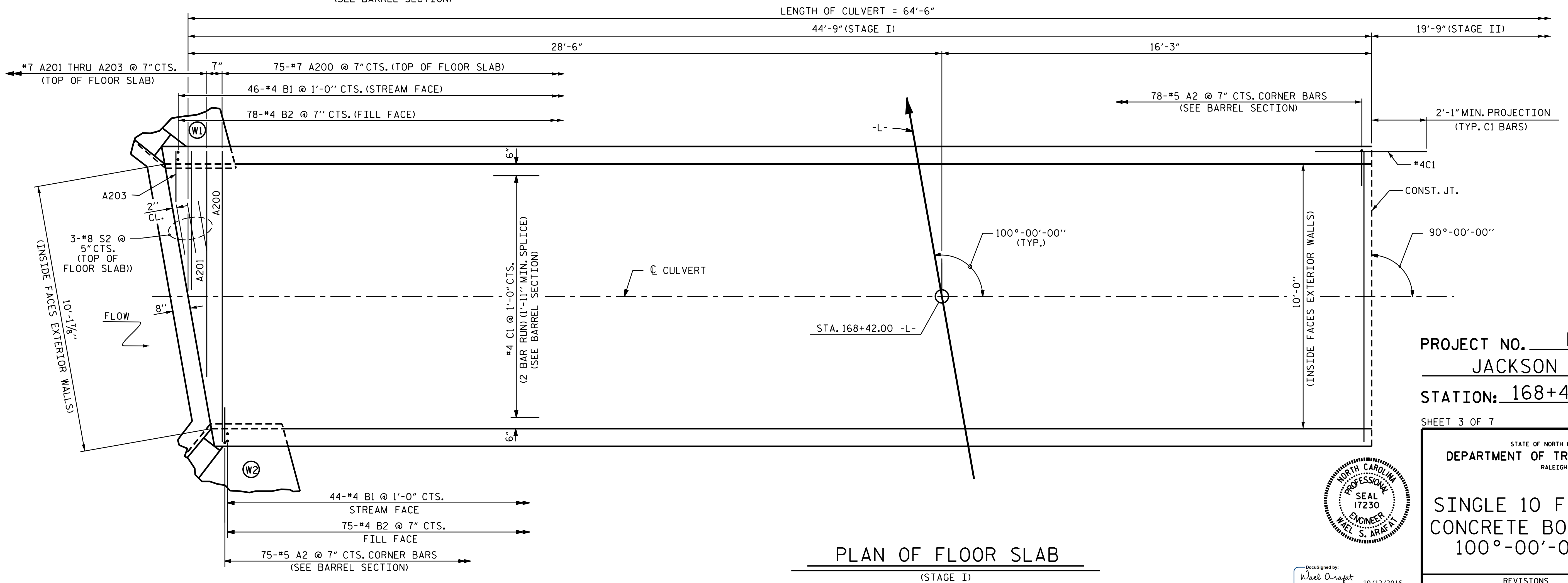
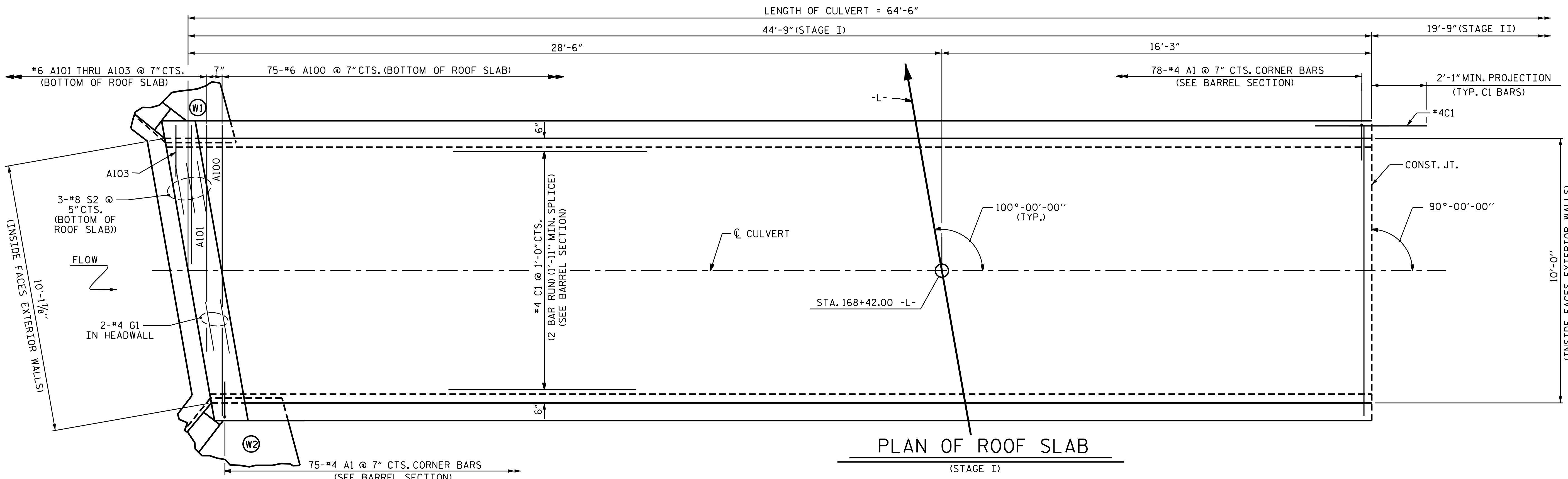


STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 SINGLE 10 FT. X 6 FT.  
 CONCRETE BOX CULVERT  
 100°-00'-00" SKEW

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  
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 SIGNATURES COMPLETED

REVISIONS						SHEET NO. C-9
NO.	BY:	DATE:	NO.	BY:	DATE:	
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2			4			



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

SHEET 3 OF 7



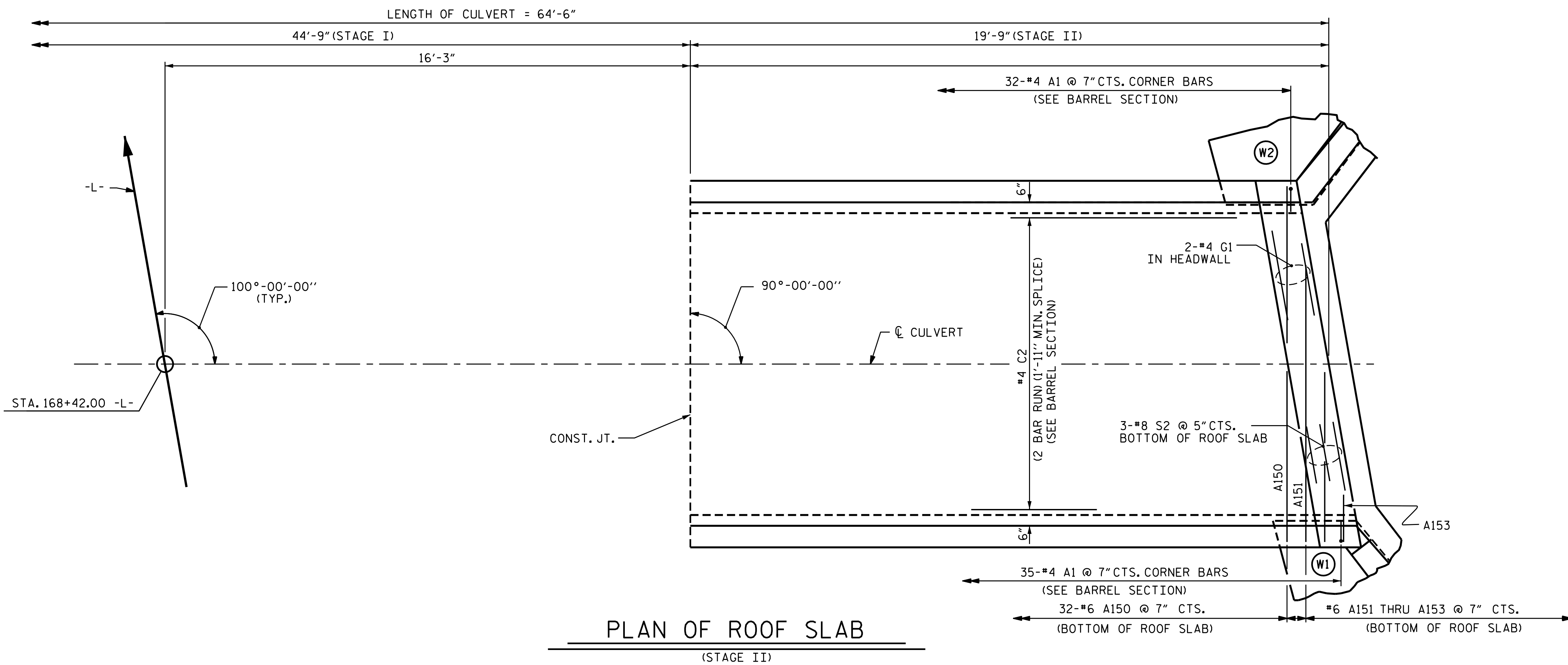
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

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

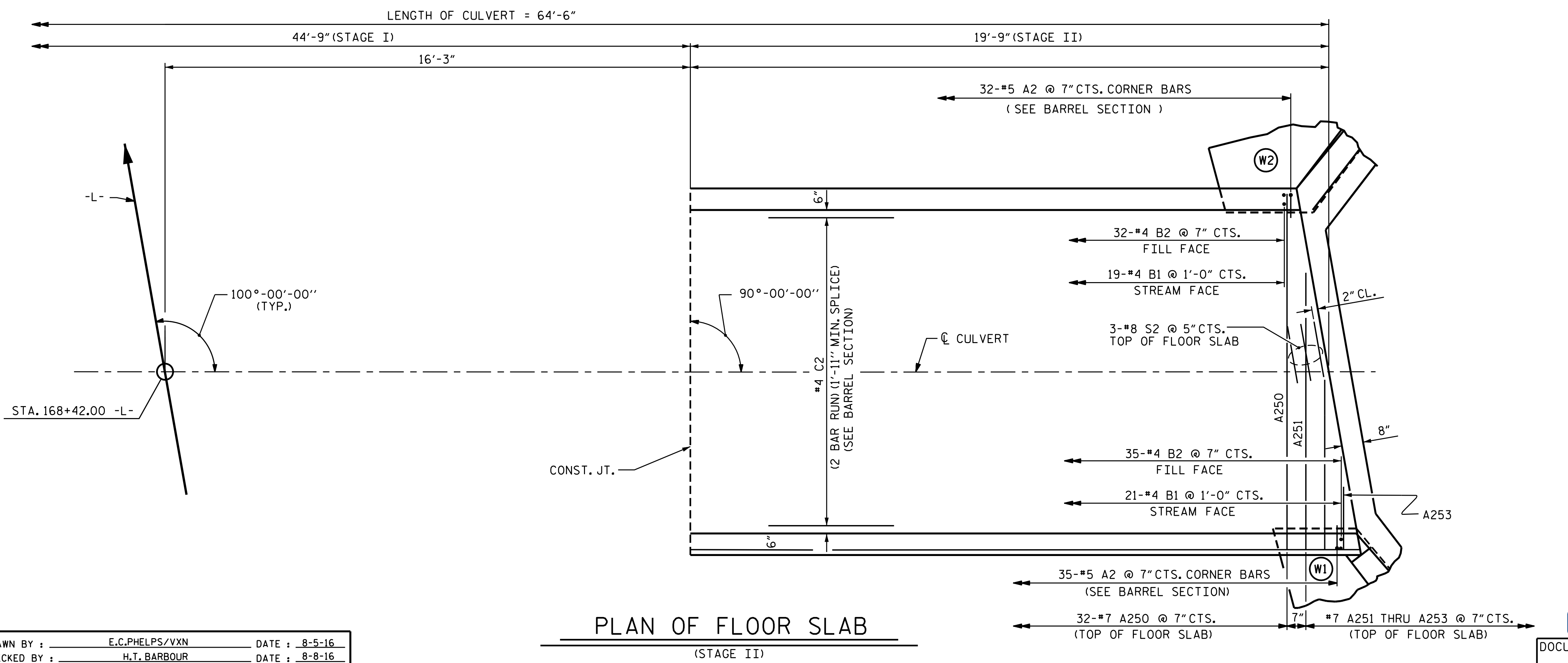
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 CHECKED BY: H.T. BARBOUR DATE: 8-8-16  
 DESIGN ENGINEER OF RECORD: A. M. LEE DATE: 9-16

Documented by: Wael Arafat 10/12/2016  
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REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-10	
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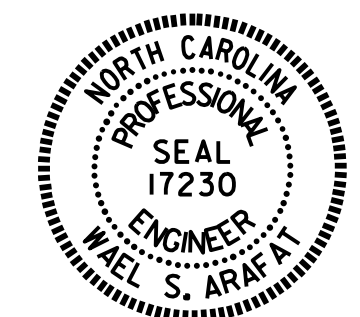
PLAN OF ROOF SLAB  
(STAGE II)



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:  
 Waad Orafat 10/12/2016  
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 FINAL UNLESS ALL  
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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.

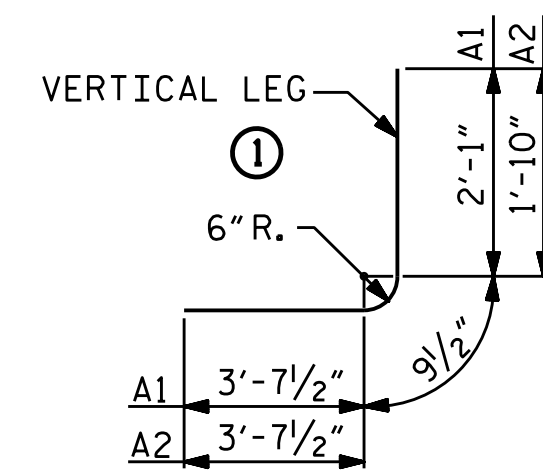
THE TOP OF BED MATERIAL IN THE LOW FLOW CHANNEL SHOULD MATCH THE STREAM BED ELEVATION.

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**



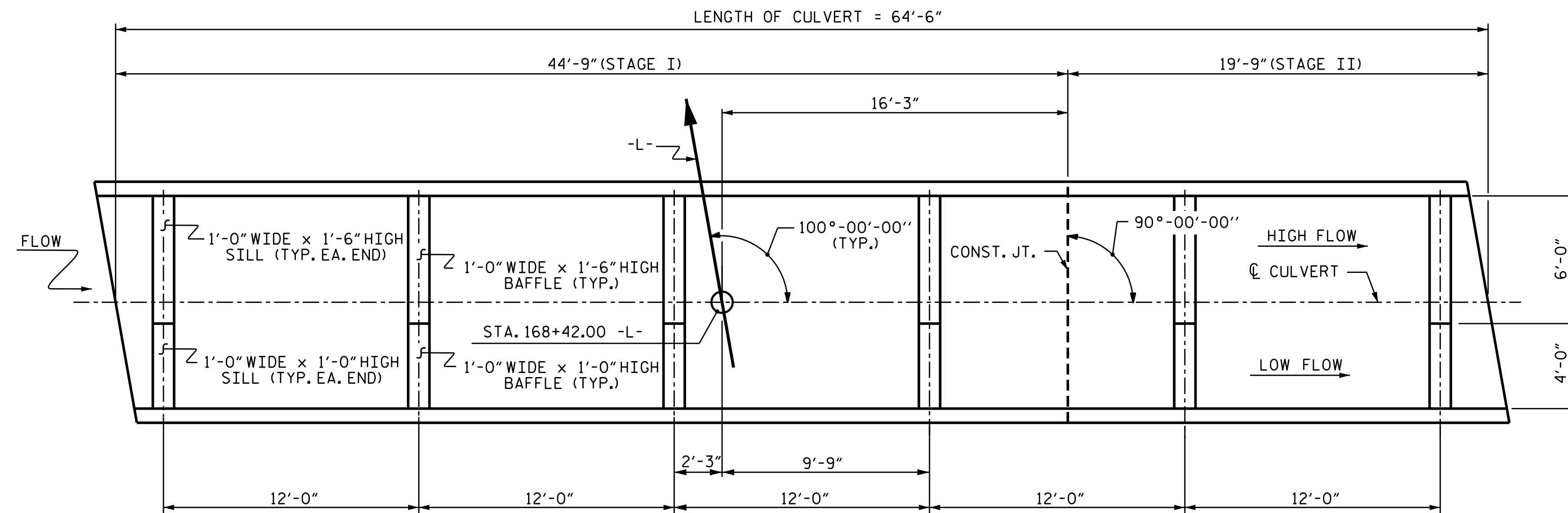
BAR DIMENSIONS ARE OUT TO OUT

**SPLICE CHART**

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

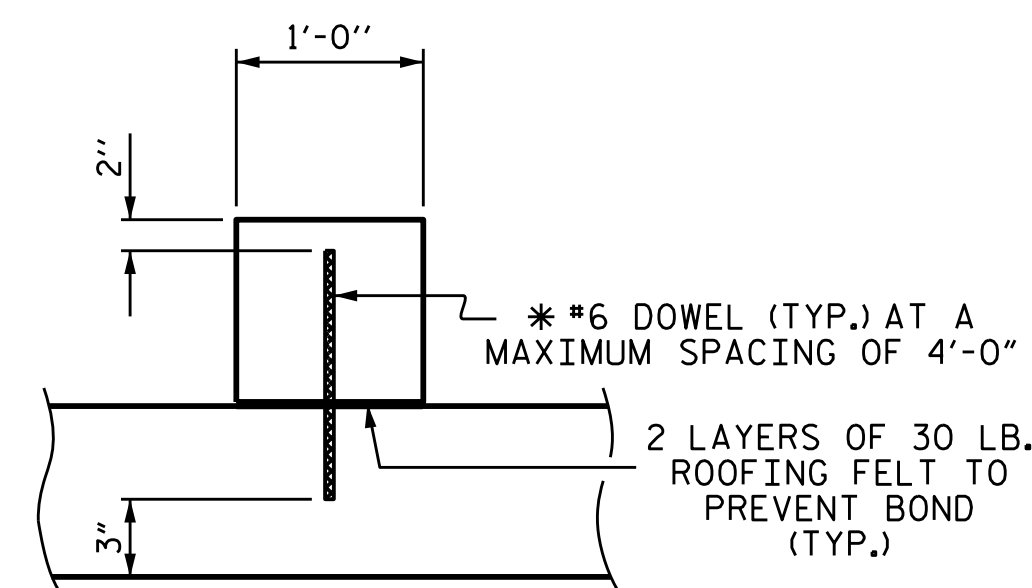
**BAR SCHEDULE**

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					



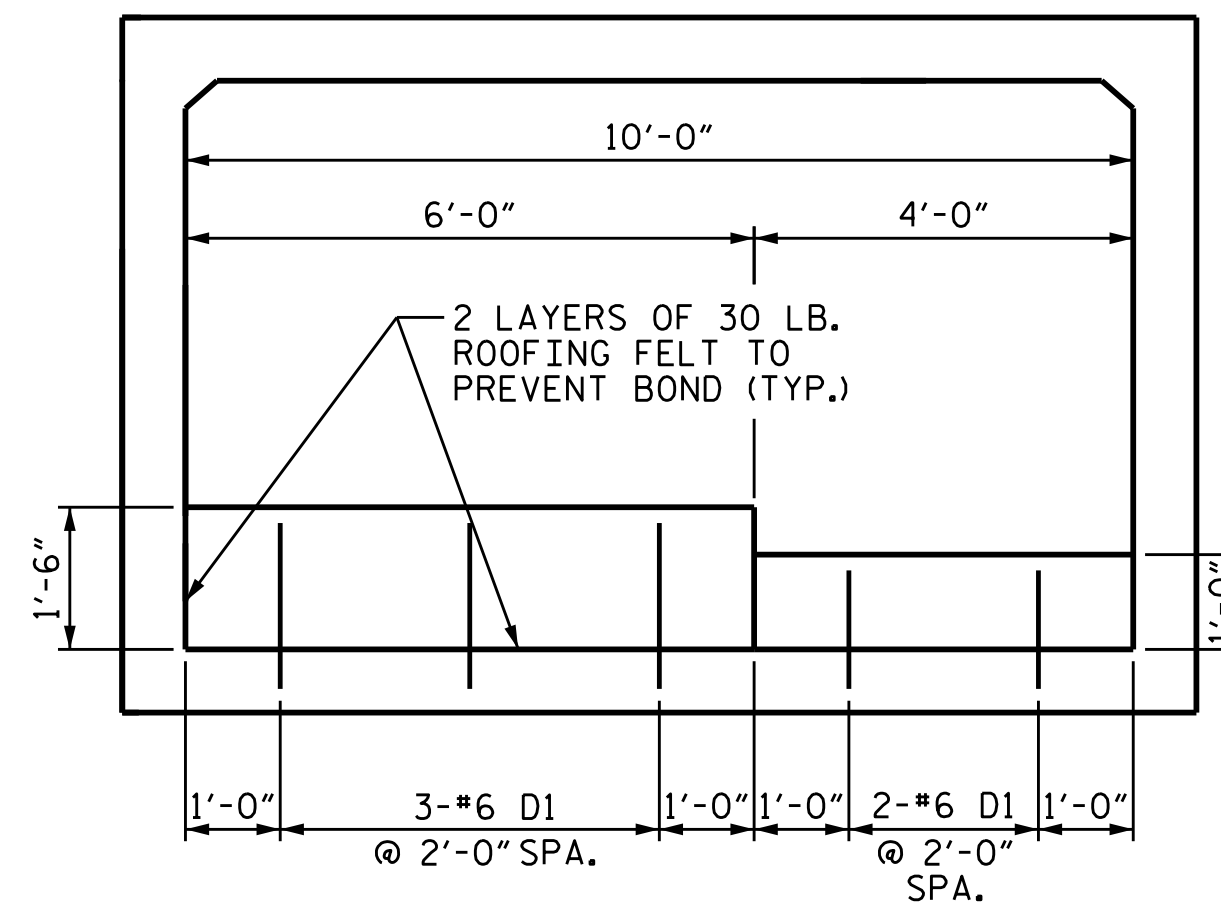
**PLAN VIEW SHOWING SILL/BAFFLE LOCATIONS**

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



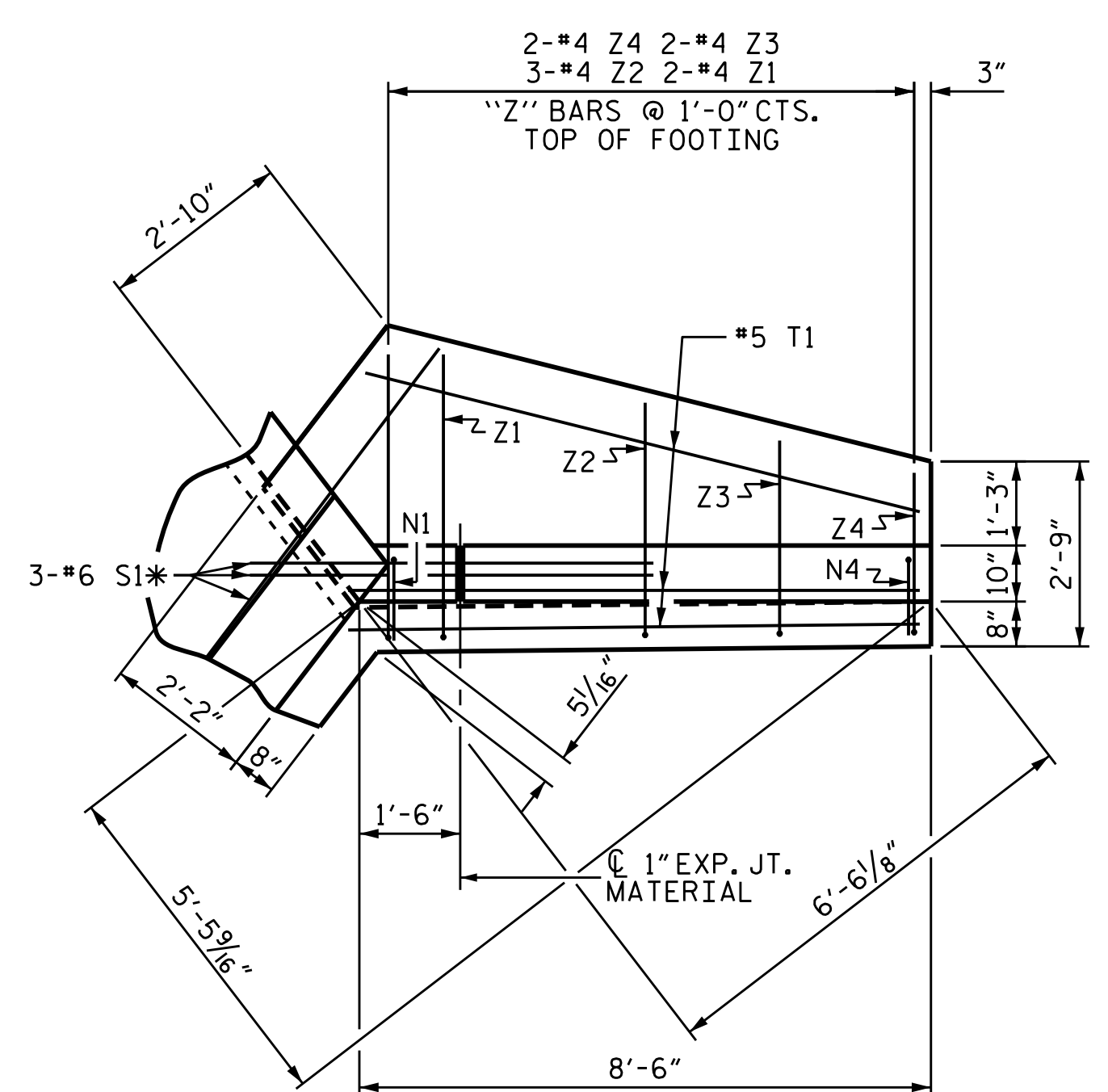
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
**SINGLE 10 FT. X 6 FT.  
 CONCRETE BOX CULVERT  
 100°-00'-00" SKEW**

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

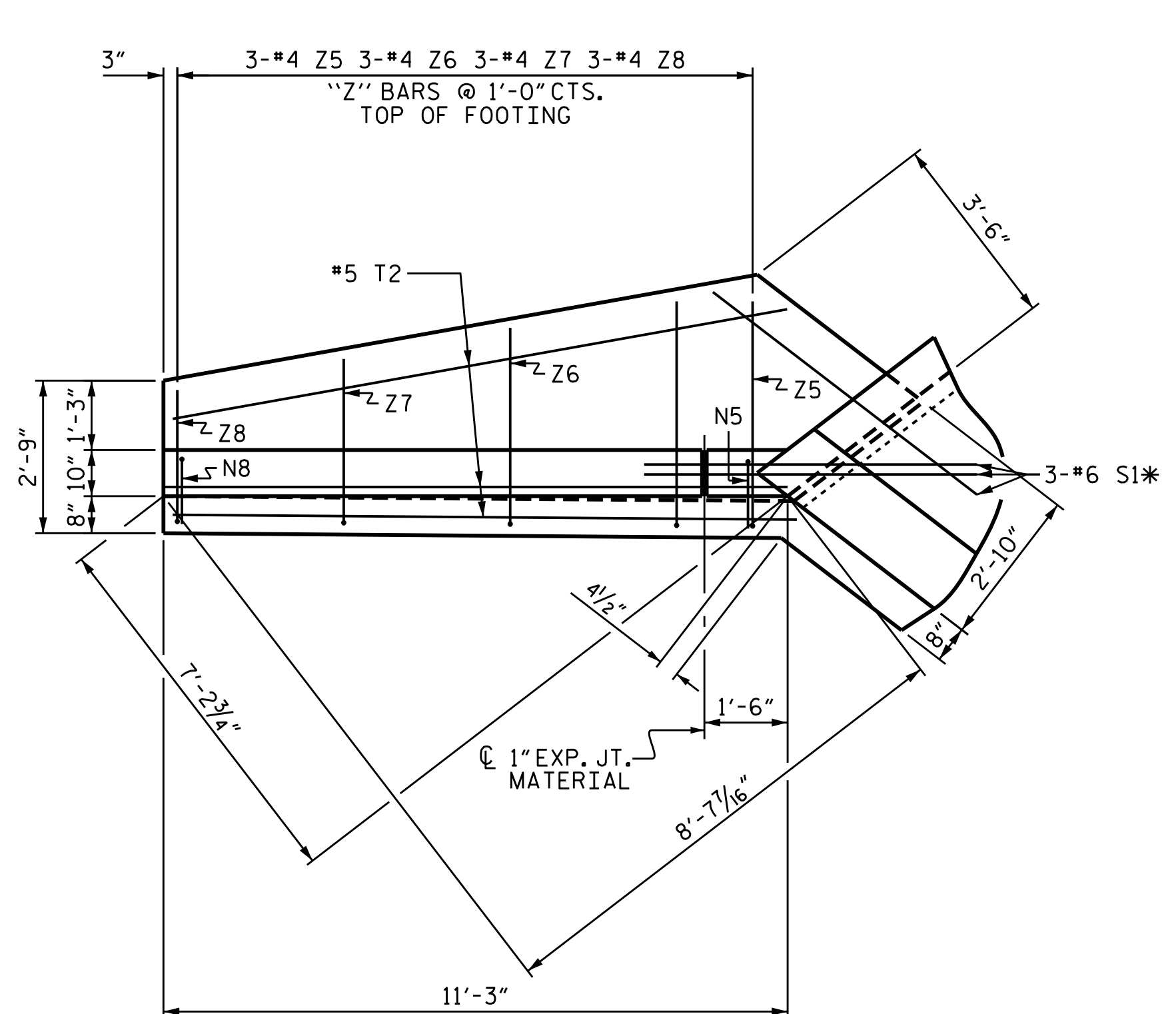
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TOTAL SHEETS 14

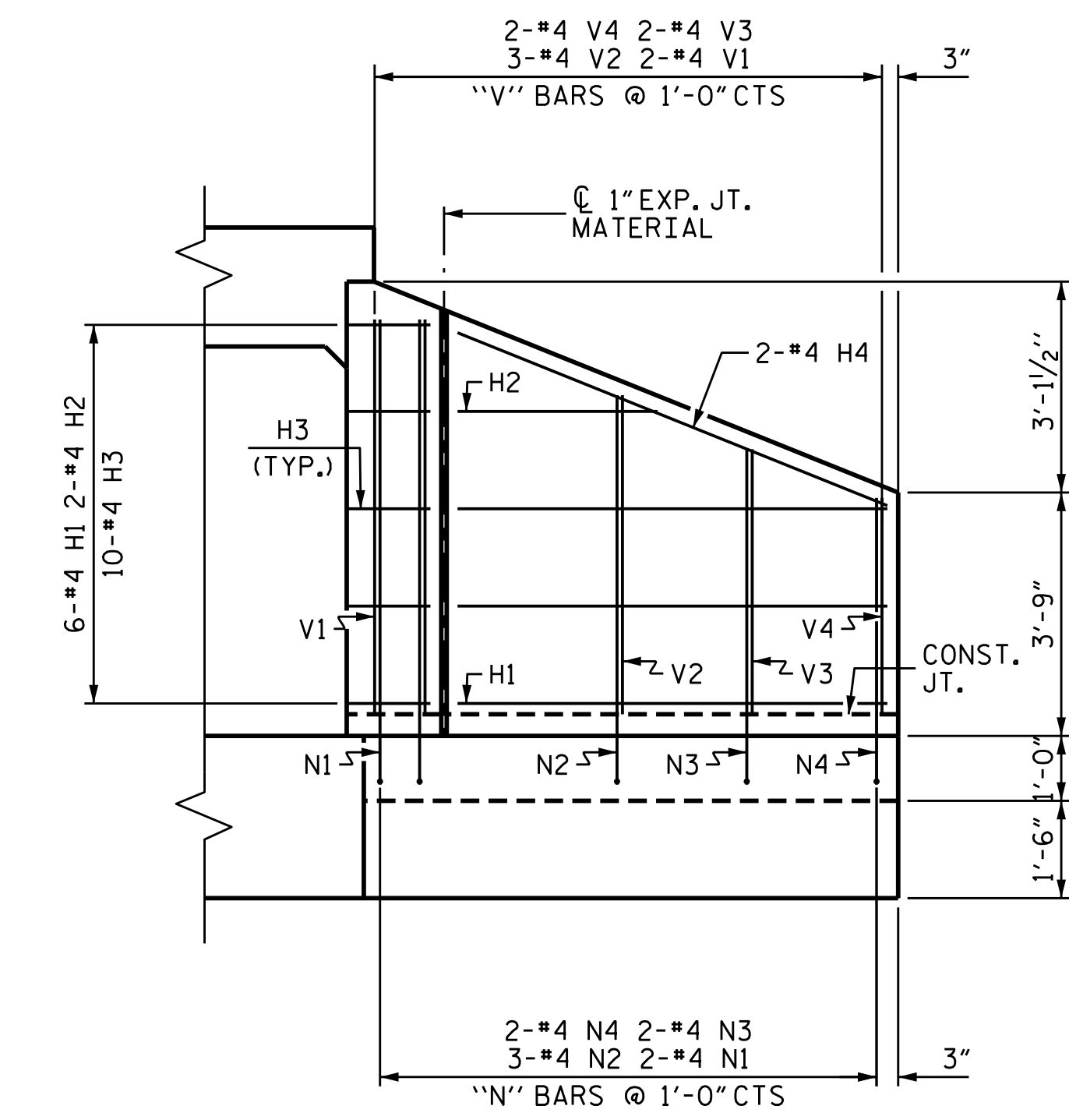


PLAN W2

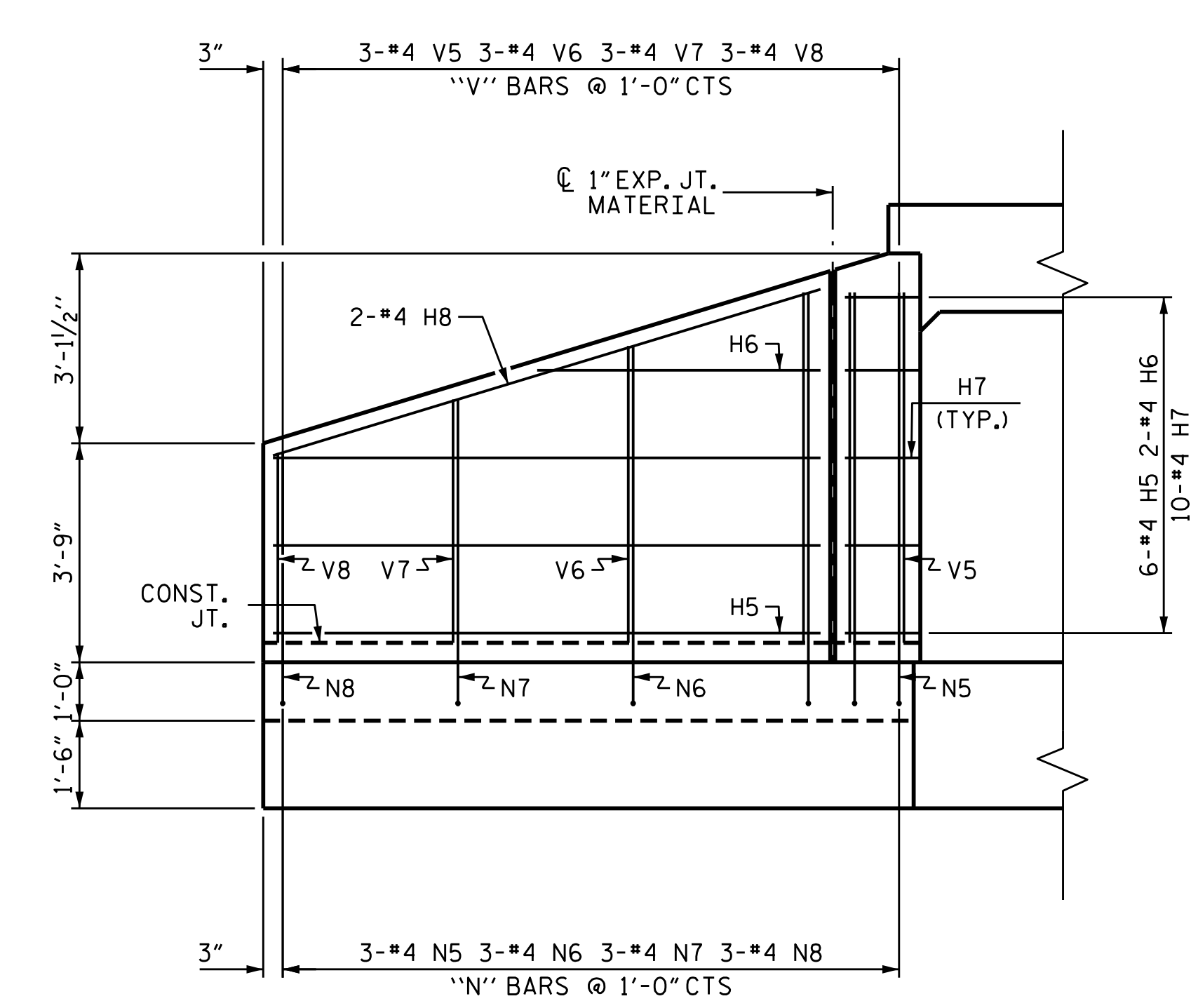
\* S1 @ BOTTOM OF FLOOR SLAB & FOOTING



PLAN W1

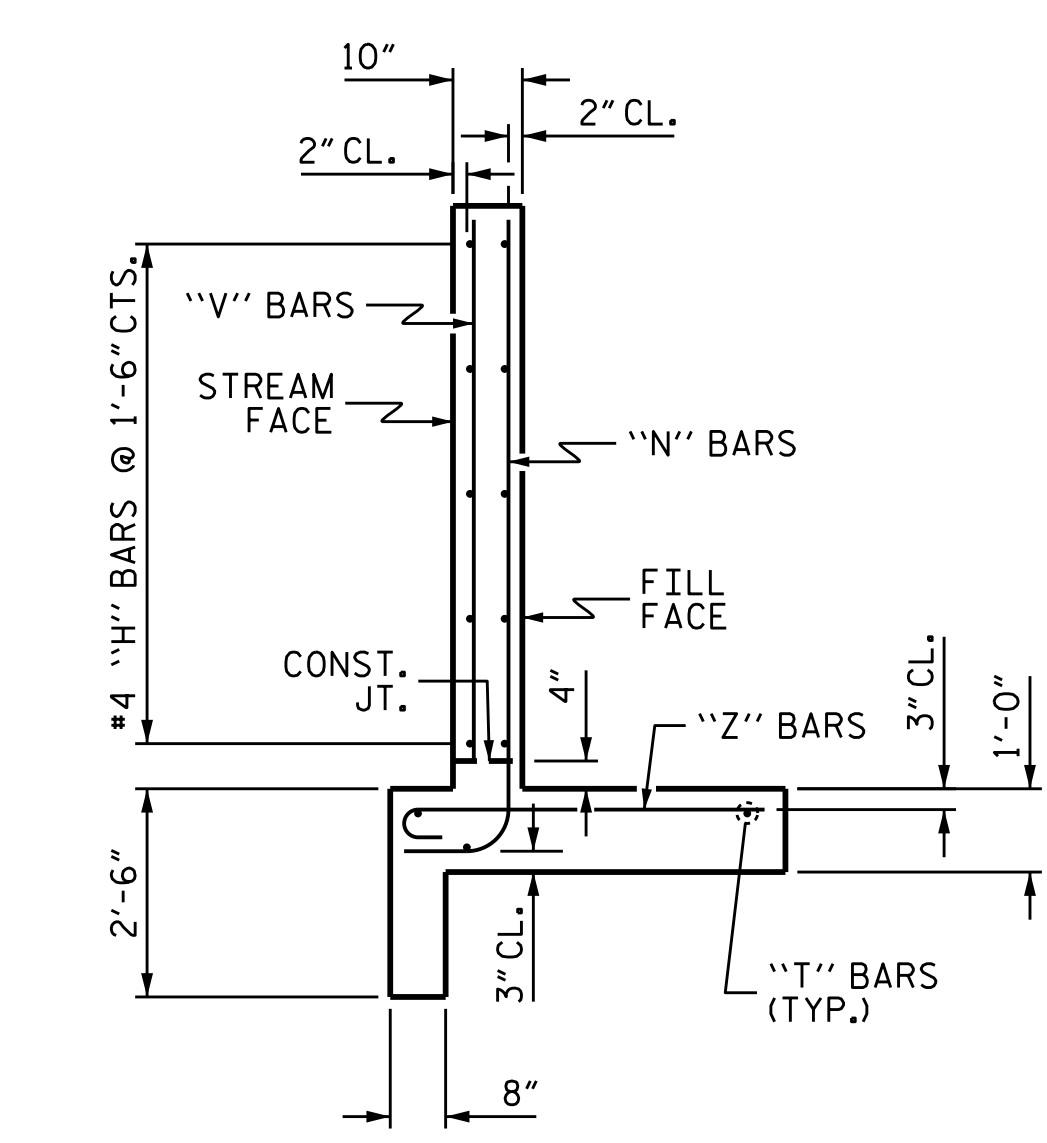
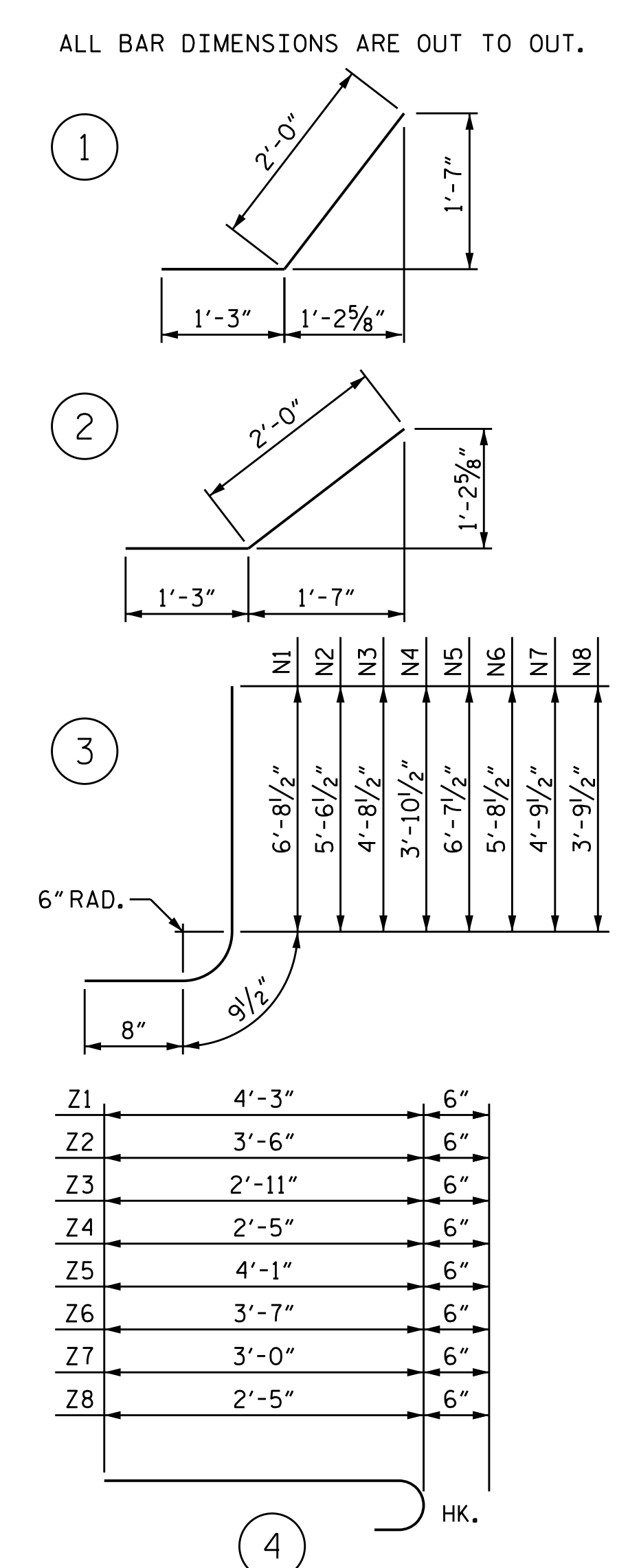


ELEVATION W2



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**

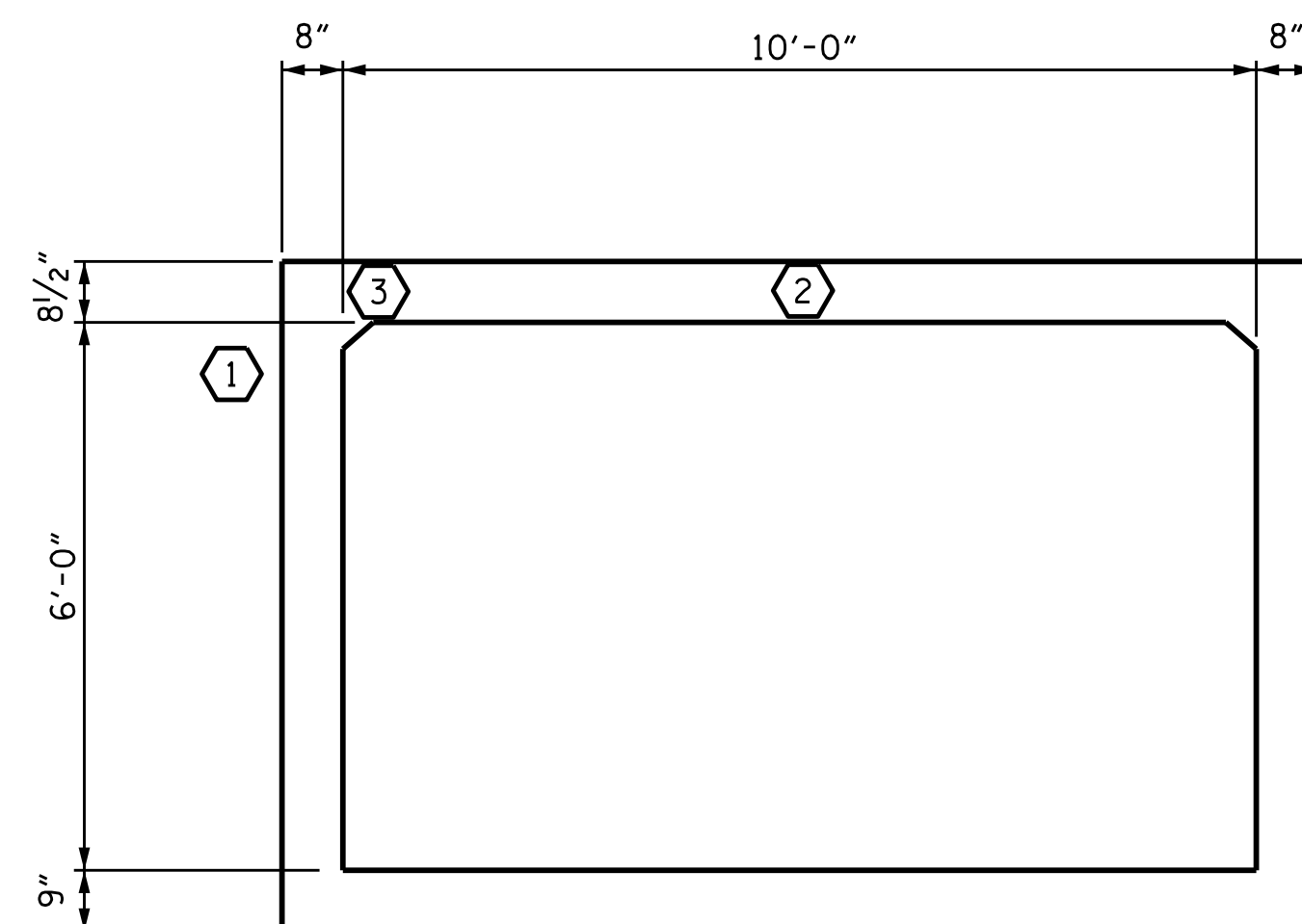
LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						LIVE-LOAD FACTORS (γ <sub>LL</sub> )	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	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

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

### SPECIAL NOTES:

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

ENGLISH

JANUARY, 1990