

LOCATION SKETCH

HYDRAULIC DATA

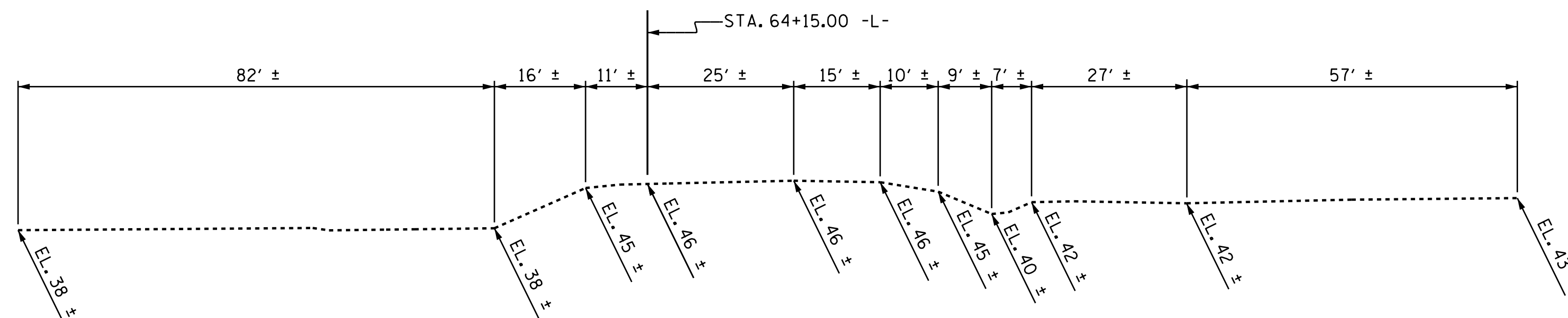
DESIGN DISCHARGE = 380 CFS  
 FREQUENCY OF DESIGN FLOOD = 50 YRS.  
 DESIGN HIGH WATER ELEVATION = 44.7 FT.  
 DRAINAGE AREA = 0.28 SQ. MI.  
 BASE DISCHARGE (Q100) = 410 CFS  
 BASE HIGH WATER ELEVATION = 45.0 FT.

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE = 460+ CFS  
 FREQUENCY OF OVERTOPPING FLOOD = 500+ YRS.  
 OVERTOPPING FLOOD ELEVATION = \* 49.35 FT.  
 \* CONC. MEDIAN SAG LOCATION AT STA. 74+84.19 -L-

GRADE DATA -L-

GRADE POINT ELEV. @ STA. 64+15.00 -L- = 51.65'  
 BED ELEVATION @ STA. 64+15.00 -L- = 38.41'  
 ROADWAY SLOPES = 3:1



PROFILE ALONG CULVERT

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.  
 MAXIMUM DESIGN FILL ----- 8.62 FT.  
 MINIMUM DESIGN FILL ----- 6.37 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 EACH STAGE OF THE 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.  
 TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.  
 AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAIL DRAWINGS FOR A PRECAST REINFORCED CONCRETE BOX CULVERT IN LIEU OF THE CAST-IN-PLACE CULVERT SHOWN ON THE PLANS. THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIONAL PRECAST REINFORCED CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.  
 AFTER SERVING AS A TEMPORARY STRUCTURE THE EXISTING 6' X 4' / 6' X 5' RCBC LOCATED JUST WEST OF THE PROPOSED 10' X 5' RCBC SHALL BE REMOVED.  
 TRAFFIC ON NC211 (SOUTHPORT - SUPPLY RD.) SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS DIRECTED BY THE ENGINEER. FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.  
 AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL AND BOTH FACES OF INTERIOR WALLS 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.  
 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 SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT 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.  
 THIS STRUCTURE CONTAINS THE NECESSARY CORROSION PROTECTION REQUIRED FOR A CORROSIVE SITE.  
 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.  
 ALL BAR SUPPORTS USED IN THE CULVERT AND ALL INCIDENTAL REINFORCING STEEL SHALL BE EPOXY COATED IN ACCORDANCE WITH THE STANDARD SPECIFICATION.  
 FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.  
 FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.

TOTAL STRUCTURE QUANTITIES	
CULVERT EXCAVATION	LUMP SUM
REMOVAL OF EXISTING STRUCTURE	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	160 TONS
CLASS A CONCRETE	
BARREL @ 0.846 CY/FT	
STAGE I	52.0 C.Y.
STAGE II	72.8 C.Y.
OUTLET WINGS ETC.	
STAGE I	9.0 C.Y.
STAGE II	9.0 C.Y.
EXISTING CULVERT	9.0 C.Y.
TOTAL	151.8 C.Y.
REINFORCING STEEL	
BARREL	
STAGE I	11,481 LBS.
STAGE II	16,004 LBS.
WINGS ETC.	
STAGE I	511 LBS.
STAGE II	511 LBS.
EXISTING 10' X 5' RCBC	567 LBS.
TOTAL	29,074 LBS.

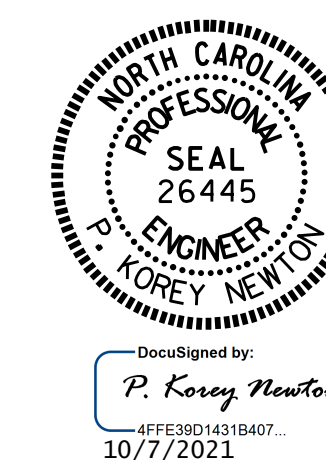
SAMPLE BAR REPLACEMENT

SIZE	LENGTH
#3	6'-2"
#4	7'-4"
#5	8'-6"
#6	9'-8"
#7	10'-10"
#8	12'-0"
#9	13'-2"
#10	14'-6"
#11	15'-10"

NOTE:  
 SAMPLE BAR REPLACEMENT LENGTHS BASED ON 30" (SAMPLE LENGTH) PLUS TWO SPLICE LENGTHS AND  $f_y = 60\text{ksi}$ .

PROJECT NO. R-5021  
 BRUNSWICK COUNTY  
 STATION: 64+15.00 -L-

SHEET 1 OF 4



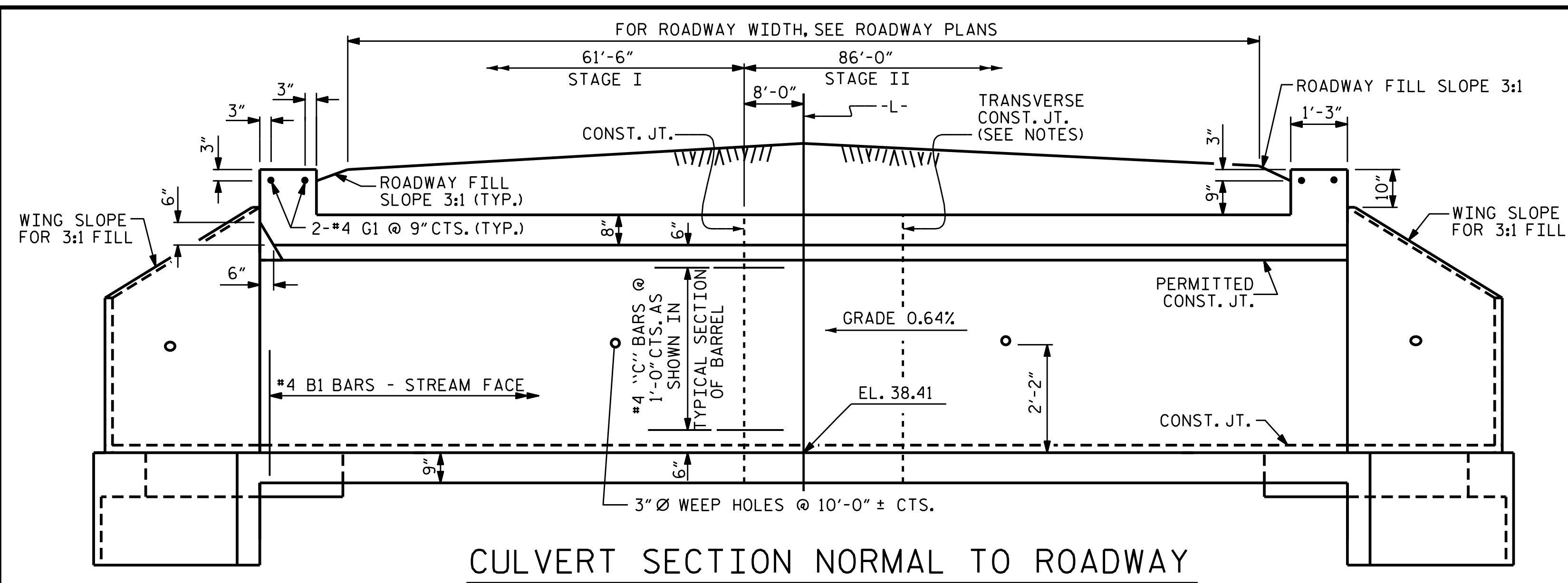
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 SINGLE 10 FT. X 5 FT.  
 CONCRETE BOX CULVERT  
 90° SKEW

ASSEMBLED BY : QTN / PKN DATE : 10/7/21  
 CHECKED BY : PKN / DRS DATE : 10/7/21  
 DRAWN BY : R.W. WRIGHT DATE : AUG. 1989  
 CHECKED BY : A.R. BISSETTE DATE : AUG. 1989

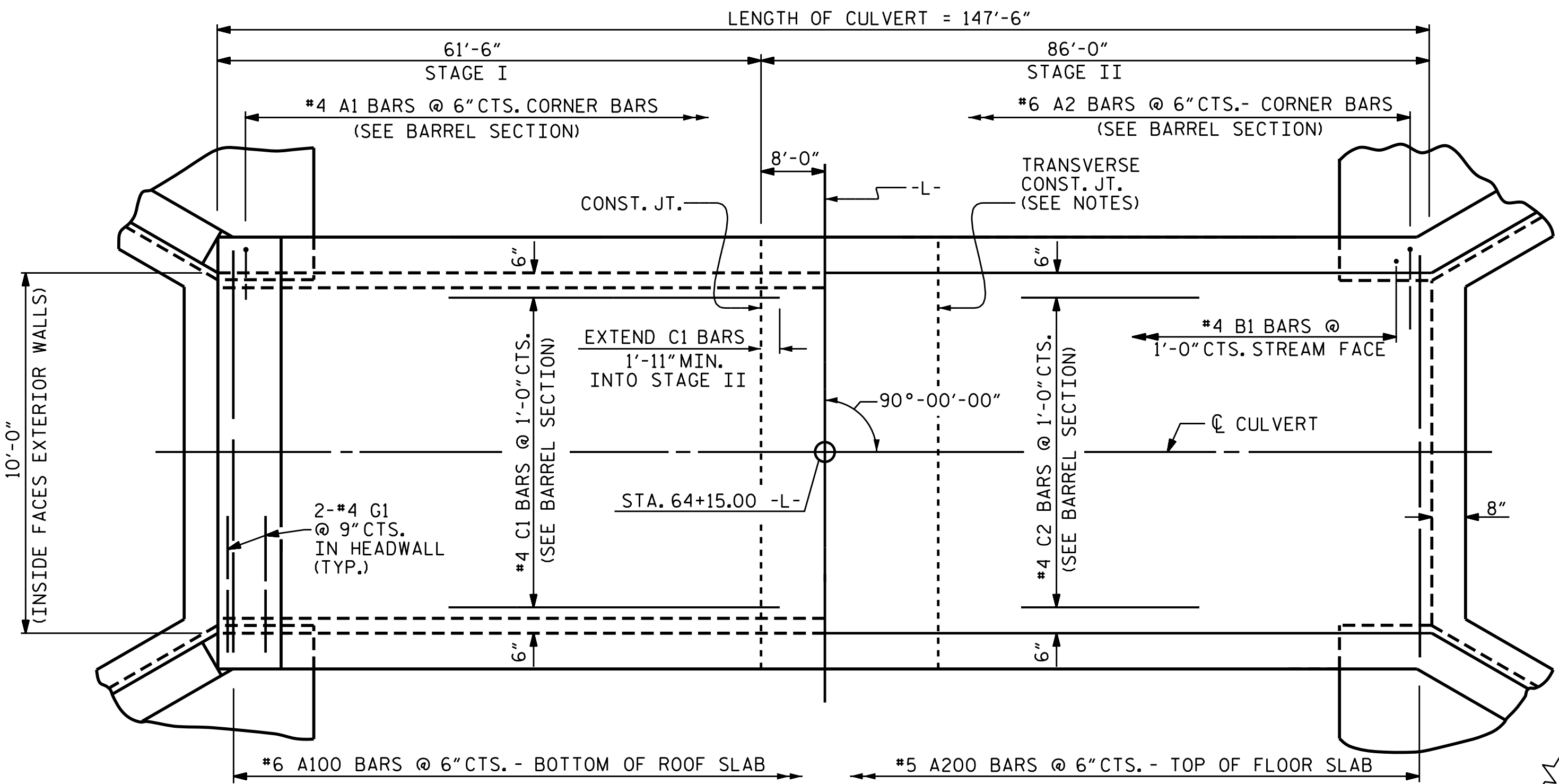
SPECIAL  
 STANDARD

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-1
1			3			TOTAL SHEETS
2			4			4

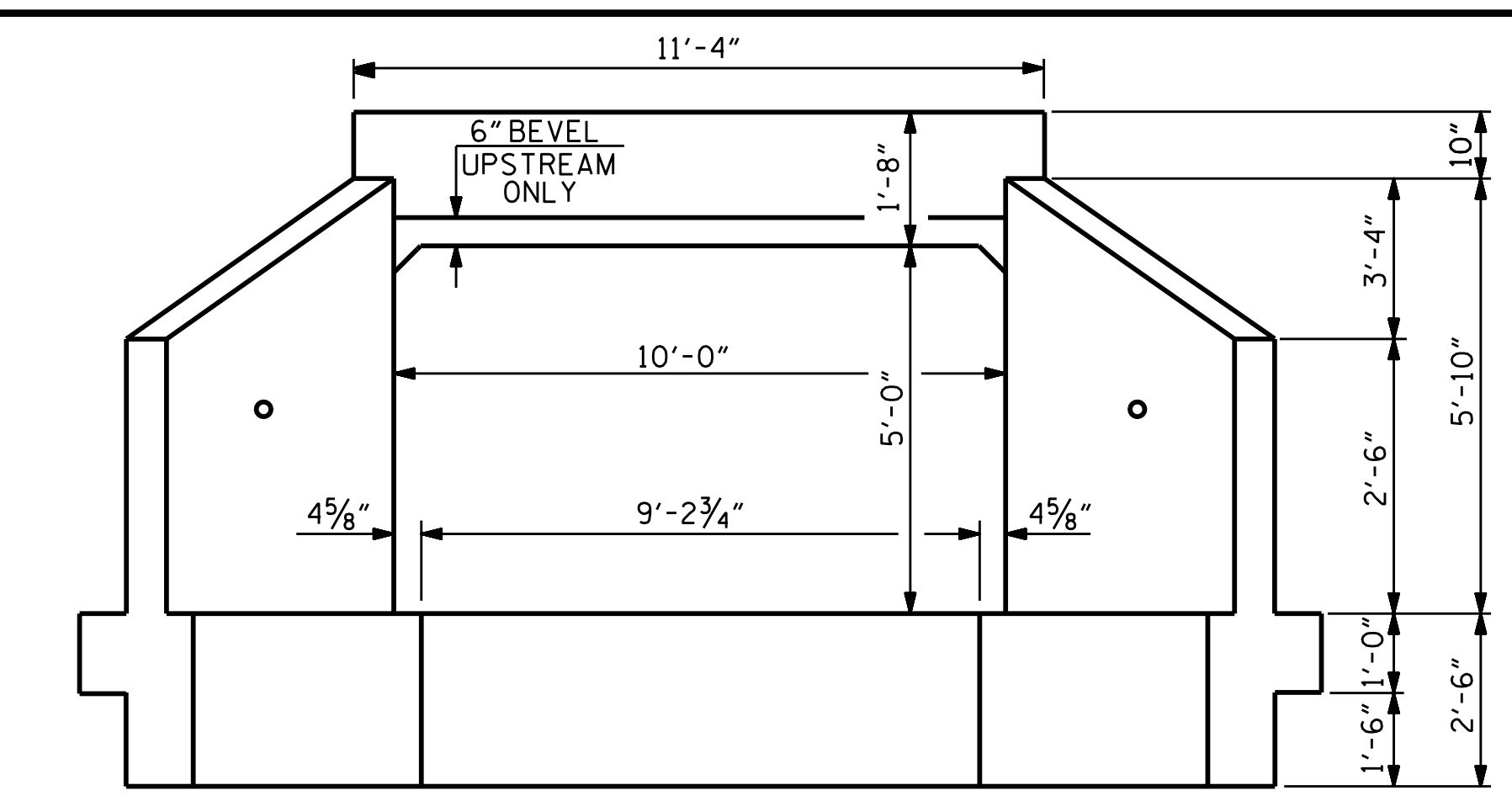


CULVERT SECTION NORMAL TO ROADWAY

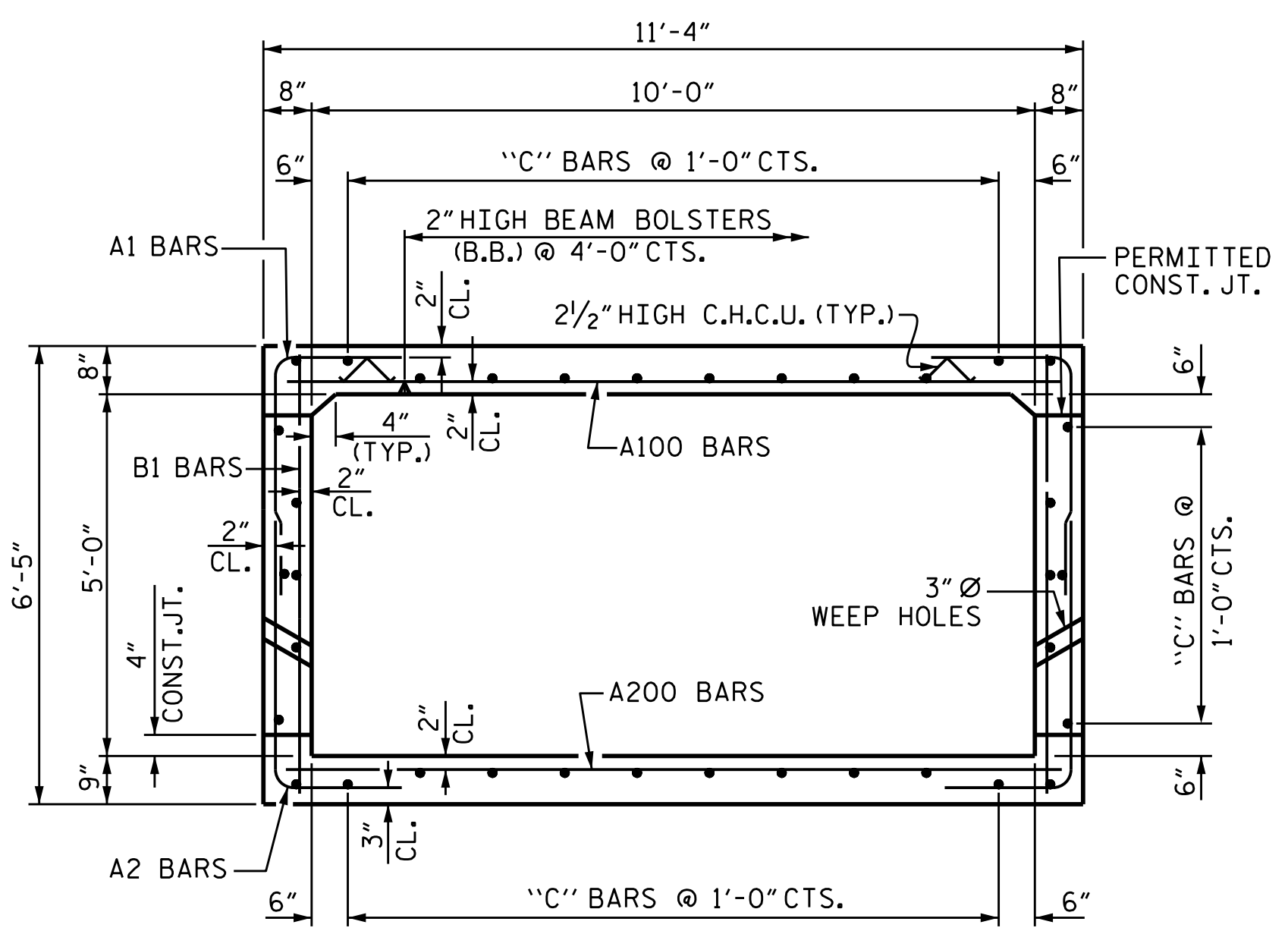


PART PLAN ROOF SLAB

PART PLAN FLOOR SLAB



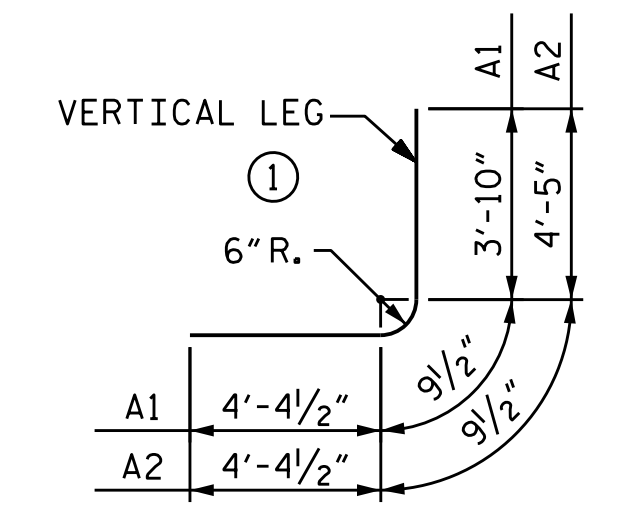
END ELEVATION



RIGHT ANGLE SECTION OF BARREL

THERE ARE 36 "C" BARS IN SECTION OF BARREL

BILL OF MATERIAL					
STAGE I					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
* A1	246	#4	1	9'-0"	1479
* A2	246	#6	1	9'-7"	2459
* A100	123	#6	STR.	10'-11"	2017
* A200	123	#5	STR.	10'-11"	1400
* B1	370	#4	STR.	5'-11"	1462
* C1	72	#4	STR.	32'-7"	1567
* G1	2	#4	STR.	11'-0"	15
* EPOXY COATED REINF. STEEL = 11,481 LBS					
STAGE II					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
* A1	344	#4	1	9'-0"	2068
* A2	344	#6	1	9'-7"	4952
* A100	172	#6	STR.	10'-11"	2820
* A200	172	#5	STR.	10'-11"	1958
* B1	516	#4	STR.	5'-11"	2039
* C2	108	#4	STR.	29'-10"	2152
* G1	2	#4	STR.	11'-0"	15
* EPOXY COATED REINF. STEEL = 16,004 LBS					



BAR TYPE

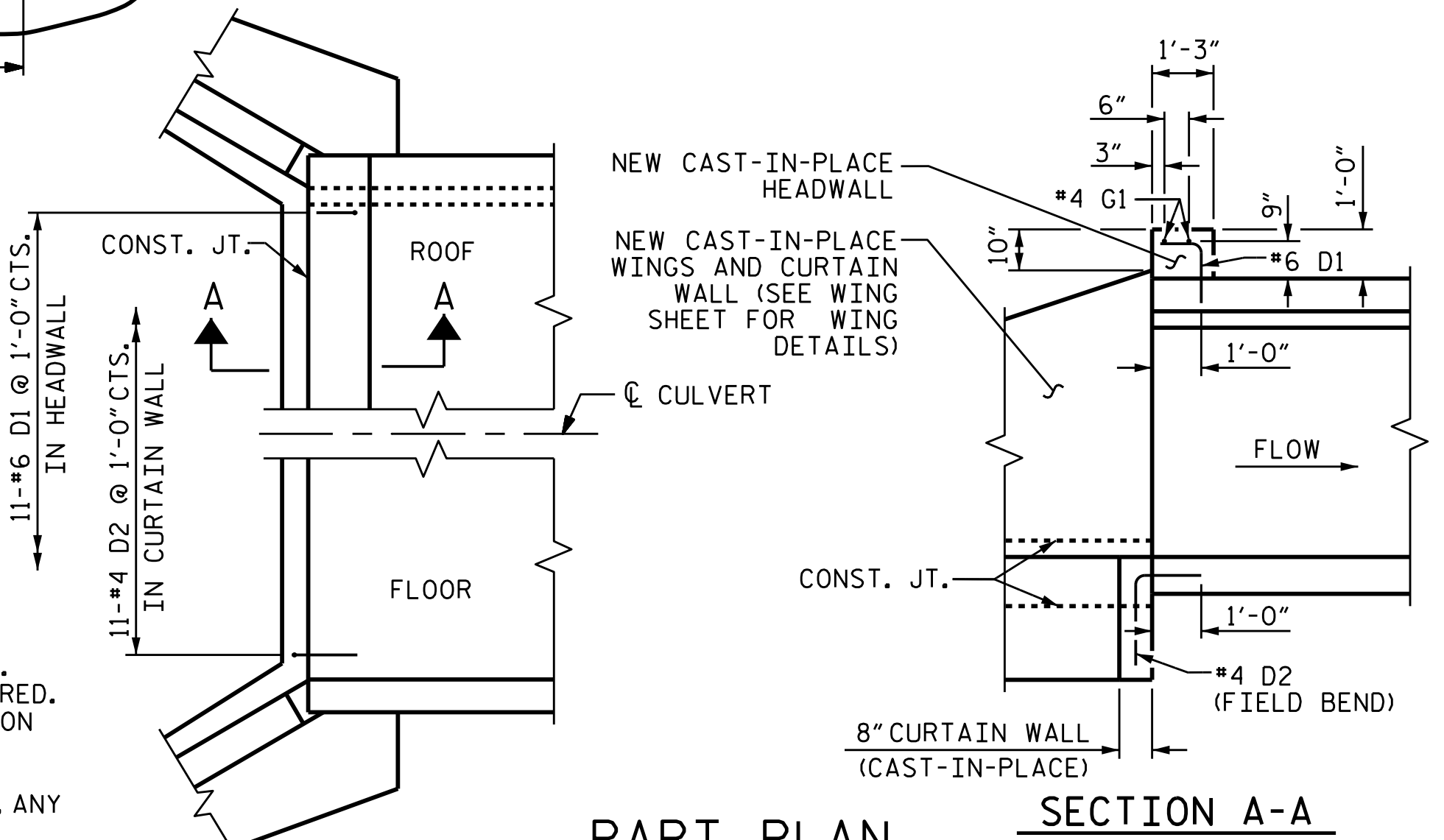
BAR DIMENSIONS ARE OUT TO OUT

SPLICE LENGTH CHART		
BAR	SIZE	SPLICE LENGTH
B1	#4	1'-5"
C1, C2	#4	1'-11"

NOTES

INSTALL #6 D1 AND #4 D2 BARS IN THE EXISTING SLAB USING ADHESIVE ANCHORAGE. THE YIELD LOAD OF THE BARS IS 10 KIPS. LEVEL ONE FIELD TESTING OF THE ANCHORING SYSTEM IS REQUIRED. FOR ADHESIVELY ANCHORED ANCHOR BOLTS OR DOWELS, SEE SECTION 420-13 OF THE STANDARD SPECIFICATIONS.

DURING CONSTRUCTION OF CURTAIN WALLS, WINGS, AND HEADWALL, ANY DAMAGE TO THE EXISTING CULVERT SHALL BE REPAIRED TO THE SATISFACTION OF THE ENGINEER. NO ADDITIONAL PAYMENT WILL BE MADE FOR SUCH REPAIRS.



PART PLAN SECTION A-A

END OF REMAINING PORTION OF EXISTING 10' X 5' RCBC



PROJECT NO. R-5021  
BRUNSWICK COUNTY  
STATION: 64+15.00 -L-

SHEET 2 OF 4

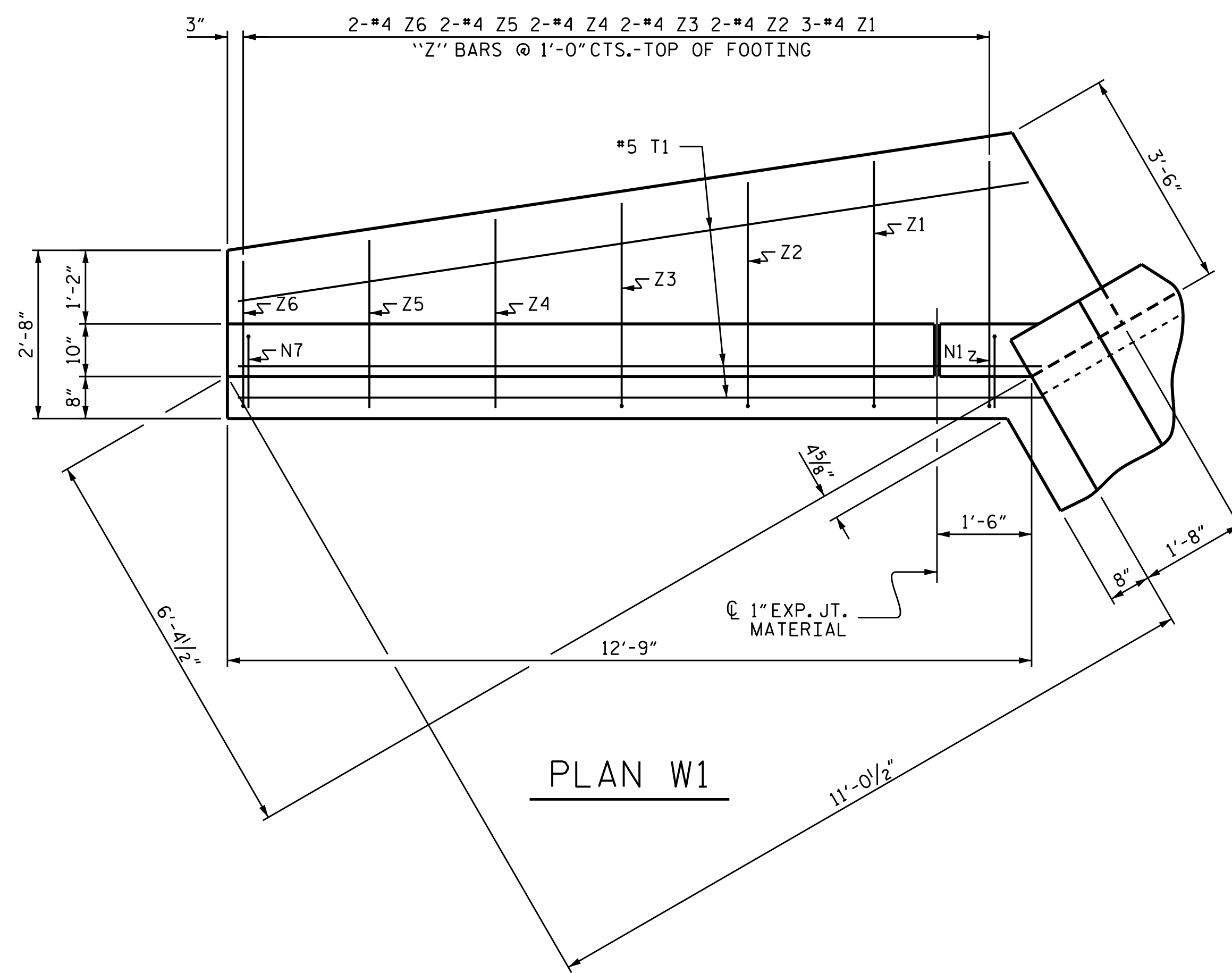
STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
SINGLE 10 FT. X 5 FT.  
CONCRETE BOX CULVERT  
90° SKEW

REVISIONS						SHEET NO. C1-2
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 4
2			4			

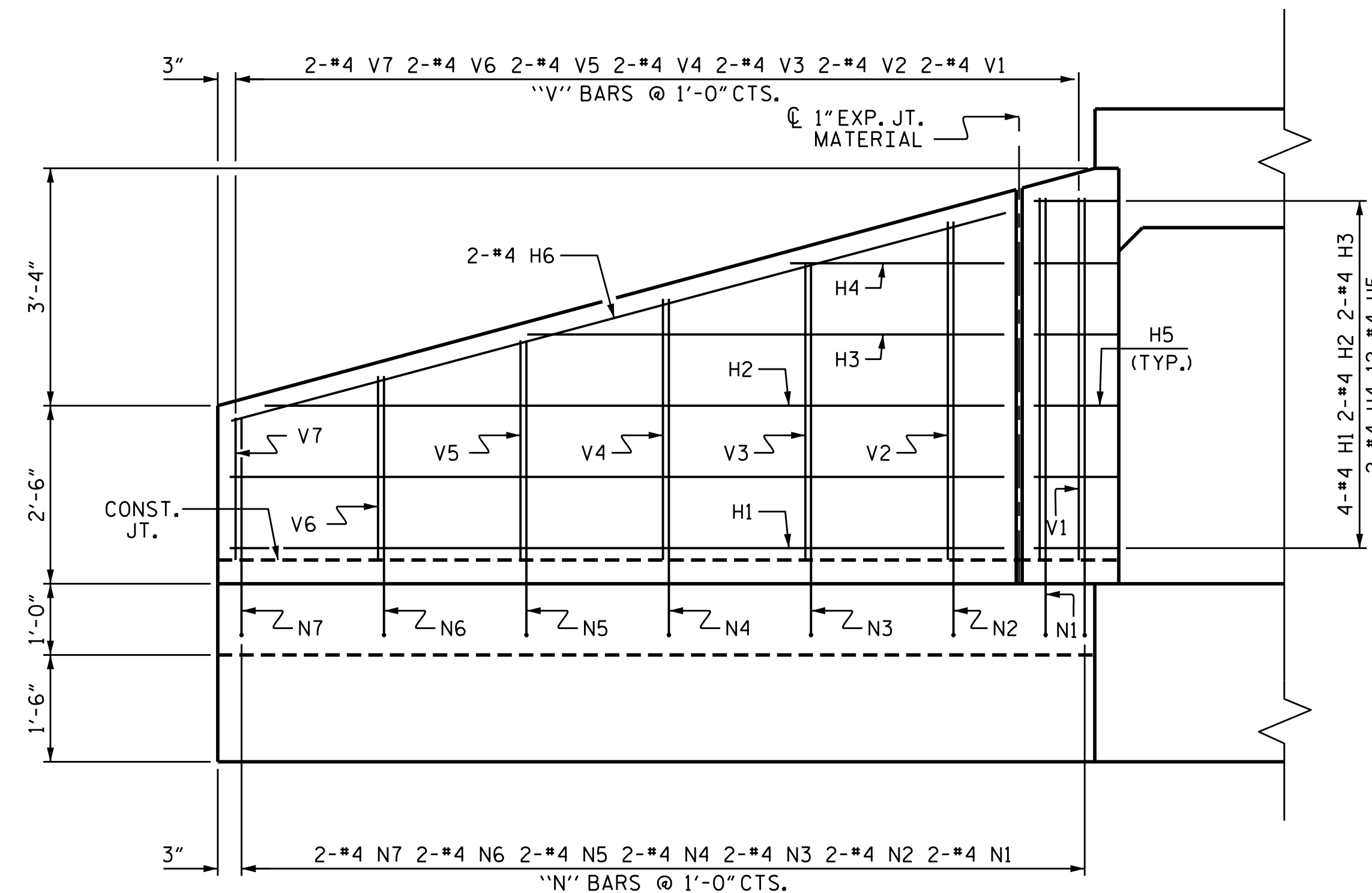
REVISED 8-28-92 BY E.L.R. CHECKED BY G.R.P.  
REVISED 6-22-98 BY A.N.B. CHECKED BY C.R.K.  
REVISED 11-19-99 BY M.M. CHECKED BY R.W.W.  
DRAWN BY R. WRIGHT DATE: AUG. 1989  
CHECKED BY A.R. BISSETTE DATE: AUG. 1989

ASSEMBLED BY : QTN / PKN	DATE : 10/7/21	SPECIAL
CHECKED BY : PKN / DRS	DATE : 10/7/21	
DRAWN BY : R. WRIGHT	DATE : AUG. 1989	STANDARD
CHECKED BY : A.R. BISSETTE	DATE : AUG. 1989	

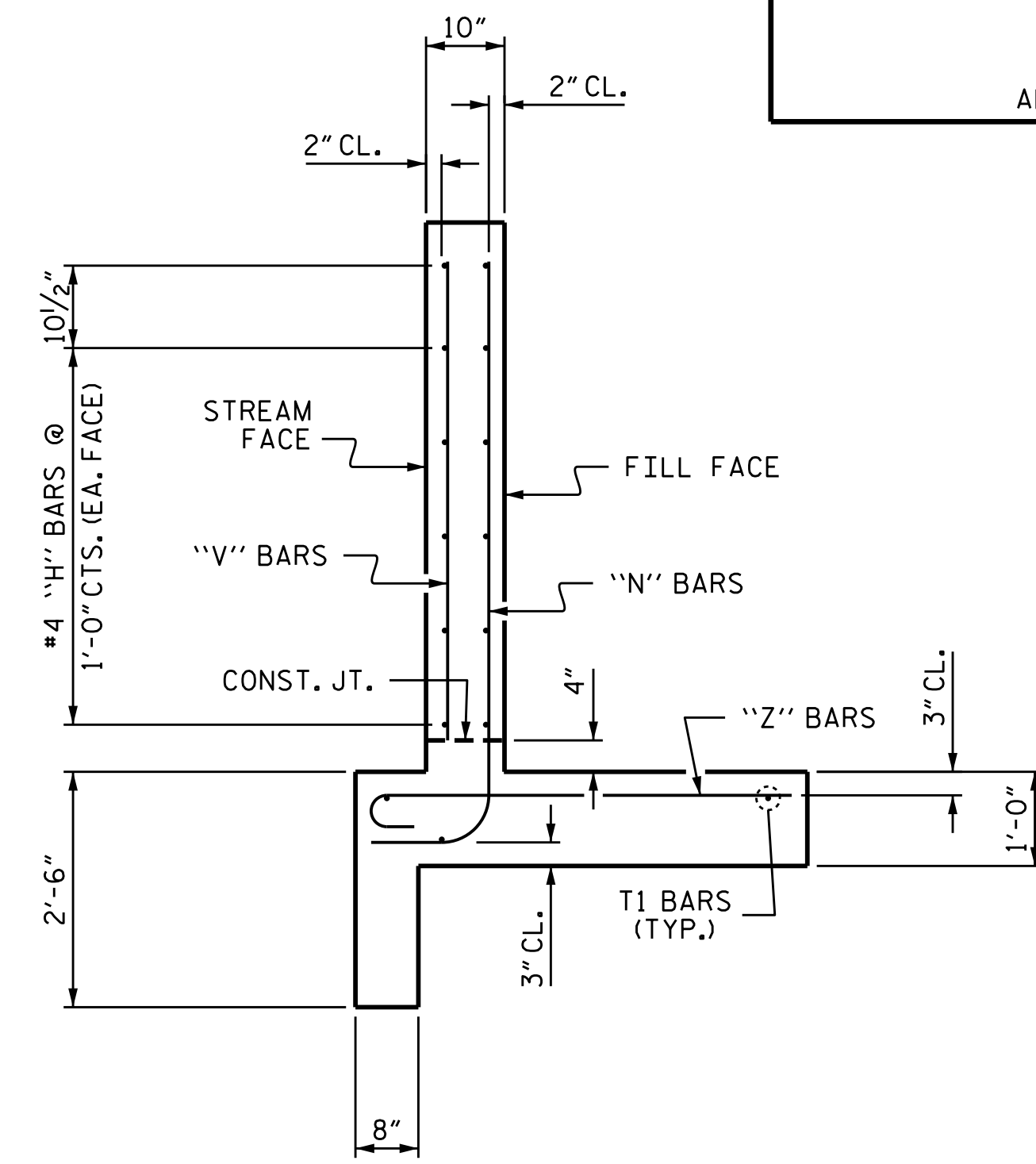
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



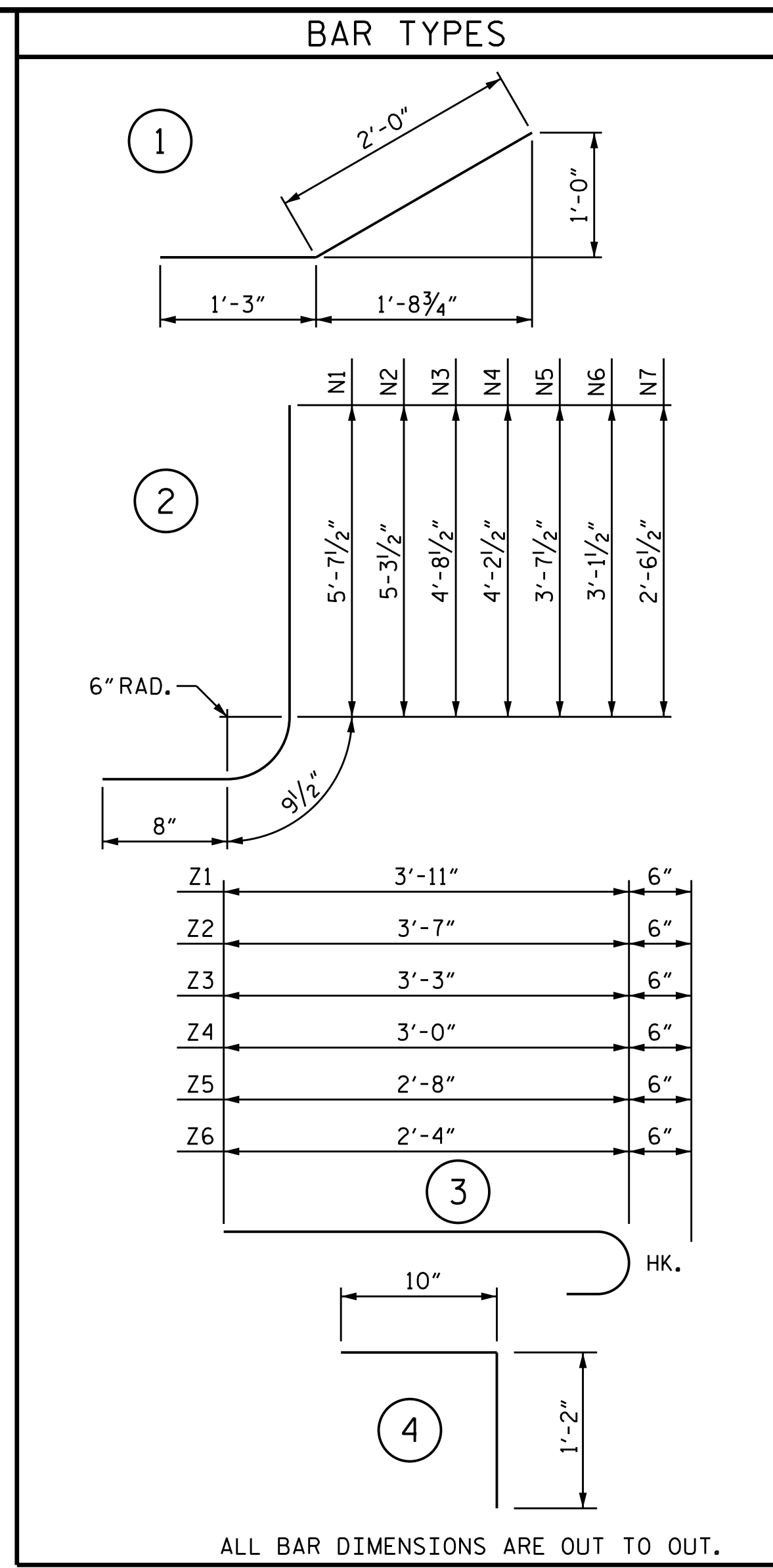
PLAN W1



ELEVATION W1



TYPICAL WING SECTION



BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	8	#4	STR	10'-10"	58
H2	4	#4	STR	10'-4"	28
H3	4	#4	STR	6'-8"	18
H4	4	#4	STR	3'-0"	8
H5	24	#4	1	3'-3"	52
H6	4	#4	STR	11'-3"	30
N1	4	#4	2	7'-1"	19
N2	4	#4	2	6'-9"	18
N3	4	#4	2	6'-2"	16
N4	4	#4	2	5'-8"	15
N5	4	#4	2	5'-1"	14
N6	4	#4	2	4'-7"	12
N7	4	#4	2	4'-0"	11
T1	6	#5	STR	12'-9"	80
V1	4	#4	STR	5'-1"	14
V2	4	#4	STR	4'-9"	13
V3	4	#4	STR	4'-2"	11
V4	4	#4	STR	3'-8"	10
V5	4	#4	STR	3'-1"	8
V6	4	#4	STR	2'-7"	7
V7	4	#4	STR	2'-0"	5
Z1	6	#4	3	4'-5"	18
Z2	4	#4	3	4'-1"	11
Z3	4	#4	3	3'-9"	10
Z4	4	#4	3	3'-6"	9
Z5	4	#4	3	3'-2"	8
Z6	4	#4	3	2'-10"	8
D1	11	#6	4	2'-0"	33
D2	11	#4	STR	3'-2"	23
G1	2	#4	STR	11'-0"	15
REINFORCING STEEL FOR 2 WINGS				LBS.	† 582
CLASS A CONCRETE 2 WINGS				CU. YDS.	7.9
1 HEADWALL				CU. YDS.	0.5
1 END CURTAIN WALL				CU. YDS.	0.6
TOTAL				CU. YDS.	9.0

† WEIGHTS FOR #6 D1, #4 D2, AND #4 G1 BARS ARE ONLY FOR THE NEW HEADWALL AND CURTAIN WALL ON THE EXISTING 10' X 5' RCBC.

DRAWN BY : WFP / QTN DATE : 10-17  
 CHECKED BY : K. W. ALFORD DATE : 12/5/18  
 DESIGN ENGINEER OF RECORD: K. A. ALFORD DATE : 12/5/18

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. R-5021  
 BRUNSWICK COUNTY  
 STATION: 64+15.00 -L-  
 SHEET 3 OF 4



STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 WINGS FOR CONCRETE BOX CULVERT  
 H = 5'-0" SLOPE = 3:1  
 90° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-3
1			3			TOTAL SHEETS
2			4			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	1.00	--	1.75	1.02	1	TOP CORNER WALL	0.57	1.00	1	TOP SLAB	0.81		
	HL-93 (OPERATING)	N/A		1.29	--	1.35	1.32	1	TOP CORNER WALL	0.57	1.29	1	TOP SLAB	0.81		
	HS-20 (INVENTORY)	36.000	2	1.35	48.74	1.75	1.37	1	TOP CORNER WALL	0.57	1.35	1	BOTTOM SLAB	0.87		
	HS-20 (OPERATING)	36.000		1.76	63.18	1.35	1.77	1	TOP CORNER WALL	0.57	1.76	1	BOTTOM SLAB	0.87		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		2.35	31.76	1.40	2.35	1	TOP CORNER WALL	0.57	2.46	1	BOTTOM SLAB	0.87		
		SNGARBS2	20.000		2.20	44.09	1.40	2.20	1	TOP CORNER WALL	0.57	2.32	1	BOTTOM SLAB	0.87	
		SNAGRIS2	22.000		2.35	51.76	1.40	2.35	1	TOP CORNER WALL	0.57	2.46	1	BOTTOM SLAB	0.87	
		SNCOTTS3	27.250	3	1.24	33.73	1.40	1.24	1	TOP CORNER WALL	0.57	1.25	1	TOP SLAB	0.81	
		SNAGGRS4	34.925		1.32	46.13	1.40	1.32	1	TOP CORNER WALL	0.57	1.32	1	BOTTOM SLAB	0.87	
		SNS5A	35.550		1.33	47.38	1.40	1.33	1	TOP CORNER WALL	0.57	1.35	1	BOTTOM SLAB	0.87	
		SNS6A	39.950		1.33	53.25	1.40	1.33	1	TOP CORNER WALL	0.57	1.35	1	BOTTOM SLAB	0.87	
	SNS7B	42.000		1.33	55.98	1.40	1.33	1	TOP CORNER WALL	0.57	1.35	1	BOTTOM SLAB	0.87		
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.08	68.65	1.40	2.08	1	TOP CORNER WALL	0.57	2.11	1	BOTTOM SLAB	0.87	
		TNT4A	33.075		1.45	47.98	1.40	1.45	1	TOP CORNER WALL	0.57	1.49	1	TOP SLAB	0.81	
		TNT6A	41.600		1.31	54.51	1.40	1.31	1	TOP CORNER WALL	0.57	1.31	1	BOTTOM SLAB	9.79	
		TNT7A	42.000		1.41	59.19	1.40	1.41	1	TOP CORNER WALL	0.57	1.44	1	TOP SLAB	9.85	
		TNT7B	42.000		1.34	56.43	1.40	1.34	1	TOP CORNER WALL	0.57	1.35	1	BOTTOM SLAB	9.79	
		TNAGRIT4	43.000		1.39	59.77	1.40	1.39	1	TOP CORNER WALL	0.57	1.42	1	TOP SLAB	0.81	
TNAGT5A		45.000		1.42	63.93	1.40	1.42	1	TOP CORNER WALL	0.57	1.45	1	TOP SLAB	0.81		
TNAGT5B	45.000		1.45	65.27	1.40	1.45	1	TOP CORNER WALL	0.57	1.49	1	TOP SLAB	0.81			

**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	0.5 OR 0.90
ES	1.35	0.5 OR 0.90
LS	1.75	0.00
WA	1.00	0.00

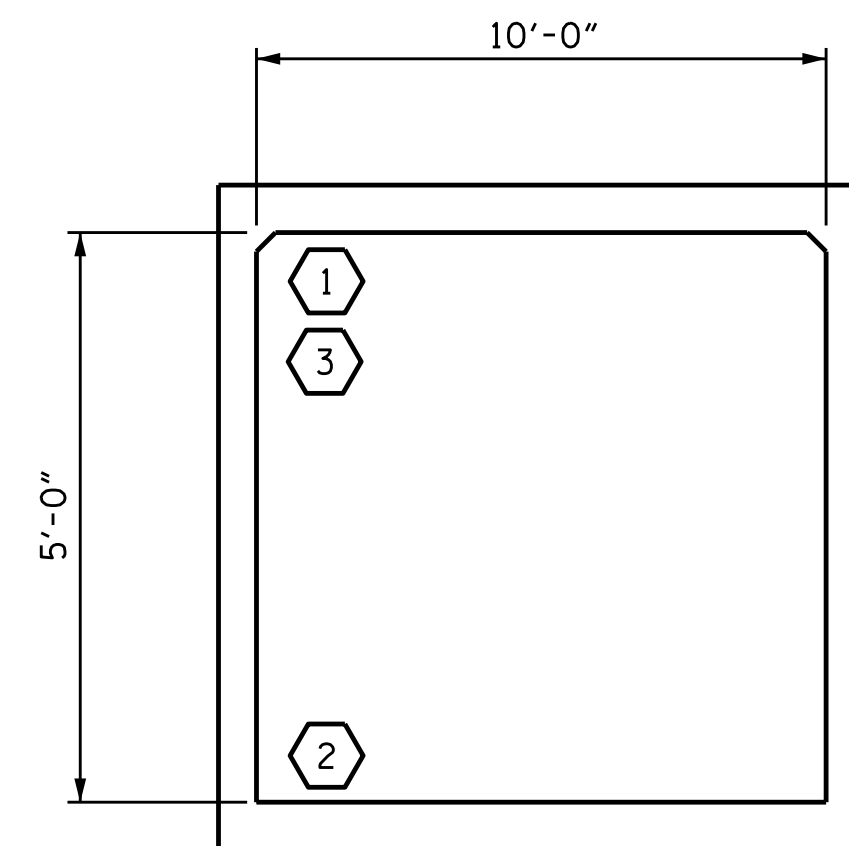
**NOTE:**

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

**COMMENTS:**

- 
- 
- 
- 

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

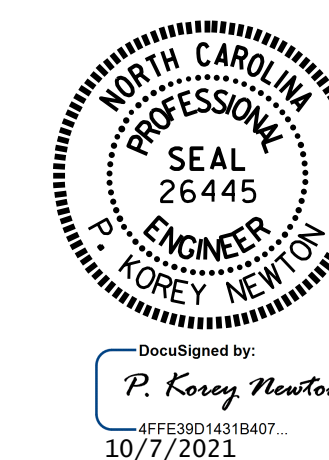


**LRFR SUMMARY**

(LOOKING DOWNSTREAM)

PROJECT NO. R-5021  
BRUNSWICK COUNTY  
 STATION: 64+15.00 -L-

SHEET 4 OF 4



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

ASSEMBLED BY : P. K. NEWTON	DATE : 10/7/21
CHECKED BY : D. R. SHACKELFORD	DATE : 10/7/21
DRAWN BY : WMC	7/11
CHECKED BY : GM	7/11
REV. 10/1/11	MAA/GM
REV. 12/17	MAA/THC

DOCUMENT NOT CONSIDERED  
 FINAL UNLESS ALL  
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-4
1			3			TOTAL SHEETS
2			4			4

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.  
 MAXIMUM DESIGN FILL ..... 4.82 FT.  
 MINIMUM DESIGN FILL ..... 3.00 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 EACH STAGE OF THE 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.  
 TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.  
 AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAIL DRAWINGS FOR A PRECAST REINFORCED CONCRETE BOX CULVERT IN LIEU OF THE CAST-IN-PLACE CULVERT SHOWN ON THE PLANS. THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIONAL PRECAST REINFORCED CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.  
 AFTER SERVING AS A TEMPORARY STRUCTURE THE EXISTING 10' X 8' RCBC LOCATED JUST WEST OF THE PROPOSED DOUBLE 8' X 6' RCBC SHALL BE REMOVED.  
 TRAFFIC ON NC211 (SOUTHPORT - SUPPLY RD.) SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS DIRECTED BY THE ENGINEER. FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.  
 AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL AND BOTH FACES OF INTERIOR WALLS 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.

TOTAL STRUCTURE QUANTITIES

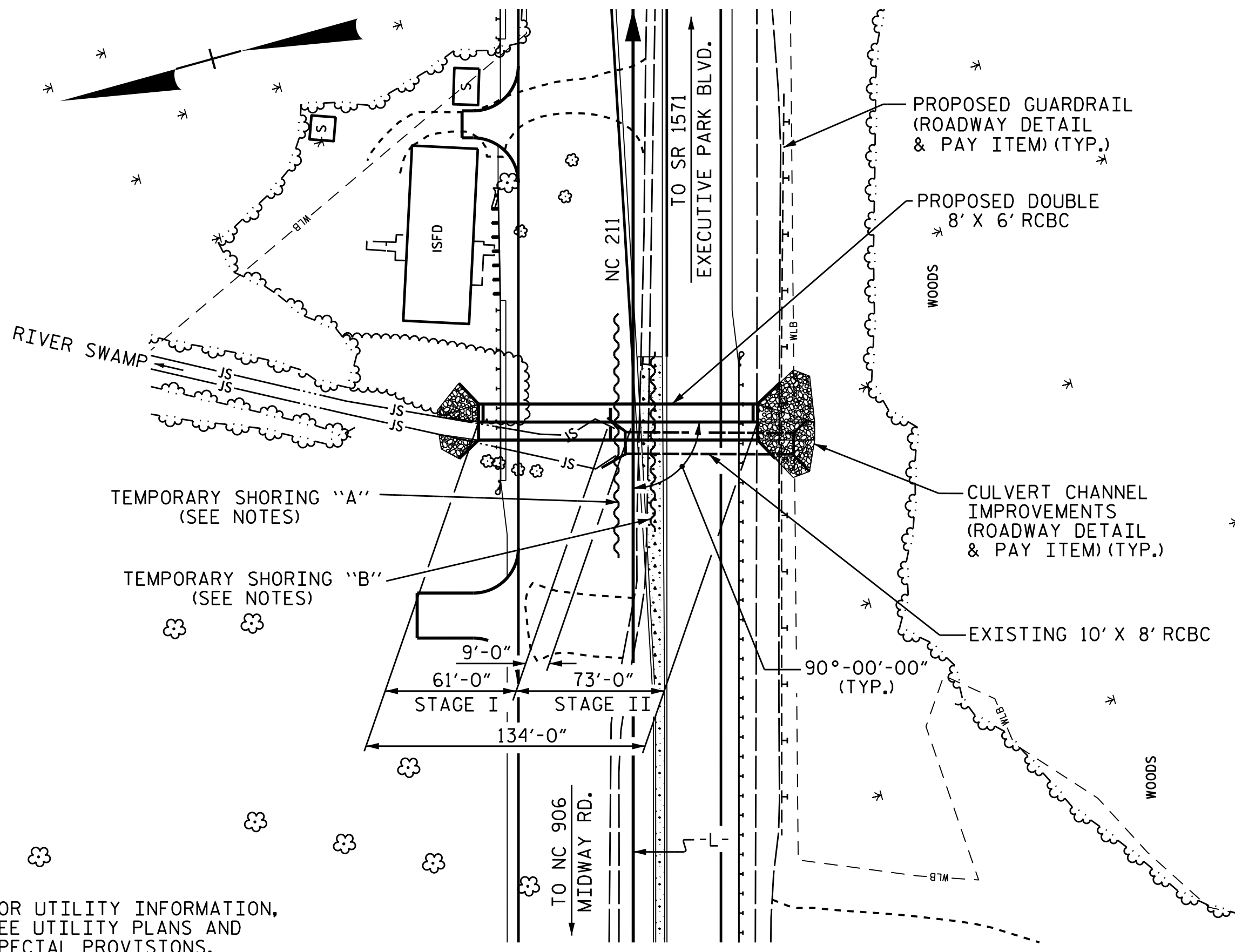
CULVERT EXCAVATION	LUMP SUM
REMOVAL OF EXISTING STRUCTURE	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	208 TONS
CLASS A CONCRETE	
BARREL @ 1.453 CY/FT	
STAGE I	88.6 C.Y.
STAGE II	106.1 C.Y.
WINGS ETC.	
STAGE I	12.5 C.Y.
STAGE II	15.3 C.Y.
TOTAL	222.5 C.Y.
REINFORCING STEEL	
BARREL	
STAGE I	12,025 LBS.
STAGE II	14,234 LBS.
WINGS ETC.	
STAGE I	593 LBS.
STAGE II	593 LBS.
TOTAL	27,445 LBS.

SAMPLE BAR REPLACEMENT

SIZE	LENGTH
#3	6'-2"
#4	7'-4"
#5	8'-6"
#6	9'-8"
#7	10'-10"
#8	12'-0"
#9	13'-2"
#10	14'-6"
#11	15'-10"

NOTE:  
 SAMPLE BAR REPLACEMENT LENGTHS BASED ON 30" (SAMPLE LENGTH) PLUS TWO SPLICE LENGTHS AND  $f_y = 60\text{ksi}$ .

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.  
 THIS STRUCTURE CONTAINS THE NECESSARY CORROSION PROTECTION REQUIRED FOR A CORROSIVE SITE.  
 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.  
 ALL BAR SUPPORTS USED IN THE CULVERT AND ALL INCIDENTAL REINFORCING STEEL SHALL BE EPOXY COATED IN ACCORDANCE WITH THE STANDARD SPECIFICATION.  
 FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.  
 FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.



LOCATION SKETCH

HYDRAULIC DATA

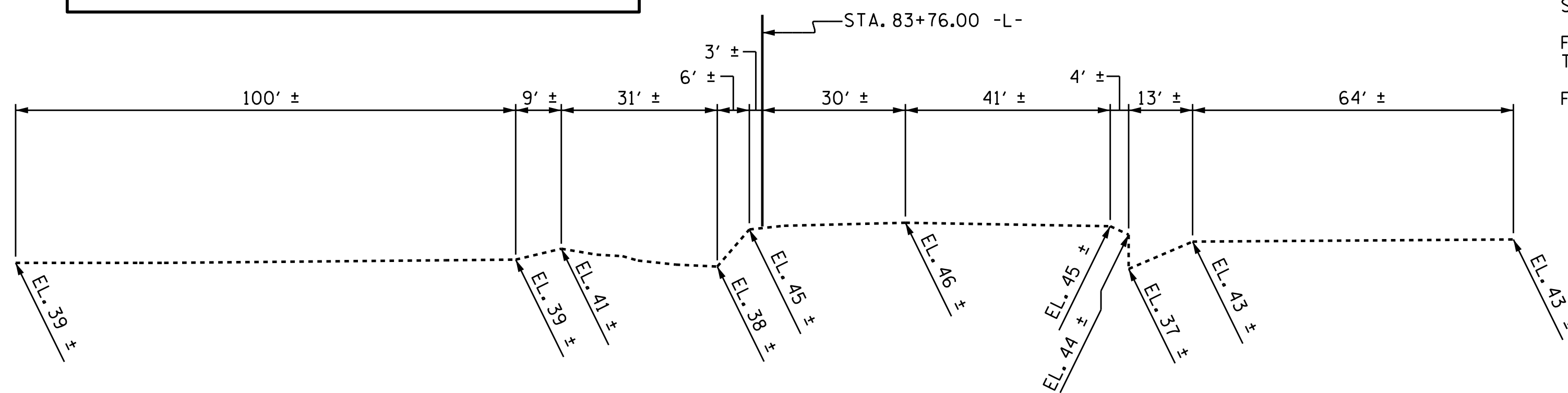
DESIGN DISCHARGE = 550 CFS  
 FREQUENCY OF DESIGN FLOOD = 50 YRS.  
 DESIGN HIGH WATER ELEVATION = 45.8 FT.  
 DRAINAGE AREA = 0.66 SQ. MI.  
 BASE DISCHARGE (Q100) = 600 CFS  
 BASE HIGH WATER ELEVATION = 46.1 FT.

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE = 750+ CFS  
 FREQUENCY OF OVERTOPPING FLOOD = 500+ YRS.  
 OVERTOPPING FLOOD ELEVATION = \* 49.6 FT.  
 \* CONC. MEDIAN SAG LOCATION AT STA. 85+51.92 -L-

GRADE DATA -L-

GRADE POINT ELEV. @ STA. 83+76.00 -L- = 49.94'  
 BED ELEVATION @ STA. 83+76.00 -L- = 39.18'  
 ROADWAY SLOPES = 3:1



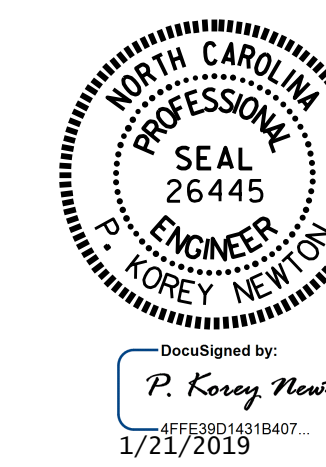
PROFILE ALONG CULVERT

ASSEMBLED BY : WFP / OTN DATE : 11-17  
 CHECKED BY : P. K. NEWTON DATE : 12/3/18  
 DRAWN BY : R.W. WRIGHT DATE : JULY, 1990  
 CHECKED BY : D.A. GLADDEN DATE : JULY, 1990

SPECIAL STANDARD

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

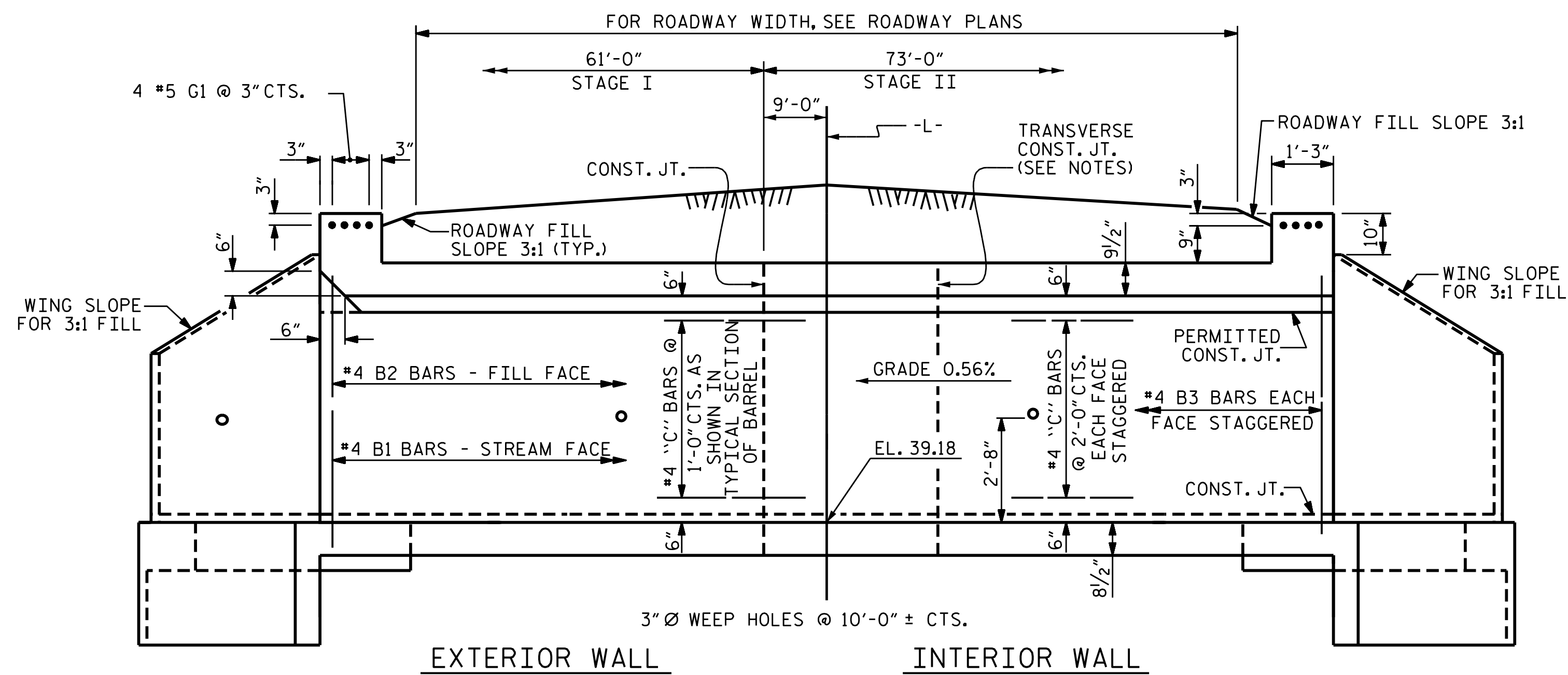
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-1
1			3			TOTAL SHEETS 5
2			4			



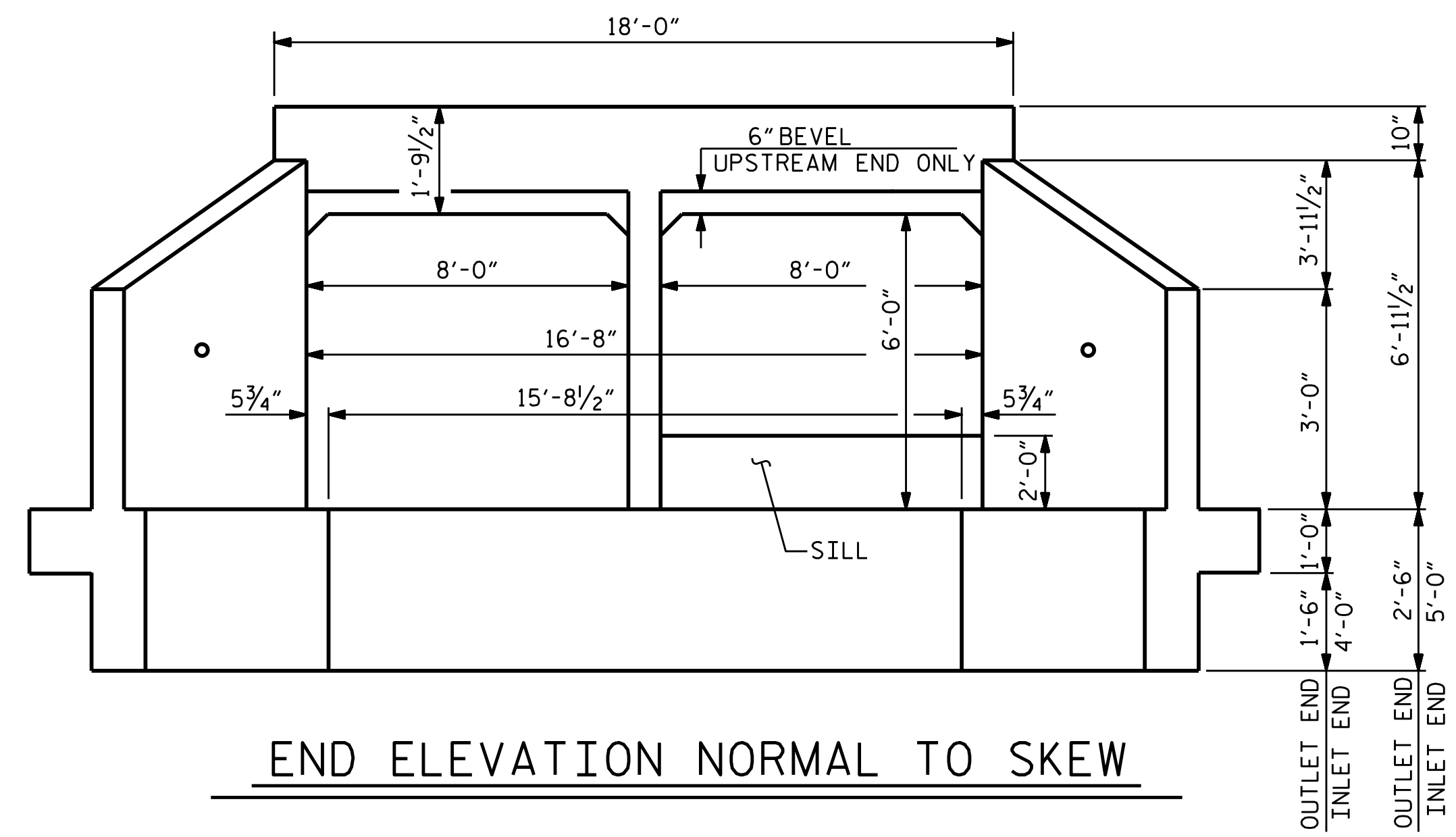
PROJECT NO. R-5021  
 BRUNSWICK COUNTY  
 STATION: 83+76.00 -L-  
 SHEET 1 OF 5

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 DOUBLE 8 FT. X 6 FT.  
 CONCRETE BOX CULVERT  
 90° SKEW

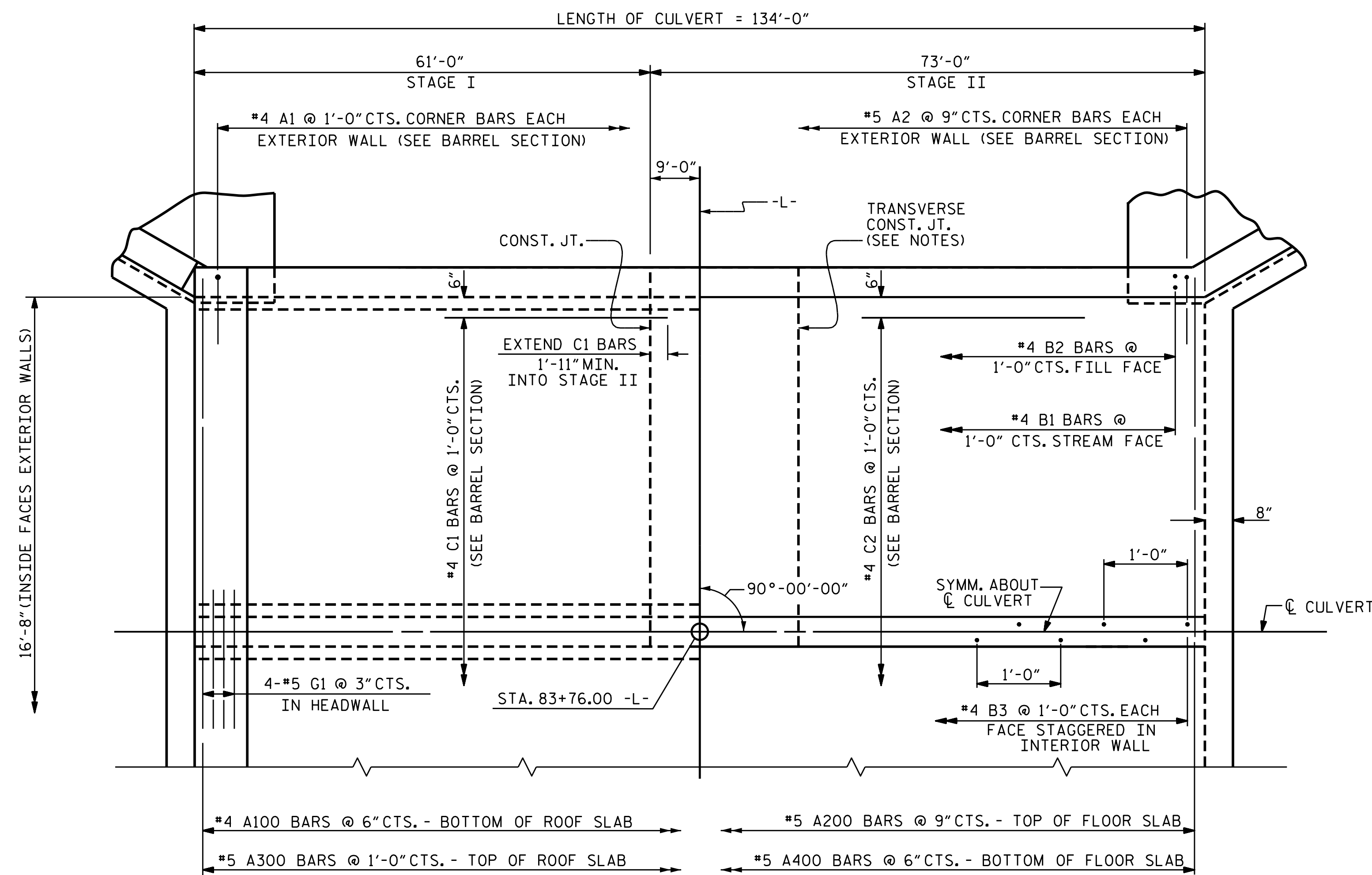
ADDED NOV. 1, 1990



EXTERIOR WALL INTERIOR WALL  
CULVERT SECTION NORMAL TO ROADWAY

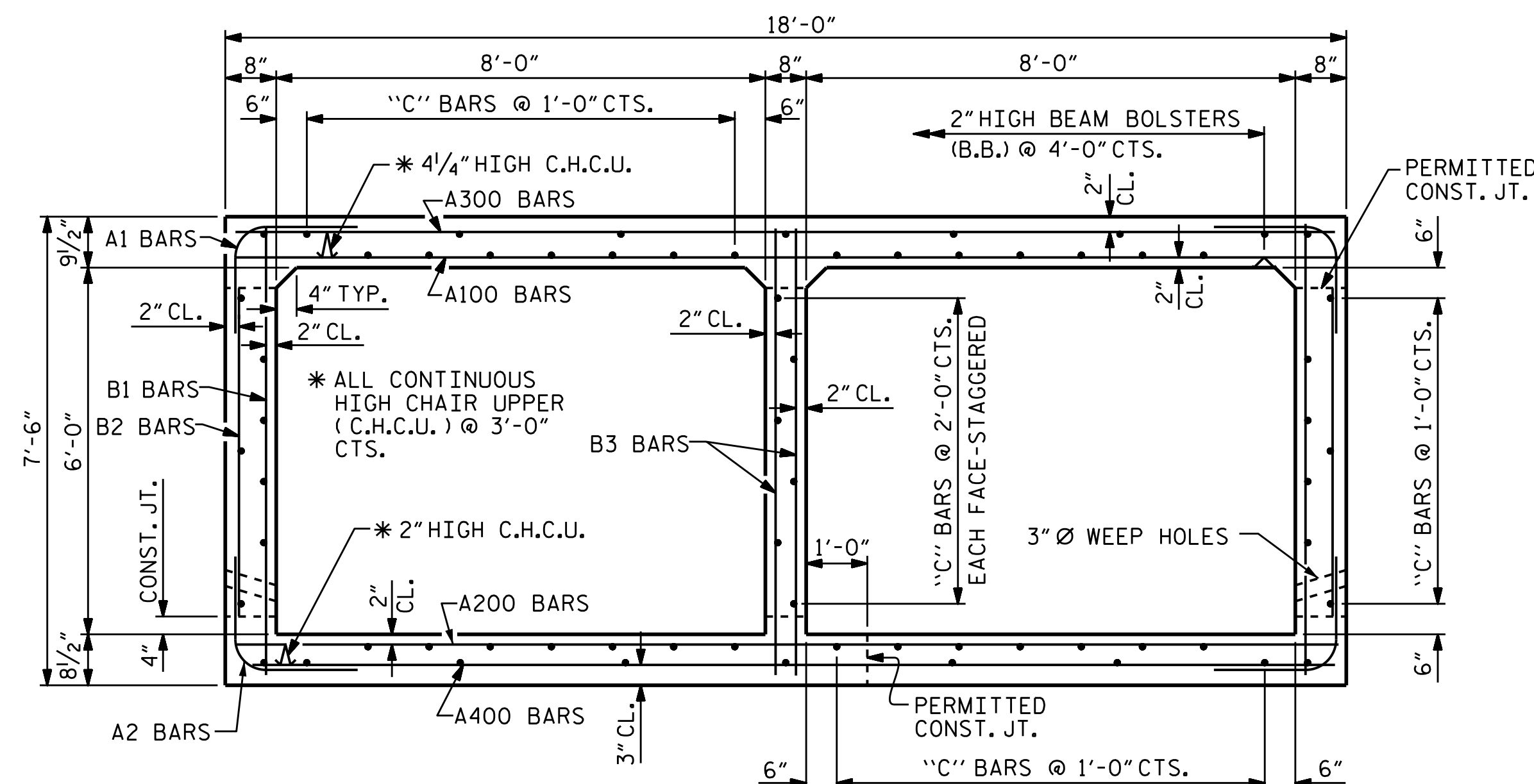


END ELEVATION NORMAL TO SKEW



PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB



RIGHT ANGLE SECTION OF BARREL

THERE ARE 66 'C' BARS IN SECTION OF BARREL.

PROJECT NO. R-5021  
BRUNSWICK COUNTY  
STATION: 83+76.00 -L-

SHEET 2 OF 5



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

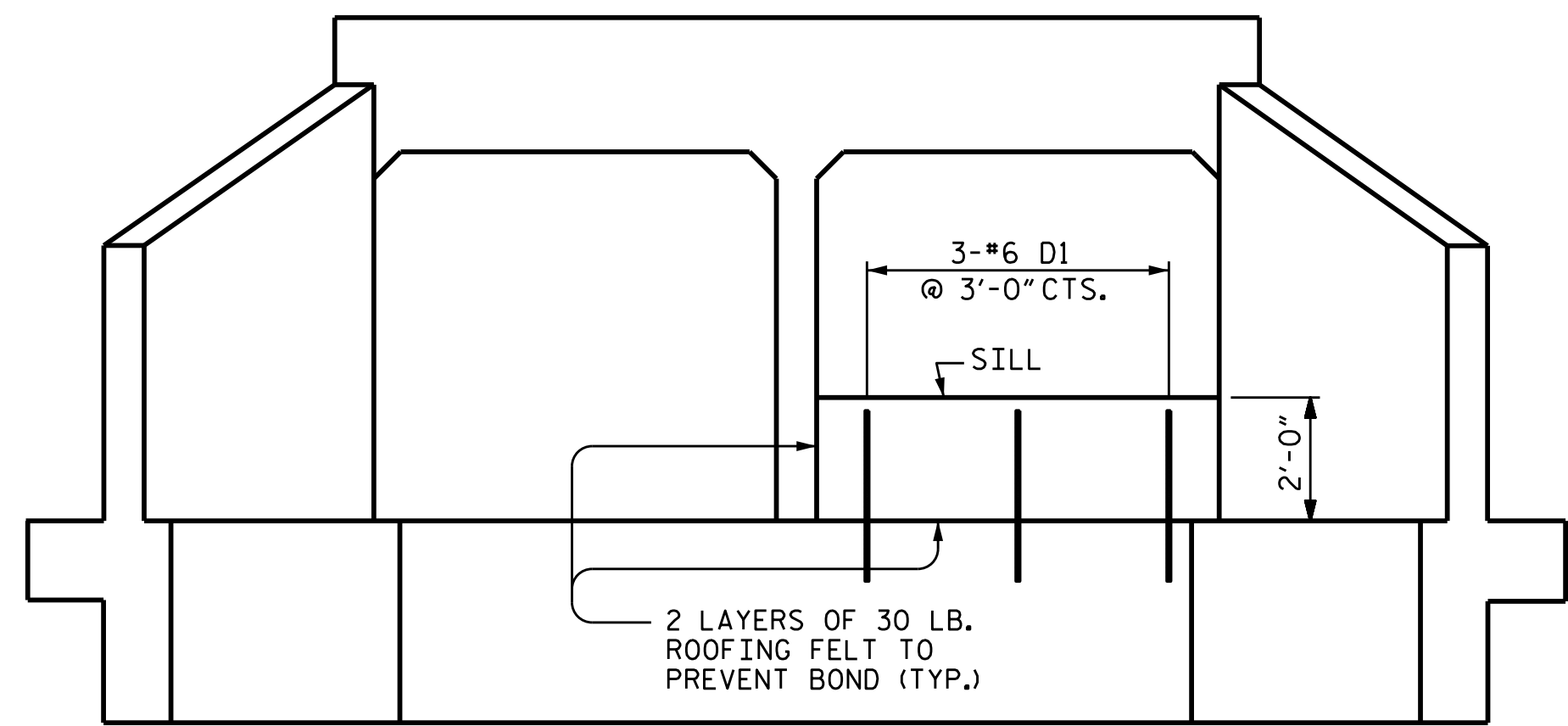
DOUBLE 8 FT. X 6 FT.  
CONCRETE BOX CULVERT  
90° SKEW

ASSEMBLED BY : WFP / OTN DATE : 11-17  
CHECKED BY : P. K. NEWTON DATE : 12/2/18  
DRAWN BY : RALPH D. UNDERWOOD DATE : MAY 1971  
CHECKED BY : JOEL A. JOHNSON DATE : JULY 1971

SPECIAL  
STANDARD

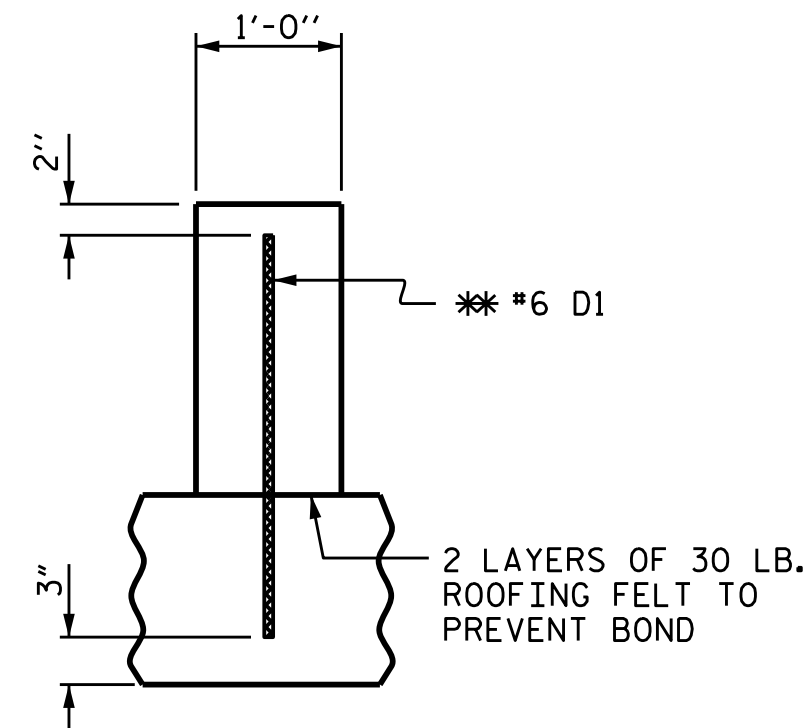
DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED

REVISIONS						SHEET NO. C2-2
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 5
2			4			



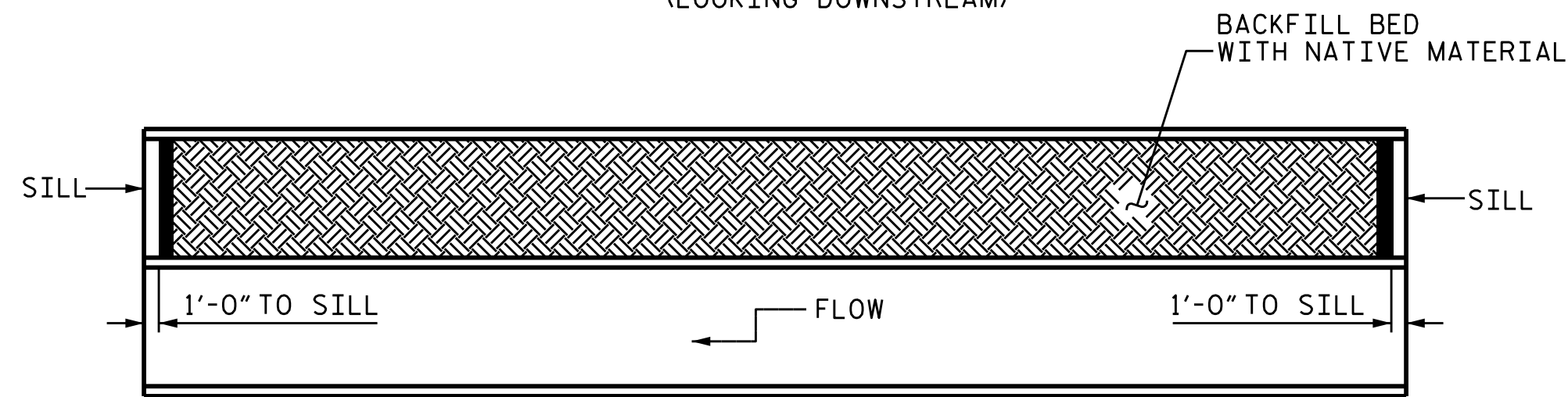
ELEVATION

ONE SILL AT INLET AND OUTLET END (LOOKING DOWNSTREAM)



SECTION THROUGH SILL

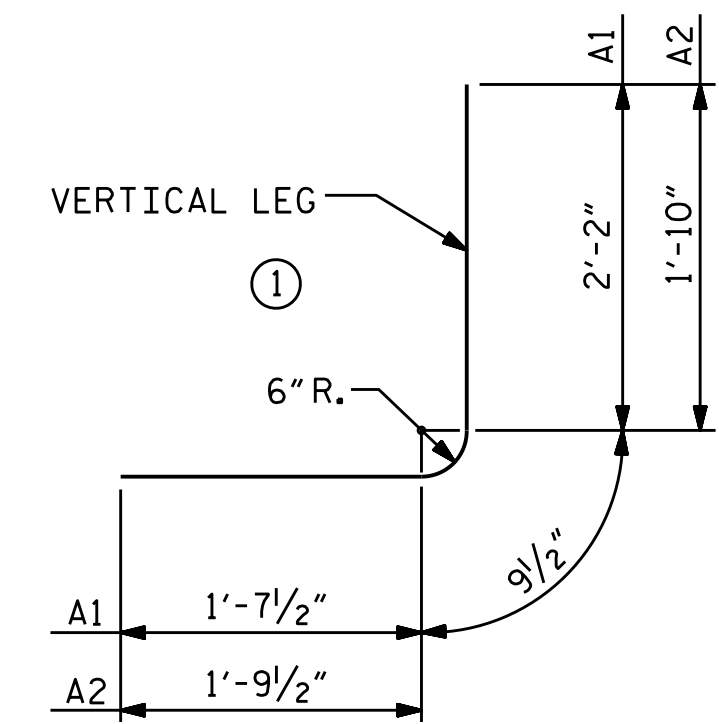
\* DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.



PLAN

SILL DETAILS

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



BAR TYPE

BAR DIMENSIONS ARE OUT TO OUT

SPLICE LENGTH CHART		
BAR	SIZE	SPLICE LENGTH
B1, B3	#4	1'-5"
C1, C2	#4	1'-11"

BILL OF MATERIAL

STAGE I

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
* A1	122	#4	1	4'-7"	374
* A2	164	#5	1	4'-5"	755
* A100	122	#4	STR.	17'-7"	1433
* A200	82	#5	STR.	17'-7"	1504
* A300	61	#5	STR.	17'-7"	1119
* A400	122	#5	STR.	17'-7"	2237
* B1	122	#4	STR.	7'-0"	570
* B2	122	#4	STR.	5'-4"	435
* B3	122	#4	STR.	7'-0"	570
* C1	198	#4	STR.	22'-3"	2943
* D1	3	#6	STR.	2'-4"	11
* G1	4	#5	STR.	17'-8"	74

\* EPOXY COATED REINF. STEEL = 12,025 LBS

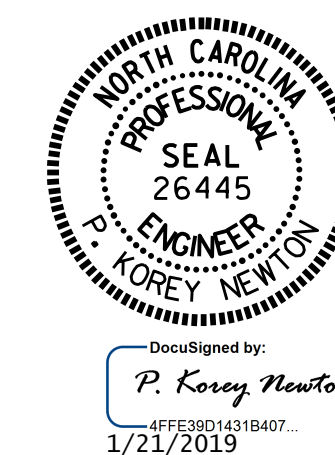
STAGE II

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
* A1	146	#4	1	4'-7"	447
* A2	196	#5	1	4'-5"	903
* A100	146	#4	STR.	17'-7"	1715
* A200	98	#5	STR.	17'-7"	1797
* A300	73	#5	STR.	17'-7"	1339
* A400	146	#5	STR.	17'-7"	2678
* B1	146	#4	STR.	7'-0"	683
* B2	146	#4	STR.	5'-4"	520
* B3	146	#4	STR.	7'-0"	683
* C2	198	#4	STR.	25'-7"	3384
* D1	3	#6	STR.	2'-4"	11
* G1	4	#5	STR.	17'-8"	74

\* EPOXY COATED REINF. STEEL = 14,234 LBS

PROJECT NO. R-5021  
BRUNSWICK COUNTY  
 STATION: 83+76.00 -L-

SHEET 3 OF 5



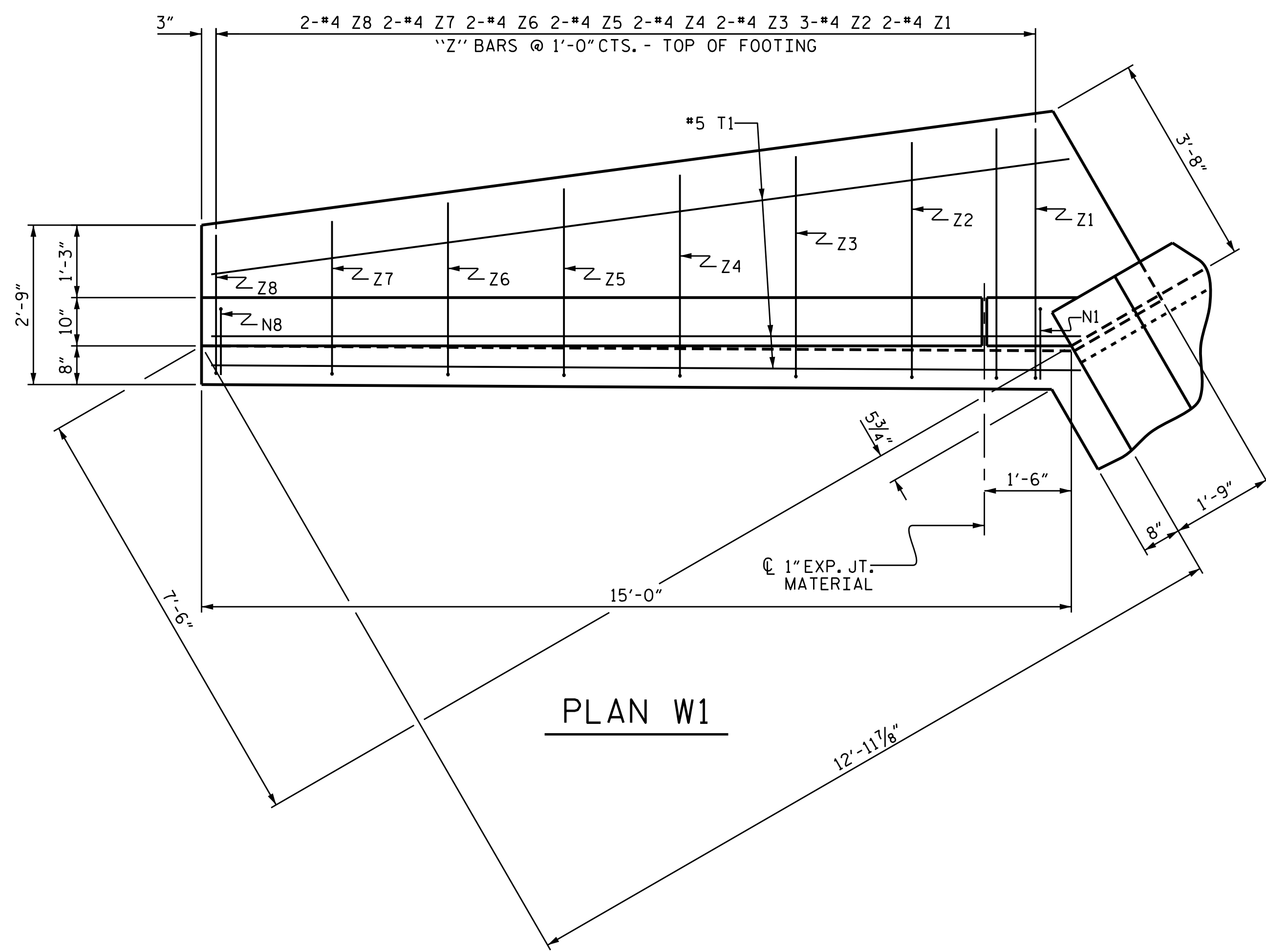
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

DOUBLE 8 FT. X 6 FT.  
 CONCRETE BOX CULVERT  
 90° SKEW

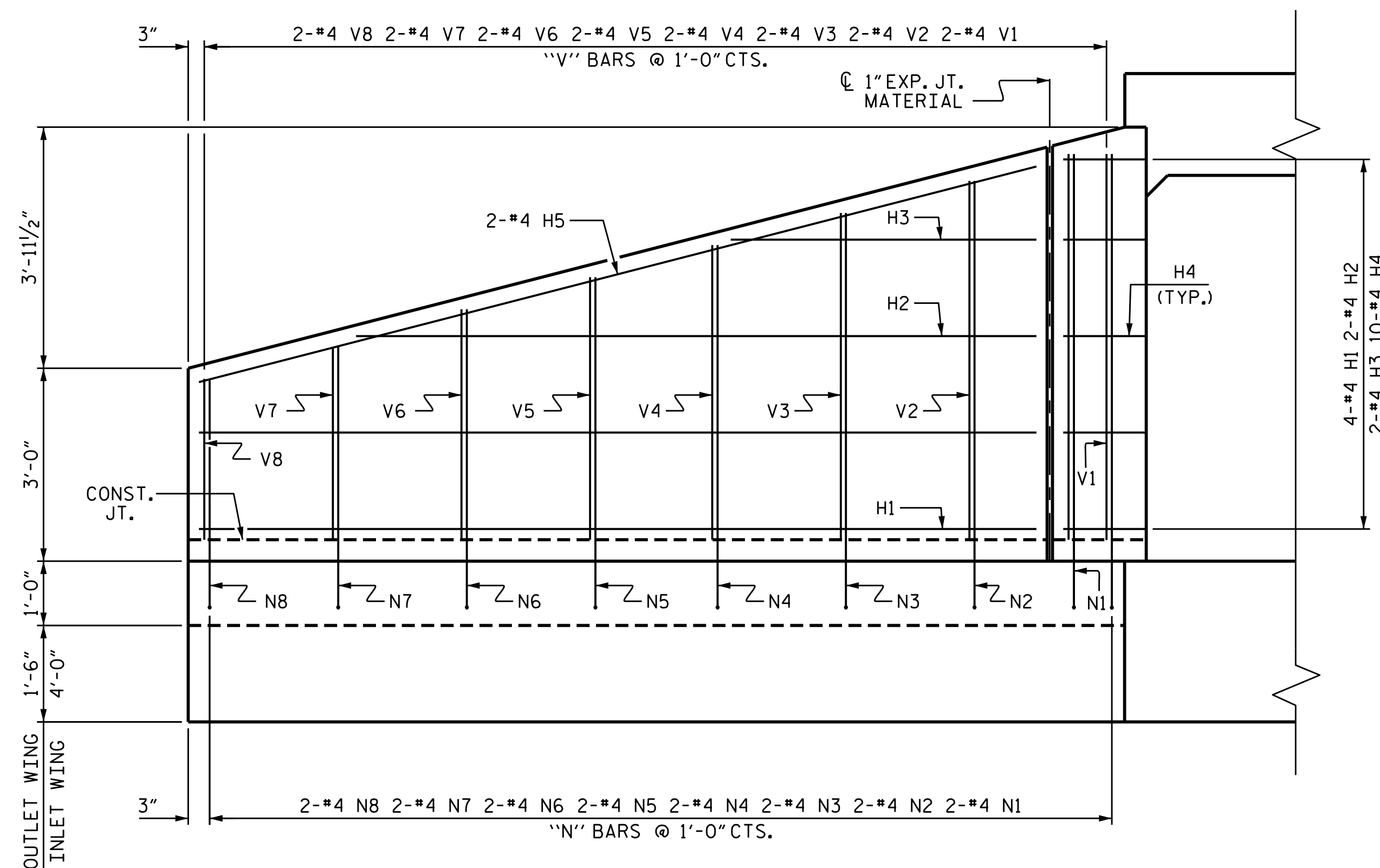
DRAWN BY : WFP / OTN DATE : 11-17  
 CHECKED BY : P.K. NEWTON DATE : 12/2/18  
 DESIGN ENGINEER OF RECORD: Z. MALIK DATE : 12/4/18

DOCUMENT NOT CONSIDERED  
 FINAL UNLESS ALL  
 SIGNATURES COMPLETED

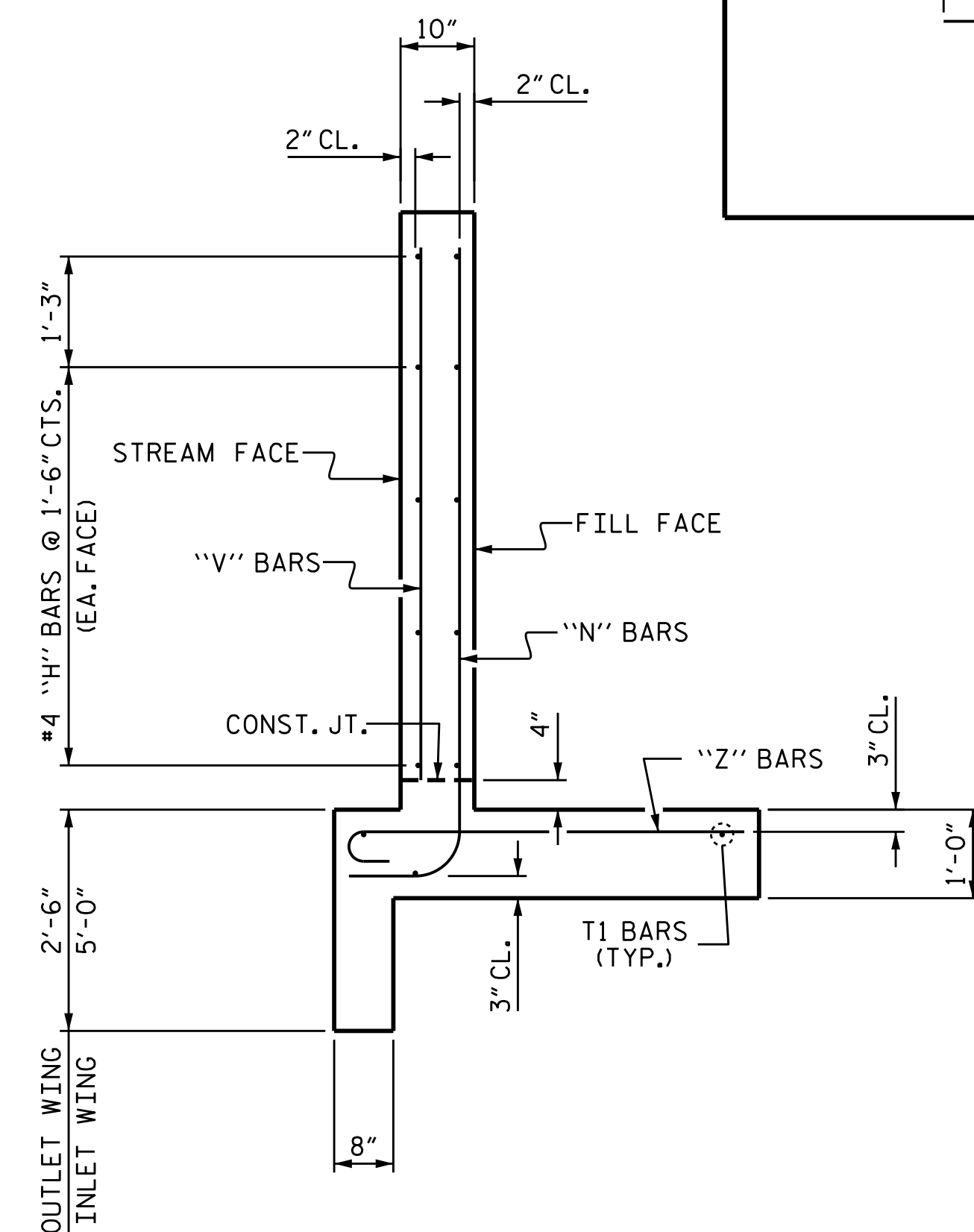
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-3
1			3			TOTAL SHEETS
2			4			5



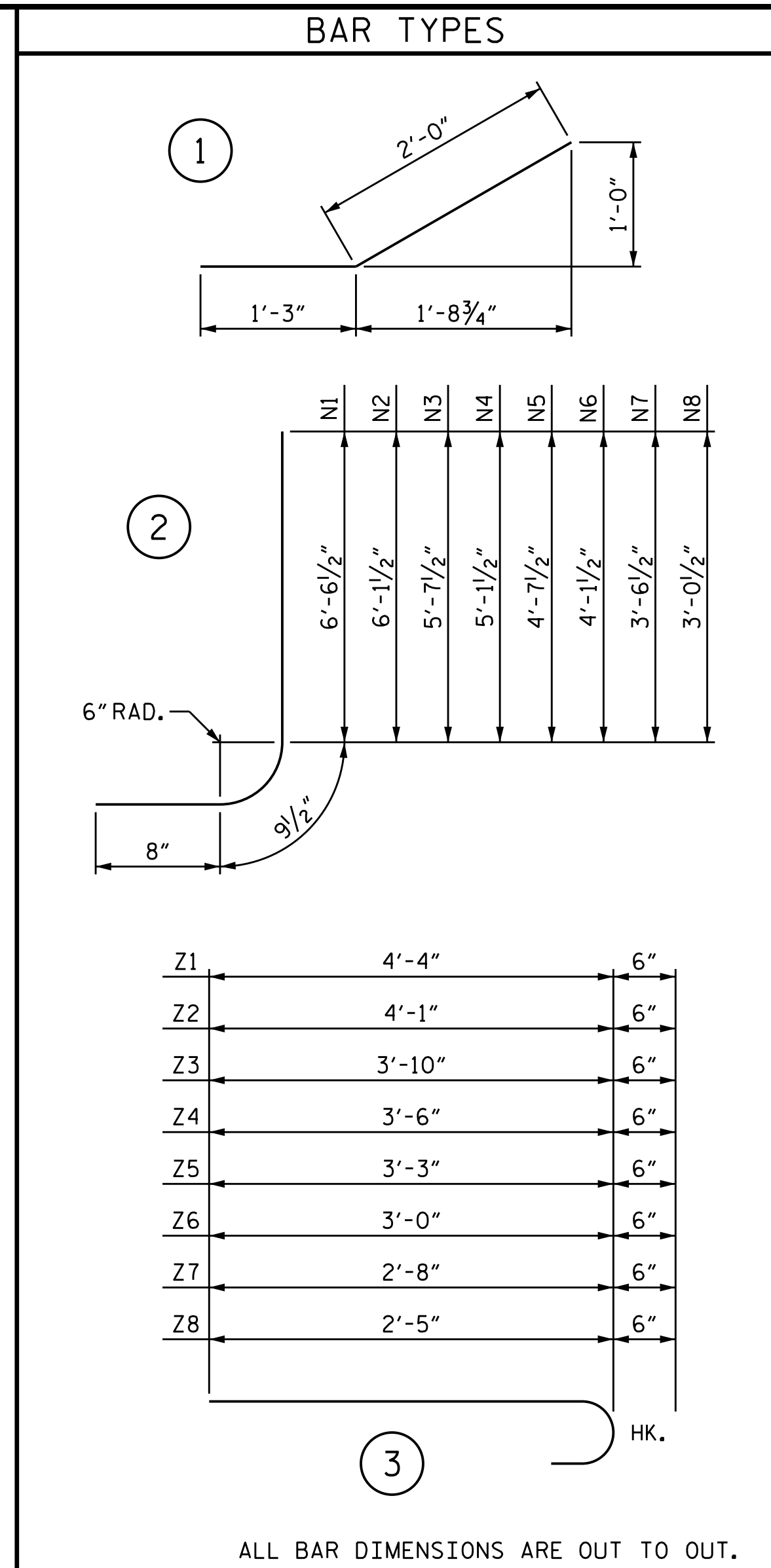
PLAN W1



ELEVATION W1



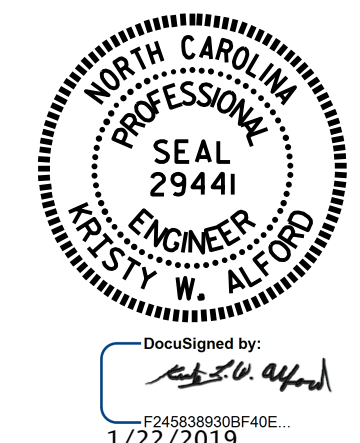
TYPICAL WING SECTION



BILL OF MATERIAL					
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	
H1	#4	STR	13'-0"	69	
H2	#4	STR	10'-7"	28	
H3	#4	STR	4'-9"	13	
H4	#4	STR	3'-3"	43	
H5	#4	STR	13'-5"	36	
N1	#4	2	8'-0"	21	
N2	#4	2	7'-7"	20	
N3	#4	2	7'-1"	19	
N4	#4	2	6'-7"	18	
N5	#4	2	6'-1"	16	
N6	#4	2	5'-7"	15	
N7	#4	2	5'-0"	13	
N8	#4	2	4'-6"	12	
T1	#5	STR	15'-0"	94	
V1	#4	STR	6'-0"	16	
V2	#4	STR	5'-7"	15	
V3	#4	STR	5'-1"	14	
V4	#4	STR	4'-7"	12	
V5	#4	STR	4'-1"	11	
V6	#4	STR	3'-7"	10	
V7	#4	STR	3'-0"	8	
V8	#4	STR	2'-6"	7	
Z1	#4	3	4'-10"	13	
Z2	#4	3	4'-7"	12	
Z3	#4	3	4'-4"	12	
Z4	#4	3	4'-0"	11	
Z5	#4	3	3'-9"	10	
Z6	#4	3	3'-6"	9	
Z7	#4	3	3'-2"	8	
Z8	#4	3	2'-11"	8	
REINFORCING STEEL FOR 2 WINGS				LBS.	593
CLASS A CONCRETE INLET END					
2 WINGS		CU. YDS.	12.0		
1 HEADWALL		CU. YDS.	0.8		
1 END CURTAIN WALL		CU. YDS.	1.9		
1 SILL		CU. YDS.	0.6		
TOTAL		CU. YDS.	15.3		
CLASS A CONCRETE OUTLET END					
2 WINGS		CU. YDS.	10.1		
1 HEADWALL		CU. YDS.	0.8		
1 END CURTAIN WALL		CU. YDS.	1.0		
1 SILL		CU. YDS.	0.6		
TOTAL		CU. YDS.	12.5		

PROJECT NO. R-5021  
 BRUNSWICK COUNTY  
 STATION: 83+76.00 -L-

SHEET 4 OF 5



STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 WINGS FOR  
 CONCRETE BOX CULVERT  
 H = 6'-0" SLOPE = 3:1  
 90° SKEW

DRAWN BY: WFP / QTN DATE: 11-17  
 CHECKED BY: K. W. ALFORD DATE: 11-18  
 DESIGN ENGINEER OF RECORD: K. W. ALFORD DATE: 11-18

DOCUMENT NOT CONSIDERED  
 FINAL UNLESS ALL  
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-4
1			3			TOTAL SHEETS
2			4			5



## 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	1.04	--	1.75	1.13	1	TOP SLAB	3.68	1.04	1	TOP SLAB	7.76		
	HL-93 (OPERATING)	N/A		1.34	--	1.35	1.47	1	TOP SLAB	3.68	1.34	1	TOP SLAB	7.76		
	HS-20 (INVENTORY)	36.000	②	1.05	37.91	1.75	1.13	1	TOP SLAB	3.68	1.05	1	BOTTOM SLAB	7.82		
	HS-20 (OPERATING)	36.000		1.37	49.15	1.35	1.47	1	TOP SLAB	3.68	1.37	1	BOTTOM SLAB	7.82		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		1.96	26.47	1.40	2.06	1	TOP SLAB	3.68	1.96	1	TOP SLAB	7.76	
		SNGARBS2	20.000		1.84	36.71	1.40	1.93	1	TOP SLAB	3.68	1.84	1	TOP SLAB	7.76	
		SNAGRIS2	22.000		1.92	42.31	1.40	2.06	1	TOP SLAB	3.68	1.92	1	BOTTOM SLAB	7.82	
		SNCOTTS3	27.250		1.30	35.32	1.40	1.47	1	TOP SLAB	3.68	1.30	1	TOP SLAB	7.76	
		SNAGGRS4	34.925		1.49	51.88	1.40	1.93	1	TOP SLAB	3.68	1.49	1	BOTTOM SLAB	7.82	
		SNS5A	35.550		1.33	47.19	1.40	1.80	1	TOP SLAB	3.68	1.33	1	BOTTOM SLAB	7.82	
		SNS6A	39.950		1.30	51.77	1.40	1.80	1	TOP SLAB	3.68	1.30	1	BOTTOM SLAB	7.82	
	SNS7B	42.000		1.30	54.43	1.40	1.86	1	TOP SLAB	3.68	1.30	1	BOTTOM SLAB	7.82		
	TRUCK TRACTOR SEMI-TRAILER (TTS1)	TNAGRIT3	33.000		1.83	60.35	1.40	2.06	1	TOP SLAB	3.68	1.83	1	BOTTOM SLAB	7.82	
		TNT4A	33.075		1.48	48.88	1.40	1.75	1	TOP SLAB	3.68	1.48	1	BOTTOM SLAB	7.82	
		TNT6A	41.600		1.48	61.66	1.40	1.78	1	TOP SLAB	3.68	1.48	1	TOP SLAB	7.76	
		TNT7A	42.000		1.48	62.01	1.40	1.79	1	TOP SLAB	3.68	1.48	1	TOP SLAB	7.76	
		TNT7B	42.000		1.36	57.21	1.40	1.75	1	TOP SLAB	3.68	1.36	1	BOTTOM SLAB	7.82	
		TNAGRIT4	43.000	③	1.24	53.35	1.40	1.67	1	TOP SLAB	3.68	1.24	1	BOTTOM SLAB	7.82	
TNAGT5A		45.000		1.26	56.71	1.40	1.72	1	TOP SLAB	3.68	1.26	1	BOTTOM SLAB	7.82		
TNAGT5B	45.000		1.25	56.30	1.40	1.75	1	TOP SLAB	3.68	1.25	1	BOTTOM SLAB	7.82			

### 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	0.5 OR 0.9
ES	1.35	0.5 OR 0.90
LS	1.75	0.00
WA	1.00	0.00

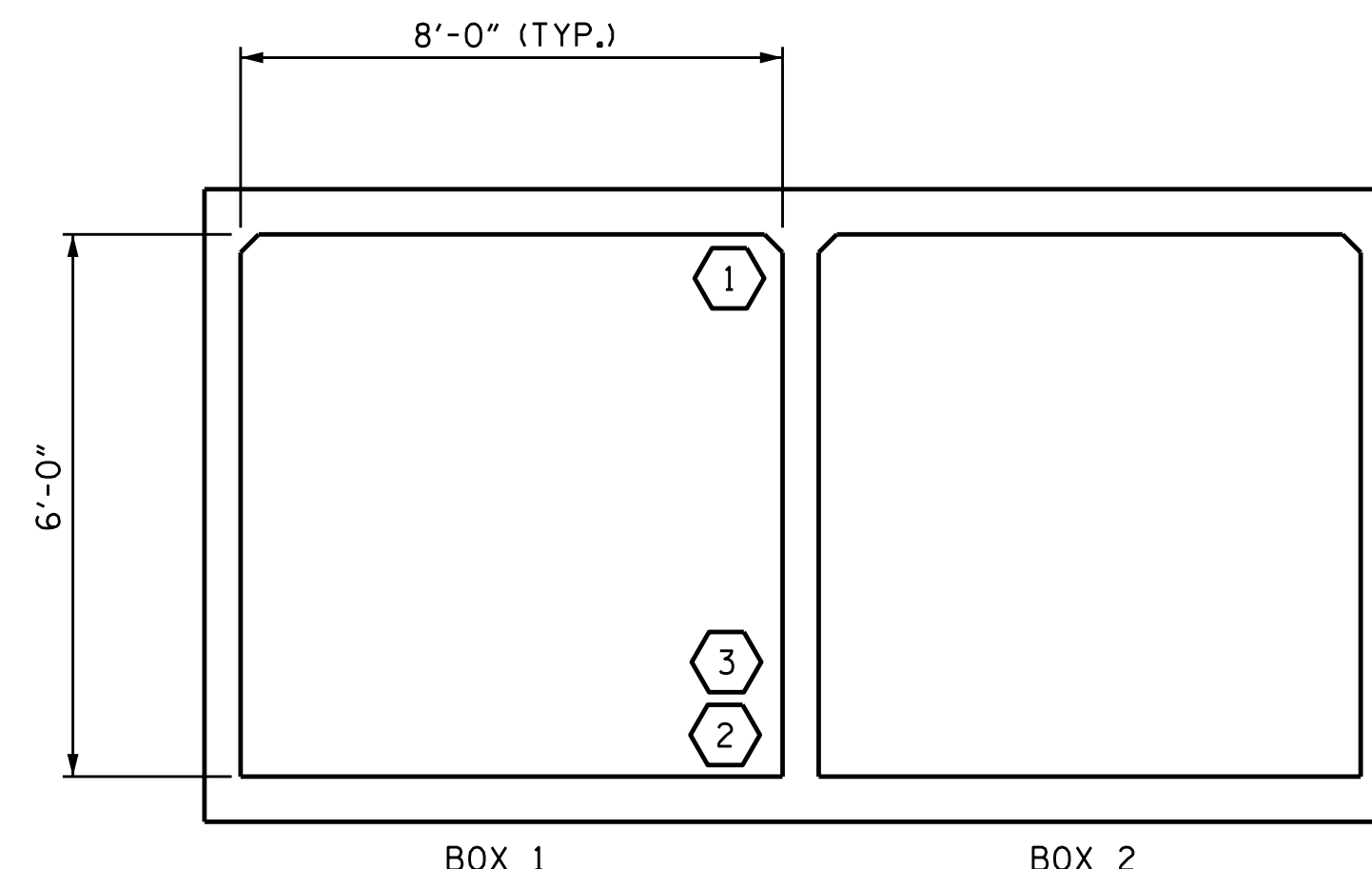
### NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

### COMMENTS:

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

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



**LRFR SUMMARY**  
(LOOKING DOWNSTREAM)

PROJECT NO. R-5021  
BRUNSWICK COUNTY  
 STATION: 83+76.00 -L-

SHEET 5 OF 5



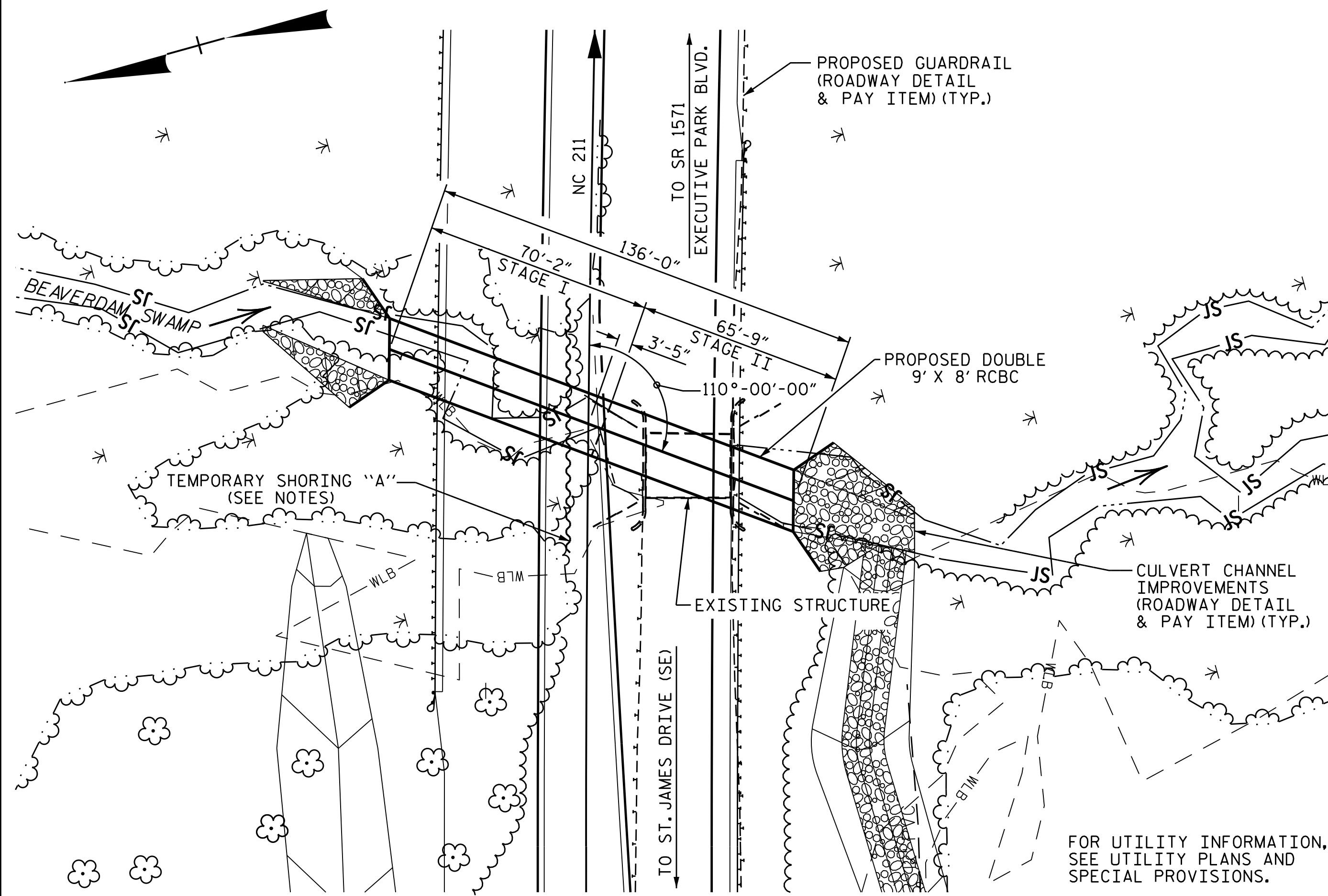
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 STANDARD  
 LRFR SUMMARY FOR  
 REINFORCED CONCRETE  
 BOX CULVERTS  
 (NON-INTERSTATE TRAFFIC)

ASSEMBLED BY : WFP / OTN	DATE : 11-17
CHECKED BY : P. K. NEWTON	DATE : 12/3/18
DRAWN BY : WMC	7/11
CHECKED BY : GM	7/11
REV. 10/1/11	MAA/GM
REV. 12/17	MAA/THC

DOCUMENT NOT CONSIDERED  
 FINAL UNLESS ALL  
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-5
1			3			TOTAL SHEETS
2			4			5

BM#5: SPIKE IN 9" PINE, 126' LEFT OF STA. 214+76.00 -L-, EL. 45.55



LOCATION SKETCH

HYDRAULIC DATA

DESIGN DISCHARGE = 1300 CFS  
 FREQUENCY OF DESIGN FLOOD = 50 YRS.  
 DESIGN HIGH WATER ELEVATION = 37.1 FT.  
 DRAINAGE AREA = 2.0 SQ. MI.  
 BASE DISCHARGE (Q100) = 1400 CFS  
 BASE HIGH WATER ELEVATION = 37.68 FT.

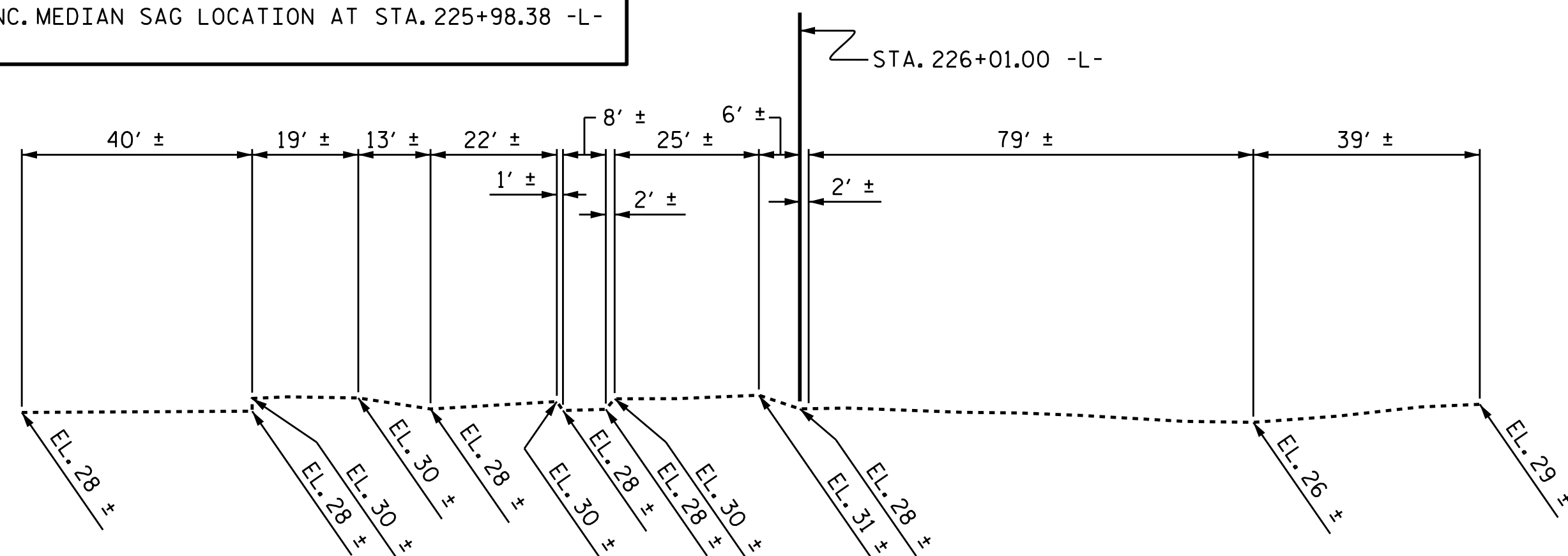
OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE = 1600+ CFS  
 FREQUENCY OF OVERTOPPING FLOOD = 500+ YRS.  
 OVERTOPPING FLOOD ELEVATION = \* 41.94 FT.  
 \* CONC. MEDIAN SAG LOCATION AT STA. 225+98.38 -L-

GRADE DATA -L-

GRADE POINT ELEV. @ STA. 226+01.00 -L- = 41.45'  
 BED ELEVATION @ STA. 226+01.00 -L- = 26.87'  
 ROADWAY SLOPES = 3:1

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS



PROFILE ALONG CULVERT

ASSEMBLED BY : WFP / QTN DATE : 10-17  
 CHECKED BY : P. K. NEWTON DATE : 12/5/18  
 DRAWN BY : R.W. WRIGHT DATE : OCT. 1989  
 CHECKED BY : C.R.K. DATE : OCT. 1989

SPECIAL STANDARD

21-JAN-2019 02:48  
 H:\Structures\Plans\CUL3\R5021\_SMU\_CUL3\_090076.dgn  
 pkenewton

NOTES

- ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
- MAXIMUM DESIGN FILL ----- 6.60 FT.
- MINIMUM DESIGN FILL ----- 5.22 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 EACH STAGE OF THE 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.
- TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
- AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAIL DRAWINGS FOR A PRECAST REINFORCED CONCRETE BOX CULVERT IN LIEU OF THE CAST-IN-PLACE CULVERT SHOWN ON THE PLANS. THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIONAL PRECAST REINFORCED CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.
- AFTER SERVING AS A TEMPORARY STRUCTURE, THE EXISTING STRUCTURE, CONSISTING OF 1 SPAN @ 19'-8" WITH A CLEAR ROADWAY WIDTH OF 26'-4" AND REINFORCED CONCRETE DECK SLAB WITH 81"2" AWS ON REINFORCED CONCRETE ABUTMENTS WITH TIMBER PILE FOOTINGS SHALL BE REMOVED. THE EXISTING BRIDGE IS PRESENTLY NOT POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE BRIDGE DETERIORATE DURING THE CONSTRUCTION OF THE PROPOSED BRIDGE, A LOAD LIMIT MAY BE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.
- TRAFFIC ON NC211 (SOUTHPORT - SUPPLY RD.) SHALL BE MAINTAINED, IN ORDER TO MAINTAIN TRAFFIC THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS DIRECTED BY THE ENGINEER. FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.
- AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL AND BOTH FACES OF INTERIOR WALLS 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.
- 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 SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT 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.
- THIS STRUCTURE CONTAINS THE NECESSARY CORROSION PROTECTION REQUIRED FOR A CORROSIVE SITE.
- 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.
- ALL BAR SUPPORTS USED IN THE CULVERT AND ALL INCIDENTAL REINFORCING STEEL SHALL BE EPOXY COATED IN ACCORDANCE WITH THE STANDARD SPECIFICATION.
- FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.
- FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.
- FOR ASBESTOS ASSESSMENT FOR BRIDGE DEMOLITION AND RENOVATION ACTIVITIES, SEE SPECIAL PROVISIONS.
- REMOVAL OF THE EXISTING BRIDGE SHALL BE PERFORMED IN A MANNER THAT PREVENTS DEBRIS FROM FALLING INTO THE WATER. THE CONTRACTOR SHALL SUBMIT DEMOLITION PLANS FOR REVIEW AND REMOVE THE BRIDGE IN ACCORDANCE WITH ARTICLE 402-2 OF THE STANDARD SPECIFICATIONS.

F. A. PROJECT NO. STP-0211(21)

TOTAL STRUCTURE QUANTITIES

CULVERT EXCAVATION	_____	LUMP SUM
REMOVAL OF EXISTING STRUCTURE	_____	LUMP SUM
ASBESTOS ASSESSMENT	_____	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	_____	230 TONS
CLASS A CONCRETE		
BARREL @ 1.805	_____	CY/FT
STAGE I	_____	126.7 C.Y.
STAGE II	_____	118.7 C.Y.
OUTLET WINGS ETC.		
STAGE I	_____	19.6 C.Y.
STAGE II	_____	19.6 C.Y.
TOTAL	_____	284.6 C.Y.
REINFORCING STEEL		
BARREL		
STAGE I	_____	15,638 LBS.
STAGE II	_____	14,623 LBS.
WINGS ETC.		
STAGE I	_____	1,109 LBS.
STAGE II	_____	1,109 LBS.
TOTAL	_____	32,479 LBS.

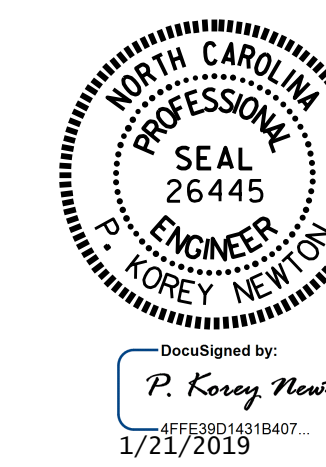
SAMPLE BAR REPLACEMENT

SIZE	LENGTH
#3	6'-2"
#4	7'-4"
#5	8'-6"
#6	9'-8"
#7	10'-10"
#8	12'-0"
#9	13'-2"
#10	14'-6"
#11	15'-10"

NOTE: SAMPLE BAR REPLACEMENT LENGTHS BASED ON 30" (SAMPLE LENGTH) PLUS TWO SPLICE LENGTHS AND  $f_y = 60$ ksi.

PROJECT NO. R-5021  
 BRUNSWICK COUNTY  
 STATION: 226+01.00 -L-

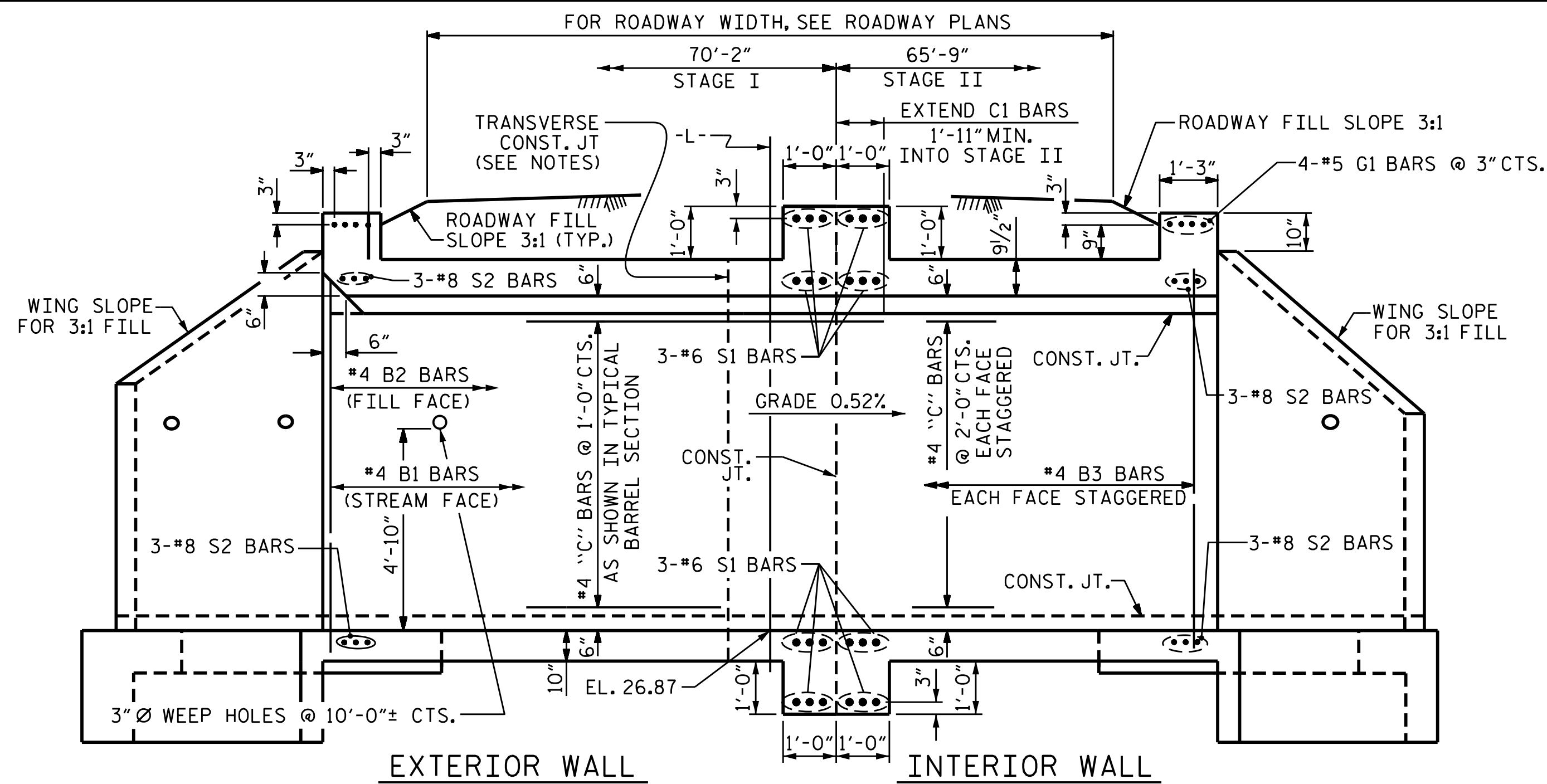
SHEET 1 OF 5 REPLACES BRIDGE NO. 76



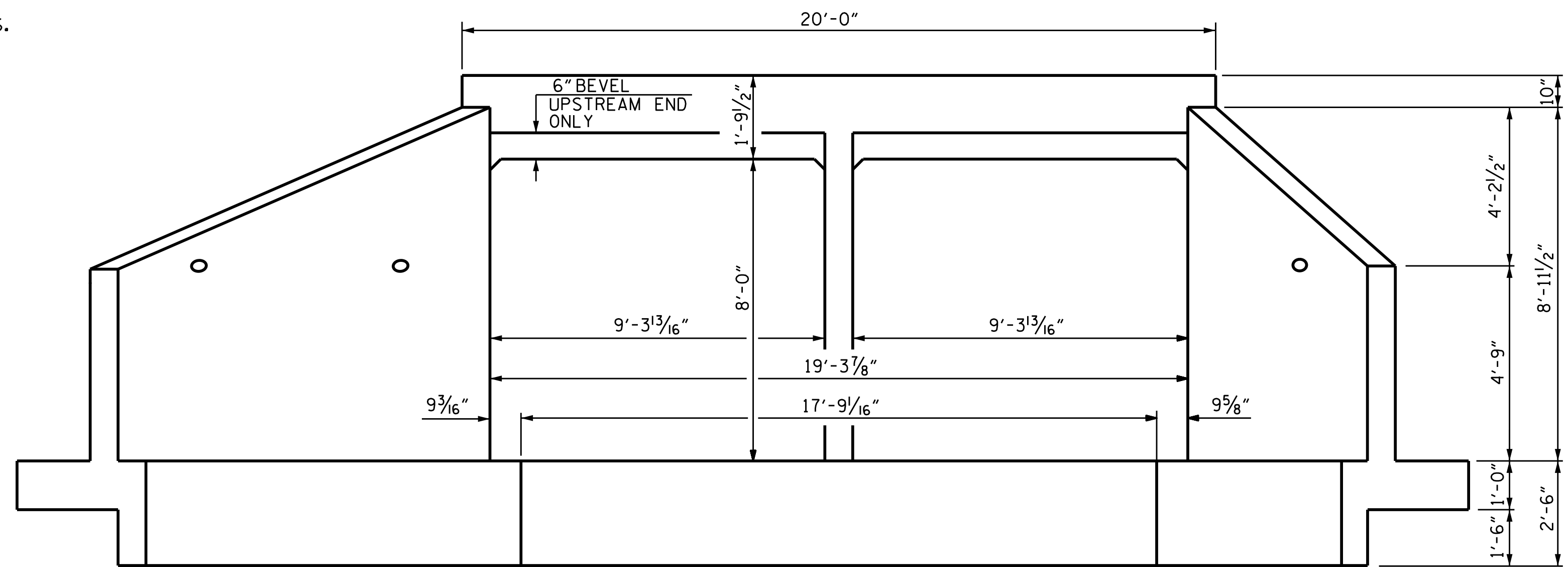
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 DOUBLE 9 FT. X 8 FT.  
 CONCRETE BOX CULVERT  
 105° SKEW

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

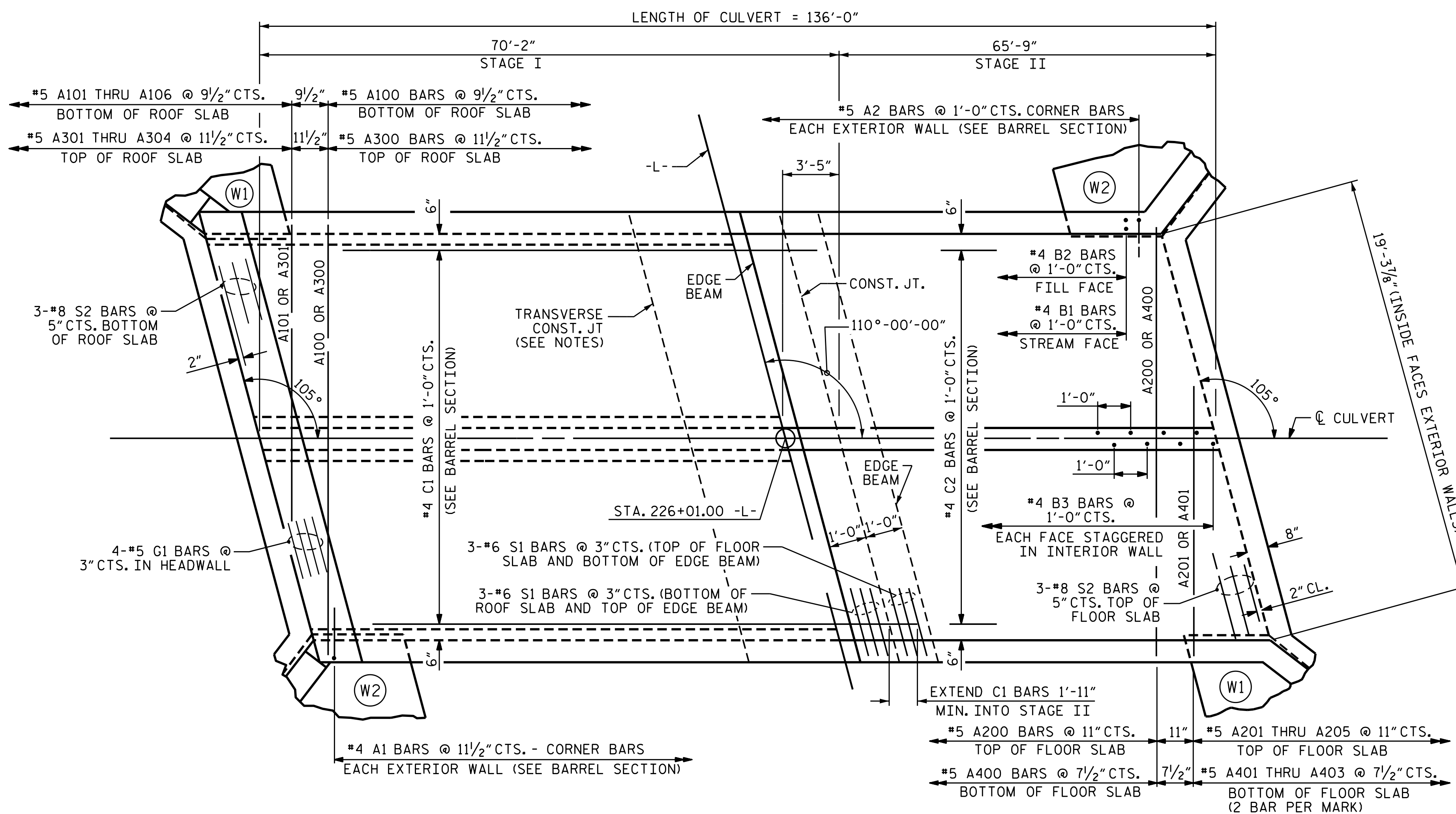
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C3-1
1			3			TOTAL SHEETS
2			4			5



EXTERIOR WALL  
INTERIOR WALL  
CULVERT SECTION NORMAL TO ROADWAY

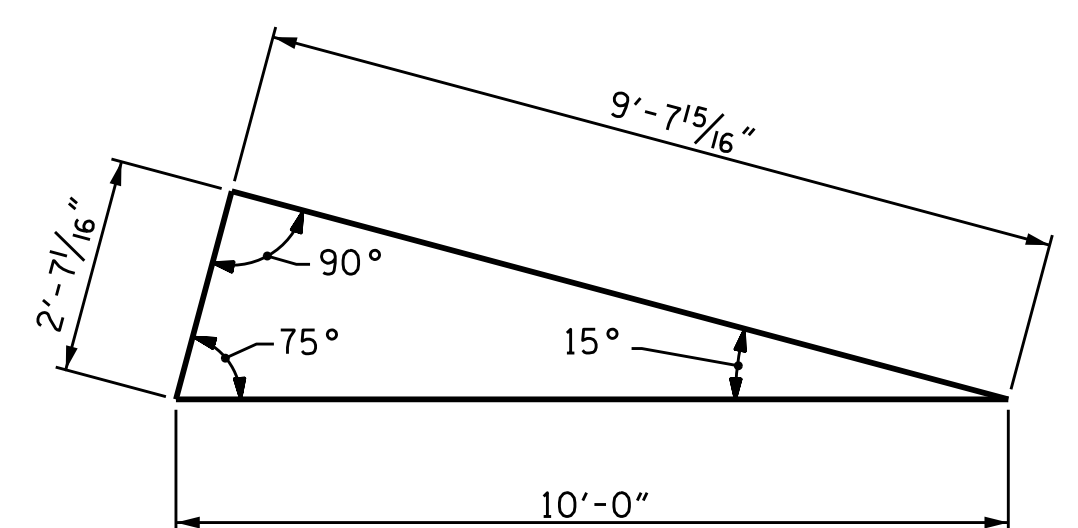


END ELEVATION NORMAL TO SKEW



PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

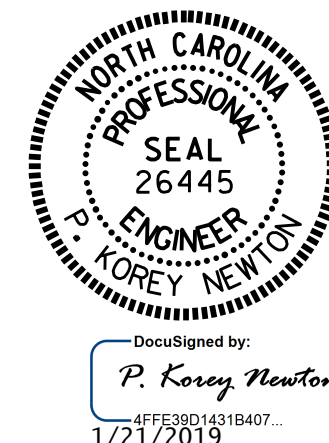


SKEW TRIANGLE

PROJECT NO. R-5021  
BRUNSWICK COUNTY  
STATION: 226+01.00 -L-

SHEET 2 OF 5

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
**DOUBLE 9 FT. X 8 FT.  
CONCRETE BOX CULVERT  
105° SKEW**

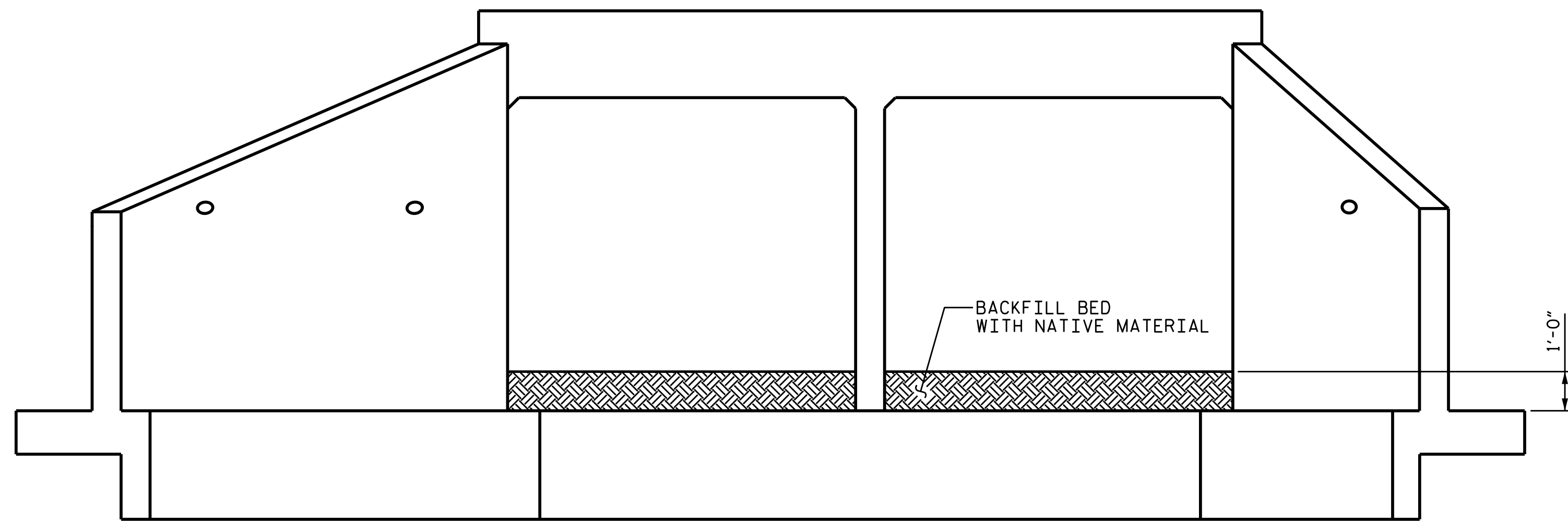


DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED

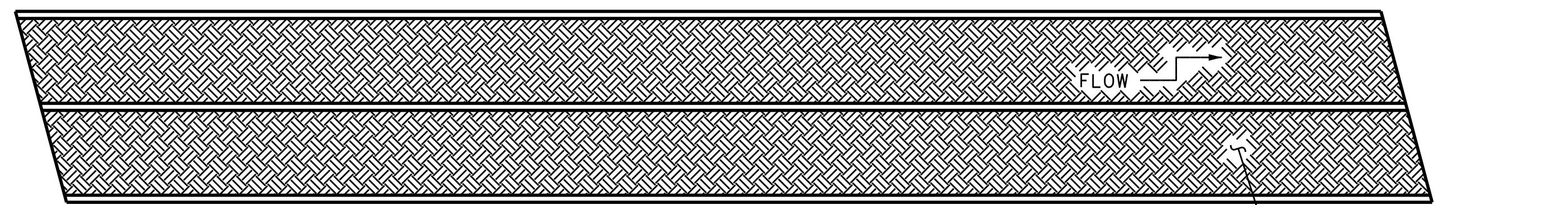
REVISIONS						SHEET NO. C3-2
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 5
2			4			

REVISED 11-9-99 BY M.M. CHECKED BY R.W.W.  
 REVISION 8-28-92 BY M.L.R. CHECKED BY C.G.P.  
 REDRAWN 11-30 BY A.R.S. CHECKED BY C.R.A.K.

ASSEMBLED BY : <u>WFP / QTN</u>	DATE : <u>10-17</u>	<b>SPECIAL</b>
CHECKED BY : <u>P. K. NEWTON</u>	DATE : <u>12/6/18</u>	
DRAWN BY : <u>W. BRYAN STANLEY II</u>	DATE : <u>NOV. 1971</u>	<b>STANDARD</b>
CHECKED BY : <u>JOEL A. JOHNSON</u>	DATE : <u>DEC. 1971</u>	



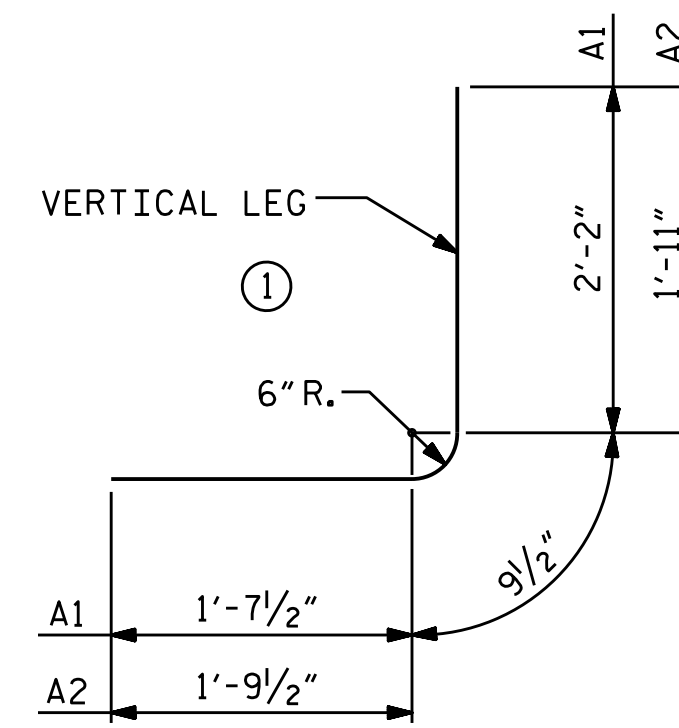
END ELEVATION



PLAN

BACKFILL DETAILS

BURY INLET AND OUTLET OF RCBC 1'-0" (MIN.) BACKFILL ENTIRE CULVERT WITH 1'-0" OF NATIVE MATERIAL IN ACCORDANCE WITH SPECIFICATION. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED AT THE PROJECT SITE DURING CULVERT CONSTRUCTION. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

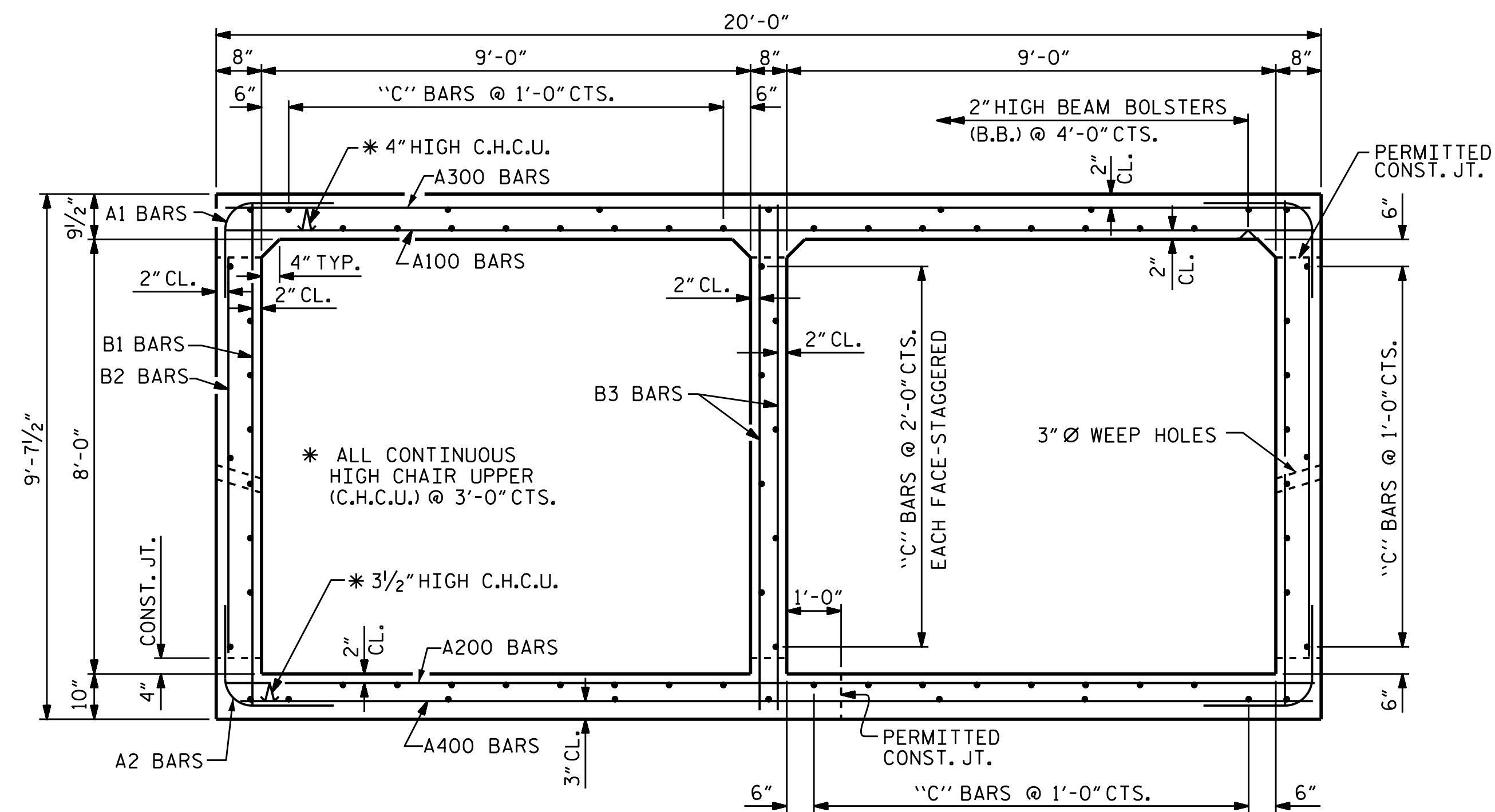


BAR TYPE

BAR DIMENSIONS ARE OUT TO OUT

SPLICE LENGTH CHART		
BAR	SIZE	SPLICE LENGTH
B1, B3	#4	1'-5"
C1, C2	#4	1'-11"

BILL OF MATERIAL											
STAGE I						STAGE II					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
* A1	147	#4	1	4'-7"	450	* A1	137	#4	1	4'-7"	419
* A2	141	#5	1	4'-6"	662	* A2	131	#5	1	4'-6"	615
* A100	85	#5	STR.	19'-7"	1736	* A100	80	#5	STR.	19'-7"	1634
* A101	2	#5	STR.	17'-5"	36	* A101	2	#5	STR.	17'-5"	36
* A102	2	#5	STR.	14'-5"	30	* A102	2	#5	STR.	14'-5"	30
* A103	2	#5	STR.	11'-6"	24	* A103	2	#5	STR.	11'-6"	24
* A104	2	#5	STR.	8'-6"	18	* A104	2	#5	STR.	8'-6"	18
* A105	2	#5	STR.	5'-7"	12	* A105	2	#5	STR.	5'-7"	12
* A106	2	#5	STR.	2'-7"	5	* A106	2	#5	STR.	2'-7"	5
* A200	74	#5	STR.	19'-7"	1511	* A200	69	#5	STR.	19'-7"	1409
* A201	2	#5	STR.	16'-4"	34	* A201	2	#5	STR.	16'-4"	34
* A202	2	#5	STR.	12'-3"	26	* A202	2	#5	STR.	12'-3"	26
* A203	2	#5	STR.	8'-8"	18	* A203	2	#5	STR.	8'-8"	18
* A204	2	#5	STR.	5'-1"	11	* A204	2	#5	STR.	5'-1"	11
* A205	2	#5	STR.	2'-7"	5	* A205	2	#5	STR.	2'-7"	5
* A300	71	#5	STR.	19'-7"	1450	* A300	66	#5	STR.	19'-7"	1348
* A301	2	#5	STR.	15'-10"	33	* A301	2	#5	STR.	15'-10"	33
* A302	2	#5	STR.	12'-3"	26	* A302	2	#5	STR.	12'-3"	26
* A303	2	#5	STR.	8'-8"	18	* A303	2	#5	STR.	8'-8"	18
* A304	2	#5	STR.	5'-1"	11	* A304	2	#5	STR.	5'-1"	11
* A400	108	#5	STR.	19'-7"	2206	* A400	101	#5	STR.	19'-7"	2063
* A401	4	#5	STR.	15'-7"	65	* A401	4	#5	STR.	15'-7"	65
* A402	4	#5	STR.	10'-11"	46	* A402	4	#5	STR.	10'-11"	46
* A403	4	#5	STR.	6'-3"	26	* A403	4	#5	STR.	6'-3"	26
* B1	142	#4	STR.	9'-1"	862	* B1	132	#4	STR.	9'-1"	801
* B2	142	#4	STR.	7'-4"	696	* B2	132	#4	STR.	7'-4"	647
* B3	142	#4	STR.	9'-1"	862	* B3	132	#4	STR.	9'-1"	801
* C1	228	#4	STR.	26'-2"	3985	* C2	228	#4	STR.	24'-1"	3668
* G1	4	#5	STR.	20'-4"	85	* G1	4	#5	STR.	20'-4"	85
* S1	12	#6	STR.	20'-3"	365	* S1	12	#6	STR.	20'-3"	365
* S2	6	#8	STR.	20'-3"	324	* S2	6	#8	STR.	20'-3"	324
* EPOXY COATED REINF. STEEL = 15,638 LBS.						* EPOXY COATED REINF. STEEL = 14,623 LBS.					

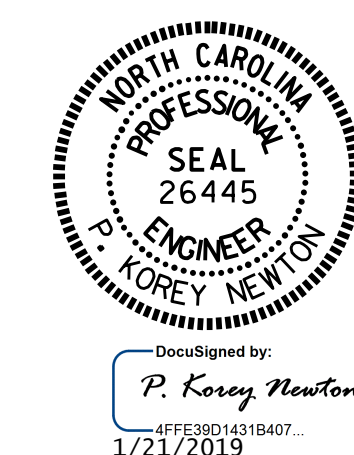


RIGHT ANGLE SECTION OF BARREL

THERE ARE 76 "C" BARS IN SECTION OF BARREL.

DRAWN BY : WFP / QTN DATE : 10-17  
 CHECKED BY : P.K. NEWTON DATE : 12/6/18  
 DESIGN ENGINEER OF RECORD : P.K. NEWTON DATE : 12/18

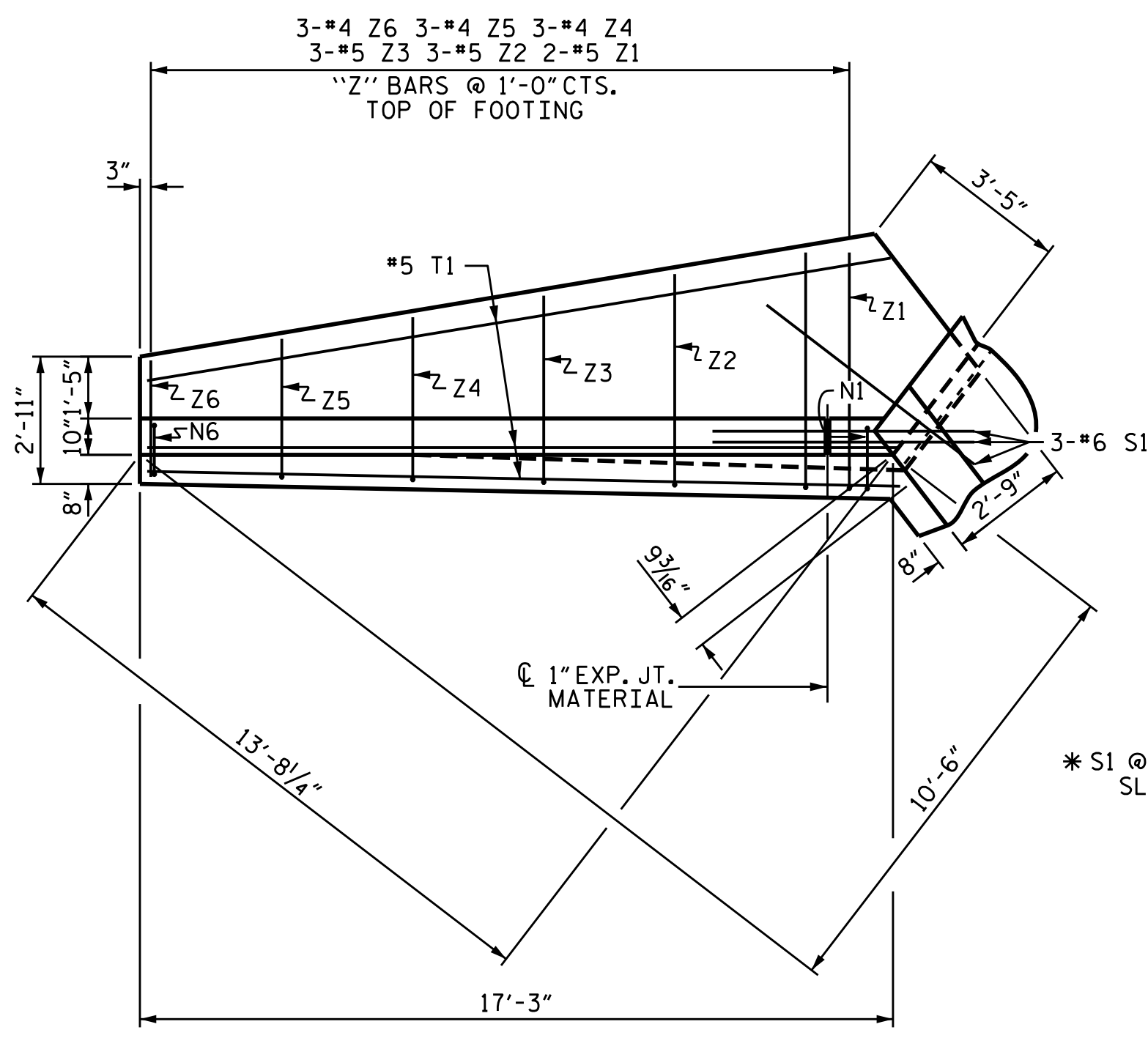
21-JAN-2019 02:48  
 H:\Structures\Plans\Cul3\R5021\_SMU.CUL3.090076.dgn  
 pknewton



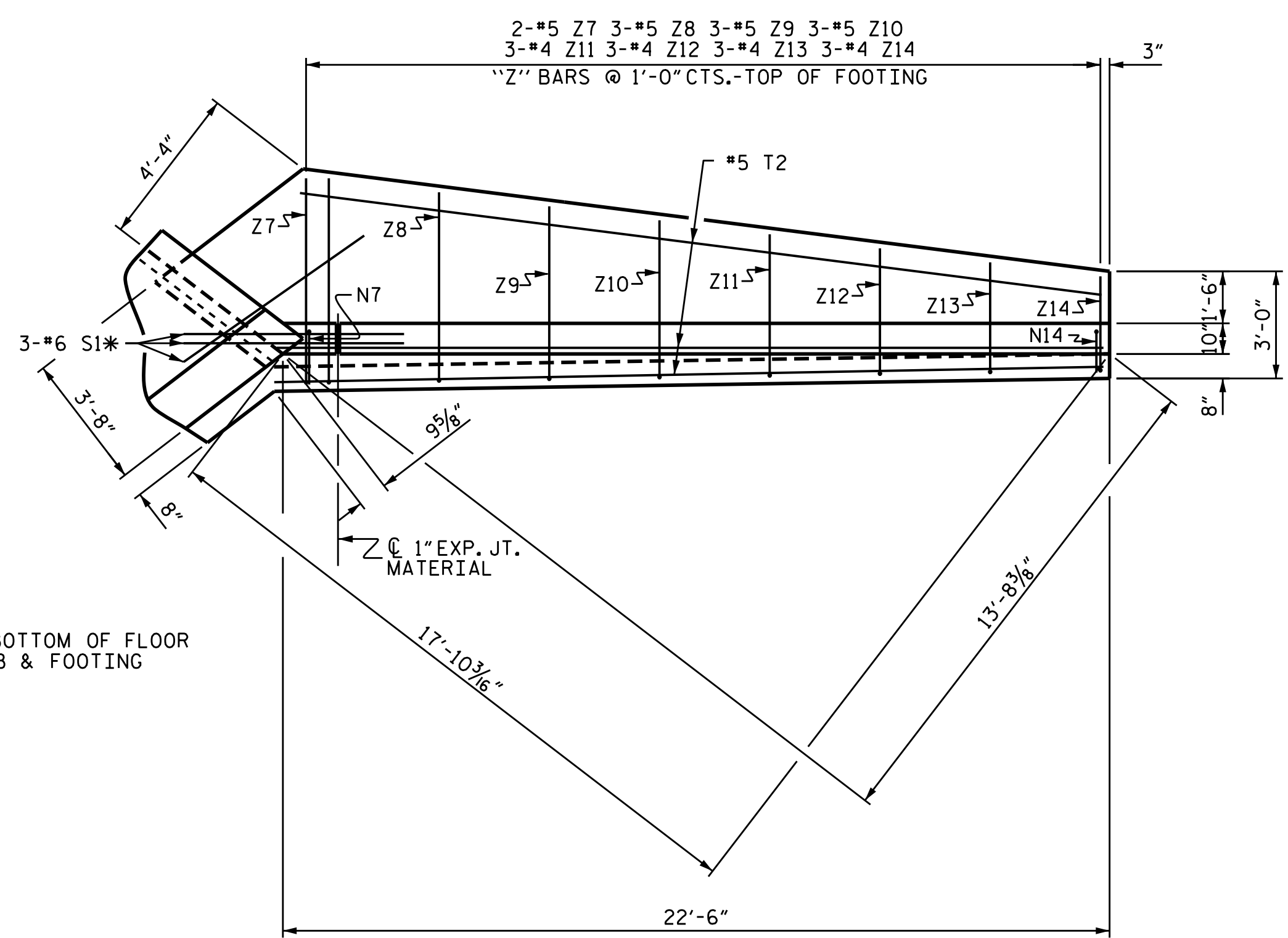
PROJECT NO. R-5021  
 BRUNSWICK COUNTY  
 STATION: 226+01.00 -L-  
 SHEET 3 OF 5

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
DOUBLE 9 FT. X 8 FT. CONCRETE BOX CULVERT 105° SKEW					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
SHEET NO. C3-3					TOTAL SHEETS 5

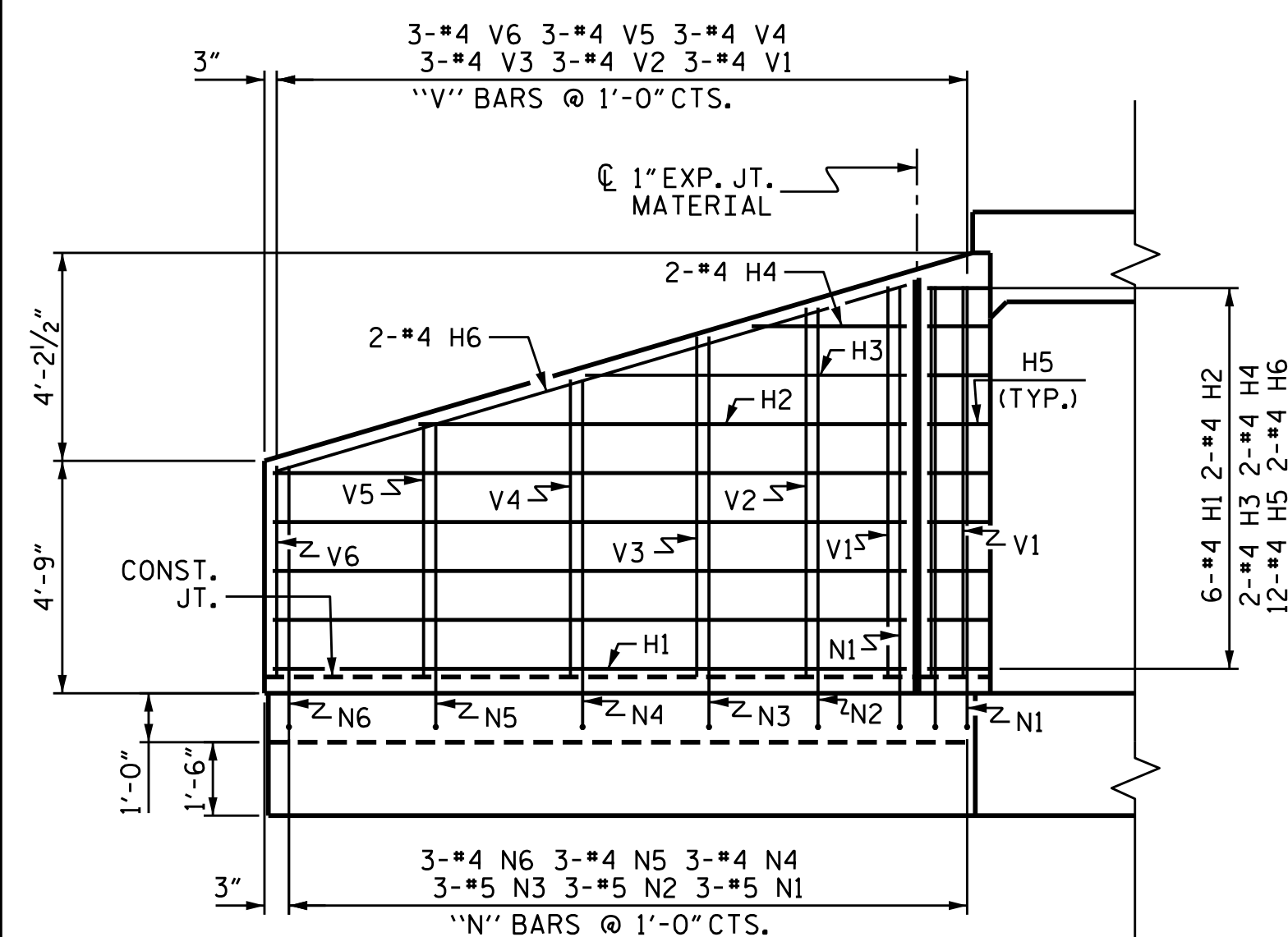
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



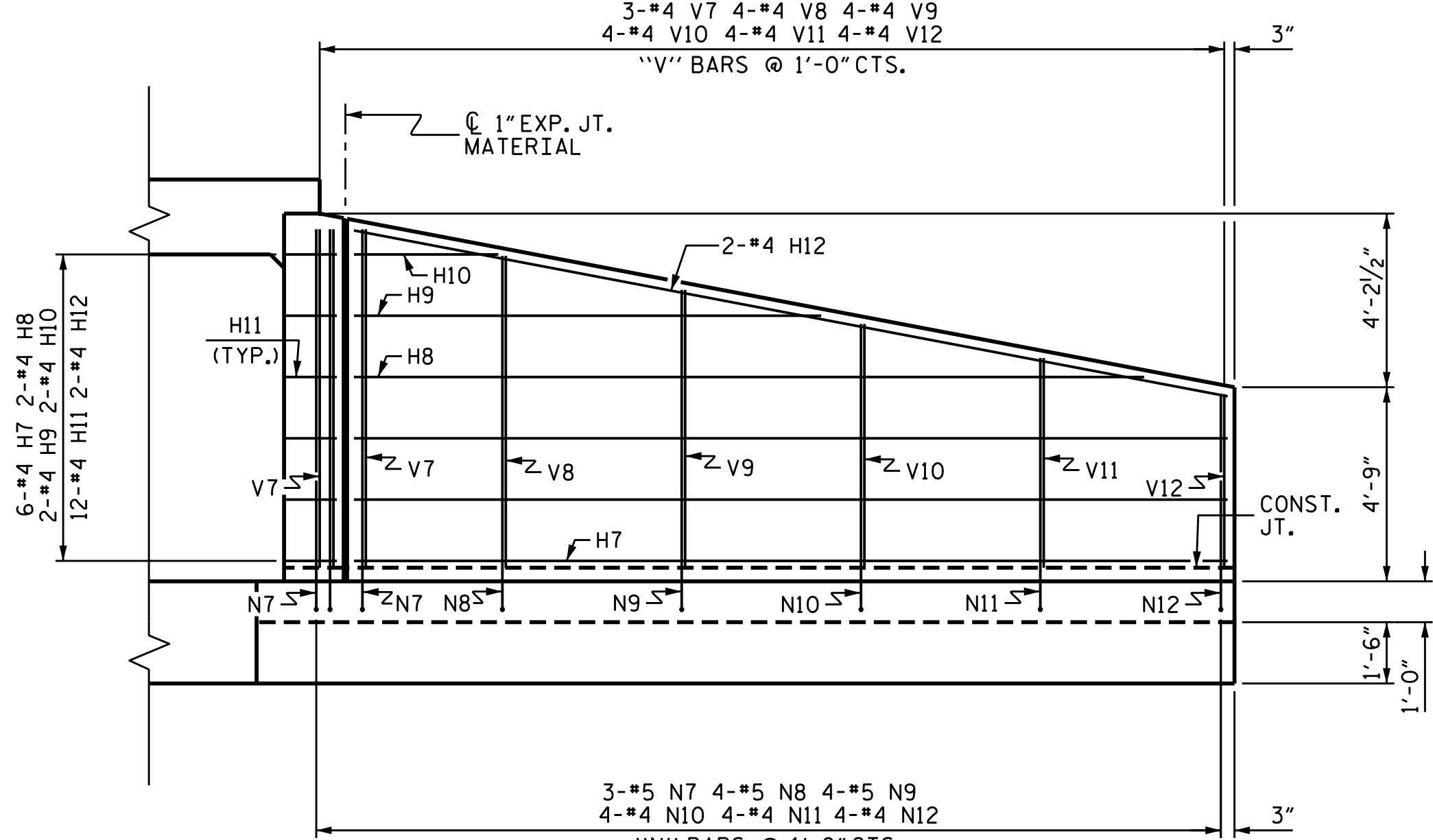
PLAN W2



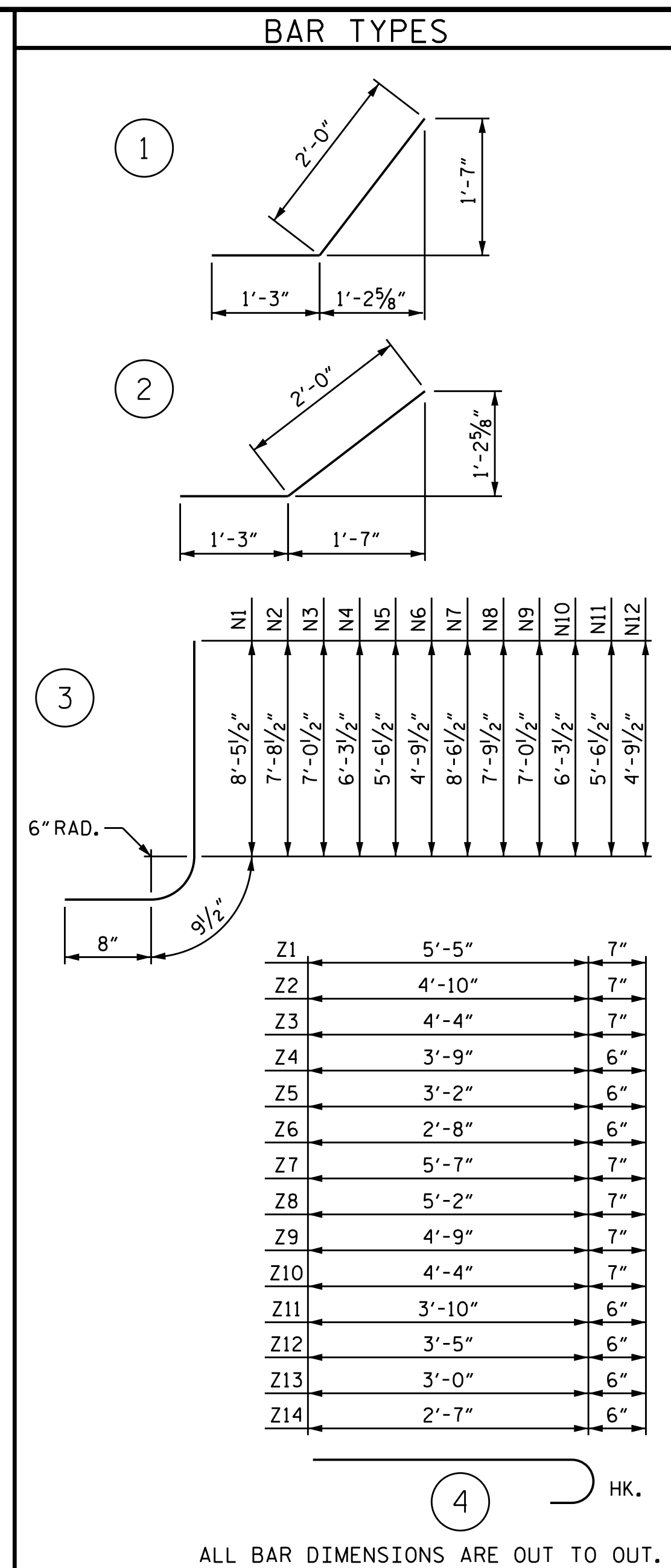
PLAN W1



ELEVATION W2

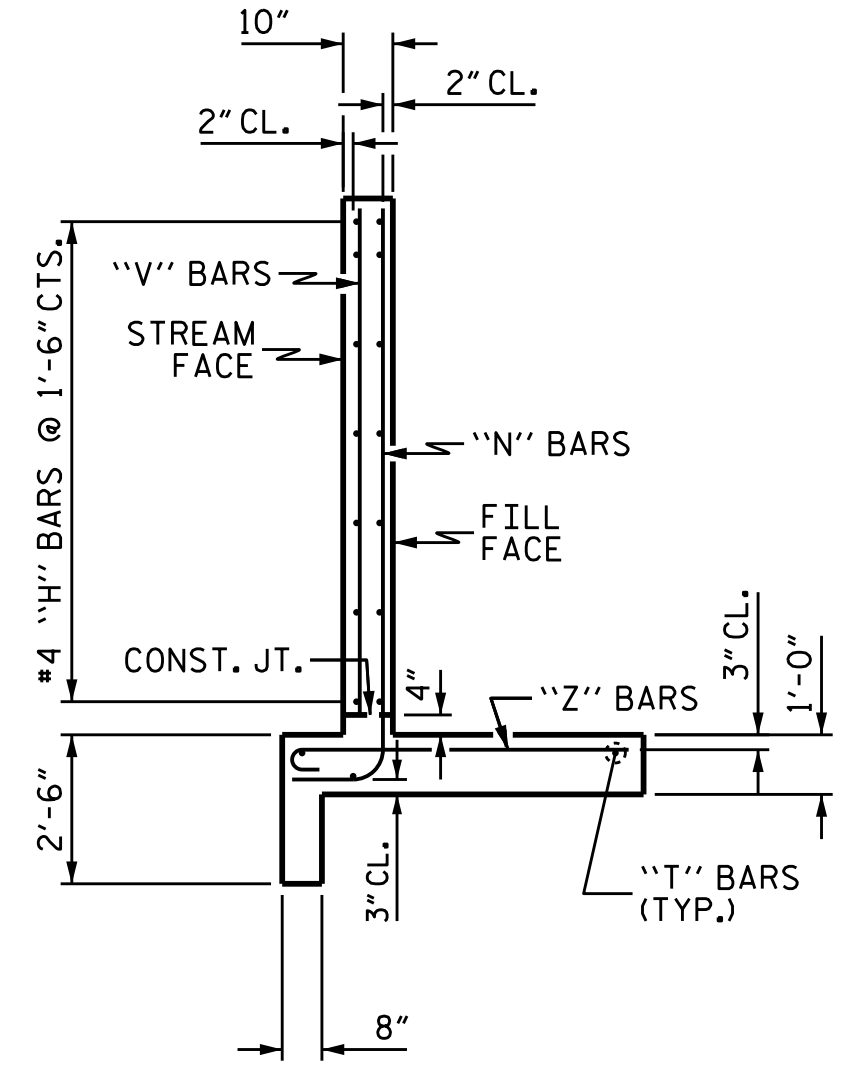


ELEVATION W1



ALL BAR DIMENSIONS ARE OUT TO OUT.

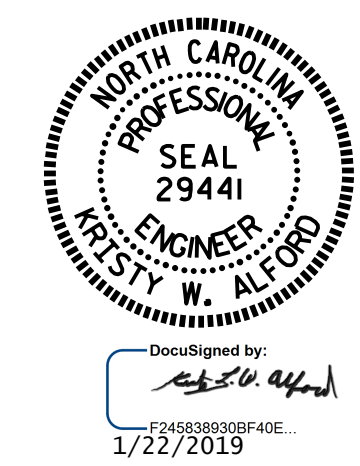
BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	15'-4"	123
H2	4	#4	STR	13'-10"	37
H3	4	#4	STR	7'-10"	21
H4	4	#4	STR	1'-8"	4
H5	24	#4	1	3'-3"	52
H6	4	#4	STR	15'-9"	42
H7	12	#4	STR	20'-0"	160
H8	4	#4	STR	18'-5"	49
H9	4	#4	STR	10'-4"	28
H10	4	#4	STR	2'-2"	6
H11	24	#4	2	3'-3"	52
H12	4	#4	STR	20'-5"	55
N1	6	#5	3	9'-11"	62
N2	6	#5	3	9'-2"	57
N3	6	#5	3	8'-6"	53
N4	6	#4	3	7'-9"	31
N5	6	#4	3	7'-0"	28
N6	6	#4	3	6'-3"	25
N7	6	#5	3	10'-0"	63
N8	8	#5	3	9'-3"	77
N9	8	#5	3	8'-6"	71
N10	8	#4	3	7'-9"	41
N11	8	#4	3	7'-0"	37
N12	8	#4	3	6'-3"	33
S1	12	#6	STR	6'-0"	108
T1	6	#5	STR	17'-3"	108
T2	6	#5	STR	22'-6"	141
V1	6	#4	STR	7'-11"	32
V2	6	#4	STR	7'-2"	29
V3	6	#4	STR	6'-5"	26
V4	6	#4	STR	5'-9"	23
V5	6	#4	STR	5'-0"	20
V6	6	#4	STR	4'-3"	17
V7	6	#4	STR	8'-0"	32
V8	8	#4	STR	7'-3"	39
V9	8	#4	STR	6'-6"	35
V10	8	#4	STR	5'-9"	31
V11	8	#4	STR	5'-0"	27
V12	8	#4	STR	4'-3"	23
Z1	4	#5	4	6'-0"	25
Z2	6	#5	4	5'-5"	34
Z3	6	#5	4	4'-11"	31
Z4	6	#4	4	4'-3"	17
Z5	6	#4	4	3'-8"	15
Z6	6	#4	4	3'-2"	13
Z7	4	#5	4	6'-2"	26
Z8	6	#5	4	5'-9"	36
Z9	6	#5	4	5'-4"	33
Z10	6	#5	4	4'-11"	31
Z11	6	#4	4	4'-4"	17
Z12	6	#4	4	3'-11"	16
Z13	6	#4	4	3'-6"	14
Z14	6	#4	4	3'-1"	12



TYPICAL WING SECTION

REINFORCING STEEL FOR 4 WINGS	2218 LBS
CLASS A CONCRETE	
4 WINGS	35.0 CY
2 HEADWALLS	2.0 CY
2 END CURTAIN WALLS	2.2 CY
TOTAL	39.2 CY

PROJECT NO. R-5021  
 BRUNSWICK COUNTY  
 STATION: 226+01.00 -L-  
 SHEET 4 OF 5



STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 WINGS FOR CONCRETE BOX CULVERT  
 H = 8'-0" SLOPE = 3:1  
 105° SKEW

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

DRAWN BY: WFP / QTN DATE: 10-17  
 CHECKED BY: K. W. ALFORD DATE: 12-18  
 DESIGN ENGINEER OF RECORD: K. W. ALFORD DATE: 12-18

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

**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	1.13	--	1.75	1.32	1	TOP SLAB	4.35	1.13	1	TOP SLAB	8.76		
	HL-93 (OPERATING)	N/A		1.46	--	1.35	1.72	1	TOP SLAB	4.35	1.46	1	TOP SLAB	8.76		
	HS-20 (INVENTORY)	36.000	②	1.33	47.80	1.75	1.77	1	TOP SLAB	4.35	1.33	1	BOTTOM SLAB	8.73		
	HS-20 (OPERATING)	36.000		1.72	61.96	1.35	2.29	1	TOP SLAB	4.35	1.72	1	BOTTOM SLAB	8.73		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		2.61	35.19	1.40	3.17	1	TOP CORNER WALL	0.66	2.61	1	TOP SLAB	8.76		
		SNGARBS2	20.000		2.41	48.21	1.40	3.01	1	TOP SLAB	4.11	2.41	1	TOP SLAB	8.76	
		SNAGRIS2	22.000		2.43	53.43	1.40	3.17	1	TOP CORNER WALL	0.66	2.43	1	BOTTOM SLAB	8.73	
		SNCOTTS3	27.250		1.39	37.89	1.40	1.65	1	TOP SLAB	4.35	1.39	1	TOP SLAB	8.76	
		SNAGGRS4	34.925		1.57	54.87	1.40	2.03	1	TOP SLAB	4.35	1.57	1	BOTTOM SLAB	8.73	
		SNS5A	35.550		1.50	53.18	1.40	1.92	1	TOP SLAB	4.11	1.50	1	TOP SLAB	8.76	
		SNS6A	39.950		1.46	58.18	1.40	1.92	1	TOP SLAB	4.11	1.46	1	BOTTOM SLAB	8.73	
	SNS7B	42.000		1.45	60.92	1.40	1.99	1	TOP SLAB	4.11	1.45	1	BOTTOM SLAB	8.73		
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		1.92	63.51	1.40	3.17	1	TOP CORNER WALL	0.66	1.92	1	BOTTOM SLAB	8.73	
		TNT4A	33.075		1.65	54.61	1.40	1.97	1	TOP SLAB	4.11	1.65	1	TOP SLAB	8.76	
		TNT6A	41.600		1.49	62.17	1.40	2.02	1	TOP SLAB	4.35	1.49	1	TOP SLAB	8.76	
		TNT7A	42.000		1.56	65.63	1.40	2.07	1	TOP SLAB	4.11	1.56	1	TOP SLAB	8.76	
		TNT7B	42.000		1.54	64.63	1.40	1.97	1	TOP SLAB	4.11	1.54	1	TOP SLAB	8.76	
		TNAGRIT4	43.000		1.48	63.74	1.40	1.87	1	TOP SLAB	4.35	1.48	1	BOTTOM SLAB	8.73	
TNAGT5A		45.000		1.38	62.03	1.40	1.92	1	TOP SLAB	4.11	1.38	1	BOTTOM SLAB	8.73		
TNAGT5B	45.000	③	1.31	59.10	1.40	1.97	1	TOP SLAB	4.11	1.31	1	BOTTOM SLAB	8.73			

**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	0.5 OR 0.90
ES	1.35	0.5 OR 0.90
LS	1.75	0.00
WA	1.00	0.00

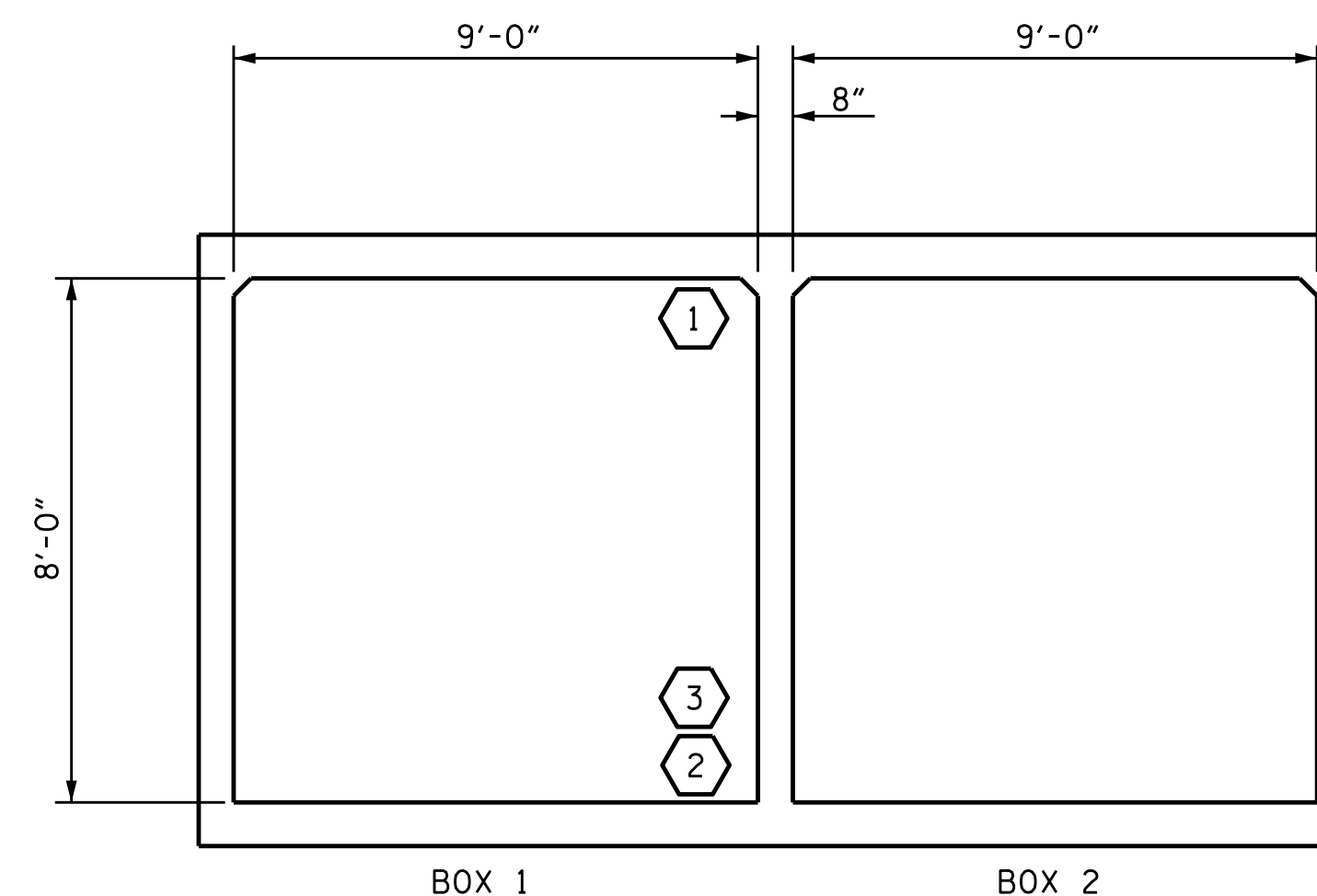
**NOTE:**

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

**COMMENTS:**

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

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



**LRFR SUMMARY**

(LOOKING DOWNSTREAM)

PROJECT NO. R-5021  
BRUNSWICK COUNTY  
 STATION: 226+01.00 -L-

SHEET 5 OF 5



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

ASSEMBLED BY : WFP / OTN	DATE : 11-17
CHECKED BY : P. K. NEWTON	DATE : 12/10/18
DRAWN BY : WMC	7/11
CHECKED BY : GM	7/11
REV. 10/1/11	MAA/GM
REV. 12/17	MAA/THC

DOCUMENT NOT CONSIDERED  
 FINAL UNLESS ALL  
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C3-5
1			3			TOTAL SHEETS 5
2			4			

BM\*30: R/R SPIKE IN BASE OF 10" PINE 290' N 11°22'46.3" W OF  
N 75768 E 2286901, EL. 32.34

F. A. PROJECT NO. STP-0211(21)

**NOTES**

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.  
 MAXIMUM DESIGN FILL ----- 8.46 FT.  
 MINIMUM DESIGN FILL ----- 4.20 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 EACH STAGE OF THE 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.  
 TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.

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

AFTER SERVING AS A TEMPORARY STRUCTURE THE EXISTING 6' X 4' RCBC LOCATED JUST WEST OF THE PROPOSED DOUBLE 7' X 7' RCBC SHALL BE REMOVED.

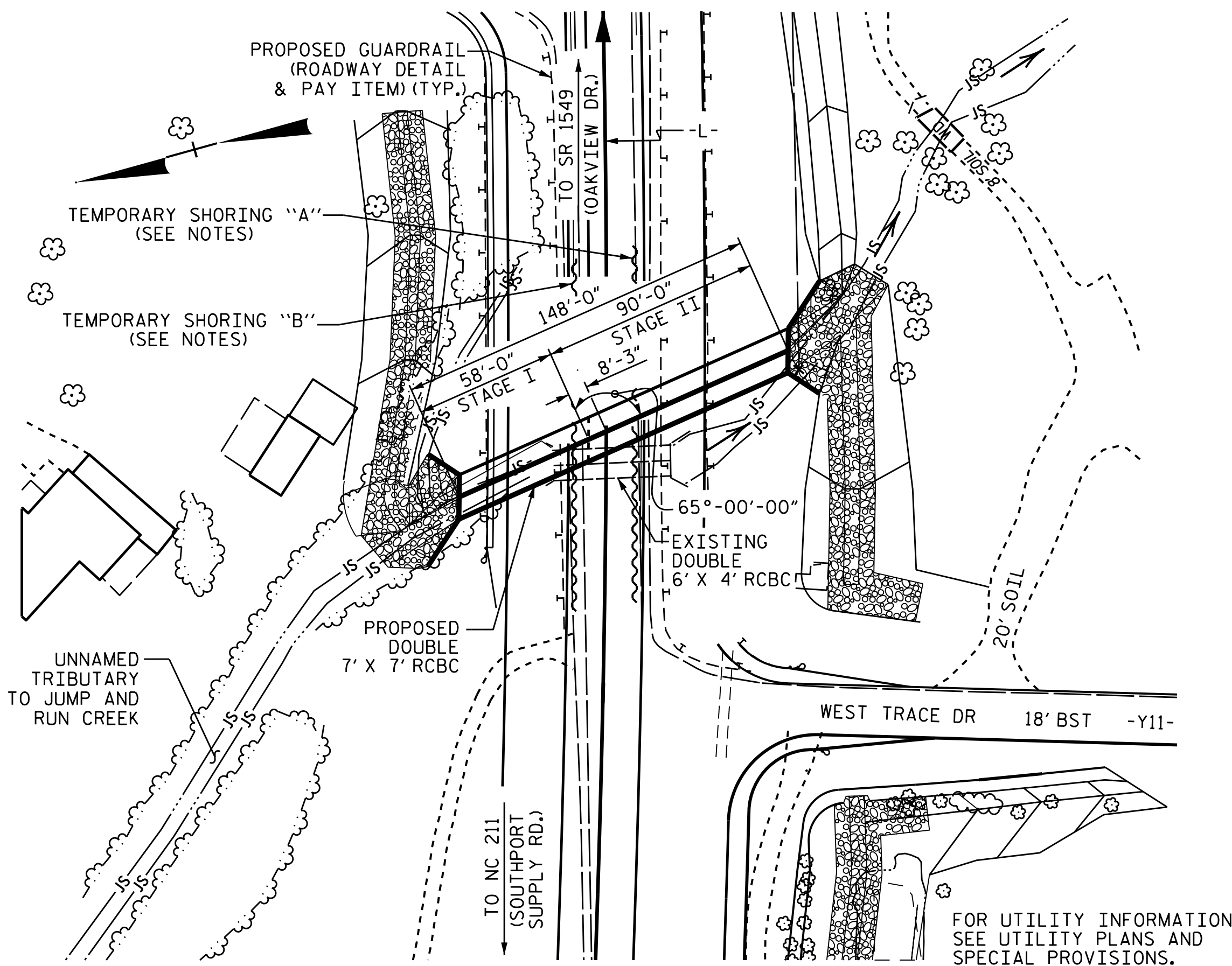
TRAFFIC ON NC211 (SOUTHPORT - SUPPLY RD.) SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS DIRECTED BY THE ENGINEER. FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.

AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL AND BOTH FACES OF INTERIOR WALLS 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.

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 SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT 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.  
 THIS STRUCTURE CONTAINS THE NECESSARY CORROSION PROTECTION REQUIRED FOR A CORROSIVE SITE.  
 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.  
 ALL BAR SUPPORTS USED IN THE CULVERT AND ALL INCIDENTAL REINFORCING STEEL SHALL BE EPOXY COATED IN ACCORDANCE WITH THE STANDARD SPECIFICATION.  
 FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.  
 FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.



LOCATION SKETCH

**HYDRAULIC DATA**

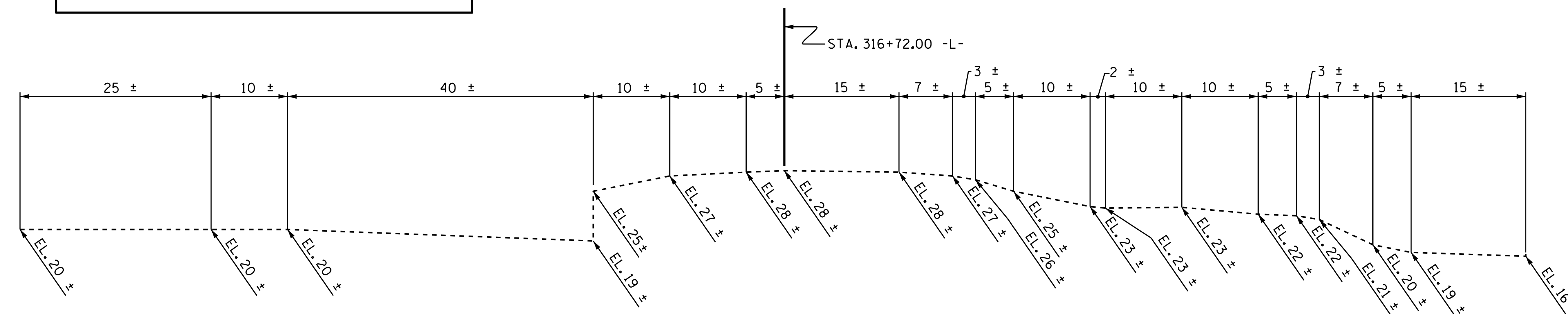
DESIGN DISCHARGE = 830 CFS  
 FREQUENCY OF DESIGN FLOOD = 50 YRS.  
 DESIGN HIGH WATER ELEVATION = 27.6 FT.  
 DRAINAGE AREA = 0.83 SQ. MI.  
 BASE DISCHARGE (Q100) = 870 CFS  
 BASE HIGH WATER ELEVATION = 27.8 FT.

**OVERTOPPING FLOOD DATA**

OVERTOPPING DISCHARGE = 950+ CFS  
 FREQUENCY OF OVERTOPPING FLOOD = 500+ YRS.  
 OVERTOPPING FLOOD ELEVATION = \* 31.87 FT.  
 \* SHD @ SAG STA. 316+83.31 (RT) -L-

**GRADE DATA -L-**

GRADE POINT ELEV. @ STA. 316+72.00 -L- = 31.39'  
 BED ELEVATION @ STA. 316+72.00 -L- = 17.58'  
 ROADWAY SLOPES = 3:1



PROFILE ALONG CULVERT

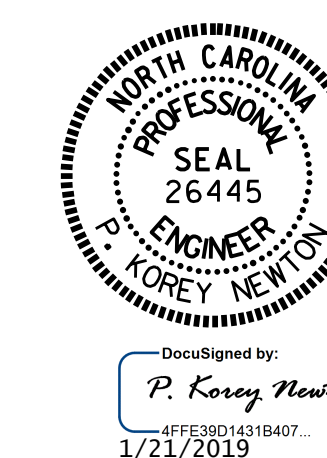
TOTAL STRUCTURE QUANTITIES	
CULVERT EXCAVATION	LUMP SUM
REMOVAL OF EXISTING STRUCTURE	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	209 TONS
CLASS A CONCRETE	
BARREL @ 1.317	CY/FT
STAGE I	76.4 C.Y.
STAGE II	118.5 C.Y.
WINGS ETC.	
STAGE I	17.6 C.Y.
STAGE II	17.6 C.Y.
TOTAL	228.3 C.Y.
REINFORCING STEEL	
BARREL	
STAGE I	11,364 LBS.
STAGE II	17,290 LBS.
WINGS ETC.	
STAGE I	936 LBS.
STAGE II	936 LBS.
TOTAL	30,526 LBS.

SAMPLE BAR REPLACEMENT	
SIZE	LENGTH
#3	6'-2"
#4	7'-4"
#5	8'-6"
#6	9'-8"
#7	10'-10"
#8	12'-0"
#9	13'-2"
#10	14'-6"
#11	15'-10"

NOTE: SAMPLE BAR REPLACEMENT LENGTHS BASED ON 30" (SAMPLE LENGTH) PLUS TWO SPLICE LENGTHS AND  $f_y = 60$ ksi.

PROJECT NO. R-5021  
 BRUNSWICK COUNTY  
 STATION: 316+72.00 -L-

SHEET 1 OF 5



STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
**DOUBLE 7 FT. X 7 FT.  
 CONCRETE BOX CULVERT  
 60° SKEW**

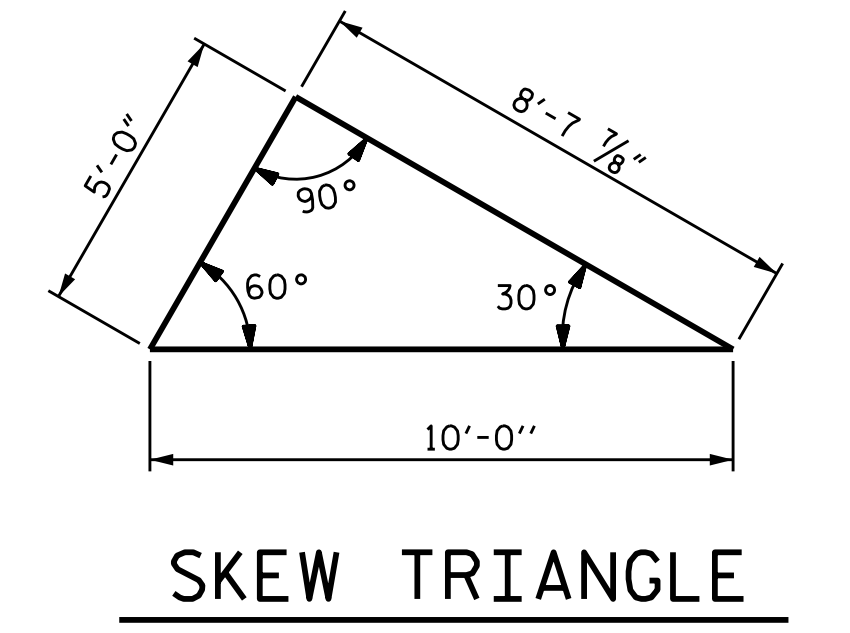
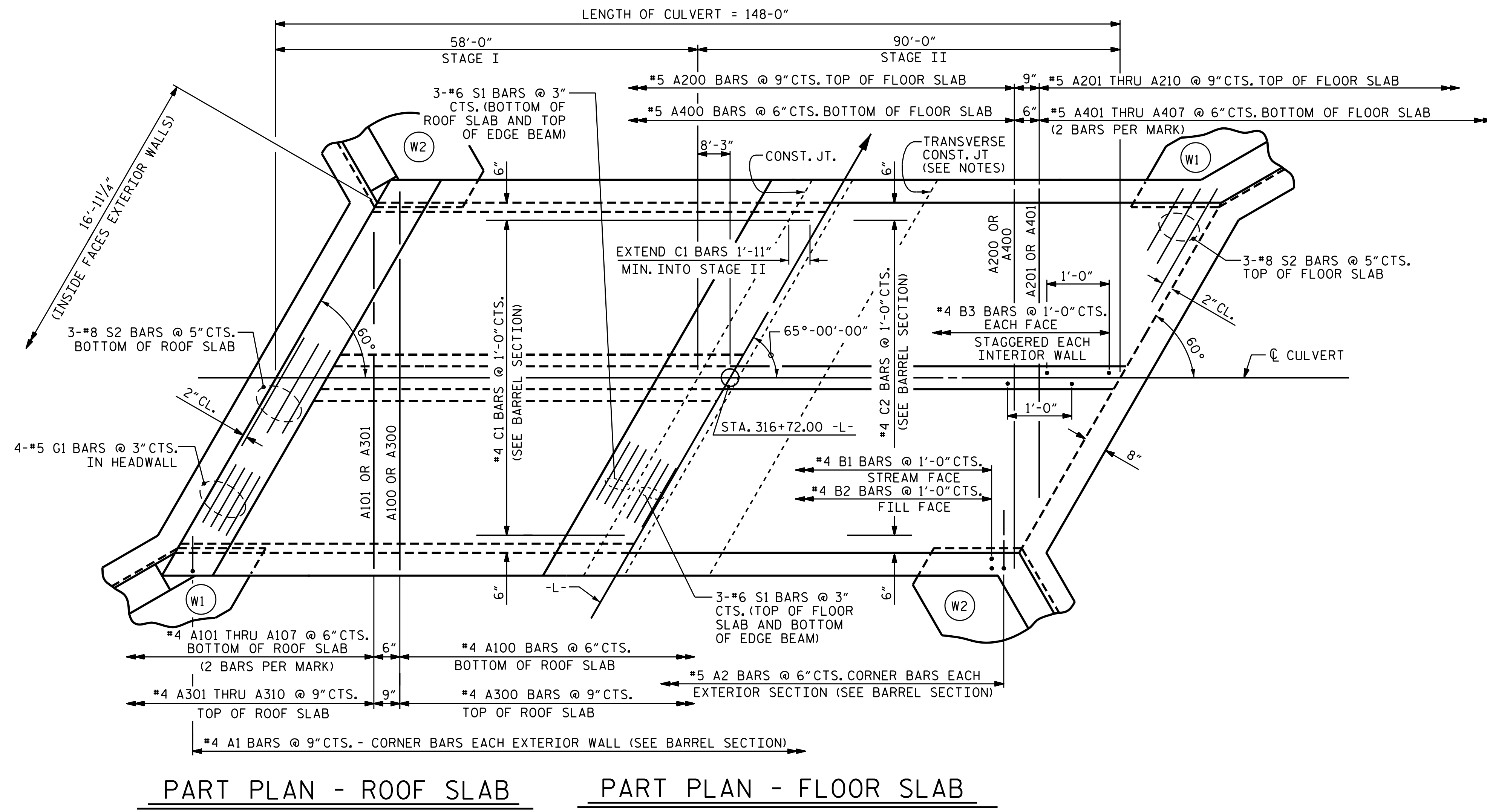
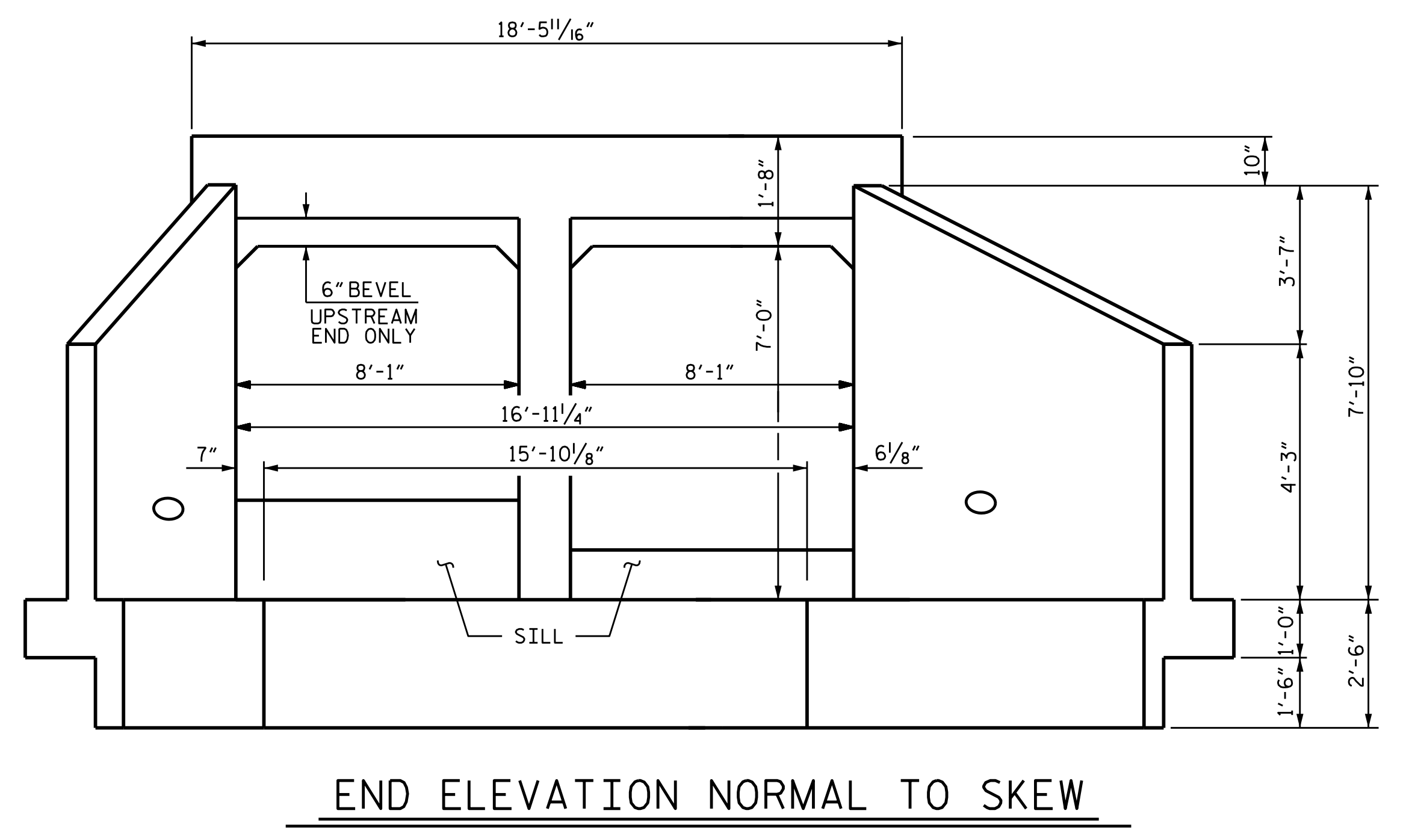
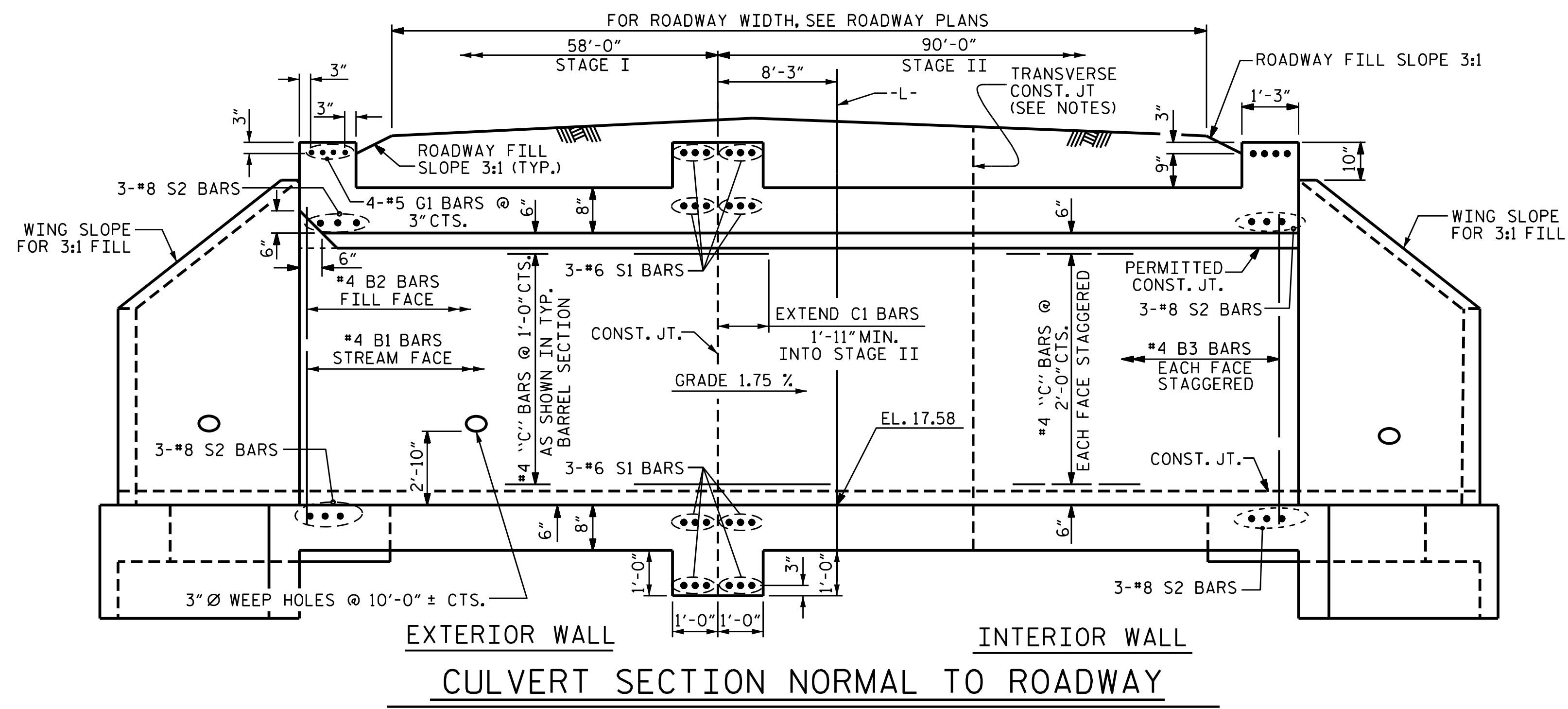
ASSEMBLED BY: O. T. NGUYEN DATE: 9/10/18  
 CHECKED BY: P. K. NEWTON DATE: 12/11/18  
 DRAWN BY: B. WYNN/D.DONOVAN DATE: SEPT. 1990  
 CHECKED BY: A.R. BISSETTE DATE: OCT. 90

**SPECIAL  
 STANDARD**

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C4-1
1			3			TOTAL SHEETS
2			4			5

ADDED 10-1-90

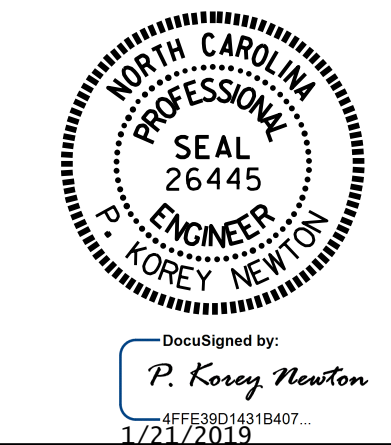


PROJECT NO. R-5021  
 BRUNSWICK COUNTY  
 STATION: 316+72.00 -L-  
 SHEET 2 OF 5

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

**DOUBLE 7 FT. X 7 FT.  
 CONCRETE BOX CULVERT  
 60° SKEW**

REVISIONS						SHEET NO. C4-2
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 5
2			4			



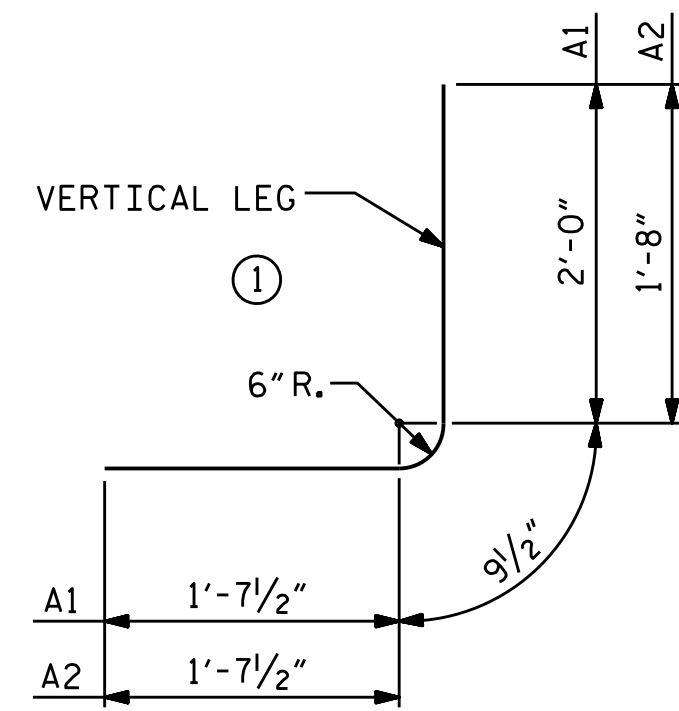
REVISED 11-19-98 BY M.M. CHECKED BY R.W.W.  
 REDRAWN 10-1-90 BY P. DONOVAN CHECKED BY ARB

ASSEMBLED BY: O.T. NGUYEN DATE: 9/10/18  
 CHECKED BY: P.K. NEWTON DATE: 12/11/18  
 DRAWN BY: JERRY HARRIS DATE: JUNE 1971  
 CHECKED BY: JOEL JOHNSON DATE: JULY 1971

**SPECIAL  
 STANDARD**



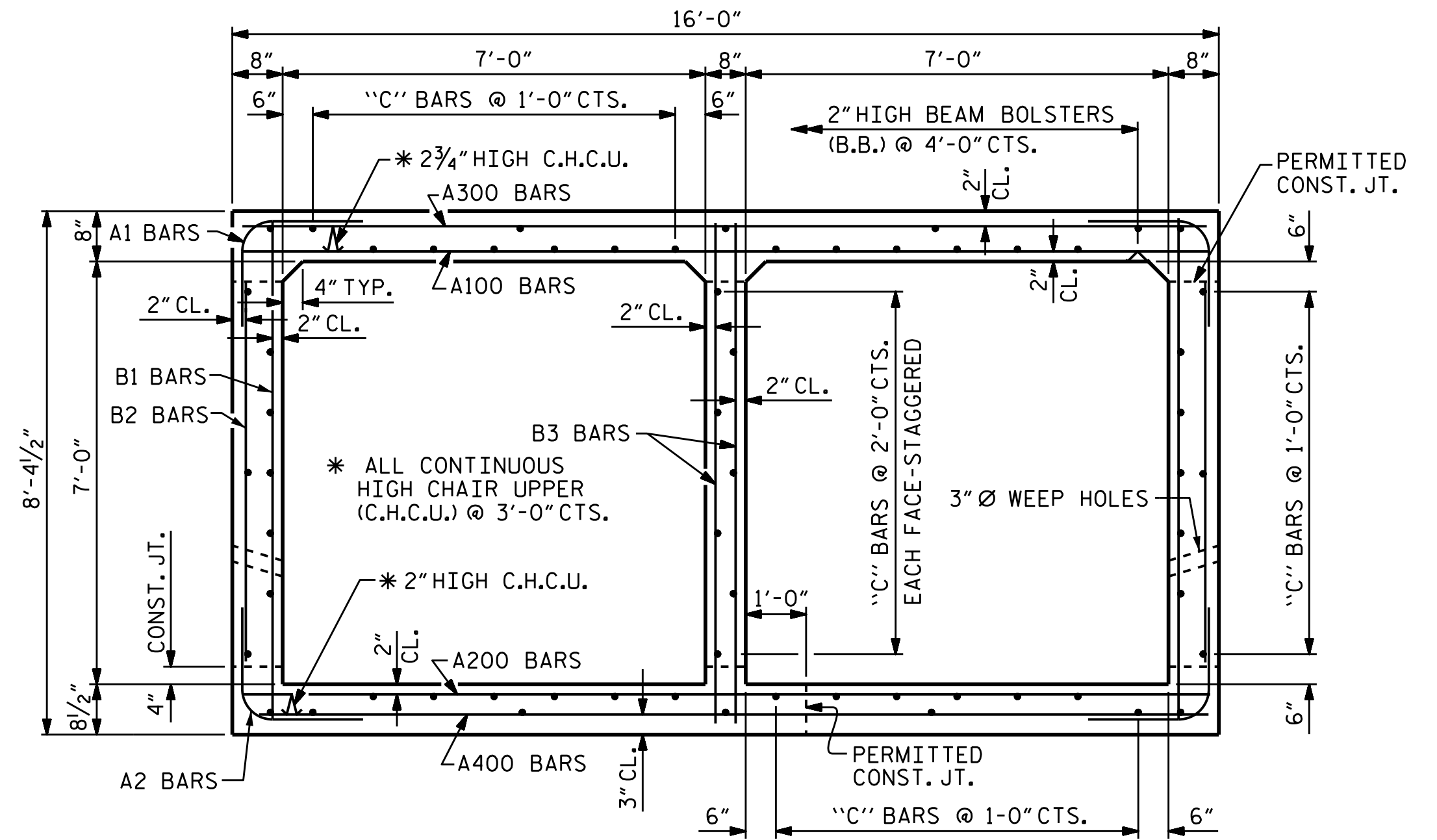
BILL OF MATERIAL											
STAGE I						STAGE II					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
* A1	154	#4	1	4'-5"	454	* A1	242	#4	1	4'-5"	714
* A2	232	#5	1	4'-1"	988	* A2	360	#5	1	4'-1"	1533
* A100	98	#4	STR.	15'-7"	1020	* A100	162	#4	STR.	15'-7"	1686
* A101	4	#4	STR.	13'-9"	37	* A101	4	#4	STR.	13'-9"	37
* A102	4	#4	STR.	12'-1"	32	* A102	4	#4	STR.	12'-1"	32
* A103	4	#4	STR.	10'-4"	28	* A103	4	#4	STR.	10'-4"	28
* A104	4	#4	STR.	8'-7"	23	* A104	4	#4	STR.	8'-7"	23
* A105	4	#4	STR.	6'-10"	18	* A105	4	#4	STR.	6'-10"	18
* A106	4	#4	STR.	5'-2"	14	* A106	4	#4	STR.	5'-2"	14
* A107	4	#4	STR.	3'-5"	9	* A107	4	#4	STR.	3'-5"	9
* A200	65	#5	STR.	15'-7"	1056	* A200	109	#5	STR.	15'-7"	1772
* A201	2	#5	STR.	14'-8"	31	* A201	2	#5	STR.	14'-8"	31
* A202	2	#5	STR.	13'-4"	28	* A202	2	#5	STR.	13'-4"	28
* A203	2	#5	STR.	12'-1"	25	* A203	2	#5	STR.	12'-1"	25
* A204	2	#5	STR.	10'-9"	22	* A204	2	#5	STR.	10'-9"	22
* A205	2	#5	STR.	9'-6"	20	* A205	2	#5	STR.	9'-6"	20
* A206	2	#5	STR.	8'-2"	17	* A206	2	#5	STR.	8'-2"	17
* A207	2	#5	STR.	6'-10"	14	* A207	2	#5	STR.	6'-10"	14
* A208	2	#5	STR.	5'-7"	12	* A208	2	#5	STR.	5'-7"	12
* A209	2	#5	STR.	4'-3"	9	* A209	2	#5	STR.	4'-3"	9
* A210	2	#5	STR.	3'-0"	6	* A210	2	#5	STR.	3'-0"	6
* A300	65	#4	STR.	15'-7"	677	* A300	109	#4	STR.	15'-7"	1135
* A301	2	#4	STR.	14'-8"	20	* A301	2	#4	STR.	14'-8"	20
* A302	2	#4	STR.	13'-4"	18	* A302	2	#4	STR.	13'-4"	18
* A303	2	#4	STR.	12'-1"	16	* A303	2	#4	STR.	12'-1"	16
* A304	2	#4	STR.	10'-9"	14	* A304	2	#4	STR.	10'-9"	14
* A305	2	#4	STR.	9'-6"	13	* A305	2	#4	STR.	9'-6"	13
* A306	2	#4	STR.	8'-2"	11	* A306	2	#4	STR.	8'-2"	11
* A307	2	#4	STR.	6'-10"	9	* A307	2	#4	STR.	6'-10"	9
* A308	2	#4	STR.	5'-7"	7	* A308	2	#4	STR.	5'-7"	7
* A309	2	#4	STR.	4'-3"	6	* A309	2	#4	STR.	4'-3"	6
* A310	2	#4	STR.	3'-0"	4	* A310	2	#4	STR.	3'-0"	4
* A400	98	#5	STR.	15'-7"	1593	* A400	162	#5	STR.	15'-7"	2633
* A401	4	#5	STR.	13'-9"	57	* A401	2	#5	STR.	13'-9"	57
* A402	4	#5	STR.	12'-1"	50	* A402	2	#5	STR.	12'-1"	50
* A403	4	#5	STR.	10'-4"	43	* A403	2	#5	STR.	10'-4"	43
* A404	4	#5	STR.	8'-7"	36	* A404	2	#5	STR.	8'-7"	36
* A405	4	#5	STR.	6'-10"	29	* A405	2	#5	STR.	6'-10"	29
* A406	4	#5	STR.	5'-2"	22	* A406	2	#5	STR.	5'-2"	22
* A407	4	#5	STR.	3'-5"	14	* A407	2	#5	STR.	3'-5"	14
* B1	116	#4	STR.	7'-10"	607	* B1	180	#4	STR.	7'-10"	942
* B2	116	#4	STR.	6'-4"	491	* B2	180	#4	STR.	6'-4"	762
* B3	116	#4	STR.	7'-10"	607	* B3	180	#4	STR.	7'-10"	942
* C1	183	#4	STR.	21'-3"	2598	* C2	244	#4	STR.	23'-11"	3898
* D1	3	#6	STR.	2'-3"	10	* D1	3	#6	STR.	2'-3"	10
* D2	3	#6	STR.	1'-3"	6	* D2	3	#6	STR.	1'-3"	6
* G1	4	#5	STR.	18'-0"	75	* G1	4	#5	STR.	18'-0"	75
* S1	12	#6	STR.	18'-0"	324	* S1	12	#6	STR.	18'-0"	324
* S2	3	#8	STR.	18'-0"	144	* S2	3	#8	STR.	18'-0"	144
* EPOXY COATED REINF. STEEL = 11,364 LBS.						* EPOXY COATED REINF. STEEL = 17,290 LBS.					



**BAR TYPE**

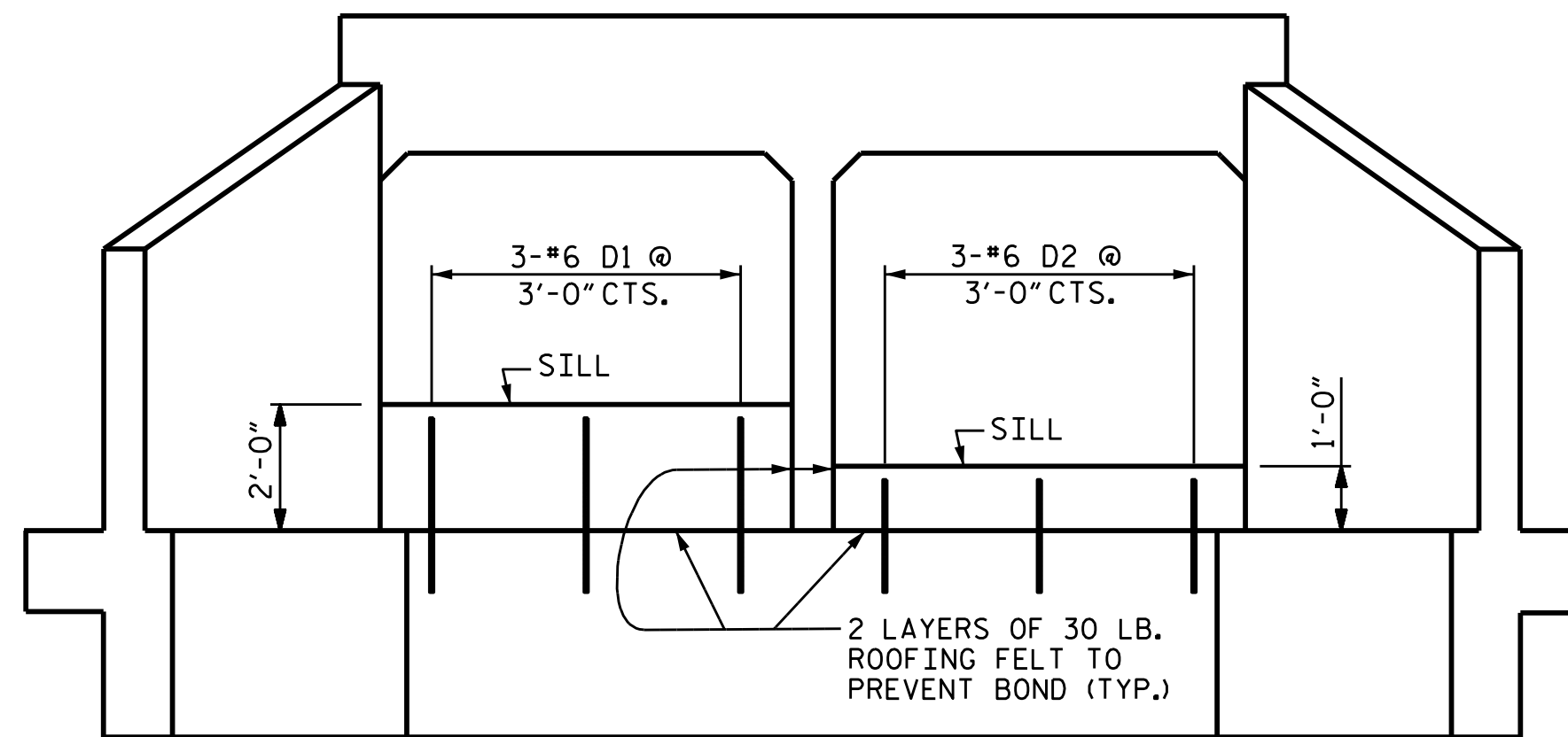
BAR DIMENSIONS ARE OUT TO OUT

SPlice LENGTH CHART		
BAR	SIZE	SPlice LENGTH
B1, B3	#4	1'-5"
C1, C2	#4	1'-11"



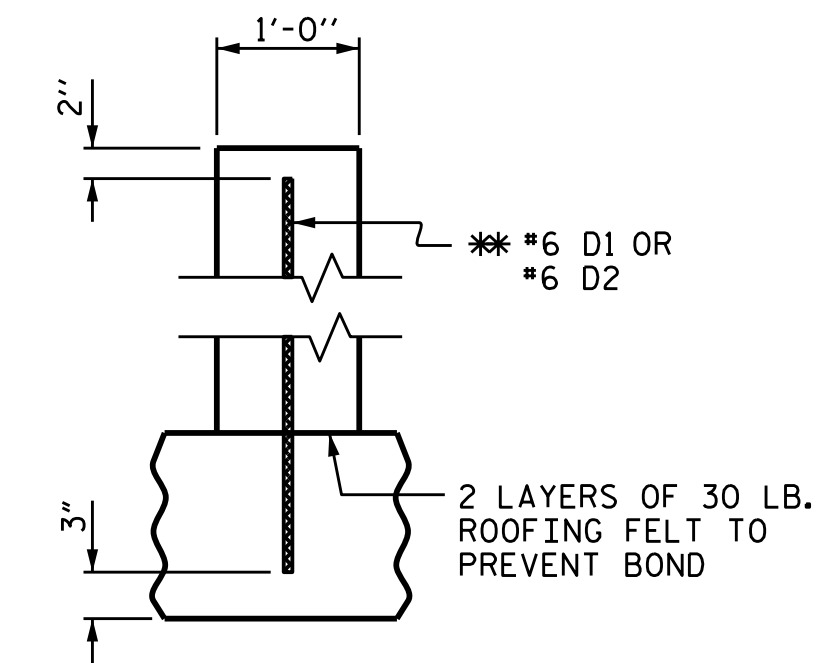
**RIGHT ANGLE SECTION OF BARREL**

THERE ARE 61 "C" BARS IN SECTION OF BARREL.



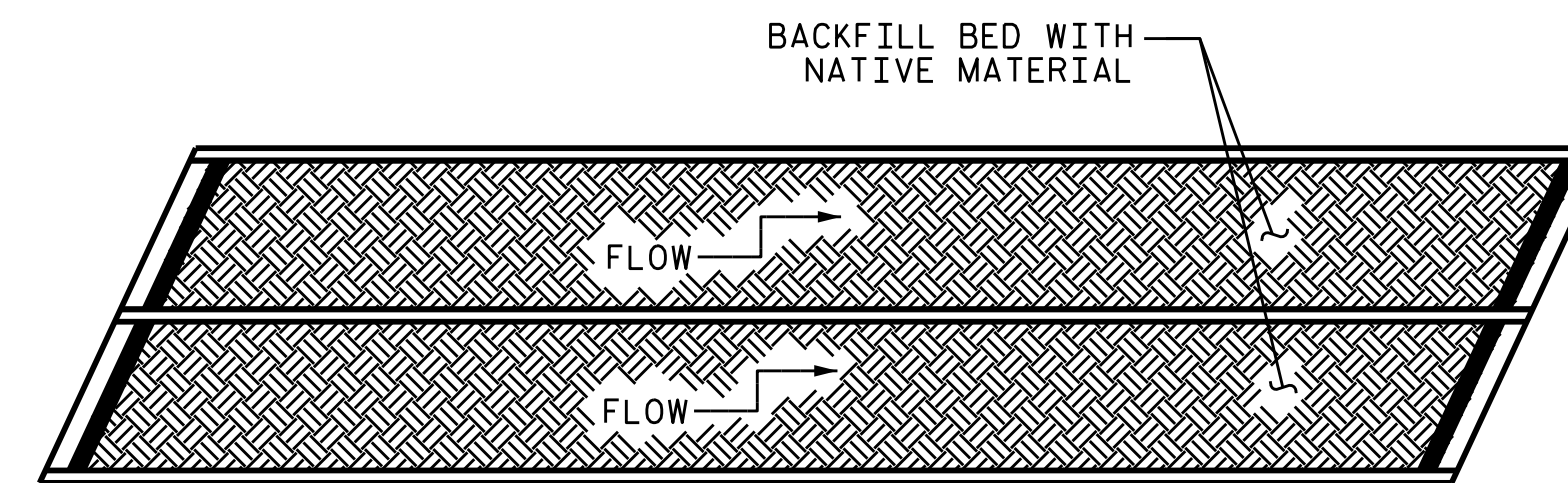
**ELEVATION**

ONE SILL AT INLET AND OUTLET FACE (LOOKING DOWNSTREAM)



**SECTION THROUGH SILL**

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



**PLAN**

**SILL DETAILS**

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



DocuSigned by:  
P. Corey Newton  
#FF92D1518A07  
1/21/2019

PROJECT NO. R-5021  
BRUNSWICK COUNTY  
STATION: 316+72.00 -L-

SHEET 3 OF 5

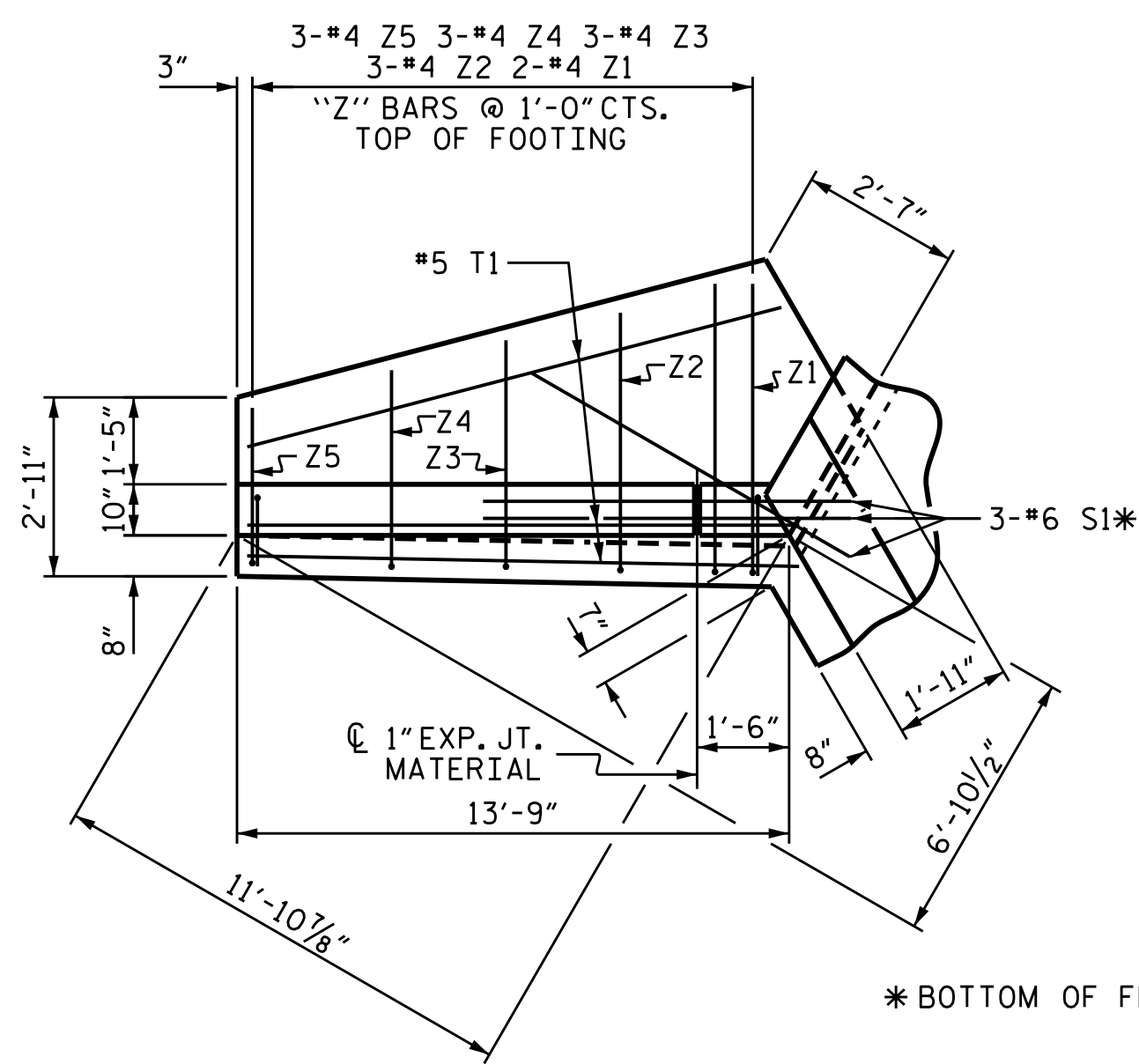
STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
**DOUBLE 7 FT. X 7 FT.  
CONCRETE BOX CULVERT  
60° SKEW**

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

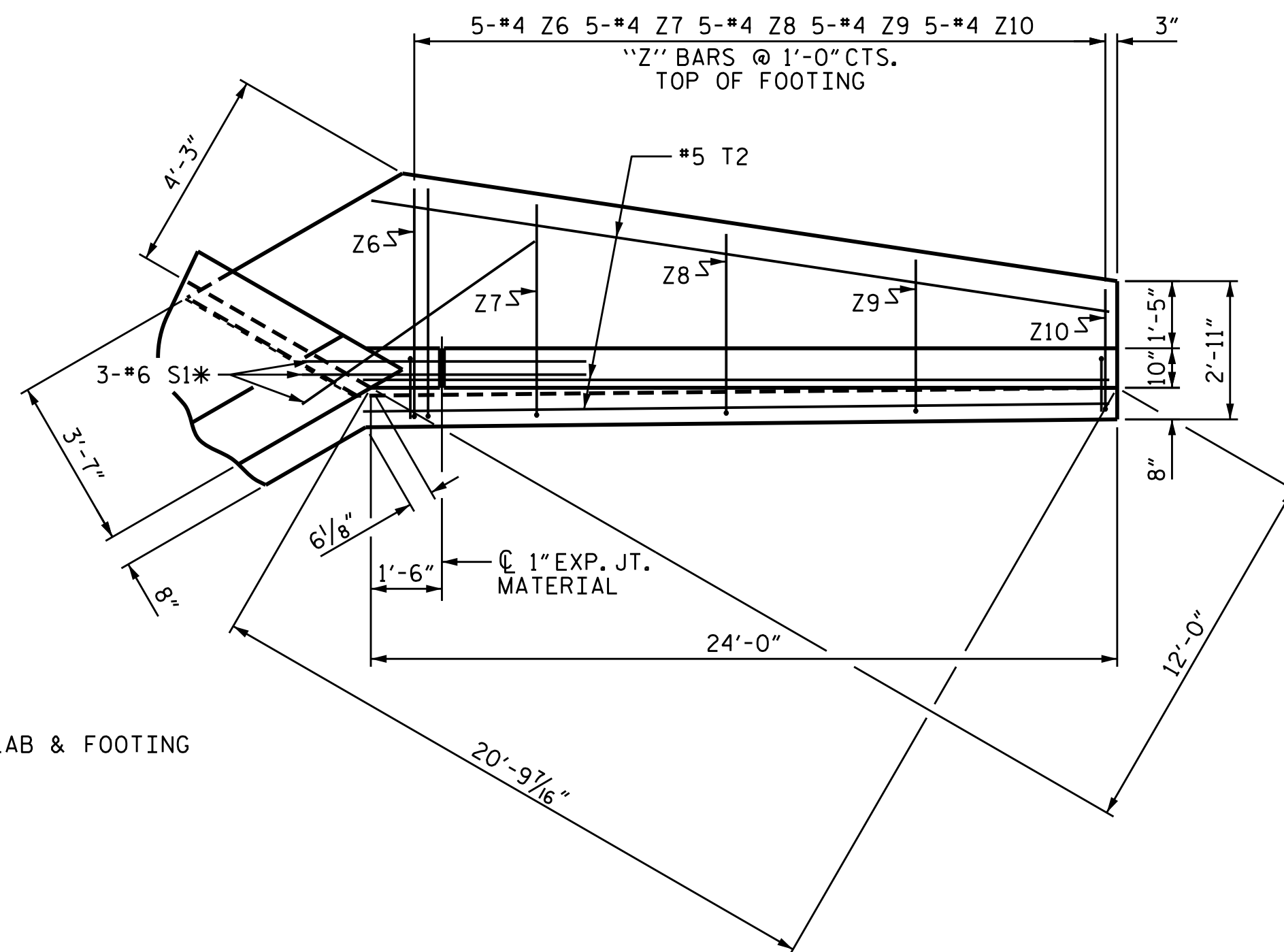
C4-3  
TOTAL SHEETS  
5

DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED

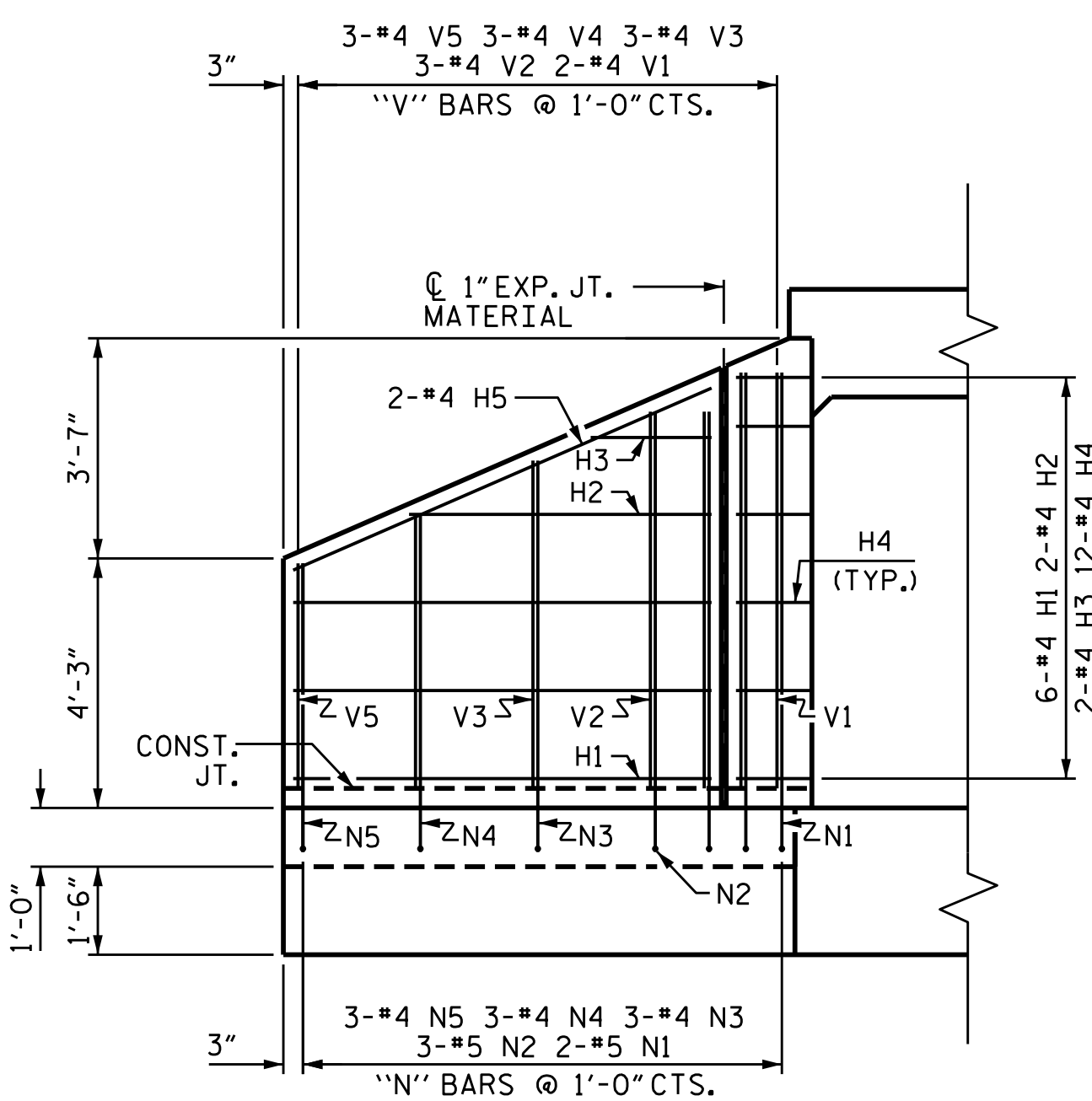
DRAWN BY : O. T. NGUYEN DATE : 8/18  
CHECKED BY : P. K. NEWTON DATE : 12/11/18  
DESIGN ENGINEER OF RECORD: Z. MALIK DATE : 12/14/18



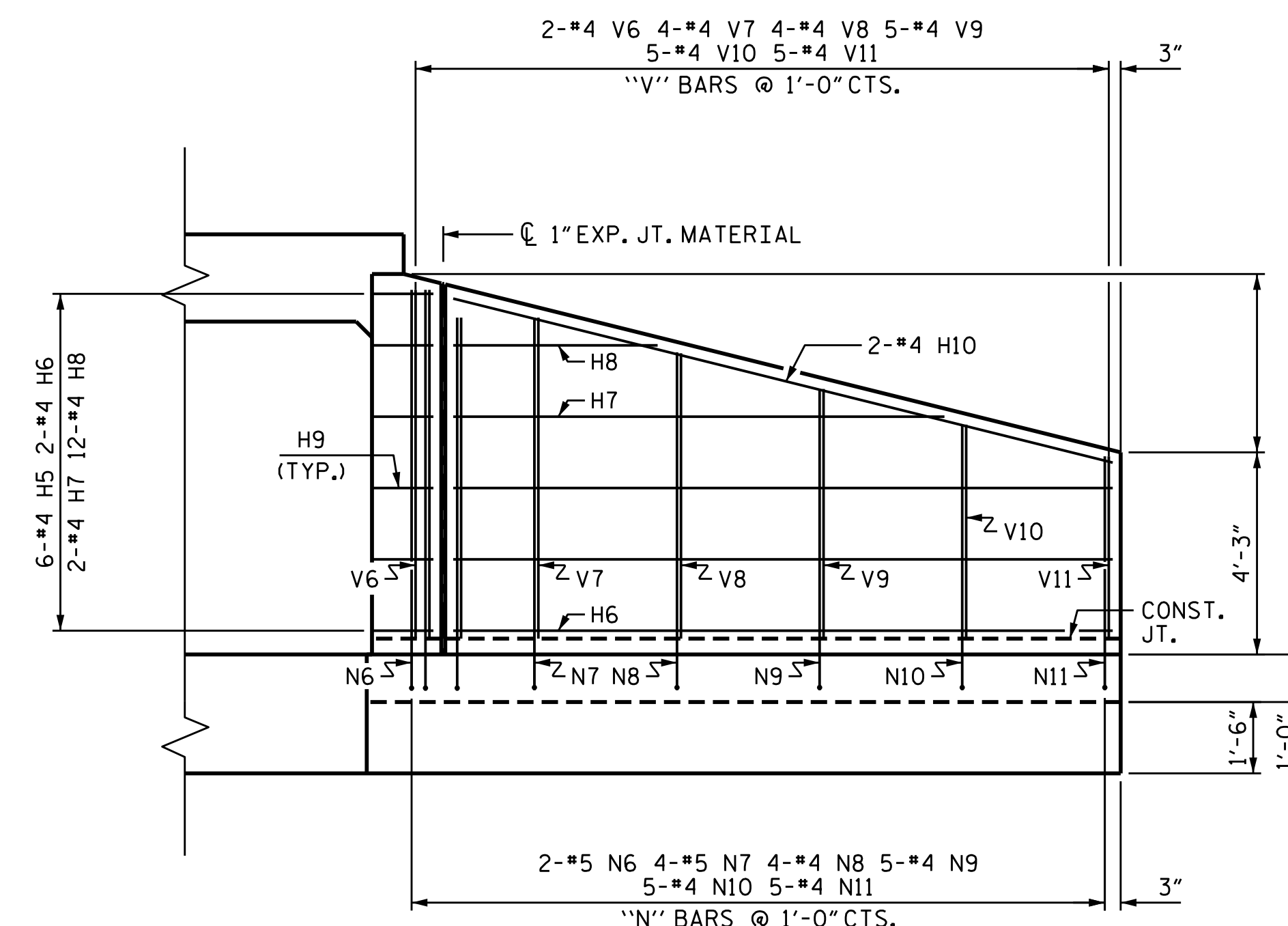
PLAN W2



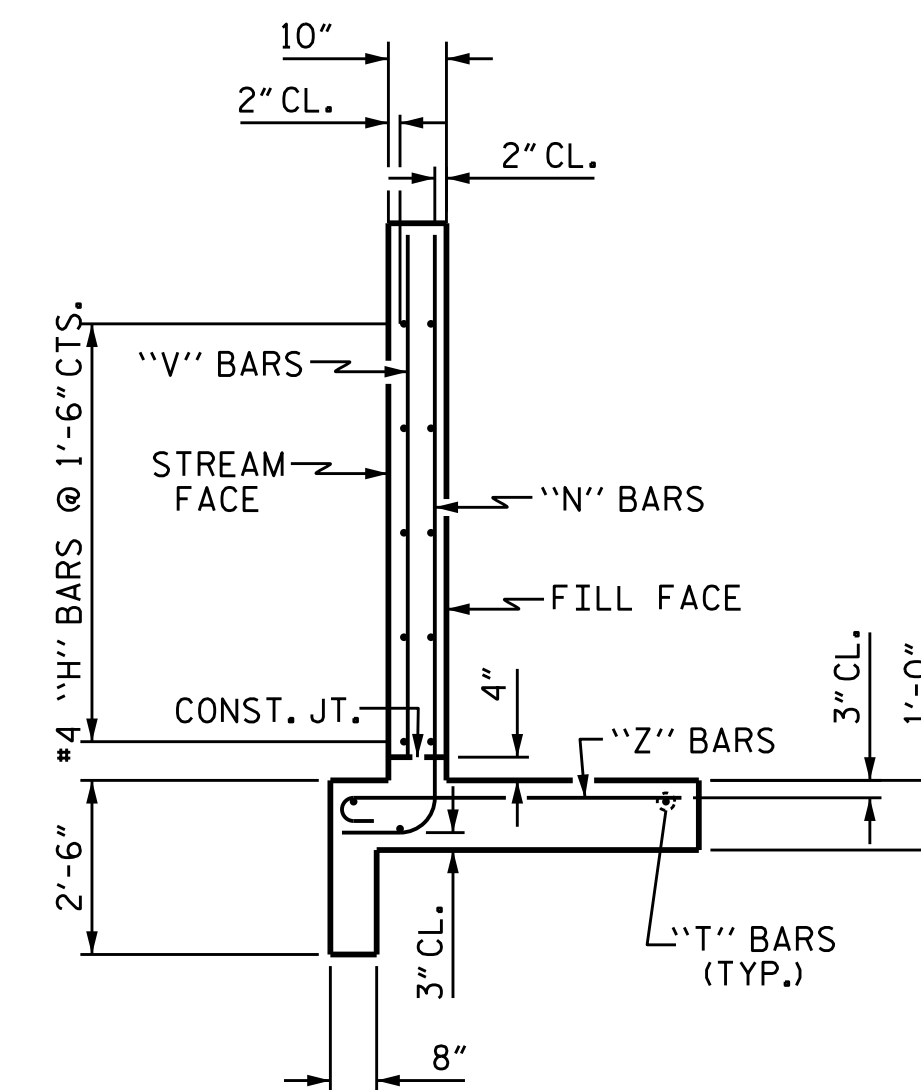
PLAN W1



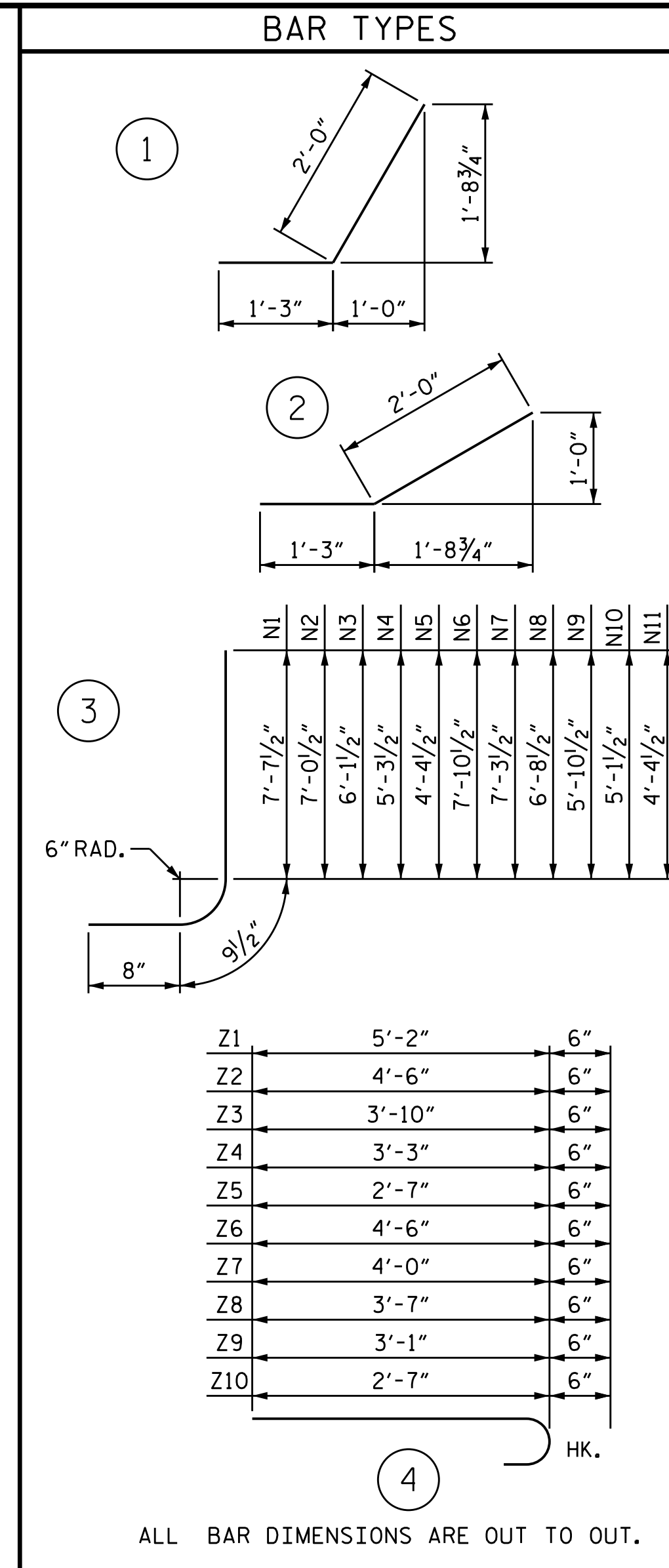
ELEVATION W2



ELEVATION W1



TYPICAL WING SECTION



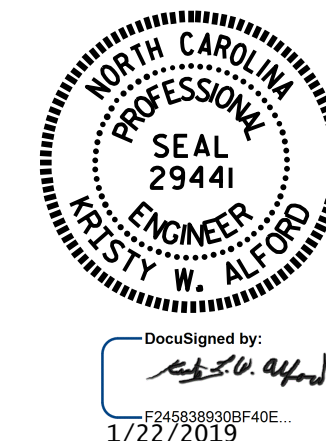
BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	11'-11"	96
H2	4	#4	STR	8'-6"	23
H3	4	#4	STR	3'-0"	8
H4	24	#4	1	3'-3"	52
H5	4	#4	STR	12'-3"	33
H6	12	#4	STR	22'-1"	177
H7	4	#4	STR	16'-3"	43
H8	4	#4	STR	6'-6"	17
H9	24	#4	2	3'-3"	52
H10	4	#4	STR	22'-3"	59
N1	4	#5	3	9'-1"	38
N2	6	#5	3	8'-6"	53
N3	6	#4	3	7'-7"	30
N4	6	#4	3	6'-9"	27
N5	6	#4	3	5'-10"	16
N6	4	#5	3	9'-4"	39
N7	8	#5	3	8'-9"	74
N8	8	#5	3	8'-2"	68
N9	10	#4	3	7'-4"	49
N10	10	#4	3	6'-7"	44
N11	10	#4	3	5'-10"	39
S1	12	#6	STR	6'-0"	108
T1	6	#5	STR	13'-9"	86
T2	6	#5	STR	24'-0"	150
V1	4	#4	STR	7'-0"	19
V2	6	#4	STR	6'-2"	25
V3	6	#4	STR	5'-5"	22
V4	6	#4	STR	4'-7"	18
V5	6	#4	STR	3'-10"	15
V6	4	#4	STR	7'-2"	19
V7	8	#4	STR	6'-8"	36
V8	8	#4	STR	6'-1"	33
V9	10	#4	STR	5'-3"	35
V10	10	#4	STR	4'-6"	30
V11	10	#4	STR	3'-9"	25
Z1	4	#4	4	5'-8"	15
Z2	6	#4	4	5'-0"	20
Z3	6	#4	4	4'-4"	17
Z4	6	#4	4	3'-9"	15
Z5	6	#4	4	3'-1"	12
Z6	10	#4	4	5'-0"	33
Z7	10	#4	4	4'-6"	30
Z8	10	#4	4	4'-1"	27
Z9	10	#4	4	3'-7"	24
Z10	10	#4	4	3'-1"	21

REINFORCING STEEL FOR 4 WINGS	1872 LBS
CLASS A CONCRETE	
4 WINGS	29.7 CY
2 HEADWALLS	1.7 CY
2 END CURTAIN WALLS	2.0 CY
4 SILLS	1.8 CY
<b>TOTAL</b>	<b>35.2 CY</b>

PROJECT NO. R-5021  
 BRUNSWICK COUNTY  
 STATION: 316+72.00 -L-

SHEET 4 OF 5

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
**WINGS FOR CONCRETE BOX CULVERT**  
 H = 7'-0" SLOPE = 3:1  
 60° SKEW



DRAWN BY: K. W. ALFORD DATE: 12/18  
 CHECKED BY: O. T. NGUYEN DATE: 12/18  
 DESIGN ENGINEER OF RECORD: K. W. ALFORD DATE: 12/18

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISIONS				SHEET NO.
NO.	BY:	DATE:	NO.	C4-4
1			3	TOTAL SHEETS
2			4	5

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

LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						LIVE-LOAD FACTORS (LL)	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	①	1.11	--	1.75	2.64	1	TOP SLAB	3.45	1.11	1	BOTTOM SLAB	6.82		
	HL-93 (OPERATING)	N/A		1.44	--	1.35	3.42	1	TOP SLAB	3.45	1.44	1	BOTTOM SLAB	6.82		
	HS-20 (INVENTORY)	36.000	②	1.52	54.63	1.75	3.94	1	TOP SLAB	3.45	1.52	1	BOTTOM SLAB	6.82		
	HS-20 (OPERATING)	36.000		1.97	70.82	1.35	5.11	1	TOP SLAB	3.45	1.97	1	BOTTOM SLAB	6.82		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		3.09	41.76	1.40	7.20	1	TOP SLAB	3.45	3.09	1	TOP SLAB	6.82	
		SNGARBS2	20.000		2.87	57.44	1.40	6.68	1	TOP SLAB	3.45	2.87	1	BOTTOM SLAB	6.82	
		SNAGRIS2	22.000		2.77	60.88	1.40	7.20	1	TOP SLAB	3.45	2.77	1	BOTTOM SLAB	6.82	
		SNCOTTS3	27.250		1.39	37.92	1.40	3.30	1	TOP SLAB	3.45	1.39	1	BOTTOM SLAB	6.82	
		SNAGGRS4	34.925		1.40	48.97	1.40	3.87	1	TOP SLAB	3.45	1.40	1	BOTTOM SLAB	6.82	
		SNS5A	35.550		1.30	46.30	1.40	3.75	1	TOP SLAB	3.45	1.30	1	BOTTOM SLAB	6.82	
		SNS6A	39.950	③	1.29	51.48	1.40	3.72	1	TOP SLAB	3.45	1.29	1	BOTTOM SLAB	6.82	
		SNS7B	42.000		1.29	54.12	1.40	3.84	1	TOP SLAB	3.45	1.29	1	BOTTOM SLAB	6.82	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		1.93	63.68	1.40	7.20	1	TOP SLAB	0.19	1.93	1	BOTTOM SLAB	6.82	
		TNT4A	33.075		1.60	52.99	1.40	3.93	1	TOP SLAB	3.45	1.60	1	BOTTOM SLAB	6.82	
		TNT6A	41.600		1.40	58.20	1.40	4.00	1	TOP SLAB	3.45	1.40	1	BOTTOM SLAB	6.82	
		TNT7A	42.000		1.56	65.41	1.40	4.07	1	TOP SLAB	3.45	1.56	1	BOTTOM SLAB	6.82	
		TNT7B	42.000		1.37	57.71	1.40	3.93	1	TOP SLAB	3.45	1.37	1	BOTTOM SLAB	6.82	
		TNAGRIT4	43.000		1.40	60.17	1.40	3.75	1	TOP SLAB	3.45	1.40	1	BOTTOM SLAB	6.82	
		TNACT5A	45.000		1.43	64.49	1.40	3.84	1	TOP SLAB	3.45	1.43	1	BOTTOM SLAB	6.82	
TNACT5B	45.000		1.45	65.31	1.40	3.93	1	TOP SLAB	3.45	1.45	1	BOTTOM SLAB	6.82			

### 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	0.00
WA	1.00	0.00

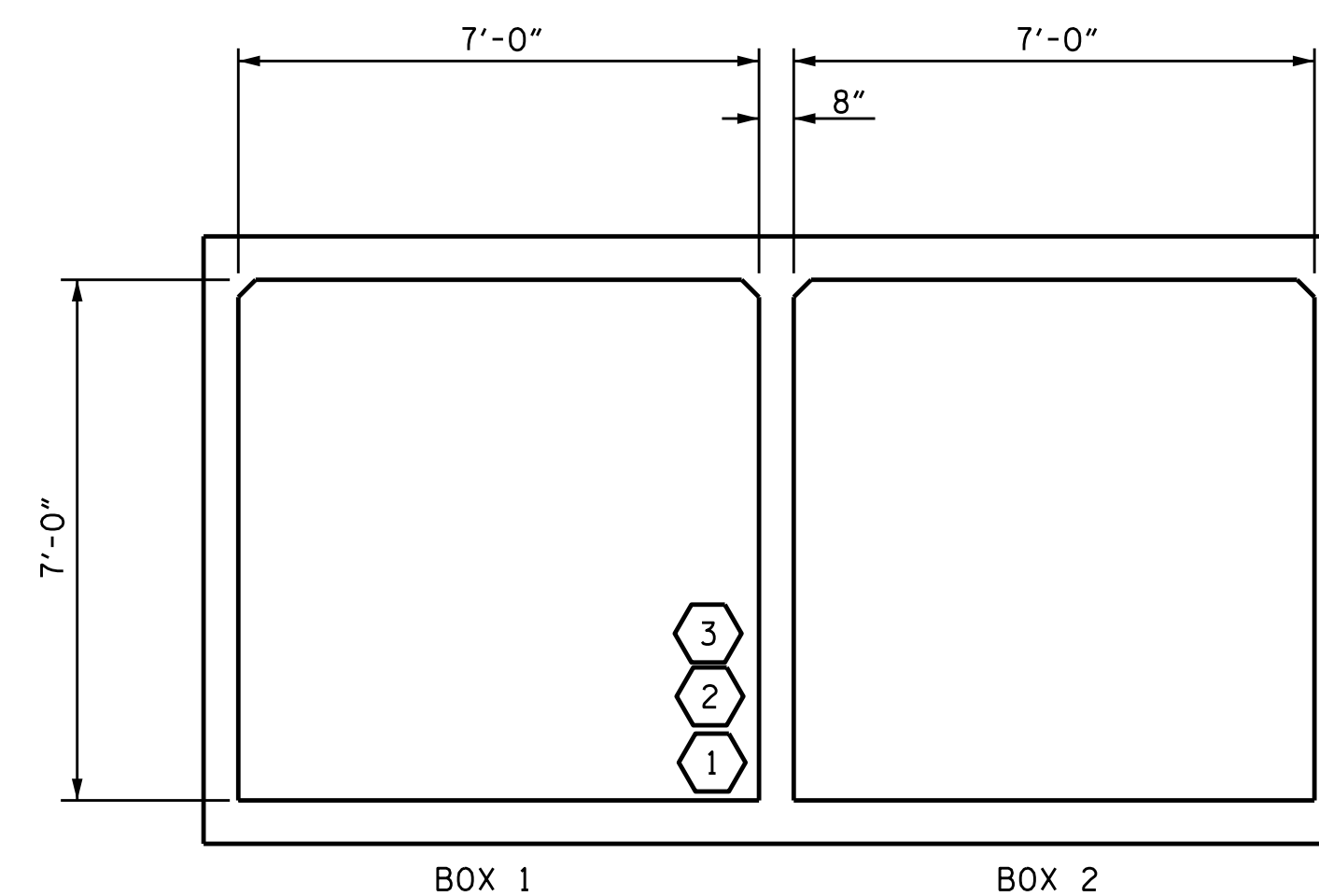
### NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

### COMMENTS:

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

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

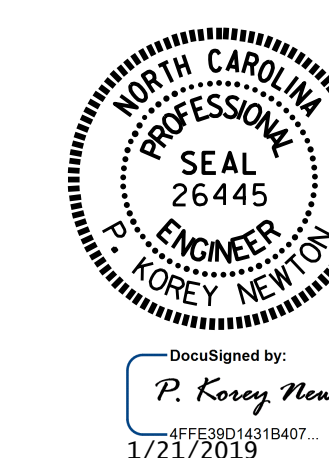


### LRFR SUMMARY

(LOOKING DOWNSTREAM)

PROJECT NO. R-5021  
BRUNSWICK COUNTY  
 STATION: 316+72.00 -L-

SHEET 5 OF 5



STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH STANDARD LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS (NON-INTERSTATE TRAFFIC)					
REVISIONS					SHEET NO. C4-5
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED					TOTAL SHEETS 5

CUL 4

STD. NO. LRFR5

ASSEMBLED BY : O. T. NGUYEN	DATE : 9/10/18
CHECKED BY : P. K. NEWTON	DATE : 12/17/18
DRAWN BY : WMC	7/11
CHECKED BY : GM	7/11
REV. 10/1/11	MAA/GM
REV. 12/17	MAA/THC

## STANDARD NOTES

### DESIGN DATA:

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

### MATERIAL AND WORKMANSHIP:

EXCEPT AS MAY OTHERWISE BE SPECIFIED ON PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE 2018 "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" OF THE N. C. DEPARTMENT OF TRANSPORTATION.

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

### CONCRETE:

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

### CONCRETE CHAMFERS:

UNLESS OTHERWISE NOTED ON THE PLANS, ALL EXPOSED CORNERS ON STRUCTURES SHALL BE CHAMFERED  $\frac{3}{4}$ " WITH THE FOLLOWING EXCEPTIONS: TOP CORNERS OF CURBS MAY BE ROUNDED TO  $1\frac{1}{2}$ " RADIUS WHICH IS BUILT INTO CURB FORMS; CORNERS OF TRANSVERSE FLOOR EXPANSION JOINTS SHALL BE ROUNDED WITH A  $\frac{1}{4}$ " 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  $\frac{1}{4}$ " 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  $\frac{7}{8}$ "  $\emptyset$  SHEAR STUDS FOR THE  $\frac{3}{4}$ "  $\emptyset$  STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 -  $\frac{7}{8}$ "  $\emptyset$  STUDS FOR 4 -  $\frac{3}{4}$ "  $\emptyset$  STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF  $\frac{7}{8}$ "  $\emptyset$  STUDS ALONG THE BEAM AS SHOWN FOR  $\frac{3}{4}$ "  $\emptyset$  STUDS BASED ON THE RATIO OF 3 -  $\frac{7}{8}$ "  $\emptyset$  STUDS FOR 4 -  $\frac{3}{4}$ "  $\emptyset$  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  $\frac{5}{16}$ " 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  $\frac{1}{16}$ " 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. FINISHES AND OTHER DEFORMATIONS RESULTING FROM CASTING OR OTHERWISE SHALL BE REMOVED IN A MANNER SO THAT A UNIFORM COLORING OF THE COMPLETED CASTING SHALL BE OBTAINED. CASTINGS WITH DISCOLORATIONS OR OF NON-UNIFORM COLORING WILL NOT BE ACCEPTED. CERTIFIED MILL REPORTS ARE REQUIRED FOR METAL RAILS AND POSTS.

### SPECIAL NOTES:

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

# ENGLISH

JANUARY, 1990

STD. NO. SN