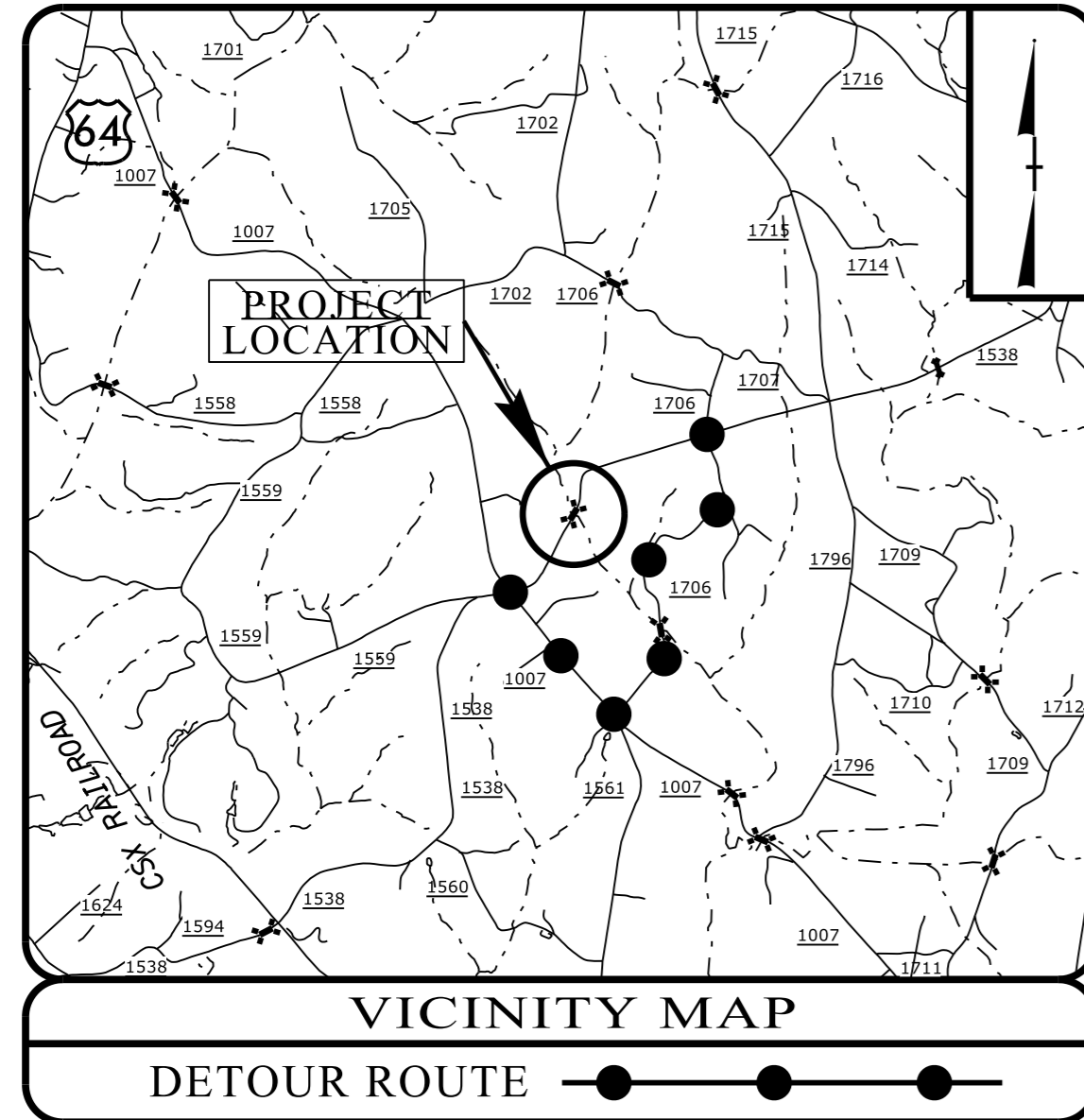


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CONTRACT: C203665 TIP NO: B-5395

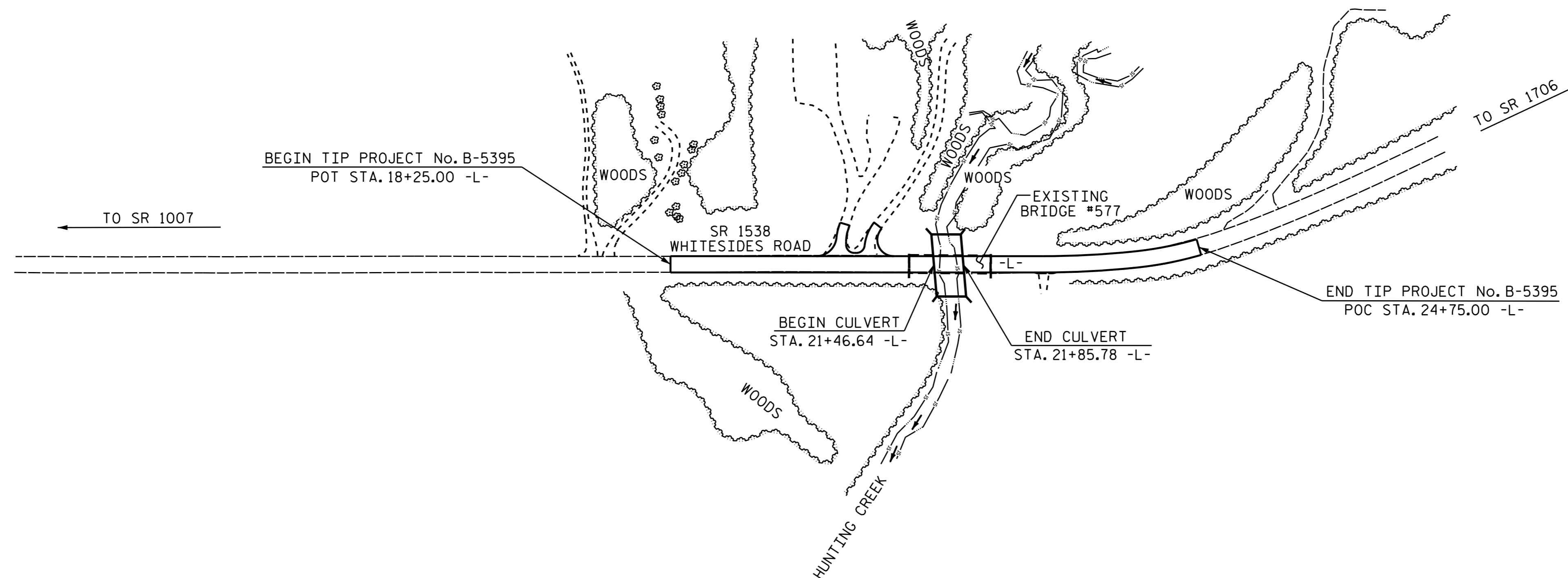
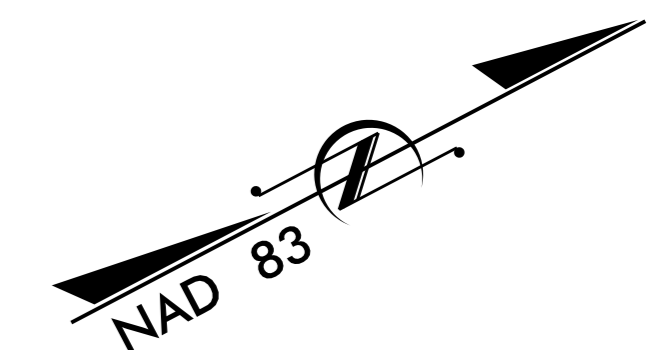
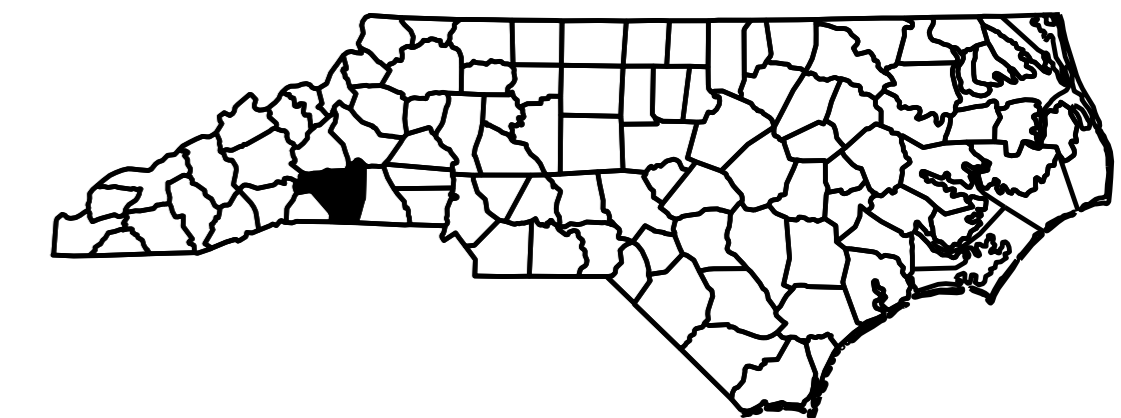


STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
RUTHERFORD COUNTY

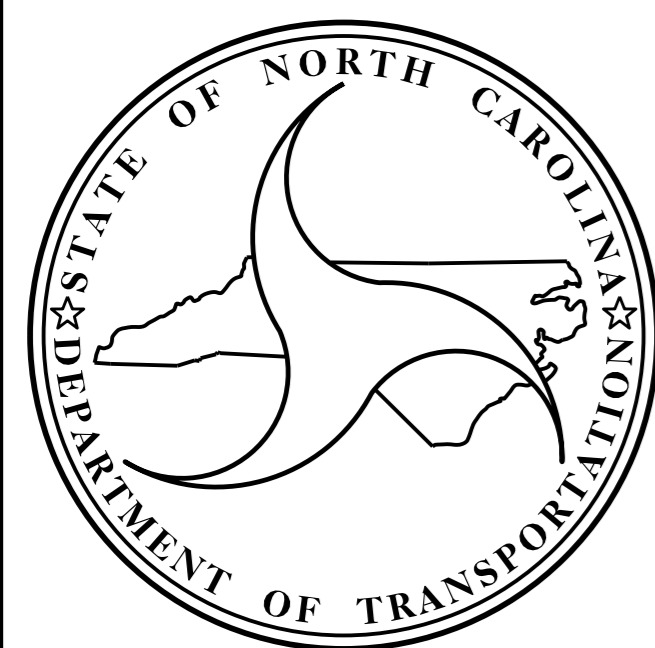
LOCATION: REPLACEMENT OF BRIDGE No. 577 OVER HUNTING CREEK ON SR 1538 (WHITESIDES ROAD)

TYPE OF WORK: GRADING, PAVING, DRAINAGE, AND CULVERT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5395		
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
46110.1.1	BRSTP-1538(8)	P.E.	
46110.2.FD1	BRSTP-1538(8)	RW, UTILITIES	
46110.3.2	BRSTP-1538(8)	CONSTRUCTION	



CULVERT



DESIGN DATA

ADT 2016 = 1040
 ADT 2036 = 1170
 K = 11 %
 D = 70%
 T = 8 % *
 V = 50 MPH
 * TTST = 3% DUAL = 5%
 FUNC CLASS = LOCAL
 SUBREGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY OF F.A. PROJECT B-5395 = 0.116 MILES
 LENGTH STRUCTURE OF F.A. PROJECT B-5395 = 0.007 MILES
 TOTAL LENGTH OF STATE PROJECT B-5395 = 0.123 MILES

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

2012 STANDARD SPECIFICATIONS

LETTING DATE : JANUARY 19, 2016

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

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

B. M. #1: RR SPIKE IN BASE OF 20" Ø SYCAMORE TREE, STA. 22+62.32 -L-, 30.08 FT. RIGHT, EL. 940.87, N 623474 E 1150906

F. A. PROJECT No.: BRSTP-1538 (8)

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
 DESIGN FILL ----- 8.91 FT. (MIN.), 10.06 FT. (MAX.)
 FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTE SHEET.
 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.

FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
 FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
 FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.

THE EXISTING STRUCTURE CONSISTING OF 3 SPANS, 1 @ 35'-6", 1 @ 29'-6" AND 1 @ 35'-6", STEEL PLANK FLOOR ON 10 LINES OF 21" I-BEAMS @ 2'-7" CTS., WITH A CLEAR ROADWAY WIDTH OF 24.3 FT. ON END BENTS AND INTERIOR BENTS WITH TIMBER CAPS, TIMBER PILES ENCASED IN CONCRETE AND LOCATED AT PROPOSED STRUCTURE SHALL BE REMOVED. SEE SPECIAL PROVISIONS.

FOR SALVAGE AND DELIVERY OF EXISTING 21" I-BEAMS, SEE SPECIAL PROVISIONS.

INASMUCH AS THE PAINT SYSTEM ON THE EXISTING STRUCTURAL STEEL CONTAINS LEAD, THE CONTRACTOR'S ATTENTION IS DIRECTED TO ARTICLE 107-1 OF THE STANDARD SPECIFICATIONS. ANY COSTS RESULTING FROM COMPLIANCE WITH APPLICABLE STATE OR FEDERAL REGULATIONS PERTAINING TO HANDLING OF MATERIALS CONTAINING LEAD BASED PAINT SHALL BE INCLUDED IN THE BID PRICE FOR "REMOVAL OF EXISTING STRUCTURE."

THE EXISTING BRIDGE INDICATED ON THE PLANS IS FROM THE BEST INFORMATION AVAILABLE. SINCE THIS INFORMATION IS SHOWN FOR THE CONVENIENCE OF THE CONTRACTOR, THE CONTRACTOR SHALL HAVE NO CLAIM WHATSOEVER AGAINST THE DEPARTMENT OF TRANSPORTATION FOR ANY DELAYS OR ADDITIONAL COST INCURRED BASED ON DIFFERENCES BETWEEN THE EXISTING BRIDGE SHOWN ON THE PLANS AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

REMOVAL OF THE EXISTING BRIDGE SHALL BE PERFORMED 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.

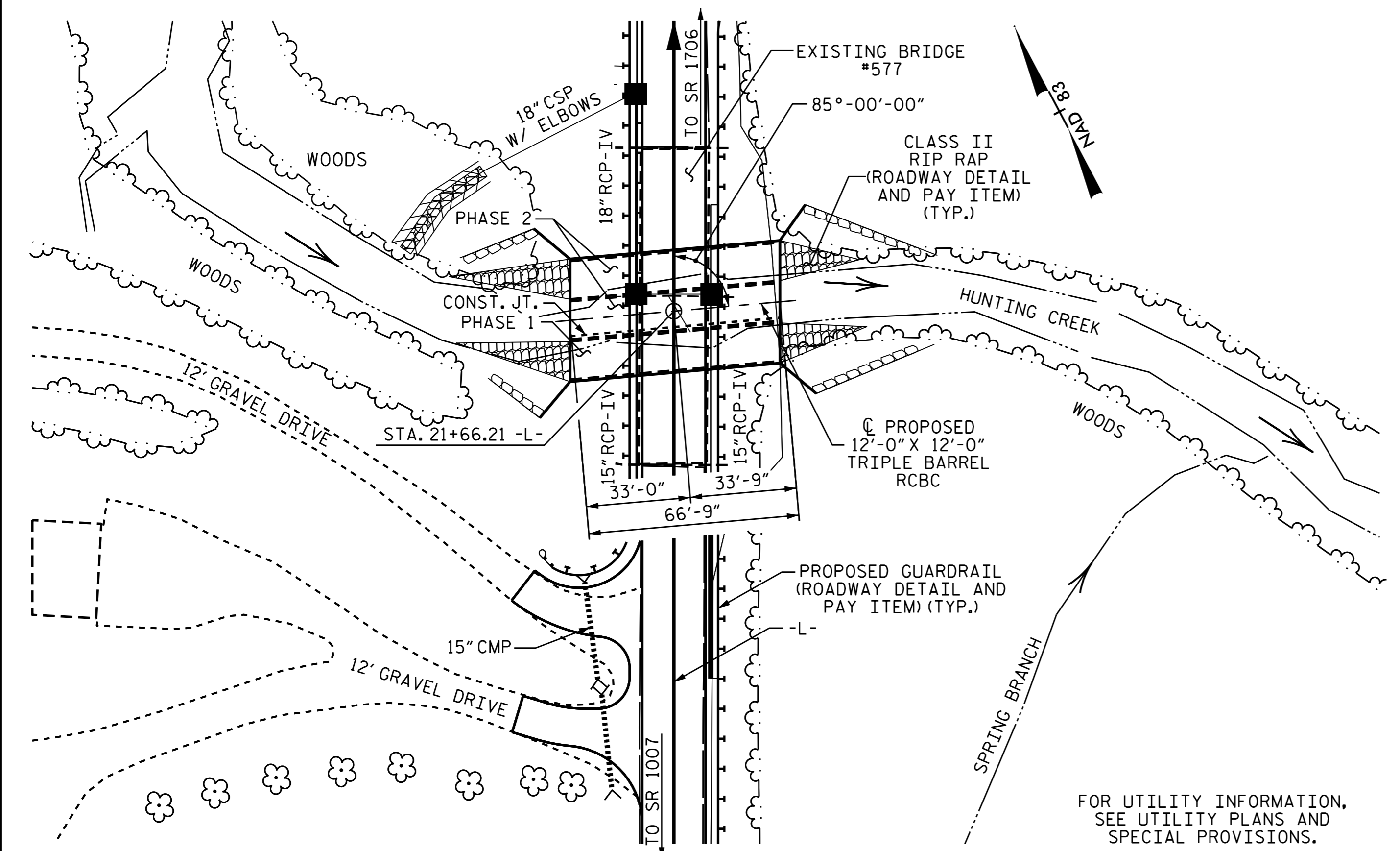
STEEL IN THE BOTTOM SLAB MAY BE SPLICED AT THE PERMITTED CONSTRUCTION JOINT AT THE CONTRACTOR'S OPTION. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES WILL BE PAID FOR BY THE CONTRACTOR.

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 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.

FOR BOX CULVERT EXCAVATION, SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.

THE REQUIRED BEARING CAPACITY AT THE BASE OF THE CULVERT IS 1 TSF. THE REQUIRED BEARING CAPACITY SHALL BE VERIFIED.



LOCATION SKETCH

CONCRETE IN PHASE 1 CULVERT TO BE POURED IN THE FOLLOWING ORDER:

1. PHASE 1 WING FOOTINGS, FLOOR SLAB AND CURTAIN WALL TO THE CONSTRUCTION JOINT INCLUDING 4" OF PHASE 1 VERTICAL WALLS.
2. THE REMAINING PORTION OF PHASE 1 WALLS AND PHASE 1 WINGS FULL HEIGHT.

CONCRETE IN PHASE 2 CULVERT TO BE POURED IN THE FOLLOWING ORDER:

1. PHASE 2 WING FOOTINGS, FLOOR SLAB AND CURTAIN WALL TO THE CONSTRUCTION JOINT INCLUDING 4" OF PHASE 2 VERTICAL WALLS.
2. THE REMAINING PORTION OF PHASE 2 WALLS AND PHASE 2 WINGS FULL HEIGHT.
3. SILLS AND BAFFLES.
4. ROOF SLAB AND HEADWALLS.

THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.

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

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.

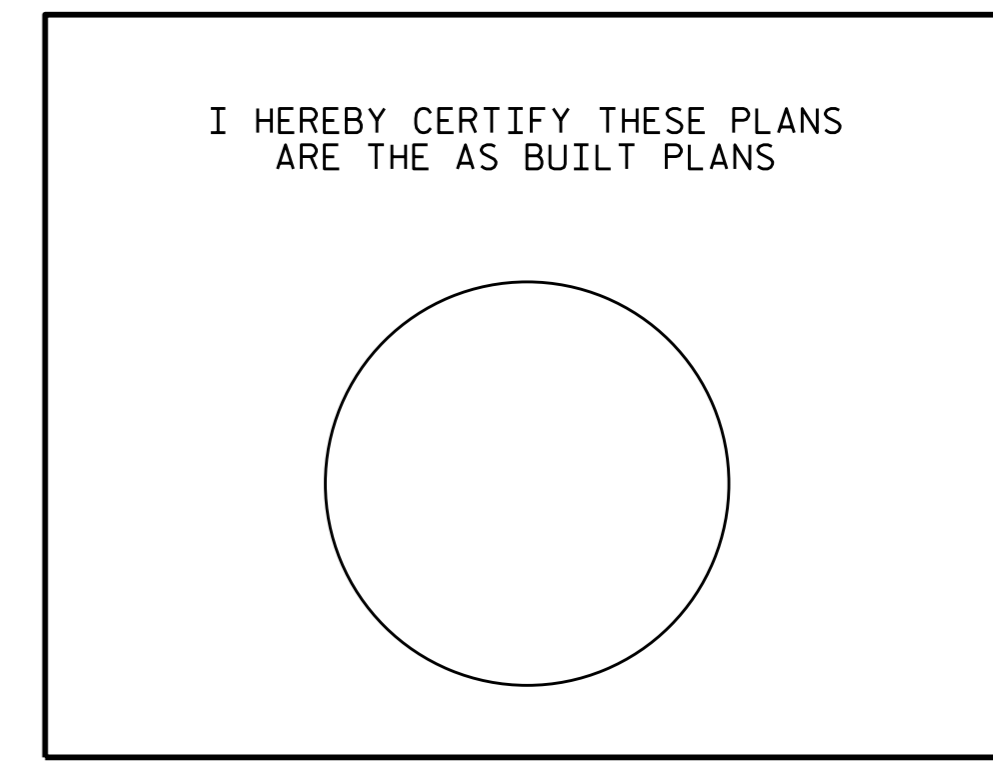
FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

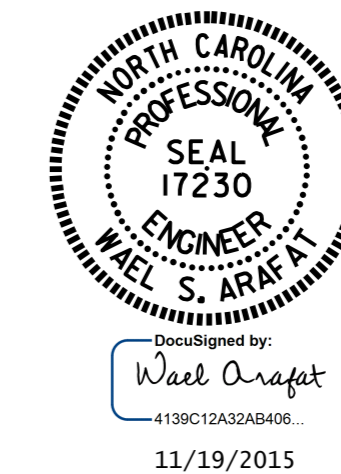
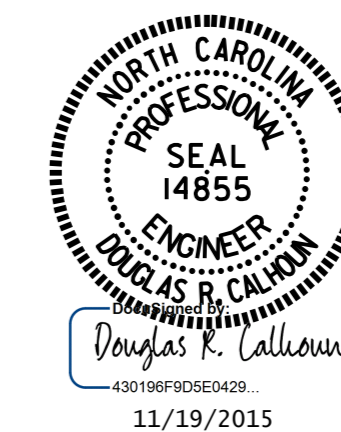
FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

I HEREBY CERTIFY THESE PLANS ARE THE AS BUILT PLANS



PROJECT NO. B-5395
RUTHERFORD COUNTY
 STATION: 21+66.21 -L-

SHEET 1 OF 7 REPLACES BRIDGE #577



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 TRIPLE 12 FT. X 12 FT.
 CONCRETE BOX CULVERT
 85°-00'-00" SKEW

ROADWAY DATA

GRADE POINT EL. @ STA. 21+66.21 -L- = 939.23
 BED EL. @ STA. 21+66.21 -L- = 917.90
 ROADWAY SLOPES = 2:1

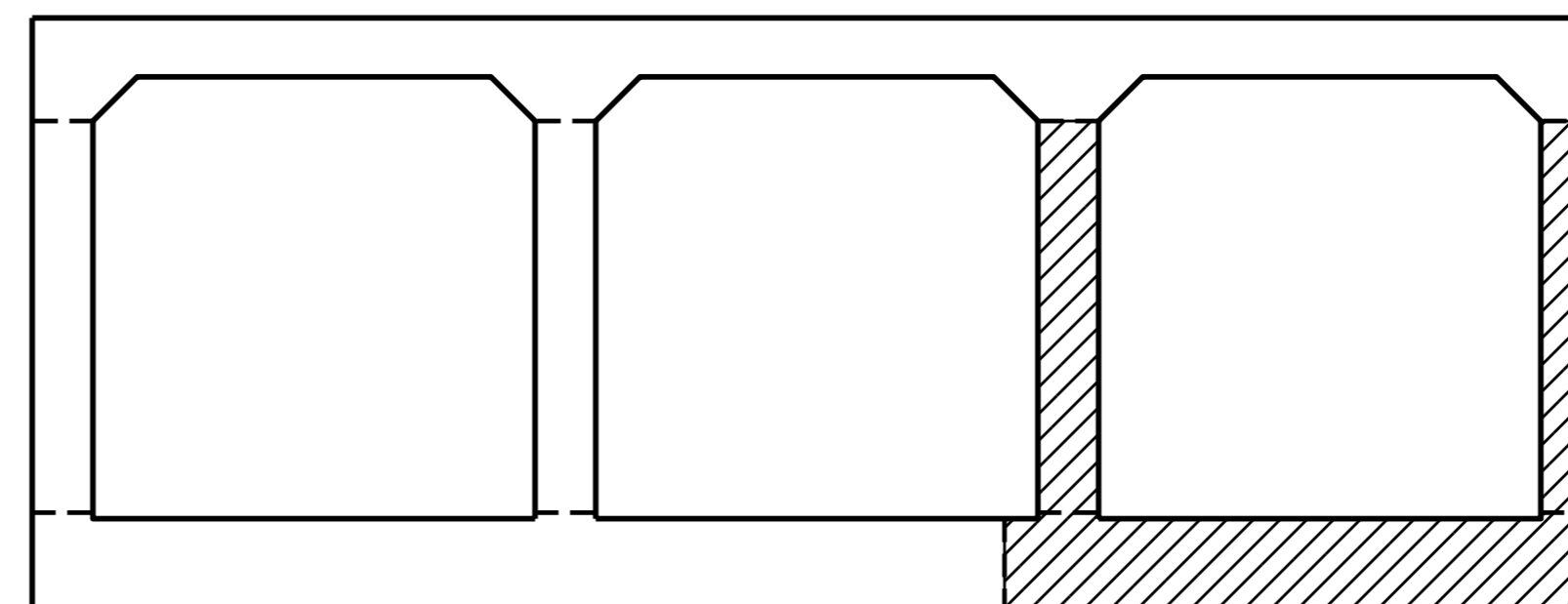
HYDRAULIC DATA

DESIGN DISCHARGE = 1200 C.F.S.
 FREQUENCY OF DESIGN FLOOD = 25 YEARS
 DESIGN HIGH WATER ELEVATION = 927.00
 DRAINAGE AREA = 3.65 SQ. MI.
 BASE DISCHARGE (Q100) = 2000 C.F.S.
 BASE HIGH WATER ELEVATION = 928.84

OVERTOPPING FLOOD DATA

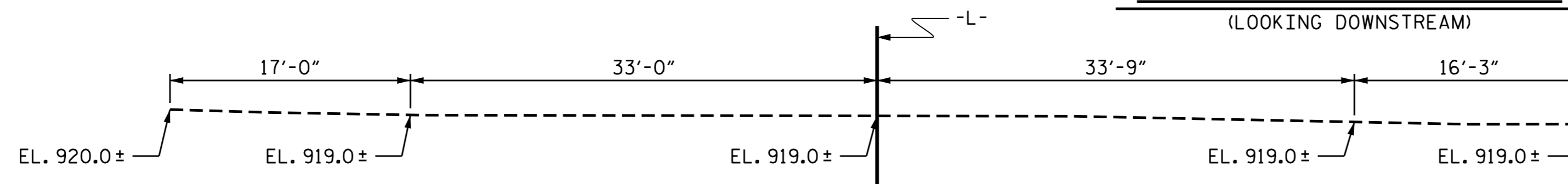
OVERTOPPING DISCHARGE = 6300 C.F.S.
 FREQUENCY OF OVERTOPPING FLOOD = 500+ YEARS
 OVERTOPPING FLOOD ELEVATION = 939.30

TOTAL STRUCTURE QUANTITIES	
CLASS A CONCRETE	
PHASE 1	117.1 C.Y.
PHASE 2	266.9 C.Y.
TOTAL	384.0 C.Y.
REINFORCING STEEL	
PHASE 1	13843 LBS.
PHASE 2	26538 LBS.
TOTAL	40381 LBS.
REMOVAL OF EXISTING STRUCTURE	LUMP SUM
CULVERT EXCAVATION	LUMP SUM
FOUNDATION COND. MAT'L.	
PHASE 1	87 TONS
PHASE 2	115 TONS
TOTAL	202 TONS



PHASING SEQUENCE

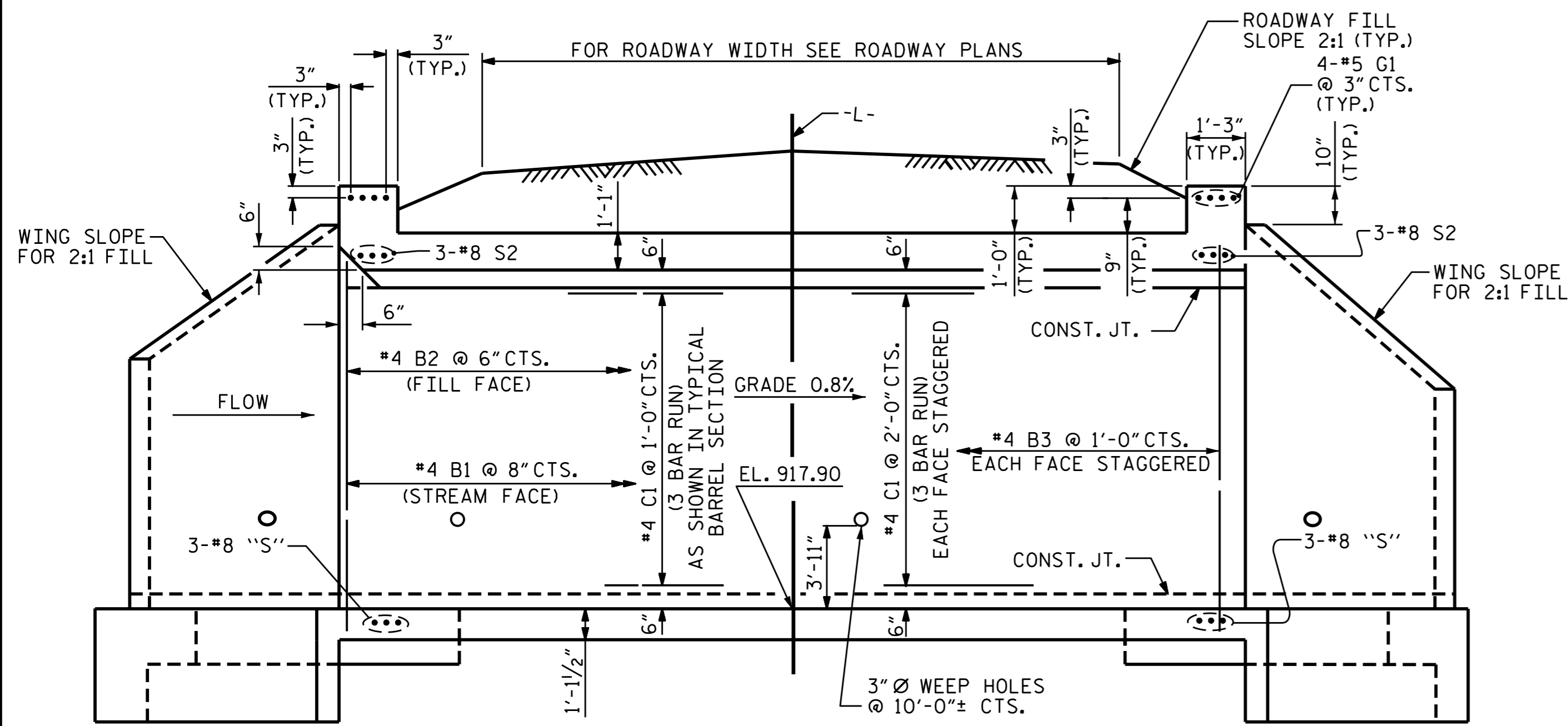
(LOOKING DOWNSTREAM)



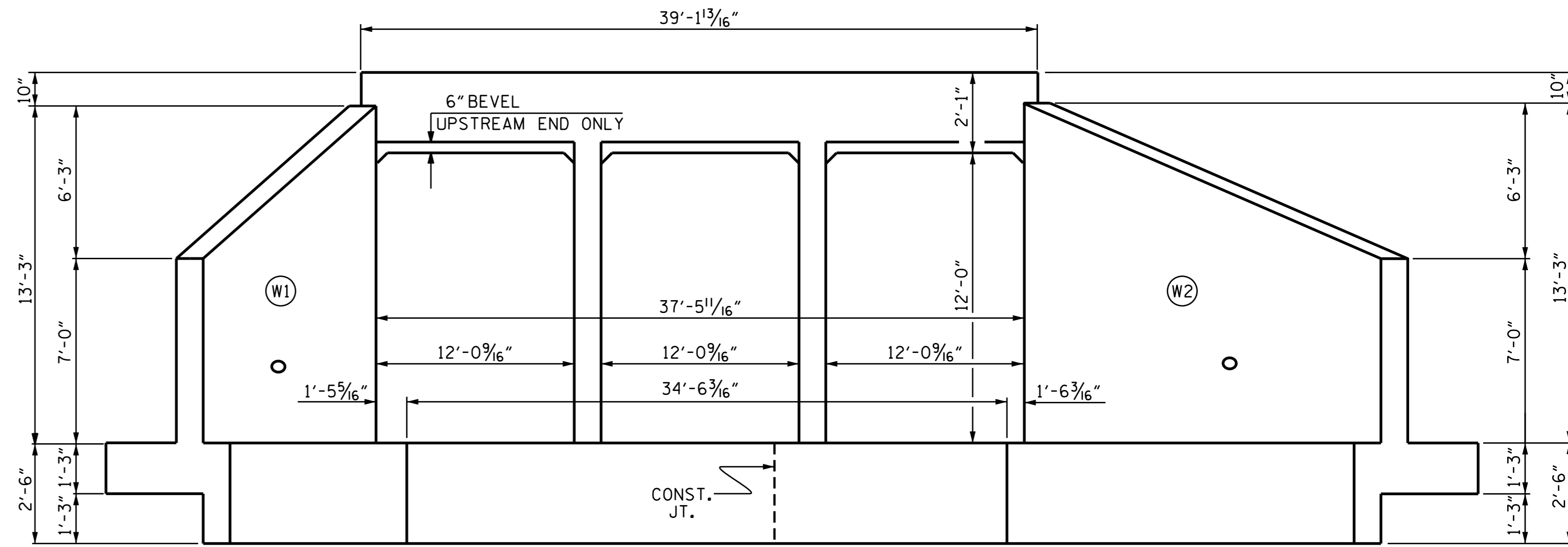
PROFILE ALONG CULVERT

DRAWN BY: H. T. BARBOUR DATE: 6-10-15
 CHECKED BY: V. X. NGUYEN DATE: 7-15
 DESIGN ENGINEER OF RECORD: J. P. McCARTHA DATE: 8-13-15

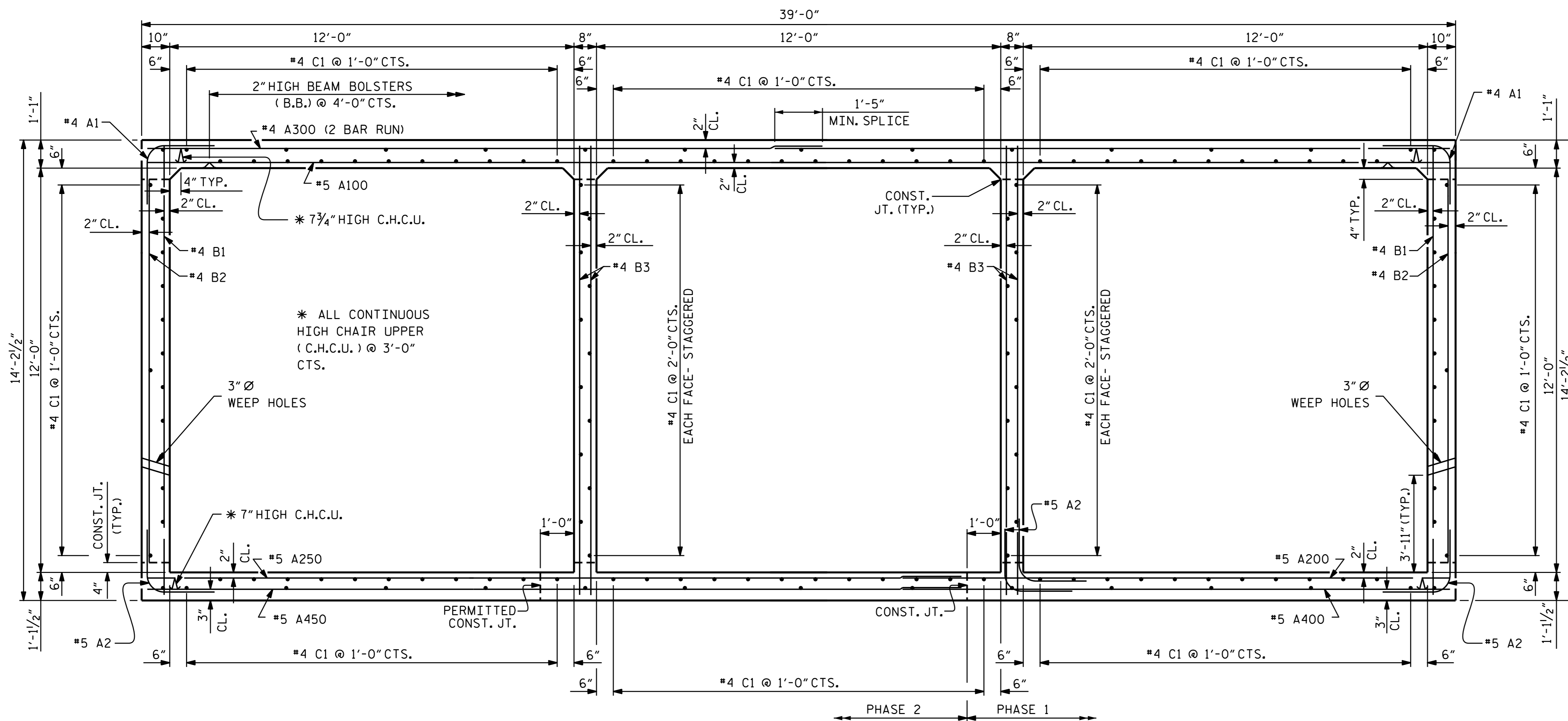
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-1
1			3			TOTAL SHEETS
2			4			7



EXTERIOR WALL INTERIOR WALL
CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION NORMAL TO SKEW
 (LOOKING DOWNSTREAM)



RIGHT ANGLE SECTION OF BARREL

(LOOKING DOWNSTREAM)
 THERE ARE 148 "C" BARS IN SECTION OF BARREL.

I HEREBY CERTIFY THESE PLANS
 ARE THE AS BUILT PLANS

PROJECT NO. B-5395
RUTHERFORD COUNTY
 STATION: 21+66.21 -L-
 SHEET 2 OF 7



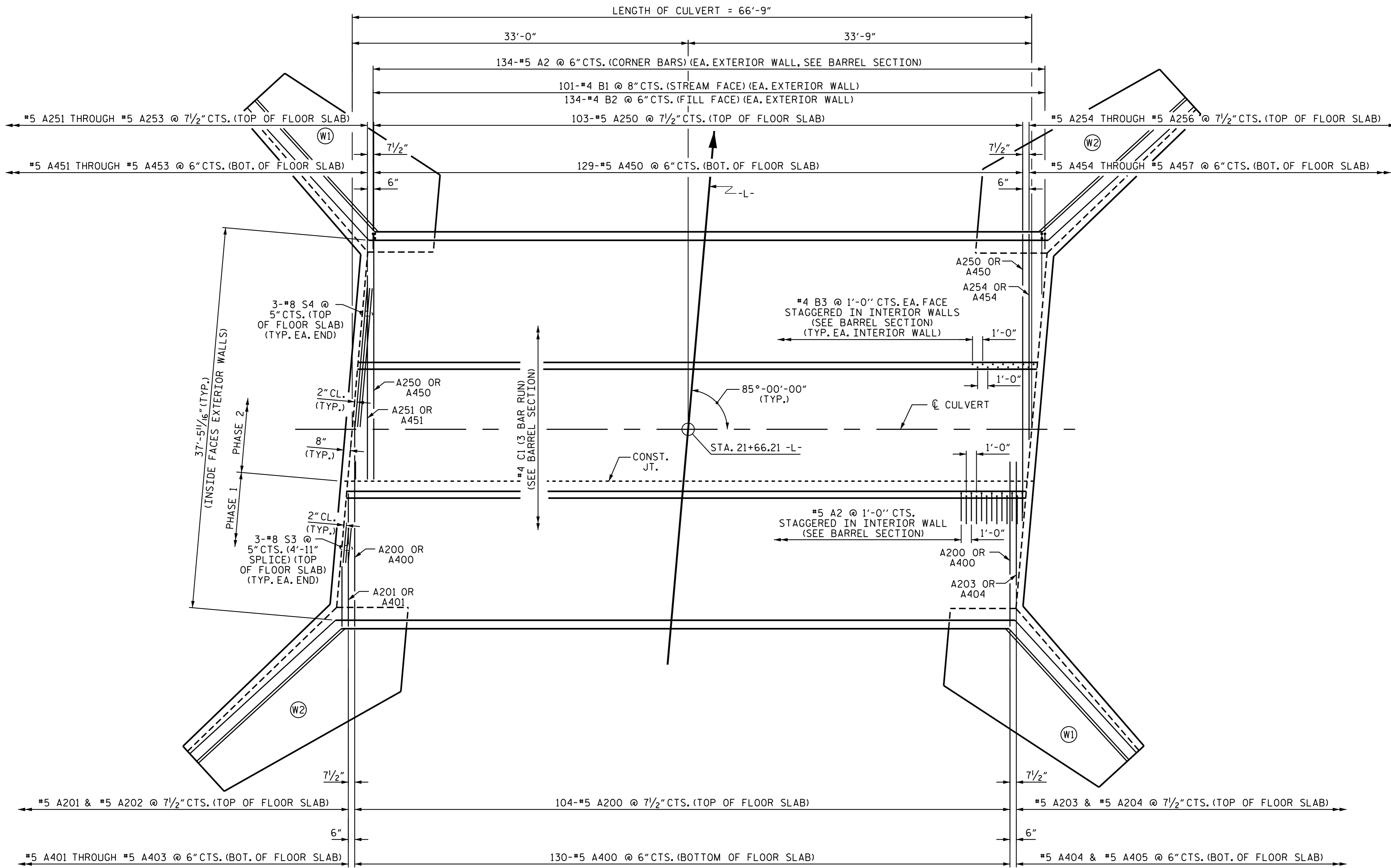
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**TRIPLE 12 FT. X 12 FT.
 CONCRETE BOX CULVERT
 85°-00'-00" SKEW**

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

C-2
 TOTAL SHEETS 7

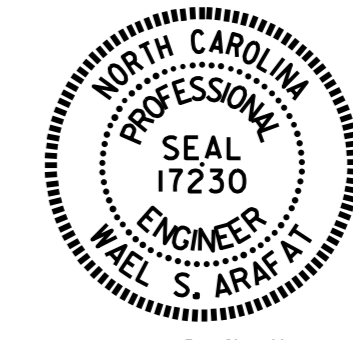
DRAWN BY: H. T. BARBOUR DATE: 6-10-15
 CHECKED BY: V. X. NGUYEN DATE: 7-15
 DESIGN ENGINEER OF RECORD: J. P. McCARTHA DATE: 8-14-15



PLAN OF FLOOR SLAB

PROJECT NO. B-5395
RUTHERFORD COUNTY
 STATION: 21+66.21 -L-

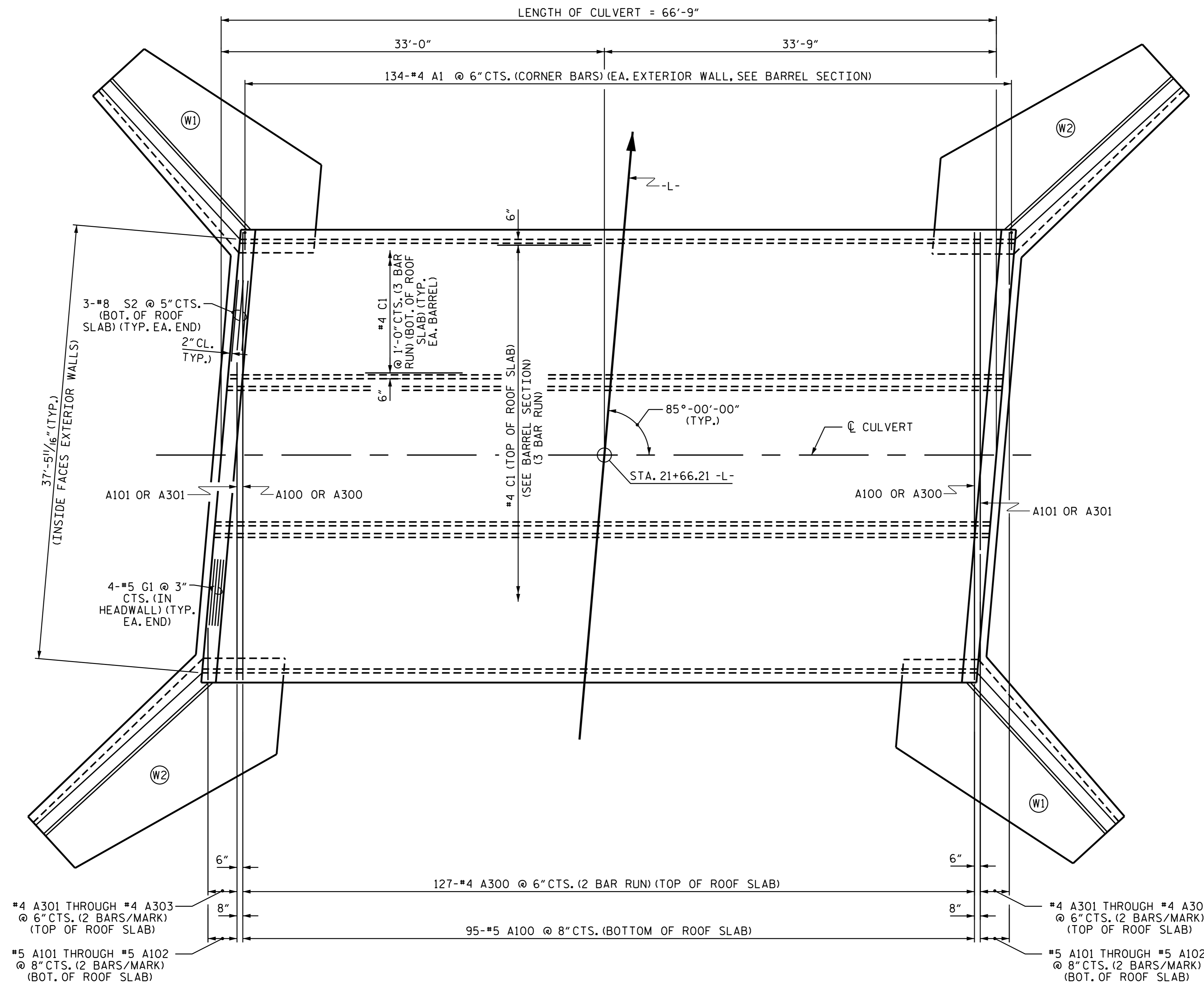
SHEET 3 OF 7



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 TRIPLE 12 FT. X 12 FT.
 CONCRETE BOX CULVERT
 85°-00'-00" SKEW
 (PHASE 1 &
 PART PHASE 2)

DRAWN BY: H. T. BARBOUR DATE: 6-12-15
 CHECKED BY: V. X. NGUYEN DATE: 7-15
 DESIGN ENGINEER OF RECORD: J. P. McCARTHA DATE: 8-18-15

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



PLAN OF ROOF SLAB

PROJECT NO. B-5395
RUTHERFORD COUNTY
 STATION: 21+66.21 -L-

SHEET 4 OF 7

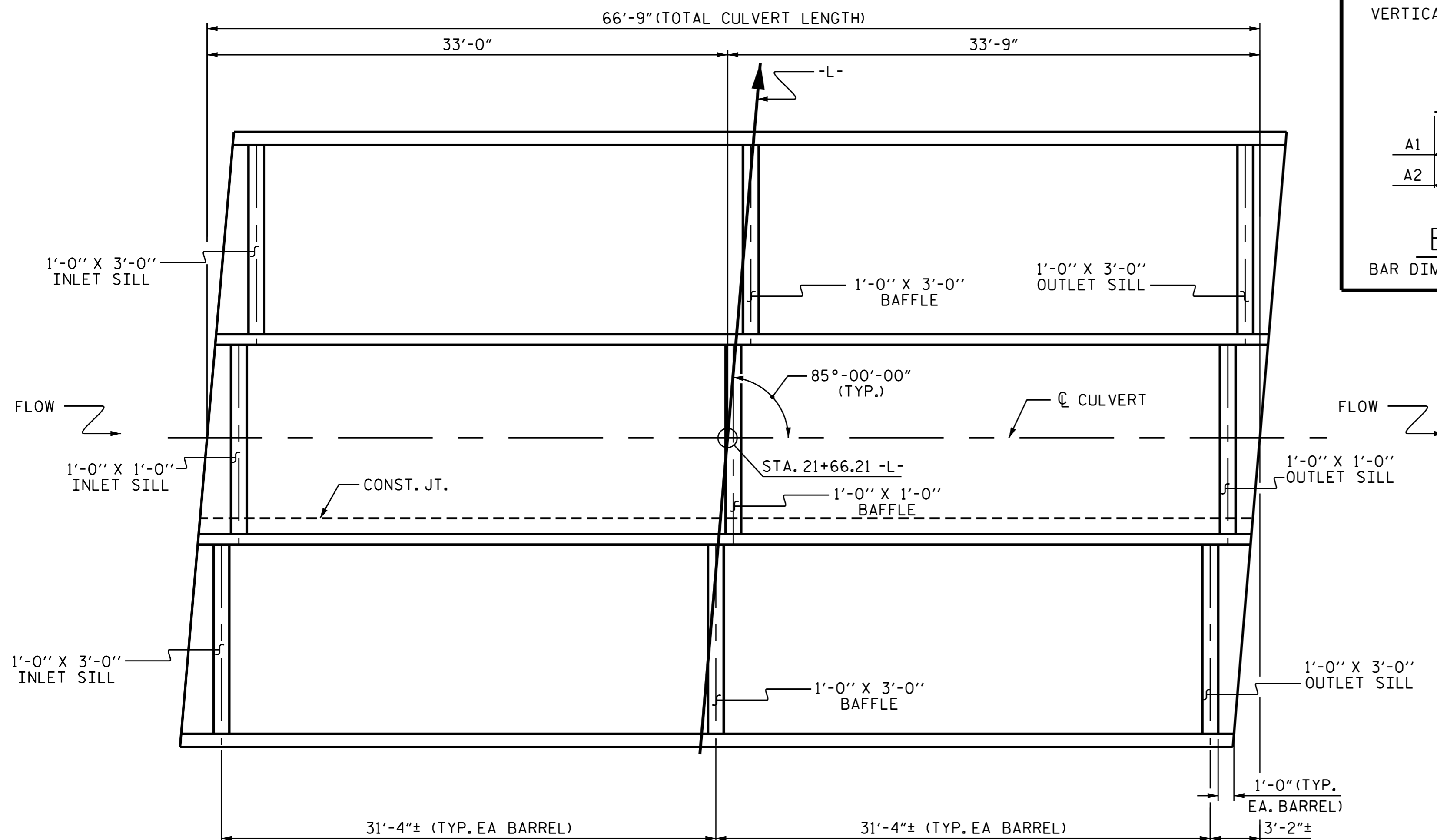


Designed by:
 Wael Arafat
 11/19/2015

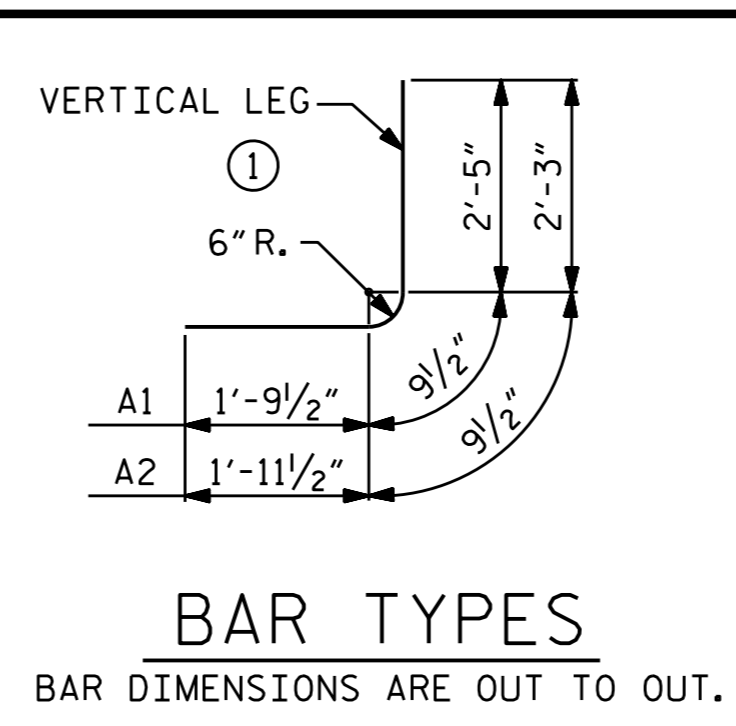
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 TRIPLE 12 FT. X 12 FT.
 CONCRETE BOX CULVERT
 85°-00'-00" SKEW
 (PART PHASE 2)

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

DRAWN BY : H. T. BARBOUR DATE : 6-12-15
 CHECKED BY : V. X. NGUYEN DATE : 7-15
 DESIGN ENGINEER OF RECORD: J. P. McCARTHA DATE : 8-18-15



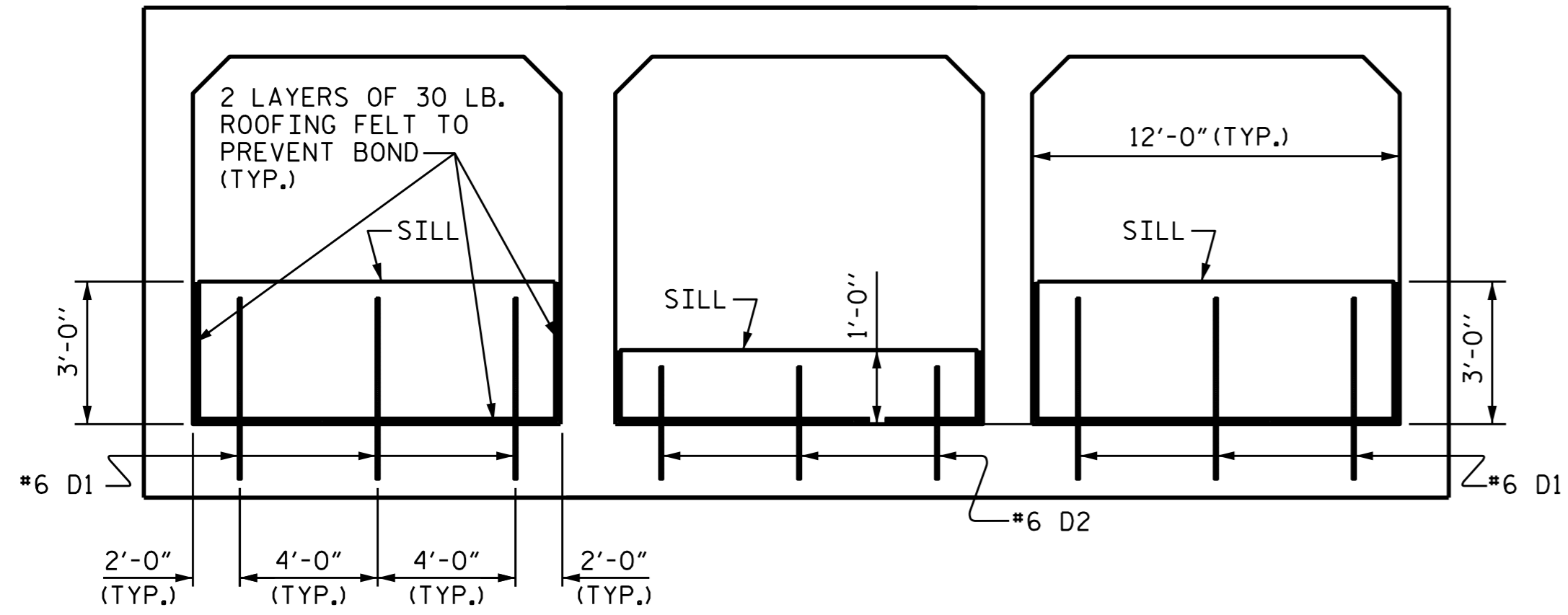
PLAN VIEW SHOWING SILL/BAFFLE LOCATIONS



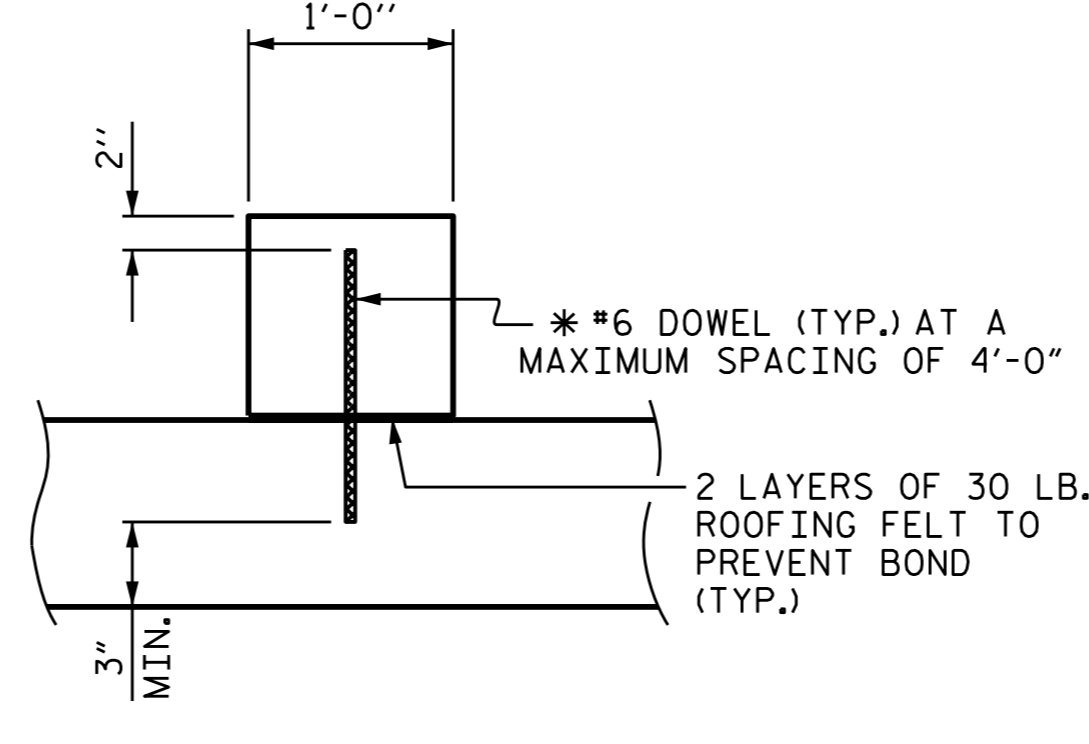
BAR TYPES

BAR DIMENSIONS ARE OUT TO OUT.

REINFORCING BAR SCHEDULE PHASE 1						REINFORCING BAR SCHEDULE PHASE 2					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	134	#4	1	5'-0"	448	A1	134	#4	1	5'-0"	448
A2	268	#5	1	5'-0"	1398	A2	134	#5	1	5'-0"	699
A200	104	#5	STR.	16'-3"	1763	A100	95	#5	STR.	38'-7"	3823
A201	1	#5	STR.	13'-1"	14	A101	4	#5	STR.	25'-5"	106
A202	1	#5	STR.	5'-11"	6	A102	4	#5	STR.	10'-2"	42
A203	1	#5	STR.	12'-2"	13						
A204	1	#5	STR.	5'-1"	5	A250	103	#5	STR.	24'-1"	2587
						A251	1	#5	STR.	20'-0"	21
A400	130	#5	STR.	16'-3"	2203	A252	1	#5	STR.	12'-11"	13
A401	1	#5	STR.	15'-11"	17	A253	1	#5	STR.	5'-9"	6
A402	1	#5	STR.	10'-2"	11	A254	1	#5	STR.	20'-2"	21
A403	1	#5	STR.	4'-6"	5	A255	1	#5	STR.	13'-1"	14
A404	1	#5	STR.	10'-9"	11	A256	1	#5	STR.	5'-11"	6
A405	1	#5	STR.	5'-1"	5						
						A300	254	#4	STR.	20'-0"	3393
B1	101	#4	STR.	13'-8"	922	A301	4	#4	STR.	27'-4"	73
B2	134	#4	STR.	11'-4"	1014	A302	4	#4	STR.	15'-11"	43
B3	134	#4	STR.	13'-8"	1223	A303	4	#4	STR.	4'-6"	12
C1	129	#4	STR.	23'-5"	2018	A450	129	#5	STR.	24'-1"	3240
						A451	1	#5	STR.	18'-7"	19
D1	9	#6	STR.	3'-8"	50	A452	1	#5	STR.	12'-10"	13
						A453	1	#5	STR.	7'-1"	7
S3	6	#8	STR.	19'-6"	312	A454	1	#5	STR.	21'-8"	23
						A455	1	#5	STR.	15'-11"	17
						A456	1	#5	STR.	10'-2"	11
						A457	1	#5	STR.	4'-6"	5
PHASE 1 REINFORCING STEEL 11438 LBS.						PHASE 2 REINFORCING STEEL 24133 LBS.					
PHASE 1 STRUCTURE QUANTITIES						PHASE 2 STRUCTURE QUANTITIES					
CLASS A CONCRETE						CLASS A CONCRETE					
BARREL _____ 83.6 C.Y.						BARREL _____ 219.2 C.Y.					
WINGS ETC. _____ 33.5 C.Y.						WINGS ETC. _____ 47.7 C.Y.					
TOTAL _____ 117.1 C.Y.						TOTAL _____ 266.9 C.Y.					
REINFORCING STEEL						REINFORCING STEEL					
BARREL _____ 11438 LBS.						BARREL _____ 24133 LBS.					
WINGS ETC. _____ 2405 LBS.						WINGS ETC. _____ 2405 LBS.					
TOTAL _____ 13843 LBS.						TOTAL _____ 26538 LBS.					
CULVERT EXCAVATION LUMP SUM						CULVERT EXCAVATION LUMP SUM					
FOUNDATION COND. MAT'L. 87 TONS						FOUNDATION COND. MAT'L. 115 TONS					



ELEVATION



SECTION THROUGH SILL

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

CULVERT SILL DETAILS

(BAFFLES SIMILAR)

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.

THE STOCKPILED MATERIAL SHALL BE PLACED TO PROVIDE A 1 FOOT DEPTH LOW FLOW CHANNEL, AND SHALL BE PLACED TO THE LEVEL OF 3' BETWEEN THE HIGH FLOW SILLS/BAFFLES.

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

BED MATERIAL SHALL BE SUPPLEMENTED BY CLASS B RIP RAP AS NECESSARY IN THE LEFT AND RIGHT BARRELS ONLY.

BED MATERIAL SHALL BE PLACED ON TOP OF THE SUPPLEMENTAL FILL, IF USED, TO PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE.

THE ENTIRE COST OF WORK REQUIRED TO PLACE EXCAVATED OR SUPPLEMENTAL 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.

PHASE 2 STRUCTURE QUANTITIES

CLASS A CONCRETE	
BARREL _____	219.2 C.Y.
WINGS ETC. _____	47.7 C.Y.
TOTAL _____	266.9 C.Y.
REINFORCING STEEL	
BARREL _____	24133 LBS.
WINGS ETC. _____	2405 LBS.
TOTAL _____	26538 LBS.
CULVERT EXCAVATION	LUMP SUM
FOUNDATION COND. MAT'L.	115 TONS

SPLICE CHART

BAR	SIZE	SPLICE LENGTH
A200	5	1'-9"
A300	4	1'-5"
A400	5	1'-9"
B1	4	1'-5"
B3	4	1'-5"
C1	4	1'-11"
S3	8	4'-11"

PROJECT NO. B-5395
RUTHERFORD COUNTY
 STATION: 21+66.21 -L-

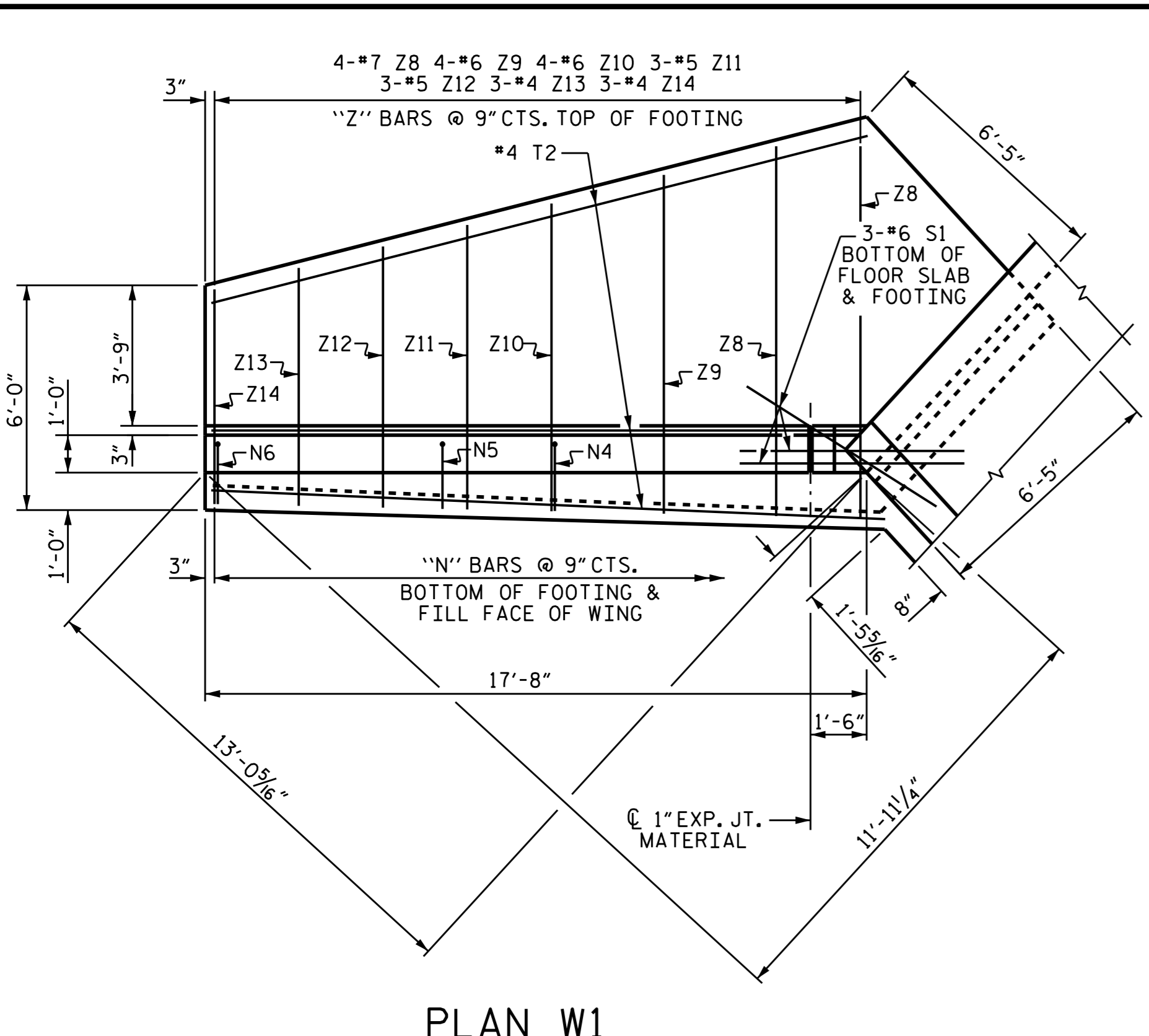
SHEET 5 OF 7



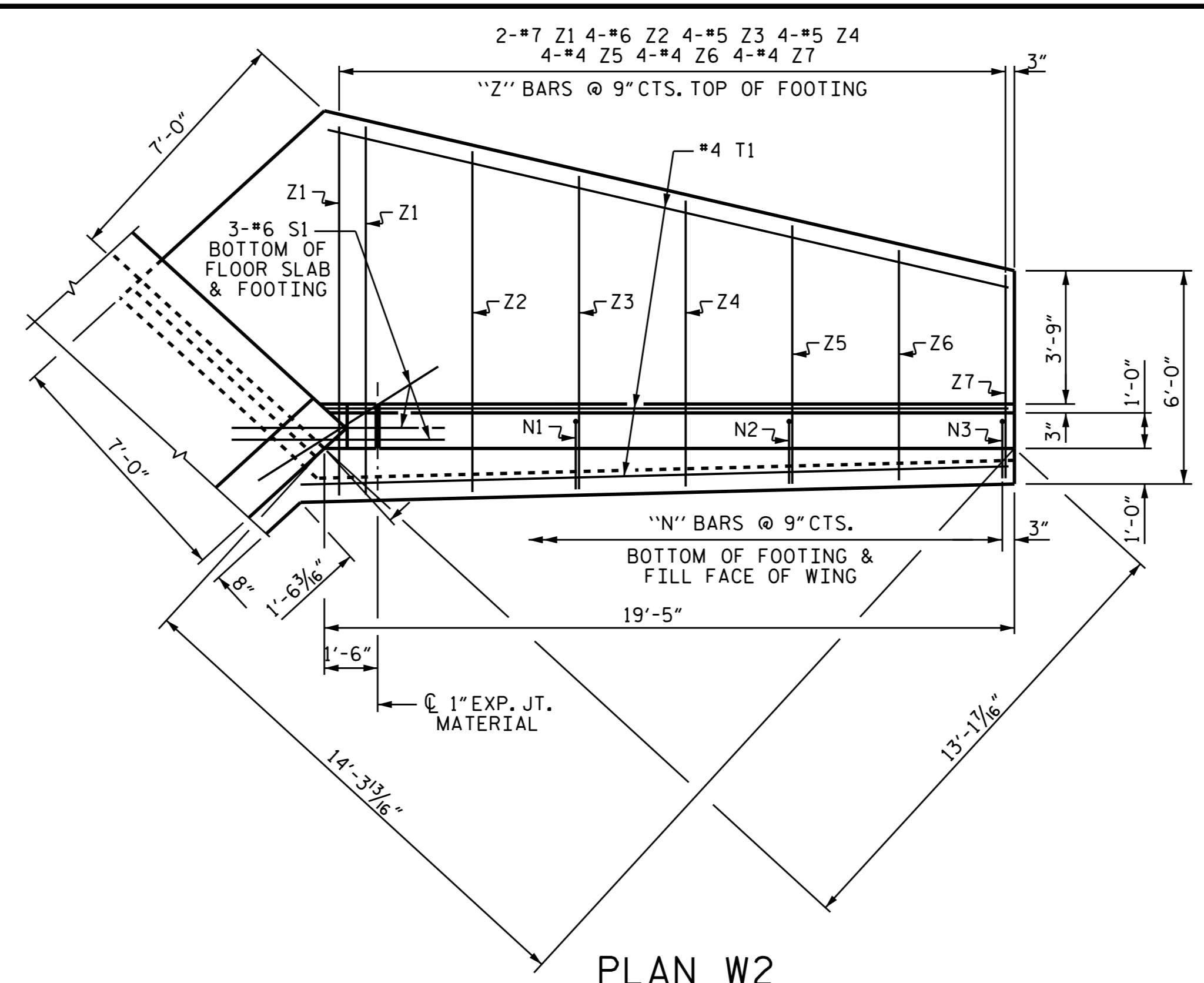
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 TRIPLE 12 FT. X 12 FT.
 CONCRETE BOX CULVERT
 85°-00'-00" SKEW

DRAWN BY: H. T. BARBOUR DATE: 6-12-15
 CHECKED BY: V. X. NGUYEN DATE: 7-15
 DESIGN ENGINEER OF RECORD: J. P. McCARTHA DATE: 8-18-15

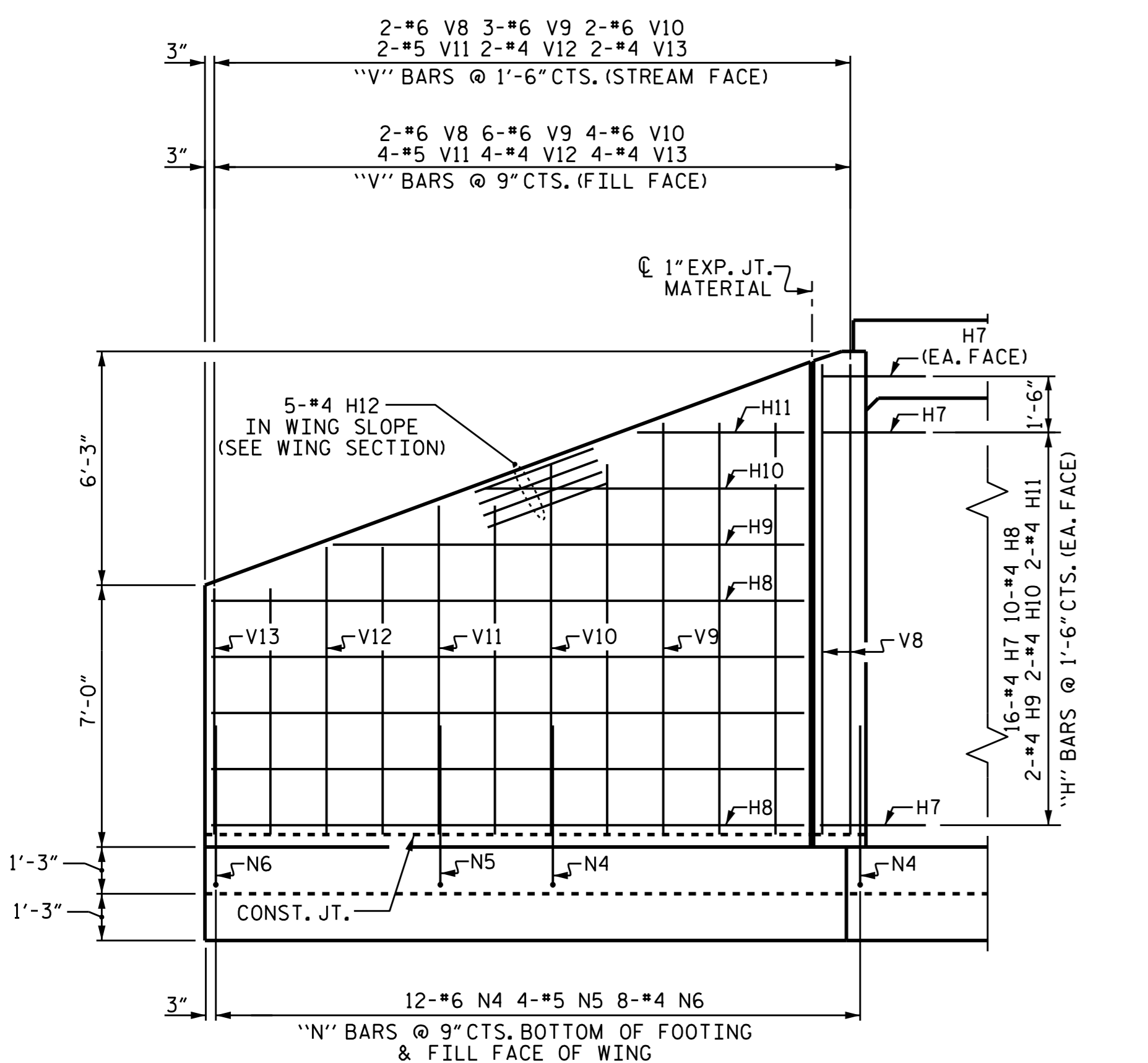
REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-5	
1			3			TOTAL SHEETS	
2			4			7	



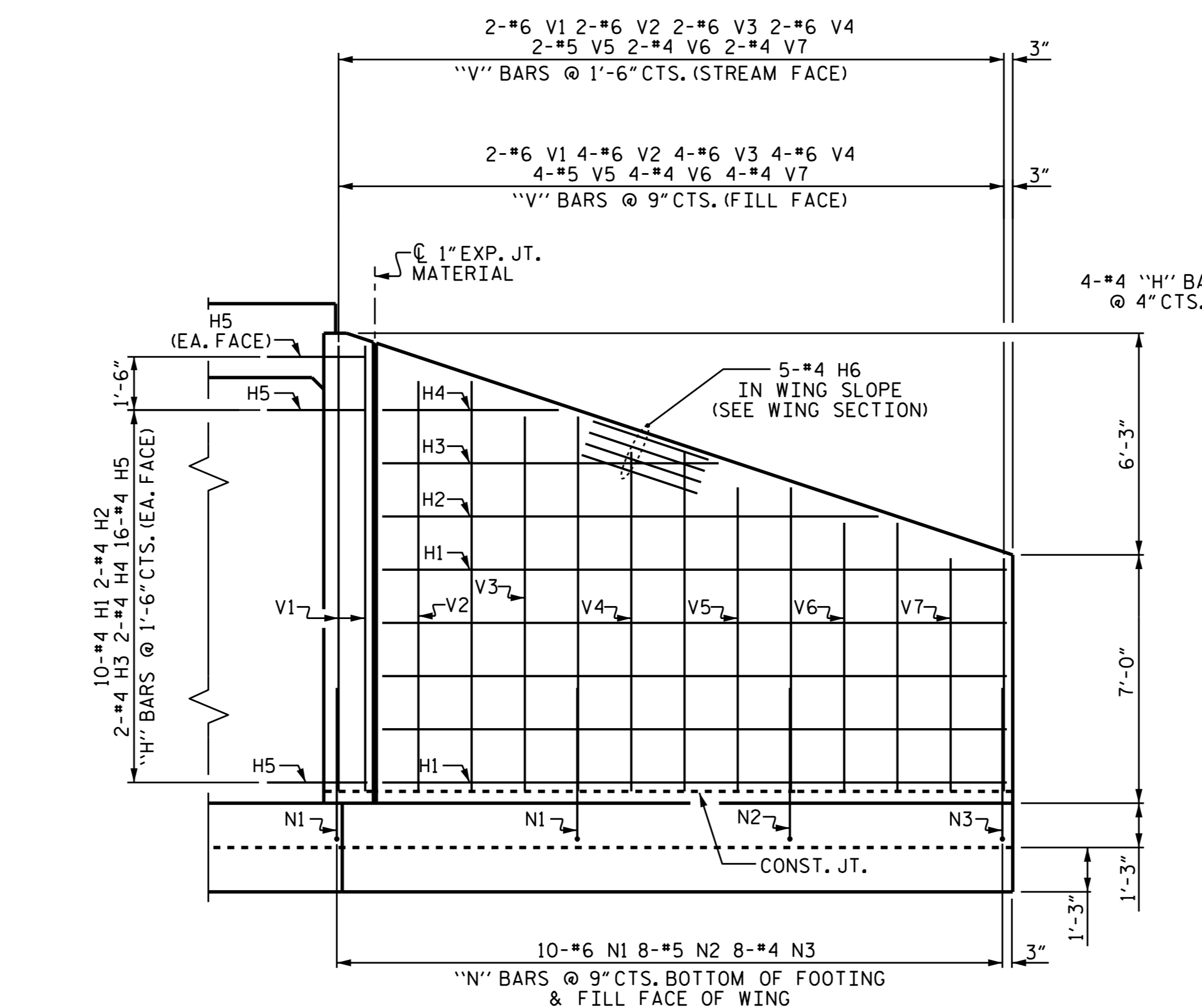
PLAN W1



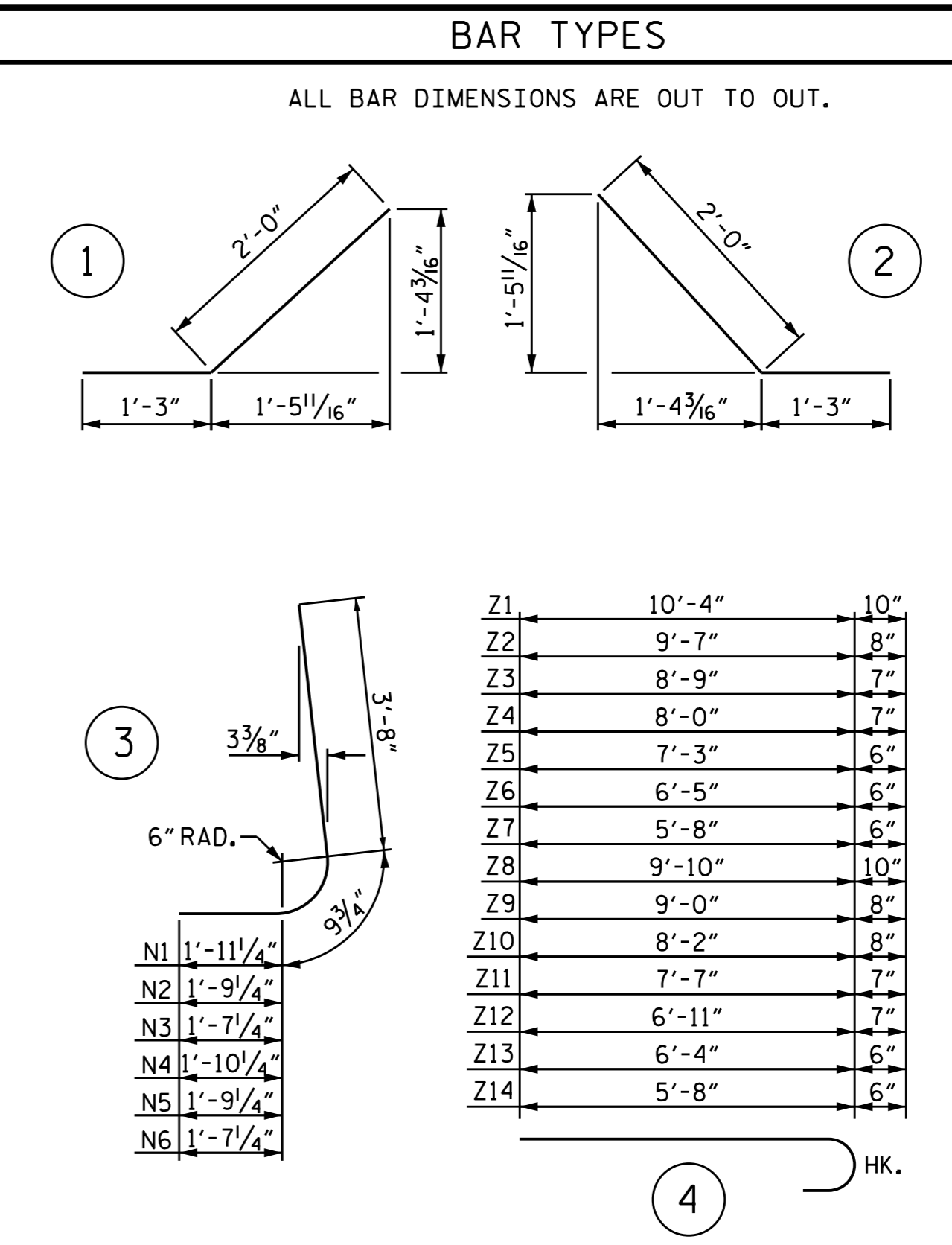
PLAN W2



ELEVATION W1

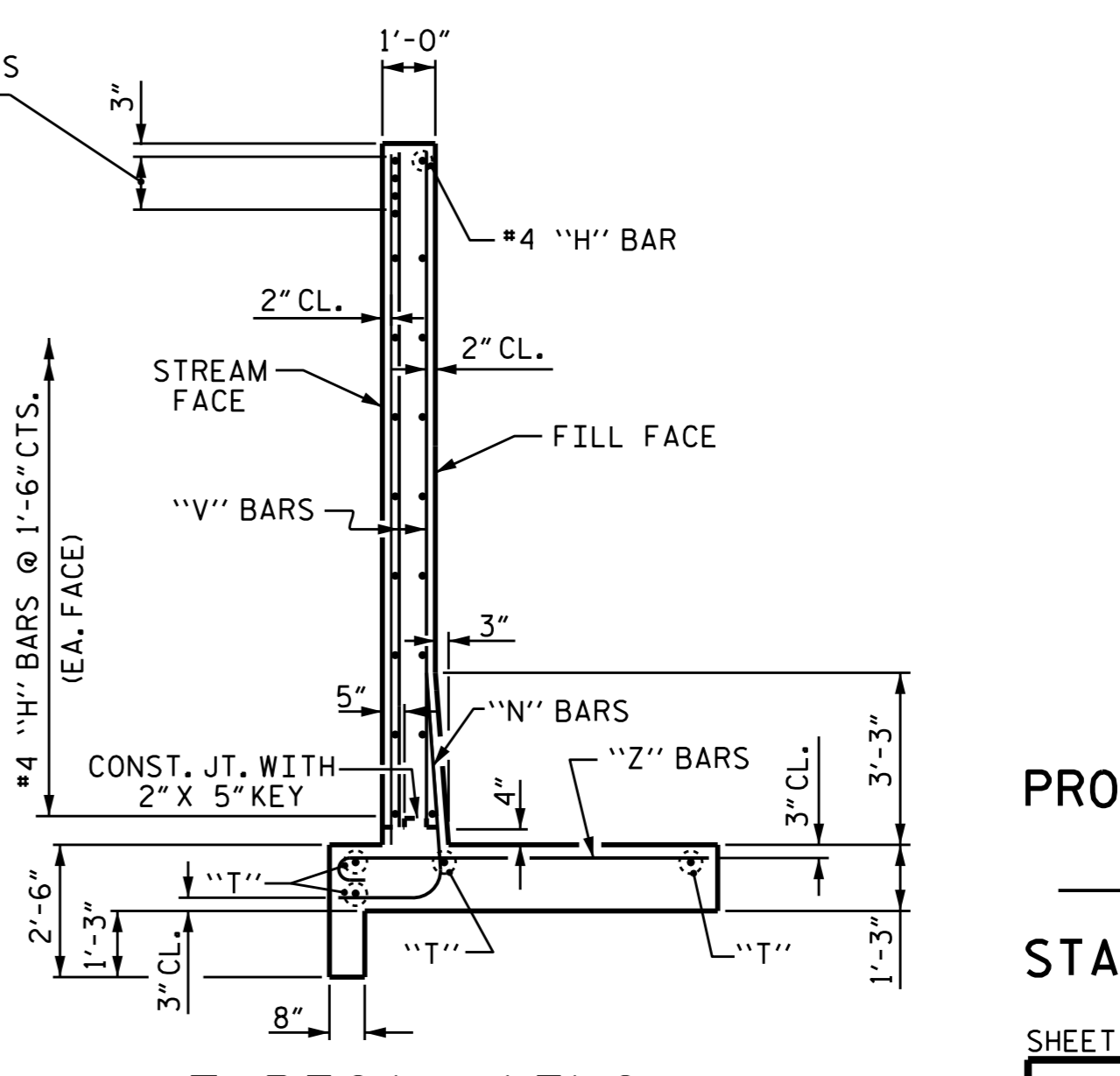


ELEVATION W2



Bar No.	Length
Z1	10'-4"
Z2	9'-7"
Z3	8'-9"
Z4	8'-0"
Z5	7'-3"
Z6	6'-5"
Z7	5'-8"
Z8	9'-10"
Z9	9'-0"
Z10	8'-2"
Z11	7'-7"
Z12	6'-11"
Z13	6'-4"
Z14	5'-8"

Phase	Item	Quantity	Unit
PHASE 1	CLASS A CONCRETE	32.0	CY
	2 WINGS	1.5	CY
	PHASE 1 TOTAL	33.5	CY
PHASE 2	CLASS A CONCRETE	32.0	CY
	2 HEADWALLS	3.6	CY
	PHASE 2 TOTAL	47.7	CY



TYPICAL WING SECTION

BAR NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	#4	STR	17'-6"	117
H2	#4	STR	13'-11"	19
H3	#4	STR	9'-5"	13
H4	#4	STR	4'-11"	7
H5	#4	1	3'-3"	39
H6	#4	STR	18'-6"	62
H7	#4	2	3'-3"	39
H8	#4	STR	15'-9"	105
H9	#4	STR	12'-7"	17
H10	#4	STR	8'-6"	11
H11	#4	STR	4'-5"	6
H12	#4	STR	16'-10"	56
N1	#6	3	6'-5"	96
N2	#5	3	6'-3"	52
N3	#4	3	6'-1"	33
N4	#6	3	6'-4"	114
N5	#5	3	6'-3"	26
N6	#4	3	6'-1"	33
S1	#6	STR	6'-0"	54
T1	#4	STR	19'-11"	53
T2	#4	STR	18'-0"	48
V1	#6	STR	12'-6"	75
V2	#6	STR	11'-6"	104
V3	#6	STR	10'-6"	95
V4	#6	STR	9'-6"	86
V5	#5	STR	8'-6"	53
V6	#4	STR	7'-6"	30
V7	#4	STR	6'-6"	26
V8	#6	STR	12'-6"	75
V9	#6	STR	11'-0"	149
V10	#6	STR	9'-10"	89
V11	#5	STR	8'-9"	55
V12	#4	STR	7'-8"	31
V13	#4	STR	6'-7"	26
Z1	#7	4	11'-2"	46
Z2	#6	4	10'-3"	62
Z3	#5	4	9'-4"	39
Z4	#5	4	8'-7"	36
Z5	#4	4	7'-9"	21
Z6	#4	4	6'-11"	18
Z7	#4	4	6'-2"	16
Z8	#7	4	10'-8"	87
Z9	#6	4	9'-8"	58
Z10	#6	4	8'-10"	53
Z11	#5	4	8'-2"	26
Z12	#5	4	7'-6"	23
Z13	#4	4	6'-10"	14
Z14	#4	4	6'-2"	12
REINFORCING STEEL FOR 2 WINGS				2405 LBS

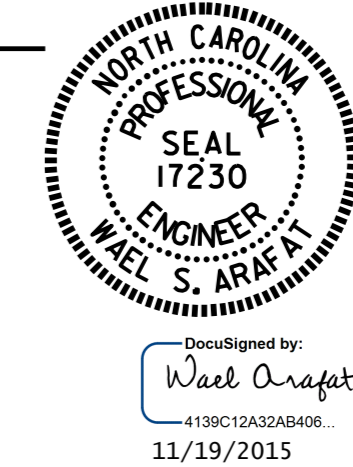
PROJECT NO. B-5395
RUTHERFORD COUNTY
 STATION: 21+66.21 -L-

SHEET 6 OF 7

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

WINGS FOR
 CONCRETE BOX CULVERT

H = 12'-0" SLOPE = 2:1
 85° SKEW



DRAWN BY: H. T. BARBOUR DATE: 6-24-15
 CHECKED BY: V. X. NGUYEN DATE: 7-15
 DESIGN ENGINEER OF RECORD: J. P. McCARTHA DATE: 8-18-15

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

SHEET NO. C-6
 TOTAL SHEETS 7

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	1.09	--	1.75	1.09	1	TOP SLAB	5.74	1.46	1	TOP SLAB	11.61		
	HL-93 (OPERATING)	N/A		1.41	--	1.35	1.41	1	TOP SLAB	5.74	1.90	1	TOP SLAB	11.61		
	HS-20 (INVENTORY)	36.000	②	1.41	50.90	1.75	1.41	1	TOP CORNER WALL	0.66	1.84	1	TOP SLAB	11.61		
	HS-20 (OPERATING)	36.000		1.83	65.98	1.35	1.83	1	TOP CORNER WALL	0.66	2.39	1	TOP SLAB	11.61		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		1.96	26.40	1.40	1.96	1	TOP CORNER WALL	0.66	2.64	1	EXTERIOR WALL	11.94	
		SNGARBS2	20.000		1.92	38.47	1.40	1.92	1	TOP CORNER WALL	0.66	2.64	1	EXTERIOR WALL	11.94	
		SNAGRIS2	22.000		1.96	43.03	1.40	1.96	1	TOP CORNER WALL	0.66	2.64	1	EXTERIOR WALL	11.94	
		SNCOTTS3	27.250	③	1.36	36.97	1.40	1.36	1	TOP SLAB	5.74	1.82	1	TOP SLAB	11.61	
		SNAGGRS4	34.925		1.41	49.30	1.40	1.41	1	TOP SLAB	5.74	1.95	1	TOP SLAB	11.61	
		SNS5A	35.550		1.38	48.90	1.40	1.38	1	TOP SLAB	5.74	1.78	1	TOP SLAB	11.61	
		SNS6A	39.950		1.38	54.95	1.40	1.38	1	TOP SLAB	5.74	1.78	1	TOP SLAB	11.61	
	SNS7B	42.000		1.40	58.90	1.40	1.40	1	TOP SLAB	5.74	1.69	1	TOP SLAB	11.61		
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		1.84	60.68	1.40	1.84	1	TOP CORNER WALL	0.66	2.55	1	TOP SLAB	11.61	
		TNT4A	33.075		1.61	53.30	1.40	1.61	1	TOP CORNER WALL	0.66	2.16	1	TOP SLAB	11.61	
		TNT6A	41.600		1.51	62.83	1.40	1.51	1	TOP SLAB	5.74	1.82	1	TOP SLAB	11.61	
		TNT7A	42.000		1.69	70.91	1.40	1.69	1	TOP SLAB	5.74	1.94	1	TOP SLAB	11.61	
		TNT7B	42.000		1.45	61.07	1.40	1.45	1	TOP SLAB	5.74	1.94	1	TOP SLAB	11.61	
		TNAGRIT4	43.000		1.54	66.09	1.40	1.54	1	TOP SLAB	5.74	1.99	1	BOTTOM SLAB	11.61	
TNAGT5A		45.000		1.57	70.74	1.40	1.57	1	TOP SLAB	5.74	1.89	1	BOTTOM SLAB	11.61		
TNAGT5B	45.000		1.61	72.51	1.40	1.61	1	TOP CORNER WALL	0.66	1.89	1	BOTTOM SLAB	11.61			

LOAD FACTORS:

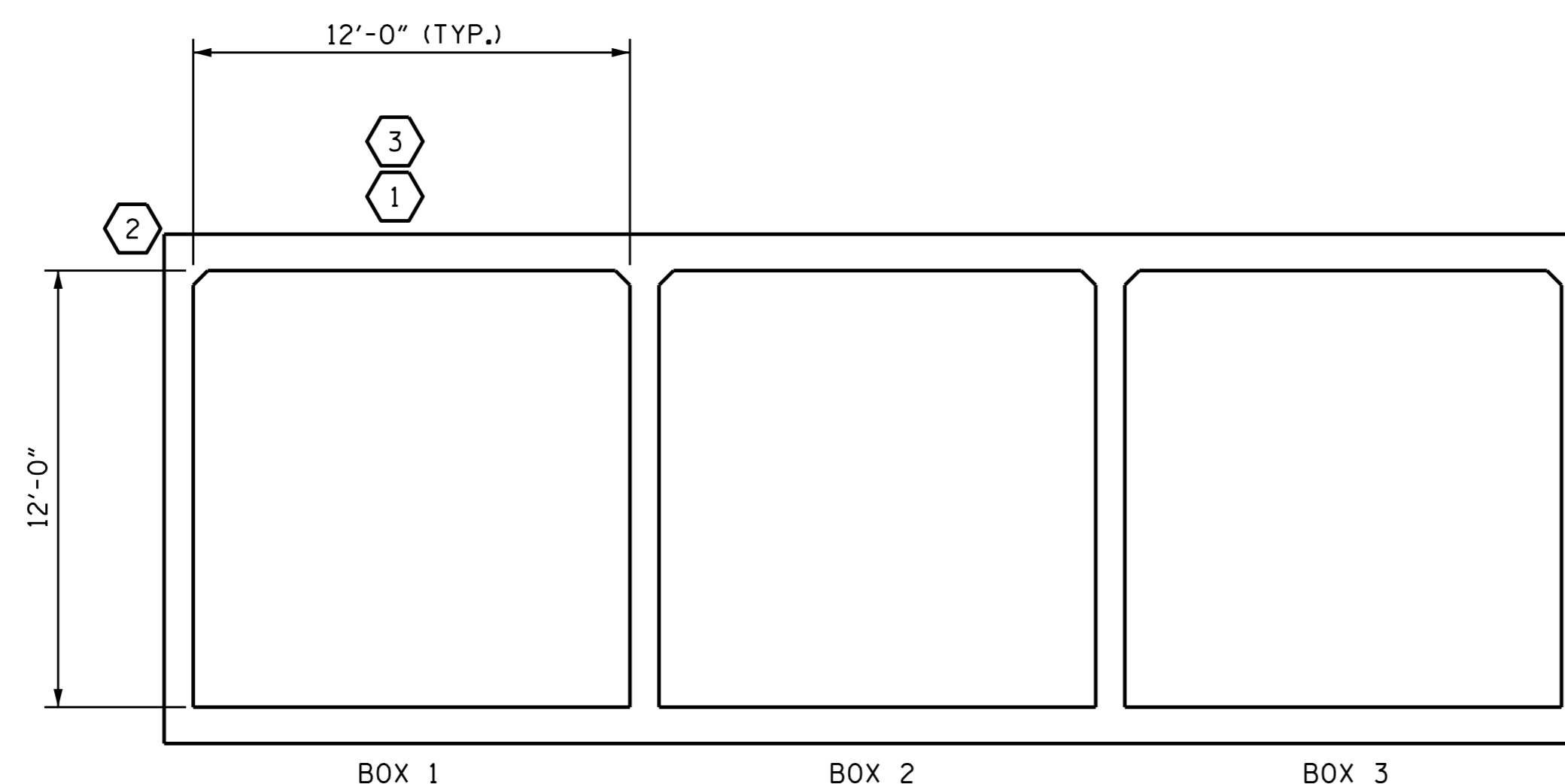
DESIGN LOAD RATING FACTORS

LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
LS	1.75	--
WA	1.00	--

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

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



LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. B-5395
RUTHERFORD COUNTY
 STATION: 21+66.21 -L-

SHEET 7 OF 7



Designed by:
 Wael Arafa
 11/19/2015

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

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

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

ASSEMBLED BY : H. T. BARBOUR	DATE : 6-25-15
CHECKED BY : V. X. NGUYEN	DATE : 7-15
DRAWN BY : WMC	7/11
CHECKED BY : CM	7/11
REV. 10/1/11	MAA/GM

STANDARD NOTES

DESIGN DATA:

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

MATERIAL AND WORKMANSHIP:

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

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

CONCRETE:

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

CONCRETE CHAMFERS:

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

DOWELS:

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

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

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

REINFORCING STEEL:

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

STRUCTURAL STEEL:

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

HANDRAILS AND POSTS:

METAL STANDARDS AND FACES OF THE CONCRETE END POSTS FOR THE METAL RAIL SHALL BE SET NORMAL TO THE GRADE OF THE CURB, UNLESS OTHERWISE SHOWN ON PLANS. THE METAL RAIL AND TOPS OF CONCRETE POSTS USED WITH THE ALUMINUM RAIL SHALL BE BUILT PARALLEL TO THE GRADE OF THE CURB.
METAL HANDRAILS SHALL BE IN ACCORDANCE WITH THE PLANS. RAILS SHALL BE AS MANUFACTURED FOR BRIDGE RAILING. CASTINGS SHALL BE OF A UNIFORM APPEARANCE. FINS AND OTHER DEFORMATIONS RESULTING FROM CASTING OR OTHERWISE SHALL BE REMOVED IN A MANNER SO THAT A UNIFORM COLORING OF THE COMPLETED CASTING SHALL BE OBTAINED. CASTINGS WITH DISCOLORATIONS OR OF NON-UNIFORM COLORING WILL NOT BE ACCEPTED. CERTIFIED MILL REPORTS ARE REQUIRED FOR METAL RAILS AND POSTS.

SPECIAL NOTES:

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

ENGLISH

JANUARY, 1990