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TIP PROJECT: W-5313

CONTRACT: C203672

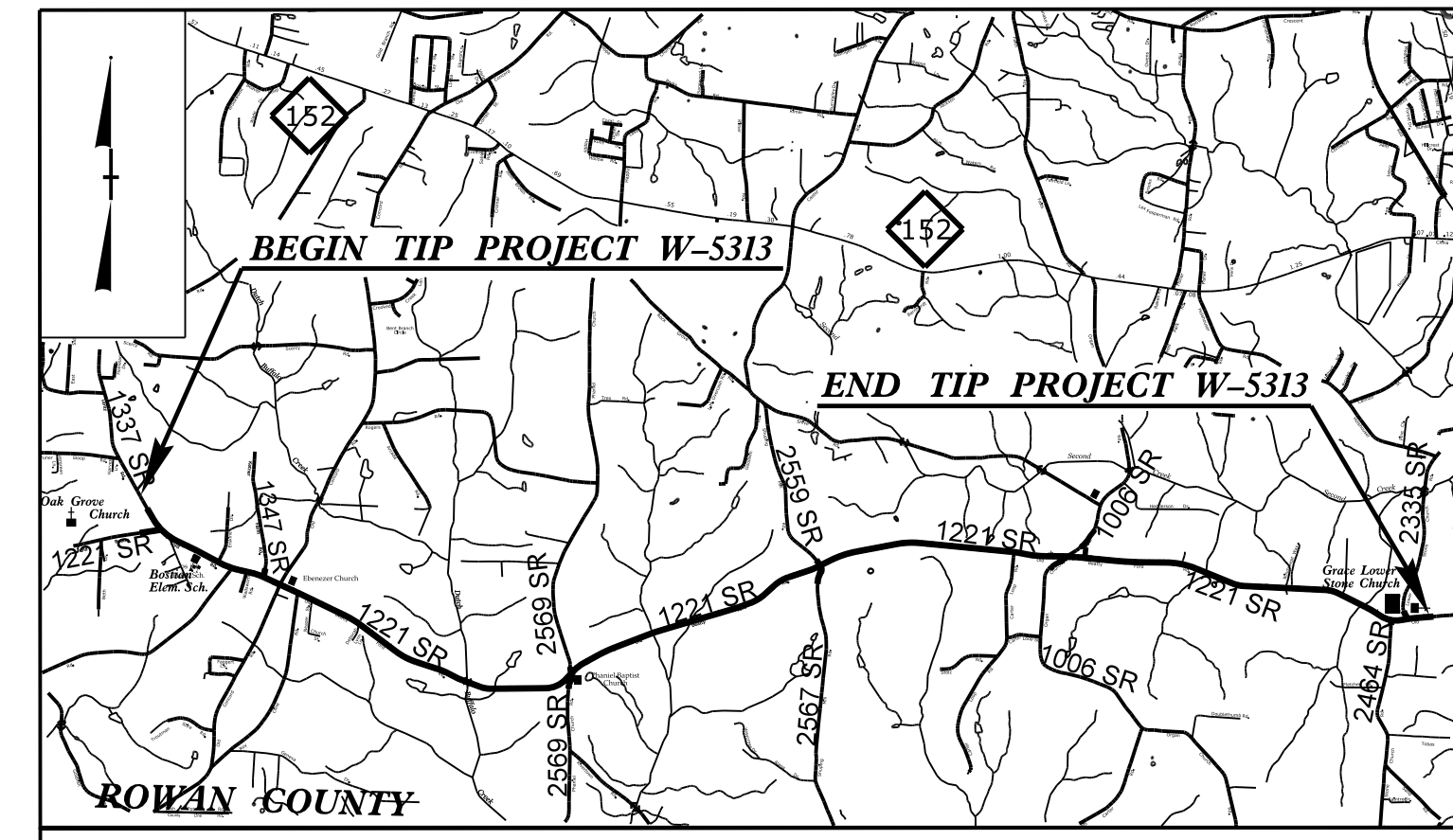
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

ROWAN COUNTY

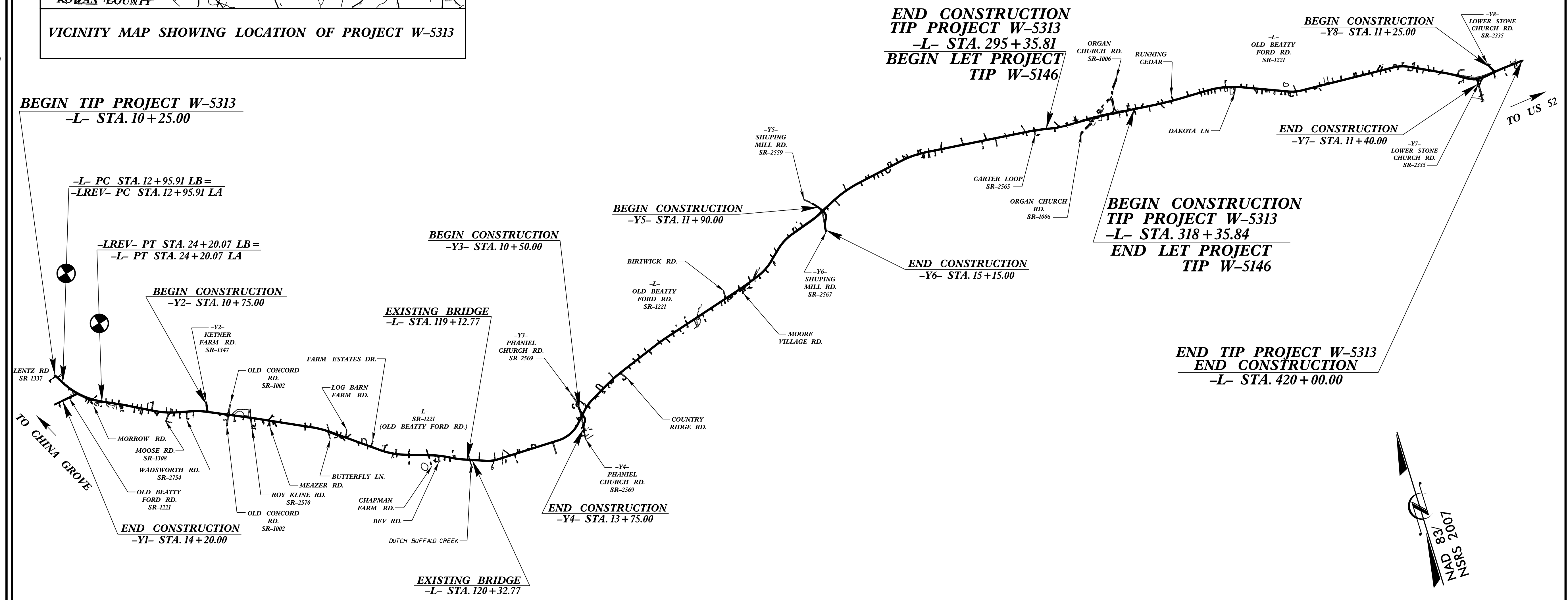
**LOCATION: SR 1221 (OLD BEATTY FORD ROAD)
FROM SR 1337 (LENTZ ROAD) TO
SR 2335 (LOWER STONE CHURCH ROAD)**

**TYPE OF WORK: WIDENING, RESURFACING, DRAINAGE, SIGNING
AND CULVERTS**

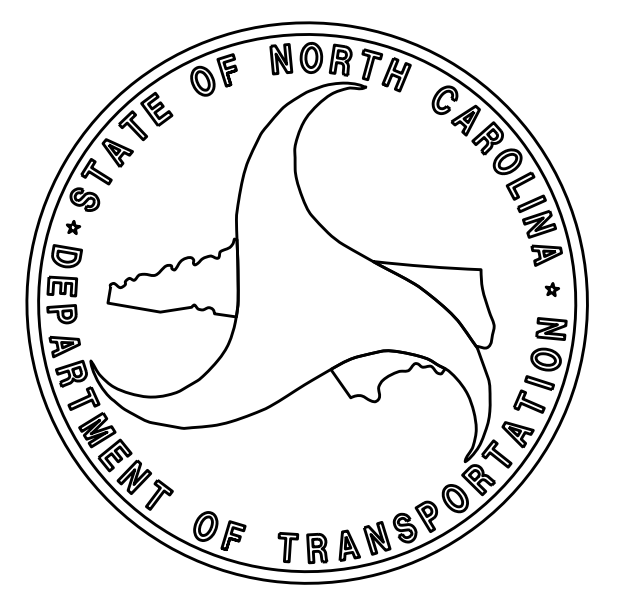
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	W-5313		
STATE PROJ. NO.	P.A. PROJ. NO.	DESCRIPTION	
46136.1.1	STP-1221(15)	P.E.	
46136.1.FD1	STP-1221(15)	RW	
46136.1.FDU1	STP-1221(15)	UTIL	
46136.3.FD1	STP-1221(15)	CONST.	



VICINITY MAP SHOWING LOCATION OF PROJECT W-5313



CULVERTS



DESIGN DATA

ADT 2016	=	4432
ADT 2036	=	5872
DHV	=	10 %
D	=	65 %
T	=	8 % *
V	=	50 MPH
* TTST	=	3 DUAL = 5
FUNC CLASS	=	RUAL COLLECTOR
	=	SUB REGIONAL TIER

PROJECT LENGTH

LENGTH OF ROADWAY TIP PROJECT W-5313	=	7.33 MILES
LENGTH OF STRUCTURE TIP PROJECT W-5313	=	0.00 MILES
TOTAL LENGTH OF TIP PROJECT W-5313	=	7.33 MILES

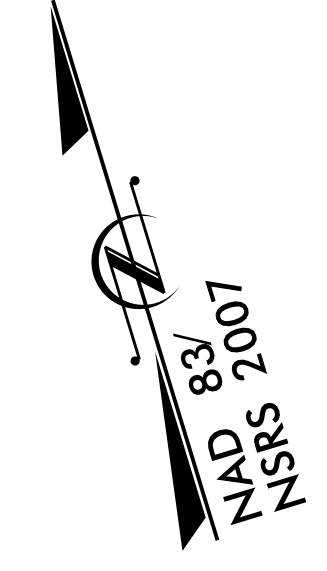
Prepared in the Office of:
DIVISION OF HIGHWAYS
STRUCTURES MANAGEMENT UNIT
1000 Birch Ridge Dr., Raleigh NC, 27610

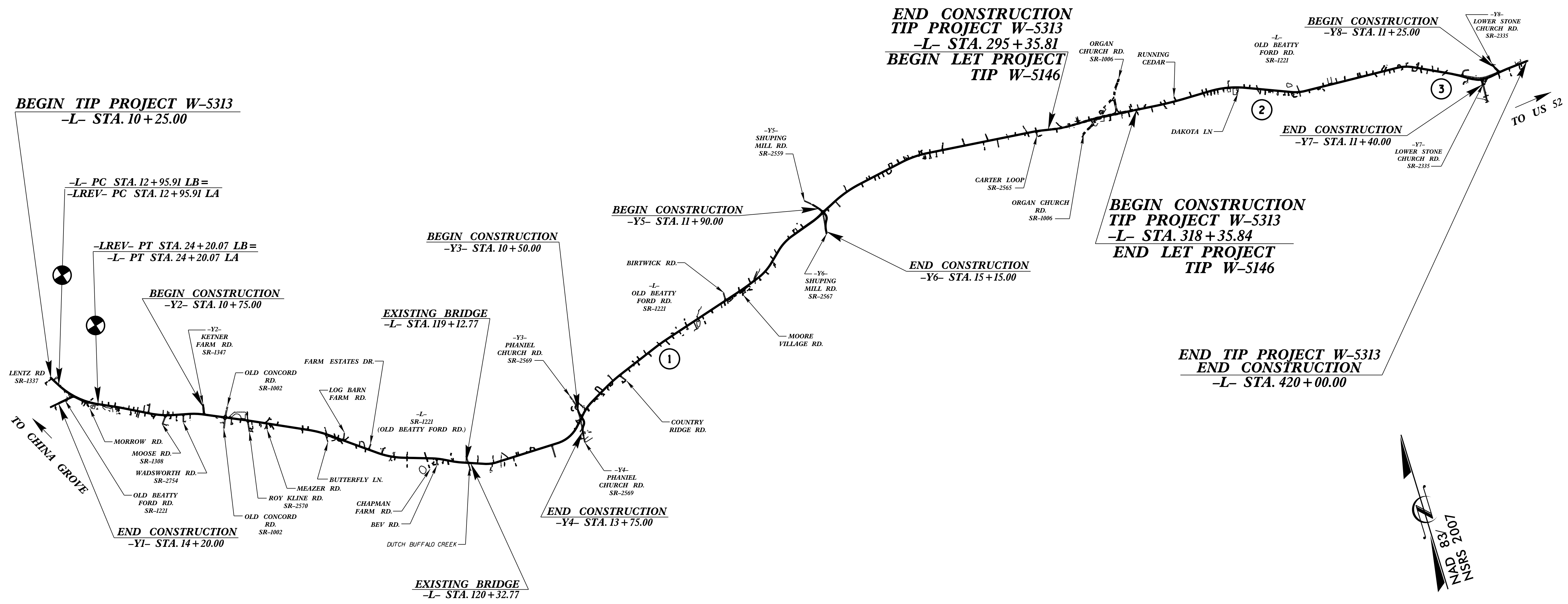
2012 STANDARD SPECIFICATIONS

LETTING DATE:
JUNE 20, 2017

E.E. MURRAY, PE
PROJECT ENGINEER

V.A. PATEL, PE
PROJECT DESIGN ENGINEER





INDEX		
STATION	DESCRIPTION	SHEET NUMBERS
① 179+65.00 -L-	SINGLE 9 FT. x 8 FT. CONCRETE BOX CULVERT OVER UT TO DUTCH BUFFALO CREEK 79° SKEW	C-1 THROUGH C-5
② 349+71.00 -L-	SINGLE 9 FT. x 8 FT. CONCRETE BOX CULVERT OVER UT TO SECOND CREEK 67° SKEW	C-6 THROUGH C-10
③ 398+18.00 -L-	SINGLE 10 FT. x 7 FT. CONCRETE BOX CULVERT OVER UT TO SECOND CREEK 123° SKEW	C-11 THROUGH C-15

PROJECT NO. W-5313
ROWAN COUNTY
 STATION: _____

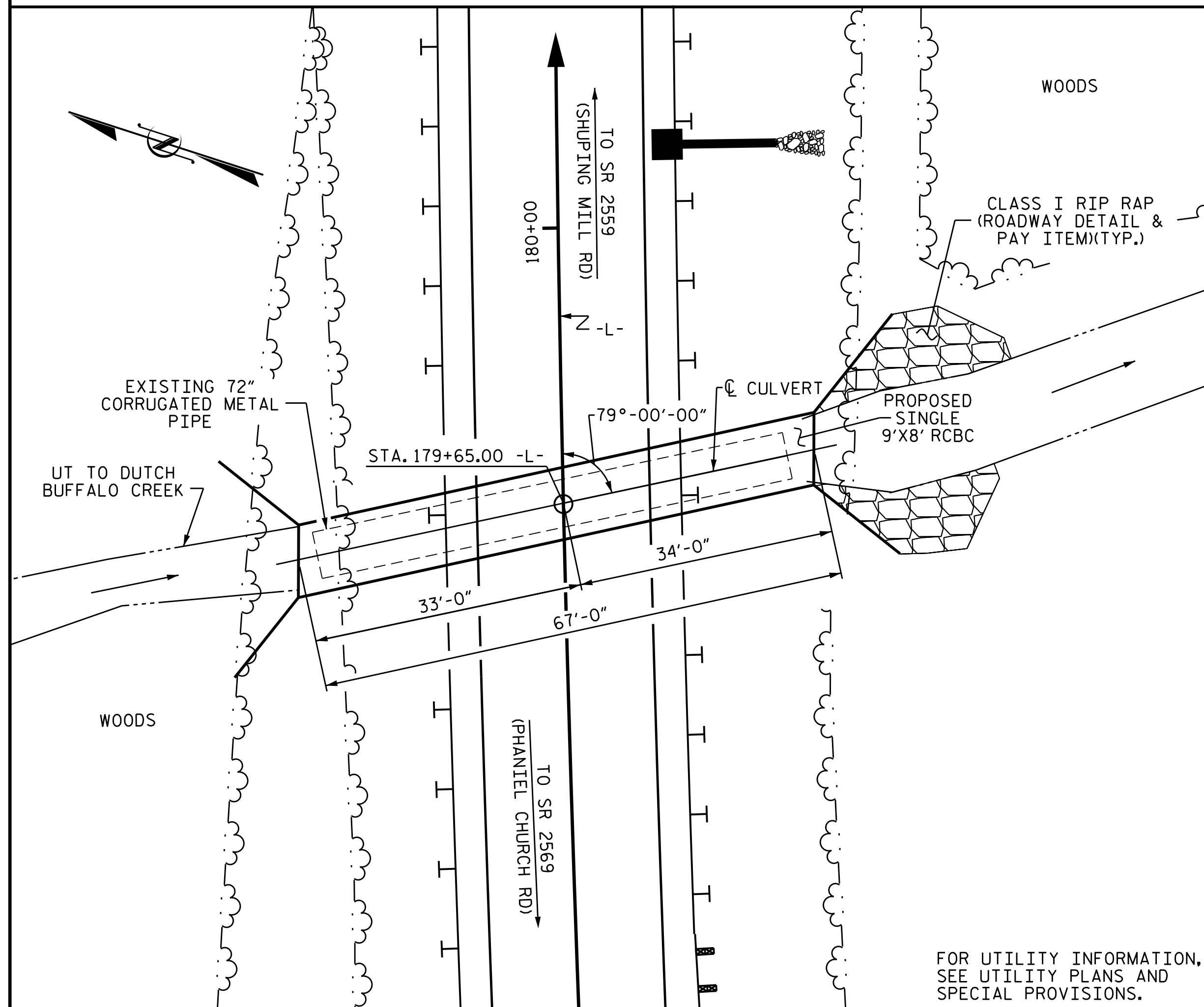
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

INDEX SHEET

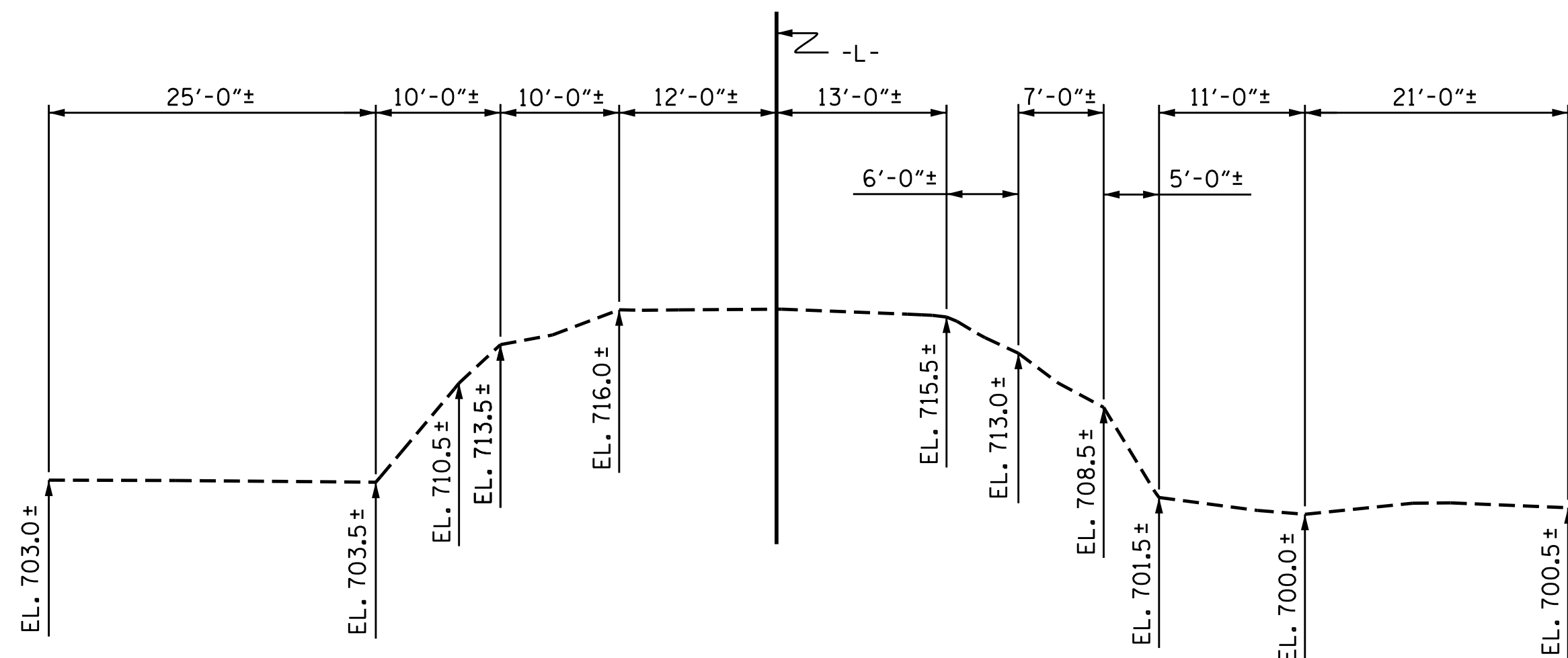
DRAWN BY : K. D. LAYNE DATE : 10/7/15
 CHECKED BY : V.A.PATEL DATE : 10/15/15

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

BM #6: RR SPIKE SET IN ROOT OF 24" WILLOW OAK, 111' RIGHT OF STA. 168+76.00 -L-, EL. 775.86



LOCATION SKETCH



PROFILE ALONG CULVERT

ROADWAY DATA	
GRADE POINT EL. @ STA. 179+65.00 -L-	= 717.74
BED ELEVATION @ STA. 179+65.00 -L-	= 701.10
ROADWAY SLOPES	= 2:1

HYDRAULIC DATA	
DESIGN DISCHARGE	= 700 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 25 YRS.
DESIGN HIGH WATER ELEVATION	= 712.2
DRAINAGE AREA	= 1.54 SQ. MI.
BASE DISCHARGE (Q100)	= 1,000 C.F.S.
BASE HIGH WATER ELEVATION	= 717.2

OVERTOPPING FLOOD DATA	
OVERTOPPING DISCHARGE	= 1,042 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 100 +/- YRS.
OVERTOPPING FLOOD ELEVATION	= 718.1

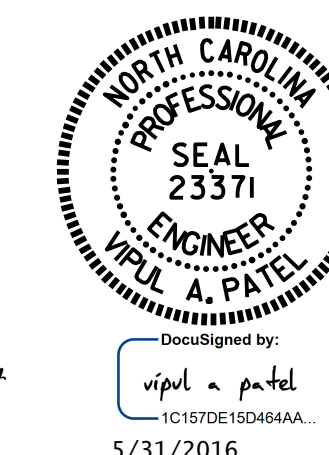
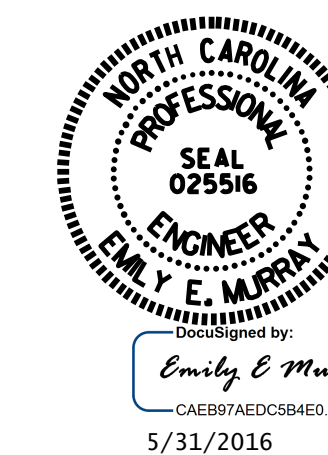
TOTAL STRUCTURE QUANTITIES	
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	68 TONS
CLASS A CONCRETE	
BARREL @ 0.941 CY/FT	63.0 C.Y.
WINGS, ETC.	25.3 C.Y.
TOTAL	88.3 C.Y.
REINFORCING STEEL	
BARREL	9,788 LBS.
WINGS, ETC.	1,547 LBS.
TOTAL	11,335 LBS.
PLACEMENT OF NATURAL STREAM BED MATERIAL	LUMP SUM

NOTES

- ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
- DESIGN FILL = 8.70 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 CULVERTS TO BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
- THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
- AT THE CONTRACTORS OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- 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.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEMS, SEE EROSION CONTROL PLANS.
- FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
- FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.
- FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
- FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
- A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTRIE LENGTH OF THE EXPANSION JOINT.
- NATURAL STREAM BED MATERIAL SHALL BE USED TO BACKFILL THE CULVERT BETWEEN THE SILLS. FOR PLACEMENT OF NATURAL STREAM BED MATERIAL, SEE SPECIAL PROVISIONS.
- THE COST FOR REMOVAL OF EXISTING 72" Ø CMP SHALL BE INCLUDED IN THE PAY ITEM FOR "CULVERT EXCAVATION".

PROJECT NO. W-5313
ROWAN COUNTY
 STATION: 179+65.00 -L-

SHEET 1 OF 5



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 BARREL STANDARD
 SINGLE 9 FT. X 8 FT.
 CONCRETE BOX CULVERT
 79° SKEW

REVISED 11-13-91 BY E.L.R. CHECKED BY G.R.P.
 ADDED 8-22-89

DRAWN BY : N.D'AIUTO DATE : 8/8/14
 CHECKED BY : H.A. LOCKLEAR DATE : 8/20/14
 DESIGN ENGINEER OF RECORD: N.D'AIUTO DATE : 8/20/14

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-1
1			3			TOTAL SHEETS
2			4			15

CUL. #1 STD.NO.CB21A

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

LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						LIVE-LOAD FACTORS (γ _{LL})	MOMENT				SHEAR					
							RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	①	1.25	--	1.75	1.25	1	TOP SLAB	4.83	1.28	1	BOTTOM SLAB	0.87		
	HL-93 (OPERATING)	N/A		1.62	--	1.35	1.62	1	TOP SLAB	4.83	1.66	1	BOTTOM SLAB	0.87		
	HS-20 (INVENTORY)	36.000	②	1.64	59.19	1.75	1.83	1	TOP SLAB	4.83	1.64	1	BOTTOM SLAB	0.87		
	HS-20 (OPERATING)	36.000		2.13	76.73	1.35	2.37	1	TOP SLAB	4.83	2.13	1	BOTTOM SLAB	0.87		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		3.00	40.48	1.40	3.14	1	BOT. CORNER WALL	8.49	3.00	1	BOTTOM SLAB	0.87		
		SNGARBS2	20.000		2.77	55.43	1.40	3.01	1	BOT. CORNER WALL	8.49	2.77	1	BOTTOM SLAB	0.87	
		SNAGRIS2	22.000		3.00	65.97	1.40	3.14	1	BOT. CORNER WALL	8.49	3.00	1	BOTTOM SLAB	0.87	
		SNCOTTS3	27.250	③	1.57	42.66	1.40	1.57	1	TOP SLAB	4.83	1.60	1	BOTTOM SLAB	0.87	
		SNAGGRS4	34.925		1.63	57.04	1.40	1.67	1	TOP SLAB	4.83	1.63	1	BOTTOM SLAB	0.87	
		SNS5A	35.550		1.68	59.66	1.40	1.71	1	TOP SLAB	4.83	1.68	1	BOTTOM SLAB	0.87	
		SNS6A	39.950		1.66	66.43	1.40	1.71	1	TOP SLAB	4.83	1.66	1	BOTTOM SLAB	0.87	
		SNS7B	42.000		1.66	69.84	1.40	1.71	1	TOP SLAB	4.83	1.66	1	BOTTOM SLAB	0.87	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.69	88.77	1.40	2.71	1	TOP SLAB	4.83	2.69	1	BOTTOM SLAB	0.87	
		TNT4A	33.075		1.86	61.60	1.40	1.86	1	TOP SLAB	4.83	1.91	1	BOTTOM SLAB	0.87	
		TNT6A	41.600		1.62	67.34	1.40	1.67	1	TOP SLAB	4.83	1.62	1	BOTTOM SLAB	8.79	
		TNT7A	42.000		1.79	75.32	1.40	1.83	1	TOP SLAB	4.83	1.79	1	BOTTOM SLAB	8.79	
		TNT7B	42.000		1.68	70.48	1.40	1.71	1	TOP SLAB	4.83	1.68	1	BOTTOM SLAB	0.87	
		TNAGRIT4	43.000		1.78	76.37	1.40	1.78	1	TOP SLAB	4.83	1.81	1	BOTTOM SLAB	0.87	
TNAGT5A	45.000		1.82	81.82	1.40	1.82	1	TOP SLAB	4.83	1.85	1	BOTTOM SLAB	0.87			
TNAGT5B	45.000		1.86	83.81	1.40	1.86	1	TOP SLAB	4.83	1.91	1	BOTTOM SLAB	0.87			

LOAD FACTORS:

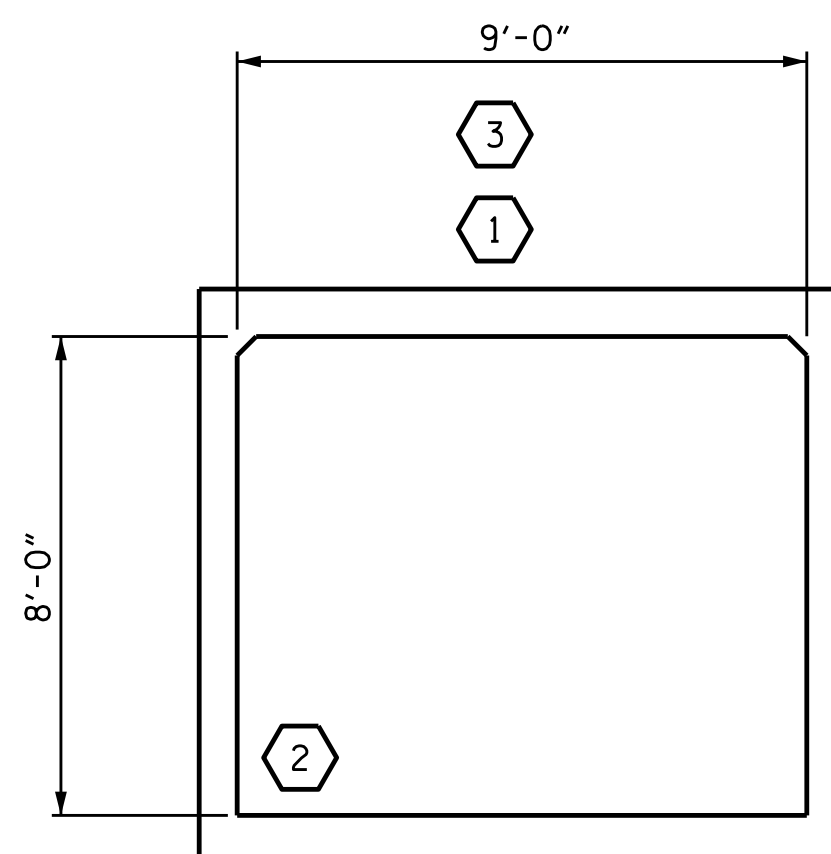
DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

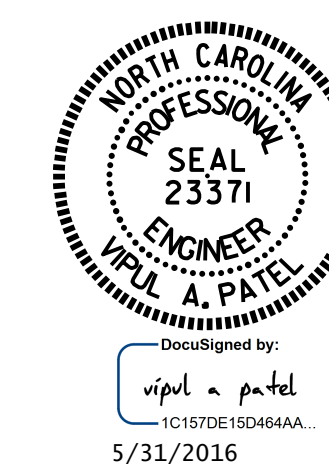
③	CONTROLLING LOAD RATING
①	DESIGN LOAD RATING (HL-93)
②	DESIGN LOAD RATING (HS-20)
③	LEGAL LOAD RATING **
** SEE CHART FOR VEHICLE TYPE	



LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. W-5313
ROWAN COUNTY
 STATION: 179+65.00 -L-

SHEET 2 OF 5



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

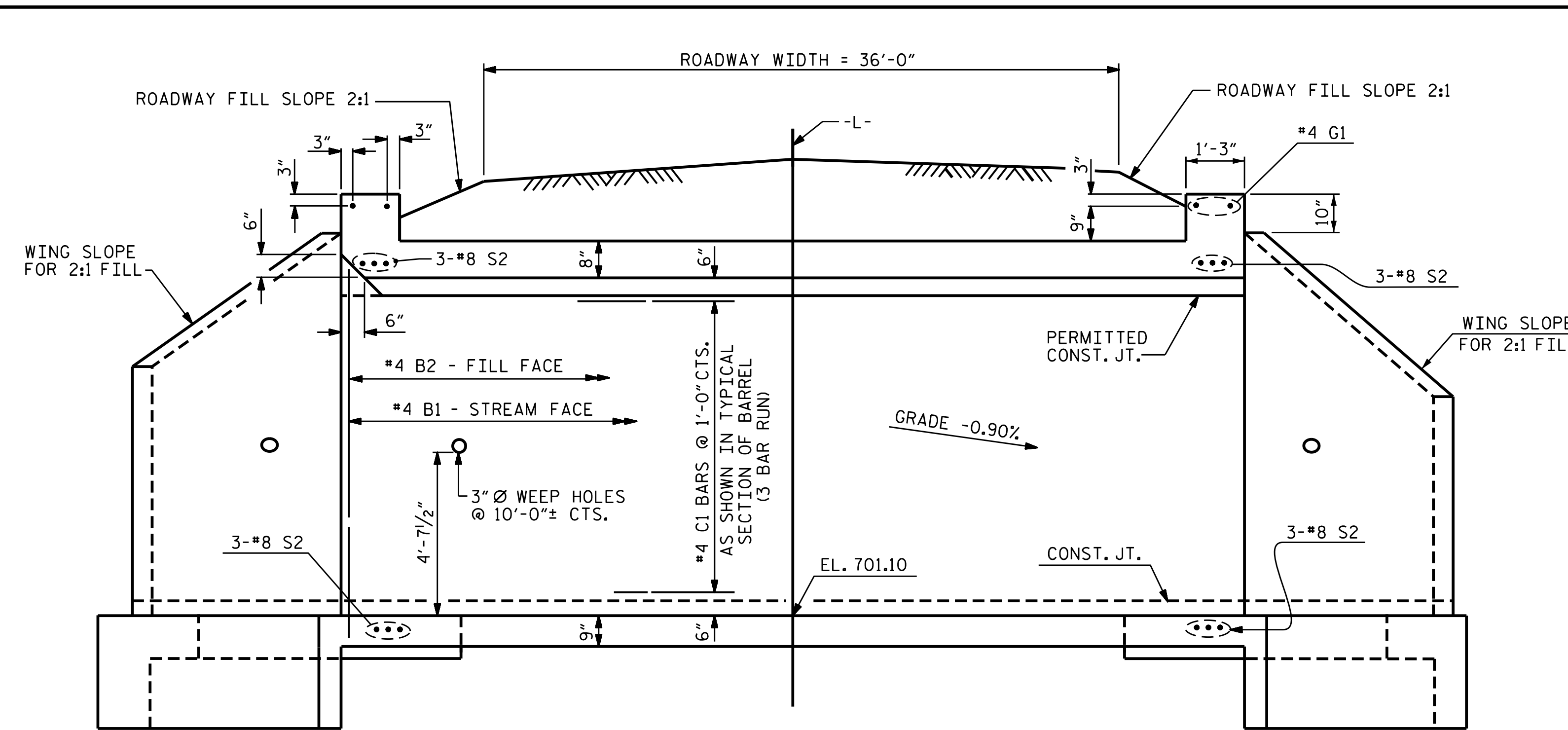
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-2
1			3			TOTAL SHEETS 15
2			4			

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 SIGNATURES COMPLETED

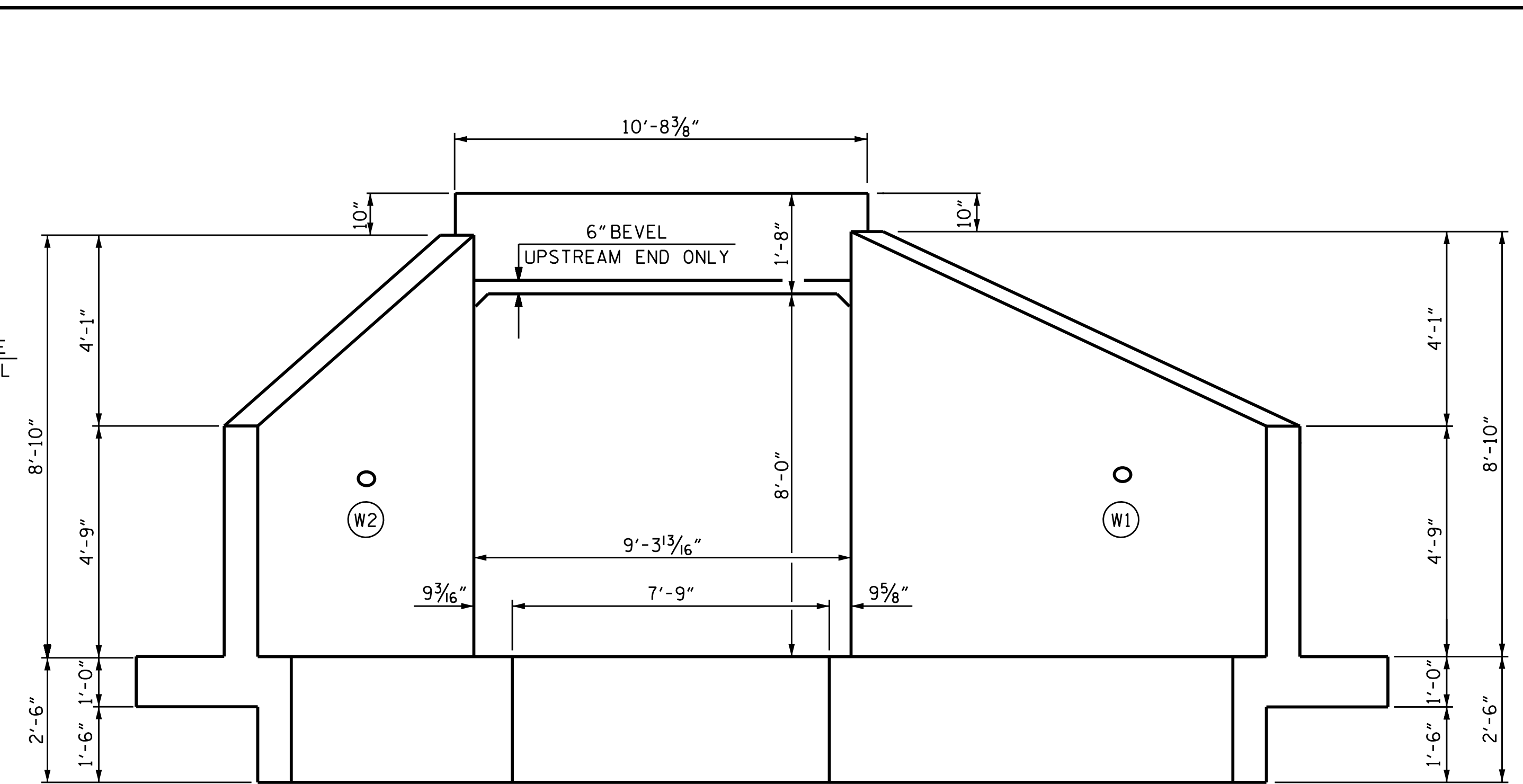
CUL. #1 STD. NO. LRFR5

DRAWN BY : N.D.'AIUTO DATE : 8-8-14
 CHECKED BY : H.A.LOCKLEAR DATE : 8-20-14

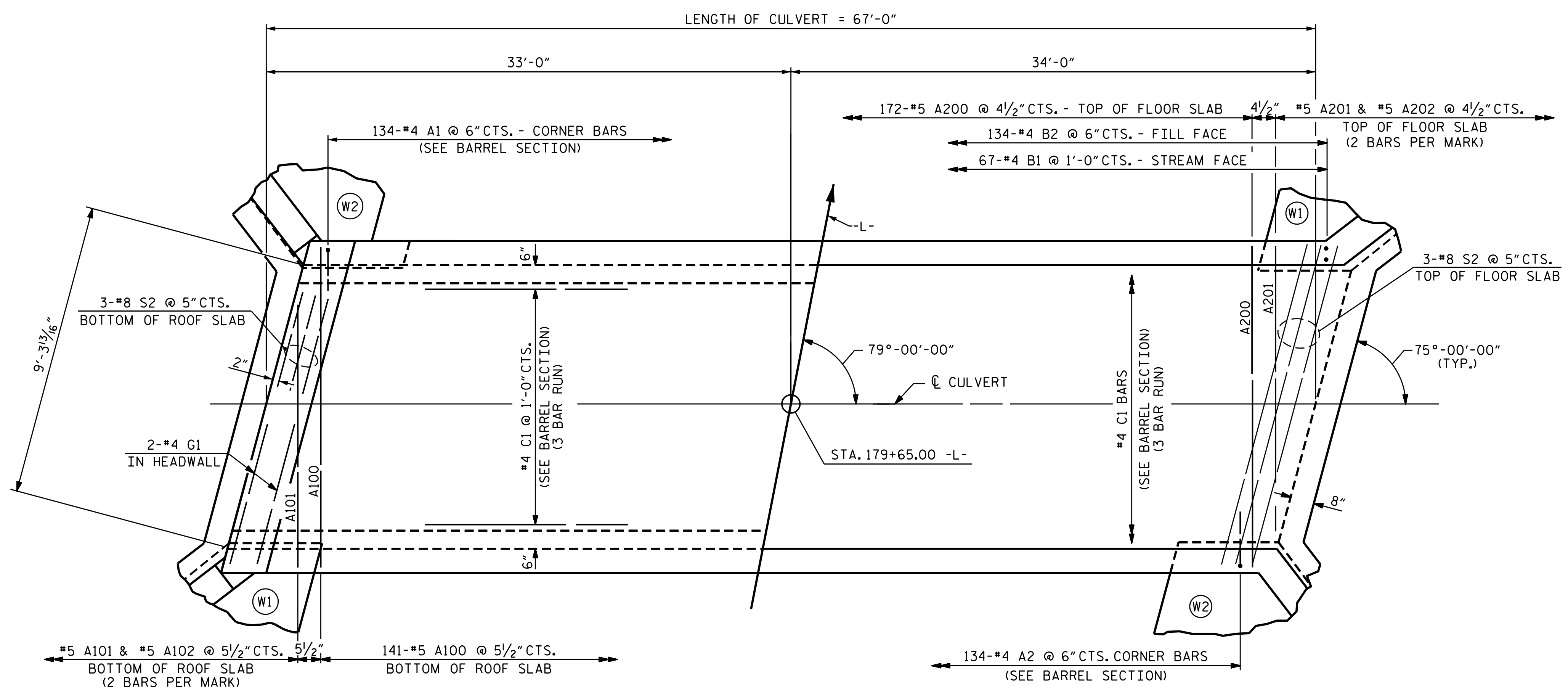
DRAWN BY : WMC 7/11
 CHECKED BY : GM 7/11
 REV. 10/1/11 MAA/GM
 DESIGN ENGINEER OF RECORD:
N.D.'AIUTO DATE : 8-20-14



CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION NORMAL TO SKEW

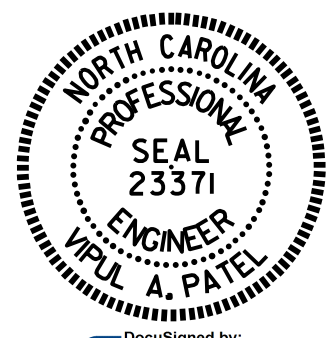


PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

PROJECT NO. W-5313
ROWAN COUNTY
 STATION: 179+65.00 -L-

SHEET 3 OF 5



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 BARREL STANDARD
 SINGLE 9 FT. X 8 FT.
 CONCRETE BOX CULVERT
 79° SKEW

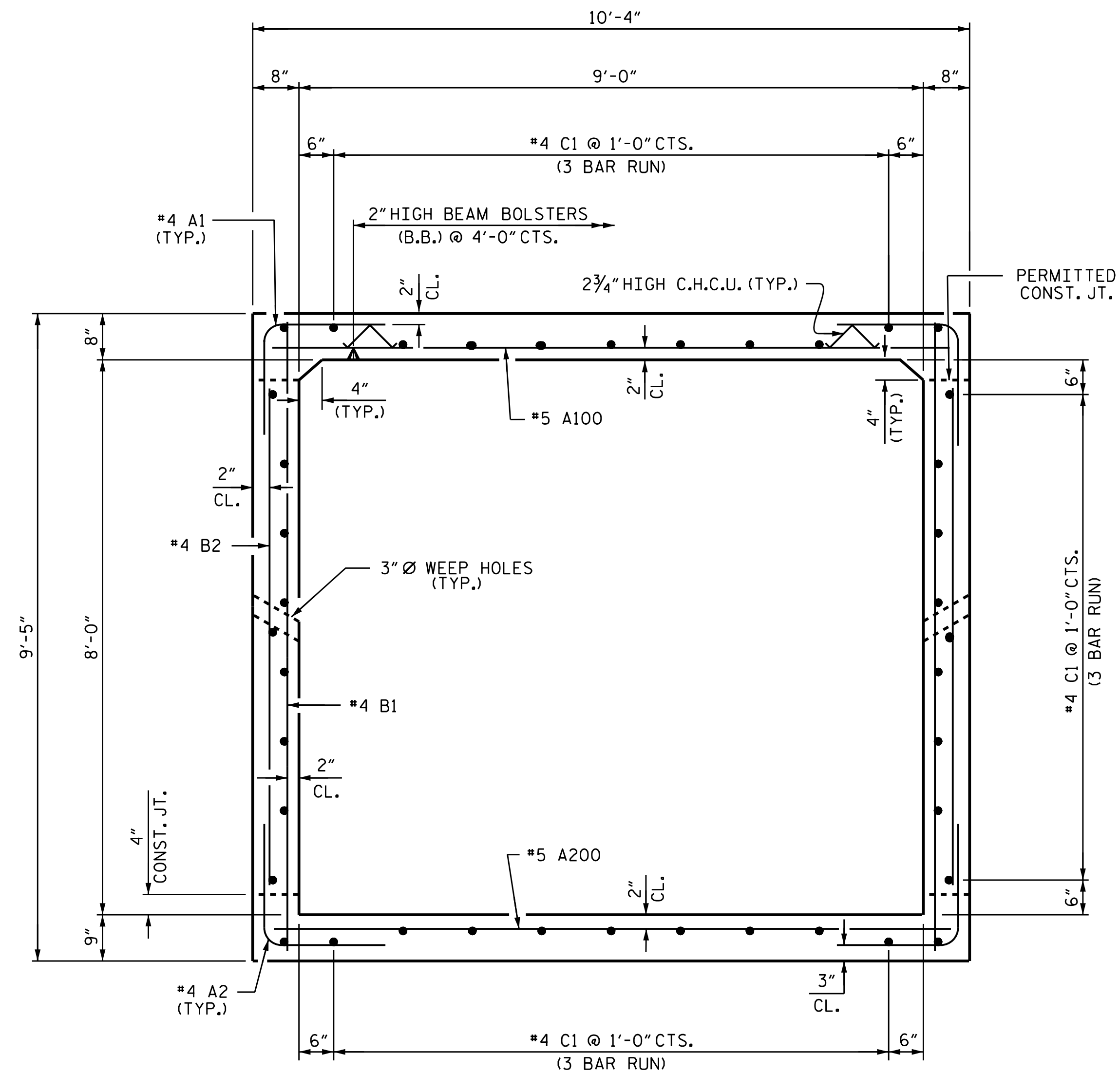
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NO.	BY:	DATE:	NO.	BY:	DATE:	C-3	
1			3			TOTAL	15
2			4			SHEETS	

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CUL. #1 STD.NO.CB21

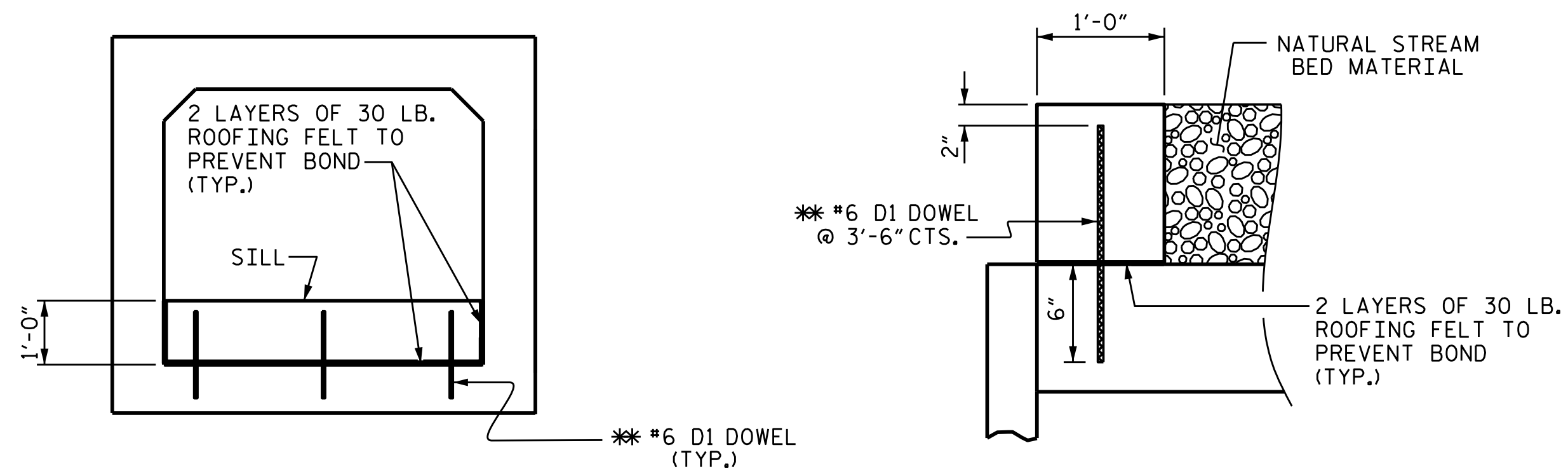
REVISED 8-28-92 BY E.L.R. CHECKED BY G.R.P.
 REVISED 8-22-89 BY A.R.B. CHECKED BY C.R.K.
 REDRAWN 8-22-89
 REVISION 11-19-99 BY M.M. CHECKED BY R.W.W.

DRAWN BY: N.D'AIUTO DATE: 8/8/14
 CHECKED BY: H.A.LOCKLEAR DATE: 8/20/14
 DESIGN ENGINEER OF RECORD: N.D'AIUTO DATE: 8/20/14



RIGHT ANGLE SECTION OF BARREL

THERE ARE 40 C1 BARS IN SECTION OF BARREL



ELEVATION

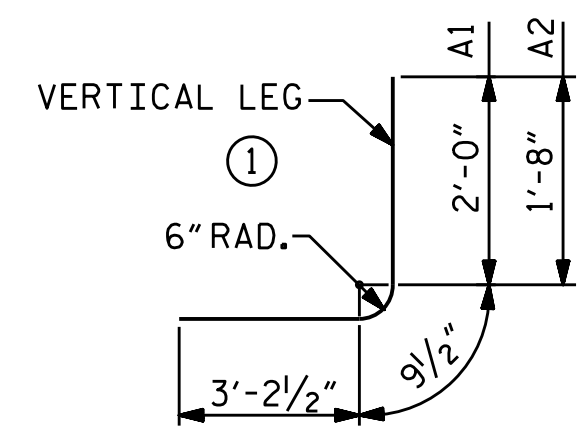
SECTION THROUGH SILL

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

SILL DETAILS

(SILLS ARE LOCATED AT UPSTREAM AND DOWNSTREAM ENDS ALONG SKEW)

BAR TYPE



BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	268	#4	1	6'-0"	1074
A2	268	#4	1	5'-8"	1014
A100	141	#5	STR	9'-11"	1458
A101	4	#5	STR	6'-1"	25
A102	4	#5	STR	2'-8"	11
A200	172	#5	STR	9'-11"	1779
A201	4	#5	STR	7'-1"	30
A202	4	#5	STR	4'-3"	18
B1	134	#4	STR	8'-11"	798
B2	268	#4	STR	7'-4"	1313
C1	120	#4	STR	23'-8"	1897
D1	6	#6	STR	1'-4"	12
G1	4	#4	STR	10'-4"	28
S2	12	#8	STR	10'-4"	331
REINFORCING STEEL				LBS.	9,788

SPLICE LENGTH CHART

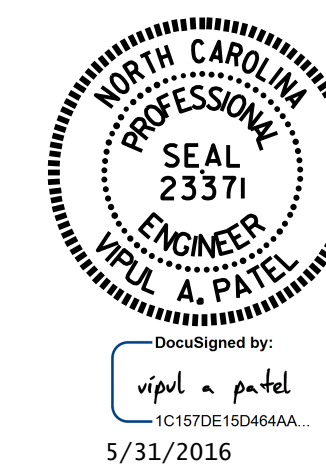
BAR	NO.	SPLICE LENGTH
B1	#4	1'-5"
C1	#4	1'-11"

PROJECT NO. W-5313
ROWAN COUNTY
 STATION: 179+65.00 -L-

SHEET 4 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**SINGLE 9 FT. X 8 FT.
 CONCRETE BOX CULVERT**

79° SKEW

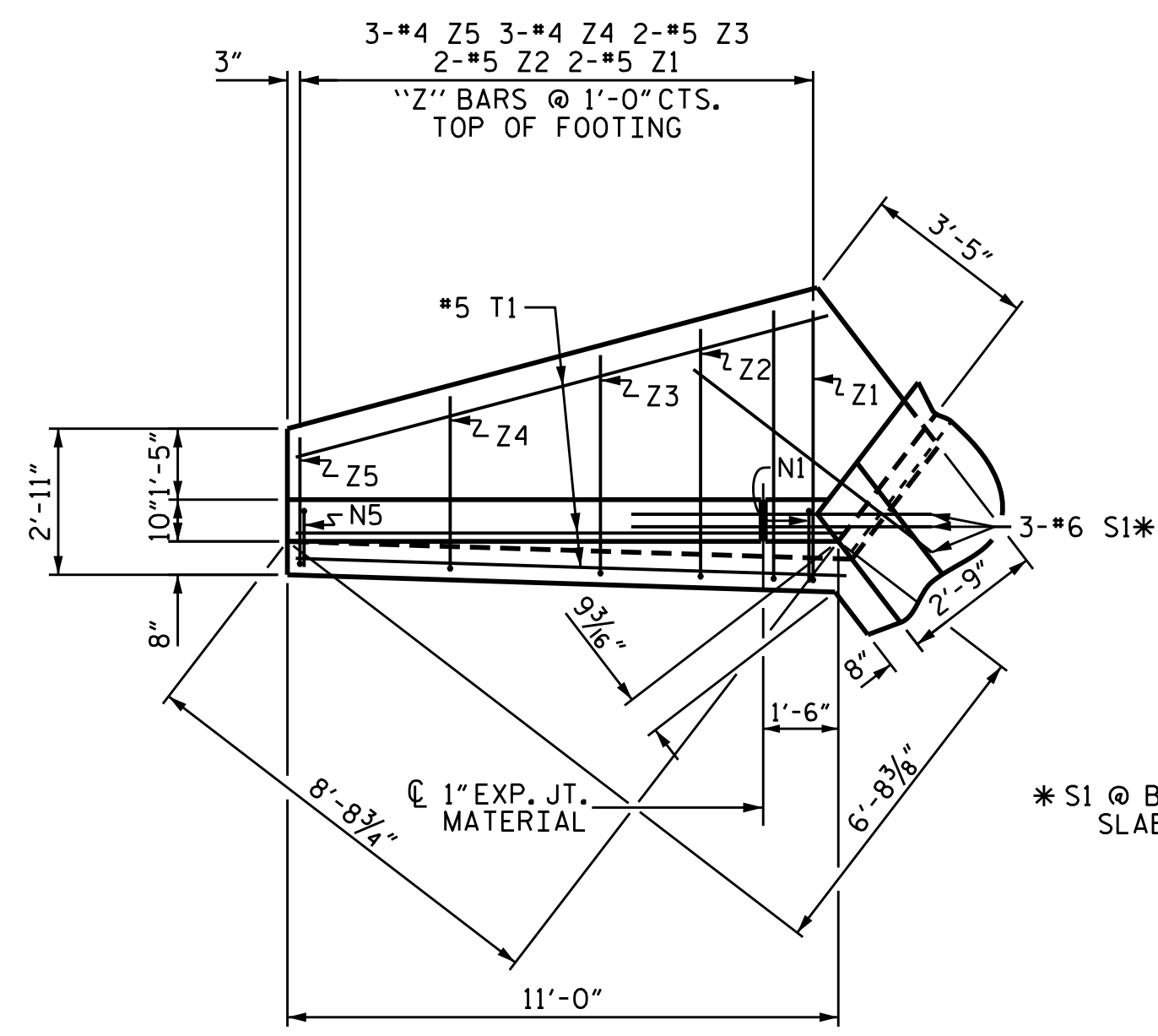


DRAWN BY : N.D'AIUTO DATE : 8/8/14
 CHECKED BY : H.A.LOCKLEAR DATE : 8/20/14
 DESIGN ENGINEER OF RECORD: N.D'AIUTO DATE : 8/20/14

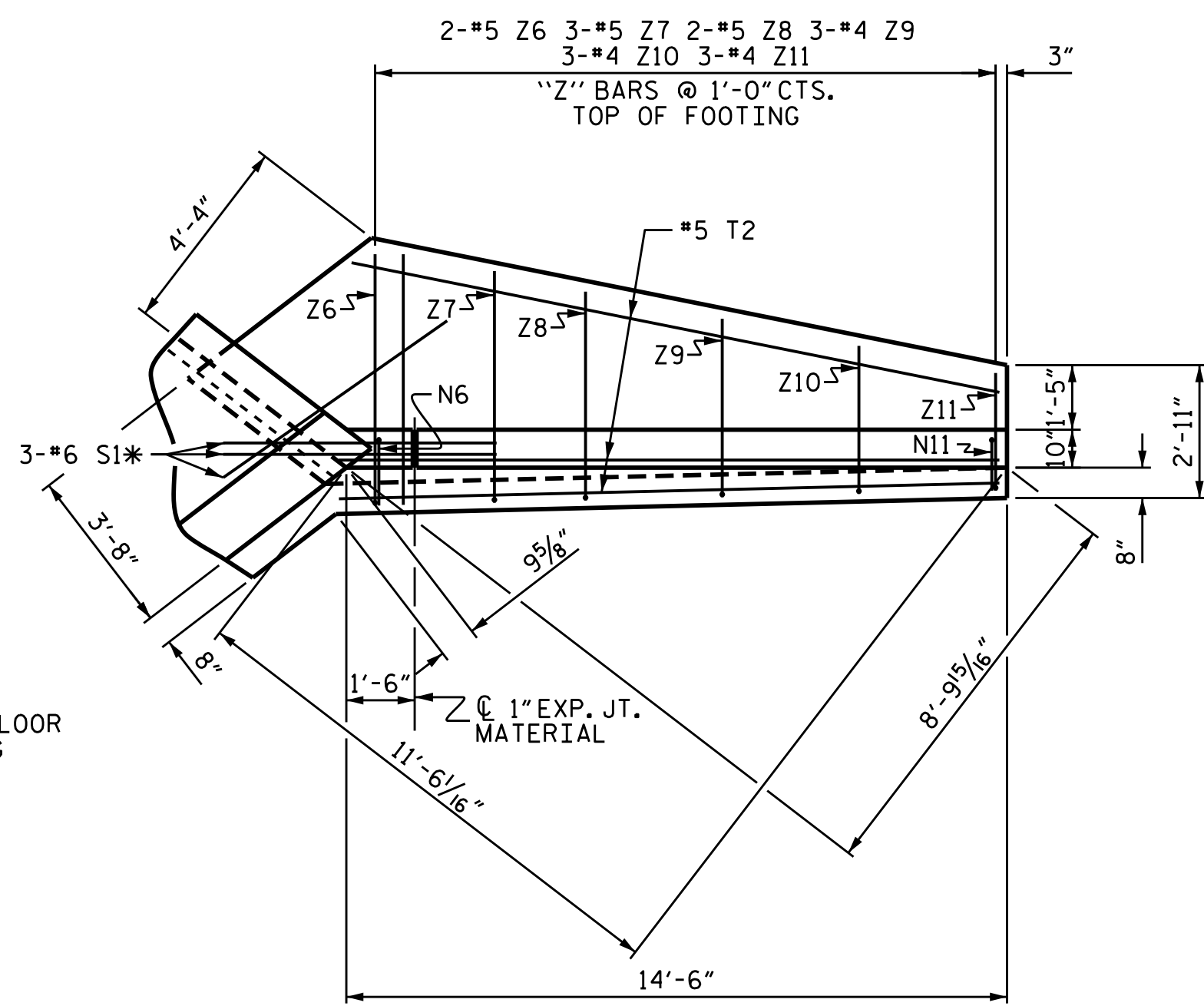
DOCUMENT NOT CONSIDERED
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 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-4
1			3			TOTAL SHEETS
2			4			15

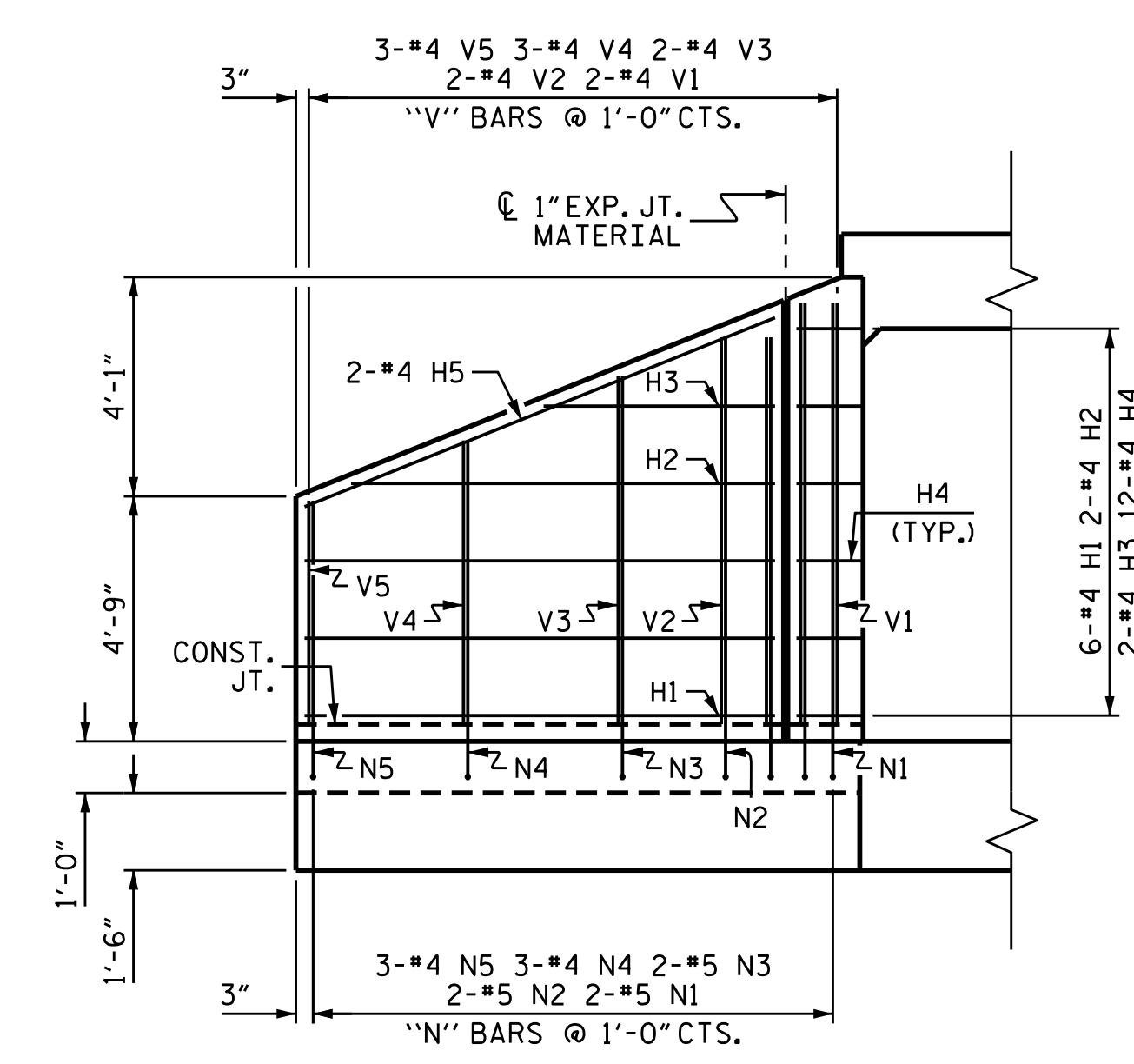
CUL. #1



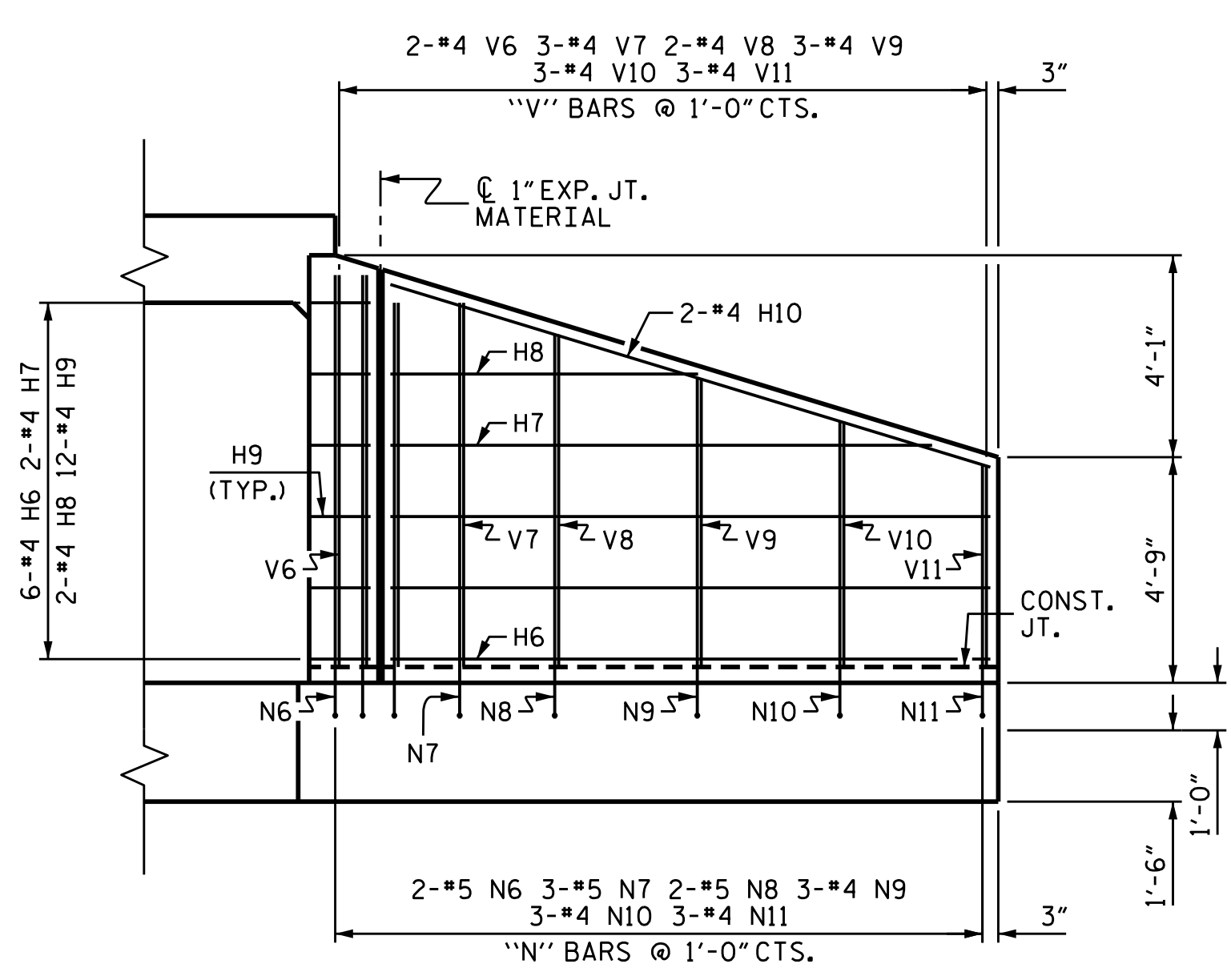
PLAN W2



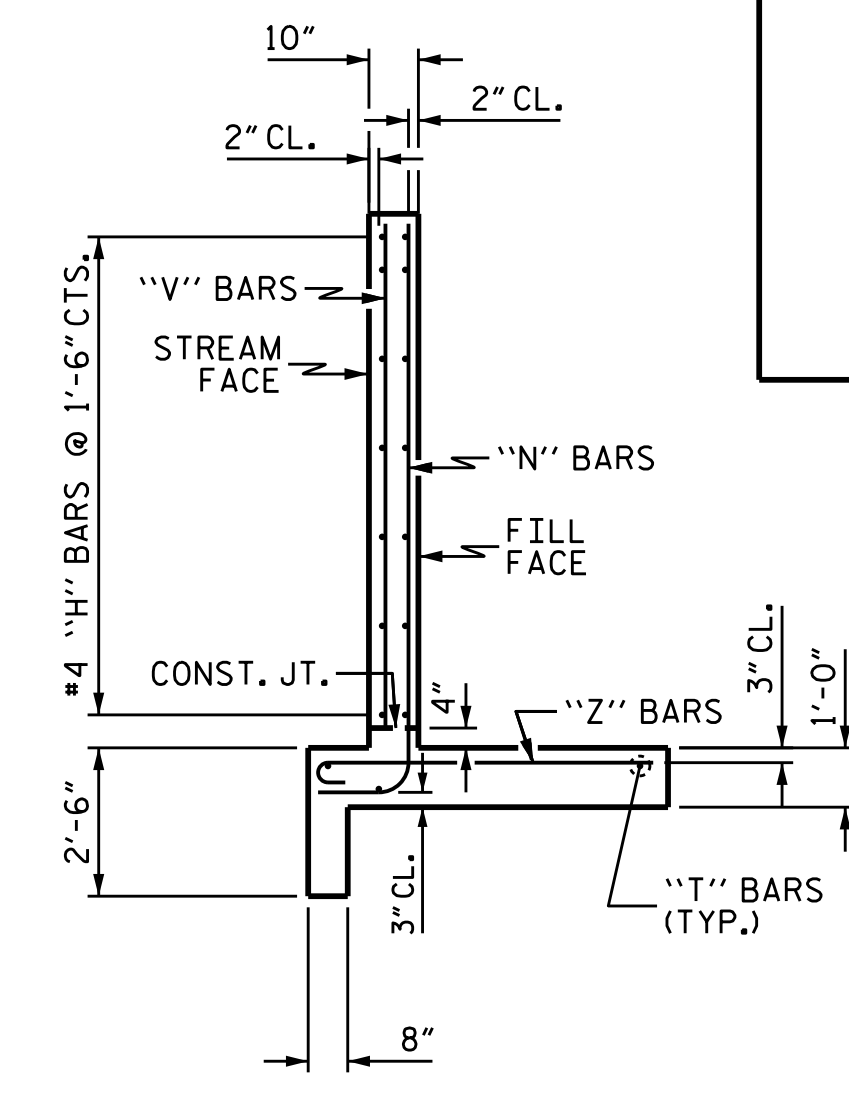
PLAN W1



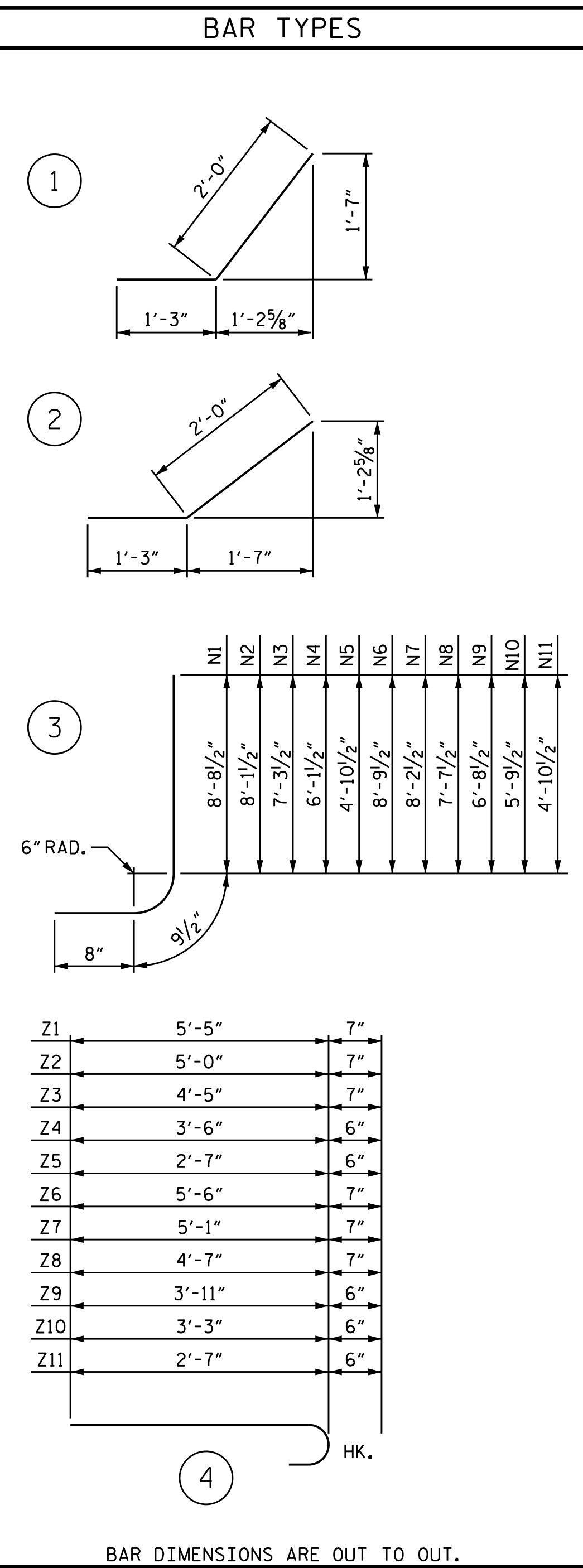
ELEVATION W2



ELEVATION W1



TYPICAL WING SECTION

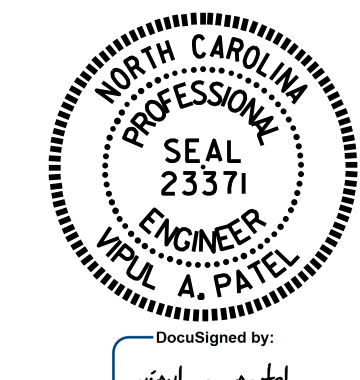


BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	9'-1"	73
H2	4	#4	STR	8'-2"	22
H3	4	#4	STR	4'-5"	12
H4	24	#4	1	3'-3"	52
H5	4	#4	STR	9'-10"	26
H6	12	#4	STR	12'-7"	101
H7	4	#4	STR	11'-4"	30
H8	4	#4	STR	6'-5"	17
H9	24	#4	2	3'-3"	52
H10	4	#4	STR	13'-2"	35
N1	4	#5	3	10'-2"	42
N2	4	#5	3	9'-7"	40
N3	4	#5	3	8'-9"	37
N4	6	#4	3	7'-7"	30
N5	6	#4	3	6'-4"	25
N6	4	#5	3	10'-3"	43
N7	6	#5	3	9'-8"	60
N8	4	#5	3	9'-1"	38
N9	6	#4	3	8'-2"	33
N10	6	#4	3	7'-3"	29
N11	6	#4	3	6'-4"	25
S1	12	#6	STR	6'-0"	108
T1	6	#5	STR	11'-0"	69
T2	6	#5	STR	14'-6"	91
V1	4	#4	STR	8'-2"	22
V2	4	#4	STR	7'-6"	20
V3	4	#4	STR	6'-9"	18
V4	6	#4	STR	5'-6"	22
V5	6	#4	STR	4'-4"	17
V6	4	#4	STR	8'-3"	22
V7	6	#4	STR	7'-8"	31
V8	4	#4	STR	7'-0"	19
V9	6	#4	STR	6'-1"	24
V10	6	#4	STR	5'-2"	21
V11	6	#4	STR	4'-3"	17
Z1	4	#5	4	6'-0"	25
Z2	4	#5	4	5'-7"	23
Z3	4	#5	4	5'-0"	21
Z4	6	#4	4	4'-0"	16
Z5	6	#4	4	3'-1"	12
Z6	4	#5	4	6'-1"	25
Z7	6	#5	4	5'-8"	35
Z8	4	#5	4	5'-2"	22
Z9	6	#4	4	4'-5"	18
Z10	6	#4	4	3'-9"	15
Z11	6	#4	4	3'-1"	12
REINFORCING STEEL FOR 4 WINGS					LBS. 1,547
CLASS A CONCRETE					
4 WINGS					C.Y. 22.6
2 HEADWALLS					C.Y. 1.0
2 END CURTAIN WALLS					C.Y. 1.0
2 SILLS					C.Y. 0.7
TOTAL					C.Y. 25.3

PROJECT NO. W-5313
 ROWAN COUNTY
 STATION: 179+65.00 -L-

SHEET 5 OF 5



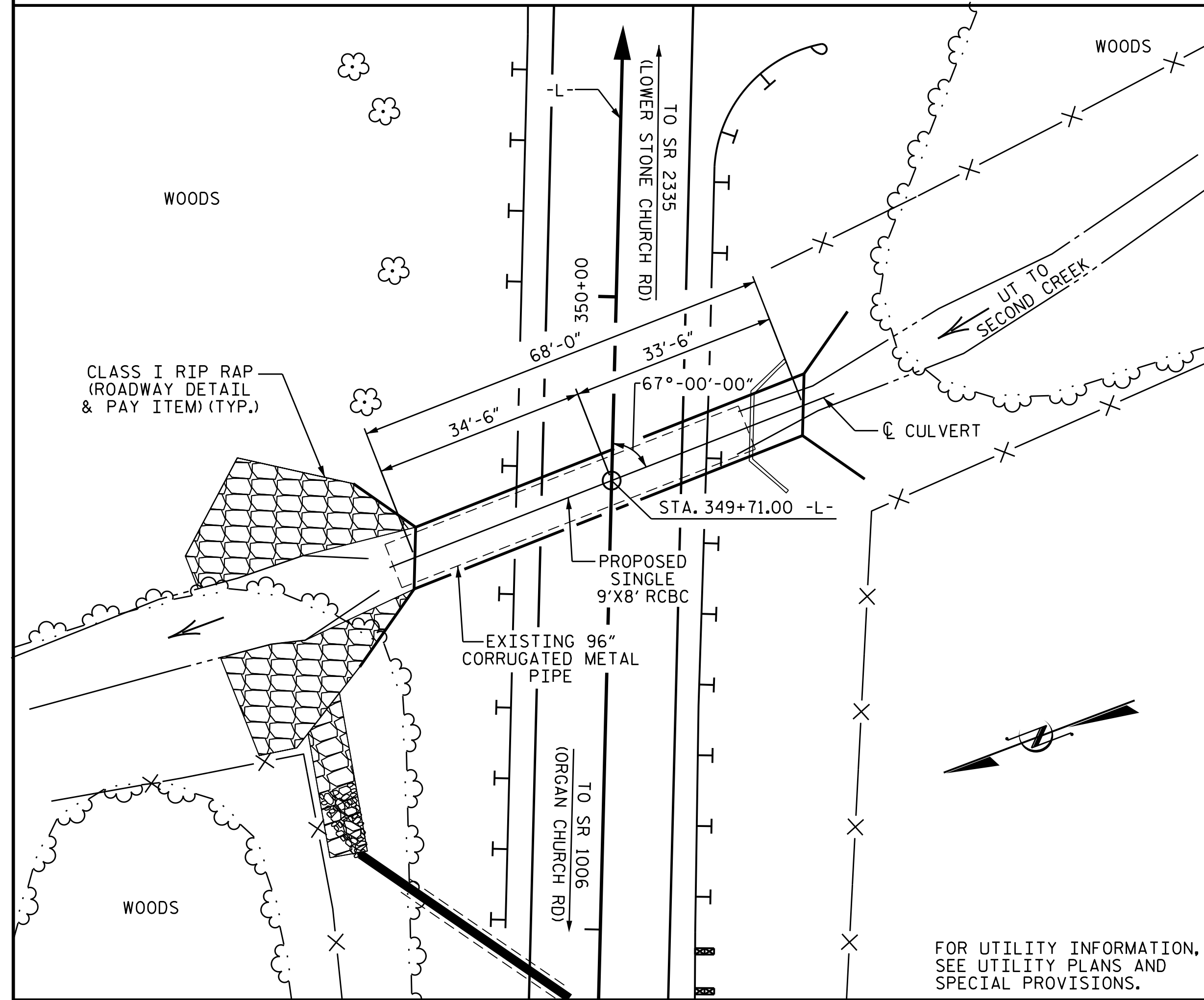
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STANDARD WINGS
 FOR
 CONCRETE BOX CULVERT
 H = 8'-0" SLOPE = 2:1
 75° SKEW

ASSEMBLED BY: N.D. AIUTO DATE: 8/8/14
 CHECKED BY: H.A. LOCKLEAR DATE: 8/20/14
 DRAWN BY: CCJ 01/00
 CHECKED BY: RWW 03/00

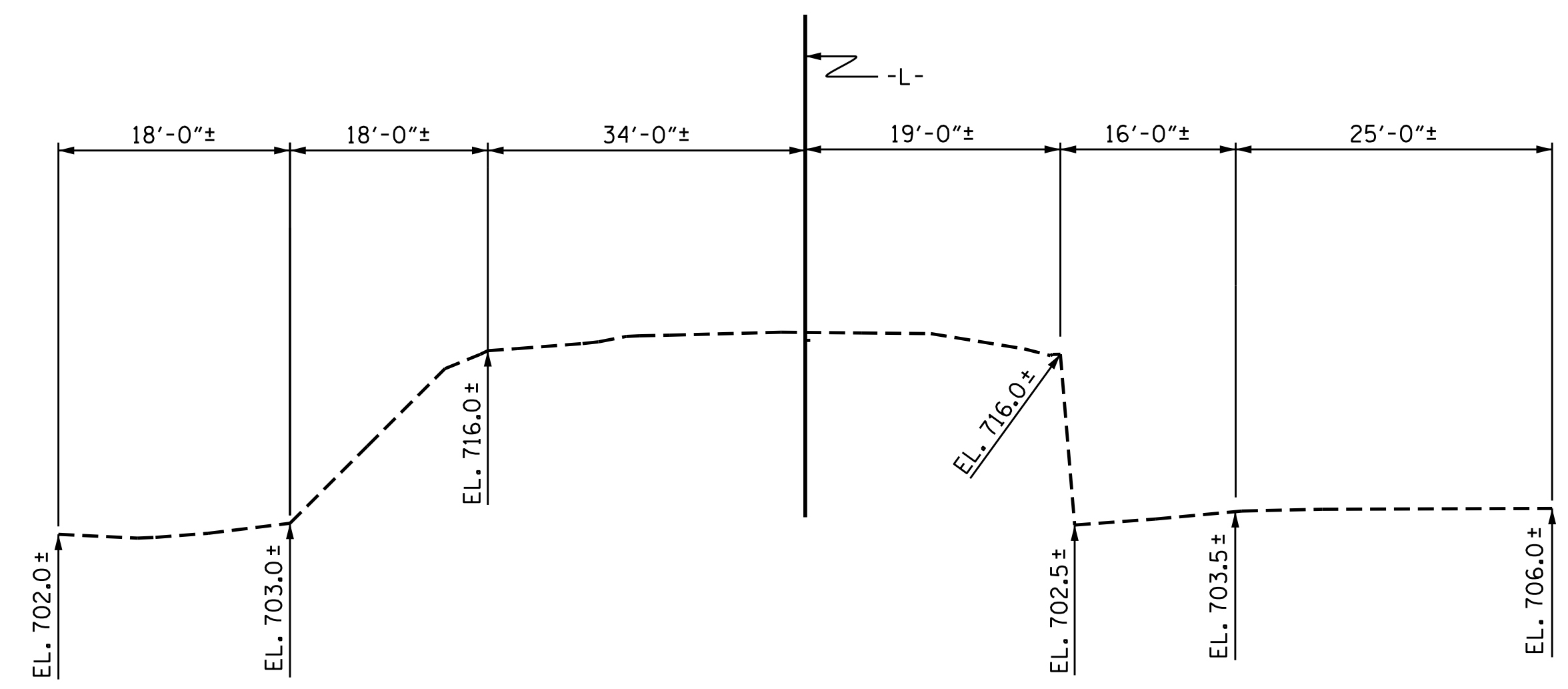
DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-5
1			3			TOTAL SHEETS
2			4			15

BM #12: RR SPIKE SET IN THE BASE OF 30" MAPLE,
42' RIGHT OF STA. 364+15.00 -BL-, EL. 754.47



LOCATION SKETCH



PROFILE ALONG CULVERT

ASSEMBLED BY : N.D. AIUTO DATE : 8/15/14
 CHECKED BY : M.E. GILES DATE : 8/28/14
 DESIGN ENGINEER OF RECORD : N.D. AIUTO DATE : 8/28/14

REVISED 11-13-91 BY E.L.R. CHECKED BY G.R.P.
 ADDED 8-22-89

ROADWAY DATA

GRADE POINT EL. @ STA. 349+71.00 -L-	= 718.12
BED ELEVATION @ STA. 349+71.00 -L-	= 702.60
ROADWAY SLOPES	= 2:1

HYDRAULIC DATA

DESIGN DISCHARGE	= 550 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 25 YRS.
DESIGN HIGH WATER ELEVATION	= 711.6
DRAINAGE AREA	= 0.87 SQ. MI.
BASE DISCHARGE (Q100)	= 850 C.F.S.
BASE HIGH WATER ELEVATION	= 715.8

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 973 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 100+ YRS.
OVERTOPPING FLOOD ELEVATION	= 718.1

TOTAL STRUCTURE QUANTITIES

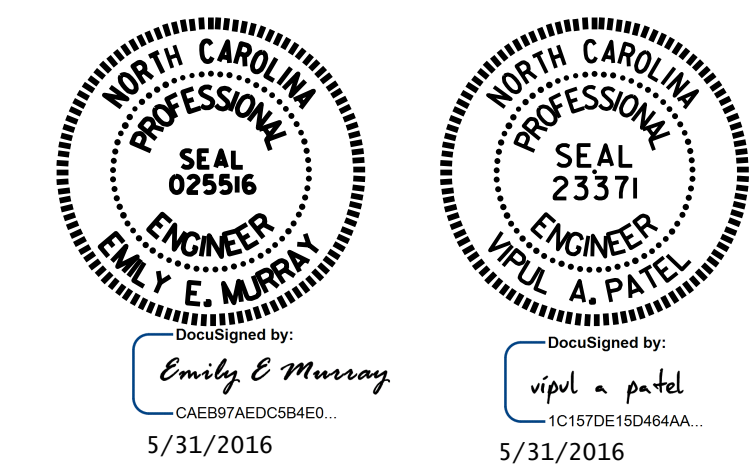
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	69 TONS
CLASS A CONCRETE	
BARREL @ 0.925 CY/FT	62.9 C.Y.
WINGS, ETC.	25.3 C.Y.
TOTAL	88.2 C.Y.
REINFORCING STEEL	
BARREL	10,139 LBS.
WINGS, ETC.	1,547 LBS.
TOTAL	11,686 LBS.
PLACEMENT OF NATURAL STREAM BED MATERIAL	LUMP SUM

NOTES

- ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
- DESIGN FILL = 7.56 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 CULVERTS TO BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
- THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
- AT THE CONTRACTORS OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- 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.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEMS, SEE EROSION CONTROL PLANS.
- FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
- FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.
- FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
- FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
- 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.
- NATURAL STREAM BED MATERIAL SHALL BE USED TO BACKFILL THE CULVERT BETWEEN THE SILLS. FOR PLACEMENT OF NATURAL STREAM BED MATERIAL, SEE SPECIAL PROVISIONS.
- THE COST FOR REMOVAL OF EXISTING 96" Ø CMP SHALL BE INCLUDED IN THE PAY ITEM FOR "CULVERT EXCAVATION".

PROJECT NO. W-5313
ROWAN COUNTY
 STATION: 349+71.00 -L-

SHEET 1 OF 5



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 BARREL STANDARD
 SINGLE 9 FT. X 8 FT.
 CONCRETE BOX CULVERT
 67° SKEW

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-6
1			3			TOTAL SHEETS
2			4			15

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

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	1.05	--	1.75	1.05	1	TOP SLAB	4.83	1.07	1	BOTTOM SLAB	0.84	
	HL-93 (OPERATING)	N/A		1.36	--	1.35	1.36	1	TOP SLAB	4.83	1.39	1	BOTTOM SLAB	0.84	
	HS-20 (INVENTORY)	36.000	②	1.38	49.84	1.75	1.46	1	TOP SLAB	4.83	1.38	1	BOTTOM SLAB	0.84	
	HS-20 (OPERATING)	36.000		1.79	64.61	1.35	1.89	1	TOP SLAB	4.83	1.79	1	BOTTOM SLAB	0.84	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		2.51	33.93	1.40	2.65	1	TOP SLAB	4.83	2.51	1	BOTTOM SLAB	0.84	
		SNGARBS2	20.000		2.35	47.04	1.40	2.48	1	TOP SLAB	4.83	2.35	1	BOTTOM SLAB	0.84
		SNAGRIS2	22.000		2.51	55.29	1.40	2.65	1	TOP SLAB	4.83	2.51	1	BOTTOM SLAB	0.84
		SNCOTTS3	27.250	③	1.31	35.69	1.40	1.31	1	TOP SLAB	4.83	1.34	1	BOTTOM SLAB	0.84
		SNAGGRS4	34.925		1.39	48.54	1.40	1.47	1	TOP SLAB	4.83	1.39	1	BOTTOM SLAB	0.84
		SNS5A	35.550		1.41	50.17	1.40	1.48	1	TOP SLAB	4.83	1.41	1	BOTTOM SLAB	0.84
		SNS6A	39.950		1.41	56.38	1.40	1.47	1	TOP SLAB	4.83	1.41	1	BOTTOM SLAB	0.84
		SNS7B	42.000		1.41	59.27	1.40	1.47	1	TOP SLAB	4.83	1.41	1	BOTTOM SLAB	0.84
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.32	76.63	1.40	2.65	1	TOP SLAB	4.83	2.32	1	BOTTOM SLAB	0.84
		TNT4A	33.075		1.56	51.49	1.40	1.56	1	TOP SLAB	4.83	1.60	1	BOTTOM SLAB	0.84
		TNT6A	41.600		1.37	56.95	1.40	1.44	1	TOP SLAB	4.83	1.37	1	BOTTOM SLAB	0.84
		TNT7A	42.000		1.50	63.16	1.40	1.56	1	TOP SLAB	4.83	1.50	1	BOTTOM SLAB	8.82
		TNT7B	42.000		1.41	59.27	1.40	1.48	1	TOP SLAB	4.83	1.41	1	BOTTOM SLAB	0.84
		TNAGRIT4	43.000		1.49	63.93	1.40	1.49	1	TOP SLAB	4.83	1.52	1	BOTTOM SLAB	0.84
TNAGT5A	45.000		1.52	68.44	1.40	1.52	1	TOP SLAB	4.83	1.54	1	BOTTOM SLAB	0.84		
TNAGT5B	45.000		1.56	70.06	1.40	1.56	1	TOP SLAB	4.83	1.60	1	BOTTOM SLAB	0.84		

LOAD FACTORS:

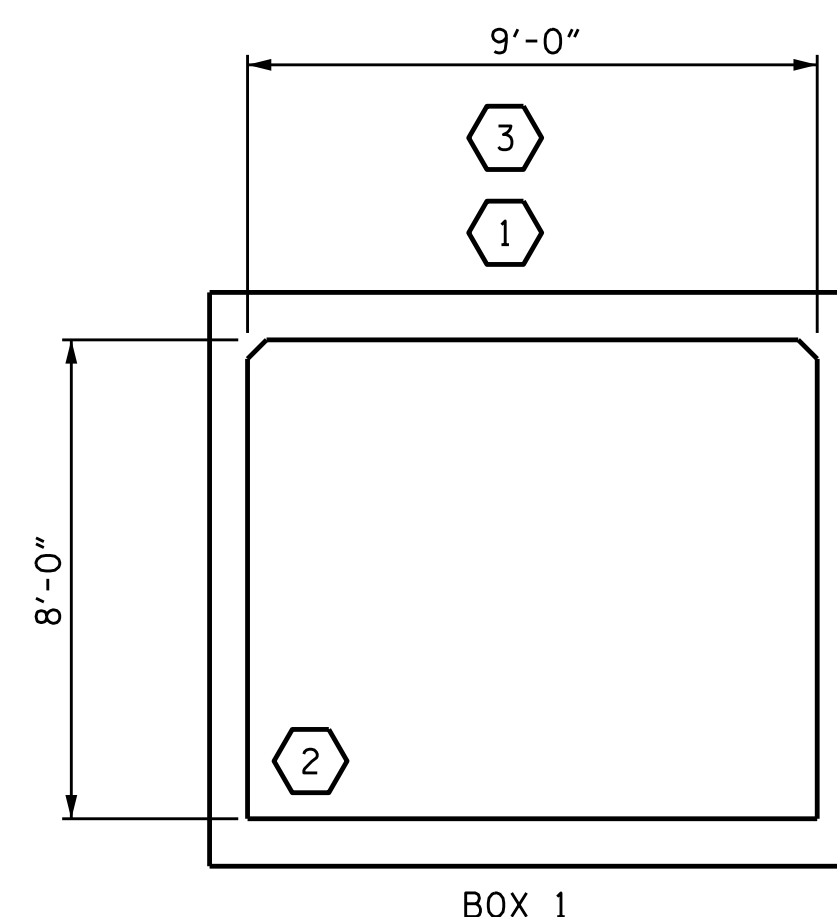
DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

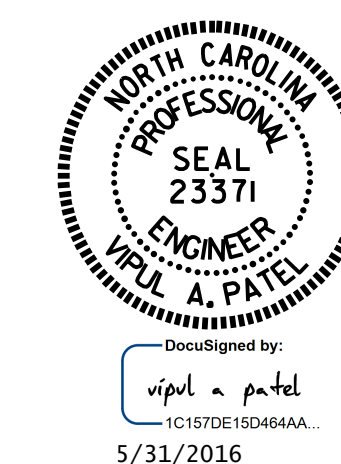
③	CONTROLLING LOAD RATING
①	DESIGN LOAD RATING (HL-93)
②	DESIGN LOAD RATING (HS-20)
③	LEGAL LOAD RATING **
** SEE CHART FOR VEHICLE TYPE	



LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. W-5313
ROWAN COUNTY
STATION: 349+71.00 -L-

SHEET 2 OF 5



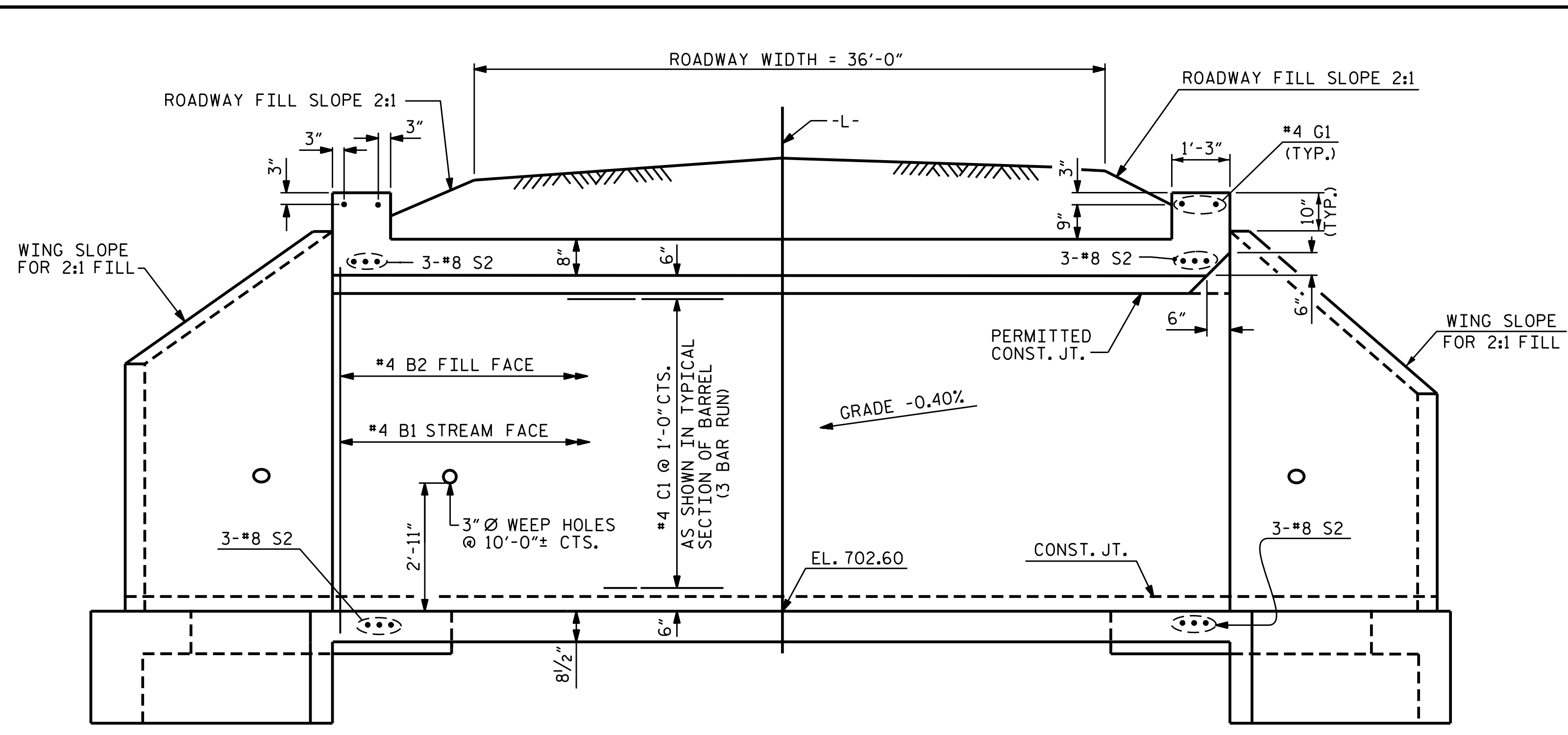
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
STANDARD
LRFR SUMMARY FOR
REINFORCED CONCRETE
BOX CULVERT
(NON-INTERSTATE TRAFFIC)

ASSEMBLED BY : N.D. AIUTO	DATE : 8/11/14
CHECKED BY : M.E. GILES	DATE : 8/28/14
DRAWN BY : WMC	7/11
CHECKED BY : GM	7/11

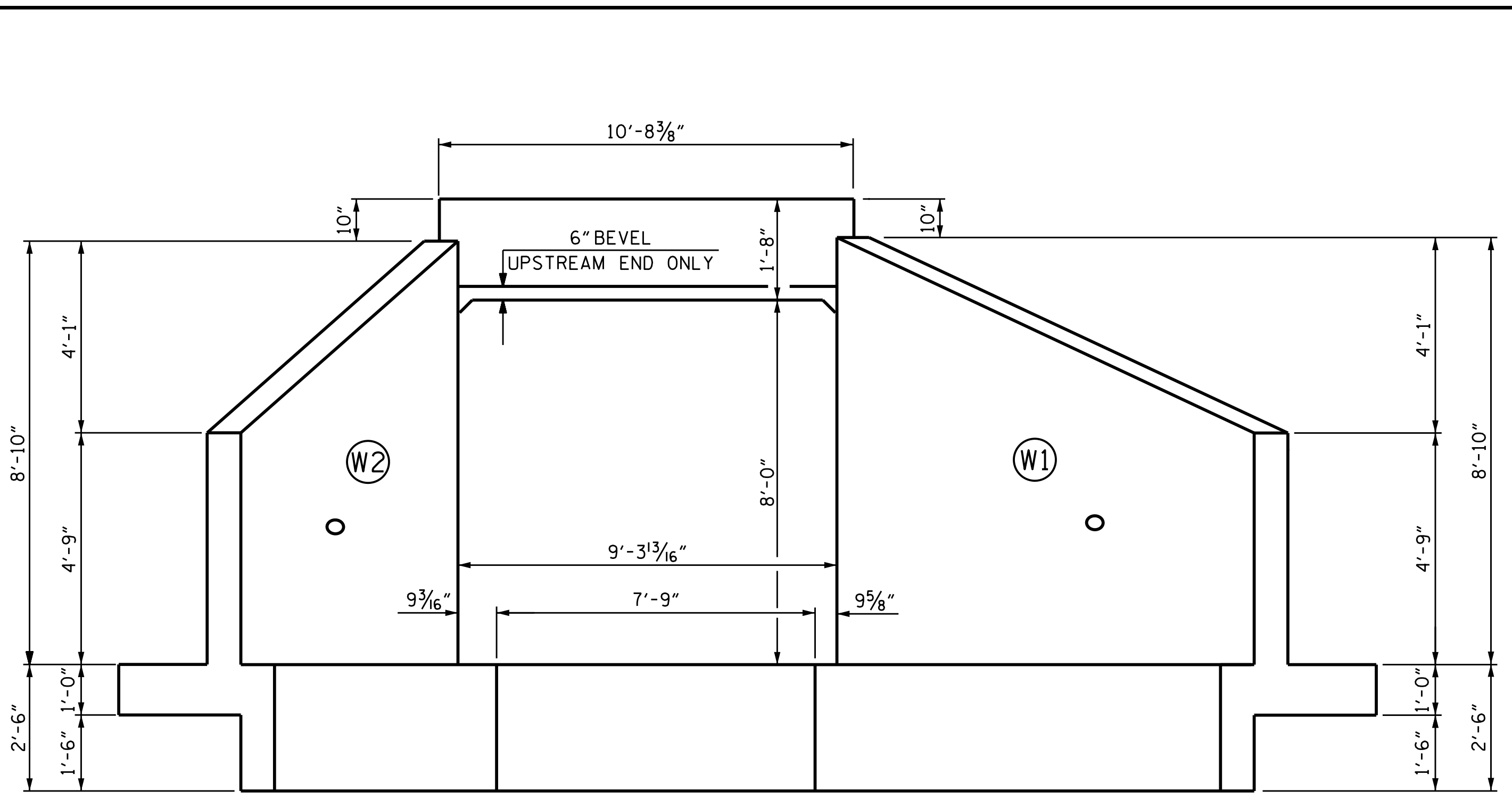
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-7
1			3			TOTAL SHEETS
2			4			15

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

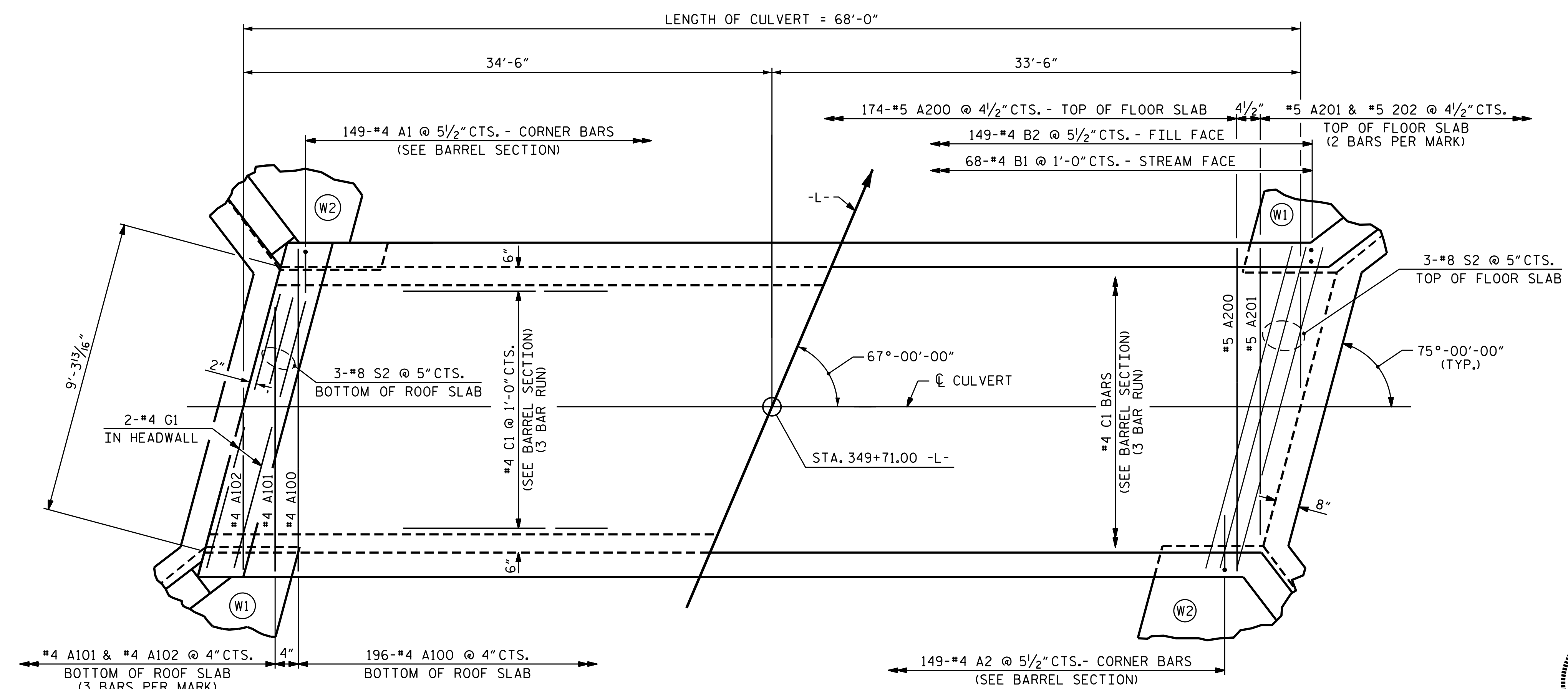
CUL. #2 STD. NO. LRFR5



CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION NORMAL TO SKEW



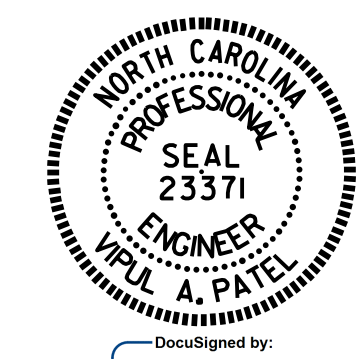
PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

PROJECT NO. W-5313
ROWAN COUNTY
 STATION: 349+71.00 -L-

SHEET 3 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 BARREL STANDARD
 SINGLE 9 FT. X 8 FT.
 CONCRETE BOX CULVERT
 67° SKEW

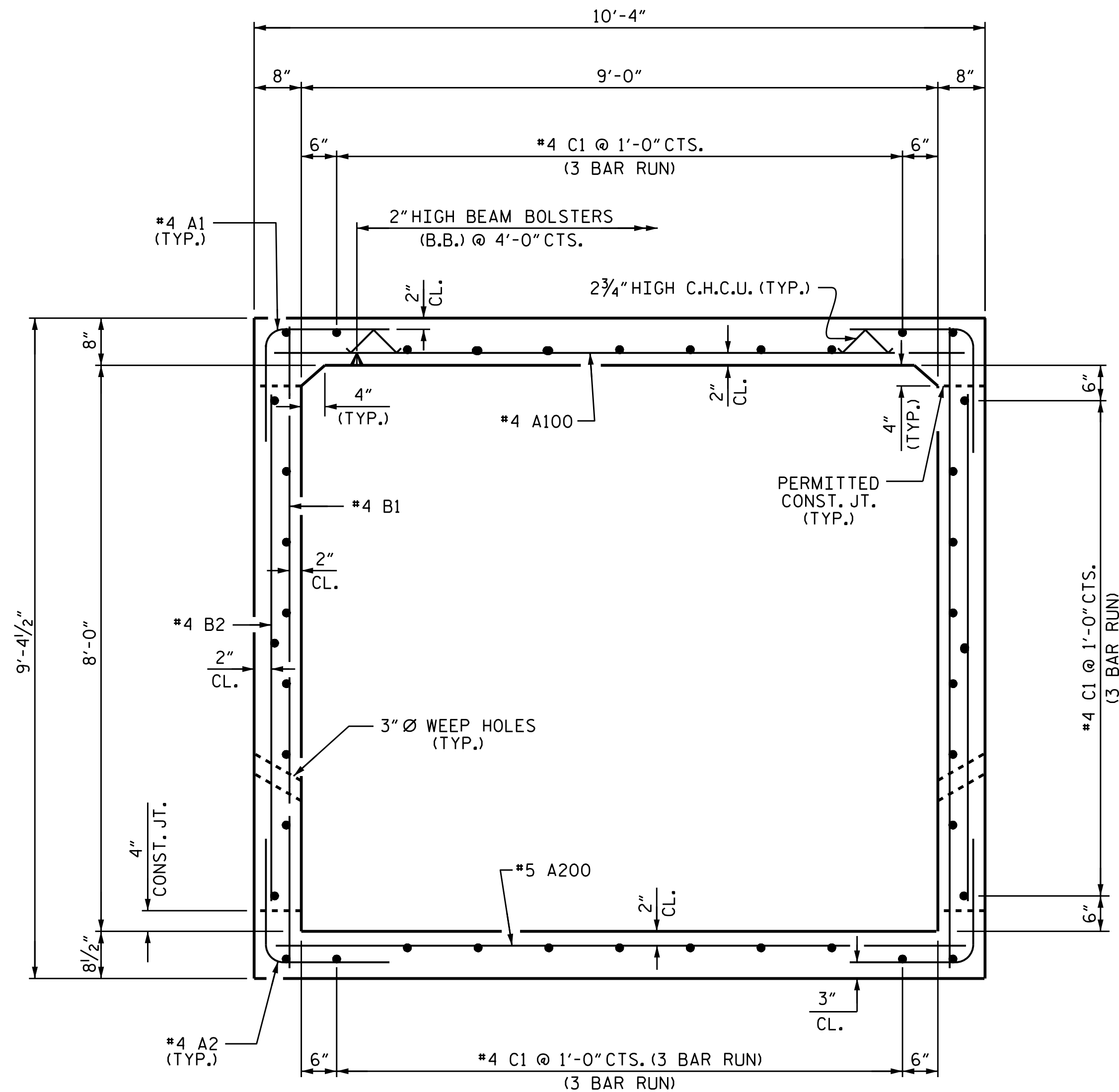


DocuSigned by:
 vipul a patel
 1C157DE1ED464AA...
 5/31/2016

ASSEMBLED BY: N.D.AIUTO DATE: 8/15/14
 CHECKED BY: M.E.GILES DATE: 8/28/14
 DESIGN ENGINEER OF RECORD: N.D.AIUTO DATE: 8/28/14

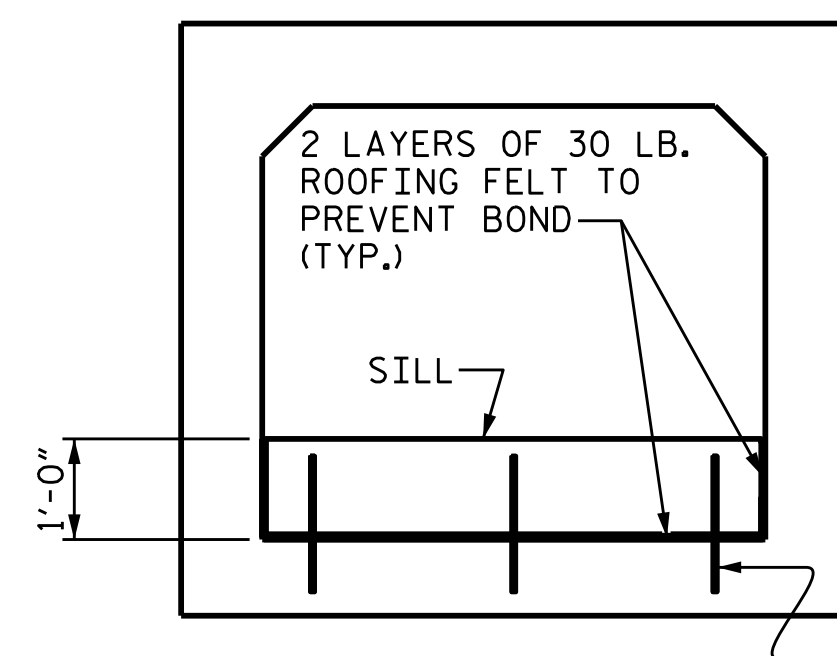
DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-8
1			3			TOTAL SHEETS
2			4			15

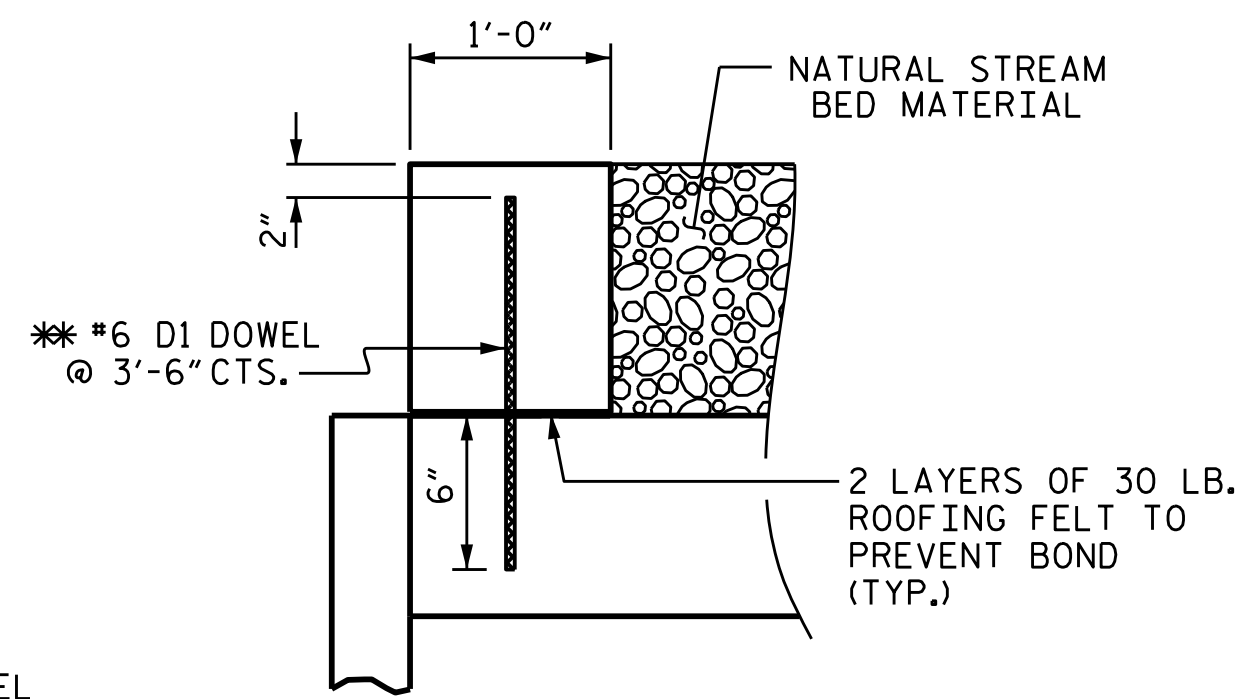


RIGHT ANGLE SECTION OF BARREL

THERE ARE 40 C1 BARS IN SECTION OF BARREL



ELEVATION



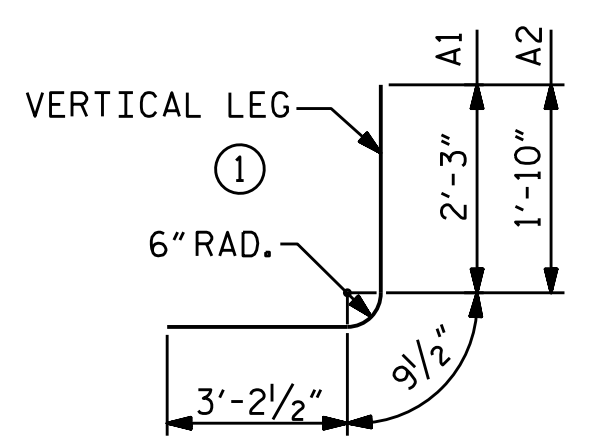
SECTION THROUGH SILL

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

SILL DETAILS

(SILLS ARE LOCATED AT UPSTREAM AND DOWNSTREAM ENDS ALONG SKEW)

BAR TYPE



BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

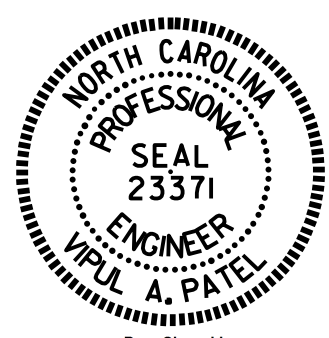
BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	298	#4	1	6'-3"	1244
A2	298	#4	1	5'-10"	1161
A100	196	#4	STR	9'-11"	1298
A101	6	#4	STR	5'-9"	23
A102	6	#4	STR	2'-0"	8
A200	174	#5	STR	9'-11"	1800
A201	4	#5	STR	7'-1"	30
A202	4	#5	STR	4'-3"	18
B1	136	#4	STR	8'-10"	802
B2	298	#4	STR	7'-4"	1460
C1	120	#4	STR	24'-0"	1924
D1	6	#6	STR	1'-4"	12
G1	4	#4	STR	10'-4"	28
S2	12	#8	STR	10'-4"	331
REINFORCING STEEL				LBS.	10,139

SPLICE LENGTH CHART

BAR NO.	NO.	SPLICE LENGTH
B1	#4	1'-5"
C1	#4	1'-11"

PROJECT NO. W-5313
ROWAN COUNTY
 STATION: 349+71.00 -L-

SHEET 4 OF 5



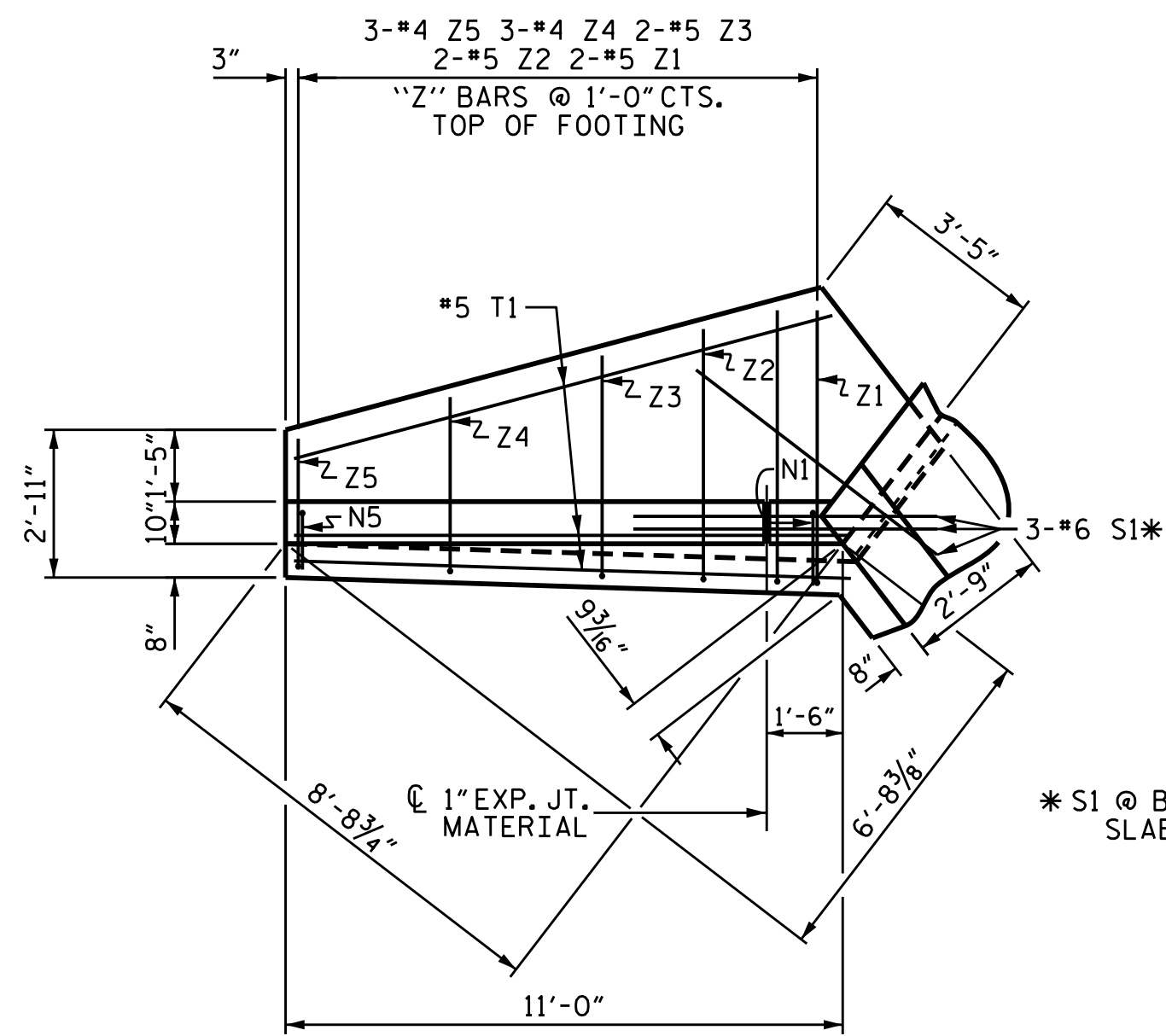
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**SINGLE 9 FT. X 8 FT.
 CONCRETE BOX CULVERT**

67° SKEW

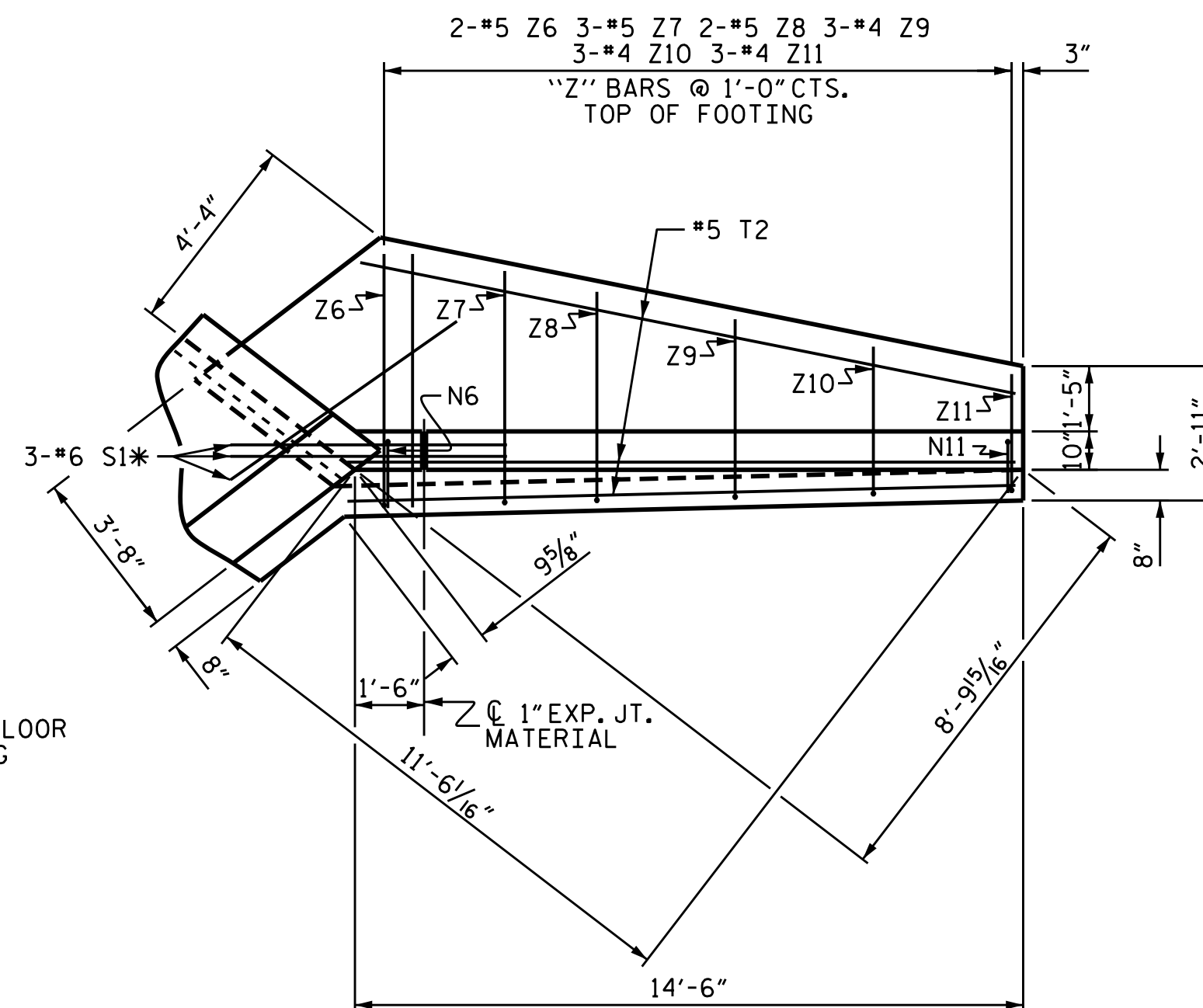
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-9
1			3			TOTAL SHEETS
2			4			15

DRAWN BY : N.D'AIUTO DATE : 8/15/14
 CHECKED BY : M.E.GILES DATE : 8/27/14
 DESIGN ENGINEER OF RECORD: N.D'AIUTO DATE : 8/27/15

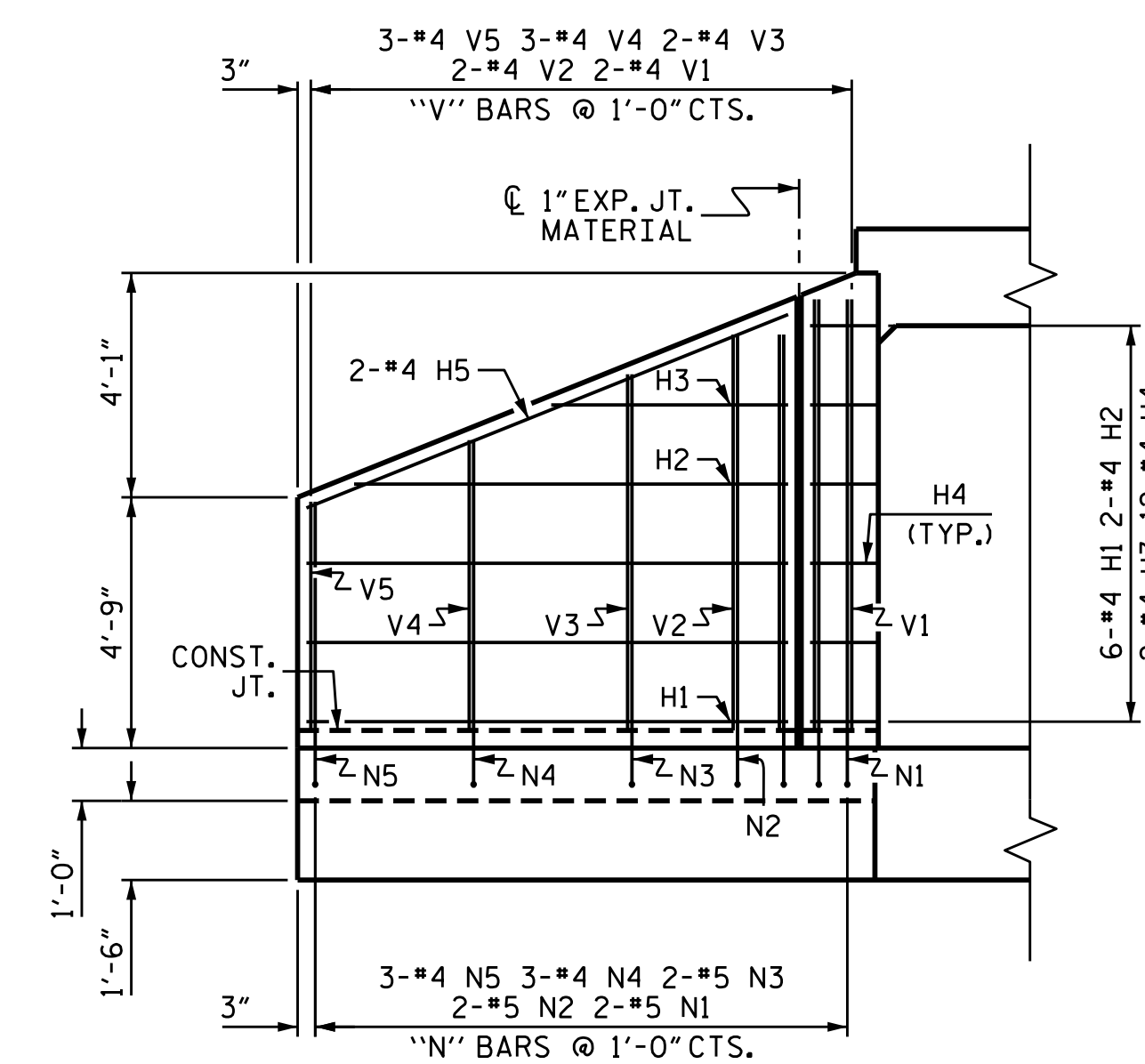
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



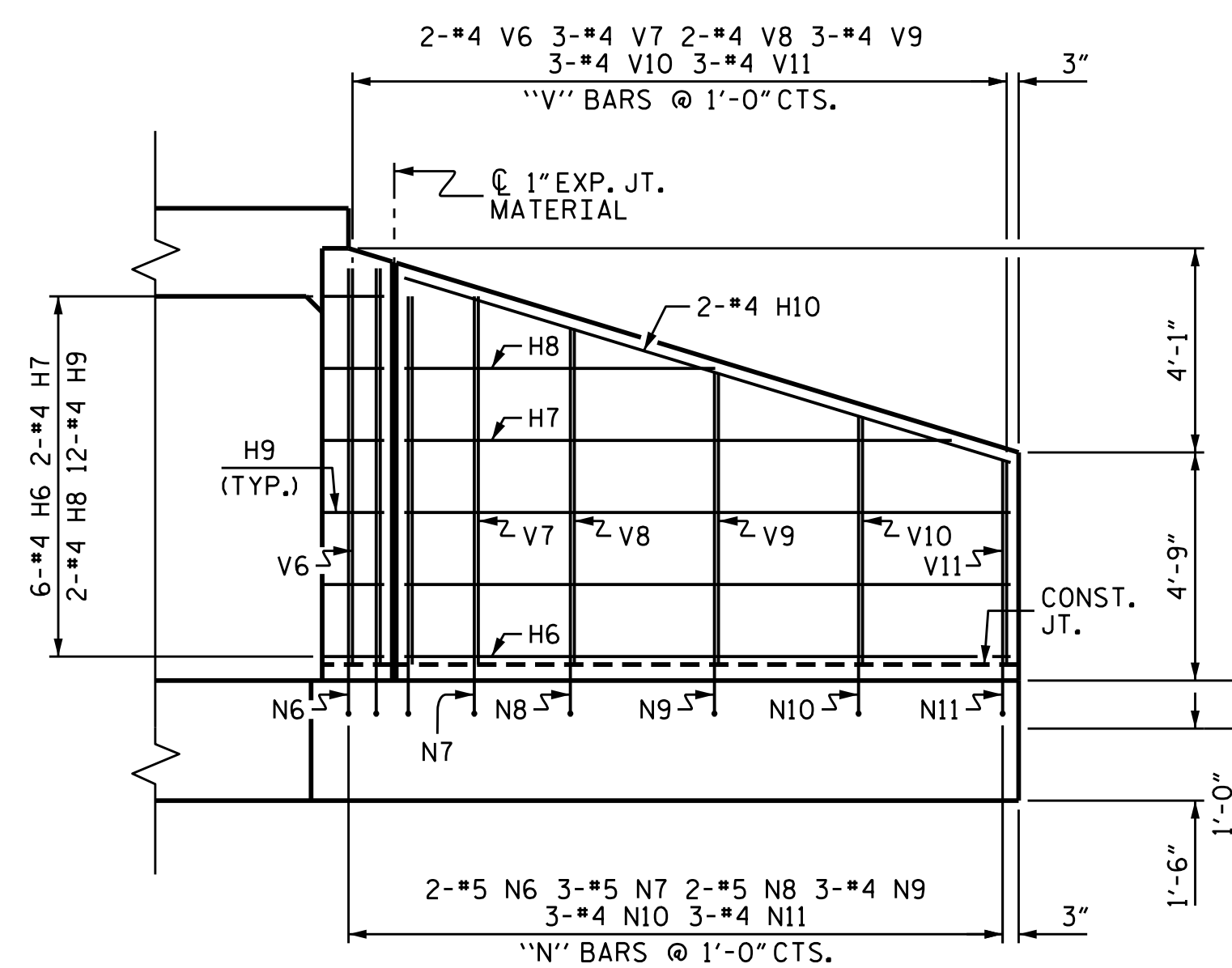
PLAN W2



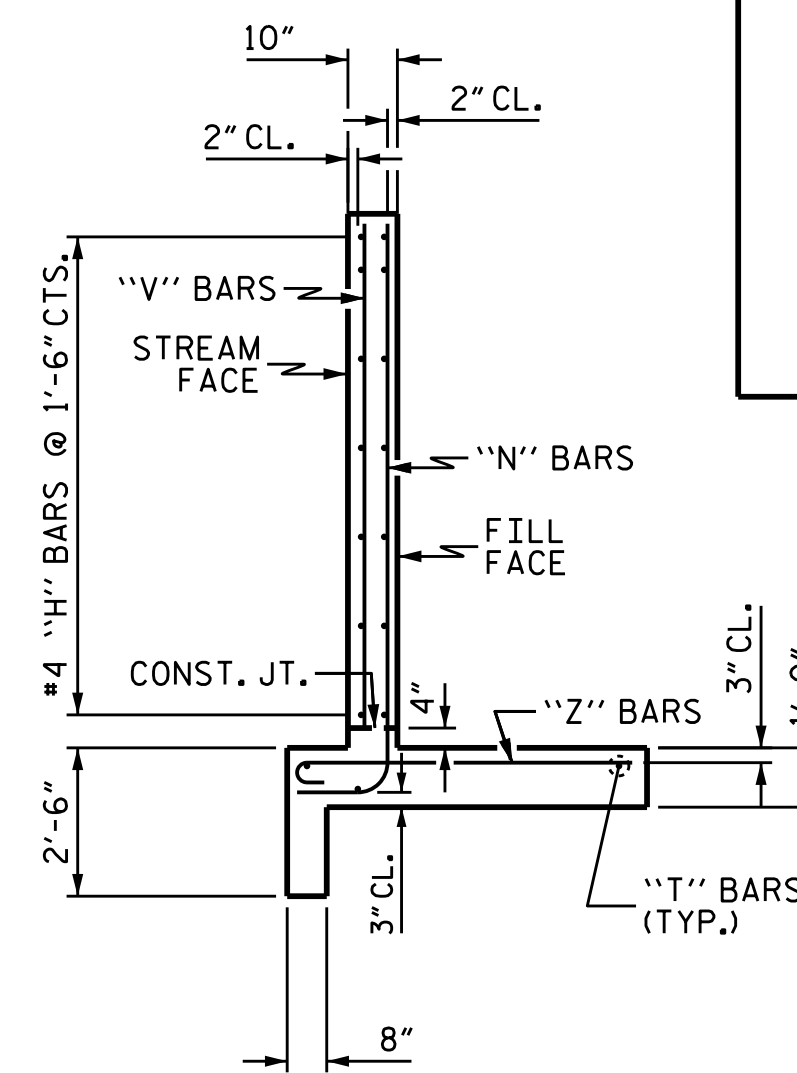
PLAN W1



ELEVATION W2



ELEVATION W1



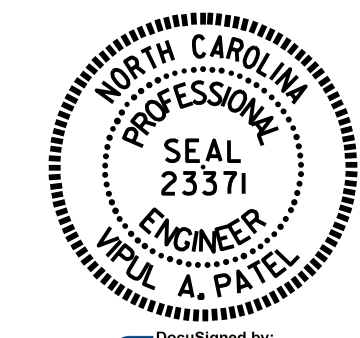
TYPICAL WING SECTION

BAR TYPES		BILL OF MATERIAL				
	H1	12	#4	STR	9'-1"	73
	H2	4	#4	STR	8'-2"	22
	H3	4	#4	STR	4'-5"	12
	H4	24	#4	1	3'-3"	52
	H5	4	#4	STR	9'-10"	26
	H6	12	#4	STR	12'-7"	101
	H7	4	#4	STR	11'-4"	30
	H8	4	#4	STR	6'-5"	17
	H9	24	#4	2	3'-3"	52
	H10	4	#4	STR	13'-2"	35
	N1	4	#5	3	10'-2"	42
	N2	4	#5	3	9'-7"	40
	N3	4	#5	3	8'-9"	37
	N4	6	#4	3	7'-7"	30
	N5	6	#4	3	6'-4"	25
	N6	4	#5	3	10'-3"	43
	N7	6	#5	3	9'-8"	60
	N8	4	#5	3	9'-1"	38
	N9	6	#4	3	8'-2"	33
	N10	6	#4	3	7'-3"	29
	N11	6	#4	3	6'-4"	25
	S1	12	#6	STR	6'-0"	108
	T1	6	#5	STR	11'-0"	69
	T2	6	#5	STR	14'-6"	91
	V1	4	#4	STR	8'-2"	22
	V2	4	#4	STR	7'-6"	20
	V3	4	#4	STR	6'-9"	18
	V4	6	#4	STR	5'-6"	22
	V5	6	#4	STR	4'-4"	17
	V6	4	#4	STR	8'-3"	22
	V7	6	#4	STR	7'-8"	31
	V8	4	#4	STR	7'-0"	19
V9	6	#4	STR	6'-1"	24	
V10	6	#4	STR	5'-2"	21	
V11	6	#4	STR	4'-3"	17	
	Z1	4	#5	4	6'-0"	25
	Z2	4	#5	4	5'-7"	23
	Z3	4	#5	4	5'-0"	21
	Z4	6	#4	4	4'-0"	16
	Z5	6	#4	4	3'-1"	12
	Z6	4	#5	4	6'-1"	25
	Z7	6	#5	4	5'-8"	35
	Z8	4	#5	4	5'-2"	22
	Z9	6	#4	4	4'-5"	18
	Z10	6	#4	4	3'-9"	15
	Z11	6	#4	4	3'-1"	12
REINFORCING STEEL FOR 4 WINGS				LBS.		1,547
CLASS A CONCRETE						
4 WINGS			C.Y.			22.6
2 HEADWALLS			C.Y.			1.0
2 END CURTAIN WALLS			C.Y.			1.0
2 SILLS			C.Y.			0.7
TOTAL			C.Y.			25.3

BAR DIMENSIONS ARE OUT TO OUT.

PROJECT NO. W-5313
 ROWAN COUNTY
 STATION: 349+71.00 -L-

SHEET 5 OF 5
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STANDARD WINGS
 FOR
 CONCRETE BOX CULVERT
 H = 8'-0" SLOPE = 2:1
 75° SKEW



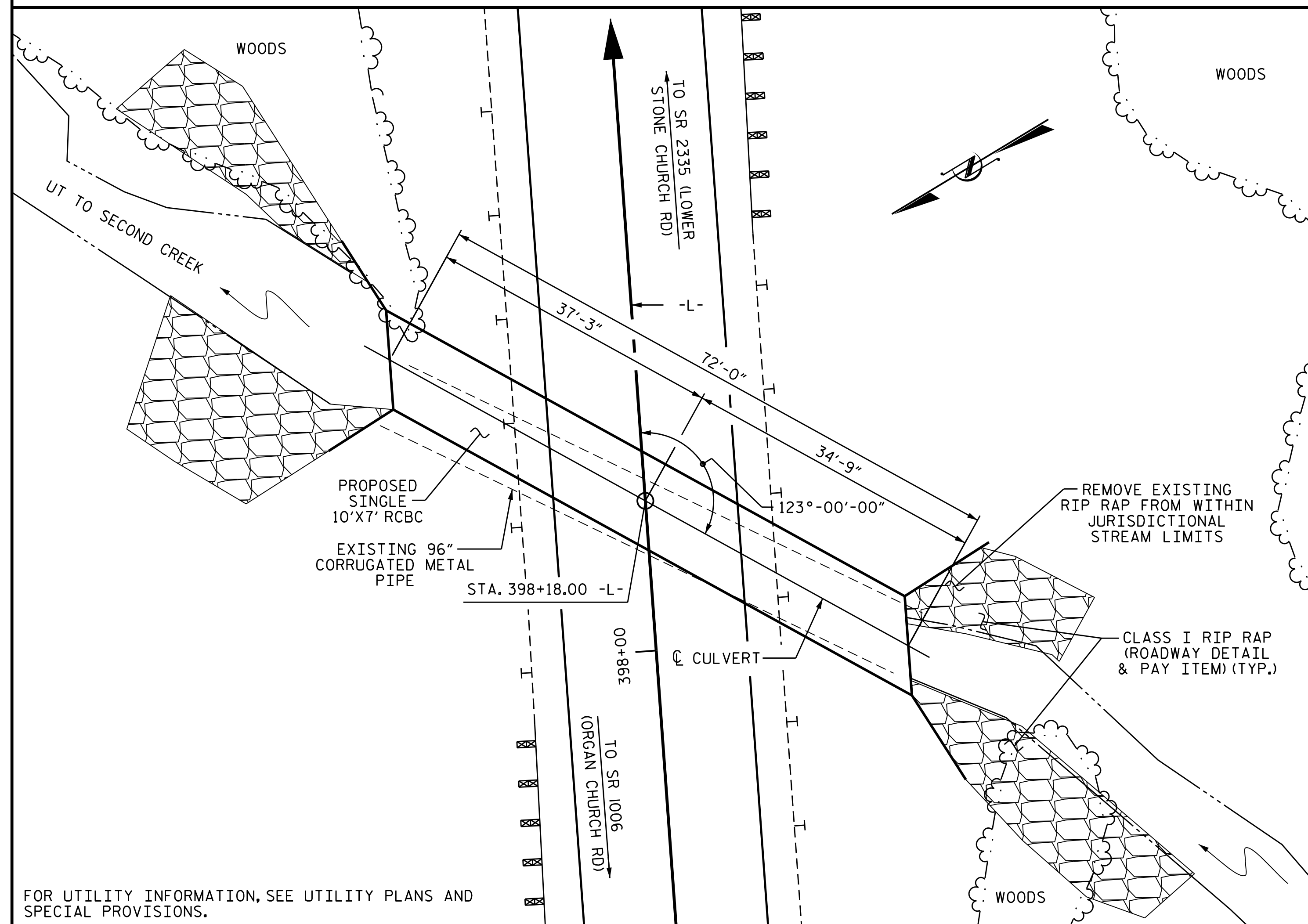
ASSEMBLED BY : N.D. AIUTO DATE : 8/8/14
 CHECKED BY : M.E. GILES DATE : 8/27/14
 DRAWN BY : CCG 01/00
 CHECKED BY : RWW 03/00

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

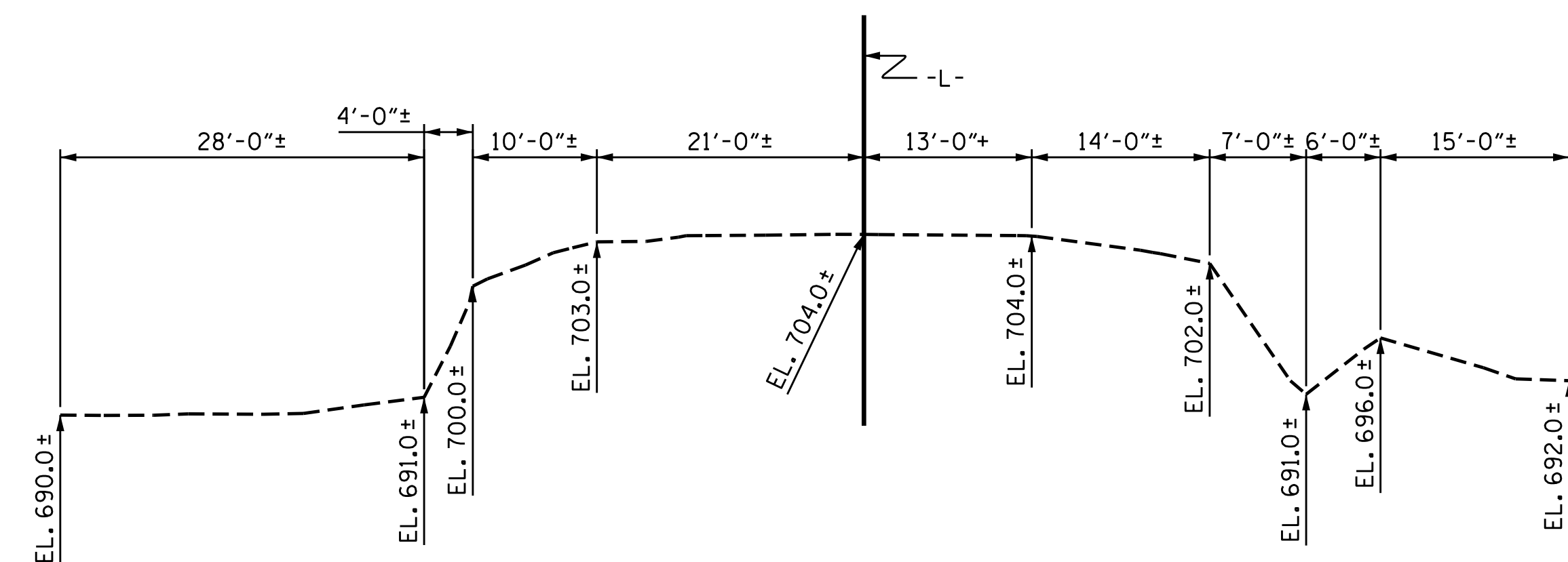
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-10
1			3			TOTAL SHEETS
2			4			15

BM #13: RR SPIKE SET IN BASE OF 36" OAK, 109' LEFT OF STA. 391+79.00 -BL-, EL. 735.76

F.A. PROJECT NO. STP-1221(15)



LOCATION SKETCH



PROFILE ALONG CULVERT

ROADWAY DATA

GRADE PT. EL. @ STA. 398+18.00 -L-	= 704.73
BED EL. @ STA. 398+18.00 -L-	= 690.65
ROADWAY SLOPES	= 2:1

HYDRAULIC DATA

DESIGN DISCHARGE	= 550 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 25 YRS.
DESIGN HIGH WATER ELEVATION	= 699.3
DRAINAGE AREA	= 0.99 SQ.MI.
BASE DISCHARGE (Q100)	= 900 C.F.S.
BASE HIGH WATER ELEVATION	= 704.8

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 881 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 100± YRS.
OVERTOPPING HIGH WATER ELEVATION	= 704.6

TOTAL STRUCTURE QUANTITIES

CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	78 TONS
CLASS A CONCRETE	
BARREL @ 0.944 CY/FT	68.0 C.Y.
WINGS, ETC.	23.2 C.Y.
TOTAL	91.2 C.Y.
REINFORCING STEEL	
BARREL	11,620 LBS.
WINGS, ETC.	1,321 LBS.
TOTAL	12,941 LBS.
PLACEMENT OF NATURAL STREAM BED MATERIAL	LUMP SUM

NOTES

- ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
- DESIGN FILL = 7.21 FT.
- FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTE SHEET.
- 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN CULVERT TO BE POURED IN THE FOLLOWING ORDER
- 1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
- 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
- THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
- AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE BARS FROM WHICH THE SAMPLES ARE TAKEN MUST THEN BE SPLICED WITH REPLACEMENT BARS OF THE SIZE AND LENGTH OF THE SAMPLE, PLUS A MINIMUM LAP SPLICE OF THIRTY BAR DIAMETERS. PAYMENT FOR THE SAMPLES OF REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEMS, SEE EROSION CONTROL PLANS.
- FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
- FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.
- FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
- FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
- 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.
- NATURAL STREAM BED MATERIAL SHALL BE USED TO BACKFILL THE CULVERT BETWEEN THE SILLS. FOR PLACEMENT OF NATURAL STREAM BED MATERIAL, SEE SPECIAL PROVISIONS.
- THE COST FOR REMOVAL OF EXISTING 96" Ø CMP SHALL BE INCLUDED IN THE PAY ITEM FOR "CULVERT EXCAVATION".

PROJECT NO. W-5313
ROWAN COUNTY
 STATION: 398+18.00 -L-

SHEET 1 OF 5



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 BARREL STANDARD
 SINGLE 10 FT. X 7 FT.
 CONCRETE BOX CULVERT
 123° SKEW

DRAWN BY : M.E. GILES DATE : 8/26/14
 CHECKED BY : N.D. AIUTO DATE : 10/2/14
 DESIGN ENGINEER OF RECORD: M.E. GILES DATE : 10/2/14

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-11
1			3			TOTAL SHEETS
2			4			15

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

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	1.08	--	1.75	1.08	1	TOP SLAB	5.33	1.17	1	BOTTOM SLAB	0.87		
	HL-93 (OPERATING)	N/A		1.40	--	1.35	1.4	1	TOP SLAB	5.33	1.52	1	BOTTOM SLAB	0.87		
	HS-20 (INVENTORY)	36.000	2	1.49	53.53	1.75	1.49	1	TOP SLAB	5.33	1.56	1	TOP SLAB	0.81		
	HS-20 (OPERATING)	36.000		1.93	69.40	1.35	1.93	1	TOP SLAB	5.33	2.02	1	TOP SLAB	0.81		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		2.70	36.40	1.40	2.70	1	TOP SLAB	5.33	2.83	1	TOP SLAB	0.81		
		SNGARBS2	20.000	2.53	50.58	1.40	2.53	1	TOP SLAB	5.33	2.64	1	TOP SLAB	0.81		
		SNAGRIS2	22.000	2.70	59.31	1.40	2.70	1	TOP SLAB	5.33	2.83	1	TOP SLAB	0.81		
		SNCOTTS3	27.250	3	1.34	36.68	1.40	1.34	1	TOP SLAB	5.33	1.47	1	BOTTOM SLAB	0.87	
		SNAGGRS4	34.925	1.54	53.64	1.40	1.54	1	TOP SLAB	5.33	1.55	1	BOTTOM SLAB	0.87		
		SNS5A	35.550	1.51	53.75	1.40	1.51	1	TOP SLAB	5.33	1.56	1	BOTTOM SLAB	0.87		
		SNS6A	39.950	1.51	60.40	1.40	1.51	1	TOP SLAB	5.33	1.56	1	BOTTOM SLAB	0.87		
		SNS7B	42.000	1.51	63.50	1.40	1.51	1	TOP SLAB	5.33	1.56	1	BOTTOM SLAB	0.87		
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000	2.51	82.67	1.40	2.51	1	TOP SLAB	7.52	2.51	1	BOTTOM SLAB	0.87		
		TNT4A	33.075	1.60	52.96	1.40	1.60	1	TOP SLAB	5.33	1.74	1	BOTTOM SLAB	0.81		
		TNT6A	41.600	1.49	61.94	1.40	1.49	1	TOP SLAB	5.33	1.53	1	BOTTOM SLAB	0.87		
		TNT7A	42.000	1.57	65.74	1.40	1.57	1	TOP SLAB	5.33	1.65	1	BOTTOM SLAB	0.87		
		TNT7B	42.000	1.51	63.50	1.40	1.51	1	TOP SLAB	5.33	1.57	1	BOTTOM SLAB	0.87		
		TNAGRIT4	43.000	1.53	65.63	1.40	1.53	1	TOP SLAB	5.33	1.66	1	BOTTOM SLAB	0.87		
		TNAGT5A	45.000	1.56	70.22	1.40	1.56	1	TOP SLAB	5.33	1.70	1	TOP SLAB	0.81		
		TNAGT5B	45.000	1.60	72.05	1.40	1.60	1	TOP SLAB	5.33	1.74	1	BOTTOM SLAB	0.87		

LOAD FACTORS:

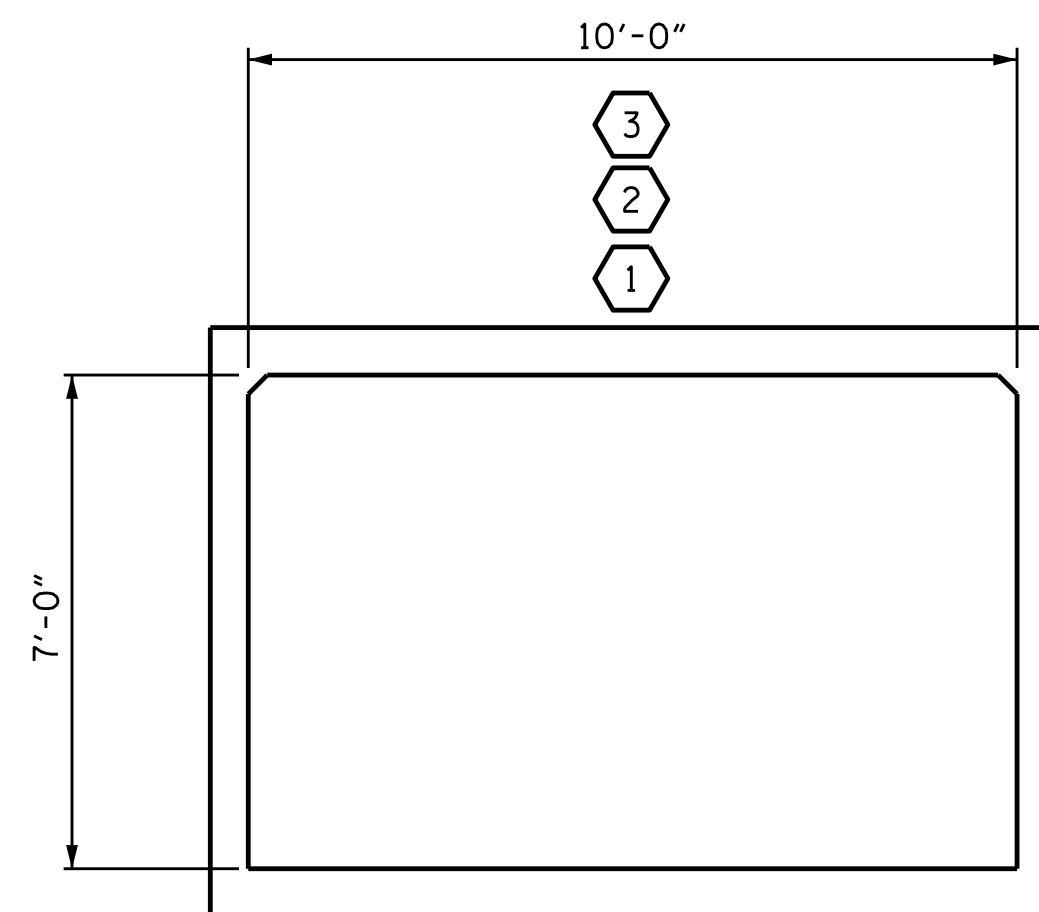
DESIGN LOAD RATING FACTORS

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	

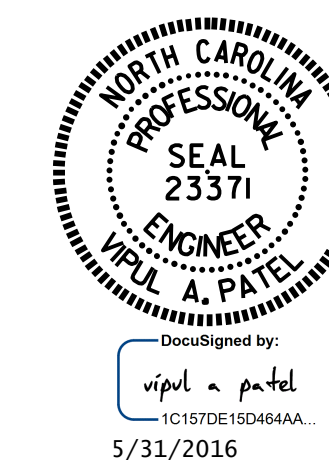


LRFR SUMMARY

(LOOKING DOWNSTREAM)

PROJECT NO. W-5313
ROWAN COUNTY
 STATION: 398+18.00 -L-

SHEET 2 OF 5



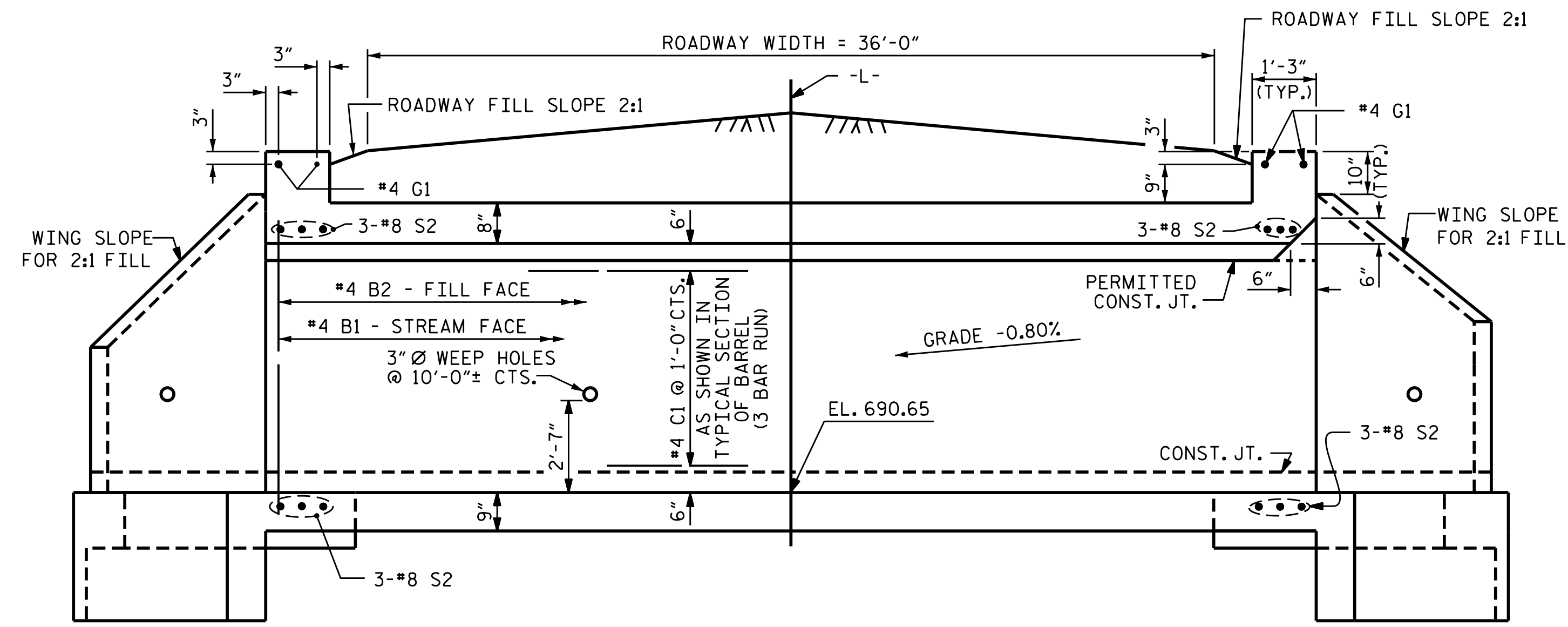
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STANDARD
 LRFR SUMMARY FOR
 REINFORCED CONCRETE
 BOX CULVERT
 (NON-INTERSTATE TRAFFIC)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-12
1			3			TOTAL SHEETS 15
2			4			

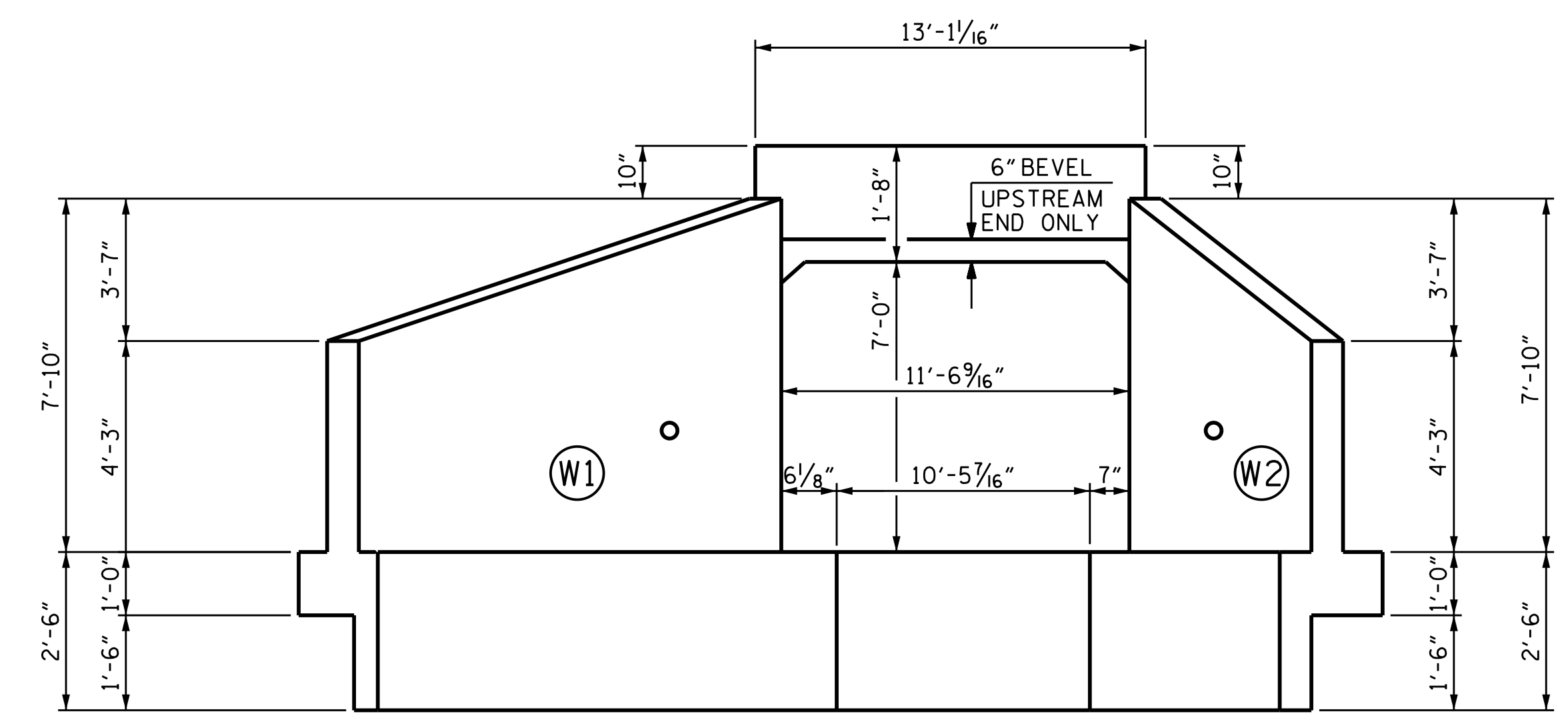
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 SIGNATURES COMPLETED

CUL. #3 STD. NO. LRFR5

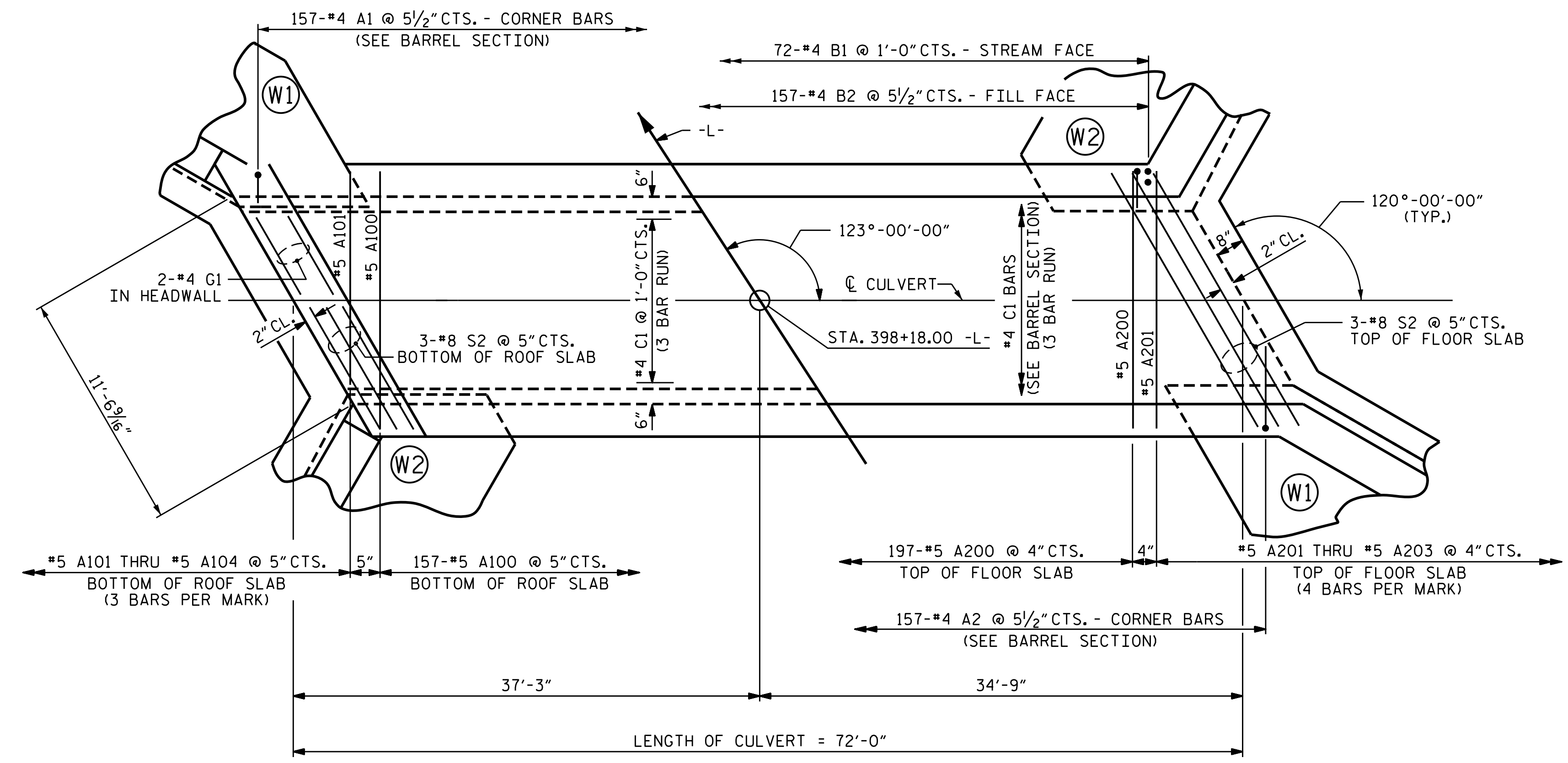
ASSEMBLED BY : M.E.GILES	DATE : 10/1/14
CHECKED BY : N.D'AUTO	DATE : 10/2/14
DRAWN BY : WMC	7/11
CHECKED BY : GM	7/11
REV. 10/1/11	MAA/GM



CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION NORMAL TO SKEW

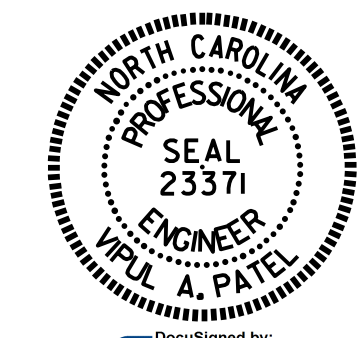


PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

PROJECT NO. W-5313
ROWAN COUNTY
 STATION: 398+18.00 -L-

SHEET 3 OF 5

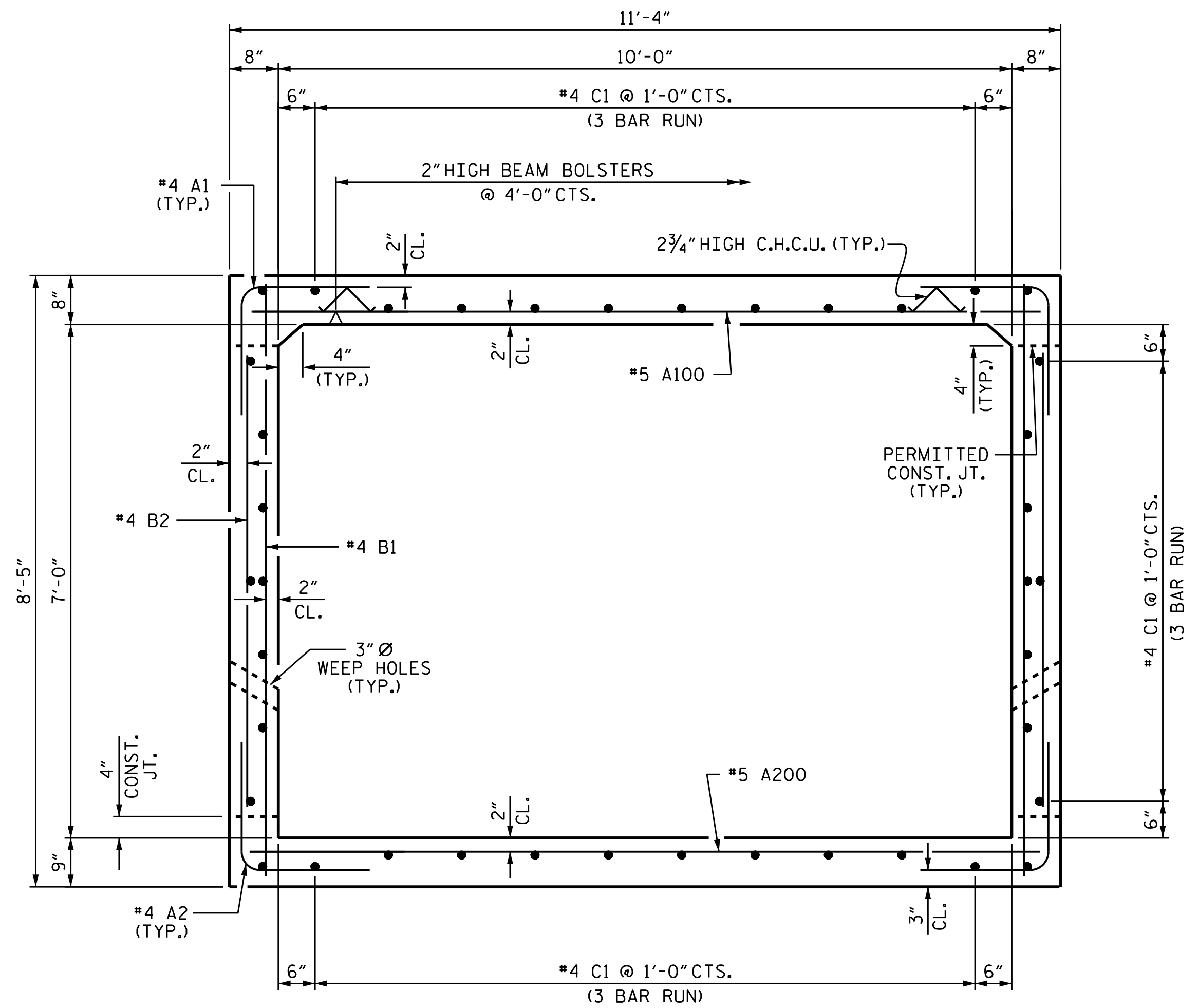


STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 BARREL STANDARD
 SINGLE 10 FT. X 7 FT.
 CONCRETE BOX CULVERT
 123° SKEW

ASSEMBLED BY : <u>M.E.GILES</u> DATE : <u>8/25/14</u>	SPECIAL
CHECKED BY : <u>N.D'AIUTO</u> DATE : <u>10/2/14</u>	
DRAWN BY : <u>J.W. ROUSE</u> DATE : <u>SEPT. 1989</u>	STANDARD
CHECKED BY : <u>A.R. BISSETTE</u> DATE : <u>AUG. 1989</u>	

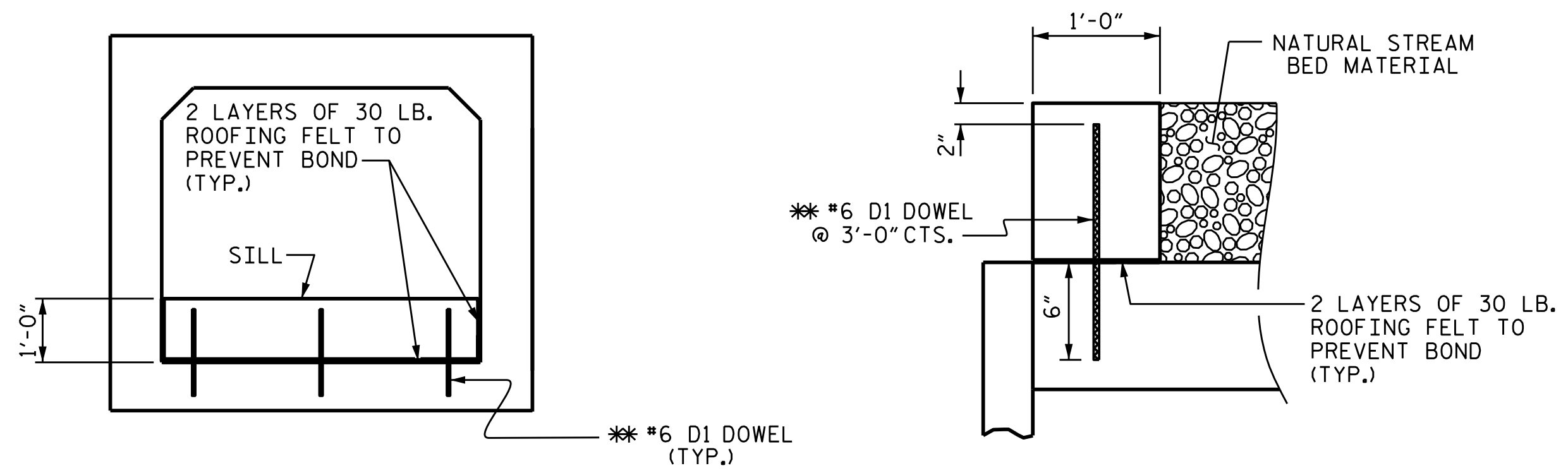
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 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-13	
1		3				TOTAL SHEETS	
2		4				15	



RIGHT ANGLE SECTION OF BARREL

THERE ARE 40 C1 BARS IN SECTION OF BARREL



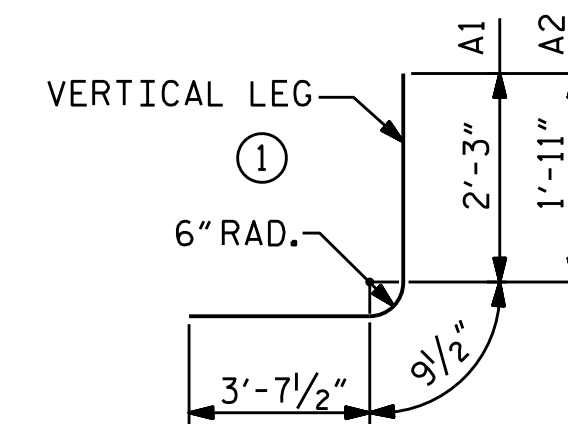
ELEVATION

SECTION THROUGH SILL

SILL DETAILS

(SILLS ARE LOCATED AT UPSTREAM AND DOWNSTREAM ENDS ALONG SKEW)

BAR TYPE



BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	314	#4	1	6'-8"	1398
A2	314	#4	1	6'-4"	1328
A100	157	#5	STR	10'-11"	1788
A101	6	#5	STR	8'-8"	54
A102	6	#5	STR	6'-6"	41
A103	6	#5	STR	4'-4"	27
A104	6	#5	STR	2'-2"	14
A200	197	#5	STR	10'-11"	2243
A201	8	#5	STR	8'-6"	71
A202	8	#5	STR	6'-2"	51
A203	8	#5	STR	3'-10"	32
B1	144	#4	STR	7'-11"	762
B2	314	#4	STR	6'-4"	1328
C1	120	#4	STR	25'-4"	2031
D1	6	#6	STR	1'-4"	12
G1	4	#4	STR	12'-8"	34
S2	12	#8	STR	12'-8"	406
REINFORCING STEEL				LBS.	11,620

SPLICE LENGTH CHART

BAR	NO.	SPLICE LENGTH
B1	#4	1'-5"
C1	#4	1'-11"

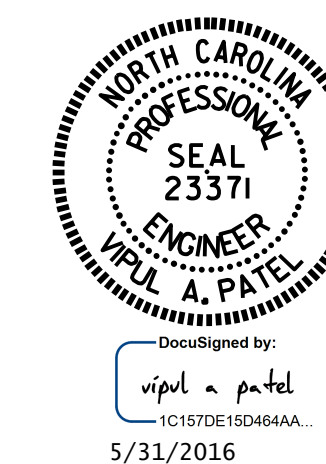
PROJECT NO. W-5313
ROWAN COUNTY
 STATION: 398+18.00 -L-

SHEET 4 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**SINGLE 10 FT. X 7 FT.
 CONCRETE BOX CULVERT**

123° SKEW

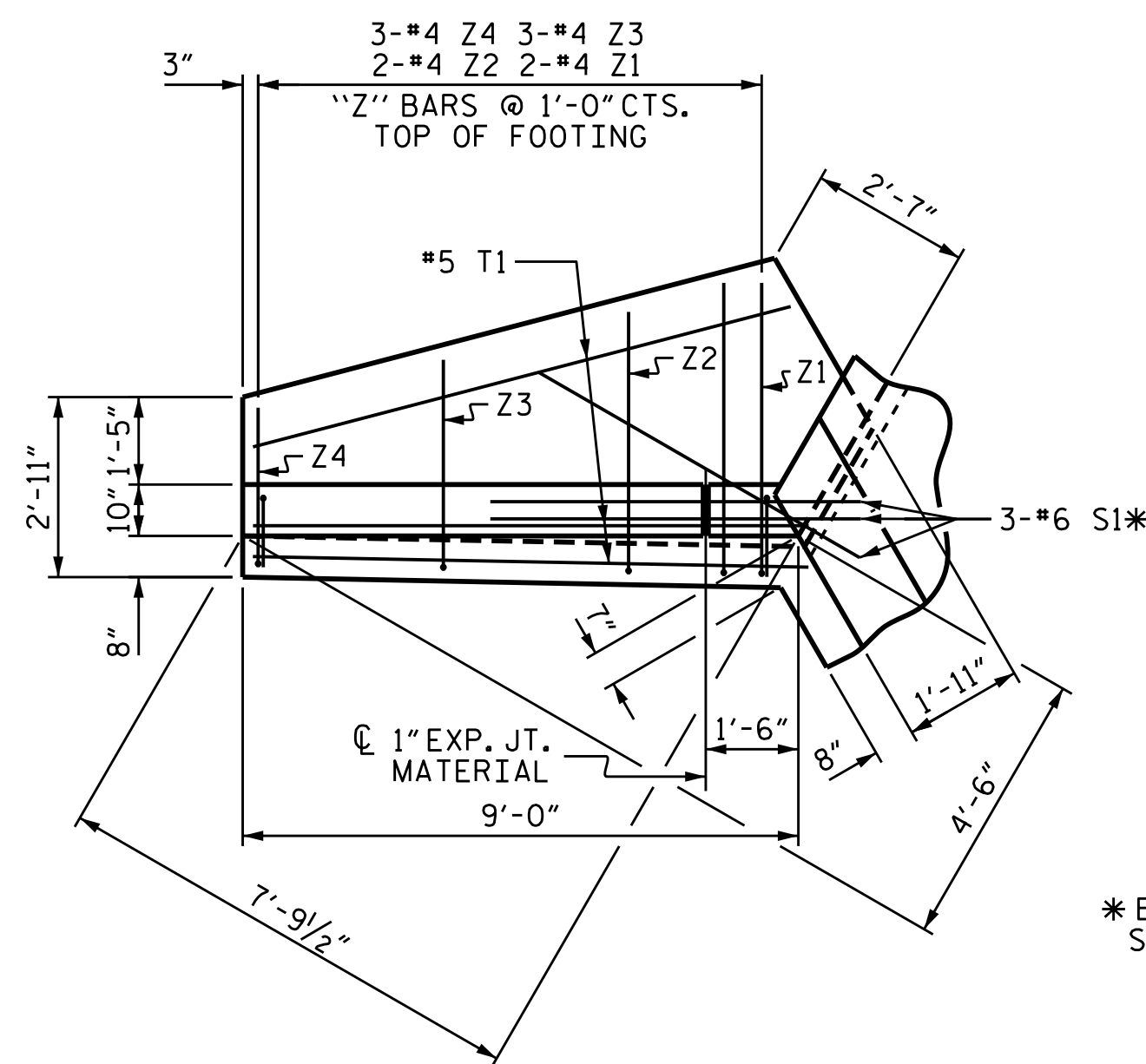


DRAWN BY : M.E.GILES DATE : 8/26/14
 CHECKED BY : N.D.AIUTO DATE : 10/2/14
 DESIGN ENGINEER OF RECORD: M.E.GILES DATE : 10/2/14

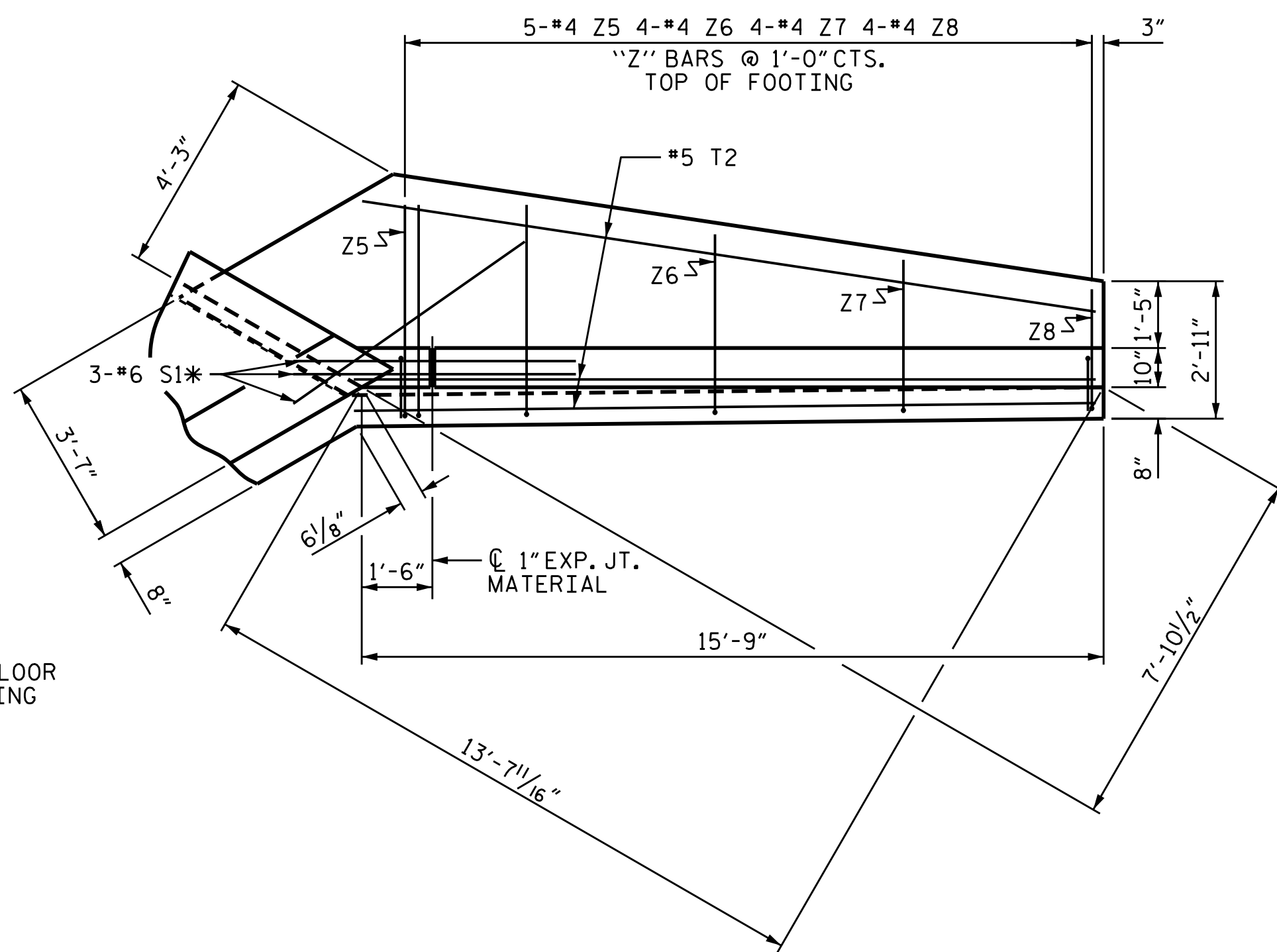
DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-14
1			3			TOTAL SHEETS
2			4			15

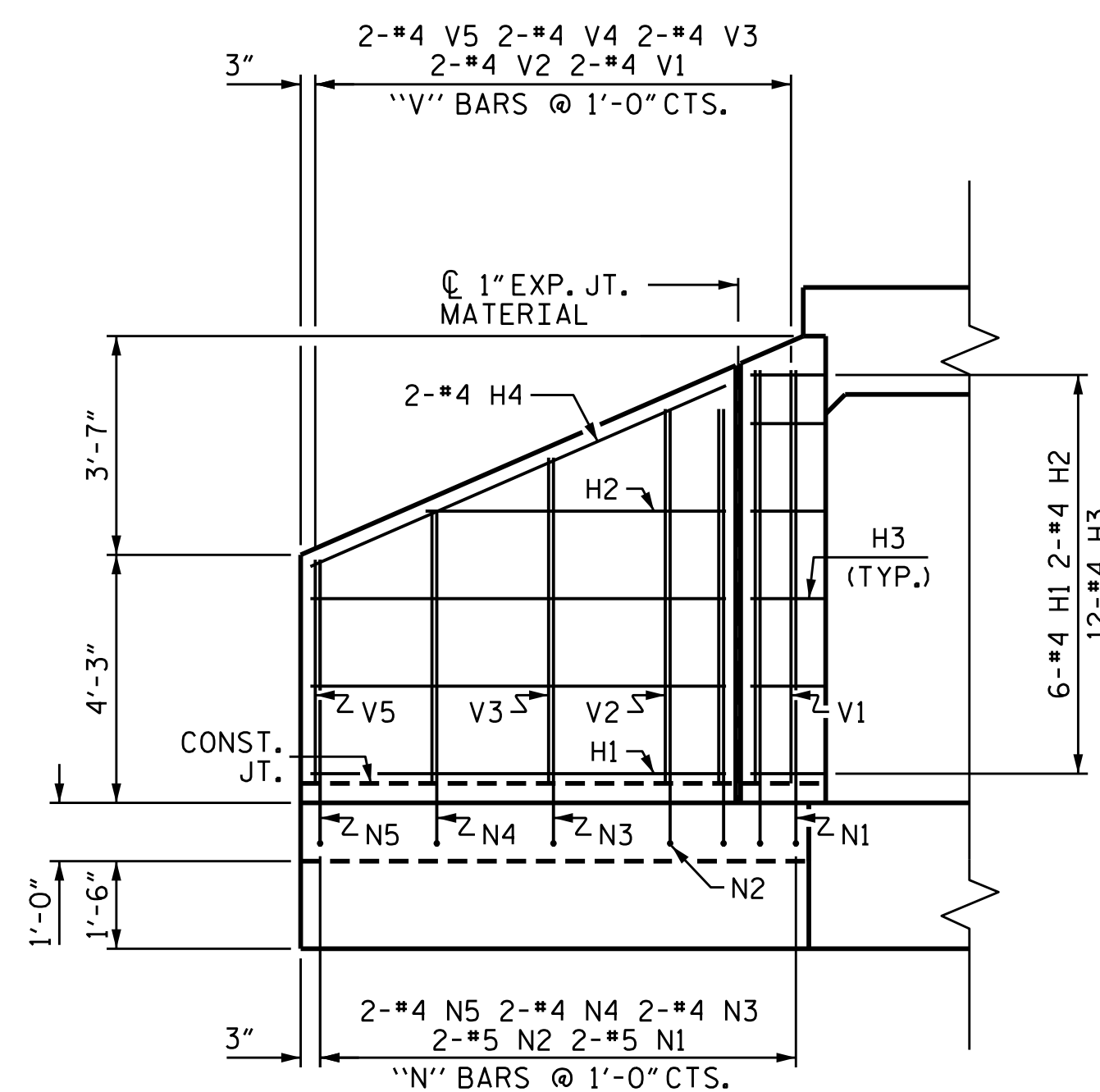
CUL. #3



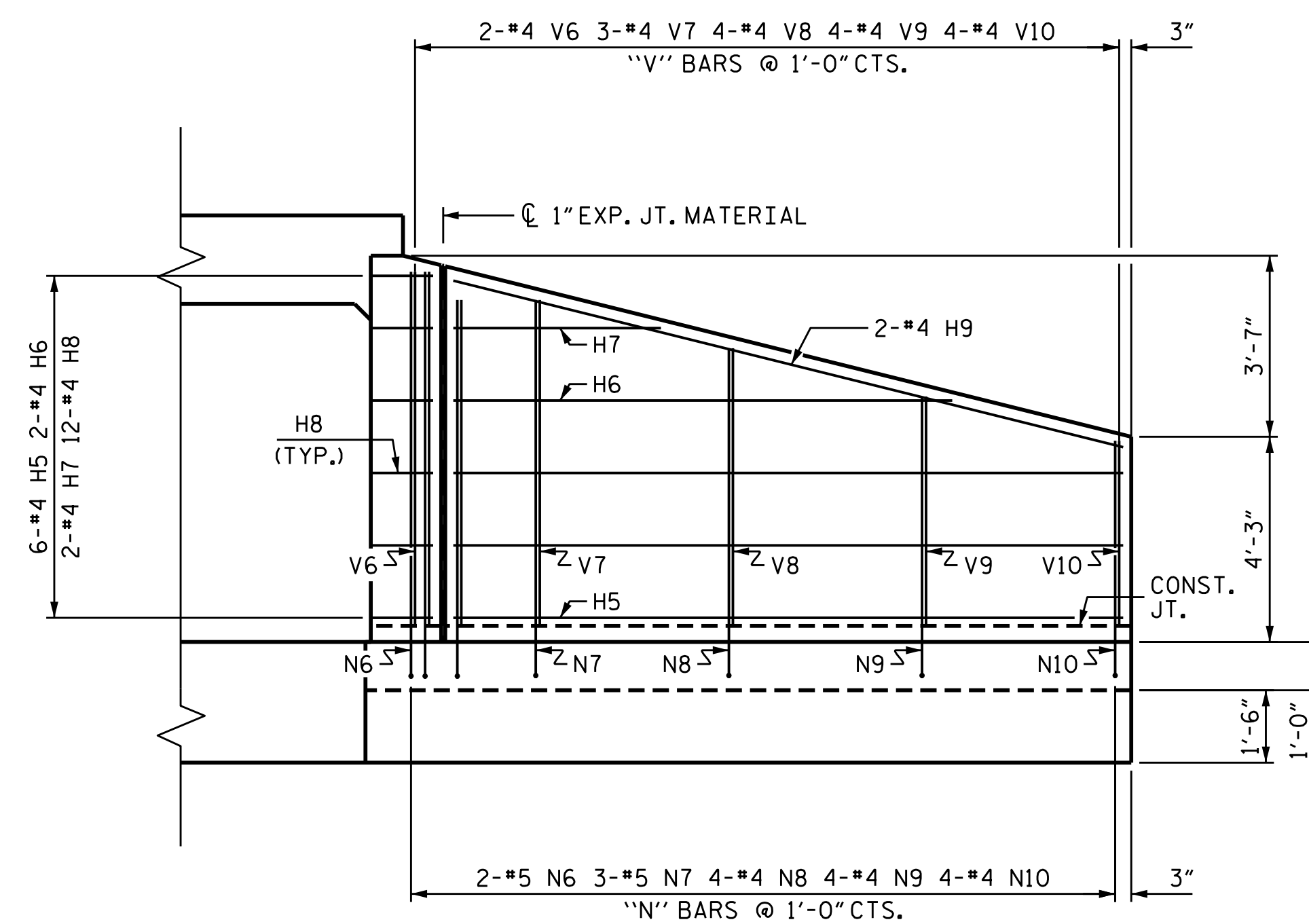
PLAN W2



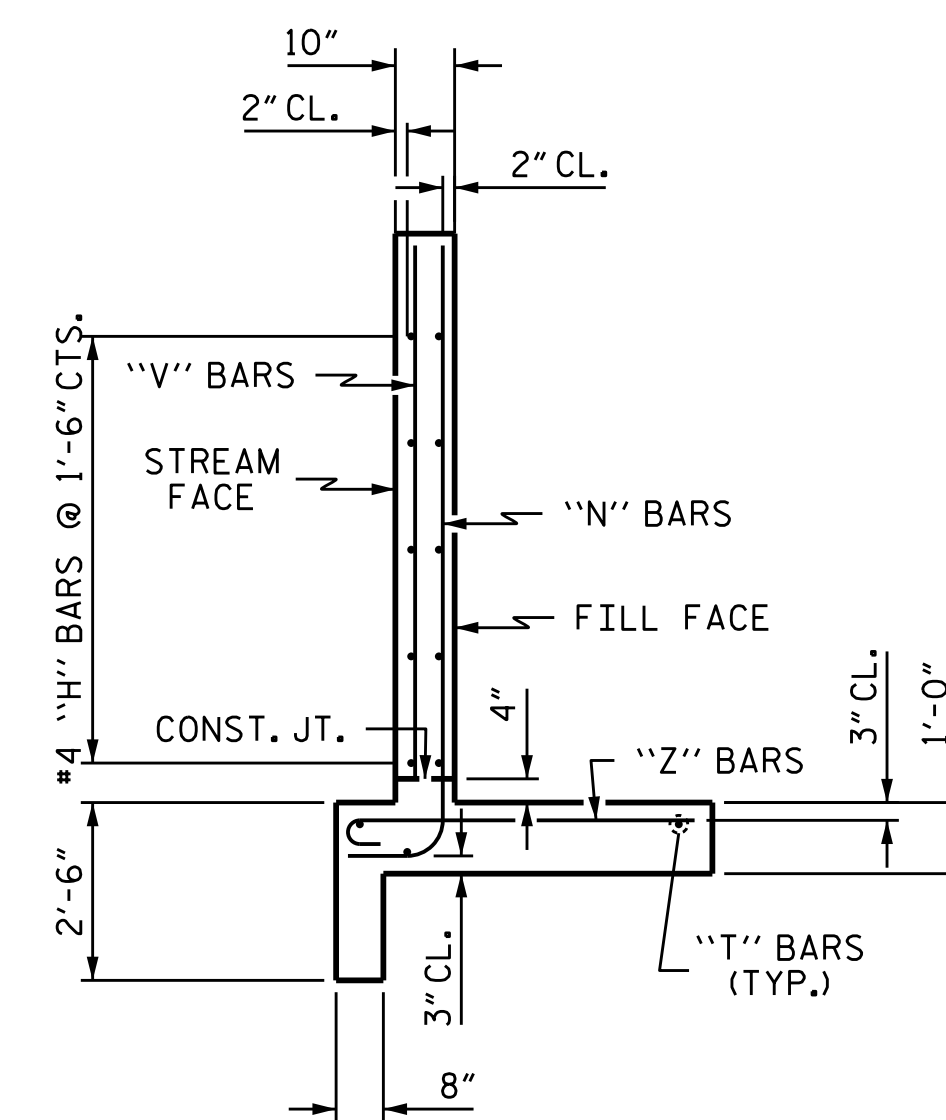
PLAN W1



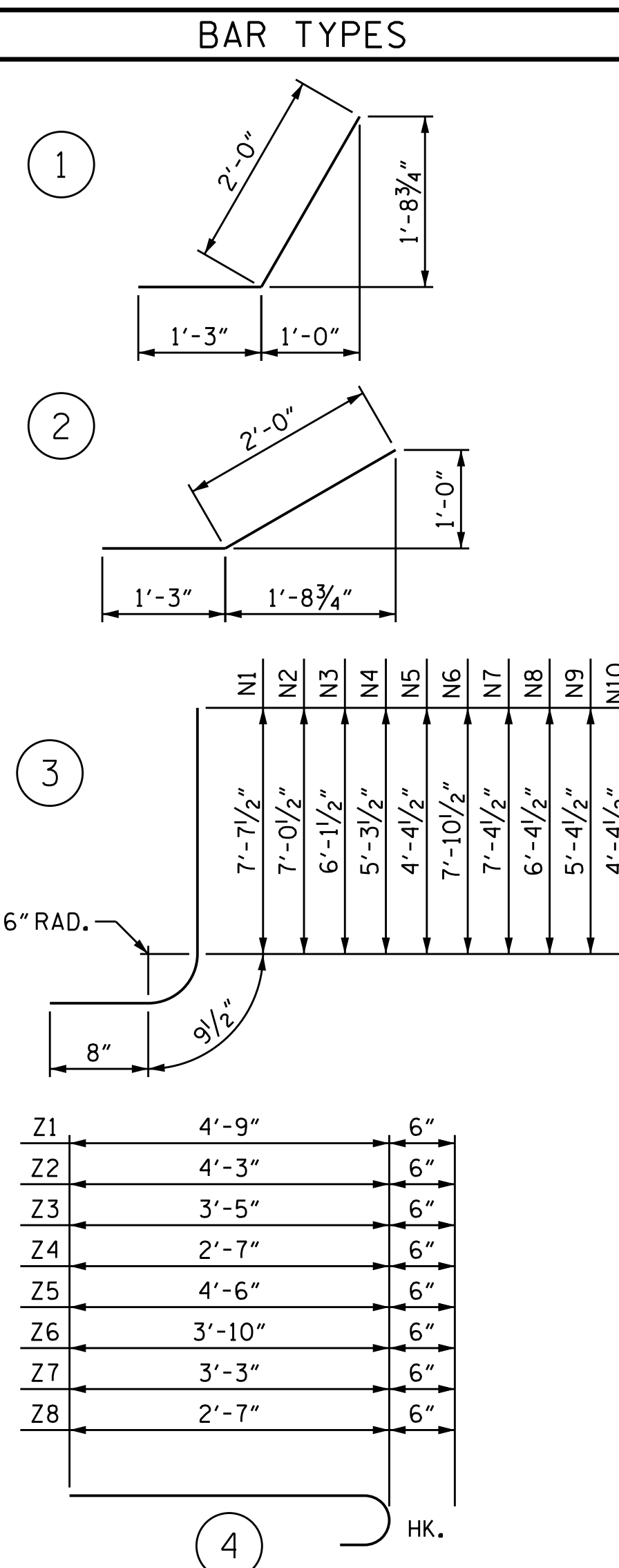
ELEVATION W2



ELEVATION W1



TYPICAL WING SECTION



ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	7'-1"	57
H2	4	#4	STR	5'-2"	14
H3	24	#4	1	3'-3"	52
H4	4	#4	STR	7'-9"	21
H5	12	#4	STR	13'-10"	111
H6	4	#4	STR	10'-4"	28
H7	4	#4	STR	4'-3"	11
H8	24	#4	2	3'-3"	52
H9	4	#4	STR	14'-3"	38
N1	4	#5	3	9'-1"	38
N2	4	#5	3	8'-6"	35
N3	4	#4	3	7'-7"	20
N4	4	#4	3	6'-9"	18
N5	4	#4	3	5'-10"	16
N6	4	#5	3	9'-4"	39
N7	6	#5	3	8'-10"	55
N8	8	#4	3	7'-10"	42
N9	8	#4	3	6'-10"	37
N10	8	#4	3	5'-10"	31
S1	12	#6	STR	6'-0"	108
T1	6	#5	STR	9'-0"	56
T2	6	#5	STR	15'-9"	99
V1	4	#4	STR	7'-1"	19
V2	4	#4	STR	6'-5"	17
V3	4	#4	STR	5'-7"	15
V4	4	#4	STR	4'-8"	12
V5	4	#4	STR	3'-10"	10
V6	4	#4	STR	7'-4"	20
V7	6	#4	STR	6'-9"	27
V8	8	#4	STR	5'-9"	31
V9	8	#4	STR	4'-9"	25
V10	8	#4	STR	3'-10"	20
Z1	4	#4	4	5'-3"	14
Z2	4	#4	4	4'-9"	13
Z3	6	#4	4	3'-11"	16
Z4	6	#4	4	3'-1"	12
Z5	10	#4	4	5'-0"	33
Z6	8	#4	4	4'-4"	23
Z7	8	#4	4	3'-9"	20
Z8	8	#4	4	3'-1"	16

REINFORCING STEEL FOR 4 WINGS		LBS.	1,321
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CLASS A CONCRETE		C.Y.	19.8
4 WINGS		C.Y.	1.2
2 HEADWALLS		C.Y.	1.3
2 END CURTAIN WALLS		C.Y.	0.9
2 SILLS		C.Y.	23.2
TOTAL			

PROJECT NO. W-5313
ROWAN COUNTY
 STATION: 398+18.00 -L-

SHEET 5 OF 5



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
STANDARD WINGS FOR CONCRETE BOX CULVERT
 H = 7'-0" SLOPE = 2:1
 120° SKEW

REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-15	
1			3			TOTAL SHEETS 15	
2			4				

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ASSEMBLED BY : M.E.GILES DATE : 10/1/14
 CHECKED BY : N.D.AIUTO DATE : 10/2/14
 DRAWN BY : CCJ 11/99
 CHECKED BY : RWW 03/00

31-MAY-2016 09:43
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 vpatel

CUL. #3 STD. NO. CW6007

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. 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.

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