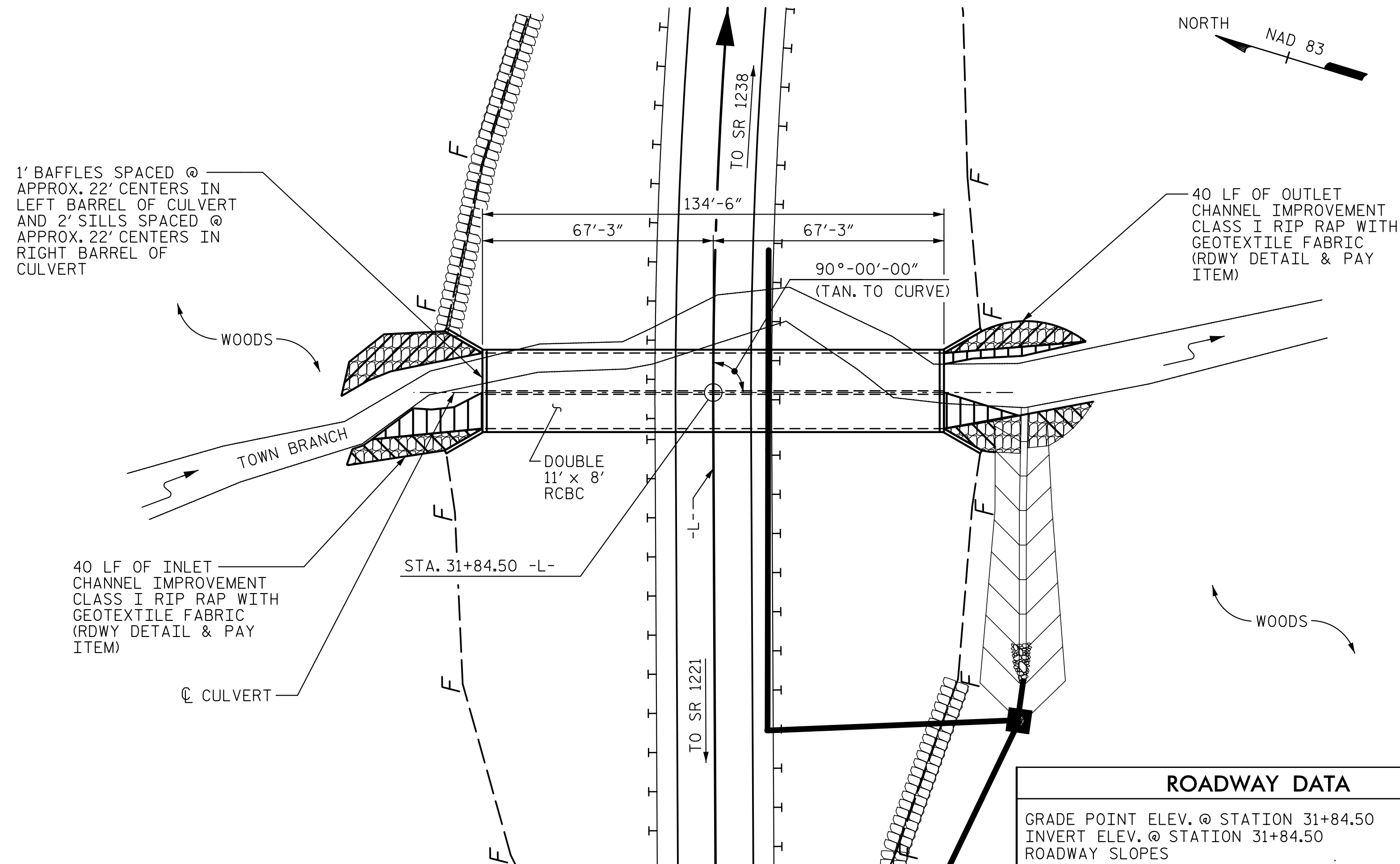


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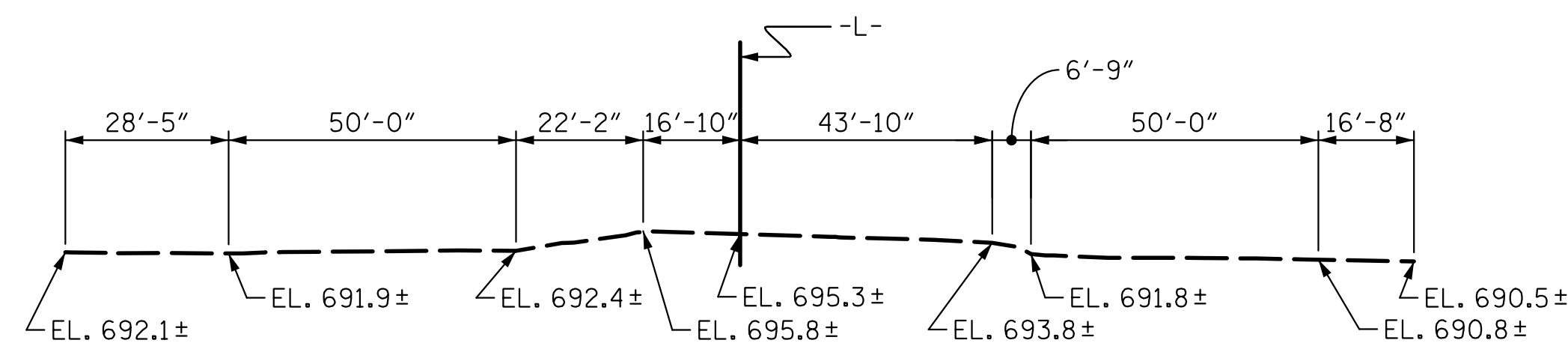
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LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.



PROFILE ALONG CULVERT

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
BARREL @ 3.854 CY/FT	518.4 C.Y.
WINGS, ETC.	24.4 C.Y.
SILLS/BAFFLES	8.6 C.Y.
TOTAL	551.4 C.Y.
REINFORCING STEEL	
BARREL, SILLS, BAFFLES	75,844 LBS.
WINGS, ETC.	1,453 LBS.
TOTAL	77,297 LBS.
FOUNDATION CONDITIONING MATERIAL	231 TONS
CULVERT EXCAVATION	LUMP SUM
PLACEMENT OF NATURAL STREAM BED MATERIAL	LUMP SUM

HYDRAULIC DATA

DESIGN DISCHARGE	= 1,000 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEVATION	= 698.2
DRAINAGE AREA	= 1.3 SQ MI
BASE DISCHARGE (Q 100)	= 1,100 CFS
BASE HIGH WATER ELEVATION	= 698.82

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 4,700 CFS
FREQUENCY OF OVERTOPPING FLOOD	= 500 YR +
OVERTOPPING FLOOD ELEVATION	= 724.0

NOTES

- ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
- DESIGN FILL = 24'
- DETAILED DRAWINGS FOR FALSEWORK AND FORMS FOR THIS CULVERT SHALL BE SUBMITTED, SEE SHEET SN.
- STEEL IN THE BOTTOM SLAB MAY BE SPLICED AT THE PERMITTED JOINT AT THE CONTRACTOR'S OPTION. 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 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
- A 3 FOOT STRIP OF GEOTEXTILE SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- 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, SILLS 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 WALLS AND BOTH FACES OF THE INTERIOR 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.
- FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
- FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
- FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.
- FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
- 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- NATURAL STREAM BED MATERIAL SHALL BE USED TO BACKFILL THE CULVERT BETWEEN SILLS AND BAFFLES. SEE SPECIAL PROVISIONS FOR "PLACEMENT OF NATURAL STREAM BED MATERIAL."
- 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.

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. W-5516

ROWAN COUNTY

STATION: 31+84.50 -L-

SHEET 1 OF 5 CULVERT NO. 468

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
**BARREL STANDARD
DOUBLE 11 FT. X 8 FT.
CONCRETE BOX CULVERT
90° SKEW**

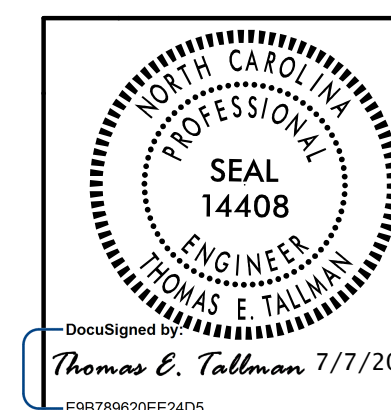
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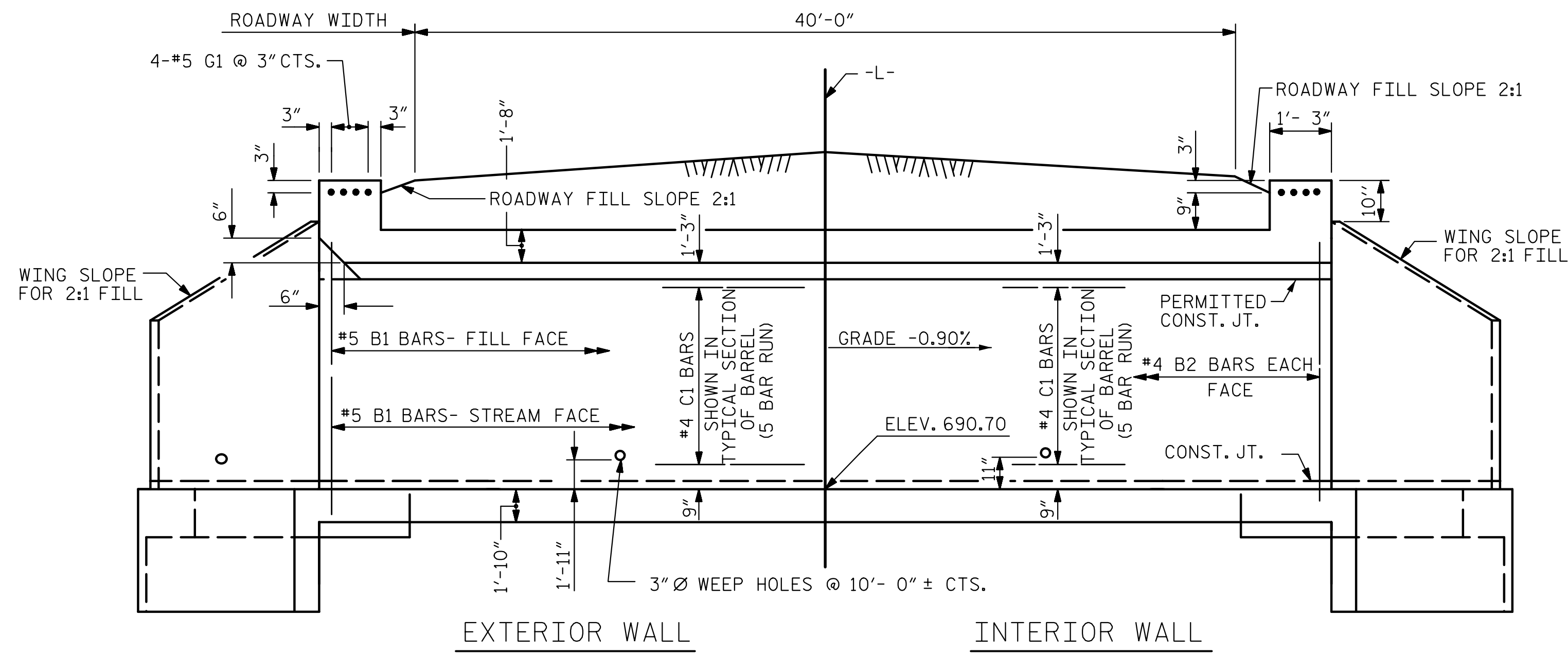
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SHEET NO. C-1
TOTAL SHEETS 13

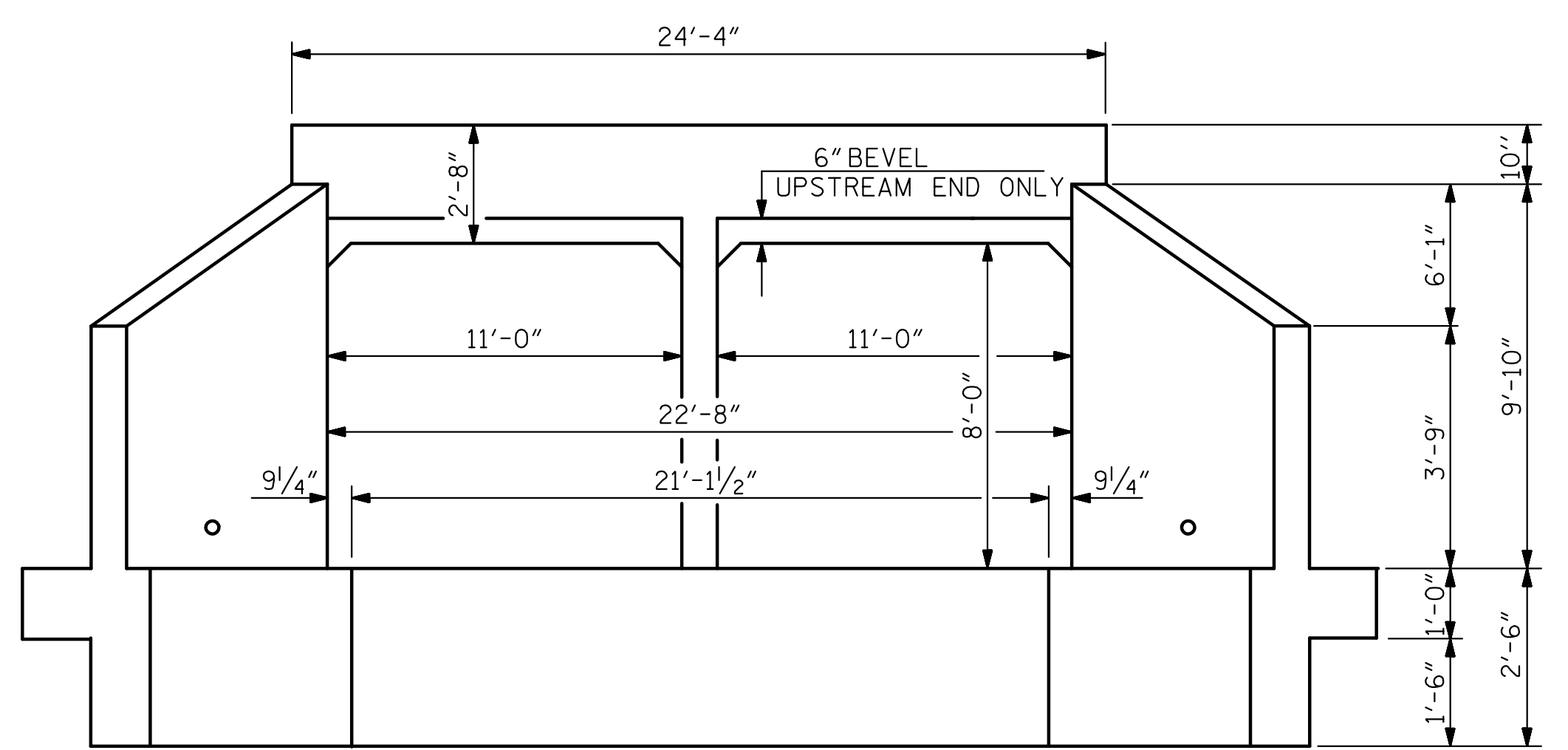
ADDED NOV. 1, 1990

ASSEMBLED BY : <u>D. H. CARTER</u> DATE : <u>MAY 2015</u>	SPECIAL
CHECKED BY : <u>T. E. TALLMAN</u> DATE : <u>MAY 2015</u>	
DRAWN BY : <u>R. W. WRIGHT</u> DATE : <u>JULY, 1990</u>	STANDARD
CHECKED BY : <u>D. A. GLADDEN</u> DATE : <u>JULY, 1990</u>	

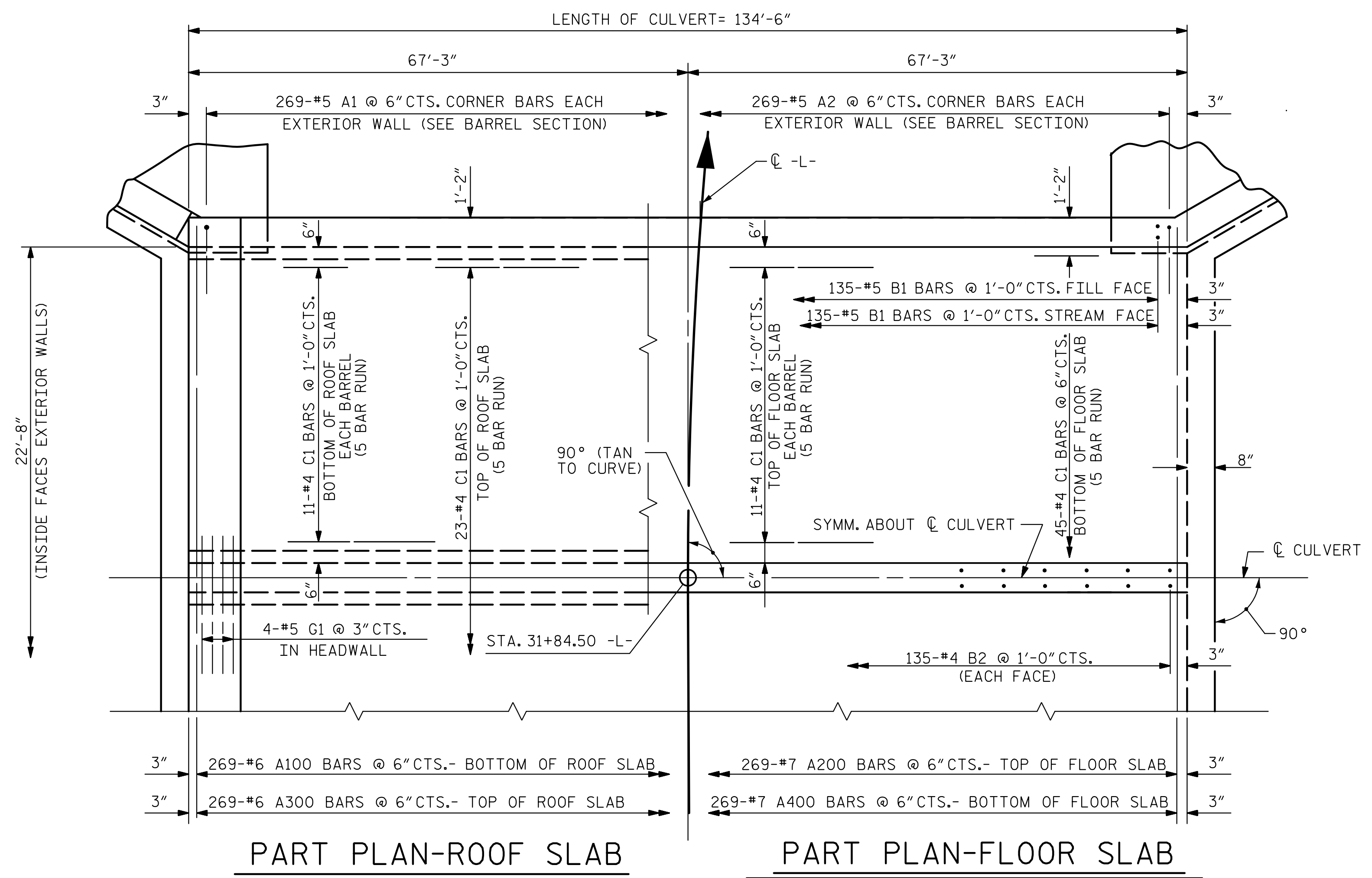




CULVERT SECTION NORMAL TO ROADWAY

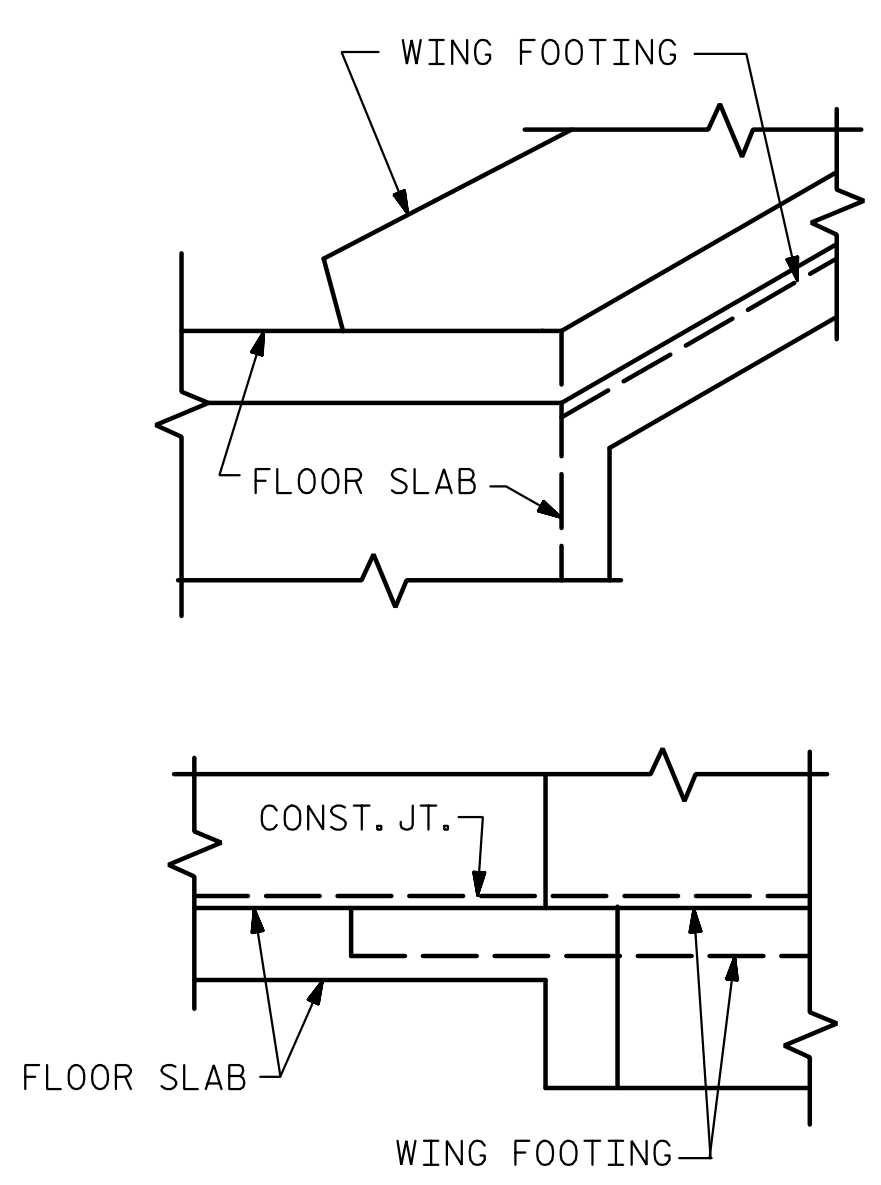


END ELEVATION



PART PLAN-ROOF SLAB

PART PLAN-FLOOR SLAB



CONNECTION OF WING FOOTING AND FLOOR SLAB WHEN SLAB IS THICKER THAN FOOTING

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. W-5516
 ROWAN COUNTY
 STATION: 31+84.50 -L-
 SHEET 2 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 BARREL STANDARD
 DOUBLE 11 FT. X 8 FT.
 CONCRETE BOX CULVERT
 90° SKEW

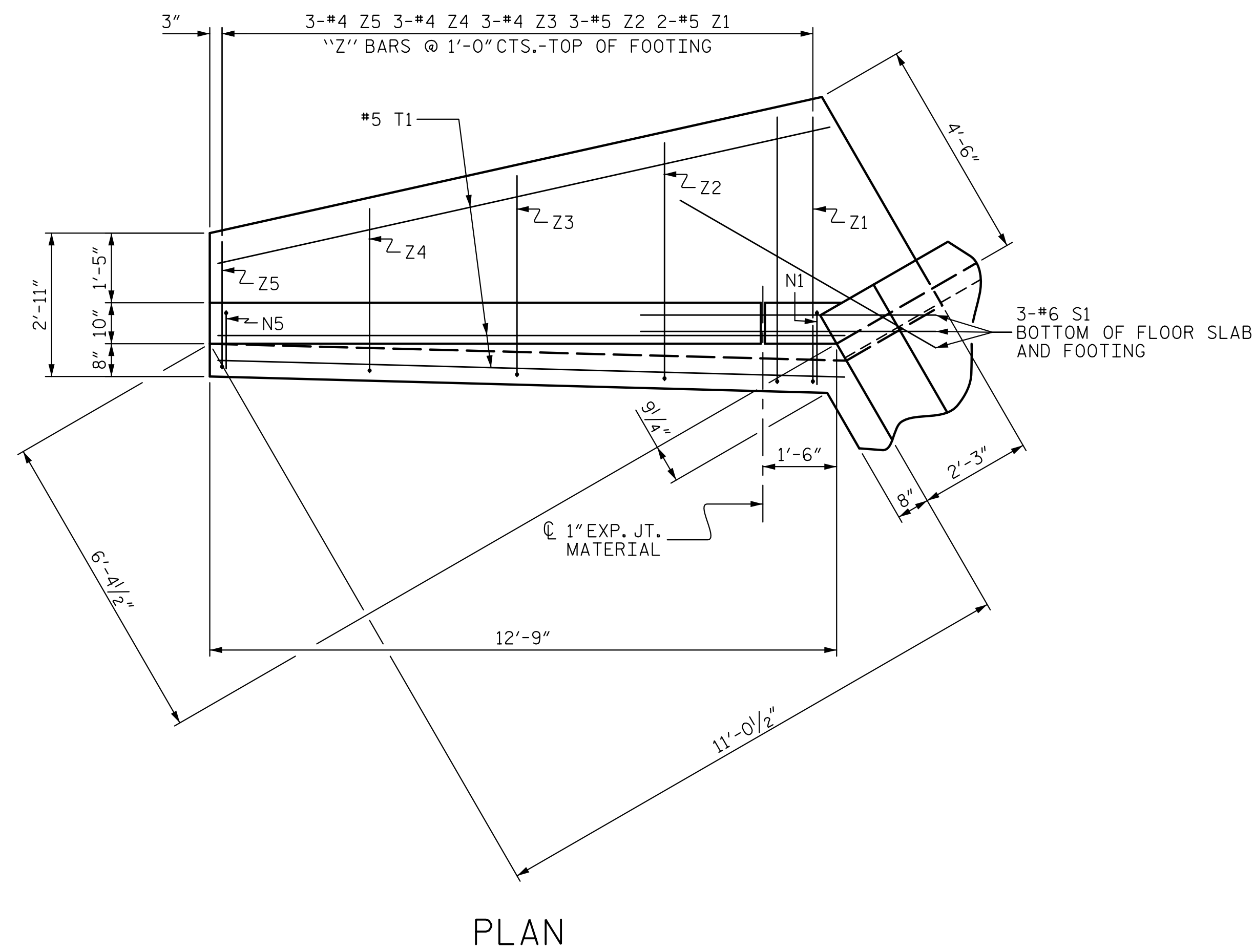
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1			3			TOTAL SHEETS 13	
2			4				

REVISED 11-19-99 BY M.M. CHECKED BY R.W.W.
 REDRAWN NOV. 1990 BY TSS CHECKED BY ARB

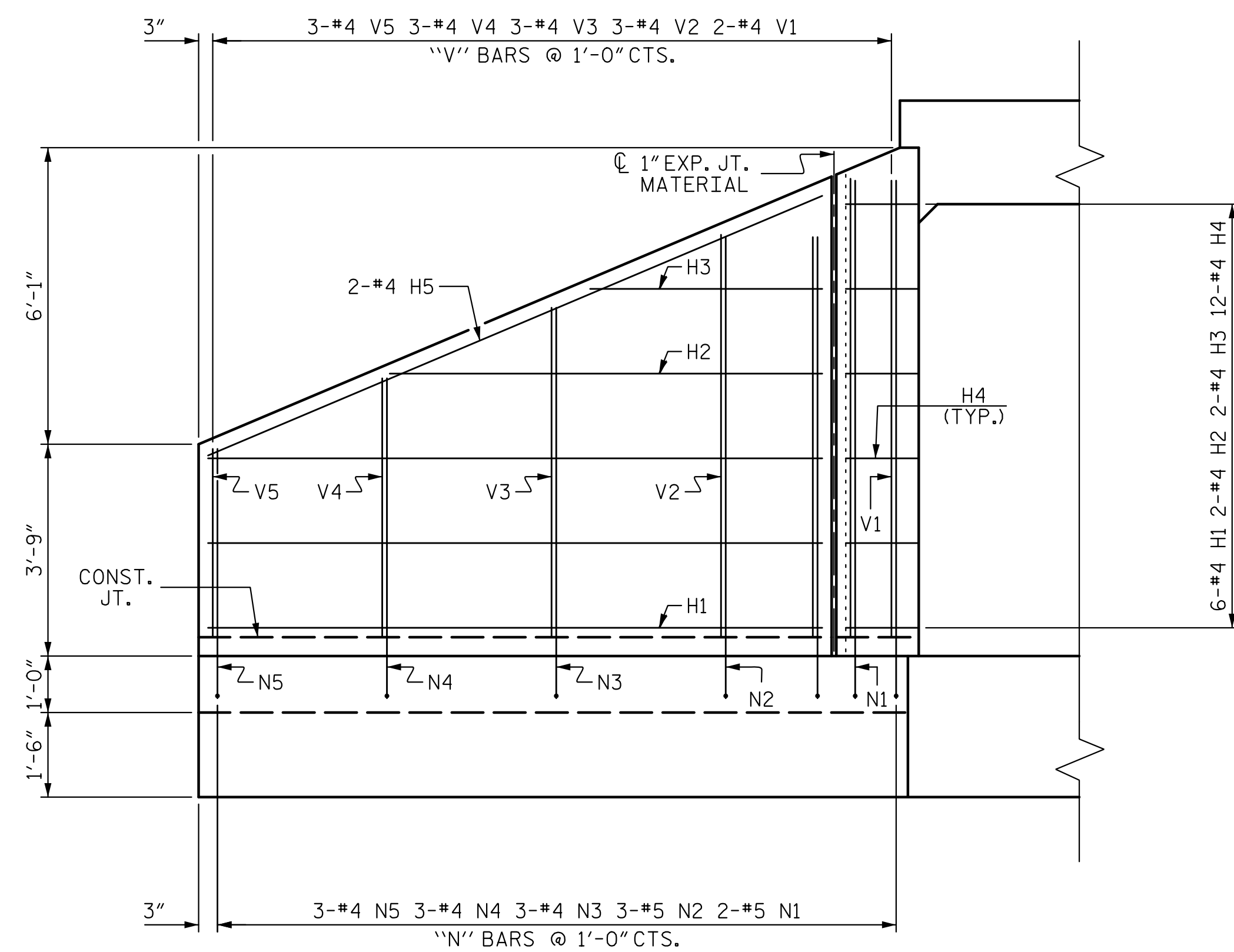
ASSEMBLED BY : D. H. CARTER	DATE : MAY 2015	SPECIAL
CHECKED BY : T. E. TALLMAN	DATE : MAY 2015	
DRAWN BY : RALPH D. UNDERWOOD	DATE : MAY 1971	STANDARD
CHECKED BY : JOEL A. JOHNSON	DATE : JULY 1971	



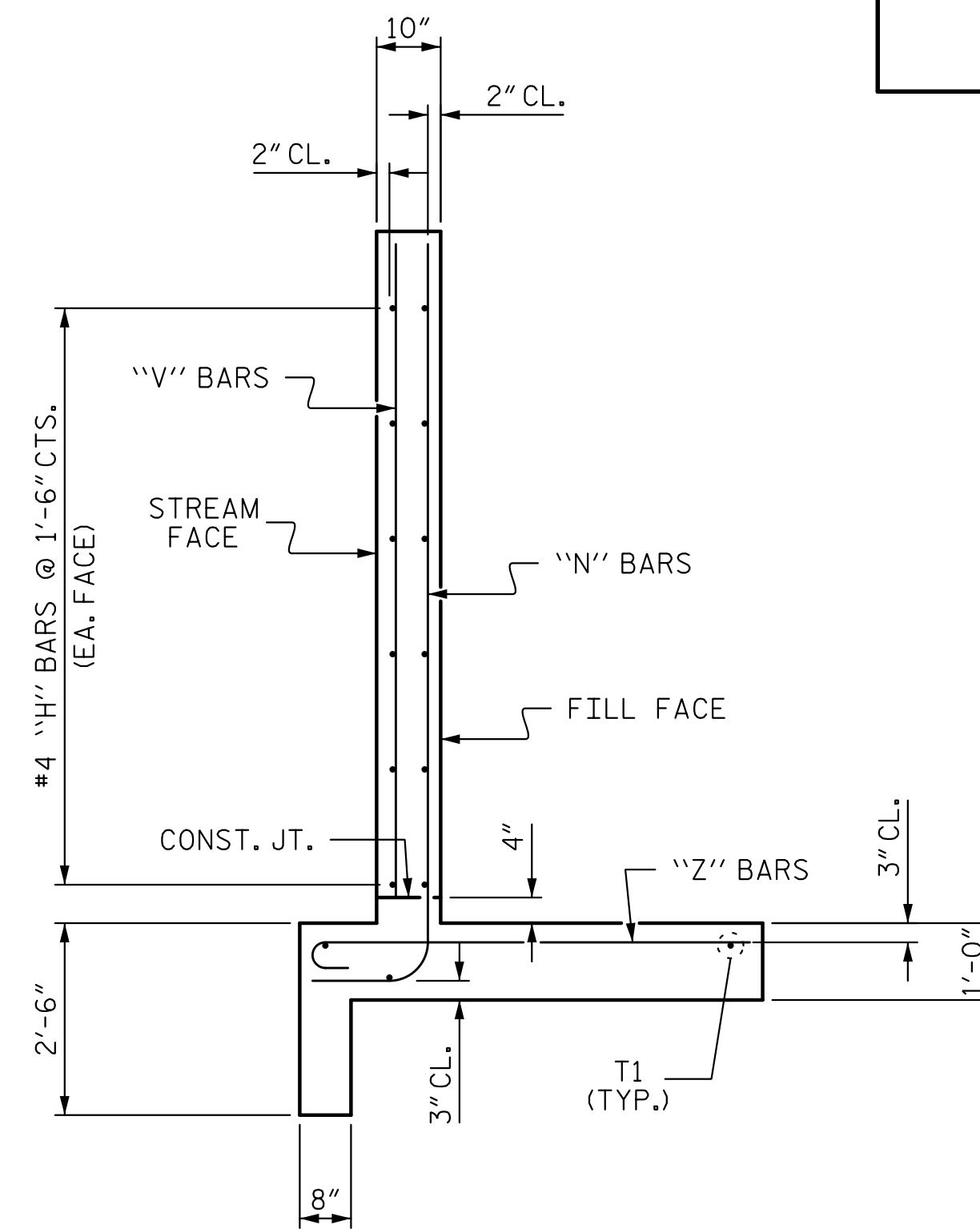
DocuSigned by
 Thomas E. Tallman 7/7/2015



PLAN



ELEVATION



TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.

BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	
H1	24	#4 STR	10'-10"	174	
H2	8	#4 STR	7'-8"	41	
H3	8	#4 STR	4'-1"	22	
H4	48	#4	3'-3"	104	
H5	8	#4 STR	11'-9"	63	
N1	8	#5	2	10'-2"	85
N2	12	#5	2	9'-2"	115
N3	12	#4	2	7'-11"	63
N4	12	#4	2	6'-7"	53
N5	12	#4	2	5'-4"	43
S1	12	#6 STR	6'-0"	108	
T1	12	#5 STR	12'-9"	160	
V1	8	#4 STR	8'-1"	43	
V2	12	#4 STR	7'-1"	57	
V3	12	#4 STR	5'-10"	47	
V4	12	#4 STR	4'-7"	37	
V5	12	#4 STR	3'-4"	27	
Z1	8	#5	3	6'-0"	50
Z2	12	#5	3	5'-5"	68
Z3	12	#4	3	4'-7"	37
Z4	12	#4	3	3'-10"	31
Z5	12	#4	3	3'-1"	25

REINFORCING STEEL FOR 4 WINGS 1453 LBS

CLASS A CONCRETE

4 WINGS 21.4 CY

2 HEADWALLS 2.3 CY

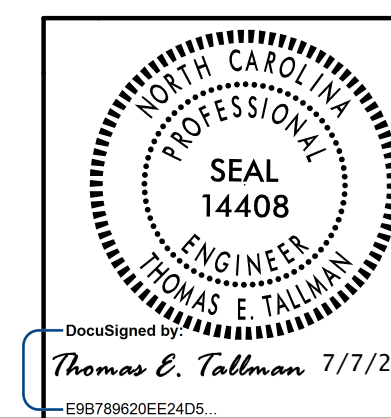
2 END CURTAIN WALLS 0.7 CY

TOTAL 24.4 CY

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	24	#4	STR	10'-10"	174
H2	8	#4	STR	7'-8"	41
H3	8	#4	STR	4'-1"	22
H4	48	#4		3'-3"	104
H5	8	#4	STR	11'-9"	63
N1	8	#5	2	10'-2"	85
N2	12	#5	2	9'-2"	115
N3	12	#4	2	7'-11"	63
N4	12	#4	2	6'-7"	53
N5	12	#4	2	5'-4"	43
S1	12	#6	STR	6'-0"	108
T1	12	#5	STR	12'-9"	160
V1	8	#4	STR	8'-1"	43
V2	12	#4	STR	7'-1"	57
V3	12	#4	STR	5'-10"	47
V4	12	#4	STR	4'-7"	37
V5	12	#4	STR	3'-4"	27
Z1	8	#5	3	6'-0"	50
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Z3	12	#4	3	4'-7"	37
Z4	12	#4	3	3'-10"	31
Z5	12	#4	3	3'-1"	25

ASSEMBLED BY : D. H. CARTER DATE : MAY 2015
 CHECKED BY : T. E. TALLMAN DATE : MAY 2015
 DRAWN BY : CCJ 10/99
 CHECKED BY : RWW 03/00



PROJECT NO. W-5516
 ROWAN COUNTY
 STATION: 31+84.50 -L-
 SHEET 4 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

STANDARD WINGS FOR CONCRETE BOX CULVERT
 H = 8'-0" SLOPE = 2:1
 90° SKEW

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

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

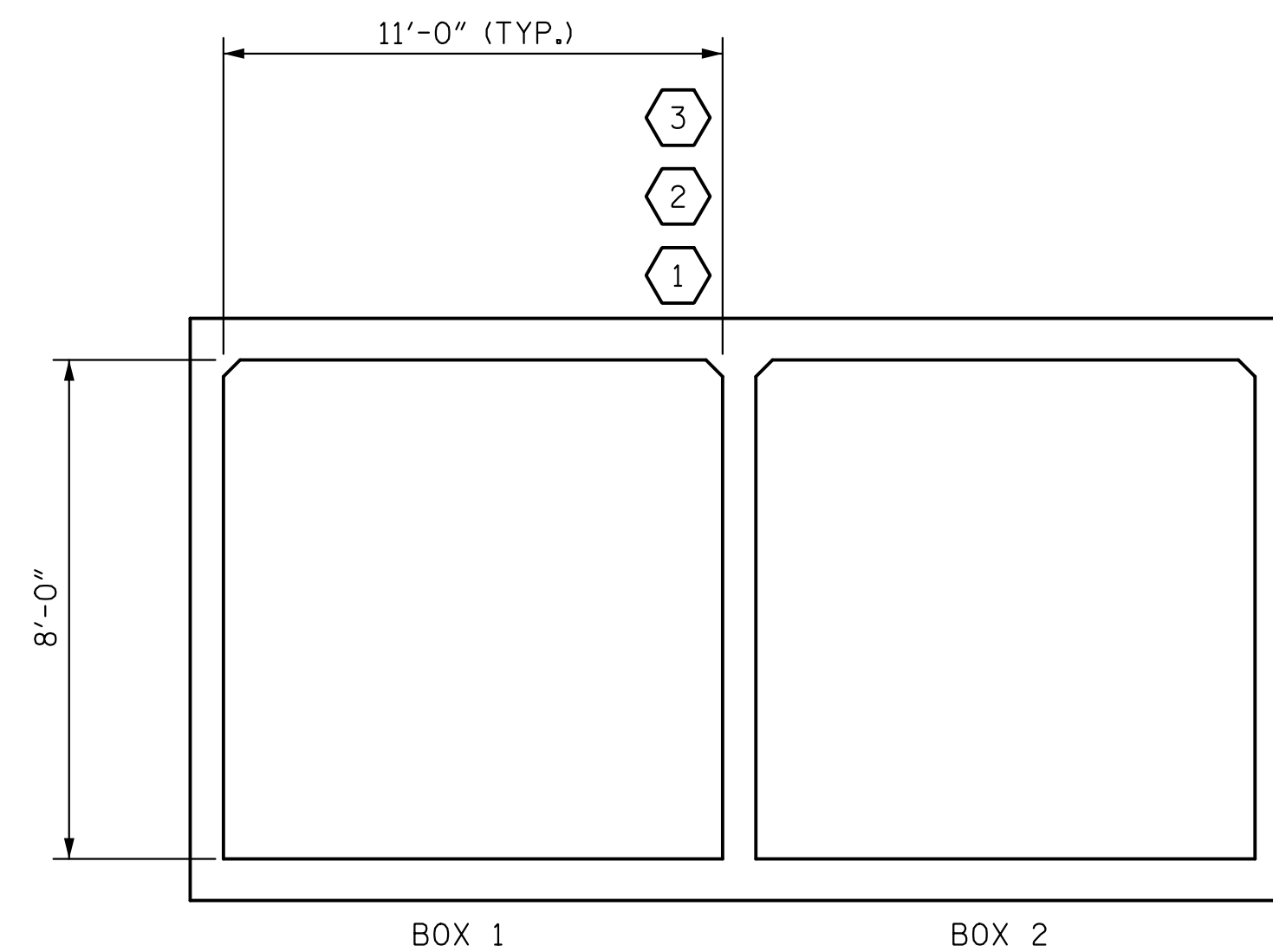
LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
LS	1.75	--
WA	1.00	--

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

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	10.07	--	1.75	13.42	1	TOP SLAB	10.75	10.07	1	TOP SLAB	9.23	.	
	HL-93 (OPERATING)	N/A		13.06	--	1.35	17.40	1	TOP SLAB	10.75	13.06	1	TOP SLAB	9.23		
	HS-20 (INVENTORY)	36,000	②	10.07	362.5	1.75	13.42	1	TOP SLAB	10.75	10.07	1	TOP SLAB	9.23		
	HS-20 (OPERATING)	36,000		13.06	470.2	1.35	17.40	1	TOP SLAB	10.75	13.06	1	TOP SLAB	9.23		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		29.21	394.3	1.40	37.39	1	TOP SLAB	10.75	29.21	1	TOP SLAB	9.23		
		SNGARBS2	20,000		20.35	407.0	1.40	27.28	1	TOP SLAB	10.75	20.35	1	TOP SLAB	9.23	
		SNAGRIS2	22,000		18.66	410.5	1.40	25.30	1	TOP SLAB	10.75	18.66	1	TOP SLAB	9.23	
		SNCOTTS3	27,250		14.30	389.7	1.40	17.86	1	TOP SLAB	10.75	14.30	1	TOP SLAB	9.23	
		SNAGGRS4	34,925		11.48	400.9	1.40	15.02	1	TOP SLAB	10.75	11.48	1	TOP SLAB	9.23	
		SNS5A	35,550		11.33	402.8	1.40	14.68	1	TOP SLAB	10.75	11.33	1	TOP SLAB	9.23	
		SNS6A	39,950		10.64	425.1	1.40	13.68	1	TOP SLAB	10.75	10.64	1	TOP SLAB	9.23	
		SNS7B	42,000		10.45	438.9	1.40	13.28	1	TOP SLAB	10.75	10.45	1	TOP SLAB	9.23	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33,000		12.43	410.2	1.40	16.99	1	TOP SLAB	10.75	12.43	1	TOP SLAB	9.23	
		TNT4A	33,075		12.65	418.4	1.40	16.74	1	TOP SLAB	10.75	12.65	1	TOP SLAB	9.23	
		TNT6A	41,600		11.12	462.6	1.40	14.09	1	TOP SLAB	10.75	11.12	1	TOP SLAB	9.23	
		TNT7A	42,000		10.60	445.2	1.40	14.11	1	TOP SLAB	10.75	10.60	1	TOP SLAB	9.23	
		TNT7B	42,000		11.12	467.0	1.40	14.44	1	TOP SLAB	10.75	11.12	1	TOP SLAB	9.23	
		TNAGRIT4	43,000		9.75	419.3	1.40	13.34	1	TOP SLAB	10.75	9.75	1	TOP SLAB	9.23	
TNAGR5A	45,000		10.20	459.0	1.40	13.39	1	TOP SLAB	10.75	10.20	1	TOP SLAB	9.23			
TNAGR5B	45,000		③	9.55	429.8	1.40	12.74	1	TOP SLAB	10.75	9.55	1	TOP SLAB	9.23		

#	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)

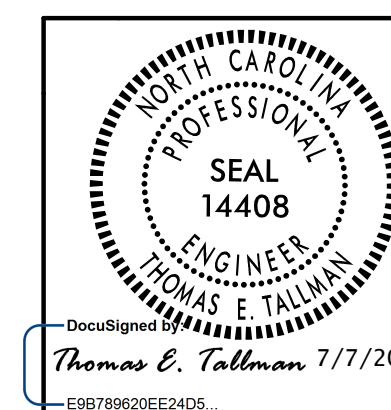
PROJECT NO. W-5516

ROWAN COUNTY

STATION: 31+84.50 -L-

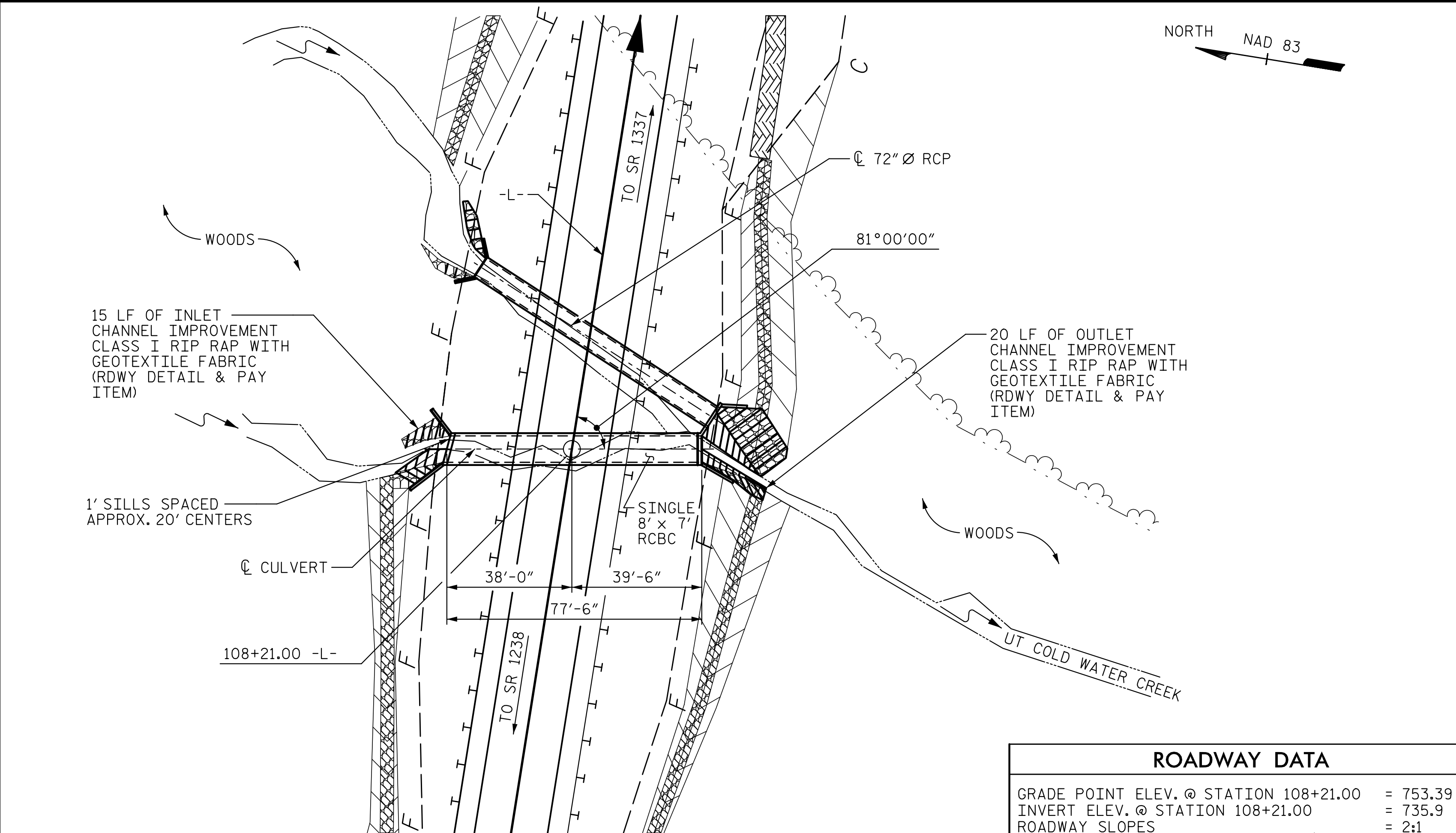
SHEET 5 OF 5

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



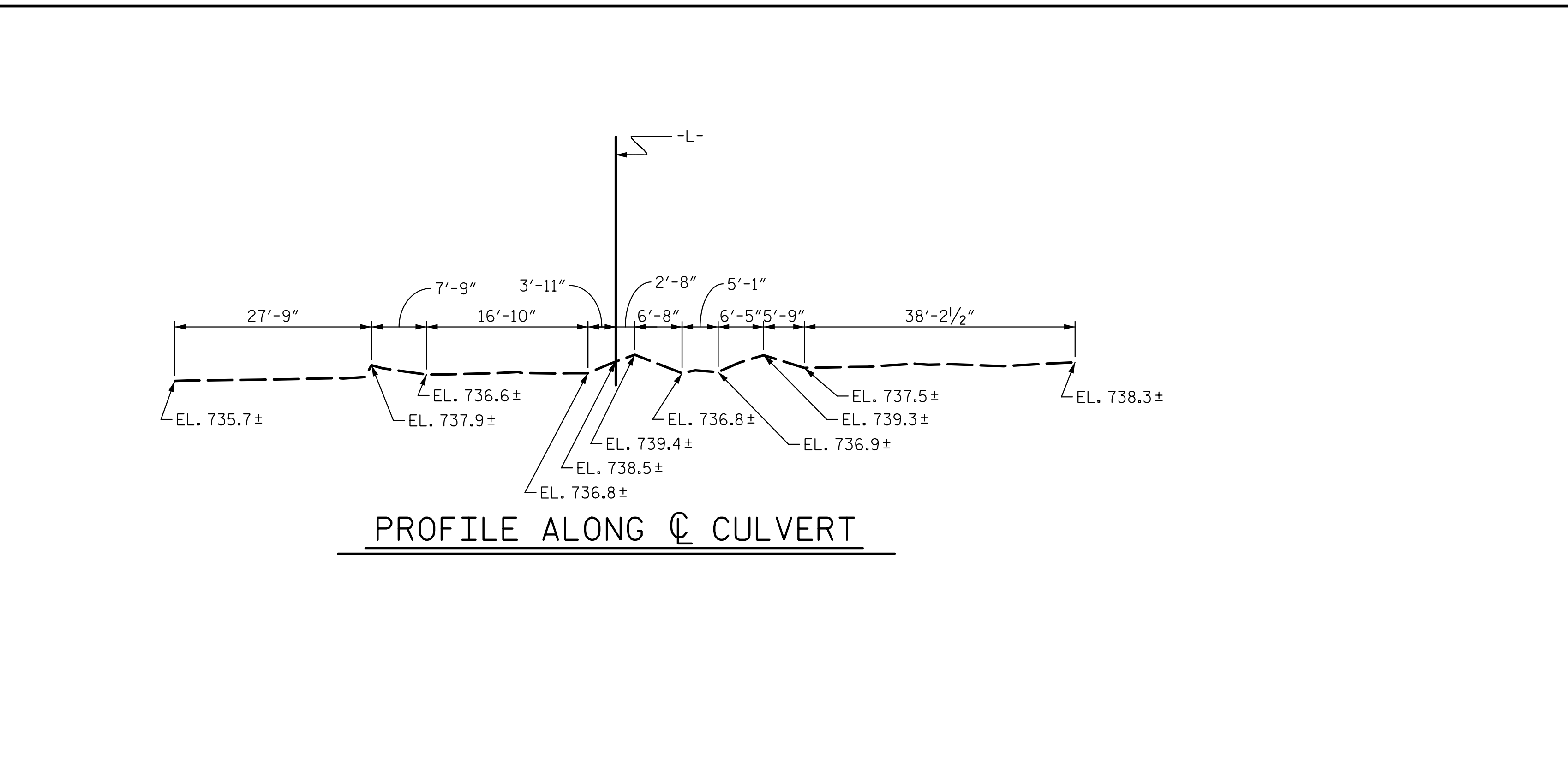
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-5
1			3			TOTAL SHEETS 13
2			4			

STD. NO. LRFR5



LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.



PROFILE ALONG CULVERT

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
BARREL @ 1.093 CY/FT	84.7 C.Y.
WINGS, ETC.	23.3 C.Y.
SILLS	1.3 C.Y.
TOTAL	109.3 C.Y.
REINFORCING STEEL	
BARREL, SILLS	9,287 LBS.
WINGS, ETC.	1,658 LBS.
TOTAL	10,945 LBS.
FOUNDATION CONDITIONING MATERIAL	53 TONS
CULVERT EXCAVATION	LUMP SUM
PLACEMENT OF NATURAL STREAM BED MATERIAL	LUMP SUM

HYDRAULIC DATA

DESIGN DISCHARGE	= 500 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEVATION	= 734.7
DRAINAGE AREA	= 0.3 SQ MI
BASE DISCHARGE (Q 100)	= 600 CFS
BASE HIGH WATER ELEVATION	= 744.43

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 1,400 CFS
FREQUENCY OF OVERTOPPING FLOOD	= 500 YR +
OVERTOPPING FLOOD ELEVATION	= 752.6

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.

DESIGN FILL = 10'

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.

FOR CULVERT DIVERSION CHANNEL DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.

A 3 FOOT STRIP OF GEOTEXTILE SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

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, SILLS 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 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.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.

NATURAL STREAM BED MATERIAL SHALL BE USED TO BACKFILL THE CULVERT BETWEEN SILLS. SEE SPECIAL PROVISIONS FOR "PLACEMENT OF NATURAL STREAM BED MATERIAL."

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.

PROJECT NO. W-5516

ROWAN COUNTY

STATION: 108+21.00 -L-

SHEET 1 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

**SINGLE BARREL
8 FT. X 7 FT.
CONCRETE BOX CULVERT
81° SKEW**

REVISIONS

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1			3		
2			4		

SHEET NO.

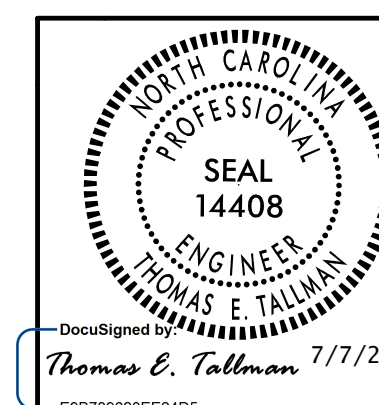
C-6

TOTAL SHEETS

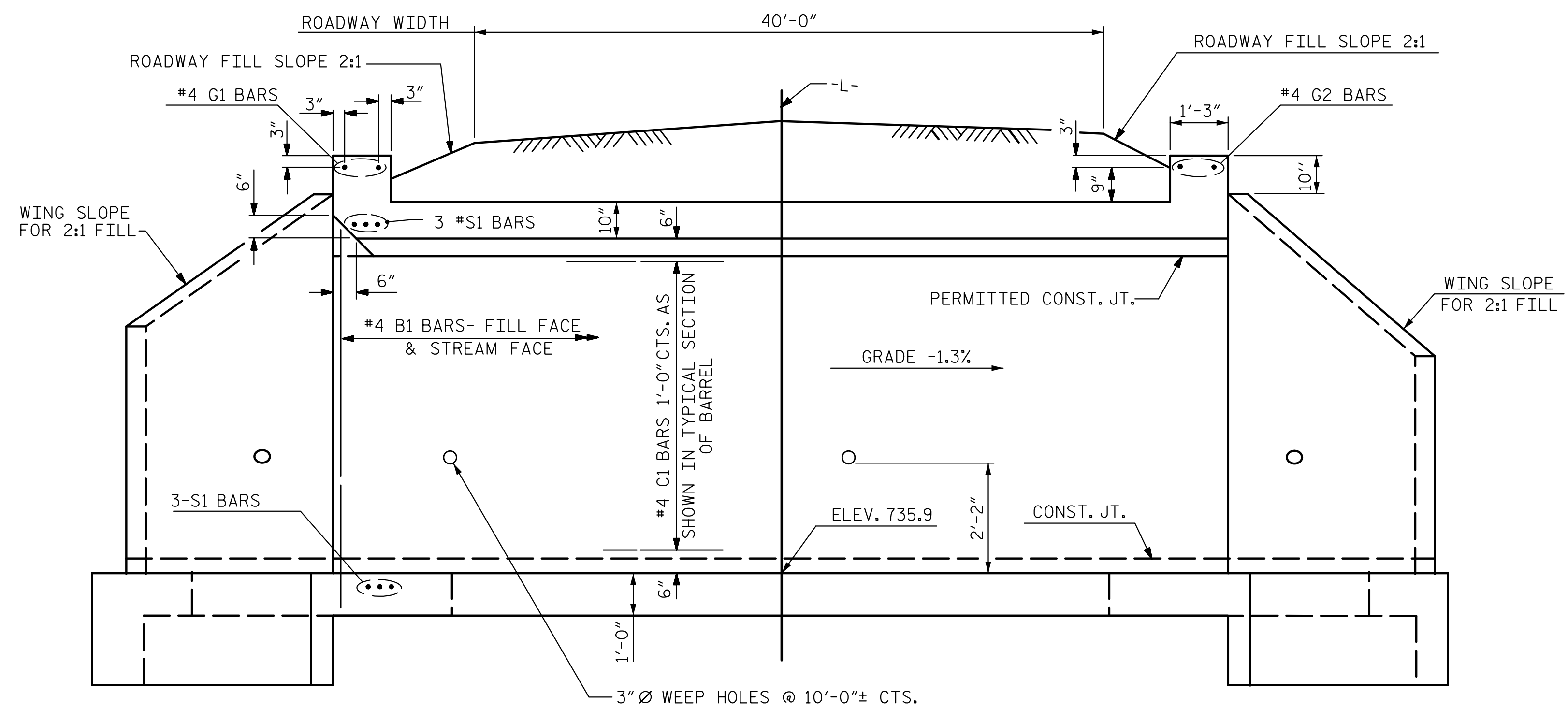
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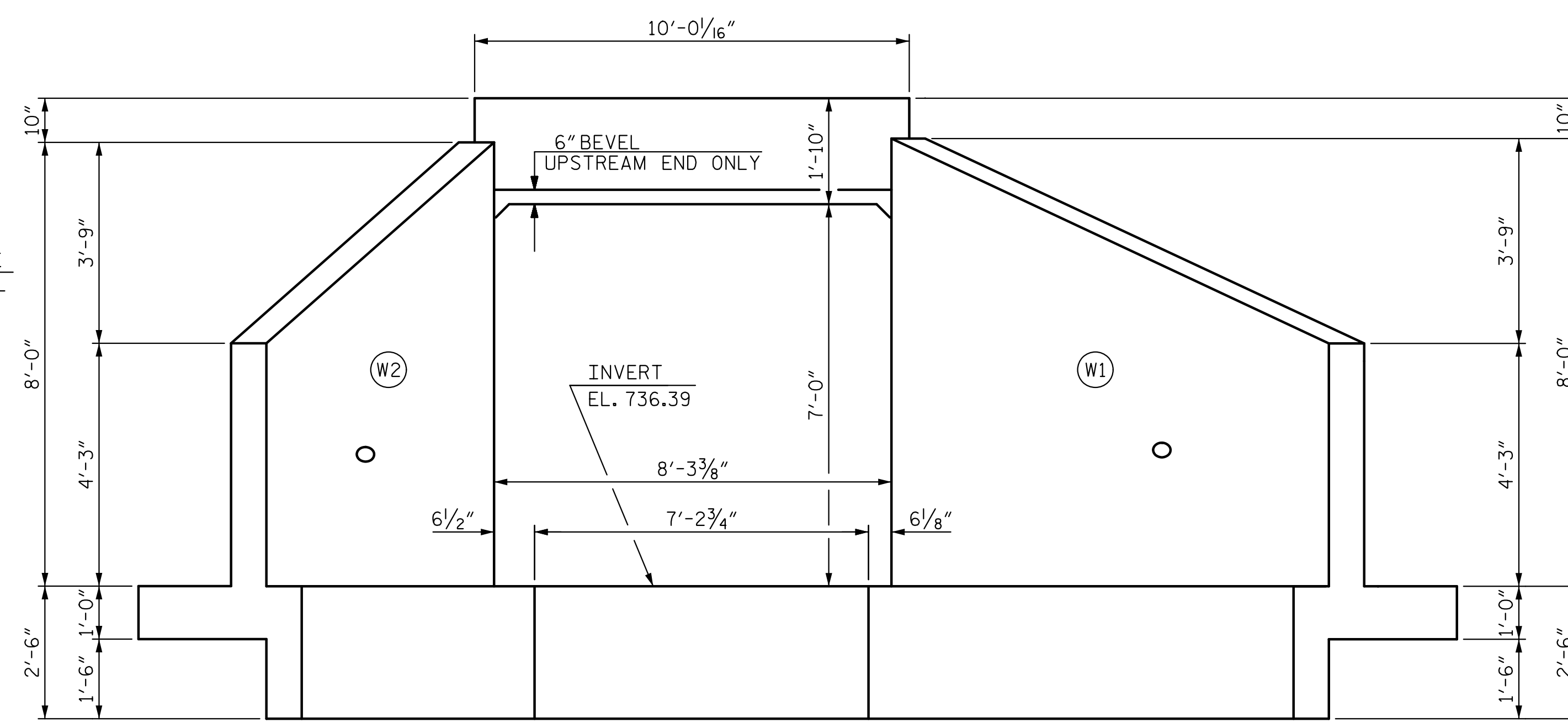
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No. P-0205



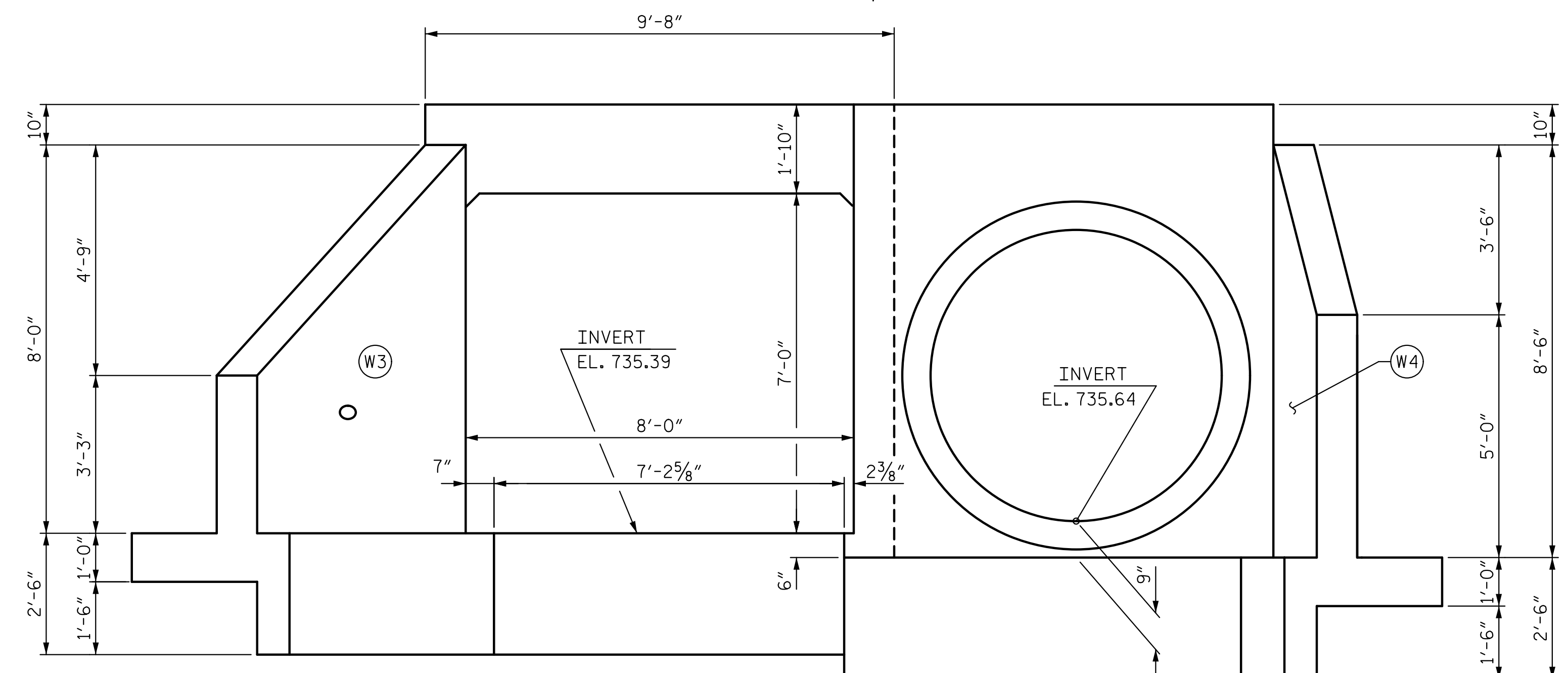
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Thomas E. Tallman 7/7/2015
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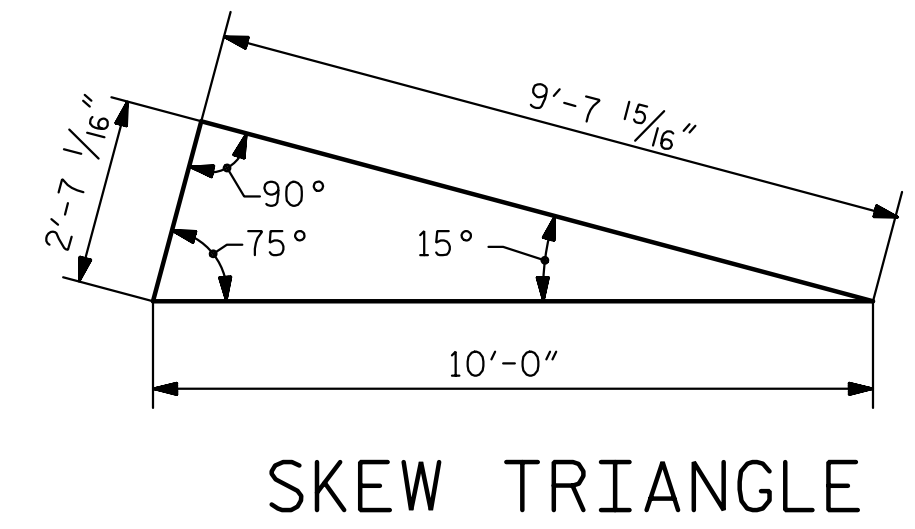
CULVERT SECTION NORMAL TO ROADWAY



INLET END ELEVATION NORMAL TO SKEW
(75° SKEW)



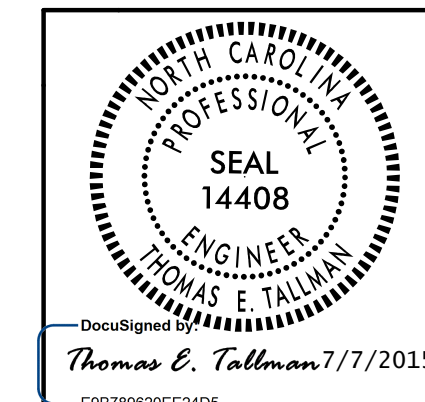
OUTLET END ELEVATION NORMAL TO SKEW
(90° SKEW)



SKEW TRIANGLE

PROJECT NO. W-5516
ROWAN COUNTY
 STATION: 108+21.00 -L-
 SHEET 2 OF 8

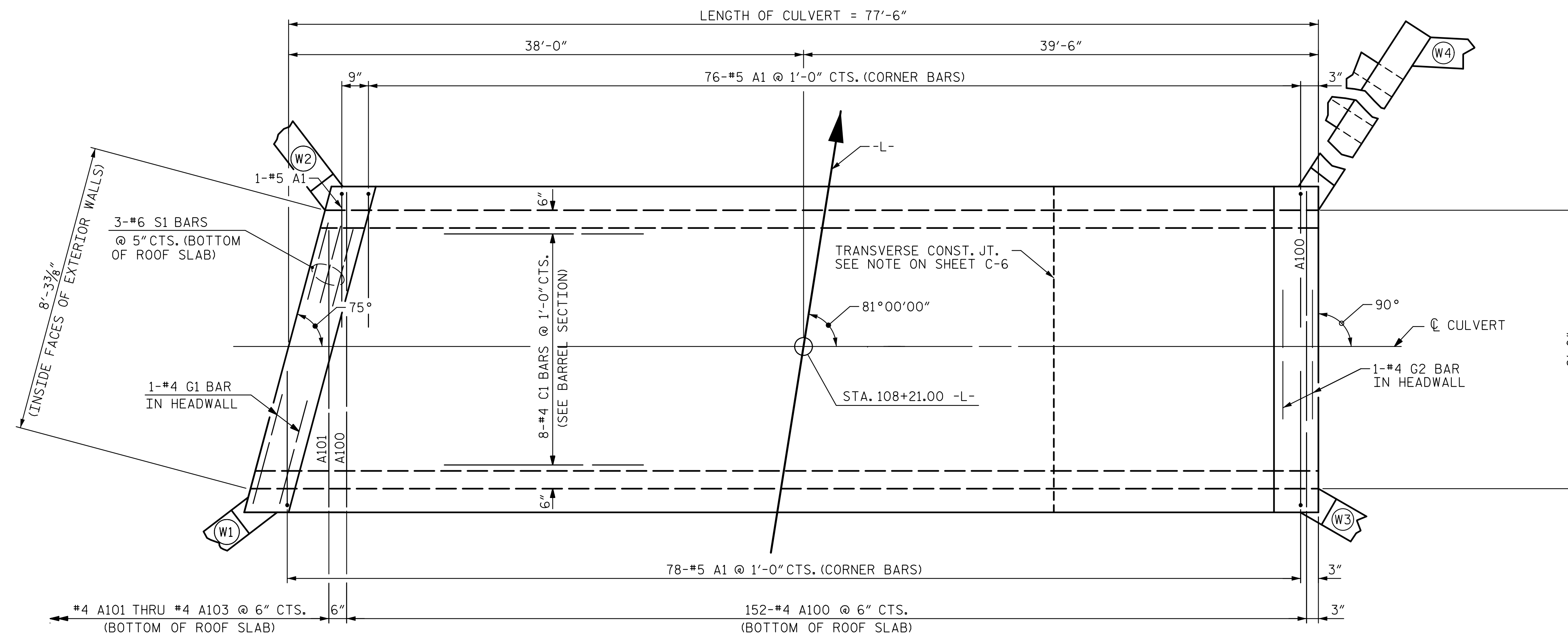
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE BARREL
 8 FT. X 7 FT.
 CONCRETE BOX CULVERT



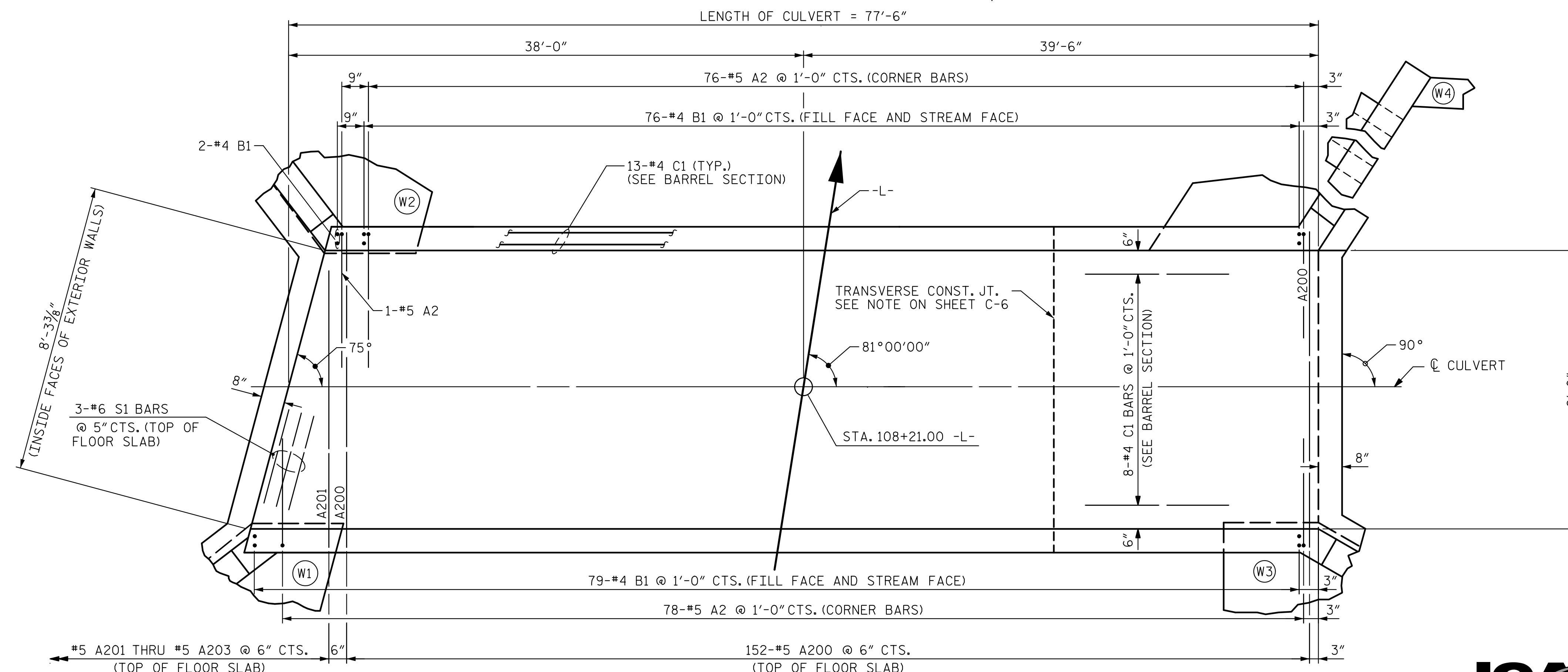
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-7
1			3			TOTAL SHEETS 13
2			4			

REVISED 8-25-92 BY E.L.R. CHECKED BY G.R.P.
 REDRAWN 8-22-89 BY A.R.B. CHECKED BY C.R.K.
 REVISED 11-19-99 BY M.M. CHECKED BY R.W.W.
 ASSEMBLED BY: D. H. CARTER DATE: MAY 2015
 CHECKED BY: T. E. TALLMAN DATE: MAY 2015
 DRAWN BY: S. A. TEDDER DATE: AUG. 1989
 CHECKED BY: A.R. BISSETTE DATE: AUG. 1989

NOTE:
ALL #4 C1 BARS ARE 3 BAR RUNS.



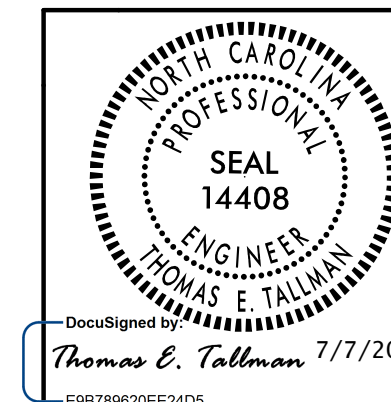
PLAN ROOF SLAB



PLAN - FLOOR SLAB

PROJECT NO. W-5516
ROWAN COUNTY
 STATION: 108+21.00 -L-
 SHEET 3 OF 8

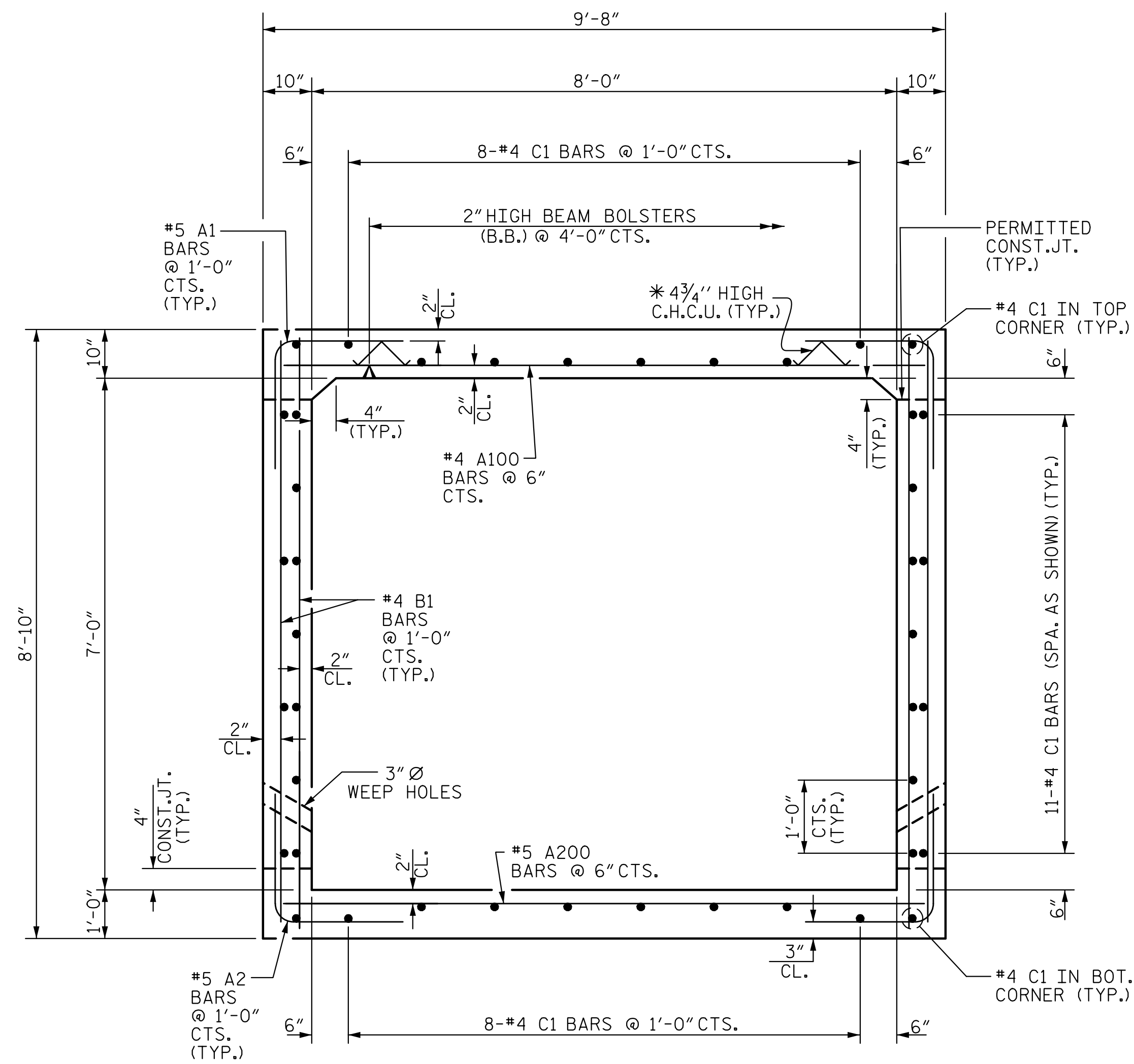
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE BARREL
 8 FT. X 7 FT.
 CONCRETE BOX CULVERT



REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-8
1			3			TOTAL SHEETS 13
2			4			

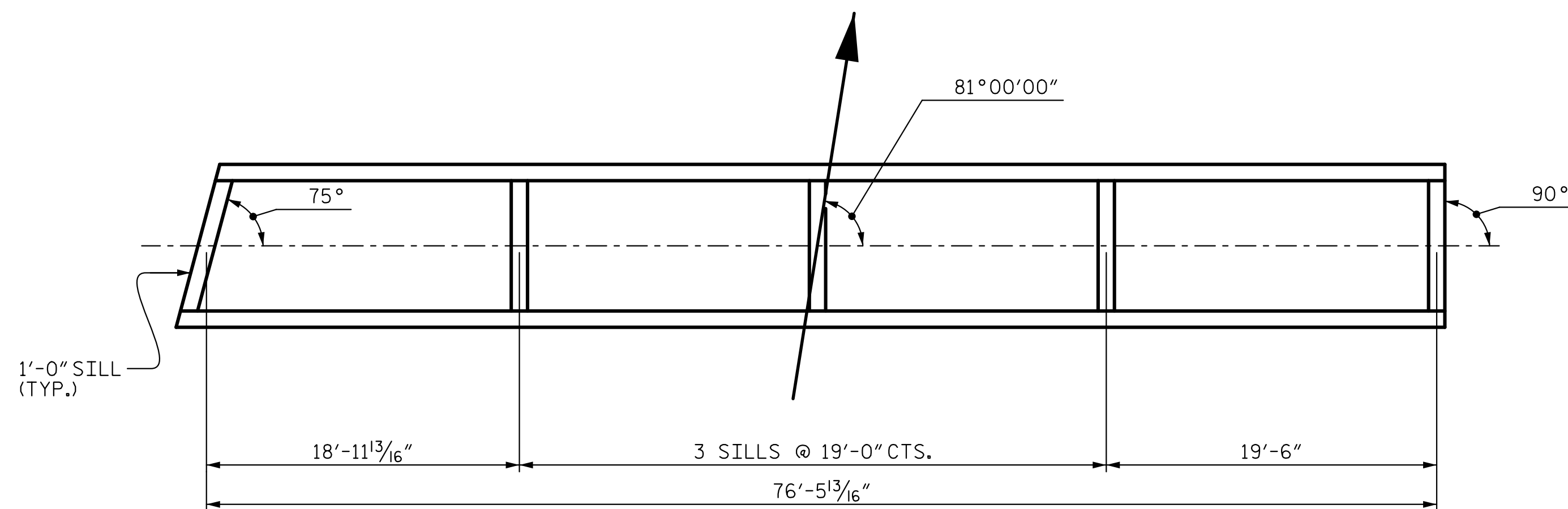
REVISED 8-25-92 BY E.L.R. CHECKED BY G.R.P.
 REVISED 8-25-92 BY A.R.B. CHECKED BY C.R.K.
 REDRAWN 8-22-99
 REVISED 11-19-99 BY M.M. CHECKED BY R.W.W.

ASSEMBLED BY : <u>D. H. CARTER</u> DATE : <u>MAY 2015</u>	SPECIAL
CHECKED BY : <u>T. E. TALLMAN</u> DATE : <u>MAY 2015</u>	
DRAWN BY : <u>S. A. TEDDER</u> DATE : <u>AUG. 1989</u>	STANDARD
CHECKED BY : <u>A.R. BISSETTE</u> DATE : <u>AUG. 1989</u>	



RIGHT ANGLE SECTION OF BARREL

THERE ARE 42 #4 BARS IN SECTION OF BARREL.
 * CONTINUOUS HIGH CHAIR UPPER (C.H.C.U.) @ 3'-0" CTS.

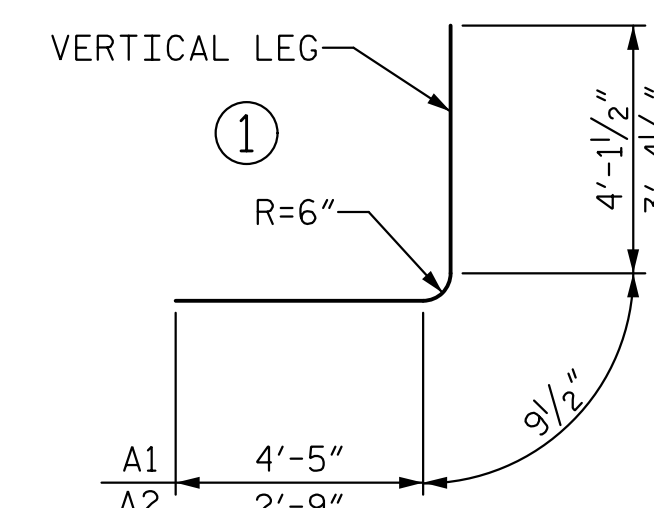


PLAN VIEW SHOWING SILL LOCATIONS

NOTE:

ALL #4 C1 BARS ARE 3 BAR RUNS.

BAR TYPES



BILL OF MATERIAL

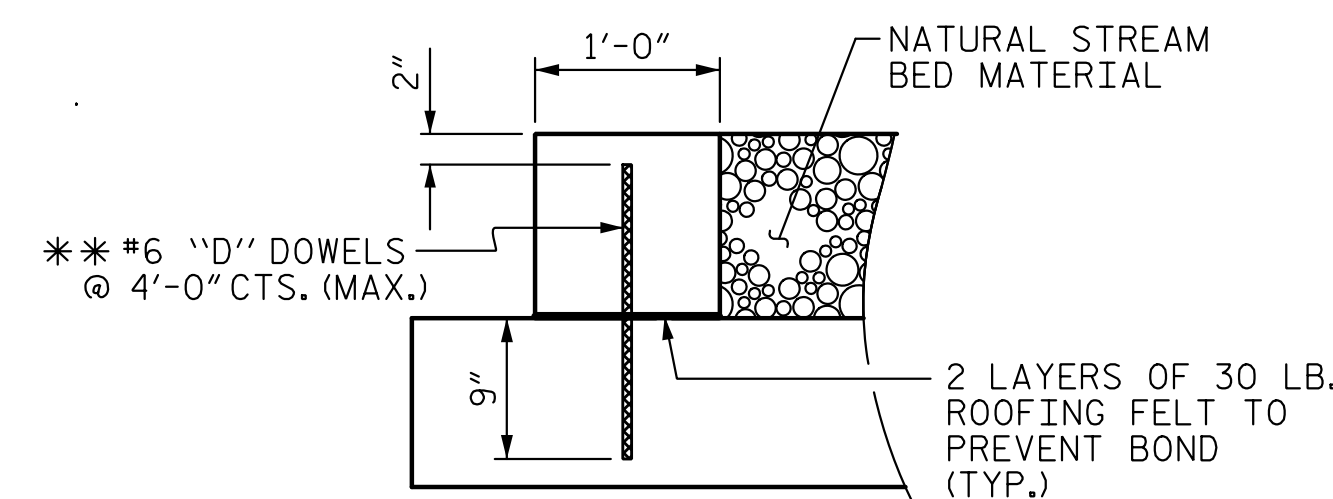
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	155	#5	1	9'-4"	1,509
A2	155	#5	1	6'-11"	1,118
A100	152	#4	STR	9'-4"	948
A101	1	#4	STR	8'-10"	6
A102	1	#4	STR	6'-10"	5
A103	1	#4	STR	4'-10"	3
A200	152	#5	STR	9'-4"	1,480
A201	1	#5	STR	8'-10"	9
A202	1	#5	STR	6'-10"	7
A203	1	#5	STR	4'-10"	5

B1	312	#4	STR	8'-5"	1,754
C1	126	#4	STR	27'-5"	2,308
D1	10	#6	STR	1'-7"	24
G1	2	#4	STR	9'-7"	13
G2	2	#4	STR	9'-4"	12
S1	6	#6	STR	9'-7"	86

SPLICE LENGTH CHART

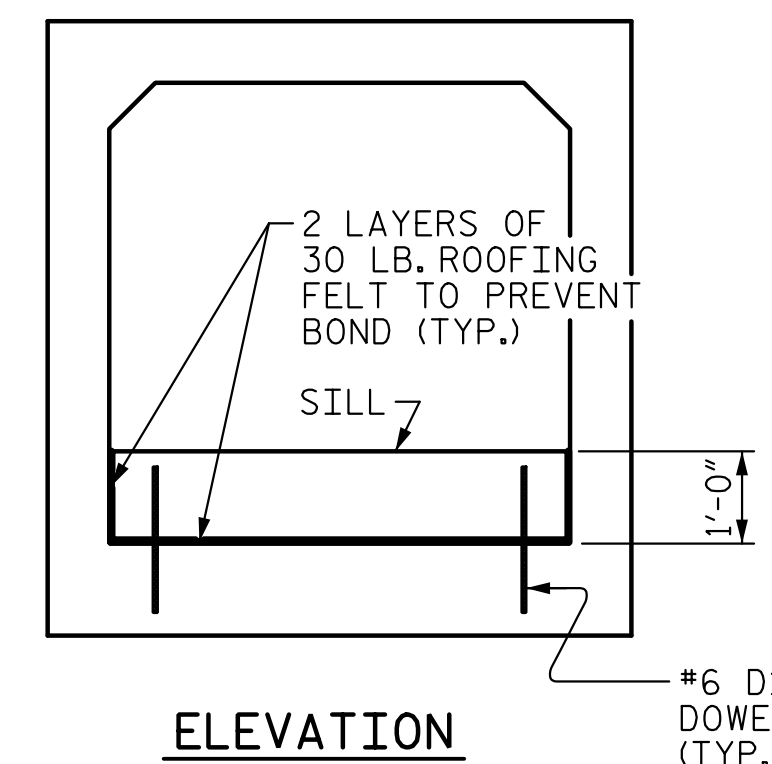
BAR	SIZE	SPLICE LENGTH
B1	#5	1'-9"
C1	#4	1'-11"

REINFORCING STEEL		9,287	LBS
CLASS A CONCRETE			
CULVERT		84.7	CY
SILLS		1.3	CY
TOTAL		86.0	CY



SECTION

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



ELEVATION

SILL DETAILS

(LOOKING DOWN STREAM)

PROJECT NO. W-5516

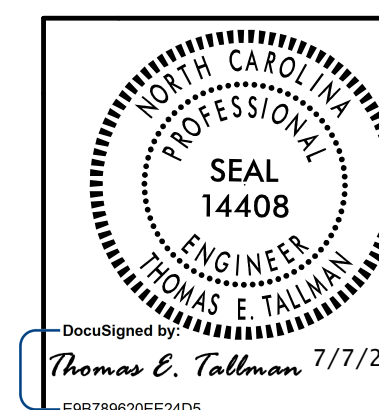
ROWAN COUNTY

STATION: 108+21.00 -L-

SHEET 4 OF 8

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

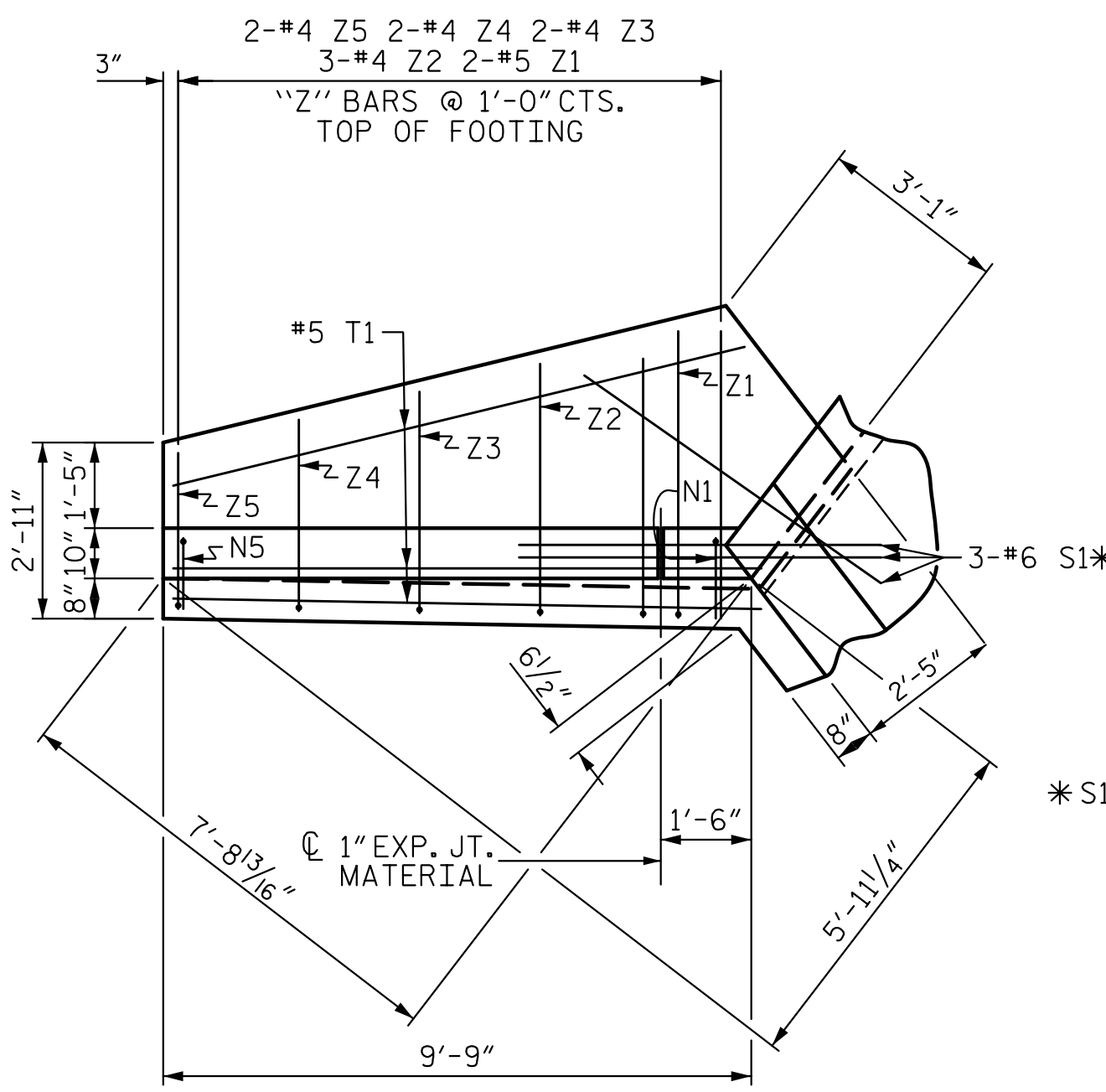
CULVERT DETAILS



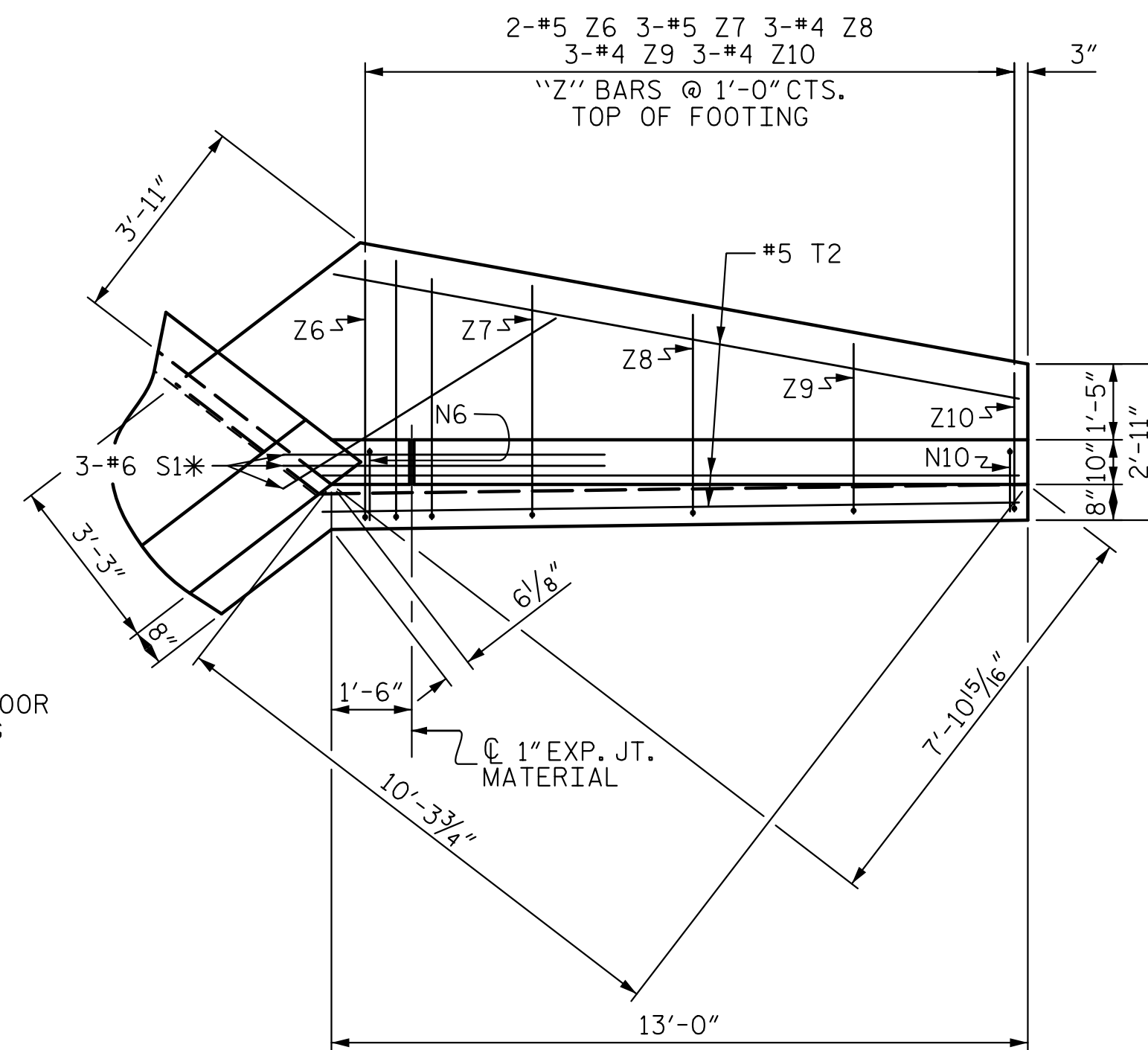
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-9
1			3			TOTAL SHEETS
2			4			13

7/7/2015 10:53 AM C:\Users\Tallman\OneDrive\Documents\Projects\W-5516\Culvert\Culvert.dwg
 T. E. Tallman, P.E.
 Thomas E. Tallman, Inc.

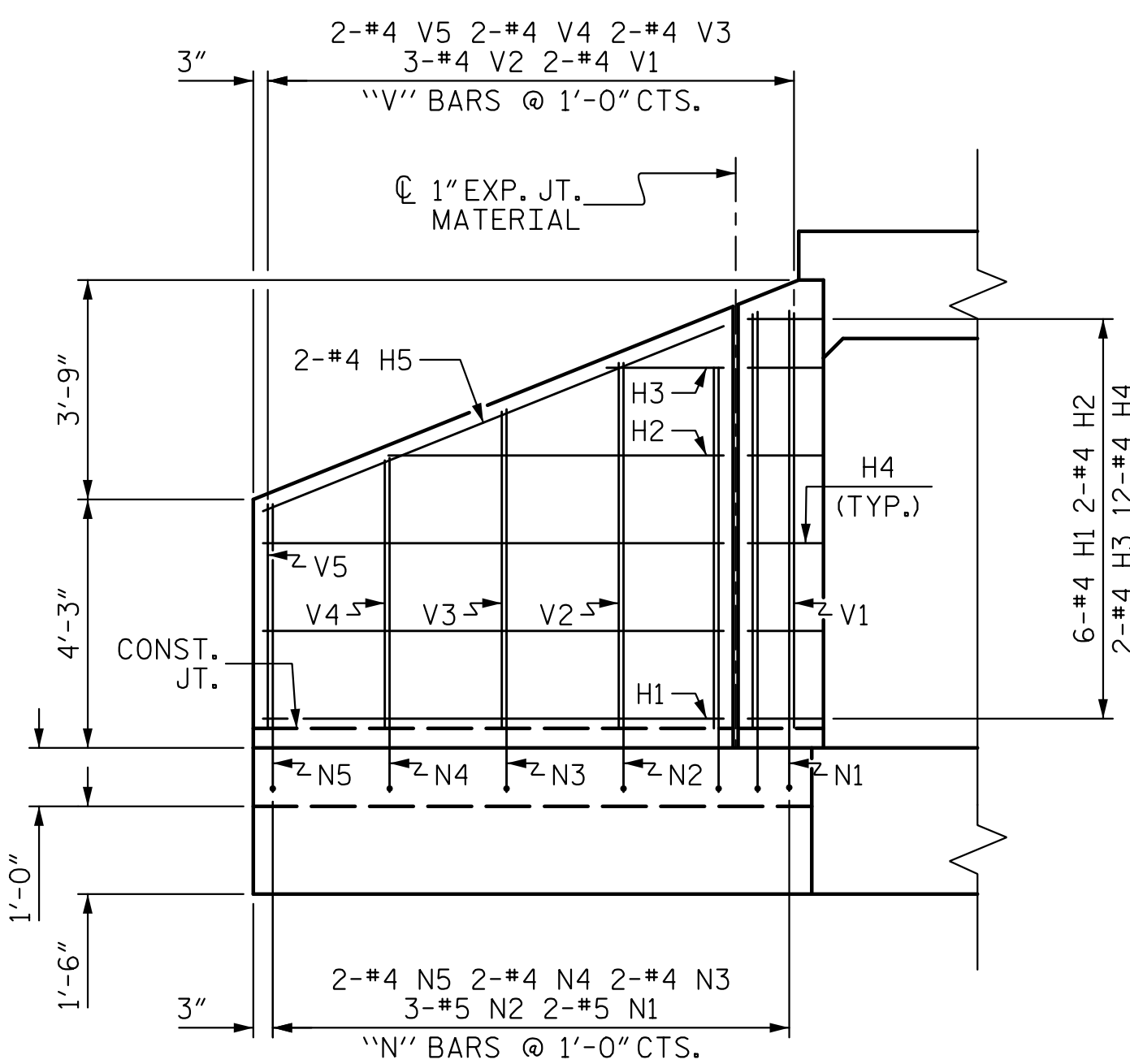
DRAWN BY: D. H. CARTER DATE: MAY 2015
 CHECKED BY: T. E. TALLMAN DATE: MAY 2015
 DESIGN ENGINEER OF RECORD: T. E. TALLMAN DATE: MAY 2015



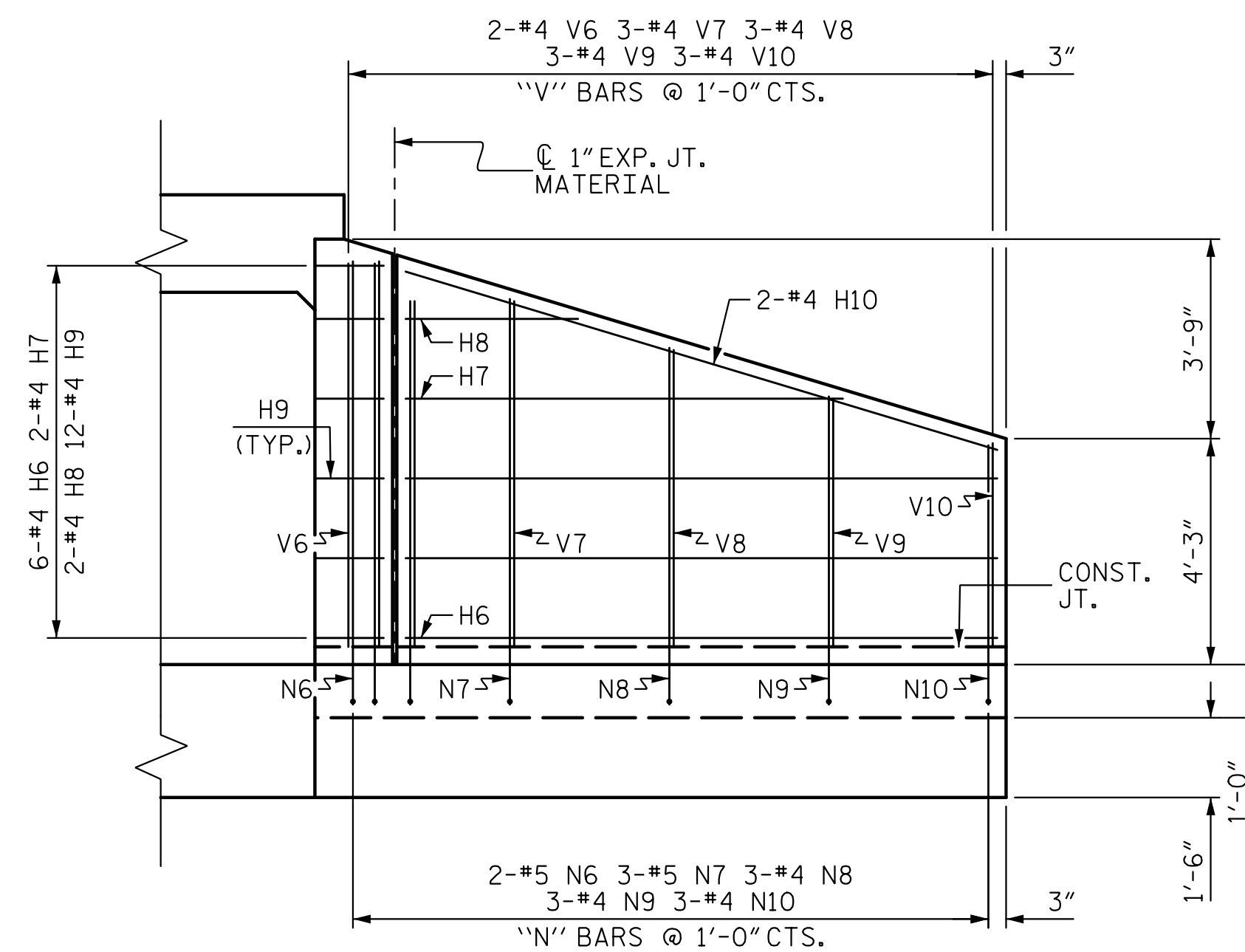
PLAN - W2



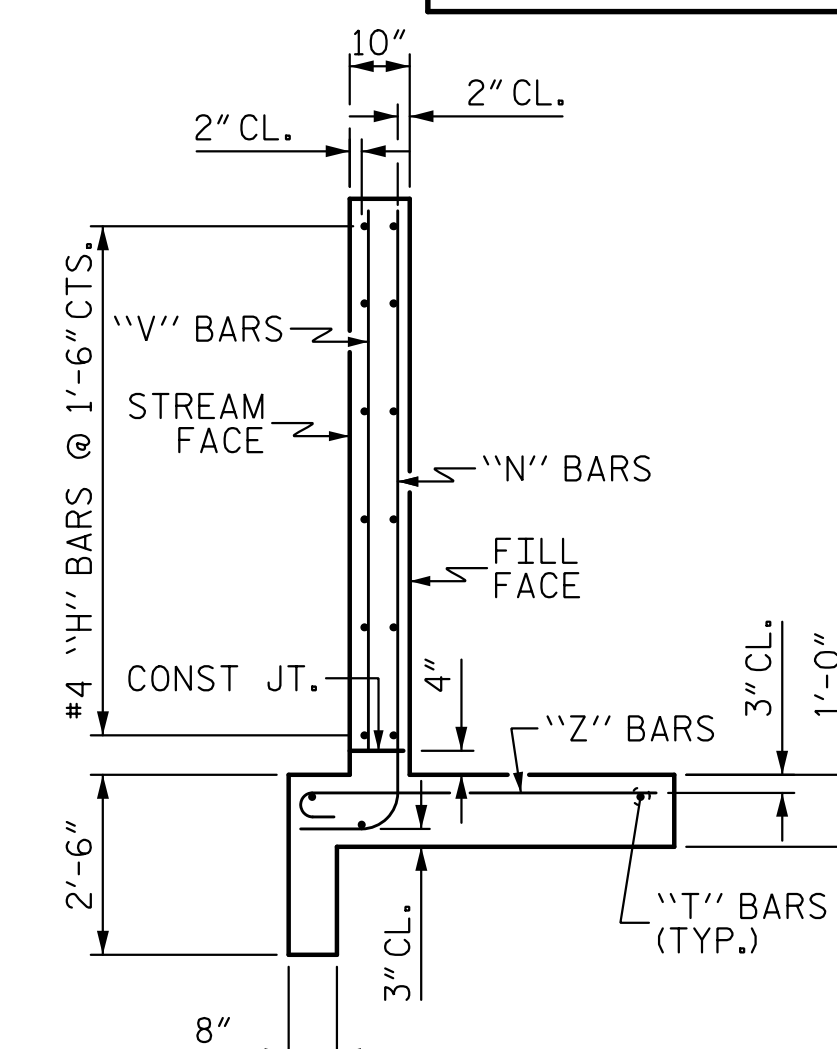
PLAN - W1



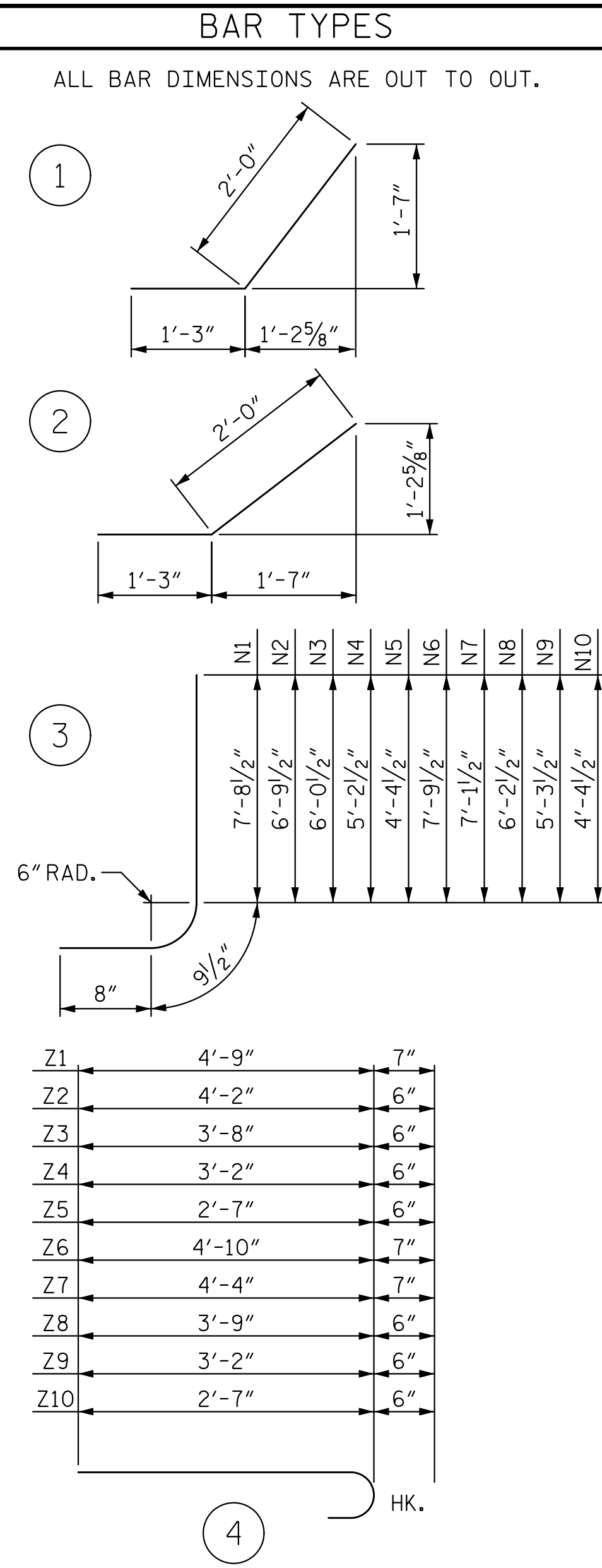
ELEVATION - W2



ELEVATION - W1



TYPICAL WING SECTION

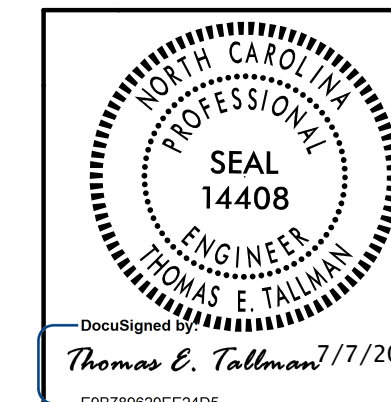


BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	6	#4	STR	7'-10"	31
H2	2	#4	STR	5'-8"	8
H3	2	#4	STR	2'-0"	3
H4	12	#4	1	3'-3"	26
H5	2	#4	STR	8'-5"	11
H6	6	#4	STR	11'-1"	44
H7	2	#4	STR	8'-2"	11
H8	2	#4	STR	3'-3"	4
H9	12	#4	2	3'-3"	26
H10	2	#4	STR	11'-7"	15
N1	2	#5	3	9'-2"	19
N2	3	#5	3	8'-3"	26
N3	2	#4	3	7'-6"	10
N4	2	#4	3	6'-8"	9
N5	2	#4	3	5'-10"	8
N6	2	#5	3	9'-3"	19
N7	3	#5	3	8'-7"	27
N8	3	#4	3	7'-8"	15
N9	3	#4	3	6'-9"	14
N10	3	#4	3	5'-10"	12
S1	6	#6	STR	6'-0"	54
T1	3	#5	STR	9'-9"	31
T2	3	#5	STR	13'-0"	41
V1	2	#4	STR	7'-1"	9
V2	3	#4	STR	6'-3"	13
V3	2	#4	STR	5'-5"	7
V4	2	#4	STR	4'-7"	6
V5	2	#4	STR	3'-10"	5
V6	2	#4	STR	7'-3"	10
V7	3	#4	STR	6'-6"	13
V8	3	#4	STR	5'-7"	11
V9	3	#4	STR	4'-8"	9
V10	3	#4	STR	3'-10"	8
Z1	2	#5	4	5'-4"	11
Z2	3	#4	4	4'-8"	9
Z3	2	#4	4	4'-2"	6
Z4	2	#4	4	3'-8"	5
Z5	2	#4	4	3'-1"	4
Z6	2	#5	4	5'-5"	11
Z7	3	#5	4	4'-11"	15
Z8	3	#4	4	4'-3"	9
Z9	3	#4	4	3'-8"	7
Z10	3	#4	4	3'-1"	6

REINFORCING STEEL 638 LBS
FOR 2 WINGS
CLASS A CONCRETE
2 WINGS 9.1 CY
1 HEADWALL 0.5 CY
1 END CURTAIN WALL 0.3 CY
TOTAL 9.9 CY

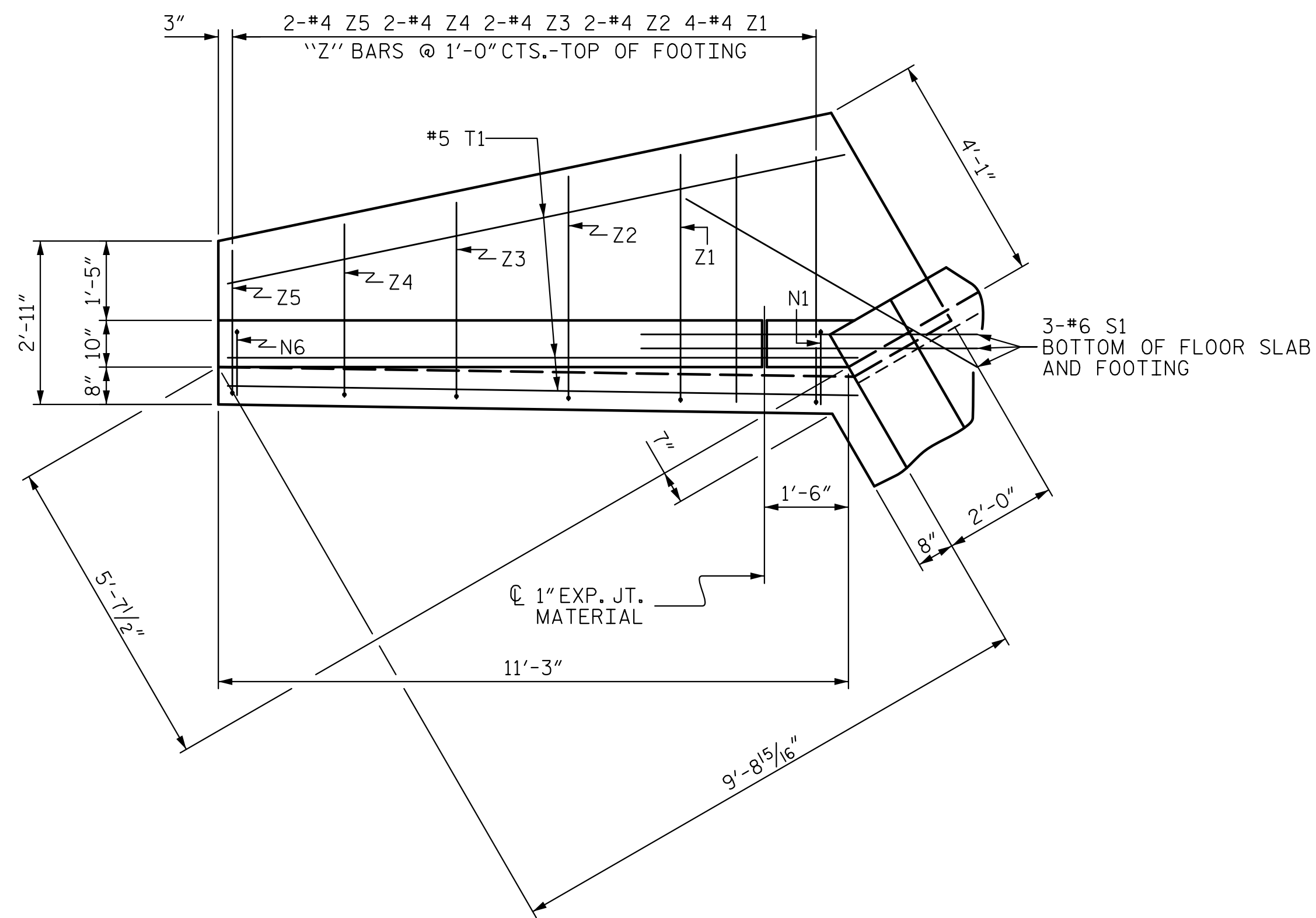
PROJECT NO. W-5516
ROWAN COUNTY
STATION: 108+21.00 -L-
SHEET 5 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
STANDARD WINGS
FOR
CONCRETE BOX CULVERT
H = 7'-0" SLOPE = 2:1
75° SKEW

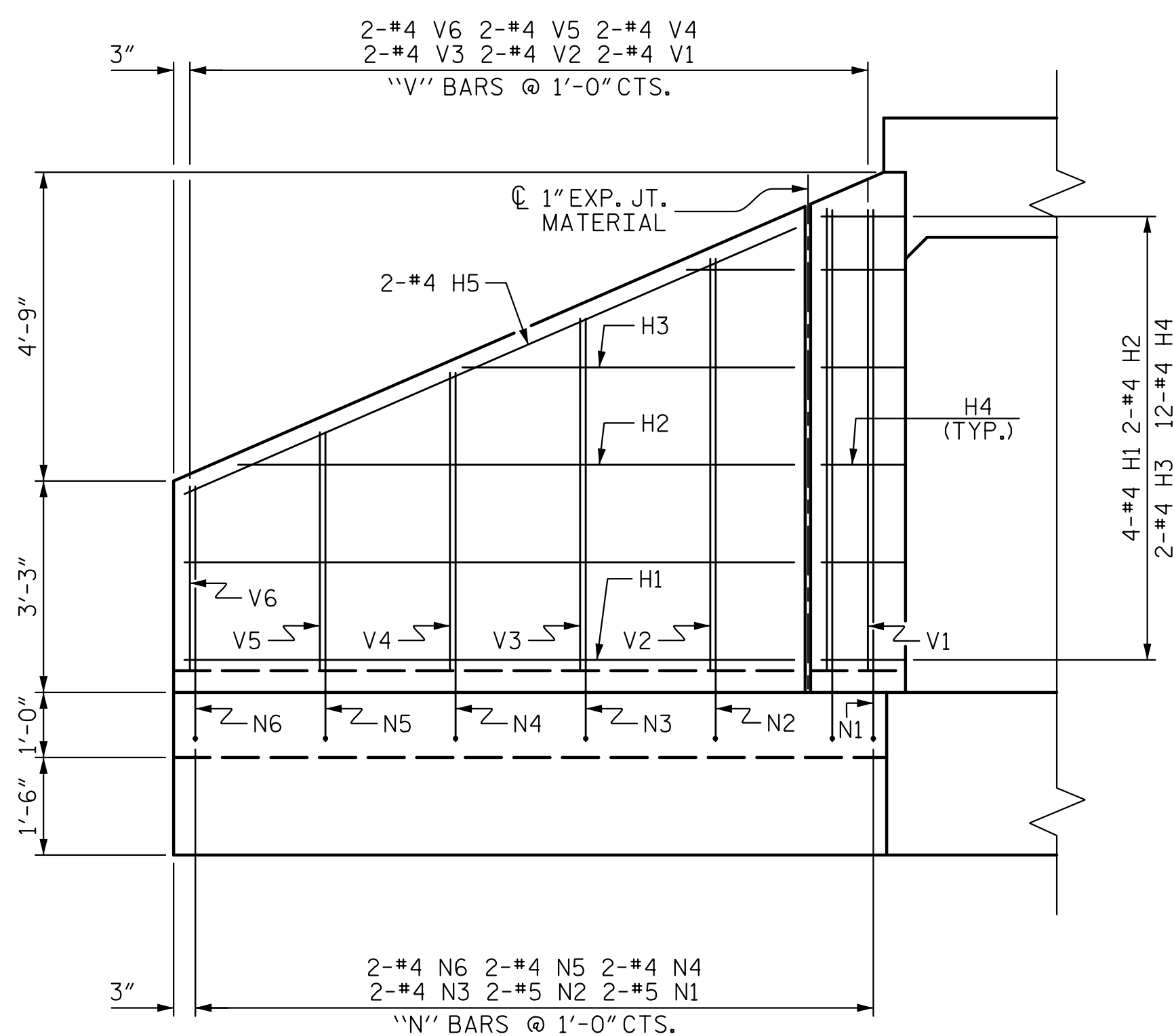


REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

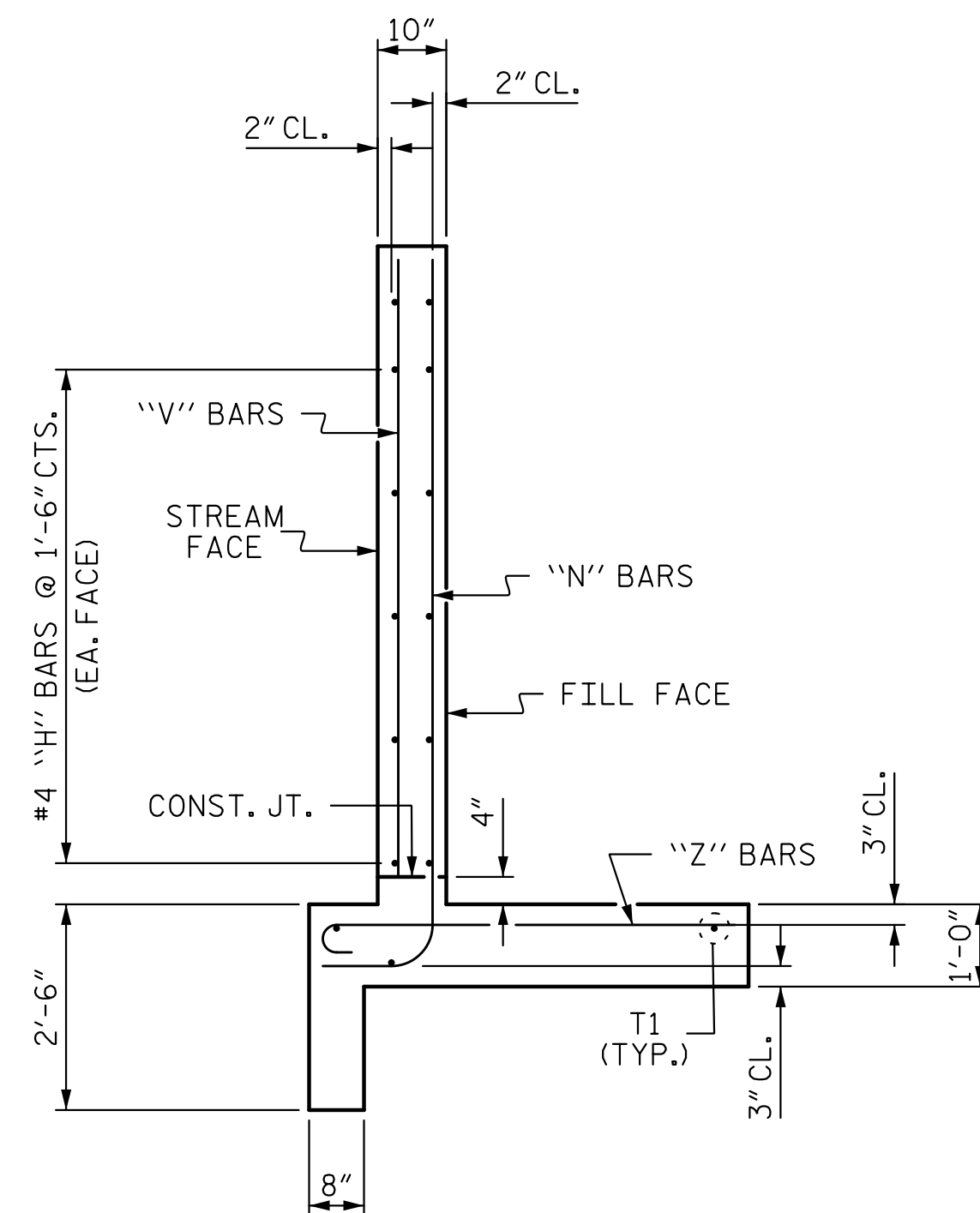
ASSEMBLED BY: D. H. CARTER DATE: MAY 2015
CHECKED BY: T. E. TALLMAN DATE: MAY 2015
DRAWN BY: CCJ 12/99
CHECKED BY: RWW 03/00



PLAN - W3



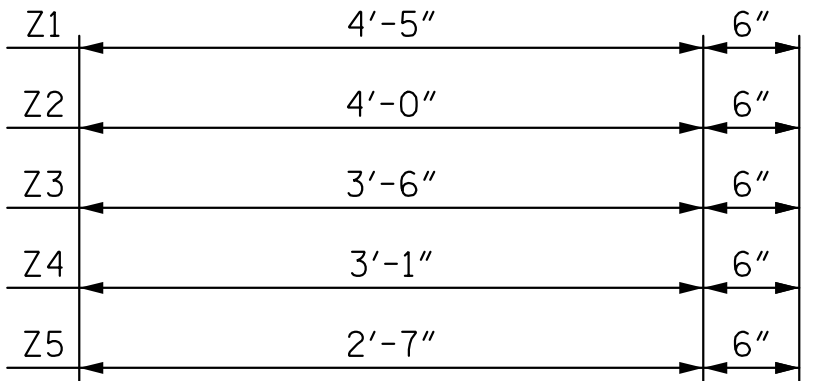
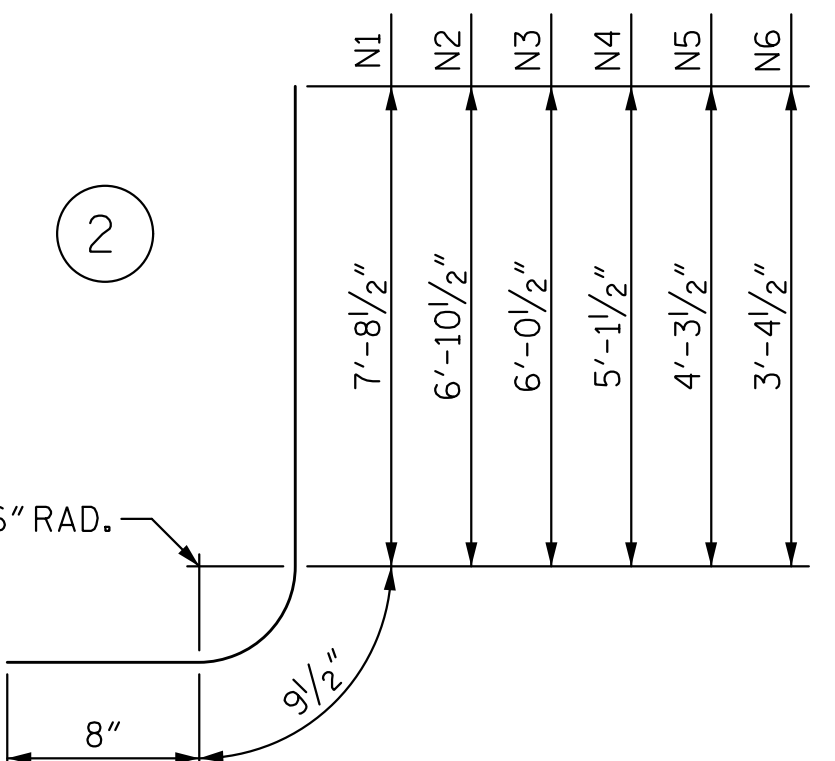
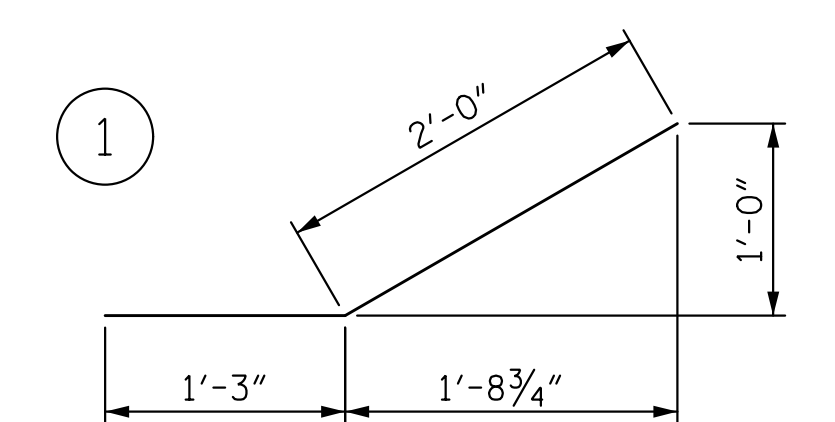
ELEVATION - W3



TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.



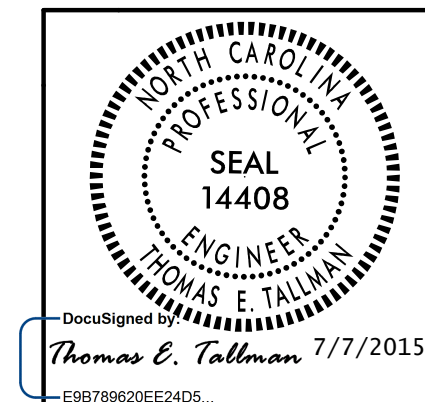
BILL OF MATERIAL

BAR NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	#4	STR	9'-4"	25
H2	#4	STR	8'-6"	11
H3	#4	STR	5'-1"	7
H4	#4	STR	3'-3"	26
H5	#4	STR	10'-3"	14
N1	#5	2	9'-2"	19
N2	#5	2	8'-4"	17
N3	#4	2	7'-6"	10
N4	#4	2	6'-7"	9
N5	#4	2	5'-9"	8
N6	#4	2	4'-10"	6
S1	#6	STR	6'-0"	27
T1	#5	STR	11'-3"	35
V1	#4	STR	7'-1"	9
V2	#4	STR	6'-4"	8
V3	#4	STR	5'-5"	7
V4	#4	STR	4'-7"	6
V5	#4	STR	3'-8"	5
V6	#4	STR	2'-10"	4
Z1	#4	3	4'-11"	13
Z2	#4	3	4'-6"	6
Z3	#4	3	4'-0"	5
Z4	#4	3	3'-7"	5
Z5	#4	3	3'-1"	4

TOTAL REINFORCING STEEL FOR 1 WING 286 LBS

CLASS A CONCRETE
 1 WING 4.3 CY
 1 HEADWALL 0.4 CY
 1 END CURTAIN WALL 0.3 CY
 TOTAL 5.0 CY

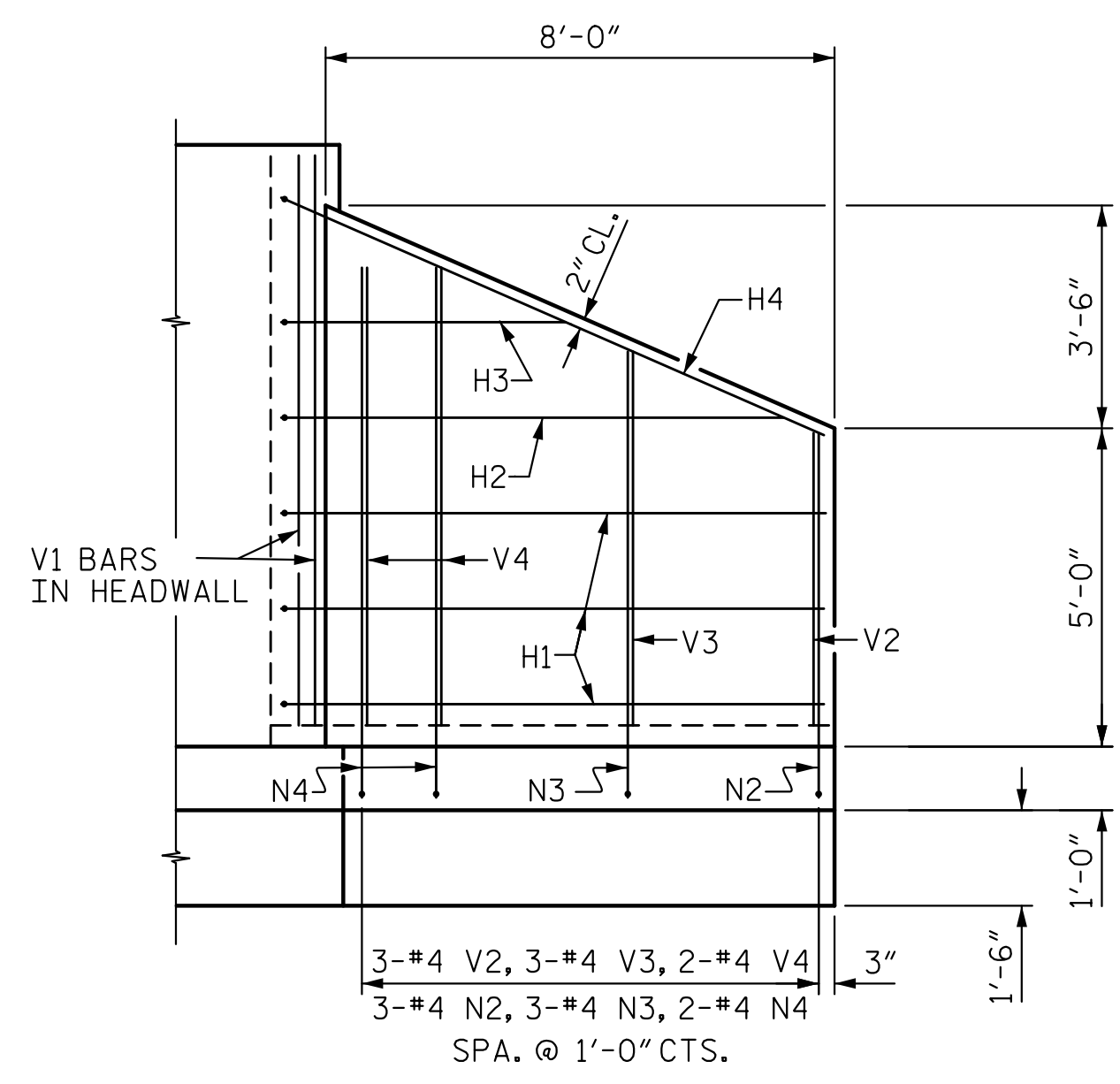
ASSEMBLED BY : D. H. CARTER DATE : MAY 2015
 CHECKED BY : T. E. TALLMAN DATE : MAY 2015
 DRAWN BY : CCJ 10/99
 CHECKED BY : RWW 03/00



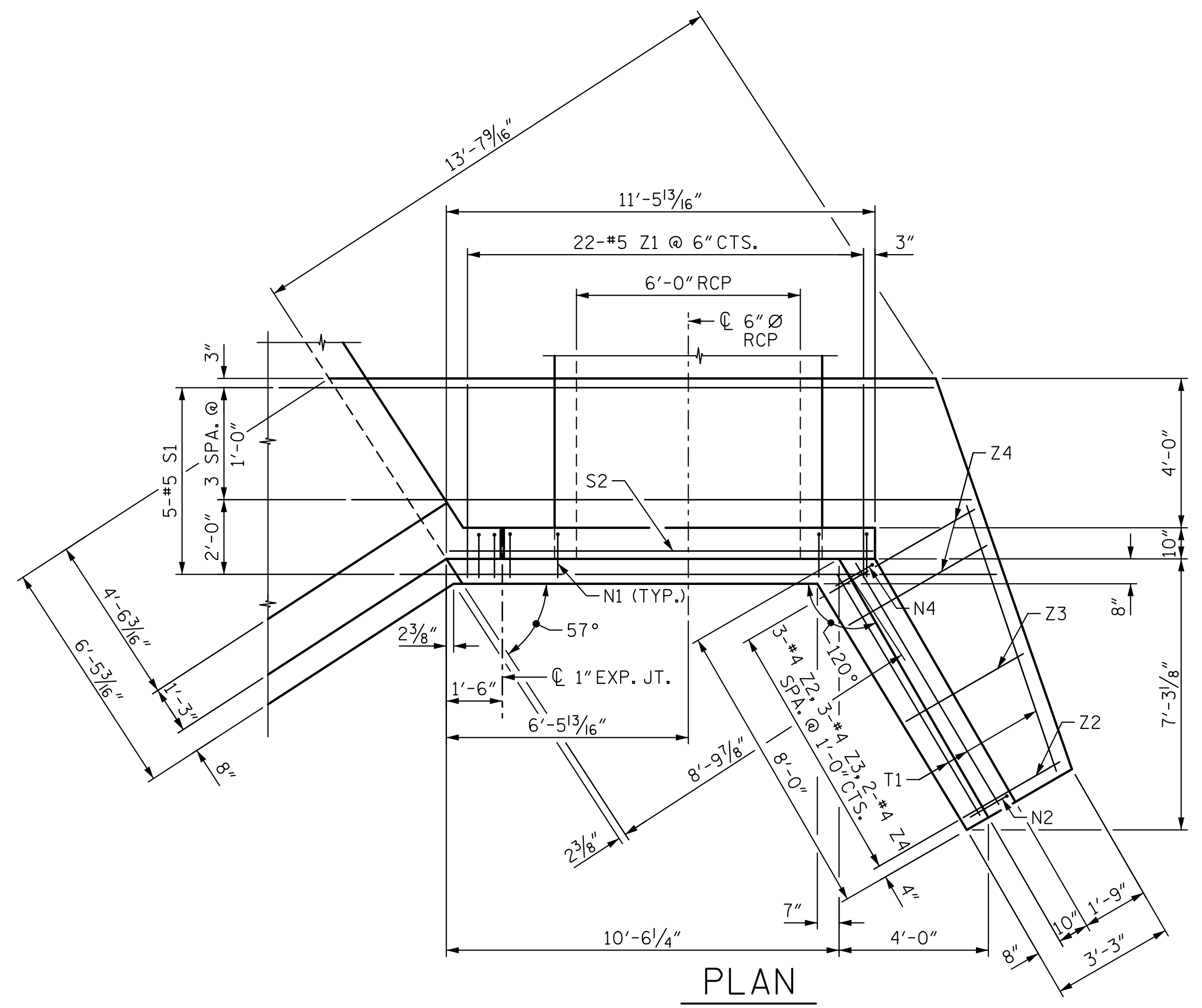
PROJECT NO. W-5516
 ROWAN COUNTY
 STATION: 108+21.00 -L-
 SHEET 6 OF 8

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-11
1			3			TOTAL SHEETS 13
2			4			

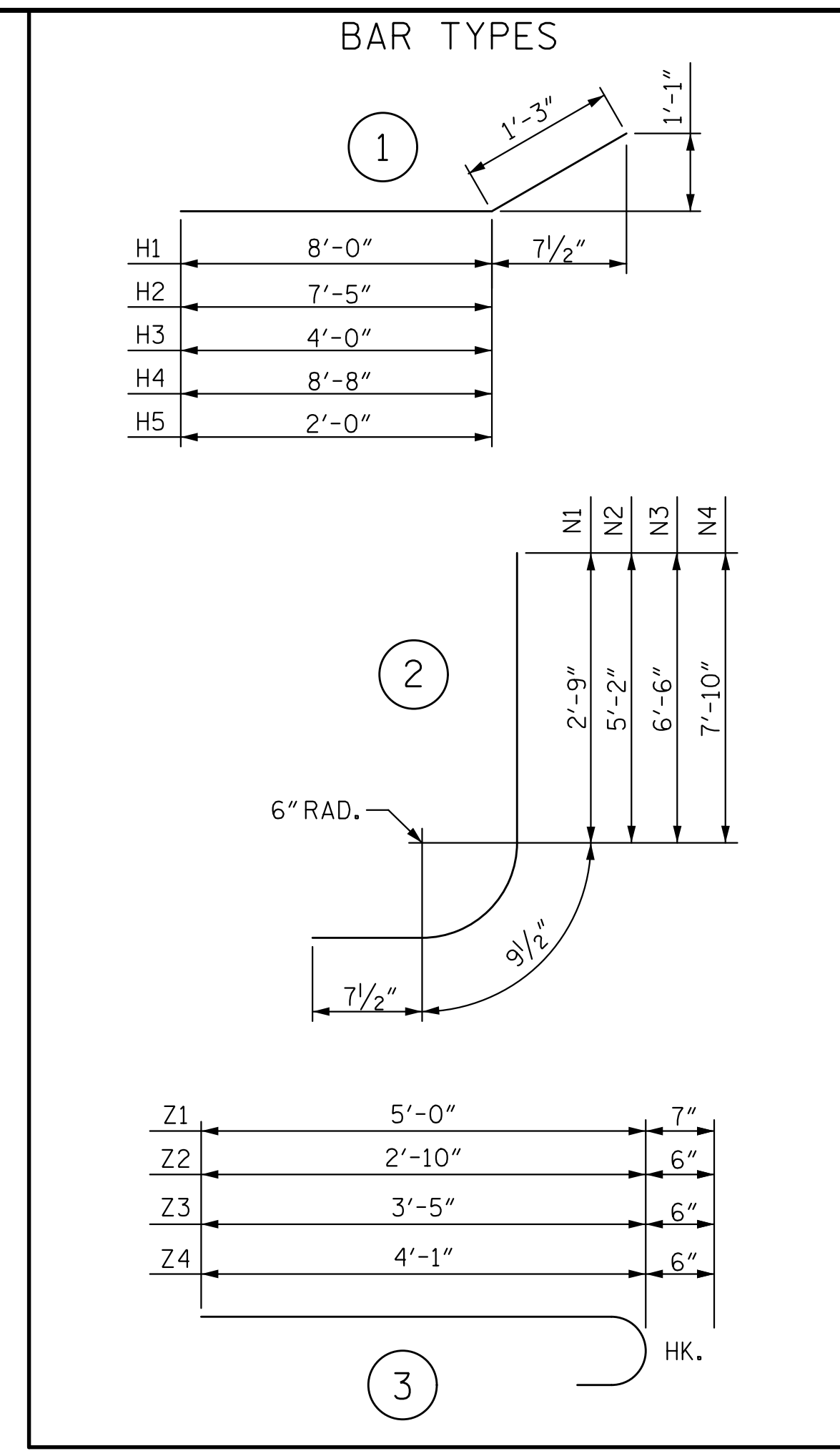
STD. NO. CW9007



WING ELEVATION

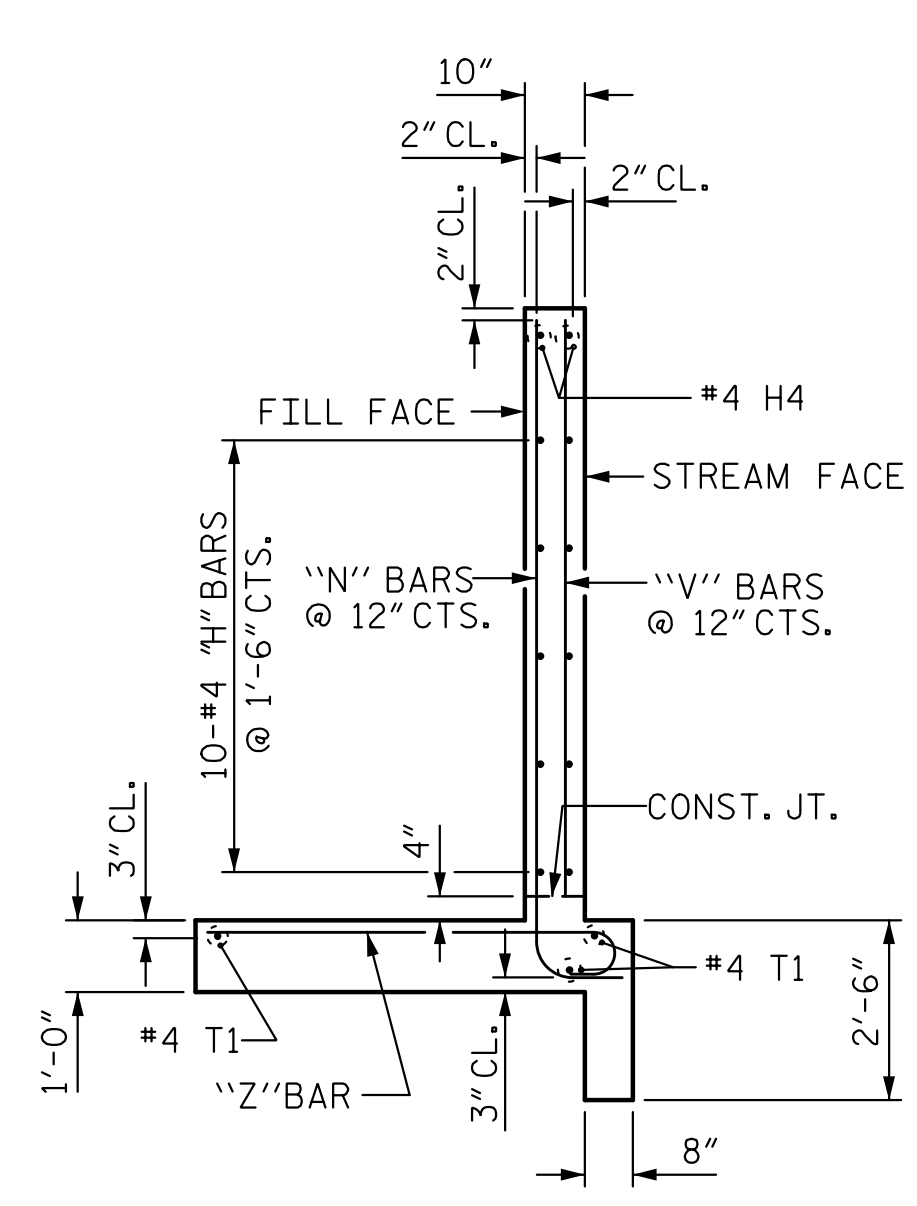


PLAN

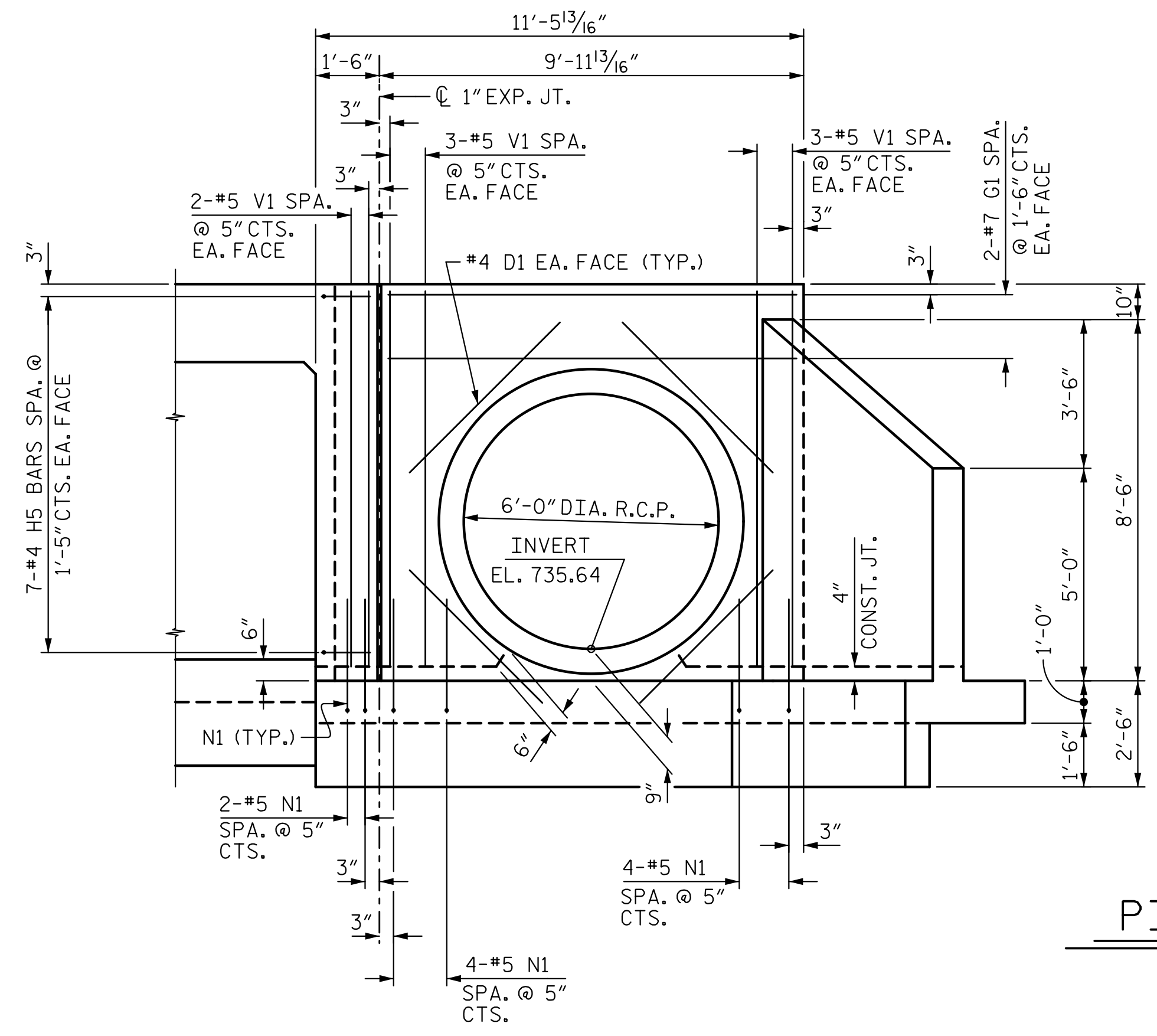


BAR TYPES

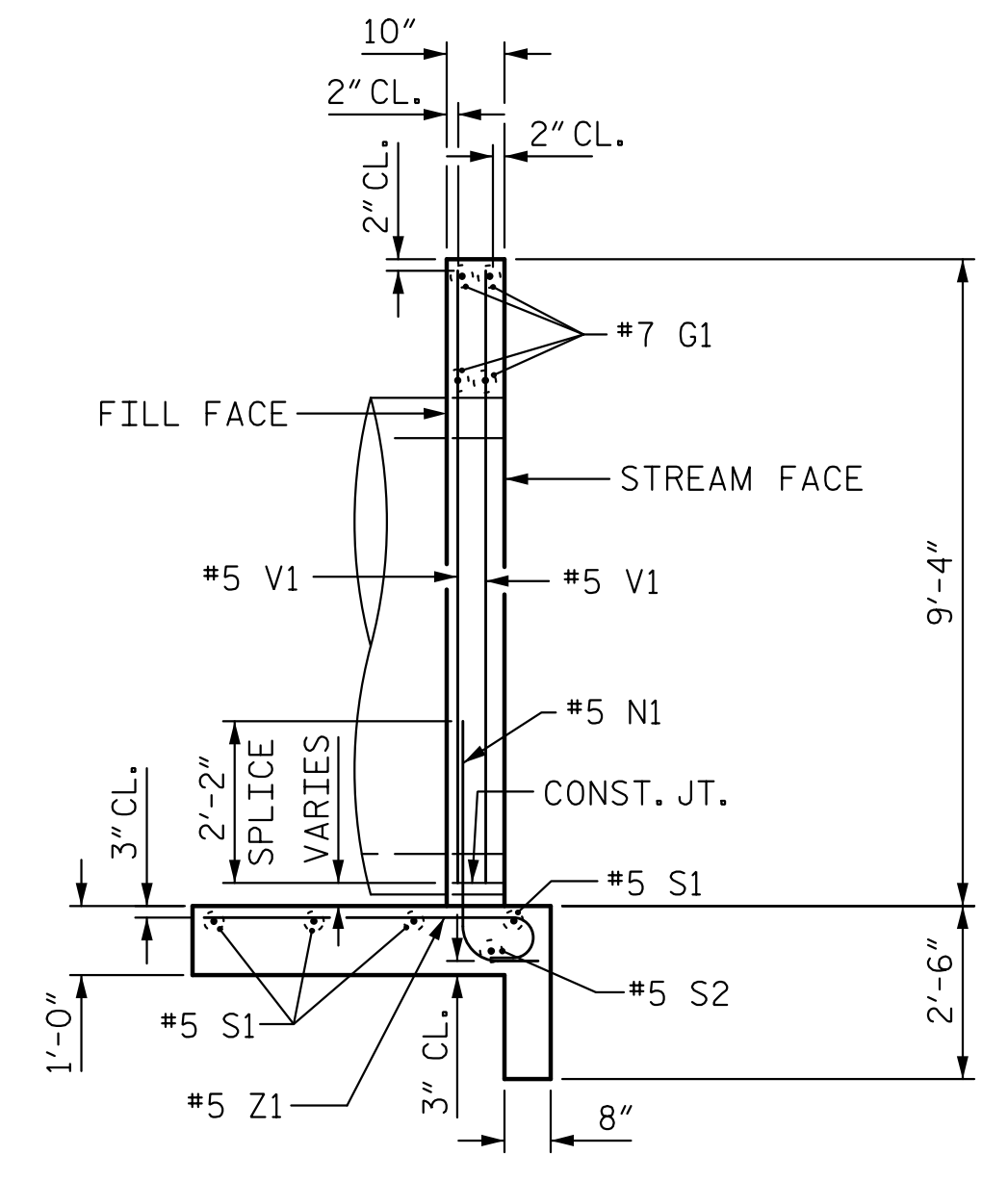
BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
D1	8	#4	STR	5'-6"	29
G1	4	#7	STR	9'-7"	78
H1	6	#4	1	9'-3"	37
H2	2	#4	1	8'-8"	12
H3	2	#4	1	5'-3"	7
H4	2	#4	1	9'-11"	13
H5	14	#4	1	3'-3"	30
N1	10	#5	2	4'-2"	43
N2	3	#4	2	6'-7"	13
N3	3	#4	2	7'-11"	16
N4	2	#4	2	9'-3"	12
S1	5	#5	STR	17'-2"	90
S2	1	#5	STR	11'-5"	12
T1	3	#4	STR	7'-8"	15
V1	16	#5	STR	8'-10"	147
V2	3	#4	STR	4'-7"	9
V3	3	#4	STR	5'-11"	12
V4	2	#4	STR	7'-3"	10
Z1	22	#5	3	5'-7"	128
Z2	3	#4	3	3'-4"	7
Z3	3	#4	3	3'-11"	8
Z4	2	#4	3	4'-7"	6
REINFORCING STEEL FOR 1 WING					734 LBS
CLASS A CONCRETE					
1 HEADWALL					2.0 CY
1 WING WALL					1.6 CY
FOOTING & CURTAIN WALL					4.8 CY
TOTAL					8.4 CY



WING SECTION



PIPE HEADWALL ELEVATION

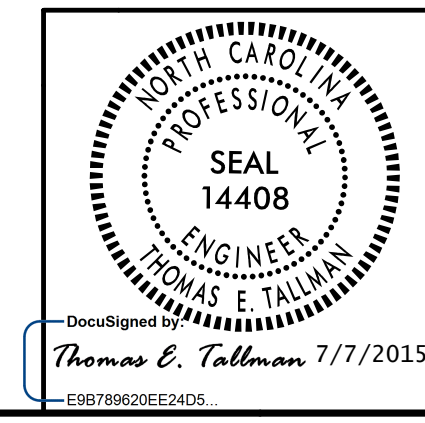


PIPE HEADWALL SECTION

NOTE:
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.

PROJECT NO. W-5516
ROWAN COUNTY
 STATION: 108+21.00 -L-
 SHEET 7 OF 8

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



5/28/2015 10:58:56 AM S:\Projects\108+21.00\108+21.00-W-5516-SD-W4.dgn
 TCA Engineering, Inc.

DRAWN BY: D. H. CARTER DATE: MAY 2015
 CHECKED BY: T. E. TALLMAN DATE: MAY 2015
 DESIGN ENGINEER OF RECORD: T. E. TALLMAN DATE: MAY 2015

SHEET NO.
C-12
 TOTAL SHEETS
13

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 (%L)	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	2.38	--	1.75	2.38	1	EXTERIOR WALL	0.37	9.53	1	TOP SLAB	0.99		
	HL-93 (OPERATING)	N/A		3.09	--	1.35	3.09	1	EXTERIOR WALL	0.37	12.36	1	TOP SLAB	0.99		
	HS-20 (INVENTORY)	36,000	②	2.38	85.7	1.75	2.38	1	EXTERIOR WALL	0.37	9.53	1	TOP SLAB	0.99		
	HS-20 (OPERATING)	36,000		3.09	111.2	1.35	3.09	1	EXTERIOR WALL	0.37	12.36	1	TOP SLAB	0.99		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13,500		4.49	60.6	1.40	4.49	1	EXTERIOR WALL	0.37	18.03	1	BOT. SLAB	0.75	
		SNGARBS2	20,000		4.20	84.0	1.40	4.20	1	EXTERIOR WALL	0.37	16.88	1	BOT. SLAB	0.75	
		SNAGRIS2	22,000		4.49	98.8	1.40	4.49	1	EXTERIOR WALL	0.37	18.03	1	BOT. SLAB	0.75	
		SNCOTTS3	27,250		1.98	54.0	1.40	1.98	1	EXTERIOR WALL	0.37	7.97	1	TOP SLAB	0.99	
		SNAGGRS4	34,925		2.03	70.9	1.40	2.03	1	EXTERIOR WALL	0.37	7.82	1	TOP SLAB	0.99	
		SNS5A	35,550	③	1.96	69.7	1.40	1.96	1	EXTERIOR WALL	0.37	7.83	1	TOP SLAB	0.99	
		SNS6A	39,950		1.96	78.3	1.40	1.96	1	EXTERIOR WALL	0.37	7.83	1	TOP SLAB	0.99	
		SNS7B	42,000		1.96	82.3	1.40	1.96	1	EXTERIOR WALL	0.37	7.83	1	TOP SLAB	0.99	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33,000		2.91	96.0	1.40	2.91	1	EXTERIOR WALL	0.37	10.78	1	TOP SLAB	0.99	
		TNT4A	33,075		2.36	78.1	1.40	2.36	1	EXTERIOR WALL	0.37	9.50	1	TOP SLAB	0.99	
		TNT6A	41,600		2.10	87.4	1.40	2.10	1	EXTERIOR WALL	0.37	8.25	1	TOP SLAB	0.99	
		TNT7A	42,000		2.23	93.7	1.40	2.23	1	EXTERIOR WALL	0.37	8.82	1	TOP SLAB	0.99	
		TNT7B	42,000		2.08	87.4	1.40	2.08	1	EXTERIOR WALL	0.37	8.15	1	TOP SLAB	0.99	
		TNAGRIT4	43,000		2.36	101.5	1.40	2.36	1	EXTERIOR WALL	0.37	9.50	1	TOP SLAB	0.99	
TNAGR5A	45,000		2.35	105.8	1.40	2.35	1	EXTERIOR WALL	0.37	9.46	1	TOP SLAB	0.99			
TNAGR5B	45,000		2.35	105.8	1.40	2.35	1	EXTERIOR WALL	0.37	9.46	1	TOP SLAB	0.99			

LOAD FACTORS:

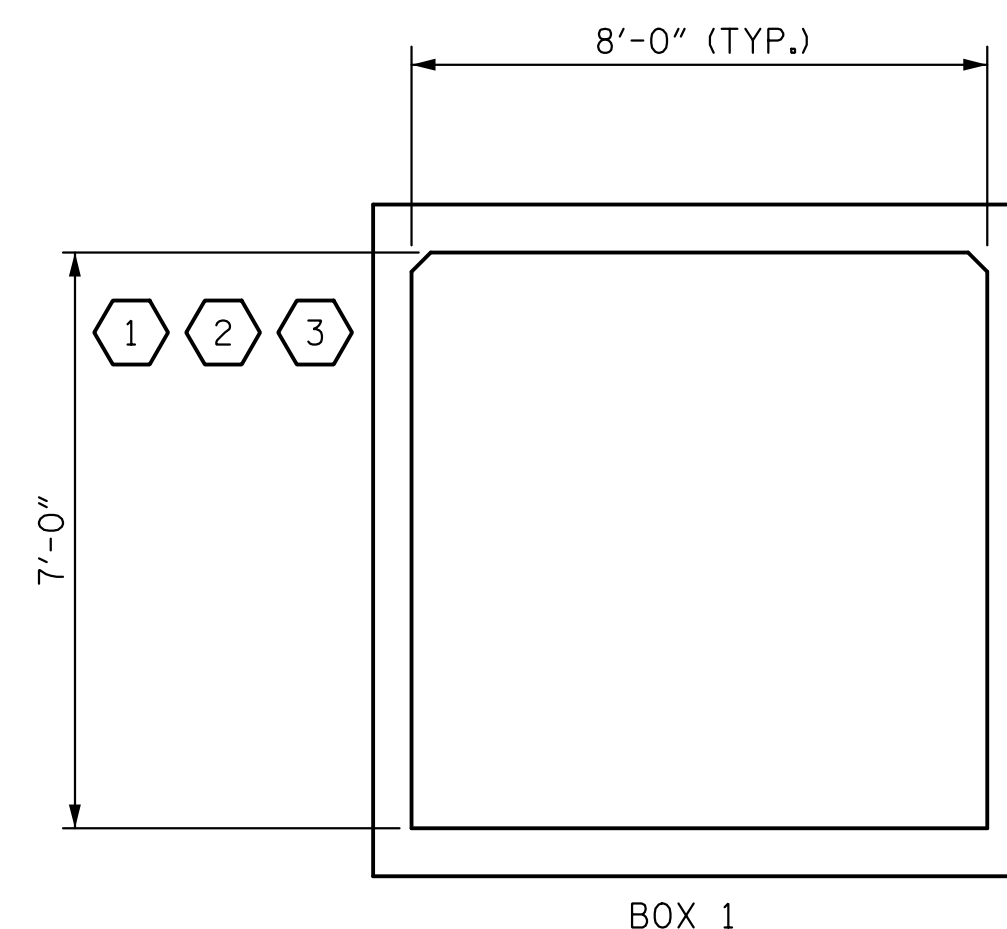
DESIGN LOAD RATING FACTORS

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

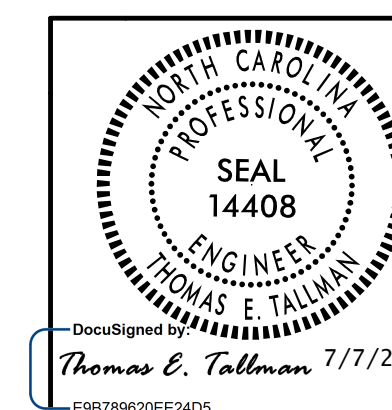


LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. W-5516
ROWAN COUNTY
 STATION: 108+21.00 -L-

SHEET 8 OF 8

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



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

STD. NO. LRFR5

5/28/2015 R:\Structures\Plans\UT_Cold_Water_Creek\C8_w5516_sd.lrf.dgn ICA Engineering

ASSEMBLED BY : D. H. CARTER DATE : MAY 2015
 CHECKED BY : T. E. TALLMAN DATE : MAY 2015
 DRAWN BY : WMC 7/11
 CHECKED BY : GM 7/11
 REV. 10/1/11 MAA/GM

5/28/2015 R:\Structures\Plans\UT_Cold_Water_Creek\C8_w5516_sd.lrf.dgn ICA Engineering