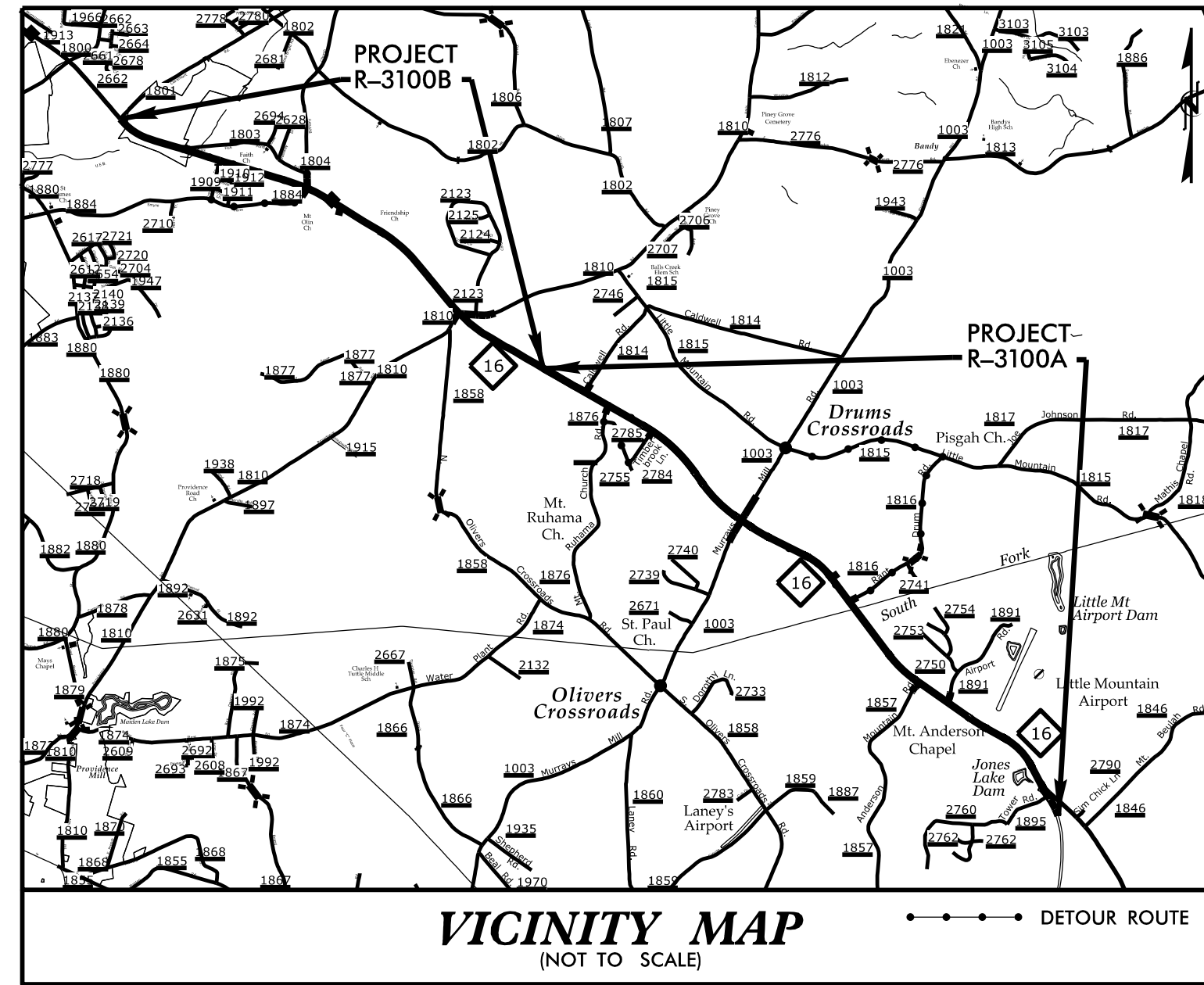


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with their signature on that page.**

**This file or an individual page
shall not be considered a certified document.**

CONTRACT: C203800 **TIP PROJECT: R-3100AR-3100B**

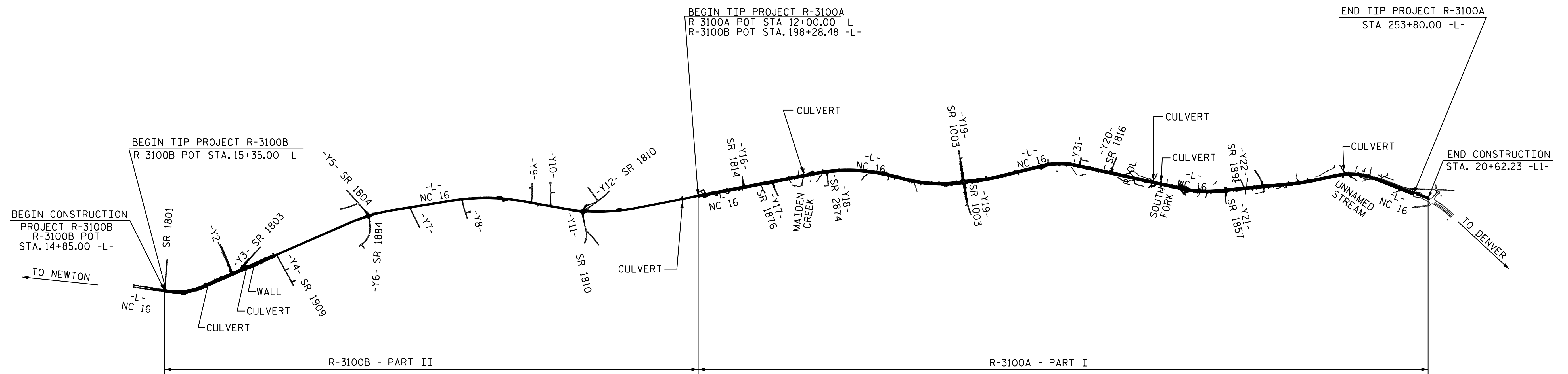
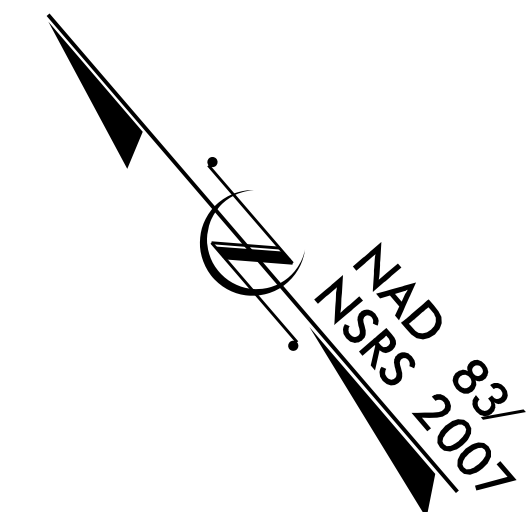


STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
CATAWBA COUNTY

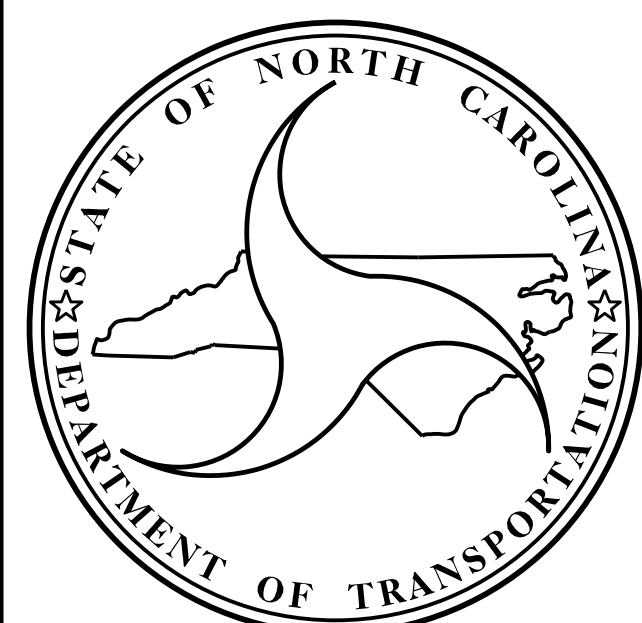
**LOCATION: NC 16 FROM NORTH OF SR 1814 (CALDWELL ROAD)
TO SR 1895 (TOWER ROAD); NC 16 TO NORTH OF
SR 1801 (CLAREMONT ROAD) AND NORTH OF SR 1814
(CALDWELL ROAD)**

**TYPE OF WORK: GRADING, PAVING, DRAINAGE, WIDENING, SIGNALS,
RETAINING WALL AND CULVERTS**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3100A /R-3100B		
STATE PROJ. NO.	P.A. PROJ. NO.	DESCRIPTION	
34522.1.3	STP-0016(52)	P.E. (R-3100A)	
34522.2.3	STP-0016(52)	RW, UTIL. (R-3100A)	
34522.3.5	STP-0016(52)	CONST. (R-3100A)	
34522.1.4	STP-0016(53)	P.E. (R-3100B)	
34522.2.FR4	STP-0016(53)	RW	
34522.2.FRU4	STP-0016(53)	UTIL. (R-3100B)	
34522.3.5	STP-0016(52)	CONST. (R-3100B)	



STRUCTURES



DESIGN DATA

ADT (2016) = 10,960
ADT (2034) = 18,700
K = 10 %
D = 60 %
T = 9 % *
V = 60 MPH
* (TTST 4 %, DUAL 5 %)

FUNC. CLASSIFICATION =
RURAL ARTERIAL-REGIONAL TIER

PROJECT LENGTH

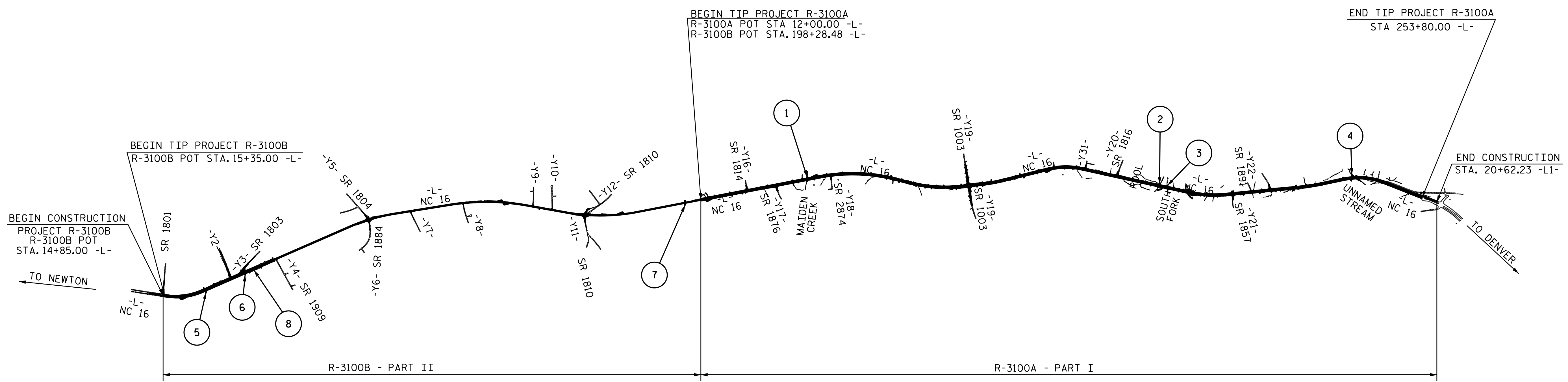
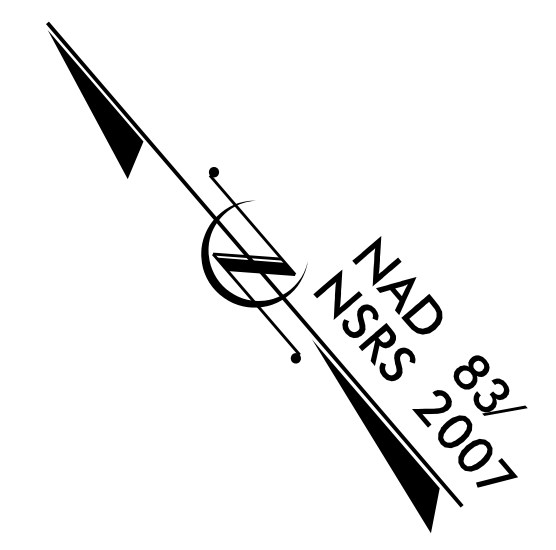
LENGTH ROADWAY TIP PROJECT R-3100A/R-3100B = 8.245 MILES
TOTAL LENGTH TIP PROJECT R-3100AR3100B = 8.245 MILES

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

2012 STANDARD SPECIFICATIONS

LETTING DATE :
APRIL 18, 2017

MARC G. CHEEK, P.E.
PROJECT DESIGN ENGINEER



INDEX				
	STR. No.	STATION	DESCRIPTION	SHEET NUMBERS
R-3100A	1	STA. 47+57.00 -L-	SINGLE 7 FT. x 8 FT. CONCRETE BOX CULVERT, 107° SKEW	C-1 THRU C-5
	2	STA. 165+35.00 -L-	DOUBLE 9 FT. x 9 FT. CONCRETE BOX CULVERT, 104° SKEW	C-6 THRU C-13
	3	STA. 168+23.00 -L-	DOUBLE 9 FT. x 9 FT. CONCRETE BOX CULVERT, 73° SKEW	C-14 THRU C-20
	4	STA. 230+73.00 -L-	SINGLE 7 FT. x 8 FT. CONCRETE BOX CULVERT, 39° SKEW	C-21 THRU C-26
R-3100B	5	STA. 28+98.00 -L-	SINGLE 6 FT. x 7 FT. CONCRETE BOX CULVERT, 86° SKEW	C-27 THRU C-32
	6	STA. 43+58.00 -L-	SINGLE 10 FT. x 10 FT. CONCRETE BOX CULVERT, 120° SKEW	C-33 THRU C-40
	7	STA. 192+97.00 -L-	SINGLE 7 FT. x 8 FT. CONCRETE BOX CULVERT, 98° SKEW	C-41 THRU C-47
	8	STA. 44+50.00 -L-	RETAINING WALL	W-1 THRU W2

PROJECT NO. R-3100A/ R-3100B
CATAWBA COUNTY
 STATION: _____

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

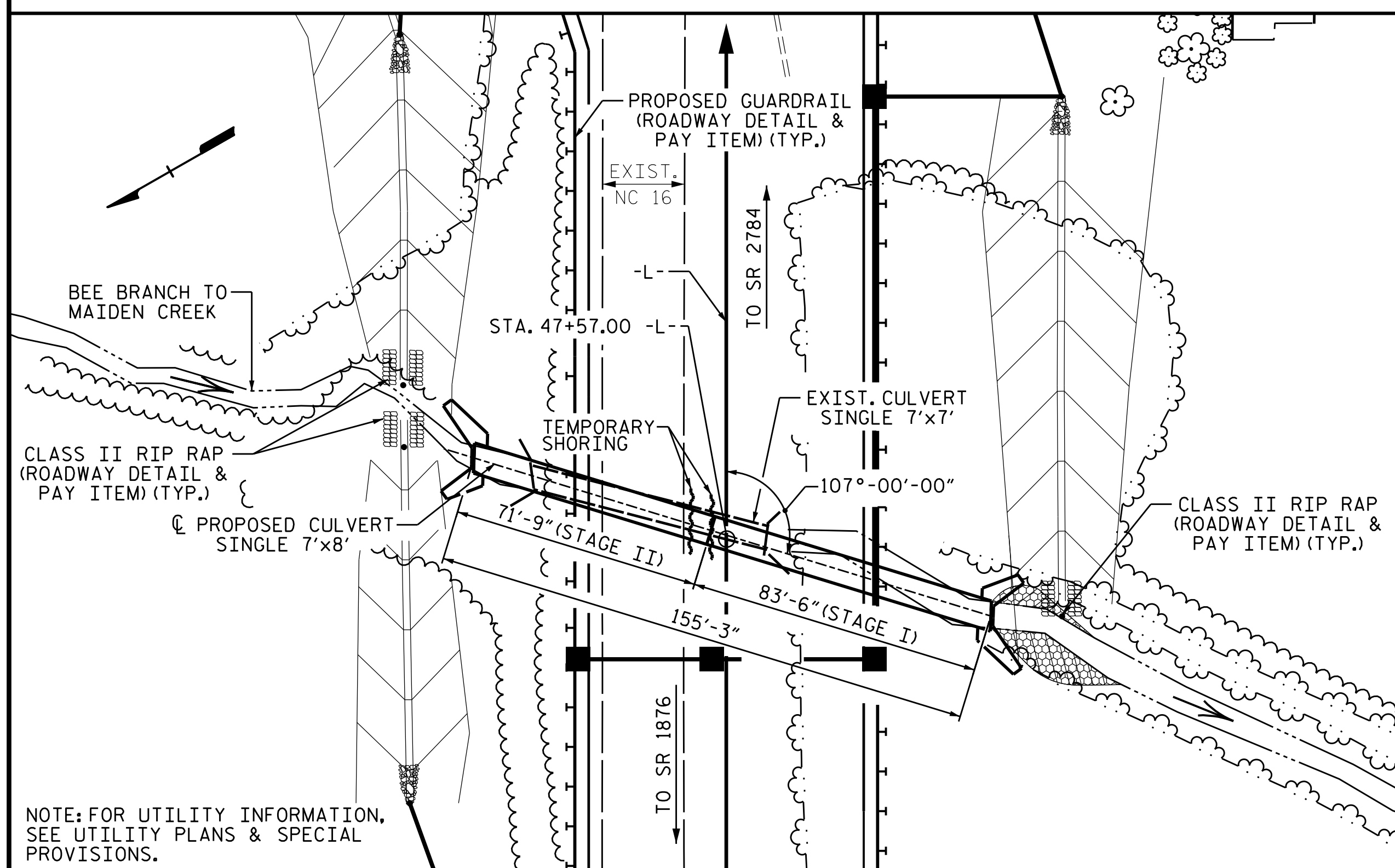
INDEX

DRAWN BY : H. I. BARBOUR DATE : 12-14-16
 CHECKED BY : M. G. CHEEK DATE : 12-16

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

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

BENCHMARK #11: 8" SPIKE IN ROOT OF 6" MAPLE TREE,
STA. 48+14 -L-, 207' LEFT, ELEV. = 968.11



LOCATION SKETCH

NOTE: FOR UTILITY INFORMATION, SEE UTILITY PLANS & SPECIAL PROVISIONS.

ROADWAY DATA	
GRADE POINT ELEV. @ STA. 47+57.00 -L-	= 984.84
BED ELEV. @ STA. 47+57.00-L-	= 961.03
ROADWAY SLOPES	= 2:1

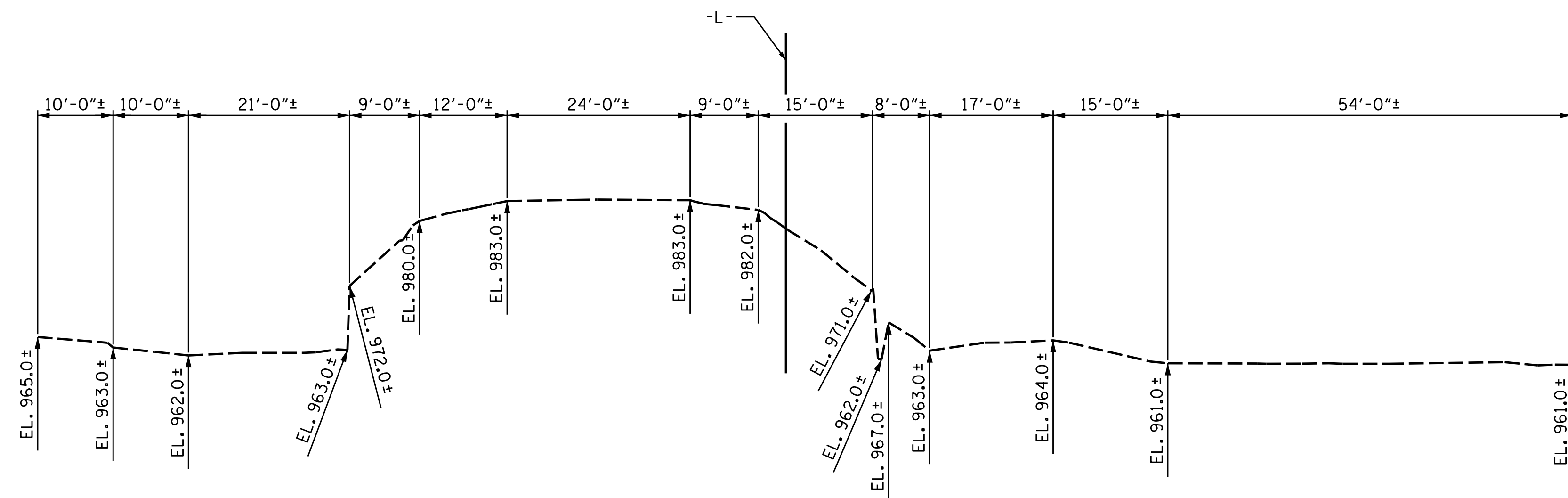
HYDRAULIC DATA	
DESIGN DISCHARGE	= 350 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEV.	= 970.0
DRAINAGE AREA	= 0.34 SQ. MI.
BASE DISCHARGE (Q100)	= 410 C.F.S.
BASE HIGH WATER ELEV.	= 970.85

OVERTOPPING FLOOD DATA	
OVERTOPPING DISCHARGE	= 1100 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YR.
OVERTOPPING FLOOD ELEV.	= 984.9

TOTAL STRUCTURE QUANTITIES	
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	
STAGE I	73 TONS
STAGE II	62 TONS
TOTAL	135 TONS
CLASS A CONCRETE	
STAGE I	82.4 C.Y.
STAGE II	72.4 C.Y.
TOTAL	154.8 C.Y.
REINFORCING STEEL	
STAGE I	11,537 LBS.
STAGE II	10,007 LBS.
TOTAL	21,544 LBS.

NOTES

- ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
- DESIGN FILL = 15.81 FEET (MAX.) AND 14.55 FEET (MIN.)
- FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.
- 3"Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN STAGE I & STAGE II CULVERTS SHALL BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
- THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
- TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
- AT THE CONTRACTOR'S OPTION, HE MAY 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.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE BARS FROM WHICH THE SAMPLES ARE TAKEN MUST THEN BE SPLICED WITH REPLACEMENT BARS OF THE SIZE AND LENGTH OF THE SAMPLE, PLUS A MINIMUM LAP SPLICE OF THIRTY BAR DIAMETERS. PAYMENT FOR THE SAMPLES OF REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- 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.
- FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.
- FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE ROADWAY PLANS.



PROFILE ALONG C CULVERT

PROJECT NO. R-3100A
CATAWBA COUNTY
STATION: 47+57.00 -L-

SHEET 1 OF 5



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

DRAWN BY : J. L. KREHNBRINK DATE : 5/19/2015
CHECKED BY : K. D. LAYNE DATE : 3/30/16
DESIGN ENGINEER OF RECORD: J. BOWLES DATE : 4/17

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			47

**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	3.32	--	1.75	3.32	1	EXTERIOR WALL	4.35	4.98	1	EXTERIOR WALL	7.85		
	HL-93 (OPERATING)	N/A		4.30	--	1.35	4.30	1	EXTERIOR WALL	4.35	6.45	1	EXTERIOR WALL	7.85		
	HS-20 (INVENTORY)	36.000	②	3.32	119.45	1.75	3.32	1	EXTERIOR WALL	4.35	4.98	1	EXTERIOR WALL	7.85		
	HS-20 (OPERATING)	36.000		4.30	154.84	1.35	4.30	1	EXTERIOR WALL	4.35	6.45	1	EXTERIOR WALL	7.85		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500	③	4.15	55.99	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85	
		SNGARBS2	20.000		4.15	82.95	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85	
		SNAGRIS2	22.000		4.15	91.24	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85	
		SNCOTTS3	27.250		4.15	113.02	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85	
		SNAGGRS4	34.925		4.15	144.85	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85	
		SNS5A	35.550		4.15	147.44	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85	
		SNS6A	39.950		4.15	165.69	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85	
		SNS7B	42.000		4.15	174.19	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		4.15	136.87	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85	
		TNT4A	33.075		4.15	137.18	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85	
		TNT6A	41.600		4.15	172.54	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85	
		TNT7A	42.000		4.15	174.19	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85	
		TNT7B	42.000		4.15	174.19	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85	
		TNAGRIT4	43.000		4.15	178.34	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85	
TNAGT5A	45.000		4.15	186.64	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85			
TNAGT5B	45.000		4.15	186.64	1.40	4.15	1	EXTERIOR WALL	4.35	6.22	1	EXTERIOR WALL	7.85			

LOAD FACTORS:

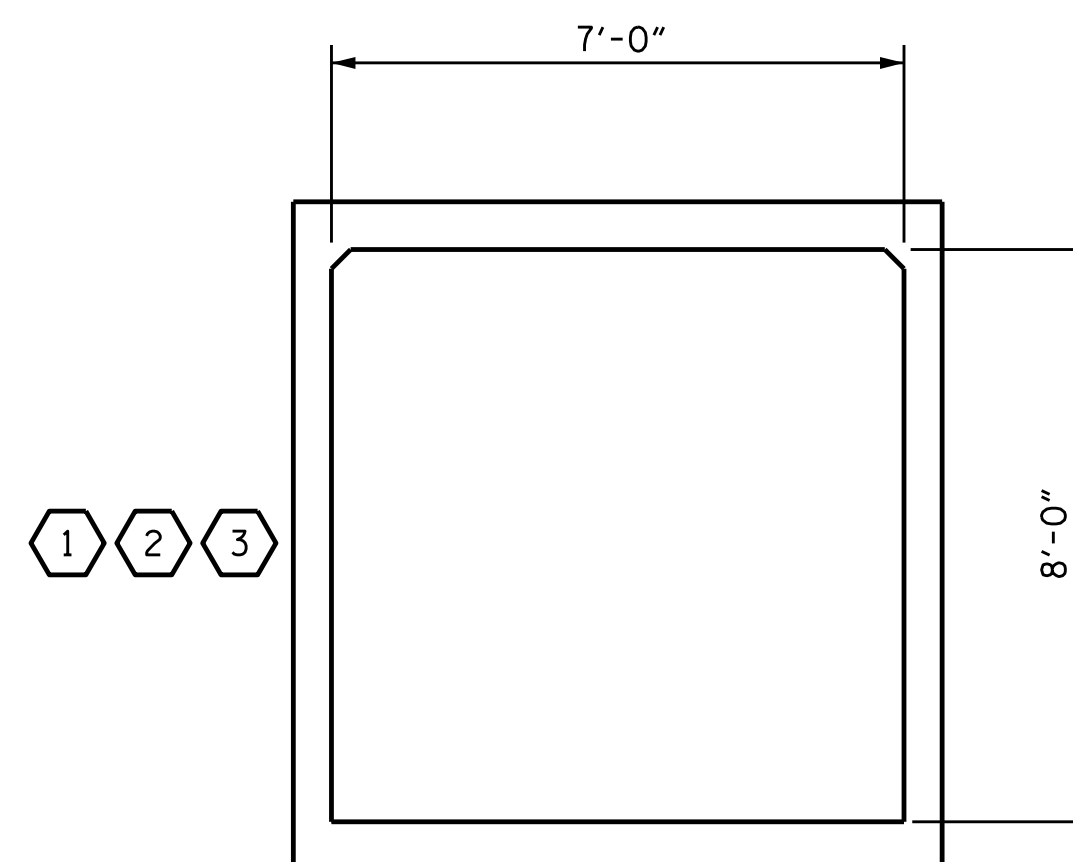
DESIGN LOAD RATING FACTORS

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

PROJECT NO. R-3100A
CATAWBA COUNTY
 STATION: 47+57.00 -L-

SHEET 2 OF 5



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

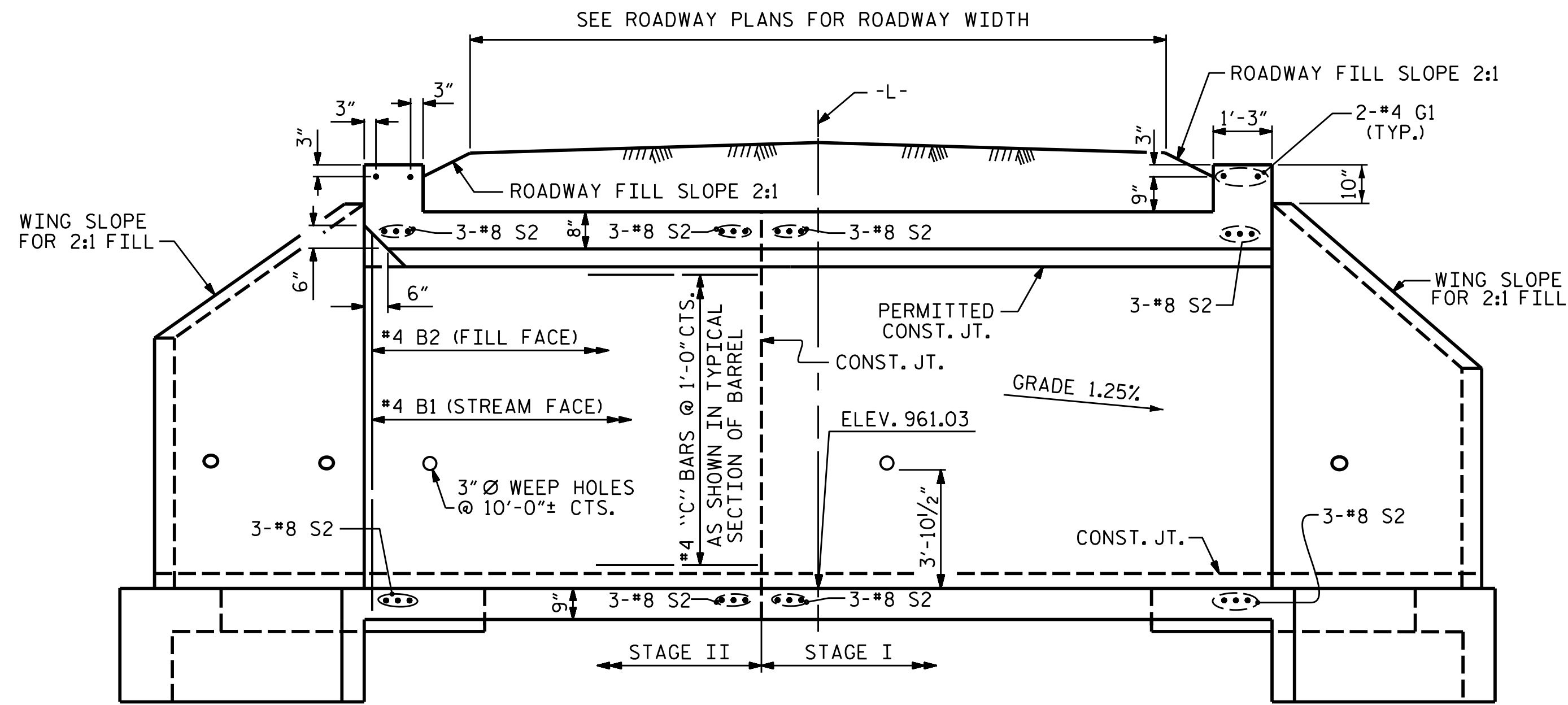
ASSEMBLED BY : J. L. KREHNBRINK	DATE : 6/19/15
CHECKED BY : H. A. LOCKLEAR	DATE : 6/15
DRAWN BY : WMC	7/11
CHECKED BY : GM	7/11

REV. 10/1/11 MAA/GM

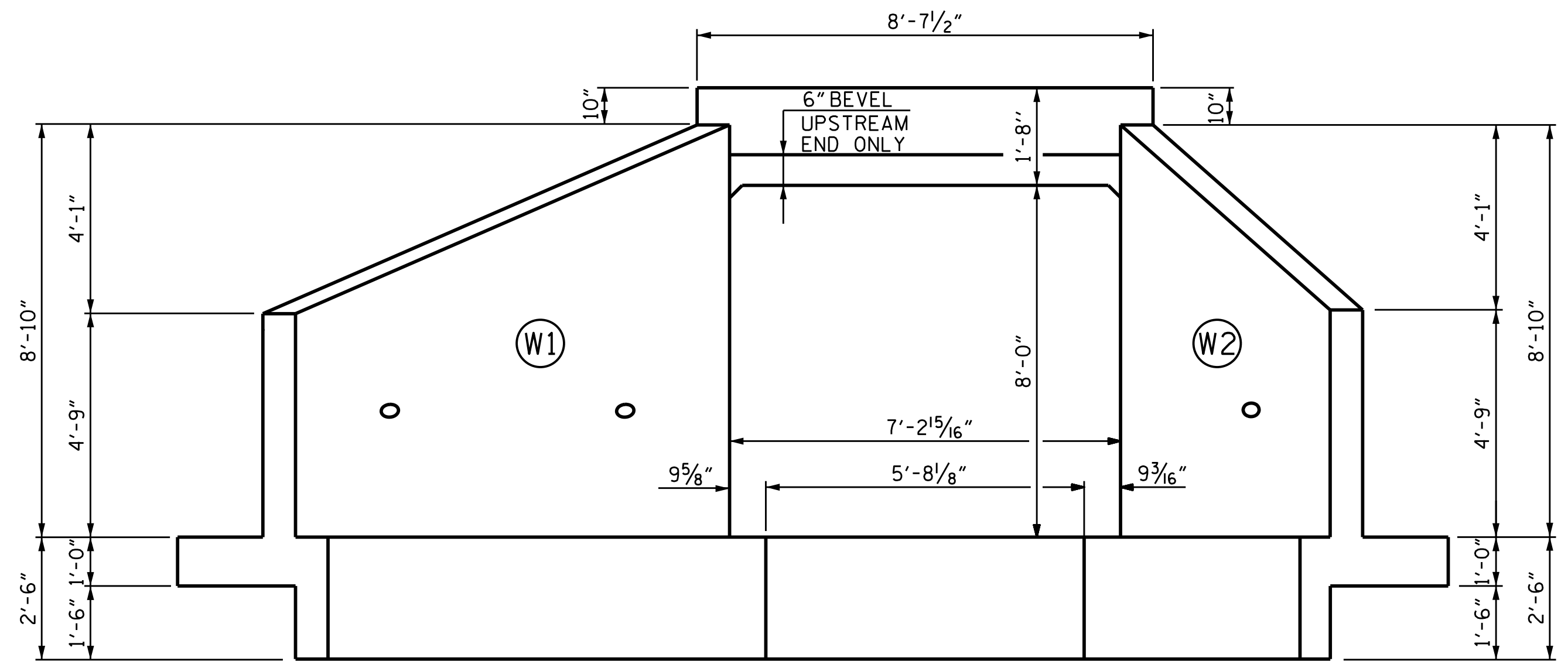
DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-2
1			3			TOTAL SHEETS 47
2			4			

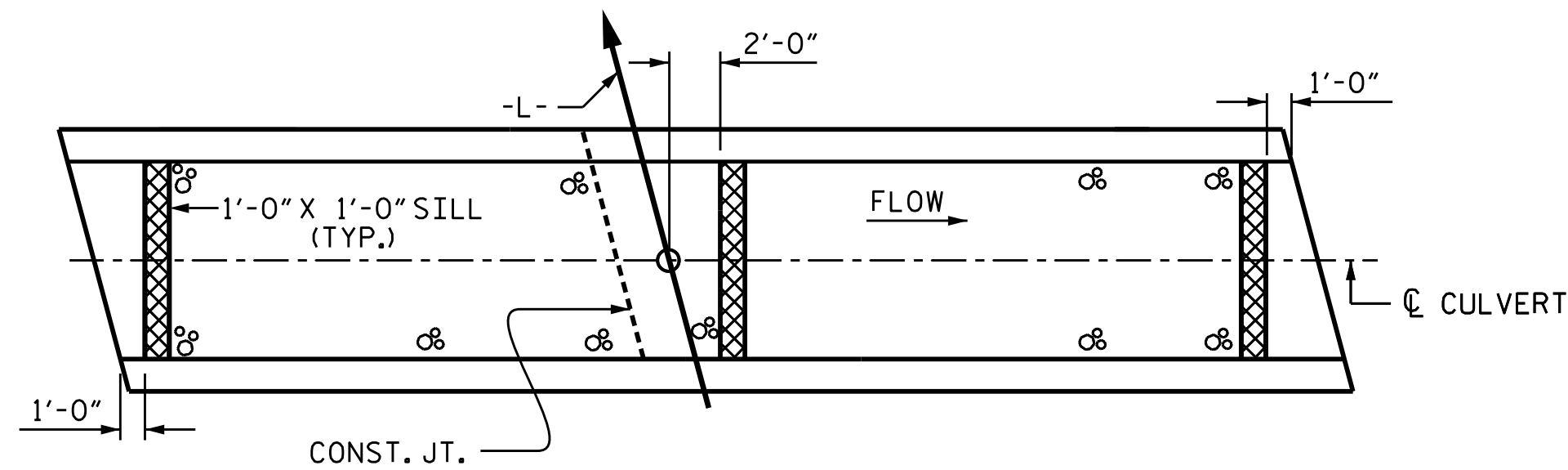
CUL. #1 STD. NO. LRFR5



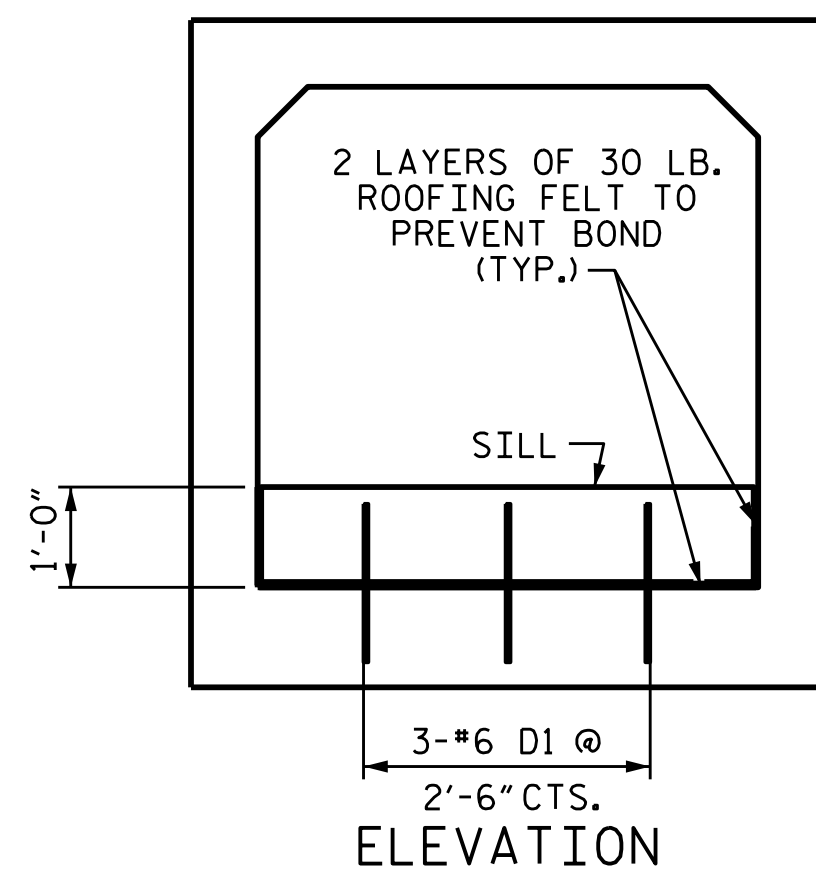
CULVERT SECTION NORMAL TO ROADWAY



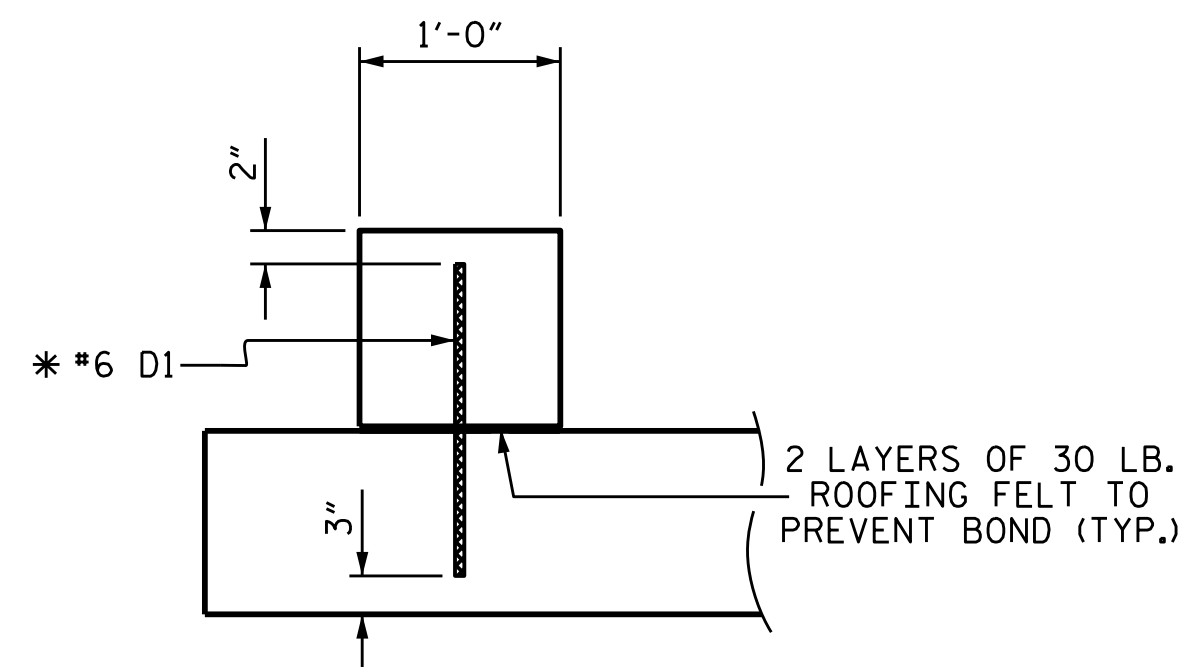
END ELEVATION NORMAL TO SKEW



PLAN



ELEVATION



SECTION THROUGH SILL

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

SILL DETAILS

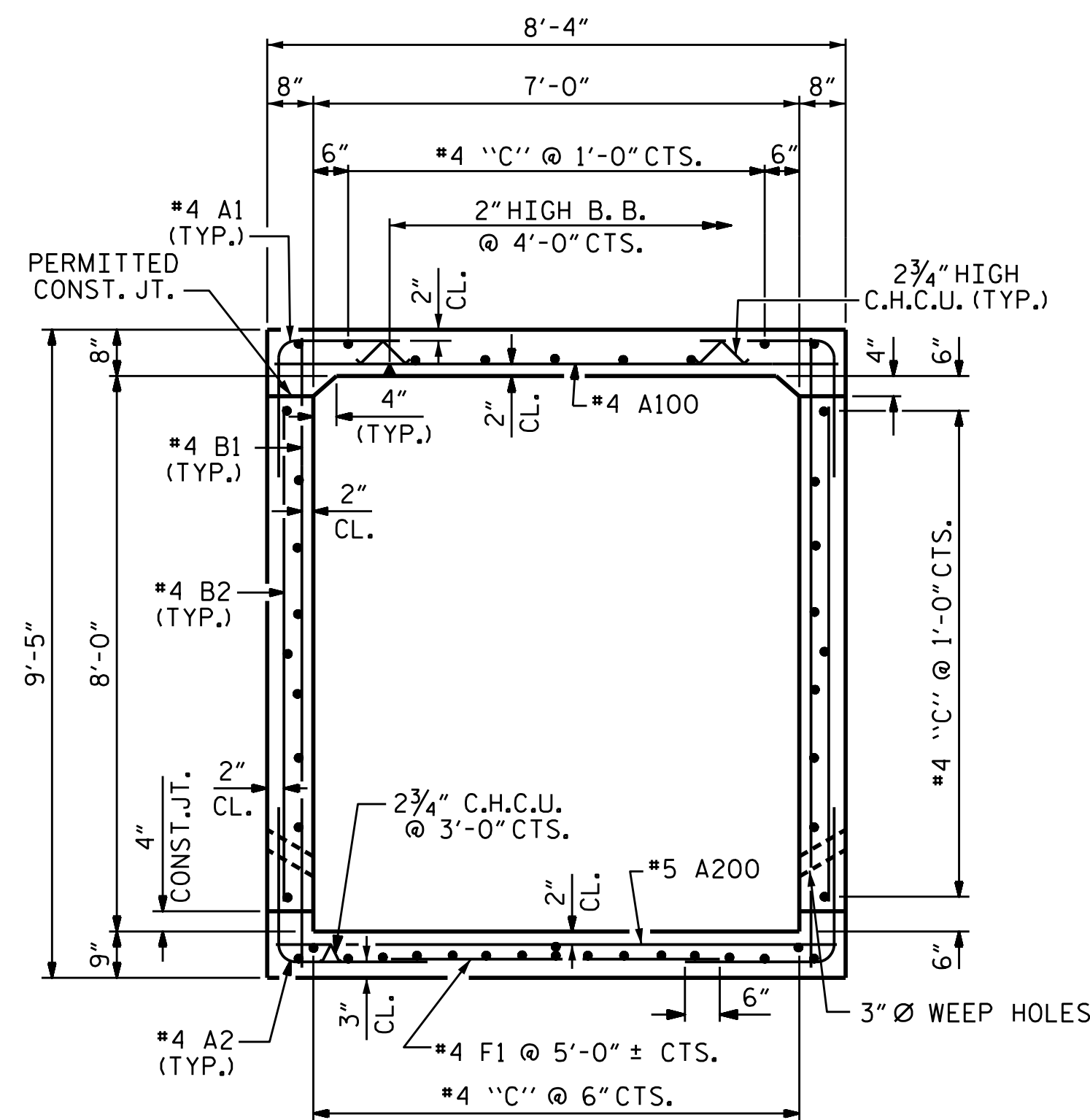
NOTES

MATERIAL EXCAVATED FROM THE EXISTING STREAMBED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AS SHOWN IN THE PLAN VIEW. ONLY NATIVE MATERIAL FROM THE EXISTING STREAMBED OR FLOODPLAIN MAY BE USED IN THE PROPOSED CULVERT. BED MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER.

THE ENTIRE COST OF WORK REQUIRED TO PLACE THE EXCAVATED MATERIAL OR SUPPLEMENTAL MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR CULVERT EXCAVATION.

THE ENTIRE COST OF WORK REQUIRED TO CONSTRUCT THE SILLS SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.

STREAMBED MATERIAL SHOULD BE PLACED LEVEL WITH THE TOP OF THE SILLS.



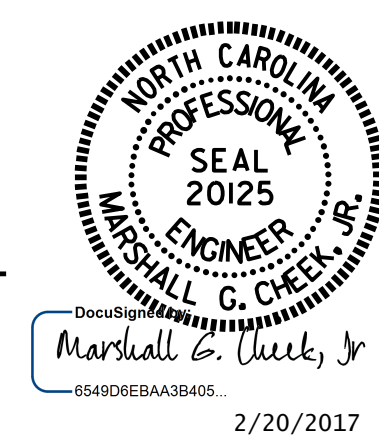
RIGHT ANGLE SECTION OF BARREL

THERE ARE 45 'C' BARS IN SECTION OF BARREL

PROJECT NO. R-3100A
 CATAWBA COUNTY
 STATION: 47+57.00 -L-

SHEET 3 OF 5

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



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

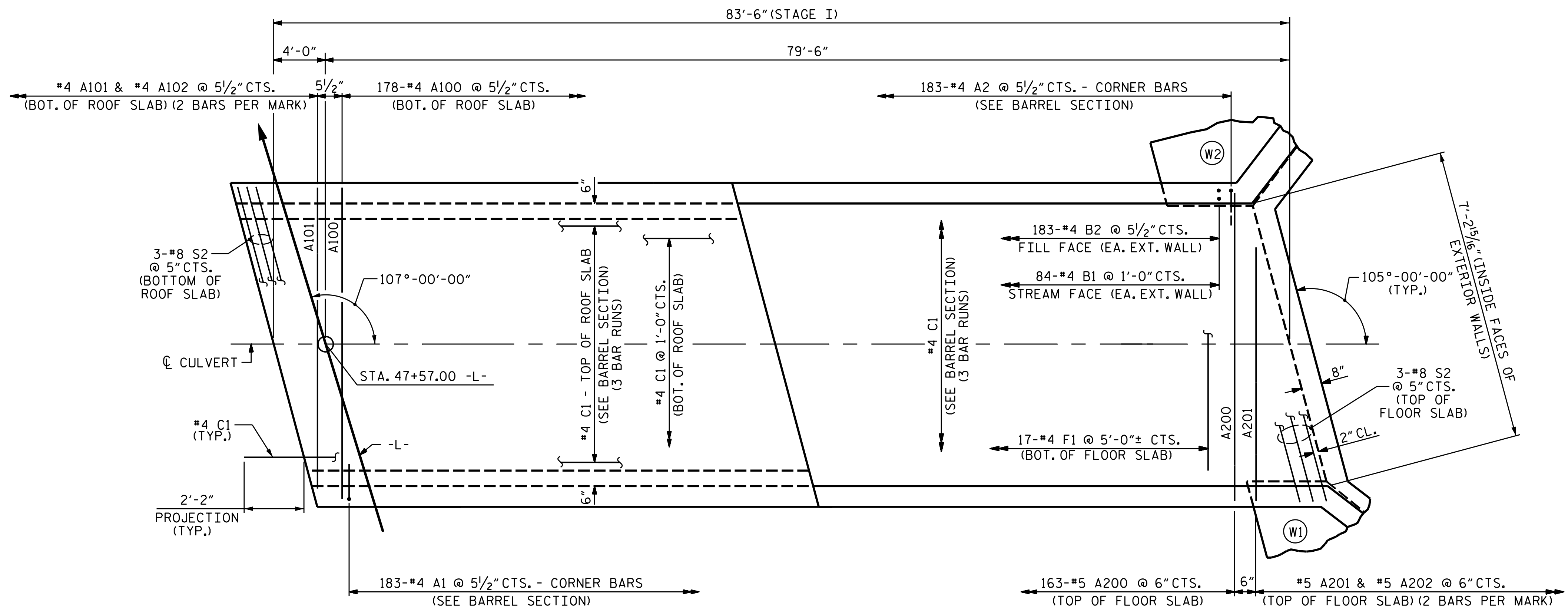
TOTAL SHEETS 47

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

CUL. #1 STD. NO. CB221

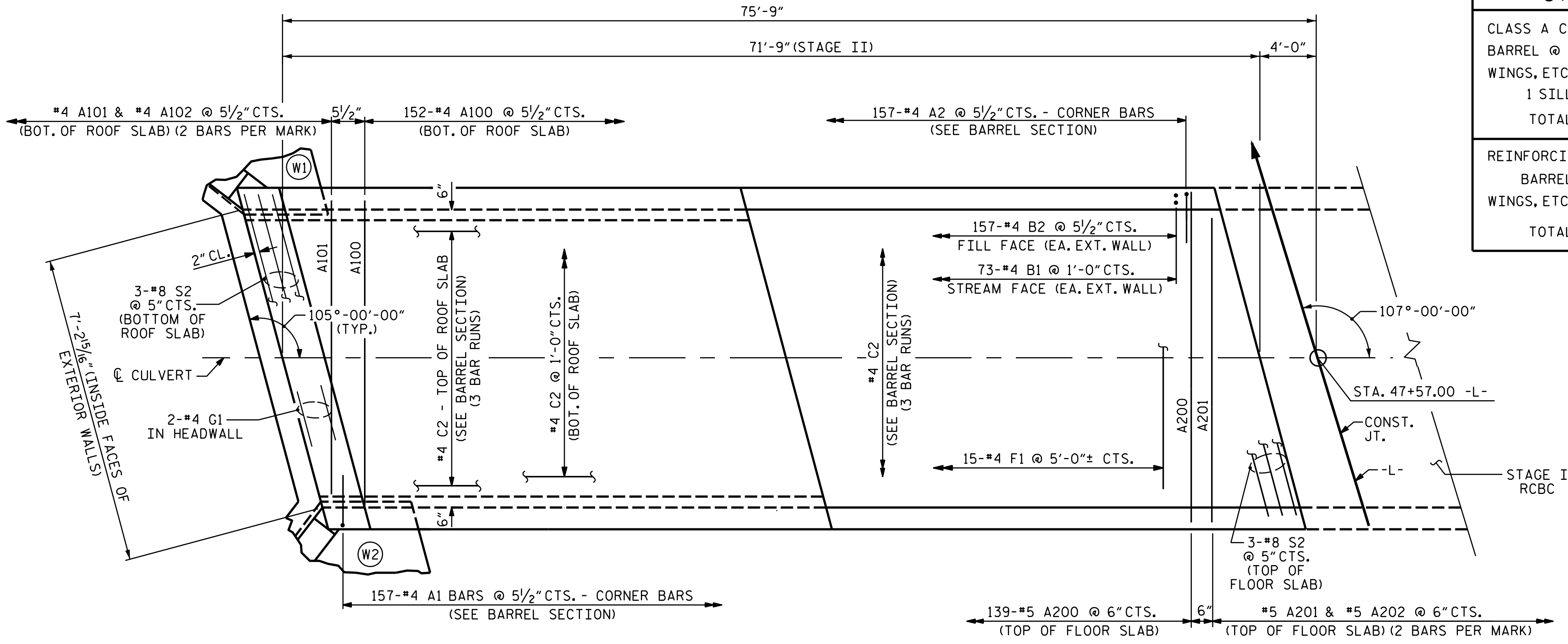
REVISED 8-28-92 BY E.L.R. CHECKED BY G.R.P.
 REVISED 8-22-89 BY A.R.B. CHECKED BY C.R.K.
 REDRAWN 8-22-89
 REVISED 11-19-99 BY M.M. CHECKED BY R.W.M.

ASSEMBLED BY: J.L. KREHNBRINK DATE: 6/24/15
 CHECKED BY: J.K. BOWLES DATE: 3/21/16



PART PLAN - ROOF SLAB
STAGE I

PART PLAN - FLOOR SLAB
STAGE I



PART PLAN - ROOF SLAB
STAGE II

PART PLAN - FLOOR SLAB
STAGE II

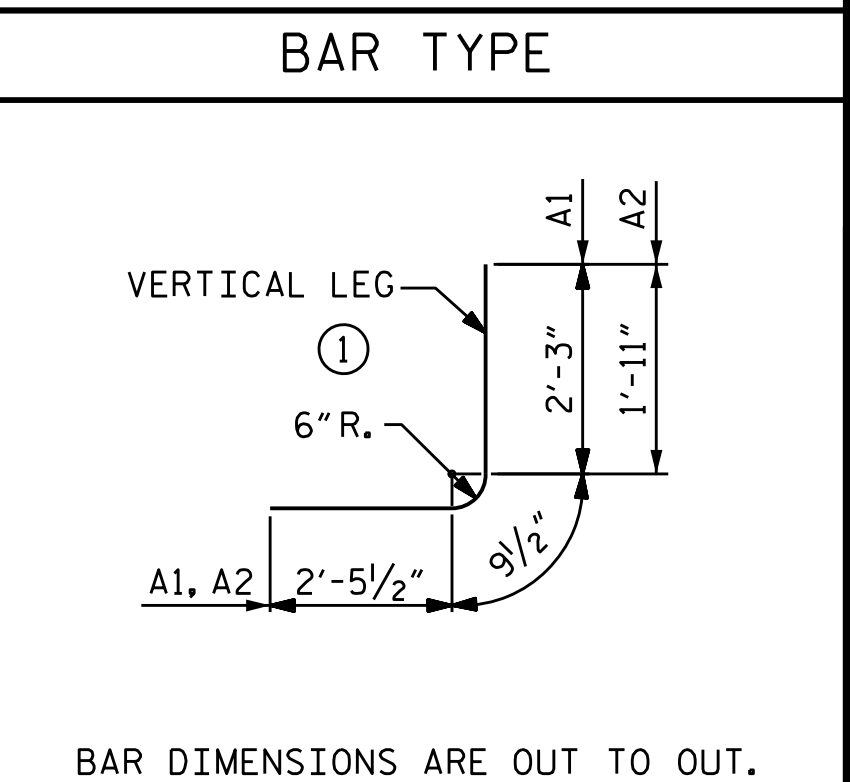
BAR SCHEDULE						BAR SCHEDULE							
STAGE I						STAGE II							
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT		
A1	366	#4	1	5'-6"	1345	A1	314	#4	1	5'-6"	1154		
A2	366	#4	1	5'-2"	1263	A2	314	#4	1	5'-2"	1084		
A100	178	#4	STR.	7'-11"	941	A100	152	#4	STR.	7'-11"	804		
A101	4	#4	STR.	4'-10"	13	A101	4	#4	STR.	4'-10"	13		
A102	4	#4	STR.	2'-0"	5	A102	4	#4	STR.	2'-0"	5		
A200	163	#5	STR.	7'-11"	1346	A200	139	#5	STR.	7'-11"	1148		
A201	4	#5	STR.	4'-7"	19	A201	4	#5	STR.	4'-7"	19		
A202	4	#5	STR.	1'-4"	6	A202	4	#5	STR.	1'-4"	6		
B1	168	#4	STR.	8'-11"	1001	B1	146	#4	STR.	8'-11"	870		
B2	366	#4	STR.	7'-4"	1793	B2	314	#4	STR.	7'-4"	1538		
C1	135	#4	STR.	29'-11"	2698	C2	135	#4	STR.	25'-2"	2270		
D1	6	#6	STR.	1'-4"	12	D1	3	#6	STR.	1'-4"	6		
F1	17	#4	STR.	4'-1"	46	F1	15	#4	STR.	4'-1"	41		
G1	2	#4	STR.	8'-3"	11	G1	2	#4	STR.	8'-3"	11		
S2	12	#8	STR.	8'-3"	264	S2	12	#8	STR.	8'-3"	264		
REINFORCING STEEL					LBS.	10,763	REINFORCING STEEL					LBS.	9,233

STAGE I QUANTITIES	
CLASS A CONCRETE	
BARREL @ 0.836 CY/FT	69.8 C.Y.
WINGS, ETC.	12.1 C.Y.
2 SILLS	0.5 C.Y.
TOTAL	82.4 C.Y.

REINFORCING STEEL	
BARREL	10,763 LBS.
WINGS, ETC.	774 LBS.
TOTAL	11,537 LBS.

STAGE II QUANTITIES	
CLASS A CONCRETE	
BARREL @ 0.836 CY/FT	60.0 C.Y.
WINGS, ETC.	12.1 C.Y.
1 SILL	0.3 C.Y.
TOTAL	72.4 C.Y.

REINFORCING STEEL	
BARREL	9,233 LBS.
WINGS, ETC.	774 LBS.
TOTAL	10,007 LBS.



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

PROJECT NO. R-3100A
CATAWBA COUNTY
 STATION: 47+57.00 -L-
 SHEET 4 OF 5



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 7 FT. X 8 FT. CONCRETE BOX CULVERT

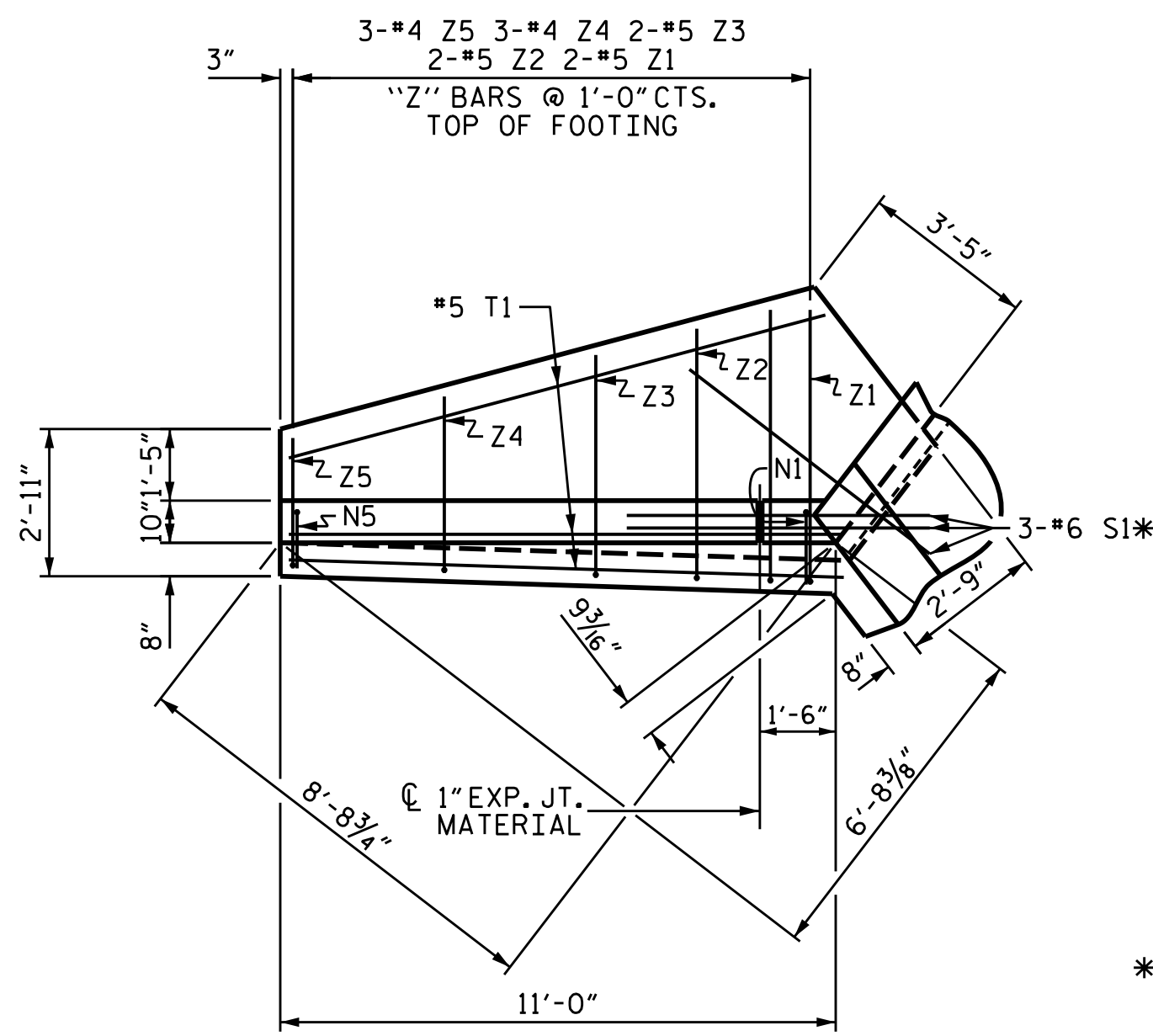
REVISED 8-28-92 BY E.L.R. CHECKED BY G.R.P.
 REVISED 8-22-89 BY A.R.B. CHECKED BY C.R.K.
 REDRAWN 8-22-89
 REVISED 11-19-99 BY M.M. CHECKED BY R.W.W.

ASSEMBLED BY: J. K. BOWLES DATE: 3/22/16
 CHECKED BY: K. D. LAYNE DATE: 3/30/16
 DESIGN ENGINEER OF RECORD: J. BOWLES DATE: 4/17

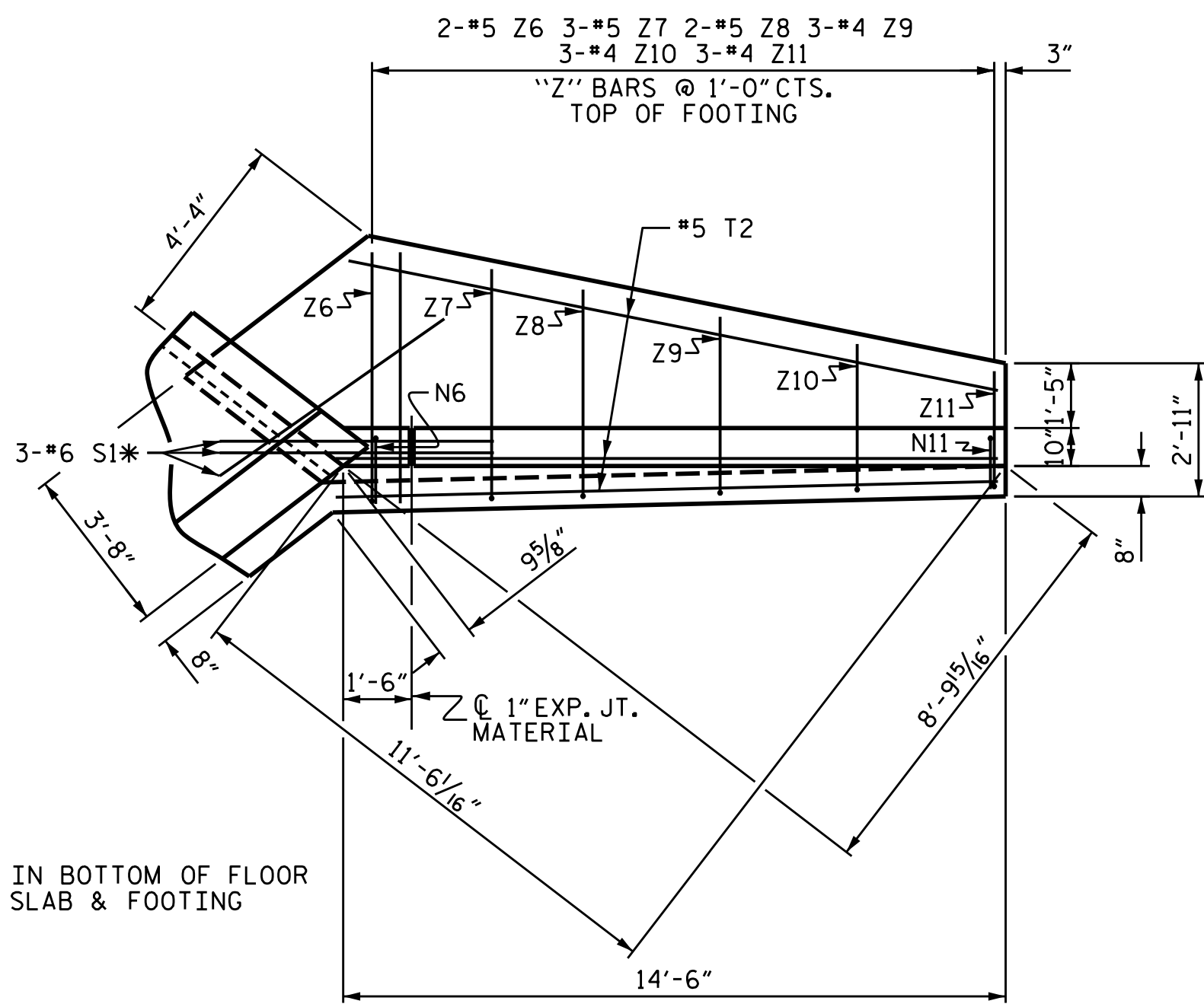
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISIONS					SHEET NO.
NO.	BY:	DATE:	NO.	DATE:	C-4
1			3		TOTAL SHEETS
2			4		47

CUL. #1 STD. NO. CB221

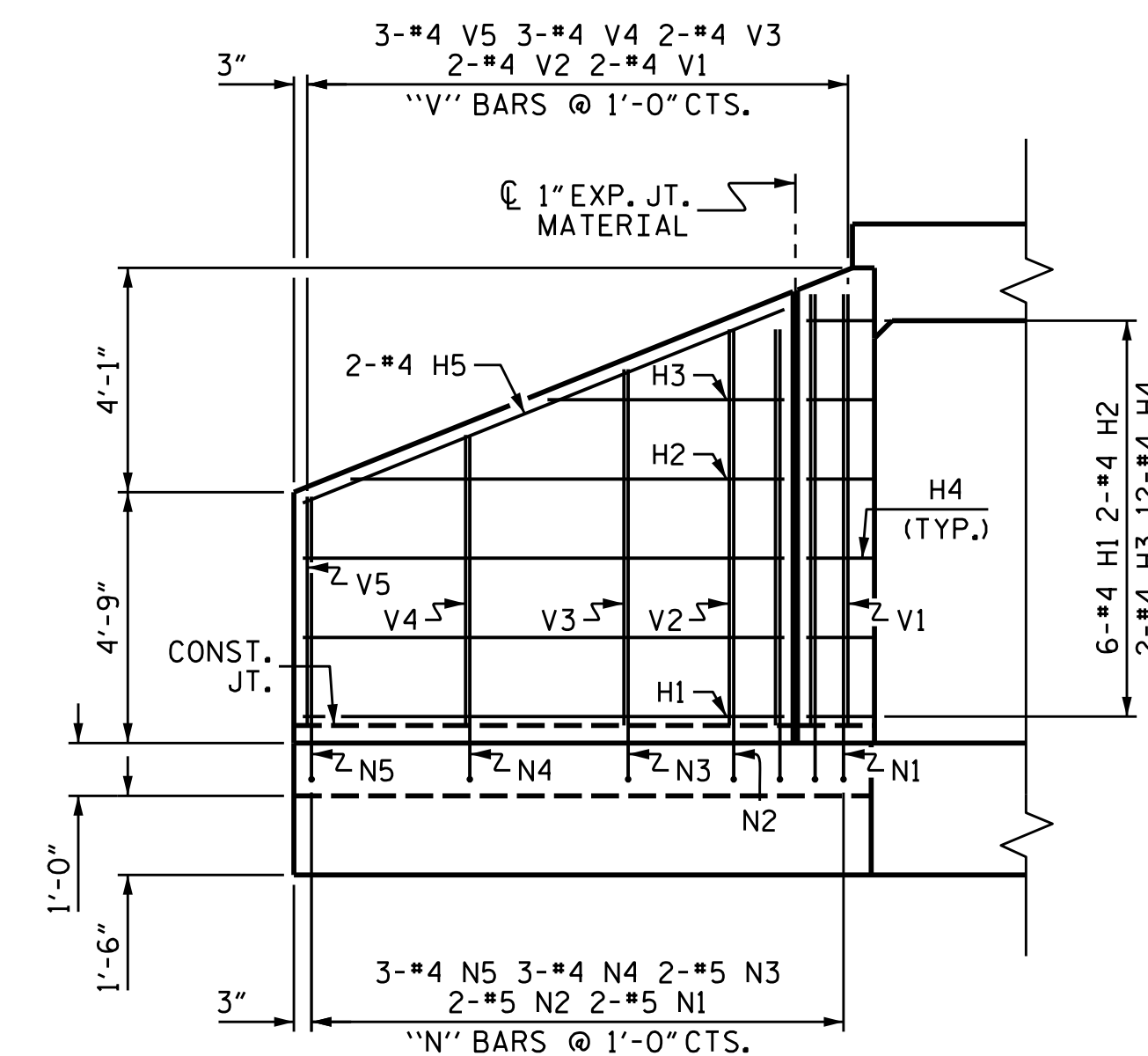


PLAN W2

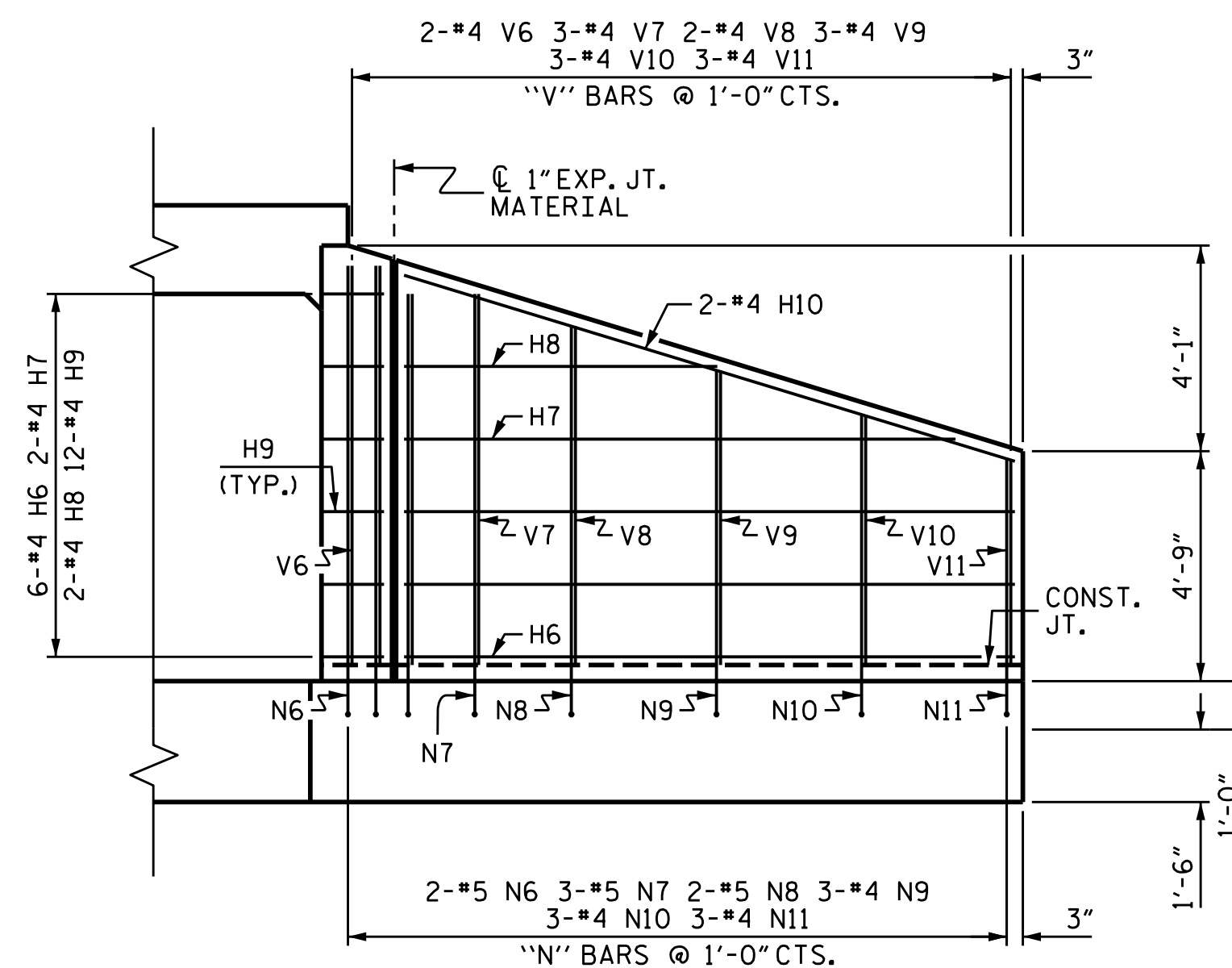


PLAN W1

* S1 IN BOTTOM OF FLOOR SLAB & FOOTING



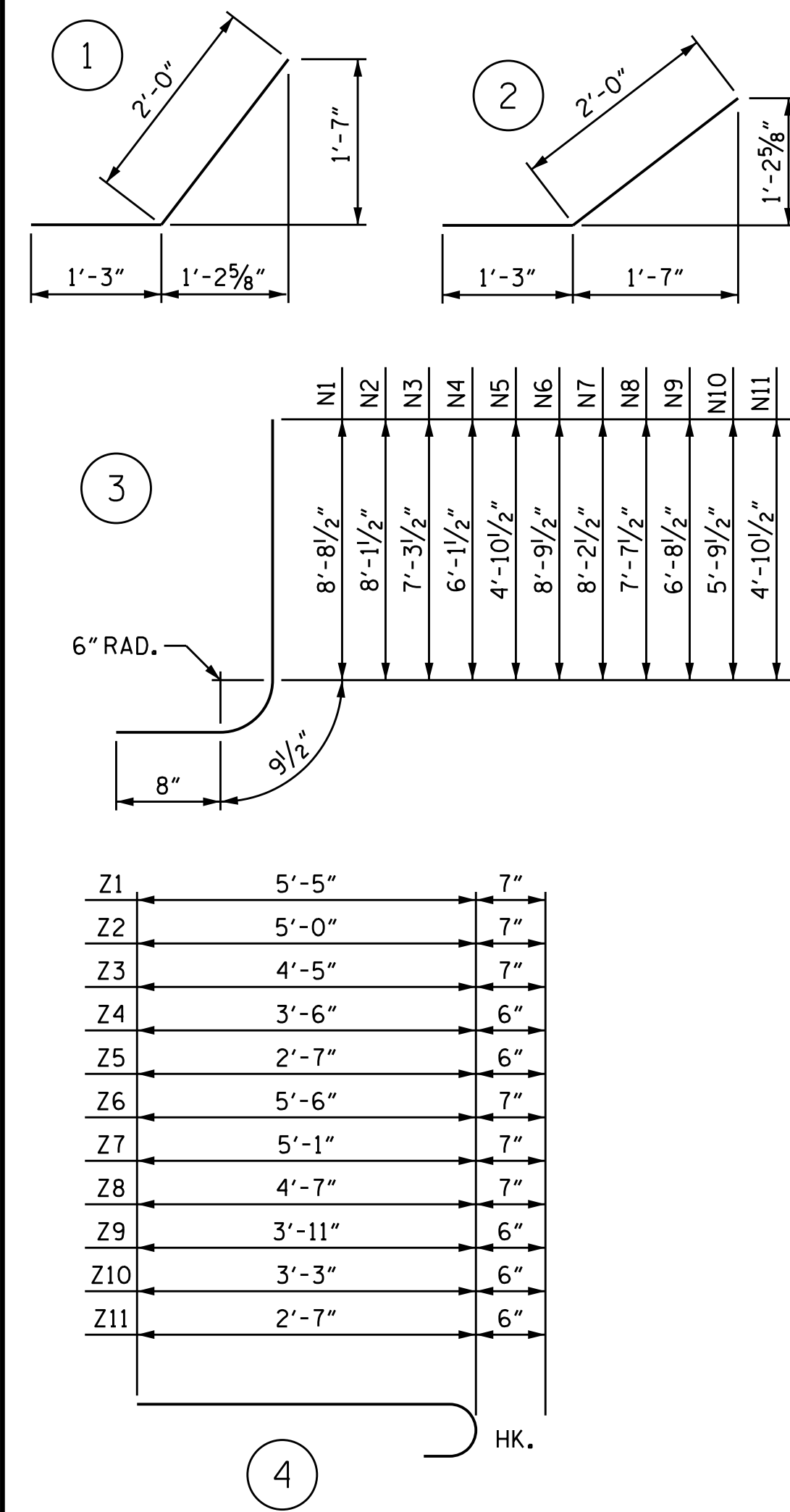
ELEVATION W2



ELEVATION W1

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.

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

STAGE I					STAGE II						
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	SIZE	TYPE	LENGTH	WEIGHT		
H1	6	#4	STR	9'-1"	36	H1	6	#4	STR	9'-1"	36
H2	2	#4	STR	8'-2"	11	H2	2	#4	STR	8'-2"	11
H3	2	#4	STR	4'-5"	6	H3	2	#4	STR	4'-5"	6
H4	12	#4	1	3'-3"	26	H4	12	#4	1	3'-3"	26
H5	2	#4	STR	9'-10"	13	H5	2	#4	STR	9'-10"	13
H6	6	#4	STR	12'-7"	50	H6	6	#4	STR	12'-7"	50
H7	2	#4	STR	11'-4"	15	H7	2	#4	STR	11'-4"	15
H8	2	#4	STR	6'-5"	9	H8	2	#4	STR	6'-5"	9
H9	12	#4	2	3'-3"	26	H9	12	#4	2	3'-3"	26
H10	2	#4	STR	13'-2"	18	H10	2	#4	STR	13'-2"	18
N1	2	#5	3	10'-2"	21	N1	2	#5	3	10'-2"	21
N2	2	#5	3	9'-7"	20	N2	2	#5	3	9'-7"	20
N3	2	#5	3	8'-9"	18	N3	2	#5	3	8'-9"	18
N4	3	#4	3	7'-7"	15	N4	3	#4	3	7'-7"	15
N5	3	#4	3	6'-4"	13	N5	3	#4	3	6'-4"	13
N6	2	#5	3	10'-3"	21	N6	2	#5	3	10'-3"	21
N7	3	#5	3	9'-8"	30	N7	3	#5	3	9'-8"	30
N8	2	#5	3	9'-1"	19	N8	2	#5	3	9'-1"	19
N9	3	#4	3	8'-2"	16	N9	3	#4	3	8'-2"	16
N10	3	#4	3	7'-3"	15	N10	3	#4	3	7'-3"	15
N11	3	#4	3	6'-4"	13	N11	3	#4	3	6'-4"	13
S1	6	#6	STR	6'-0"	54	S1	6	#6	STR	6'-0"	54
T1	3	#5	STR	11'-0"	34	T1	3	#5	STR	11'-0"	34
T2	3	#5	STR	14'-6"	45	T2	3	#5	STR	14'-6"	45
V1	2	#4	STR	8'-2"	11	V1	2	#4	STR	8'-2"	11
V2	2	#4	STR	7'-6"	10	V2	2	#4	STR	7'-6"	10
V3	2	#4	STR	6'-9"	9	V3	2	#4	STR	6'-9"	9
V4	3	#4	STR	5'-6"	11	V4	3	#4	STR	5'-6"	11
V5	3	#4	STR	4'-4"	9	V5	3	#4	STR	4'-4"	9
V6	2	#4	STR	8'-3"	11	V6	2	#4	STR	8'-3"	11
V7	3	#4	STR	7'-8"	15	V7	3	#4	STR	7'-8"	15
V8	2	#4	STR	7'-0"	9	V8	2	#4	STR	7'-0"	9
V9	3	#4	STR	6'-1"	12	V9	3	#4	STR	6'-1"	12
V10	3	#4	STR	5'-2"	10	V10	3	#4	STR	5'-2"	10
V11	3	#4	STR	4'-3"	9	V11	3	#4	STR	4'-3"	9
Z1	2	#5	4	6'-0"	13	Z1	2	#5	4	6'-0"	13
Z2	2	#5	4	5'-7"	12	Z2	2	#5	4	5'-7"	12
Z3	2	#5	4	5'-0"	10	Z3	2	#5	4	5'-0"	10
Z4	3	#4	4	4'-0"	8	Z4	3	#4	4	4'-0"	8
Z5	3	#4	4	3'-1"	6	Z5	3	#4	4	3'-1"	6
Z6	2	#5	4	6'-1"	13	Z6	2	#5	4	6'-1"	13
Z7	3	#5	4	5'-8"	18	Z7	3	#5	4	5'-8"	18
Z8	2	#5	4	5'-2"	11	Z8	2	#5	4	5'-2"	11
Z9	3	#4	4	4'-5"	9	Z9	3	#4	4	4'-5"	9
Z10	3	#4	4	3'-9"	8	Z10	3	#4	4	3'-9"	8
Z11	3	#4	4	3'-1"	6	Z11	3	#4	4	3'-1"	6

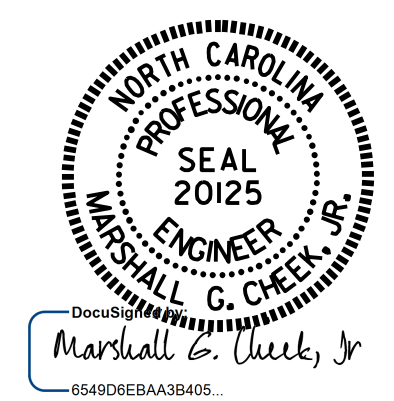
REINFORCING STEEL FOR 2 WINGS	774 LBS.	REINFORCING STEEL FOR 2 WINGS	774 LBS.
CLASS A CONCRETE 2 WINGS	11.3 C.Y.	CLASS A CONCRETE 2 WINGS	11.3 C.Y.
1 HEADWALL	0.4 C.Y.	1 HEADWALL	0.4 C.Y.
1 END CURTAIN WALL	0.4 C.Y.	1 END CURTAIN WALL	0.4 C.Y.
TOTAL	12.1 C.Y.	TOTAL	12.1 C.Y.

PROJECT NO. R-3100A
CATAWBA COUNTY
 STATION: 47+57.00 -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
 105° SKEW



2/20/2017

ASSEMBLED BY : J. L. KREHNBRINK	DATE : 5/20/15
CHECKED BY : J. K. BOWLES	DATE : 3/2/16
DRAWN BY : CCJ	01/00
CHECKED BY : RWW	03/00

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	NO. 1	BY:	DATE:	NO. 3	BY:	DATE:	NO. 4	BY:	DATE:	SHEET NO. C-5
	2									TOTAL SHEETS 47

BENCHMARK #17: 8" SPIKE IN ROOT OF 12" CUCUMBER TREE,
STA. 168+56.12 -L-, 254' RT, ELEV.=902.19

F.A. PROJECT NO.: STP-0016(52)

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
DESIGN FILL = 10.52 FEET (MAX.), 9.52 FEET (MIN.).
FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.
3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
CONCRETE IN STAGE I & STAGE II CULVERTS SHALL BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS, CURTAIN WALLS, FLOOR SLAB AND SILLS 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.

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

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

THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE BARS FROM WHICH THE SAMPLES ARE TAKEN MUST THEN BE SPLICED WITH REPLACEMENT BARS OF THE SIZE AND LENGTH OF THE SAMPLE, PLUS A MINIMUM LAP SPLICE OF THIRTY BAR DIAMETERS. PAYMENT FOR THE SAMPLES OF REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.

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

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

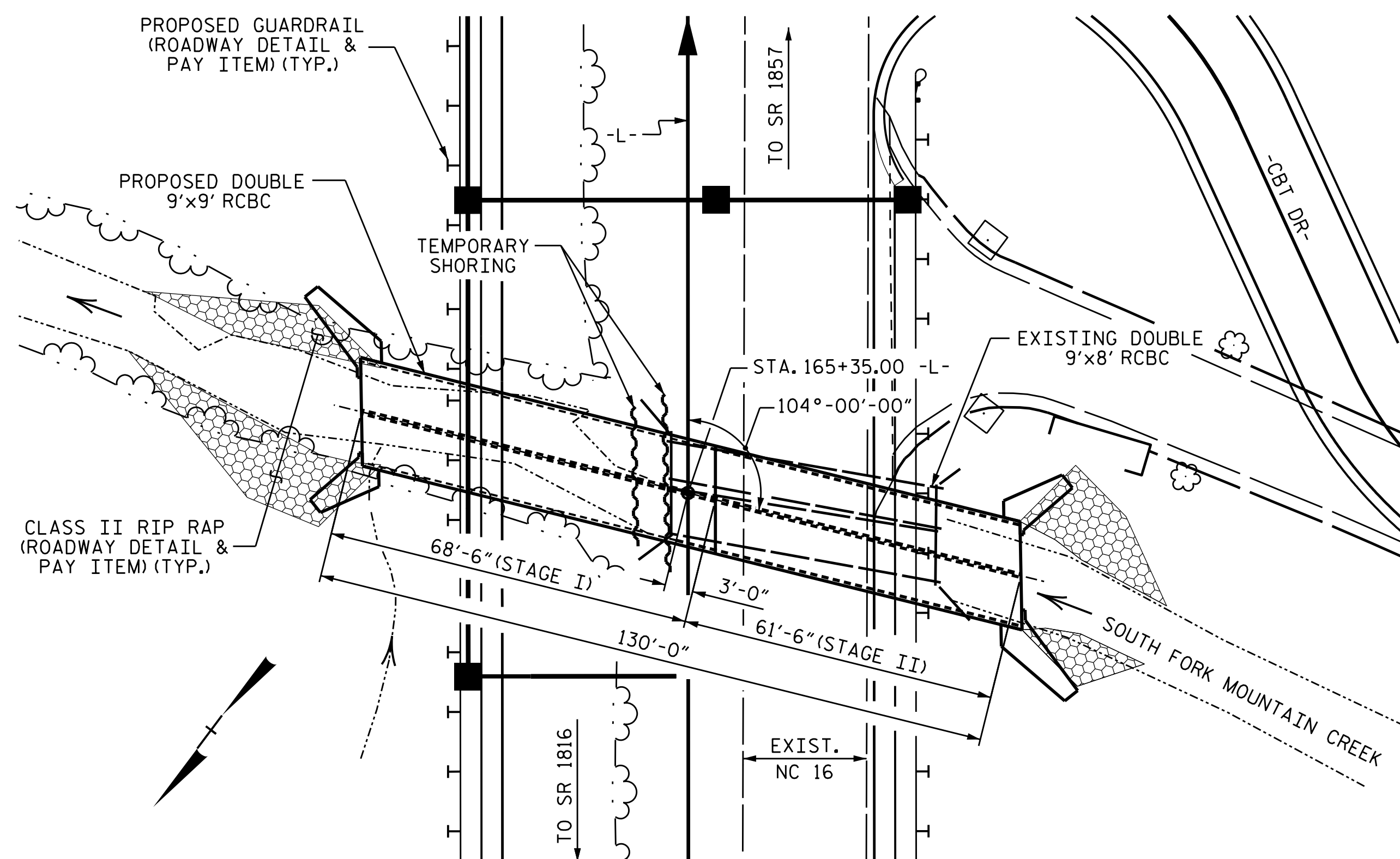
FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE ROADWAY PLANS.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.



NOTE: FOR UTILITY INFORMATION, SEE UTILITY PLANS & SPECIAL PROVISIONS.

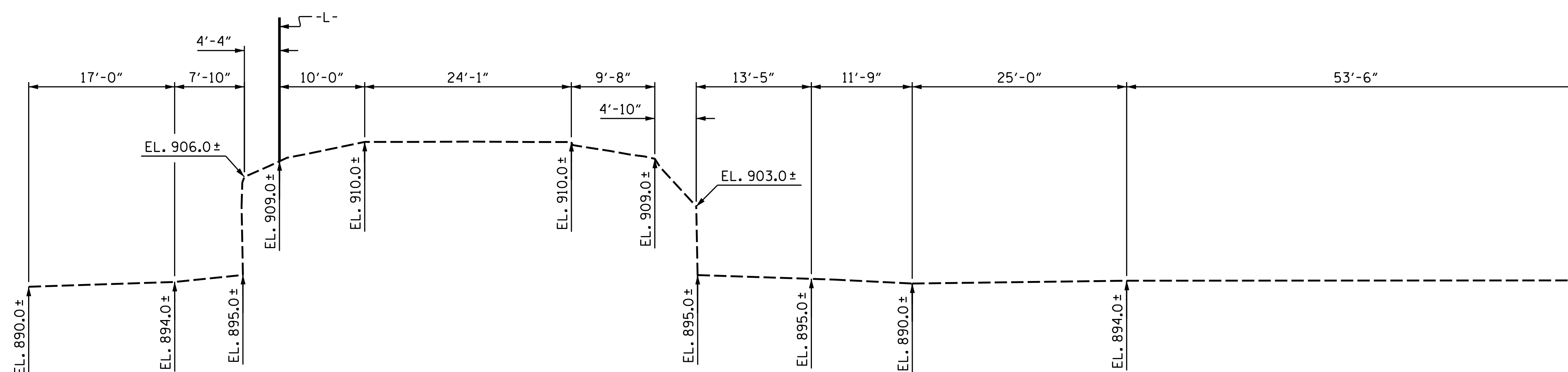
LOCATION SKETCH

ROADWAY DATA	
GRADE POINT ELEV. @ STA. 165+35.00 -L-	= 912.64
BED ELEV. @ STA. 165+35.00 -L-	= 893.16
ROADWAY SLOPES	= 2:1

HYDRAULIC DATA	
DESIGN DISCHARGE	= 850 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEV.	= 902.0
DRAINAGE AREA	= 1.47 SQ. MI.
BASE DISCHARGE (0100)	= 1000 C.F.S.
BASE HIGH WATER ELEV.	= 902.73

OVERTOPPING FLOOD DATA	
OVERTOPPING DISCHARGE	= 2700 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YR.
OVERTOPPING FLOOD ELEV. @ STA. 165+90.94	= 912.5

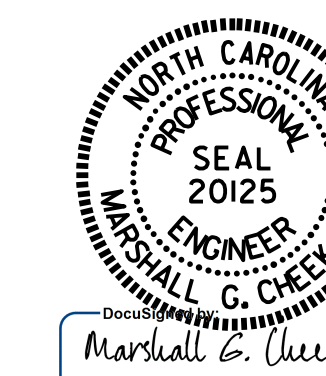
TOTAL STRUCTURE QUANTITIES	
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	
STAGE I	116 TONS
STAGE II	104 TONS
TOTAL	220 TONS
CLASS A CONCRETE	
STAGE I	162.0 C.Y.
STAGE II	147.3 C.Y.
TOTAL	309.3 C.Y.
REINFORCING STEEL	
STAGE I	19,304 LBS.
STAGE II	17,430 LBS.
TOTAL	36,734 LBS.



PROFILE ALONG CULVERT

PROJECT NO. R-3100A
CATAWBA COUNTY
STATION: 165+35.00 -L-

SHEET 1 OF 8



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 9 FT. X 9 FT.
CONCRETE BOX CULVERT

DRAWN BY : A. SORSENGINH DATE : 12/2016
CHECKED BY : H. T. BARBOUR DATE : 12/2016
DESIGN ENGINEER OF RECORD : J. BOWLES DATE : 3/2016

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

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

C-6
TOTAL SHEETS
47

CUL. #2

**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	1.77	--	1.75	1.91	1	TOP SLAB	4.11	1.77	1	TOP SLAB	8.67	1	
	HL-93 (OPERATING)	N/A		2.30	--	1.35	2.47	1	TOP SLAB	4.11	2.30	1	TOP SLAB	8.67	1	
	HS-20 (INVENTORY)	36.00	②	1.93	69.50	1.75	2.84	1	TOP SLAB	4.11	1.93	1	BOTTOM SLAB	8.61	1	
	HS-20 (OPERATING)	36.00		2.50	90.09	1.35	3.68	1	TOP SLAB	4.11	2.50	1	BOTTOM SLAB	8.61	1	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		3.80	51.31	1.40	4.56	1	EXTERIOR WALL	5.23	3.80	1	EXTERIOR WALL	8.98	2	
		SNGARBS2	20.00		3.69	73.88	1.40	4.56	1	EXTERIOR WALL	5.23	3.69	1	BOTTOM SLAB	8.61	2
		SNAGRIS2	22.00		3.49	76.69	1.40	4.56	1	EXTERIOR WALL	5.23	3.49	1	BOTTOM SLAB	8.61	2
		SNCOTTS3	27.25		2.18	59.40	1.40	2.38	1	TOP SLAB	4.11	2.18	1	TOP SLAB	8.67	1
		SNAGGRS4	34.93		1.98	69.27	1.40	2.55	1	TOP SLAB	4.11	1.98	1	BOTTOM SLAB	8.61	1
		SNS5A	35.55		1.95	69.22	1.40	2.61	1	TOP SLAB	4.11	1.95	1	BOTTOM SLAB	8.61	2
		SNS6A	39.95		1.83	72.95	1.40	2.61	1	TOP SLAB	4.11	1.83	1	BOTTOM SLAB	8.61	2
	SNS7B	42.00		1.83	76.69	1.40	2.64	1	TOP SLAB	4.11	1.83	1	BOTTOM SLAB	8.61	2	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.00		2.42	79.70	1.40	3.80	1	TOP SLAB	4.11	2.42	1	BOTTOM SLAB	8.61	2
		TNT4A	33.08		2.32	76.71	1.40	2.84	1	TOP SLAB	4.11	2.32	1	BOTTOM SLAB	8.61	1
		TNT6A	41.60		2.11	87.87	1.40	2.65	1	TOP SLAB	4.11	2.11	1	BOTTOM SLAB	8.61	2
		TNT7A	42.00		2.21	92.82	1.40	2.99	1	TOP SLAB	4.11	2.21	1	BOTTOM SLAB	8.61	1
		TNT7B	42.00		2.03	85.43	1.40	2.65	1	TOP SLAB	4.11	2.03	1	BOTTOM SLAB	8.61	1
		TNAGRIT4	43.00		2.03	87.35	1.40	2.71	1	TOP SLAB	4.11	2.03	1	BOTTOM SLAB	8.61	1
TNAGT5A		45.00		1.84	83.01	1.40	2.76	1	TOP SLAB	4.11	1.84	1	BOTTOM SLAB	8.61	1	
TNAGT5B	45.00		③	1.74	78.30	1.40	2.84	1	TOP SLAB	4.11	1.74	1	BOTTOM SLAB	8.61	1	

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	--

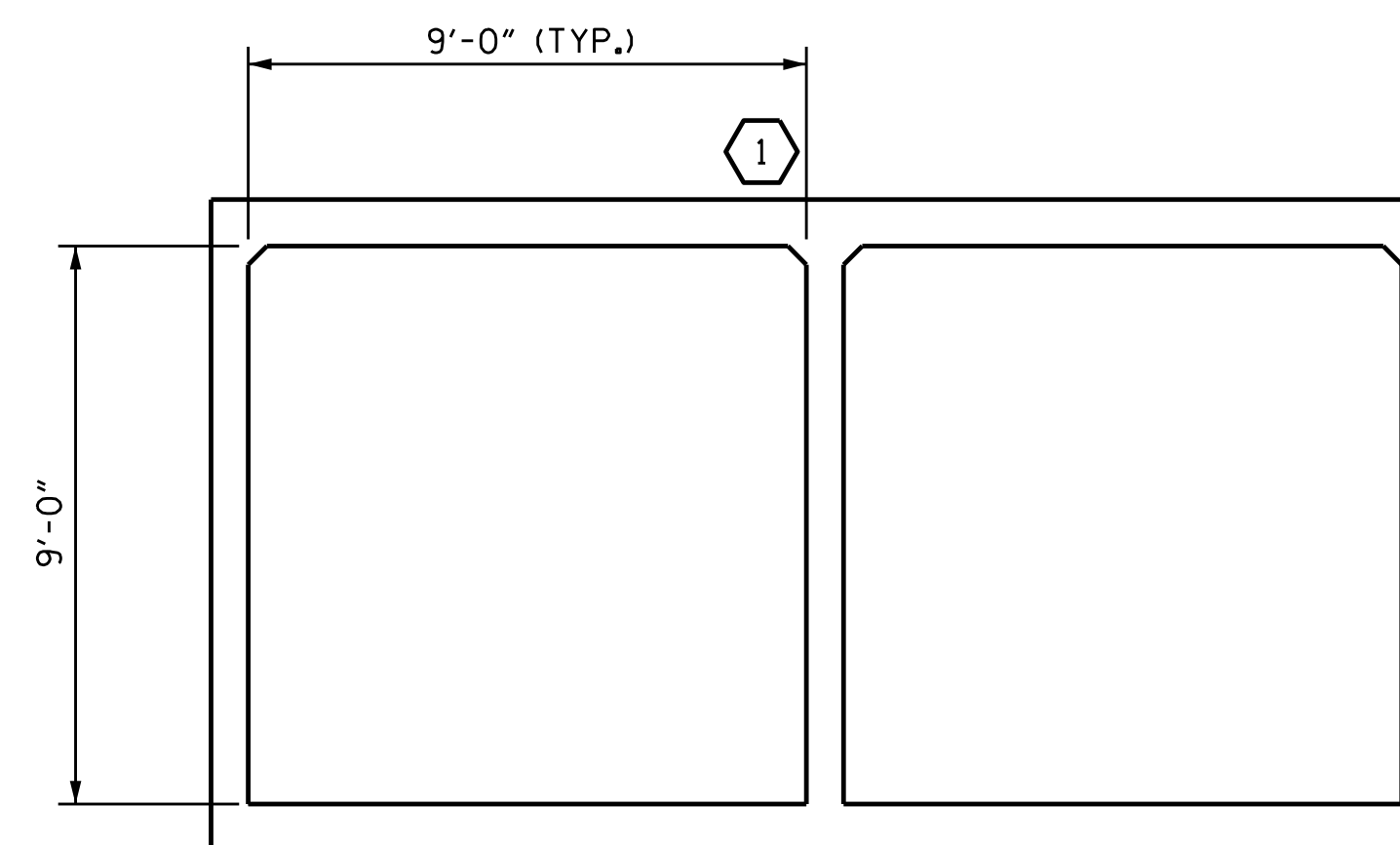
NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

COMMENTS:

- MOMENT RATING FACTOR IS CONTROLLED BY MINIMUM FILL. SHEAR RATING FACTOR IS CONTROLLED BY MAXIMUM FILL.
- BOTH MOMENT AND SHEAR RATING FACTORS ARE CONTROLLED BY MAXIMUM FILL.

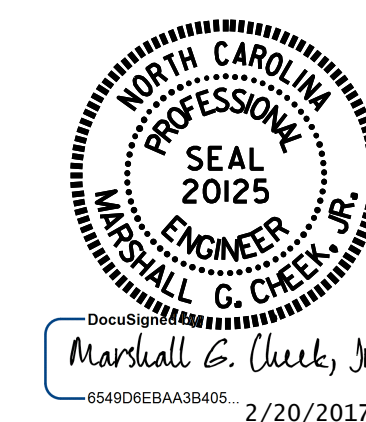
#	CONTROLLING LOAD RATING
①	DESIGN LOAD RATING (HL-93)
②	DESIGN LOAD RATING (HS-20)
③	LEGAL LOAD RATING **
**	SEE CHART FOR VEHICLE TYPE



LRFR SUMMARY

PROJECT NO. R-3100A
CATAWBA COUNTY
 STATION: 165+35.00 -L-

SHEET 2 OF 8



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

ASSEMBLED BY : A. SORSENGINH	DATE : 12/2016
CHECKED BY : H. T. BARBOUR	DATE : 12/2016
DRAWN BY : WMC	7/11
CHECKED BY : GM	7/11

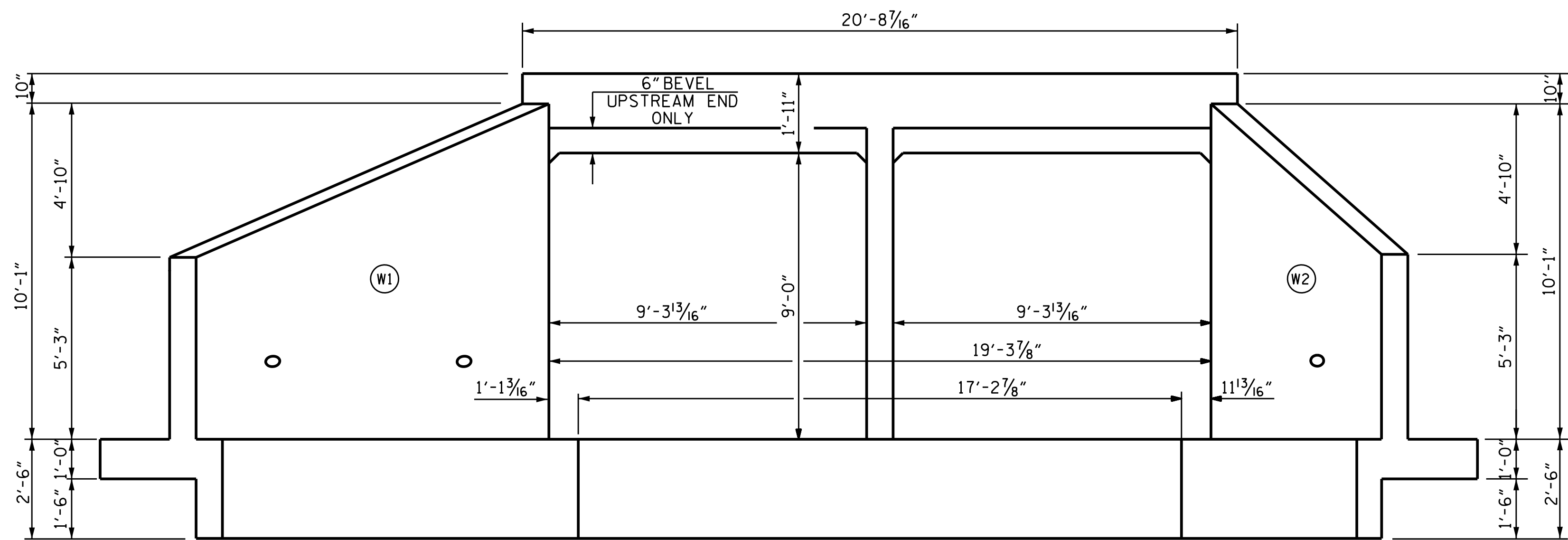
REV. 10/11/11 MAA/GM

DOCUMENT NOT CONSIDERED
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 SIGNATURES COMPLETED

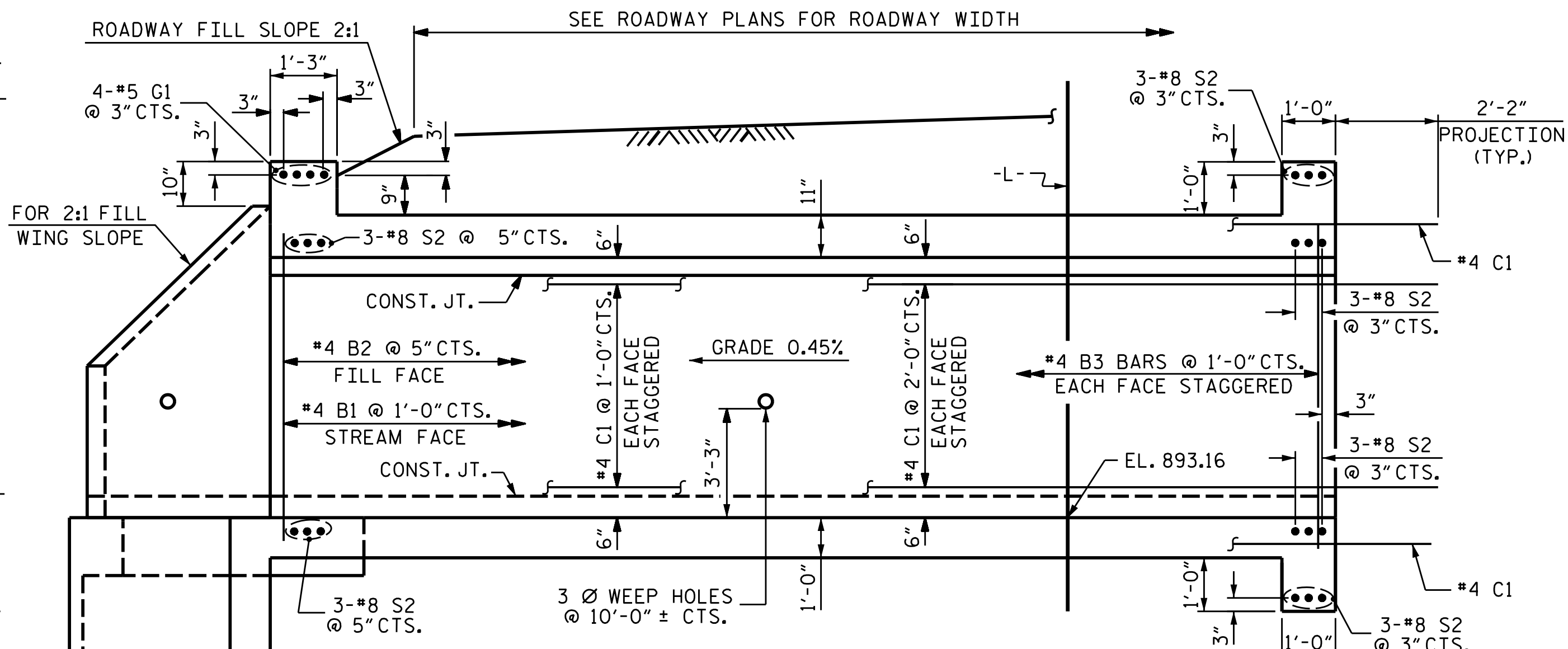
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-7
1			3			TOTAL SHEET 47
2			4			

CUL. #2

STD. NO. LRFR5



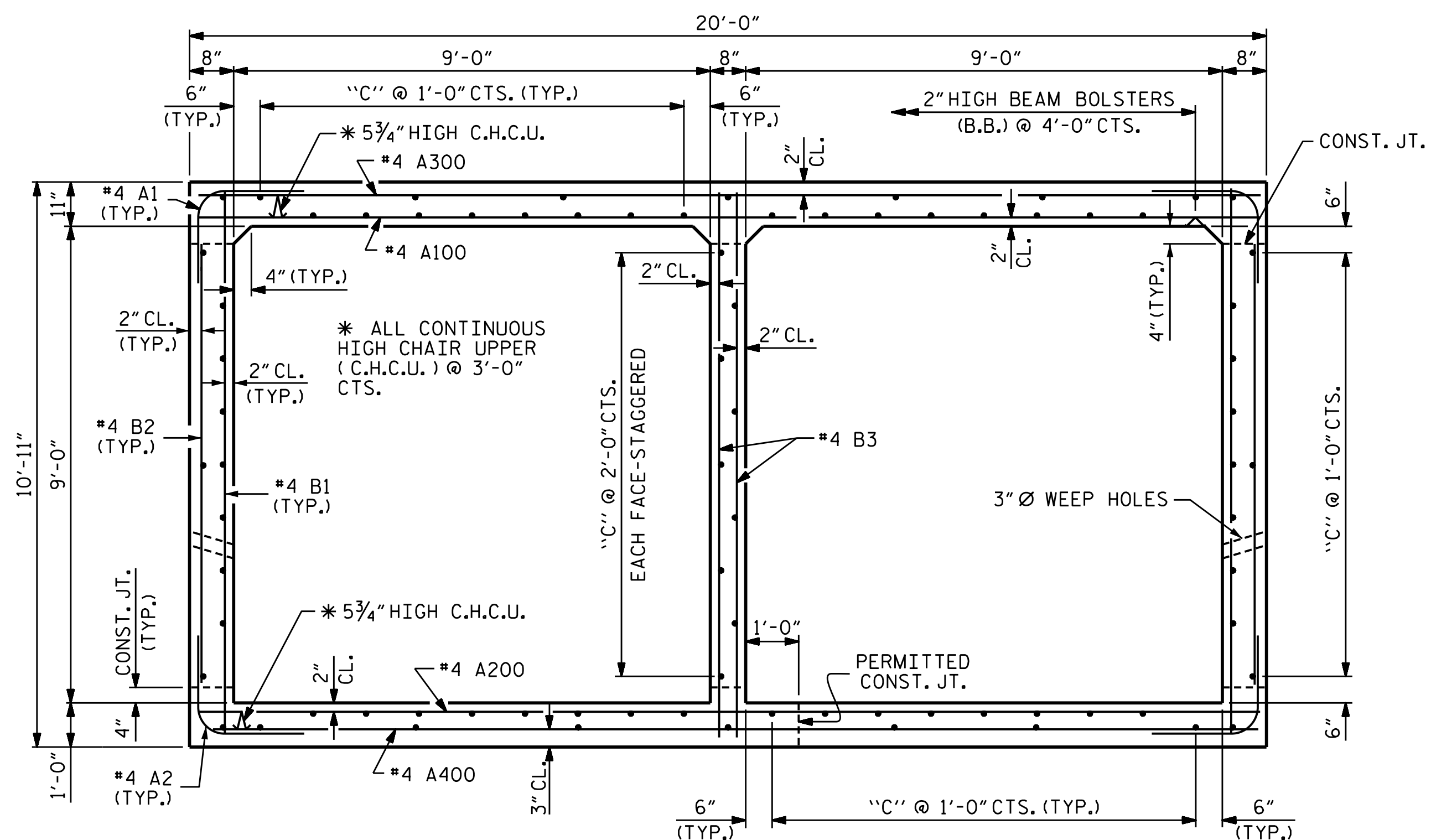
END ELEVATION NORMAL TO SKEW



EXTERIOR WALL INTERIOR WALL

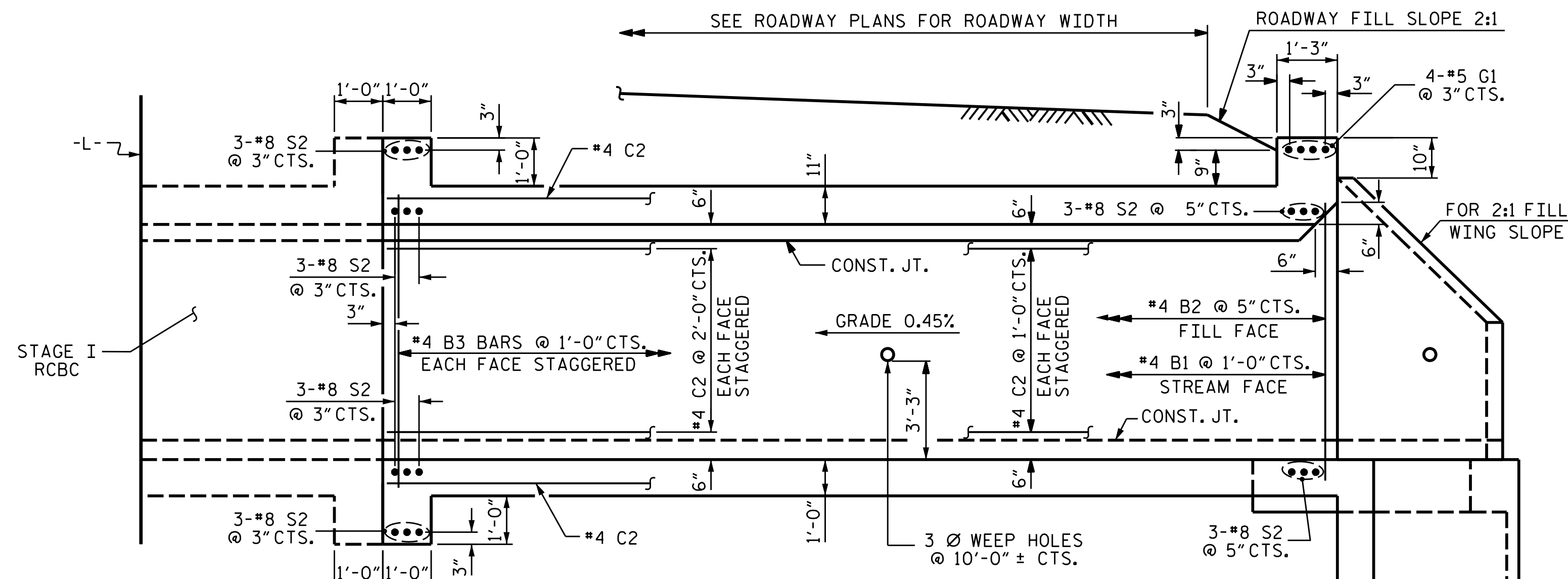
CULVERT SECTION NORMAL TO ROADWAY

STAGE I



RIGHT ANGLE SECTION OF BARREL

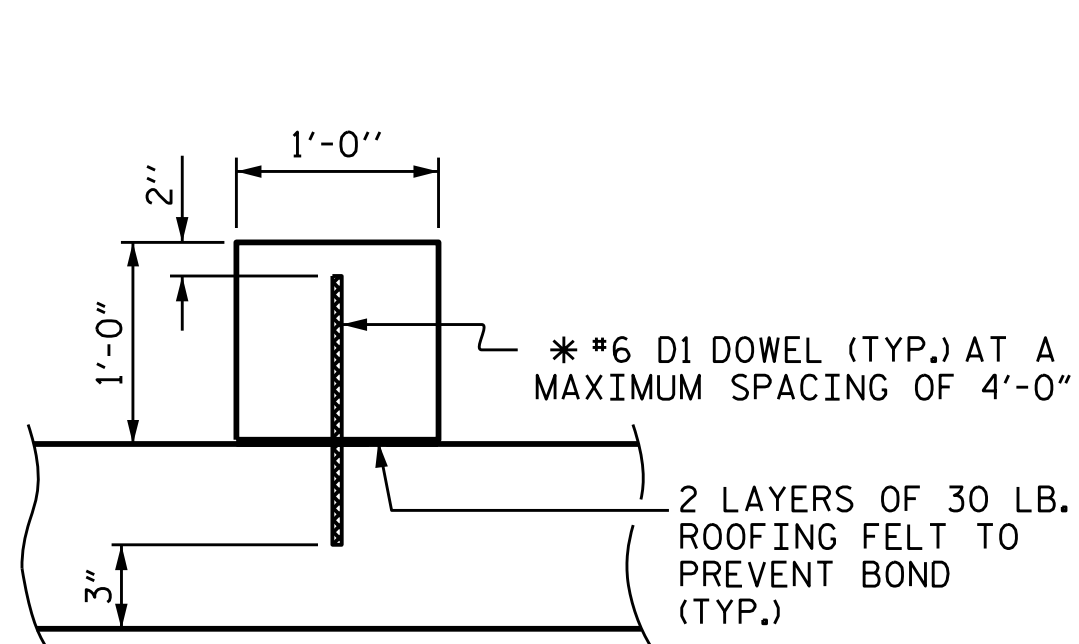
THERE ARE 79 "C" BARS IN SECTION OF BARREL.



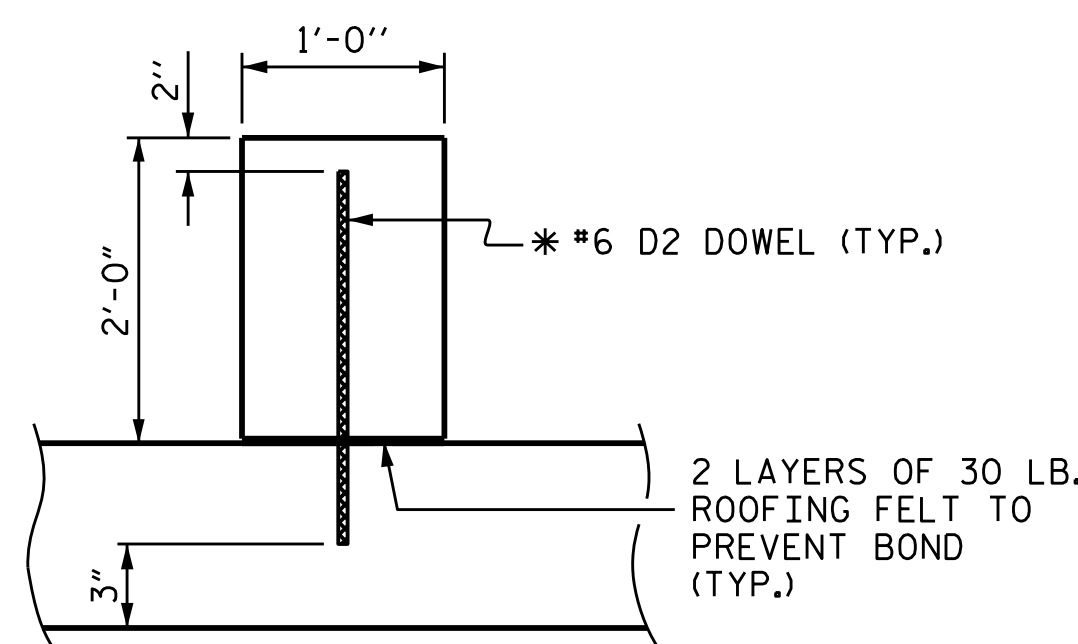
INTERIOR WALL EXTERIOR WALL

CULVERT SECTION NORMAL TO ROADWAY

STAGE II

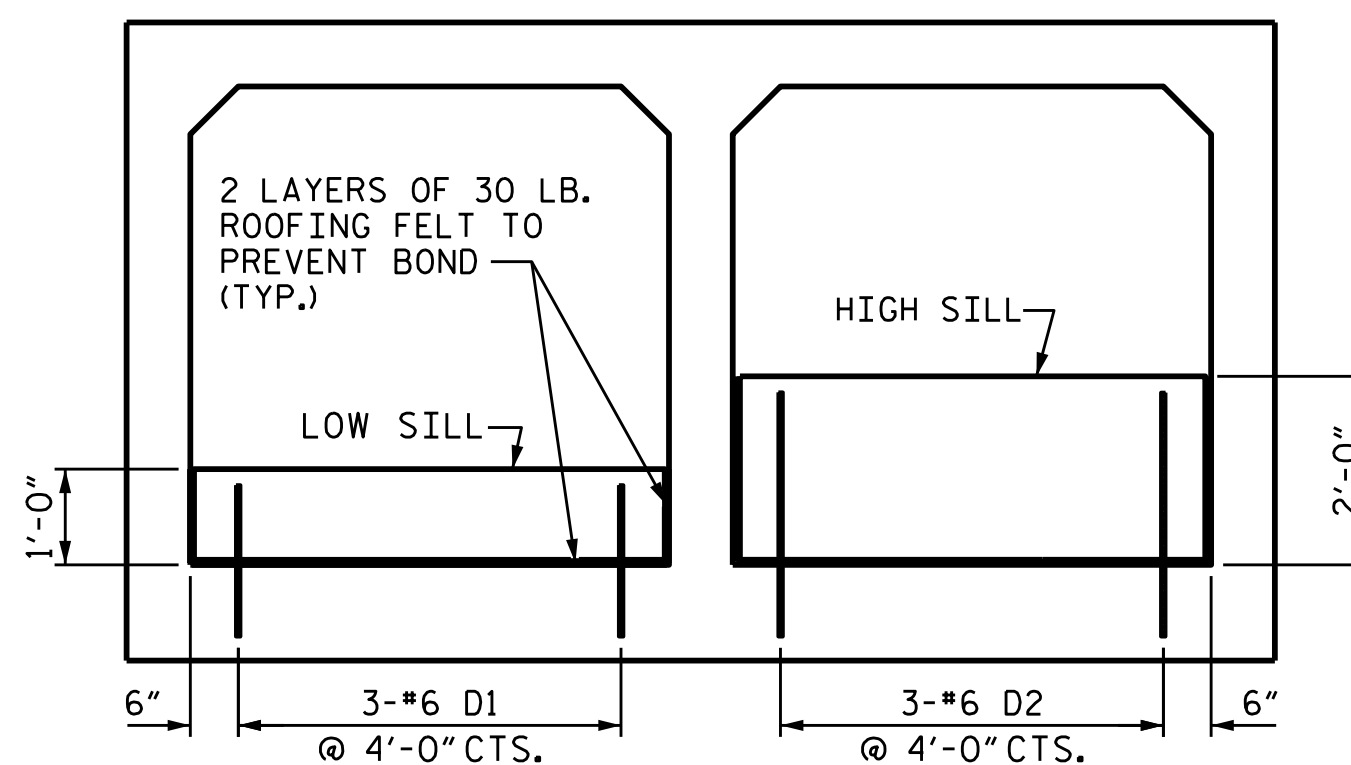


SECTION THROUGH 1'-0" SILL



SECTION THROUGH 2'-0" SILL

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



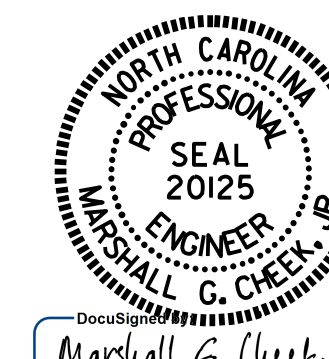
ELEVATION

CULVERT SILL DETAILS

(LOOKING DOWNSTREAM)

PROJECT NO. R-3100A
 CATAWBA COUNTY
 STATION: 165+35.00 -L-

SHEET 3 OF 8



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

DOUBLE 9 FT. X 9 FT.
 CONCRETE BOX CULVERT
 104° SKEW

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

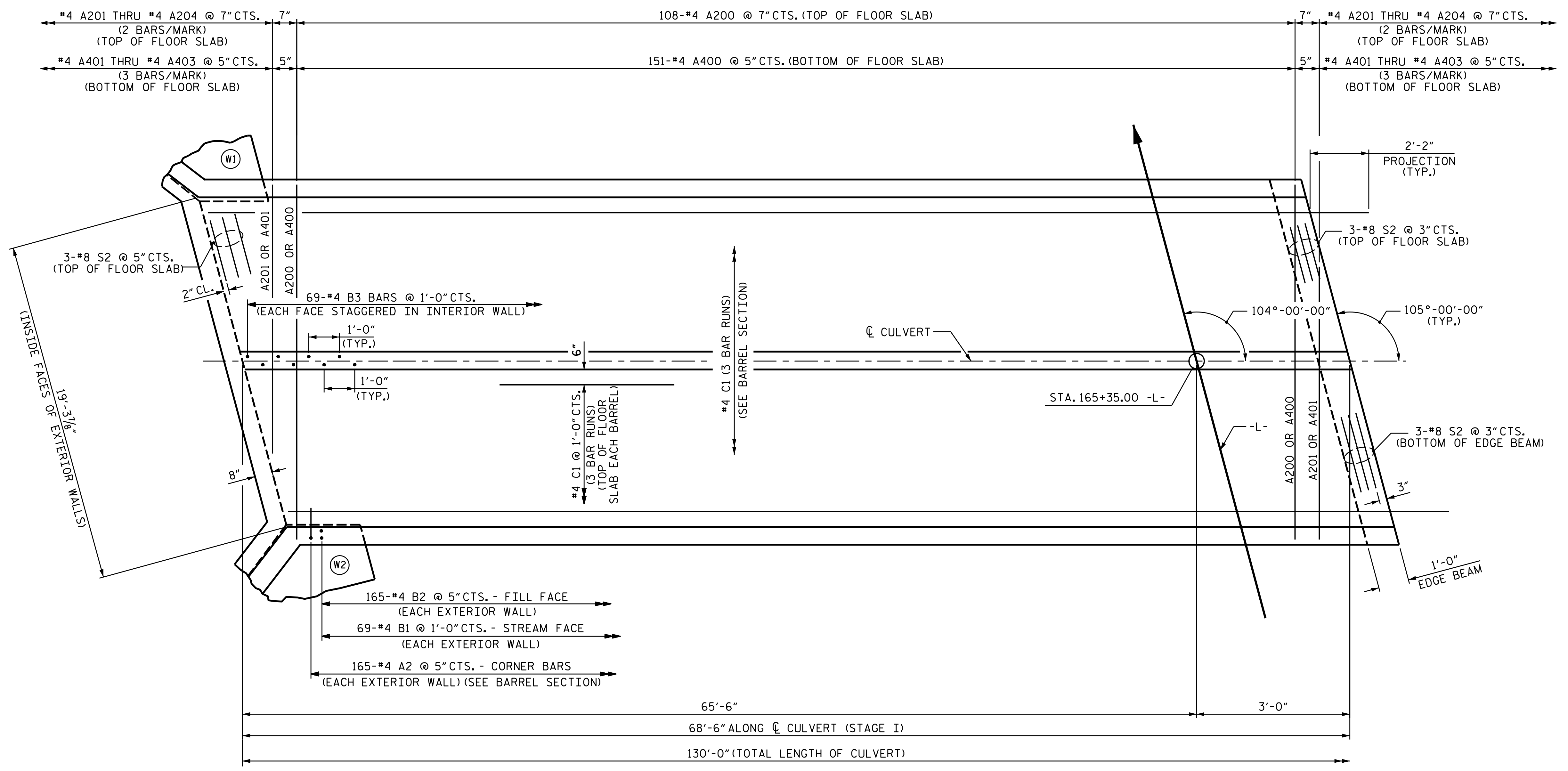
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 SIGNATURES COMPLETED

CUL. #2

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
 REVISED 11-19-99 BY M.M. CHECKED BY R.W.W.

DRAWN BY : A. SORSENGINH DATE : 12/2016
 CHECKED BY : H. T. BARBOUR DATE : 12/2016
 DESIGN ENGINEER OF RECORD : J. BOWLES DATE : 3/2016

*****SYSTEM*****
 *****DCN*****
 *****USERNAME*****



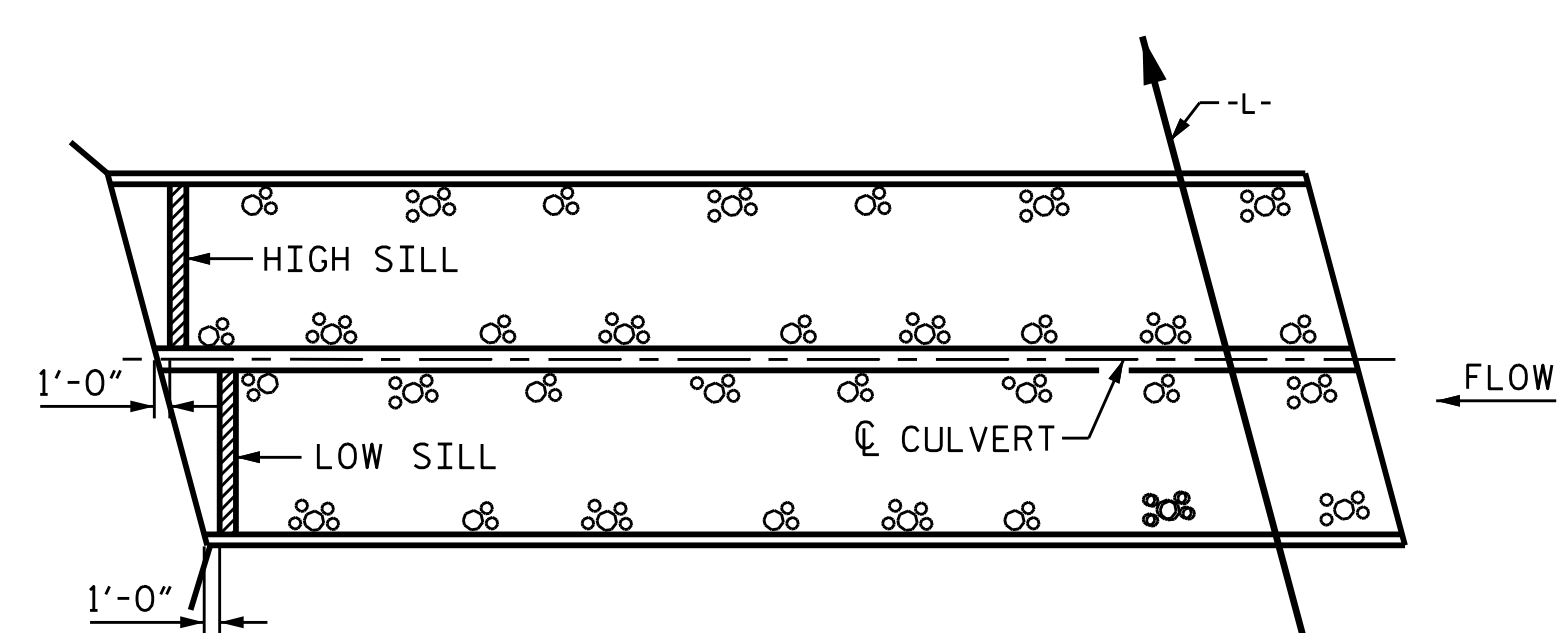
PLAN OF FLOOR SLAB
STAGE I

NOTES

MATERIAL EXCAVATED FROM THE EXISTING STREAMBED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AS SHOWN IN THE PLAN VIEW. ONLY NATIVE MATERIAL MAY BE USED IN THE LOW FLOW BARREL. BED MATERIAL IN THE HIGH FLOW BARREL MAY BE SUPPLEMENTED WITH CLASS A RIP RAP. IF RIP RAP IS USED, NATIVE MATERIAL SHALL BE PLACED ON TOP TO FILL VOIDS AND PROVIDE A SMOOTH STREAMBED FOR ANIMAL PASSAGE. BED MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER.

THE ENTIRE COST OF WORK REQUIRED TO PLACE THE EXCAVATED MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR CULVERT EXCAVATION.

THE ENTIRE COST OF WORK REQUIRED TO CONSTRUCT THE SILLS SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.



PLAN OF SILL LOCATIONS
STAGE I

PROJECT NO. R-3100A
CATAWBA COUNTY
STATION: 165+35.00 -L-

SHEET 4 OF 8



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
**DOUBLE 9 FT. X 9 FT.
CONCRETE BOX CULVERT
STAGE I**

ASSEMBLED BY : A. SORSENGIH DATE : 12/2016
CHECKED BY : H. T. BARBOUR DATE : 12/2016
DESIGN ENGINEER OF RECORD: J. BOWLES DATE : 3/2016

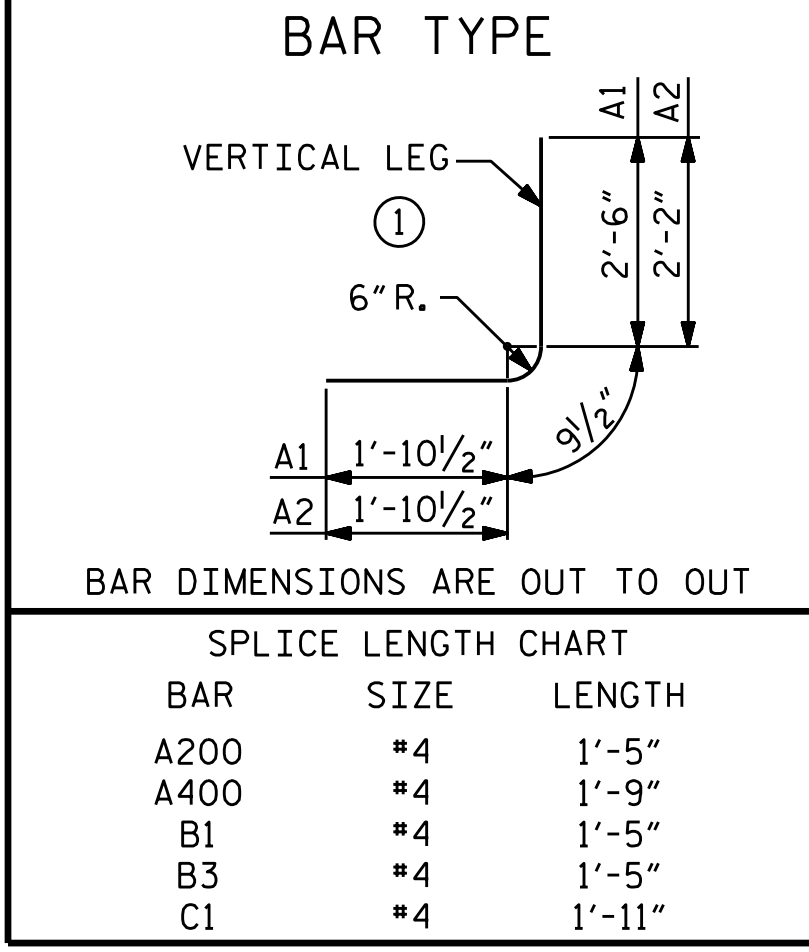
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FINAL UNLESS ALL
SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-9
1			3			TOTAL SHEETS
2			4			47

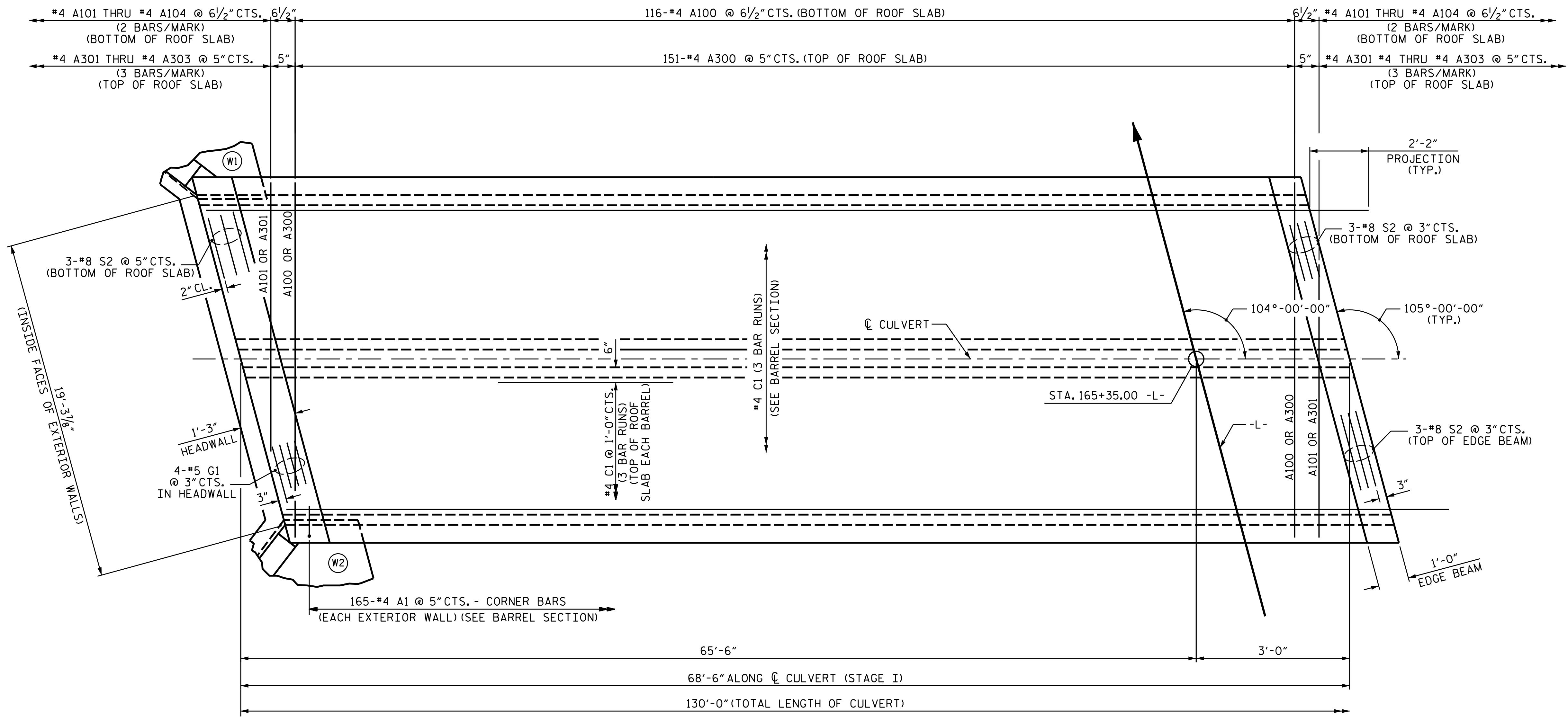
*****SYSTEM*****
*****SDGN*****
*****USERNAME*****

CUL. #2

STAGE I QUANTITIES	
CLASS A CONCRETE	
BARREL @ 2.095 CY/FT	143.5 C.Y.
WINGS, ETC.	17.5 C.Y.
SILLS	1.0 C.Y.
TOTAL	162.0 C.Y.
REINFORCING STEEL	
BARREL	18,326 LBS.
WINGS, ETC.	978 LBS.
TOTAL	19,304 LBS.
FOUNDATION CONDITIONING MATERIAL	116 TONS
CULVERT EXCAVATION	LUMP SUM

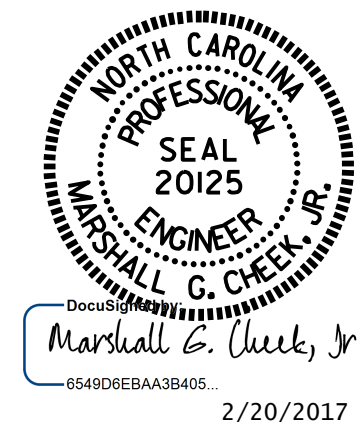


BAR SCHEDULE STAGE I											
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	330	#4	1	5'-2"	1139	A302	6	#4	STR	10'-10"	43
A2	330	#4	1	4'-10"	1065	A303	6	#4	STR	6'-2"	25
A100	116	#4	STR	19'-7"	1517	A400	151	#4	STR	19'-7"	1975
A101	4	#4	STR	16'-6"	44	A401	6	#4	STR	15'-6"	62
A102	4	#4	STR	12'-5"	33	A402	6	#4	STR	10'-10"	43
A103	4	#4	STR	8'-5"	22	A403	6	#4	STR	6'-2"	25
A104	4	#4	STR	4'-4"	12						
						B1	138	#4	STR	10'-5"	960
A200	108	#4	STR	19'-7"	1413	B2	330	#4	STR	8'-4"	1837
A201	4	#4	STR	15'-11"	43	B3	138	#4	STR	10'-5"	960
A202	4	#4	STR	11'-7"	31						
A203	4	#4	STR	7'-3"	19	C1	237	#4	STR	24'-10"	3932
A204	4	#4	STR	2'-11"	8						
						D1	3	#6	STR	1'-7"	7
A300	151	#4	STR	19'-7"	1975	D2	3	#6	STR	2'-7"	12
A301	6	#4	STR	15'-6"	62						
						G1	4	#5	STR	20'-4"	85
						S2	18	#8	STR	20'-4"	977
						REINFORCING STEEL = 18,326 LBS.					



**PLAN OF ROOF SLAB
STAGE I**

PROJECT NO. R-3100A
CATAWBA COUNTY
STATION: 165+35.00 -L-
SHEET 5 OF 8



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

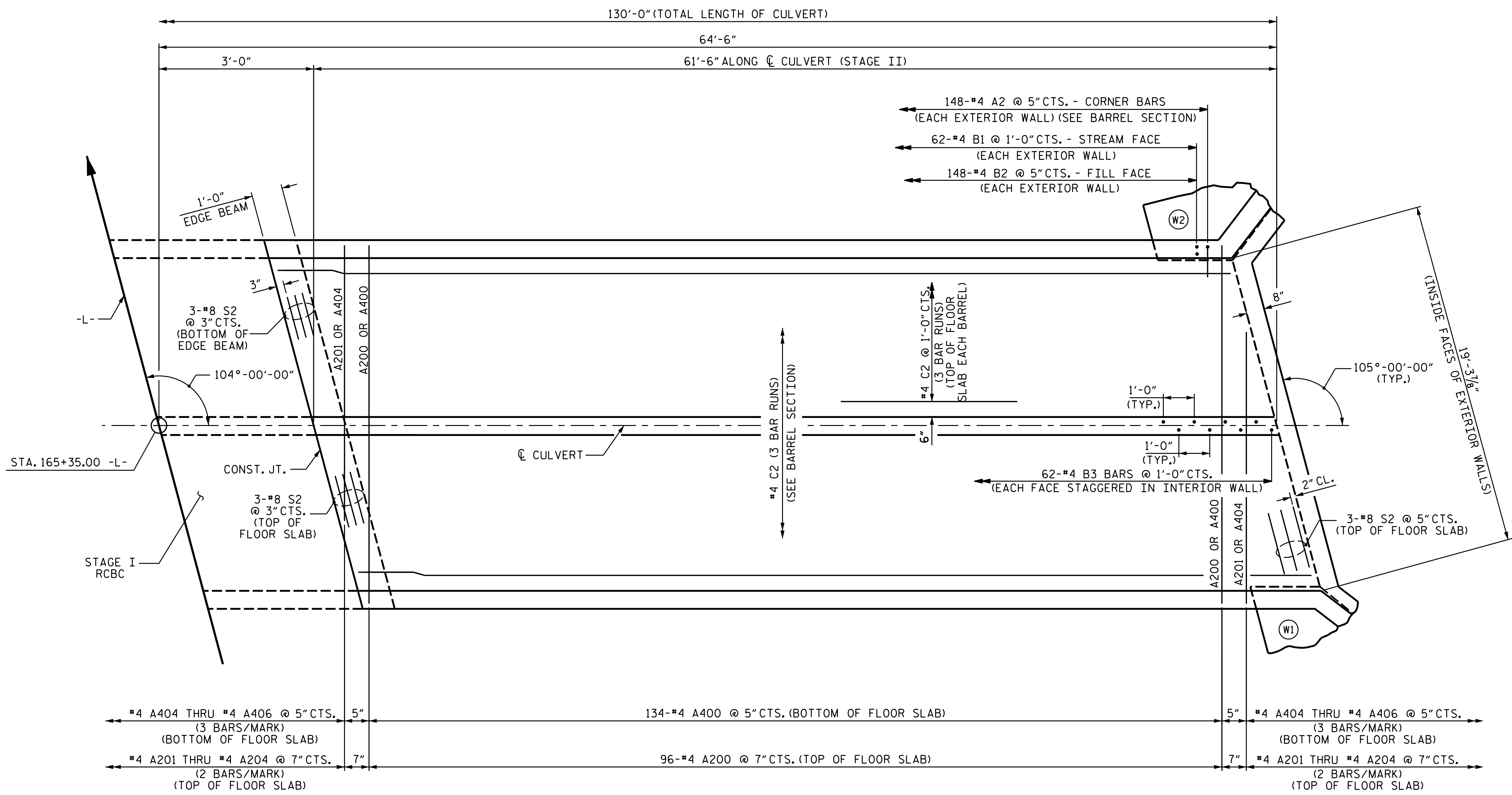
**DOUBLE 9 FT. X 9 FT.
CONCRETE BOX CULVERT
STAGE I**

ASSEMBLED BY : A. SORSENGINH DATE : 12/2016
CHECKED BY : H. T. BARBOUR DATE : 12/2016
DESIGN ENGINEER OF RECORD: J. BOWLES DATE : 3/2016

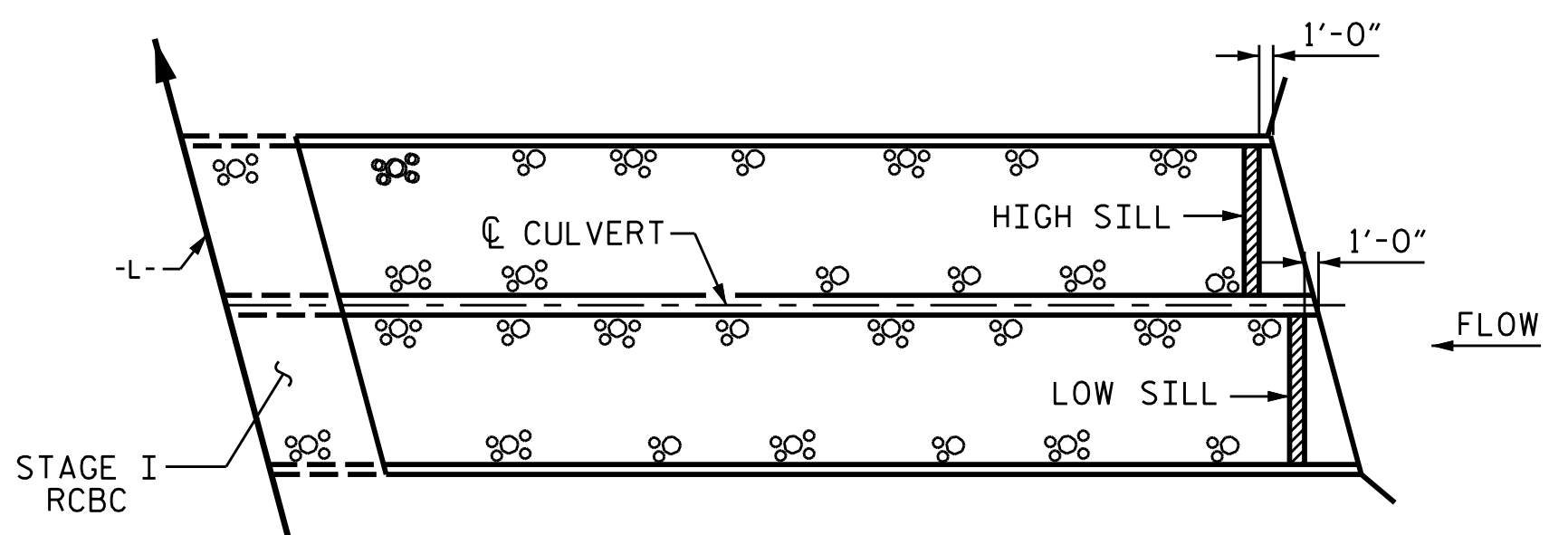
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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-10
1			3			TOTAL SHEETS
2			4			47

CUL. #2



**PLAN OF FLOOR SLAB
STAGE II**



**PLAN OF SILL LOCATIONS
STAGE II**

NOTES

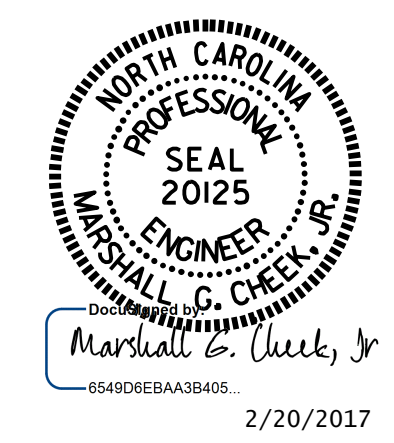
MATERIAL EXCAVATED FROM THE EXISTING STREAMBED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AS SHOWN IN THE PLAN VIEW. ONLY NATIVE MATERIAL MAY BE USED IN THE LOW FLOW BARREL. BED MATERIAL IN THE HIGH FLOW BARREL MAY BE SUPPLEMENTED WITH CLASS A RIP RAP. IF RIP RAP IS USED, NATIVE MATERIAL SHALL BE PLACED ON TOP TO FILL VOIDS AND PROVIDE A SMOOTH STREAMBED FOR ANIMAL PASSAGE. BED MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER.

THE ENTIRE COST OF WORK REQUIRED TO PLACE THE EXCAVATED MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR CULVERT EXCAVATION.

THE ENTIRE COST OF WORK REQUIRED TO CONSTRUCT THE SILLS SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.

PROJECT NO. R-3100A
CATAWBA COUNTY
 STATION: 165+35.00 -L-

SHEET 6 OF 8



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**DOUBLE 9 FT. X 9 FT.
 CONCRETE BOX CULVERT
 STAGE II**

ASSEMBLED BY : A. SORSENGIH DATE : 12/2016
 CHECKED BY : H. T. BARBOUR DATE : 12/2016
 DESIGN ENGINEER OF RECORD: J. BOWLES DATE : 3/2016

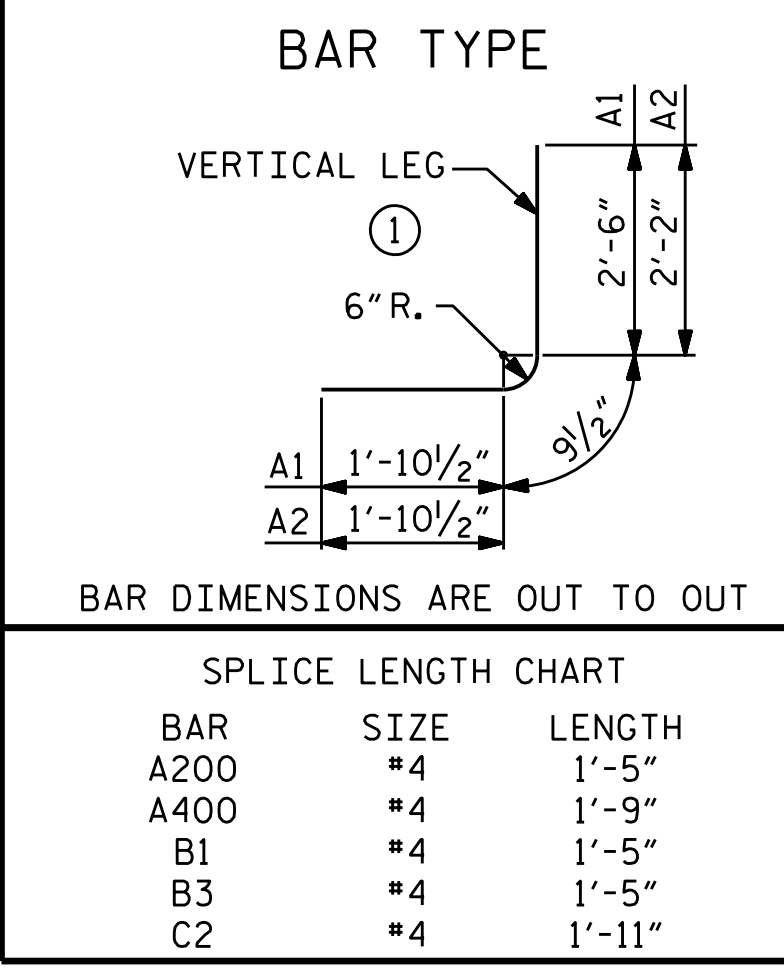
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 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-11
1			3			TOTAL SHEETS
2			4			47

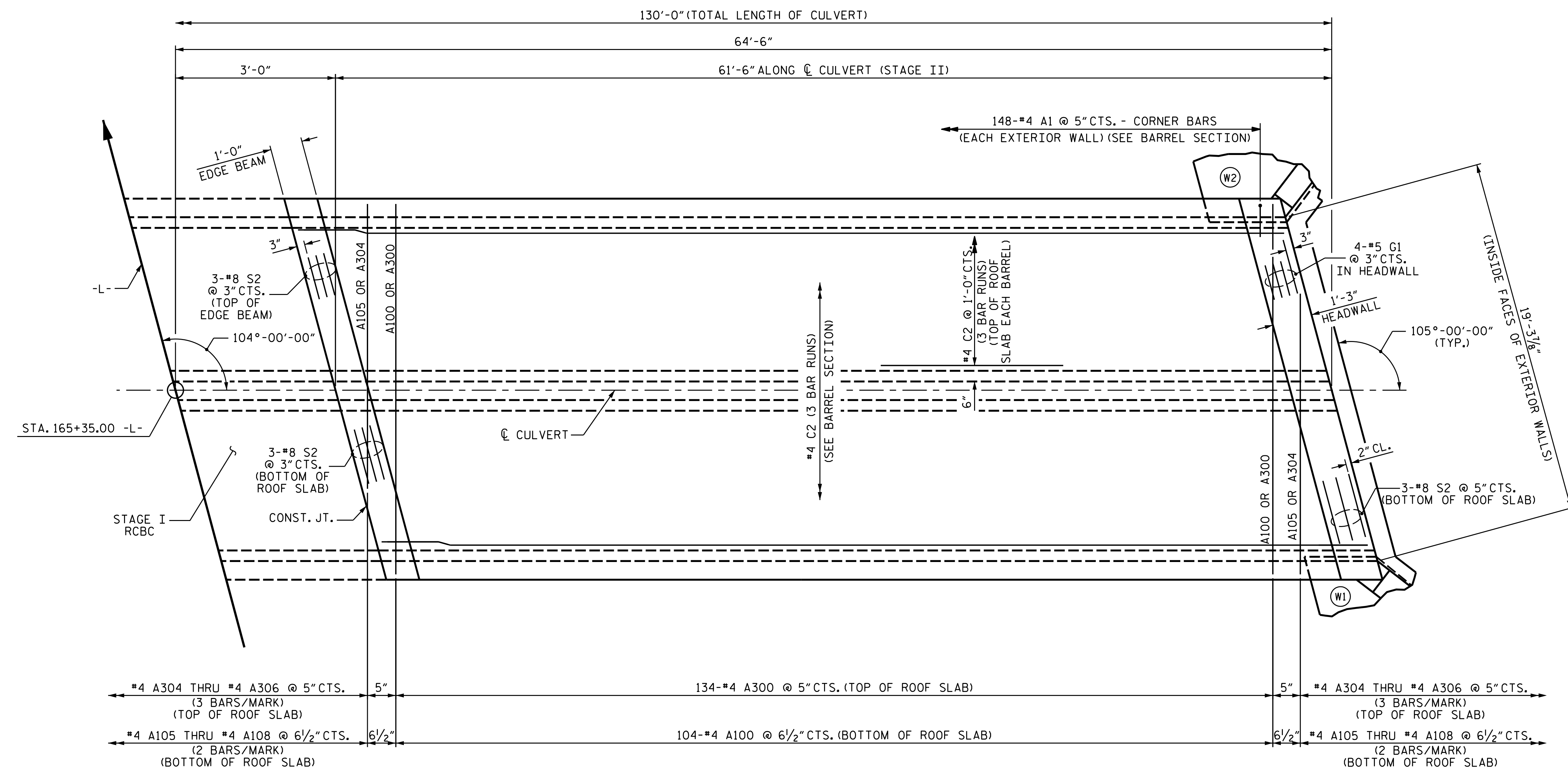
*****SYSTEM*****
 *****DGN*****
 *****USERNAME*****

CUL. #2

STAGE II QUANTITIES	
CLASS A CONCRETE	
BARREL @ 2.095 CY/FT	128.8 C.Y.
WINGS, ETC.	17.5 C.Y.
SILLS	1.0 C.Y.
TOTAL	147.3 C.Y.
REINFORCING STEEL	
BARREL	16,452 LBS.
WINGS, ETC.	978 LBS.
TOTAL	17,430 LBS.
FOUNDATION CONDITIONING MATERIAL	104 TONS
CULVERT EXCAVATION	LUMP SUM

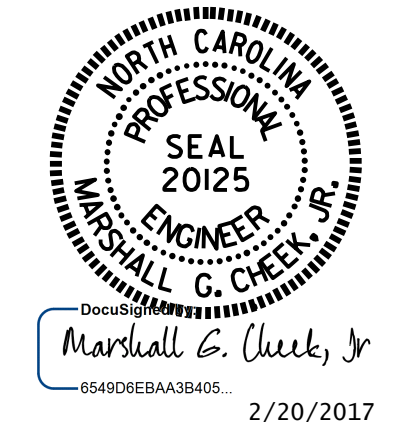


BAR SCHEDULE STAGE II											
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	296	#4	1	5'-2"	1022	A305	6	#4	STR	11'-0"	44
A2	296	#4	1	4'-10"	956	A306	6	#4	STR	6'-4"	25
A100	104	#4	STR	19'-7"	1360	A400	134	#4	STR	19'-7"	1753
A105	4	#4	STR	15'-7"	42	A404	6	#4	STR	15'-8"	63
A106	4	#4	STR	11'-6"	31	A405	6	#4	STR	11'-0"	44
A107	4	#4	STR	7'-6"	20	A406	6	#4	STR	6'-4"	25
A108	4	#4	STR	3'-5"	9						
						B1	124	#4	STR	10'-5"	863
						B2	296	#4	STR	8'-4"	1648
						B3	124	#4	STR	10'-5"	863
						C2	237	#4	STR	21'-8"	3430
						D1	3	#6	STR	1'-7"	7
						D2	3	#6	STR	2'-7"	12
						G1	4	#5	STR	20'-4"	85
						S2	18	#8	STR	20'-4"	977
REINFORCING STEEL = 16,452 LBS.											



**PLAN OF ROOF SLAB
STAGE II**

PROJECT NO. R-3100A
CATAWBA COUNTY
 STATION: 165+35.00 -L-
 SHEET 7 OF 8



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**DOUBLE 9 FT. X 9 FT.
 CONCRETE BOX CULVERT
 STAGE II**

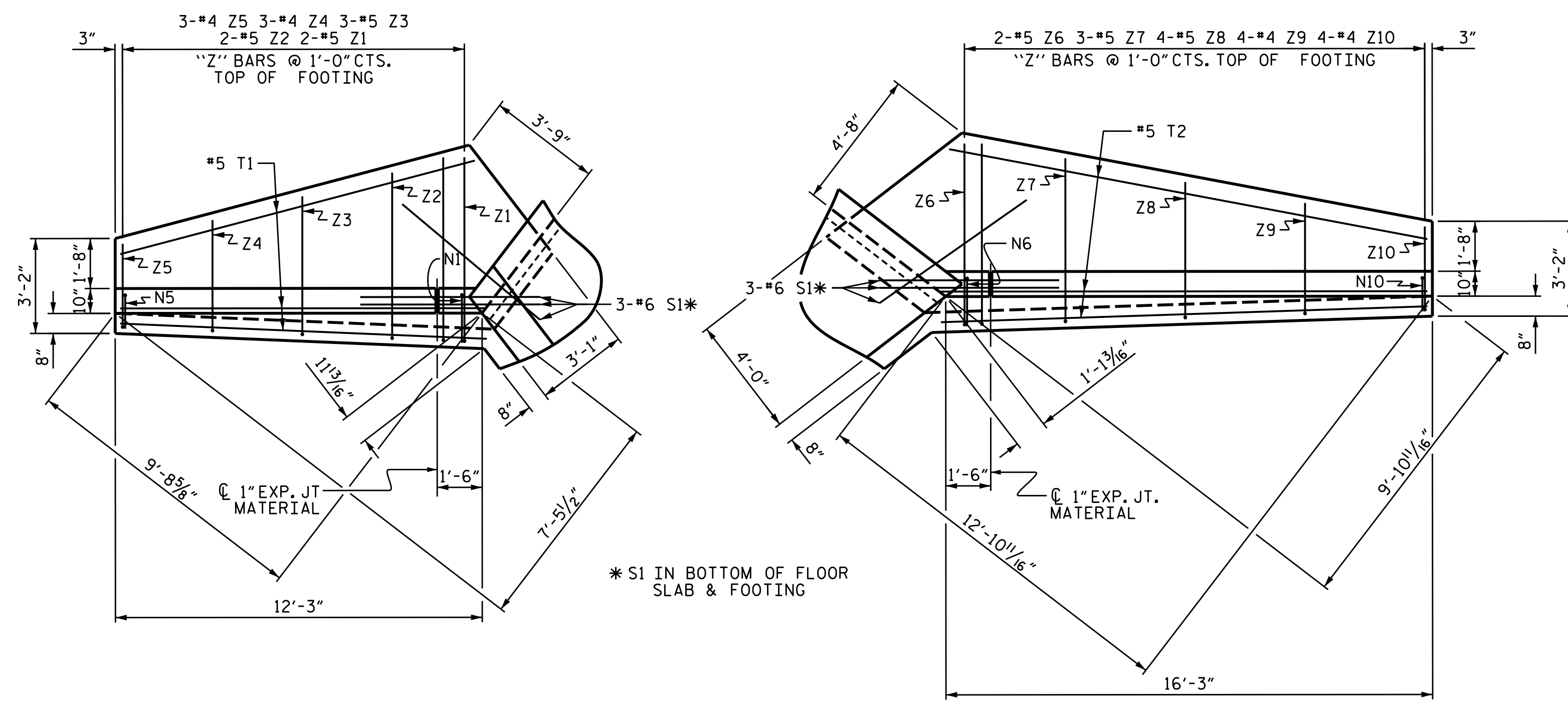
ASSEMBLED BY : A. SORSENGIH DATE : 12/2016
 CHECKED BY : H. T. BARBOUR DATE : 12/2016
 DESIGN ENGINEER OF RECORD : J. BOWLES DATE : 3/2016

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 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-12
1			3			TOTAL SHEETS
2			4			47

*****SYTIME*****
 *****DGN*****
 *****USERNAME*****

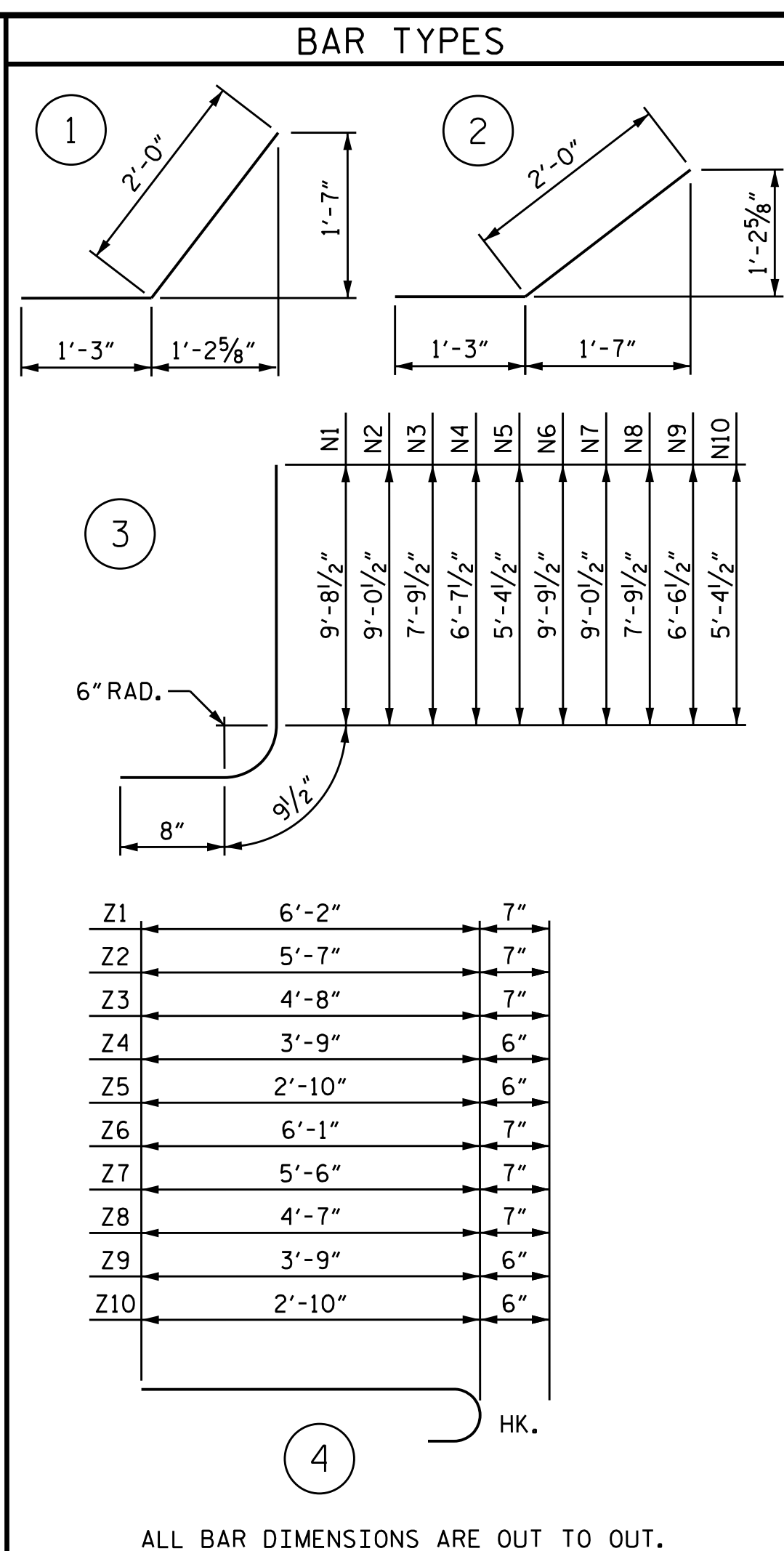
CUL. #2



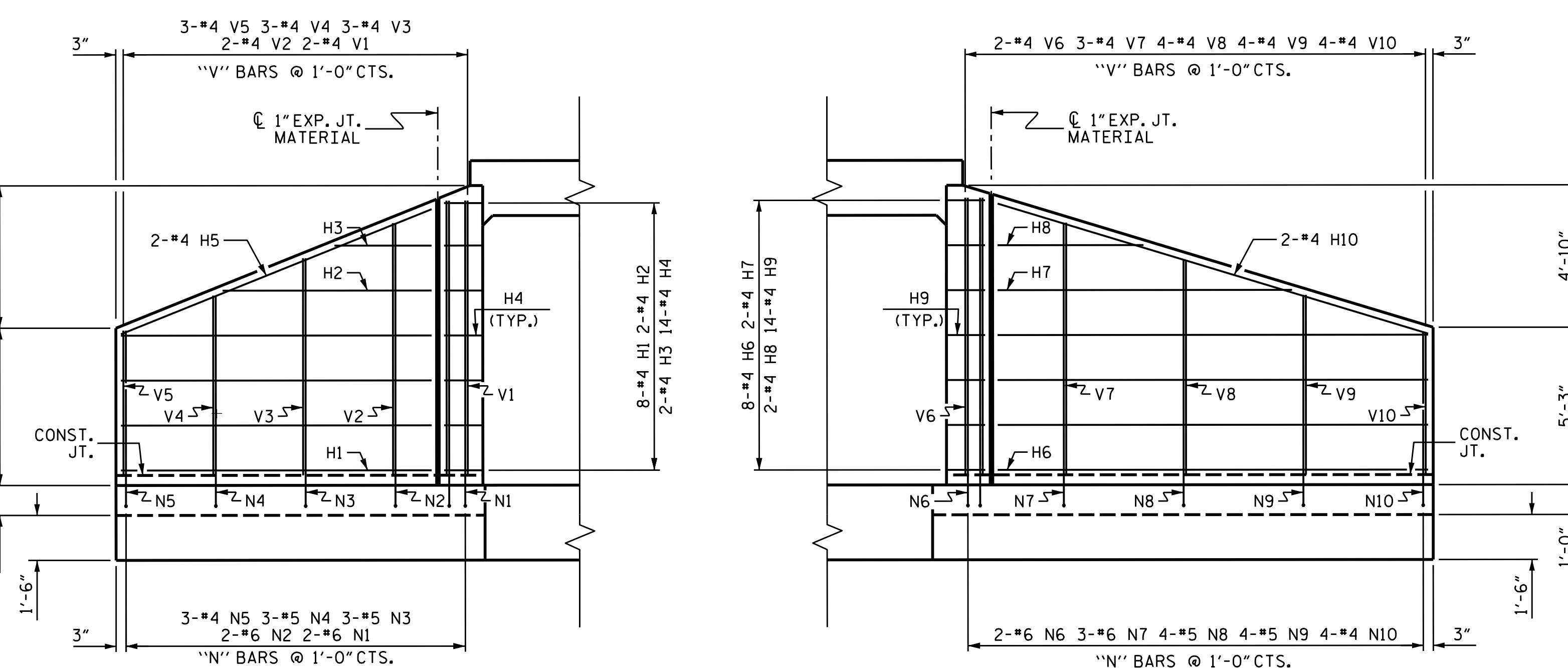
PLAN W2

PLAN W1

* S1 IN BOTTOM OF FLOOR SLAB & FOOTING

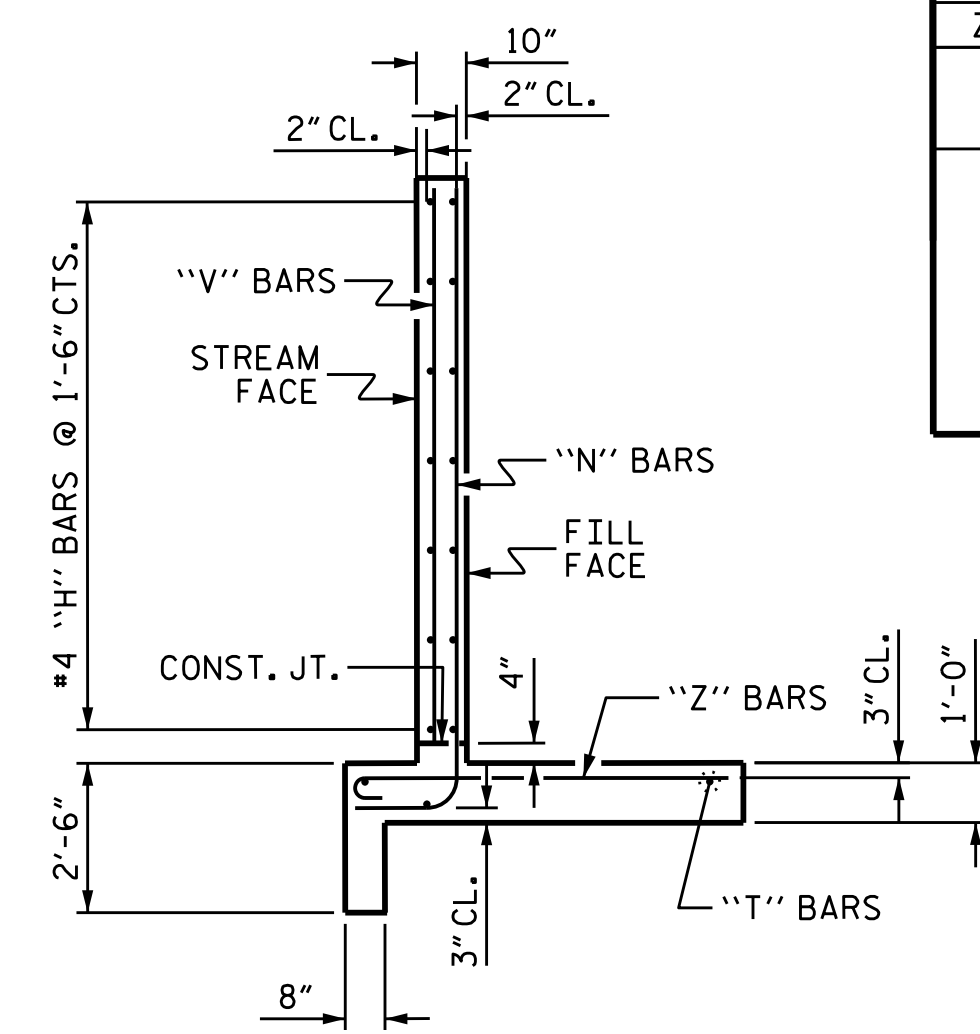


ALL BAR DIMENSIONS ARE OUT TO OUT.



ELEVATION W2

ELEVATION W1



TYPICAL WING SECTION

BILL OF MATERIAL											
STAGE I					STAGE II						
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	SIZE	TYPE	LENGTH	WEIGHT		
H1	8	#4	STR	10'-4"	55	H1	8	#4	STR	10'-4"	55
H2	2	#4	STR	6'-11"	9	H2	2	#4	STR	6'-11"	9
H3	2	#4	STR	3'-3"	4	H3	2	#4	STR	3'-3"	4
H4	14	#4	1	3'-3"	30	H4	14	#4	1	3'-3"	30
H5	2	#4	STR	11'-2"	15	H5	2	#4	STR	11'-2"	15
H6	8	#4	STR	14'-4"	77	H6	8	#4	STR	14'-4"	77
H7	2	#4	STR	9'-10"	13	H7	2	#4	STR	9'-10"	13
H8	2	#4	STR	4'-10"	6	H8	2	#4	STR	4'-10"	6
H9	14	#4	2	3'-3"	30	H9	14	#4	2	3'-3"	30
H10	2	#4	STR	15'-0"	20	H10	2	#4	STR	15'-0"	20
N1	2	#6	3	11'-2"	34	N1	2	#6	3	11'-2"	34
N2	2	#6	3	10'-6"	32	N2	2	#6	3	10'-6"	32
N3	3	#5	3	9'-3"	29	N3	3	#5	3	9'-3"	29
N4	3	#5	3	8'-1"	25	N4	3	#5	3	8'-1"	25
N5	3	#4	3	6'-10"	14	N5	3	#4	3	6'-10"	14
N6	2	#6	3	11'-3"	34	N6	2	#6	3	11'-3"	34
N7	3	#6	3	10'-6"	47	N7	3	#6	3	10'-6"	47
N8	4	#5	3	9'-3"	39	N8	4	#5	3	9'-3"	39
N9	4	#5	3	8'-0"	33	N9	4	#5	3	8'-0"	33
N10	4	#4	3	6'-10"	18	N10	4	#4	3	6'-10"	18
S1	6	#6	STR	6'-0"	54	S1	6	#6	STR	6'-0"	54
T1	3	#5	STR	12'-3"	38	T1	3	#5	STR	12'-3"	38
T2	3	#5	STR	16'-3"	51	T2	3	#5	STR	16'-3"	51
V1	2	#4	STR	9'-2"	12	V1	2	#4	STR	9'-2"	12
V2	2	#4	STR	8'-5"	11	V2	2	#4	STR	8'-5"	11
V3	3	#4	STR	7'-3"	15	V3	3	#4	STR	7'-3"	15
V4	3	#4	STR	6'-0"	12	V4	3	#4	STR	6'-0"	12
V5	3	#4	STR	4'-10"	10	V5	3	#4	STR	4'-10"	10
V6	2	#4	STR	9'-3"	12	V6	2	#4	STR	9'-3"	12
V7	3	#4	STR	8'-5"	17	V7	3	#4	STR	8'-5"	17
V8	4	#4	STR	7'-2"	19	V8	4	#4	STR	7'-2"	19
V9	4	#4	STR	6'-0"	16	V9	4	#4	STR	6'-0"	16
V10	4	#4	STR	4'-9"	13	V10	4	#4	STR	4'-9"	13
Z1	2	#5	4	6'-9"	14	Z1	2	#5	4	6'-9"	14
Z2	2	#5	4	6'-2"	13	Z2	2	#5	4	6'-2"	13
Z3	3	#5	4	5'-3"	16	Z3	3	#5	4	5'-3"	16
Z4	3	#4	4	4'-3"	9	Z4	3	#4	4	4'-3"	9
Z5	3	#4	4	3'-4"	7	Z5	3	#4	4	3'-4"	7
Z6	2	#5	4	6'-8"	14	Z6	2	#5	4	6'-8"	14
Z7	3	#5	4	6'-1"	19	Z7	3	#5	4	6'-1"	19
Z8	4	#5	4	5'-2"	22	Z8	4	#5	4	5'-2"	22
Z9	4	#4	4	4'-3"	11	Z9	4	#4	4	4'-3"	11
Z10	4	#4	4	3'-4"	9	Z10	4	#4	4	3'-4"	9
REINFORCING STEEL FOR 2 WINGS					978 LBS.	REINFORCING STEEL FOR 2 WINGS					978 LBS.
CLASS A CONCRETE						CLASS A CONCRETE					
2 WINGS					13.9 C.Y.	2 WINGS					13.9 C.Y.
1 HEADWALL					1.0 C.Y.	1 HEADWALL					1.0 C.Y.
1 END CURTAIN WALL					1.1 C.Y.	1 END CURTAIN WALL					1.1 C.Y.
2 EDGE BEAMS					1.5 C.Y.	2 EDGE BEAMS					1.5 C.Y.
TOTAL					17.5 C.Y.	TOTAL					17.5 C.Y.

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. R-3100A
CATAWBA COUNTY
 STATION: 165+35.00 -L-

SHEET 8 OF 8

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

STANDARD WINGS
 FOR
 CONCRETE BOX CULVERT
 H = 9'-0" SLOPE = 2:1
 105° SKEW



2/20/2017

ASSEMBLED BY : A. SORSENGINH DATE : 12/2016
 CHECKED BY : H. T. BARBOUR DATE : 12/2016
 DRAWN BY : CCJ 01/00
 CHECKED BY : RWW 03/00

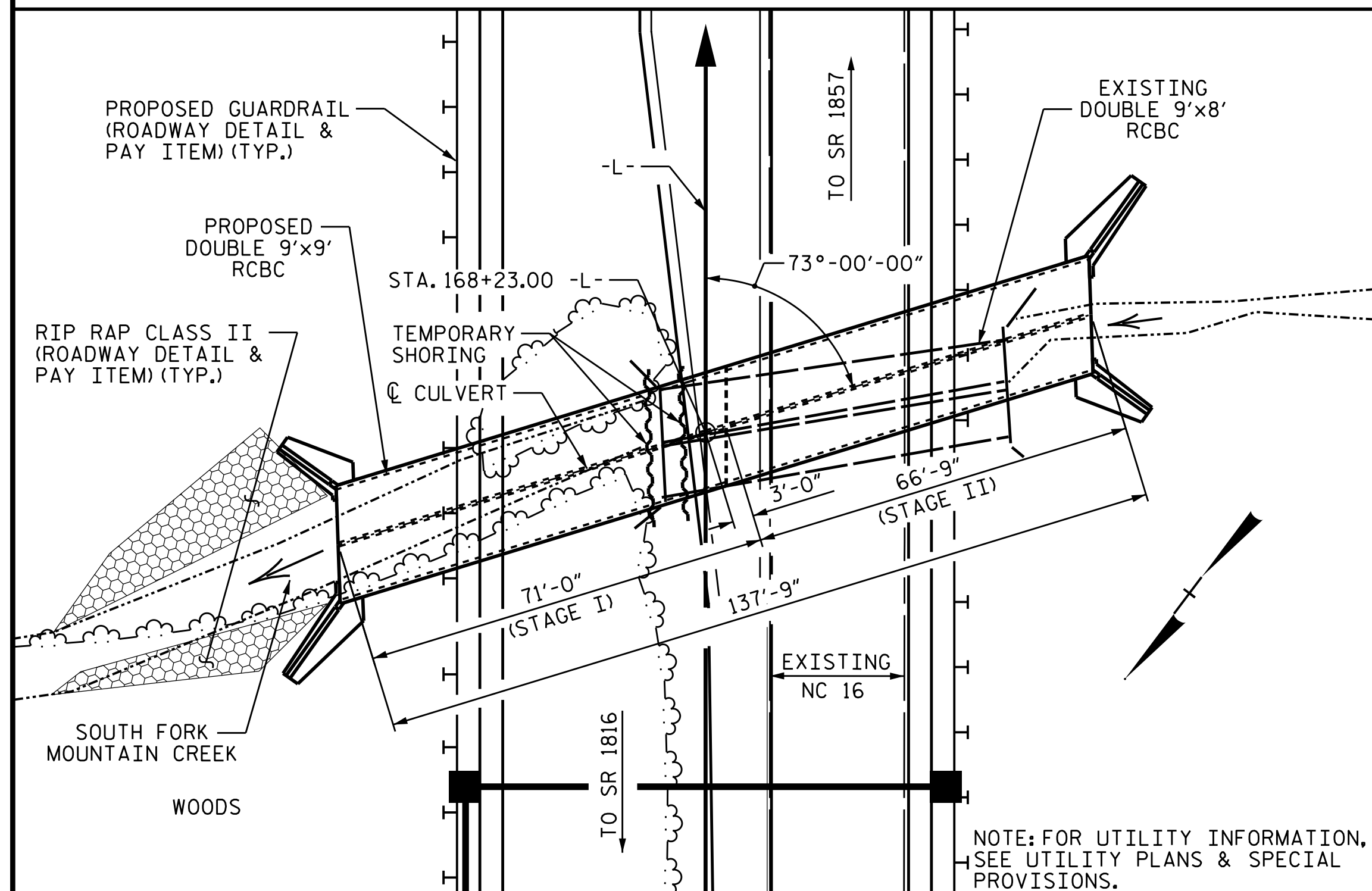
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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-13
1			3			TOTAL SHEETS
2			4			47

CUL. #2 STD. NO. CW7509

*****SYTIME*****
 *****DGN*****
 *****USER*****

BENCHMARK #17: 8" SPIKE IN ROOT OF 12" Ø CUCUMBER TREE,
STA. 168+56.12 -L-, 254' RIGHT, EL. 902.19



LOCATION SKETCH

NOTE: FOR UTILITY INFORMATION,
SEE UTILITY PLANS & SPECIAL
PROVISIONS.

ROADWAY DATA

GRADE POINT EL. @ STA. 168+23.00 -L- = 914.84
BED EL. @ STA. 168+23.00 -L- = 894.02
ROADWAY SLOPES = 2:1

HYDRAULIC DATA

DESIGN DISCHARGE = 750 C.F.S.
FREQUENCY OF DESIGN FLOOD = 50 YR.
DESIGN HIGH WATER ELEV. = 901.9
DRAINAGE AREA = 1.24 SQ. MI.
BASE DISCHARGE (Q100) = 900 C.F.S.
BASE HIGH WATER ELEV. = 902.75

OVERTOPPING FLOOD DATA

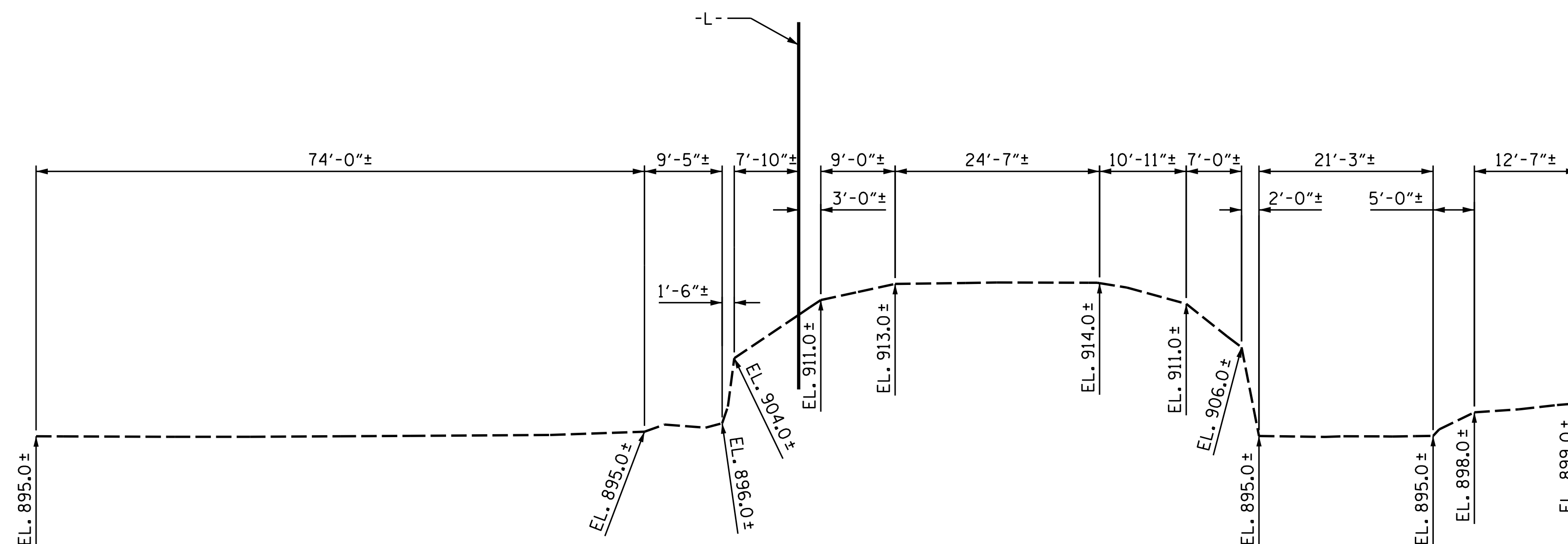
OVERTOPPING DISCHARGE = 2700 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD = 500+ YR.
OVERTOPPING FLOOD ELEV. @ STA. 165+90.94 -L- = 912.5

TOTAL STRUCTURE QUANTITIES

CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	
STAGE I	120 TONS
STAGE II	113 TONS
TOTAL	233 TONS
CLASS A CONCRETE	
STAGE I	173.8 C.Y.
STAGE II	164.5 C.Y.
TOTAL	338.3 C.Y.
REINFORCING STEEL	
STAGE I	22,717 LBS.
STAGE II	21,303 LBS.
TOTAL	44,020 LBS.

NOTES

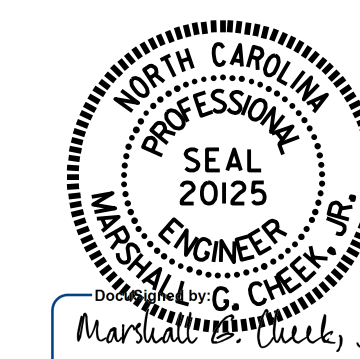
- ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
- DESIGN FILL = 12.05 FEET (MAX.) AND 10.70 (MIN.).
- FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.
- 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN STAGE I & STAGE II CULVERTS SHALL BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
- THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
- TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
- STEEL IN THE BOTTOM SLAB MAY BE SPLICED AT THE PERMITTED CONSTRUCTION JOINT AT THE CONTRACTOR'S OPTION. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL AND BOTH FACES OF INTERIOR WALLS ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE BARS FROM WHICH THE SAMPLES ARE TAKEN MUST THEN BE SPLICED WITH REPLACEMENT BARS OF THE SIZE AND LENGTH OF THE SAMPLE, PLUS A MINIMUM LAP SPLICE OF THIRTY BAR DIAMETERS. PAYMENT FOR THE SAMPLES OF REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- 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.
- FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE ROADWAY PLANS.
- FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.



PROFILE ALONG CULVERT

PROJECT NO. R-3100A
CATAWBA COUNTY
STATION: 168+23.00 -L-

SHEET 1 OF 7



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 9 FT. X 9 FT.
CONCRETE BOX CULVERT

2/21/2017

ASSEMBLED BY : N.D'AIUTO DATE : 2/8/16
CHECKED BY : J.K.BOWLES DATE : 3/11/16
DESIGN ENGINEER OF RECORD: J. BOWLES DATE : 4/17

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

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

TOTAL SHEETS: 47

**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		
						MOMENT				SHEAR						
						LIVE-LOAD FACTORS (LL)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	①	2.04	--	1.75	2.65	1	TOP SLAB	4.11	2.04	1	TOP SLAB	8.64		
	HL-93 (OPERATING)	N/A		2.65	--	1.35	3.43	1	TOP SLAB	4.11	2.65	1	TOP SLAB	8.64		
	HS-20 (INVENTORY)	36.00	②	2.62	94.45	1.75	3.76	1	EXTERIOR WALL	5.26	2.62	1	BOTTOM SLAB	8.55		
	HS-20 (OPERATING)	36.00		3.40	122.44	1.35	4.88	1	EXTERIOR WALL	5.26	3.40	1	BOTTOM SLAB	8.55		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		3.53	47.65	1.40	4.69	1	EXTERIOR WALL	5.26	3.53	1	EXTERIOR WALL	9.00		
		SNGARBS2	20.00		3.53	70.57	1.40	4.69	1	EXTERIOR WALL	5.26	3.53	1	EXTERIOR WALL	9.00	
		SNAGRIS2	22.00		3.53	77.66	1.40	4.69	1	EXTERIOR WALL	5.26	3.53	1	EXTERIOR WALL	9.00	
		SNCOTTS3	27.25		2.54	69.12	1.40	3.30	1	TOP SLAB	4.11	2.54	1	TOP SLAB	8.64	
		SNAGGRS4	34.93		2.40	83.79	1.40	3.26	1	TOP SLAB	4.11	2.40	1	TOP SLAB	8.64	
		SNS5A	35.55		2.31	81.99	1.40	3.32	1	TOP SLAB	4.11	2.31	1	TOP SLAB	8.64	
		SNS6A	39.95		2.31	92.12	1.40	3.39	1	TOP SLAB	4.11	2.31	1	TOP SLAB	8.64	
		SNS7B	42.00	③	2.28	95.81	1.40	3.35	1	TOP SLAB	4.11	2.28	1	TOP SLAB	8.64	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.00		3.06	101.07	1.40	4.50	1	TOP SLAB	4.11	3.06	1	TOP SLAB	8.64	
		TNT4A	33.08		3.00	99.16	1.40	3.92	1	TOP SLAB	4.11	3.00	1	TOP SLAB	8.64	
		TNT6A	41.60		2.42	100.88	1.40	3.48	1	TOP SLAB	4.11	2.42	1	TOP SLAB	8.64	
		TNT7A	42.00		2.72	114.09	1.40	4.04	1	TOP SLAB	4.11	2.72	1	TOP SLAB	8.64	
		TNT7B	42.00		2.49	104.65	1.40	3.48	1	TOP SLAB	4.11	2.49	1	TOP SLAB	8.64	
		TNAGRIT4	43.00		2.61	112.10	1.40	3.76	1	TOP SLAB	4.11	2.61	1	TOP SLAB	8.64	
TNAGT5A	45.00		2.51	113.14	1.40	3.84	1	TOP SLAB	4.11	2.51	1	BOTTOM SLAB	8.55			
TNAGT5B	45.00		2.38	106.99	1.40	3.92	1	TOP SLAB	4.11	2.38	1	BOTTOM SLAB	8.55			

LOAD FACTORS:

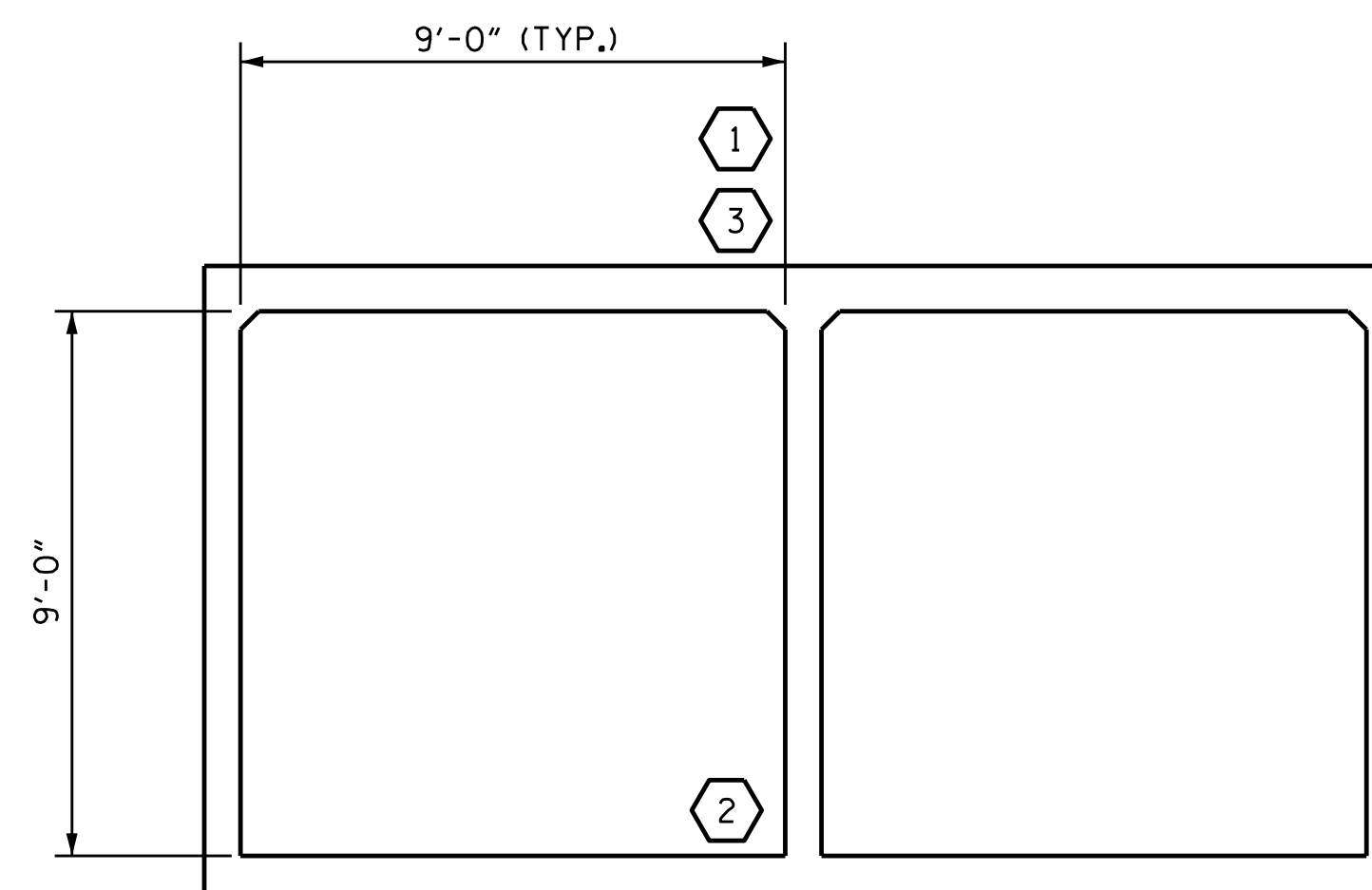
DESIGN LOAD RATING FACTORS

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.

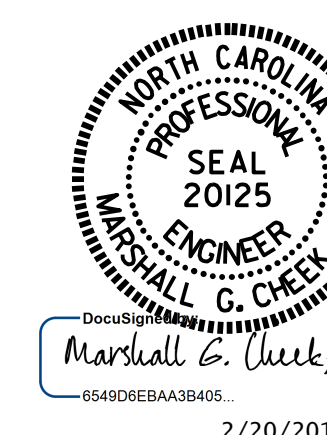
#	CONTROLLING LOAD RATING
①	DESIGN LOAD RATING (HL-93)
②	DESIGN LOAD RATING (HS-20)
③	LEGAL LOAD RATING **
** SEE CHART FOR VEHICLE TYPE	



LRFR SUMMARY

PROJECT NO. R-3100A
CATAWBA COUNTY
 STATION: 168+23.00 -L-

SHEET 2 OF 7

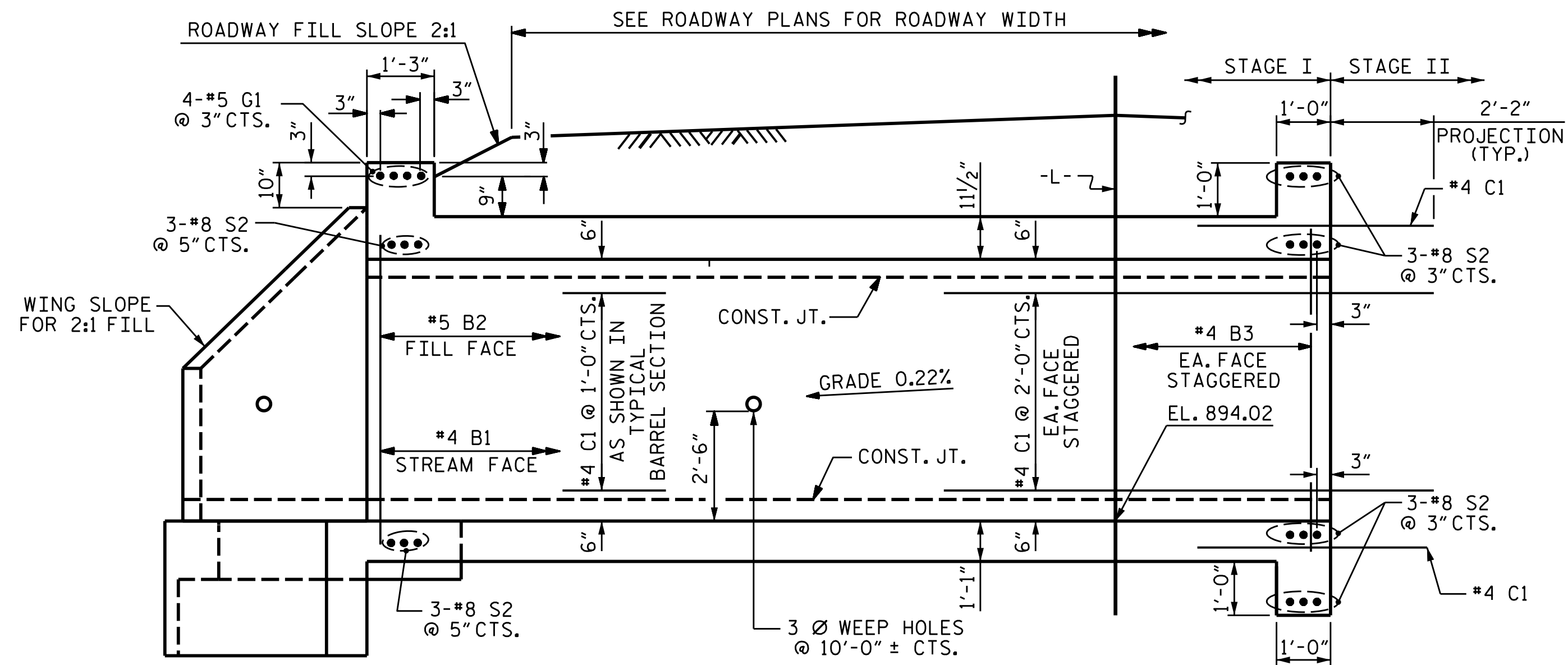


STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STANDARD
 LRFR SUMMARY FOR
 REINFORCED CONCRETE
 BOX CULVERT
 (NON-INTERSTATE TRAFFIC)

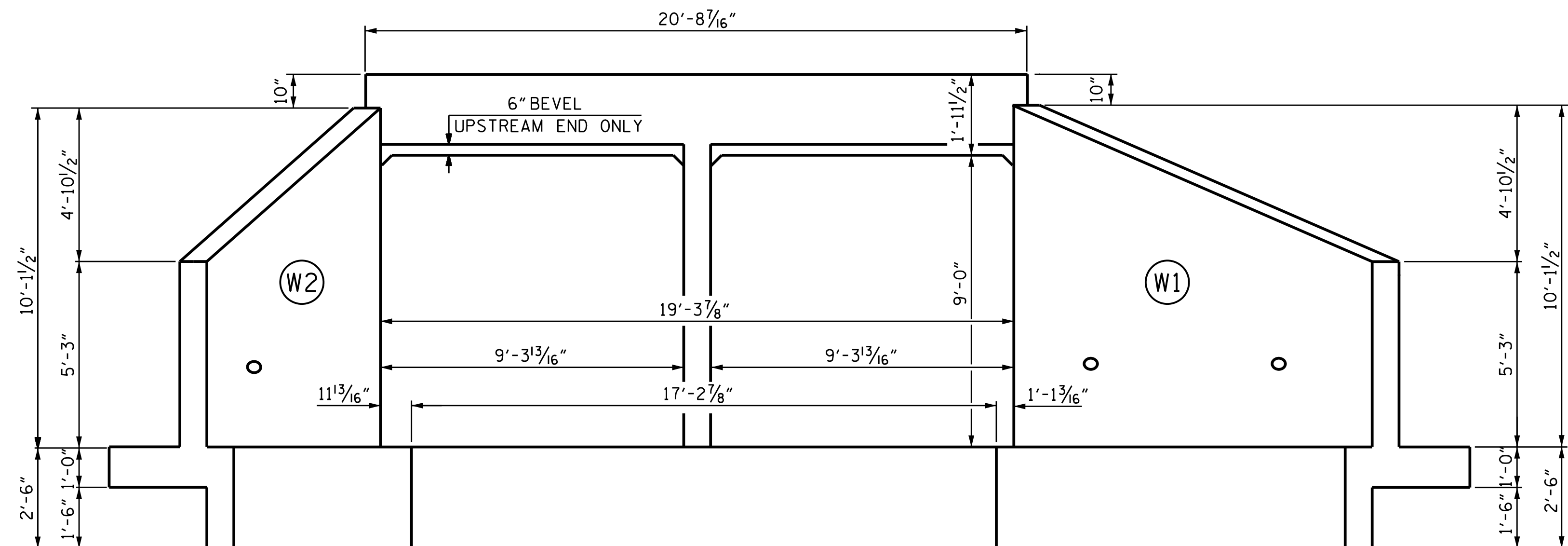
ASSEMBLED BY : T.L. AVERETTE DATE : 12/16
 CHECKED BY : H.T. BARBOUR DATE : 12/16
 DRAWN BY : WMC 7/11
 CHECKED BY : GM 7/11
 REV. 10/11/11 MAA/GM

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

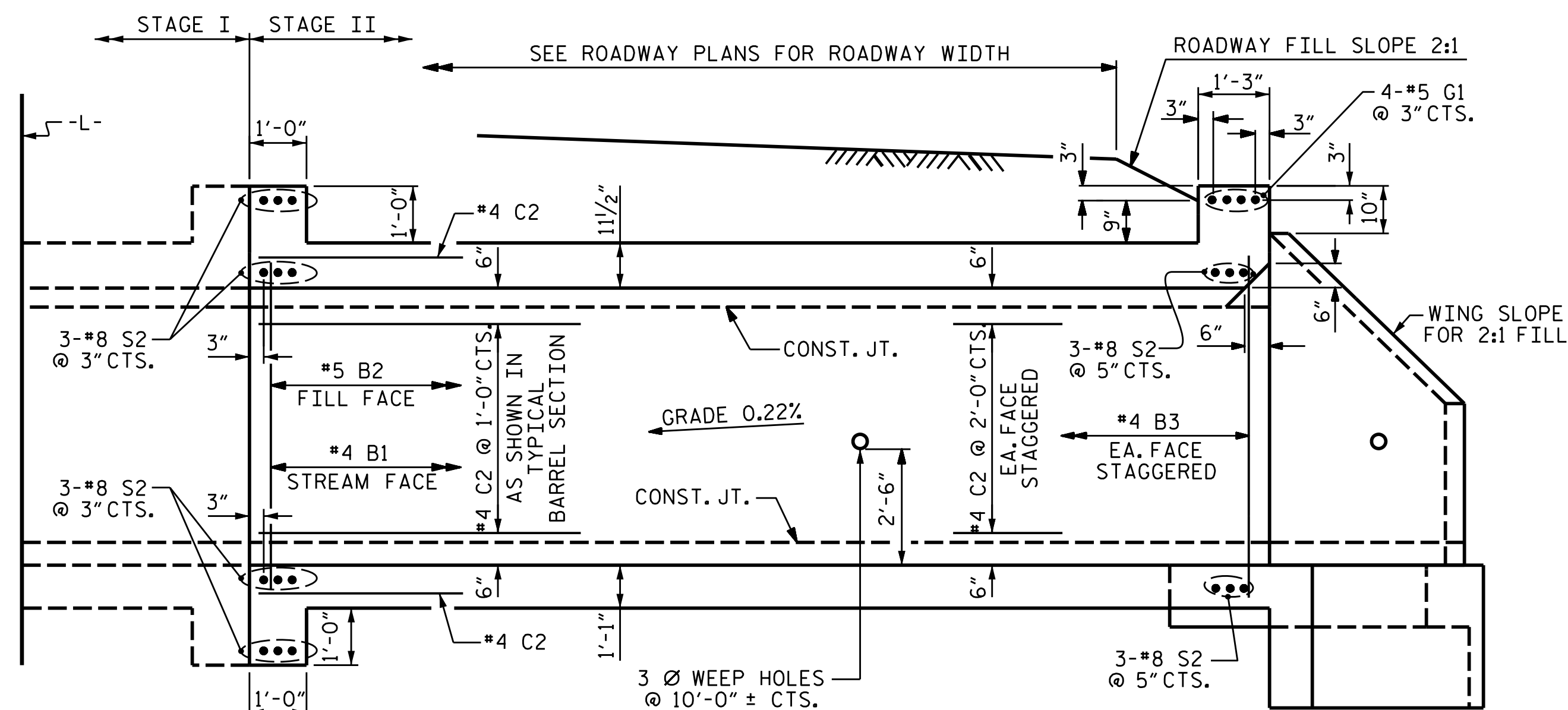
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-15
1			3			TOTAL SHEETS 47
2			4			



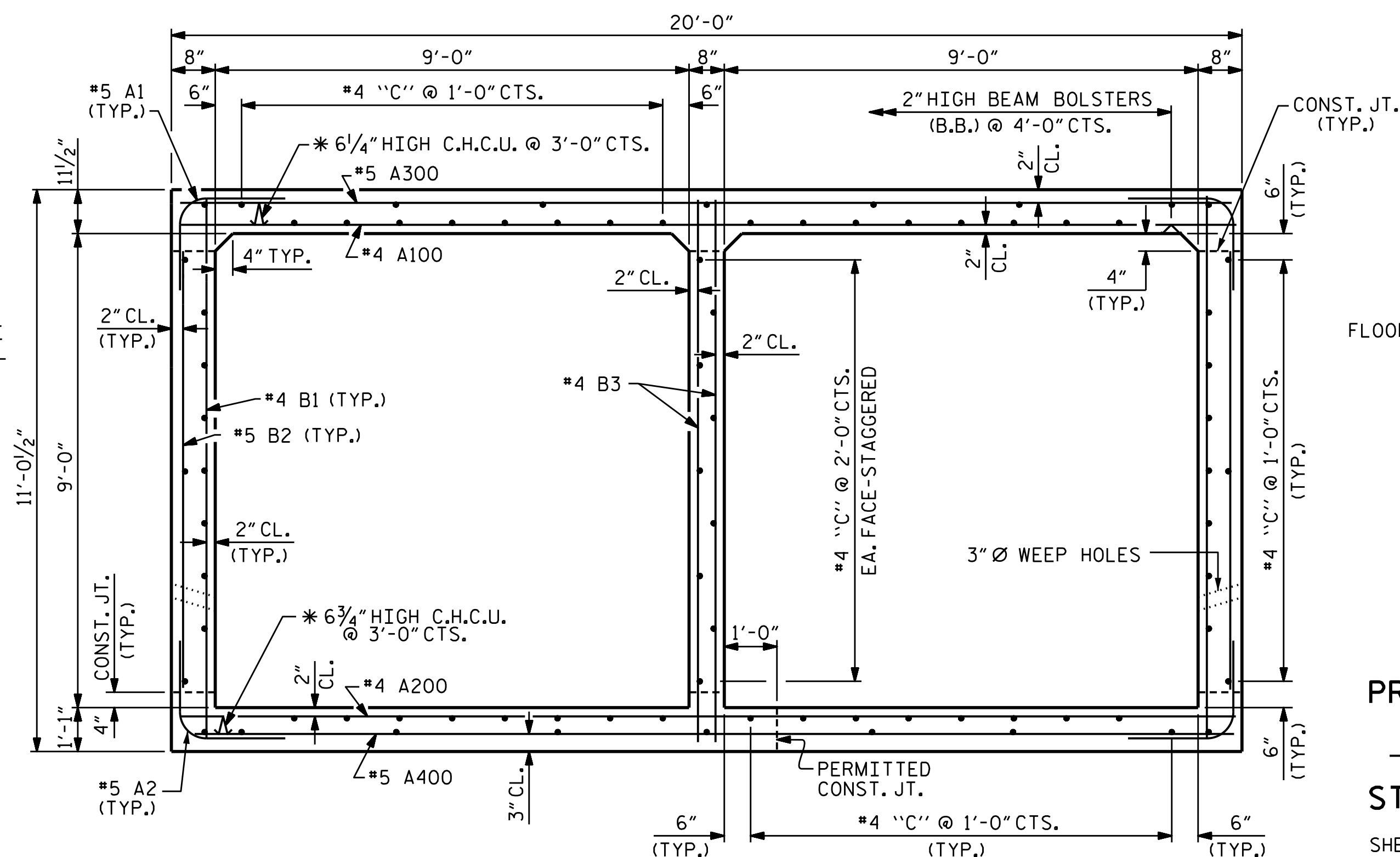
EXTERIOR WALL INTERIOR WALL
CULVERT SECTION NORMAL TO ROADWAY
STAGE I



END ELEVATION NORMAL TO SKEW

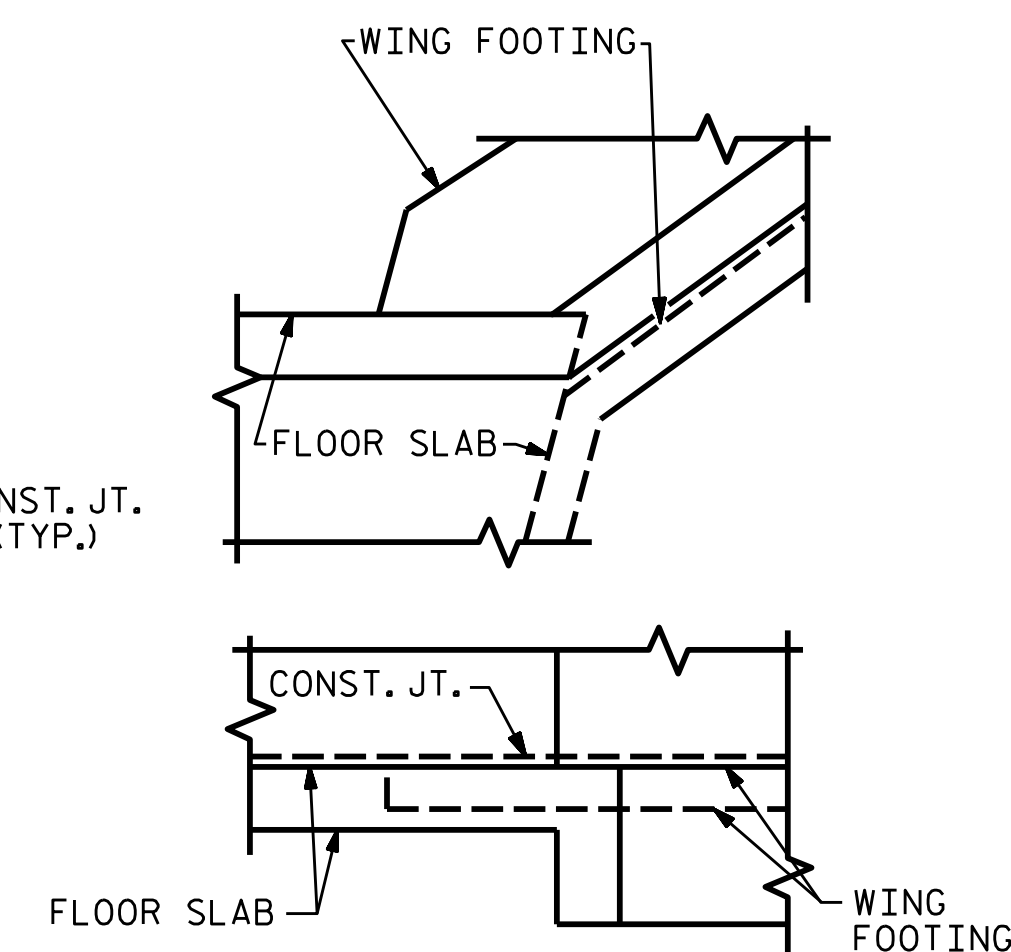


EXTERIOR WALL INTERIOR WALL
CULVERT SECTION NORMAL TO ROADWAY
STAGE II



RIGHT ANGLE SECTION OF BARREL

THERE ARE 79 "C" BARS IN SECTION OF BARREL.

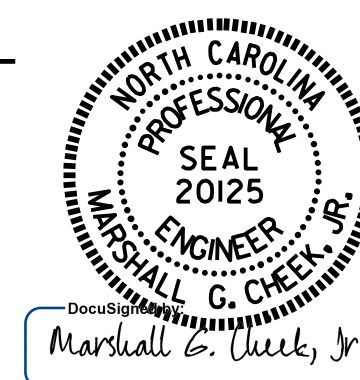


CONNECTION OF WING FOOTING AND FLOOR SLAB

PROJECT NO. R-3100A
CATAWBA COUNTY
STATION: 168+23.00 -L-
SHEET 3 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 9 FT. X 9 FT.
CONCRETE BOX CULVERT



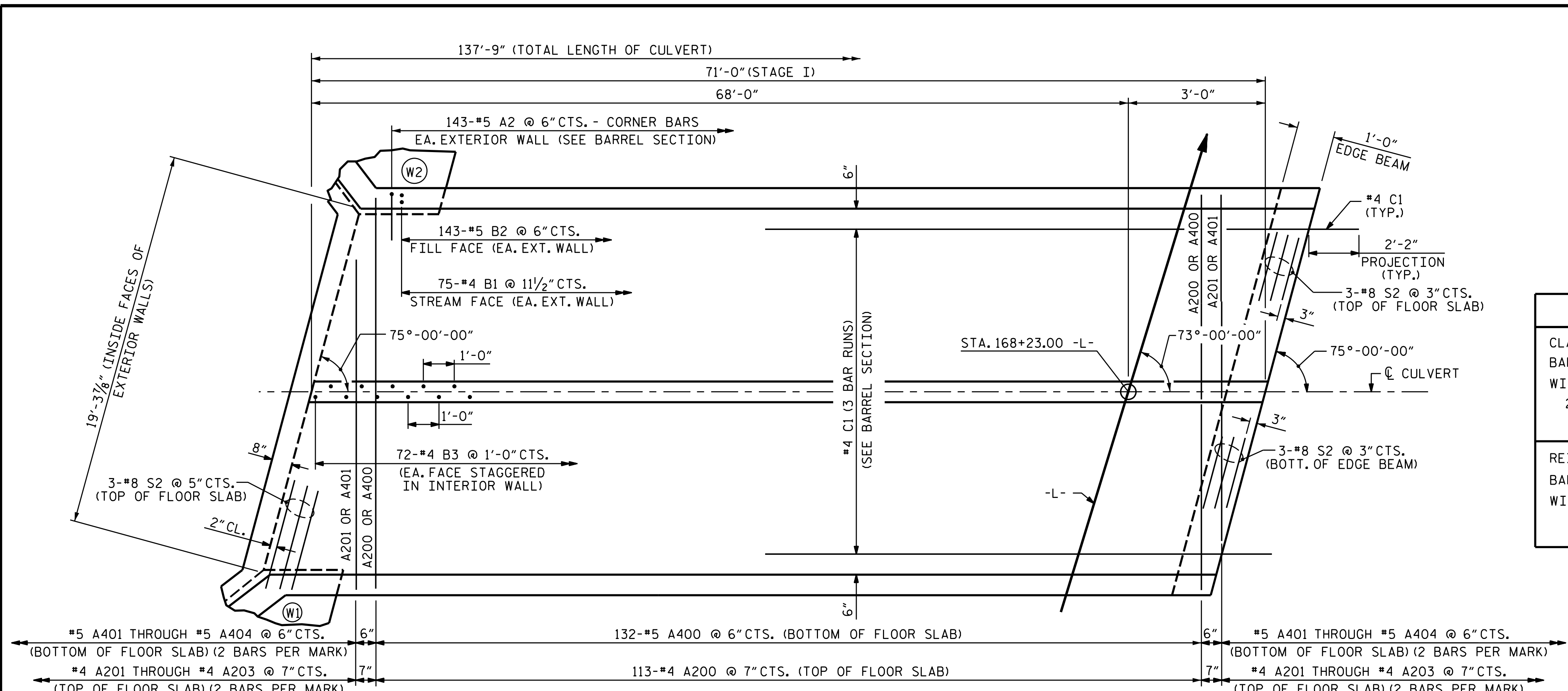
2/21/2017

ASSEMBLED BY: T.L. AVERETTE DATE: 12/2016
CHECKED BY: H.T. BARBOUR DATE: 12/2016
DESIGN ENGINEER OF RECORD: J. BOWLESV DATE: 4/17

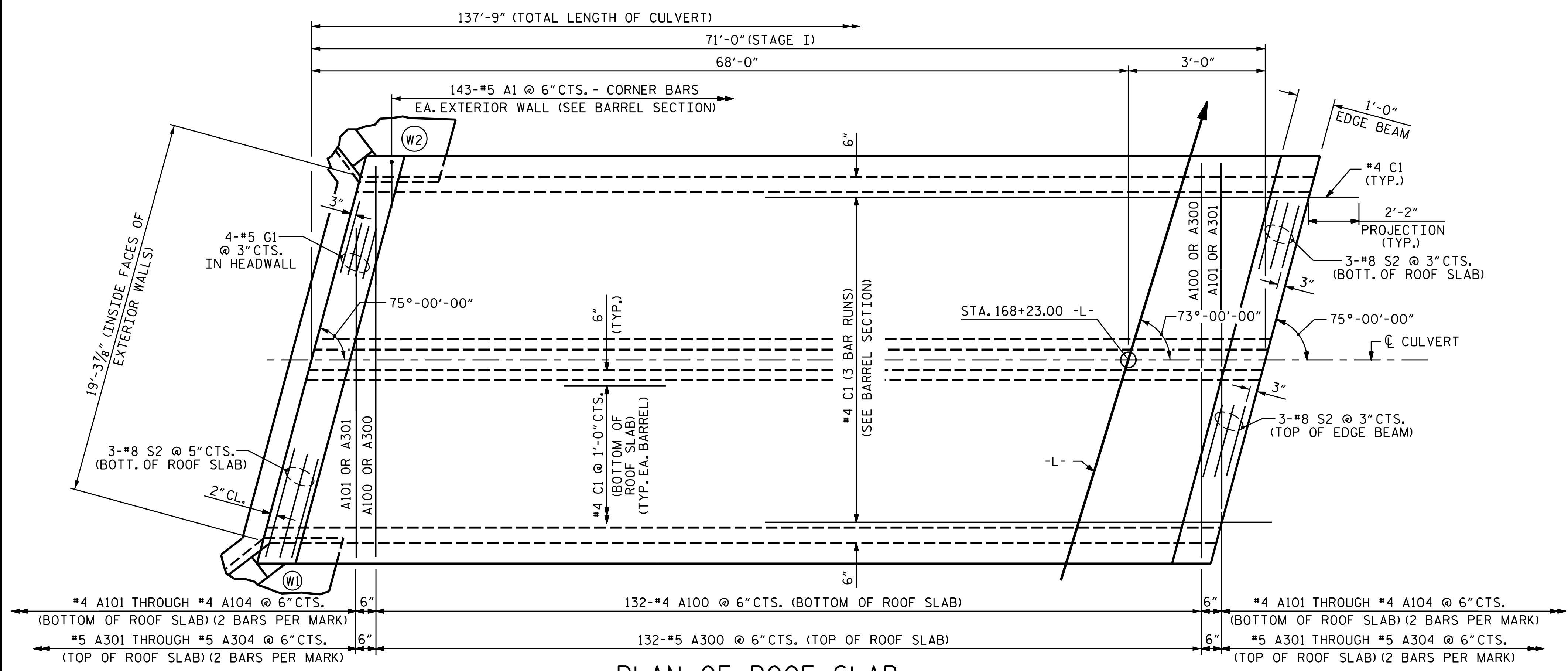
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

TOTAL SHEETS: 47



PLAN OF FLOOR SLAB
STAGE I

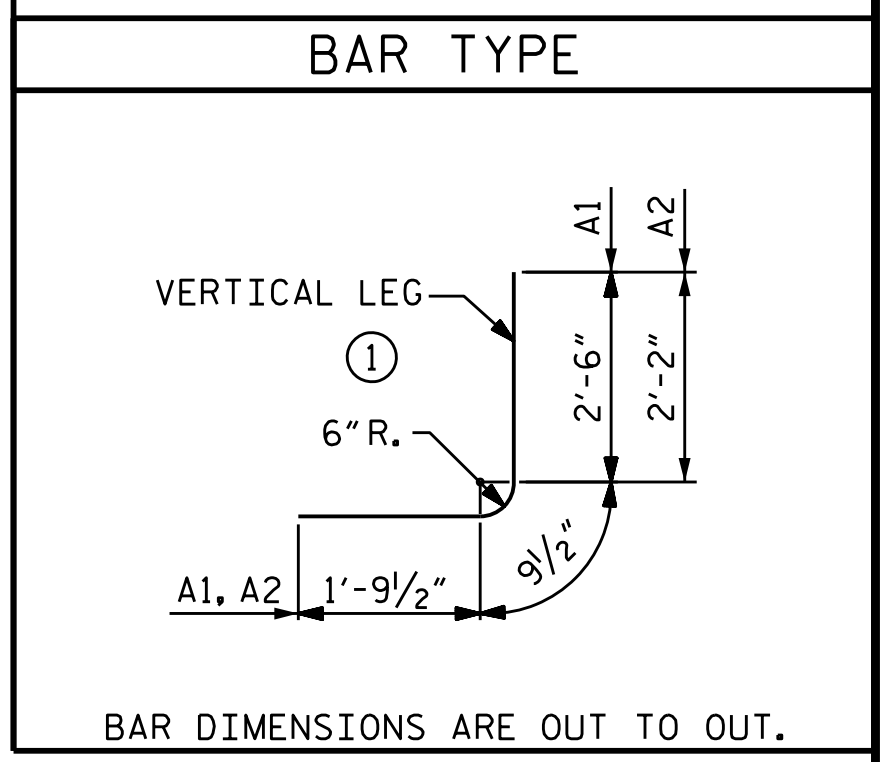


PLAN OF ROOF SLAB
STAGE I

STAGE I QUANTITIES			
CLASS A CONCRETE			
BARREL @	2.187	CY/FT	155.3 C.Y.
WINGS, ETC.			17.5 C.Y.
2 SILLS			1.0 C.Y.
TOTAL			173.8 C.Y.
REINFORCING STEEL			
BARREL			21,739 LBS.
WINGS, ETC.			978 LBS.
TOTAL			22,717 LBS.

BAR SCHEDULE					
STAGE I					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	286	#5	1	5'-1"	1516
A2	286	#5	1	4'-9"	1417
A100	132	#4	STR.	19'-7"	1727
A101	4	#4	STR.	15'-5"	41
A102	4	#4	STR.	11'-8"	31
A103	4	#4	STR.	7'-11"	21
A104	4	#4	STR.	4'-3"	11
A200	113	#4	STR.	19'-7"	1478
A201	4	#4	STR.	14'-10"	40
A202	4	#4	STR.	10'-5"	28
A203	4	#4	STR.	6'-1"	16
A300	132	#5	STR.	19'-7"	2696
A301	4	#5	STR.	15'-5"	64
A302	4	#5	STR.	11'-8"	49
A303	4	#5	STR.	7'-11"	33
A304	4	#5	STR.	4'-3"	18
A400	132	#5	STR.	19'-7"	2696
A401	4	#5	STR.	15'-5"	64
A402	4	#5	STR.	11'-8"	49
A403	4	#5	STR.	7'-11"	33
A404	4	#5	STR.	4'-3"	18
B1	150	#4	STR.	10'-6"	1052
B2	286	#5	STR.	8'-4"	2486
B3	144	#4	STR.	10'-6"	1010
C1	237	#4	STR.	25'-8"	4063
D1	3	#6	STR.	1'-8"	8
D2	3	#6	STR.	2'-8"	12
G1	4	#5	STR.	20'-4"	85
S2	18	#8	STR.	20'-4"	977
REINFORCING STEEL					LBS. 21,739

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



PROJECT NO. R-3100A
CATAWBA COUNTY
 STATION: 168+23.00 -L-
 SHEET 4 OF 7

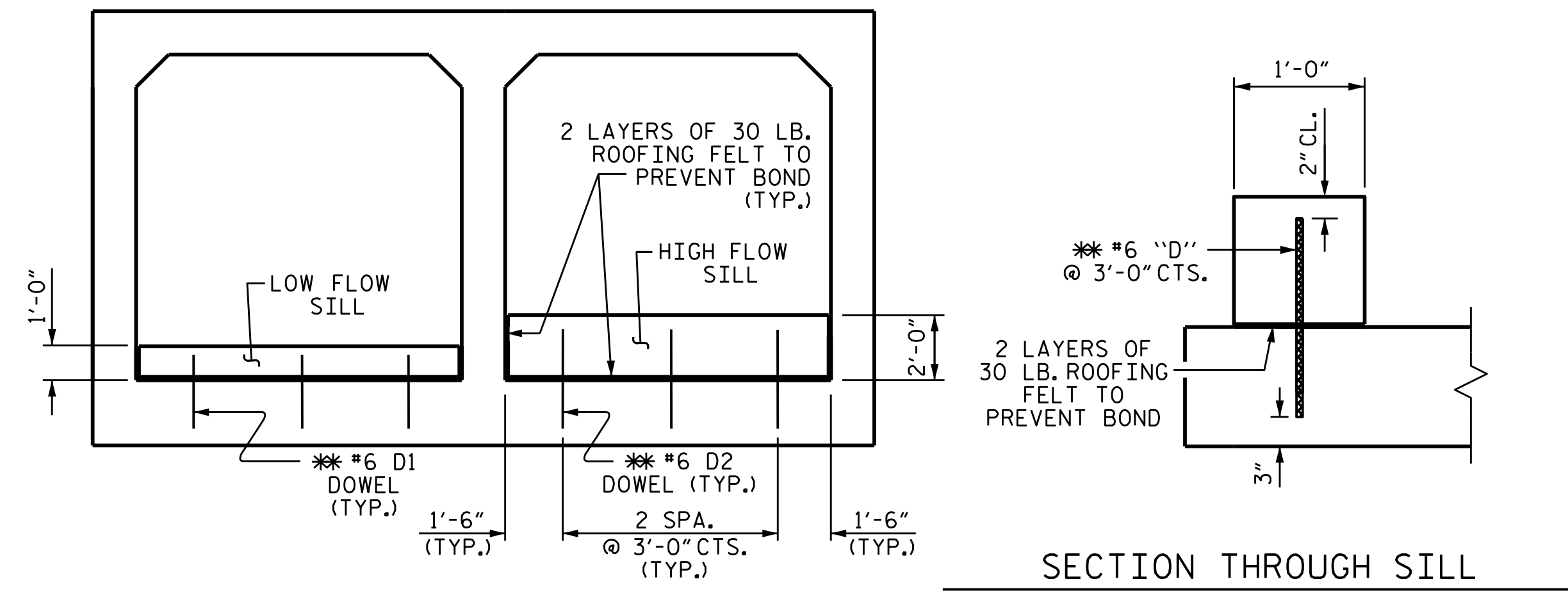


STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**DOUBLE 9 FT. X 9 FT.
 CONCRETE BOX CULVERT
 STAGE I**

ASSEMBLED BY: I.L. AVERETTE DATE: 12/2016
 CHECKED BY: H.T. BARBOUR DATE: 12/2016
 DESIGN ENGINEER OF RECORD: J. BOWLES DATE: 4/17

DOCUMENT NOT CONSIDERED
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 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-17
1			3			TOTAL SHEETS
2			4			47



ELEVATION NORMAL TO SKEW
(LOOKING UPSTREAM,
SILLS AT INLET AND OUTLET)

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

SILL DETAILS
SEE PLAN FOR PLACEMENT OF SILLS

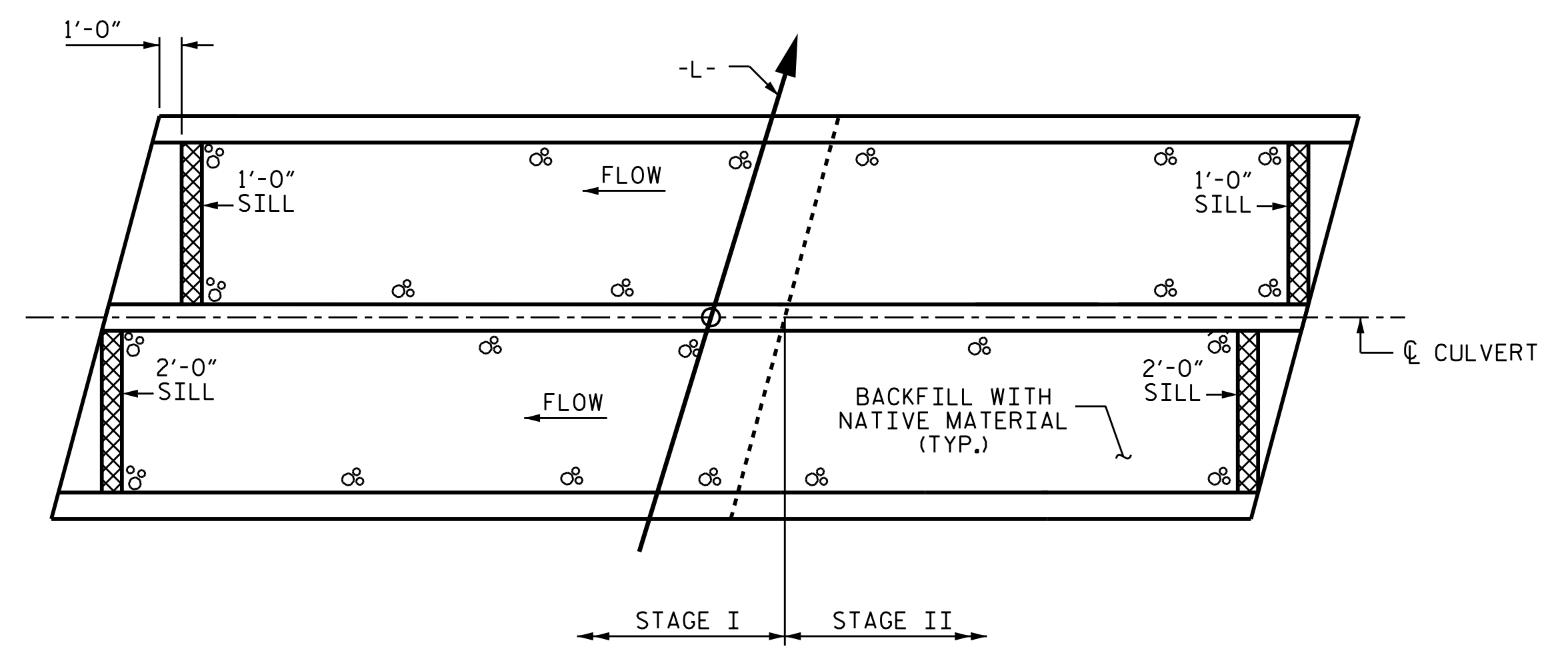
NOTES

MATERIAL EXCAVATED FROM THE EXISTING STREAMBED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AS SHOWN IN THE PLAN VIEW. ONLY STOCKPILED MATERIAL MAY BE USED IN THE LOW FLOW BARREL. BED MATERIAL IN THE HIGH FLOW BARREL MAY BE SUPPLEMENTED WITH WITH CLASS A RIP RAP. IF RIP RAP IS USED, NATIVE MATERIAL SHALL BE PLACED ON TOP TO FILL VOIDS AND PROVIDE A SMOOTH STREAMBED FOR ANIMAL PASSAGE. BED MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER.

THE ENTIRE COST OF WORK REQUIRED TO PLACE THE EXCAVATED MATERIAL OR SUPPLEMENTAL MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR CULVERT EXCAVATION.

THE ENTIRE COST OF WORK REQUIRED TO CONSTRUCT THE SILLS SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.

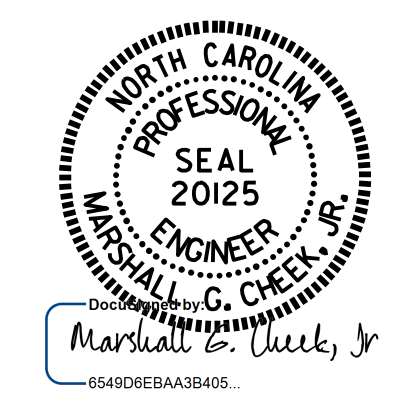
STREAMBED MATERIAL SHOULD BE PLACED LEVEL WITH THE TOP OF THE SILLS.



PLAN OF SILL LOCATIONS

PROJECT NO. R-3100A
CATAWBA COUNTY
STATION: 168+23.00 -L-

SHEET 6 OF 7



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

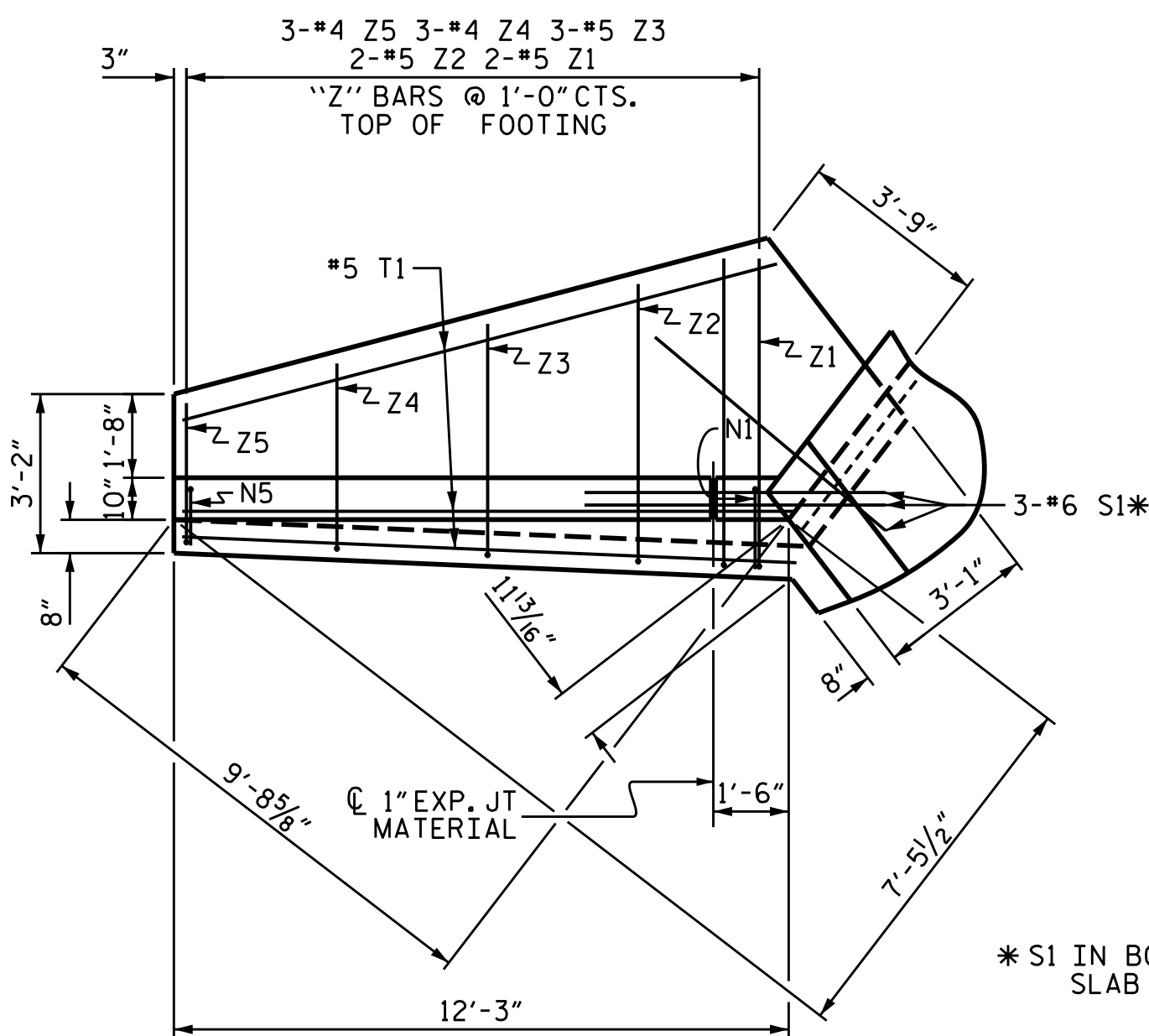
DRAWN BY : T.L. AVERETTE DATE : 12/2016
CHECKED BY : H.T. BARBOUR DATE : 12/16
DESIGN ENGINEER OF RECORD: J. BOWLES DATE : 4/17

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

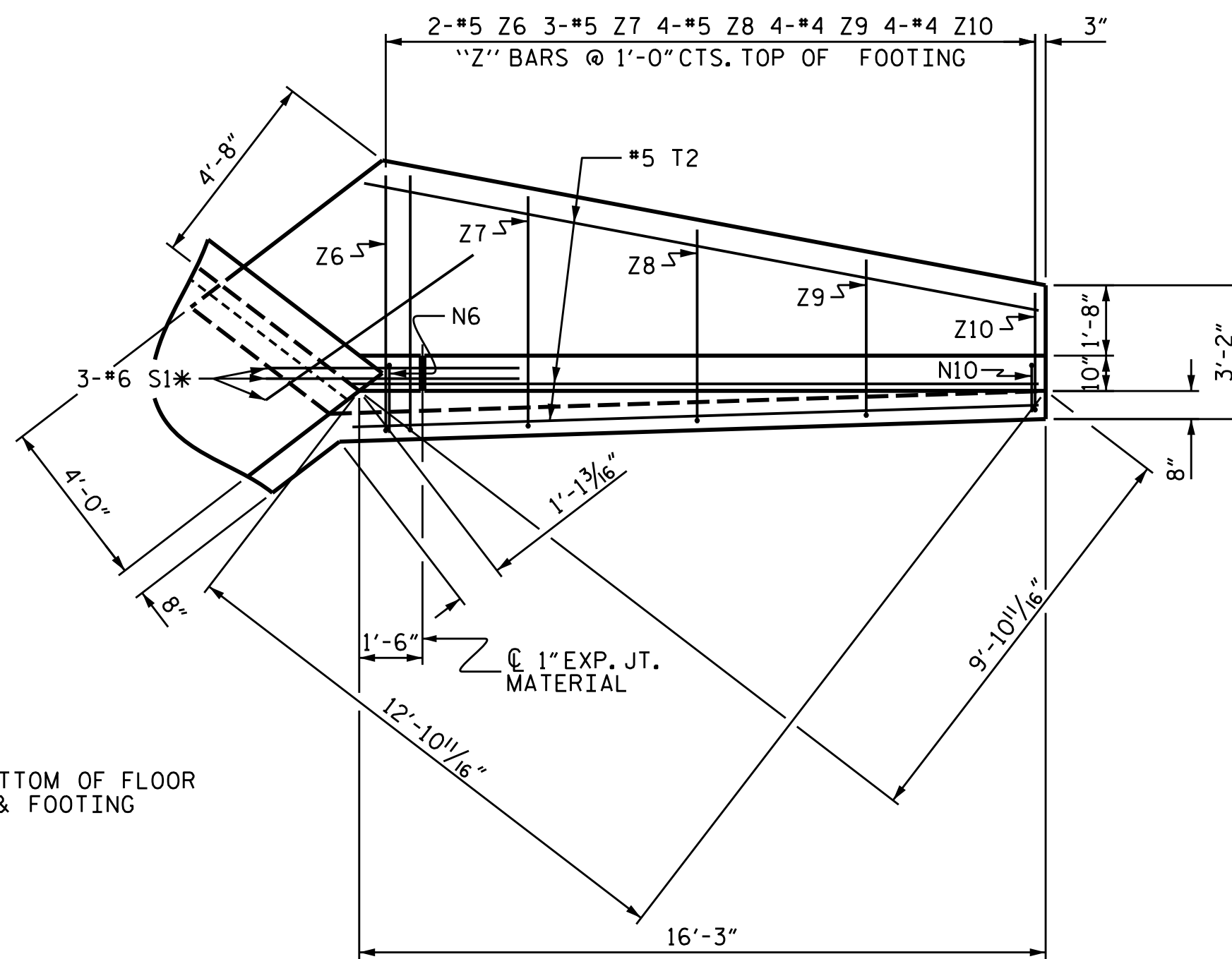
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	TOTAL SHEETS
1			3			C-19
2			4			47

NOTE

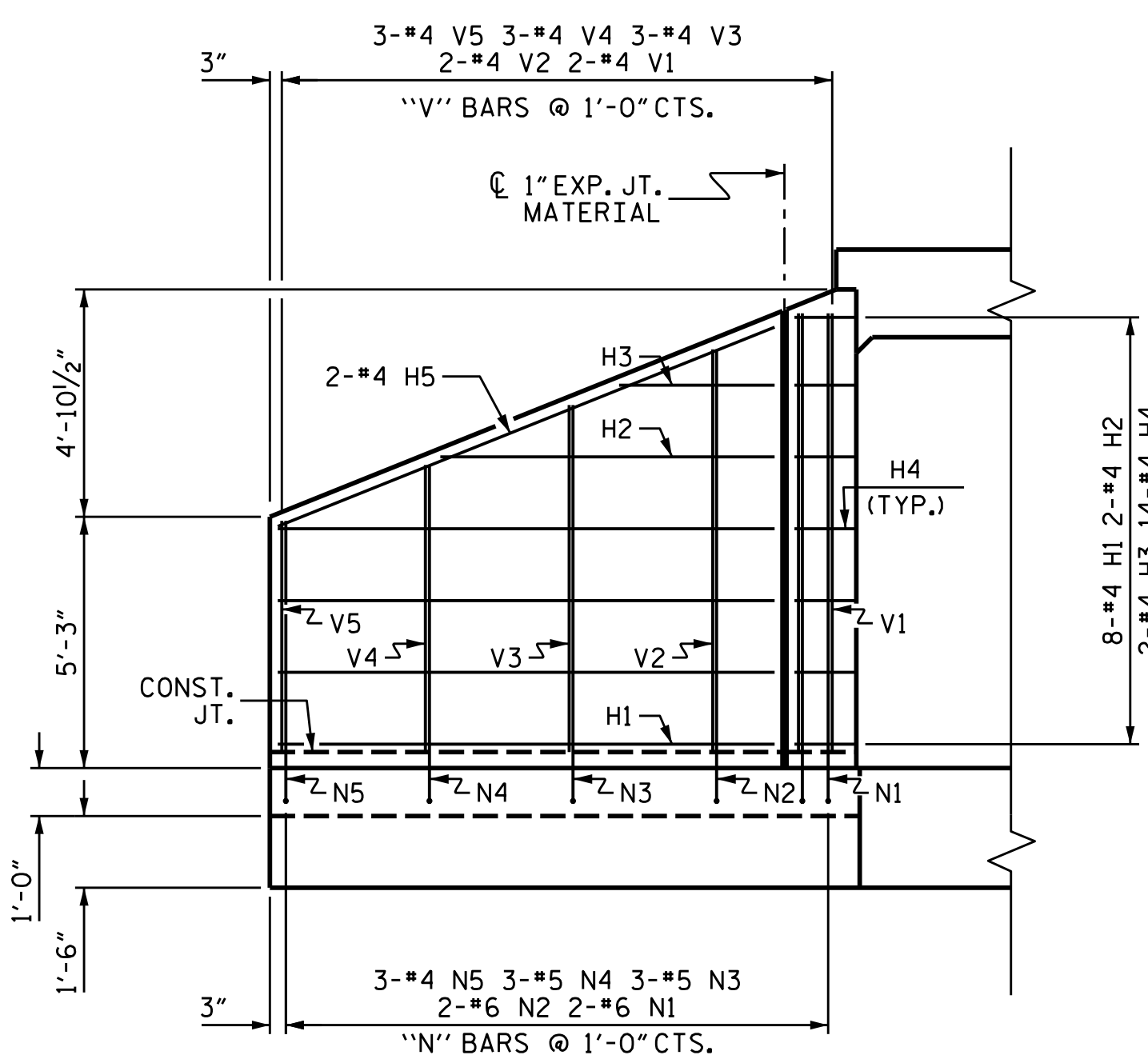
A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.



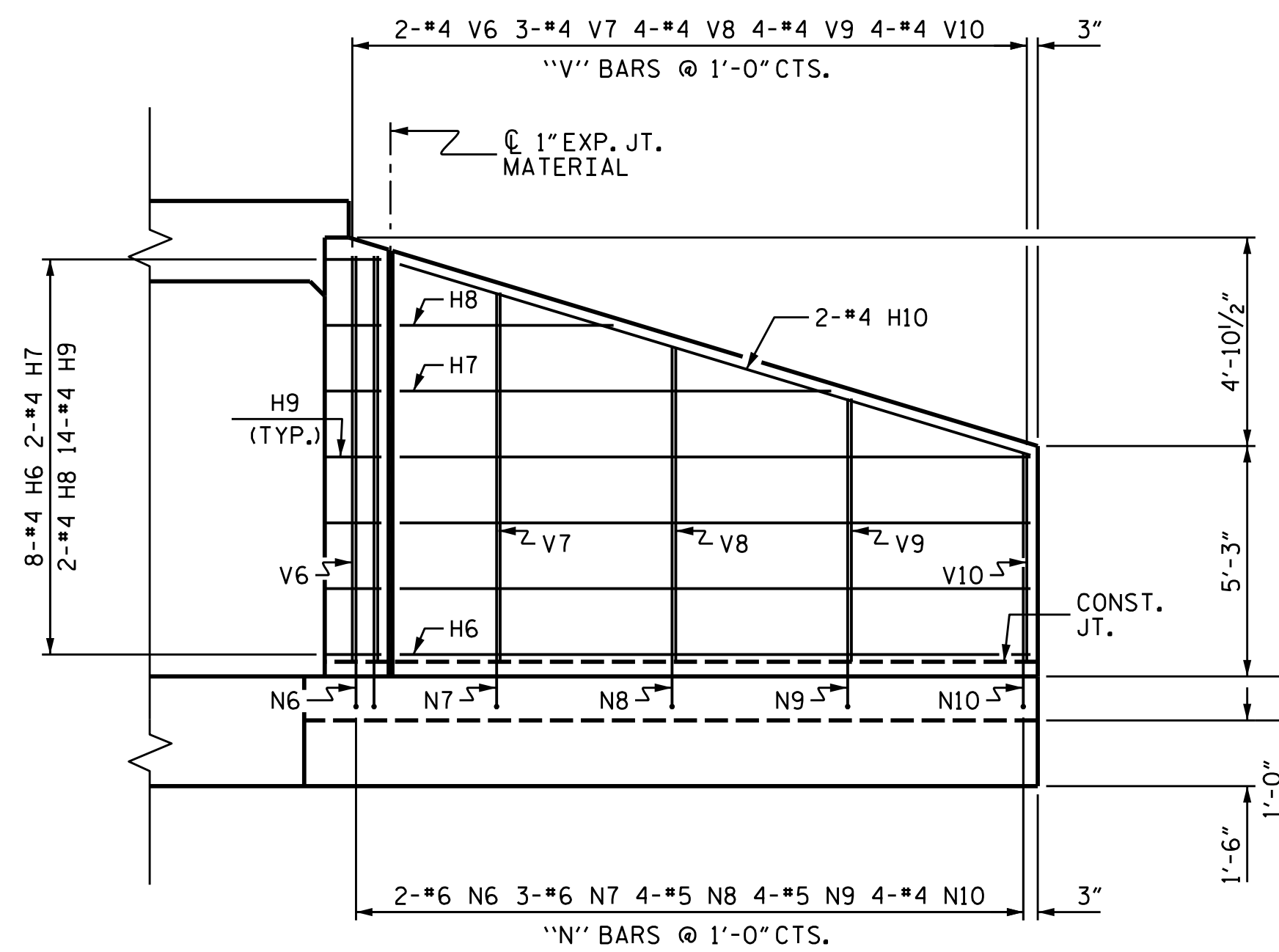
PLAN W2



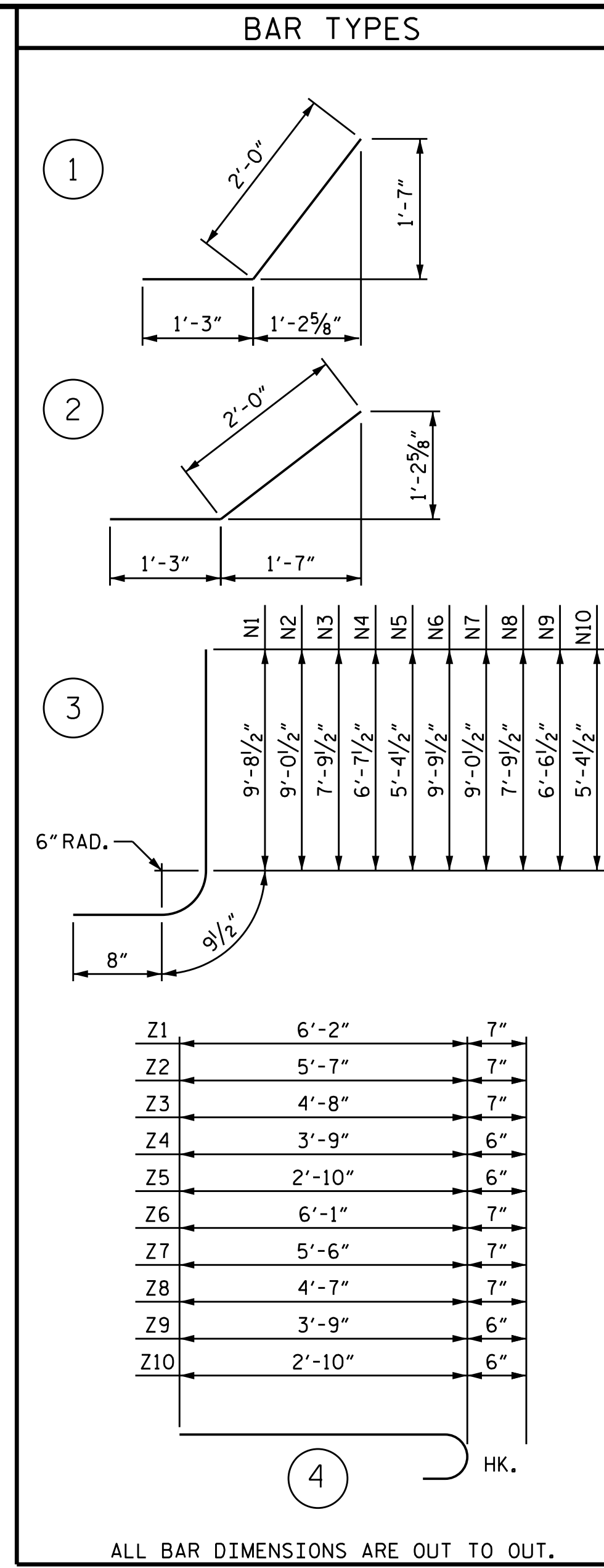
PLAN W1



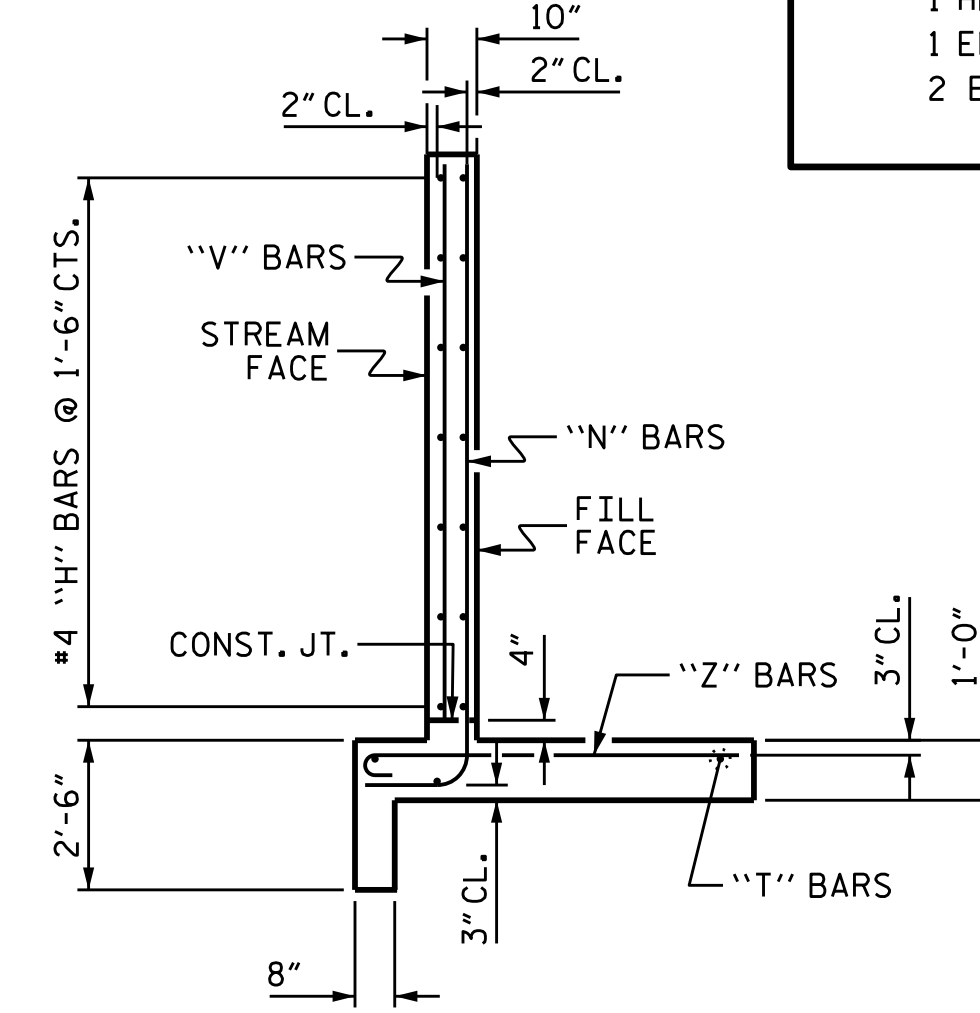
ELEVATION W2



ELEVATION W1



ALL BAR DIMENSIONS ARE OUT TO OUT.

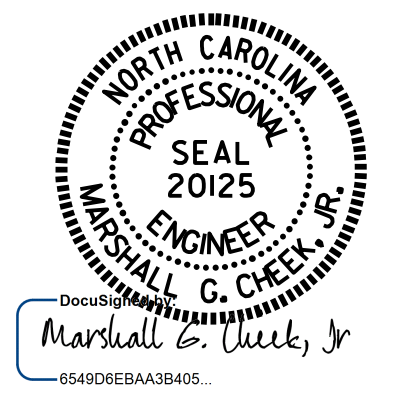


TYPICAL WING SECTION

BILL OF MATERIAL											
STAGE I					STAGE II						
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	SIZE	TYPE	LENGTH	WEIGHT		
H1	8	#4	STR	10'-4"	55	H1	8	#4	STR	10'-4"	55
H2	2	#4	STR	6'-11"	9	H2	2	#4	STR	6'-11"	9
H3	2	#4	STR	3'-3"	4	H3	2	#4	STR	3'-3"	4
H4	14	#4	1	3'-3"	30	H4	14	#4	1	3'-3"	30
H5	2	#4	STR	11'-2"	15	H5	2	#4	STR	11'-2"	15
H6	8	#4	STR	14'-4"	77	H6	8	#4	STR	14'-4"	77
H7	2	#4	STR	9'-10"	13	H7	2	#4	STR	9'-10"	13
H8	2	#4	STR	4'-10"	6	H8	2	#4	STR	4'-10"	6
H9	14	#4	2	3'-3"	30	H9	14	#4	2	3'-3"	30
H10	2	#4	STR	15'-0"	20	H10	2	#4	STR	15'-0"	20
N1	2	#6	3	11'-2"	34	N1	2	#6	3	11'-2"	34
N2	2	#6	3	10'-6"	32	N2	2	#6	3	10'-6"	32
N3	3	#5	3	9'-3"	29	N3	3	#5	3	9'-3"	29
N4	3	#5	3	8'-1"	25	N4	3	#5	3	8'-1"	25
N5	3	#4	3	6'-10"	14	N5	3	#4	3	6'-10"	14
N6	2	#6	3	11'-3"	34	N6	2	#6	3	11'-3"	34
N7	3	#6	3	10'-6"	47	N7	3	#6	3	10'-6"	47
N8	4	#5	3	9'-3"	39	N8	4	#5	3	9'-3"	39
N9	4	#5	3	8'-0"	33	N9	4	#5	3	8'-0"	33
N10	4	#4	3	6'-10"	18	N10	4	#4	3	6'-10"	18
S1	6	#6	STR	6'-0"	54	S1	6	#6	STR	6'-0"	54
T1	3	#5	STR	12'-3"	38	T1	3	#5	STR	12'-3"	38
T2	3	#5	STR	16'-3"	51	T2	3	#5	STR	16'-3"	51
V1	2	#4	STR	9'-2"	12	V1	2	#4	STR	9'-2"	12
V2	2	#4	STR	8'-5"	11	V2	2	#4	STR	8'-5"	11
V3	3	#4	STR	7'-3"	15	V3	3	#4	STR	7'-3"	15
V4	3	#4	STR	6'-0"	12	V4	3	#4	STR	6'-0"	12
V5	3	#4	STR	4'-10"	10	V5	3	#4	STR	4'-10"	10
V6	2	#4	STR	9'-3"	12	V6	2	#4	STR	9'-3"	12
V7	3	#4	STR	8'-5"	17	V7	3	#4	STR	8'-5"	17
V8	4	#4	STR	7'-2"	19	V8	4	#4	STR	7'-2"	19
V9	4	#4	STR	6'-0"	16	V9	4	#4	STR	6'-0"	16
V10	4	#4	STR	4'-9"	13	V10	4	#4	STR	4'-9"	13
Z1	2	#5	4	6'-9"	14	Z1	2	#5	4	6'-9"	14
Z2	2	#5	4	6'-2"	13	Z2	2	#5	4	6'-2"	13
Z3	3	#5	4	5'-3"	16	Z3	3	#5	4	5'-3"	16
Z4	3	#4	4	4'-3"	9	Z4	3	#4	4	4'-3"	9
Z5	3	#4	4	3'-4"	7	Z5	3	#4	4	3'-4"	7
Z6	2	#5	4	6'-8"	14	Z6	2	#5	4	6'-8"	14
Z7	3	#5	4	6'-1"	19	Z7	3	#5	4	6'-1"	19
Z8	4	#5	4	5'-2"	22	Z8	4	#5	4	5'-2"	22
Z9	4	#4	4	4'-3"	11	Z9	4	#4	4	4'-3"	11
Z10	4	#4	4	3'-4"	9	Z10	4	#4	4	3'-4"	9
REINFORCING STEEL FOR 2 WINGS					978 LBS.	REINFORCING STEEL FOR 2 WINGS					978 LBS.
CLASS A CONCRETE						CLASS A CONCRETE					
2 WINGS					13.9 C.Y.	2 WINGS					13.9 C.Y.
1 HEADWALL					1.0 C.Y.	1 HEADWALL					1.0 C.Y.
1 END CURTAIN WALL					1.1 C.Y.	1 END CURTAIN WALL					1.1 C.Y.
2 EDGE BEAMS					1.5 C.Y.	2 EDGE BEAMS					1.5 C.Y.
TOTAL					17.5 C.Y.	TOTAL					17.5 C.Y.

PROJECT NO. R-3100A
CATAWBA COUNTY
 STATION: 168+23.00 -L-

SHEET 7 OF 7



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
STANDARD WINGS FOR CONCRETE BOX CULVERT
 H = 9'-0" SLOPE = 2:1
 75° SKEW

ASSEMBLED BY : N.D'AIUTO DATE : 2/8/16
 CHECKED BY : J.K.BOWLES DATE : 3/10/16
 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:
1			3		
2			4		

TOTAL SHEETS 47

BENCHMARK #20 : 8" SPIKE IN ROOT OF 12" POPLAR TREE
 STA. 232+76.00 -L-, 140.7' RT, EL.=970.95

ROADWAY DATA

GRADE POINT ELEV. @ STA. 230+73.00 -L-	= 989.93
BED ELEV. @ STA. 230+73.00 -L-	= 957.37
ROADWAY SLOPES	= 2:1

HYDRAULIC DATA

DESIGN DISCHARGE	= 340 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEV.	= 969.9
DRAINAGE AREA	= 0.33 SQ. MI.
BASE DISCHARGE (0100)	= 400 C.F.S.
BASE HIGH WATER ELEV.	= 970.73

OVERTOPPING FLOOD DATA

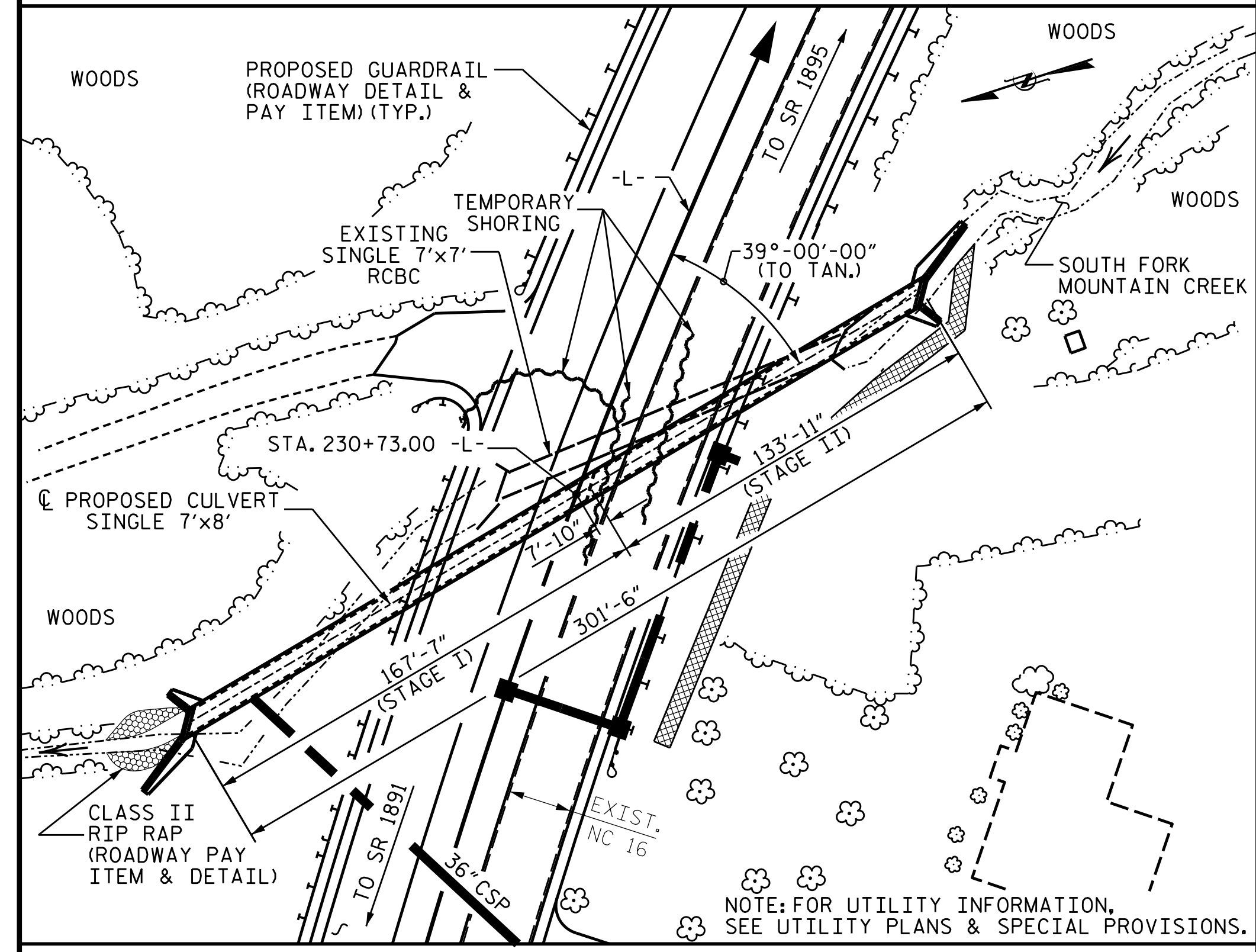
OVERTOPPING DISCHARGE	= 1200 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YR.
OVERTOPPING FLOOD ELEV.	= 985.46

TOTAL STRUCTURE QUANTITIES

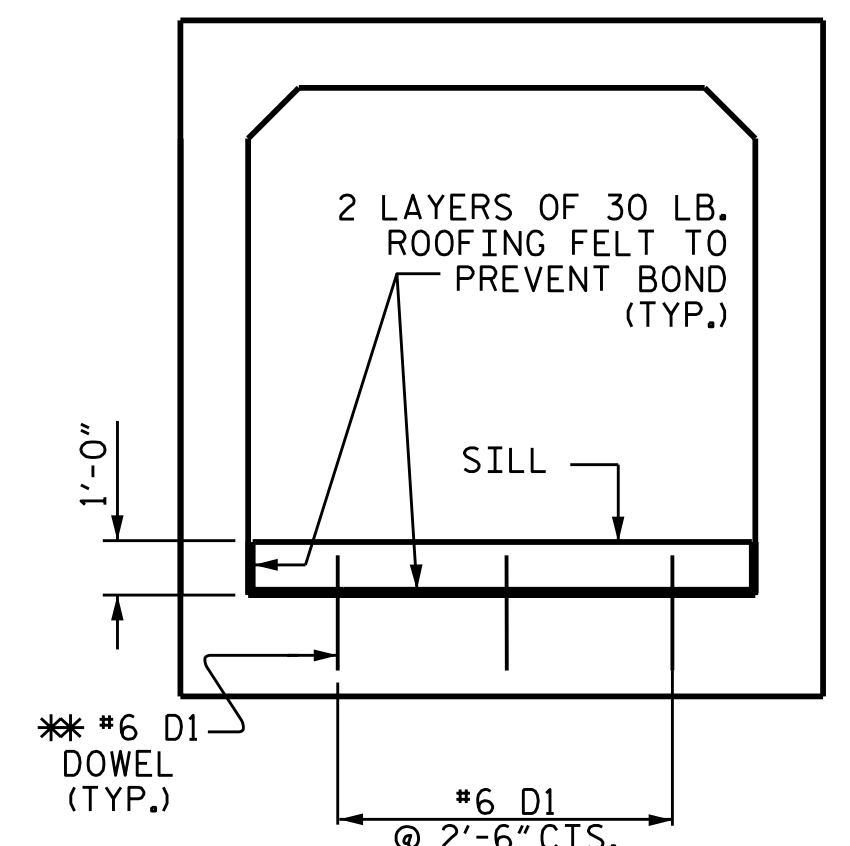
REMOVAL OF EXISTING STRUCTURE	LUMP SUM
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	
STAGE I	147 TONS
STAGE II	117 TONS
TOTAL	264 TONS
CLASS A CONCRETE	
STAGE I	195.8 C.Y.
STAGE II	159.9 C.Y.
TOTAL	355.7 C.Y.
REINFORCING STEEL	
STAGE I	22,837 LBS.
STAGE II	18,340 LBS.
TOTAL	41,177 LBS.

NOTES

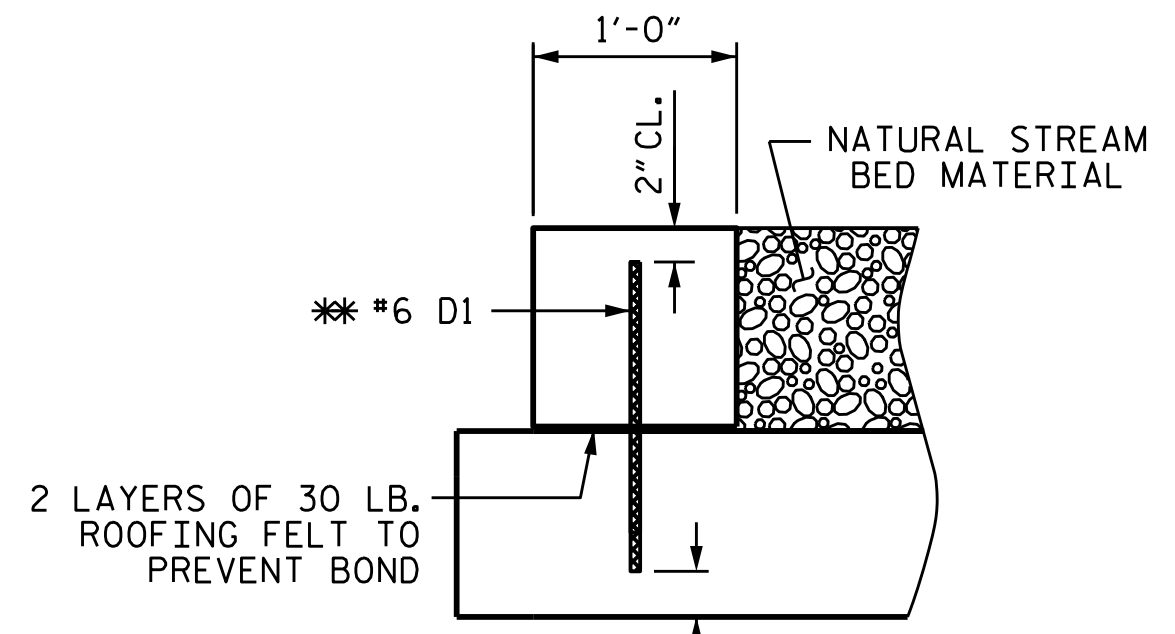
ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
 DESIGN FILL = 27.80 FEET (MAX.) AND 21.53 (MIN.).
 FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.
 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
 CONCRETE IN STAGE I & STAGE II CULVERTS SHALL BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
 THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
 DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
 TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
 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.
 THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE BARS FROM WHICH THE SAMPLES ARE TAKEN MUST THEN BE SPLICED WITH REPLACEMENT BARS OF THE SIZE AND LENGTH OF THE SAMPLE, PLUS A MINIMUM LAP SPLICE OF THIRTY BAR DIAMETERS. PAYMENT FOR THE SAMPLES OF REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
 FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
 NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
 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.
 FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING, SEE ROADWAY PLANS.
 FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.



LOCATION SKETCH

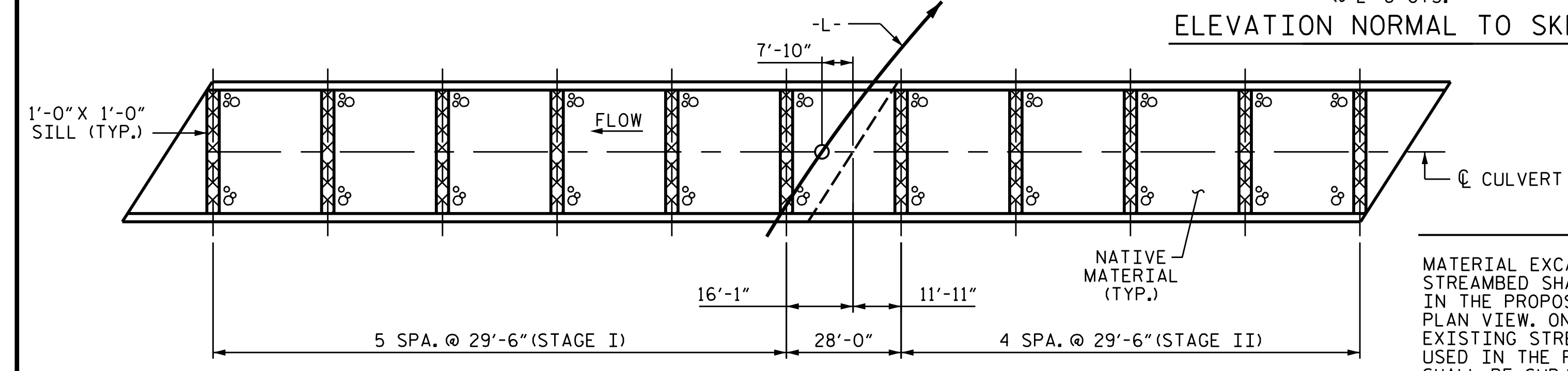


ELEVATION NORMAL TO SKEW



SECTION THROUGH SILL

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



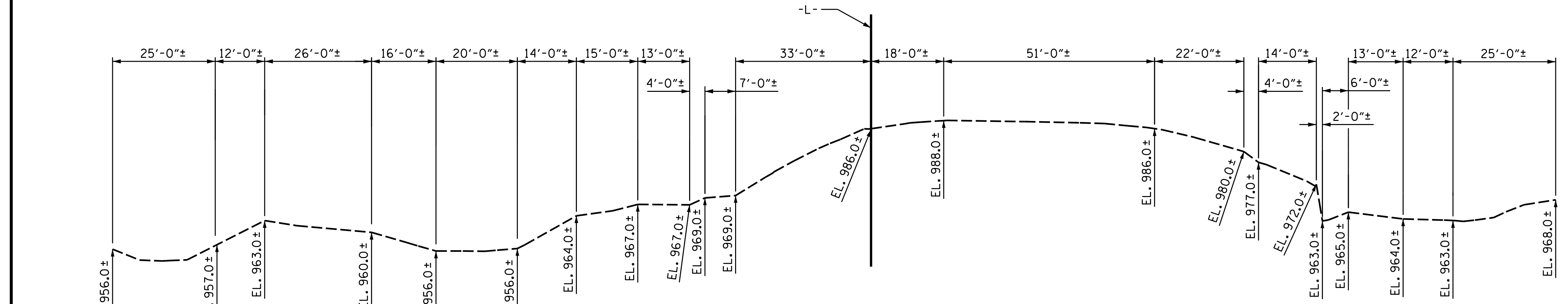
PLAN

MATERIAL EXCAVATED FROM THE EXISTING STREAMBED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AS SHOWN IN THE PLAN VIEW. ONLY NATIVE MATERIAL FROM THE EXISTING STREAMBED OR FLOODPLAIN MAY BE USED IN THE PROPOSED CULVERT. BED MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER.

NOTES

THE ENTIRE COST OF WORK REQUIRED TO PLACE EXCAVATED MATERIAL OR SUPPLEMENTAL MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR CULVERT EXCAVATION.
 THE ENTIRE COST OF WORK REQUIRED TO CONSTRUCT THE SILLS SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.
 THE STOCKPILED MATERIAL SHALL BE PLACED EVEN WITH THE TOP OF THE SILLS.

SILL DETAILS



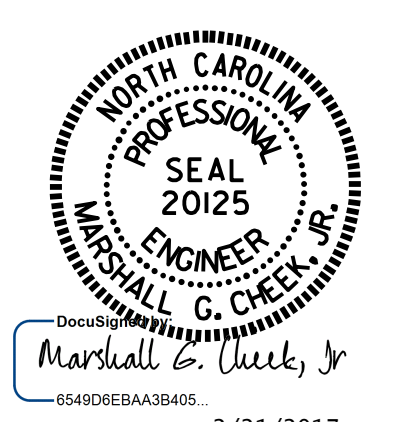
PROFILE ALONG CULVERT

ASSEMBLED BY :	N.D. AIUTO	DATE :	2/8/16
CHECKED BY :	J.K. BOWLES	DATE :	3/15/16
DESIGN ENGINEER OF RECORD :	J. BOWLES	DATE :	4/17

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. R-3100A
CATAWBA COUNTY
 STATION: 230+73.00 -L-

SHEET 1 OF 6



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

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-21
1			3			TOTAL SHEETS
2			4			47

**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	
						MOMENT				SHEAR					
						LIVE-LOAD FACTORS (%LL)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	1	1.81	--	1.75	2.15	1	EXTERIOR WALL	4.51	1.81	1	EXTERIOR WALL	7.97	
	HL-93 (OPERATING)	N/A		2.34	--	1.35	2.79	1	EXTERIOR WALL	4.51	2.34	1	EXTERIOR WALL	7.97	
	HS-20 (INVENTORY)	36.000	2	1.81	65.02	1.75	2.15	1	EXTERIOR WALL	4.51	1.81	1	EXTERIOR WALL	7.97	
	HS-20 (OPERATING)	36.000		2.34	84.29	1.35	2.69	1	EXTERIOR WALL	4.51	2.34	1	EXTERIOR WALL	7.97	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	3	2.26	30.48	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97	
		SNGARBS2		2.26	45.15	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97	
		SNAGRIS2		2.26	49.67	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97	
		SNCOTTS3		2.26	61.52	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97	
		SNAGGRS4		2.26	78.85	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97	
		SNS5A		2.26	80.26	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97	
		SNS6A		2.26	90.20	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97	
		SNS7B		2.26	94.82	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3		2.26	74.50	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97	
		TNT4A		2.26	74.67	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97	
		TNT6A		2.26	93.92	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97	
		TNT7A		2.26	94.82	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97	
		TNT7B		2.26	94.82	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97	
		TNAGRIT4		2.26	97.08	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97	
TNAGT5A		2.26	101.60	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97			
TNAGT5B		2.26	101.60	1.40	2.69	1	EXTERIOR WALL	4.51	2.26	1	EXTERIOR WALL	7.97			

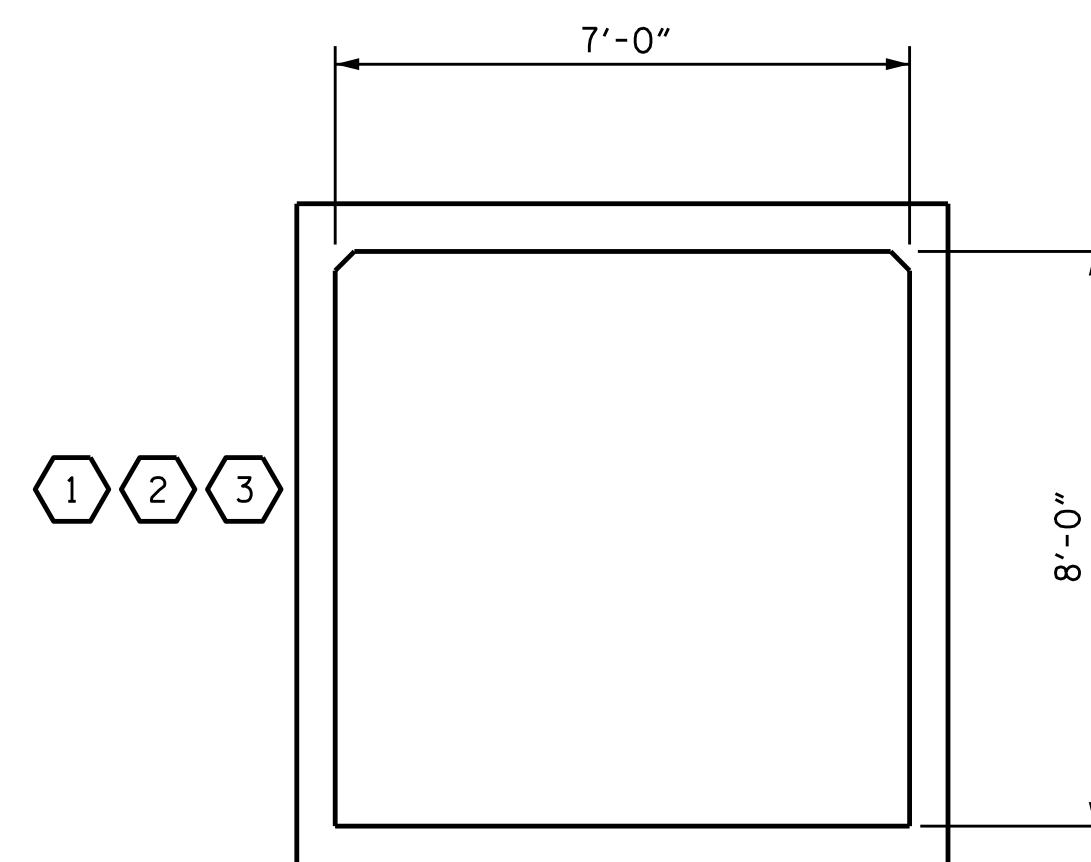
LOAD FACTORS:

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

PROJECT NO. R-3100A
CATAWBA COUNTY
 STATION: 230+73.00 -L-

SHEET 2 OF 6

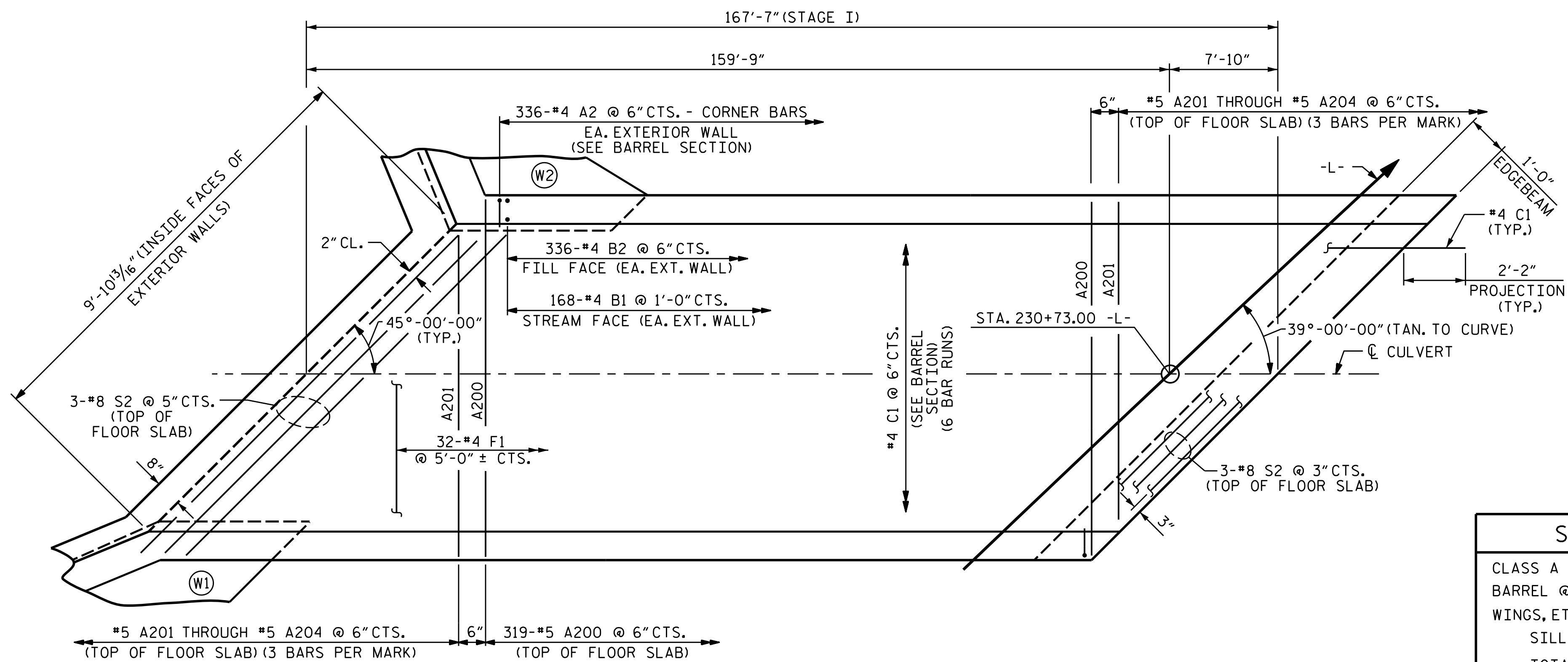


STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STANDARD
 LRFR SUMMARY FOR
 REINFORCED CONCRETE
 BOX CULVERT
 (NON-INTERSTATE TRAFFIC)

ASSEMBLED BY : JLKREHNBRINK	DATE : 6/19/15
CHECKED BY : J.K.BOWLES	DATE : 3/14/16
DRAWN BY : WMC	7/11
CHECKED BY : GM	7/11
REV. 10/1/11	MAA/GM

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-22
1			3			TOTAL SHEETS 47
2			4			



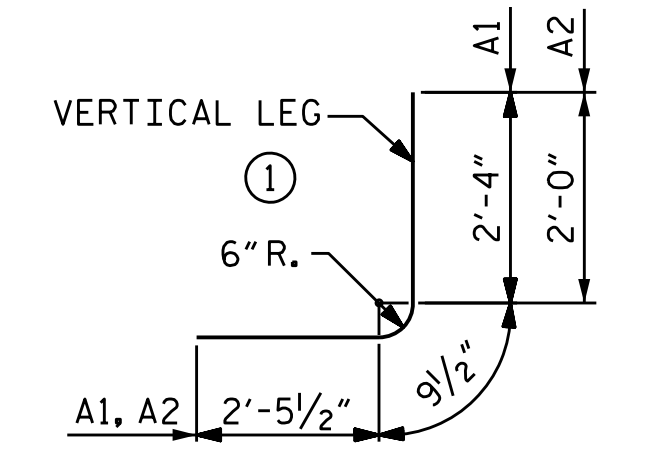
PLAN OF FLOOR SLAB
STAGE I

STAGE I QUANTITIES			
CLASS A CONCRETE			
BARREL @	1.060	CY/FT	177.6 C.Y.
WINGS, ETC.			16.6 C.Y.
SILLS			1.6 C.Y.
TOTAL			195.8 C.Y.
REINFORCING STEEL			LBS. 21,896
REINFORCING STEEL			
BARREL		21,896	LBS.
WINGS, ETC.		941	LBS.
TOTAL		22,837	LBS.

BAR SCHEDULE

STAGE I					
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	
A1	#4	1	5'-7"	2506	
A2	#4	1	5'-3"	2357	
A100	#5	STR.	8'-1"	2689	
A101	#5	STR.	6'-9"	42	
A102	#5	STR.	5'-3"	33	
A103	#5	STR.	3'-9"	23	
A104	#5	STR.	2'-3"	14	
A200	#5	STR.	8'-1"	2689	
A201	#5	STR.	6'-9"	42	
A202	#5	STR.	5'-3"	33	
A203	#5	STR.	3'-9"	23	
A204	#5	STR.	2'-3"	14	
B1	#4	STR.	9'-6"	2132	
B2	#4	STR.	7'-4"	3292	
C1	#4	STR.	29'-11"	5396	
D1	#6	STR.	1'-8"	45	
E1	#5	STR.	5'-9"	96	
F1	#4	STR.	4'-2"	89	
G1	#4	STR.	11'-5"	15	
S2	#8	STR.	11'-5"	366	
REINFORCING STEEL				LBS.	21,896

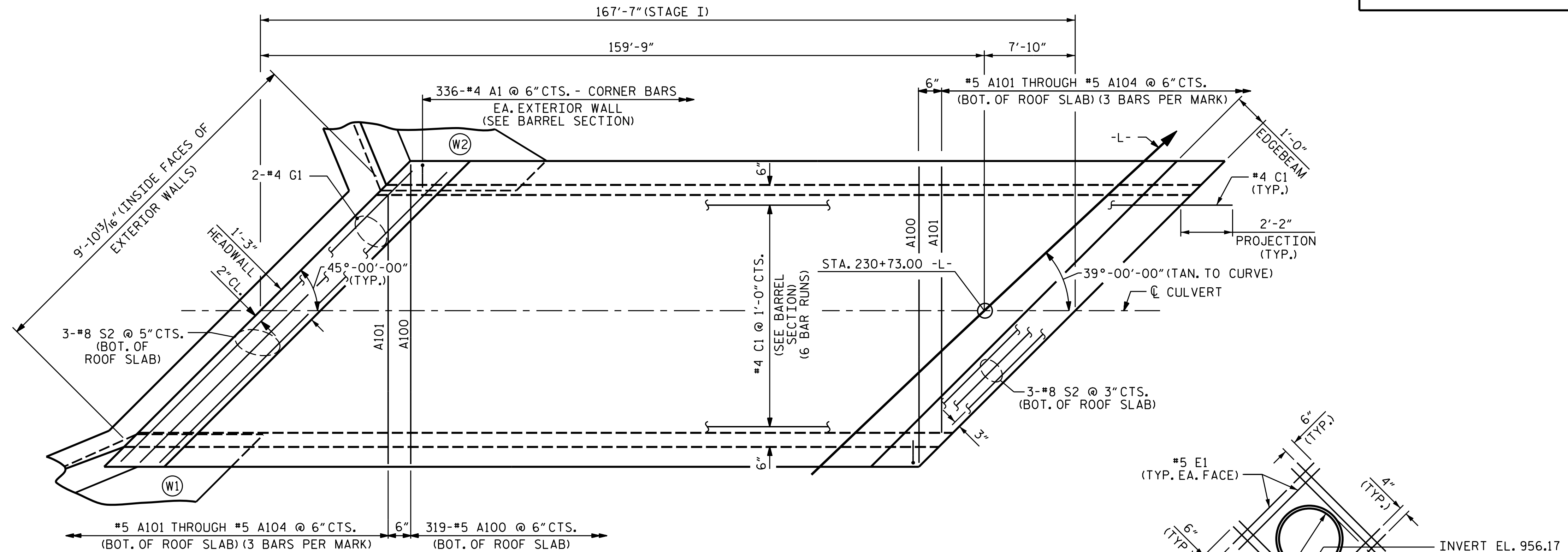
BAR TYPE



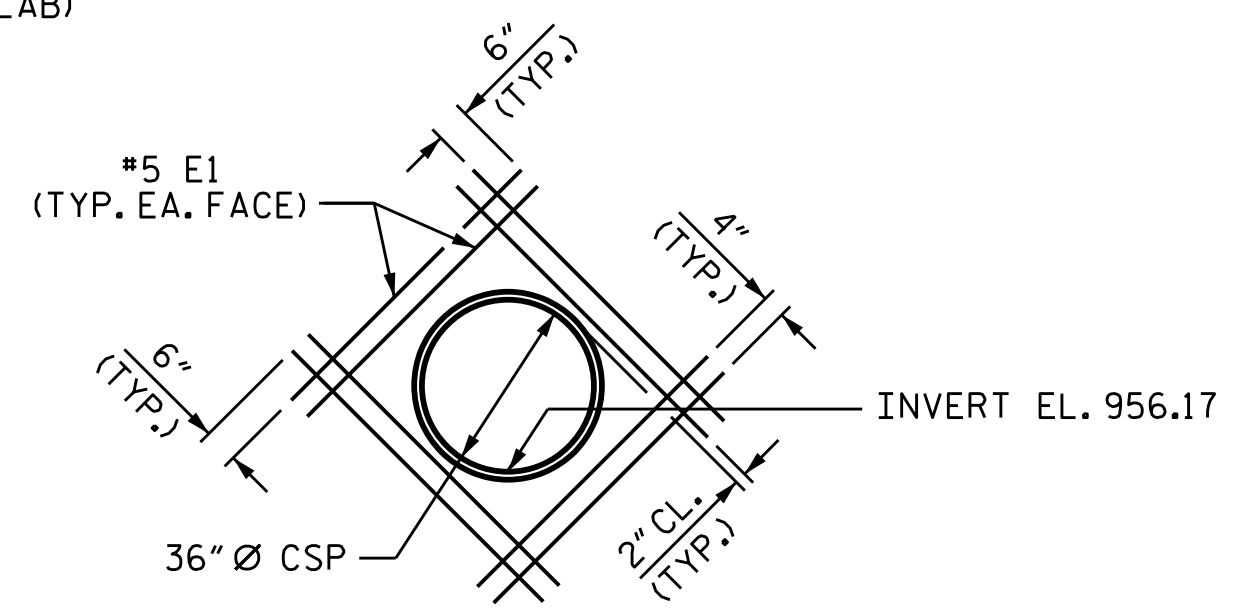
BAR DIMENSIONS ARE OUT TO OUT.

SPLICE LENGTH

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

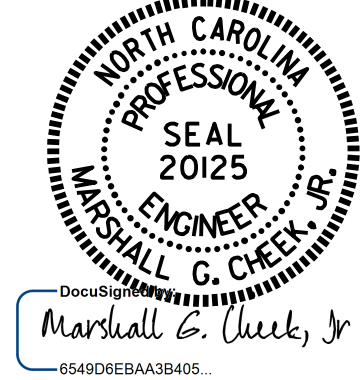


PLAN OF ROOF SLAB
STAGE I



DETAIL OF REINFORCING AROUND CSP

* THE 36" Ø CSP THROUGH THE SIDEWALL OF THE CULVERT WILL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE FIELD BENT OR CUT AS NECESSARY TO CLEAR PIPE.



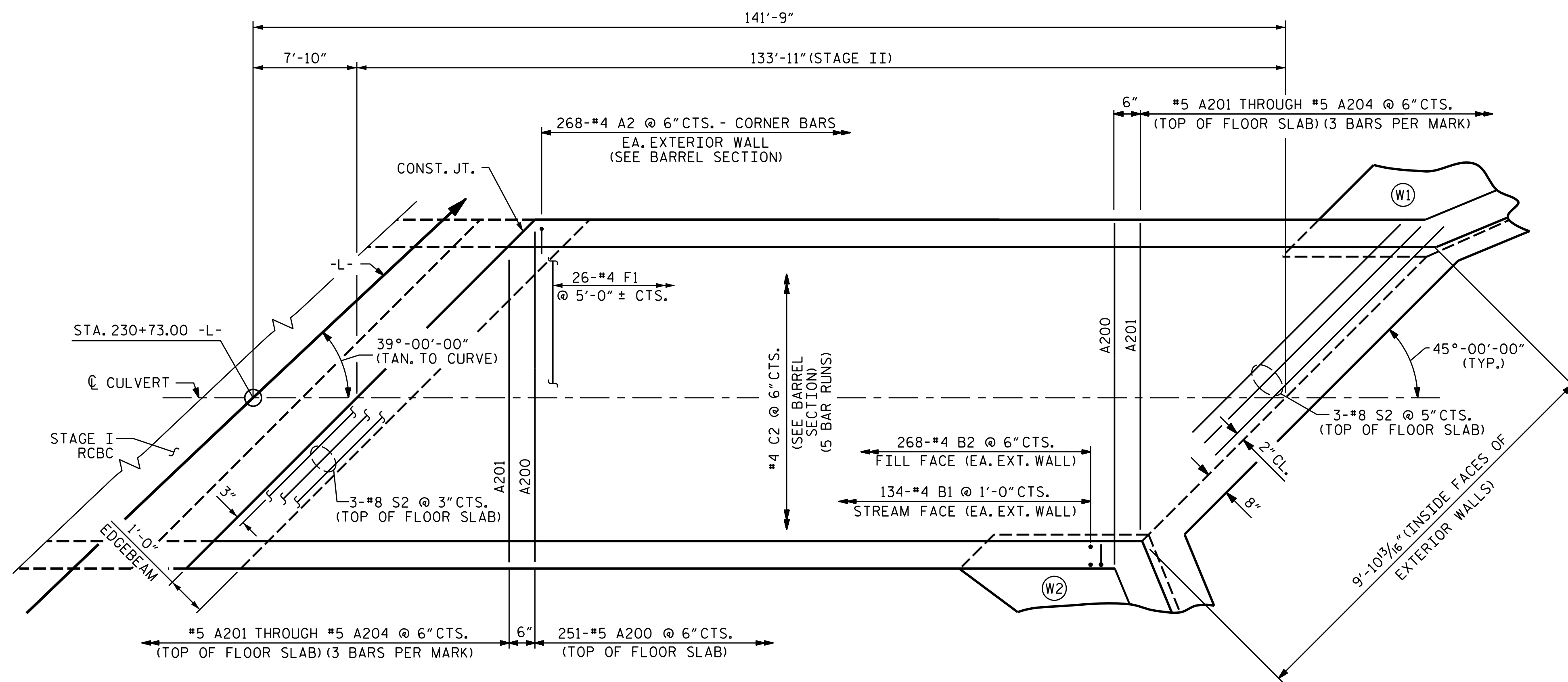
PROJECT NO. R-3100A
CATAWBA COUNTY
STATION: 230+73.00 -L-
SHEET 4 OF 6

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

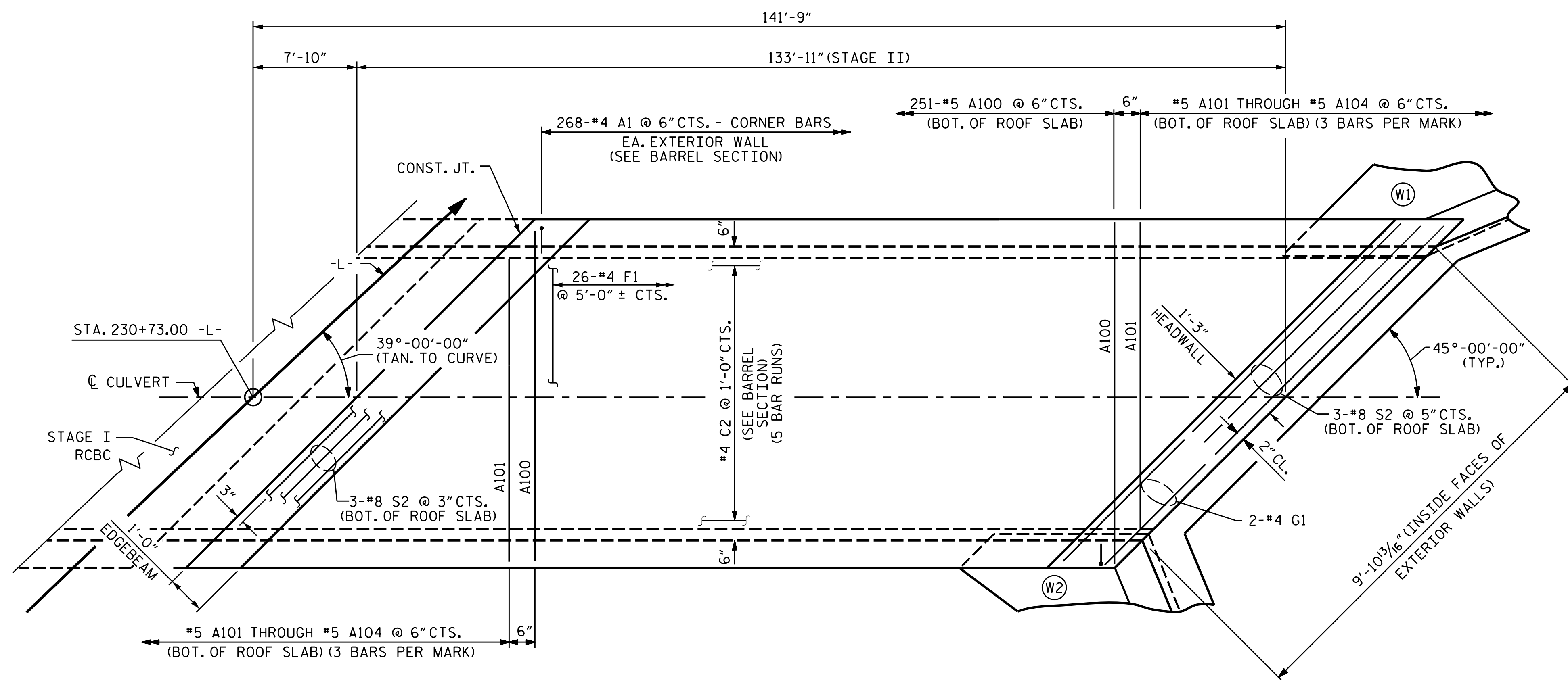
REVISIONS				SHEET NO.
NO.	BY:	DATE:	NO.	DATE:
1			3	
2			4	

ASSEMBLED BY: N.D. AUTO DATE: 2/8/16
CHECKED BY: J.K. BOWLES DATE: 3/15/16
DESIGN ENGINEER OF RECORD: J. BOWLES DATE: 4/17

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



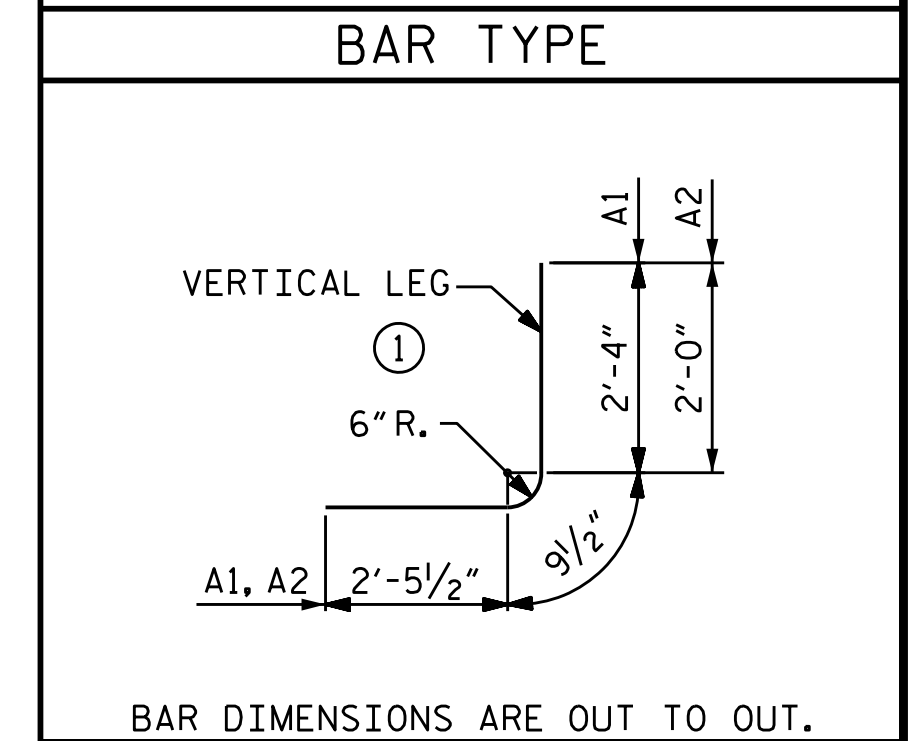
PLAN OF FLOOR SLAB
STAGE II



PLAN OF ROOF SLAB
STAGE II

STAGE II QUANTITIES	
CLASS A CONCRETE	
BARREL @ 1.060 CY/FT	142.0 C.Y.
WINGS, ETC.	16.6 C.Y.
SILLS	1.3 C.Y.
TOTAL	159.9 C.Y.
REINFORCING STEEL	
BARREL	17,399 LBS.
WINGS, ETC.	941 LBS.
TOTAL	18,340 LBS.

BAR SCHEDULE					
STAGE II					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	536	#4	1	5'-7"	1999
A2	536	#4	1	5'-3"	1880
A100	251	#5	STR.	8'-1"	2116
A101	6	#5	STR.	6'-9"	42
A102	6	#5	STR.	5'-3"	33
A103	6	#5	STR.	3'-9"	23
A104	6	#5	STR.	2'-3"	14
A200	251	#5	STR.	8'-1"	2116
A201	6	#5	STR.	6'-9"	42
A202	6	#5	STR.	5'-3"	33
A203	6	#5	STR.	3'-9"	23
A204	6	#5	STR.	2'-3"	14
B1	268	#4	STR.	9'-6"	1701
B2	536	#4	STR.	7'-4"	2626
C2	225	#4	STR.	28'-3"	4246
D1	15	#6	STR.	1'-8"	38
F1	26	#4	STR.	4'-2"	72
G1	2	#4	STR.	11'-5"	15
S2	12	#8	STR.	11'-5"	366
REINFORCING STEEL					LBS. 17,399



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

PROJECT NO. R-3100A
 CATAWBA COUNTY
 STATION: 230+73.00 -L-
 SHEET 5 OF 6



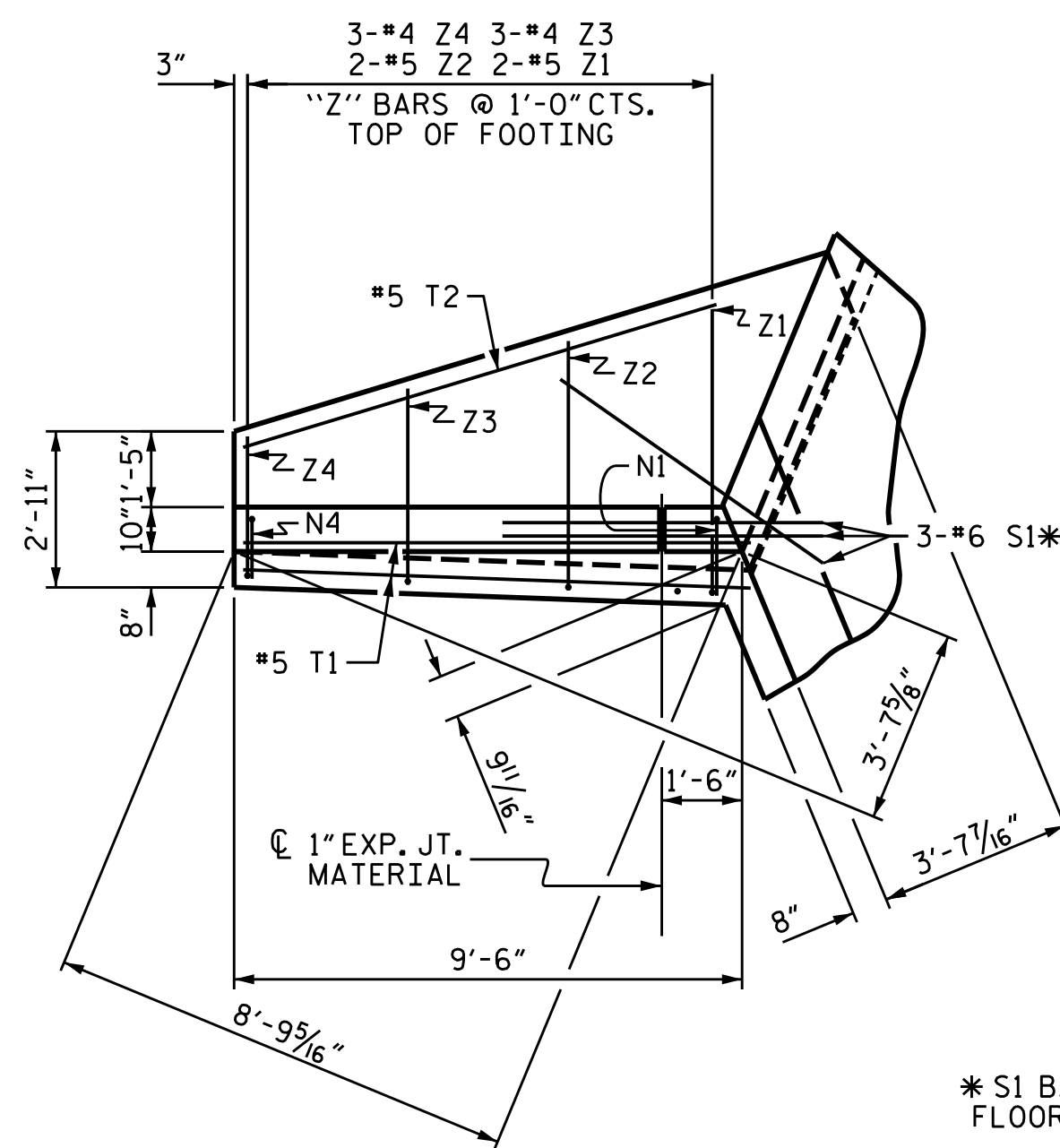
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 7 FT. X 8 FT.
 CONCRETE BOX CULVERT
 STAGE II

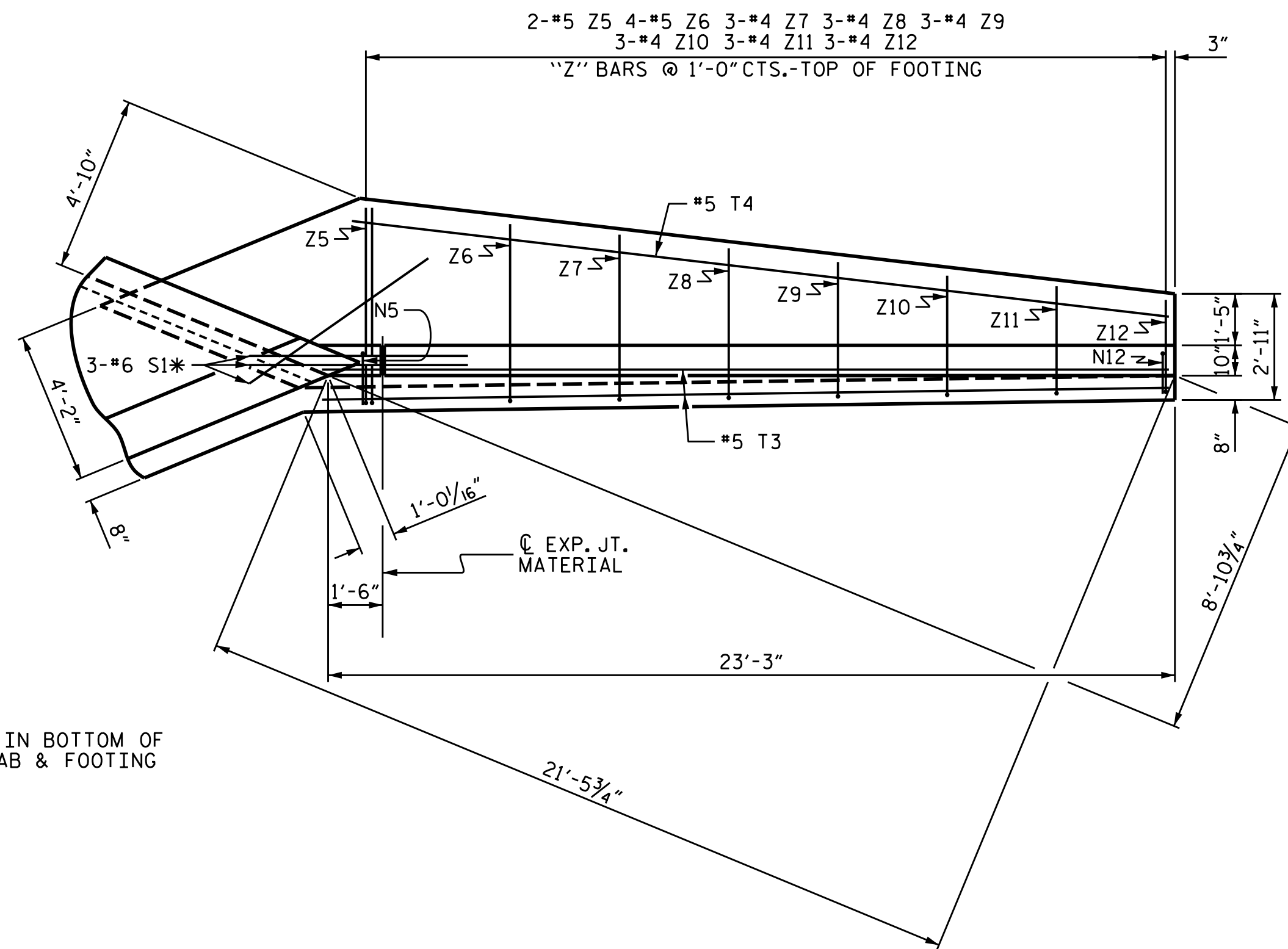
ASSEMBLED BY: N.D'AIUTO DATE: 2/8/16
 CHECKED BY: J.K.BOWLES DATE: 3/15/16
 DESIGN ENGINEER OF RECORD: J.BOWLES DATE: 4/17

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

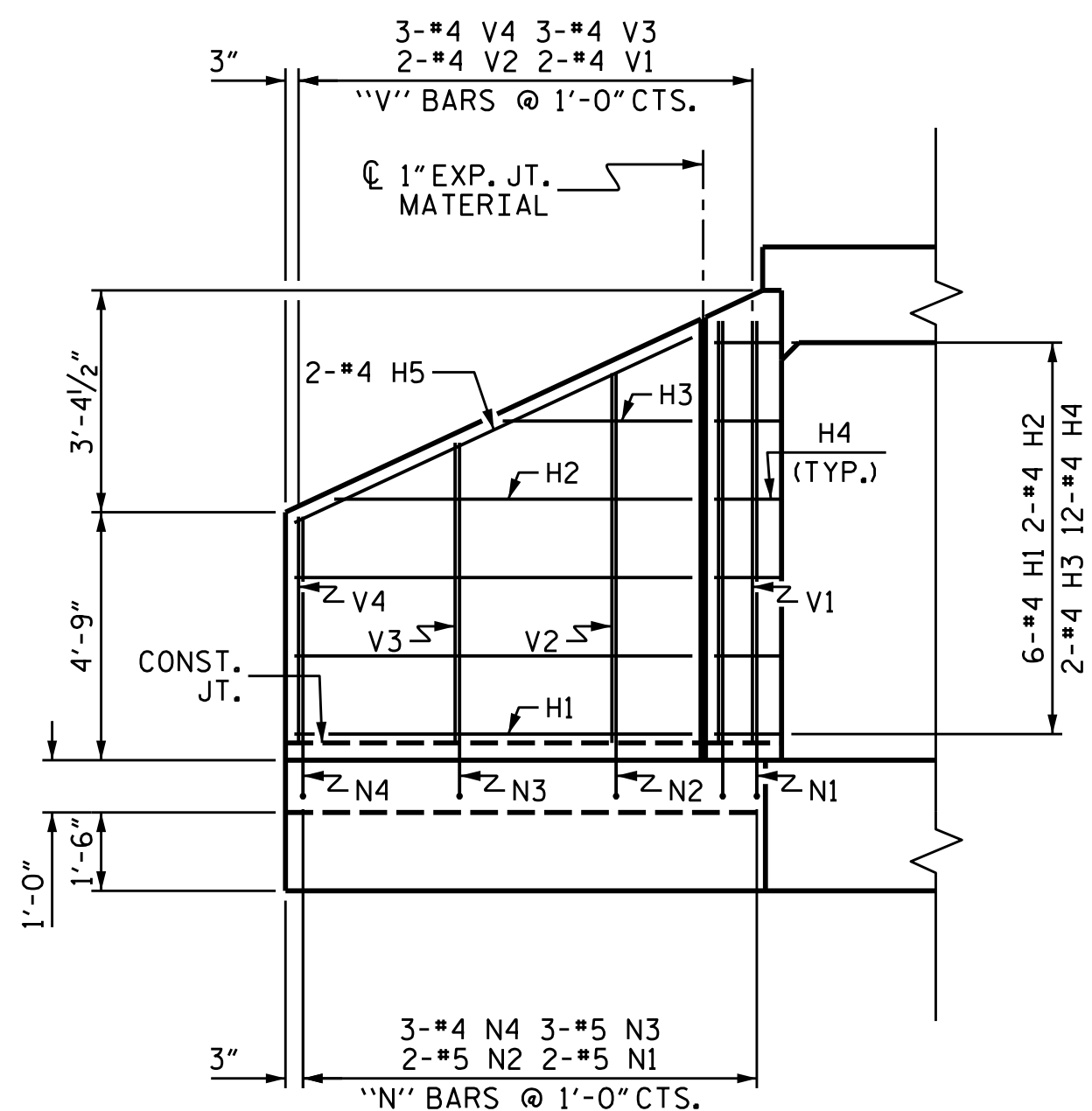
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-25
1			3			TOTAL SHEETS
2			4			47



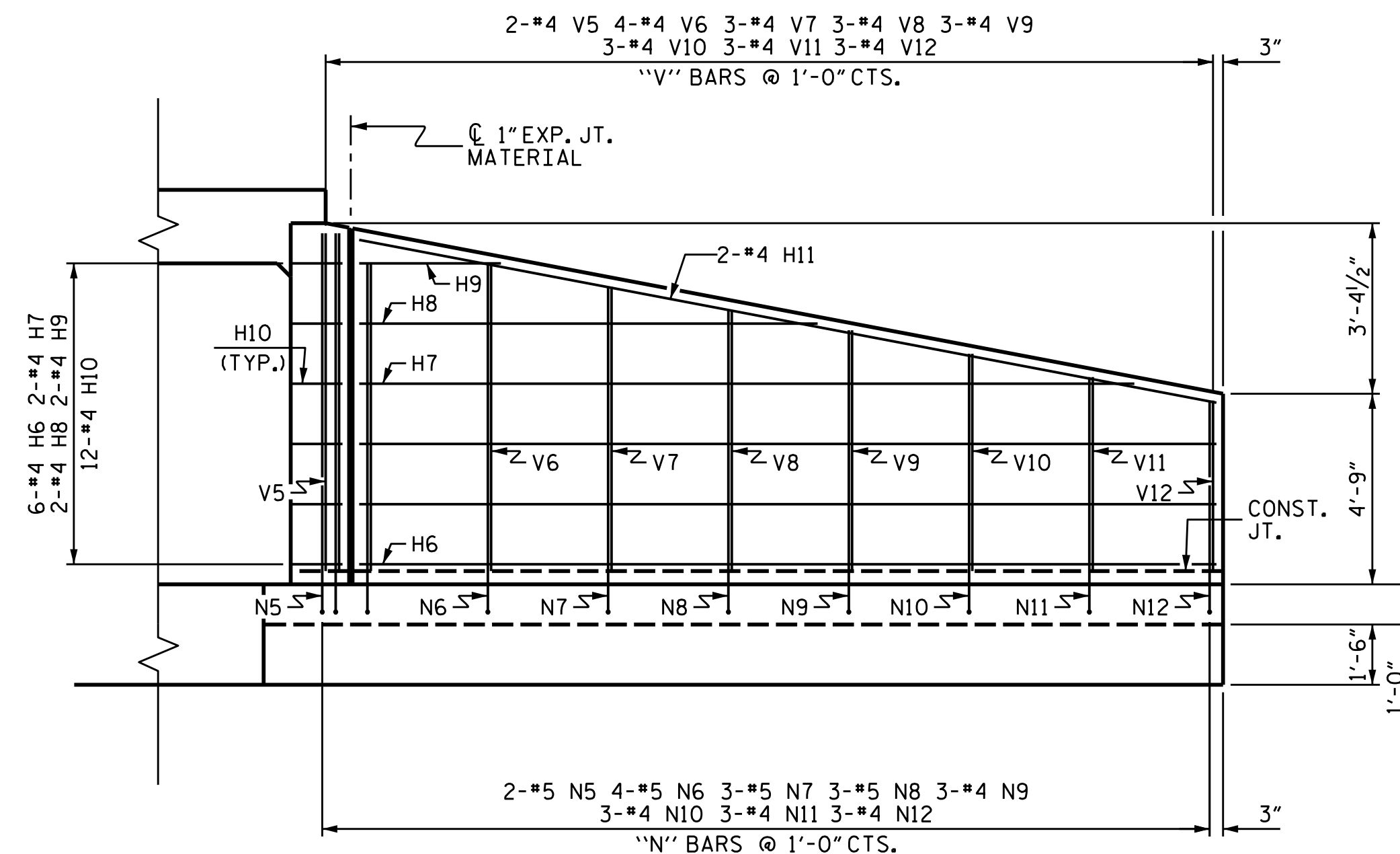
PLAN W2



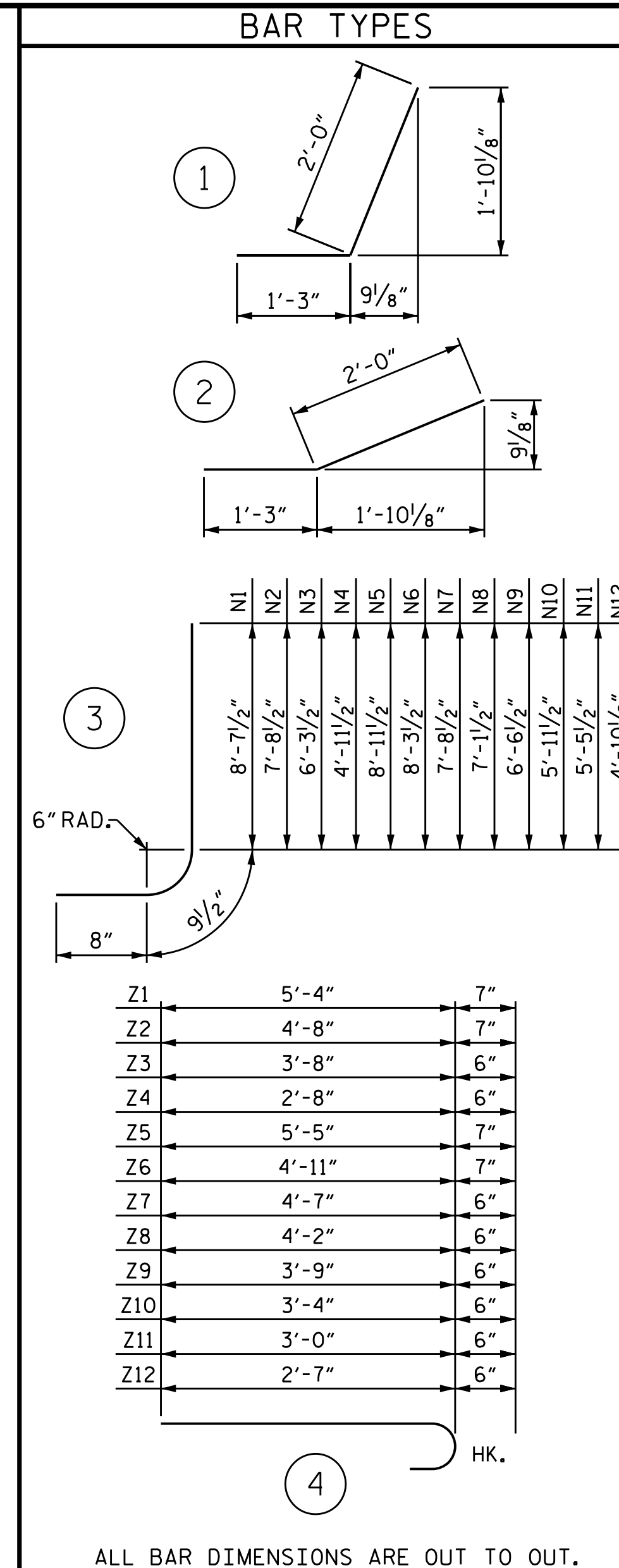
PLAN W1



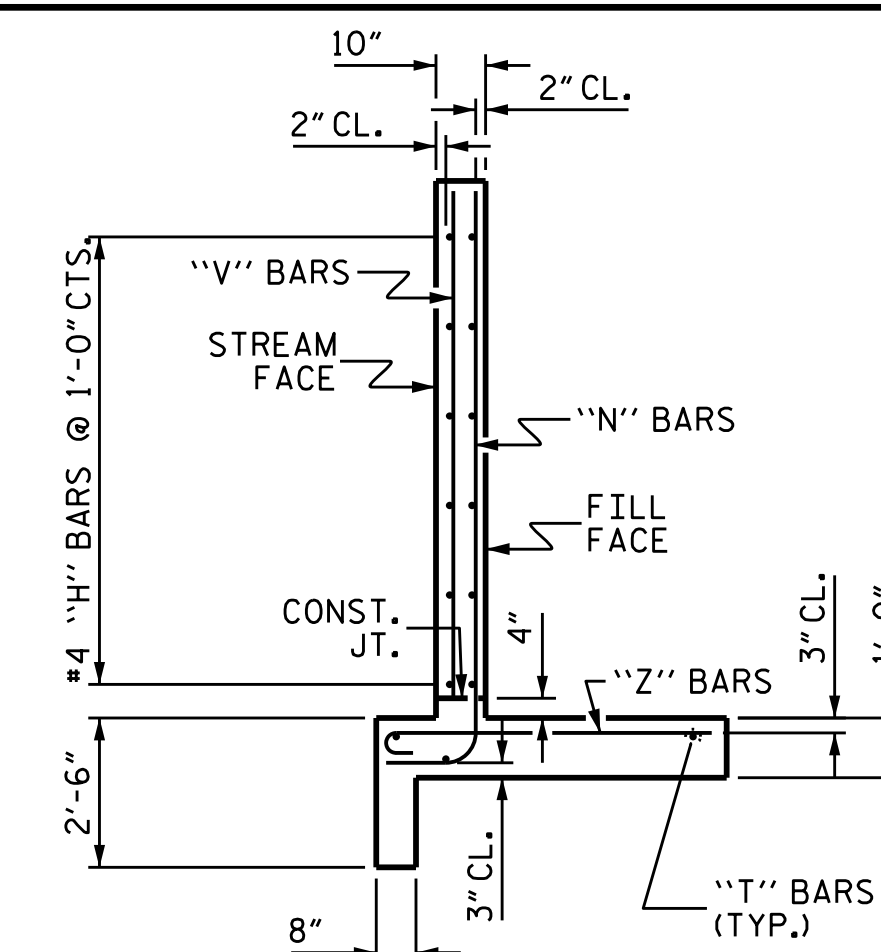
ELEVATION W2



ELEVATION W1



ALL BAR DIMENSIONS ARE OUT TO OUT.



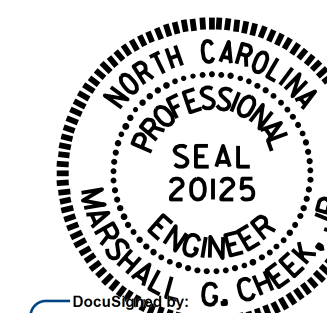
TYPICAL WING SECTION

BILL OF MATERIAL (STG. I)					BILL OF MATERIAL (STG. II)				
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	#4	STR	7'-7"	30	H1	#4	STR	7'-7"	30
H2	#4	STR	6'-10"	9	H2	#4	STR	6'-10"	9
H3	#4	STR	3'-7"	5	H3	#4	STR	3'-7"	5
H4	#4	STR	3'-3"	26	H4	#4	STR	3'-3"	26
H5	#4	STR	8'-5"	11	H5	#4	STR	8'-5"	11
H6	#4	STR	21'-4"	86	H6	#4	STR	21'-4"	86
H7	#4	STR	19'-4"	26	H7	#4	STR	19'-4"	26
H8	#4	STR	11'-5"	15	H8	#4	STR	11'-5"	15
H9	#4	STR	3'-6"	5	H9	#4	STR	3'-6"	5
H10	#4	STR	3'-3"	26	H10	#4	STR	3'-3"	26
H11	#4	STR	21'-9"	29	H11	#4	STR	21'-9"	29
N1	#5	STR	10'-1"	21	N1	#5	STR	10'-1"	21
N2	#5	STR	9'-2"	19	N2	#5	STR	9'-2"	19
N3	#5	STR	7'-9"	24	N3	#5	STR	7'-9"	24
N4	#4	STR	6'-5"	13	N4	#4	STR	6'-5"	13
N5	#5	STR	10'-5"	22	N5	#5	STR	10'-5"	22
N6	#5	STR	9'-9"	41	N6	#5	STR	9'-9"	41
N7	#5	STR	9'-2"	29	N7	#5	STR	9'-2"	29
N8	#5	STR	8'-7"	27	N8	#5	STR	8'-7"	27
N9	#4	STR	8'-0"	16	N9	#4	STR	8'-0"	16
N10	#4	STR	7'-5"	15	N10	#4	STR	7'-5"	15
N11	#4	STR	6'-11"	14	N11	#4	STR	6'-11"	14
N12	#4	STR	6'-4"	13	N12	#4	STR	6'-4"	13
S1	#6	STR	6'-0"	54	S1	#6	STR	6'-0"	54
T1	#5	STR	9'-6"	20	T1	#5	STR	9'-6"	20
T2	#5	STR	9'-3"	10	T2	#5	STR	9'-3"	10
T3	#5	STR	23'-3"	48	T3	#5	STR	23'-3"	48
T4	#5	STR	22'-7"	24	T4	#5	STR	22'-7"	24
V1	#4	STR	8'-1"	11	V1	#4	STR	8'-1"	11
V2	#4	STR	7'-1"	9	V2	#4	STR	7'-1"	9
V3	#4	STR	5'-9"	12	V3	#4	STR	5'-9"	12
V4	#4	STR	4'-4"	9	V4	#4	STR	4'-4"	9
V5	#4	STR	8'-5"	11	V5	#4	STR	8'-5"	11
V6	#4	STR	7'-8"	20	V6	#4	STR	7'-8"	20
V7	#4	STR	7'-1"	14	V7	#4	STR	7'-1"	14
V8	#4	STR	6'-6"	13	V8	#4	STR	6'-6"	13
V9	#4	STR	6'-0"	12	V9	#4	STR	6'-0"	12
V10	#4	STR	5'-5"	11	V10	#4	STR	5'-5"	11
V11	#4	STR	4'-10"	10	V11	#4	STR	4'-10"	10
V12	#4	STR	4'-3"	9	V12	#4	STR	4'-3"	9
Z1	#5	STR	5'-11"	12	Z1	#5	STR	5'-11"	12
Z2	#5	STR	4'-5"	11	Z2	#5	STR	4'-5"	11
Z3	#4	STR	4'-2"	8	Z3	#4	STR	4'-2"	8
Z4	#4	STR	3'-2"	6	Z4	#4	STR	3'-2"	6
Z5	#5	STR	6'-0"	13	Z5	#5	STR	6'-0"	13
Z6	#5	STR	5'-6"	23	Z6	#5	STR	5'-6"	23
Z7	#4	STR	5'-1"	10	Z7	#4	STR	5'-1"	10
Z8	#4	STR	4'-8"	9	Z8	#4	STR	4'-8"	9
Z9	#4	STR	4'-3"	9	Z9	#4	STR	4'-3"	9
Z10	#4	STR	3'-10"	8	Z10	#4	STR	3'-10"	8
Z11	#4	STR	3'-6"	7	Z11	#4	STR	3'-6"	7
Z12	#4	STR	3'-1"	6	Z12	#4	STR	3'-1"	6
REINFORCING STEEL 941 LBS.					REINFORCING STEEL 941 LBS.				
FOR 2 WINGS					FOR 2 WINGS				
CLASS A CONCRETE					CLASS A CONCRETE				
2 WINGS					2 WINGS				
1 HEADWALL					1 HEADWALL				
1 END CURTAIN WALL					1 END CURTAIN WALL				
2 EDGEBEAMS					2 EDGEBEAMS				
TOTAL 16.6 C.Y.					TOTAL 16.6 C.Y.				

PROJECT NO. R-3100A
 CATAWBA COUNTY
 STATION: 230+73.00 -L-

SHEET 6 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STANDARD WINGS
 FOR
 CONCRETE BOX CULVERT
 H = 8'-0" SLOPE = 2:1
 45° SKEW



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

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.

ASSEMBLED BY : N.D'AIUTO DATE : 2/10/16
 CHECKED BY : J.K.BOWLES DATE : 3/14/16
 DRAWN BY : CCJ 01/00
 CHECKED BY : RWW 03/00

*****SYTIME*****
 *****DCN*****
 *****USERNAME*****

CUL. #4 STD. NO. CW4508

BENCHMARK #2: 8" SPIKE IN ROOT OF 30" SYCAMORE,
STA. 38+17 -L-, 197 RT., ELEV. = 882.63

ROADWAY DATA

GRADE POINT ELEV. @ STA. 28+98.00 -L-	= 891.38
BED ELEV. @ STA. 28+98.00 -L-	= 870.29
ROADWAY SLOPES	= 2:1

HYDRAULIC DATA

DESIGN DISCHARGE	= 250 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEV.	= 878.40
DRAINAGE AREA	= 0.17 SQ. MI.
BASE DISCHARGE (Q100)	= 300 C.F.S.
BASE HIGH WATER ELEV.	= 879.23

OVERTOPPING FLOOD DATA

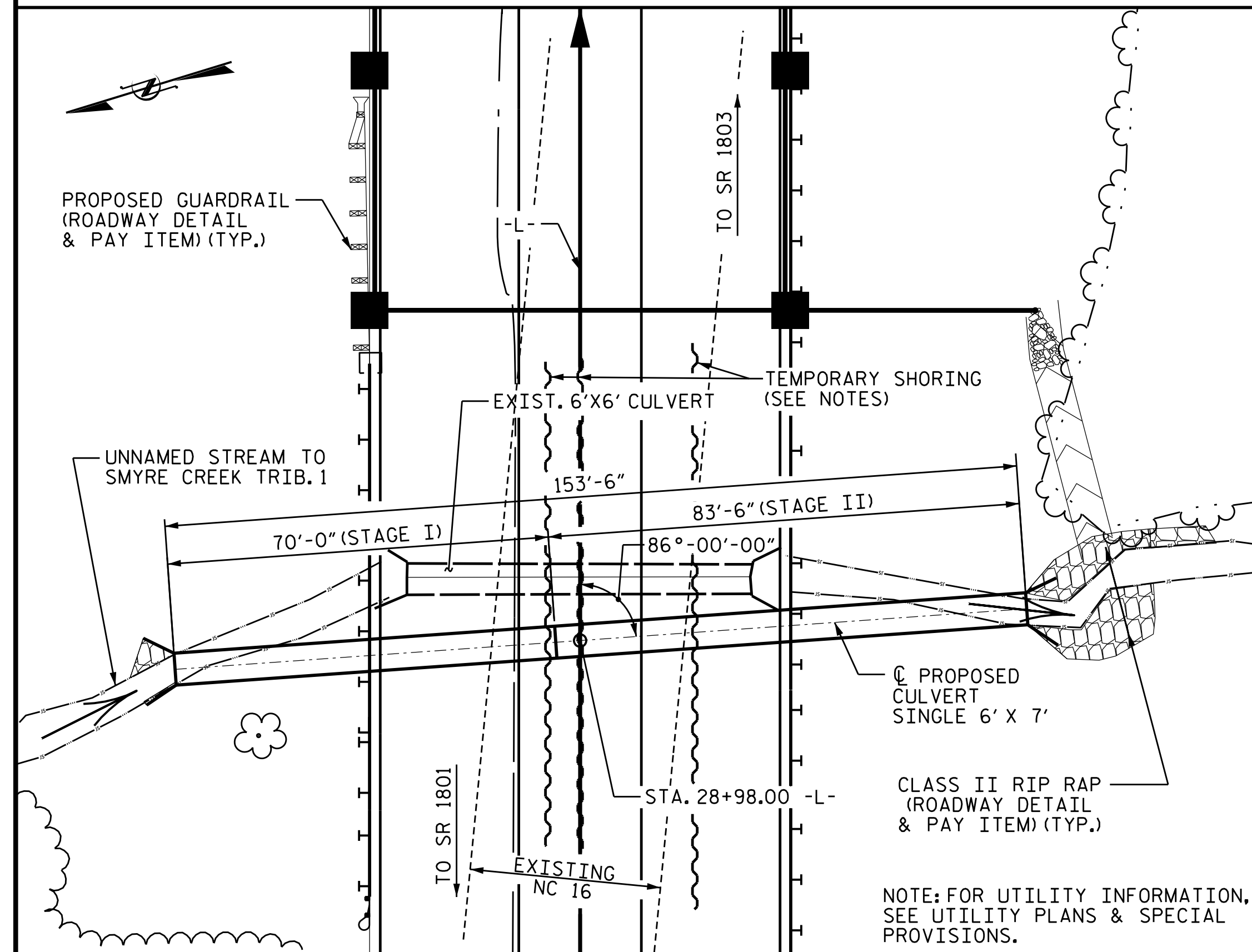
OVERTOPPING DISCHARGE	= 900 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= >500 YR.
OVERTOPPING FLOOD ELEV.	= 891.5

TOTAL STRUCTURE QUANTITIES

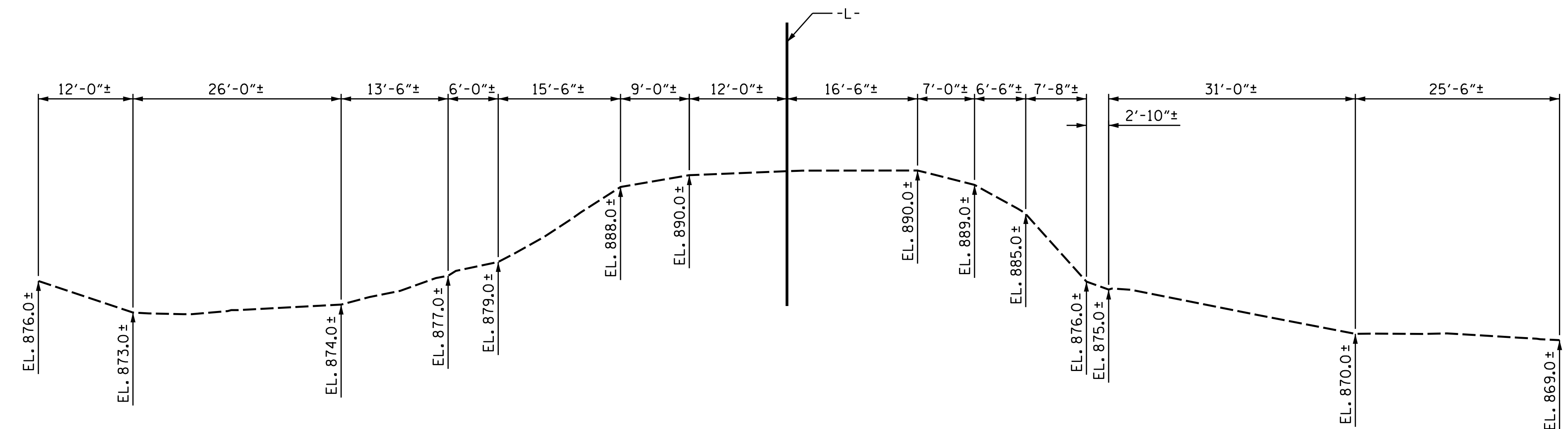
REMOVAL OF EXISTING STRUCTURE	LUMP SUM
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	
STAGE I	56 TONS
STAGE II	67 TONS
TOTAL	123 TONS
CLASS A CONCRETE	
STAGE I	59.2 C.Y.
STAGE II	68.9 C.Y.
TOTAL	128.1 C.Y.
REINFORCING STEEL	
STAGE I	7,130 LBS.
STAGE II	8,322 LBS.
TOTAL	15,452 LBS.

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
 DESIGN FILL = 14.75 FEET (MAX.), 12.74 FEET (MIN.).
 FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.
 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
 CONCRETE IN STAGE I & STAGE II CULVERTS SHALL BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS, CURTAIN WALL, FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALL AND SILL.
 2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
 THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
 DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
 TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
 AT THE CONTRACTORS 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.
 THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE BARS FROM WHICH THE SAMPLES ARE TAKEN MUST THEN BE SPLICED WITH REPLACEMENT BARS OF THE SIZE AND LENGTH OF THE SAMPLE, PLUS A MINIMUM LAP SPLICE OF THIRTY BAR DIAMETERS. PAYMENT FOR THE SAMPLES OF REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
 FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
 NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
 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.
 FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE ROADWAY PLANS.
 FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.



LOCATION SKETCH



PROFILE ALONG CULVERT

PROJECT NO. R-3100B
CATAWBA COUNTY
 STATION: 28+98.00 -L-

SHEET 1 OF 6



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**SINGLE 6 FT. X 7 FT.
 CONCRETE BOX CULVERT**

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-27
1			3			TOTAL SHEETS
2			4			47

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISED 11-13-09 BY E.L.R. CHECKED BY G.R.P.
 ADDED 8-22-09

ASSEMBLED BY: J.K.BOWLES DATE: 2/5/2015
 CHECKED BY: H.A. LOCKLEAR DATE: 7/12/2016
 DESIGN ENGINEER OF RECORD: J.K.BOWLES DATE: 12/2016

*****SYSTEM*****
 *****DCGN*****
 *****USERNAME*****

**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	5.18	--	1.75	5.18	1	EXTERIOR WALL	3.83	7.88	1	EXTERIOR WALL	6.85	
	HL-93 (OPERATING)	N/A		6.72	--	1.35	6.72	1	EXTERIOR WALL	3.83	10.22	1	EXTERIOR WALL	6.85	
	HS-20 (INVENTORY)	36.000	②	5.18	186.63	1.75	5.18	1	EXTERIOR WALL	3.83	7.88	1	EXTERIOR WALL	6.85	
	HS-20 (OPERATING)	36.000		6.72	241.93	1.35	6.72	1	EXTERIOR WALL	3.83	10.22	1	EXTERIOR WALL	6.85	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	③	6.48	87.48	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85	
		SNGARBS2		6.48	129.61	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85	
		SNAGRIS2		6.48	142.57	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85	
		SNCOTTS3		6.48	176.59	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85	
		SNAGRS4		6.48	226.33	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85	
		SNS5A		6.48	230.38	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85	
		SNS6A		6.48	258.89	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85	
		SNS7B		6.48	272.18	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3		6.48	213.85	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85	
		TNT4A		6.48	214.34	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85	
		TNT6A		6.48	269.58	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85	
		TNT7A		6.48	272.18	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85	
		TNT7B		6.48	272.18	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85	
		TNAGRIT4		6.48	278.66	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85	
TNAGT5A		6.48	291.62	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85			
TNAGT5B		6.48	291.62	1.40	6.48	1	EXTERIOR WALL	3.83	9.85	1	EXTERIOR WALL	6.85			

LOAD FACTORS:

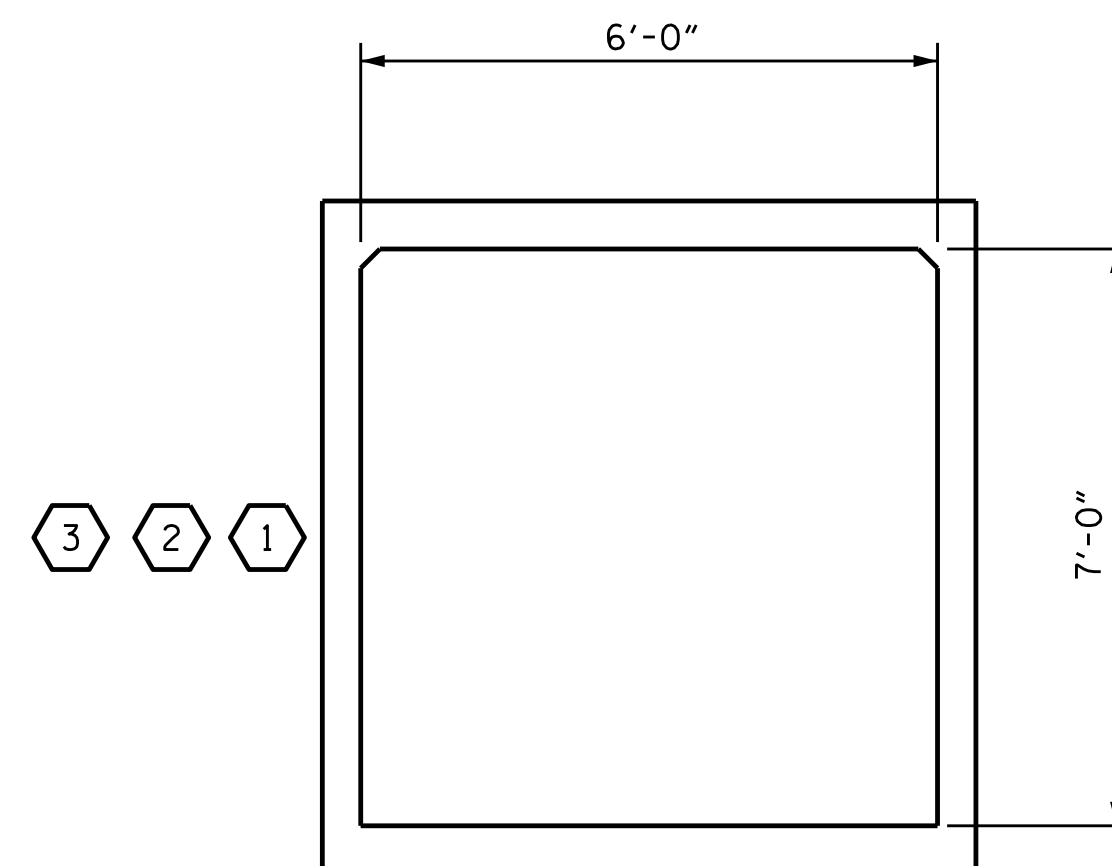
DESIGN LOAD RATING FACTORS

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.

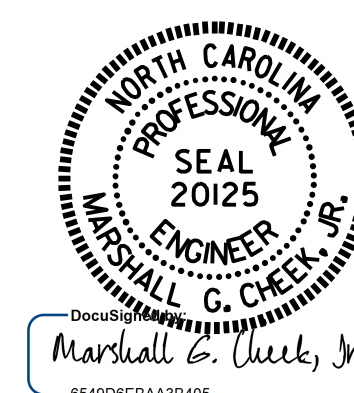
③	CONTROLLING LOAD RATING
①	DESIGN LOAD RATING (HL-93)
②	DESIGN LOAD RATING (HS-20)
③	LEGAL LOAD RATING **
** SEE CHART FOR VEHICLE TYPE	



LRFR SUMMARY

PROJECT NO. R-3100B
CATAWBA COUNTY
 STATION: 28+98.00 -L-

SHEET 2 OF 6



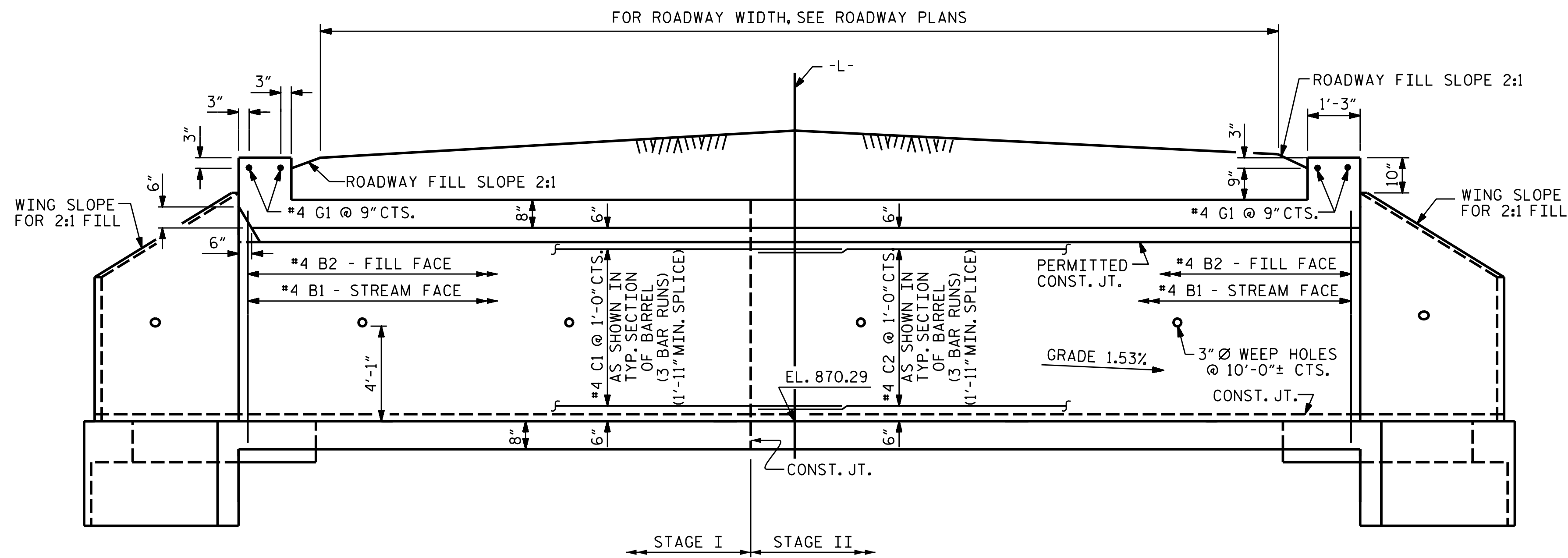
2/20/2017

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

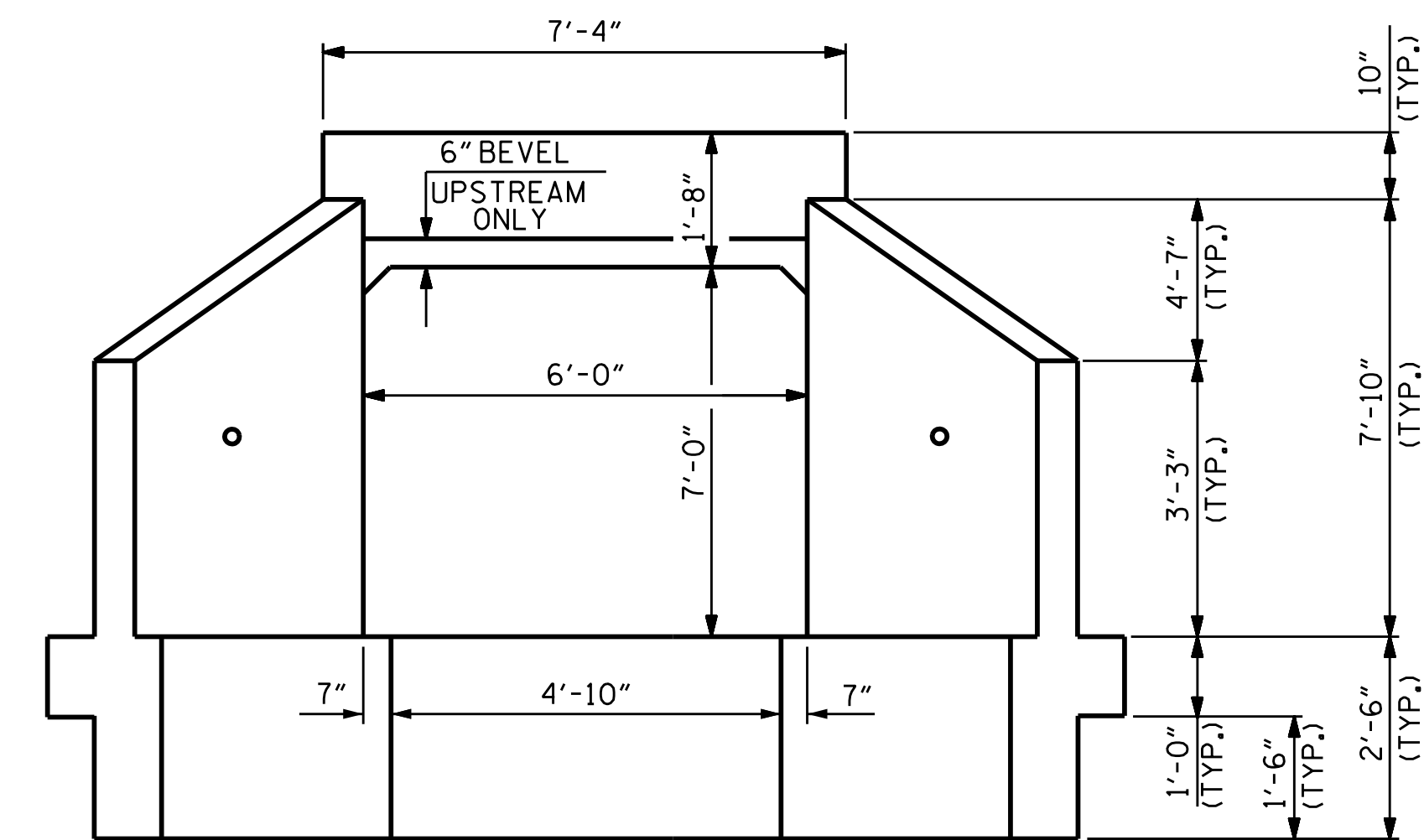
ASSEMBLED BY : J.K.BOWLES DATE : 2/4/2015
 CHECKED BY : H.A.LOCKLEAR DATE : 7/12/2016
 DRAWN BY : WMC 7/11 REV. 10/1/11 MAA/GM
 CHECKED BY : GM 7/11

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

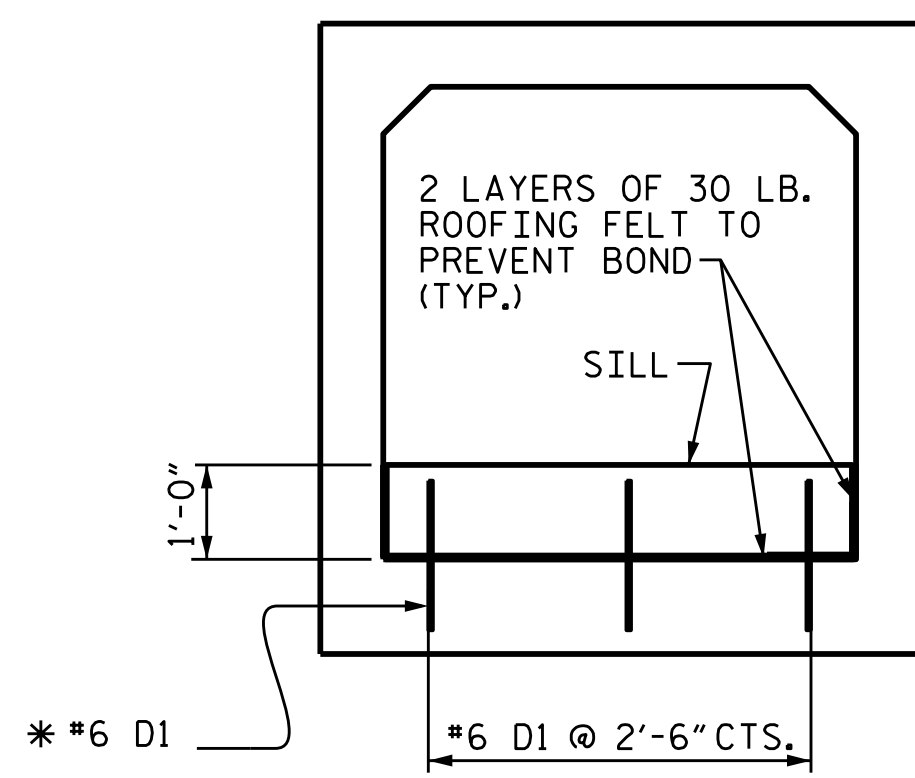
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-28
1			3			TOTAL SHEETS 47
2			4			



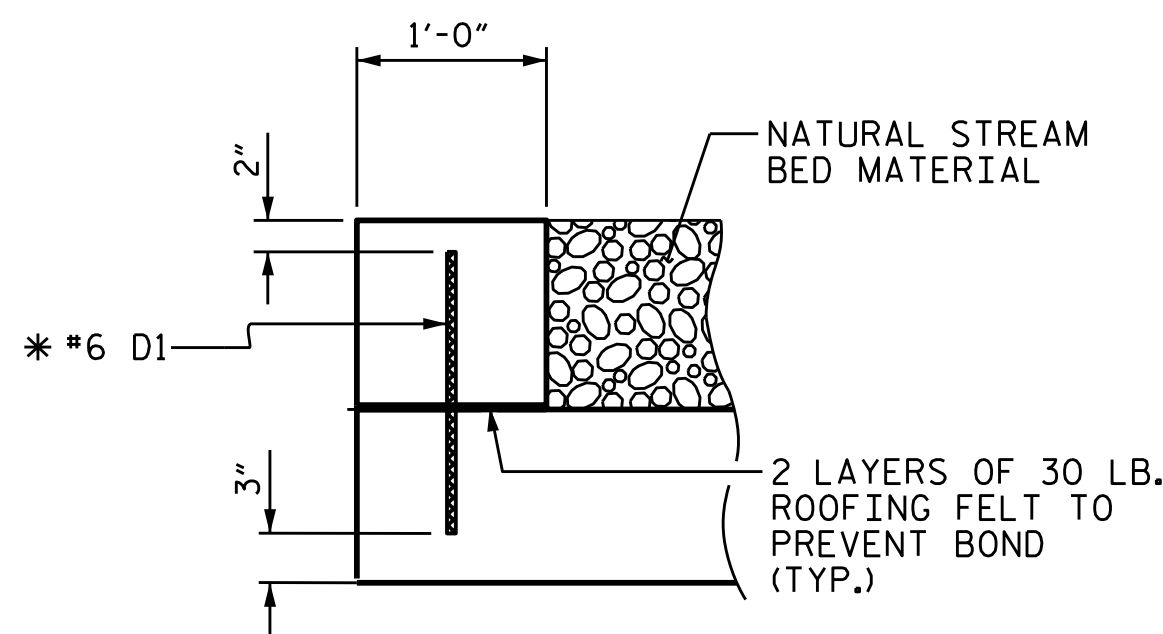
CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION

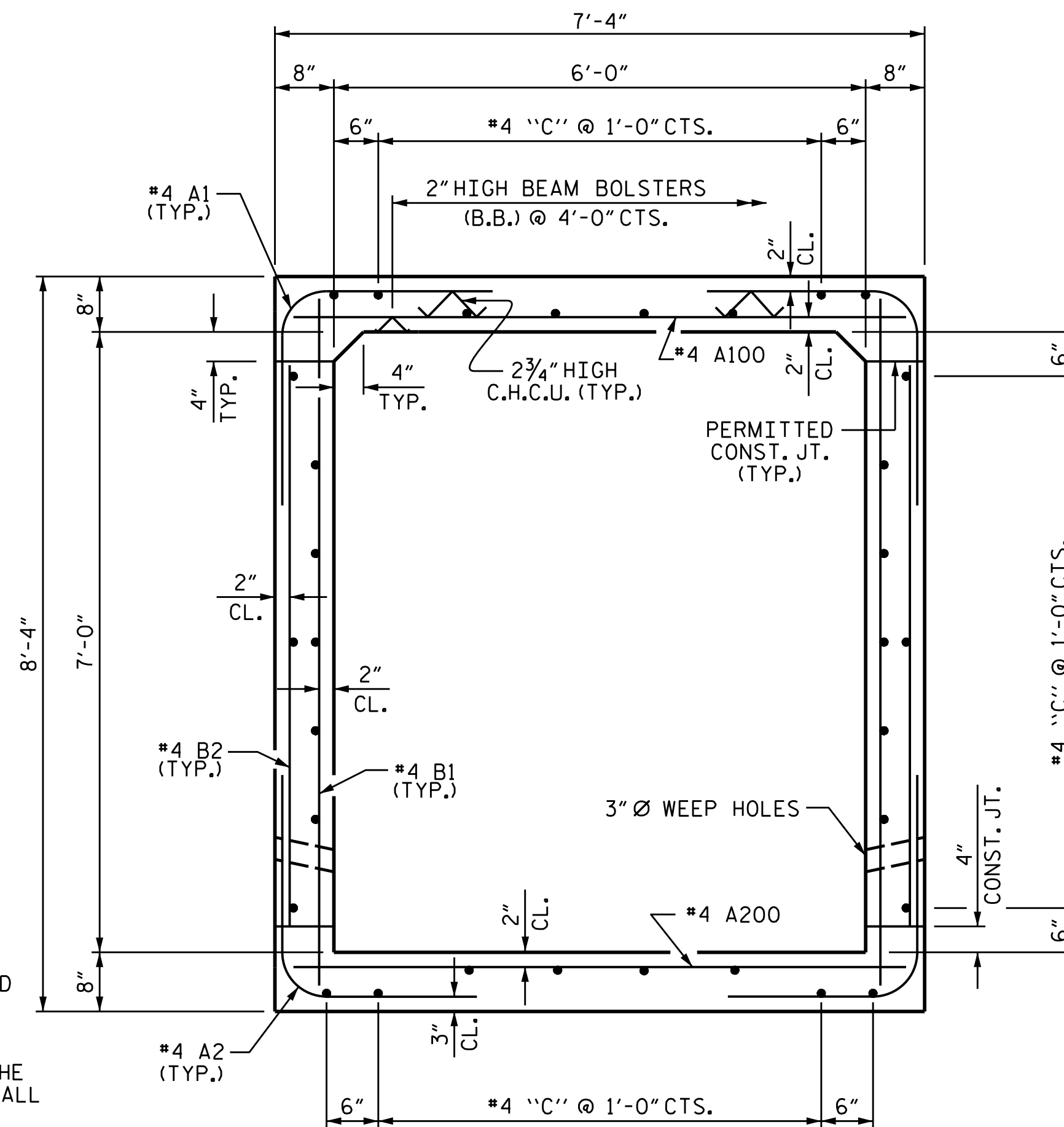


ELEVATION



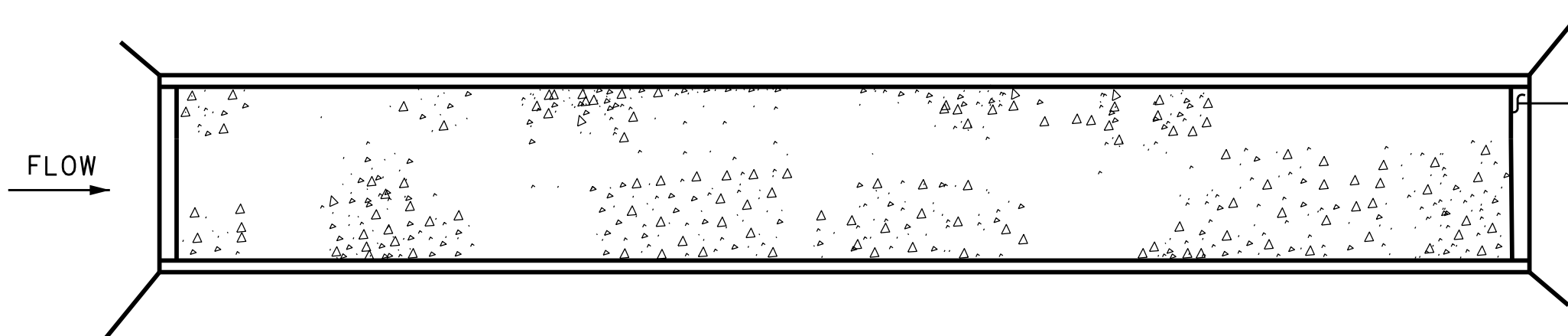
SECTION THROUGH SILL

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



RIGHT ANGLE SECTION OF BARREL

THERE ARE 32 "C" BARS IN SECTION OF BARREL



PLAN

SILL DETAILS

NOTES

MATERIAL EXCAVATED FROM THE EXISTING STREAMBED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AS SHOWN IN THE PLAN VIEW. ONLY NATIVE MATERIAL SHALL BE USED IN THE PROPOSED CULVERT. BED MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER.

THE ENTIRE COST OF WORK REQUIRED TO PLACE THE EXCAVATED MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR CULVERT EXCAVATION.

THE ENTIRE COST OF WORK REQUIRED TO CONSTRUCT THE SILLS SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.

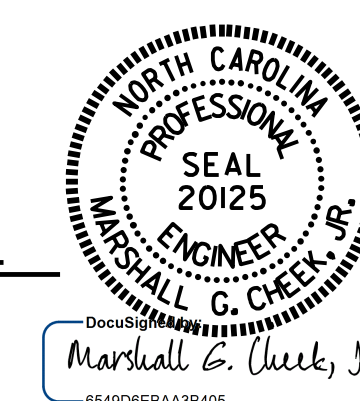
THE STREAMBED MATERIAL SHOULD BE PLACED LEVEL WITH THE TOP OF THE SILLS.

PROJECT NO. R-3100B
 CATAWBA COUNTY
 STATION: 28+98.00 -L-

SHEET 3 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 6 FT. X 7 FT.
 CONCRETE BOX CULVERT



2/20/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

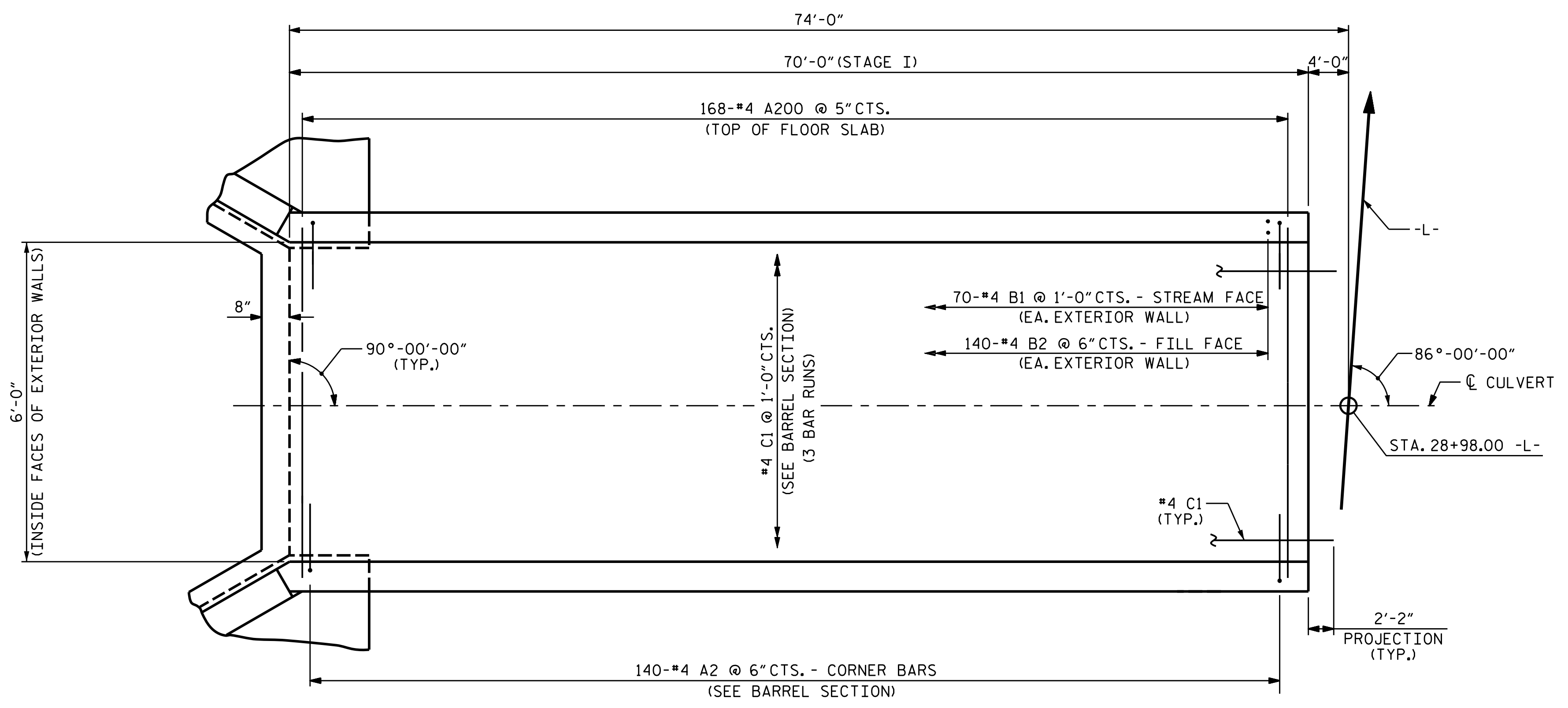
REVISIONS					SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

CUL. #5 STD. NO. CB11

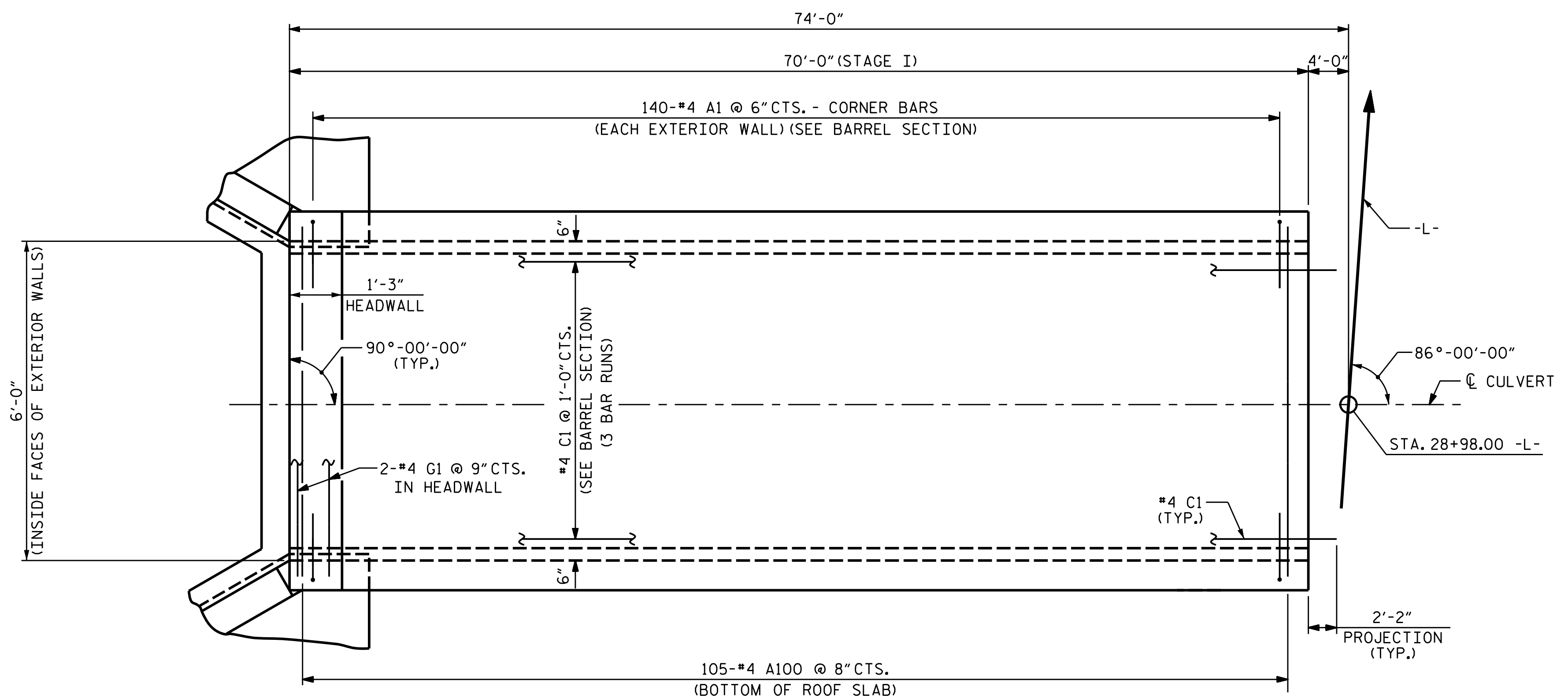
REVISED 8-28-92 BY E.L.R. CHECKED BY G.R.P.
 REVISED 8-22-99 BY A.R.B. CHECKED BY C.R.K.
 REDRAWN 8-22-1989
 REVISED 11-9-99 BY M.M. CHECKED BY R.W.W.

ASSEMBLED BY: J.K. BOWLES DATE: 2/5/2015
 CHECKED BY: H.A. LOCKLEAR DATE: 7/12/2016
 DESIGN ENGINEER OF RECORD: J.K. BOWLES DATE: 12/2016

*****SYTIME*****
 *****DCN*****
 *****USERNAME*****

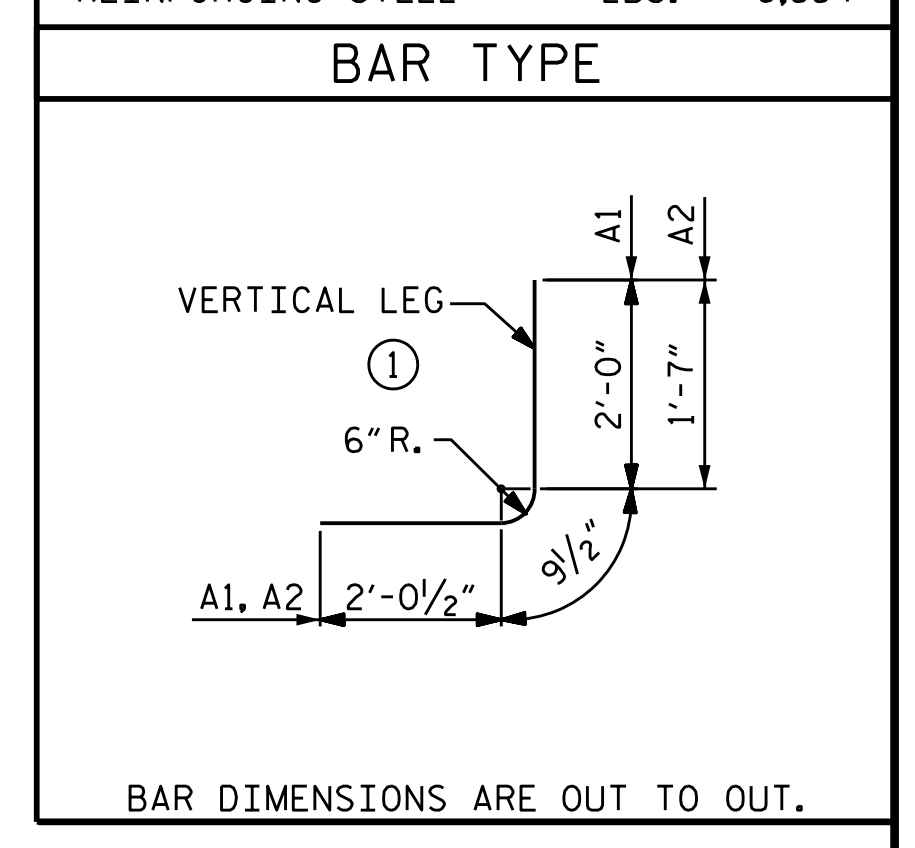


PLAN OF FLOOR SLAB
STAGE I



PLAN OF ROOF SLAB
STAGE I

BAR SCHEDULE					
STAGE I					
BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	280	#4	1	4'-10"	904
A2	280	#4	1	4'-5"	826
A100	105	#4	STR.	6'-11"	485
A200	168	#4	STR.	6'-11"	776
B1	140	#4	STR.	7'-10"	733
B2	280	#4	STR.	6'-4"	1185
C1	96	#4	STR.	25'-5"	1630
D1	3	#6	STR.	1'-3"	6
G1	2	#4	STR.	7'-0"	9
REINFORCING STEEL					LBS. 6,554

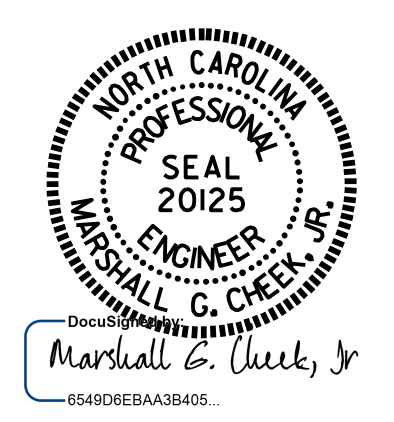


STAGE I QUANTITIES	
CLASS A CONCRETE	
BARREL @ 0.712 CY/FT	49.8 C.Y.
WINGS, ETC.	9.2 C.Y.
SILL	0.2 C.Y.
TOTAL	59.2 C.Y.
REINFORCING STEEL	
BARREL	6,554 LBS.
WINGS, ETC.	576 LBS.
TOTAL	7,130 LBS.

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

DRAWN BY : J.K.BOWLES DATE : 2/5/2015
 CHECKED BY : H.A. LOCKLEAR DATE : 7/12/2016
 DESIGN ENGINEER OF RECORD: J.K.BOWLES DATE : 12/2016

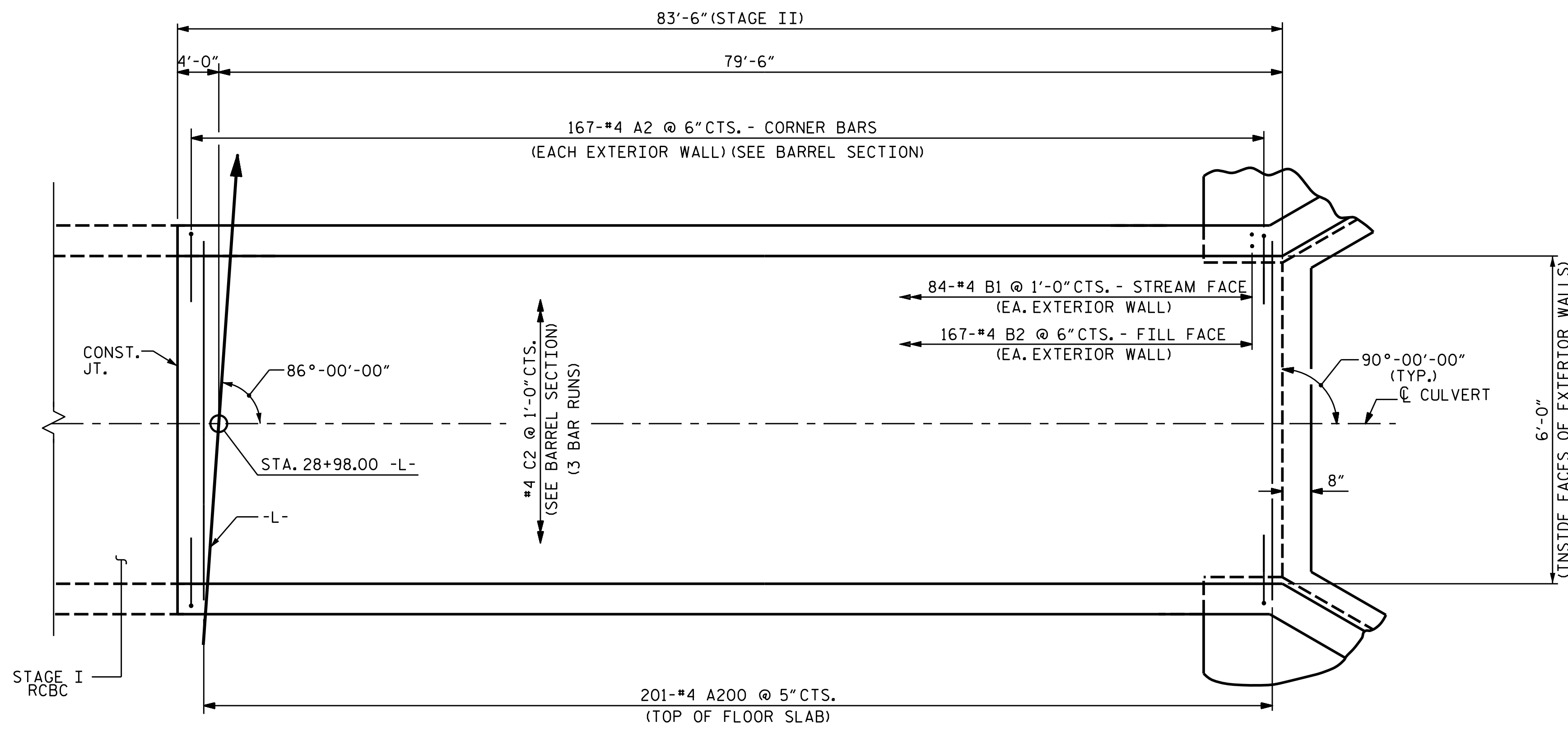
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



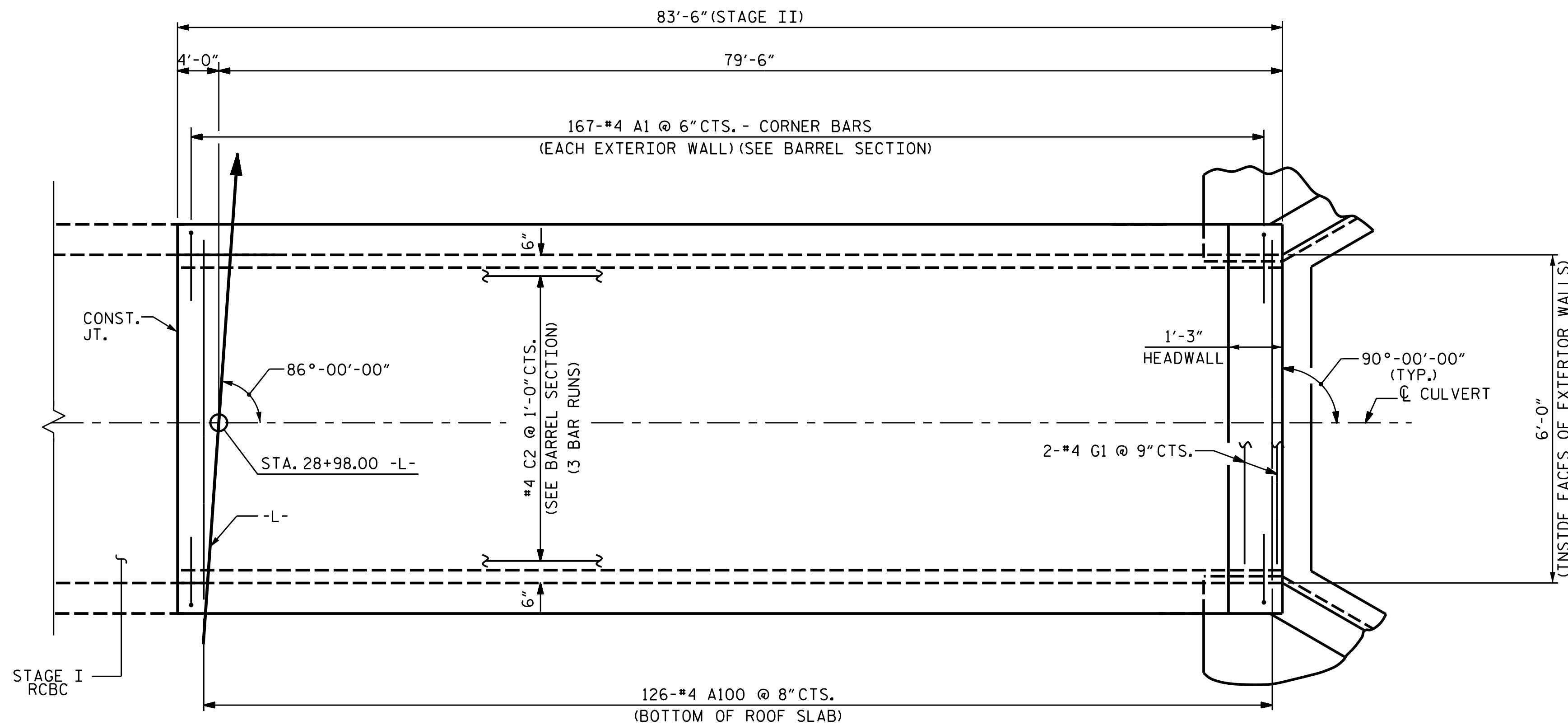
PROJECT NO. R-3100B
CATAWBA COUNTY
 STATION: 28+98.00 -L-
 SHEET 4 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**SINGLE 6 FT. X 7 FT.
 CONCRETE BOX CULVERT
 STAGE I**

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-30
1			3			TOTAL SHEETS
2			4			47



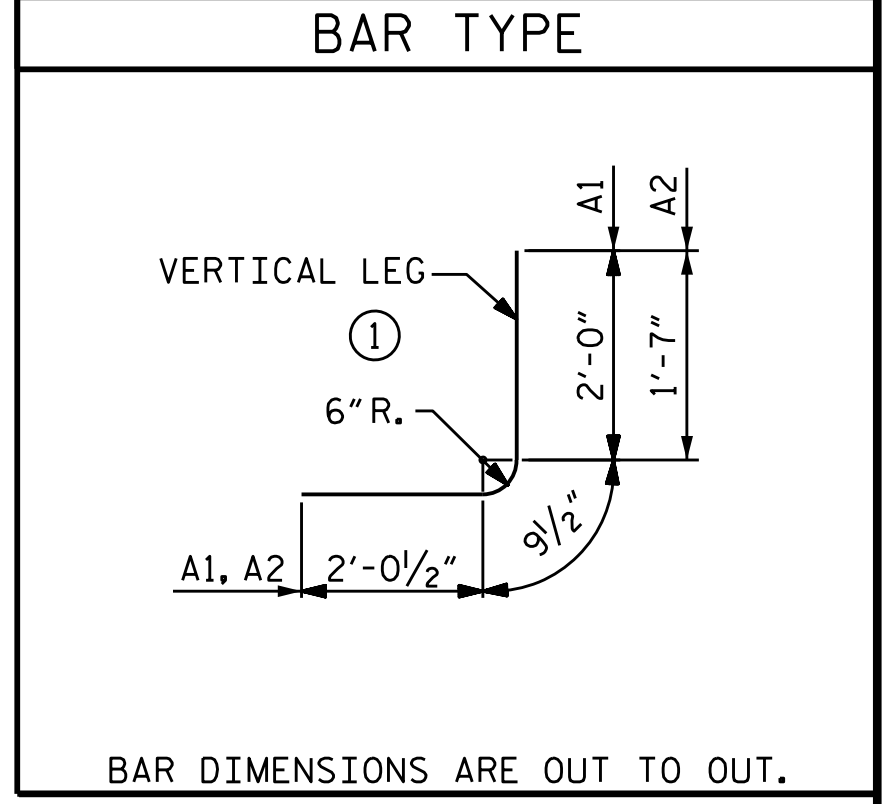
PLAN OF FLOOR SLAB
STAGE II



PLAN OF ROOF SLAB
STAGE II

STAGE II QUANTITIES		
CLASS A CONCRETE		
BARREL @	0.712	59.5 C.Y.
WINGS, ETC.		9.2 C.Y.
SILL		0.2 C.Y.
TOTAL		68.9 C.Y.
REINFORCING STEEL		
BARREL		7,746 LBS.
WINGS, ETC.		576 LBS.
TOTAL		8,322 LBS.

BAR SCHEDULE					
STAGE II					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	334	#4	1	4'-10"	1078
A2	334	#4	1	4'-5"	985
A100	126	#4	STR.	6'-11"	582
A200	201	#4	STR.	6'-11"	929
B1	168	#4	STR.	7'-10"	879
B2	334	#4	STR.	6'-4"	1413
C2	96	#4	STR.	29'-1"	1865
D1	3	#6	STR.	1'-3"	6
G1	2	#4	STR.	7'-0"	9
REINFORCING STEEL				LBS.	7,746



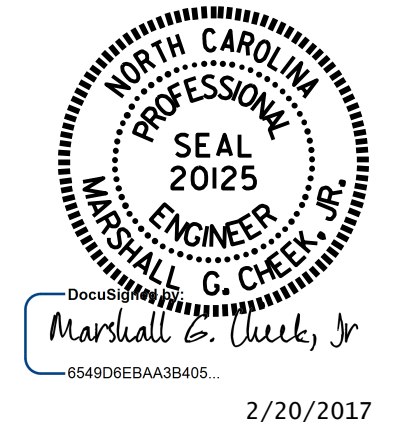
SPLICE LENGTH		
BAR	SIZE	SPLICE LENGTH
B1	#4	1'-5"
C2	#4	1'-11"

PROJECT NO. R-3100B
CATAWBA COUNTY
 STATION: 28+98.00 -L-

SHEET 5 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

**SINGLE 6 FT. X 7 FT.
 CONCRETE BOX CULVERT
 STAGE II**

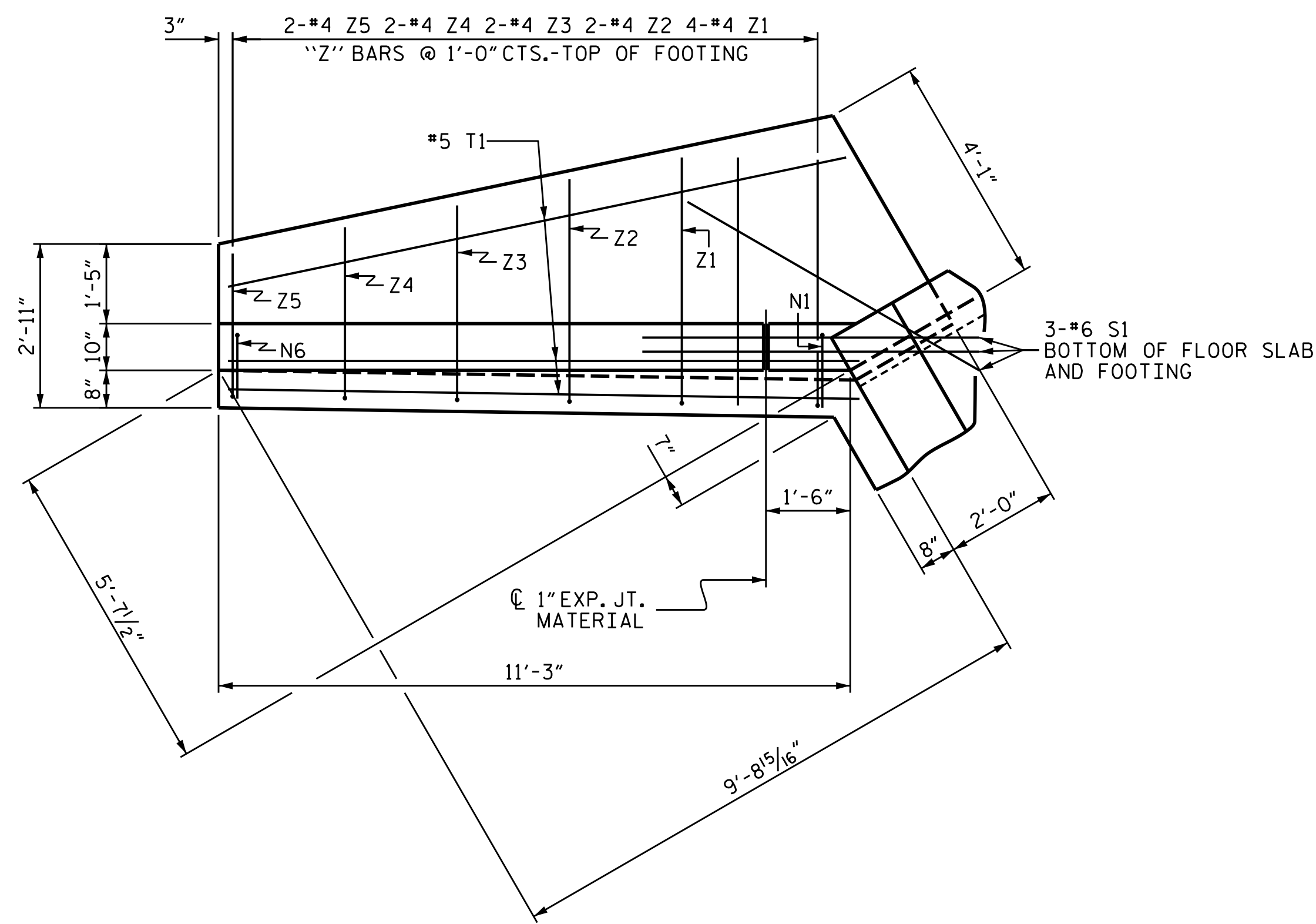


2/20/2017

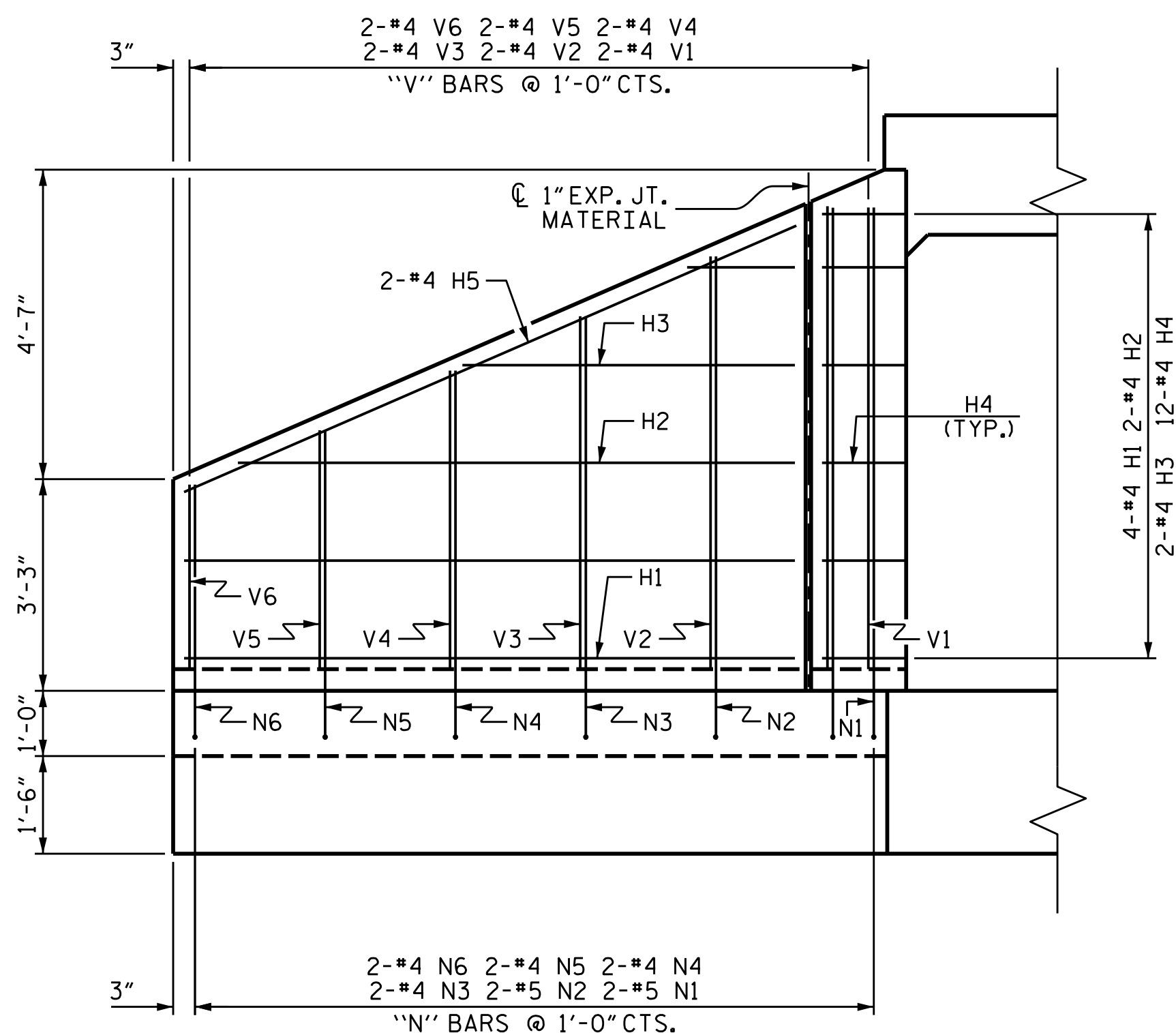
DRAWN BY: J.K. BOWLES DATE: 2/5/2015
 CHECKED BY: H.A. LOCKLEAR DATE: 7/12/2016
 DESIGN ENGINEER OF RECORD: J.K. BOWLES DATE: 12/2016

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
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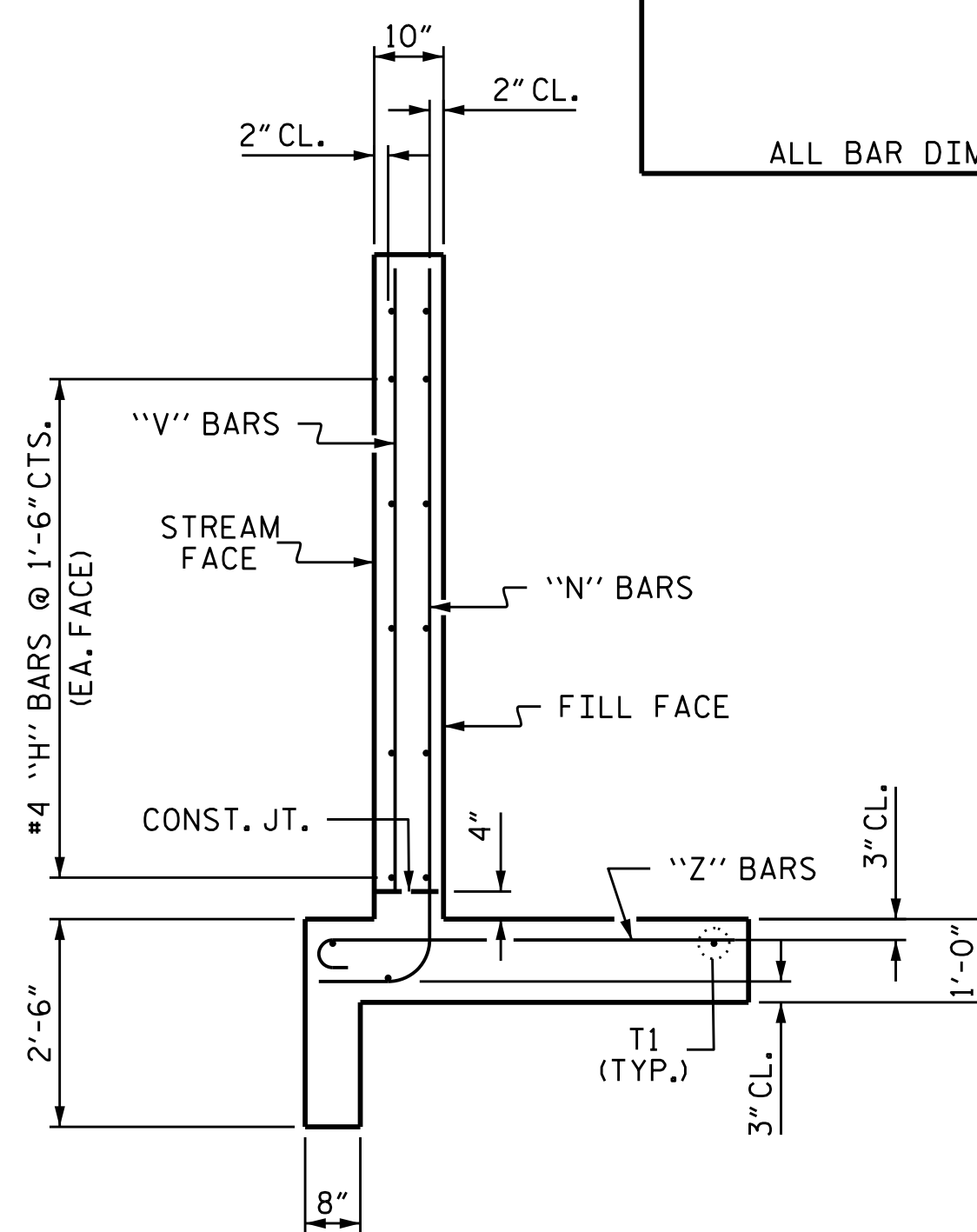
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-31
1			3			TOTAL SHEETS
2			4			47



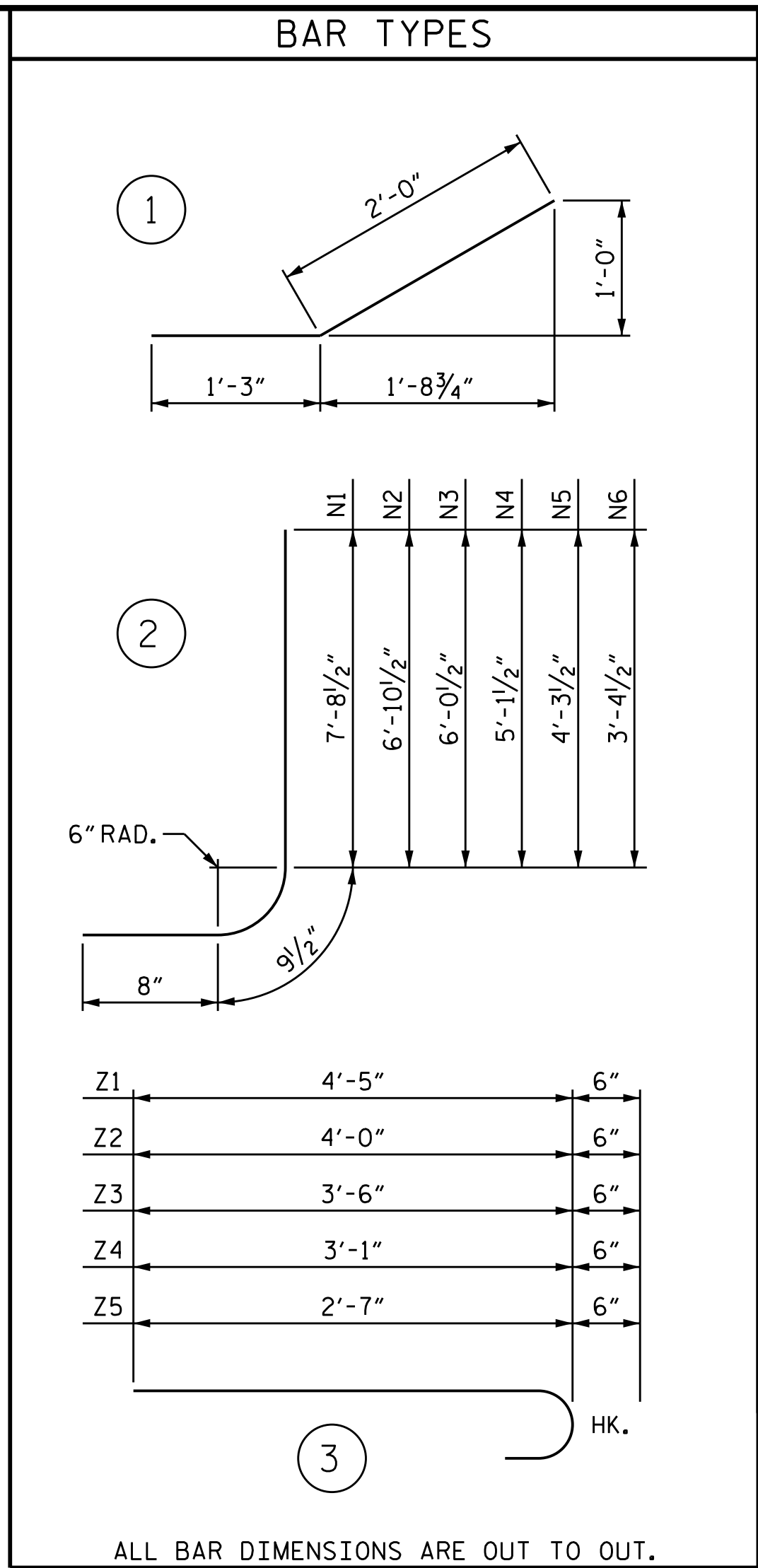
PLAN



ELEVATION



TYPICAL WING SECTION



ALL BAR DIMENSIONS ARE OUT TO OUT.

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.

BILL OF MATERIAL						BILL OF MATERIAL					
STAGE I						STAGE II					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	8	#4	STR.	9'-4"	50	H1	8	#4	STR.	9'-4"	50
H2	4	#4	STR.	8'-6"	23	H2	4	#4	STR.	8'-6"	23
H3	4	#4	STR.	5'-1"	14	H3	4	#4	STR.	5'-1"	14
H4	24	#4	1	3'-3"	52	H4	24	#4	1	3'-3"	52
H5	4	#4	STR.	10'-3"	27	H5	4	#4	STR.	10'-3"	27
N1	4	#5	2	9'-2"	38	N1	4	#5	2	9'-2"	38
N2	4	#5	2	8'-4"	35	N2	4	#5	2	8'-4"	35
N3	4	#4	2	7'-6"	20	N3	4	#4	2	7'-6"	20
N4	4	#4	2	6'-7"	18	N4	4	#4	2	6'-7"	18
N5	4	#4	2	5'-9"	15	N5	4	#4	2	5'-9"	15
N6	4	#4	2	4'-10"	13	N6	4	#4	2	4'-10"	13
S1	6	#6	STR.	6'-0"	54	S1	6	#6	STR.	6'-0"	54
T1	6	#5	STR.	11'-3"	70	T1	6	#5	STR.	11'-3"	70
V1	4	#4	STR.	7'-1"	19	V1	4	#4	STR.	7'-1"	19
V2	4	#4	STR.	6'-4"	17	V2	4	#4	STR.	6'-4"	17
V3	4	#4	STR.	5'-5"	14	V3	4	#4	STR.	5'-5"	14
V4	4	#4	STR.	4'-7"	12	V4	4	#4	STR.	4'-7"	12
V5	4	#4	STR.	3'-8"	10	V5	4	#4	STR.	3'-8"	10
V6	4	#4	STR.	2'-10"	8	V6	4	#4	STR.	2'-10"	8
Z1	8	#4	3	4'-11"	26	Z1	8	#4	3	4'-11"	26
Z2	4	#4	3	4'-6"	12	Z2	4	#4	3	4'-6"	12
Z3	4	#4	3	4'-0"	11	Z3	4	#4	3	4'-0"	11
Z4	4	#4	3	3'-7"	10	Z4	4	#4	3	3'-7"	10
Z5	4	#4	3	3'-1"	8	Z5	4	#4	3	3'-1"	8
TOTAL REINFORCING STEEL FOR 2 WINGS 576 LBS.						TOTAL REINFORCING STEEL FOR 2 WINGS 576 LBS.					
CLASS A CONCRETE 2 WINGS 8.6 C.Y.						CLASS A CONCRETE 2 WINGS 8.6 C.Y.					
1 HEADWALL 0.3 C.Y.						1 HEADWALL 0.3 C.Y.					
1 END CURTAIN WALL 0.3 C.Y.						1 END CURTAIN WALL 0.3 C.Y.					
TOTAL 9.2 C.Y.						TOTAL 9.2 C.Y.					

ASSEMBLED BY : J.K.BOWLES DATE : 2/4/2015
 CHECKED BY : H.A. LOCKLEAR DATE : 7/12/2016
 DRAWN BY : CCJ 10/99
 CHECKED BY : RWW 03/00

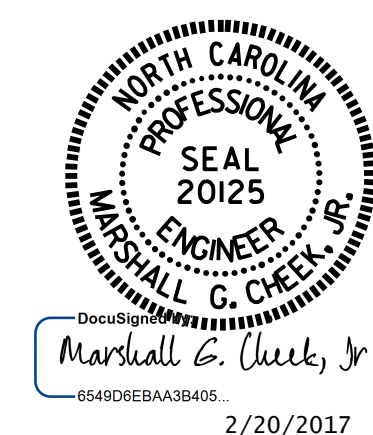
*****SYSTEM*****
 *****DGN*****
 *****USER*****

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 SIGNATURES COMPLETED

REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-32	
1			3			TOTAL SHEETS 47	
2			4				

PROJECT NO. R-3100B
 CATAWBA COUNTY
 STATION: 28+98.00 -L-

SHEET 6 OF 6



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STANDARD WINGS
 FOR
 CONCRETE BOX CULVERT
 H = 7'-0" SLOPE = 2:1
 90° SKEW

CUL. #5 STD. NO. CW9007

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
 DESIGN FILL = 8.68 FEET (MIN.), 9.61 FEET (MAX.).
 FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.
 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
 DURING STAGE I & STAGE II CONSTRUCTION, CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS, CURTAIN WALLS, FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS AND SILLS/BAFFLES.
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.

TRAFFIC ON EXISTING ROAD SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC, THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS SHOWN ON THESE PLANS AND/OR AS DIRECTED BY THE ENGINEER.

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

TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.

AT THE CONTRACTOR'S OPTION, HE MAY 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.

THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE BARS FROM WHICH THE SAMPLES ARE TAKEN MUST THEN BE SPLICED WITH REPLACEMENT BARS OF THE SIZE AND LENGTH OF THE SAMPLE, PLUS A MINIMUM LAP SPLICE OF THIRTY BAR DIAMETERS. PAYMENT FOR THE SAMPLES OF REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.

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

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

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.

FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE ROADWAY PLANS.

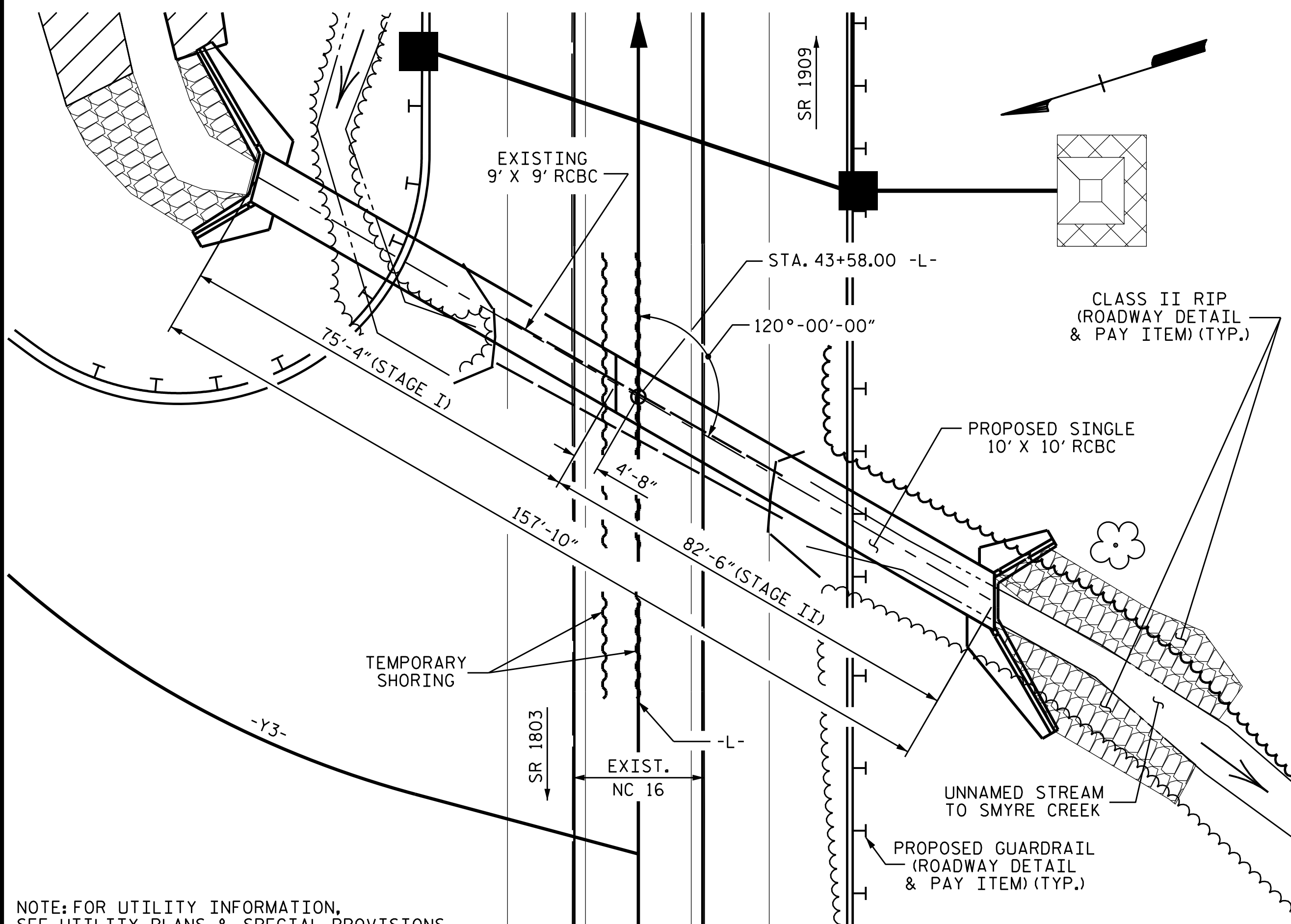
FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.

AFTER SERVING AS A TEMPORARY STRUCTURE, THE EXISTING 9' X 9' X 57' LONG (APPROX.) RCBC AND LOCATED AT THE PROPOSED CULVERT SHALL BE REMOVED. THE EXISTING STRUCTURE IS PRESENTLY NOT POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE STRUCTURE DETERIORATE DURING CONSTRUCTION OF THE PROPOSED STRUCTURE, A LOAD LIMIT MAYBE POSTED AND MAYBE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.

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

THE REINFORCED CONCRETE BOX CULVERT SHALL BE PLACED ON THE STANDARD 12 INCH BLANKET OF FOUNDATION CONDITIONING MATERIAL.

THE REQUIRED BEARING CAPACITY AT THE BASE OF THE CULVERT IS 1.5 TSF. THE REQUIRED BEARING CAPACITY SHALL BE VERIFIED.



NOTE: FOR UTILITY INFORMATION, SEE UTILITY PLANS & SPECIAL PROVISIONS.

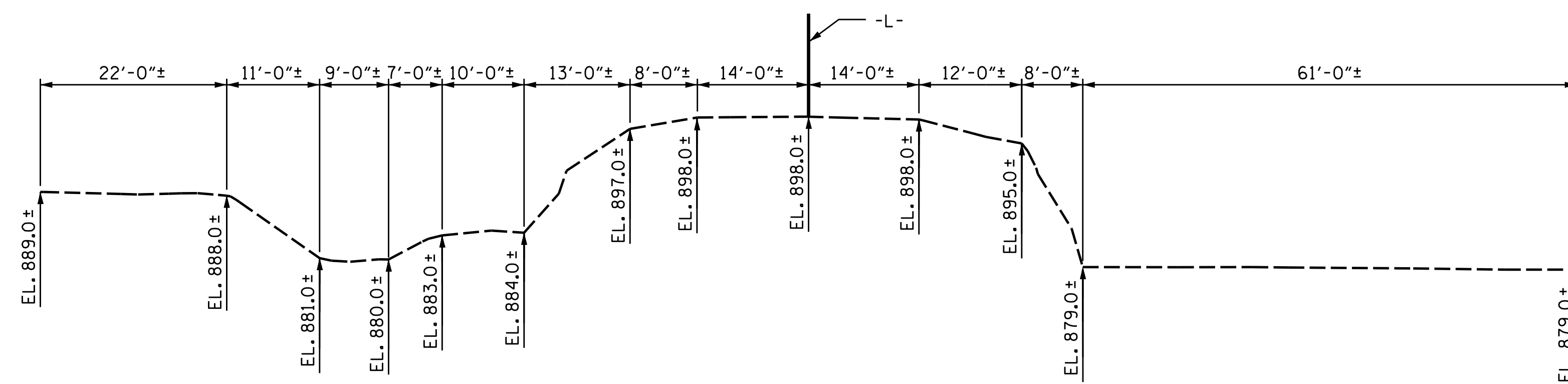
LOCATION SKETCH

ROADWAY DATA	
GRADE POINT ELEV. @ STA. 43+58.00 -L-	= 898.31
BED ELEV. @ STA. 43+58.00 -L-	= 878.75
ROADWAY SLOPES	= 2:1

HYDRAULIC DATA	
DESIGN DISCHARGE	= 650 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEV.	= 889.5
DRAINAGE AREA	= 0.72 SQ. MI.
BASE DISCHARGE (Q100)	= 800 C.F.S.
BASE HIGH WATER ELEV.	= 890.68

OVERTOPPING FLOOD DATA	
OVERTOPPING DISCHARGE	= 1500 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YR.
OVERTOPPING FLOOD ELEV.	= 897.5

TOTAL STRUCTURE QUANTITIES	
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	
STAGE I	81 TONS
STAGE II	89 TONS
TOTAL	170 TONS
CLASS A CONCRETE	
STAGE I	106.1 C.Y.
STAGE II	116.1 C.Y.
TOTAL	222.2 C.Y.
REINFORCING STEEL	
STAGE I	16,208 LBS.
STAGE II	17,581 LBS.
TOTAL	33,789 LBS.



PROFILE ALONG CULVERT

DRAWN BY : A. SORSENGINH DATE : 11/2016
 CHECKED BY : H. T. BARBOUR DATE : 11/2016
 DESIGN ENGINEER OF RECORD: J. BOWLES DATE : 11/2016

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. R-3100B
 CATAWBA COUNTY
 STATION: 43+58.00 -L-

SHEET 1 OF 9



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE 10 FT. X 10 FT. CONCRETE BOX CULVERT
 120° SKEW

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

TOTAL SHEETS: 47

**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		
						MOMENT				SHEAR						
						LIVE-LOAD FACTORS (fLL)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	1	1.11	--	1.75	1.40	1	TOP SLAB	5.33	1.11	1	TOP SLAB	0.84		
	HL-93 (OPERATING)	N/A		1.44	--	1.35	1.81	1	TOP SLAB	5.33	1.44	1	TOP SLAB	0.84		
	HS-20 (INVENTORY)	36.00	2	1.67	60.28	1.75	1.98	1	EXTERIOR WALL	5.65	1.67	1	TOP SLAB	0.84		
	HS-20 (OPERATING)	36.00		2.17	78.14	1.35	2.57	1	EXTERIOR WALL	5.65	2.17	1	TOP SLAB	0.84		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		2.47	33.41	1.40	2.47	1	EXTERIOR WALL	5.65	3.03	1	BOTTOM SLAB	0.93		
		SNGARBS2	20.00		2.47	49.50	1.40	2.47	1	EXTERIOR WALL	5.65	2.84	1	BOTTOM SLAB	0.93	
		SNAGRIS2	22.00		2.47	54.45	1.40	2.47	1	EXTERIOR WALL	5.65	3.03	1	BOTTOM SLAB	0.93	
		SNCOTTS3	27.25	3	1.39	37.88	1.40	1.75	1	TOP SLAB	5.33	1.39	1	TOP SLAB	0.84	
		SNAGGRS4	34.93		1.53	53.45	1.40	1.81	1	TOP SLAB	5.33	1.53	1	TOP SLAB	0.84	
		SNS5A	35.55		1.54	54.86	1.40	1.87	1	TOP SLAB	5.33	1.54	1	TOP SLAB	0.84	
		SNS6A	39.95		1.54	61.65	1.40	1.87	1	TOP SLAB	5.33	1.54	1	TOP SLAB	0.84	
	SNS7B	42.00		1.54	64.82	1.40	1.87	1	TOP SLAB	5.33	1.54	1	TOP SLAB	0.84		
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.00		2.40	79.07	1.40	2.47	1	EXTERIOR WALL	5.65	2.40	1	TOP SLAB	0.84	
		TNT4A	33.08		1.66	54.76	1.40	2.08	1	TOP SLAB	5.33	1.66	1	TOP SLAB	0.84	
		TNT6A	41.60		1.52	63.13	1.40	1.82	1	TOP SLAB	5.33	1.52	1	TOP SLAB	9.82	
		TNT7A	42.00		1.61	67.69	1.40	1.99	1	TOP SLAB	5.33	1.61	1	TOP SLAB	9.82	
		TNT7B	42.00		1.54	64.82	1.40	1.87	1	TOP SLAB	5.33	1.54	1	TOP SLAB	9.82	
		TNAGRIT4	43.00		1.58	68.09	1.40	1.99	1	TOP SLAB	5.33	1.58	1	TOP SLAB	0.84	
TNAGT5A		45.00		1.63	73.17	1.40	2.03	1	TOP SLAB	5.33	1.63	1	TOP SLAB	0.84		
TNAGT5B	45.00		1.66	74.50	1.40	2.08	1	TOP SLAB	5.33	1.66	1	TOP SLAB	0.84			

LOAD FACTORS

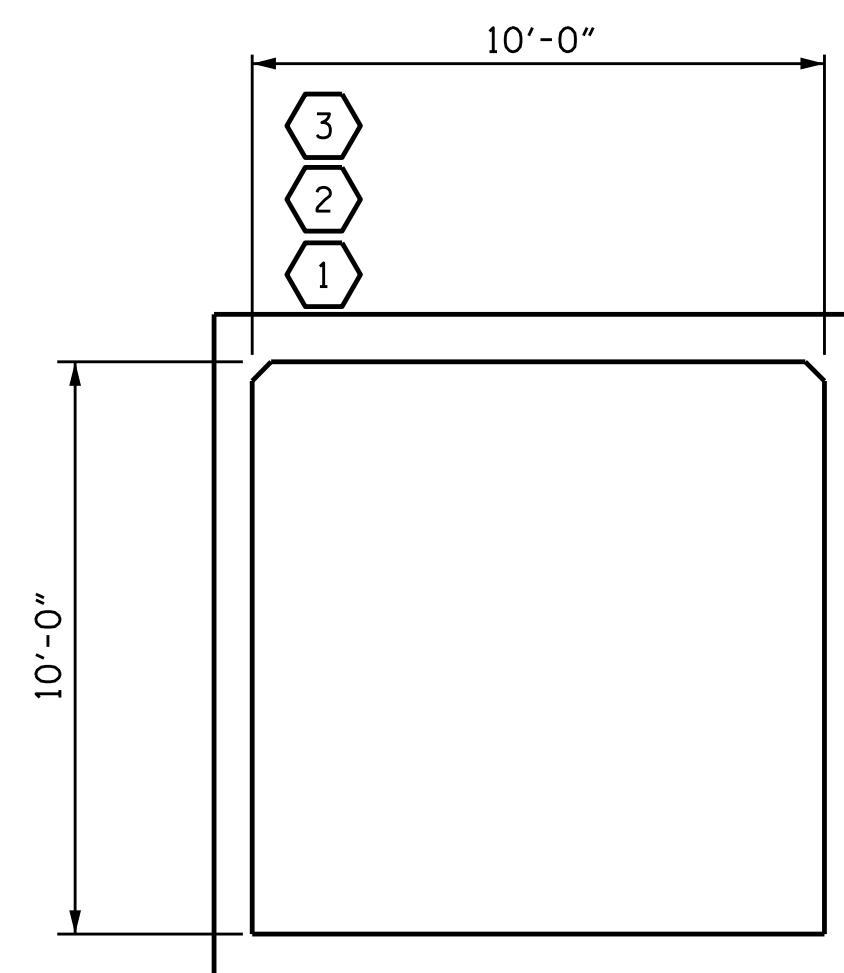
DESIGN LOAD RATING FACTORS

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

NOTE

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

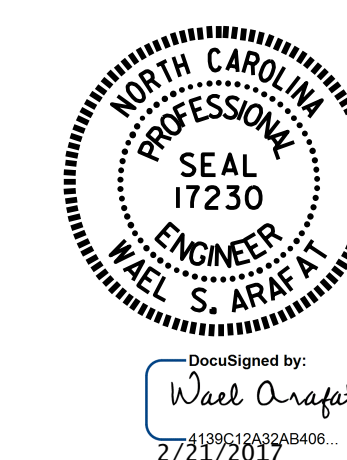
#	CONTROLLING LOAD RATING
1	DESIGN LOAD RATING (HL-93)
2	DESIGN LOAD RATING (HS-20)
3	LEGAL LOAD RATING **
** SEE CHART FOR VEHICLE TYPE	



LRFR SUMMARY

PROJECT NO. R-3100B
CATAWBA COUNTY
 STATION: 43+58.00 -L-

SHEET 2 OF 9

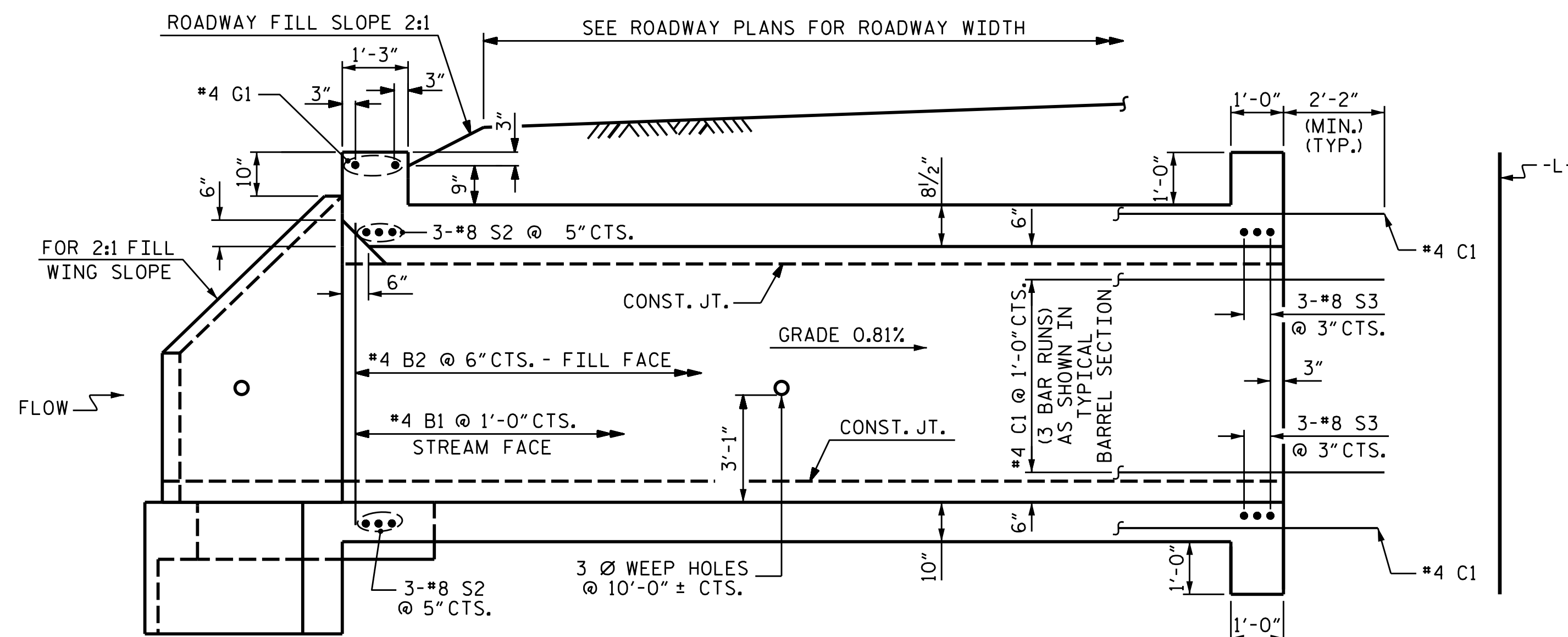


STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STANDARD
 LRFR SUMMARY FOR
 REINFORCED CONCRETE
 BOX CULVERTS
 (NON-INTERSTATE TRAFFIC)

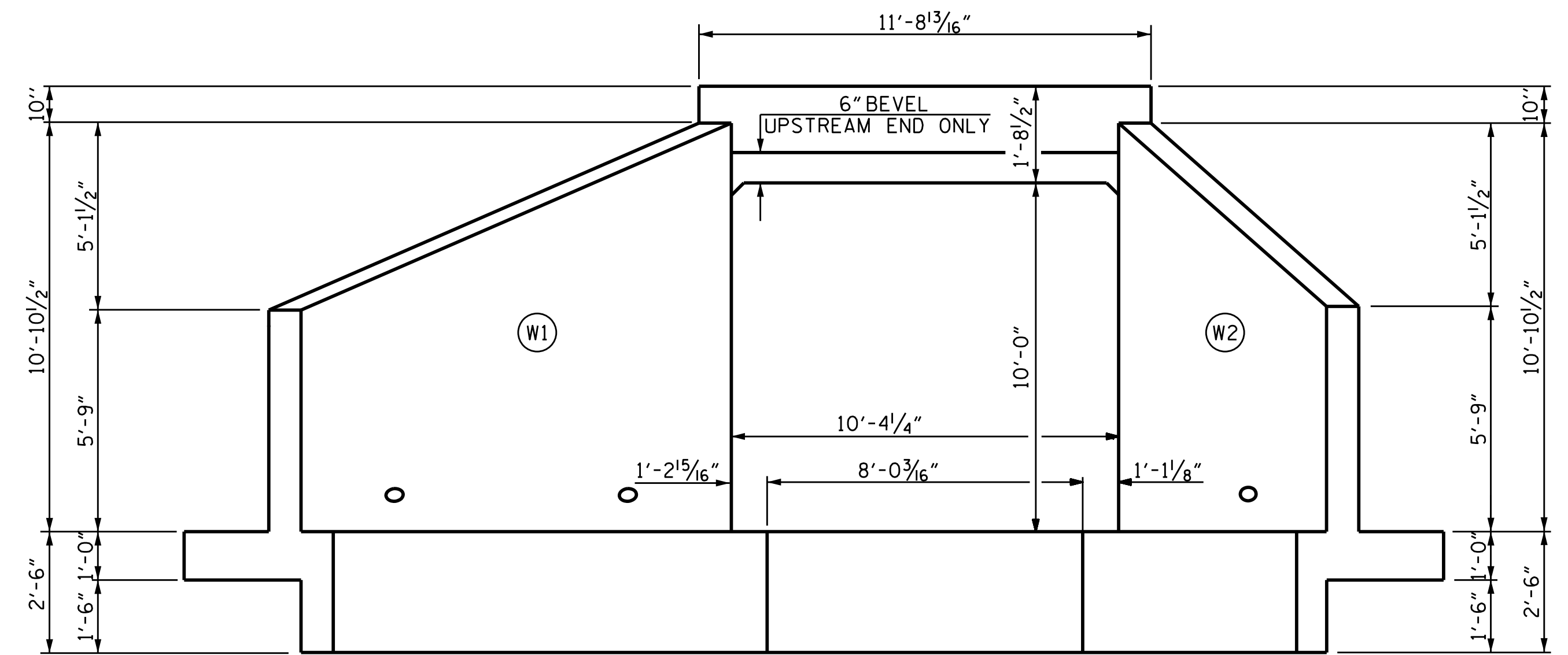
ASSEMBLED BY : A. SORSENGIH	DATE : 11/2016
CHECKED BY : H. T. BARBOUR	DATE : 11/2016
DRAWN BY : WMC	7/11
CHECKED BY : GM	7/11
REV. 10/1/11	MAA/GM
DESIGN ENGINEER OF RECORD: J. BOWLES	DATE : 11/2016

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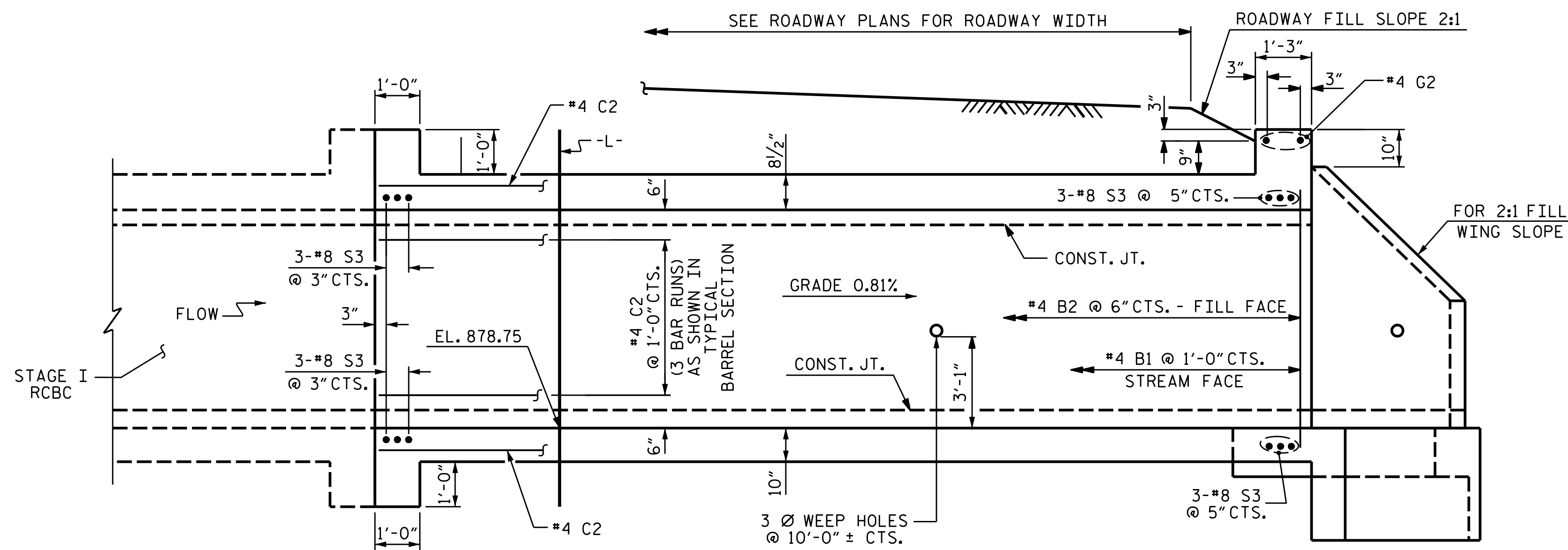
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NO.	BY:	DATE:	NO.	BY:	DATE:	TOTAL SHEETS
1			3			C-34
2			4			47



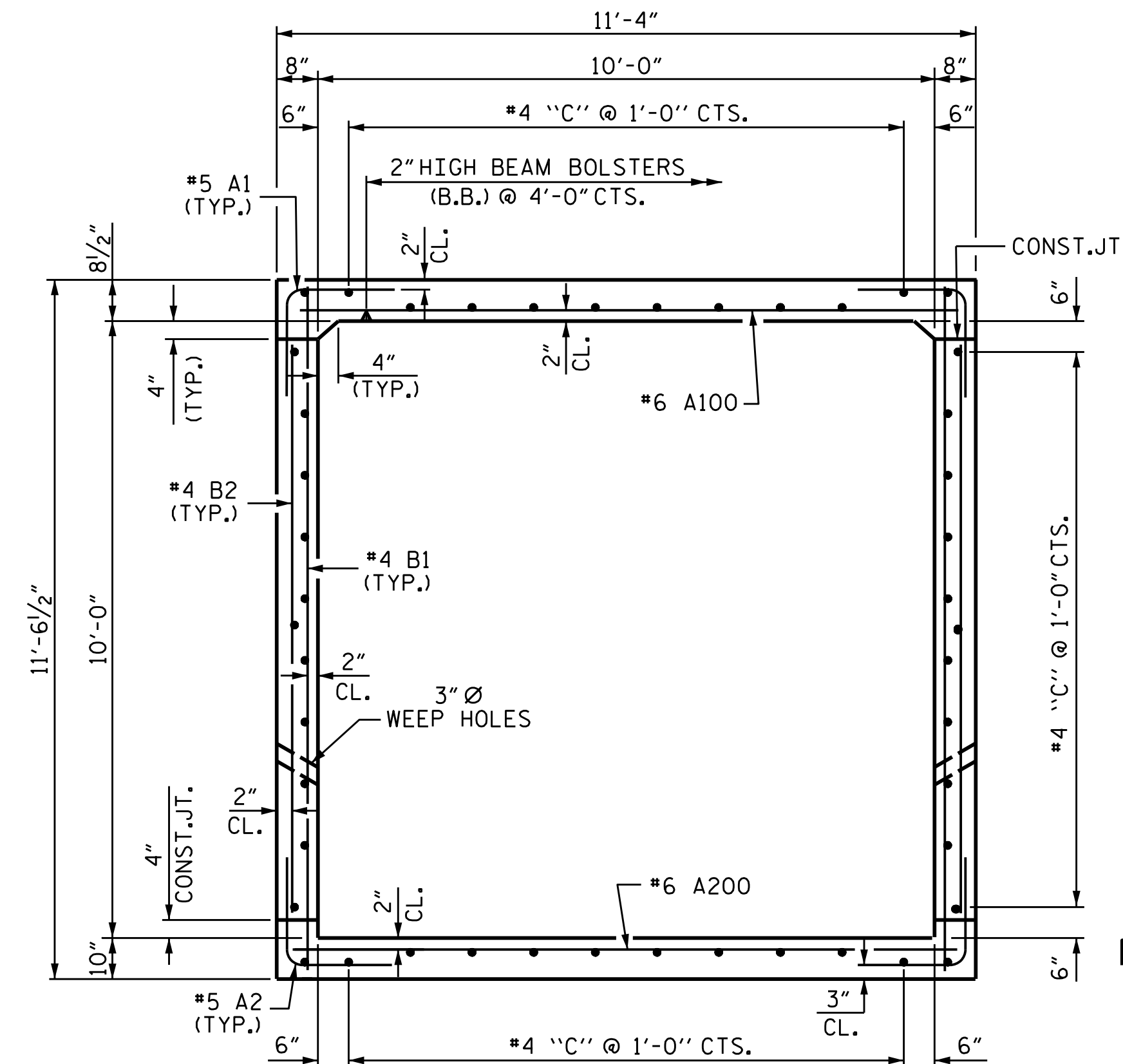
CULVERT SECTION NORMAL TO ROADWAY
STAGE I



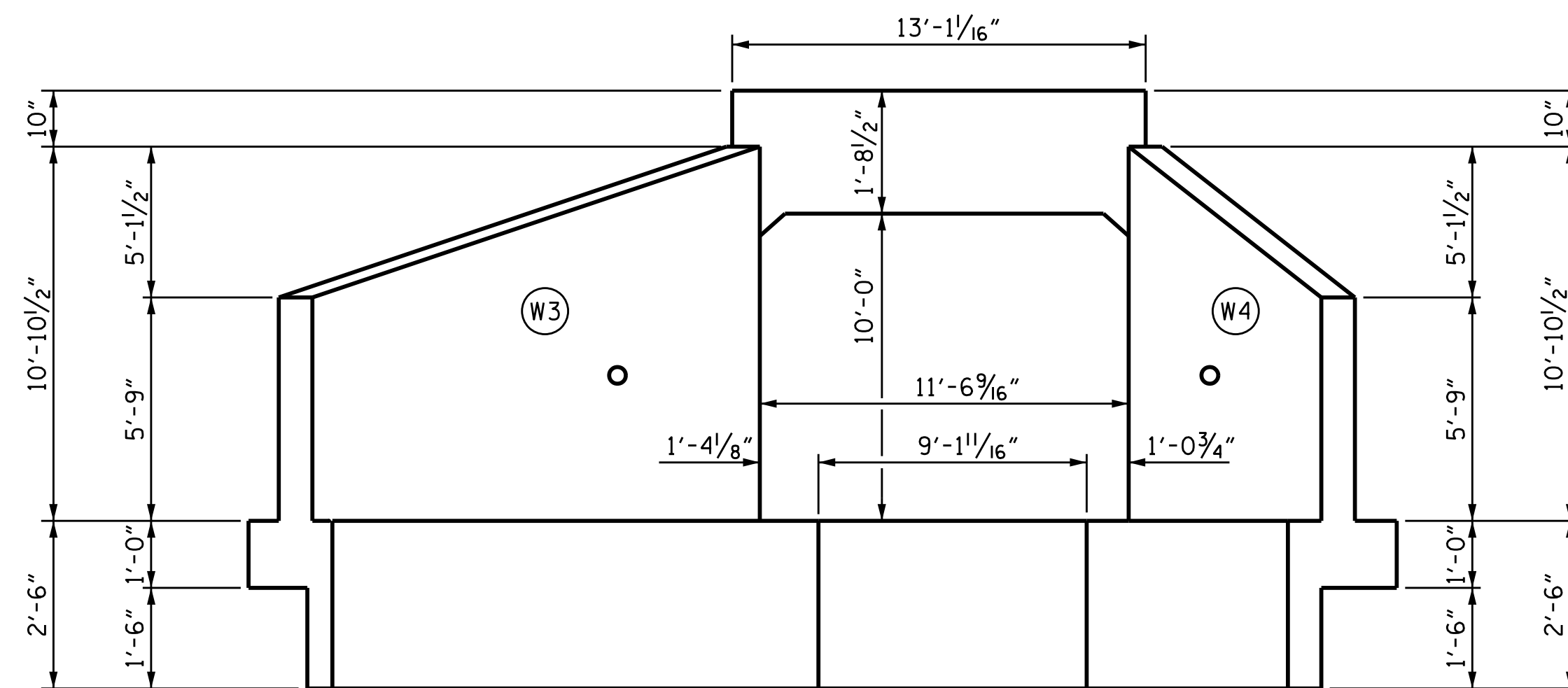
INLET END ELEVATION NORMAL TO SKEW



CULVERT SECTION NORMAL TO ROADWAY
STAGE II



RIGHT ANGLE SECTION OF BARREL
THERE ARE 46 "C" BARS IN SECTION OF BARREL



OUTLET END ELEVATION NORMAL TO SKEW

REVISED 8-28-92 BY E.L.R. CHECKED BY G.R.P.
 REVISED 8-22-99 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.

DRAWN BY : A. SORSENGINH DATE : 11/2016
 CHECKED BY : H. T. BARBOUR DATE : 11/2016
 DESIGN ENGINEER OF RECORD : J. BOWLES DATE : 11/2016

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 SIGNATURES COMPLETED



PROJECT NO. R-3100B
 CATAWBA COUNTY
 STATION: 43+58.00 -L-

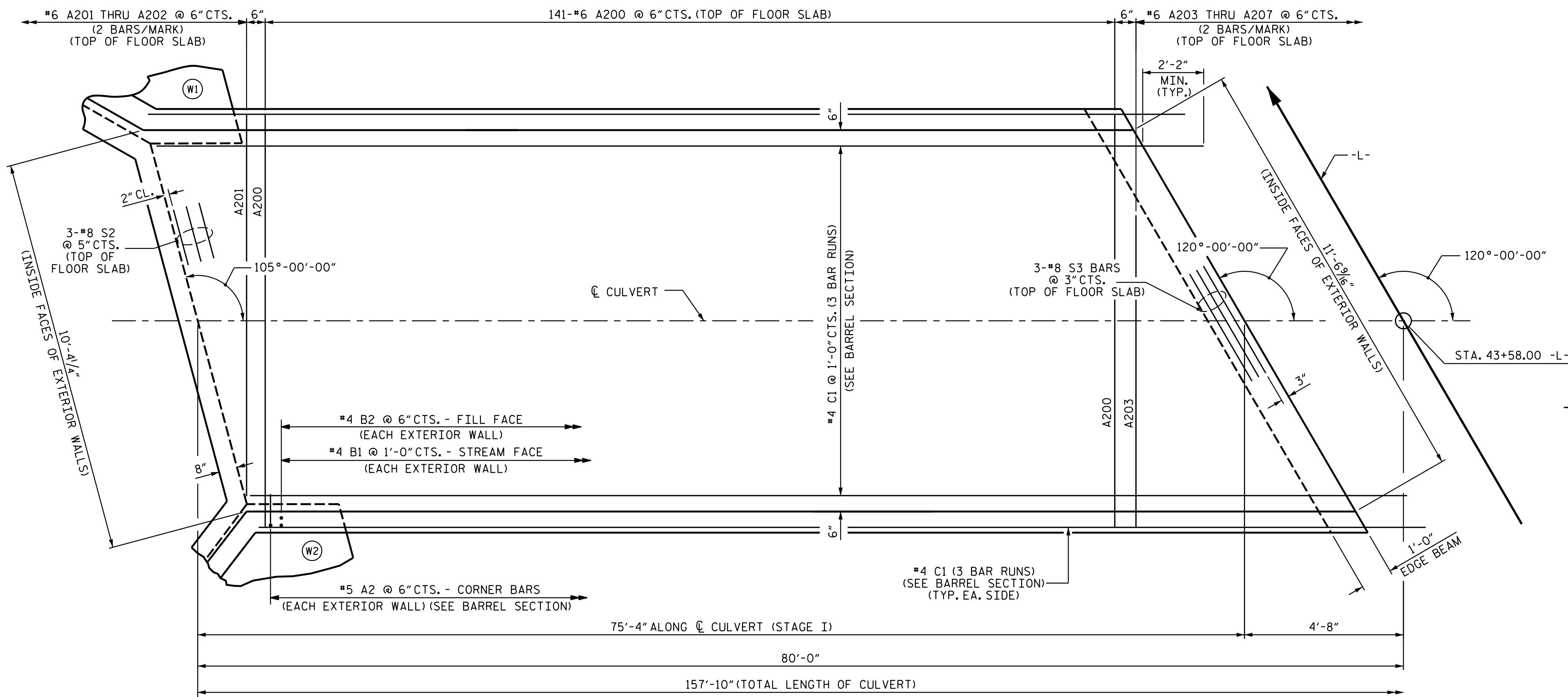
SHEET 3 OF 9

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE 10 FT. X 10 FT.
 CONCRETE BOX CULVERT
 STAGE I & II
 120° SKEW

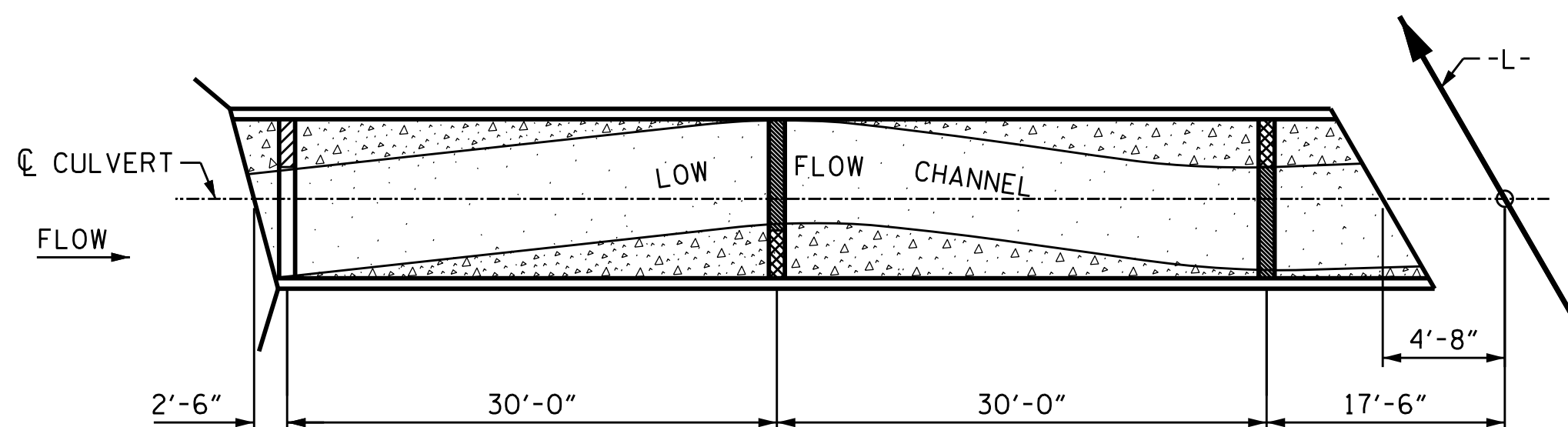
REVISIONS				SHEET NO.
NO.	BY:	DATE:	NO.	DATE:
1			3	
2			4	

TOTAL SHEETS 47

CUL. #6

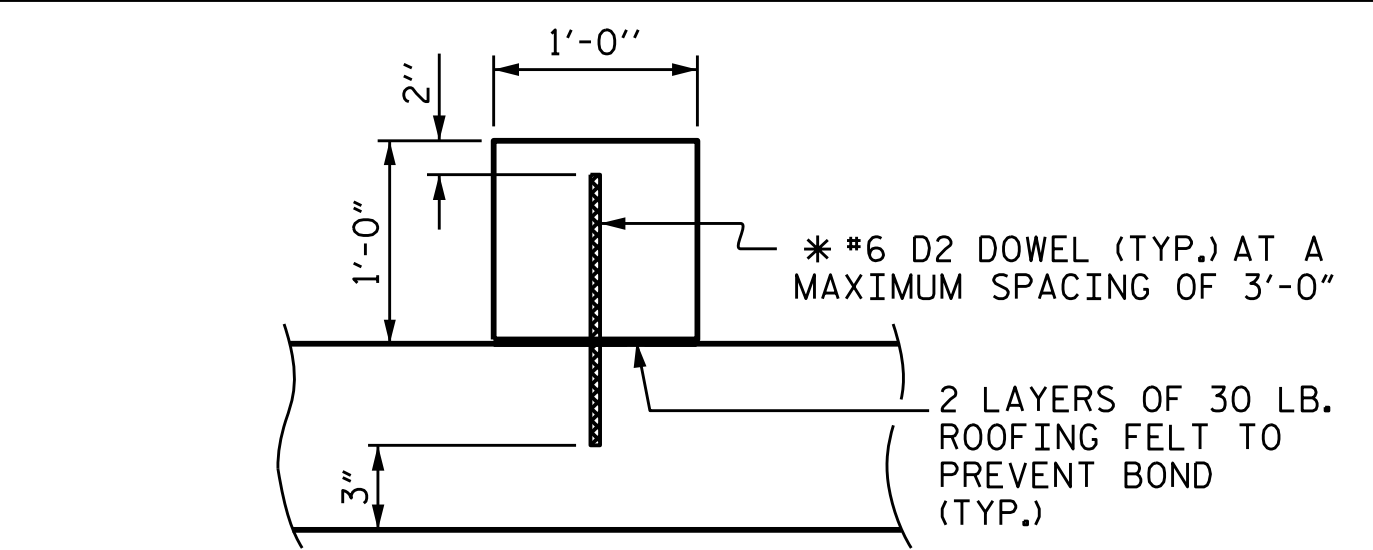


PLAN OF FLOOR SLAB
STAGE I



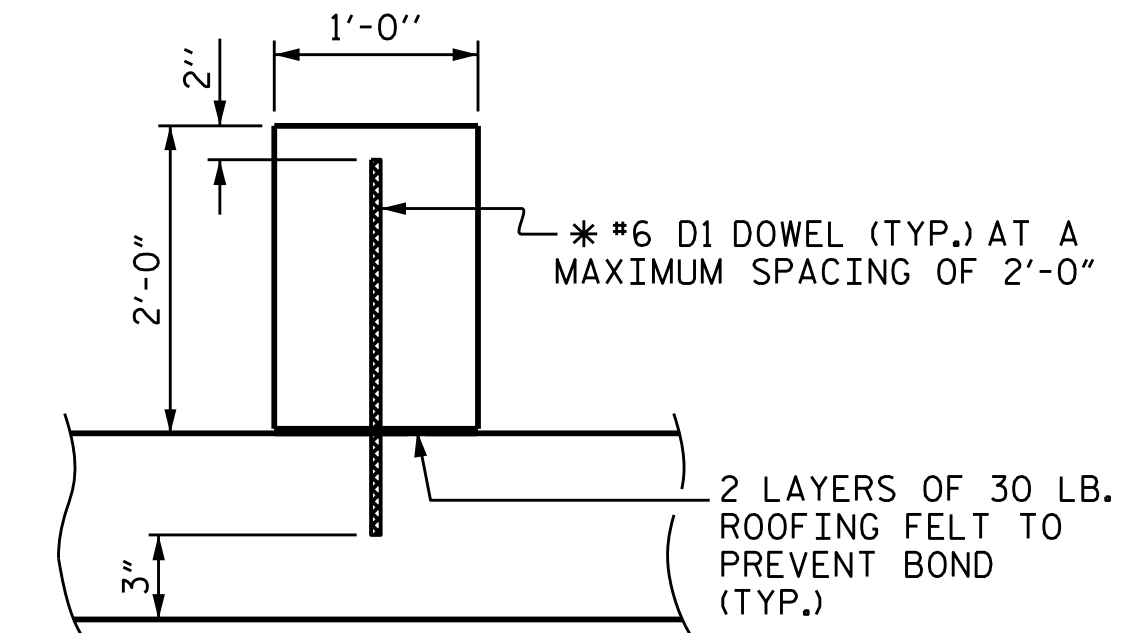
PLAN OF SILL & BAFFLE LOCATIONS
STAGE I

- HIGH SILL
- HIGH BAFFLE
- LOW SILL
- LOW BAFFLE

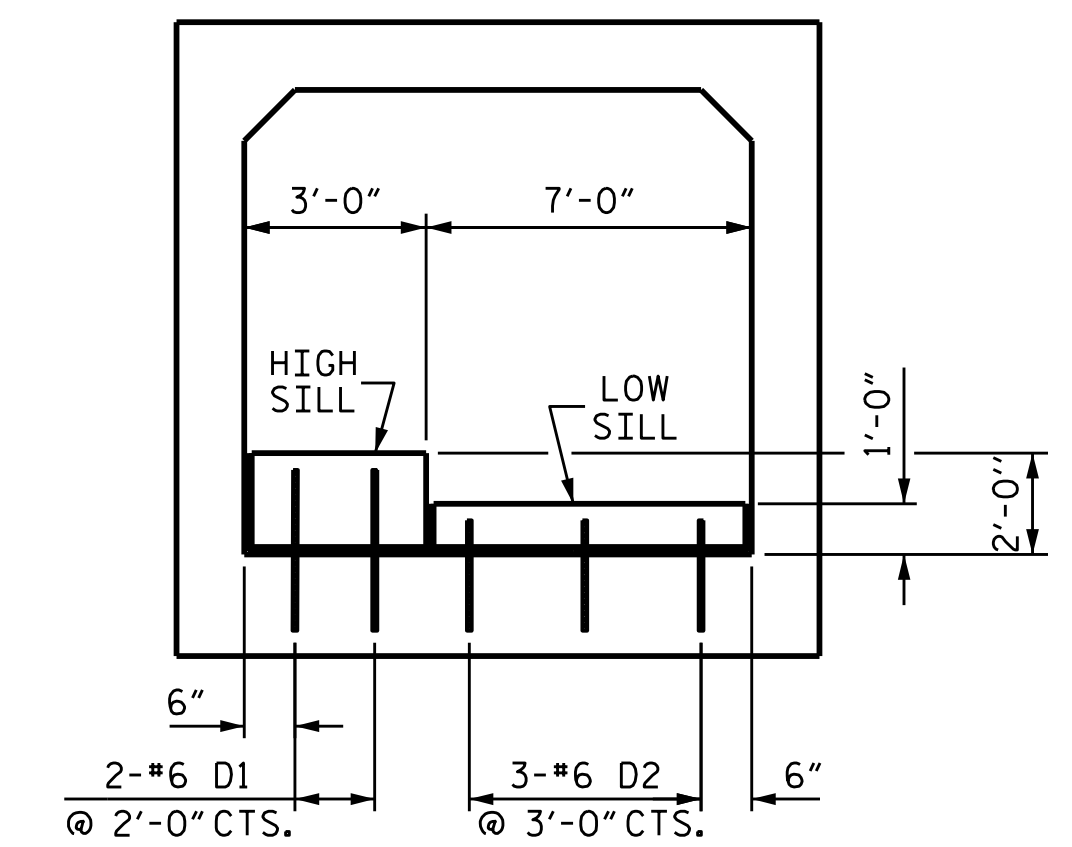


SECTION THROUGH 1'-0" SILL & BAFFLE

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



SECTION THROUGH 2'-0" SILL & BAFFLE



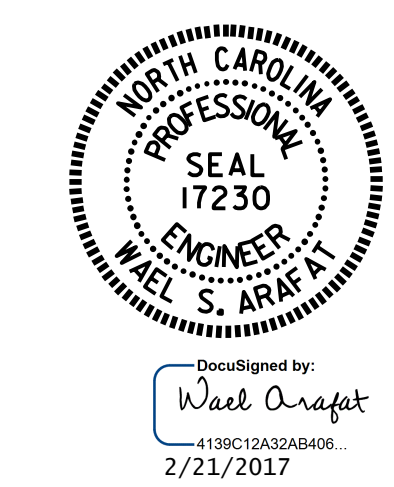
ELEVATION
CULVERT SILL DETAILS
INTLET END
(LOOKING DOWNSTREAM)

NOTES

- MATERIAL EXCAVATED FROM THE EXISTING STREAMBED SHALL BE STOCKPILED FOR USE IN THE THE PROPOSED CULVERT AS SHOWN IN THE PLAN VIEW. BED MATERIAL SHALL BE SUPPLEMENTED WITH CLASS I RIP RAP AS NECESSARY. BED MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER.
- THE ENTIRE COST OF WORK REQUIRED TO PLACE THE EXCAVATED MATERIAL OR THE SUPPLEMENTAL MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR CULVERT EXCAVATION.
- THE ENTIRE COST OF WORK REQUIRED TO CONSTRUCT THE SILLS SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.
- THE STEAMBED MATERIAL SHOULD BE PLACED LEVEL WITH THE TOP OF THE SILLS.

PROJECT NO. R-3100B
CATAWBA COUNTY
STATION: 43+58.00 -L-

SHEET 4 OF 9



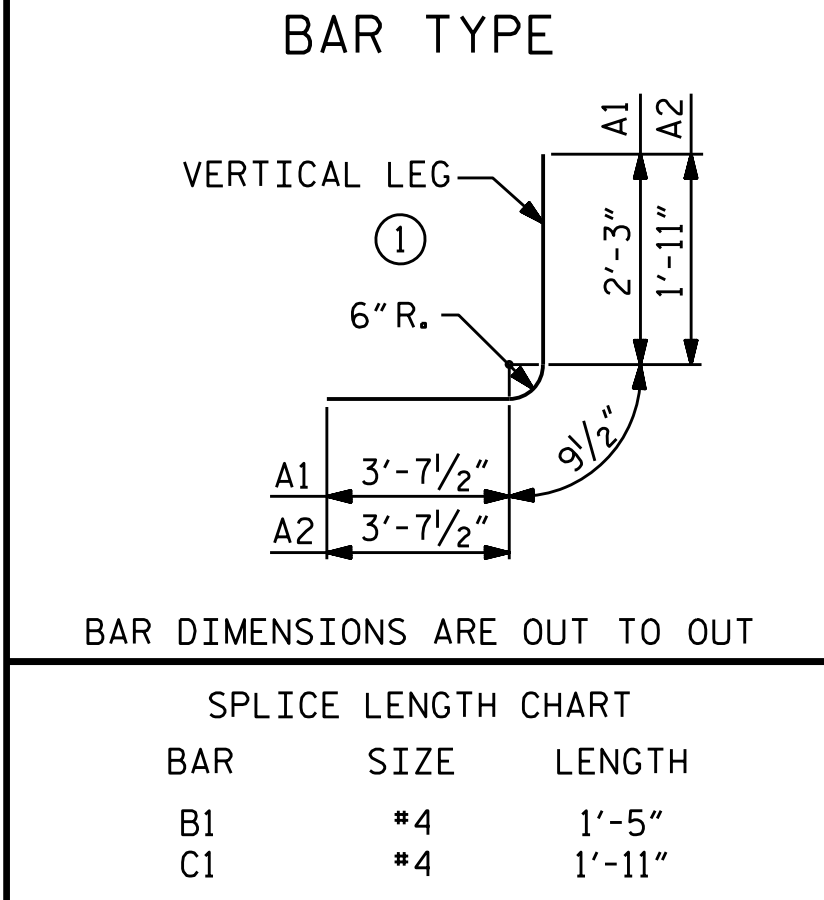
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
SINGLE 10 FT. X 10 FT.
CONCRETE BOX CULVERT
STAGE I

ASSEMBLED BY : A. SORSENGINH DATE : 11/2016
CHECKED BY : H. T. BARBOUR DATE : 11/2016
DESIGN ENGINEER OF RECORD: J. BOWLES DATE : 11/2016

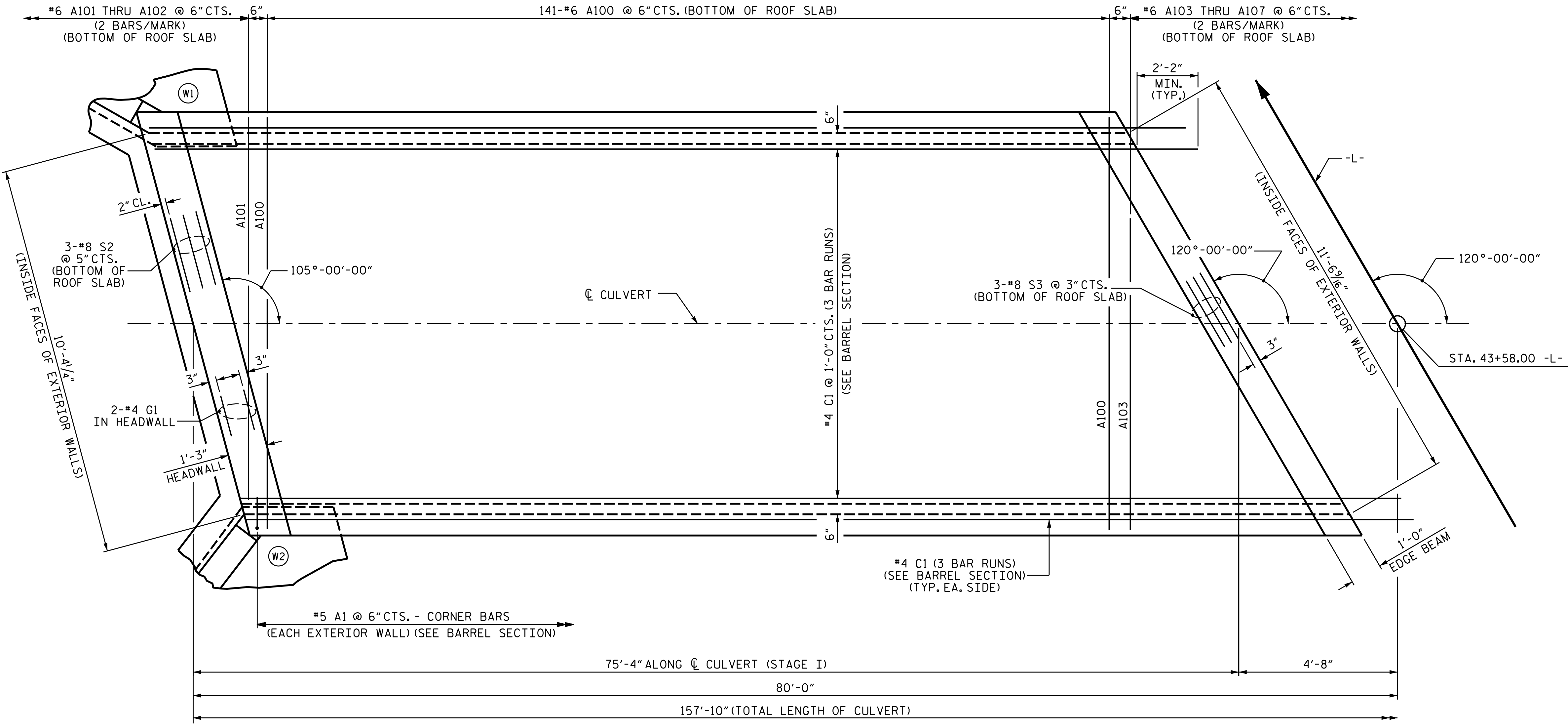
DOCUMENT NOT CONSIDERED
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SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-36
1			3			TOTAL SHEETS
2			4			47

STAGE I QUANTITIES		
CLASS A CONCRETE		
BARREL @ 1.145	CY/FT	86.3 C.Y.
WINGS, ETC.		18.4 C.Y.
SILLS & BAFFLES		1.4 C.Y.
TOTAL		106.1 C.Y.
REINFORCING STEEL		
BARREL	14,973	LBS.
WINGS, ETC.	1,235	LBS.
TOTAL	16,208	LBS.
FOUNDATION CONDITIONING MATERIAL	81	TONS
CULVERT EXCAVATION		LUMP SUM

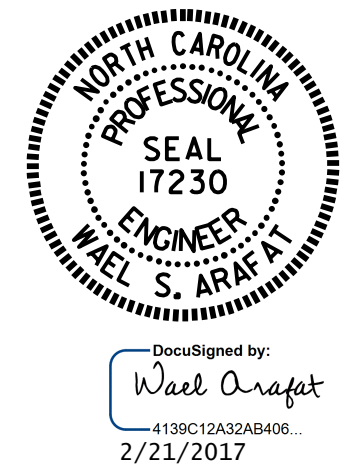


BAR SCHEDULE					
STAGE I					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	301	#5	1	6'-8"	2093
A2	301	#5	1	6'-4"	1988
A100	141	#6	STR	11'-0"	2330
A101	2	#6	STR	7'-10"	24
A102	2	#6	STR	4'-1"	12
A103	2	#6	STR	9'-6"	29
A104	2	#6	STR	7'-9"	23
A105	2	#6	STR	6'-1"	18
A106	2	#6	STR	4'-4"	13
A107	2	#6	STR	2'-7"	8
A200	141	#6	STR	11'-0"	2330
A201	2	#6	STR	7'-10"	24
A202	2	#6	STR	4'-1"	12
A203	2	#6	STR	9'-6"	29
A204	2	#6	STR	7'-9"	23
A205	2	#6	STR	6'-1"	18
A206	2	#6	STR	4'-4"	13
A207	2	#6	STR	2'-7"	8
B1	151	#4	STR	11'-0"	1110
B2	301	#4	STR	9'-4"	1877
C1	138	#4	STR	27'-8"	2550
D1	6	#6	STR	2'-5"	22
D2	9	#6	STR	1'-5"	19
G1	2	#4	STR	11'-4"	15
S2	6	#8	STR	11'-4"	182
S3	6	#8	STR	12'-8"	203
REINFORCING STEEL					= 14,973 LBS.



PLAN OF ROOF SLAB
STAGE I

PROJECT NO. R-3100B
CATAWBA COUNTY
STATION: 43+58.00 -L-
SHEET 5 OF 9



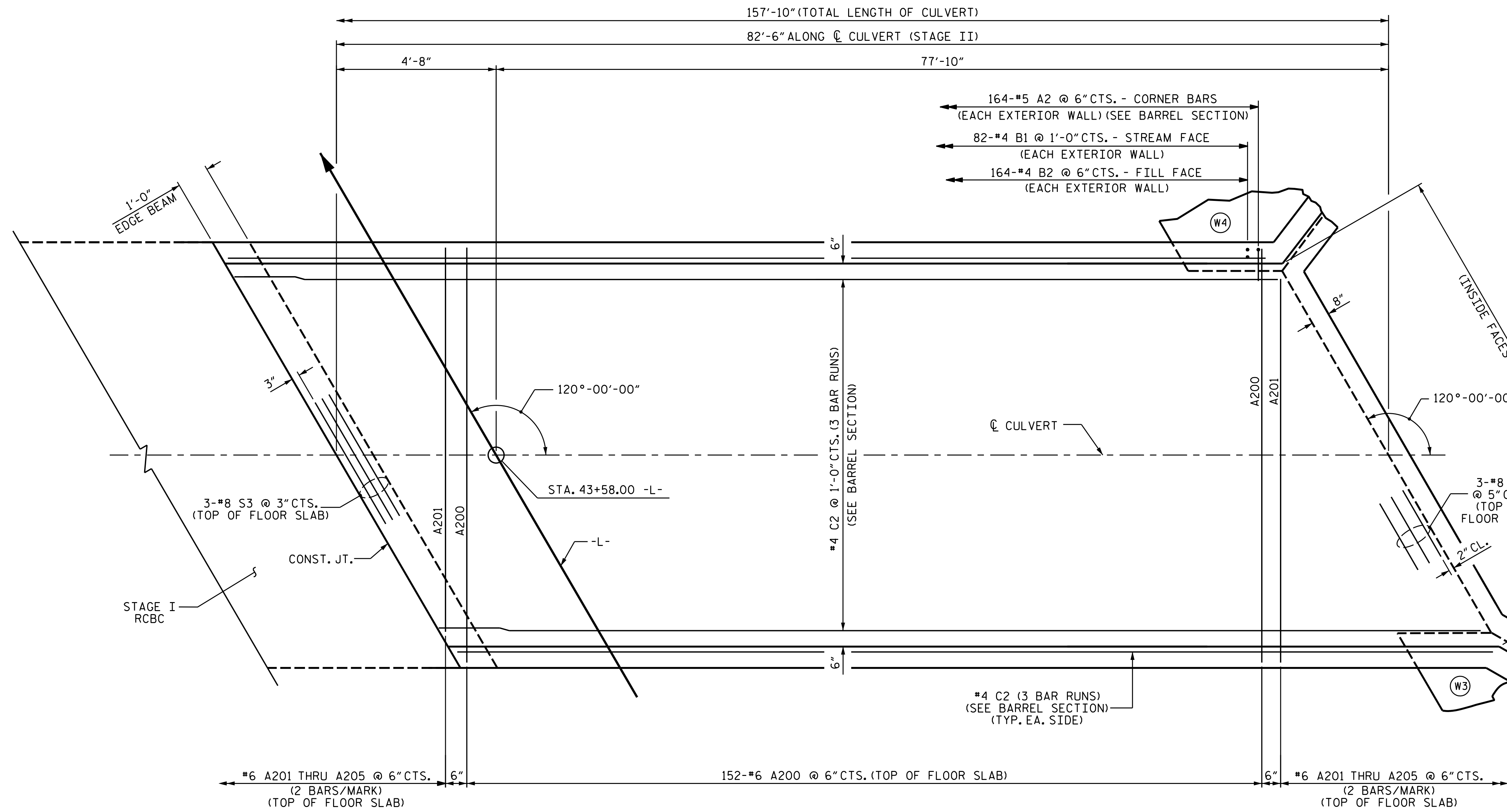
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
SINGLE 10 FT. X 10 FT.
CONCRETE BOX CULVERT
STAGE I

ASSEMBLED BY: A. SORSENGINH DATE: 11/2016
CHECKED BY: H. T. BARBOUR DATE: 11/2016
DESIGN ENGINEER OF RECORD: J. BOWLES DATE: 11/2016

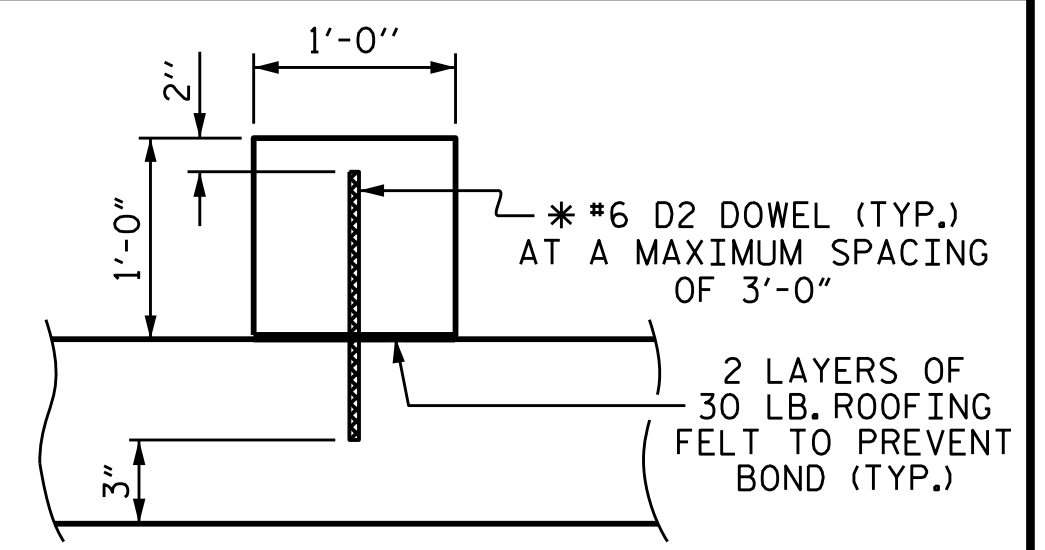
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-37
1			3			TOTAL SHEETS
2			4			47

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

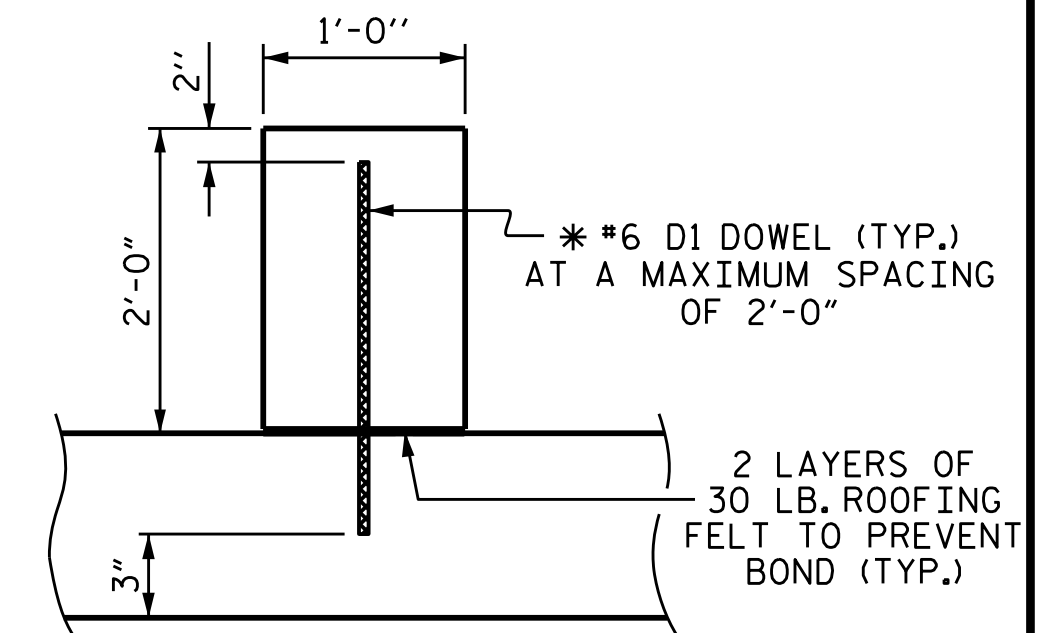
CUL. #6



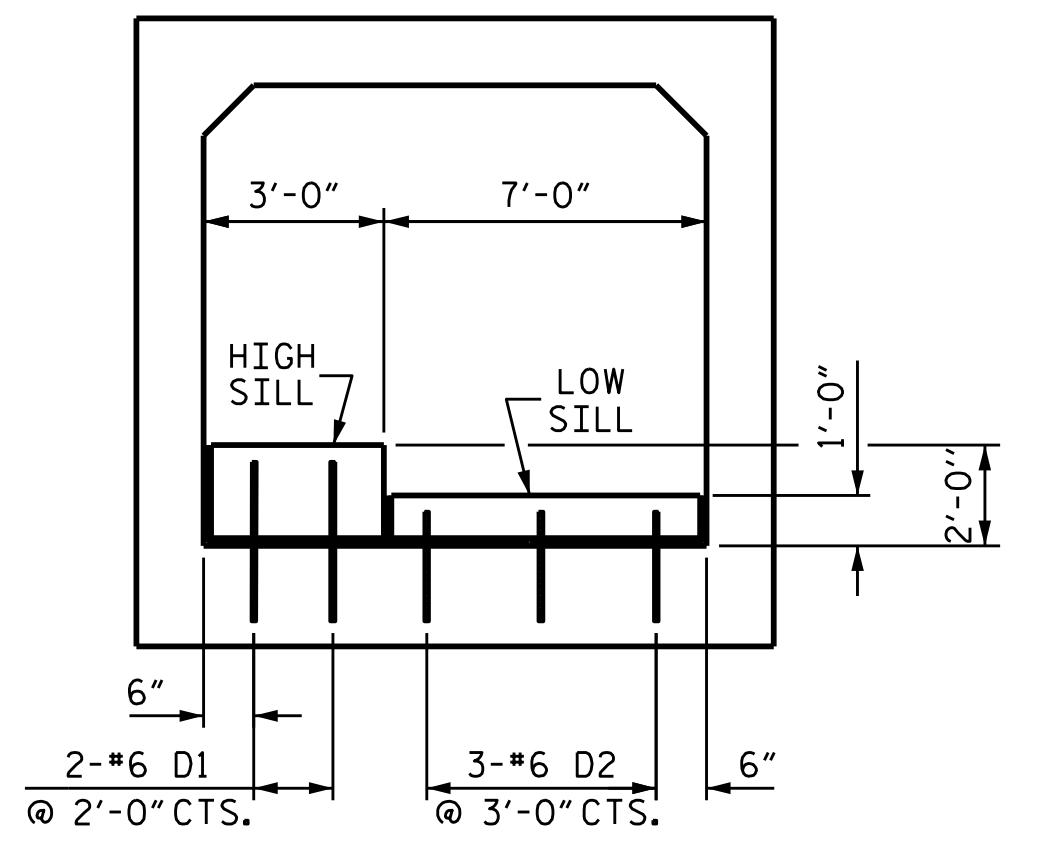
**PLAN OF FLOOR SLAB
STAGE II**



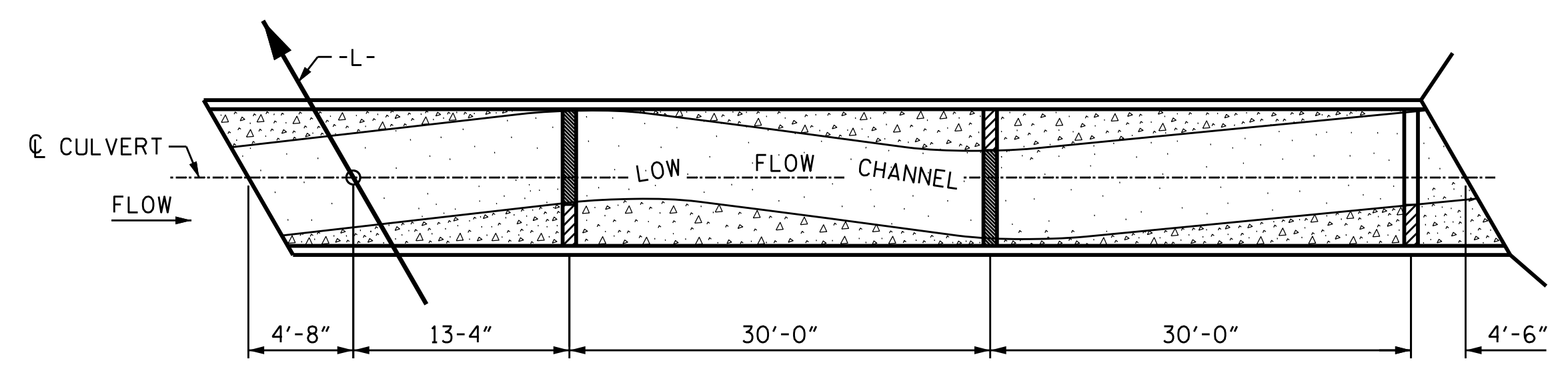
SECTION THROUGH 1'-0" SILL & BAFFLE
* DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.



SECTION THROUGH 2'-0" SILL & BAFFLE



**ELEVATION
CULVERT SILL DETAILS**
OUTLET END
(LOOKING UPSTREAM)



**PLAN OF SILL & BAFFLE LOCATIONS
STAGE II**

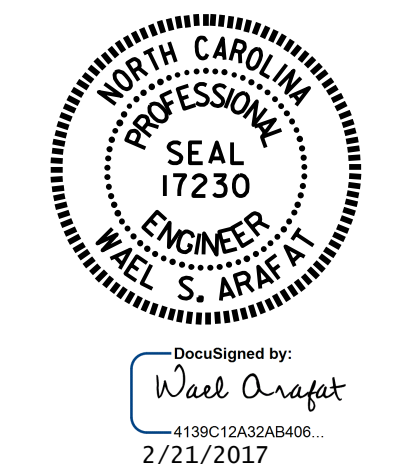
[Hatched Box] HIGH SILL [Dotted Box] HIGH BAFFLE
 [White Box] LOW SILL [Solid Black Box] LOW BAFFLE

NOTES

- BED MATERIAL BETWEEN SILLS/BAFFLES IN THE CULVERT SHALL BE NATIVE MATERIAL. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED AT THE PROJECT SITE DURING CULVERT CONSTRUCTION. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.
- TOP OF LOW FLOW SILLS SHOULD MATCH THE NATURAL STREAM BED ELEVATION IN LOW FLOW CHANNEL OF STREAM.
- DO NOT SET ELEVATION OF HIGH SILLS/BAFFLES ABOVE BANKFULL.
- BED MATERIAL SHALL BE SUPPLEMENTED BY CLASS B RIP RAP AS NECESSARY IN THE HIGH FLOW CHANNEL ONLY.
- THE ENTIRE COST OF WORK REQUIRED TO PLACE THE EXCAVATED MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR RIP RAP EXCAVATION.
- THE ENTIRE COST OF WORK REQUIRED TO CONSTRUCT THE SILLS/BAFFLES SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.

PROJECT NO. R-3100B
CATAWBA COUNTY
 STATION: 43+58.00 -L-

SHEET 6 OF 9



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

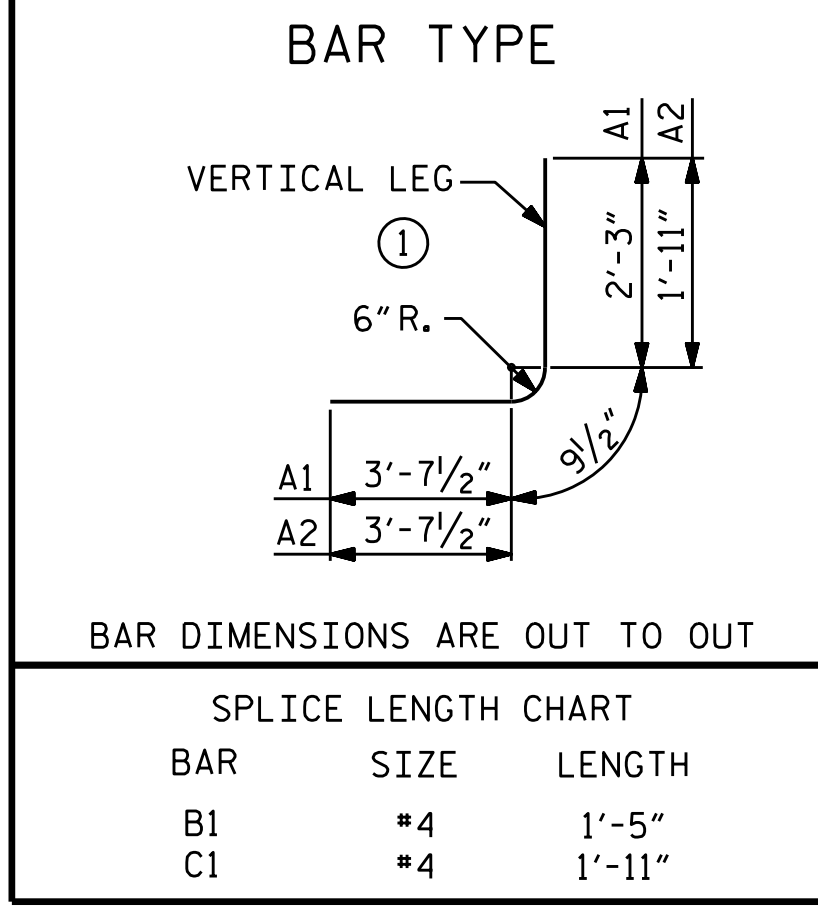
**SINGLE 10 FT. X 10 FT.
 CONCRETE BOX CULVERT
 STAGE II
 120° SKEW**

ASSEMBLED BY: A. SORSENGIH DATE: 11/2016
 CHECKED BY: H. T. BARBOUR DATE: 11/2016
 DESIGN ENGINEER OF RECORD: J. BOWLES DATE: 11/2016

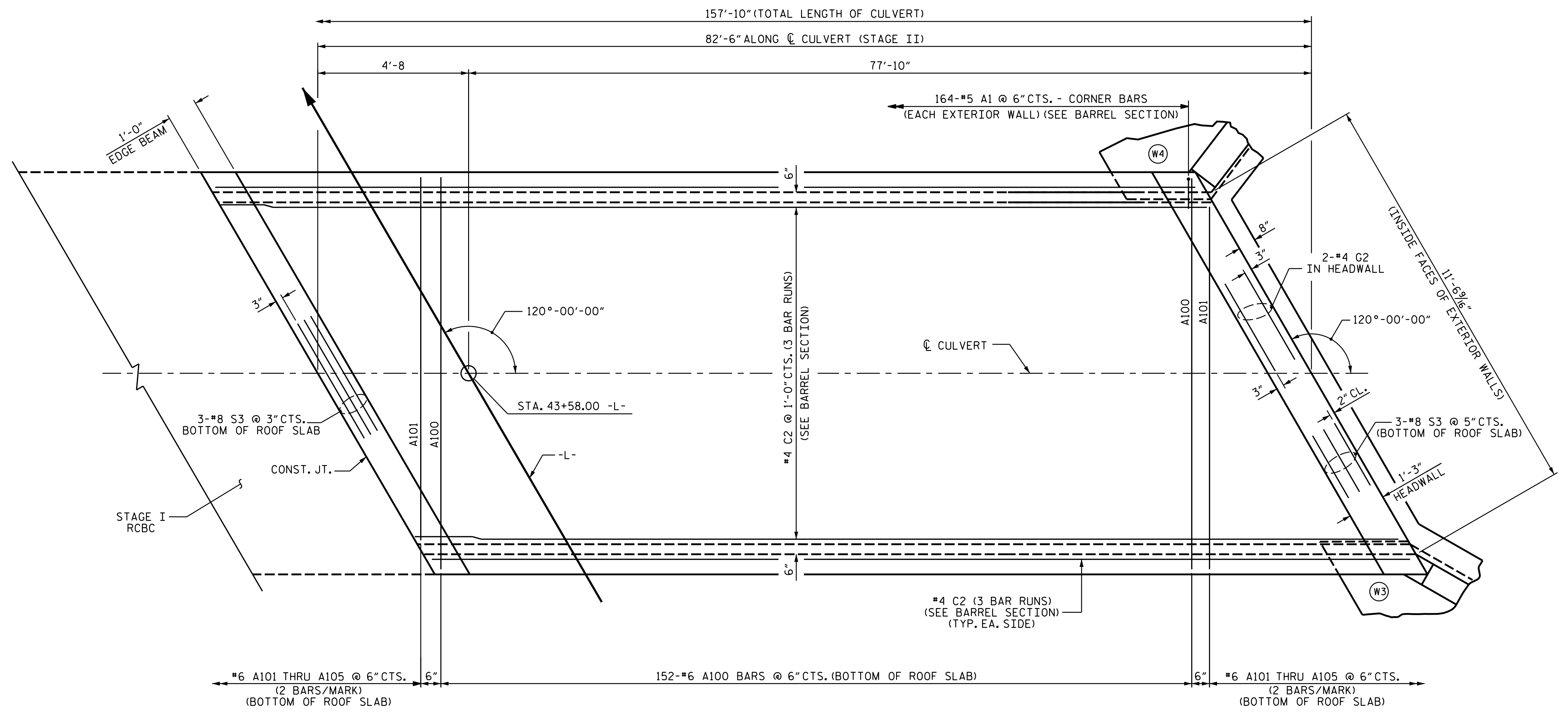
DOCUMENT NOT CONSIDERED
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REVISIONS						SHEET NO. C-38
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 47
2			4			

STAGE II QUANTITIES	
CLASS A CONCRETE	
BARREL @ 1.145 CY/FT	94.5 C.Y.
WINGS, ETC.	20.2 C.Y.
SILLS & BAFFLES	1.4 C.Y.
TOTAL	116.1 C.Y.
REINFORCING STEEL	
BARREL	16,189 LBS.
WINGS, ETC.	1,392 LBS.
TOTAL	17,581 LBS.
FOUNDATION CONDITIONING MATERIAL	89 TONS
CULVERT EXCAVATION	LUMP SUM

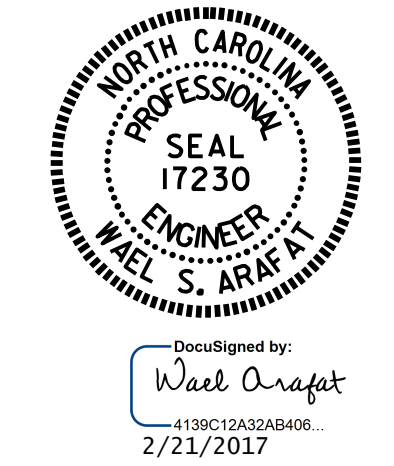


BAR SCHEDULE					
STAGE II					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	328	#5	1	6'-8"	2281
A2	328	#5	1	6'-4"	2167
A100	152	#6	STR	11'-0"	2511
A101	4	#6	STR	9'-6"	57
A102	4	#6	STR	7'-9"	47
A103	4	#6	STR	6'-0"	36
A104	4	#6	STR	4'-3"	26
A105	4	#6	STR	2'-6"	15
A200	152	#6	STR	11'-0"	2511
A201	4	#6	STR	9'-6"	57
A202	4	#6	STR	7'-9"	47
A203	4	#6	STR	6'-0"	36
A204	4	#6	STR	4'-3"	26
A205	4	#6	STR	2'-6"	15
B1	164	#4	STR	11'-0"	1205
B2	328	#4	STR	9'-4"	2045
C2	138	#4	STR	28'-8"	2643
D1	6	#6	STR	2'-5"	22
D2	9	#6	STR	1'-5"	19
G2	2	#4	STR	12'-8"	17
S3	12	#8	STR	12'-8"	406
REINFORCING STEEL					= 16,189 LBS.



PLAN OF ROOF SLAB
STAGE II

PROJECT NO. R-3100B
CATAWBA COUNTY
STATION: 43+58.00 -L-
SHEET 7 OF 9

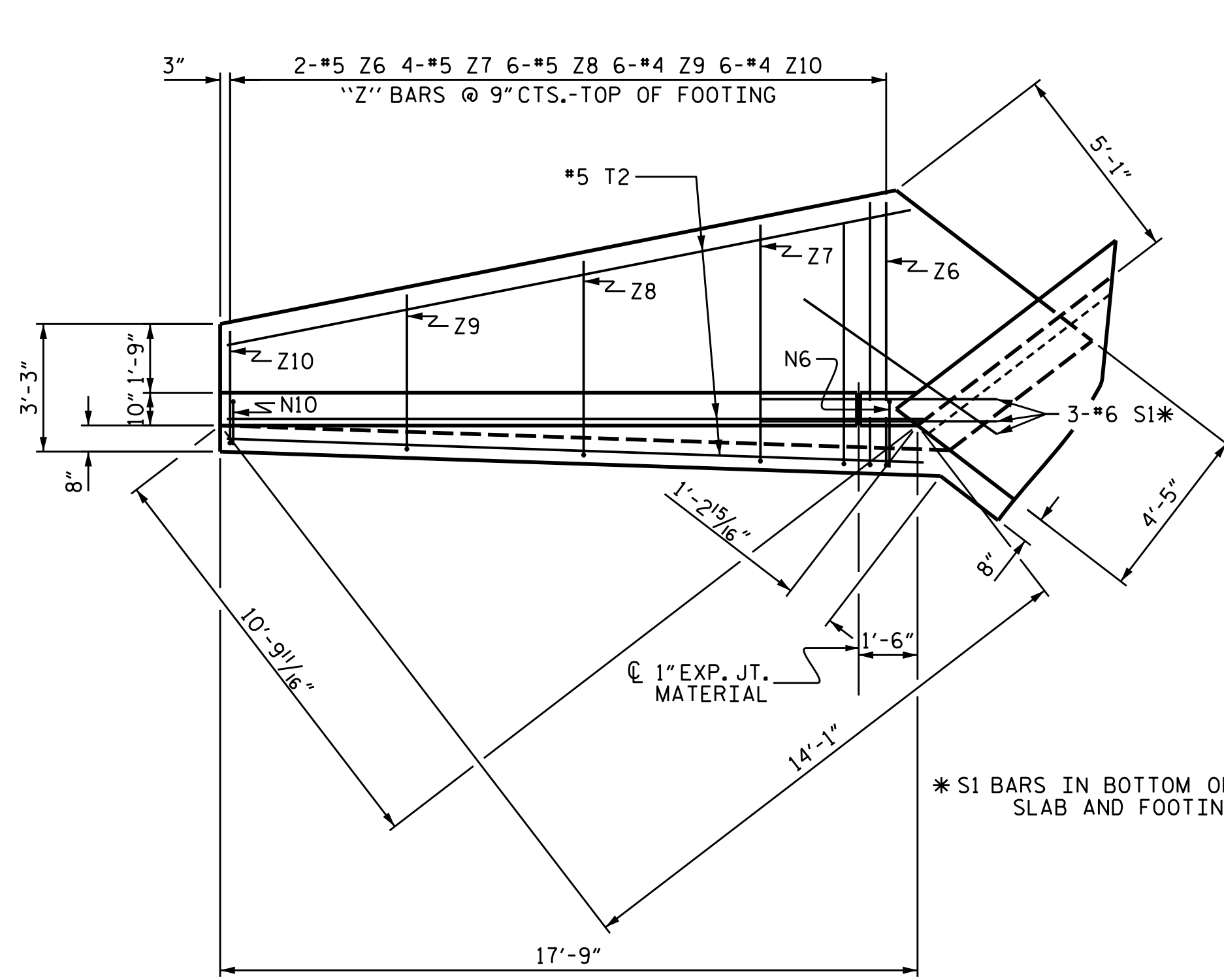


STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
SINGLE 10 FT. X 10 FT.
CONCRETE BOX CULVERT
STAGE II
120° SKEW

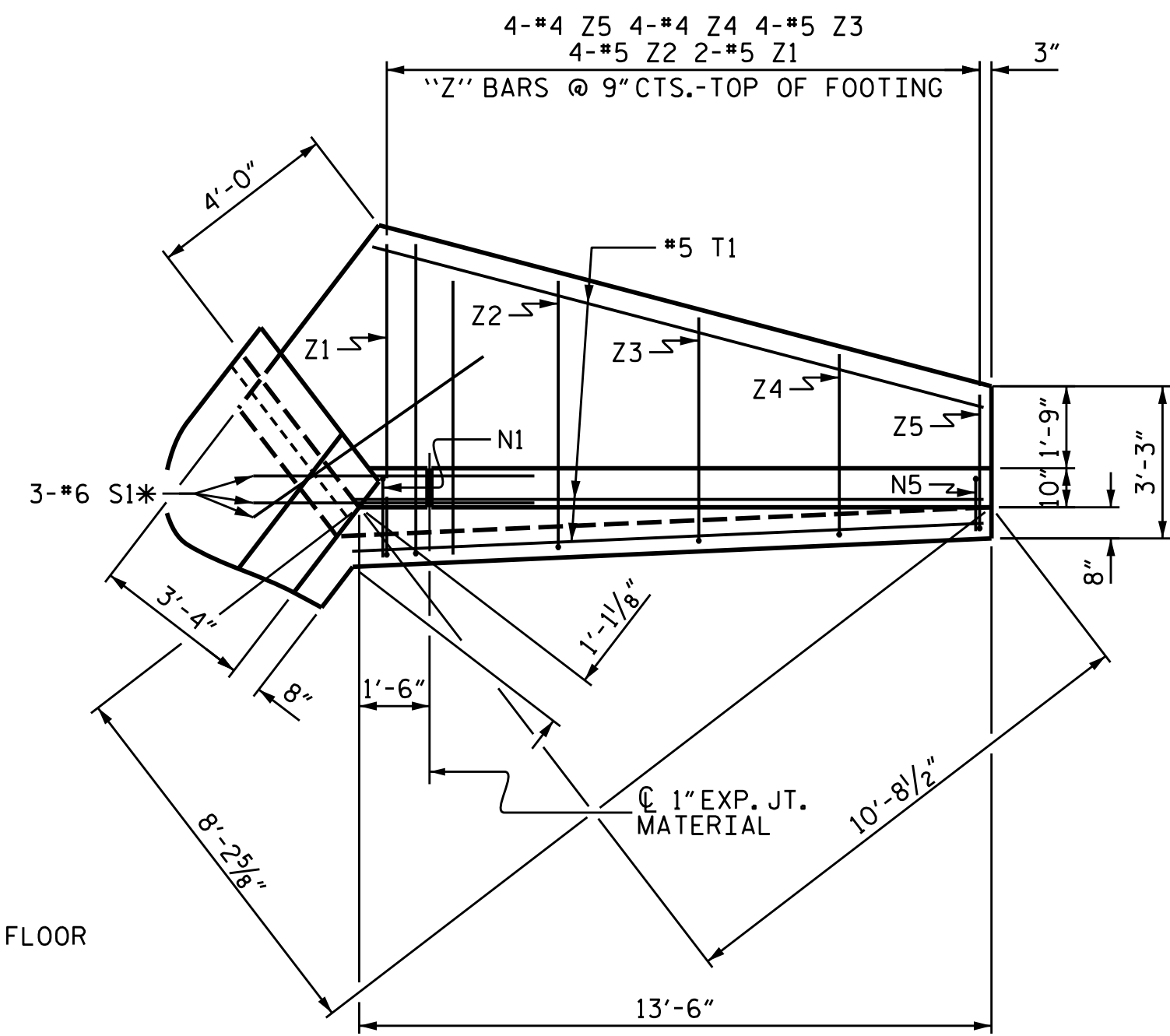
ASSEMBLED BY : A. SORSENGINH DATE : 11/2016
CHECKED BY : H. T. BARBOUR DATE : 11/2016
DESIGN ENGINEER OF RECORD: J. BOWLES DATE : 11/2016

DOCUMENT NOT CONSIDERED
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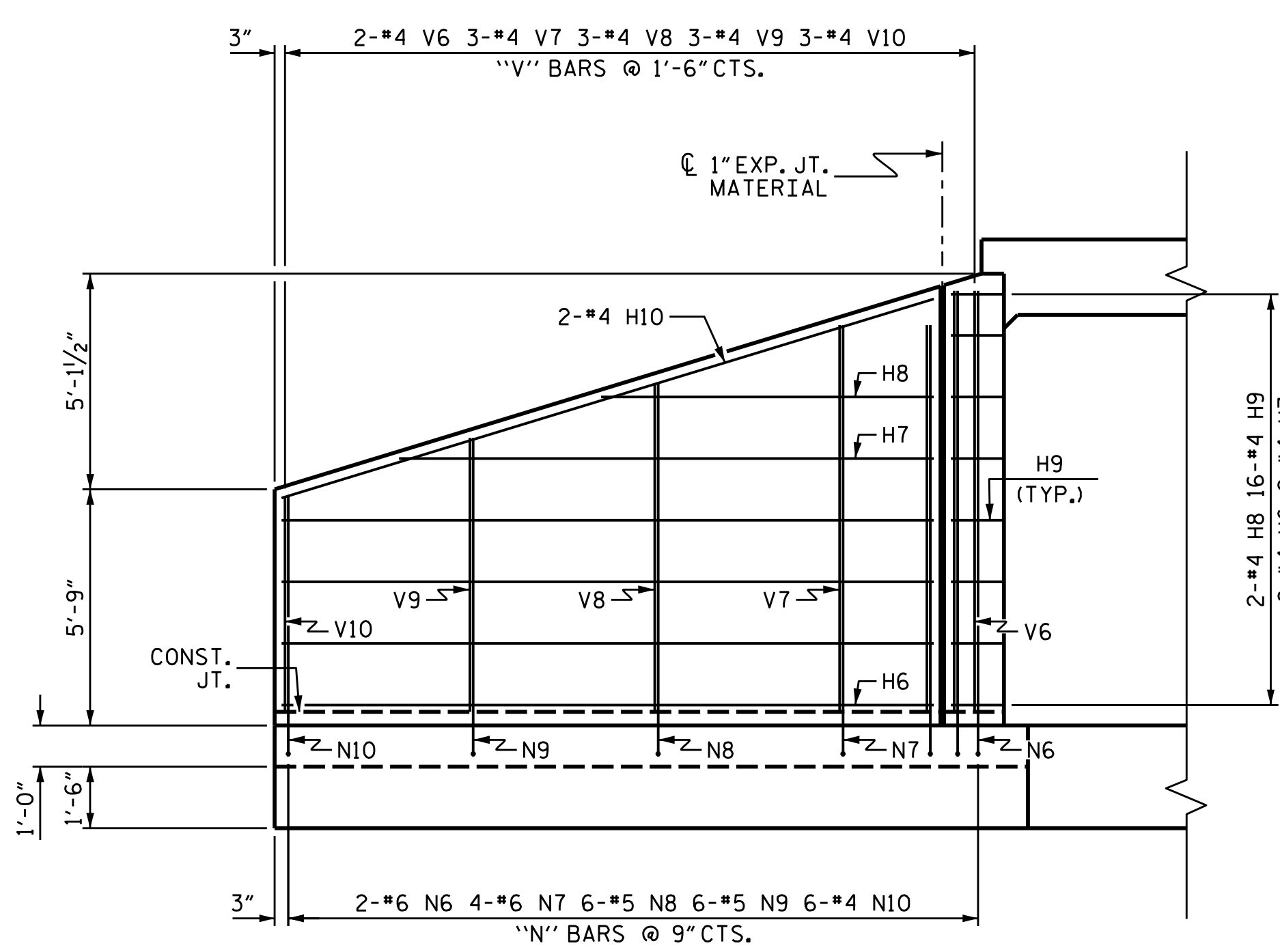
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-39
1			3			TOTAL SHEETS
2			4			47



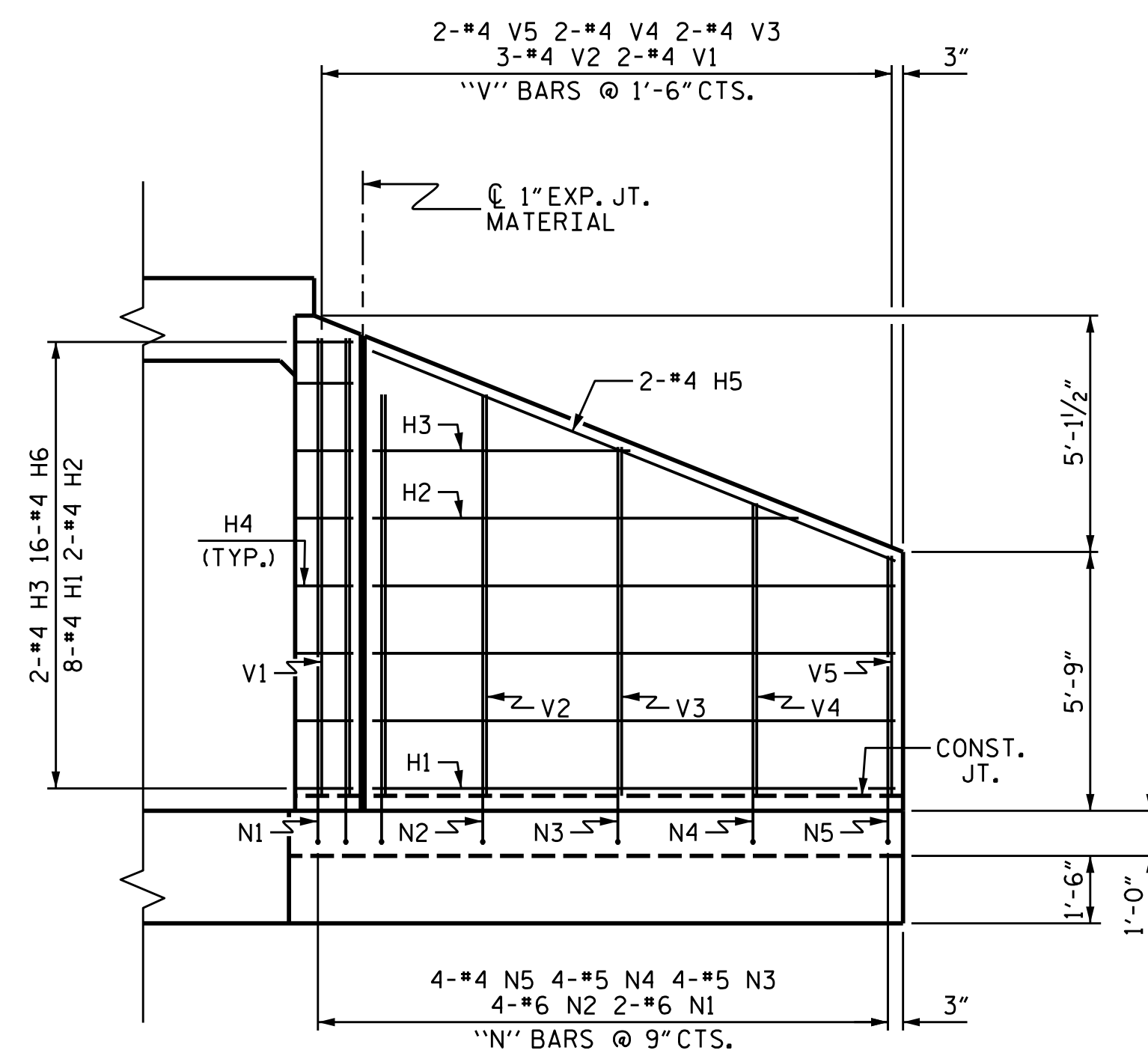
PLAN W1



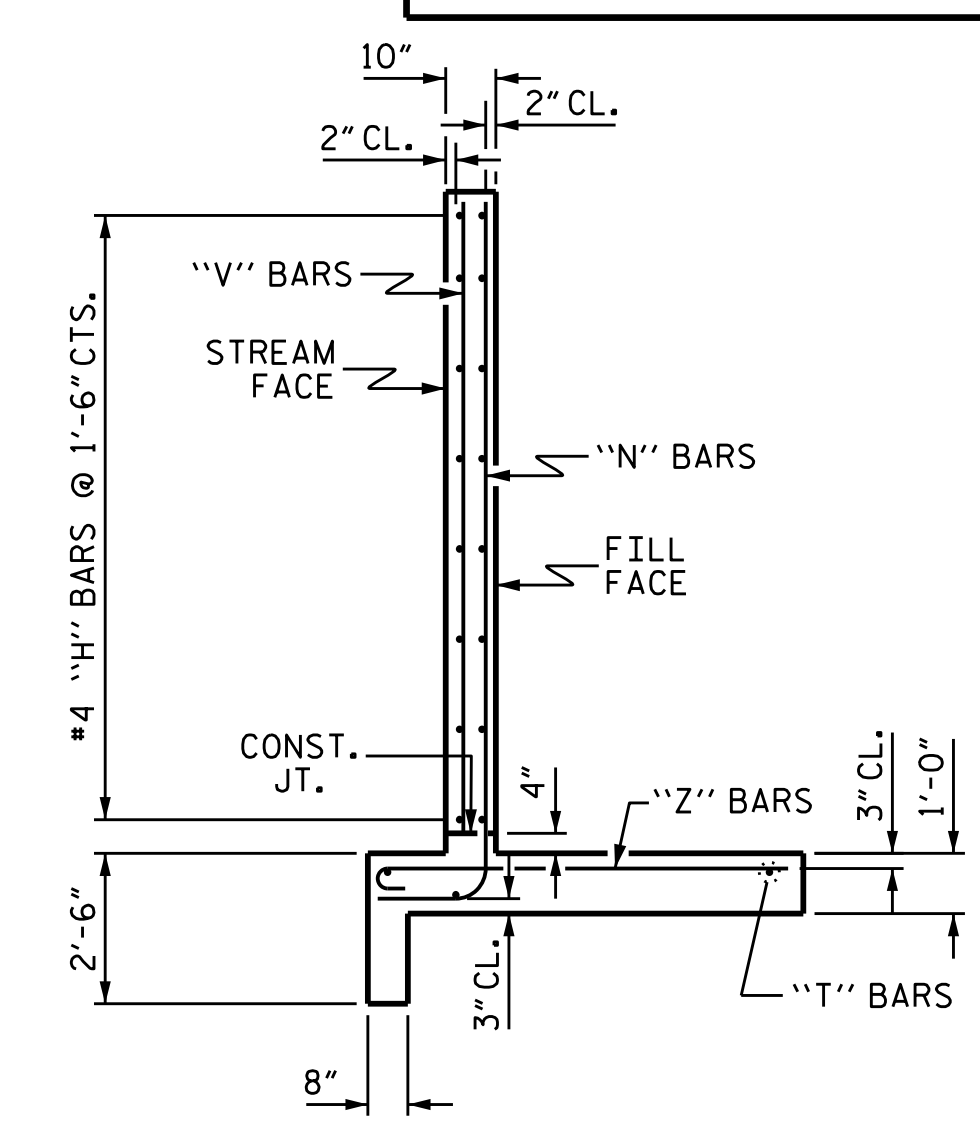
PLAN W2



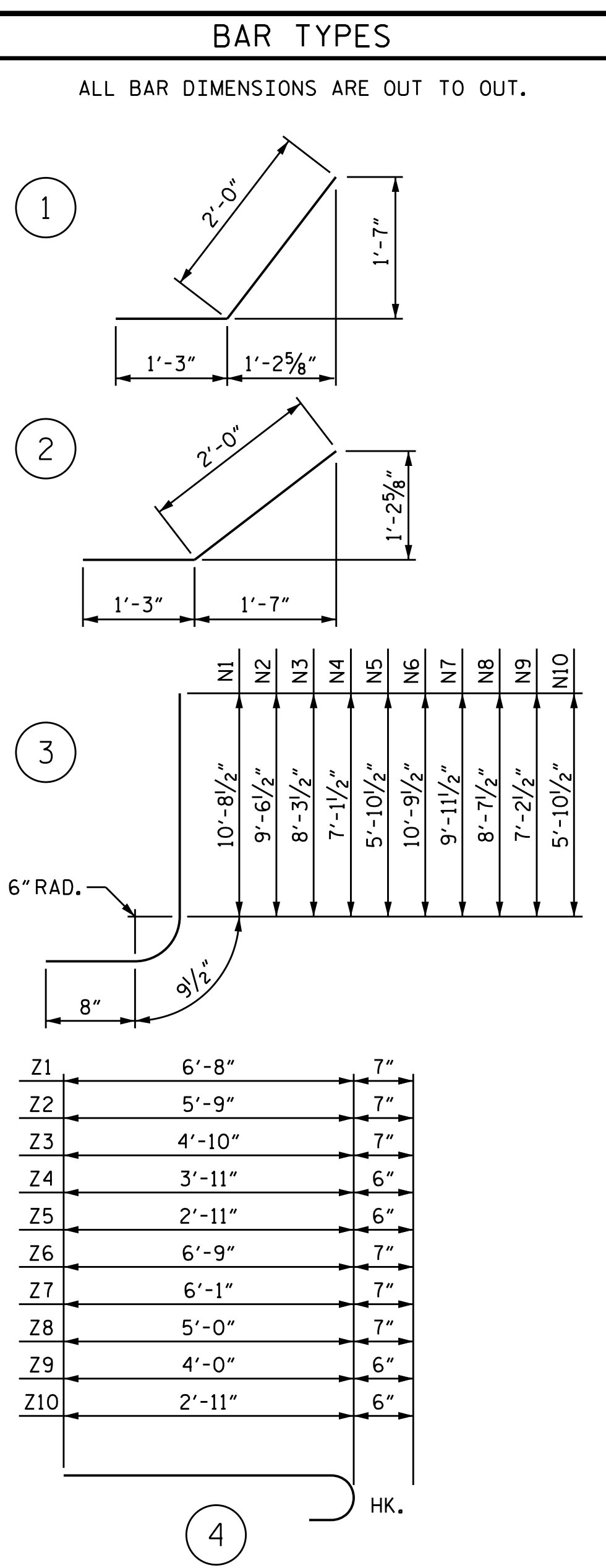
ELEVATION W1



ELEVATION W2



TYPICAL WING SECTION



4

BILL OF MATERIAL					
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	
H1	8	#4	STR	11'-7"	62
H2	2	#4	STR	9'-5"	13
H3	2	#4	STR	5'-8"	8
H4	16	#4	1	3'-3"	35
H5	2	#4	STR	12'-6"	17
H6	8	#4	STR	15'-10"	85
H7	2	#4	STR	13'-0"	17
H8	2	#4	STR	8'-1"	11
H9	16	#4	2	3'-3"	35
H10	2	#4	STR	16'-7"	22
N1	2	#6	3	12'-2"	37
N2	4	#6	3	11'-0"	66
N3	4	#5	3	9'-9"	41
N4	4	#5	3	8'-7"	36
N5	4	#4	3	7'-4"	20
N6	2	#6	3	12'-3"	37
N7	4	#6	3	11'-5"	69
N8	6	#5	3	10'-1"	63
N9	6	#5	3	8'-8"	54
N10	6	#4	3	7'-4"	29
S1	6	#6	STR	6'-0"	54
T1	3	#5	STR	13'-6"	42
T2	3	#5	STR	17'-9"	56
V1	2	#4	STR	10'-2"	14
V2	3	#4	STR	8'-11"	18
V3	2	#4	STR	7'-9"	10
V4	2	#4	STR	6'-6"	9
V5	2	#4	STR	5'-4"	7
V6	2	#4	STR	10'-3"	14
V7	3	#4	STR	9'-5"	19
V8	3	#4	STR	8'-0"	16
V9	3	#4	STR	6'-8"	13
V10	3	#4	STR	5'-3"	11
Z1	2	#5	4	7'-3"	15
Z2	4	#5	4	6'-4"	26
Z3	4	#5	4	5'-5"	23
Z4	4	#4	4	4'-5"	12
Z5	4	#4	4	3'-5"	9
Z6	2	#5	4	7'-4"	15
Z7	4	#5	4	6'-8"	28
Z8	6	#5	4	5'-7"	35
Z9	6	#4	4	4'-6"	18
Z10	6	#4	4	3'-5"	14
REINFORCING STEEL FOR 2 WINGS				1235 LBS.	
CLASS A CONCRETE					
2 WINGS				16.4 C.Y.	
1 HEADWALL				0.5 C.Y.	
1 END CURTAIN WALL				0.5 C.Y.	
2 EDGE BEAMS				1.0 C.Y.	
TOTAL				18.4 C.Y.	

PROJECT NO. R-3100B
 CATAWBA COUNTY
 STATION: 43+58.00 -L-

SHEET 8 OF 9
 STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STANDARD WINGS FOR
 CONCRETE BOX CULVERT
 STAGE I - INLET END
 H = 10'-0" SLOPE = 2:1
 105° SKEW

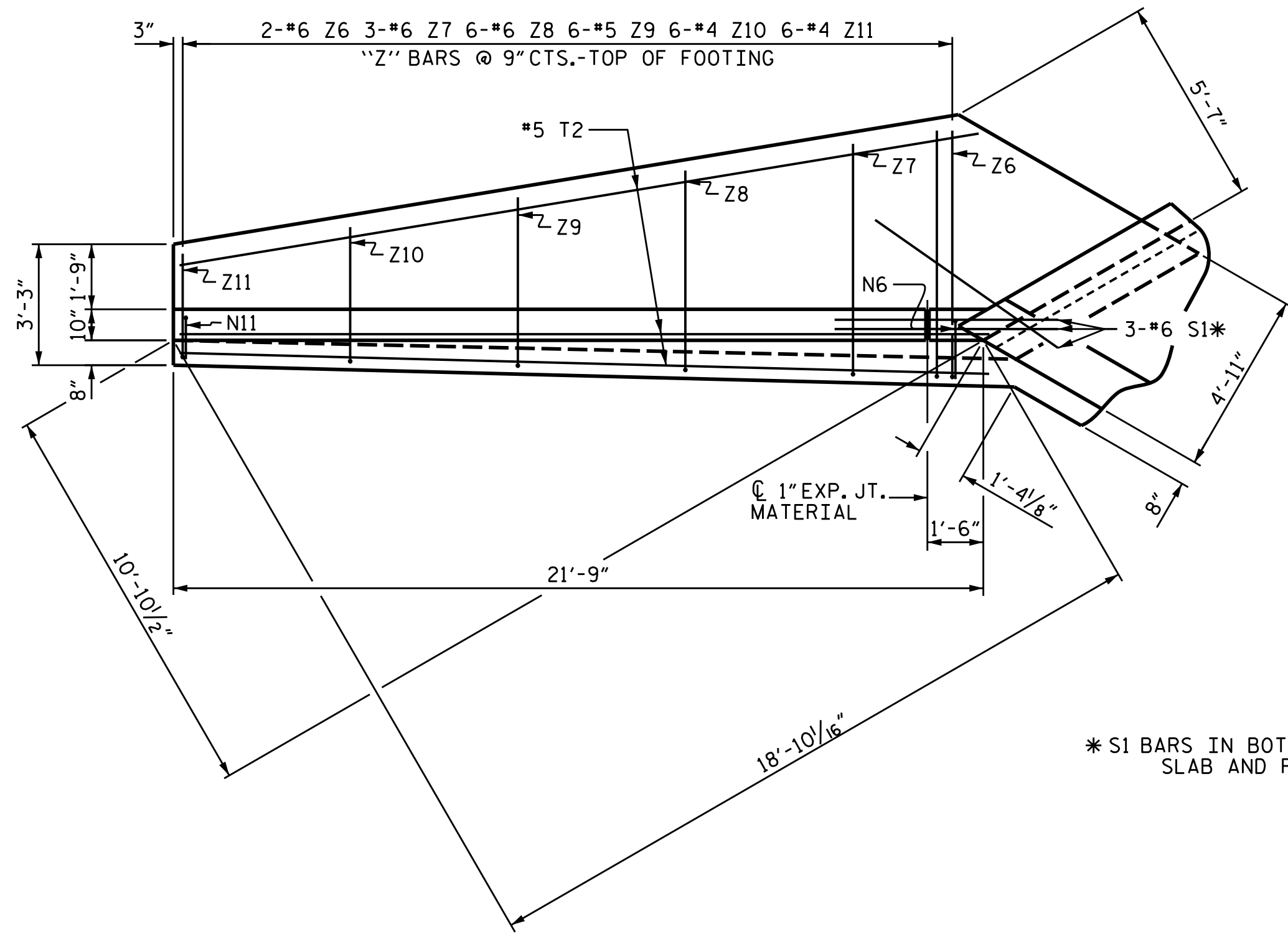


REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-40	
1			3			TOTAL SHEETS	47
2			4				

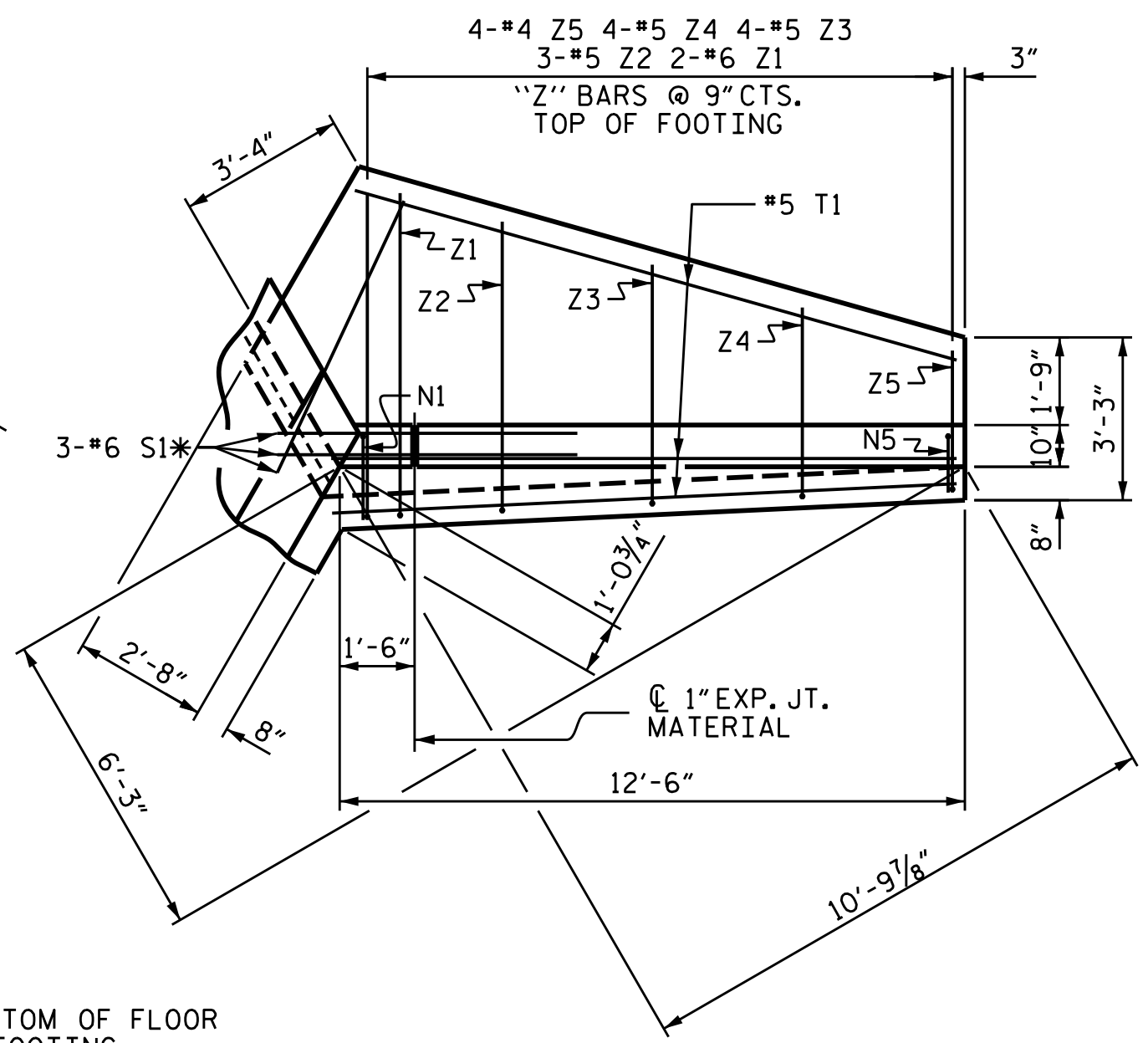
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ASSEMBLED BY: A. SORSENGINH DATE: 11/2016
 CHECKED BY: H. T. BARBOUR DATE: 11/2016
 DRAWN BY: CCJ 01/00
 CHECKED BY: RWW 03/00

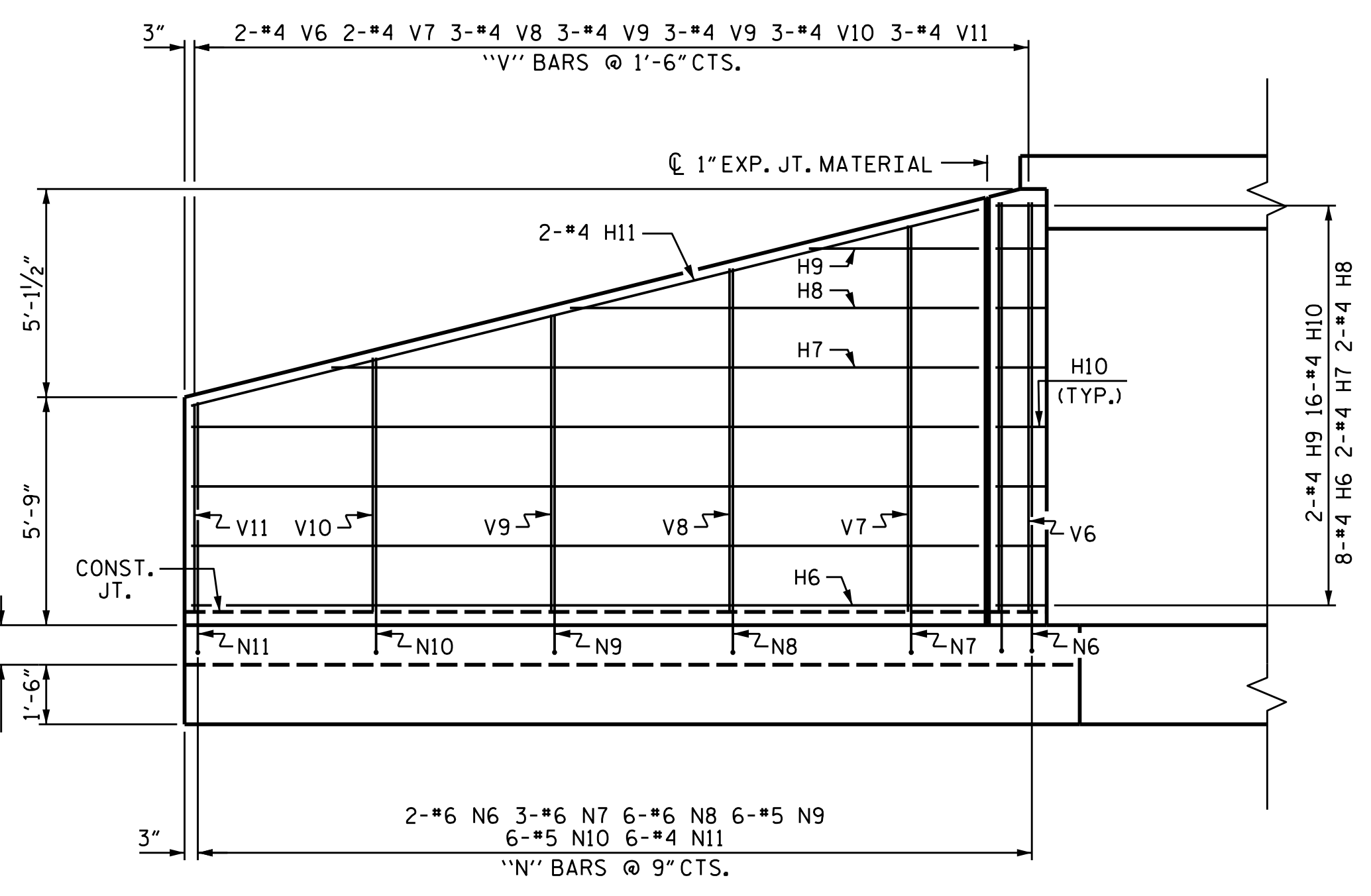
NOTE
 A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.



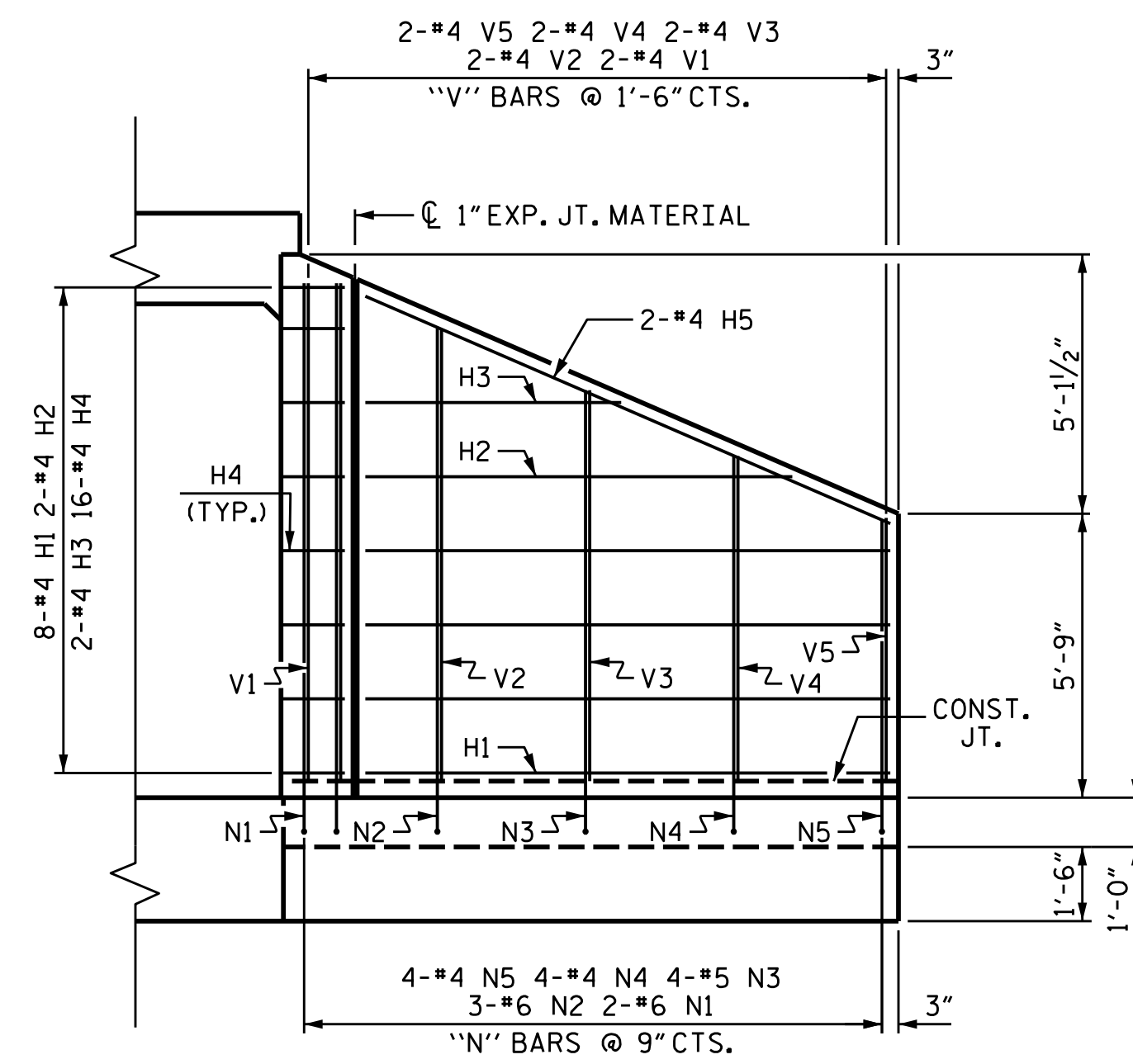
PLAN W3



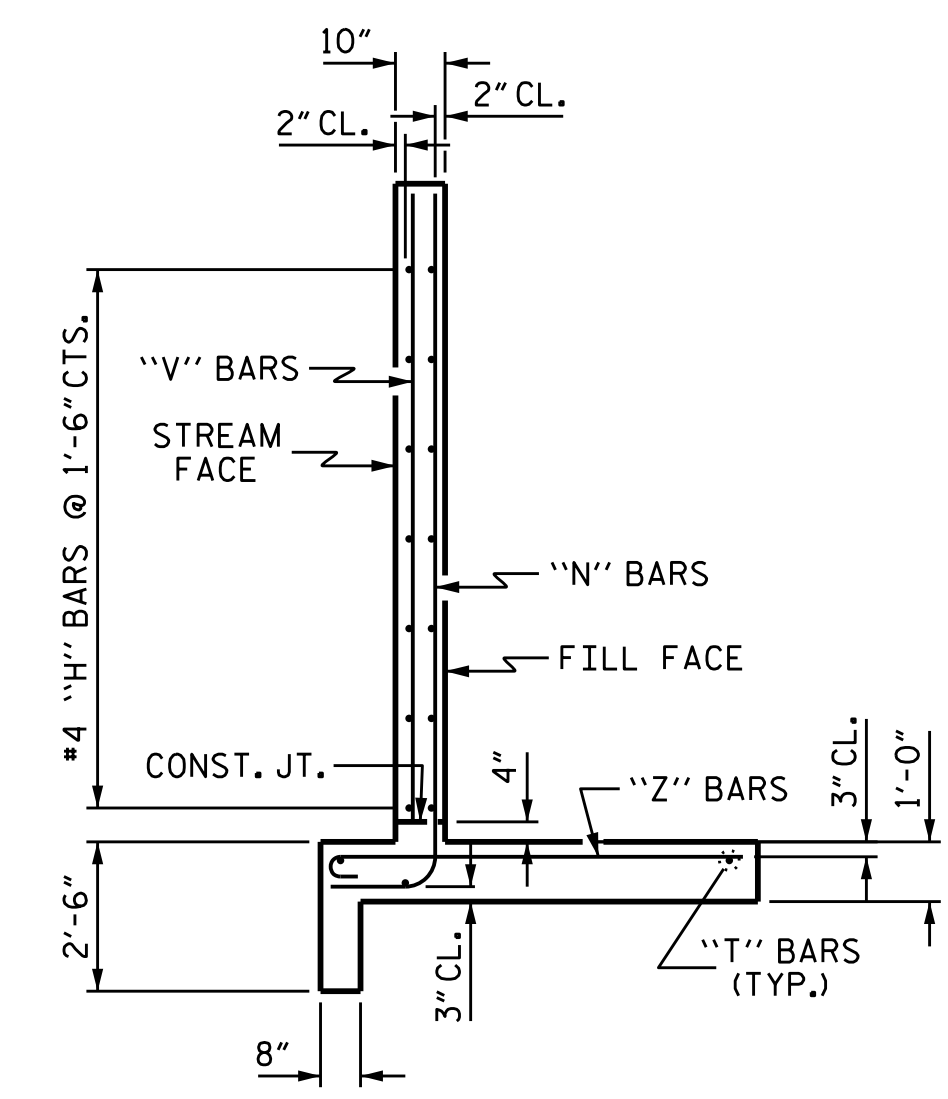
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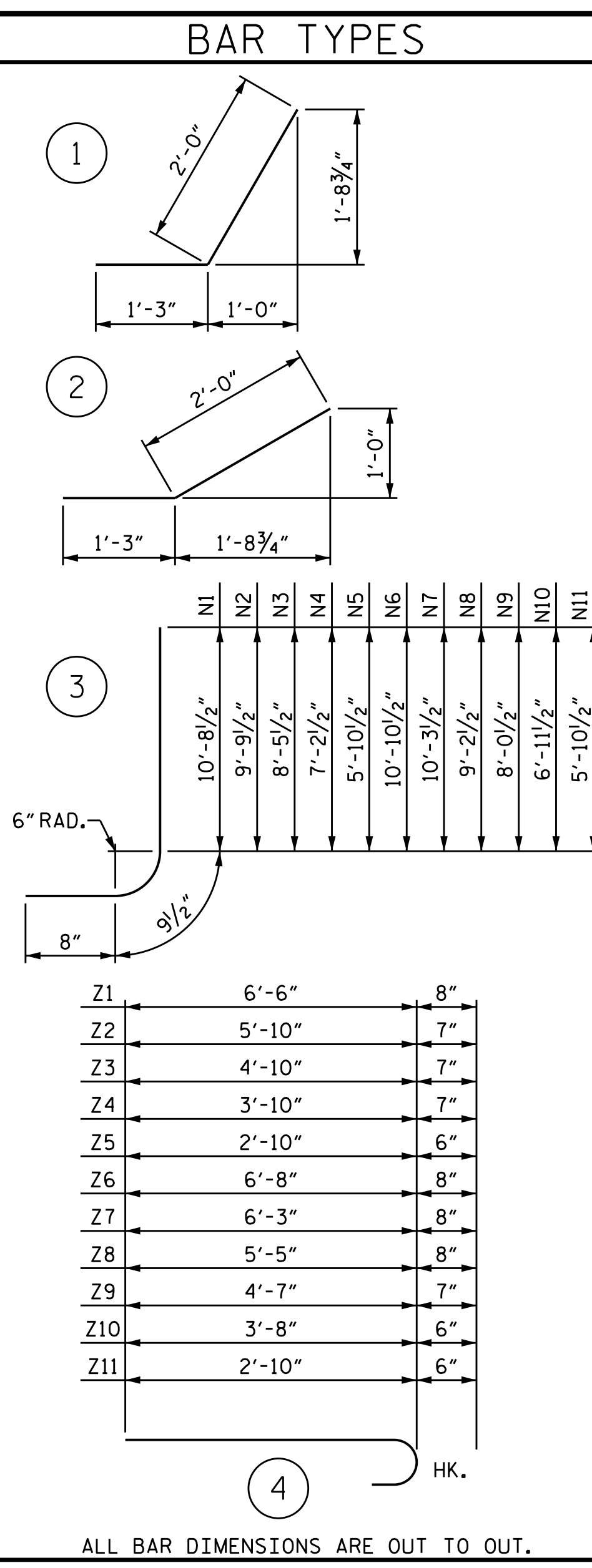
ELEVATION W3



ELEVATION W4



TYPICAL WING SECTION

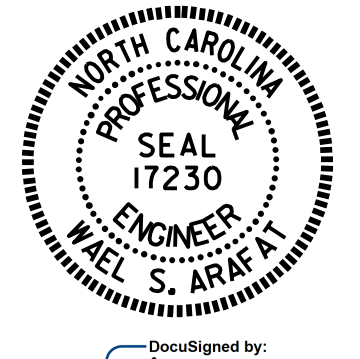


BILL OF MATERIAL					
STAGE II					
BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	8	#4	STR	10'-7"	57
H2	2	#4	STR	8'-7"	11
H3	2	#4	STR	5'-2"	7
H4	16	#4	1	3'-3"	35
H5	2	#4	STR	11'-7"	15
H6	8	#4	STR	19'-10"	106
H7	2	#4	STR	16'-4"	22
H8	2	#4	STR	10'-3"	14
H9	2	#4	STR	4'-3"	6
H10	16	#4	2	3'-3"	35
H11	2	#4	STR	20'-5"	27
N1	2	#6	3	12'-2"	37
N2	3	#6	3	11'-3"	51
N3	4	#5	3	9'-11"	41
N4	4	#4	3	8'-8"	23
N5	4	#4	3	7'-4"	20
N6	2	#6	3	12'-4"	37
N7	3	#6	3	11'-9"	53
N8	6	#6	3	10'-8"	96
N9	6	#5	3	9'-6"	59
N10	6	#5	3	8'-5"	53
N11	6	#4	3	7'-4"	29
S1	6	#6	STR	6'-0"	54
T1	3	#5	STR	12'-6"	39
T2	3	#5	STR	21'-9"	68
V1	2	#4	STR	10'-1"	13
V2	2	#4	STR	9'-2"	12
V3	2	#4	STR	7'-11"	11
V4	2	#4	STR	6'-7"	9
V5	2	#4	STR	5'-4"	7
V6	2	#4	STR	10'-4"	14
V7	2	#4	STR	9'-9"	13
V8	3	#4	STR	8'-8"	17
V9	3	#4	STR	7'-6"	15
V10	3	#4	STR	6'-5"	13
V11	3	#4	STR	5'-3"	11
Z1	2	#6	4	7'-2"	22
Z2	3	#5	4	6'-5"	20
Z3	4	#5	4	5'-5"	23
Z4	4	#5	4	4'-5"	18
Z5	4	#4	4	3'-4"	9
Z6	2	#6	4	7'-4"	22
Z7	3	#6	4	6'-11"	31
Z8	6	#6	4	6'-1"	55
Z9	6	#5	4	5'-2"	32
Z10	6	#4	4	4'-2"	17
Z11	6	#4	4	3'-4"	13

REINFORCING STEEL	1,392 LBS.
FOR 2 WINGS	
CLASS A CONCRETE	
2 WINGS	18.0 C.Y.
1 HEADWALL	0.6 C.Y.
1 END CURTAIN WALL	0.6 C.Y.
2 EDGE BEAMS	1.0 C.Y.
TOTAL	20.2 C.Y.

PROJECT NO. R-3100B
CATAWBA COUNTY
 STATION: 43+58.00 -L-

SHEET 9 OF 9
 STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
STANDARD WINGS FOR CONCRETE BOX CULVERT STAGE II - OUTLET END
 H = 10'-0" SLOPE = 2:1
 120° SKEW



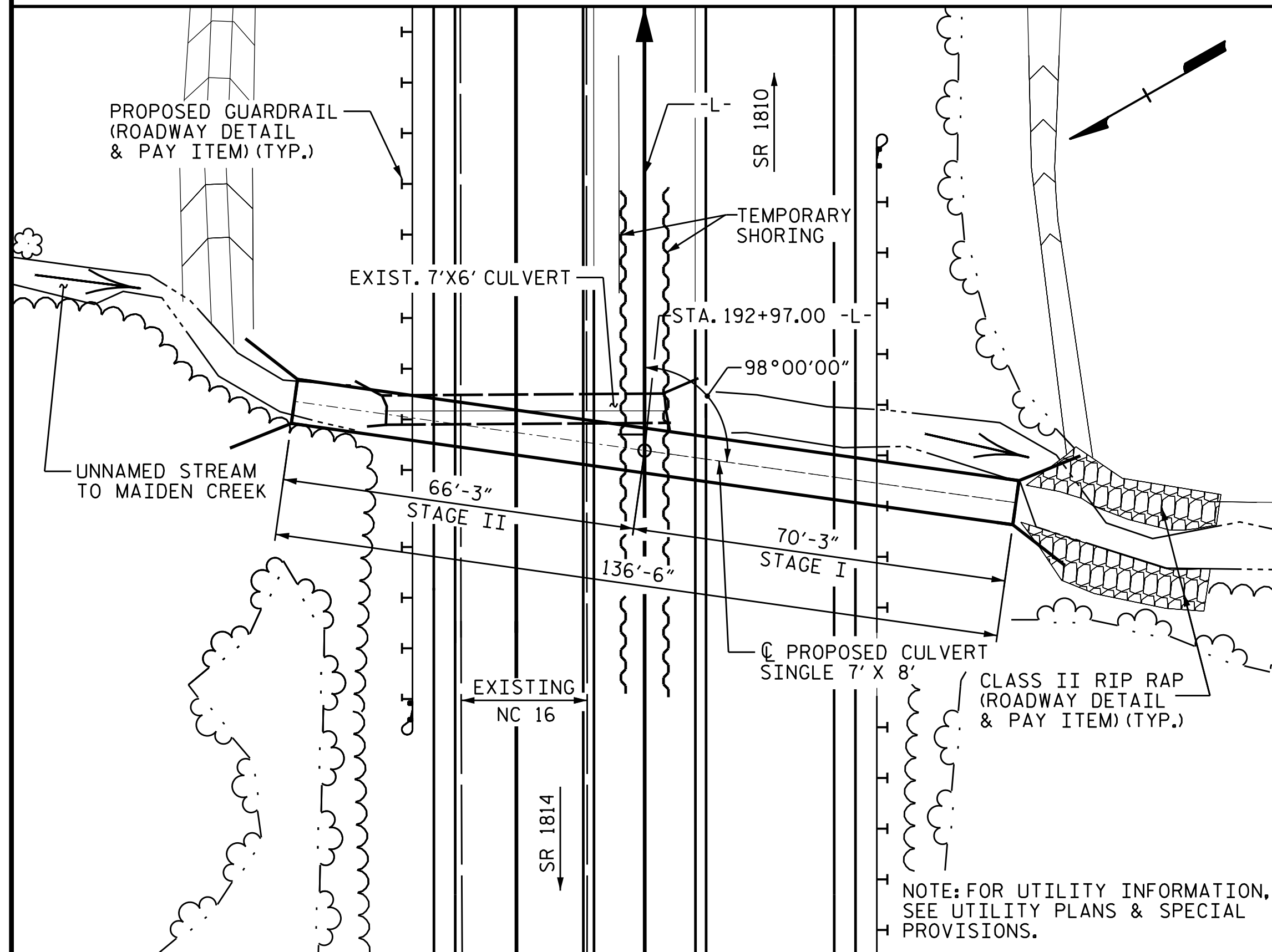
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REVISIONS		SHEET NO.
NO.	BY: DATE:	C-41
1		TOTAL SHEETS
2		47

ASSEMBLED BY :	A. SORSENGINH	DATE :	11/2016
CHECKED BY :	H. T. BARBOUR	DATE :	11/2016
DRAWN BY :	CCJ	12/99	
CHECKED BY :	RWW	03/00	

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.

BENCHMARK #9 : 8" SPIKE IN ROOT OF 10" HICKORY
 STA. 190+54 -L-, 270 LT., ELEV. = 975.79



LOCATION SKETCH

ROADWAY DATA

GRADE POINT ELEV. @ STA. 192+97 -L-	= 970.67
BED ELEV. @ STA. 192+97 -L-	= 950.31
ROADWAY SLOPES	= 2:1

HYDRAULIC DATA

DESIGN DISCHARGE	= 480 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEV.	= 960.90
DRAINAGE AREA	= 0.46 SQ. MI.
BASE DISCHARGE (Q100)	= 580 C.F.S.
BASE HIGH WATER ELEV.	= 962.26

OVERTOPPING FLOOD DATA

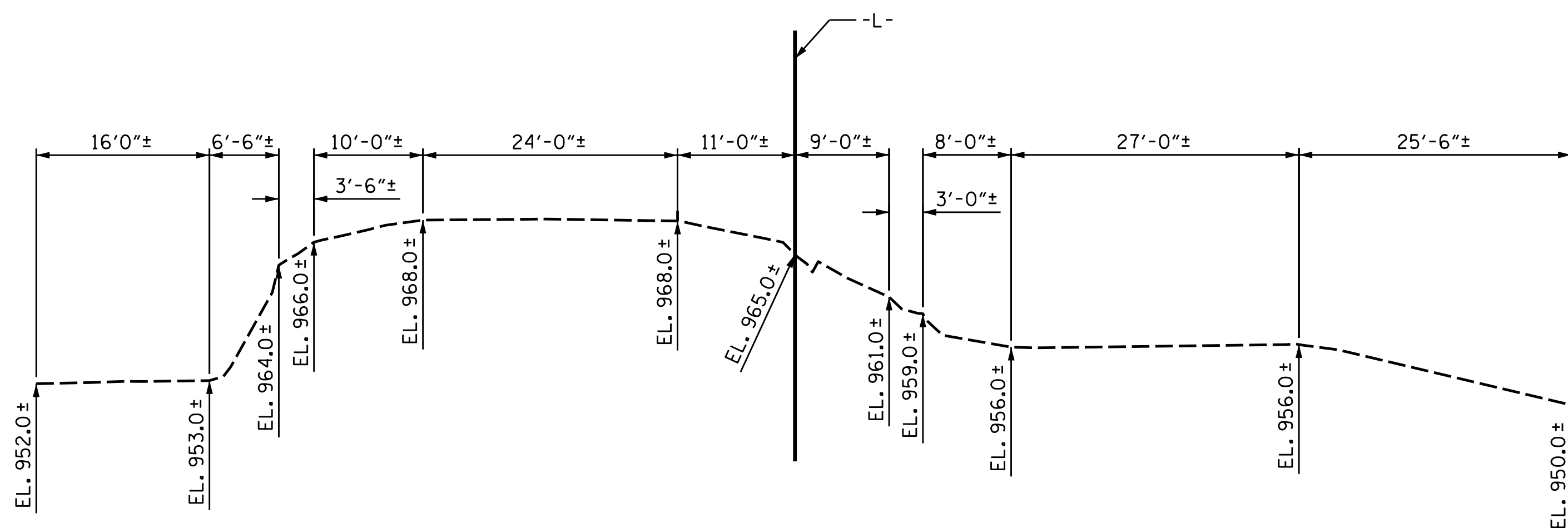
OVERTOPPING DISCHARGE	= 1100 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YR.
OVERTOPPING FLOOD ELEV.	= 970.50

TOTAL STRUCTURE QUANTITIES

REMOVAL OF EXISTING STRUCTURE LUMP SUM	
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	
STAGE I	61 TONS
STAGE II	58 TONS
TOTAL	119 TONS
CLASS A CONCRETE	
STAGE I	68.7 C.Y.
STAGE II	65.4 C.Y.
TOTAL	134.1 C.Y.
REINFORCING STEEL	
STAGE I	9,260 LBS.
STAGE II	8,719 LBS.
TOTAL	17,979 LBS.

NOTES

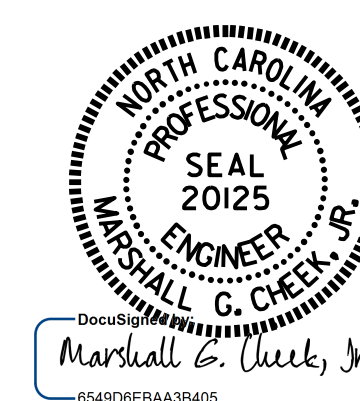
- ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
- DESIGN FILL = 12.39 FEET (MAX.), 10.95 FEET (MIN.).
- FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.
- 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN STAGE I & STAGE II CULVERTS SHALL BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS, CURTAIN WALL, FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALL AND SILL.
 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.
- TRAFFIC ON EXISTING ROAD SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC, THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS SHOWN ON THESE PLANS AND/OR AS DIRECTED BY THE ENGINEER.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
- TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
- AT THE CONTRACTORS 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.
- THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE BARS FROM WHICH THE SAMPLES ARE TAKEN MUST THEN BE SPLICED WITH REPLACEMENT BARS OF THE SIZE AND LENGTH OF THE SAMPLE, PLUS A MINIMUM LAP SPLICE OF THIRTY BAR DIAMETERS. PAYMENT FOR THE SAMPLES OF REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- 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.
- FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE ROADWAY PLANS.
- AFTER SERVING AS A TEMPORARY STRUCTURE THE EXISTING 7' X 6' X 55±' LONG RCBC AND LOCATED AT THE PROPOSED CULVERT SHALL BE REMOVED. THE EXISTING CULVERT IS NOT PRESENTLY POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE CULVERT DETERIORATE DURING CONSTRUCTION OF THE PROPOSED CULVERT, A LOAD LIMIT MAY BE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.
- FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.



PROFILE ALONG C CULVERT

PROJECT NO. R-3100B
CATAWBA COUNTY
 STATION: 192+97.00 -L-

SHEET 1 OF 6



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

DRAWN BY : J. K. BOWLES DATE : 3/24/16
 CHECKED BY : H. A. LOCKLEAR DATE : 7/12/16
 DESIGN ENGINEER OF RECORD: J. K. BOWLES DATE : 12/16

DOCUMENT NOT CONSIDERED
 FINAL UNLESS ALL
 SIGNATURES COMPLETED

REVISIONS					SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
					TOTAL SHEETS 47

**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	3.63	--	1.75	3.63	1	EXTERIOR WALL	4.33	6.34	1	EXTERIOR WALL	7.85		
	HL-93 (OPERATING)	N/A		4.71	--	1.35	4.71	1	EXTERIOR WALL	4.33	8.21	1	EXTERIOR WALL	7.85		
	HS-20 (INVENTORY)	36.000	②	3.63	130.85	1.75	3.63	1	EXTERIOR WALL	4.33	6.34	1	EXTERIOR WALL	7.85		
	HS-20 (OPERATING)	36.000		4.71	169.62	1.35	4.71	1	EXTERIOR WALL	4.33	8.21	1	EXTERIOR WALL	7.85		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500	③	4.54	61.34	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85	
		SNGARBS2	20.000		4.54	90.87	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85	
		SNAGRIS2	22.000		4.54	99.96	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85	
		SNCOTTS3	27.250		4.54	123.81	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85	
		SNAGGRS4	34.925		4.54	158.88	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85	
		SNS5A	35.550		4.54	161.52	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85	
		SNS6A	39.950		4.54	181.51	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85	
		SNS7B	42.000		4.54	190.83	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		4.54	149.93	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85	
		TNT4A	33.075		4.54	150.27	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85	
		TNT6A	41.600		4.54	189.01	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85	
		TNT7A	42.000		4.54	190.83	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85	
		TNT7B	42.000		4.54	190.83	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85	
		TNAGRIT4	43.000		4.54	195.37	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85	
TNAGT5A	45.000		4.54	204.46	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85			
TNAGT5B	45.000		4.54	204.46	1.40	4.54	1	EXTERIOR WALL	4.33	7.92	1	EXTERIOR WALL	7.85			

LOAD FACTORS

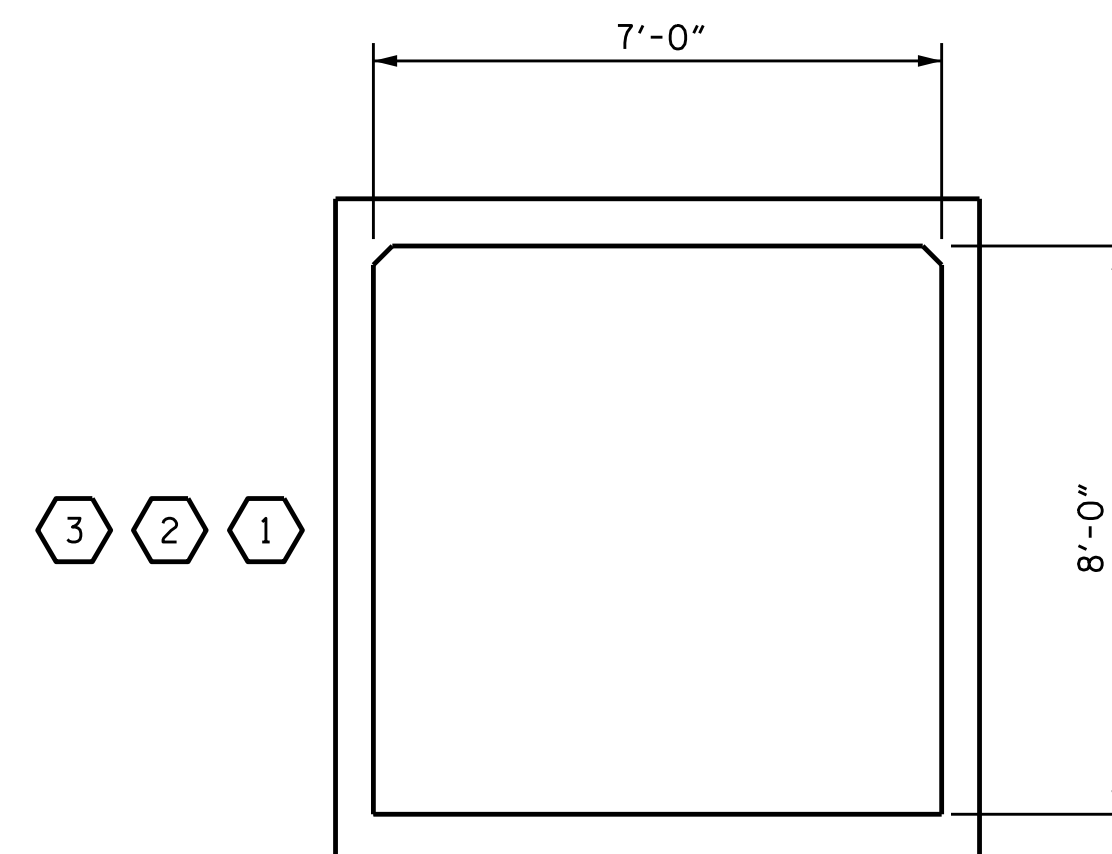
DESIGN LOAD RATING FACTORS

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.

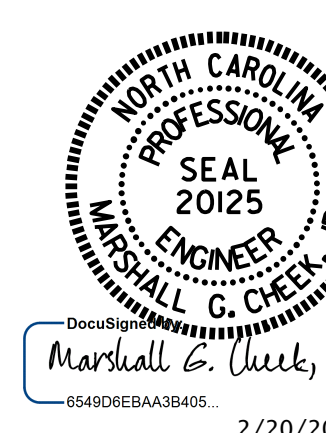
③	CONTROLLING LOAD RATING
①	DESIGN LOAD RATING (HL-93)
②	DESIGN LOAD RATING (HS-20)
③	LEGAL LOAD RATING **
** SEE CHART FOR VEHICLE TYPE	



LRFR SUMMARY

PROJECT NO. R-3100B
CATAWBA COUNTY
 STATION: 192+97.00 -L-

SHEET 2 OF 6



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

ASSEMBLED BY : J.K.BOWLES DATE : 3/17/2015
 CHECKED BY : H.A.LOCKLEAR DATE : 7/12/2016

DRAWN BY : WMC 7/11
 CHECKED BY : GM 7/11

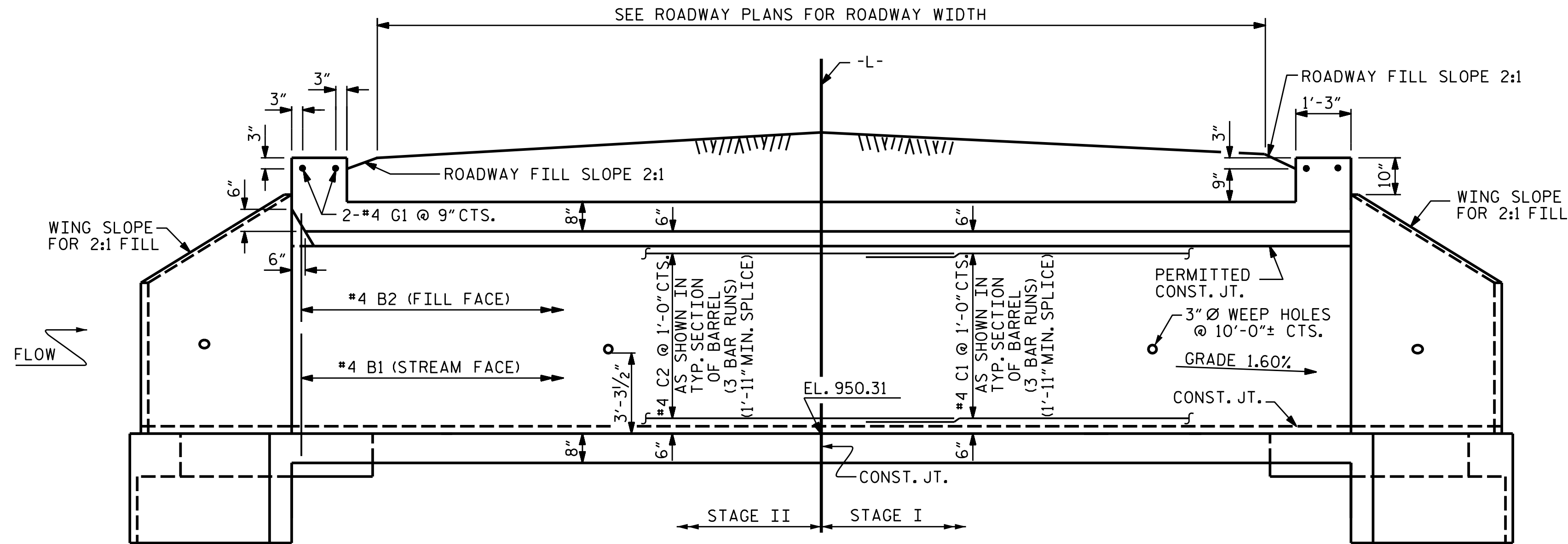
REV. 10/1/11 MAA/GM

DESIGN ENGINEER OF RECORD:
 J.K.BOWLES DATE : 12/16

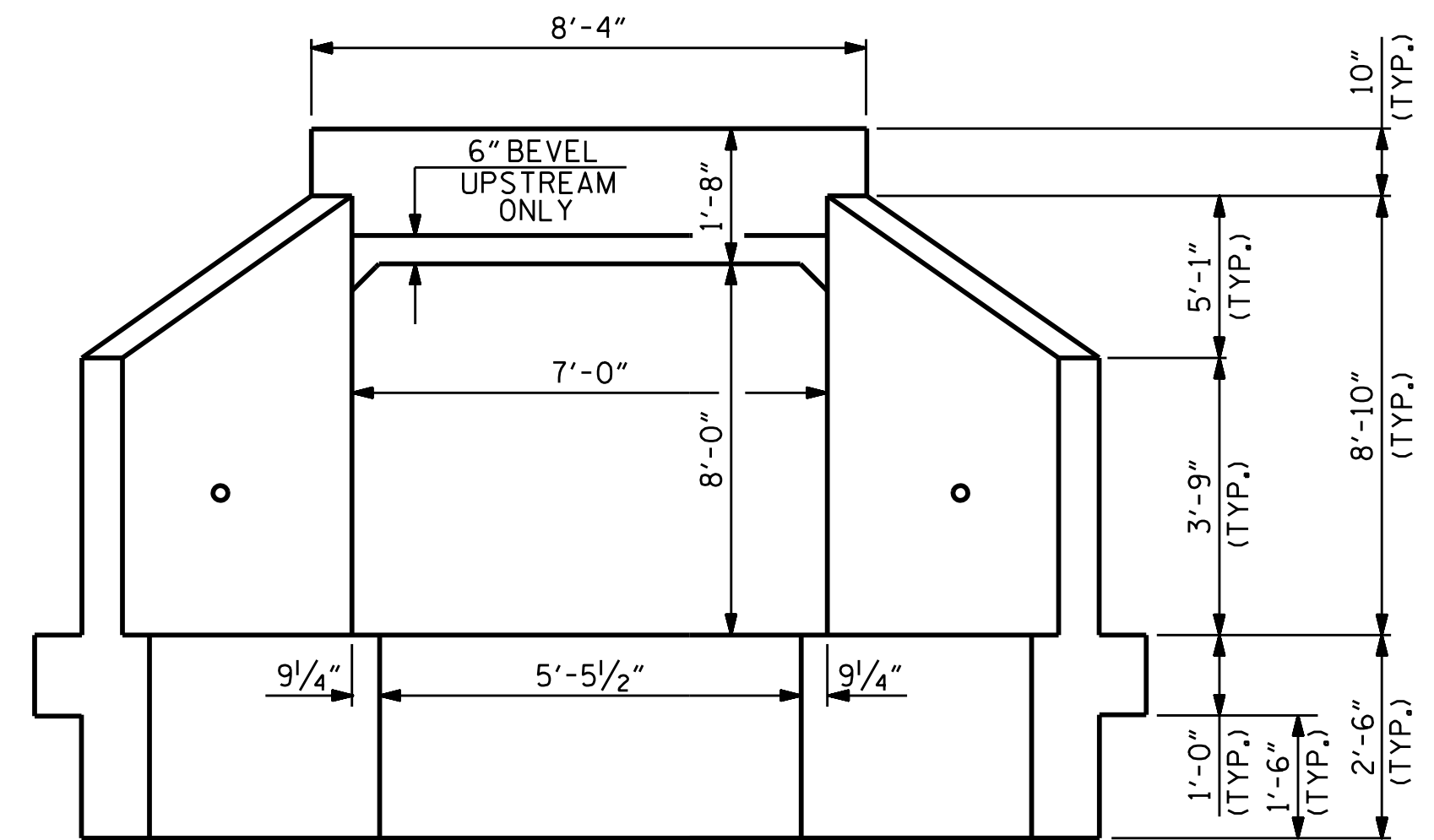
DOCUMENT NOT CONSIDERED
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 SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-43
1			3			TOTAL SHEETS
2			4			47

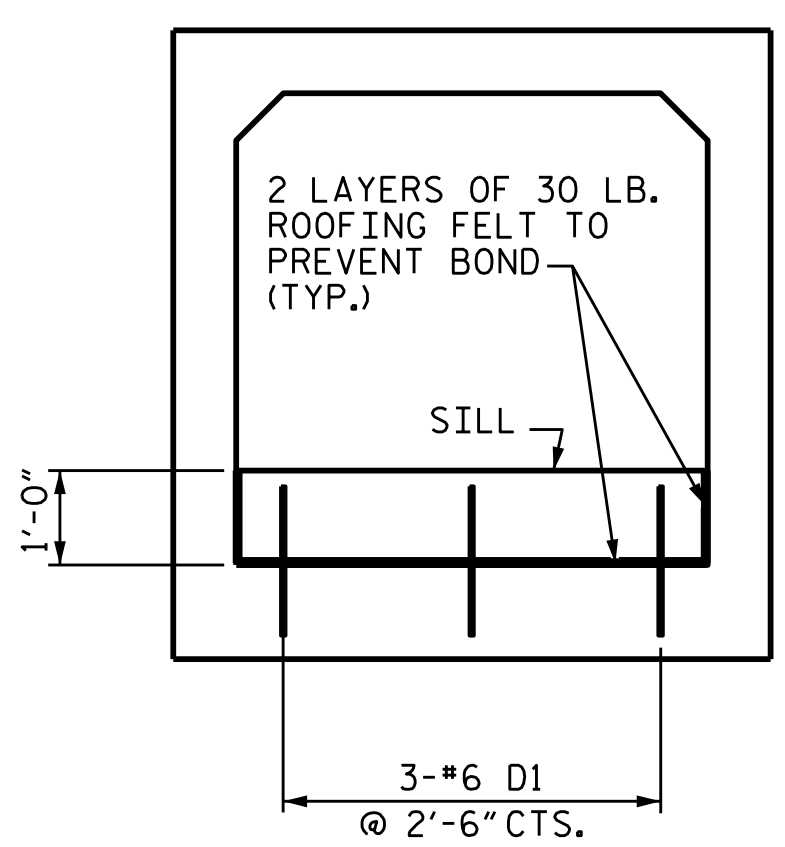
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 *****USER*****



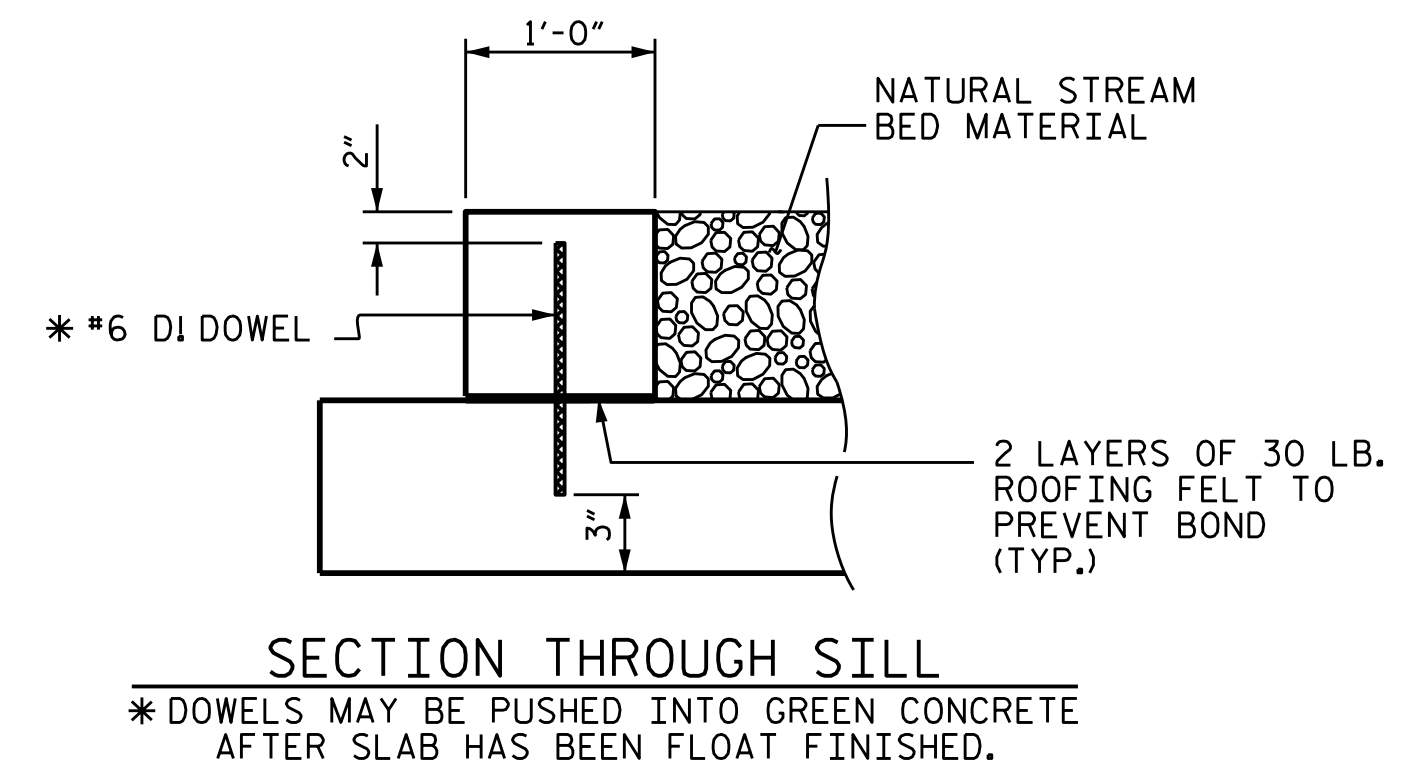
CULVERT SECTION NORMAL TO ROADWAY



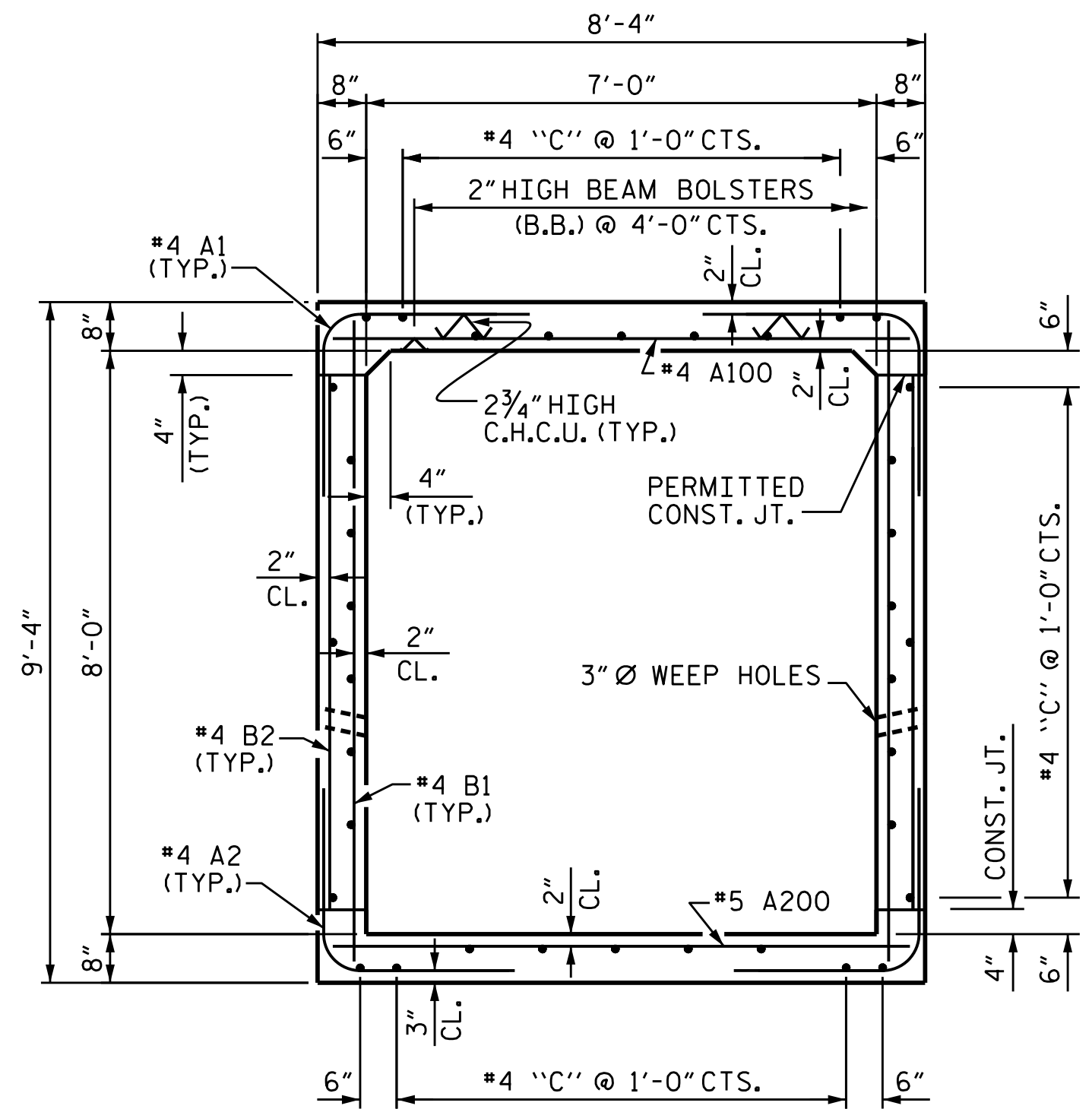
END ELEVATION



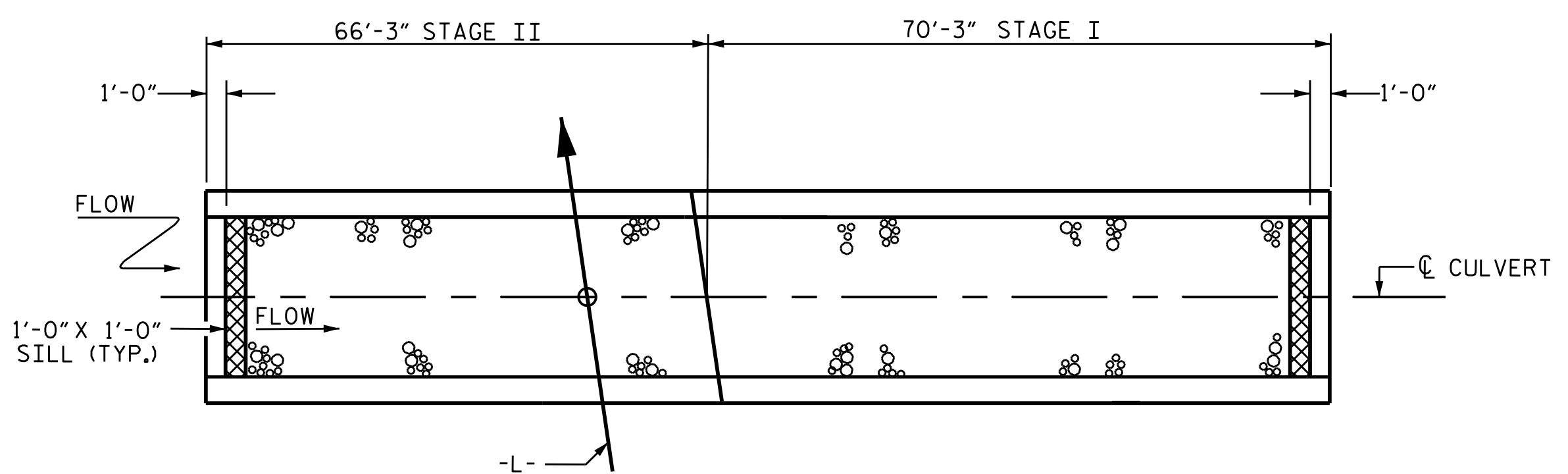
ELEVATION NORMAL TO SKEW



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



RIGHT ANGLE SECTION OF BARREL
THERE ARE 36 "C" BARS IN SECTION OF BARREL



PLAN

SILL DETAILS

NOTES

MATERIAL EXCAVATED FROM THE EXISTING STREAMBED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AS SHOWN IN THE PLAN VIEW. ONLY NATIVE MATERIAL SHALL BE USED IN THE PROPOSED CULVERT. BED MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER.

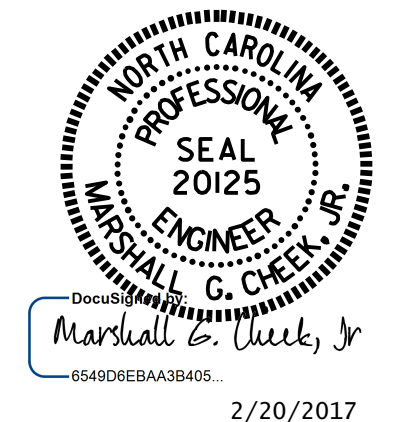
THE ENTIRE COST OF WORK REQUIRED TO PLACE THE EXCAVATED MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR CULVERT EXCAVATION.

THE ENTIRE COST OF WORK REQUIRED TO CONSTRUCT THE SILLS SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.

THE STREAMBED MATERIAL SHOULD BE PLACED LEVEL WITH THE TOP OF THE SILLS.

PROJECT NO. R-3100B
CATAWBA COUNTY
STATION: 192+97.00 -L-

SHEET 3 OF 6



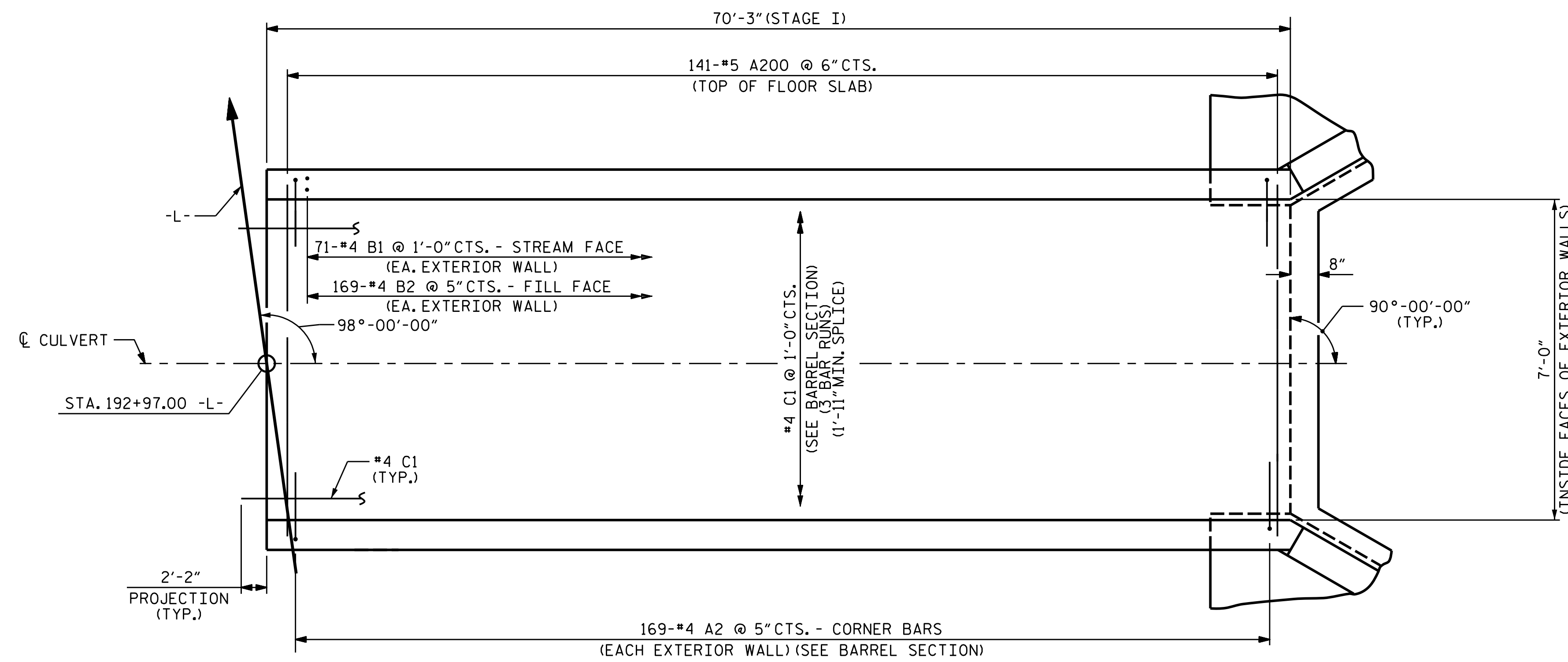
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
**SINGLE 7 FT. X 8 FT.
CONCRETE BOX CULVERT**

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-44
1			3			TOTAL SHEETS
2			4			47

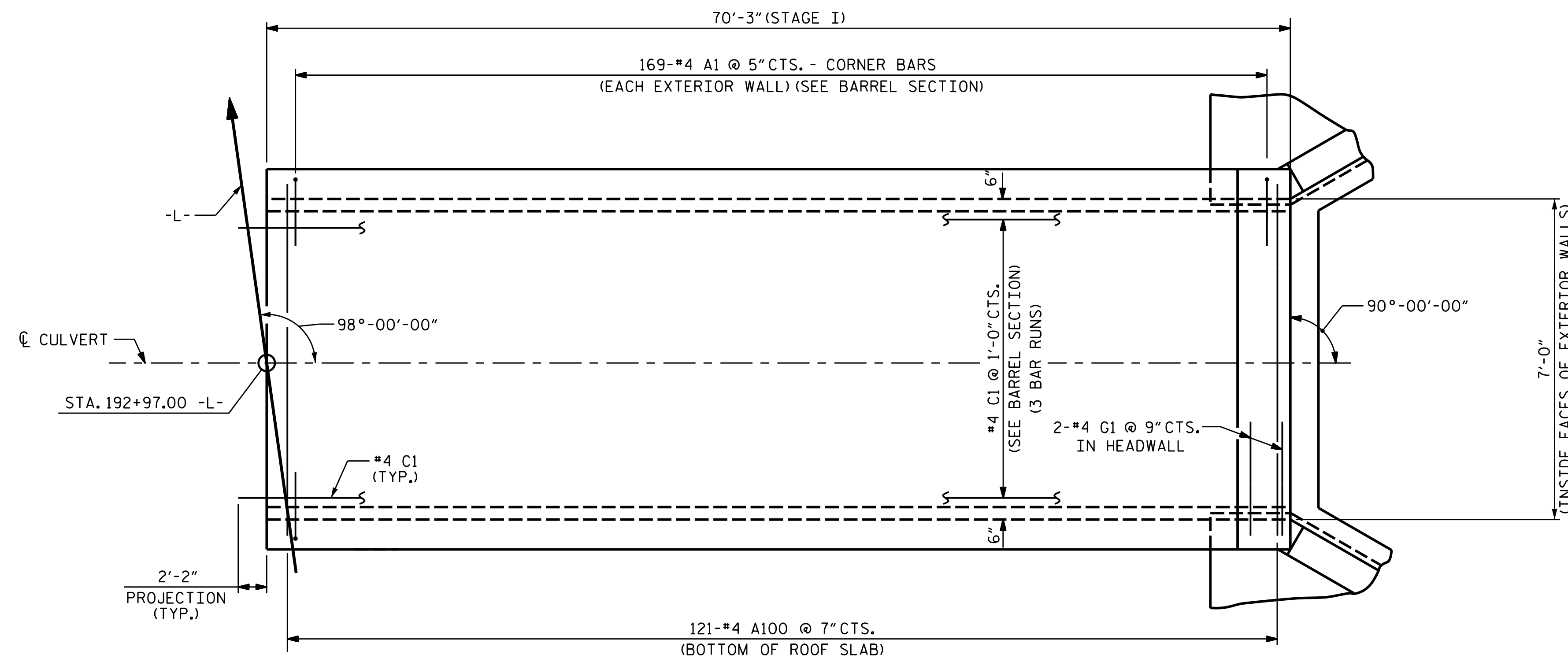
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISED 8-28-92 BY E.L.R. CHECKED BY C.R.P.
 REVISED 8-22-93 BY A.R.B. CHECKED BY C.R.K.
 REDRAWN 8-22-1989
 REVISED 11-19-99 BY M.M. CHECKED BY R.W.W.

DRAWN BY: J.K. BOWLES DATE: 3/24/16
 CHECKED BY: H.A. LOCKLEAR DATE: 7/12/16
 DESIGN ENGINEER OF RECORD: J.K. BOWLES DATE: 12/16



PLAN OF FLOOR SLAB
STAGE I



PLAN OF ROOF SLAB
STAGE I

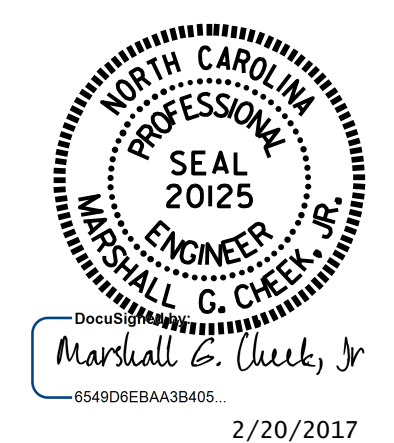
STAGE I QUANTITIES			
CLASS A CONCRETE			
BARREL @	0.811	CY/FT	57.0 C.Y.
WINGS, ETC.			11.4 C.Y.
SILL			0.3 C.Y.
TOTAL			68.7 C.Y.
REINFORCING STEEL			
BARREL		8,539	LBS.
WINGS, ETC.		721	LBS.
TOTAL		9,260	LBS.

BAR SCHEDULE					
STAGE I					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	338	#4	1	5'-6"	1242
A2	338	#4	1	5'-1"	1148
A100	121	#4	STR.	7'-11"	640
A200	141	#5	STR.	7'-11"	1164
B1	142	#4	STR.	8'-10"	838
B2	338	#4	STR.	7'-4"	1656
C1	108	#4	STR.	25'-5"	1834
D1	3	#6	STR.	1'-3"	6
G1	2	#4	STR.	8'-0"	11
REINFORCING STEEL				LBS.	8,539
BAR TYPE					
BAR DIMENSIONS ARE OUT TO OUT.					

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

PROJECT NO. R-3100B
CATAWBA COUNTY
 STATION: 192+97.00 -L-

SHEET 4 OF 6



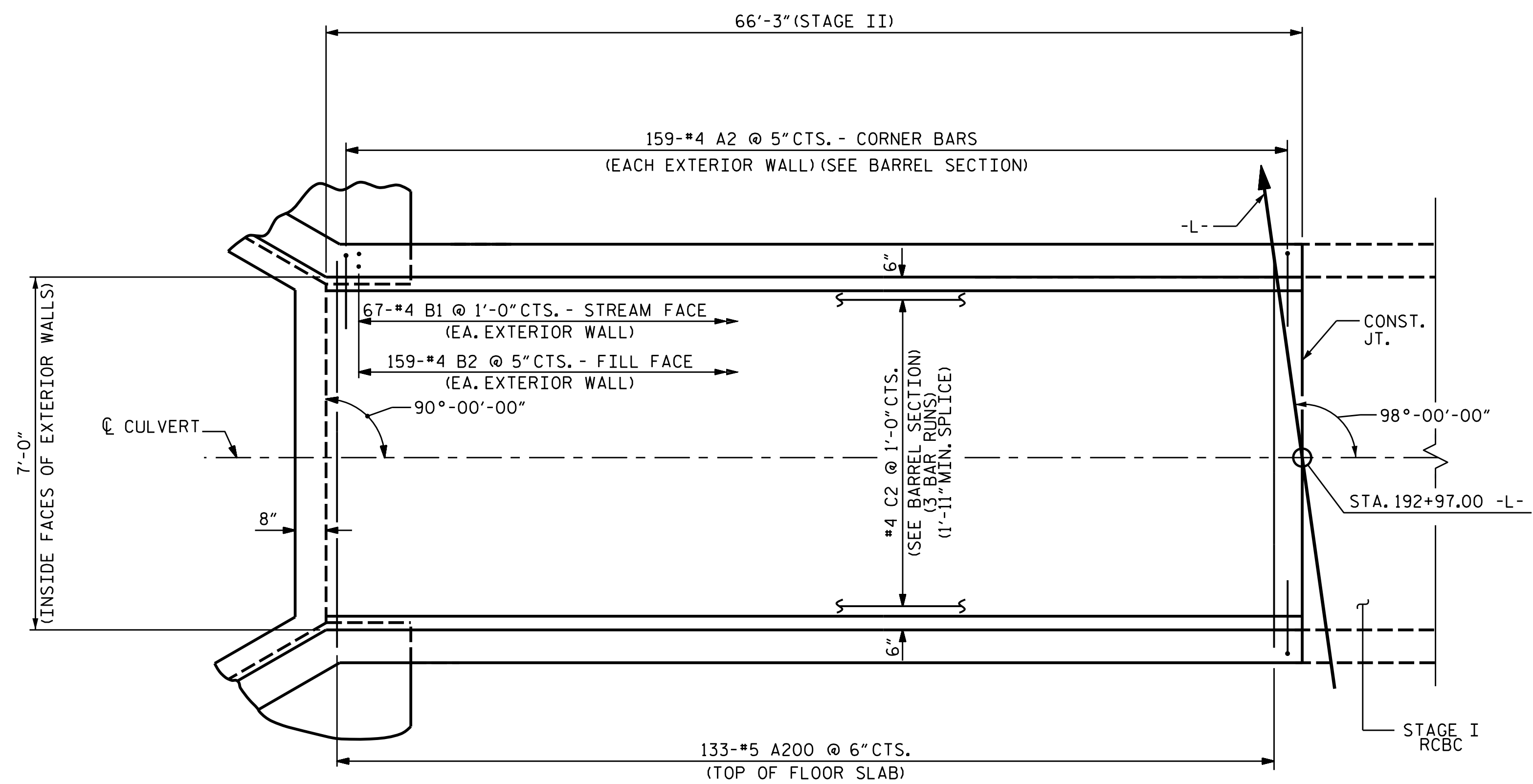
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**SINGLE 7 FT X 8 FT
 CONCRETE BOX CULVERT**

DRAWN BY: J. K. BOWLES DATE: 3/24/16
 CHECKED BY: H.A. LOCKLEAR DATE: 7/12/16
 DESIGN ENGINEER OF RECORD: J. K. BOWLES DATE: 12/16

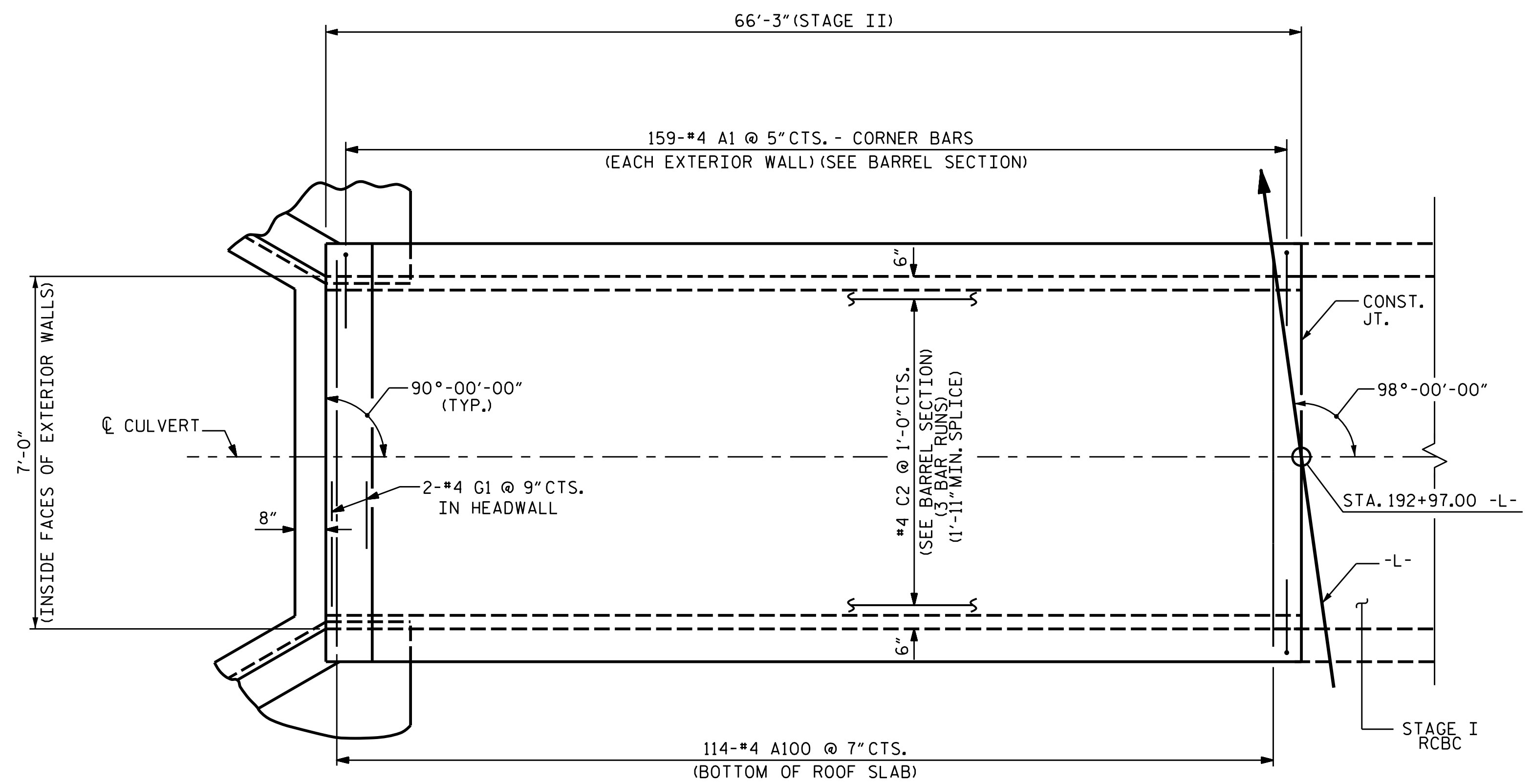
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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-45
1			3			TOTAL SHEETS
2			4			47

*****SYSTEM*****
 *****DCN*****
 *****USERNAME*****

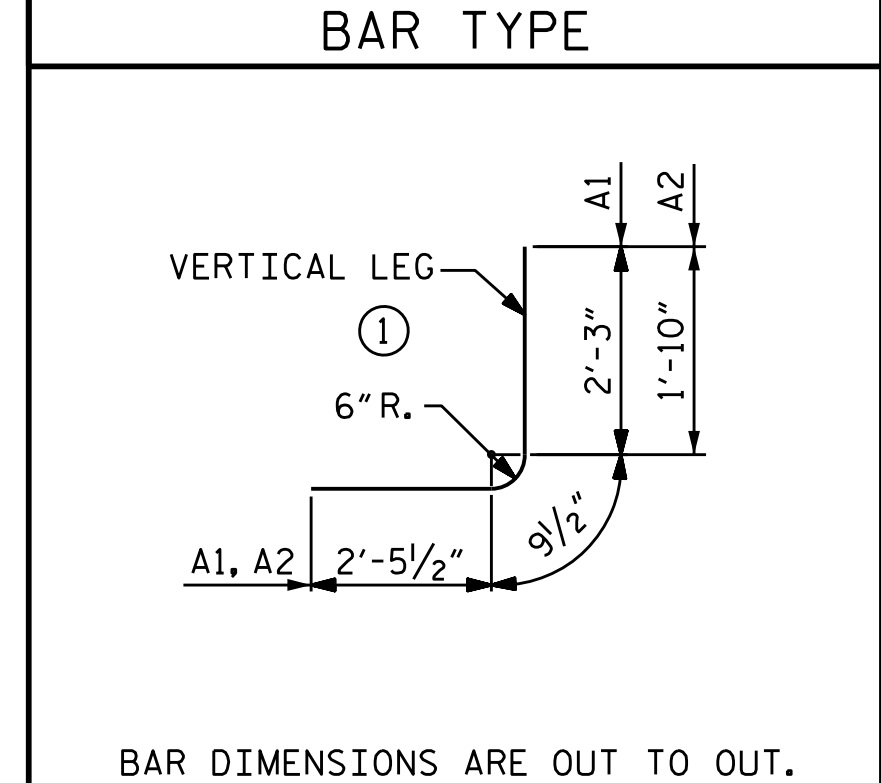


**PLAN FLOOR SLAB
STAGE II**



**PLAN ROOF SLAB
STAGE II**

BAR SCHEDULE					
STAGE II					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	318	#4	1	5'-6"	1168
A2	318	#4	1	5'-1"	1080
A100	114	#4	STR.	7'-11"	603
A200	133	#5	STR.	7'-11"	1098
B1	134	#4	STR.	8'-10"	791
B2	318	#4	STR.	7'-4"	1558
C2	108	#4	STR.	23'-4"	1683
D1	3	#6	STR.	1'-3"	6
G1	2	#4	STR.	8'-0"	11
REINFORCING STEEL				LBS.	7,998



STAGE II QUANTITIES

CLASS A CONCRETE			
BARREL @	0.811	CY/FT	53.7 C.Y.
WINGS, ETC.			11.4 C.Y.
SILL			0.3 C.Y.
TOTAL			65.4 C.Y.
REINFORCING STEEL			
BARREL		7,998	LBS.
WINGS, ETC.		721	LBS.
TOTAL		8,719	LBS.

SPLICE LENGTH

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

DRAWN BY : J. K. BOWLES DATE : 3/24/16
 CHECKED BY : H. A. LOCKLEAR DATE : 7/12/16
 DESIGN ENGINEER OF RECORD: J. K. BOWLES DATE : 12/16

*****SYTIME*****
 *****SDGN*****
 *****USERNAME*****



2/20/2017

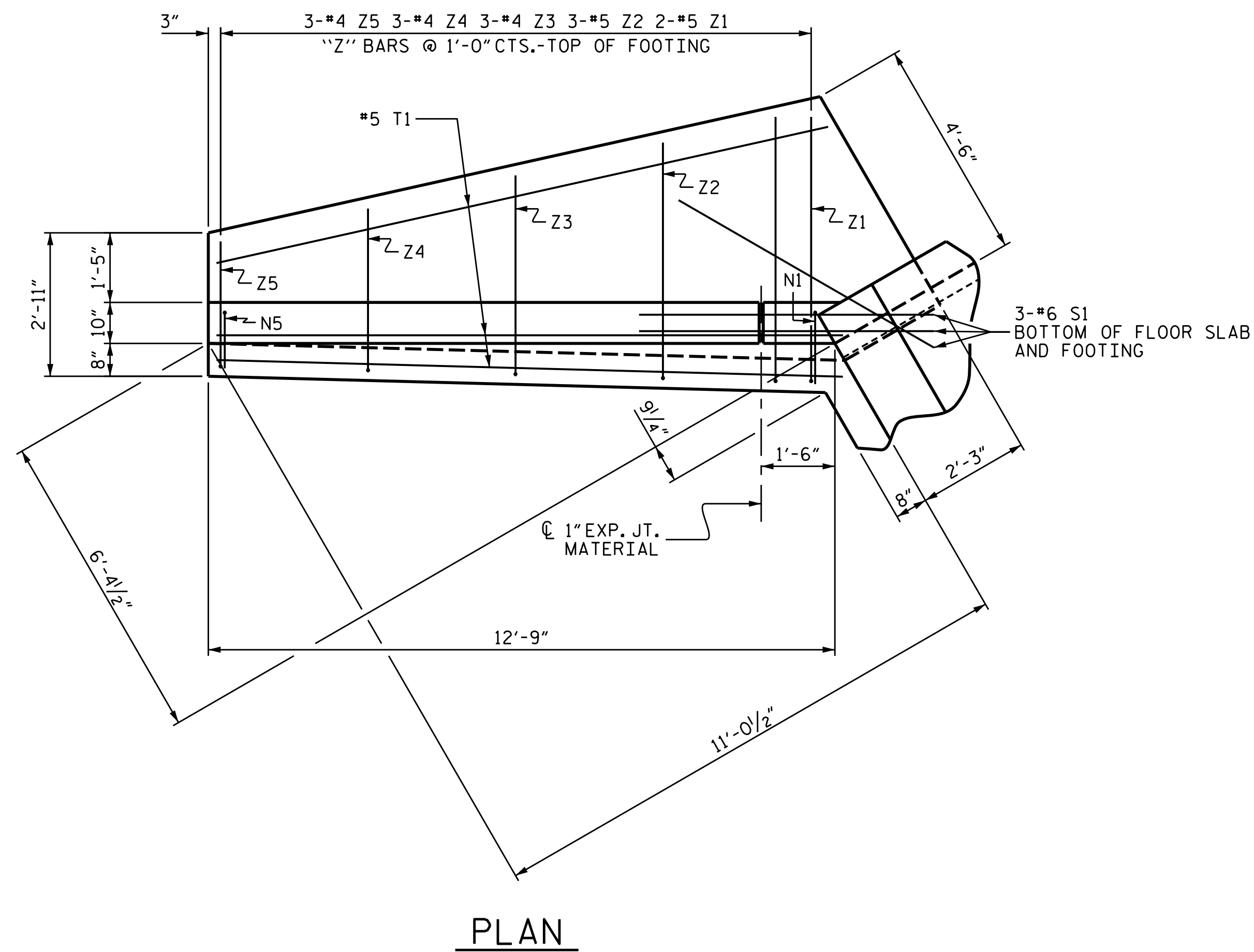
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PROJECT NO. R-3100B
CATAWBA COUNTY
 STATION: 192+97.00 -L-

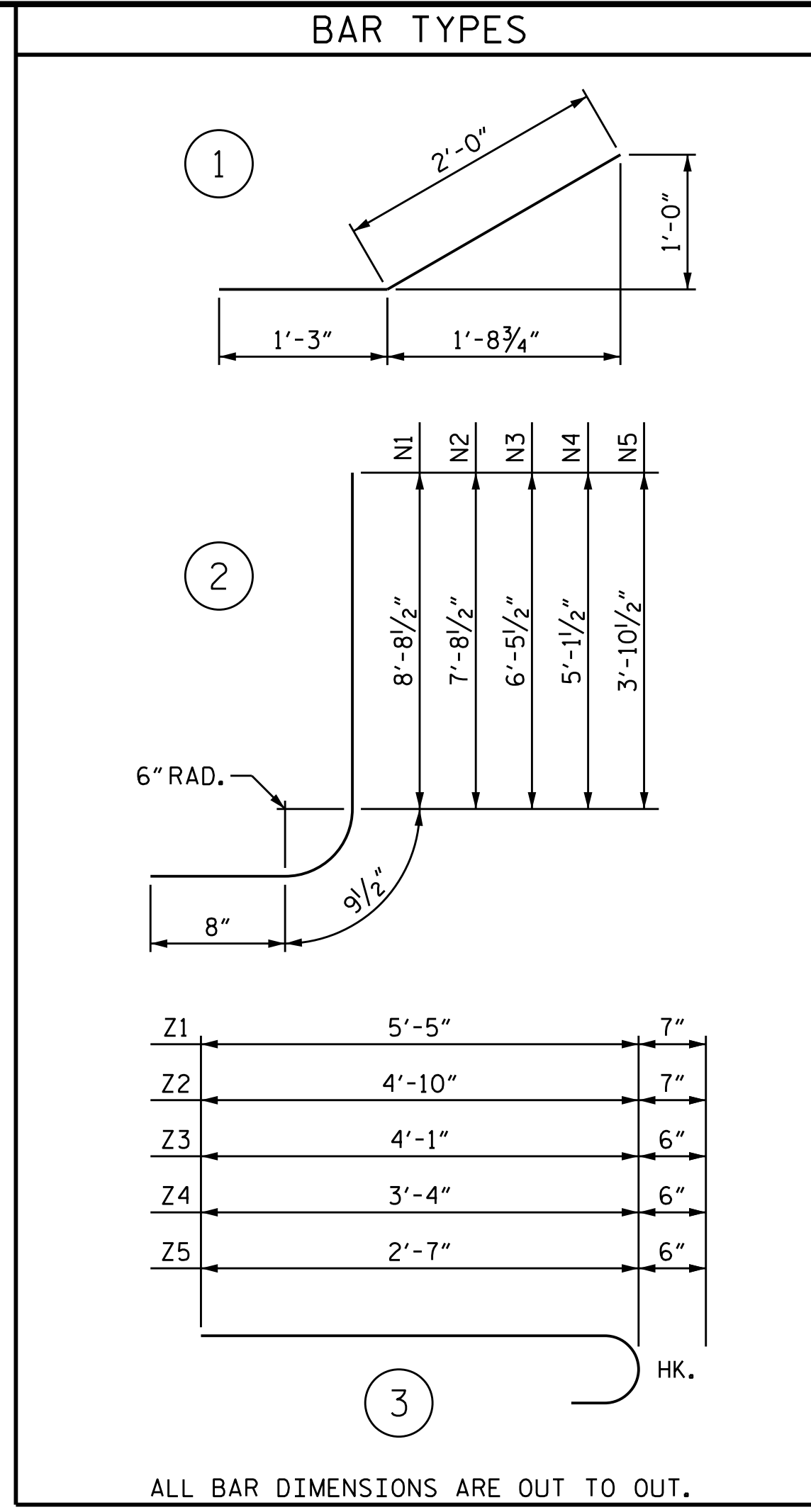
SHEET 5 OF 6

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

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-46
1			3			TOTAL SHEETS
2			4			47

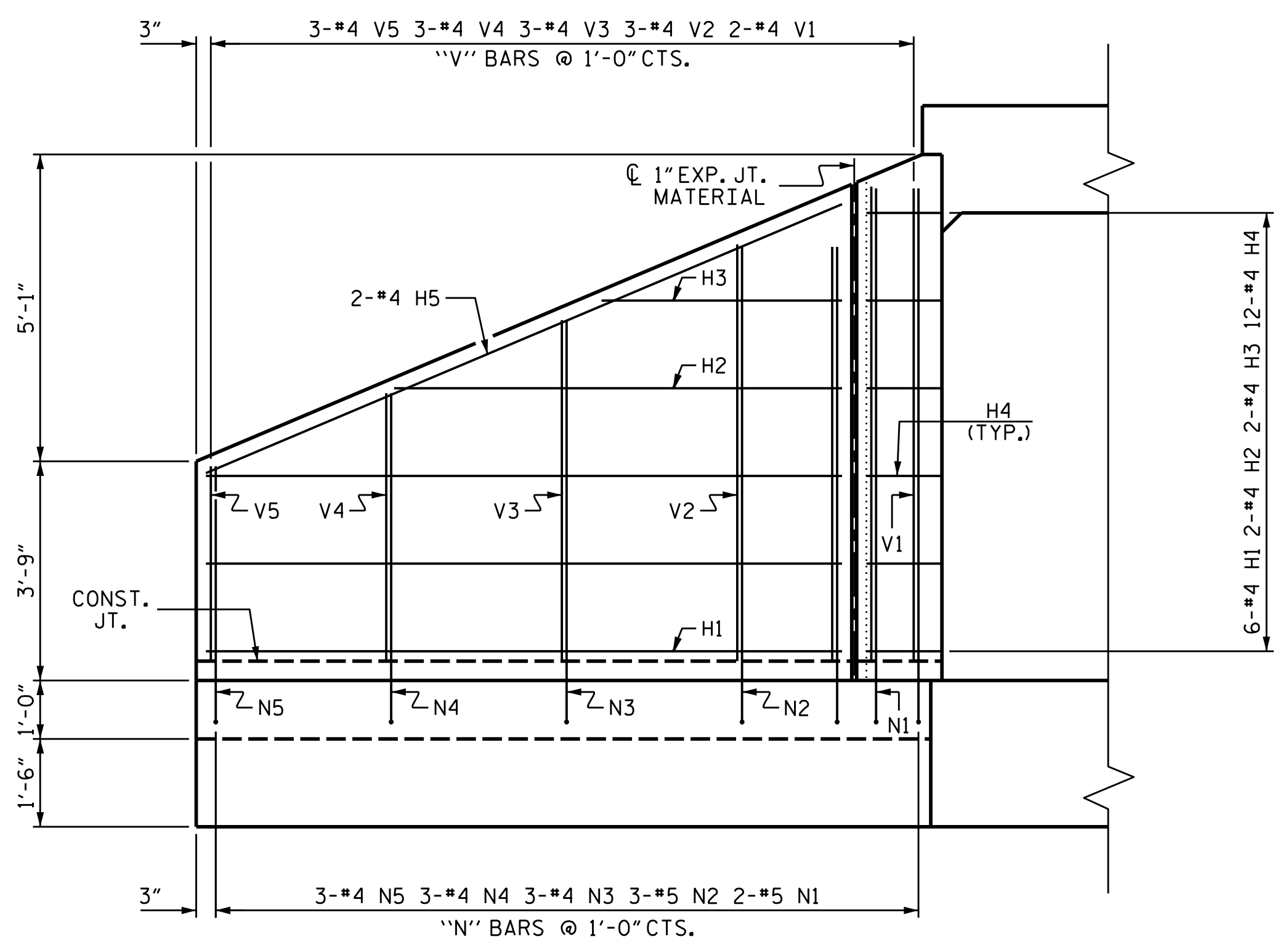


PLAN

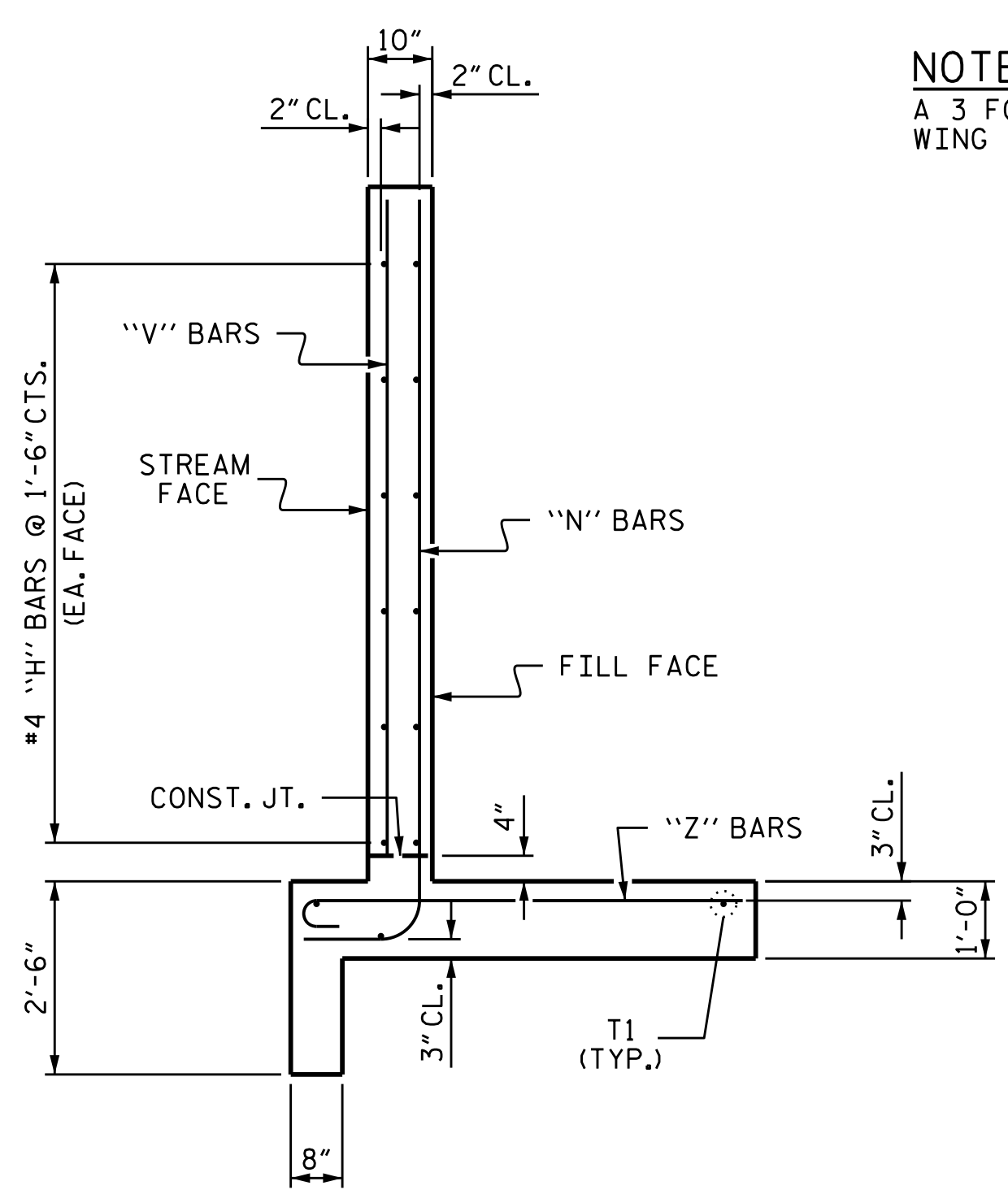


ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL													
STAGE I						STAGE II							
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT		
H1	12	#4	STR.	10'-10"	87	H1	12	#4	STR.	10'-10"	87		
H2	4	#4	STR.	7'-8"	20	H2	4	#4	STR.	7'-8"	20		
H3	4	#4	STR.	4'-1"	11	H3	4	#4	STR.	4'-1"	11		
H4	24	#4	1	3'-3"	52	H4	24	#4	1	3'-3"	52		
H5	4	#4	STR.	11'-9"	31	H5	4	#4	STR.	11'-9"	31		
N1	4	#5	2	10'-2"	42	N1	4	#5	2	10'-2"	42		
N2	6	#5	2	9'-2"	57	N2	6	#5	2	9'-2"	57		
N3	6	#4	2	7'-11"	32	N3	6	#4	2	7'-11"	32		
N4	6	#4	2	6'-7"	26	N4	6	#4	2	6'-7"	26		
N5	6	#4	2	5'-4"	21	N5	6	#4	2	5'-4"	21		
S1	6	#6	STR.	6'-0"	54	S1	6	#6	STR.	6'-0"	54		
T1	6	#5	STR.	12'-9"	80	T1	6	#5	STR.	12'-9"	80		
V1	4	#4	STR.	8'-1"	22	V1	4	#4	STR.	8'-1"	22		
V2	6	#4	STR.	7'-1"	28	V2	6	#4	STR.	7'-1"	28		
V3	6	#4	STR.	5'-10"	23	V3	6	#4	STR.	5'-10"	23		
V4	6	#4	STR.	4'-7"	18	V4	6	#4	STR.	4'-7"	18		
V5	6	#4	STR.	3'-4"	13	V5	6	#4	STR.	3'-4"	13		
Z1	4	#5	3	6'-0"	25	Z1	4	#5	3	6'-0"	25		
Z2	6	#5	3	5'-5"	34	Z2	6	#5	3	5'-5"	34		
Z3	6	#4	3	4'-7"	18	Z3	6	#4	3	4'-7"	18		
Z4	6	#4	3	3'-10"	15	Z4	6	#4	3	3'-10"	15		
Z5	6	#4	3	3'-1"	12	Z5	6	#4	3	3'-1"	12		
REINFORCING STEEL FOR 2 WINGS						LBS.	721	REINFORCING STEEL FOR 2 WINGS					
CLASS A CONCRETE						C.Y.	10.7	CLASS A CONCRETE					
2 WINGS						C.Y.	0.4	2 WINGS					
1 HEADWALL						C.Y.	0.3	1 HEADWALL					
1 END CURTAIN WALL						C.Y.	0.3	1 END CURTAIN WALL					
TOTAL						C.Y.	11.4	TOTAL					



ELEVATION

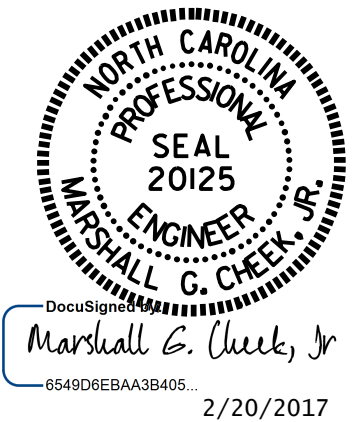


TYPICAL WING SECTION

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.

ASSEMBLED BY : J.K. BOWLES DATE : 3/24/16
 CHECKED BY : H.A. LOCKLEAR DATE : 7/12/16
 DRAWN BY : CCJ 10/99
 CHECKED BY : RWW 03/00

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



PROJECT NO. R-3100B
 CATAWBA COUNTY
 STATION: 192+97.00 -L-

SHEET 6 OF 6
 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:		C-47
1				TOTAL SHEETS
2				47

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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