

TIP PROJECT: B-5167

CONTRACT: C203369

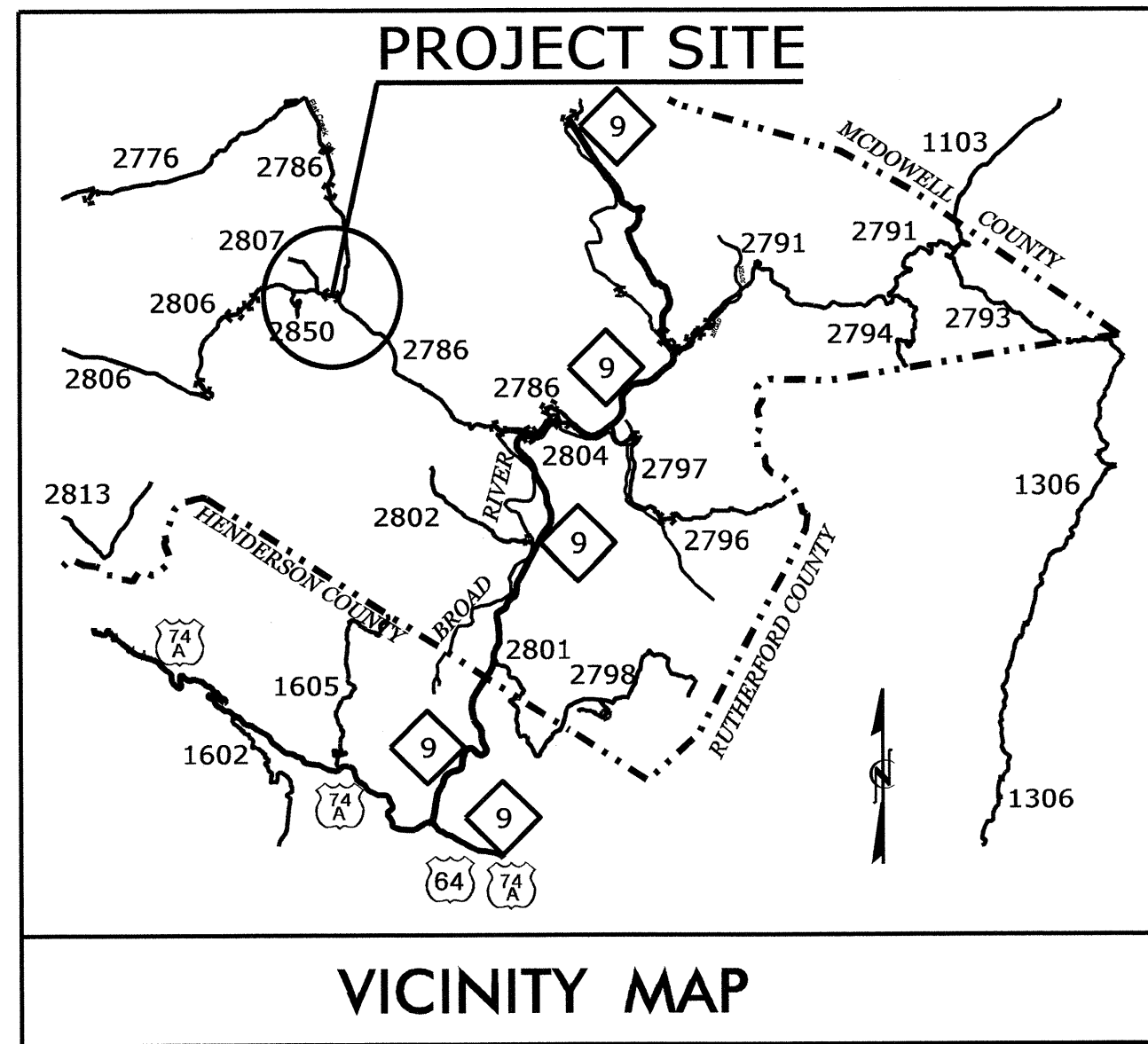
CULVERT

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

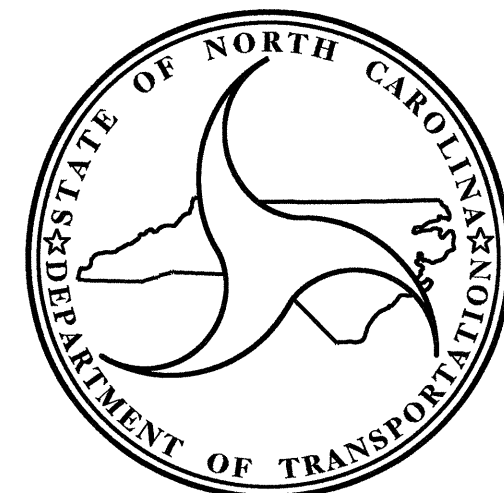
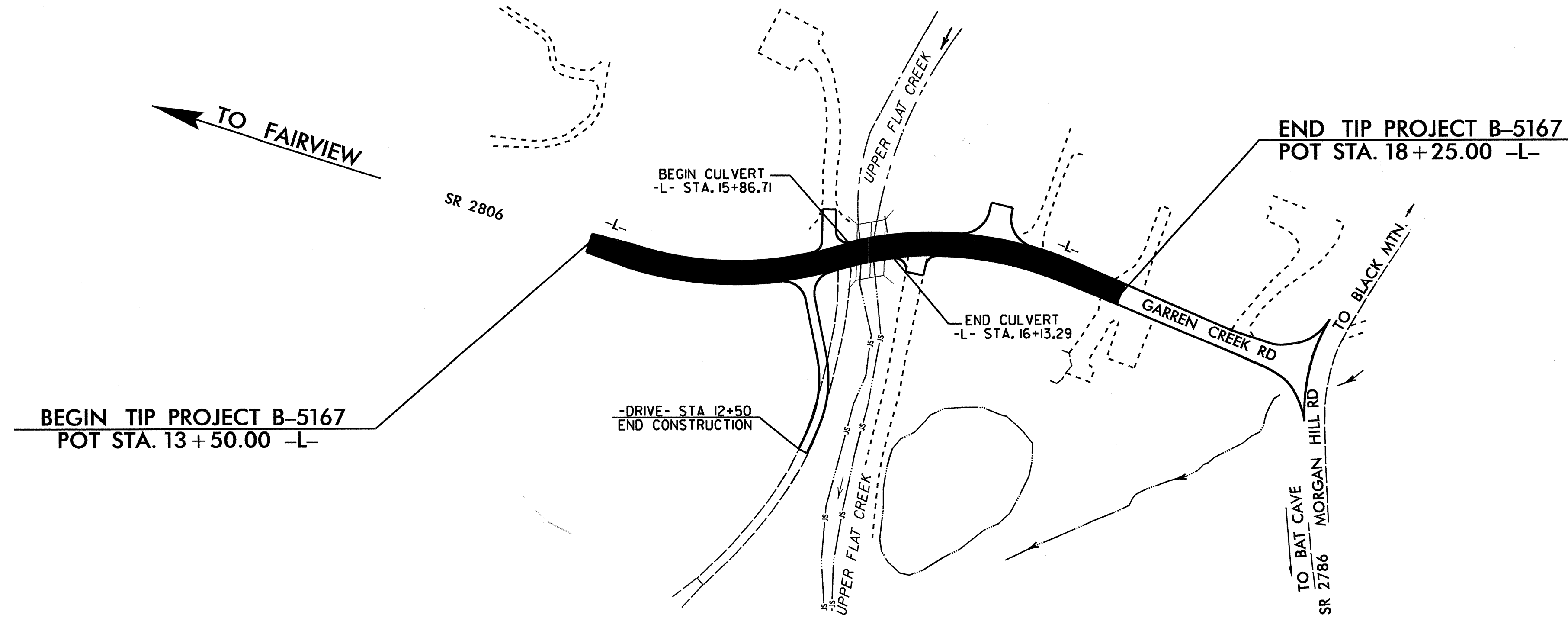
BUNCOMBE COUNTY

**LOCATION: BRIDGE 108 OVER UPPER FLAT CREEK ON
SR 2806 (GARREN CREEK ROAD)**

**TYPE OF WORK: GRADING, DRAINAGE, PAVING, CULVERT,
AND TEMPORARY SIGNALS**



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5167		
STATE PROJ. NO.	P.A. PROJ. NO.	DESCRIPTION	
42324.1.1	BRSTP-2806(1)	PE	
42324.2.1	BRSTP-2806(1)	R/W & UTIL.	
42324.3.FD1	BRSTP-2806(1)	CONST.	



DESIGN DATA

ADT 2014 = 166
ADT 2035 = 250
DHV = 10 %
DIR = 60 %
T = 5 % *
V = 30 MPH
*TTST = 2% DUAL 3%
FUNC. CLASS. =
RURAL LOCAL
SUB-REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B-5167 = 0.085 MILES
LENGTH STRUCTURE TIP PROJECT B-5167 = 0.005 MILES
TOTAL LENGTH TIP PROJECT B-5167 = 0.090 MILES

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

2012 STANDARD SPECIFICATIONS

LETTING DATE:
MARCH 18, 2014

Q. H. NGUYEN, P.E.
PROJECT ENGINEER

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

STRUCTURES MANAGEMENT UNIT
1000 BIRCH RIDGE DRIVE
RALEIGH, N.C. 27610

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

STATE DESIGN ENGINEER _____ P.E.
DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED _____ DATE _____
DIVISION ADMINISTRATOR

22-JAN-2014 08:24
\$\$\$\$\$\$\$\$DCN\$\$\$\$\$\$\$\$

BENCHMARK #1 : RAILROAD SPIKE IN POWER POLE; 120.99 FT. RT. OF STA. 15+75.15 -L-, EL. 2500.28

F.A. PROJECT No. : BRSTP-2806(1)

NOTES

ASSUMED LIVE LOAD----- HL-93 OR ALTERNATE LOADING.
 DESIGN FILL ----- 4.4 FT.
 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 OR STAGE II CULVERT TO BE POURED IN THE FOLLOWING ORDER:

1. PHASE I WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF VERTICAL WALLS.
2. THE REMAINING PORTIONS OF PHASE I WALLS AND PHASE I WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
3. PHASE II WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF PHASE II VERTICAL WALLS.
4. THE REMAINING PORTIONS OF PHASE II WALLS AND PHASE II WINGS FULL HEIGHT.
5. ROOF SLAB AND HEADWALLS.

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

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

AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACES OF THE EXTERIOR WALLS 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 LIMITS OF TEMPORARY SHORING, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING, SEE ROADWAY PLANS.

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

AFTER SERVING AS A TEMPORARY STRUCTURE, THE EXISTING 1 SPAN STRUCTURE (1 @ 25'-6") WITH A CLEAR ROADWAY WIDTH OF 19'-2" AND A 4 1/2" ASPHALT WEARING SURFACE ON A TIMBER DECK ON 10 LINES OF STEEL I-BEAMS, AND A SUBSTRUCTURE CONSISTING OF TIMBER CAPS, TIMBER POSTS AND CONCRETE SILL ABUTMENTS AND LOCATED AT THE SITE OF THE PROPOSED STRUCTURE SHALL BE REMOVED. THE EXISTING BRIDGE IN PRESENTLY NOT POSTED FOR LOAD LIMIT, SHOULD THE STRUCTURAL INTEGRITY OF THE BRIDGE DETERIORATE DURING CONSTRUCTION OF THE PROPOSED BRIDGE, A LOAD LIMIT MAY BE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT. SEE SPECIAL PROVISION FOR "REMOVAL OF EXISTING STRUCTURE".

THE EXISTING BRIDGE SHALL BE PARTIALLY REMOVED AS SHOWN IN THE TRAFFIC CONTROL PLANS. THE EXISTING RAIL SHALL BE REMOVED AND REATTACHED TO THE REMAINING PORTION OF THE EXISTING BRIDGE. SEE SPECIAL PROVISION FOR "REMOVAL OF EXISTING STRUCTURE".

REMOVAL OF THE EXISTING BRIDGE SHALL BE PERFORMED SO AS NOT TO ALLOW DEBRIS TO FALL INTO THE WATER. THE CONTRACTOR SHALL REMOVE THE BRIDGE AND SUBMIT PLANS FOR DEMOLITION IN ACCORDANCE WITH ARTICLE 402-2 OF THE STANDARD SPECIFICATIONS.

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

FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

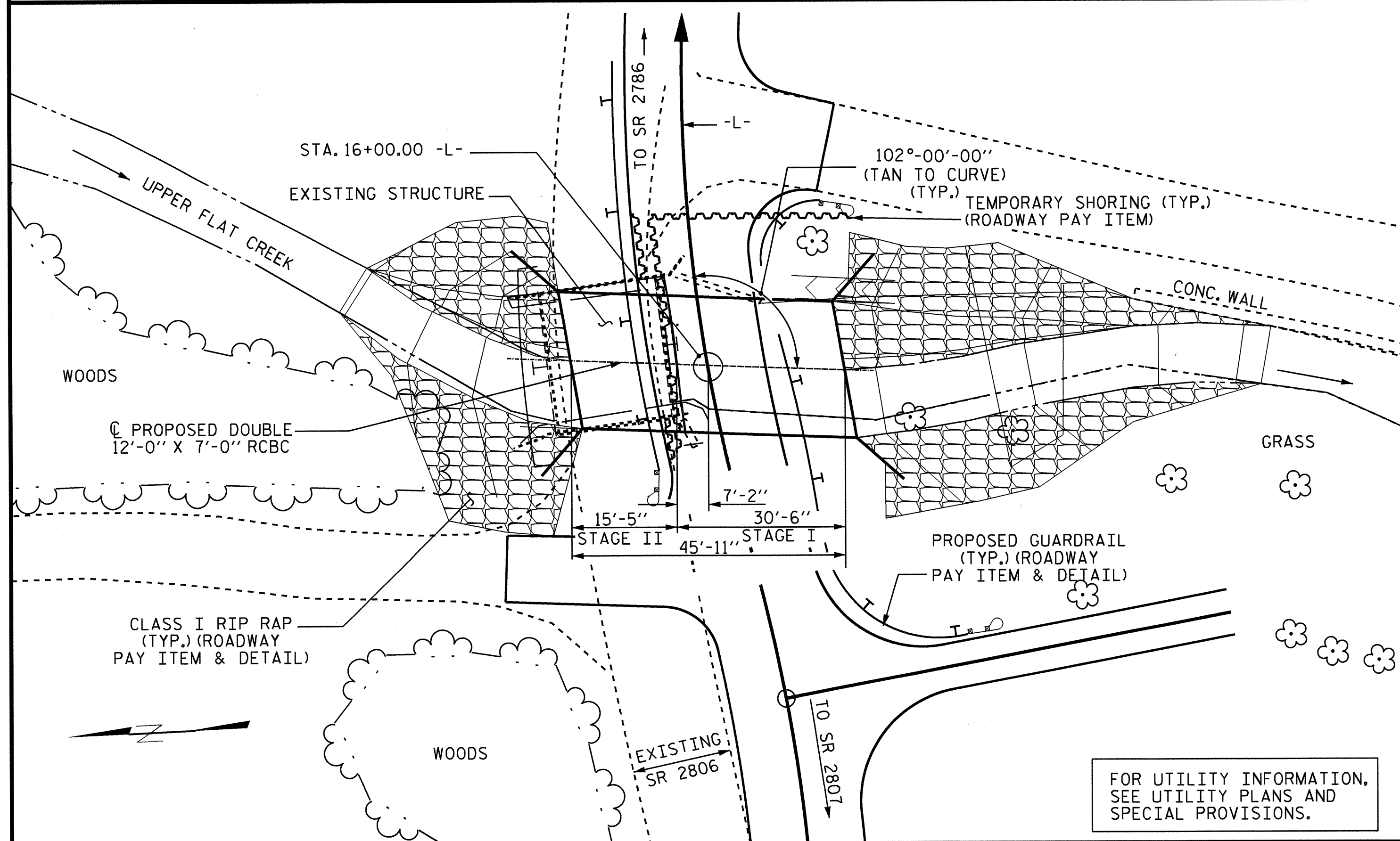
FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

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

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.

FOR TRAFFIC PHASING, SEE TRAFFIC CONTROL PLANS.



LOCATION SKETCH

HYDRAULIC DATA

DESIGN DISCHARGE ----- 1100 CFS
 FREQUENCY OF DESIGN FLOOD ----- 25 YRS.
 DESIGN HIGH WATER ELEVATION ----- 2501.2
 DRAINAGE AREA ----- 4.0 SQ. MI.
 BASE DISCHARGE (Q100) ----- 1600 CFS
 BASE HIGH WATER ELEVATION ----- 2503.6

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE ----- 1440 CFS
 FREQUENCY OF OVERTOPPING FLOOD ----- 50 YRS. ±
 OVERTOPPING FLOOD ELEVATION ----- 2503.1

GRADE DATA

GRADE POINT ELEV. @ STATION 16+00.00 -L- ---- 2504.09
 BED ELEV. @ STATION 16+00.00 -L- ----- 2493.24
 ROADWAY FILL SLOPES ----- 2:1

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
STAGE I -----	88.4 C.Y.
STAGE II -----	52.0 C.Y.
TOTAL -----	140.4 C.Y.
REINFORCING STEEL	
STAGE I -----	12872 LBS.
STAGE II -----	7344 LBS.
TOTAL -----	20216 LBS.
CULVERT EXCAVATION ----- LUMP SUM	
FOUNDATION COND. MAT'L.	
STAGE I -----	56 TONS
STAGE II -----	29 TONS
TOTAL -----	85 TONS
REMOVAL OF EXISTING STRUCTURE ----- LUMP SUM	

PROJECT NO. B-5167
BUNCOMBE COUNTY
 STATION: 16+00.00 -L-

SHEET 1 OF 10 REPLACES BRIDGE No. 108

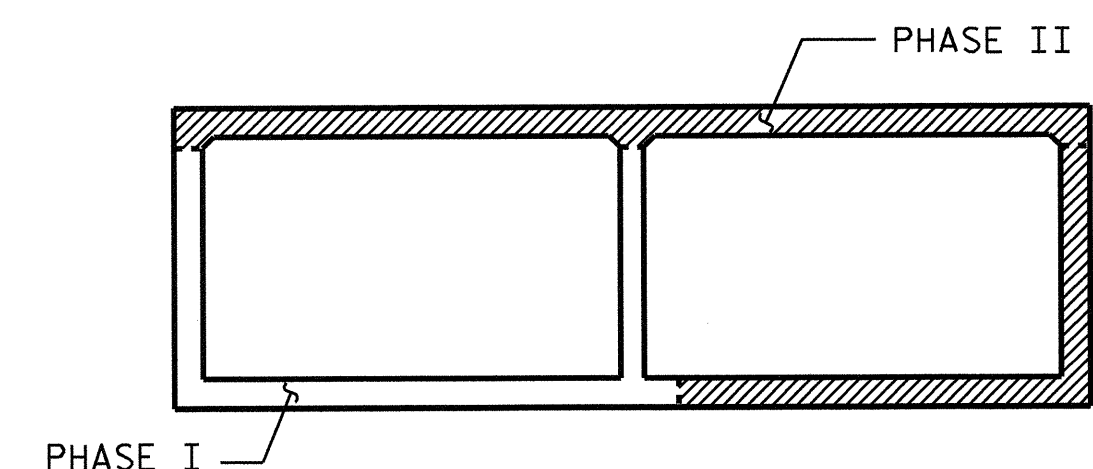


Quang H. Nguyen
1-22-14



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
DOUBLE 12'-0" X 7'-0" CONCRETE BOX CULVERT
 102° SKEW

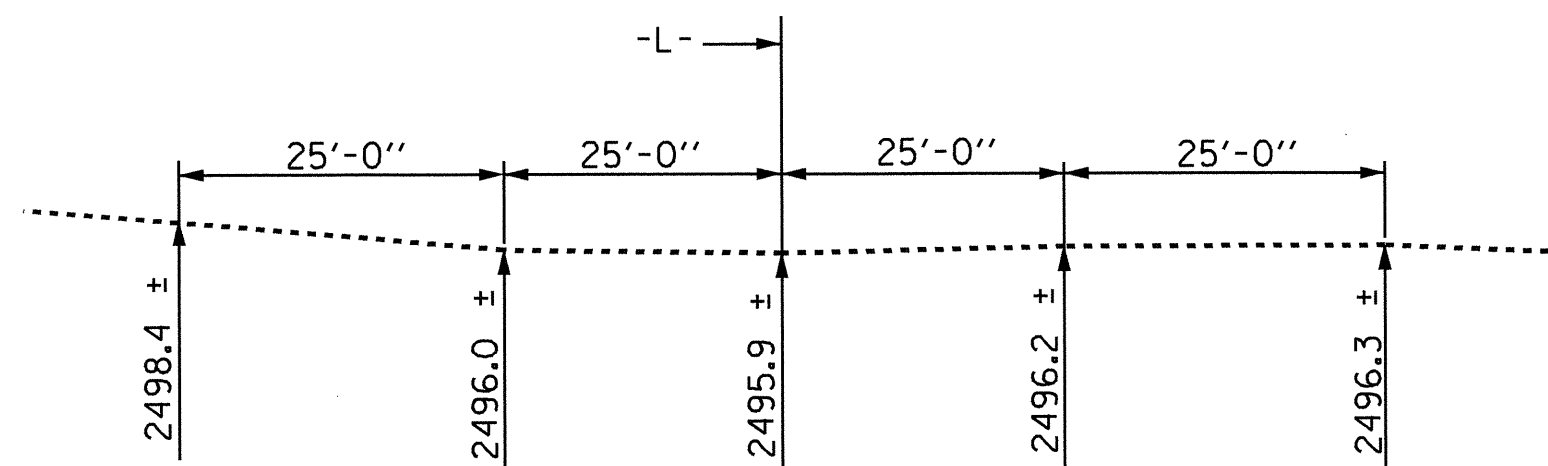
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NO.	BY:	DATE:	NO.	BY:	DATE:	C-1
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2			4			10



CONSTRUCTION PHASING

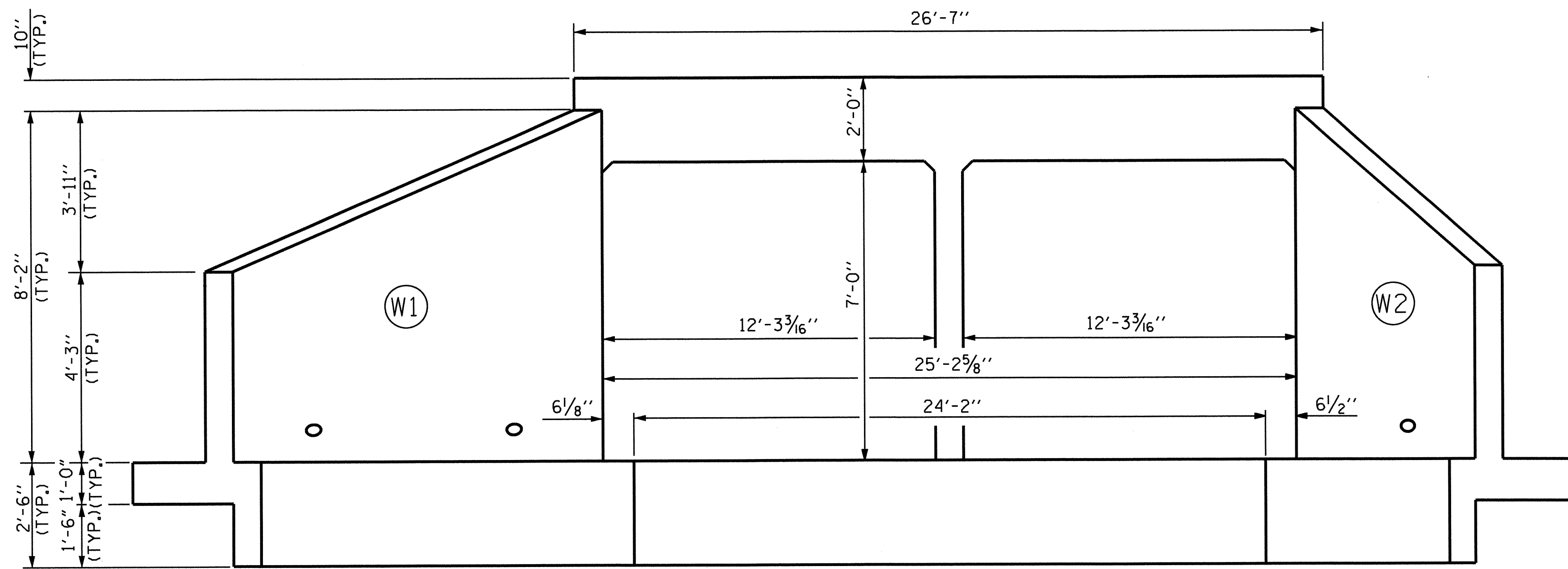
(LOOKING DOWNSTREAM)

- PHASE II CONSTRUCTION
- PHASE I CONSTRUCTION

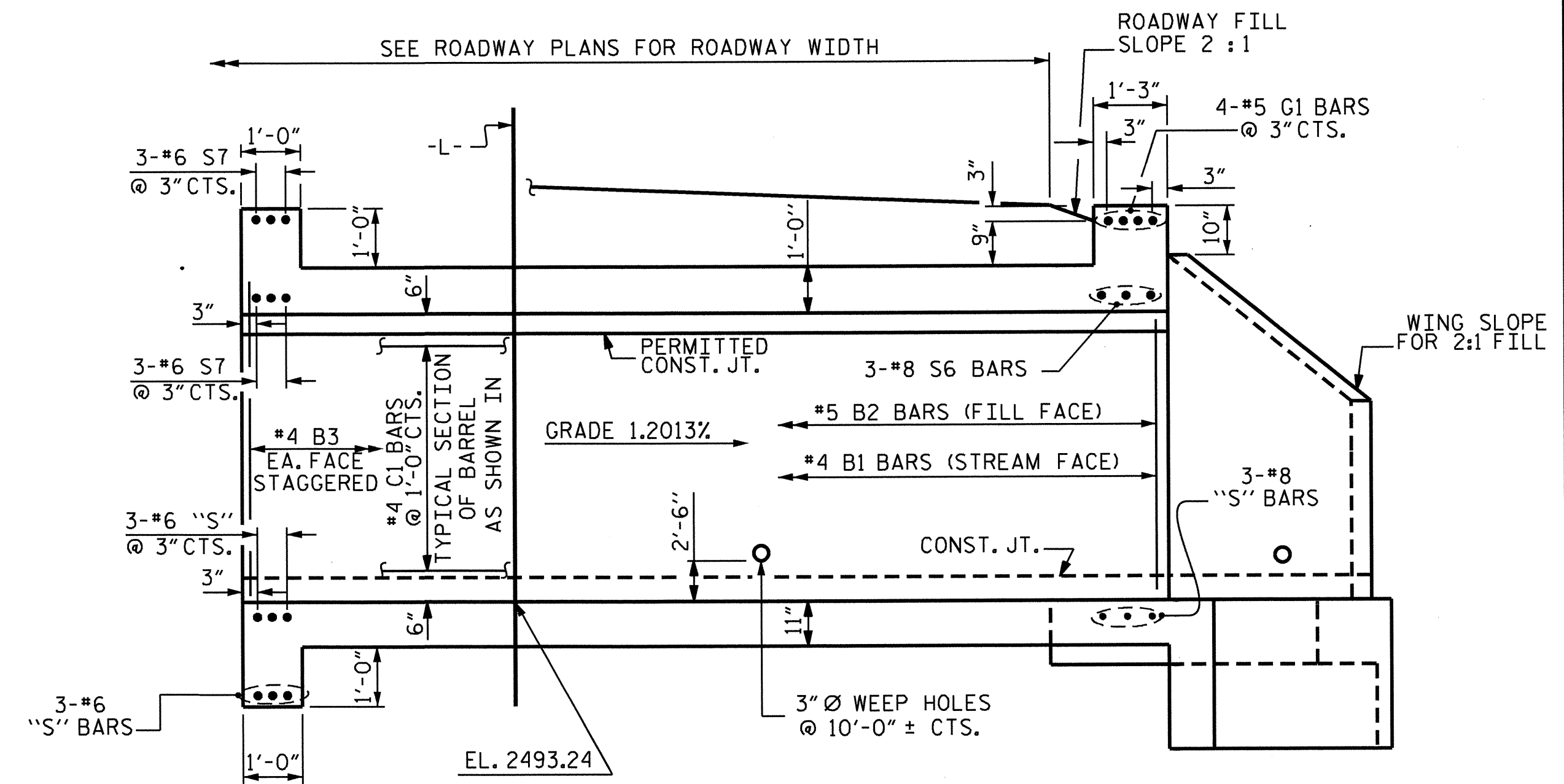


PROFILE ALONG CULVERT

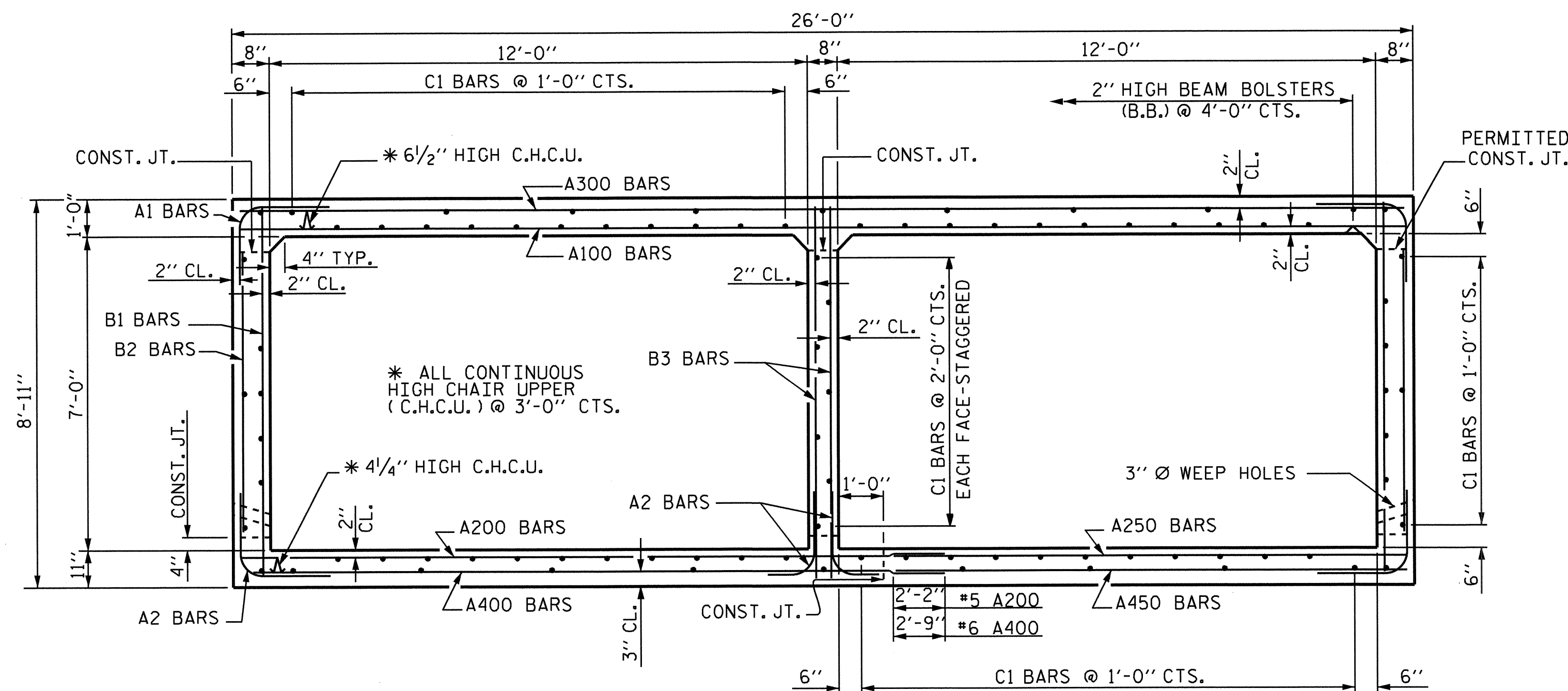
DRAWN BY : M. POOLE DATE : 12/12
 CHECKED BY : J. R. MCROY DATE : 07/13



OUTLET END ELEVATION NORMAL TO SKEW



INT. WALL EXT. WALL
CULVERT SECTION NORMAL TO ROADWAY



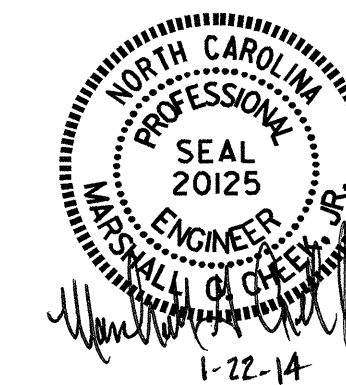
RIGHT ANGLE SECTION OF BARREL

THERE ARE 89 "C" BARS IN SECTION OF BARREL.
 (LOOKING DOWNSTREAM)

PROJECT NO. B-5167
BUNCOMBE COUNTY
 STATION: 16+00.00 -L-

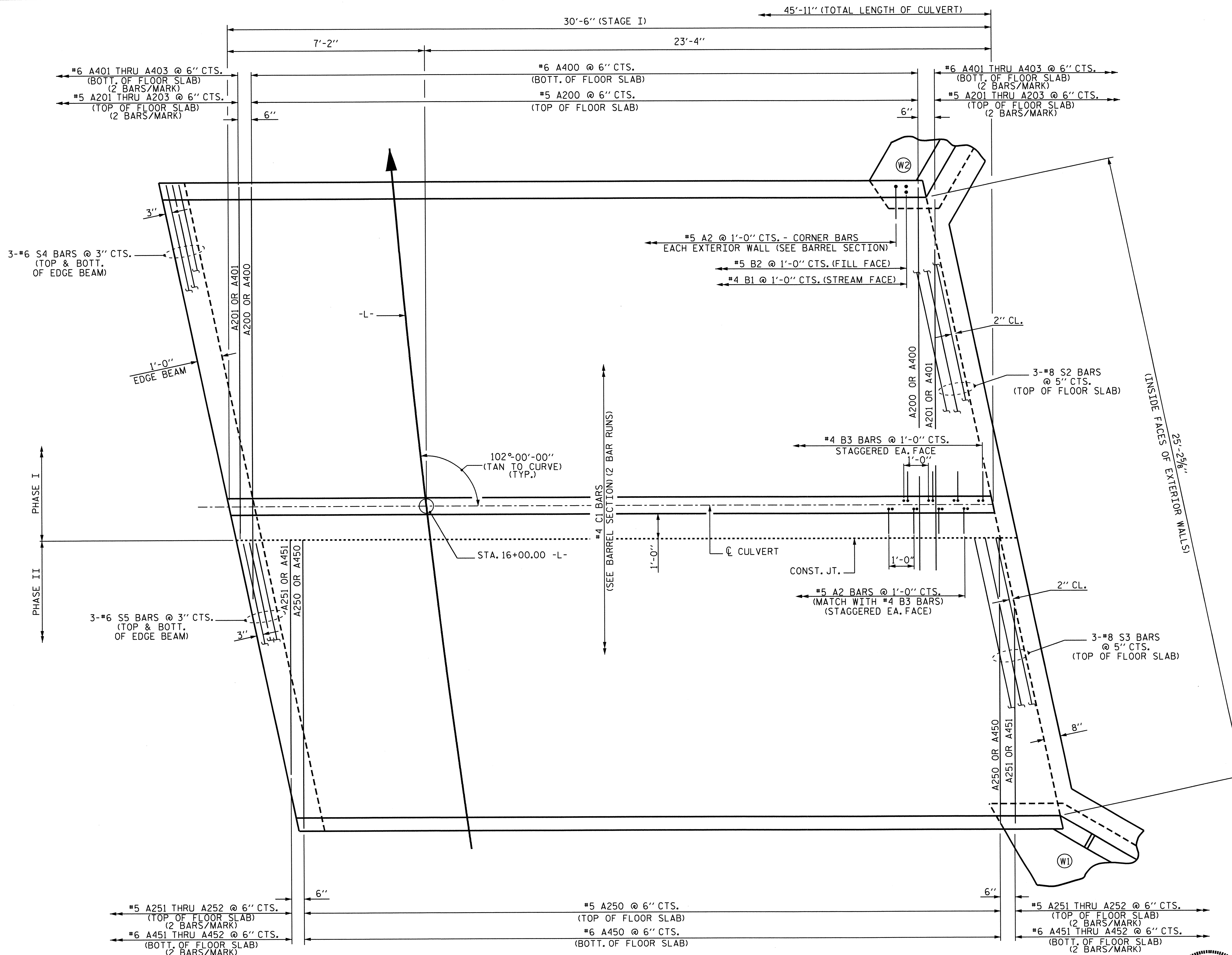
SHEET 2 OF 10

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
DOUBLE 12'-0" X 7'-0" CONCRETE BOX CULVERT STAGE I



DRAWN BY: M. POOLE DATE: 01/13
 CHECKED BY: J. R. MCROY DATE: 05/13
 DESIGN ENGINEER OF RECORD: J. R. MCROY DATE: 07/13

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



PLAN OF FLOOR SLAB

STAGE I

NOTE : FOR S1 BARS IN FLOOR SLAB & WING FOOTINGS, SEE WING SHEET.

PROJECT NO. B-5167
BUNCOMBE COUNTY
 STATION: 16+00.00 -L-

SHEET 3 OF 10

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

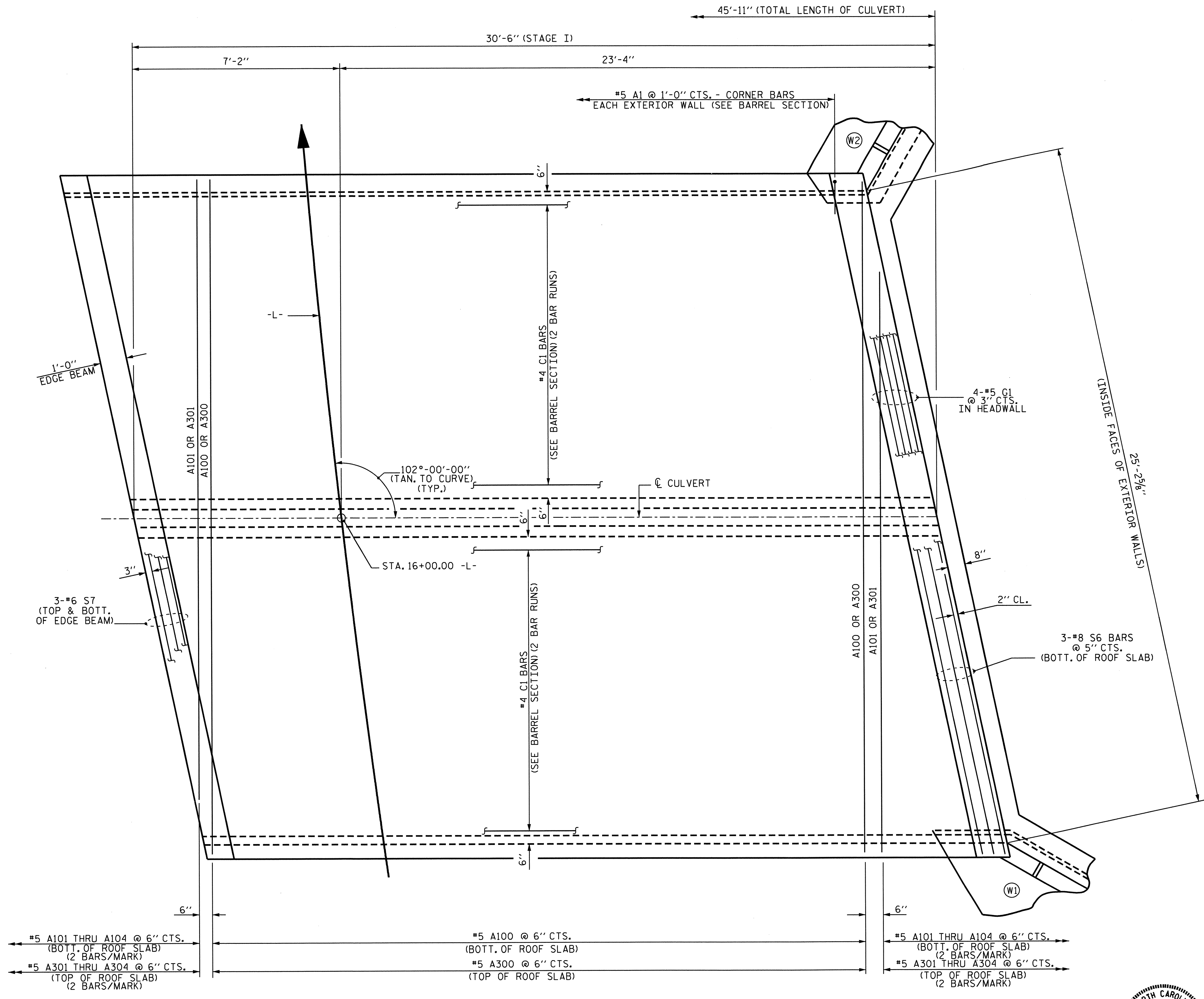
DOUBLE 12'-0" X 7'-0" CONCRETE BOX CULVERT STAGE I

REVISIONS						SHEET NO.
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2			4			10



DRAWN BY : M. POOLE DATE : 01/13
 CHECKED BY : J. R. MCROY DATE : 07/13
 DESIGN ENGINEER OF RECORD: J. R. MCROY DATE : 07/13

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**PLAN OF ROOF SLAB
STAGE I**

PROJECT NO. B-5167
BUNCOMBE COUNTY
 STATION: 16+00.00 -L-

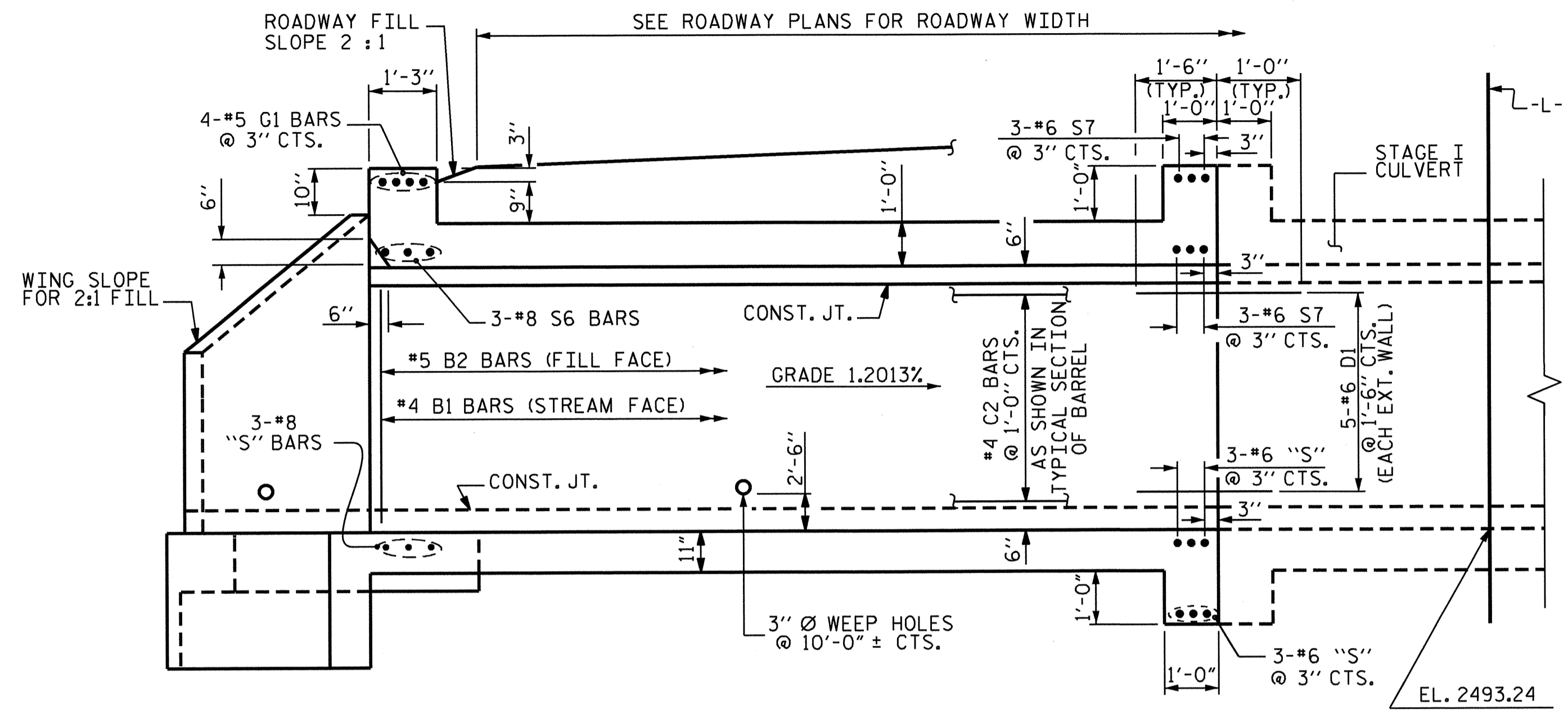
SHEET 4 OF 10
 STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**DOUBLE 12'-0" X 7'-0"
 CONCRETE BOX CULVERT
 STAGE I**



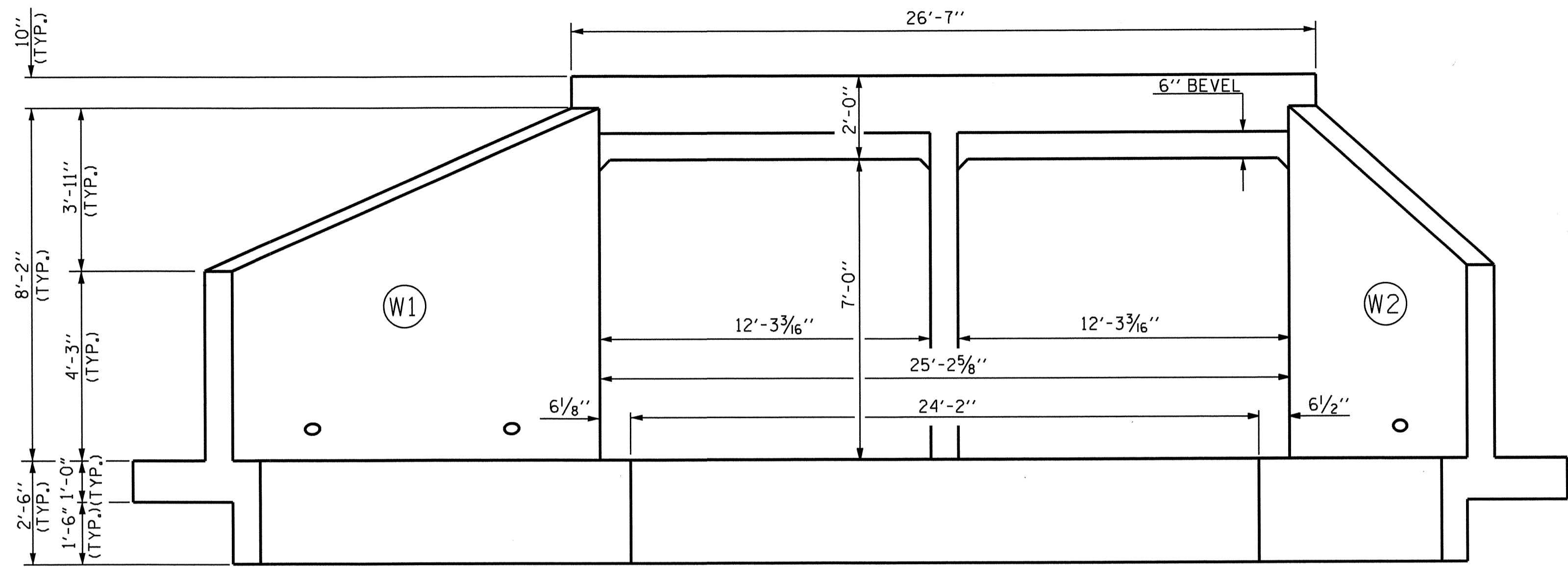
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 CHECKED BY : J.R. MCROY DATE : 05/13
 DESIGN ENGINEER OF RECORD: J.R. MCROY DATE : 07/13

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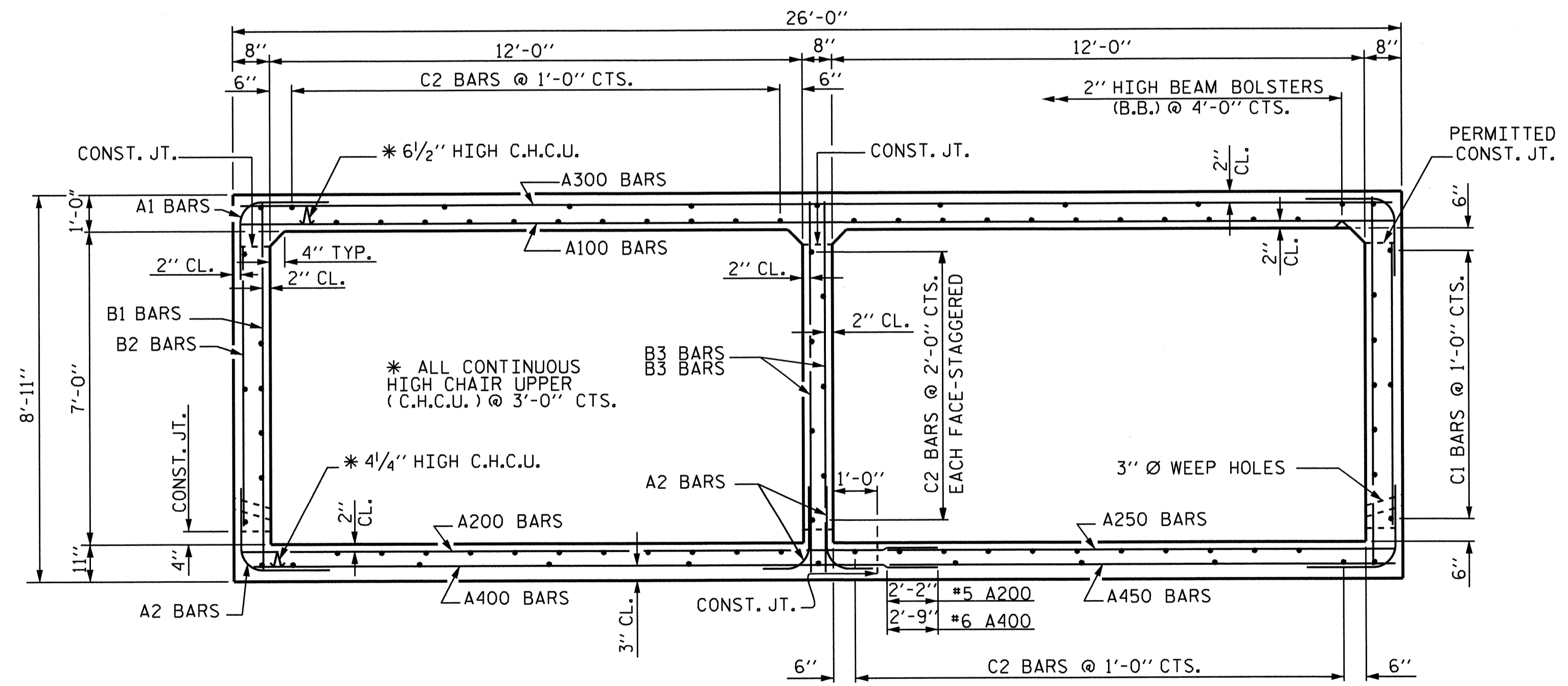
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NO.	BY:	DATE:	NO.	BY:	DATE:	C-4
1			3			TOTAL SHEETS
2			4			10



CULVERT SECTION NORMAL TO ROADWAY



INLET END ELEVATION NORMAL TO SKEW

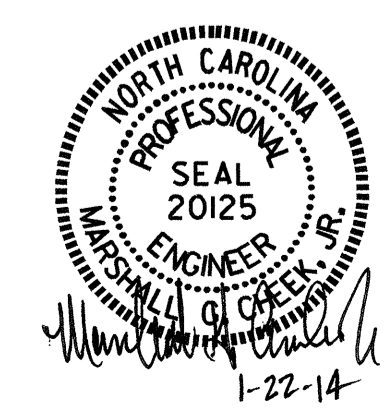


RIGHT ANGLE SECTION OF BARREL

THERE ARE 89 "C" BARS IN SECTION OF BARREL.
 (LOOKING DOWNSTREAM)

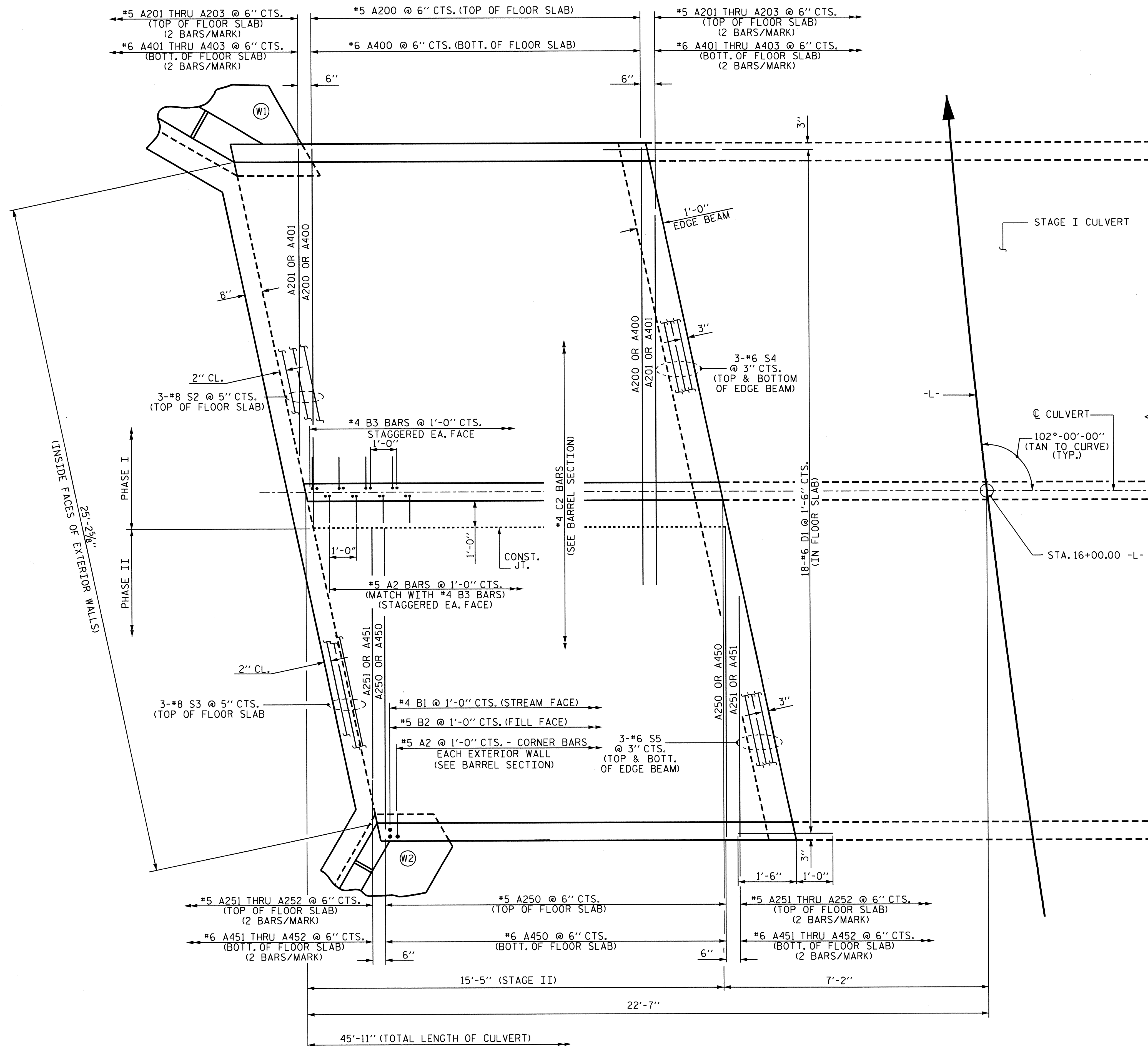
PROJECT NO. B-5167
BUNCOMBE COUNTY
 STATION: 16+00.00 -L-

SHEET 5 OF 10
 STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 DOUBLE 12'-0" X 7'-0"
 CONCRETE BOX CULVERT
 STAGE II



DRAWN BY : M. POOLE DATE : 01/13
 CHECKED BY : J. R. MCROY DATE : 05/13
 DESIGN ENGINEER OF RECORD: J. R. MCROY DATE : 07/13

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-5
1			3			TOTAL SHEETS
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PLAN OF FLOOR SLAB

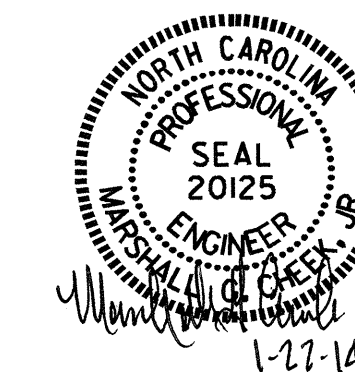
STAGE II

NOTE : FOR S1 BARS IN FLOOR SLAB & WING FOOTINGS, SEE WING SHEET.

PROJECT NO. B-5167
BUNCOMBE COUNTY
 STATION: 16+00.00 -L-

SHEET 6 OF 10

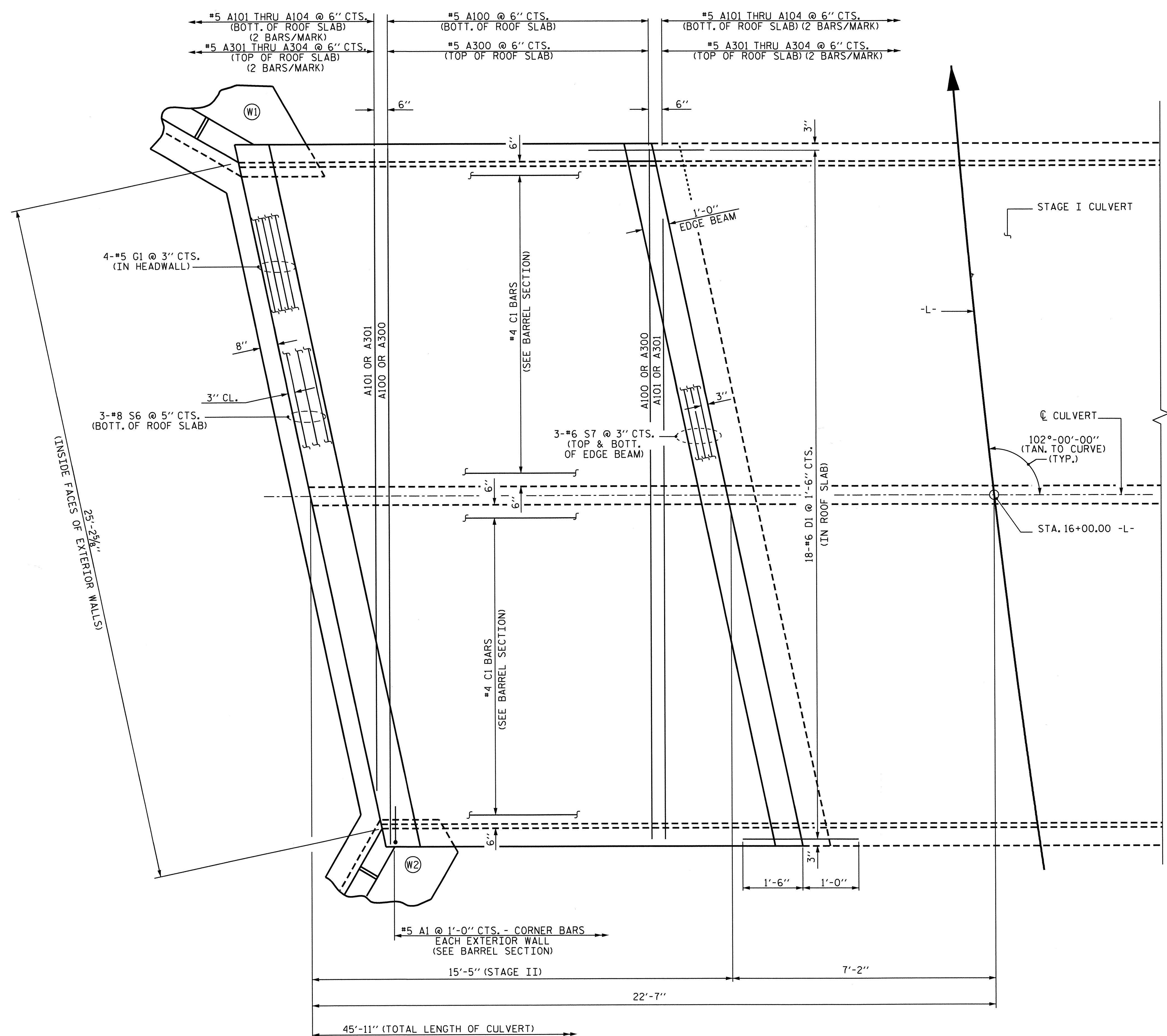
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
DOUBLE 12'-0" X 7'-0" CONCRETE BOX CULVERT STAGE II



DRAWN BY : M. POOLE DATE : 01/13
 CHECKED BY : J. R. MCROY DATE : 05/13
 DESIGN ENGINEER OF RECORD: J. R. MCROY DATE : 07/13

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-6
1			3			TOTAL SHEETS
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PLAN OF ROOF SLAB
STAGE II

PROJECT NO. B-5167
BUNCOMBE COUNTY
 STATION: 16+00.00 -L-
 SHEET 7 OF 10

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH						SHEET NO.
DOUBLE 12'-0" X 7'-0" CONCRETE BOX CULVERT STAGE II						C-7
REVISIONS						TOTAL SHEETS
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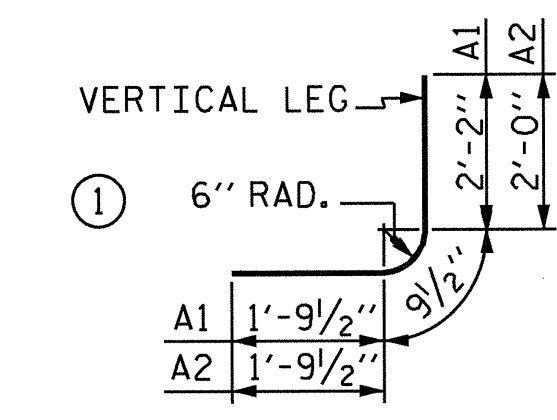
DRAWN BY : M. POOLE DATE : 01/13
 CHECKED BY : J. R. MCROY DATE : 05/13
 DESIGN ENGINEER OF RECORD: J. R. MCROY DATE : 07/13

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STAGE I QUANTITIES			
CLASS A CONCRETE	BARREL @	2.372 CY_{FT}	72.3 CY
WINGS, ETC.			13.8 CY
SILLS			2.3 CY
TOTAL			88.4 CY
REINFORCING STEEL			
BARREL & SILLS			12234 LBS.
WINGS, ETC.			638 LBS.
TOTAL			12872 LBS.
CULVERT EXCAVATION ----- LUMP SUM			
FOUNDATION COND. MAT'L. ----- 56 TONS			

STAGE II QUANTITIES			
CLASS A CONCRETE	BARREL @	2.372 CY_{FT}	36.6 CY
WINGS, ETC.			13.8 CY
SILLS			1.6 CY
TOTAL			52.0 CY
REINFORCING STEEL			
BARREL & SILLS			6706 LBS.
WINGS, ETC.			638 LBS.
TOTAL			7344 LBS.
CULVERT EXCAVATION ----- LUMP SUM			
FOUNDATION COND. MAT'L. ----- 29 TONS			

BAR SCHEDULE STAGE I												BAR SCHEDULE STAGE II											
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	62	5	1	4'-9"	307	A400	54	6	STR	16'-11"	1372	A1	32	5	1	4'-9"	159	A400	23	6	STR	16'-11"	584
A2	124	5	1	4'-7"	593	A401	4	6	STR	12'-4"	74	A2	64	5	1	4'-7"	306	A401	4	6	STR	13'-4"	80
						A402	4	6	STR	7'-7"	46							A402	4	6	STR	8'-7"	52
A100	50	5	STR	25'-7"	1334	A403	4	6	STR	2'-11"	18	A100	20	5	STR	25'-7"	534	A403	4	6	STR	3'-11"	24
A101	4	5	STR	20'-3"	84							A101	4	5	STR	20'-3"	84						
A102	4	5	STR	15'-7"	65	A450	56	6	STR	11'-6"	967	A102	4	5	STR	15'-7"	65	A450	26	6	STR	11'-6"	449
A103	4	5	STR	10'-11"	46	A451	4	6	STR	7'-3"	44	A103	4	5	STR	10'-11"	46	A451	4	6	STR	7'-1"	43
A104	4	5	STR	6'-2"	26	A452	4	6	STR	2'-7"	16	A104	4	5	STR	6'-2"	26	A452	4	6	STR	2'-4"	14
A200	54	5	STR	16'-4"	920	B1	62	4	STR	8'-5"	349	A200	24	5	STR	16'-4"	409	B1	32	4	STR	8'-5"	180
A201	4	5	STR	11'-10"	49	B2	62	5	STR	6'-4"	410	A201	4	5	STR	11'-10"	49	B2	32	5	STR	6'-4"	211
A202	4	5	STR	7'-2"	30	B3	62	4	STR	8'-5"	349	A202	4	5	STR	7'-2"	30	B3	32	4	STR	8'-5"	180
A203	4	5	STR	2'-5"	10							A203	4	5	STR	2'-5"	10						
						C1	178	4	STR	16'-2"	1922							C2	89	4	STR	15'-1"	897
A250	56	5	STR	11'-6"	672							A250	26	5	STR	11'-6"	312						
A251	4	5	STR	7'-3"	30	G1	4	5	STR	26'-2"	109	A251	4	5	STR	7'-1"	30	D1	46	6	STR	2'-6"	173
A252	4	5	STR	2'-7"	11							A252	4	5	STR	2'-4"	10	D2	12	6	STR	2'-6"	45
						S2	3	8	STR	19'-5"	156							D3	6	6	STR	1'-6"	14
A300	50	5	STR	25'-7"	1334	S3	3	8	STR	11'-8"	93	A300	20	5	STR	25'-7"	534						
A301	4	5	STR	20'-3"	84	S4	3	6	STR	17'-3"	78	A301	4	5	STR	20'-3"	84	G1	4	5	STR	26'-2"	109
A302	4	5	STR	15'-7"	65	S5	3	6	STR	11'-8"	53	A302	4	5	STR	15'-7"	65						
A303	4	5	STR	10'-11"	46	S6	3	8	STR	26'-2"	210	A303	4	5	STR	10'-11"	46	S2	3	8	STR	19'-5"	156
A304	4	5	STR	6'-2"	26	S7	6	6	STR	26'-2"	236	A304	4	5	STR	6'-2"	26	S3	3	8	STR	11'-8"	93
																		S4	3	6	STR	17'-3"	78
																		S5	3	6	STR	11'-8"	53
																		S6	3	8	STR	26'-2"	210
																		S7	6	6	STR	26'-2"	236
REINFORCING STEEL						12234 LBS.						REINFORCING STEEL						6706 LBS.					

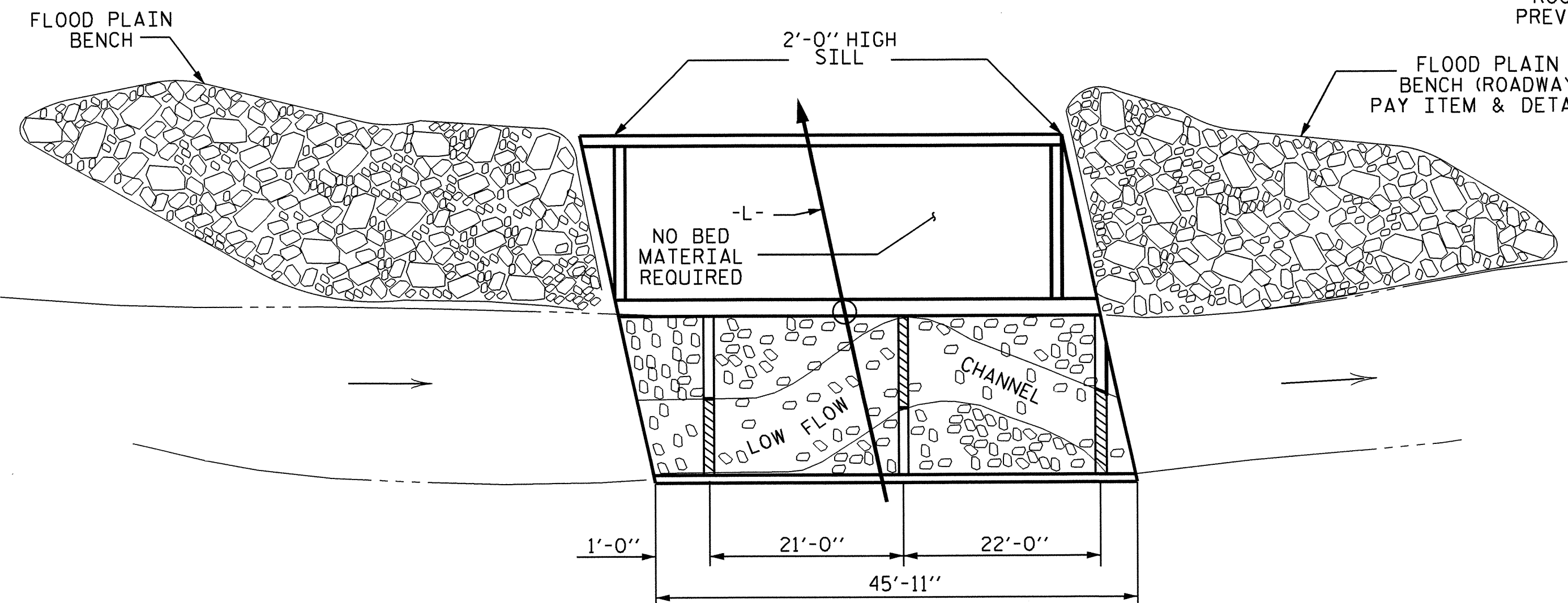


SPLICE LENGTH CHART		
BAR	SIZE	SPLICE LENGTH
A200	5	2'-2"
A400	6	2'-9"
C2	4	1'-11"
"S"	6	2'-9"
"S"	8	4'-11"

NOTES

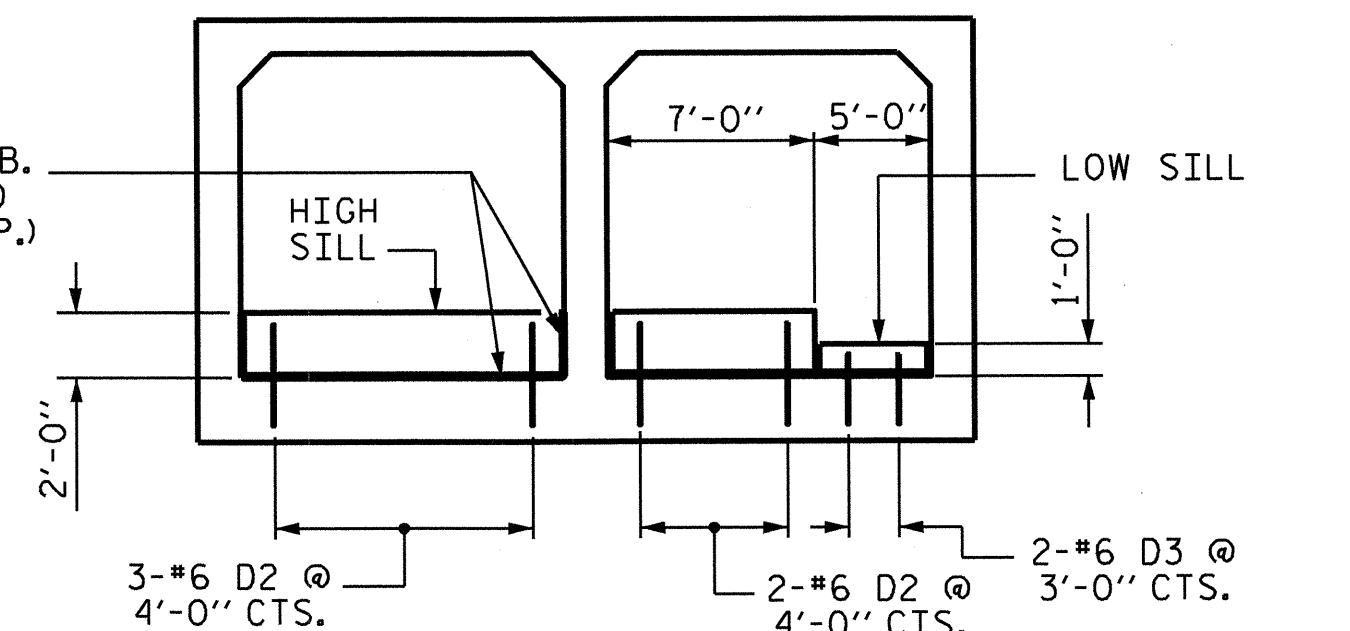
MATERIAL EXCAVATED FROM THE EXISTING BED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AS SHOWN IN THE "PLAN OF FLOOR SILL LAYOUT". BED MATERIAL SHALL BE SUPPLEMENTED WITH CLASS 'A' RIP RAP AS NECESSARY. STONES LARGER THAN 4 INCHES SHALL NOT BE PLACED WITHIN THE LOW FLOW CHANNEL. BED MATERIAL SUBJECT TO APPROVAL BY THE ENGINEER.
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 AS SHOWN IN THE "PLAN OF FLOOR SILL LAYOUT" SKETCH TO PROVIDE A 1 FOOT DEPTH LOW FLOW CHANNEL BETWEEN THE LOW FLOW SILLS, AND SHALL BE PLACED TO THE LEVEL OF 2'-0" BETWEEN THE HIGH FLOW SILLS.



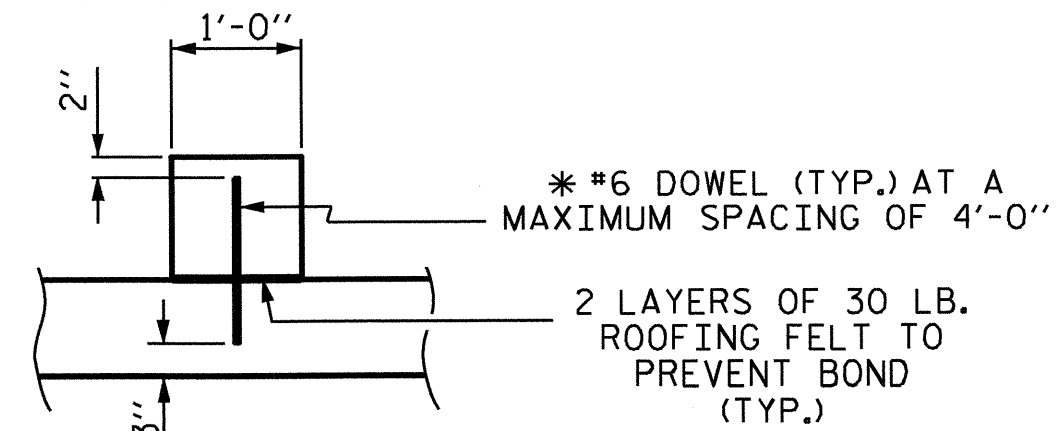
PLAN OF FLOOR SILL LAYOUT
LOW FLOW SILLS DENOTED BY CROSSHATCHED AREA.

2 LAYERS OF 30 LB. ROOFING FELT TO PREVENT BOND (TYP.)



ELEVATION

LOOKING DOWNSTREAM



SECTION THROUGH SILL

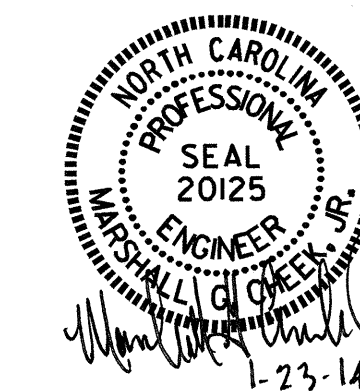
* DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.

CULVERT SILL DETAILS

PROJECT NO. B-5167
BUNCOMBE COUNTY
STATION: 16+00.00 -L-

SHEET 8 OF 10

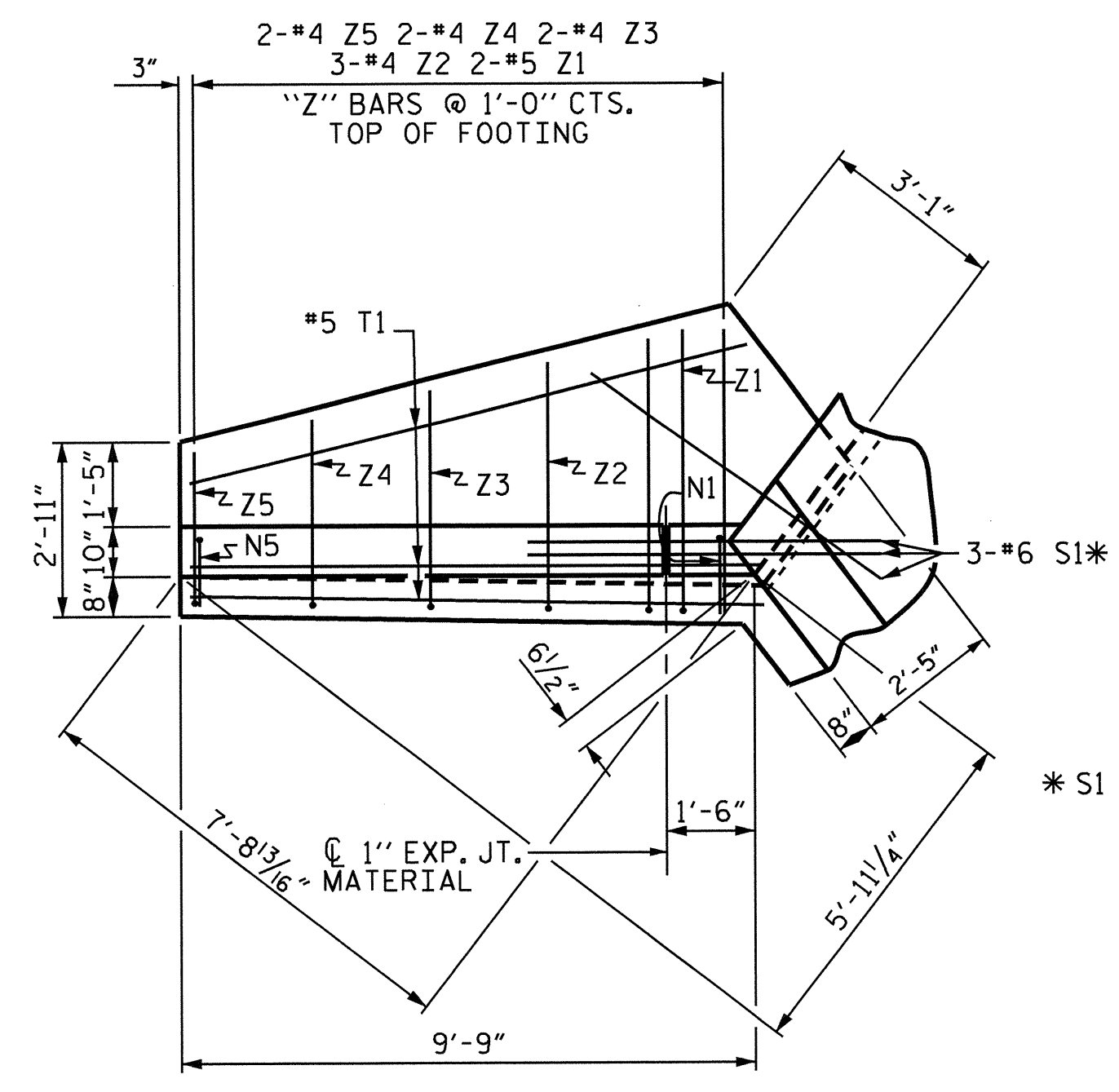
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
DOUBLE 12'-0" X 7'-0" CONCRETE BOX CULVERT STAGES I & II



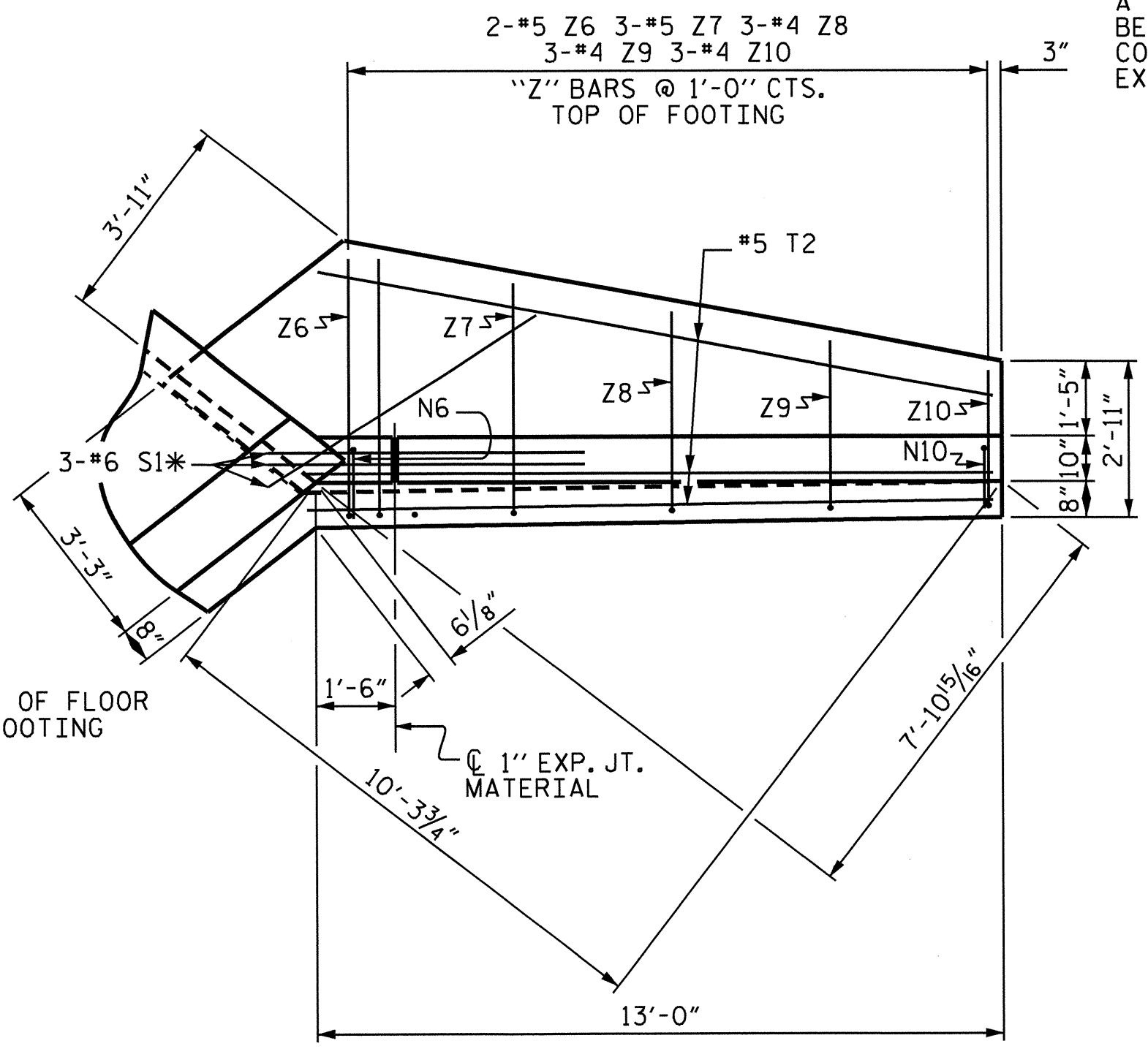
DRAWN BY: M. POOLE DATE: 01/13
CHECKED BY: J. R. MCROY DATE: 07/13
DESIGN ENGINEER OF RECORD: J. R. MCROY DATE: 07/13

REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C-8	
1			3			TOTAL SHEETS	10
2			4				

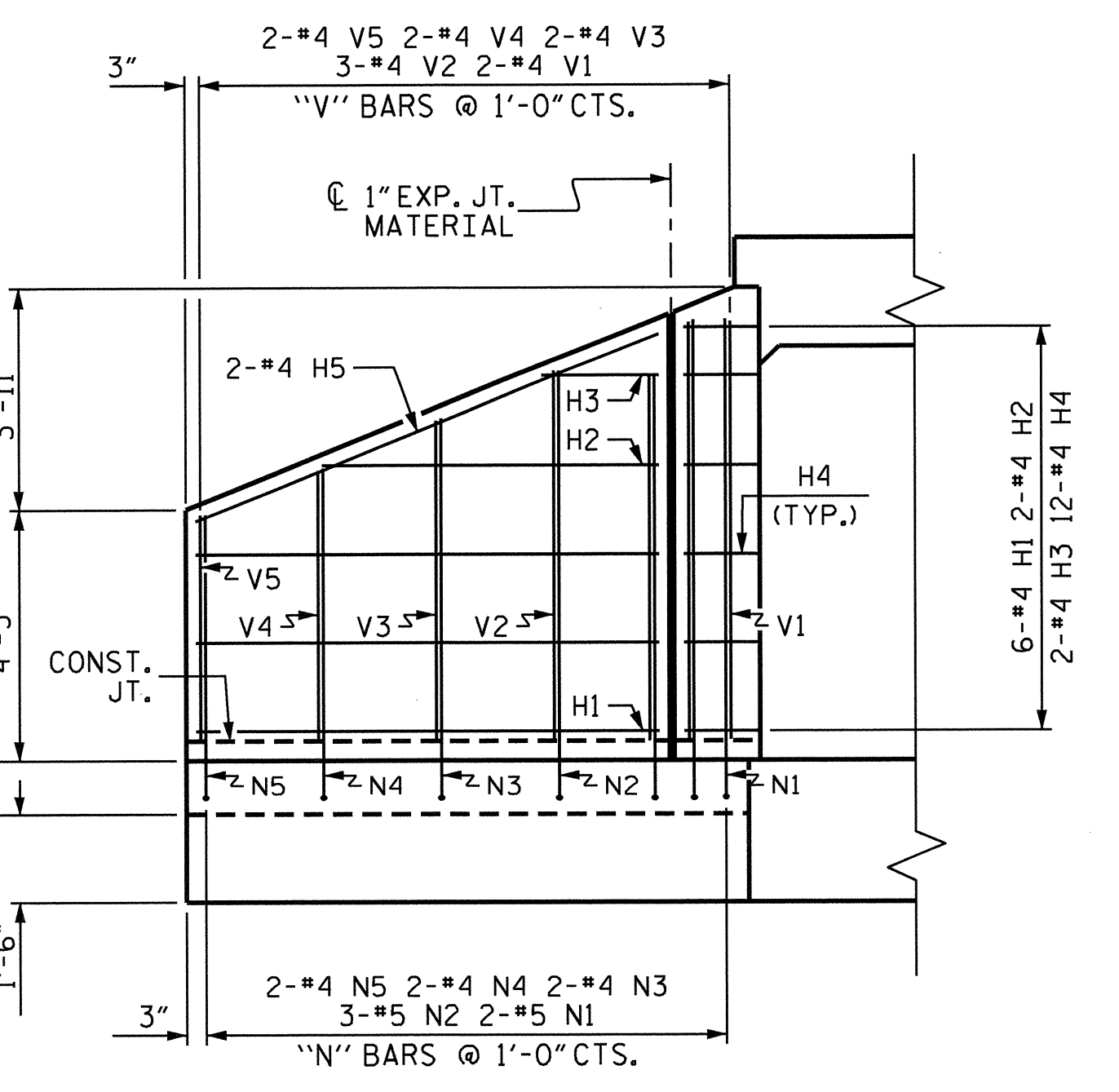
NOTES
 G1 BARS IN HEADWALL ARE INCLUDED WITH THE BARREL REINFORCING STEEL.
 A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.



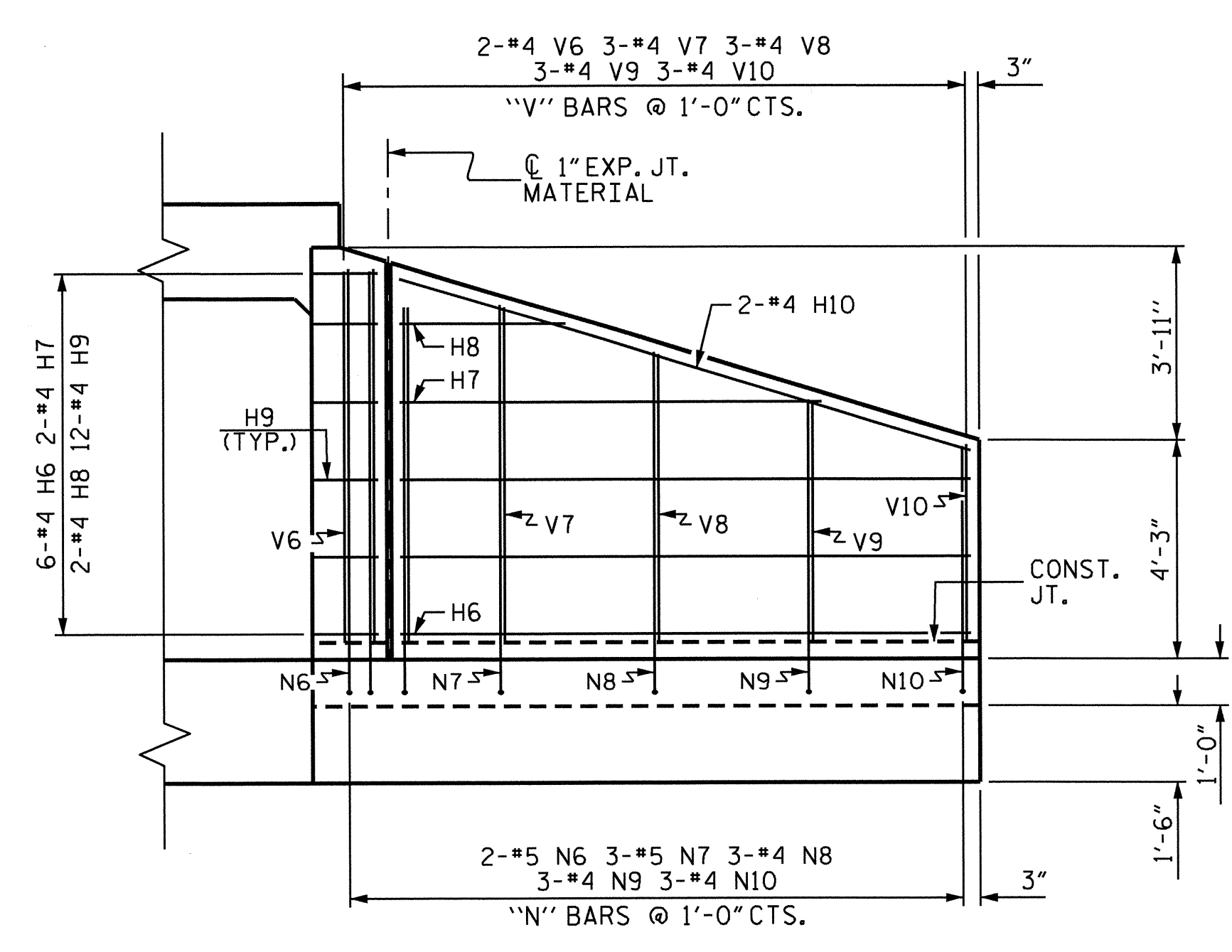
PLAN W2



PLAN W1

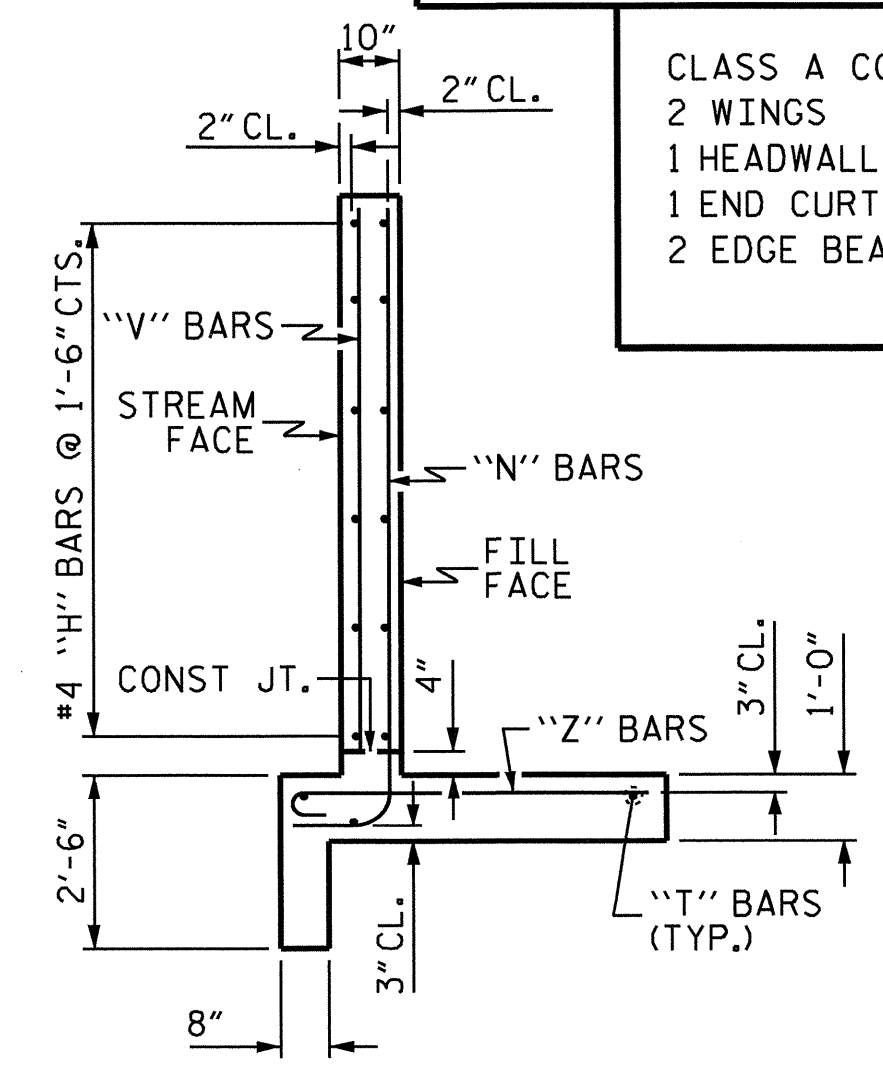
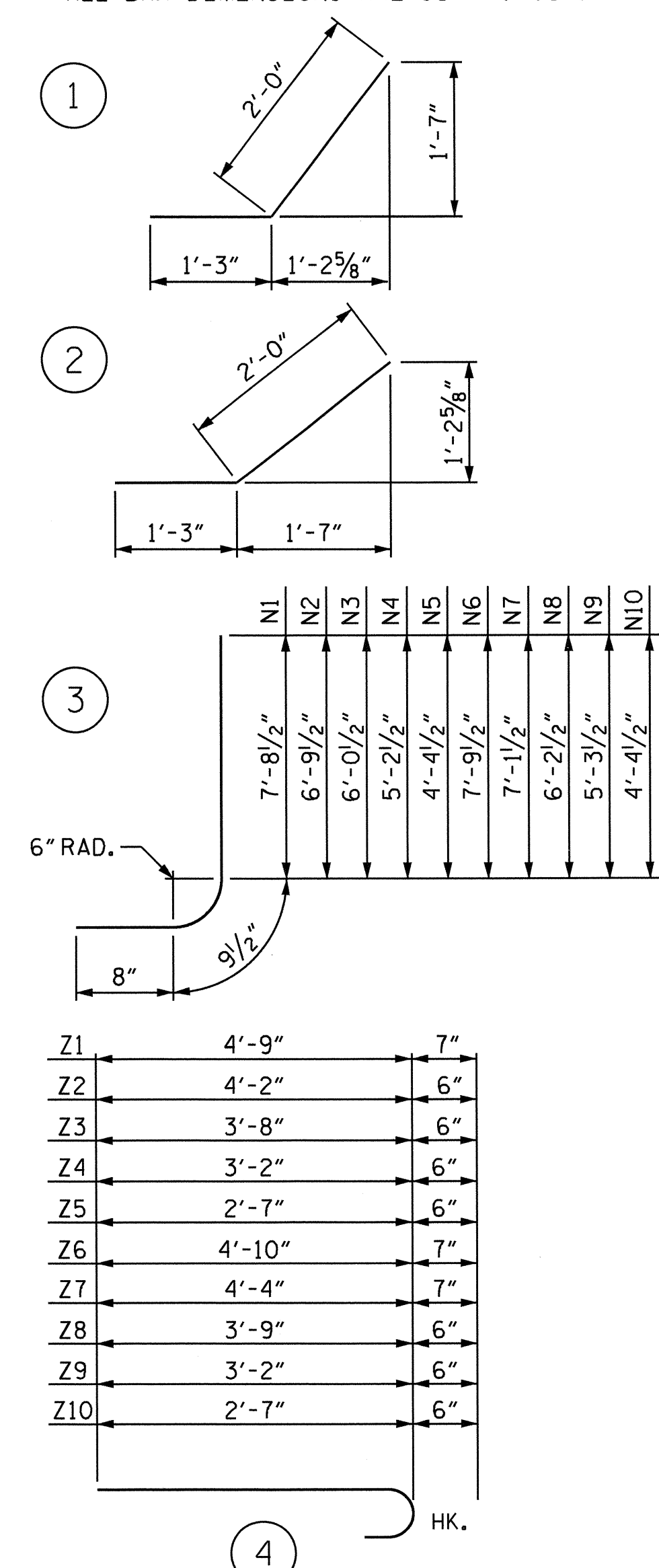


ELEVATION W2



ELEVATION W1

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



TYPICAL WING SECTION

CLASS A CONCRETE - STAGE I	
2 WINGS	9.1 C.Y.
1 HEADWALL	1.2 C.Y.
1 END CURTAIN WALL	1.5 C.Y.
2 EDGE BEAMS	2.0 C.Y.
TOTAL	13.8 C.Y.

REINFORCING STEEL	638 LBS.
FOR 2 WINGS	
CLASS A CONCRETE - STAGE II	
2 WINGS	9.1 C.Y.
1 HEADWALL	1.2 C.Y.
1 END CURTAIN WALL	1.5 C.Y.
2 EDGE BEAMS	2.0 C.Y.
TOTAL	13.8 C.Y.

PROJECT NO. B-5167
 BUNCOMBE COUNTY
 STATION: 16+00.00 -L-

SHEET 9 OF 10
 STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
STANDARD WINGS FOR CONCRETE BOX CULVERT
 H = 7'-0" SLOPE = 2:1
 STAGES I & II



ASSEMBLED BY : M. POOLE DATE : 12/12
 CHECKED BY : J. R. MCROY DATE : 04/13
 DRAWN BY : CCJ 12/99
 CHECKED BY : RW 03/00

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

TOTAL SHEETS 10

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

LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING #	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER		
						MOMENT				SHEAR						
						LIVE-LOAD FACTORS (γ _{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	1.05	--	1.75	1.07	1	TOP SLAB	5.38	1.05	1	TOP SLAB	11.61		
	HL-93 (OPERATING)	N/A		1.37	--	1.35	1.39	1	TOP SLAB	5.38	1.37	1	TOP SLAB	11.61		
	HS-20 (INVENTORY)	36.00	②	1.26	45.20	1.75	1.26	1	TOP SLAB	12.03	1.29	1	BOTTOM SLAB	11.67		
	HS-20 (OPERATING)	36.00		1.63	58.59	1.35	1.63	1	TOP SLAB	12.03	1.67	1	BOTTOM SLAB	11.67		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		2.31	31.15	1.40	2.31	1	TOP SLAB	5.38	2.42	1	TOP SLAB	11.61		
		SNGARBS2	20.00		2.16	43.18	1.40	2.16	1	TOP SLAB	5.38	2.28	1	TOP SLAB	11.61	
		SNAGRIS2	22.00		2.28	50.20	1.40	2.28	1	TOP SLAB	12.03	2.35	1	BOTTOM SLAB	11.67	
		SNCOTTS3	27.25		1.31	35.63	1.40	1.34	1	TOP SLAB	5.38	1.31	1	TOP SLAB	11.61	
		SNAGGRS4	34.93		1.48	51.55	1.40	1.57	1	BOTTOM SLAB	12.35	1.48	1	BOTTOM SLAB	11.67	
		SNS5A	35.55		1.45	51.49	1.40	1.52	1	TOP SLAB	5.38	1.45	1	TOP SLAB	11.61	
		SNS6A	39.95		1.43	57.08	1.40	1.52	1	TOP SLAB	5.38	1.43	1	TOP SLAB	11.61	
		SNS7B	42.00		1.36	57.22	1.40	1.53	1	BOTTOM SLAB	12.35	1.36	1	TOP SLAB	11.61	
	TRUCK TRACTOR SEMI-TRAILER (TTS)	TNAGRIT3	33.00		1.58	52.19	1.40	1.76	1	BOTTOM SLAB	12.35	1.58	1	BOTTOM SLAB	11.67	
		TNT4A	33.08		1.55	51.27	1.40	1.59	1	TOP SLAB	5.38	1.55	1	TOP SLAB	11.61	
		TNT6A	41.60		1.37	56.80	1.40	1.65	1	TOP SLAB	12.03	1.37	1	TOP SLAB	11.61	
		TNT7A	42.00		1.38	58.08	1.40	1.56	1	BOTTOM SLAB	12.35	1.38	1	BOTTOM SLAB	11.67	
		TNT7B	42.00		1.47	61.83	1.40	1.55	1	TOP SLAB	5.38	1.47	1	TOP SLAB	11.61	
		TNAGRIT4	43.00		1.24	53.34	1.40	1.36	1	BOTTOM SLAB	12.35	1.24	1	BOTTOM SLAB	11.67	
		TNAGT5A	45.00		1.34	60.50	1.40	1.41	1	TOP SLAB	12.03	1.34	1	BOTTOM SLAB	11.67	
TNAGT5B	45.00		③	1.24	55.64	1.40	1.30	1	TOP SLAB	12.03	1.24	1	BOTTOM SLAB	11.67		

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	--

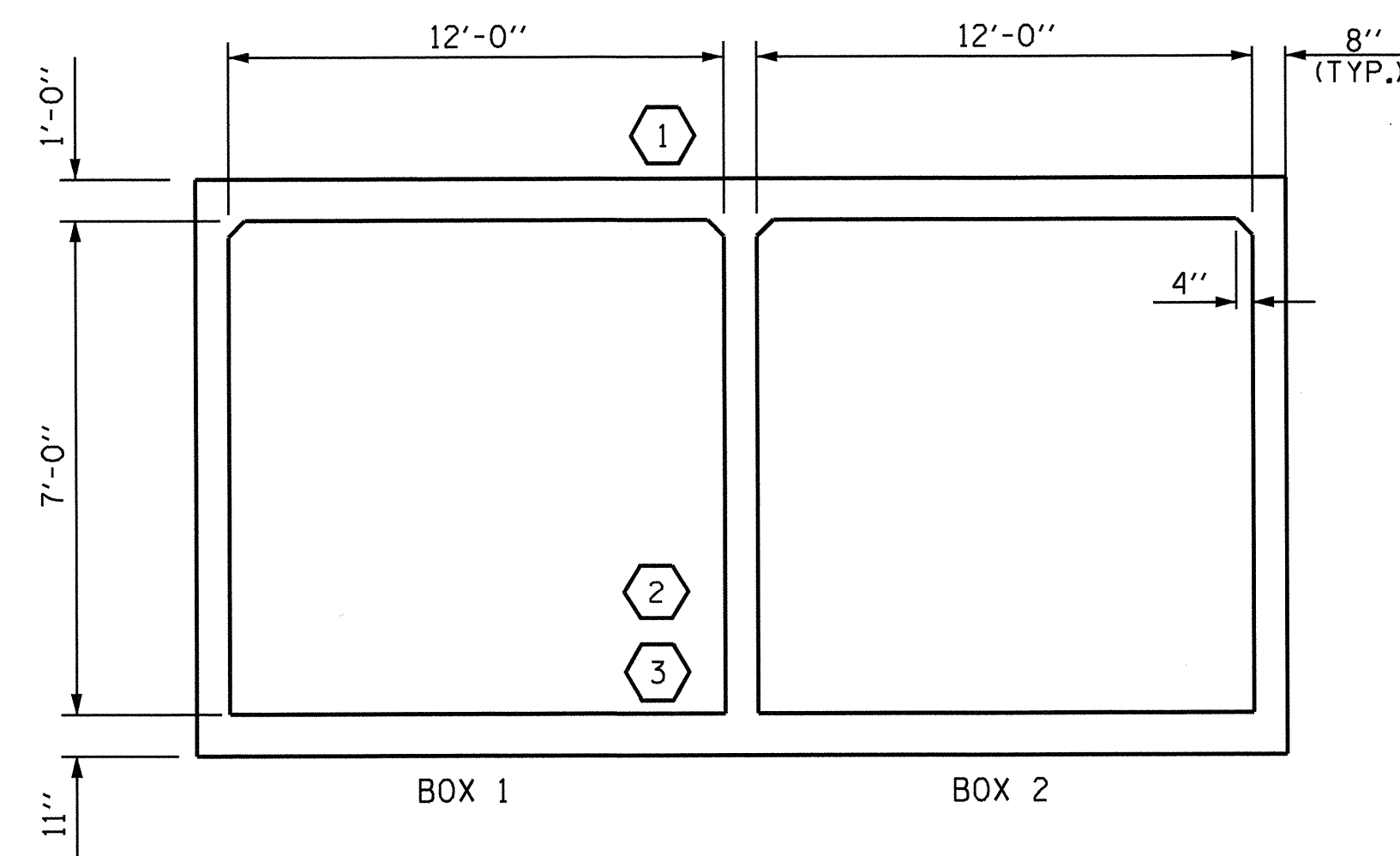
NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

COMMENTS:

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

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

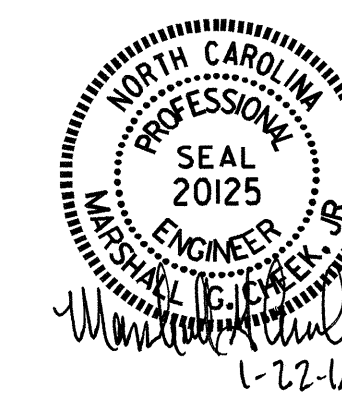


LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. B-5167
BUNCOMBE COUNTY
 STATION: 16+00.00 -L-

SHEET 10 OF 10

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



ASSEMBLED BY : M. POOLE	DATE : 01/13
CHECKED BY : J. R. MCROY	DATE : 04/13
DRAWN BY : WMC	7/11
CHECKED BY : GM	7/11

REV. 10/1/11	MAA/GM
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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-10
1			3			TOTAL SHEETS
2			4			10

STD. NO. LRFR5

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. FINIS AND OTHER DEFORMATIONS RESULTING FROM CASTING OR OTHERWISE SHALL BE REMOVED IN A MANNER SO THAT A UNIFORM COLORING OF THE COMPLETED CASTING SHALL BE OBTAINED. CASTINGS WITH DISCOLORATIONS OR OF NON-UNIFORM COLORING WILL NOT BE ACCEPTED. CERTIFIED MILL REPORTS ARE REQUIRED FOR METAL RAILS AND POSTS.

SPECIAL NOTES:

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

ENGLISH

JANUARY, 1990