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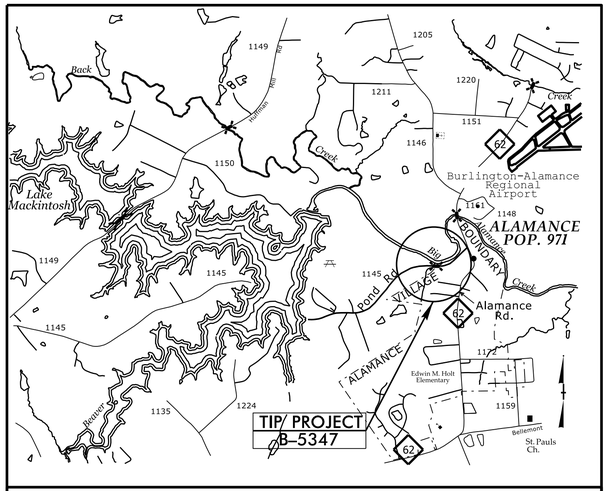
TIP PROJECT: B–5347

CONTRACT: C203984



VICINITY MAP

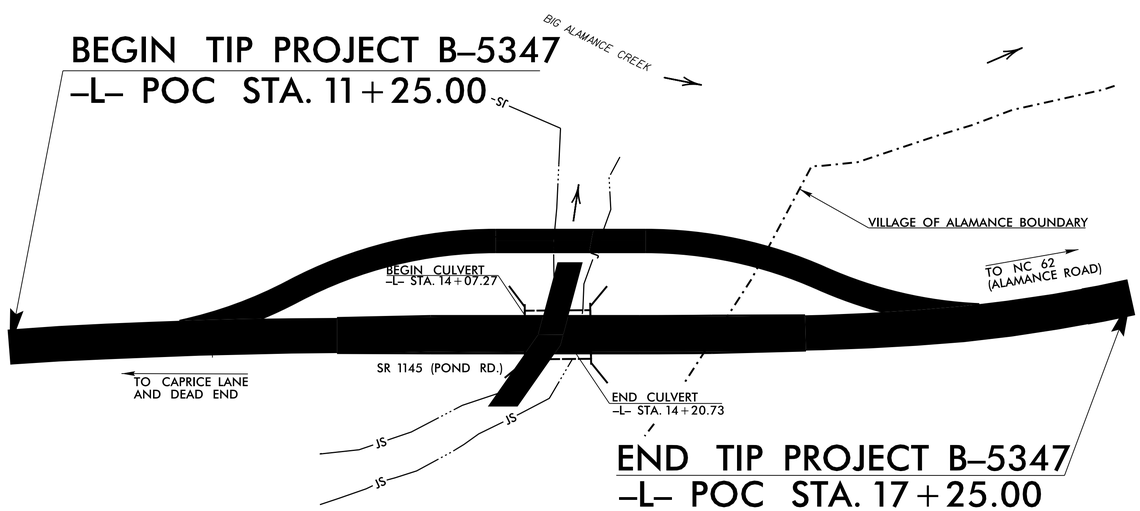
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
ALAMANCE COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B–5347		

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
46061.1.1	BRZ–1145(8)	P.E.
46061.3.1	–	CONST.

LOCATION: BRIDGE NO. 170 OVER A PRONG OF BIG ALAMANCE CREEK ON SR 1145 (POND RD.)

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



CULVERT

DESIGN DATA

ADT 2017 = 455 VPD
ADT 2035 = 700 VPD
K = 12 %
D = 60 %
T = 7 % **
* V = 45 MPH
** (TTST 2%, DUAL 5%)

FUNC CLASS = LOCAL

SUB–REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT B–5347 = 0.114 MILES
LENGTH STRUCTURE TIP PROJECT B–5347 = 0.000 MILES

TOTAL LENGTH TIP PROJECT B–5347 = 0.114 MILES

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

2012 STANDARD SPECIFICATIONS

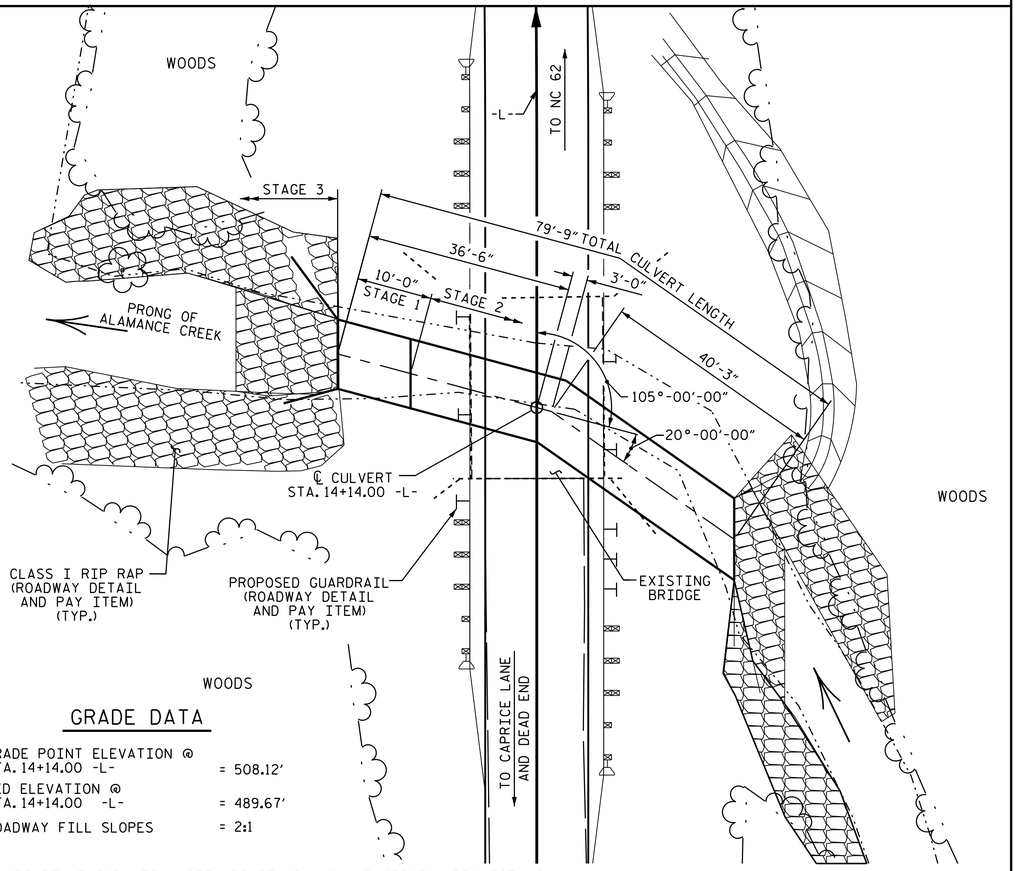
LETTING DATE :

NOVEMBER 21, 2017

G.W. DICKEY, P.E.
PROJECT ENGINEER

K.W. ALFORD, P.E.
PROJECT DESIGN ENGINEER

BM#1: RR SPIKE IN BASE OF 27" RED OAK, STA. 31+82.00 -BL-, 151' RIGHT, ELEV. 515.66



GRADE DATA

GRADE POINT ELEVATION @ STA. 14+14.00 -L-	= 508.12'
BED ELEVATION @ STA. 14+14.00 -L-	= 489.67'
ROADWAY FILL SLOPES	= 2:1

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.

LOCATION SKETCH

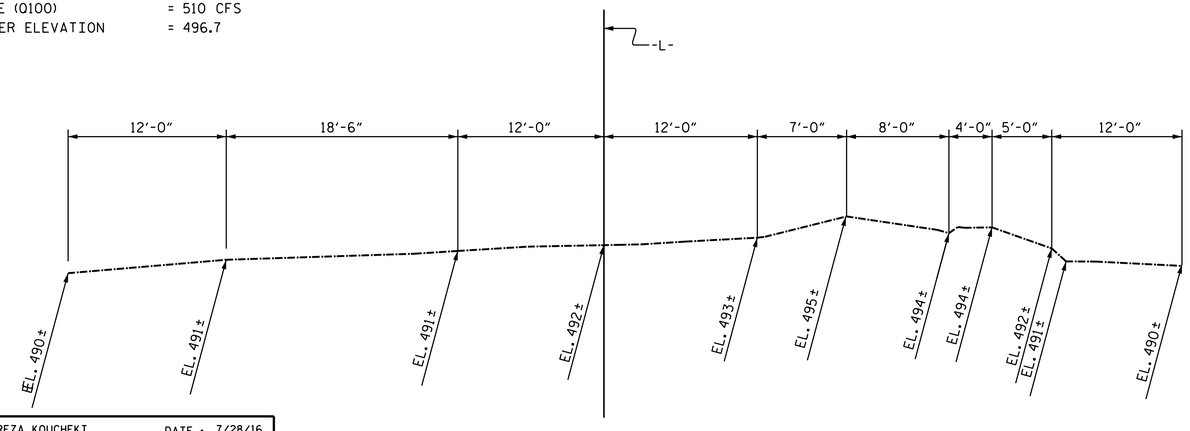
HYDRAULIC DATA

DESIGN DISCHARGE	= 450 CFS
FREQUENCY OF DESIGN FLOOD	= 25 YRS.
DESIGN HIGH WATER ELEVATION	= 496.3
DRAINAGE AREA	= 0.49 SQ. MI.
BASE DISCHARGE (Q100)	= 510 CFS
BASE HIGH WATER ELEVATION	= 496.7

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 580+ CFS
FREQUENCY OF OVERTOPPING FLOOD	= >500+ YRS.
OVERTOPPING FLOOD ELEVATION	= 508.0

OVERTOPPING OCCURS AT ℄ STA. 14+53 -L-



NOTES

ASSUMED LIVE LOAD ---------- HL-93 OR ALTERNATE LOADING.

DESIGN FILL ---------- 11.46'

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

STAGE I
1. FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS FOR 10' AT OUTLET END.
2. THE REMAINING PORTIONS OF THE WALLS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.

STAGE II
1. THE INLET WING FOOTINGS AND THE REMAINING PORTION OF THE FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE WALLS AND INLET WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.

STAGE III
1. THE OUTLET WING FOOTINGS INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE OUTLET WINGS FULL HEIGHT.

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.

AT THE CONTRACTORS OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.

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

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 AT STATION 14+14.00 -L-."

THE CONTRACTOR SHALL FILL THE PROPOSED CULVERT WITH NATIVE MATERIAL TO A DEPTH OF 1 FOOT. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM OR FLOOD PLAIN AT THE PROJECT SITE DURING CONSTRUCTION. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

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

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

THE EXISTING STRUCTURE CONSISTING OF ONE 35'-5" SPAN WITH A CLEAR ROADWAY WIDTH OF 25'-0", WITH A TIMBER DECK ON I-BEAMS ON TIMBER CAPS AND PILE END BENTS WITH STEEL PLANK BULKHEADS AND LOCATED AT THE PROPOSED STRUCTURE SHALL BE REMOVED. THE EXISTING BRIDGE IS PRESENTLY POSTED FOR LOAD LIMIT.

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

REMOVAL OF THE EXISTING BRIDGE SHALL BE PERFORMED IN A MANNER THAT PREVENTS DEBRIS FROM FALLING INTO THE WATER. THE CONTRACTOR SHALL SUBMIT DEMOLITION PLANS FOR REVIEW AND REMOVE THE BRIDGE IN ACCORDANCE WITH ARTICLE 402-2 OF THE STANDARD SPECIFICATIONS.

FOR ASBESTOS ASSESSMENT FOR BRIDGE DEMOLITION AND RENOVATION ACTIVITES, SEE SPECIAL PROVISIONS.

I HEREBY CERTIFY THESE PLANS ARE THE AS BUILT PLANS

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE		
STAGE I	18.4	C.Y.
STAGE II	134.0	C.Y.
STAGE III	9.1	C.Y.
TOTAL	161.5	C.Y.
REINFORCING STEEL		
STAGE I	2,540	LBS.
STAGE II	16,651	LBS.
STAGE III	639	LBS.
TOTAL	19,830	LBS.
FOUNDATION COND. MAT'L.		
STAGE I	13	TONS
STAGE II	90	TONS
TOTAL	103	TONS
CULVERT EXCAVATION	LUMP SUM	
REMOVAL OF EXISTING STRUCTURE	LUMP SUM	
ASBESTOS ASSESSMENT	LUMP SUM	

PROJECT NO. B-5347

ALAMANCE COUNTY

STATION: 14+14.00 -L-

SHEET 1 OF 8 REPLACES BRIDGE #170

NORTH CAROLINA PROFESSIONAL SEAL 29441 ENGINEER KRISTY W. ALFORD

DocuSigned by: F24583893D8F40E...

9/25/2017

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL STANDARD

SINGLE 13 FT. X 7 FT. CONCRETE BOX CULVERT 105° SKEW

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

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CHECKED BY : K.W. ALFORD DATE : 3/30/17
DESIGN ENGINEER OF RECORD: K.W. ALFORD DATE : 3/30/17

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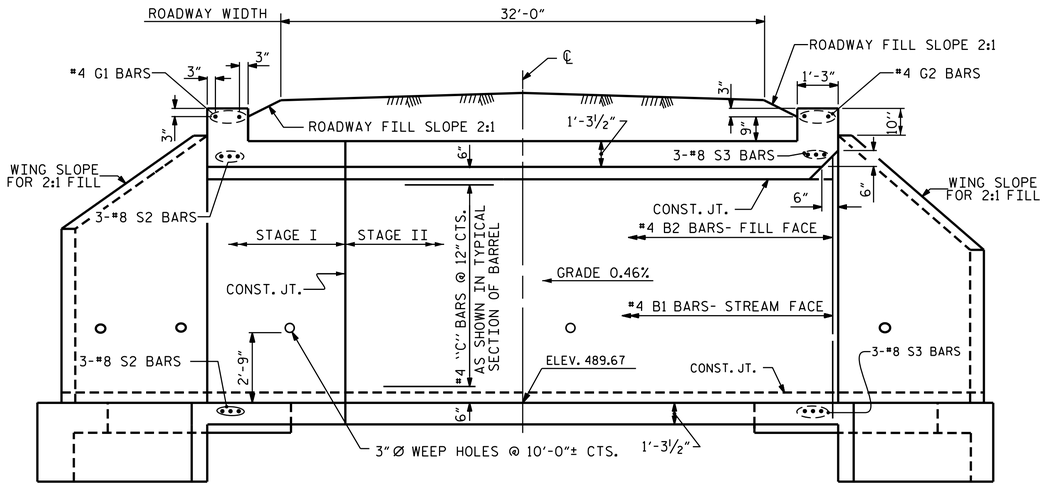
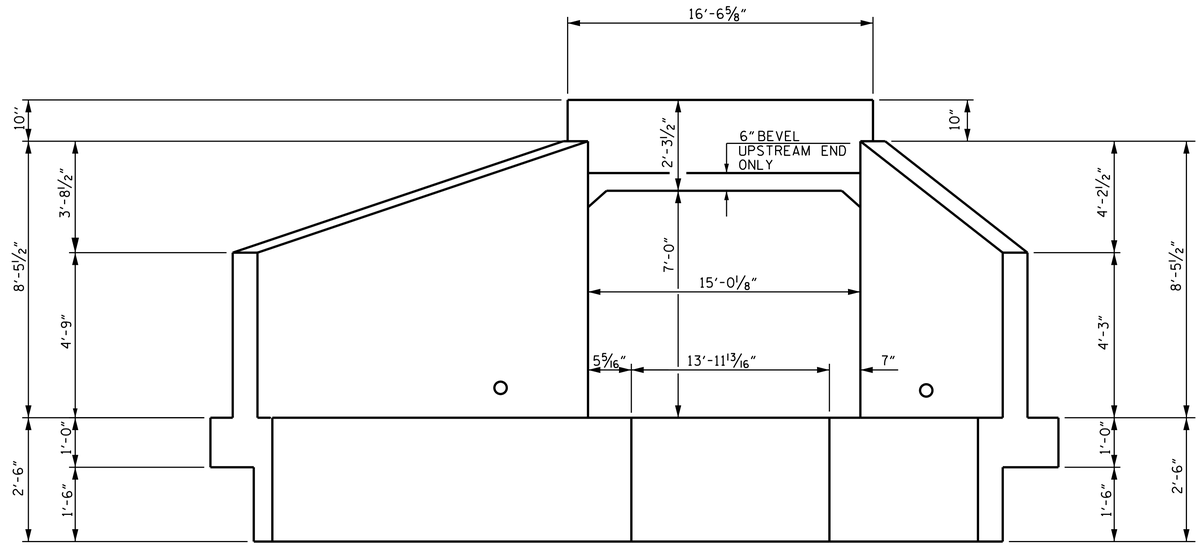


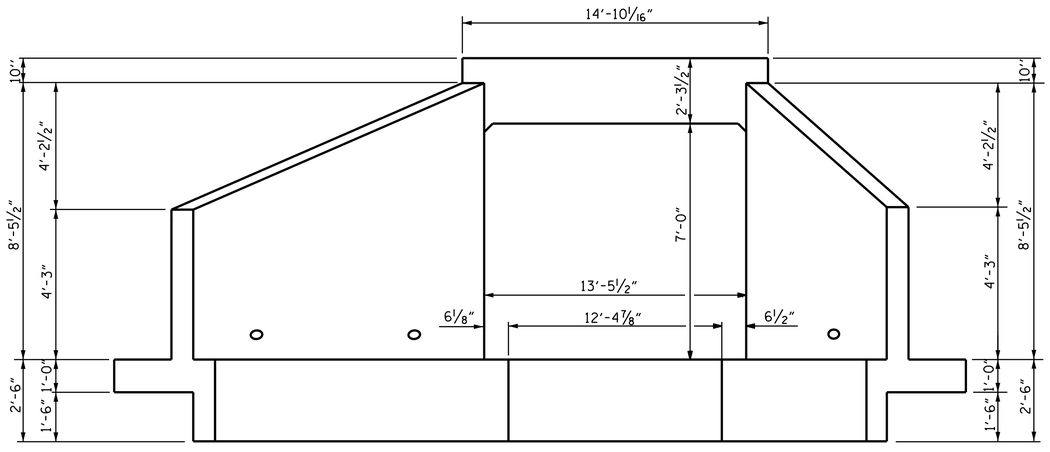
CULVERT SECTION NORMAL TO ROADWAY

OUTLET WINGS SHALL BE BUILT AS STAGE III CONSTRUCTION



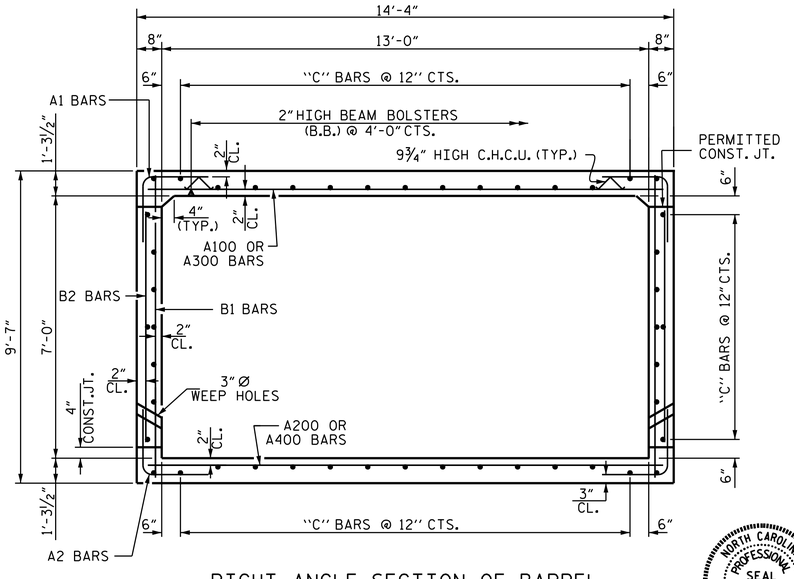
INLET END ELEVATION NORMAL TO SKEW

LOOKING DOWNSTREAM



OUTLET END ELEVATION

LOOKING UPSTREAM



RIGHT ANGLE SECTION OF BARREL

THERE ARE 46 "C" BARS IN SECTION OF BARREL

PROJECT NO. B-5347

ALAMANCE COUNTY

STATION: 14+14.00 -L-

SHEET 2 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 13 FT. X 7 FT. CONCRETE BOX CULVERT 105° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 29441 ENGINEER KRISTY W. ALFORD

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9/25/2017

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1			3		
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SHEET NO. C-2

TOTAL SHEETS 8

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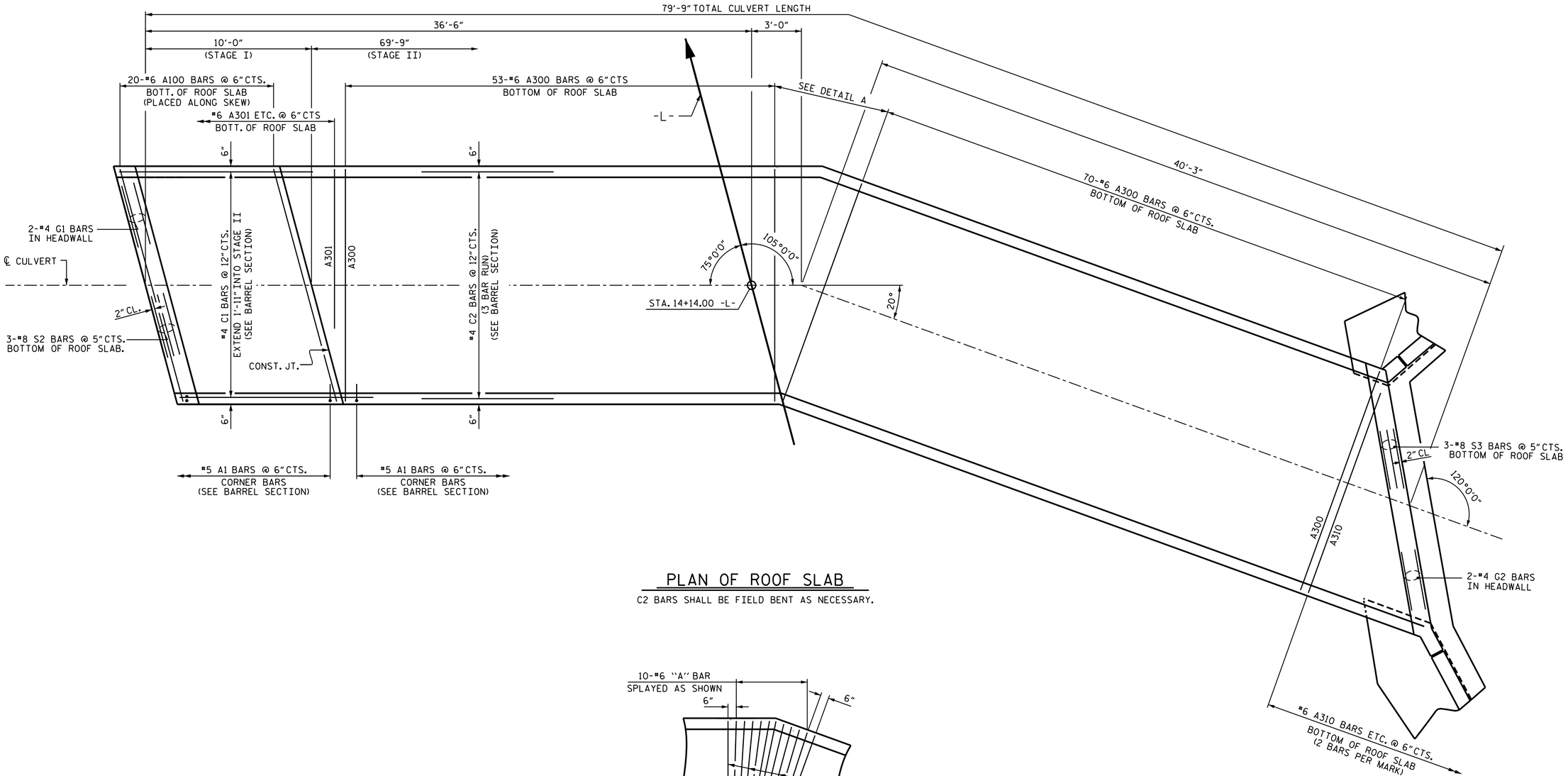
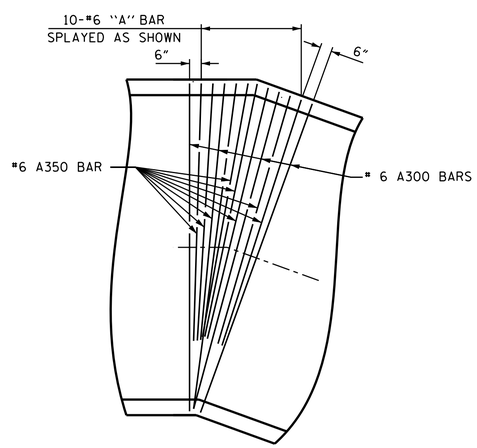


PLAN OF ROOF SLAB

C2 BARS SHALL BE FIELD BENT AS NECESSARY.



DETAIL A

PROJECT NO. B-5347

ALAMANCE COUNTY

STATION: 14+14.00 -L-

SHEET 3 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 13' X 7' CONCRETE BOX CULVERT ROOF SLAB DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 29441 ENGINEER KRISTY W. ALFORD

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9/25/2017

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2			4			8

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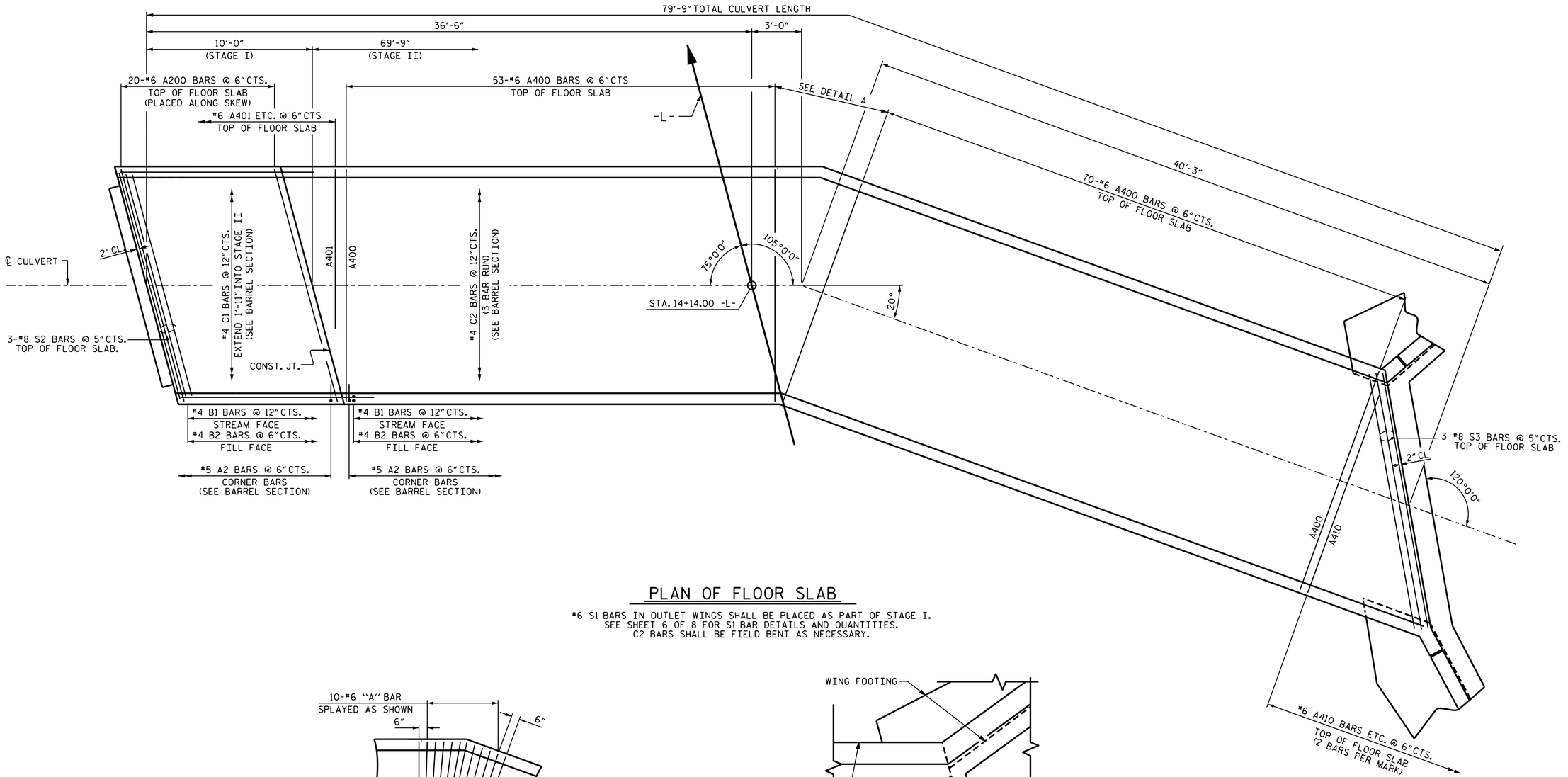
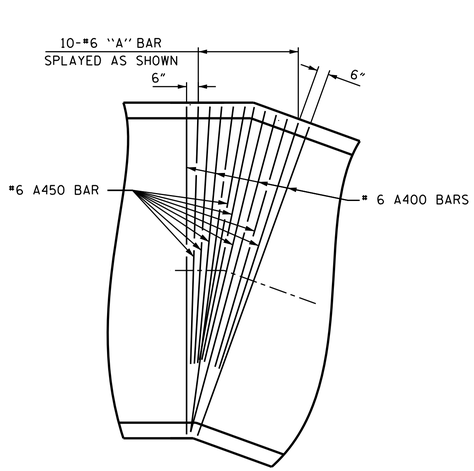
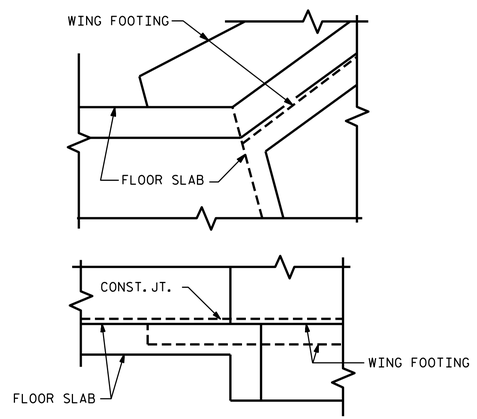


PLAN OF FLOOR SLAB

#6 S1 BARS IN OUTLET WINGS SHALL BE PLACED AS PART OF STAGE I.
SEE SHEET 6 OF 8 FOR S1 BAR DETAILS AND QUANTITIES.
C2 BARS SHALL BE FIELD BENT AS NECESSARY.



DETAIL A



DETAIL

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

PROJECT NO. B-5347
ALAMANCE COUNTY
STATION: 14+14.00 -L-

SHEET 4 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 13' X 7' CONCRETE BOX CULVERT FLOOR SLAB DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 29441 ENGINEER KRISTY W. ALFORD

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9/25/2017

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REVISIONS						SHEET NO.
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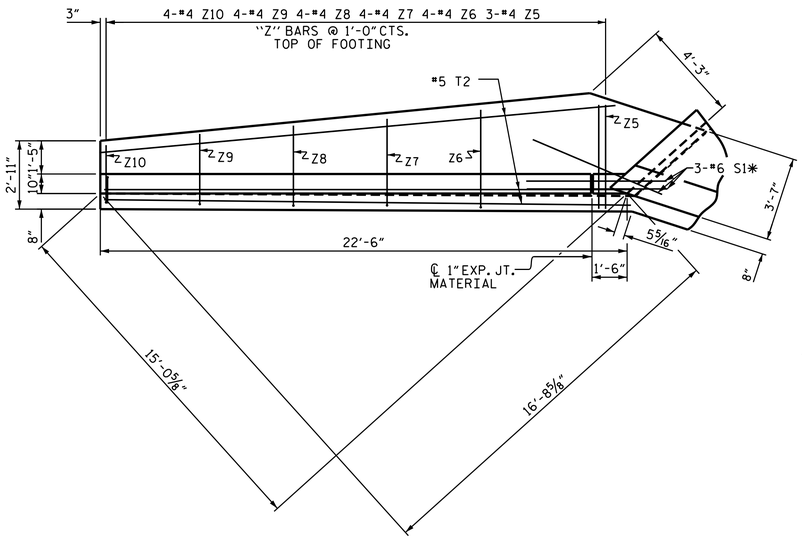
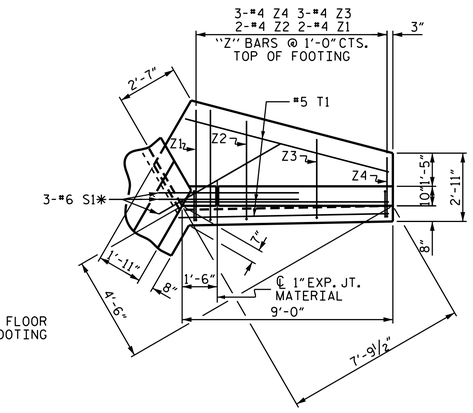


PLAN W1

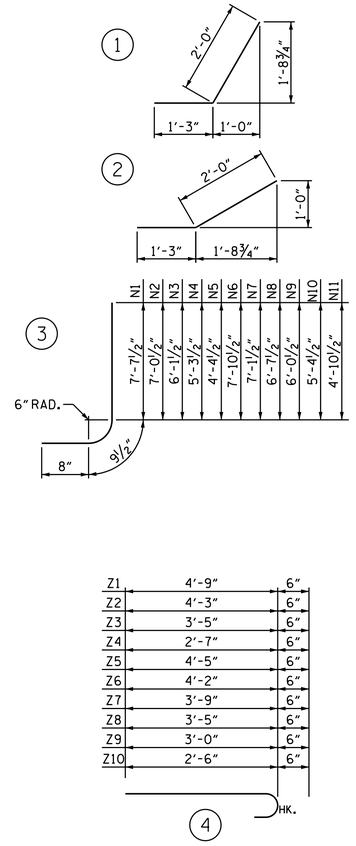


* BOTTOM OF FLOOR SLAB & FOOTING

PLAN W2

BAR TYPES

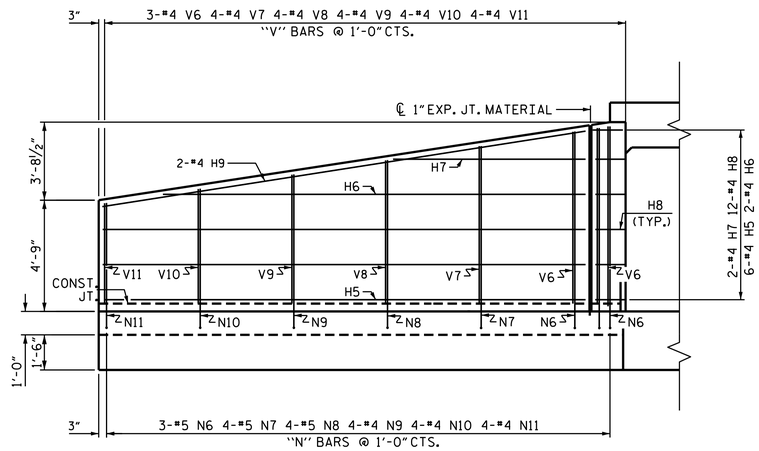
ALL BAR DIMENSIONS ARE OUT TO OUT.



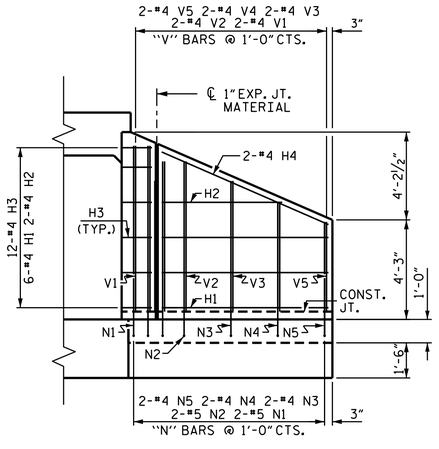
BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	6	#4	STR	7'-1"	28
H2	2	#4	STR	5'-2"	7
H3	6	#4	1	3'-3"	13
H4	2	#4	STR	7'-9"	10
H5	6	#4	STR	20'-7"	82
H6	2	#4	STR	18'-0"	24
H7	2	#4	STR	8'-3"	11
H8	6	#4	2	3'-3"	13
H9	2	#4	STR	20'-11"	28
N1	2	#5	3	9'-1"	19
N2	2	#5	3	8'-6"	18
N3	2	#4	3	7'-7"	10
N4	2	#4	3	6'-9"	9
N5	2	#4	3	5'-10"	8
N6	3	#5	3	9'-4"	29
N7	4	#5	3	8'-7"	36
N8	4	#5	3	8'-1"	34
N9	4	#4	3	7'-6"	20
N10	4	#4	3	6'-10"	18
N11	4	#4	3	6'-4"	17
S1	6	#6	STR	6'-0"	54
T1	3	#5	STR	9'-0"	28
T2	3	#5	STR	22'-6"	70
V1	2	#4	STR	7'-1"	10
V2	2	#4	STR	6'-5"	9
V3	2	#4	STR	5'-7"	7
V4	2	#4	STR	4'-8"	6
V5	2	#4	STR	3'-10"	5
V6	3	#4	STR	7'-4"	15
V7	4	#4	STR	6'-9"	18
V8	4	#4	STR	6'-1"	16
V9	4	#4	STR	5'-6"	15
V10	4	#4	STR	4'-11"	13
V11	4	#4	STR	4'-3"	11
Z1	2	#4	4	5'-3"	7
Z2	2	#4	4	4'-9"	6
Z3	3	#4	4	3'-11"	8
Z4	3	#4	4	3'-1"	6
Z5	3	#4	4	4'-11"	10
Z6	4	#4	4	4'-8"	12
Z7	4	#4	4	4'-3"	11
Z8	4	#4	4	3'-11"	10
Z9	4	#4	4	3'-6"	9
Z10	4	#4	4	3'-0"	8

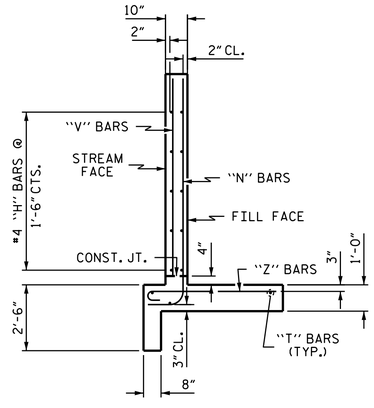
REINFORCING STEEL FOR 2 WINGS	798 LBS
CLASS A CONCRETE	
2 WINGS	12.7 CY
1 HEADWALLS	0.8 CY
1 END CURTAIN WALLS	0.5 CY
TOTAL	14.0 CY



ELEVATION W1



ELEVATION W2



TYPICAL WING SECTION

PROJECT NO. B-5347

ALAMANCE COUNTY

STATION: 14+14.00 -L-

SHEET 5 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STAGE II WINGS FOR CONCRETE BOX CULVERT 120° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 29441 ENGINEER KRISTY W. ALFORD

DocuSigned by: K.W. Alford
F2458380308F40E...
9/25/2017

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-5
1			3			TOTAL SHEETS
2			4			8

DRAWN BY :	REZA KOUCHEKI	DATE : 8/16
CHECKED BY :	K.W. ALFORD	DATE : 3/17
DESIGN ENGINEER OF RECORD:	REZA KOUCHEKI	DATE : 8/16

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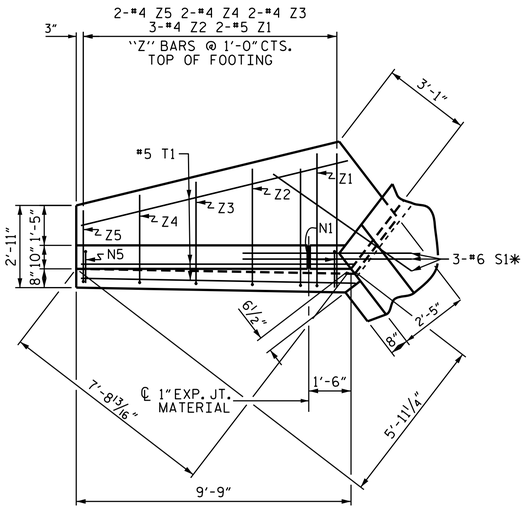
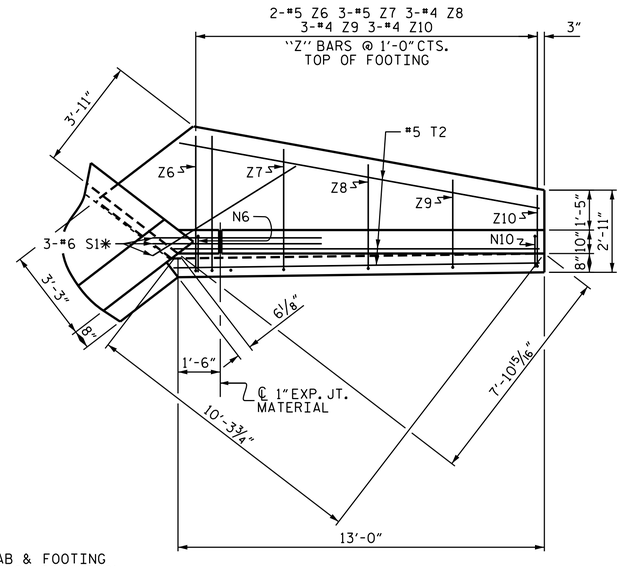




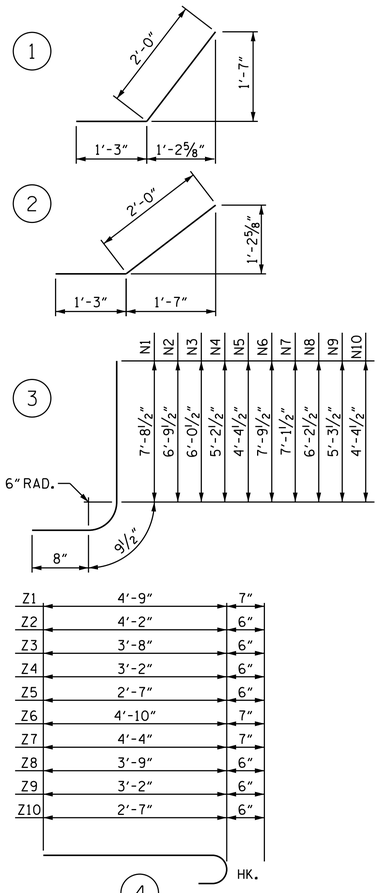
* S1 @ BOTTOM OF FLOOR SLAB & FOOTING SHALL BE PLACED WITH STAGE I CONSTRUCTION. HEADWALL AND CURTAIN WALL SHALL BE PLACED AS PART OF STAGE I CONSTRUCTION.

PLAN W2

PLAN W1

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.



Z1	4'-9"	7"
Z2	4'-2"	6"
Z3	3'-8"	6"
Z4	3'-2"	6"
Z5	2'-7"	6"
Z6	4'-10"	7"
Z7	4'-4"	7"
Z8	3'-9"	6"
Z9	3'-2"	6"
Z10	2'-7"	6"

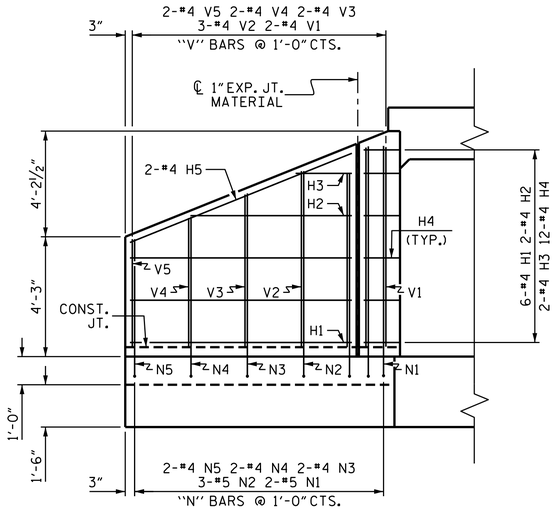
4 HK.

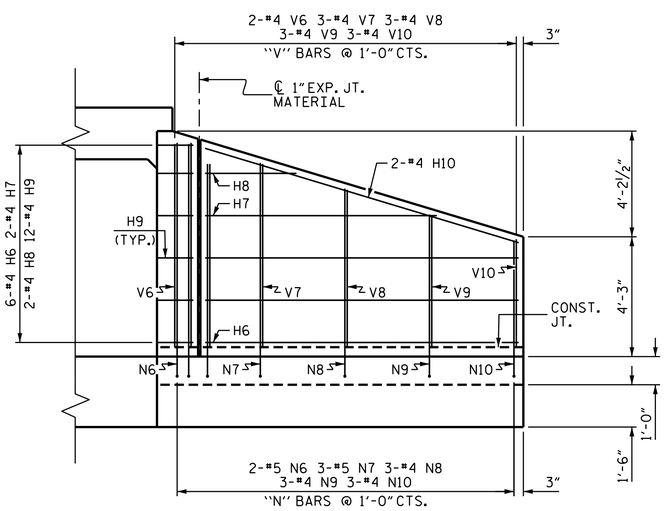
BILL OF MATERIAL

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

REINFORCING STEEL FOR 2 WINGS 639 LBS

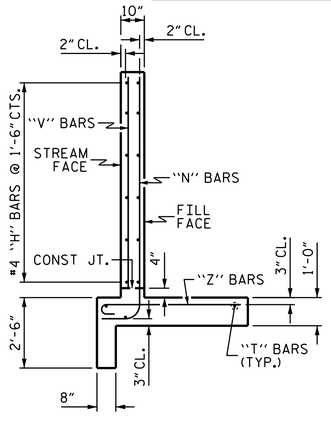
CLASS A CONCRETE
2 WINGS 9.1 CY
TOTAL 9.1 CY





ELEVATION W2

ELEVATION W1



TYPICAL WING SECTION

PROJECT NO. B-5347
ALAMANCE COUNTY
STATION: 14+14.00 -L-

SHEET 6 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STAGE III STANDARD WINGS FOR CONCRETE BOX CULVERT 105° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 29441 ENGINEER KRISTY W. ALFORD
DocuSigned by: F2458389308F40E...
9/25/2017

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-6
1			3			TOTAL SHEETS
2			4			8

ASSEMBLED BY : K.W. ALFORD DATE : 3/17
CHECKED BY : J.D. HAWK DATE : 3/17

DRAWN BY : CCJ 12/99
CHECKED BY : RWW 03/00

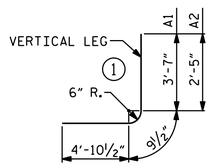
STD. NO. CW7507

REINFORCING STEEL

STAGE I

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	40	#5	1	9'-3"	386
A2	40	#5	1	8'-1"	337
A100	20	#6	STR	14'-5"	433
A200	20	#6	STR	14'-5"	433
B1	20	#4	STR	9'-3"	124
B2	40	#4	STR	8'-1"	216
C1	46	#4	STR	11'-9"	361
G1	2	#4	STR	14'-5"	19
S1	6	#8	STR	14'-5"	231
REINFORCING STEEL =					2,540 LBS.

BAR TYPE



BAR DIMENSIONS ARE OUT TO OUT

SPLICE LENGTH CHART

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

REINFORCING STEEL

STAGE II

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	278	#5	1	9'-3"	2682
A2	278	#5	1	8'-1"	2344
A300	125	#6	STR	13'-11"	2613
A301	1	#6	STR	12'-3"	18
A302	1	#6	STR	10'-4"	16
A303	1	#6	STR	8'-6"	13
A304	1	#6	STR	6'-8"	10
A305	1	#6	STR	4'-9"	7
A306	1	#6	STR	2'-11"	4
A310	2	#6	STR	12'-4"	37
A311	2	#6	STR	10'-7"	32
A312	2	#6	STR	8'-10"	27
A313	2	#6	STR	7'-2"	22
A314	2	#6	STR	5'-5"	16
A315	2	#6	STR	3'-8"	11
A350	8	#6	STR	11'-0"	132
A400	125	#6	STR	13'-11"	2613
A401	1	#6	STR	12'-3"	18
A402	1	#6	STR	10'-4"	16
A403	1	#6	STR	8'-6"	13
A404	1	#6	STR	6'-8"	10
A405	1	#6	STR	4'-9"	7
A406	1	#6	STR	2'-11"	4
A410	2	#6	STR	12'-4"	37
A411	2	#6	STR	10'-7"	32
A412	2	#6	STR	8'-10"	27
A413	2	#6	STR	7'-2"	22
A414	2	#6	STR	5'-5"	16
A415	2	#6	STR	3'-8"	11
A450	8	#6	STR	11'-0"	132
B1	140	#4	STR	9'-3"	865
B2	278	#4	STR	8'-1"	1501
C2	138	#4	STR	24'-7"	2266
G2	2	#4	STR	16'-1"	21
S2	6	#8	STR	16'-1"	258
REINFORCING STEEL =					15,853 LBS.

STAGE I QUANTITIES

CLASS A CONCRETE

BARREL @ 1.721 CY./FT. 17.2 C.Y.
HEADWALL 0.7 C.Y.
CURTAIN WALL 0.5 C.Y.
TOTAL 18.4 C.Y.

REINFORCING STEEL

BARREL 2,540 LBS.
TOTAL 2,540 LBS.

FOUNDATION CONDITIONING MATERIAL 13 TONS

STAGE II QUANTITIES

CLASS A CONCRETE

BARREL @ 1.721 CY./FT. 120.0 C.Y.
INLET WINGS 14.0 C.Y.
TOTAL 134.0 C.Y.

REINFORCING STEEL

BARREL 15,853 LBS.
INLET WINGS 798 C.Y.
TOTAL 16,651 LBS.

FOUNDATION CONDITIONING MATERIAL 90 TONS

STAGE III QUANTITIES

CLASS A CONCRETE

OUTLET WINGS 9.1 C.Y.
TOTAL 9.1 C.Y.

REINFORCING STEEL

OUTLET WINGS 639 C.Y.
TOTAL 639 LBS.

PROJECT NO. B-5347

ALAMANCE COUNTY

STATION: 14+14.00 -L-

SHEET 7 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 13' X 7' CONCRETE BOX CULVERT

NORTH CAROLINA PROFESSIONAL SEAL 29441 ENGINEER KRISTY W. ALFORD

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9/25/2017

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-7
1			3			TOTAL SHEETS
2			4			8

DRAWN BY : K.W. ALFORD DATE : 3/17
CHECKED BY : J.D. HAWK DATE : 3/17
DESIGN ENGINEER OF RECORD: K.W. ALFORD DATE : 3/17

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jdhawk

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

LEVEL		VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING (#)	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE									COMMENT NUMBER
							LIVE-LOAD FACTORS (γ_{LL})	MOMENT				SHEAR				
								RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING		HL-93 (INVENTORY)	N/A	(1)	1.14	--	1.75	1.14	1	TOP SLAB	6.83	4.64	1	Top Slab	1.32	
		HL-93 (OPERATING)	N/A		1.48	--	1.35	1.48	1	TOP SLAB	6.83	6.02	1	Top Slab	1.32	
		HS-20 (INVENTORY)	36.000	(2)	1.63	58.64	1.75	1.63	1	BOTTOM SLAB	6.83	6.86	1	Top Slab	1.32	
		HS-20 (OPERATING)	36.000		2.11	76.02	1.35	2.11	1	BOTTOM SLAB	6.83	8.89	1	Top Slab	1.32	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		2.97	40.11	1.40	2.97	1	BOTTOM SLAB	6.83	11.57	1	Exterior Wall	7.17	
		SNGARBS2	20.000		2.78	55.62	1.40	2.78	1	BOTTOM SLAB	6.83	11.57	1	Exterior Wall	7.17	
		SNAGRIS2	22.000		2.97	65.36	1.40	2.97	1	BOTTOM SLAB	6.83	11.57	1	Exterior Wall	7.17	
		SNCOTTS3	27.250		1.43	38.89	1.40	1.43	1	TOP SLAB	6.83	5.8	1	Top Slab	1.32	
		SNAGGRS4	34.925		1.44	50.34	1.40	1.44	1	TOP SLAB	6.83	6.08	1	Top Slab	1.32	
		SNS5A	35.550		1.37	48.86	1.40	1.37	1	TOP SLAB	6.83	5.76	1	Top Slab	12.35	
		SNS6A	39.950	3	1.37	54.8	1.40	1.37	1	TOP SLAB	6.83	5.76	1	Top Slab	1.32	
		SNS7B	42.000		1.37	57.61	1.40	1.37	1	TOP SLAB	6.83	5.76	1	Top Slab	1.32	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.06	68.1	1.40	2.06	1	TOP SLAB	6.83	8.87	1	Top Slab	1.32	
		TNT4A	33.075		1.70	56.24	1.40	1.7	1	TOP SLAB	6.83	6.92	1	Top Slab	1.32	
		TNT6A	41.600		1.45	60.48	1.40	1.45	1	TOP SLAB	6.83	6.03	1	Top Slab	1.32	
		TNT7A	42.000		1.60	67.37	1.40	1.6	1	TOP SLAB	6.83	6.62	1	Top Slab	12.35	
		TNT7B	42.000		1.47	61.76	1.40	1.47	1	BOTTOM SLAB	6.83	6.13	1	Top Slab	12.35	
		TNAGRIT4	43.000		1.57	67.67	1.40	1.57	1	BOTTOM SLAB	6.83	6.62	1	Top Slab	1.32	
		TNAGT5A	45.000		1.61	72.31	1.40	1.61	1	BOTTOM SLAB	6.83	6.73	1	Top Slab	1.32	
		TNAGT5B	45.000		1.62	72.89	1.40	1.62	1	BOTTOM SLAB	6.83	6.81	1	Bottom Slab	1.32	

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.

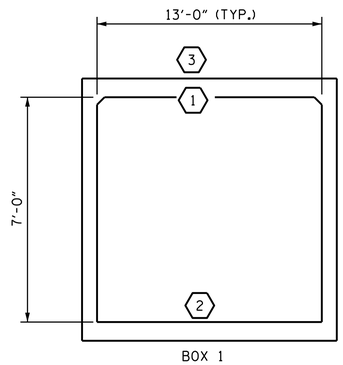
(#) CONTROLLING LOAD RATING

(1) DESIGN LOAD RATING (HL-93)

(2) DESIGN LOAD RATING (HS-20)

(3) LEGAL LOAD RATING **

** SEE CHART FOR VEHICLE TYPE



BOX 1

LRFR SUMMARY

(LOOKING DOWNSTREAM)

PROJECT NO. B-5347

ALAMANCE COUNTY

STATION: 14+14.00 -L-

SHEET 8 OF 8

NORTH CAROLINA PROFESSIONAL SEAL 29441 ENGINEER KRISTY W. ALFORD

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9/25/2017

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

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

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

STD. NO. LRFR5

ASSEMBLED BY : REZA KOUCHEKI	DATE : 8/23/16	
CHECKED BY : K.W. ALFORD	DATE : 3/17	
DRAWN BY : WMC	7/11	REV. 10/17/11 MAA/GM
CHECKED BY : GM	7/11	

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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 ¾" Ø STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - 7/8" Ø STUDS FOR 4 - 3/4" Ø STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF 7/8" Ø STUDS ALONG THE BEAM AS SHOWN FOR 3/4" Ø STUDS BASED ON THE RATIO OF 3 - 7/8" Ø STUDS FOR 4 - 3/4" Ø STUDS. STUDS OF THE LENGTH SPECIFIED ON THE PLANS MUST BE PROVIDED. THE MAXIMUM SPACING SHALL BE 2'-0".

EXCEPT AT THE INTERIOR SUPPORTS OF CONTINUOUS BEAMS WHERE THE COVER PLATE IS IN CONTACT WITH BEARING PLATE, THE CONTRACTOR MAY, AT HIS OPTION, SUBSTITUTE FOR THE COVER PLATES DESIGNATED ON THE PLANS COVER PLATES OF THE EQUIVALENT AREA PROVIDED THESE PLATES ARE AT LEAST 5/16" IN THICKNESS AND DO NOT EXCEED A WIDTH EQUAL TO THE FLANGE WIDTH LESS 2" OR A THICKNESS EQUAL TO 2 TIMES THE FLANGE THICKNESS. THE SIZE OF FILLET WELDS SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT ANSI/AASHTO/AWS "BRIDGE WELDING CODE". ELECTROSLAG WELDING WILL NOT BE PERMITTED.

WITH THE SOLE EXCEPTION OF EDGES AT SURFACES WHICH BEAR ON OTHER SURFACES, ALL SHARP EDGES AND ENDS OF SHAPES AND PLATES SHALL BE SLIGHTLY ROUNDED BY SUITABLE MEANS TO A RADIUS OF APPROXIMATELY 1/16 INCH OR EQUIVALENT FLAT SURFACE AT A SUITABLE ANGLE PRIOR TO PAINTING, GALVANIZING, OR METALLIZING.

HANDRAILS AND POSTS:

METAL STANDARDS AND FACES OF THE CONCRETE END POSTS FOR THE METAL RAIL SHALL BE SET NORMAL TO THE GRADE OF THE CURB, UNLESS OTHERWISE SHOWN ON PLANS. THE METAL RAIL AND TOPS OF CONCRETE POSTS USED WITH THE ALUMINUM RAIL SHALL BE BUILT PARALLEL TO THE GRADE OF THE CURB.

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

SPECIAL NOTES:

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

ENGLISH

JANUARY, 1990

STD. NO. SN

REV. 6-16-95 EEM (c) RGW REV. 5-7-03 RWW (c) JTE REV. 10-1-11 MAA (c) GM
REV. 8-16-99 RWW (c) LES REV. 5-1-06 TLA (c) GM

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