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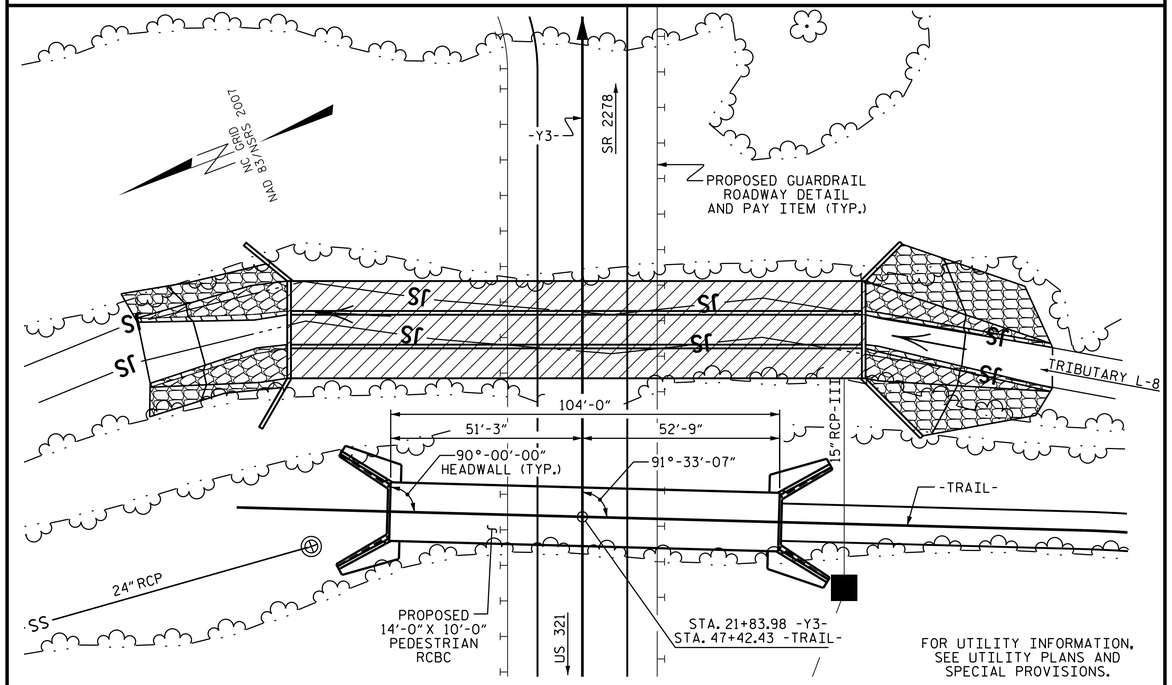
BENCHMARK #3: CHISELED SQUARE IN CORNER OF UTILITY BOX BASE, STA. 11+80.00 -Y1- 56 FT. LEFT; EL. 739.23; N 567774 E 1347226



LOCATION SKETCH

ROADWAY DATA

GRADE POINT ELEV. @ STA. 21+83.98 -Y3-	= 717.68
BED ELEV. @ STA. 47+42.43 -TRAIL-	= 691.37
ROADWAY SLOPES	= 2:1

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
BARREL @ 2.145 C.Y./FT.	223.1 CU.YDS.
WING ETC.	34.2 CU.YDS.
TOTAL	257.3 CU.YDS.
REINFORCING STEEL	
BARREL	33170 LBS.
WINGS ETC.	2427 LBS.
TOTAL	35597 LBS.
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	230.0 TONS

NOTES:

F. A. PROJECT No.: IMF-085-1(113)17

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

DESIGN FILL ---------- 15.55 FT. (MIN.) 16.67 FT. (MAX.)

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS, CURTAIN WALL 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 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.

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.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

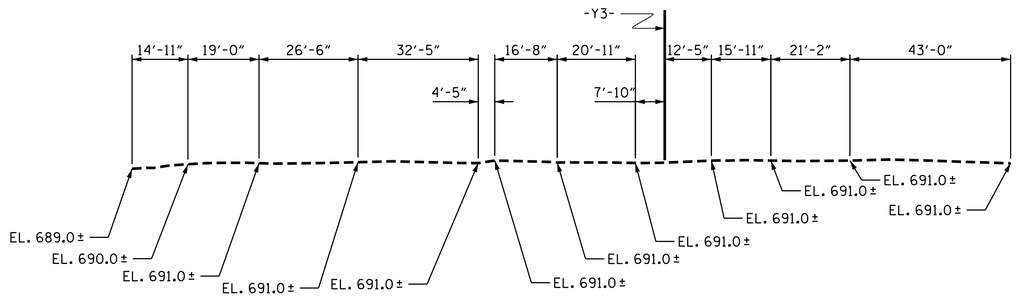
FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

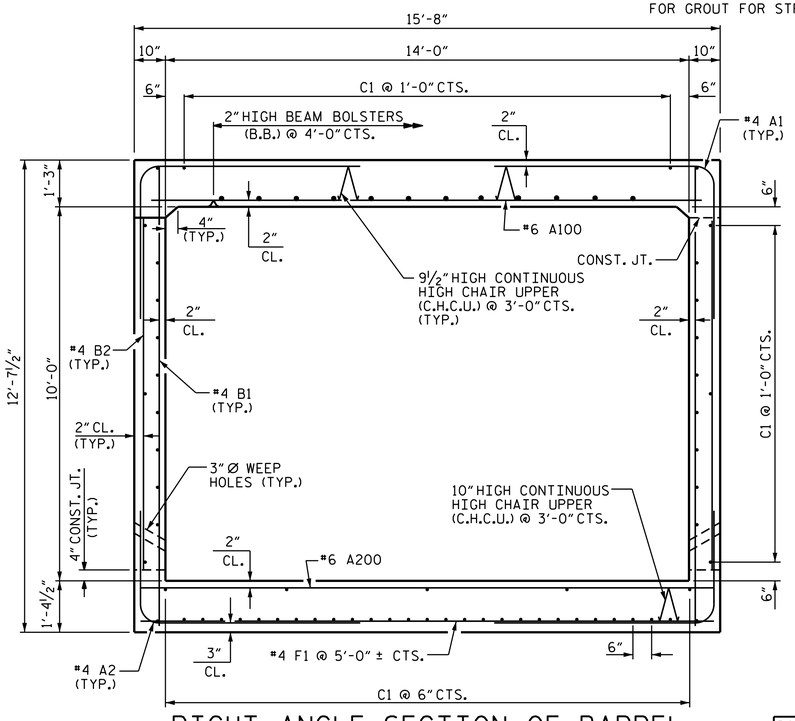
FOR PEDESTRIAN CULVERT LIGHTING SYSTEMS, SEE SHEET C-26.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.



PROFILE ALONG ℄ CULVERT



RIGHT ANGLE SECTION OF BARREL

THERE ARE 73 "C" BARS IN SECTION OF BARREL

PROJECT NO. I-5000

GASTON COUNTY

STATION: 21+83.98 -Y3-

SHEET 1 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 14 FT. X 10 FT. RCBC
91°-33'-07" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 4139C12A32AB406...
2/21/2017

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			26

DRAWN BY : H. T. BARBOUR DATE : 8-15-16
CHECKED BY : A. M. LEE DATE : 9-28-16
DESIGN ENGINEER OF RECORD: O. PUIGCERVER DATE : 10-31-16

16-FEB-2017 13:42
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rwwright

CULVERT #1

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 $\gamma_{(LL)}$	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⟩	1.30	--	1.75	1.30	1	BOT. CORNER WALL	10.75	2.14	1	TOP SLAB	1.36	
		HL-93 (OPERATING)	N/A		1.69	--	1.35	1.69	1	BOT. CORNER WALL	10.75	2.78	1	TOP SLAB	1.36	
		HS-20 (INVENTORY)	36.00	⟨2⟩	1.39	50.13	1.75	1.39	1	BOT. CORNER WALL	10.75	2.43	1	TOP SLAB	1.36	
		HS-20 (OPERATING)	36.00		1.81	64.99	1.35	1.81	1	BOT. CORNER WALL	10.75	3.15	1	TOP SLAB	1.36	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.50		1.89	25.52	1.40	1.89	1	BOT. CORNER WALL	10.75	6.07	1	TOP SLAB	1.36	
		SNGARBS2	20.00		1.86	37.16	1.40	1.86	1	BOT. CORNER WALL	10.75	4.69	1	TOP SLAB	1.36	
		SNAGRIS2	22.00		1.82	40.10	1.40	1.82	1	BOT. CORNER WALL	10.75	4.39	1	TOP SLAB	1.36	
		SNCOTTS3	27.25		1.57	42.90	1.40	1.57	1	BOT. CORNER WALL	10.75	2.68	1	TOP SLAB	1.36	
		SNAGGRS4	34.93		1.60	55.79	1.40	1.60	1	BOT. CORNER WALL	10.75	2.52	1	TOP SLAB	1.36	
		SNS5A	35.55	⟨3⟩	1.55	55.17	1.40	1.55	1	BOT. CORNER WALL	10.75	2.37	1	TOP SLAB	1.36	
		SNS6A	39.95		1.55	62.02	1.40	1.55	1	BOT. CORNER WALL	10.75	2.40	1	TOP SLAB	1.36	
		SNS7B	42.00		1.55	65.20	1.40	1.55	1	BOT. CORNER WALL	10.75	2.40	1	TOP SLAB	1.36	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.00		1.74	57.34	1.40	1.74	1	BOT. CORNER WALL	10.75	3.17	1	TOP SLAB	1.36	
		TNT4A	33.08		1.65	54.45	1.40	1.65	1	BOT. CORNER WALL	10.75	2.87	1	TOP SLAB	13.47	
		TNT6A	41.60		1.59	66.26	1.40	1.59	1	BOT. CORNER WALL	10.75	2.58	1	TOP SLAB	1.36	
		TNT7A	42.00		1.62	68.23	1.40	1.62	1	BOT. CORNER WALL	10.75	2.91	1	TOP SLAB	1.36	
		TNT7B	42.00		1.58	66.19	1.40	1.58	1	BOT. CORNER WALL	10.75	2.49	1	TOP SLAB	13.47	
		TNAGRIT4	43.00		1.57	67.53	1.40	1.57	1	BOT. CORNER WALL	10.75	2.46	1	TOP SLAB	1.36	
		TNAGT5A	45.00		1.58	71.18	1.40	1.58	1	BOT. CORNER WALL	10.75	2.49	1	TOP SLAB	1.36	
		TNAGT5B	45.00		1.59	71.64	1.40	1.59	1	BOT. CORNER WALL	10.75	2.55	1	TOP SLAB	1.36	

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

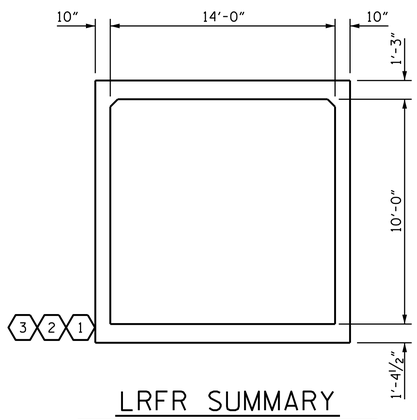
⟨#⟩ CONTROLLING LOAD RATING

⟨1⟩ DESIGN LOAD RATING (HL-93)

⟨2⟩ DESIGN LOAD RATING (HS-20)

⟨3⟩ LEGAL LOAD RATING **

** SEE CHART FOR VEHICLE TYPE



LRFR SUMMARY

(LOOKING DOWNSTREAM)

PROJECT NO. I-5000

GASTON COUNTY

STATION: 21+83.98 -Y3-

SHEET 2 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

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

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 4139C12A32AB406...

1/17/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-2
1			3			TOTAL SHEETS
2			4			26

ASSEMBLED BY : H. T. BARBOUR DATE : 8-15-16
CHECKED BY : A. M. LEE DATE : 9-28-16

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

REV. 10/1/11 MAA/GM

DESIGN ENGINEER OF RECORD: O. PUIGCERVER DATE : 10-31-16

13-JAN-2017 14:55
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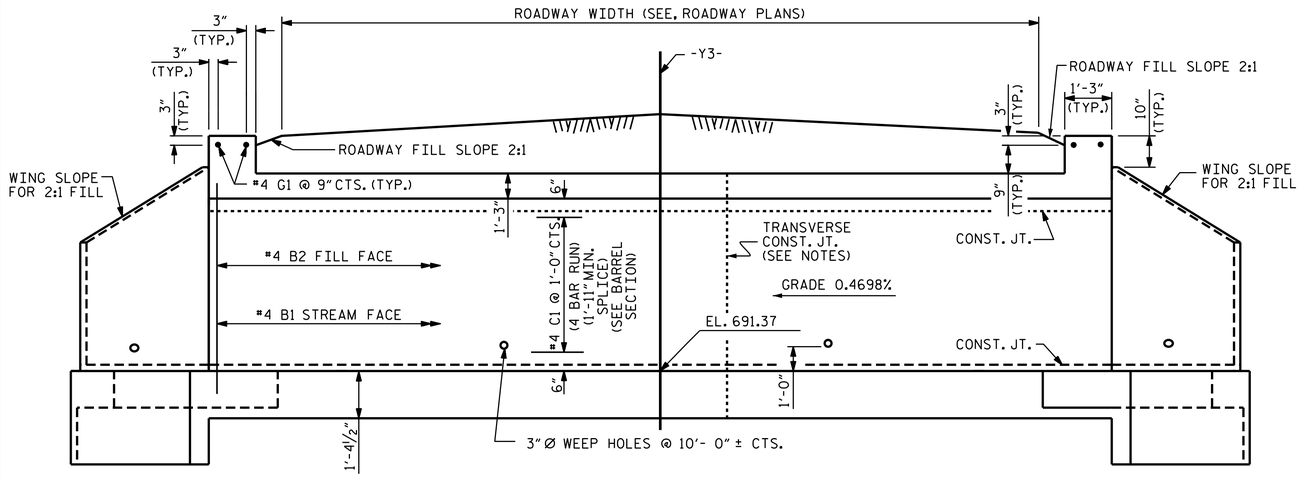
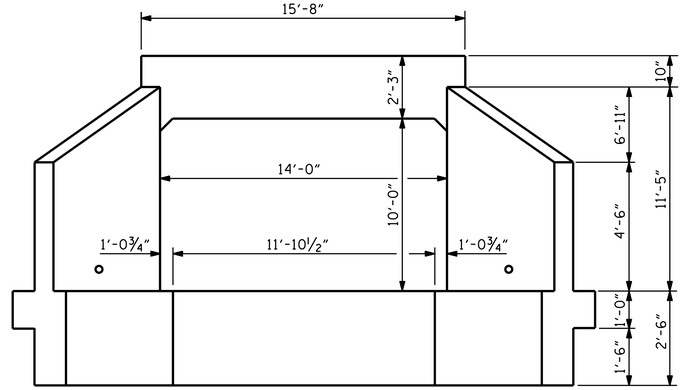
tbarbour

CULVERT #1

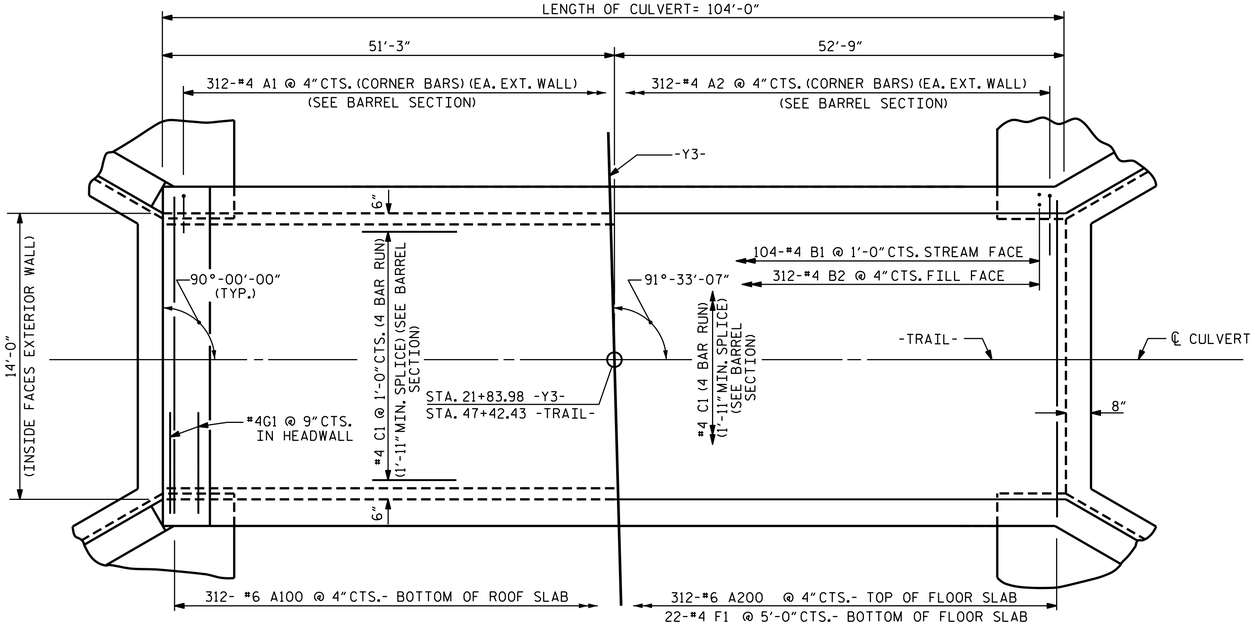
STD. NO. LRFR5



CULVERT SECTION NORMAL TO ROADWAY

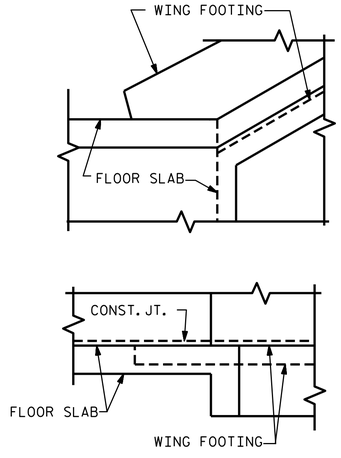


END ELEVATION



PART PLAN ROOF SLAB

PART PLAN FLOOR SLAB

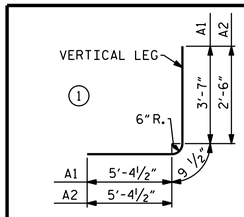


DETAIL

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

REINFORCING BAR SCHEDULE

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	624	#4	1	9'-9"	4064
A2	624	#4	1	8'-8"	3613
A100	312	#6	STR.	15'-3"	7147
A200	312	#6	STR.	15'-3"	7147
B1	208	#4	STR.	12'-1"	1679
B2	624	#4	STR.	9'-4"	3890
C1	292	#4	STR.	27'-6"	5364
G1	4	#4	STR.	15'-4"	41
F1	22	#4	STR.	15'-4"	225
TOTAL REINFORCING STEEL					33170 LBS.



BAR TYPE

BAR DIMENSIONS ARE OUT TO OUT

SPLICE CHART

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

PROJECT NO. I-5000

GASTON COUNTY

STATION: 21+83.98 -Y3-

SHEET 3 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL STANDARD SINGLE 14 FT. X 10 FT. CONCRETE BOX CULVERT 91°-33'-07" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARHEET

DocuSigned by: Wael Arafat 413DC12A32AB406...
1/17/2017

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-3
1			3			TOTAL SHEETS
2			4			26

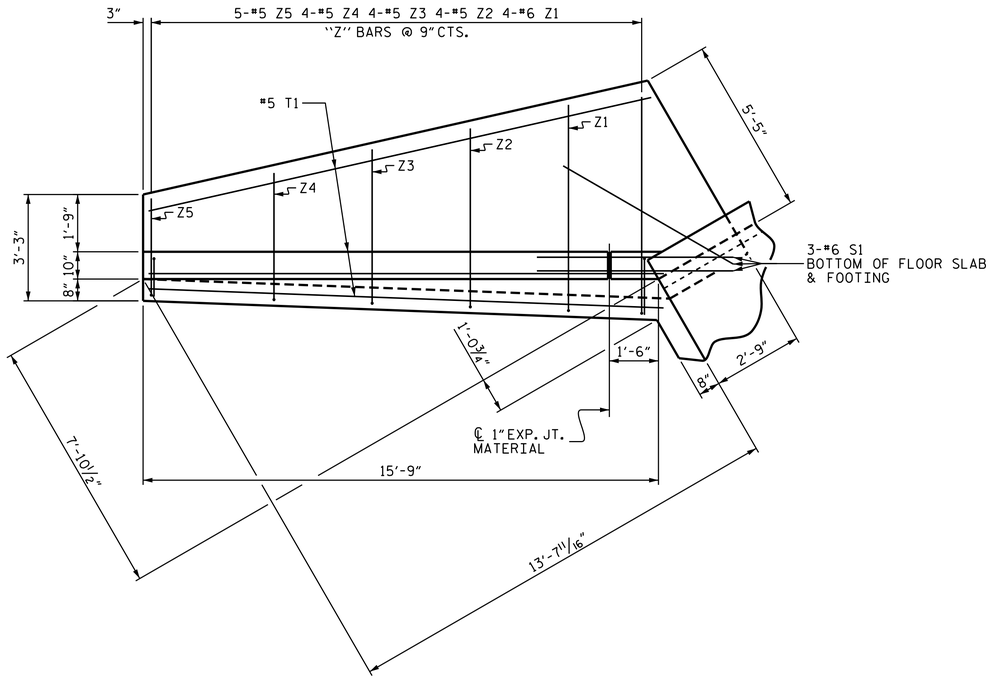
ASSEMBLED BY : H. T. BARBOUR DATE : 8-15-16
CHECKED BY : A. M. LEE DATE : 9-28-16

DRAWN BY : R. WRIGHT DATE : AUG. 1989
CHECKED BY : A.R. BISSETTE DATE : AUG. 1989

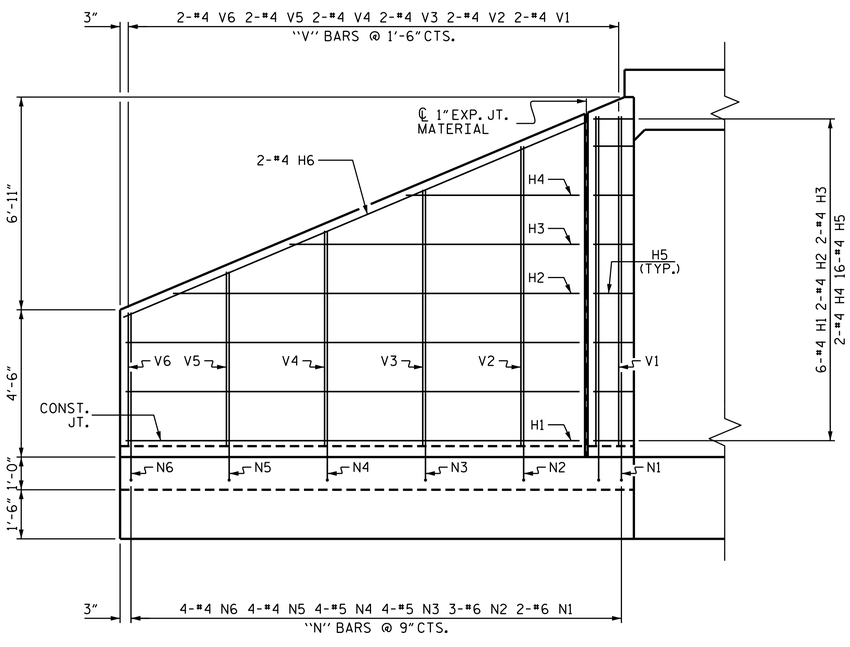
SPECIAL
STANDARD

DESIGN ENGINEER OF RECORD: O. PUIGCERVER DATE : 10-31-16

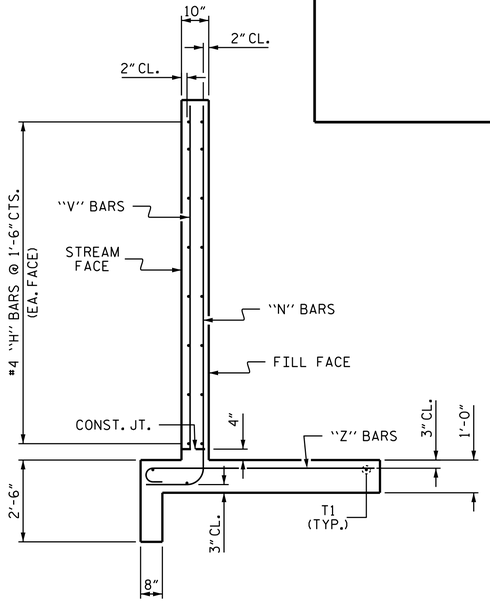
REVISED 8-28-92 BY E.L.R. CHECKED BY G.R.P.
REVISED 8-22-89 BY A.R.B. CHECKED BY C.R.K.
REDRAWN 8-22-1989
REVISED 11-19-99 BY M.M. CHECKED BY R.W.W.



PLAN



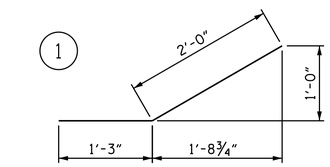
ELEVATION

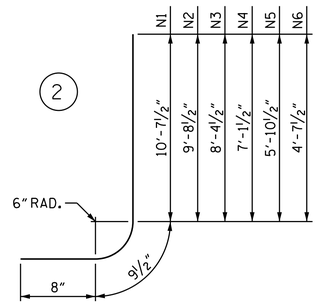


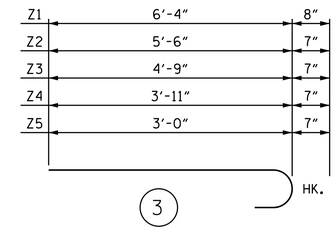
TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.







BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	24	#4	STR	13'-10"	222
H2	8	#4	STR	12'-5"	66
H3	8	#4	STR	8'-10"	47
H4	8	#4	STR	5'-4"	29
H5	64	#4	1	3'-3"	139
H6	8	#4	STR	15'-5"	82
N1	8	#6	2	12'-1"	146
N2	12	#6	2	11'-2"	201
N3	16	#5	2	9'-10"	164
N4	16	#5	2	8'-7"	143
N5	16	#4	2	7'-4"	78
N6	16	#4	2	6'-1"	65
S1	12	#6	STR	6'-0"	108
T1	12	#5	STR	15'-9"	197
V1	8	#4	STR	10'-1"	54
V2	8	#4	STR	9'-2"	49
V3	8	#4	STR	7'-10"	42
V4	8	#4	STR	6'-7"	35
V5	8	#4	STR	5'-4"	29
V6	8	#4	STR	4'-1"	22
Z1	16	#6	3	7'-0"	168
Z2	16	#5	3	6'-1"	102
Z3	16	#5	3	5'-4"	89
Z4	16	#5	3	4'-6"	75
Z5	20	#5	3	3'-7"	75

REINFORCING STEEL
FOR 4 WINGS 2427 LBS

CLASS A CONCRETE
4 WINGS 31.2 CY
2 HEADWALLS 1.5 CY
END CURTAIN WALLS 1.5 CY
TOTAL 34.2 CY

PROJECT NO. I-5000
GASTON COUNTY
STATION: 21+83.98 -Y3-

SHEET 4 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD WINGS FOR CONCRETE BOX CULVERT

H = 10'-0" SLOPE = 2:1
90° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 4139C12A32AB406...
1/17/2017

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-4
1			3			TOTAL SHEETS
2			4			26

ASSEMBLED BY :	H. T. BARBOUR	DATE :	8-15-16
CHECKED BY :	A. M. LEE	DATE :	9-28-16
DRAWN BY :	CCJ		10/99
CHECKED BY :	RWW		03/00

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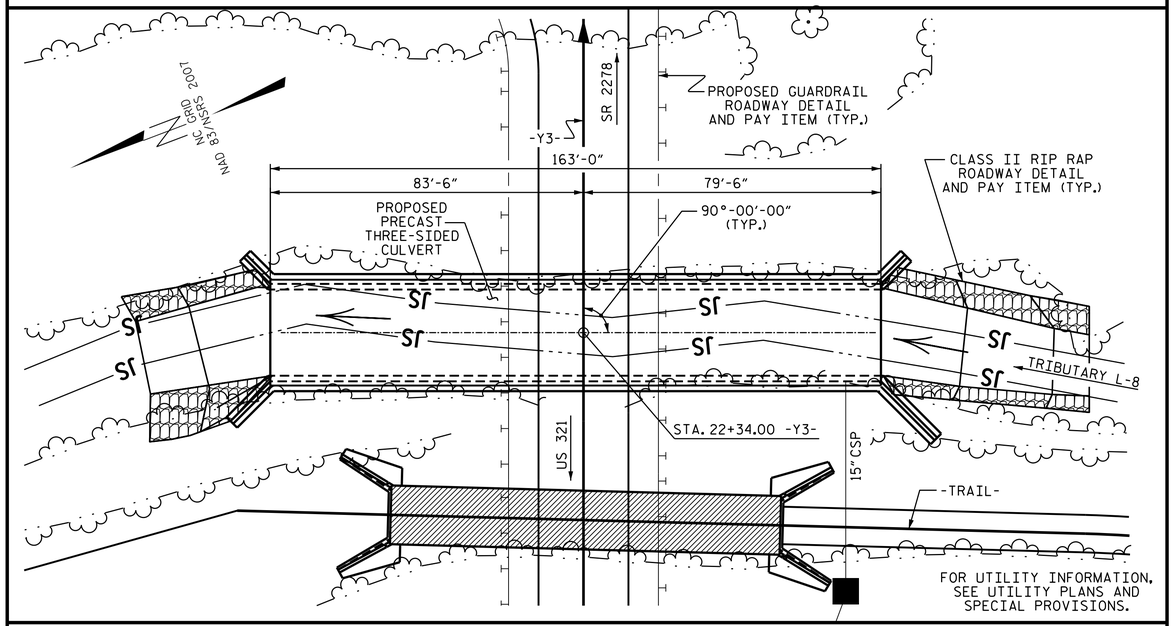
13-JAN-2017 14:55
tbarbour

CULVERT #1 STD. NO. CW9010

BENCHMARK #3: CHISELED SQUARE IN CORNER OF UTILITY BOX BASE, STA. 11+80.00 -Y1- 56 FT. LEFT; EL. 739.23; N 567774 E 1347226



LOCATION SKETCH

ROADWAY DATA

GRADE POINT ELEV. @ STA. 22+34.00 -Y3-	= 715.15
BED ELEV. @ STA. 22+34.00 -Y3-	= 678.2
ROADWAY SLOPES	= 2:1

HYDRAULIC DATA

DESIGN DISCHARGE	= 950 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 50 YEARS
DESIGN HIGH WATER ELEVATION	= 683.7
DRAINAGE AREA	= 1.28 SQ. MI.
BASE DISCHARGE (Q100)	= 1100 C.F.S.
BASE HIGH WATER ELEVATION	= 684.30

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 6700 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YEARS
OVERTOPPING FLOOD ELEVATION	= 707.6 AT STA. 23+61.09 -Y3-

NOTES

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

DESIGN FILL ---------- 27.73 (MIN.) 29.65 (MAX.)

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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.

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.

THE 15"DIA. PIPE THROUGH THE SIDEWALL OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER. REINFORCING STEEL IN THE PRECAST CULVERT SHALL BE BENT AS NECESSARY TO CLEAR PIPE.

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

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

THE SCOUR CRITICAL ELEVATION FOR THE CULVERT IS THE BOTTOM OF FOOTING ELEVATION. SCOUR CRITICAL ELEVATIONS ARE USED TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.

THE SPREAD FOOTINGS FOR THE CULVERT ARE DESIGNED FOR A FACTORED RESISTANCE OF 4 TSF. CHECK FIELD CONDITIONS FOR THE REQUIRED RESISTANCE OF 9 TSF JUST BEFORE PLACING CONCRETE.

KEY IN SPREAD FOOTINGS FOR THE CULVERT AT LEAST 12 INCHES INTO WEATHERED ROCK OR CRYSTALLINE ROCK WITH A MINIMUM THICKNESS AS SHOWN ON THE PLANS.

THE BOTTOM OF FOOTING ELEVATIONS MAY BE LOWERED IF NECESSARY TO ACHIEVE REQUIRED BEARING CAPACITY.

FOR BLASTING ADJACENT TO HIGHWAY STRUCTURES, SEE ARTICLE 410-9 OF THE STANDARD SPECIFICATIONS.

THIS STRUCTURE HAS BEEN DESIGNED IN ACCORDANCE WITH HEC 18 "EVALUATING SCOUR AT BRIDGES."

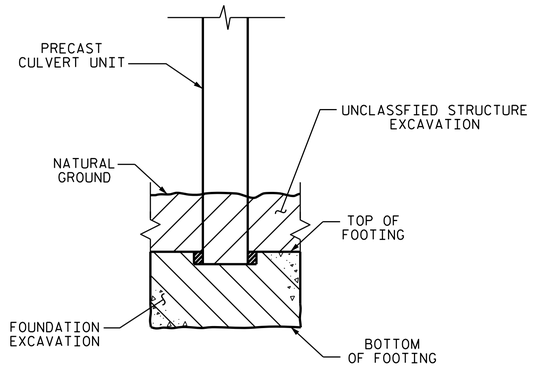
FOR PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

A SPREAD FOOTING IS REQUIRED FOR THE PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT FOUNDATION. THE CONTRACTOR SHALL PROVIDE THE FOOTING DESIGN TO THE ENGINEER FOR REVIEW AND APPROVAL.

THE CULVERT SECTIONS AND WINGS SHALL BE DESIGNED TO HANDLE FULL DEPTH HYDROSTATIC PRESSURE IF WEEP HOLES ARE NOT UTILIZED. IF PROVIDED, WEEP HOLES SHALL BE LOCATED A MINIMUM HEIGHT OF 6 INCHES ABOVE THE NORMAL FLOW LINE AND HAVE A MAXIMUM SPACING OF 10 FEET.

F. A. PROJECT No.: IMF-085-1(113)17

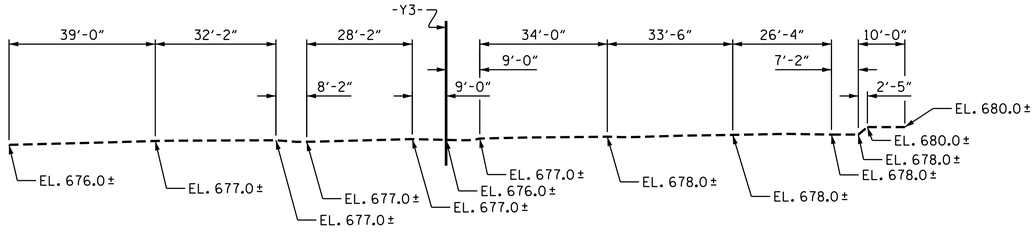


EXCAVATION DETAIL

TOTAL STRUCTURE QUANTITIES

UNCLASSFIED STRUCTURE EXCAVATION	LUMP SUM
FOUNDATION EVCAVATION	111.0 C. Y.
PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT @ STA. 22+34.00 -Y3-	LUMP SUM
* CLASS A CONCRETE	151.0 C. Y.

* CLASS A CONCRETE QUANTITY SHOWN IS ESTIMATED AND IS BASED UPON THE BEST INFORMATION AVAILABLE. ESTIMATED QUANTITY INCLUDES HEADWALLS, WINGS, CULVERT FOOTINGS AND/OR SUB-FOOTINGS (IF USED).



PROFILE ALONG ℄ CULVERT

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 4139C12A32AB406...
1/17/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. I-5000

GASTON COUNTY

STATION: 22+34.00 -Y3-

SHEET 1 OF 3 BRIDGE No. 446

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT

90° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-5
1			3			TOTAL SHEETS
2			4			26

DRAWN BY : H. T. BARBOUR DATE : 11-29-16
CHECKED BY : T. L. AVERETTE DATE : 11-16

13-JAN-2017 14:55
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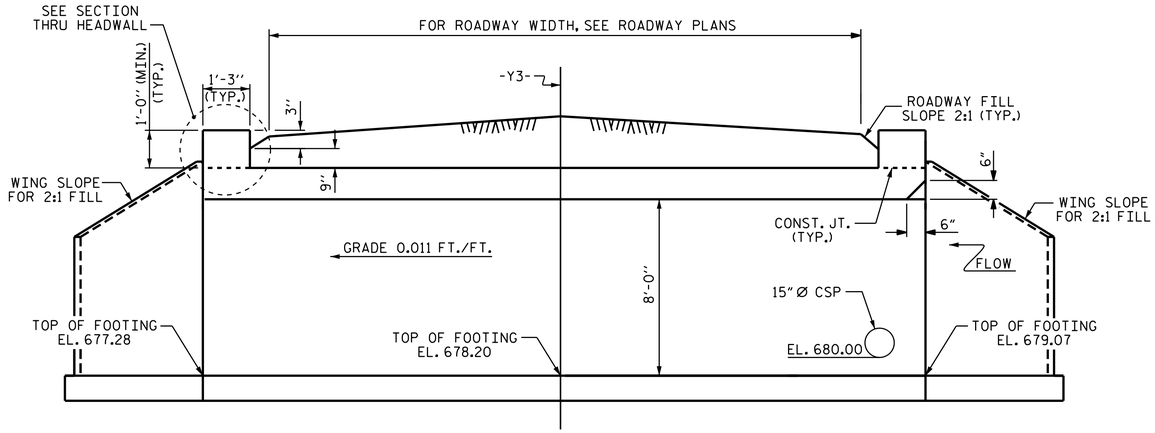
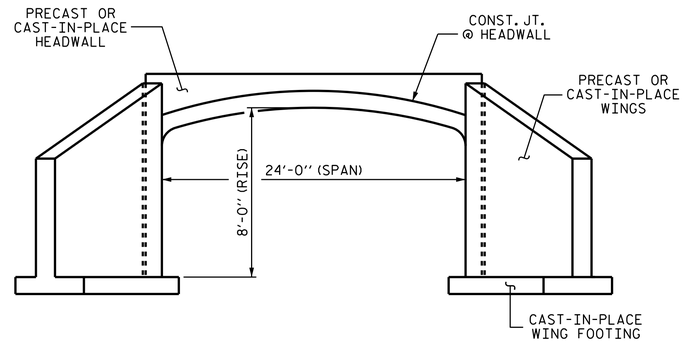
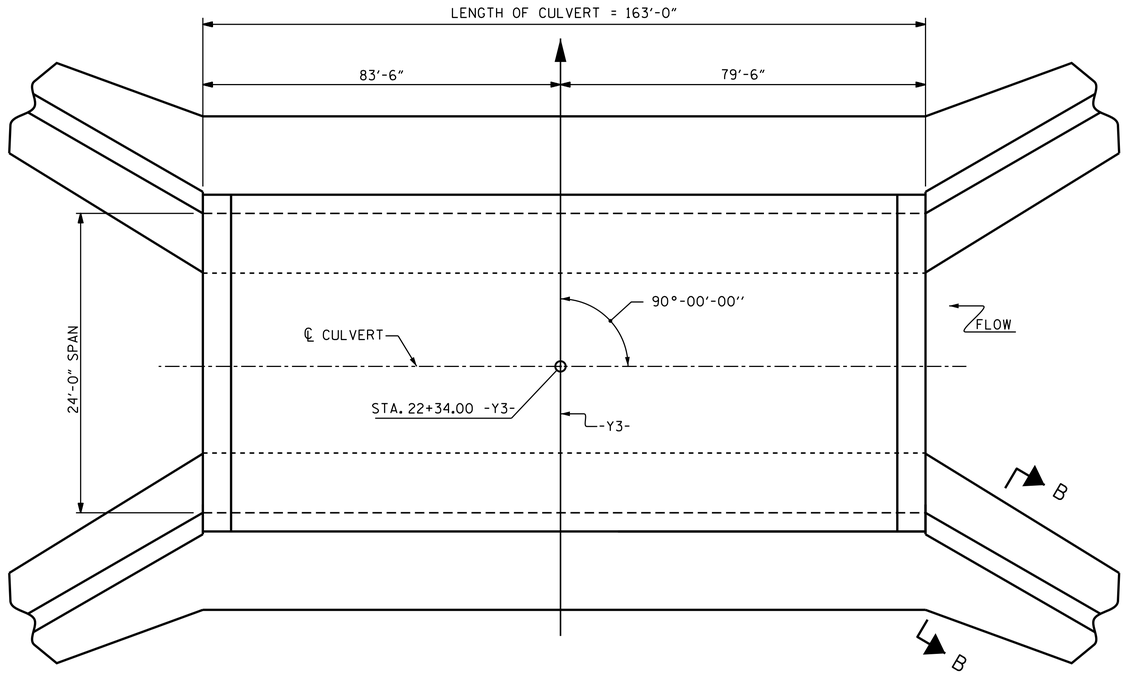
tbarbour



CULVERT SECTION NORMAL TO ROADWAY

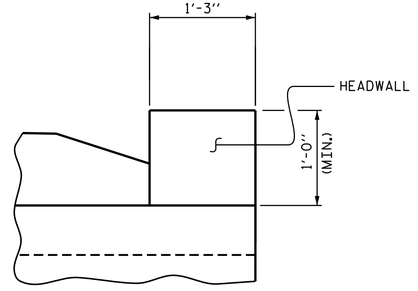


END ELEVATION



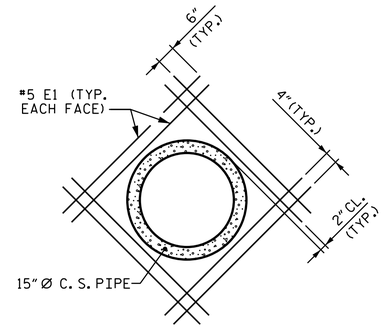
LENGTH FOR PRECAST THREE-SIDED CULVERT

NOTE: SEE SHEET 3 OF 3 FOR SECTION B-B



SECTION THRU HEADWALL

BEVEL AT INLET END NOT SHOWN



DETAIL OF REINFORCING AROUND 15" Ø PIPE

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. I-5000

GASTON COUNTY

STATION: 22+34.00 -Y3-

SHEET 2 OF 3

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT 90° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 413BC12A32AB406...

1/17/2017

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-6
1			3			TOTAL SHEETS
2			4			26

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DRAWN BY : H. T. BARBOUR DATE : 11-29-16

CHECKED BY : T. L. AVERETTE DATE : 11-16

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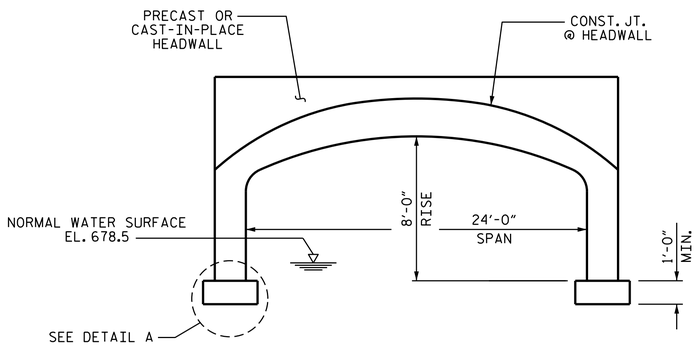
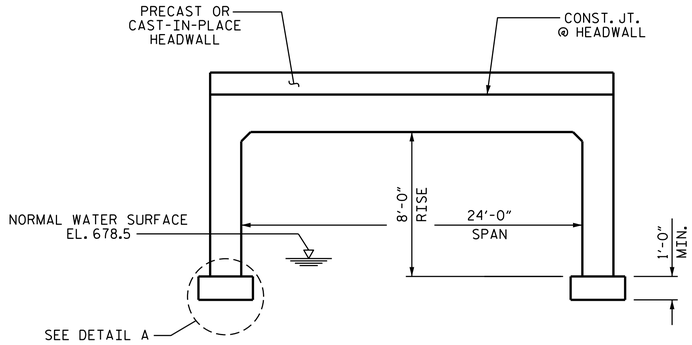
tbarbour

CULVERT #2

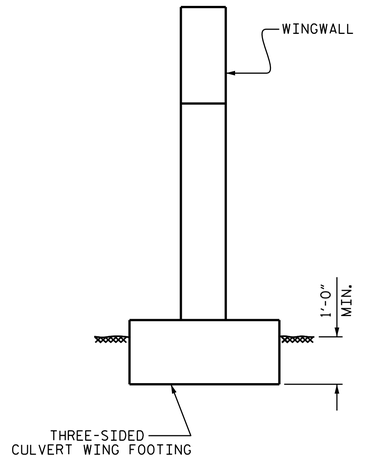


ARCH ALTERNATIVE

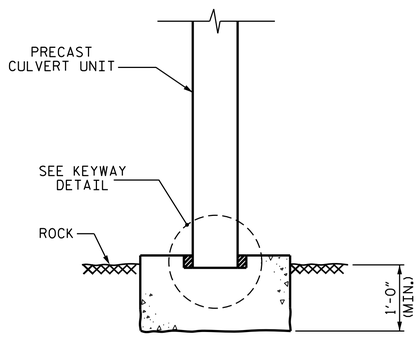


FLAT TOPPED ALTERNATIVE

RIGHT ANGLE SECTION OF PRECAST CONCRETE THREE-SIDED CULVERT

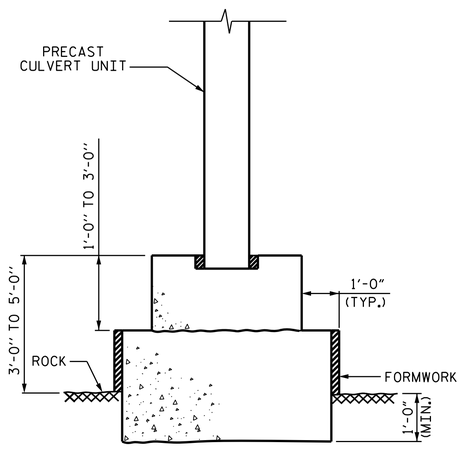


SECTION B-B



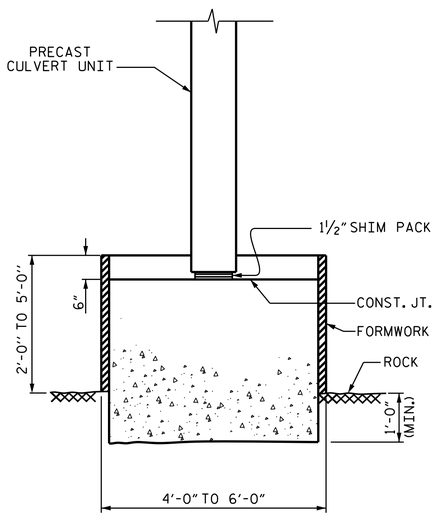
DETAIL A

FOOTING KEYED 1'-0" INTO ROCK



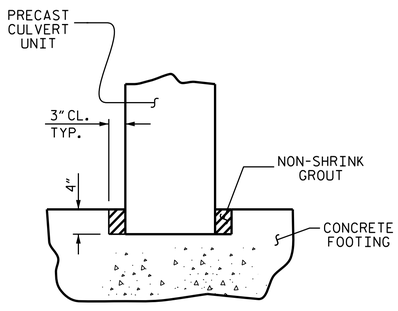
DETAIL A

OPTION #1 - SUB-FOOTING
KEYED 1'-0" INTO ROCK



DETAIL A

OPTION #2 - MONOLITHIC SUB-FOOTING
KEYED 1'-0" INTO ROCK



KEYWAY DETAIL

NOTE:
OPTIONS #1 AND #2 REPRESENT THE FOUNDATION ALTERNATIVES WHEN THE ROCKLINE IS BELOW THE FOOTING.

PROJECT NO. I-5000

GASTON COUNTY

STATION: 22+34.00 -Y3-

SHEET 3 OF 3

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT

90° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 4139C12A32AB406...

1/17/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SHEET NO. C-7

TOTAL SHEETS 26

DRAWN BY : H. T. BARBOUR DATE : 11-29-16

CHECKED BY : T. L. AVERETTE DATE : 11-16

13-JAN-2017 14:55
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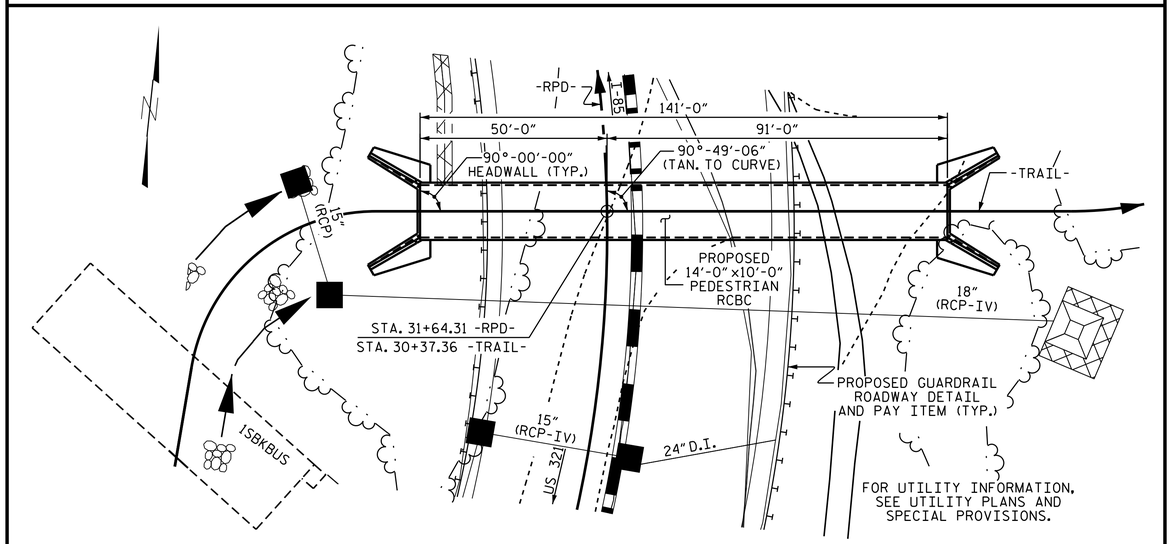
tbarbour

BENCHMARK #3: CHISELED SQUARE CORNER OF UTILITY BOX STA. 11+80.00 -Y1- 56 FT. LEFT; EL. 739.23; N 567774, E 1347226



LOCATION SKETCH

ROADWAY DATA

GRADE POINT ELEV. @ STA. 31+64.31 -RPD-	= 732.15
BED ELEV. @ STA. 30+37.36 -TRAIL-	= 709.60
ROADWAY SLOPES	= 2:1

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
BARREL @ 2.051 C.Y./FT.	289.2 CU.YDS.
WING ETC.	34.1 CU.YDS.
TOTAL	323.3 CU.YDS.
REINFORCING STEEL	
BARREL	47758 LBS.
WINGS ETC.	2427 LBS.
TOTAL	50185 LBS.
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	403.0 TONS

NOTES

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

DESIGN FILL ---------- 8.91 FT. (MIN.) 18.19 FT. (MAX.)

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERT TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS, CURTAIN WALL 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 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.

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.

NO PRECAST CONCRETE BOX CULVERT OPTION WILL BE ALLOWED.

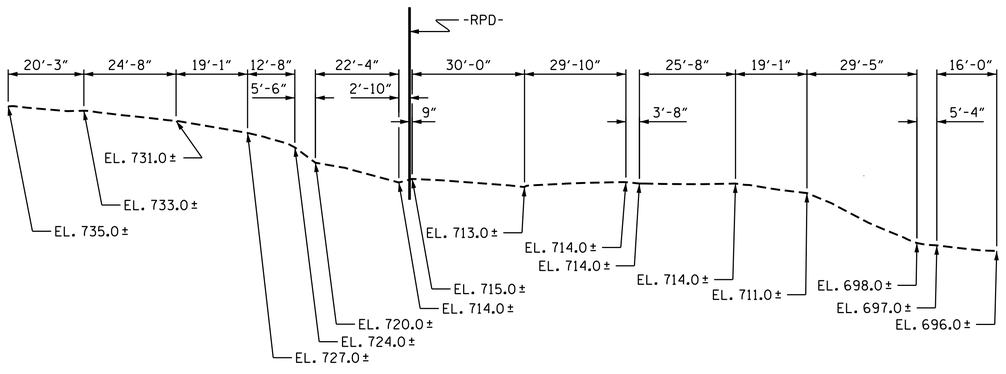
FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

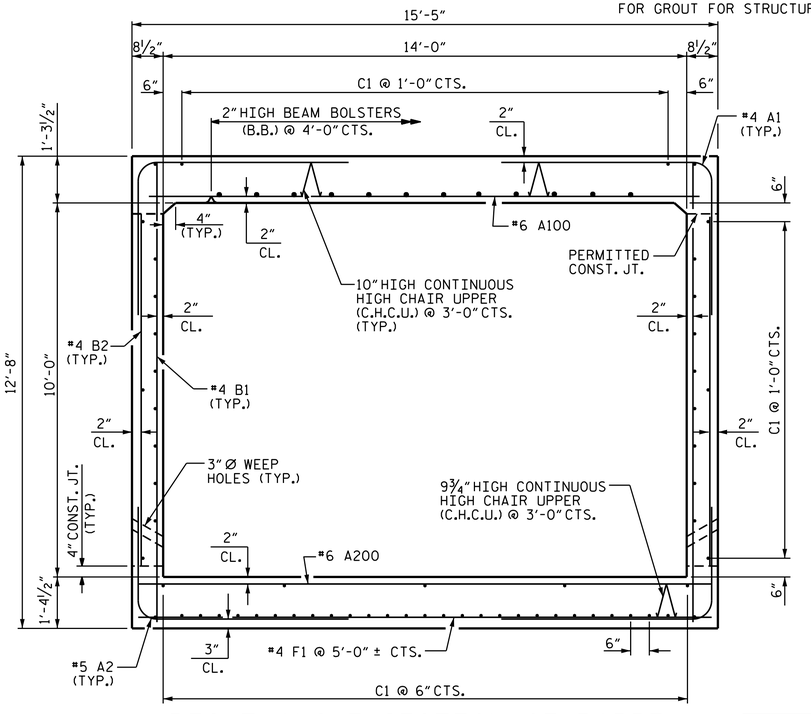
FOR PEDESTRIAN CULVERT LIGHTING SYSTEMS, SEE SHEET C-26.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.



PROFILE ALONG ℄ CULVERT



RIGHT ANGLE SECTION OF BARREL

THERE ARE 73 "C" BARS IN SECTION OF BARREL

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 4139C12A32AB406...

2/21/2017

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F. A. PROJECT No.: IMF-085-1(113)17

PROJECT NO. I-5000

GASTON COUNTY

STATION: 31+64.31 -RPD-

SHEET 1 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 14 FT. X 10 FT. RCBC 90°-49'-06" SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-8
1			3			TOTAL SHEETS
2			4			26

CULVERT #3

DRAWN BY : H. T. BARBOUR DATE : 8-15-16
CHECKED BY : H. B. DESAI DATE : 10-3-16
DESIGN ENGINEER OF RECORD: O. PUIGCERVER DATE : 10-31-16

16-FEB-2017 13:42
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rwwright

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	1.88	--	1.75	1.88	1	TOP CORNER WALL	0.85	1.93	1	EXTERIOR WALL	10.14	
		HL-93 (OPERATING)	N/A		2.44	--	1.35	2.44	1	TOP CORNER WALL	0.85	2.50	1	EXTERIOR WALL	10.14	
		HS-20 (INVENTORY)	36.00	2	1.88	67.74	1.75	1.88	1	TOP CORNER WALL	0.85	1.93	1	EXTERIOR WALL	10.14	
		HS-20 (OPERATING)	36.00		2.44	87.81	1.35	2.44	1	TOP CORNER WALL	0.85	2.50	1	EXTERIOR WALL	10.14	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.50	3	2.35	31.75	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
		SNGARBS2	20.00		2.35	47.04	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
		SNAGRIS2	22.00		2.35	51.75	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
		SNCOTTS3	27.25		2.35	64.09	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
		SNAGGRS4	34.93		2.35	82.15	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
		SNS5A	35.55		2.35	83.62	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
		SNS6A	39.95		2.35	93.96	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
		SNS7B	42.00		2.35	98.79	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.00		2.35	77.62	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
		TNT4A	33.08		2.35	77.79	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
		TNT6A	41.60		2.35	97.85	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
		TNT7A	42.00		2.35	98.79	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
		TNT7B	42.00		2.35	98.79	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
		TNAGRIT4	43.00		2.35	101.14	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
		TNAGT5A	45.00		2.35	105.84	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	
		TNAGT5B	45.00		2.35	105.84	1.40	2.35	1	TOP CORNER WALL	0.85	2.41	1	EXTERIOR WALL	10.14	

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

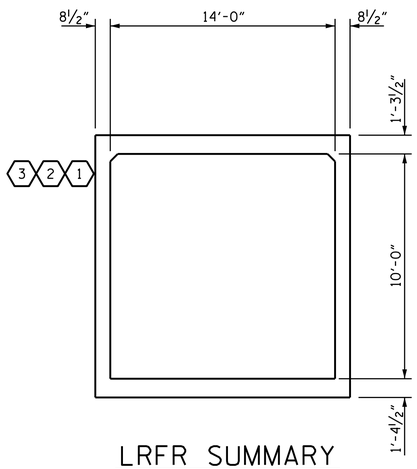
(#) CONTROLLING LOAD RATING

(1) DESIGN LOAD RATING (HL-93)

(2) DESIGN LOAD RATING (HS-20)

(3) LEGAL LOAD RATING **

** SEE CHART FOR VEHICLE TYPE



LRFR SUMMARY

(LOOKING DOWNSTREAM)

PROJECT NO. I-5000

GASTON COUNTY

STATION: 31+64.31 -RPD

SHEET 2 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

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

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 4139C12A32AB406...
1/17/2017

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-9
1			3			TOTAL SHEETS
2			4			26

CULVERT #3

STD. NO. LRFR5

ASSEMBLED BY :	H. T. BARBOUR	DATE :	8-19-16
CHECKED BY :	H. B. DESAI	DATE :	10-3-16
DRAWN BY : WMC	7/11	REV. 10/1/11	MAA/GM
CHECKED BY : GM	7/11		

DESIGN ENGINEER OF RECORD:
O. PUIGCERVER DATE : 10-31-16

13-JAN-2017 14:55
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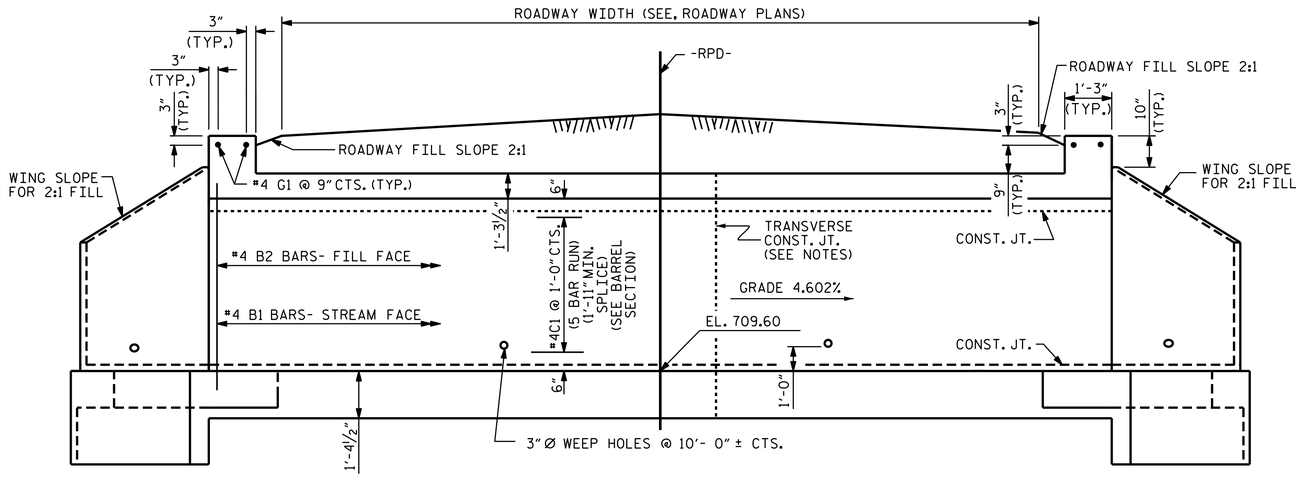
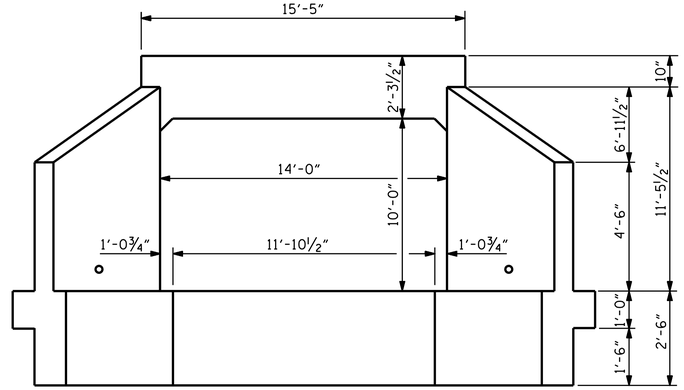
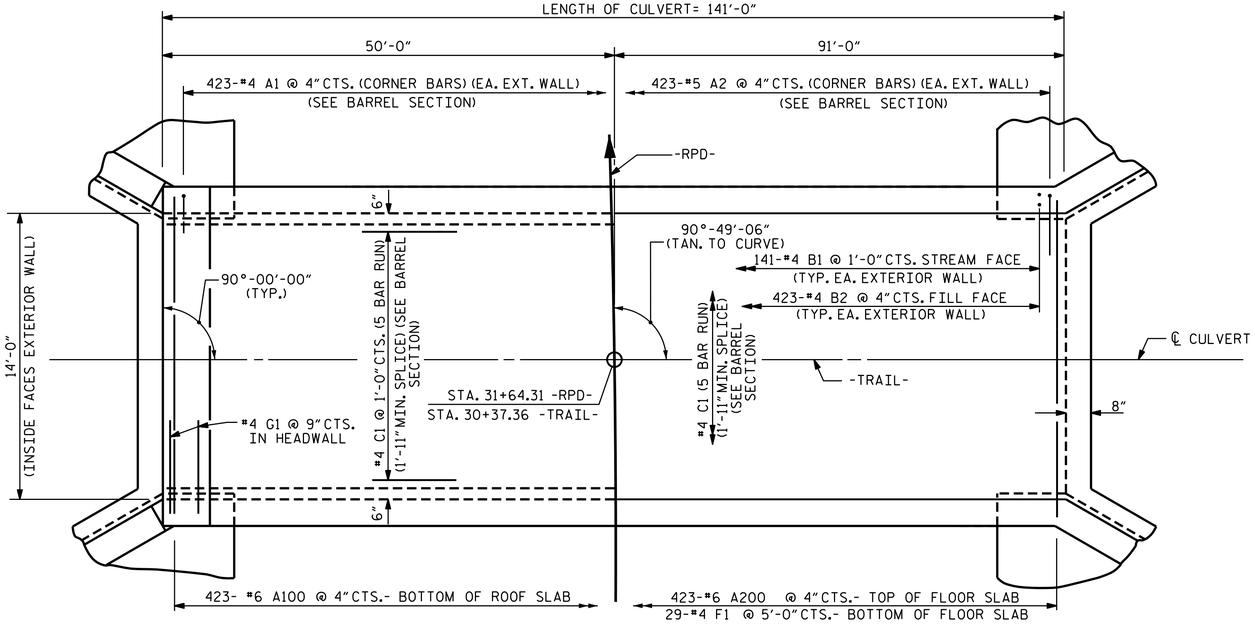
tbarbour



CULVERT SECTION NORMAL TO ROADWAY

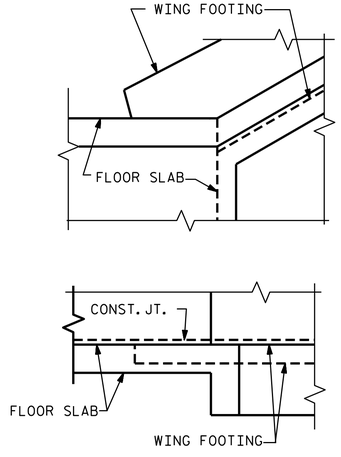


END ELEVATION



PART PLAN ROOF SLAB

PART PLAN FLOOR SLAB

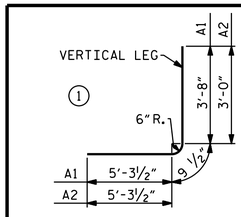


DETAIL

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

REINFORCING BAR SCHEDULE

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	846	#4	1	9'-9"	5510
A2	846	#5	1	9'-1"	8015
A100	423	#6	STR.	15'-0"	9530
A200	423	#6	STR.	15'-0"	9530
B1	282	#4	STR.	12'-2"	2292
B2	846	#4	STR.	9'-4"	5275
C1	365	#4	STR.	29'-10"	7274
G1	4	#4	STR.	15'-1"	40
F1	29	#4	STR.	15'-1"	292
TOTAL REINFORCING STEEL					47758 LBS.



BAR TYPE

BAR DIMENSIONS ARE OUT TO OUT

SPLICE CHART

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

PROJECT NO. I-5000

GASTON COUNTY

STATION: 31+64.31 -RPD-

SHEET 3 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL STANDARD SINGLE 14 FT. X 10 FT. CONCRETE BOX CULVERT 90°-49'-06" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARHEET

DocuSigned by: Wael Arafat 413DC12A32AB406...

1/17/2017

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-10
1			3			TOTAL SHEETS
2			4			26

CULVERT #3

STD. NO. CB11

ASSEMBLED BY : H. T. BARBOUR DATE : 8-18-16
CHECKED BY : H. B. DESAI DATE : 10-3-16

DRAWN BY : R. WRIGHT DATE : AUG. 1989
CHECKED BY : A.R. BISSETTE DATE : AUG. 1989

SPECIAL

STANDARD

DESIGN ENGINEER OF RECORD: O. PUIGCERVER DATE : 10-31-16

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 8-22-1989

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

13-JAN-2017 14:55
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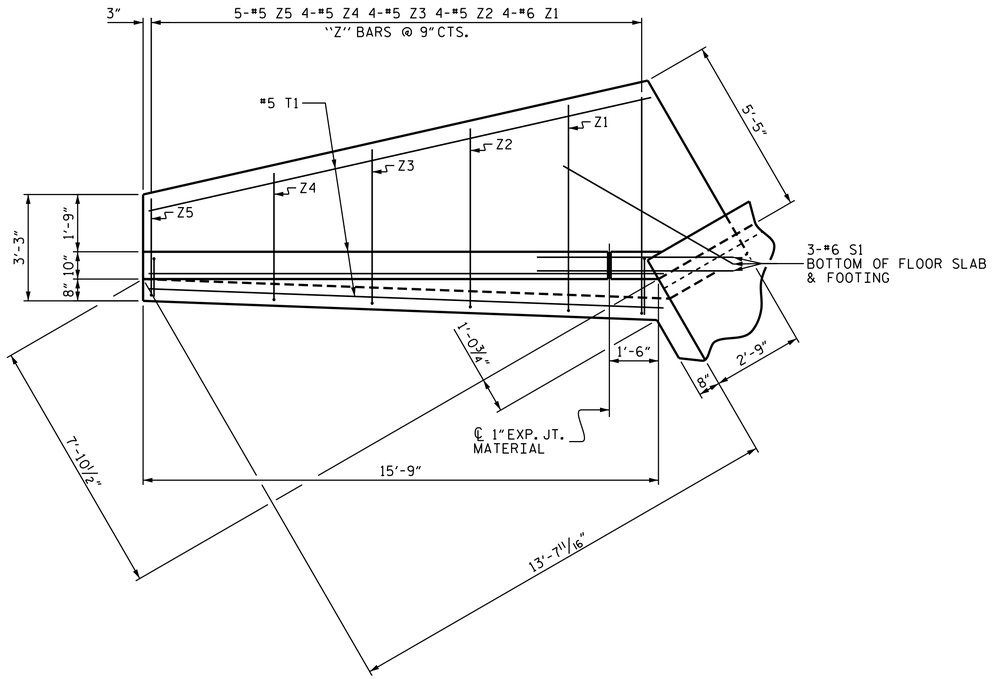
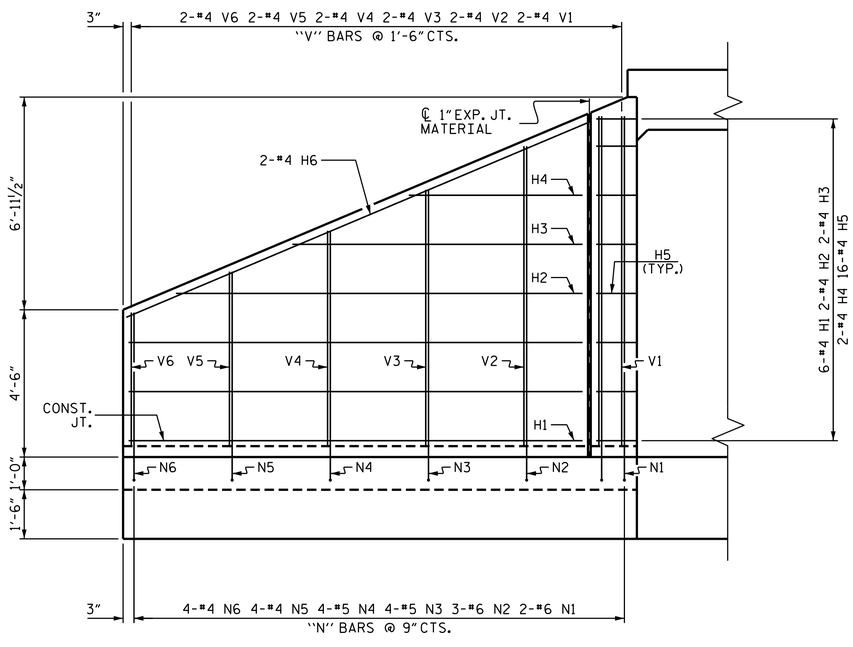
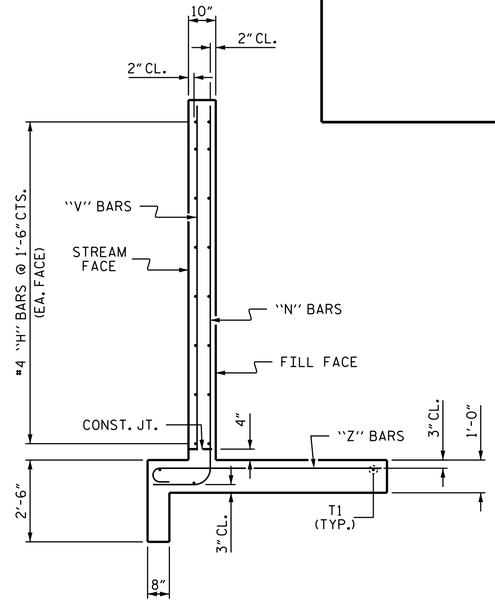
tbarbour



PLAN



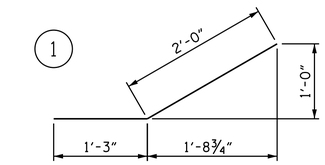
ELEVATION

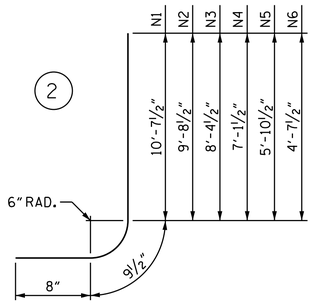


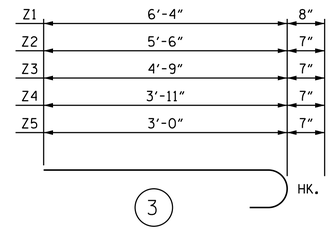
TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.







BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	24	#4	STR	13'-10"	222
H2	8	#4	STR	12'-5"	66
H3	8	#4	STR	8'-10"	47
H4	8	#4	STR	5'-4"	29
H5	64	#4	1	3'-3"	139
H6	8	#4	STR	15'-5"	82
N1	8	#6	2	12'-1"	146
N2	12	#6	2	11'-2"	201
N3	16	#5	2	9'-10"	164
N4	16	#5	2	8'-7"	143
N5	16	#4	2	7'-4"	78
N6	16	#4	2	6'-1"	65
S1	12	#6	STR	6'-0"	108
T1	12	#5	STR	15'-9"	197
V1	8	#4	STR	10'-1"	54
V2	8	#4	STR	9'-2"	49
V3	8	#4	STR	7'-10"	42
V4	8	#4	STR	6'-7"	35
V5	8	#4	STR	5'-4"	29
V6	8	#4	STR	4'-1"	22
Z1	16	#6	3	7'-0"	168
Z2	16	#5	3	6'-1"	102
Z3	16	#5	3	5'-4"	89
Z4	16	#5	3	4'-6"	75
Z5	20	#5	3	3'-7"	75

REINFORCING STEEL
FOR 4 WINGS 2427 LBS

CLASS A CONCRETE
4 WINGS 31.2 CY
2 HEADWALLS 1.4 CY
END CURTAIN WALLS 1.5 CY
TOTAL 34.1 CY

PROJECT NO. I-5000
GASTON COUNTY
STATION: 31+64.31 -RPD

SHEET 4 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD WINGS FOR CONCRETE BOX CULVERT

H = 10'-0" SLOPE = 2:1
90°-00'-00" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 4139C12A32AB406...
1/17/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-11
1			3			TOTAL SHEETS
2			4			26

CULVERT #3

STD. NO. CW9010

ASSEMBLED BY :	H. T. BARBOUR	DATE : 8-15-16
CHECKED BY :	H. B. DESAI	DATE : 10-3-16
DRAWN BY : CCJ	10/99	
CHECKED BY : RWW	03/00	

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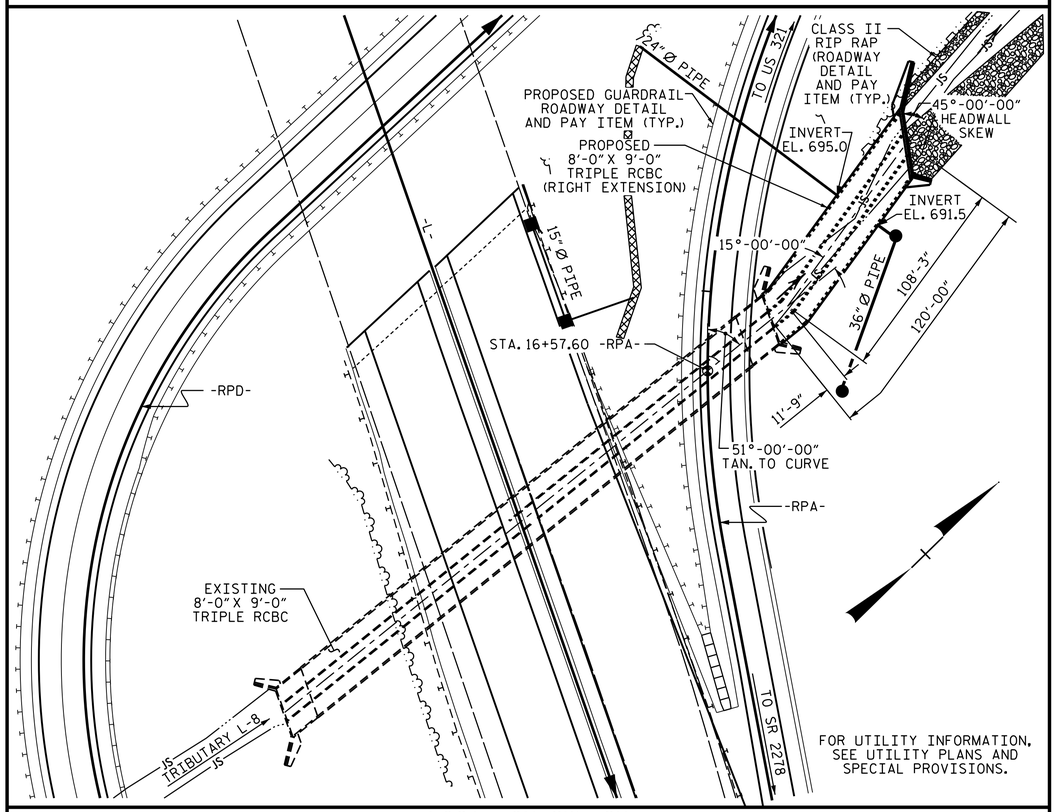
13-JAN-2017 14:55
tbarbour

BM. #2: CHISELED SQUARE IN BRIDGE PIER BASE,
STA. 18+14.37 -RPA-, 188.81 LT., EL. 721.88



LOCATION SKETCH

ROADWAY DATA

GRADE POINT ELEV. @ STA. 16+57.60 -RPA-	= 735.15
BED ELEV. @ STA. 16+57.60 -RPA-	= 689.5±
ROADWAY SLOPES	= 2:1

HYDRAULIC DATA

DESIGN DISCHARGE	= 850 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 50 YEARS
DESIGN HIGH WATER ELEVATION	= 703.1
DRAINAGE AREA	= 1.12 SQ. MI.
BASE DISCHARGE (Q100)	= 950 C.F.S.
BASE HIGH WATER ELEVATION	= 703.98

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 4900 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YEARS
OVERTOPPING FLOOD ELEVATION	= 730.1

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

NOTES

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

DESIGN FILL ---------- 21.00 FT. (MIN.) 31.25 FT. (MAX.)

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERT TO BE POURED IN THE FOLLOWING ORDER:
1. WING FOOTINGS, CURTAIN WALL AND FLOOR SLAB INCLUDING 4" OF VERTICAL WALLS.
2. THE REMAINING PORTION OF WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB, HEADWALLS AND SILLS.

FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.

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 WILL BE PAID FOR BY THE CONTRACTOR.

DOWELS SHALL BE USED TO CONNECT THE CULVERT EXTENSION TO THE EXISTING CULVERT AS SHOWN. FOR NOTE REGARDING SETTING OF DOWELS, SEE SHEET SN.

IF APPROVED BY THE ENGINEER, THE CONTRACTOR MAY USE THE EXISTING WINGS AS TEMPORARY SHORING FOR THE CONSTRUCTION OF THE CULVERT EXTENSIONS. IN THIS CASE, THE BOTTOM SLAB OF THE EXTENSION SHALL BE POURED AT LEAST 72 HOURS PRIOR TO CUTTING THE WINGS. THE WINGS MAY BE CUT EARLIER PROVIDED THE SLAB CONCRETE STRENGTH HAS REACHED A MINIMUM COMPRESSIVE STRENGTH OF 1500 PSI.

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.

THE 24" & 36" DIA. PIPE THROUGH THE SIDEWALLS OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE FIELD BENT AS NECESSARY TO CLEAR PIPE.

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.

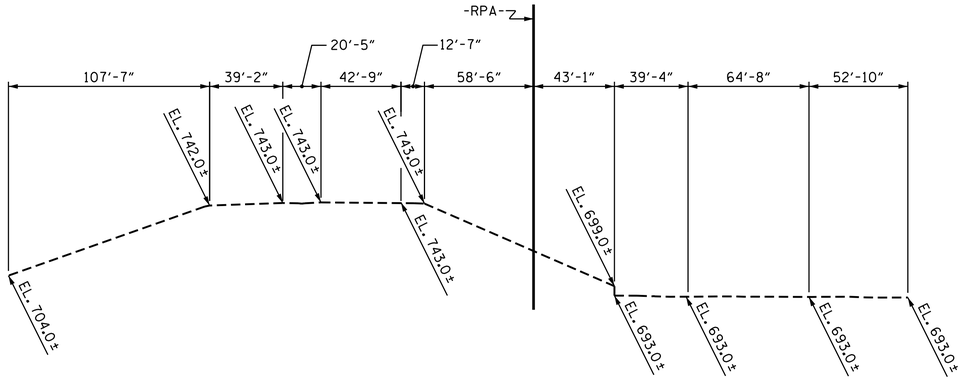
FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

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

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.



PROFILE ALONG ℄ CULVERT

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE		
BARREL @ 4.198	CY/FT	503.8 C.Y.
WING ETC.		24.2 C.Y.
TOTAL		528.0 C.Y.
REINFORCING STEEL		
BARREL		47977 LBS.
WINGS ETC.		1259 LBS.
TOTAL		49236 LBS.
CULVERT EXCAVATION		LUMP SUM
FOUNDATION CONDITIONING MATERIAL		400 TONS

F. A. PROJECT No. IMF-085-1(113)17

PROJECT NO. I-5000
GASTON COUNTY
STATION: 16+57.60 -RPA-

SHEET 1 OF 7

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT
DocuSigned by: Wael Arafat 413BC12A32AB406...
1/17/2017

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 8 FT. X 9 FT. RCBC
51°-00'-00" SKEW
(RIGHT EXTENSION)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-12
1			3			TOTAL SHEETS
2			4			26

DRAWN BY : H. T. BARBOUR DATE : 11-8-16
CHECKED BY : T. L. AVERETTE DATE : 11-16
DESIGN ENGINEER OF RECORD: A. M. LEE DATE : 11-16

13-JAN-2017 14:55
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tbarbour

CULVERT #4

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)	3.29	--	1.75	6.24	1	EXTERIOR WALL	5.25	3.29	1	EXTERIOR WALL	8.96	
		HL-93 (OPERATING)	N/A		4.27	--	1.35	8.08	1	EXTERIOR WALL	5.25	4.27	1	EXTERIOR WALL	8.96	
		HS-20 (INVENTORY)	36.00	(2)	3.29	118.59	1.75	6.24	1	EXTERIOR WALL	5.25	3.29	1	EXTERIOR WALL	8.96	
		HS-20 (OPERATING)	36.00		4.27	153.72	1.35	8.08	1	EXTERIOR WALL	5.25	4.27	1	EXTERIOR WALL	8.96	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SH	12.50	(3)	4.12	51.47	1.40	7.78	1	EXTERIOR WALL	5.51	4.12	1	EXTERIOR WALL	8.96	
		S3C	21.50		4.12	88.53	1.40	7.78	1	EXTERIOR WALL	5.51	4.12	1	EXTERIOR WALL	8.96	
		S3A	22.75		4.12	93.67	1.40	7.78	1	EXTERIOR WALL	5.51	4.12	1	EXTERIOR WALL	8.96	
		S4A	26.75		4.12	110.15	1.40	7.78	1	EXTERIOR WALL	5.51	4.12	1	EXTERIOR WALL	8.96	
		S5A	30.50		4.12	125.59	1.40	7.78	1	EXTERIOR WALL	5.51	4.12	1	EXTERIOR WALL	8.96	
		S6A	34.50		4.12	142.06	1.40	7.78	1	EXTERIOR WALL	5.51	4.12	1	EXTERIOR WALL	8.96	
		S7B	38.50		4.12	158.53	1.40	7.78	1	EXTERIOR WALL	5.51	4.12	1	EXTERIOR WALL	8.96	
		S7A	40.00		4.12	164.70	1.40	7.78	1	EXTERIOR WALL	5.51	4.12	1	EXTERIOR WALL	8.96	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	T4A	28.25		4.12	116.32	1.40	7.78	1	EXTERIOR WALL	5.51	4.12	1	EXTERIOR WALL	8.96	
		T5B	32.00		4.12	131.76	1.40	7.78	1	EXTERIOR WALL	5.51	4.12	1	EXTERIOR WALL	8.96	
		T6A	36.00		4.12	148.23	1.40	7.78	1	EXTERIOR WALL	5.51	4.12	1	EXTERIOR WALL	8.96	
		T7A	40.00		4.12	164.70	1.40	7.78	1	EXTERIOR WALL	5.51	4.12	1	EXTERIOR WALL	8.96	
		T7B	40.00		4.12	164.70	1.40	7.78	1	EXTERIOR WALL	5.51	4.12	1	EXTERIOR WALL	8.96	

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

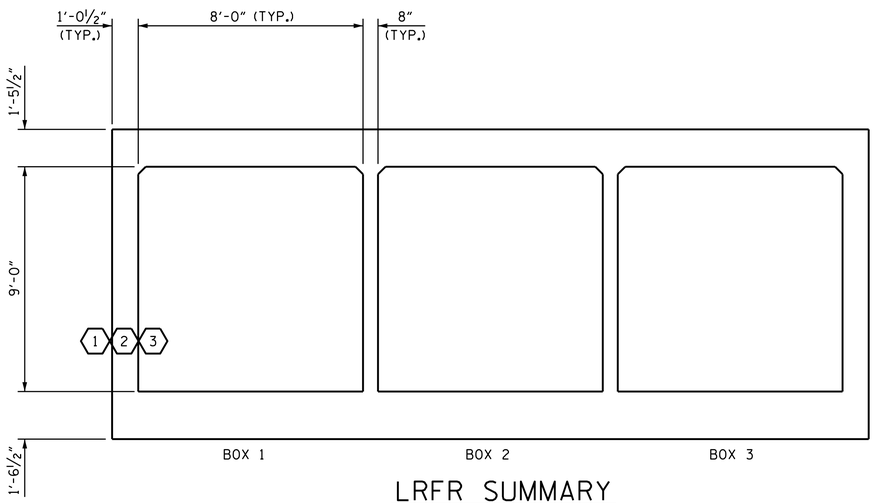
(#) CONTROLLING LOAD RATING

(1) DESIGN LOAD RATING (HL-93)

(2) DESIGN LOAD RATING (HS-20)

(3) LEGAL LOAD RATING **

** SEE CHART FOR VEHICLE TYPE



LRFR SUMMARY

(LOOKING DOWNSTREAM)

PROJECT NO. I-5000

GASTON COUNTY

STATION: 16+57.60 -RPA-

SHEET 2 OF 7

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 4139C12A32AB406...

1/17/2017

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS (INTERSTATE TRAFFIC)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-13
1			3			TOTAL SHEETS
2			4			26

CULVERT #4 STD. NO. LRFR6

ASSEMBLED BY :	H. T. BARBOUR	DATE :	8-31-16
CHECKED BY :	A. M. LEE	DATE :	10-16
DRAWN BY :	WMC 7/11	REV. 10/1/11	MAA/GM
CHECKED BY :	GM 7/11		

DESIGN ENGINEER OF RECORD: A. M. LEE DATE : 11-16

13-JAN-2017 14:55
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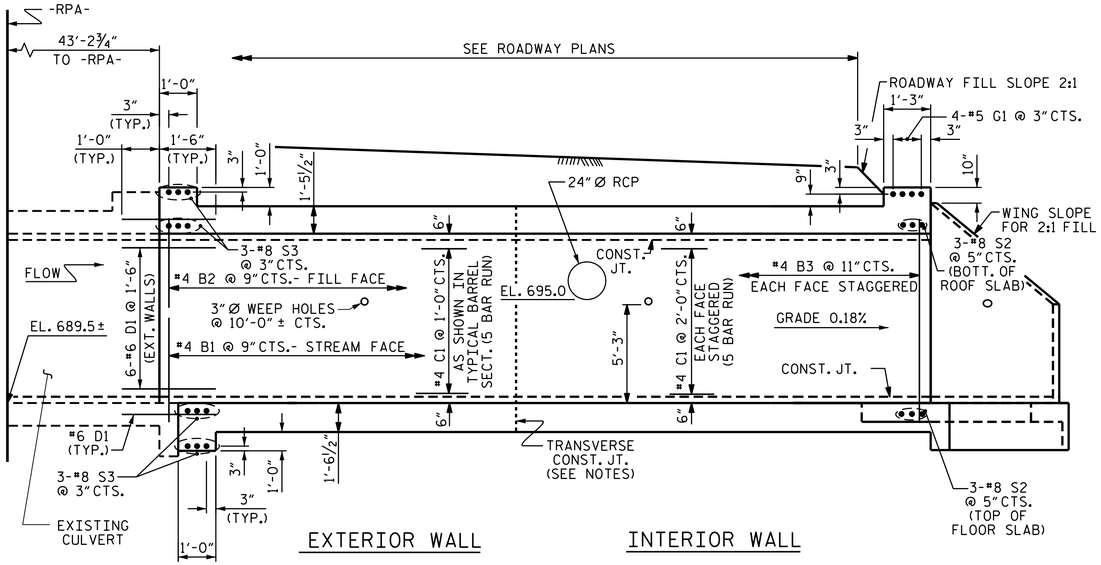
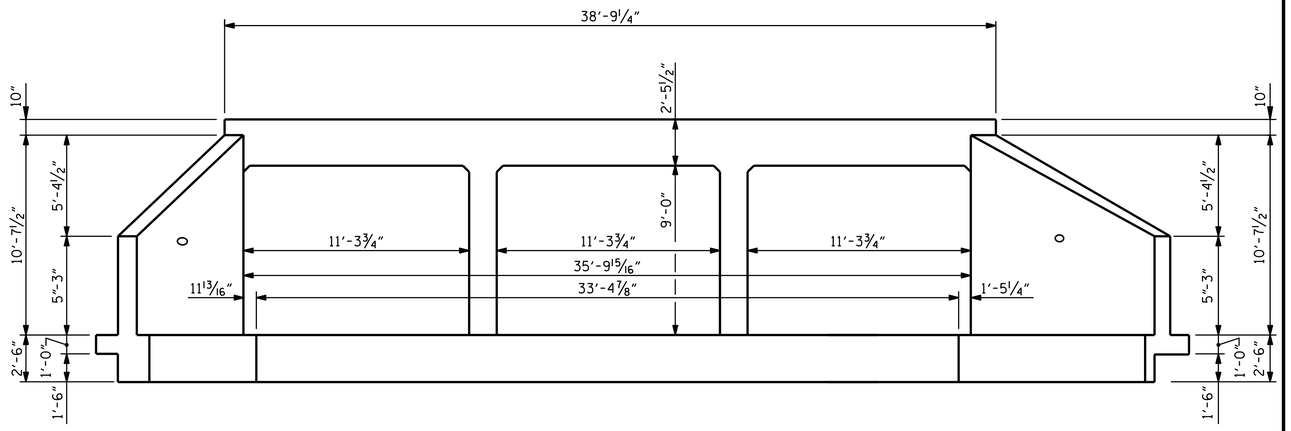
tbarbour

13-JAN-2017 14:55
R:\Structures\Final Plans\Culvert #4_EXT\15000_SMU_CU.dgn
tbarbour



CULVERT SECTION NORMAL TO ROADWAY

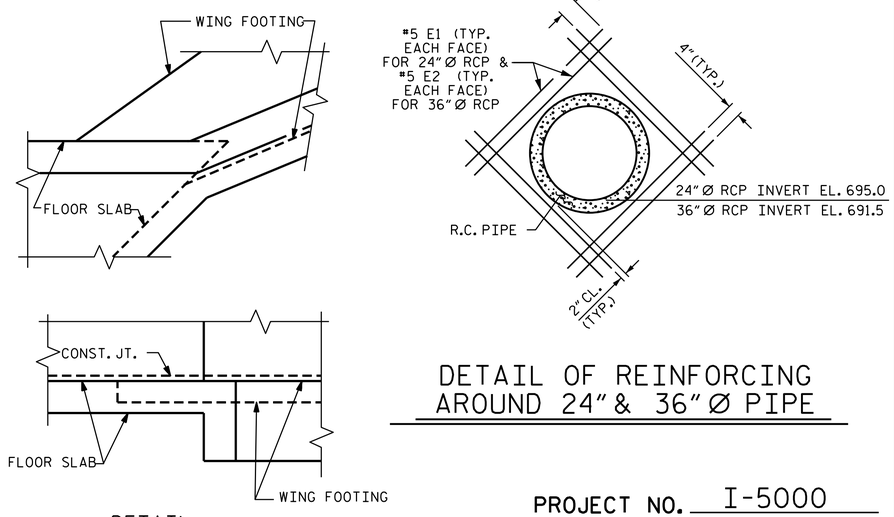


OUTLET END ELEVATION NORMAL TO SKEW

(LOOKING UPSTREAM)

RIGHT ANGLE SECTION OF BARREL

THERE ARE 133 "C" BARS IN SECTION OF BARREL.



DETAIL OF REINFORCING AROUND 24" & 36" Ø PIPE

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

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 4139C12A32AB406...

1/17/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. I-5000

GASTON COUNTY

STATION: 16+57.60 -RPA-

SHEET 3 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 8 FT. X 9 FT. RCBC 51°-00'-00" SKEW (RIGHT EXTENSION)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-14
1			3			TOTAL SHEETS
2			4			26

ASSEMBLED BY : H.T.BARBOUR DATE : 11-9-16
CHECKED BY : T.L.AVERETTE DATE : 11-16

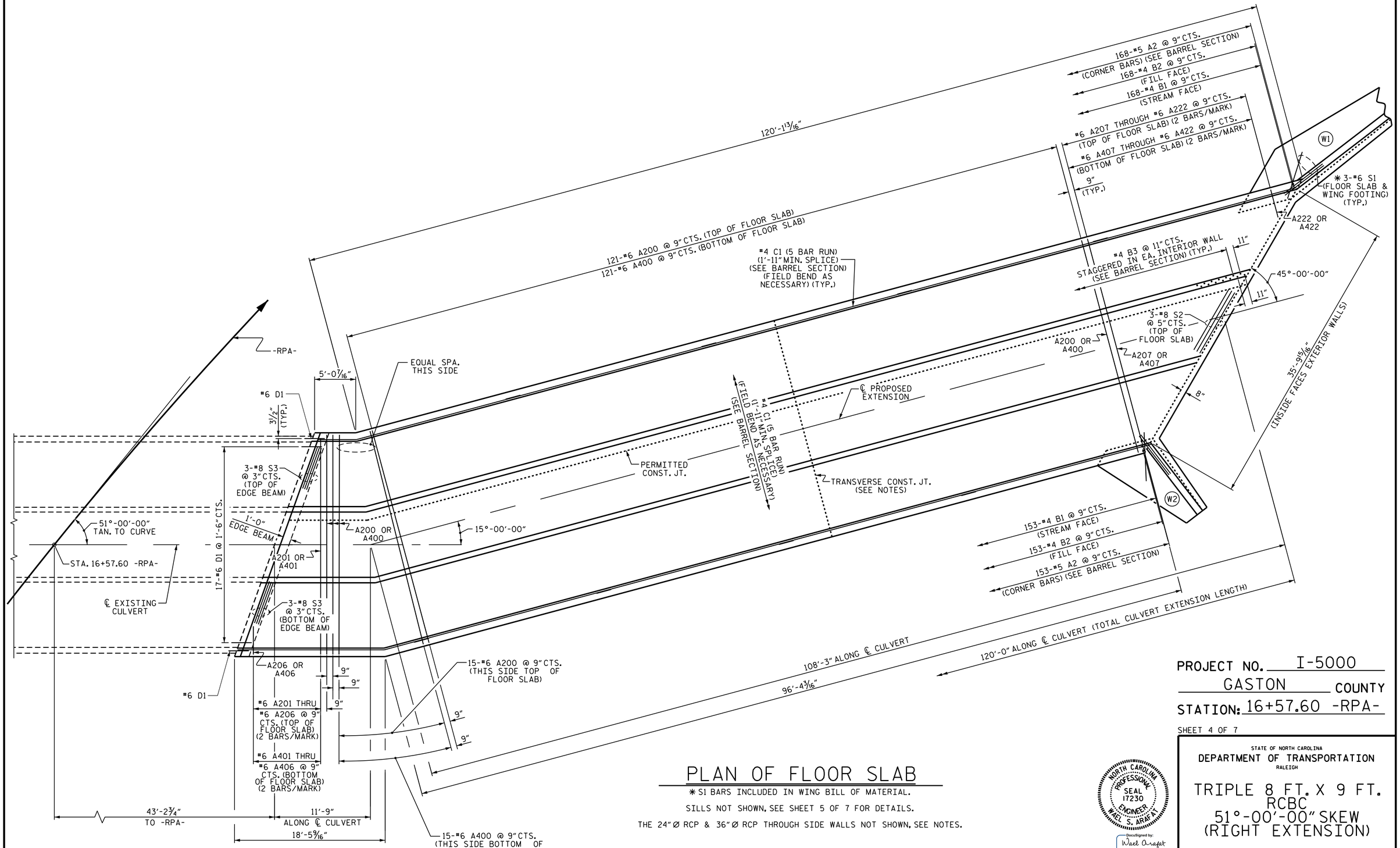
DRAWN BY : DANNY SHERROD DATE : 4-24-72
CHECKED BY : F.M.H. DATE : 5-3-72

SPECIAL

STANDARD

DESIGN ENGINEER OF RECORD: A.M.LEE DATE : 11-16

REVISED 11-19-99 BY M.M. CHECKED BY R.M.W.
REVISED 8-28-92 BY E.L.R. CHECKED BY G.R.P.
REDRAWN BY B.M.MEYERS OCT.1990 CHECKED BY A.R.BISSETTE



PLAN OF FLOOR SLAB

* S1 BARS INCLUDED IN WING BILL OF MATERIAL.

SILLS NOT SHOWN, SEE SHEET 5 OF 7 FOR DETAILS.

THE 24" Ø RCP & 36" Ø RCP THROUGH SIDE WALLS NOT SHOWN, SEE NOTES.

PROJECT NO. I-5000

GASTON COUNTY

STATION: 16+57.60 -RPA-

SHEET 4 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 8 FT. X 9 FT. RCBC
51°-00'-00" SKEW
(RIGHT EXTENSION)

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 413BC12A32AB406...
1/17/2017

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-15
1			3			TOTAL SHEETS
2			4			26

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DRAWN BY : H. T. BARBOUR DATE : 11-10-16
CHECKED BY : T. L. AVERETTE DATE : 11-16
DESIGN ENGINEER OF RECORD: A. M. LEE DATE : 11-16

13-JAN-2017 14:55
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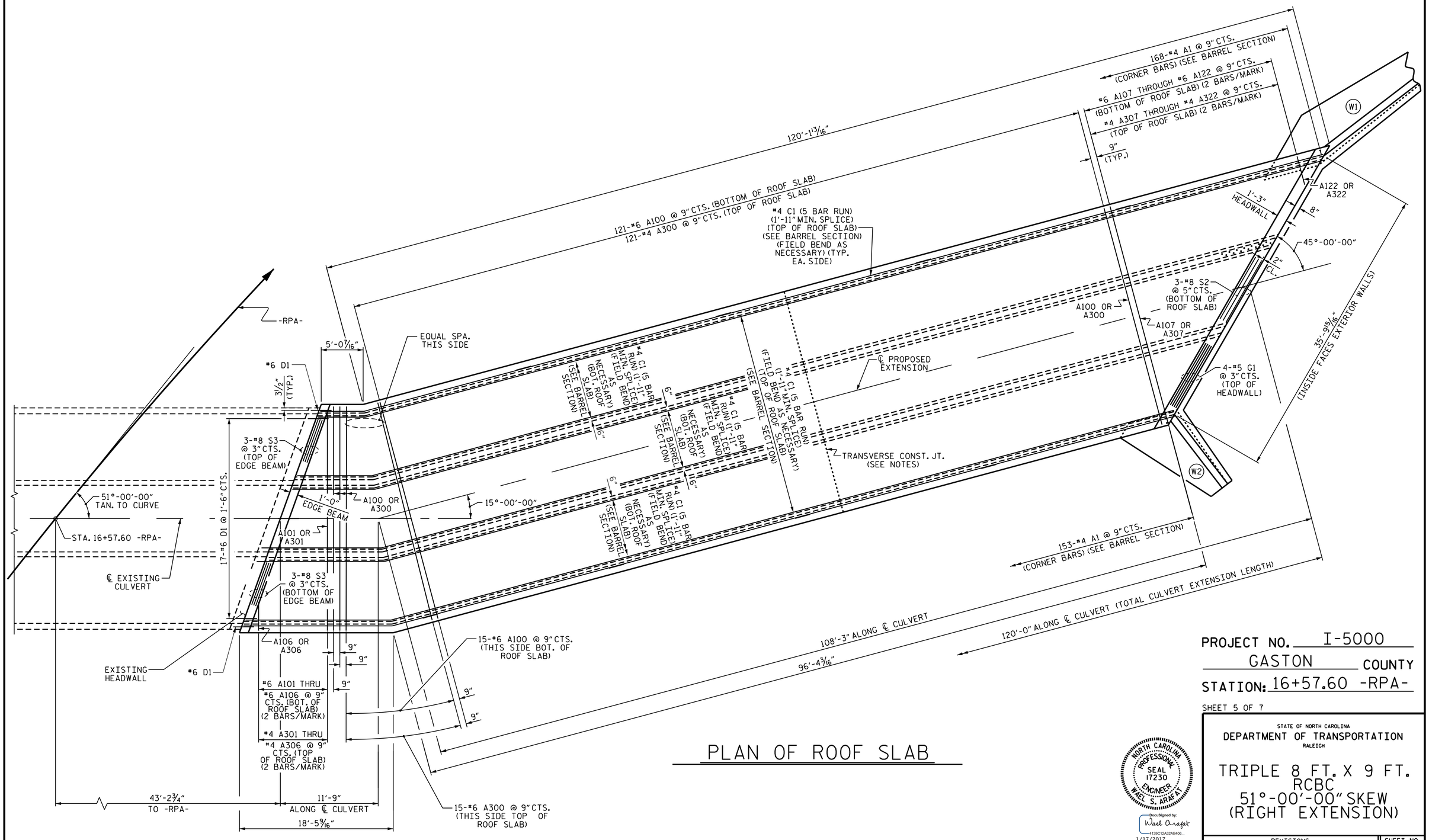
tbarbour

CULVERT #4



PLAN OF ROOF SLAB

PROJECT NO. I-5000
GASTON COUNTY
STATION: 16+57.60 -RPA-

SHEET 5 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 8 FT. X 9 FT. RCBC
51°-00'-00" SKEW
(RIGHT EXTENSION)

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 4139C12A32AB406...
1/17/2017

DRAWN BY : H. T. BARBOUR DATE : 11-10-16
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13-JAN-2017 14:55
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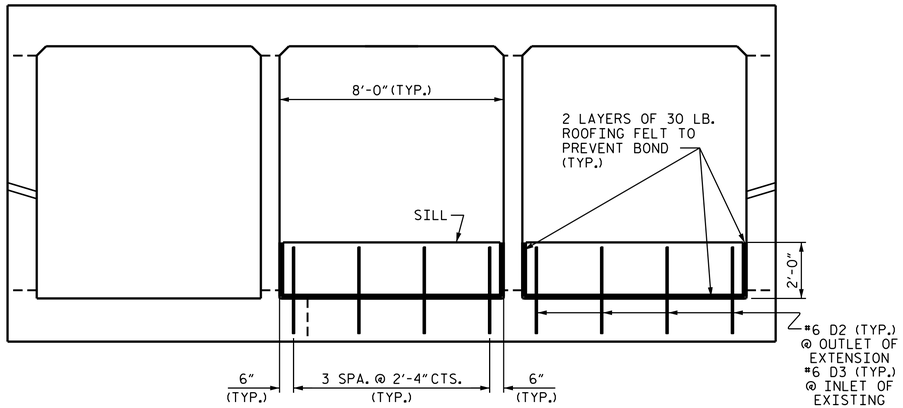
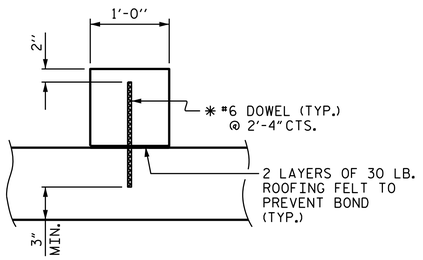
tbarbour

CULVERT #4



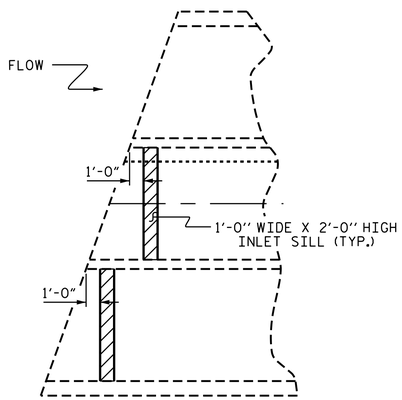
ELEVATION
(LOOKING DOWN STREAM)



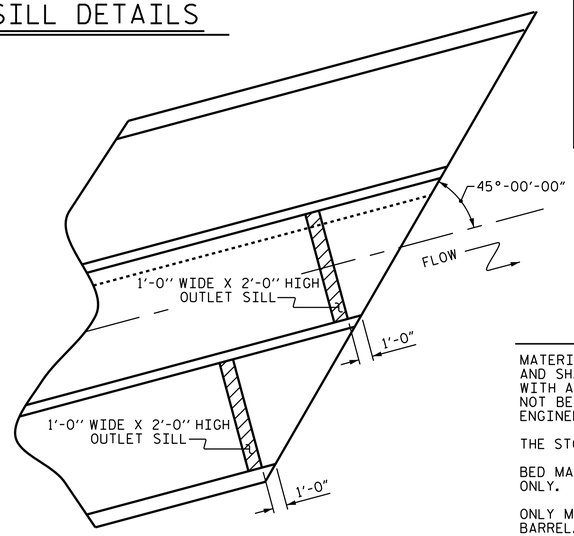
SECTION THROUGH SILL

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

CULVERT SILL DETAILS



EXISTING INLET END

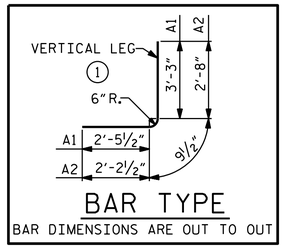


PROPOSED OUTLET END

PLAN VIEW SHOWING SILL/BAFFLE LOCATIONS

REINFORCING BAR SCHEDULE

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	321	#4	1	6'-6"	1394	A300	138	#4	STR.	26'-11"	2481	B3	520	#4	STR.	11'-6"	3995
A2	321	#5	1	5'-8"	1897	A301	2	#4	STR.	24'-5"	33						
						A302	2	#4	STR.	20'-2"	27	C1	665	#4	STR.	26'-6"	11772
A100	138	#6	STR.	26'-11"	5579	A303	2	#4	STR.	15'-11"	21						
A101	2	#6	STR.	24'-5"	73	A304	2	#4	STR.	11'-10"	16	D1	50	#6	STR.	2'-6"	188
A102	2	#6	STR.	20'-2"	61	A305	2	#4	STR.	7'-7"	10	D2	8	#6	STR.	3'-1"	37
A103	2	#6	STR.	15'-11"	48	A306	2	#4	STR.	3'-5"	5	D3	8	#6	STR.	3'-3"	39
A104	2	#6	STR.	11'-10"	36	A307	2	#4	STR.	26'-0"	35						
A105	2	#6	STR.	7'-7"	23	A308	2	#4	STR.	24'-6"	33	E1	16	#5	STR.	4'-7"	76
A106	2	#6	STR.	3'-5"	10	A309	2	#4	STR.	23'-0"	31	E2	16	#5	STR.	5'-9"	96
A107	2	#6	STR.	26'-0"	78	A310	2	#4	STR.	21'-6"	29						
A108	2	#6	STR.	24'-6"	74	A311	2	#4	STR.	20'-0"	27	G1	4	#5	STR.	38'-5"	160
A109	2	#6	STR.	23'-0"	69	A312	2	#4	STR.	18'-6"	25						
A110	2	#6	STR.	21'-6"	65	A313	2	#4	STR.	17'-0"	23	S2	6	#8	STR.	38'-5"	615
A111	2	#6	STR.	20'-0"	60	A314	2	#4	STR.	15'-6"	21	S3	12	#8	STR.	28'-7"	916
A112	2	#6	STR.	18'-6"	56	A315	2	#4	STR.	14'-0"	19						
A113	2	#6	STR.	17'-0"	51	A316	2	#4	STR.	12'-6"	17	TOTAL REINFORCING STEEL				47977 LBS.	
A114	2	#6	STR.	15'-6"	47	A317	2	#4	STR.	11'-0"	15						
A115	2	#6	STR.	14'-0"	42	A318	2	#4	STR.	9'-6"	13						
A116	2	#6	STR.	12'-6"	38	A319	2	#4	STR.	8'-0"	11						
A117	2	#6	STR.	11'-0"	33	A320	2	#4	STR.	6'-6"	9						
A118	2	#6	STR.	9'-6"	29	A321	2	#4	STR.	5'-0"	7						
A119	2	#6	STR.	8'-0"	24	A322	2	#4	STR.	3'-6"	5						
A120	2	#6	STR.	6'-6"	20												
A121	2	#6	STR.	5'-0"	15	A400	138	#6	STR.	26'-11"	5579						
A122	2	#6	STR.	3'-6"	11	A401	2	#6	STR.	24'-5"	73						
						A402	2	#6	STR.	20'-2"	61						
A200	138	#6	STR.	26'-11"	5579	A403	2	#6	STR.	15'-11"	48						
A201	2	#6	STR.	24'-5"	73	A404	2	#6	STR.	11'-10"	36						
A202	2	#6	STR.	20'-2"	61	A405	2	#6	STR.	7'-7"	23						
A203	2	#6	STR.	15'-11"	48	A406	2	#6	STR.	3'-5"	10						
A204	2	#6	STR.	11'-10"	36	A407	2	#6	STR.	26'-0"	78						
A205	2	#6	STR.	7'-7"	23	A408	2	#6	STR.	24'-6"	74						
A206	2	#6	STR.	3'-5"	10	A409	2	#6	STR.	23'-0"	69						
A207	2	#6	STR.	26'-0"	78	A410	2	#6	STR.	21'-6"	65						
A208	2	#6	STR.	24'-6"	74	A411	2	#6	STR.	20'-0"	60						
A209	2	#6	STR.	23'-0"	69	A412	2	#6	STR.	18'-6"	56						
A210	2	#6	STR.	21'-6"	65	A413	2	#6	STR.	17'-0"	51						
A211	2	#6	STR.	20'-0"	60	A414	2	#6	STR.	15'-6"	47						
A212	2	#6	STR.	18'-6"	56	A415	2	#6	STR.	14'-0"	42						
A213	2	#6	STR.	17'-0"	51	A416	2	#6	STR.	12'-6"	38						
A214	2	#6	STR.	15'-6"	47	A417	2	#6	STR.	11'-0"	33						
A215	2	#6	STR.	14'-0"	42	A418	2	#6	STR.	9'-6"	29						
A216	2	#6	STR.	12'-6"	38	A419	2	#6	STR.	8'-0"	24						
A217	2	#6	STR.	11'-0"	33	A420	2	#6	STR.	6'-6"	20						
A218	2	#6	STR.	9'-6"	29	A421	2	#6	STR.	5'-0"	15						
A219	2	#6	STR.	8'-0"	24	A422	2	#6	STR.	3'-6"	11						
A220	2	#6	STR.	6'-6"	20												
A221	2	#6	STR.	5'-0"	15	B1	321	#4	STR.	11'-6"	2466						
A222	2	#6	STR.	3'-6"	11	B2	321	#4	STR.	8'-4"	1787						



BAR TYPE
BAR DIMENSIONS ARE OUT TO OUT

SPLICE CHART

BAR	SIZE	SPLICE LENGTH
A200	#6	3'-3"
A400	#6	2'-4"
B1 & B3	#4	1'-5"
C1	#4	1'-11"

NOTES

MATERIAL EXCAVATED FROM THE EXISTING BED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AND SHALL PROVIDE A CONTINUOUS HIGH FLOW CHANNEL AS SHOWN. THE MATERIAL SHALL BE NATURAL STONE WITH A GRADATION SIZE SIMILAR TO THAT OF CLASS B RIP RAP. STONES LARGER THAN 6 INCHES SHALL NOT BE PLACED WITHIN THE LOW FLOW CHANNEL. BED MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

THE STOCKPILED MATERIAL SHALL BE PLACED TO THE LEVEL OF 2' BETWEEN THE HIGH FLOW SILLS.

BED MATERIAL SHALL BE SUPPLEMENTED BY CLASS B RIP RAP AS NECESSARY IN THE HIGH FLOW BARRELS ONLY.

ONLY MATERIAL THAT IS EXCAVATED FROM THE STREAM BED MAY BE USED TO LINE THE LOW FLOW CULVERT BARREL.

BED MATERIAL SHALL BE PLACED ON TOP OF THE SUPPLEMENTAL FILL, IF USED, TO PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE.

THE ENTIRE COST OF WORK REQUIRED TO PLACE EXCAVATED 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.

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

Docusigned by: Wael Arafat 4136C12A32AB406...

1/17/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. I-5000

GASTON COUNTY

STATION: 16+57.60 -RPA-

SHEET 6 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 8 FT. X 9 FT. RCBC
51°-00'-00" SKEW
(RIGHT EXTENSION)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-17
1			3			TOTAL SHEETS
2			4			26

DRAWN BY : H. T. BARBOUR DATE : 11-16-16
CHECKED BY : T. L. AVERETTE DATE : 11-16
DESIGN ENGINEER OF RECORD: A. M. LEE DATE : 11-16

13-JAN-2017 14:55
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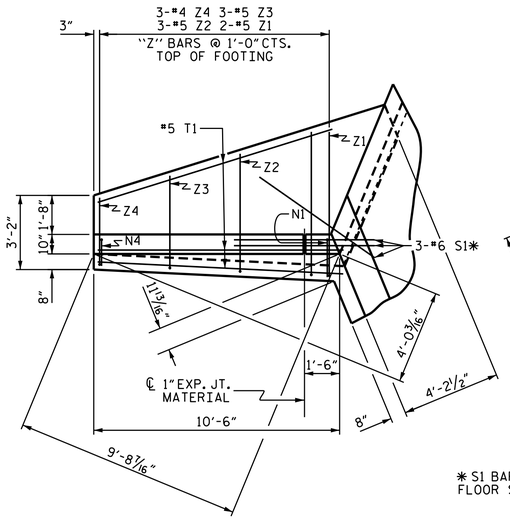
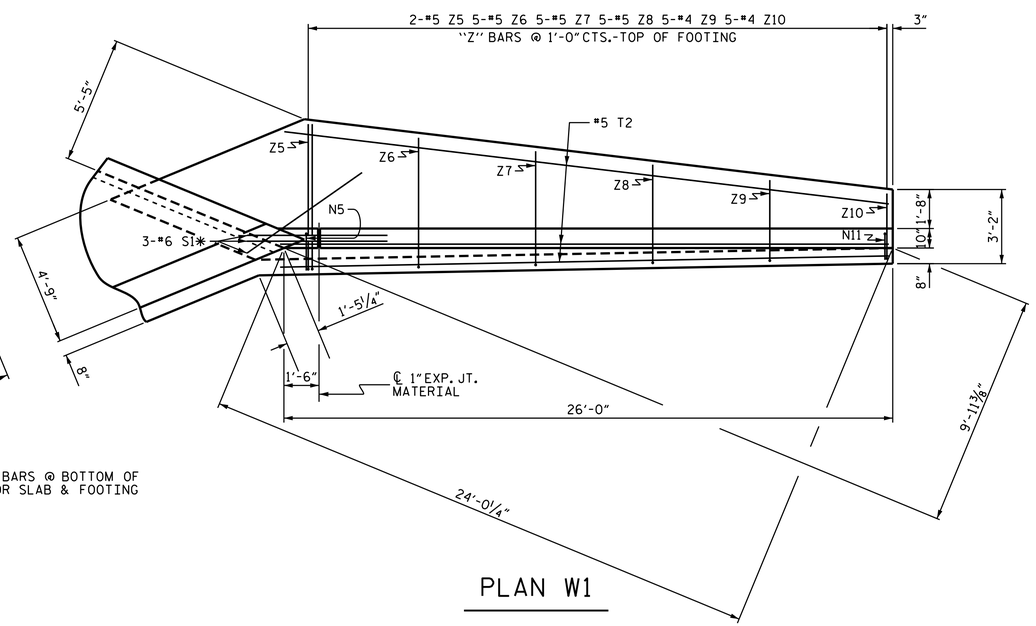
CULVERT #4

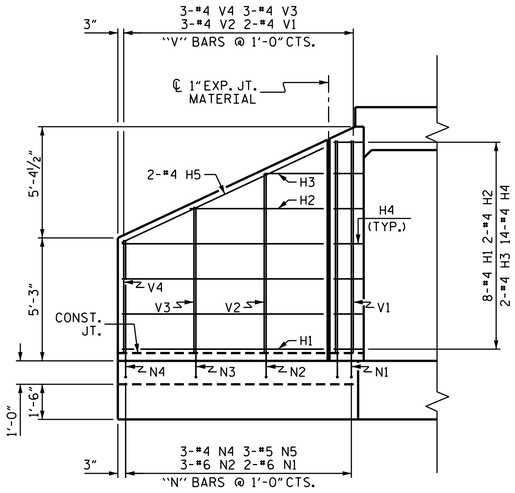


PLAN W2

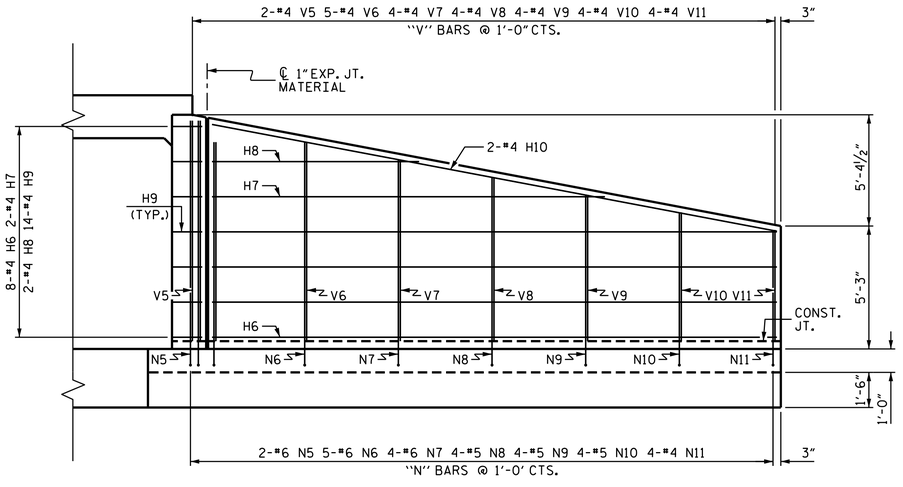


PLAN W1

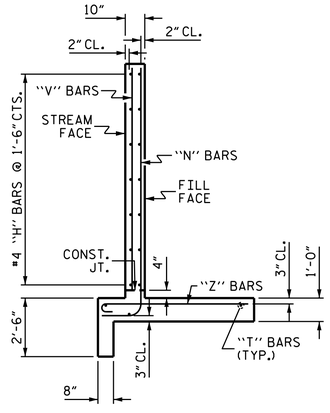
✱S1 BARS @ BOTTOM OF FLOOR SLAB & FOOTING



ELEVATION W2



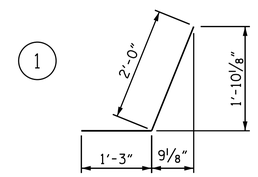
ELEVATION W1

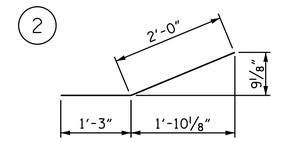


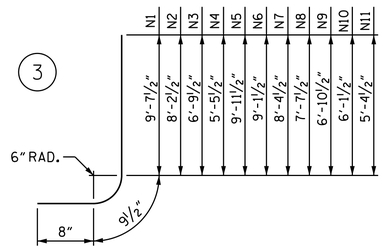
TYPICAL WING SECTION

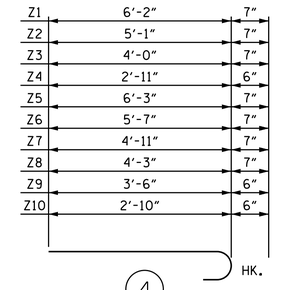
BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.









BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	8	#4	STR	8'-7"	46
H2	2	#4	STR	5'-8"	8
H3	2	#4	STR	2'-6"	3
H4	14	#4	1	3'-3"	30
H5	2	#4	STR	9'-6"	13
H6	8	#4	STR	24'-1"	129
H7	2	#4	STR	16'-9"	22
H8	2	#4	STR	8'-10"	12
H9	14	#4	2	3'-3"	30
H10	2	#4	STR	24'-6"	33
N1	2	#6	3	11'-1"	33
N2	3	#6	3	9'-8"	44
N3	3	#5	3	8'-3"	26
N4	3	#4	3	6'-11"	14
N5	2	#6	3	11'-5"	34
N6	5	#6	3	10'-7"	79
N7	4	#6	3	9'-10"	59
N8	4	#5	3	9'-1"	38
N9	4	#5	3	8'-4"	35
N10	4	#5	3	7'-7"	32
N11	4	#4	3	6'-10"	18
S1	6	#6	STR	6'-0"	54
T1	3	#5	STR	10'-6"	33
T2	3	#5	STR	26'-0"	81
V1	2	#4	STR	9'-1"	12
V2	3	#4	STR	7'-8"	15
V3	3	#4	STR	6'-3"	13
V4	3	#4	STR	4'-10"	10
V5	2	#4	STR	9'-5"	13
V6	5	#4	STR	8'-6"	28
V7	4	#4	STR	7'-9"	21
V8	4	#4	STR	7'-0"	19
V9	4	#4	STR	6'-3"	17
V10	4	#4	STR	5'-6"	15
V11	4	#4	STR	4'-9"	13
Z1	2	#5	4	6'-9"	14
Z2	3	#5	4	5'-8"	18
Z3	3	#5	4	4'-7"	14
Z4	3	#4	4	3'-5"	7
Z5	2	#5	4	6'-10"	14
Z6	5	#5	4	6'-2"	32
Z7	5	#5	4	5'-6"	29
Z8	5	#5	4	4'-10"	25
Z9	5	#4	4	4'-0"	13
Z10	5	#4	4	3'-4"	11

REINFORCING STEEL FOR 2 WINGS 1259 LBS

CLASS A CONCRETE

2 WINGS	18.1	CY
1 HEADWALL	1.8	CY
1 END CURTAIN WALL	2.1	CY
2 EDGE BEAMS	2.2	CY
TOTAL	24.2	CY

PROJECT NO. I-5000

GASTON COUNTY

STATION: 16+57.60 -RPA-

SHEET 7 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD WINGS FOR CONCRETE BOX CULVERT

H = 9'-0" SLOPE = 2:1

45° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S ARAFAT

Docusigned by: Wael Arafat 4139C12A32AB406...

1/17/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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2			4		

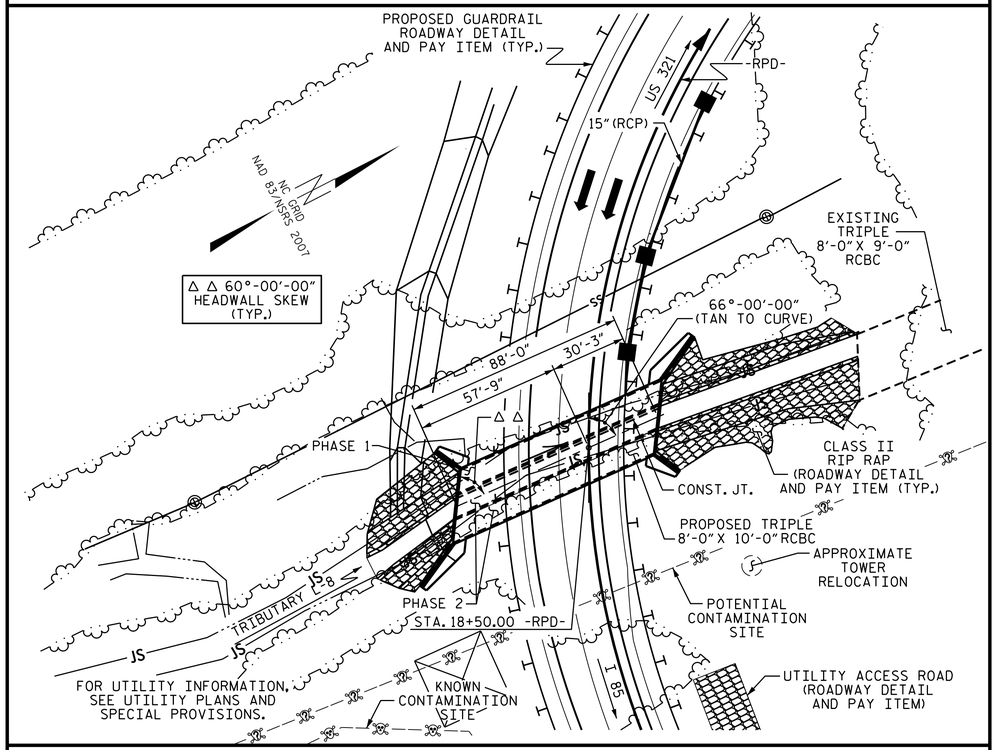
SHEET NO. C-18

TOTAL SHEETS 26

ASSEMBLED BY :	H. T. BARBOUR	DATE :	11-9-16
CHECKED BY :	T. L. AVERETTE	DATE :	11-16
DRAWN BY :	CCJ	01/00	
CHECKED BY :	RWW	03/00	

CULVERT #4 STD. NO. CW4509

BENCHMARK #1: RR SPIKE IN BASE OF 15 INCH DOGWOOD STA. 53+71 -Y1- 78 FT. LEFT; EL. 719.05; N 563584, E 1347187



LOCATION SKETCH

ROADWAY DATA

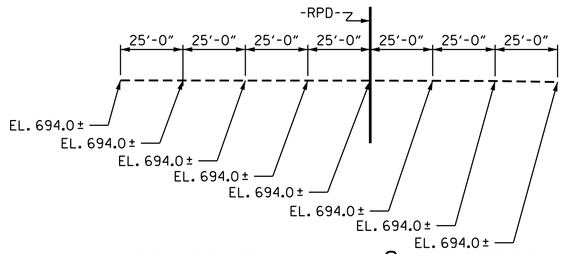
GRADE POINT ELEV. @ STA. 18+50.00 -RPD-	= 708.97
BED ELEV. @ STA. 18+50.00 -RPD-	= 693.00
ROADWAY SLOPES	= 2:1

HYDRAULIC DATA

DESIGN DISCHARGE	= 850 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 50 YEARS
DESIGN HIGH WATER ELEVATION	= 703.5
DRAINAGE AREA	= 1.12 SQ. MI.
BASE DISCHARGE (Q100)	= 950 C.F.S.
BASE HIGH WATER ELEVATION	= 704.51

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 2100 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YEARS
OVERTOPPING FLOOD ELEVATION	= 710.46



PROFILE ALONG ℄ CULVERT

NOTES

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

DESIGN FILL ---------- MIN. 4.90 MAX. 8.26

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN PHASE 1 CULVERT TO BE POURED IN THE FOLLOWING ORDER:
1. PHASE 1 WING FOOTINGS, FLOOR SLAB AND CURTAIN WALL TO THE CONSTRUCTION JOINT INCLUDING 4"OF PHASE 1 VERTICAL WALLS.
2. THE REMAINING PORTION OF PHASE 1 WALLS AND PHASE 1 WINGS FULL HEIGHT.
3. SILLS.

CONCRETE IN PHASE 2 CULVERT TO BE POURED IN THE FOLLOWING ORDER:
1. PHASE 2 WING FOOTINGS, FLOOR SLAB AND CURTAIN WALL TO THE CONSTRUCTION JOINT INCLUDING 4"OF PHASE 2 VERTICAL WALLS.
2. THE REMAINING PORTION OF PHASE 2 WALLS AND PHASE 2 WINGS FULL HEIGHT.
3. SILLS.
4. ROOF SLAB AND HEADWALLS.

FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.

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 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.

AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAIL 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.

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.

THE 15"DIA. PIPE THROUGH THE SIDEWALL OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE FIELD BENT AS NECESSARY TO CLEAR PIPE.

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.

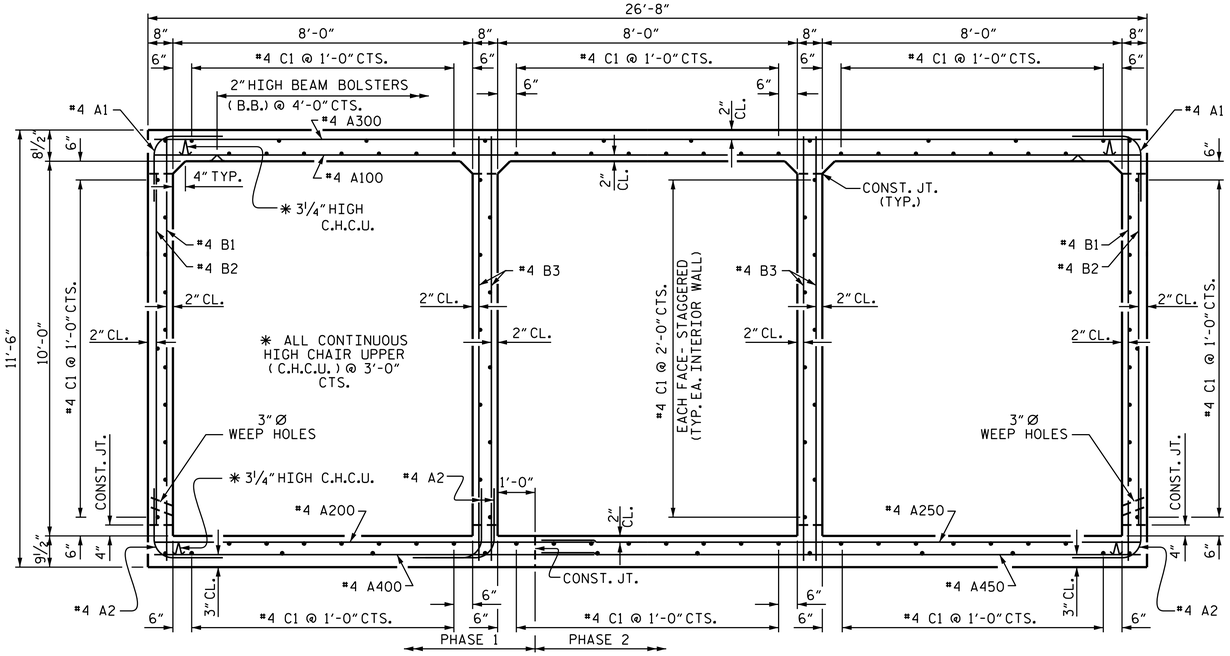
FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

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

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.



RIGHT ANGLE SECTION OF BARREL

THERE ARE 110 "C" BARS IN SECTION OF BARREL.
(LOOKING DOWNSTREAM)

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
PHASE 1	89.1 C.Y.
PHASE 2	173.9 C.Y.
TOTAL	263.0 C.Y.
REINFORCING STEEL	
PHASE 1	11376 LBS.
PHASE 2	21316 LBS.
TOTAL	32692 LBS.
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	
PHASE 1	157 TONS
PHASE 2	178 TONS
TOTAL	335 TONS

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 4139C12A32A8406...

1/17/2017

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F. A. PROJECT No. IMF-085-1(113)17

PROJECT NO. I-5000

GASTON COUNTY

STATION: 18+50.00 -RPD-

SHEET 1 OF 7 BRIDGE #445

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 8 FT. X 10 FT. RCBC
66°-00'-00" SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-19
1			3			TOTAL SHEETS
2			4			26

DRAWN BY : H. T. BARBOUR DATE : 9-27-16
CHECKED BY : A. M. LEE DATE : 10-16
DESIGN ENGINEER OF RECORD: O. PUIGCERVER DATE : 11-16

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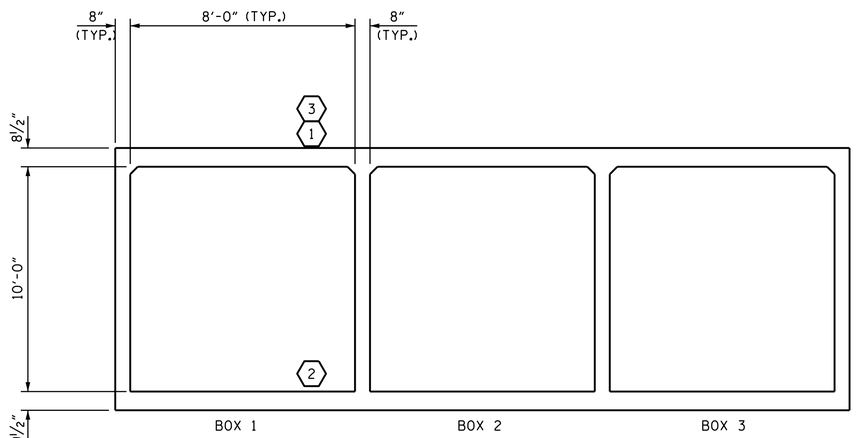
CULVERT #5

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)	1.24	--	1.75	1.64	1	BOT. CORNER WALL	10.48	1.24	1	TOP SLAB	7.82	
		HL-93 (OPERATING)	N/A		1.61	--	1.35	2.13	1	BOT. CORNER WALL	10.48	1.61	1	TOP SLAB	7.82	
		HS-20 (INVENTORY)	36.00	(2)	1.74	62.55	1.75	1.75	1	BOT. CORNER WALL	10.48	1.74	1	BOTTOM SLAB	7.76	
		HS-20 (OPERATING)	36.00		2.25	81.08	1.35	2.27	1	BOT. CORNER WALL	10.48	2.25	1	BOTTOM SLAB	7.76	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SH	12.50		2.45	30.64	1.40	2.45	1	BOT. CORNER WALL	10.48	2.93	1	EXTERIOR WALL	9.87	
		S3C	21.50		2.03	43.66	1.40	2.23	1	BOT. CORNER WALL	10.48	2.03	1	TOP SLAB	7.82	
		S3A	22.75		2.03	46.21	1.40	2.27	1	BOT. CORNER WALL	10.48	2.03	1	TOP SLAB	7.82	
		S4A	26.75		2.01	53.71	1.40	2.18	1	BOT. CORNER WALL	10.48	2.01	1	TOP SLAB	7.82	
		S5A	30.50	(3)	1.82	55.50	1.40	2.13	1	BOT. CORNER WALL	10.48	1.82	1	TOP SLAB	7.82	
		S6A	34.50		1.83	63.07	1.40	2.14	1	BOT. CORNER WALL	10.48	1.83	1	TOP SLAB	7.82	
		S7B	38.50		1.82	70.24	1.40	2.10	1	BOT. CORNER WALL	10.48	1.82	1	TOP SLAB	7.82	
		S7A	40.00		1.85	73.92	1.40	2.06	1	BOT. CORNER WALL	10.48	1.85	1	TOP SLAB	7.82	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	T4A	28.25		2.03	57.38	1.40	2.27	1	BOT. CORNER WALL	10.48	2.03	1	TOP SLAB	7.82	
		T5B	32.00		1.98	63.44	1.40	2.18	1	BOT. CORNER WALL	10.48	1.98	1	TOP SLAB	7.82	
		T6A	36.00		1.90	68.53	1.40	2.13	1	BOT. CORNER WALL	10.48	1.90	1	TOP SLAB	7.82	
		T7A	40.00		2.01	80.26	1.40	2.15	1	BOT. CORNER WALL	10.48	2.01	1	TOP SLAB	7.82	
		T7B	40.00		1.97	78.85	1.40	2.18	1	BOT. CORNER WALL	10.48	1.97	1	TOP SLAB	7.82	



LRFR SUMMARY

(LOOKING DOWNSTREAM)

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

PROJECT NO. I-5000

GASTON COUNTY

STATION: 18+50.00 -RPD

SHEET 2 OF 7

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

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1/17/2017

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-20
1			3			TOTAL SHEETS
2			4			26

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ASSEMBLED BY :	H. T. BARBOUR	DATE :	8-31-16
CHECKED BY :	A. M. LEE	DATE :	10-16
DRAWN BY :	WMC 7/11	REV. 10/1/11	MAA/GM
CHECKED BY :	GM 7/11		

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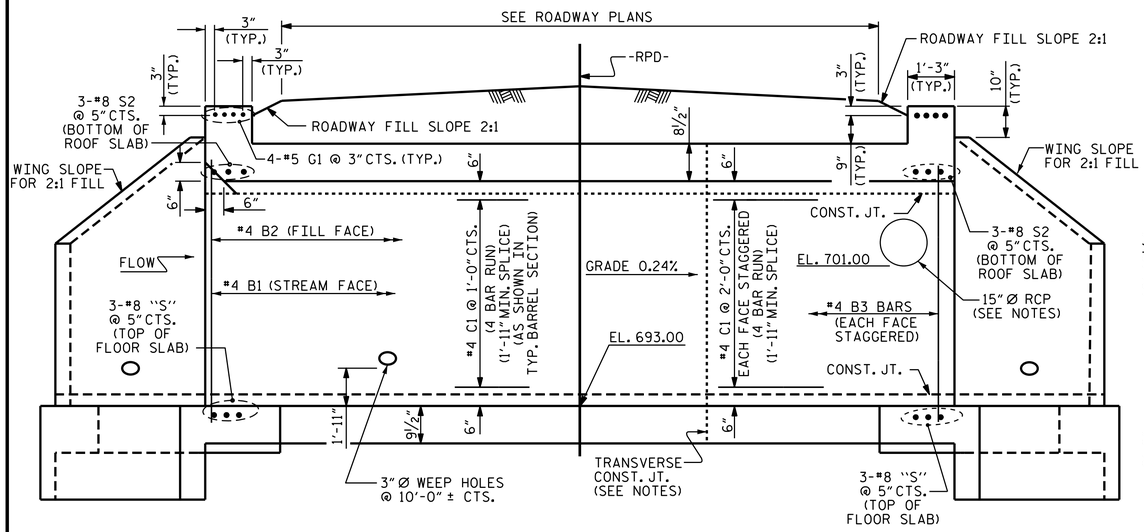
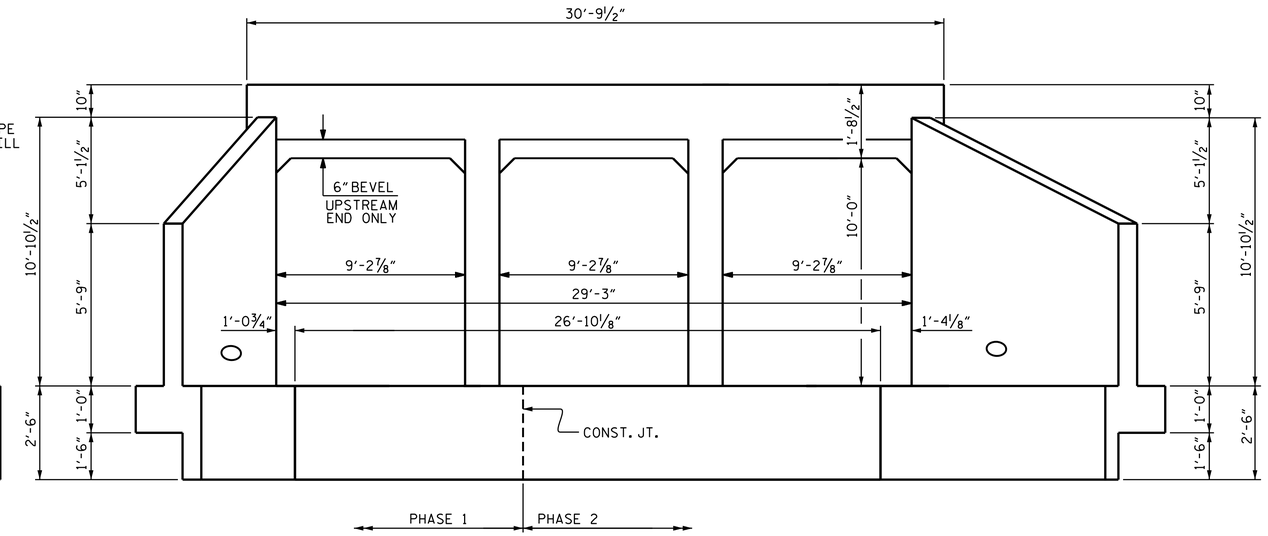
CULVERT #5

STD. NO. LRFR6



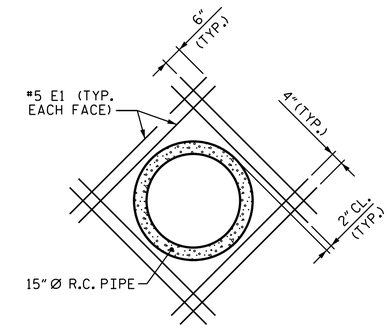
EXTERIOR WALL INTERIOR WALL

CULVERT SECTION NORMAL TO ROADWAY

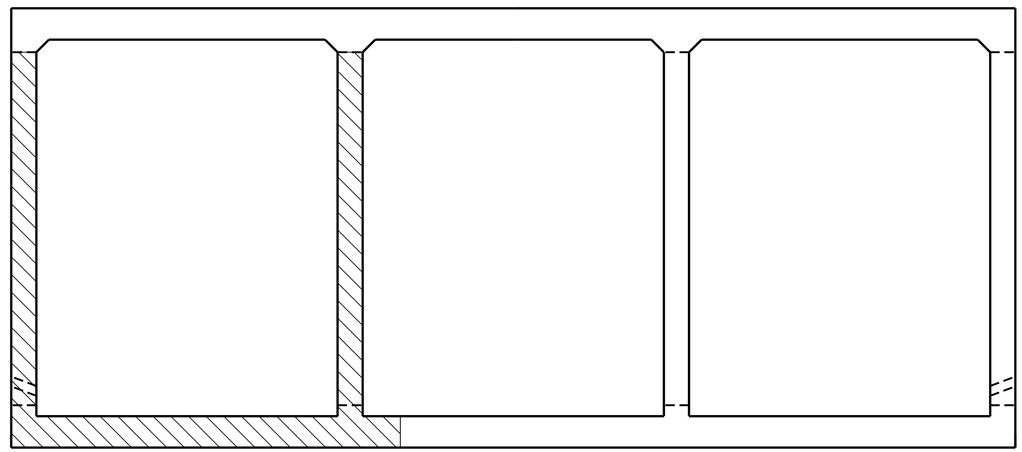


END ELEVATION NORMAL TO SKEW

(LOOKING DOWNSTREAM)



DETAIL OF REINFORCING AROUND 15" Ø PIPE



PHASE 1 PHASE 2

PHASING SEQUENCE

(LOOKING DOWNSTREAM)

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFA

Docusigned by: Wael Arafat 4139C12A32AB406...

1/17/2017

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PROJECT NO. I-5000

GASTON COUNTY

STATION: 18+50.00 -RPD-

SHEET 3 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 8 FT. X 10 FT. RCBC 66°-00'-00" SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-21
1			3			TOTAL SHEETS
2			4			26

ASSEMBLED BY : H. T. BARBOUR DATE : 9-27-16
CHECKED BY : A. M. LEE DATE : 10-16
DESIGN ENGINEER OF RECORD: O. PUIGCERVER DATE : 10-16

DRAWN BY : H.A. JUDEH DATE : JULY 15,1971
CHECKED BY : RALPH D. UNDERWOOD DATE : AUG.4, 1971

SPECIAL

STANDARD

REVISED 11-19-99 BY M.M. CHECKED BY R.W.W.
REVISED 8-28-92 BY E.L.R. CHECKED BY G.R.P.
REDRAWN NOV.1990 BY B.E.W., CHECKED BY M.A.J.

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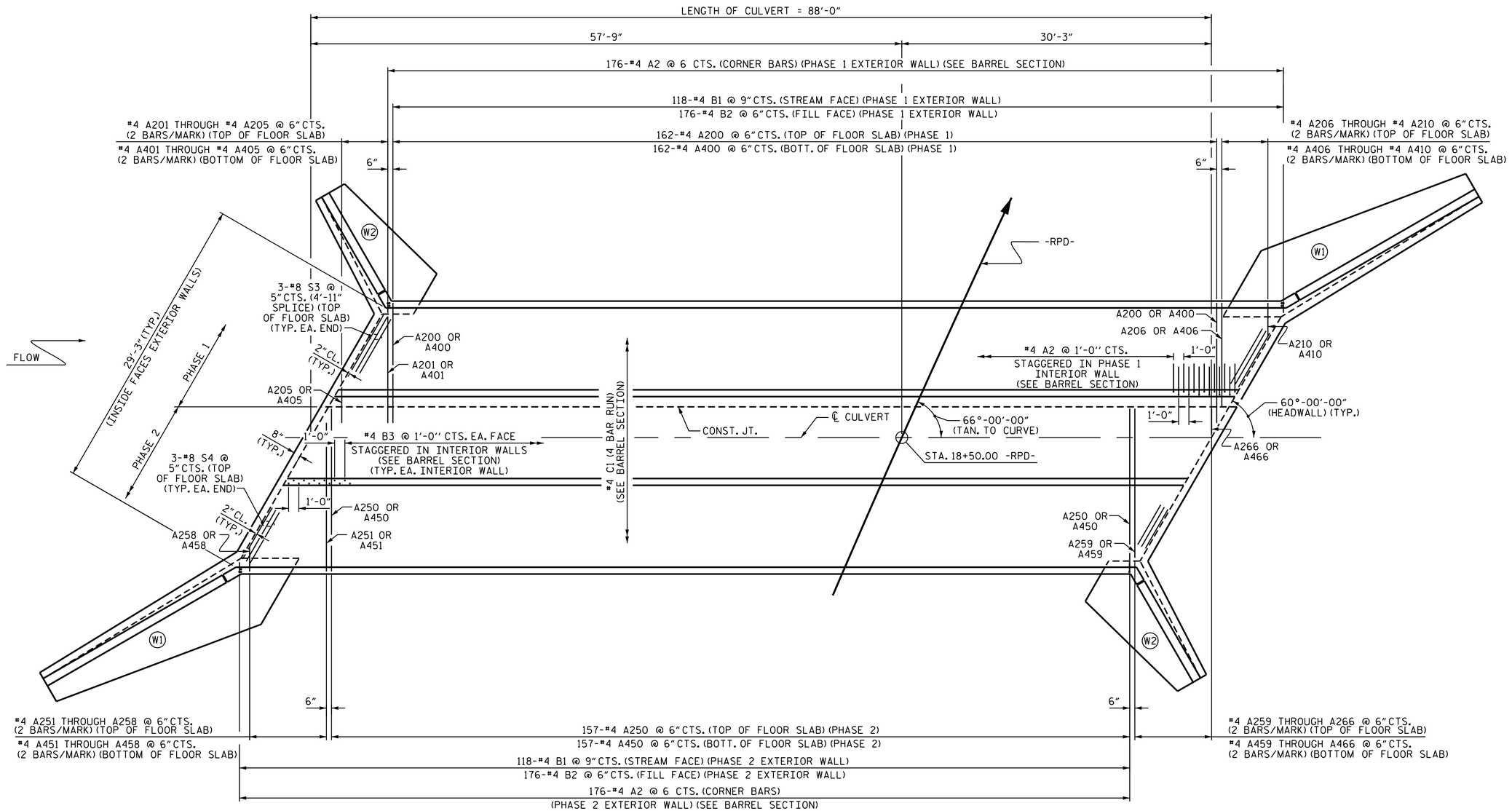
CULVERT #5 STD. NO. CB33



PLAN OF FLOOR SLAB

PROJECT NO. I-5000

GASTON COUNTY

STATION: 18+50.00 -RPD-

SHEET 4 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 8 FT. X 10 FT. RCBC 66°-00'-00" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-22
1			3			TOTAL SHEETS
2			4			26

DRAWN BY : H. T. BARBOUR DATE : 9-23-16
CHECKED BY : A. M. LEE DATE : 10-16
DESIGN ENGINEER OF RECORD: O. PUIGCERVER DATE : 11-16

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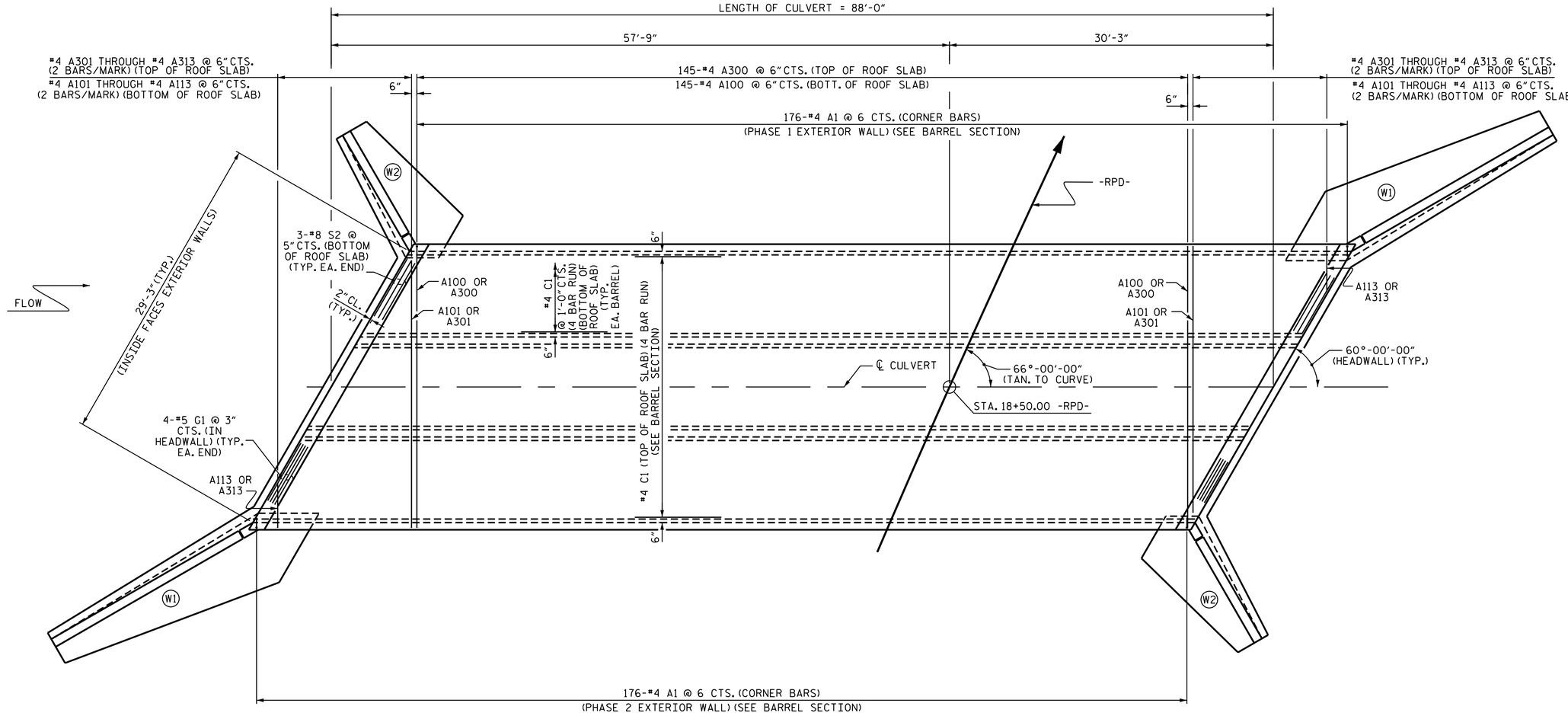

PLAN OF ROOF SLAB

PROJECT NO. I-5000

GASTON COUNTY

STATION: 18+50.00 -RPD-

SHEET 5 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 8 FT. X 10 FT. RCBC 66°-00'-00" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

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2			4			26

DRAWN BY : H. T. BARBOUR DATE : 9-23-16
CHECKED BY : A. M. LEE DATE : 10-16
DESIGN ENGINEER OF RECORD: O. PUIGCERVER DATE : 11-16

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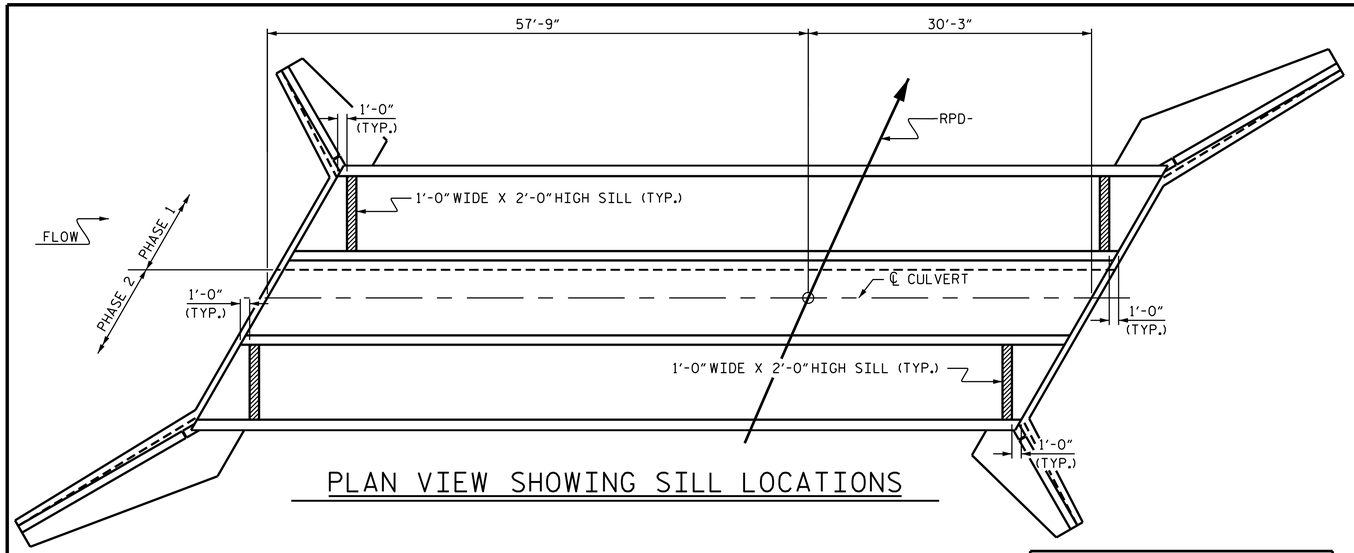
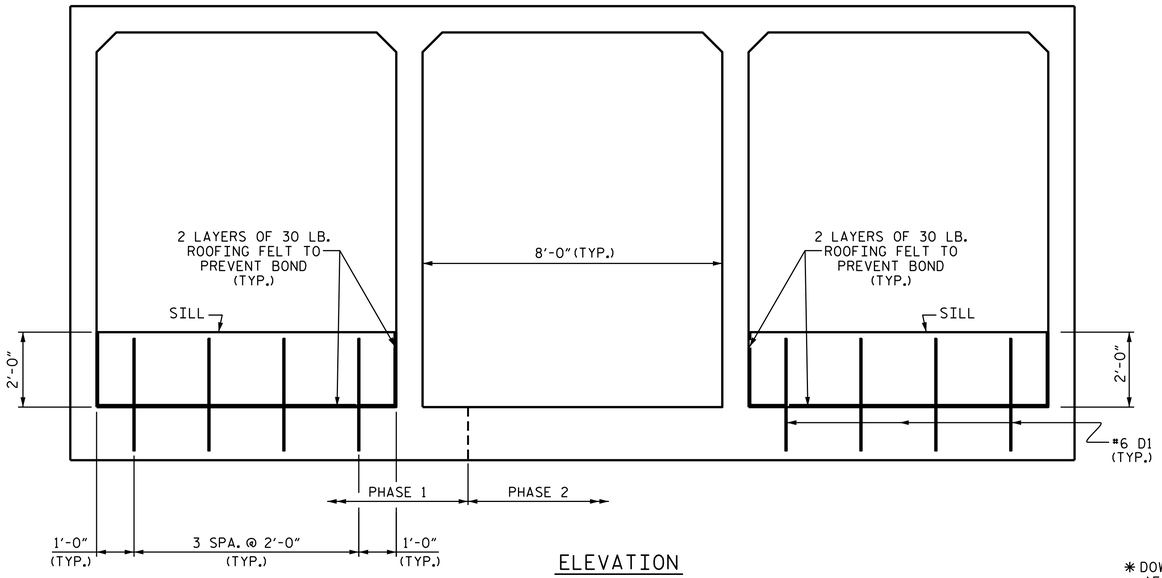


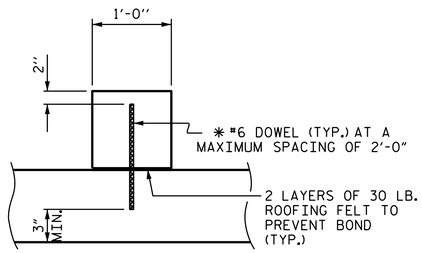
PLAN VIEW SHOWING SILL LOCATIONS

SPLICE CHART

BAR	SIZE	SPLICE LENGTH
A200	#4	1'-5"
A400	#4	1'-5"
B1 & B3	#4	1'-5"
C1	#4	1'-11"
S3	#8	4'-11"



ELEVATION



SECTION THROUGH SILL

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

CULVERT SILL DETAILS

(LOOKING DOWNSTREAM)

REINFORCING BAR SCHEDULE

PHASE 1

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	176	#4	1	4'-6"	529
A2	352	#4	1	4'-2"	980
A200	162	#4	STR.	11'-9"	1272
A201	2	#4	STR.	10'-4"	14
A202	2	#4	STR.	8'-7"	11
A203	2	#4	STR.	6'-11"	9
A204	2	#4	STR.	5'-2"	7
A205	2	#4	STR.	3'-5"	5
A206	2	#4	STR.	10'-0"	13
A207	2	#4	STR.	8'-6"	11
A208	2	#4	STR.	6'-9"	9
A209	2	#4	STR.	5'-0"	7
A210	2	#4	STR.	3'-3"	4
A400	162	#4	STR.	11'-9"	1272
A401	2	#4	STR.	10'-4"	14
A402	2	#4	STR.	8'-7"	11
A403	2	#4	STR.	6'-11"	9
A404	2	#4	STR.	5'-2"	7
A405	2	#4	STR.	3'-5"	5
A406	2	#4	STR.	10'-0"	13
A407	2	#4	STR.	8'-6"	11
A408	2	#4	STR.	6'-9"	9
A409	2	#4	STR.	5'-0"	7
A410	2	#4	STR.	3'-3"	4
B1	118	#4	STR.	11'-0"	867
B2	176	#4	STR.	9'-4"	1097
B3	176	#4	STR.	11'-0"	1293
C1	136	#4	STR.	23'-6"	2135
D1	8	#6	STR.	2'-4"	28
E1	16	#5	STR.	3'-8"	61
S3	6	#8	STR.	16'-10"	270

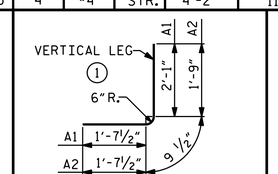
PHASE 1 REINFORCING STEEL 9984 LBS.

PHASE 2

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	176	#4	1	4'-6"	529
A2	176	#4	1	4'-2"	490
A100	145	#4	STR.	26'-3"	2543
A101	4	#4	STR.	24'-11"	67
A102	4	#4	STR.	23'-2"	62
A103	4	#4	STR.	21'-6"	57
A104	4	#4	STR.	19'-9"	53
A105	4	#4	STR.	18'-0"	48
A106	4	#4	STR.	16'-3"	43
A107	4	#4	STR.	14'-6"	39
A108	4	#4	STR.	12'-10"	34
A109	4	#4	STR.	11'-1"	30
A110	4	#4	STR.	9'-4"	25
A111	4	#4	STR.	7'-7"	20
A112	4	#4	STR.	5'-10"	16
A113	4	#4	STR.	4'-2"	11
A250	157	#4	STR.	16'-0"	1678
A251	2	#4	STR.	14'-6"	19
A252	2	#4	STR.	12'-10"	17
A253	2	#4	STR.	11'-1"	15
A254	2	#4	STR.	9'-4"	12
A255	2	#4	STR.	7'-7"	10
A256	2	#4	STR.	5'-10"	8
A257	2	#4	STR.	4'-2"	6
A258	2	#4	STR.	2'-5"	3
A259	2	#4	STR.	14'-7"	19
A260	2	#4	STR.	12'-10"	17
A261	2	#4	STR.	11'-1"	15
A262	2	#4	STR.	9'-5"	13
A263	2	#4	STR.	7'-8"	10
A264	2	#4	STR.	5'-11"	8
A265	2	#4	STR.	4'-2"	6
A266	2	#4	STR.	2'-5"	3
A300	145	#4	STR.	26'-3"	2543
A301	4	#4	STR.	24'-11"	67
A302	4	#4	STR.	23'-2"	62
A303	4	#4	STR.	21'-6"	57
A304	4	#4	STR.	19'-9"	53
A305	4	#4	STR.	18'-0"	48
A306	4	#4	STR.	16'-3"	43
A307	4	#4	STR.	14'-6"	39
A308	4	#4	STR.	12'-10"	34
A309	4	#4	STR.	11'-1"	30
A310	4	#4	STR.	9'-4"	25
A311	4	#4	STR.	7'-7"	20
A312	4	#4	STR.	5'-10"	16
A313	4	#4	STR.	4'-2"	11

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A450	157	#4	STR.	16'-0"	1678
A451	2	#4	STR.	14'-6"	19
A452	2	#4	STR.	12'-10"	17
A453	2	#4	STR.	11'-1"	15
A454	2	#4	STR.	9'-4"	12
A455	2	#4	STR.	7'-7"	10
A456	2	#4	STR.	5'-10"	8
A457	2	#4	STR.	4'-2"	6
A458	2	#4	STR.	2'-5"	3
A459	2	#4	STR.	14'-7"	19
A460	2	#4	STR.	12'-10"	17
A461	2	#4	STR.	11'-1"	15
A462	2	#4	STR.	9'-5"	13
A463	2	#4	STR.	7'-8"	10
A464	2	#4	STR.	5'-11"	8
A465	2	#4	STR.	4'-2"	6
A466	2	#4	STR.	2'-5"	3
B1	118	#4	STR.	11'-0"	867
B2	176	#4	STR.	9'-4"	1097
B3	176	#4	STR.	11'-0"	1293
C1	304	#4	STR.	23'-6"	4772
D1	8	#6	STR.	2'-4"	28
G1	8	#5	STR.	30'-4"	253
S2	6	#8	STR.	30'-4"	486
S4	6	#8	STR.	18'-5"	295

PHASE 2 REINFORCING STEEL 19924 LBS.



BAR TYPE

BAR DIMENSIONS ARE OUT TO OUT

PHASE 1 QUANTITIES

CLASS A CONCRETE
- BARREL ____ 68.7 C.Y.
- WINGS ETC. ____ 20.4 C.Y.
- TOTAL ____ 89.1 C.Y.

REINFORCING STEEL
- BARREL ____ 9984 LBS.
- WINGS ETC. ____ 1392 LBS.
- TOTAL ____ 11376 LBS.

CULVERT EXCAVATION — LUMP SUM

FOUNDATION CONDITIONING MATERIAL. — 157 TONS

PHASE 2 QUANTITIES

CLASS A CONCRETE
- BARREL ____ 149.7 C.Y.
- WINGS ETC. ____ 24.2 C.Y.
- TOTAL ____ 173.9 C.Y.

REINFORCING STEEL
- BARREL ____ 19924 LBS.
- WINGS ETC. ____ 1392 LBS.
- TOTAL ____ 21316 LBS.

CULVERT EXCAVATION — LUMP SUM

FOUNDATION CONDITIONING MATERIAL. — 178 TONS

PROJECT NO. I-5000

GASTON COUNTY

STATION: 18+50.00 -RPD-

SHEET 6 OF 7

NOTES

MATERIAL EXCAVATED FROM THE EXISTING BED SHALL BE STOCKPILED FOR USE IN THE PROPOSED CULVERT AND SHALL PROVIDE A CONTINUOUS HIGH FLOW CHANNEL AS SHOWN. THE MATERIAL SHALL BE NATURAL STONE WITH A GRADATION SIZE SIMILAR TO THAT OF CLASS B RIP RAP. STONES LARGER THAN 6 INCHES SHALL NOT BE PLACED WITHIN THE LOW FLOW CHANNEL. BED MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

THE STOCKPILED MATERIAL SHALL BE PLACED TO THE LEVEL OF 2' BETWEEN THE HIGH FLOW SILLS.

BED MATERIAL SHALL BE SUPPLEMENTED BY CLASS B RIP RAP AS NECESSARY IN THE LEFT AND RIGHT BARRELS ONLY.

BED MATERIAL SHALL BE PLACED ON TOP OF THE SUPPLEMENTAL FILL, IF USED, TO PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE.

THE ENTIRE COST OF WORK REQUIRED TO PLACE EXCAVATED 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/BAFFLES SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S ARAFAT

DocuSigned by: Wael Arafat 4139C12A32AB406...

1/17/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 8 FT. X 10 FT. RCBC
66°-00'-00" SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-24
1			3			TOTAL SHEETS
2			4			26

DRAWN BY : H. T. BARBOUR DATE : 9-27-16
CHECKED BY : A. M. LEE DATE : 10-16
DESIGN ENGINEER OF RECORD: O. PUIGCERVER DATE : 11-16

13-JAN-2017 14:55
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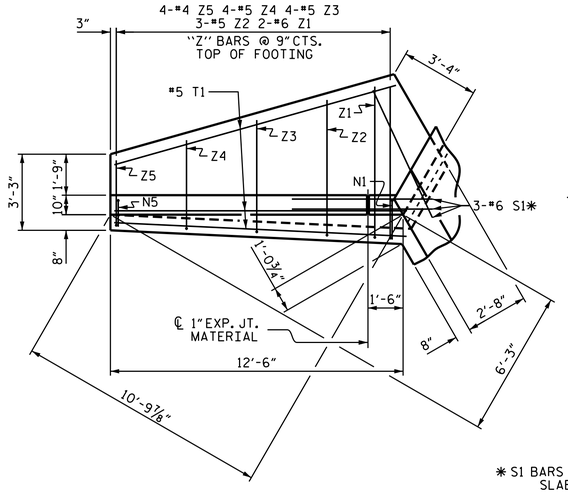
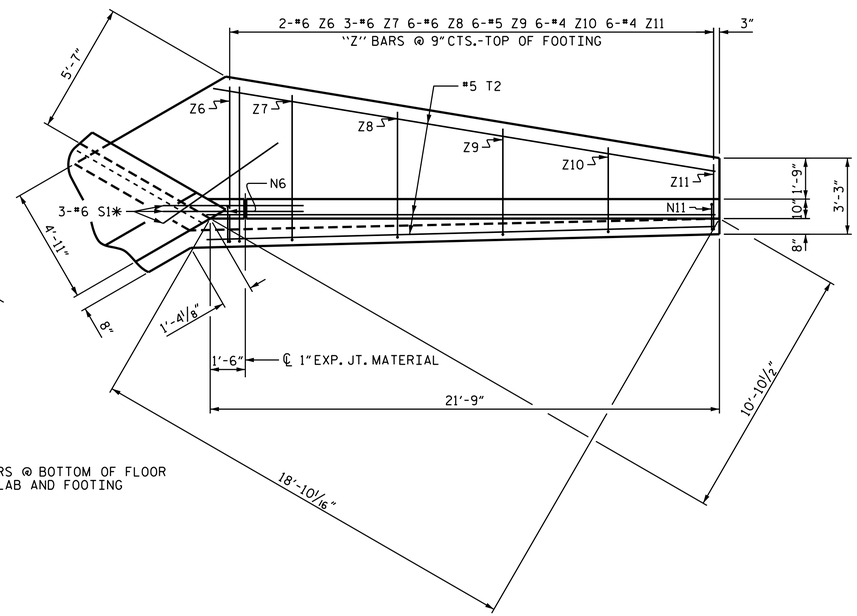
tbarbour

CULVERT #5

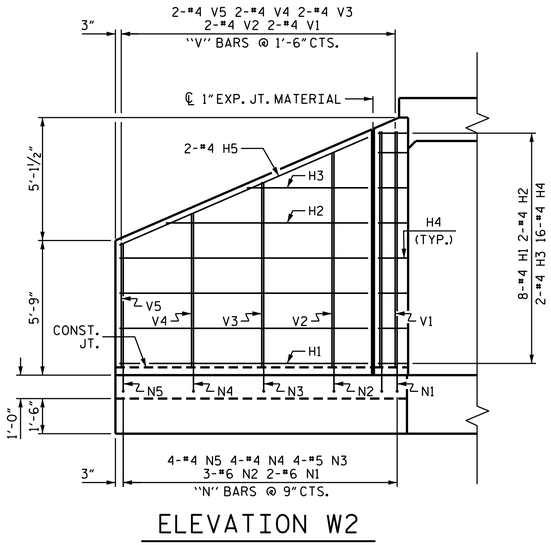


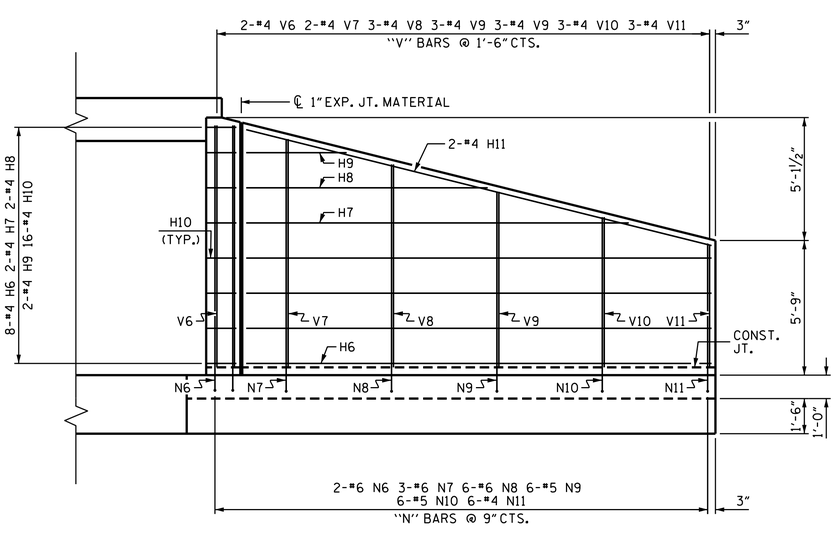


* S1 BARS @ BOTTOM OF FLOOR SLAB AND FOOTING

PLAN W2

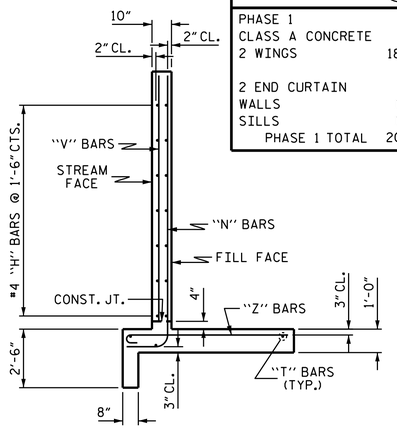
PLAN W1





ELEVATION W2

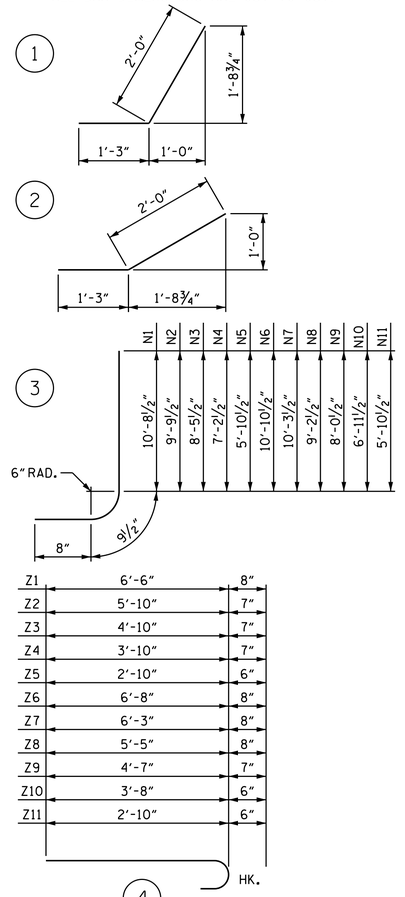
ELEVATION W1



TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.



PHASE 1			PHASE 2		
CLASS A CONCRETE			CLASS A CONCRETE		
2 WINGS	18.0	CY	2 WINGS	18.0	CY
			2 HEADWALLS	2.9	CY
2 END CURTAIN			2 END CURTAIN		
WALLS	1.2	CY	WALLS	2.1	CY
SILLS	1.2	CY	SILLS	1.2	CY
PHASE 1 TOTAL	20.4	CY	PHASE 2 TOTAL	24.2	CY

REINFORCING BAR SCHEDULE FOR PHASE 1 OR PHASE 2

BAR	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 FOR 2 WINGS 1392 LBS

PROJECT NO. I-5000

GASTON COUNTY

STATION: 18+50.00 -RPD-

SHEET 7 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD WINGS FOR CONCRETE BOX CULVERT

H = 10'-0" SLOPE = 2:1
60° OR 120° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 17230 ENGINEER WAEL S. ARAFAT

DocuSigned by: Wael Arafat 4139C12A32AB406...
1/17/2017

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SHEET NO. C-25

TOTAL SHEETS 26

ASSEMBLED BY :	H. T. BARBOUR	DATE :	9-27-16
CHECKED BY :	A. M. LEE	DATE :	10-16
DRAWN BY :	CCJ	12/99	
CHECKED BY :	RWW	03/00	

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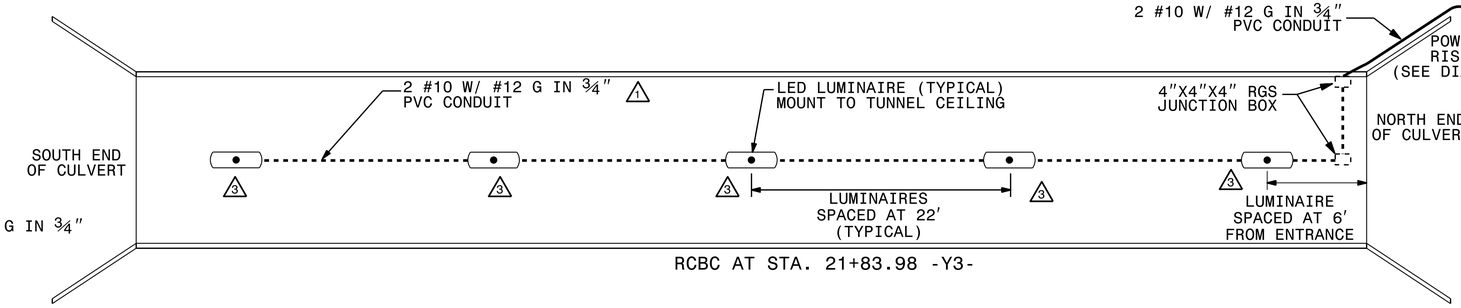
CULVERT #5

STD. NO. CW6010

DCN

USE FOR LIGHTING CONSTRUCTION ONLY



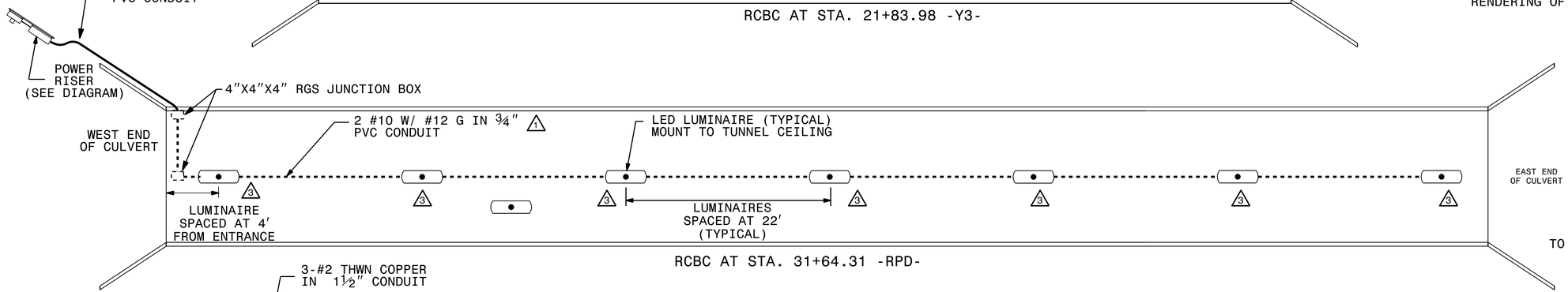
RCBC AT STA. 21+83.98 -Y3-

△ NOTES

△1 FOR CAST IN PLACE CULVERT, PVC CONDUIT, OUTLET BOXES AND EXPANSION FITTINGS SHALL BE EMBEDDED IN TOP OF CULVERT.

△2 INSTALL ¾" PVC EXPANSION FITTINGS AT ALL CONCRETE CULVERT SECTION JUNCTIONS.

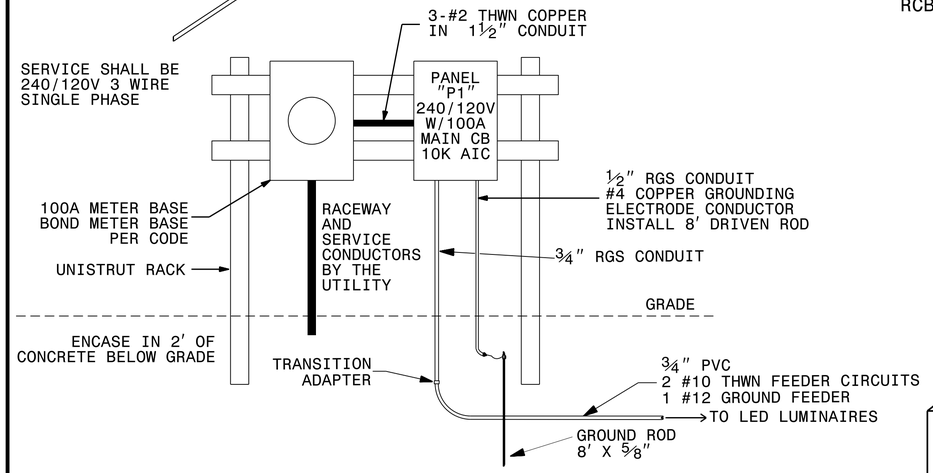
△3 INSTALL LED LUMINAIRES THAT ARE FOR PASSAGE WAY LIGHTING, 50W MAXIMUM, AND WITH A COLOR RENDERING OF 4000K.



RCBC AT STA. 31+64.31 -RPD-

CULVERT LIGHTING PLANS

PLAN VIEW



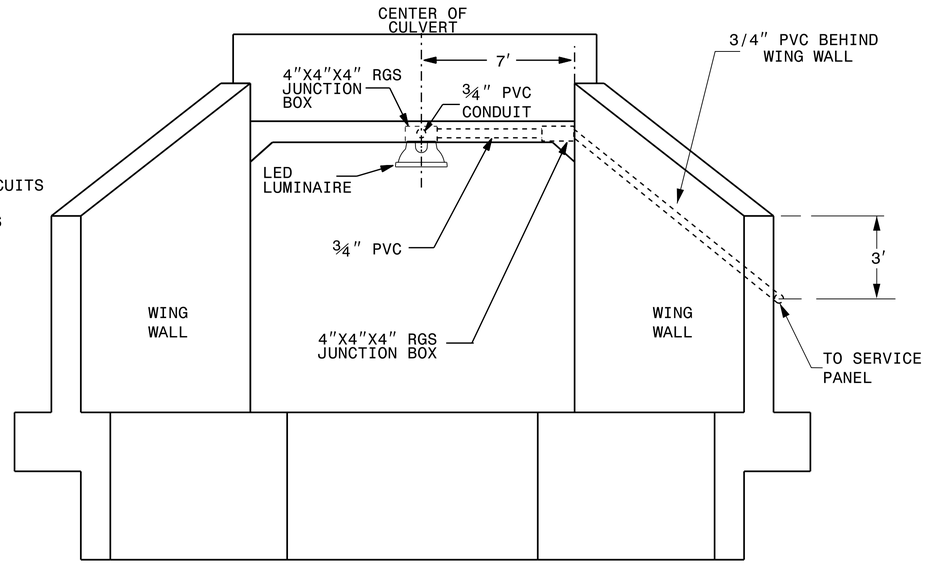
SERVICE	WIRE SZ	GRND SZ	LOAD VA	BRK AMP	CKT #	P1	CKT #	BRK AMP	LOAD VA	GRND SZ	WIRE SZ	SERVICE
CULVERT LIGHTS	2#10	#12	600	15/1	1		2					
SPARE			600	15/1	3		4					
					5		6					
					7		8					
					9		10					
					11		12					
					13		14					
					15		16					
					17		18					
					19		20					

A B

LOCATION: OUTDOOR
PANEL MOUNTING: SURFACE
SERVICE: 240/120, 1PH, 3 WIRE, AC, FULL NEUTRAL, SERVICE ENTRANCE
MAIN BREAKER: 100A
CABINET: NEMA 3R
ACCESSORIES: GROUND BAR
COMMENTS: NEW PANEL "P1", BOLT ON BREAKERS

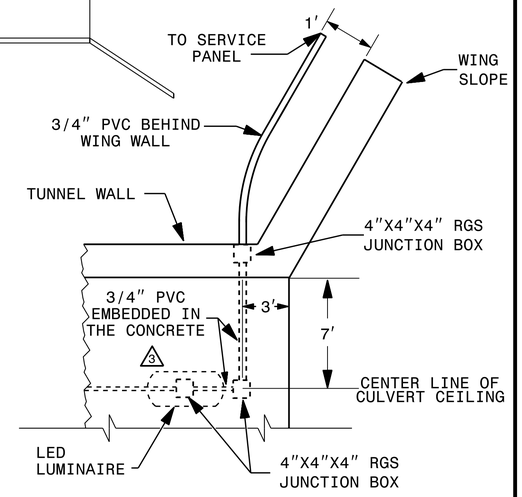
CONNECTED VA
PHASE "A" = 600 VA
PHASE "B" = 600 VA

POWER RISER DIAGRAM



FIXTURE MOUNTING DETAIL

ENTRANCE/FRONT VIEW



FIXTURE MOUNTING DETAIL

TOP VIEW

SEE PROJECT SPECIAL PROVISIONS TITLED "PEDESTRIAN CULVERT LIGHTING SYSTEMS" FOR MATERIALS CONSTRUCTION METHODS AND PAYMENT

NORTH CAROLINA PROFESSIONAL SEAL 022582 ENGINEER PAUL KI-BUN CHAN

DocuSigned by: Paul Chan F83C4B85EEF442... 1/10/2017

PROJECT NO. I-5000

GASTON COUNTY

STATIONS: 21+83.98 -Y3-
& 31+64.31 -RPD-

SHEET 1 OF 1

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PEDESTRIAN CULVERT LIGHTING SYSTEMS
UNDER I85/US 321 EXIT RAMP
AND UNDER BULB AVENUE

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-26
1			3			SHEETS
2			4			26

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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 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. 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

REV. 6-16-95 EEM (W) RGW REV. 5-7-03 RWW (W) JTE REV. 10-1-11 MAA (W) GM
REV. 8-16-99 RWW (W) LES REV. 5-1-06 TLA (W) GM
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STD. NO. SN