09/08/99

TIP PROJECT: R-5020B

CONTRACT: C204423

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

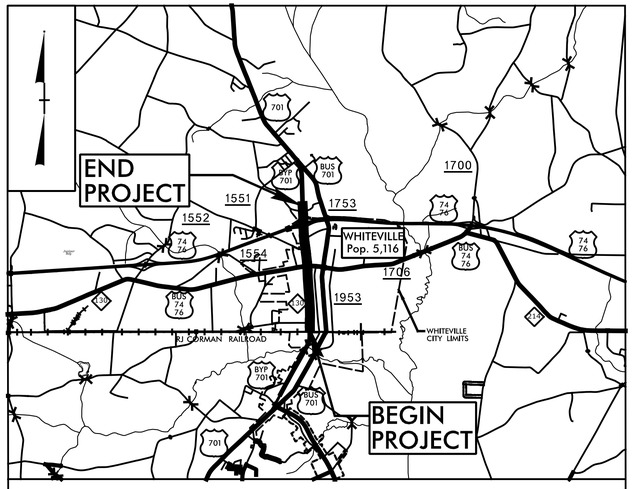
COLUMBUS COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5020B	1	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
41499.1.3	NHP-0701(033)	P.E.
41499.2.3	N.A.	R/W
41499.2.5	N.A.	UTIL.
41499.3.3	N.A.	CONST.

LOCATION: US 701 BYPASS (MADISON STREET – JK POWELL BOULEVARD) FROM SR 1437 (VIRGIL AVENUE) TO US 74/76

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

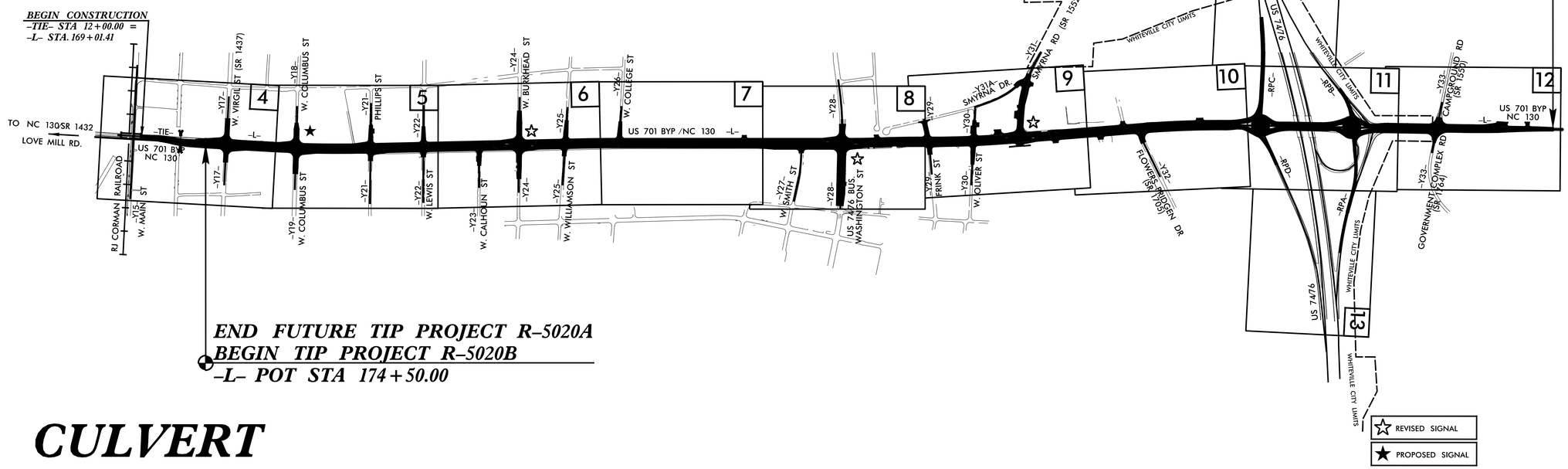


VICINITY MAP
(NOT TO SCALE)

NAD 83/
NA 2011

END TIP PROJECT R-5020B
-L- POT STA 289+75.00

BEGIN CONSTRUCTION
-TIE- STA 12+00.00 =
-L- STA. 169+01.41



END FUTURE TIP PROJECT R-5020A
BEGIN TIP PROJECT R-5020B
-L- POT STA 174+50.00

REVISED SIGNAL
PROPOSED SIGNAL

CULVERT

DESIGN DATA

ADT 2020 = 21,417
ADT 2040 = 26,000
K = 8 %
D = 55 %
T = 6 % *
V = 50 MPH

*(TTST = 3% + DUAL 3%)

FUNC CLASS = URBAN ARTERIAL
REGIONAL TIER

PROJECT LENGTH

LENGTH OF ROADWAY TIP PROJECT R-5020B = 2.183 MILES

TOTAL LENGTH OF TIP PROJECT R-5020B = 2.183 MILES

Prepared In the Office of:
KCI Associates of N.C., P.A.
4505 Falls of Neuse Road, Suite 400
Raleigh, NC 27609
Phone (919) 783-9214
Fax (919) 783-9266
http://www.kci.com

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
FEBRUARY 16, 2018

LETTING DATE:
APRIL 20, 2021

NCDOT CONTACT: DAVID STUTTS, P.E.
STRUCTURES MANAGEMENT UNIT

Plans Prepared For:
DIVISION OF HIGHWAYS
558 Gillespie St.
Fayetteville NC, 28301

ELIZABETH R. PHIPPS, P.E.
PROJECT ENGINEER

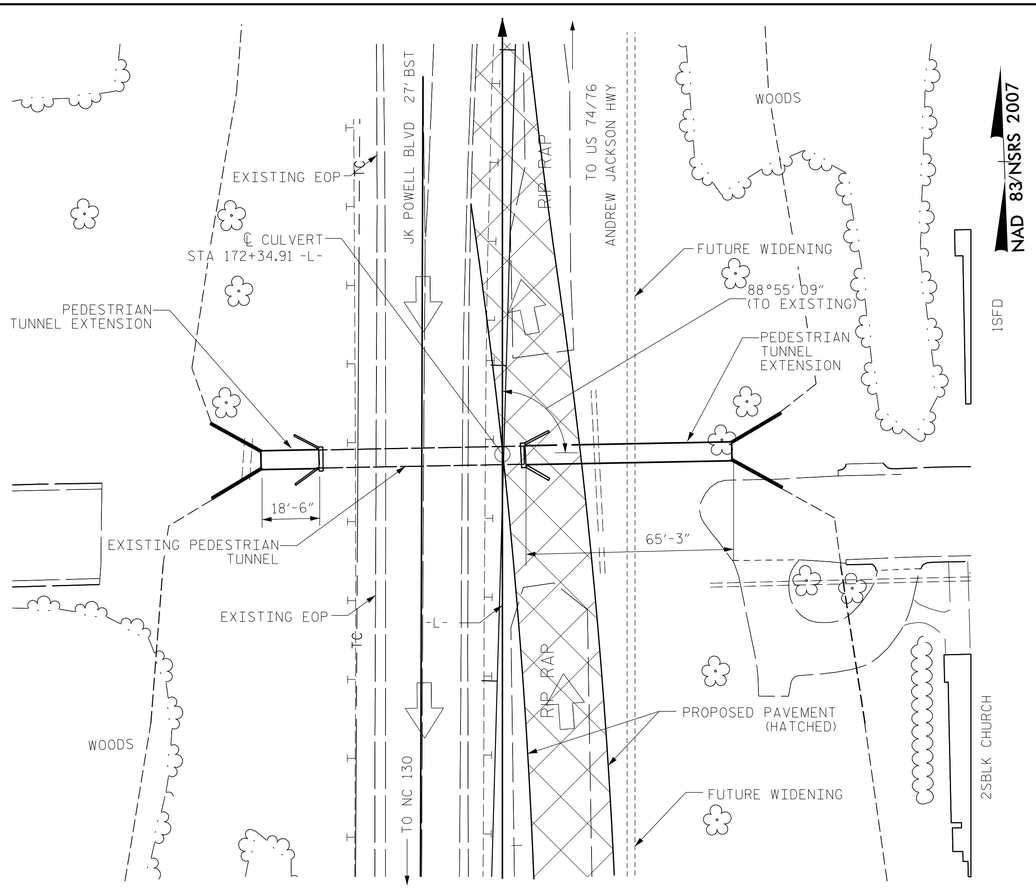
ROBERT C. LARSON, P.E.
PROJECT DESIGN ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION ·

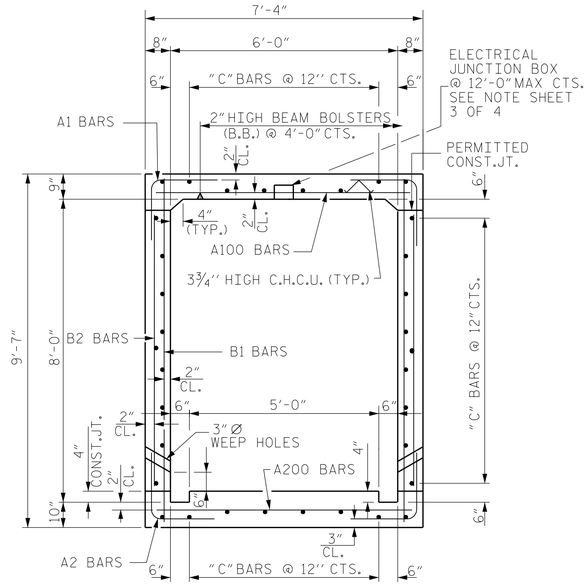
6:47:14 PM
R-5020B_Rdy_tsh_structures.dgn
Division:

BENCHMARK: BM3 RR SPIKE IN 18" PINE -L- STATION 114+31.86 52.89 RIGHT ELEVATION 52.04



FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS

LOCATION SKETCH



RIGHT ANGLE SECTION OF BARREL

THERE ARE 34 "C" BARS IN SECTION OF BARREL

NOTE: EXISTING CULVERT VERTICAL CLEARANCE MAY VARY. TAPER WALL HEIGHT OF PROPOSED CULVERT TO MATCH EXISTING OVER 5' LENGTH IF NECESSARY

NOTES:

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

THIS CULVERT HAS BEEN DESIGNED IN ACCORDANCE WITH THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

DESIGN FILL----------8.6'

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 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.

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

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

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

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 THE CUTTING OF THE WINGS. THE WINGS MAY BE CUT EARLIER PROVIDED THE SLAB CONCRETE HAS REACHED A MINIMUM COMPRESSIVE STRENGTH OF 1500 psi.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

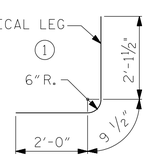
FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE			
BARREL @ 0.89	CY/FT	74.5	C.Y.
WING ETC.		32.1	C.Y.
TOTAL		106.6	C.Y.
REINFORCING STEEL			
BARREL		7236	LBS.
WINGS ETC.		2059	LBS.
TOTAL		9295	LBS.
FOUNDATION CONDITIONING MATERIAL, TONS		67	
CULVERT EXCAVATION,		LUMP SUM	

BAR TYPES



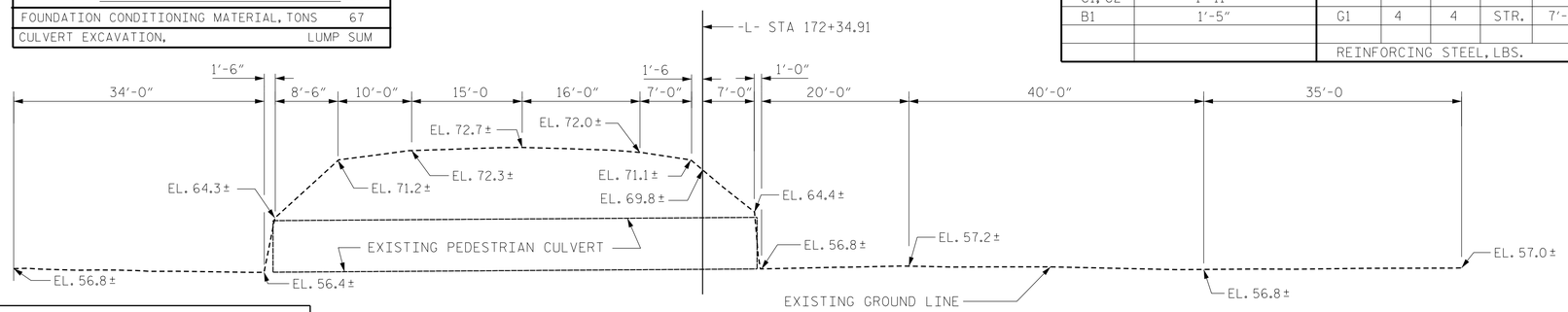
DIMENSIONS ARE OUT TO OUT

SPLICE LENGTHS

BAR	SPLICE LENGTH
C1, C2	1'-11"
B1	1'-5"

REINFORCING STEEL SCHEDULE

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	334	4	1	4'-11"	1097
A2	334	4	1	4'-11"	1097
A100	112	4	STR.	7'-0"	524
A200	112	4	STR.	7'-0"	524
B1	170	4	STR.	9'-2"	1041
B2	170	4	STR.	7'-0"	795
C1	34	4	STR.	18'-2"	413
C2	102	4	STR.	22'-11"	1561
D1	44	6	STR.	2'-6"	165
G1	4	4	STR.	7'-0"	19
REINFORCING STEEL, LBS.					7236



PROFILE ALONG ℄ CULVERT

PROJECT NO. R-5020B

COLUMBUS COUNTY

STATION: 172+34.91 -L-

SHEET 1 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL SINGLE 6 FT. X 8 FT. CONCRETE PEDESTRIAN BOX CULVERT EXTENSION

DESIGN ENGINEER OF RECORD: DocuSigned by: DATE: 1/27/2020
DB3C8E45B06D499...

DRAWN BY: K. SU DATE: 10/01/18

CHECKED BY: R. A. PRUETT DATE: 03/29/19

DocuSigned by:
DB3C8E45B06D499...
1/27/2020

NORTH CAROLINA PROFESSIONAL SEAL 14114 ENGINEER ROBERT C. LASSON

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ENGINEERS ● PLANNERS ● SCIENTISTS ● CONSTRUCTION MANAGERS LICENSE NUMBER: C-0764
KCI Associates of North Carolina, P.A.
4505 Falls of Neuse Road, Suite 400 Raleigh, NC 27609-6270 Phone (919) 783-9214

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

SHEET NO. C-1

TOTAL SHEETS 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)	- -	(1)	1.79	- -	1.75	1.79	1	TOP SLAB	3.67	3.19	1	TOP SLAB	0.00	
		HL-93 (OPERATING)	- -		2.32	- -	1.35	2.32	1	TOP SLAB	3.67	4.14	1	TOP SLAB	0.00	
		HS-20 (INVENTORY)	36.000	(2)	2.74	98.60	1.75	2.74	1	TOP SLAB	3.67	4.63	1	TOP SLAB	0.00	
		HS-20 (OPERATING)	36.000		3.55	127.80	1.35	3.55	1	TOP SLAB	3.67	6.00	1	TOP SLAB	0.00	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		7.95	107.30	1.40	7.95	1	TOP SLAB	3.67	12.12	1	TOP SLAB	0.00	
		SNGARBS2	20.000		7.44	148.80	1.40	7.44	1	TOP SLAB	3.67	11.35	1	TOP SLAB	0.00	
		SNAGRIS2	22.000		7.95	174.90	1.40	7.95	1	TOP SLAB	3.67	12.12	1	TOP SLAB	0.00	
		SNCOTTS3	27.250	(3)	3.74	101.90	1.40	3.74	1	TOP SLAB	3.67	5.75	1	TOP SLAB	0.00	
		SNAGGRS4	34.925		4.14	144.50	1.40	4.14	1	TOP SLAB	3.67	6.33	1	TOP SLAB	0.00	
		SNS5A	35.550		3.87	137.50	1.40	3.87	1	TOP SLAB	3.67	5.92	1	TOP SLAB	0.00	
		SNS6A	39.950		3.86	154.20	1.40	3.86	1	TOP SLAB	3.67	5.91	1	TOP SLAB	0.00	
		SNS7B	42.000		3.86	162.10	1.40	3.86	1	TOP SLAB	3.67	5.91	1	TOP SLAB	0.00	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		6.89	227.30	1.40	6.89	1	TOP SLAB	3.67	16.59	1	TOP SLAB	0.00	
		TNT4A	33.075		4.45	147.10	1.40	4.45	1	TOP SLAB	3.67	6.84	1	TOP SLAB	0.00	
		TNT6A	41.600		4.09	175.80	1.40	4.09	1	TOP SLAB	3.67	6.27	1	TOP SLAB	0.00	
		TNT7A	42.000		4.27	192.10	1.40	4.27	1	TOP SLAB	3.67	6.55	1	TOP SLAB	0.00	
		TNT7B	42.000		4.08	183.60	1.40	4.08	1	TOP SLAB	3.67	6.26	1	TOP SLAB	0.00	
		TNAGRIT4	43.000		4.45	184.60	1.40	4.45	1	TOP SLAB	3.67	6.84	1	TOP SLAB	0.00	
		TNAGT5A	45.000		4.45	186.90	1.40	4.45	1	TOP SLAB	3.67	6.84	1	TOP SLAB	0.00	
		TNAGT5B	45.000		4.45	186.90	1.40	4.45	1	TOP SLAB	3.67	6.84	1	TOP SLAB	0.00	

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

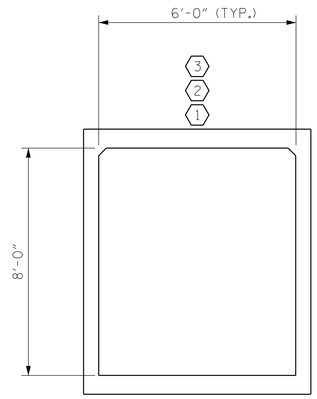
(#) CONTROLLING LOAD RATING

(1) DESIGN LOAD RATING (HL-93)

(2) DESIGN LOAD RATING (HS-20)

(3) LEGAL LOAD RATING **

** SEE CHART FOR VEHICLE TYPE



LRFR SUMMARY

PROJECT NO. R-5020B

COLUMBUS COUNTY

STATION: 172+34.91 -L-

SHEET 2 OF 4

DESIGN ENGINEER OF RECORD: DocuSigned by: DB3C8E45B06D499... DATE : 1/27/2020

DRAWN BY : R. A. PRUETT DATE : 11/15/18

CHECKED BY : R. C. LARSON DATE : 11/15/18

DocuSigned by: DB3C8E45B06D499...

NORTH CAROLINA PROFESSIONAL SEAL 14114 ENGINEER ROBERT C. LARSON

1/27/2020

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ENGINEERS ★ PLANNERS ★ SCIENTISTS ★ CONSTRUCTION MANAGERS LICENSE NUMBER: C-0764

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

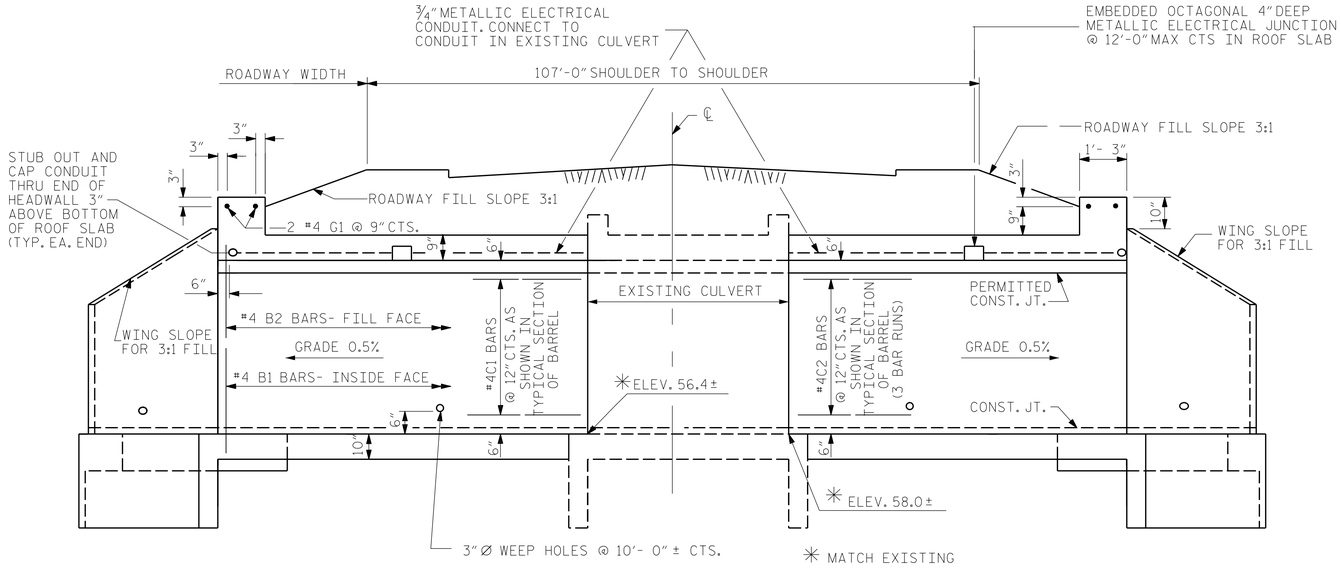
STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

RALEIGH

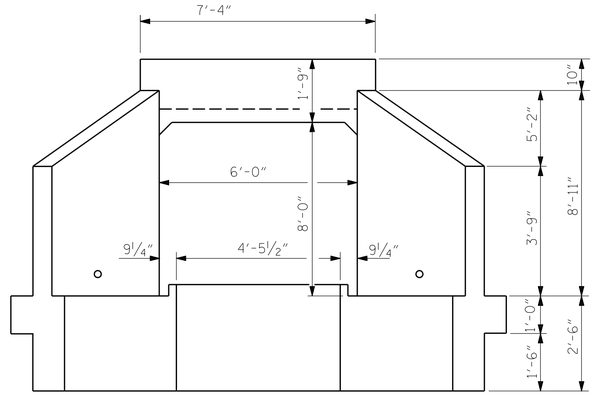
LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

(NON-INTERSTATE TRAFFIC)

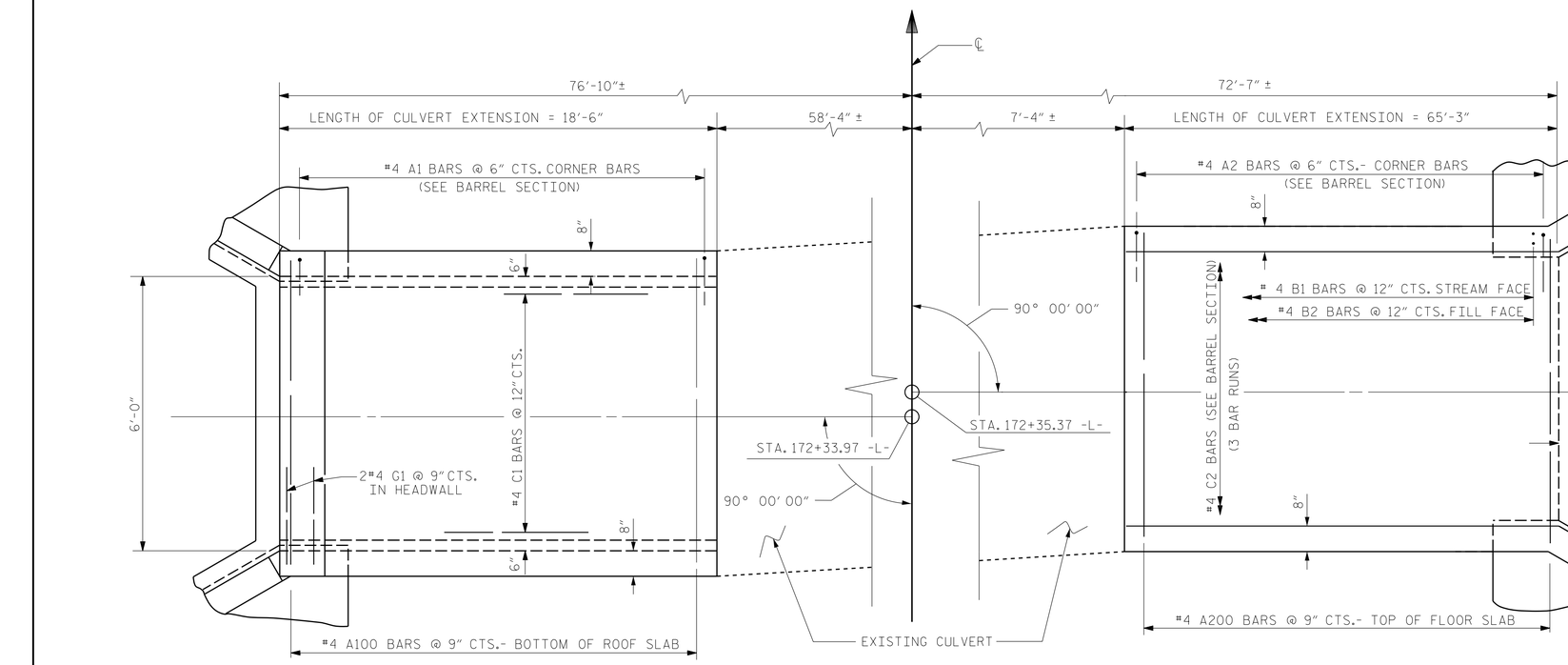


CULVERT SECTION NORMAL TO ROADWAY

CONDUIT SYSTEM NOTE:
PROVIDE ELECTRICAL CONDUIT SYSTEM FOR FUTURE LIGHTING AS SHOWN. ALL WORK TO BE IN ACCORDANCE WITH CURRENT NATIONAL ELECTRICAL CODE. KEEP JUNCTION BOXES FREE OF CONRETE AND PROVIDE BLANK COVERS. THE SYSTEM IS CONSIDERED INCIDENTAL TO CONSTRUCTION OF THE CULVERT AND NO SEPARATE PAYMENT WILL BE MADE FOR THIS WORK.

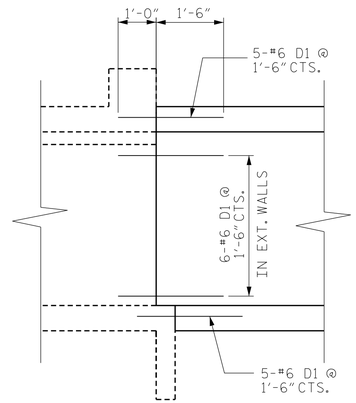


END ELEVATION



PART PLAN ROOF SLAB

PART PLAN FLOOR SLAB



CONNECTION TO EXISTING CULVERT

PROJECT NO. R-5020B
COLUMBUS COUNTY
STATION: 172+34.91 -L-

SHEET 3 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL SINGLE 6 FT. X 8 FT. CONCRETE PEDESTRIAN BOX CULVERT

DocuSigned by: DB3C8E45B06D499...
NORTH CAROLINA PROFESSIONAL SEAL 14114 ENGINEER ROBERT C. LARSON
1/27/2020

DESIGN ENGINEER OF RECORD: DocuSigned by: DB3C8E45B06D499... DATE: 1/27/2020
DRAWN BY: K. SU DATE: 10/01/18
CHECKED BY: R. A. PRUETT DATE: 11/07/18

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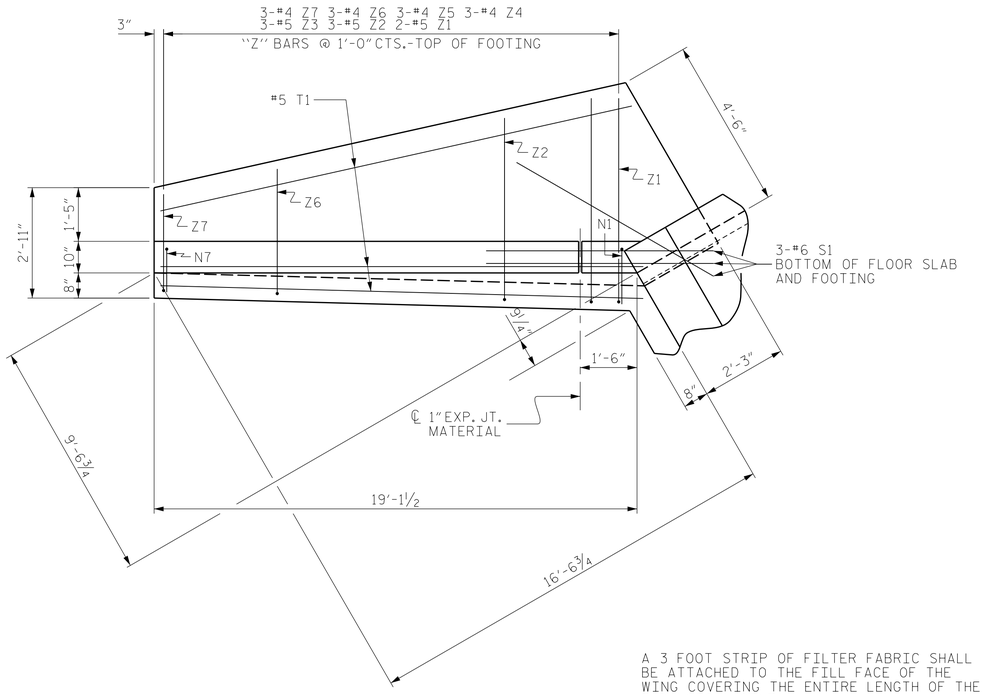
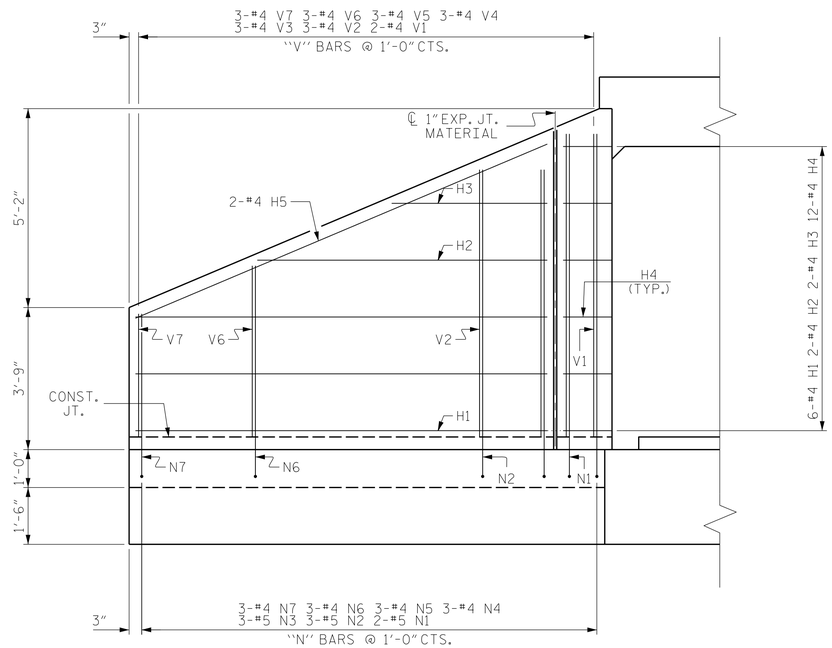
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-3
1			3			TOTAL SHEETS
2			4			4

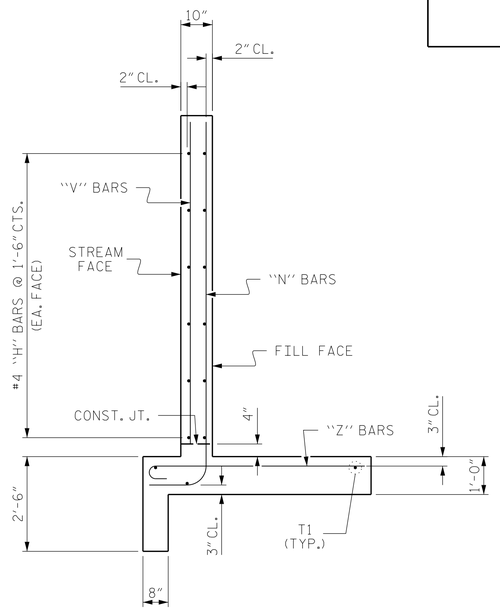


PLAN

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.



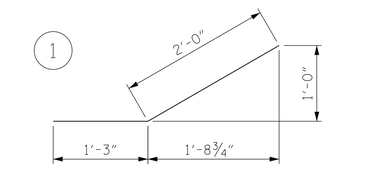
ELEVATION

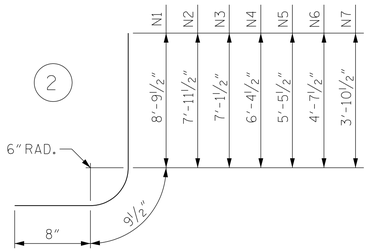


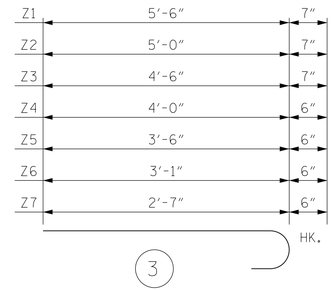
TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.







BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	24	#4	STR	17'-3"	277
H2	8	#4	STR	11'-11"	64
H3	8	#4	STR	6'-5"	34
H4	48	#4	1	3'-3"	104
H5	8	#4	STR	19'-5"	104
N1	8	#5	2	10'-3"	86
N2	12	#5	2	9'-5"	118
N3	12	#5	2	8'-7"	107
N4	12	#4	2	7'-10"	63
N5	12	#4	2	6'-11"	55
N6	12	#4	2	6'-1"	49
N7	12	#4	2	5'-4"	43
S1	12	#6	STR	6'-0"	108
T1	12	#5	STR	19'-0"	238
V1	8	#4	STR	8'-3"	44
V2	12	#4	STR	7'-5"	59
V3	12	#4	STR	6'-7"	53
V4	12	#4	STR	5'-10"	47
V5	12	#4	STR	4'-11"	39
V6	12	#4	STR	4'-1"	33
V7	12	#4	STR	3'-4"	27
Z1	8	#5	3	6'-1"	51
Z2	12	#5	3	5'-7"	70
Z3	12	#5	3	5'-1"	64
Z4	12	#4	3	4'-6"	36
Z5	12	#4	3	4'-0"	32
Z6	12	#4	3	3'-7"	29
Z7	12	#4	3	3'-1"	25

REINFORCING STEEL
FOR 4 WINGS 2059 LBS

CLASS A CONCRETE
4 WINGS 30.8 CY
2 HEADWALLS 0.7 CY
2 END CURTAIN WALLS 0.6 CY
TOTAL 32.1 CY

PROJECT NO. R-5020B

COLUMBUS COUNTY

STATION: 172+34.91 -L-

SHEET 4 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR CONCRETE BOX CULVERT

H = 8'-0" SLOPE = 3:1
90° SKEW

DocuSigned by: DB3C8E45B06D499...
NORTH CAROLINA PROFESSIONAL SEAL 14114 ENGINEER ROBERT C. LARSON
1/27/2020

DESIGN ENGINEER OF RECORD: DATE : 1/27/2020
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4505 Falls of Neuse Road, Suite 400 Raleigh, NC 27609-6270 Phone: (919) 783-9214

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