

09.08/99

05-MAY-2021 09:48
M:\2016\1221601889_NCDOT R-5020B US 701 Widening\Structures\Drawings\R-5020B_Rdy_tsh_structures.dgn
\$\$\$\$\$SERVNAME\$\$\$\$\$

TIP PROJECT: R-5020B

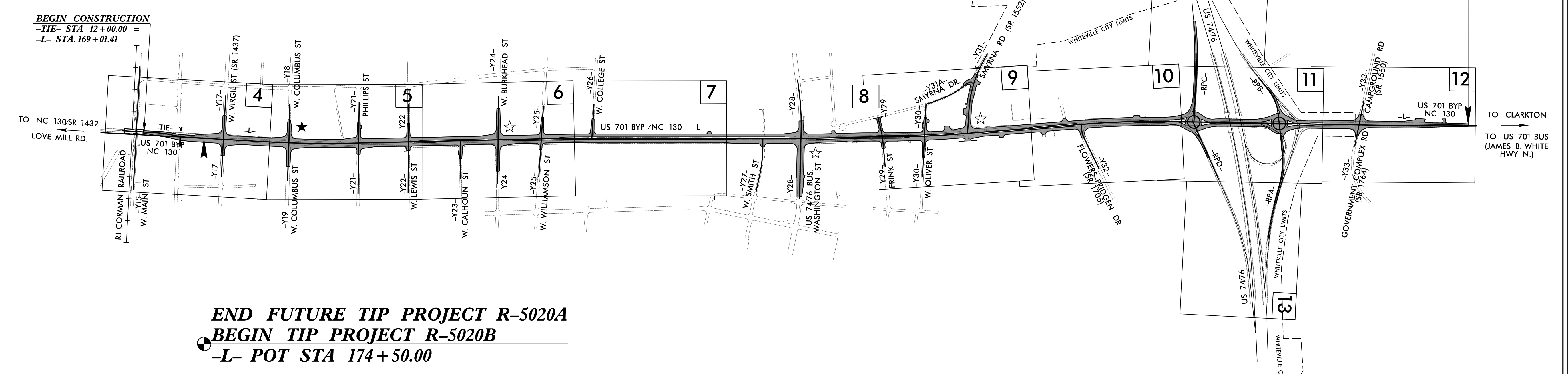
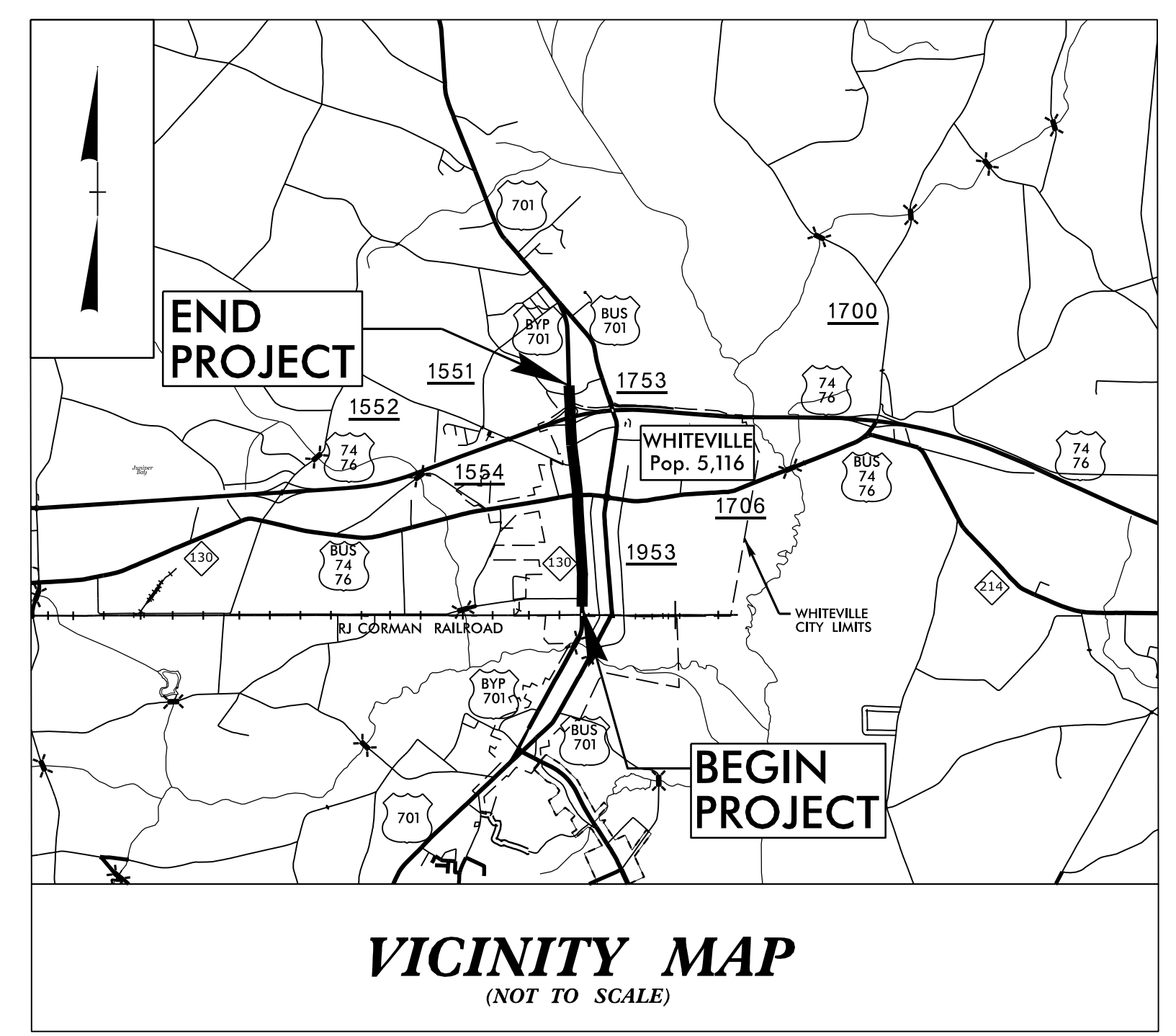
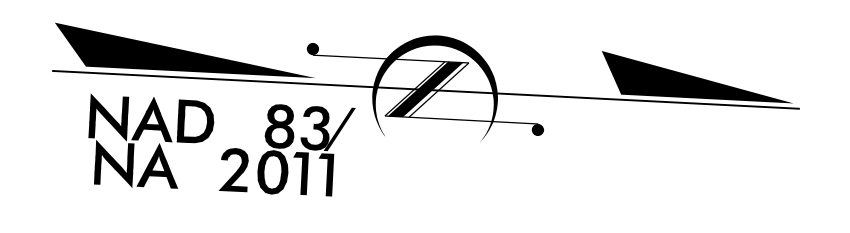
CONTRACT: C204469

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 7476**

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



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

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
 FEBRUARY 16, 2018

LETTING DATE:
 AUGUST 17, 2021

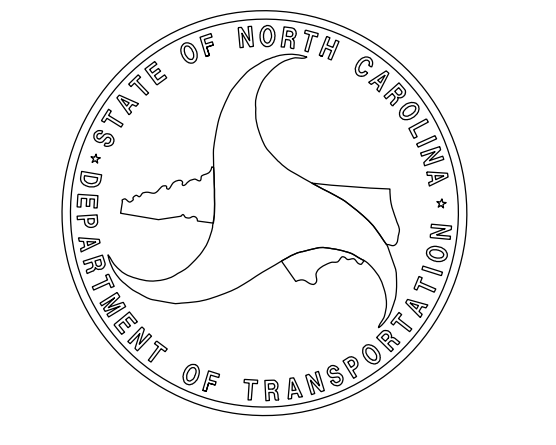
NCDOT CONTACT: DAVID STUTTS, P.E.
 STRUCTURES MANAGEMENT UNIT

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

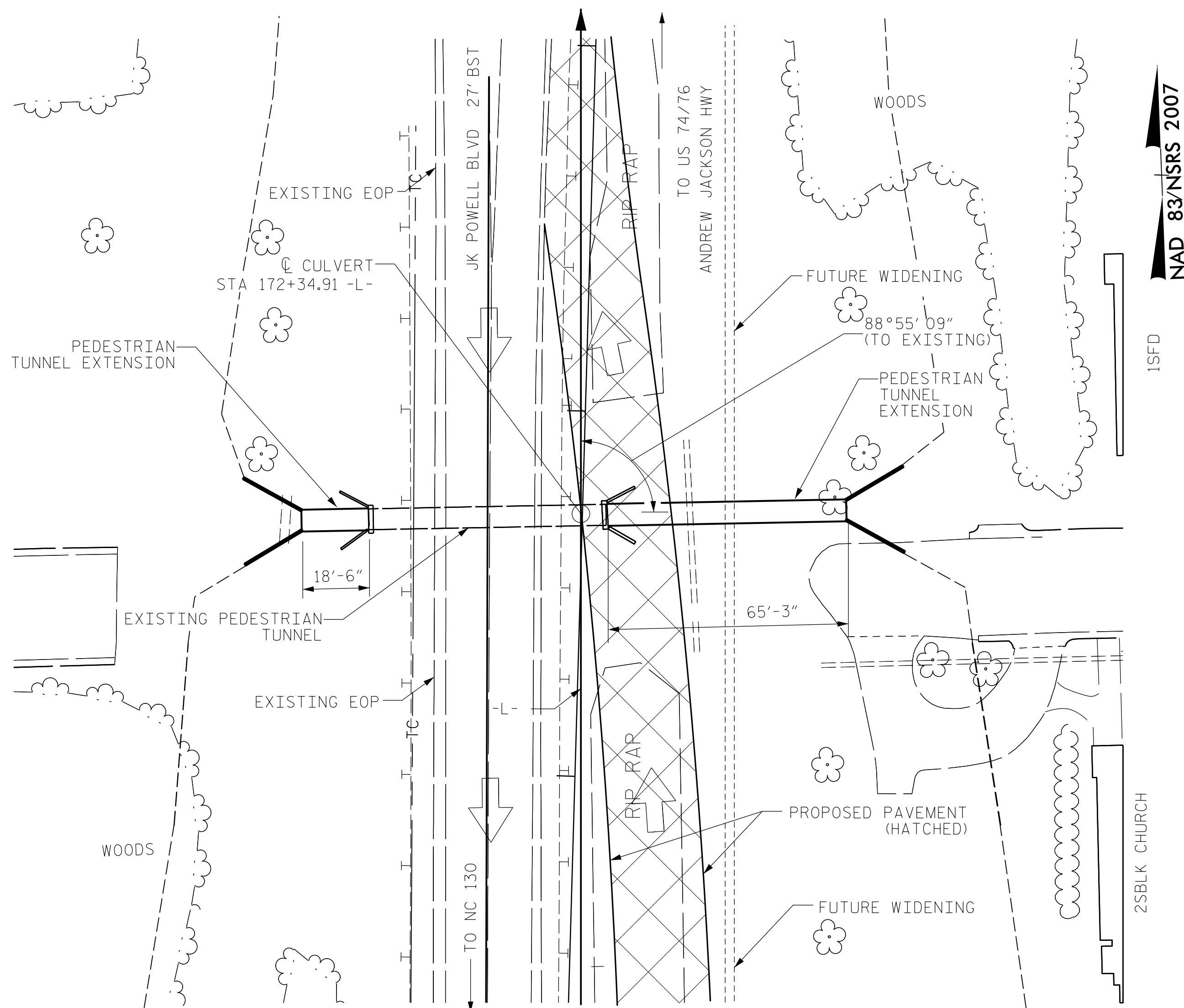
ELIZABETH R. PHIPPS, P.E.
 PROJECT ENGINEER

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

**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**



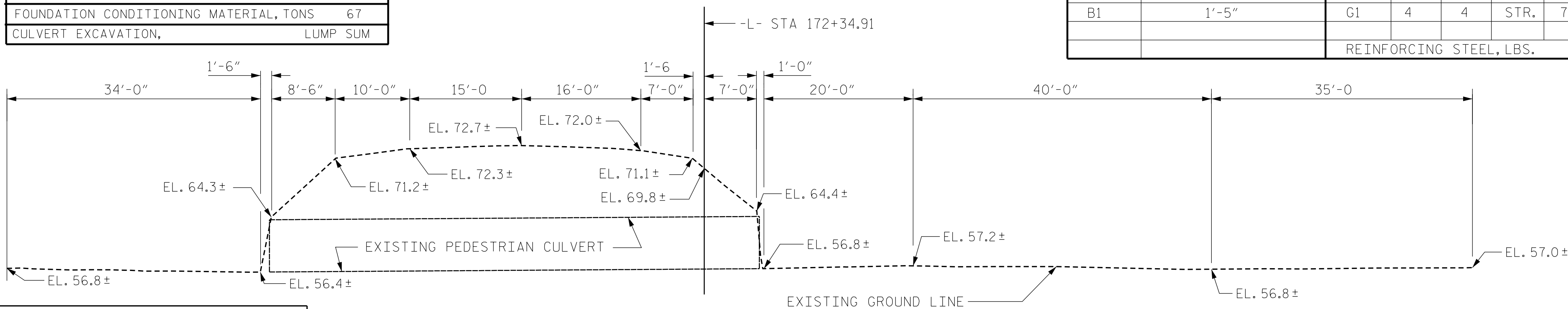
BENCHMARK: BM3 RR SPIKE IN 18" PINE -L- STATION 114+31.86 52.89 RIGHT ELEVATION 52.04



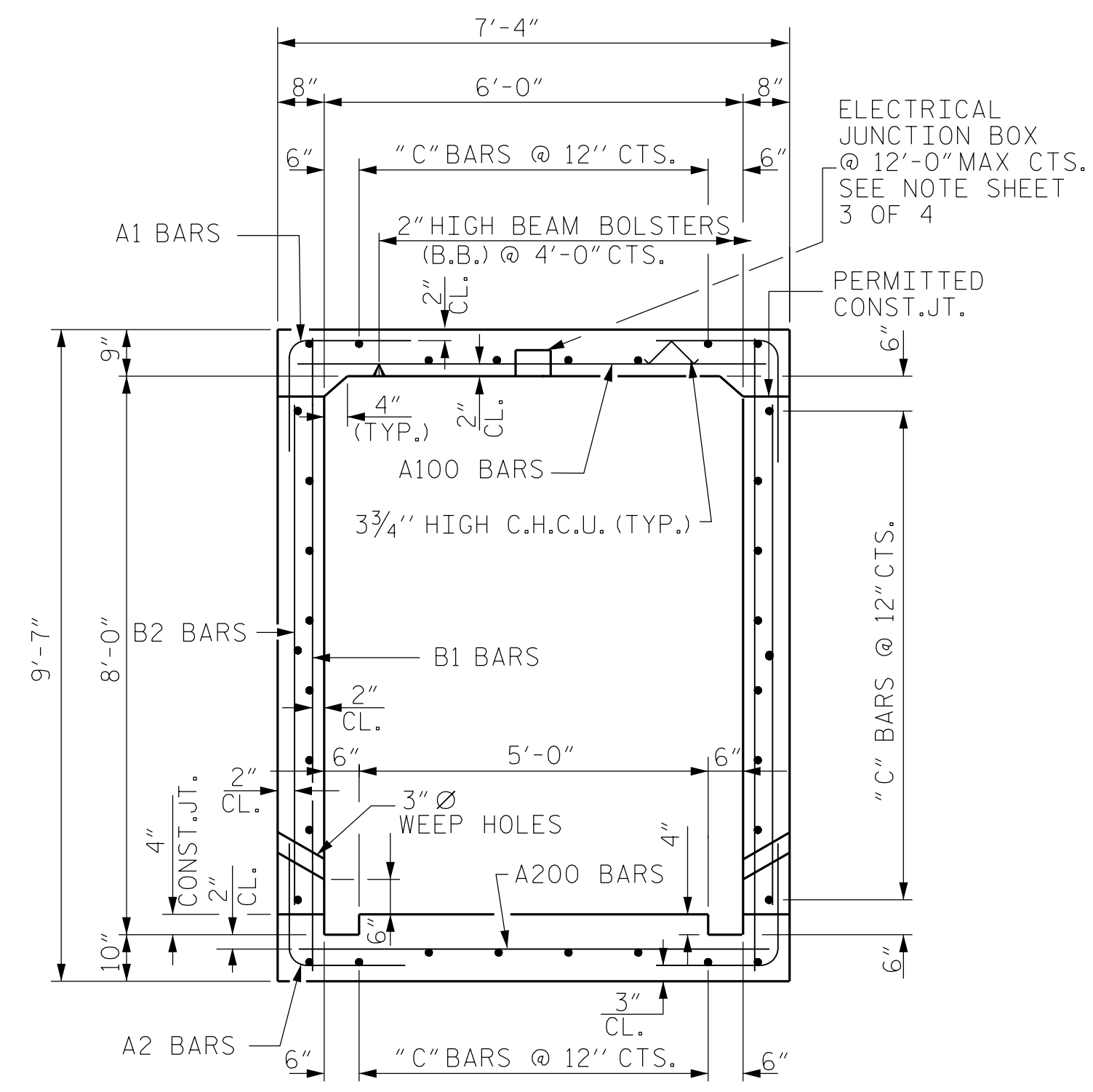
FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS

LOCATION SKETCH

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			



PROFILE ALONG CULVERT

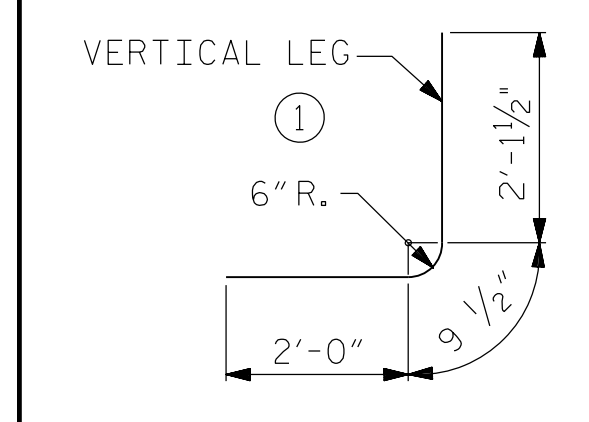


RIGHT ANGLE SECTION OF BARREL

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

BAR TYPES		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	



DIMENSIONS ARE OUT TO OUT

SPLICE LENGTHS

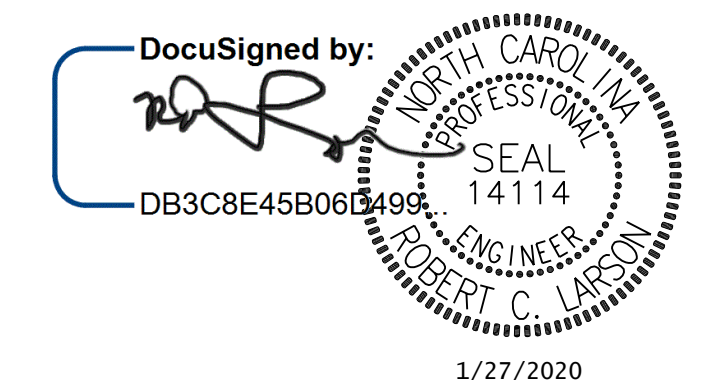
BAR	SPLICE LENGTH
C1, C2	1'-11"
B1	1'-5"

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:
 - WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
 - 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.

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: RCL DATE: 1/27/2020
 DRAWN BY: K. SU DATE: 10/01/18
 CHECKED BY: R. A. PRUETT DATE: 03/29/19

**DOCUMENT NOT CONSIDERED FINAL
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NO.	BY:	DATE:	NO.	BY:	DATE:	SHEET NO.
1			3			C - 1
2			4			TOTAL SHEETS 4

ENGINEERS • PLANNERS • SCIENTISTS • CONSTRUCTION MANAGERS LICENSE NUMBER: C-0764
KCI Associates
 of North Carolina, P.A.
 6505 Falls of Neuse Road, Suite 400 Raleigh, NC 27609-6270 Phone 919-783-924

**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 (QL)	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 (TTS)	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:

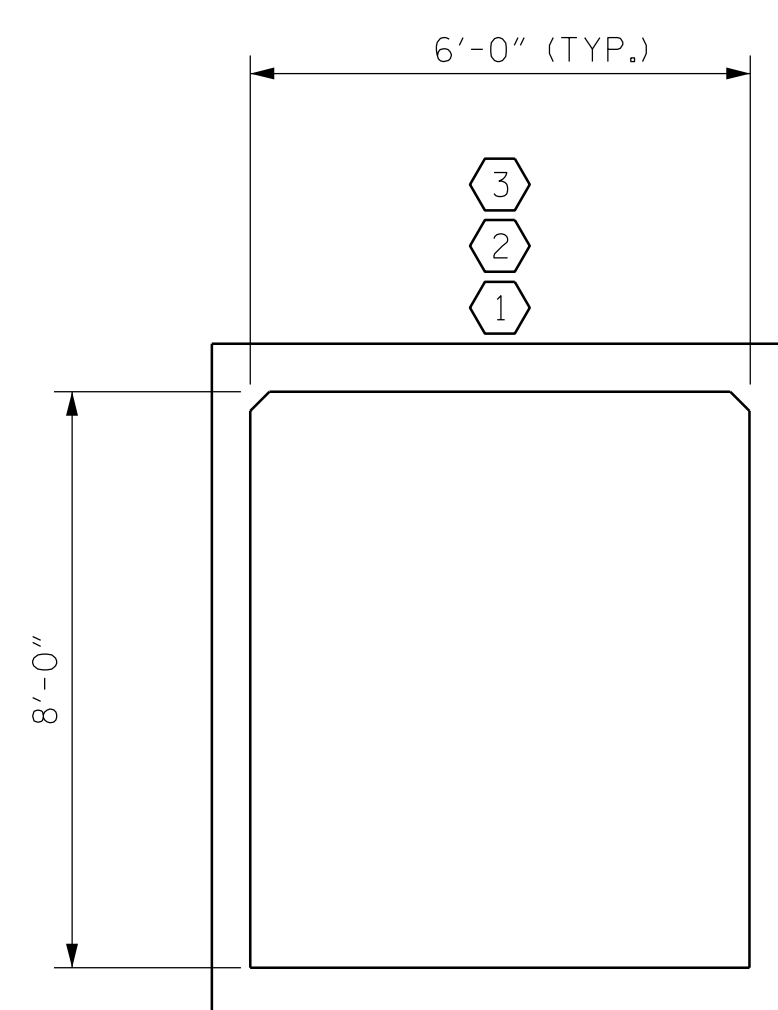
DESIGN LOAD RATING FACTORS

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	



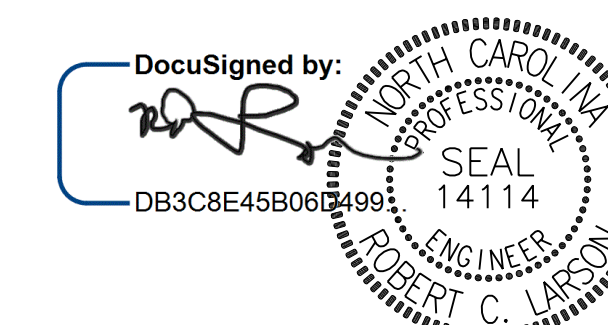
LRFR SUMMARY

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

SHEET 2 OF 4

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

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

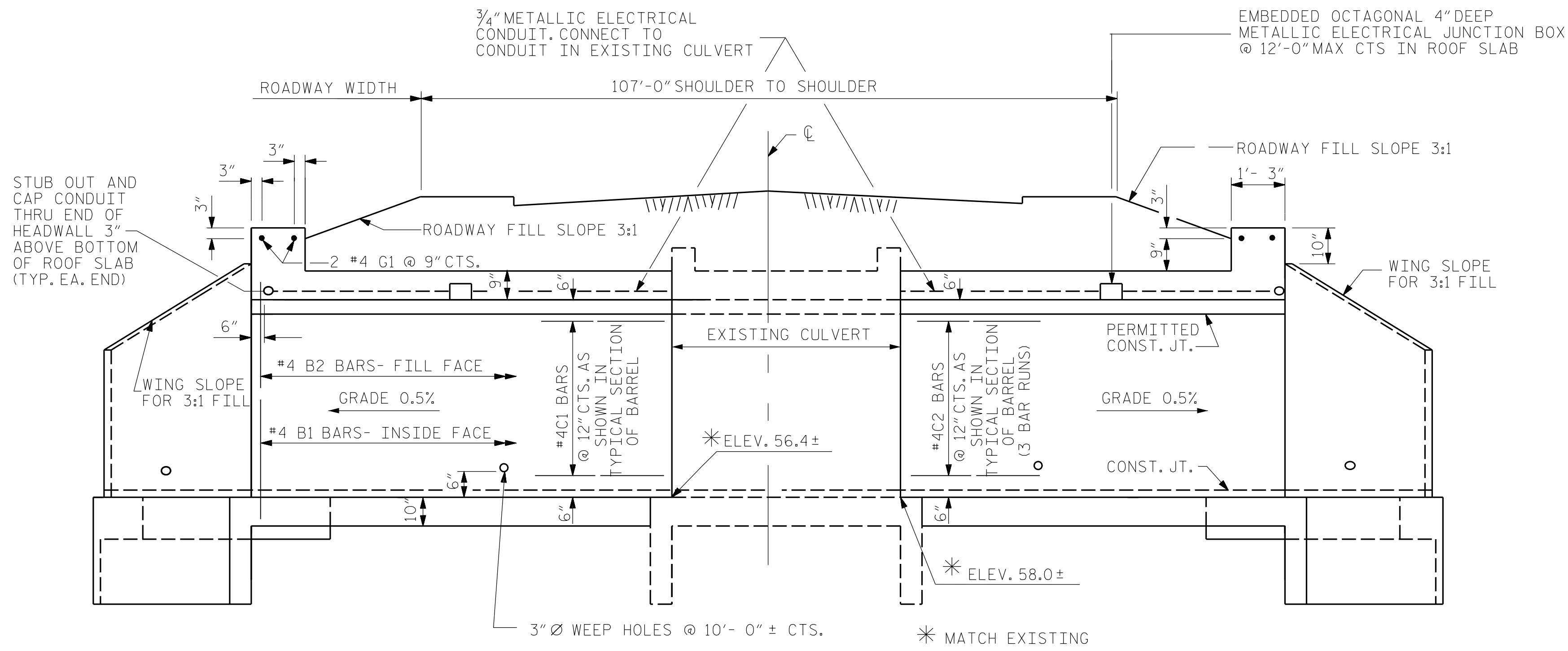


DESIGN ENGINEER OF RECORD: R. C. LARSON DATE: 1/27/2020
 DRAWN BY: R. A. PRUETT DATE: 11/15/18
 CHECKED BY: R. C. LARSON DATE: 11/15/18

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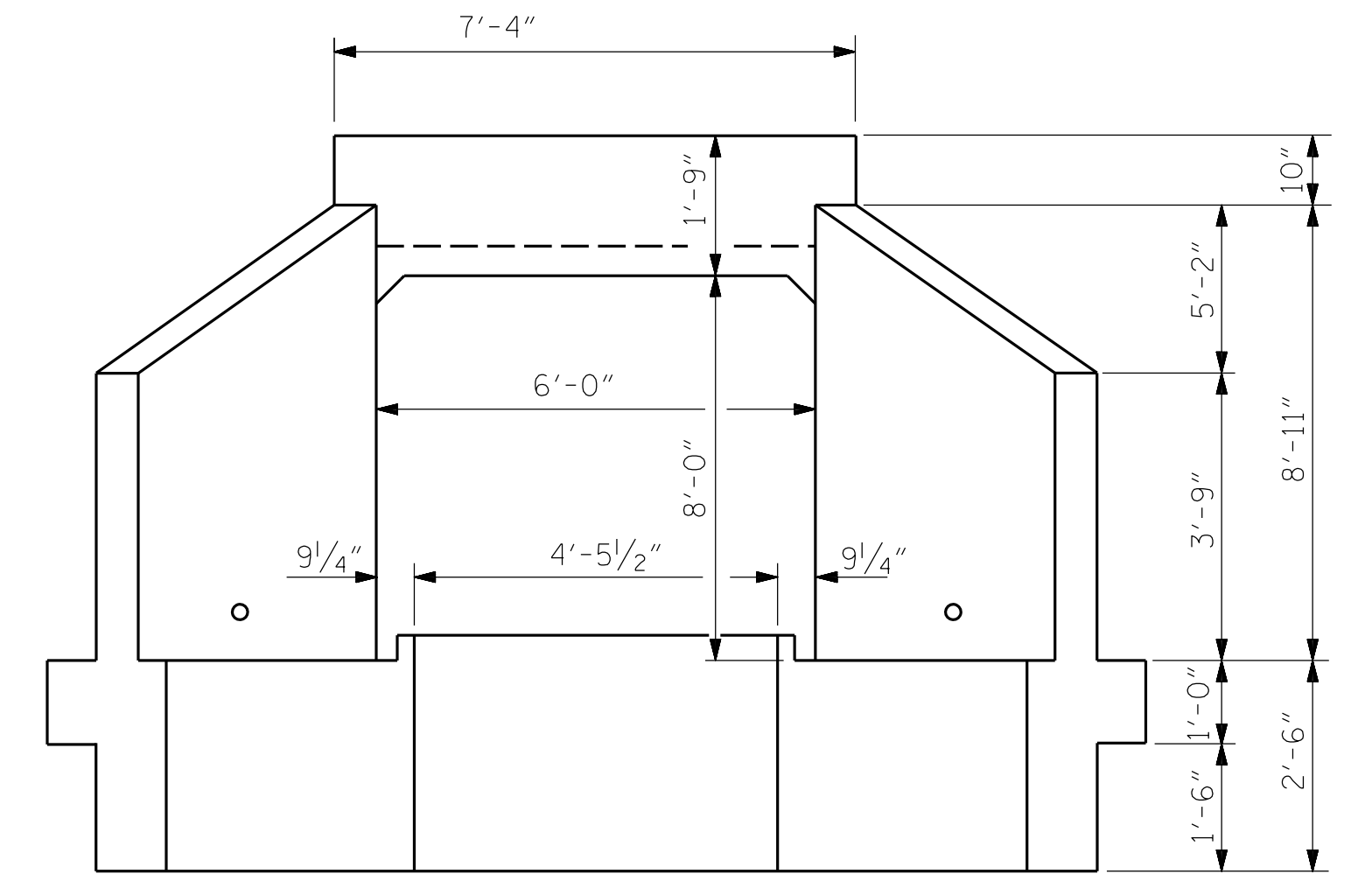
KCI Associates
 of North Carolina, P.A.
2505 Falls of Neuse Road, Suite 400 Raleigh, NC 27609-6270 Phone 919-783-924

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

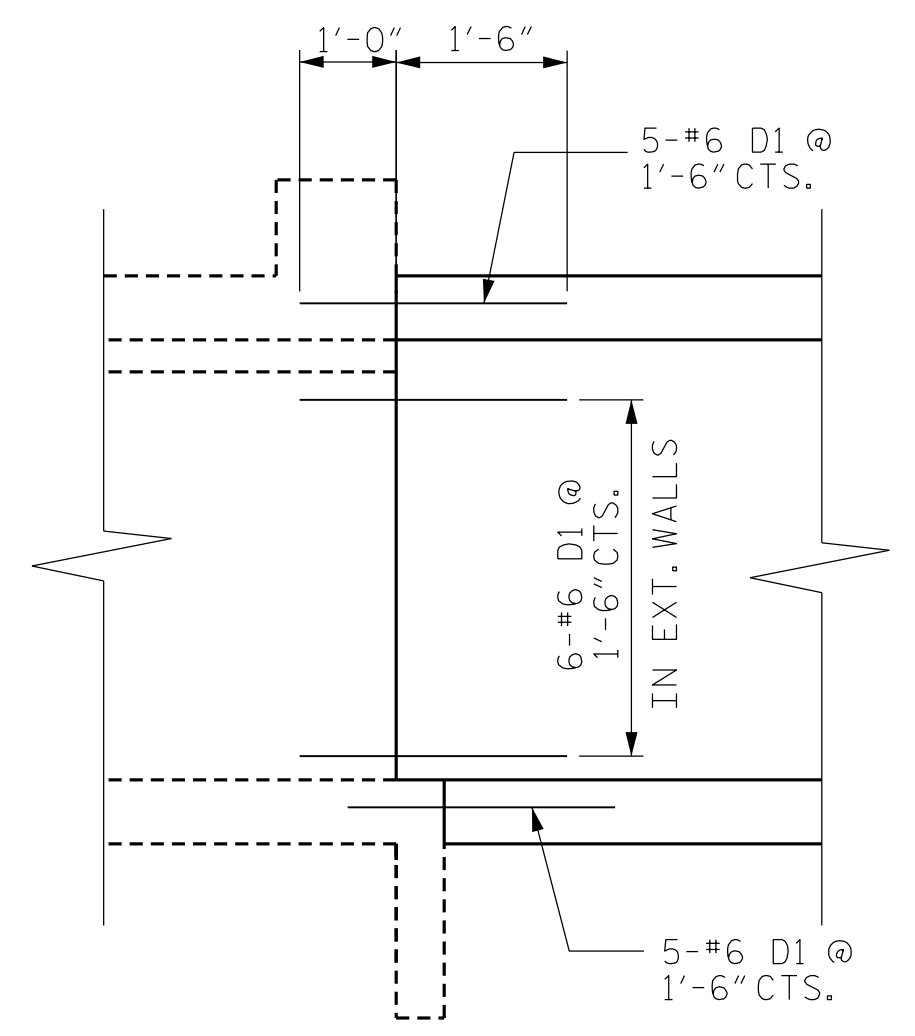


CULVERT SECTION NORMAL TO ROADWAY

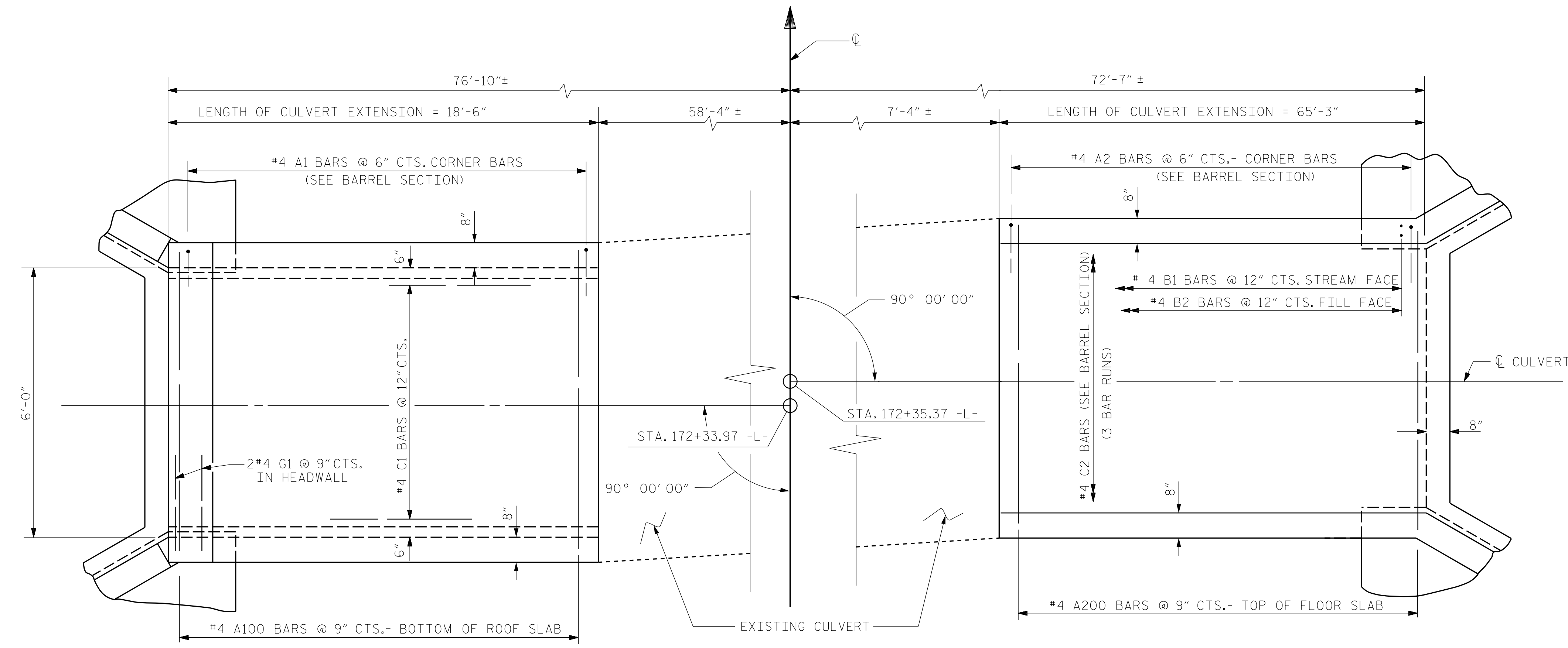
CONDUIT SYSTEM NOTE:
 PROVIDE ELECTRICAL CONDUIT SYSTEM FOR FUTURE LIGHTING AS SHOWN.
 ALL WORK TO BE IN ACCORDANCE WITH CURRENT NATIONAL ELECTRICAL
 CODE. KEEP JUNCTION BOXES FREE OF CONCRETE AND PROVIDE BLANK COVERS.
 THE SYSTEM IS CONSIDERED INCIDENTAL TO CONSTRUCTION OF THE CULVERT
 AND NO SEPARATE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



END ELEVATION



CONNECTION TO EXISTING CULVERT



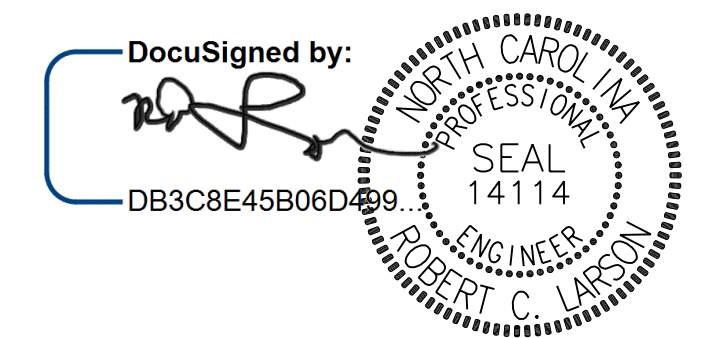
PART PLAN ROOF SLAB

PART PLAN FLOOR SLAB

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



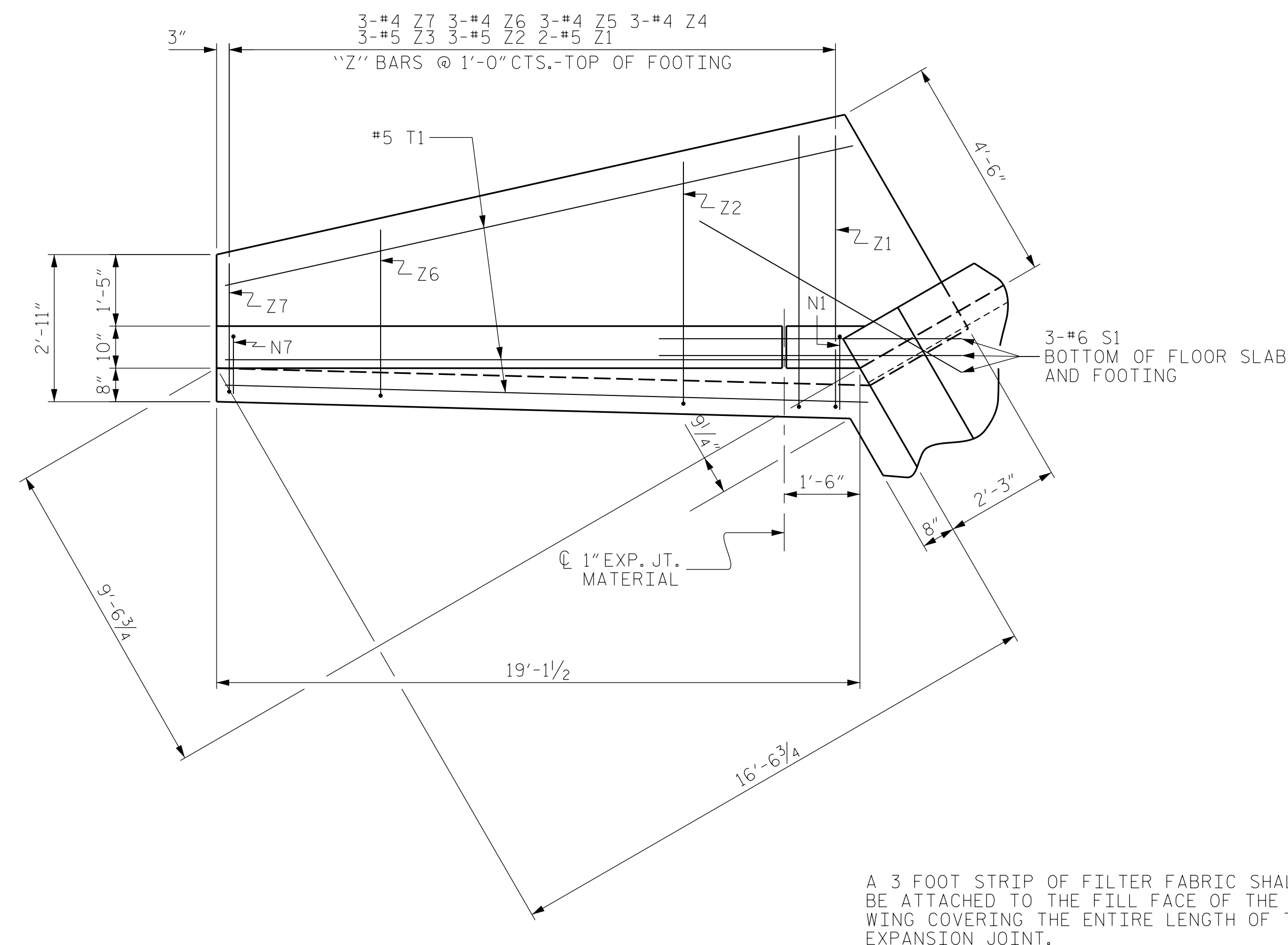
DESIGN ENGINEER OF RECORD: DATE: 1/27/2020
 DRAWN BY: K. SU DATE: 10/01/18
 CHECKED BY: R. A. PRUETT DATE: 11/07/18

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

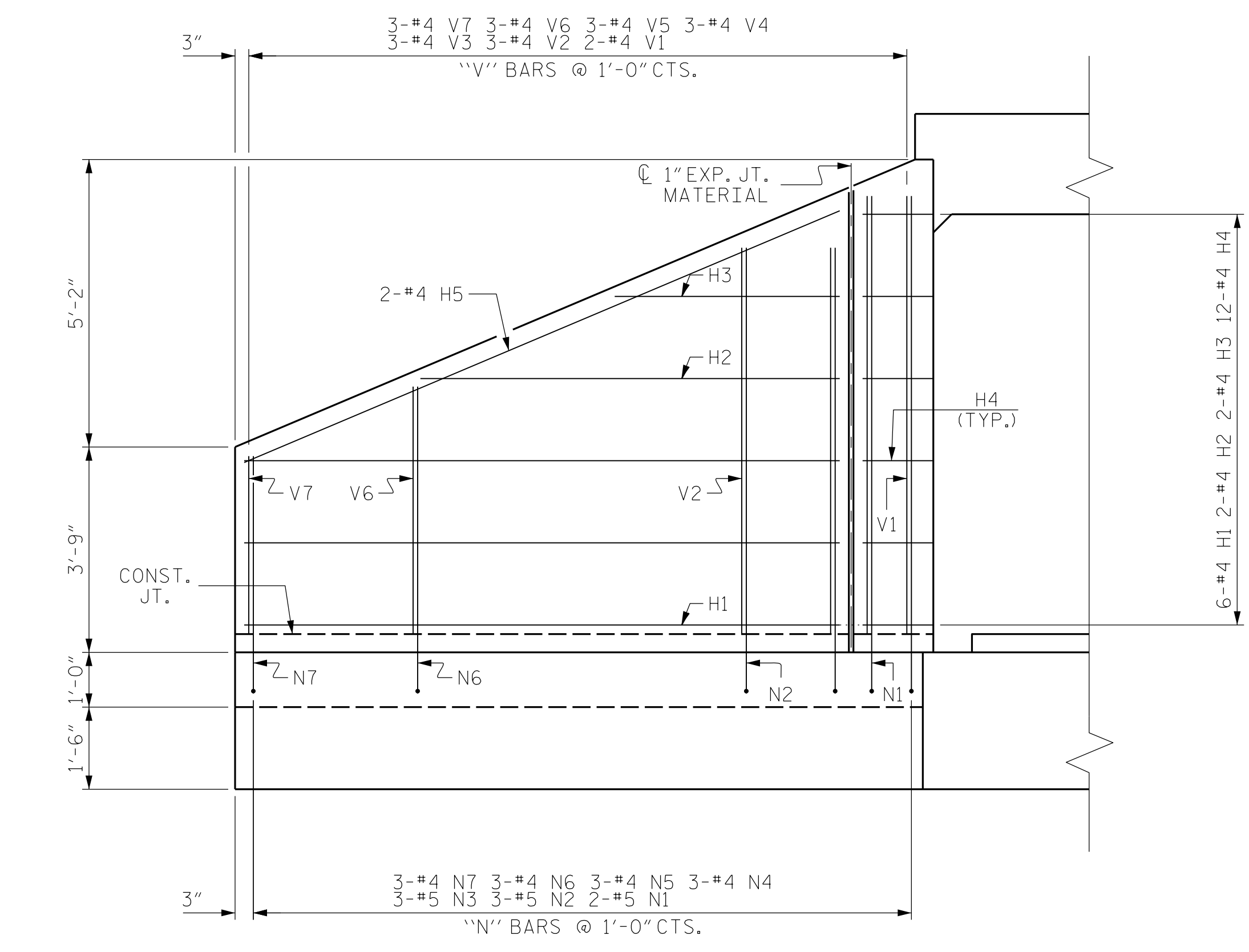
SHEET NO. C-3
 TOTAL SHEETS 4

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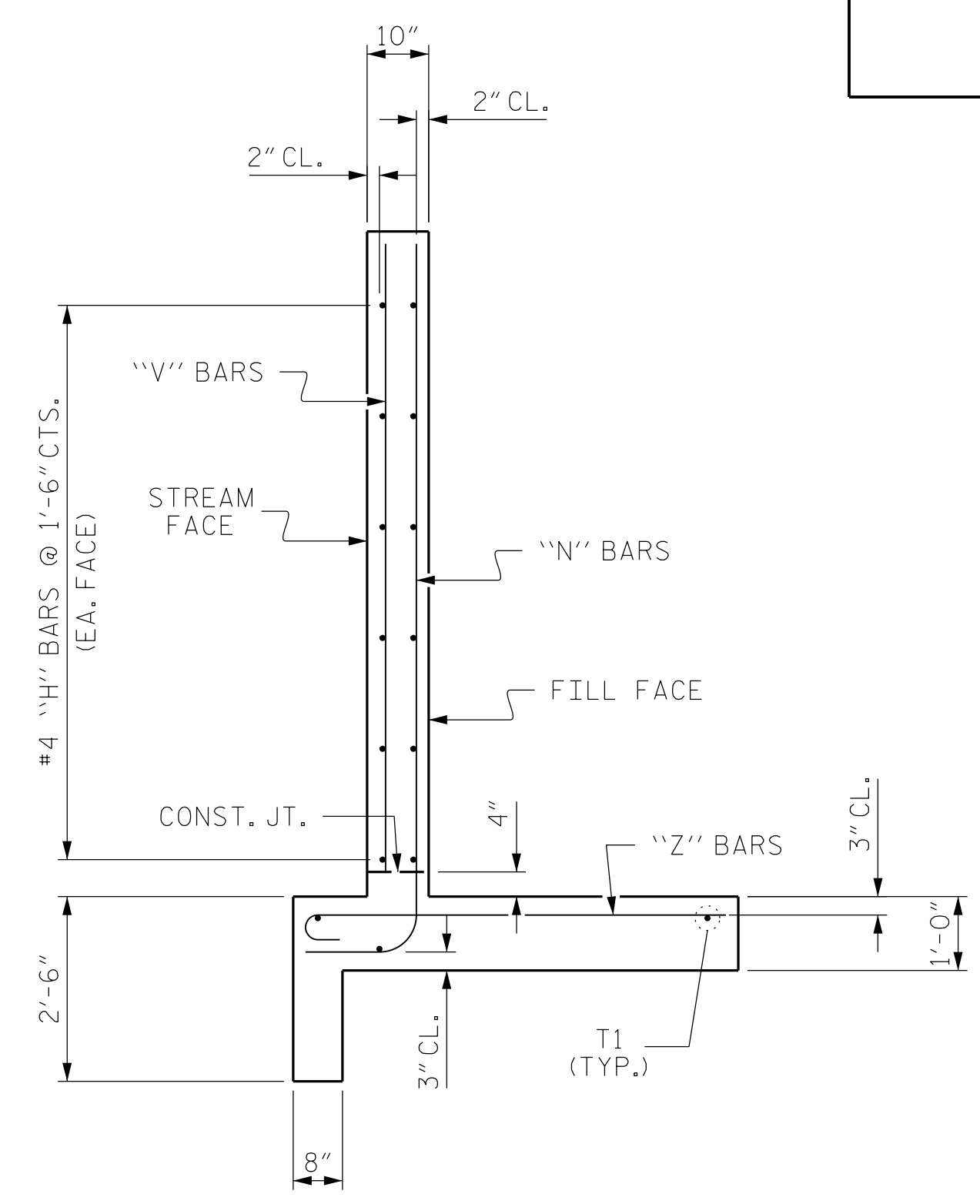


PLAN

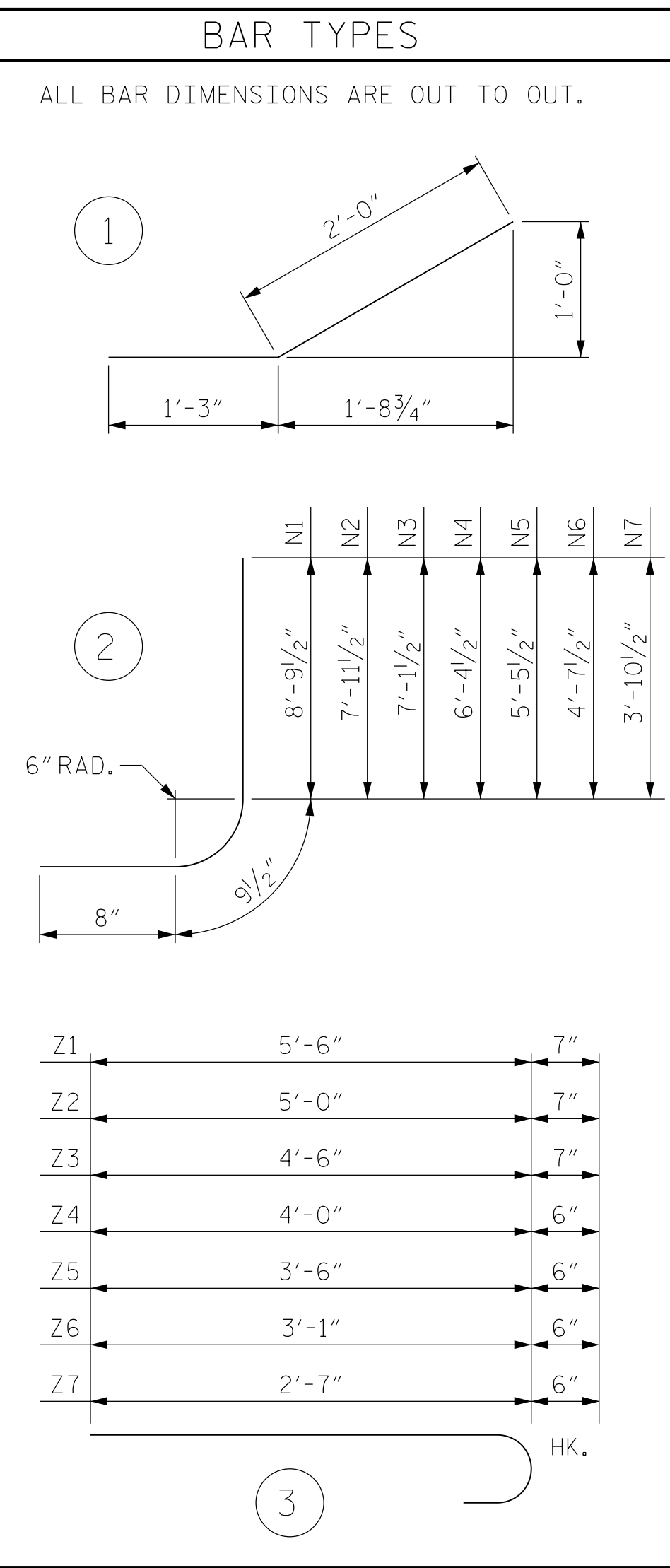
A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.



ELEVATION

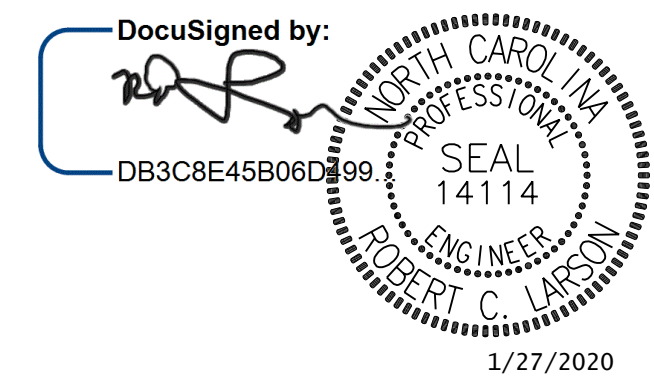


TYPICAL WING SECTION



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



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

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 WINGS FOR CONCRETE BOX CULVERT
 H = 8'-0" SLOPE = 3:1
 90° SKEW

DESIGN ENGINEER OF RECORD: DATE: 1/27/2020
 DRAWN BY: K. SU DATE: 10/07/18
 CHECKED BY: R. C. LARSON DATE: 03/27/19

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KCI Associates of North Carolina, P.A.
 ENGINEERS • PLANNERS • SCIENTISTS • CONSTRUCTION MANAGERS LICENSE NUMBER: C-0764
 4505 Falls of Neuse Road, Suite 400 Raleigh, NC 27609-6270 Phone (919) 783-9014

SHEET NO. C-4
 TOTAL SHEETS 4