09/08/99

TIP PROJECT: W-5601EY

CONTRACT: C204987

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

WAKE COUNTY

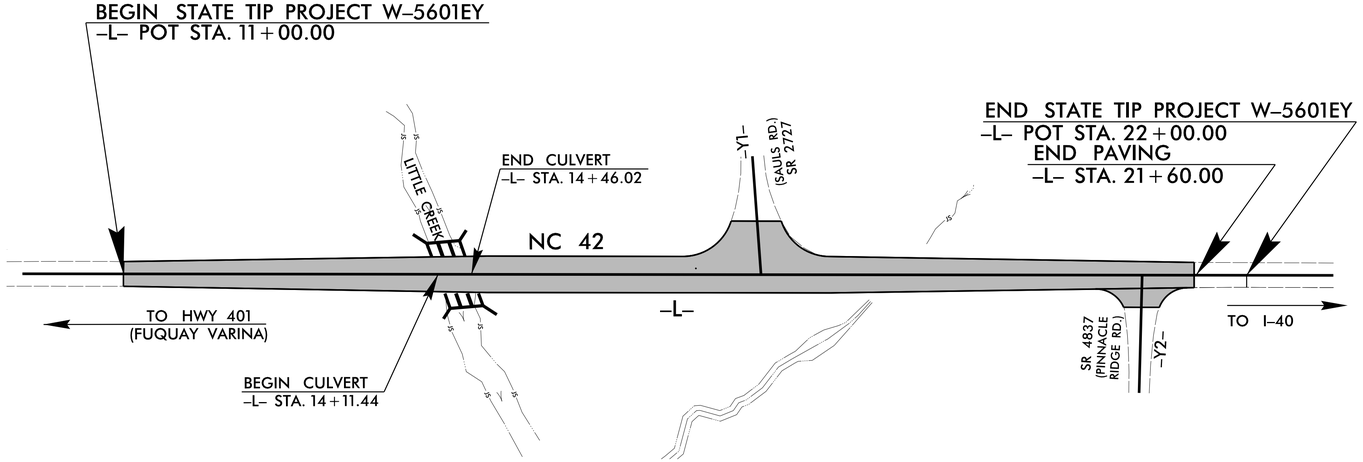
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	W-5601EY	1	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
	W-5601EX	
50138.1.155	HSIP-0042(66)	PE
50138.2.155	HSIP-0042(66)	R/W & UTIL.
50138.3.155	HSIP-0042(66)	CONST.
	W-5601EY	
50138.1.156	HSIP-0042(67)	PE
50138.2.155	HSIP-0042(66)	R/W & UTIL.

LOCATION: CONSTRUCT AN EASTBOUND LEFT TURN LANE ON NC 42 AT THE SAULS ROAD (SR 2727) INTERSECTION.

TYPE OF WORK: GRADING, DRAINAGE, PAVING AND CULVERT

NAD 83
NA 2011



STRUCTURES

NOTE: W-5601EY WAS DELETED. THE WORK FROM W-5601EY WAS INCORPORATED INTO W-5601EX.

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

DESIGN DATA

ADT 2022 = 14,900
ADT 2042 = 22,000

V = 60 MPH

FUNC CLASS =
MINOR ARTERIAL

REGIONAL TIER

PROJECT LENGTH

LENGTH OF ROADWAY TIP PROJECT W-5601EY = .208 MILES

NORTH CAROLINA PROFESSIONAL SEAL 36321 ENGINEER ROBERT F. DECOLA

DocuSigned by:
Robert Decola
C918186E8951B4FF...
9/18/2024

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
www.kci.com

2024 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
AUGUST 19, 2019

LETTING DATE:
NOVEMBER 19, 2024

Plans Prepared For:

NCDOT DIVISION 5
2612 N. Duke St.
Durham NC, 27704

CHARLES L. FLOWE, P.E.
PROJECT ENGINEER

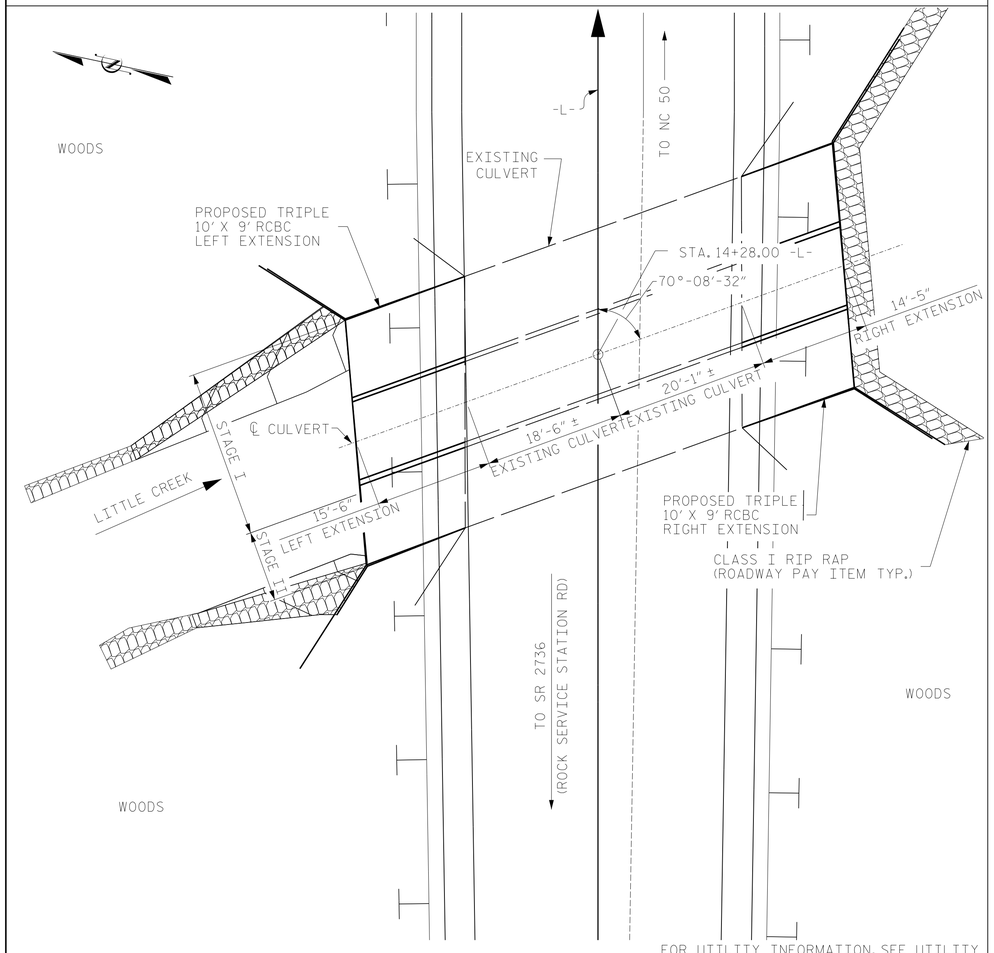
BRYAN E. HOUGH, P.E.
PROJECT DESIGN ENGINEER

NCDOT CONTACT: ***STEPHEN R. DAVIDSON, PE***
DIVISION DESIGN ENGINEER - DIVISION 5

8:28:34 AM
000_W560IEY_SMU_CU_TSH.dgn
Division:

FA PROJECT # HSIP-0042(066)

BM #1 - YELLOW BENCH TIE IN 16" OAK TREE STA. 14+13.75 -L-, 87.06' LT EL = 231.12' N 669941 E 2108509



LOCATION SKETCH

ROADWAY DATA

GRADE POINT ELEV @ STA. 14+28.00 -L- = 234.90
BED ELEV @ STA. 14+28.00 -L- = 222.75
ROADWAY SLOPES = 2:1

HYDRAULIC DATA

DESIGN DISCHARGE	= 1,300 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YRS
DESIGN HIGH WATER ELEVATION	= 229.00
DRAINAGE AREA	= 9.3 SQ MI.
BASE DISCHARGE (Q100)	= 1,711 CFS
BASE HIGH WATER ELEVATION	= 229.80

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 3,400 CFS
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YRS
OVERTOPPING FLOOD ELEVATION	= 234.90

I HEARBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

NOTES:

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

DESIGN FILL---------- 3.2'

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 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.

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

NO PRECAST REINFORCED BOX CULVERT 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.

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.

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 SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

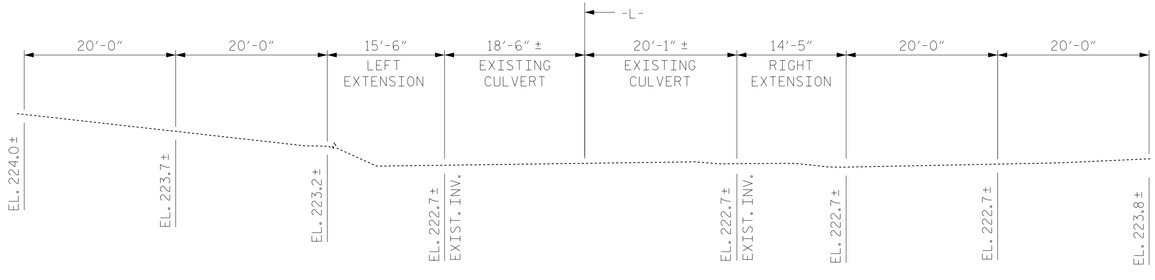
FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

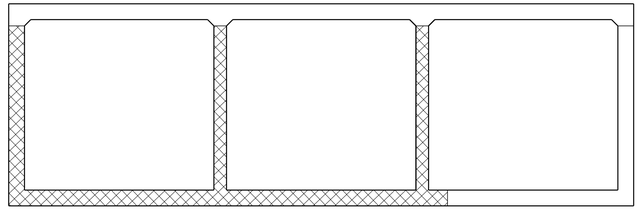
FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.

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 HAS REACHED A MINIMUM COMPRESSIVE STRENGTH OF 1500 PSI (10.3 MPA).



PROFILE ALONG ℄ CULVERT



CONSTRUCTION SEQUENCE

(LOOKING DOWNSTREAM)

PHASE I CONSTRUCTION
PHASE II CONSTRUCTION

PROJECT NO. W-5601EY
WAKE COUNTY
STATION: 14+28.00 -L-
EXTENDS CULVERT NO. 975

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 10 FT. X 9 FT. CONCRETE BOX CULVERT LEFT AND RIGHT EXTENSIONS 70°-08'-32" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 036321 ENGINEER ROBERT F. DECOLA
Robert Decola
9/18/2024

DESIGN ENGINEER OF RECORD: R.F. DECOLA DATE: 02/06/23
DRAWN BY: R.J. FLORY DATE: 05/01/20
CHECKED BY: R.F. DECOLA DATE: 05/02/20

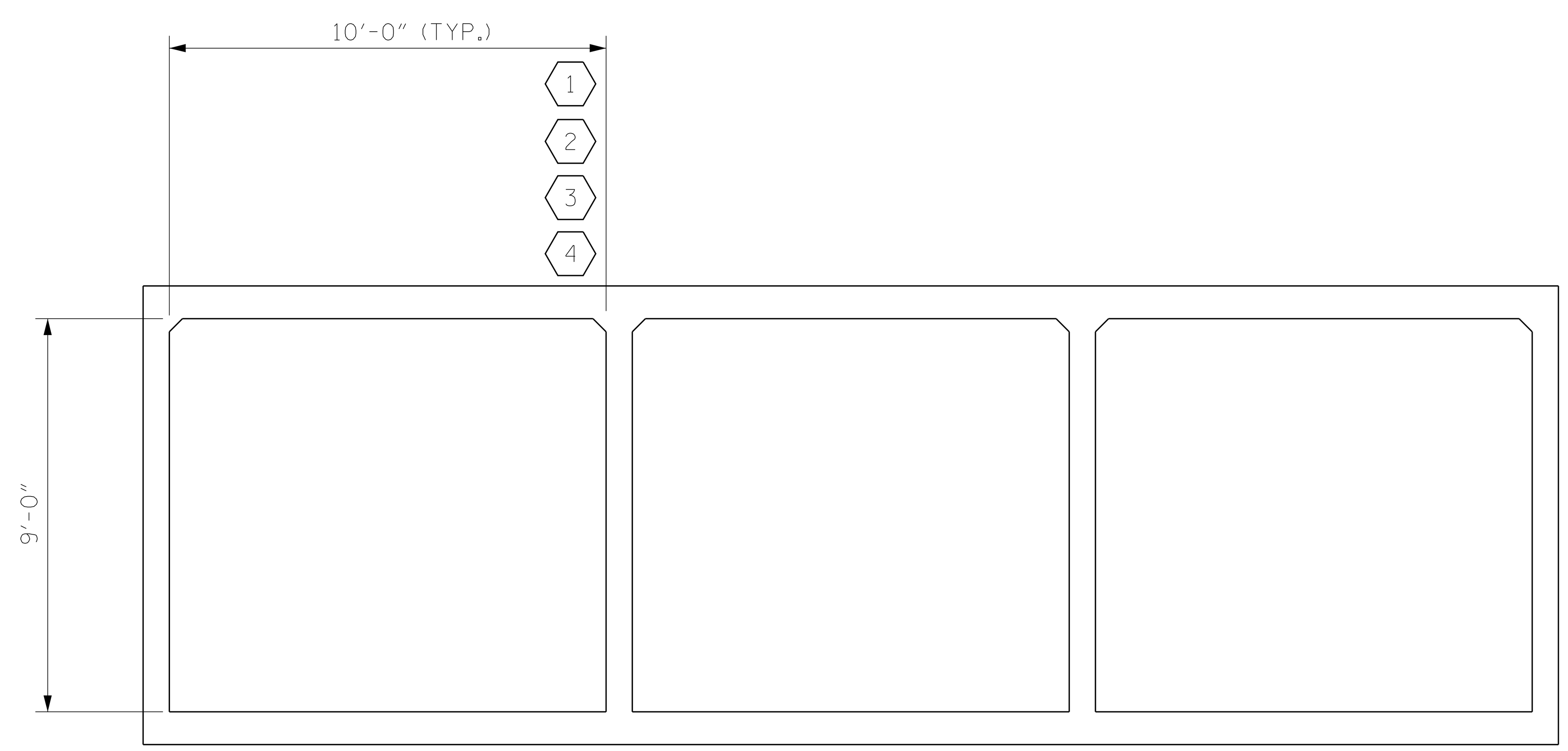
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ENGINEERS • PLANNERS • SCIENTISTS • CONSTRUCTION MANAGERS (NC FIRM 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						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-01
1			3			TOTAL SHEETS
2			4			12

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 × RF	LIVE-LOAD FACTORS (γ_{LL})	STRENGTH I LIMIT STATE — MOMENT: RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	SHEAR: RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	COMMENT NUMBER
DESIGN LOAD RATING		HL-93 (INVENTORY)	N/A	1	1.42	--	1.75	1.49	1	TOP SLAB	5.00	1.42	1	TOP SLAB	10.00	
		HL-93 (OPERATING)	N/A		1.84	--	1.35	1.93	1	TOP SLAB	5.00	1.84	1	TOP SLAB	10.00	
		HS-20 (INVENTORY)	36.000	2	1.42	51.120	1.75	1.49	1	TOP SLAB	5.00	1.42	1	TOP SLAB	10.00	
		HS-20 (OPERATING)	36.000		1.84	66.240	1.35	1.93	1	TOP SLAB	5.00	1.84	1	TOP SLAB	10.00	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		2.84	38.340	1.40	2.84	1	TOP SLAB	5.00	3.45	1	TOP SLAB	10.00	
		SNGARBS2	20.000		2.66	53.200	1.40	2.66	1	TOP SLAB	5.00	3.09	1	TOP SLAB	10.00	
		SNAGRIS2	22.000		2.84	62.480	1.40	2.84	1	TOP SLAB	5.00	3.31	1	TOP SLAB	10.00	
		SNCOTTS3	27.250	3	1.43	38.968	1.40	2.09	1	TOP SLAB	5.00	1.43	1	TOP SLAB	10.00	
		SNAGGRS4	34.925		1.86	64.961	1.40	2.46	1	TOP SLAB	5.00	1.86	1	TOP SLAB	10.00	
		SNS5A	35.550		1.72	61.146	1.40	2.34	1	TOP SLAB	5.00	1.72	1	TOP SLAB	10.00	
		SNS6A	39.950		1.66	66.317	1.40	2.33	1	TOP SLAB	5.00	1.66	1	TOP SLAB	10.00	
		SNS7B	42.000		1.64	68.880	1.40	2.34	1	TOP SLAB	5.00	1.64	1	TOP SLAB	10.00	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.74	90.420	1.40	2.74	1	TOP SLAB	5.00	2.86	1	TOP SLAB	10.00	
		TNT4A	33.075		1.76	58.212	1.40	2.4	1	TOP SLAB	5.00	1.76	1	TOP SLAB	10.00	
		TNT6A	41.600		1.71	71.136	1.40	2.35	1	TOP SLAB	5.00	1.71	1	TOP SLAB	10.00	
		TNT7A	42.000		1.74	73.080	1.40	2.41	1	TOP SLAB	5.00	1.74	1	TOP SLAB	10.00	
		TNT7B	42.000		1.73	72.660	1.40	2.27	1	TOP SLAB	5.00	1.73	1	TOP SLAB	10.00	
		TNAGRIT4	43.000		1.67	71.810	1.40	2.38	1	TOP SLAB	5.00	1.67	1	TOP SLAB	10.00	
		TNAGT5A	45.000		1.72	77.400	1.40	2.46	1	TOP SLAB	5.00	1.72	1	TOP SLAB	10.00	
		TNAGT5B	45.000		1.66	74.700	1.40	2.42	1	TOP SLAB	5.00	1.66	1	TOP SLAB	10.00	
EMERGENCY VEHICLE (EV)		EV2	28.750		1.92	55.140	1.30	1.92	1	TOP SLAB	5.00	1.93	1	TOP SLAB	10.00	
		EV3	43.000		1.04	44.890	1.30	1.68	1	TOP SLAB	5.00	1.04	1	TOP SLAB	10.00	



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 ✱✱
4. EMERGENCY VEHICLE LOAD RATING ✱✱

✱✱ SEE CHART FOR VEHICLE TYPE

PROJECT NO. W-5601EY

WAKE COUNTY

STATION: 14+28.00 -L-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

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

NORTH CAROLINA PROFESSIONAL SEAL 036321 ENGINEER ROBERT F. DECOLA

9/18/2024 Robert Decola

KCI Associates of North Carolina, P.A.

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISIONS							
NO.	BY:	DATE:	NO.	BY:	DATE:	SHEET NO.	C-02
1			3			TOTAL SHEETS	12
2			4				

STD. NO. LRFR5

DESIGN ENGINEER OF RECORD: R. F. DECOLA — DATE: 02/06/23

ASSEMBLED BY: R. J. FLORY — DATE: 05/01/20
CHECKED BY: R. F. DECOLA — DATE: 05/01/20

DRAWN BY: WMC 7/11 — REV. 10/1/11 MAA/GM
CHECKED BY: GM 7/11 — REV. 12/17 MAA/THC

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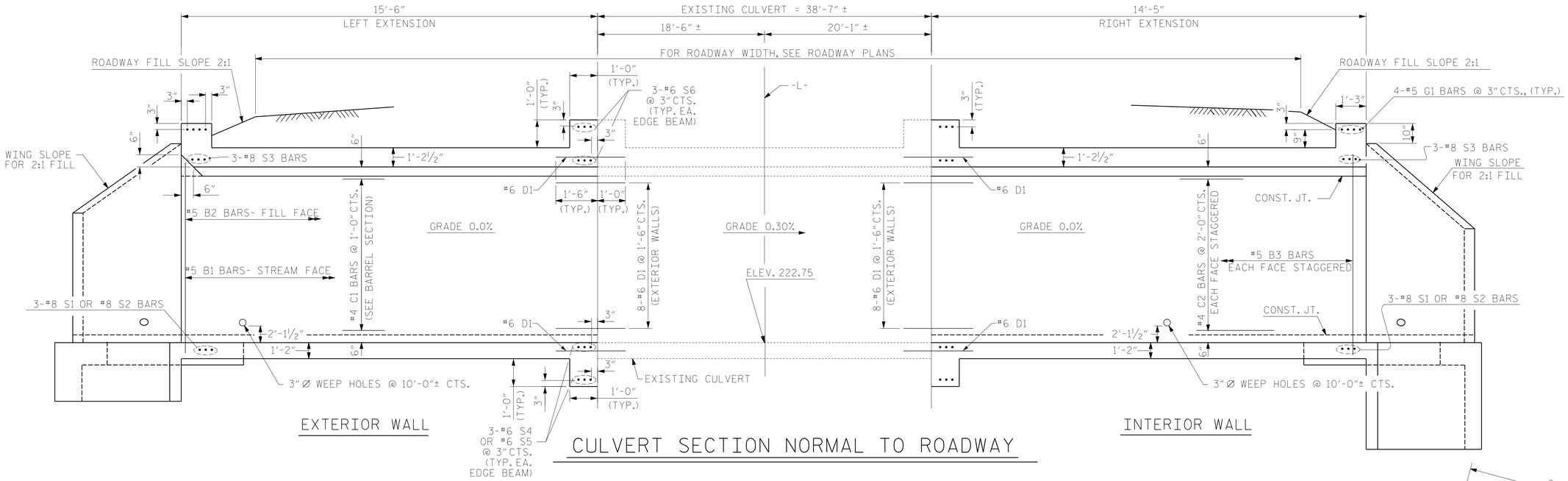

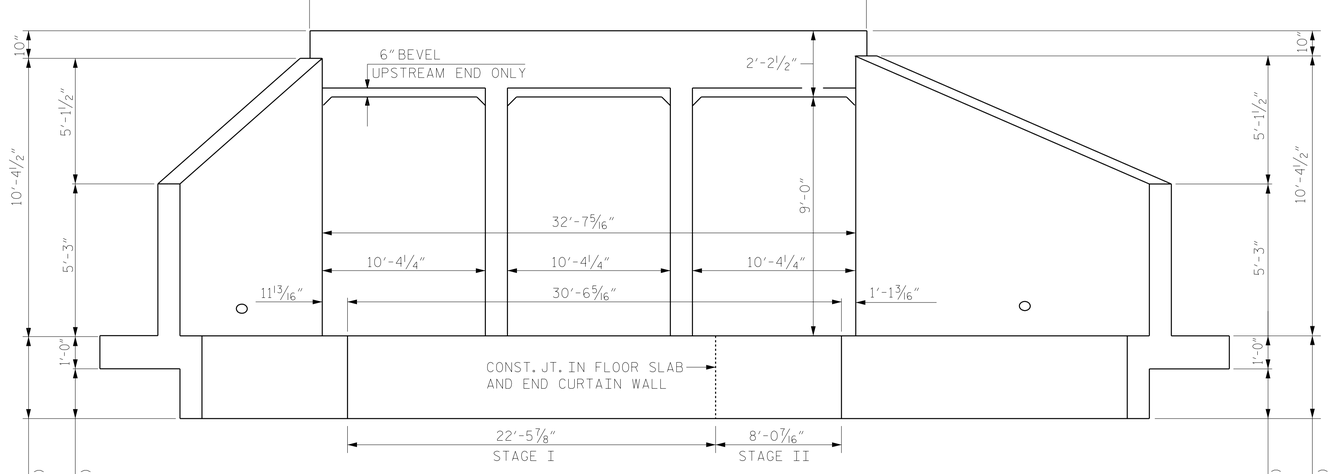

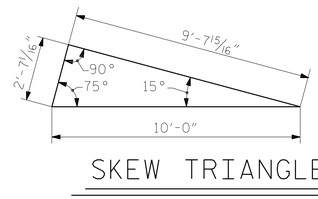

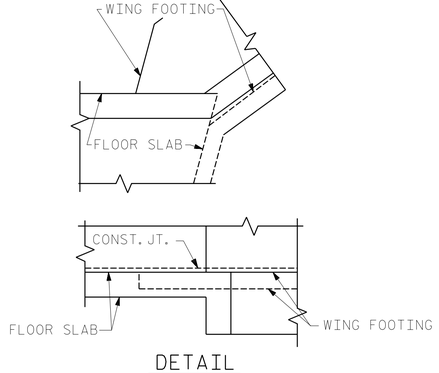

PROJECT NO. W-5601EY
WAKE COUNTY
STATION: 14+28.00 -L-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 10 FT. X 9 FT. CONCRETE BOX CULVERT LEFT AND RIGHT EXTENSIONS 70°-08′-32″ SKEW

NORTH CAROLINA PROFESSIONAL SEAL 030321 ENGINEER ROBERT F. DECOLA
2/6/2023

DESIGN ENGINEER OF RECORD: R.F.DECOLA	DATE: 02/06/23	
ASSEMBLED BY : R.J. FLORY	DATE : 01/12/2021	
CHECKED BY : R.F.DECOLA	DATE : 01/12/2021	
DRAWN BY : RWW 10/89	REV. 6/19	MAA/THC
CHECKED BY : ARB 10/89		

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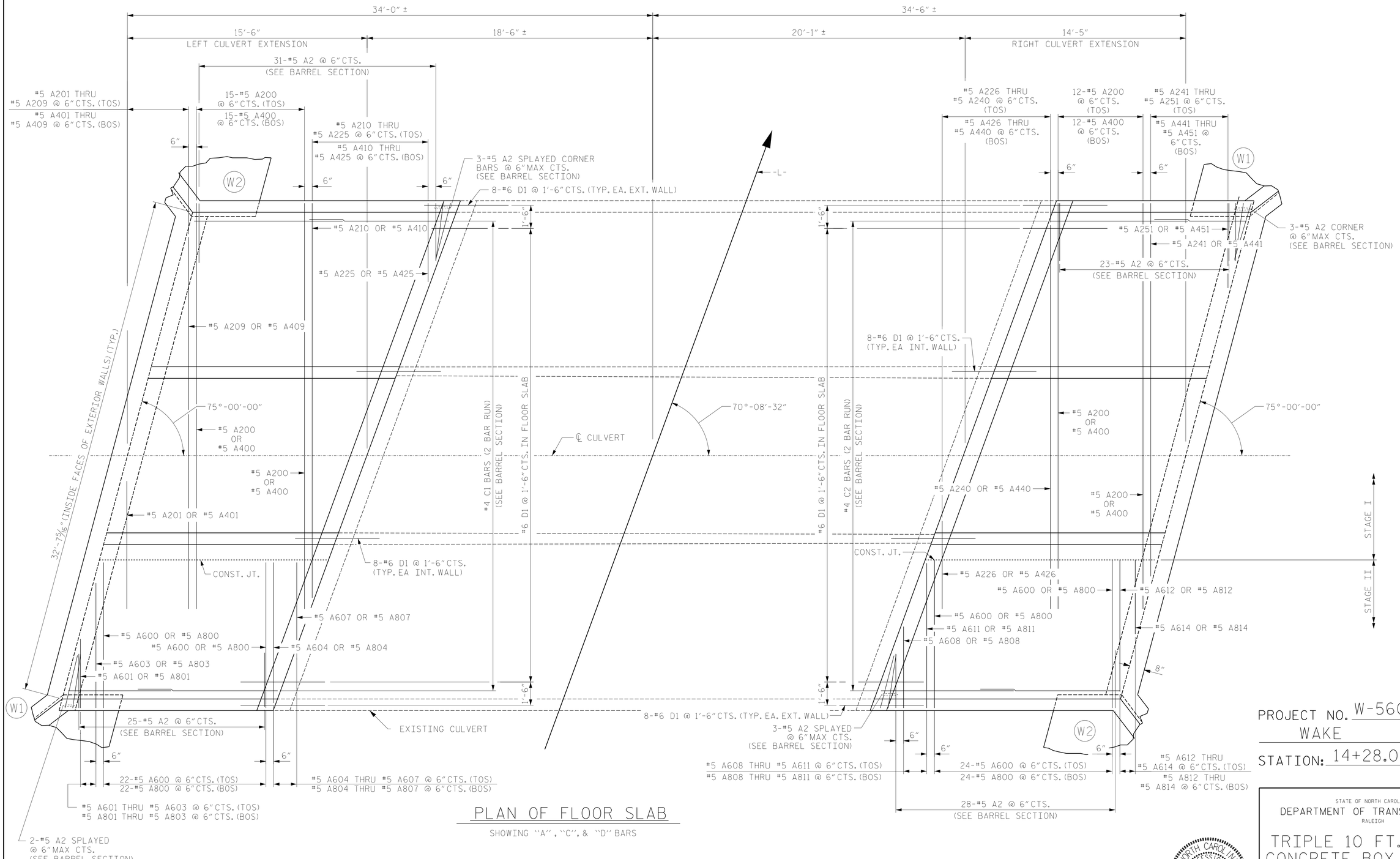
ENGINEERS ★ PLANNERS ★ SCIENTISTS ★ CONSTRUCTION MANAGERS LICENSE NUMBER: C-0764
KCI Associates of North Carolina, P.A.
1505 Falls of Neuse Road, Suite 400 Raleigh, NC 27609-6270 Phone (919) 783-9214

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-03
1			3			TOTAL SHEETS
2			4			12



PLAN OF FLOOR SLAB

SHOWING "A", "C", & "D" BARS

(TOS) DENOTES TOP OF SLAB
(BOS) DENOTES BOTTOM OF SLAB

PROJECT NO. W-5601EY
WAKE COUNTY
STATION: 14+28.00 -L-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 10 FT. X 9 FT. CONCRETE BOX CULVERT LEFT AND RIGHT EXTENSIONS 70°-08′-32″ SKEW

NORTH CAROLINA PROFESSIONAL SEAL 038321 ENGINEER ROBERT F. DECOLA
2/6/2023

DESIGN ENGINEER OF RECORD: R.F. DECOLA	DATE: 02/06/23
DRAWN BY: R.J. FLORY	DATE: 01/12/2021
CHECKED BY: R.F. DECOLA	DATE: 01/12/2021

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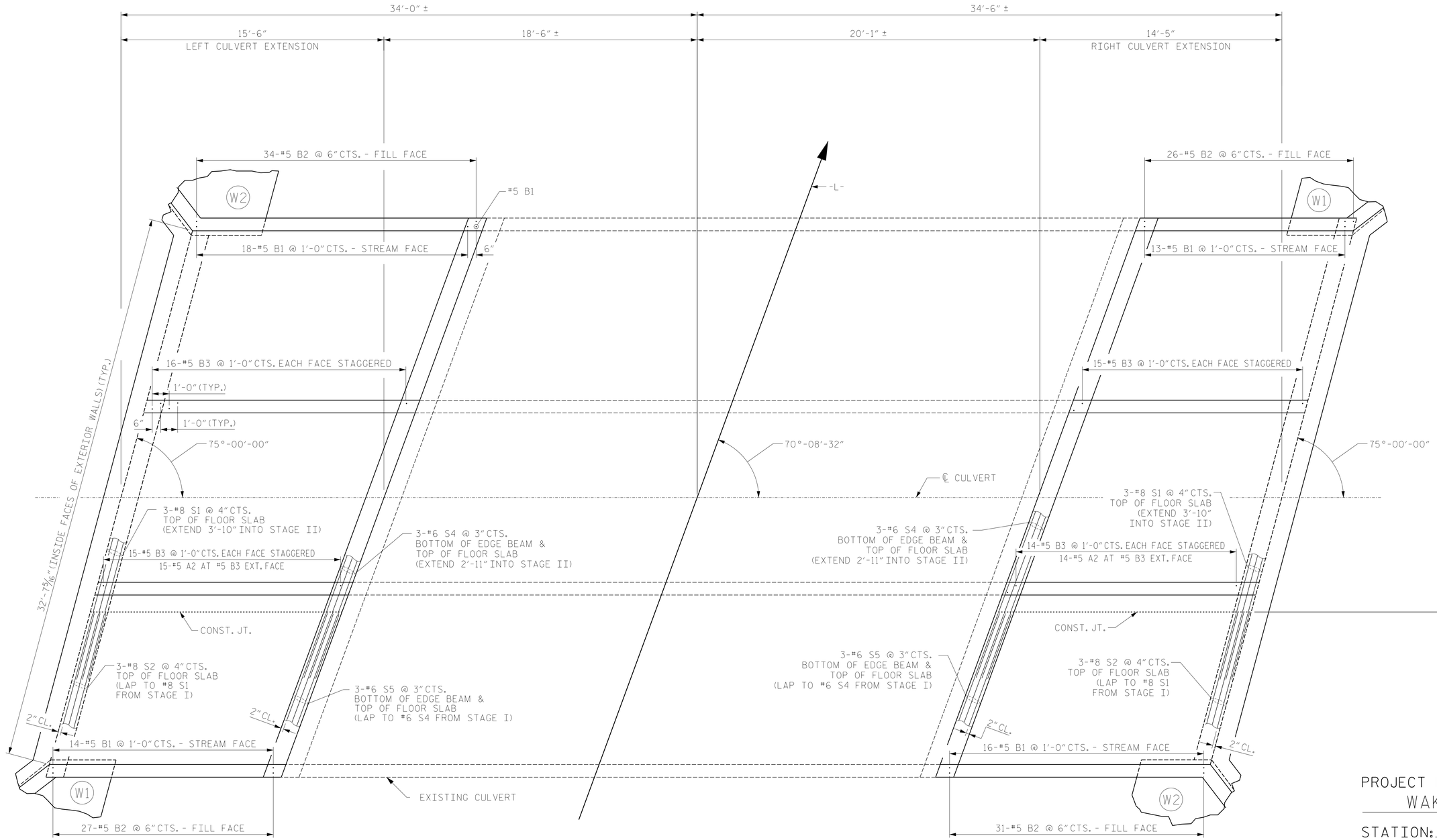
4505 Falls of Neuse Road, Suite 400 Raleigh, NC 27609-6270 Phone: (919) 783-9214

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-04
1			3			TOTAL SHEETS
2			4			12



PLAN OF FLOOR SLAB

SHOWING A2, "S", AND "B" BARS

PROJECT NO. W-5601EY

WAKE COUNTY

STATION: 14+28.00 -L-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 10 FT. X 9 FT. CONCRETE BOX CULVERT LEFT AND RIGHT EXTENSIONS 70°-08'-32" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 038127 ENGINEER Robert Decola ROBERT F. DECOLA
2/6/2023

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-05
1			3			TOTAL SHEETS
2			4			12

DESIGN ENGINEER OF RECORD: R.F. DECOLA DATE: 02/06/23

DRAWN BY: R.J. FLORY DATE: 01/01/2021

CHECKED BY: R.F. DECOLA DATE: 01/12/2021

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ENGINEERS • PLANNERS • SCIENTISTS • CONSTRUCTION MANAGERS LICENSE NUMBER: C-0764
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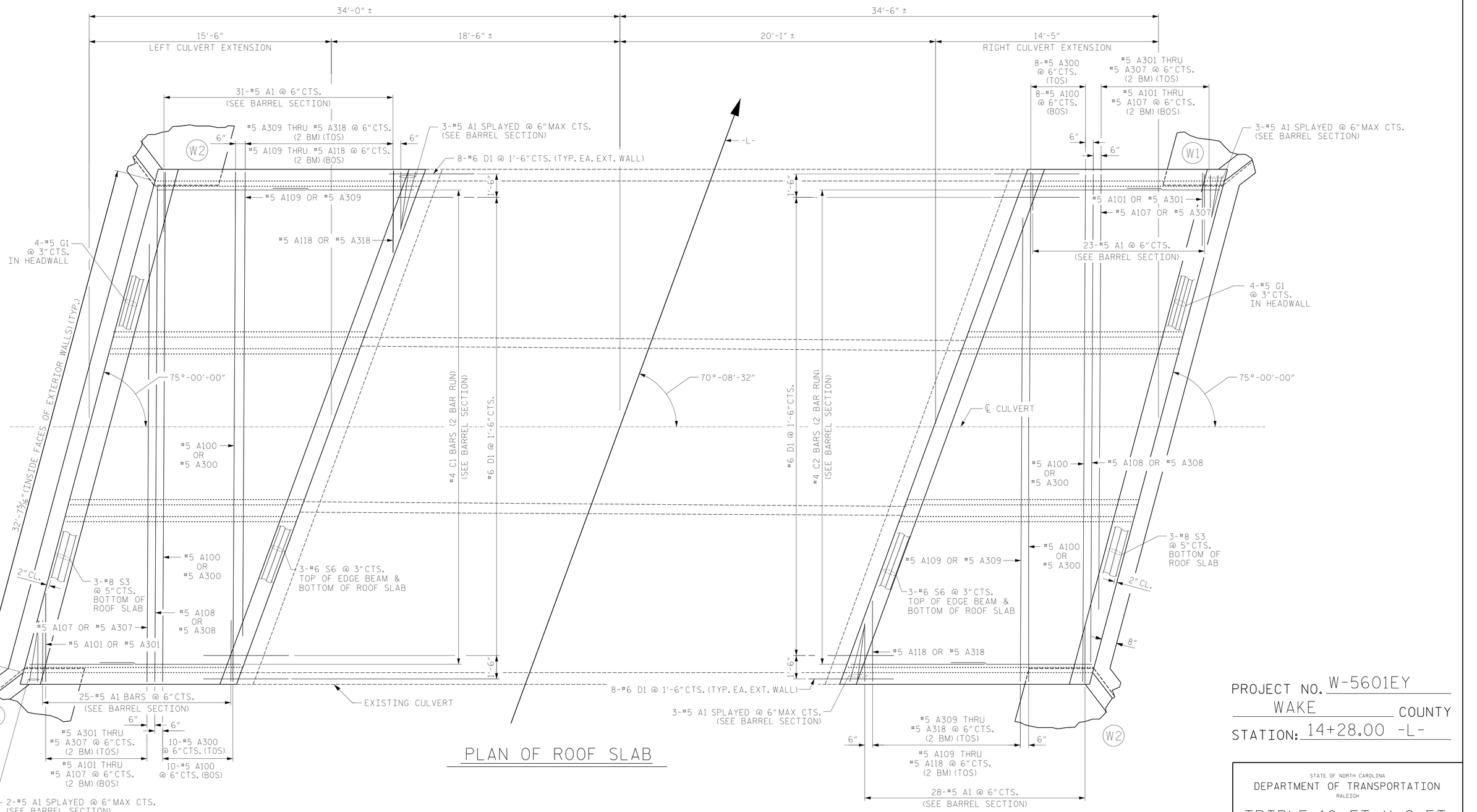
4505 Falls of Neuse Road, Suite 400 Raleigh, NC 27609-6270 Phone (919) 783-9214



PLAN OF ROOF SLAB

(TOS) DENOTES TOP OF SLAB
(BOS) DENOTES BOTTOM OF SLAB
(2 BM) DENOTES 2 BARS PER MARK

PROJECT NO. W-5601EY
WAKE COUNTY
STATION: 14+28.00 -L-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 10 FT. X 9 FT. CONCRETE BOX CULVERT LEFT AND RIGHT EXTENSIONS 70°-08'-32" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 036421 ENGINEER Robert Vicola DocuSigned by: ROBERT F. DECOLA
2/6/2023

DESIGN ENGINEER OF RECORD: R.F. DECOLA	DATE : 02/06/23
DRAWN BY : R.J. FLORY	DATE : 01/12/2021
CHECKED BY : R.F. DECOLA	DATE : 01/12/2021

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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						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-06
1			3			TOTAL SHEETS
2			4			12

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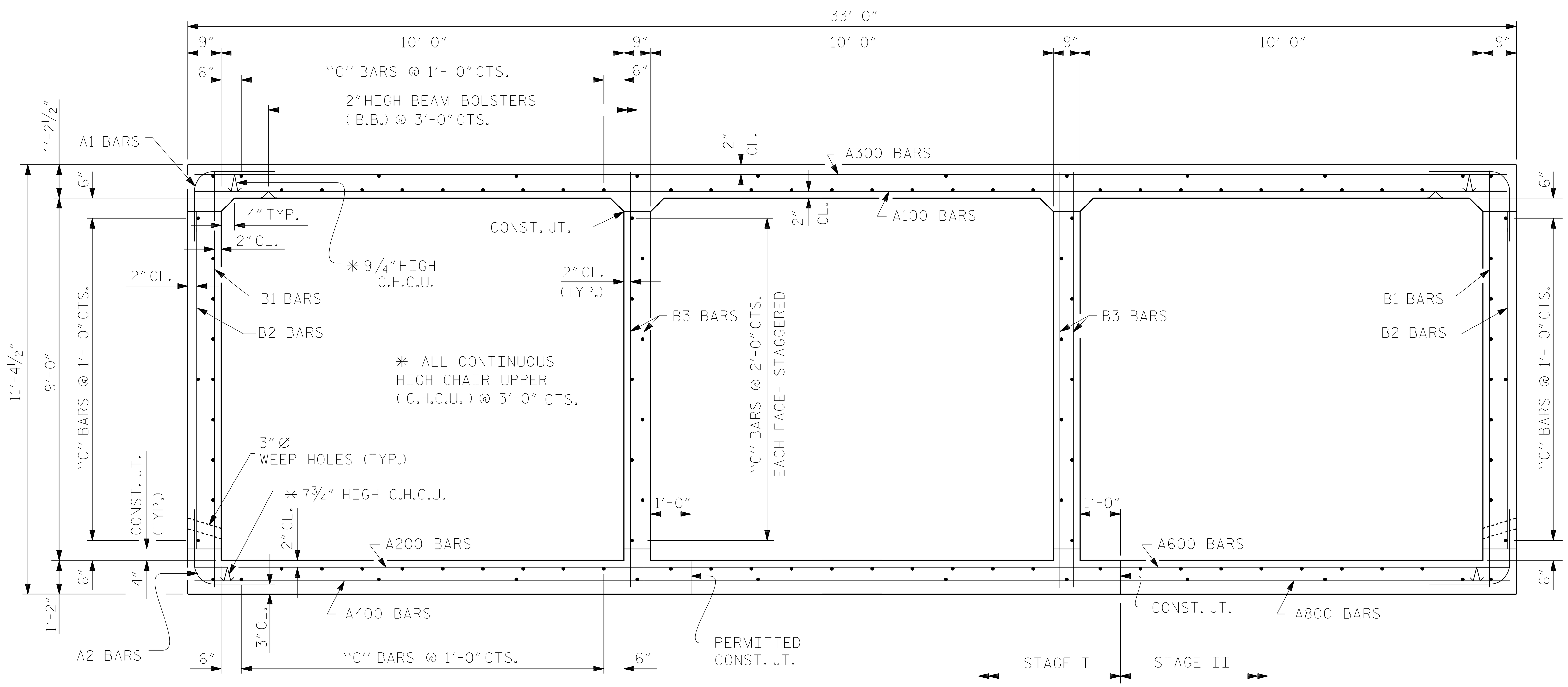

RIGHT ANGLE SECTION OF BARREL

THERE ARE 118 "C" BARS IN SECTION OF BARREL.

#6 D1 NOT SHOWN FOR CLARITY

PROJECT NO. W-5601EY

WAKE COUNTY

STATION: 14+28.00 -L-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 10 FT. X 9 FT.
CONCRETE BOX CULVERT
LEFT AND RIGHT EXTENSIONS
70°-08'-32" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 036321 ROBERT F. DECOLA
2/6/2023

REVISIONS								SHEET NO.
NO.	BY:	DATE:		NO.	BY:	DATE:		C-07
1				3				TOTAL SHEETS
2				4				12

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

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DESIGN ENGINEER OF RECORD: R.F. DECOLA DATE: 02/06/23
DRAWN BY: R.J. FLORY DATE: 01/12/21
CHECKED BY: R.F. DECOLA DATE: 01/12/21

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2/6/2023 12:16:19 PM Robert.DeCola Structures.tbl Structures.pltcfg
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BILL OF MATERIAL

LEFT EXTENSION

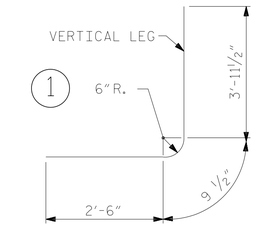
STAGE I

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A2	34	5	1	7'-3''	257	A400	15	5	STR	26'-3''	411
A200	15	5	STR	26'-3''	411	A401	1	5	STR	8'-3''	9
						A402	1	5	STR	11'-0''	11
A201	1	5	STR	8'-3''	9	A403	1	5	STR	12'-10''	13
A202	1	5	STR	11'-0''	11	A404	1	5	STR	14'-8''	15
A203	1	5	STR	12'-10''	13	A405	1	5	STR	16'-7''	17
A204	1	5	STR	14'-8''	15	A406	1	5	STR	18'-5''	19
A205	1	5	STR	16'-7''	17	A407	1	5	STR	20'-4''	21
A206	1	5	STR	18'-5''	19	A408	1	5	STR	22'-2''	23
A207	1	5	STR	20'-4''	21	A409	1	5	STR	24'-0''	25
A208	1	5	STR	22'-2''	23	A410	1	5	STR	25'-6''	27
A209	1	5	STR	24'-0''	25	A411	1	5	STR	24'-2''	25
A210	1	5	STR	25'-6''	27	A412	1	5	STR	22'-9''	24
A211	1	5	STR	24'-2''	25	A413	1	5	STR	21'-5''	22
A212	1	5	STR	22'-9''	24	A414	1	5	STR	20'-1''	21
A213	1	5	STR	21'-5''	22	A415	1	5	STR	18'-8''	19
A214	1	5	STR	20'-1''	21	A416	1	5	STR	17'-4''	18
A215	1	5	STR	18'-8''	19	A417	1	5	STR	16'-0''	17
A216	1	5	STR	17'-4''	18	A418	1	5	STR	14'-7''	15
A217	1	5	STR	16'-0''	17	A419	1	5	STR	13'-3''	14
A218	1	5	STR	14'-7''	15	A420	1	5	STR	11'-11''	12
A219	1	5	STR	13'-3''	14	A421	1	5	STR	10'-6''	11
A220	1	5	STR	11'-11''	12	A422	1	5	STR	9'-2''	10
A221	1	5	STR	10'-6''	11	A423	1	5	STR	7'-9''	8
A222	1	5	STR	9'-2''	10	A424	1	5	STR	6'-5''	7
A223	1	5	STR	7'-9''	8	A425	1	5	STR	5'-1''	5
A224	1	5	STR	6'-5''	7						
A225	1	5	STR	5'-1''	5	B1	18	5	STR	10'-11''	205
						B2	34	5	STR	8'-0''	284
						B3	62	5	STR	10'-11''	706
						D1	36	6	STR	2'-6''	135
						C1	112	4	STR	9'-8''	723
						S1	3	8	STR	27'-9''	222
						S4	6	6	STR	27'-6''	248
						REINFORCING STEEL, LB.					4,418

STAGE II

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	61	5	1	7'-3''	461	A600	22	5	STR	9'-5''	216
A2	27	5	1	7'-3''	204	A601	1	5	STR	4'-5''	5
						A602	1	5	STR	6'-2''	6
A100	10	5	STR	32'-8''	341	A603	1	5	STR	8'-1''	8
						A604	1	5	STR	9'-1''	9
A101	2	5	STR	5'-8''	12	A605	1	5	STR	7'-8''	8
A102	2	5	STR	9'-5''	20	A606	1	5	STR	6'-4''	7
A103	2	5	STR	13'-2''	27	A607	1	5	STR	5'-1''	5
A104	2	5	STR	16'-10''	35						
A105	2	5	STR	20'-7''	43	A800	22	5	STR	9'-5''	216
A106	2	5	STR	24'-4''	51						
A107	2	5	STR	28'-0''	58	A801	1	5	STR	4'-5''	5
A108	1	5	STR	32'-8''	34	A802	1	5	STR	6'-2''	6
A109	2	5	STR	29'-9''	62	A803	1	5	STR	8'-1''	8
A110	2	5	STR	27'-0''	56	A804	1	5	STR	9'-1''	9
A111	2	5	STR	24'-3''	51	A805	1	5	STR	7'-8''	8
A112	2	5	STR	21'-7''	45	A806	1	5	STR	6'-4''	7
A113	2	5	STR	18'-10''	39	A807	1	5	STR	5'-1''	5
A114	2	5	STR	16'-1''	34						
A115	2	5	STR	13'-4''	28	B1	14	5	STR	10'-11''	159
A116	2	5	STR	10'-8''	22	B2	27	5	STR	8'-0''	225
A117	2	5	STR	8'-0''	17						
A118	2	5	STR	5'-3''	11	C1	124	4	STR	9'-8''	801
A300	10	5	STR	32'-8''	341	D1	38	6	STR	2'-6''	143
A301	2	5	STR	5'-8''	12	G1	4	5	STR	33'-10''	141
A302	2	5	STR	9'-5''	20						
A303	2	5	STR	13'-2''	27	S2	3	8	STR	9'-9''	78
A304	2	5	STR	16'-10''	35	S3	3	8	STR	33'-10''	271
A305	2	5	STR	20'-7''	43	S5	6	6	STR	10'-0''	90
A306	2	5	STR	24'-4''	51	S6	6	6	STR	34'-10''	314
A307	2	5	STR	28'-0''	58						
A308	1	5	STR	32'-8''	34						
A309	2	5	STR	29'-9''	62						
A310	2	5	STR	27'-0''	56						
A311	2	5	STR	24'-3''	51						
A312	2	5	STR	21'-7''	45						
A313	2	5	STR	18'-10''	39						
A314	2	5	STR	16'-1''	34						
A315	2	5	STR	13'-4''	28						
A316	2	5	STR	10'-8''	22						
A317	2	5	STR	8'-0''	17						
A318	2	5	STR	5'-3''	11						
						REINFORCING STEEL, LB.					5,387

BAR TYPES



DIMENSIONS ARE OUT TO OUT

REINFORCING SPLICE LENGTH CHART

BAR	SPLICE
#4 "B"	1'-10"
#4 C1	2'-5"
#5 "A"	2'-4"
#6 "S"	2'-9"
#8 "S"	3'-8"

PROJECT NO. W-5601EY

WAKE COUNTY

STATION: 14+28.00 -L-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 10 FT. X 9 FT. CONCRETE BOX CULVERT LEFT AND RIGHT EXTENSIONS 70°-08'-32" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 038321 ENGINEER ROBERT F DECOLA
Documents Not Considered Final Unless Sealed
2/6/2023

DESIGN ENGINEER OF RECORD: R.F. DECOLA DATE : 02/06/23

DRAWN BY : R.J. FLORY DATE : 01/12/21

CHECKED BY : R.F. DECOLA DATE : 01/12/21

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ENGINEERS • PLANNERS • SCIENTISTS • CONSTRUCTION MANAGERS LICENSE NUMBER: C-0768
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-08

TOTAL SHEETS 12

BILL OF MATERIAL

RIGHT EXTENSION

STAGE I

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A2	26	5	1	7'-3"	197	A400	12	5	STR	26'-3"	329
A200	12	5	STR	26'-3"	329	A426	1	5	STR	5'-8"	6
						A427	1	5	STR	7'-0"	7
A226	1	5	STR	5'-8"	6	A428	1	5	STR	8'-5"	9
A227	1	5	STR	7'-0"	7	A429	1	5	STR	9'-9"	10
A228	1	5	STR	8'-5"	9	A430	1	5	STR	11'-1"	12
A229	1	5	STR	9'-9"	10	A431	1	5	STR	12'-6"	13
A230	1	5	STR	11'-1"	12	A432	1	5	STR	13'-10"	14
A231	1	5	STR	12'-6"	13	A433	1	5	STR	15'-3"	16
A232	1	5	STR	13'-10"	14	A434	1	5	STR	16'-7"	17
A233	1	5	STR	15'-3"	16	A435	1	5	STR	18'-0"	19
A234	1	5	STR	16'-7"	17	A436	1	5	STR	19'-4"	20
A235	1	5	STR	18'-0"	19	A437	1	5	STR	20'-8"	22
A236	1	5	STR	19'-4"	20	A438	1	5	STR	22'-1"	23
A237	1	5	STR	20'-8"	22	A439	1	5	STR	23'-5"	24
A238	1	5	STR	22'-1"	23	A440	1	5	STR	24'-10"	26
A239	1	5	STR	23'-5"	24	A441	1	5	STR	24'-2"	25
A240	1	5	STR	24'-10"	26	A442	1	5	STR	22'-3"	23
A241	1	5	STR	24'-2"	25	A443	1	5	STR	20'-5"	21
A242	1	5	STR	22'-3"	23	A444	1	5	STR	18'-6"	19
A243	1	5	STR	20'-5"	21	A445	1	5	STR	16'-8"	17
A244	1	5	STR	18'-6"	19	A446	1	5	STR	14'-9"	15
A245	1	5	STR	16'-8"	17	A447	1	5	STR	12'-11"	13
A246	1	5	STR	14'-9"	15	A448	1	5	STR	11'-1"	12
A247	1	5	STR	12'-11"	13	A449	1	5	STR	9'-2"	10
A248	1	5	STR	11'-1"	12	A450	1	5	STR	7'-4"	8
A249	1	5	STR	9'-2"	10	A451	1	5	STR	5'-5"	6
A250	1	5	STR	7'-4"	8						
A251	1	5	STR	5'-5"	6	B1	13	5	STR	10'-11"	148
						B2	26	5	STR	8'-0"	217
						B3	58	5	STR	10'-11"	660
						D1	36	6	STR	2'-6"	135
						C2	112	4	STR	9'-1"	680
						S1	3	8	STR	27'-9"	222
						S4	6	6	STR	27'-6"	248
						REINFORCING STEEL, LB.					3,979

STAGE II

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	57	5	1	7'-3"	431	A600	24	5	STR	9'-5"	236
A2	31	5	1	7'-3"	234	A608	1	5	STR	5'-3"	5
						A609	1	5	STR	6'-7"	7
A100	8	5	STR	32'-8"	273	A610	1	5	STR	8'-0"	8
						A611	1	5	STR	9'-4"	10
A101	2	5	STR	5'-8"	12	A612	1	5	STR	8'-6"	9
A102	2	5	STR	9'-5"	20	A613	1	5	STR	6'-8"	7
A103	2	5	STR	13'-2"	27	A614	1	5	STR	4'-9"	5
A104	2	5	STR	16'-10"	35						
A105	2	5	STR	20'-7"	43	A800	24	5	STR	9'-5"	236
A106	2	5	STR	24'-4"	51						
A107	2	5	STR	28'-0"	58	A808	1	5	STR	5'-3"	5
A108	1	5	STR	32'-8"	34	A809	1	5	STR	6'-7"	7
A109	2	5	STR	29'-9"	62	A810	1	5	STR	8'-0"	8
A110	2	5	STR	27'-0"	56	A811	1	5	STR	9'-4"	10
A111	2	5	STR	24'-3"	51	A812	1	5	STR	8'-6"	9
A112	2	5	STR	21'-7"	45	A813	1	5	STR	6'-8"	7
A113	2	5	STR	18'-10"	39	A814	1	5	STR	4'-9"	5
A114	2	5	STR	16'-1"	34						
A115	2	5	STR	13'-4"	28	B1	16	5	STR	10'-11"	182
A116	2	5	STR	10'-8"	22	B2	31	5	STR	8'-0"	259
A117	2	5	STR	8'-0"	17						
A118	2	5	STR	5'-3"	11	C2	124	4	STR	9'-1"	752
A300	8	5	STR	32'-8"	273	D1	38	6	STR	2'-6"	143
A301	2	5	STR	5'-8"	12	G1	4	5	STR	33'-10"	141
A302	2	5	STR	9'-5"	20						
A303	2	5	STR	13'-2"	27	S2	3	8	STR	9'-9"	78
A304	2	5	STR	16'-10"	35	S3	3	8	STR	33'-10"	271
A305	2	5	STR	20'-7"	43	S5	6	6	STR	10'-0"	90
A306	2	5	STR	24'-4"	51	S6	6	6	STR	34'-10"	314
A307	2	5	STR	28'-0"	58						
A308	1	5	STR	32'-8"	34						
A309	2	5	STR	29'-9"	62						
A310	2	5	STR	27'-0"	56						
A311	2	5	STR	24'-3"	51						
A312	2	5	STR	21'-7"	45						
A313	2	5	STR	18'-10"	39						
A314	2	5	STR	16'-1"	34						
A315	2	5	STR	13'-4"	28						
A316	2	5	STR	10'-8"	22						
A317	2	5	STR	8'-0"	17						
A318	2	5	STR	5'-3"	11						
						REINFORCING STEEL, LB.					5,305

TOTAL STRUCTURE QUANTITIES

LEFT EXTENSION

CLASS A CONCRETE
- STAGE I BARREL @ 1.727 CY/FT ___ 27.7 C.Y.
- STAGE II BARREL @ 2.188 CY/FT ___ 31.3 C.Y.
- WINGS, ETC. ___ 20.2 C.Y.
- TOTAL ___ 79.2 C.Y.

RIGHT EXTENSION

CLASS A CONCRETE
- STAGE I BARREL @ 1.727 CY/FT ___ 24.2 C.Y.
- STAGE II BARREL @ 2.188 CY/FT ___ 34.0 C.Y.
- WINGS, ETC. ___ 24.1 C.Y.
- TOTAL ___ 82.3 C.Y.

TOTAL CLASS A CONCRETE ___ 161.5 C.Y.

LEFT EXTENSION
REINFORCING STEEL
- STAGE I BARREL ___ 4,418 LBS.
- STAGE II BARREL ___ 5,387 LBS.
- WINGS, ETC. ___ 978 LBS.
- TOTAL ___ 10,783 LBS.

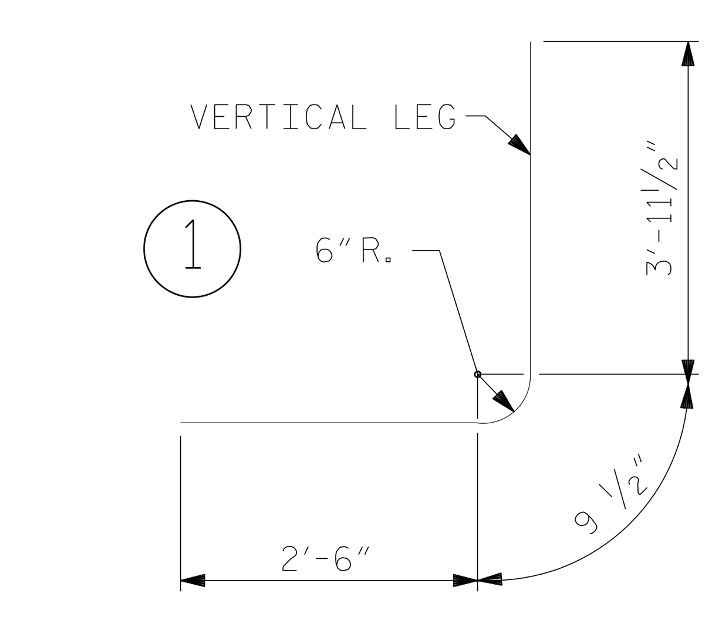
RIGHT EXTENSION
REINFORCING STEEL
- STAGE I BARREL ___ 3,979 LBS.
- STAGE II BARREL ___ 5,305 LBS
- WINGS, ETC. ___ 978 LBS
- TOTAL ___ 10,262 LBS

TOTAL REINFORCING STEEL ___ 21,045 LBS

FOUNDATION CONDITIONING MATERIAL
- LEFT EXTENSION ___ 130 TONS
- RIGHT EXTENSION ___ 122 TONS
- TOTAL ___ 252 TONS

CULVERT EXCAVATION ___ LUMP SUM

BAR TYPES



DIMENSIONS ARE OUT TO OUT

REINFORCING SPLICE LENGTH CHART

BAR	SPLICE
#4 "B"	1'-10"
#4 C2	2'-5"
#5 "A"	2'-4"
#6 "S"	2'-9"
#8 "S"	3'-8"

PROJECT NO. W-5601EY

WAKE COUNTY

STATION: 14+28.00 -L-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 10 FT. X 9 FT. CONCRETE BOX CULVERT LEFT AND RIGHT EXTENSIONS 70°-08'-32" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 036321 ENGINEER ROBERT F. DECOLA

9/18/2024

REVISIONS

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

SHEET NO. C-09

TOTAL SHEETS 12

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

KCI Associates of North Carolina, P.A.

DESIGN ENGINEER OF RECORD: R.F. DECOLA DATE: 02/06/23

DRAWN BY: R.J. FLORY DATE: 01/13/21

CHECKED BY: R.F. DECOLA DATE: 01/13/21

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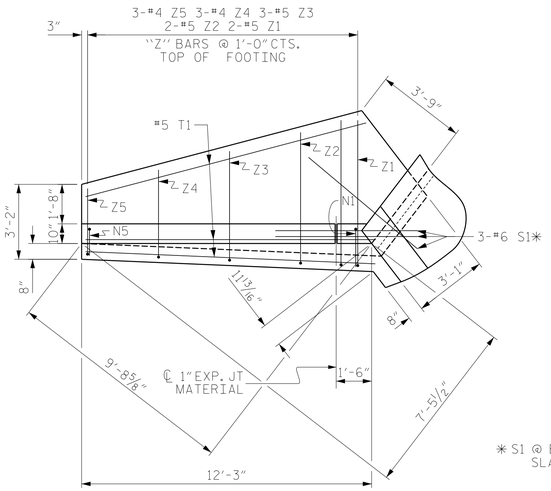
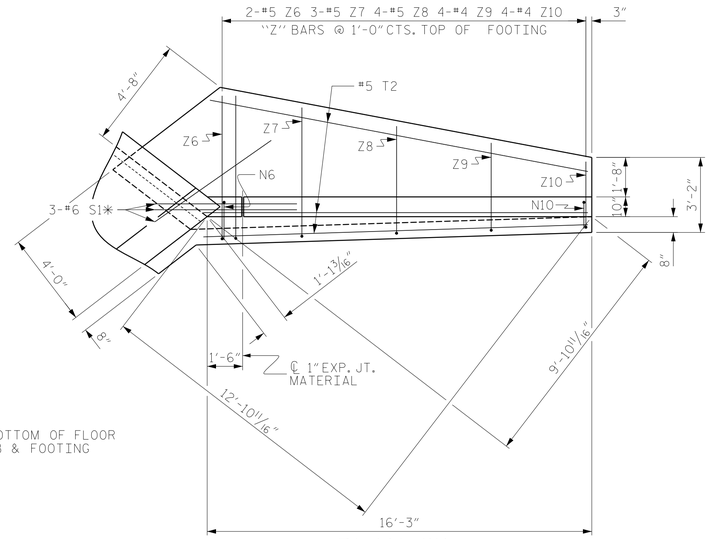




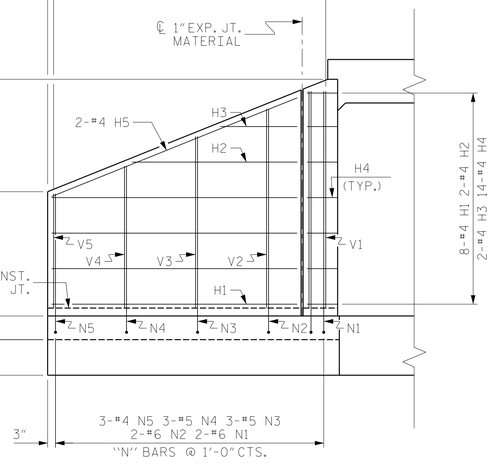
* S1 @ BOTTOM OF FLOOR SLAB & FOOTING

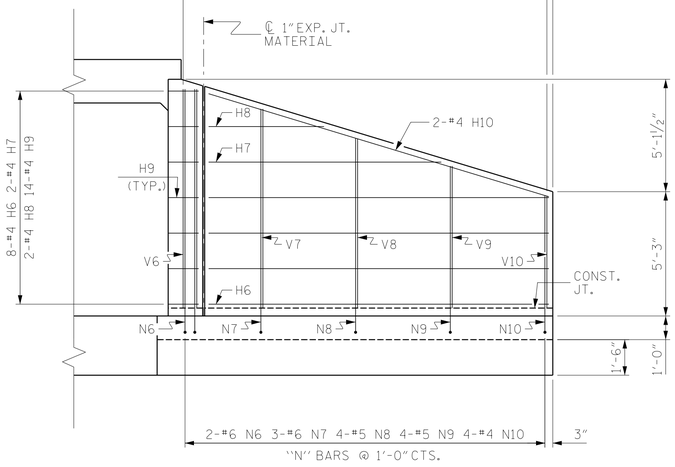
PLAN W2

STAGE I

PLAN W1

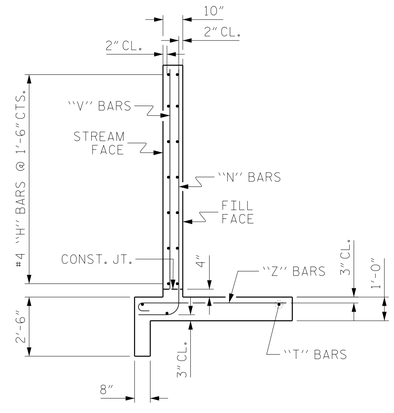
STAGE II





ELEVATION W2

ELEVATION W1



TYPICAL WING SECTION

STAGE I — BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	8	4	STR	10'-4"	55
H2	2	4	STR	6'-11"	9
H3	2	4	STR	3'-3"	4
H4	14	4	1	3'-3"	30
H5	2	4	STR	11'-2"	15
N1	2	6	3	11'-2"	34
N2	2	6	3	10'-6"	32
N3	3	5	3	9'-3"	29
N4	3	5	3	8'-1"	25
N5	3	4	3	6'-10"	14
S1	3	6	STR	6'-0"	27
T1	3	5	STR	12'-3"	38
V1	2	4	STR	9'-2"	12
V2	2	4	STR	8'-5"	11
V3	3	4	STR	7'-3"	15
V4	3	4	STR	6'-0"	12
V5	3	4	STR	4'-10"	10
Z1	2	5	4	6'-9"	14
Z2	2	5	4	6'-2"	13
Z3	3	5	4	5'-3"	16
Z4	3	4	4	4'-3"	9
Z5	3	4	4	3'-4"	7

REINFORCING STEEL FOR 1 WING — 431 LBS

CLASS A CONCRETE

1 WING	6.0	CY
1 END CURTAIN WALL	1.4	CY
1 EDGEBEAM	0.9	CY
TOTAL	8.3	CY

STAGE II — BILL OF MATERIAL

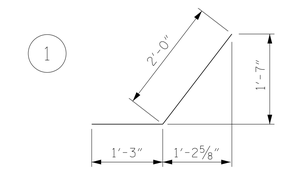
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H6	8	4	STR	14'-4"	77
H7	2	4	STR	9'-10"	13
H8	2	4	STR	4'-10"	6
H9	14	4	2	3'-3"	30
H10	2	4	STR	15'-0"	20
N6	2	6	3	11'-3"	34
N7	3	6	3	10'-6"	47
N8	4	5	3	9'-3"	39
N9	4	5	3	8'-0"	33
N10	4	4	3	6'-10"	18
S1	3	6	STR	6'-0"	27
T2	3	5	STR	16'-3"	51
V6	2	4	STR	9'-3"	12
V7	3	4	STR	8'-5"	17
V8	4	4	STR	7'-2"	19
V9	4	4	STR	6'-0"	16
V10	4	4	STR	4'-9"	13
Z6	2	5	4	6'-8"	14
Z7	3	5	4	6'-1"	19
Z8	4	5	4	5'-2"	22
Z9	4	4	4	4'-3"	11
Z10	4	4	4	3'-4"	9

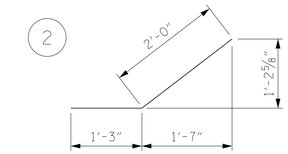
REINFORCING STEEL FOR 1 WING — 547 LBS

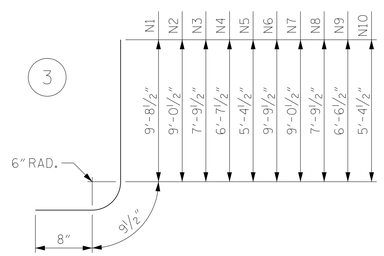
CLASS A CONCRETE

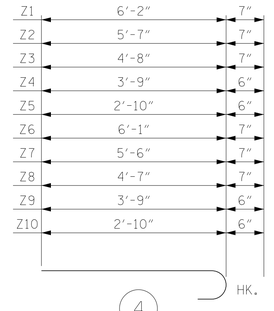
1 WING	8.0	CY
1 HEADWALL	1.6	CY
1 END CURTAIN WALL	0.6	CY
2 EDGEBEAMS	1.7	CY
TOTAL	11.9	CY

BAR TYPES









ALL BAR DIMENSIONS ARE OUT TO OUT.

PROJECT NO. W-5601EY

WAKE COUNTY

STATION: 14+28.00 -L-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

LEFT EXTENSION WINGS CONCRETE BOX CULVERT

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

75° END SKEW

NORTH CAROLINA PROFESSIONAL SEAL 036 ENGINEER Robert F. DeCola ROBERT F. DECOLA

2/6/2023

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ENGINEERS • PLANNERS • SCIENTISTS • CONSTRUCTION MANAGERS LICENSE NUMBER: C-0764
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2			4		

SHEET NO. C-10

TOTAL SHEETS 12

DESIGN ENGINEER OF RECORD: R.F.DECOLA	DATE : 02/06/23	
ASSEMBLED BY : R.J. FLORY	DATE : 01/18/21	
CHECKED BY : R.F.DECOLA	DATE : 01/18/21	
DRAWN BY : CCJ 01/00	REV. 6/19	MAA/THC
CHECKED BY : RWW 03/00		

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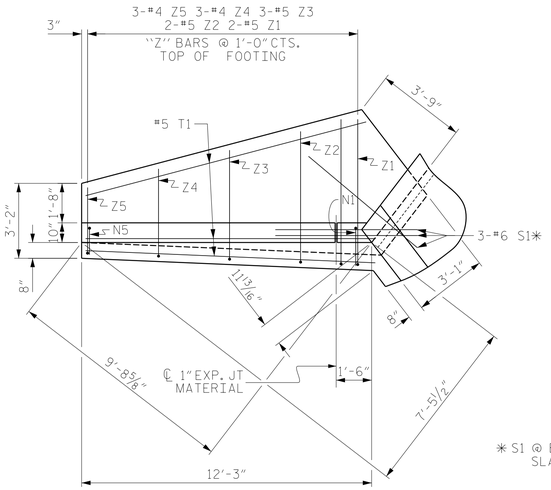
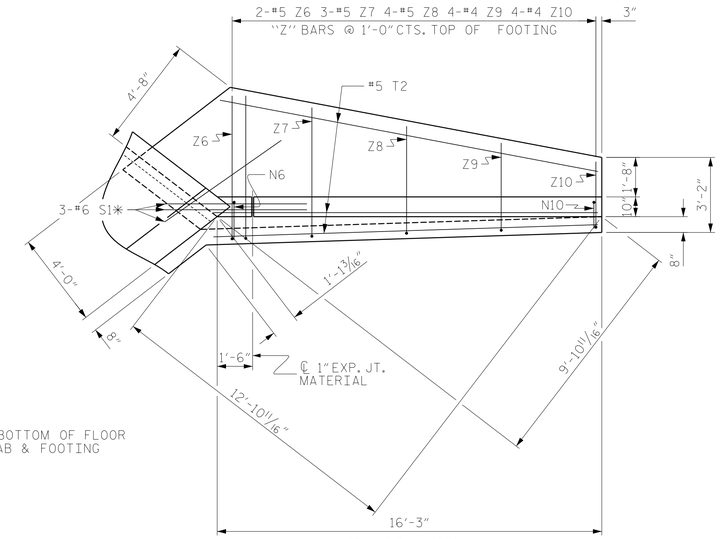




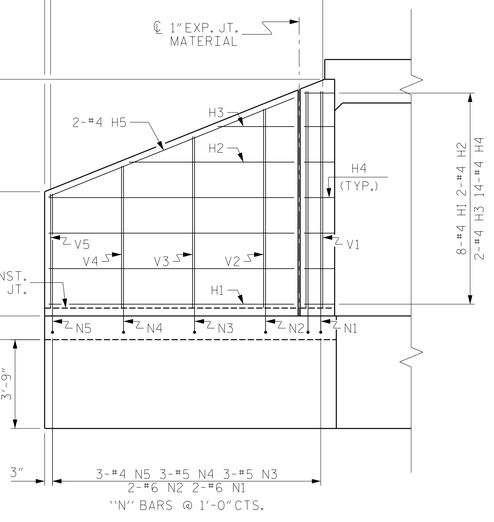
* S1 @ BOTTOM OF FLOOR SLAB & FOOTING

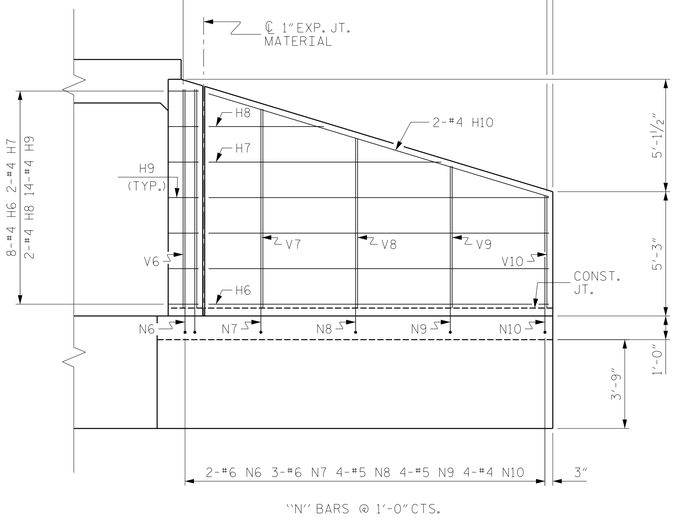
PLAN W2

STAGE II

PLAN W1

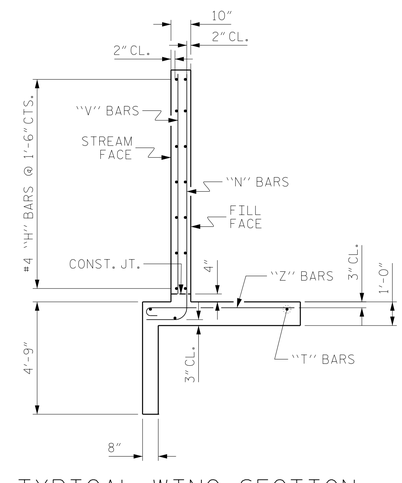
STAGE I





ELEVATION W2

ELEVATION W1



TYPICAL WING SECTION

STAGE I — BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H6	8	4	STR	14'-4"	77
H7	2	4	STR	9'-10"	13
H8	2	4	STR	4'-10"	6
H9	14	4	2	3'-3"	30
H10	2	4	STR	15'-0"	20
N6	2	6	3	11'-3"	34
N7	3	6	3	10'-6"	47
N8	4	5	3	9'-3"	39
N9	4	5	3	8'-0"	33
N10	4	4	3	6'-10"	18
S1	3	6	STR	6'-0"	27
T2	3	5	STR	16'-3"	51
V6	2	4	STR	9'-3"	12
V7	3	4	STR	8'-5"	17
V8	4	4	STR	7'-2"	19
V9	4	4	STR	6'-0"	16
V10	4	4	STR	4'-9"	13
Z6	2	5	4	6'-8"	14
Z7	3	5	4	6'-1"	19
Z8	4	5	4	5'-2"	22
Z9	4	4	4	4'-3"	11
Z10	4	4	4	3'-4"	9

REINFORCING STEEL FOR 1 WING 547 LBS

CLASS A CONCRETE
- 1 WING 9.3 CY
- 1 END CURTAIN WALL 2.6 CY
- 1 EDGEBEAM 0.9 CY
- TOTAL 12.8 CY

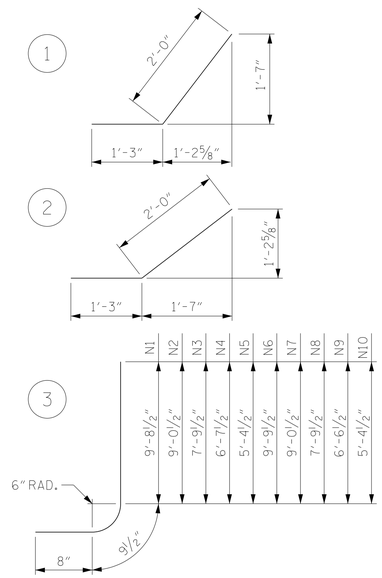
STAGE II — BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	8	4	STR	10'-4"	55
H2	2	4	STR	6'-11"	9
H3	2	4	STR	3'-3"	4
H4	14	4	1	3'-3"	30
H5	2	4	STR	11'-2"	15
N1	2	6	3	11'-2"	34
N2	2	6	3	10'-6"	32
N3	3	5	3	9'-3"	29
N4	3	5	3	8'-1"	25
N5	3	4	3	6'-10"	14
S1	3	6	STR	6'-0"	27
T1	3	5	STR	12'-3"	38
V1	2	4	STR	9'-2"	12
V2	2	4	STR	8'-5"	11
V3	3	4	STR	7'-3"	15
V4	3	4	STR	6'-0"	12
V5	3	4	STR	4'-10"	10
Z1	2	5	4	6'-9"	14
Z2	2	5	4	6'-2"	13
Z3	3	5	4	5'-3"	16
Z4	3	4	4	4'-3"	9
Z5	3	4	4	3'-4"	7

REINFORCING STEEL FOR 1 WING 431 LBS

CLASS A CONCRETE
- 1 WING 7.1 CY
- 1 HEADWALL 1.6 CY
- 1 END CURTAIN WALL 0.9 CY
- 2 EDGEBEAMS 1.7 CY
- TOTAL 11.3 CY

BAR TYPES



Z1	6'-2" 7"
Z2	5'-7" 7"
Z3	4'-8" 7"
Z4	3'-9" 6"
Z5	2'-10" 6"
Z6	6'-1" 7"
Z7	5'-6" 7"
Z8	4'-7" 7"
Z9	3'-9" 6"
Z10	2'-10" 6"

HK.

4

ALL BAR DIMENSIONS ARE OUT TO OUT.

PROJECT NO. W-5601EY

WAKE COUNTY

STATION: 14+28.00 -L-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

RIGHT EXTENSION WINGS CONCRETE BOX CULVERT

H = 9'-0" SLOPE = 2:1
75° END SKEW

NORTH CAROLINA PROFESSIONAL SEAL 036321 ENGINEER ROBERT F. DECOLA

Digitally signed by: Robert Decola

9/18/2024

DESIGN ENGINEER OF RECORD: R.F.DECOLA	DATE : 02/06/23
ASSEMBLED BY : R.J. FLORY	DATE : 01/18/21
CHECKED BY : R.F.DECOLA	DATE : 01/18/21
DRAWN BY : CCJ 01/00	REV. 6/19 MAA/THC
CHECKED BY : RWW 03/00	

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8505 Falls of Neuse Road, Suite 400 Raleigh, NC 27615-6270 Phone (919) 783-9104

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2			4		

SHEET NO. C-11

TOTAL SHEETS 12

NOTES

THE GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS SHALL CONSIST OF THE FOLLOWING COMPONENTS :

A. FERRULES SHALL BE MADE FROM STEEL MEETING THE REQUIREMENTS OF AASHTO M169, GRADE 12L14 AND SHALL HAVE A MINIMUM LENGTH OF THREADS OF 2½".

B. 4 - 1"Ø X 2¼" BOLTS WITH WASHERS. BOLTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A307. BOLTS AND WASHERS SHALL BE GALVANIZED. (AT THE CONTRACTOR'S OPTION, STAINLESS STEEL BOLTS AND WASHERS MAY BE USED AS AN ALTERNATE FOR THE 1"Ø X 2 ¼" GALVANIZED BOLTS AND WASHERS. THEY SHALL CONFORM TO OR EXCEED THE MECHANICAL REQUIREMENTS OF ASTM A307. THE USE OF THIS ALTERNATE SHALL BE APPROVED BY THE ENGINEER.)

C. WIRE STRUTS SHOWN IN THE GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS DETAIL ARE MINIMUM ALLOWABLE SIZE AND SHALL HAVE A MINIMUM TENSILE STRENGTH OF 100,000 P.S.I. AS AN OPTION, A 7/16"Ø WIRE STRUT WITH A MINIMUM TENSILE STRENGTH OF 90,000 PSI IS ACCEPTABLE.

GUARDRAIL ANCHOR ASSEMBLY WITH BOLTS SHALL BE ASSEMBLED IN THE SHOP. BOLT THREADS MAY BE RECUT AS NECESSARY TO INSURE FIT.

THE COST OF THE GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS COMPLETE IN PLACE, SHALL BE INCLUDED IN THE UNIT CONTRACT PRICE BID FOR CLASS "A" CONCRETE.

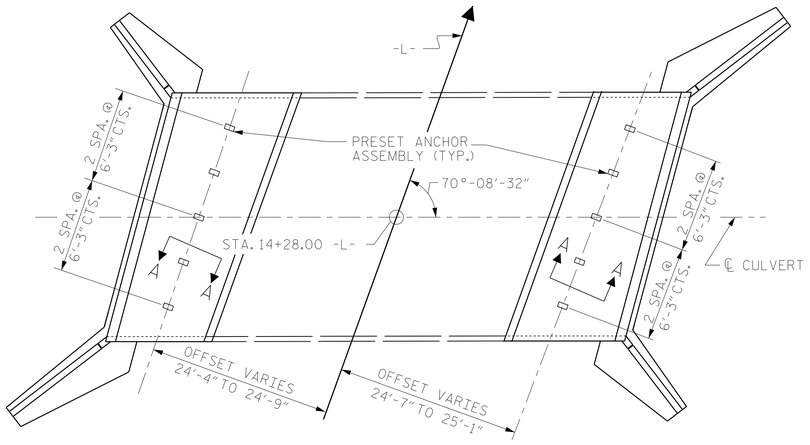
FERRULES TO BE PLUGGED DURING POURING OF SLAB AS RECOMMENDED BY THE MANUFACTURER.

AT THE CONTRACTOR'S OPTION, FERRULES WITH OPEN OR CLOSED ENDS MAY BE USED.

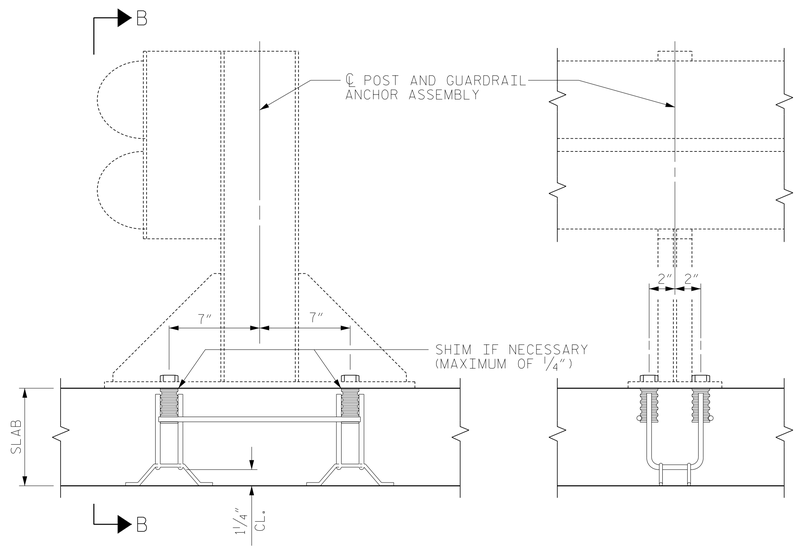
PAYMENT FOR GUARDRAIL, POSTS, AND POST BASE PLATES IS INCLUDED IN ROADWAY PAY ITEMS.

SLAB REINFORCING STEEL MAY BE SHIFTED AS NECESSARY TO CLEAR GUARDRAIL ANCHOR ASSEMBLY. CARE SHOULD BE TAKEN TO KEEP THE SHIFTING OF REINFORCING STEEL TO A MINIMUM.

THE CONTRACTOR MAY USE ADHESIVELY ANCHORED ANCHOR BOLTS IN PLACE OF GUARDRAIL ANCHOR ASSEMBLY. LEVEL TWO FIELD TESTING IS REQUIRED, AND THE YIELD LOAD OF THE 1"Ø BOLT IS 21.8 KIPS. FOR ADHESIVELY ANCHORED ANCHOR BOLTS OR DOWELS, SEE STANDARD SPECIFICATIONS.

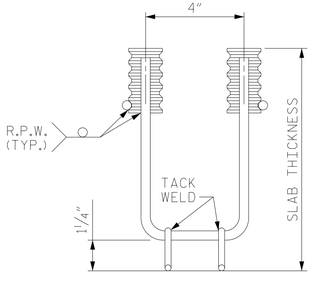


PLAN OF CULVERT GUARDRAIL ANCHOR ASSEMBLY SPACING



SECTION A-A

SECTION B-B



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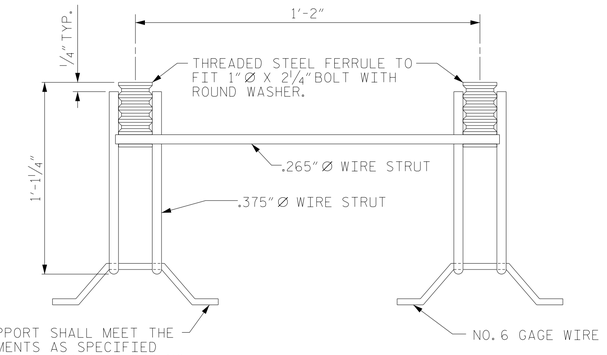
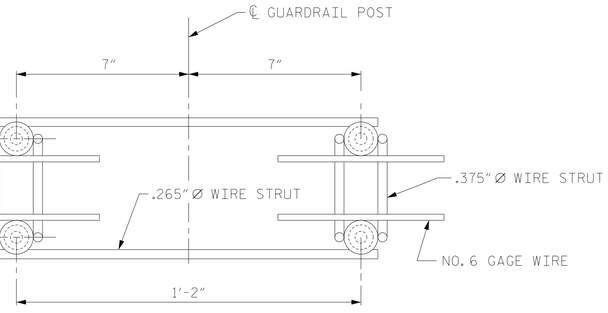


SIDE VIEW



PLAN

GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS

PROJECT NO. W-5601EY

WAKE COUNTY

STATION: 14+28.00 -L-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

ANCHORAGE DETAILS FOR GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS

DESIGN ENGINEER OF RECORD: R.F. DECOLA	DATE : 02/06/23		
ASSEMBLED BY : R.J. FLORY	DATE : 03/11/21		
CHECKED BY : R.F. DECOLA	DATE : 03/11/21		
DRAWN BY : FCJ 6/88	REV. 10/1/11	MAA/GM	
CHECKED BY : ARB 6/88	REV. 12/17	MAA/THC	
	REV. 6/19	MAA/THC	

SEAL 036371 ROBERT F. DECOLA NORTH CAROLINA PROFESSIONAL ENGINEER
2/6/2023

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2			4			12

STD. NO. GRA1 (SHT 1)

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2/6/2023 12:16:24 PM Robert.DeCola Structures.tbl Structures.pltcfg
KCI PROJ. #22133395.05

8/26/21

STANDARD NOTES

DESIGN DATA:

SPECIFICATIONS	AASHTO (CURRENT)
LIVE LOAD	SEE PLANS
IMPACT ALLOWANCE	SEE AASHTO
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 AASHTO
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 2024 "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 $\frac{3}{4}$" WITH THE FOLLOWING EXCEPTIONS: TOP CORNERS OF CURBS MAY BE ROUNDED TO $1\frac{1}{2}$" RADIUS WHICH IS BUILT INTO CURB FORMS; CORNERS OF TRANSVERSE FLOOR EXPANSION JOINTS SHALL BE ROUNDED WITH A $\frac{1}{4}$" 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 $\frac{1}{4}$" 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 $\frac{7}{8}$" Ø SHEAR STUDS FOR THE $\frac{3}{4}$" Ø STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - $\frac{7}{8}$" Ø STUDS FOR 4 - $\frac{3}{4}$" Ø STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF $\frac{7}{8}$" Ø STUDS ALONG THE BEAM AS SHOWN FOR $\frac{3}{4}$" Ø STUDS BASED ON THE RATIO OF 3 - $\frac{7}{8}$"Ø STUDS FOR 4 - $\frac{3}{4}$" 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 $\frac{5}{16}$" 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 $\frac{1}{16}$" 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.