

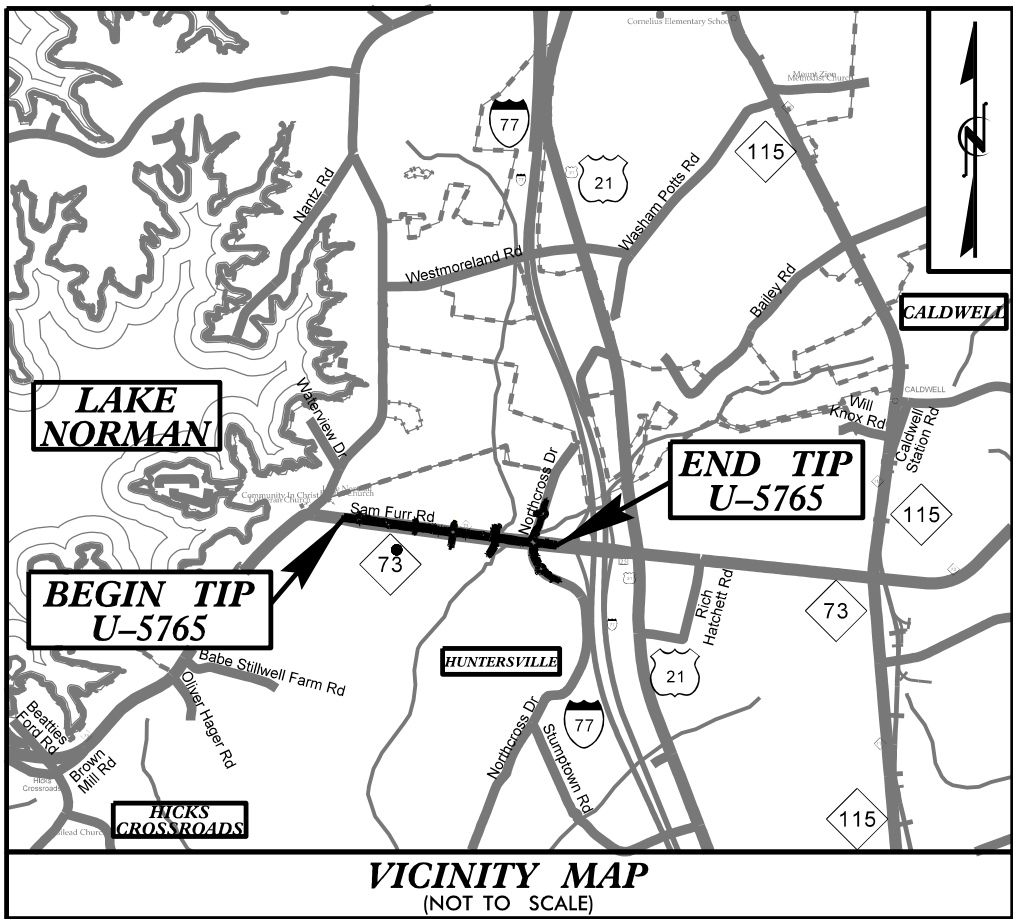
09/08/99

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PENTABLE: \$PENTBLS\$
USER: \$USER\$
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DATE: 9/21/2026

TIME: 9:56:48 AM

CONTRACT: C205223 TIP PROJECT: U-5765/BL-0119



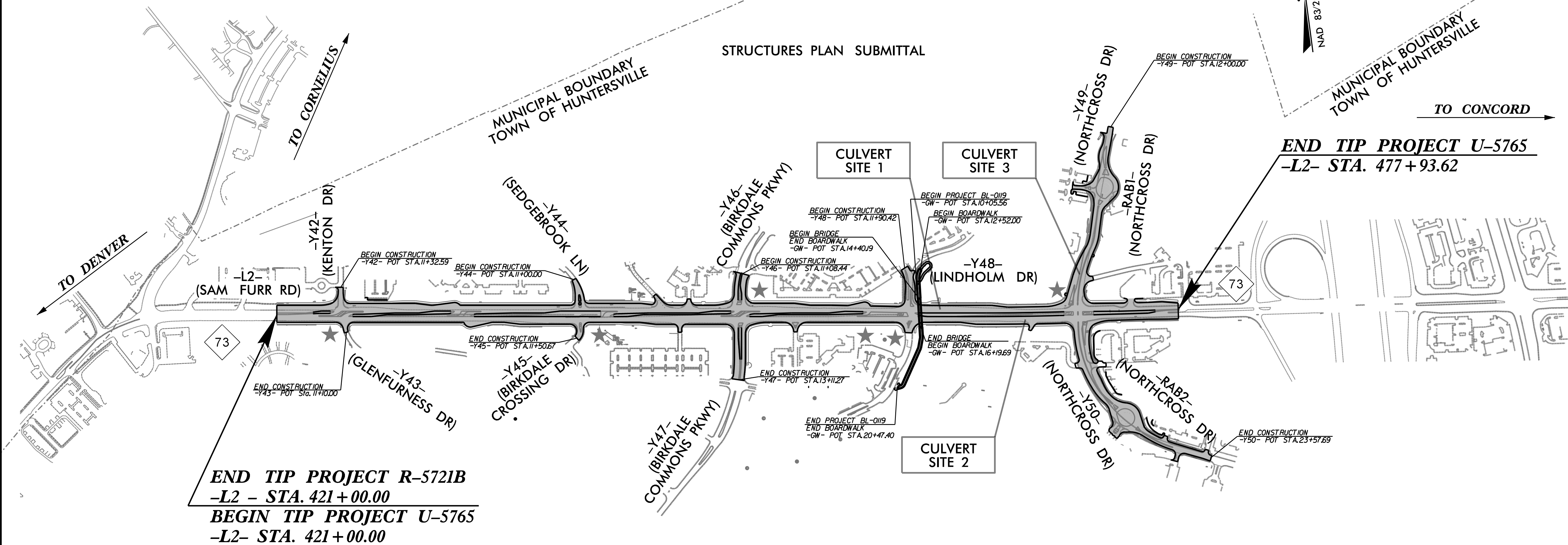
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

MECKLENBURG COUNTY

LOCATION: NC 73 – SR 5544 (WEST CATAWBA AVENUE) TO
SR 2316 (NORTHCROSS DRIVE)

TYPE OF WORK: WIDENING, GRADING, DRAINAGE, PAVING, RETAINING WALLS,
SIGNALS, SIGNING AND CULVERTS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5765/BL-0119	C01	36
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
50178.1.1	N/A	PE	
50178.2.1	N/A	ROW	
50178.2.2	N/A	UTIL	
50178.3.1	N/A	CONST.	
501704.3.1	5170401	CONST. (BL-0119)	



CULVERTS

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St, Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

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GRAPHIC SCALES

DESIGN DATA

ADT 2026 = 63,350
ADT 2045 = 76,100
K = 8 %
D = 55 %
T = 4 % *
V = 50 MPH
*TTST = 1% DUAL = 3%
FUNC CLASS =
REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECTS U-5765 / BL-0119 = 1.067 MILES
LENGTH STRUCTURE TIP PROJECTS U-5765 / BL-0119 = 0.011 MILES
TOTAL LENGTH TIP PROJECTS U-5765 / BL-0119 = 1.078 MILES

NCDOT CONTACT: RADHA ATTALURI, PE
PROJECT MANAGER

Prepared In the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
SEPTEMBER 16, 2022

LETTING DATE:
OCTOBER 20, 2026

PAUL ROBBINS, PE
PROJECT ENGINEER

JORDAN BOND, PE
PROJECT DESIGN ENGINEER

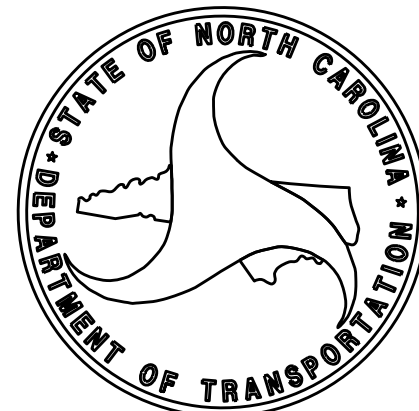
ENGINEER



9/21/2026
PAUL G. BEUCHAMP

SIGNATURE:

P.E.



INDEX OF SHEETS

C01	COVER SHEET
C02	INDEX OF SHEETS
C03	TRIPLE BARREL 8 FT. X 9 FT. CONCRETE BOX CULVERT EXTENSIONS
C04	TRIPLE BARREL 8 FT. X 9 FT. CONCRETE BOX CULVERT UPSTREAM EXTENSION (SHEET 1 OF 4)
C05	TRIPLE BARREL 8 FT. X 9 FT. CONCRETE BOX CULVERT UPSTREAM EXTENSION (SHEET 2 OF 4)
C06	TRIPLE BARREL 8 FT. X 9 FT. CONCRETE BOX CULVERT UPSTREAM EXTENSION (SHEET 3 OF 4)
C07	TRIPLE BARREL 8 FT. X 9 FT. CONCRETE BOX CULVERT UPSTREAM EXTENSION (SHEET 4 OF 4)
C08	TRIPLE BARREL 8 FT. X 9 FT. CONCRETE BOX CULVERT DOWNSTREAM EXTENSION (SHEET 1 OF 4)
C09	TRIPLE BARREL 8 FT. X 9 FT. CONCRETE BOX CULVERT DOWNSTREAM EXTENSION (SHEET 2 OF 4)
C10	TRIPLE BARREL 8 FT. X 9 FT. CONCRETE BOX CULVERT DOWNSTREAM EXTENSION (SHEET 3 OF 4)
C11	TRIPLE BARREL 8 FT. X 9 FT. CONCRETE BOX CULVERT DOWNSTREAM EXTENSION (SHEET 4 OF 4)
C12	STANDARD WINGS FOR MULTIPLE BARREL CONCRETE BOX CULVERT
C13	HEADWALL AND APRON DETAILS
C14	TRIPLE BARREL 8 FT. X 9 FT. CONCRETE BOX CULVERT (NON-INTERSTATE TRAFFIC)
C15	ANCHORAGE DETAILS FOR GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS
C16	DOUBLE BARREL 10 FT. X 9 FT. CONCRETE BOX CULVERT EXTENSIONS
C17	DOUBLE BARREL 10 FT. X 9 FT. CONCRETE BOX CULVERT UPSTREAM EXTENSION (SHEET 1 OF 3)
C18	DOUBLE BARREL 10 FT. X 9 FT. CONCRETE BOX CULVERT UPSTREAM EXTENSION (SHEET 2 OF 3)
C19	DOUBLE BARREL 10 FT. X 9 FT. CONCRETE BOX CULVERT UPSTREAM EXTENSION (SHEET 3 OF 3)
C20	DOUBLE BARREL 10 FT. X 9 FT. CONCRETE BOX CULVERT DOWNSTREAM EXTENSION (SHEET 1 OF 3)
C21	DOUBLE BARREL 10 FT. X 9 FT. CONCRETE BOX CULVERT DOWNSTREAM EXTENSION (SHEET 2 OF 3)
C22	DOUBLE BARREL 10 FT. X 9 FT. CONCRETE BOX CULVERT DOWNSTREAM EXTENSION (SHEET 3 OF 3)
C23	STANDARD WINGS FOR MULTIPLE BARREL CONCRETE BOX CULVERT
C24	HEADWALL AND APRON DETAILS
C25	DOUBLE BARREL 10 FT. X 9 FT. CONCRETE BOX CULVERT (NON-INTERSTATE TRAFFIC)
C26	DOUBLE BARREL 10 FT. X 8 FT. CONCRETE BOX CULVERT EXTENSIONS
C27	DOUBLE BARREL 10 FT. X 8 FT. CONCRETE BOX CULVERT UPSTREAM EXTENSION (SHEET 1 OF 3)
C28	DOUBLE BARREL 10 FT. X 8 FT. CONCRETE BOX CULVERT UPSTREAM EXTENSION (SHEET 2 OF 3)
C29	DOUBLE BARREL 10 FT. X 8 FT. CONCRETE BOX CULVERT UPSTREAM EXTENSION (SHEET 3 OF 3)
C30	DOUBLE BARREL 10 FT. X 8 FT. CONCRETE BOX CULVERT DOWNSTREAM EXTENSION (SHEET 1 OF 3)
C31	DOUBLE BARREL 10 FT. X 8 FT. CONCRETE BOX CULVERT DOWNSTREAM EXTENSION (SHEET 2 OF 3)
C32	DOUBLE BARREL 10 FT. X 8 FT. CONCRETE BOX CULVERT DOWNSTREAM EXTENSION (SHEET 3 OF 3)
C33	STANDARD WINGS FOR MULTIPLE BARREL CONCRETE BOX CULVERT
C34	HEADWALL AND APRON DETAILS
C35	DOUBLE BARREL 10 FT. X 8 FT. CONCRETE BOX CULVERT (NON-INTERSTATE TRAFFIC)
SN	STANDARD NOTES SHEET

INDEX OF STRUCTURES

CULVERT SITE	STATION	STRUCTURE DESCRIPTION	STRUCTURE #
1	463+27.43 -L2-	TRIPLE BARREL 8 FT. X 9 FT. RCBC ON McDOWELL CREEK UNDER NC73 (-L2-)	590683
2	468+34.19 -L2-	DOUBLE BARREL 10 FT. X 9 FT. RCBC ON CALDWELL STATION CREEK UNDER NC73 (-L2-)	590684
3	21+58.00 -Y49-	DOUBLE BARREL 10 FT. X 8 FT. RCBC ON CALDWELL STATION CREEK UNDER SR-2141 (-Y49-)	590616

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 463+27.43 -L2-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

INDEX OF SHEETS

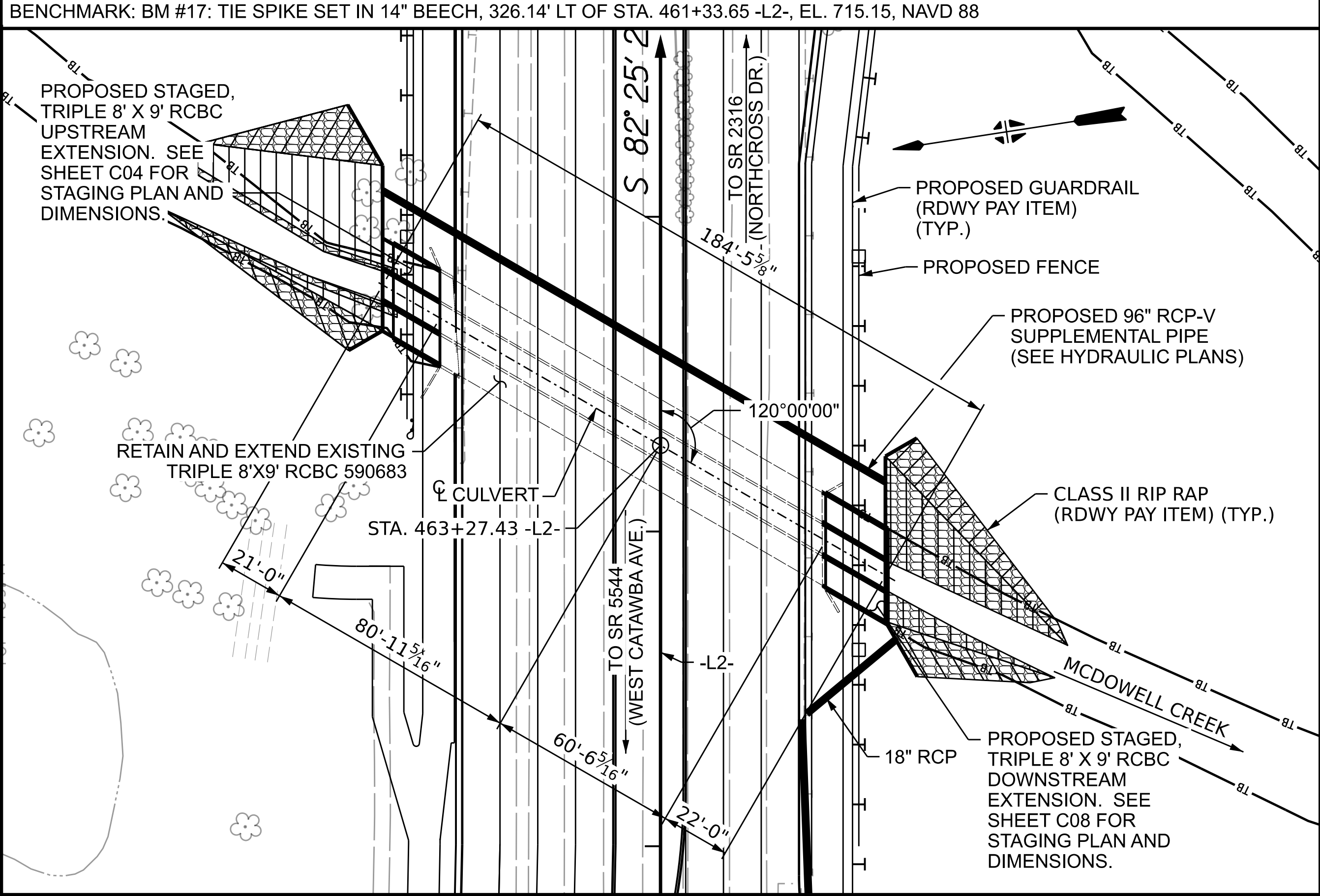
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C02
1	--	--	3	--	--	TOTAL SHEETS 36
2	--	--	4	--	--	



7/21/2026
R. BEAUCHAMP
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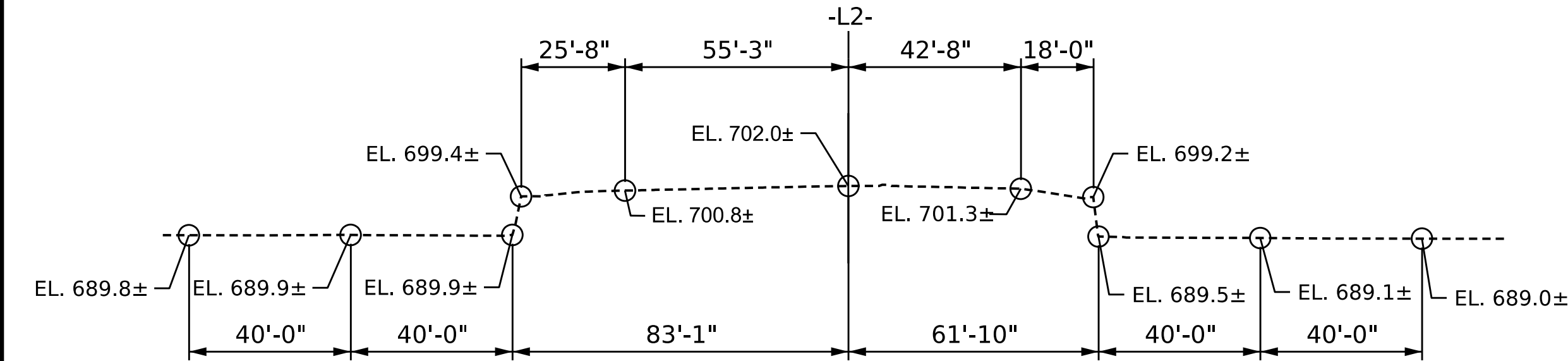
HDR HDR Engineering, Inc. of the Carolinas
555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

DES BY: <u>R. BEAUCHAMP</u>	DATE: <u>11/25</u>	DWG BY: <u>D. CHAPMAN</u>	DATE: <u>11/25</u>
DES CHK: <u>D. MAST</u>	DATE: <u>11/25</u>	CHK BY: <u>B. BUSH</u>	DATE: <u>11/25</u>



LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS



PROFILE ALONG CULVERT

TOTAL STRUCTURE QUANTITIES - UPSTREAM EXTENSION	
CLASS A CONCRETE (STAGE I)	
BARREL @ 1.35 CY./FT.	28.3 C.Y.
CURTAIN WALL, EDGE BEAM, PIPE HEADWALL	28.2 C.Y.
WING (W1)	14.2 C.Y.
TOTAL	70.7 C.Y.
CLASS A CONCRETE (STAGE II)	
BARREL @ 1.95 CY./FT.	40.9 C.Y.
CURTAIN WALL, EDGE BEAM, SILLS	3.8 C.Y.
WING (W2)	7.3 C.Y.
TOTAL	52.0 C.Y.
REINFORCING STEEL (STAGE I)	
BARREL, CURTAIN WALL, PIPE HEADWALL, SILLS	8833 LBS.
WING (W1)	1886 LBS.
TOTAL	10719 LBS.
REINFORCING STEEL (STAGE II)	
BARREL, CURTAIN WALL, SILLS	5430 LBS.
WING (W2)	992 LBS.
TOTAL	6422 LBS.
CULVERT EXCAVATION, STA. 463+27.43 -L2-	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	46 TONS

TOTAL STRUCTURE QUANTITIES - DOWNSTREAM EXTENSION	
CLASS A CONCRETE (STAGE I)	
BARREL @ 1.35 CY./FT.	29.7 C.Y.
EDGE BEAM, APRON, PIPE HEADWALL	56.2 C.Y.
WING (W4)	9.0 C.Y.
TOTAL	94.9 C.Y.
CLASS A CONCRETE (STAGE II)	
BARREL @ 1.95 CY./FT.	42.8 C.Y.
APRON, EDGE BEAM, SILLS	11.2 C.Y.
WING (W3)	13.6 C.Y.
TOTAL	67.6 C.Y.
REINFORCING STEEL (STAGE I)	
BARREL, APRON, PIPE HEADWALL, SILLS	10710 LBS.
WING (W4)	1153 LBS.
TOTAL	11863 LBS.
REINFORCING STEEL (STAGE II)	
BARREL, APRON, SILLS	6141 LBS.
WING (W3)	1811 LBS.
TOTAL	7952 LBS.
CULVERT EXCAVATION, STA. 463+27.43 -L2-	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	49 TONS

HYDRAULIC DATA

DESIGN DISCHARGE	= 2900 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEVATION	= 700.5
DRAINAGE AREA	= 6.8 SQ. MI.
BASE DISCHARGE (Q100)	= 3200 CFS
BASE HIGH WATER ELEVATION	= 701.0

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 4300 CFS
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YR.
OVERTOPPING FLOOD ELEVATION	= 702.9 **

** OVERTOPPING OCCURS @ SAG STATION 464+79.49 -L2-

ROADWAY DATA

GRADE POINT ELEV. @ STA. 463+27.43 -L2=	702.63
BED ELEV. @ STA. 463+27.43 -L2-	= 689.31
BED ELEV. @ BEGIN UPSTREAM EXT.	= 690.36
BED ELEV. @ BEGIN DOWNSTREAM EXT.	= 688.52
ROADWAY SLOPES	= 2:1

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.

DESIGN FILL = 5.97' (MAX.) AND 1.58' (MIN.).

FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:
(FOR FULL CONSTRUCTION SEQUENCE, SEE MOT AND EROSION CONTROL PLANS)

STAGE I DOWNSTREAM

- WING FOOTING (W4), SUPPLEMENTAL PIPE FOOTING AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS FOR BARRELS 1 & 2 OF DOWNSTREAM EXTENSION.
- THE REMAINING PORTIONS OF THE WALLS, SUPPLEMENTAL PIPE HEADWALL AND WINGS FULL HEIGHT FOR BARRELS 1 & 2 OF DOWNSTREAM EXTENSION.

STAGE II DOWNSTREAM

- WING FOOTING (W3) AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS FOR BARREL 3 OF DOWNSTREAM EXTENSION.
- THE REMAINING PORTIONS OF THE WALLS AND WINGS (WITH 18" RCP) FULL HEIGHT FOR BARREL 3 FOLLOWED BY ROOF SLAB AND HEADWALLS FOR ALL BARRELS OF DOWNSTREAM EXTENSION.

STAGE I UPSTREAM

- WING FOOTING (W1), SUPPLEMENTAL PIPE FOOTING AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS FOR BARRELS 1 & 2 OF UPSTREAM EXTENSION.
- THE REMAINING PORTIONS OF THE WALLS, SUPPLEMENTAL PIPE HEADWALL AND WINGS FULL HEIGHT FOR BARRELS 1 & 2 OF UPSTREAM EXTENSION.

STAGE II UPSTREAM

- WING FOOTING (W2) AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS FOR BARREL 3 OF UPSTREAM EXTENSION.
- THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOR BARREL 3 FOLLOWED BY ROOF SLAB AND HEADWALLS FOR ALL BARRELS OF UPSTREAM EXTENSION.

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.

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

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 GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

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 SHALL BE PAID FOR BY THE CONTRACTOR.

THE ENTIRE COST OF WORK REQUIRED TO PLACE EXCAVATED OR SUPPLEMENTAL MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE LUMP SUM PRICE FOR CULVERT EXCAVATION.

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.

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

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

I HEREBY CERTIFY THESE PLANS
ARE THE AS-BUILT PLANS

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 463+27.43 -L2-

CULVERT NO. 590683

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE BARREL
8 FT. X 9 FT.
CONCRETE BOX CULVERT
EXTENSIONS

REVISIONS						SHEET NO. C03
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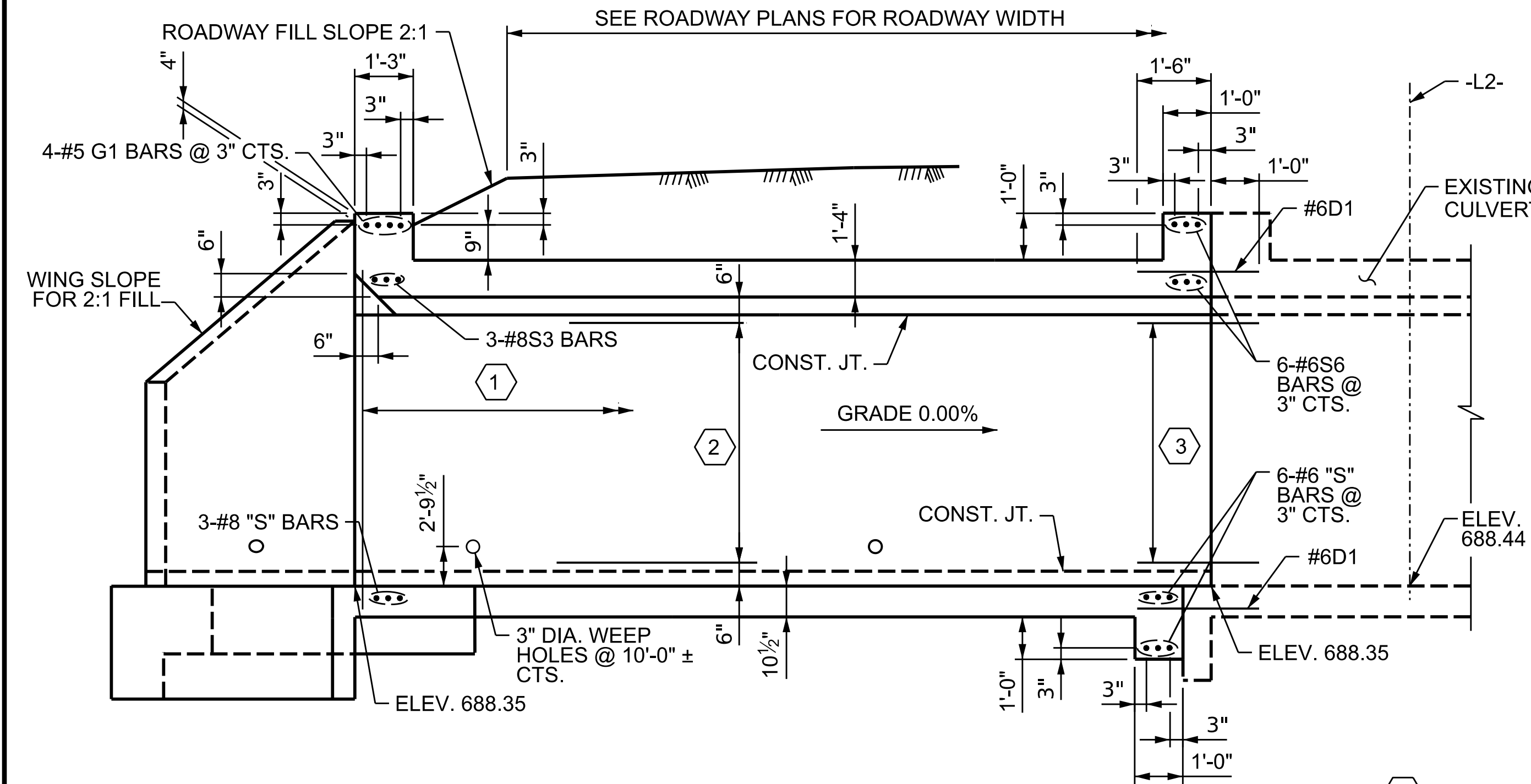


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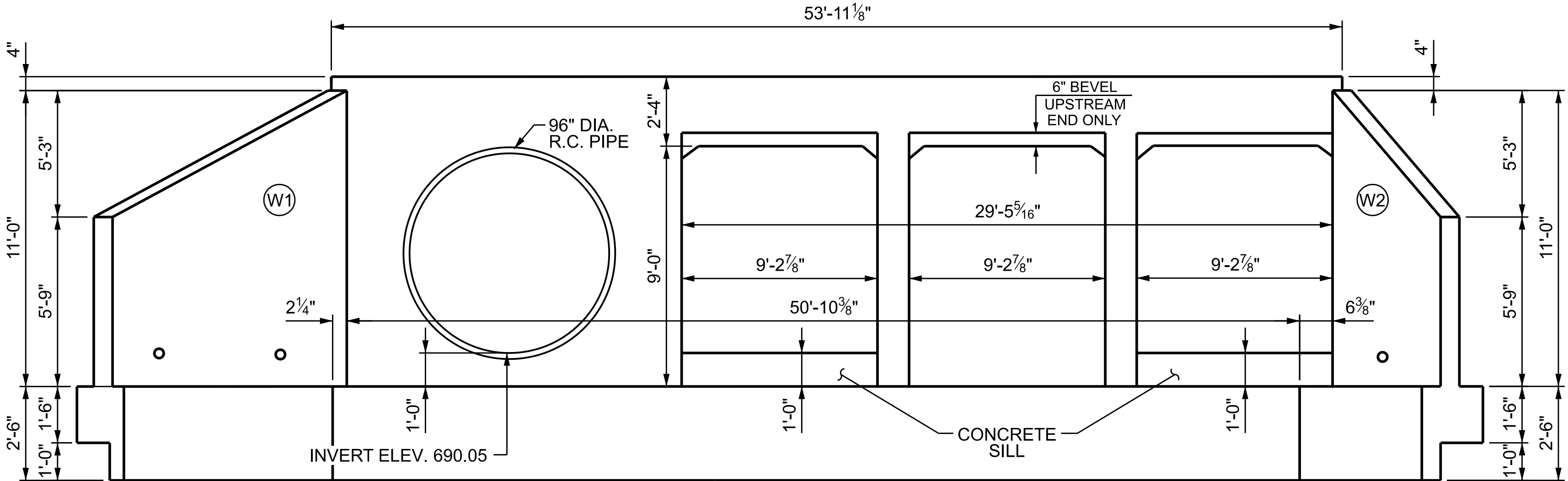
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HDR Engineering, Inc. of the Carolinas
555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

DES BY: R. BEAUCHAMP DATE: 09/25 DWG BY: D. CHAPMAN DATE: 09/25
DES CHK: G. MARTINEZ DATE: 09/25 CHK BY: B. BUSH DATE: 09/25

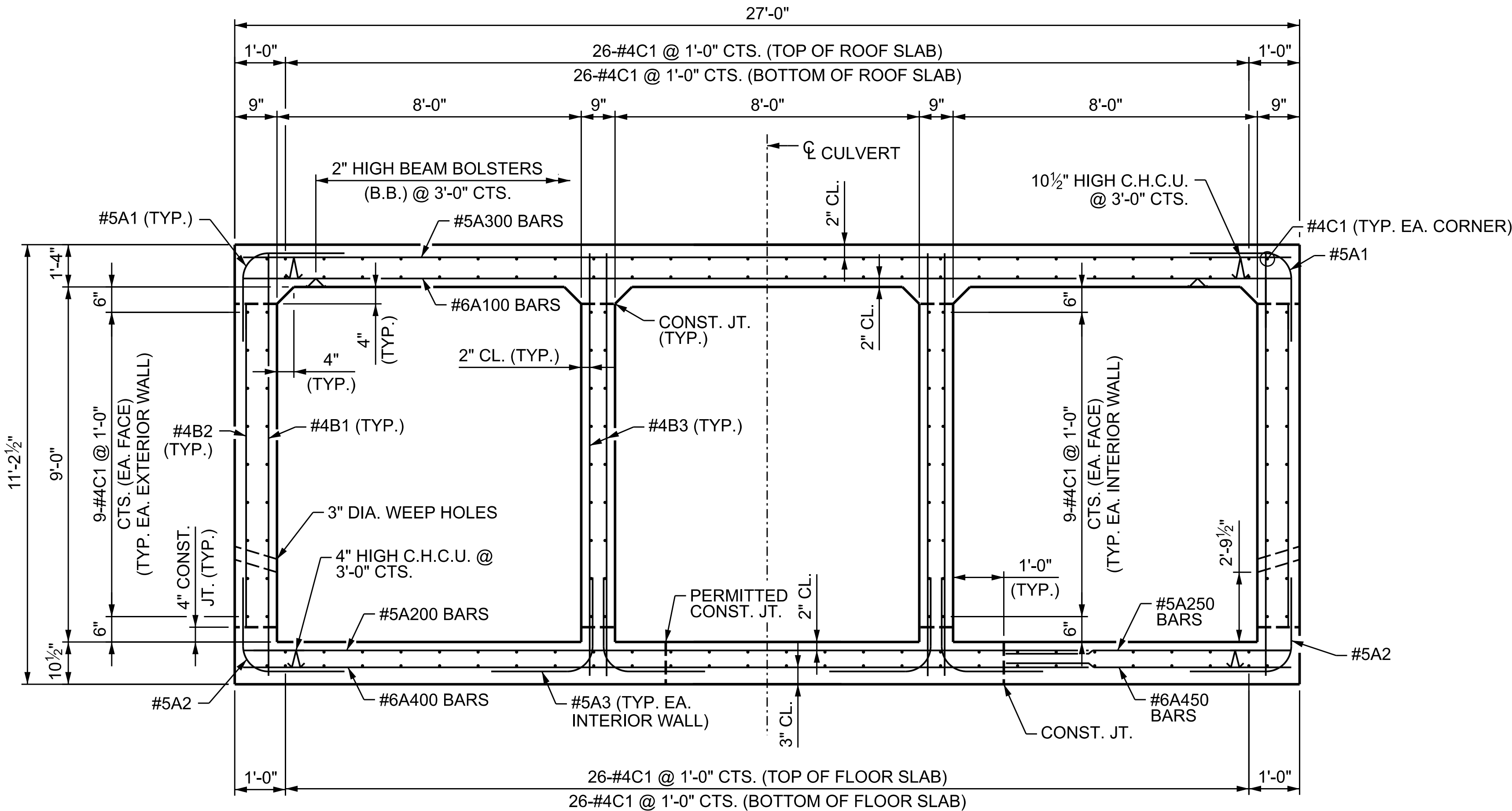


**UPSTREAM CULVERT EXTENSION SECTION
NORMAL TO ROADWAY**

- ① #4B1 BARS @ 8" CTS. STREAM FACE (EXTERIOR WALL)
#4B2 BARS @ 1'-0" CTS. FILL FACE (EXTERIOR WALL)
#4B3 BARS @ 1'-0" CTS. EA. FACE (INTERIOR WALL)
- ② #4C1 @ 1'-0" CTS. AS SHOWN IN TYPICAL BARREL SECTION (2 BAR RUN)
- ③ 6-#6D1 @ 1'-6" CTS.

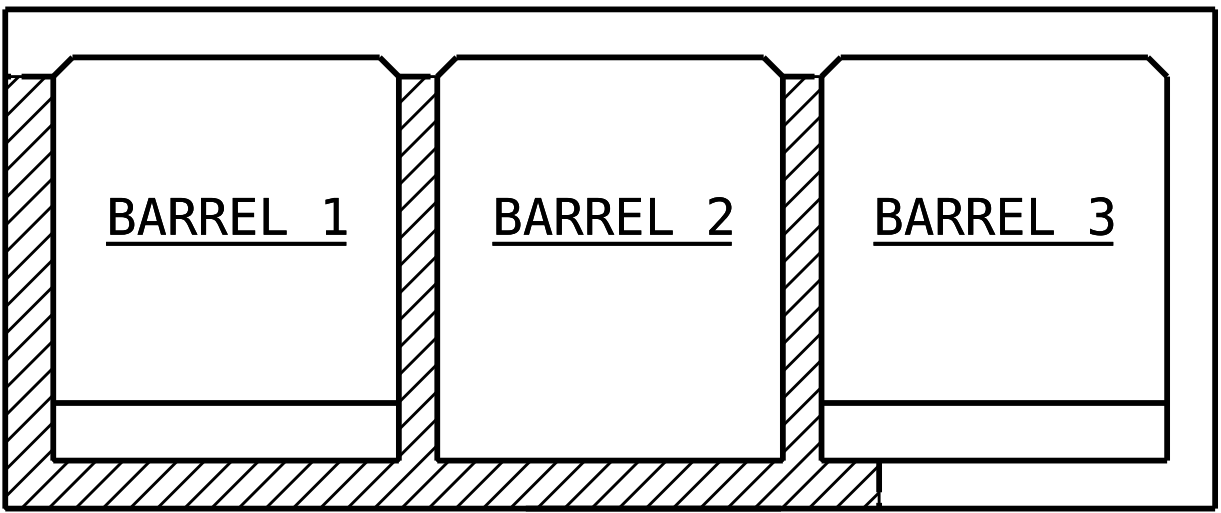


END ELEVATION NORMAL TO SKEW



RIGHT ANGLE SECTION OF BARREL(UPSTREAM EXTENSION)

THERE ARE 180 "C" BARS BARS IN SECTION OF BARREL
(LOOKING DOWNSTREAM)



CONSTRUCTION SEQUENCE

- LOOKING DOWNSTREAM
- STAGE I (INCLUDES SILL DOWELS)
- STAGE II (INCLUDING SILL CONCRETE)

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 463+27.43 -L2-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
**TRIPLE BARREL
8 FT. X 9 FT.
CONCRETE BOX CULVERT
UPSTREAM EXTENSION
120° SKEW**

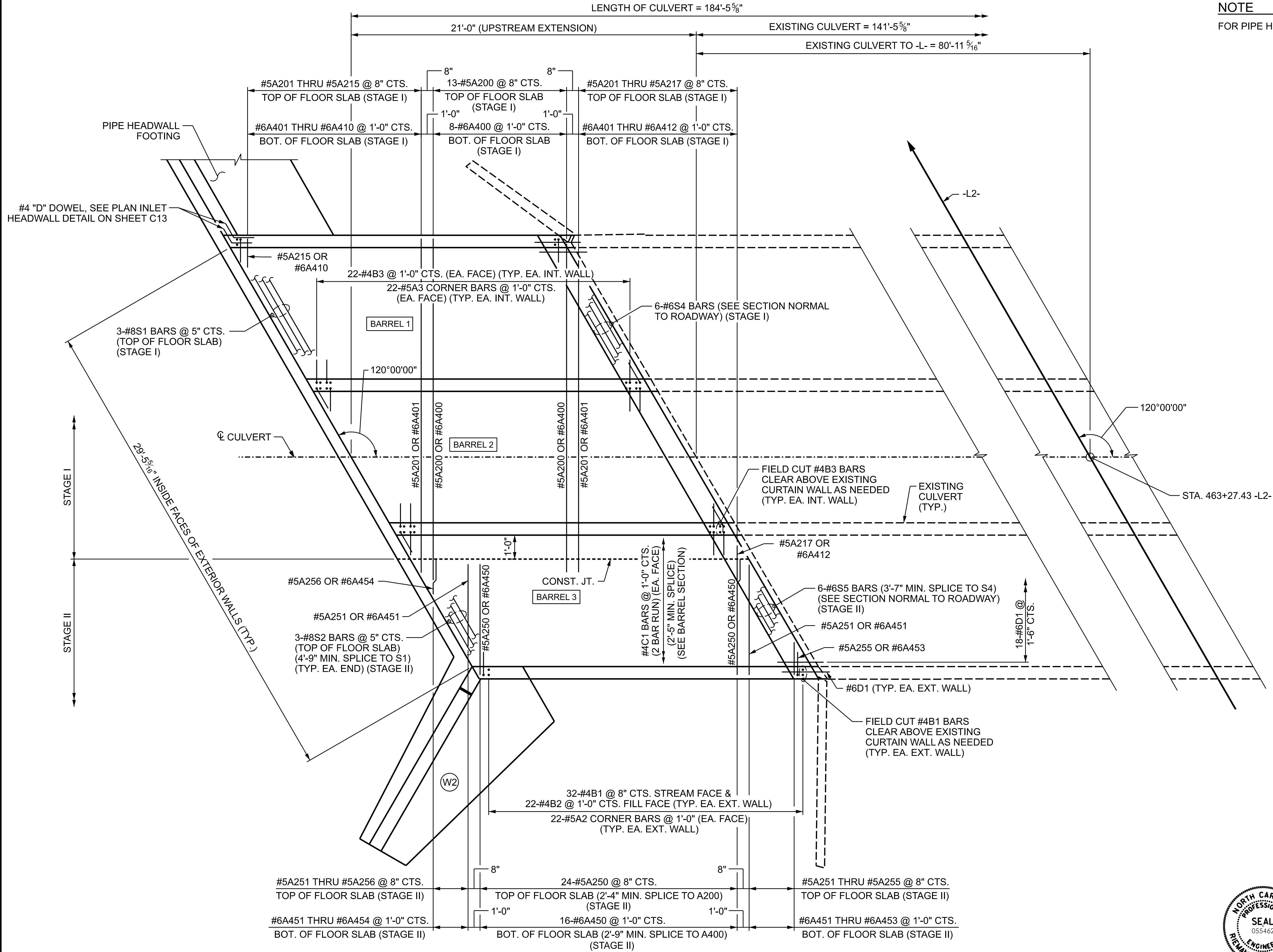
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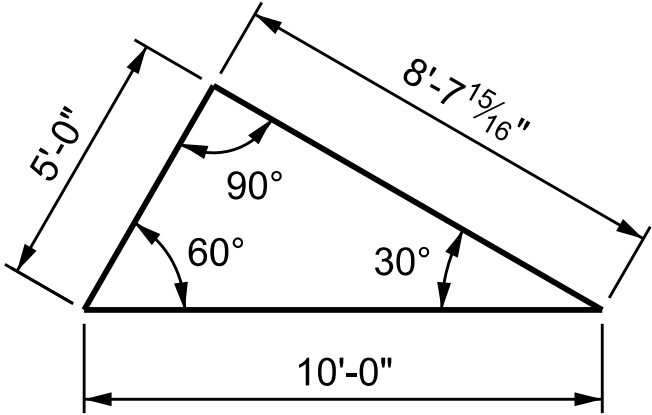
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DES CHK: G. MARTINEZ DATE: 09/25 CHK BY: D. MAST DATE: 09/25



NOTE

FOR PIPE HEADWALL AND FOOTING DETAILS, SEE SHEET C13.



SKEW TRIANGLE

PROJECT NO. U-5765

MECKLENBURG COUNTY

STATION: 463+27.43 -L2-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

**TRIPLE BARREL
8 FT. X 9 FT.
CONCRETE BOX CULVERT
UPSTREAM EXTENSION
120° SKEW**

REVISIONS						SHEET NO. C05
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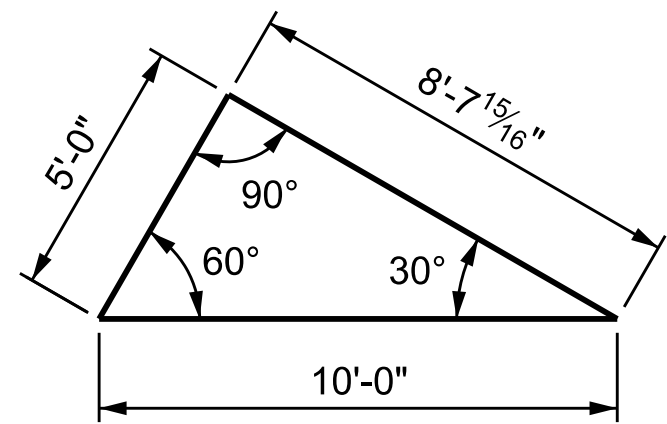
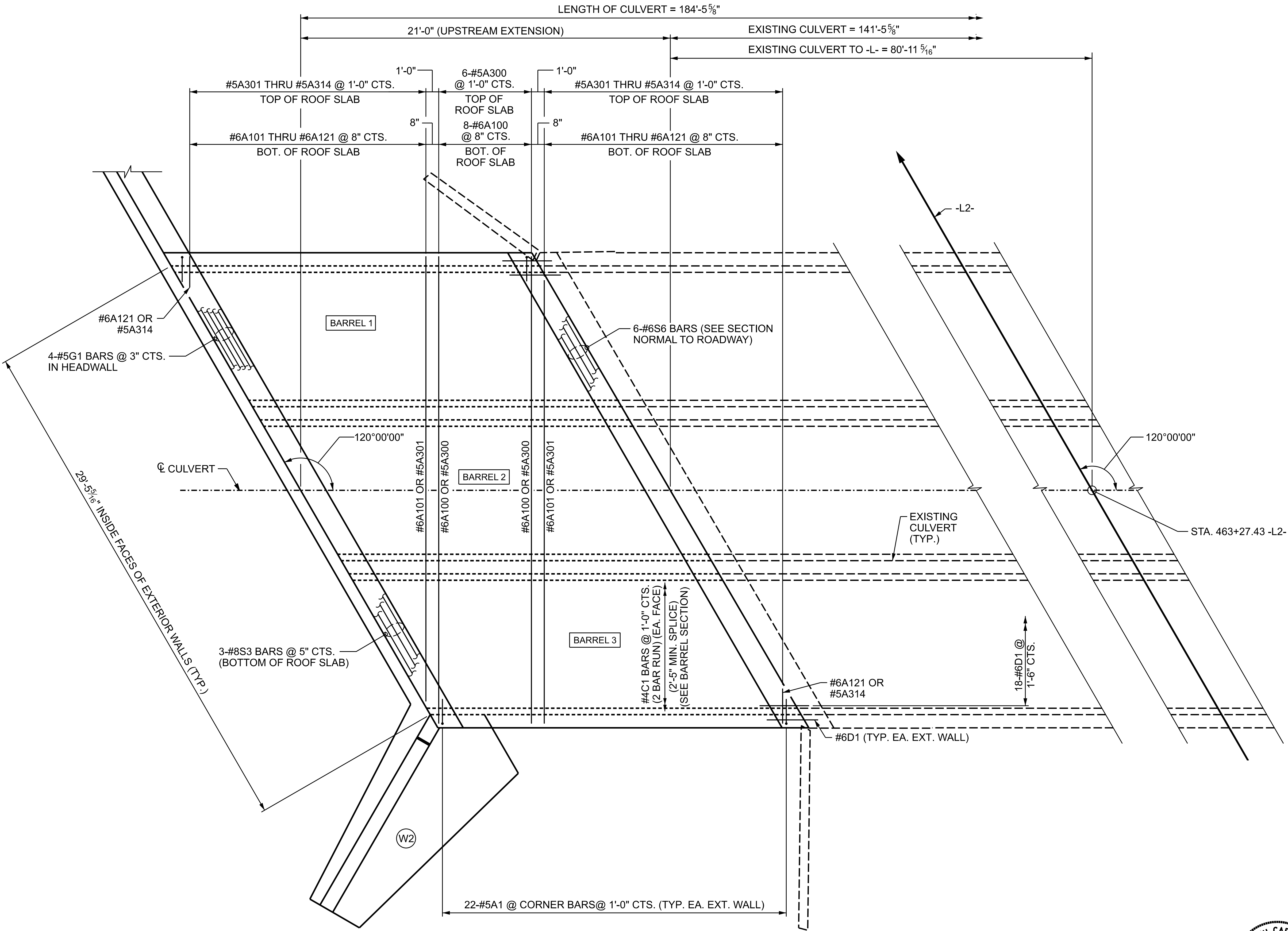


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FLOOR SLAB
(SILLS NOT SHOWN FOR CLARITY)



SKEW TRIANGLE

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 463+27.43 -L2-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
**TRIPLE BARREL
8 FT. X 9 FT.
CONCRETE BOX CULVERT
UPSTREAM EXTENSION
120° SKEW**

REVISIONS						SHEET NO. C06
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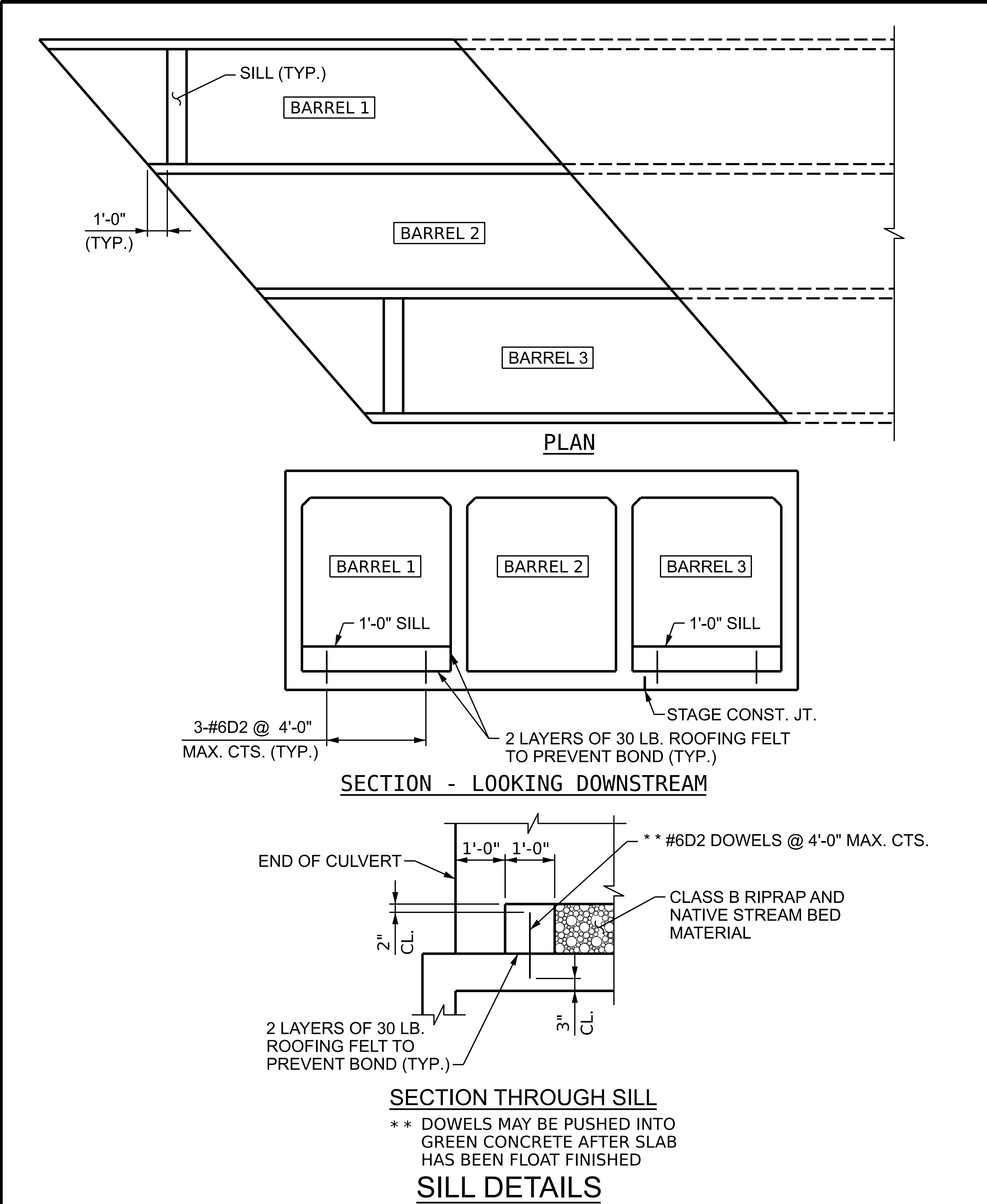


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DES CHK: <u>G. MARTINEZ</u>	DATE: <u>09/25</u>	CHK BY: <u>D. MAST</u>	DATE: <u>09/25</u>

ROOF SLAB



NOTES

BACKFILL CULVERT BARRELS WITH CLASS B RIPRAP AND TOP WITH NATIVE MATERIAL TO SILL HEIGHT.

NATIVE MATERIAL BETWEEN SILLS IN THE CULVERT SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM OR FLOODPLAIN AT THE PROJECT SITE DURING CONSTRUCTION. ONLY MATERIAL THAT IS EXCAVATED FROM THE STREAM BED MAY BE USED TO LINE THE LOW FLOW CULVERT BARREL. RIPRAP MAY BE USED TO SUPPLEMENT THE NATIVE MATERIAL IN THE HIGH FLOW CULVERT BARRELS. IF RIPRAP IS USED TO LINE THE HIGH FLOW CULVERT BARRELS, NATIVE MATERIAL SHOULD BE PLACED ON TOP TO FILL VOIDS AND PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

SILLS ARE TO BE 1.0 FT. WIDE, CAST SEPARATELY AND ATTACHED BY DOWELS.

TOP OF LOW FLOW SILLS SHOULD MATCH STREAM BED ELEVATION IN LOW FLOW CHANNEL OF STREAM.

SILLS TO BE CAST DURING STAGE II CONSTRUCTION. D1 DOWELS MAY BE INSTALLED DURING STAGES I & II CONSTRUCTION AS APPLICABLE.

THE ENGINEER, IN CONSULTATION WITH DEO STAFF, SHALL REVIEW ALL MATERIAL TO BE USED AS BACKFILL PRIOR TO CONDUCTING THE BACKFILL ACTIVITY. BACKFILL SHALL CONSIST OF CLASS B RIPRAP AND NATIVE MATERIAL ONLY, UNLESS THE ENGINEER, IN CONSULTATION WITH DEO STAFF, DETERMINES THAT (1) THE NATIVE MATERIAL IS UNSUITABLE, OR (2) ADDITIONAL MATERIAL IS REQUIRED TO SUPPLEMENT THE NATIVE MATERIAL. THE CHOSEN BACKFILL MATERIAL SHALL NOT HAVE ADVERSE EFFECTS TO AQUATIC LIFE, AQUATIC LIFE PASSAGE, OR WATER QUALITY. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED OR FLOODPLAIN AT THE PROJECT SITE DURING CULVERT CONSTRUCTION.

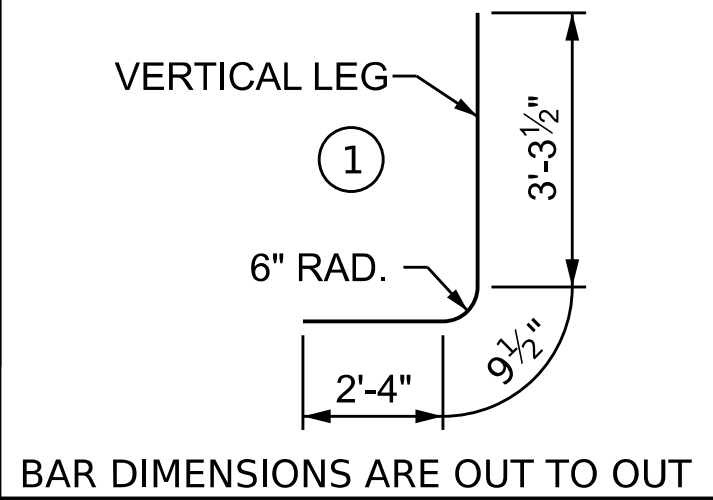
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DES CHK: G. MARTINEZ	DATE: 09/25	CHK BY: D. MAST	DATE: 09/25

BILL OF MATERIAL																	
STAGE I						STAGE II											
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	22	#5	1	6'-5"	148	A1	22	#5	1	6'-5"	148	A450	16	#6	STR	7'-5"	179
A2	22	#5	1	6'-5"	148	A2	22	#5	1	6'-5"	148	A451	2	#6	STR	6'-8"	21
A3	88	#5	1	6'-5"	589							A452	2	#6	STR	4'-11"	15
						A100	8	#6	STR	26'-8"	321	A453	2	#6	STR	3'-2"	10
A200	13	#5	STR	21'-9"	295	A101	2	#6	STR	25'-11"	78	A454	1	#6	STR	1'-5"	3
A201	2	#5	STR	20'-6"	43	A102	2	#6	STR	24'-10"	75						
A202	2	#5	STR	19'-4"	41	A103	2	#6	STR	23'-8"	72	B1	32	#4	STR	10'-9"	230
A203	2	#5	STR	18'-3"	39	A104	2	#6	STR	22'-6"	68	B2	22	#4	STR	8'-4"	123
A204	2	#5	STR	17'-1"	36	A105	2	#6	STR	21'-4"	65						
A205	2	#5	STR	15'-11"	34	A106	2	#6	STR	20'-2"	61	C1	174	#4	STR	13'-0"	1512
A206	2	#5	STR	14'-9"	31	A107	2	#6	STR	19'-0"	58						
A207	2	#5	STR	13'-7"	29	A108	2	#6	STR	17'-10"	54	D1	29	#6	STR	2'-6"	109
A208	2	#5	STR	12'-5"	26	A109	2	#6	STR	16'-9"	51	D2	3	#6	STR	1'-5"	7
A209	2	#5	STR	11'-3"	24	A110	2	#6	STR	15'-7"	47						
A210	2	#5	STR	10'-2"	22	A111	2	#6	STR	14'-5"	44	G1	4	#5	STR	35'-0"	147
A211	2	#5	STR	9'-0"	19	A112	2	#6	STR	13'-3"	40						
A212	2	#5	STR	7'-10"	17	A113	2	#6	STR	12'-1"	37	S2	3	#8	STR	8'-7"	69
A213	2	#5	STR	6'-8"	14	A114	2	#6	STR	10'-11"	33	S3	3	#8	STR	36'-4"	292
A214	2	#5	STR	5'-6"	12	A115	2	#6	STR	9'-9"	30	S5	6	#6	STR	8'-7"	78
A215	2	#5	STR	4'-4"	10	A116	2	#6	STR	8'-8"	27	S6	6	#6	STR	30'-9"	278
A216	1	#5	STR	3'-2"	4	A117	2	#6	STR	7'-6"	23	REINFORCING STEEL					LBS. 5430
A217	1	#5	STR	2'-1"	3	A118	2	#6	STR	6'-4"	20	CLASS "A" CONCRETE					
						A119	2	#6	STR	5'-2"	16	BARREL					CU. YDS. 40.9
A400	8	#6	STR	22'-4"	269	A120	2	#6	STR	4'-0"	13	CURTAIN WALL					CU. YDS. 1.3
A401	2	#6	STR	21'-0"	64	A121	2	#6	STR	2'-10"	9	SILL					CU. YDS. 0.6
A402	2	#6	STR	19'-3"	58							EDGE BEAM					CU. YDS. 1.9
A403	2	#6	STR	17'-7"	53	A250	24	#5	STR	7'-5"	186	TOTAL *					CU. YDS. 44.7
A404	2	#6	STR	15'-10"	48	A251	2	#5	STR	7'-1"	15	* FOR HEADWALL QUANTITIES, SEE C13.					
A405	2	#6	STR	14'-1"	43	A252	2	#5	STR	5'-11"	13						
A406	2	#6	STR	12'-4"	38	A253	2	#5	STR	4'-9"	10						
A407	2	#6	STR	10'-8"	33	A254	2	#5	STR	3'-7"	8						
A408	2	#6	STR	8'-11"	27	A255	2	#5	STR	2'-5"	6						
A409	2	#6	STR	7'-2"	22	A256	1	#5	STR	1'-4"	2						
A410	2	#6	STR	5'-5"	17												
A411	1	#6	STR	3'-8"	6	A300	6	#5	STR	26'-8"	167						
A412	1	#6	STR	2'-0"	4	A301	2	#5	STR	25'-1"	53						
						A302	2	#5	STR	23'-4"	49						
B1	32	#4	STR	10'-9"	230	A303	2	#5	STR	21'-7"	46						
B2	22	#4	STR	8'-4"	123	A304	2	#5	STR	19'-11"	42						
B3	88	#4	STR	10'-9"	632	A305	2	#5	STR	18'-2"	38						
						A306	2	#5	STR	16'-5"	35						
C1	186	#4	STR	13'-0"	1616	A307	2	#5	STR	14'-8"	31						
						A308	2	#5	STR	13'-0"	28						
D1	19	#6	STR	2'-6"	72	A309	2	#5	STR	11'-3"	24						
D2	3	#6	STR	1'-5"	7	A310	2	#5	STR	9'-6"	20						
						A311	2	#5	STR	7'-9"	17						
S1	3	#8	STR	27'-2"	218	A312	2	#5	STR	6'-0"	13						
S4	6	#6	STR	26'-0"	235	A313	2	#5	STR	4'-4"	10						
						A314	2	#5	STR	2'-7"	6						

REINFORCING STEEL			LBS.	5399
CLASS "A" CONCRETE				
BARREL			CU. YDS.	28.3
CURTAIN WALL			CU. YDS.	3.1
SILL			CU. YDS.	0.0
EDGE BEAM			CU. YDS.	1.7
TOTAL *			CU. YDS.	33.1
* FOR HEADWALL QUANTITIES, SEE C13.				

SPlice LENGTH CHART		
BAR	SIZE	SPlice LENGTH
A200, A250	#5	2'-4"
A400, A450	#6	2'-9"
C1	#4	2'-5"
S1, S2, S3	#8	4'-9"
S4, S5, S6	#6	3'-7"

BAR TYPES



PROJECT NO. U-5765

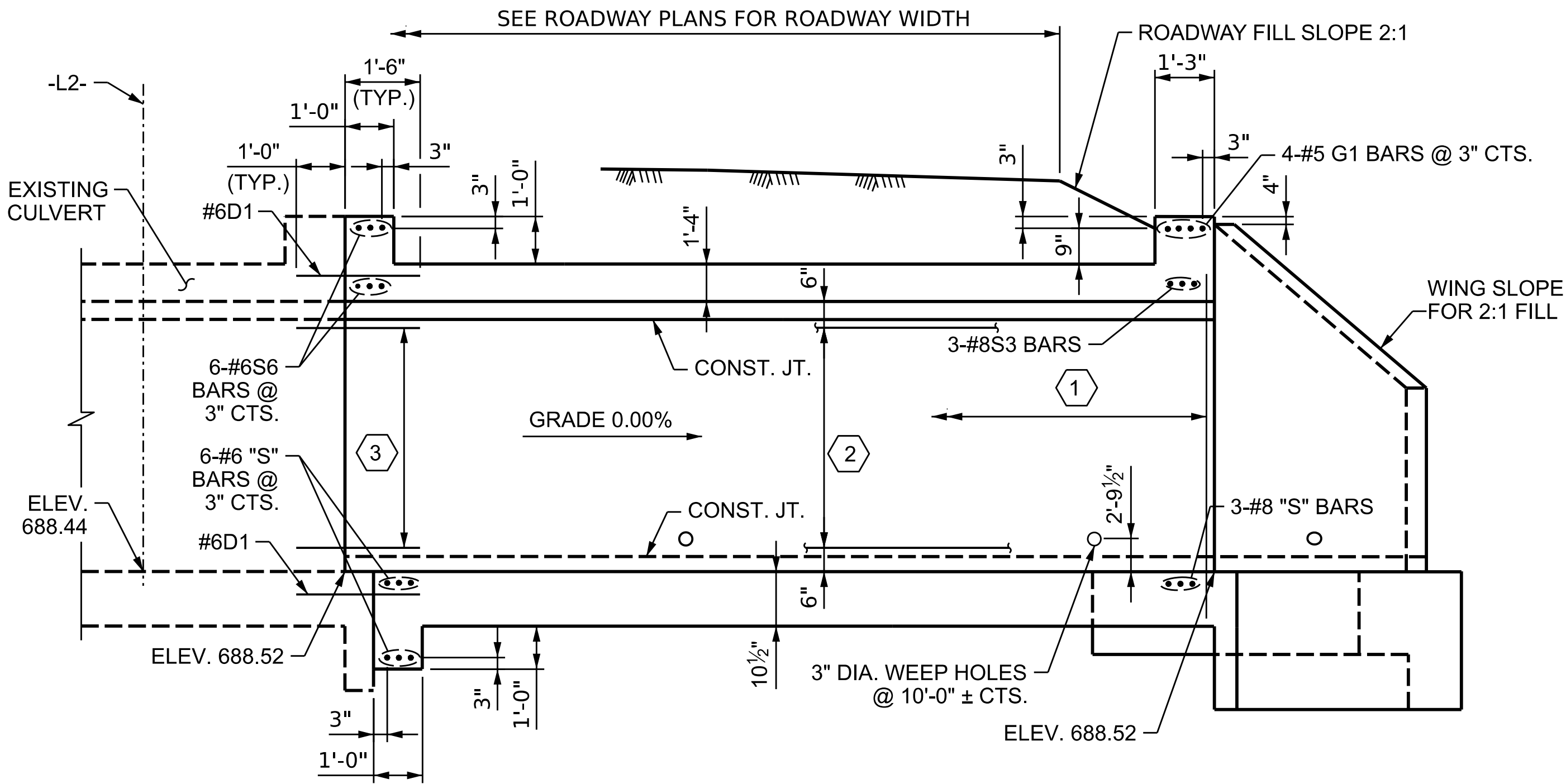
MECKLENBURG COUNTY

STATION: 463+27.43 -L2-



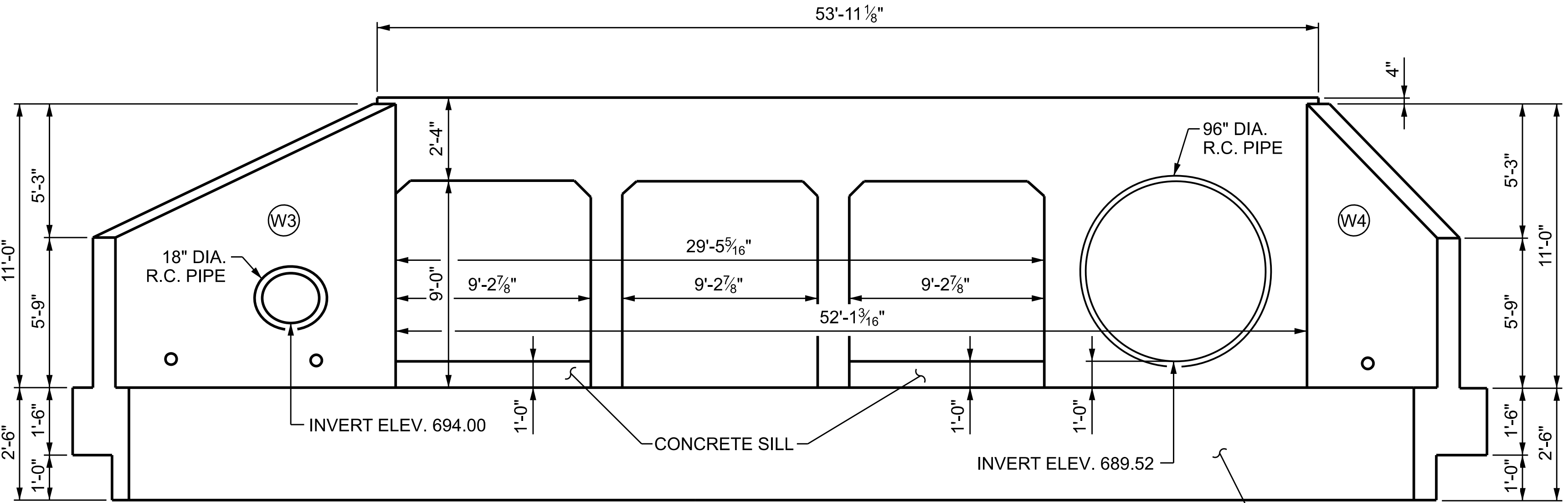
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH											
TRIPLE BARREL 8 FT. X 9 FT. CONCRETE BOX CULVERT UPSTREAM EXTENSION 120° SKEW											
REVISIONS										SHEET NO. C07	
NO.	BY:	DATE:	NO.	BY:	DATE:						TOTAL SHEETS
1	--	--	3	--	--						36
2	--	--	4	--	--						



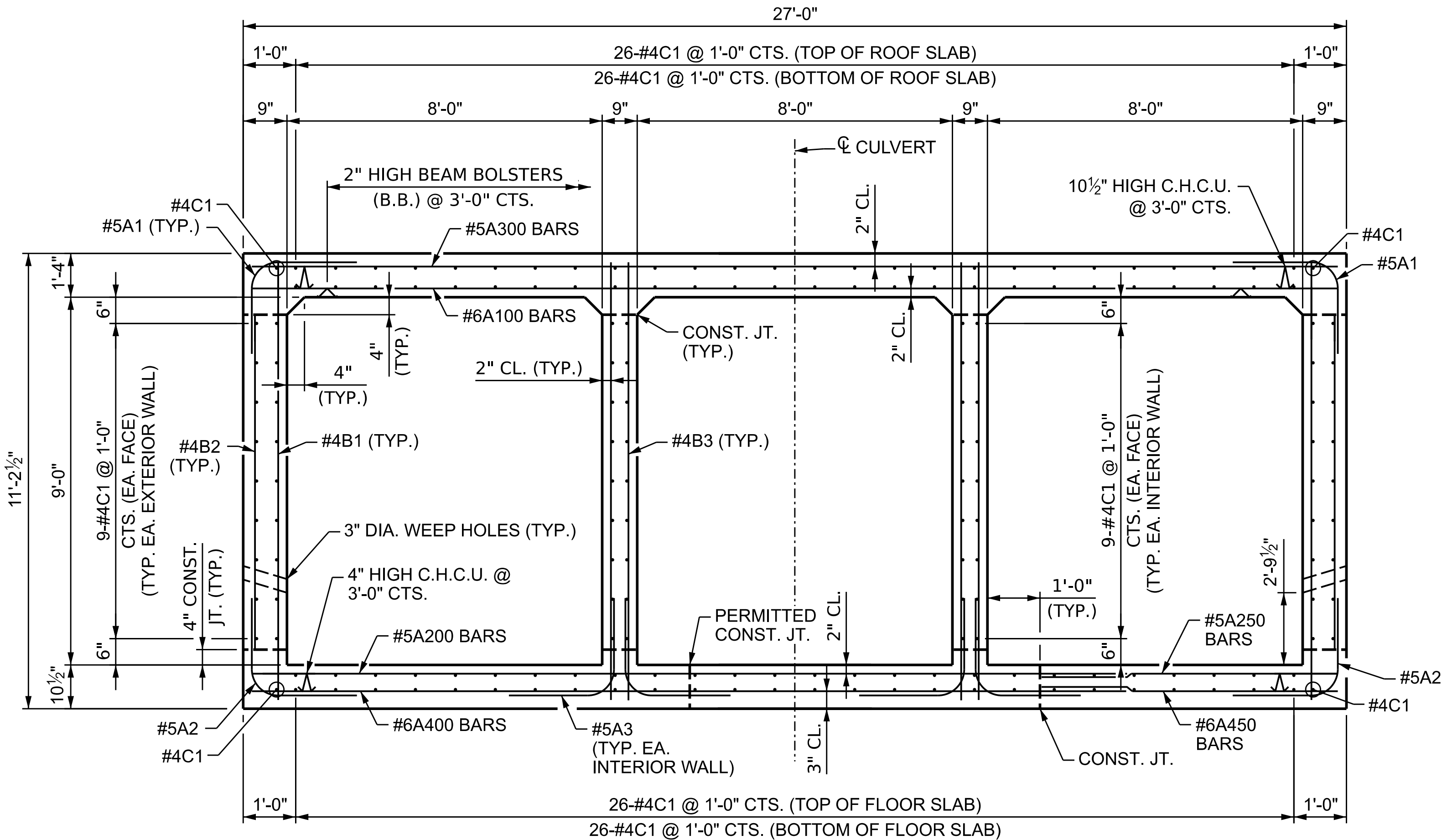
DOWNSTREAM CULVERT EXTENSION
SECTION NORMAL TO ROADWAY

- 1 #4B1 BARS @ 8" CTS. STREAM FACE (EXTERIOR WALL)
#4B2 BARS @ 1'-0" CTS. FILL FACE (EXTERIOR WALL)
#4B3 BARS @ 1'-0" CTS. EA. FACE (INTERIOR WALL)
- 2 #4C1 BARS @ 1'-0" CTS. AS SHOWN IN TYPICAL BARREL SECTION (2 BAR RUN)
- 3 6-#6D1 @ 1'-6" CTS.



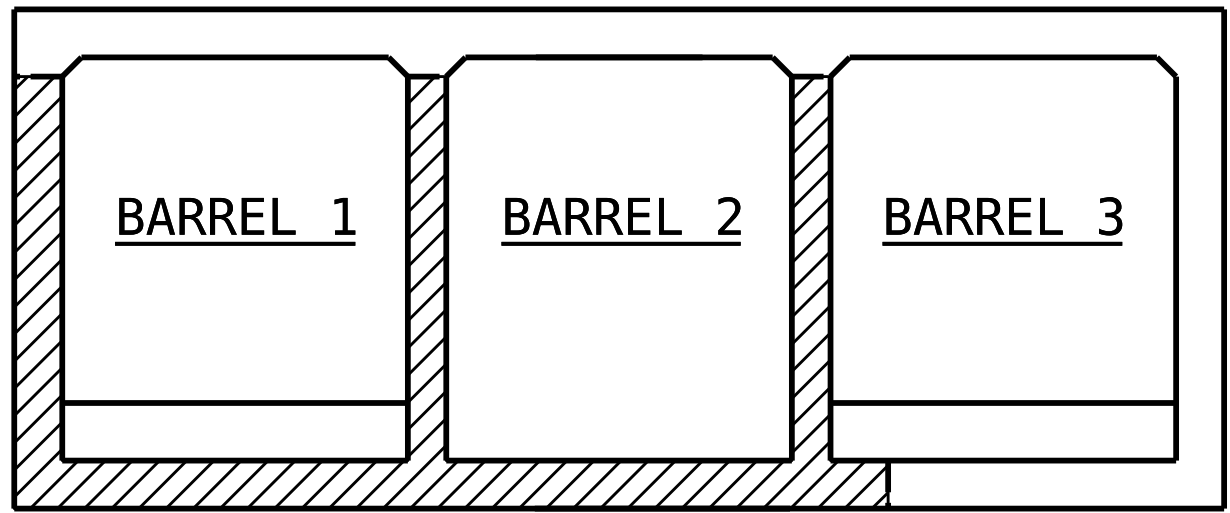
END ELEVATION NORMAL TO SKEW

FOR APRON DETAILS
SEE C13



RIGHT ANGLE SECTION OF BARREL(DOWNSTREAM EXTENSION)

THERE ARE 180 "C1" BARS BARS IN SECTION OF BARREL
(LOOKING DOWNSTREAM)



CONSTRUCTION SEQUENCE

LOOKING DOWNSTREAM

- STAGE I (INCLUDES SILL DOWELS)
- STAGE II (INCLUDES SILL CONCRETE)

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 463+27.43 -L2-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE BARREL
8 FT. X 9 FT.
CONCRETE BOX CULVERT
DOWNSTREAM EXTENSION
120° SKEW

REVISIONS						SHEET NO. C08
NO.	BY:	DATE:	NO.	BY:	DATE:	
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2	--	--	4	--	--	36



RIEMAN G. BEAUCHAMP
7/21/2026

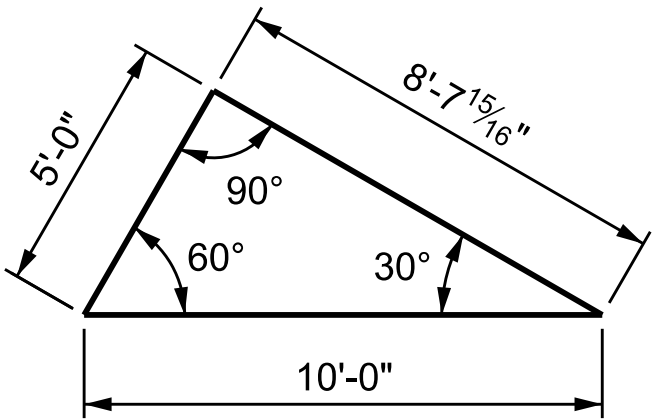
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



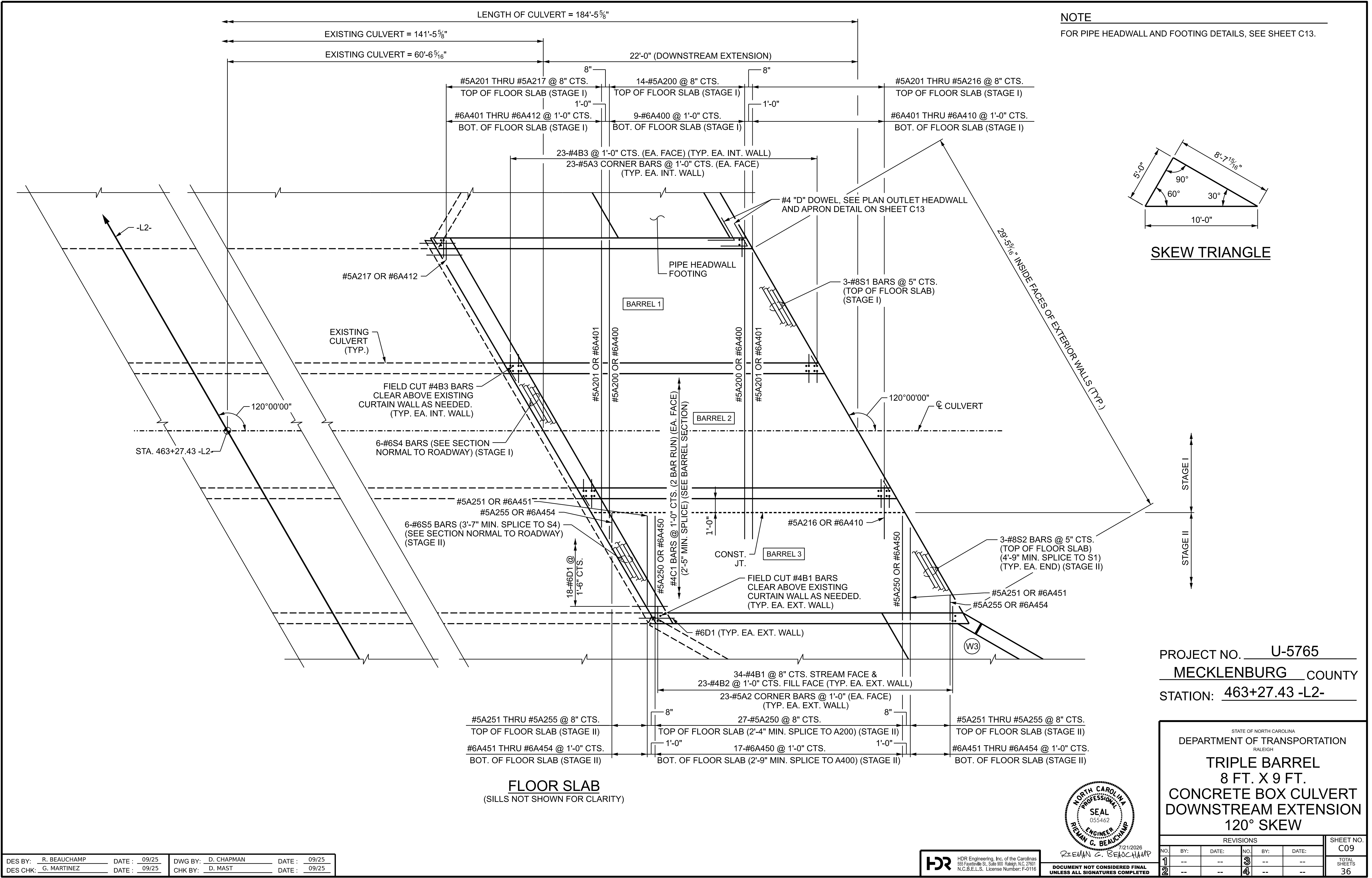
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

DES BY: R. BEAUCHAMP DATE: 09/25 DWG BY: D. CHAPMAN DATE: 09/25
DES CHK: G. MARTINEZ DATE: 09/25 CHK BY: D. MAST DATE: 09/25

NOTE
FOR PIPE HEADWALL AND FOOTING DETAILS, SEE SHEET C13.



SKEW TRIANGLE



PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 463+27.43 -L2-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
**TRIPLE BARREL
8 FT. X 9 FT.
CONCRETE BOX CULVERT
DOWNSTREAM EXTENSION
120° SKEW**

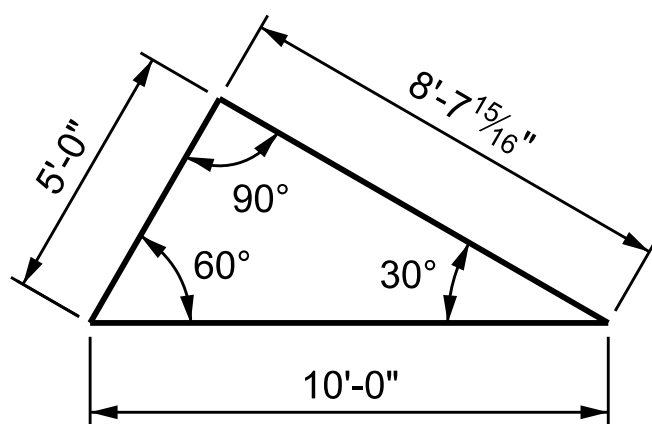
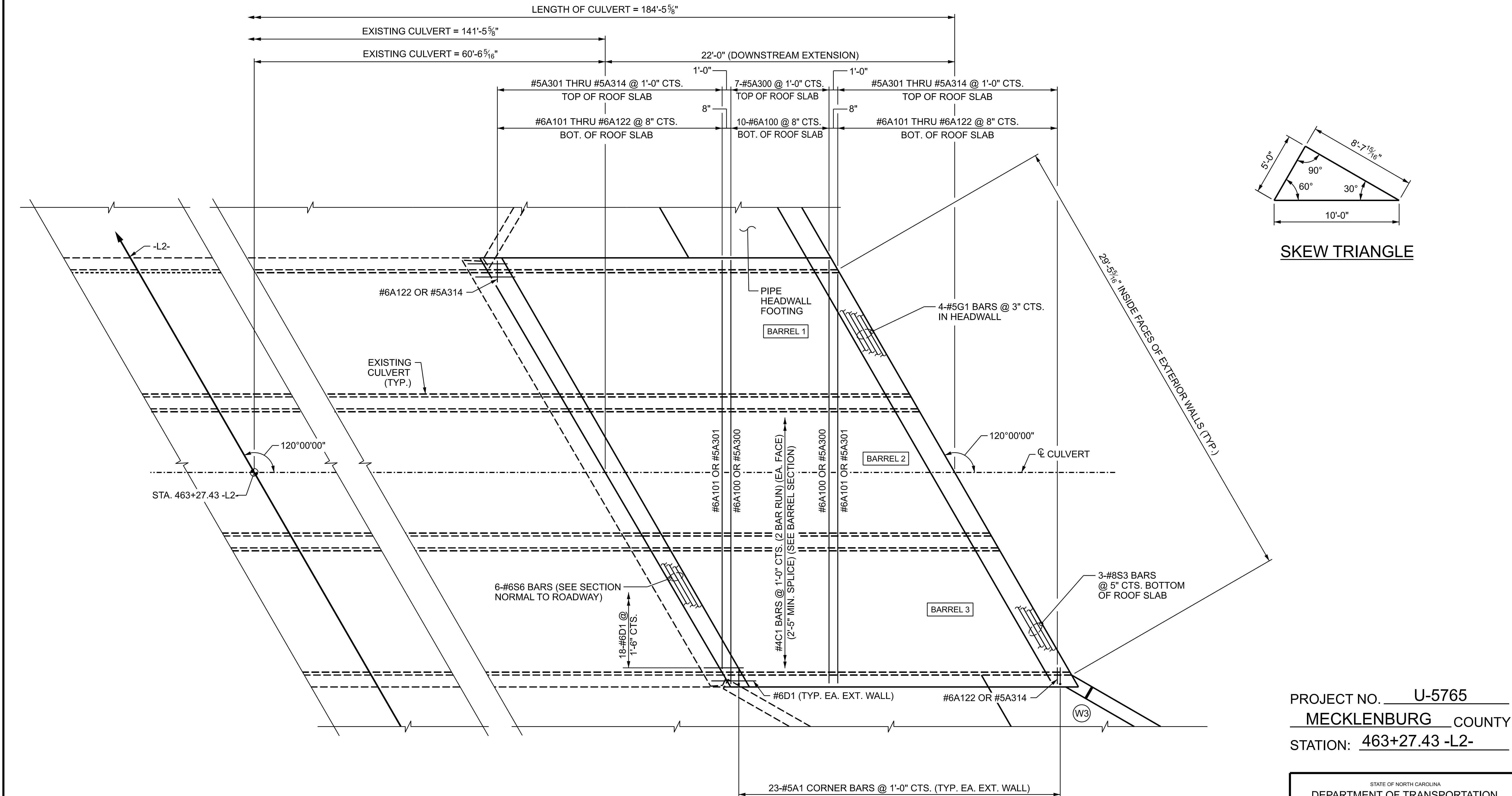
REVISIONS						SHEET NO. C09
NO.	BY:	DATE:	NO.	BY:	DATE:	
1	--	--	3	--	--	TOTAL SHEETS 36
2	--	--	4	--	--	



7/21/2026
RIEMAN G. BEAUCHAMP
ENGINEER
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

HDR
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

DES BY: <u>R. BEAUCHAMP</u>	DATE: <u>09/25</u>	DWG BY: <u>D. CHAPMAN</u>	DATE: <u>09/25</u>
DES CHK: <u>G. MARTINEZ</u>	DATE: <u>09/25</u>	CHK BY: <u>D. MAST</u>	DATE: <u>09/25</u>



SKEW TRIANGLE

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 463+27.43 -L2-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
**TRIPLE BARREL
8 FT. X 9 FT.
CONCRETE BOX CULVERT
DOWNSTREAM EXTENSION
120° SKEW**

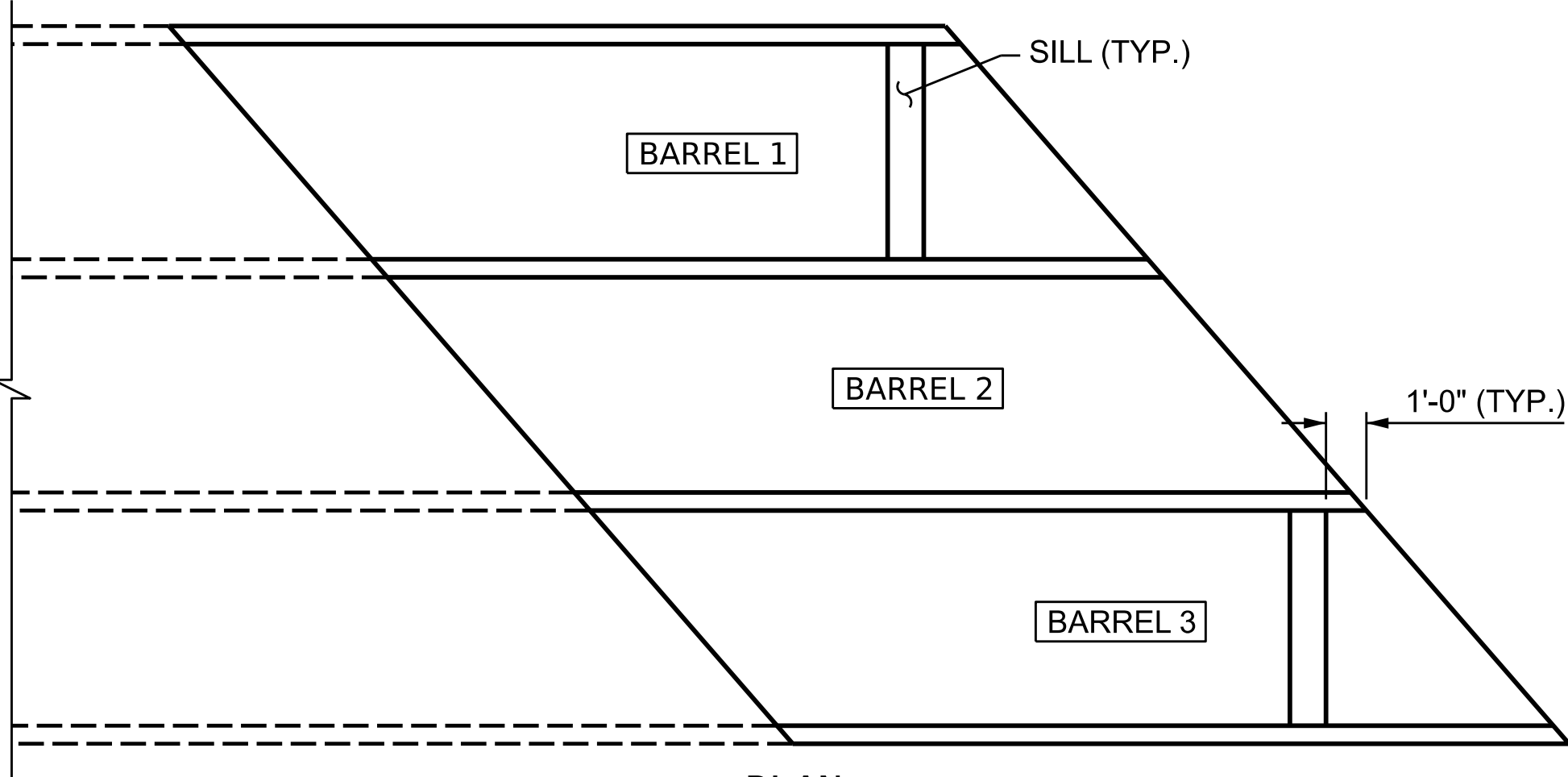
REVISIONS						SHEET NO. C10
NO.	BY:	DATE:	NO.	BY:	DATE:	TOTAL SHEETS
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2	--	--	4	--	--	

DES BY: <u>R. BEAUCHAMP</u>	DATE: <u>09/25</u>	DWG BY: <u>D. CHAPMAN</u>	DATE: <u>09/25</u>
DES CHK: <u>G. MARTINEZ</u>	DATE: <u>09/25</u>	CHK BY: <u>D. MAST</u>	DATE: <u>09/25</u>

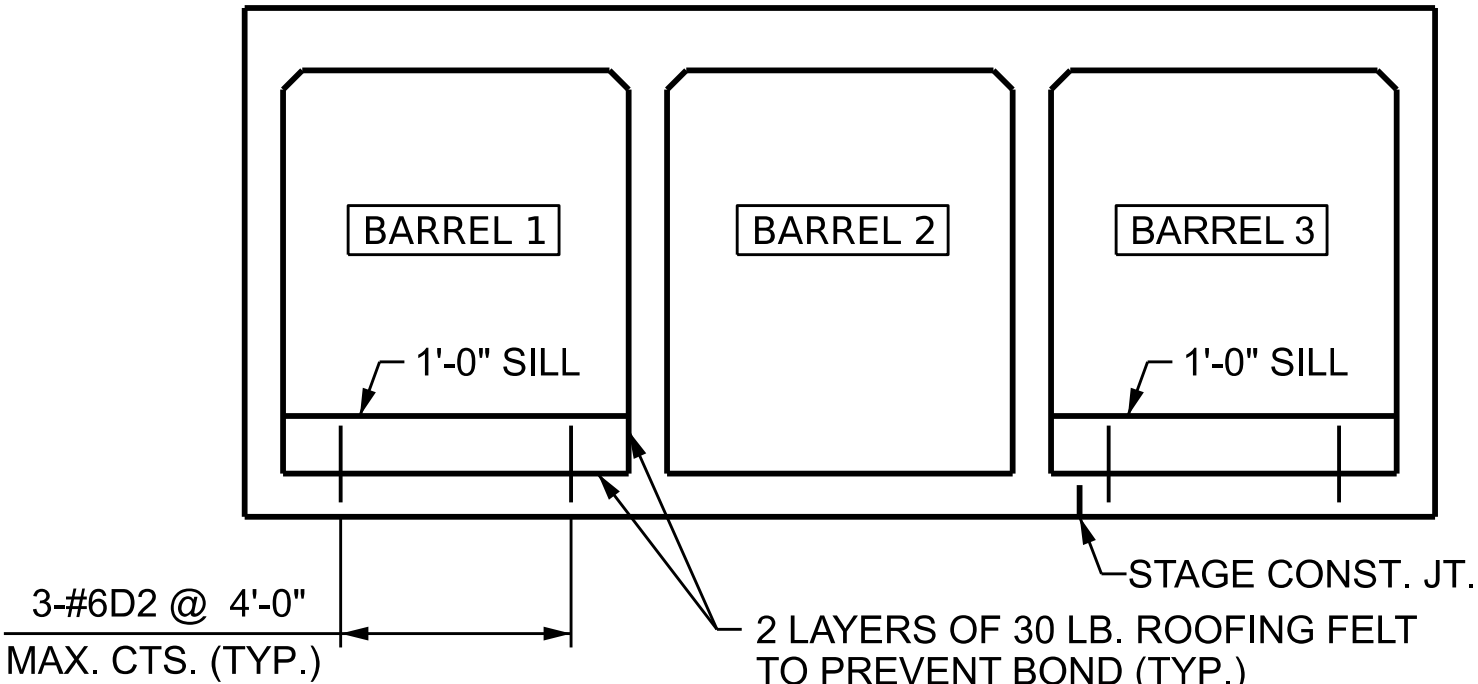
HDR
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St., Suite 900, Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

7/21/2026
RHEMAN G. BEAUCHAMP

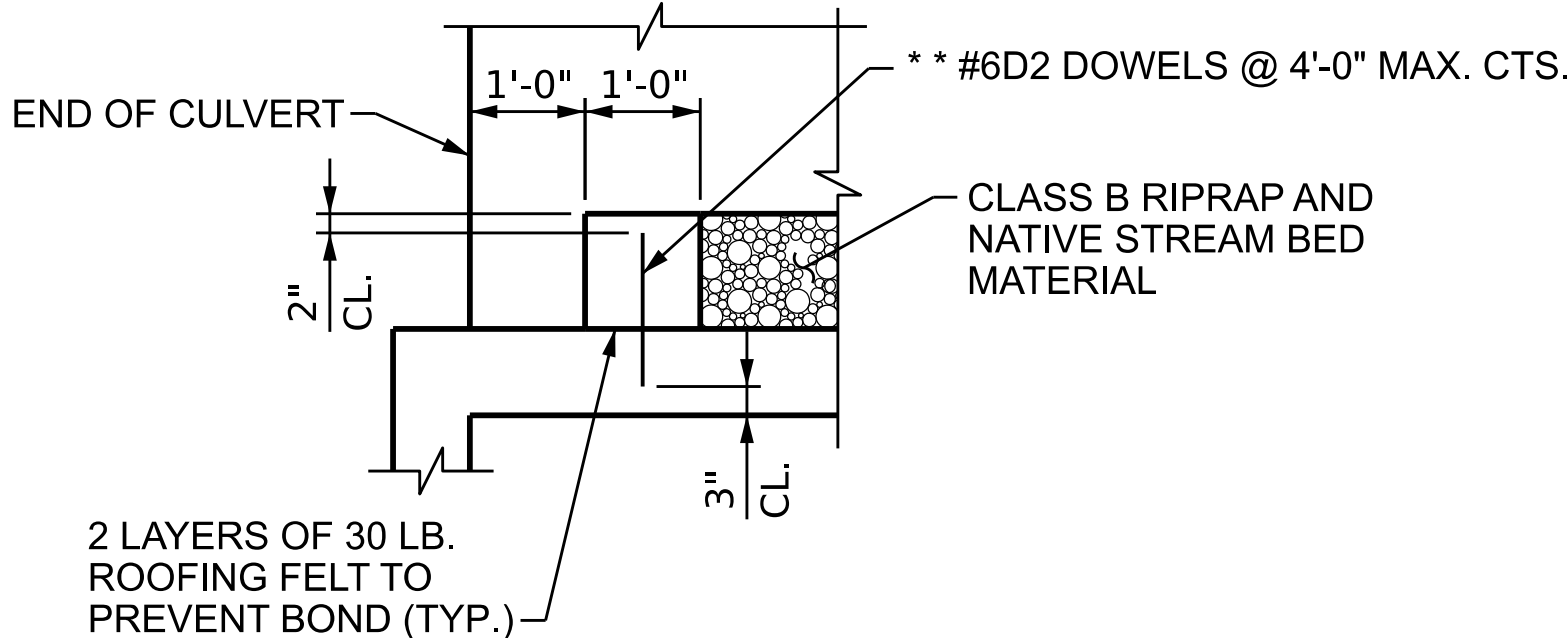
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



PLAN



SECTION - LOOKING DOWNSTREAM



SECTION THROUGH SILL

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

SILL DETAILS

NOTES

BACKFILL CULVERT BARRELS WITH CLASS B RIPRAP AND TOP WITH NATIVE MATERIAL TO SILL HEIGHT.

NATIVE MATERIAL BETWEEN SILLS IN THE CULVERT SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM OR FLOODPLAIN AT THE PROJECT SITE DURING CONSTRUCTION. ONLY MATERIAL THAT IS EXCAVATED FROM THE STREAM BED MAY BE USED TO LINE THE LOW FLOW CULVERT BARREL. RIPRAP MAY BE USED TO SUPPLEMENT THE NATIVE MATERIAL IN THE HIGH FLOW CULVERT BARRELS. IF RIPRAP IS USED TO LINE THE HIGH FLOW CULVERT BARRELS, NATIVE MATERIAL SHOULD BE PLACED ON TOP TO FILL VOIDS AND PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

SILLS ARE TO BE 1.0 FT. WIDE, CAST SEPARATELY AND ATTACHED BY DOWELS.

TOP OF LOW FLOW SILLS SHOULD MATCH STREAM BED ELEVATION IN LOW FLOW CHANNEL OF STREAM.

SILLS TO BE CAST DURING STAGE II CONSTRUCTION. D1 DOWELS MAY BE INSTALLED DURING STAGES I & II CONSTRUCTION AS APPLICABLE.

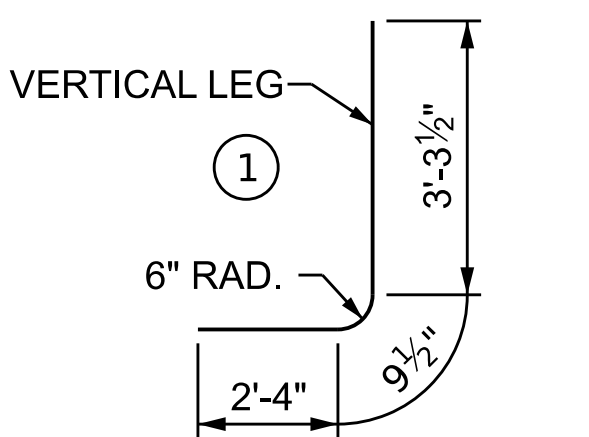
THE ENGINEER, IN CONSULTATION WITH DEO STAFF, SHALL REVIEW ALL MATERIAL TO BE USED AS BACKFILL PRIOR TO CONDUCTING THE BACKFILL ACTIVITY. BACKFILL SHALL CONSIST OF CLASS B RIPRAP AND NATIVE MATERIAL ONLY, UNLESS THE ENGINEER, IN CONSULTATION WITH DEO STAFF, DETERMINES THAT (1) THE NATIVE MATERIAL IS UNSUITABLE, OR (2) ADDITIONAL MATERIAL IS REQUIRED TO SUPPLEMENT THE NATIVE MATERIAL. THE CHOSEN BACKFILL MATERIAL SHALL NOT HAVE ADVERSE EFFECTS TO AQUATIC LIFE, AQUATIC LIFE PASSAGE, OR WATER QUALITY. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED OR FLOODPLAIN AT THE PROJECT SITE DURING CULVERT CONSTRUCTION.

DES BY: R. BEAUCHAMP DATE: 09/25 DWG BY: D. CHAPMAN DATE: 09/25
DES CHK: D. MAST DATE: 09/25 CHK BY: B. BUSH DATE: 09/25

BILL OF MATERIAL																	
STAGE I						STAGE II											
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	23	#5	1	6'-5"	154	A1	23	#5	1	6'-5"	154	A450	17	#6	STR	7'-5"	190
A2	23	#5	1	6'-5"	154	A2	23	#5	1	6'-5"	154	A451	2	#6	STR	7'-0"	22
A3	92	#5	1	6'-5"	616							A452	2	#6	STR	4'-11"	15
						A100	10	#6	STR	26'-8"	401	A453	2	#6	STR	3'-2"	10
A200	14	#5	STR	21'-9"	318	A101	2	#6	STR	25'-8"	78	A454	2	#6	STR	1'-5"	5
A201	2	#5	STR	20'-10"	44	A102	2	#6	STR	24'-6"	74						
A202	2	#5	STR	19'-8"	42	A103	2	#6	STR	23'-4"	71	B1	34	#4	STR	10'-9"	245
A203	2	#5	STR	18'-6"	39	A104	2	#6	STR	22'-2"	67	B2	23	#4	STR	8'-4"	129
A204	2	#5	STR	17'-4"	37	A105	2	#6	STR	21'-1"	64						
A205	2	#5	STR	16'-2"	34	A106	2	#6	STR	19'-11"	60	C1	174	#4	STR	13'-0"	1512
A206	2	#5	STR	15'-0"	32	A107	2	#6	STR	18'-9"	57						
A207	2	#5	STR	13'-11"	30	A108	2	#6	STR	17'-7"	53	D1	29	#6	STR	2'-6"	109
A208	2	#5	STR	12'-9"	27	A109	2	#6	STR	16'-5"	50	D2	3	#6	STR	1'-5"	7
A209	2	#5	STR	11'-7"	25	A110	2	#6	STR	15'-3"	46						
A210	2	#5	STR	10'-5"	22	A111	2	#6	STR	14'-1"	43	G1	4	#5	STR	35'-0"	147
A211	2	#5	STR	9'-3"	20	A112	2	#6	STR	13'-0"	40						
A212	2	#5	STR	8'-1"	17	A113	2	#6	STR	11'-10"	36	S2	3	#8	STR	8'-7"	69
A213	2	#5	STR	6'-11"	15	A114	2	#6	STR	10'-8"	33	S3	3	#8	STR	36'-4"	292
A214	2	#5	STR	5'-10"	13	A115	2	#6	STR	9'-6"	29	S5	6	#6	STR	8'-7"	78
A215	2	#5	STR	4'-8"	10	A116	2	#6	STR	8'-4"	26	S6	6	#6	STR	30'-9"	278
A216	2	#5	STR	3'-6"	8	A117	2	#6	STR	7'-2"	22						
A217	1	#5	STR	2'-4"	3	A118	2	#6	STR	6'-0"	19	REINFORCING STEEL					LBS. 5583
						A119	2	#6	STR	4'-11"	15	CLASS "A" CONCRETE					
A400	9	#6	STR	22'-4"	302	A120	2	#6	STR	3'-9"	12	BARREL					CU. YDS. 42.8
A401	2	#6	STR	21'-0"	64	A121	2	#6	STR	2'-7"	8	SILL					CU. YDS. 0.6
A402	2	#6	STR	19'-3"	58	A122	2	#6	STR	1'-5"	5	EDGE BEAM					CU. YDS. 1.9
A403	2	#6	STR	17'-7"	53	A250	27	#5	STR	7'-5"	209	TOTAL *					CU. YDS. 45.3
A404	2	#6	STR	15'-10"	48	A251	2	#5	STR	6'-2"	13	* FOR HEADWALL QUANTITIES, SEE C13					
A405	2	#6	STR	14'-1"	43	A252	2	#5	STR	5'-0"	11						
A406	2	#6	STR	12'-4"	38	A253	2	#5	STR	3'-10"	8						
A407	2	#6	STR	10'-8"	33	A254	2	#5	STR	2'-9"	6						
A408	2	#6	STR	8'-11"	27	A255	2	#5	STR	1'-7"	4						
A409	2	#6	STR	7'-2"	22												
A410	2	#6	STR	5'-5"	17	A300	7	#5	STR	26'-8"	195						
A411	1	#6	STR	3'-8"	6	A301	2	#5	STR	25'-1"	53						
A412	1	#6	STR	2'-0"	4	A302	2	#5	STR	23'-4"	49						
						A303	2	#5	STR	21'-7"	46						
B1	34	#4	STR	10'-9"	245	A304	2	#5	STR	19'-11"	42						
B2	23	#4	STR	8'-4"	129	A305	2	#5	STR	18'-2"	38						
B3	92	#4	STR	10'-9"	661	A306	2	#5	STR	16'-5"	35						
						A307	2	#5	STR	14'-8"	31						
C1	186	#4	STR	13'-0"	1616	A308	2	#5	STR	13'-0"	28						
						A309	2	#5	STR	11'-3"	24						
D1	19	#6	STR	2'-6"	72	A310	2	#5	STR	9'-6"	20						
D2	3	#6	STR	1'-5"	7	A311	2	#5	STR	7'-9"	17						
						A312	2	#5	STR	6'-0"	13						
S1	3	#8	STR	27'-2"	218	A313	2	#5	STR	4'-4"	10						
S4	6	#6	STR	26'-0"	235	A314	2	#5	STR	2'-7"	6						

REINFORCING STEEL			LBS.	5558
CLASS "A" CONCRETE				
BARREL			CU. YDS.	29.7
SILL			CU. YDS.	0.0
EDGE BEAM			CU. YDS.	1.7
TOTAL *			CU. YDS.	31.4
* FOR HEADWALL QUANTITIES, SEE C13				

BAR TYPES



BAR DIMENSIONS ARE OUT TO OUT

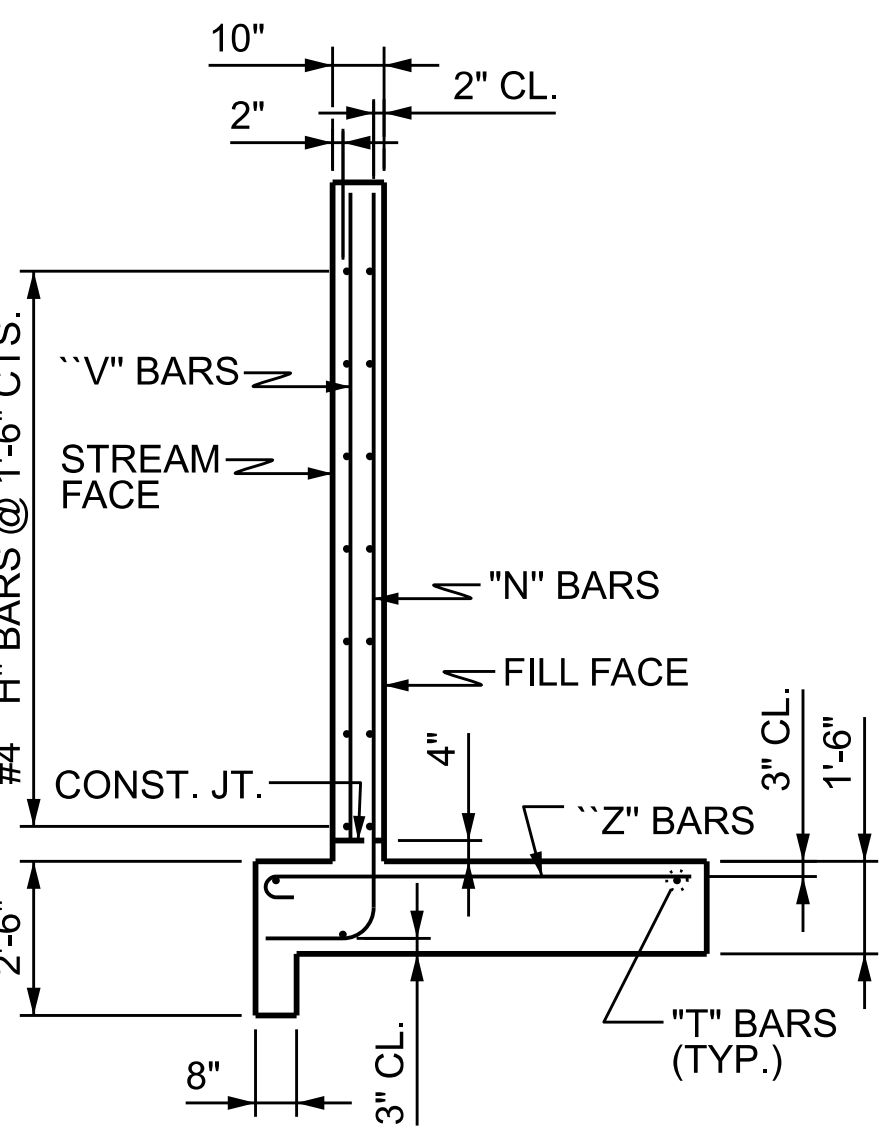
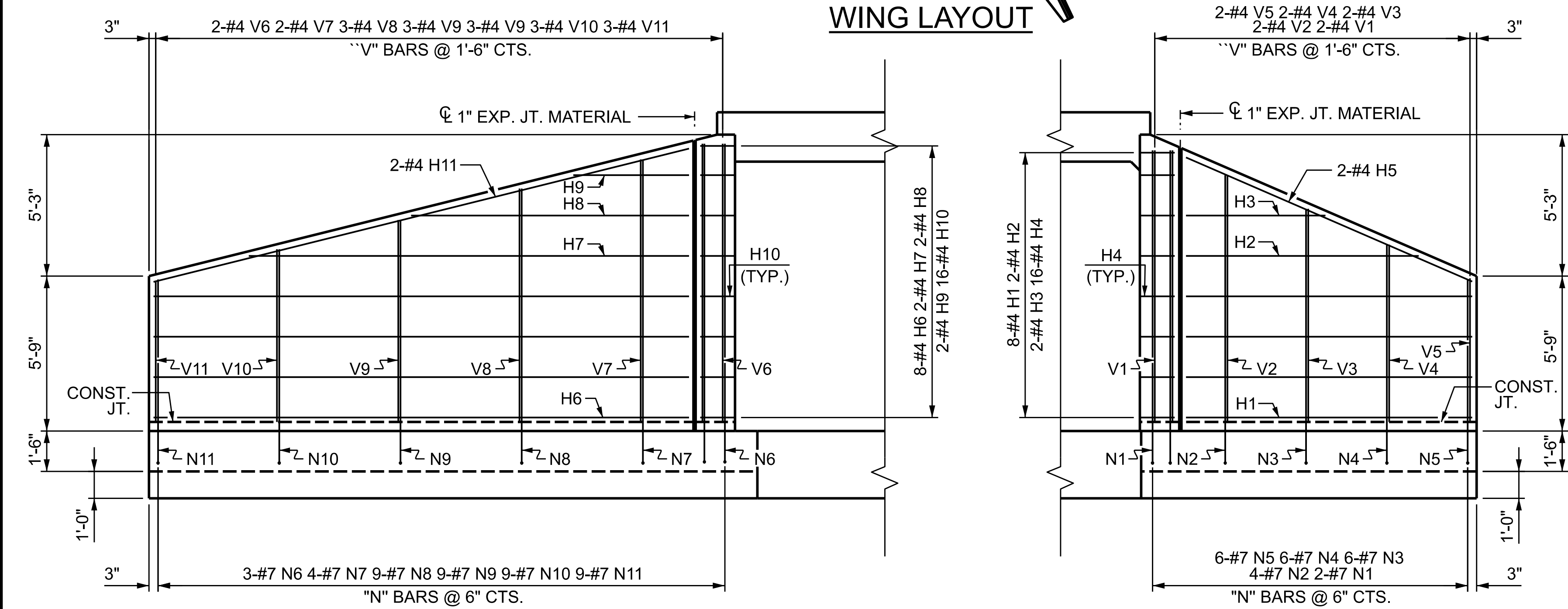
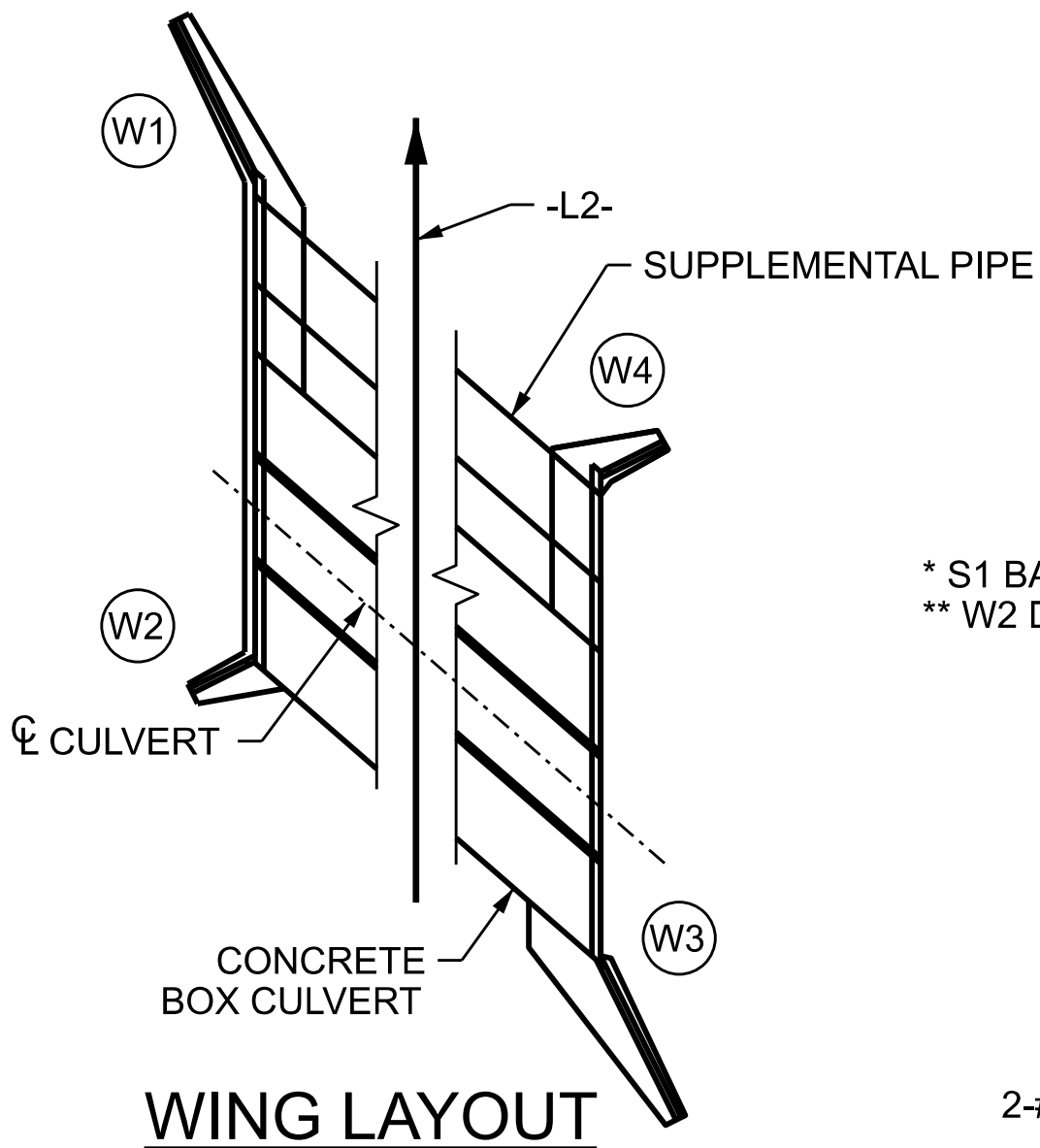
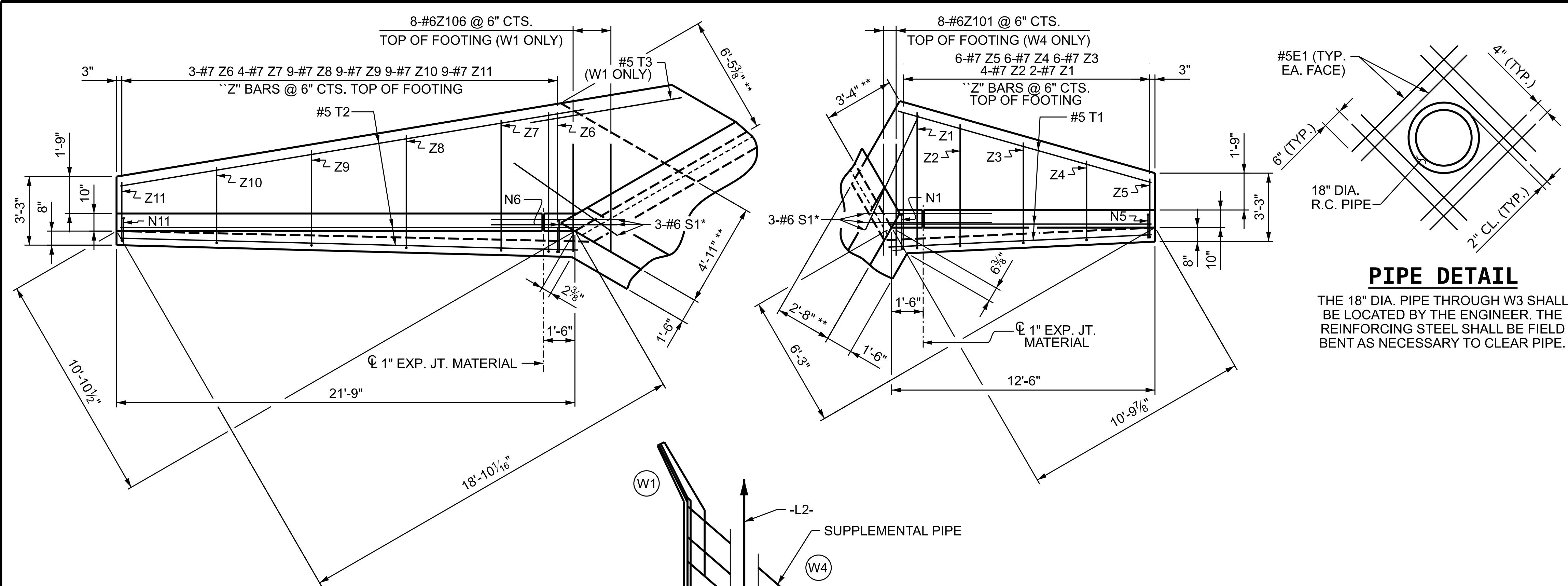
SPLICE LENGTH CHART

BAR	SIZE	SPLICE LENGTH
A200, A250	#5	2'-4"
A400, A450	#6	2'-9"
C1	#4	2'-5"
S1, S2, S3	#8	4'-9"
S4, S5, S6	#6	3'-7"



PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 463+27.43 -L2-

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH TRIPLE BARREL 8 FT. X 9 FT. CONCRETE BOX CULVERT DOWNSTREAM EXTENSION 120° SKEW											
REVISIONS										SHEET NO. C11	
NO.	BY:	DATE:	NO.	BY:	DATE:					TOTAL SHEETS 36	
1	--	--	3	--	--						
2	--	--	4	--	--						



BILL OF MATERIAL FOR 1 LONG WING							
	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	
	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	1	3'-3"	35	
	H11	2	#4	STR	20'-5"	28	
	W3	E1	16	#5	STR	4'-0"	67
		N6	3	#7	2	12'-10"	79
		N7	4	#7	2	12'-3"	101
	N8	9	#7	2	11'-2"	206	
	N9	9	#7	2	9'-12"	184	
	N10	9	#7	2	8'-11"	165	
	N11	9	#7	2	7'-10"	145	
	S1	3	#6	STR	6'-0"	28	
	T2	3	#5	STR	21'-9"	69	
W1	T3	1	#5	STR	7'-0"	8	
	V6	2	#4	STR	10'-4"	14	
	V7	2	#4	STR	9'-9"	14	
	V8	3	#4	STR	8'-8"	18	
	V9	3	#4	STR	7'-6"	16	
	V10	3	#4	STR	6'-5"	13	
	V11	3	#4	STR	5'-3"	11	
	Z6	3	#7	3	7'-6"	46	
	Z7	4	#7	3	7'-1"	58	
	Z8	9	#7	3	6'-3"	115	
	Z9	9	#7	3	5'-5"	100	
	Z10	9	#7	3	4'-6"	83	
	Z11	9	#7	3	3'-8"	68	
W1	Z106	8	#7	3	8'-2"	134	
REINFORCING STEEL (W1)						1886 LBS.	
REINFORCING STEEL (W3)						1811 LBS.	
WING QUANTITIES							
CLASS A CONCRETE - UPSTREAM							
STAGE I (WING W1)						14.2 C.Y.	
STAGE II (WING W2)						7.3 C.Y.	
CLASS A CONCRETE - DOWNSTREAM							
STAGE I (WING W4)						9.0 C.Y.	
STAGE II (WING W3)						13.6 C.Y.	

BAR TYPES						
BILL OF MATERIAL FOR 1 SHORT WING						
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	
H1	8	#4	STR	10'-7"	57	
H2	2	#4	STR	8'-7"	12	
H3	2	#4	STR	5'-2"	7	
H4	16	#4	1	3'-3"	35	
H5	2	#4	STR	11'-7"	16	
N1	2	#7	2	12'-8"	52	
N2	4	#7	2	11'-9"	97	
N3	6	#7	2	10'-5"	128	
N4	6	#7	2	9'-2"	113	
N5	6	#7	2	7'-10"	97	
S1	3	#6	STR	6'-0"	28	
T1	3	#5	STR	12'-6"	40	
V1	2	#4	STR	10'-1"	14	
V2	2	#4	STR	9'-2"	13	
V3	2	#4	STR	7'-11"	11	
V4	2	#4	STR	6'-7"	9	
V5	2	#4	STR	5'-4"	8	
Z1	2	#7	3	7'-4"	30	
Z2	4	#7	3	6'-7"	54	
Z3	6	#7	3	5'-7"	69	
Z4	6	#7	3	4'-7"	57	
Z5	6	#7	3	3'-8"	45	
W4	Z101	8	#7	3	9'-10"	161
REINFORCING STEEL (W2)					992 LBS.	
REINFORCING STEEL (W4)					1153 LBS.	

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 463+27.43 -L2-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS
FOR MULTIPLE BARREL
CONCRETE BOX CULVERT

H = 10'-0" SLOPE = 2:1

120° SKEW

REVISIONS					SHEET NO. C12
NO.	BY:	DATE:	NO.	BY:	
1	--	--	3	--	TOTAL SHEETS
2	--	--	4	--	36

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS																
LOAD TYPE		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		HL-93 (INVENTORY)	N/A	Ⓢ1	1.39	--	1.75	1.87	1	BOTTOM SLAB	8.00	1.39	1	TOP SLAB	8.00	
		HL-93 (OPERATING)	N/A		1.80	--	1.35	2.42	1	BOTTOM SLAB	8.00	1.80	1	TOP SLAB	8.00	
		HS-20 (INVENTORY)	36.000	Ⓢ2	1.46	52.56	1.75	1.87	1	BOTTOM SLAB	8.00	1.46	1	TOP SLAB	8.00	
		HS-20 (OPERATING)	36.000		1.89	68.04	1.35	2.42	1	BOTTOM SLAB	8.00	1.89	1	TOP SLAB	8.00	
LEGAL LOAD	SINGLE VEHICLE (SV)	SNSH	13.500		3.17	42.80	1.40	3.63	1	EXT. WALL	4.50	3.17	1	TOP SLAB	8.00	
		SNGARBS2	20.000		2.90	58.00	1.40	3.63	1	EXT. WALL	4.50	2.90	1	TOP SLAB	8.00	
		SNAGRIS2	22.000		3.17	69.74	1.40	3.39	1	BOTTOM SLAB	8.00	3.17	1	TOP SLAB	8.00	
		SNCOTTS3	27.250	Ⓢ3	1.73	47.14	1.40	2.40	1	TOP SLAB	8.00	1.73	1	TOP SLAB	8.00	
		SNAGGRS4	34.925		2.14	74.74	1.40	2.14	1	BOTTOM SLAB	8.00	2.43	1	TOP SLAB	8.00	
		SNS5A	35.550		2.12	75.37	1.40	2.12	1	BOTTOM SLAB	8.00	2.15	1	TOP SLAB	8.00	
		SNS6A	39.950		2.06	82.30	1.40	2.06	1	BOTTOM SLAB	8.00	2.10	1	TOP SLAB	8.00	
		SNS7B	42.000		1.96	82.32	1.40	1.96	1	BOTTOM SLAB	8.00	2.09	1	TOP SLAB	8.00	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.31	76.23	1.40	2.31	1	BOTTOM SLAB	8.00	2.91	1	TOP SLAB	8.00	
		TNT4A	33.075		2.13	70.45	1.40	2.34	1	BOTTOM SLAB	8.00	2.13	1	TOP SLAB	8.00	
		TNT6A	41.600		2.13	88.61	1.40	2.16	1	BOTTOM SLAB	8.00	2.13	1	TOP SLAB	8.00	
		TNT7A	42.000		2.03	85.26	1.40	2.03	1	BOTTOM SLAB	8.00	2.14	1	TOP SLAB	8.00	
		TNT7B	42.000		2.10	88.20	1.40	2.10	1	BOTTOM SLAB	8.00	2.10	1	TOP SLAB	8.00	
		TNAGRIT4	43.000		1.79	76.97	1.40	1.79	1	BOTTOM SLAB	8.00	2.08	1	TOP SLAB	8.00	
		TNAGT5A	45.000		1.91	85.95	1.40	1.91	1	BOTTOM SLAB	8.00	2.06	1	TOP SLAB	8.00	
		TNAGT5B	45.000		1.82	81.90	1.40	1.82	1	BOTTOM SLAB	8.00	2.07	1	TOP SLAB	8.00	
EMERGENCY VEHICLE (EV)		EV2	28.750		1.92	55.20	1.30	2.83	1	BOTTOM SLAB	8.00	1.92	1	TOP SLAB	8.00	
		EV3	43.000	Ⓢ4	1.37	58.91	1.30	1.92	1	INT. WALL	0.00	1.37	1	TOP SLAB	8.00	

LOAD FACTORS:

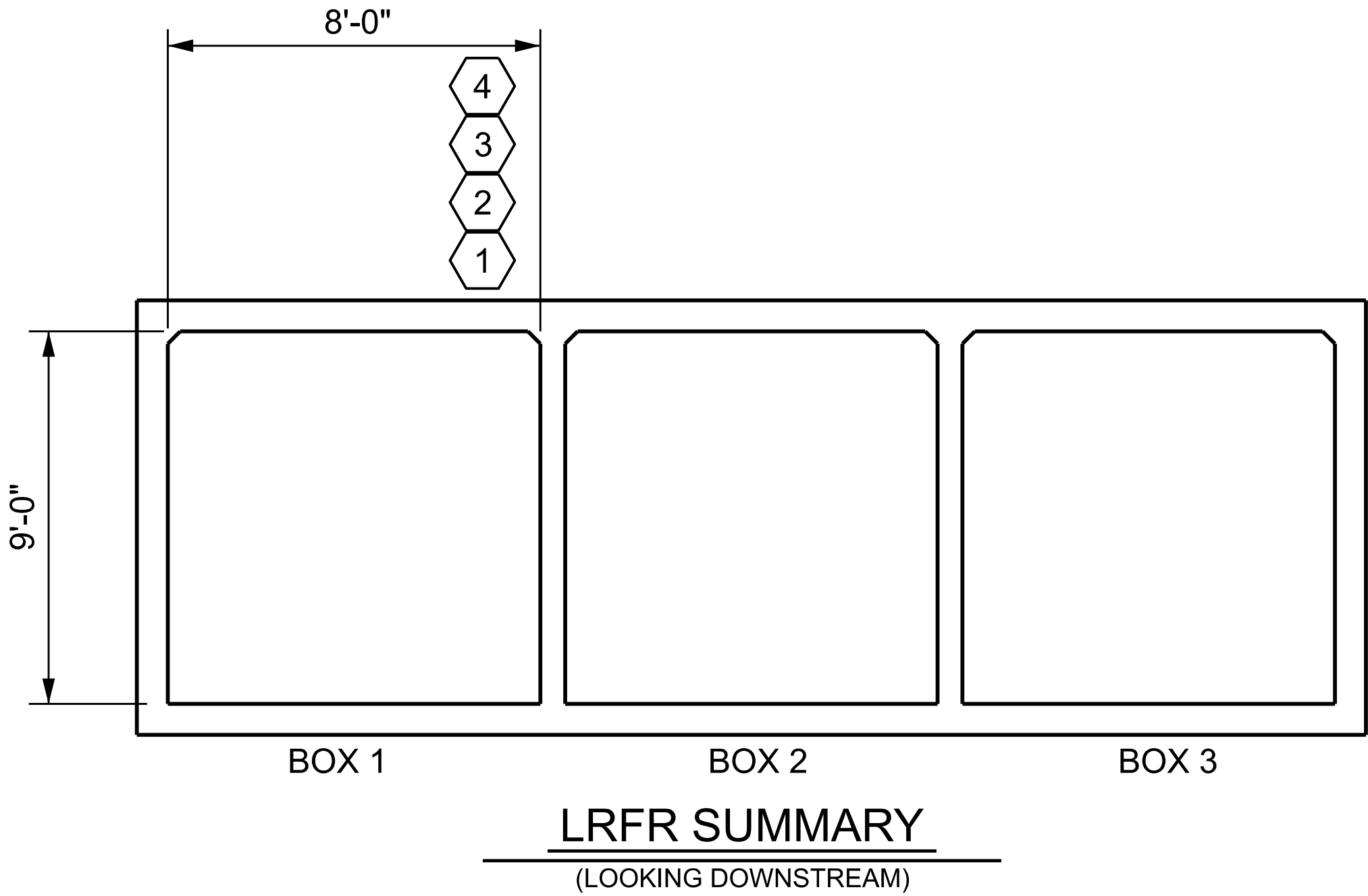
DESIGN LOAD RATING FACTORS		
LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
LS	1.75	--
WA	1.00	--

NOTES:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATES.

RATING FACTORS ARE FOR THE EXTENSION OF THE CONCRETE BOX
DETAILED IN THESE PLANS. THE EXISTING CONCRETE BOX AND WAS
NOT RATED.

⬡#	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	



LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 463+27.43 -L2-

DES BY: <u>R BEAUCHAMP</u>	DATE : <u>09/25</u>	DWG BY: <u>D. CHAPMAN</u>	DATE : <u>09/25</u>
DES CHK: <u>G. MARTINEZ</u>	DATE : <u>09/25</u>	CHK BY: <u>D. MAST</u>	DATE : <u>09/25</u>

HDR Engineering, Inc. of the Carolinas

555 Fayetteville St., Suite 900 Raleigh, N.C. 27601

N.C.B.E.L.S. License Number: F-0116

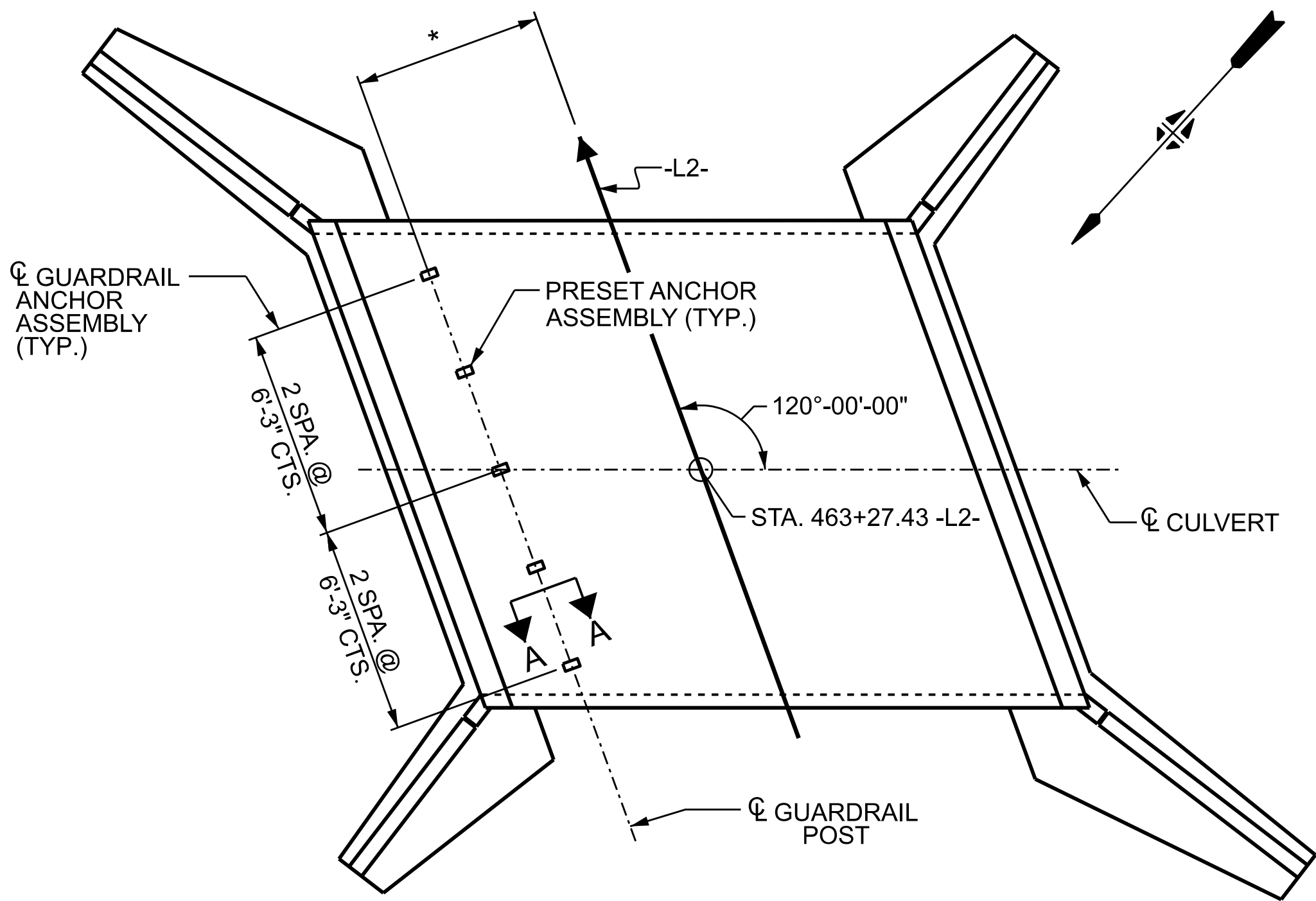


7/21/2026
RIEGAN G. BEAUCHAMP
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

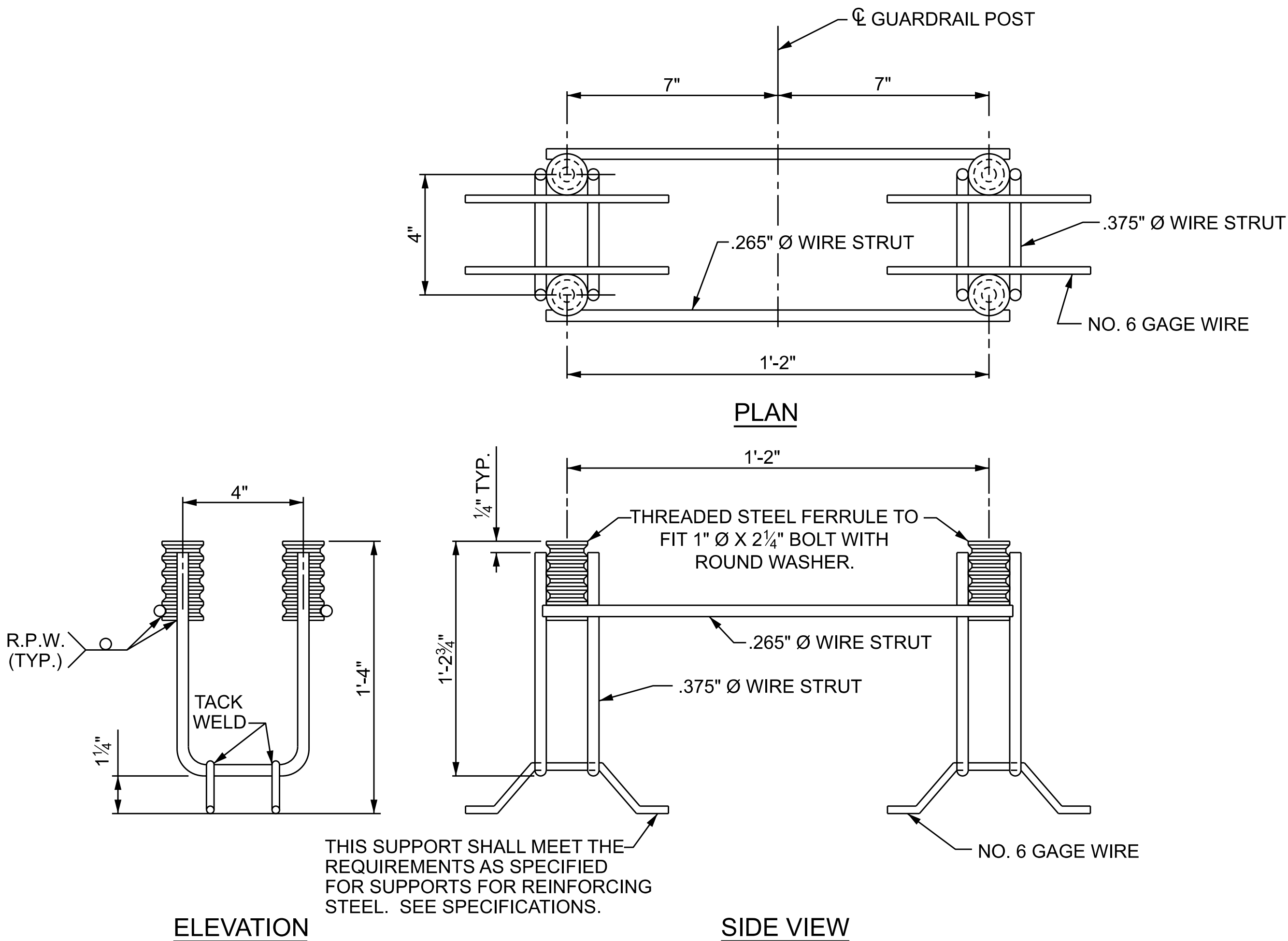
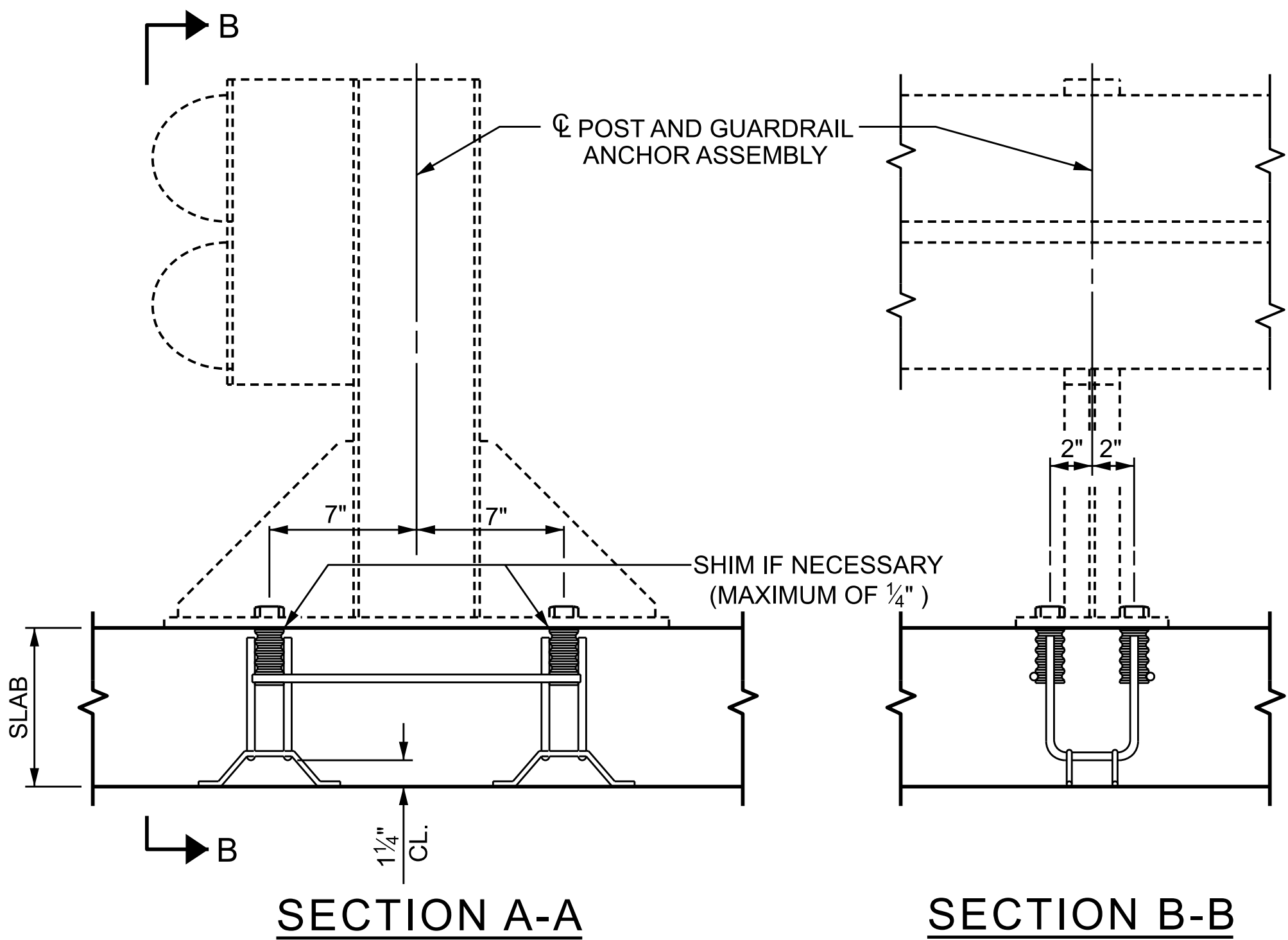
TRIPLE BARREL
8 FT. X 9 FT.
CONCRETE BOX CULVERT
(NON-INTERSTATE TRAFFIC)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C14
1	--	--	3	--	--	TOTAL SHEETS 36
2	--	--	4	--	--	



PLAN OF CULVERT GUARDRAIL ANCHOR ASSEMBLY SPACING

* THIS DIMENSION TO BE FURNISHED BY THE ENGINEER



GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS

NOTES

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

- FERRULES SHALL BE MADE FROM STEEL MEETING THE REQUIREMENTS OF AASHTO M169, GRADE 12L14 AND SHALL HAVE A MINIMUM LENGTH OF THREADS OF 2 1/2".
- 4 - 1" Ø X 2 1/4" 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 1/4" 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.)
- 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.

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 463+27.43 -L2-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
**STANDARD
ANCHORAGE DETAILS FOR
GUARDRAIL ANCHOR
ASSEMBLY FOR CULVERTS**

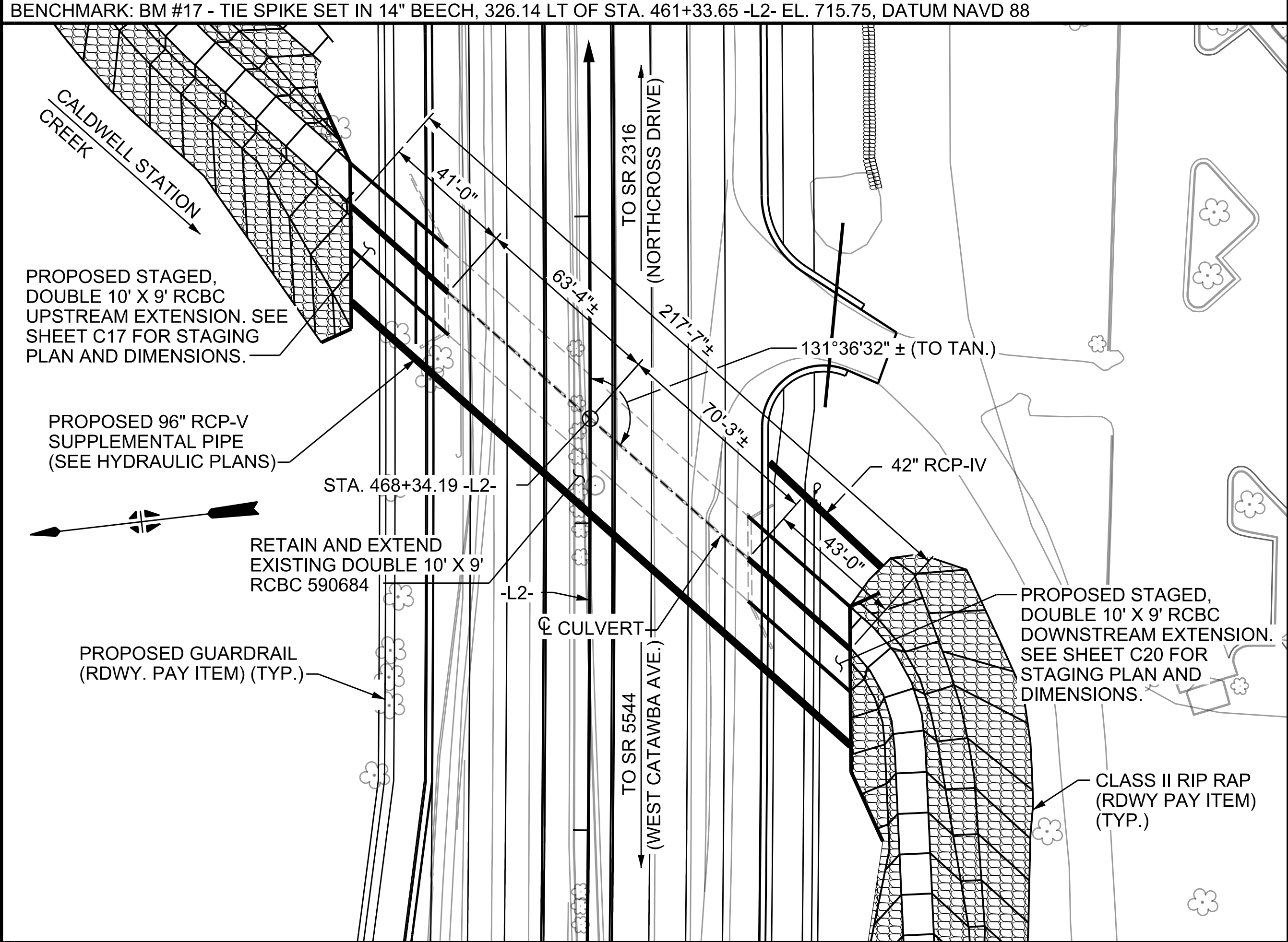
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C15
1	--	--	3	--	--	TOTAL SHEETS
2	--	--	4	--	--	36



7/21/2026
R. BEAUCHAMP
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

HDR HDR Engineering, Inc. of the Carolinas
555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

STANDARD DRAWN BY : FCJ	DATE : 06/88	REV. 10/11	MAA/GM
CHECKED BY : ARB	DATE : 06/88	REV. 12/17	MAA/THC
		REV. 06/19	MAA/THC
DES BY : B. BUSH	DATE : 09/25	DWG BY : D. CHAPMAN	DATE : 09/25
DES CHK : R. BEAUCHAMP	DATE : 09/25	CHK BY : R. BEAUCHAMP	DATE : 09/25



LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.

DESIGN FILL = 5.94' (MAX.) AND 4.64' (MIN.).

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:
(FOR FULL CONSTRUCTION SEQUENCE, SEE MOT AND EROSION CONTROL PLANS)

STAGE I DOWNSTREAM

- WING FOOTING (W4) AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS FOR BARREL 1 OF DOWNSTREAM EXTENSION.
- THE REMAINING PORTIONS OF THE WALLS AND WING FULL HEIGHT FOR BARREL 1 OF DOWNSTREAM EXTENSION.

STAGE II DOWNSTREAM

- WING FOOTING (W3), SUPPLEMENTAL PIPE FOOTING AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS FOR BARREL 2 OF DOWNSTREAM EXTENSION.
- THE REMAINING PORTIONS OF THE WALLS, SUPPLEMENTAL PIPE HEADWALL AND WINGS FULL HEIGHT FOR BARREL 2 FOLLOWED BY ROOF SLAB AND HEADWALLS FOR ALL BARRELS OF DOWNSTREAM EXTENSION.

STAGE III UPSTREAM

- WING FOOTING (W2), SUPPLEMENTAL PIPE FOOTING AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS FOR BARREL 2 OF UPSTREAM EXTENSION.
- THE REMAINING PORTIONS OF THE WALLS, SUPPLEMENTAL PIPE HEADWALL AND WINGS FULL HEIGHT FOR BARREL 2 OF UPSTREAM EXTENSION.

STAGE IV UPSTREAM

- WING FOOTING (W1) AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS FOR BARREL 1 OF UPSTREAM EXTENSION.
- THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOR BARREL 1 FOLLOWED BY ROOF SLAB AND HEADWALLS FOR ALL BARRELS OF UPSTREAM EXTENSION.

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 SHEETS.

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

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 GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

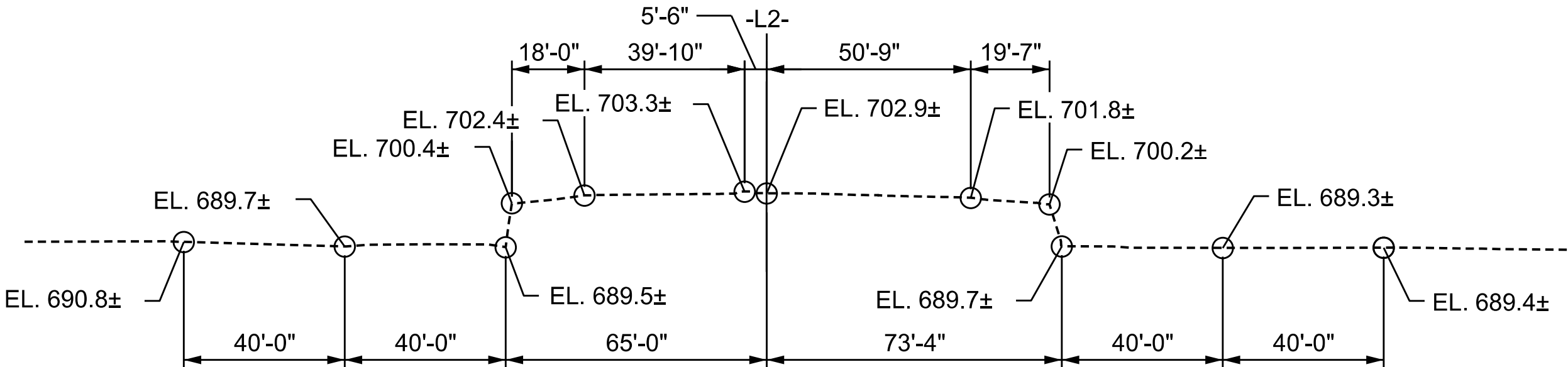
STEEL IN THE BOTTOM SLAB MAY BE SPliced AT THE PERMITTED CONSTRUCTION JOINT AT THE CONTRACTOR'S OPTION. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.

THE ENTIRE COST OF WORK REQUIRED TO PLACE EXCAVATED OR SUPPLEMENTAL MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE LUMP SUM PRICE FOR CULVERT EXCAVATION.

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.

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

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.



PROFILE ALONG ϕ CULVERT

TOTAL STRUCTURE QUANTITIES - UPSTREAM EXTENSION			
CLASS A CONCRETE (STAGE I)			
BARREL @ 0.91 CY./FT.	37.2	C.Y.	
CURTAIN WALL, PIPE HEADWALL, EDGE BEAM	27.3	C.Y.	
WINGS (W2)	7.3	C.Y.	
TOTAL	71.8	C.Y.	
CLASS A CONCRETE (STAGE II)			
BARREL @ 1.40 CY./FT.	57.3	C.Y.	
CURTAIN WALL, EDGE BEAM, SILL	4.4	C.Y.	
WINGS (W1)	20.0	C.Y.	
TOTAL	81.7	C.Y.	
REINFORCING STEEL (STAGE I)			
BARREL, CURTAIN WALL, PIPE HEADWALL, SILL	12059	LBS.	
WINGS (W2)	802	LBS.	
TOTAL	12861	LBS.	
REINFORCING STEEL (STAGE II)			
BARREL, CURTAIN WALL, EDGE BEAM	11079	LBS.	
WINGS (W1)	3440	LBS.	
TOTAL	14519	LBS.	
CULVERT EXCAVATION, STA. 468+34.19 -L2-	LUMP SUM		
FOUNDATION CONDITIONING MATERIAL	76	TONS	

TOTAL STRUCTURE QUANTITIES - DOWNSTREAM EXTENSION			
CLASS A CONCRETE (STAGE I)			
BARREL @ 0.91 CY./FT.	39.0	C.Y.	
APRON, EDGE BEAM	14.7	C.Y.	
WINGS (W4)	6.3	C.Y.	
TOTAL	60.0	C.Y.	
CLASS A CONCRETE (STAGE II)			
BARREL @ 1.40 CY./FT.	60.1	C.Y.	
PIPE HEADWALL, APRON, EDGE BEAM, SILL	51.2	C.Y.	
WINGS (W3)	21.3	C.Y.	
TOTAL	132.6	C.Y.	
REINFORCING STEEL (STAGE I)			
BARREL, APRON	9984	LBS.	
WINGS (W4)	804	LBS.	
TOTAL	10788	LBS.	
REINFORCING STEEL (STAGE II)			
BARREL, PIPE HEADWALL, APRON, EDGE BEAM, SILL	16059	LBS.	
WINGS (W3)	2884	LBS.	
TOTAL	18943	LBS.	
CULVERT EXCAVATION, STA. 468+34.19 -L2-	LUMP SUM		
FOUNDATION CONDITIONING MATERIAL	80	TONS	

HYDRAULIC DATA

DESIGN DISCHARGE	= 2900 CFS
FREQUENCY OF DESIGN FLOOD	= 50 YR.
DESIGN HIGH WATER ELEVATION	= 700.5
DRAINAGE AREA	= 6.80 SQ. MI.
BASE DISCHARGE (Q100)	= 3200 CFS
BASE HIGH WATER ELEVATION	= 701.0

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 4300 CFS
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YR.
OVERTOPPING FLOOD ELEVATION	= 702.9 **

** OVERTOPPING OCCURS @ SAG STATION 464+79.49 -L2-

ROADWAY DATA

GRADE POINT ELEV. @ STA. 468+34.19 -L2-	= 703.96
BED ELEV. @ STA. 468+34.19 -L2-	= 689.37
BED ELEV. @ BEGIN UPSTREAM EXT.	= 689.52
BED ELEV. @ BEGIN DOWNSTREAM EXT.	= 689.23
ROADWAY SLOPES	= 2:1

I HEREBY CERTIFY THESE PLANS
ARE THE AS-BUILT PLANS

PROJECT NO. U-5765

MECKLENBURG COUNTY

STATION: 468+34.19 -L2-

CULVERT NO. 590684

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE BARREL
10 FT. X 9 FT.
CONCRETE BOX CULVERT
EXTENSIONS

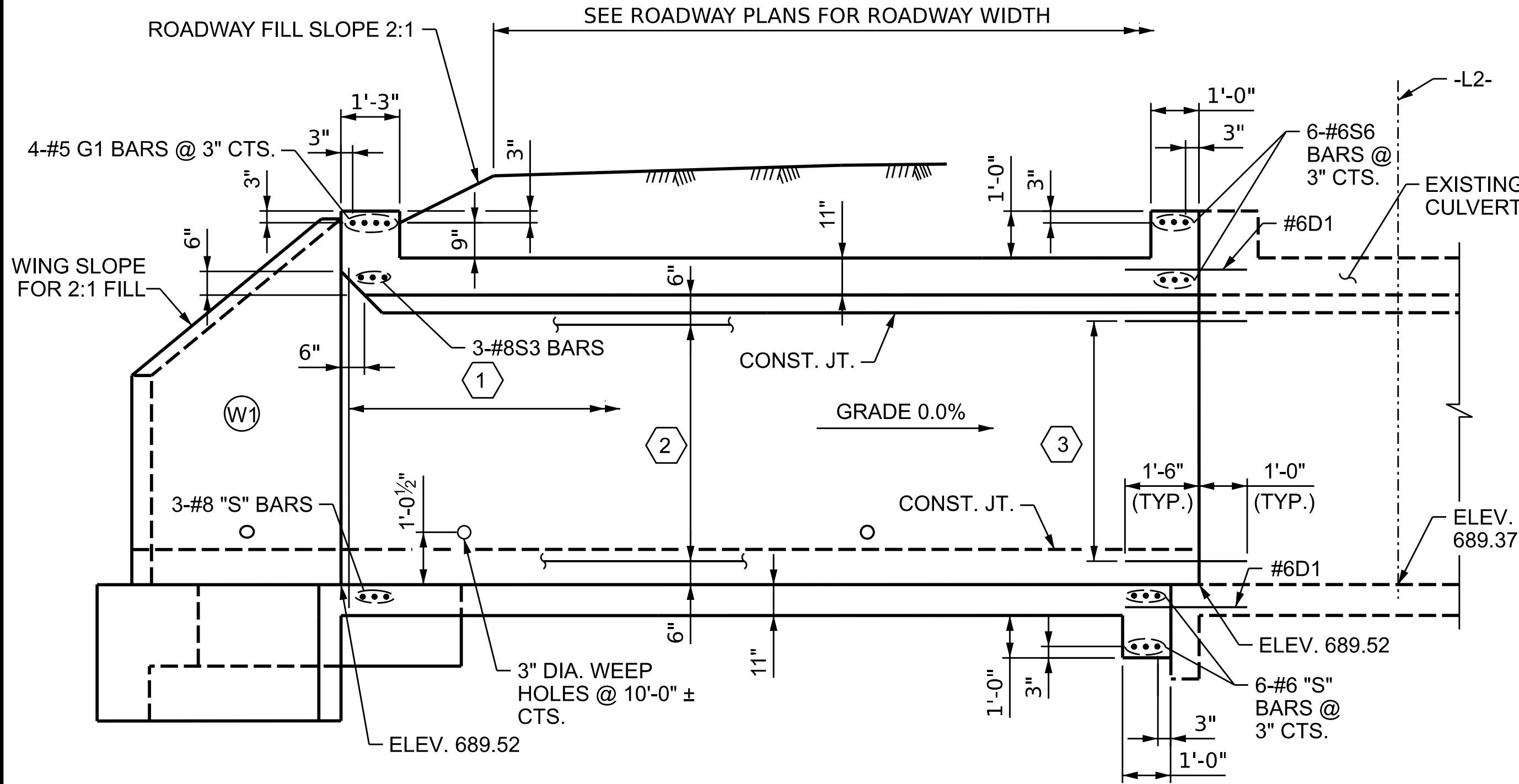
REVISIONS						SHEET NO. C16
NO.	BY:	DATE:	NO.	BY:	DATE:	
1	--	--	3	--	--	TOTAL SHEETS
2	--	--	4	--	--	36

DES BY: <u>R. BEAUCHAMP</u>	DATE: <u>09/25</u>	DWG BY: <u>D. CHAPMAN</u>	DATE: <u>09/25</u>
DES CHK: <u>D. MAST</u>	DATE: <u>09/25</u>	CHK BY: <u>B. BUSH</u>	DATE: <u>09/25</u>

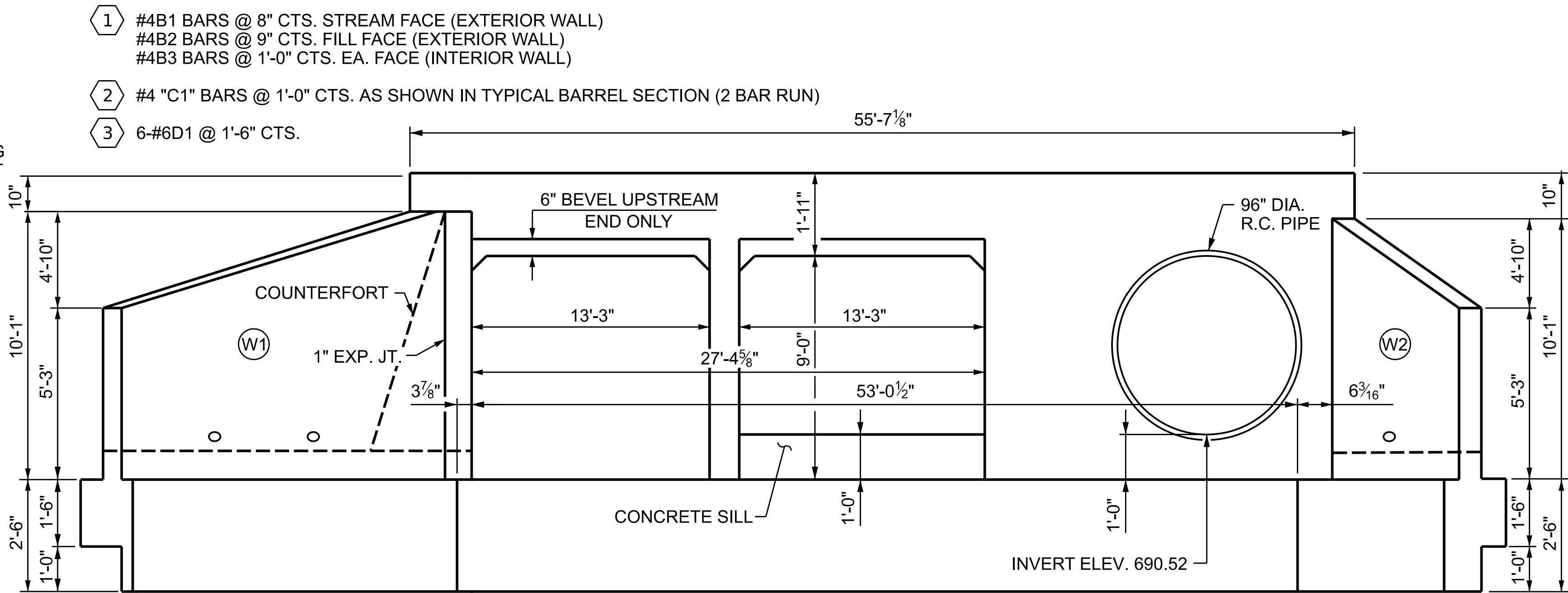
HDR	HDR Engineering, Inc. of the Carolinas 555 Fayetteville St., Suite 900 Raleigh, N.C. 27601 N.C.B.E.L.S. License Number: F-0116
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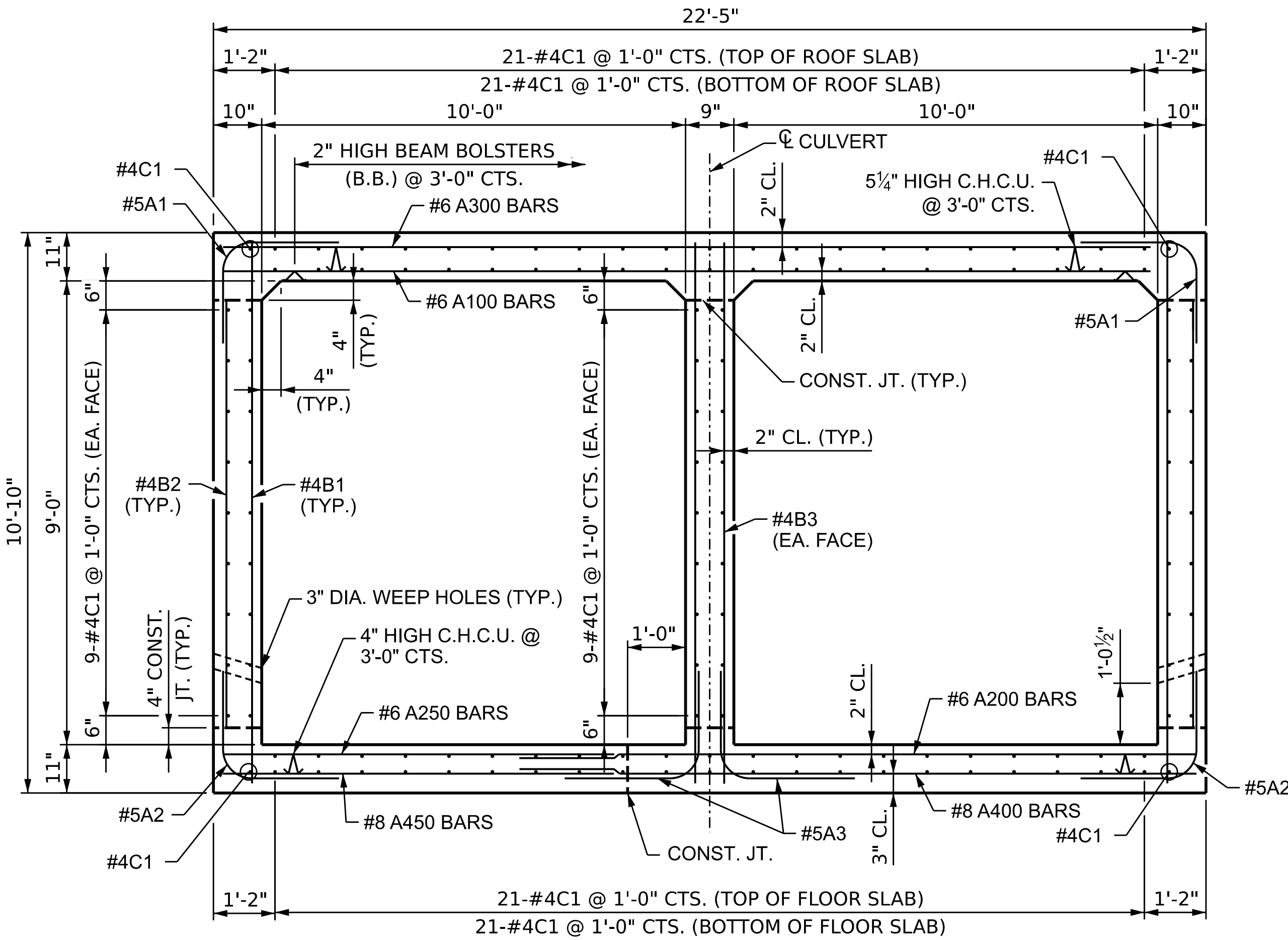
7/21/2026
R. BEAUCHAMP
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



UPSTREAM CULVERT EXTENSION SECTION
NORMAL TO ROADWAY

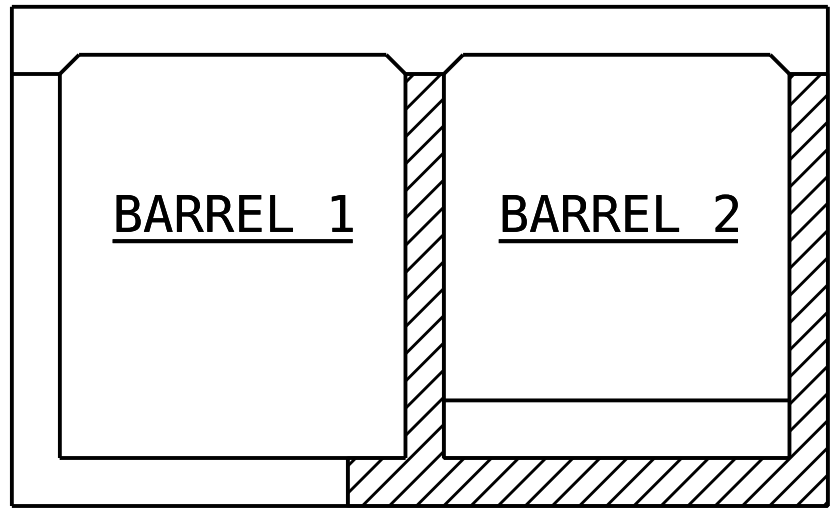


END ELEVATION NORMAL TO SKEW



RIGHT ANGLE SECTION OF BARREL (UPSTREAM EXTENSION)

THERE ARE 142 C1 BARS IN SECTION OF BARREL
(LOOKING DOWNSTREAM)



CONSTRUCTION SEQUENCE

LOOKING DOWNSTREAM

- STAGE I (INCLUDES SILL DOWELS)
- STAGE II (INCLUDES SILL CONCRETE)

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 468+34.19 -L2-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
DOUBLE BARREL
10 FT. X 9 FT.
CONCRETE BOX CULVERT
UPSTREAM EXTENSION
131° SKEW

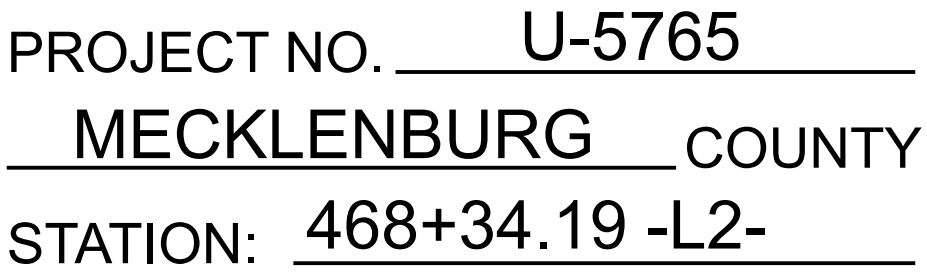
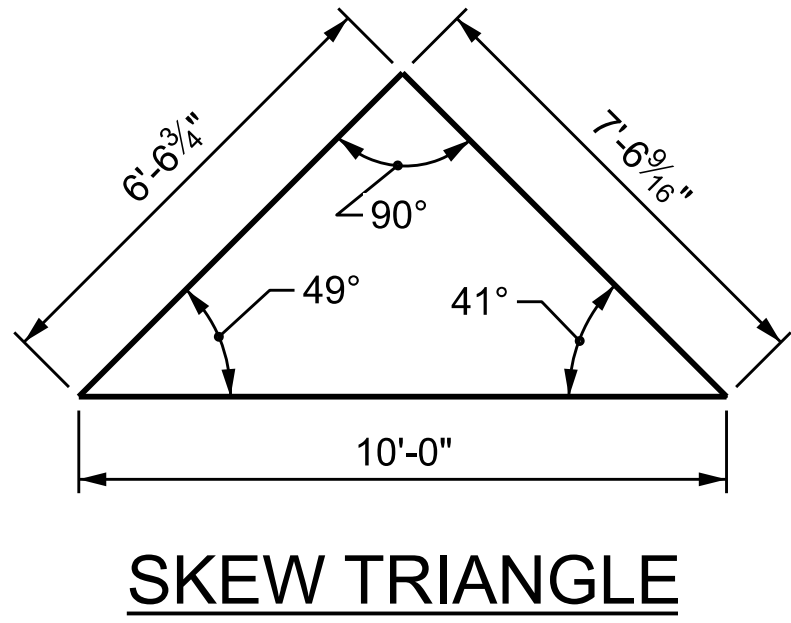
REVISIONS						SHEET NO. C17
NO.	BY:	DATE:	NO.	BY:	DATE:	
1	--	--	3	--	--	TOTAL SHEETS 36
2	--	--	4	--	--	



7/21/2026
R. G. BEAUCHAMP
ENGINEER
UNLESS ALL SIGNATURES COMPLETED

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

DES BY: G. MARTINEZ DATE: 09/25 DWG BY: D. CHAPMAN DATE: 09/25
DES CHK: R. BEAUCHAMP DATE: 09/25 CHK BY: D. MAST DATE: 09/25

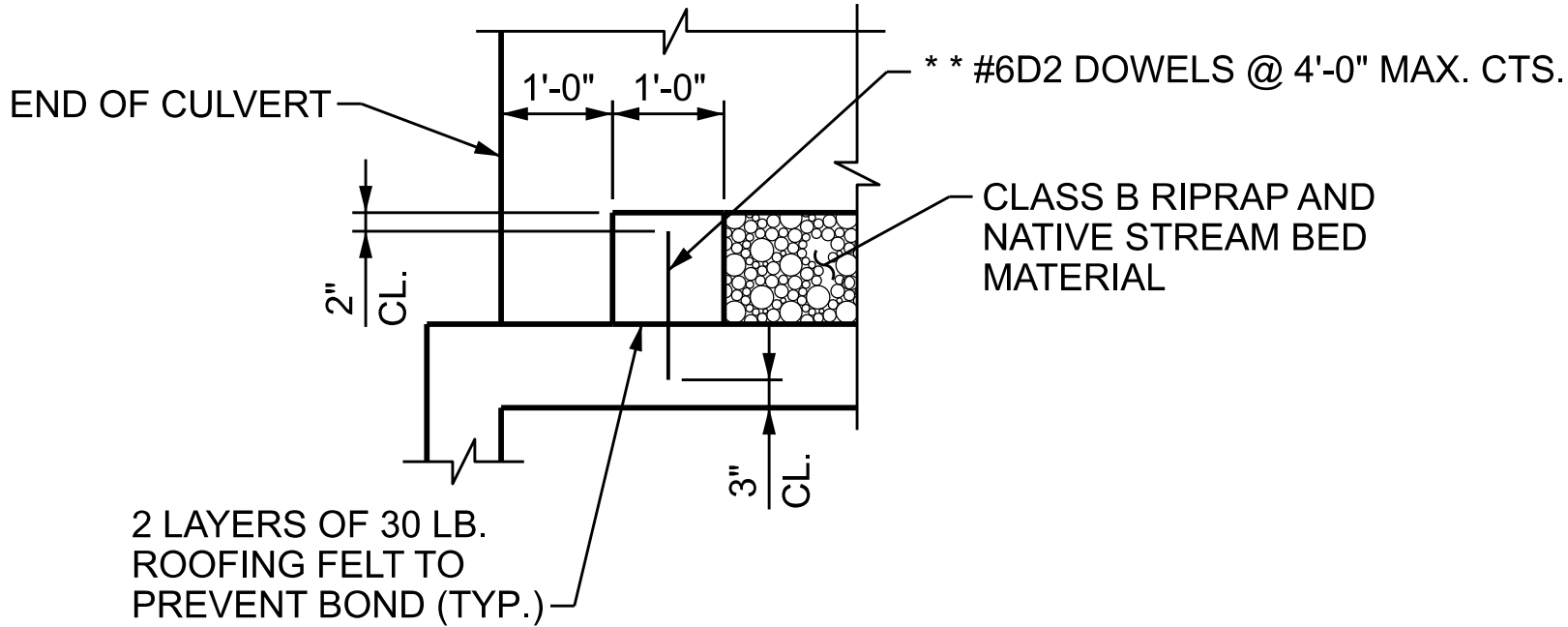
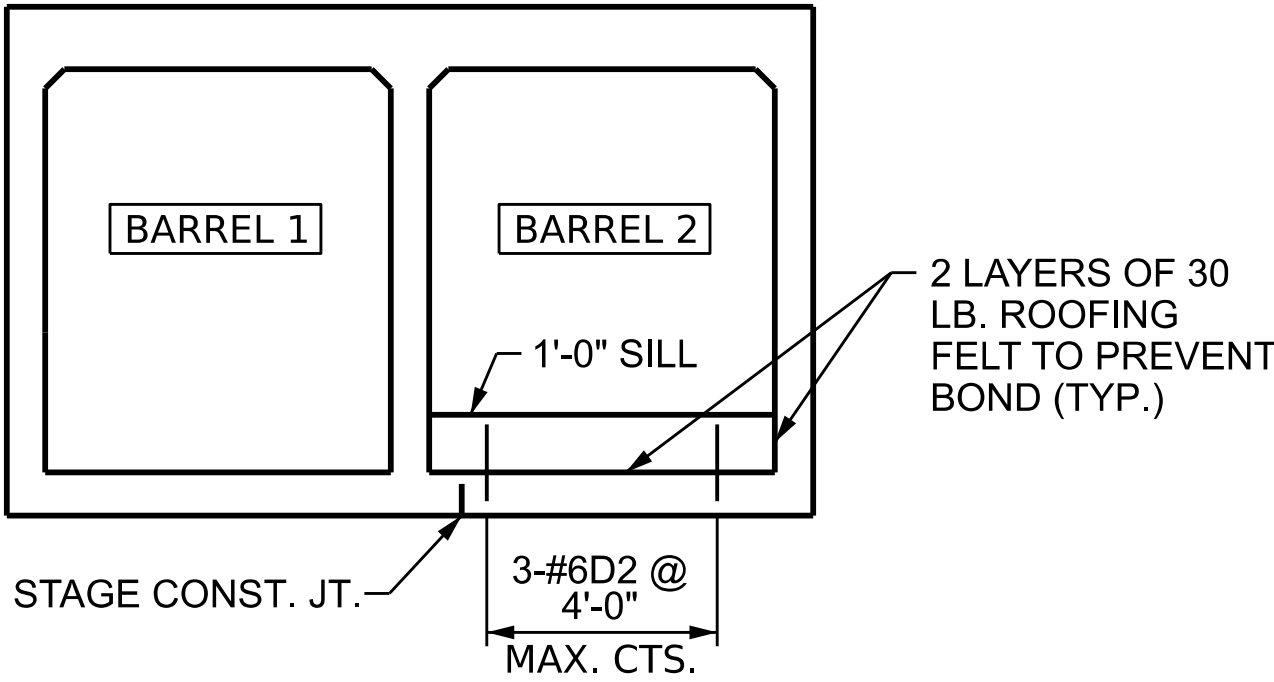
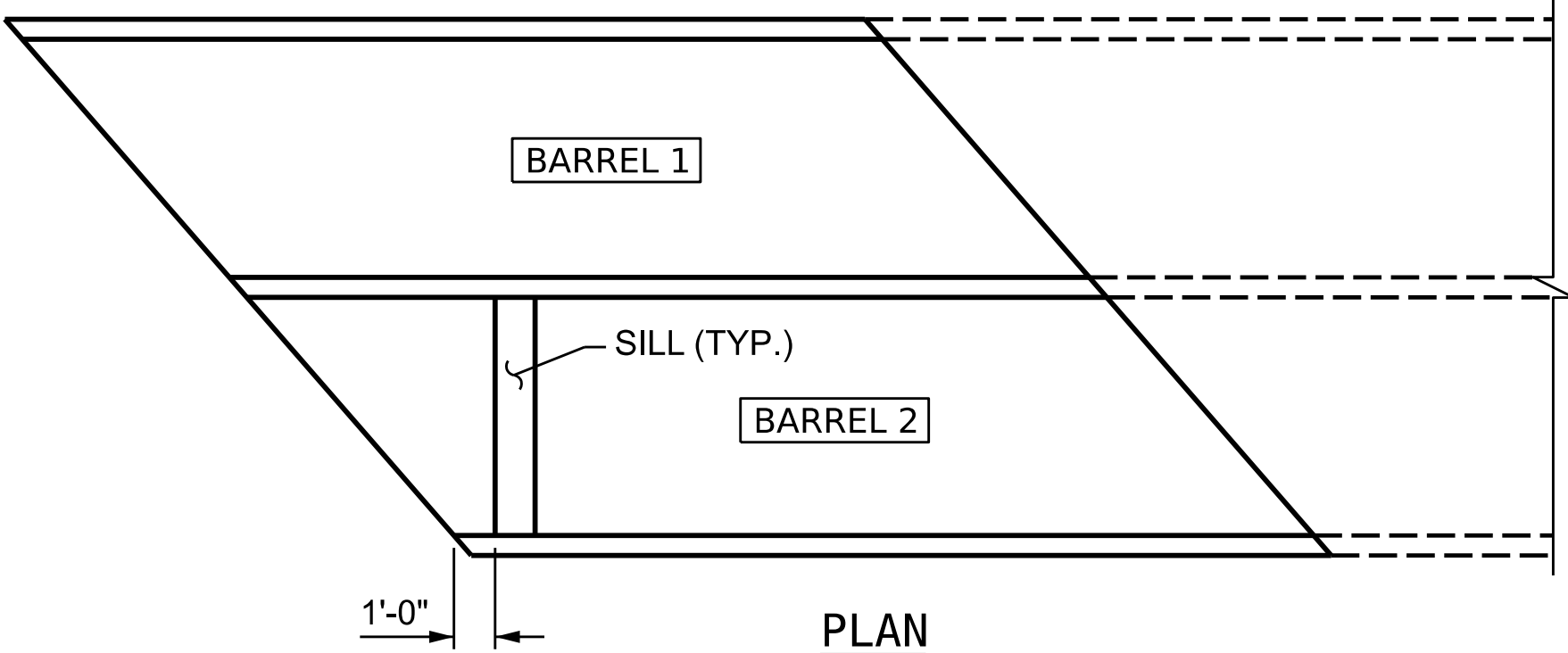


7/21/2026
RIEMANN G. BEAUCHAMP

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

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

DOUBLE BARREL 10 FT. X 9 FT. CONCRETE BOX CULVERT UPSTREAM EXTENSION 131° SKEW



SECTION THROUGH SILL

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

SILL DETAILS

NOTES

BACKFILL CULVERT BARRELS WITH CLASS B RIPRAP AND TOP WITH NATIVE MATERIAL TO SILL HEIGHT.

NATIVE MATERIAL BETWEEN SILLS IN THE CULVERT SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM OR FLOODPLAIN AT THE PROJECT SITE DURING CONSTRUCTION. ONLY MATERIAL THAT IS EXCAVATED FROM THE STREAM BED MAY BE USED TO LINE THE LOW FLOW CULVERT BARREL. RIPRAP MAY BE USED TO SUPPLEMENT THE NATIVE MATERIAL IN THE HIGH FLOW CULVERT BARRELS. IF RIPRAP IS USED TO LINE THE HIGH FLOW CULVERT BARRELS, NATIVE MATERIAL SHOULD BE PLACED ON TOP TO FILL VOIDS AND PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

SILLS ARE TO BE 1.0 FT. WIDE, CAST SEPARATELY AND ATTACHED BY DOWELS.

TOP OF LOW FLOW SILLS SHOULD MATCH STREAM BED ELEVATION IN LOW FLOW CHANNEL OF STREAM.

SILLS TO BE CAST DURING STAGE II CONSTRUCTION. D1 DOWELS MAY BE INSTALLED DURING STAGES I & II CONSTRUCTION AS APPLICABLE.

THE ENGINEER, IN CONSULTATION WITH DEO STAFF, SHALL REVIEW ALL MATERIAL TO BE USED AS BACKFILL PRIOR TO CONDUCTING THE BACKFILL ACTIVITY. BACKFILL SHALL CONSIST OF CLASS B RIPRAP AND NATIVE MATERIAL ONLY, UNLESS THE ENGINEER, IN CONSULTATION WITH DEO STAFF, DETERMINES THAT (1) THE NATIVE MATERIAL IS UNSUITABLE, OR (2) ADDITIONAL MATERIAL IS REQUIRED TO SUPPLEMENT THE NATIVE MATERIAL. THE CHOSEN BACKFILL MATERIAL SHALL NOT HAVE ADVERSE EFFECTS TO AQUATIC LIFE, AQUATIC LIFE PASSAGE, OR WATER QUALITY. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED OR FLOODPLAIN AT THE PROJECT SITE DURING CULVERT CONSTRUCTION.

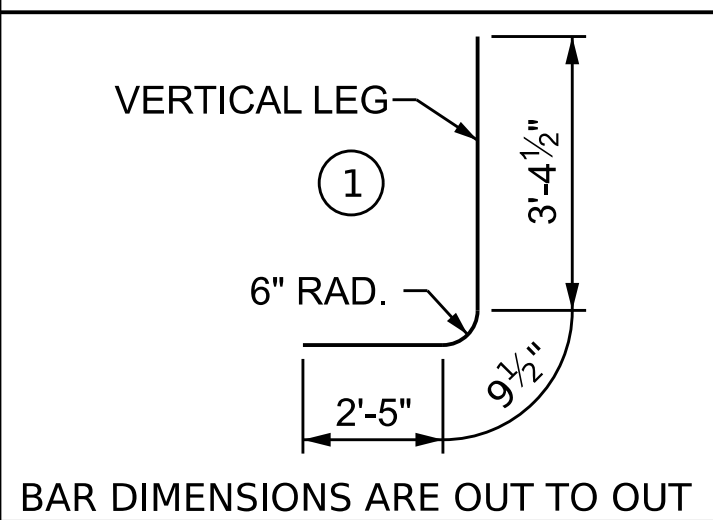
DES BY: G. MARTINEZ	DATE: 09/25	DWG BY: M. SELLS	DATE: 09/25
DES CHK: R. BEAUCHAMP	DATE: 09/25	CHK BY: D. MAST	DATE: 09/25

BILL OF MATERIAL																	
STAGE I						STAGE II											
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	A310	2	#6	STR	13'-9"	42
A1	56	#5	1	6'-7"	385	A1	56	#5	1	6'-7"	385	A311	2	#6	STR	12'-11"	39
A2	56	#5	1	6'-7"	385	A2	56	#5	1	6'-7"	385	A312	2	#6	STR	12'-0"	37
A3	84	#5	1	6'-7"	577							A313	2	#6	STR	11'-2"	34
						A100	32	#6	STR	22'-0"	1058	A314	2	#6	STR	10'-4"	32
A200	41	#6	STR	15'-5"	950	A101	2	#6	STR	21'-6"	65	A315	2	#6	STR	9'-5"	29
A201	2	#6	STR	14'-7"	44	A102	2	#6	STR	20'-9"	63	A316	2	#6	STR	8'-7"	26
A202	2	#6	STR	13'-10"	42	A103	2	#6	STR	20'-0"	61	A317	2	#6	STR	7'-8"	24
A203	2	#6	STR	13'-1"	40	A104	2	#6	STR	19'-2"	58	A318	2	#6	STR	6'-10"	21
A204	2	#6	STR	12'-4"	38	A105	2	#6	STR	18'-5"	56	A319	2	#6	STR	6'-0"	19
A205	2	#6	STR	11'-7"	35	A106	2	#6	STR	17'-8"	54	A320	2	#6	STR	5'-1"	16
A206	2	#6	STR	10'-9"	33	A107	2	#6	STR	16'-11"	51	A321	2	#6	STR	4'-3"	13
A207	2	#6	STR	10'-0"	31	A108	2	#6	STR	16'-2"	49	A322	2	#6	STR	3'-5"	11
A208	2	#6	STR	9'-3"	28	A109	2	#6	STR	15'-4"	47	A323	2	#6	STR	2'-6"	8
A209	2	#6	STR	8'-6"	26	A110	2	#6	STR	14'-7"	44	A324	2	#6	STR	1'-8"	6
A210	2	#6	STR	7'-8"	24	A111	2	#6	STR	13'-10"	42						
A211	2	#6	STR	6'-11"	21	A112	2	#6	STR	13'-1"	40	A450	43	#8	STR	9'-6"	1091
A212	2	#6	STR	6'-2"	19	A113	2	#6	STR	12'-4"	38	A451	2	#8	STR	9'-2"	49
A213	2	#6	STR	5'-5"	17	A114	2	#6	STR	11'-6"	35	A452	2	#8	STR	8'-4"	45
A214	2	#6	STR	4'-8"	15	A115	2	#6	STR	10'-9"	33	A453	2	#8	STR	7'-6"	41
A215	2	#6	STR	3'-10"	12	A116	2	#6	STR	10'-0"	31	A454	2	#8	STR	6'-7"	36
A216	1	#6	STR	3'-1"	5	A117	2	#6	STR	9'-3"	28	A455	2	#8	STR	5'-9"	31
A217	1	#6	STR	2'-4"	4	A118	2	#6	STR	8'-6"	26	A456	2	#8	STR	4'-11"	27
A218	1	#6	STR	1'-7"	3	A119	2	#6	STR	7'-8"	24	A457	2	#8	STR	4'-0"	22
						A120	2	#6	STR	6'-11"	21	A458	2	#8	STR	3'-2"	17
A400	35	#8	STR	16'-4"	1527	A121	2	#6	STR	6'-2"	19	A459	2	#8	STR	2'-4"	13
A401	2	#8	STR	15'-8"	84	A122	2	#6	STR	5'-5"	17	A460	2	#8	STR	1'-5"	8
A402	2	#8	STR	14'-10"	80	A123	2	#6	STR	4'-8"	15						
A403	2	#8	STR	13'-11"	75	A124	2	#6	STR	3'-10"	12	B1	62	#4	STR	10'-5"	432
A404	2	#8	STR	13'-1"	70	A125	2	#6	STR	3'-1"	10	B2	56	#4	STR	8'-4"	312
A405	2	#8	STR	12'-2"	65	A126	2	#6	STR	2'-4"	8						
A406	2	#8	STR	11'-4"	61	A127	2	#6	STR	1'-7"	5	C1	162	#4	STR	23'-4"	2526
A407	2	#8	STR	10'-6"	57												
A408	2	#8	STR	9'-7"	52	A250	48	#6	STR	9'-6"	685	D1	28	#6	STR	2'-6"	106
A409	2	#8	STR	8'-9"	47	A251	2	#6	STR	9'-0"	28	D2	3	#6	STR	1'-6"	7
A410	2	#8	STR	7'-11"	43	A252	2	#6	STR	8'-3"	25						
A411	2	#8	STR	7'-0"	38	A253	2	#6	STR	7'-6"	23	G1	4	#5	STR	33'-0"	138
A412	2	#8	STR	6'-2"	33	A254	2	#6	STR	6'-9"	21						
A413	2	#8	STR	5'-4"	29	A255	2	#6	STR	5'-11"	18	S2	3	#8	STR	12'-8"	102
A414	1	#8	STR	4'-5"	12	A256	2	#6	STR	5'-2"	16	S3	3	#8	STR	30'-0"	241
A415	1	#8	STR	3'-7"	10	A257	2	#6	STR	4'-5"	14	S5	6	#6	STR	12'-8"	115
A416	1	#8	STR	2'-9"	8	A258	2	#6	STR	3'-8"	12	S6	6	#6	STR	29'-8"	268
A417	1	#8	STR	1'-10"	5	A259	2	#6	STR	2'-11"	9						
						A260	2	#6	STR	2'-1"	7	REINFORCING STEEL					
B1	62	#4	STR	10'-5"	432	A261	2	#6	STR	1'-4"	5						11079
B2	56	#4	STR	8'-4"	312							CLASS "A" CONCRETE					
B3	84	#4	STR	10'-5"	585	A300	29	#6	STR	22'-0"	959	BARREL				CU. YDS.	57.3
						A301	2	#6	STR	21'-6"	65	CURTAIN WALL				CU. YDS.	1.9
						A302	2	#6	STR	20'-8"	63	SILL				CU. YDS.	0.4
C1	122	#4	STR	23'-4"	1902	A303	2	#6	STR	19'-9"	60	EDGE BEAM				CU. YDS.	2.1
						A304	2	#6	STR	18'-11"	57	TOTAL *				CU. YDS.	61.7
D1	14	#6	STR	2'-6"	53	A305	2	#6	STR	18'-1"	55	* FOR HEADWALL QUANTITIES, SEE C24					
D2	3	#6	STR	1'-6"	7	A306	2	#6	STR	17'-2"	52						
						A307	2	#6	STR	16'-4"	50						
S1	3	#8	STR	21'-9"	175	A308	2	#6	STR	15'-6"	47						
S4	6	#6	STR	20'-7"	186	A309	2	#6	STR	14'-7"	44						

REINFORCING STEEL		LBS.	8682
CLASS "A" CONCRETE			
BARREL		CU. YDS.	37.2
CURTAIN WALL		CU. YDS.	2.4
SILL		CU. YDS.	0.0
EDGE BEAM		CU. YDS.	1.3
TOTAL *		CU. YDS.	40.9
* FOR HEADWALL QUANTITIES, SEE C24			

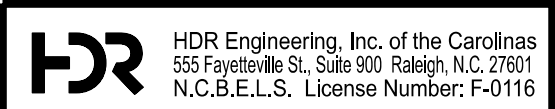
SPlice LENGTH CHART		
BAR	SIZE	SPlice LENGTH
A200, A250	#6	2'-9"
A400, A450	#8	3'-8"
C1	#4	2'-5"
S1, S2, S3	#8	4'-9"
S4, S5, S6	#6	3'-7"

BAR TYPES

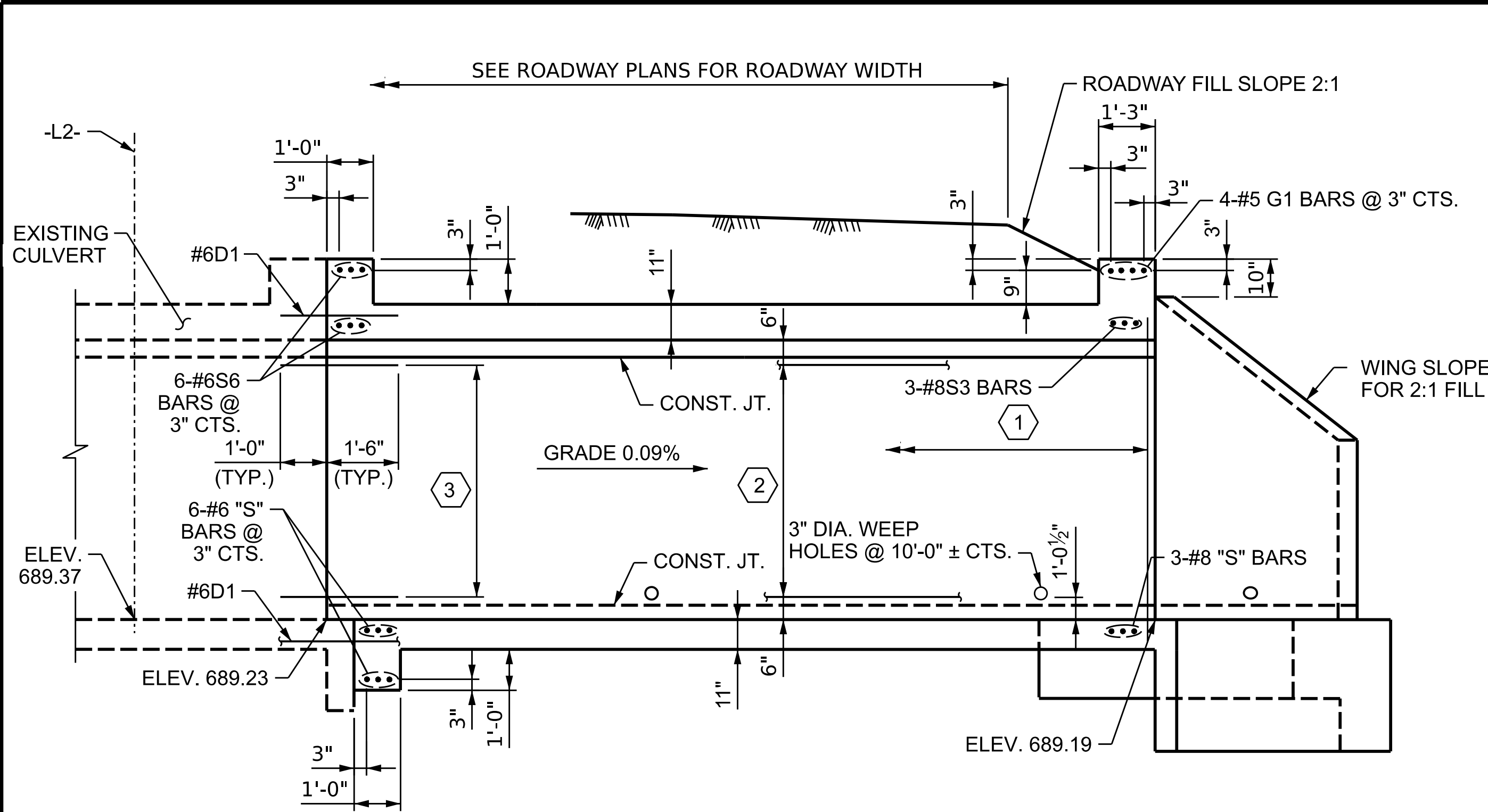


PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 468+34.19 -L2-

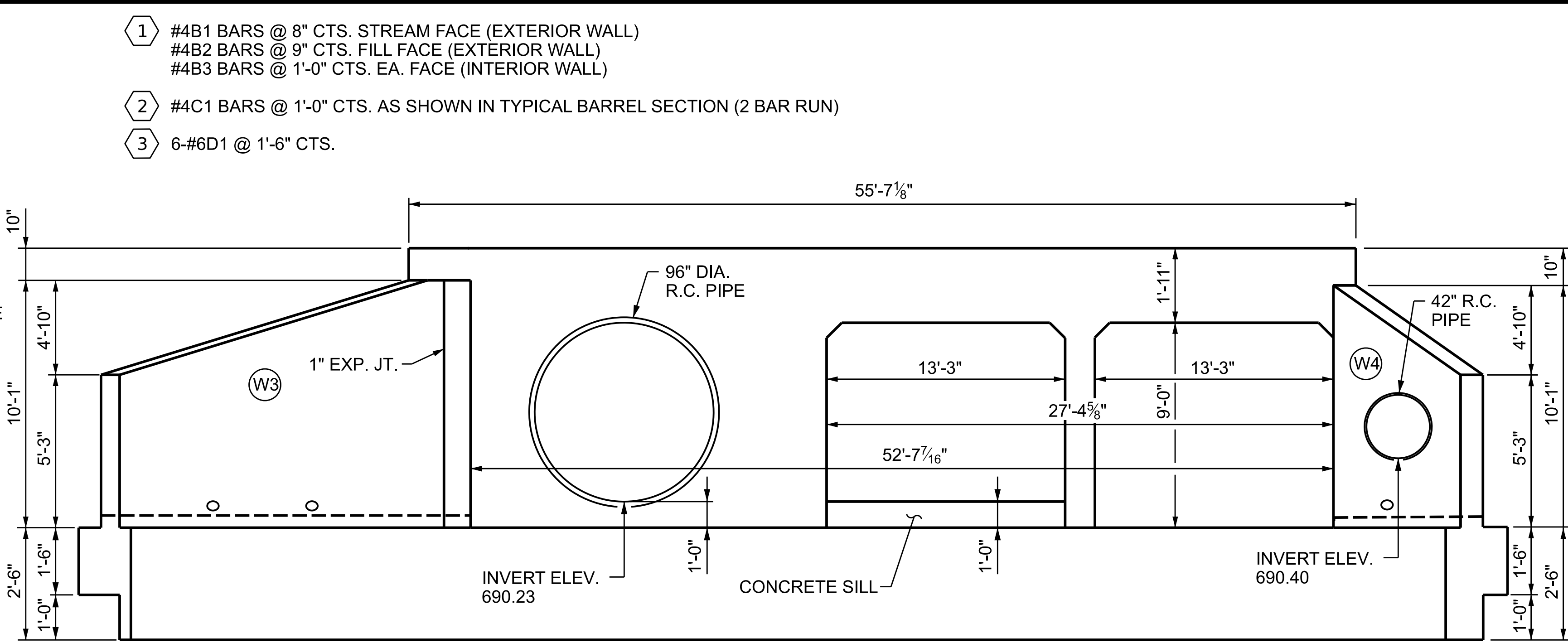
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
DOUBLE BARREL 10 FT. X 9 FT. CONCRETE BOX CULVERT UPSTREAM EXTENSION 131° SKEW					
REVISIONS					SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:
1	--	--	3	--	--
2	--	--	4	--	--
TOTAL SHEETS					C19
36					



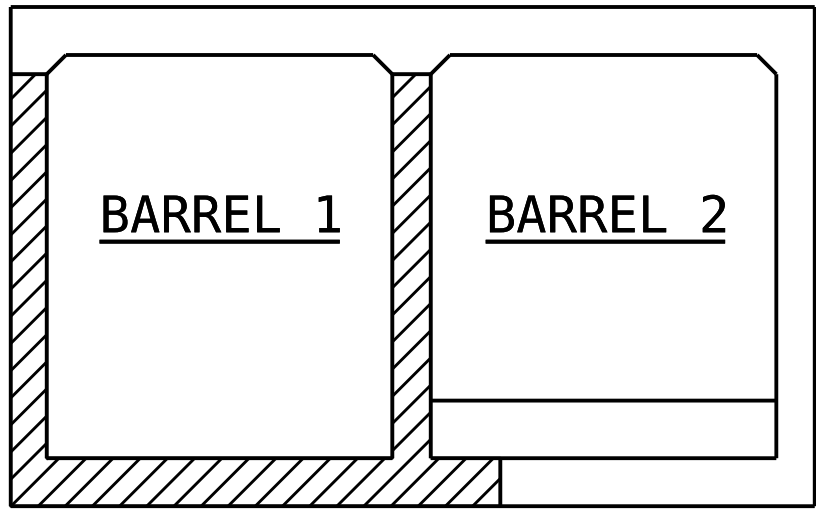
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED



DOWNSTREAM CULVERT EXTENSION
SECTION NORMAL TO ROADWAY



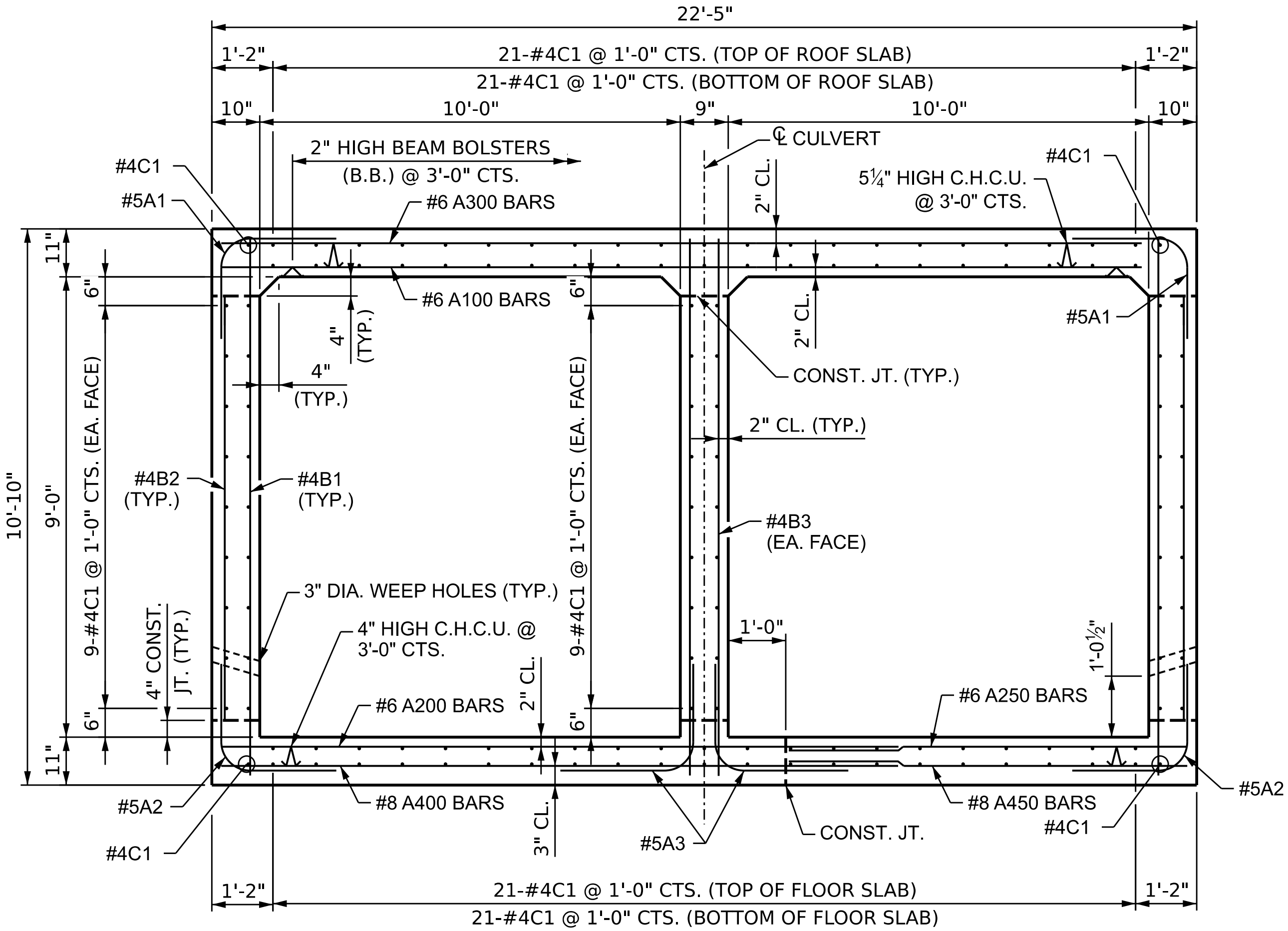
END ELEVATION NORMAL TO SKEW



CONSTRUCTION SEQUENCE

LOOKING DOWNSTREAM

- STAGE I (INCLUDES SILL DOWELS)
- STAGE II (INCLUDES SILL CONCRETE)



RIGHT ANGLE SECTION OF BARREL (DOWNSTREAM EXTENSION)

THERE ARE 142 C1 BARS IN SECTION OF BARREL
(LOOKING DOWNSTREAM)

DES BY: G.MARTINEZ	DATE: 09/25	DWG BY: D. CHAPMAN	DATE: 09/25
DES CHK: R. BEAUCHAMP	DATE: 09/25	CHK BY: D. MAST	DATE: 09/25

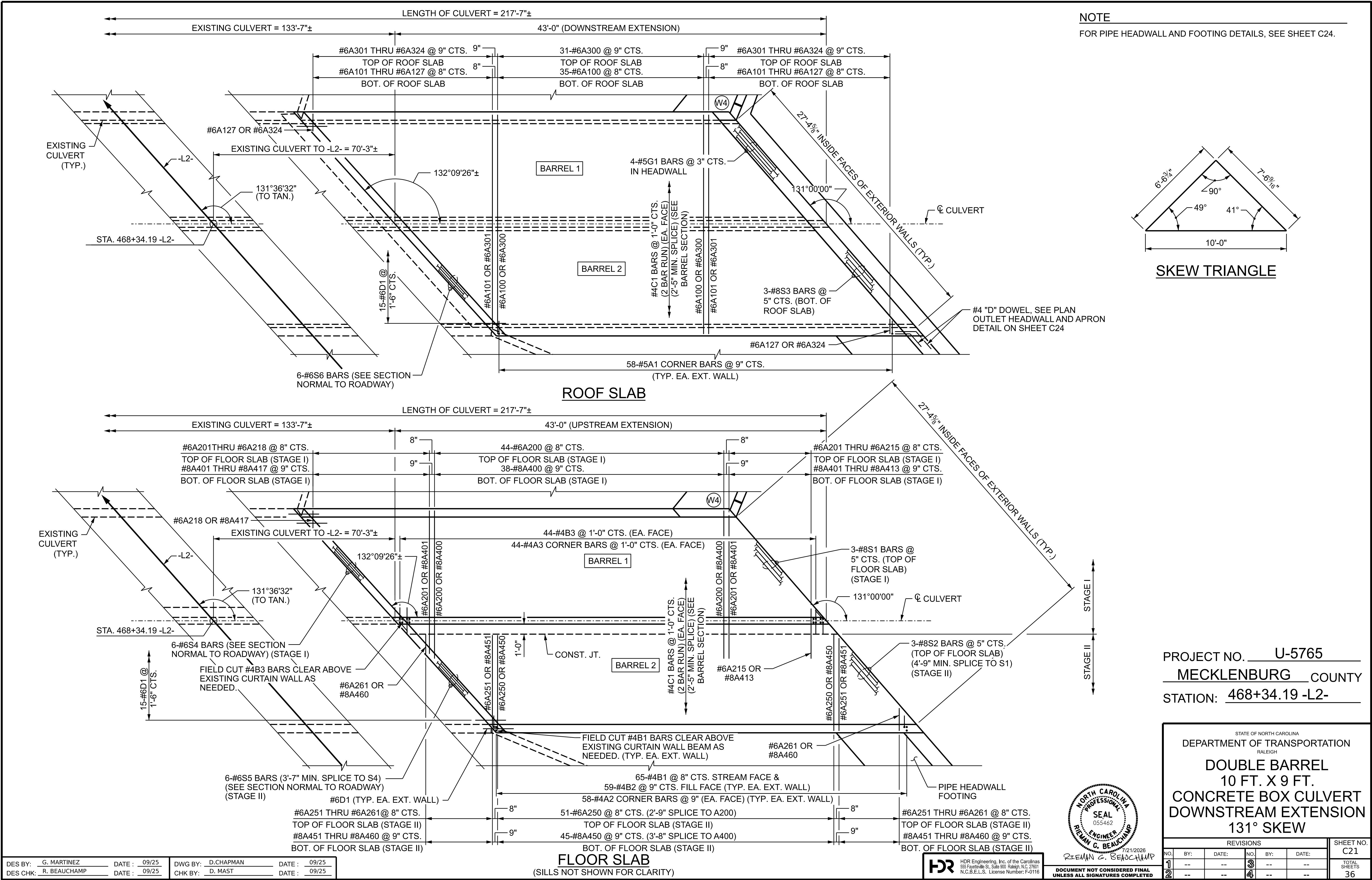
HDR	HDR Engineering, Inc. of the Carolinas 555 Fayetteville St., Suite 900 Raleigh, N.C. 27601 N.C.B.E.L.S. License Number: F-0116
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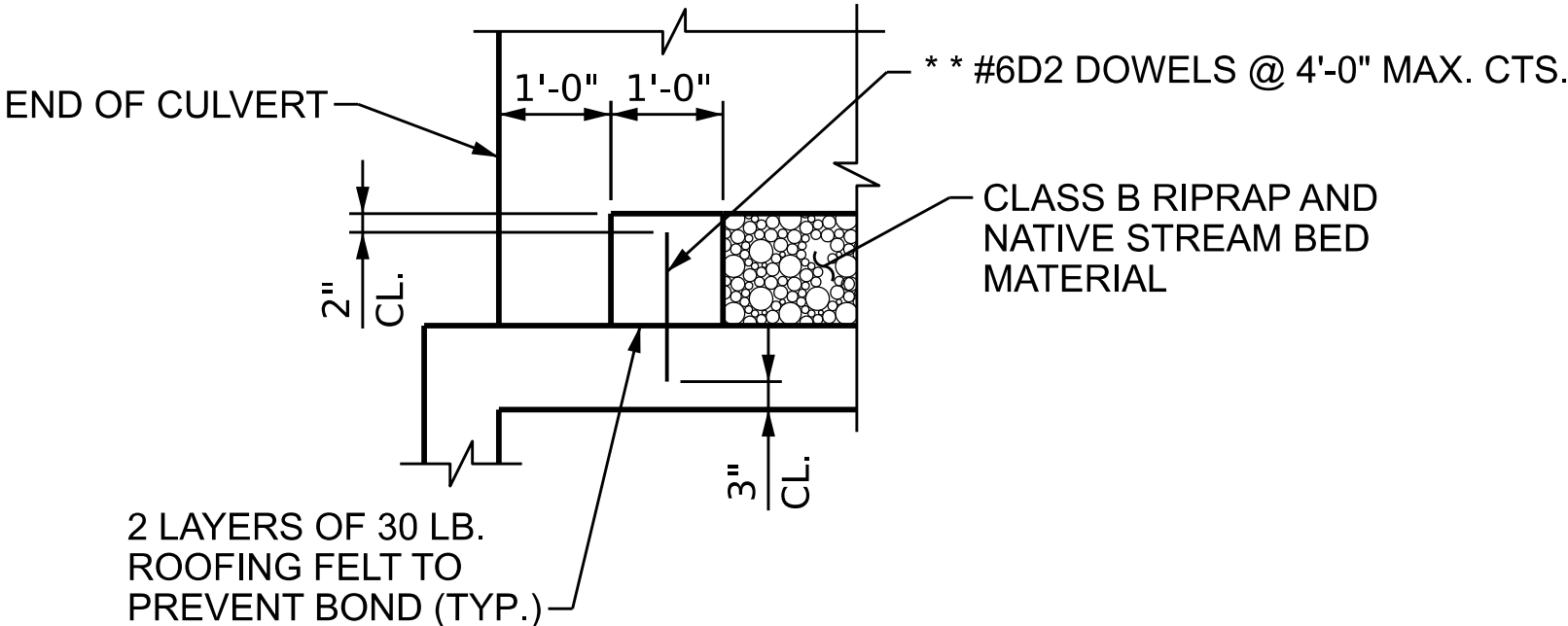
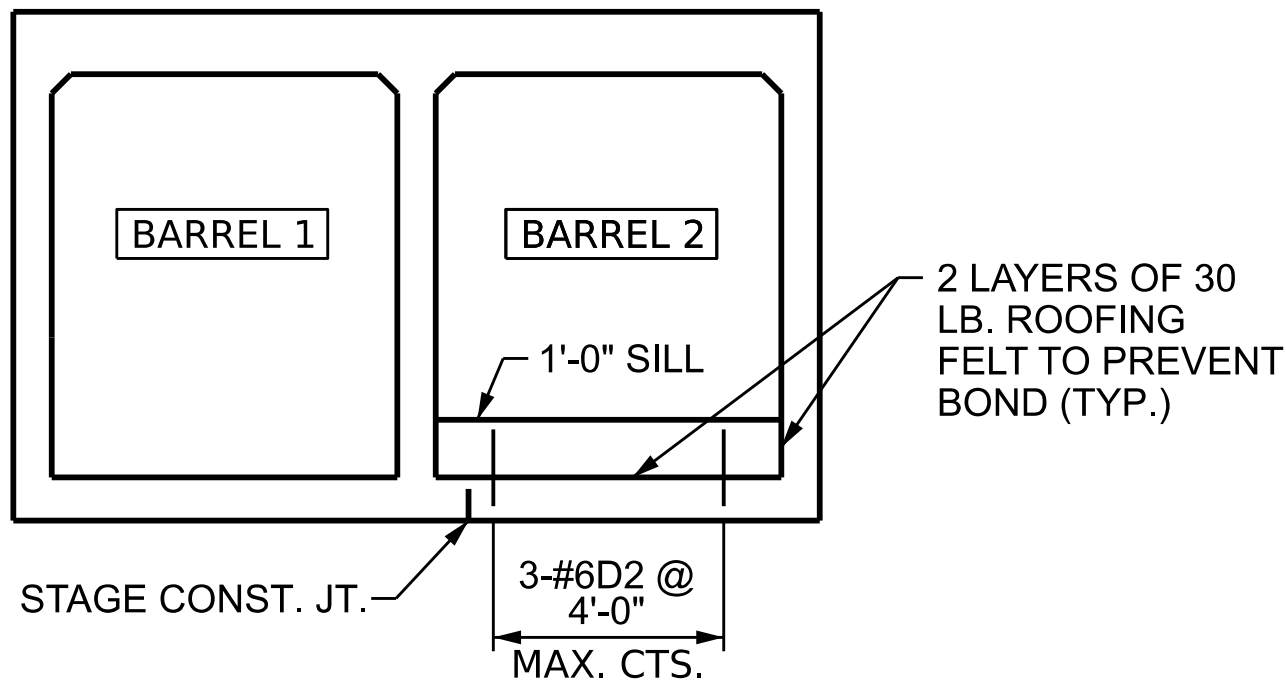
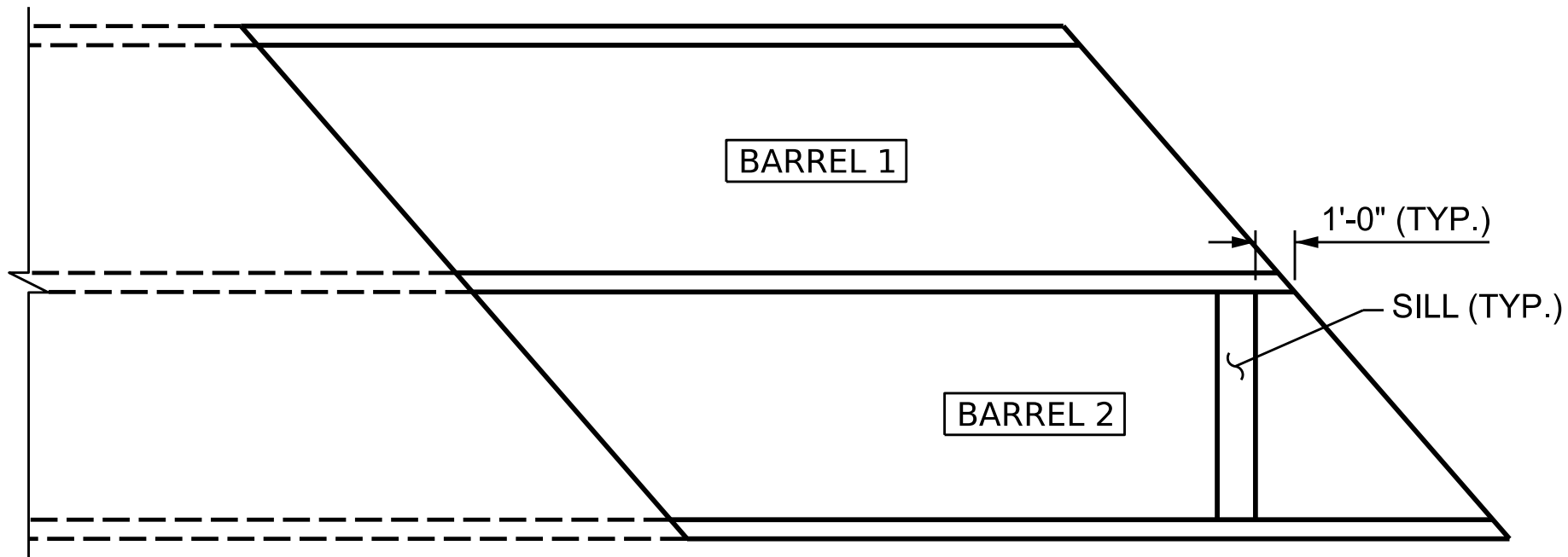


7/21/2026
R. G. BEAUCHAMP
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 468+34.19 -L2-

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
DOUBLE BARREL 10 FT. X 9 FT. CONCRETE BOX CULVERT DOWNSTREAM EXTENSION 131° SKEW					
REVISIONS					SHEET NO. C20
NO.	BY:	DATE:	NO.	BY:	DATE:
1	--	--	3	--	--
2	--	--	4	--	--
TOTAL SHEETS					36





SECTION THROUGH SILL

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

SILL DETAILS

NOTES

BACKFILL CULVERT BARRELS WITH CLASS B RIPRAP AND TOP WITH NATIVE MATERIAL TO SILL HEIGHT.

NATIVE MATERIAL BETWEEN SILLS IN THE CULVERT SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM OR FLOODPLAIN AT THE PROJECT SITE DURING CONSTRUCTION. ONLY MATERIAL THAT IS EXCAVATED FROM THE STREAM BED MAY BE USED TO LINE THE LOW FLOW CULVERT BARREL. RIPRAP MAY BE USED TO SUPPLEMENT THE NATIVE MATERIAL IN THE HIGH FLOW CULVERT BARRELS. IF RIPRAP IS USED TO LINE THE HIGH FLOW CULVERT BARRELS, NATIVE MATERIAL SHOULD BE PLACED ON TOP TO FILL VOIDS AND PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

SILLS ARE TO BE 1.0 FT. WIDE, CAST SEPARATELY AND ATTACHED BY DOWELS.

TOP OF LOW FLOW SILLS SHOULD MATCH STREAM BED ELEVATION IN LOW FLOW CHANNEL OF STREAM.

SILLS TO BE CAST DURING STAGE II CONSTRUCTION. D1 DOWELS MAY BE INSTALLED DURING STAGES I & II CONSTRUCTION AS APPLICABLE.

THE ENGINEER, IN CONSULTATION WITH DEO STAFF, SHALL REVIEW ALL MATERIAL TO BE USED AS BACKFILL PRIOR TO CONDUCTING THE BACKFILL ACTIVITY. BACKFILL SHALL CONSIST OF CLASS B RIPRAP AND NATIVE MATERIAL ONLY, UNLESS THE ENGINEER, IN CONSULTATION WITH DEO STAFF, DETERMINES THAT (1) THE NATIVE MATERIAL IS UNSUITABLE, OR (2) ADDITIONAL MATERIAL IS REQUIRED TO SUPPLEMENT THE NATIVE MATERIAL. THE CHOSEN BACKFILL MATERIAL SHALL NOT HAVE ADVERSE EFFECTS TO AQUATIC LIFE, AQUATIC LIFE PASSAGE, OR WATER QUALITY. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED OR FLOODPLAIN AT THE PROJECT SITE DURING CULVERT CONSTRUCTION.

DES BY:	G. MARTINEZ	DATE :	09/25	DWG BY:	D. CHAPMAN	DATE :	09/25
DES CHK:	R. BEAUCHAMP	DATE :	09/25	CHK BY:	D. MAST	DATE :	09/25

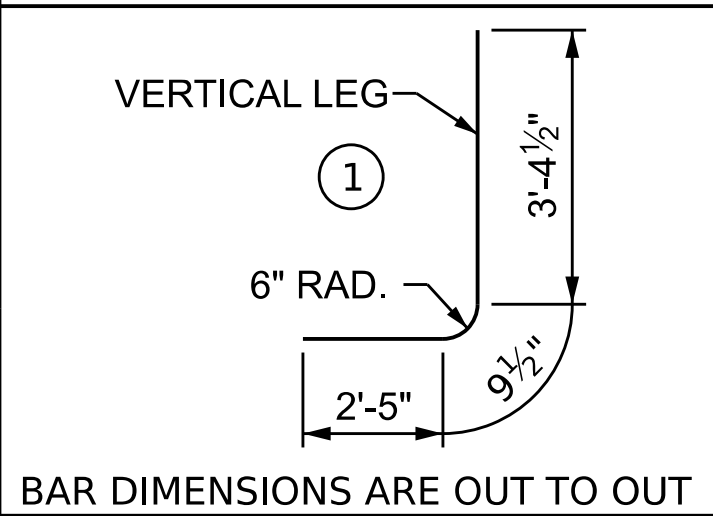
BILL OF MATERIAL																			
STAGE I						STAGE II													
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT		
A1	58	#5	1	6'-7"	399	A1	58	#5	1	6'-7"	399	A308	2	#6	STR	15'-6"	47		
A2	58	#5	1	6'-7"	399	A2	58	#5	1	6'-7"	399	A309	2	#6	STR	14'-7"	44		
A3	88	#5	1	6'-7"	605							A310	2	#6	STR	13'-9"	42		
						A100	35	#6	STR	22'-0"	1157	A311	2	#6	STR	12'-11"	39		
A200	44	#6	STR	15'-5"	1019	A101	2	#6	STR	21'-6"	65	A312	2	#6	STR	12'-0"	37		
A201	2	#6	STR	14'-7"	44	A102	2	#6	STR	20'-9"	63	A313	2	#6	STR	11'-2"	34		
A202	2	#6	STR	13'-10"	42	A103	2	#6	STR	20'-0"	61	A314	2	#6	STR	10'-4"	32		
A203	2	#6	STR	13'-1"	40	A104	2	#6	STR	19'-2"	58	A315	2	#6	STR	9'-5"	29		
A204	2	#6	STR	12'-4"	38	A105	2	#6	STR	18'-5"	56	A316	2	#6	STR	8'-7"	26		
A205	2	#6	STR	11'-7"	35	A106	2	#6	STR	17'-8"	54	A317	2	#6	STR	7'-8"	24		
A206	2	#6	STR	10'-9"	33	A107	2	#6	STR	16'-11"	51	A318	2	#6	STR	6'-10"	21		
A207	2	#6	STR	10'-0"	31	A108	2	#6	STR	16'-2"	49	A319	2	#6	STR	6'-0"	19		
A208	2	#6	STR	9'-3"	28	A109	2	#6	STR	15'-4"	47	A320	2	#6	STR	5'-1"	16		
A209	2	#6	STR	8'-6"	26	A110	2	#6	STR	14'-7"	44	A321	2	#6	STR	4'-3"	13		
A210	2	#6	STR	7'-8"	24	A111	2	#6	STR	13'-10"	42	A322	2	#6	STR	3'-5"	11		
A211	2	#6	STR	6'-11"	21	A112	2	#6	STR	13'-1"	40	A323	2	#6	STR	2'-6"	8		
A212	2	#6	STR	6'-2"	19	A113	2	#6	STR	12'-4"	38	A324	2	#6	STR	1'-8"	6		
A213	2	#6	STR	5'-5"	17	A114	2	#6	STR	11'-6"	35								
A214	2	#6	STR	4'-8"	15	A115	2	#6	STR	10'-9"	33	A450	45	#8	STR	9'-6"	1142		
A215	2	#6	STR	3'-10"	12	A116	2	#6	STR	10'-0"	31	A451	2	#8	STR	9'-2"	49		
A216	1	#6	STR	3'-1"	5	A117	2	#6	STR	9'-3"	28	A452	2	#8	STR	8'-4"	45		
A217	1	#6	STR	2'-4"	4	A118	2	#6	STR	8'-6"	26	A453	2	#8	STR	7'-6"	41		
A218	1	#6	STR	1'-7"	3	A119	2	#6	STR	7'-8"	24	A454	2	#8	STR	6'-7"	36		
						A120	2	#6	STR	6'-11"	21	A455	2	#8	STR	5'-9"	31		
A400	38	#8	STR	16'-4"	1658	A121	2	#6	STR	6'-2"	19	A456	2	#8	STR	4'-11"	27		
A401	2	#8	STR	15'-8"	84	A122	2	#6	STR	5'-5"	17	A457	2	#8	STR	4'-0"	22		
A402	2	#8	STR	14'-10"	80	A123	2	#6	STR	4'-8"	15	A458	2	#8	STR	3'-2"	17		
A403	2	#8	STR	13'-11"	75	A124	2	#6	STR	3'-10"	12	A459	2	#8	STR	2'-4"	13		
A404	2	#8	STR	13'-1"	70	A125	2	#6	STR	3'-1"	10	A460	2	#8	STR	1'-5"	8		
A405	2	#8	STR	12'-2"	65	A126	2	#6	STR	2'-4"	8								
A406	2	#8	STR	11'-4"	61	A127	2	#6	STR	1'-7"	6	B1	65	#4	STR	10'-5"	453		
A407	2	#8	STR	10'-6"	57							B2	59	#4	STR	8'-4"	329		
A408	2	#8	STR	9'-7"	52	A250	51	#6	STR	9'-6"	728								
A409	2	#8	STR	8'-9"	47	A251	2	#6	STR	9'-0"	28	C1	162	#4	STR	23'-4"	2526		
A410	2	#8	STR	7'-11"	43	A252	2	#6	STR	8'-3"	25								
A411	2	#8	STR	7'-0"	38	A253	2	#6	STR	7'-6"	23	D1	28	#6	STR	2'-6"	106		
A412	2	#8	STR	6'-2"	33	A254	2	#6	STR	6'-9"	21	D2	3	#6	STR	1'-6"	7		
A413	2	#8	STR	5'-4"	29	A255	2	#6	STR	5'-11"	18								
A414	1	#8	STR	4'-5"	12	A256	2	#6	STR	5'-2"	16	G1	4	#5	STR	32'-5"	136		
A415	1	#8	STR	3'-7"	10	A257	2	#6	STR	4'-5"	14								
A416	1	#8	STR	2'-9"	8	A258	2	#6	STR	3'-8"	12	S2	3	#8	STR	12'-9"	103		
A417	1	#8	STR	1'-10"	5	A259	2	#6	STR	2'-11"	9	S3	3	#8	STR	29'-5"	236		
						A260	2	#6	STR	2'-1"	8	S5	6	#6	STR	12'-9"	115		
B1	65	#4	STR	10'-5"	453	A261	2	#6	STR	1'-4"	6	S6	6	#6	STR	29'-8"	268		
B2	59	#4	STR	8'-4"	329							REINFORCING STEEL						LBS.	11387
B3	88	#4	STR	10'-5"	613	A300	31	#6	STR	22'-0"	1025	CLASS "A" CONCRETE							
						A301	2	#6	STR	21'-6"	65	BARREL						CU. YDS.	60.1
C1	122	#4	STR	23'-4"	1902	A302	2	#6	STR	20'-8"	63	SILL						CU. YDS.	0.4
						A303	2	#6	STR	19'-9"	60	EDGE BEAM						CU. YDS.	2.1
D1	14	#6	STR	2'-6"	53	A304	2	#6	STR	18'-11"	57	TOTAL *						CU. YDS.	62.6
						A305	2	#6	STR	18'-1"	55	* FOR HEADWALL QUANTITIES, SEE C24							
S1	3	#8	STR	21'-9"	175	A306	2	#6	STR	17'-2"	52								
S4	6	#6	STR	20'-7"	186	A307	2	#6	STR	16'-4"	50								

REINFORCING STEEL			LBS.	8997
CLASS "A" CONCRETE				
BARREL			CU. YDS.	39.0
SILL			CU. YDS.	0.0
EDGE BEAM			CU. YDS.	1.3
TOTAL *			CU. YDS.	40.3

* FOR HEADWALL QUANTITIES, SEE C24

SPlice LENGTH CHART		
BAR	SIZE	SPlice LENGTH
A200, A250	#6	2'-9"
A400, A450	#8	3'-8"
C1	#4	2'-5"
S1, S2, S3	#8	4'-9"
S4, S5, S6	#6	3'-7"

BAR TYPES

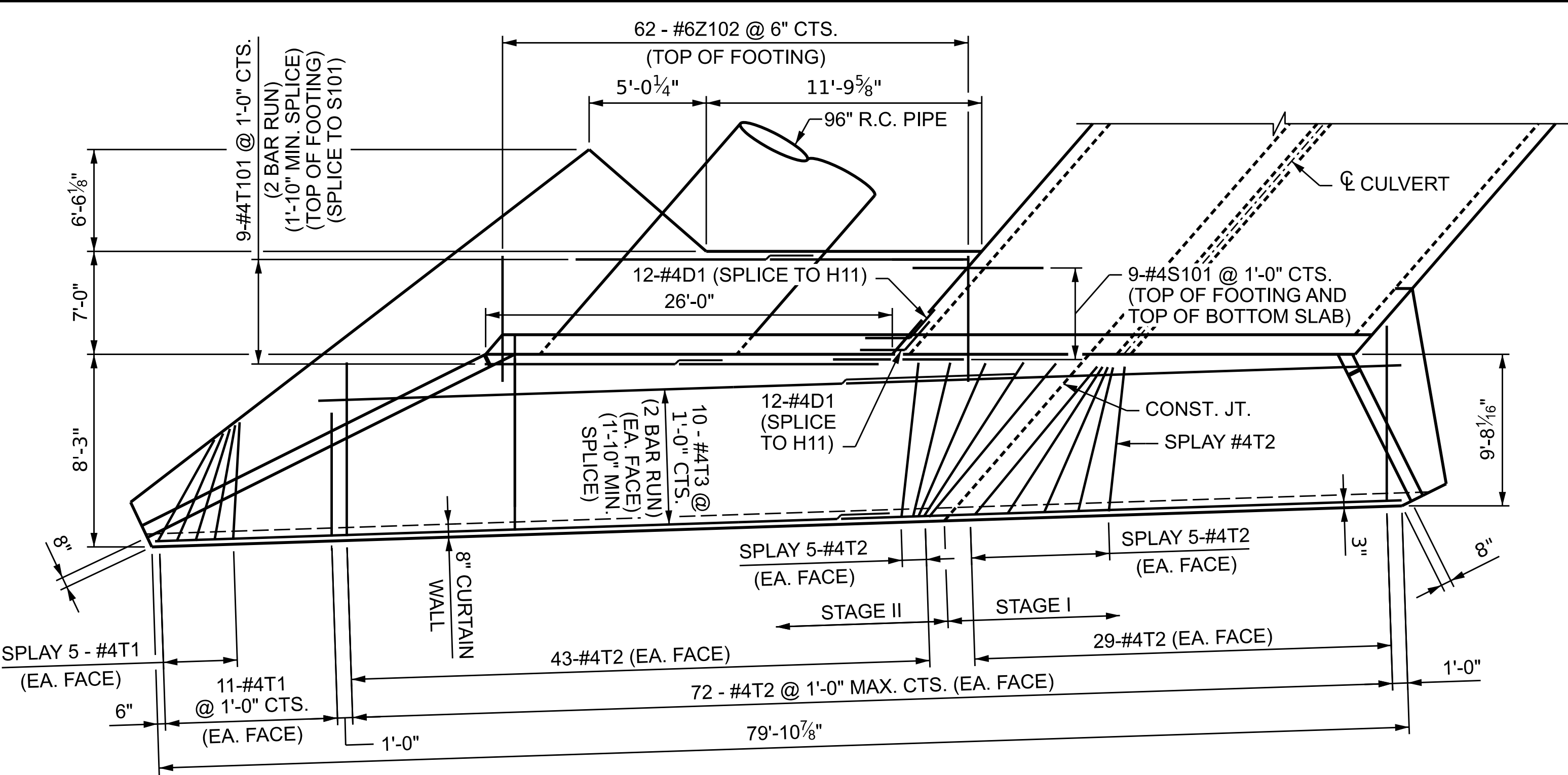


PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 468+34.19 -L2-

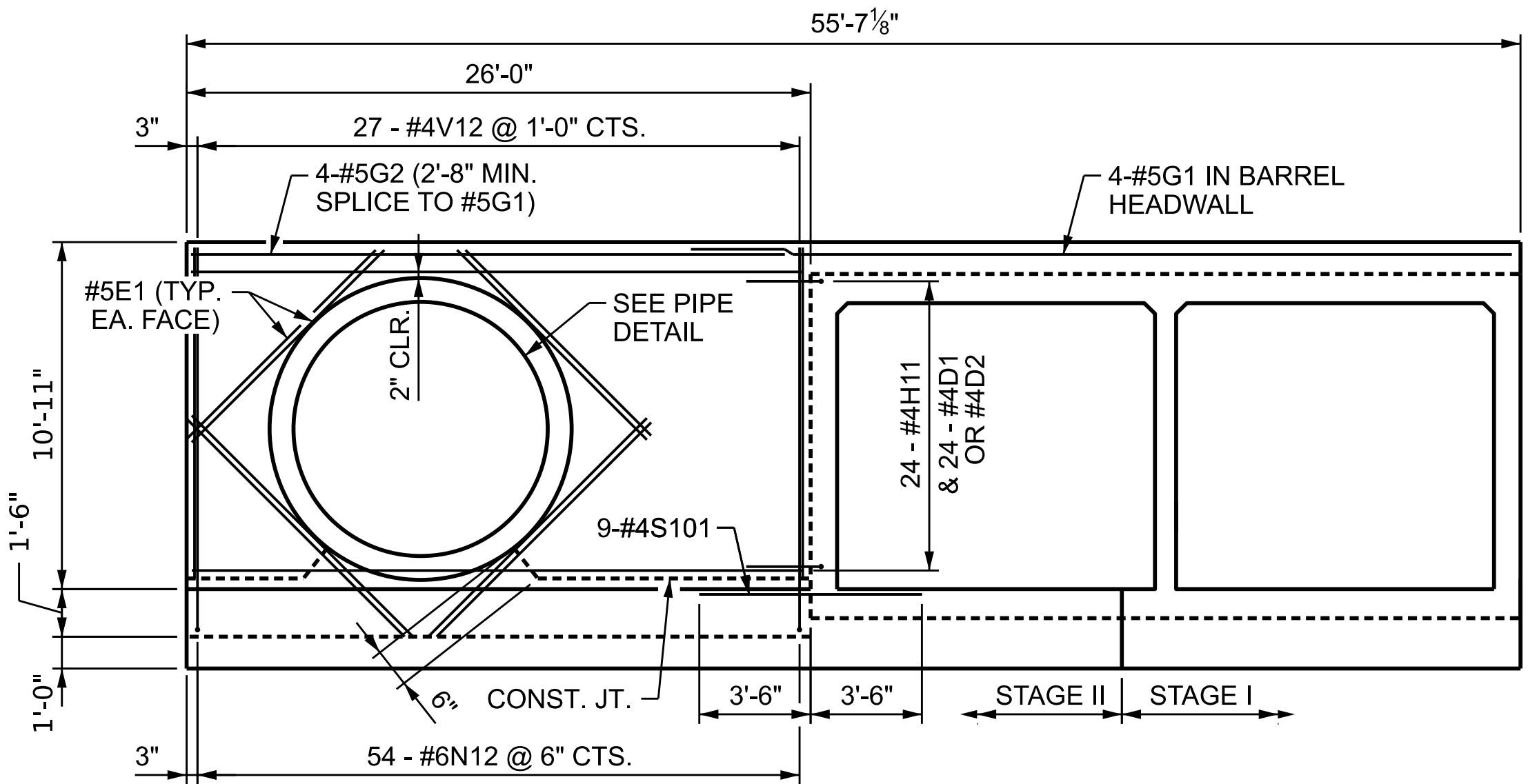
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH DOUBLE BARREL 10 FT. X 9 FT. CONCRETE BOX CULVERT DOWNSTREAM EXTENSION 131° SKEW									
REVISIONS						SHEET NO. C22			
NO.	BY:	DATE:	NO.	BY:	DATE:	TOTAL SHEETS			
1	--	--	3	--	--	36			
2	--	--	4	--	--				



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UNLESS ALL SIGNATURES COMPLETED

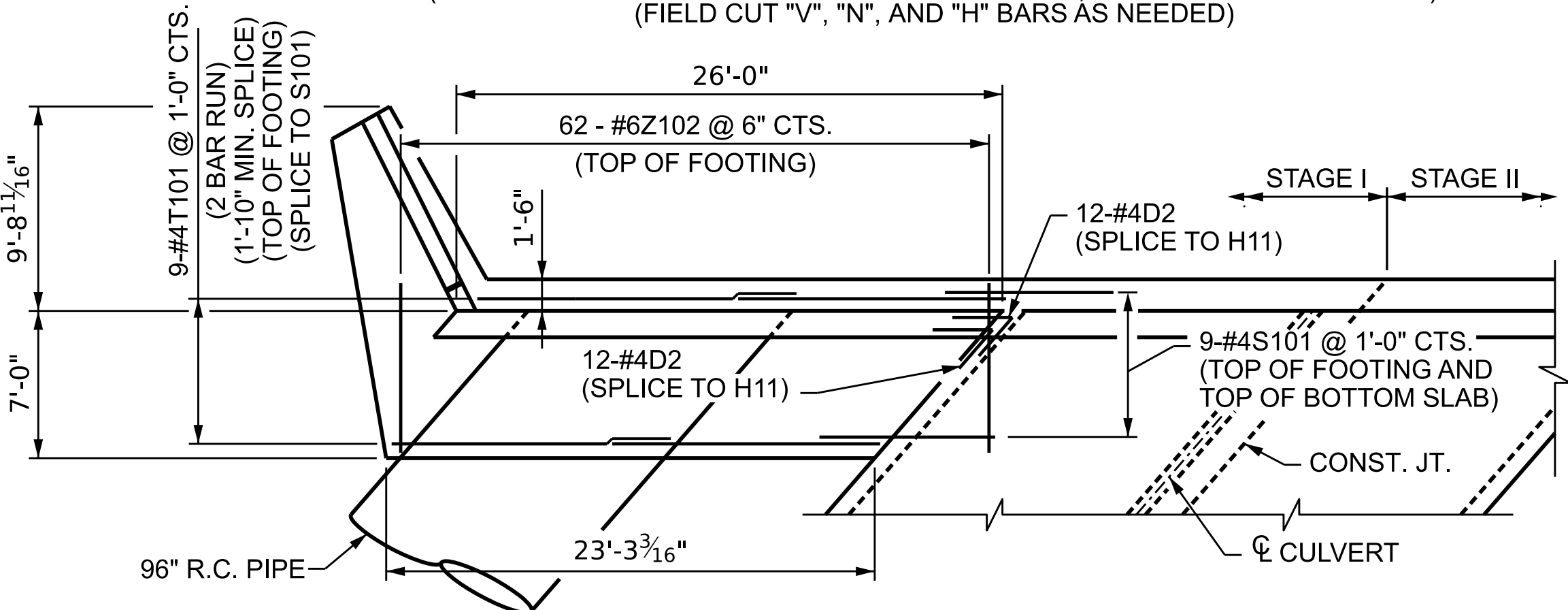


PLAN OUTLET HEADWALL AND APRON

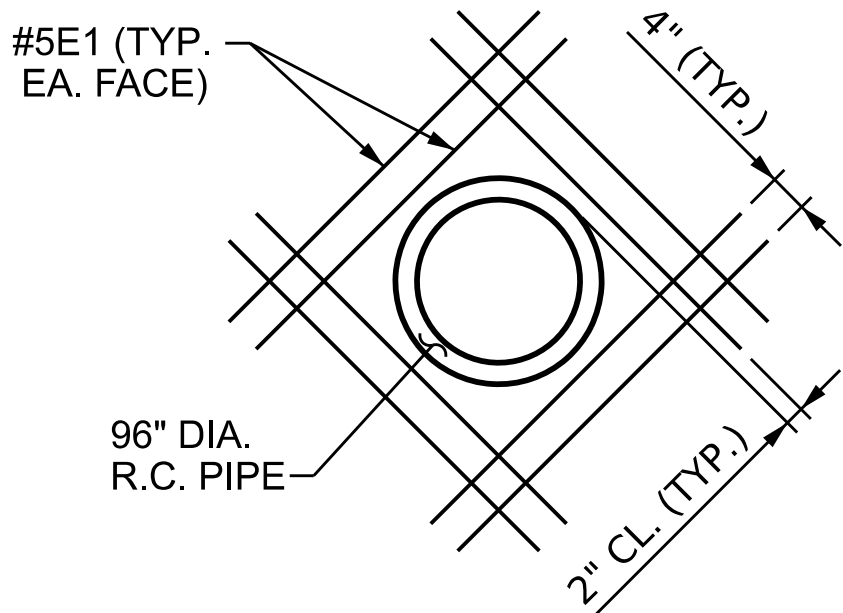


ELEVATION OUTLET HEADWALL

(OUTLET HEADWALL SHOWN LOOKING UPSTREAM, INLET HEADWALL SIMILAR)
(FIELD CUT "V", "N", AND "H" BARS AS NEEDED)

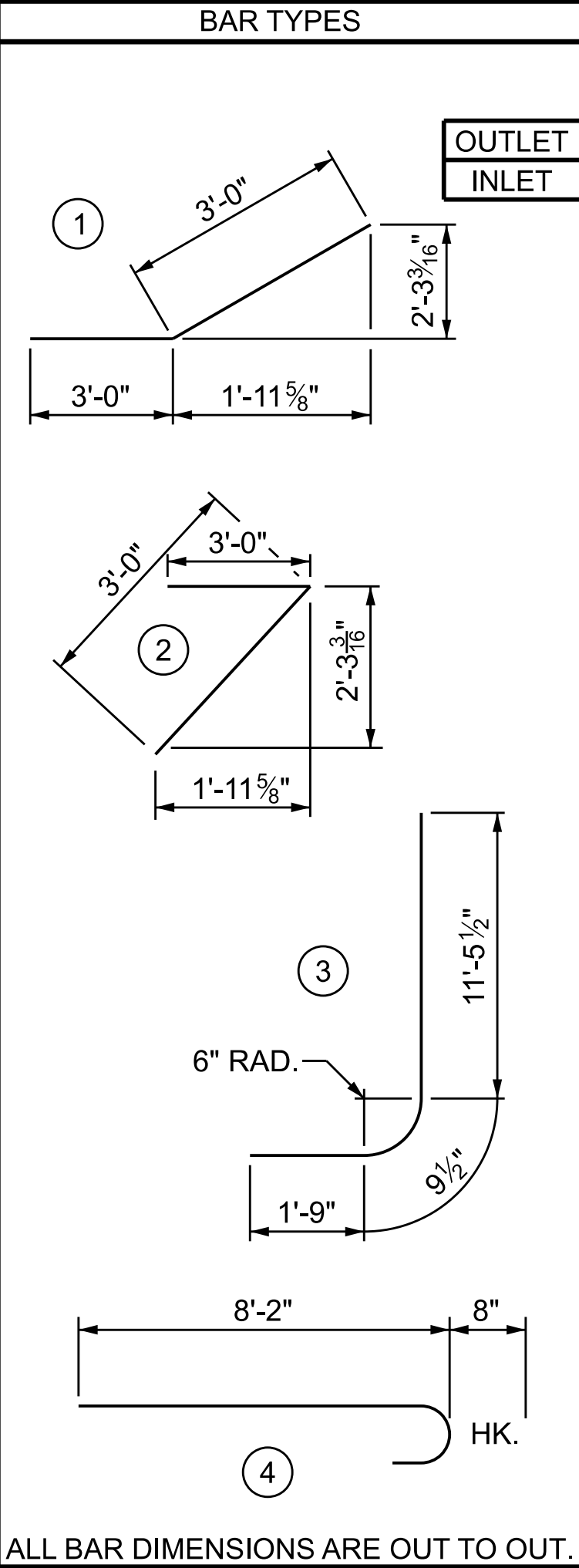


PLAN INLET HEADWALL

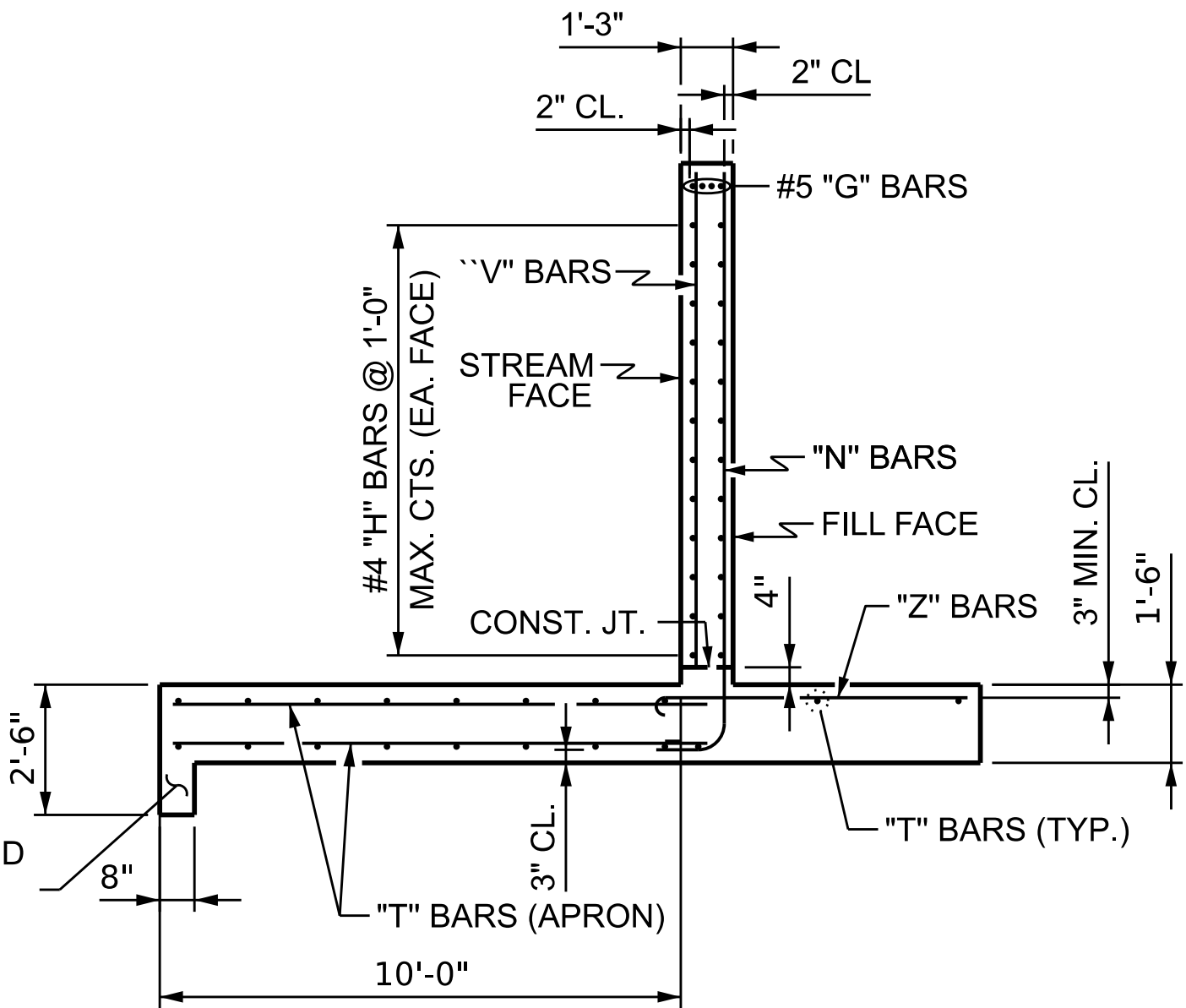


PIPE DETAIL

THE 96" DIA. PIPE THROUGH THE HEADWALL OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE FIELD BENT AS NECESSARY TO CLEAR PIPE.



ALL BAR DIMENSIONS ARE OUT TO OUT.



HEADWALL SECTION

(OUTLET HEADWALL SHOWN)

BILL OF MATERIAL					
PER 1 HEADWALL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
D1	24	#4	1	6'-0"	97
D2	24	#4	2	6'-0"	97
E1	16	#5	STR	9'-6"	159
G2	4	#5	STR	25'-8"	108
H11	24	#4	STR	25'-8"	412
N12	54	#6	3	14'-0"	1136
S101	9	#4	STR	7'-0"	43
T101	18	#4	STR	14'-1"	170
V12	27	#4	STR	10'-5"	188
Z102	62	#6	4	11'-5"	1064
REINFORCING STEEL				LBS.	3377
CLASS "A" CONCRETE					
UPSTREAM HEADWALL				CU. YDS.	23.6
DOWNSTREAM HEADWALL				CU. YDS.	19.5
BILL OF MATERIAL					
FOR APRON (STAGE I)					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
T2	58	#4	STR	11'-4"	440
T3	20	#4	STR	40'-11"	547
REINFORCING STEEL				LBS.	987
CLASS "A" CONCRETE					
APRON (STAGE I)				CU. YDS.	13.4
BILL OF MATERIAL					
FOR APRON (STAGE II)					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
T1	22	#4	STR	6'-6"	96
T2	86	#4	STR	11'-4"	652
T3	20	#4	STR	40'-11"	547
REINFORCING STEEL				LBS.	1295
CLASS "A" CONCRETE					
APRON (STAGE II)				CU. YDS.	29.2

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 468+34.19 -L2-



STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
HEADWALL AND APRON DETAILS					
REVISIONS					SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:
1	--	--	3	--	--
2	--	--	4	--	--
TOTAL SHEETS					C24
36					

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS																		
LOAD TYPE		VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE								COMMENT NUMBER			
							LIVE-LOAD FACTORS (γLL)	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		HL-93 (INVENTORY)	N/A	①	1.57	--	1.75	1.57	1	TOP SLAB	10.00	1.57	1	TOP SLAB	10.00			
		HL-93 (OPERATING)	N/A		2.04	--	1.35	2.04	1	TOP SLAB	10.00	2.04	1	TOP SLAB	10.00			
		HS-20 (INVENTORY)	36.000	②	1.57	56.52	1.75	1.57	1	TOP SLAB	10.00	1.63	1	TOP SLAB	10.00			
		HS-20 (OPERATING)	36.000		2.04	73.44	1.35	2.04	1	TOP SLAB	10.00	2.11	1	TOP SLAB	10.00			
LEGAL LOAD		SINGLE VEHICLE (SV)		SNSH	13.500		3.19	43.07	1.40	3.61	1	TOP SLAB	10.00	3.19	1	TOP SLAB	10.00	
				SNGARBS2	20.000		2.93	58.60	1.40	2.93	1	TOP SLAB	10.00	2.94	1	TOP SLAB	10.00	
				SNAGRIS2	22.000		2.85	62.70	1.40	2.85	1	TOP SLAB	10.00	3.09	1	TOP SLAB	10.00	
				SNCOTTS3	27.250		1.97	53.68	1.40	2.03	1	TOP SLAB	10.00	1.97	1	TOP SLAB	10.00	
				SNAGGRS4	34.925		1.99	69.50	1.40	1.99	1	TOP SLAB	10.00	2.11	1	TOP SLAB	10.00	
				SNS5A	35.550		2.10	74.66	1.40	2.10	1	TOP SLAB	10.00	2.39	1	BOTTOM SLAB	10.00	
				SNS6A	39.950		2.01	80.30	1.40	2.01	1	TOP SLAB	10.00	2.11	1	TOP SLAB	10.00	
				SNS7B	42.000		1.81	76.02	1.40	1.81	1	TOP SLAB	10.00	2.04	1	TOP SLAB	10.00	
		TRUCK TRACTOR SEMI-TRAILER (TTST)		TNAGRIT3	33.000		2.34	77.22	1.40	2.34	1	TOP SLAB	10.00	2.59	1	BOTTOM SLAB	10.00	
				TNT4A	33.075		2.08	68.80	1.40	2.08	1	TOP SLAB	10.00	2.25	1	TOP SLAB	10.00	
				TNT6A	41.600		2.08	86.53	1.40	2.08	1	TOP SLAB	10.00	2.10	1	TOP SLAB	10.00	
				TNT7A	42.000		2.10	88.20	1.40	2.10	1	TOP SLAB	10.00	2.20	1	TOP SLAB	10.00	
				TNT7B	42.000		2.03	85.26	1.40	2.03	1	TOP SLAB	10.00	2.07	1	TOP SLAB	10.00	
				TNAGRIT4	43.000		1.81	77.83	1.40	1.81	1	TOP SLAB	10.00	2.16	1	TOP SLAB	10.00	
		TNAGT5A	45.000		1.80	81.00	1.40	1.80	1	TOP SLAB	10.00	2.16	1	TOP SLAB	10.00			
		TNAGT5B	45.000	③	1.67	75.15	1.40	1.67	1	TOP SLAB	10.00	1.91	1	BOTTOM SLAB	10.00			
EMERGENCY VEHICLE (EV)		EV2	28.750		2.25	64.69	1.30	2.36	1	TOP SLAB	10.00	2.25	1	TOP SLAB	10.00			
		EV3	43.000	④	1.72	73.96	1.30	1.81	1	TOP SLAB	10.00	1.72	1	TOP SLAB	10.00			

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	--

NOTES:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATES.

RATING FACTORS ARE FOR THE EXTENSION OF THE CONCRETE BOX
DETAILED IN THESE PLANS. THE EXISTING CONCRETE BOX AND WAS
NOT RATED.

⬡# CONTROLLING LOAD RATING

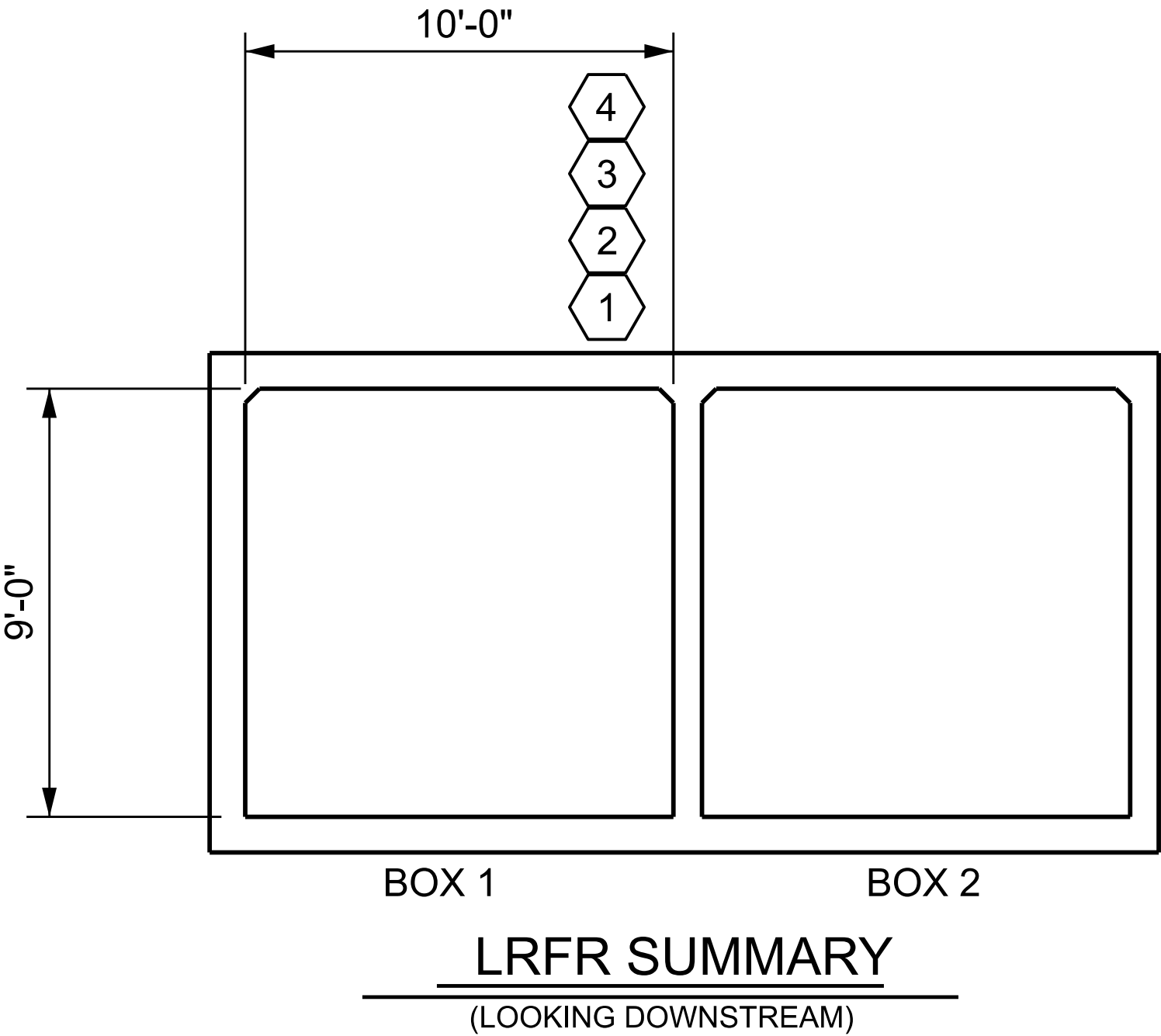
⬡1 DESIGN LOAD RATING (HL-93)

⬡2 DESIGN LOAD RATING (HS-20)

⬡3 LEGAL LOAD RATING **

⬡4 EMERGENCY VEHICLE LOAD RATING **

** SEE CHART FOR VEHICLE TYPE



PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 468+34.19 -L2-



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE BARREL
10 FT. X 9 FT.
CONCRETE BOX CULVERT
(NON-INTERSTATE TRAFFIC)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C25
1	--	--	3	--	--	TOTAL SHEETS 36
2	--	--	4	--	--	

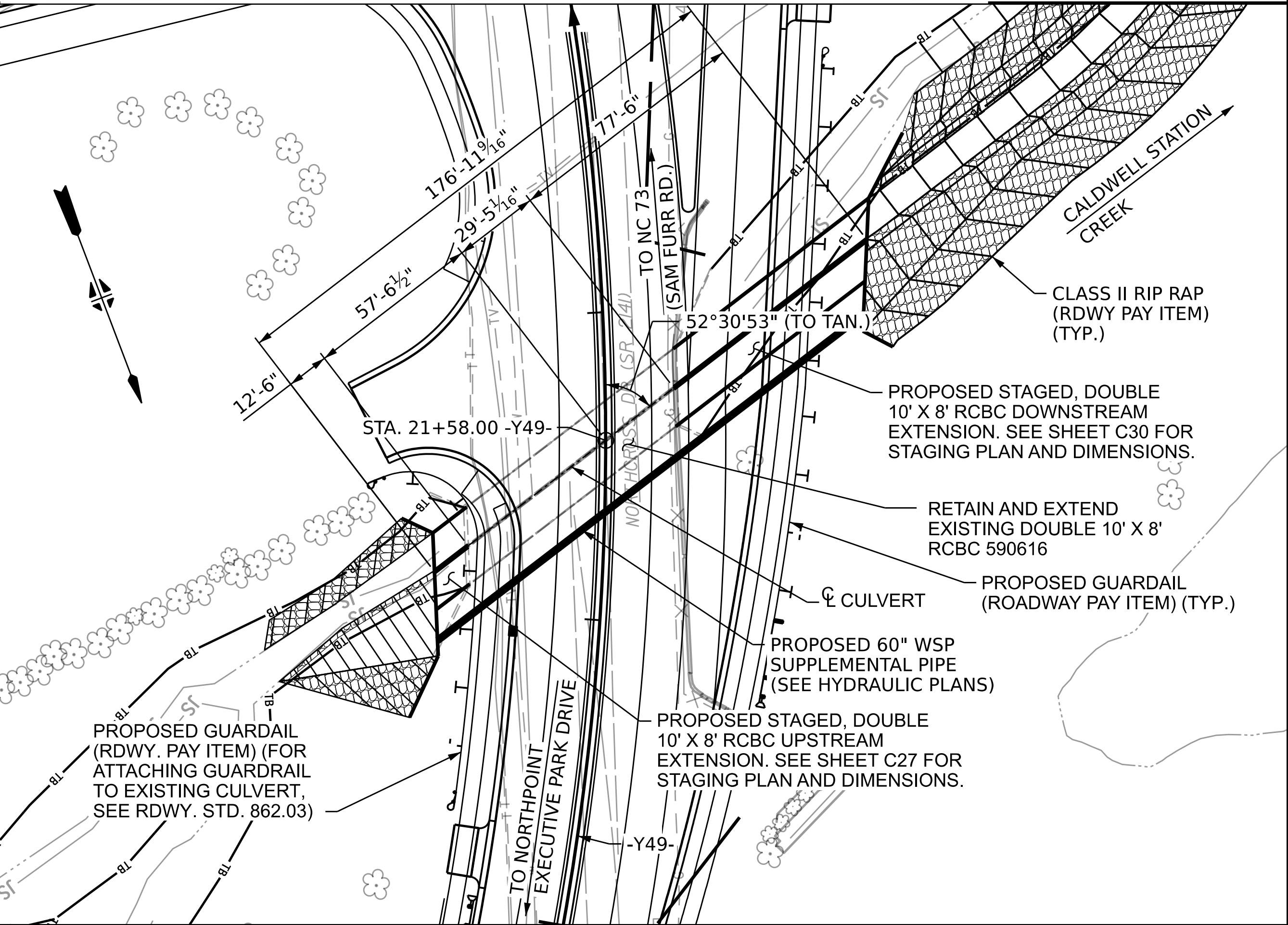
DES BY: <u>G. MARTINEZ</u>	DATE: <u>09/25</u>	DWG BY: <u>D. CHAPMAN</u>	DATE: <u>09/25</u>
DES CHK: <u>R. BEAUCHAMP</u>	DATE: <u>09/25</u>	CHK BY: <u>D. MAST</u>	DATE: <u>09/25</u>

HDR Engineering, Inc. of the Carolinas
555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

7/21/2026
R. BEAUCHAMP

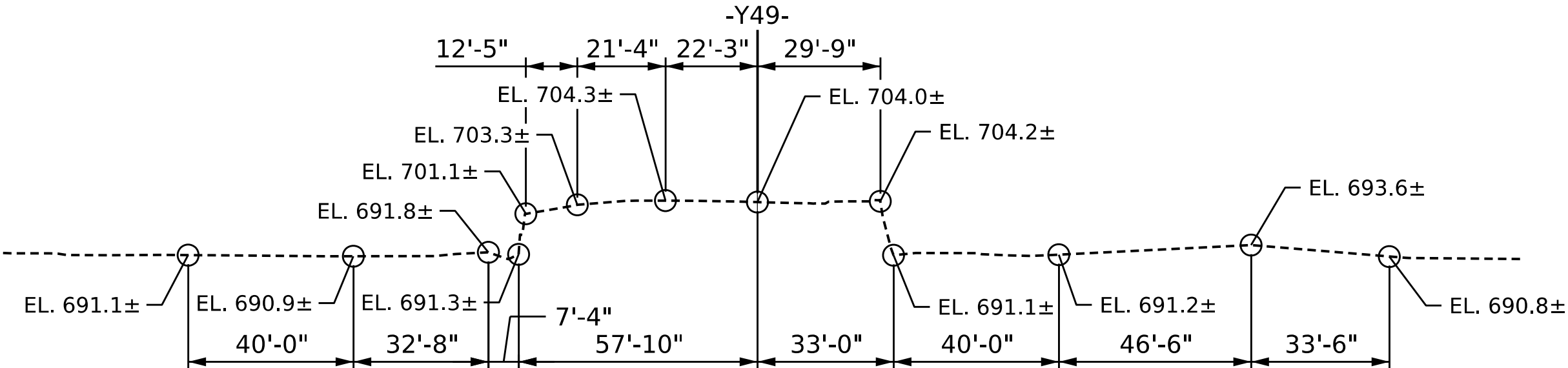
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BENCHMARK: BM #17: TIE SPIKE SET IN 14" BEECH, 326.14' LT OF STA. 461+33.63 EL. 715.75, DATUM NAVD 88



LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS



PROFILE ALONG CULVERT

TOTAL STRUCTURE QUANTITIES - UPSTREAM EXTENSION			
CLASS A CONCRETE (STAGE I)			
BARREL @ 0.90 CY./FT.	11.2	C.Y.	
CURTAIN WALL, PIPE HEADWALL, EDGE BEAM	15.8	C.Y.	
WINGS (W2)	22.1	C.Y.	
TOTAL	49.1	C.Y.	
CLASS A CONCRETE (STAGE II)			
BARREL @ 1.85 CY./FT.	23.1	C.Y.	
CURTAIN WALL, EDGE BEAM, SILL	3.6	C.Y.	
WINGS (W1)	6.0	C.Y.	
TOTAL	32.7	C.Y.	
REINFORCING STEEL (STAGE I)			
BARREL, CURTAIN WALL, PIPE HEADWALL	4901	LBS.	
WINGS (W2)	2882	LBS.	
TOTAL	7783	LBS.	
REINFORCING STEEL (STAGE II)			
BARREL, CURTAIN WALL, EDGE BEAM, SILL	3941	LBS.	
WINGS (W1)	693	LBS.	
TOTAL	4634	LBS.	
CULVERT EXCAVATION, STA. 21+58.00 -Y49-	LUMP SUM		
FOUNDATION CONDITIONING MATERIAL	24	TONS	

TOTAL STRUCTURE QUANTITIES - DOWNSTREAM EXTENSION			
CLASS A CONCRETE (STAGE I)			
BARREL @ 0.89 CY./FT.	69.0	C.Y.	
APRON, EDGE BEAM, PIPE HEADWALL	37.3	C.Y.	
WINGS (W3)	7.8	C.Y.	
TOTAL	114.1	C.Y.	
CLASS A CONCRETE (STAGE II)			
BARREL @ 1.76 CY./FT.	136.3	C.Y.	
APRON, EDGE BEAM, SILL	14.4	C.Y.	
WINGS (W4)	19.1	C.Y.	
TOTAL	169.8	C.Y.	
REINFORCING STEEL (STAGE I)			
BARREL, APRON, PIPE HEADWALL	17403	LBS.	
WINGS (W3)	800	LBS.	
TOTAL	18203	LBS.	
REINFORCING STEEL (STAGE II)			
BARREL, HEADWALL, APRON, EDGE BEAM, SILL	19594	LBS.	
WINGS (W4)	3440	LBS.	
TOTAL	23034	LBS.	
CULVERT EXCAVATION, STA. 21+58.00 -Y49-	LUMP SUM		
FOUNDATION CONDITIONING MATERIAL	144	TONS	

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.

DESIGN FILL = 8.92' (MAX.) AND 1.74' (MIN.).

FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:
(FOR FULL CONSTRUCTION SEQUENCE, SEE MOT AND EROSION CONTROL PLANS)

STAGE I UPSTREAM

- WING FOOTING (W2), SUPPLEMENTAL PIPE FOOTING AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS FOR BARREL 2 OF UPSTREAM EXTENSION.
- THE REMAINING PORTIONS OF THE WALLS, SUPPLEMENTAL PIPE HEADWALL AND WING FULL HEIGHT FOR BARREL 2 OF UPSTREAM EXTENSION.

STAGE II UPSTREAM

- WING FOOTING (W1) AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS FOR BARREL 1 OF UPSTREAM EXTENSION.
- THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOR BARREL 1 FOLLOWED BY ROOF SLAB AND HEADWALLS FOR ALL BARRELS OF UPSTREAM EXTENSION.

STAGE I DOWNSTREAM

- WING FOOTING (W3), SUPPLEMENTAL PIPE FOOTING AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS FOR BARREL 2 OF DOWNSTREAM EXTENSION.
- THE REMAINING PORTIONS OF THE WALLS, SUPPLEMENTAL PIPE HEADWALL AND WING FULL HEIGHT FOR BARREL 2 OF DOWNSTREAM EXTENSION.

STAGE II DOWNSTREAM

- WING FOOTING (W4) AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS FOR BARREL 1 OF DOWNSTREAM EXTENSION.
- THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOR BARREL 1 FOLLOWED BY ROOF SLAB AND HEADWALLS FOR ALL BARRELS OF DOWNSTREAM EXTENSION.

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.

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

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 GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

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 SHALL BE PAID FOR BY THE CONTRACTOR.

THE ENTIRE COST OF WORK REQUIRED TO PLACE EXCAVATED OR SUPPLEMENTAL MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE LUMP SUM PRICE FOR CULVERT EXCAVATION.

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.

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

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

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.

I HEREBY CERTIFY THESE PLANS
ARE THE AS-BUILT PLANS

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 21+58.00 -Y49-

CULVERT NO. 590616

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE BARREL
10 FT. X 8 FT.
CONCRETE BOX CULVERT
EXTENSIONS

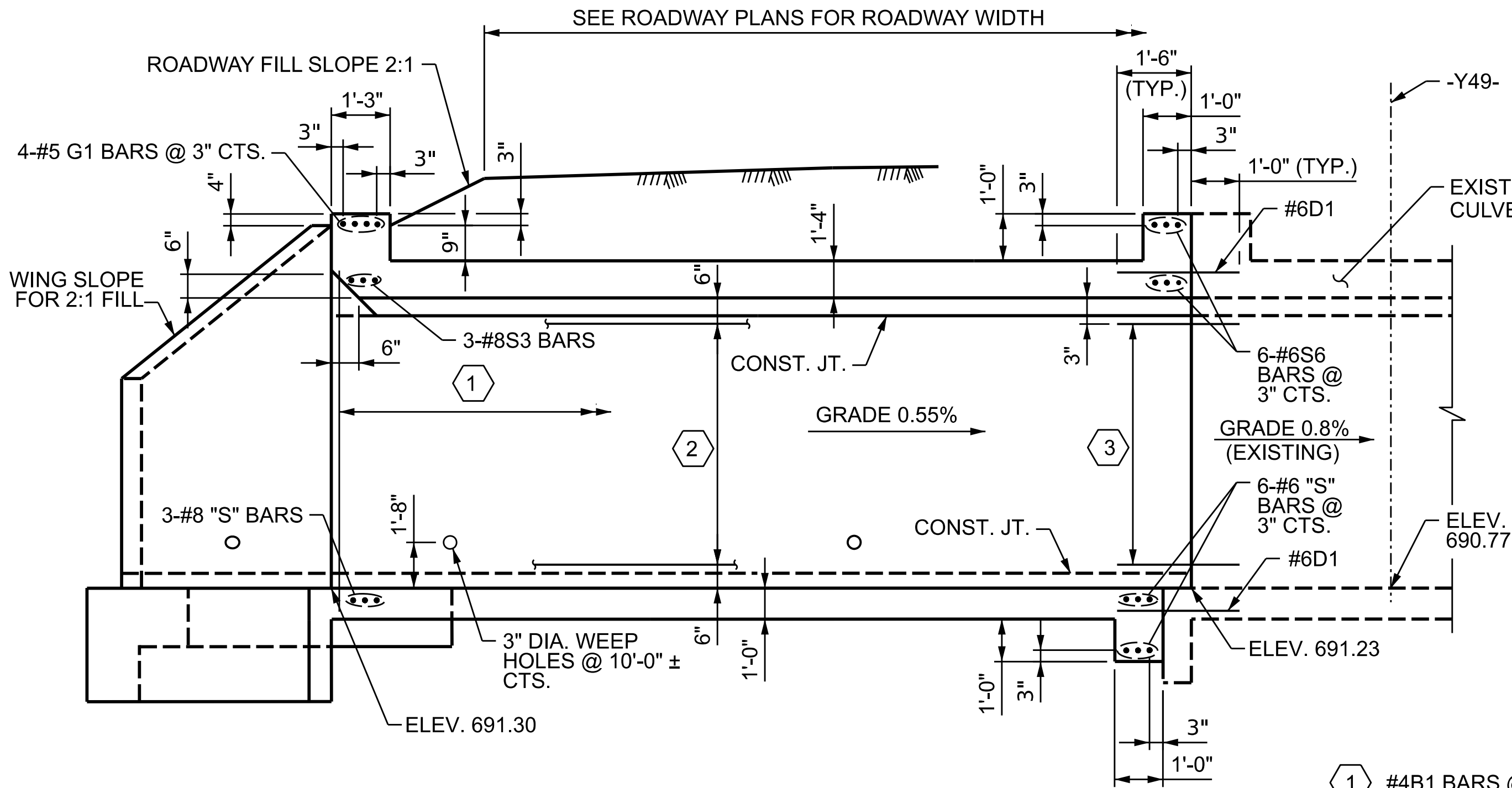
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C26
1	--	--	3	--	--	TOTAL SHEETS
2	--	--	4	--	--	36



7/21/2026
R. BEAUCHAMP
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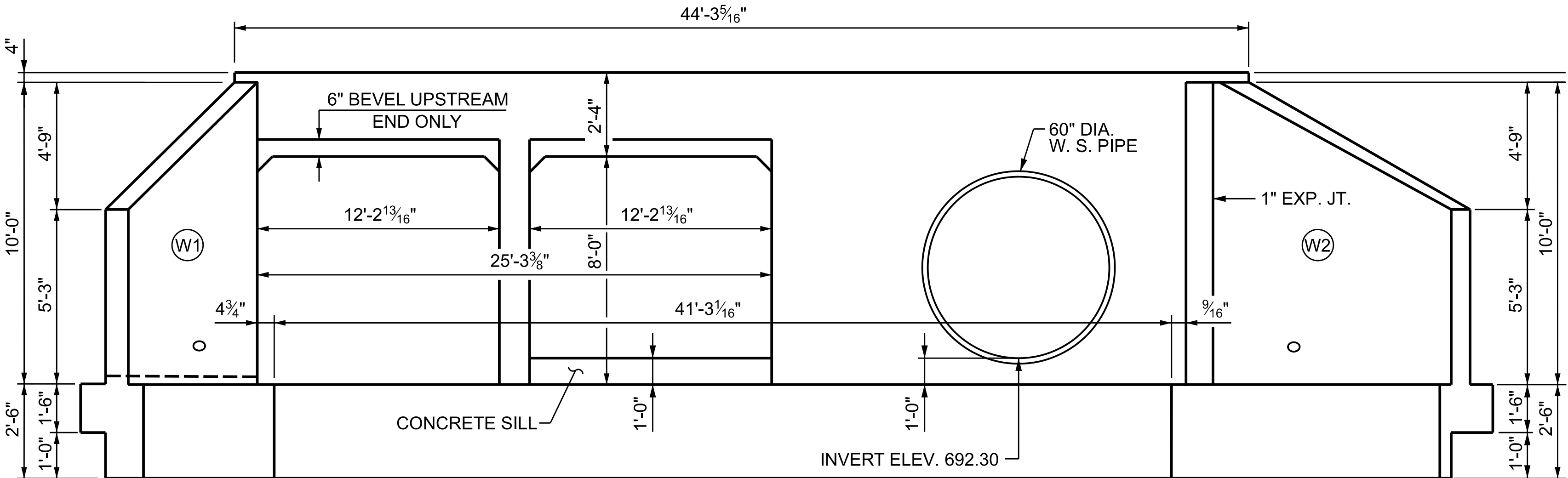
HDR Engineering, Inc. of the Carolinas
555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

DES BY: <u>R. BEAUCHAMP</u>	DATE: <u>09/25</u>	DWG BY: <u>D. CHAPMAN</u>	DATE: <u>09/25</u>
DES CHK: <u>D. MAST</u>	DATE: <u>09/25</u>	CHK BY: <u>B. BUSH</u>	DATE: <u>09/25</u>

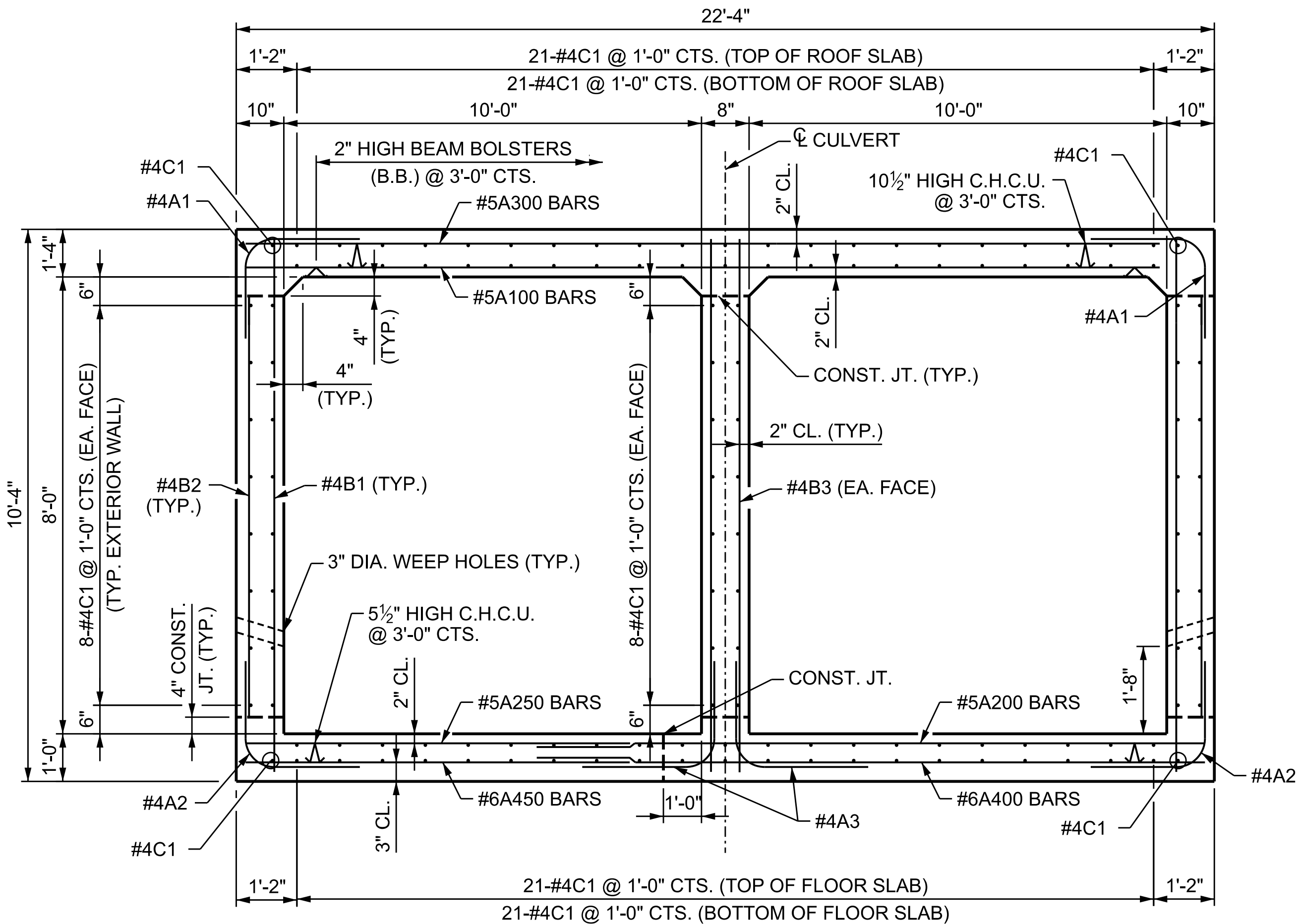


UPSTREAM CULVERT EXTENSION SECTION
NORMAL TO ROADWAY

- 1 #4B1 BARS @ 6" CTS. STREAM FACE (EXTERIOR WALL)
#4B2 BARS @ 6" CTS. FILL FACE (EXTERIOR WALL)
#4B3 BARS @ 1'-0" CTS. EA. FACE (INTERIOR WALL)
- 2 #4C1 BARS @ 1'-0" CTS. AS SHOWN IN TYPICAL BARREL SECTION (2 BAR RUN)
- 3 6-#6D1 @ 1'-6" CTS.

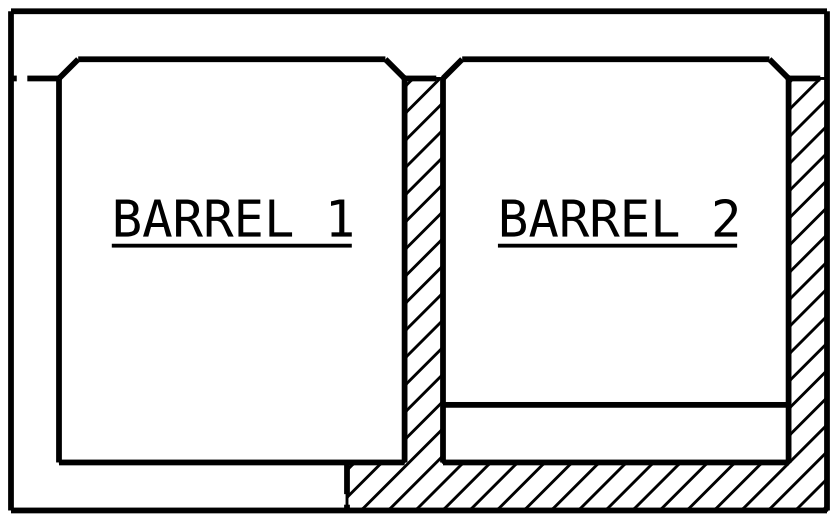


END ELEVATION NORMAL TO SKEW



RIGHT ANGLE SECTION OF BARREL (UPSTREAM EXTENSION)

THERE ARE 136 #4C1 BARS IN SECTION OF BARREL
(LOOKING DOWNSTREAM)



CONSTRUCTION SEQUENCE

LOOKING DOWNSTREAM

- STAGE I
- STAGE II (INCLUDING SILLS)

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 21+58.00 -Y49-



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
**DOUBLE BARREL
10 FT. X 8 FT.
CONCRETE BOX CULVERT
UPSTREAM EXTENSION
54°49'48" SKEW**

REVISIONS						SHEET NO. C27
NO.	BY:	DATE:	NO.	BY:	DATE:	
1	--	--	3	--	--	TOTAL SHEETS 36
2	--	--	4	--	--	

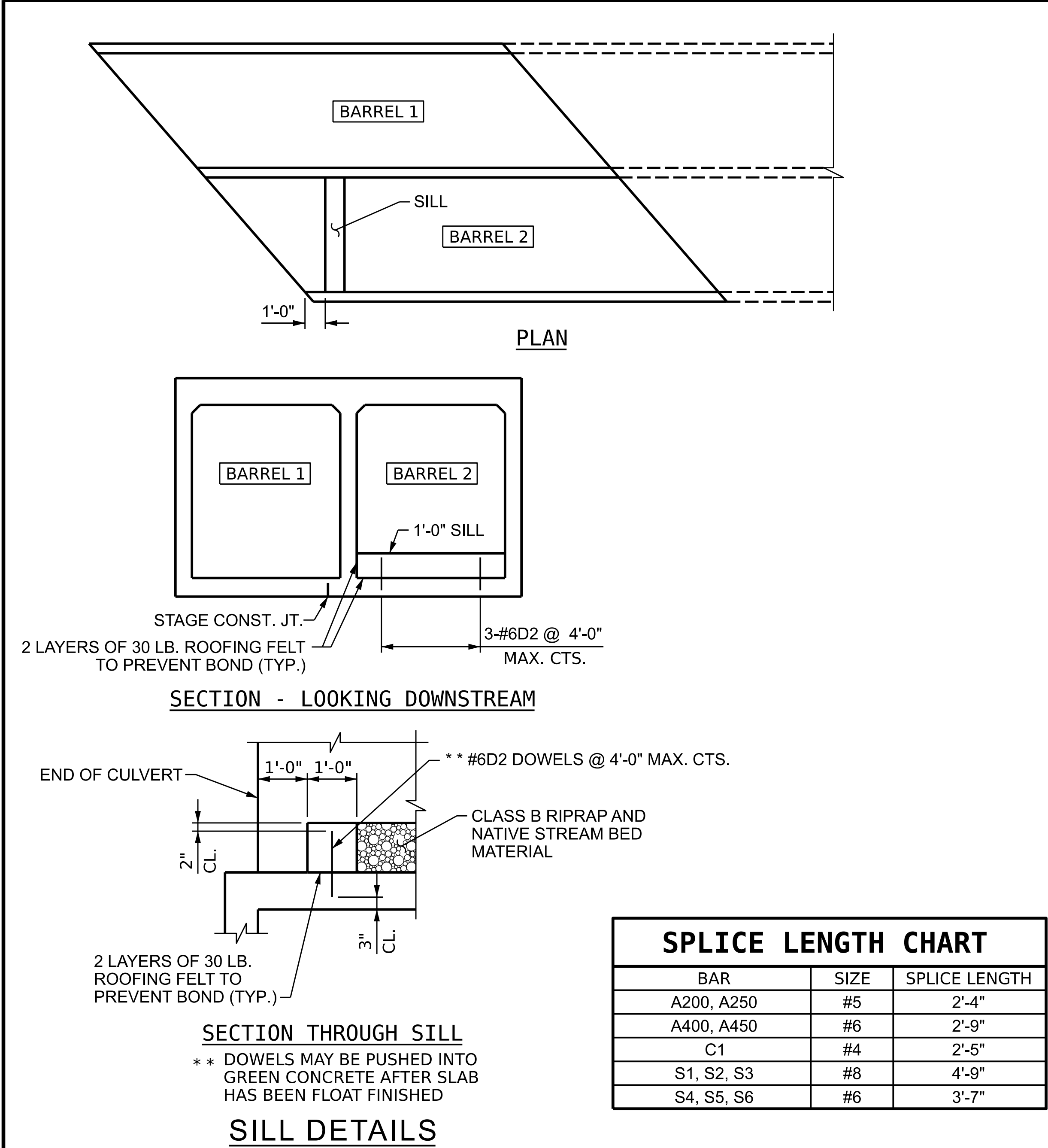
DES BY: R. BEAUCHAMP DATE: 09/25 DWG BY: D. CHAPMAN DATE: 09/25
DES CHK: G. MARTINEZ DATE: 09/25 CHK BY: D. MAST DATE: 09/25

HDR HDR Engineering, Inc. of the Carolinas
555 Fayetteville St., Suite 900 Raleigh, N.C. 27601
N.C.B.E.L.S. License Number: F-0116

RIEMAN G. BEAUCHAMP
7/21/2026
DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

7/21/2026
RIEMAN G. BEAUCHAMP

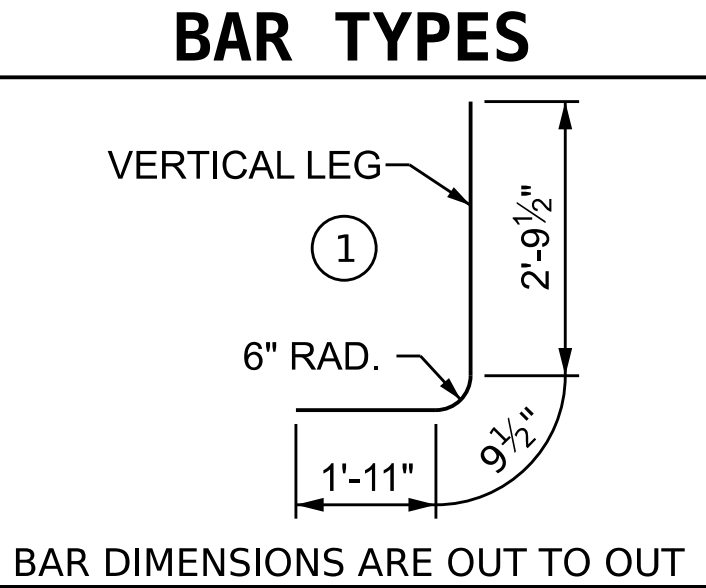
**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**



BILL OF MATERIAL																			
STAGE I						STAGE II													
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT		
A1	25	#4	1	5'-6"	92	A1	25	#4	1	5'-6"	92	A307	2	#5	STR	12'-1"	26		
A2	25	#4	1	5'-6"	92	A2	25	#4	1	5'-6"	92	A308	2	#5	STR	11'-5"	24		
A3	26	#4	1	5'-6"	96							A309	2	#5	STR	10'-8"	23		
						A100	8	#5	STR	17'-1"	143	A310	2	#5	STR	10'-0"	21		
A200	4	#5	STR	15'-0"	63	A101	2	#5	STR	16'-4"	35	A311	2	#5	STR	9'-3"	20		
A201	2	#5	STR	14'-2"	30	A102	2	#5	STR	15'-8"	33	A312	2	#5	STR	8'-7"	18		
A202	2	#5	STR	13'-6"	29	A103	2	#5	STR	14'-11"	32	A313	2	#5	STR	7'-10"	17		
A203	2	#5	STR	12'-9"	27	A104	2	#5	STR	14'-3"	30	A314	2	#5	STR	7'-1"	15		
A204	2	#5	STR	12'-1"	26	A105	2	#5	STR	13'-6"	29	A315	2	#5	STR	6'-5"	14		
A205	2	#5	STR	11'-4"	24	A106	2	#5	STR	12'-10"	27	A316	2	#5	STR	5'-8"	12		
A206	2	#5	STR	10'-8"	23	A107	2	#5	STR	12'-1"	26	A317	2	#5	STR	5'-0"	11		
A207	2	#5	STR	9'-11"	21	A108	2	#5	STR	11'-5"	24	A318	2	#5	STR	4'-3"	9		
A208	2	#5	STR	9'-3"	20	A109	2	#5	STR	10'-8"	23	A319	2	#5	STR	3'-7"	8		
A209	2	#5	STR	8'-6"	18	A110	2	#5	STR	10'-0"	21	A320	2	#5	STR	2'-10"	6		
A210	2	#5	STR	7'-10"	17	A111	2	#5	STR	9'-3"	20	A321	2	#5	STR	2'-2"	5		
A211	2	#5	STR	7'-1"	15	A112	2	#5	STR	8'-7"	18	A322	2	#5	STR	1'-5"	3		
A212	2	#5	STR	6'-5"	14	A113	2	#5	STR	7'-10"	17								
A213	2	#5	STR	5'-8"	12	A114	2	#5	STR	7'-1"	15	A450	12	#6	STR	9'-6"	172		
A214	2	#5	STR	5'-0"	11	A115	2	#5	STR	6'-5"	14	A451	2	#6	STR	8'-8"	27		
A215	2	#5	STR	4'-3"	9	A116	2	#5	STR	5'-8"	12	A452	2	#6	STR	7'-11"	24		
A216	2	#5	STR	3'-6"	8	A117	2	#5	STR	5'-0"	11	A453	2	#6	STR	7'-3"	22		
A217	1	#5	STR	2'-10"	3	A118	2	#5	STR	4'-3"	9	A454	2	#6	STR	6'-6"	20		
A218	1	#5	STR	2'-1"	3	A119	2	#5	STR	3'-7"	8	A455	2	#6	STR	5'-10"	18		
A219	1	#5	STR	1'-5"	2	A120	2	#5	STR	2'-10"	6	A456	2	#6	STR	5'-1"	16		
						A121	2	#5	STR	2'-2"	5	A457	2	#6	STR	4'-5"	14		
A400	3	#6	STR	15'-3"	69	A122	2	#5	STR	1'-5"	3	A458	2	#6	STR	3'-8"	12		
A401	2	#6	STR	14'-9"	45							A459	2	#6	STR	2'-11"	9		
A402	2	#6	STR	14'-0"	43	A250	12	#5	STR	9'-6"	119	A460	1	#6	STR	2'-4"	4		
A403	2	#6	STR	13'-4"	41	A251	1	#5	STR	8'-9"	10	A461	1	#6	STR	1'-8"	3		
A404	2	#6	STR	12'-7"	38	A252	1	#5	STR	8'-1"	9	A462	1	#6	STR	1'-6"	3		
A405	2	#6	STR	11'-11"	36	A253	1	#5	STR	7'-4"	8								
A406	2	#6	STR	11'-2"	34	A254	1	#5	STR	6'-8"	7	B1	25	#4	STR	9'-11"	166		
A407	2	#6	STR	10'-6"	32	A255	1	#5	STR	5'-11"	7	B2	25	#4	STR	7'-4"	123		
A408	2	#6	STR	9'-9"	30	A256	1	#5	STR	5'-3"	6								
A409	2	#6	STR	9'-1"	28	A257	1	#5	STR	4'-6"	5	C1	158	#4	STR	8'-1"	854		
A410	2	#6	STR	8'-4"	26	A258	1	#5	STR	3'-10"	4								
A411	2	#6	STR	7'-8"	24	A259	1	#5	STR	3'-1"	4	D1	28	#6	STR	2'-6"	106		
A412	2	#6	STR	6'-11"	21	A260	1	#5	STR	9'-3"	10	D2	3	#6	STR	1'-6"	7		
A413	2	#6	STR	6'-3"	19	A261	1	#5	STR	8'-7"	9								
A414	2	#6	STR	5'-6"	17	A262	1	#5	STR	7'-10"	9	G1	4	#5	STR	30'-0"	126		
A415	2	#6	STR	4'-10"	15	A263	1	#5	STR	7'-2"	8								
A416	2	#6	STR	4'-1"	13	A264	1	#5	STR	6'-5"	7	S2	3	#8	STR	11'-9"	95		
A417	1	#6	STR	3'-5"	6	A265	1	#5	STR	5'-9"	6	S3	3	#8	STR	26'-10"	215		
A418	1	#6	STR	2'-8"	5	A266	1	#5	STR	5'-0"	6	S5	6	#6	STR	11'-9"	106		
A419	1	#6	STR	2'-0"	4	A267	1	#5	STR	4'-4"	5	S6	6	#6	STR	26'-8"	241		
A420	1	#6	STR	1'-3"	2	A268	1	#5	STR	3'-7"	4								
						A269	1	#5	STR	2'-11"	4	REINFORCING STEEL					LBS.	3941	
B1	25	#4	STR	9'-11"	166	A270	1	#5	STR	2'-2"	3	CLASS "A" CONCRETE							
B2	25	#4	STR	7'-4"	123	A271	1	#5	STR	1'-6"	2	BARREL						CU. YDS.	23.1
B3	26	#4	STR	9'-11"	173							CURTAIN WALL						CU. YDS.	1.2
						A300	8	#5	STR	17'-1"	143	SILL						CU. YDS.	0.4
C1	114	#4	STR	8'-1"	616	A301	2	#5	STR	16'-4"	35	EDGE BEAM						CU. YDS.	2.0
						A302	2	#5	STR	15'-8"	33	TOTAL *						CU. YDS.	26.7
D1	14	#6	STR	2'-6"	53	A303	2	#5	STR	14'-11"	32								
						A304	2	#5	STR	14'-3"	30								
S1	3	#8	STR	20'-3"	163	A305	2	#5	STR	13'-6"	29								
S4	6	#6	STR	19'-1"	172	A306	2	#5	STR	12'-10"	27								
PROJECT NO. U-5765																			
MECKLENBURG COUNTY																			

REINFORCING STEEL		LBS.	2669
CLASS "A" CONCRETE			
BARREL	CU. YDS.	11.2	
CURTAIN WALL	CU. YDS.	1.5	
SILL	CU. YDS.	0.0	
EDGE BEAM	CU. YDS.	1.2	
TOTAL *	CU. YDS.	13.9	

* FOR HEADWALL QUANTITIES, SEE C34



* FOR HEADWALL QUANTITIES, SEE C34



PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 21+58.00 -Y49-

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH DOUBLE BARREL 10 FT. X 8 FT. CONCRETE BOX CULVERT UPSTREAM EXTENSION 54°49'48" SKEW							
REVISIONS						SHEET NO. C29	
NO.	BY:	DATE:	NO.	BY:	DATE:	TOTAL SHEETS	
1	--	--	3	--	--	36	
2	--	--	4	--	--		

DES BY: <u>R. BEAUCHAMP</u>	DATE: <u>09/25</u>	DWG BY: <u>D. CHAPMAN</u>	DATE: <u>09/25</u>
DES CHK: <u>G. MARTINEZ</u>	DATE: <u>09/25</u>	CHK BY: <u>B. BUSH</u>	DATE: <u>09/25</u>

RIEMAN G. BEAUCHAMP

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

Diagram illustrating the cross-section of a roof assembly. The assembly consists of two barrels (BARREL 1 and BARREL 2) supported by a 1'-0" SILL. The roof structure is reinforced with 2 LAYERS OF 30 LB. ROOFING FELT TO PREVENT BOND (TYP.) and a 3-#6D2 @ 4'-0" reinforcement layer. A STAGE CONST. JT. (Stage Construction Joint) is indicated at the bottom of the reinforcement layer. The maximum clear span (MAX. CTS.) is shown for the reinforcement.

END OF CULVERT

1'-0" 1'-0"

2" C.L.

3" C.L.

** #6D2 DOWELS @ 4'-0" MAX. CTS.

CLASS B RIPRAP AND NATIVE STREAM BED MATERIAL

2 LAYERS OF 30 LB. ROOFING FELT TO PREVENT BOND (TYP.)

SPL
BA
A200,

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

NOTES

BACKFILL CULVERT BARRELS WITH CLASS B RIPRAP AND TOP WITH NATIVE MATERIAL TO SILL HEIGHT.

NATIVE MATERIAL BETWEEN SILLS IN THE CULVERT SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM OR FLOODPLAIN AT THE PROJECT SITE DURING CONSTRUCTION. ONLY MATERIAL THAT IS EXCAVATED FROM THE STREAM BED MAY BE USED TO LINE THE LOW FLOW CULVERT BARREL. RIPRAP MAY BE USED TO SUPPLEMENT THE NATIVE MATERIAL IN THE HIGH FLOW CULVERT BARRELS. IF RIPRAP IS USED TO LINE THE HIGH FLOW CULVERT BARRELS, NATIVE MATERIAL SHOULD BE PLACED ON TOP TO FILL VOIDS AND PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

SILLS ARE TO BE 1.0 FT. WIDE, CAST SEPARATELY AND ATTACHED BY DOWELS.

TOP OF LOW FLOW SILLS SHOULD MATCH STREAM BED ELEVATION IN LOW FLOW CHANNEL OF STREAM.

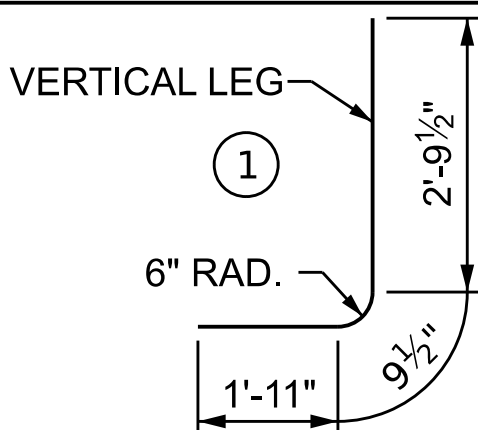
SILLS TO BE CAST DURING STAGE II CONSTRUCTION. D1 DOWELS MAY BE INSTALLED DURING STAGES I & II CONSTRUCTION AS APPLICABLE.

THE ENGINEER, IN CONSULTATION WITH DEO STAFF, SHALL REVIEW ALL MATERIAL TO BE USED AS BACKFILL PRIOR TO CONDUCTING THE BACKFILL ACTIVITY. BACKFILL SHALL CONSIST OF CLASS B RIPRAP AND NATIVE MATERIAL ONLY, UNLESS THE ENGINEER, IN CONSULTATION WITH DEO STAFF, DETERMINES THAT (1) THE NATIVE MATERIAL IS UNSUITABLE, OR (2) ADDITIONAL MATERIAL IS REQUIRED TO SUPPLEMENT THE NATIVE MATERIAL. THE CHOSEN BACKFILL MATERIAL SHALL NOT HAVE ADVERSE EFFECTS TO AQUATIC LIFE, AQUATIC LIFE PASSAGE, OR WATER QUALITY. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED OR FLOODPLAIN AT THE PROJECT SITE DURING CULVERT CONSTRUCTION.

DES BY: <u>R. BEAUCHAMP</u>	DATE : <u>09/25</u>	DWG BY: <u>D. CHAPMAN</u>	DATE : <u>09/25</u>
DES CHK: <u>G. MARTINEZ</u>	DATE : <u>09/25</u>	CHK BY: <u>B. BUSH</u>	DATE : <u>09/25</u>

BILL OF MATERIAL																															
STAGE I						STAGE II																									
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT														
A1	156	#4	1	5'-6"	574	A1	156	#4	1	5'-6"	574	A315	2	#5	STR	11'-5"	24														
A2	155	#4	1	5'-6"	570	A2	155	#4	1	5'-6"	570	A316	2	#5	STR	10'-8"	23														
A3	156	#4	1	5'-6"	574							A317	2	#5	STR	10'-0"	21														
						A100	124	#5	STR	22'-0"	2846	A318	2	#5	STR	9'-3"	20														
A200	133	#5	STR	15'-5"	2139	A101	2	#5	STR	21'-4"	45	A319	2	#5	STR	8'-7"	18														
A201	2	#5	STR	14'-10"	31	A102	2	#5	STR	20'-7"	43	A320	2	#5	STR	7'-10"	17														
A202	2	#5	STR	14'-1"	30	A103	2	#5	STR	19'-11"	42	A321	2	#5	STR	7'-1"	15														
A203	2	#5	STR	13'-5"	28	A104	2	#5	STR	19'-2"	40	A322	2	#5	STR	6'-5"	14														
A204	2	#5	STR	12'-8"	27	A105	2	#5	STR	18'-6"	39	A323	2	#5	STR	5'-8"	12														
A205	2	#5	STR	12'-0"	26	A106	2	#5	STR	17'-9"	38	A324	2	#5	STR	5'-0"	11														
A206	2	#5	STR	11'-3"	24	A107	2	#5	STR	17'-1"	36	A325	2	#5	STR	4'-3"	9														
A207	2	#5	STR	10'-7"	23	A108	2	#5	STR	16'-4"	35	A326	2	#5	STR	3'-7"	8														
A208	2	#5	STR	9'-10"	21	A109	2	#5	STR	15'-8"	33	A327	2	#5	STR	2'-10"	6														
A209	2	#5	STR	9'-2"	20	A110	2	#5	STR	14'-11"	32	A328	2	#5	STR	2'-2"	5														
A210	2	#5	STR	8'-5"	18	A111	2	#5	STR	14'-3"	30	A329	2	#5	STR	1'-5"	3														
A211	2	#5	STR	7'-9"	17	A112	2	#5	STR	13'-6"	29																				
A212	2	#5	STR	7'-0"	15	A113	2	#5	STR	12'-10"	27	A450	142	#6	STR	9'-6"	2027														
A213	2	#5	STR	6'-4"	14	A114	2	#5	STR	12'-1"	26	A451	2	#6	STR	8'-8"	27														
A214	2	#5	STR	5'-7"	12	A115	2	#5	STR	11'-5"	24	A452	2	#6	STR	7'-11"	24														
A215	2	#5	STR	4'-11"	11	A116	2	#5	STR	10'-8"	23	A453	2	#6	STR	7'-3"	22														
A216	2	#5	STR	4'-2"	9	A117	2	#5	STR	10'-0"	21	A454	2	#6	STR	6'-6"	20														
A217	1	#5	STR	3'-6"	4	A118	2	#5	STR	9'-3"	20	A455	2	#6	STR	5'-10"	18														
A218	1	#5	STR	2'-9"	3	A119	2	#5	STR	8'-7"	18	A456	2	#6	STR	5'-1"	16														
A219	1	#5	STR	2'-1"	3	A120	2	#5	STR	7'-10"	17	A457	2	#6	STR	4'-5"	14														
A220	1	#5	STR	1'-4"	2	A121	2	#5	STR	7'-1"	15	A458	2	#6	STR	3'-8"	12														
						A122	2	#5	STR	6'-5"	14	A459	2	#6	STR	2'-11"	9														
A400	133	#6	STR	15'-3"	3047	A123	2	#5	STR	5'-8"	12	A460	1	#6	STR	2'-4"	4														
A401	2	#6	STR	14'-9"	45	A124	2	#5	STR	5'-0"	11	A461	1	#6	STR	1'-8"	3														
A402	2	#6	STR	14'-0"	43	A125	2	#5	STR	4'-3"	9																				
A403	2	#6	STR	13'-4"	41	A126	2	#5	STR	3'-7"	8	B1	155	#4	STR	9'-11"	1027														
A404	2	#6	STR	12'-7"	38	A127	2	#5	STR	2'-10"	6	B2	155	#4	STR	7'-4"	760														
A405	2	#6	STR	11'-11"	36	A128	2	#5	STR	2'-2"	5																				
A406	2	#6	STR	11'-2"	34	A129	2	#5	STR	1'-5"	3	C1	158	#4	STR	40'-0"	4222														
A407	2	#6	STR	10'-6"	32																										
A408	2	#6	STR	9'-9"	30	A250	142	#5	STR	9'-6"	1408	D1	28	#6	STR	2'-6"	106														
A409	2	#6	STR	9'-1"	28	A251	2	#5	STR	8'-8"	19	D2	3	#6	STR	1'-6"	7														
A410	2	#6	STR	8'-4"	26	A252	2	#5	STR	7'-11"	17																				
A411	2	#6	STR	7'-8"	24	A253	2	#5	STR	7'-3"	16	G1	4	#5	STR	30'-2"	126														
A412	2	#6	STR	6'-11"	21	A254	2	#5	STR	6'-6"	14																				
A413	2	#6	STR	6'-3"	19	A255	2	#5	STR	5'-10"	13	S2	3	#8	STR	11'-9"	95														
A414	2	#6	STR	5'-6"	17	A256	2	#5	STR	5'-1"	11	S3	3	#8	STR	26'-10"	215														
A415	2	#6	STR	4'-10"	15	A257	2	#5	STR	4'-5"	10	S5	6	#6	STR	11'-9"	106														
A416	2	#6	STR	4'-1"	13	A258	2	#5	STR	3'-8"	8	S6	6	#6	STR	26'-10"	242														
A417	1	#6	STR	3'-5"	6	A259	2	#5	STR	3'-0"	7	REINFORCING STEEL						LBS.	18871												
A418	1	#6	STR	2'-8"	5	A260	2	#5	STR	2'-3"	5																				
A419	1	#6	STR	2'-0"	4	A261	2	#5	STR	1'-5"	3																				
A420	1	#6	STR	1'-3"	2																										
						A300	124	#5	STR	22'-0"	2846	CLASS "A" CONCRETE						CU. YDS.	136.3												
B1	155	#4	STR	9'-11"	1027	A301	2	#5	STR	21'-4"	45							BARREL													
B2	155	#4	STR	7'-4"	760	A302	2	#5	STR	20'-7"	43																				
B3	156	#4	STR	9'-11"	1034	A303	2	#5	STR	19'-11"	42																				
						A304	2	#5	STR	19'-2"	40	SILL																			
C1	114	#4	STR	40'-0"	3047	A305	2	#5	STR	18'-6"	39							EDGE BEAM													
						A306	2	#5	STR	17'-9"	38													TOTAL *							
D1	14	#6	STR	2'-6"	53	A307	2	#5	STR	17'-1"	36																			* FOR HEADWALL QUANTITIES, SEE C34.	
						A308	2	#5	STR	16'-4"	35	PROJECT NO. <u>U-5765</u>																			
S1	3	#8	STR	20'-3"	163	A309	2	#5	STR	15'-8"	33							<u>MECKLENBURG</u> COUNTY													
S4	6	#6	STR	19'-1"	172	A310	2	#5	STR	14'-11"	32													STATION: <u>21+58.00 -Y49-</u>							
						A311	2	#5	STR	14'-3"	30																				
REINFORCING STEEL					LBS.	13977	A312	2	#5	STR	13'-6"	29																			
					A313	2	#5	STR	12'-10"	27																					
					A314	2	#5	STR	12'-1"	26																					
CLASS "A" CONCRETE																															

BAR TYPES



BAR DIMENSIONS ARE OUT TO OUT



RIEMAN G. BEAUCHAMP

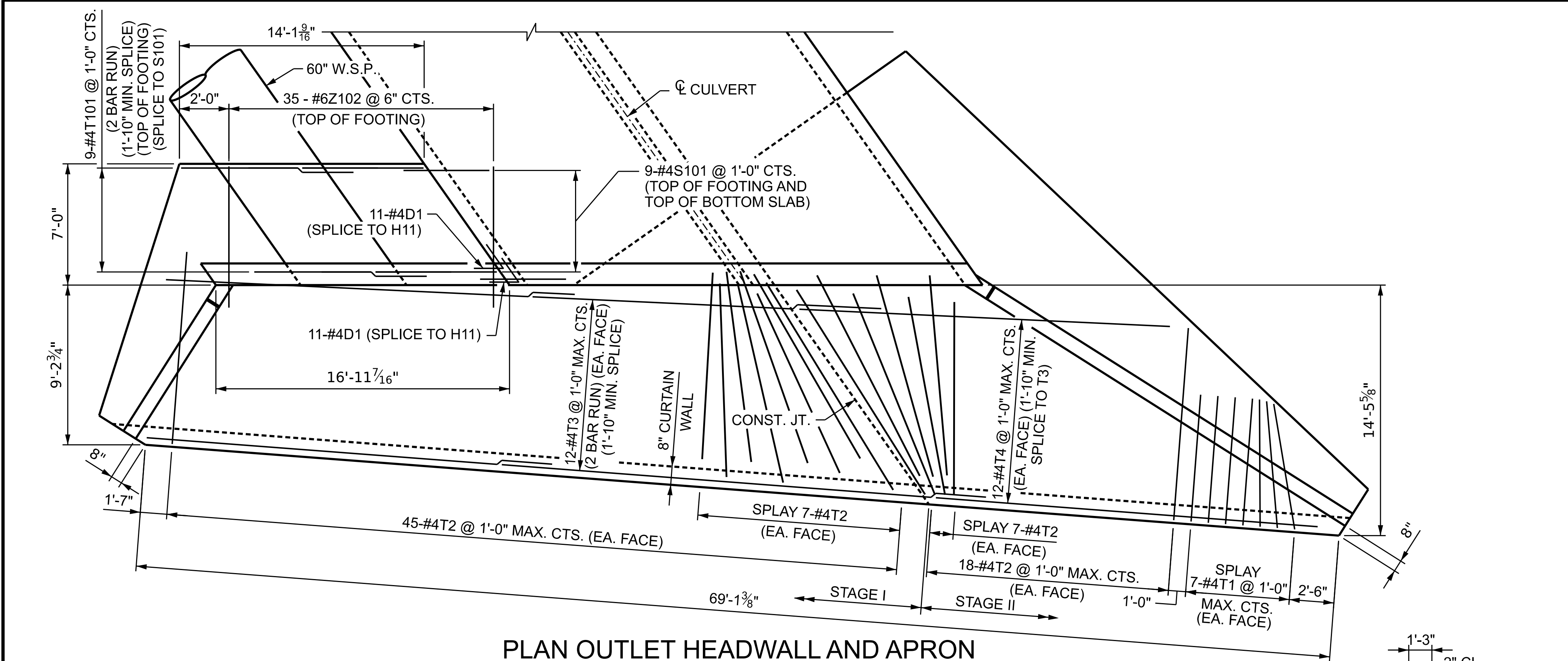
**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

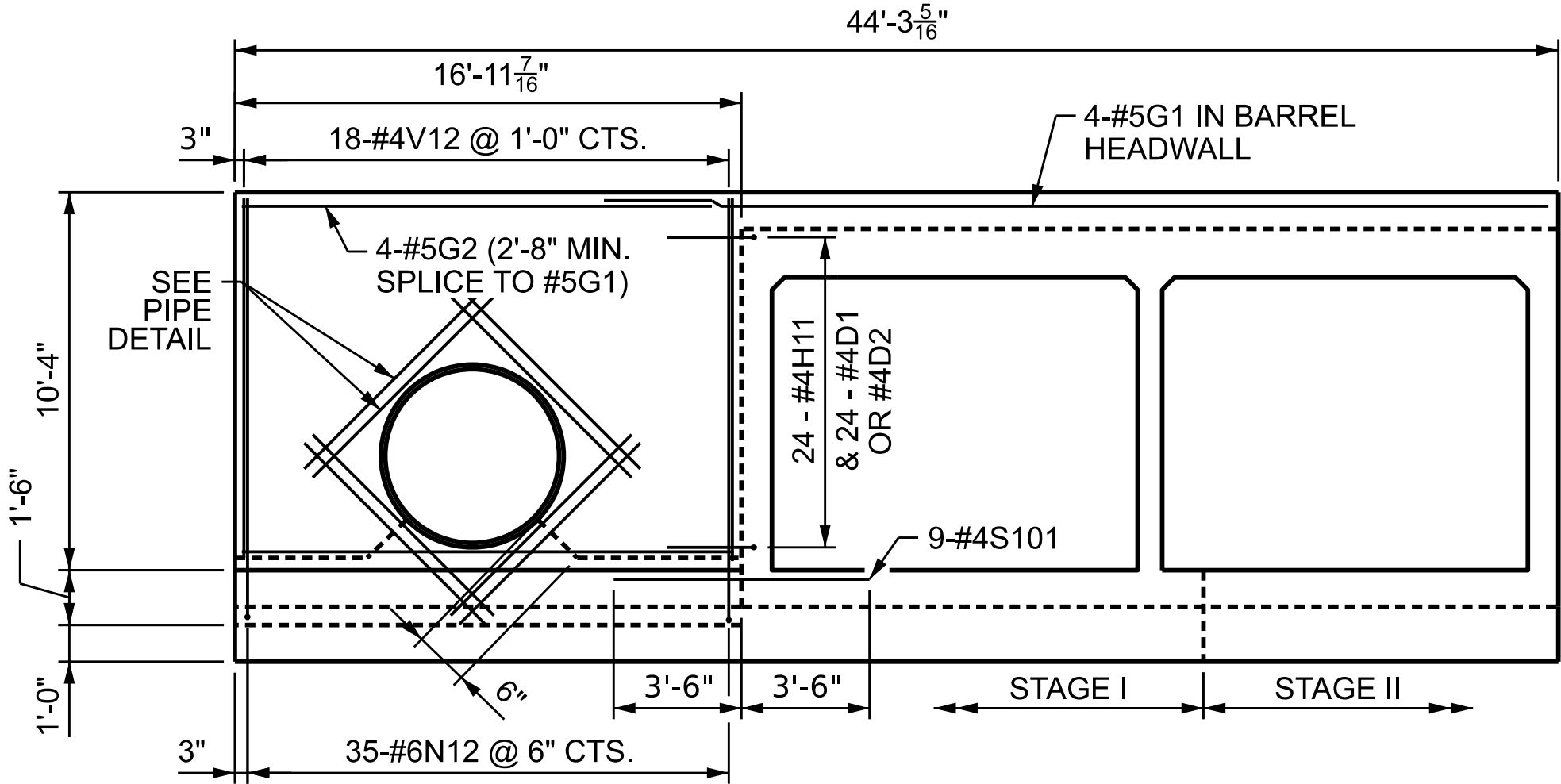
DOUBLE BARREL 10 FT. X 8 FT. CONCRETE BOX CULVERT DOWNSTREAM EXTENSION 54°49'48" SKEW

SILL	CU. YDS.	0.0
EDGE BEAM	CU. YDS.	1.2
TOTAL *	CU. YDS.	70.2

* FOR HEADWALL QUANTITIES, SEE C34.

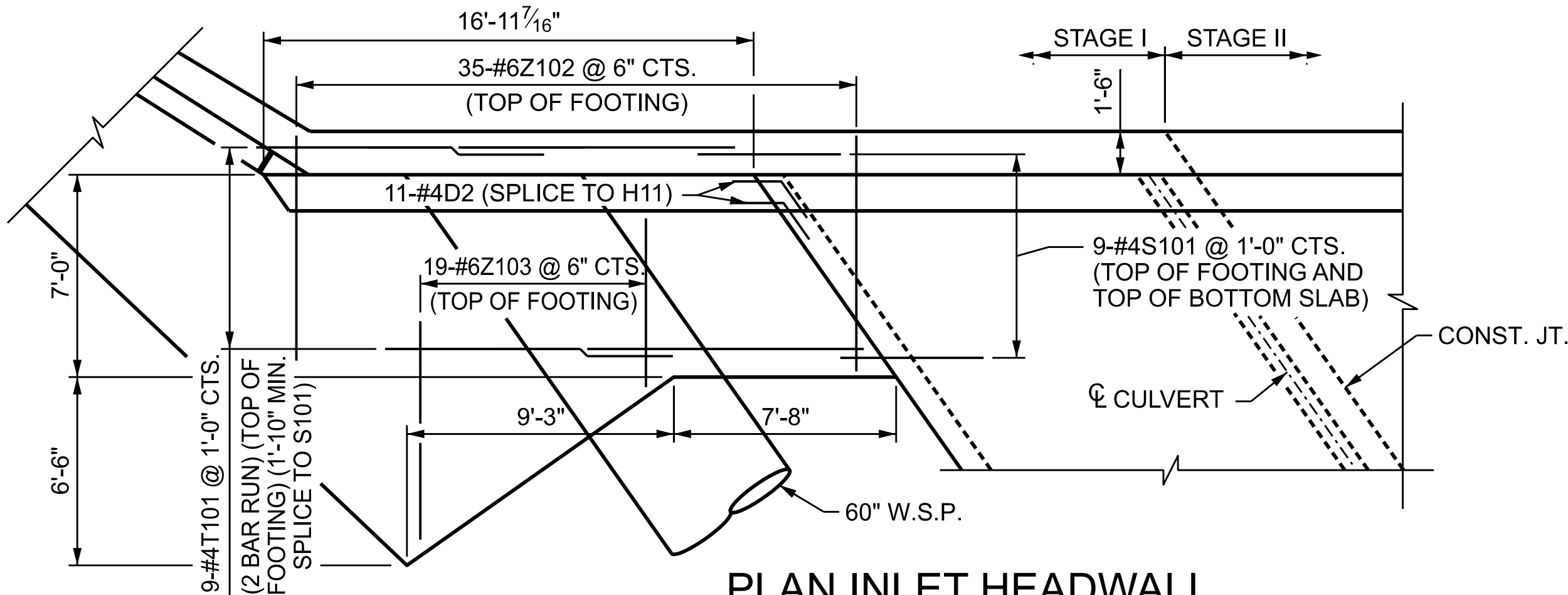


PLAN OUTLET HEADWALL AND APRON



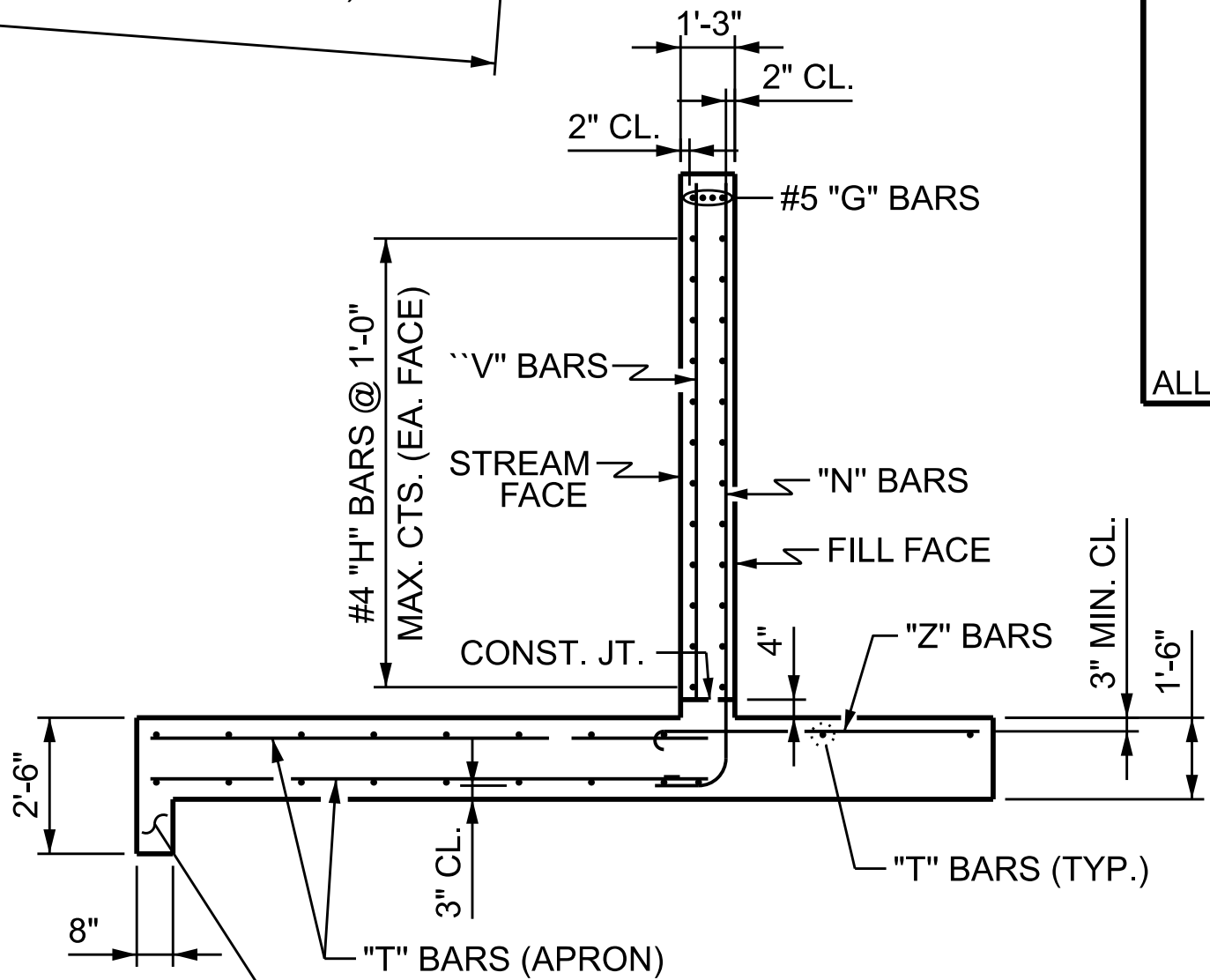
ELEVATION OUTLET HEADWALL

(OUTLET HEADWALL SHOWN LOOKING UPSTREAM, INLET HEADWALL SIMILAR)
(FIELD CUT "V", "N", AND "H" BARS AS NEEDED)



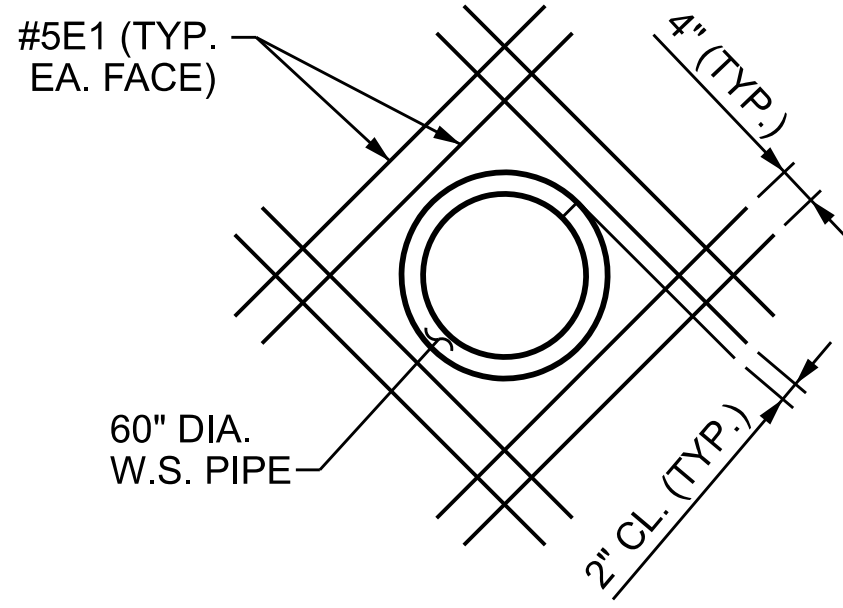
PLAN INLET HEADWALL

CURTAIN WALL INCLUDED
IN APRON QUANTITIES



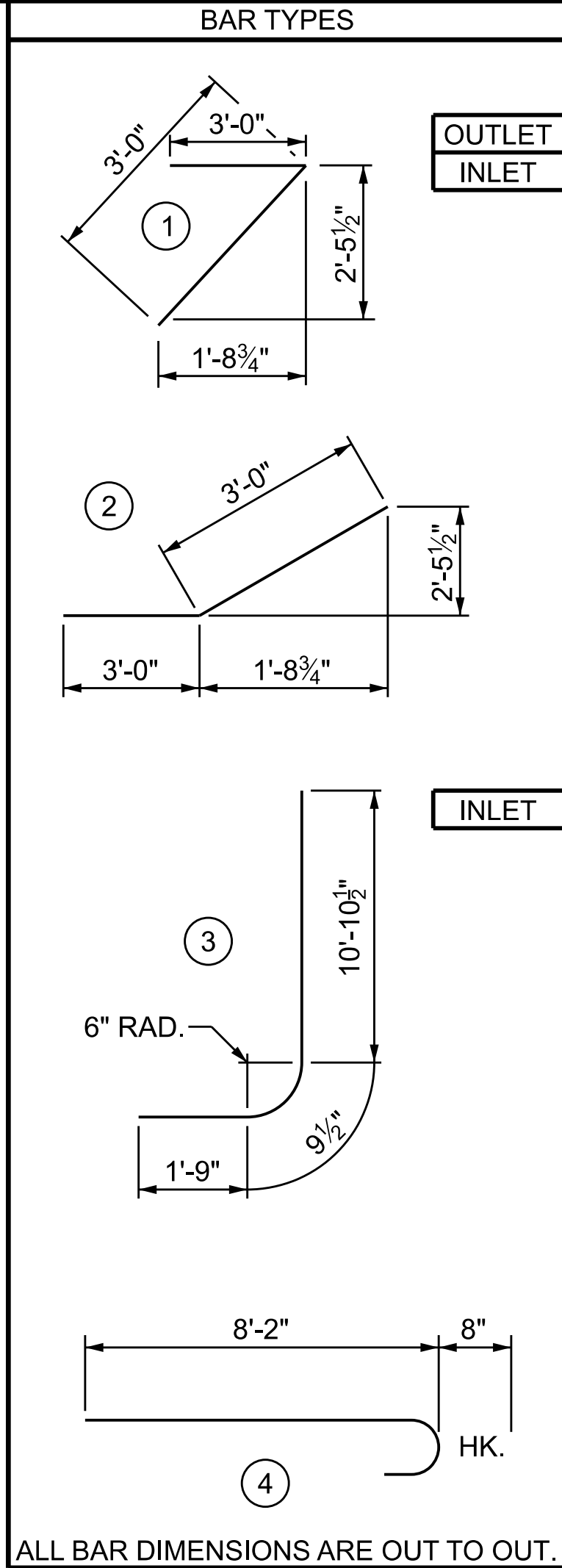
HEADWALL SECTION

(OUTLET HEADWALL SHOWN)



PIPE DETAIL

THE 60" DIA. PIPE THROUGH THE
HEADWALL OF THE CULVERT SHALL BE
LOCATED BY THE ENGINEER. THE
REINFORCING STEEL SHALL BE FIELD
BENT AS NECESSARY TO CLEAR PIPE.



ALL BAR DIMENSIONS ARE OUT TO OUT.

		BILL OF MATERIAL					
		PER 1 HEADWALL					
		BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
OUTLET		D1	22	#4	1	6'-0"	89
INLET		D2	22	#4	2	6'-0"	89
2'-5 1/2"							
		E1	16	#5	STR	7'-0"	117
		G2	4	#5	STR	16'-11"	71
		H11	22	#4	STR	16'-6"	243
		N12	35	#6	3	13'-5"	706
		S101	9	#4	STR	7'-0"	43
		T101	18	#4	STR	9'-6"	115
	V12	18	#4	STR	9'-10"	119	
	Z102	35	#6	4	8'-10"	465	
INLET		Z103	19	#6	STR	9'-3"	264

REINFORCING STEEL (OUTLET)		LBS.	1968
REINFORCING STEEL (INLET)		LBS.	2232

CLASS "A" CONCRETE			
UPSTREAM HEADWALL		CU. YDS.	13.1
DOWNSTREAM HEADWALL		CU. YDS.	12.2

BILL OF MATERIAL					
FOR APRON (STAGE I)					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
T2	90	#4	STR	11'-2"	672
T3	48	#4	STR	24'-6"	786

REINFORCING STEEL		LBS.	1458
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CLASS "A" CONCRETE			
APRON (STAGE I)		CU. YDS.	23.9

BILL OF MATERIAL						
FOR APRON (STAGE II)						
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	
T1	14	#4	STR	7'-4"	69	
T2	36	#4	STR	11'-2"	269	
T4	24	#4	STR	24'-0"	385	

REINFORCING STEEL		LBS.	723
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CLASS "A" CONCRETE			
APRON (STAGE II)		CU. YDS.	12.0

DES BY:	R. BEAUCHAMP	DATE:	09/25	DWG BY:	D. CHAPMAN	DATE:	09/25
DES CHK:	G. MARTINEZ	DATE:	09/25	CHK BY:	D. MAST	DATE:	09/25

HDR	HDR Engineering, Inc. of the Carolinas 555 Fayetteville St., Suite 900 Raleigh, N.C. 27601 N.C.B.E.L.S. License Number: F-0116
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REMAN G. BEAUCHAMP
7/21/2026
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PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: 21+58.00 -Y49-

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
HEADWALL AND APRON DETAILS					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1	--	--	3	--	--
2	--	--	4	--	--
SHEET NO. C34					TOTAL SHEETS 36

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS																
LOAD TYPE		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		HL-93 (INVENTORY)	N/A	①	1.36	--	1.75	1.70	1	TOP SLAB	5.00	1.36	1	TOP SLAB	10.00	
		HL-93 (OPERATING)	N/A		1.77	--	1.35	2.21	1	TOP SLAB	5.00	1.77	1	TOP SLAB	10.00	
		HS-20 (INVENTORY)	36.000	②	1.44	51.84	1.75	1.77	1	TOP SLAB	5.00	1.44	1	TOP SLAB	10.00	
		HS-20 (OPERATING)	36.000		1.86	66.96	1.35	2.30	1	TOP SLAB	5.00	1.86	1	TOP SLAB	10.00	
LEGAL LOAD	SINGLE VEHICLE (SV)	SNSH	13.500		3.40	45.90	1.40	3.40	1	TOP SLAB	5.00	3.46	1	TOP SLAB	10.00	
		SNGARBS2	20.000		3.16	63.20	1.40	3.18	1	TOP SLAB	5.00	3.16	1	TOP SLAB	10.00	
		SNAGRIS2	22.000		3.38	74.36	1.40	3.40	1	TOP SLAB	5.00	3.38	1	TOP SLAB	10.00	
		SNCOTTS3	27.250		1.69	46.05	1.40	2.13	1	TOP SLAB	5.00	1.69	1	TOP SLAB	10.00	
		SNAGGRS4	34.925		1.90	66.36	1.40	2.35	1	BOTTOM SLAB	5.00	1.90	1	BOTTOM SLAB	10.00	
		SNS5A	35.550		2.03	72.17	1.40	2.52	1	TOP SLAB	5.00	2.03	1	TOP SLAB	10.00	
		SNS6A	39.950		1.98	79.10	1.40	2.44	1	BOTTOM SLAB	5.00	1.98	1	BOTTOM SLAB	10.00	
		SNS7B	42.000		1.86	78.12	1.40	2.35	1	BOTTOM SLAB	5.00	1.86	1	BOTTOM SLAB	10.00	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.09	68.97	1.40	2.58	1	BOTTOM SLAB	5.00	2.09	1	BOTTOM SLAB	10.00	
		TNT4A	33.075		2.03	67.14	1.40	2.54	1	TOP SLAB	5.00	2.03	1	TOP SLAB	10.00	
		TNT6A	41.600		1.98	82.37	1.40	2.55	1	BOTTOM SLAB	5.00	1.98	1	TOP SLAB	10.00	
		TNT7A	42.000		1.99	83.58	1.40	2.50	1	BOTTOM SLAB	5.00	1.99	1	TOP SLAB	10.00	
		TNT7B	42.000		2.03	85.26	1.40	2.50	1	TOP SLAB	5.00	2.03	1	TOP SLAB	10.00	
		TNAGRIT4	43.000		1.94	83.42	1.40	2.50	1	TOP SLAB	10.00	1.94	1	TOP SLAB	10.00	
		TNAGT5A	45.000		1.94	87.30	1.40	2.41	1	BOTTOM SLAB	5.00	1.94	1	TOP SLAB	10.00	
		TNAGT5B	45.000	③	1.51	67.95	1.40	1.98	1	BOTTOM SLAB	5.00	1.51	1	BOTTOM SLAB	10.00	
EMERGENCY VEHICLE (EV)	EV2	28.750		2.17	62.39	1.30	2.40	1	TOP SLAB	5.00	2.17	1	TOP SLAB	10.00		
	EV3	43.000	④	1.37	58.91	1.30	1.85	1	TOP SLAB	5.00	1.37	1	TOP SLAB	10.00		

LOAD FACTORS:

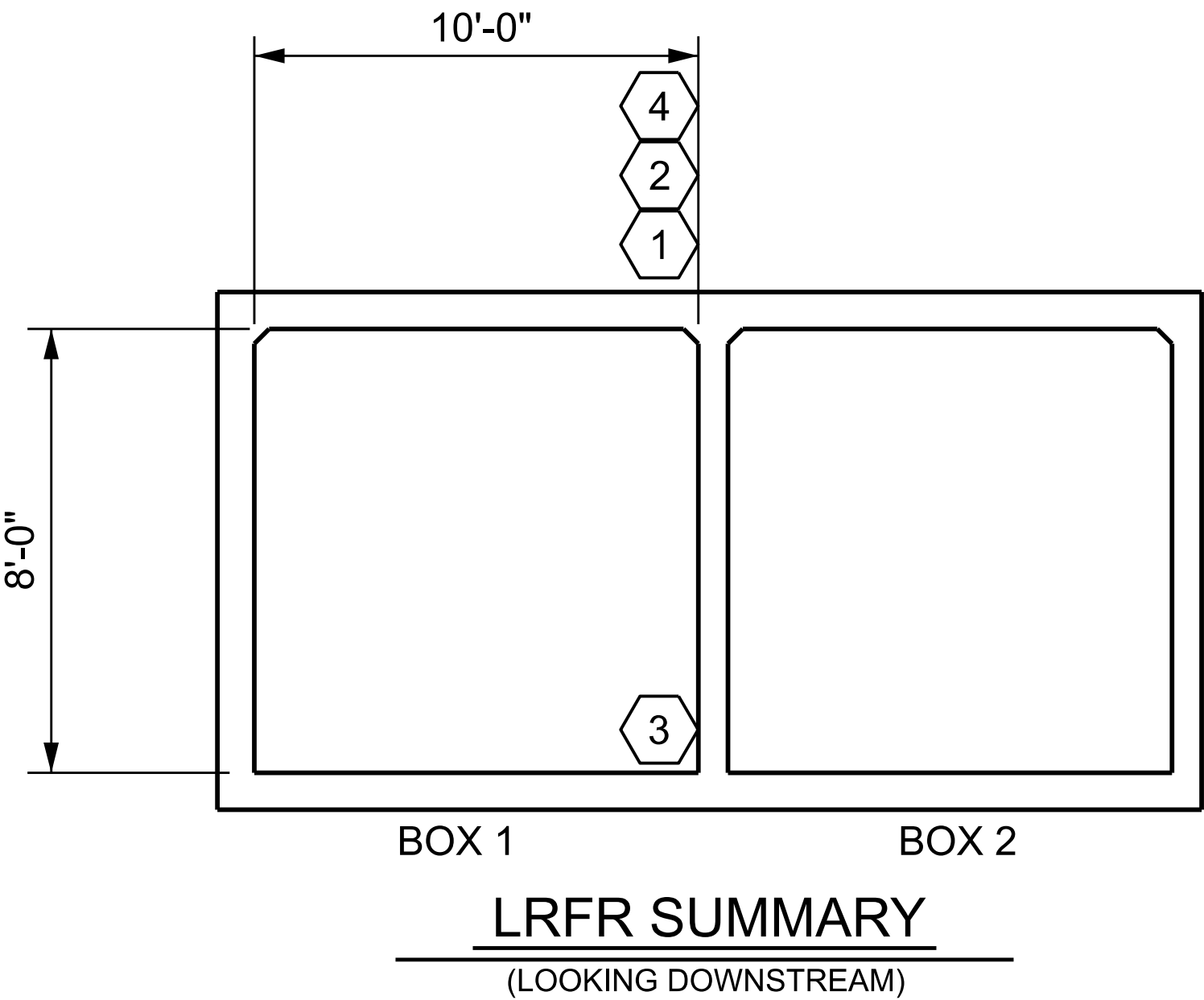
DESIGN LOAD RATING FACTORS		
LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
LS	1.75	--
WA	1.00	--

NOTES:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATES.

RATING FACTORS ARE FOR THE EXTENSION OF THE CONCRETE BOX
DETAILED IN THESE PLANS. THE EXISTING CONCRETE BOX WAS
NOT RATED.

⬡#	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. U-5765
MECKLENBURG COUNTY
STATION: 21+58.00 -Y49-

DES BY: <u>R. BEAUCHAMP</u>	DATE: <u>09/25</u>	DWG BY: <u>D. CHAPMAN</u>	DATE: <u>09/25</u>
DES CHK: <u>G. MARTINEZ</u>	DATE: <u>09/25</u>	CHK BY: <u>D. MAST</u>	DATE: <u>09/25</u>

HDR Engineering, Inc. of the Carolinas

555 Fayetteville St., Suite 900 | Raleigh, N.C. 27601

N.C.B.E.L.S. License Number: F-0116

7/21/2026

RIEGAN G. BEAUCHAMP

DOCUMENT NOT CONSIDERED FINAL

UNLESS ALL SIGNATURES COMPLETED

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
DOUBLE BARREL 10 FT. X 8 FT. CONCRETE BOX CULVERT (NON-INTERSTATE TRAFFIC)					
REVISIONS					SHEET NO. C35
NO.	BY:	DATE:	NO.	BY:	DATE:
1	--	--	3	--	--
2	--	--	4	--	--
					TOTAL SHEETS 36

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 ¾" WITH THE FOLLOWING EXCEPTIONS: TOP CORNERS OF CURBS MAY BE ROUNDED TO 1½" RADIUS WHICH IS BUILT INTO CURB FORMS; CORNERS OF TRANSVERSE FLOOR EXPANSION JOINTS SHALL BE ROUNDED WITH A ¼" 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 ¼" 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 ⅞" Ø SHEAR STUDS FOR THE ¾" Ø STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - ⅞" Ø STUDS FOR 4 - ¾" Ø STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF ⅞" Ø STUDS ALONG THE BEAM AS SHOWN FOR ¾" Ø STUDS BASED ON THE RATIO OF 3 - ⅞"Ø STUDS FOR 4 - ¾" 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 ⅝₁₆" 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 ⅓₁₆" 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. FINIS 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.

PROJECT NO. U-5765
MECKLENBURG COUNTY
STATION: _____

REV. 05/03	RWW/JTE	REV. 12/17	MAA/THC
REV. 05/06	TLA/GM	REV. 10/23	BNB/NAP
REV. 10/11	MAA/GM		

DES BY:	<u>R. BEAUCHAMP</u>	DATE :	<u>09/25</u>	DWG BY:	<u>D. CHAPMAN</u>	DATE :	<u>09/25</u>
DES CHK:	<u>G. MARTINEZ</u>	DATE :	<u>09/25</u>	CHK BY:	<u>D. MAST</u>	DATE :	<u>09/25</u>



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N.C.B.E.L.S. License Number: F-0116

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STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
STANDARD NOTES					
REVISIONS					SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:
1	--	--	3	--	--
2	--	--	4	--	--
					TOTAL SHEETS
					36