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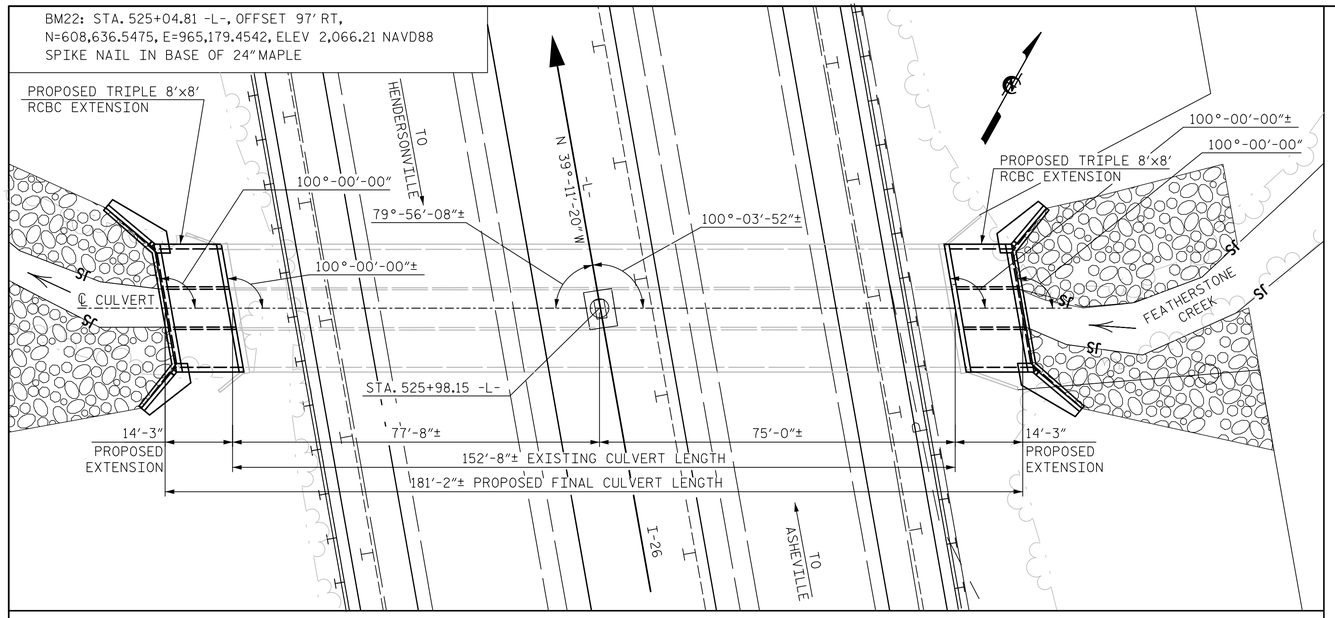
F.A. PROJECT NO. NHF-26-1(62)23



LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.

NOTES

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

DESIGN FILL----------9.75'

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

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

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

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.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

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

SEE SECTION 414 OF THE STANDARD SPECIFICATIONS FOR CULVERT EXCAVATION AND BACKFILLING.

EXCAVATE AT LEAST ONE FOOT BELOW BOTTOM OF CULVERT AND REPLACE WITH FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH ARTICLE 414-4 OF THE STANDARD SPECIFICATIONS.

SUBGRADE SHOULD BE VERIFIED BY ENGINEER OR THEIR REPRESENTATIVE PRIOR TO PLACING FOUNDATION CONDITIONING MATERIAL.

NO BACKFILLING OF EXTERIOR WALLS SHALL BE PERMITTED UNTIL ROOF SLAB HAS BEEN PLACED AND CURED. CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY BRACING WALLS UNTIL ROOF SLAB IS COMPLETED.

DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

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

AT THE DIRECTION OF THE ENGINEER, UNDERCUT SOFT/LOOSE SOILS THAT MAY BE ENCOUNTERED BENEATH THE BOTTOM OF THE FOUNDATION CONDITIONING MATERIAL. BACKFILL UNDERCUT AREAS WITH FOUNDATION CONDITIONING MATERIAL.

THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.

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

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

FOR PHASING DETAILS, SEE BILL OF MATERIAL SHEET.

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

TOTAL STRUCTURE QUANTITIES		
CLASS A CONCRETE BARREL @ 2.48 CY/FT	70.7	C.Y.
LEFT EXTENSION	35.4	C.Y.
RIGHT EXTENSION	35.3	C.Y.
WING ETC.	30.7	C.Y.
TOTAL	101.4	C.Y.
REINFORCING STEEL BARREL	21,699	LBS.
LEFT EXTENSION	10,859	LBS.
RIGHT EXTENSION	10,840	LBS.
WINGS ETC.	2,336	LBS.
TOTAL	24,035	LBS.
FOUNDATION CONDITIONING MATERIAL, BOX CULVERT	62	TONS
CULVERT EXCAVATION AT POC STATION 525+98.16 -L-		LUMP SUM

SAMPLE BAR REPLACEMENT	
SIZE	LENGTH
#3	6'-2"
#4	7'-4"
#5	8'-6"
#6	9'-8"
#7	10'-10"
#8	12'-0"
#9	13'-2"
#10	14'-6"
#11	15'-10"

NOTE:
SAMPLE BAR REPLACEMENT LENGTHS BASED ON 30" (SAMPLE LENGTH) PLUS TWO SPLICE LENGTHS AND fy = 60ksi.

HYDRAULIC DATA

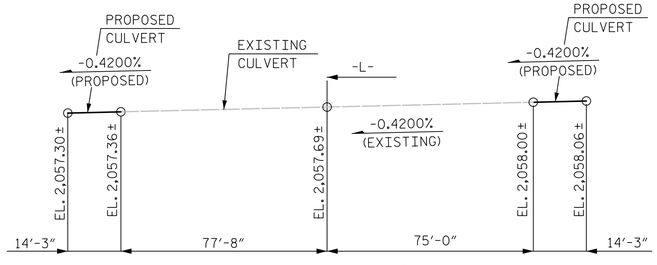
DESIGN DISCHARGE	1,700 CFS
FREQUENCY OF DESIGN FLOOD	50 YR.
DESIGN HIGH WATER ELEV.	2,072.1
DRAINAGE AREA	4.05 SQ. MI.
BASIC DISCHARGE (Q100)	2,000 CFS
BASIC HIGH WATER ELEV.	2,073.7

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	2,000-2,770 CFS
FREQUENCY OF OVERTOPPING FLOOD	100+ YR.
OVERTOPPING FLOOD ELEV.	2,073.4

GRADE DATA

GRADE POINT ELEV. @ STA. 525+98.15 -L- = 2,074.21
CULVERT BED ELEVATION @ STA. 525+98.15 -L- = 2,057.69
ROADWAY SLOPES 2:1



PROFILE ALONG ℄ CULVERT

I HEREBY CERTIFY THESE PLANS ARE AS-BUILT PLANS

PROJECT NO. I-4400BB
HENDERSON COUNTY
STATION: 525+98.15 -L-

SHEET 1 OF 10 BRIDGE NO. 440218

Digitally signed by: David W. Hawkins
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 27812 5/13/2019 ENGINEER DAVID W. HAWKINS

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

LOCATION SKETCH FOR TRIPLE 8 FT. x 8 FT. CONCRETE BOX CULVERT

100 DEGREE SKEW
ON I-26 OVER FEATHERSTONE CREEK

HNTB NORTH CAROLINA, P.C.
NC License No. C-1554
343 E. Six Forks Rd., Suite 200, Raleigh, N.C. 27609

DRAWN BY M. WRIGHT DATE 2/19
CHECKED BY N. HART DATE 2/19
DESIGN ENGINEER OF RECORD D. HAWKINS DATE 3/19

DWG. NO. 1

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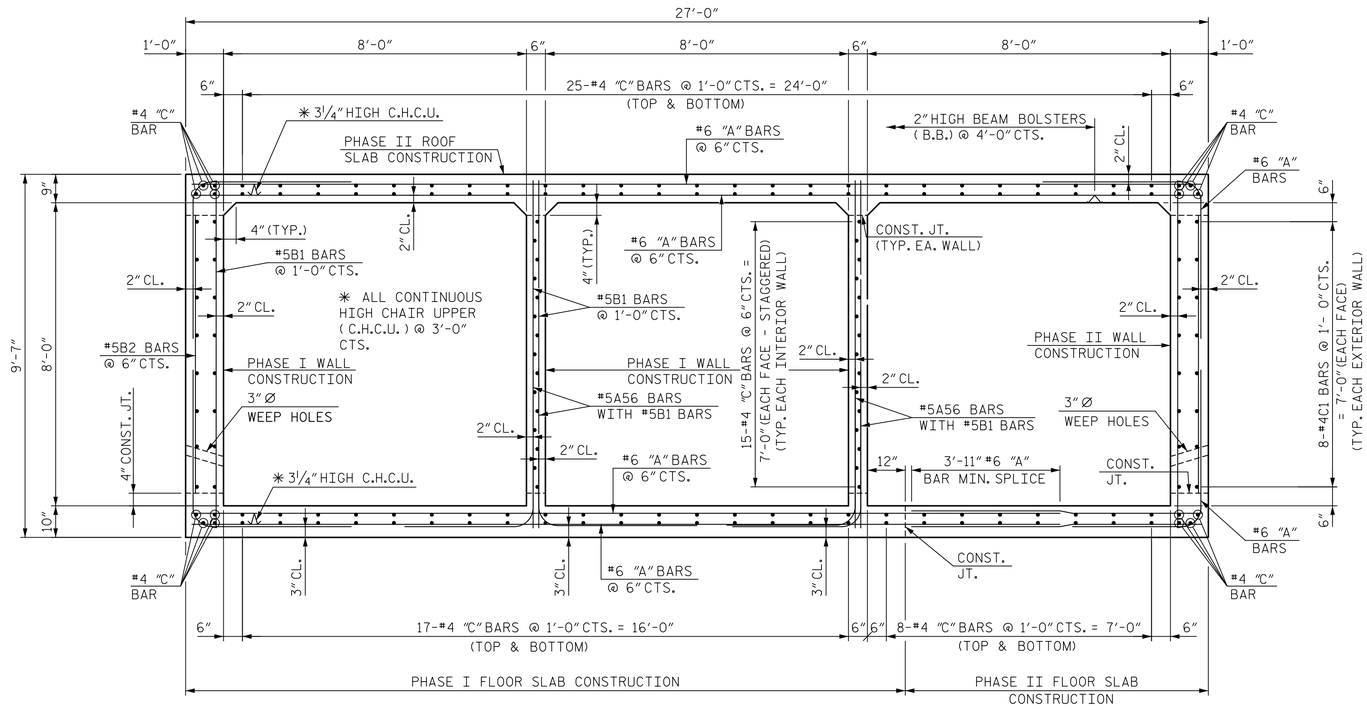
REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	C1-1
1			3			TOTAL SHEETS
2			4			10



RIGHT ANGLE SECTION OF BARREL

THERE ARE 178 "C" BARS IN SECTION OF BARREL

I HEREBY CERTIFY THESE PLANS ARE AS-BUILT PLANS

PROJECT NO. I-4400BB

HENDERSON COUNTY

STATION: 525+98.15 -L-

SHEET 2 OF 10

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 27812 5/13/2019 ENGINEER DAVID W. HAWKINS

Digitally signed by David W. Hawkins

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL SECTION FOR TRIPLE 8 FT. x 8 FT. CONCRETE BOX CULVERT

100 DEGREE SKEW
ON I-26 OVER FEATHERSTONE CREEK

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	C1-2
1			3			TOTAL SHEETS
2			4			10

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

LEVEL		VEHICLE	WEIGHT (W) (TONS)	⟨#⟩ CONTROLLING LOAD RATING	MINIMUM RATING FACTORS (RF)	TONS = W × RF	STRENGTH I LIMIT STATE									COMMENT NUMBER
								MOMENT				SHEAR				
							LIVE-LOAD FACTORS (γ_{LL})	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING		HL-93 (INVENTORY)	N/A	⟨1⟩	3.27	--	1.75	4.95	2	BOT. SLAB	8.00	3.27	3	TOP SLAB	0.54	--
		HL-93 (OPERATING)	N/A	--	4.24	--	1.35	6.42	2	BOT. SLAB	8.00	4.24	3	TOP SLAB	0.54	--
		HS-20 (INVENTORY)	36.000	⟨2⟩	3.63	130.5	1.75	5.77	2	BOT. SLAB	8.00	3.63	3	TOP SLAB	0.54	--
		HS-20 (OPERATING)	36.000	--	4.70	169.2	1.35	7.48	2	BOT. SLAB	8.00	4.70	3	TOP SLAB	0.54	--
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SH	12.500	--	6.34	79.3	1.40	9.80	2	BOT. SLAB	8.00	6.34	3	TOP SLAB	0.54	--
		S3C	21.500	--	6.56	141.0	1.40	10.28	2	BOT. SLAB	8.00	6.56	3	TOP SLAB	0.54	--
		S3A	22.750	--	5.86	133.4	1.40	8.98	2	BOT. SLAB	8.00	5.86	3	TOP SLAB	0.54	--
		S4A	26.750	--	5.67	151.8	1.40	8.90	2	BOT. SLAB	8.00	5.67	3	TOP SLAB	0.54	--
		S5A	30.500	--	5.68	173.3	1.40	8.91	2	BOT. SLAB	8.00	5.68	3	TOP SLAB	0.54	--
		S6A	34.500	--	5.65	194.9	1.40	8.86	2	BOT. SLAB	8.00	5.65	3	TOP SLAB	0.54	--
		S7B	38.500	⟨3⟩	5.62	216.4	1.40	8.81	2	BOT. SLAB	8.00	5.62	3	TOP SLAB	0.54	--
		S7A	40.000	--	6.08	243.4	1.40	9.54	2	BOT. SLAB	8.00	6.08	3	TOP SLAB	0.54	--
	TRUCK TRACTOR SEMI-TRAILER (TTST)	T4A	28.250	--	6.33	178.7	1.40	9.92	2	BOT. SLAB	8.00	6.33	3	TOP SLAB	0.54	--
		T5B	32.000	--	6.26	200.3	1.40	9.81	2	BOT. SLAB	8.00	6.26	3	TOP SLAB	0.54	--
		T6A	36.000	--	6.16	221.8	1.40	9.66	2	BOT. SLAB	8.00	6.16	3	TOP SLAB	0.54	--
		T7A	40.000	--	6.08	243.4	1.40	9.54	2	BOT. SLAB	8.00	6.08	3	TOP SLAB	0.54	--
		T7B	40.000	--	6.08	243.4	1.40	9.54	2	BOT. SLAB	8.00	6.08	3	TOP SLAB	0.54	--

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

COMMENTS:

1.
2.
3.
4.

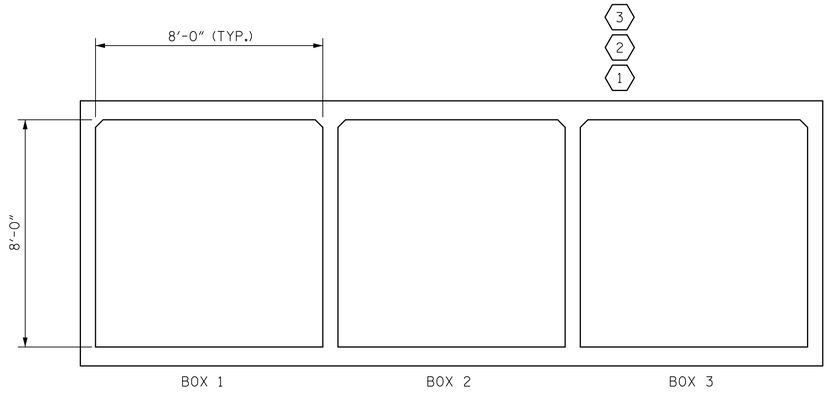
⟨#⟩ CONTROLLING LOAD RATING

⟨1⟩ DESIGN LOAD RATING (HL-93)

⟨2⟩ DESIGN LOAD RATING (HS-20)

⟨3⟩ LEGAL LOAD RATING **

** SEE CHART FOR VEHICLE TYPE



LRFR SUMMARY

(LOOKING UPSTREAM)

PROJECT NO. I-4400BB

HENDERSON COUNTY

STATION: 525+98.15 -L-

SHEET 3 OF 10

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD
LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS
(INTERSTATE TRAFFIC)
100 DEGREE SKEW
ON I-26 OVER FEATHERSTONE CREEK

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 27812 4/17/2019 ENGINEER DAVID W. HAWKINS
Digitally signed by: David W. Hawkins

HNTB NORTH CAROLINA, P.C.
NC License No. C-1554
343 E. Six Forks Rd., Suite 200, Raleigh, N.C. 27609

DRAWN BY M. WRIGHT DATE 2/19
CHECKED BY N. HART DATE 2/19
DESIGN ENGINEER OF RECORD D. HAWKINS DATE 3/19

DWG. NO. 3

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	C1-3
1			3			TOTAL SHEETS
2			4			10

ASSEMBLED BY : M. WRIGHT DATE : 2/19
CHECKED BY : N. HART DATE : 2/19

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

REV. 10/1/11 MAA/GM
REV. 12/17 MAA/THC

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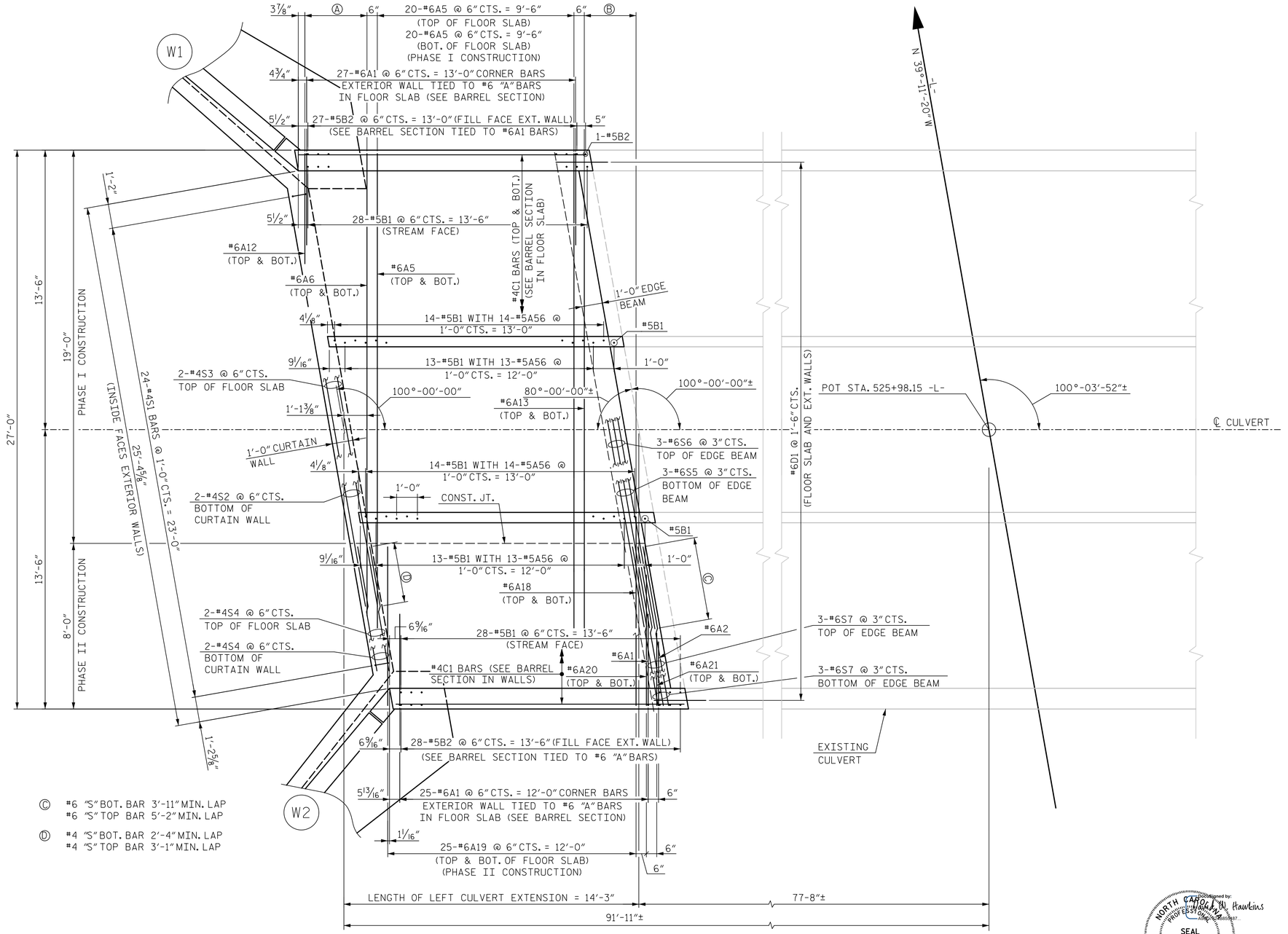
STD. NO. LRFR6

Ⓐ #6A12 THRU #6A6 @ 6"CTS. = 3'-0"(TOP & BOT. OF FLOOR SLAB)

Ⓑ #6A13 THRU #6A18 @ 6"CTS. = 2'-6"(TOP & BOT. OF FLOOR SLAB)



Ⓒ #6 "S" BOT. BAR 3'-11" MIN. LAP
#6 "S" TOP BAR 5'-2" MIN. LAP

Ⓓ #4 "S" BOT. BAR 2'-4" MIN. LAP
#4 "S" TOP BAR 3'-1" MIN. LAP

PLAN - FLOOR SLAB (LEFT EXTENSION)

(PHASE I & II CONSTRUCTION)

PROJECT NO. I-4400BB

HENDERSON COUNTY

STATION: 525+98.15 -L-

SHEET 4 OF 10

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

FLOOR SLAB PLAN FOR TRIPLE 8 FT. x 8 FT. CONCRETE BOX CULVERT LEFT EXTENSION

100 DEGREE SKEW
ON I-26 OVER FEATHERSTONE CREEK

Digitally signed by: David W. Hawkins
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 27812 5/13/2019 ENGINEER DAVID W. HAWKINS

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DWG. NO. 4

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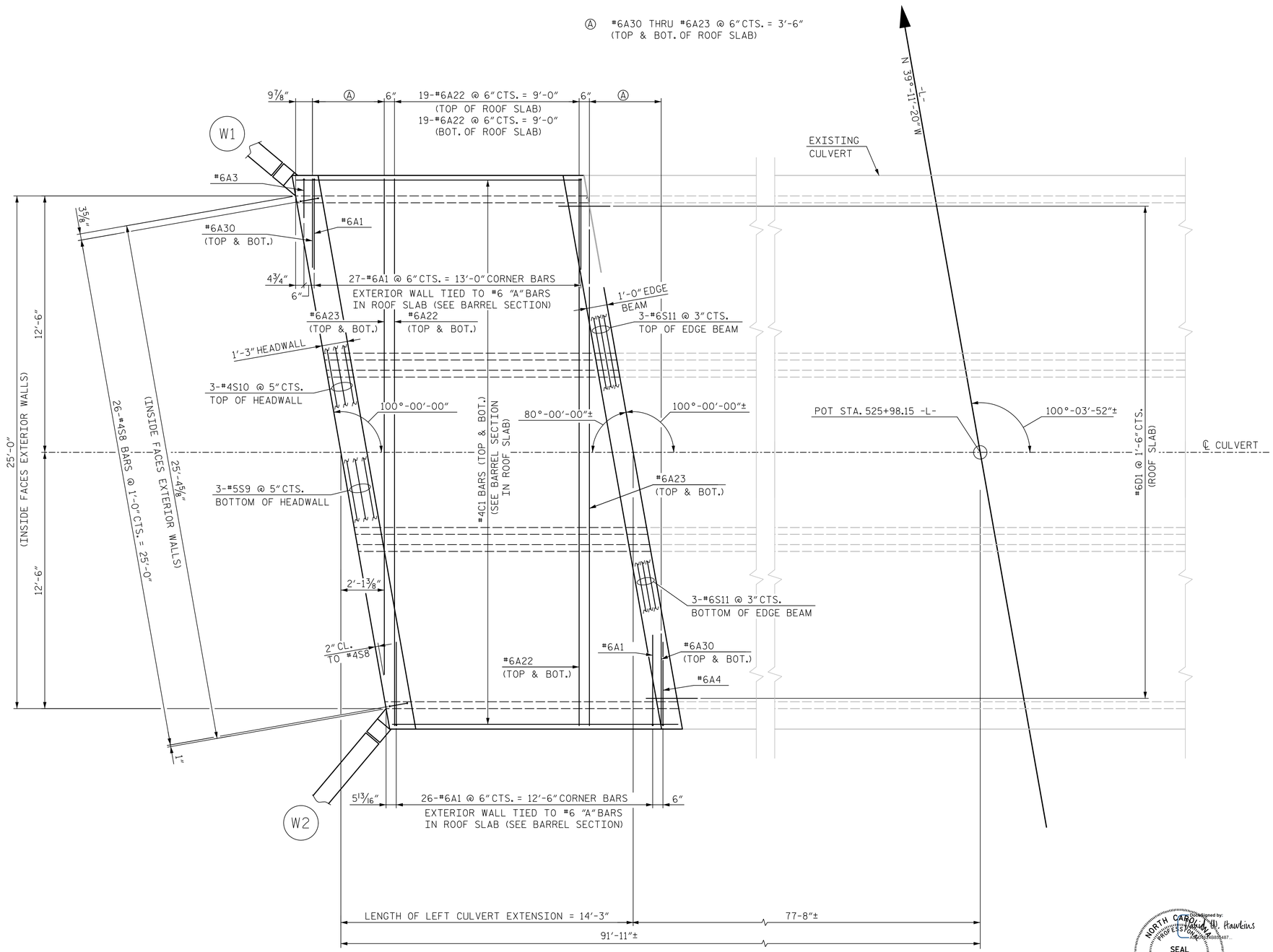
2			4			10



PLAN - ROOF SLAB (LEFT EXTENSION)
(PHASE II CONSTRUCTION)

PROJECT NO. I-4400BB
HENDERSON COUNTY
STATION: 525+98.15 -L-

SHEET 5 OF 10

Designed by: David W. Hawkins
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 27812 4/17/2019 ENGINEER DAVID W. HAWKINS

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
ROOF SLAB PLAN
FOR TRIPLE
8 FT. x 8 FT.
CONCRETE BOX CULVERT
LEFT EXTENSION
100 DEGREE SKEW
ON I-26 OVER FEATHERSTONE CREEK

HNTB NORTH CAROLINA, P.C.
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1			3			TOTAL SHEETS
2			4			10

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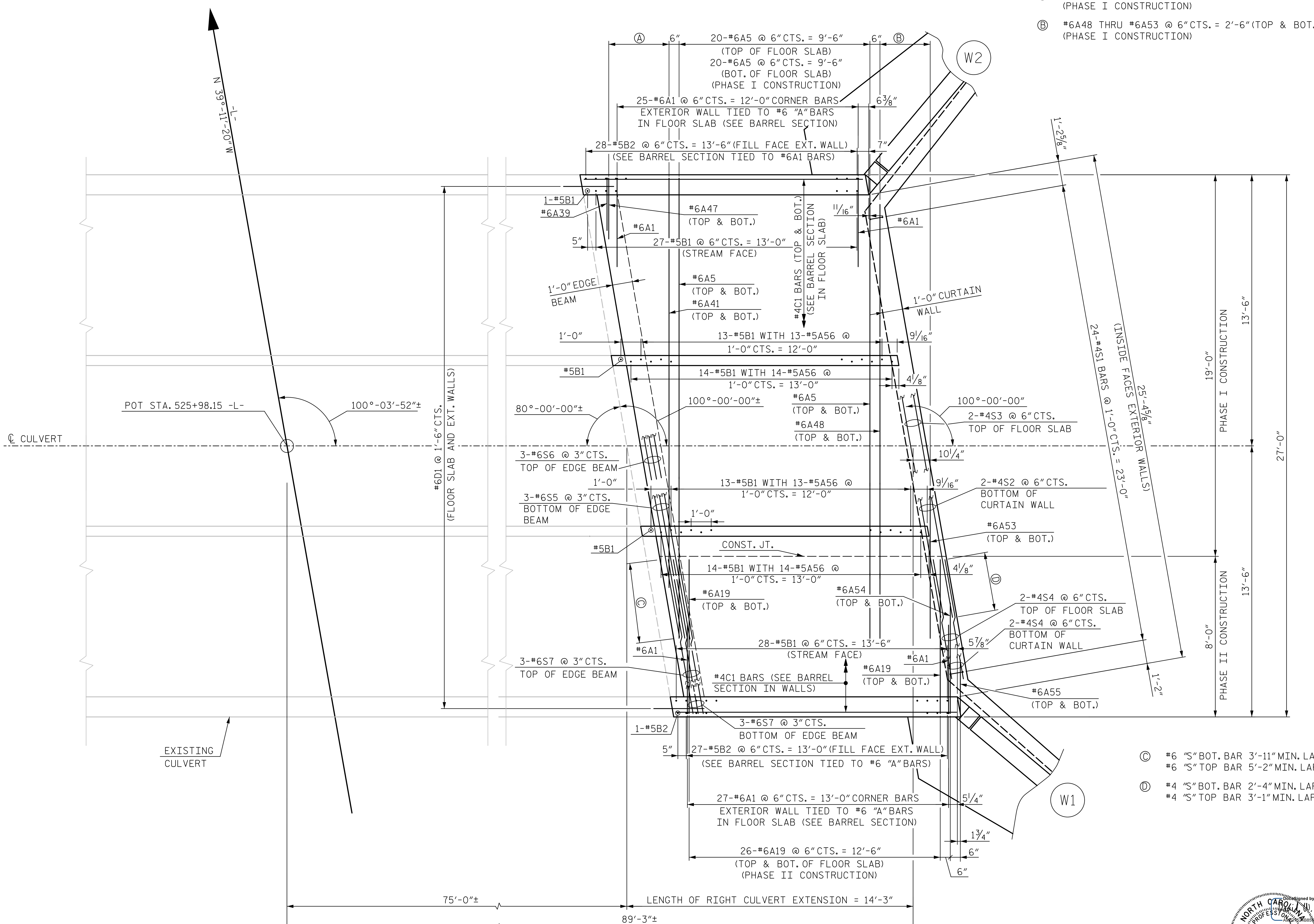
Ⓐ #6A47 THRU #6A41 @ 6″CTS. = 3′-0″(TOP & BOT. OF FLOOR SLAB) (PHASE I CONSTRUCTION)

Ⓑ #6A48 THRU #6A53 @ 6″CTS. = 2′-6″(TOP & BOT. OF FLOOR SLAB) (PHASE I CONSTRUCTION)



PLAN - FLOOR SLAB (RIGHT EXTENSION)

(PHASE I & II CONSTRUCTION)

Ⓒ #6 "S" BOT. BAR 3′-11″ MIN. LAP
#6 "S" TOP BAR 5′-2″ MIN. LAP

Ⓓ #4 "S" BOT. BAR 2′-4″ MIN. LAP
#4 "S" TOP BAR 3′-1″ MIN. LAP

PROJECT NO. I-4400BB

HENDERSON COUNTY

STATION: 525+98.15 -L-

SHEET 6 OF 10

SEAL 27812 5/13/2019 — NORTH CAROLINA PROFESSIONAL ENGINEER DAVID W. HAWKINS

DocuSigned by: David W. Hawkins

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

FLOOR SLAB PLAN FOR TRIPLE 8 FT. x 8 FT. CONCRETE BOX CULVERT RIGHT EXTENSION

100 DEGREE SKEW
ON I-26 OVER FEATHERSTONE CREEK

HNTB — HNTB NORTH CAROLINA, P.C.
NC License No. C-1554
343 E. Six Forks Rd., Suite 200, Raleigh, N.C. 27609

DRAWN BY	M. WRIGHT	DATE	2/19
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DESIGN ENGINEER OF RECORD	D. HAWKINS	DATE	3/19

DWG. NO. 6

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REVISIONS

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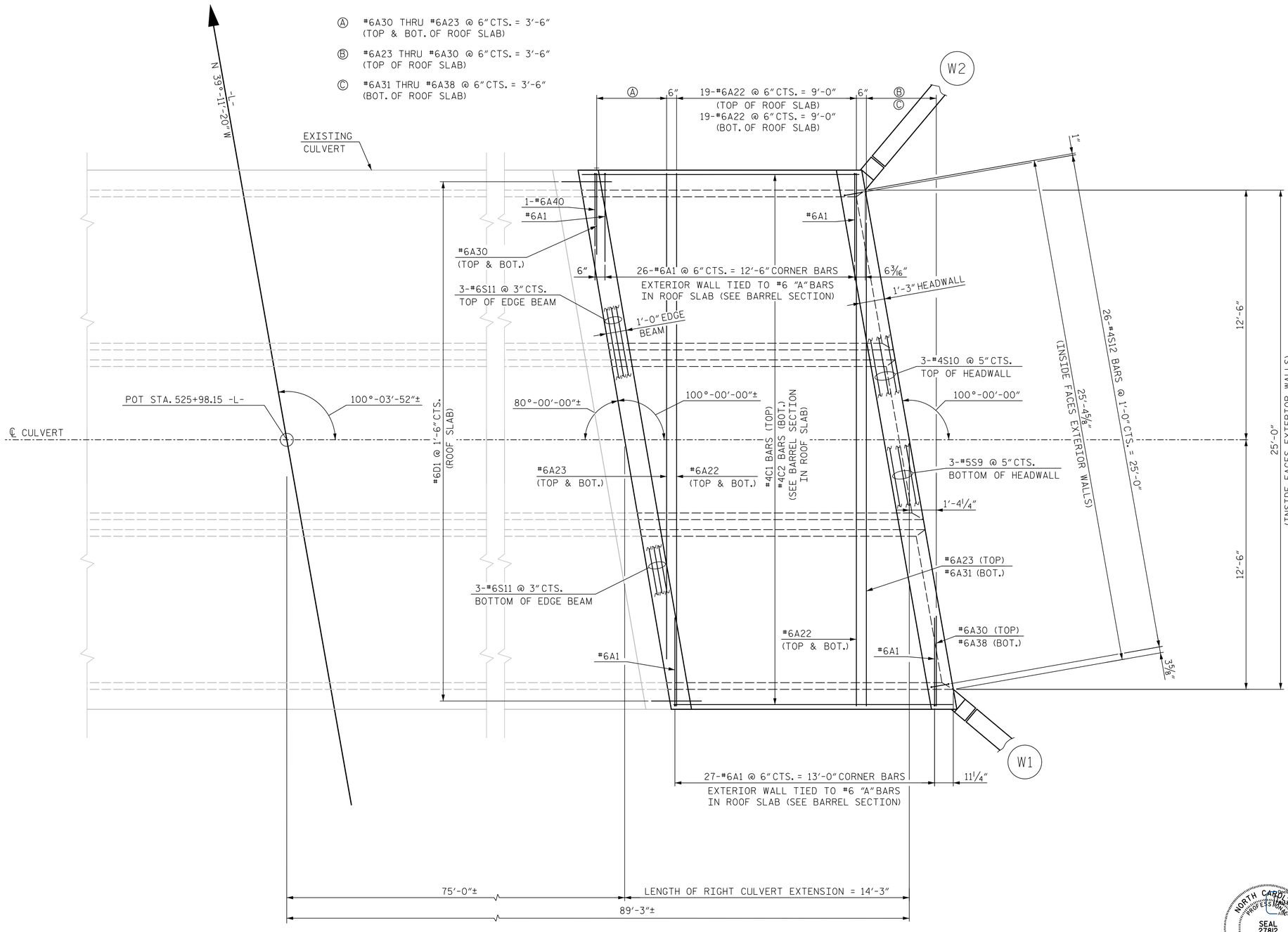
2			4		

SHEET NO. C1-6

TOTAL SHEETS 10



PLAN - ROOF SLAB (RIGHT EXTENSION)

(PHASE II CONSTRUCTION)

PROJECT NO. I-4400BB

HENDERSON COUNTY

STATION: 525+98.15 -L-

SHEET 7 OF 10

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

RALEIGH

ROOF SLAB PLAN FOR TRIPLE 8 FT. x 8 FT. CONCRETE BOX CULVERT RIGHT EXTENSION

100 DEGREE SKEW

ON I-26 OVER FEATHERSTONE CREEK

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 27812 4/17/2019 ENGINEER DAVID W. HAWKINS

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DWG. NO. 7

REVISIONS						SHEET NO.
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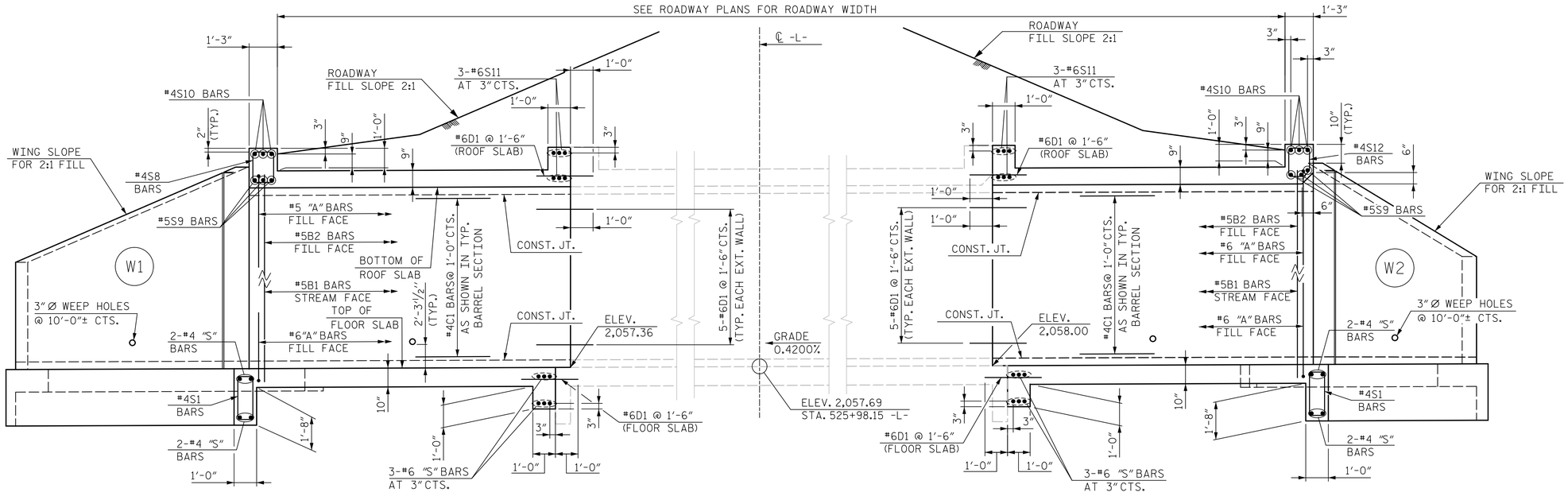
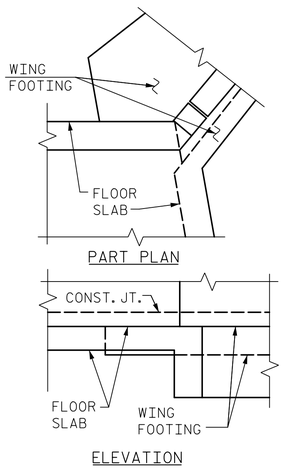
1			3			TOTAL SHEETS
2			4			10

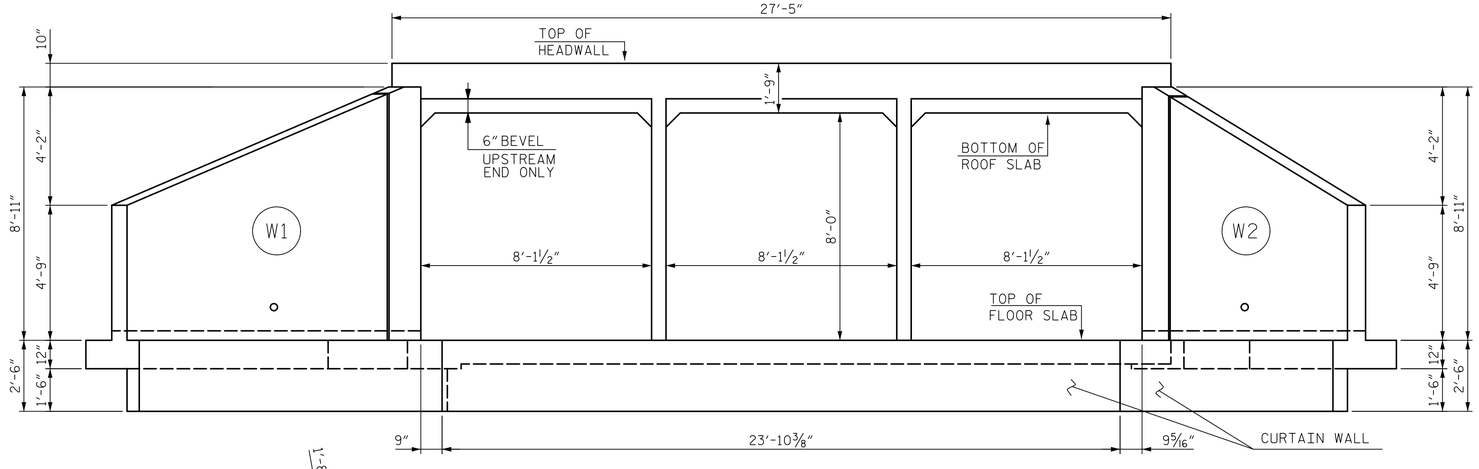


CULVERT LEFT SECTION NORMAL TO ROADWAY

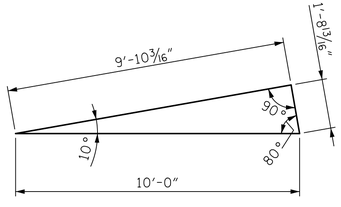
CULVERT RIGHT SECTION NORMAL TO ROADWAY



WING FOOTING
FLOOR SLAB DETAIL



END ELEVATION NORMAL TO SKEW



SKEW TRIANGLE

I HEREBY CERTIFY THESE PLANS ARE AS-BUILT PLANS

PROJECT NO. I-4400BB

HENDERSON COUNTY

STATION: 525+98.15 -L-

SHEET 8 OF 10

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SECTION AND ELEVATION FOR TRIPLE 8 FT. × 8 FT. CONCRETE BOX CULVERT

100 DEGREE SKEW
ON I-26 OVER FEATHERSTONE CREEK

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 27812 4/17/2019 ENGINEER DAVID W. HAWKINS

Digitally signed by: David W. Hawkins

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NC License No. C-1554
343 E. Six Forks Rd., Suite 200, Raleigh, N.C. 27609

DRAWN BY	M. WRIGHT	DATE 2/19
CHECKED BY	N. HART	DATE 2/19
DESIGN ENGINEER OF RECORD	D. HAWKINS	DATE 3/19

DWG. NO. 8

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	C1-8
1			3			TOTAL SHEETS
2			4			10

BILL OF MATERIAL - LEFT EXTENSION

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	105	6	1	9′-3″	1,459
A2	1	6	1	7′-11″	12
A3	1	6	1	6′-8″	10
A4	1	6	1	8′-10″	13
A5	40	6	STR	22′-11″	1,377
A6	2	6	STR	22′-4″	67
A7	2	6	STR	19′-6″	59
A8	2	6	STR	16′-8″	50
A9	2	6	STR	13′-9″	41
A10	2	6	STR	10′-11″	33
A11	2	6	STR	8′-1″	24
A12	2	6	STR	5′-3″	16
A13	2	6	STR	19′-6″	59
A14	2	6	STR	16′-8″	50
A15	2	6	STR	13′-10″	42
A16	2	6	STR	11′-0″	33
A17	2	6	STR	8′-3″	25
A18	2	6	STR	5′-5″	16
A19	50	6	STR	7′-8″	576
A20	2	6	STR	6′-3″	19
A21	2	6	STR	3′-4″	10
A22	38	6	STR	26′-8″	1,522
A23	4	6	STR	24′-2″	145
A24	4	6	STR	21′-3″	128
A25	4	6	STR	18′-5″	111
A26	4	6	STR	15′-6″	93
A27	4	6	STR	12′-8″	76
A28	4	6	STR	9′-9″	59
A29	4	6	STR	6′-11″	42
A30	4	6	STR	4′-0″	24
A56	54	5	1	7′-11″	446

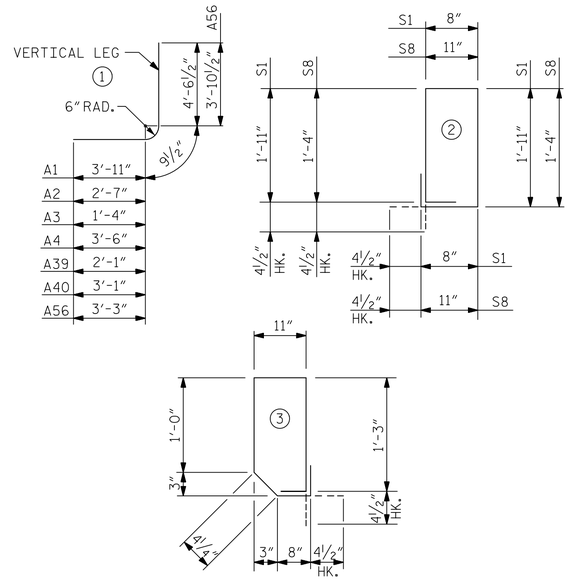
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
B1	112	5	STR	9′-2″	1,071
B2	56	5	STR	7′-4″	428
C1	178	4	STR	13′-9″	1,635
D1	44	6	STR	2′-6″	165
S1	24	4	2	5′-11″	95
S2	2	4	STR	19′-11″	27
S3	2	4	STR	20′-8″	28
S4	4	4	STR	6′-1″	16
S5	3	6	STR	23′-3″	105
S6	3	6	STR	24′-6″	110
S7	6	6	STR	7′-9″	70
S8	26	4	2	5′-3″	91
S9	3	5	STR	27′-0″	84
S10	3	4	STR	27′-0″	54
S11	6	6	STR	27′-0″	243
REINFORCING STEEL				LBS.	10,859

BILL OF MATERIAL - RIGHT EXTENSION

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	105	6	1	9′-3″	1,459
A5	40	6	STR	22′-11″	1,377
A19	52	6	STR	7′-8″	599
A22	38	6	STR	26′-8″	1,522
A23	3	6	STR	24′-2″	109
A24	3	6	STR	21′-3″	96
A25	3	6	STR	18′-5″	83
A26	3	6	STR	15′-6″	70
A27	3	6	STR	12′-8″	57
A28	3	6	STR	9′-9″	44
A29	3	6	STR	6′-11″	31
A30	3	6	STR	4′-0″	18
A31	1	6	STR	22′-10″	34
A32	1	6	STR	20′-0″	30
A33	1	6	STR	17′-2″	26
A34	1	6	STR	14′-4″	22
A35	1	6	STR	11′-6″	17
A36	1	6	STR	8′-8″	13
A37	1	6	STR	5′-10″	9
A38	1	6	STR	3′-0″	5
A39	1	6	1	7′-5″	11
A40	1	6	1	8′-5″	13
A41	2	6	STR	20′-4″	61
A42	2	6	STR	17′-6″	53
A43	2	6	STR	14′-7″	44
A44	2	6	STR	11′-8″	35
A45	2	6	STR	8′-9″	26
A46	2	6	STR	5′-11″	18
A47	2	6	STR	3′-0″	9
A48	2	6	STR	21′-8″	65
A49	2	6	STR	18′-10″	57
A50	2	6	STR	16′-0″	48
A51	2	6	STR	13′-2″	40
A52	2	6	STR	10′-4″	31
A53	2	6	STR	7′-6″	23
A54	2	6	STR	5′-6″	17
A55	2	6	STR	2′-8″	8
A56	54	5	1	7′-11″	446

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
B1	112	5	STR	9′-2″	1,071
B2	56	5	STR	7′-4″	428
C1	149	4	STR	13′-9″	1,369
C2	29	4	STR	13′-6″	262
D1	44	6	STR	2′-6″	165
S1	24	4	2	5′-11″	95
S2	2	4	STR	19′-11″	27
S3	2	4	STR	20′-8″	28
S4	4	4	STR	6′-1″	16
S5	3	6	STR	23′-3″	105
S6	3	6	STR	24′-6″	110
S7	6	6	STR	7′-9″	70
S9	3	5	STR	27′-0″	84
S10	3	4	STR	27′-0″	54
S11	6	6	STR	27′-0″	243
S12	26	4	3	5′-0″	87
REINFORCING STEEL				LBS.	10,840

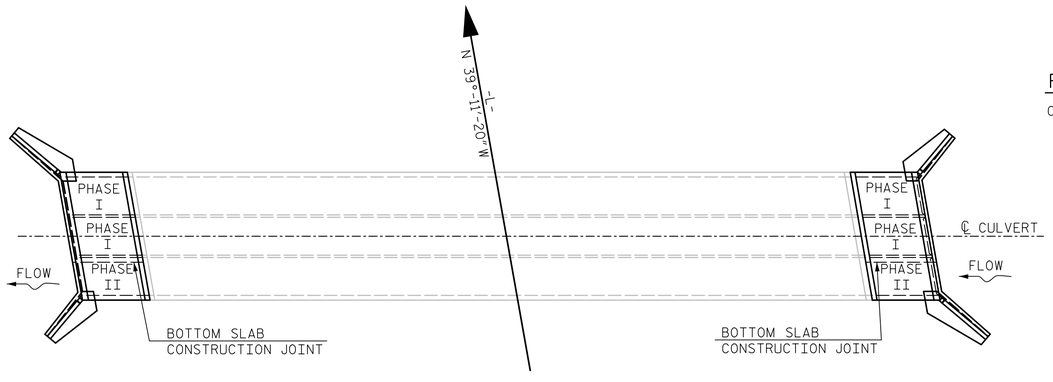
BAR TYPE



BAR DIMENSIONS ARE OUT TO OUT

SPLICE LENGTH CHART

BAR	SIZE	SPLICE LENGTH
"A"	#6	3′-11″
"B"	#5	3′-3″
"B"	#6	3′-11″
S9	#5	4′-3″ (TOP BARS)
S9	#5	3′-3″ (BOTTOM BARS)
S10	#6	5′-2″ (TOP BARS)
S10	#6	3′-11″ (BOTTOM BARS)



CONSTRUCTION SEQUENCE

PHASING REQUIRES CREEK FLOW DIVERSION - SEE EROSION CONTROL PLANS.

PHASING NOTES

CONCRETE IN CULVERT TO BE POURED IN THE FOLLOWING ORDER:

PHASE I:

1. INSTALL IMPERVIOUS DIKE TO SHIFT STREAM FLOW FROM PHASE I AND DEWATER CONSTRUCTION AREA.
2. CONSTRUCT PHASE I WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF VERTICAL WALLS.
3. CONSTRUCT REMAINING PHASE I PORTIONS OF THE WALLS AND WINGS FULL HEIGHT.

PHASE II:

1. RECONFIGURE IMPERVIOUS DIKE AND SHIFT STREAM FLOW THROUGH PHASE I CELL.
2. CONSTRUCT PHASE II WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF REMAINING VERTICAL WALL.
3. CONSTRUCT REMAINING PHASE II PORTION OF WALL AND WINGS FULL HEIGHT.
4. CONSTRUCT ENTIRE ROOF SLAB AND HEADWALLS.

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 27812 5/13/2019 ENGINEER DAVID W. HAWKINS
Digitally signed by: David W. Hawkins

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HNTB NORTH CAROLINA, P.C.
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DRAWN BY M. WRIGHT DATE 2/19
CHECKED BY N. HART DATE 2/19
DESIGN ENGINEER OF RECORD D. HAWKINS DATE 3/19

DWG. NO. 9

PROJECT NO. I-4400BB
HENDERSON COUNTY
STATION: 525+98.15 -L-

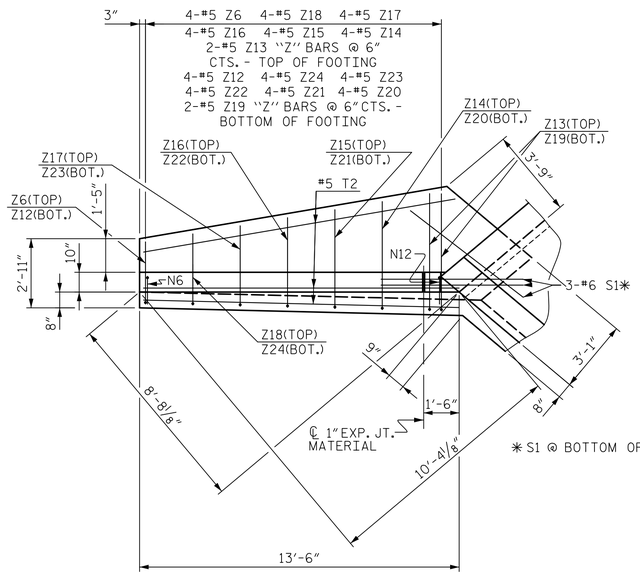
SHEET 9 OF 10

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

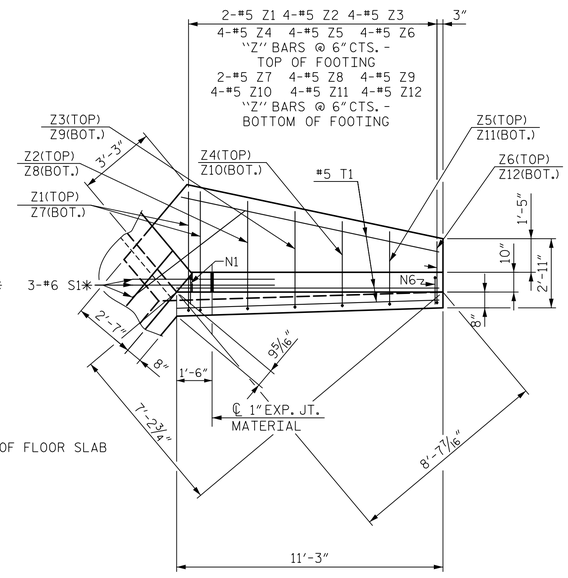
BILL OF MATERIAL FOR TRIPLE 8 FT. x 8 FT. CONCRETE BOX CULVERT

100 DEGREE SKEW
ON I-26 OVER FEATHERSTONE CREEK

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	C1-9
1			3			TOTAL SHEETS
2			4			10



PLAN W1



PLAN W2

* S1 @ BOTTOM OF FLOOR SLAB

REINFORCING STEEL FOR 2 WINGS	1,168 LBS
REINFORCING STEEL FOR 4 WINGS	2,336 LBS
CLASS A CONCRETE	
4 WINGS	20.2 CY
2 HEADWALLS	2.5 CY
2 END CURTAIN WALLS	3.9 CY
4 EDGE BEAMS	4.1 CY
TOTAL	30.7 CY

NOTE: AT THE CONTRACTOR'S OPTION, THE VERTICAL REINFORCING STEEL IN THE FILL FACE OF THE WING ABOVE THE CONSTRUCTION JOINT MAY BE SPLICED. THE SPLICE LENGTHS SHALL BE AS FOLLOWS:

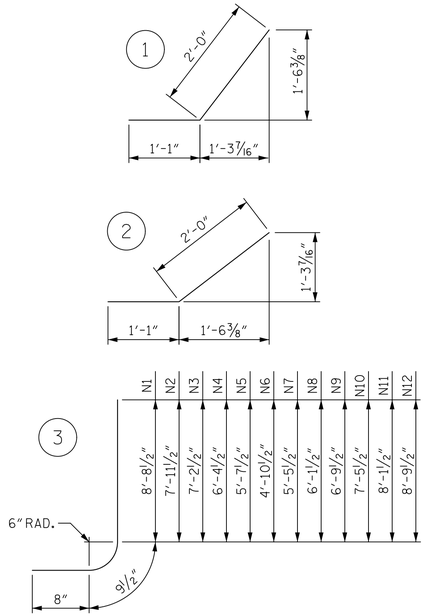
#4 "N" BARS 2'-4"

EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.

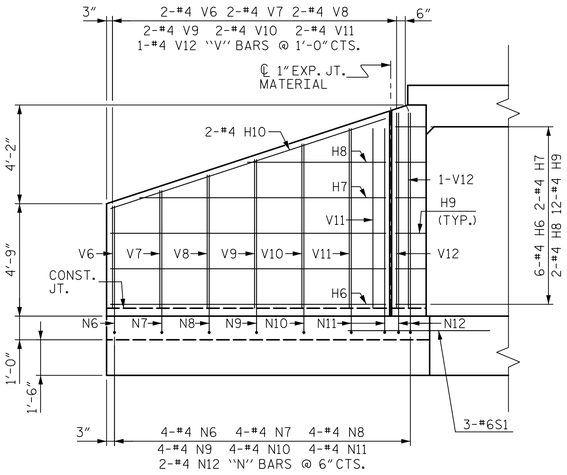
BILL OF MATERIAL FOR WINGS W1 AND W2

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	6	#4	STR	9'-4"	37
H2	2	#4	STR	8'-4"	11
H3	2	#4	STR	4'-7"	6
H4	12	#4	1	3'-1"	25
H5	2	#4	STR	10'-0"	13
H6	6	#4	STR	11'-7"	46
H7	2	#4	STR	10'-5"	14
H8	2	#4	STR	5'-10"	8
H9	12	#4	2	3'-1"	25
H10	2	#4	STR	12'-2"	16
N1	2	#4	3	10'-2"	14
N2	3	#4	3	9'-5"	19
N3	4	#4	3	8'-8"	23
N4	4	#4	3	7'-10"	21
N5	4	#4	3	7'-1"	19
N6	8	#4	3	6'-4"	34
N7	4	#4	3	6'-11"	18
N8	4	#4	3	7'-7"	20
N9	4	#4	3	8'-3"	22
N10	4	#4	3	8'-11"	24
N11	4	#4	3	9'-7"	26
N12	2	#4	3	10'-3"	14
S1	6	#6	STR	6'-0"	54
T1	6	#5	STR	11'-1"	69
T2	6	#5	STR	13'-4"	83
V1	2	#4	STR	8'-2"	11
V2	2	#4	STR	7'-5"	10
V3	2	#4	STR	6'-8"	9
V4	2	#4	STR	5'-10"	8
V5	2	#4	STR	5'-1"	7
V6	4	#4	STR	4'-4"	12
V7	2	#4	STR	4'-11"	7
V8	2	#4	STR	5'-7"	7
V9	2	#4	STR	6'-3"	8
V10	2	#4	STR	6'-11"	9
V11	2	#4	STR	7'-7"	10
V12	2	#4	STR	8'-3"	11
Z1	2	#5	4	5'-7"	12
Z2	4	#5	4	5'-2"	22
Z3	4	#5	4	4'-8"	19
Z4	4	#5	4	4'-2"	17
Z5	4	#5	4	3'-9"	16
Z6	8	#5	4	3'-2"	26
Z7	2	#5	STR	5'-0"	10
Z8	4	#5	STR	4'-7"	19
Z9	4	#5	STR	4'-1"	17
Z10	4	#5	STR	3'-7"	15
Z11	4	#5	STR	3'-2"	13
Z12	8	#5	STR	2'-7"	22
Z13	2	#5	4	5'-6"	11
Z14	4	#5	4	5'-1"	21
Z15	4	#5	4	4'-9"	20
Z16	4	#5	4	4'-4"	18
Z17	4	#5	4	3'-11"	16
Z18	4	#5	STR	3'-7"	15
Z19	2	#5	STR	4'-11"	10
Z20	4	#5	STR	4'-6"	19
Z21	4	#5	STR	4'-2"	17
Z22	4	#5	STR	3'-9"	16
Z23	4	#5	STR	3'-4"	14
Z24	4	#5	STR	3'-0"	13

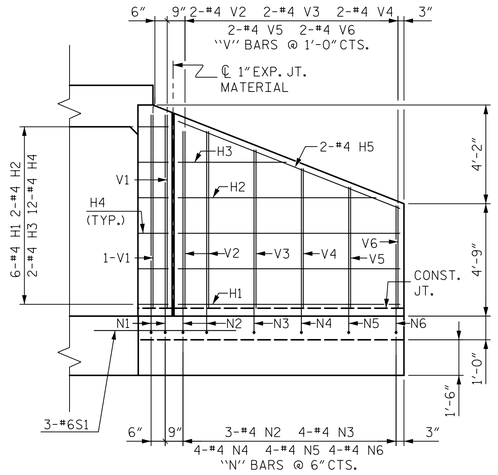
BAR TYPES



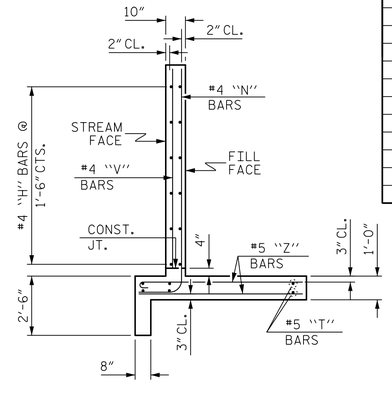
ALL BAR DIMENSIONS ARE OUT TO OUT.



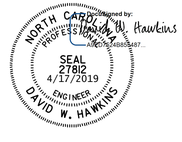
ELEVATION W1



ELEVATION W2



TYPICAL WING SECTION



PROJECT NO. I-4400BB

HENDERSON COUNTY

STATION: 525+98.15 -L-

SHEET 10 OF 10

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR TRIPLE 8 FT. x 8 FT. CONCRETE BOX CULVERT 100 DEGREE SKEW

100 DEGREE SKEW
ON I-26 OVER FEATHERSTONE CREEK

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HNTB NORTH CAROLINA, P.C.
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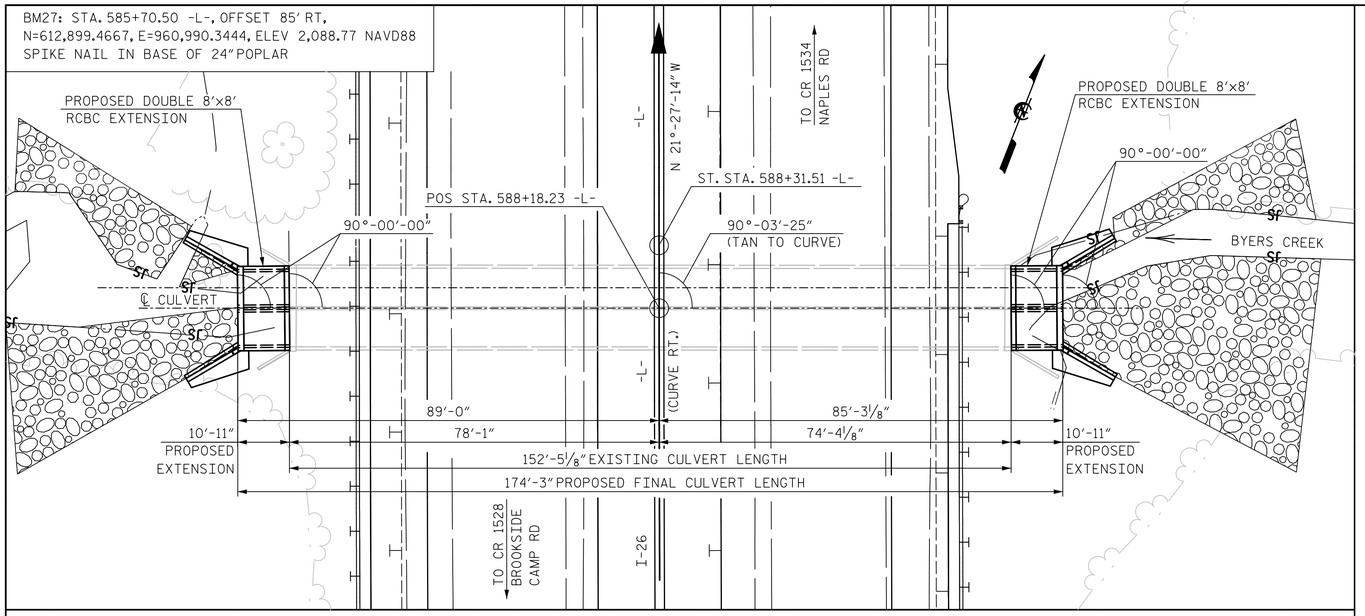
DRAWN BY M. WRIGHT DATE 2/19
CHECKED BY N. HART DATE 2/19
DESIGN ENGINEER OF RECORD D. HAWKINS DATE 3/19

DWG. NO. 10

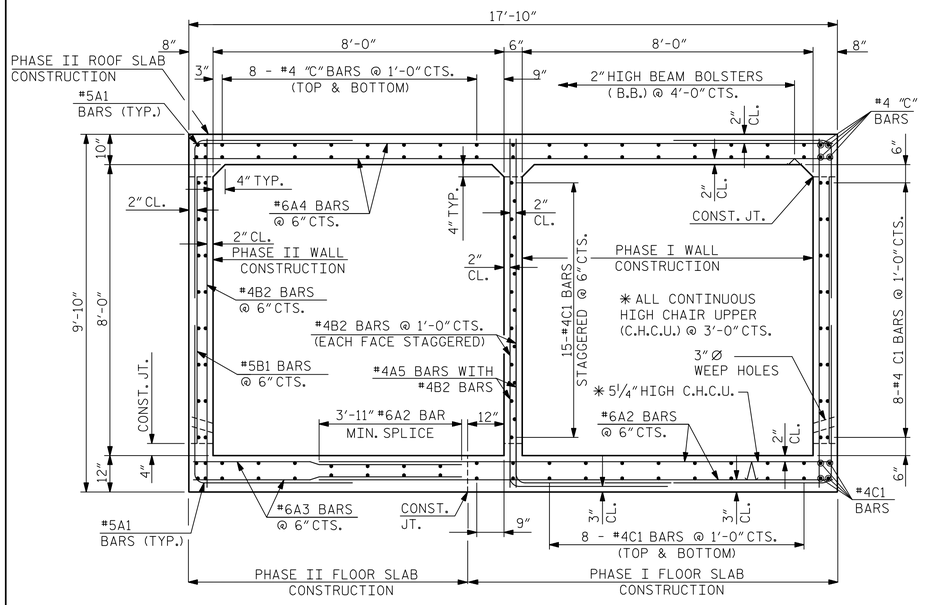
REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	C1-10
1			3			TOTAL SHEETS
2			4			10

F.A. PROJECT NO. NHF-26-1(62)23



LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.



RIGHT ANGLE SECTION OF BARREL

THERE ARE 131 "C" BARS IN SECTION OF BARREL

TOTAL STRUCTURE QUANTITIES		
CLASS A CONCRETE BARREL @ 1.76 CY/FT	38.4	C.Y.
LEFT EXTENSION	19.2	C.Y.
RIGHT EXTENSION	19.2	C.Y.
WING ETC.	28.1	C.Y.
TOTAL	66.5	C.Y.
REINFORCING STEEL BARREL	8,716	LBS.
LEFT EXTENSION	4,361	LBS.
RIGHT EXTENSION	4,355	LBS.
WINGS ETC.	1,453	LBS.
TOTAL	10,169	LBS.
FOUNDATION CONDITIONING MATERIAL, BOX CULVERT	34.0	TONS
CULVERT EXCAVATION AT POS STATION 588+18.23 -L-	LUMP SUM	

SAMPLE BAR REPLACEMENT	
SIZE	LENGTH
#3	6'-2"
#4	7'-4"
#5	8'-6"
#6	9'-8"
#7	10'-10"
#8	12'-0"
#9	13'-2"
#10	14'-6"
#11	15'-10"

NOTE:
SAMPLE BAR REPLACEMENT LENGTHS BASED ON 30" (SAMPLE LENGTH) PLUS TWO SPLICE LENGTHS AND fy = 60ksi.

NOTES

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

DESIGN FILL----------11.84'

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

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

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

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.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

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

SEE SECTION 414 OF THE STANDARD SPECIFICATIONS FOR CULVERT EXCAVATION AND BACKFILLING.

EXCAVATE AT LEAST ONE FOOT BELOW BOTTOM OF CULVERT AND REPLACE WITH FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH ARTICLE 414-4 OF THE STANDARD SPECIFICATIONS.

SUBGRADE SHOULD BE VERIFIED BY ENGINEER OR THEIR REPRESENTATIVE PRIOR TO PLACING FOUNDATION CONDITIONING MATERIAL.

NO BACKFILLING OF EXTERIOR WALLS SHALL BE PERMITTED UNTIL TOP SLAB HAS BEEN PLACED AND CURED. CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY BRACING WALLS UNTIL TOP SLAB IS COMPLETED.

DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

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

AT THE DIRECTION OF THE ENGINEER, UNDERCUT SOFT/LOOSE SOILS THAT MAY BE ENCOUNTERED BENEATH THE BOTTOM OF THE FOUNDATION CONDITIONING MATERIAL. BACKFILL UNDERCUT AREAS WITH FOUNDATION CONDITIONING MATERIAL.

THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE SAMPLE BARS SHOULD COME FROM STEEL ACTUALLY USED IN THE PROJECT AND THE SAMPLE BARS SHOULD BE REPLACED BY SPLICED BARS AS SPECIFIED IN THE SAMPLE BAR REPLACEMENT CHART. PAYMENT FOR THE SAMPLE BARS AND REPLACEMENT REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.

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

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

FOR PHASING DEATILS, SEE BILL OF MATERIAL SHEET.

HYDRAULIC DATA

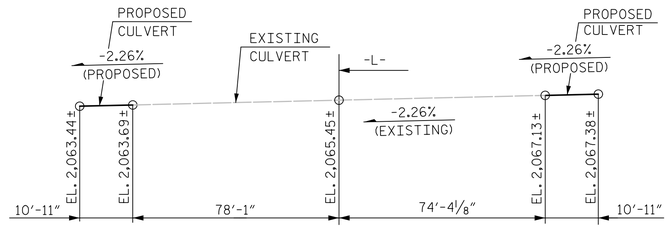
DESIGN DISCHARGE	1,270 CFS
FREQUENCY OF DESIGN FLOOD	50 YR.
DESIGN HIGH WATER ELEV.	2,076.8
DRAINAGE AREA	2.41 SQ. MI.
BASIC DISCHARGE (Q100)	1,530 CFS
BASIC HIGH WATER ELEV.	2,078.4

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	>2110 CFS
FREQUENCY OF OVERTOPPING FLOOD	>500 YR.
OVERTOPPING FLOOD ELEV.	2,085.8

GRADE DATA

GRADE POINT ELEV. @ STA. 588+18.23 -L- = 2,083.13
CULVERT BED ELEVATION @ STA. 588+18.23 -L- = 2,065.45
ROADWAY SLOPES 2:1



PROFILE ALONG ℄ CULVERT

PROJECT NO. I-4400BB

HENDERSON COUNTY

STATION: 588+18.23 -L-

SHEET 1 OF 9

Signed by: DAVID W. Hawkins

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 27812 5/13/2019 ENGINEER DAVID W. HAWKINS

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

LOCATION SKETCH/ BARREL SECTION FOR DOUBLE 8 FT. x 8 FT. CONCRETE BOX CULVERT

90 DEGREE SKEW
ON I-26 OVER BYERS CREEK

HNTB NORTH CAROLINA, P.C.
NC License No. C-1554
343 E. Six Forks Rd., Suite 200, Raleigh, N.C. 27609

DRAWN BY B. STEIB DATE 2/19
CHECKED BY M. BARRAGAN DATE 2/19
DESIGN ENGINEER OF RECORD D. HAWKINS DATE 2/19

DWG. NO. 1

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	C2-1
1			3			TOTAL SHEETS
2			4			9

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

LEVEL		VEHICLE	WEIGHT (W) (TONS)	⟨#⟩ CONTROLLING LOAD RATING	MINIMUM RATING FACTORS (RF)	TONS = W × RF	STRENGTH I LIMIT STATE									COMMENT NUMBER
								MOMENT				SHEAR				
							LIVE-LOAD FACTORS (γ_{LL})	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING		HL-93 (INVENTORY)	N/A	⟨1⟩	**2.95**	--	1.75	5.16	2	TOP. SLAB	0	**2.95**	2	TOP SLAB	0.6	--
		HL-93 (OPERATING)	N/A		3.83	--	1.35	6.68	2	TOP. SLAB	0	3.83	2	TOP SLAB	0.6	--
		HS-20 (INVENTORY)	36.000	⟨2⟩	**3.56**	128.1	1.75	6.21	2	TOP. SLAB	0	**3.56**	2	TOP SLAB	0.6	--
		HS-20 (OPERATING)	36.000		4.61	166.1	1.35	8.05	2	TOP. SLAB	0	4.61	2	TOP SLAB	0.6	--
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SH	12.500		6.41	80.1	1.40	13.61	2	TOP. SLAB	0	6.41	2	TOP SLAB	0.6	--
		S3C	21.500		5.87	126.3	1.40	10.25	2	TOP. SLAB	0	5.87	2	TOP SLAB	0.6	--
		S3A	22.750		5.16	117.4	1.40	9.01	2	TOP. SLAB	0	5.16	2	TOP SLAB	0.6	--
		S4A	26.750		5.05	135.1	1.40	8.82	2	TOP. SLAB	0	5.05	2	TOP SLAB	0.6	--
		S5A	30.500		5.01	152.9	1.40	8.75	2	TOP. SLAB	0	5.01	2	TOP SLAB	0.6	--
		S6A	34.500		4.94	170.6	1.40	8.63	2	TOP. SLAB	0	4.94	2	TOP SLAB	0.6	--
		S7B	38.500	⟨3⟩	**4.89**	188.3	1.40	8.54	2	TOP. SLAB	0	**4.89**	2	TOP SLAB	0.6	--
		S7A	40.000		5.26	210.5	1.40	9.19	2	TOP. SLAB	0	5.26	2	TOP SLAB	0.6	--
	TRUCK TRACTOR SEMI-TRAILER (TTST)	T4A	28.250		5.57	157.3	1.40	9.72	2	TOP. SLAB	0	5.57	2	TOP SLAB	0.6	--
		T5B	32.000		5.47	175.0	1.40	9.55	2	TOP. SLAB	0	5.47	2	TOP SLAB	0.6	--
		T6A	36.000		5.35	192.7	1.40	9.35	2	TOP. SLAB	0	5.35	2	TOP SLAB	0.6	--
		T7A	40.000		5.26	210.5	1.40	9.19	2	TOP. SLAB	0	5.26	2	TOP SLAB	0.6	--
		T7B	40.000		5.26	210.5	1.40	9.19	2	TOP. SLAB	0	5.26	2	TOP SLAB	0.6	--

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

COMMENTS:

1.
2.
3.
4.

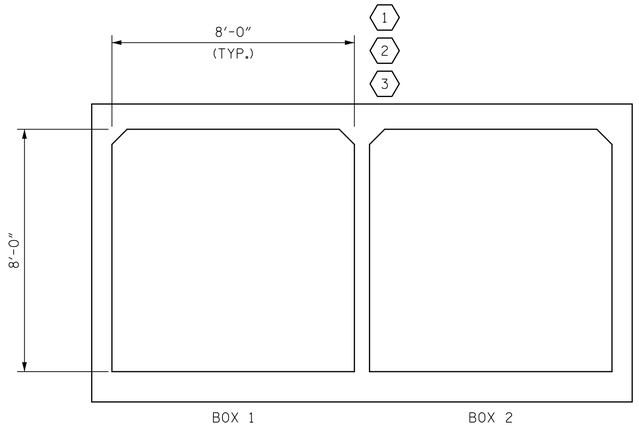
⟨#⟩ CONTROLLING LOAD RATING

⟨1⟩ DESIGN LOAD RATING (HL-93)

⟨2⟩ DESIGN LOAD RATING (HS-20)

⟨3⟩ LEGAL LOAD RATING **

** SEE CHART FOR VEHICLE TYPE



LRFR SUMMARY

(LOOKING UPSTATION)

PROJECT NO. I-4400BB

HENDERSON COUNTY

STATION: 588+18.23 -L-

SHEET 2 OF 9

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD
LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS
(INTERSTATE TRAFFIC)
90 DEGREE SKEW
ON I-26 OVER BYERS CREEK

SHEET NO. C2-2

TOTAL SHEETS 9

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

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 27815 DAVID W. HAWKINS 4/23/2019

HNTB NORTH CAROLINA, P.C.
NC License No. C-1554
343 E. Six Forks Rd., Suite 200, Raleigh, N.C. 27609

DRAWN BY B. STEIB DATE 2/19
CHECKED BY M. BARRAGAN DATE 2/19
DESIGN ENGINEER OF RECORD D. HAWKINS DATE 2/19

DWG. NO. 2

ASSEMBLED BY : B. STEIB DATE : 2/19
CHECKED BY : M. BARRAGAN DATE : 2/19

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

REV. 10/1/11 MAA/GM
REV. 12/17 MAA/THC

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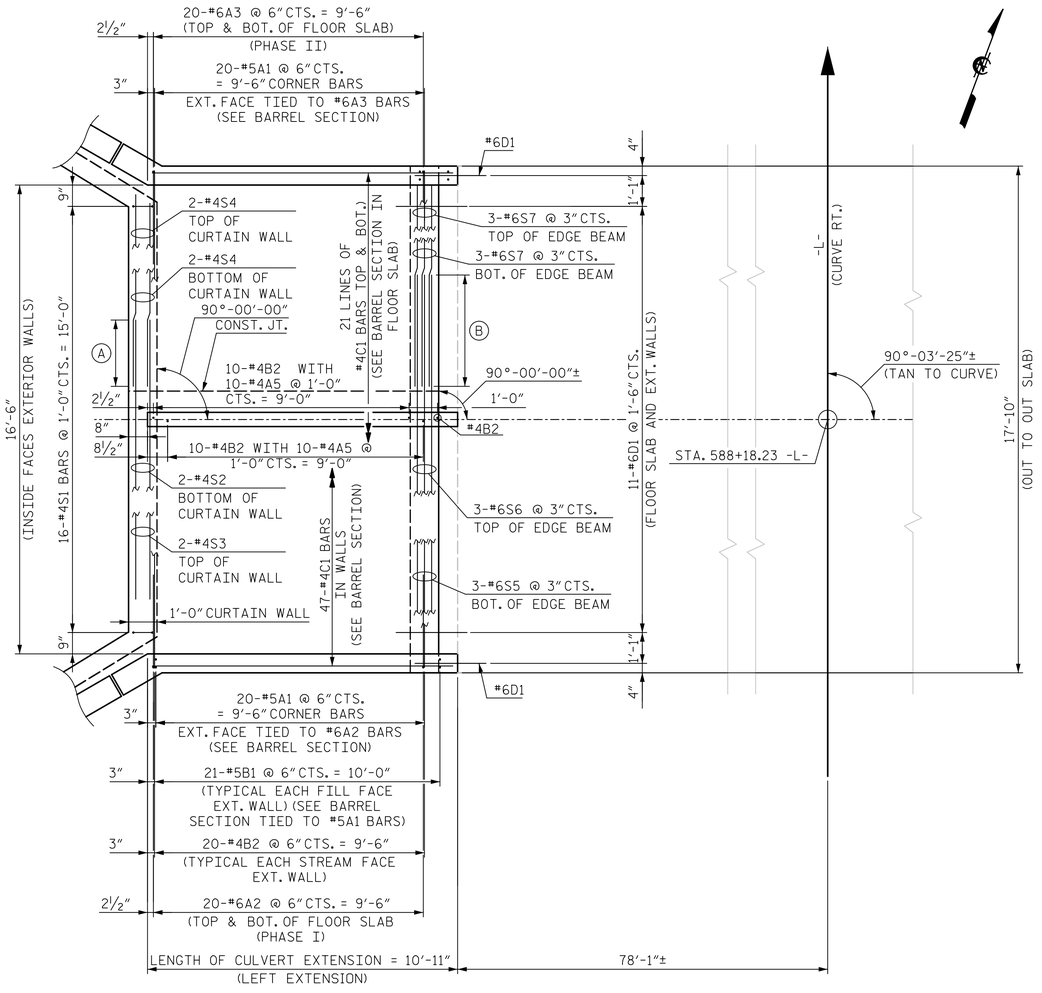
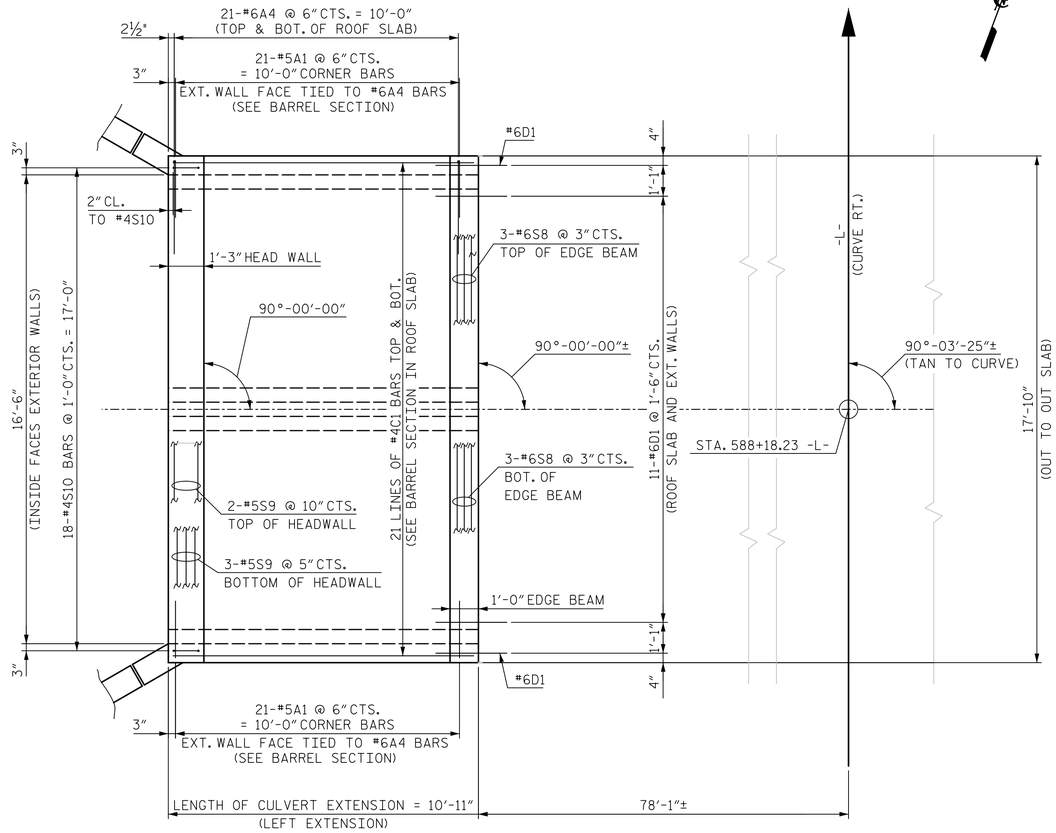
STD. NO. LRFR6



PLAN - LEFT FLOOR SLAB EXTENSION

Ⓐ #4 S2 2'-4" MIN. LAP
#4 S3 3'-1" MIN. LAP

Ⓑ #6 S5 3'-11" MIN. LAP
#6 S6 5'-2" MIN. LAP



PLAN - LEFT ROOF SLAB EXTENSION

PROJECT NO. I-4400BB

HENDERSON COUNTY

STATION: 588+18.23 -L-

SHEET 3 OF 9

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 27812 5/13/2019 DAVID W. HAWKINS
Signed by: David W. Hawkins

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DRAWN BY B. STEIB DATE 2/19
CHECKED BY M. BARRAGAN DATE 2/19
DESIGN ENGINEER OF RECORD D. HAWKINS DATE 2/19

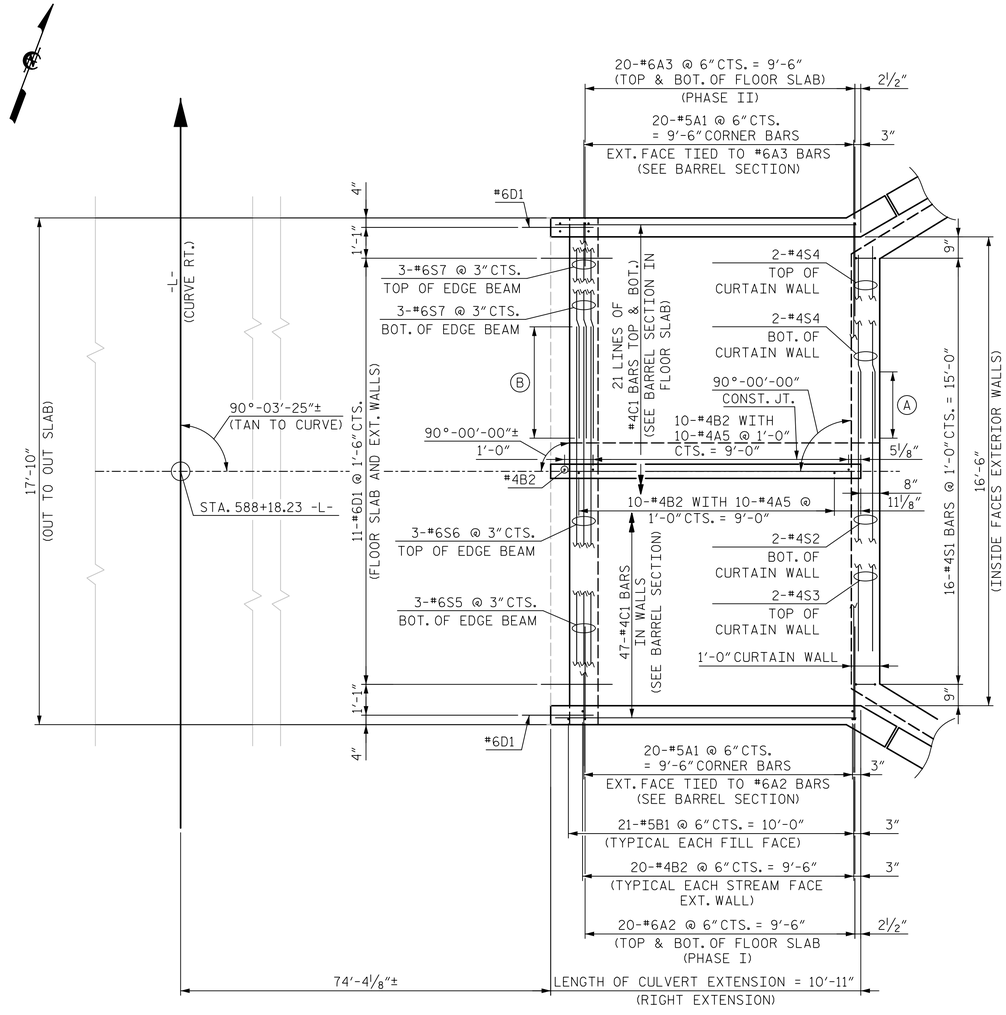
DWG. NO. 3

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PLAN OF SLAB FOR DOUBLE 8 FT. x 8 FT. CONCRETE BOX CULVERT LEFT EXTENSION

90 DEGREE SKEW
ON I-26 OVER BYERS CREEK

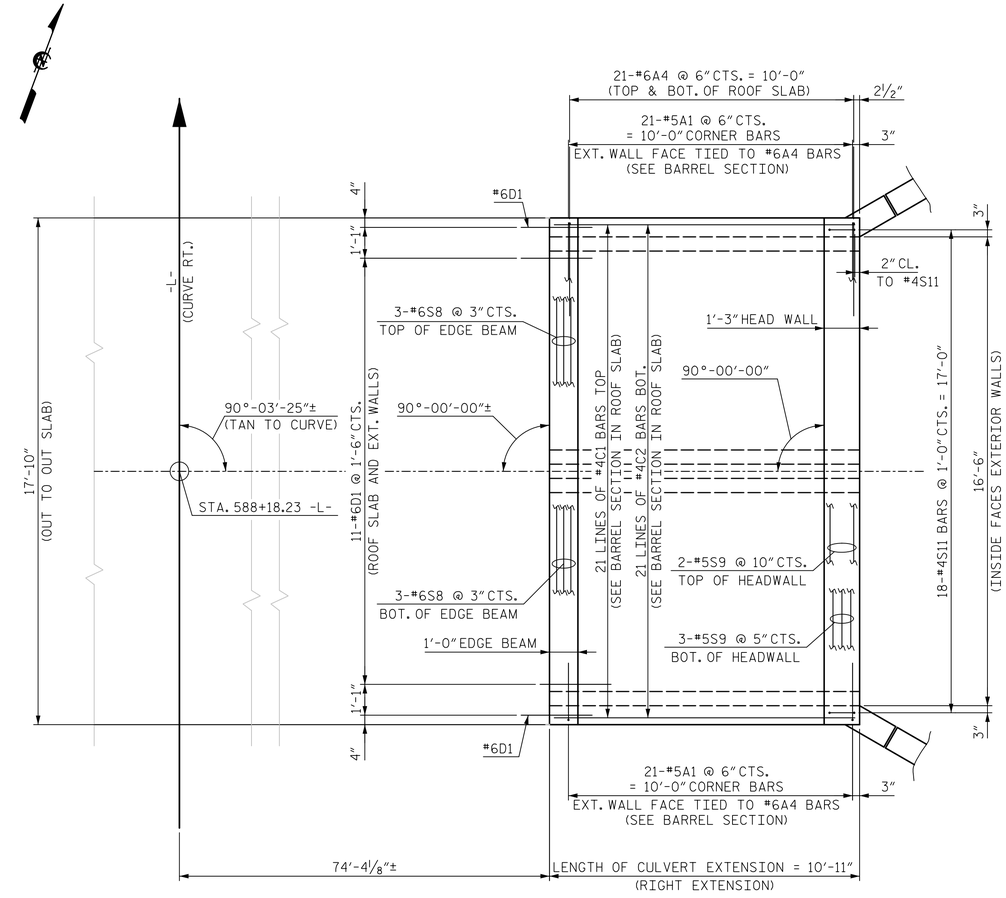
REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	C2-3
1			3			TOTAL SHEETS
2			4			9



PLAN - RIGHT FLOOR SLAB EXTENSION

Ⓐ #4 S2 2'-4" MIN. LAP
#4 S3 3'-1" MIN. LAP

Ⓑ #6 S5 3'-11" MIN. LAP
#6 S6 5'-2" MIN. LAP



PLAN - RIGHT ROOF SLAB EXTENSION

PROJECT NO. I-4400BB

HENDERSON **COUNTY**

STATION: 588+18.23 -L-

SHEET 4 OF 9

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 27812 5/13/2019 ENGINEER DAVID W. HAWKINS

Digitally signed by: David W. Hawkins

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CHECKED BY M. BARRAGAN DATE 2/19
DESIGN ENGINEER OF RECORD D. HAWKINS DATE 2/19

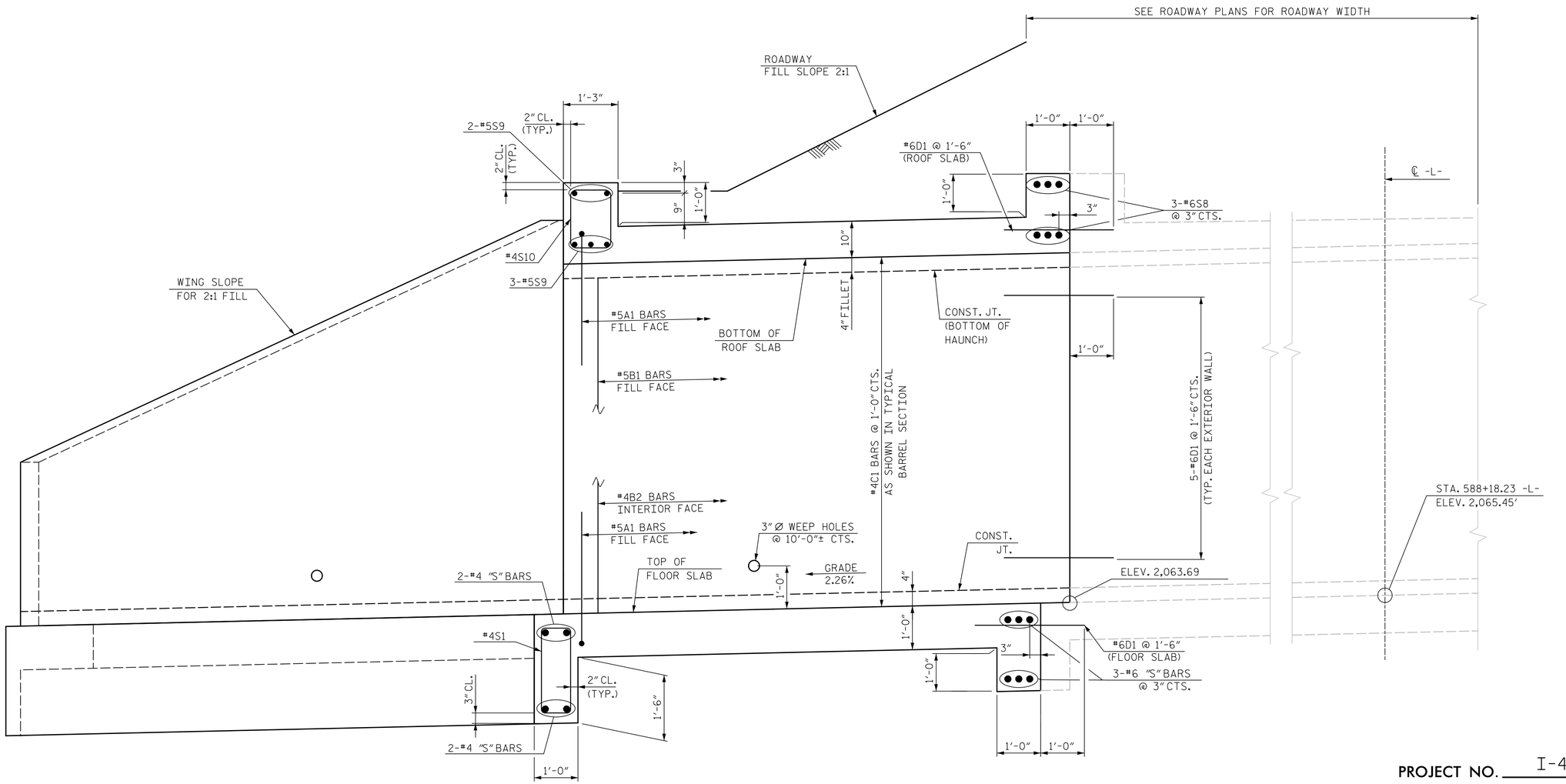
DWG. NO. 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PLAN OF SLAB FOR DOUBLE 8 FT. x 8 FT. CONCRETE BOX CULVERT RIGHT EXTENSION

90 DEGREE SKEW
ON I-26 OVER BYERS CREEK

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	C2-4
1			3			TOTAL SHEETS
2			4			9



CULVERT LEFT SECTION NORMAL TO ROADWAY

PROJECT NO. I-4400BB

HENDERSON COUNTY

STATION: 588+18.23 -L-

SHEET 5 OF 9

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 27812 DAVID W. HAWKINS 4/23/2019

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SECTION FOR DOUBLE 8 FT. x 8 FT. CONCRETE BOX CULVERT LEFT EXTENSION

90 DEGREE SKEW
ON I-26 OVER BYERS CREEK

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DWG. NO. 5

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	C2-5
1			3			TOTAL SHEETS
2			4			9

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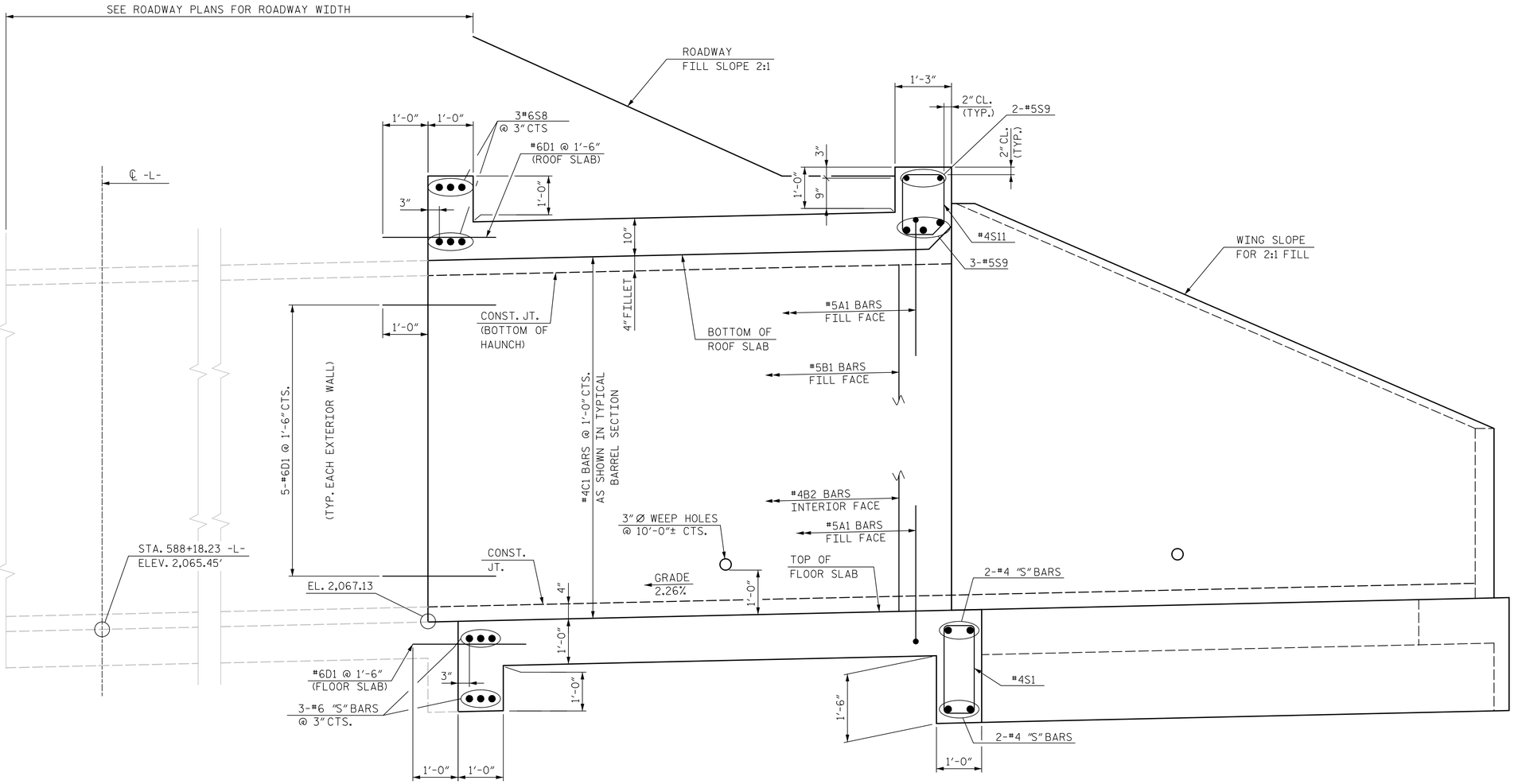

CULVERT RIGHT SECTION NORMAL TO ROADWAY

PROJECT NO. I-4400BB

HENDERSON COUNTY

STATION: 588+18.23 -L-

SHEET 6 OF 9

NORTH CAROLINA PROFESSIONAL SEAL 27812 ENGINEER DAVID W. HAWKINS
David W. Hawkins
4/23/2019

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NC License No. C-1554
343 E. Six Forks Rd., Suite 200, Raleigh, N.C. 27609

DRAWN BY	B. STEIB	DATE 2/19
CHECKED BY	M. BARRAGAN	DATE 2/19
DESIGN ENGINEER OF RECORD	D. HAWKINS	DATE 2/19

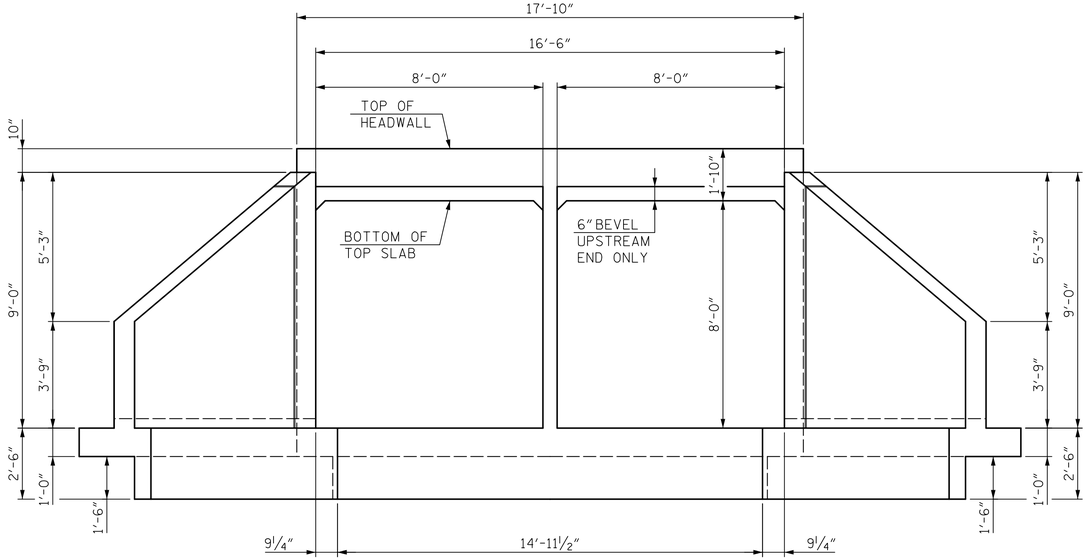
DWG. NO. 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

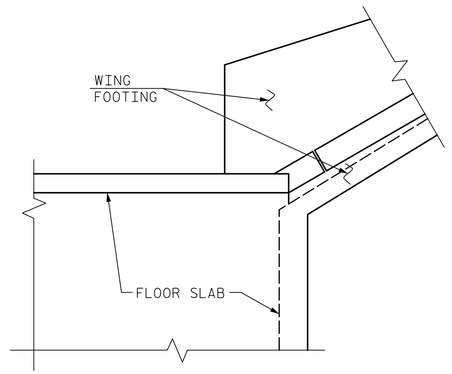
SECTION FOR DOUBLE 8 FT. x 8 FT. CONCRETE BOX CULVERT RIGHT EXTENSION

90 DEGREE SKEW
ON I-26 OVER BYERS CREEK

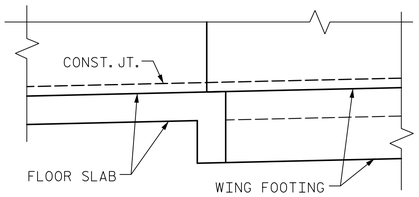
REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	C2-6
1			3			TOTAL SHEETS
2			4			9



END ELEVATION NORMAL TO ROADWAY



PART PLAN



ELEVATION

WING FOOTING
FLOOR SLAB DETAIL

PROJECT NO. I-4400BB

HENDERSON COUNTY

STATION: 588+18.23 -L-

SHEET 7 OF 9

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

ELEVATION FOR DOUBLE 8 FT. × 8 FT. CONCRETE BOX CULVERT

90 DEGREE SKEW
ON I-26 OVER BYERS CREEK

NORTH CAROLINA PROFESSIONAL SEAL 27812 ENGINEER DAVID W. HAWKINS
David W. Hawkins
4/23/2019

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DWG. NO. 7

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	C2-7
1			3			TOTAL SHEETS
2			4			9

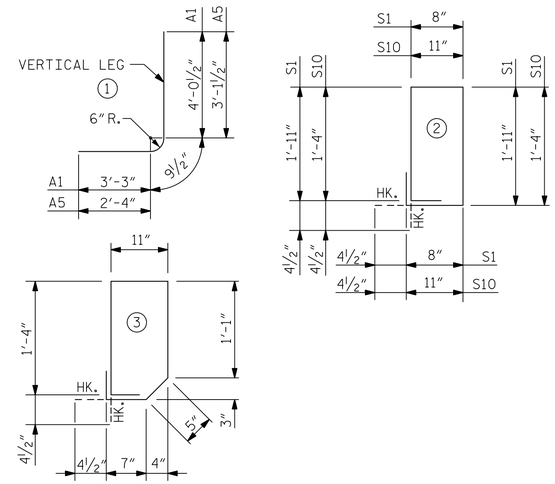
BILL OF MATERIAL LEFT EXTENSION

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	82	5	1	8′-1″	691
A2	20	6	STR	14′-1″	423
A3	20	6	STR	7′-4″	220
A4	21	6	STR	17′-6″	552
A5	20	4	1	6′-3″	84
B1	42	5	STR	7′-4″	322
B2	61	4	STR	9′-6″	387
C1	131	4	STR	10′-7″	926
D1	36	6	STR	2′-6″	135
S1	16	4	2	5′-11″	63
S2	2	4	STR	11′-3″	15
S3	2	4	STR	12′-0″	16
S4	4	4	STR	6′-1″	16
S5	3	6	STR	14′-1″	64
S6	3	6	STR	15′-4″	69
S7	6	6	STR	7′-4″	66
S8	6	6	STR	17′-6″	158
S9	5	5	STR	17′-6″	91
S10	18	4	2	5′-3″	63
REINFORCING STEEL				LBS.	4361

BILL OF MATERIAL RIGHT EXTENSION

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	82	5	1	8′-1″	691
A2	20	6	STR	14′-1″	423
A3	20	6	STR	7′-4″	220
A4	21	6	STR	17′-6″	552
A5	20	4	1	6′-3″	84
B1	42	5	STR	7′-4″	322
B2	61	4	STR	9′-6″	387
C1	110	4	STR	10′-7″	778
C2	21	4	STR	10′-3″	144
D1	36	6	STR	2′-6″	135
S1	16	4	2	5′-11″	63
S2	2	4	STR	11′-3″	15
S3	2	4	STR	12′-0″	16
S4	4	4	STR	6′-1″	16
S5	3	6	STR	14′-1″	64
S6	3	6	STR	15′-4″	69
S7	6	6	STR	7′-4″	66
S8	6	6	STR	17′-6″	158
S9	5	5	STR	17′-6″	91
S11	18	4	3	5′-1″	61
REINFORCING STEEL				LBS.	4355

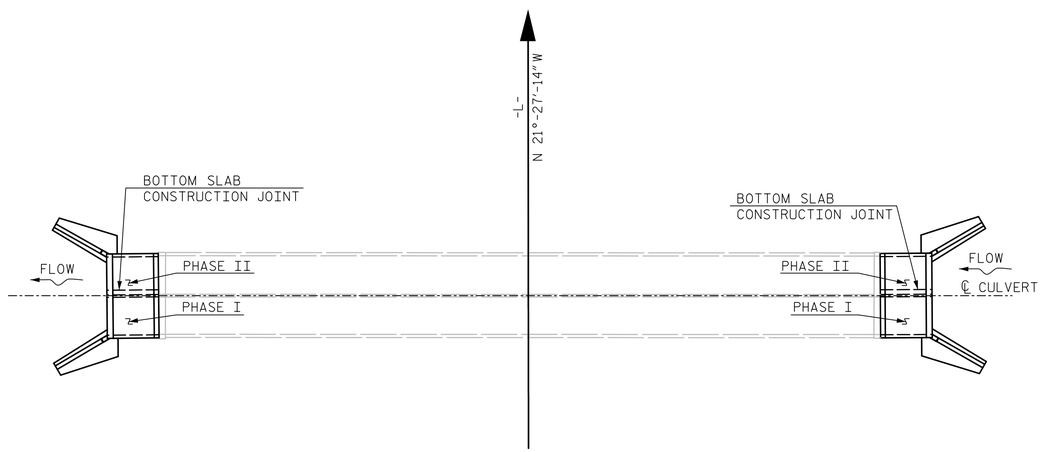
BAR TYPE



BAR DIMENSIONS ARE OUT TO OUT

SPLICE LENGTH CHART

BAR	SIZE	SPLICE LENGTH
A1	#5	3′-3″(BOTTOM BARS)
A2	#6	3′-11″
B1	#5	3′-3″
S2	#4	2′-4″
S3	#4	3′-1″
S5	#6	3′-11″
S6	#6	5′-2″



CONSTRUCTION SEQUENCE

PHASING REQUIRES CREEK FLOW DIVERSION - SEE EROSION CONTROL PLANS.

PHASING NOTES

CONCRETE IN CULVERT TO BE POURED IN THE FOLLOWING ORDER:

PHASE I:
1. INSTALL IMPERVIOUS DIKE TO SHIFT STREAM FLOW FROM PHASE I AND DEWATER CONSTRUCTION AREA.
2. CONSTRUCT PHASE I WING FOOTINGS AND FLOOR SLAB INCLUDING 4″ OF VERTICAL WALLS.
3. CONSTRUCT REMAINING PHASE I PORTIONS OF THE WALLS AND WINGS FULL HEIGHT.

PHASE II:
1. RECONFIGURE IMPERVIOUS DIKE AND SHIFT STREAM FLOW THROUGH PHASE I CELL.
2. CONSTRUCT PHASE II WING FOOTINGS AND FLOOR SLAB INCLUDING 4″ OF REMAINING VERTICAL WALL.
3. CONSTRUCT REMAINING PHASE II PORTION OF WALL AND WINGS FULL HEIGHT.
4. CONSTRUCT ENTIRE ROOF SLAB AND HEADWALLS.

Digitally signed by: D. W. Hawkins
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 27812 5/13/2019 ENGINEER DAVID W. HAWKINS

PROJECT NO. I-4400BB

HENDERSON **COUNTY**

STATION: 588+18.23 -L-

SHEET 8 OF 9

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BILL OF MATERIAL FOR DOUBLE 8 FT. × 8 FT. CONCRETE BOX CULVERT

90 DEGREE SKEW
ON I-26 OVER BYERS CREEK

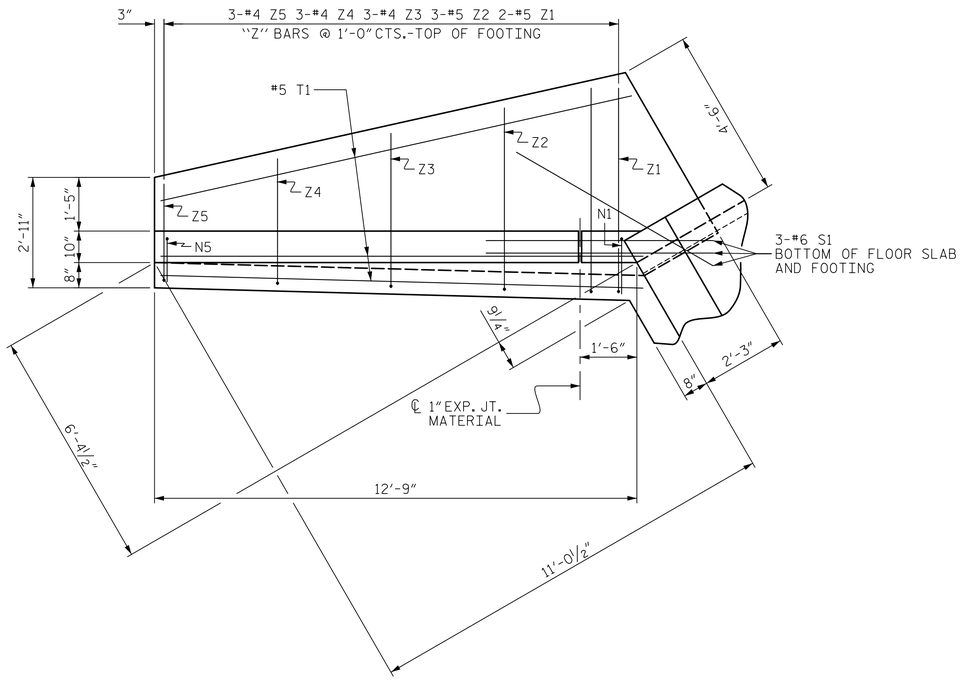
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

HNTB NORTH CAROLINA, P.C.
NC License No. C-1554
343 E. Six Forks Rd., Suite 200, Raleigh, N.C. 27609

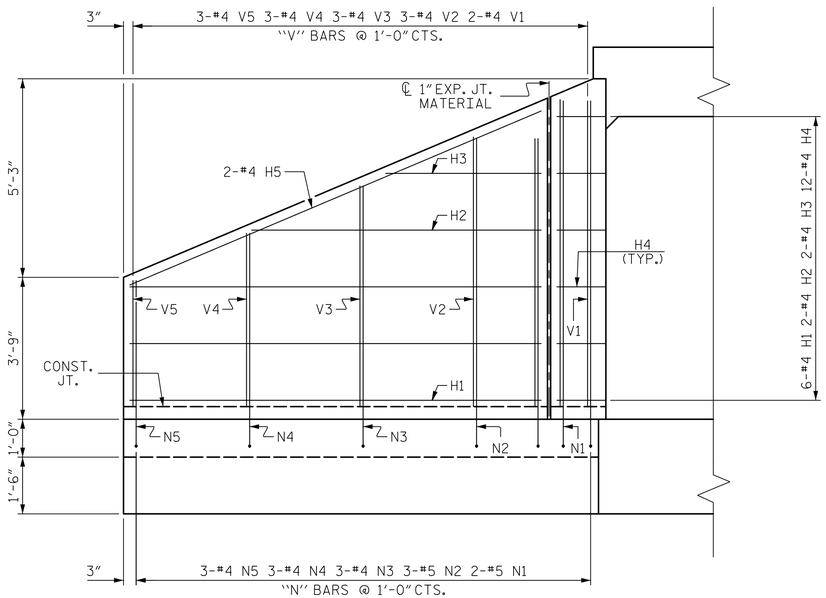
DRAWN BY B. STEIB DATE 2/19
CHECKED BY M. BARRAGAN DATE 2/19
DESIGN ENGINEER OF RECORD D. HAWKINS DATE 2/19

DWG. NO. 8

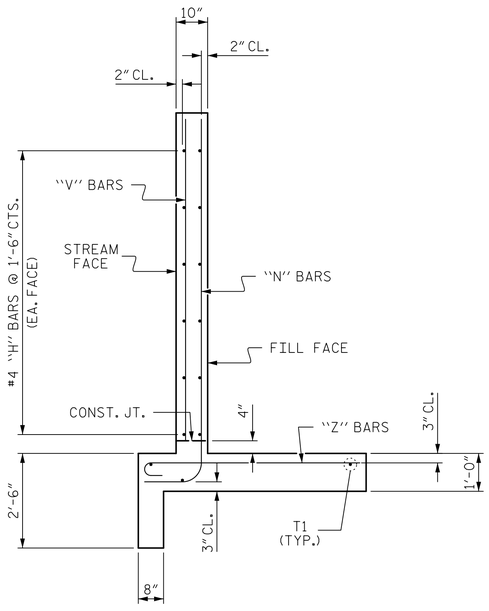
REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	C2-8
1			3			TOTAL SHEETS
2			4			9



PLAN



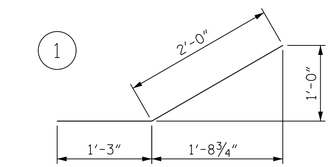
ELEVATION

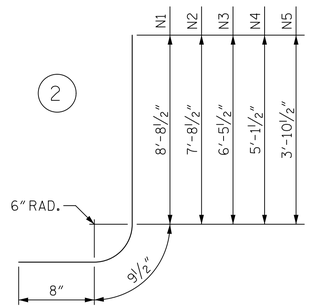


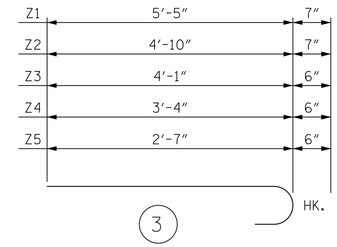
TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.







BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	24	#4	STR	10'-10"	174
H2	8	#4	STR	7'-8"	41
H3	8	#4	STR	4'-1"	22
H4	48	#4	1	3'-3"	104
H5	8	#4	STR	11'-9"	63
N1	8	#5	2	10'-2"	85
N2	12	#5	2	9'-2"	115
N3	12	#4	2	7'-11"	63
N4	12	#4	2	6'-7"	53
N5	12	#4	2	5'-4"	43
S1	12	#6	STR	6'-0"	108
T1	12	#5	STR	12'-9"	160
V1	8	#4	STR	8'-1"	43
V2	12	#4	STR	7'-1"	57
V3	12	#4	STR	5'-10"	47
V4	12	#4	STR	4'-7"	37
V5	12	#4	STR	3'-4"	27
Z1	8	#5	3	6'-0"	50
Z2	12	#5	3	5'-5"	68
Z3	12	#4	3	4'-7"	37
Z4	12	#4	3	3'-10"	31
Z5	12	#4	3	3'-1"	25

REINFORCING STEEL
FOR 4 WINGS 1453 LBS

CLASS A CONCRETE
4 WINGS 21.4 CY
2 HEADWALLS 1.7 CY
2 END CURTAIN WALLS 2.4 CY
4 EDGEBEAMS 2.6 CY
TOTAL 28.1 CY

PROJECT NO. I-4400BB
HENDERSON COUNTY
STATION: 588+18.23 -L-

SHEET 9 OF 9

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD WINGS FOR CONCRETE BOX CULVERT

H = 8'-0" SLOPE = 2:1
90 DEGREE SKEW
ON I-26 OVER BYERS CREEK

NORTH CAROLINA PROFESSIONAL SEAL 27812 ENGINEER DAVID W. HAWKINS
David W. Hawkins
4/23/2019

REVISIONS						SHEET NO.
NO.	BY	DATE	NO.	BY	DATE	C2-9
1			3			TOTAL SHEETS
2			4			9

HNTB NORTH CAROLINA, P.C.
NC License No. C-1554
343 E. Six Forks Rd., Suite 200, Raleigh, N.C. 27609

DRAWN BY B. STEIB DATE 2/19
CHECKED BY M. BARRAGAN DATE 2/19
DESIGN ENGINEER OF RECORD D. HAWKINS DATE 2/19
DWG. NO. 9

ASSEMBLED BY : B. STEIB DATE : 2/19
CHECKED BY : M. BARRAGAN DATE : 2/19
DRAWN BY : CCJ 10/99
CHECKED BY : RWW 03/00

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STD. NO. CW9008