TIP PROJECT: R–2915E

CONTRACT: C204356

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

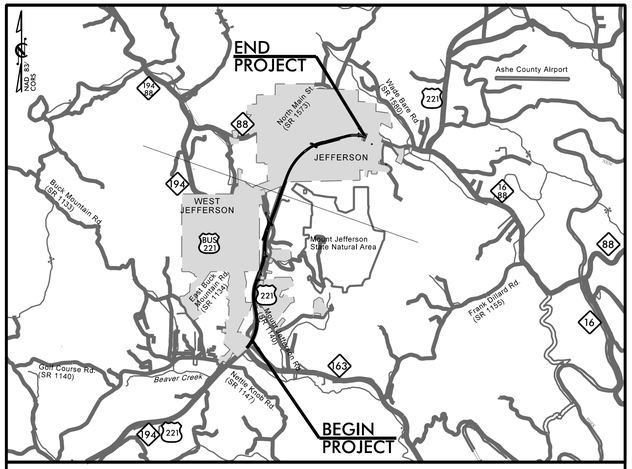
ASHE COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R–2915E	1	11

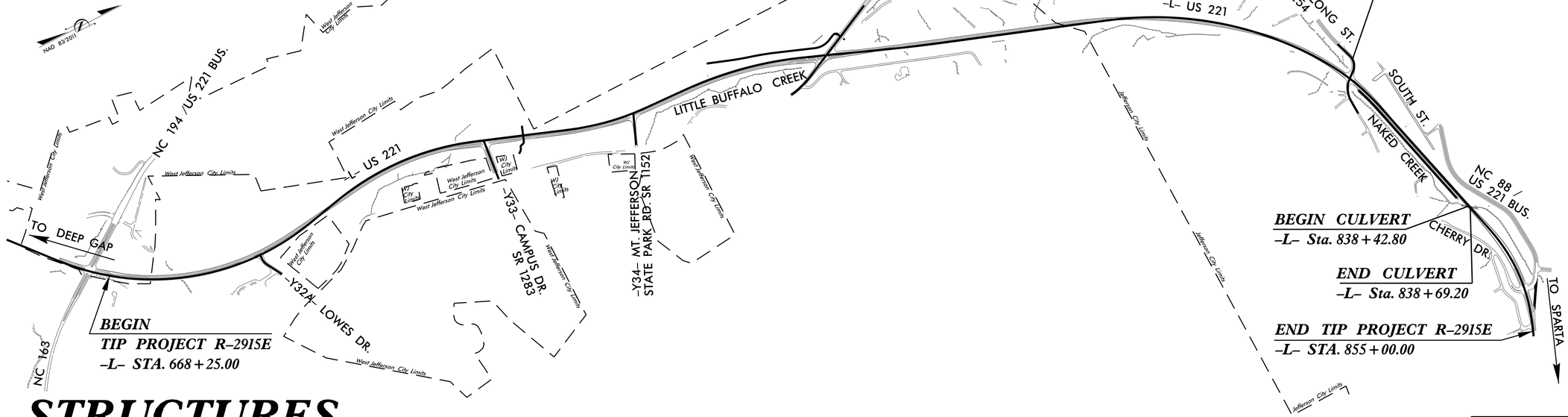
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
34518.1.FR6	STP–0221(45)	PE
34518.2.6	STP–0221(45)	R/W
34518.2.7	STP–0221(45)	UTIL.
34518.3.8		CONST.

LOCATION: *US 221 FROM US 221 BYPASS TO US 221 BUSINESS/NC 88 IN JEFFERSON*

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



VICINITY MAP (NTS)



STRUCTURES

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DESIGN DATA

ADT 2019 = 15,900
ADT 2039 = 19,400
K = 8 %
D = 55 %
T = 6 % *
V = 60 MPH
* (TTST 3 % + DUALS 3 %)

FUNC CLASSIFICATION = RURAL ARTERIAL

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R–2915E = 3.532 MILES
LENGTH CULVERT TIP PROJECT R–2915E = 0.005 MILE

TOTAL LENGTH TIP PROJECT R–2915E = 3.537 MILES

Prepared for the Office of:
DIVISION OF HIGHWAYS
STRUCTURES MANAGEMENT UNIT
1000 BIRCH RIDGE DR.
RALEIGH, N.C. 27610

2018 STANDARD SPECIFICATIONS

LETTING DATE : MARCH 17, 2020

Scott D. Blevins, P.E.
PROJECT ENGINEER
Ricky V. Keith, P.E.
PROJECT STRUCTURE ENGINEER

PLANS PREPARED BY:

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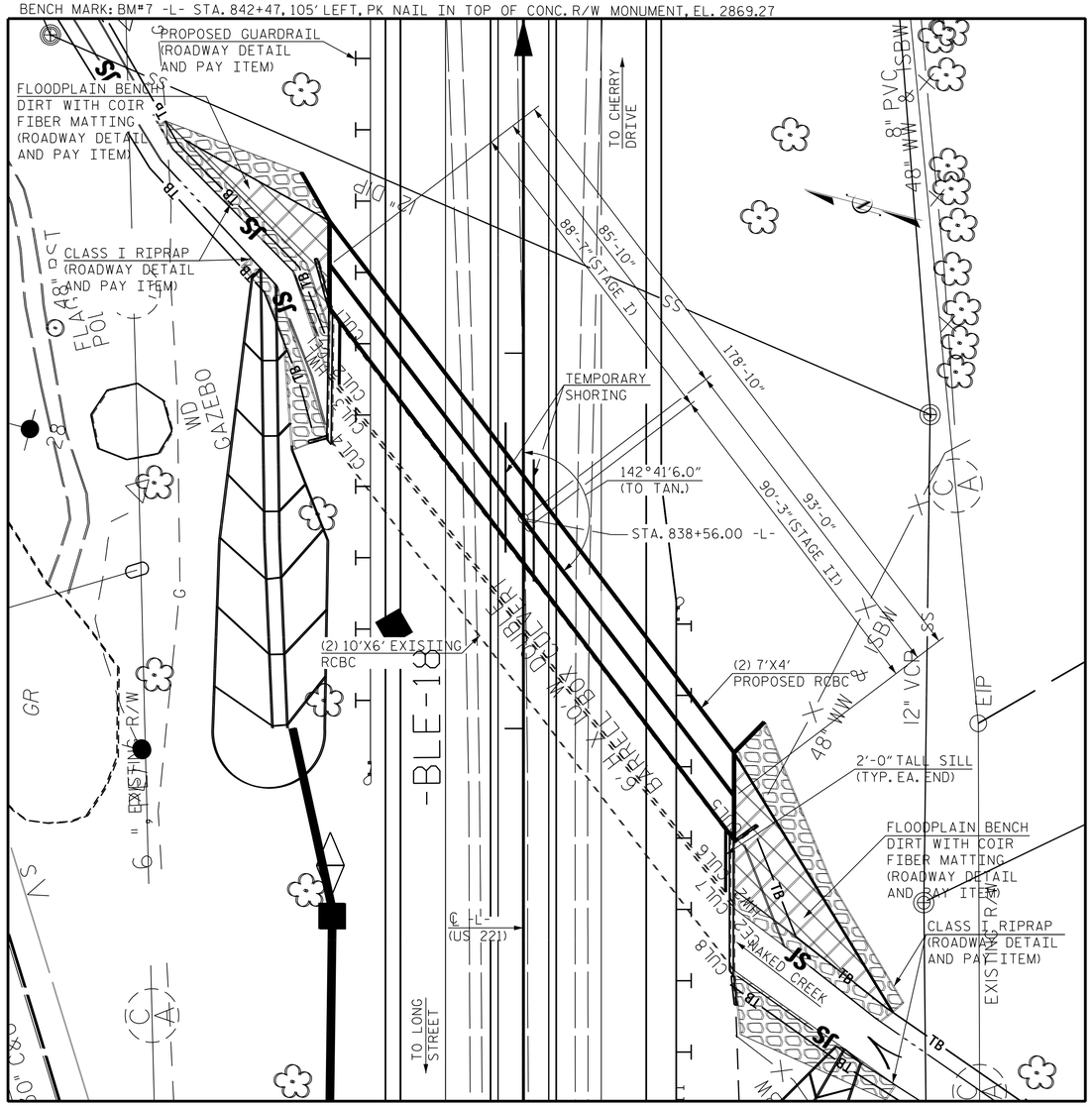
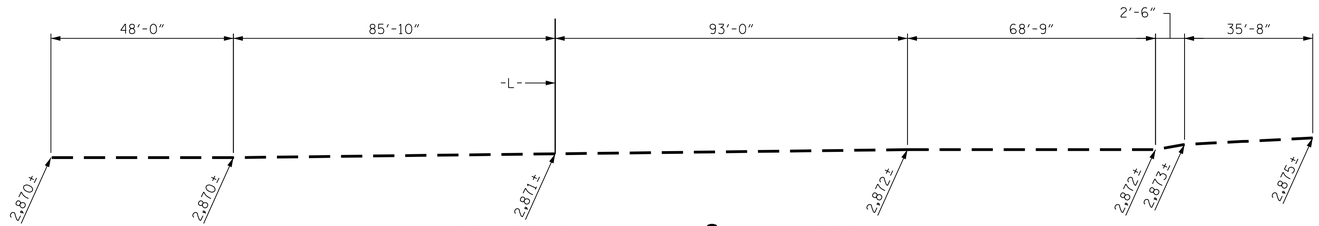
1/10/2020



LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS
GRADE POINT ELEVATION @ STA. 838+56.00 -L- = 2,879.20
BED ELEVATION @ STA. 838+56.00 -L- = 2,870.55
ROADWAY SLOPES = 3:1 (MIN.)



PROFILE ALONG ℄ CULVERT

DRAWN BY :	D. G. ROBINSON	DATE :	JAN 2019
CHECKED BY :	A. L. STROUD	DATE :	JAN 2019
DESIGN ENGINEER OF RECORD :	R. V. KEITH	DATE :	JAN 2019

STAGE I STRUCTURE QUANTITIES

CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	102 TONS

CLASS A CONCRETE

BARREL @	1.29	CY/FT	114.5	C.Y.
WING ETC.			7.6	C.Y.
TOTAL			122.1	C.Y.

REINFORCING STEEL

BARREL	16,381	LBS.
WINGS ETC.	275	LBS.
TOTAL	16,656	LBS.

STAGE II STRUCTURE QUANTITIES

CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	100 TONS

CLASS A CONCRETE

BARREL @	1.29	CY/FT	116.6	C.Y.
WING ETC.			7.2	C.Y.
TOTAL			123.8	C.Y.

REINFORCING STEEL

BARREL	16,233	LBS.
WINGS ETC.	186	LBS.
TOTAL	16,419	LBS.

TOTAL STRUCTURE QUANTITIES

CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	202 TONS

CLASS A CONCRETE

BARREL @	1.29	CY/FT	231.1	C.Y.
WING ETC.			14.8	C.Y.
TOTAL			245.9	C.Y.

REINFORCING STEEL

BARREL	32,614	LBS.
WINGS ETC.	461	LBS.
TOTAL	33,075	LBS.

HYDRAULIC DATA

DESIGN DISCHARGE----------1,000 C.F.S.
FREQUENCY OF DESIGN FLOOD----------50 YR.
DESIGN HIGH WATER ELEVATION----------2,875.6
DRAINAGE AREA----------1.8 SQ. MI.
BASE DISCHARGE (Q100)----------1,200 C.F.S.
BASE HIGH WATER ELEVATION----------2,876.3

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE----------1,275 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD-----100+ YR
OVERTOPPING FLOOD ELEVATION---------2,876.6

NOTES:

F.A. PROJECT NO. STP-0221(45)

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

DESIGN FILL----------4.81 FT.

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN STAGE I CULVERT TO BE POURED IN THE FOLLOWING ORDER:
1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4"OF ALL VERTICAL WALLS
2. THE REMAINING PORTIONS OF THE WALLS, ROOFSLAB, HEADWALLS, AND WINGS FULL HEIGHT.

CONCRETE IN STAGE II CULVERT TO BE POURED IN THE FOLLOWING ORDER:
1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4"OF ALL VERTICAL WALLS
2. THE REMAINING PORTIONS OF THE WALLS, ROOFSLABS, HEADWALLS, AND WINGS FULL HEIGHT, FOLLOWED BY SILLS

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 THE BARREL ARE SHOWN ON WING SHEET.

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

AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAIL DRAWINGS FOR A PRECAST REINFORCED CONCRETE BOX CULVERT IN LIEU OF THE CAST-IN-PLACE CULVERT SHOWN ON THE PLANS. THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIMAL PRECAST CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.

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

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

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

THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SMAPLES 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.

TRAFFIC ON US221 SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC, THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS DIRECTED BY THE ENGINEER.

FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.

FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTANCE OF TRAFFIC, SEE ROADWAY PLANS.

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

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

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"

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BRIDGE NO. 513

NORTH CAROLINA PROFESSIONAL SEAL 10966 ENGINEER RICKY V. KEITH
1/10/2020

PROJECT NO. R-2915E
ASHE COUNTY
STATION: 838+56.00 -L-

BRIDGE NO. 513

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE BARREL

7 FT. X 4 FT.
CONCRETE BOX CULVERT
142°41'6.0" SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	CU-1
1			3			TOTAL SHEETS
2			4			11

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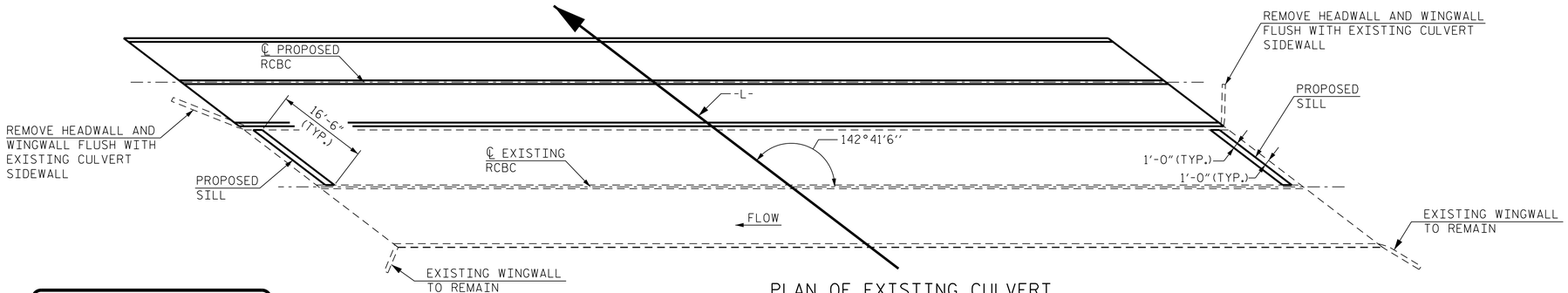
1/10/2020 R:\Structures\DGN\Culverts\R-2915E_531_SD_01_LLOC.dgn

NOTES:

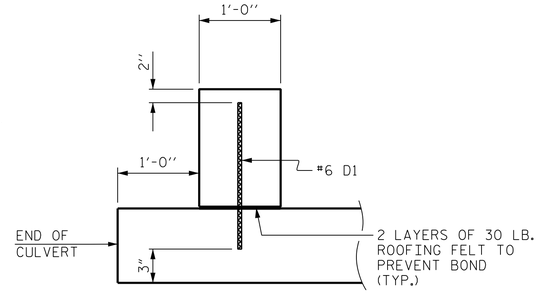
NATIVE MATERIAL CONSITS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED OR FLOODPLAIN AT THE PROJECT SITE DURING CULVERT CONSTRUCTION. ONLY MATERIAL THAT IS EXCAVATED FROM THE STREAM BED MAY BE USED TO LINE THE LOW FLOW CULVERT BARREL. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

#6 D1 BARS SHALL BE DRILLED AND GROUTED EITHER 6'' INTO THE BOTTOM SLAB OF THE EXISTING CULVERT OR TO ALLOW 3'' CLEAR TO THE BOTTOM OF THE BOTTOM SLAB.

#6 D1 BARS MAY BE FIELD CUT AS NECESSARY TO ACHIEVE THE REQUIRED CLEAR DISTANCES.



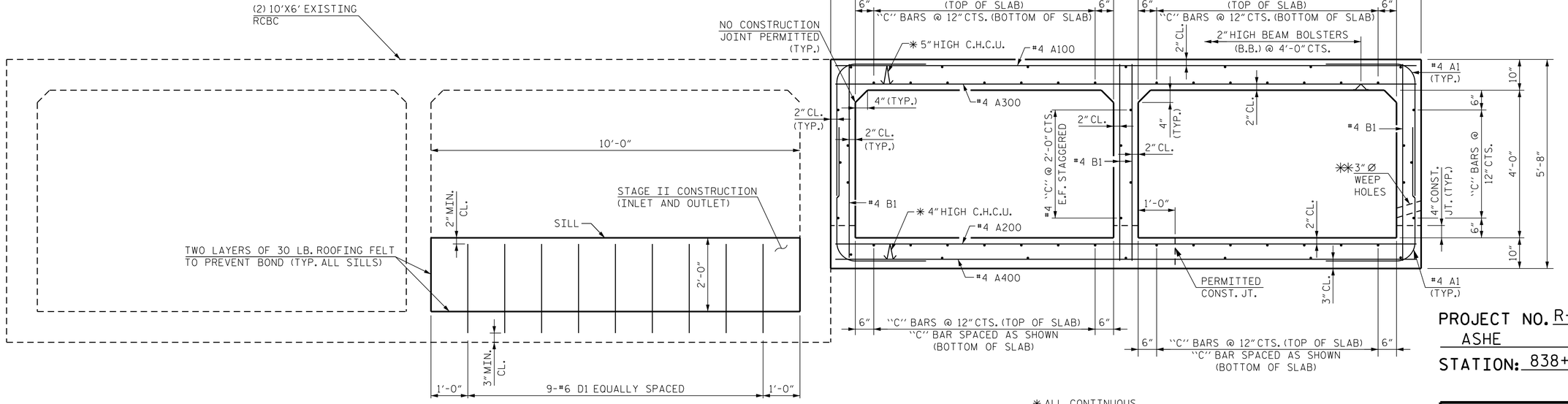
PLAN OF EXISTING CULVERT



SECTION THROUGH SILL

(EXISTING CULVERT)

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS



RIGHT ANGLE SECTION OF BARREL

(LOOKING DOWNSTREAM)
THERE ARE 56 "C'' BARS IN SECTION OF BARREL

✳ ALL CONTINUOUS HIGH CHAIR UPPER (C.H.C.U.) @ 3'-0" CTS.
✳✳ EXTERIOR SIDE ONLY

PROJECT NO. R-2915E
ASHE COUNTY
STATION: 838+56.00 -L-

BRIDGE NO. 513

STATE OF NORTH CAROLINA
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RALEIGH

DOUBLE BARREL

7 FT. X 4 FT.
CONCRETE BOX CULVERT
142°41'6.0" SKEW

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1/10/2020

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

SHEET NO. CU-2
TOTAL SHEETS 11

DRAWN BY : D. C. ROBINSON DATE : JAN 2019
CHECKED BY : A. L. STROUD DATE : JAN 2019
DESIGN ENGINEER OF RECORD : R. V. KEITH DATE : JAN 2019

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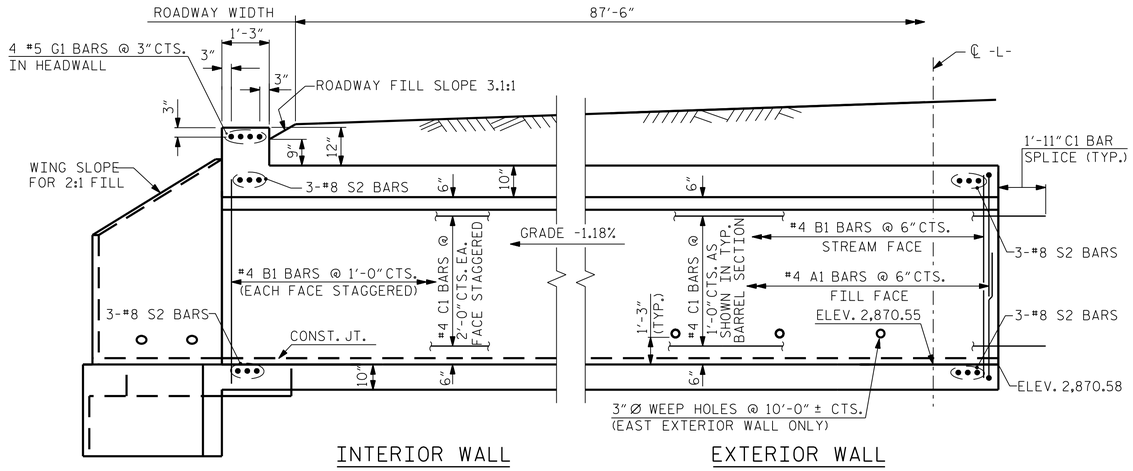
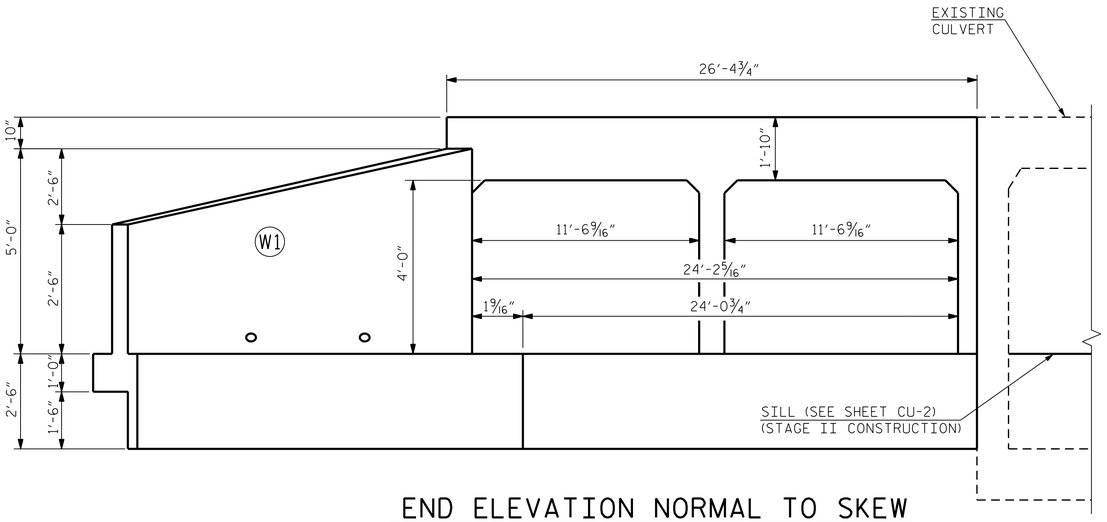
1/10/2020 R:\Structures\DGN\Culverts\R-2915E_531_SD_02_TYP.dgn

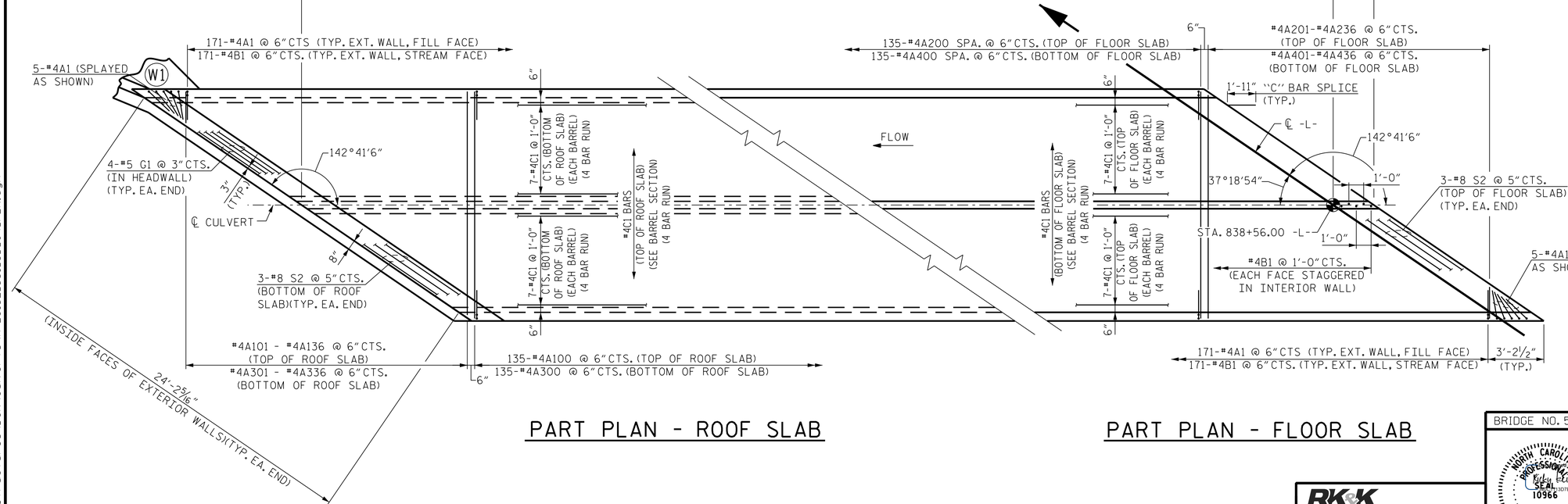


STAGE I CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION NORMAL TO SKEW

LOOKING UPSTREAM AT OUTLET



PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. R-2915E

ASHE COUNTY

STATION: 838+56.00 -L-

SHEET 1 OF 2

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 7 FT. X 4 FT. H CONCRETE BOX CULVERT ROOF AND FLOOR DETAILS STAGE I

BRIDGE NO. 513

NORTH CAROLINA PROFESSIONAL SEAL 30761 ENGINEER RICKY V. KEITH
1/10/2020

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1			3			TOTAL SHEETS
2			4			11

DRAWN BY : D. G. ROBINSON DATE : JAN 2019
CHECKED BY : A. L. STROUD DATE : JAN 2019
DESIGN ENGINEER OF RECORD : R. V. KEITH DATE : JAN 2019

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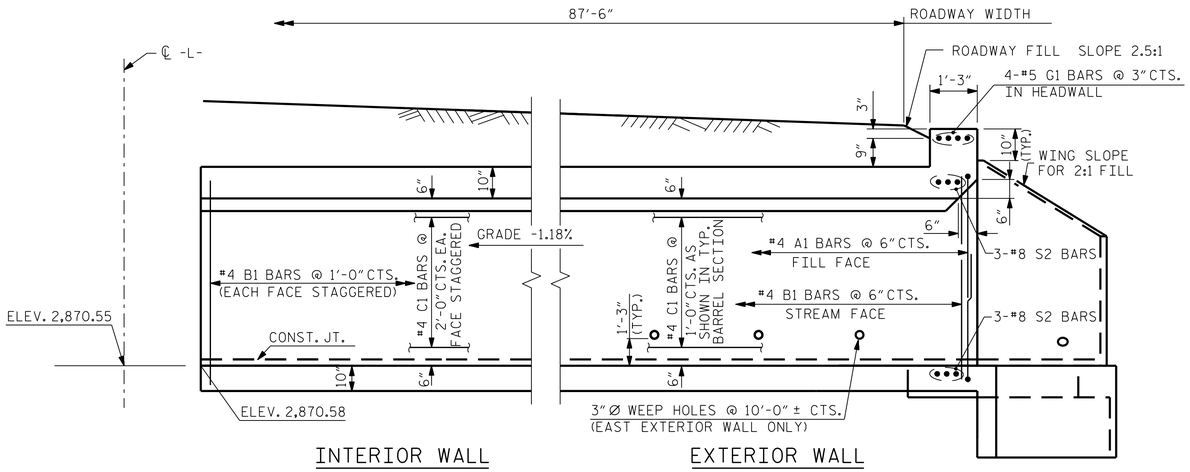
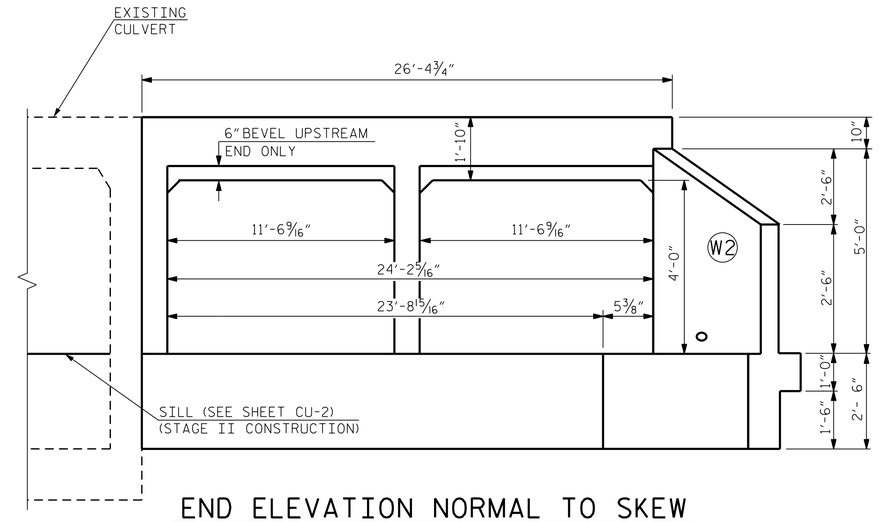
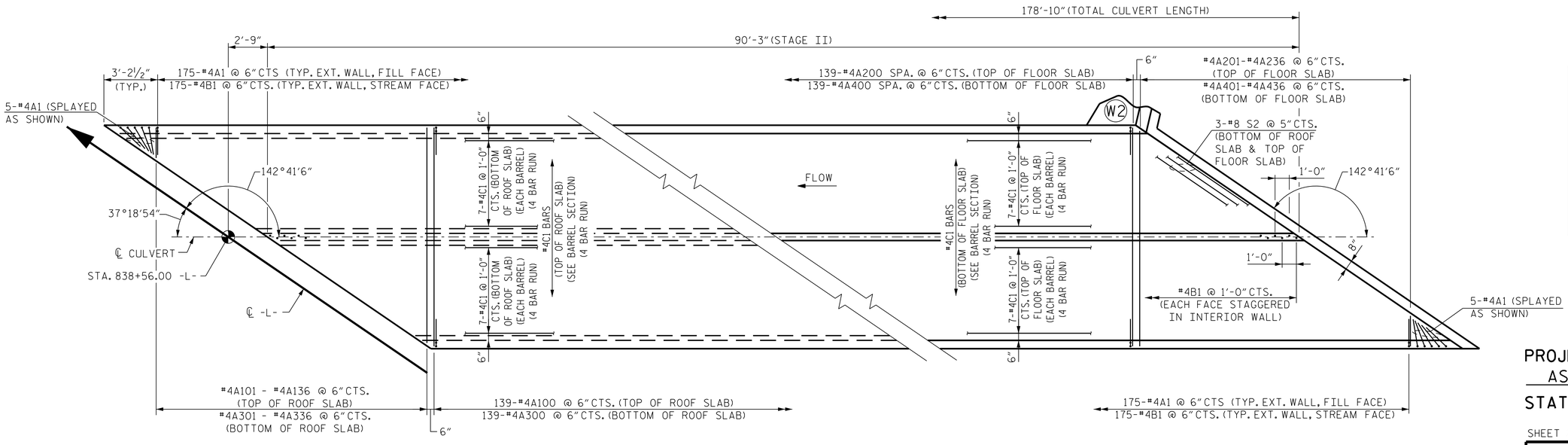


STAGE II CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION NORMAL TO SKEW

LOOKING DOWNSTREAM AT INLET



PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. R-2915E

ASHE COUNTY

STATION: 838+56.00 -L-

SHEET 2 OF 2

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 7 FT. X 4 FT. H CONCRETE BOX CULVERT ROOF AND FLOOR DETAILS STAGE II

BRIDGE NO. 513

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1/10/2020

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1			3			TOTAL SHEETS
2			4			11

DRAWN BY : D. G. ROBINSON DATE : JAN 2019
CHECKED BY : A. L. STROUD DATE : JAN 2019
DESIGN ENGINEER OF RECORD : R. V. KEITH DATE : JAN 2019

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REINFORCING BAR SCHEDULE

STAGE I

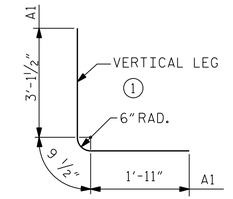
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	704	#4	1	5′-10″	2,743	A217	2	#4	STR.	9′-3″	12	A335	2	#4	STR.	2′-5″	3
A100	135	#4	STR.	15′-8″	1,413	A218	2	#4	STR.	8′-11″	12	A336	2	#4	STR.	2′-0″	3
A101	2	#4	STR.	15′-4″	20	A219	2	#4	STR.	8′-6″	11	A400	135	#4	STR.	15′-8″	1,413
A102	2	#4	STR.	15′-0″	20	A220	2	#4	STR.	8′-1″	11	A401	2	#4	STR.	15′-4″	20
A103	2	#4	STR.	14′-7″	19	A221	2	#4	STR.	7′-9″	10	A402	2	#4	STR.	15′-0″	20
A104	2	#4	STR.	14′-3″	19	A222	2	#4	STR.	7′-4″	10	A403	2	#4	STR.	14′-7″	19
A105	2	#4	STR.	13′-10″	18	A223	2	#4	STR.	7′-0″	9	A404	2	#4	STR.	14′-3″	19
A106	2	#4	STR.	13′-6″	18	A224	2	#4	STR.	6′-7″	9	A405	2	#4	STR.	13′-10″	18
A107	2	#4	STR.	13′-1″	17	A225	2	#4	STR.	6′-3″	8	A406	2	#4	STR.	13′-6″	18
A108	2	#4	STR.	12′-8″	17	A226	2	#4	STR.	5′-10″	8	A407	2	#4	STR.	13′-1″	17
A109	2	#4	STR.	12′-4″	16	A227	2	#4	STR.	5′-5″	7	A408	2	#4	STR.	12′-8″	17
A110	2	#4	STR.	11′-11″	16	A228	2	#4	STR.	5′-1″	7	A409	2	#4	STR.	12′-4″	16
A111	2	#4	STR.	11′-7″	15	A229	2	#4	STR.	4′-8″	6	A410	2	#4	STR.	11′-11″	16
A112	2	#4	STR.	11′-2″	15	A230	2	#4	STR.	4′-4″	6	A411	2	#4	STR.	11′-7″	15
A113	2	#4	STR.	10′-10″	14	A231	2	#4	STR.	3′-11″	5	A412	2	#4	STR.	11′-2″	15
A114	2	#4	STR.	10′-5″	14	A232	2	#4	STR.	3′-7″	5	A413	2	#4	STR.	10′-10″	14
A115	2	#4	STR.	10′-0″	13	A233	2	#4	STR.	3′-2″	4	A414	2	#4	STR.	10′-5″	14
A116	2	#4	STR.	9′-8″	13	A234	2	#4	STR.	2′-9″	4	A415	2	#4	STR.	10′-0″	13
A117	2	#4	STR.	9′-3″	12	A235	2	#4	STR.	2′-5″	3	A416	2	#4	STR.	9′-8″	13
A118	2	#4	STR.	8′-11″	12	A236	2	#4	STR.	2′-0″	3	A417	2	#4	STR.	9′-3″	12
A119	2	#4	STR.	8′-6″	11	A300	135	#4	STR.	15′-8″	1,413	A418	2	#4	STR.	8′-11″	12
A120	2	#4	STR.	8′-1″	11	A301	2	#4	STR.	15′-4″	20	A419	2	#4	STR.	8′-6″	11
A121	2	#4	STR.	7′-9″	10	A302	2	#4	STR.	15′-0″	20	A420	2	#4	STR.	8′-1″	11
A122	2	#4	STR.	7′-4″	10	A303	2	#4	STR.	14′-7″	19	A421	2	#4	STR.	7′-9″	10
A123	2	#4	STR.	7′-0″	9	A304	2	#4	STR.	14′-3″	19	A422	2	#4	STR.	7′-4″	10
A124	2	#4	STR.	6′-7″	9	A305	2	#4	STR.	13′-10″	18	A423	2	#4	STR.	7′-0″	9
A125	2	#4	STR.	6′-3″	8	A306	2	#4	STR.	13′-6″	18	A424	2	#4	STR.	6′-7″	9
A126	2	#4	STR.	5′-10″	8	A307	2	#4	STR.	13′-1″	17	A425	2	#4	STR.	6′-3″	8
A127	2	#4	STR.	5′-5″	7	A308	2	#4	STR.	12′-8″	17	A426	2	#4	STR.	5′-10″	8
A128	2	#4	STR.	5′-1″	7	A309	2	#4	STR.	12′-4″	16	A427	2	#4	STR.	5′-5″	7
A129	2	#4	STR.	4′-8″	6	A310	2	#4	STR.	11′-11″	16	A428	2	#4	STR.	5′-1″	7
A130	2	#4	STR.	4′-4″	6	A311	2	#4	STR.	11′-7″	15	A429	2	#4	STR.	4′-8″	6
A131	2	#4	STR.	3′-11″	5	A312	2	#4	STR.	11′-2″	15	A430	2	#4	STR.	4′-4″	6
A132	2	#4	STR.	3′-7″	5	A313	2	#4	STR.	10′-10″	14	A431	2	#4	STR.	3′-11″	5
A133	2	#4	STR.	3′-2″	4	A314	2	#4	STR.	10′-5″	14	A432	2	#4	STR.	3′-7″	5
A134	2	#4	STR.	2′-9″	4	A315	2	#4	STR.	10′-0″	13	A433	2	#4	STR.	3′-2″	4
A135	2	#4	STR.	2′-5″	3	A316	2	#4	STR.	9′-8″	13	A434	2	#4	STR.	2′-9″	4
A136	2	#4	STR.	2′-0″	3	A317	2	#4	STR.	9′-3″	12	A435	2	#4	STR.	2′-5″	3
A200	135	#4	STR.	15′-8″	1,413	A318	2	#4	STR.	8′-11″	12	A436	2	#4	STR.	2′-0″	3
A201	2	#4	STR.	15′-4″	20	A319	2	#4	STR.	8′-6″	11						
A202	2	#4	STR.	15′-0″	20	A320	2	#4	STR.	8′-1″	11	B1	514	#4	STR.	5′-3″	1,803
A203	2	#4	STR.	14′-7″	19	A321	2	#4	STR.	7′-9″	10						
A204	2	#4	STR.	14′-3″	19	A322	2	#4	STR.	7′-4″	10	C1	224	#4	STR.	24′-0″	3,591
A205	2	#4	STR.	13′-10″	18	A323	2	#4	STR.	7′-0″	9						
A206	2	#4	STR.	13′-6″	18	A324	2	#4	STR.	6′-7″	9	G1	4	#5	STR.	25′-10″	108
A207	2	#4	STR.	13′-1″	17	A325	2	#4	STR.	6′-3″	8						
A208	2	#4	STR.	12′-8″	17	A326	2	#4	STR.	5′-10″	8	S2	12	#8	STR.	25′-10″	828
A209	2	#4	STR.	12′-4″	16	A327	2	#4	STR.	5′-5″	7						
A210	2	#4	STR.	11′-11″	16	A328	2	#4	STR.	5′-1″	7						
A211	2	#4	STR.	11′-7″	15	A329	2	#4	STR.	4′-8″	6						
A212	2	#4	STR.	11′-2″	15	A330	2	#4	STR.	4′-4″	6						
A213	2	#4	STR.	10′-10″	14	A331	2	#4	STR.	3′-11″	5						
A214	2	#4	STR.	10′-5″	14	A332	2	#4	STR.	3′-7″	5						
A215	2	#4	STR.	10′-0″	13	A333	2	#4	STR.	3′-2″	4						
A216	2	#4	STR.	9′-8″	13	A334	2	#4	STR.	2′-9″	4						
												REINFORCING STEEL				16,381 LBS.	

REINFORCING BAR SCHEDULE

STAGE II

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	720	#4	1	5′-10″	2,806	A217	2	#4	STR.	9′-3″	12	A335	2	#4	STR.	2′-5″	3
A100	139	#4	STR.	15′-8″	1,455	A218	2	#4	STR.	8′-11″	12	A336	2	#4	STR.	2′-0″	3
A101	2	#4	STR.	15′-4″	20	A219	2	#4	STR.	8′-6″	11	A400	139	#4	STR.	15′-8″	1,455
A102	2	#4	STR.	15′-0″	20	A220	2	#4	STR.	8′-1″	11	A401	2	#4	STR.	15′-4″	20
A103	2	#4	STR.	14′-7″	19	A221	2	#4	STR.	7′-9″	10	A402	2	#4	STR.	15′-0″	20
A104	2	#4	STR.	14′-3″	19	A222	2	#4	STR.	7′-4″	10	A403	2	#4	STR.	14′-7″	19
A105	2	#4	STR.	13′-10″	18	A223	2	#4	STR.	7′-0″	9	A404	2	#4	STR.	14′-3″	19
A106	2	#4	STR.	13′-6″	18	A224	2	#4	STR.	6′-7″	9	A405	2	#4	STR.	13′-10″	18
A107	2	#4	STR.	13′-1″	17	A225	2	#4	STR.	6′-3″	8	A406	2	#4	STR.	13′-6″	18
A108	2	#4	STR.	12′-8″	17	A226	2	#4	STR.	5′-10″	8	A407	2	#4	STR.	13′-1″	17
A109	2	#4	STR.	12′-4″	16	A227	2	#4	STR.	5′-5″	7	A408	2	#4	STR.	12′-8″	17
A110	2	#4	STR.	11′-11″	16	A228	2	#4	STR.	5′-1″	7	A409	2	#4	STR.	12′-4″	16
A111	2	#4	STR.	11′-7″	15	A229	2	#4	STR.	4′-8″	6	A410	2	#4	STR.	11′-11″	16
A112	2	#4	STR.	11′-2″	15	A230	2	#4	STR.	4′-4″	6	A411	2	#4	STR.	11′-7″	15
A113	2	#4	STR.	10′-10″	14	A231	2	#4	STR.	3′-11″	5	A412	2	#4	STR.	11′-2″	15
A114	2	#4	STR.	10′-5″	14	A232	2	#4	STR.	3′-7″	5	A413	2	#4	STR.	10′-10″	14
A115	2	#4	STR.	10′-0″	13	A233	2	#4	STR.	3′-2″	4	A414	2	#4	STR.	10′-5″	14
A116	2	#4	STR.	9′-8″	13	A234	2	#4	STR.	2′-9″	4	A415	2	#4	STR.	10′-0″	13
A117	2	#4	STR.	9′-3″	12	A235	2	#4	STR.	2′-5″	3	A416	2	#4	STR.	9′-8″	13
A118	2	#4	STR.	8′-11″	12	A236	2	#4	STR.	2′-0″	3	A417	2	#4	STR.	9′-3″	12
A119	2	#4	STR.	8′-6″	11	A300	139	#4	STR.	15′-8″	1,455	A418	2	#4	STR.	8′-11″	12
A120	2	#4	STR.	8′-1″	11	A301	2	#4	STR.	15′-4″	20	A419	2	#4	STR.	8′-6″	11
A121	2	#4	STR.	7′-9″	10	A302	2	#4	STR.	15′-0″	20	A420	2	#4	STR.	8′-1″	11
A122	2	#4	STR.	7′-4″	10	A303	2	#4	STR.	14′-7″	19	A421	2	#4	STR.	7′-9″	10
A123	2	#4	STR.	7′-0″	9	A304	2	#4	STR.	14′-3″	19	A422	2	#4	STR.	7′-4″	10
A124	2	#4	STR.	6′-7″	9	A305	2	#4	STR.	13′-10″	18	A423	2	#4	STR.	7′-0″	9
A125	2	#4	STR.	6′-3″	8	A306	2	#4	STR.	13′-6″	18	A424	2	#4	STR.	6′-7″	9
A126	2	#4	STR.	5′-10″	8	A307	2	#4	STR.	13′-1″	17	A425	2	#4	STR.	6′-3″	8
A127	2	#4	STR.	5′-5″	7	A308	2	#4	STR.	12′-8″	17	A426	2	#4	STR.	5′-10″	8
A128	2	#4	STR.	5′-1″	7	A309	2	#4	STR.	12′-4″	16	A427	2	#4	STR.	5′-5″	7
A129	2	#4	STR.	4′-8″	6	A310	2	#4	STR.	11′-11″	16	A428	2	#4	STR.	5′-1″	7
A130	2	#4	STR.	4′-4″	6	A311	2	#4	STR.	11′-7″	15	A429	2	#4	STR.	4′-8″	6
A131	2	#4	STR.	3′-11″	5	A312	2	#4	STR.	11′-2″	15	A430	2	#4	STR.	4′-4″	6
A132	2	#4	STR.	3′-7″	5	A313	2	#4	STR.	10′-10″	14	A431	2	#4	STR.	3′-11″	5
A133	2	#4	STR.	3′-2″	4	A314	2	#4	STR.	10′-5″	14	A432	2	#4	STR.	3′-7″	5
A134	2	#4	STR.	2′-9″	4	A315	2	#4	STR.	10′-0″	13	A433	2	#4	STR.	3′-2″	4
A135	2	#4	STR.	2′-5″	3	A316	2	#4	STR.	9′-8″	13	A434	2	#4	STR.	2′-9″	4
A136	2	#4	STR.	2′-0″	3	A317	2	#4	STR.	9′-3″	12	A435	2	#4	STR.	2′-5″	3
A200	139	#4	STR.	15′-8″	1,455	A318	2	#4	STR.	8′-11″	12	A436	2	#4	STR.	2′-0″	3
A201	2	#4	STR.	15′-4″	20	A319	2	#4	STR.	8′-6″	11						
A202	2	#4	STR.	15′-0″	20	A320	2	#4	STR.	8′-1″	11	B1	524	#4	STR.	5′-3″	1,838
A203	2	#4	STR.	14′-7″	19	A321	2	#4	STR.	7′-9″	10						
A204	2	#4	STR.	14′-3″	19	A322	2	#4	STR.	7′-4″	10	C1	224	#4	STR.	24′-0″	3,591
A205	2	#4	STR.	13′-10″	18	A323	2	#4	STR.	7′-0″	9						
A206	2	#4	STR.	13′-6″	18	A324	2	#4	STR.	6′-7″	9	G1	4	#5	STR.	25′-10″	108
A207	2	#4	STR.	13′-1″	17	A325	2	#4	STR.	6′-3″	8						
A208	2	#4	STR.	12′-8″	17	A326	2	#4	STR.	5′-10″	8	S2	6	#8	STR.	25′-10″	414
A209	2	#4	STR.	12′-4″	16	A327	2	#4	STR.	5′-5″	7						
A210	2	#4	STR.	11′-11″	16	A328	2	#4	STR.	5′-1″	7						
A211	2	#4	STR.	11′-7″	15	A329	2	#4	STR.	4′-8″	6						
A212	2	#4	STR.	11′-2″	15	A330	2	#4	STR.	4′-4″	6						
A213	2	#4	STR.	10′-10″	14	A331	2	#4	STR.	3′-11″	5						
A214	2	#4	STR.	10′-5″	14	A332	2	#4	STR.	3′-7″	5						
A215	2	#4	STR.	10′-0″	13	A333	2	#4	STR.	3′-2″	4						
A216	2	#4	STR.	9′-8″	13	A334	2	#4	STR.	2′-9″	4						
												REINFORCING STEEL				16,233 LBS.	

BAR TYPE



DIMENSIONS ARE OUT TO OUT

SPLICE LENGTHS

BAR	SIZE	SPLICE LENGTHS
''A''	#4	1′-11″
C1 & C2	#4	1′-11″
B1	#4	1′-11″

PROJECT NO. R-2915E

ASHE COUNTY

STATION: 838+56.00 -L-

BRIDGE NO. 513

RK&K
P: (919) 878-9560
8601 Six Forks Road, Forum 1 Suite 700
Raleigh, North Carolina 27615 | NC License No. F-0112
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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 10966 RICKY V. KEITH

1/10/2020

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE BARREL

7 FT. X 4 FT. CONCRETE BOX CULVERT 142°41′6.0″ SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	CU-5
1			3			TOTAL SHEETS
2			4			11

DRAWN BY : D. G. ROBINSON DATE : JAN 2019
CHECKED BY : A. L. STROUD DATE : JAN 2019
DESIGN ENGINEER OF RECORD : R. V. KEITH DATE : JAN 2019

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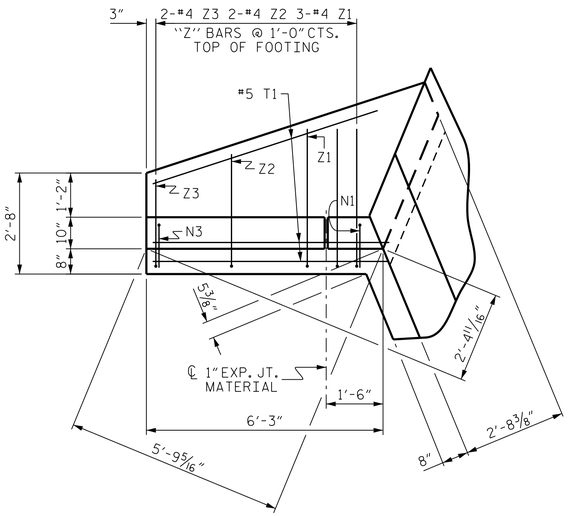
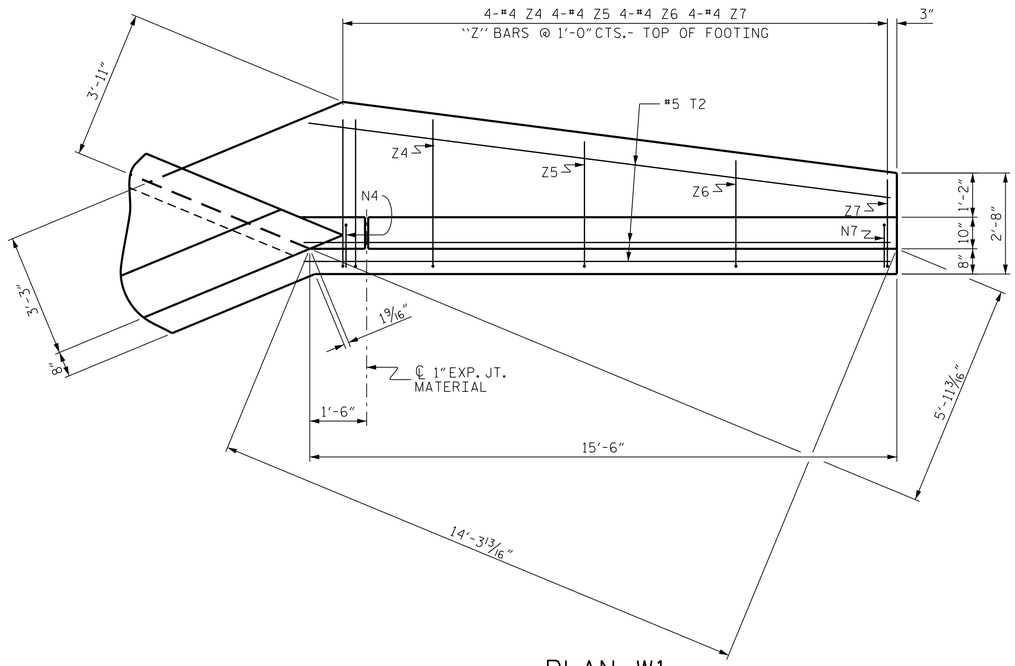
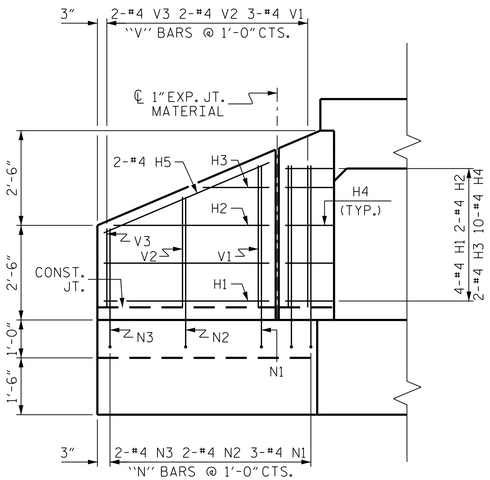


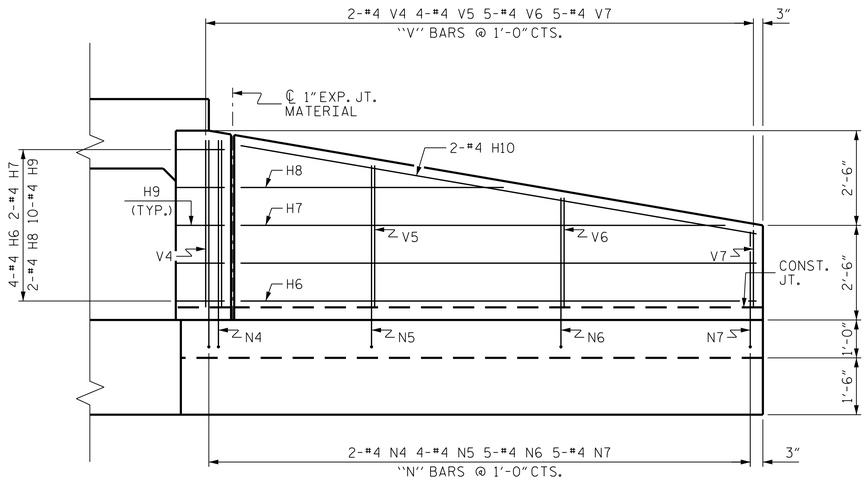
PLAN W2



PLAN W1



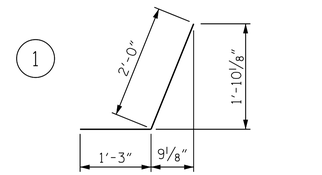
ELEVATION W2

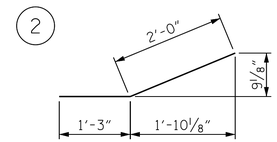


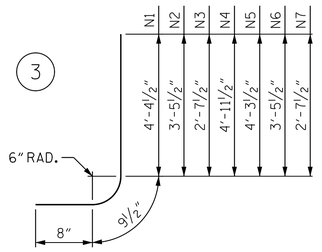
ELEVATION W1

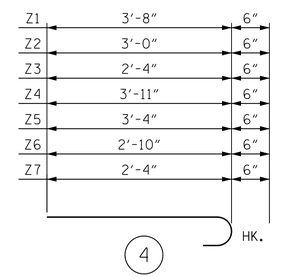
BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.









STAGE I BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H6	4	#4	STR	13'-7"	36
H7	2	#4	STR	12'-9"	17
H8	2	#4	STR	6'-11"	9
H9	10	#4	2	3'-3"	22
H10	2	#4	STR	13'-9"	18
N4	2	#4	3	6'-5"	9
N5	4	#4	3	5'-9"	15
N6	5	#4	3	4'-11"	16
N7	5	#4	3	4'-1"	14
T2	3	#5	STR	15'-6"	48
V4	2	#4	STR	4'-5"	6
V5	4	#4	STR	3'-9"	10
V6	5	#4	STR	2'-10"	9
V7	5	#4	STR	2'-0"	7
Z4	4	#4	4	4'-5"	12
Z5	4	#4	4	3'-10"	10
Z6	4	#4	4	3'-4"	9
Z7	4	#4	4	2'-10"	8

REINFORCING STEEL FOR 1 WING 275 LBS

CLASS A CONCRETE

1 WING	4.7	CY
1 HEADWALL	1.3	CY
1 END CURTAIN WALL	1.6	CY
TOTAL	7.6	CY

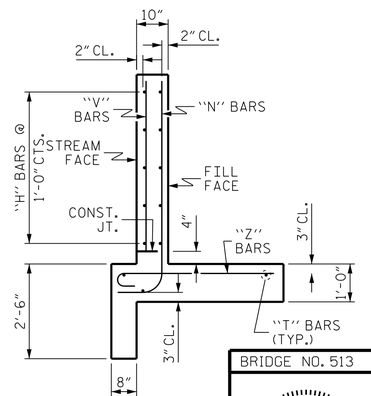
STAGE II BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
D1	18	#6	STR	2'-4"	63
H1	4	#4	STR	4'-4"	12
H2	2	#4	STR	4'-1"	5
H3	2	#4	STR	1'-9"	2
H4	10	#4	1	3'-3"	22
H5	2	#4	STR	4'-9"	6
N1	3	#4	3	5'-10"	12
N2	2	#4	3	4'-11"	7
N3	2	#4	3	4'-1"	5
T1	3	#5	STR	6'-3"	20
V1	3	#4	STR	3'-9"	8
V2	2	#4	STR	2'-11"	4
V3	2	#4	STR	2'-1"	3
Z1	3	#4	4	4'-2"	8
Z2	2	#4	4	3'-6"	5
Z3	2	#4	4	2'-10"	4

REINFORCING STEEL FOR 1 WING AND SILLS 186 LBS

CLASS A CONCRETE

1 WING	1.9	CY
1 HEADWALL	1.2	CY
1 END CURTAIN WALL	1.6	CY
2 SILLS	2.5	CY
TOTAL	7.2	CY



PROJECT NO. R-2915E

ASHE COUNTY

STATION: 838+56.00 -L-

BRIDGE NO. 513

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR CONCRETE BOX CULVERT

H = 4'-0" SLOPE = 2:1

142°41'6" SKEW

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P: (919) 878-9560
8601 Six Forks Road, Forum 1 Suite 700
Raleigh, North Carolina 27615 | NC License No. F-0112
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NORTH CAROLINA PROFESSIONAL SEAL 10966 ENGINEER RICKY V. KEITH — Ricky Keith (3D7EA4C8)

1/10/2020

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

DRAWN BY : D. G. ROBINSON DATE : JAN 2019
CHECKED BY : A. L. STROUD DATE : JAN 2019
DESIGN ENGINEER OF RECORD : R. V. KEITH DATE : JAN 2019

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	CU-6
1			3			TOTAL SHEETS
2			4			11

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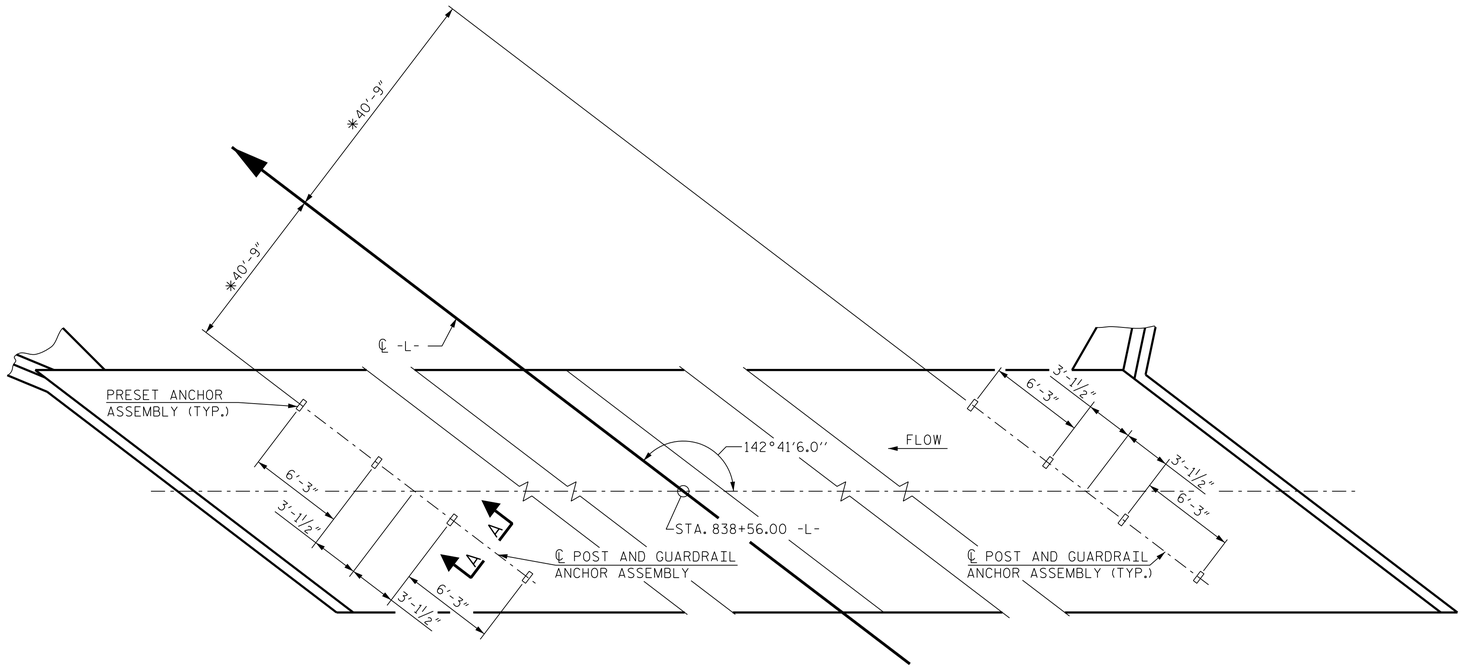
1/10/2020 R:\Structures\DGN\Culverts\R-2915E_531_SD_08_WW.dgn



PLAN OF PROPOSED CULVERT

SHOWING : GUARDRAIL ANCHOR ASSEMBLY SPACING.
* THIS DIMENSION TO BE VERIFIED BY THE ENGINEER.

NOTES

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

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

B. 4 - 1" Ø X 2 ¼" 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 2¼" GALVANIZED BOLTS AND WASHERS. THEY SHALL CONFORM TO OR EXCEED THE MECHANICAL REQUIREMENTS OF ASTM A307. THE USE OF THIS ALTERNATE SHALL BE APPROVED BY THE ENGINEER.)

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

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

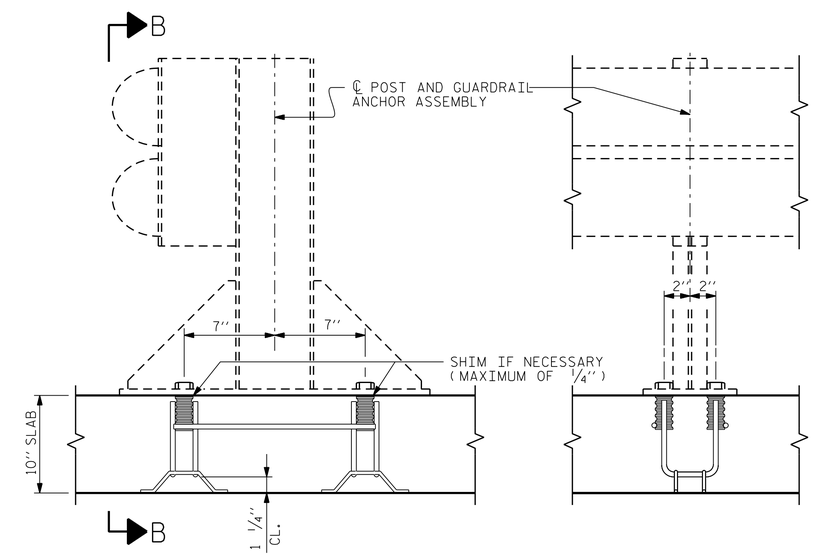
FERRULES TO BE PLUGGED DURING POURING OF SLAB AS RECOMMENDED BY THE MANUFACTURER.

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.

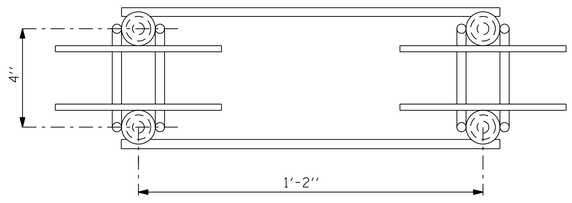
SLAB REINFORCING STEEL MAY BE SHIFTED AS NECESSARY TO CLEAR GUARDRAIL ANCHOR ASSEMBLY. CARE SHOULD BE TAKEN TO KEEP THE SHIFTING OF REINFORCING STEEL TO A MINIMUM.

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.

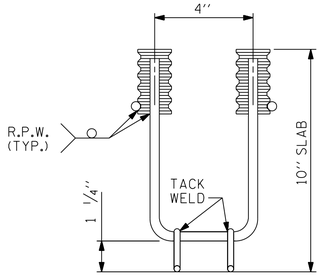


SECTION A-A

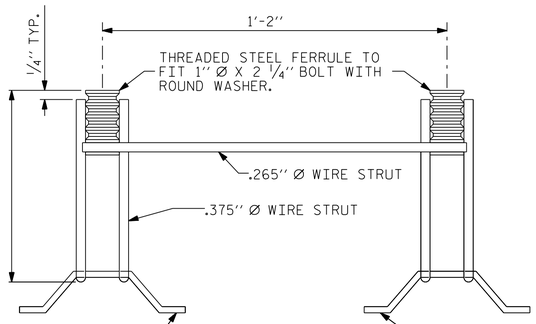
SECTION B-B



PLAN



ELEVATION



THIS SUPPORT SHALL MEET THE REQUIREMENTS AS SPECIFIED FOR SUPPORTS FOR REINFORCING STEEL. SEE SPECIFICATIONS.

SIDE VIEW

GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS

PROJECT NO. R-2915E
ASHE COUNTY
STATION: 838+56.00 -L-

BRIDGE NO. 513

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD
ANCHORAGE DETAILS FOR GUARDRAIL ANCHOR ASSEMBLIES FOR CULVERT

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NORTH CAROLINA PROFESSIONAL SEAL 10966 ENGINEER RICKY V. KEITH
1/10/2020

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	CU-7
1			3			TOTAL SHEETS
2			4			11

DRAWN BY : D. G. ROBINSON DATE : JAN 2019
CHECKED BY : A. L. STROUD DATE : JAN 2019
DESIGN ENGINEER OF RECORD : R. V. KEITH DATE : JAN 2019

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NOTES

ANCHOR BOLTS SHALL BE MADE FROM STEEL MEETING THE REQUIREMENTS OF AASHTO M169, GRADE 12L14 AND SHALL HAVE A MINIMUM LENGTH OF THREADS OF 8".

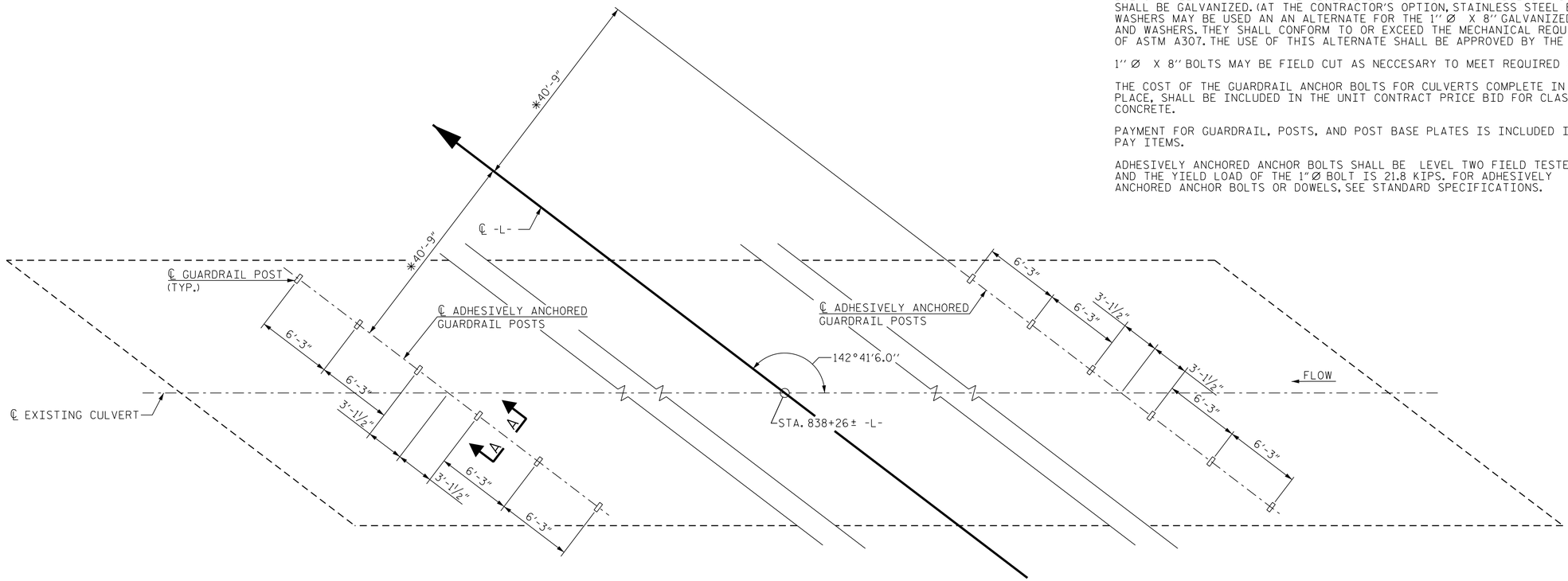
ADHESIVELY ANCHORED ANCHOR BOLTS SHALL BE 1'' Ø X 8'' BOLTS WITH WASHERS. BOLTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A307. BOLTS AND WASHERS SHALL BE GALVANIZED. (AT THE CONTRACTOR'S OPTION, STAINLESS STEEL BOLTS AND WASHERS MAY BE USED AN AN ALTERNATE FOR THE 1'' Ø X 8'' GALVANIZED BOLTS AND WASHERS. THEY SHALL CONFORM TO OR EXCEED THE MECHANICAL REQUIREMENTS OF ASTM A307. THE USE OF THIS ALTERNATE SHALL BE APPROVED BY THE ENGINEER.)

1'' Ø X 8'' BOLTS MAY BE FIELD CUT AS NECCESARY TO MEET REQUIRED CLEARANCES.

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

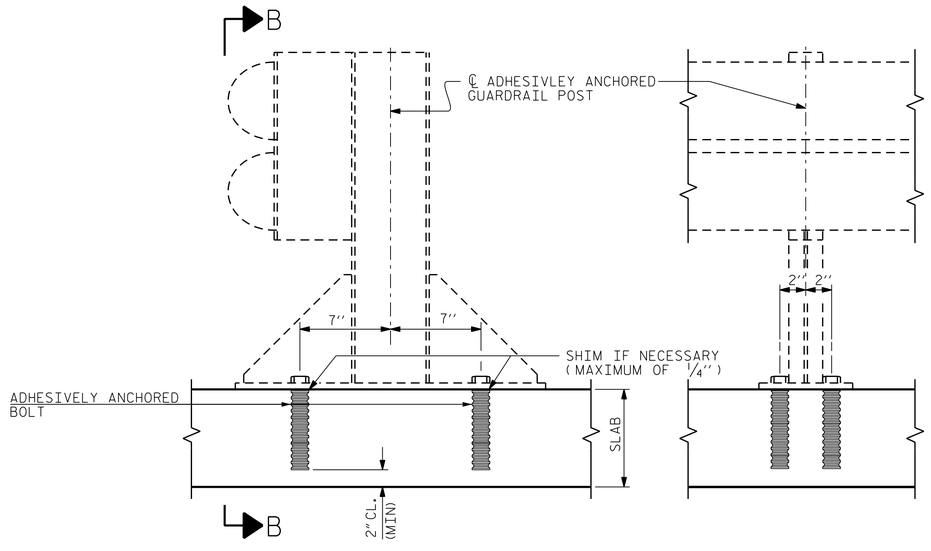
PAYMENT FOR GUARDRAIL, POSTS, AND POST BASE PLATES IS INCLUDED IN ROADWAY PAY ITEMS.

ADHESIVELY ANCHORED ANCHOR BOLTS SHALL BE LEVEL TWO FIELD TESTED, AND THE YIELD LOAD OF THE 1"Ø BOLT IS 21.8 KIPS. FOR ADHESIVELY ANCHORED ANCHOR BOLTS OR DOWELS, SEE STANDARD SPECIFICATIONS.



PLAN OF EXISTING CULVERT

SHOWING : GUARDRAIL POST SPACING.
* THIS DIMENSION TO BE VERIFIED BY THE ENGINEER.



SECTION A-A

SECTION B-B

PROJECT NO. R-2915E
ASHE COUNTY
STATION: 838+56.00 -L-

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1/10/2020

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DETAILS FOR
ADHESIVELY ANCHORED
GUARDRAIL

REVISIONS						SHEET NO.
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1			3			TOTAL SHEETS
2			4			11

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1/10/2020 R:\Structures\DGN\Culverts\R-2915E_531_SD_07_GRAb.dgn

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

LEVEL		VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING (#)	MINIMUM RATING FACTORS (RF)	TONS = W x RF	STRENGTH I LIMIT STATE									COMMENT NUMBER
							LIVE-LOAD FACTORS (γ_{LL})	MOMENT				SHEAR				
								RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING		HL-93 (INVENTORY)	N/A	1	1.57	--	1.75	1.63	2	BOTTOM SLAB	7	1.57	2	TOP SLAB	0.1	
		HL-93 (OPERATING)	N/A		2.04	--	1.35	2.11	2	BOTTOM SLAB	7	2.04	2	TOP SLAB	0.1	
		HS-20 (INVENTORY)	36.000	2	1.89	68	1.75	1.91	2	BOTTOM SLAB	7	1.89	2	TOP SLAB	0.1	
		HS-20 (OPERATING)	36.000		2.45	88	1.35	2.48	2	BOTTOM SLAB	7	2.45	2	TOP SLAB	0.1	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		5.02	67	1.40	5.92	2	BOTTOM SLAB	7	5.02	2	TOP SLAB	0.1	
		SNGARBS2	20.000		4.68	93	1.40	4.98	2	BOTTOM SLAB	7	4.68	2	TOP SLAB	0.1	
		SNAGRIS2	22.000		5.01	110	1.40	5.01	2	BOTTOM SLAB	7	5.01	2	TOP SLAB	0.1	
		SNCOTTS3	27.250		2.83	77	1.40	2.9	2	BOTTOM SLAB	7	2.83	2	TOP SLAB	0.1	
		SNAGGRS4	34.925		2.78	97	1.40	2.97	2	BOTTOM SLAB	7	2.78	1	BOTTOM SLAB	0.1	
		SNS5A	35.550		2.66	94	1.40	2.86	2	BOTTOM SLAB	7	2.66	1	BOTTOM SLAB	0.1	
		SNS6A	39.950		2.51	100	1.40	2.66	2	BOTTOM SLAB	7	2.51	1	BOTTOM SLAB	0.1	
		SNS7B	42.000		2.51	105	1.40	2.66	2	BOTTOM SLAB	7	2.51	1	BOTTOM SLAB	0.1	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		3.43	113	1.40	3.68	2	BOTTOM SLAB	7	3.43	1	BOTTOM SLAB	0.1	
		TNT4A	33.075		3.15	104	1.40	3.15	2	BOTTOM SLAB	7	3.18	1	BOTTOM SLAB	0.1	
		TNT6A	41.600		2.99	124	1.40	3.02	2	BOTTOM SLAB	7	2.99	1	BOTTOM SLAB	0.1	
		TNT7A	42.000		3.08	129	1.40	3.08	2	BOTTOM SLAB	7	3.11	1	BOTTOM SLAB	0.1	
		TNT7B	42.000		2.68	112	1.40	2.8	2	BOTTOM SLAB	7	2.68	1	BOTTOM SLAB	0.1	
		TNAGRIT4	43.000		2.77	119	1.40	2.9	2	BOTTOM SLAB	7	2.77	1	BOTTOM SLAB	0.1	
		TNAGT5A	45.000		2.77	124	1.40	2.89	2	BOTTOM SLAB	7	2.77	1	BOTTOM SLAB	0.1	
		TNAGT5B	45.000	3	2.49	112	1.40	2.7	2	BOTTOM SLAB	7	2.49	1	BOTTOM SLAB	0.1	

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.

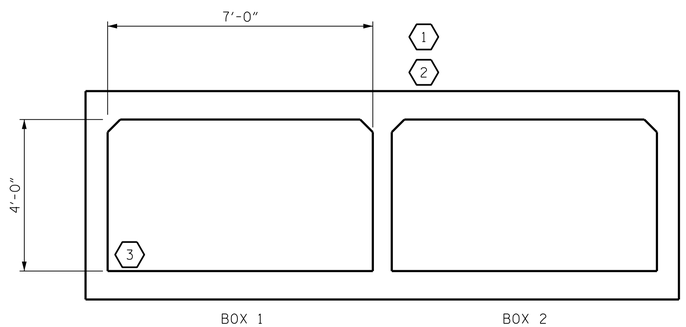
(#) CONTROLLING LOAD RATING

(1) DESIGN LOAD RATING (HL-93)

(2) DESIGN LOAD RATING (HS-20)

(3) LEGAL LOAD RATING **

** SEE CHART FOR VEHICLE TYPE



LRFR SUMMARY

(LOOKING DOWNSTREAM)

PROJECT NO. R-2915E

ASHE COUNTY

STATION: 838+56.00 -L-

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BRIDGE NO. 513

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 10966 RICKY V. KEITH

1/10/2020

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

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

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	CU-9
1			3			TOTAL SHEETS
2			4			11

DRAWN BY : D. G. ROBINSON DATE : JAN 2019
CHECKED BY : A. L. STROUD DATE : JAN 2019
DESIGN ENGINEER OF RECORD : R. V. KEITH DATE : JAN 2019

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1/10/2020
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STANDARD NOTES

DESIGN DATA:

SPECIFICATIONS	A.A.S.H.T.O. (CURRENT)
LIVE LOAD	SEE PLANS
IMPACT ALLOWANCE	SEE A.A.S.H.T.O.
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 A.A.S.H.T.O.
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 2018 "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 5/16" IN THICKNESS AND DO NOT EXCEED A WIDTH EQUAL TO THE FLANGE WIDTH LESS 2" OR A THICKNESS EQUAL TO 2 TIMES THE FLANGE THICKNESS. THE SIZE OF FILLET WELDS SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT ANSI/AASHTO/AWS "BRIDGE WELDING CODE". ELECTROSLAG WELDING WILL NOT BE PERMITTED.

WITH THE SOLE EXCEPTION OF EDGES AT SURFACES WHICH BEAR ON OTHER SURFACES, ALL SHARP EDGES AND ENDS OF SHAPES AND PLATES SHALL BE SLIGHTLY ROUNDED BY SUITABLE MEANS TO A RADIUS OF APPROXIMATELY 1/16 INCH OR EQUIVALENT FLAT SURFACE AT A SUITABLE ANGLE PRIOR TO PAINTING, GALVANIZING, OR METALLIZING.

HANDRAILS AND POSTS:

METAL STANDARDS AND FACES OF THE CONCRETE END POSTS FOR THE METAL RAIL SHALL BE SET NORMAL TO THE GRADE OF THE CURB, UNLESS OTHERWISE SHOWN ON PLANS. THE METAL RAIL AND TOPS OF CONCRETE POSTS USED WITH THE ALUMINUM RAIL SHALL BE BUILT PARALLEL TO THE GRADE OF THE CURB.

METAL HANDRAILS SHALL BE IN ACCORDANCE WITH THE PLANS. RAILS SHALL BE AS MANUFACTURED FOR BRIDGE RAILING. CASTINGS SHALL BE OF A UNIFORM APPEARANCE. FINS AND OTHER DEFORMATIONS RESULTING FROM CASTING OR OTHERWISE SHALL BE REMOVED IN A MANNER SO THAT A UNIFORM COLORING OF THE COMPLETED CASTING SHALL BE OBTAINED. CASTINGS WITH DISCOLORATIONS OR OF NON-UNIFORM COLORING WILL NOT BE ACCEPTED. CERTIFIED MILL REPORTS ARE REQUIRED FOR METAL RAILS AND POSTS.

SPECIAL NOTES:

GENERALLY, IN CASE OF DISCREPANCY, THIS STANDARD SHEET OF NOTES SHALL GOVERN OVER THE SPECIFICATIONS, BUT THE REMAINDER OF THE PLANS SHALL GOVERN OVER NOTES HEREON, AND SPECIAL PROVISIONS SHALL GOVERN OVER ALL. SEE SPECIFICATIONS ARTICLE 105-4.

PROJECT NO. R-2915E

ASHE COUNTY

STATION: 838+56.00 -L-

BRIDGE NO. 513

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

NOTES

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