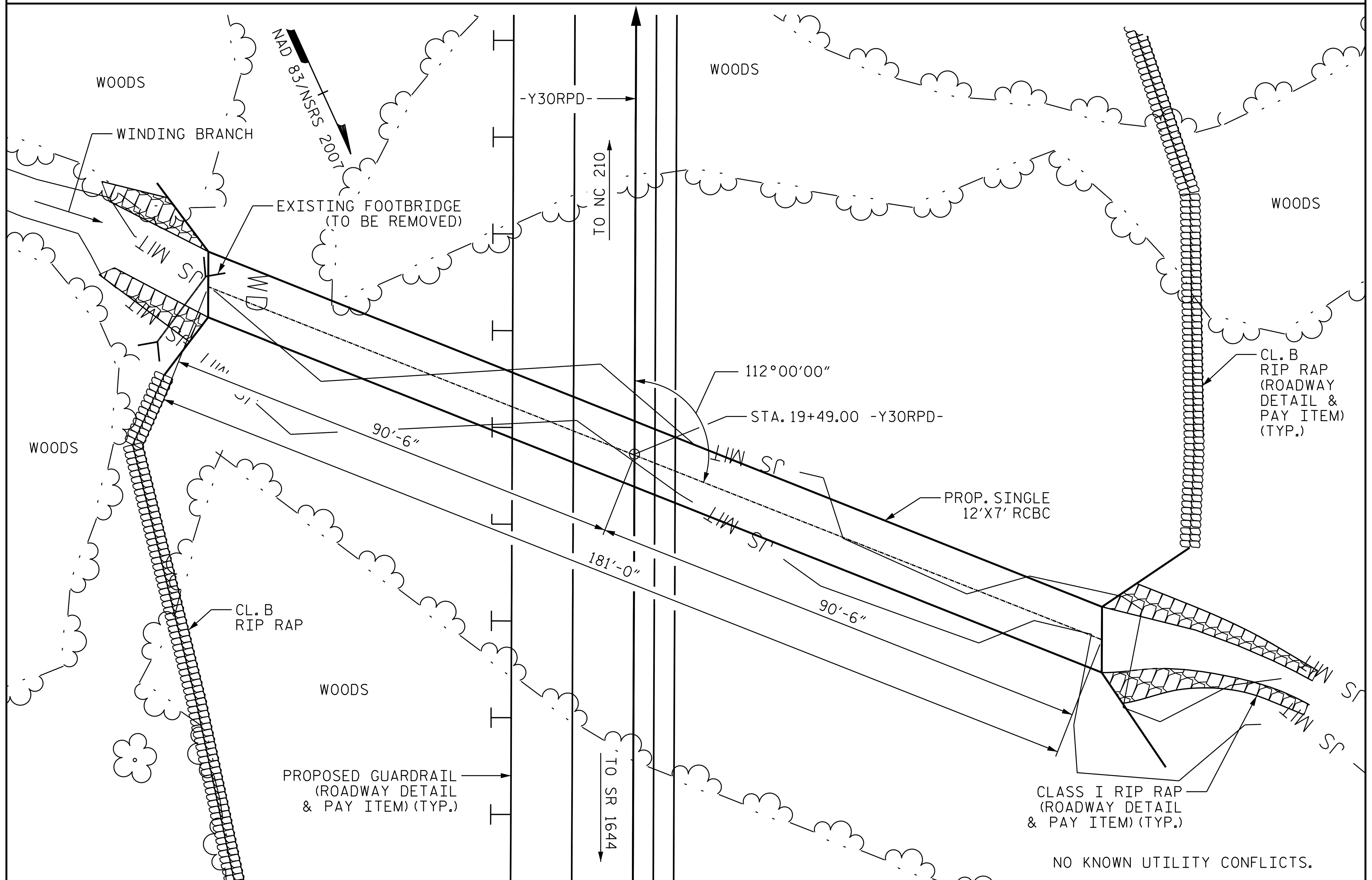
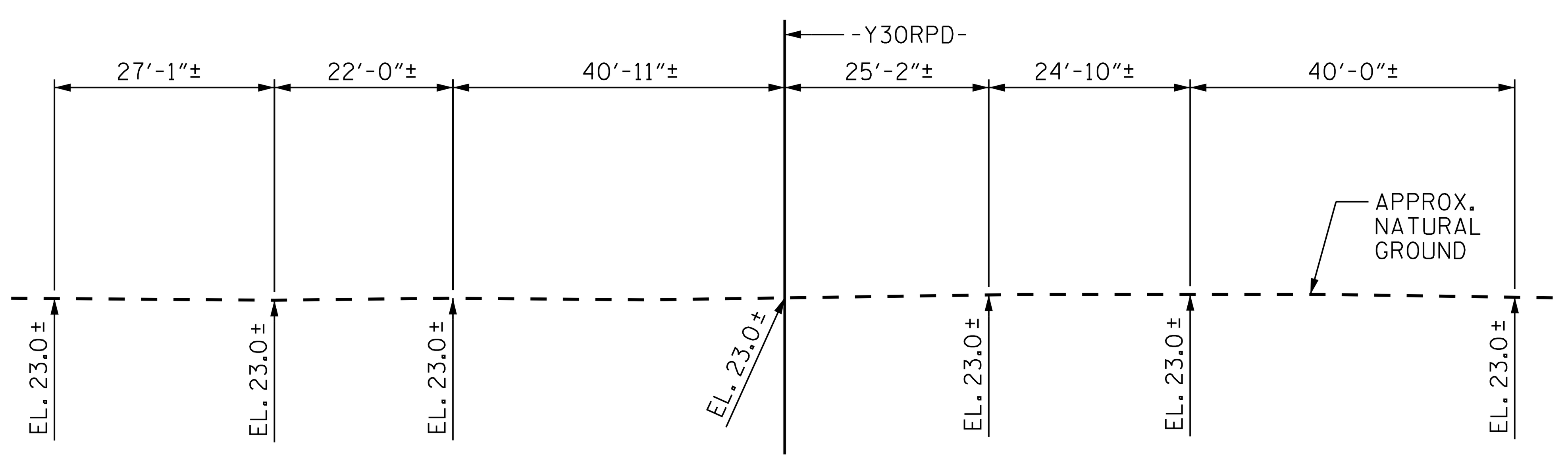
BM #22: R.R. SPIKE IN 10" HICKORY, STA. 17+88.40 -Y3ORPD-, 541.3' RT. EL. 26.37



LOCATION SKETCH



PROFILE ALONG ℄ CULVERT

FOUNDATION NOTES

EXCAVATE FOUNDATION A MINIMUM OF 3.0 FEET BELOW CULVERT BEARING ELEVATION. PLACE 3.0 FEET OF CLASS VI FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH SECTION 414 OF THE STANDARD SPECIFICATIONS.

ENCAPSULATE FOUNDATION CONDITIONING MATERIAL IN TYPE 4 GEOTEXTILE. FOR FOUNDATION CONDITIONING GEOTEXTILE, SEE GEOTECHNICAL SPECIAL PROVISIONS.

NOTES

ASSUMED LIVE LOAD = HL-93.

DESIGN FILL= 21.1 FT. (MAXIMUM) 19.8 FT. (MINIMUM)

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERT TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS, CURTAIN WALLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY THE ROOF SLAB AND HEADWALLS.

THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

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

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

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

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

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

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

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

REMOVAL OF THE EXISTING FOOT BRIDGE SHALL BE PERFORMED IN A MANNER THAT PREVENTS DEBRIS FROM FALLING INTO THE WATER. THE CONTRACTOR SHALL SUBMIT DEMOLITION PLANS FOR REVIEW AND REMOVE THE BRIDGE IN ACCORDANCE WITH ARTICLE 402-2 OF THE STANDARD SPECIFICATIONS.

FOR ASBESTOS ASSESSMENT FOR FOOT BRIDGE DEMOLITION AND RENOVATION ACTIVITIES, SEE SPECIAL PROVISIONS.

TOTAL STRUCTURE QUANTITIES

REMOVAL OF EXISTING STRUCTURE	LUMP SUM
CULVERT EXCAVATION	LUMP SUM
ASBESTOS ASSESSMENT	LUMP SUM
FOUNDATION COND. MATERIAL	664 TONS
FOUNDATION COND. GEOTEXTILE	1,040 S.Y.
CLASS A CONCRETE	
BARREL @ 1.667 CY/FT	301.7 C.Y.
WINGS ETC.	39.0 C.Y.
TOTAL	340.7 C.Y.
REINFORCING STEEL	
BARREL	52,737 LBS.
WINGS ETC.	2,499 LBS.
TOTAL	55,236 LBS.

HYDRAULIC DATA

DESIGN DISCHARGE	=	370 C.F.S.
FREQUENCY OF DESIGN FLOOD	=	50 YR.
DESIGN HIGH WATER ELEVATION	=	28.70
DRAINAGE AREA	=	0.43 SQ. MI.
BASE DISCHARGE (Q100)	=	420 C.F.S.
BASE HIGH WATER ELEVATION	=	29.20

ROADWAY DATA

GRADE POINT EL. @ STATION 19+49.00 -Y3ORPD-	=	49.36
BED ELEV. @ STATION 19+49.00 -Y3ORPD-	=	22.11
ROADWAY SLOPES	=	3:1 (LT.) 4:1 (RT.)

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	=	1500 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	=	500+ YRS.
OVERTOPPING FLOOD ELEVATION	=	41.20

OVERTOPS ROADWAY AT STATION 14+95.0 -Y3ORPD- RT.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 19+49.00 -Y3ORPD-

SHEET 1 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 12 FT. X 7 FT. CONCRETE BOX CULVERT

112°00'00" SKEW

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL — MELINDA B. ISENHOUR
10/26/2021

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SHEET NO. C08-01

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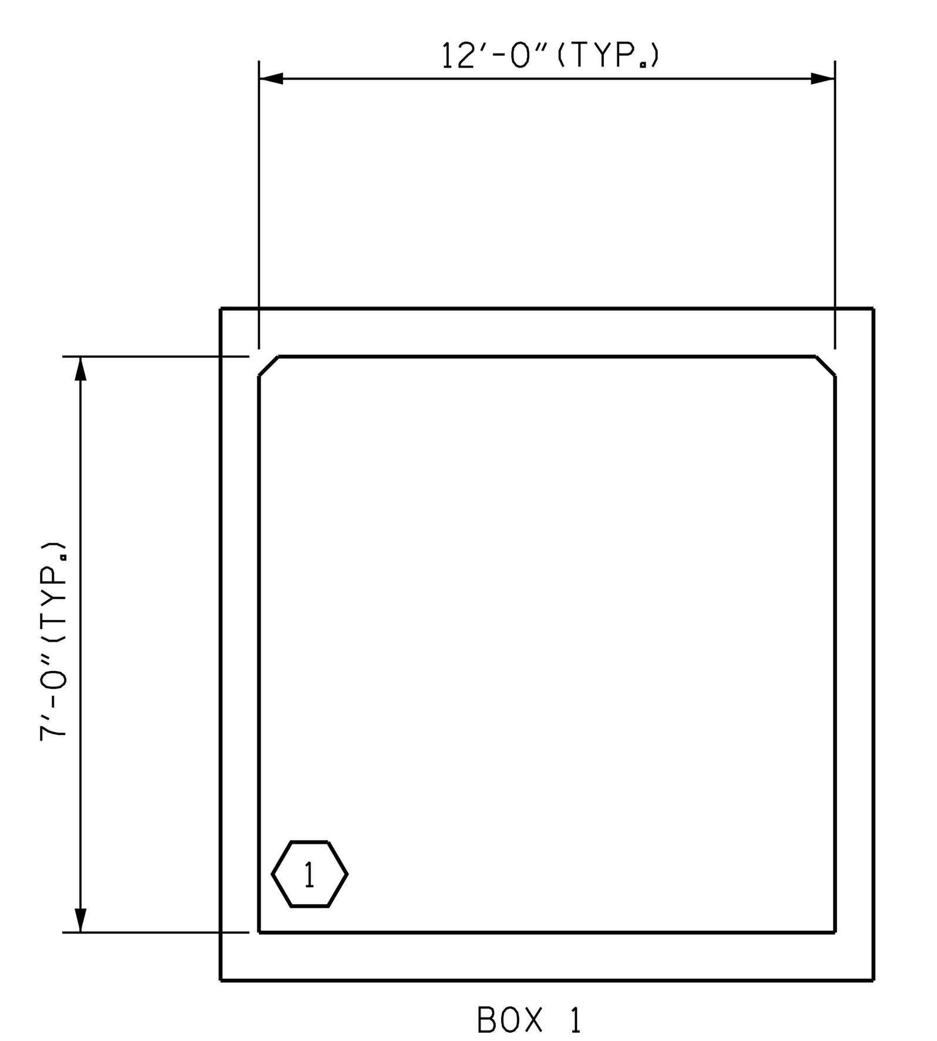
LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

			STRENGTH I LIMIT STATE							
			MOMENT				SHEAR			
	CONTROLLING LOAD RATING	MINIMUM RATING FACTOR (RF)	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)
PERMANENT LOAD RATING	(1)	1.17	1.30	1	BOTT. SLAB (MID) - INSIDE	6.67	1.17	1	LEFT END - BOTT. SLAB	0.00



LRFR SUMMARY
(LOOKING DOWNSTREAM)

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

THE EFFECTS OF LIVE LOAD ON DESIGN AND LOAD RATING MAY BE NEGLECTED FOR CULVERTS WITH CERTAIN FILL DEPTHS DESCRIBED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

CULVERTS WITH NEGLIGIBLE LIVE LOAD SHOULD BE LOAD RATED FOR PERMANENT LOADS ONLY IN ACCORDANCE WITH THE AASHTO MANUAL FOR BRIDGE EVALUATION.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 19+49.00 -Y30RPD-

SHEET 2 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

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

NORTH CAROLINA PROFESSIONAL SEAL 030430 ENGINEER MELINDA B. ISENHOUR
10/25/2021

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TOTAL SHEETS 07

STD. NO. LRFR7

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ASSEMBLED BY : N. D'AIUTO DATE : 2/10/20
CHECKED BY : T.N.ENNIS DATE : 2/19/20

DRAWN BY : BNB 6/19
CHECKED BY : THC 6/19

DESIGN ENGINEER OF RECORD: M.B. ISENHOUR DATE : 10/25/21

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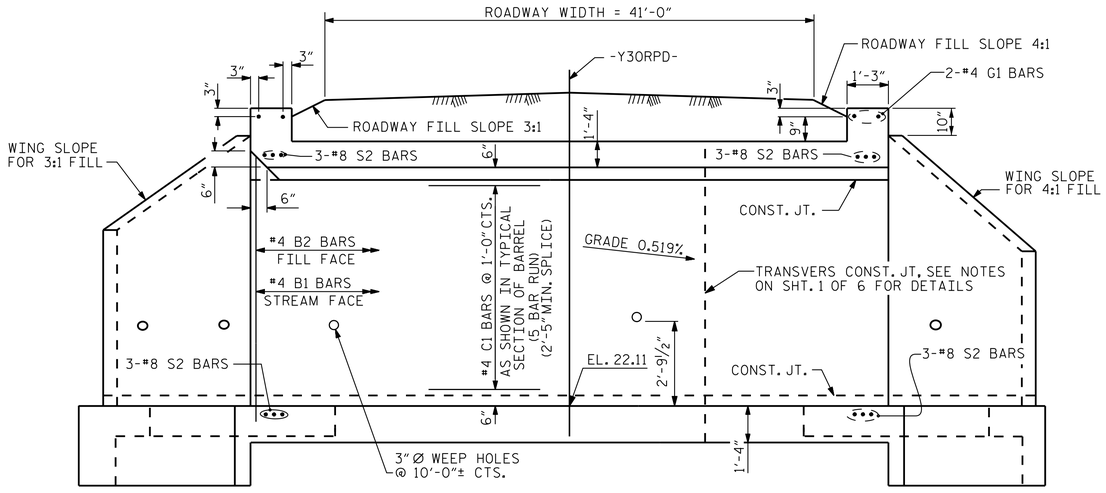
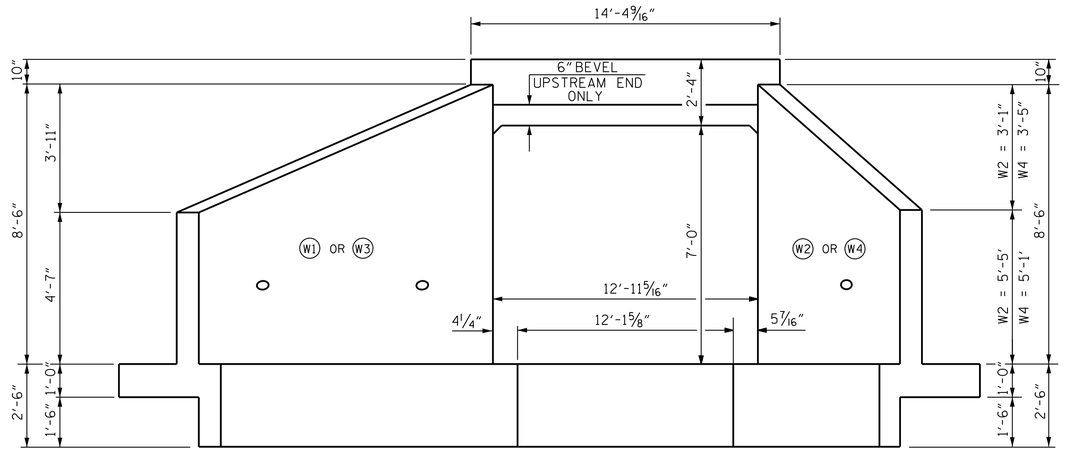
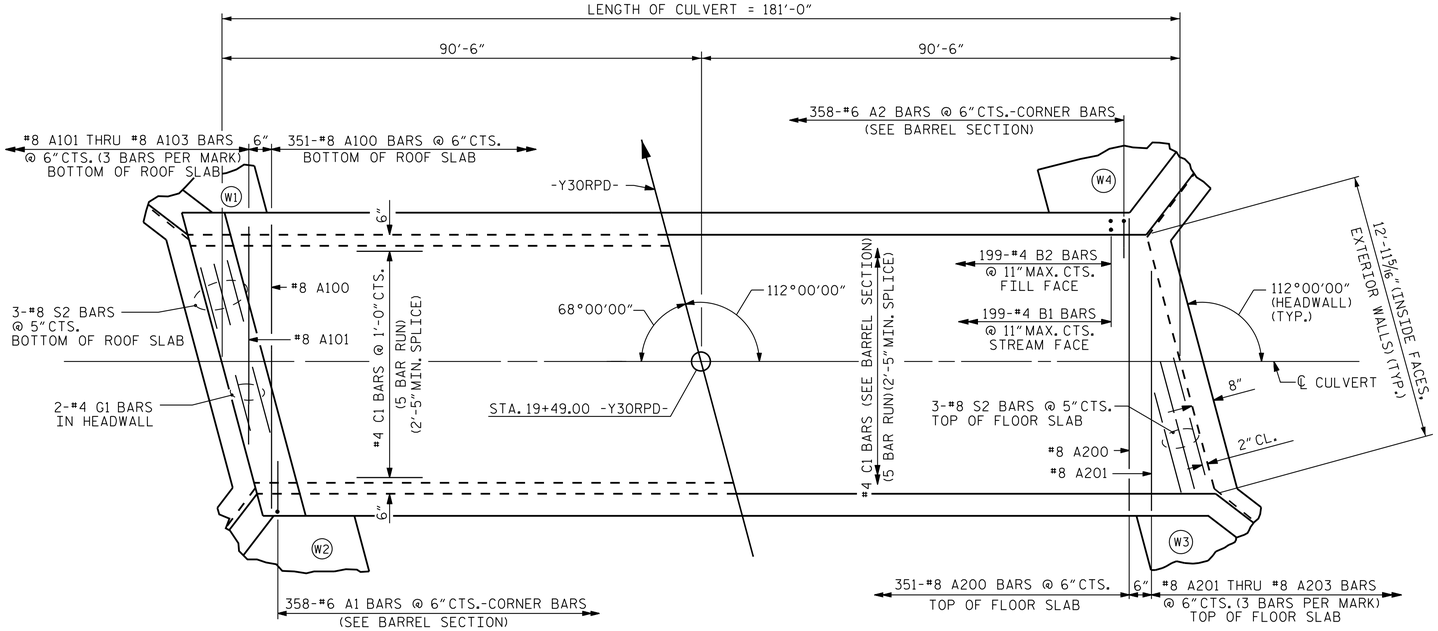


CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION NORMAL TO SKEW

(LOOKING DOWNSTREAM)

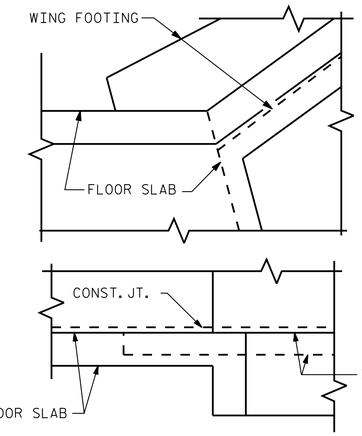


PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

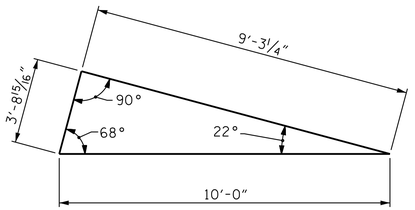
TRANSVERSE CONST. JTS. NOT SHOWN FOR CLARITY.
SEE SHEET 1 OF 6 FOR ADDITIONAL INFORMATION.

FOR #4 F1 BARS, SEE BARREL SECTION.



DETAIL

CONNECTION OF WING FOOTING AND FLOOR SLAB WHEN SLAB IS THICKER THAN FOOTING



SKEW TRIANGLE

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 19+49.00 -Y30RPD-

SHEET 3 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 12 FT. X 7 FT.
CONCRETE BOX CULVERT

112°00'00" SKEW

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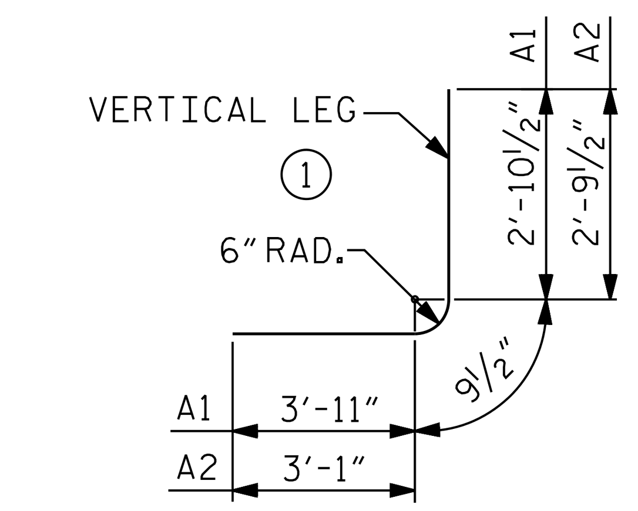
BAR TYPE



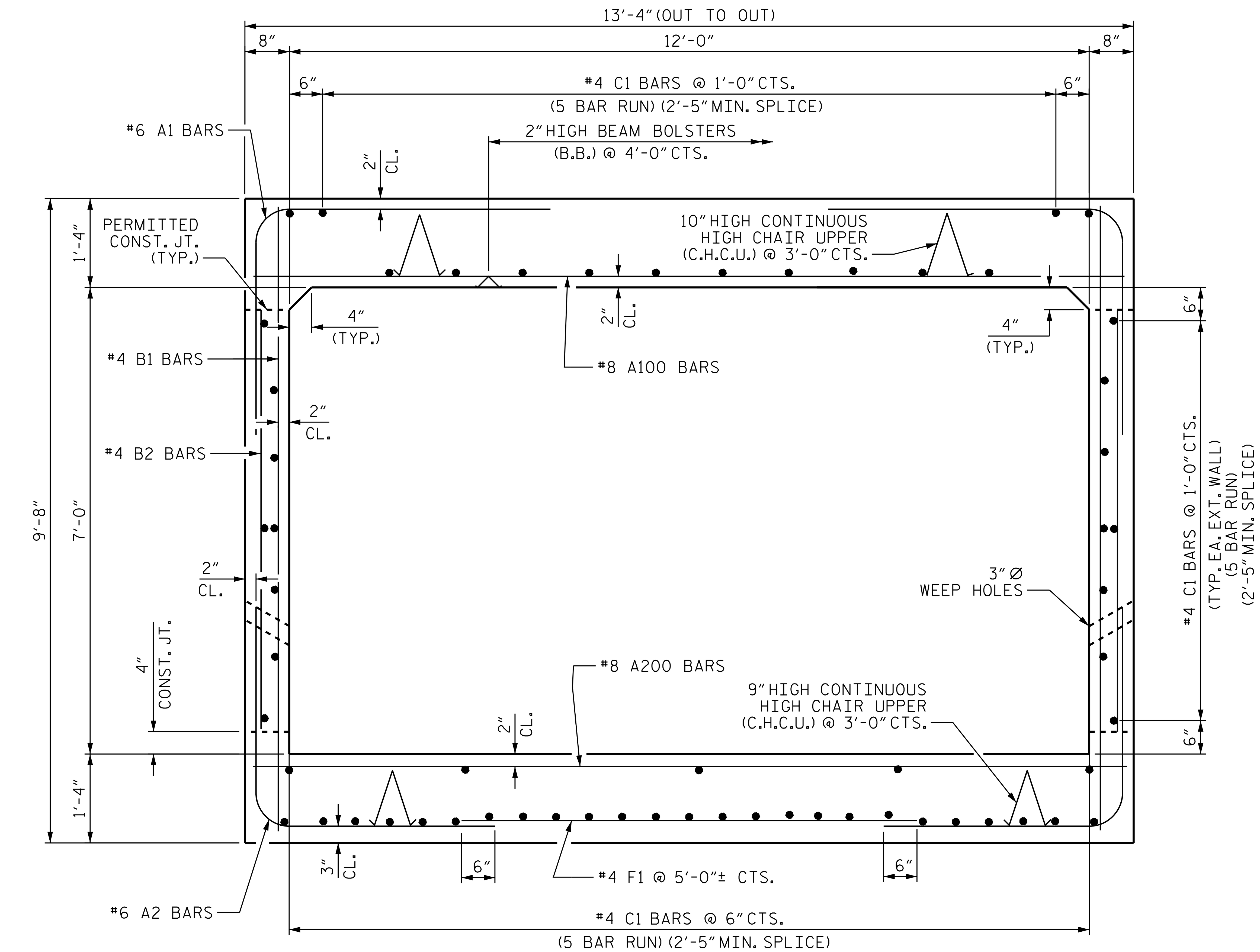
BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	716	#6	1	7'-7"	8156
A2	716	#6	1	6'-8"	7170
A100	351	#8	STR	13'-0"	12184
A101	6	#8	STR	9'-9"	157
A102	6	#8	STR	6'-0"	97
A103	6	#8	STR	2'-4"	38
A200	351	#8	STR	13'-0"	12184
A201	6	#8	STR	9'-9"	157
A202	6	#8	STR	6'-0"	97
A203	6	#8	STR	2'-4"	38
B1	398	#4	STR	9'-4"	2482
B2	398	#4	STR	6'-4"	1684
C1	300	#4	STR	38'-1"	7632
F1	38	#4	STR	6'-10"	174
G1	4	#4	STR	14'-0"	38
S2	12	#8	STR	14'-0"	449
REINFORCING STEEL					52,737 LBS.

SPLICE CHART

BAR	SIZE	SPLICE LENGTH
B1,B2	#4	1'-10"
C1	#4	2'-5"



RIGHT ANGLE SECTION OF BARREL

THERE ARE 60 C1 BARS IN SECTION OF BARREL

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 19+49.00 -Y3ORPD-

SHEET 4 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 12 FT. X 7 FT.
CONCRETE BOX CULVERT

112°00'00" SKEW

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NORTH CAROLINA PROFESSIONAL SEAL ENGINEER — MALINDA B. ISENHOUR
10/25/2021

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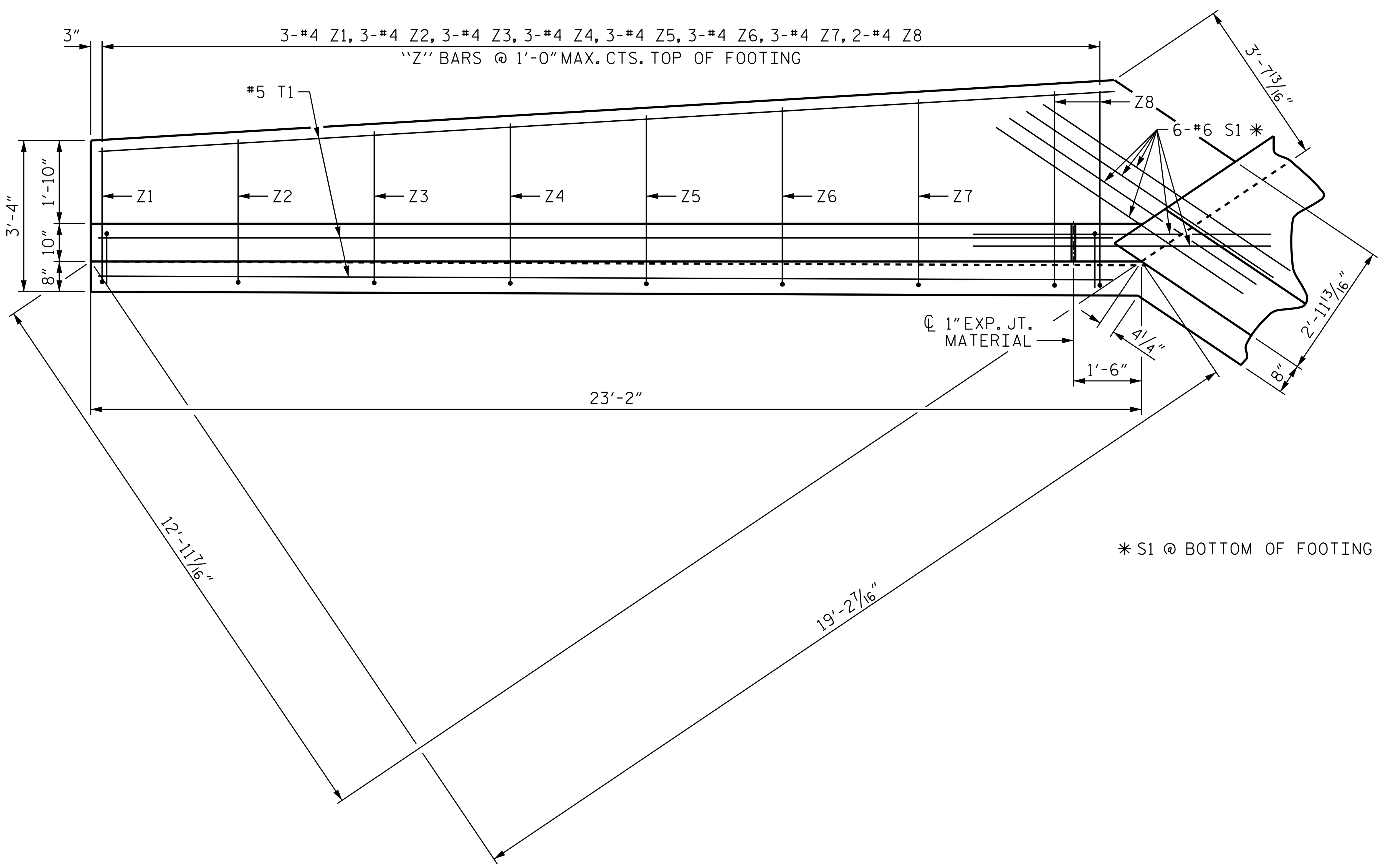
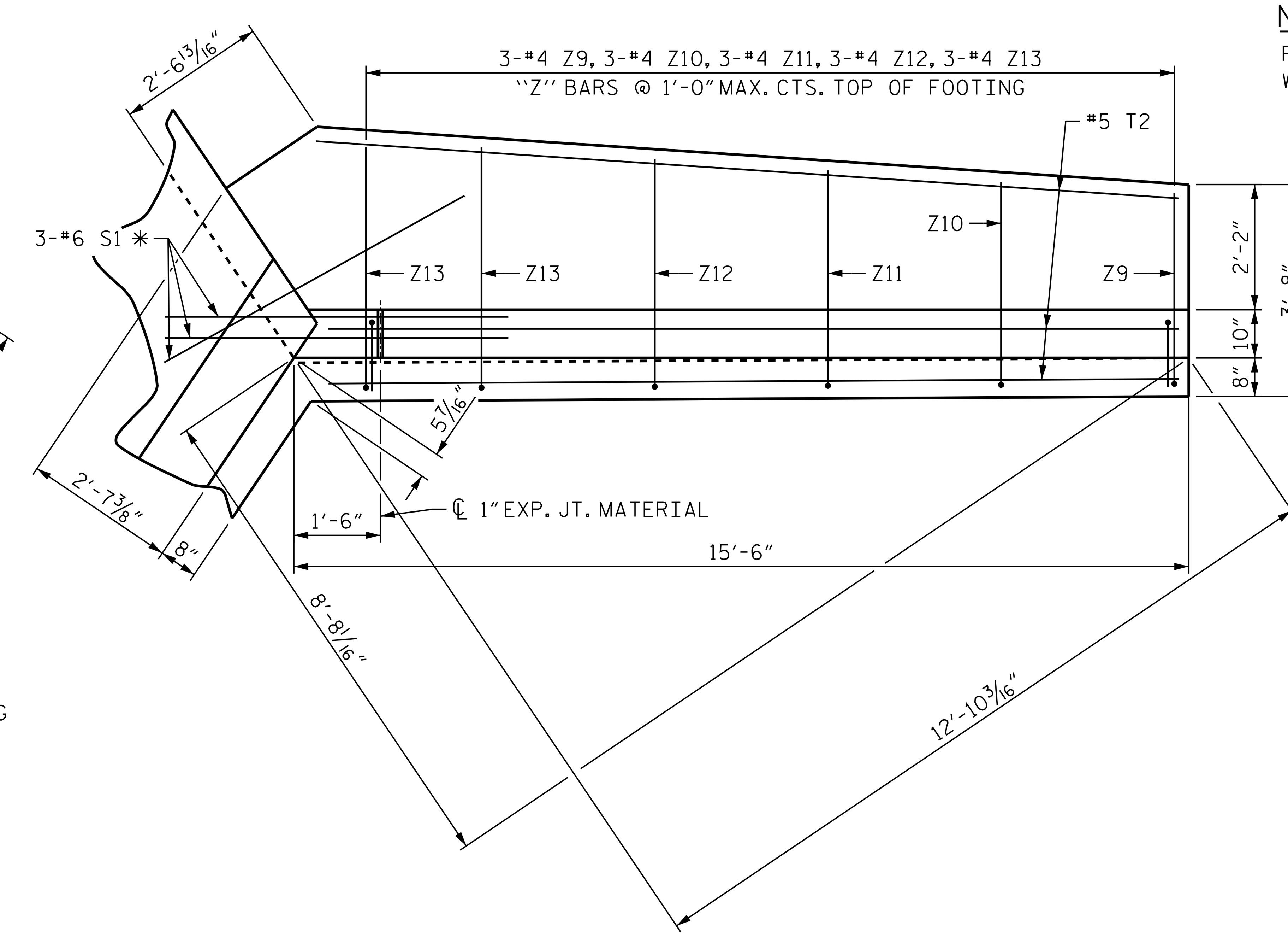
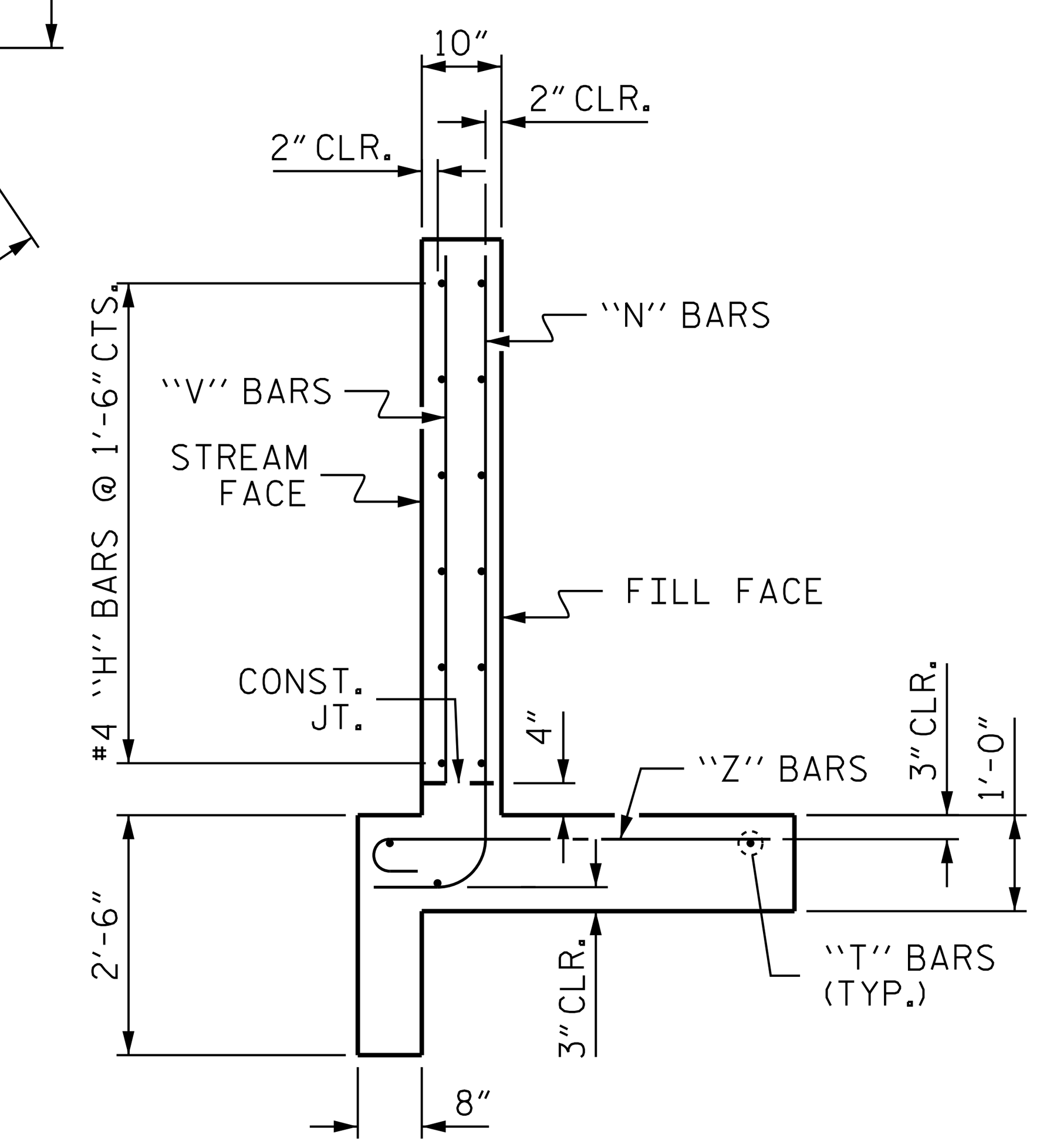
NOTES:
FOR REINFORCING SCHEDULE, SEE SHEET C08-07.
WEEP HOLES NOT SHOWN FOR CLARITY.



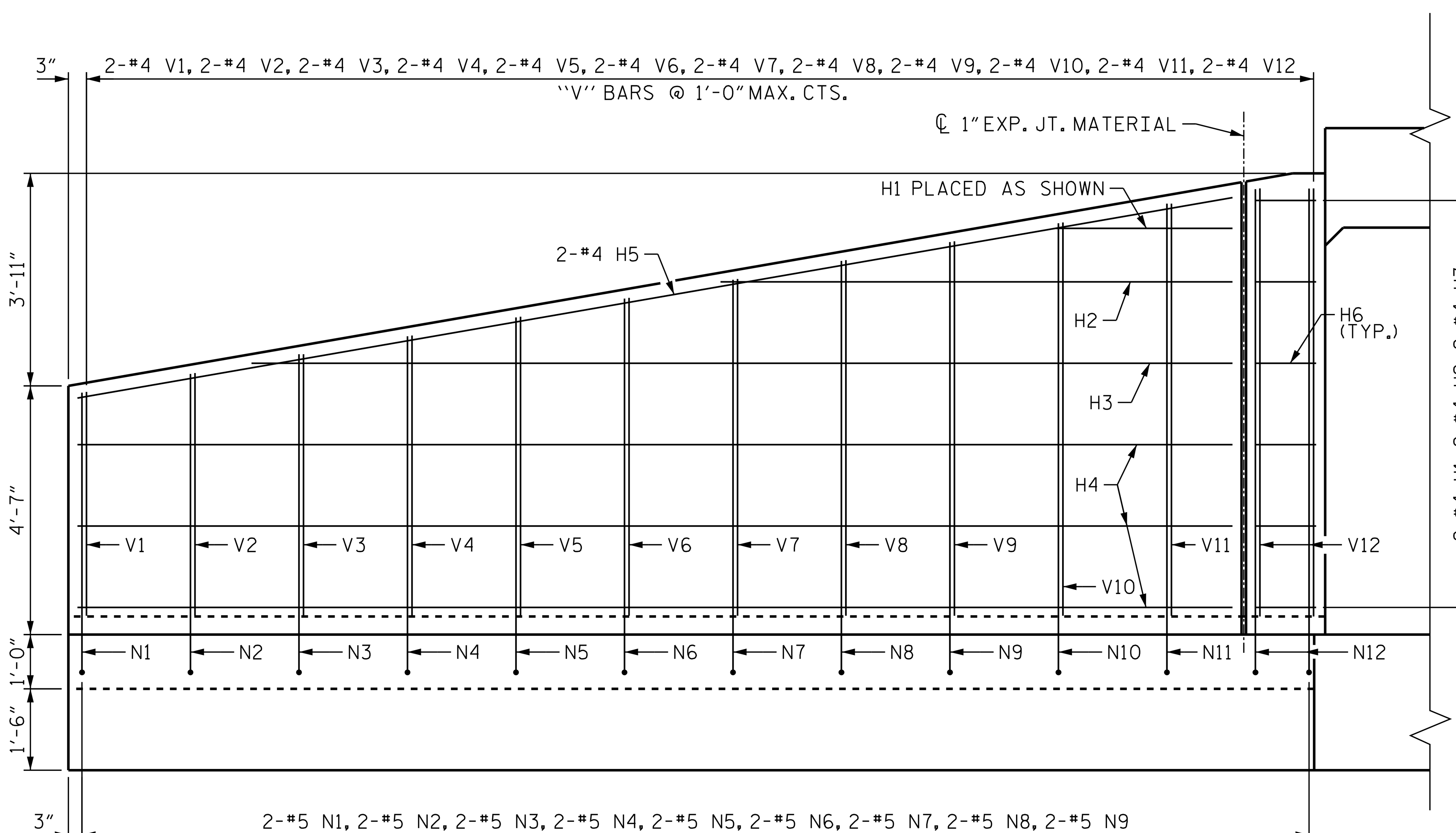
PLAN W1



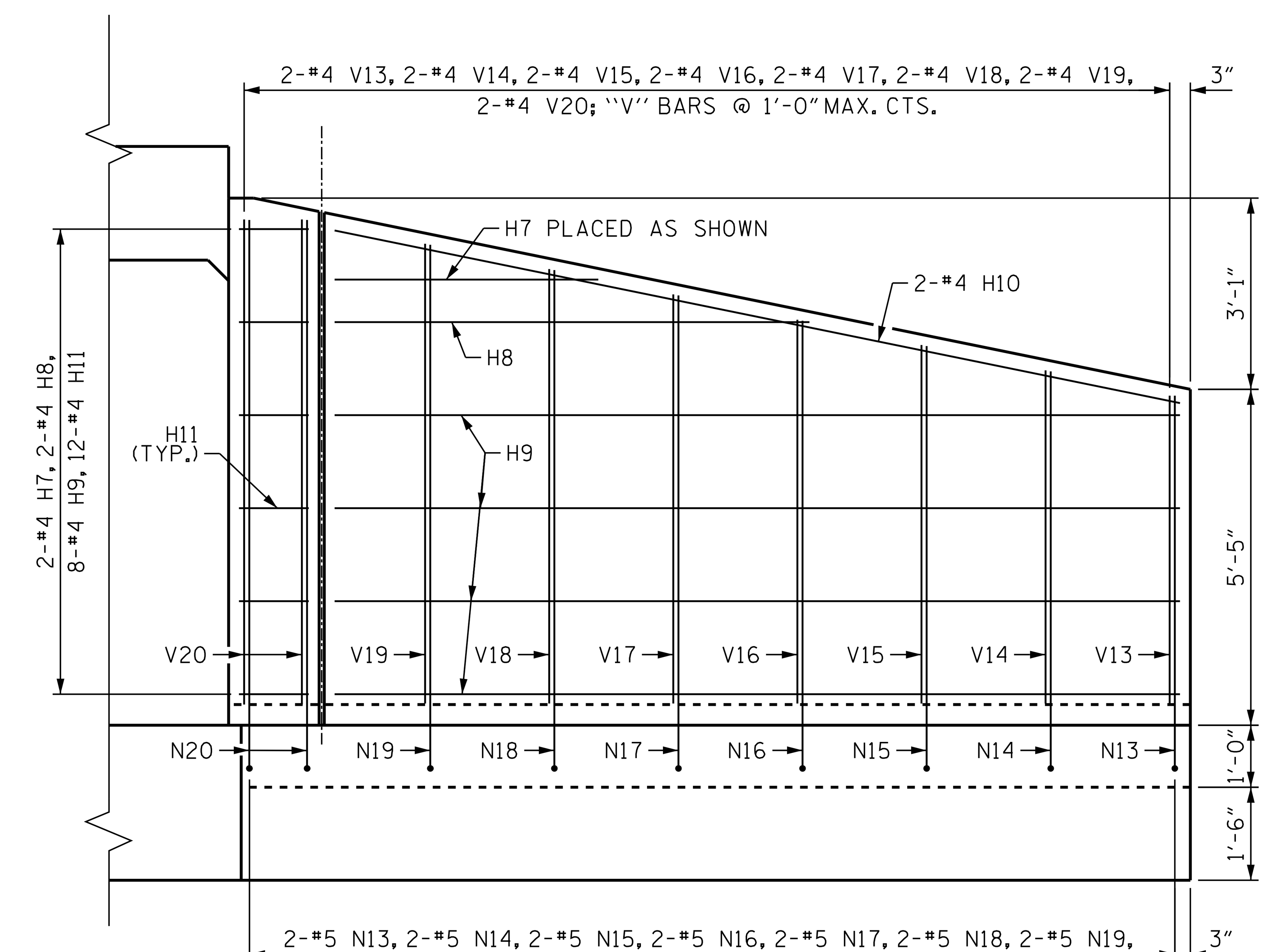
PLAN W2



TYPICAL WING SECTION



ELEVATION W1



ELEVATION W2

PROJECT NO. R-3300B
PENDER COUNTY
STATION: 19+49.00 -Y3ORPD-

SHEET 5 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR
CONCRETE BOX CULVERT
H= 7'-0" SLOPE= 3:1 (LT.)

112°00'00" SKEW

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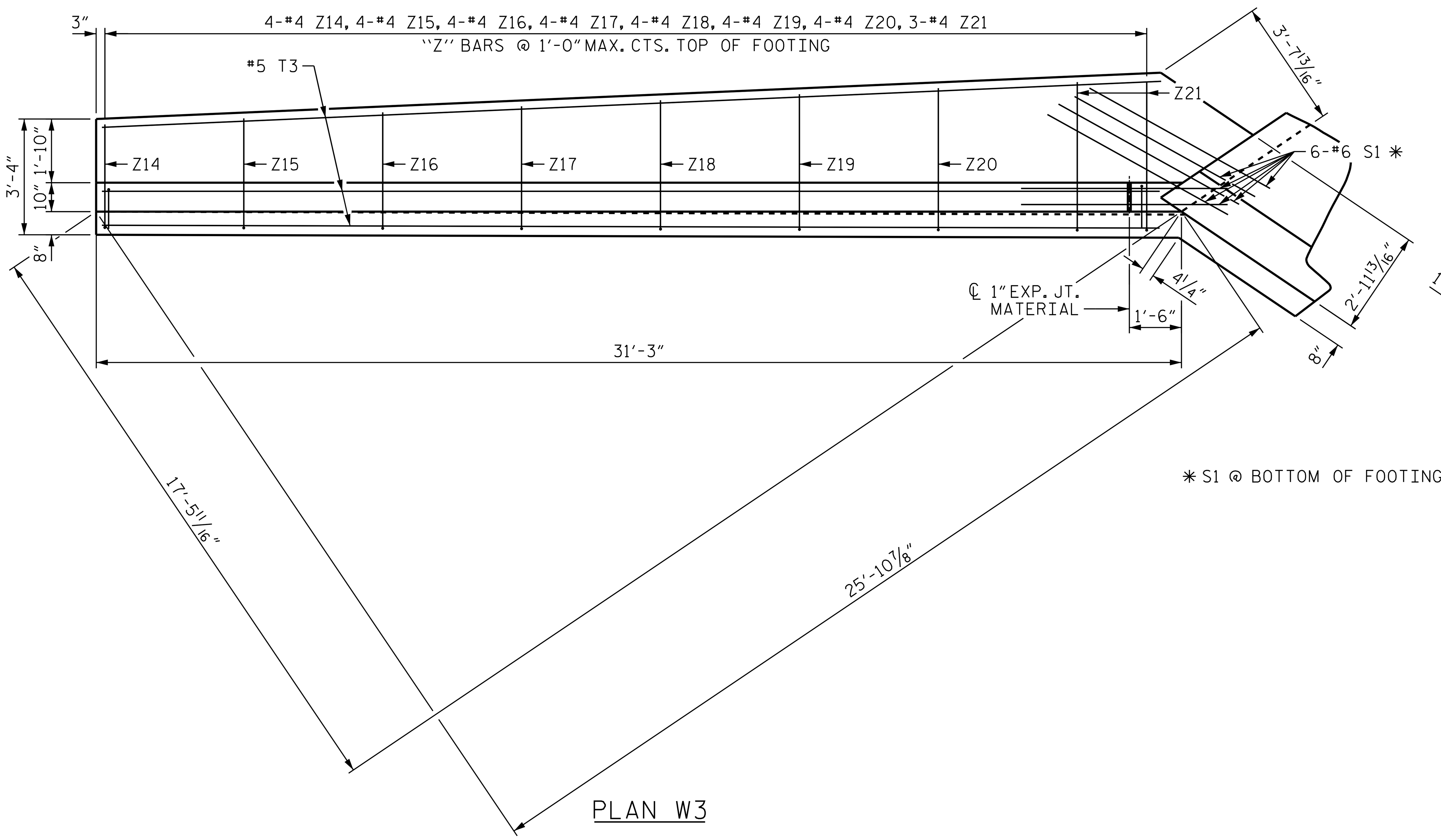
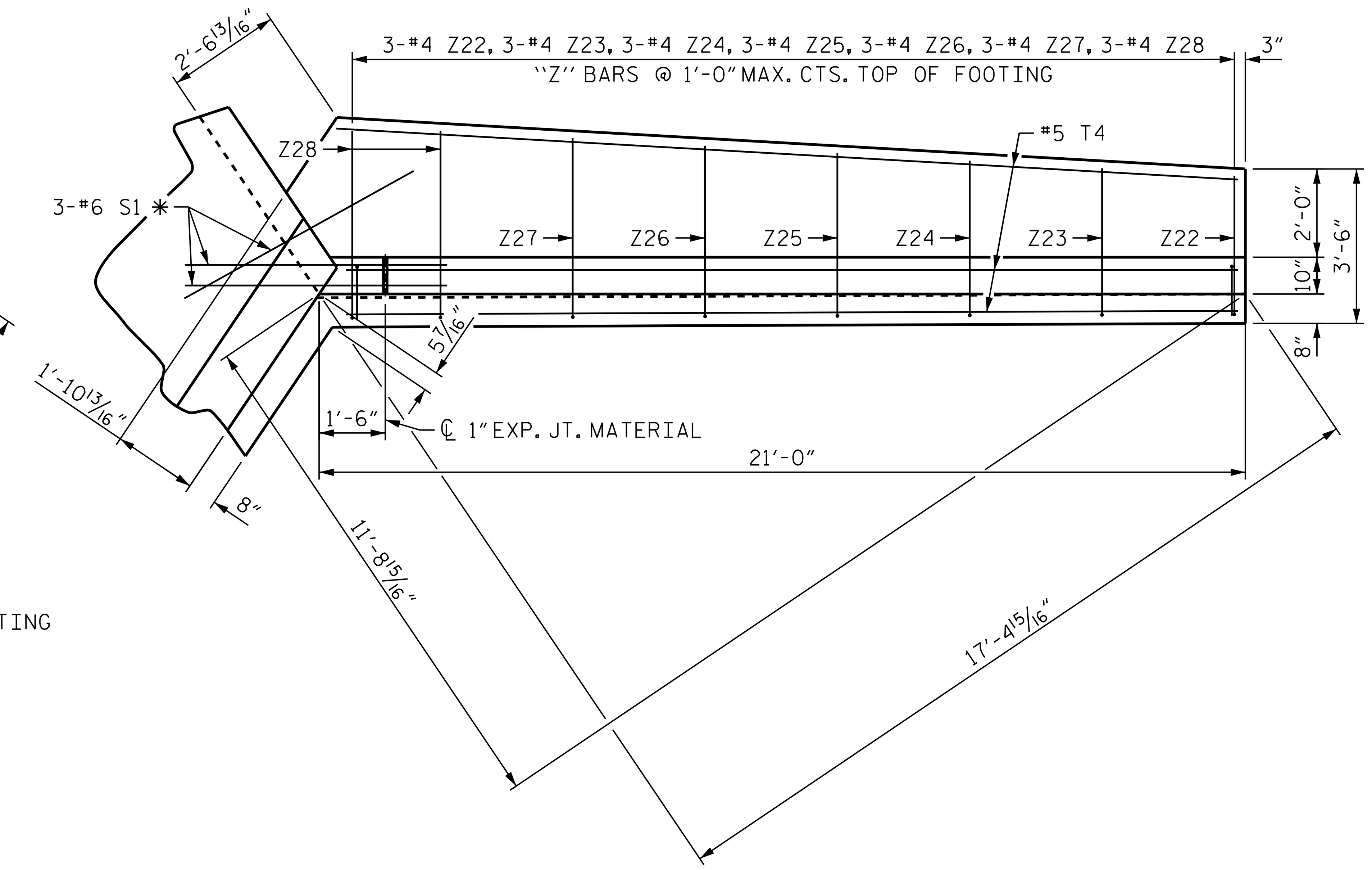
NOTES:

FOR TYPICAL WING SECTION, SEE SHEET C08-05.
FOR REINFORCEMENT SCHEDULE, SEE SHEET C08-07.
WEEP HOLES NOT SHOWN FOR CLARITY.

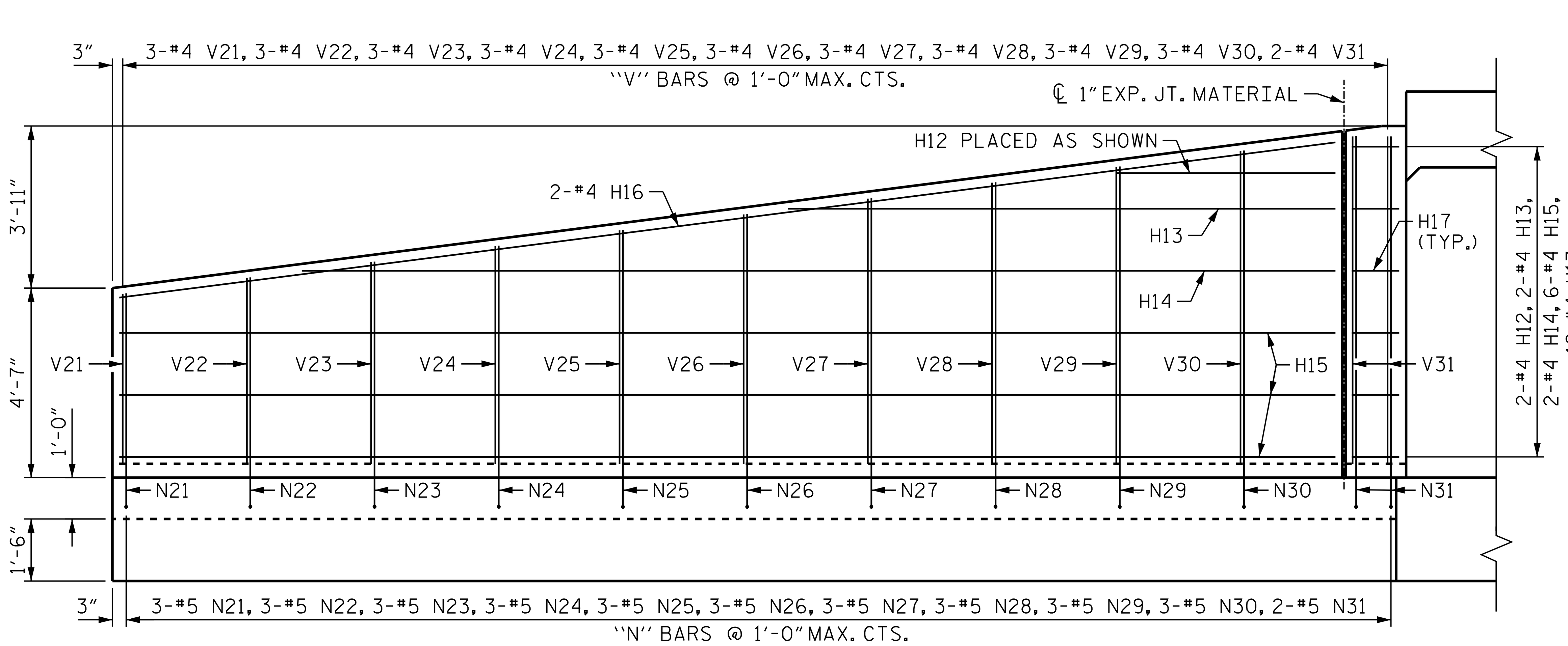


PLAN W3

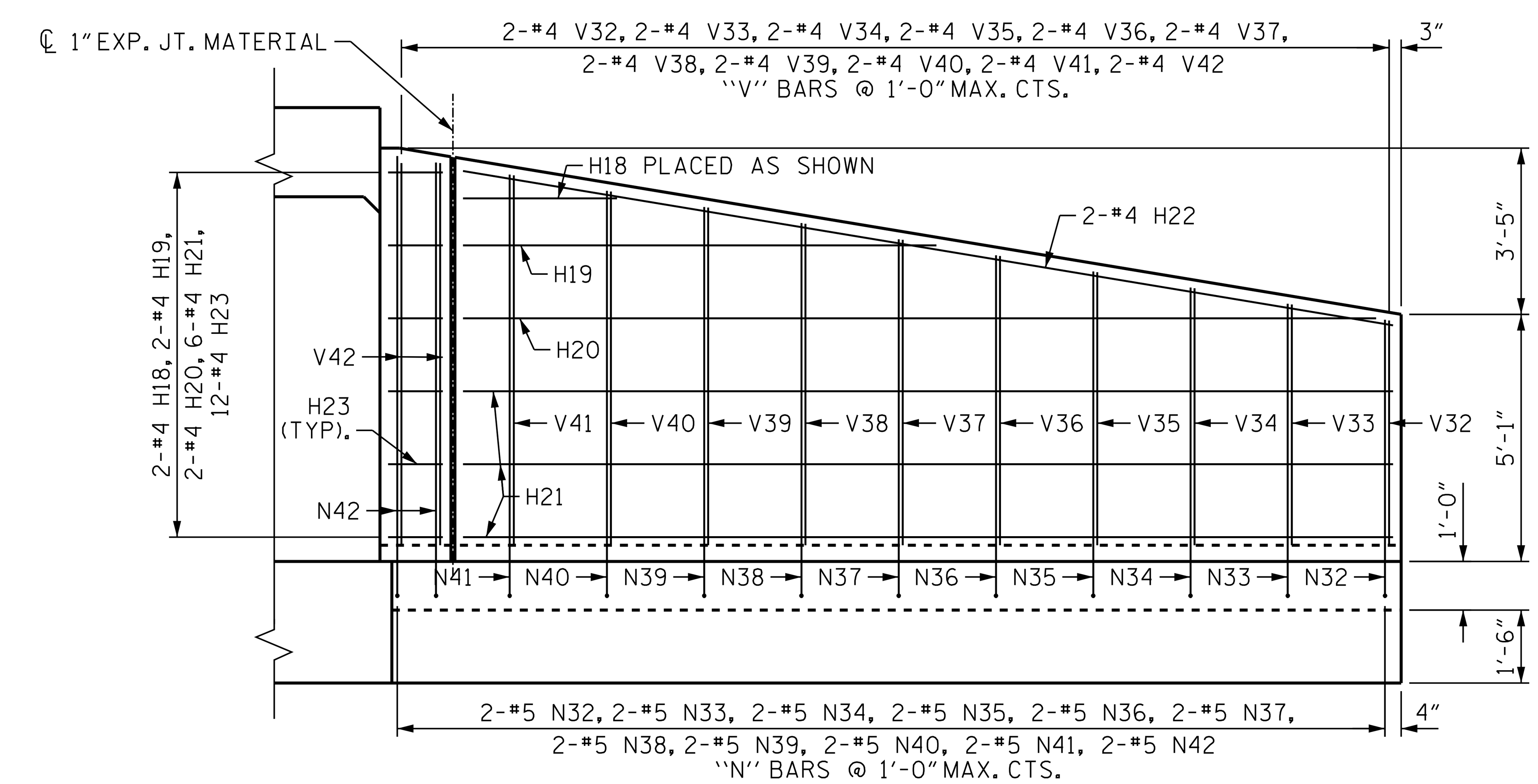
✱ S1 @ BOTTOM OF FOOTING



PLAN W4



ELEVATION W3



ELEVATION W4

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 19+49.00 -Y3ORPD-

SHEET 6 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR
CONCRETE BOX CULVERT
H= 7'-0" SLOPE= 4:1 (RT.)

112°00'00" SKEW

10/25/2021

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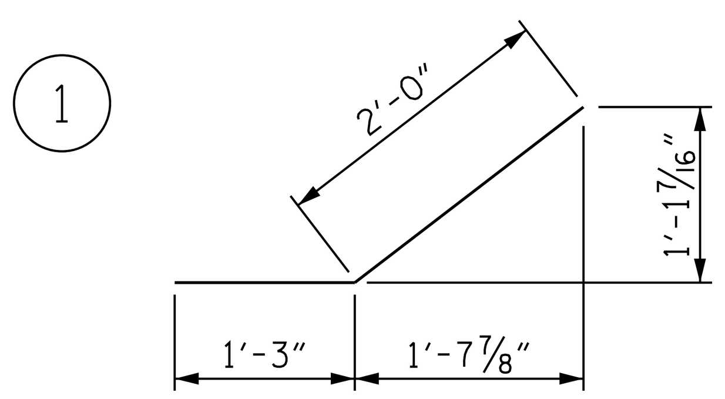
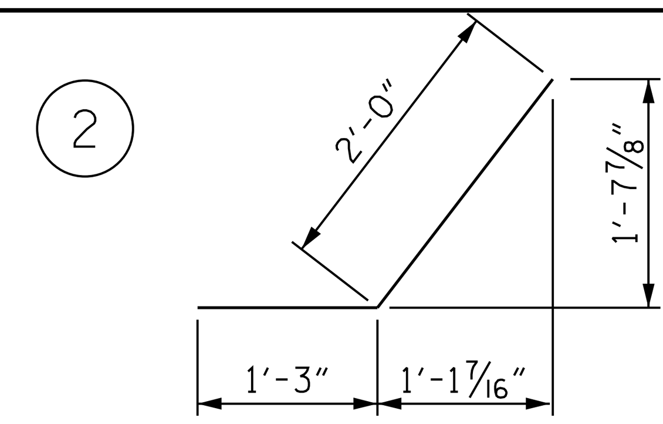
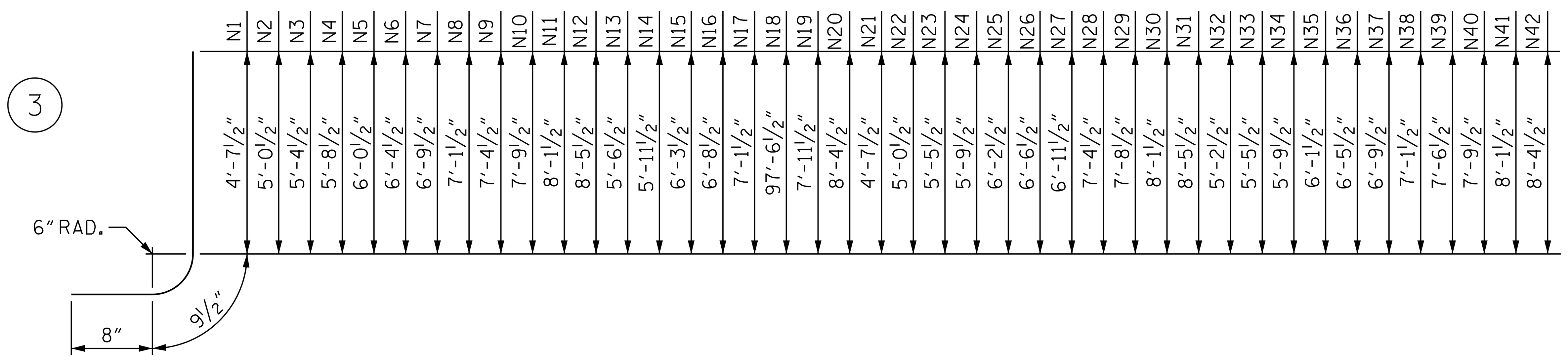
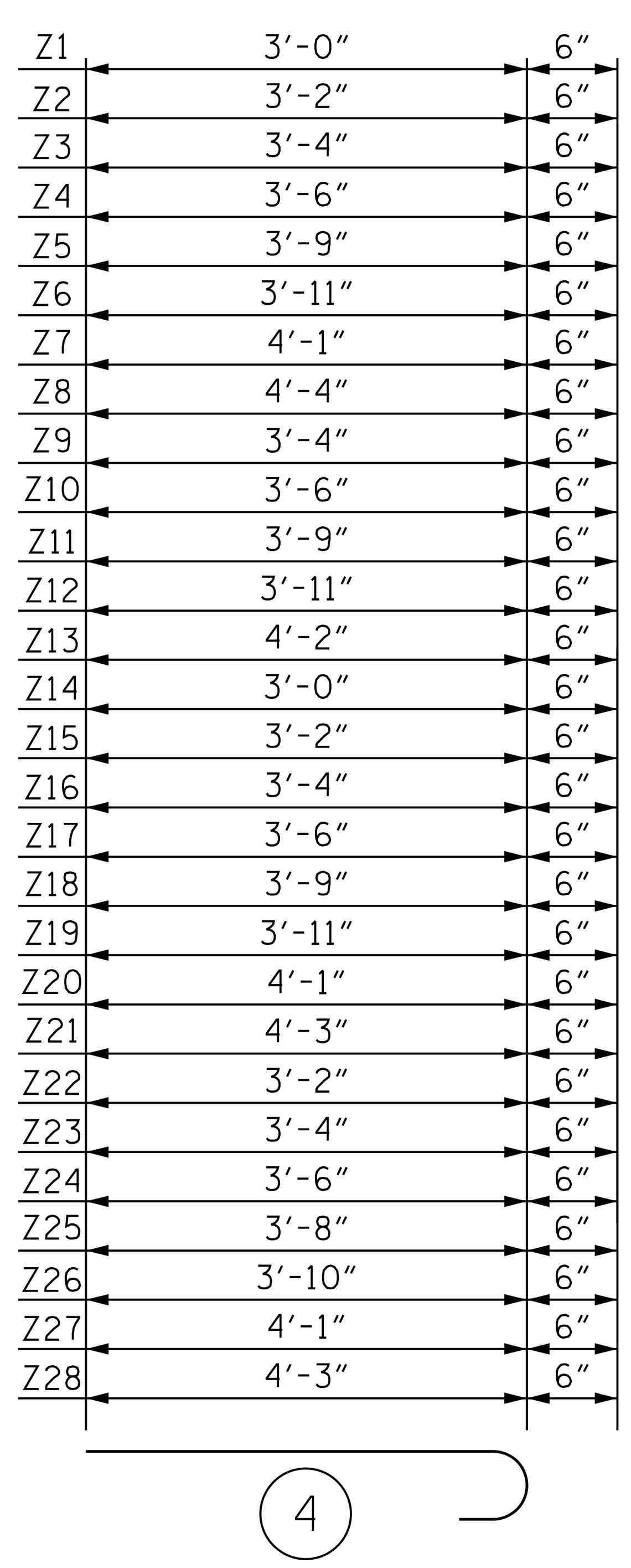
BAR TYPES









ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	2	#4	STR	3'-3"	5
H2	2	#4	STR	9'-5"	13
H3	2	#4	STR	18'-1"	25
H4	6	#4	STR	21'-3"	86
H5	2	#4	STR	21'-7"	29
H6	12	#4	1	3'-3"	27
H7	2	#4	STR	4'-3"	6
H8	2	#4	STR	7'-7"	11
H9	8	#4	STR	13'-7"	73
H10	2	#4	STR	13'-10"	19
H11	12	#4	2	3'-3"	27
H12	2	#4	STR	3'-5"	5
H13	2	#4	STR	13'-2"	18
H14	2	#4	STR	24'-11"	34
H15	6	#4	STR	29'-4"	118
H16	2	#4	STR	29'-7"	40
H17	12	#4	1	3'-3"	27
H18	2	#4	STR	3'-2"	5
H19	2	#4	STR	9'-8"	13
H20	2	#4	STR	18'-9"	26
H21	6	#4	STR	19'-1"	77
H22	2	#4	STR	19'-4"	26
H23	12	#4	2	3'-3"	27
N1	2	#5	3	6'-1"	13
N2	2	#5	3	6'-6"	14
N3	2	#5	3	6'-10"	15
N4	2	#5	3	7'-2"	15
N5	2	#5	3	7'-6"	16
N6	2	#5	3	7'-10"	17
N7	2	#5	3	8'-3"	18
N8	2	#5	3	8'-7"	18
N9	2	#5	3	8'-10"	19
N10	2	#5	3	9'-3"	20
N11	2	#5	3	9'-7"	20
N12	2	#5	3	9'-11"	21
N13	2	#5	3	7'-0"	15
N14	2	#5	3	7'-5"	16
N15	2	#5	3	7'-9"	17
N16	2	#5	3	8'-2"	18
N17	2	#5	3	8'-7"	18
N18	2	#5	3	9'-0"	19
N19	2	#5	3	9'-5"	20
N20	2	#5	3	9'-10"	21
N21	3	#5	3	6'-1"	20
N22	3	#5	3	6'-6"	21
N23	3	#5	3	6'-11"	22
N24	3	#5	3	7'-3"	23
N25	3	#5	3	7'-8"	24
N26	3	#5	3	8'-0"	26
N27	3	#5	3	8'-5"	27
N28	3	#5	3	8'-10"	28
N29	3	#5	3	9'-2"	29
N30	3	#5	3	9'-7"	30
N31	2	#5	3	9'-11"	21
N32	2	#5	3	6'-8"	14
N33	2	#5	3	6'-11"	15
N34	2	#5	3	7'-3"	16
N35	2	#5	3	7'-7"	16
N36	2	#5	3	7'-11"	17
N37	2	#5	3	8'-3"	18
N38	2	#5	3	8'-7"	18
N39	2	#5	3	9'-0"	19
N40	2	#5	3	9'-3"	20
N41	2	#5	3	9'-7"	20
N42	2	#5	3	9'-10"	21

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
S1	18	#6	STR	6'-0"	163
T1	3	#5	STR	22'-4"	70
T2	3	#5	STR	14'-8"	46
T3	3	#5	STR	30'-5"	96
T4	3	#5	STR	20'-2"	64
V1	2	#4	STR	4'-1"	6
V2	2	#4	STR	4'-5"	6
V3	2	#4	STR	4'-9"	7
V4	2	#4	STR	5'-2"	7
V5	2	#4	STR	5'-6"	8
V6	2	#4	STR	5'-10"	8
V7	2	#4	STR	6'-2"	9
V8	2	#4	STR	6'-6"	9
V9	2	#4	STR	6'-10"	10
V10	2	#4	STR	7'-3"	10
V11	2	#4	STR	7'-7"	11
V12	2	#4	STR	7'-10"	11
V13	2	#4	STR	4'-11"	7
V14	2	#4	STR	5'-4"	8
V15	2	#4	STR	5'-9"	8
V16	2	#4	STR	6'-2"	9
V17	2	#4	STR	6'-7"	9
V18	2	#4	STR	7'-0"	10
V19	2	#4	STR	7'-5"	10
V20	2	#4	STR	7'-9"	11
V21	3	#4	STR	4'-1"	9
V22	3	#4	STR	4'-5"	9
V23	3	#4	STR	4'-10"	10
V24	3	#4	STR	5'-3"	11
V25	3	#4	STR	5'-7"	12
V26	3	#4	STR	6'-0"	13
V27	3	#4	STR	6'-4"	13
V28	3	#4	STR	6'-9"	14
V29	3	#4	STR	7'-2"	15
V30	3	#4	STR	7'-6"	16
V31	2	#4	STR	7'-11"	11
V32	2	#4	STR	4'-7"	7
V33	2	#4	STR	4'-11"	7
V34	2	#4	STR	5'-3"	8
V35	2	#4	STR	5'-7"	8
V36	2	#4	STR	5'-11"	8
V37	2	#4	STR	6'-3"	9
V38	2	#4	STR	6'-7"	9
V39	2	#4	STR	6'-11"	10
V40	2	#4	STR	7'-3"	10
V41	2	#4	STR	7'-7"	11
V42	2	#4	STR	7'-10"	11

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
Z1	3	#4	4	3'-6"	8
Z2	3	#4	4	3'-8"	8
Z3	3	#4	4	3'-10"	8
Z4	3	#4	4	4'-0"	9
Z5	3	#4	4	4'-3"	9
Z6	3	#4	4	4'-5"	9
Z7	3	#4	4	4'-7"	10
Z8	2	#4	4	4'-10"	7
Z9	3	#4	4	3'-10"	8
Z10	3	#4	4	4'-0"	9
Z11	3	#4	4	4'-3"	9
Z12	3	#4	4	4'-5"	9
Z13	3	#4	4	4'-8"	10
Z14	4	#4	4	3'-6"	10
Z15	4	#4	4	3'-8"	10
Z16	4	#4	4	3'-10"	11
Z17	4	#4	4	4'-0"	11
Z18	4	#4	4	4'-3"	12
Z19	4	#4	4	4'-5"	12
Z20	4	#4	4	4'-7"	13
Z21	3	#4	4	4'-9"	10
Z22	3	#4	4	3'-8"	8
Z23	3	#4	4	3'-10"	8
Z24	3	#4	4	4'-0"	9
Z25	3	#4	4	4'-2"	9
Z26	3	#4	4	4'-4"	9
Z27	3	#4	4	4'-7"	10
Z28	3	#4	4	4'-9"	10

REINF. STEEL FOR 4 WINGS 2,499 LBS

CLASS A CONCRETE		
4 WINGS	36.2	CY
2 HEADWALLS	1.3	CY
2 END CURTAIN WALLS	1.5	CY
TOTAL	39.0	CY

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 19+49.00 -Y3ORPD-

SHEET 7 OF 7

STATE OF NORTH CAROLINA
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WINGS FOR CONCRETE BOX CULVERT - BILL OF MATERIAL -

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NORTH CAROLINA PROFESSIONAL SEAL ENGINEER MELINDA B. ISENHOUR
10/25/2021

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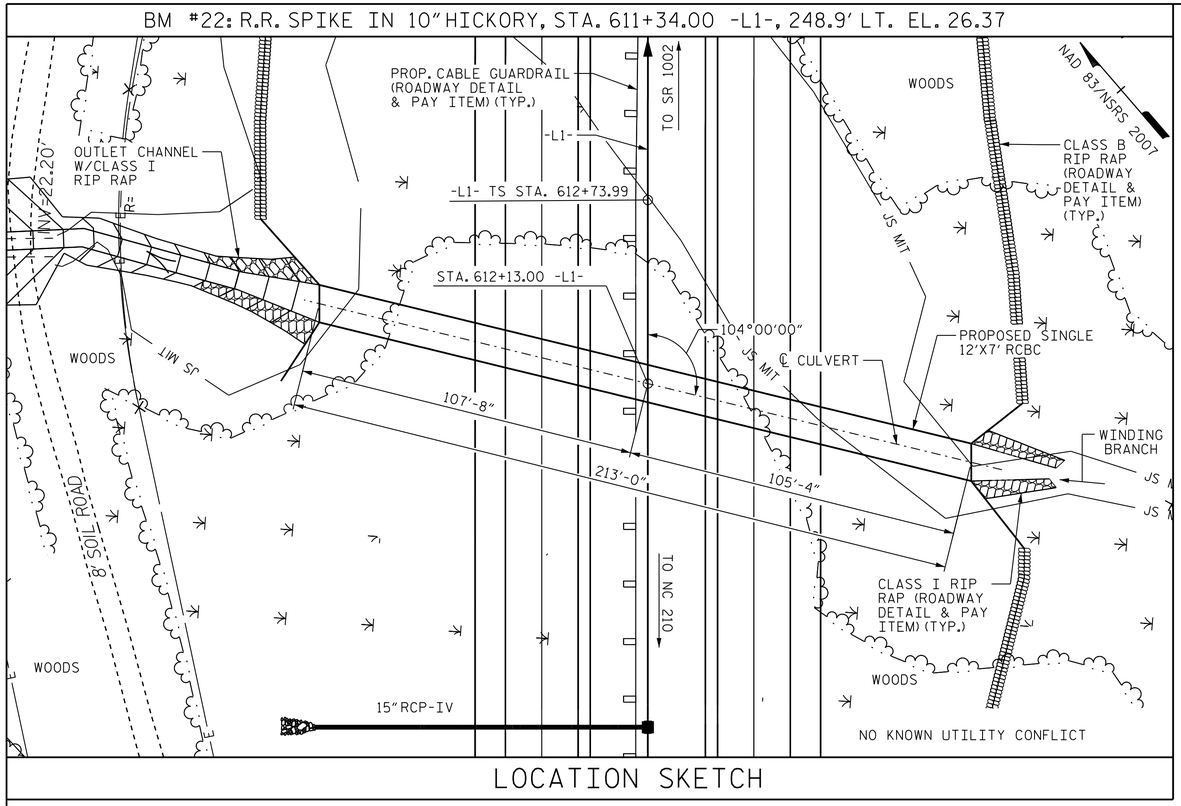

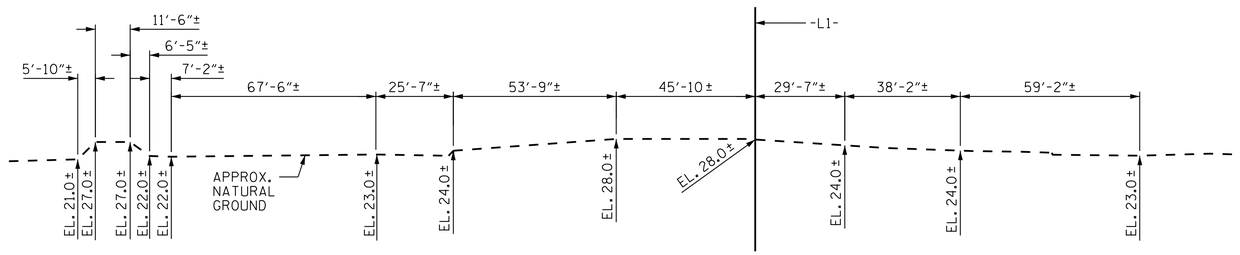

PROFILE ALONG ℄ CULVERT

FOUNDATION NOTES

EXCAVATE FOUNDATION A MINIMUM OF 3.0 FEET BELOW CULVERT BEARING ELEVATION. PLACE 3.0 FEET OF CLASS VI FOUNDATION CONDITIONING MATERIAL ENCAPSULATED IN TYPE II GEOTEXTILE IN ACCORDANCE WITH SECTION 414 OF THE STANDARD SPECIFICATIONS.

TOTAL STRUCTURE QUANTITIES

CULVERT EXCAVATION	LUMP SUM	
FOUNDATION COND. MATERIAL	782	TONS
CLASS A CONCRETE		
BARREL @ 1.337 CY/FT	284.9	C.Y.
WINGS ETC.	43.6	C.Y.
TOTAL	328.5	C.Y.
REINFORCING STEEL		
BARREL	67,836	LBS.
WINGS ETC.	2,876	LBS.
TOTAL	70,712	LBS.

NOTES

ASSUMED LIVE LOAD = HL-93.

DESIGN FILL = 13.8' (MAXIMUM) 12.0' (MINIMUM)

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERT TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS, CURTAIN WALLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY THE ROOF SLAB AND HEADWALLS.

THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

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

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

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

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

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

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

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

HYDRAULIC DATA

DESIGN DISCHARGE	=	370 C.F.S.
FREQUENCY OF DESIGN FLOOD	=	50 YR.
DESIGN HIGH WATER ELEVATION	=	27.50
DRAINAGE AREA	=	0.43 SQ. MI.
BASE DISCHARGE (Q100)	=	420 C.F.S.
BASE HIGH WATER ELEVATION	=	27.90

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	=	1070 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	=	500+ YRS.
OVERTOPPING FLOOD ELEVATION	=	40.30

OVERTOPS ROADWAY AT STATION 613+93.0 -L1- RT.

ROADWAY DATA

GRADE POINT EL. @ STATION 612+13.00 -L1-	=	41.08
BED ELEV. @ STATION 612+13.00 -L1-	=	20.70
ROADWAY SLOPES	=	4:1

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 612+13.00 -L1-

SHEET 1 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 12 FT. X 7 FT. CONCRETE BOX CULVERT

104°00'00" SKEW

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NORTH CAROLINA PROFESSIONAL SEAL 49756 ENGINEER MAXINE B. ISENHOUR
6/29/2020

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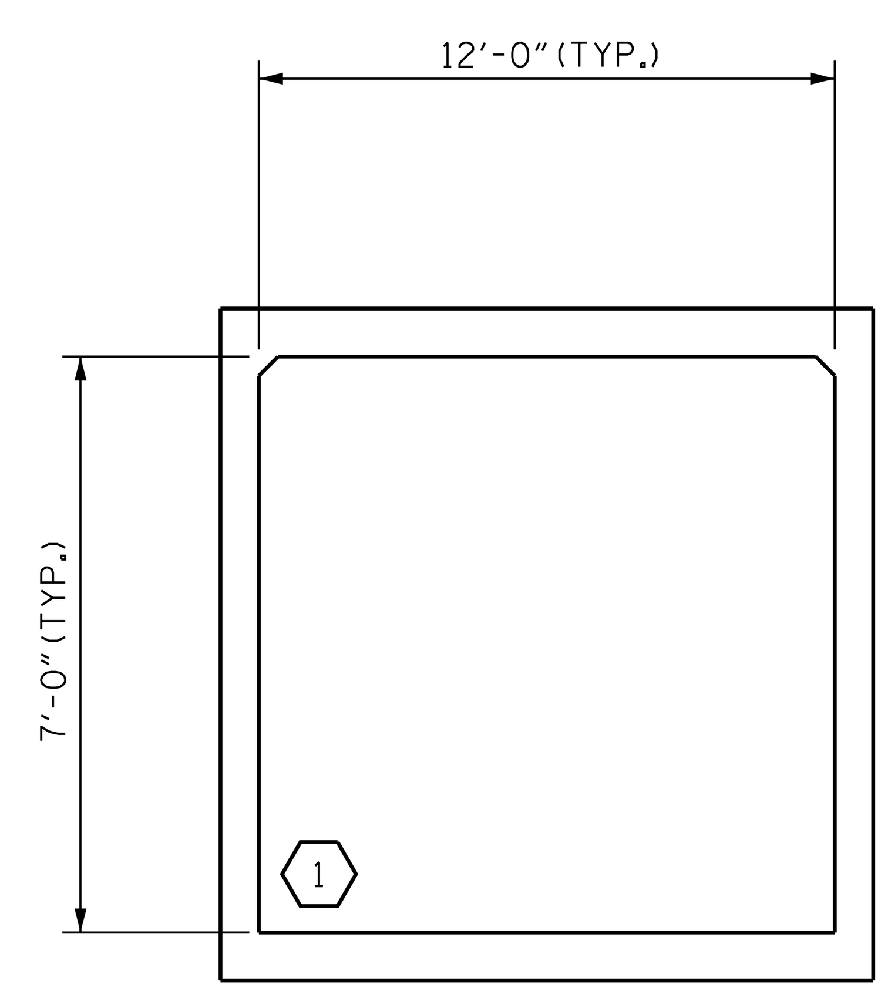
LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

	CONTROLLING LOAD RATING	MINIMUM RATING FACTOR (RF)	STRENGTH I LIMIT STATE: MOMENT — RATING FACTOR	MOMENT — BOX NO.	MOMENT — ELEMENT TYPE	MOMENT — DISTANCE FROM LEFT END OF ELEMENT (ft)	SHEAR — RATING FACTOR	SHEAR — BOX NO.	SHEAR — ELEMENT TYPE	SHEAR — DISTANCE FROM LEFT END OF ELEMENT (ft)
PERMANENT LOAD RATING	⟨1⟩	1.10	1.16	1	BOTT. SLAB (MID) - INSIDE	6.67	1.10	1	LEFT END - BOTT. SLAB	0.00



BOX 1

LRFR SUMMARY

(LOOKING DOWNSTREAM)

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

LOAD RATING FOR MAXIMUM AND MINIMUM FILL CONDITIONS HAVE BEEN EVALUATED. MAXIMUM FILL CONDITIONS CONTROL LOAD RATINGS AND ARE PRESENTED IN THE ADJACENT TABLE AS THE MOST CRITICAL LOAD RATING.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 612+13.00 -L1-

SHEET 2 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

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

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STD. NO. LRFR7

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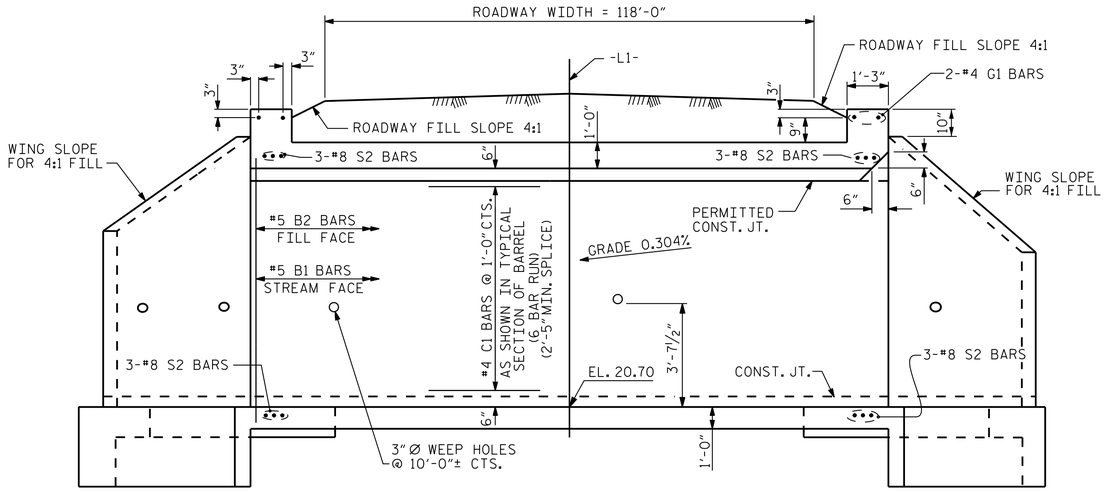
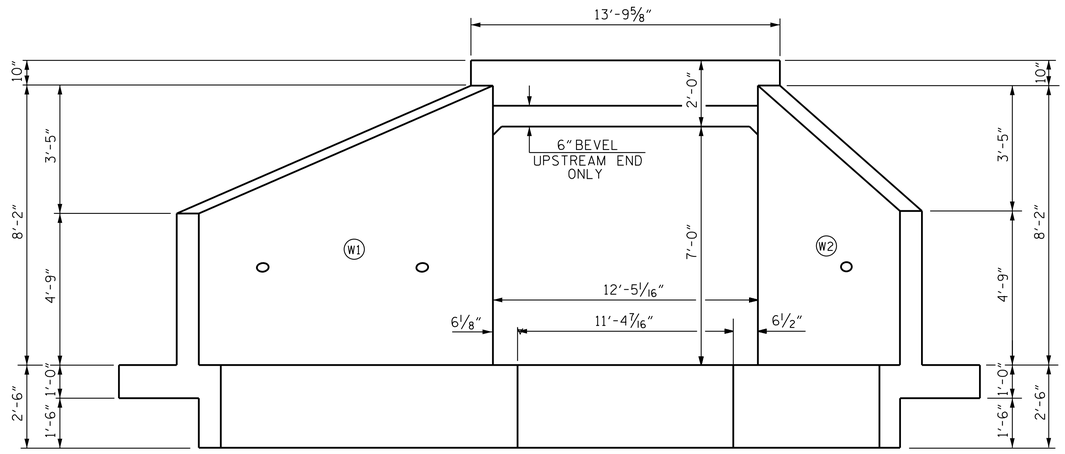


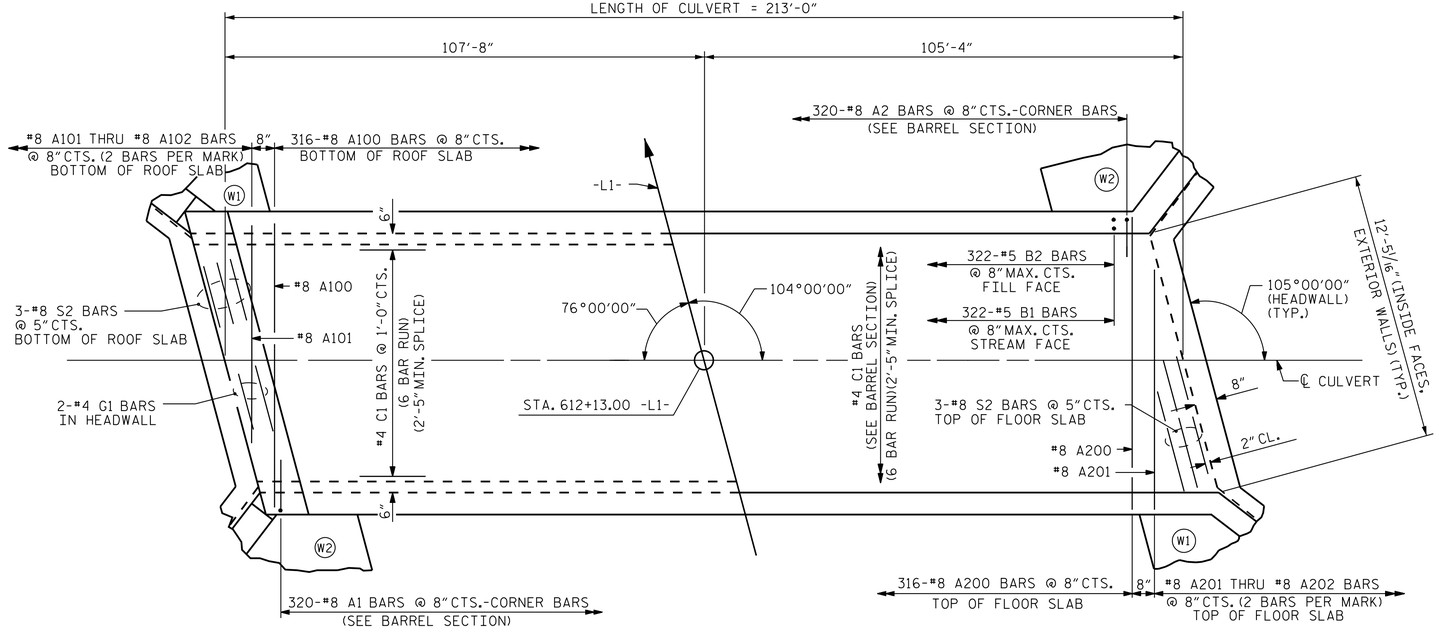
CULVERT SECTION NORMAL TO ROADWAY

(LOOKING UPSTATION)



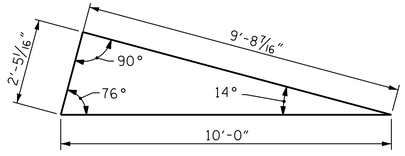
END ELEVATION NORMAL TO SKEW

(LOOKING DOWNSTREAM)



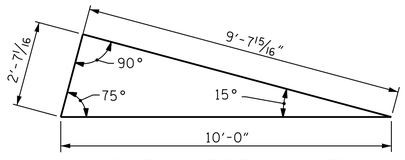
PART PLAN - ROOF SLAB PART PLAN - FLOOR SLAB

TRANSVERSE CONST. JTS. NOT SHOWN FOR CLARITY.
SEE SHEET 1 OF 6 FOR ADDITIONAL INFORMATION.



SKEW TRIANGLE

(℄ ROADWAY)



SKEW TRIANGLE

(HEADWALL)

PROJECT NO. R-3300B

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SHEET 3 OF 6

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 12 FT. X 7 FT. CONCRETE BOX CULVERT

104°00'00" SKEW

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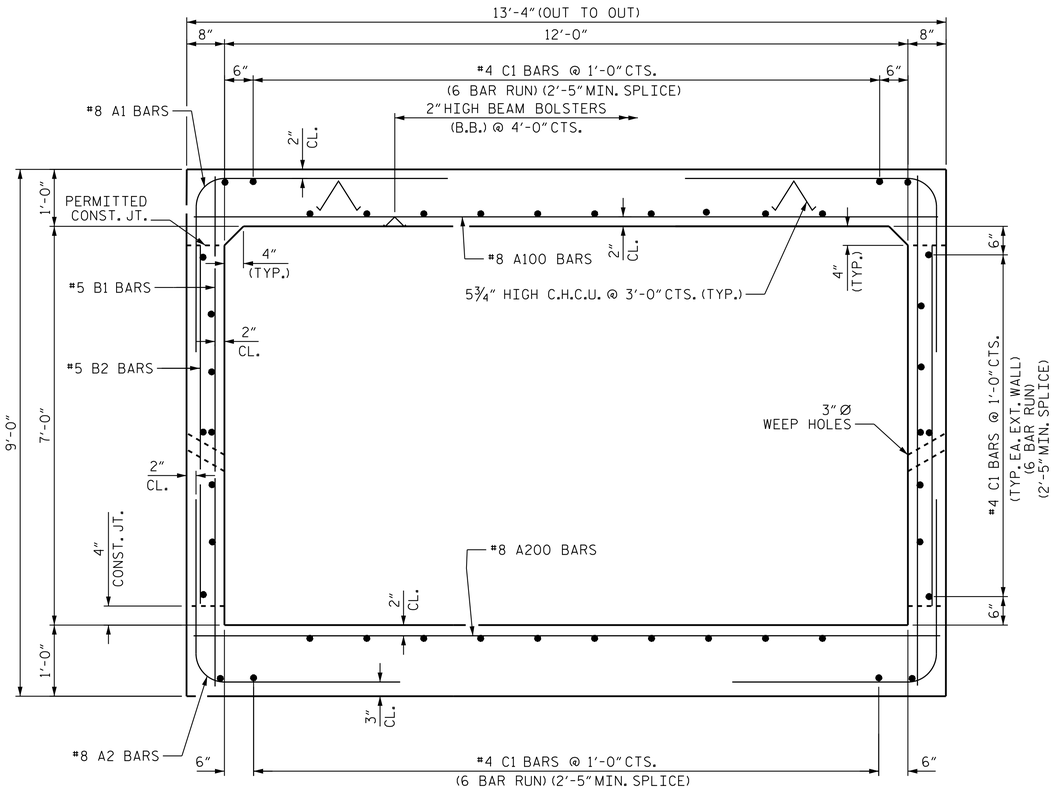
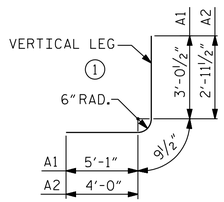


RIGHT ANGLE SECTION OF BARREL

THERE ARE 44 C1 BARS IN SECTION OF BARREL

BAR TYPE



BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	640	#8	1	8'-11"	15,237
A2	640	#8	1	7'-9"	13,244
A100	316	#8	STR	13'-0"	10,969
A101	4	#8	STR	8'-10"	95
A102	4	#8	STR	3'-10"	41
A200	316	#8	STR	13'-0"	10,969
A201	4	#8	STR	8'-10"	95
A202	4	#8	STR	3'-10"	41
B1	644	#5	STR	8'-7"	5,766
B2	644	#5	STR	6'-4"	4,255
C1	264	#4	STR	37'-9"	6,658
G1	4	#4	STR	13'-5"	36
S2	12	#8	STR	13'-5"	430
REINFORCING STEEL					67,836 LBS.

SPLICE CHART

BAR	SIZE	SPLICE LENGTH
B1, B2	#5	2'-4"
C1	#4	2'-5"

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 612+13.00 -L1-

SHEET 4 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 12 FT. X 7 FT.
CONCRETE BOX CULVERT

104°00'00" SKEW

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NORTH CAROLINA PROFESSIONAL SEAL 49756 ENGINEER MALINDA B ISENHOUR
Malinda B Isenhour
6/29/2020

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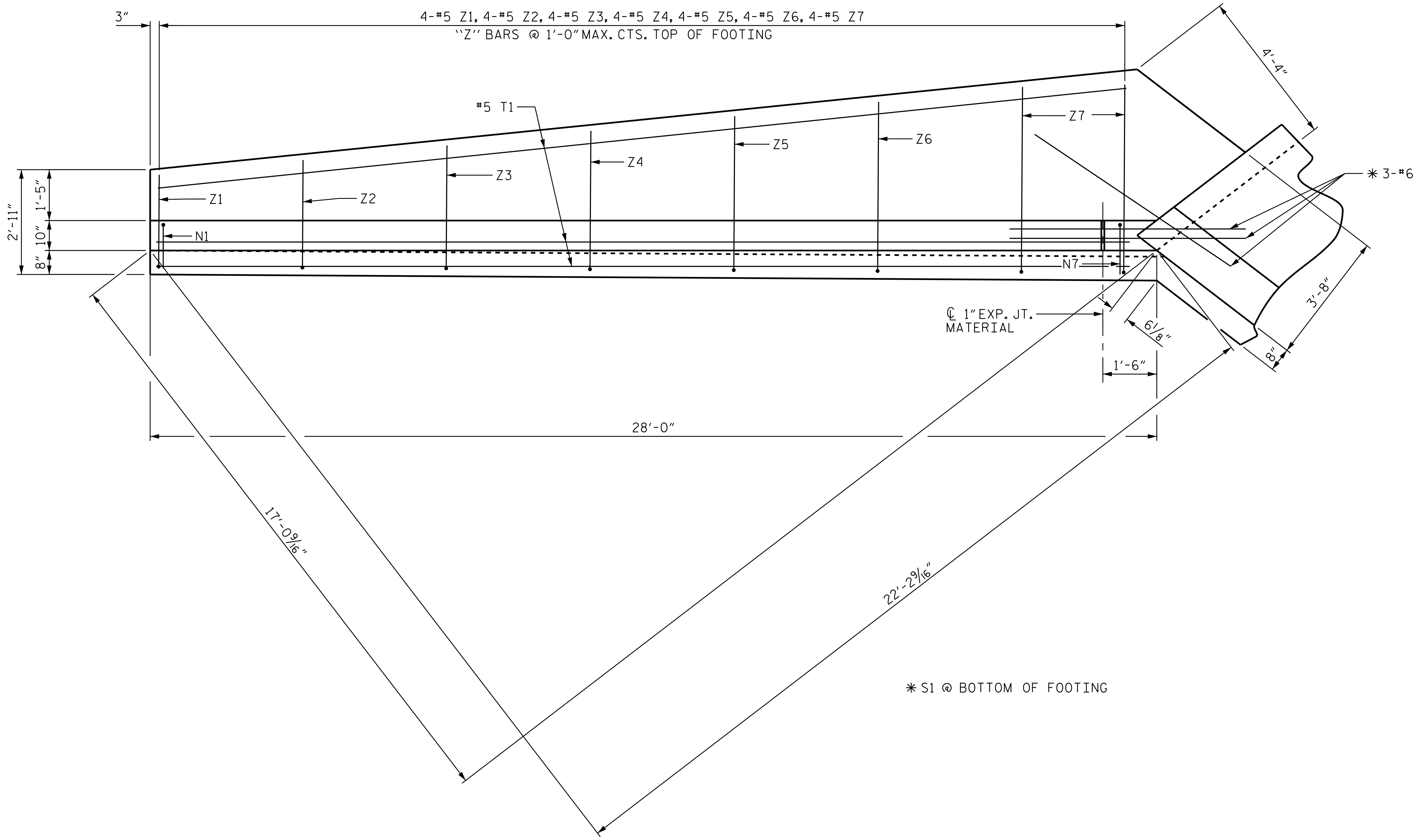
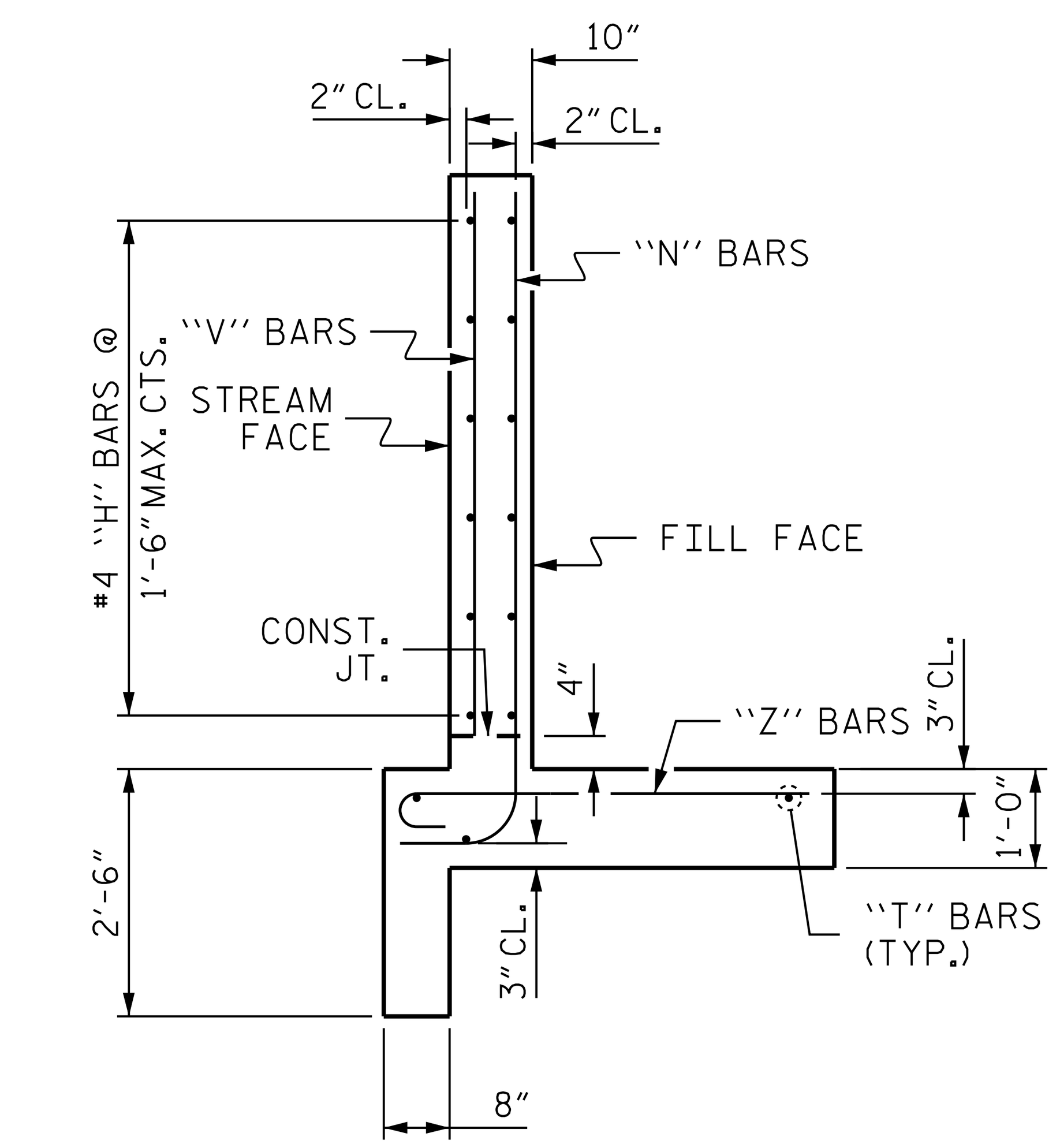


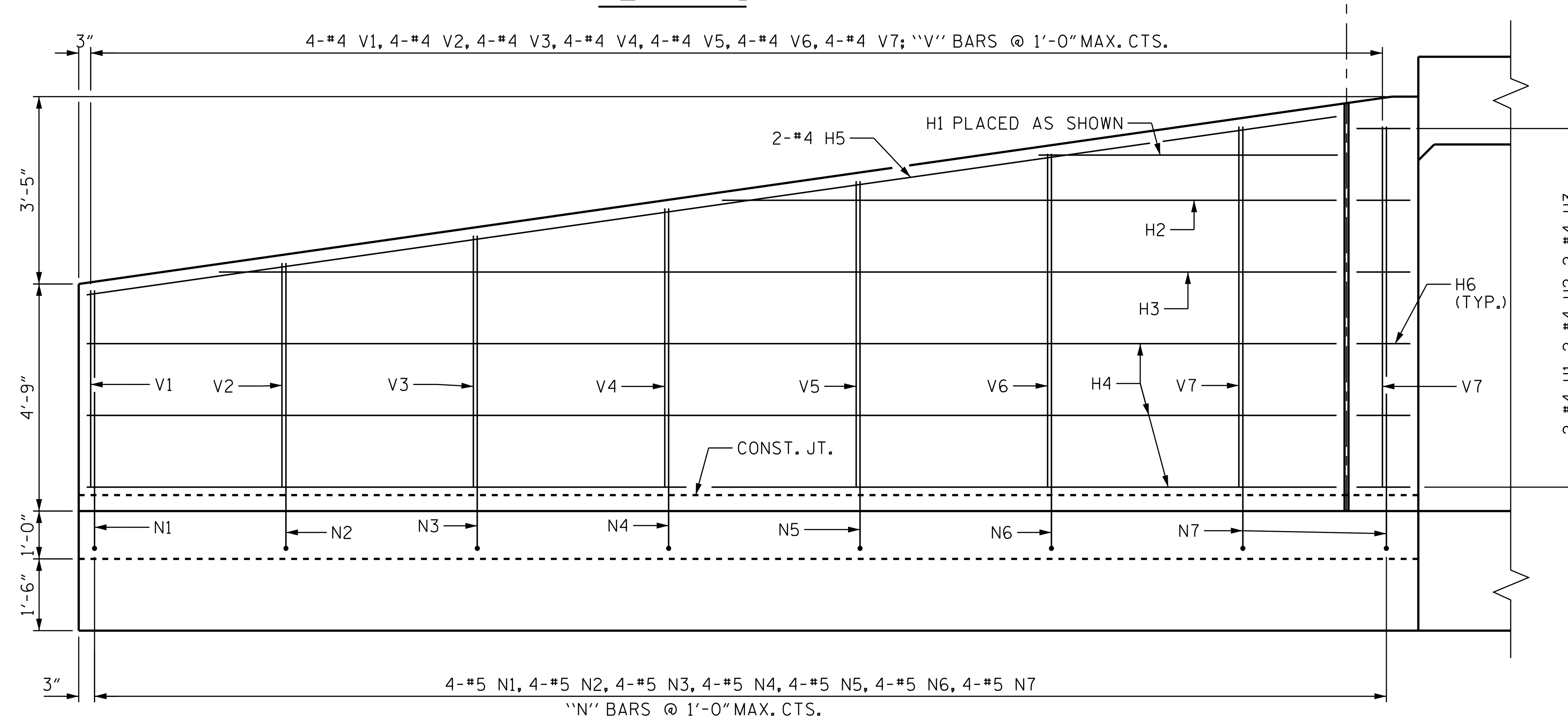
PLAN W1

NOTES

FOR REINFORCING SCHEDULE, SEE SHEET 6 OF 6.



TYPICAL WING SECTION



ELEVATION W1

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 612+13.00 -L1-

SHEET 5 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR CONCRETE BOX CULVERT

H = 7'-0" SLOPE= 4:1

105°00'00" SKEW

SEAL 49756 — NORTH CAROLINA PROFESSIONAL ENGINEER — MALINDA B. ISENHOUR — 6/29/2020

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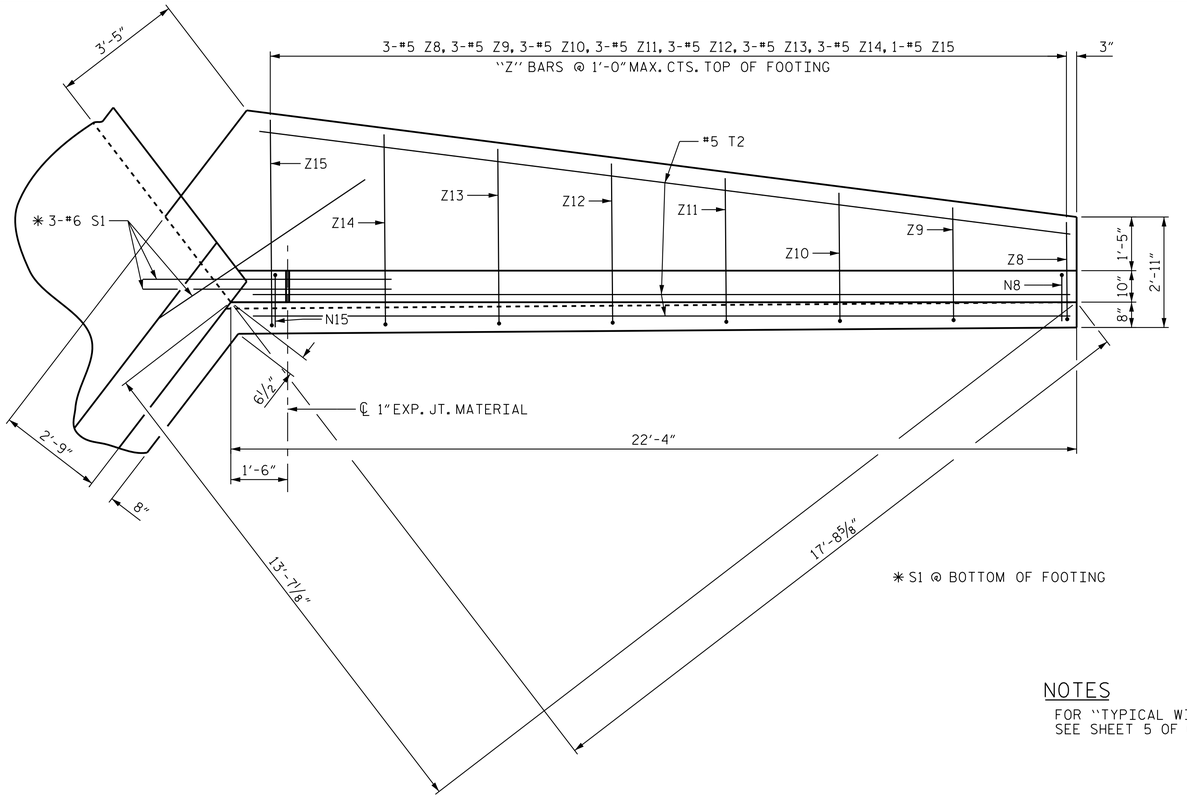
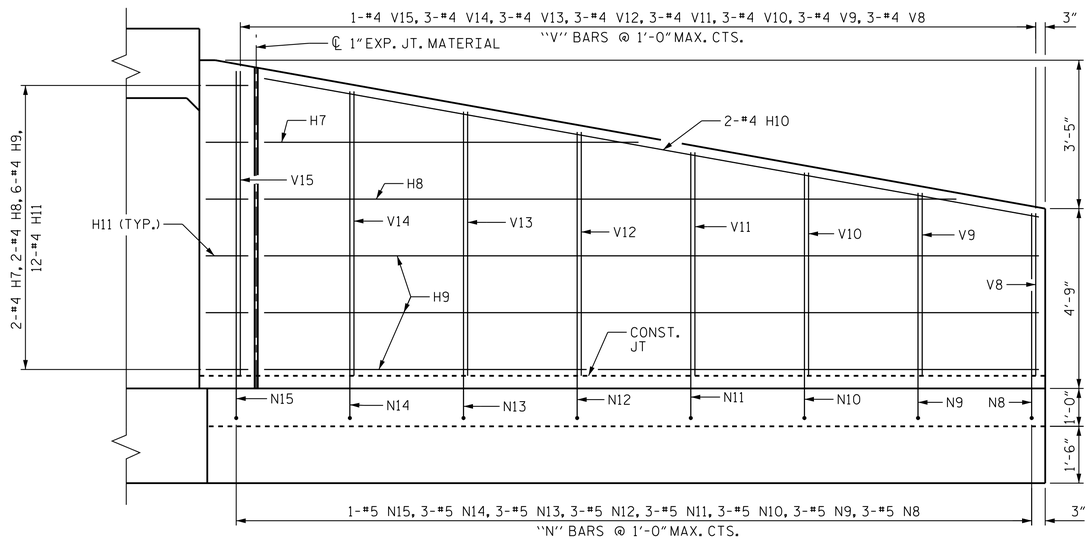
JHagenbush



PLAN W2



ELEVATION W2

NOTES

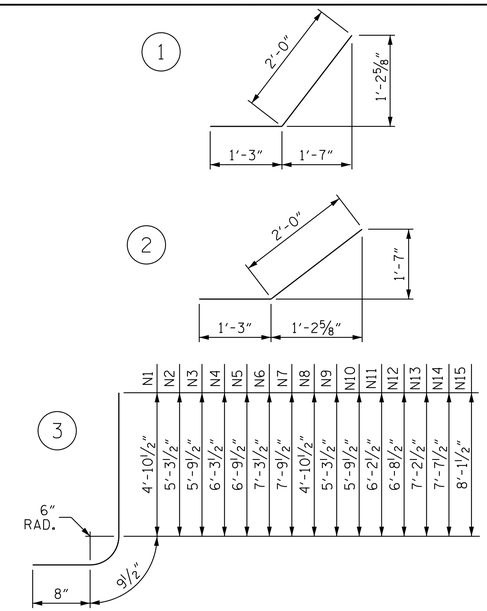
FOR "TYPICAL WING SECTION" DETAIL, SEE SHEET 5 OF 6.

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	4	#4	STR	3'-4"	9
H2	4	#4	STR	10'-10"	29
H3	4	#4	STR	22'-11"	62
H4	12	#4	STR	26'-1"	210
H5	4	#4	STR	26'-3"	71
H6	24	#4	1	3'-3"	53
H7	4	#4	STR	8'-3"	23
H8	4	#4	STR	17'-11"	48
H9	12	#4	STR	20'-5"	164
H10	4	#4	STR	20'-8"	56
H11	24	#4	2	3'-3"	53
N1	8	#5	3	6'-4"	53
N2	8	#5	3	6'-9"	57
N3	8	#5	3	7'-3"	61
N4	8	#5	3	7'-9"	65
N5	8	#5	3	8'-3"	69
N6	8	#5	3	8'-9"	74
N7	8	#5	3	9'-3"	78
N8	6	#5	3	6'-4"	40
N9	6	#5	3	6'-9"	43
N10	6	#5	3	7'-3"	46
N11	6	#5	3	7'-8"	48
N12	6	#5	3	8'-2"	52
N13	6	#5	3	8'-8"	55
N14	6	#5	3	9'-1"	57
N15	2	#5	3	9'-7"	20
S1	12	#6	STR	6'-0"	109
T1	6	#5	STR	27'-1"	170
T2	6	#5	STR	21'-7"	136
V1	8	#4	STR	4'-3"	23
V2	8	#4	STR	4'-9"	26
V3	8	#4	STR	5'-3"	29
V4	8	#4	STR	5'-9"	31
V5	8	#4	STR	6'-3"	34
V6	8	#4	STR	6'-9"	37
V7	8	#4	STR	7'-3"	39
V8	6	#4	STR	4'-3"	18
V9	6	#4	STR	4'-9"	20
V10	6	#4	STR	5'-2"	21
V11	6	#4	STR	5'-8"	23
V12	6	#4	STR	6'-1"	25
V13	6	#4	STR	6'-7"	27
V14	6	#4	STR	7'-1"	29
V15	2	#4	STR	7'-6"	11
Z1	8	#5	4	3'-2"	27
Z2	8	#5	4	3'-7"	30
Z3	8	#5	4	4'-0"	34
Z4	8	#5	4	4'-5"	37
Z5	8	#5	4	4'-11"	42
Z6	8	#5	4	5'-4"	45
Z7	8	#5	4	5'-9"	48
Z8	6	#5	4	3'-2"	20
Z9	6	#5	4	3'-7"	23
Z10	6	#5	4	4'-0"	26
Z11	6	#5	4	4'-5"	28
Z12	6	#5	4	4'-10"	31
Z13	6	#5	4	5'-2"	33
Z14	6	#5	4	5'-7"	35
Z15	2	#5	4	6'-0"	13
REINF. STEEL FOR 4 WINGS				2,876 LBS.	

CLASS A CONCRETE	
4 WINGS	40.9 CY
2 HEADWALLS	1.3 CY
2 END CURTAIN WALLS	1.4 CY
TOTAL	43.6 CY

BAR TYPES



Z1	2'-7" 7"
Z2	3'-0" 7"
Z3	3'-5" 7"
Z4	3'-10" 7"
Z5	4'-4" 7"
Z6	4'-9" 7"
Z7	5'-2" 7"
Z8	2'-7" 7"
Z9	3'-0" 7"
Z10	3'-5" 7"
Z11	3'-10" 7"
Z12	4'-3" 7"
Z13	4'-7" 7"
Z14	5'-0" 7"
Z15	5'-5" 7"

ALL BAR DIMENSIONS ARE OUT TO OUT.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 612+13.00 -L1-

SHEET 6 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

# WINGS FOR CONCRETE BOX CULVERT
H = 7'-0" SLOPE= 4:1

105°00'00" SKEW

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DRAWN BY : N. D'AIUTO DATE : 02/12/20
CHECKED BY : T.N.ENNIS DATE : 02/21/20
DESIGN ENGINEER OF RECORD: M. B. ISENHOUR DATE : 06/29/20

NORTH CAROLINA PROFESSIONAL SEAL 49756 ENGINEER MALINDA B ISENHOUR
Docusigned by: Malinda B Isenhour
6/29/2020

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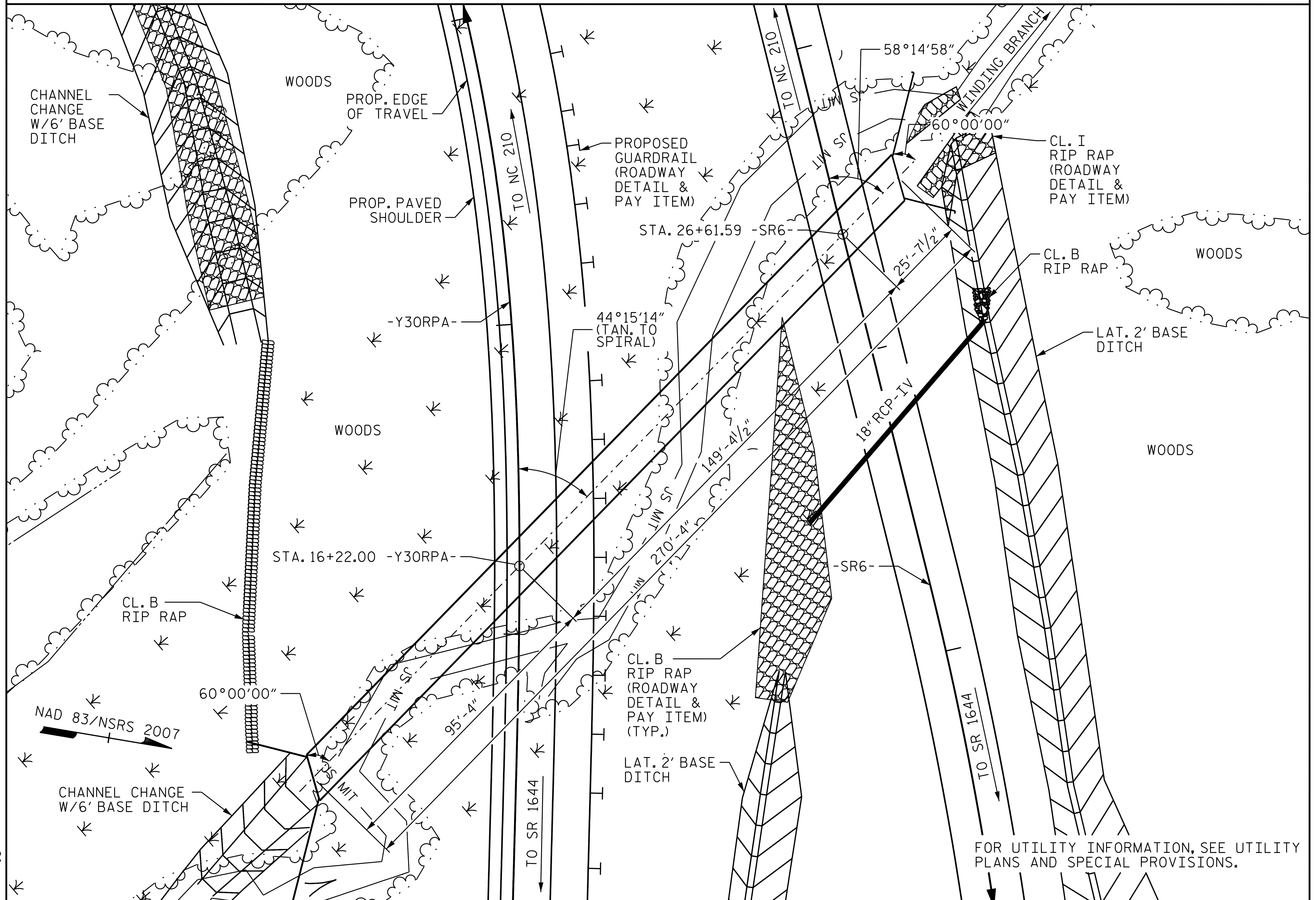
2			4			06

BM #22: R.R. SPIKE IN 10" HICKORY, STA. 15+30.40 -Y30RPA-, 208.6' LT. EL. 26.37



LOCATION SKETCH

FOUNDATION NOTES

EXCAVATE FOUNDATION A MINIMUM OF 3.0 FEET BELOW CULVERT BEARING ELEVATION. PLACE 3.0 FEET OF CLASS VI FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH SECTION 414 OF THE STANDARD SPECIFICATIONS.

ENCAPSULATE FOUNDATION CONDITIONING MATERIAL IN TYPE 4 GEOTEXTILE. FOR FOUNDATION CONDITIONING GEOTEXTILE, SEE GEOTECHNICAL SPECIAL PROVISIONS.

NOTES

ASSUMED LIVE LOAD = HL-93.

DESIGN FILL = 18.1' (MAXIMUM) 4.6' (MINIMUM)

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERT TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS, CURTAIN WALLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY THE ROOF SLAB AND HEADWALLS.

THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

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

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

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

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

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

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

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

OVERTOPPING FLOOD DATA

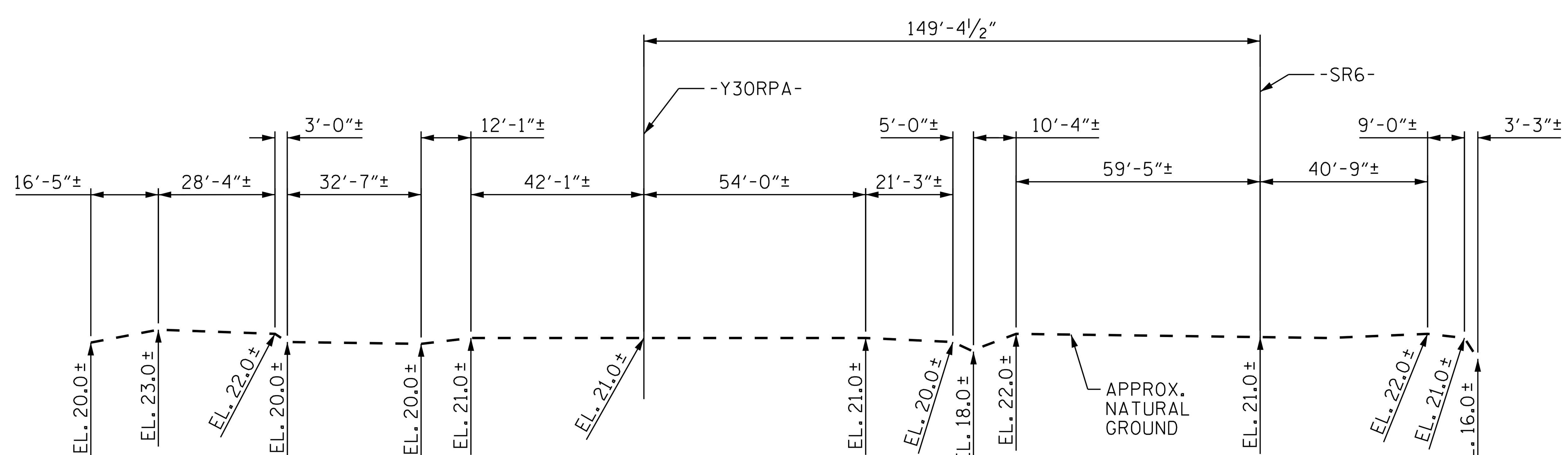
OVERTOPPING DISCHARGE	=	1450 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	=	500+ YRS.
OVERTOPPING FLOOD ELEVATION	=	40.40
OVERTOPS ROADWAY AT STATION 14+55.0 -Y30RPA- LT.		

HYDRAULIC DATA

DESIGN DISCHARGE	=	370 C.F.S.
FREQUENCY OF DESIGN FLOOD	=	50 YR.
DESIGN HIGH WATER ELEVATION	=	24.60
DRAINAGE AREA	=	0.43 SQ. MI.
BASE DISCHARGE (Q100)	=	420 C.F.S.
BASE HIGH WATER ELEVATION	=	25.0

ROADWAY DATA

GRADE POINT EL. @ STATION 16+22.00 -Y30RPA-	=	41.51
BED ELEV. @ STATION 16+22.00 -Y30RPA-	=	17.96
LEFT ROADWAY SLOPE	=	4:1
RIGHT ROADWAY SLOPE	=	3:1



PROFILE ALONG ℄ CULVERT

TOTAL STRUCTURE QUANTITIES

CULVERT EXCAVATION	LUMP SUM	
FOUNDATION COND. MATERIAL	992	TONS
FOUNDATION COND. GEOTEXTILE	1,443	S.Y.
CLASS A CONCRETE		
BARREL @ 1.667 CY/FT	450.6	C.Y.
WINGS ETC.	41.7	C.Y.
TOTAL	492.3	C.Y.
REINFORCING STEEL		
BARREL	78,771	LBS.
WINGS ETC.	2,862	LBS.
TOTAL	81,633	LBS.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 16+22.00 -Y30RPA-

SHEET 1 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 12 FT. X 7 FT. CONCRETE BOX CULVERT

44°15'14" SKEW

NORTH CAROLINA PROFESSIONAL SEAL ENGINEER MALINDA B. ISENHOUR
10/26/2021

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DRAWN BY : M. B. ISENHOUR DATE : 02/26/20
CHECKED BY : N. D'AIUTO DATE : 03/06/20
DESIGN ENGINEER OF RECORD: M.B.ISENHOUR DATE : 10/26/21

jgelle
10/26/2021
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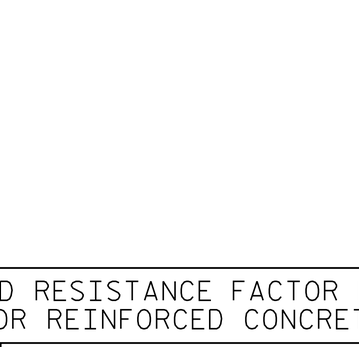
LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

	CONTROLLING LOAD RATING	MINIMUM RATING FACTOR (RF)	STRENGTH I LIMIT STATE							
			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)
PERMANENT LOAD RATING	(1)	1.32	1.45	1	BOTT. SLAB (MID) - INSIDE	6.67	1.32	1	LEFT END - BOTT. SLAB	0



LRFR SUMMARY

(LOOKING DOWNSTREAM)

PERMANENT LOAD 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
WA	1.00	--

NOTES:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

LOAD RATING FOR MAXIMUM AND MINIMUM FILL CONDITIONS HAVE BEEN EVALUATED. MAXIMUM FILL CONDITIONS CONTROL LOAD RATINGS AND ARE PRESENTED IN THE ADJACENT TABLE AS THE MOST CRITICAL LOAD RATING.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 16+22.00 -Y30RPA-

SHEET 2 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

(DEEP FILLS)

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ASSEMBLED BY : M. B. ISENHOUR DATE : 02/26/20
CHECKED BY : N, D'AIUTO DATE : 03/06/20

DRAWN BY : BNB 6/19
CHECKED BY : THC 6/19

DESIGN ENGINEER OF RECORD: M.B.ISENHOUR DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 49756 ENGINEER MELINDA B. ISENHOUR
DocuSigned by: Melinda Isenhour
10/25/2021

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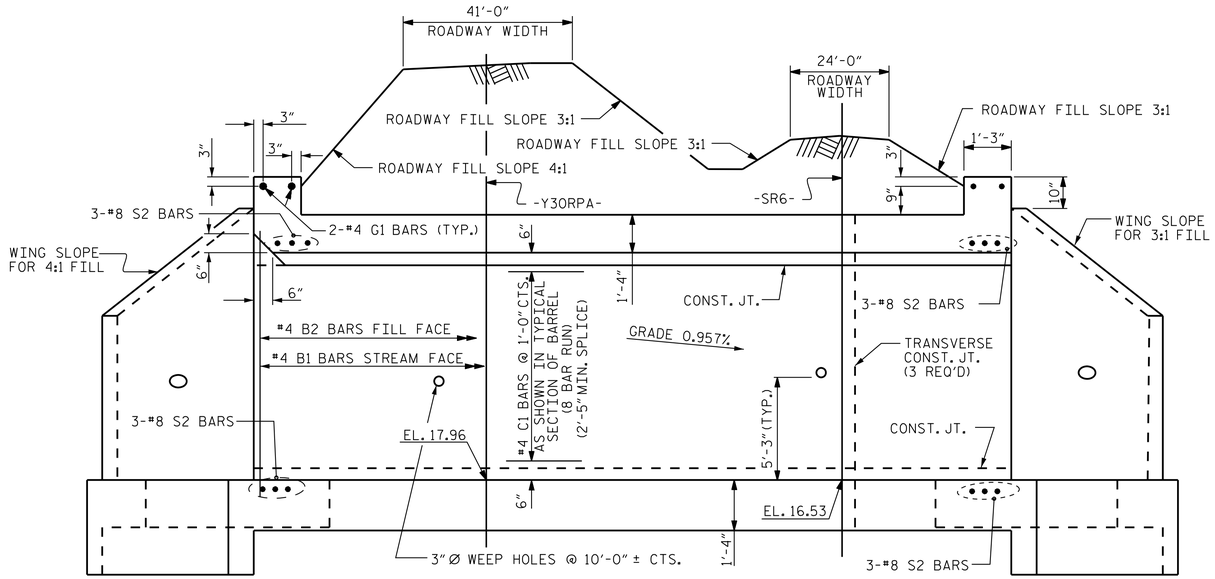
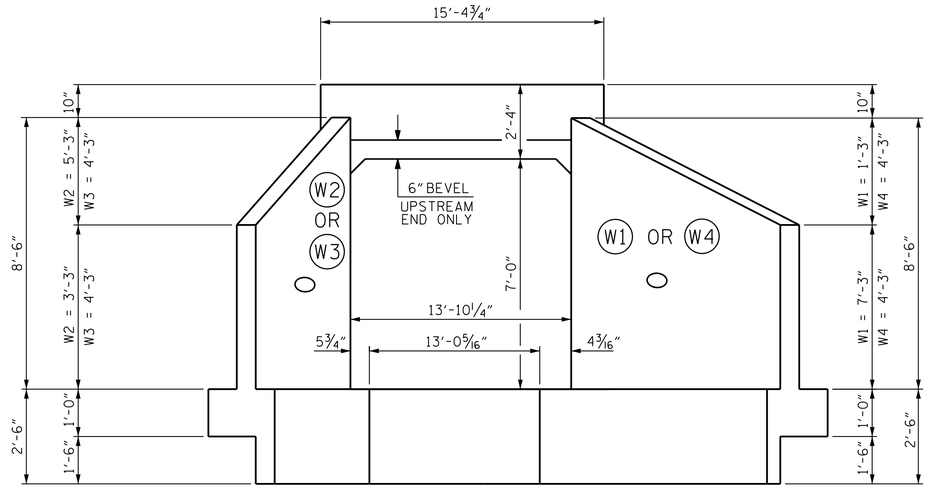
2			4			07

STD. NO. LRFR7



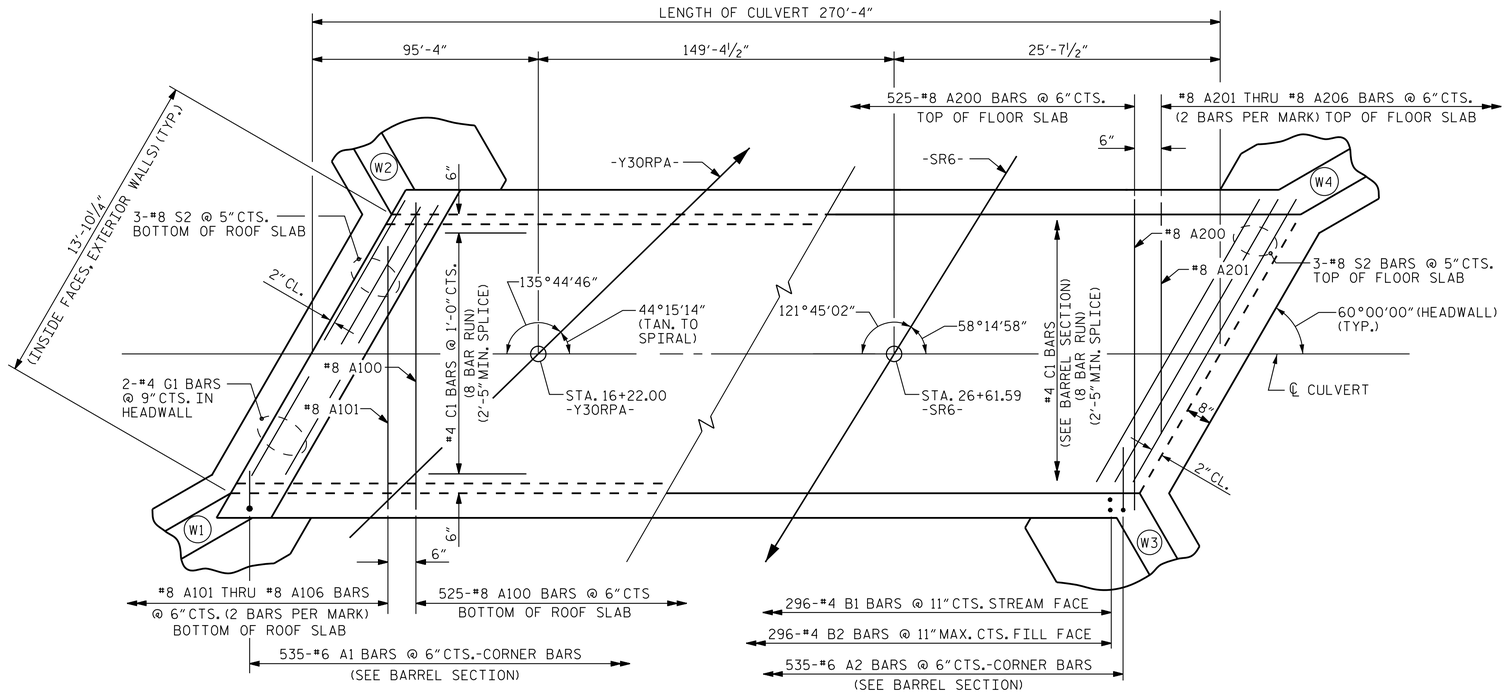
CULVERT SECTION NORMAL TO ROADWAY

LOOKING UPSTATION



END ELEVATION NORMAL TO SKEW

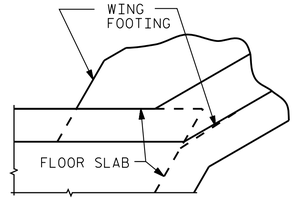
OUTLET AND INLET DIMENSIONS SHOWN

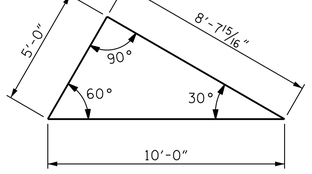


PART PLAN - ROOF SLAB PART PLAN - FLOOR SLAB

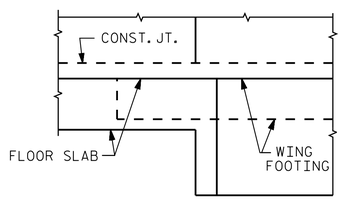
TRANSVERSE CONST. JTS. NOT SHOWN FOR CLARITY.
SEE SHEET 1 OF 6 FOR ADDITIONAL INFORMATION.

FOR #4 F1 BARS, SEE BARREL SECTION





SKEW TRIANGLE



CONNECTION OF WING FOOTING AND FLOOR SLAB WHEN SLAB IS THICKER THAN FOOTING

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 16+22.00 -Y30RPA-

SHEET 3 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 12 FT. X 7 FT. CONCRETE BOX CULVERT

44°15'14" SKEW

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DRAWN BY : M. B. ISENHOUR DATE : 02/28/20
CHECKED BY : N. D'AIUTO DATE : 03/06/20
DESIGN ENGINEER OF RECORD: M.B.ISENHOUR DATE : 10/25/21

SEAL 49756 NORTH CAROLINA PROFESSIONAL ENGINEER MELINDA B. ISENHOUR
Docusigned by: Melinda Isenhour
10/25/2021

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SHEET NO. C10-03
TOTAL SHEETS 07

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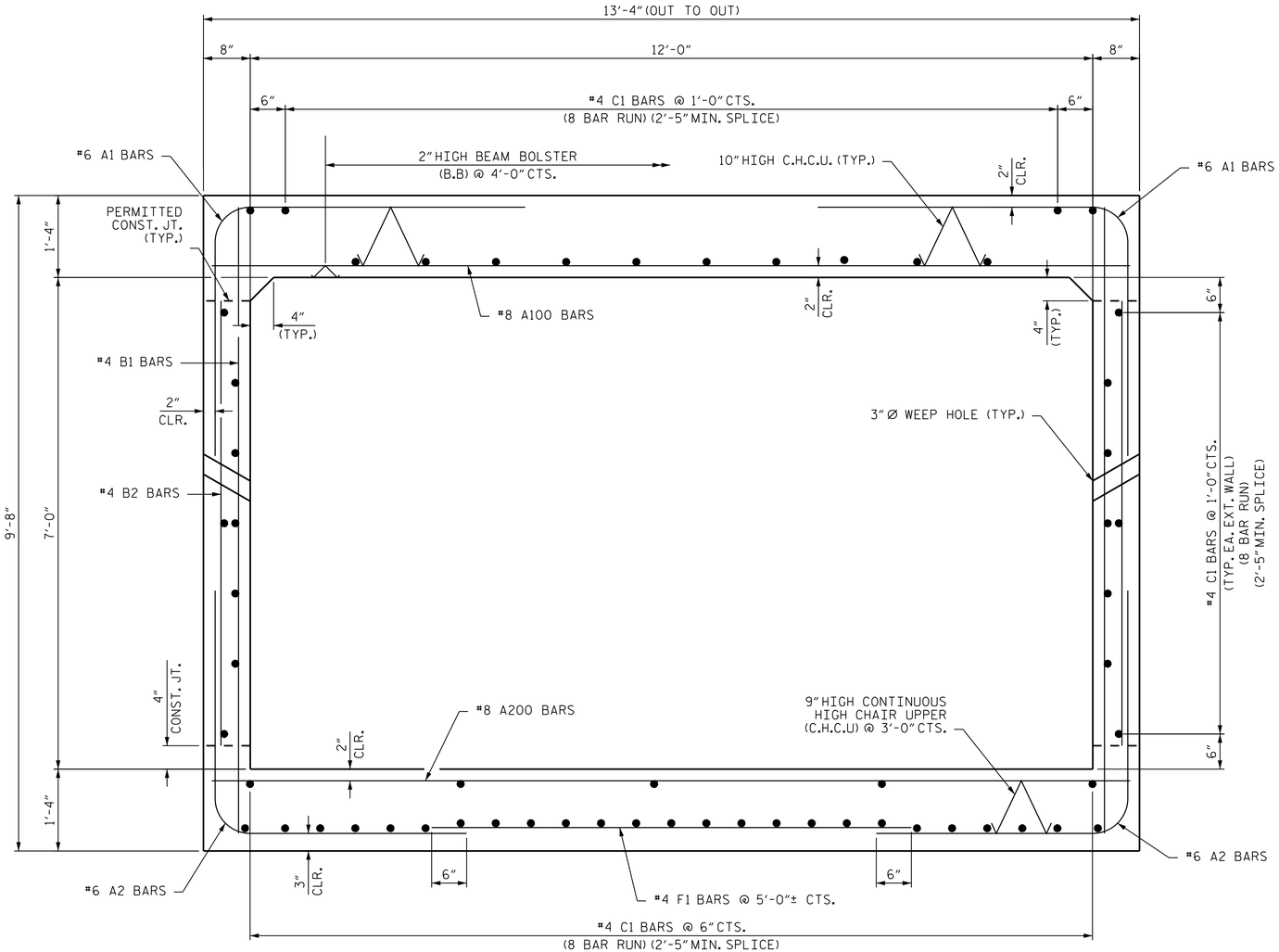
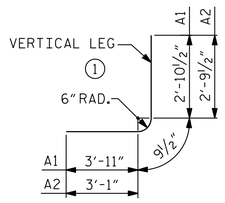


RIGHT ANGLE SECTION OF BARREL

THERE ARE 60 C1 BARS IN SECTION OF BARREL

BAR TYPE



BAR DIMENSIONS ARE OUT TO OUT

SPLICE CHART

BAR	SIZE	SPLICE LENGTH
B1, B2	#4	1'-10"
C1	#4	2'-5"

REINFORCING BAR SCHEDULE

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	1070	#6	1	7'-7"	12188
A2	1070	#6	1	6'-8"	10715
A100	525	#8	STR	13'-0"	18223
A101	4	#8	STR	11'-7"	124
A102	4	#8	STR	9'-11"	106
A103	4	#8	STR	8'-2"	88
A104	4	#8	STR	6'-6"	70
A105	4	#8	STR	4'-8"	50
A106	4	#8	STR	2'-11"	32
A200	525	#8	STR	13'-0"	18223
A201	4	#8	STR	11'-7"	124
A202	4	#8	STR	9'-11"	106
A203	4	#8	STR	8'-2"	88
A204	4	#8	STR	6'-6"	70
A205	4	#8	STR	4'-8"	50
A206	4	#8	STR	2'-11"	32
B1	592	#4	STR	9'-4"	3691
B2	592	#4	STR	6'-4"	2505
C1	480	#4	STR	35'-11"	11517
F1	54	#4	STR	6'-10"	247
G1	4	#4	STR	15'-0"	41
S2	12	#8	STR	15'-0"	481
REINFORCING STEEL					78,771 LBS.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 16+22.00 -Y30RPA-

SHEET 4 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 12 FT. X 7 FT.
CONCRETE BOX CULVERT

44°15'14" SKEW

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CHECKED BY : N. D'AIUTO DATE : 03/06/20
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NORTH CAROLINA PROFESSIONAL SEAL 49756 ENGINEER MARINA B. ISENHOUR
10/25/2021

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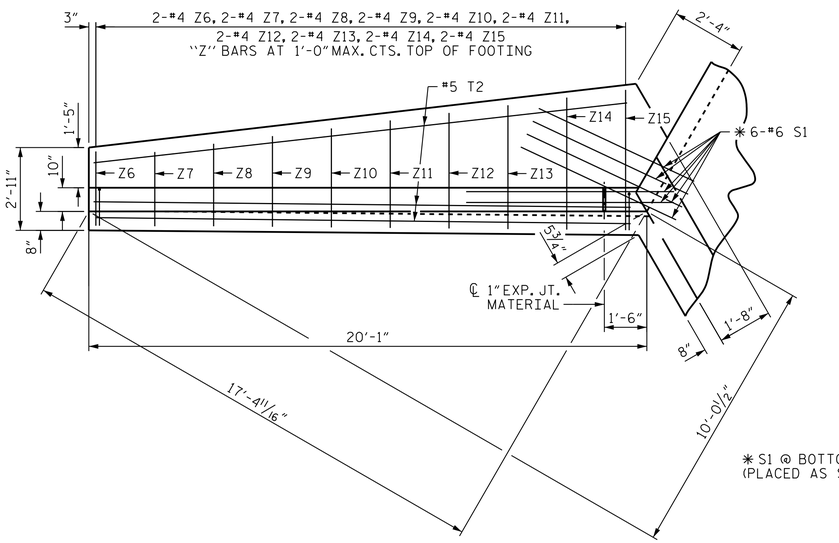
NOTES:

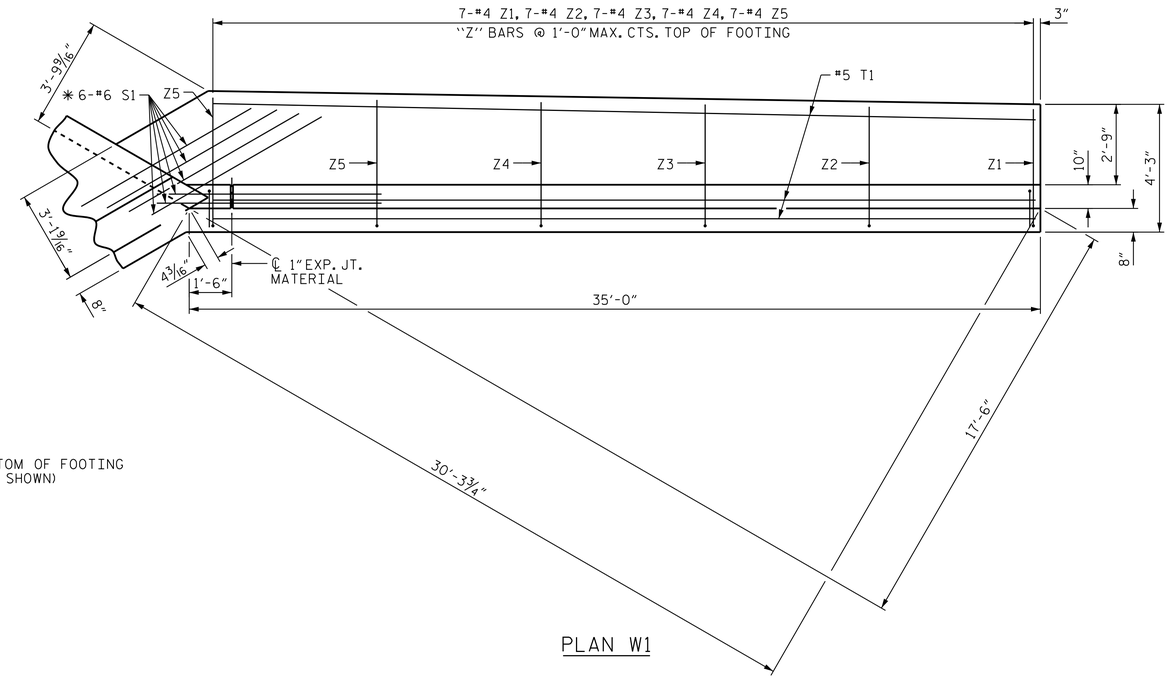
FOR REINFORCING SCHEDULE, SEE SHEET C10-07.

WEEP HOLES NOT SHOWN FOR CLARITY.

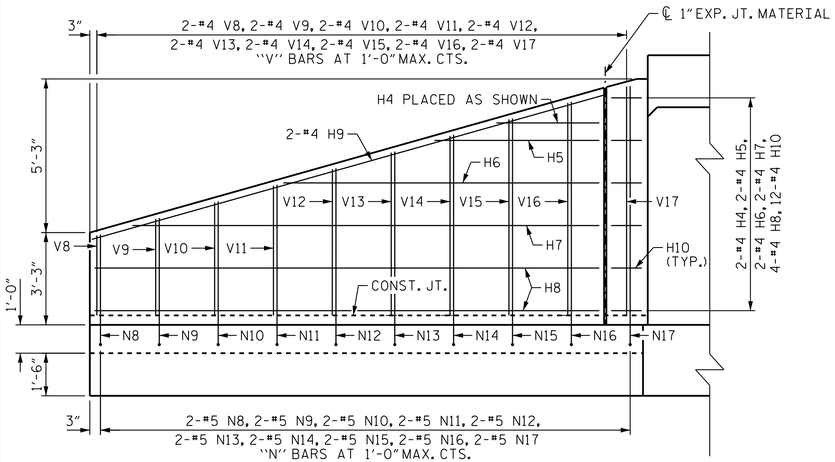


PLAN W2

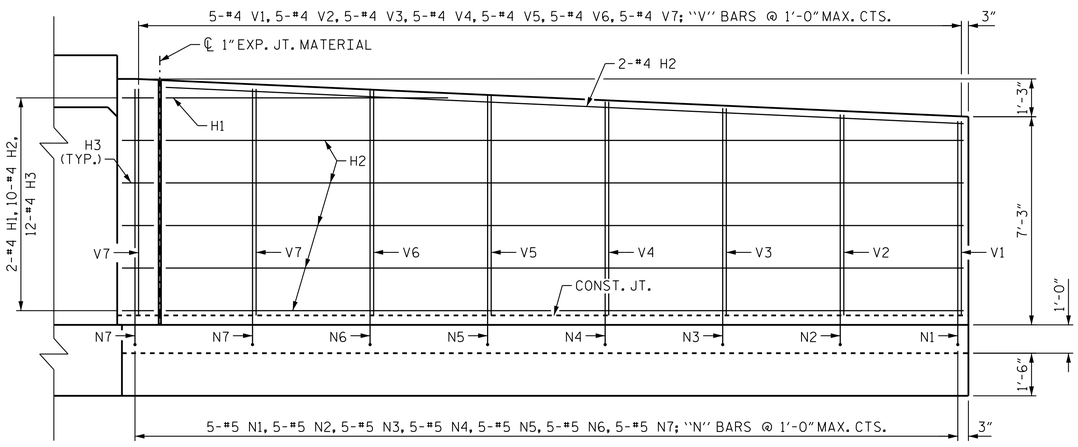
✱S1 @ BOTTOM OF FOOTING
(PLACED AS SHOWN)



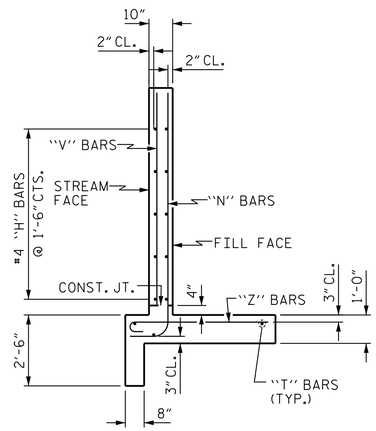
PLAN W1



ELEVATION W2



ELEVATION W1



TYPICAL WING SECTION

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 16+22.00 -Y30RPA-

SHEET 5 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR CONCRETE BOX CULVERT H= 7'-0" SLOPE: 4:1 (LT.)

44°15'14" SKEW

Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road
Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
www.stantec.com
License No. F-0672

DRAWN BY : M. B. ISENHOUR DATE : 05/05/20
CHECKED BY : E. M. MURR DATE : 05/06/20
DESIGN ENGINEER OF RECORD: M.B.ISENHOUR DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 49756 ENGINEER MARSHA B. ISENHOUR
Docusigned by: Marsha B. Isenhour
10/25/2021

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C10-05
1			3			TOTAL SHEETS
2			4			07

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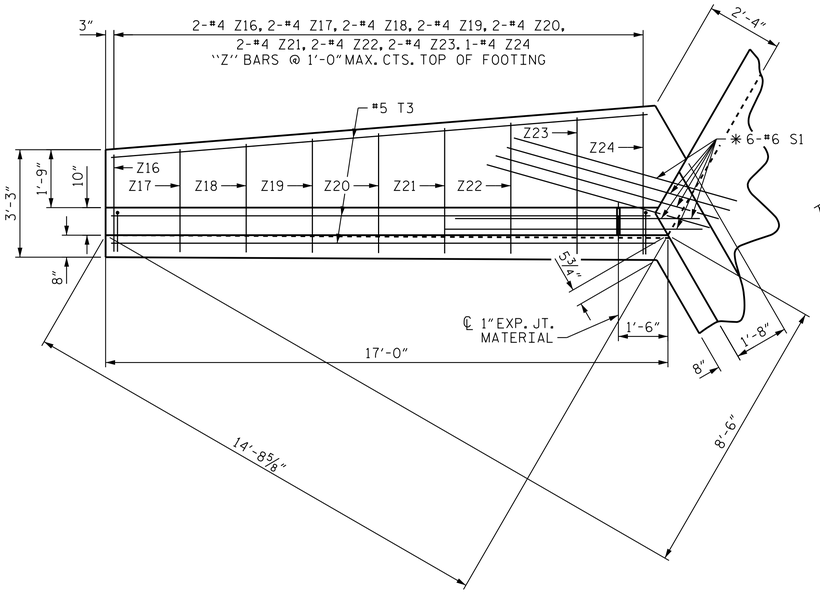
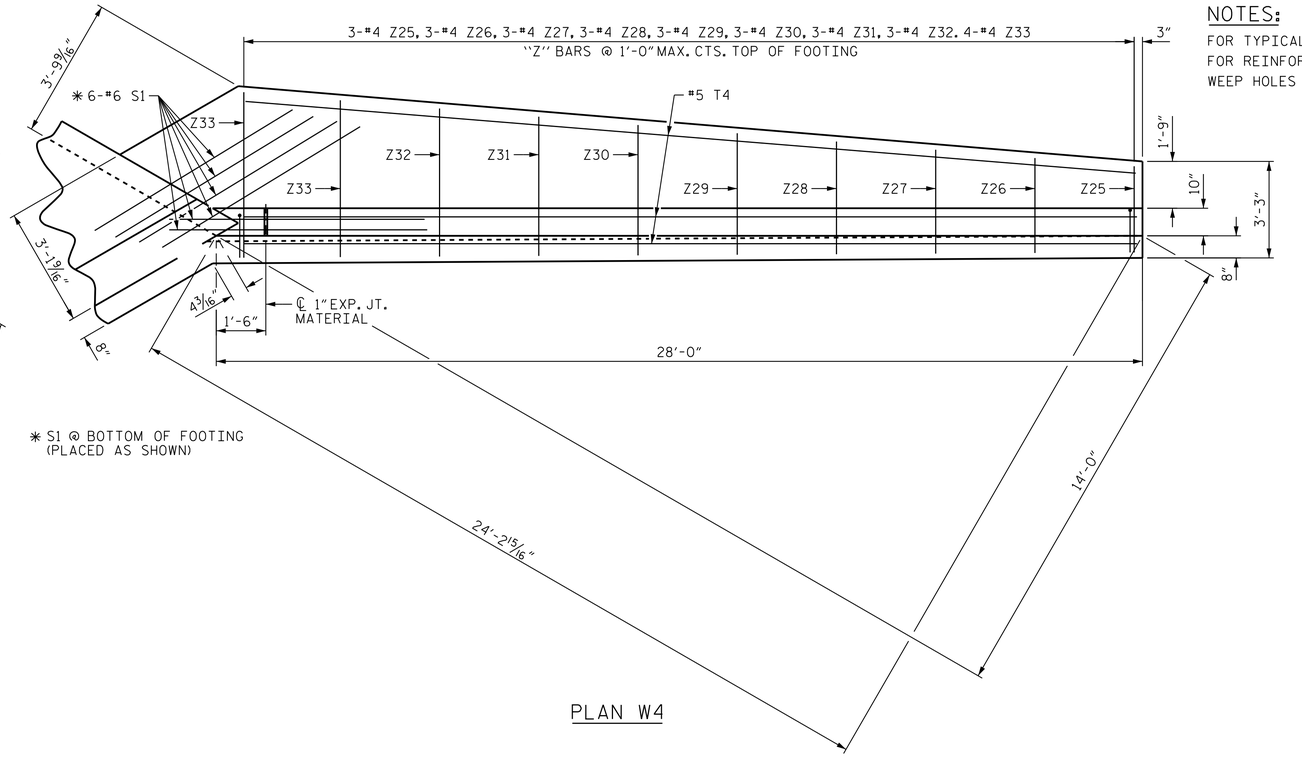


PLAN W3

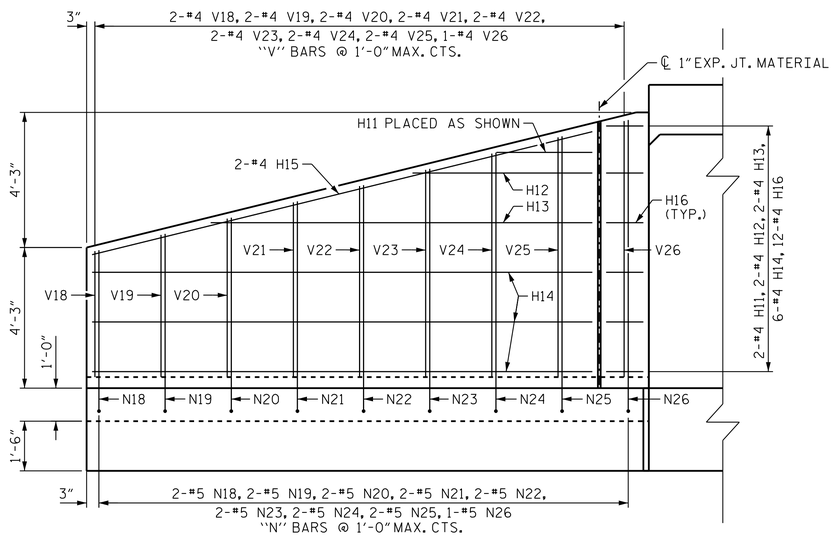


✱ S1 @ BOTTOM OF FOOTING
(PLACED AS SHOWN)

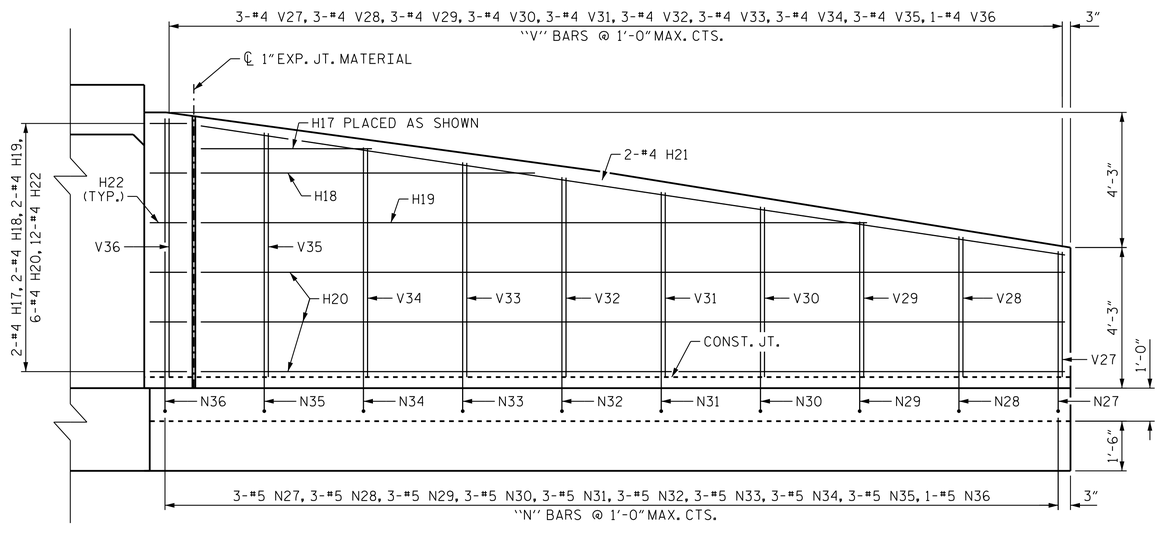
PLAN W4

NOTES:

FOR TYPICAL WING SECTION, SEE SHEET C10-05.
FOR REINFORCEMENT SCHEDULE, SEE SHEET C10-07.
WEEP HOLES NOT SHOWN FOR CLARITY.



ELEVATION W3



ELEVATION W4

Stantec
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DRAWN BY : M. B. ISENHOUR DATE : 05/05/20
CHECKED BY : E. M. MURR DATE : 05/06/20
DESIGN ENGINEER OF RECORD: M.B.ISENHOUR DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 49756 LINDA B. ISENHOUR
Digitally signed by LINDA B. ISENHOUR
10/25/2021

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. R-3300B
PENDER COUNTY
STATION: 16+22.00 -Y30RPA-

SHEET 6 OF 7

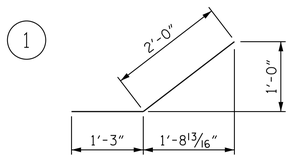
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

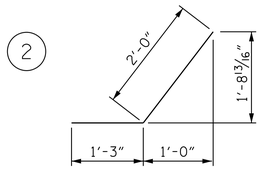
WINGS FOR CONCRETE BOX CULVERT H= 7'-0" SLOPE: 3:1 (RT.)

44°15'14" SKEW

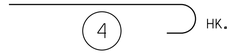
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C10-06
1			3			TOTAL SHEETS
2			4			07

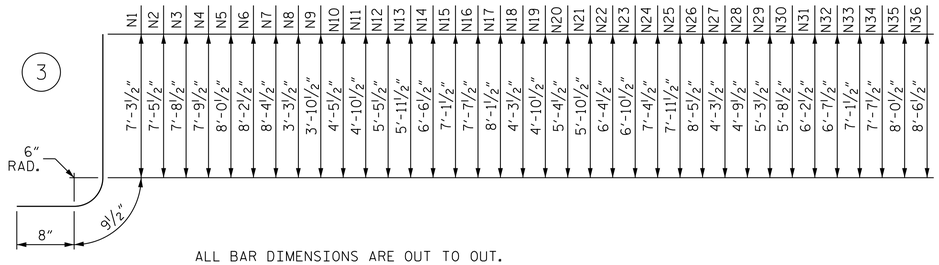
BAR TYPES





Z1	3'-11"	6"
Z2	4'-0"	6"
Z3	4'-1"	6"
Z4	4'-2"	6"
Z5	4'-3"	6"
Z6	2'-7"	6"
Z7	2'-9"	6"
Z8	2'-11"	6"
Z9	3'-2"	6"
Z10	3'-4"	6"
Z11	3'-6"	6"
Z12	3'-8"	6"
Z13	3'-10"	6"
Z14	4'-1"	6"
Z15	4'-3"	6"
Z16	2'-11"	6"
Z17	3'-1"	6"
Z18	3'-3"	6"
Z19	3'-5"	6"
Z20	3'-7"	6"
Z21	3'-10"	6"
Z22	4'-0"	6"
Z23	4'-2"	6"
Z24	4'-4"	6"
Z25	2'-11"	6"
Z26	3'-1"	6"
Z27	3'-3"	6"
Z28	3'-5"	6"
Z29	3'-7"	6"
Z30	3'-9"	6"
Z31	3'-11"	6"
Z32	4'-1"	6"
Z33	4'-3"	6"





ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	2	#4	STR	8'-1"	11
H2	12	#4	STR	33'-1"	266
H3	12	#4	1	3'-3"	27
H4	2	#4	STR	3'-0"	5
H5	2	#4	STR	5'-6"	8
H6	2	#4	STR	11'-1"	15
H7	2	#4	STR	16'-9"	23
H8	4	#4	STR	18'-2"	49
H9	2	#4	STR	18'-10"	26
H10	12	#4	2	3'-3"	27
H11	2	#4	STR	3'-3"	5
H12	2	#4	STR	5'-9"	8
H13	2	#4	STR	11'-8"	16
H14	6	#4	STR	15'-1"	61
H15	2	#4	STR	15'-7"	21
H16	12	#4	2	3'-3"	27
H17	2	#4	STR	3'-6"	5
H18	2	#4	STR	10'-8"	15
H19	2	#4	STR	20'-4"	28
H20	6	#4	STR	26'-1"	105
H21	2	#4	STR	26'-5"	36
H22	12	#4	1	3'-3"	27
N1	5	#5	3	8'-9"	46
N2	5	#5	3	8'-11"	47
N3	5	#5	3	9'-2"	48
N4	5	#5	3	9'-3"	49
N5	5	#5	3	9'-6"	50
N6	5	#5	3	9'-8"	51
N7	5	#5	3	9'-10"	52
N8	2	#5	3	4'-9"	10
N9	2	#5	3	5'-4"	12
N10	2	#5	3	5'-11"	13
N11	2	#5	3	6'-4"	14
N12	2	#5	3	6'-11"	15
N13	2	#5	3	7'-5"	16
N14	2	#5	3	8'-0"	17
N15	2	#5	3	8'-7"	18
N16	2	#5	3	9'-1"	19
N17	2	#5	3	9'-7"	20
N18	2	#5	3	5'-9"	12
N19	2	#5	3	6'-4"	14
N20	2	#5	3	6'-10"	15
N21	2	#5	3	7'-4"	16
N22	2	#5	3	7'-10"	17
N23	2	#5	3	8'-4"	18
N24	2	#5	3	8'-10"	19
N25	2	#5	3	9'-5"	20
N26	1	#5	3	9'-11"	11
N27	3	#5	3	5'-9"	18
N28	3	#5	3	6'-3"	20
N29	3	#5	3	6'-9"	22
N30	3	#5	3	7'-2"	23
N31	3	#5	3	7'-8"	24
N32	3	#5	3	8'-1"	26
N33	3	#5	3	8'-7"	27
N34	3	#5	3	9'-1"	29
N35	3	#5	3	9'-6"	30
N36	1	#5	3	10'-0"	11
S1	24	#6	STR	6'-0"	217
T1	3	#5	STR	34'-2"	107
T2	3	#5	STR	19'-4"	61
T3	3	#5	STR	16'-3"	51
T4	3	#5	STR	27'-2"	86
V1	5	#4	STR	6'-9"	23
V2	5	#4	STR	6'-11"	24
V3	5	#4	STR	7'-1"	24
V4	5	#4	STR	7'-3"	25
V5	5	#4	STR	7'-5"	25
V6	5	#4	STR	7'-8"	26
V7	5	#4	STR	7'-10"	27
V8	2	#4	STR	2'-9"	4
V9	2	#4	STR	3'-4"	5
V10	2	#4	STR	3'-10"	6
V11	2	#4	STR	4'-4"	6
V12	2	#4	STR	4'-11"	7
V13	2	#4	STR	5'-5"	8
V14	2	#4	STR	6'-0"	9
V15	2	#4	STR	6'-6"	9
V16	2	#4	STR	7'-0"	10
V17	2	#4	STR	7'-7"	11
V18	2	#4	STR	3'-9"	6
V19	2	#4	STR	4'-3"	6
V20	2	#4	STR	4'-10"	7
V21	2	#4	STR	5'-4"	8
V22	2	#4	STR	5'-10"	8
V23	2	#4	STR	6'-4"	9
V24	2	#4	STR	6'-10"	10
V25	2	#4	STR	7'-4"	10
V26	1	#4	STR	7'-10"	6
V27	3	#4	STR	3'-9"	8
V28	3	#4	STR	4'-3"	9
V29	3	#4	STR	4'-8"	10
V30	3	#4	STR	5'-2"	11
V31	3	#4	STR	5'-7"	12
V32	3	#4	STR	6'-1"	13
V33	3	#4	STR	6'-7"	14
V34	3	#4	STR	7'-0"	15
V35	3	#4	STR	7'-6"	16
V36	1	#4	STR	7'-11"	6
Z1	7	#4	4	4'-5"	21
Z2	7	#4	4	4'-6"	22
Z3	7	#4	4	4'-7"	22
Z4	7	#4	4	4'-8"	22
Z5	7	#4	4	4'-9"	23
Z6	2	#4	4	3'-1"	5
Z7	2	#4	4	3'-3"	5
Z8	2	#4	4	3'-5"	5
Z9	2	#4	4	3'-8"	5
Z10	2	#4	4	3'-10"	6
Z11	2	#4	4	4'-0"	6
Z12	2	#4	4	4'-2"	6
Z13	2	#4	4	4'-4"	6
Z14	2	#4	4	4'-7"	7
Z15	2	#4	4	4'-9"	7
Z16	2	#4	4	3'-5"	5
Z17	2	#4	4	3'-7"	5
Z18	2	#4	4	3'-9"	6
Z19	2	#4	4	3'-11"	6
Z20	2	#4	4	4'-1"	6
Z21	2	#4	4	4'-4"	6
Z22	2	#4	4	4'-6"	7
Z23	2	#4	4	4'-8"	7
Z24	1	#4	4	4'-10"	4
Z25	3	#4	4	3'-5"	7
Z26	3	#4	4	3'-7"	8
Z27	3	#4	4	3'-9"	8
Z28	3	#4	4	3'-11"	8
Z29	3	#4	4	4'-1"	9
Z30	3	#4	4	4'-3"	9
Z31	3	#4	4	4'-5"	9
Z32	3	#4	4	4'-7"	10
Z33	4	#4	4	4'-9"	13

REINF. STEEL FOR 4 WINGS	2,862 LBS
CLASS A CONCRETE	
4 WINGS	38.7 CY
2 HEADWALLS	1.4 CY
2 END CURTAIN WALLS	1.6 CY
TOTAL	41.7 CY

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 16+22.00 -Y30RPA-

SHEET 7 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WING WALL BILL OF MATERIALS

44°15'14" SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C10-07
1			3			TOTAL SHEETS
2			4			07

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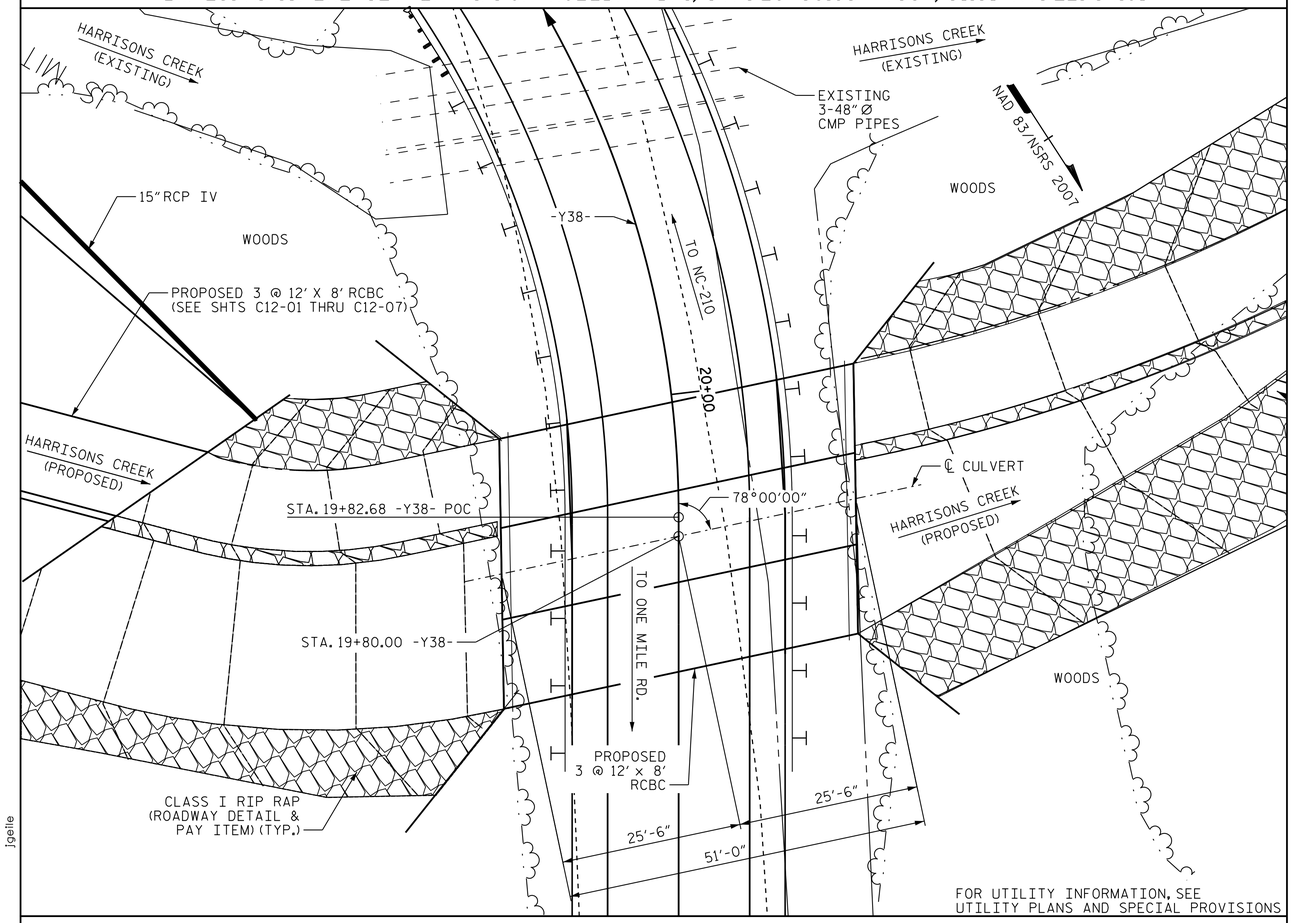
DRAWN BY : E. M. MURR DATE : 05/05/20
CHECKED BY : M. B. ISENHOUR DATE : 05/06/20
DESIGN ENGINEER OF RECORD: M.B.ISENHOUR DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 49756 ENGINEER MELINDA B ISENHOUR
Digitally signed by MELINDA ISENHOUR
10/25/2021

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

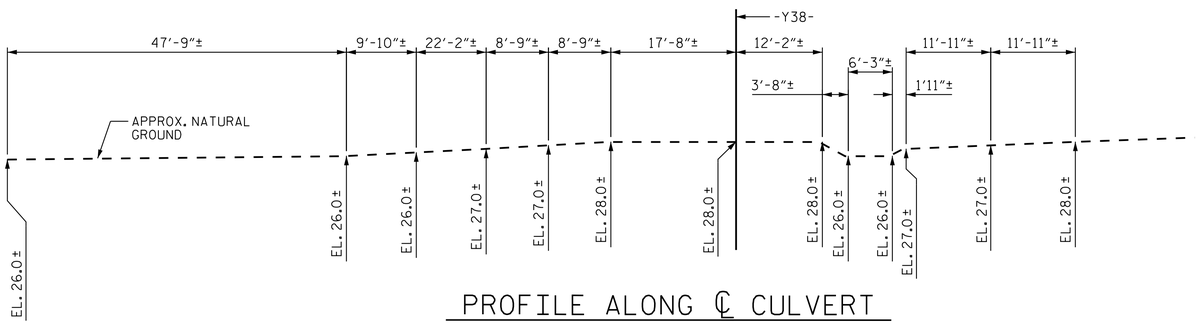
jgelle
10/25/2021
U:\Structures\C10\Drafting\Final\R3300B_SMU_CU07_70001D.dgn

BM#25: R.R.SPIKE SET IN P.P. ON HOLIDAY DR., STA. 29+39.83 -Y38-, 31.31' RT. EL. 34.91



FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS

LOCATION SKETCH



PROFILE ALONG ℄ CULVERT

FOUNDATION NOTES

EXCAVATE FOUNDATION A MINIMUM OF 3.0 FEET BELOW CULVERT BEARING ELEVATION. PLACE 3.0 FEET OF CLASS VI FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH SECTION 414 OF THE STANDARD SPECIFICATIONS.

ENCAPSULATE FOUNDATION CONDITIONING MATERIAL IN TYPE 4 GEOTEXTILE. FOR FOUNDATION CONDITIONING GEOTEXTILE, SEE GEOTECHNICAL SPECIAL PROVISIONS.

TOTAL STRUCTURE QUANTITIES

CULVERT EXCAVATION	LUMP SUM	
FOUNDATION COND. MATERIAL	461	TONS
FOUNDATION COND. GEOTEXTILE	1,005	S.Y.
CLASS A CONCRETE		
BARREL @ 4.144 CY/FT	211.4	C.Y.
WINGS ETC.	45.6	C.Y.
TOTAL	257.0	C.Y.
REINFORCING STEEL		
BARREL	28,901	LBS.
WINGS ETC.	2,471	LBS.
TOTAL	31,372	LBS.

ROADWAY DATA

GRADE POINT ELEV. @ STATION 19+80.00 -Y38-	=	31.71
BED ELEV. @ STATION 19+80.00 -Y38-	=	19.80
ROADWAY SLOPES	=	3:1

HYDRAULIC DATA

DESIGN DISCHARGE	=	840.0	C.F.S.
FREQUENCY OF DESIGN FLOOD	=	25	YRS.
DESIGN HIGH WATER ELEVATION	=	27.60	
DRAINAGE AREA	=	2.12	SQ. MI.
BASE DISCHARGE (Q100)	=	1,100	C.F.S.
BASE HIGH WATER ELEVATION	=	28.30	

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	=	1,900	C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	=	500+	YRS.
OVERTOPPING FLOOD ELEVATION	=	30.40	

OVERTOPS AT STATION 23+49.00 -Y38- SAG; EL. 30.40

NOTES

ASSUMED LIVE LOAD = HL-93.

DESIGN FILL= 4.17' (MAXIMUM) & 3.48' (MINIMUM)

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.

THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

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

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

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

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

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.

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.

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.

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. RIP-RAP MAY BE USED TO SUPPLEMENT THE NATIVE MATERIAL IN THE HIGH FLOW CULVERT BARREL(S). IF RIP-RAP IS USED TO LINE THE HIGH FLOW CULVERT BARREL(S), NATIVE MATERIALS 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. (THALWEG)

DO NOT SET ELEVATION OF HIGH SILLS ABOVE BANK FULL.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

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DRAWN BY : J. HAGENBUSH DATE : 11/22/19
CHECKED BY : T. R. DUDECK DATE : 12/12/19

DESIGN ENGINEER OF RECORD: T. R. DUDECK DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 31462 ENGINEER THOMAS R DUDECK
Digitally signed by Thomas R Dudeck
10/25/2021

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PROJECT NO. R-3300B
PENDER COUNTY
STATION: 19+80.00 -Y38-

SHEET 1 OF 6 BRIDGE NO. 700263

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 12 FT. X 8 FT. CONCRETE BOX CULVERT

78° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C11-01
1			3			TOTAL SHEETS
2			4			06

jgelle
10/22/2021
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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	1.27	--	1.75	1.32	1 & 3	TOP SLAB (MID) - INSIDE	6.67	1.27	3	TOP SLAB (LEFT END)	0.00	1
		HL-93 (OPERATING)	N/A		1.64	--	1.35	1.71	1	TOP SLAB (MID) - INSIDE	6.67	1.64	3	TOP SLAB (LEFT END)	0.00	1
		HS-20 (INVENTORY)	36.000	2	1.43	51.480	1.75	1.47	1 & 3	TOP SLAB (MID) - INSIDE	6.67	1.43	3	TOP SLAB (LEFT END)	0.00	1
		HS-20 (OPERATING)	36.000		1.85	66.600	1.35	1.90	1	TOP SLAB (MID) - INSIDE	6.67	1.85	3	TOP SLAB (LEFT END)	0.00	1
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		2.85	38.475	1.40	2.85	1 & 3	EXT. WALL (MID) - INSIDE	5.17	3.84	3	TOP SLAB (LEFT END)	0.00	1
		SNGARBS2	20.000		2.85	57.000	1.40	2.85	1 & 3	EXT. WALL (MID) - INSIDE	5.17	3.55	3	TOP SLAB (LEFT END)	0.00	1
		SNAGRIS2	22.000		2.85	62.700	1.40	2.85	1 & 3	EXT. WALL (MID) - INSIDE	5.17	3.76	3	TOP SLAB (LEFT END)	0.00	1
		SNCOTTS3	27.250	3	2.01	54.773	1.40	2.32	3	TOP SLAB (MID) - INSIDE	6.67	2.01	3	TOP SLAB (LEFT END)	0.00	1
		SNAGGRS4	34.925		2.26	78.931	1.40	2.74	1 & 3	TOP SLAB (MID) - INSIDE	6.67	2.26	3	TOP SLAB (LEFT END)	0.00	1
		SNS5A	35.550		2.16	76.788	1.40	2.61	1	TOP SLAB (MID) - INSIDE	6.67	2.16	3	TOP SLAB (LEFT END)	0.00	1
		SNS6A	39.950		2.14	85.493	1.40	2.61	1	TOP SLAB (MID) - INSIDE	6.67	2.14	3	TOP SLAB (LEFT END)	0.00	1
		SNS7B	42.000		2.12	89.040	1.40	2.61	3	TOP SLAB (MID) - INSIDE	6.67	2.12	3	TOP SLAB (LEFT END)	0.00	1
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.85	94.050	1.40	2.85	1 & 3	EXT. WALL (MID) - INSIDE	5.17	2.99	3	TOP SLAB (LEFT END)	0.00	1
		TNT4A	33.075		2.32	76.734	1.40	2.76	1	TOP SLAB (MID) - INSIDE	6.67	2.32	3	TOP SLAB (LEFT END)	0.00	1
		TNT6A	41.600		2.16	89.856	1.40	2.66	1 & 3	TOP SLAB (MID) - INSIDE	6.67	2.16	3	TOP SLAB (LEFT END)	0.00	1
		TNT7A	42.000		2.22	93.240	1.40	2.72	3	TOP SLAB (MID) - INSIDE	6.67	2.22	3	TOP SLAB (LEFT END)	0.00	1
		TNT7B	42.000		2.24	94.080	1.40	2.61	1	TOP SLAB (MID) - INSIDE	6.67	2.24	3	TOP SLAB (LEFT END)	0.00	1
		TNAGRIT4	43.000		2.26	97.180	1.40	2.65	3	TOP SLAB (LEFT END)	0.00	2.26	3	TOP SLAB (LEFT END)	0.00	1
		TNAGT5A	45.000		2.25	101.250	1.40	2.65	3	TOP SLAB (LEFT END)	0.00	2.25	3	TOP SLAB (LEFT END)	0.00	1
		TNAGT5B	45.000		2.20	99.000	1.40	2.29	3	TOP SLAB (LEFT END)	0.00	2.20	3	TOP SLAB (LEFT END)	0.00	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. MINIMUM FILL CONDITION CONTROLS.

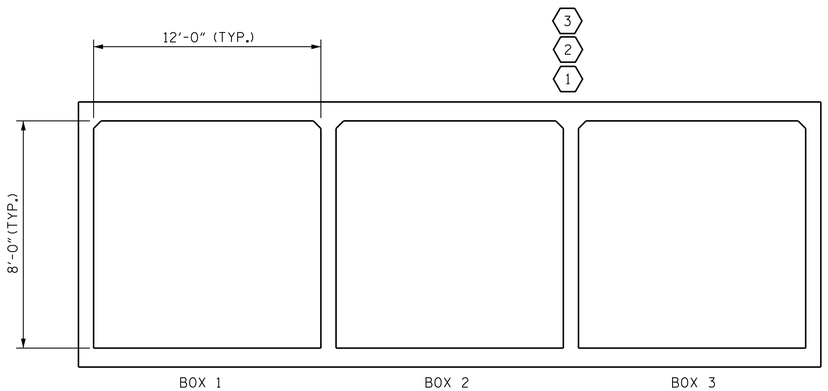
(#) CONTROLLING LOAD RATING

(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-3300B

PENDER COUNTY

STATION: 19+80.00 -Y38-

SHEET 2 OF 6

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:	C11-02
1			3			TOTAL SHEETS
2			4			06

STD. NO. LRFR5

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ASSEMBLED BY : J. HAGENBUSH DATE : 11/25/19
CHECKED BY : T. R. DUDECK DATE : 12/12/19

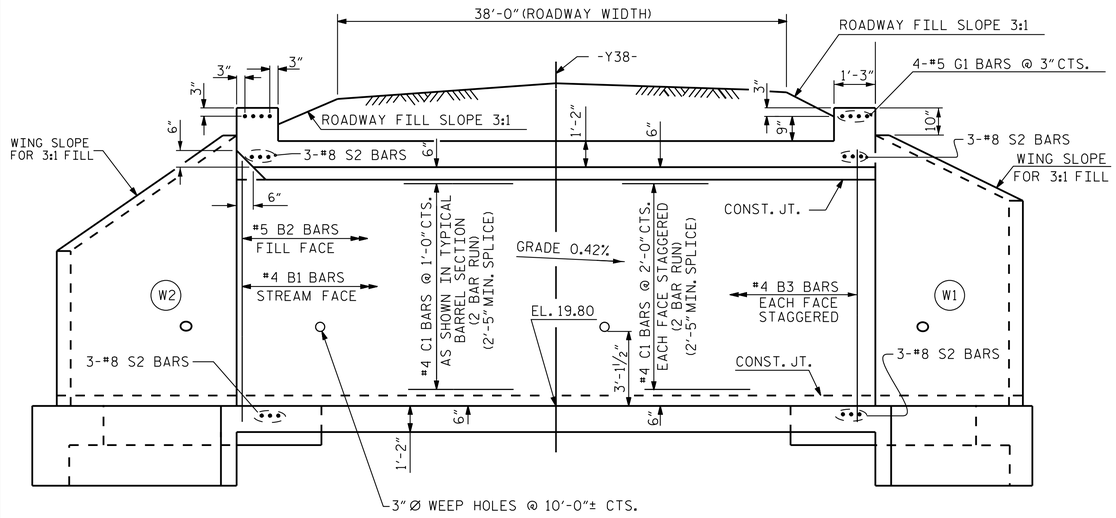
DRAWN BY : WMC 7/11
CHECKED BY : GM 7/11

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

DESIGN ENGINEER OF RECORD: T. R. DUDECK DATE : 10/25/21

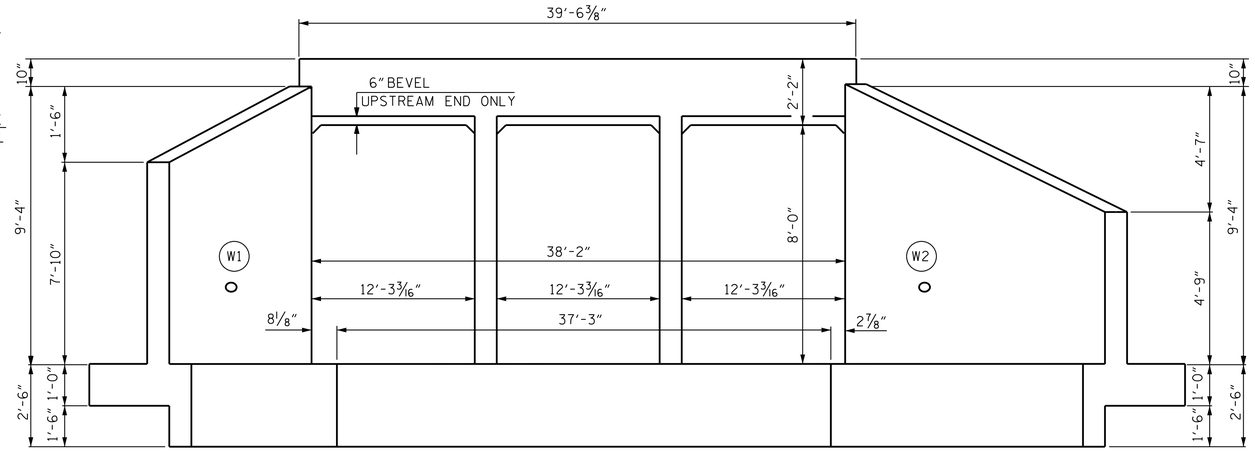
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 39462 THOMAS R. DUDECK
Docu Signed by: Tommy Dudeck
10/25/2021

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



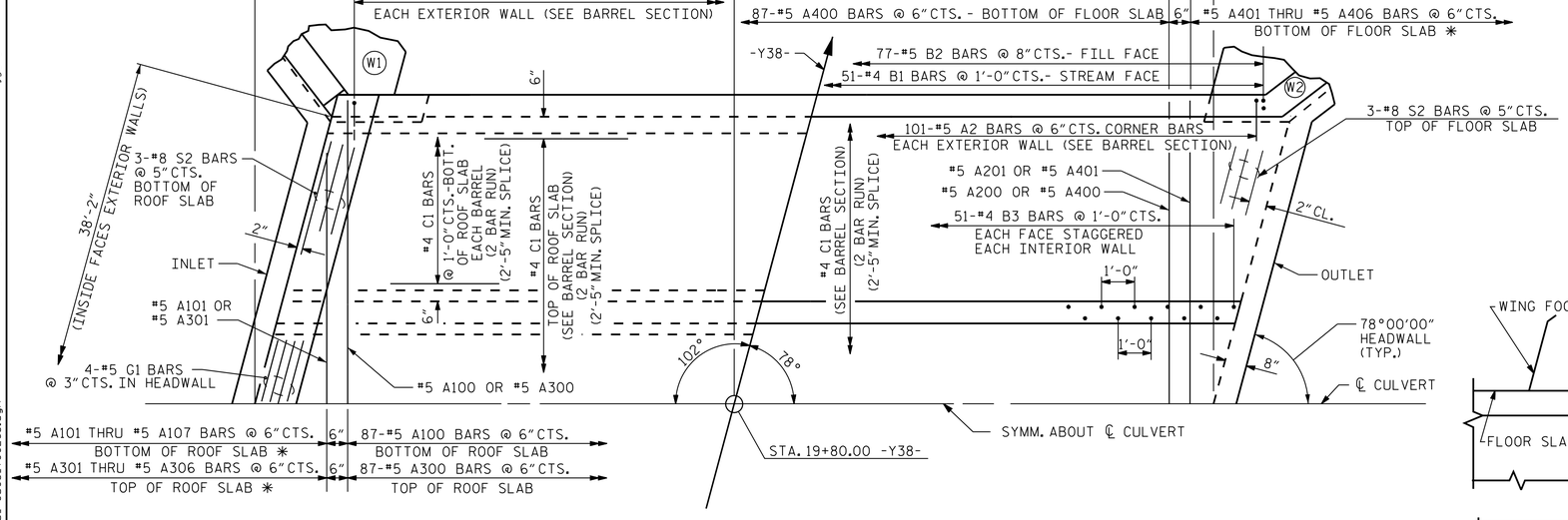
EXTERIOR WALL INTERIOR WALL

CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION NORMAL TO SKEW

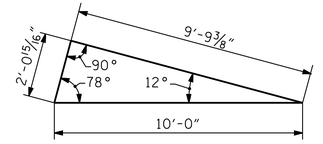
(LOOKING UPSTREAM)



PART PLAN - ROOF SLAB PART PLAN - FLOOR SLAB

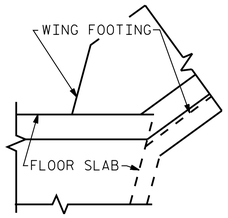
* 2 BARS PER MARK

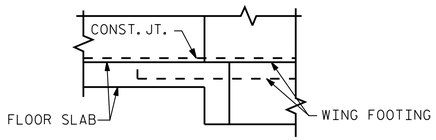
SEE NOTES ON SHEET 1 OF 6 FOR ADDITIONAL INFORMATION.



SKEW TRIANGLE

(℄ ROADWAY)





DETAIL
CONNECTION OF WING FOOTING AND FLOOR SLAB WHEN SLAB IS THICKER THAN FOOTING

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 19+80.00 -Y38-

SHEET 3 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 12 FT. X 8 FT. CONCRETE BOX CULVERT

78° SKEW

REVISIONS						SHEET NO.
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DRAWN BY : J. HAGENBUSH DATE : 11/25/19
CHECKED BY : T. R. DUDECK DATE : 12/12/19

DESIGN ENGINEER OF RECORD: T. R. DUDECK DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 31462 ENGINEER THOMAS R. DUDECK
10/25/2021

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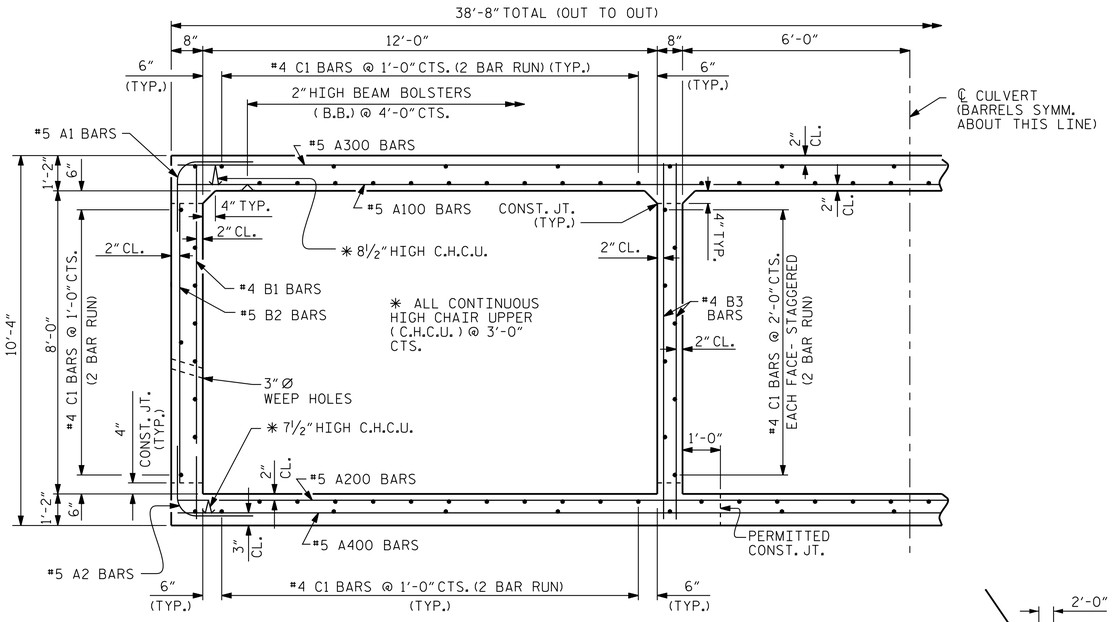
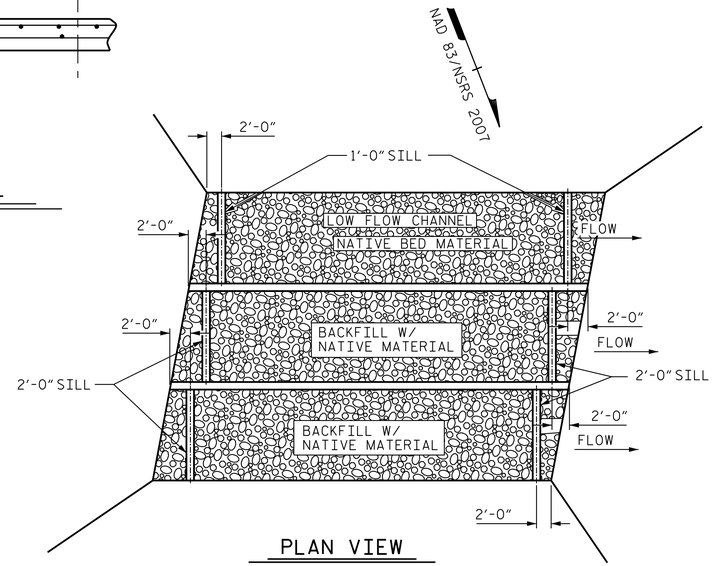


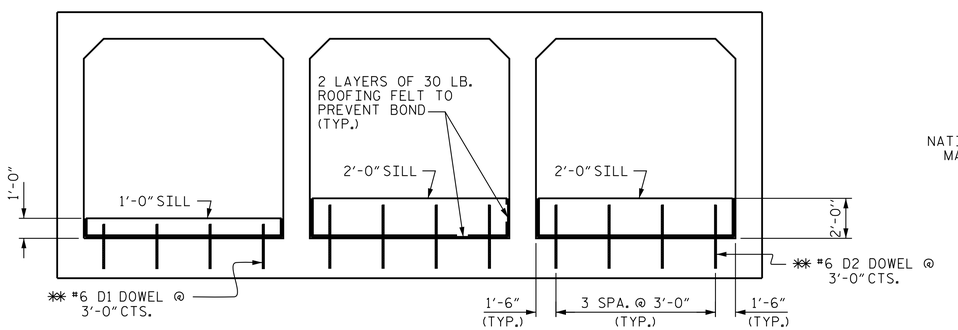
RIGHT ANGLE SECTION OF BARREL

THERE ARE 132 C1 BARS IN SECTION OF BARREL.



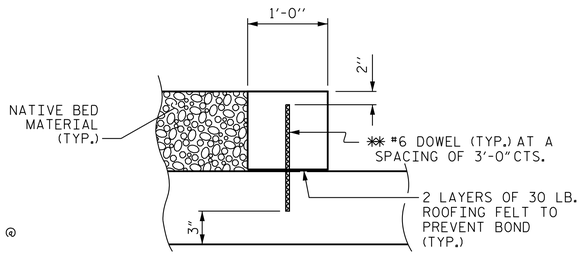
PLAN VIEW

(SEE NOTES SHEET 1 OF 6 FOR BACKFILL INSTRUCTIONS.)



ELEVATION

(LOOKING DOWNSTREAM)



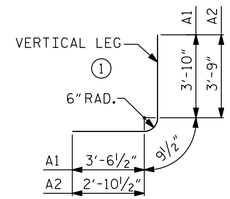
SECTION THROUGH SILL

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

CULVERT SILL DETAILS

(SEE PLAN VIEW FOR LOCATION OF SILLS)
(SEE SHEET 1 OF 6 FOR NOTES REGARDING ADDITIONAL SILL INFORMATION)

BAR TYPE



BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	202	#5	1	8'-2"	1721	A400	87	#5	STR	38'-4"	3479
A2	202	#5	1	7'-5"	1563	A401	4	#5	STR	33'-9"	141
						A402	4	#5	STR	28'-7"	120
A100	87	#5	STR	38'-4"	3479	A403	4	#5	STR	23'-5"	98
A101	4	#5	STR	33'-9"	141	A404	4	#5	STR	18'-3"	77
A102	4	#5	STR	28'-7"	120	A405	4	#5	STR	13'-2"	55
A103	4	#5	STR	23'-5"	98	A406	4	#5	STR	8'-0"	34
A104	4	#5	STR	18'-3"	77						
A105	4	#5	STR	13'-2"	55	B1	102	#4	STR	10'-0"	682
A106	4	#5	STR	8'-0"	34	B2	154	#5	STR	7'-4"	1178
A107	4	#5	STR	2'-10"	12	B3	204	#4	STR	10'-0"	1363
A200	87	#5	STR	38'-4"	3479	C1	264	#4	STR	26'-7"	4689
A201	4	#5	STR	33'-9"	141						
A202	4	#5	STR	28'-7"	120	D1	8	#6	STR	1'-9"	22
A203	4	#5	STR	23'-5"	98	D2	16	#6	STR	2'-9"	67
A204	4	#5	STR	18'-3"	77						
A205	4	#5	STR	13'-2"	55	G1	8	#5	STR	39'-0"	326
A206	4	#5	STR	8'-0"	34						
A207	4	#5	STR	2'-10"	12	S2	12	#8	STR	39'-0"	1250
A300	87	#5	STR	38'-4"	3479	REINFORCING STEEL					28,901 LBS
A301	4	#5	STR	33'-9"	141						
A302	4	#5	STR	28'-7"	120						
A303	4	#5	STR	23'-5"	98						
A304	4	#5	STR	18'-3"	77						
A305	4	#5	STR	13'-2"	55						
A306	4	#5	STR	8'-0"	34						

SPLICE CHART

BAR	SIZE	SPLICE LENGTH
B1,B2	#4	1'-10"
C1	#4	2'-5"

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 19+80.00 -Y38-

SHEET 4 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 12 FT. X 8 FT.
CONCRETE BOX CULVERT

78° SKEW

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DRAWN BY : J. B. GEILE DATE : 11/26/19
CHECKED BY : T. R. DUDECK DATE : 12/18/19

DESIGN ENGINEER OF RECORD: T. R. DUDECK DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 31462 ENGINEER THOMAS R. DUDECK
10/25/2021

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2			4			06

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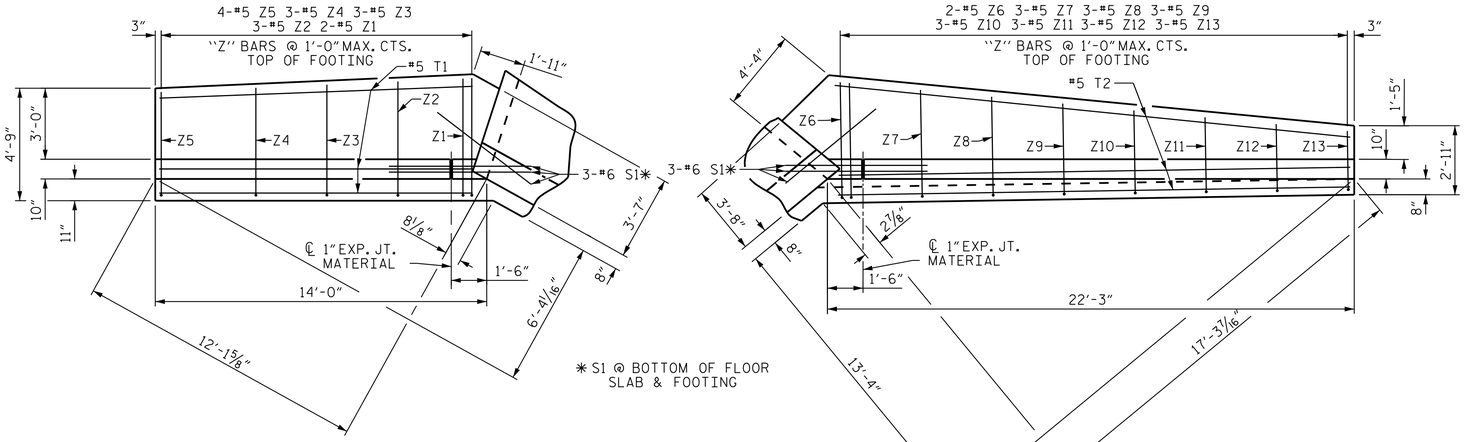
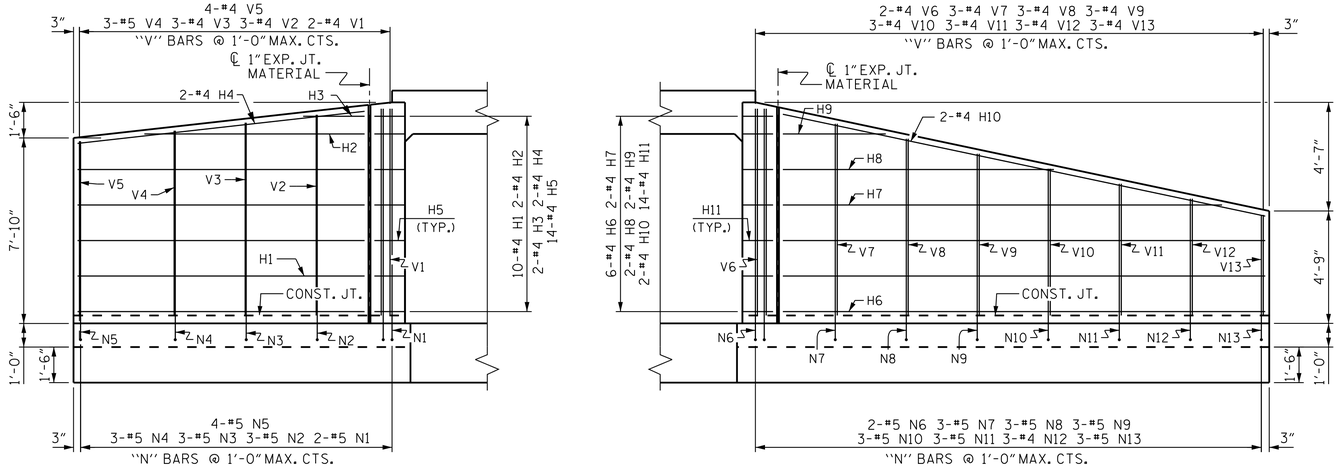


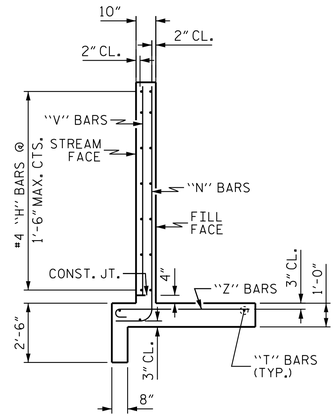
PLAN W1

PLAN W2



ELEVATION W1

ELEVATION W2



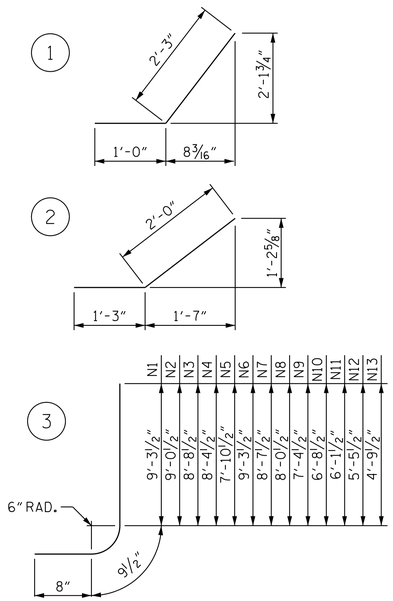
TYPICAL WING SECTION

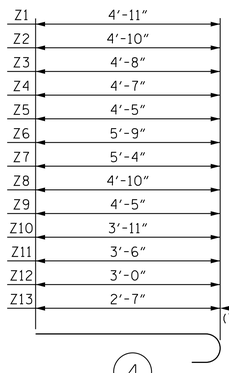
BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	20	#4	STR	12'-1"	162
H2	4	#4	STR	9'-3"	25
H3	4	#4	STR	2'-7"	7
H4	4	#4	STR	12'-2"	33
H5	28	#4	1	3'-3"	61
H6	12	#4	STR	20'-4"	163
H7	4	#4	STR	18'-6"	50
H8	4	#4	STR	11'-5"	31
H9	4	#4	STR	4'-4"	12
H10	4	#4	STR	20'-9"	56
H11	28	#4	2	3'-3"	61
N1	4	#5	3	10'-9"	45
N2	6	#5	3	10'-6"	66
N3	6	#5	3	10'-2"	64
N4	6	#5	3	9'-10"	62
N5	8	#5	3	9'-4"	78
N6	4	#6	3	10'-9"	45
N7	6	#5	3	10'-1"	64
N8	6	#5	3	9'-6"	60
N9	6	#5	3	8'-10"	56
N10	6	#5	3	8'-2"	52
N11	6	#5	3	7'-7"	48
N12	6	#5	3	6'-11"	44
N13	6	#5	3	6'-3"	40
S1	12	#6	STR	6'-0"	109
T1	6	#5	STR	13'-3"	83
T2	6	#5	STR	21'-7"	136
V1	4	#4	STR	8'-8"	24
V2	6	#4	STR	8'-5"	34
V3	6	#4	STR	8'-1"	33
V4	6	#4	STR	7'-9"	32
V5	8	#4	STR	7'-4"	40
V6	4	#4	STR	8'-8"	24
V7	6	#4	STR	8'-1"	33
V8	6	#4	STR	7'-5"	30
V9	6	#4	STR	6'-10"	28
V10	6	#4	STR	6'-2"	25
V11	6	#4	STR	5'-6"	23
V12	6	#4	STR	4'-11"	20
V13	6	#4	STR	4'-3"	18
Z1	4	#5	4	5'-6"	23
Z2	6	#5	4	5'-5"	34
Z3	6	#5	4	5'-3"	33
Z4	6	#5	4	5'-2"	33
Z5	8	#5	4	5'-0"	42
Z6	4	#5	4	6'-4"	27
Z7	6	#5	4	5'-11"	38
Z8	6	#5	4	5'-5"	34
Z9	6	#5	4	5'-0"	32
Z10	6	#5	4	4'-6"	29
Z11	6	#5	4	4'-1"	26
Z12	6	#5	4	3'-7"	23
Z13	6	#5	4	3'-1"	20
REINFORCING STEEL FOR 4 WINGS					2,471 LBS

CLASS A CONCRETE		
4 WINGS	33.0	CY
2 HEADWALLS	3.6	CY
2 END CURTAIN WALLS	4.5	CY
6 SILLS	4.5	CY
TOTAL	45.6	CY

BAR TYPES





ALL BAR DIMENSIONS ARE OUT TO OUT.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 19+80.00 -Y38-

SHEET 5 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR CONCRETE BOX CULVERT H= 8'-0" SLOPE= 3:1 78° SKEW

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DRAWN BY : J. HAGENBUSH DATE : 12/04/19
CHECKED BY : T.R. DUDECK DATE : 12/12/19
DESIGN ENGINEER OF RECORD: T. R. DUDECK DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 31462 ENGINEER THOMAS R. DUDECK
10/25/2021

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2			4			06

NOTES

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

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

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

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

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

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

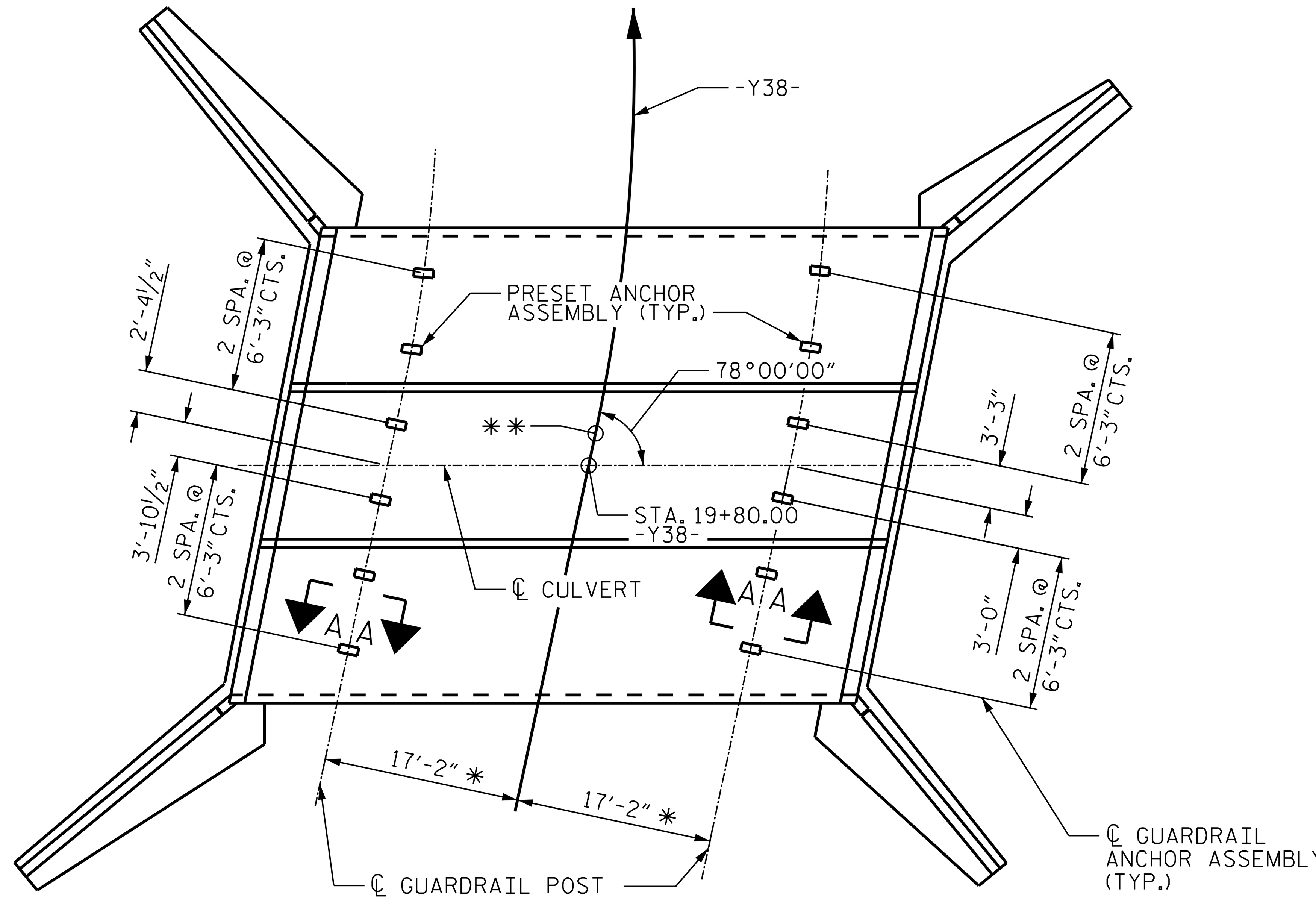
FERRULES TO BE PLUGGED DURING POURING OF SLAB AS RECOMMENDED BY THE MANUFACTURER.

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

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

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

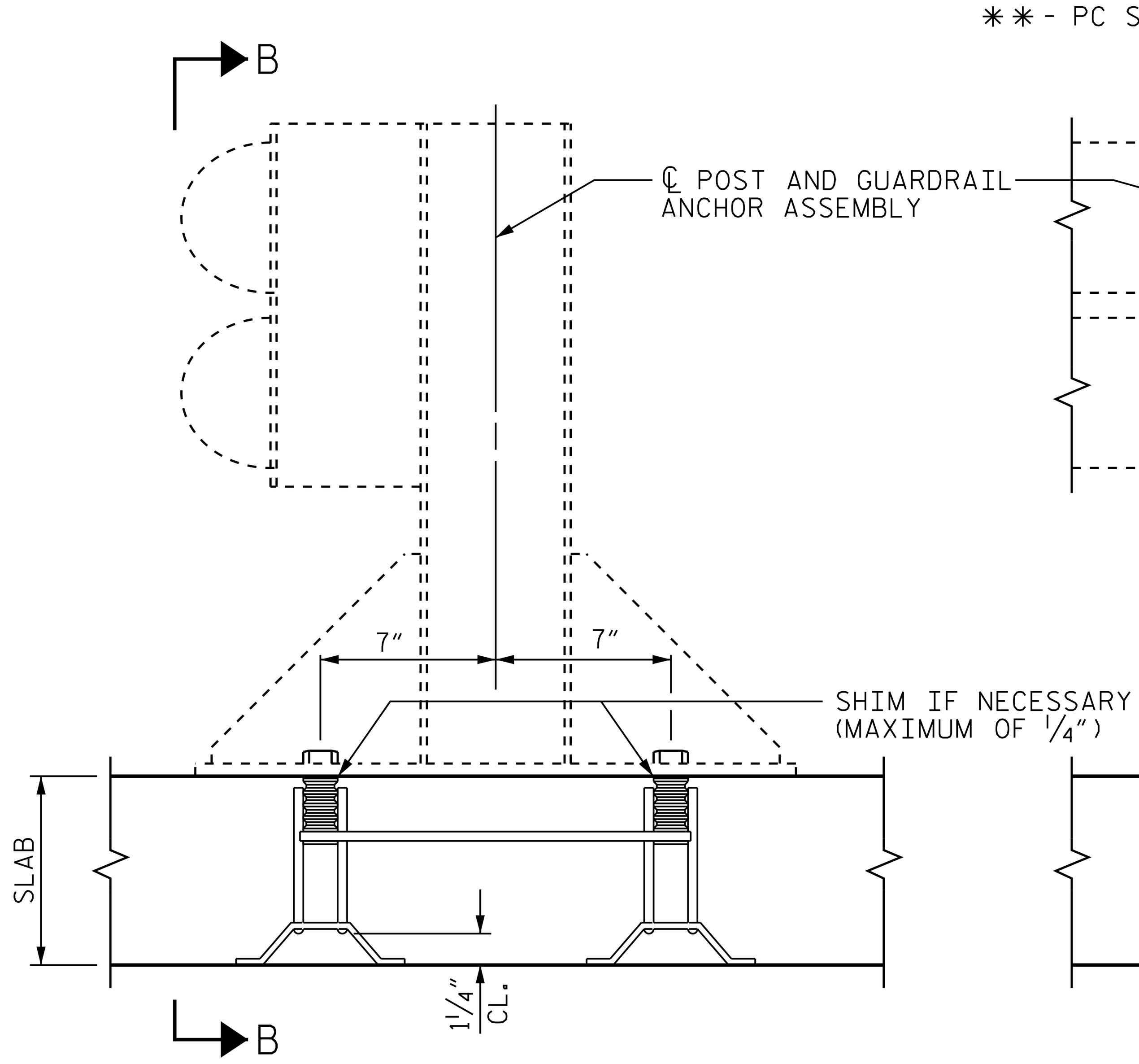
THE CONTRACTOR MAY USE ADHESIVELY ANCHORED ANCHOR BOLTS IN PLACE OF GUARDRAIL ANCHOR ASSEMBLY. LEVEL TWO FIELD TESTING IS REQUIRED, AND THE YIELD LOAD OF THE 1"Ø BOLT IS 21.8 KIPS. FOR ADHESIVELY ANCHORED ANCHOR BOLTS OR DOWELS, SEE STANDARD SPECIFICATIONS.



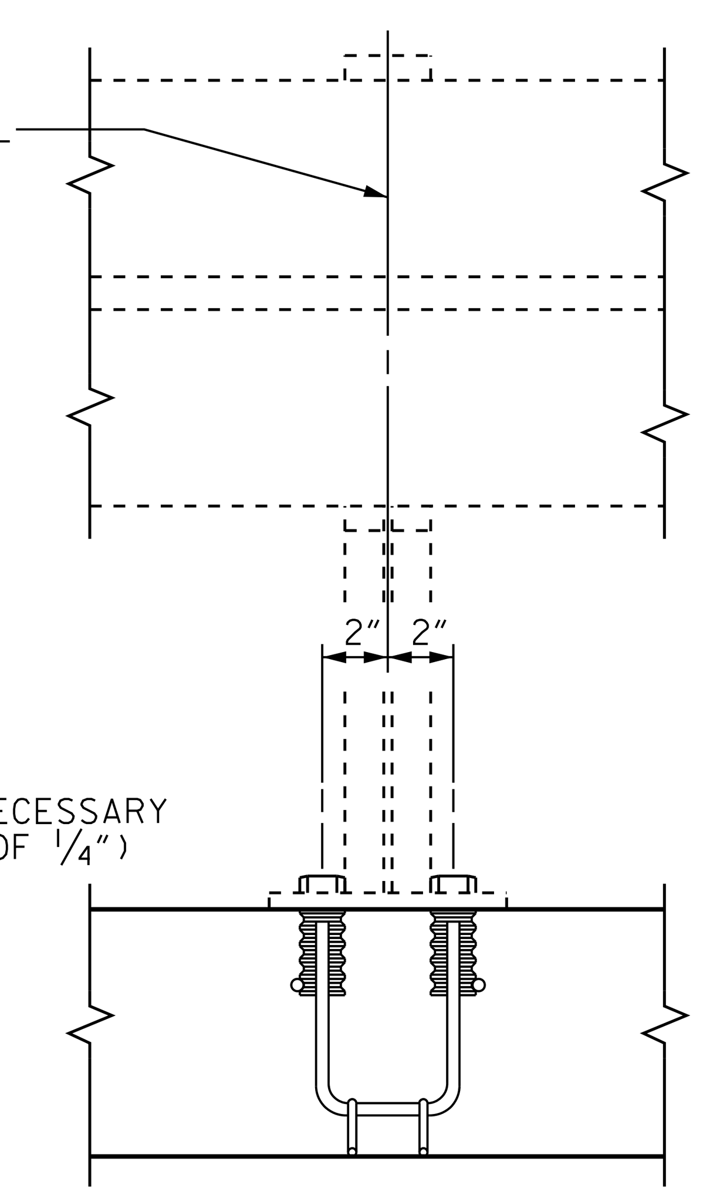
PLAN OF CULVERT GUARDRAIL ANCHOR ASSEMBLY SPACING

✱ - CONTRACTOR TO VERIFY LOCATION WITH FIELD ENGINEER PRIOR TO INSTALLATION.

✱✱ - PC STA. 19+82.68 -Y38-



SECTION A-A



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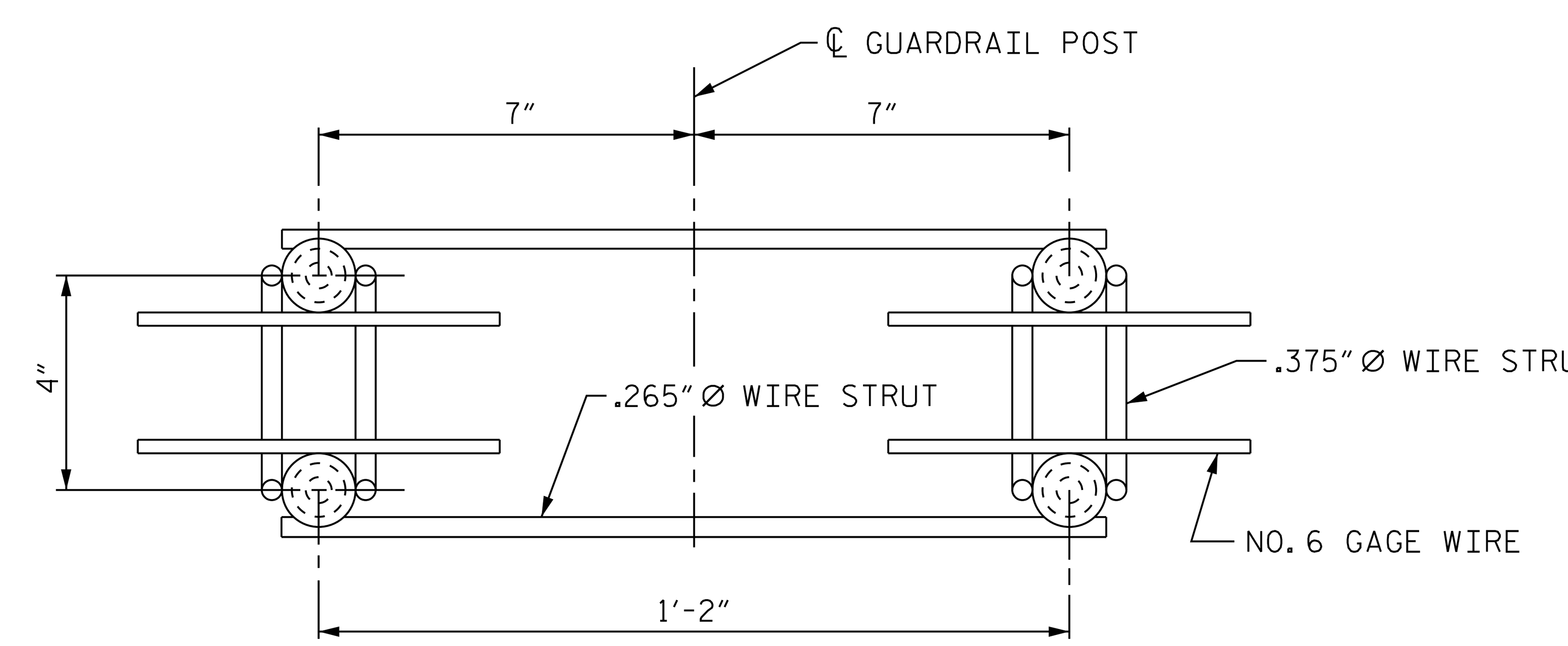
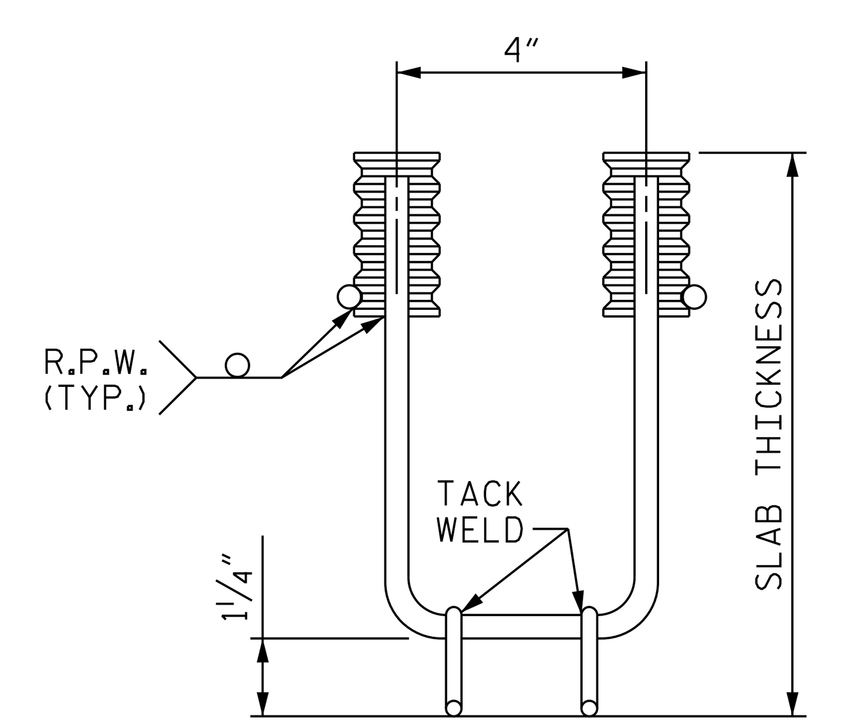
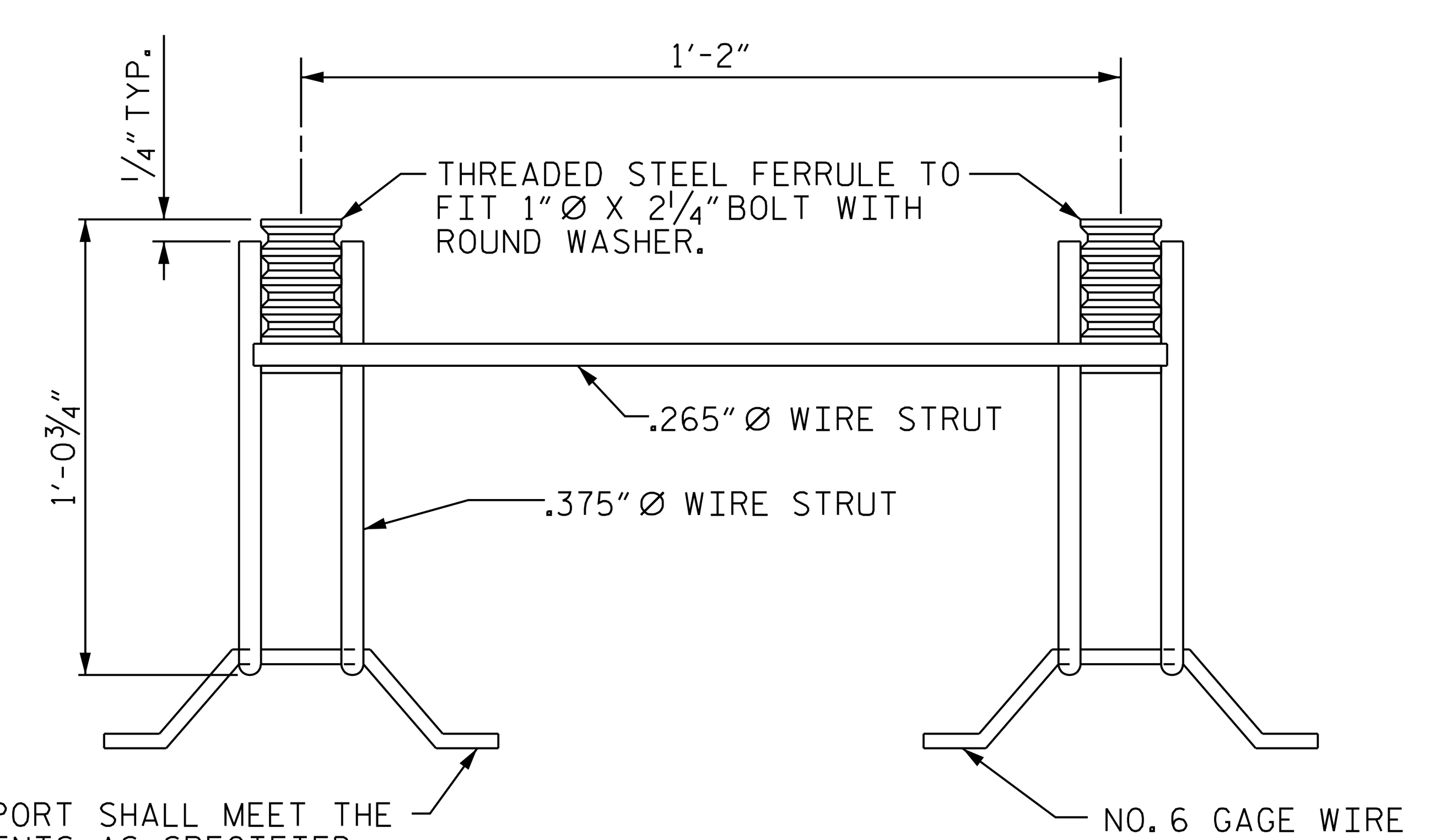


PLAN



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

ELEVATION



SIDE VIEW

GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 19+80.00 -Y38-

SHEET 6 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

ANCHORAGE DETAILS FOR GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS

78° SKEW

REVISIONS							SHEET NO.
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10/25/2021

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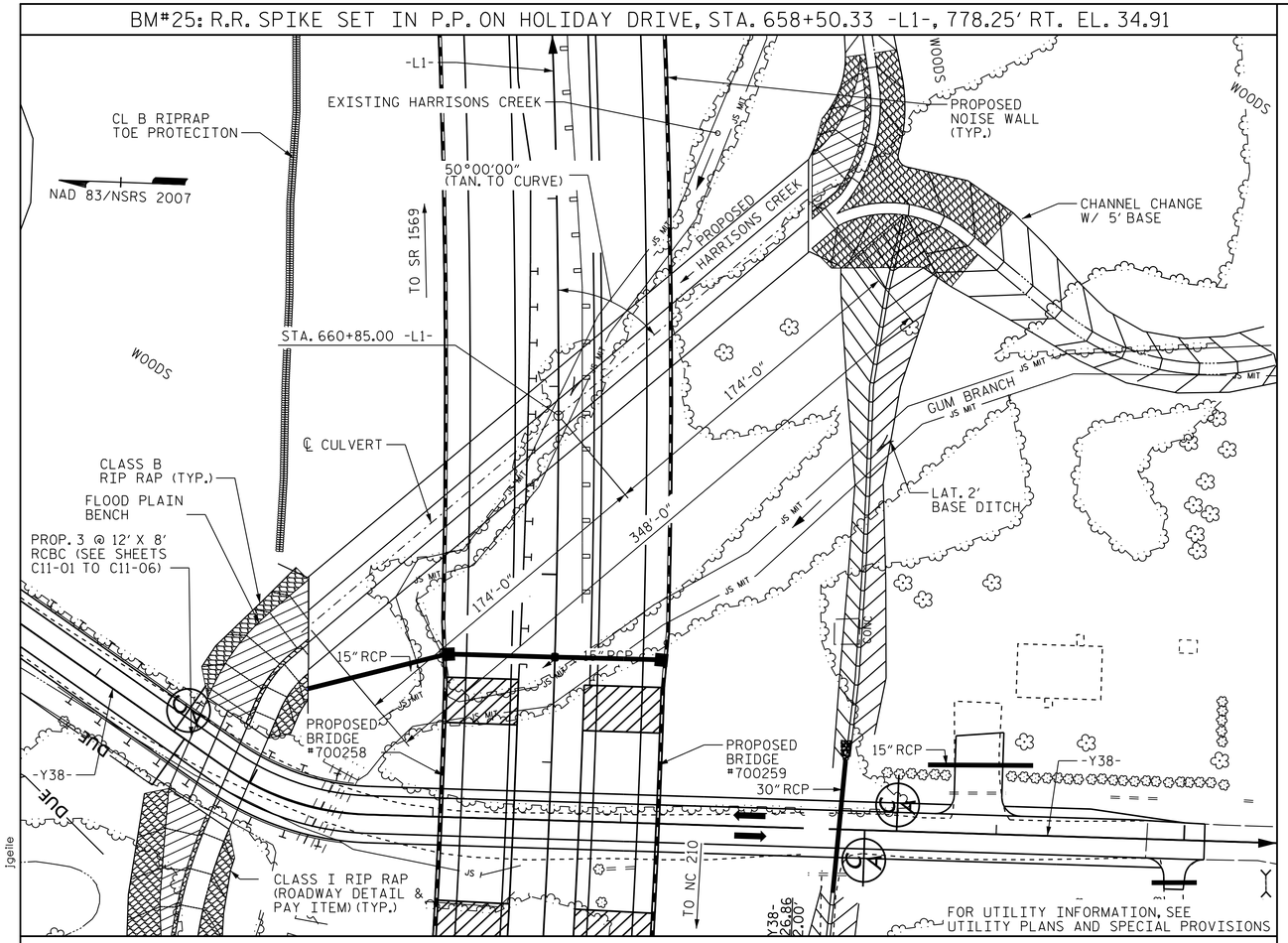
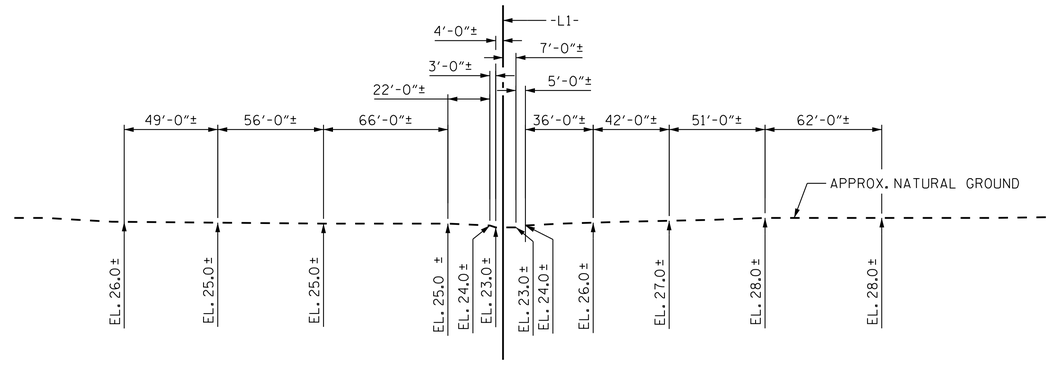
ASSEMBLED BY : J. B. GEILE	DATE : 11/04/19			
CHECKED BY : T. R. DUDECK	DATE : 12/12/19			
DRAWN BY : FCJ 6/88	REV. 10/1/11 MAA/GM	DESIGN ENGINEER OF RECORD: T. R. DUDECK	DATE : 10/25/21	
CHECKED BY : ARB 6/88	REV. 12/17 MAA/THC			
	REV. 6/19 MAA/THC			

jgeile 10/22/2021 U:\Structures\Cl\Drafting\Final\R3300B_SMU_CU06_700263.dgn



LOCATION SKETCH



PROFILE ALONG ℄ CULVERT

NOTES:

ASSUMED LIVE LOAD = HL-93.

DESIGN FILL = 26.25 FT. (MAX.) 24.24 FT. (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:

1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.

THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

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

TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO 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 SHALL BE PAID FOR BY THE CONTRACTOR.

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

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

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

DETAILED DRAWINGS FOR FALSEWORK AND FORMS FOR THIS TRIPLE 12 FT. X 8 FT. RCBC SHALL BE SUBMITTED. SEE SHEET SN.

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.

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.

NATIVE MATERIAL BETWEEN SILLS IN THE CULVERT SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE 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. RIP-RAP MAY BE USED TO SUPPLEMENT THE NATIVE MATERIAL IN THE HIGH FLOW CULVERT BARREL(S), IF RIP-RAP IS USED TO LINE THE HIGH FLOW CULVERT BARREL(S), 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. (THALWEG).

DO NOT SET ELEVATION OF HIGH SILLS ABOVE BANK FULL.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

FOUNDATION NOTES:

EXCAVATE FOUNDATION A MINIMUM OF 3.0 FEET BELOW CULVERT BEARING ELEVATION. PLACE 3.0 FEET OF CLASS VI FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH SECTION 414 OF THE STANDARD SPECIFICATIONS.

ENCAPSULATE FOUNDATION CONDITIONING MATERIAL IN TYPE 4 GEOTEXTILE FOR FOUNDATION CONDITIONING GEOTEXTILE, SEE GEOTECHNICAL SPECIAL PROVISIONS.

CONSTRUCT THE REINFORCED CONCRETE BOX CULVERT AT STATION 660+85.00 -L1- WITH 2 INCHES OF CAMBER TO ACCOUNT FOR ANTICIPATED SETTLEMENT.

TOTAL STRUCTURE QUANTITIES

CULVERT EXCAVATION	LUMP SUM	
FOUNDATION COND. MATERIAL	3,142	TONS
FOUNDATION COND. GEOTEXTILE	4,019	TONS
CLASS A CONCRETE		
BARREL @ 7.008 CY/FT	2,438.8	C.Y.
WINGS ETC.	64.4	C.Y.
TOTAL	2,503.2	C.Y.
REINFORCING STEEL		
BARREL	351,468	LBS.
WINGS ETC.	3,854	LBS.
TOTAL	355,322	LBS.

HYDRAULIC DATA

DESIGN DISCHARGE	=	980	C.F.S.
FREQUENCY OF DESIGN FLOOD	=	50	YRS.
DESIGN HIGH WATER ELEVATION	=	28.90	
DRAINAGE AREA	=	2.12	SQ. MI.
BASE DISCHARGE (Q100)	=	1,100	C.F.S.
BASE HIGH WATER ELEVATION	=	29.40	

ROADWAY DATA

GRADE POINT ELEV. @ STATION 660+85.00 -L1-	=	54.44
BED ELEV. @ STATION 660+85.00 -L1-	=	20.90
ROADWAY SLOPES	=	3:1

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	=	1,300	C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	=	200	YRS.
OVERTOPPING FLOOD ELEVATION	=	30.40	
OVERTOPS AT STATION 23+49.00 -Y38- SAG; EL = 30.40			

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 660+85.00 -L1-

SHEET 1 OF 7 BRIDGE NO. 700264

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 12 FT. X 8 FT. CONCRETE BOX CULVERT

50° SKEW

REVISIONS						SHEET NO.
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DRAWN BY : J. B. GEILE DATE : 11/22/19
CHECKED BY : T. R. DUDECK DATE : 04/06/20
DESIGN ENGINEER OF RECORD: T. R. DUDECK DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 31462 ENGINEER THOMAS R. DUDECK
10/25/2021

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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	2.43	--	1.75	6.87	3	MIDDLE - TOP SLAB	6.00	2.43	3	LEFT END - TOP SLAB	0.00	1
		HL-93 (OPERATING)	N/A		3.15	--	1.35	8.90	3	MIDDLE - TOP SLAB	6.00	3.15	3	LEFT END - TOP SLAB	0.00	1
		HS-20 (INVENTORY)	36.000	2	2.43	87.4	1.75	6.87	3	MIDDLE - TOP SLAB	6.00	2.43	3	LEFT END - BOTT SLAB	0.00	1
		HS-20 (OPERATING)	36.000		3.15	113.4	1.35	8.90	3	MIDDLE - TOP SLAB	6.00	3.15	3	LEFT END - BOTT SLAB	0.00	1
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		10.54	142.2	1.40	37.92	3	MIDDLE - TOP SLAB	6.00	10.54	1	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		SNGARBS2	20.000		7.37	147.4	1.40	25.60	3	MIDDLE - TOP SLAB	6.00	7.37	1	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		SNAGRIS2	22.000		6.79	149.4	1.40	23.28	3	MIDDLE - TOP SLAB	6.00	6.79	1	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		SNCOTTS3	27.250		5.16	140.6	1.40	18.80	3	MIDDLE - TOP SLAB	6.00	5.16	1	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		SNAGGRS4	34.925		4.21	147.0	1.40	14.75	3	MIDDLE - TOP SLAB	6.00	4.21	1	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		SNS5A	35.550		4.15	147.5	1.40	14.80	3	MIDDLE - TOP SLAB	6.00	4.15	3	LEFT END - BOTT SLAB	0.00	1
		SNS6A	39.950		3.78	151.0	1.40	13.85	3	MIDDLE - TOP SLAB	6.00	3.78	3	LEFT END - BOTT SLAB	0.00	1
		SNS7B	42.000		3.55	149.1	1.40	12.75	3	MIDDLE - TOP SLAB	6.00	3.55	1	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		4.64	153.1	1.40	15.76	3	MIDDLE - TOP SLAB	6.00	4.64	1	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		TNT4A	33.075		4.62	152.8	1.40	16.46	3	MIDDLE - TOP SLAB	6.00	4.62	1	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		TNT6A	41.600		3.81	158.5	1.40	14.65	3	MIDDLE - TOP SLAB	6.00	3.81	3	LEFT END - BOTT SLAB	0.00	1
		TNT7A	42.000		3.77	158.3	1.40	13.52	3	MIDDLE - TOP SLAB	6.00	3.77	1	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		TNT7B	42.000		3.89	163.4	1.40	14.25	3	MIDDLE - TOP SLAB	6.00	3.89	1	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		TNAGRIT4	43.000		3.61	155.2	1.40	12.73	3	MIDDLE - TOP SLAB	6.00	3.61	1	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		TNAGT5A	45.000		3.54	159.3	1.40	13.12	3	MIDDLE - TOP SLAB	6.00	3.54	3	LEFT END - BOTT SLAB	0.00	1
		TNAGT5B	45.000	3	3.37	151.7	1.40	12.11	3	MIDDLE - TOP SLAB	6.00	3.37	1	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	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. MAXIMUM FILL CONDITION CONTROLS.

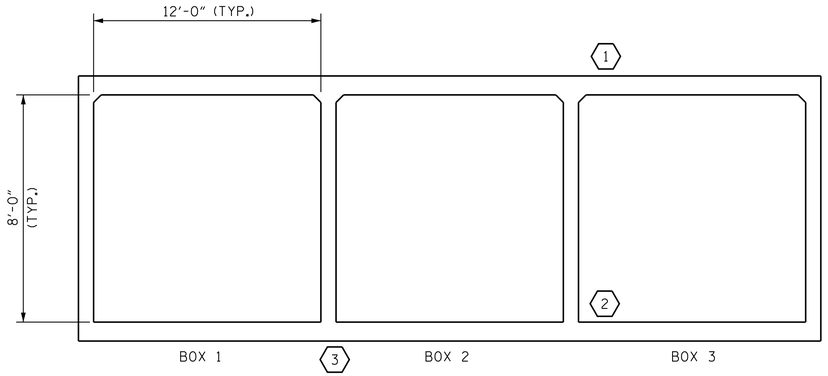
(#) CONTROLLING LOAD RATING

(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)

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CHECKED BY : T. R. DUDECK DATE : 04/06/20

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

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

DESIGN ENGINEER OF RECORD: T. R. DUDECK DATE : 10/25/21

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 660+85.00 -L1-

SHEET 2 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

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

REVISIONS						SHEET NO.
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1			3			TOTAL SHEETS
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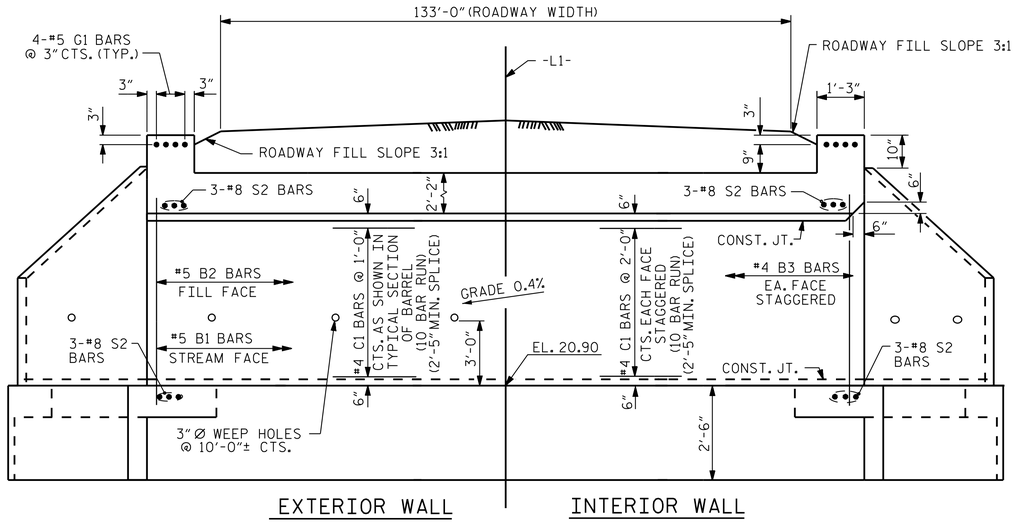
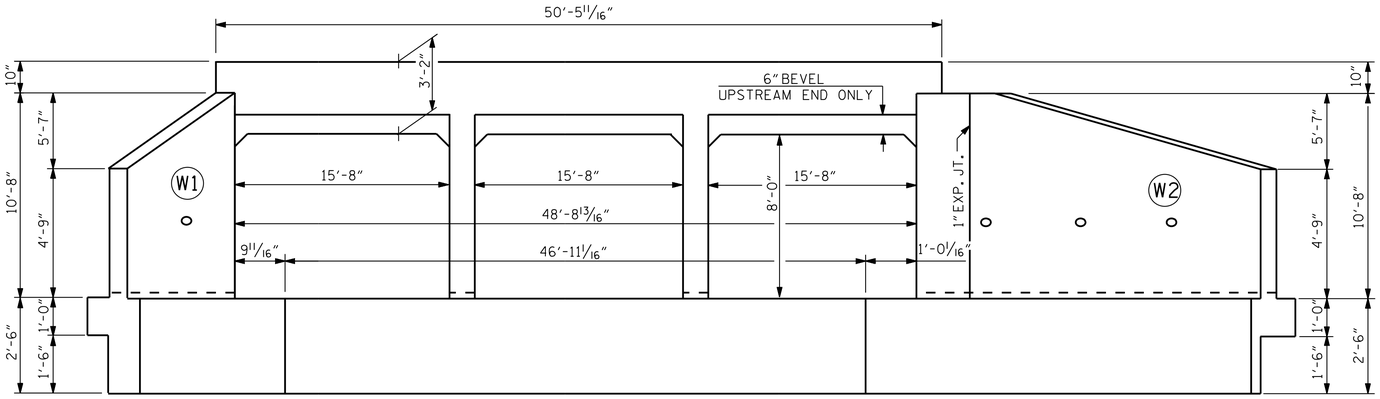
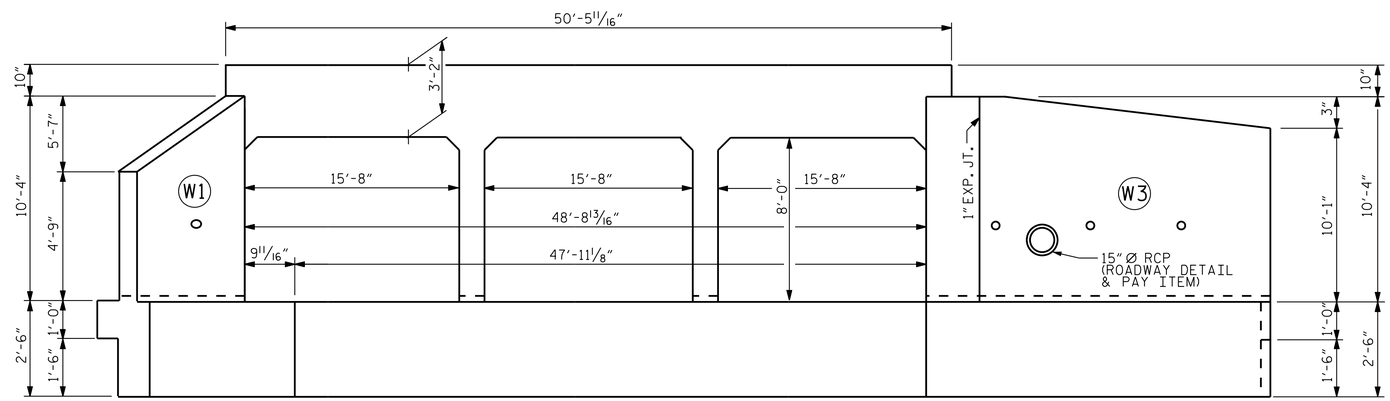


CULVERT SECTION NORMAL TO ROADWAY



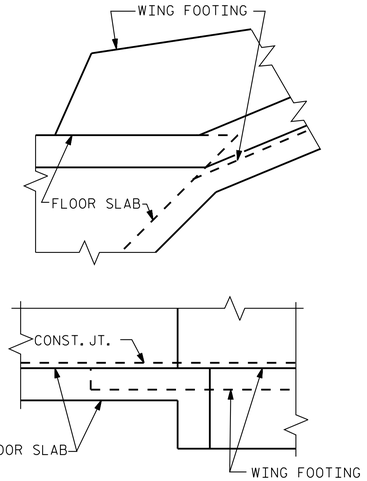
END ELEVATION NORMAL TO SKEW

(INLET ONLY) (LOOKING DOWNSTREAM)

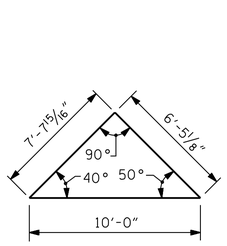


END ELEVATION NORMAL TO SKEW

(OUTLET ONLY) (LOOKING UPSTREAM)



CONNECTION OF WING FOOTING AND FLOOR SLAB WHEN SLAB IS THICKER THAN FOOTING



SKEW TRIANGLE

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 660+85.00 -L1-

SHEET 3 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 12 FT. X 8 FT. CONCRETE BOX CULVERT

50° SKEW

REVISIONS						SHEET NO.
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DRAWN BY : J. B. GEILE DATE : 11/26/19
CHECKED BY : T. R. DUDECK DATE : 04/06/20

DESIGN ENGINEER OF RECORD: T. R. DUDECK DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 031462 ENGINEER THOMAS R. DUDECK
DocuSigned by: Thomas R. Dudeck
10/25/2021

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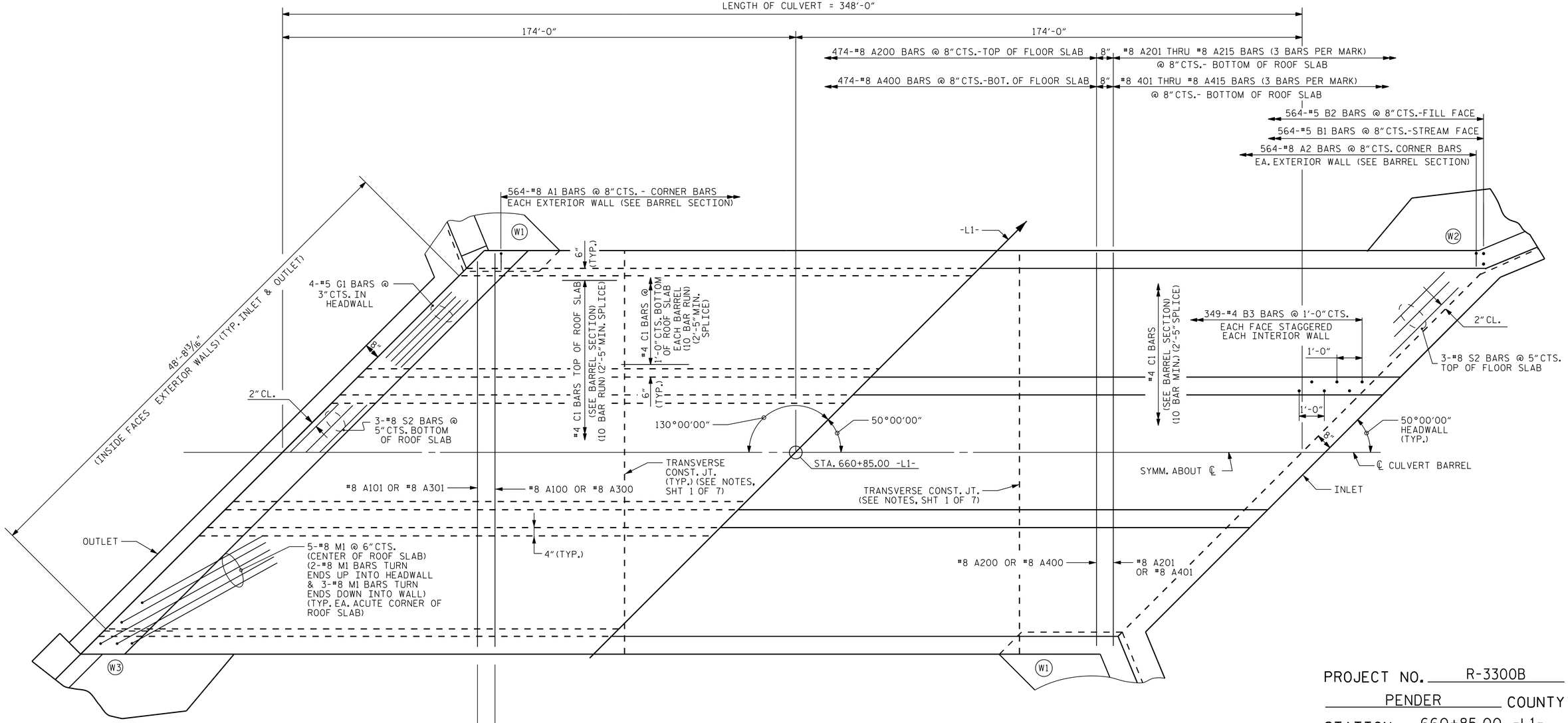

PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB

SEE WING SHEETS FOR ADDITIONAL INFORMATION FOR M1 BARS

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CHECKED BY : T. R. DUDECK DATE : 04/06/20

DESIGN ENGINEER OF RECORD: T. R. DUDECK DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 31462 ENGINEER TIMOTHY R DUDECK
Digitally signed by Timothy R Dudeck
10/25/2021

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PROJECT NO. R-3300B

PENDER COUNTY

STATION: 660+85.00 -L1-

SHEET 4 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 12 FT. X 8 FT.
CONCRETE BOX CULVERT

50° SKEW

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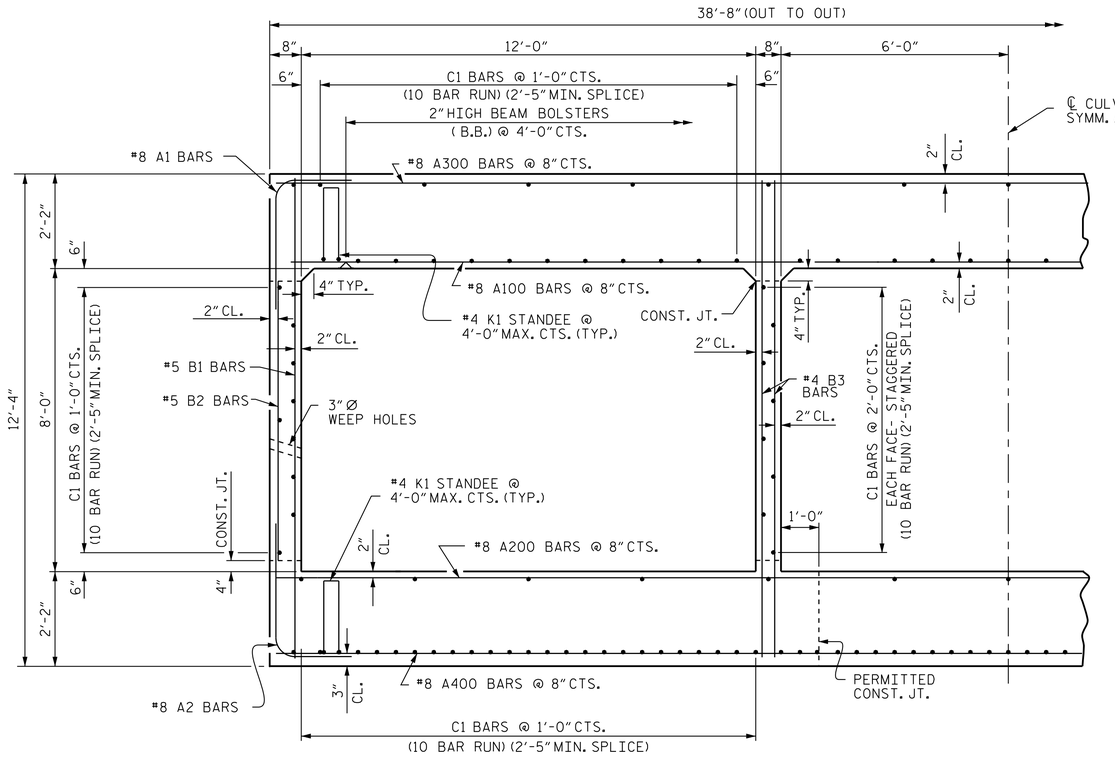
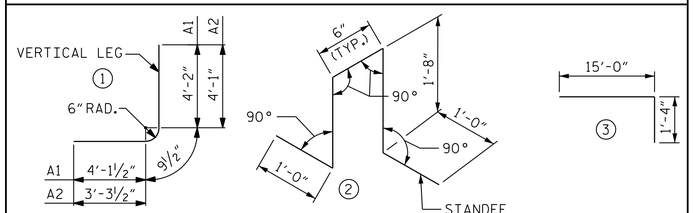
jgeile



RIGHT ANGLE SECTION OF BARREL

THERE ARE 171 C1 BARS IN SECTION OF BARREL.

BAR TYPE



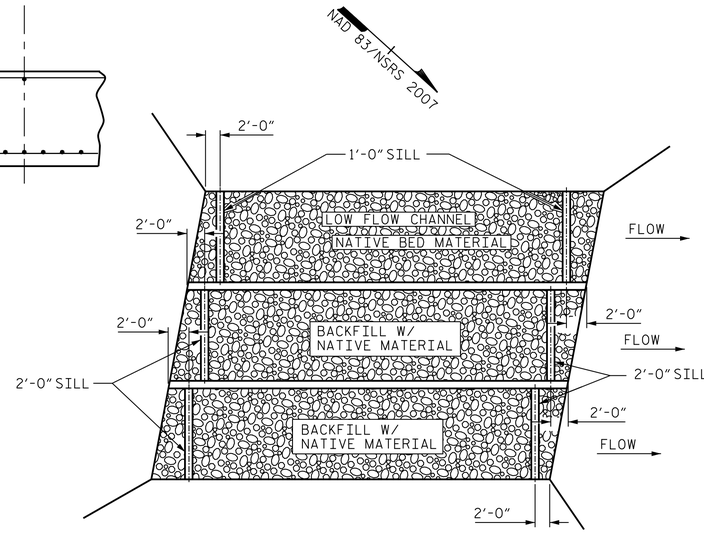
BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

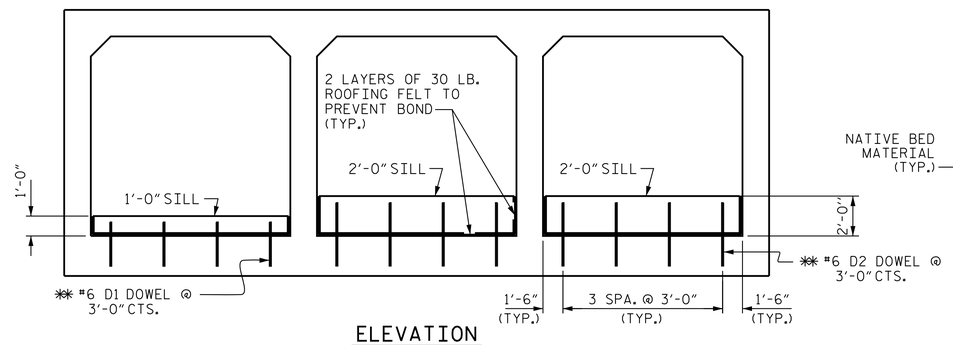
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	1128	#8	1	9'-1"	27357	A307	6	#8	STR	21'-8"	348
A2	1128	#8	1	8'-2"	24597	A308	6	#8	STR	19'-3"	309
						A309	6	#8	STR	16'-11"	272
A100	474	#8	STR	38'-4"	48514	A310	6	#8	STR	14'-6"	233
A101	6	#8	STR	36'-0"	577	A311	6	#8	STR	12'-2"	195
A102	6	#8	STR	33'-7"	539	A312	6	#8	STR	9'-9"	157
A103	6	#8	STR	31'-2"	500	A313	6	#8	STR	7'-4"	118
A104	6	#8	STR	28'-10"	462	A314	6	#8	STR	5'-0"	81
A105	6	#8	STR	26'-5"	424	A315	6	#8	STR	2'-7"	42
A106	6	#8	STR	24'-1"	386						
A107	6	#8	STR	21'-8"	348	A400	474	#8	STR	38'-4"	48514
A108	6	#8	STR	19'-3"	309	A401	6	#8	STR	36'-0"	577
A109	6	#8	STR	16'-11"	272	A402	6	#8	STR	33'-7"	539
A110	6	#8	STR	14'-6"	233	A403	6	#8	STR	31'-2"	500
A111	6	#8	STR	12'-2"	195	A404	6	#8	STR	28'-10"	462
A112	6	#8	STR	9'-9"	157	A405	6	#8	STR	26'-5"	424
A113	6	#8	STR	7'-4"	118	A406	6	#8	STR	24'-1"	386
A114	6	#8	STR	5'-0"	81	A407	6	#8	STR	41'-8"	348
A115	6	#8	STR	2'-7"	42	A408	6	#8	STR	19'-3"	309
						A409	6	#8	STR	16'-11"	272
A200	474	#8	STR	38'-4"	48514	A410	6	#8	STR	14'-6"	233
A201	6	#8	STR	36'-0"	577	A411	6	#8	STR	12'-2"	195
A202	6	#8	STR	33'-7"	539	A412	6	#8	STR	9'-9"	157
A203	6	#8	STR	31'-2"	500	A413	6	#8	STR	7'-4"	118
A204	6	#8	STR	28'-10"	462	A414	6	#8	STR	5'-0"	81
A205	6	#8	STR	26'-5"	424	A415	6	#8	STR	2'-7"	42
A206	6	#8	STR	24'-1"	386						
A207	6	#8	STR	21'-8"	348	B1	1128	#5	STR	12'-7"	14805
A208	6	#8	STR	19'-3"	309	B2	1128	#5	STR	7'-4"	8628
A209	6	#8	STR	16'-11"	272	B3	1396	#4	STR	12'-7"	11735
A210	6	#8	STR	14'-6"	233						
A211	6	#8	STR	12'-2"	195	C1	1710	#4	STR	37'-0"	42265
A212	6	#8	STR	9'-9"	157						
A213	6	#8	STR	7'-4"	118	D1	8	#6	STR	3'-1"	38
A214	6	#8	STR	5'-0"	81	D2	16	#6	STR	4'-1"	99
A215	6	#8	STR	2'-7"	42						
						K1	1760	#4	2	5'-10"	6859
A300	474	#8	STR	38'-4"	48514						
A301	6	#8	STR	36'-0"	577	G1	8	#5	STR	50'-0"	418
A302	6	#8	STR	33'-7"	539						
A303	6	#8	STR	31'-2"	500	M1	10	#8	3	16'-4"	437
A304	6	#8	STR	28'-10"	462						
A305	6	#8	STR	26'-5"	424	S2	12	#8	STR	50'-0"	1602
A306	6	#8	STR	24'-1"	386	REINFORCING STEEL					351,468 LBS.

SPLICE CHART

BAR	SIZE	SPLICE LENGTH
B1, B2	#5	2'-4"
B3, C1	#4	2'-5"

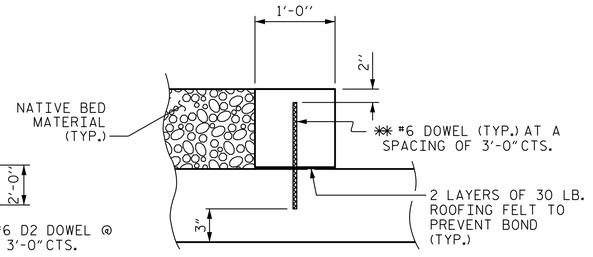


PLAN VIEW



ELEVATION

(LOOKING DOWNSTREAM)



SECTION THROUGH SILL

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

CULVERT SILL DETAILS

(SEE PLAN VIEW FOR LOCATION OF SILLS)
(SEE SHEET 1 OF 7 FOR NOTES REGARDING ADDITIONAL SILL/BACKFILL INFORMATION)

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 660+85.00 -L1-

SHEET 5 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

TRIPLE 12 FT. X 8 FT.
CONCRETE BOX CULVERT

50° SKEW

Stantec
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www.stantec.com
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DRAWN BY : J. B. GEILE DATE : 12/18/19
CHECKED BY : T. R. DUDECK DATE : 04/06/20

DESIGN ENGINEER OF RECORD: T. R. DUDECK DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 31462 ENGINEER THOMAS R DUDECK
10/25/2021

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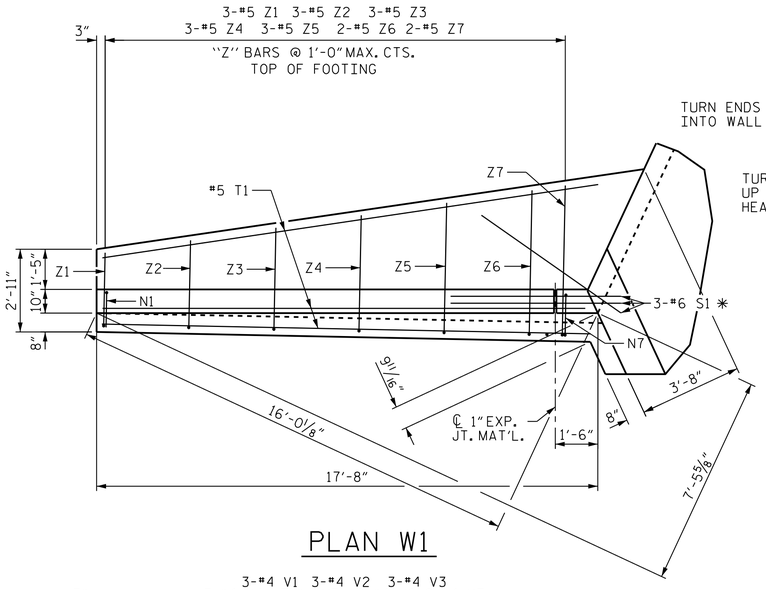
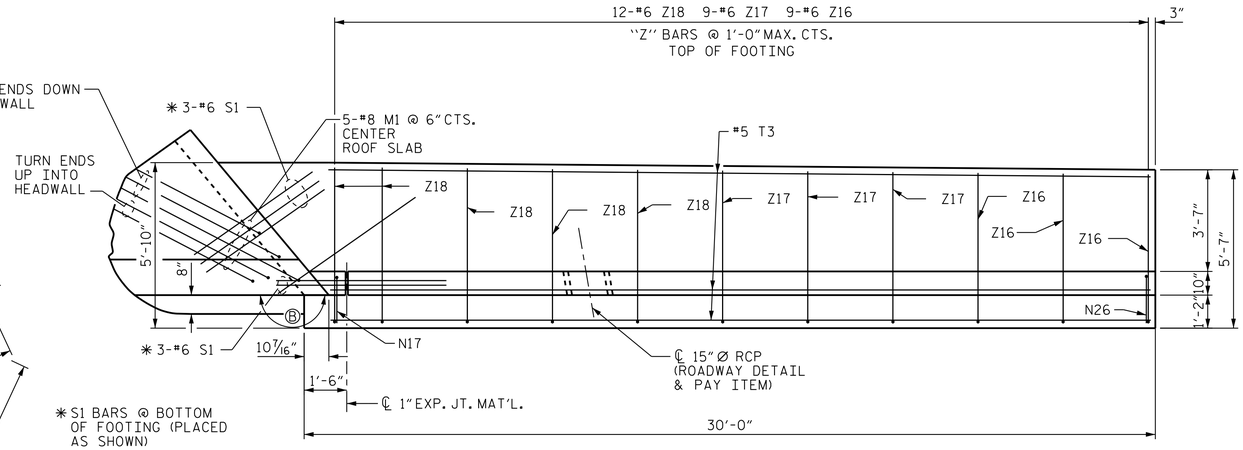
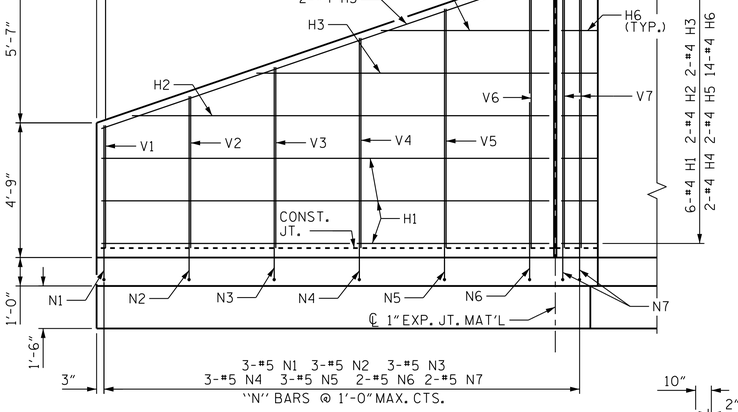


PLAN W1

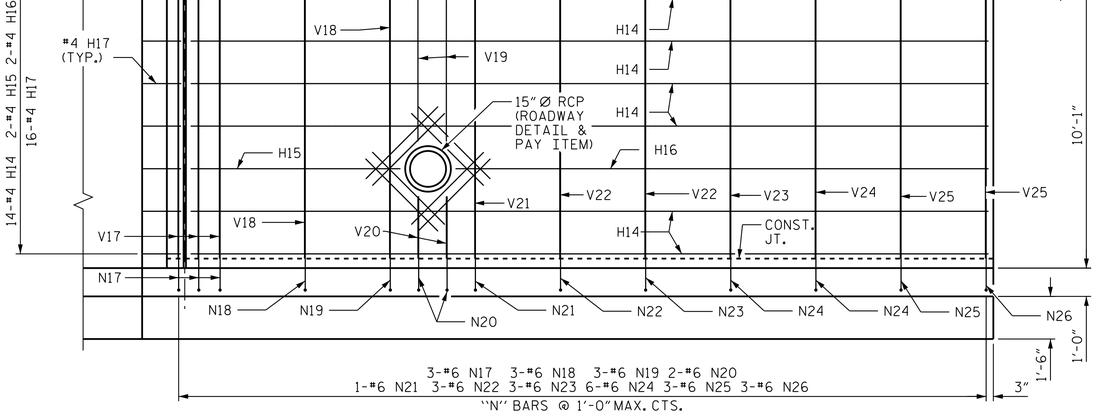


* S1 BARS @ BOTTOM OF FOOTING (PLACED AS SHOWN)

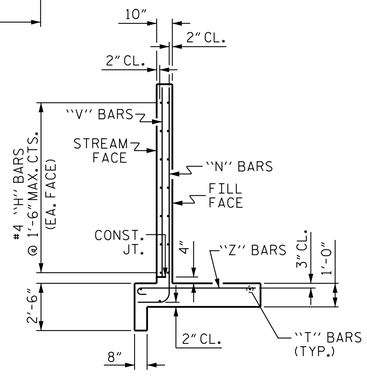
PLAN W3
Ⓑ 180°00'00"



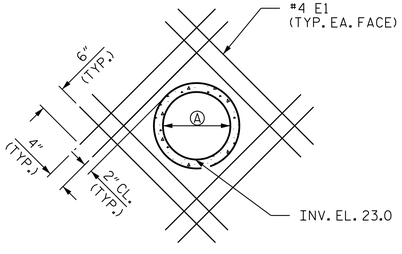
ELEVATION W1



ELEVATION W3



TYPICAL WING SECTION



DETAIL OF REINFORCING AROUND 15" RCP
Ⓐ 15" Ø RCP (ROADWAY DETAIL & PAY ITEM)

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DRAWN BY : J. B. GEILE DATE : 12/20/19
CHECKED BY : T. R. DUDECK DATE : 04/06/20
DESIGN ENGINEER OF RECORD: T. R. DUDECK DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 31462 ENGINEER THOMAS R. DUDECK
Docusigned by: Thomas R. Dudeck
10/25/2021

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PROJECT NO. R-3300B
PENDER COUNTY
STATION: 660+85.00 -L1-

SHEET 6 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS
FOR
CONCRETE BOX CULVERT
H= 8'-0" SLOPE= 3:1
50° SKEW

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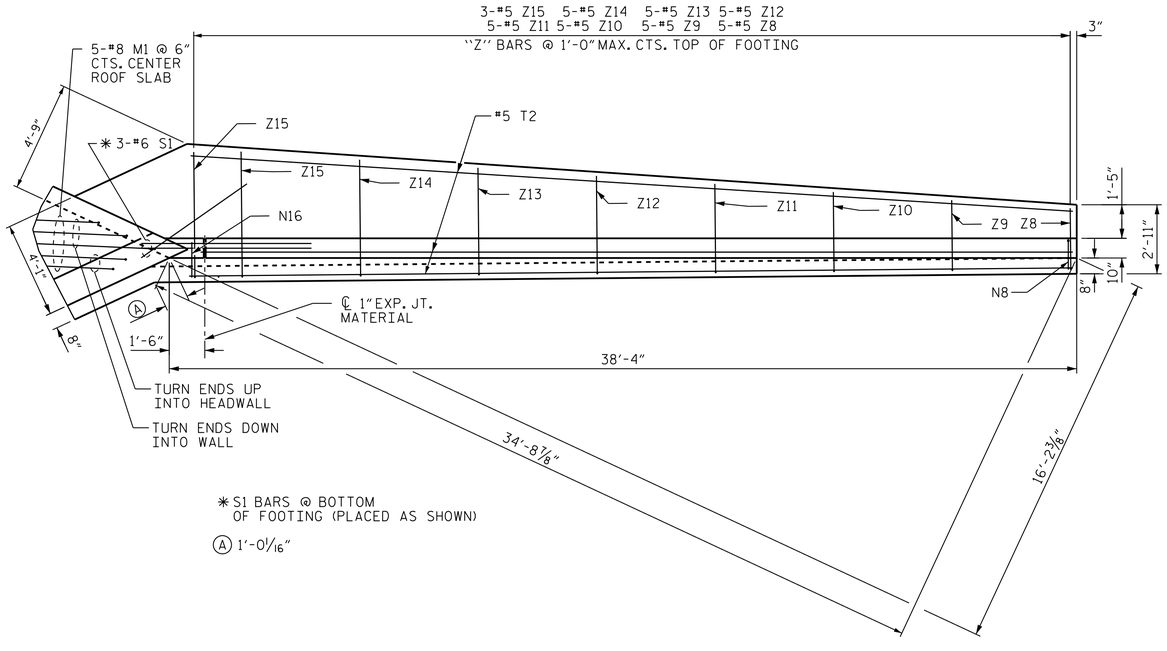
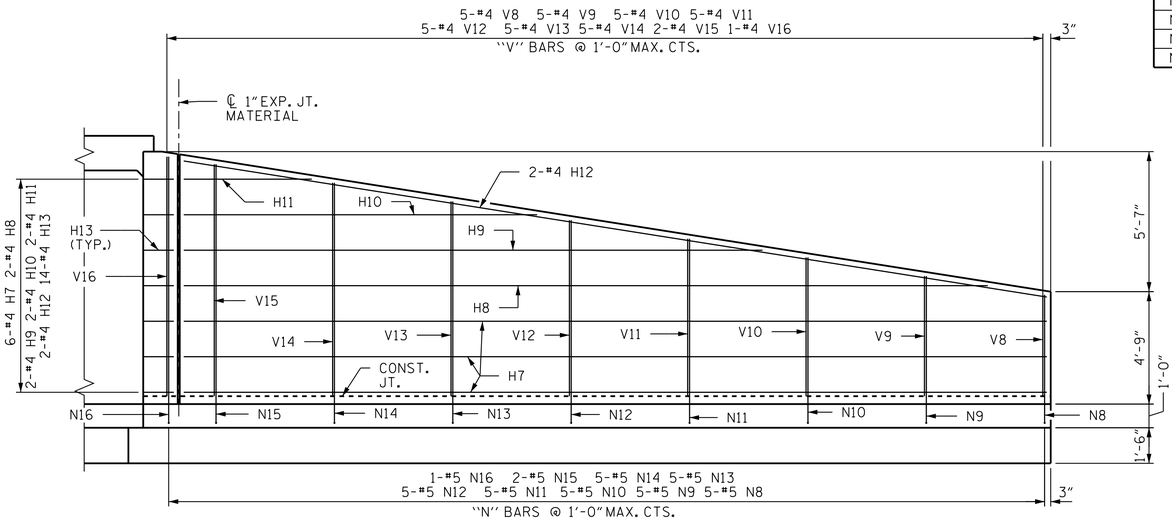
NOTE:

FOR TYPICAL WING SECTION, SEE SHEET 6 OF 7.



PLAN W2



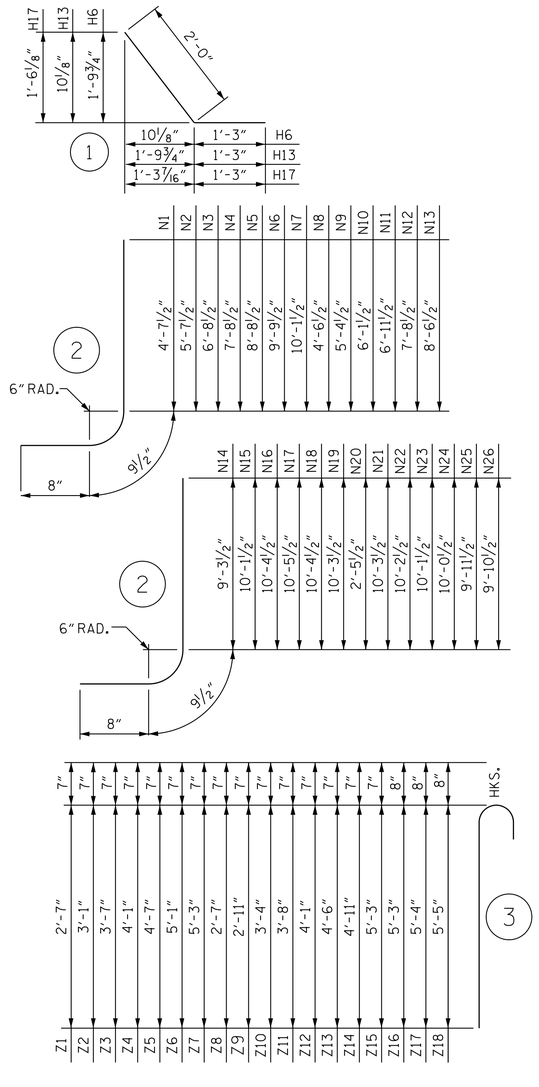
ELEVATION W2

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
E1	16	#4	STR	3'-7"	39	S1	15	#6	STR	6'-0"	136
H1	12	#4	STR	15'-9"	127	T1	6	#5	STR	17'-3"	108
H2	4	#4	STR	14'-8"	40	T2	3	#5	STR	37'-4"	117
H3	4	#4	STR	10'-3"	28	T3	3	#5	STR	28'-11"	91
H4	4	#4	STR	5'-11"	16						
H5	4	#4	STR	16'-8"	45	V1	6	#4	STR	3'-11"	16
H6	28	#4	1	3'-3"	61	V2	6	#4	STR	5'-0"	21
H7	6	#4	STR	36'-5"	146	V3	6	#4	STR	6'-0"	25
H8	2	#4	STR	33'-11"	46	V4	6	#4	STR	7'-0"	29
H9	2	#4	STR	24'-5"	33	V5	6	#4	STR	8'-1"	33
H10	2	#4	STR	14'-11"	20	V6	4	#4	STR	9'-1"	25
H11	2	#4	STR	5'-4"	8	V7	4	#4	STR	9'-6"	26
H12	2	#4	STR	36'-10"	50	V8	5	#4	STR	3'-11"	14
H13	14	#4	1	3'-3"	31	V9	5	#4	STR	4'-8"	16
H14	14	#4	STR	28'-1"	263	V10	5	#4	STR	5'-4"	19
H15	2	#4	STR	7'-4"	10	V11	5	#4	STR	6'-3"	21
H16	2	#4	STR	18'-9"	26	V12	5	#4	STR	7'-1"	24
H17	16	#4	1	3'-3"	35	V13	5	#4	STR	7'-10"	27
						V14	5	#4	STR	9'-8"	29
N1	6	#5	2	6'-1"	39	V15	2	#4	STR	9'-5"	13
N2	6	#5	2	7'-1"	45	V16	1	#4	STR	9'-9"	7
N3	6	#5	2	8'-2"	52	V17	3	#4	STR	9'-9"	20
N4	6	#5	2	9'-2"	58	V18	6	#4	STR	9'-8"	39
N5	6	#5	2	10'-2"	64	V19	2	#4	STR	5'-6"	8
N6	4	#5	2	11'-3"	47	V20	2	#4	STR	1'-10"	3
N7	4	#5	2	11'-7"	49	V21	1	#4	STR	9'-7"	7
N8	5	#5	2	6'-0"	32	V22	6	#4	STR	9'-6"	39
N9	5	#5	2	6'-10"	36	V23	3	#4	STR	9'-5"	19
N10	5	#5	2	7'-7"	40	V24	3	#4	STR	9'-4"	19
N11	5	#5	2	8'-5"	44	V25	6	#4	STR	9'-3"	38
N12	5	#5	2	9'-2"	48						
N13	5	#5	2	10'-0"	53	Z1	6	#5	3	3'-2"	20
N14	5	#5	2	10'-9"	57	Z2	6	#5	3	3'-8"	23
N15	2	#5	2	11'-7"	25	Z3	6	#5	3	4'-2"	27
N16	1	#5	2	11'-10"	13	Z4	6	#5	3	4'-8"	30
N17	3	#6	2	11'-11"	54	Z5	6	#5	3	5'-2"	33
N18	3	#6	2	11'-10"	54	Z6	4	#5	3	5'-8"	24
N19	3	#6	2	11'-9"	53	Z7	4	#5	3	5'-10"	25
N20	2	#6	2	3'-11"	12	Z8	5	#5	3	3'-2"	17
N21	1	#6	2	11'-9"	18	Z9	5	#5	3	3'-6"	19
N22	3	#6	2	11'-8"	53	Z10	5	#5	3	3'-11"	21
N23	3	#6	2	11'-7"	53	Z11	5	#5	3	4'-3"	23
N24	6	#6	2	11'-6"	104	Z12	5	#5	3	4'-8"	25
N25	3	#6	2	11'-5"	52	Z13	5	#5	3	5'-1"	27
N26	3	#6	2	11'-4"	52	Z14	5	#5	3	5'-6"	29
						Z15	3	#5	3	5'-10"	19
						Z16	9	#6	3	5'-11"	80
						Z17	9	#6	3	6'-0"	82
						Z18	12	#6	3	6'-1"	110

REINFORCING STEEL FOR 4 WINGS	3,854	LBS
CLASS A CONCRETE		
4 WINGS	49.4	CY
2 HEADWALLS	4.7	CY
2 END CURTAIN WALLS	5.8	CY
6 SILLS	4.5	CY
TOTAL	64.4	CY

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 660+85.00 -L1-

SHEET 7 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

# WINGS FOR CONCRETE BOX CULVERT
H= 8'-0" SLOPE= 3:1
50° SKEW

REVISIONS						SHEET NO.
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DRAWN BY : J. B. GEILE DATE : 01/14/20
CHECKED BY : T. R. DUDECK DATE : 04/06/20
DESIGN ENGINEER OF RECORD: T. R. DUDECK DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 3462 ENGINEER THOMAS R DUDECK
Signed by: DocuSigned by:
10/25/2021

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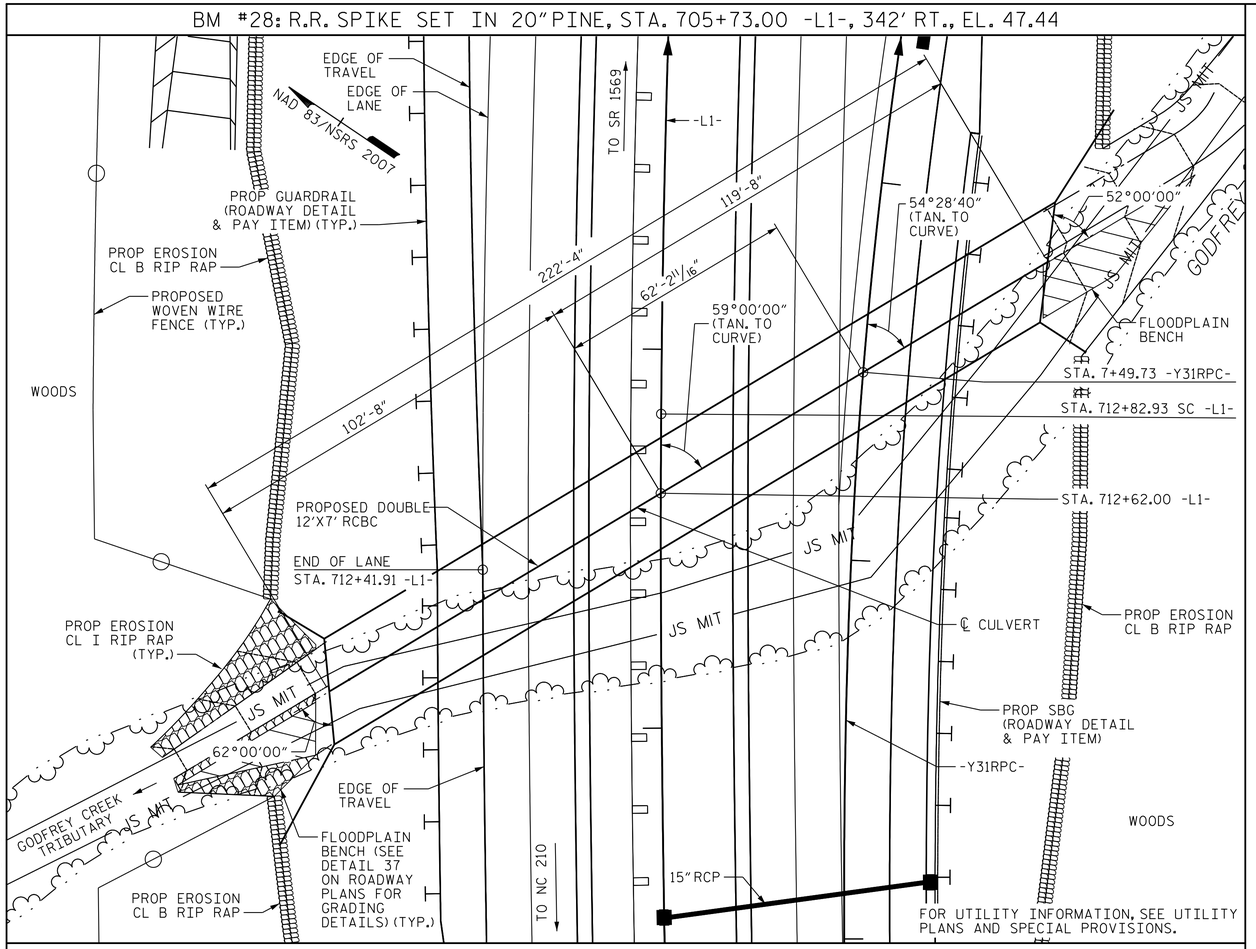
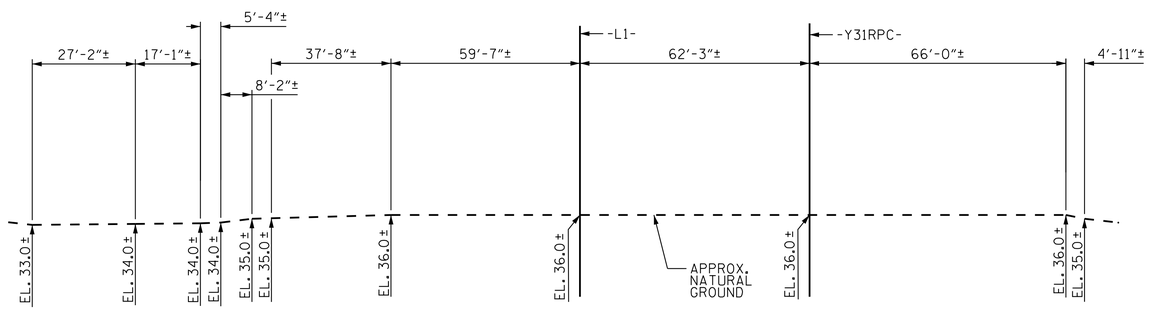


LOCATION SKETCH



PROFILE ALONG ℄ CULVERT

NOTES:

ASSUMED LIVE LOAD = HL-93.

DESIGN FILL = 11.75 FT. (MAX.) 7.50 FT. (MIN.)

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.

THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

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

TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO 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 SHALL BE PAID FOR BY THE CONTRACTOR.

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

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

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

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.

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.

NATIVE MATERIAL BETWEEN SILLS IN THE CULVERT SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE 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. RIP-RAP MAY BE USED TO SUPPLEMENT THE NATIVE MATERIAL IN THE HIGH FLOW CULVERT BARREL(S). IF RIP-RAP IS USED TO LINE THE HIGH FLOW CULVERT BARREL(S), 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. (THALWEG).

DO NOT SET ELEVATION OF HIGH SILLS ABOVE BANK FULL.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOUNDATION NOTES

EXCAVATE FOUNDATION A MINIMUM OF 12" BELOW CULVERT BEARING ELEVATION. PLACE 12" OF CLASS VI FOUNDATION CONDITIONING MATERIAL ENCAPSULATED IN TYPE II GEOTEXTILE IN ACCORDANCE WITH SECTION 414 OF THE STANDARD SPECIFICATIONS.

CONSTRUCT THE REINFORCED CONCRETE BOX CULVERT AT -L1- STATION 712+62 WITH 7" OF CAMBER TO ACCOUNT FOR ANTICIPATED SETTLEMENT.

TOTAL STRUCTURE QUANTITIES

CULVERT EXCAVATION		LUMP SUM
FOUNDATION COND. MATERIAL	471	TONS
CLASS A CONCRETE		
BARREL @ 3.095 CY/FT	688.1	C.Y.
WINGS ETC.	42.4	C.Y.
TOTAL	730.5	C.Y.
REINFORCING STEEL		
BARREL	120,298	LBS.
WINGS ETC.	2,437	LBS.
TOTAL	122,735	LBS.

ROADWAY DATA

GRADE POINT ELEV. @ STATION 712+62.00 -L1-	= 50.10
BED ELEV. @ STATION 712+62.00 -L1-	= 32.50
ROADWAY SLOPES	= 3:1

HYDRAULIC DATA

DESIGN DISCHARGE	=	580	C.F.S.
FREQUENCY OF DESIGN FLOOD	=	50	YR.
DESIGN HIGH WATER ELEVATION	=	39.50	
DRAINAGE AREA	=	0.90	SQ. MI.
BASE DISCHARGE (0100)	=	660	C.F.S.
BASE HIGH WATER ELEVATION	=	39.90	

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	=	1,280	C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	=	500+	YRS.
OVERTOPPING FLOOD ELEVATION	=	44.10	

OVERTOPS DRAINAGE AREA AT STATION 708+00.00 -L1- RT.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 712+62.00 -L1-

SHEET 1 OF 6 BRIDGE NO. 700265

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 12 FT. X 7 FT. CONCRETE BOX CULVERT

59°00'00" SKEW

Stantec Consulting Services Inc.
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DRAWN BY : J. HAGENBUSH DATE : 11/22/19
CHECKED BY : T. N. ENNIS DATE : 04/15/20

DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 04/15/20

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS
Docusigned by: Trevor Ennis 6/25/2020

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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	1.34	--	1.75	3.59	2	EXT. WALL (MID) - INSIDE	5.00	1.34	2	LEFT END - BOTT SLAB	0.00	1
		HL-93 (OPERATING)	N/A		1.74	--	1.35	3.59	2	EXT. WALL (MID) - INSIDE	5.00	1.74	2	LEFT END - BOTT SLAB	0.00	1
		HS-20 (INVENTORY)	36.000	2	1.35	48.600	1.75	3.60	2	EXT. WALL (MID) - INSIDE	5.00	1.35	2	LEFT END - BOTT SLAB	0.00	1
		HS-20 (OPERATING)	36.000		1.74	62.640	1.35	3.60	2	EXT. WALL (MID) - INSIDE	5.00	1.74	2	LEFT END - BOTT SLAB	0.00	1
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		4.32	58.320	1.40	4.32	2	EXT. WALL (MID) - INSIDE	5.00	5.72	2	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		SNGARBS2	20.000		3.88	77.600	1.40	4.32	2	EXT. WALL (MID) - INSIDE	5.00	3.88	2	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		SNAGRIS2	22.000		3.54	77.880	1.40	4.32	2	EXT. WALL (MID) - INSIDE	5.00	3.54	2	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		SNCOTTS3	27.250		2.85	77.663	1.40	4.31	2	EXT. WALL (MID) - INSIDE	5.00	2.85	2	LEFT END - BOTT SLAB	0.00	1
		SNAGGRS4	34.925		2.35	82.074	1.40	4.31	2	EXT. WALL (MID) - INSIDE	5.00	2.35	2	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		SNS5A	35.550		2.36	83.898	1.40	4.31	1	EXT. WALL (MID) - INSIDE	5.00	2.36	2	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		SNS6A	39.950		2.21	88.290	1.40	4.31	2	EXT. WALL (MID) - INSIDE	5.00	2.21	2	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		SNS7B	42.000		2.04	85.680	1.40	4.31	2	EXT. WALL (MID) - INSIDE	5.00	2.04	2	LEFT END - BOTT SLAB	0.00	1
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.64	87.120	1.40	4.32	2	EXT. WALL (MID) - INSIDE	5.00	2.64	2	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		TNT4A	33.075		2.66	87.980	1.40	4.31	2	EXT. WALL (MID) - INSIDE	5.00	2.66	2	LEFT END - BOTT SLAB	0.00	1
		TNT6A	41.600		2.35	97.760	1.40	4.31	2	EXT. WALL (MID) - INSIDE	5.00	2.35	2	LEFT END - BOTT SLAB	0.00	1
		TNT7A	42.000		2.24	94.080	1.40	4.31	2	EXT. WALL (MID) - INSIDE	5.00	2.24	2	LEFT END - BOTT SLAB	0.00	1
		TNT7B	42.000		2.40	100.800	1.40	4.31	2	EXT. WALL (MID) - INSIDE	5.00	2.40	2	RIGHT END (BOTT SLAB) - OUTSIDE	12.00	1
		TNAGRIT4	43.000		2.16	92.880	1.40	4.31	2	EXT. WALL (MID) - INSIDE	5.00	2.16	2	LEFT END - BOTT SLAB	0.00	1
		TNAGT5A	45.000		2.18	98.100	1.40	4.31	2	EXT. WALL (MID) - INSIDE	5.00	2.18	2	LEFT END - BOTT SLAB	0.00	1
		TNAGT5B	45.000	3	1.93	86.850	1.40	4.31	2	EXT. WALL (MID) - INSIDE	5.00	1.93	2	LEFT END - BOTT SLAB	0.00	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.

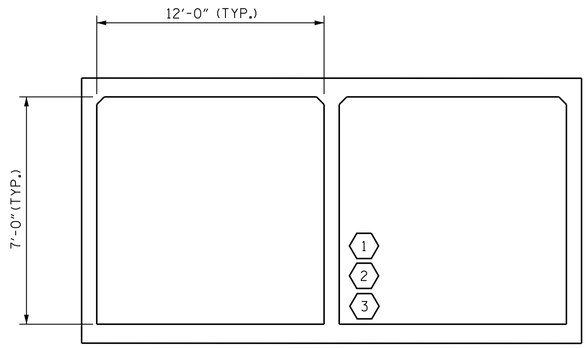
COMMENTS:

LOAD RATINGS FOR MAXIMUM AND MINIMUM FILL CONDITIONS HAVE BEEN EVALUATED. MAXIMUM FILL CONDITIONS CONTROL LOAD RATINGS AND ARE PRESENTED IN THE ADJACENT TABLE AS THE MOST CRITICAL LOAD RATING.

(#) 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)

Stantec
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www.stantec.com
License No. F-0672

ASSEMBLED BY : J. B. GEILE DATE : 12/05/19
CHECKED BY : T. N. ENNIS DATE : 04/15/20

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

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

DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 04/15/20

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS
Docusigned by: Trevor Ennis 6/25/2020

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 712+62.00 -L1-

SHEET 2 OF 6

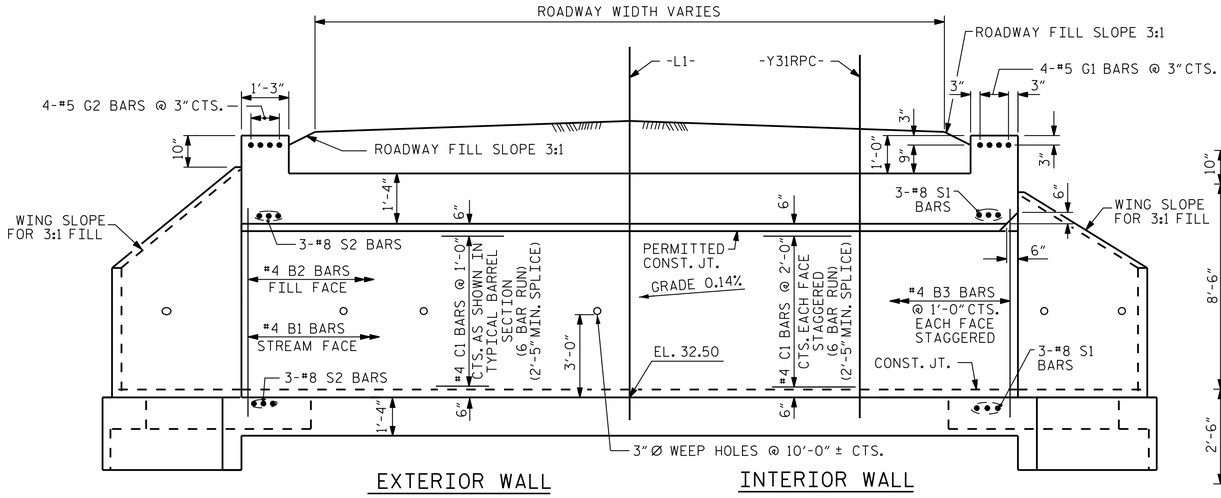
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

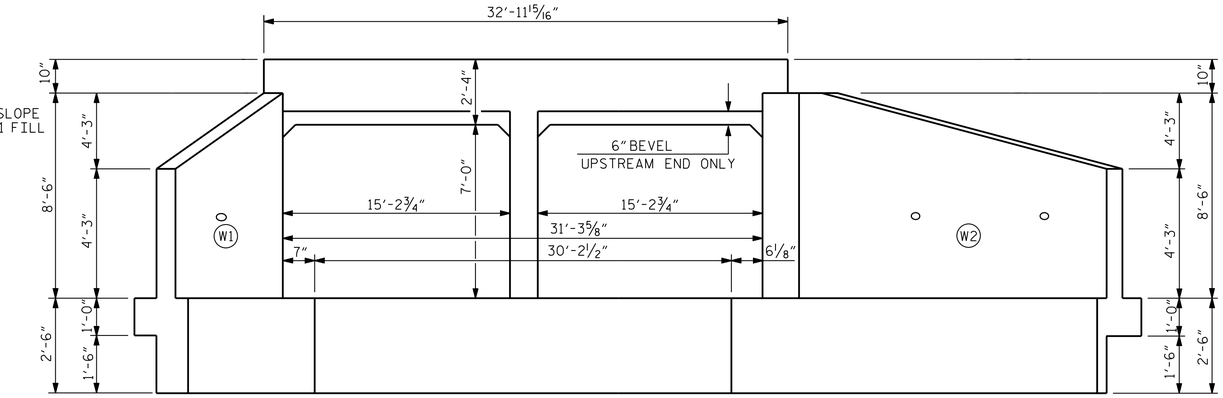
LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS
(NON-INTERSTATE TRAFFIC)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C13-02
1			3			TOTAL SHEETS
2			4			06

STD. NO. LRFR5

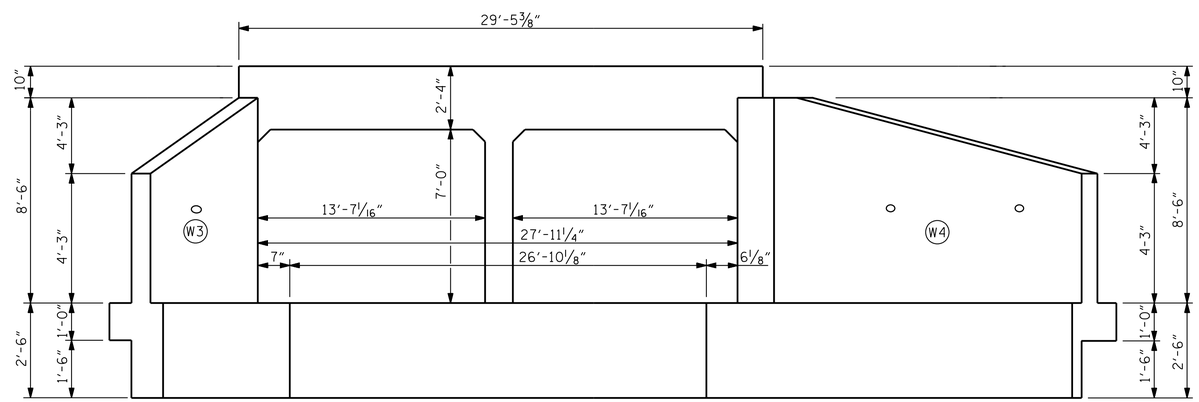


CULVERT SECTION NORMAL TO ROADWAY



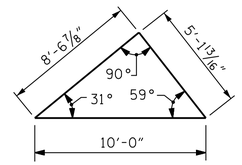
END ELEVATION NORMAL TO SKEW

(INLET ONLY) (LOOKING DOWNSTREAM)



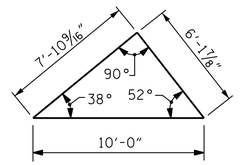
END ELEVATION NORMAL TO SKEW

(OUTLET ONLY) (LOOKING UPSTREAM)



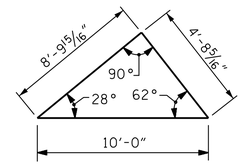
SKEW TRIANGLE

(℄ ROADWAY)



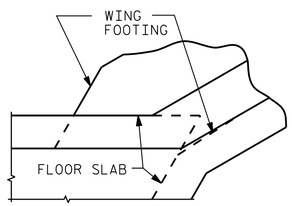
SKEW TRIANGLE

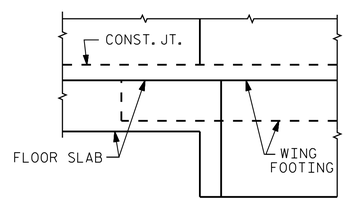
(INLET HEADWALL)



SKEW TRIANGLE

(OUTLET HEADWALL)





CONNECTION OF WING FOOTING AND FLOOR SLAB WHEN SLAB IS THICKER THAN FOOTING

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 712+62.00 -L1-

SHEET 3 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 12 FT. X 7 FT. CONCRETE BOX CULVERT

59°00'00" SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C13-03
1			3			TOTAL SHEETS
2			4			06

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DRAWN BY : J. B. GEILE DATE : 12/10/19
CHECKED BY : T. N. ENNIS DATE : 04/15/20

DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 04/15/20

DocuSigned by: Trevor Ennis 6/25/2020

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS

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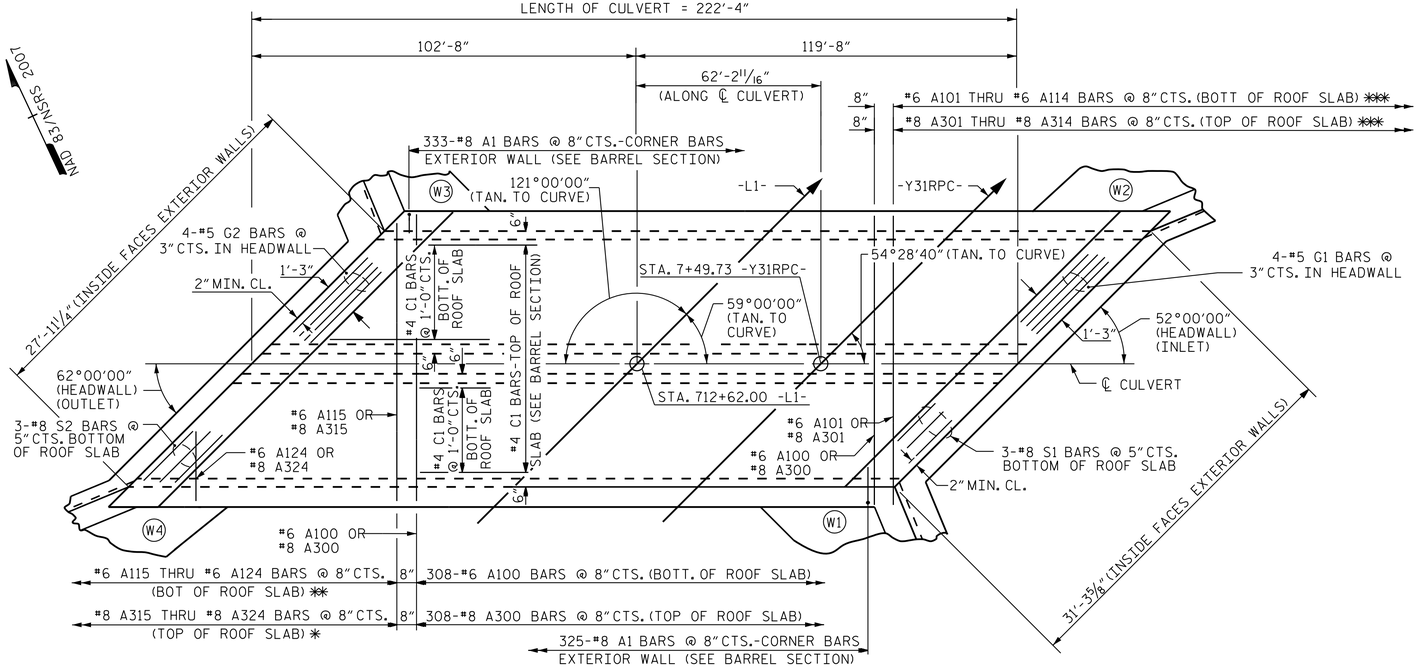
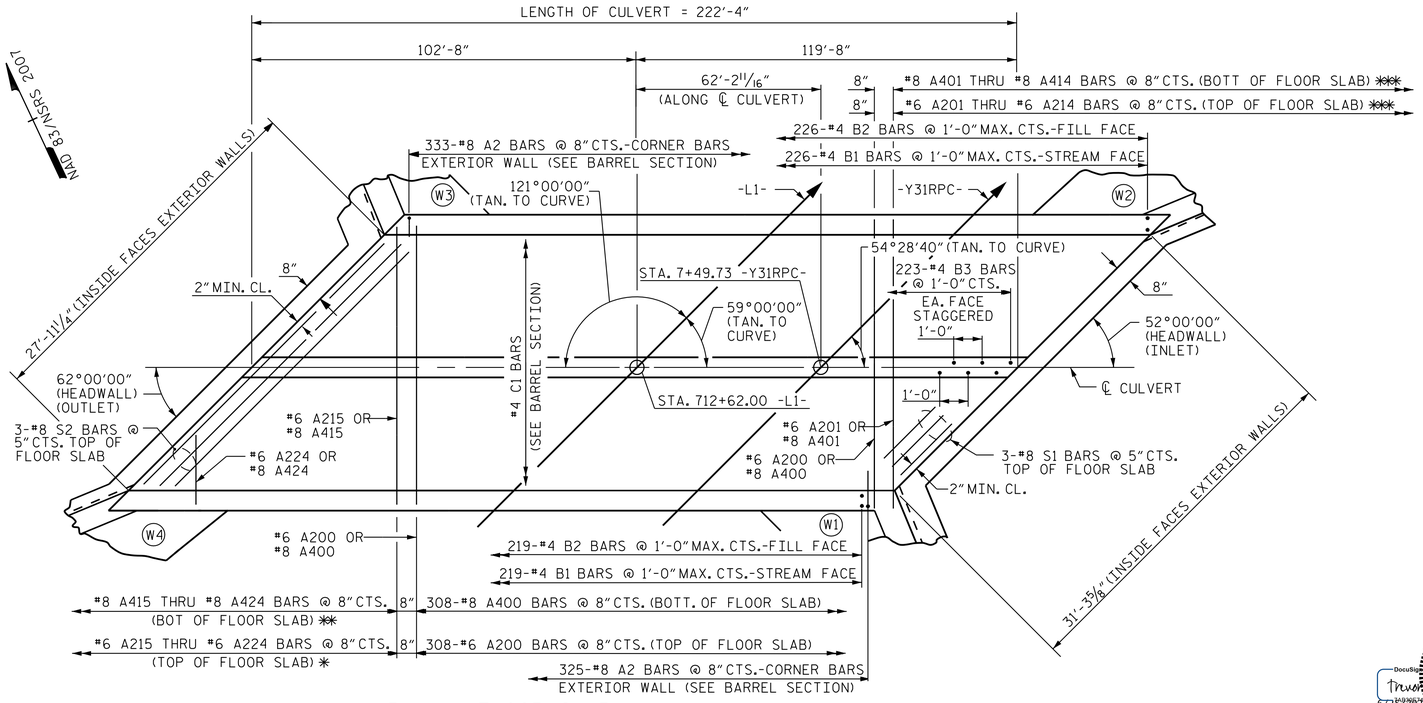


* - #6 A315 THRU #6 A323 (2 BARS PER MARK)
** - #6 A115 THRU #6 A123 (2 BARS PER MARK)
*** - 2 BARS PER MARK

PLAN - ROOF SLAB

#4 C1 BARS HAVE A 2'-5" MIN SPLICE & 6 BAR RUN.
TRANSVERSE CONST. JTS. ARE NOT SHOWN FOR CLARITY. SEE NOTES ON SHEET 1 OF 6 FOR ADDITIONAL INFORMATION.



* - #6 A215 THRU #6 A223 (2 BARS PER MARK)
** - #6 A415 THRU #6 A423 (2 BARS PER MARK)
*** - 2 BARS PER MARK

PLAN - FLOOR SLAB

#4 C1 BARS HAVE A 2'-5" MIN SPLICE & 6 BAR RUN.
TRANSVERSE CONST. JTS. ARE NOT SHOWN FOR CLARITY.
SEE NOTES ON SHEET 1 OF 6 FOR ADDITIONAL INFORMATION.
SILLS NOT SHOWN. SEE SHEET 5 OF 6 FOR SILL LOCATIONS.

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DRAWN BY : J. B. GEILE DATE : 11/26/19
CHECKED BY : T. N. ENNIS DATE : 04/15/20
DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 04/15/20

PROJECT NO. R-3300B
PENDER COUNTY
STATION: 712+62.00 -L1-

SHEET 4 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 12 FT. X 7 FT. CONCRETE BOX CULVERT

59°00'00" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS
DocuSigned by: Trevor Ennis
6/25/2020

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C13-04
1			3			TOTAL SHEETS
2			4			06

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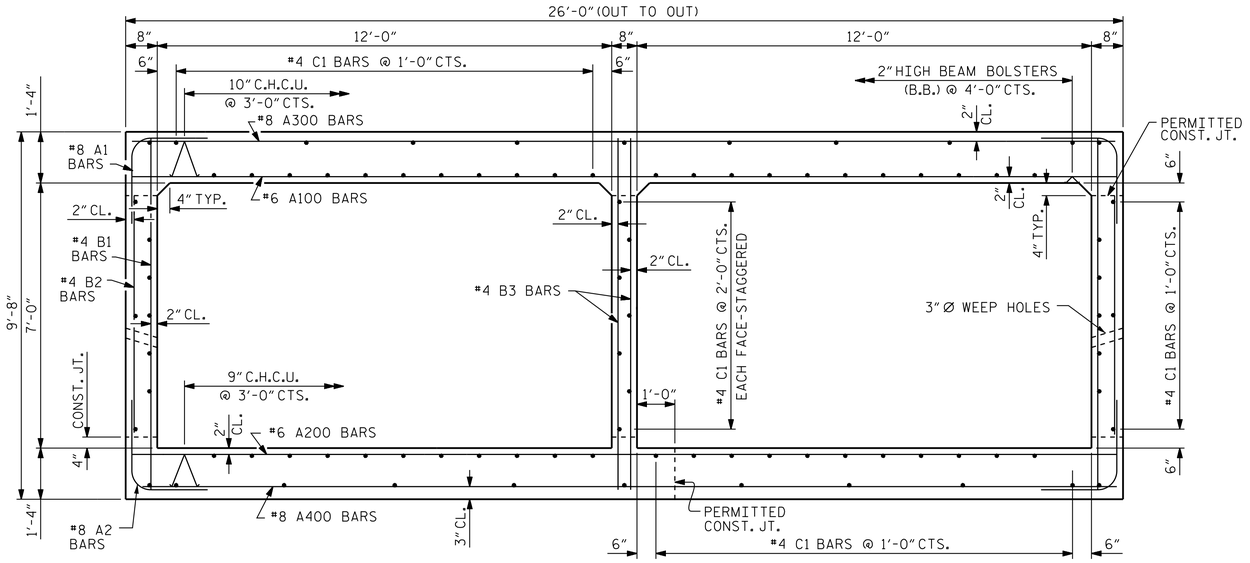
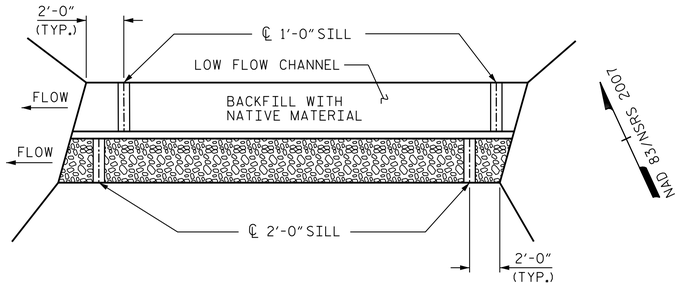
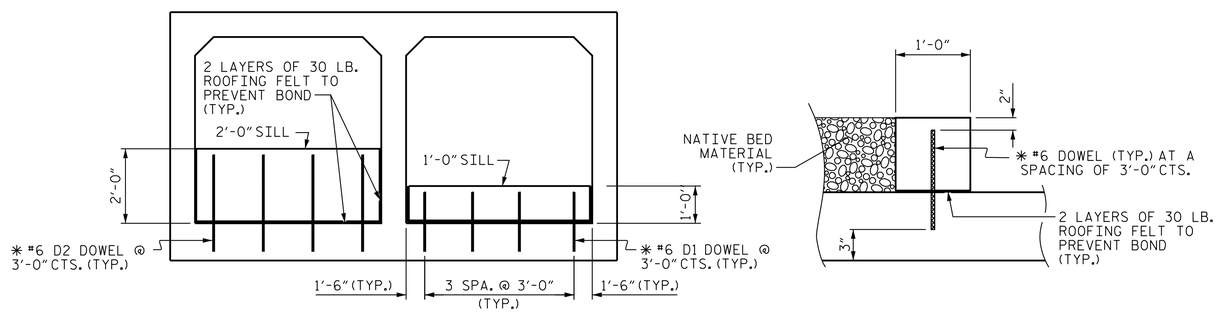


RIGHT ANGLE SECTION OF BARREL

THERE ARE 89 C1 BARS IN SECTION OF BARREL. (6 BAR RUN) (2'-5" MIN SPLICE)



PLAN VIEW



ELEVATION
(LOOKING DOWNSTREAM)

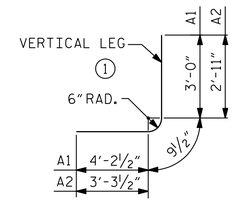
SECTION THROUGH SILL
* DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.

CULVERT SILL DETAILS
(SEE PLAN VIEW FOR LOCATION OF SILLS)
(SEE SHEET 1 OF 6 FOR NOTES REGARDING ADDITIONAL SILL/BACKFILL INFORMATION)

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	658	#8	1	8'-0"	14055	A300	308	#8	STR	25'-8"	21108
A2	658	#8	1	7'-0"	12299	A301	2	#8	STR	24'-2"	130
						A302	2	#8	STR	22'-6"	121
A100	308	#6	STR	25'-8"	11874	A303	2	#8	STR	20'-10"	112
A101	2	#6	STR	24'-2"	73	A304	2	#8	STR	19'-1"	102
A102	2	#6	STR	22'-6"	68	A305	2	#8	STR	17'-5"	94
A103	2	#6	STR	20'-10"	63	A306	2	#8	STR	15'-8"	84
A104	2	#6	STR	19'-1"	58	A307	2	#8	STR	14'-0"	75
A105	2	#6	STR	17'-5"	53	A308	2	#8	STR	12'-3"	66
A106	2	#6	STR	15'-8"	48	A309	2	#8	STR	10'-7"	57
A107	2	#6	STR	14'-0"	43	A310	2	#8	STR	8'-10"	48
A108	2	#6	STR	12'-3"	37	A311	2	#8	STR	7'-2"	39
A109	2	#6	STR	10'-7"	32	A312	2	#8	STR	5'-5"	29
A110	2	#6	STR	8'-10"	27	A313	2	#8	STR	3'-9"	21
A111	2	#6	STR	7'-2"	22	A314	2	#8	STR	2'-0"	11
A112	2	#6	STR	5'-5"	17	A315	2	#8	STR	23'-6"	126
A113	2	#6	STR	3'-9"	12	A316	2	#8	STR	21'-0"	113
A114	2	#6	STR	2'-0"	7	A317	2	#8	STR	18'-6"	99
A115	2	#6	STR	23'-6"	71	A318	2	#8	STR	16'-0"	86
A116	2	#6	STR	21'-0"	64	A319	2	#8	STR	13'-6"	73
A117	2	#6	STR	18'-6"	56	A320	2	#8	STR	11'-0"	59
A118	2	#6	STR	16'-0"	49	A321	2	#8	STR	8'-6"	46
A119	2	#6	STR	13'-6"	41	A322	2	#8	STR	6'-0"	33
A120	2	#6	STR	11'-0"	34	A323	2	#8	STR	3'-6"	19
A121	2	#6	STR	8'-6"	26	A324	1	#8	STR	2'-2"	6
A122	2	#6	STR	6'-0"	19						
A123	2	#6	STR	3'-6"	11	A400	308	#8	STR	25'-8"	21108
A124	1	#6	STR	2'-2"	4	A401	2	#8	STR	24'-2"	130
						A402	2	#8	STR	22'-6"	121
A200	308	#6	STR	25'-8"	11874	A403	2	#8	STR	20'-10"	112
A201	2	#6	STR	24'-2"	73	A404	2	#8	STR	19'-1"	102
A202	2	#6	STR	22'-6"	68	A405	2	#8	STR	17'-5"	94
A203	2	#6	STR	20'-10"	63	A406	2	#8	STR	15'-8"	84
A204	2	#6	STR	19'-1"	58	A407	2	#8	STR	14'-0"	75
A205	2	#6	STR	17'-5"	53	A408	2	#8	STR	12'-3"	66
A206	2	#6	STR	15'-8"	48	A409	2	#8	STR	10'-7"	57
A207	2	#6	STR	14'-0"	43	A410	2	#8	STR	8'-10"	48
A208	2	#6	STR	12'-3"	37	A411	2	#8	STR	7'-2"	39
A209	2	#6	STR	10'-7"	32	A412	2	#8	STR	5'-5"	29
A210	2	#6	STR	8'-10"	27	A413	2	#8	STR	3'-9"	21
A211	2	#6	STR	7'-2"	22	A414	2	#8	STR	2'-0"	11
A212	2	#6	STR	5'-5"	17	A415	2	#8	STR	23'-6"	126
A213	2	#6	STR	3'-9"	12	A416	2	#8	STR	21'-0"	113
A214	2	#6	STR	2'-0"	7	A417	2	#8	STR	18'-6"	99
A215	2	#6	STR	23'-6"	71	A418	2	#8	STR	16'-0"	86
A216	2	#6	STR	21'-0"	64	A419	2	#8	STR	13'-6"	73
A217	2	#6	STR	18'-6"	56	A420	2	#8	STR	11'-0"	59
A218	2	#6	STR	16'-0"	49	A421	2	#8	STR	8'-6"	46
A219	2	#6	STR	13'-6"	41	A422	2	#8	STR	6'-0"	33
A220	2	#6	STR	11'-0"	34	A423	2	#8	STR	3'-6"	19
A221	2	#6	STR	8'-6"	26	A424	1	#8	STR	2'-2"	6
A222	2	#6	STR	6'-0"	19						
A223	2	#6	STR	3'-6"	11	B1	445	#4	STR	9'-3"	2750
A224	1	#6	STR	2'-2"	4	B2	445	#4	STR	6'-4"	1883

BAR TYPE



BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
B3	446	#4	STR	9'-3"	2756
C1	534	#4	STR	39'-7"	14120
D1	8	#6	STR	1'-11"	24
D2	8	#6	STR	2'-11"	36
G1	4	#5	STR	32'-6"	136
G2	4	#5	STR	29'-0"	121
S1	6	#8	STR	32'-6"	521
S2	6	#8	STR	29'-0"	465
REINFORCING STEEL					120,298 lbs.

SPLICE CHART

BAR	SIZE	SPLICE LENGTH
B1,B2	#4	1'-10"
C1	#4	2'-5"

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 712+62.00 -L1-

SHEET 5 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 12 FT. X 7 FT.
CONCRETE BOX CULVERT

59°00'00" SKEW

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DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 04/15/20

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6/25/2020

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C13-05
1			3			TOTAL SHEETS
2			4			06

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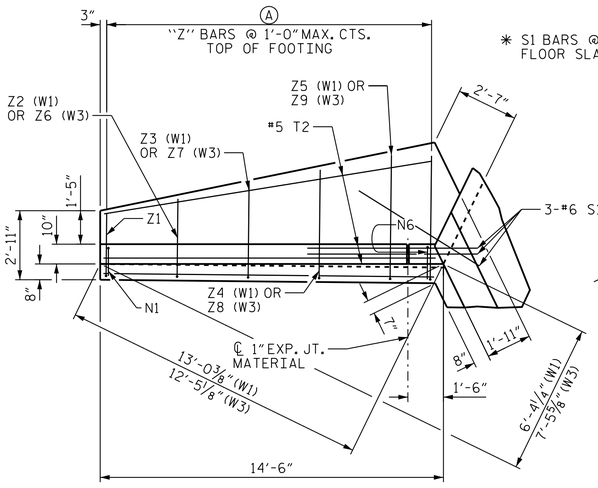
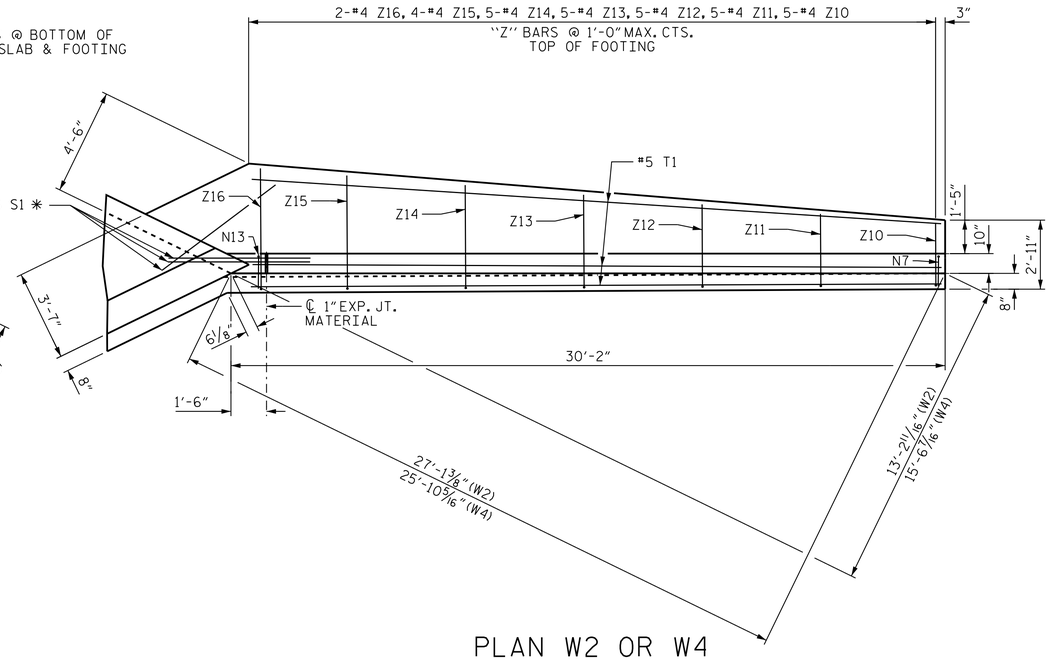


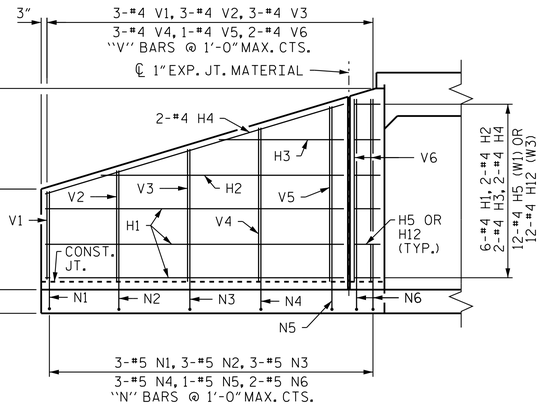
✳ S1 BARS @ BOTTOM OF FLOOR SLAB & FOOTING



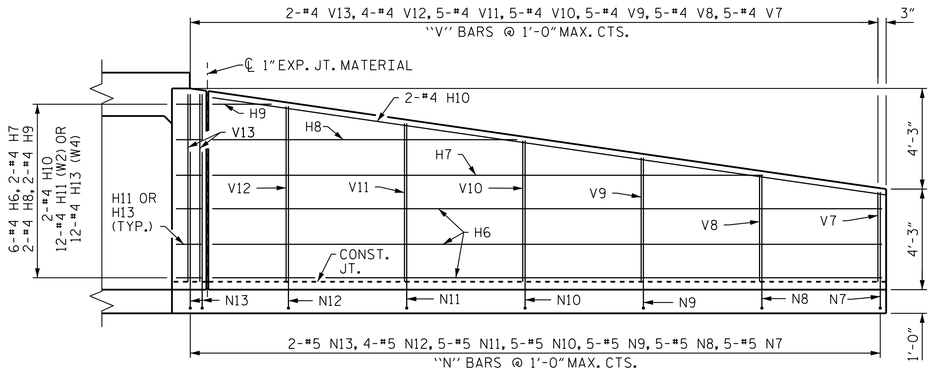
PLAN W1 OR W3

Ⓐ WING W1 = 3-#4 Z1, 3-#4 Z2, 3-#4 Z3, 3-#4 Z4, 3-#4 Z5
WING W3 = 3-#4 Z1, 3-#4 Z6, 3-#4 Z7, 3-#4 Z8, 3-#4 Z9

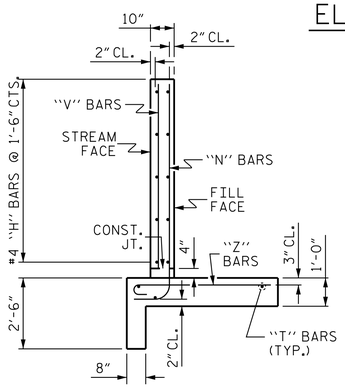
PLAN W2 OR W4



ELEVATION W1 OR W3



ELEVATION W2 OR W4



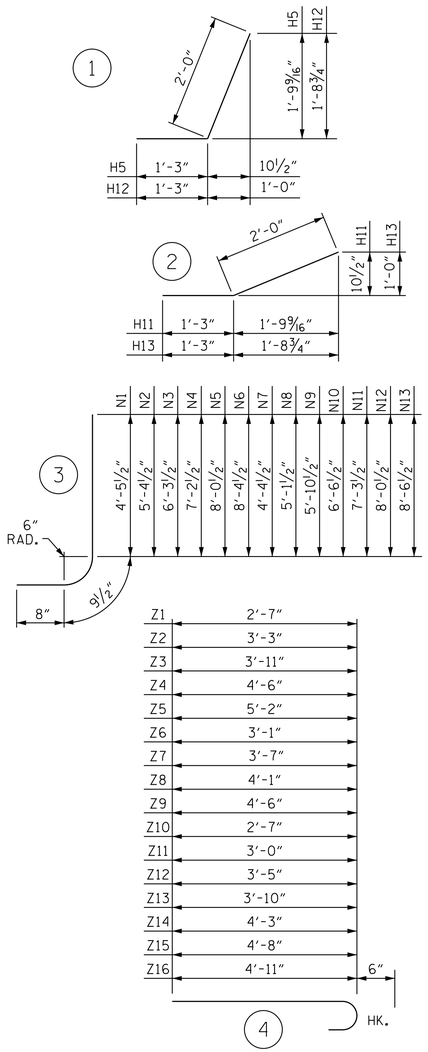
TYPICAL WING SECTION

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	12'-7"	101
H2	4	#4	STR	10'-3"	28
H3	4	#4	STR	5'-3"	15
H4	4	#4	STR	13'-2"	36
H5	12	#4	1	3'-3"	27
H6	12	#4	STR	28'-3"	227
H7	4	#4	STR	23'-3"	63
H8	4	#4	STR	12'-10'	35
H9	4	#4	STR	2'-6"	7
H10	4	#4	STR	28'-7"	77
H11	12	#4	2	3'-3"	27
H12	12	#4	1	3'-3"	27
H13	12	#4	2	3'-3"	27
N1	6	#5	3	5'-11"	38
N2	6	#5	3	6'-10"	43
N3	6	#5	3	7'-9"	49
N4	6	#5	3	8'-8"	55
N5	2	#5	3	9'-6"	20
N6	4	#5	3	9'-10"	42
N7	10	#5	3	5'-10"	61
N8	10	#5	3	6'-7"	69
N9	10	#5	3	7'-4"	77
N10	10	#5	3	8'-0"	84
N11	10	#5	3	8'-9"	93
N12	8	#5	3	9'-6'	80
N13	4	#5	3	10'-0"	42
S1	12	#6	STR	6'-0"	109
T1	6	#5	STR	29'-4"	184
T2	6	#5	STR	14'-0"	88
V1	6	#4	STR	3'-9"	16
V2	6	#4	STR	4'-8"	19
V3	6	#4	STR	5'-7"	23
V4	6	#4	STR	6'-6"	27
V5	2	#4	STR	7'-5"	10
V6	4	#4	STR	7'-8"	21
V7	10	#4	STR	3'-9"	26
V8	10	#4	STR	4'-6"	31
V9	10	#4	STR	5'-2"	35
V10	10	#4	STR	5'-11"	40
V11	10	#4	STR	6'-8"	45
V12	8	#4	STR	7'-4"	40
V13	4	#4	STR	7'-11"	22
Z1	6	#4	4	3'-1"	13
Z2	3	#4	4	3'-9"	8
Z3	3	#4	4	4'-5"	9
Z4	3	#4	4	5'-0"	11
Z5	3	#4	4	5'-8"	12
Z6	3	#4	4	3'-7"	8
Z7	3	#4	4	4'-1"	9
Z8	3	#4	4	4'-7"	10
Z9	3	#4	4	5'-0"	11
Z10	10	#4	4	3'-1"	21
Z11	10	#4	4	3'-6"	24
Z12	10	#4	4	3'-11"	27
Z13	10	#4	4	4'-4"	29
Z14	10	#4	4	4'-9"	32
Z15	8	#4	4	5'-2"	28
Z16	4	#4	4	5'-5"	15

REINFORCING STEEL FOR 4 WINGS	2,437 LBS.
CLASS A CONCRETE	
4 WINGS	33.2 CY
2 HEADWALLS	2.9 CY
2 END CURTAIN WALLS	3.6 CY
SILLS	2.7 CY
TOTAL	42.4 CY

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 712+62.00 -L1-

SHEET 6 OF 6

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR CONCRETE BOX CULVERT H=7'-0" SLOPE= 3:1

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License No. F-0672

DRAWN BY : J. B. GEILE DATE : 12/12/19
CHECKED BY : T. N. ENNIS DATE : 04/15/20

DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 04/15/20

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS
DocuSigned by: Trevor Ennis 6/25/2020

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C13-06
1			3			TOTAL SHEETS
2			4			06

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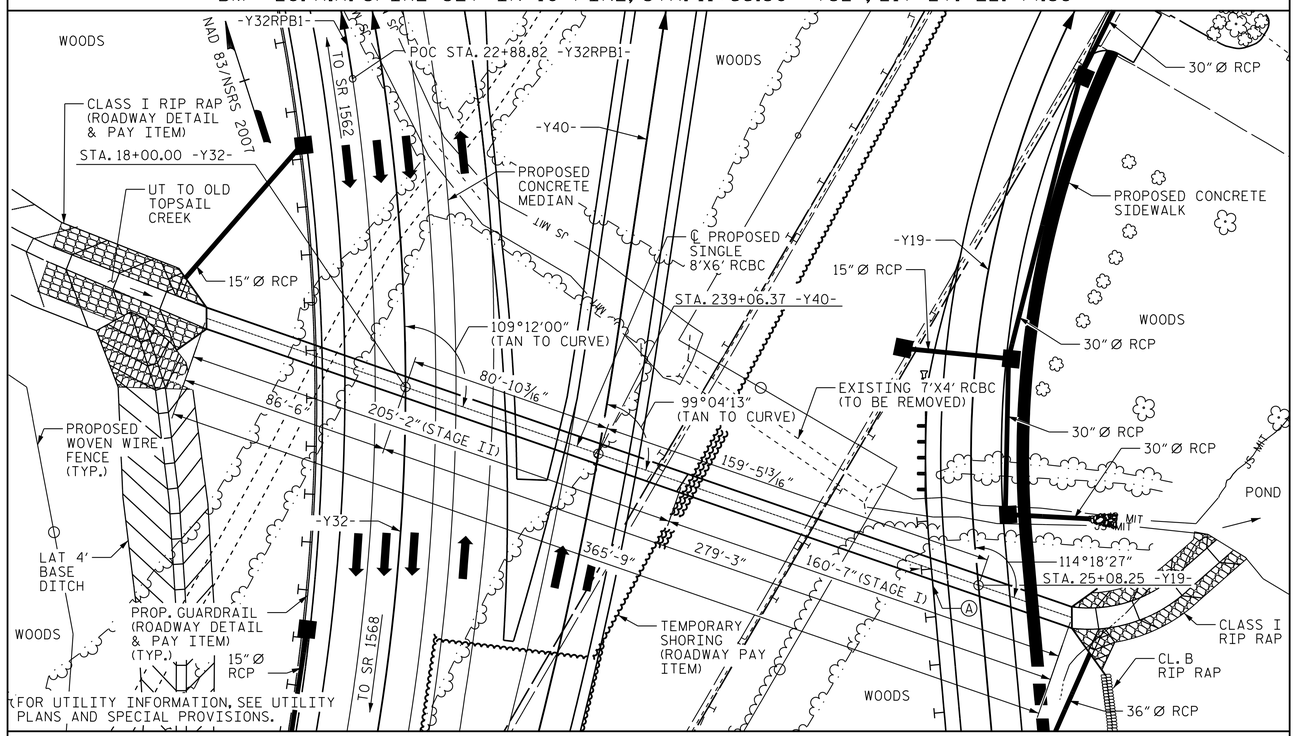

HYDRAULIC DATA

DESIGN DISCHARGE	=	270	C.F.S.
FREQUENCY OF DESIGN FLOOD	=	50	YR.
DESIGN HIGH WATER ELEVATION	=	39.80	
DRAINAGE AREA	=	0.21	SQ. MI.
BASE DISCHARGE (Q100)	=	300	C.F.S.
BASE HIGH WATER ELEVATION	=	40.50	

ROADWAY DATA

GRADE POINT ELEV. @ STATION 18+00.00 -Y32-	=	55.50
BED ELEV. @ STATION 18+00.00 -Y32-	=	33.12
ROADWAY SLOPES	=	3:1

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	=	425 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	=	500+ YRS.
OVERTOPPING FLOOD ELEVATION	=	43.90

OVERTOPS ROADWAY MEDIAN AT STATION 12+00.00 -Y32-

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DRAWN BY : J. B. GEILE DATE : 12/02/19
CHECKED BY : T. N. ENNIS DATE : 04/20/20
DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 10/25/21

FOUNDATION NOTES

EXCAVATE FOUNDATION A MINIMUM OF 1.0 FEET BELOW CULVERT BEARING ELEVATION. PLACE 1.0 FEET OF CLASS VI FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH SECTION 414 OF THE STANDARD SPECIFICATIONS.

OVEREXCAVATE ADDITIONAL LOOSE/SOFT OR ORGANIC MATERIAL IF PRESENT AND REPLACE WITH ADDITIONAL CLASS VI FOUNDATION CONDITIONING MATERIAL.

ENCAPSULATE FOUNDATION CONDITIONING MATERIAL IN TYPE 4 GEOTEXTILE. FOR FOUNDATION CONDITIONING GEOTEXTILE, SEE GEOTECHNICAL SPECIAL PROVISIONS.

CONSTRUCT THE REINFORCED CONCRETE BOX CULVERT AT STATION 18+00 -Y32- WITH 3 INCHES OF CAMBER AT ACCOUNT FOR ANTICIPATED SETTLEMENT.

STAGE I STRUCTURE QUANTITIES

CULVERT EXCAVATION	LUMP SUM
ASBESTOS ASSESSMENT	LUMP SUM
FOUNDATION COND. MATERIAL	151 TONS
FOUNDATION COND. GEOTEXTILE	627 S.Y.
CLASS A CONCRETE	
BARREL @ 0.934 CY/FT	150.1 C.Y.
WINGS	14.4 C.Y.
TOTAL	164.5 C.Y.
REINFORCING STEEL	
BARREL	28,454 LBS.
WINGS	1,019 LBS.
TOTAL	29,473 LBS.

STAGE II STRUCTURE QUANTITIES

REMOVAL OF EXISTING STRUCTURE	LUMP SUM
ASBESTOS ASSESSMENT	LUMP SUM
CULVERT EXCAVATION	LUMP SUM
FOUNDATION COND. MATERIAL	194 TONS
FOUNDATION COND. GEOTEXTILE	769 S.Y.
CLASS A CONCRETE	
BARREL @ 0.934 CY/FT	191.7 C.Y.
WINGS	14.5 C.Y.
TOTAL	206.2 C.Y.
REINFORCING STEEL	
BARREL	36,189 LBS.
WINGS	1,018 LBS.
TOTAL	37,207 LBS.

TOTAL STRUCTURE QUANTITIES

REMOVAL OF EXISTING STRUCTURE	LUMP SUM
ASBESTOS ASSESSMENT	LUMP SUM
CULVERT EXCAVATION	LUMP SUM
FOUNDATION COND. MATERIAL	345 TONS
FOUNDATION COND. GEOTEXTILE	1,396 S.Y.
CLASS A CONCRETE	
BARREL @ 0.934 CY/FT	341.8 C.Y.
WINGS	28.9 C.Y.
TOTAL	370.7 C.Y.
REINFORCING STEEL	
BARREL	64,643 LBS.
WINGS	2,037 LBS.
TOTAL	66,680 LBS.

NOTES

ASSUMED LIVE LOAD = HL-93.

DESIGN FILL= 20.75 FT. (MAXIMUM) & 4.00 FT. (MINIMUM)

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. STAGE I WING FOOTINGS, CURTAIN WALLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE STAGE I WALLS AND STAGE I WINGS FOR FULL HEIGHT FOLLOWED BY THE STAGE I ROOF SLAB AND HEADWALLS.

CONCRETE IN STAGE II CULVERT TO BE POURED IN THE FOLLOWING ORDER:

1. STAGE II WING FOOTINGS, CURTAIN WALLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE STAGE II WALLS AND STAGE II WINGS FOR FULL HEIGHT FOLLOWED BY THE STAGE II ROOF SLAB AND HEADWALLS.

THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

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

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

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

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

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

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

FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

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

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

FOR ASBESTOS ASSESSMENT FOR CULVERT DEMOLITION AND RENOVATION ACTIVITIES, SEE SPECIAL PROVISIONS.

Ⓐ FOR DETAILS OF GUARDRAIL ACROSS CULVERT, SEE ROADWAY DETAIL DRAWING 862D01.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 18+00.00 -Y32-

SHEET 1 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 8 FT. X 6 FT. CONCRETE BOX CULVERT

109°12'00" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS

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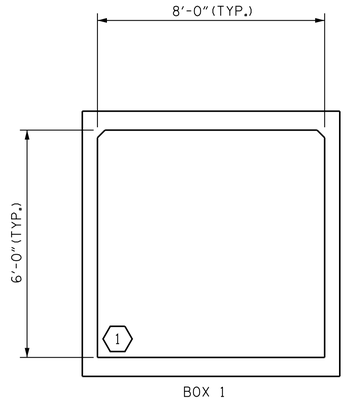
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO. C14-01

TOTAL SHEETS 08

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

	CONTROLLING LOAD RATING	MINIMUM RATING FACTOR (RF)	STRENGTH I LIMIT STATE							
			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)
PERMANENT LOAD RATING	1	1.05	1.21	1	BOTT. SLAB - MID	4.00	1.05	1	BOTT. SLAB - LEFT END	0.00



BOX 1

LRFR SUMMARY

(LOOKING DOWNSTREAM)

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

LOAD RATINGS FOR MAXIMUM AND MINIMUM FILL CONDITIONS HAVE BEEN EVALUATED. MAXIMUM FILL CONDITIONS CONTROL LOAD RATINGS AND ARE PRESENTED IN THE ADJACENT TABLE AS THE MOST CRITIAL LOAD RATING.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 18+00.00 -Y32-

SHEET 2 OF 8

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CHECKED BY : N. D'AIUTO DATE : 01/30/20

DRAWN BY : BNB 6/19
CHECKED BY : THC 6/19

DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS

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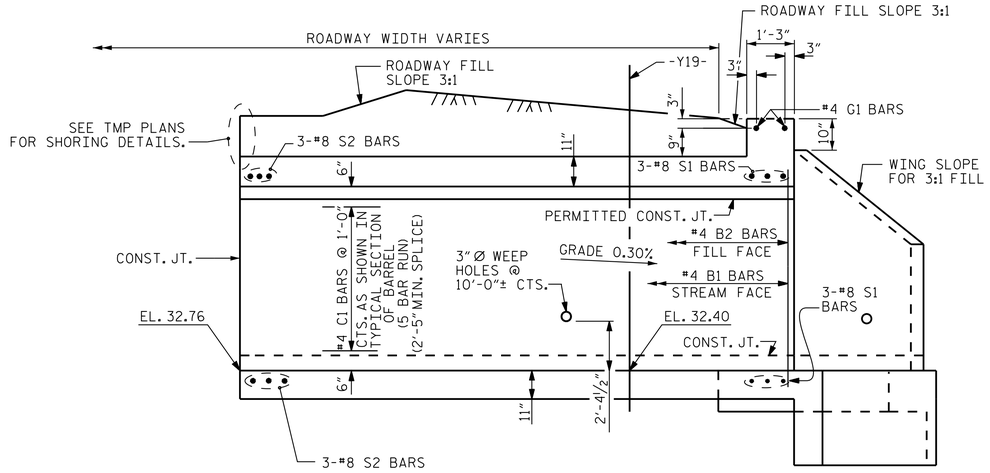
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

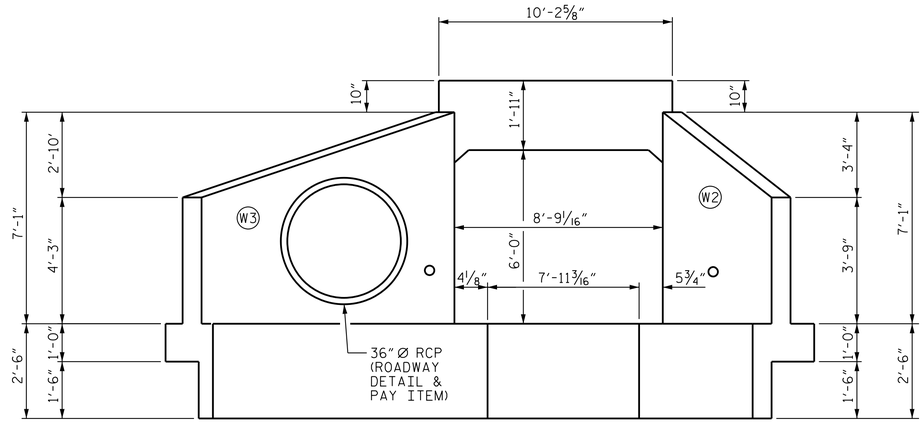
STANDARD
LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS
(NON-INTERSTATE TRAFFIC)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C14-02
1			3			TOTAL SHEETS
2			4			08

STD. NO. LRFR7



CULVERT SECTION NORMAL TO ROADWAY (STAGE I)



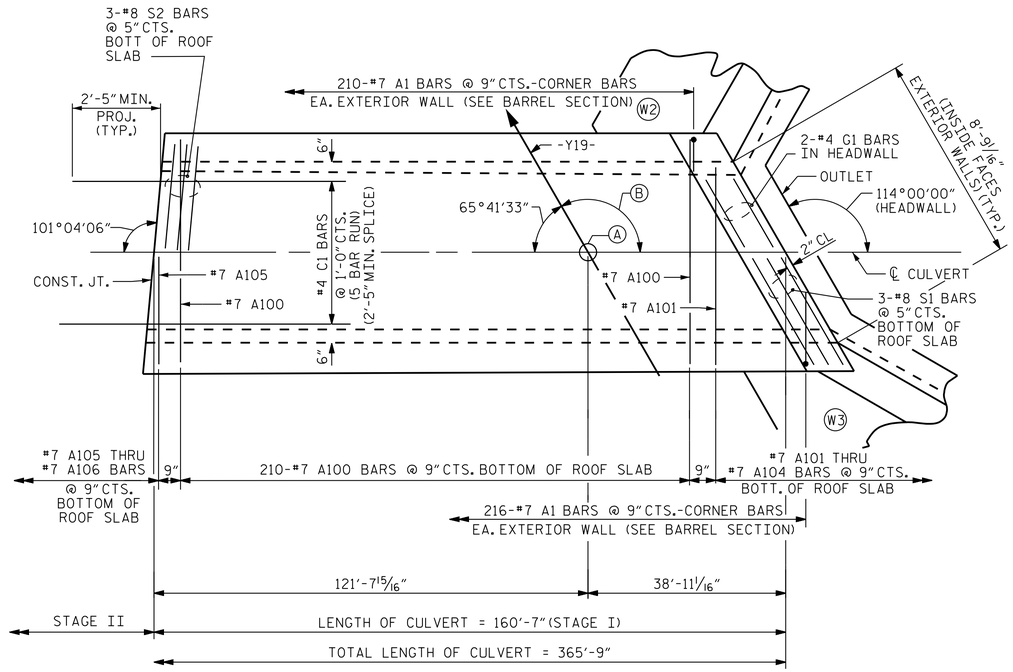
END ELEVATION NORMAL TO SKEW (STAGE I)

(LOOKING UPSTREAM)

NOTES

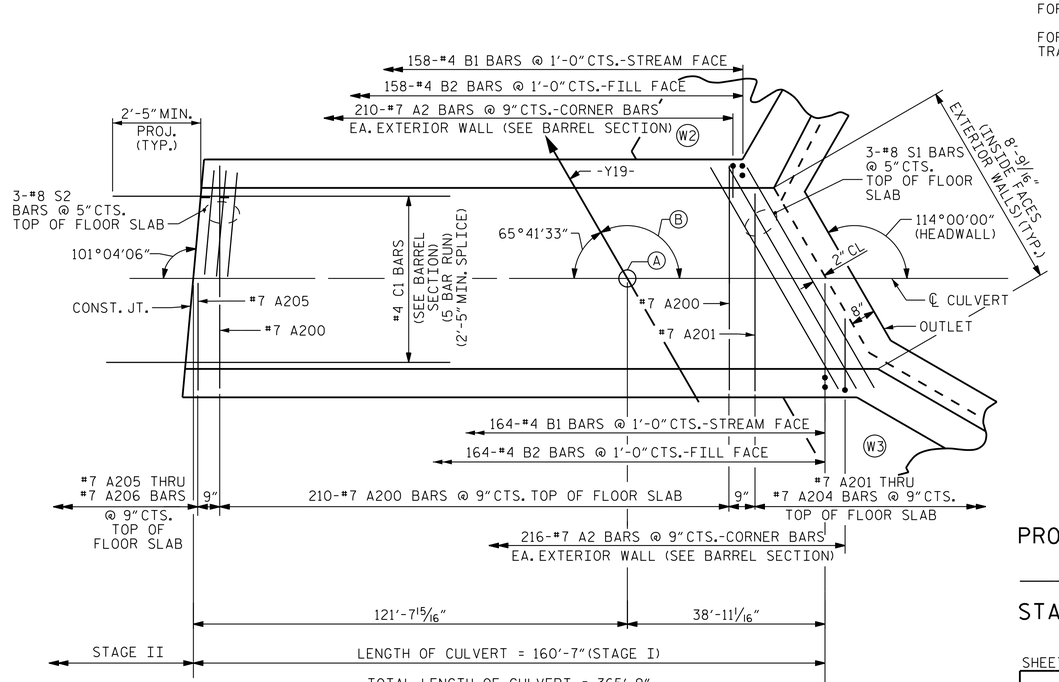
FOR SKEW TRIANGLES, SEE SHEET 5 OF 9.

FOR ADDITIONAL STAGING DETAILS, SEE TRAFFIC CONTROL PLANS.



PLAN - ROOF SLAB (STAGE I)

TRANSVERSE CONST. JTS. NOT SHOWN FOR CLARITY, SEE SHEET 1 OF 9 FOR ADDITIONAL INFORMATION.



PLAN - FLOOR SLAB (STAGE I)

TRANSVERSE CONST. JTS. NOT SHOWN FOR CLARITY, SEE SHEET 1 OF 9 FOR ADDITIONAL INFORMATION. SEE BARREL SECTION FOR #4 F1 BARS. NOT SHOWN HERE FOR CLARITY.

Ⓐ STA. 25+08.25 -Y19-

Ⓑ 114°18'27" (℄ ROADWAY TO ℄ CULVERT)

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DRAWN BY : J. B. GEILE DATE : 01/03/20
CHECKED BY : T. N. ENNIS DATE : 04/20/20
DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS

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PROJECT NO. R-3300B
PENDER COUNTY
STATION: 18+00.00 -Y32-

SHEET 3 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 8 FT. X 6 FT. CONCRETE BOX CULVERT

STAGE I

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C14-03
1			3			TOTAL SHEETS
2			4			08

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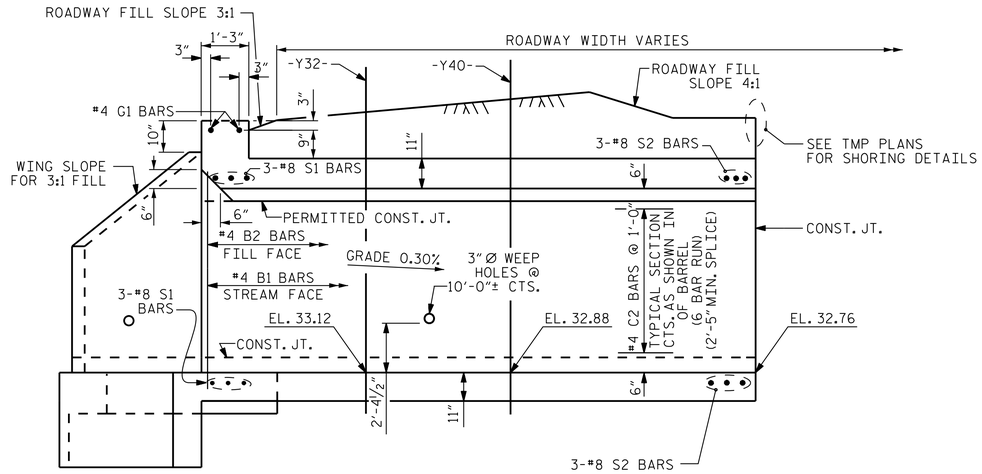
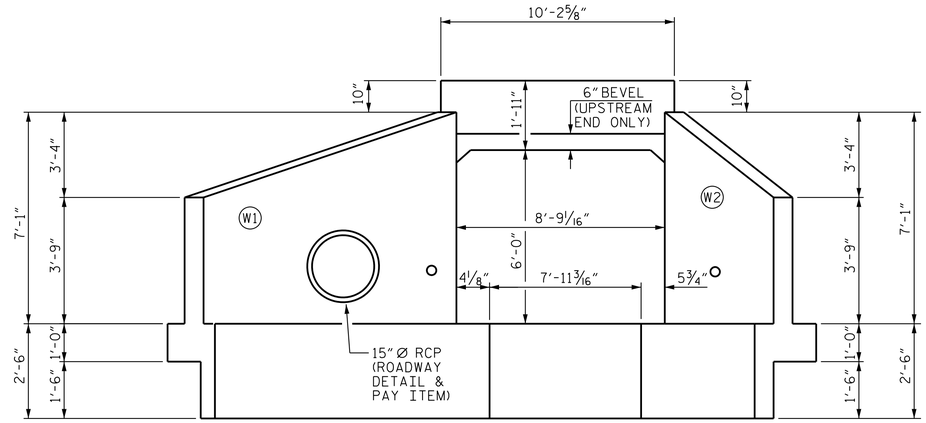
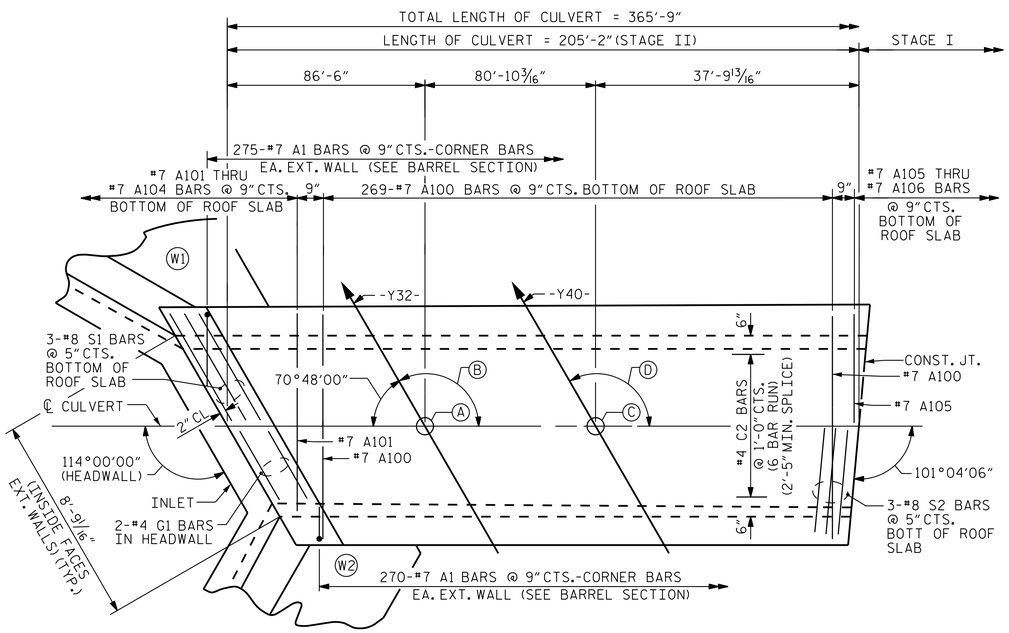


CULVERT SECTION NORMAL TO ROADWAY (STAGE II)



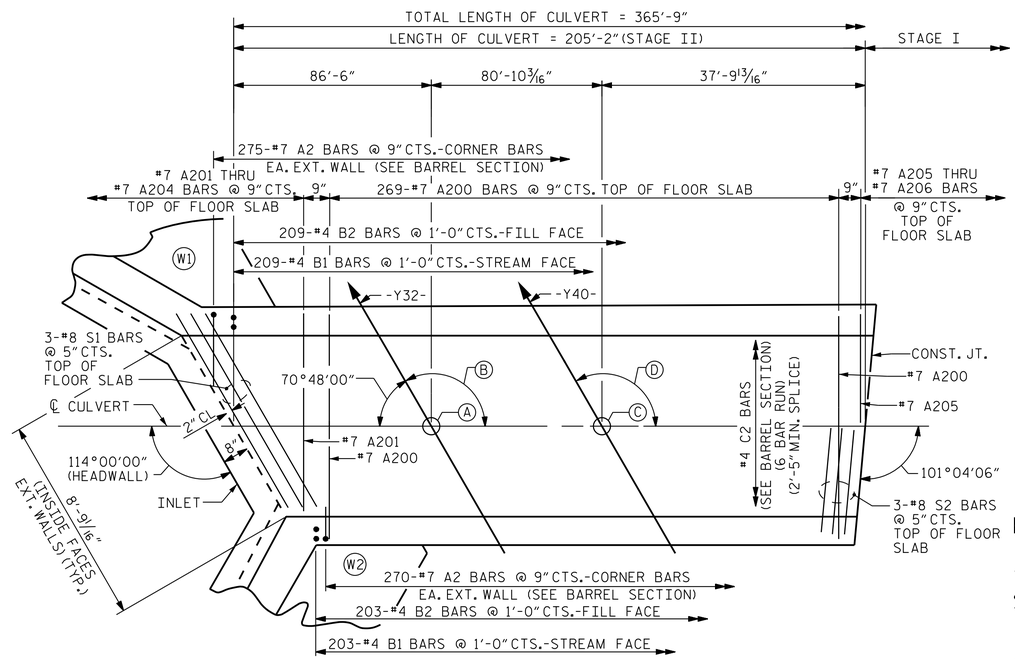
END ELEVATION NORMAL TO SKEW (STAGE II)

(LOOKING DOWNSTREAM)



PLAN - ROOF SLAB (STAGE II)

TRANSVERSE CONST. JTS. NOT SHOWN FOR CLARITY.
SEE SHEET 1 OF 9 FOR ADDITIONAL INFORMATION.



PLAN - FLOOR SLAB (STAGE II)

TRANSVERSE CONST. JTS. NOT SHOWN FOR CLARITY.
SEE SHEET 1 OF 9 FOR ADDITIONAL INFORMATION.
SEE BARREL SECTION FOR #4 F1 BARS. NOT SHOWN HERE FOR CLARITY.

Ⓐ STA. 18+00.00 -Y32-
Ⓑ 109°12'00" (TAN. TO CURVE)
Ⓒ STA. 239+06.37 -Y40-
Ⓓ 99°04'13" (TAN. TO CURVE)

NOTES

FOR SKEW TRIANGLES, SEE SHEET 5 OF 9.

FOR ADDITIONAL STAGING DETAILS, SEE TRAFFIC CONTROL PLANS.

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DRAWN BY : J. B. GEILE DATE : 01/03/20
CHECKED BY : T. N. ENNIS DATE : 04/20/20
DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS

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PROJECT NO. R-3300B
PENDER COUNTY
STATION: 18+00.00 -Y32-

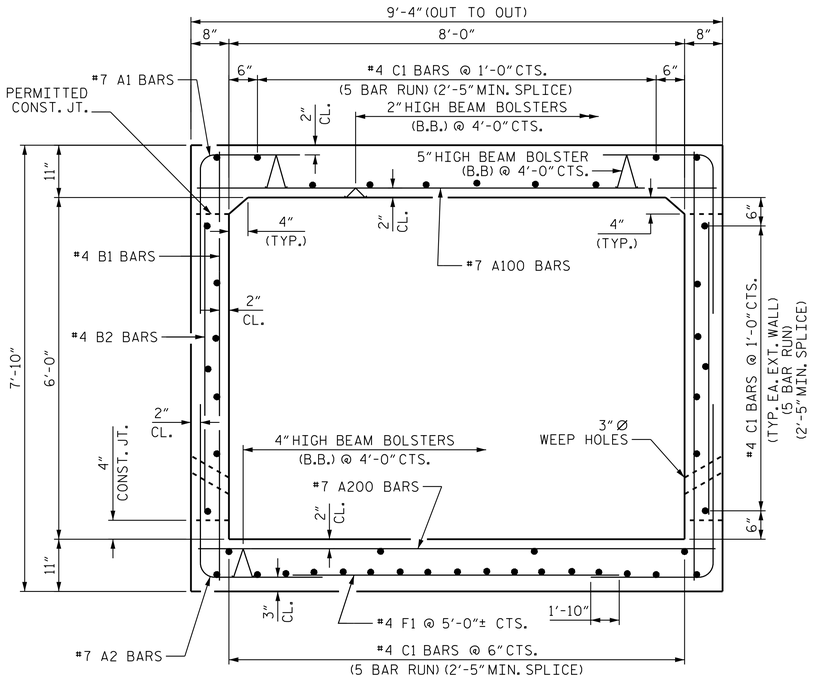
SHEET 4 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 8 FT. X 6 FT. CONCRETE BOX CULVERT

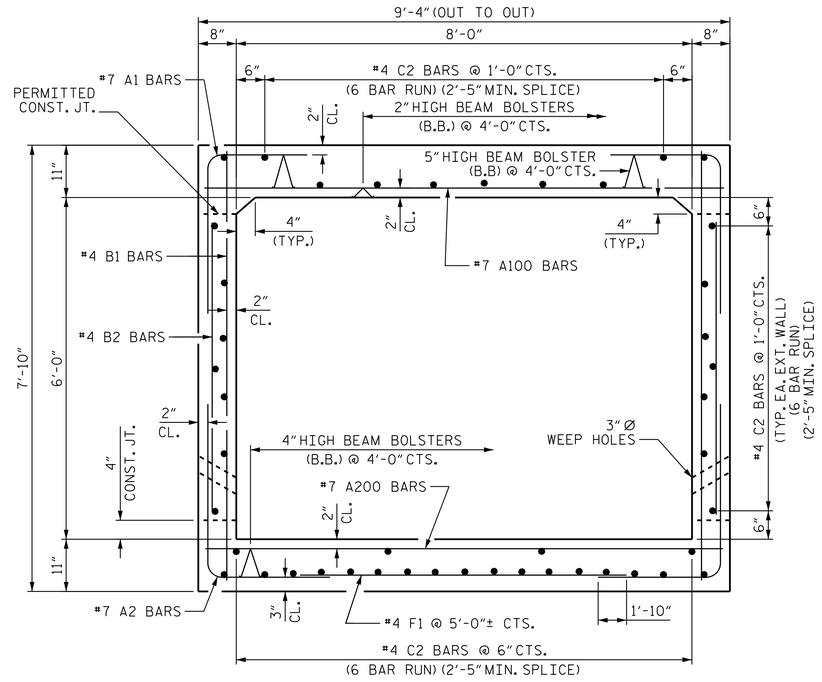
STAGE II

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C14-04
1			3			TOTAL SHEETS
2			4			08



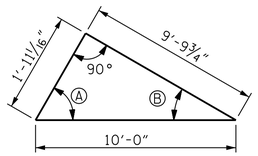
RIGHT ANGLE SECTION OF BARREL

(STAGE I)
THERE ARE 45 C1 BARS IN SECTION OF BARREL



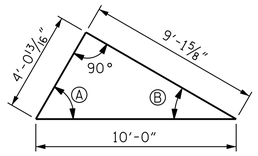
RIGHT ANGLE SECTION OF BARREL

(STAGE II)
THERE ARE 45 C2 BARS IN SECTION OF BARREL



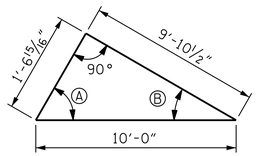
SKEW TRIANGLE

(CONST. JT. BETWEEN STAGES)
Ⓐ 78°55'54" Ⓑ 11°04'06"



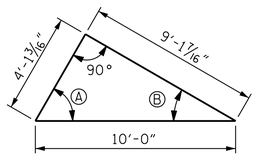
SKEW TRIANGLE (STAGE I & II)

(HEADWALLS)
Ⓐ 66°00'00" Ⓑ 24°00'00"



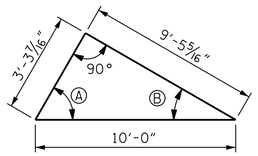
SKEW TRIANGLE (STAGE II)

(-Y40-) (TAN. TO CURVE)
Ⓐ 80°55'47" Ⓑ 09°04'13"



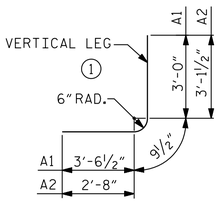
SKEW TRIANGLE (STAGE I)

(℄ ROADWAY TO ℄ CULVERT) (-Y19-)
Ⓐ 65°41'33" Ⓑ 24°18'27"



SKEW TRIANGLE (STAGE II)

(-Y32-) (TAN. TO CURVE)
Ⓐ 70°48'00" Ⓑ 19°12'00"



BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL
STAGE I

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	426	#7	1	7'-4"	6386
A2	426	#7	1	6'-7"	5733
A100	210	#7	STR	9'-0"	3864
A101	1	#7	STR	8'-4"	18
A102	1	#7	STR	6'-7"	14
A103	1	#7	STR	4'-11"	11
A104	1	#7	STR	3'-3"	7
A105	1	#7	STR	5'-7"	12
A106	1	#7	STR	2'-0"	5
A200	210	#7	STR	9'-0"	3864
A201	1	#7	STR	8'-4"	18
A202	1	#7	STR	6'-7"	14
A203	1	#7	STR	4'-11"	11
A204	1	#7	STR	3'-3"	7
A205	1	#7	STR	5'-7"	12
A206	1	#7	STR	2'-0"	5
B1	322	#4	STR	7-5"	1596
B2	322	#4	STR	5'-4"	1148

STAGE I - CONT'D

C1	225	#4	STR	35'-1"	5274
F1	32	#4	STR	6'-4"	136
G1	2	#4	STR	9'-10"	14
S1	6	#8	STR	9'-10"	158
S2	6	#8	STR	9'-2"	147
REINFORCING STEEL					28,454 LBS.

BILL OF MATERIAL
STAGE II

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	545	#7	1	7'-4"	8170
A2	545	#7	1	6'-7"	7334
A100	270	#7	STR	9'-0"	4967
A101	1	#7	STR	8'-4"	18
A102	1	#7	STR	6'-7"	14
A103	1	#7	STR	4'-11"	11
A104	1	#7	STR	3'-3"	7
A105	1	#7	STR	5'-7"	12
A106	1	#7	STR	2'-0"	5
A200	270	#7	STR	9'-0"	4967
A201	1	#7	STR	8'-4"	18
A202	1	#7	STR	6'-7"	14
A203	1	#7	STR	4'-11"	11
A204	1	#7	STR	3'-3"	7
A205	1	#7	STR	5'-7"	12
A206	1	#7	STR	2'-0"	5
B1	412	#4	STR	7'-5"	2042
B2	412	#4	STR	5'-4"	1468
C2	270	#4	STR	36'-8"	6614
F1	41	#4	STR	6'-4"	174
G1	2	#4	STR	9'-10"	14
S1	6	#8	STR	9'-10"	158
S2	6	#8	STR	9'-2"	147
REINFORCING STEEL					36,189 LBS.

SPLICE CHART

BAR	SIZE	SPLICE LENGTH
B1,F1,B2	#4	1'-10"
C1	#4	2'-5"

PROJECT NO. R-3300B
PENDER COUNTY
STATION: 18+00.00 -Y32-

SHEET 5 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 8 FT. X 6 FT.
CONCRETE BOX CULVERT

STAGES I & II

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

SHEET NO. C14-05
TOTAL SHEETS 08

Stantec
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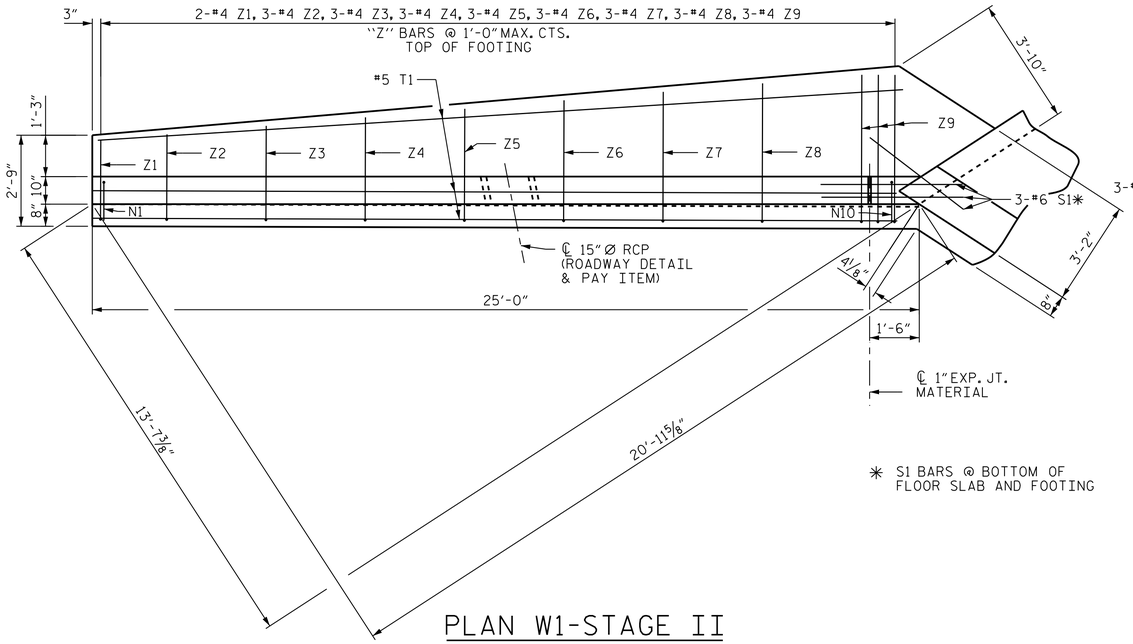
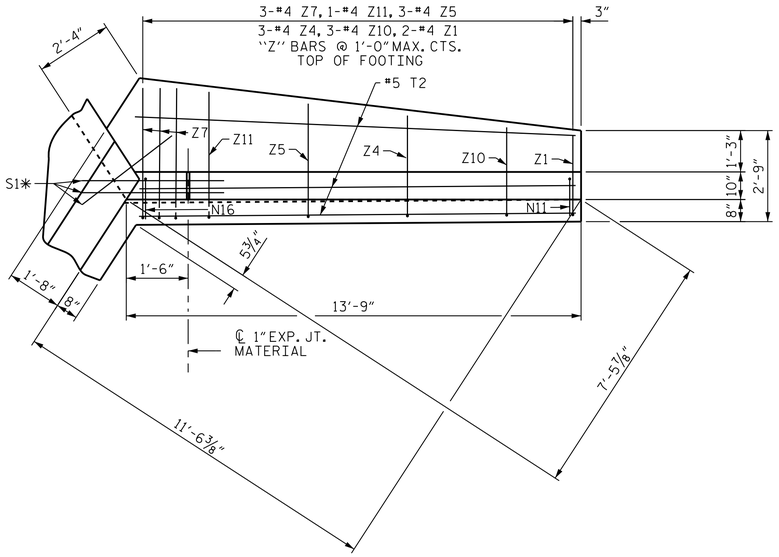
www.stantec.com
License No. F-0672

DRAWN BY : J. HAGENBUSH DATE : 12/17/19
CHECKED BY : T. N. ENNIS DATE : 04/20/20
DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 10/25/21



* S1 BARS @ BOTTOM OF FLOOR SLAB AND FOOTING

PLAN W1-STAGE II

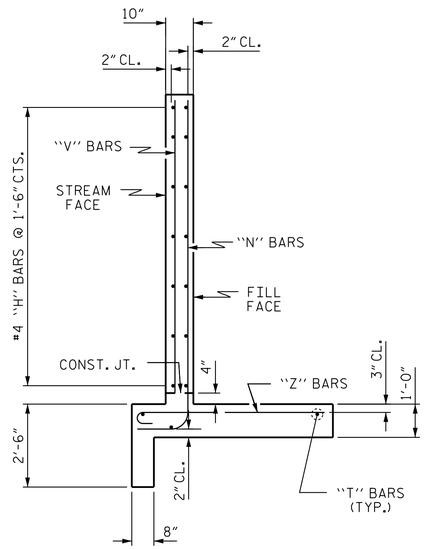


PLAN W2-STAGES I & II

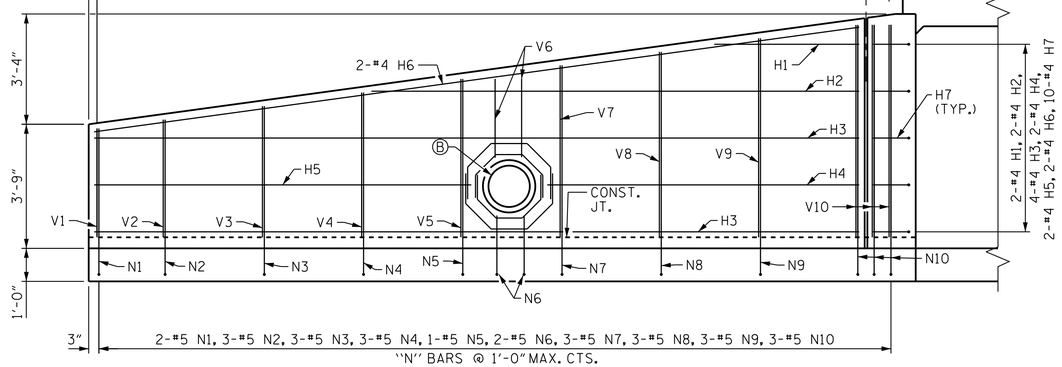
NOTES

SEE SHEET C14-08 FOR "REINFORCING SCHEDULE".

THE 15" DIAMETER PIPE THROUGH THE WINGWALL OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER.

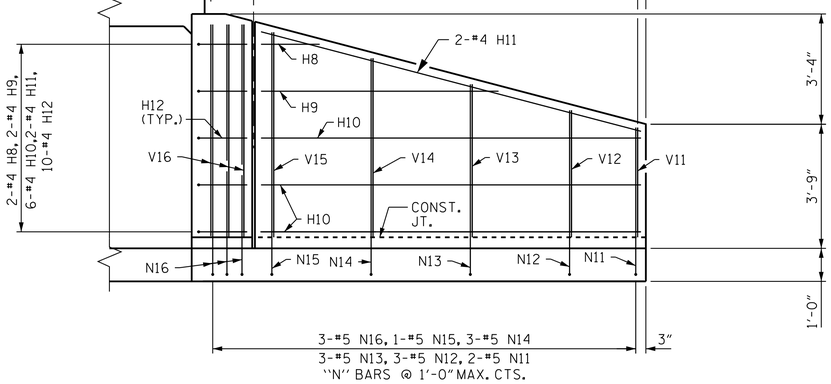


TYPICAL WING SECTION

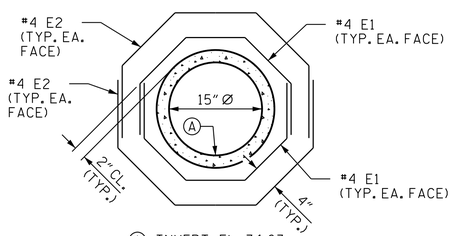


Ⓑ 15" Ø RCP
(ROADWAY DETAIL
& PAY ITEM) (SEE
DETAIL)

ELEVATION W1-STAGE II



ELEVATION W2-STAGES I & II



Ⓐ INVERT EL. 34.63

DETAIL OF REINFORCING AROUND 15" Ø RCP

#4 E1 & #4 E2 MAY BE SHIFTED AS NECESSARY TO CLEAR OTHER BARS.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 18+00.00 -Y32-

SHEET 6 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR CONCRETE BOX CULVERT H= 6'-0" SLOPE= 3:1

STAGES I & II

Stantec
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DRAWN BY : J. HAGENBUSH DATE : 01/03/20
CHECKED BY : T. N. ENNIS DATE : 04/20/20
DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS

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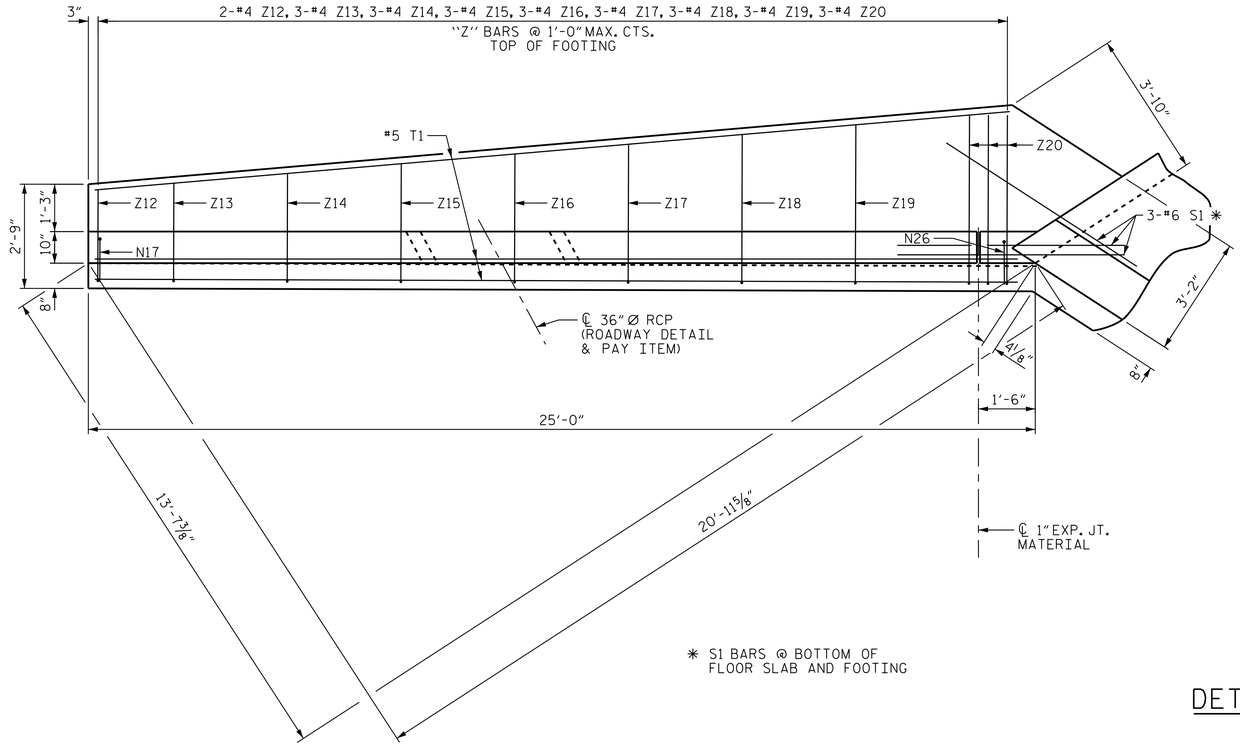
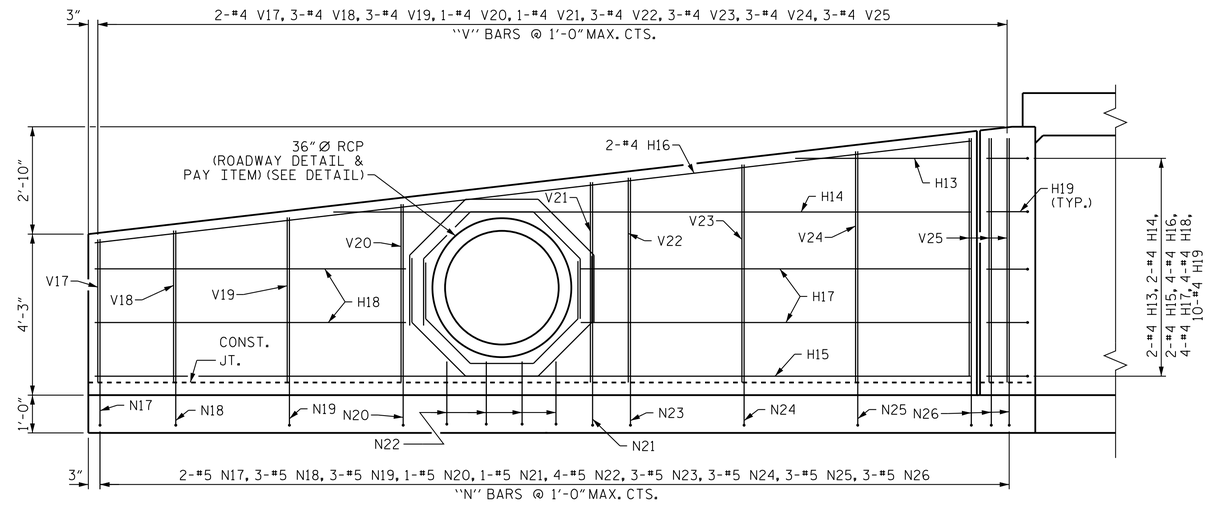
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C14-06
1			3			TOTAL SHEETS
2			4			08

U:\Structures\C14\Drafting\Final\R3300B_SMU_CU06_T000l4.dgn jgelle 10/25/2021



PLAN W3-STAGE I



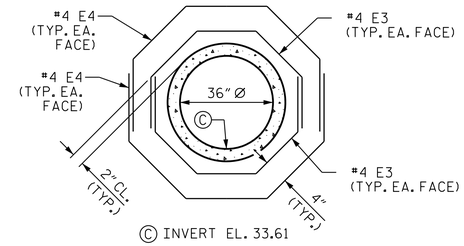
ELEVATION W3-STAGE I

NOTES

SEE SHEET C14-06 FOR "TYPICAL WING SECTION".

SEE SHEET C14-08 FOR "REINFORCING SCHEDULE".

THE 36" DIAMETER PIPE THROUGH THE WINGWALL OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER.



DETAIL OF REINFORCING AROUND 36" Ø RCP

#4 E3 & #4 E4 MAY BE SHIFTED AS NECESSARY TO CLEAR OTHER BARS.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 18+00.00 -Y32-

SHEET 7 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR
CONCRETE BOX CULVERT
H= 6'-0" SLOPE= 3:1

STAGE I

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C14-07
1			3			TOTAL SHEETS
2			4			08

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS

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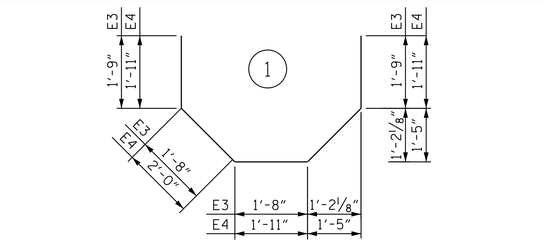
DRAWN BY : J. HAGENBUSH DATE : 01/06/20
CHECKED BY : T. N. ENNIS DATE : 04/20/20
DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 10/25/21

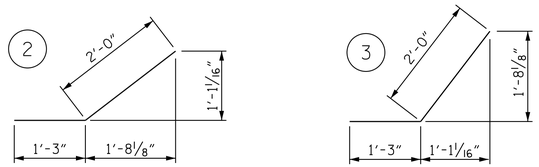
BILL OF MATERIAL- STAGE I WINGS

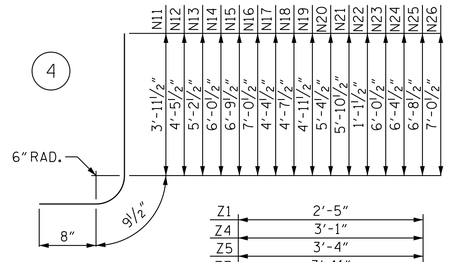
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
E3	4	#4	1	8'-6"	23
E4	4	#4	1	9'-9"	27
H8	2	#4	STR	1'-9"	3
H9	2	#4	STR	7'-2"	10
H10	6	#4	STR	11'-5"	46
H11	2	#4	STR	11'-10"	16
H12	10	#4	3	3'-3"	22
H13	2	#4	STR	5'-1"	7
H14	2	#4	STR	16'-9"	23
H15	2	#4	STR	23'-1"	31
H16	2	#4	STR	23'-3"	28
H17	4	#4	STR	10'-3"	28
H18	4	#4	STR	8'-2"	22
H19	10	#4	2	3'-3"	22
N11	2	#5	4	5'-5"	12
N12	3	#5	4	5'-11"	19
N13	3	#5	4	6'-8"	21
N14	3	#5	4	7'-6"	24
N15	1	#5	4	8'-3"	9
N16	3	#5	4	8'-6"	27
N17	2	#5	4	5'-10"	13
N18	3	#5	4	6'-1"	20
N19	3	#5	4	6'-5"	21
N20	1	#5	4	6'-10"	8
N21	1	#5	4	7'-4"	8
N22	4	#5	4	2'-7"	11
N23	3	#5	4	7'-6"	24
N24	3	#5	4	7'-10"	25
N25	3	#5	4	8'-2"	26
N26	3	#5	4	8'-6"	27
S1	6	#6	STR	6'-0"	55
T1	3	#5	STR	24'-4"	77
T2	3	#5	STR	13'-2"	42
V11	2	#4	STR	3'-1"	5
V12	3	#4	STR	3'-8"	8
V13	3	#4	STR	4'-5"	9
V14	3	#4	STR	5'-2"	11
V15	1	#4	STR	6'-0"	5
V16	3	#4	STR	6'-3"	13
V17	2	#4	STR	3'-3"	5
V18	3	#4	STR	3'-7"	9
V19	3	#4	STR	4'-1"	9
V20	1	#4	STR	4'-6"	4
V21	1	#4	STR	5'-4"	4
V22	3	#4	STR	5'-6"	11
V23	3	#4	STR	6'-0"	12
V24	3	#4	STR	6'-6"	13
V25	3	#4	STR	6'-9"	13
Z1	2	#4	5	2'-11"	4
Z4	3	#4	5	3'-7"	8
Z5	3	#4	5	3'-10"	8
Z7	3	#4	5	4'-5"	9
Z10	3	#4	5	3'-2"	7
Z11	1	#4	5	4'-4"	3
Z12	2	#4	5	2'-11"	4
Z13	3	#4	5	3'-1"	7
Z14	3	#4	5	3'-4"	7
Z15	3	#4	5	3'-7"	8
Z16	3	#4	5	3'-10"	8
Z17	3	#4	5	4'-2"	9
Z18	3	#4	5	4'-5"	9
Z19	3	#4	5	4'-8"	10
Z20	3	#4	5	4'-11"	10
REINFORCING STEEL FOR 2 WINGS					1,019 LBS.

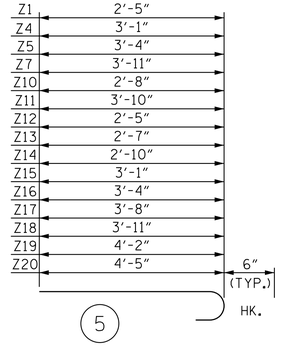
CLASS A CONCRETE		
2 WINGS	13.4	CY
1 HEADWALLS	0.5	CY
1 END CURTAIN WALLS	0.5	CY
TOTAL	14.4	CY

BAR TYPES - STAGE I









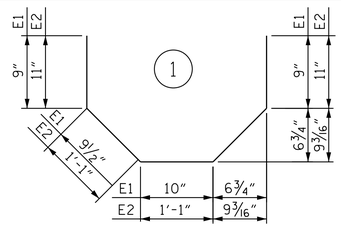
ALL BAR DIMENSIONS ARE OUT TO OUT.

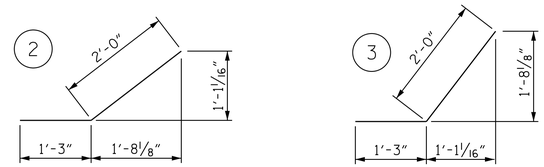
BILL OF MATERIAL- STAGE II WINGS

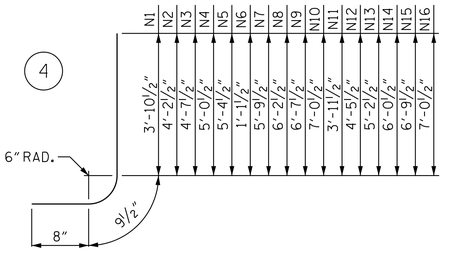
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
E1	4	#4	1	3'-11"	11
E2	4	#4	1	5'-1"	14
H1	2	#4	STR	4'-4"	6
H2	2	#4	STR	14'-8"	20
H3	4	#4	STR	23'-1"	62
H4	2	#4	STR	9'-5"	16
H5	2	#4	STR	11'-4"	16
H6	2	#4	STR	23'-4"	32
H7	10	#4	2	3'-3"	22
H8	2	#4	STR	1'-9"	3
H9	2	#4	STR	7'-2"	10
H10	6	#4	STR	11'-5"	46
H11	2	#4	STR	11'-10"	16
H12	10	#4	3	3'-3"	22
N1	2	#5	4	5'-4"	12
N2	3	#5	4	5'-8"	18
N3	3	#5	4	6'-1"	20
N4	3	#5	4	6'-6"	21
N5	1	#5	4	6'-10"	8
N6	2	#5	4	2'-7"	6
N7	3	#5	4	7'-3"	23
N8	3	#5	4	7'-8"	24
N9	3	#5	4	8'-1"	26
N10	3	#5	4	8'-6"	27
N11	2	#5	4	5'-5"	12
N12	3	#5	4	5'-11"	19
N13	3	#5	4	6'-8"	21
N14	3	#5	4	7'-6"	24
N15	1	#5	4	8'-3"	9
N16	3	#5	4	8'-6"	27
S1	6	#6	STR	6'-0"	55
T1	3	#5	STR	24'-4"	77
T2	3	#5	STR	13'-2"	42
V1	2	#4	STR	3'-3"	5
V2	3	#4	STR	3'-6"	8
V3	3	#4	STR	3'-11"	8
V4	3	#4	STR	4'-4"	9
V5	1	#4	STR	4'-9"	4
V6	4	#4	STR	2'-6"	7
V7	3	#4	STR	5'-2"	11
V8	3	#4	STR	5'-7"	12
V9	3	#4	STR	6'-0"	13
V10	3	#4	STR	6'-5"	13
V11	2	#4	STR	3'-1"	5
V12	3	#4	STR	3'-8"	8
V13	3	#4	STR	4'-5"	9
V14	3	#4	STR	5'-2"	11
V15	1	#4	STR	6'-0"	5
V16	3	#4	STR	6'-3"	13
Z1	4	#4	5	2'-11"	8
Z2	3	#4	5	3'-1"	7
Z3	3	#4	5	3'-4"	7
Z4	6	#4	5	3'-7"	15
Z5	6	#4	5	3'-10"	16
Z6	3	#4	5	4'-2"	9
Z7	6	#4	5	4'-5"	18
Z8	3	#4	5	4'-8"	10
Z9	3	#4	5	4'-11"	10
Z10	3	#4	5	3'-2"	7
Z11	1	#4	5	4'-4"	3
REINFORCING STEEL FOR 2 WINGS					1,018 LBS.

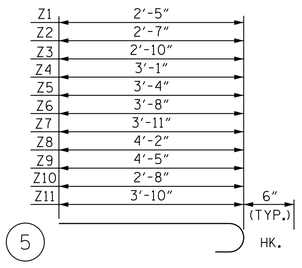
CLASS A CONCRETE		
2 WINGS	13.5	CY
1 HEADWALLS	0.5	CY
1 END CURTAIN WALLS	0.5	CY
TOTAL	14.5	CY

BAR TYPES - STAGE II









ALL BAR DIMENSIONS ARE OUT TO OUT.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 18+00.00 -Y32-

SHEET 8 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

REINFORCING SCHEDULE FOR CONCRETE BOX CULVERT WINGS H= 6'-0" SLOPE= 3:1 STAGES I & II

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C14-08
1			3			TOTAL SHEETS
2			4			08

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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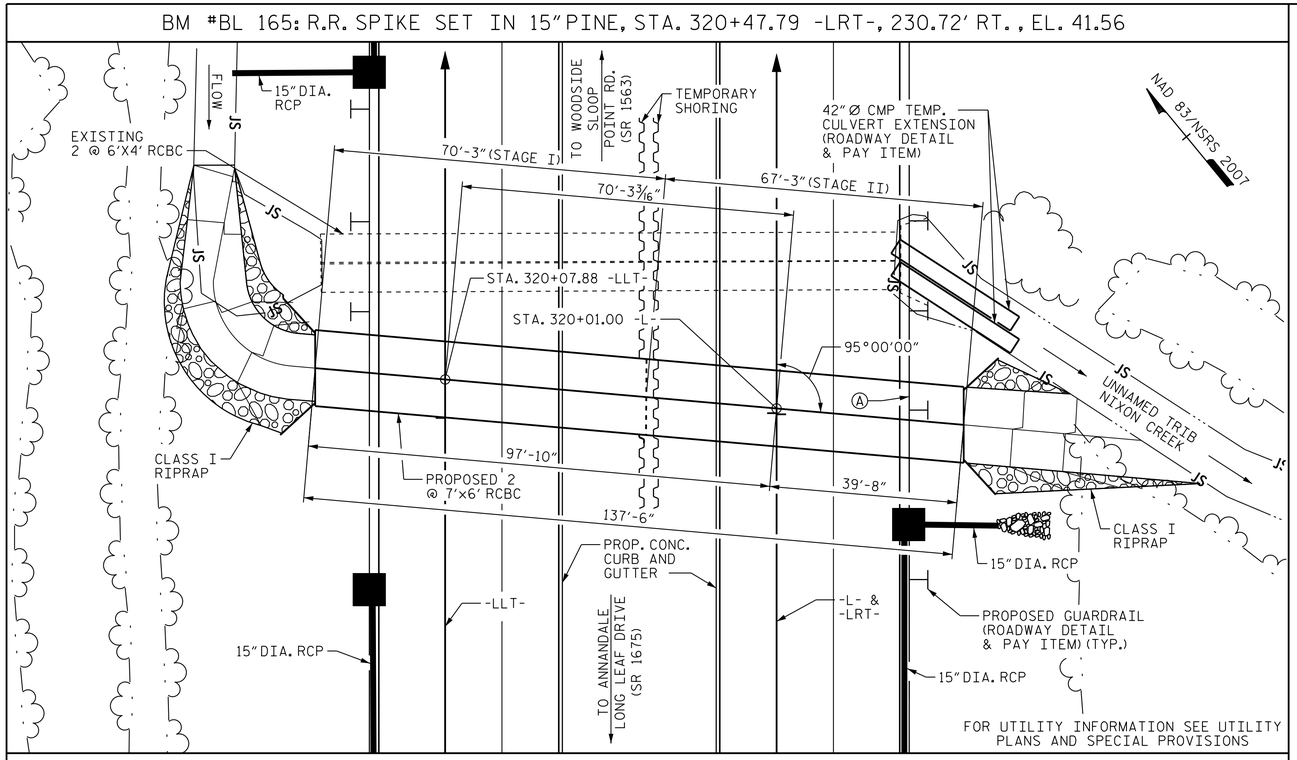
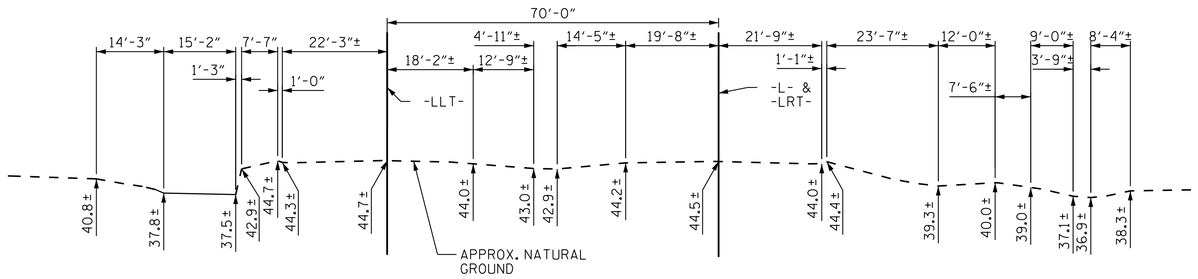
DRAWN BY : J. HAGENBUSH DATE : 01/06/20
CHECKED BY : T. N. ENNIS DATE : 04/20/20

DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 10/25/21



LOCATION SKETCH



PROFILE ALONG ℄ CULVERT

HYDRAULIC DATA

DESIGN DISCHARGE	=	440	C.F.S.
FREQUENCY OF DESIGN FLOOD	=	50	YR.
DESIGN HIGH WATER ELEVATION	=	43.5	
DRAINAGE AREA	=	1.77	SQ. MI.
BASE DISCHARGE (Q100)	=	530	C.F.S.
BASE HIGH WATER ELEVATION	=	44.50	

ROADWAY DATA

GRADE POINT ELEV. @ STATION 320+01.00 -L-	=	44.87
INVERT ELEV. @ STATION 320+01.00 -L-	=	36.10
ROADWAY SLOPES	=	2:1

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	=	590 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	=	100+ YRS.
OVERTOPPING FLOOD ELEVATION	=	45.20

OVERTOPS ROADWAY AT STATION 320+71.00 -L-

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DRAWN BY : J. B. GEILE DATE : 08/09/21
CHECKED BY : T. N. ENNIS DATE : 08/09/21
DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 10/25/21

FOUNDATION NOTES

EXCAVATE FOUNDATION A MINIMUM OF 1.0 FEET BELOW CULVERT BEARING ELEVATION. PLACE 1.0 FEET OF CLASS VI FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH SECTION 414 OF THE STANDARD SPECIFICATIONS.

ENCAPSULATE FOUNDATION CONDITIONING MATERIAL IN TYPE 4 GEOTEXTILE. FOR FOUNDATION CONDITIONING GEOTEXTILE, SEE GEOTECHNICAL SPECIAL PROVISIONS.

AFTER SERVING AS A TEMPORARY CROSSING, THE EXISTING 2 @ 6'X4' CULVERT IS TO BE FILLED WITH FLOWABLE FILL (ROADWAY DETAIL AND PAY ITEM). EXISTING WING WALL SHALL BE REMOVED AS SHOWN IN THE PLANS.

STAGE I STRUCTURE QUANTITIES

REMOVAL OF EXISTING STRUCTURE	LUMP SUM
ASBESTOS ASSESSMENT	LUMP SUM
CULVERT EXCAVATION	LUMP SUM
FOUNDATION COND. MATERIAL	100 TONS
FOUNDATION COND. GEOTEXTILE	440 S.Y.
CLASS A CONCRETE	
BARREL @ 1.64 CY/FT	115.1 C.Y.
WINGS ETC.	10.5 C.Y.
TOTAL	125.6 C.Y.
REINFORCING STEEL	
BARREL	27,766 LBS.
WINGS	432 LBS.
TOTAL	28,198 LBS.

STAGE II STRUCTURE QUANTITIES

CULVERT EXCAVATION	LUMP SUM
ASBESTOS ASSESSMENT	LUMP SUM
FOUNDATION COND. MATERIAL	96 TONS
FOUNDATION COND. GEOTEXTILE	426 S.Y.
CLASS A CONCRETE	
BARREL @ 1.64 CY/FT	110.1 C.Y.
WINGS ETC.	10.5 C.Y.
TOTAL	120.6 C.Y.
REINFORCING STEEL	
BARREL	26,576 LBS.
WINGS	432 LBS.
TOTAL	27,008 LBS.

TOTAL STRUCTURE QUANTITIES

REMOVAL OF EXISTING STRUCTURE	LUMP SUM
ASBESTOS ASSESSMENT	LUMP SUM
CULVERT EXCAVATION	LUMP SUM
FOUNDATION COND. MATERIAL	196 TONS
FOUNDATION COND. GEOTEXTILE	866 S.Y.
CLASS A CONCRETE	
BARREL @ 1.64 CY/FT	225.2 C.Y.
WINGS ETC.	21.0 C.Y.
TOTAL	246.2 C.Y.
REINFORCING STEEL	
BARREL	54,342 LBS.
WINGS	864 LBS.
TOTAL	55,206 LBS.

NOTES

ASSUMED LIVE LOAD = HL-93.

DESIGN FILL= 3.78 FT. (MAXIMUM) & 2.09 FT. (MINIMUM)

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. STAGE I WING FOOTINGS, CURTAIN WALLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE STAGE I WALLS AND STAGE I WINGS FOR FULL HEIGHT FOLLOWED BY THE STAGE I ROOF SLAB AND HEADWALLS.

CONCRETE IN STAGE II CULVERT TO BE POURED IN THE FOLLOWING ORDER:

1. STAGE II WING FOOTINGS, CURTAIN WALLS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE STAGE II WALLS AND STAGE II WINGS FOR FULL HEIGHT FOLLOWED BY THE STAGE II ROOF SLAB AND HEADWALLS.

THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

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

A TRANSVERSE CONSTRUCTION JOINT SHALL BE USED IN THE STAGE I BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINT SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.

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

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

FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRANSPORTATION MANAGEMENT PLANS.

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

FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

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

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

Ⓐ FOR DETAILS OF GUARDRAIL ACROSS CULVERT, SEE ROADWAY DETAIL DRAWING 862D01.

BACKFILL CULVERT BARRELS WITH NATIVE MATERIAL. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED AT THE PROJECT SITE DURING CULVERT CONSTRUCTION. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.

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.

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

FOR ASBESTOS ASSESSMENT FOR CULVERT DEMOLITION AND RENOVATION ACTIVITIES, SEE SPECIAL PROVISIONS.

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 320+01.00 -L-

SHEET 1 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 7 FT. X 6 FT. CONCRETE BOX CULVERT

95°00'00" SKEW

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS
Docusigned by: Trevor Ennis
10/25/2021

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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C15-01
1			3			TOTAL SHEETS
2			4			07

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)	1.18	--	1.75	2.09	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	1.18	2	LEFT END OF TOP SLAB	0.00	1
		HL-93 (OPERATING)	N/A		1.54	--	1.35	2.71	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	1.54	2	LEFT END OF TOP SLAB	0.00	1
		HS-20 (INVENTORY)	36.000	(2)	1.54	55.440	1.75	1.75	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	1.54	2	LEFT END OF TOP SLAB	0.00	1
		HS-20 (OPERATING)	36.000		2.00	72.000	1.35	2.26	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	2.00	2	LEFT END OF TOP SLAB	0.00	1
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		4.57	61.695	1.40	4.57	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	4.64	2	LEFT END OF TOP SLAB	0.00	1
		SNGARBS2	20.000		4.28	85.600	1.40	4.28	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	4.29	2	LEFT END OF TOP SLAB	0.00	1
		SNAGRIS2	22.000		4.57	100.540	1.40	4.57	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	4.64	2	LEFT END OF TOP SLAB	0.00	1
		SNCOTTS3	27.250	(3)	2.41	65.673	1.40	4.02	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	2.41	2	LEFT END OF TOP SLAB	0.00	1
		SNAGGRS4	34.925		3.24	113.157	1.40	5.29	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	3.24	2	LEFT END OF TOP SLAB	0.00	1
		SNS5A	35.550		2.98	105.939	1.40	4.84	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	2.98	2	LEFT END OF TOP SLAB	0.00	1
		SNS6A	39.950		2.92	116.654	1.40	4.86	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	2.92	2	LEFT END OF TOP SLAB	0.00	1
		SNS7B	42.000		2.91	122.220	1.40	4.85	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	2.91	2	LEFT END OF TOP SLAB	0.00	1
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		4.44	146.520	1.40	4.57	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	4.44	2	LEFT END OF TOP SLAB	0.00	1
		TNT4A	33.075		3.04	100.548	1.40	4.79	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	3.04	2	LEFT END OF TOP SLAB	0.00	1
		TNT6A	41.600		2.98	123.968	1.40	4.84	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	2.98	2	LEFT END OF TOP SLAB	0.00	1
		TNT7A	42.000		2.97	124.740	1.40	4.84	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	2.97	2	LEFT END OF TOP SLAB	0.00	1
		TNT7B	42.000		2.95	123.900	1.40	4.79	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	2.95	2	LEFT END OF TOP SLAB	0.00	1
		TNAGRIT4	43.000		3.03	130.290	1.40	4.57	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	3.03	2	LEFT END OF TOP SLAB	0.00	1
		TNAGT5A	45.000		3.03	136.350	1.40	4.57	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	3.03	2	LEFT END OF TOP SLAB	0.00	1
		TNAGT5B	45.000		3.02	135.900	1.40	4.79	2	MIDDLE OF TOP SLAB, INSIDE FACE	3.50	3.02	2	LEFT END OF TOP SLAB	0.00	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. LOAD RATINGS FOR MAXIMUM AND MINIMUM FILL CONDITIONS HAVE BEEN EVALUATED. MINIMUM FILL CONDITIONS CONTROL LOAD RATINGS AND ARE PRESENTED IN THE ADJACENT TABLE AS THE MOST CRITICAL LOAD RATING.

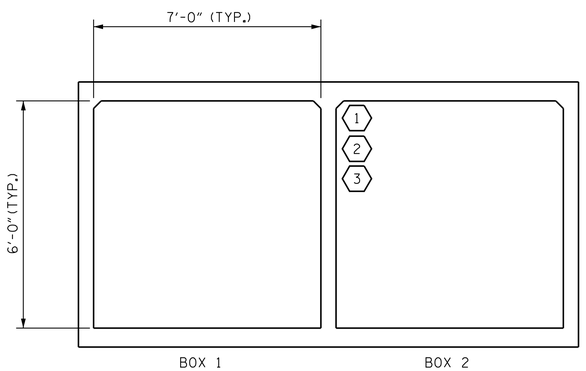
(#) CONTROLLING LOAD RATING

(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-3300B

PENDER COUNTY

STATION: 320+01.00 -L-

SHEET 2 OF 7

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:	C15-02
1			3			TOTAL SHEETS
2			4			07

STD. NO. LRFR5

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DRAWN BY : J. B. GEILE DATE : 08/09/21
CHECKED BY : T. N. ENNIS DATE : 08/09/21

DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS
DocuSigned by: Trevor Ennis
10/25/2021

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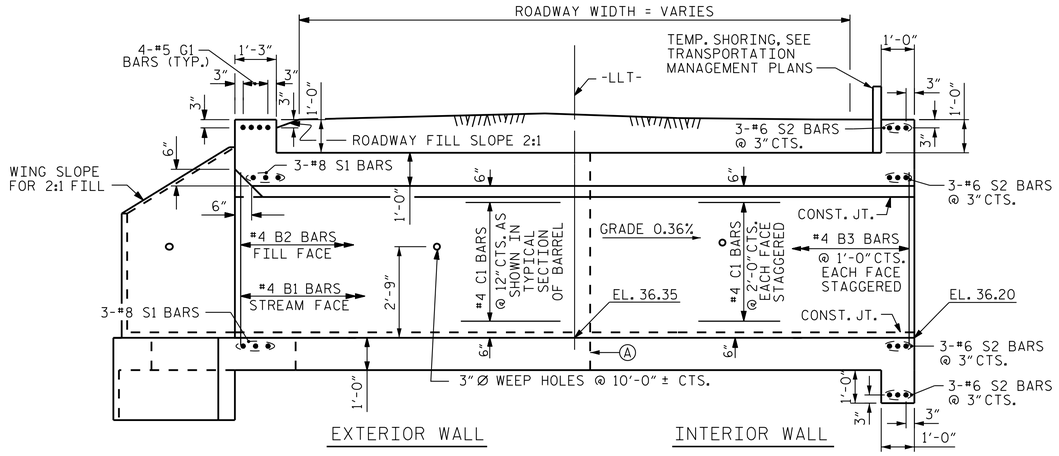
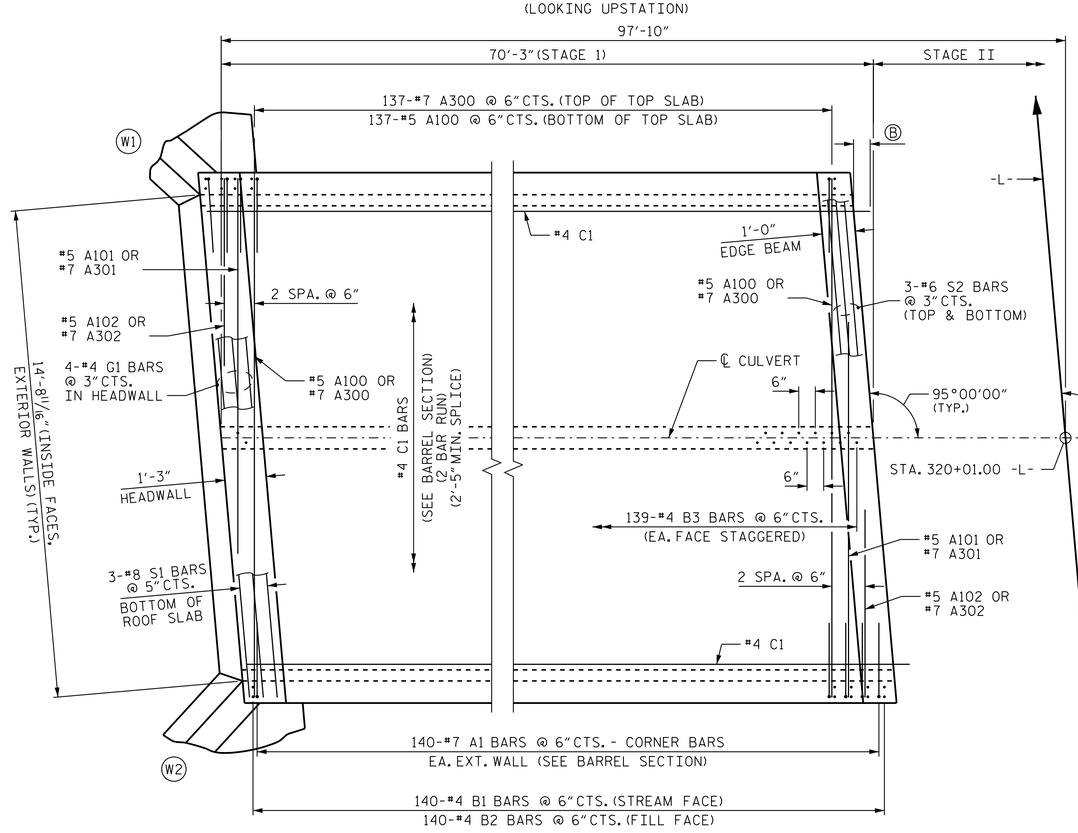


CULVERT SECTION NORMAL TO ROADWAY (STAGE I)

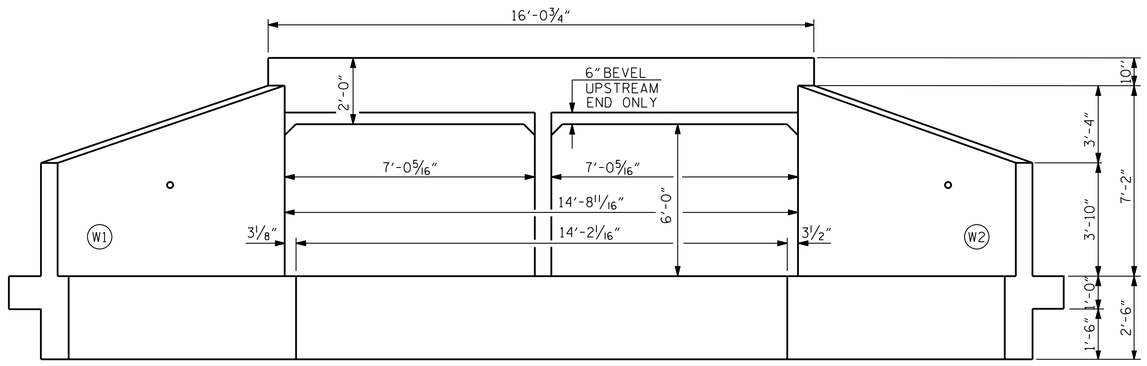
(LOOKING UPSTATION)

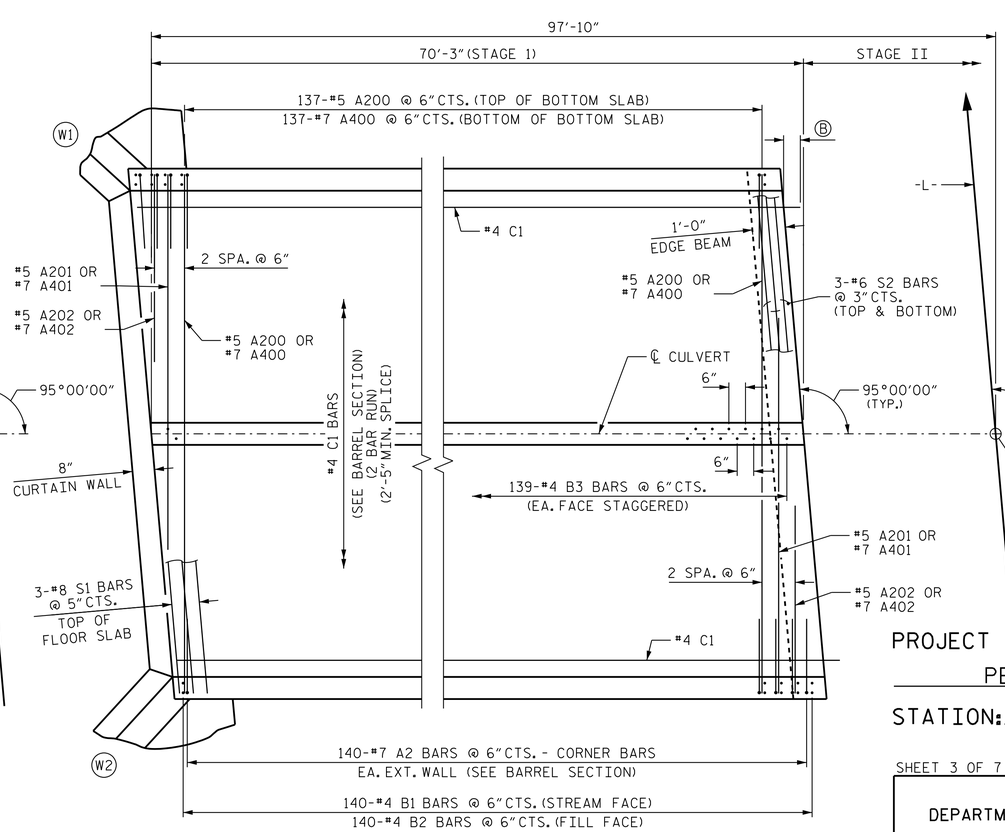


PLAN - ROOF SLAB (STAGE I)

END ELEVATION NORMAL TO SKEW (STAGE I)

(LOOKING DOWNSTREAM)





PLAN - FLOOR SLAB (STAGE I)

NOTES:

FOR SKEW TRIANGLE, SEE SHEET 5 OF 7.

Ⓐ TRANSVERSE CONSTRUCTION JT. (1 REQ'D) (SEE NOTES SHEET 1 OF 7).

Ⓑ 6" MIN. PROJECTION FOR C1 BARS

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DRAWN BY : J. B. GEILE DATE : 08/07/21
CHECKED BY : T. N. ENNIS DATE : 08/09/21
DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS
DocuSigned by: Trevor Ennis C1A4A5...
10/25/2021

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PROJECT NO. R-3300B
PENDER COUNTY
STATION: 320+01.00 -L-

SHEET 3 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 7 FT. X 6 FT. CONCRETE BOX CULVERT

STAGE I

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C15-03
1			3			TOTAL SHEETS
2			4			07

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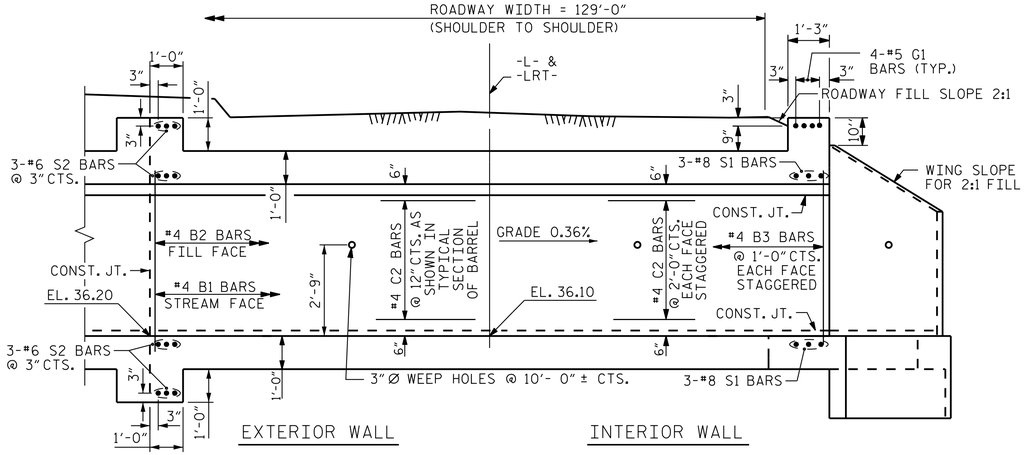
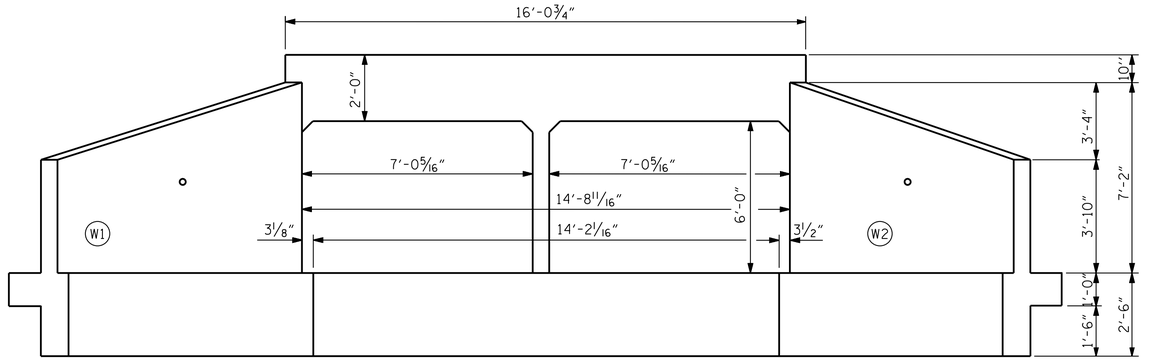


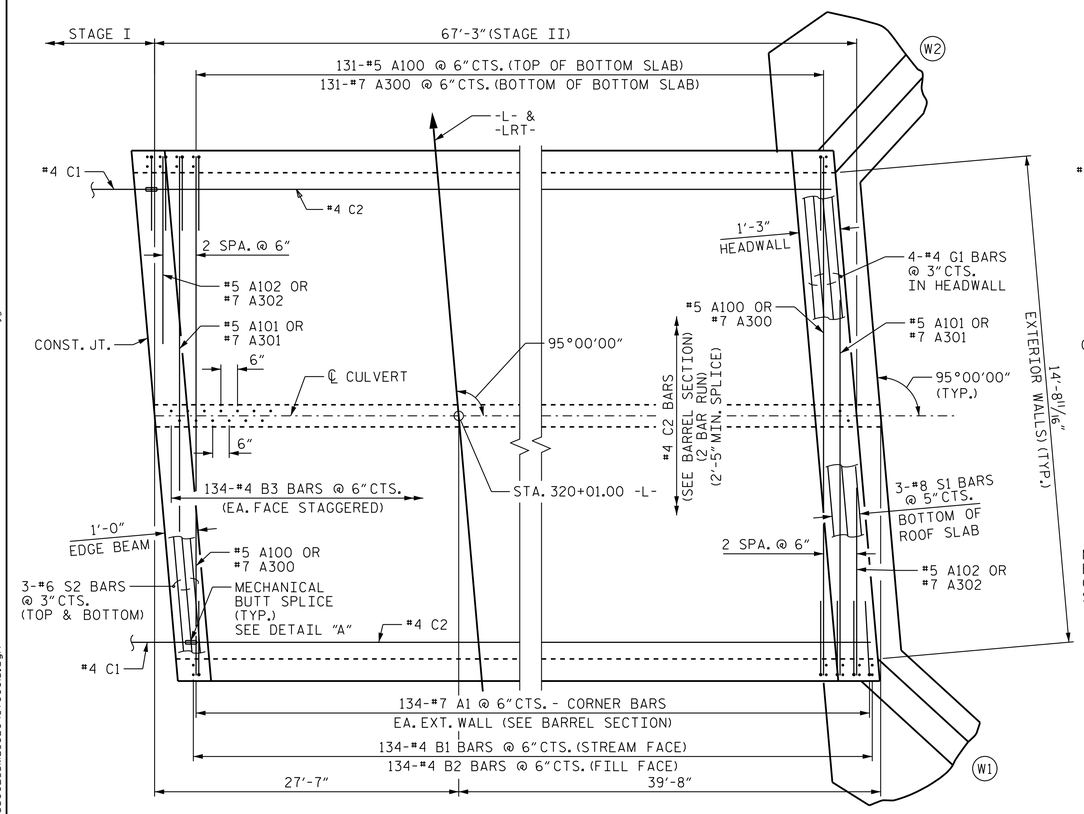
CULVERT SECTION NORMAL TO ROADWAY (STAGE II)

(LOOKING UPSTATION)

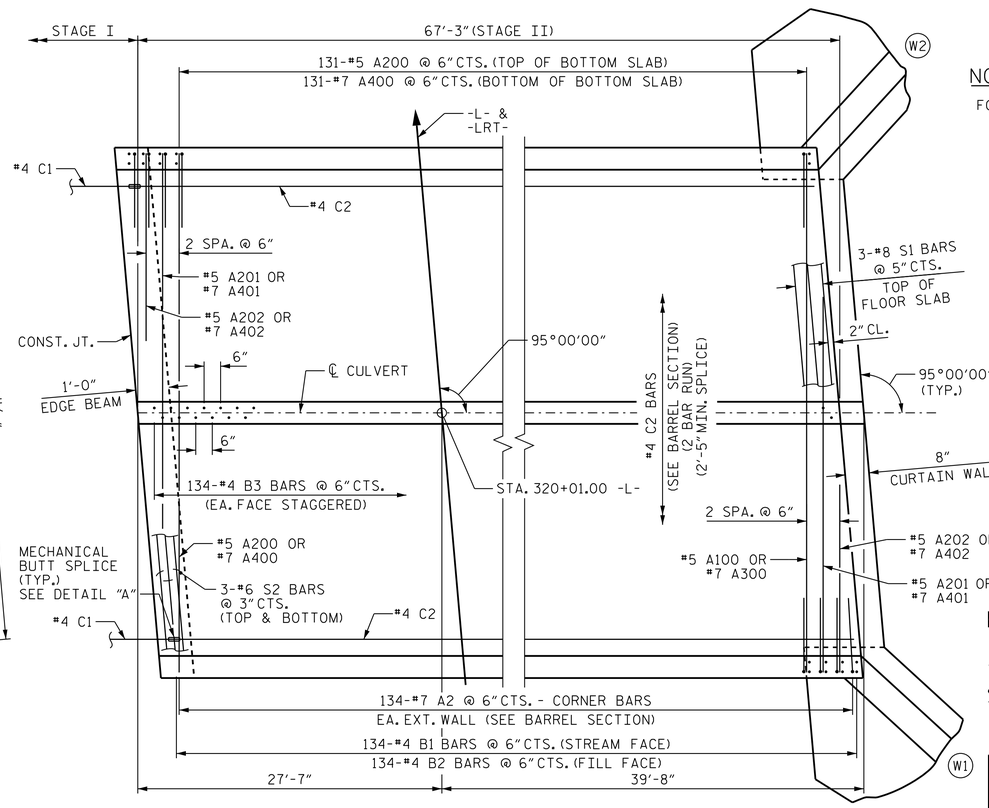


END ELEVATION NORMAL TO SKEW (STAGE II)

(LOOKING UPSTREAM)



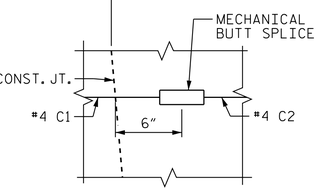
PLAN - ROOF SLAB (STAGE II)



PLAN - FLOOR SLAB (STAGE II)

NOTES:

FOR SKEW TRIANGLE, SEE SHEET 5 OF 7.



DETAIL "A"

TYP. FOR #4 C1 TO #4 C2 BAR SPLICES
(58 COUPLERS TOTAL)

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 320+01.00 -L-

SHEET 4 OF 7

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DRAWN BY : J. B. GEILE DATE : 08/06/21
CHECKED BY : T. N. ENNIS DATE : 08/09/21
DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS
DocuSigned by: Trevor Ennis
10/25/2021

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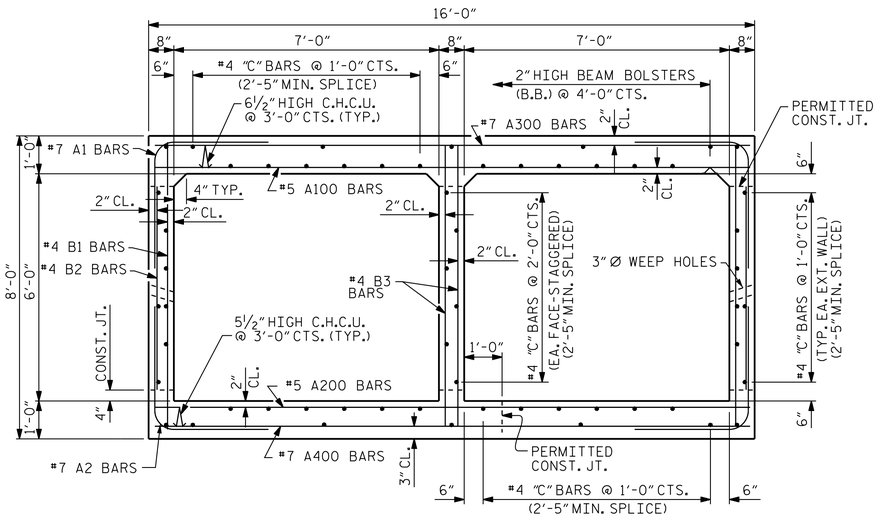
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 7 FT. X 6 FT.
CONCRETE BOX CULVERT

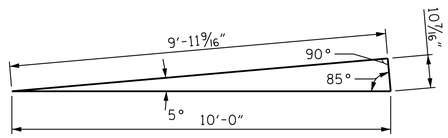
STAGE II

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C15-04
1			3			TOTAL SHEETS
2			4			07



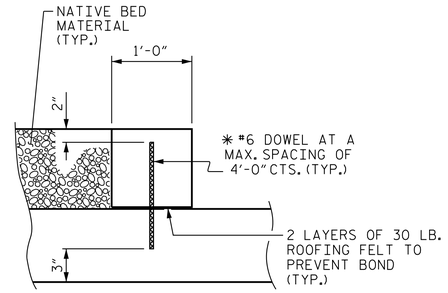
RIGHT ANGLE SECTION OF BARREL

THERE ARE 58 "C" BARS IN SECTION OF BARREL.



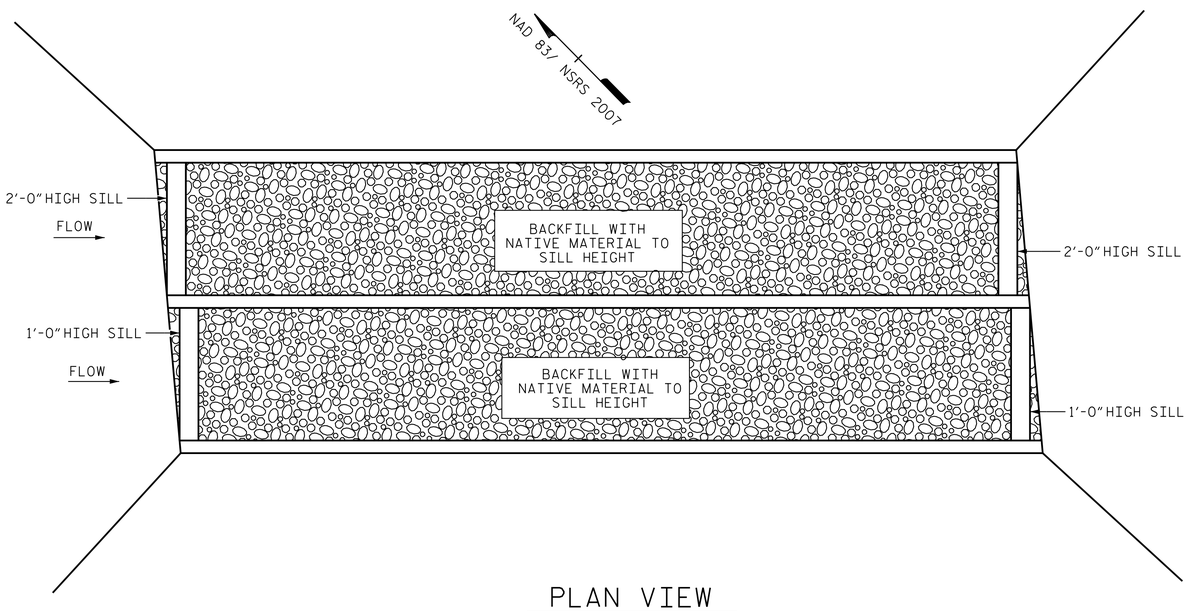
SKEW TRIANGLE

(HEADWALL AND -L-)



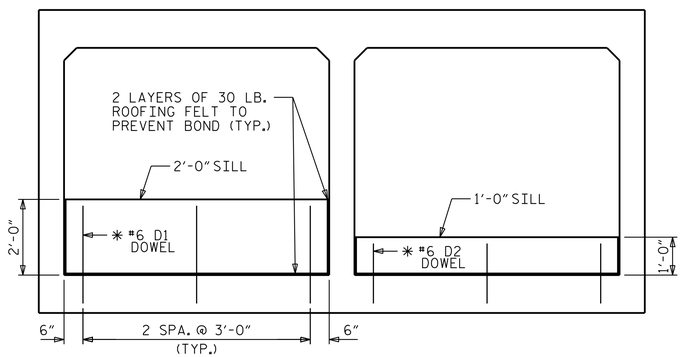
SECTION THROUGH SILL/BAFFLE

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



PLAN VIEW

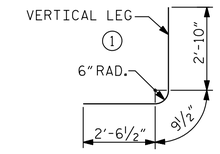
SEE NOTES SHEET 1 OF 7 FOR BACKFILL INSTRUCTIONS.



ELEVATION

(LOOKING DOWNSTREAM)

BAR TYPE



BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL STAGE I

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	280	#7	1	6'-2"	3529
A2	280	#7	1	6'-2"	3529
A100	137	#5	STR	15'-8"	2239
A101	2	#5	STR	11'-4"	24
A102	2	#5	STR	5'-8"	12
A200	137	#5	STR	15'-8"	2239
A201	2	#5	STR	11'-4"	24
A202	2	#5	STR	5'-8"	12
A300	137	#7	STR	15'-8"	4387
A301	2	#7	STR	11'-4"	46
A302	2	#7	STR	5'-8"	23
A400	137	#7	STR	15'-8"	4387
A401	2	#7	STR	11'-4"	46
A402	2	#7	STR	5'-8"	23
B1	280	#4	STR	7'-7"	1418
B2	280	#4	STR	5'-4"	998
B3	278	#4	STR	7'-7"	1408

STAGE I - CONT'D

C1	116	#4	STR	36'-6"	2828
D1	3	#6	STR	2'-7"	12
D2	3	#6	STR	1'-7"	7
G1	4	#4	STR	15'-8"	42
S1	6	#8	STR	15'-8"	251
S2	12	#6	STR	15'-8"	282
REINFORCING STEEL					27,766 LBS.

BILL OF MATERIAL STAGE II

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	268	#7	1	6'-2"	3378
A2	268	#7	1	6'-2"	3378
A100	131	#5	STR	15'-8"	2141
A101	2	#5	STR	11'-4"	24
A102	2	#5	STR	5'-8"	12
A200	131	#5	STR	15'-8"	2141
A201	2	#5	STR	11'-4"	24
A202	2	#5	STR	5'-8"	12
A300	131	#7	STR	15'-8"	4195
A301	2	#7	STR	11'-4"	46
A302	2	#7	STR	5'-8"	23
A400	131	#7	STR	15'-8"	4195
A401	2	#7	STR	11'-4"	46
A402	2	#7	STR	5'-8"	23
B1	268	#4	STR	7'-7"	1358
B2	268	#4	STR	5'-4"	955
B3	268	#4	STR	7'-7"	1358
C2	116	#4	STR	34'-6"	2673
D1	3	#6	STR	2'-7"	12
D2	3	#6	STR	1'-7"	7
G1	4	#4	STR	15'-8"	42
S1	6	#8	STR	15'-8"	251
S2	12	#6	STR	15'-8"	282
REINFORCING STEEL					26,576 LBS.

SPLICE CHART

BAR	SIZE	SPLICE LENGTH
C1	#4	2'-5"

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 320+01.00 -L-

SHEET 5 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

DOUBLE 7 FT. X 6 FT. CONCRETE BOX CULVERT

STAGES I & II

Stantec
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www.stantec.com
License No. F-0672

DRAWN BY : J. B. GEILE DATE : 08/09/21
CHECKED BY : T. N. ENNIS DATE : 08/09/21

DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS
DocuSigned by: Trevor Ennis
10/25/2021

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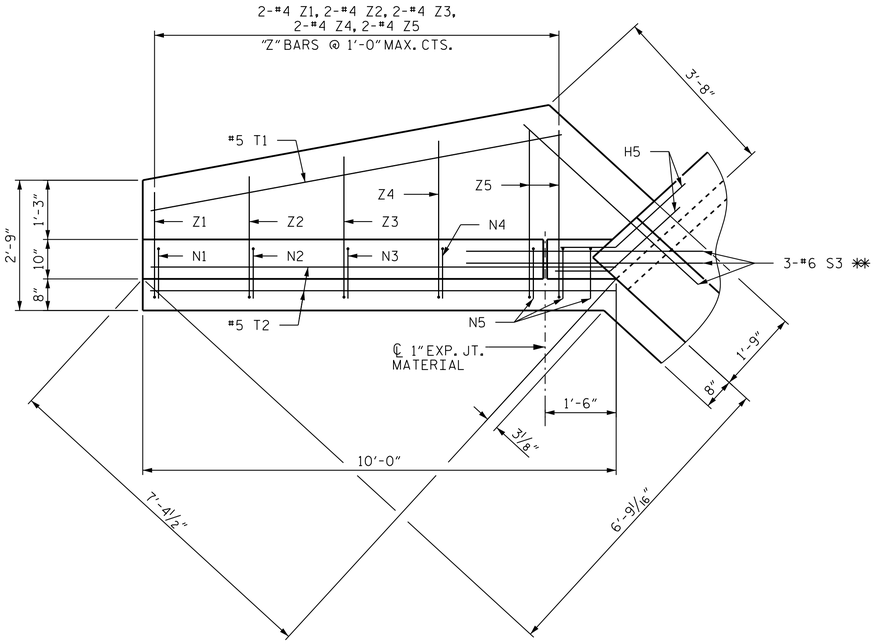
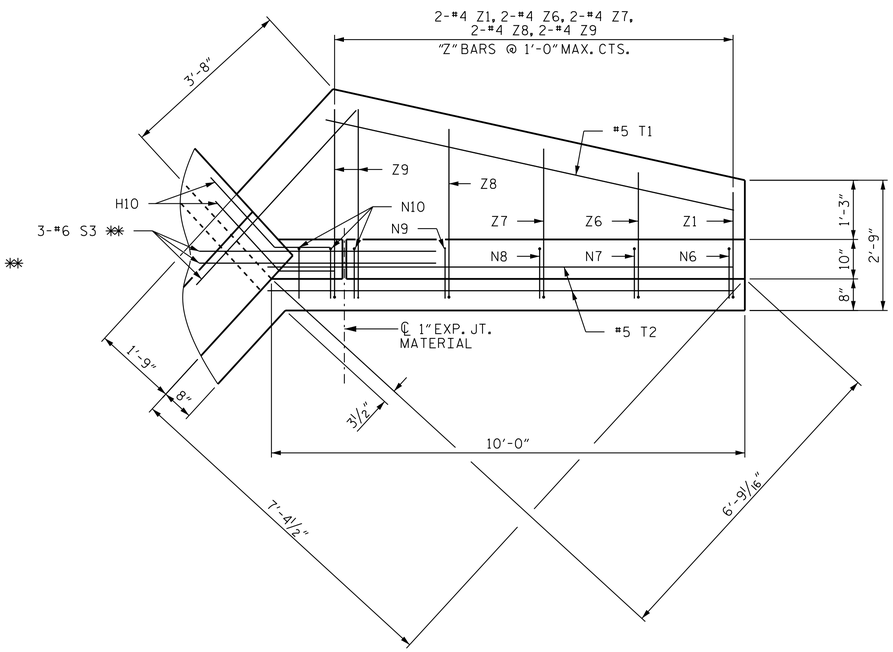
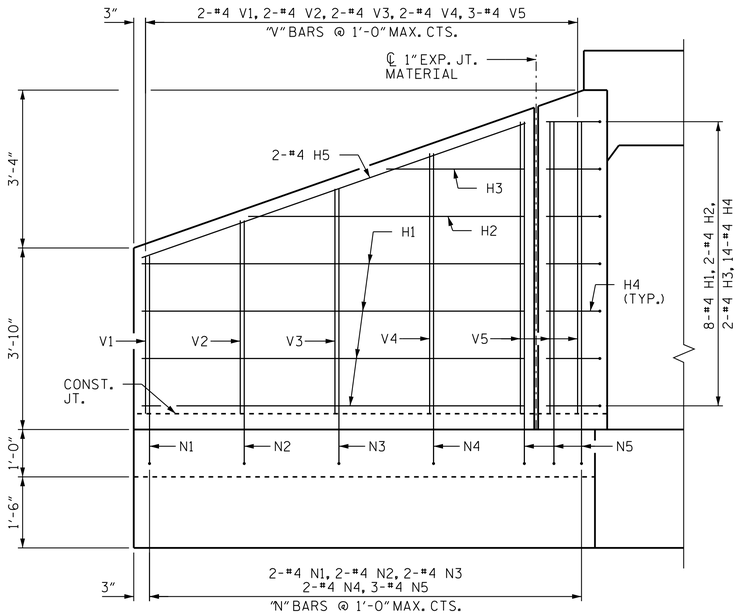


PLAN W1

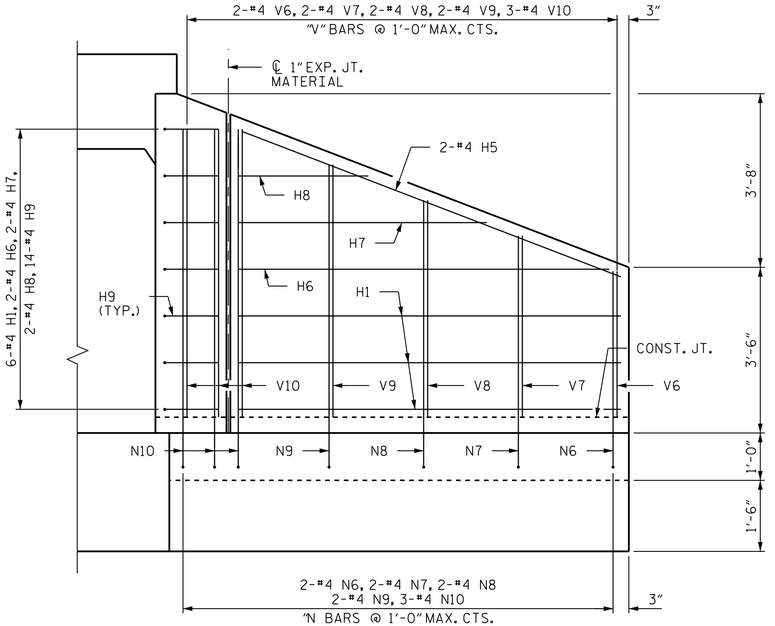


PLAN W2

** S3 BARS AT BOTTOM OF FLOOR SLAB & FOOTING



ELEVATION W1



ELEVATION W2

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PROJECT NO. R-3300B
PENDER COUNTY
STATION: 320+01.00 -L-

SHEET 6 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR
CONCRETE BOX CULVERT
H= 7'-0" SLOPE= 2:1

95°00'00" SKEW

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2			4			07

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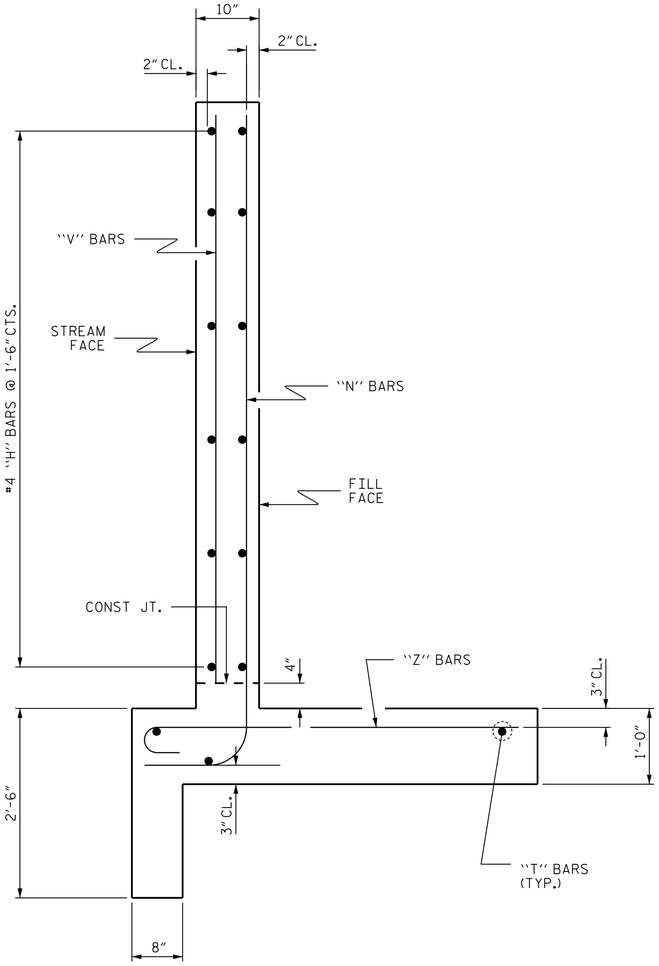
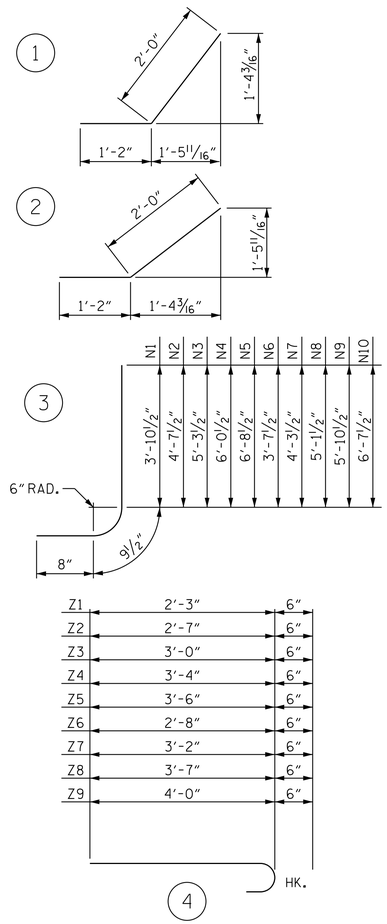


TYPICAL WING SECTION

BAR TYPES - STAGE I



ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL - STAGE I

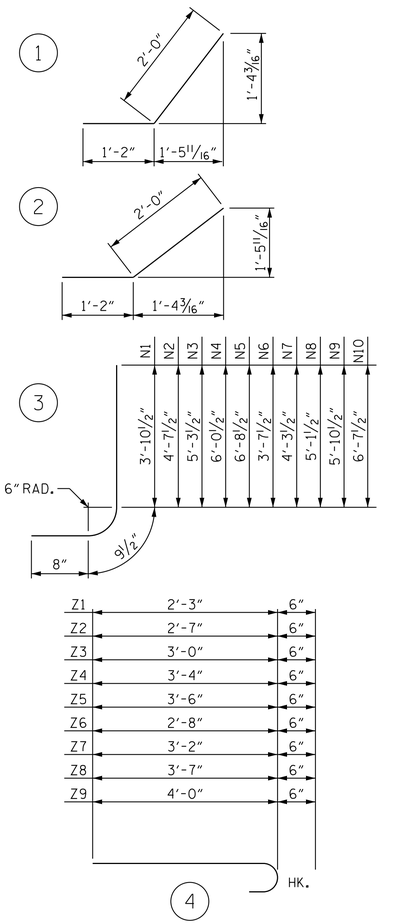
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	14	#4	STR	8'-1"	76
H2	2	#4	STR	5'-10"	8
H3	2	#4	STR	2'-11"	4
H4	14	#4	1	3'-2"	30
H5	4	#4	STR	8'-7"	23
H6	2	#4	STR	7'-10"	10
H7	2	#4	STR	5'-3"	7
H8	2	#4	STR	2'-9"	4
H9	14	#4	2	3'-2"	30
N1	2	#4	3	5'-4"	7
N2	2	#4	3	6'-1"	8
N3	2	#4	3	6'-9"	9
N4	2	#4	3	7'-6"	10
N5	3	#4	3	8'-2"	16
N6	2	#4	3	5'-2"	7
N7	2	#4	3	5'-10"	8
N8	2	#4	3	6'-7"	9
N9	2	#4	3	7'-4"	10
N10	3	#4	3	8'-1"	16
S3	6	#6	STR	5'-0"	45
T1	2	#5	STR	8'-10"	18
T2	4	#5	STR	9'-10"	41
V1	2	#4	STR	3'-4"	4
V2	2	#4	STR	4'-1"	5
V3	2	#4	STR	4'-9"	6
V4	2	#4	STR	5'-6"	7
V5	3	#4	STR	6'-2"	12
V6	2	#4	STR	3'-1"	4
V7	2	#4	STR	3'-10"	5
V8	2	#4	STR	4'-7"	6
V9	2	#4	STR	5'-4"	7
V10	3	#4	STR	6'-1"	12
Z1	4	#4	4	2'-9"	7
Z2	2	#4	4	3'-1"	4
Z3	2	#4	4	3'-6"	5
Z4	2	#4	4	3'-10"	5
Z5	3	#4	4	4'-0"	8
Z6	2	#4	4	3'-2"	4
Z7	2	#4	4	3'-8"	5
Z8	2	#4	4	4'-1"	5
Z9	3	#4	4	4'-6"	9

REINFORCING STEEL FOR 2 WINGS - STAGE I 432 LBS

CLASS A CONCRETE

2 WINGS	6.9	CY
1 HEADWALL	0.7	CY
2 EDGE BEAMS	1.2	CY
1 END CURTAIN WALL	0.9	CY
2 SILLS	0.8	CY
TOTAL	10.5	CY

BAR TYPES - STAGE II



ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL-STAGE II

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	14	#4	STR	8'-1"	76
H2	2	#4	STR	5'-10"	8
H3	2	#4	STR	2'-11"	4
H4	14	#4	1	3'-2"	30
H5	4	#4	STR	8'-7"	23
H6	2	#4	STR	7'-10"	10
H7	2	#4	STR	5'-3"	7
H8	2	#4	STR	2'-9"	4
H9	14	#4	2	3'-2"	30
N1	2	#4	3	5'-4"	7
N2	2	#4	3	6'-1"	8
N3	2	#4	3	6'-9"	9
N4	2	#4	3	7'-6"	10
N5	3	#4	3	8'-2"	16
N6	2	#4	3	5'-2"	7
N7	2	#4	3	5'-10"	8
N8	2	#4	3	6'-7"	9
N9	2	#4	3	7'-4"	10
N10	3	#4	3	8'-1"	16
S3	6	#6	STR	5'-0"	45
T1	2	#5	STR	8'-10"	18
T2	4	#5	STR	9'-10"	41
V1	2	#4	STR	3'-4"	4
V2	2	#4	STR	4'-1"	5
V3	2	#4	STR	4'-9"	6
V4	2	#4	STR	5'-6"	7
V5	3	#4	STR	6'-2"	12
V6	2	#4	STR	3'-1"	4
V7	2	#4	STR	3'-10"	5
V8	2	#4	STR	4'-7"	6
V9	2	#4	STR	5'-4"	7
V10	3	#4	STR	6'-1"	12
Z1	4	#4	4	2'-9"	7
Z2	2	#4	4	3'-1"	4
Z3	2	#4	4	3'-6"	5
Z4	2	#4	4	3'-10"	5
Z5	3	#4	4	4'-0"	8
Z6	2	#4	4	3'-2"	4
Z7	2	#4	4	3'-8"	5
Z8	2	#4	4	4'-1"	5
Z9	3	#4	4	4'-6"	9

REINFORCING STEEL FOR 2 WINGS - STAGE II 432 LBS

CLASS A CONCRETE

2 WINGS	6.9	CY
1 HEADWALL	0.7	CY
2 EDGE BEAMS	1.2	CY
1 END CURTAIN WALL	0.9	CY
2 SILLS	0.8	CY
TOTAL	10.5	CY

PROJECT NO. R-3300B

PENDER COUNTY

STATION: 320+01.00 -L-

SHEET 7 OF 7

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS DETAILS
CONCRETE BOX CULVERT
H= 7'-0" SLOPE= 2:1

95°00'00" SKEW

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DRAWN BY : J. B. GEILE DATE : 08/09/21
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DESIGN ENGINEER OF RECORD: T. N. ENNIS DATE : 10/25/21

NORTH CAROLINA PROFESSIONAL SEAL 46484 ENGINEER TREVOR ENNIS
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10/25/2021
Jgeile

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.

ENGLISH

JANUARY, 1990

REV. 6-16-95 EEM (-) RGW REV. 5-7-03 RWW (-) JTE REV. 10-1-11 MAA (-) GM
REV. 8-16-99 RWW (-) LES REV. 5-1-06 TLA (-) GM REV. 12-17 MAA (-) THC
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