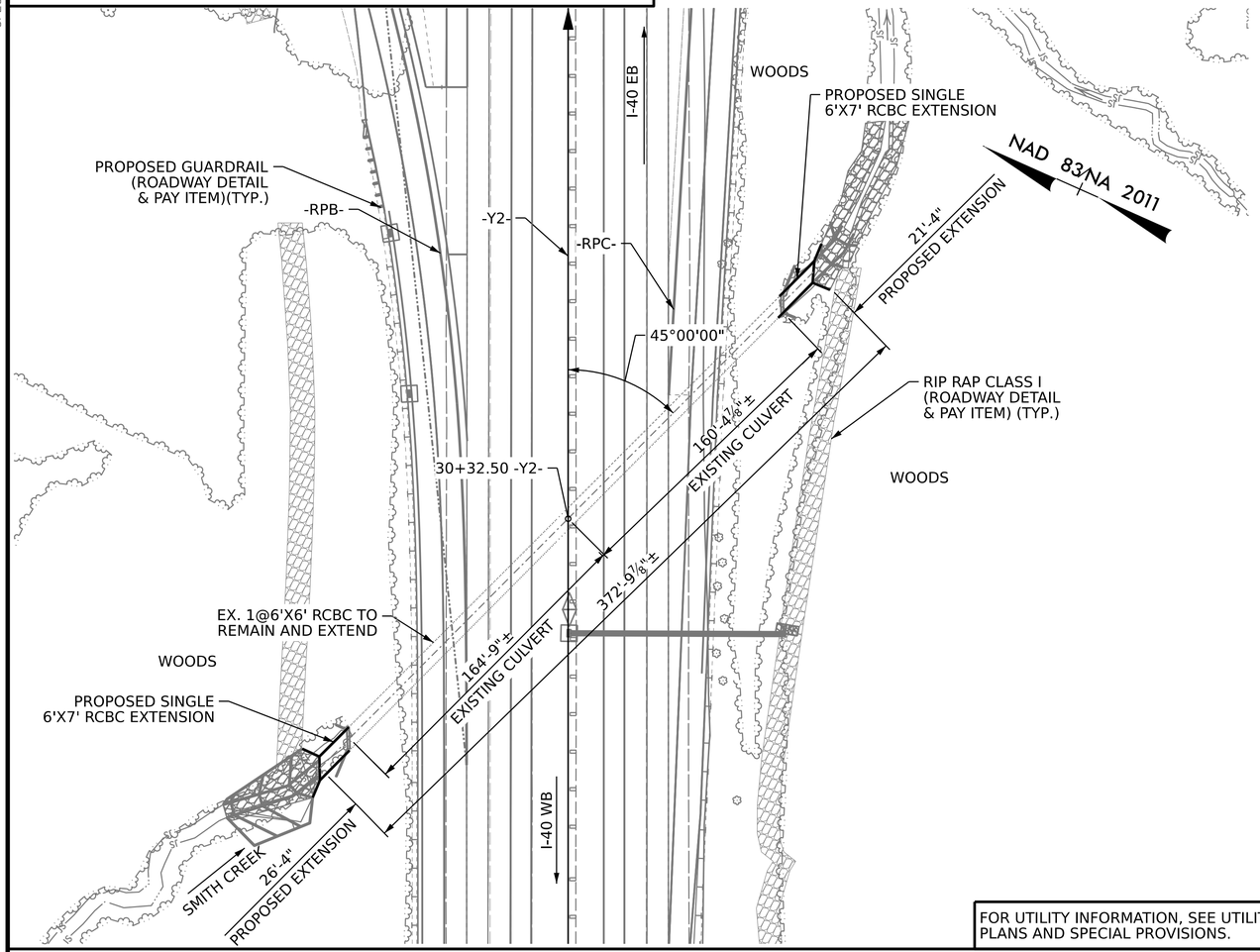
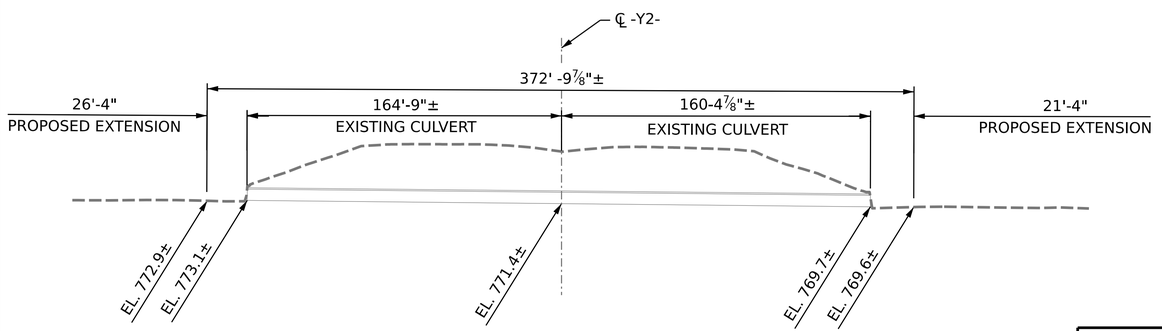
8/26/21

BENCHMARK #1: BENCH TIE IN 18" OAK; 317' RT OF STA. 5+13.00 -Y2-, ELEV. 861.9'



FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.

- LOCATION SKETCH -



PROFILE ALONG ℄ OF CULVERT

NOTES

1. ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
2. DESIGN FILL IS 24 FT.
3. FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTE SHEET.
4. 3"∅ WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
5. 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.
6. 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.
7. DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
8. AT THE CONTRACTOR'S OPTION, THEY 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.
9. NO PRECAST BOX CULVERT OPTION WILL BE ALLOWED.
10. FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
11. FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
12. FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
13. FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.
14. FOR CULVERT DIVERSION DETAILS AND PAY ITEMS, SEE EROSION CONTROL PLANS.
15. DOWELS SHALL BE USED TO CONNECT THE CULVERT EXTENSION TO THE EXISTING CULVERT AS SHOWN. FOR NOTE REGARDING SETTING OF DOWELS, SEE STANDARD NOTES SHEET.
16. IF APPROVED BY THE ENGINEER, THE CONTRACTOR MAY USE THE EXISTING WINGS AS TEMPORARY SHORING FOR THE CONSTRUCTION OF THE CULVERT EXTENSION. IN THIS CASE, THE BOTTOM SLAB OF THE EXTENSION SHALL BE POURED AT LEAST 72 HOURS PRIOR TO CUTTING THE WINGS. THE WINGS MAY BE CUT EARLIER PROVIDED THE SLAB CONCRETE STRENGTH HAS REACHED A MINIMUM COMPRESSIVE STRENGTH OF 1500 PSI.
17. 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.

HYDRAULIC DATA

DESIGN DISCHARGE	=	410 C.F.S.
FREQUENCY OF DESIGN FLOOD	=	50 YRS.
DESIGN HIGH WATER ELEVATION	=	781.3 FT.
DRAINAGE AREA	=	0.46 SQ. MI.
BASIC DISCHARGE (Q100)	=	450 C.F.S.
BASIC HIGH WATER ELEVATION	=	781.9 FT.

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	=	830 C.F.S.
FREQUENCY OF OVERRTOPPING FLOOD	=	500+ YRS.
OVERTOPPING FLOOD ELEVATION	=	791.4' *

*OT LOCATION AT STA. 17+44.76 -RPB- (SAG)

WS EL. Taken @ River Station N/A

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE		
BARREL @ 0.78 CY/FT	37.2	C.Y.
WING ETC.	25.2	C.Y.
SILLS	0.5	C.Y.
TOTAL	62.9	C.Y.
REINFORCING STEEL		
BARREL	6,709	LBS.
WING ETC.	1,501	LBS.
TOTAL	8,210	LBS.
FOUNDATION COND. MAT'L.	39	TONS
CULVERT EXCAVATION	LUMP SUM	

ROADWAY DATA

GRADE POINT EL. @ STATION 30+32.50 -Y2- = 800.41 FT.

BED EL. @ STATION 30+32.50 -Y2- = 770.4 FT.

ROADWAY SLOPES = 2:1

PROJECT NO. U-6187

DAVIE COUNTY

STATION: 30+32.50 -Y2-

SHEET 1 OF 5

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 6 FT. X 7FT. CONCRETE BOX CULVERT EXTENSION 45° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 040384 ENGINEER JEFFREY C. WILSON
Signed by: Jeffrey C. Wilson 5CA734DE9D5848B...
7/14/2025

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-1
1			3			TOTAL SHEETS
2			4			5

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VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606

DRAWN BY : C.P. MALAGON DATE : 01/2025
CHECKED BY : E.C. PHELPS DATE : 06/2025
DESIGN ENGINEER OF RECORD: J.C. WILSON DATE : 07/2025

7/14/2025
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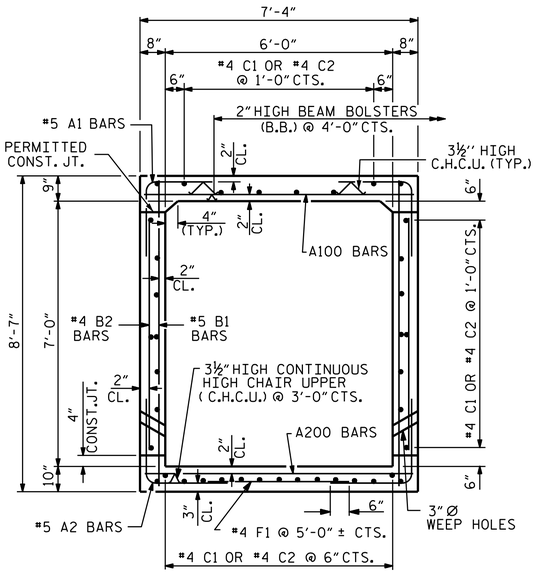
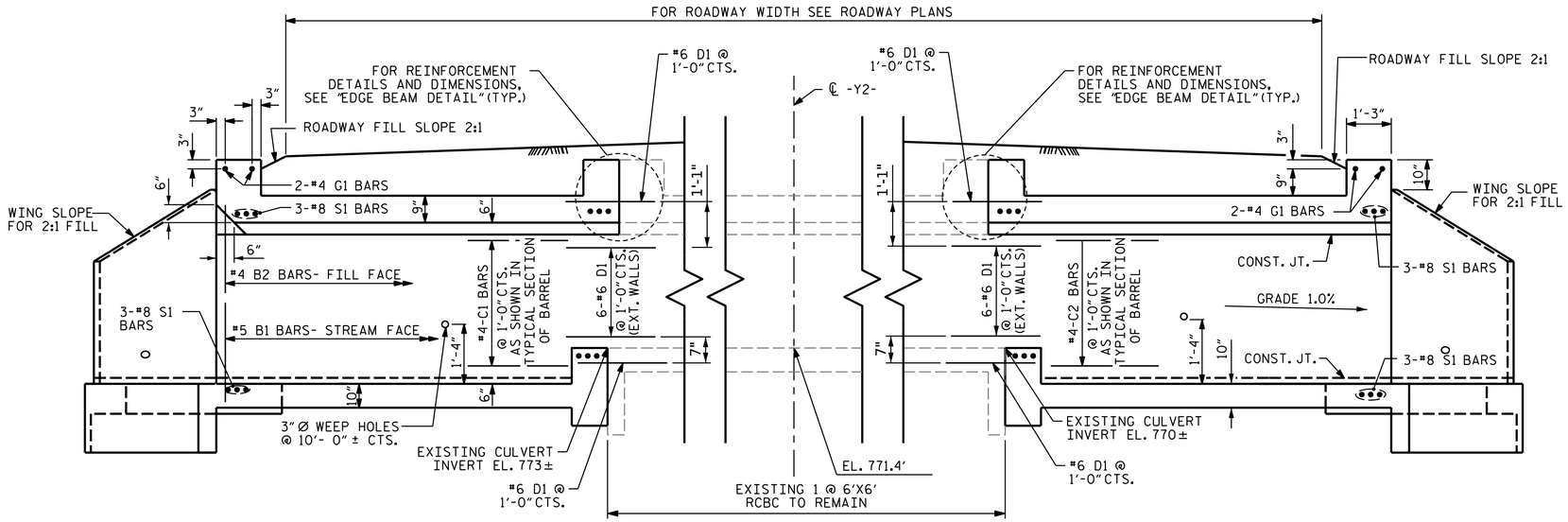
8/26/21

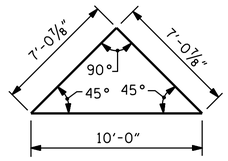


RIGHT ANGLE SECTION OF BARREL

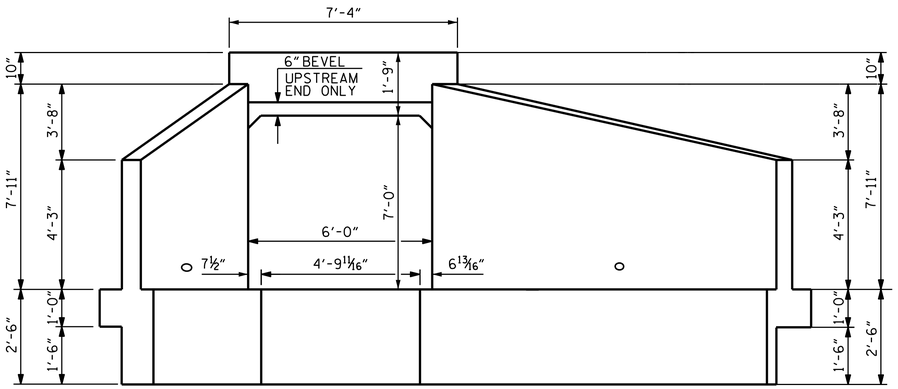
THERE ARE 40 "C" BARS IN SECTION OF BARREL



CULVERT SECTION NORMAL TO ROADWAY

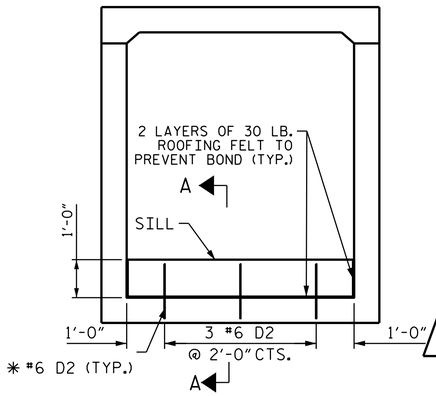


SKEW TRIANGLE



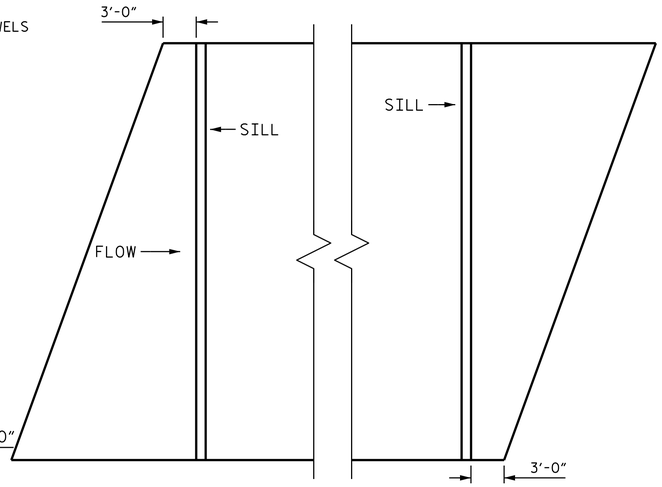
END ELEVATION NORMAL TO SKEW

SECTION A-A

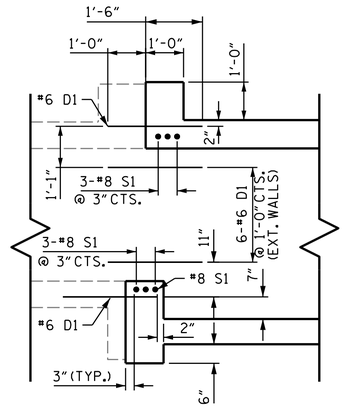


SILL DETAIL

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



SILL LAYOUT



EDGE BEAM DETAIL

PROJECT NO. U-6187

DAVIE COUNTY

STATION: 30+32.50 -Y2-

SHEET 2 OF 5

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 6 FT. X 7FT. CONCRETE BOX CULVERT EXTENSION 45° SKEW

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NORTH CAROLINA PROFESSIONAL SEAL 040384 ENGINEER JEFFREY C. WILSON

Signed by: Jeffrey C. Wilson 7/14/2025
5CA734DE6905848B...

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DESIGN ENGINEER OF RECORD: J.C. WILSON DATE : 07/2025

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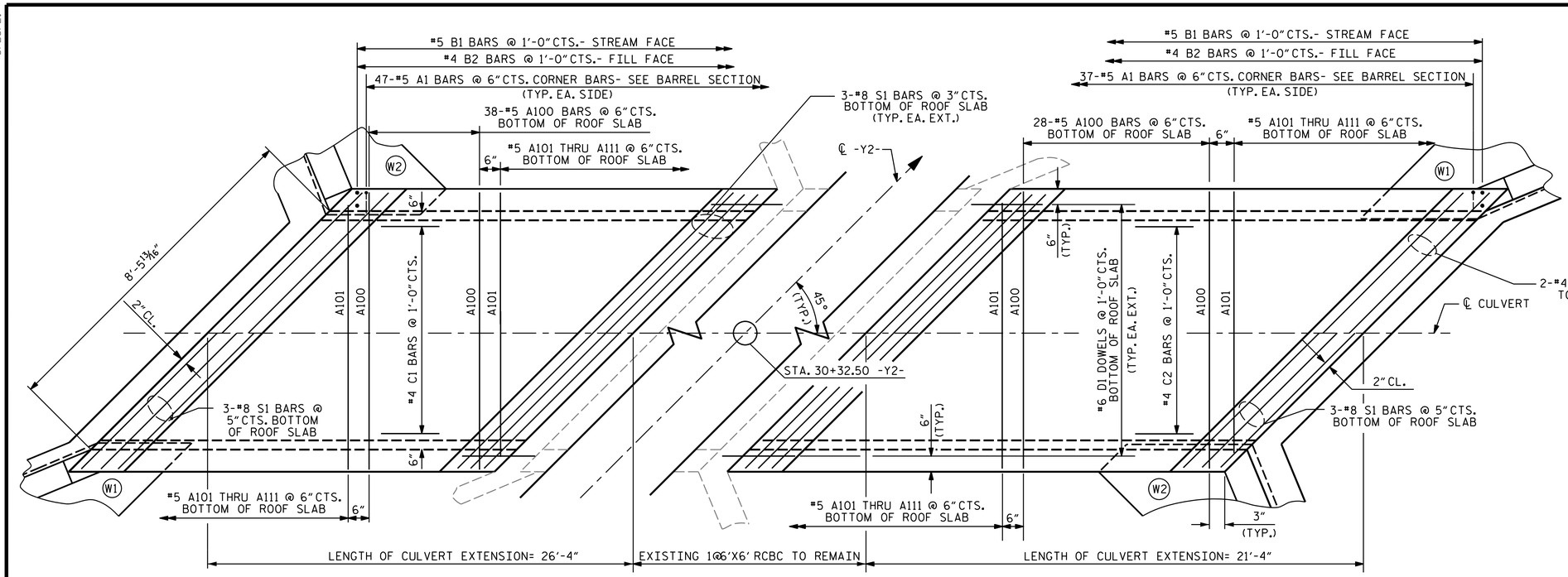
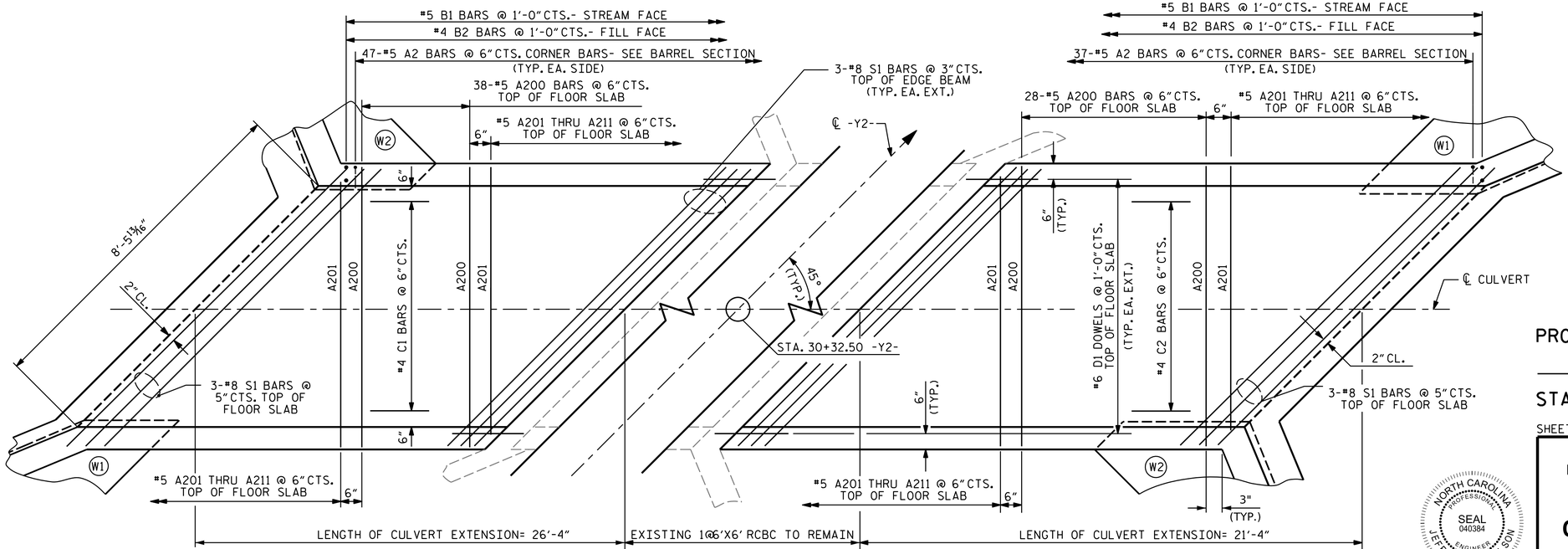
8/26/21



PART PLAN - ROOF SLAB (LEFT EXT.)

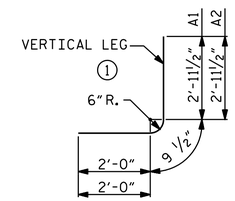
PART PLAN - ROOF SLAB (RIGHT EXT.)



PART PLAN - FLOOR SLAB (LEFT EXT.)

PART PLAN - FLOOR SLAB (RIGHT EXT.)

BAR TYPE



DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	168	#5	1	5'-9"	1008
A2	168	#5	1	5'-9"	1008
A100	66	#5	STR.	7'-0"	482
A101	4	#5	STR.	6'-8"	28
A102	4	#5	STR.	6'-2"	26
A103	4	#5	STR.	5'-8"	24
A104	4	#5	STR.	5'-2"	22
A105	4	#5	STR.	4'-8"	20
A106	4	#5	STR.	4'-2"	18
A107	4	#5	STR.	3'-8"	16
A108	4	#5	STR.	3'-2"	14
A109	4	#5	STR.	2'-8"	11
A110	4	#5	STR.	2'-2"	9
A111	4	#5	STR.	1'-8"	7
A200	66	#5	STR.	7'-0"	482
A201	4	#5	STR.	6'-8"	28
A202	4	#5	STR.	6'-2"	26
A203	4	#5	STR.	5'-8"	24
A204	4	#5	STR.	5'-2"	22
A205	4	#5	STR.	4'-8"	20
A206	4	#5	STR.	4'-2"	18
A207	4	#5	STR.	3'-8"	16
A208	4	#5	STR.	3'-2"	14
A209	4	#5	STR.	2'-8"	11
A210	4	#5	STR.	2'-2"	9
A211	4	#5	STR.	1'-8"	7
B1	94	#5	STR.	8'-1"	801
B2	94	#4	STR.	6'-0"	377
C1	40	#4	STR.	26'-0"	695
C2	40	#4	STR.	21'-0"	561
D1	56	#6	STR.	2'-6"	210
D2	6	#6	STR.	1'-5"	13
F1	7	#4	STR.	3'-0"	14
G1	4	#4	STR.	10'-0"	27
S1	24	#8	STR.	10'-0"	641
REINFORCING STEEL					6,709 LBS.

PROJECT NO. U-6187

DAVIE COUNTY

STATION: 30+32.50 -Y2-

SHEET 3 OF 5

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 6 FT. X 7FT. CONCRETE BOX CULVERT EXTENSION 45° SKEW

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TOTAL SHEETS 5

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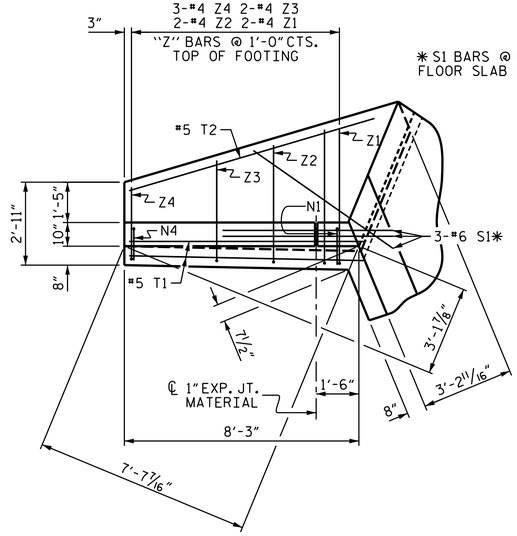
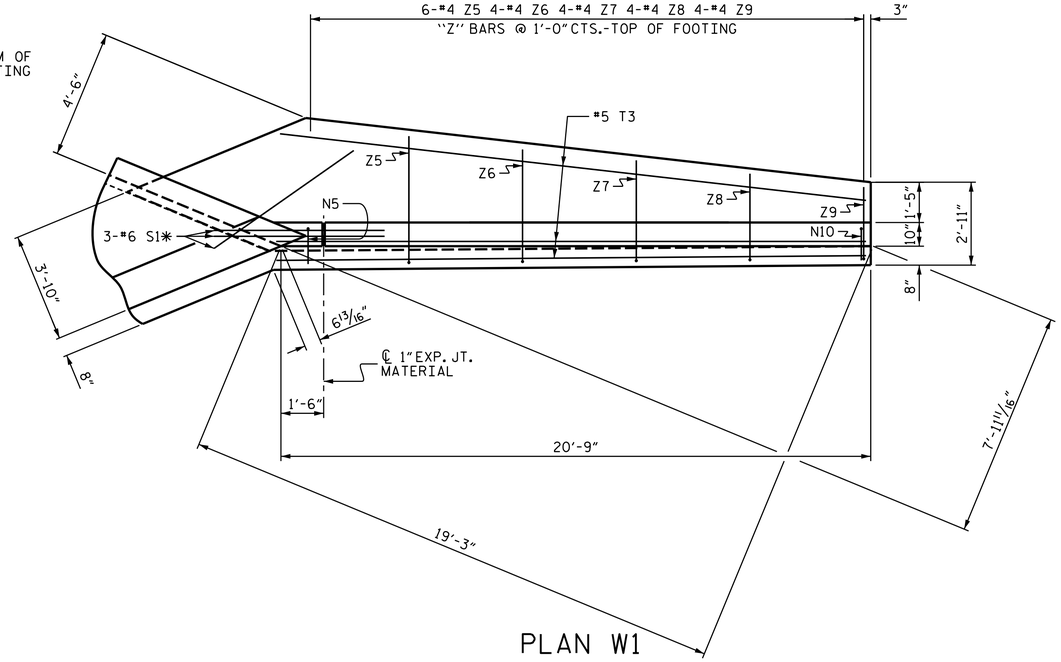
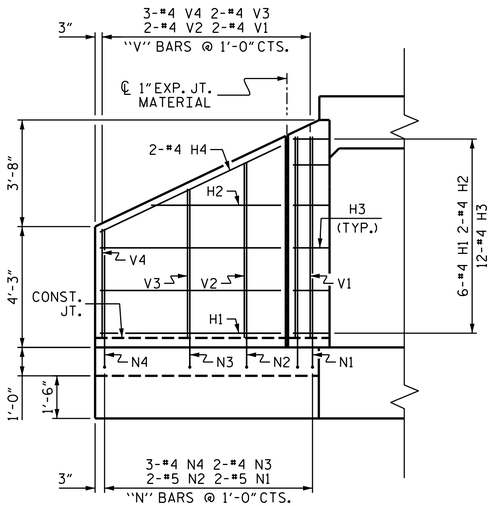


PLAN W2

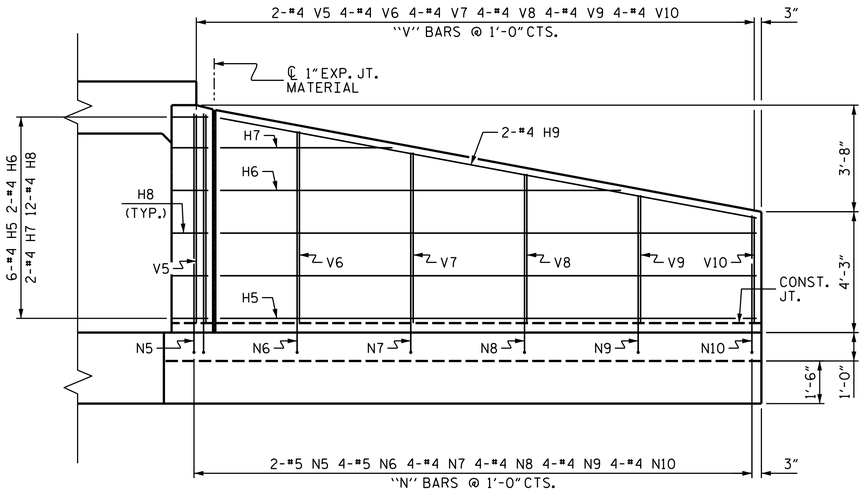
* S1 BARS @ BOTTOM OF FLOOR SLAB & FOOTING



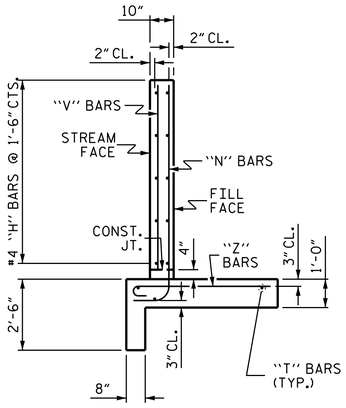
PLAN W1



ELEVATION W2

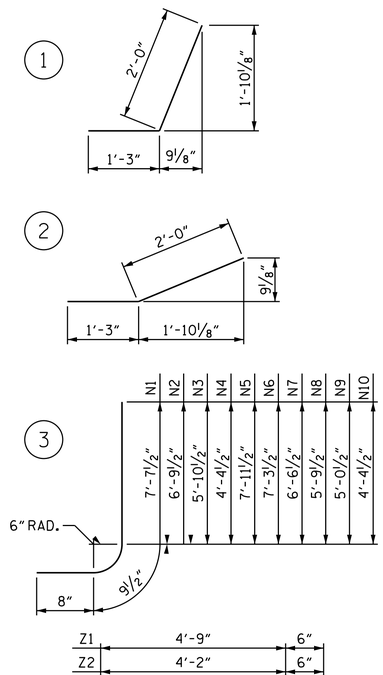


ELEVATION W1



TYPICAL WING SECTION

BAR TYPES



Z1	4'-9"	6"
Z2	4'-2"	6"
Z3	3'-7"	6"
Z4	2'-7"	6"
Z5	4'-6"	6"
Z6	4'-0"	6"
Z7	3'-7"	6"
Z8	3'-1"	6"
Z9	2'-7"	6"

HK.

4

ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	6'-4"	51
H2	4	#4	STR	4'-6"	12
H3	24	#4	1	3'-3"	52
H4	4	#4	STR	7'-0"	19
H5	12	#4	STR	18'-10"	151
H6	4	#4	STR	14'-1"	38
H7	4	#4	STR	6'-0"	16
H8	24	#4	2	3'-3"	52
H9	4	#4	STR	19'-2"	51
N1	4	#5	3	9'-1"	38
N2	4	#5	3	8'-3"	34
N3	4	#4	3	7'-4"	20
N4	6	#4	3	5'-7"	22
N5	4	#5	3	9'-5"	39
N6	8	#5	3	8'-9"	73
N7	8	#4	3	8'-0"	43
N8	8	#4	3	7'-3"	39
N9	8	#4	3	6'-6"	35
N10	8	#4	3	5'-10"	31
S1	12	#6	STR	6'-0"	108
T1	4	#5	STR	8'-3"	34
T2	2	#5	STR	9'-0"	19
T3	6	#5	STR	20'-9"	130
V1	4	#4	STR	7'-1"	19
V2	4	#4	STR	6'-2"	16
V3	4	#4	STR	5'-3"	14
V4	6	#4	STR	3'-9"	15
V5	4	#4	STR	7'-4"	20
V6	8	#4	STR	6'-9"	36
V7	8	#4	STR	6'-0"	32
V8	8	#4	STR	5'-3"	28
V9	8	#4	STR	4'-6"	24
V10	8	#4	STR	3'-9"	20
Z1	4	#4	4	5'-3"	14
Z2	4	#4	4	4'-8"	12
Z3	4	#4	4	4'-1"	11
Z4	6	#4	4	3'-1"	12
Z5	12	#4	4	5'-0"	40
Z6	8	#4	4	4'-6"	24
Z7	8	#4	4	4'-1"	22
Z8	8	#4	4	3'-7"	19
Z9	8	#4	4	3'-1"	16

REINFORCING STEEL FOR 4 WINGS	1501 LBS
CLASS A CONCRETE	
4 WINGS	23.6 CY
2 HEADWALLS	1.0 CY
2 END CURTAIN WALLS	0.6 CY
TOTAL	25.2 CY

VHB Engineering NC, P.C. (C-3705)
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Signed by: Jeffrey C. Wilson 7/14/2025
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PROJECT NO. U-6187
DAVIE COUNTY
STATION: 30+32.50 -Y2-

SHEET 4 OF 5

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD WINGS FOR CONCRETE BOX CULVERT

H = 7'-0" SLOPE = 2:1
45° SKEW

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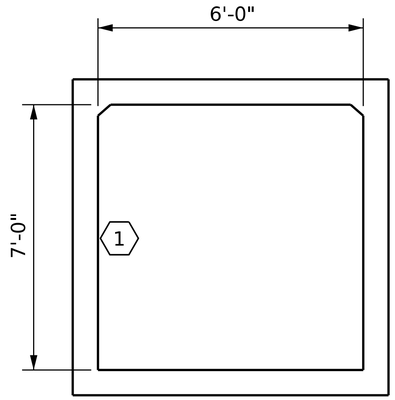
2			4			5

STD. NO. CW4507

8/26/21

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

	CONTROLLING LOAD RATING	MINIMUM RATING FACTORS (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	1.10	1.10	1	EXT. WALL	0.5	1.11	1	BOTTOM SLAB	0.25



LRFR SUMMARY

(LOOKING DOWNSTREAM)

PERMANENT LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

NOTES:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATES.

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.

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PROJECT NO. U-6187
DAVIE COUNTY
STATION: 30+32.50 -Y2-

SHEET 5 OF 5

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

(DEEP FILLS)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-5
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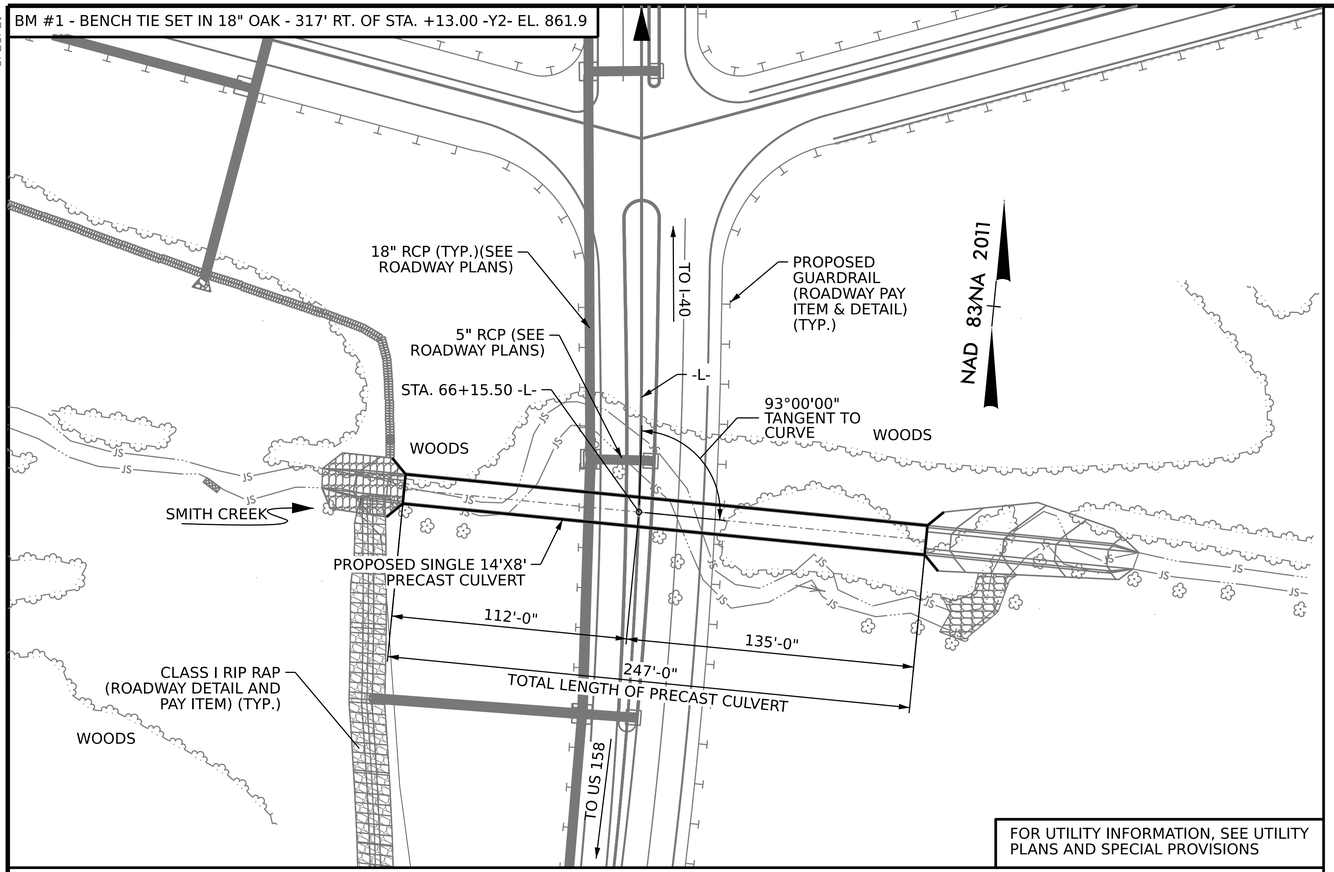
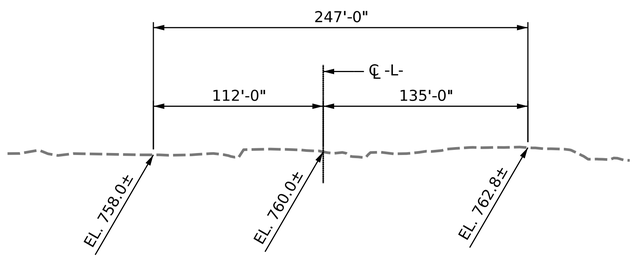
2			4			5

STD. NO. LRFR7

8/26/21



-LOCATION SKETCH-



PROFILE ALONG ℄ OF CULVERT

HYDRAULIC DATA

DESIGN DISCHARGE	=	700 C.F.S.
FREQUENCY OF DESIGN FLOOD	=	50 YRS.
DESIGN HIGH WATER ELEVATION	=	764.6 FT.
DRAINAGE AREA	=	0.9 SQ. MI.
BASIC DISCHARGE (Q100)	=	800 C.F.S.
BASIC HIGH WATER ELEVATION	=	765.2 FT.

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	=	3110 C.F.S.
FREQUENCY OF OVERRTOPPING FLOOD	=	500+ YRS.
OVERTOPPING FLOOD ELEVATION	=	791.9' *

*OT LOCATION AT STA. 17+09.94 -RPC- (SAG)
WS EL. Taken @ River Station N/A

ROADWAY DATA

GRADE POINT EL. @ STATION 66+15.50 -L- = 800.41 FT.

BED EL. @ STATION 30+32.50 -Y2- = 770.4 FT.

ROADWAY SLOPES = 2:1

NOTES

1. ASSUMED LIVE LOAD ---------- HL-93 OR ALTERNATE LOADING.
2. FOR OTHER STANDARD DATA AND NOTES SEE SHEET S-N.
3. 3'' ∅ WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
4. 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.
5. FOR CULVERT EXCAVATION, SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.
6. THE PRECAST BOX CULVERT SHALL BE PLACED ON A LOAD TRANSFER MAT. LOAD TRANSFER MAT WILL CONSIST OF CLASS IV SELECT MATERIAL REINFORCED WITH GEOTEXTILE AND WILL BE INSTALLED TO A DEPTH OF 5 FEET BELOW THE CULVERT AND EXTEND 5 FEET OUTSIDE THE CULVERT. SEE LOAD TRANSFER MAT DETAIL AND SPECIAL PROVISION.
7. THE PRECAST CONCRETE BOX CULVERT WILL BE CONSTRUCTED WITH CAMBER. SEE CAMBER DETAIL.
8. INSTALL REFLECTIVE SURVEY TARGETS TO MONITOR SETTLEMENT ON THE INSIDE OF CULVERT. WE RECOMMEND 7 TARGETS BE INSTALLED AT THE LOCATIONS INDICATED ON THE CAMBER PROFILE DETAIL. SURVEY CULVERT PRIOR TO PLACING FILL AND EVERY WEEK AFTER AND SUBMIT SURVEY RESULTS TO OPERATIONS ENGINEER. OPERATIONS ENGINEER WILL PROVIDE NOTIFICATION WHEN SURVEYING CAN BE COMPLETED AND WE ESTIMATE THIS WILL BE APPROXIMATELY 4 MONTHS AFTER FILL REACHES GRADE ELEVATION.
9. DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
10. THE CONCRETE FOR THE PRECAST UNITS SHALL ATTAIN A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 5000 P.S.I. . THE CONCRETE FOR THE HEADWALLS, WINGS AND END CURTAIN WALLS SHALL BE CLASS ``A'' CONCRETE AS PER THE STANDARD SPECIFICATIONS.
11. CAST-IN-PLACE CONCRETE SHALL BE POURED IN THE FOLLOWING ORDER:
    1. WING FOOTINGS, AND CURTAIN WALL.
    2. HEADWALLS, WING WALLS, SILLS.
12. ALL PRECAST UNITS SHALL BE PLACED PRIOR TO POURING THE WINGS, END CURTAIN WALLS AND HEADWALLS. THE EXTERIOR PRECAST UNITS SHALL BE UNDERMINED TO PROVIDE FOR THE WING FOOTINGS TO BE POURED TO THE DEPTH AND DIMENSIONS AS SHOWN ON THIS PLAN SHEET.
13. THE PRECAST UNITS SHALL BE CAREFULLY POSITIONED ON THE PREPARED LOAD TRANSFER MAT, FEMALE END UPGRADE WITH THE MALE END FULLY INSERTED AND EACH JOINT CHECKED FOR ALIGNMENT PRIOR TO JACKING THE UNIT INTO PLACE. SATISFACTORY FITTING AND PROPER GRADE SHALL BE MAINTAINED AS THE WORK PROCEEDS.
14. WHEN ANY PRECAST UNIT IS DAMAGED DURING HANDLING, THE ENGINEER AT HIS DISCRETION SHALL REJECT THE UNIT AS BEING UNFIT FOR INSTALLATION AND THE CONTRACTOR SHALL REMOVE SUCH REJECTED UNIT FROM THE PROJECT. MINOR DAMAGE TO THE UNIT MAY BE REPAIRED BY THE CONTRACTOR WHEN PERMITTED BY THE ENGINEER.
15. CARE SHALL BE TAKEN DURING BACKFILL AND COMPACTION OPERATION TO MAINTAIN ALIGNMENT AND PREVENT DAMAGE TO THE JOINTS. UNITS WHICH BECOME MISALIGNED, SHOW EXCESSIVE SETTLEMENT, OR HAVE OTHERWISE BEEN DAMAGED BY THE CONTRACTOR'S OPERATION SHALL AT THE DISCRETION OF THE ENGINEER BE REMOVED AND REPLACED BY THE CONTRACTOR AT NO COST TO THE DEPARTMENT OF TRANSPORTATION.
16. CONCRETE CHAMFERS ON EXTERIOR LONGITUDINAL EDGES OF THE PRECAST UNITS MAY BE AS PER THE FABRICATORS RECOMMENDATION, HOWEVER ALL WORKMANSHIP SHALL PROVIDE CONCRETE COVER OVER THE WELDED WIRE FABRIC AS SPECIFIED ON THE PLANS AND THE CONCRETE CHAMFERS CHOSEN SHALL IN NO WAY FUNCTIONALLY LESSEN THE DESIGN SHOWN ON THE PLANS.
17. DESIGN EARTH COVER = 45'-8"
18. FOR PRECAST REINFORCED CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.
19. FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
20. FOR CULVERT LOAD TRANSFER MAT AND CAMBER DETAILS, SEE SHEETS C2-5 & C2-6
21. 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 FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
22. FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
23. FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
24. FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.
25. FOUNDATION CONDITIONING MATERIAL SHALL HAVE A THICKNESS OF AT LEAST 1'-0" BELOW THE BOTTOM OF THE PRECAST UNITS. THE MATERIAL SHALL BE FORMED AND SCREEDED TO THE PROPER ELEVATION AT LEAST 1'-0" BEYOND THE SIDES OF THE PRECAST UNITS.

TOTAL BILL OF MATERIAL

PRECAST REINFORCED CONCRETE BOX CULVERT @ STA. 66+15.50 -L-	LUMP SUM
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL BOX CULVERT	383 TONS

vhb
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940 Main Campus Drive, Suite 500
Raleigh, NC 27606

DRAWN BY : C.P. MALAGON DATE : 05/2025
CHECKED BY : J.C. WILSON DATE : 06/2025
DESIGN ENGINEER OF RECORD: J.C. WILSON DATE : 06/2025

7/14/2025
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chontgman

NORTH CAROLINA PROFESSIONAL SEAL 040384 ENGINEER JEFFREY C. WILSON
Signed by: Jeffrey C. Wilson 7/14/2025
5CA734DE9058488...

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PROJECT NO. U-6187
DAVIE COUNTY
STATION: 66+15.50 -L-

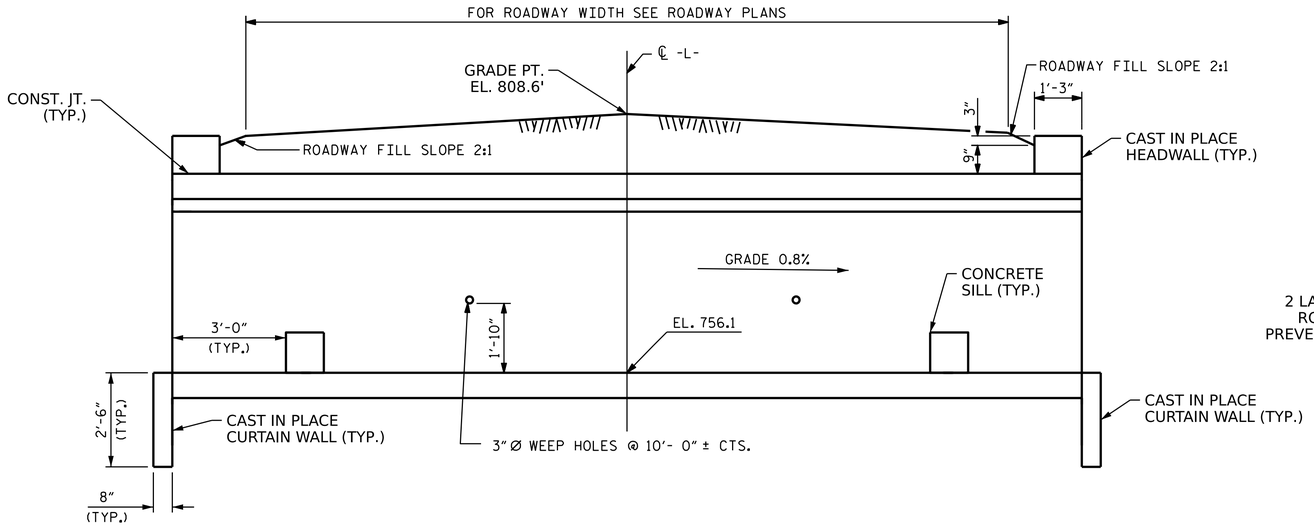
SHEET 1 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

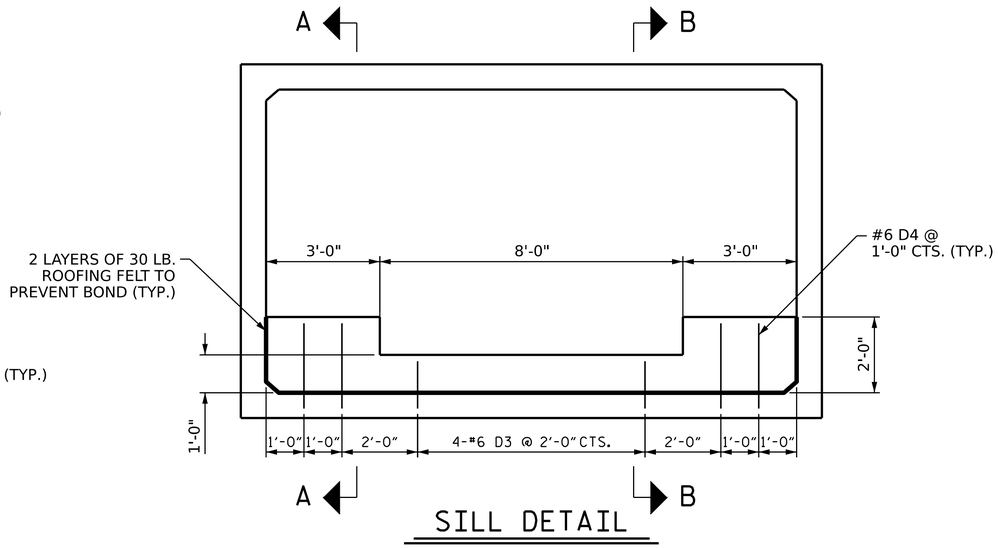
STANDARD PRECAST REINFORCED CONCRETE BOX CULVERT SINGLE 14 FT. X 8FT. 93° SKEW

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

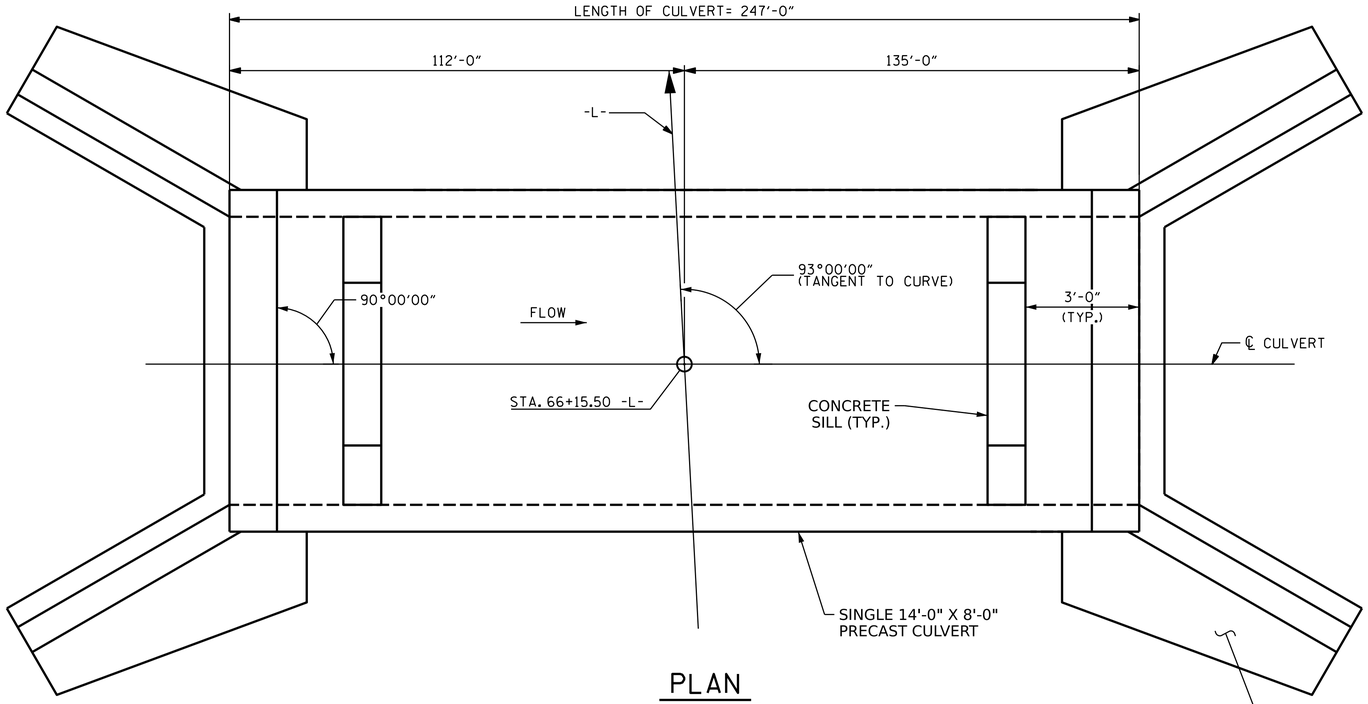
8/26/21



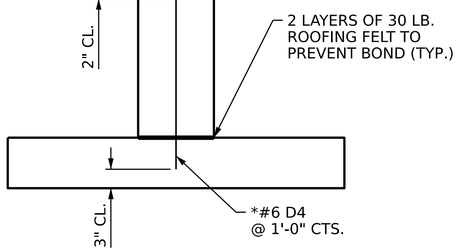
CULVERT SECTION NORMAL TO ROADWAY



SILL DETAIL

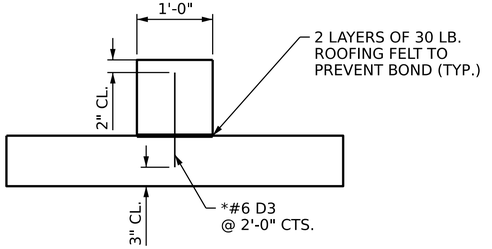


PLAN



SECTION A-A

* DRILL AND EPOXY INTO PRECAST CULVERT



SECTION B-B

* DRILL AND EPOXY INTO PRECAST CULVERT

PROJECT NO. U-6187

DAVIE COUNTY

STATION: 66+15.50 -L-

SHEET 2 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD PRECAST REINFORCED CONCRETE BOX CULVERT SINGLE 14 FT. X 8FT. 93° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 040384 ENGINEER JEFFREY C. WILSON

Signed by: Jeffrey C. Wilson 7/14/2025
5CA734DE9058488...

VHB Engineering NC, P.C. (C-3705)
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DRAWN BY : C.P. MALAGON DATE : 05/2025
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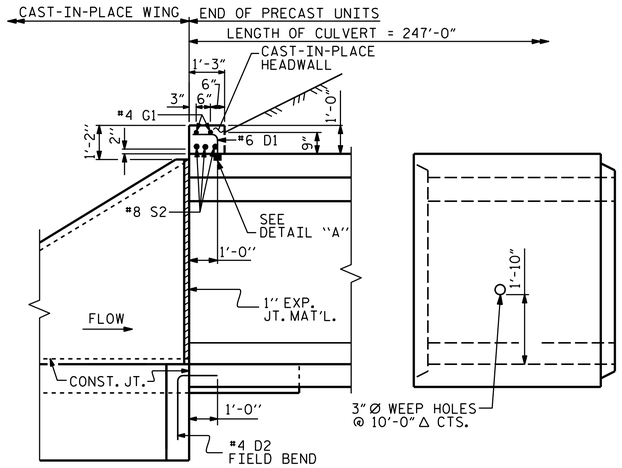
1			3			TOTAL SHEETS
2			4			6

8/26/21

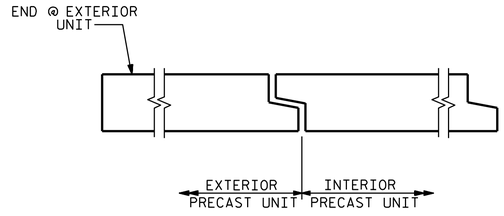


SECTION B-B
(SHOWING INLET END UNIT)

TYPICAL PRECAST UNIT
(INTERIOR UNIT SHOWN)

NOTE: NO END UNIT SHALL BE LESS THAN 3'-0".

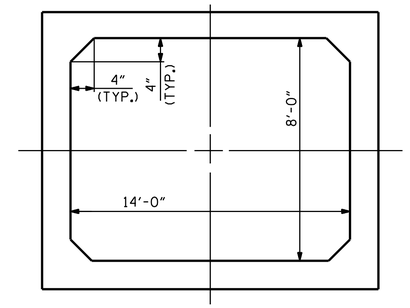
ELEVATION



SECTION THRU TOP SLAB
(BOTTOM SLAB JOINT SIMILAR)

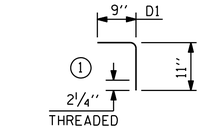
DETAIL A

** STRUCTURAL CONNECTION INSERTS 2 STRUT OR EQUAL; LENGTH = 4 ½", INSERT WIDTH = 2", DIA. = ¾". NO. REQUIRED 30

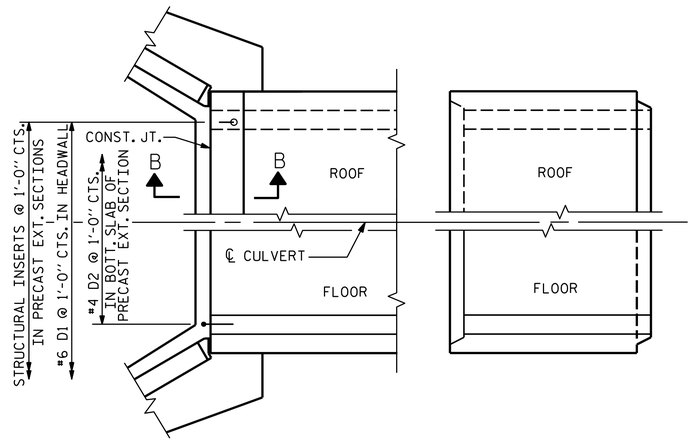


TYPICAL SECTION

BAR SCHEDULE					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
D1	30	6	1	1'-8"	75
D2	30	4	STR	3'-4"	67
D3	8	6	STR	1'-3"	15
D4	8	6	STR	2'-3"	27
G1	4	5	STR	15'-0"	40
S2	6	8	STR	15'-0"	240
TOTAL				464 LBS.	



BAR TYPE



PLAN - END UNIT

PLAN - TYPICAL PRECAST UNIT
(INTERIOR UNIT SHOWN)

VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606

PROJECT NO. U-6187
DAVIE COUNTY
STATION: 66+15.50 -L-

SHEET 3 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD PRECAST REINFORCED CONCRETE BOX CULVERT SINGLE 14 FT. X 8FT. 93° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 040384 ENGINEER JEFFREY C. WILSON

Signed by: Jeffrey C. Wilson 7/14/2025
5CA734DE9D5848B...

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

DRAWN BY : C.P. MALAGON DATE : 05/2025
CHECKED BY : J.C. WILSON DATE : 06/2025
DESIGN ENGINEER OF RECORD: J.C. WILSON DATE : 06/2025

7/14/2025
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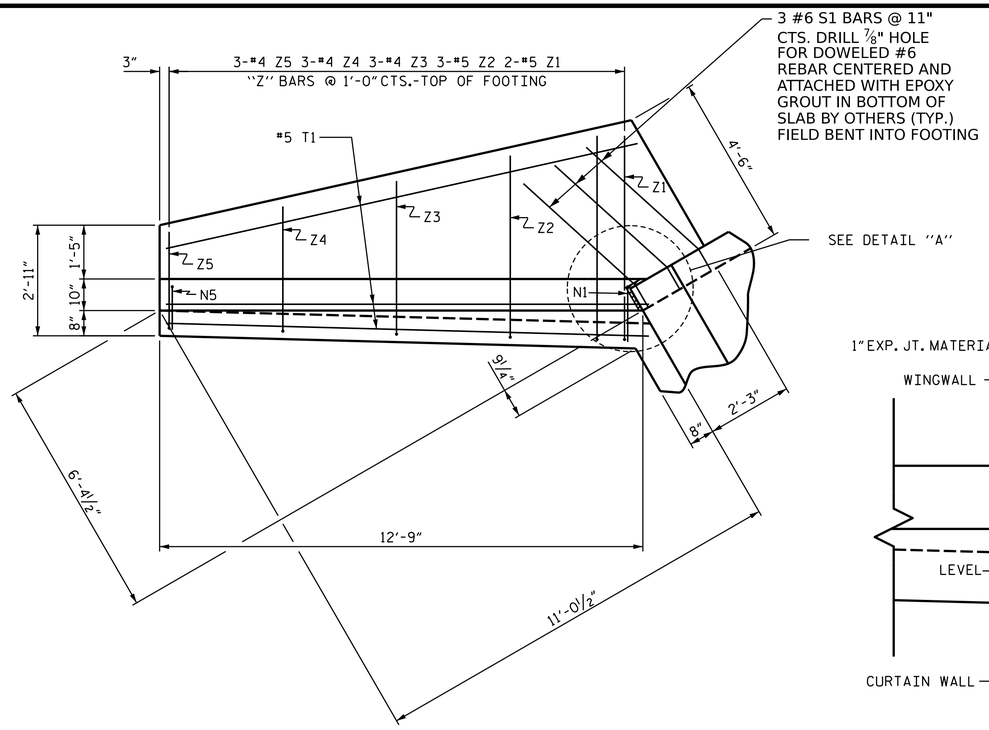
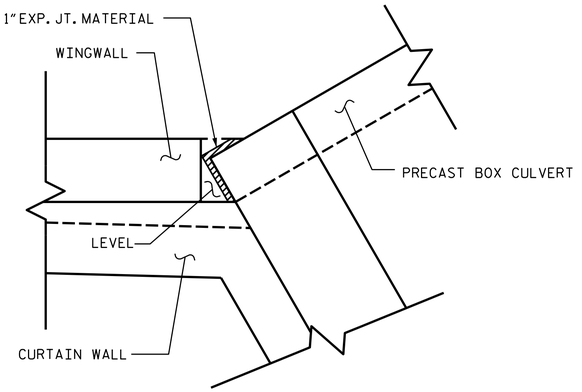
STD. NO. PBCI

8/26/21

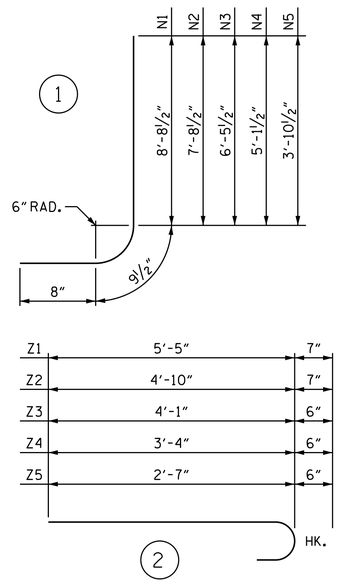


PLAN



DETAIL "A"

BAR TYPES



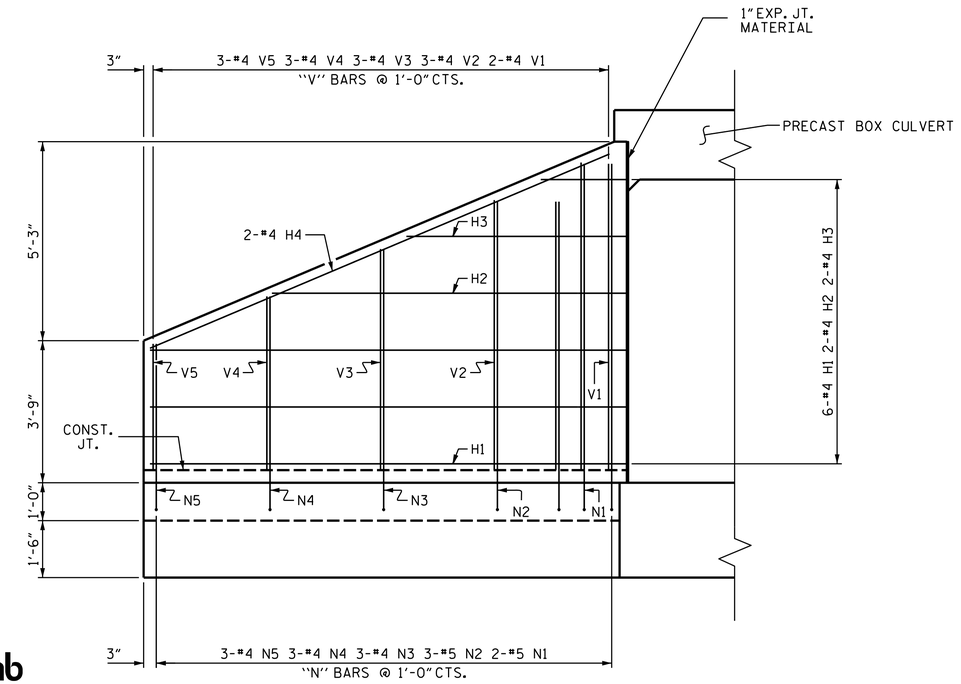
ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

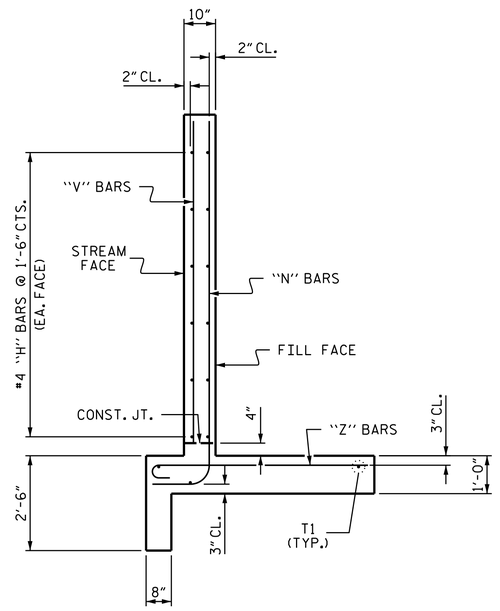
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	24	#4	STR	12'-5"	199
H2	8	#4	STR	8'-9"	47
H3	8	#4	STR	5'-2"	29
H4	8	#4	STR	13'-5"	72
N1	8	#5	1	10'-2"	85
N2	12	#5	1	9'-2"	115
N3	12	#4	1	7'-11"	63
N4	12	#4	1	6'-7"	53
N5	12	#4	1	5'-4"	43
S1	12	#6	STR	4'-8"	84
T1	12	#5	STR	12'-9"	160
V1	8	#4	STR	8'-1"	43
V2	12	#4	STR	7'-1"	57
V3	12	#4	STR	5'-10"	47
V4	12	#4	STR	4'-7"	37
V5	12	#4	STR	3'-4"	27
Z1	8	#5	2	6'-0"	50
Z2	12	#5	2	5'-5"	68
Z3	12	#4	2	4'-7"	37
Z4	12	#4	2	3'-10"	31
Z5	12	#4	2	3'-1"	25

REINFORCING STEEL
FOR 4 WINGS 1372 LBS

CLASS A CONCRETE
4 WINGS 21.4 CY
2 HEADWALLS 1.4 CY
2 END CURTAIN WALLS 1.0 CY
2 SILLS 1.5 CY
TOTAL 25.3 CY



ELEVATION



TYPICAL WING SECTION

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DRAWN BY : C.P. MALAGON DATE : 05/2025
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chonigman

Signed by: Jeffrey C. Wilson 7/14/2025
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NORTH CAROLINA PROFESSIONAL SEAL 040384 ENGINEER JEFFREY C. WILSON

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PROJECT NO. U-6187
DAVIE COUNTY
STATION: 66+15.50 -L-

SHEET 4 OF 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

WINGS FOR PRECAST CONCRETE BOX CULVERT

H = 8'-0" SLOPE = 2:1
90° SKEW

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

GEOTECHNICAL ENGINEER

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 028893 MICHAEL H. STEPHENS

Signed by: C4678209231 4CC 06/13/2025

SIGNATURE DATE

ENGINEER

SIGNATURE DATE

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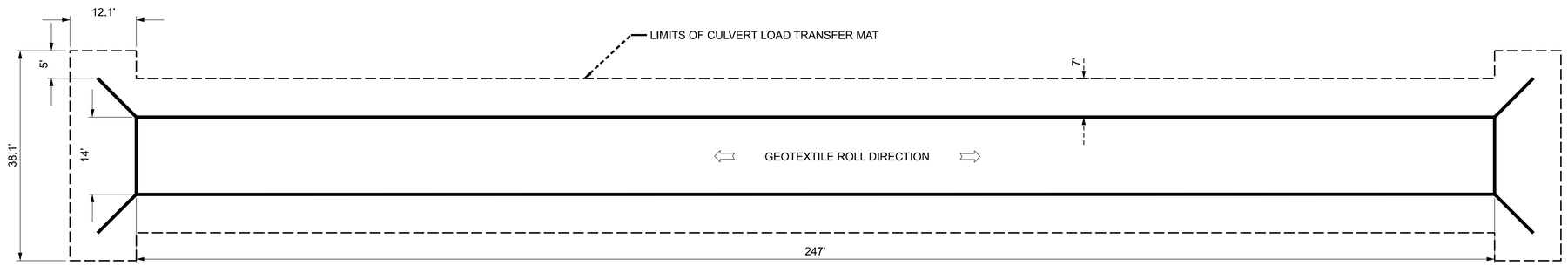
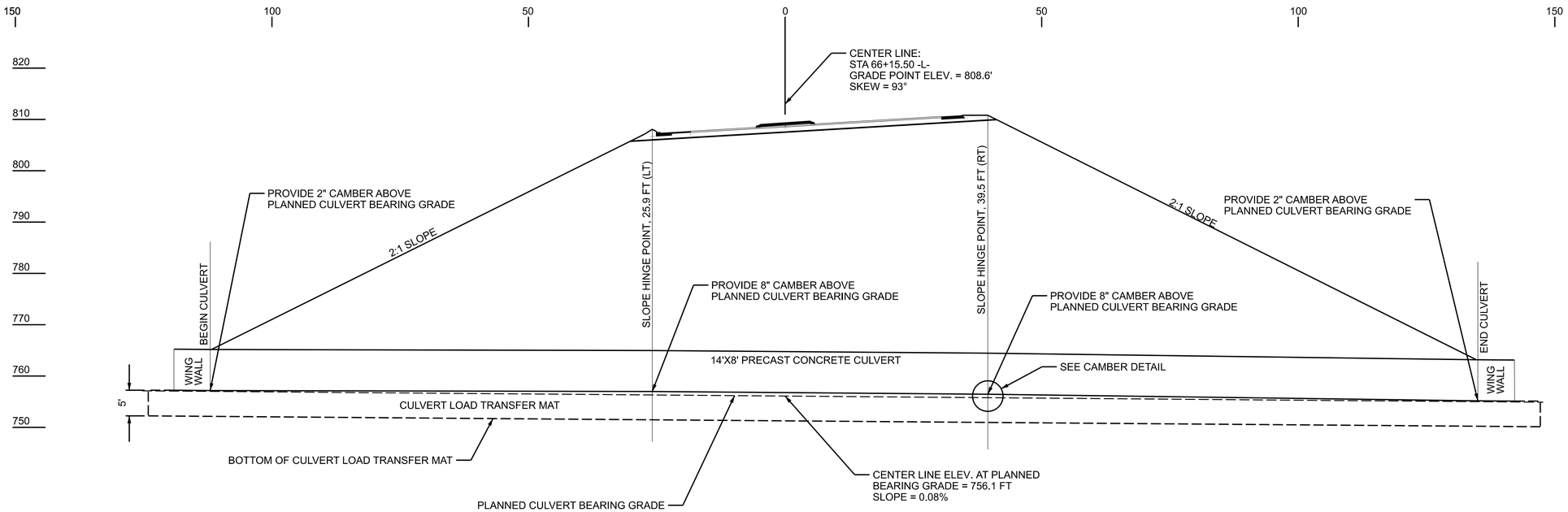


CULVERT PLAN VIEW



CULVERT CAMBER PROFILE VIEW

PROJECT NO.: U-6187

DAVIE COUNTY

STATION: 66+15.50 -L-

SHEET 1 OF 2

PREPARED BY: MHS	DATE: 6/25
REVIEWED BY: ENW/SCC/JDH	DATE: 6/25

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

CULVERT LOAD TRANSFER MAT PLAN AND PROFILE VIEWS

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

GEOTECHNICAL ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 028893 ENGINEER MICHAEL H. STEPHENS

Signed by: C44768209214CC...

06/13/2025

SIGNATURE DATE

ENGINEER

SIGNATURE DATE

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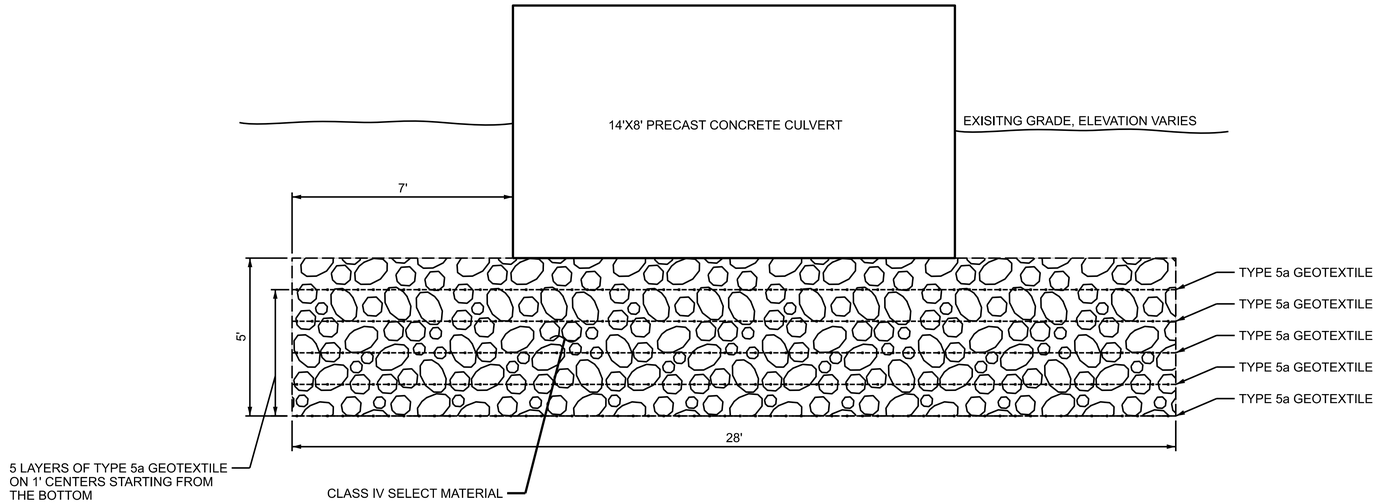
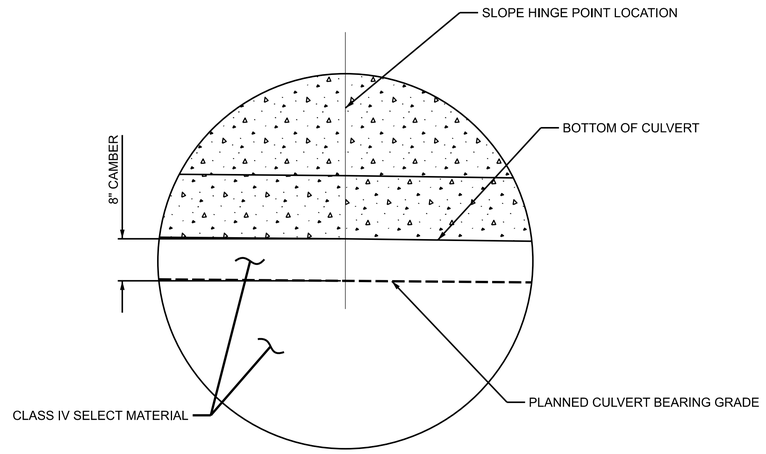


CULVERT LOAD TRANFER MAT DETAIL



CAMBER DETAIL

NOTE:

1) FOR CULVERT LOAD TRANSFER MAT SEE CULVERT LOAD TRANSFER MAT SPECIAL PROVISION

2) IF EXCAVATION HAS WATER AT THE BOTTOM AND / OR SOFT UNSTABLE GROUND IS PRESENT, PLACE CLASS III TYPE 3 SELECT MATERAL FOR THE FIRST LAYER.

3) INSTALL REFLECTIVE SURVEY TARGETS IN THE CULVERT WALL NEAR THE ROOF SLAB AT THE 4 CAMBER LOCATIONS SHOWN ON THE CAMBER PROFILE DETAIL TO MONITOR SETTLEMENT. SURVEY THE TARGETS PRIOR TO PLACING FILL AND ONCE PER WEEK OR EVERY 10 FEET OF FILL, AND SUBMIT SURVEY RESULTS TO THE RESIDENT ENGINEER. MONITOR CULVERT SETTLEMENT FOR UP TO 4 MONTHS AFTER CONSTRUCTING THE ENTIRE EMBANKMENT BETWEEN STA. 65+50 -L- AND STA. 67+25 -L- TO ROADWAY SUBGRADE. ENGINEER WILL PROVIDE NOTIFICATION WHEN SURVEYING IS COMPLETED.

4) DIFFERENTIAL SETTLEMENT ALONG THE CULVERT IS ESTIMATED TO BE 0.7 INCHES IN 10 FEET.

5) MINIMUM OVERLAP FOR GEOTEXTILE IS 18 INCHES IN BOTH DIRECTIONS.

ESTIMATED CULVERT LOAD TRANSFER MAT QUANTITY	
MATERIAL TYPE	QUANTITY
CULVERT TRANSFER MAT	875 SY

PROJECT NO.: U-6187

DAVIE COUNTY

STATION: 66+15.50 -L-

SHEET 2 OF 2

PREPARED BY: MHS	DATE: 6/25
REVIEWED BY: ENW/SCC/JDH	DATE: 6/25

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

CULVERT LOAD TRANSFER MAT CAMBER DETAILS AND NOTES

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

STANDARD NOTES

DESIGN DATA:

SPECIFICATIONS	AASHTO (CURRENT)
LIVE LOAD	SEE PLANS
IMPACT ALLOWANCE	SEE AASHTO
STRESS IN EXTREME FIBER OF STRUCTURAL STEEL - AASHTO M270 GRADE 36	20,000 LBS. PER SQ. IN.
- AASHTO M270 GRADE 50W	27,000 LBS. PER SQ. IN.
- AASHTO M270 GRADE 50	27,000 LBS. PER SQ. IN.
REINFORCING STEEL IN TENSION - GRADE 60	24,000 LBS. PER SQ. IN.
CONCRETE IN COMPRESSION	1,200 LBS. PER SQ. IN.
CONCRETE IN SHEAR	SEE AASHTO
STRUCTURAL TIMBER - TREATED OR UNTREATED EXTREME FIBER STRESS	1,800 LBS. PER SQ. IN.
COMPRESSION PERPENDICULAR TO GRAIN OF TIMBER	375 LBS. PER SQ. IN.
EQUIVALENT FLUID PRESSURE OF EARTH	30 LBS. PER CU. FT. (MINIMUM)

MATERIAL AND WORKMANSHIP:

EXCEPT AS MAY OTHERWISE BE SPECIFIED ON PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE 2024 "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" OF THE N. C. DEPARTMENT OF TRANSPORTATION.

STEEL SHEET PILING FOR PERMANENT OR TEMPORARY APPLICATIONS SHALL BE HOT ROLLED.

CONCRETE:

UNLESS OTHERWISE REQUIRED ON PLANS, CLASS A CONCRETE SHALL BE USED FOR ALL PORTIONS OF ALL STRUCTURES WITH THE EXCEPTION THAT: CLASS AA CONCRETE SHALL BE USED IN BRIDGE SUPERSTRUCTURES, ABUTMENT BACKWALLS, AND APPROACH SLABS; AND CLASS B CONCRETE SHALL BE USED FOR SLOPE PROTECTION AND RIP RAP.

CONCRETE CHAMFERS:

UNLESS OTHERWISE NOTED ON THE PLANS, ALL EXPOSED CORNERS ON STRUCTURES SHALL BE CHAMFERED ¾" WITH THE FOLLOWING EXCEPTIONS: TOP CORNERS OF CURBS MAY BE ROUNDED TO 1½" RADIUS WHICH IS BUILT INTO CURB FORMS; CORNERS OF TRANSVERSE FLOOR EXPANSION JOINTS SHALL BE ROUNDED WITH A ¼" FINISHING TOOL UNLESS OTHERWISE REQUIRED ON PLANS; AND CORNERS OF EXPANSION JOINTS IN THE ROADWAY FACES AND TOPS OF CURBS AND SIDEWALKS SHALL BE ROUNDED TO A ¼" RADIUS WITH A FINISHING STONE OR TOOL UNLESS OTHERWISE REQUIRED ON PLANS.

DOWELS:

DOWELS WHEN INDICATED ON PLANS AS FOR CULVERT EXTENSIONS, SHALL BE EMBEDDED AT LEAST 12" INTO THE OLD CONCRETE AND GROUTED INTO PLACE WITH 1:2 CEMENT MORTAR.

ALLOWANCE FOR DEAD LOAD DEFLECTION, SETTLEMENT, ETC. IN CASTING SUPERSTRUCTURES:

BRIDGES SHALL BE BUILT ON THE GRADE OR VERTICAL CURVE SHOWN ON PLANS. SLABS, CURBS AND PARAPETS SHALL CONFORM TO THE GRADE OR CURVE.

ALL DIMENSIONS WHICH ARE GIVEN IN SECTION AND ARE AFFECTED BY DEAD LOAD DEFLECTIONS ARE DIMENSIONS AT CENTER LINE OF BEARING UNLESS OTHERWISE NOTED ON PLANS. IN SETTING FORMS FOR STEEL BEAM BRIDGES AND PRESTRESSED CONCRETE GIRDER BRIDGES, ADJUSTMENTS SHALL BE MADE DUE TO THE DEAD LOAD DEFLECTIONS FOR THE ELEVATIONS SHOWN. WHERE BLOCKS ARE SHOWN OVER BEAMS FOR BUILDING UP TO THE SLAB, THE VERTICAL DIMENSIONS OF THE BLOCKS SHALL BE ADJUSTED BETWEEN BEARINGS TO COMPENSATE FOR DEAD LOAD DEFLECTIONS, VERTICAL CURVE ORDINATE, AND ACTUAL BEAM CAMBER. WHERE BOTTOM OF SLAB IS IN LINE WITH BOTTOM OF TOP FLANGES, DEPTH OF SLAB BETWEEN BEARINGS SHALL BE ADJUSTED TO COMPENSATE FOR DEAD LOAD DEFLECTION, VERTICAL CURVE ORDINATE, AND ACTUAL BEAM CAMBER.

IN SETTING FALSEWORK AND FORMS FOR REINFORCED CONCRETE SPANS, AN ALLOWANCE SHALL BE MADE FOR DEAD LOAD DEFLECTIONS, SETTLEMENT OF FALSEWORK, AND PERMANENT CAMBER WHICH SHALL BE PROVIDED FOR IN ADDITION TO THE ELEVATIONS SHOWN. AFTER REMOVAL OF THE FALSEWORK, THE FINISHED STRUCTURES SHALL CONFORM TO THE PROFILE AND ELEVATIONS SHOWN ON THE PLANS AND CONSTRUCTION ELEVATIONS FURNISHED BY THE ENGINEER.

DETAILED DRAWINGS FOR FALSEWORK OR FORMS FOR BRIDGE SUPERSTRUCTURE AND ANY STRUCTURE OR PARTS OF A STRUCTURE AS NOTED ON THE PLANS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL BEFORE CONSTRUCTION OF THE FALSEWORK OR FORMS IS STARTED.

REINFORCING STEEL:

ALL REINFORCING STEEL SHALL BE DEFORMED. DIMENSIONS RELATIVE TO PLACEMENT OF REINFORCING ARE TO CENTERS OF BARS UNLESS OTHERWISE INDICATED IN THE PLANS. DIMENSIONS ON BAR DETAILS ARE TO CENTERS OF BARS OR ARE OUT TO OUT AS INDICATED ON PLANS.

WIRE BAR SUPPORTS SHALL BE PROVIDED FOR REINFORCING STEEL WHERE INDICATED ON THE PLANS. WHEN BAR SUPPORT PIECES ARE PLACED IN CONTINUOUS LINES, THEY SHALL BE SO PLACED THAT THE ENDS OF THE SUPPORTING WIRES SHALL BE LAPPED TO LOCK LEGS ON ADJOINING PIECES.

STRUCTURAL STEEL:

AT THE CONTRACTOR'S OPTION, HE MAY SUBSTITUTE ⅞" ∅ SHEAR STUDS FOR THE ¾" ∅ STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - ⅞" ∅ STUDS FOR 4 - ¾" ∅ STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF ⅞" ∅ STUDS ALONG THE BEAM AS SHOWN FOR ¾" ∅ STUDS BASED ON THE RATIO OF 3 - ⅞"∅ STUDS FOR 4 - ¾" ∅ 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" 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.