

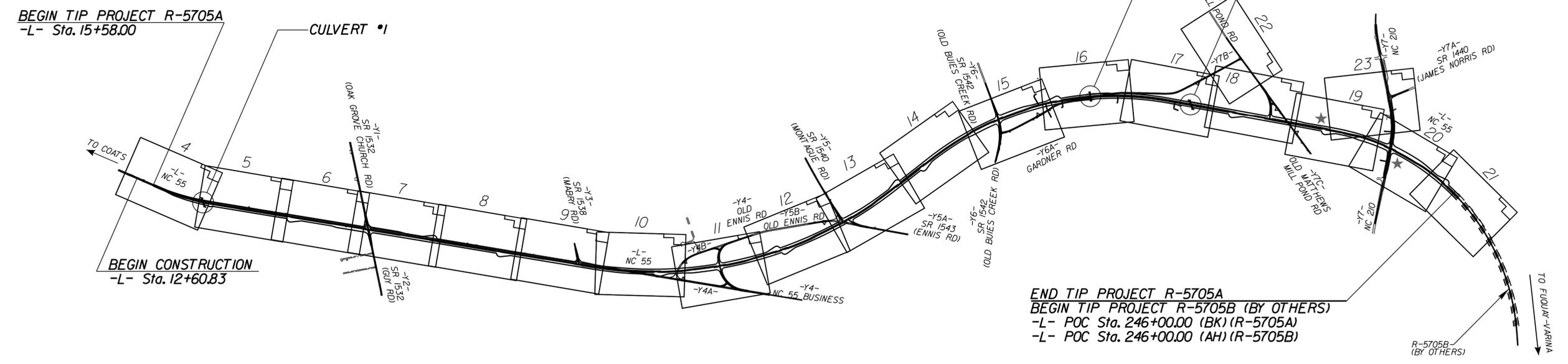
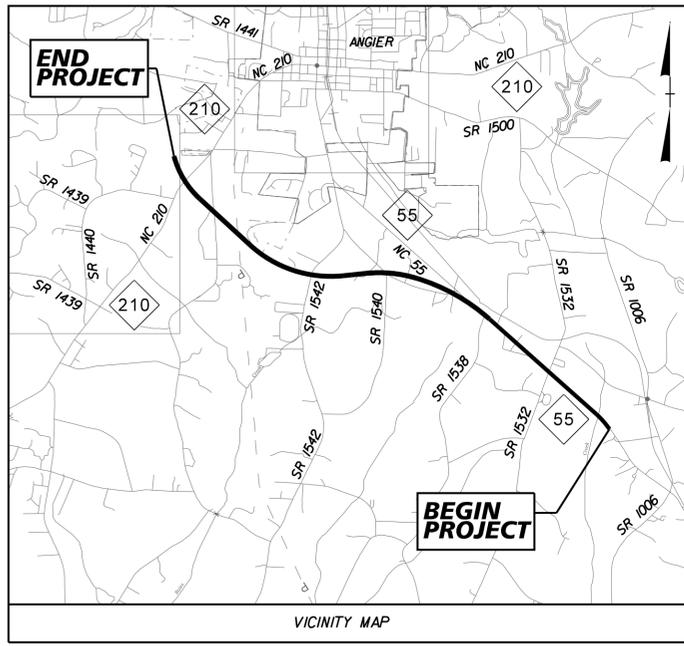
TIP PROJECT: R-5705A

CONTRACT: C204785

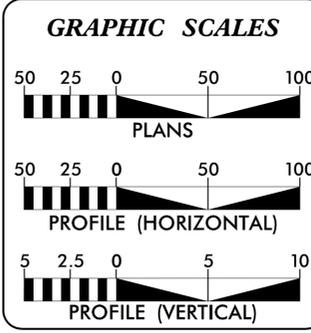
STATE OF NORTH CAROLINA DIVISION OF HIGHWAYS **HARNETT COUNTY**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5705A		
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
46377.1.2		P.E.	
46377.2.1		RIGHT-OF-WAY	
46377.2.5		UTILITIES	
46377.3.1		CONSTRUCTION	

LOCATION: NC 55 FROM JUST SOUTH OF SR 1532 (OAK GROVE CHURCH ROAD) TO NC 210
TYPE OF WORK: DRAINAGE, GRADING, PAVING, SIGNING, SIGNALS, AND CULVERTS



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DESIGN DATA

AADT 2023 =	16,400
AADT 2045 =	27,100
K =	9%
D =	60%
T =	4%*
** V =	50/60 MPH

* (TTST 1% + DUAL 3%)

FUNCTIONAL CLASSIFICATION:
MINOR ARTERIAL REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT R-5705A	= 4.364 MILES
TOTAL LENGTH ROADWAY TIP PROJECT R-5705A	= 4.364 MILES

PLANS PREPARED FOR THE NCDOT BY:

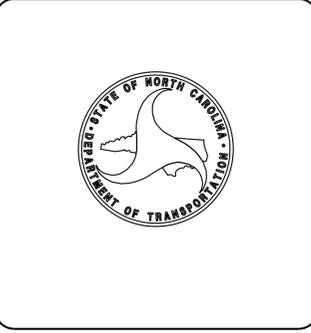
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2018 STANDARD SPECIFICATIONS

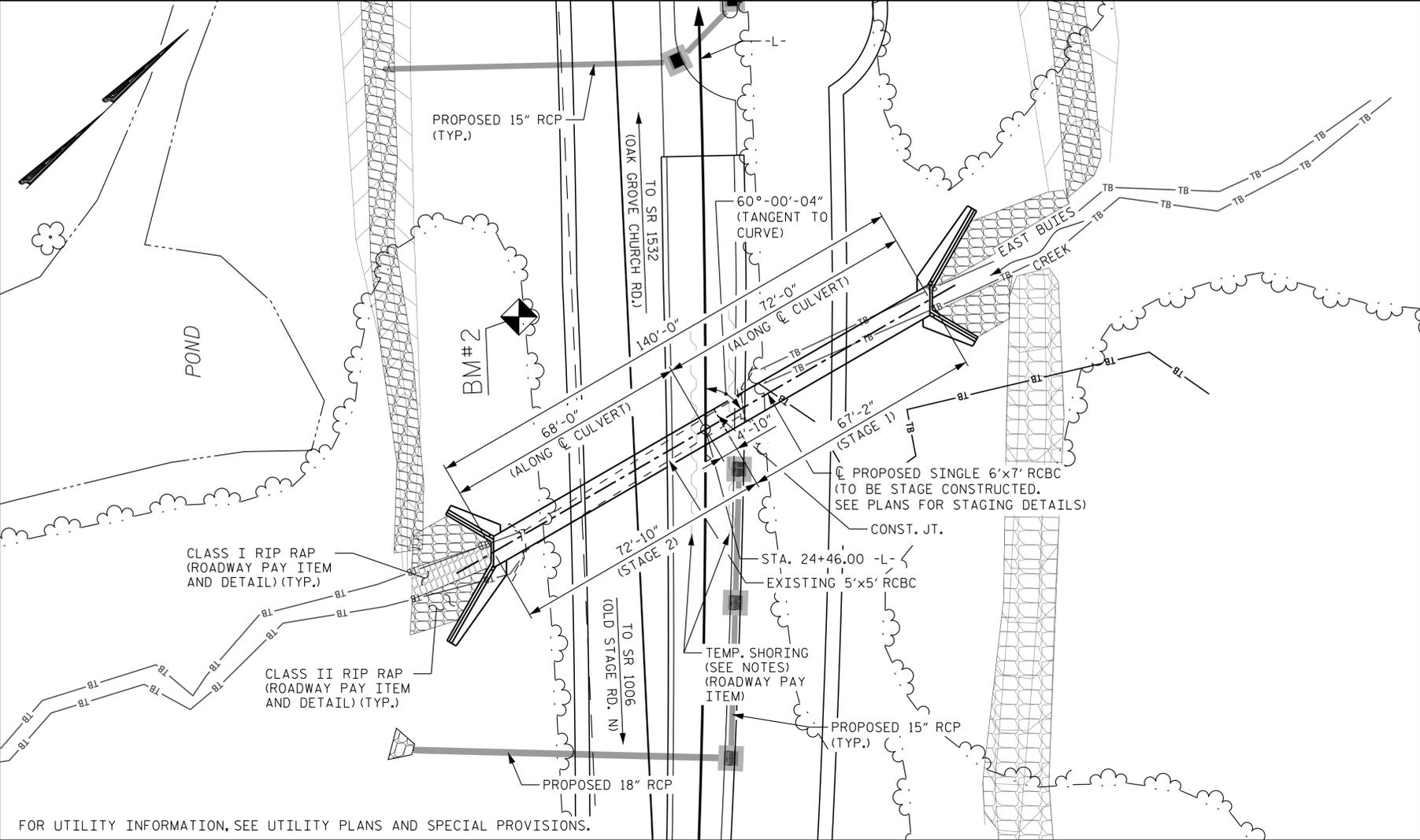
LETTING DATE:
SEPTEMBER 19, 2023

SETH A. DENNEY, P.E.
PROJECT ENGINEER

CLAY T. POOLE, P.E.
PROJECT DESIGN ENGINEER



BENCHMARK: BM#2 -L- STA. 24+77.69, OFFSET 51.70' LEFT, EL. 259.24', BENCH NAIL IN BASE OF 15' PINE TREE



NOTES

- ASSUMED LIVE LOAD -----HL-93 OR ALTERNATE LOADING
DESIGN FILL -----6'-0" (MAX.), 2'-0" (MIN.)
FOR OTHER DESIGN DATA AND GENERAL NOTES, SEE SHEET SN.
3"Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH NCDOT STANDARD SPECIFICATIONS.
THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
CONCRETE IN STAGE 1 OR STAGE 2 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 ROOF SLAB AND HEADWALLS.
DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON THE WING SHEETS.
AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACES OF THE EXTERIOR WALLS ABOVE THE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
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.
AFTER SERVING AS A TEMPORARY STRUCTURE THE EXISTING 5'-0" X 5'-0" RCBC LOCATED AT THE SAME LOCATION AS THE PROPOSED CULVERT SHALL BE REMOVED. THE EXISTING STRUCTURE IS PRESENTLY NOT POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE STRUCTURE DETERIORATE DURING CONSTRUCTION OF THE PROPOSED CULVERT, A LOAD LIMIT MAY BE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.
AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAIL DRAWINGS FOR A PRECAST REINFORCED CONCRETE BOX CULVERT IN LIEU OF THE CAST-IN-PLACE CULVERT SHOWN ON THE PLANS. THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIONAL PRECAST REINFORCED CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.
FOR LIMITS OF TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS. FOR PAY ITEM FOR TEMPORARY SHORING FOR MAINTENANCE OF TRAFFIC, SEE ROADWAY PLANS.
TRAFFIC ON NC 55 SHALL BE MAINTAINED. IN ORDER TO MAINTAIN TRAFFIC THE CULVERT SHALL BE CONSTRUCTED IN SECTIONS AS SHOWN ON THESE PLANS AS DIRECTED BY THE ENGINEER.
CULVERT BARREL SHALL BE BACKFILLED WITH NATIVE MATERIAL TO BURY DEPTH 1.0 FT. 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 REINFORCED CONCRETE BOX CULVERT SHALL BE PLACED ON THE STANDARD 1.0 FT. BLANKET OF FOUNDATION CONDITIONING MATERIAL. SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.
FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

LOCATION SKETCH

HYDRAULIC DATA

DESIGN DISCHARGE -----250 CFS
FREQUENCY OF DESIGN FLOOD -----50 YR.
DESIGN HIGH WATER ELEVATION-----255.9 FT.
DRAINAGE AREA -----0.48 SQ. MI.
BASE DISCHARGE (Q100) -----270 CFS
BASE HIGH WATER ELEVATION -----256.2 FT.

OVERTOPPING FLOOD DATA

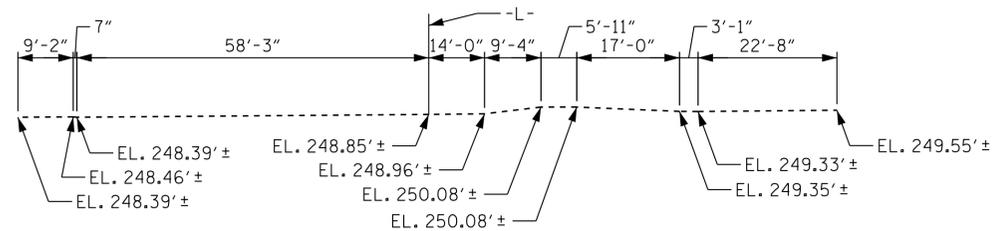
OVERTOPPING DISCHARGE -----570 CFS
FREQUENCY OF OVERTOPPING FLOOD --->500 YR.
OVERTOPPING FLOOD ELEVATION -----262.5 FT.
OVERTOPPING OCCURS AT APPROX. STA. 23+98 -L-

ROADWAY DATA

GRADE POINT EL. @ STA. 24+46.00 -L- = 261.64'
BED ELEVATION @ STA. 24+46.00 -L- = 248.25'
ROADWAY SLOPES 3 : 1

TOTAL STRUCTURE QUANTITIES

Table with 2 columns: STAGE 1 and STAGE 2. Rows include Class A Concrete (Barrel, Wings Etc., Total), Reinforcing Steel (Barrel, Wings Etc., Total), Foundation Conditioning Material (55 tons vs 60 tons), Culvert Excavation (5 C.Y.), and Channel Excavation (5 C.Y.).



PROFILE ALONG CULVERT
ELEVATIONS TAKEN ALONG CENTERLINE CHANNEL



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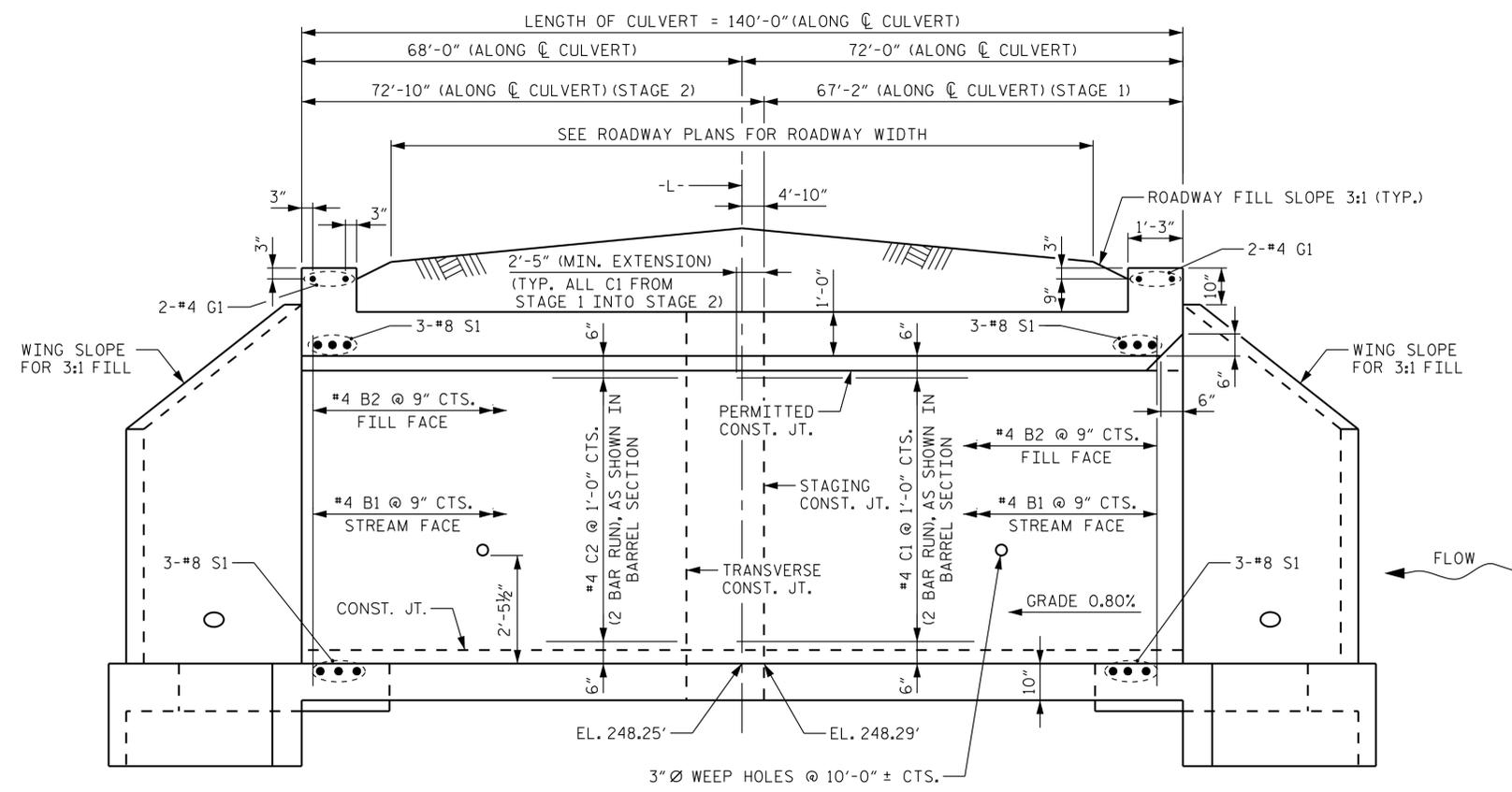
PROJECT NO. R-5705A
HARNETT COUNTY
STATION: 24+46.00 -L-

SHEET 1 OF 8

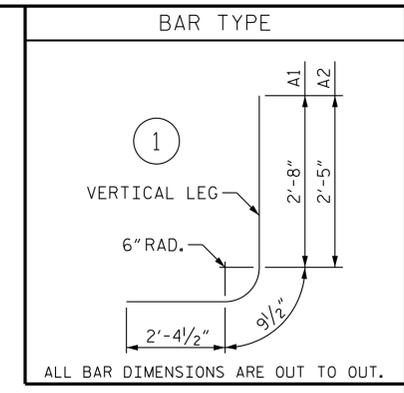
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
SINGLE 6 FT. X 7 FT.
CONCRETE BOX CULVERT
102° SKEW

Table with 2 columns: REVISIONS and SHEET NO. C1-1. Includes a grid for revision tracking with columns for NO., BY, and DATE.

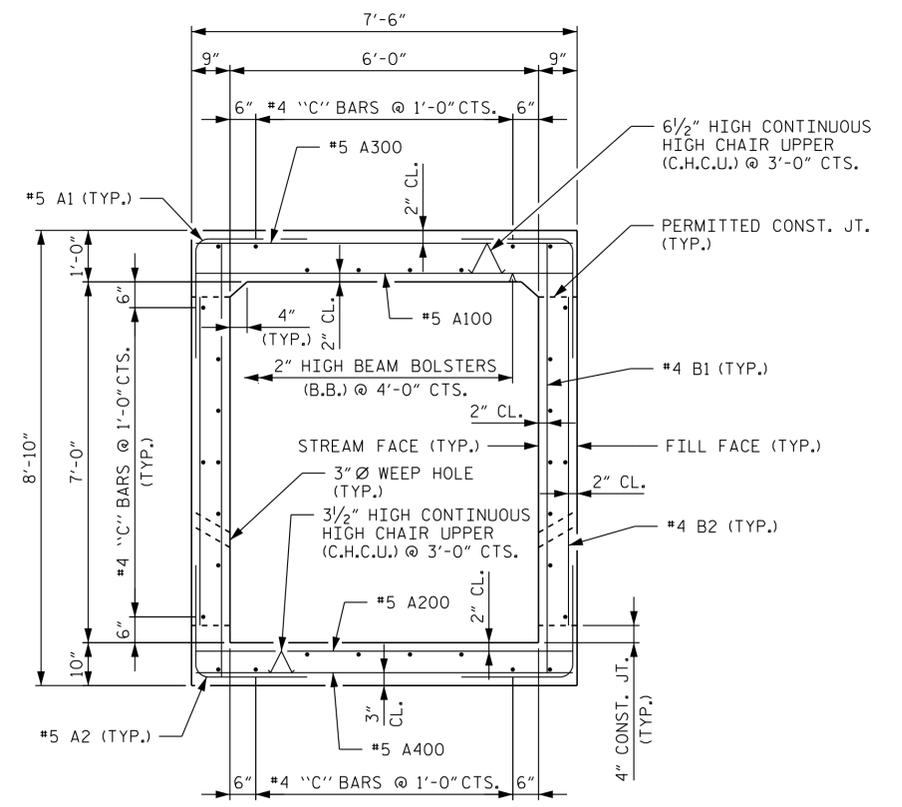
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CULVERT SECTION NORMAL TO ROADWAY



BILL OF MATERIAL											
STAGE 1					STAGE 2						
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	SIZE	TYPE	LENGTH	WEIGHT		
A1	180	5	1	5'-10"	1,095	A1	194	5	1	5'-10"	1,180
A2	180	5	1	5'-7"	1,048	A2	194	5	1	5'-7"	1,130
A100	87	5	STR	7'-2"	650	A100	94	5	STR	7'-2"	703
A101	1	5	STR	6'-3"	7	A105	1	5	STR	7'-0"	7
A102	1	5	STR	4'-11"	5	A106	1	5	STR	5'-8"	6
A103	1	5	STR	3'-8"	4	A107	1	5	STR	4'-4"	5
A104	3	5	STR	2'-4"	7	A108	3	5	STR	3'-1"	10
A200	87	5	STR	7'-2"	650	A200	94	5	STR	7'-2"	703
A201	1	5	STR	6'-3"	7	A205	1	5	STR	7'-0"	7
A202	1	5	STR	4'-11"	5	A206	1	5	STR	5'-8"	6
A203	1	5	STR	3'-8"	4	A207	1	5	STR	4'-4"	5
A204	3	5	STR	2'-4"	7	A208	3	5	STR	3'-1"	10
A300	87	5	STR	7'-2"	650	A300	94	5	STR	7'-2"	703
A301	1	5	STR	6'-3"	7	A305	1	5	STR	7'-0"	7
A302	1	5	STR	4'-11"	5	A306	1	5	STR	5'-8"	6
A303	1	5	STR	3'-8"	4	A307	1	5	STR	4'-4"	5
A304	3	5	STR	2'-4"	7	A308	3	5	STR	3'-1"	10
A400	87	5	STR	7'-2"	650	A400	94	5	STR	7'-2"	703
A401	1	5	STR	6'-3"	7	A405	1	5	STR	7'-0"	7
A402	1	5	STR	4'-11"	5	A406	1	5	STR	5'-8"	6
A403	1	5	STR	3'-8"	4	A407	1	5	STR	4'-4"	5
A404	3	5	STR	2'-4"	7	A408	3	5	STR	3'-1"	10
B1	180	4	STR	8'-5"	1,012	B1	194	4	STR	8'-5"	1,091
B2	180	4	STR	6'-4"	762	B2	194	4	STR	6'-4"	821
C1	64	4	STR	37'-0"	1,582	C2	64	4	STR	38'-7"	1,650
G1	2	4	STR	8'-3"	11	G1	2	4	STR	8'-3"	11
S1	6	8	STR	8'-3"	132	S1	6	8	STR	8'-3"	132
REINFORCING STEEL				LBS.	8,334	REINFORCING STEEL				LBS.	8,939



RIGHT ANGLE SECTION OF BARREL
THERE ARE 32 "C" BARS IN SECTION OF BARREL

STAGE 1 QUANTITIES	
CLASS A CONCRETE	
BARREL @ 0.902 C.Y./FT.	60.6 C.Y.
WINGS, ETC.	16.5 C.Y.
TOTAL	77.1 C.Y.
REINFORCING STEEL	
BARREL	8,334 LBS.
WINGS, ETC.	994 LBS.
TOTAL	9,328 LBS.

STAGE 2 QUANTITIES	
CLASS A CONCRETE	
BARREL @ 0.902 C.Y./FT.	65.7 C.Y.
WINGS, ETC.	16.5 C.Y.
TOTAL	82.2 C.Y.
REINFORCING STEEL	
BARREL	8,939 LBS.
WINGS, ETC.	994 LBS.
TOTAL	9,933 LBS.

BAR SIZE	SPLICE LENGTH
#4 B1	1'-10"
#4 "C"	2'-5"



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HARNETT COUNTY
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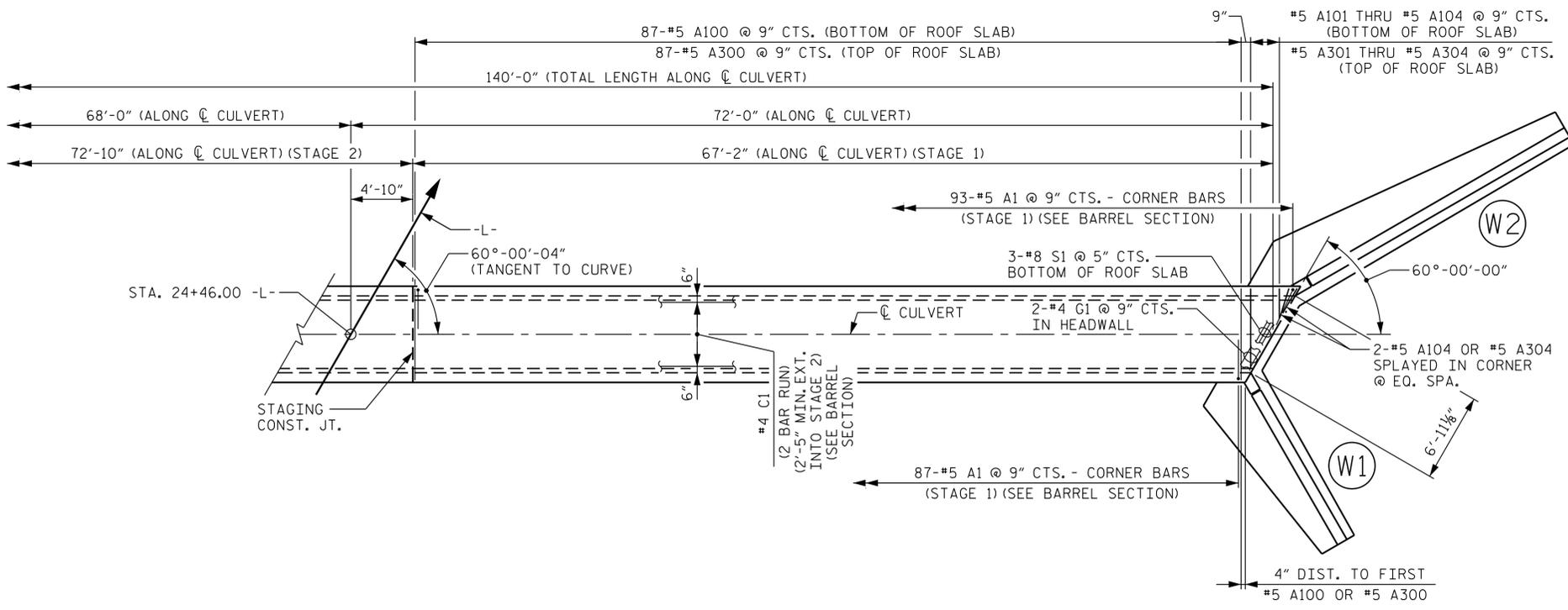
SHEET 2 OF 8
 STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 SINGLE 6 FT. X 7 FT.
 CONCRETE BOX CULVERT
 102° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-2
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2			4			8

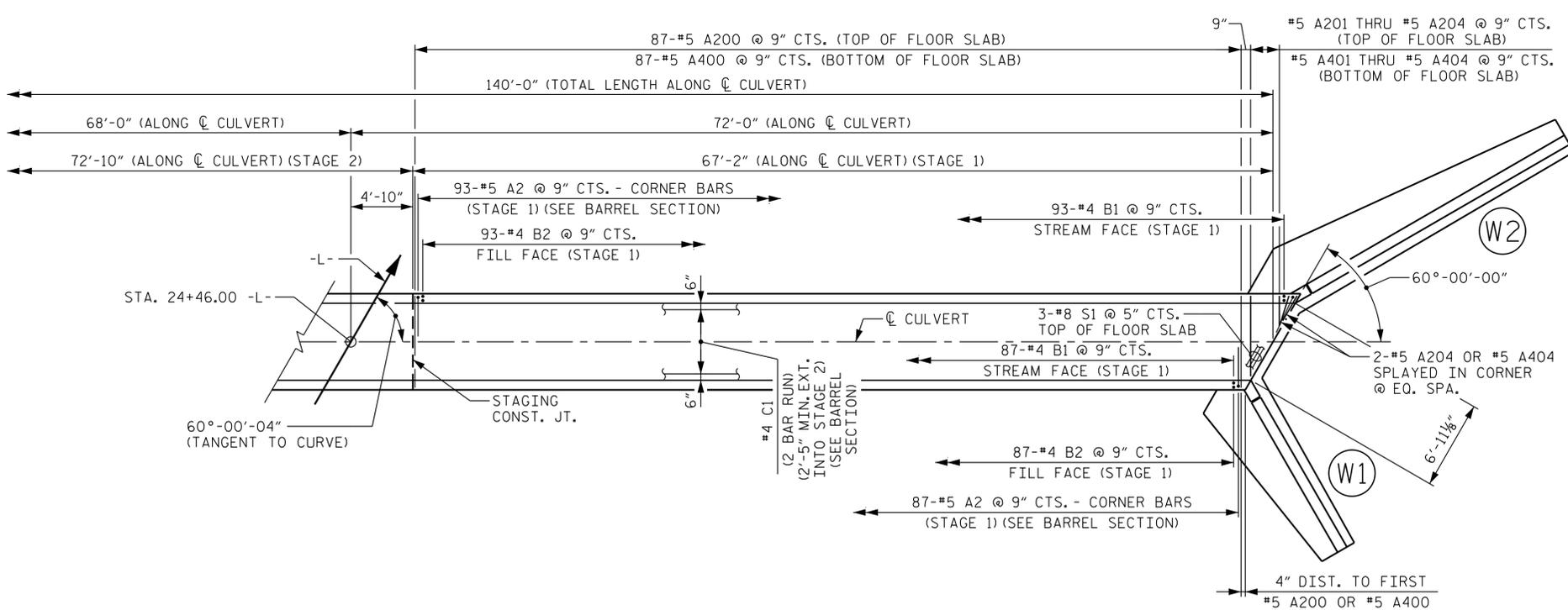
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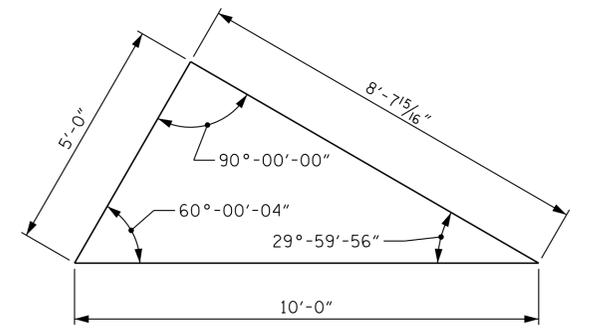
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 DESIGN ENGINEER OF RECORD: S. A. DENNEY DATE: 02/2022



ROOF SLAB - STAGE 1



FLOOR SLAB - STAGE 1



SKEW TRIANGLE

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SHEET 3 OF 8



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 DEPARTMENT OF TRANSPORTATION
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 SINGLE 6 FT. X 7 FT.
 CONCRETE BOX CULVERT
 102° SKEW
 STAGE 1

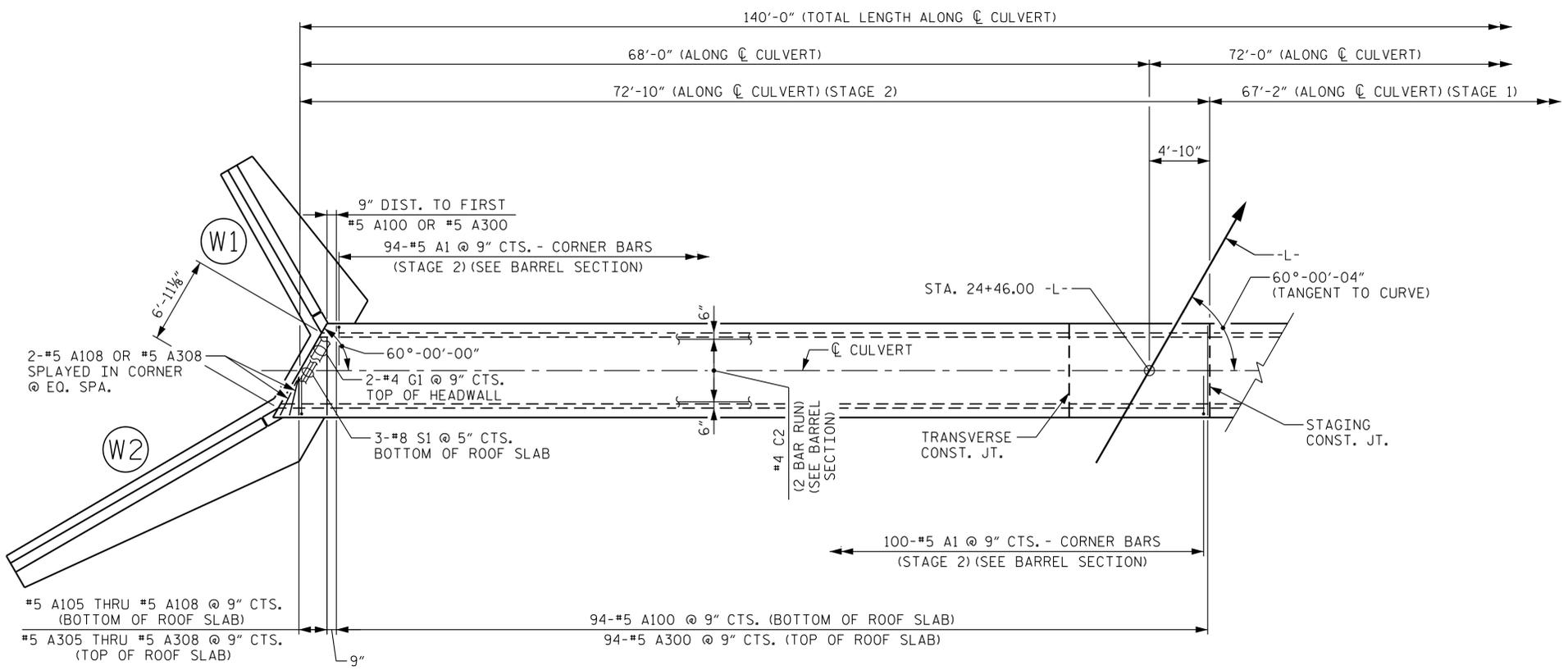
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NO.	BY:	DATE:	NO.	BY:	DATE:	C1-3
1			3			TOTAL SHEETS
2			4			8

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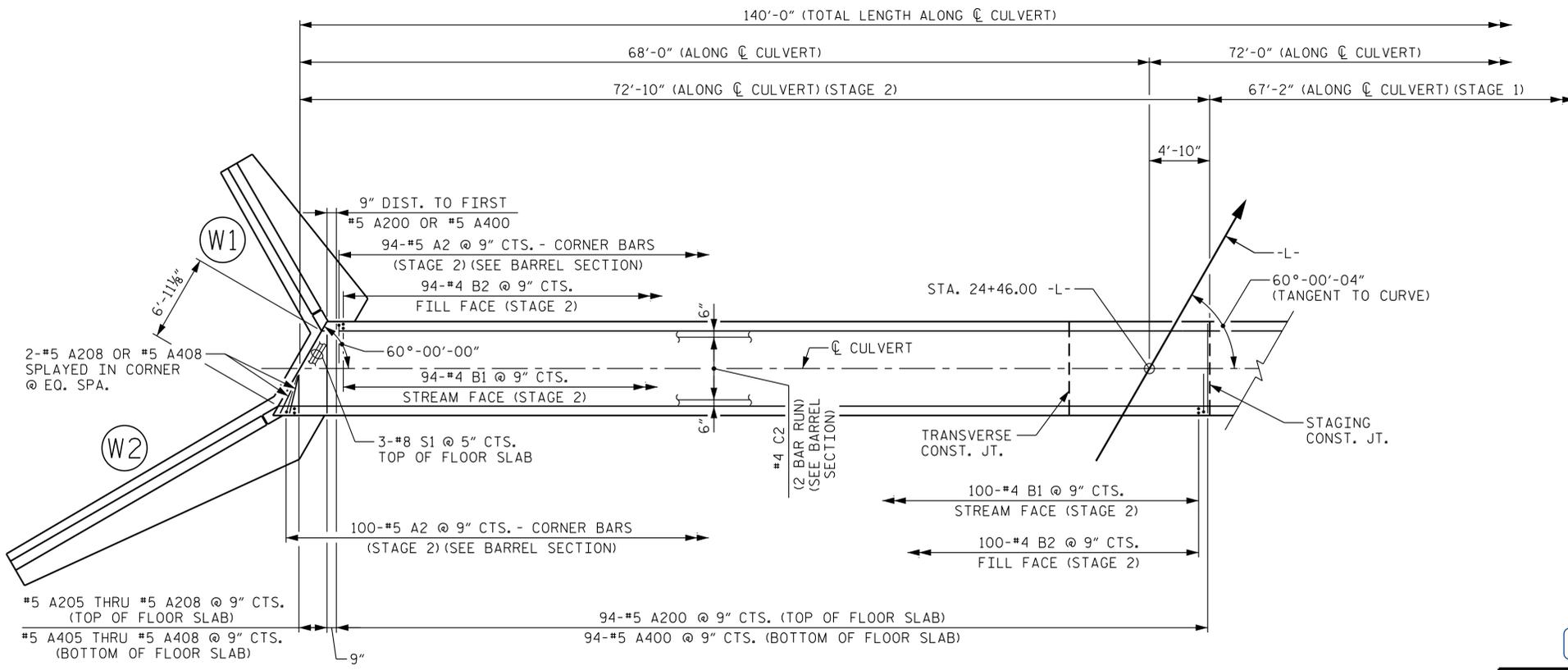
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 DESIGN ENGINEER OF RECORD: S. A. DENNEY DATE: 02/2022

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CULVERT 42C001



ROOF SLAB - STAGE 2



FLOOR SLAB - STAGE 2

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SHEET 4 OF 8



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 RALEIGH

**SINGLE 6 FT. X 7 FT.
 CONCRETE BOX CULVERT
 102° SKEW
 STAGE 2**

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1			3			TOTAL SHEETS
2			4			8

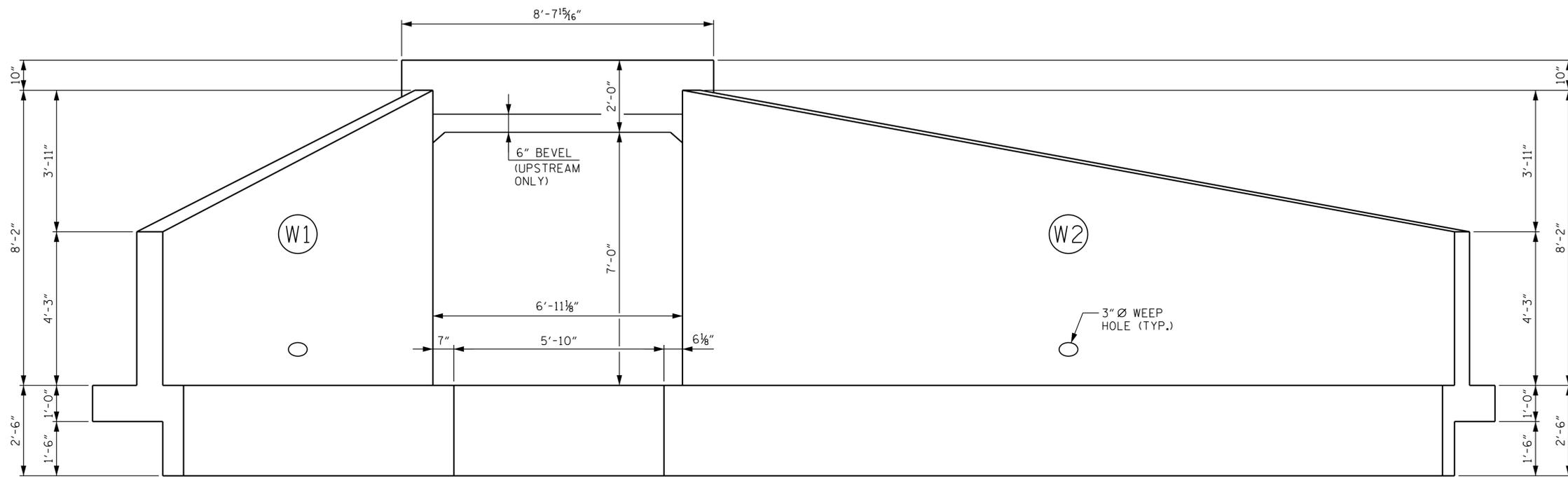
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CULVERT 42C001



END ELEVATION NORMAL TO SKEW

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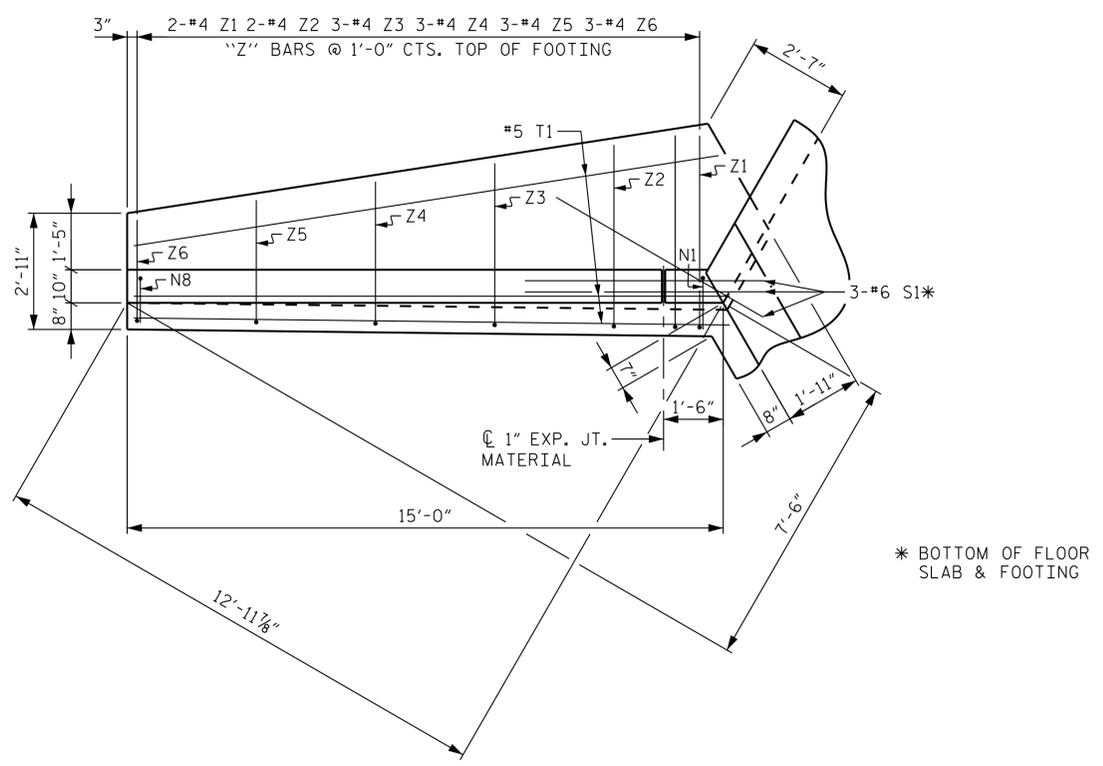
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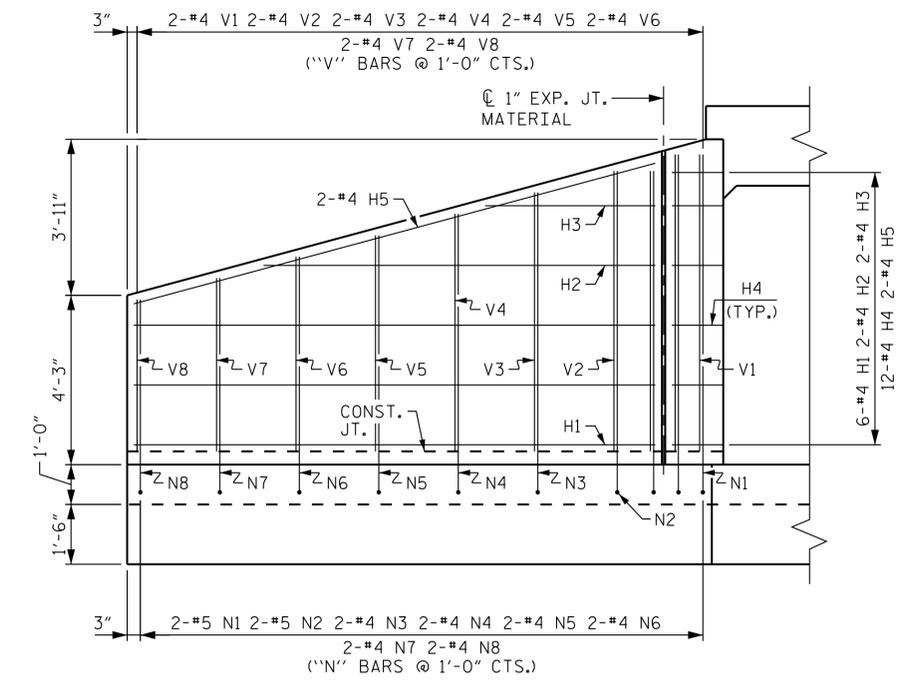
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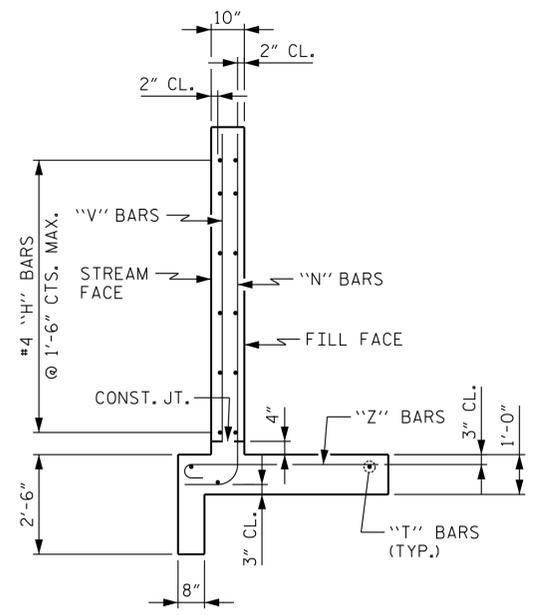
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PLAN W1



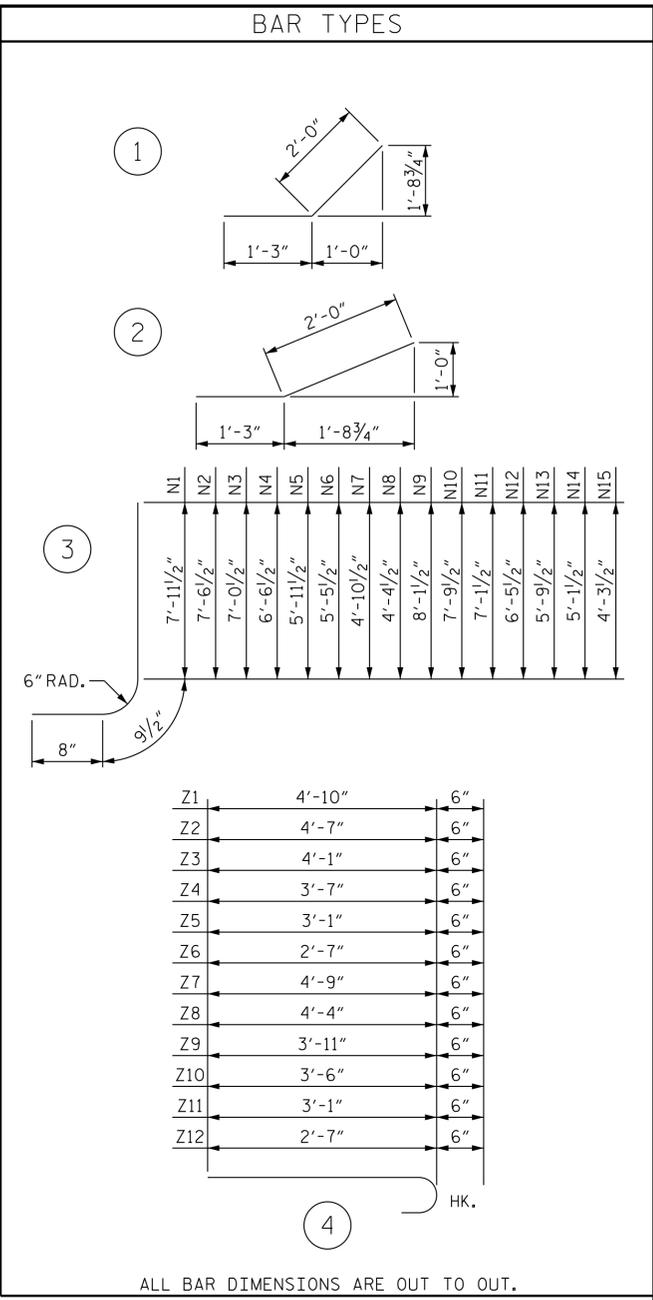
ELEVATION W1



TYPICAL WING SECTION

BILL OF MATERIAL											
BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	4	STR	13'-1"	105	V1	4	4	STR	7'-5"	20
H2	4	4	STR	9'-10"	26	V2	4	4	STR	7'-0"	19
H3	4	4	STR	4'-3"	11	V3	4	4	STR	6'-6"	17
H4	24	4	1	3'-3"	52	V4	4	4	STR	5'-11"	16
H5	4	4	STR	13'-7"	36	V5	4	4	STR	5'-5"	14
H6	12	4	STR	22'-10"	183	V6	4	4	STR	4'-10"	13
H7	4	4	STR	17'-4"	46	V7	4	4	STR	4'-4"	12
H8	4	4	STR	8'-2"	22	V8	4	4	STR	3'-9"	10
H9	24	4	2	3'-3"	52	V9	4	4	STR	7'-7"	20
H10	4	4	STR	23'-2"	62	V10	6	4	STR	7'-2"	29
						V11	8	4	STR	6'-6"	35
N1	4	5	3	9'-5"	39	V12	8	4	STR	5'-10"	31
N2	4	5	3	9'-0"	38	V13	8	4	STR	5'-3"	28
N3	4	4	3	8'-6"	23	V14	8	4	STR	4'-7"	24
N4	4	4	3	8'-0"	21	V15	10	4	STR	3'-9"	25
N5	4	4	3	7'-5"	20						
N6	4	4	3	6'-11"	18	Z1	4	4	4	5'-4"	14
N7	4	4	3	6'-4"	17	Z2	4	4	4	5'-1"	14
N8	4	4	3	5'-10"	16	Z3	6	4	4	4'-7"	18
N9	4	5	3	9'-7"	40	Z4	6	4	4	4'-1"	16
N10	6	5	3	9'-3"	58	Z5	6	4	4	3'-7"	14
N11	8	4	3	8'-7"	46	Z6	6	4	4	3'-1"	12
N12	8	4	3	7'-11"	42	Z7	10	4	4	5'-3"	35
N13	8	4	3	7'-3"	39	Z8	8	4	4	4'-10"	26
N14	8	4	3	6'-7"	35	Z9	8	4	4	4'-5"	24
N15	10	4	3	5'-9"	38	Z10	8	4	4	4'-0"	21
						Z11	8	4	4	3'-7"	19
S1	12	6	STR	6'-0"	108	Z12	10	4	4	3'-1"	21
T1	6	5	STR	14'-10"	93						
T2	6	5	STR	24'-9"	155						

REINFORCING STEEL FOR 4 WINGS	1,988 LBS
CLASS A CONCRETE	
4 WINGS	31.4 CY
2 HEADWALL	0.8 CY
2 END CURTAIN WALL	0.8 CY
TOTAL	33.0 CY



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DRAWN BY: D. D. LOWERY DATE: 02/2022
 CHECKED BY: C. I. POOLE DATE: 02/2022
 DESIGN ENGINEER OF RECORD: S. A. DENNEY DATE: 02/2022

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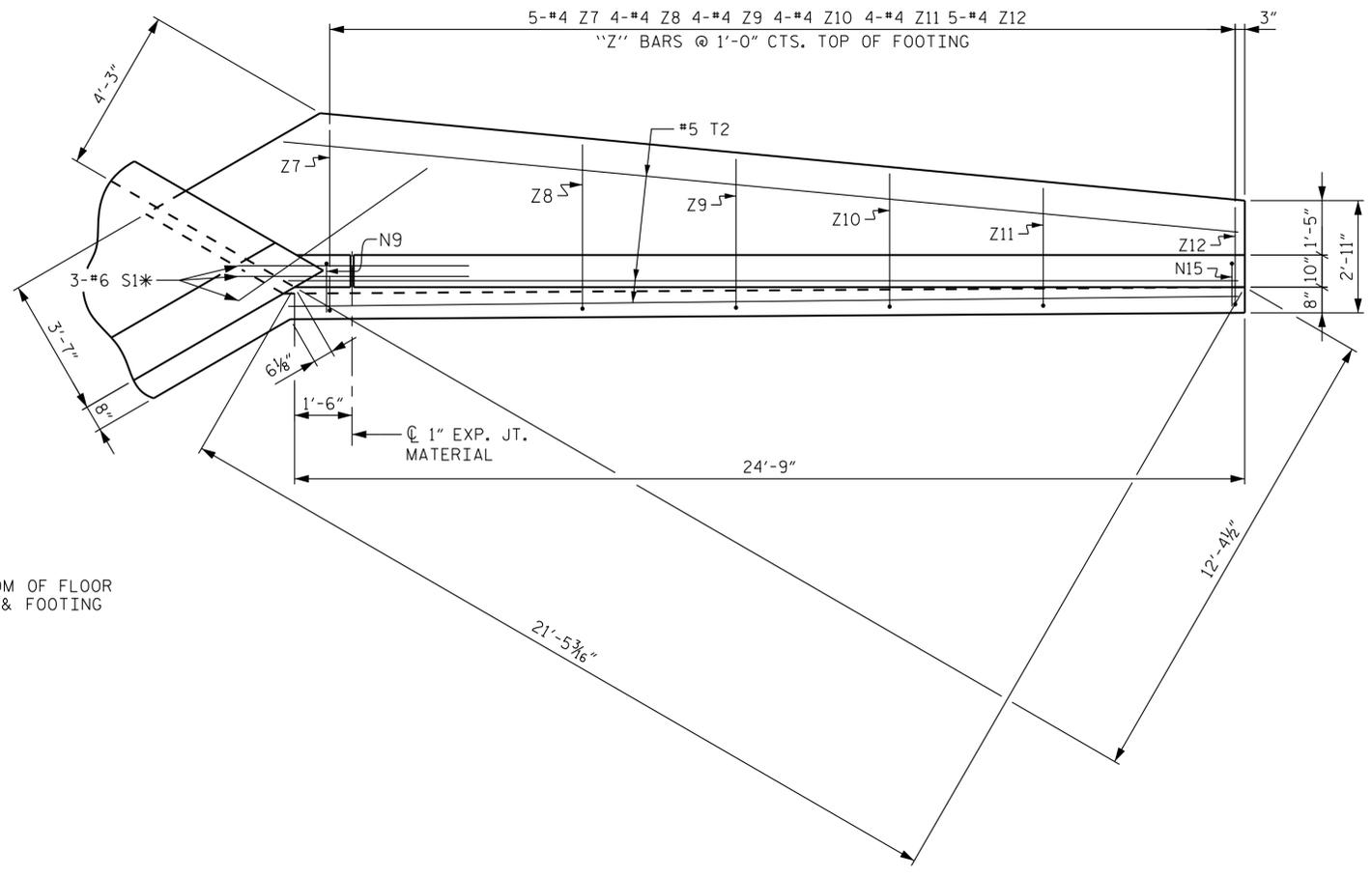
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HARNETT COUNTY
 STATION: 24+46.00 -L-

SHEET 6 OF 8

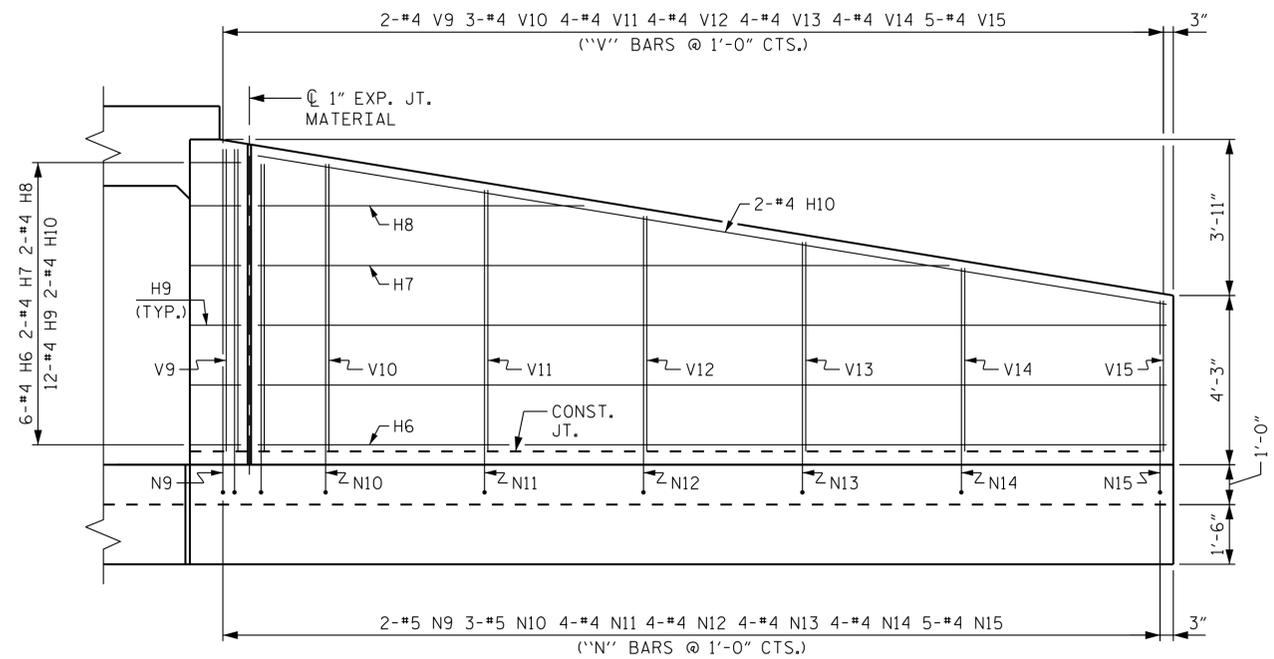
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
WING DETAILS FOR CONCRETE BOX CULVERT					
H = 7'-0"			SLOPE = 3:1		
			60° SKEW		
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
SHEET NO. C1-6					TOTAL SHEETS 8

CULVERT 42C001



* BOTTOM OF FLOOR SLAB & FOOTING

PLAN W2



ELEVATION W2

PROJECT NO. R-5705A
HARNETT COUNTY
 STATION: 24+46.00 -L-

SHEET 7 OF 8



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 Raleigh, NC 27601-1772
 Phone (919) 677-2000 NC LICENSE # F-0102

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

WING DETAILS FOR
 CONCRETE BOX CULVERT

H = 7'-0" SLOPE = 3:1
 60° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-7
1			3			TOTAL SHEETS
2			4			8

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DRAWN BY: D. D. LOWERY DATE: 02/2022
 CHECKED BY: C. T. POOLE DATE: 02/2022
 DESIGN ENGINEER OF RECORD: S. A. DENNEY DATE: 02/2022

CULVERT 42C001

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 _{L1})	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	1.05	--	1.75	1.05	1	TOP SLAB	3.75	1.27	1	TOP SLAB	0.75		
	HL-93 (OPERATING)	N/A		1.36	--	1.35	1.36	1	TOP SLAB	3.75	1.65	1	TOP SLAB	0.75		
	HS-20 (INVENTORY)	36,000	②	1.11	39.96	1.75	1.11	1	TOP SLAB	3.75	1.36	1	TOP SLAB	0.75		
	HS-20 (OPERATING)	36,000		1.44	51.84	1.35	1.44	1	TOP SLAB	3.75	1.76	1	TOP SLAB	0.75		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13,500		2.42	32.67	1.40	2.42	1	TOP SLAB	3.75	4.40	1	TOP SLAB	0.75	
		SNGARBS2	20,000		2.27	45.40	1.40	2.27	1	TOP SLAB	3.75	4.02	1	TOP SLAB	0.75	
		SNAGRIS2	22,000		2.42	53.24	1.40	2.42	1	TOP SLAB	3.75	4.40	1	TOP SLAB	0.75	
		SNCOTTS3	27,250	③	1.77	48.23	1.40	1.77	1	BOTTOM SLAB	3.75	2.59	1	BOTTOM SLAB	0.75	
		SNAGGRS4	34,925		2.33	81.38	1.40	2.33	1	BOTTOM SLAB	3.75	3.70	1	BOTTOM SLAB	0.75	
		SNS5A	35,550		2.11	75.01	1.40	2.11	1	BOTTOM SLAB	3.75	3.25	1	BOTTOM SLAB	0.75	
		SNS6A	39,950		2.11	84.29	1.40	2.11	1	BOTTOM SLAB	3.75	3.25	1	BOTTOM SLAB	0.75	
		SNS7B	42,000		2.11	88.62	1.40	2.11	1	BOTTOM SLAB	3.75	3.25	1	BOTTOM SLAB	0.75	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33,000		2.42	79.86	1.40	2.42	1	TOP SLAB	3.75	4.40	1	TOP SLAB	0.75	
		TNT4A	33,075		2.11	69.79	1.40	2.11	1	BOTTOM SLAB	3.75	3.25	1	BOTTOM SLAB	0.75	
		TNT6A	41,600		2.11	87.78	1.40	2.11	1	BOTTOM SLAB	3.75	3.25	1	BOTTOM SLAB	0.75	
		TNT7A	42,000		2.11	88.62	1.40	2.11	1	BOTTOM SLAB	3.75	3.25	1	BOTTOM SLAB	0.75	
		TNT7B	42,000		2.11	88.62	1.40	2.11	1	BOTTOM SLAB	3.75	3.25	1	BOTTOM SLAB	0.75	
		TNAGRIT4	43,000		2.11	90.73	1.40	2.11	1	BOTTOM SLAB	3.75	3.25	1	BOTTOM SLAB	0.75	
		TNAGT5A	45,000		2.11	94.95	1.40	2.11	1	BOTTOM SLAB	3.75	3.25	1	BOTTOM SLAB	0.75	
TNAGT5B	45,000		2.11	94.95	1.40	2.11	1	BOTTOM SLAB	3.75	3.25	1	BOTTOM SLAB	0.75			

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

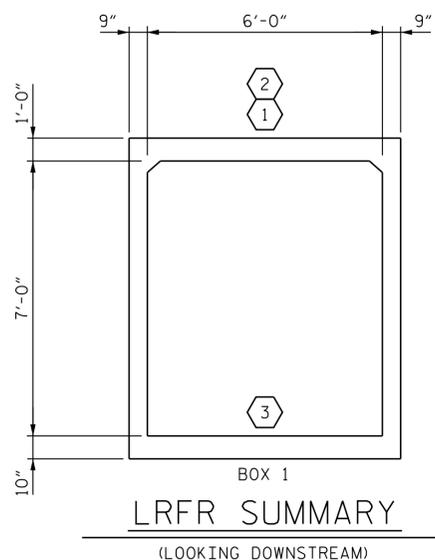
LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
LS	1.75	--
WA	1.00	--

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM THE EXTERIOR EDGE OF EXTERIOR WALL.

#	CONTROLLING LOAD RATING
①	DESIGN LOAD RATING (HL-93)
②	DESIGN LOAD RATING (HS-20)
③	LEGAL LOAD RATING **
** SEE CHART FOR VEHICLE TYPE	



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HARNETT COUNTY
 STATION: 24+46.00 -L-

SHEET 8 OF 8



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 RALEIGH

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

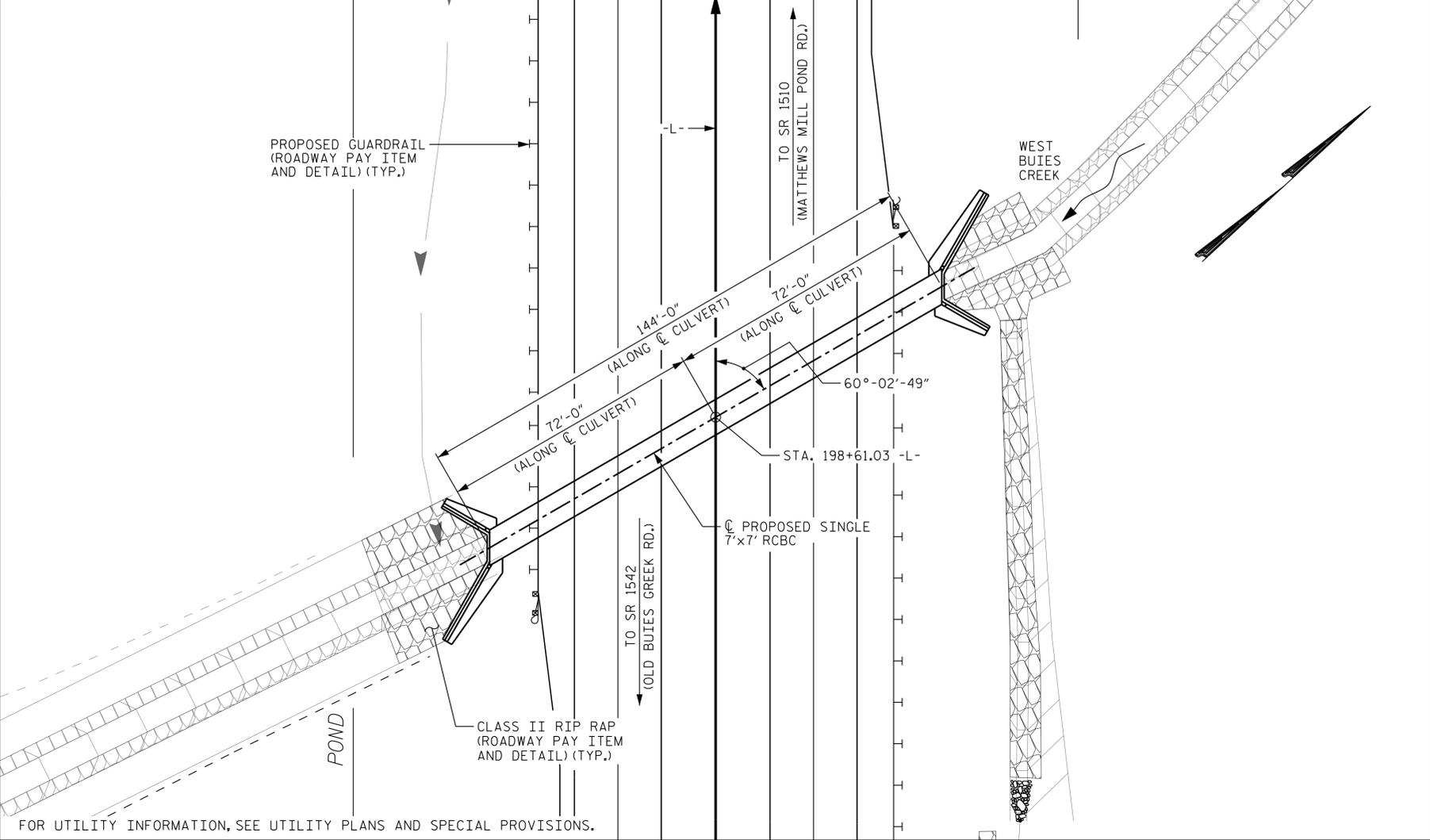
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NO.	BY:	DATE:	NO.	BY:	DATE:	C1-8
①			③			TOTAL SHEETS
②			④			8

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ASSEMBLED BY : D. D. LOWERY	DATE : 02/2022
CHECKED BY : C. T. POOLE	DATE : 02/2022
DRAWN BY : WMC	7/11
CHECKED BY : GM	7/11
REV. 10/1/11	MAA/GM
REV. 12/17	MAA/THC

BENCHMARK: BM#9 -L- STA. 194+10.47, OFFSET 71.87' LEFT, EL. 260.58', BENCH NAIL IN BASE OF 24" PINE TREE



LOCATION SKETCH

NOTES

- ASSUMED LIVE LOAD -----HL-93 OR ALTERNATE LOADING
- DESIGN FILL ----- 5'-0" (MAX.), 2'-0" (MIN.)
- FOR OTHER DESIGN DATA AND GENERAL NOTES, SEE SHEET SN.
- 3"Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH NCDOT STANDARD SPECIFICATIONS.
- THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
- CONCRETE IN THE 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 ROOF SLAB AND HEADWALLS.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON THE WING SHEETS.
- AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACES OF THE EXTERIOR WALLS ABOVE THE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
- A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
- AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAIL DRAWINGS FOR A PRECAST REINFORCED CONCRETE BOX CULVERT IN LIEU OF THE CAST-IN-PLACE CULVERT SHOWN ON THE PLANS. THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIONAL PRECAST REINFORCED CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.
- CULVERT BARREL SHALL BE BACKFILLED WITH NATIVE MATERIAL TO BURY DEPTH OF 1.0 FT. 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 REINFORCED CONCRETE BOX CULVERT SHALL BE PLACED ON THE STANDARD 1.0 FT. BLANKET OF FOUNDATION CONDITIONING MATERIAL. SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.
- FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
- FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
- FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
- FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

HYDRAULIC DATA

DESIGN DISCHARGE -----260 CFS
 FREQUENCY OF DESIGN FLOOD -----50 YR.
 DESIGN HIGH WATER ELEVATION-----256.8 FT.
 DRAINAGE AREA -----0.5 SQ. MI.
 BASE DISCHARGE (Q100) -----280 CFS
 BASE HIGH WATER ELEVATION -----257.1 FT.

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE -----680 CFS
 FREQUENCY OF OVERTOPPING FLOOD --->500 YR.
 OVERTOPPING FLOOD ELEVATION -----262.9 FT.
 OVERTOPPING OCCURS AT
 APPROX. STA. 196+78 -L-

ROADWAY DATA

GRADE POINT EL. @ STA. 198+61.03 -L- = 262.82'
 BED ELEVATION @ STA. 198+61.03 -L- = 249.88'
 ROADWAY SLOPES 3 : 1

TOTAL STRUCTURE QUANTITIES

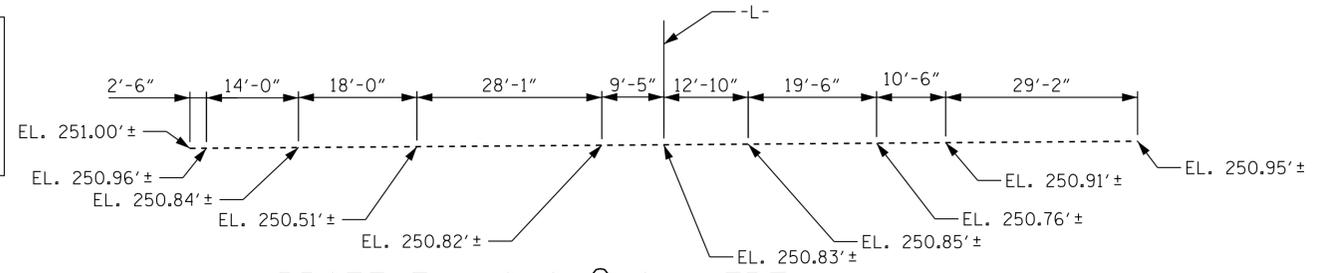
CLASS A CONCRETE			
BARREL @	1.075	CY/FT	154.8 C.Y.
WINGS ETC.			33.4 C.Y.
TOTAL			188.2 C.Y.
REINFORCING STEEL			
BARREL			18,884 LBS.
WINGS ETC.			2,010 LBS.
TOTAL			20,894 LBS.
CULVERT EXCAVATION STA. 198+61.03 -L-		LUMP SUM	
FOUNDATION CONDITIONING MATERIAL			127 TONS
CHANNEL EXCAVATION STA. 198+61.03 -L-			1,050 C.Y.

PROJECT NO. R-5705A
HARNETT COUNTY
 STATION: 198+61.03 -L-

SHEET 1 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

 SINGLE 7 FT. X 7 FT.
 CONCRETE BOX CULVERT
 60° SKEW



PROFILE ALONG CULVERT

ELEVATIONS TAKEN ALONG CENTERLINE CHANNEL



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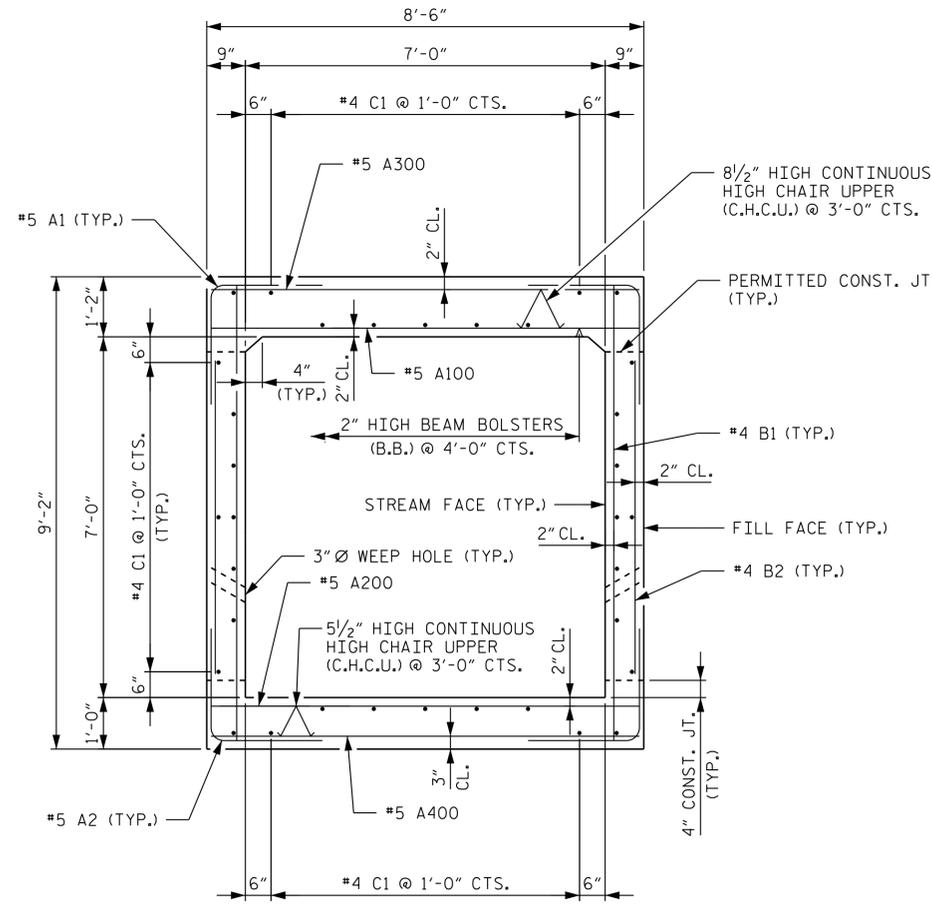
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-1
1			3			TOTAL SHEETS
2			4			6

CULVERT 42C002

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DRAWN BY: D. D. LOWERY DATE: 02/2022
 CHECKED BY: C. T. POOLE DATE: 02/2022
 DESIGN ENGINEER OF RECORD: S. A. DENNEY DATE: 02/2022

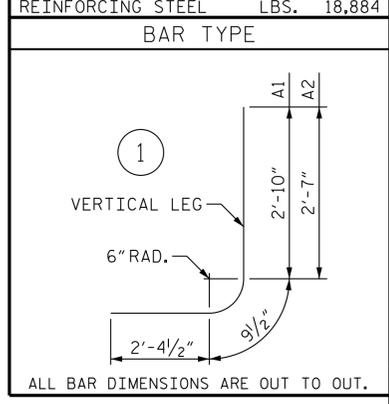
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RIGHT ANGLE SECTION OF BARREL
THERE ARE 34 C1 BARS IN SECTION OF BARREL

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

BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	384	5	1	6'-0"	2,403
A2	384	5	1	5'-9"	2,303
A100	186	5	STR	8'-2"	1,584
A101	2	5	STR	6'-11"	14
A102	2	5	STR	5'-8"	12
A103	2	5	STR	4'-4"	9
A104	6	5	STR	3'-1"	19
A200	186	5	STR	8'-2"	1,584
A201	2	5	STR	6'-11"	14
A202	2	5	STR	5'-8"	12
A203	2	5	STR	4'-4"	9
A204	6	5	STR	3'-1"	19
A300	186	5	STR	8'-2"	1,584
A301	2	5	STR	6'-11"	14
A302	2	5	STR	5'-8"	12
A303	2	5	STR	4'-4"	9
A304	6	5	STR	3'-1"	19
A400	186	5	STR	8'-2"	1,584
A401	2	5	STR	6'-11"	14
A402	2	5	STR	5'-8"	12
A403	2	5	STR	4'-4"	9
A404	6	5	STR	3'-1"	19
B1	384	4	STR	8'-9"	2,244
B2	384	4	STR	6'-4"	1,625
C1	136	4	STR	37'-9"	3,430
G1	4	4	STR	9'-5"	25
S1	12	8	STR	9'-5"	302
REINFORCING STEEL				LBS.	18,884



PROJECT NO. R-5705A
HARNETT COUNTY
STATION: 198+61.03 -L-

SHEET 2 OF 6



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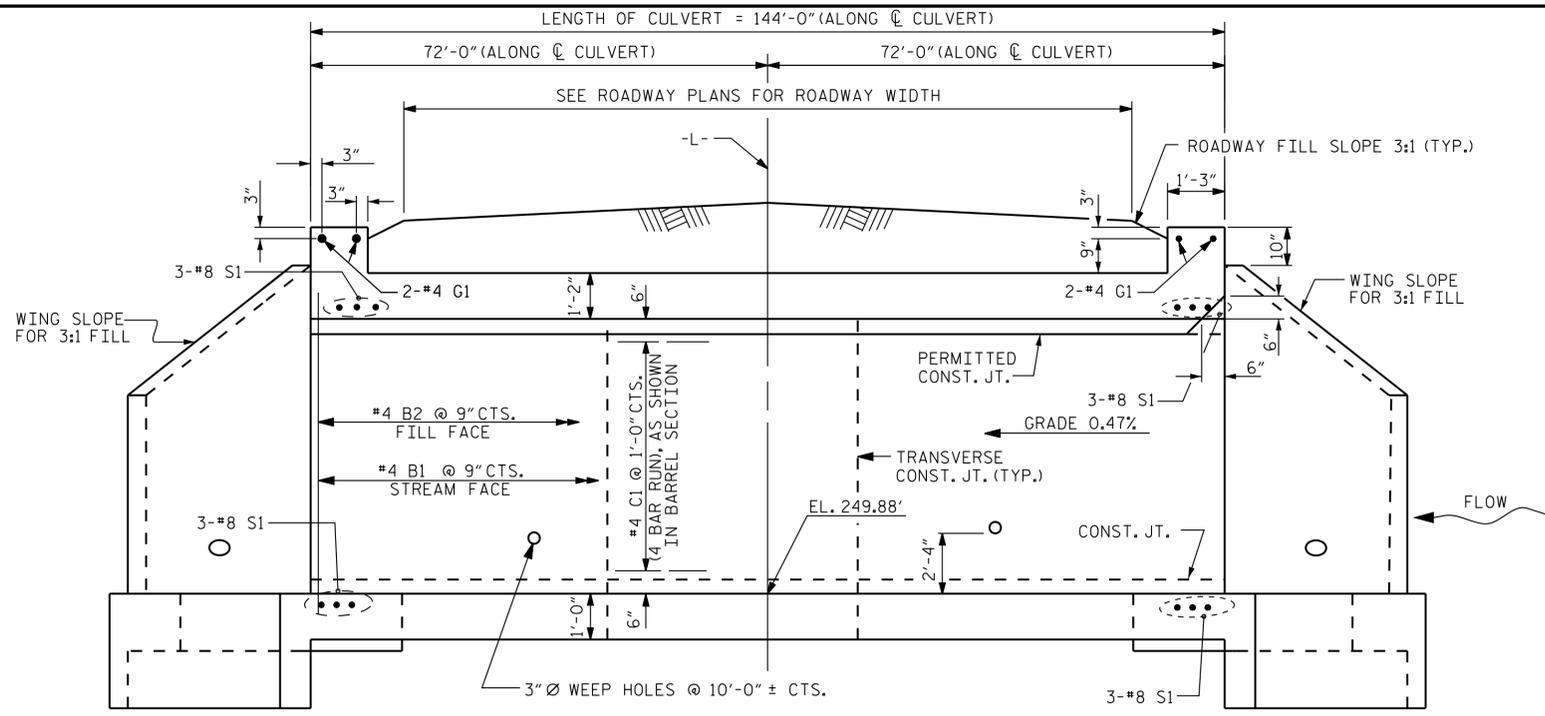
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
**SINGLE 7 FT. X 7 FT.
CONCRETE BOX CULVERT
60° SKEW**

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

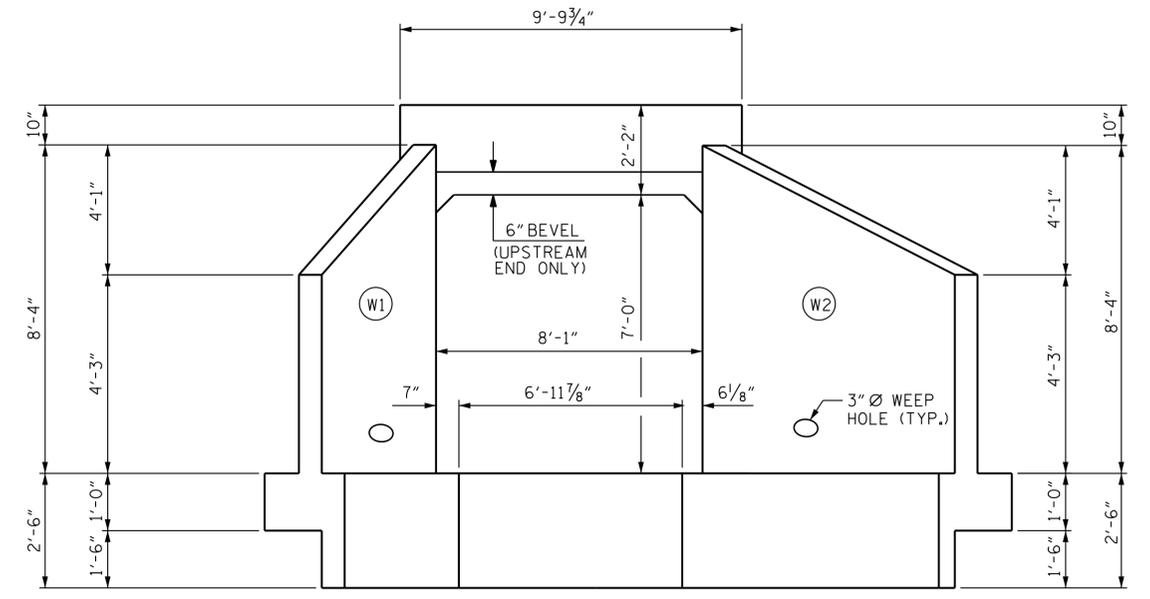
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CHECKED BY: C. I. POOLE DATE: 02/2022
DESIGN ENGINEER OF RECORD: S. A. DENNEY DATE: 02/2022

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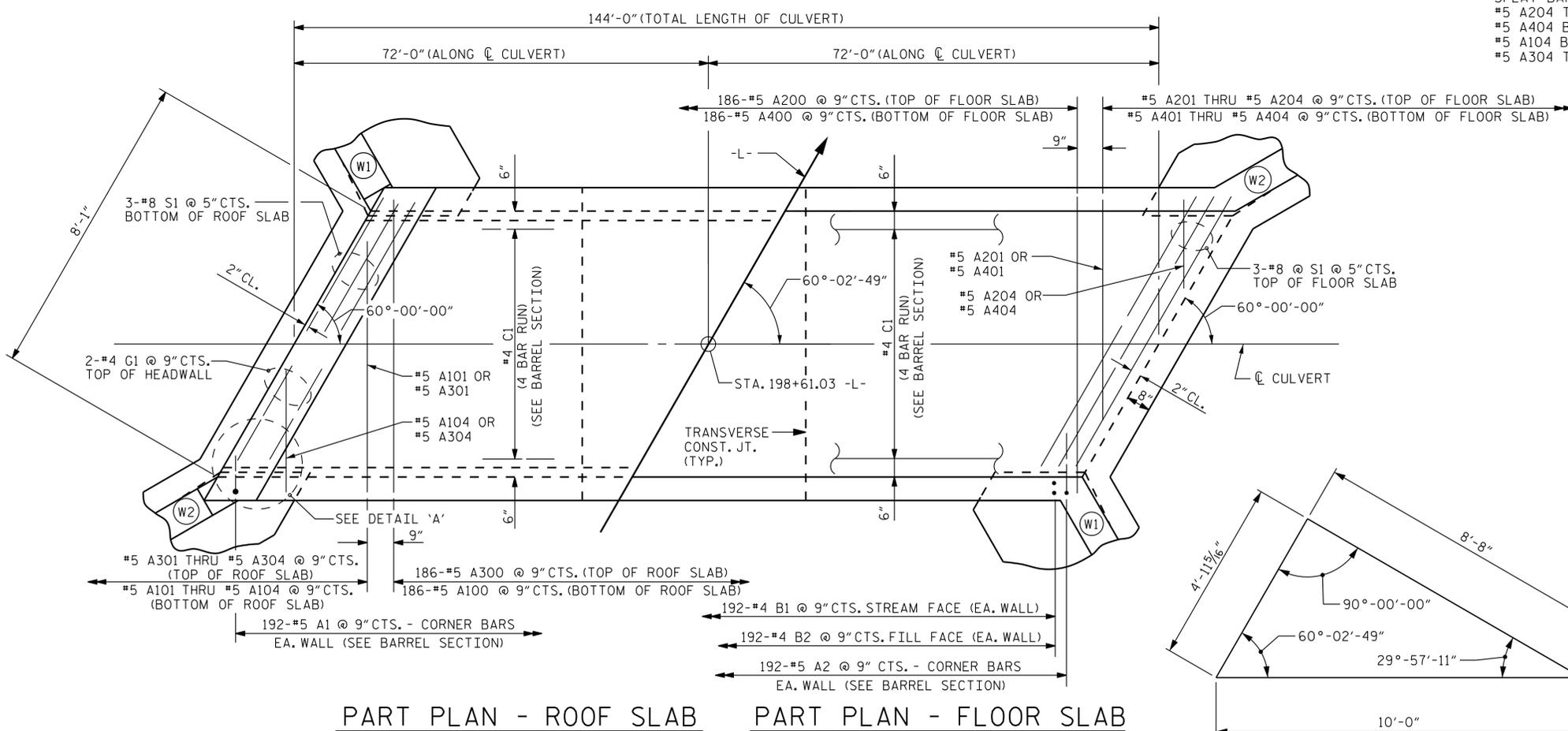
CULVERT 42C002



CULVERT SECTION NORMAL TO ROADWAY

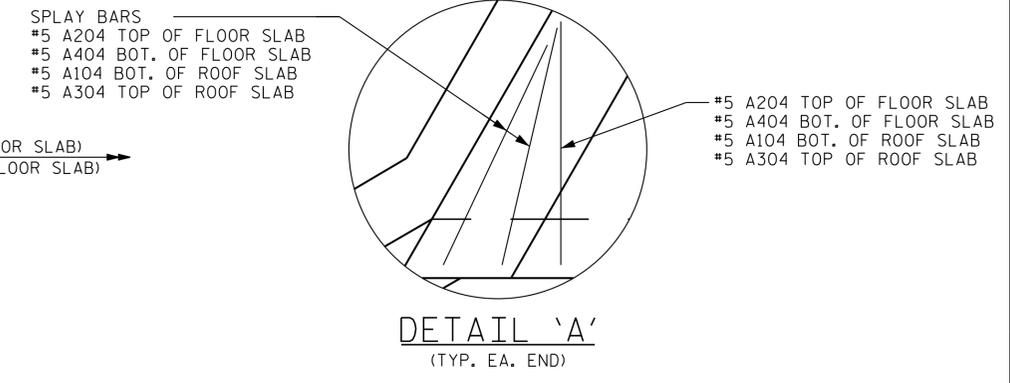


END ELEVATION NORMAL TO SKEW

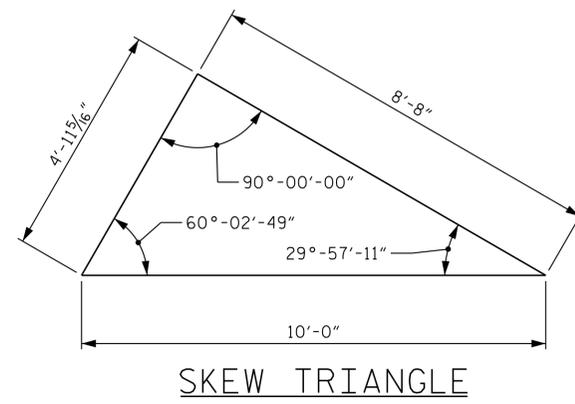


PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB



DETAIL 'A'
(TYP. EA. END)



SKEW TRIANGLE

PROJECT NO. R-5705A
HARNETT COUNTY
 STATION: 198+61.03 -L-
 SHEET 3 OF 6



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 DEPARTMENT OF TRANSPORTATION
 RALEIGH
**SINGLE 7 FT. X 7 FT.
 CONCRETE BOX CULVERT
 60° SKEW**

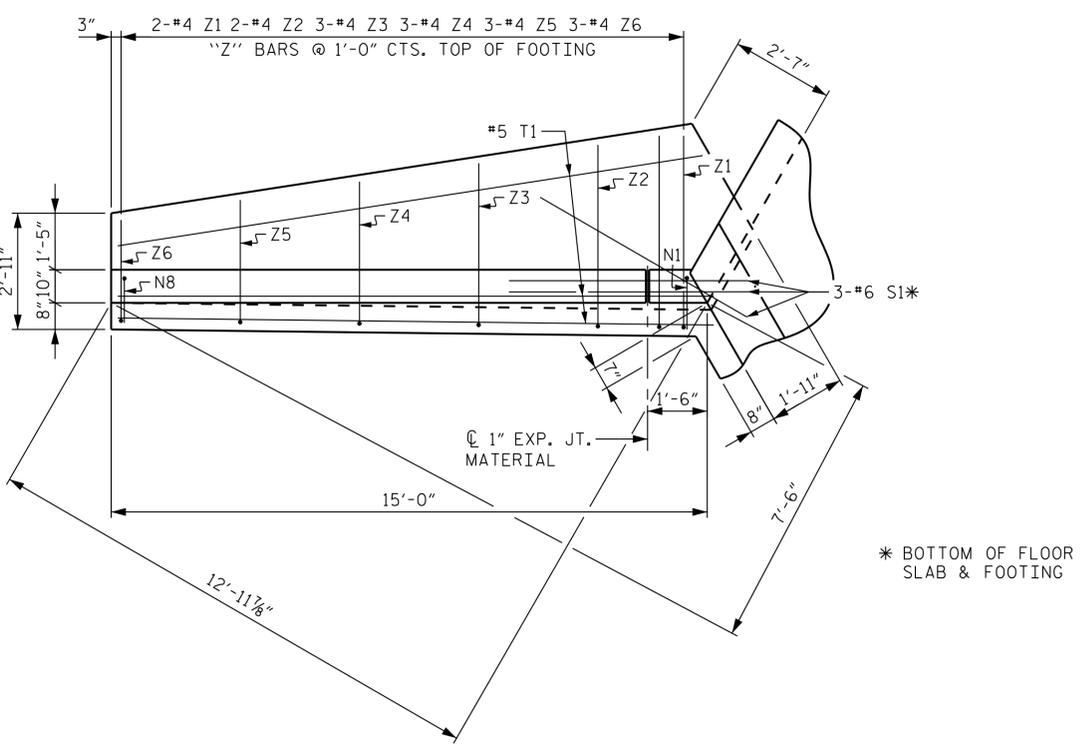
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NO.	BY:	DATE:	NO.	BY:	DATE:	C2-3
1			3			TOTAL SHEETS
2			4			6

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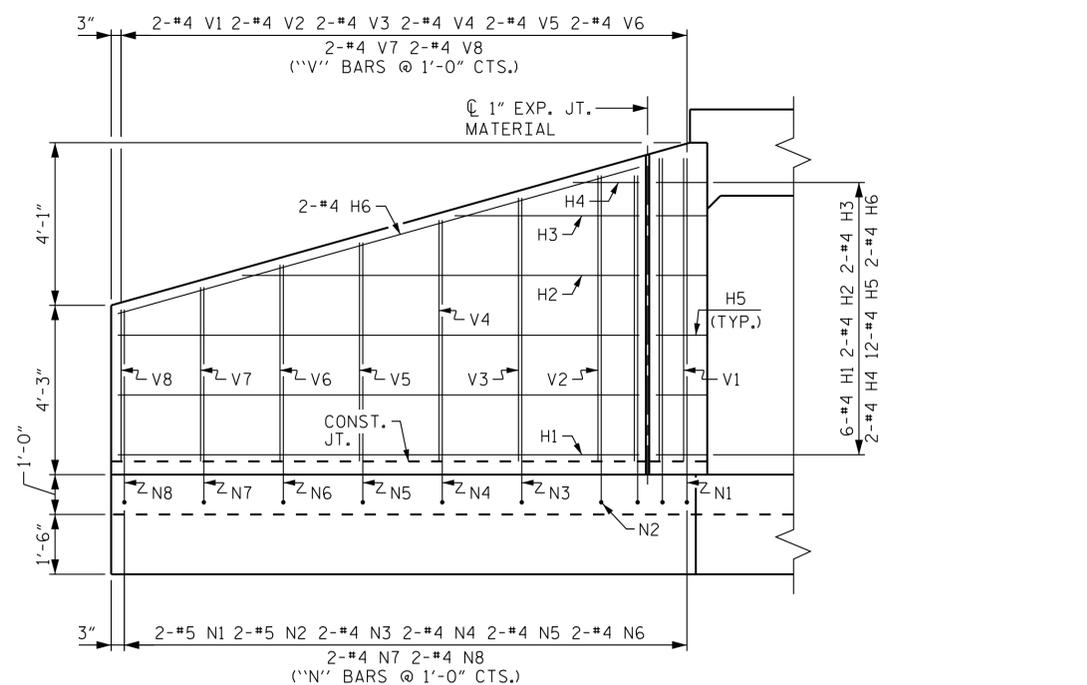
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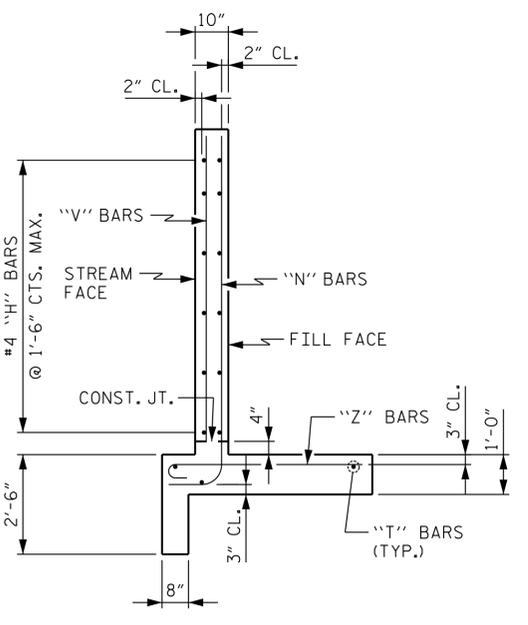
DRAWN BY: D. D. LOWERY DATE: 02/2022
 CHECKED BY: C. T. POOLE DATE: 02/2022
 DESIGN ENGINEER OF RECORD: S. A. DENNEY DATE: 02/2022



PLAN W1



ELEVATION W1

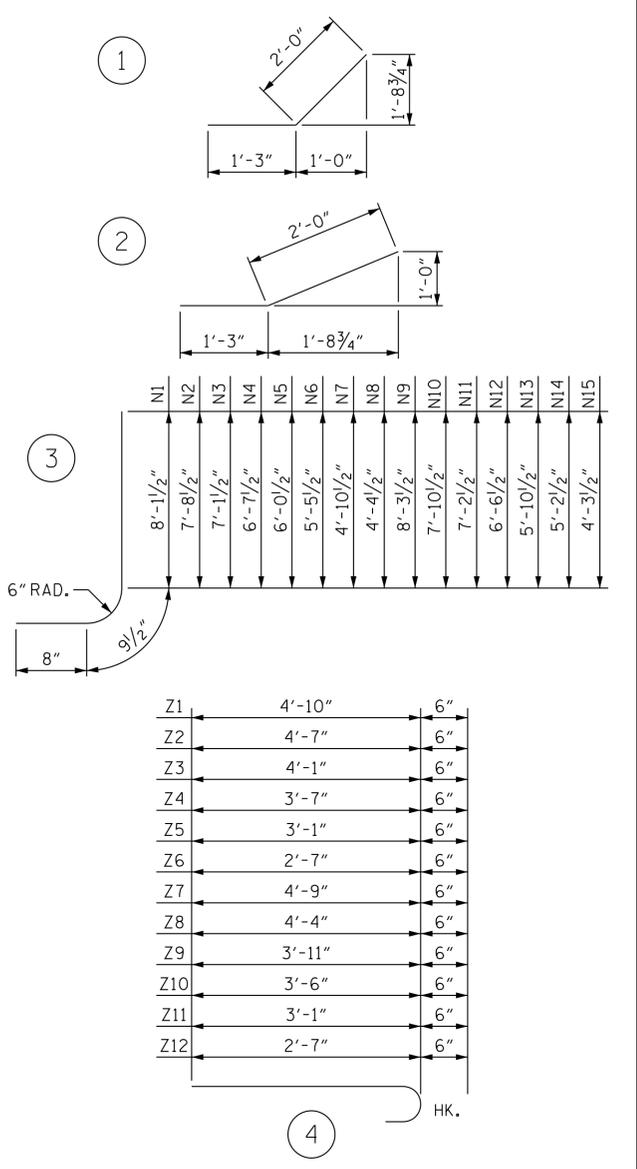


TYPICAL WING SECTION

BILL OF MATERIAL											
BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	4	STR	13'-1"	105	V1	4	4	STR	7'-7"	20
H2	4	4	STR	9'-11"	26	V2	4	4	STR	7'-2"	19
H3	4	4	STR	4'-7"	12	V3	4	4	STR	6'-7"	18
H4	4	4	STR	1'-8"	4	V4	4	4	STR	6'-0"	16
H5	24	4	1	3'-3"	52	V5	4	4	STR	5'-5"	14
H6	4	4	STR	13'-7"	36	V6	4	4	STR	4'-11"	13
H7	12	4	STR	22'-10"	183	V7	4	4	STR	4'-4"	12
H8	4	4	STR	17'-7"	47	V8	4	4	STR	3'-9"	10
H9	4	4	STR	8'-9"	23	V9	4	4	STR	7'-9"	21
H10	4	4	STR	2'-5"	6	V10	6	4	STR	7'-4"	29
H11	24	4	2	3'-3"	52	V11	8	4	STR	6'-8"	36
H12	4	4	STR	23'-2"	62	V12	8	4	STR	6'-0"	32
						V13	8	4	STR	5'-3"	28
N1	4	5	3	9'-7"	40	V14	8	4	STR	4'-7"	24
N2	4	5	3	9'-2"	38	V15	10	4	STR	3'-9"	25
N3	4	4	3	8'-7"	23						
N4	4	4	3	8'-1"	22	Z1	4	4	4	5'-4"	14
N5	4	4	3	7'-6"	20	Z2	4	4	4	5'-1"	14
N6	4	4	3	6'-11"	18	Z3	6	4	4	4'-7"	18
N7	4	4	3	6'-4"	17	Z4	6	4	4	4'-1"	16
N8	4	4	3	5'-10"	16	Z5	6	4	4	3'-7"	14
N9	4	5	3	9'-9"	41	Z6	6	4	4	3'-1"	12
N10	6	5	3	9'-4"	58	Z7	10	4	4	5'-3"	35
N11	8	4	3	8'-8"	46	Z8	8	4	4	4'-10"	26
N12	8	4	3	8'-0"	43	Z9	8	4	4	4'-5"	24
N13	8	4	3	7'-4"	39	Z10	8	4	4	4'-0"	21
N14	8	4	3	6'-8"	36	Z11	8	4	4	3'-7"	19
N15	10	4	3	5'-9"	38	Z12	10	4	4	3'-1"	21
S1	12	6	STR	6'-0"	108						
T1	6	5	STR	14'-10"	93						
T2	6	5	STR	24'-9"	155						

REINFORCING STEEL FOR 4 WINGS 2,010 LBS
 CLASS A CONCRETE
 4 WINGS 31.6 CY
 2 HEADWALLS 0.9 CY
 2 END CURTAIN WALL 0.9 CY
 TOTAL 33.4 CY

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT.

PROJECT NO. R-5705A
 HARNETT COUNTY
 STATION: 198+61.03 -L-

SHEET 4 OF 6



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 421 Fayetteville Street, Suite 600
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 Phone (919) 677-2000 NC LICENSE # F-0102

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

WING DETAILS FOR CONCRETE BOX CULVERT
 H = 7'-0" SLOPE = 3:1
 60° SKEW

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

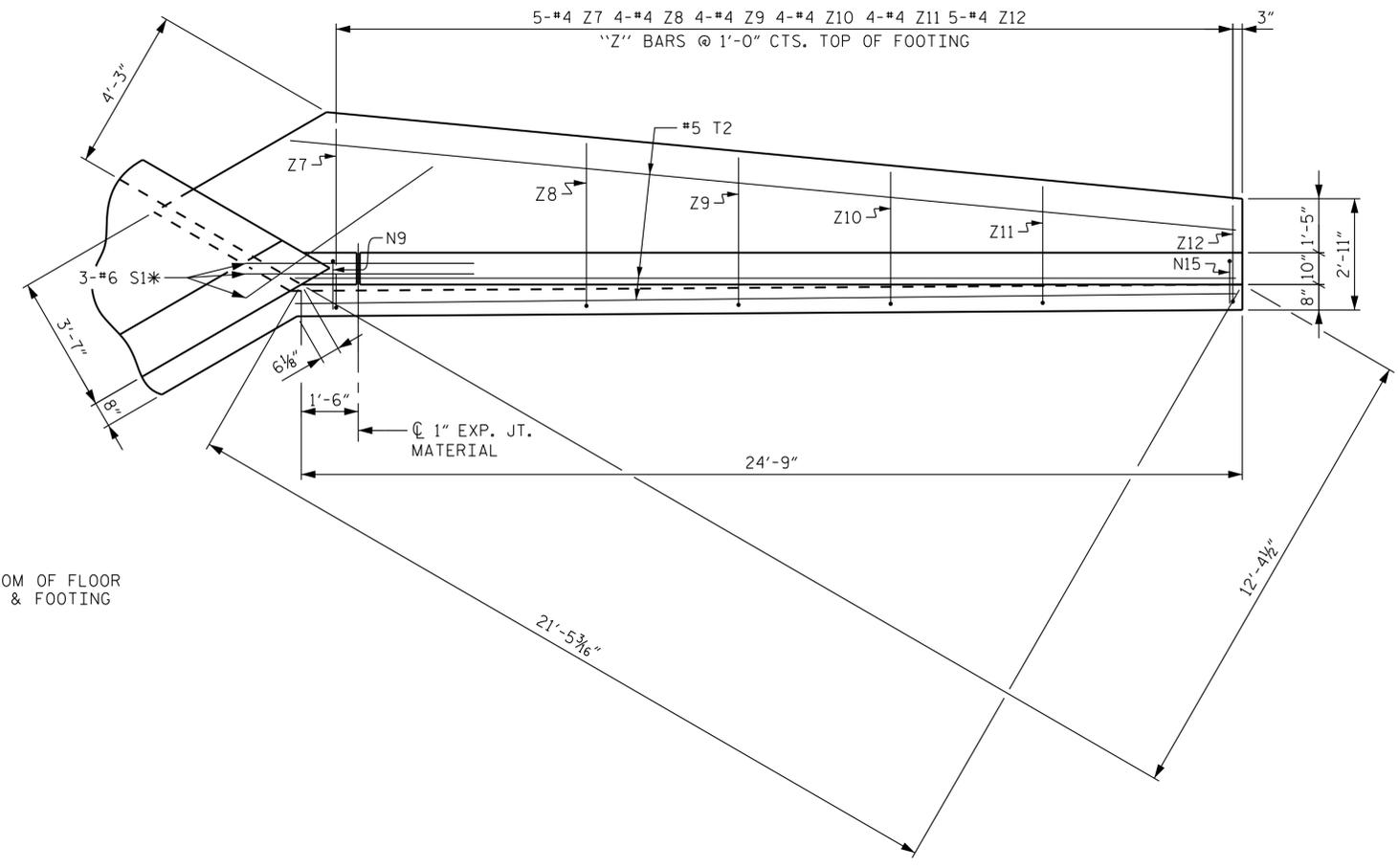
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CULVERT 42C002

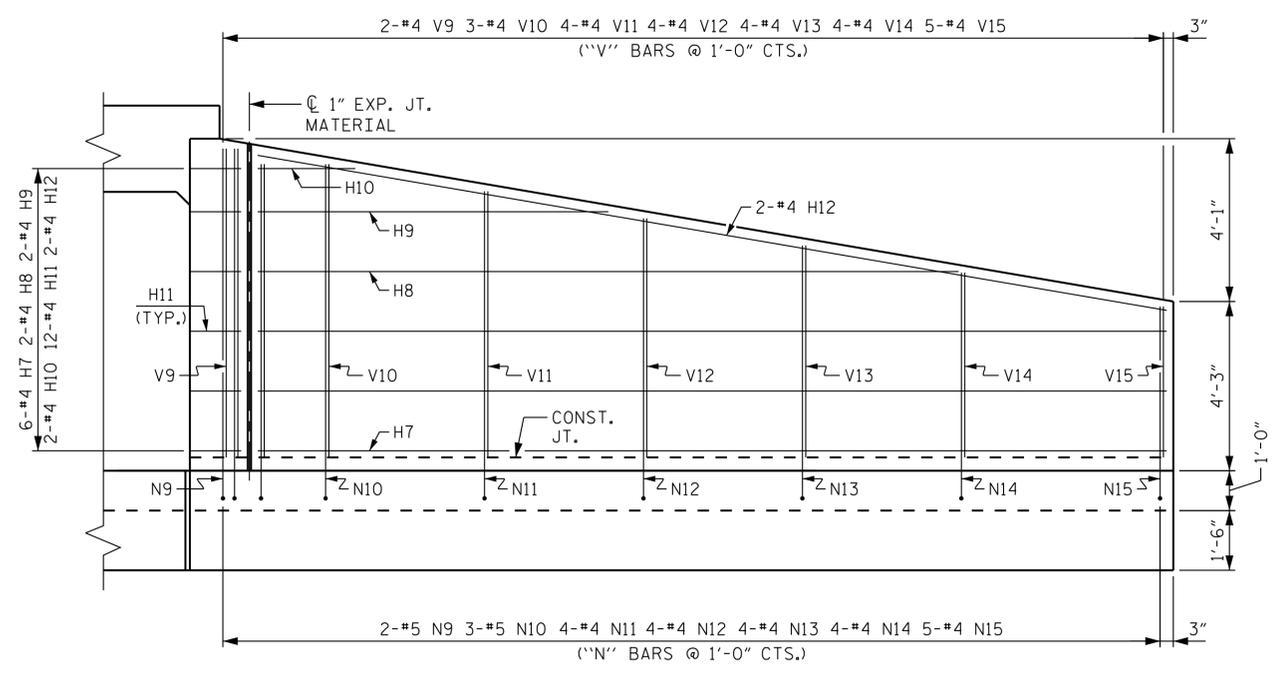
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DRAWN BY: D. D. LOWERY DATE: 02/2022
 CHECKED BY: C. I. POOLE DATE: 02/2022
 DESIGN ENGINEER OF RECORD: S. A. DENNEY DATE: 02/2022



* BOTTOM OF FLOOR SLAB & FOOTING

PLAN W2



ELEVATION W2

PROJECT NO. R-5705A
HARNETT COUNTY
 STATION: 198+61.03 -L-

SHEET 5 OF 6



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

WING DETAILS FOR
 CONCRETE BOX CULVERT
 H = 7'-0" SLOPE = 3:1
 60° SKEW

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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 _{L1})	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	1.05	--	1.75	1.05	1	TOP SLAB	4.25	1.52	1	TOP SLAB	7.75		
	HL-93 (OPERATING)	N/A		1.36	--	1.35	1.36	1	TOP SLAB	4.25	1.97	1	TOP SLAB	7.75		
	HS-20 (INVENTORY)	36,000	②	1.11	39.96	1.75	1.11	1	TOP SLAB	4.25	1.65	1	TOP SLAB	7.75		
	HS-20 (OPERATING)	36,000		1.44	51.84	1.35	1.44	1	TOP SLAB	4.25	2.14	1	TOP SLAB	7.75		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13,500		2.43	32.81	1.40	2.43	1	TOP SLAB	4.25	5.23	1	TOP SLAB	7.75	
		SNGARBS2	20,000		2.27	45.40	1.40	2.27	1	TOP SLAB	4.25	4.77	1	TOP SLAB	7.75	
		SNAGRIS2	22,000		2.43	53.46	1.40	2.43	1	TOP SLAB	4.25	5.23	1	TOP SLAB	7.75	
		SNCOTTS3	27,250	③	1.71	46.60	1.40	1.71	1	BOTTOM SLAB	4.25	2.96	1	TOP SLAB	7.75	
		SNAGGRS4	34,925		2.25	78.58	1.40	2.25	1	BOTTOM SLAB	4.25	4.38	1	TOP SLAB	7.75	
		SNS5A	35,550		2.04	72.52	1.40	2.04	1	BOTTOM SLAB	4.25	3.80	1	TOP SLAB	7.75	
		SNS6A	39,950		2.04	81.50	1.40	2.04	1	BOTTOM SLAB	4.25	3.80	1	TOP SLAB	0.75	
		SNS7B	42,000		2.04	85.68	1.40	2.04	1	BOTTOM SLAB	4.25	3.79	1	TOP SLAB	0.75	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33,000		2.43	80.19	1.40	2.43	1	TOP SLAB	4.25	5.21	1	TOP SLAB	7.75	
		TNT4A	33,075		2.04	67.47	1.40	2.04	1	BOTTOM SLAB	4.25	3.81	1	TOP SLAB	7.75	
		TNT6A	41,600		2.04	84.86	1.40	2.04	1	BOTTOM SLAB	4.25	3.81	1	TOP SLAB	7.75	
		TNT7A	42,000		2.04	85.68	1.40	2.04	1	BOTTOM SLAB	4.25	3.80	1	TOP SLAB	0.75	
		TNT7B	42,000		2.04	85.68	1.40	2.04	1	BOTTOM SLAB	4.25	3.83	1	TOP SLAB	7.75	
		TNAGRIT4	43,000		2.04	87.72	1.40	2.04	1	BOTTOM SLAB	4.25	3.80	1	TOP SLAB	7.75	
TNAGT5A	45,000		2.04	91.80	1.40	2.04	1	BOTTOM SLAB	4.25	3.80	1	TOP SLAB	7.75			
TNAGT5B	45,000		2.04	91.80	1.40	2.04	1	BOTTOM SLAB	4.25	3.79	1	TOP SLAB	0.75			

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

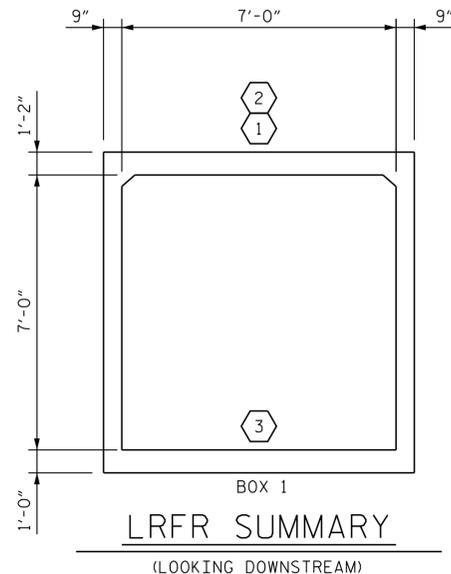
LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
LS	1.75	--
WA	1.00	--

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM THE EXTERIOR EDGE OF EXTERIOR WALL.

#	CONTROLLING LOAD RATING
①	DESIGN LOAD RATING (HL-93)
②	DESIGN LOAD RATING (HS-20)
③	LEGAL LOAD RATING **
	** SEE CHART FOR VEHICLE TYPE



PROJECT NO. R-5705A
HARNETT COUNTY
 STATION: 198+61.03 -L-

SHEET 6 OF 6



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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.
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1			3			TOTAL SHEETS
2			4			6

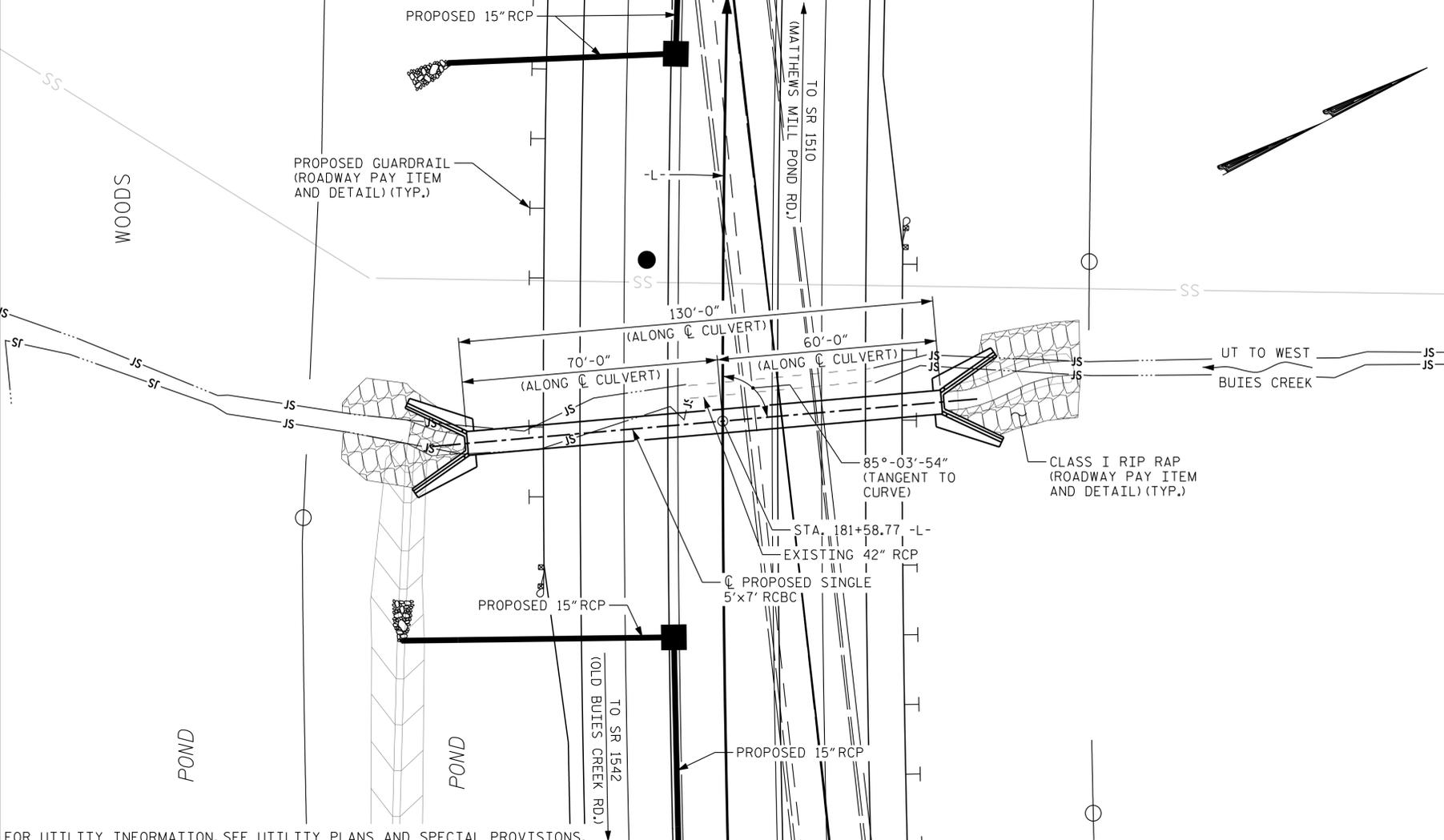
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ASSEMBLED BY : D. D. LOWERY	DATE : 02/2022
CHECKED BY : C. T. POOLE	DATE : 02/2022
DRAWN BY : WMC 7/11	REV. 10/1/11 MAA/GM
CHECKED BY : GM 7/11	REV. 12/17 MAA/THC

BENCHMARK: BM#9 -L- STA. 194+10.47, OFFSET 71.86' LEFT, EL. 260.58', BENCH NAIL IN BASE OF 24" PINE TREE



FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.

LOCATION SKETCH

NOTES

- ASSUMED LIVE LOAD -----HL-93 OR ALTERNATE LOADING
- DESIGN FILL ----- 5'-3" (MAX.), 2'-0" (MIN.)
- FOR OTHER DESIGN DATA AND GENERAL NOTES, SEE SHEET SN.
- 3"Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH NCDOT STANDARD SPECIFICATIONS.
- THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
- CONCRETE IN THE 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 ROOF SLAB AND HEADWALLS.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON THE WING SHEETS.
- AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACES OF THE EXTERIOR WALLS ABOVE THE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT POURS TO A MAXIMUM OF 70 FEET. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
- A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
- AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAIL DRAWINGS FOR A PRECAST REINFORCED CONCRETE BOX CULVERT IN LIEU OF THE CAST-IN-PLACE CULVERT SHOWN ON THE PLANS. THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIONAL PRECAST REINFORCED CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.
- CULVERT BARREL SHALL BE BACKFILLED WITH NATIVE MATERIAL TO BURY DEPTH OF 1.0 FT. 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 REINFORCED CONCRETE BOX CULVERT SHALL BE PLACED ON THE STANDARD 1.0 FT. BLANKET OF FOUNDATION CONDITIONING MATERIAL. SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.
- FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
- FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
- FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
- FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

HYDRAULIC DATA

DESIGN DISCHARGE -----210 CFS
 FREQUENCY OF DESIGN FLOOD -----50 YR.
 DESIGN HIGH WATER ELEVATION-----253.1 FT.
 DRAINAGE AREA -----0.35 SQ. MI.
 BASE DISCHARGE (Q100) -----230 CFS
 BASE HIGH WATER ELEVATION -----253.5 FT.

OVERTOPPING FLOOD DATA

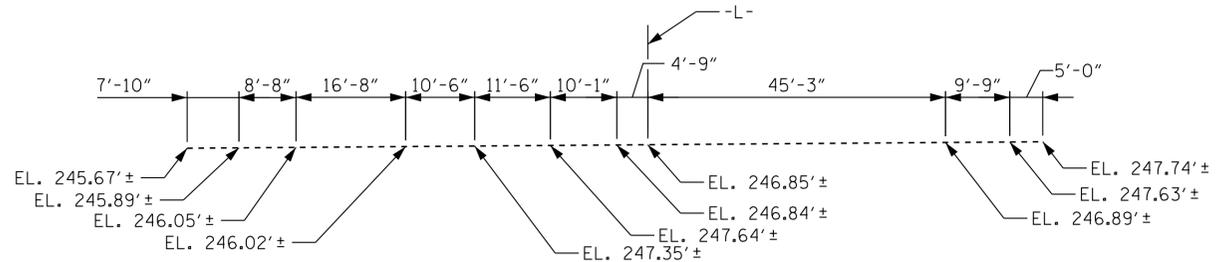
OVERTOPPING DISCHARGE -----390 CFS
 FREQUENCY OF OVERTOPPING FLOOD ---->500 YR.
 OVERTOPPING FLOOD ELEVATION -----257.9 FT.
 OVERTOPPING OCCURS AT SAG
 MEDIAN CREST ELEV. AT STA. 182+58 -L-

ROADWAY DATA

GRADE POINT EL. @ STA. 181+58.77 -L- = 256.93'
 BED ELEVATION @ STA. 181+58.77 -L- = 245.26'
 ROADWAY SLOPES 3 : 1

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
BARREL @ 0.834 CY/FT	108.5 C.Y.
WINGS ETC.	28.6 C.Y.
TOTAL	137.1 C.Y.
REINFORCING STEEL	
BARREL	14,926 LBS.
WINGS ETC.	1,745 LBS.
TOTAL	16,671 LBS.
CULVERT EXCAVATION STA. 181+58.77 -L-	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	97 TONS
CHANNEL EXCAVATION STA. 181+58.77 -L-	10 C.Y.



PROFILE ALONG CULVERT

ELEVATIONS TAKEN ALONG CENTERLINE CHANNEL



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 STATION: 181+58.77 -L-

SHEET 1 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 5 FT. X 7 FT.
 CONCRETE BOX CULVERT
 85° SKEW

REVISIONS						SHEET NO. C3-1
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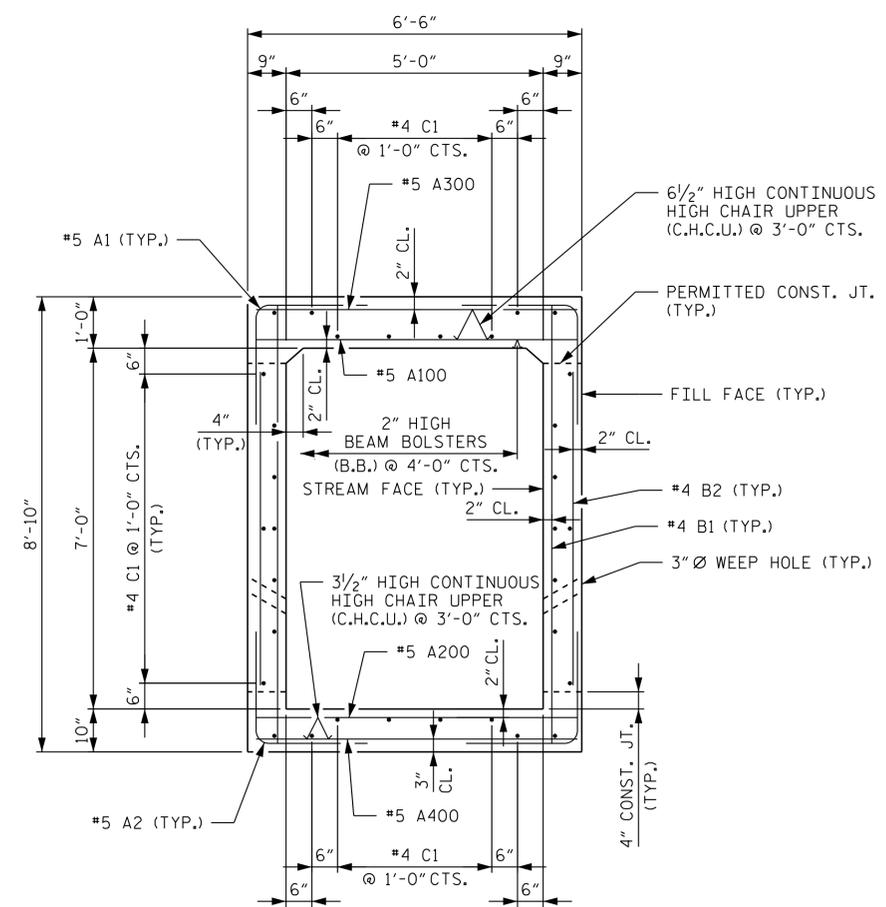
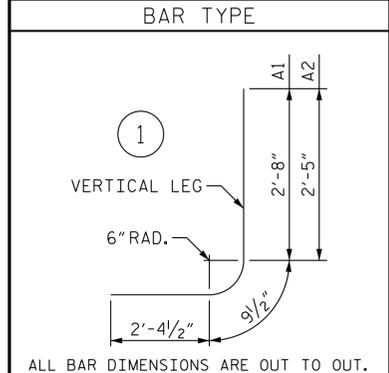
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 CHECKED BY: C. I. POOLE DATE: 02/2022
 DESIGN ENGINEER OF RECORD: S. A. DENNEY DATE: 02/2022

BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	346	5	1	5'-10"	2,105
A2	346	5	1	5'-7"	2,015
A100	173	5	STR	6'-2"	1,113
A200	173	5	STR	6'-2"	1,113
A300	173	5	STR	6'-2"	1,113
A400	173	5	STR	6'-2"	1,113
B1	346	4	STR	8'-5"	1,945
B2	346	4	STR	6'-4"	1,464
C1	128	4	STR	34'-3"	2,929
G1	4	4	STR	6'-2"	16

REINFORCING STEEL LBS. 14,926



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

RIGHT ANGLE SECTION OF BARREL
THERE ARE 32 C1 BARS IN SECTION OF BARREL

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HARNETT COUNTY
 STATION: 181+58.77 -L-

SHEET 2 OF 5

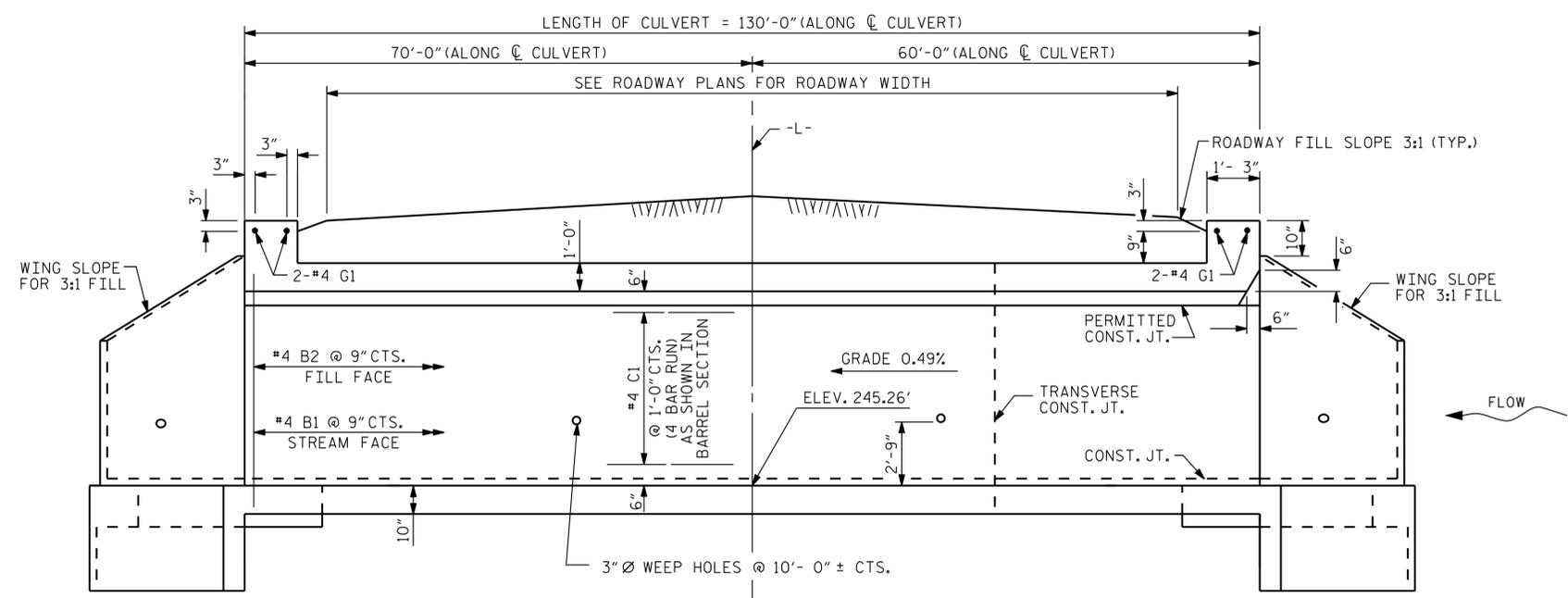
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 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 5 FT. X 7 FT.
 CONCRETE BOX CULVERT
 85° SKEW

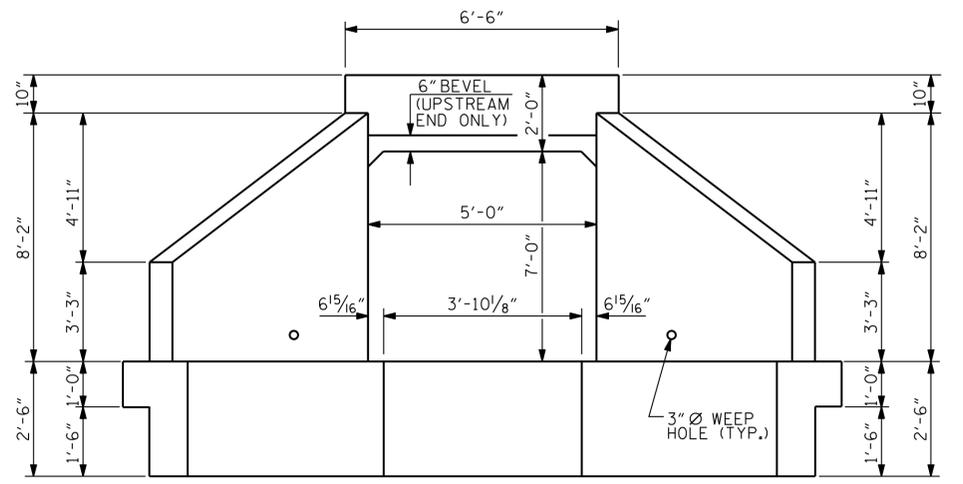
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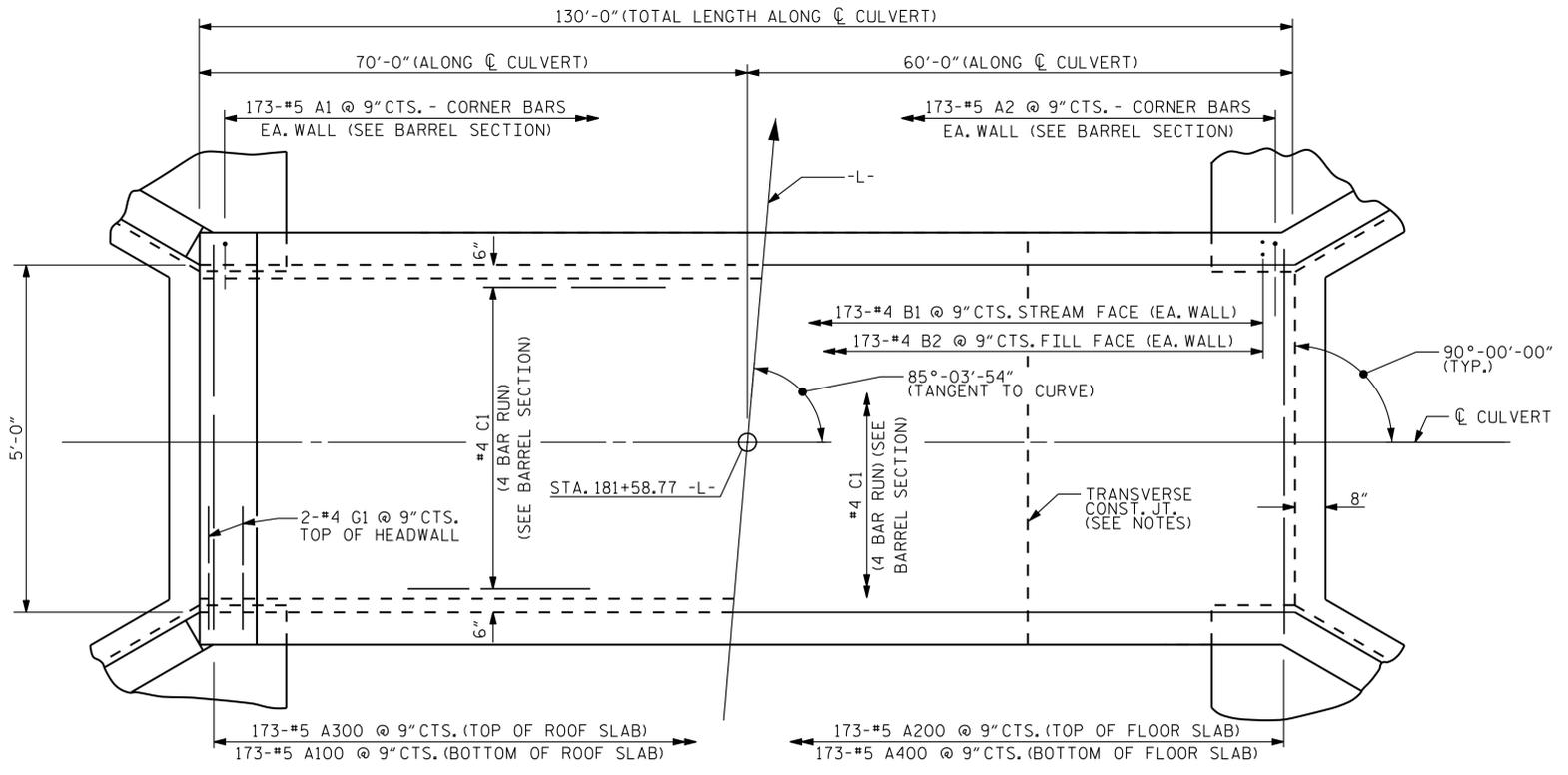
CULVERT 42C003



CULVERT SECTION NORMAL TO ROADWAY

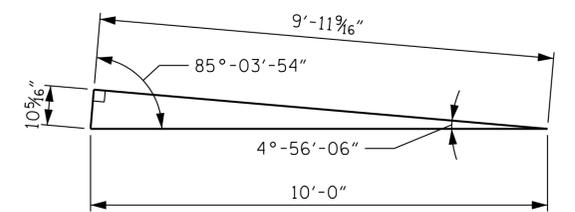


END ELEVATION NORMAL TO SKEW



PART PLAN ROOF SLAB

PART PLAN FLOOR SLAB



SKEW TRIANGLE

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HARNETT COUNTY
 STATION: 181+58.77 -L-

SHEET 3 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 5 FT. X 7 FT.
 CONCRETE BOX CULVERT
 85° SKEW



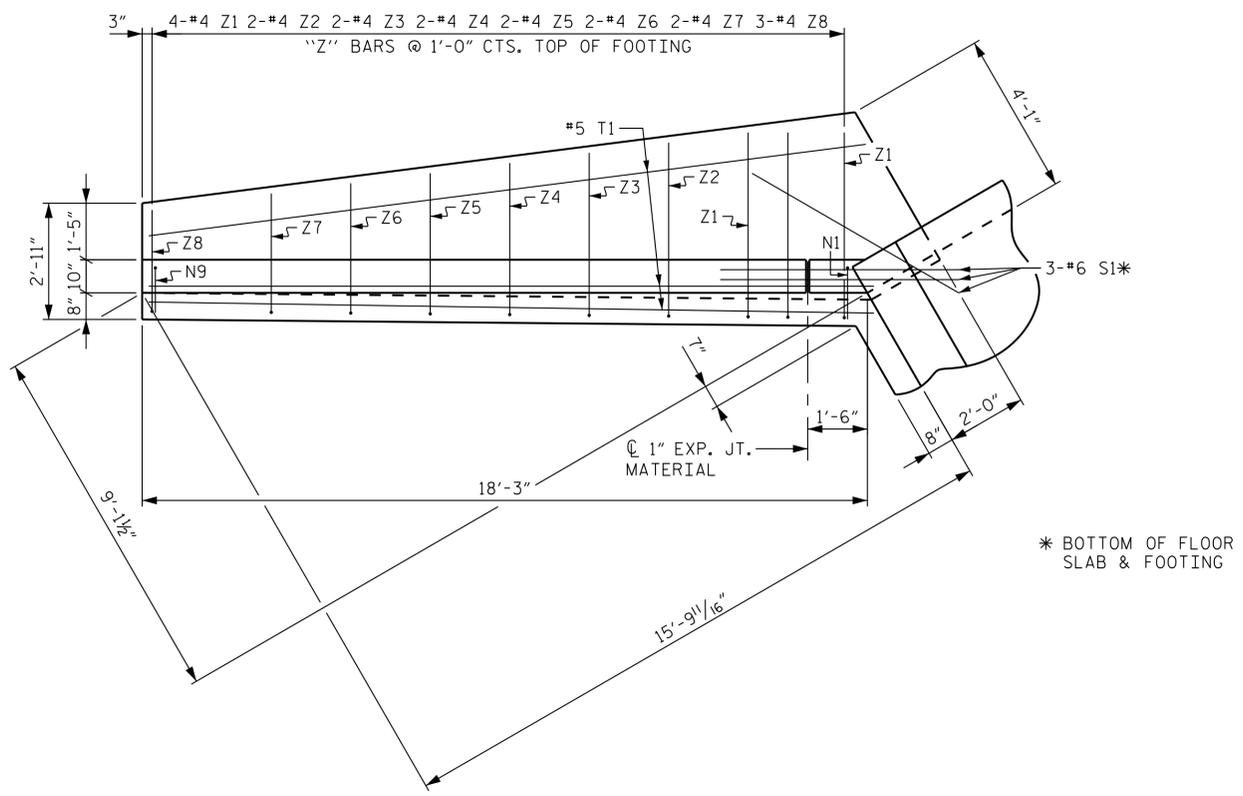
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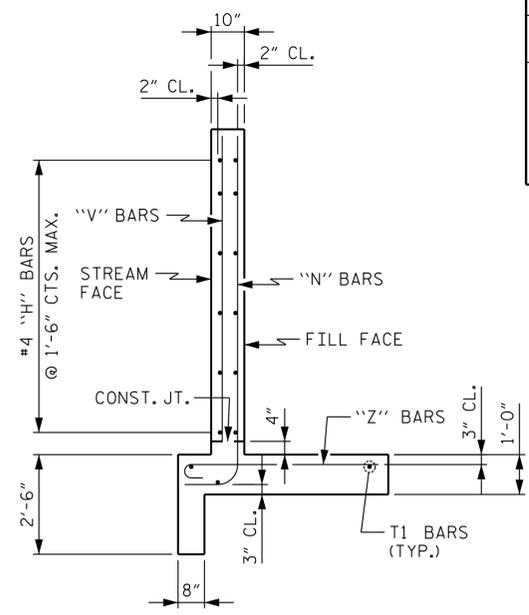
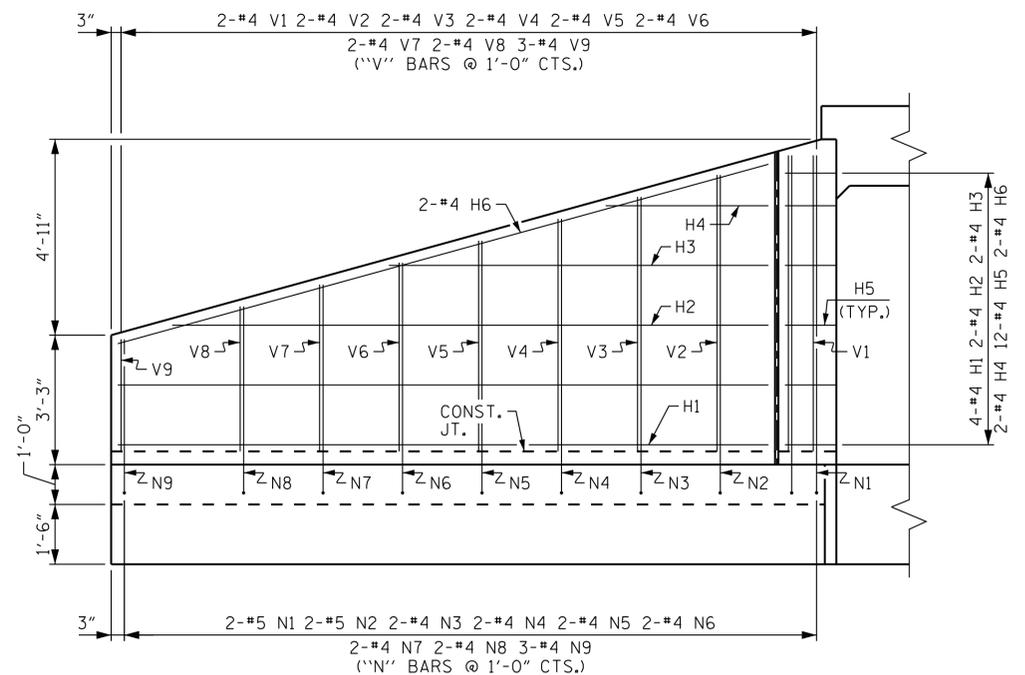
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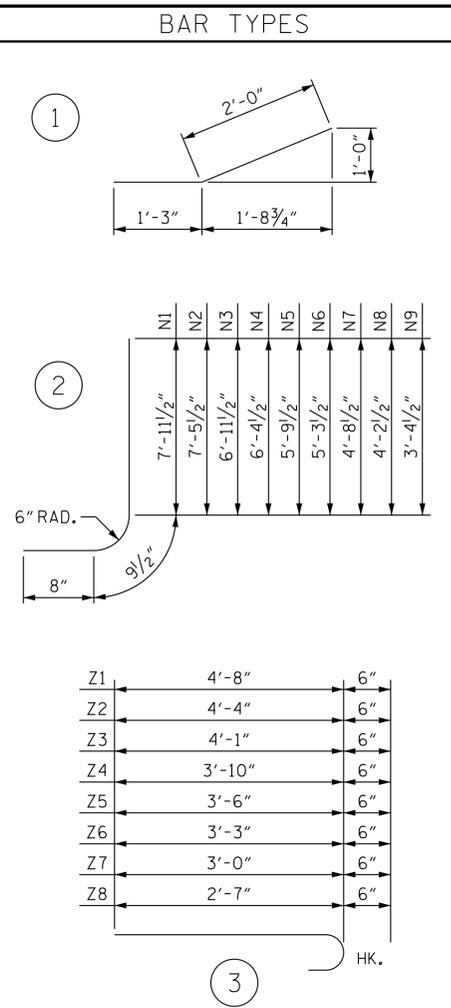
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 CHECKED BY: C. T. POOLE DATE: 02/2022
 DESIGN ENGINEER OF RECORD: S. A. DENNEY DATE: 02/2022



* BOTTOM OF FLOOR SLAB & FOOTING



BILL OF MATERIAL					
BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	16	4	STR	16'-4"	175
H2	8	4	STR	15'-0"	80
H3	8	4	STR	9'-6"	51
H4	8	4	STR	4'-1"	22
H5	48	4	1	3'-3"	104
H6	8	4	STR	16'-11"	90
N1	8	5	2	9'-5"	79
N2	8	5	2	8'-11"	74
N3	8	4	2	8'-5"	45
N4	8	4	2	7'-10"	42
N5	8	4	2	7'-3"	39
N6	8	4	2	6'-9"	36
N7	8	4	2	6'-2"	33
N8	8	4	2	5'-8"	30
N9	12	4	2	4'-10"	39
S1	12	6	STR	6'-0"	108
T1	12	5	STR	18'-2"	227
V1	8	4	STR	7'-5"	40
V2	8	4	STR	6'-11"	37
V3	8	4	STR	6'-4"	34
V4	8	4	STR	5'-10"	31
V5	8	4	STR	5'-3"	28
V6	8	4	STR	4'-8"	25
V7	8	4	STR	4'-2"	22
V8	8	4	STR	3'-7"	19
V9	12	4	STR	2'-9"	22
Z1	16	4	3	5'-2"	55
Z2	8	4	3	4'-10"	26
Z3	8	4	3	4'-7"	24
Z4	8	4	3	4'-4"	23
Z5	8	4	3	4'-0"	21
Z6	8	4	3	3'-9"	20
Z7	8	4	3	3'-6"	19
Z8	12	4	3	3'-1"	25
REINFORCING STEEL FOR 4 WINGS					1,745 LBS
CLASS A CONCRETE					
4 WINGS					27.5 CY
2 HEADWALL					0.6 CY
2 END CURTAIN WALL					0.5 CY
TOTAL					28.6 CY



ALL BAR DIMENSIONS ARE OUT TO OUT.

PROJECT NO. R-5705A
HARNETT COUNTY
 STATION: 181+58.77 -L-

SHEET 4 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

WING DETAILS FOR CONCRETE BOX CULVERT
 H = 7'-0" SLOPE = 3:1
 90° SKEW



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1			3			TOTAL SHEETS
2			4			5

CULVERT 42C003

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 8/9/2023

DRAWN BY: D. D. LOWERY DATE: 02/2022
 CHECKED BY: C. I. POOLE DATE: 02/2022
 DESIGN ENGINEER OF RECORD: S. A. DENNEY DATE: 02/2022

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 _{L1})	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	1.26	--	1.75	1.26	1	TOP SLAB	3.25	1.44	1	TOP SLAB	5.75		
	HL-93 (OPERATING)	N/A		1.64	--	1.35	1.64	1	TOP SLAB	3.25	1.86	1	TOP SLAB	5.75		
	HS-20 (INVENTORY)	36.000	②	1.32	47.52	1.75	1.32	1	TOP SLAB	3.25	1.53	1	TOP SLAB	5.75		
	HS-20 (OPERATING)	36.000		1.71	61.56	1.35	1.71	1	TOP SLAB	3.25	1.98	1	TOP SLAB	5.75		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		2.89	39.02	1.40	2.89	1	TOP SLAB	3.25	4.87	1	TOP SLAB	0.75	
		SNGARBS2	20.000		2.70	54.00	1.40	2.70	1	TOP SLAB	3.25	4.44	1	TOP SLAB	0.75	
		SNAGRIS2	22.000		2.89	63.58	1.40	2.89	1	TOP SLAB	3.25	4.87	1	TOP SLAB	0.75	
		SNCOTTS3	27.250	③	2.18	59.41	1.40	2.18	1	BOTTOM SLAB	3.25	2.98	1	BOTTOM SLAB	0.75	
		SNAGGRS4	34.925		2.87	100.23	1.40	2.87	1	BOTTOM SLAB	3.25	4.24	1	BOTTOM SLAB	0.75	
		SNS5A	35.550		2.60	92.43	1.40	2.60	1	BOTTOM SLAB	3.25	3.74	1	BOTTOM SLAB	0.75	
		SNS6A	39.950		2.60	103.87	1.40	2.60	1	BOTTOM SLAB	3.25	3.74	1	BOTTOM SLAB	0.75	
		SNS7B	42.000		2.60	109.20	1.40	2.60	1	BOTTOM SLAB	3.25	3.74	1	BOTTOM SLAB	0.75	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		2.89	95.37	1.40	2.89	1	TOP SLAB	3.25	4.87	1	TOP SLAB	0.75	
		TNT4A	33.075		2.60	86.00	1.40	2.60	1	BOTTOM SLAB	3.25	3.74	1	BOTTOM SLAB	0.75	
		TNT6A	41.600		2.60	108.16	1.40	2.60	1	BOTTOM SLAB	3.25	3.74	1	BOTTOM SLAB	0.75	
		TNT7A	42.000		2.60	109.20	1.40	2.60	1	BOTTOM SLAB	3.25	3.74	1	BOTTOM SLAB	0.75	
		TNT7B	42.000		2.60	109.20	1.40	2.60	1	BOTTOM SLAB	3.25	3.74	1	BOTTOM SLAB	0.75	
		TNAGRIT4	43.000		2.60	111.80	1.40	2.60	1	BOTTOM SLAB	3.25	3.74	1	BOTTOM SLAB	0.75	
TNAGT5A	45.000		2.60	117.00	1.40	2.60	1	BOTTOM SLAB	3.25	3.74	1	BOTTOM SLAB	0.75			
TNAGT5B	45.000		2.60	117.00	1.40	2.60	1	BOTTOM SLAB	3.25	3.74	1	BOTTOM SLAB	0.75			

LOAD FACTORS:

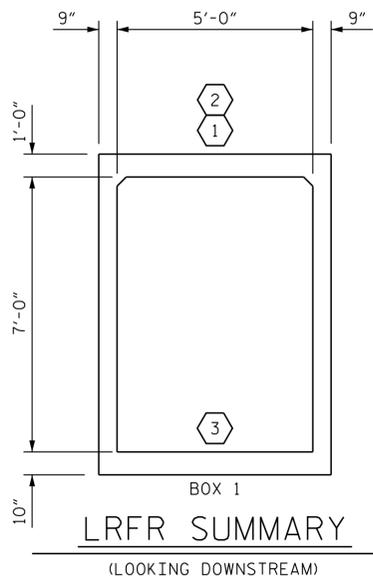
DESIGN LOAD RATING FACTORS

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.
DISTANCE FROM LEFT END OF ELEMENT IS GIVEN FROM THE EXTERIOR EDGE OF EXTERIOR WALL.

⑥	CONTROLLING LOAD RATING
①	DESIGN LOAD RATING (HL-93)
②	DESIGN LOAD RATING (HS-20)
③	LEGAL LOAD RATING **
**	SEE CHART FOR VEHICLE TYPE



PROJECT NO. R-5705A
HARNETT COUNTY
 STATION: 181+58.77 -L-

SHEET 5 OF 5



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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:	C3-5
①			③			TOTAL SHEETS
②			④			5

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 UNLESS ALL SIGNATURES COMPLETED**

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ASSEMBLED BY : D. D. LOWERY DATE : 02/2022
 CHECKED BY : C. T. POOLE DATE : 02/2022
 DRAWN BY : WMC 7/11 REV. 10/1/11 MAA/GM
 CHECKED BY : GM 7/11 REV. 12/17 MAA/THC

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 $\frac{3}{4}$ " WITH THE FOLLOWING EXCEPTIONS; TOP CORNERS OF CURBS MAY BE ROUNDED TO $1\frac{1}{2}$ " RADIUS WHICH IS BUILT INTO CURB FORMS; CORNERS OF TRANSVERSE FLOOR EXPANSION JOINTS SHALL BE ROUNDED WITH A $\frac{1}{4}$ " 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 $\frac{1}{4}$ " 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 $\frac{7}{8}$ " \emptyset SHEAR STUDS FOR THE $\frac{3}{4}$ " \emptyset STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - $\frac{7}{8}$ " \emptyset STUDS FOR 4 - $\frac{3}{4}$ " \emptyset STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF $\frac{7}{8}$ " \emptyset STUDS ALONG THE BEAM AS SHOWN FOR $\frac{3}{4}$ " \emptyset STUDS BASED ON THE RATIO OF 3 - $\frac{7}{8}$ " \emptyset STUDS FOR 4 - $\frac{3}{4}$ " \emptyset 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 $\frac{5}{16}$ " 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 $\frac{1}{16}$ 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. FINIS AND OTHER DEFORMATIONS RESULTING FROM CASTING OR OTHERWISE SHALL BE REMOVED IN A MANNER SO THAT A UNIFORM COLORING OF THE COMPLETED CASTING SHALL BE OBTAINED. CASTINGS WITH DISCOLORATIONS OR OF NON-UNIFORM COLORING WILL NOT BE ACCEPTED. CERTIFIED MILL REPORTS ARE REQUIRED FOR METAL RAILS AND POSTS.

SPECIAL NOTES:

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

ENGLISH

JANUARY, 1990