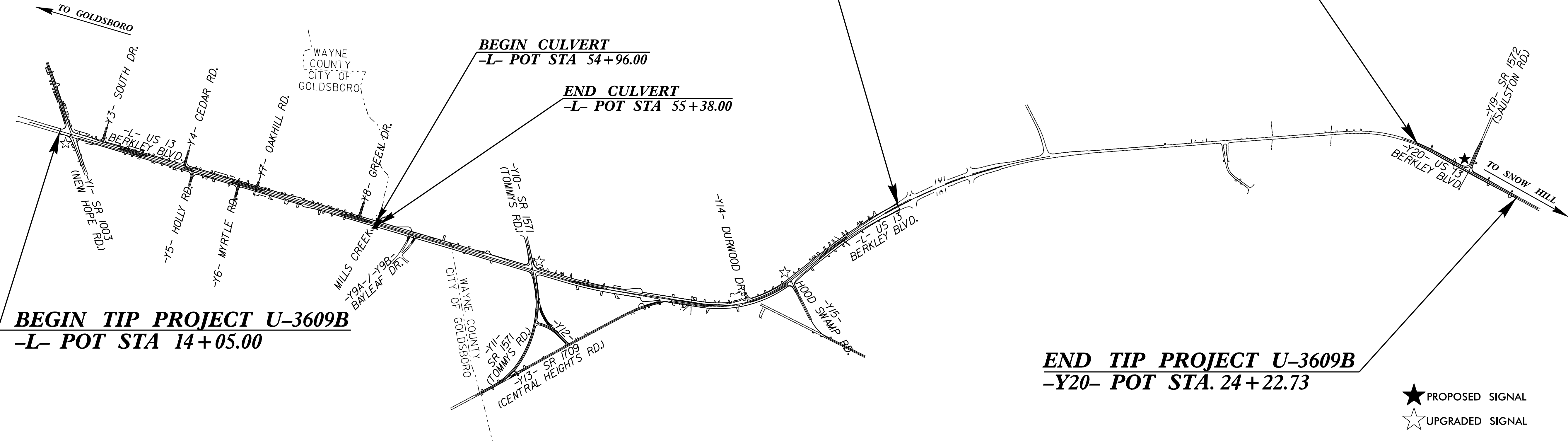
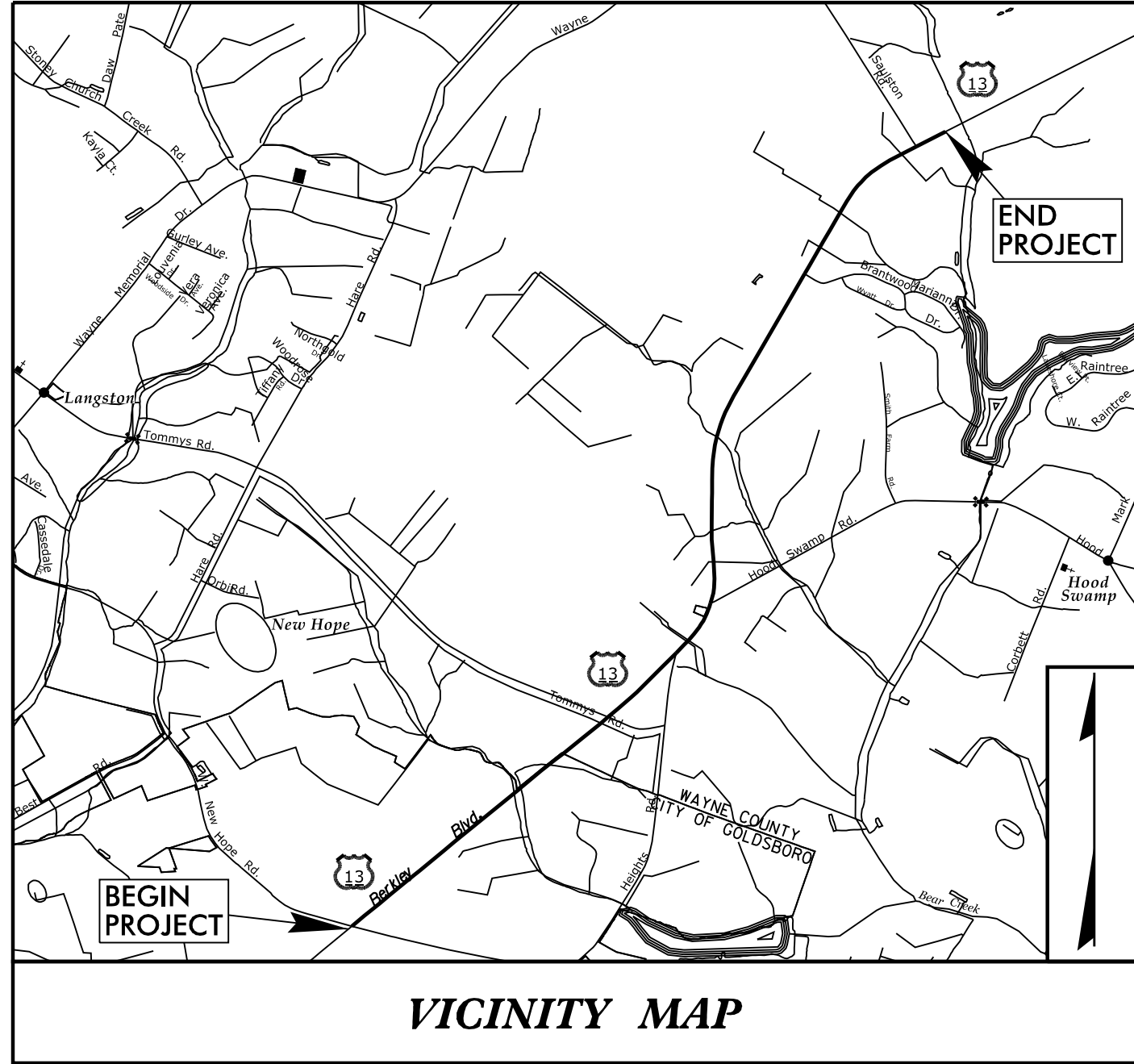


09.08/99
\$\$\$\$\$SYTIME\$\$\$\$\$
\$\$\$\$\$DON\$\$\$\$\$
\$\$\$\$\$SERNAME\$\$\$\$\$

TIP PROJECT: U-3609B

CONTRACT:



STRUCTURE

DESIGN DATA

ADT 2025 = 16,800
ADT 2045 = 19,200
K = 9 %
D = 55 %
T = 3 % *
V = 50/60 MPH
* TTST = 1% DUAL = 2%
FUNC CLASS = PRINCIPAL
AND MINOR ARTERIAL
STATEWIDE TIER

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT U-3609B = 2.357 miles
LENGTH STRUCTURES TIP PROJECT U-3609B = 0.009 miles
TOTAL LENGTH TIP PROJECT U-3609B = 2.366 miles

PREPARED IN THE OFFICE OF:

Stantec

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

FOR THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

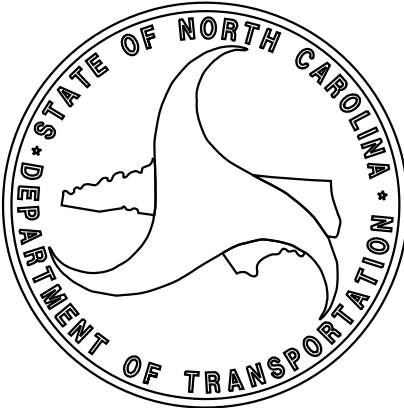
2024 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
FEBRUARY 21, 2020

LETTING DATE:
FEBRUARY 17, 2026

STEVE SMALLWOOD, P.E.
PROJECT ENGINEER

ADDISON GAINNEY, P.E.
NCDOT DIVISION 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 7/8" Ø SHEAR STUDS FOR THE ¾" Ø STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - 7/8" Ø STUDS FOR 4 - ¾" Ø STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF 7/8" Ø STUDS ALONG THE BEAM AS SHOWN FOR ¾" Ø STUDS BASED ON THE RATIO OF 3 - 7/8" Ø STUDS FOR 4 - ¾" Ø STUDS. STUDS OF THE LENGTH SPECIFIED ON THE PLANS MUST BE PROVIDED. THE MAXIMUM SPACING SHALL BE 2'-0".

EXCEPT AT THE INTERIOR SUPPORTS OF CONTINUOUS BEAMS WHERE THE COVER PLATE IS IN CONTACT WITH BEARING PLATE, THE CONTRACTOR MAY, AT HIS OPTION, SUBSTITUTE FOR THE COVER PLATES DESIGNATED ON THE PLANS COVER PLATES OF THE EQUIVALENT AREA PROVIDED THESE PLATES ARE AT LEAST 5/16" IN THICKNESS AND DO NOT EXCEED A WIDTH EQUAL TO THE FLANGE WIDTH LESS 2" OR A THICKNESS EQUAL TO 2 TIMES THE FLANGE THICKNESS. THE SIZE OF FILLET WELDS SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT ANSI/AASHTO/AWS "BRIDGE WELDING CODE". ELECTROSLAG WELDING WILL NOT BE PERMITTED.

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

HANDRAILS AND POSTS:

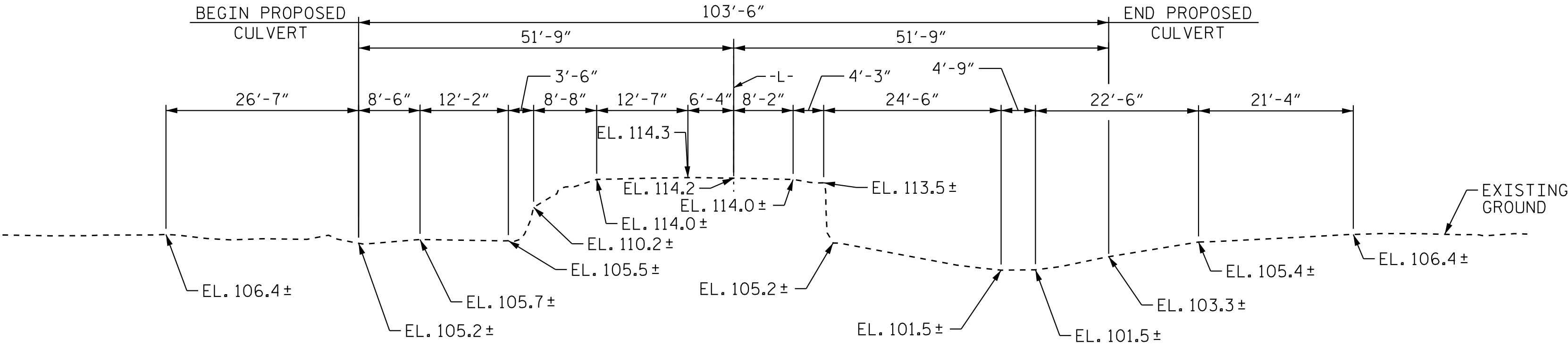
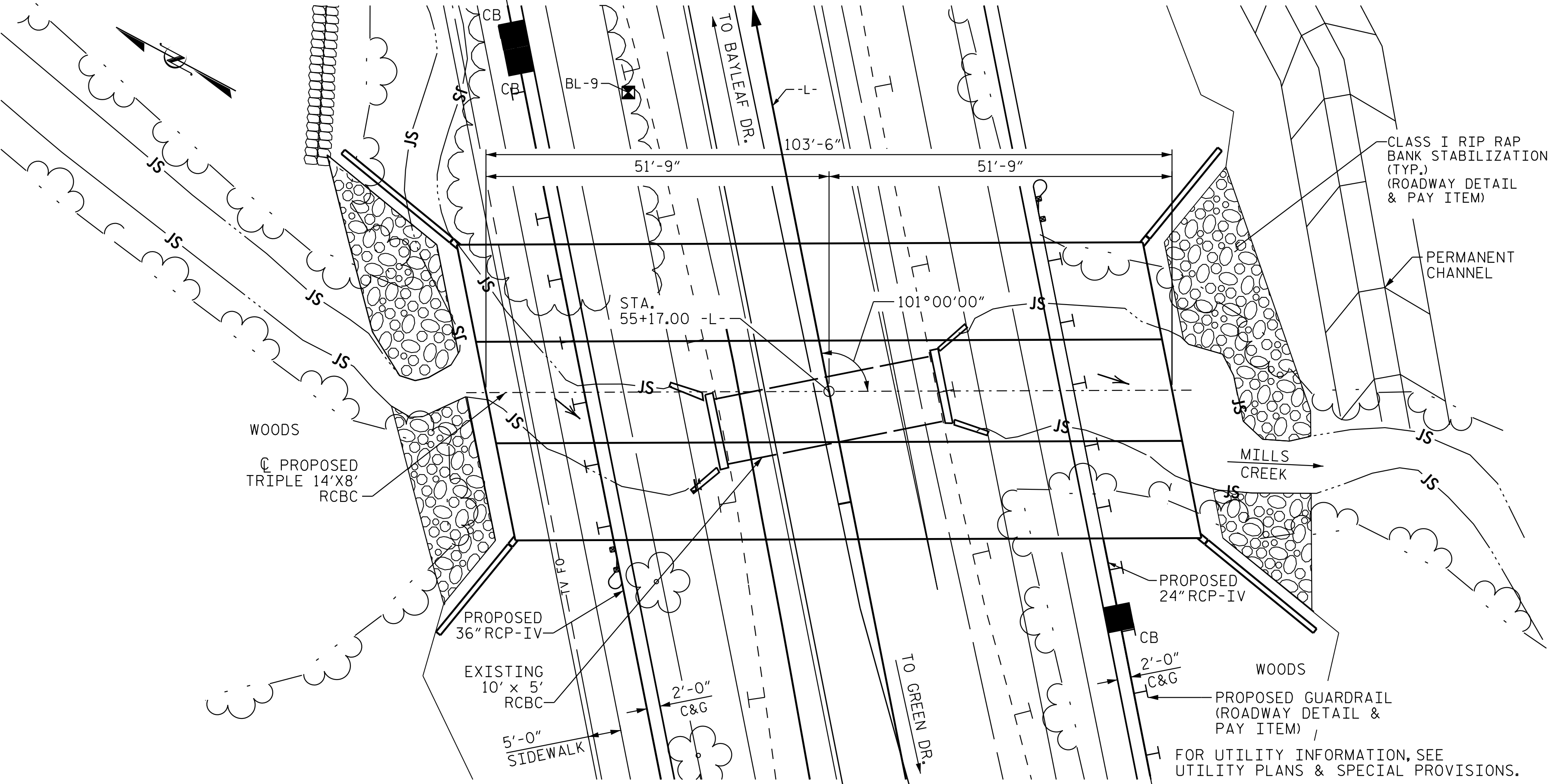
METAL STANDARDS AND FACES OF THE CONCRETE END POSTS FOR THE METAL RAIL SHALL BE SET NORMAL TO THE GRADE OF THE CURB, UNLESS OTHERWISE SHOWN ON PLANS. THE METAL RAIL AND TOPS OF CONCRETE POSTS USED WITH THE ALUMINUM RAIL SHALL BE BUILT PARALLEL TO THE GRADE OF THE CURB.

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.

BM #9: TBM-C; FILLED "X" IN BONNET BOLT OF FIRE HYDRANT; N600995 E2325386, STA 60+65.54 -L-, 34.34' RT. EL. 118.78



PROFILE ALONG CULVERT

HYDRAULIC DATA

DESIGN DISCHARGE	=	600	CFS
FREQUENCY OF DESIGN FLOOD	=	50	YR
DESIGN HIGH WATER ELEVATION	=	113.8	
DRAINAGE AREA	=	1.9	SQ. MI.
BASIC DISCHARGE (Q100)	=	FEMA 1430 CFS	
BASIC HIGH WATER ELEVATION	=	USGS 690 CFS	
	=	FEMA 115.1	
	=	USGS 113.9	

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	=	1610	CFS
FREQUENCY OF OVERTOPPING FLOOD	=	>500+	YR
OVERTOPPING FLOOD ELEVATION	=	115.3	
OVERTOPPING EXCEEDS 500YR FLOOD EVENT			
OVERTOPPING AT STA. 55+76.87 -L- SAG POINT;			
TOP OF CONCRETE MEDIAN			

ROADWAY DATA

GRADE POINT ELEV. @ STATION 55+17.00 -L-	=	116.26
BED ELEV. @ STATION	=	105.0
ROADWAY SLOPES	=	3:1

FOUNDATION NOTES:

SEE SECTION 414 OF STANDARD SPECIFICATIONS FOR BOX CULVERT EXCAVATION.

CONSTRUCT RCB WITH (1) FOOT FOUNDATION CONDITIONING MATERIALS BELOW THE BOTTOM OF CULVERT. FOR FOUNDATION CONDITIONING MATERIAL, SEE SECTION 414-2 OF THE STANDARD SPECIFICATIONS.

NOTES:

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

DESIGN FILL-----2.0'

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

THE 24"DIA. PIPE AND THE 36"DIA. PIPE THRU THE SIDEWALL OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE FIELD BENT AS NECESSARY TO CLEAR PIPE.

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.

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

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

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

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

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

THE ENTIRE COST OF WORK REQUIRED TO PLACE EXCAVATED OR SUPPLEMENTAL MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE LUMP SUM PRICE FOR CULVERT EXCAVATION.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.

CONCRETE 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.

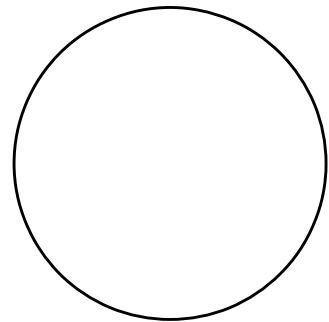
TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE			
BARREL @	5.214	CY/FT	539.7 C.Y.
WINGS ETC.			54.6 C.Y.
TOTAL			594.3 C.Y.

REINFORCING STEEL	
BARREL	83,489 LBS.
WINGS ETC.	2,373 LBS.
TOTAL	85,862 LBS.

CULVERT EXCAVATION	LUMP SUM
FOUNDATION COND. MATERIAL	355 TONS
REMOVAL OF EXISTING STRUCTURE	LUMP SUM

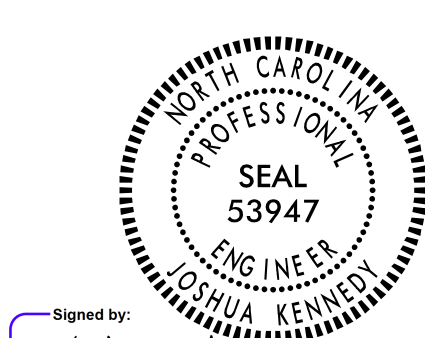
I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS



DRAWN BY : J. B. GEILE DATE : 07/07/21
CHECKED BY : J. F. KENNEDY DATE : 05/29/24
DESIGN ENGINEER OF RECORD: J. F. KENNEDY DATE : 11/03/25



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License No. F-0672



Signed by: Joshua Kennedy 11/3/2025

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. U-3609B

WAYNE COUNTY

STATION: 55+17.00 -L-

SHEET 1 OF 8 STRUCTURE NO. 950402

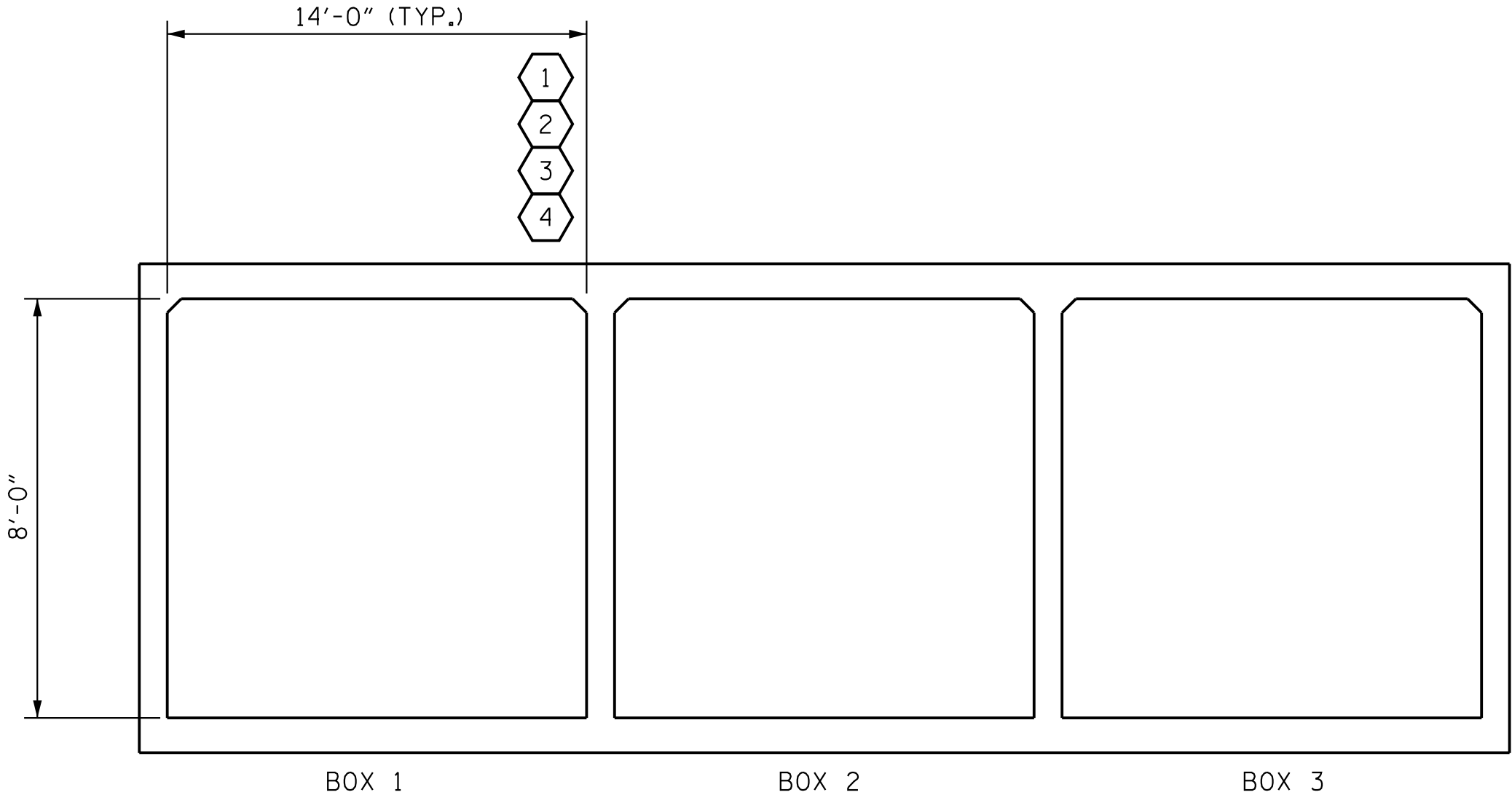
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL STANDARD

TRIPLE 14 FT. X 8 FT.
CONCRETE BOX CULVERT
101° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			C-01
2			4			TOTAL SHEETS 8

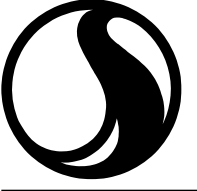
LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS																
LEVEL	VEHICLE	WEIGHT (W) (TONS)	<div>#</div>	MINIMUM RATING FACTORS (RF)	TONS = W × RF	STRENGTH I LIMIT STATE										
						<div>LIVE-LOAD FACTORS (γ_{LL})</div>	MOMENT				SHEAR				<div>COMMENT NUMBER</div>	
							<div>RATING FACTOR</div>	<div>BOX NO.</div>	<div>ELEMENT TYPE</div>	<div>DISTANCE FROM LEFT END OF ELEMENT (ft)</div>	<div>RATING FACTOR</div>	<div>BOX NO.</div>	<div>ELEMENT TYPE</div>	<div>DISTANCE FROM LEFT END OF ELEMENT (ft)</div>		
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	<div>1</div>	1.38	--	1.75	1.49	3	MIDDLE (TOP SLAB) - INSIDE	7.00	1.38	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1	
	HL-93 (OPERATING)	N/A		1.79	--	1.35	1.93	3	MIDDLE (TOP SLAB) - INSIDE	7.00	1.79	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1	
	HS-20 (INVENTORY)	36.000	<div>2</div>	1.85	66.600	1.75	2.02	1	RIGHT END (TOP SLAB) - INSIDE	14.00	1.85	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1	
	HS-20 (OPERATING)	36.000		2.40	86.400	1.35	2.62	1	RIGHT END (TOP SLAB) - INSIDE	14.00	2.40	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1	
LEGAL LOAD RATING	<div>SINGLE VEHICLE (SV)</div>	SN5H	13.500		4.36	58.860	1.40	4.56	3	MIDDLE (TOP SLAB) - INSIDE	7.00	4.36	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
		SNGARBS2	20.000		3.91	78.200	1.40	4.27	3	MIDDLE (TOP SLAB) - INSIDE	7.00	3.91	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
		SNAGRIS2	22.000		4.08	89.760	1.40	4.42	1	RIGHT END (TOP SLAB) - INSIDE	14.00	4.08	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
		SNCOTTS3	27.250	<div>3</div>	2.28	62.130	1.40	2.47	3	MIDDLE (TOP SLAB) - INSIDE	7.00	2.28	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
		SNAGGRS4	34.925		2.52	88.010	1.40	2.84	3	MIDDLE (TOP SLAB) - INSIDE	7.00	2.52	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
		SNS5A	35.550		2.46	87.450	1.40	2.70	1	MIDDLE (TOP SLAB) - INSIDE	7.00	2.46	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
		SNS6A	39.950		2.45	97.870	1.40	2.70	1	MIDDLE (TOP SLAB) - INSIDE	7.00	2.45	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
		SNS7B	42.000		2.39	100.380	1.40	2.71	1	MIDDLE (TOP SLAB) - INSIDE	7.00	2.39	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
	<div>TRUCK TRACTOR SEMI-TRAILER (TTST)</div>	TNAGRIT3	33.000		3.37	111.210	1.40	3.92	1	RIGHT END (TOP SLAB) - INSIDE	14.00	3.37	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
		TNT4A	33.075		2.64	87.310	1.40	2.94	3	MIDDLE (TOP SLAB) - INSIDE	7.00	2.64	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
		TNT6A	41.600		2.42	100.670	1.40	2.80	1	MIDDLE (TOP SLAB) - INSIDE	7.00	2.42	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
		TNT7A	42.000		2.48	104.160	1.40	2.87	1	RIGHT END (TOP SLAB) - INSIDE	14.00	2.48	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
		TNT7B	42.000		2.48	104.160	1.40	2.76	3	MIDDLE (TOP SLAB) - INSIDE	7.00	2.48	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
		TNAGRIT4	43.000		2.55	109.650	1.40	2.94	1	RIGHT END (TOP SLAB) - INSIDE	14.00	2.55	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
		TNAGT5A	45.000		2.57	115.650	1.40	2.95	3	MIDDLE (TOP SLAB) - INSIDE	7.00	2.57	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
		TNAGT5B	45.000		2.44	109.800	1.40	2.52	1	RIGHT END (TOP SLAB) - INSIDE	14.00	2.44	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1
EMERGENCY VEHICLE (EV)	EV2	28.750		3.02	86.820	1.30	3.23	3	MIDDLE (TOP SLAB) - INSIDE	7.00	3.02	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1	
	EV3	43.000	<div>4</div>	1.94	83.420	1.30	2.15	1	MIDDLE (TOP SLAB) - INSIDE	7.00	1.94	1	RIGHT END (TOP SLAB) - OUTSIDE	14.00	1	




LRFR SUMMARY
(LOOKING DOWNSTREAM)

ASSEMBLED BY: J. B. GEILE		DATE : 07/13/21	
CHECKED BY : J. F. KENNEDY		DATE : 05/29/24	
DRAWN BY : WMC	7/11	REV. 10/17/11	MAA/GM
CHECKED BY : GM	7/11	REV. 12/17	MAA/THC
		REV. 04/23	BNB/AA1

DESIGN
ENGINEER
OF RECORD: J. F. KENNEDY DATE : 11/03/25



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Signed by: Joshua Kennedy
11/3/2025

DOCUMENT NOT CONSIDERED
FINAL UNLESS ALL
SIGNATURES COMPLETED

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

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

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C- 02
1			3			TOTAL SHEETS 8
2			4			

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

COMMENTS:

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

⬡# CONTROLLING LOAD RATING

⬡1 DESIGN LOAD RATING (HL-93)

⬡2 DESIGN LOAD RATING (HS-20)

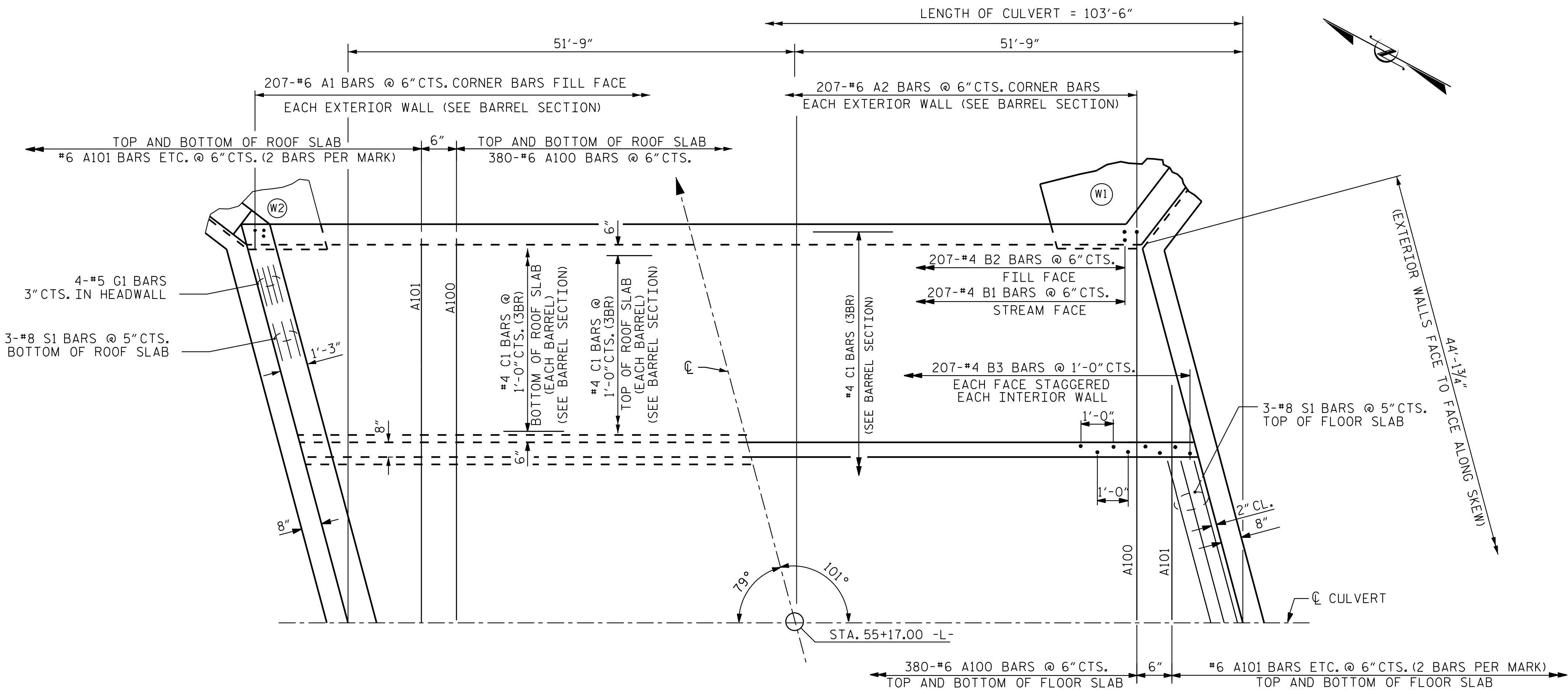
⬡3 LEGAL LOAD RATING **

⬡4 EMERGENCY VEHICLE LOAD RATING **

** SEE CHART FOR VEHICLE TYPE

PROJECT NO. U-3609B
WAYNE COUNTY
STATION: 55+17.00 -L-

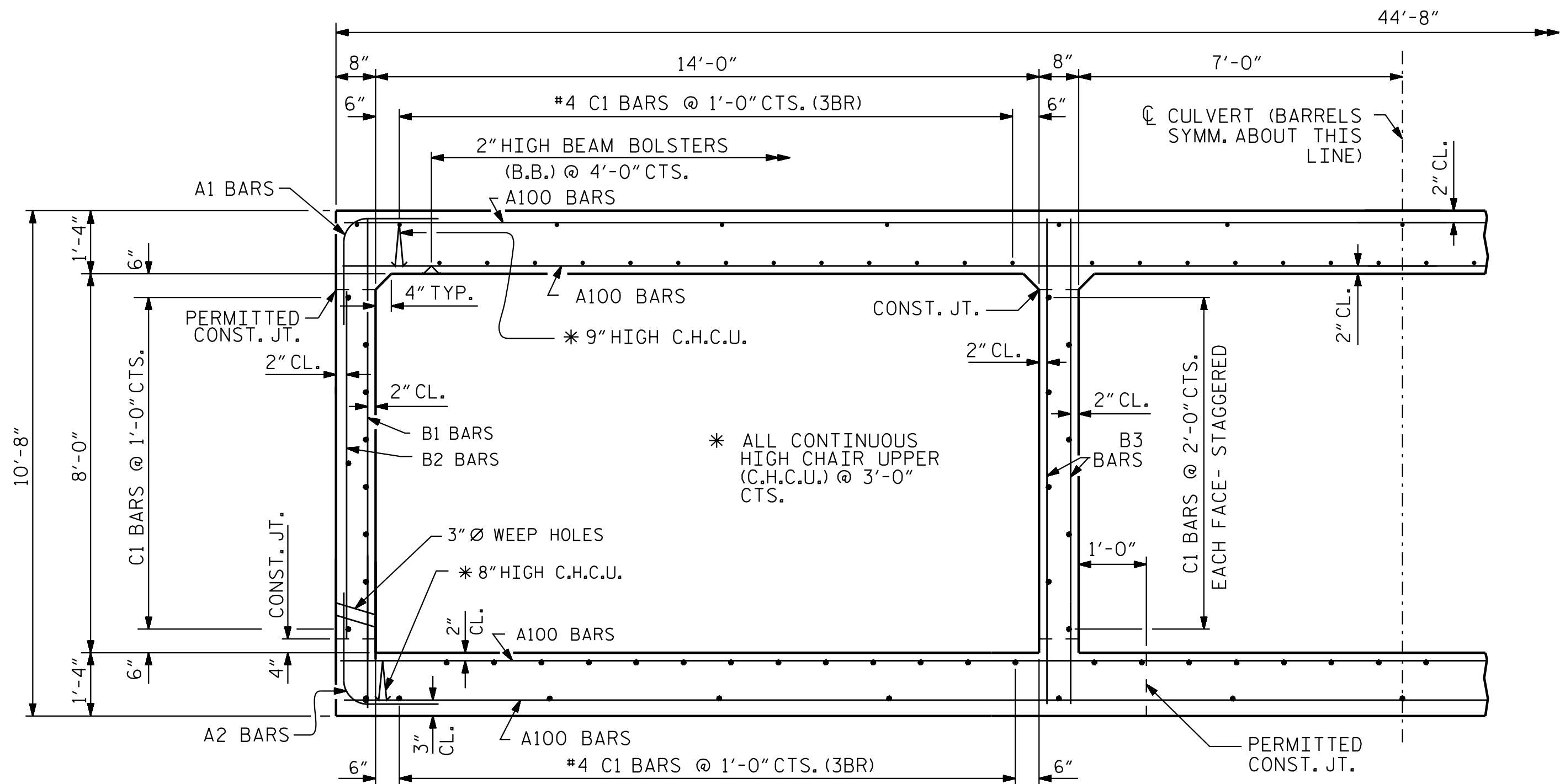
SHEET 2 OF 8



NOTES:
(3BR) DENOTES 3 BAR RUN.
FOR SILL AND BAFFLE DETAILS REFER TO SHEET C-06.

PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB



RIGHT ANGLE SECTION OF BARREL

THERE ARE 144 "C" BARS IN SECTION OF BARREL.

PROJECT NO. U-3609B
WAYNE COUNTY
STATION: 55+17.00 -L-

SHEET 3 OF 8

DRAWN BY : J. B. GEILE DATE : 07/13/21
CHECKED BY : J. F. KENNEDY DATE : 05/29/24
DESIGN ENGINEER OF RECORD: J. F. KENNEDY DATE : 11/03/25



Stantec Consulting Services Inc.
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6744229/111618465

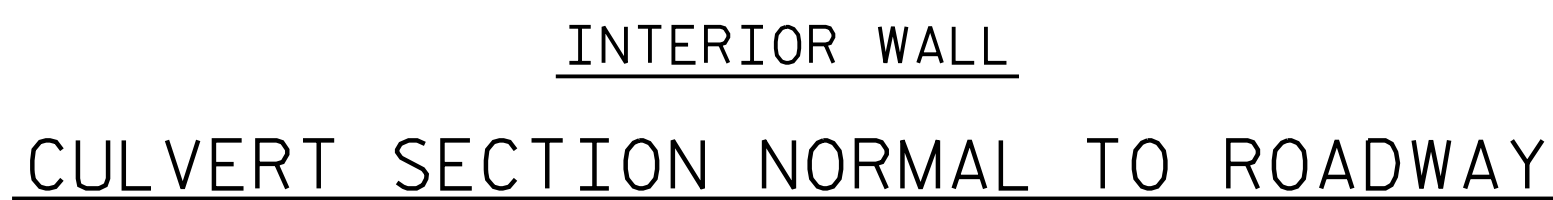
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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL STANDARD
TRIPLE 14 FT. X 8 FT.
CONCRETE BOX CULVERT

101° SKEW



REVISIONS						SHEET NO. C-03 TOTAL SHEETS 8
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			
2			4			



PROJECT NO. U-3609B
WAYNE COUNTY
 STATION: 55+17.00 -L-

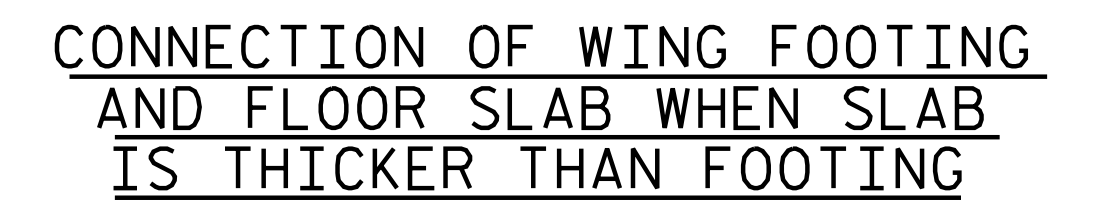
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
BARREL STANDARD
TRIPLE 14 FT. X 8 FT.
CONCRETE BOX CULVERT
101° SKEW

REVISIONS						SHEET NO.
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WAYNE COUNTY
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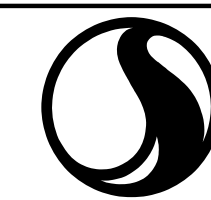
SHEET 5 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

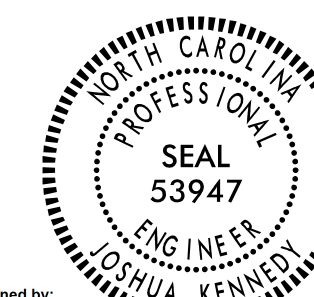
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CONCRETE BOX CULVERT
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1			3			TOTAL SHEETS 8
2			4			

DRAWN BY :	<u>J. B. GEILE</u>	DATE :	<u>07/08/21</u>
CHECKED BY :	<u>J. F. KENNEDY</u>	DATE :	<u>05/29/24</u>
DESIGN ENGINEER OF RECORD:	<u>J. F. KENNEDY</u>	DATE :	<u>11/03/25</u>

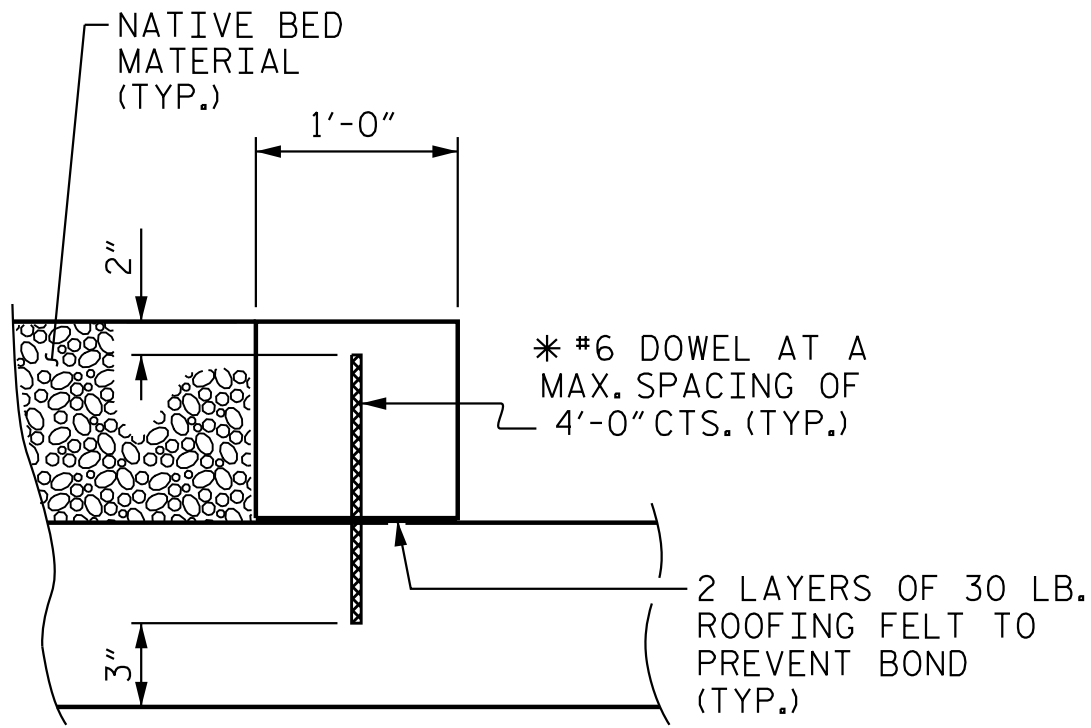


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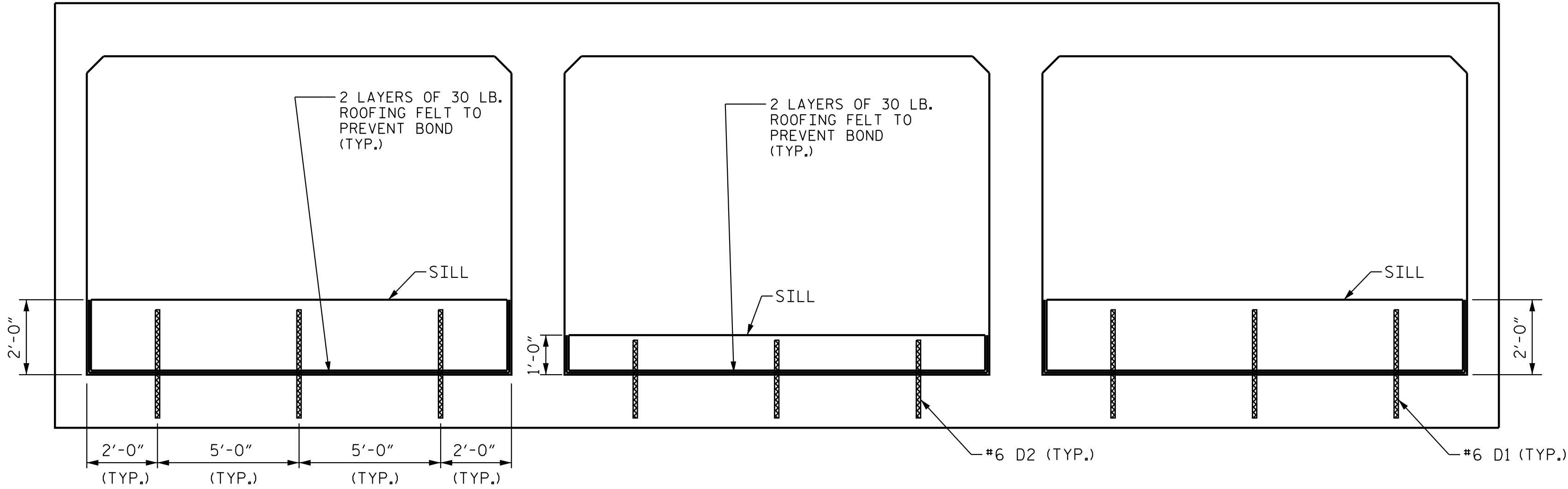
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SECTION THROUGH SILL/BAFFLE

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



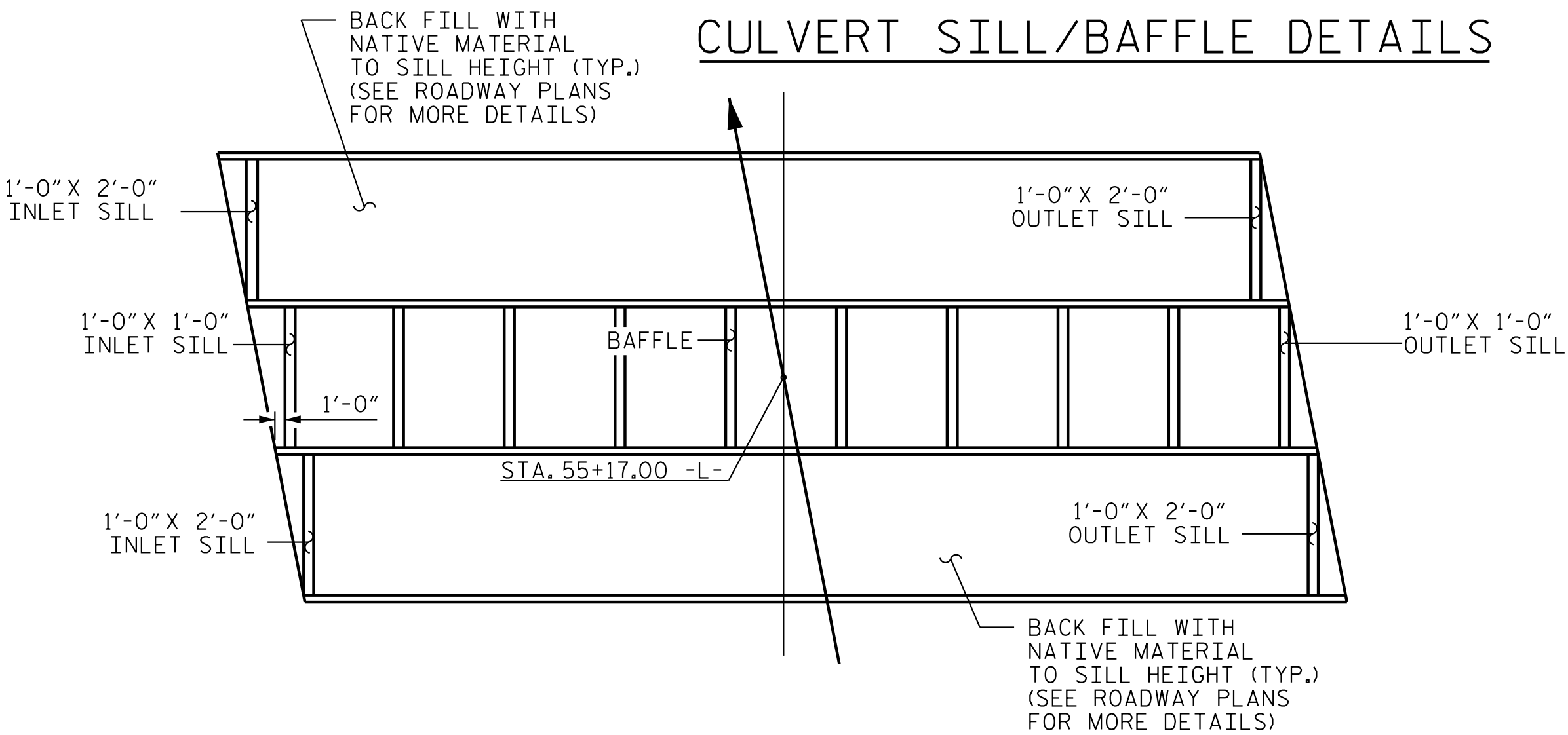
SILL/BAFFLE DETAIL

(LOOKING DOWNSTREAM)

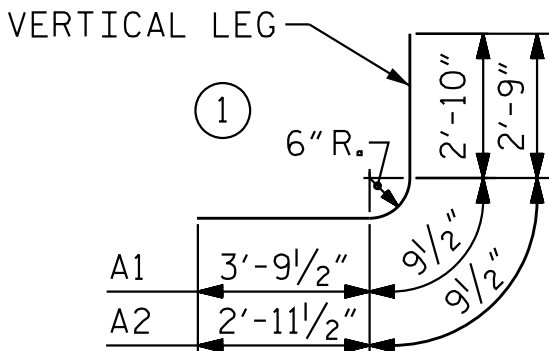
NOTES:

- 1) NATIVE MATERIAL BETWEEN SILLS/BAFFLES IN THE CULVERT SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE THE STREAM OR FLOODPLAIN AT THE PROJECT SITE DURING CONSTRUCTION. ONLY MATERIAL THAT IS EXCAVATED FROM THE STREAM BED MAY BE USED TO LINE THE LOW FLOW CULVERT BARREL. RIP-RAP MAY BE USED TO SUPPLEMENT THE NATIVE MATERIAL IN THE HIGH FLOW CULVERT BARREL(S). IF RIP-RAP IS USED TO LINE THE HIGH FLOW CULVERT BARREL(S), NATIVE MATERIAL SHOULD BE PLACED ON TOP TO FILL VOIDS AND PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.
- 2) TOP OF LOW FLOW SILLS/BAFFLES SHOULD MATCH STREAM BED ELEVATION IN LOW FLOW CHANNEL OF STREAM. (THALWEG)

CULVERT SILL/BAFFLE DETAILS



PLAN VIEW SHOWING SILL LOCATIONS



BAR TYPES

BAR DIMENSIONS ARE OUT TO OUT

MIN. SPLICE LENGTHS CHART

BAR	SIZE	SPLICE LENGTH
A1	#6	3'-7"
A2	#6	2'-9"
C1	#4	2'-5"
S1	#8	4'-9"

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	414	#6	1	7'-5"	4,612
A2	414	#6	1	6'-6"	4,042
A100	760	#6	STR.	44'-4"	50,608
A101	16	#6	STR.	39'-3"	944
A102	16	#6	STR.	34'-1"	820
A103	16	#6	STR.	29'-0"	697
A104	16	#6	STR.	23'-10"	573
A105	16	#6	STR.	18'-8"	449
A106	16	#6	STR.	13'-6"	325
A107	16	#6	STR.	8'-5"	203
A108	8	#6	STR.	5'-10"	71
B1	414	#4	STR.	10'-3"	2,835
B2	414	#4	STR.	7'-4"	2,029
B3	414	#4	STR.	10'-3"	2,835
C1	432	#4	STR.	36'-0"	10,389
D1	18	#6	STR.	2'-11"	79
D2	24	#6	STR.	1'-11"	70
E1	16	#5	STR.	4'-6"	75
E2	16	#5	STR.	5'-8"	95
G1	8	#5	STR.	45'-1"	377
S1	12	#8	STR.	45'-1"	1,445

REINFORCING STEEL LBS. 83,489

PROJECT NO. U-3609B

WAYNE COUNTY

STATION: 55+17.00 -L-

SHEET 6 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL STANDARD

TRIPLE 14 FT. X 8 FT.
CONCRETE BOX CULVERT
101° SKEW

DRAWN BY : J. B. GEILE DATE : 07/07/21
CHECKED BY : J. F. KENNEDY DATE : 05/29/24
DESIGN ENGINEER OF RECORD: J. F. KENNEDY DATE : 11/03/25



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Signed by: Joshua Kennedy
11/3/2025

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REVISIONS

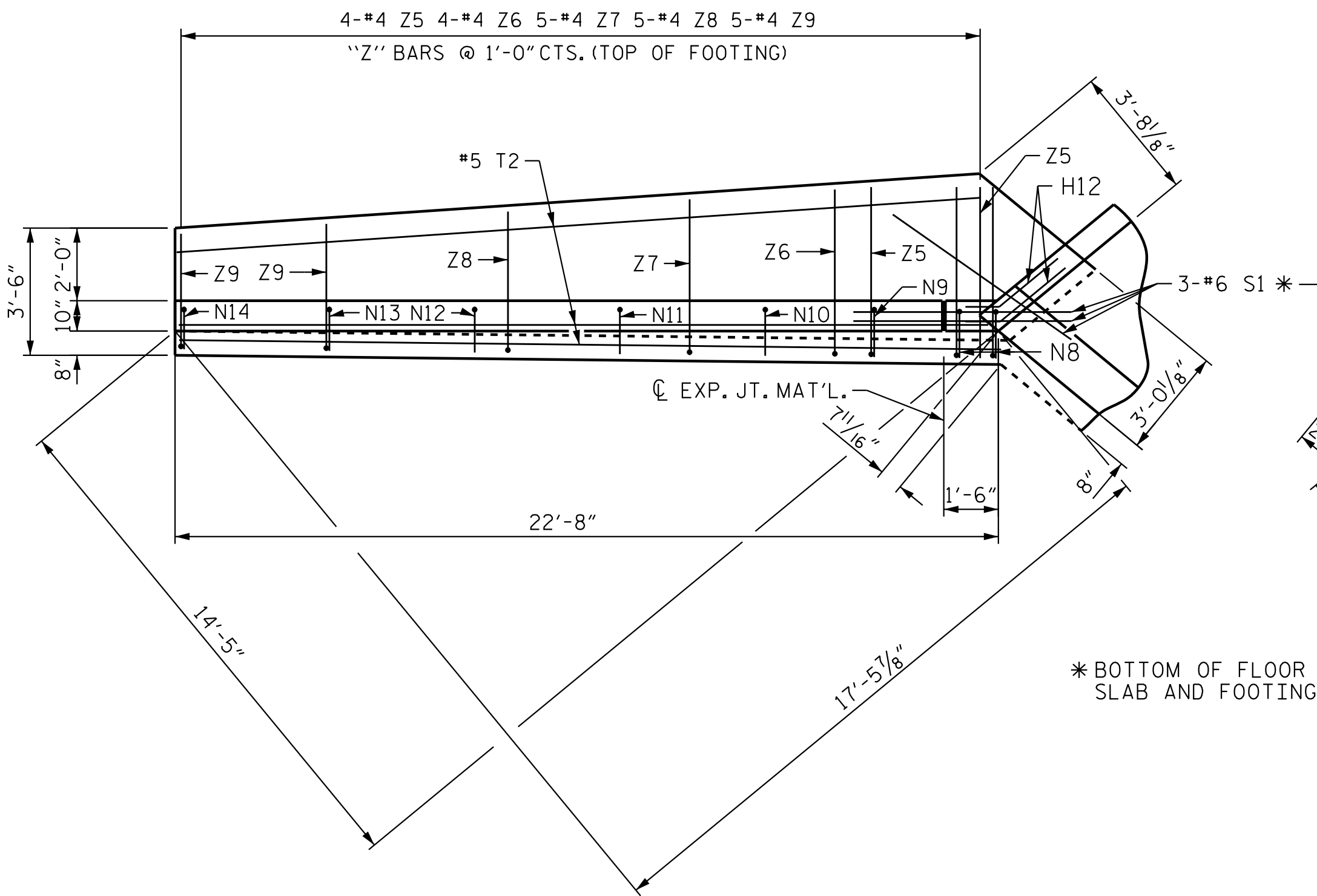
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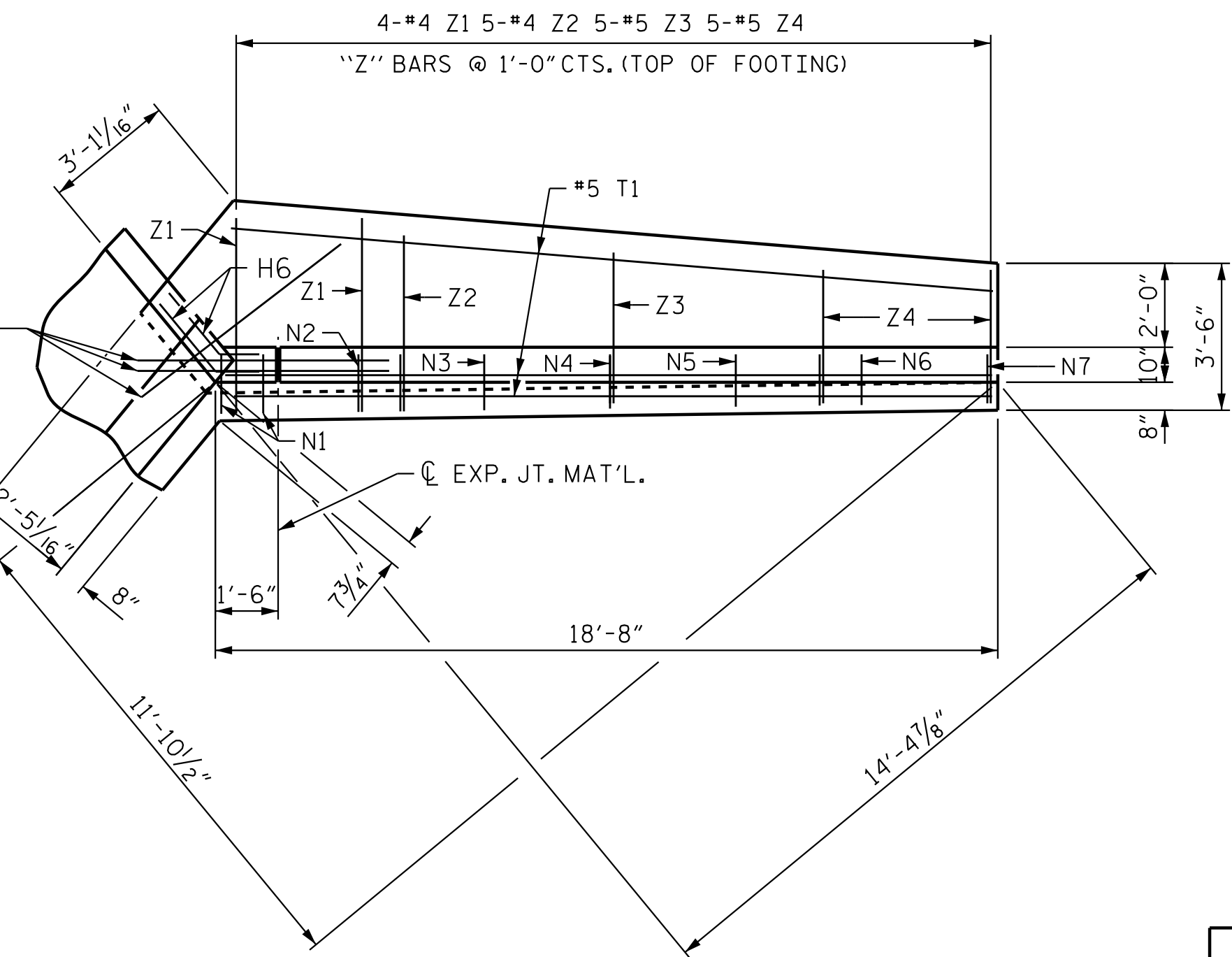
C-06

TOTAL SHEETS

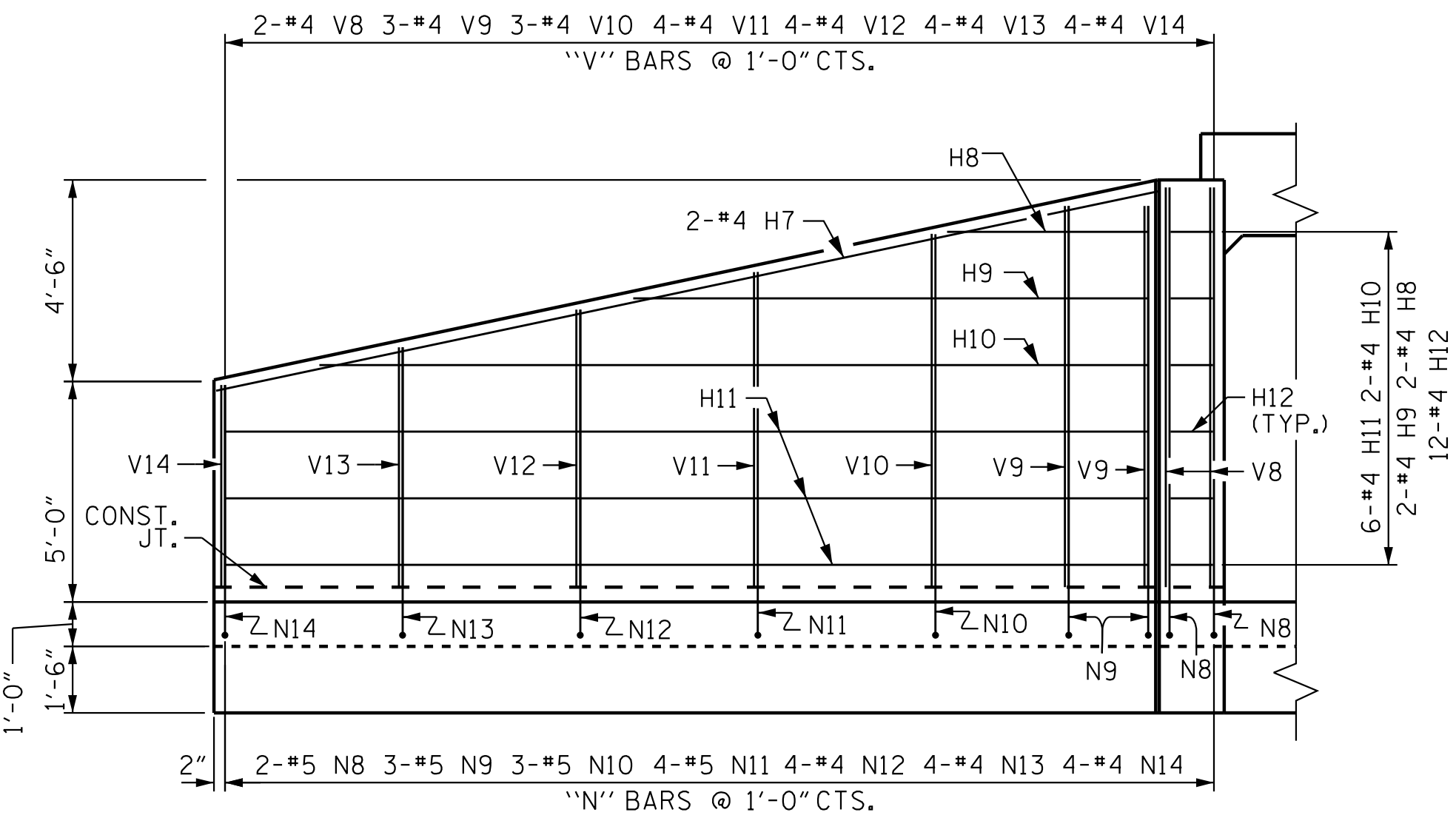
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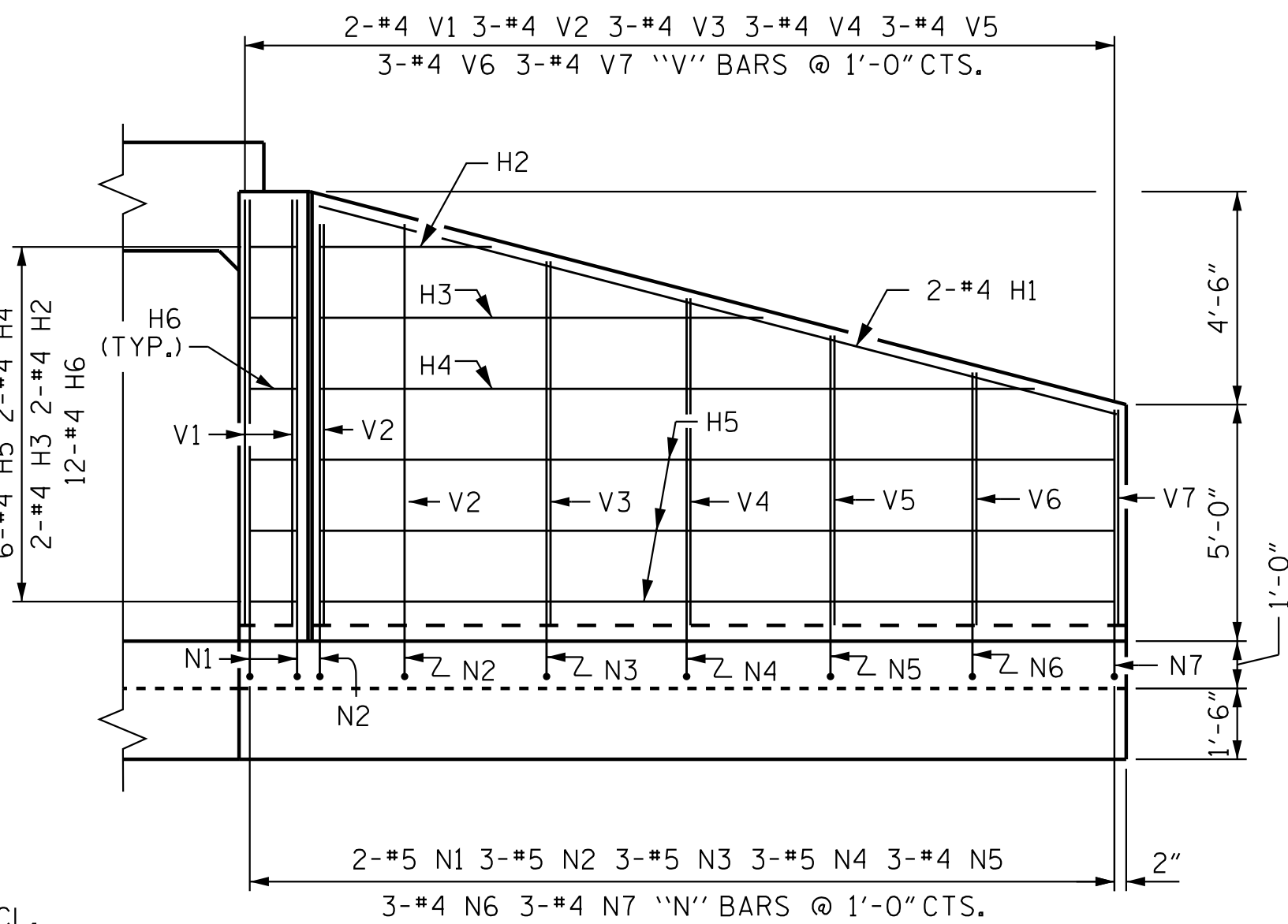
PLAN W2



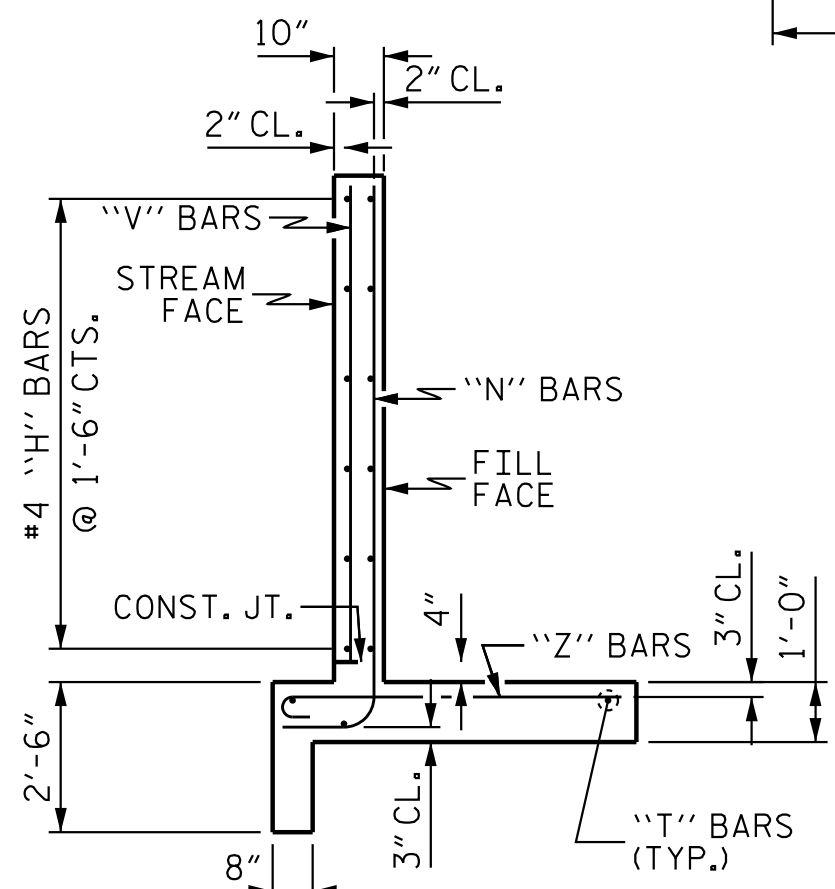
PLAN W1



ELEVATION W2



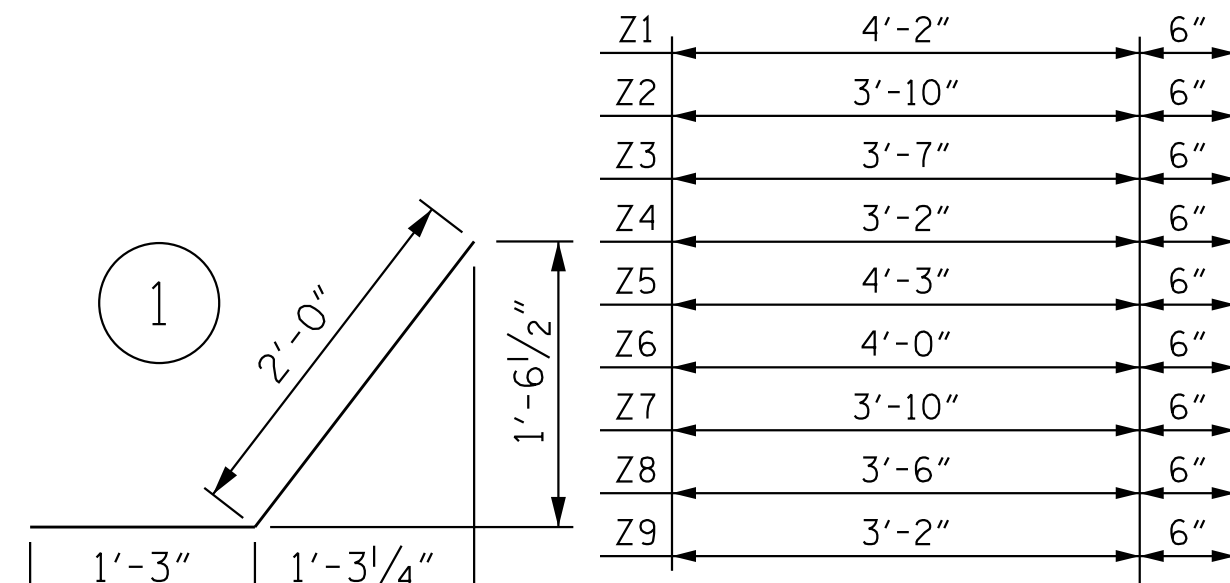
ELEVATION W1



TYPICAL WING SECTION

BILL OF MATERIAL						CON'T BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	4	#4	STR	17'-4"	47	S1	12	#6	STR	6'-0"	109
H2	4	#4	STR	3'-7"	10	T1	6	#5	STR	18'-0"	113
H3	4	#4	STR	9'-3"	25	T2	6	#5	STR	21'-11"	138
H4	4	#4	STR	15'-0"	41						
H5	12	#4	STR	16'-9"	135						
H6	24	#4	1	3'-3"	53	V1	4	#4	STR	9'-0"	25
H7	4	#4	STR	21'-3"	57	V2	6	#4	STR	8'-5"	34
H8	4	#4	STR	4'-6"	13	V3	6	#4	STR	7'-8"	31
H9	4	#4	STR	11'-6"	31	V4	6	#4	STR	6'-10"	28
H10	4	#4	STR	18'-7"	50	V5	6	#4	STR	6'-1"	25
H11	12	#4	STR	20'-9"	167	V6	6	#4	STR	5'-3"	22
H12	24	#4	2	3'-3"	53	V7	6	#4	STR	4'-6"	19
						V8	4	#4	STR	9'-0"	25
N1	4	#5	3	11'-0"	46	V9	6	#4	STR	8'-6"	35
N2	6	#5	3	10'-6"	66	V10	6	#4	STR	7'-11"	32
N3	6	#5	3	9'-8"	61	V11	8	#4	STR	7'-1"	38
N4	6	#5	3	8'-11"	56	V12	8	#4	STR	6'-2"	33
N5	6	#4	3	8'-1"	33	V13	8	#4	STR	5'-4"	29
N6	6	#4	3	7'-4"	30	V14	8	#4	STR	4'-6"	25
N7	6	#4	3	6'-6"	27						
N8	4	#5	3	11'-0"	46	Z1	8	#4	4	4'-8"	25
N9	6	#5	3	10'-7"	67	Z2	10	#4	4	4'-4"	29
N10	6	#5	3	9'-11"	63	Z3	10	#4	4	4'-1"	28
N11	8	#5	3	9'-1"	76	Z4	10	#4	4	3'-8"	25
N12	8	#4	3	8'-3"	45	Z5	8	#4	4	4'-9"	26
N13	8	#4	3	7'-5"	40	Z6	8	#4	4	4'-6"	25
N14	8	#4	3	6'-6"	35	Z7	10	#4	4	4'-4"	29

BAR TYPES



REINFORCING STEEL	2,373 LBS
FOR 4 WINGS	
CLASS A CONCRETE	
4 WINGS	35.8 CY
2 HEADWALLS	4.2 CY
2 END CURTAIN WALLS	5.3 CY
14 SILLS/BAFFLES	9.3 CY
TOTAL	54.6 CY

PROJECT NO. U-3609B
WAYNE COUNTY
STATION: 55+17.00 -L-

SHEET 7 OF 8

DRAWN BY : J. B. GEILE DATE : 10/01/21
CHECKED BY : J. F. KENNEDY DATE : 05/29/24
DESIGN ENGINEER OF RECORD: J. F. KENNEDY DATE : 11/03/25

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Seal of J. F. Kennedy, Professional Engineer, License No. 53947, State of North Carolina.

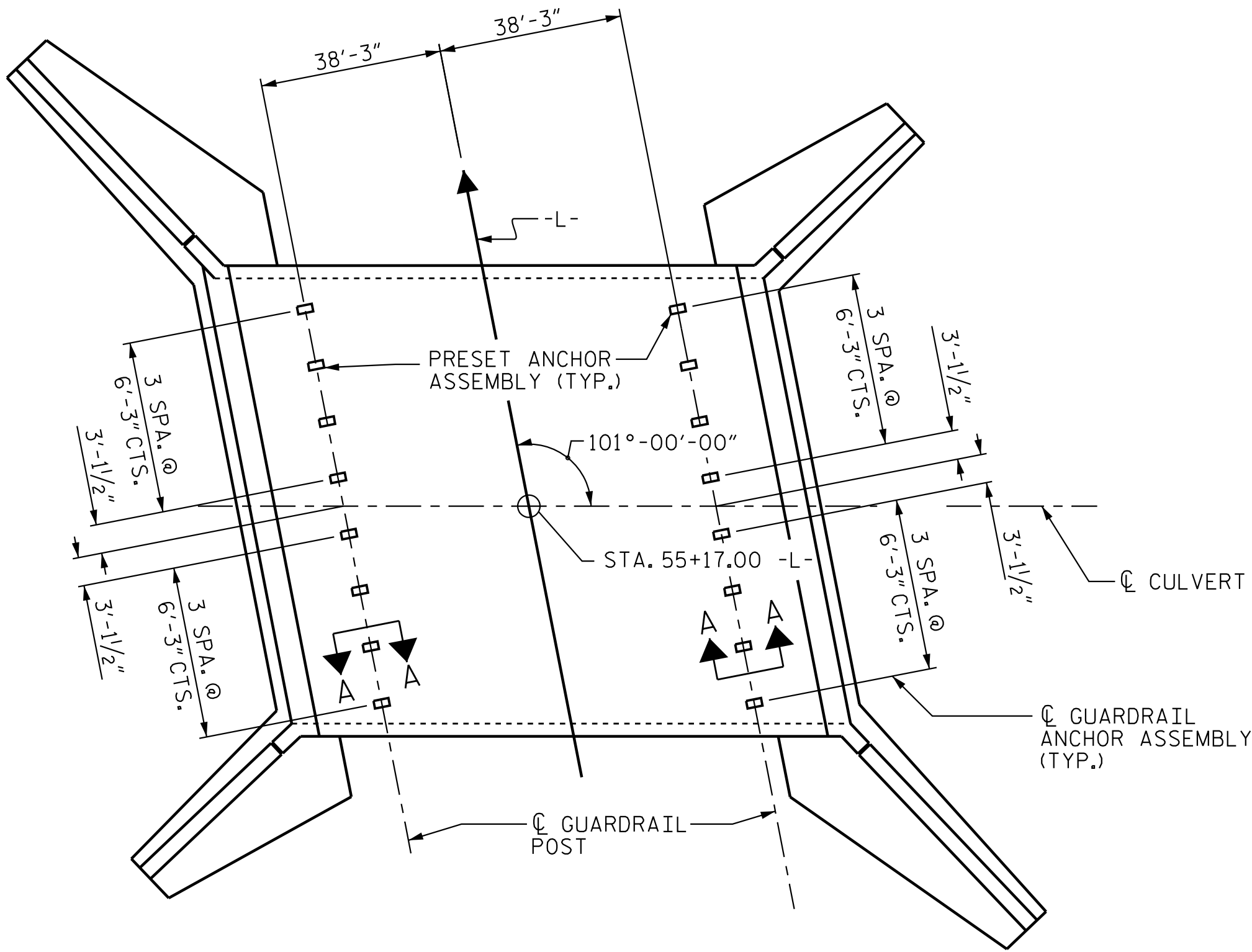
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RALEIGH

WINGS FOR CONCRETE BOX CULVERT

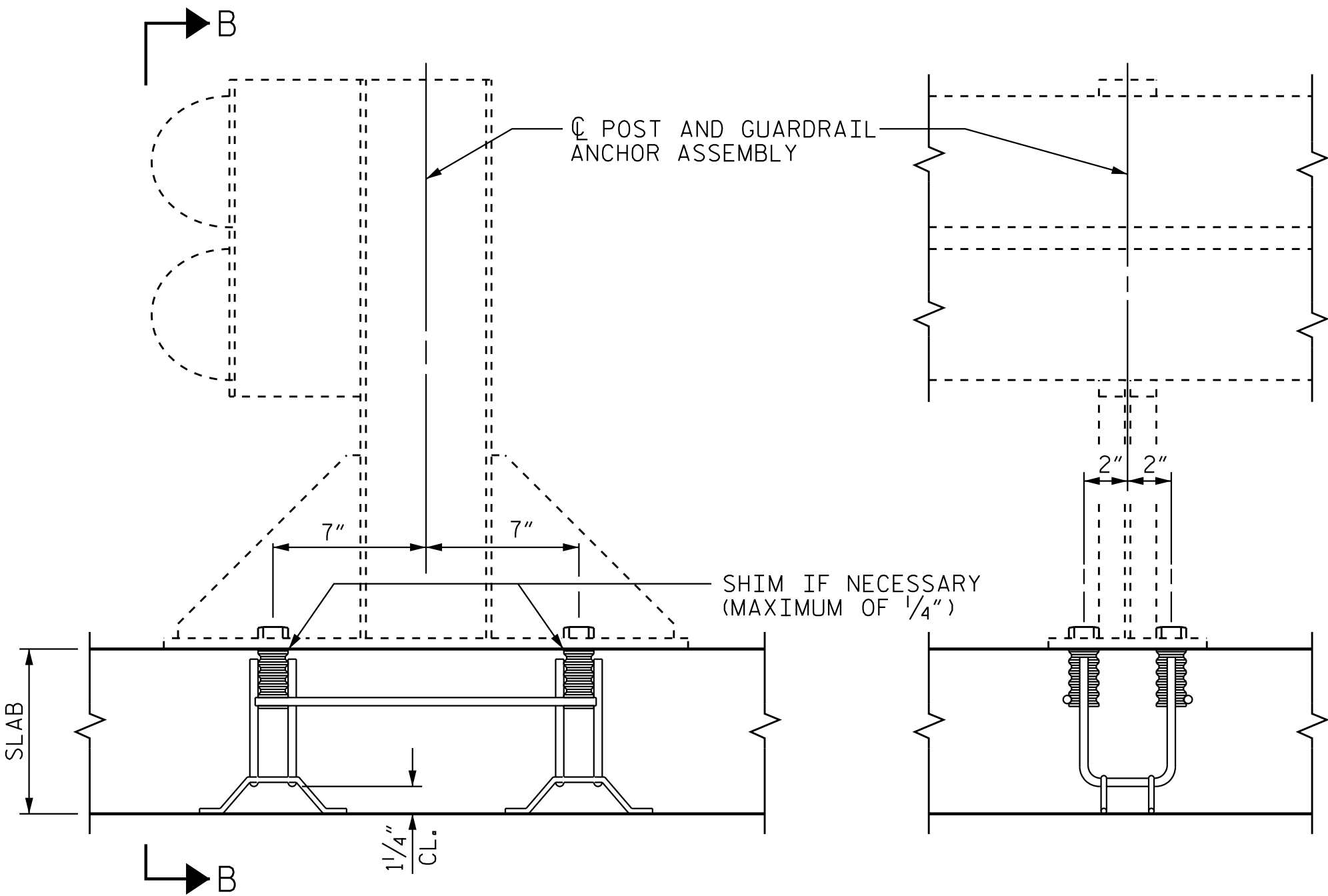
H = 8'-0" SLOPE = 3:1
101° SKEW

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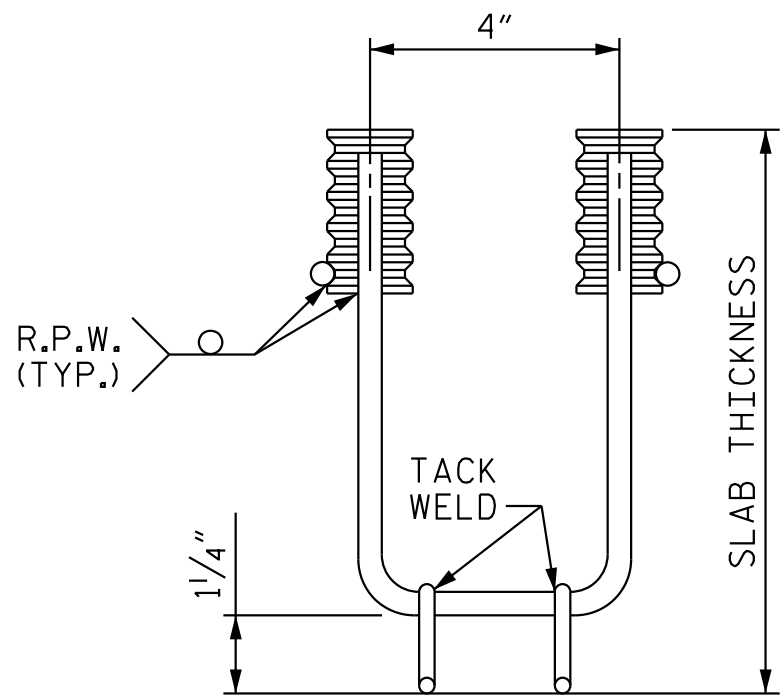
PLAN OF CULVERT GUARDRAIL ANCHOR ASSEMBLY SPACING

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

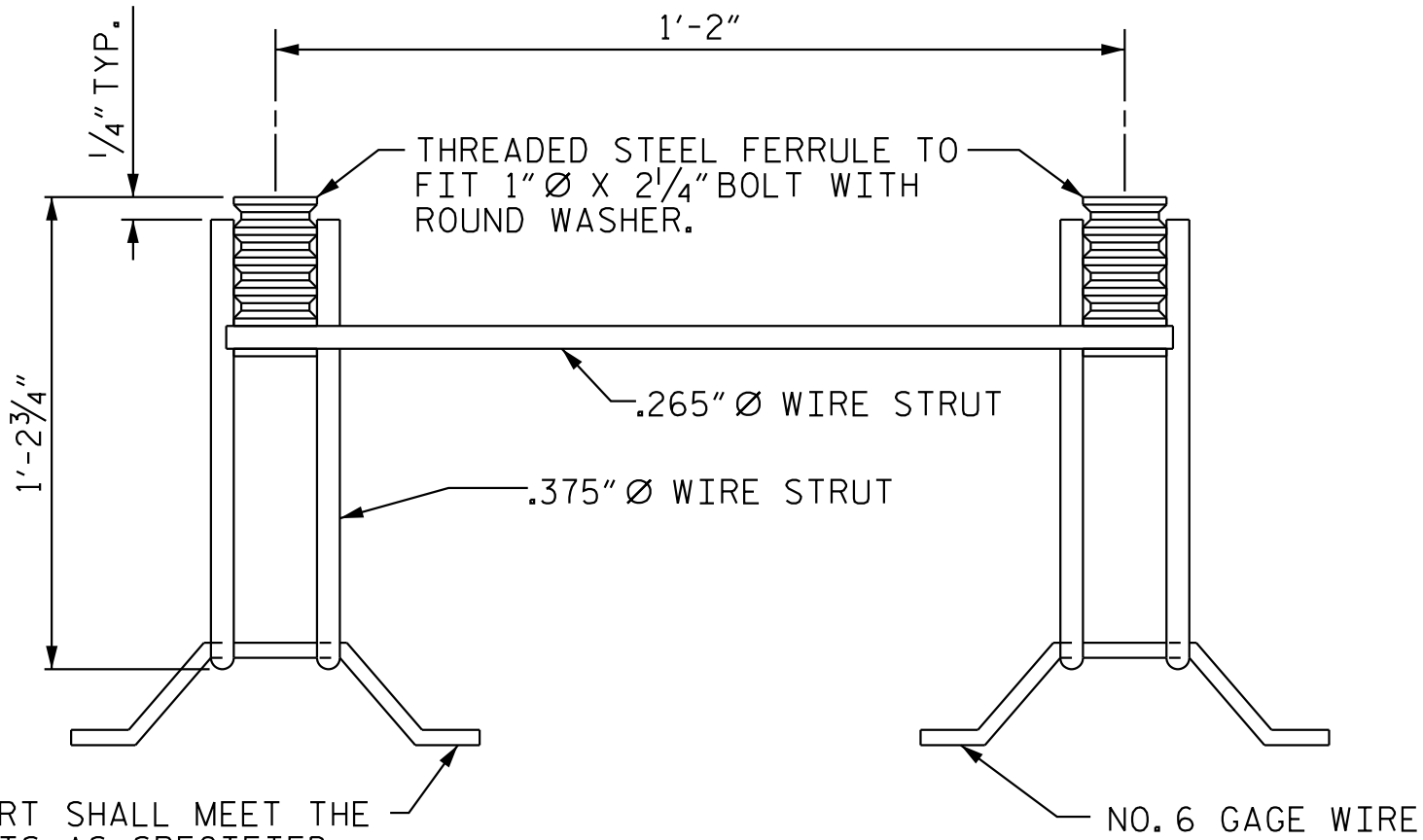


SECTION A-A

SECTION B-B



ELEVATION



SIDE VIEW

GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS

NOTES

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

- A. FERRULES SHALL BE MADE FROM STEEL MEETING THE REQUIREMENTS OF AASHTO M169, GRADE 12L14 AND SHALL HAVE A MINIMUM LENGTH OF THREADS OF 2 1/2".
- B. 4 - 1" Ø X 2 1/4" BOLTS WITH WASHERS, BOLTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A307. BOLTS AND WASHERS SHALL BE GALVANIZED. (AT THE CONTRACTOR'S OPTION, STAINLESS STEEL BOLTS AND WASHERS MAY BE USED AS AN ALTERNATE FOR THE 1" Ø X 2 1/4" GALVANIZED BOLTS AND WASHERS. THEY SHALL CONFORM TO OR EXCEED THE MECHANICAL REQUIREMENTS OF ASTM A307. THE USE OF THIS ALTERNATE SHALL BE APPROVED BY THE ENGINEER.)
- C. WIRE STRUTS SHOWN IN THE GUARDRAIL ANCHOR ASSEMBLY FOR CULVERTS DETAIL ARE MINIMUM ALLOWABLE SIZE AND SHALL HAVE A MINIMUM TENSILE STRENGTH OF 100,000 P.S.I. AS AN OPTION, A 7/16" Ø WIRE STRUT WITH A MINIMUM TENSILE STRENGTH OF 90,000 PSI IS ACCEPTABLE.

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

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

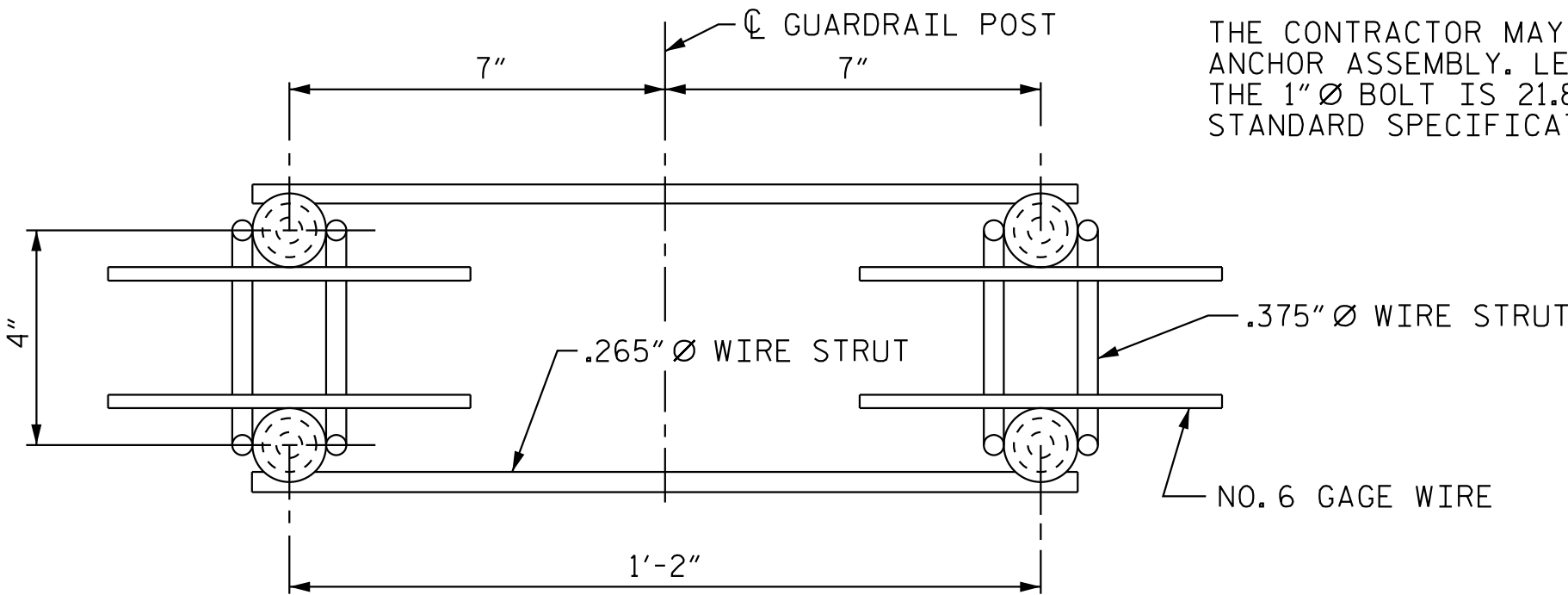
FERRULES TO BE PLUGGED DURING POURING OF SLAB AS RECOMMENDED BY THE MANUFACTURER.

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

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

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

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



PLAN

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

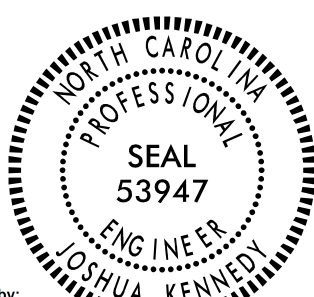
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WAYNE COUNTY
STATION: 55+17.00 -L-

SHEET 8 OF 8

DRAWN BY : J. E. HAGENBUSH DATE : 07/13/21
CHECKED BY : J. F. KENNEDY DATE : 05/29/24
DESIGN ENGINEER OF RECORD: J. F. KENNEDY DATE : 11/03/25



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11/3/2025

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STATE OF NORTH CAROLINA
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RALEIGH

STANDARD
ANCHORAGE DETAILS FOR
GUARDRAIL ANCHOR ASSEMBLY
FOR CULVERTS

101° SKEW

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