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09/08/2019

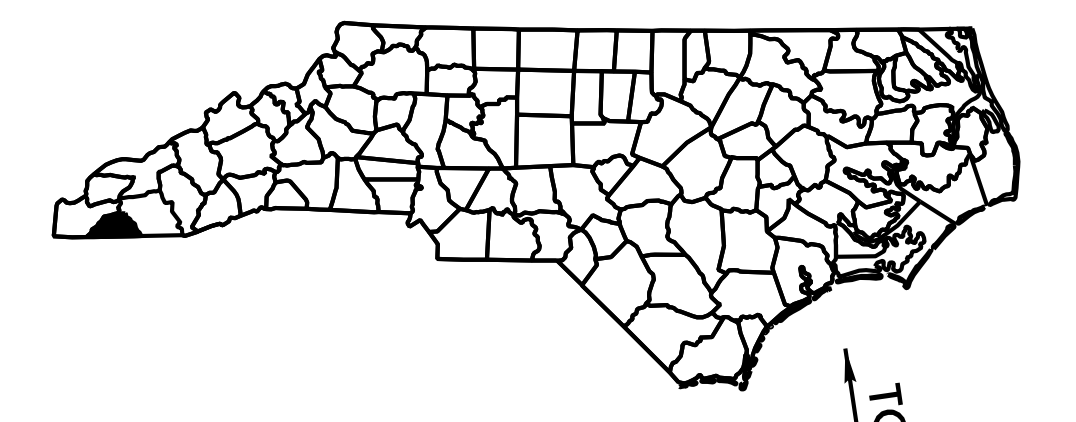
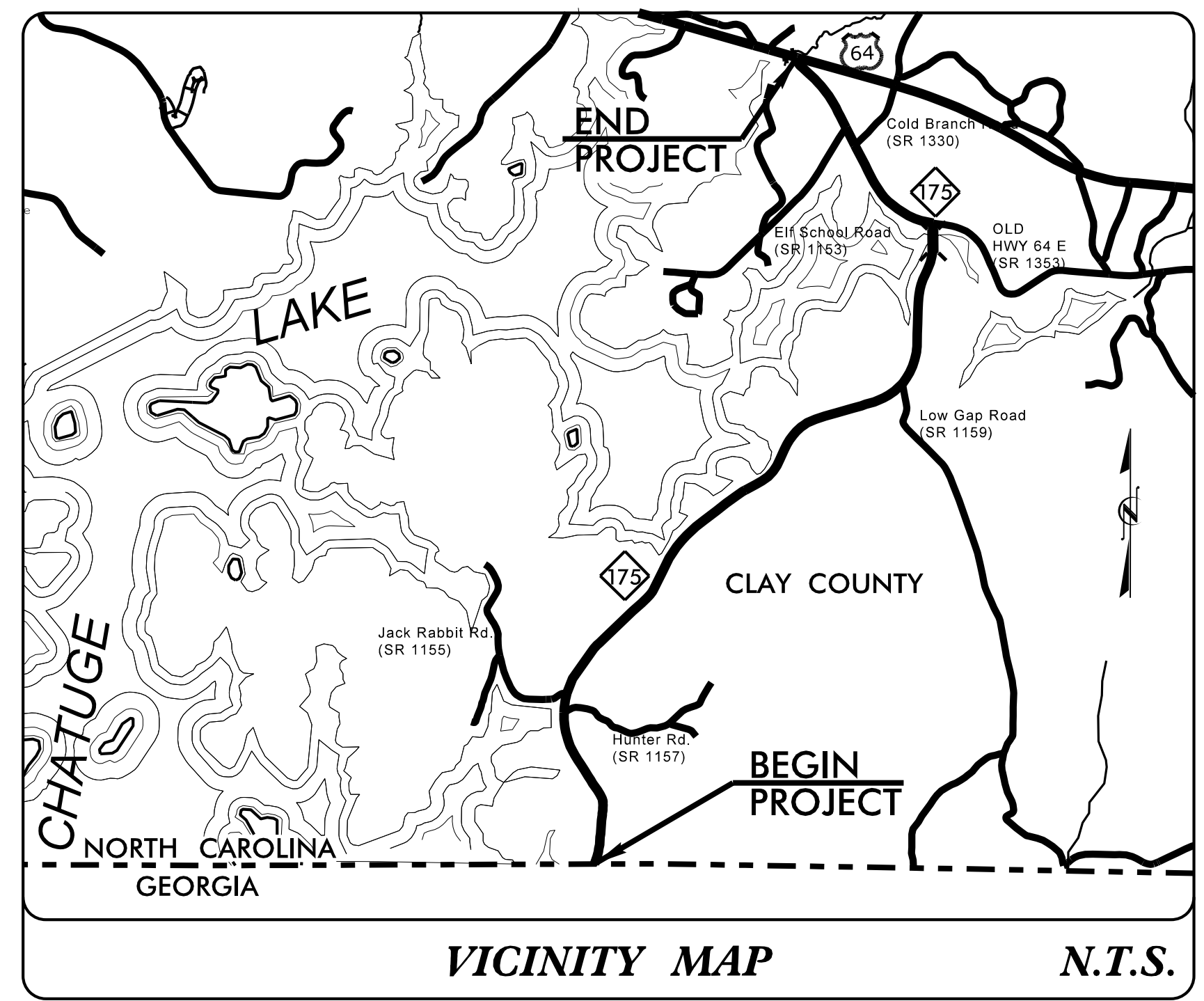
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5742		7
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
46325.1.D.1		PE	
46325.2.1		RW	
46325.3.1		CONST.	

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

# CLAY COUNTY

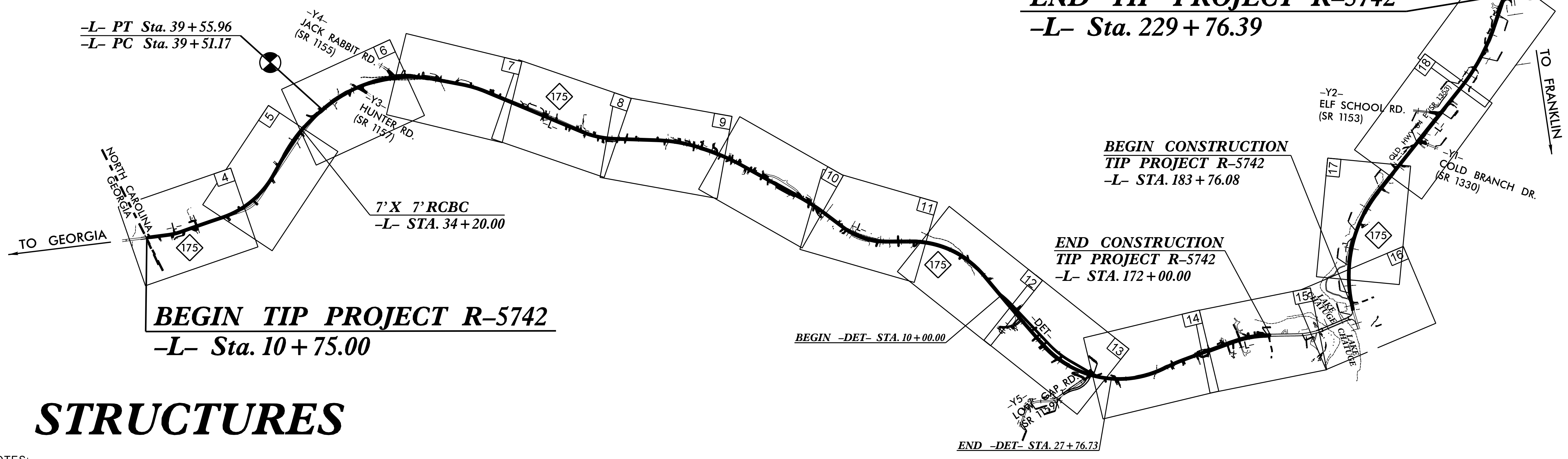
LOCATION: NC 175 FROM GEORGIA STATE LINE TO US 64. UPGRADE ROADWAY

TYPE OF WORK: STRUCTURES



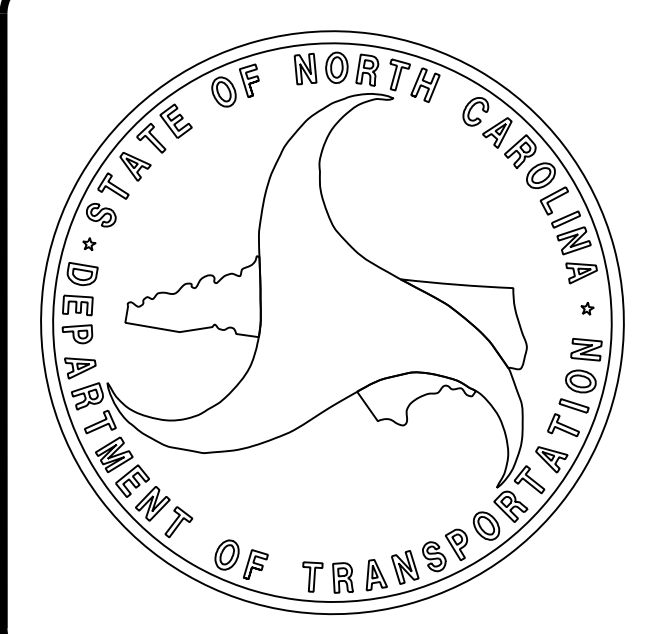
TIP PROJECT: R-5742

CONTRACT: C204291



## STRUCTURES

NOTES:  
1. THIS IS NOT A CONTROLLED ACCESS PROJECT.



DESIGN DATA	
ADT 2019 =	2,820
ADT 2030 =	3,950
K =	%
D =	%
T =	6.4 % *
V =	50 MPH
* (TTST 5.2% + DUALS 2.0%)	
CLASSIFICATION: RURAL MAJOR COLLECTOR	

PROJECT LENGTH	
ROADWAY LENGTH TIP PROJECT R-5742.....	3.925 MILES
TOTAL LENGTH TIP PROJECT R-5742.....	3.925 MILES

PLANS PREPARED BY:  
**RK&K**  
RUMMEL, KLEPPER & KAHL, LLP  
900 RIDGEFIELD DRIVE, SUITE 350  
RALEIGH, NORTH CAROLINA 27609  
NC LICENSE NO. F-0112  
1-888-521-4455 OR 919-878-9560

FOR NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:  
MAY 22, 2017

LETTING DATE:  
FEBRUARY 19, 2019

NCDOT CONTACT: KENNETH McDOWELL  
ASSISTANT DDC ENGINEER - DIVISION 14

B. KEITH SKINNER, P.E.  
PROJECT ENGINEER

BRANDON McINNIS, P.E.  
PROJECT DESIGN ENGINEER

STRUCTURAL ENGINEER

DocuSigned by:  
Ricky Keith

SIGNATURE: \_\_\_\_\_

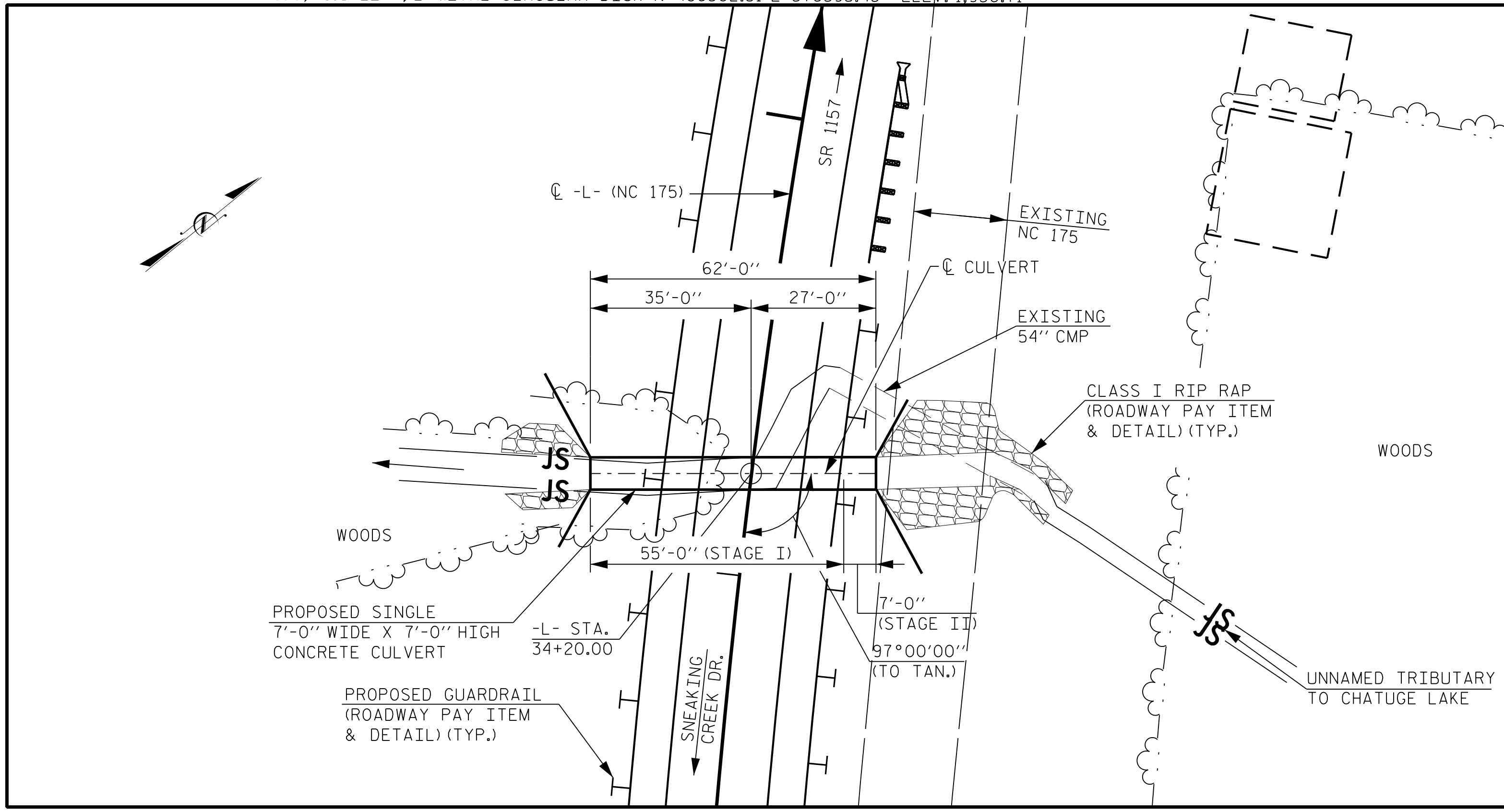
Seal of the Professional Engineer: RICKY V. KEITH, P.E., 12/19/2018

DIVISION OF HIGHWAYS  
STATE OF NORTH CAROLINA

STATE HIGHWAY DESIGN ENGINEER

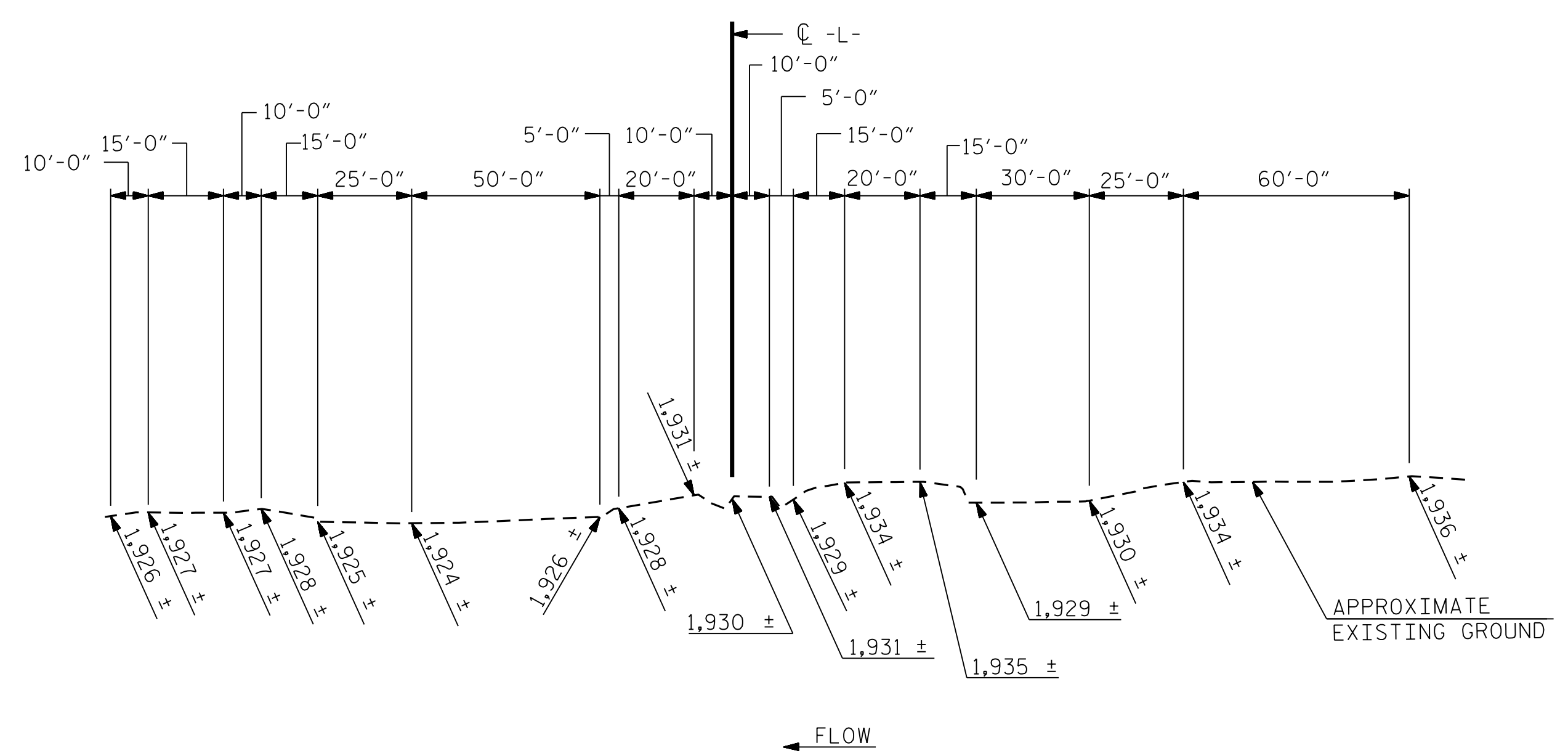
\$\$\$\$\$ SYSTEM \$\$\$\$\$\$  
\$\$\$\$\$ DGN \$\$\$\$\$\$  
\$\$\$\$\$ USERNAME \$\$\$\$\$\$

BENCH MARK: -L- STA. 31+44.00, 7.91' LEFT, 2" METAL CIRCULAR DISK N 486502.31 E 576395.43 ELEV. 1,936.71



**LOCATION SKETCH**

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS  
 GRADE POINT ELEVATION @ STA. 34+20.00-L- = 1,938.2  
 BED ELEVATION @ STA. 34+20.00-L- = 1,926.2  
 ROADWAY SLOPES = 2:1



**PROFILE ALONG CULVERT**

**OVERTOPPING FLOOD DATA**

OVERTOPPING DISCHARGE-----600 C.F.S.  
 FREQUENCY OF OVERTOPPING FLOOD-----500 + YR  
 OVERTOPPING FLOOD ELEVATION-----1,938.2

**NOTES:**

ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING.  
 DESIGN FILL ----- 7.07 FT. (MAX), 2.00 FT. (MIN)  
 FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.  
 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.  
 CONCRETE IN STAGE I CULVERT TO BE POURED IN THE FOLLOWING ORDER:  
 1. STAGE I WING FOOTINGS, FLOOR SLAB, AND CURTAIN WALL TO THE CONSTRUCTION JOINT INCLUDING 4" OF STAGE I VERTICAL WALLS.  
 2. THE REMAINING PORTION OF STAGE I WALLS AND STAGE I WINGS FOR FULL HEIGHT.  
 3. STAGE I ROOF SLAB AND HEADWALL  
 CONCRETE IN STAGE II CULVERT TO BE POURED IN THE FOLLOWING ORDER:  
 1. STAGE II WING FOOTINGS, FLOOR SLAB, AND CURTAIN WALL TO THE CONSTRUCTION JOINT INCLUDING 4" OF STAGE II VERTICAL WALLS.  
 2. THE REMAINING PORTION OF STAGE II WALLS AND STAGE II WINGS FOR FULL HEIGHT.  
 3. STAGE II ROOF SLAB AND HEADWALL.  
 4. STAGE I AND STAGE II SILLS  
 THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.  
 DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.  
 AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF THE EXTERIOR WALL ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.

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

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

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

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

EXCAVATE A MINIMUM OF 1 FOOT BELOW CULVERT BEARING ELEVATION AND REPLACE WITH FOUNDATION CONDITIONING MATERIAL PER SECTION 414 OF THE STANDARD SPECIFICATIONS.

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

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CONSTRUCTION SEQUENCE, SEE EROSION CONTROL PLANS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

TRAFFIC ON NC 175 SHALL BE MAINTAINED, FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC CONTROL PLANS.

**HYDRAULIC DATA**

DESIGN DISCHARGE-----290 C.F.S.  
 FREQUENCY OF DESIGN FLOOD-----50 YR.  
 DESIGN HIGH WATER ELEVATION-----1,934.3  
 DRAINAGE AREA-----0.49 SQ. MI.  
 BASE DISCHARGE (Q100)-----350 C.F.S.  
 BASE HIGH WATER ELEVATION-----1,935.2

**STAGE I  
TOTAL STRUCTURE QUANTITIES**

CLASS A CONCRETE	
BARREL @ 0.79 CY/FT	43.5 C.Y.
WING ETC.	9.4 C.Y.
SILLS/BAFFLES	1.3 C.Y.
<b>TOTAL</b>	<b>54.2 C.Y.</b>

REINFORCING STEEL	
BARREL	6,059 LBS.
WINGS ETC.	576 LBS.
<b>TOTAL</b>	<b>6,635 LBS.</b>

CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	33 TONS

**STAGE II  
TOTAL STRUCTURE QUANTITIES**

CLASS A CONCRETE	
BARREL @ 0.79 CY/FT	5.5 C.Y.
WING ETC.	9.4 C.Y.
SILLS/BAFFLES	0.3 C.Y.
<b>TOTAL</b>	<b>15.2 C.Y.</b>

REINFORCING STEEL	
BARREL	894 LBS.
WINGS ETC.	576 LBS.
<b>TOTAL</b>	<b>1,470 LBS.</b>

CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	4 TONS

PROJECT NO. R-5742  
CLAY COUNTY  
 STATION: 34+20.00 -L-

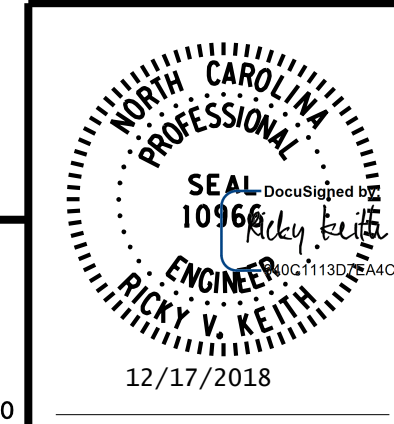
SHEET 1 OF 7

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

**SINGLE 7 FT. X 7 FT.  
CONCRETE BOX CULVERT  
97° SKEW**

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

**RK&K**  
 RUMMEL, KLEPPER & KAHL, LLP  
 900 RIDGEFIELD DRIVE SUITE 350  
 RALEIGH, NC 27609-3960 (919) 878-9560  
 NC LICENSE NUMBER: F-0112

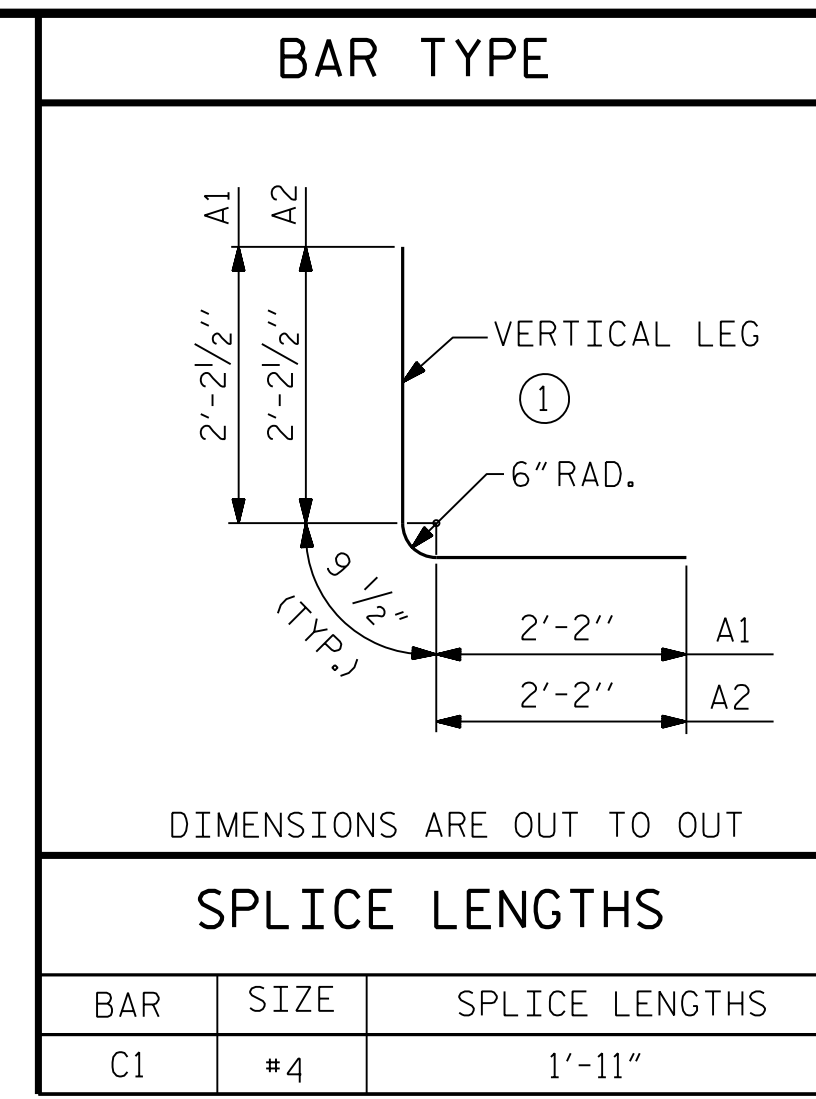


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DRAWN BY : A. L. STROUD DATE : JAN 2019  
 CHECKED BY : R. V. KEITH DATE : JAN 2019  
 DESIGN ENGINEER OF RECORD : A. L. STROUD DATE : JAN 2019

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**STAGE I  
BILL OF MATERIAL**

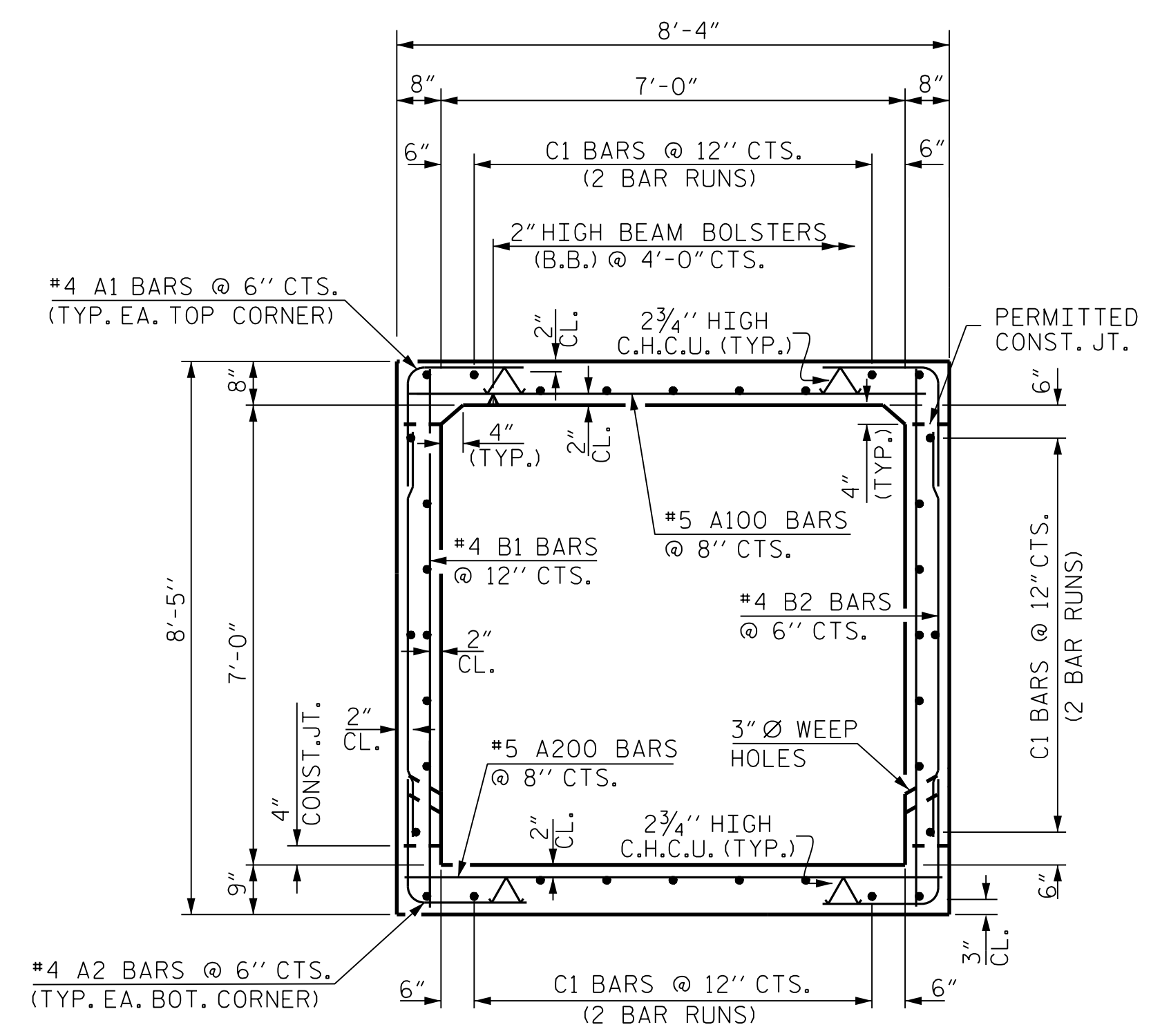
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	220	#4	1	5'-2"	759
A2	220	#4	1	5'-2"	759
A100	82	#5	STR.	8'-0"	684
A200	82	#5	STR.	8'-0"	684
B1	110	#4	STR.	8'-0"	588
B2	220	#4	STR.	6'-4"	931
C1	68	#4	STR.	29'-5"	1,336
D1	4	#6	STR.	2'-3"	14
D2	8	#6	STR.	1'-3"	15
G1	4	#5	STR.	8'-0"	33
S1	12	#8	STR.	8'-0"	256

REINFORCING STEEL 6,059 LBS.

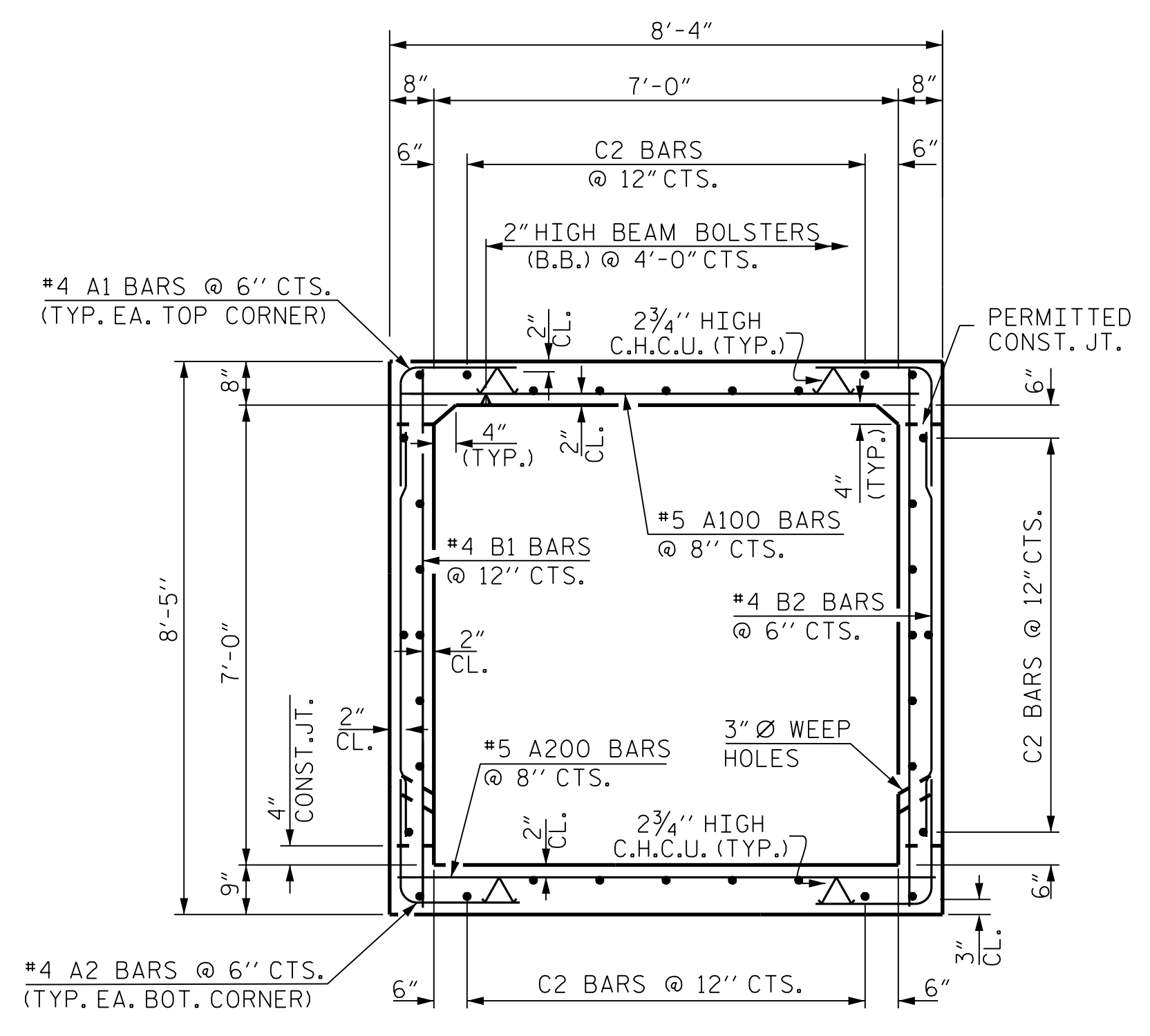
**STAGE II  
BILL OF MATERIAL**

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	28	#4	1	5'-2"	97
A2	28	#4	1	5'-2"	97
A100	11	#5	STR.	8'-0"	92
A200	11	#5	STR.	8'-0"	92
B1	14	#4	STR.	8'-0"	75
B2	28	#4	STR.	6'-4"	118
C2	34	#4	STR.	6'-10"	155
D1	1	#6	STR.	2'-3"	3
D2	2	#6	STR.	1'-3"	4
G1	4	#5	STR.	8'-0"	33
S1	6	#8	STR.	8'-0"	128

REINFORCING STEEL 894 LBS.



**RIGHT ANGLE SECTION OF BARREL (STAGE I)**  
THERE ARE 34 "C" BARS IN SECTION OF BARREL



**RIGHT ANGLE SECTION OF BARREL (STAGE II)**  
THERE ARE 34 "C" BARS IN SECTION OF BARREL

PROJECT NO. R-5742  
CLAY COUNTY  
 STATION: 34+20.00 -L-

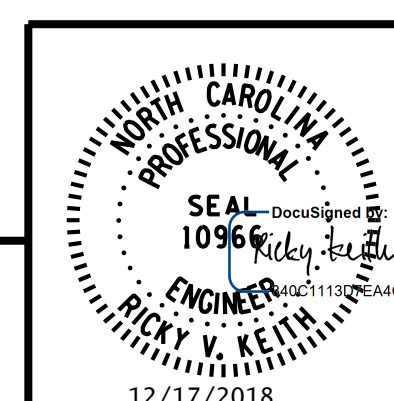
SHEET 2 OF 7

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

**SECTION DETAILS  
 STAGE I AND STAGE II**

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

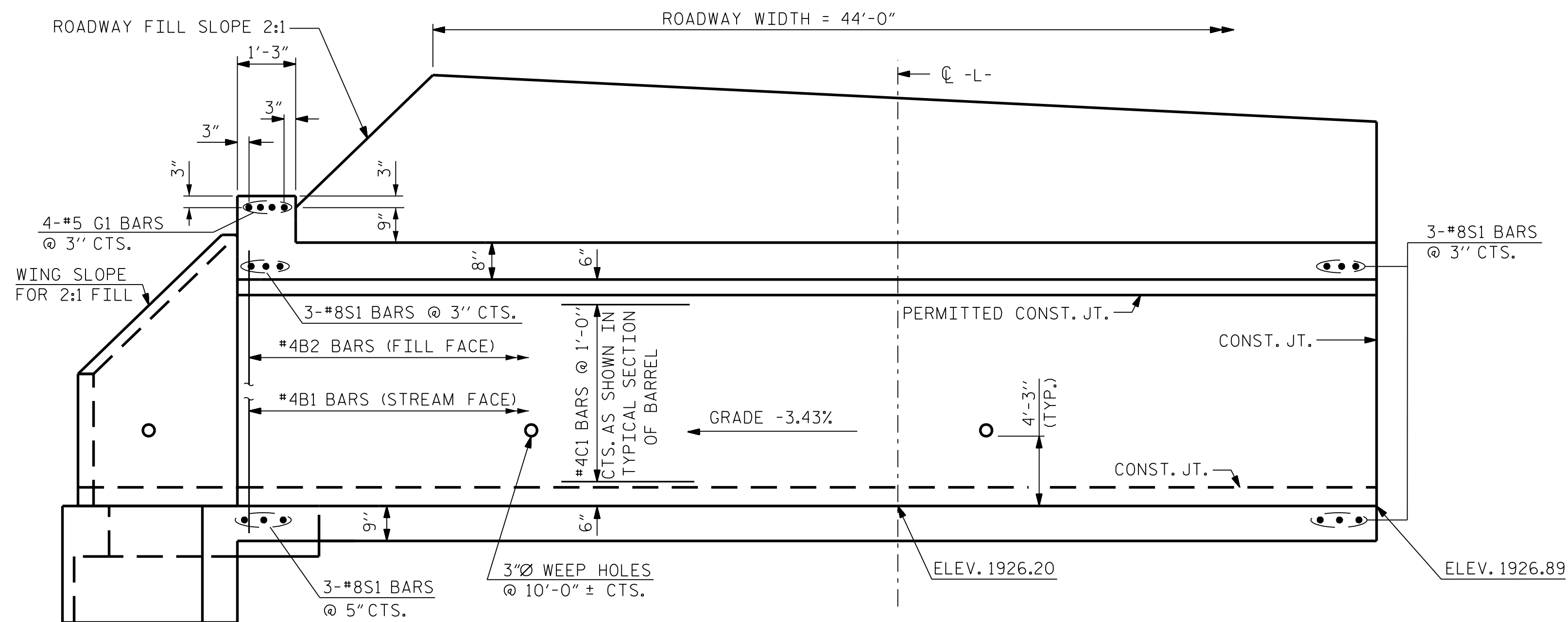
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 TOTAL SHEETS 7



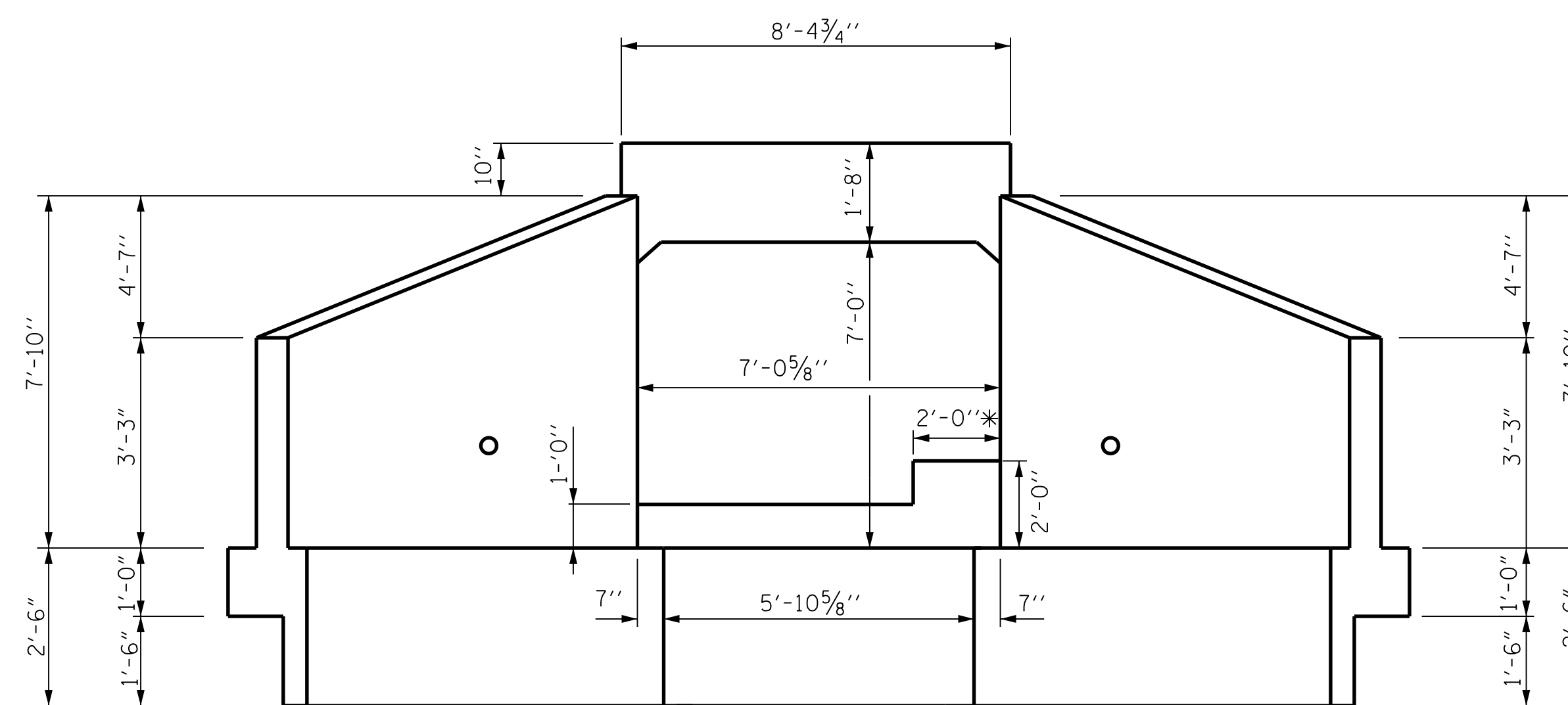
**RK&K**  
 RUMMEL, KLEPPER & KAHL, LLP  
 900 RIDGEFIELD DRIVE SUITE 350  
 RALEIGH, NC 27609-3960 (919) 878-9560  
 NC LICENSE NUMBER: F-0112

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 DESIGN ENGINEER OF RECORD : A. L. STROUD DATE : JAN 2019

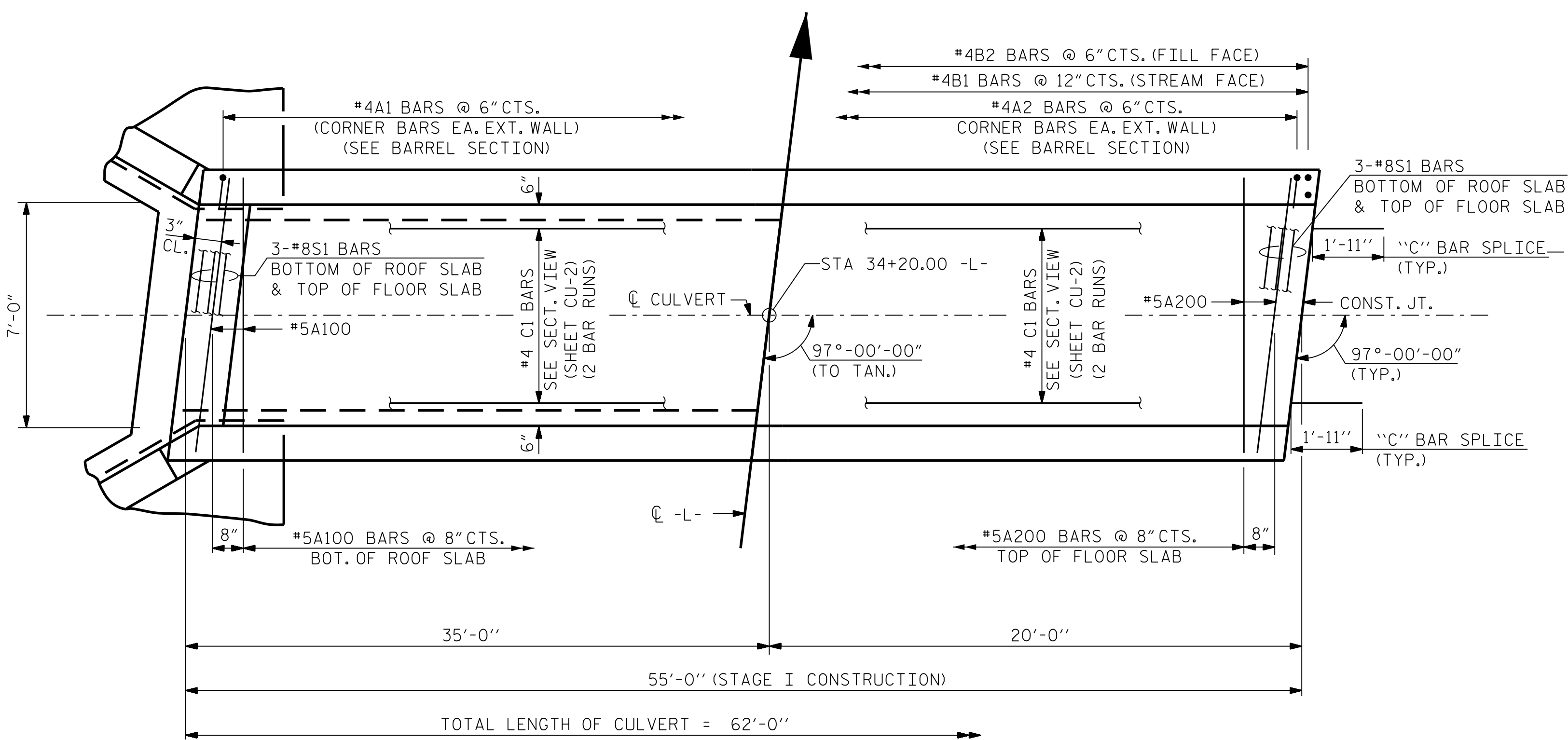


**CULVERT SECTION NORMAL TO ROADWAY (STAGE I)**



**END ELEVATION NORMAL TO SKEW (STAGE I)**

(LOOKING UPSTREAM)



**PART PLAN - ROOF SLAB (STAGE I)**

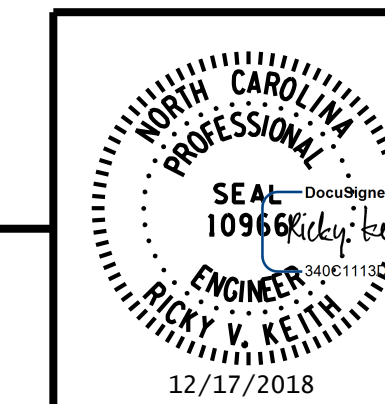
**PART PLAN - FLOOR SLAB (STAGE I)**

PROJECT NO. R-5742  
CLAY COUNTY  
 STATION: 34+20.00 -L-

SHEET 3 OF 7

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

SINGLE 7 FT. W X 7 FT. H  
 CONCRETE BOX CULVERT  
 ROOF AND FLOOR DETAILS  
 STAGE I



**RK&K**  
 RUMMEL, KLEPPER & KAHL, LLP  
 900 RIDGEFIELD DRIVE SUITE 350  
 RALEIGH, NC 27609-3960 (919) 878-9560  
 NC LICENSE NUMBER: F-0112

REVISIONS

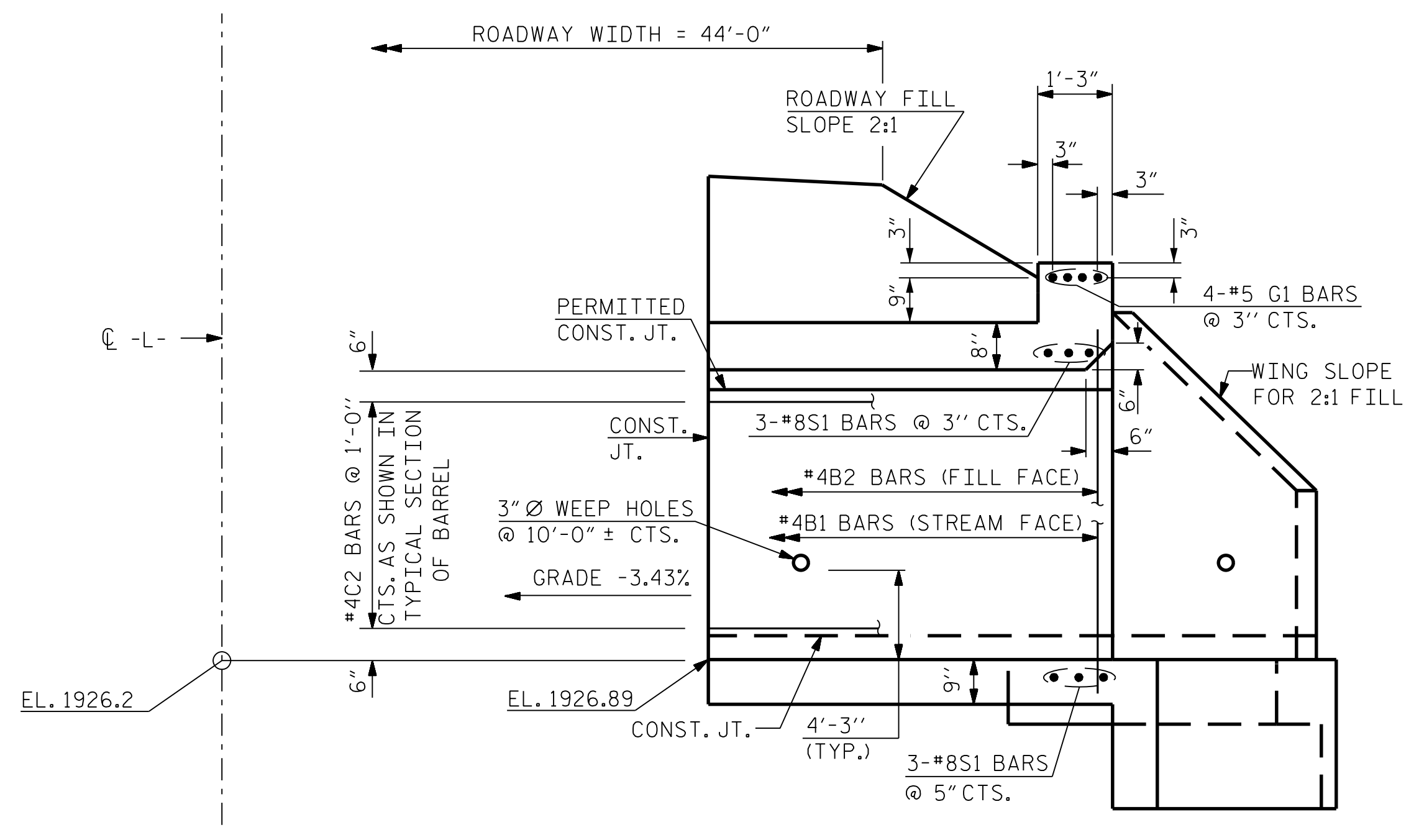
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SHEET NO.  
**C1-3**  
 TOTAL SHEETS  
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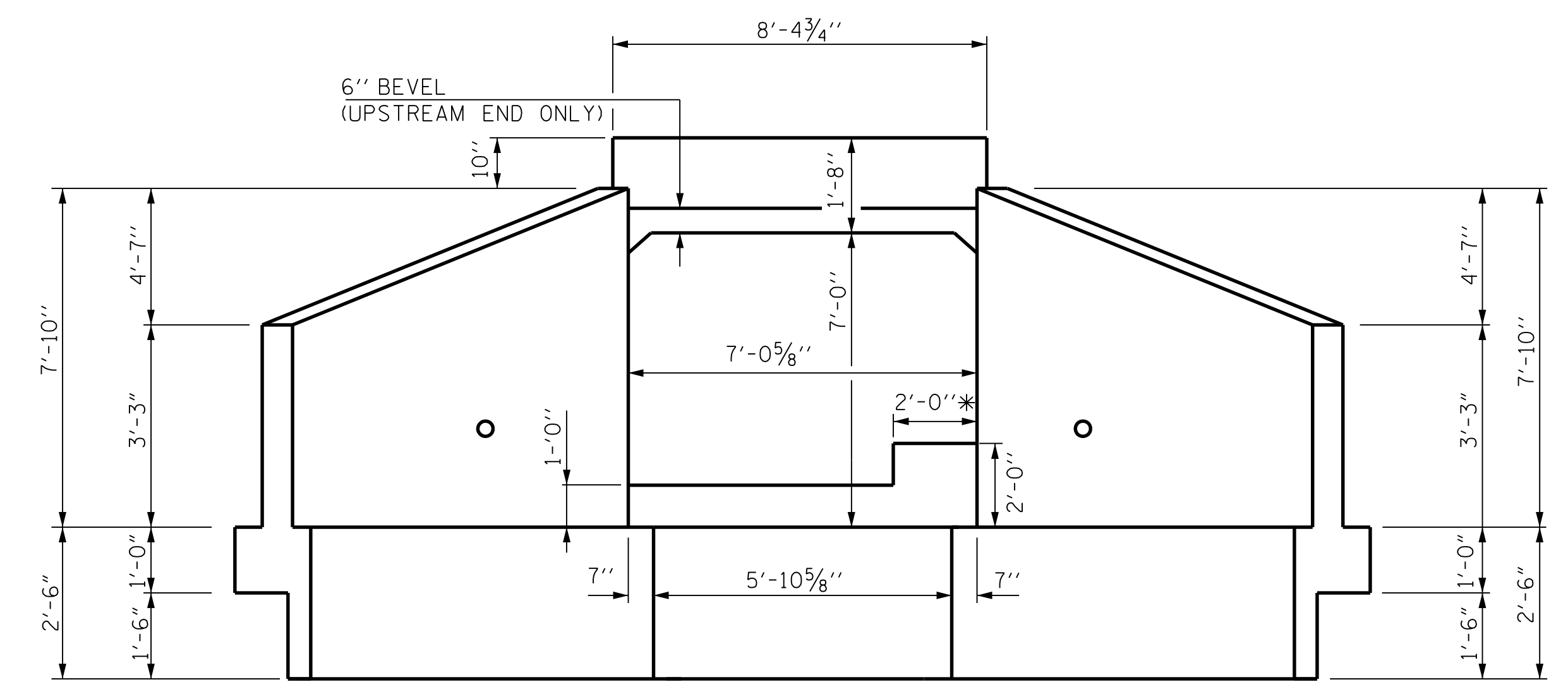
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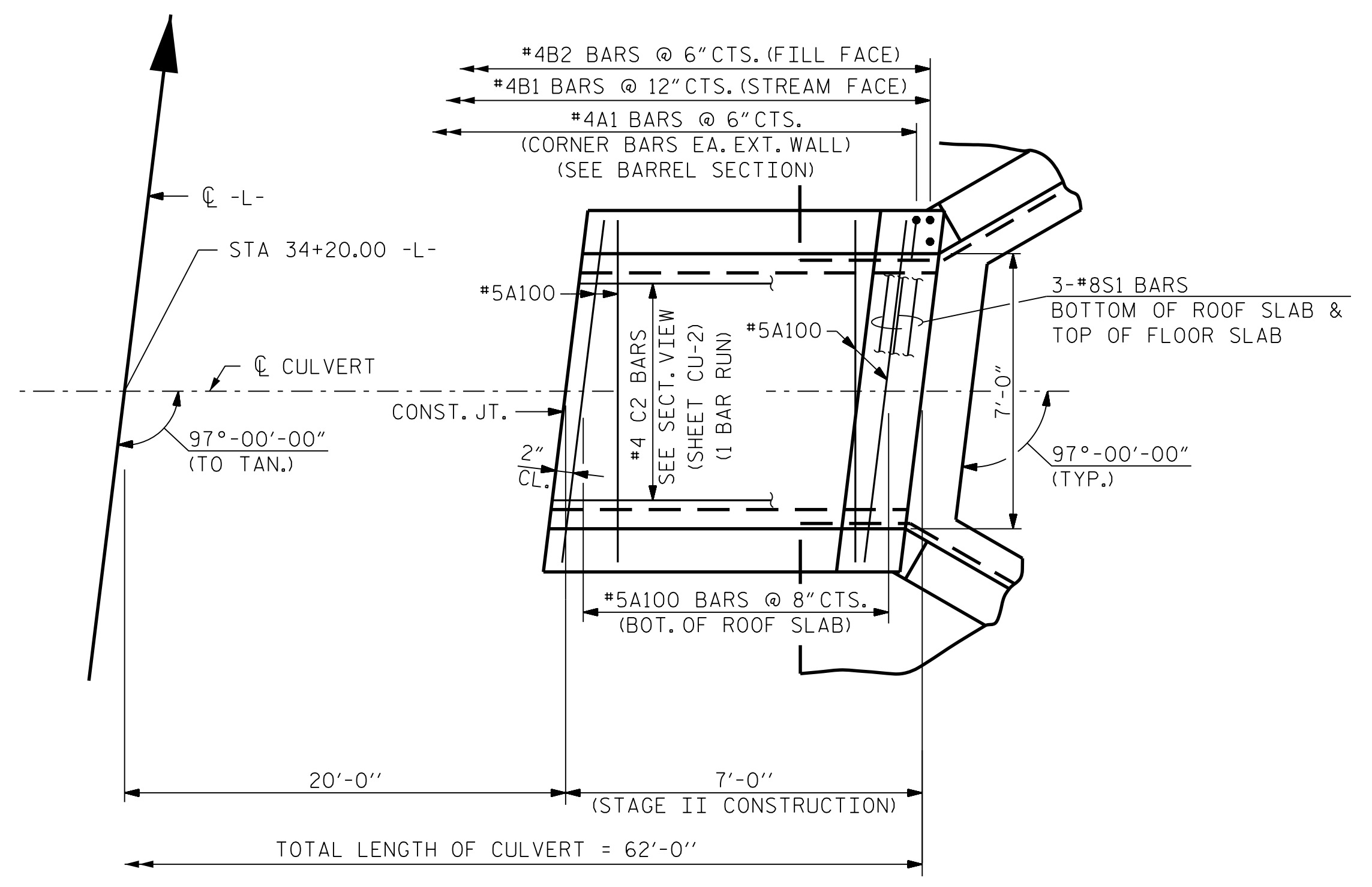
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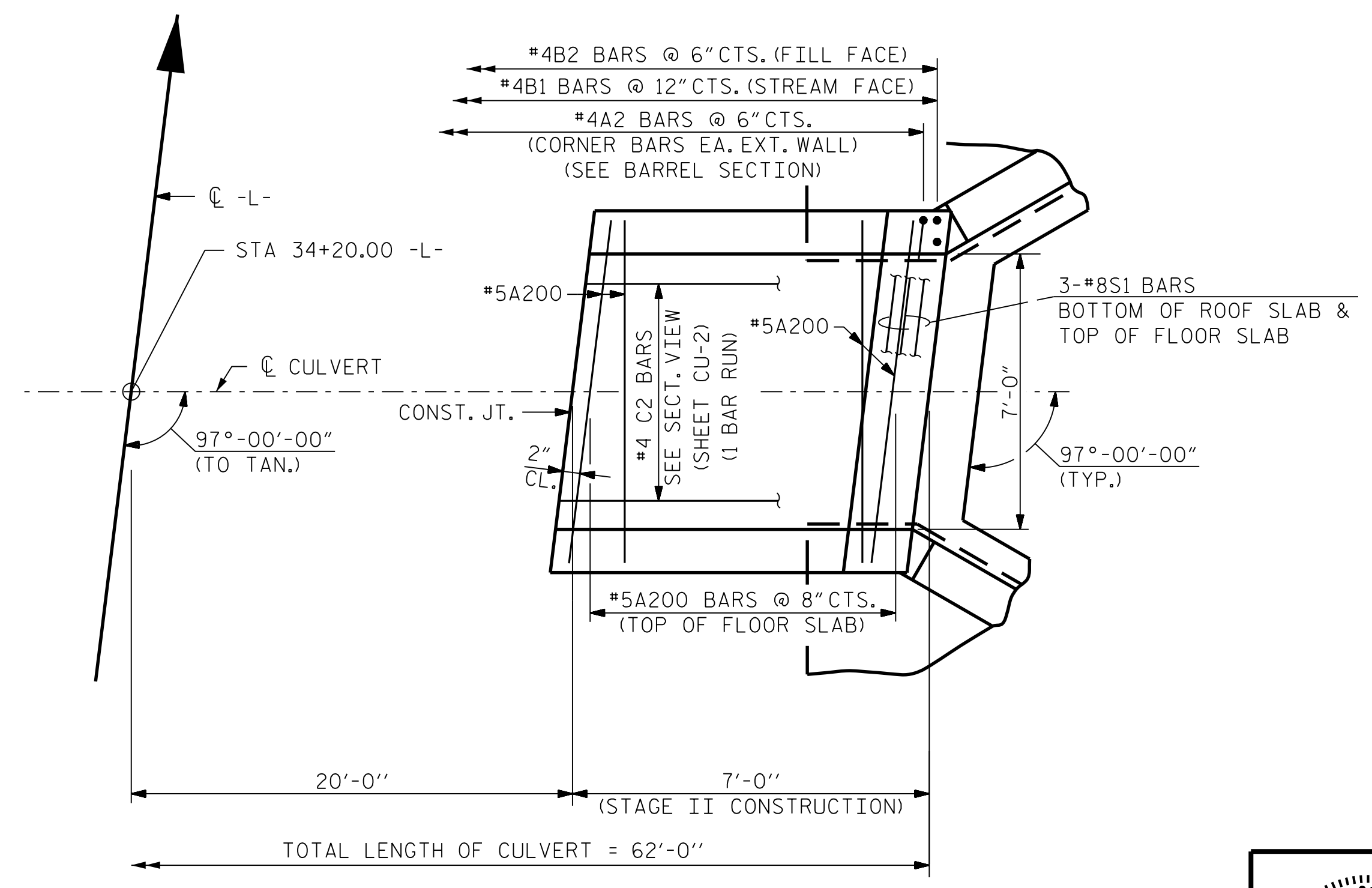
**CULVERT SECTION NORMAL TO ROADWAY (STAGE II)**



**END ELEVATION NORMAL TO SKEW (STAGE II)**  
(LOOKING UPSTREAM)



**PART PLAN - ROOF SLAB**  
(STAGE II)



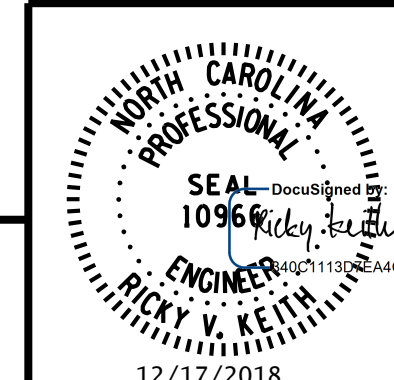
**PART PLAN - FLOOR SLAB**  
(STAGE II)

PROJECT NO. R-5742  
CLAY COUNTY  
 STATION: 34+20.00 -L-

SHEET 4 OF 7

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

SINGLE 7 FT. W X 7 FT. H  
 CONCRETE BOX CULVERT  
 ROOF AND FLOOR DETAILS  
 STAGE II



**RK&K**  
 RUMMEL, KLEPPER & KAHL, LLP  
 900 RIDGEFIELD DRIVE SUITE 350  
 RALEIGH, NC 27609-3960 (919) 878-9560  
 NC LICENSE NUMBER: F-0112

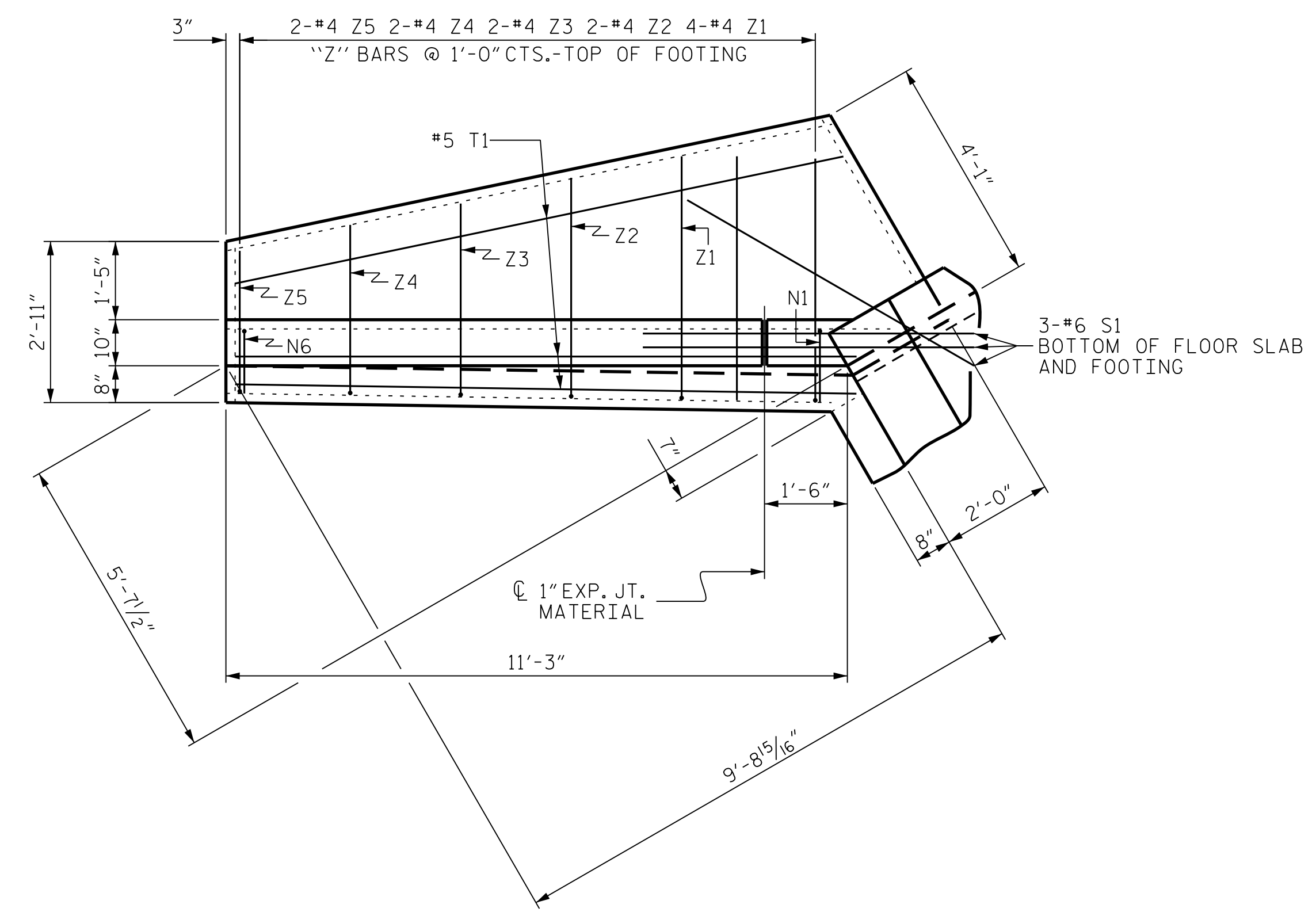
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2			4			7

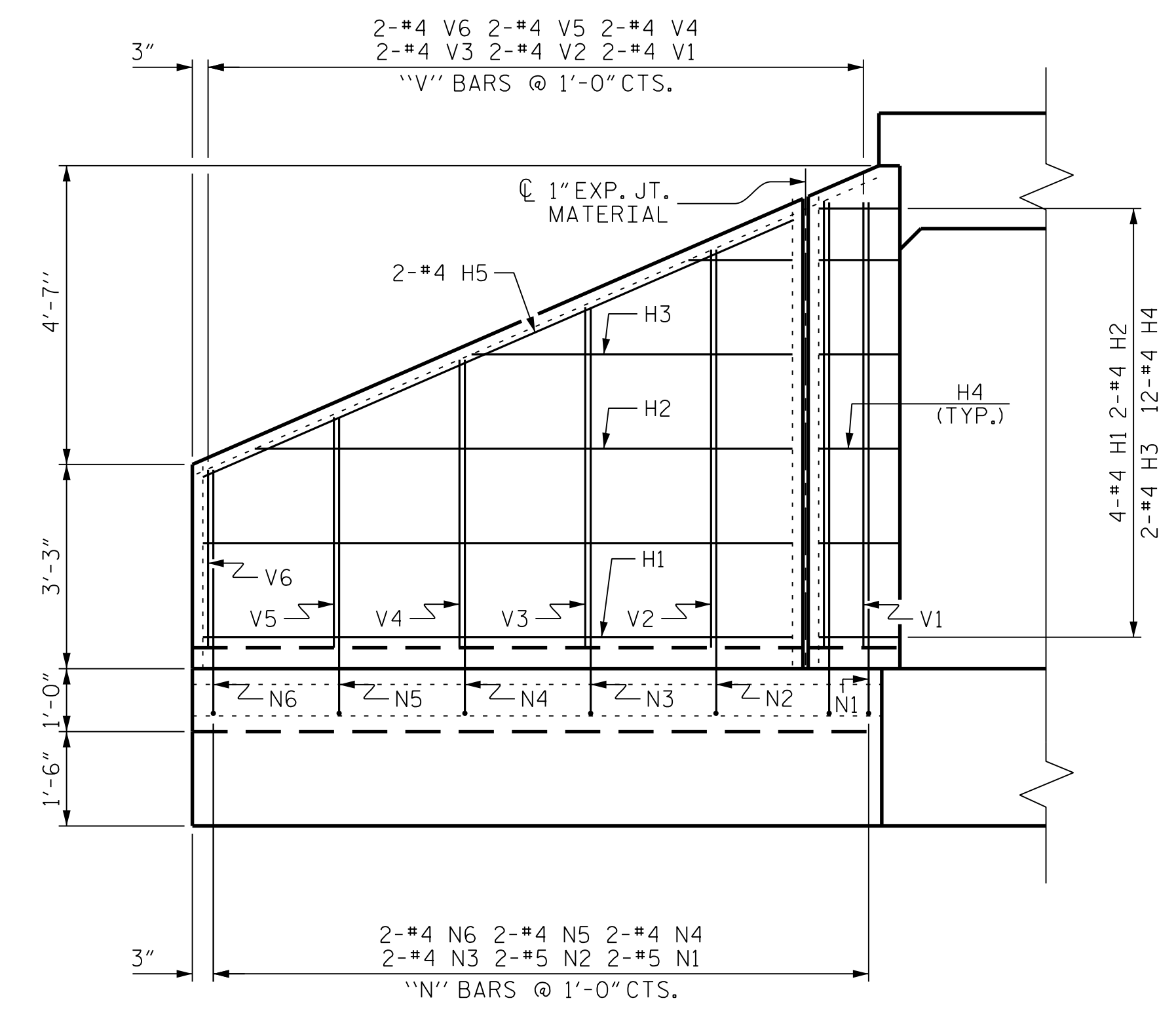
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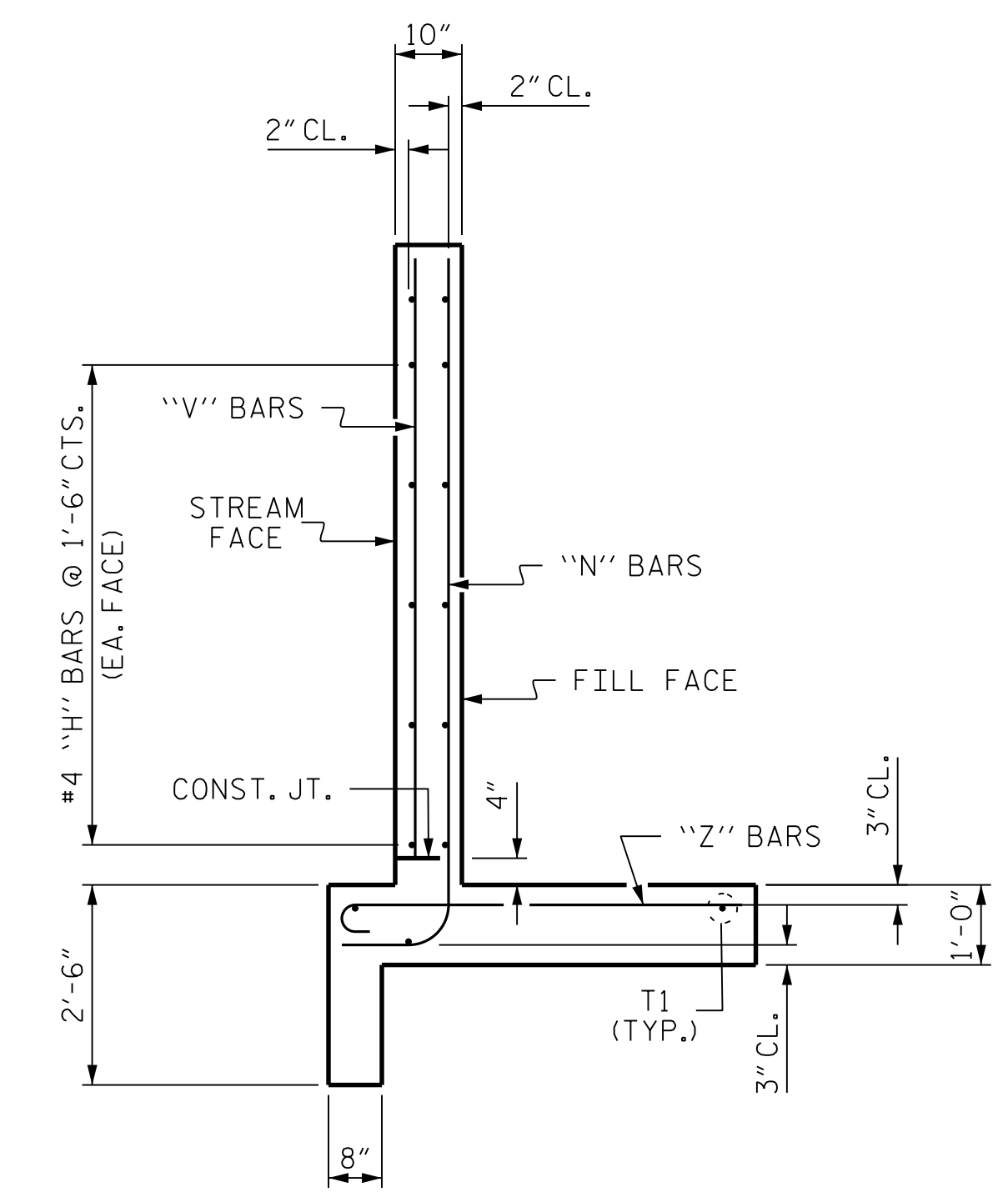
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PLAN



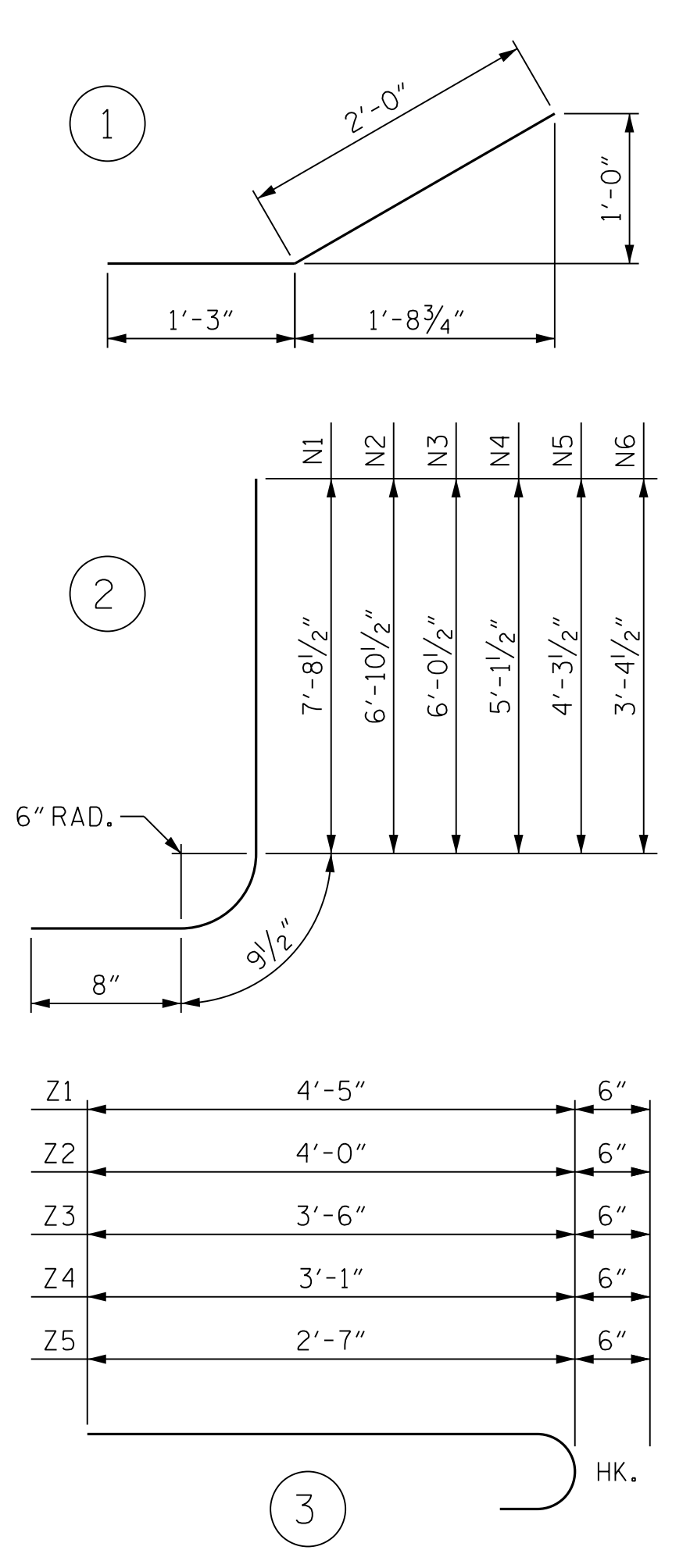
ELEVATION



TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.



BILL OF MATERIAL

BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	16	#4	STR	9'-4"	100
H2	8	#4	STR	8'-6"	45
H3	8	#4	STR	5'-1"	27
H4	48	#4	1	3'-3"	104
H5	8	#4	STR	10'-3"	55
N1	8	#5	2	9'-2"	76
N2	8	#5	2	8'-4"	70
N3	8	#4	2	7'-6"	40
N4	8	#4	2	6'-7"	35
N5	8	#4	2	5'-9"	31
N6	8	#4	2	4'-10"	26
S1	12	#6	STR	6'-0"	108
T1	12	#5	STR	11'-3"	141
V1	8	#4	STR	7'-1"	38
V2	8	#4	STR	6'-4"	34
V3	8	#4	STR	5'-5"	29
V4	8	#4	STR	4'-7"	24
V5	8	#4	STR	3'-8"	20
V6	8	#4	STR	2'-10"	15
Z1	16	#4	3	4'-11"	53
Z2	8	#4	3	4'-6"	24
Z3	8	#4	3	4'-0"	21
Z4	8	#4	3	3'-7"	19
Z5	8	#4	3	3'-1"	16

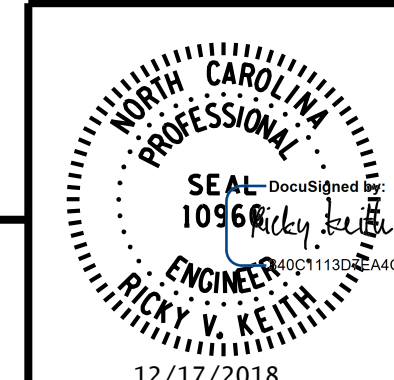
TOTAL REINFORCING STEEL FOR 4 WINGS 1151 LBS

CLASS A CONCRETE		
4 WINGS	17.1	CY
2 HEADWALLS	0.78	CY
2 END CURTAIN WALLS	0.88	CY
<b>TOTAL</b>	<b>18.8</b>	<b>CY</b>

PROJECT NO. R-5742  
 CLAY COUNTY  
 STATION: 34+20.00 -L-

SHEET 5 OF 7

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
**STANDARD WINGS FOR CONCRETE BOX CULVERT**  
 H = 7'-0" SLOPE = 2:1



**RK&K**  
 RUMMEL, KLEPPER & KAHL, LLP  
 900 RIDGEFIELD DRIVE SUITE 350  
 RALEIGH, NC 27609-3960 (919) 878-9560  
 NC LICENSE NUMBER: F-0112

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-5
1			3			TOTAL SHEETS
2			4			7

DRAWN BY : A.L. STROUD DATE : JAN 2019  
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STD. NO. CW9007

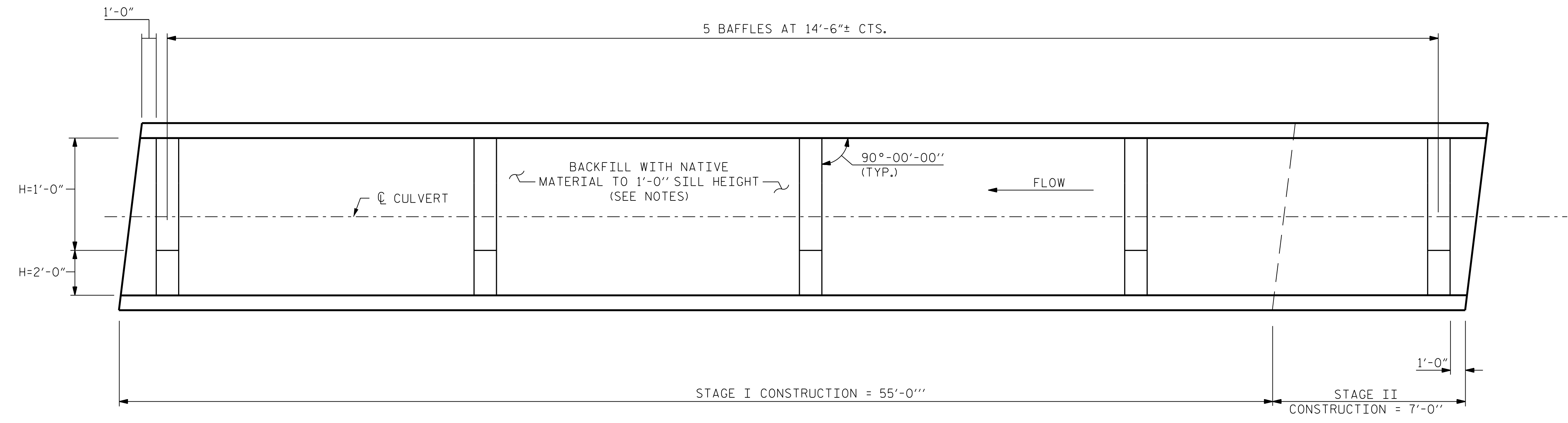
**NOTES:**

NATIVE MATERIAL BETWEEN SILLS / BAFFLES IN THE CULVERT SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL.

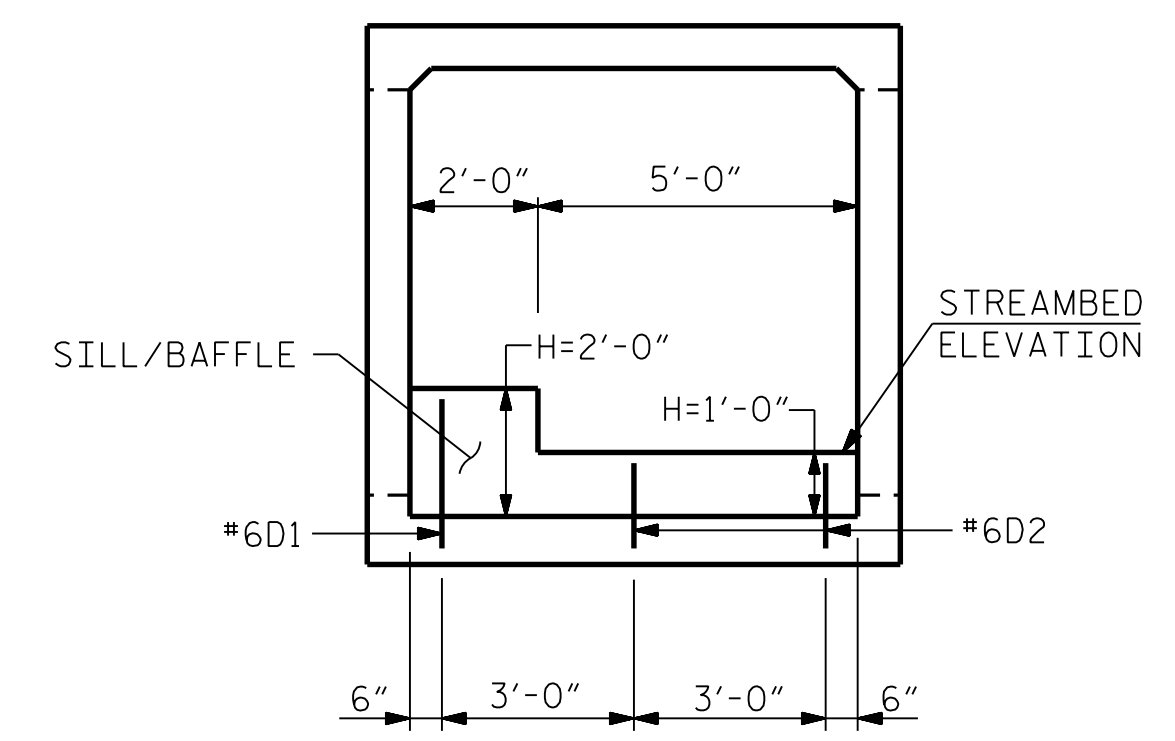
NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM OR FLOODPLAIN AT THE PROJECT SITE DURING CONSTRUCTION. ONLY MATERIAL THAT IS EXCAVATED FROM THE STREAM BED MAY BE USED TO BACKFILL THE LOW FLOW CULVERT BARREL. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT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

TOP OF LOW FLOW SILLS / BAFFLES SHOULD MATCH STREAM BED ELEVATION IN LOW FLOW CHANNEL OF STREAM. (THALWEG)

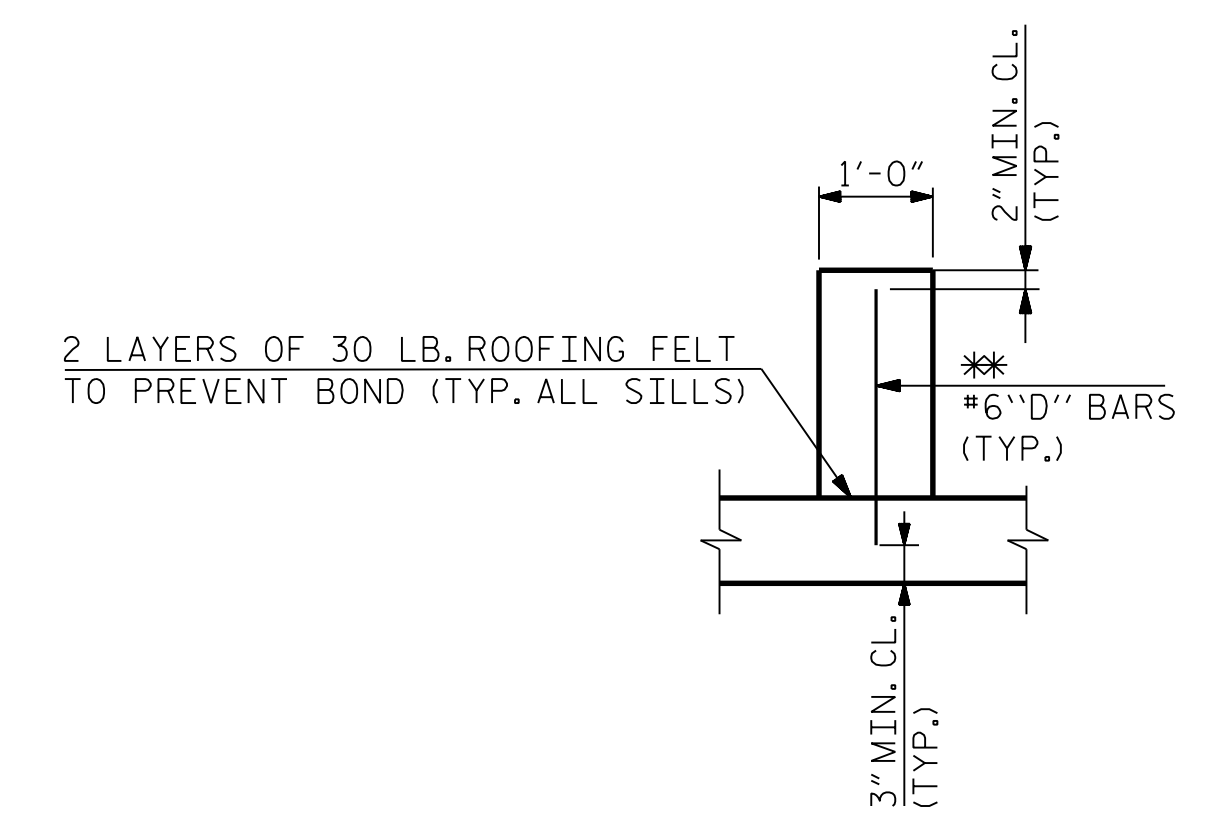
DO NOT SET ELEVATION OF HIGH SILLS / BAFFLES ABOVE BANK FULL.



SILL/BAFFLE PLAN



SILL/BAFFLE ELEVATION  
(LOOKING DOWNSTREAM)



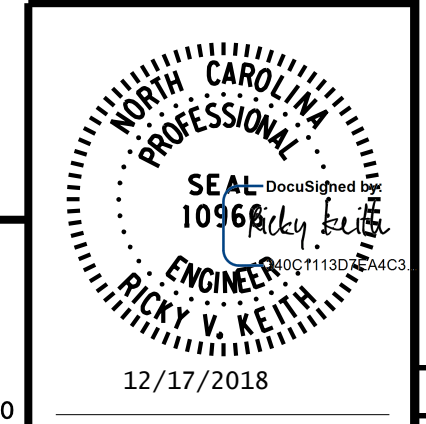
\*  
DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.

SILL/BAFFLE SECTIONS

PROJECT NO. R-5742  
CLAY COUNTY  
STATION: 34+20.00 -L-

SHEET 6 OF 7

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
SINGLE 7 FT. W X 7 FT. H  
CONCRETE BOX CULVERT  
97° SKEW  
SILL/BAFFLE DETAILS



**RK&K**  
RUMMEL, KLEPPER & KAHL, LLP  
900 RIDGEFIELD DRIVE SUITE 350  
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NC LICENSE NUMBER: F-0112

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-6
1			3			TOTAL SHEETS
2			4			7

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



## 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		
						MOMENT				SHEAR						
						LIVE-LOAD FACTORS (%LL)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE		DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING	HL-93 (INVENTORY)	N/A	1	2.47	--	1.75	2.47	1	BOTTOM SLAB	3.5	2.15	1	BOTTOM SLAB	0.1		
	HL-93 (OPERATING)	N/A		3.20	--	1.35	3.20	1	BOTTOM SLAB	3.5	2.78	1	BOTTOM SLAB	0.1		
	HS-20 (INVENTORY)	36.000	2	2.06	74.1	1.75	2.06	1	BOTTOM SLAB	3.5	2.41	1	BOTTOM SLAB	0.1		
	HS-20 (OPERATING)	36.000		2.68	96.4	1.35	2.68	1	BOTTOM SLAB	3.5	3.12	1	BOTTOM SLAB	0.1		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		3.86	52.1	1.40	3.86	1	BOTTOM SLAB	3.5	7.59	1	BOTTOM SLAB	0.1		
		SNGARBS2	20.000		3.86	77.1	1.40	3.86	1	BOTTOM SLAB	3.5	7.10	1	BOTTOM SLAB	0.1	
		SNAGRIS2	22.000		3.86	84.8	1.40	3.86	1	BOTTOM SLAB	3.5	7.59	1	BOTTOM SLAB	0.1	
		SNCOTTS3	27.250	3	3.58	97.4	1.40	3.58	1	BOTTOM SLAB	3.5	4.42	1	BOTTOM SLAB	0.1	
		SNAGGRS4	34.925		3.76	131	1.40	3.76	1	BOTTOM SLAB	3.5	4.58	1	BOTTOM SLAB	0.1	
		SNS5A	35.550		3.79	134	1.40	3.79	1	BOTTOM SLAB	3.5	4.65	1	BOTTOM SLAB	0.1	
		SNS6A	39.950		3.78	151	1.40	3.78	1	BOTTOM SLAB	3.5	4.65	1	BOTTOM SLAB	0.1	
	SNS7B	42.000		3.78	158	1.40	3.78	1	BOTTOM SLAB	3.5	4.65	1	BOTTOM SLAB	0.1		
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		3.86	127	1.40	3.86	1	BOTTOM SLAB	3.5	7.59	1	BOTTOM SLAB	0.1	
		TNT4A	33.075		3.86	127	1.40	3.86	1	BOTTOM SLAB	3.5	5.27	1	BOTTOM SLAB	0.1	
		TNT6A	41.600		3.84	159	1.40	3.84	1	BOTTOM SLAB	3.5	4.67	1	BOTTOM SLAB	0.1	
		TNT7A	42.000		3.86	161	1.40	3.86	1	BOTTOM SLAB	3.5	4.96	1	BOTTOM SLAB	0.1	
		TNT7B	42.000		3.82	160	1.40	3.82	1	BOTTOM SLAB	3.5	4.66	1	BOTTOM SLAB	0.1	
		TNAGRIT4	43.000		3.86	165	1.40	3.86	1	BOTTOM SLAB	3.5	5.27	1	BOTTOM SLAB	0.1	
TNAGT5A		45.000		3.86	173	1.40	3.86	1	BOTTOM SLAB	3.5	5.27	1	BOTTOM SLAB	0.1		
TNAGT5B	45.000		3.86	173	1.40	3.86	1	BOTTOM SLAB	3.5	5.27	1	BOTTOM SLAB	0.1			

### LOAD FACTORS:

#### DESIGN LOAD RATING FACTORS

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

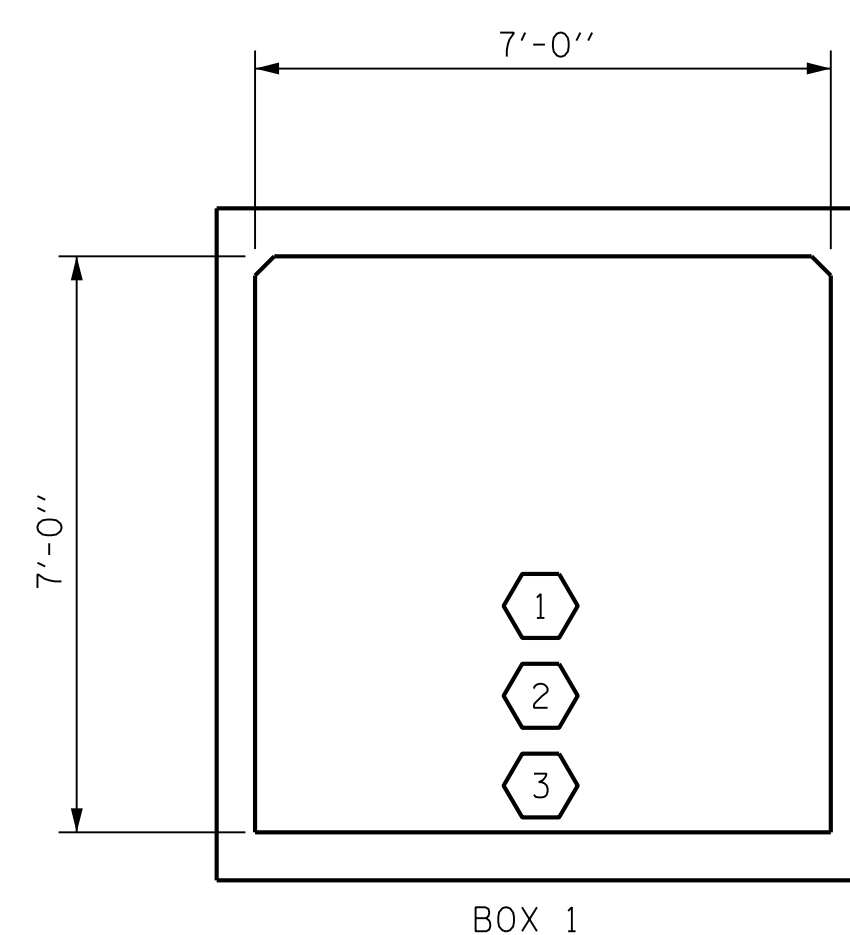
### NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

### COMMENTS:

- 1.
- 2.
- 3.
- 4.

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

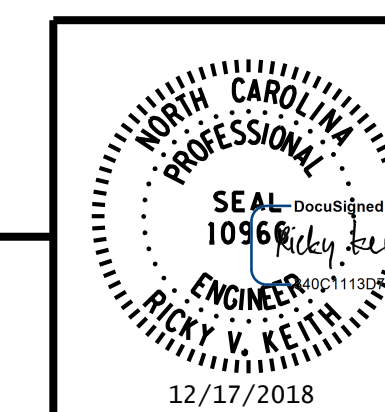


**LRFR SUMMARY**  
(LOOKING DOWNSTREAM)

PROJECT NO. R-5742  
CLAY COUNTY  
 STATION: 34+20.00 -L-

SHEET 7 OF 7

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
**STANDARD**  
 LRFR SUMMARY FOR  
 REINFORCED CONCRETE  
 BOX CULVERTS  
 (NON-INTERSTATE TRAFFIC)



**RK&K**  
 RUMMEL, KLEPPER & KAHL, LLP  
 900 RIDGEFIELD DRIVE SUITE 350  
 RALEIGH, NC 27609-3960 (919) 878-9560  
 NC LICENSE NUMBER: F-0112

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1			3			TOTAL SHEETS
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DRAWN BY : A.L. STROUD DATE : JAN 2019  
 CHECKED BY : R.V. KEITH DATE : JAN 2019  
 DESIGN ENGINEER OF RECORD : A.L. STROUD DATE : JAN 2019

## 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 3/4" WITH THE FOLLOWING EXCEPTIONS: TOP CORNERS OF CURBS MAY BE ROUNDED TO 1/2" RADIUS WHICH IS BUILT INTO CURB FORMS; CORNERS OF TRANSVERSE FLOOR EXPANSION JOINTS SHALL BE ROUNDED WITH A 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 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 7/8" Ø SHEAR STUDS FOR THE 3/4" Ø STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - 7/8" Ø STUDS FOR 4 - 3/4" 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 3/4" Ø STUDS BASED ON THE RATIO OF 3 - 7/8" Ø STUDS FOR 4 - 3/4" 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 3/16" IN THICKNESS AND DO NOT EXCEED A WIDTH EQUAL TO THE FLANGE WIDTH LESS 2" OR A THICKNESS EQUAL TO 2 TIMES THE FLANGE THICKNESS. THE SIZE OF FILLET WELDS SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT ANSI/AASHTO/AWS "BRIDGE WELDING CODE". ELECTROSLAG WELDING WILL NOT BE PERMITTED.

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

### HANDRAILS AND POSTS:

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

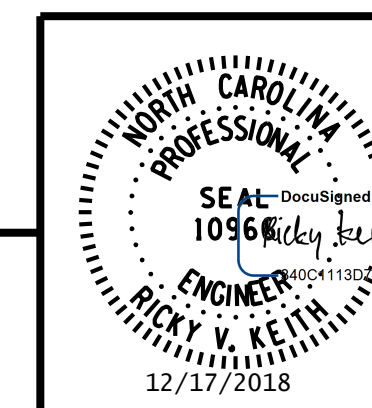
METAL HANDRAILS SHALL BE IN ACCORDANCE WITH THE PLANS. RAILS SHALL BE AS MANUFACTURED FOR BRIDGE RAILING. CASTINGS SHALL BE OF A UNIFORM APPEARANCE. FINS AND OTHER DEFORMATIONS RESULTING FROM CASTING OR OTHERWISE SHALL BE REMOVED IN A MANNER SO THAT A UNIFORM COLORING OF THE COMPLETED CASTING SHALL BE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

### SPECIAL NOTES:

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

PROJECT NO. R-5742  
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 STATION: 34+20.00 -L-

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH			
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