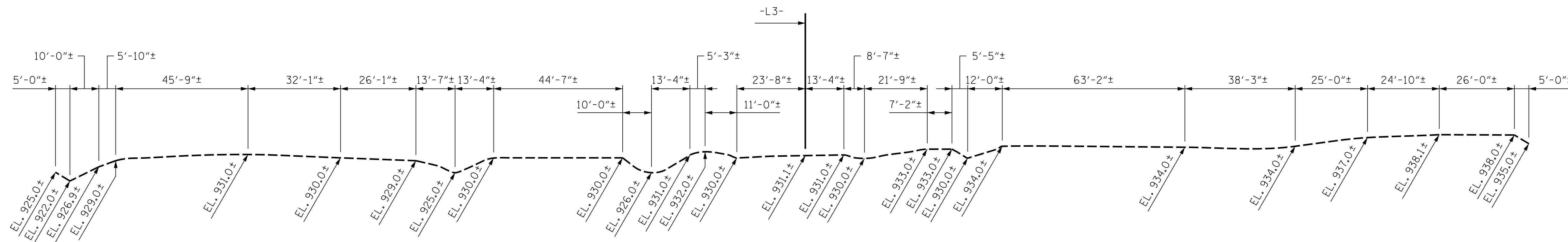


LOCATION SKETCH



PROFILE ALONG CULVERT

ROADWAY DATA

GRADE PT. EL. @ STA. 797+66.00 -L3- = 1,020.80
 BED EL. @ STA. 797+66.00 -L3- = 927.10
 ROADWAY SLOPES @ STA. 797+66.00 -L3- = 2:1

HYDRAULIC DATA

DESIGN DISCHARGE = 170 C.F.S.
 FREQUENCY OF DESIGN FLOOD = 50 YR.
 DESIGN HIGH WATER ELEVATION = 937.3
 DRAINAGE AREA = 105 AC
 BASE DISCHARGE (Q100) = 220 C.F.S.
 BASE HIGH WATER ELEVATION = 938.6

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE = 1,270 C.F.S.
 FREQUENCY OF OVERTOPPING FLOOD = 500+ YR.
 OVERTOPPING FLOOD ELEVATION = 996.9

TOTAL STRUCTURE QUANTITIES

CULVERT EXCAVATION _____ LUMP SUM

FOUNDATION COND. MATERIAL _____ 573 TONS

CLASS A CONCRETE
 BARREL @ 3.91 CY/FT _____ 1,815.5 C.Y.
 WING ETC. _____ 20.0 C.Y.
 BAFFLES / SILLS ETC. _____ 15.0 C.Y.
 TOTAL _____ 1,851 C.Y.

REINFORCING STEEL
 BARREL _____ 253,766 LBS.
 WING ETC. _____ 1,151 LBS.
 TOTAL _____ 254,917 LBS.

NOTES:

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

DESIGN FILL ----- 88.0 FT.

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

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

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

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

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.

THE 18"Ø AND 15"Ø PIPES THROUGH THE SIDEWALLS OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE FIELD BENT AS NECESSARY TO CLEAR PIPE. SEE ROADWAY PLAN SHEET FOR LOCATIONS.

DETAILED DRAWINGS FOR FALSEWORK AND FORMS FOR THIS CULVERT SHALL BE SUBMITTED. SEE SHEET SN.

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

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

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

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.

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

THE ENTIRE COST OF WORK REQUIRED TO PLACE NATIVE BED MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR CULVERT EXCAVATION.

FOR BOX CULVERT EXCAVATION, SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.

THE REINFORCED CONCRETE BOX CULVERT SHALL BE PLACED ON THE STANDARD 1.0 FOOT BLANKET OF FOUNDATION CONDITIONING MATERIAL.

UNDERCUT SOFT/VERY LOOSE SOILS THAT MAY BE ENCOUNTERED BENEATH THE BOTTOM OF THE FOUNDATION CONDITIONING MATERIAL. BACKFILL UNDERCUT AREAS WITH FOUNDATION CONDITIONING MATERIAL. IF MORE THAN 1 FT. UNDERCUT IS REQUIRED, CONTACT THE OPERATIONS ENGINEER FOR APPROVAL.

THE REINFORCED CONCRETE BOX CULVERT SHALL BE CONSTRUCTED WITH 12 INCHES OF CAMBER TO ACCOUNT FOR ANTICIPATED SETTLEMENT.

PROJECT NO. R-2233BB
RUTHERFORD COUNTY
 STATION: 797+66.00 -L3-

SHEET 1 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 10 FT. X 7 FT.
 CONCRETE BOX CULVERT
 91°-00'-00" SKEW

REVISIONS

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

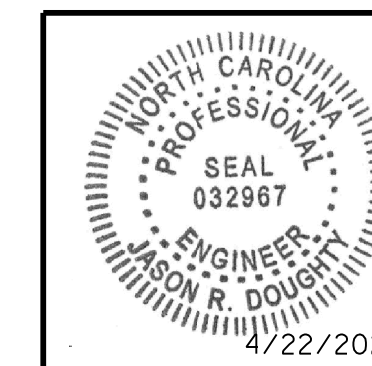
SHEET NO.

C1-1
 TOTAL SHEETS
 5

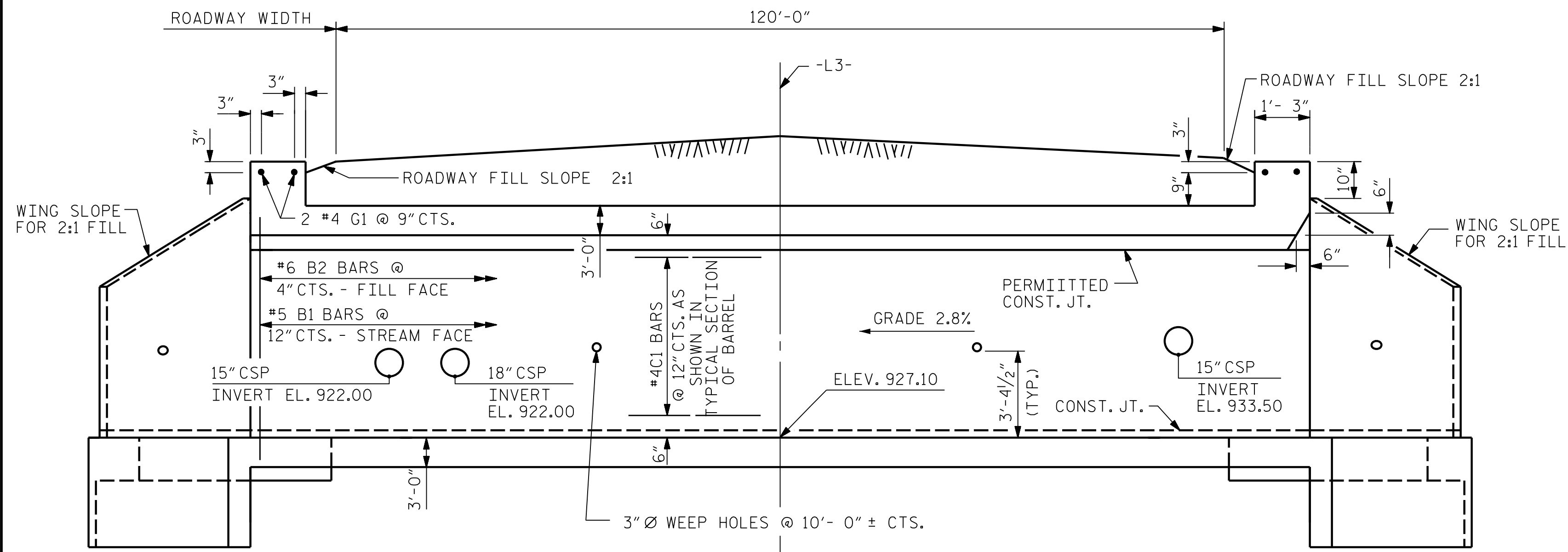


333 FAYETTEVILLE STREET, SUITE 500
 RALEIGH, NC 27601
 NC LICENSE NO. C-2979

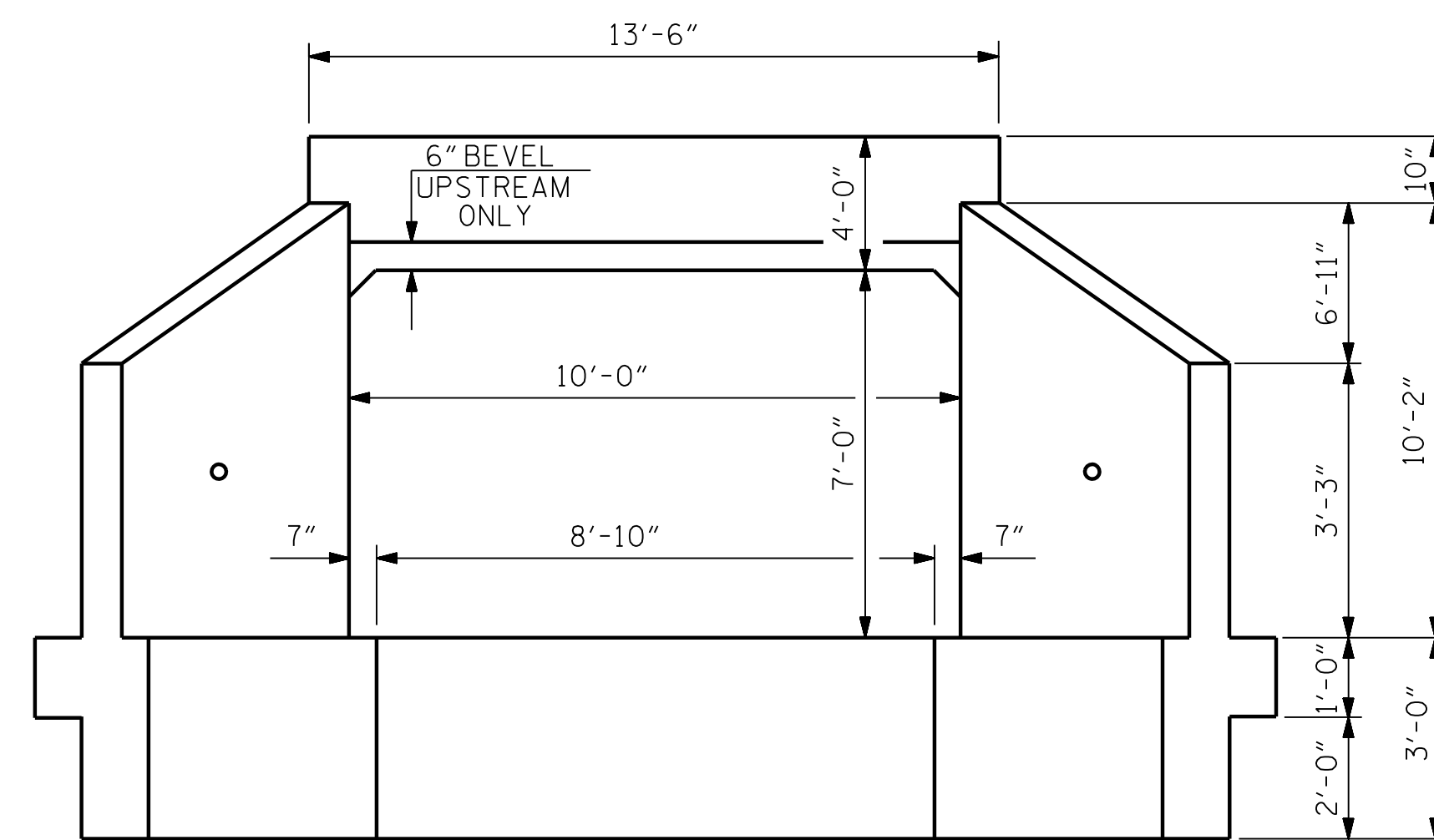
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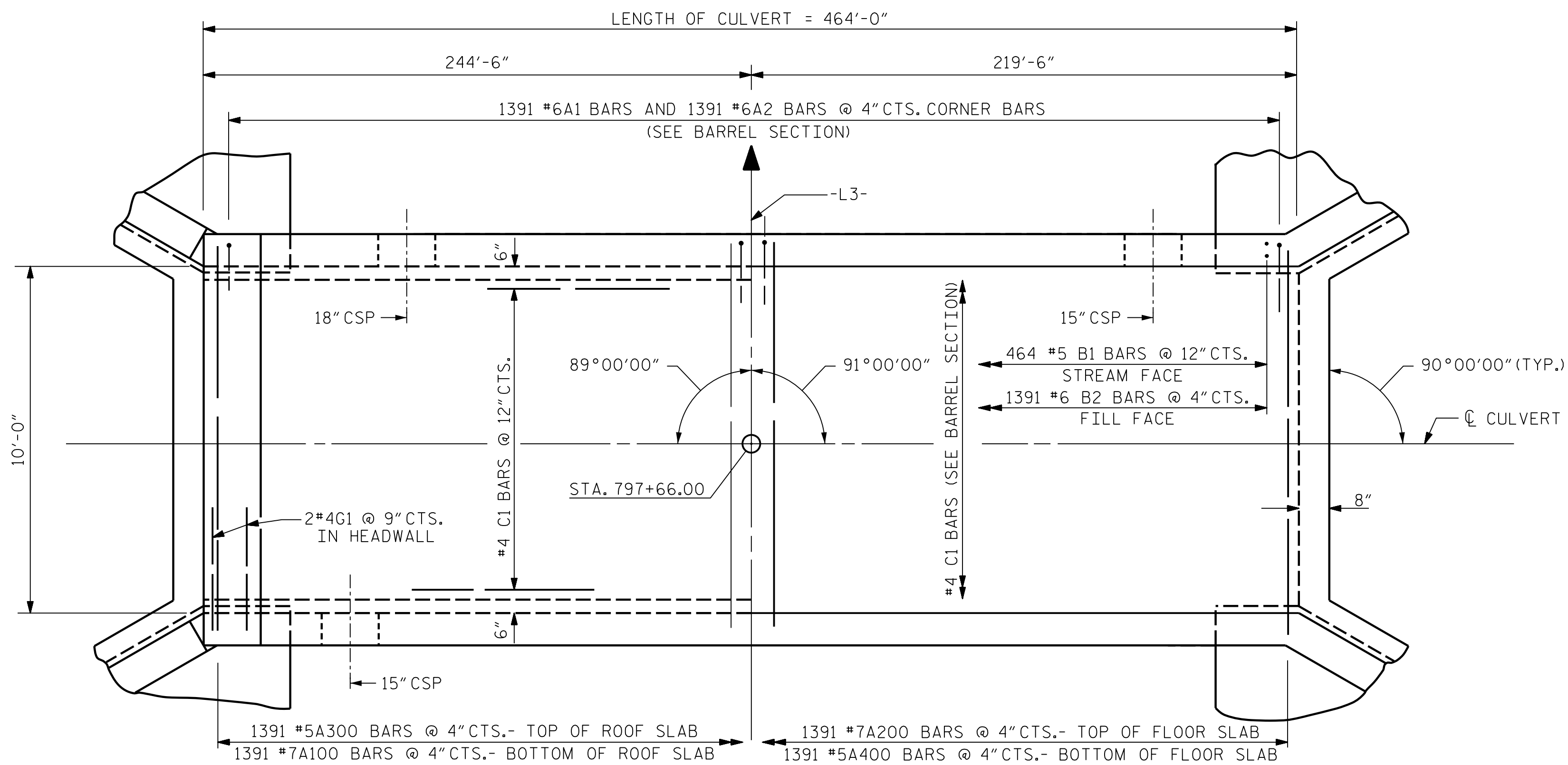
DocuSigned by:
 Jason R. Doughty
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CULVERT SECTION NORMAL TO ROADWAY

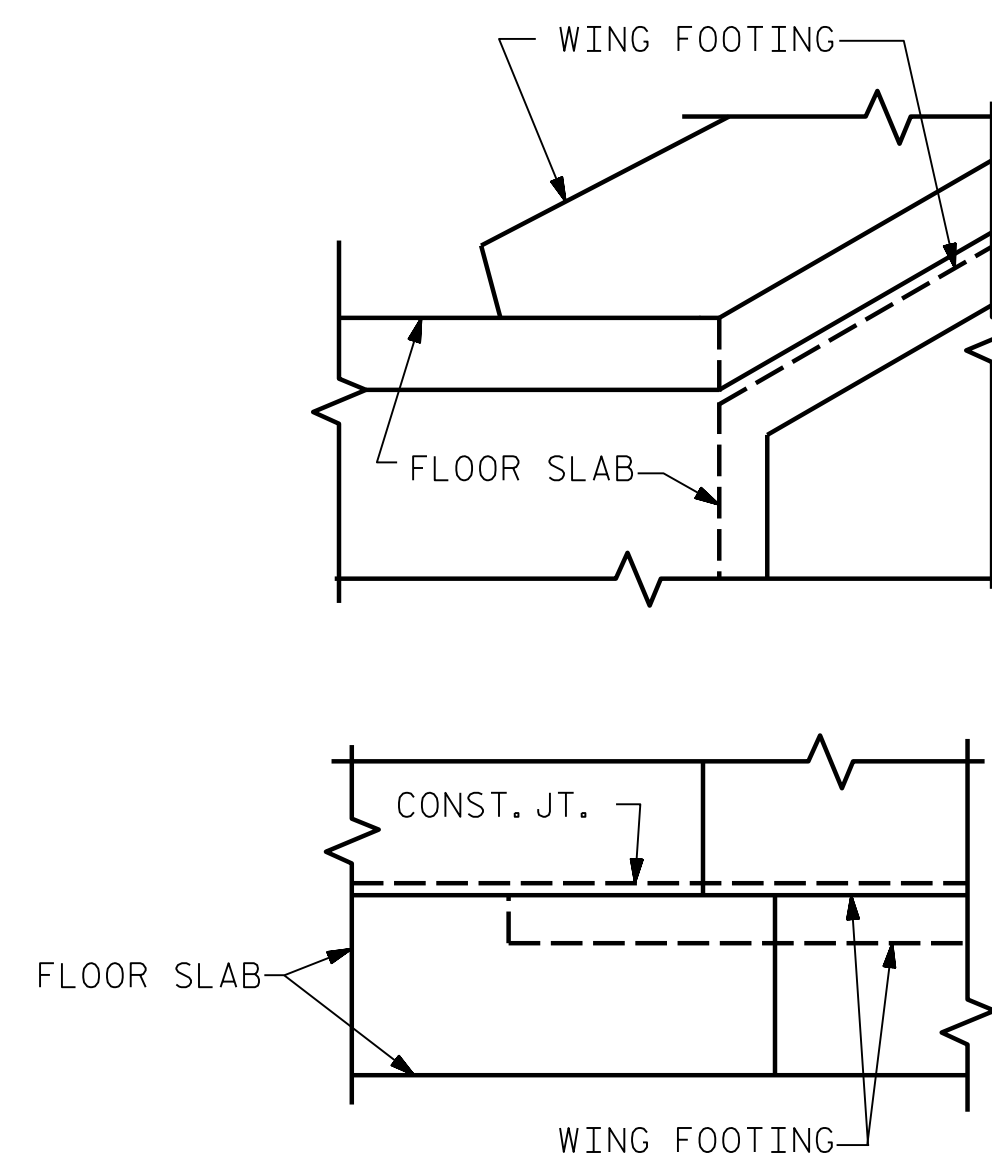


END ELEVATION



PART PLAN ROOF SLAB

PART PLAN FLOOR SLAB



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

PROJECT NO. R-2233BB
RUTHERFORD COUNTY
 STATION: 797+66.00 -L3-

SHEET 2 OF 5

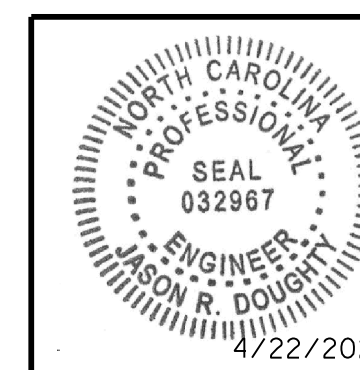
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 BARREL STANDARD
 SINGLE 10 FT. X 7 FT.
 CONCRETE BOX CULVERT
 91°-00'-00" SKEW

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



333 FAYETTEVILLE STREET, SUITE 500
 RALEIGH, NC 27601
 NC LICENSE NO. C-2979

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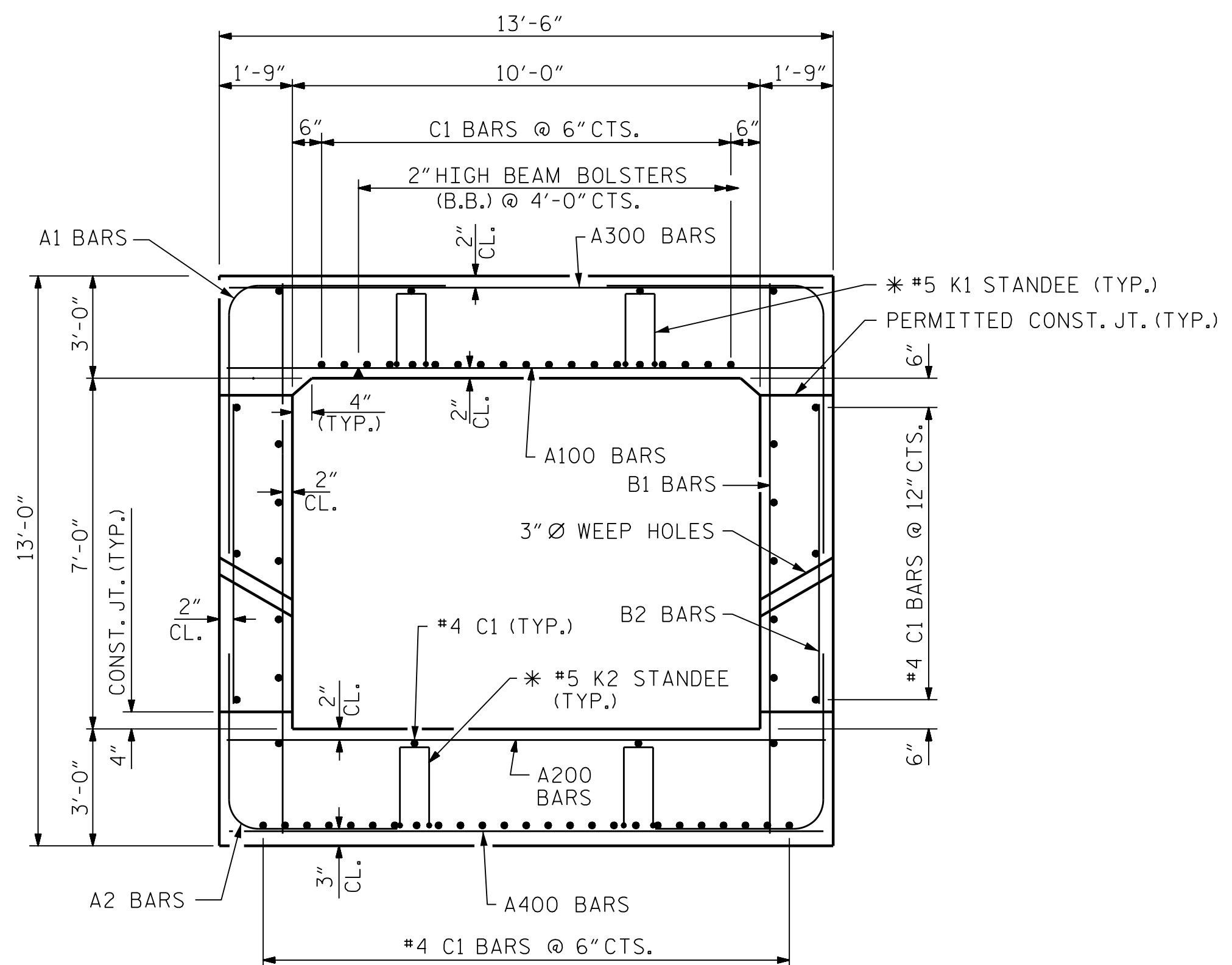


DocuSigned by:
 Jason R. Doughty
 SF73FA2DEA874E8...

4/22/2020
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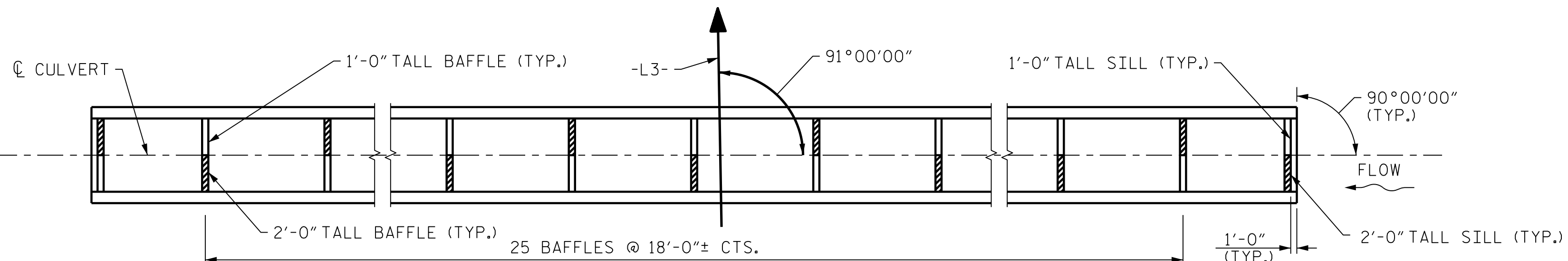
DESIGNED BY: A. DUTTA DATE: AUG 2019
 DRAWN BY: K. WHITE DATE: AUG 2019
 CHECKED BY: B. LOFLIN DATE: AUG 2019
 DESIGN ENGINEER OF RECORD: J. DOUGHTY DATE: NOV 2019

DRAWN BY: RWW 8/89 REV. 6/19 MAA/THC
 CHECKED BY: ARB 8/89

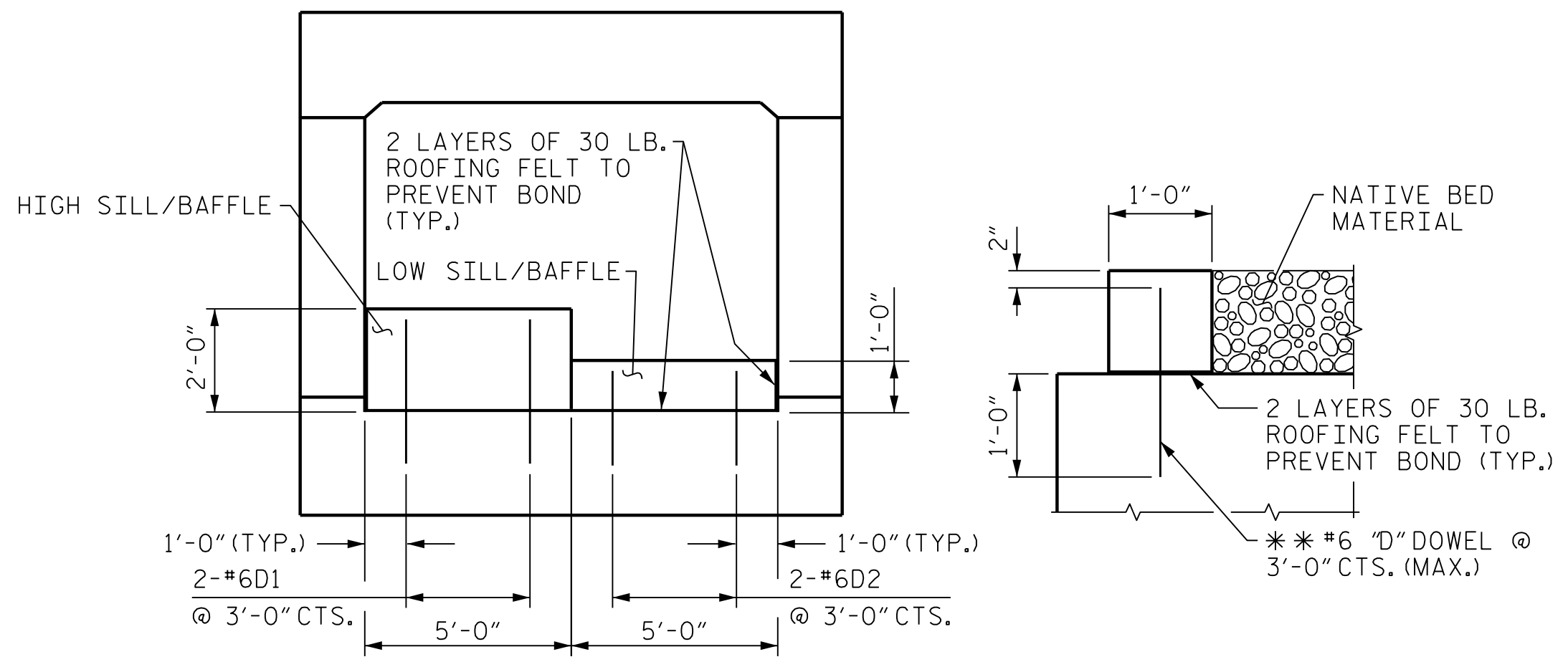


RIGHT ANGLE SECTION OF BARREL

THERE ARE 68 C1 BARS IN SECTION OF BARREL
 * ALL STANDEE BARS @ 4'-0" CTS.

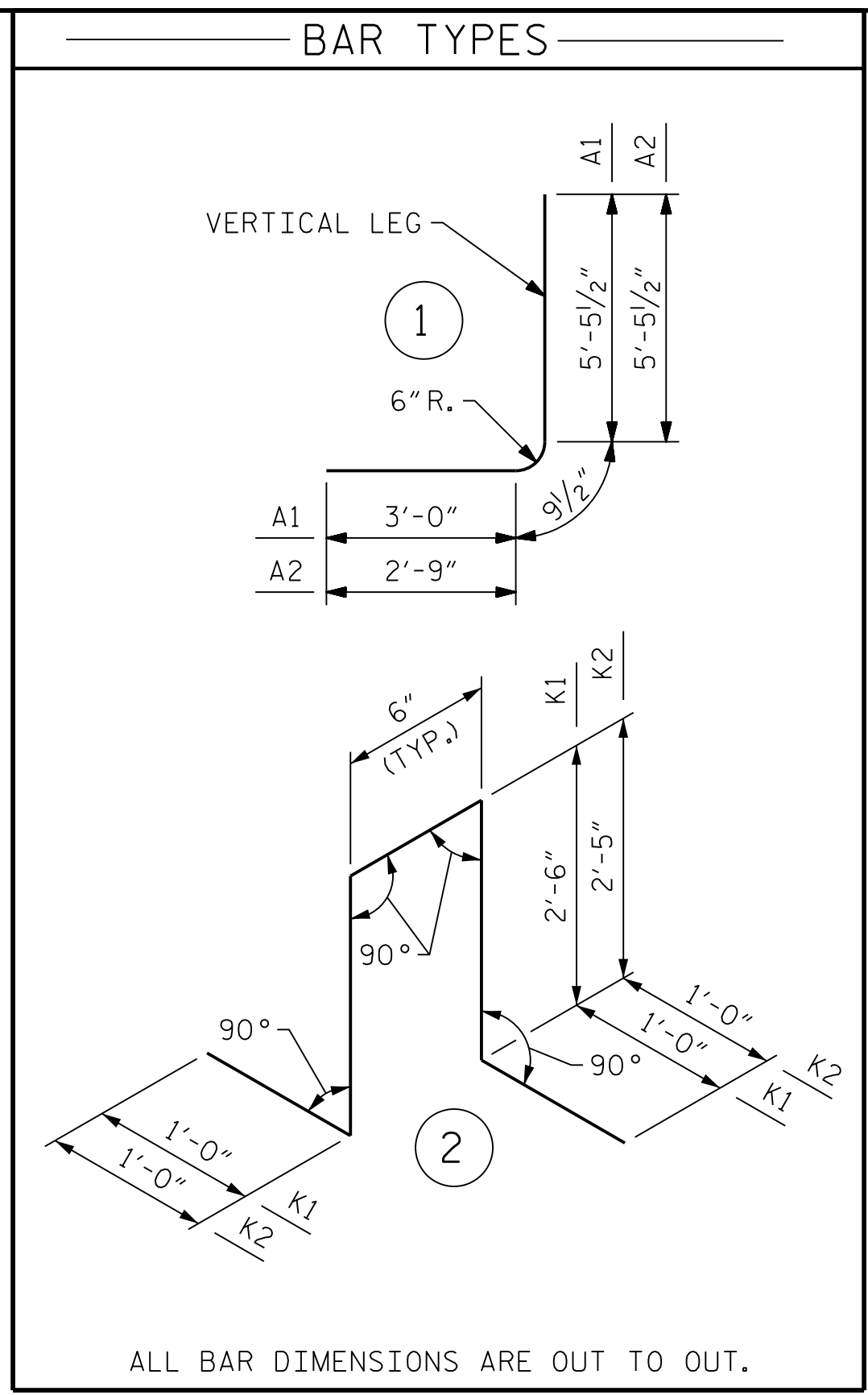


PLAN VIEW SHOWING SILL/BAFFLE LOCATIONS



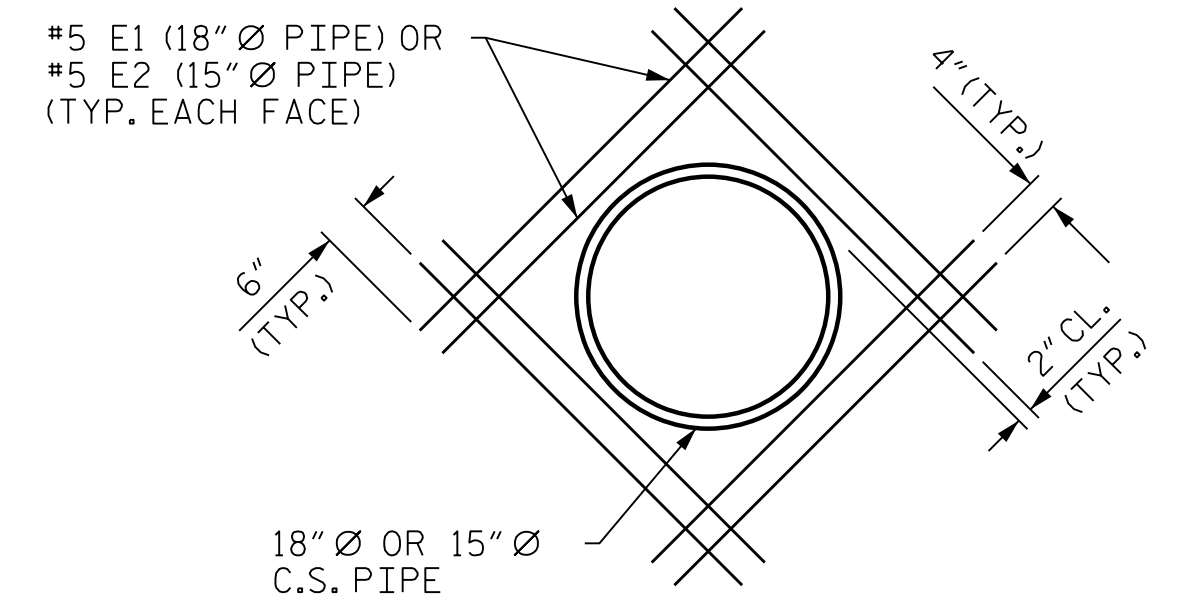
SILL/BAFFLE DETAILS

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



BAR	SIZE	SPLICE LENGTH
C1	#4	1'-11"

BILL OF MATERIAL					
BAR	NUMBER	SIZE	TYPE	LENGTH	WEIGHT
A1	2782	#6	1	9'-3"	38652
A2	2782	#6	1	9'-0"	37607
A100	1391	#7	STR	13'-1"	37199
A200	1391	#7	STR	13'-1"	37199
A300	1391	#5	STR	13'-1"	18981
A400	1391	#5	STR	13'-1"	18981
B1	928	#5	STR	12'-7"	12179
B2	2782	#6	STR	6'-4"	26464
C1	952	#4	STR	35'-0"	22258
D1	54	#6	STR	1'-10"	149
D2	54	#6	STR	2'-10"	230
E1	16	#5	STR	3'-10"	64
E2	32	#5	STR	3'-7"	120
G1	4	#4	STR	13'-1"	35
K1	234	#5	2	7'-6"	1830
K2	234	#5	2	7'-4"	1790
REINFORCING STEEL =					LBS. 253,766



DETAIL OF REINFORCING AROUND 18" Ø AND 15" Ø PIPE

FIELD CUT AND BEND "B" AND "C" BARS AS NEEDED TO CLEAR PIPE.

PROJECT NO. R-2233BB
RUTHERFORD COUNTY
 STATION: 797+66.00 -L3-

SHEET 3 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 10 FT. X 7 FT. CONCRETE BOX CULVERT
 91°-00'-00" SKEW

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

SHEET NO. **C1-3**
 TOTAL SHEETS 5

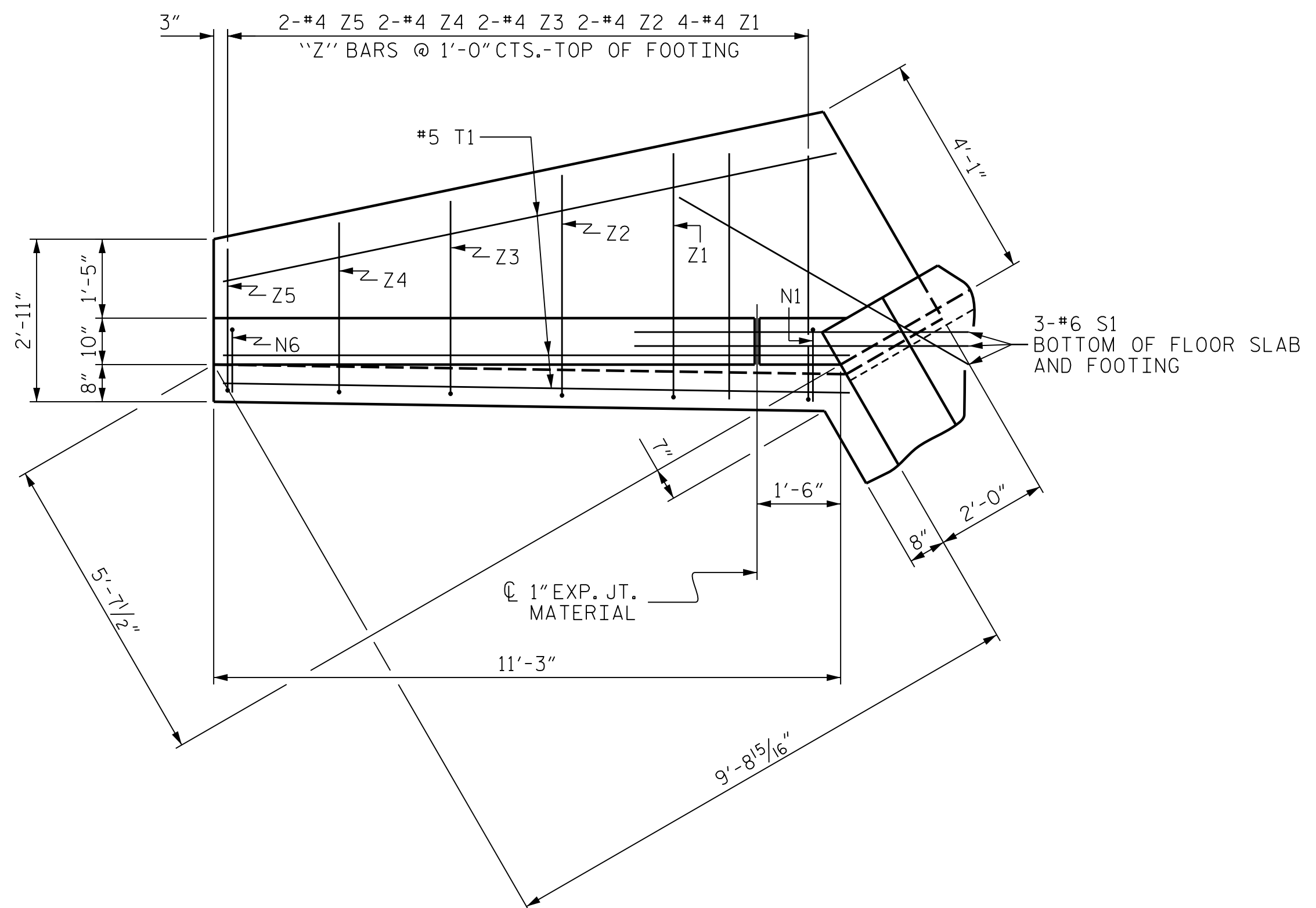
MODJESKI and MASTERS
 Experience great bridges.
 333 FAYETTEVILLE STREET, SUITE 500
 RALEIGH, NC 27601
 NC LICENSE NO. C-2979

DocuSigned by:
Jason R. Dougherty
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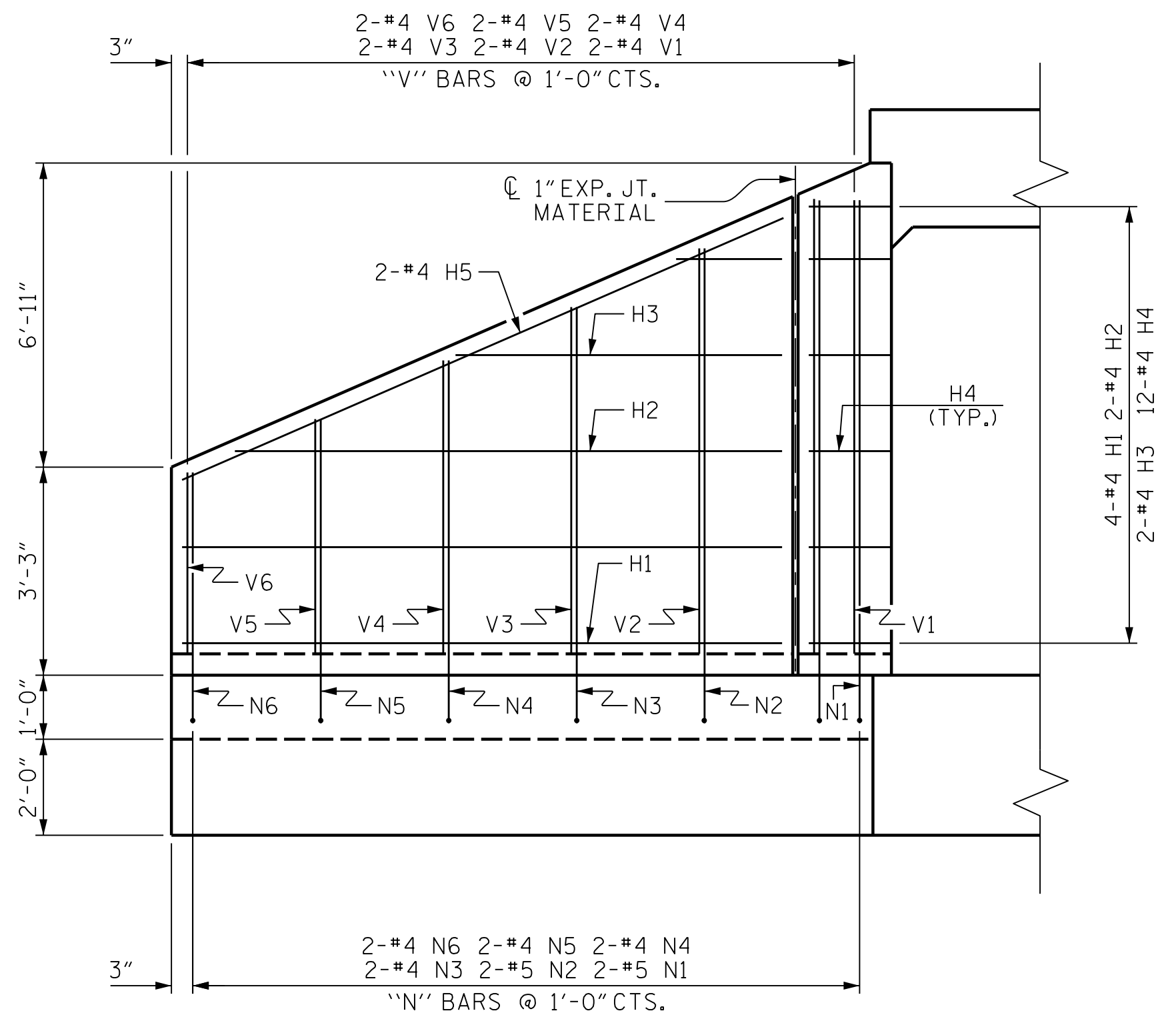
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

DESIGNED BY: A. DUTTA DATE: JULY 2019
 DRAWN BY: K. WHITE DATE: JULY 2019
 CHECKED BY: B. LOFLIN DATE: AUG 2019
 DESIGN ENGINEER OF RECORD: J. DOUGHTY DATE: NOV 2019

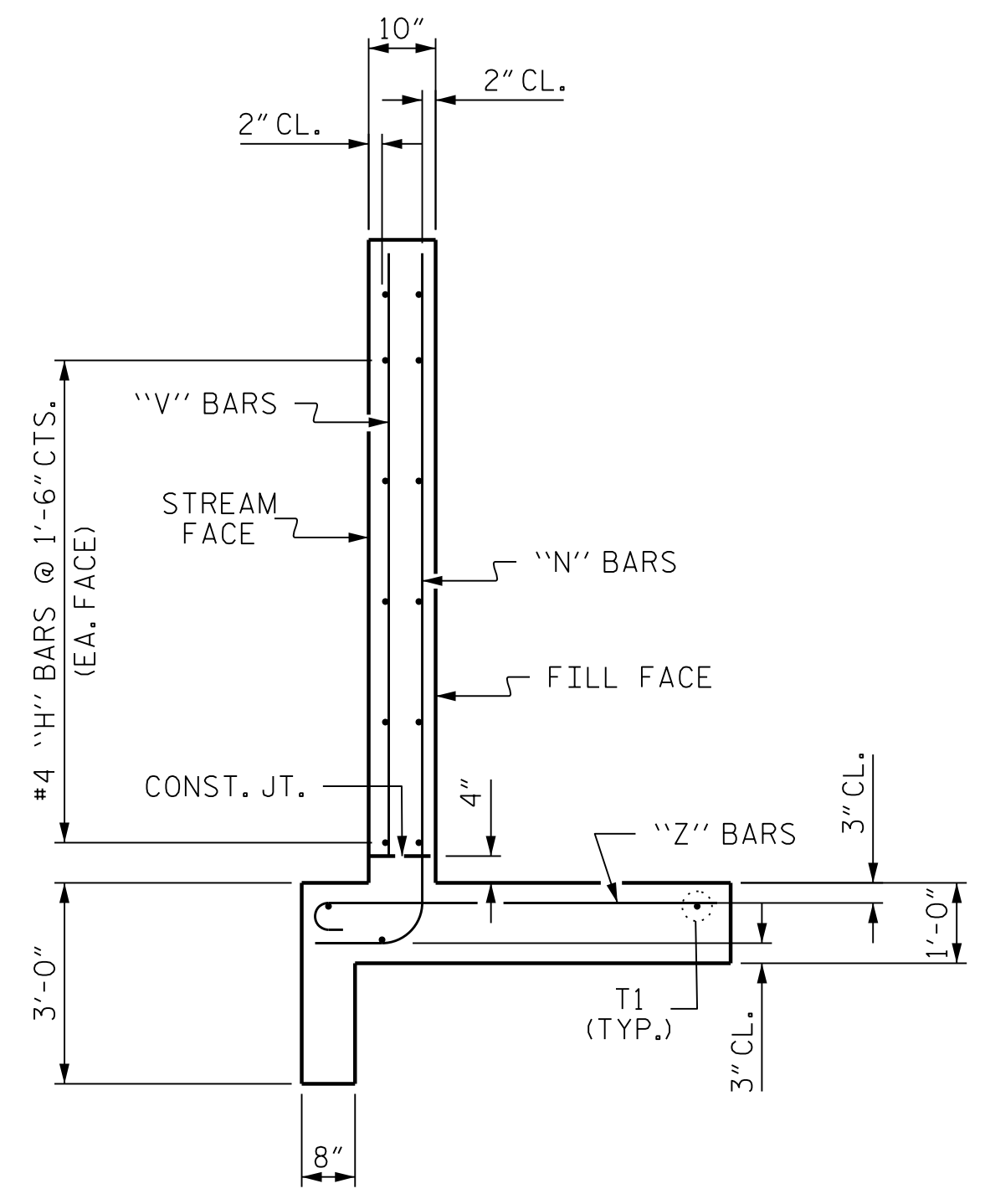
4/22/2020
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PLAN



ELEVATION



TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL					
BAR	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					17.4 CY
2 HEADWALLS					1.3 CY
2 END CURTAIN WALLS					1.3 CY
TOTAL					20.0 CY

PROJECT NO. R-2233BB
RUTHERFORD COUNTY
 STATION: 797+66.00 -L3-

SHEET 4 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

STANDARD WINGS FOR
 CONCRETE BOX CULVERT
 H = 7'-0" SLOPE = 2:1
 90° SKEW

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

SHEET NO. C1-4
 TOTAL SHEETS 5

MODJESKI and MASTERS
 Experience great bridges.
 333 FAYETTEVILLE STREET, SUITE 500
 RALEIGH, NC 27601
 NC LICENSE NO. C-2979

DocuSigned by:

 Jason R. Doughty
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 UNLESS ALL SIGNATURES COMPLETED**

4/22/2020 410.007_R2233BB_SML_WMG.dgn

DESIGNED BY: <u>A. DUTTA</u>	DATE: <u>AUG 2019</u>	REV. 6/19	MAA/THC
DRAWN BY: <u>K. WHITE</u>	DATE: <u>AUG 2019</u>		
CHECKED BY: <u>B. LOFLIN</u>	DATE: <u>AUG 2019</u>		
DESIGN ENGINEER OF RECORD: <u>J. DOUGHTY</u>	DATE: <u>NOV 2019</u>		
DRAWN BY: <u>CCJ</u>	10/99		
CHECKED BY: <u>RWW</u>	03/00		

PERMANENT LOAD FACTORS:

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

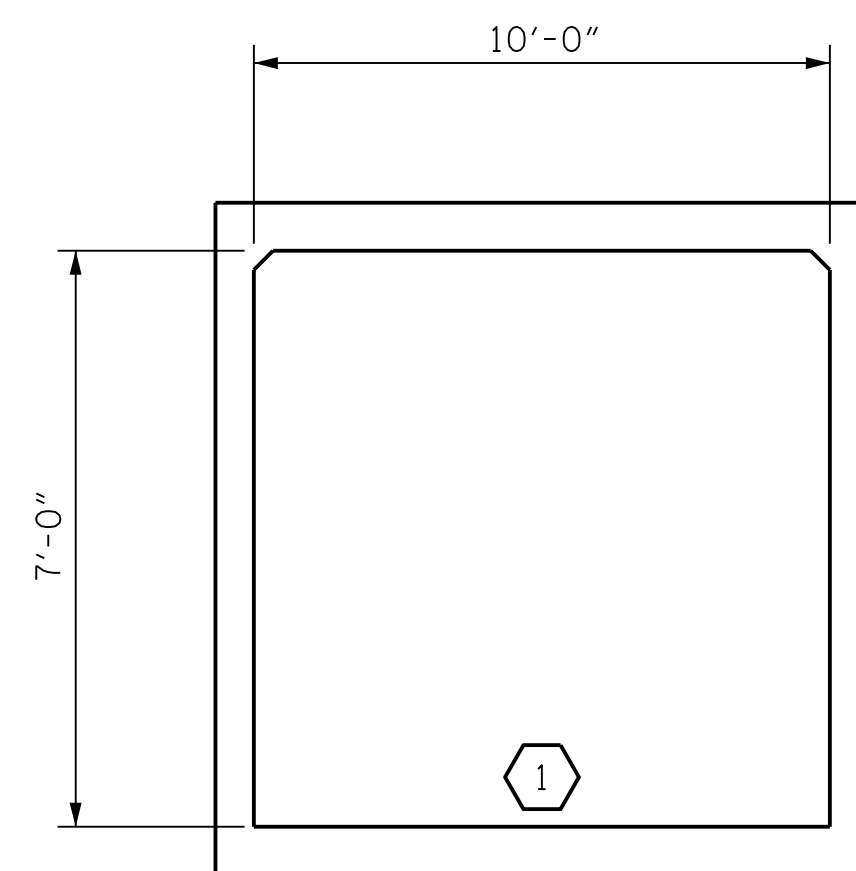
LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS										
	CONTROLLING LOAD RATING	MINIMUM RATING FACTOR (RF)	STRENGTH I LIMIT STATE							
			MOMENT				SHEAR			
			RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (FT)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (FT)
PERMANENT LOAD RATING	①	1.09	1.09	1	BOTTOM SLAB	5.00	1.42	1	BOTT. SLAB	2.65

NOTES:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

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

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



LRFR SUMMARY
(LOOKING DOWNSTREAM)

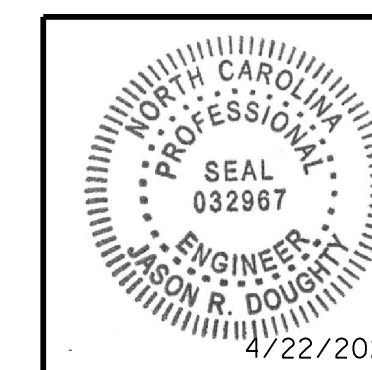
PROJECT NO. R-2233BB
RUTHERFORD COUNTY
 STATION: 797+66.00 -L3-

SHEET 5 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STANDARD
 LRFR SUMMARY FOR
 REINFORCED CONCRETE
 BOX CULVERTS
 (DEEP FILLS)

REVISIONS

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



DocuSigned by:
 Jason R Doughty
 SF73FA2DEA874E8...

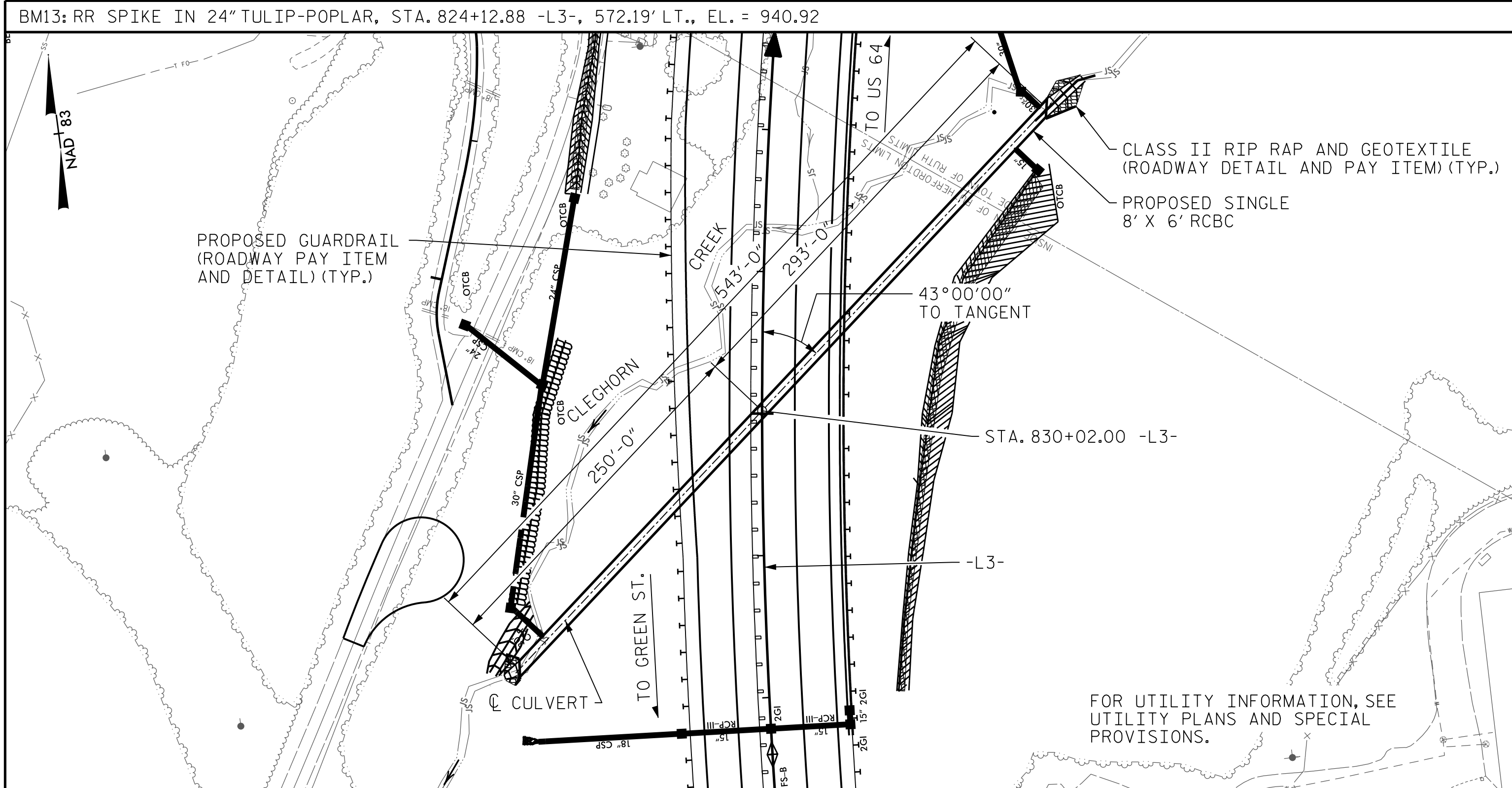
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CUL 1

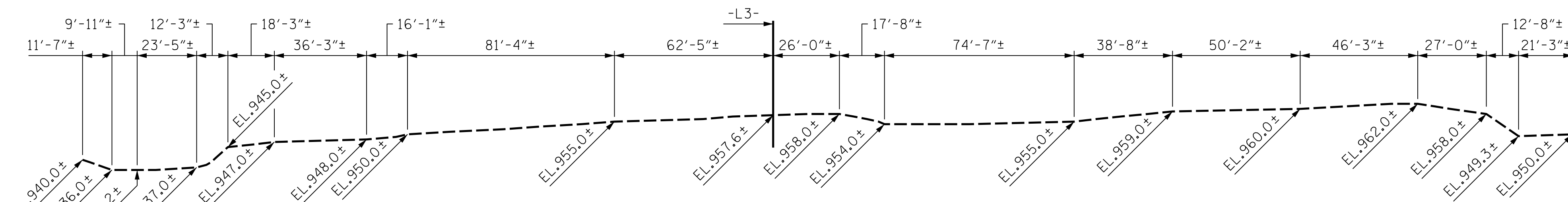
STD. NO. LRFR7

4/22/2020 410_009_R2233BB_SML_LRFR.dgn

DESIGNED BY: A. DUTTA DATE : JULY 2019
 DRAWN BY: K. WHITE DATE : JULY 2019
 CHECKED BY: B. LOFLIN DATE : AUG 2019
 DESIGN ENGINEER OF RECORD: J. DOUGHTY DATE : NOV 2019



LOCATION SKETCH



PROFILE ALONG CULVERT

ROADWAY DATA

GRADE PT. EL. @ STA. 830+02.00 -L3- = 1,001.28
 BED EL. @ STA. 830+02.00 -L3- = 940.90
 ROADWAY SLOPES @ STA. 830+02.00 -L3- = 2:1

HYDRAULIC DATA

DESIGN DISCHARGE = 230 C.F.S.
 FREQUENCY OF DESIGN FLOOD = 50 YR.
 DESIGN HIGH WATER ELEVATION = 953.7
 DRAINAGE AREA = 58 AC
 BASE DISCHARGE (Q100) = 270 C.F.S.
 BASE HIGH WATER ELEVATION = 954.3

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE = 595 C.F.S.
 FREQUENCY OF OVERTOPPING FLOOD = 500+ YR.
 OVERTOPPING FLOOD ELEVATION = 990.0

TOTAL STRUCTURE QUANTITIES

CULVERT EXCAVATION _____ LUMP SUM

FOUNDATION COND. MATERIAL _____ 556 TONS

CLASS A CONCRETE
 BARREL @ 2.02 CY/FT _____ 1,095.8 C.Y.
 WING ETC. _____ 21.2 C.Y.
 BAFFLES / SILLS ETC. _____ 8.5 C.Y.
 TOTAL _____ 1,125.5 C.Y.

REINFORCING STEEL
 BARREL @ _____ 131,881 LBS.
 WING ETC. _____ 1,185 LBS.
 TOTAL _____ 133,066 LBS.

NOTES:

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

DESIGN FILL ----- 57.0 FT.

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

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

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

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

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.

THE 30"Ø AND 15"Ø PIPES THROUGH THE SIDEWALLS OF THE CULVERT SHALL BE LOCATED BY THE ENGINEER. THE REINFORCING STEEL SHALL BE FIELD BENT AS NECESSARY TO CLEAR PIPE. SEE ROADWAY PLAN SHEET FOR LOCATIONS.

DETAILED DRAWINGS FOR FALSEWORK AND FORMS FOR THIS CULVERT SHALL BE SUBMITTED. SEE SHEET SN.

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

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

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

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.

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

THE ENTIRE COST OF WORK REQUIRED TO PLACE NATIVE BED MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR CULVERT EXCAVATION.

THE REINFORCED CONCRETE BOX CULVERT SHALL BE CONSTRUCTED WITH 10 INCHES OF CAMBER TO ACCOUNT FOR ANTICIPATED SETTLEMENT.

PROJECT NO. R-2233BB
RUTHERFORD COUNTY
 STATION: 830+02.00 -L3-

SHEET 1 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 8 FT. X 6 FT.
 CONCRETE BOX CULVERT
 43°-00'-00" SKEW

REVISIONS

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

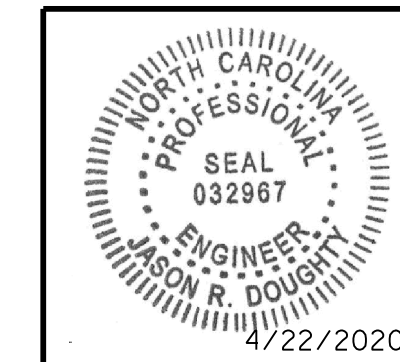
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C2-1
 TOTAL SHEETS
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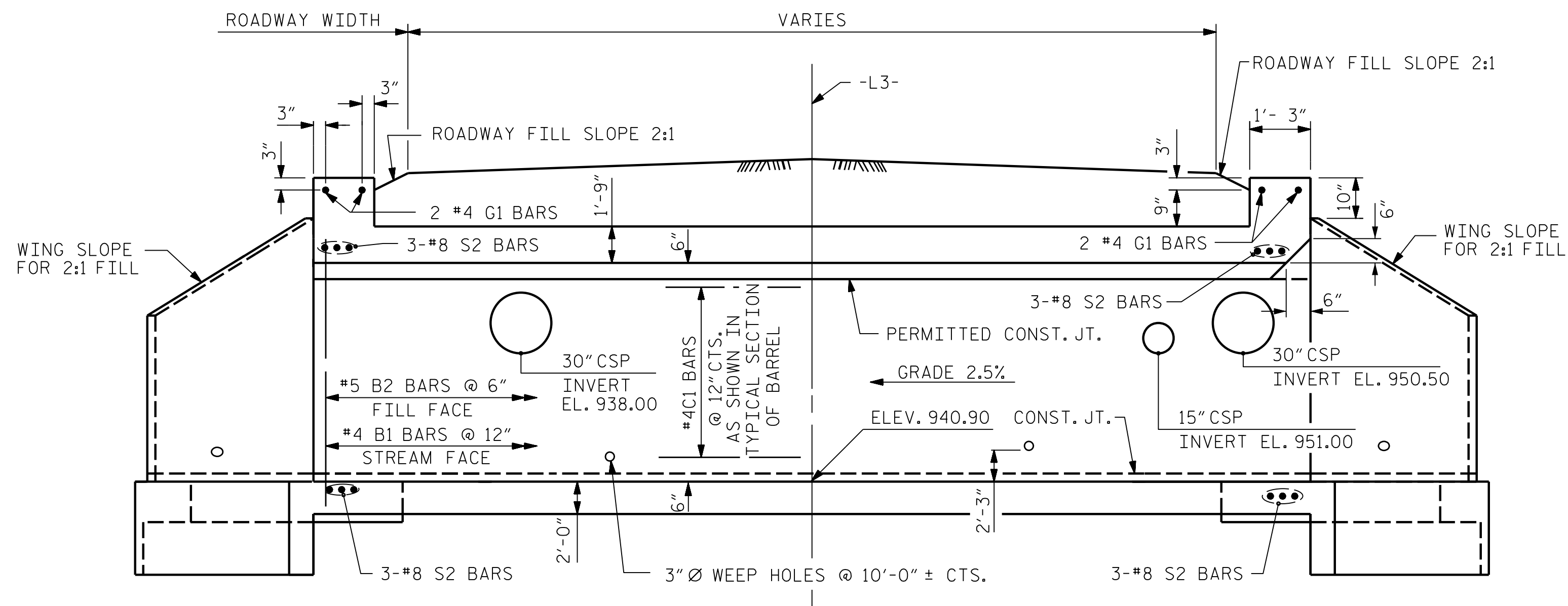


333 FAYETTEVILLE STREET, SUITE 500
 RALEIGH, NC 27601
 NC LICENSE NO. C-2979

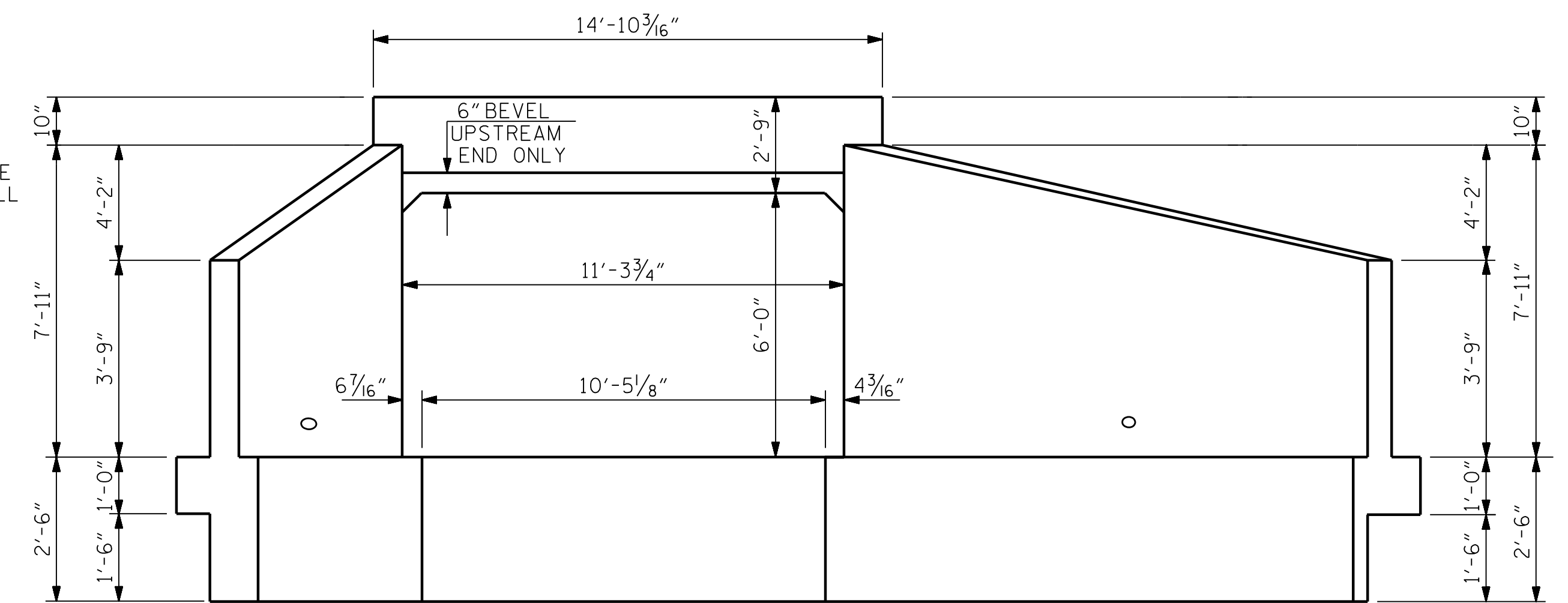
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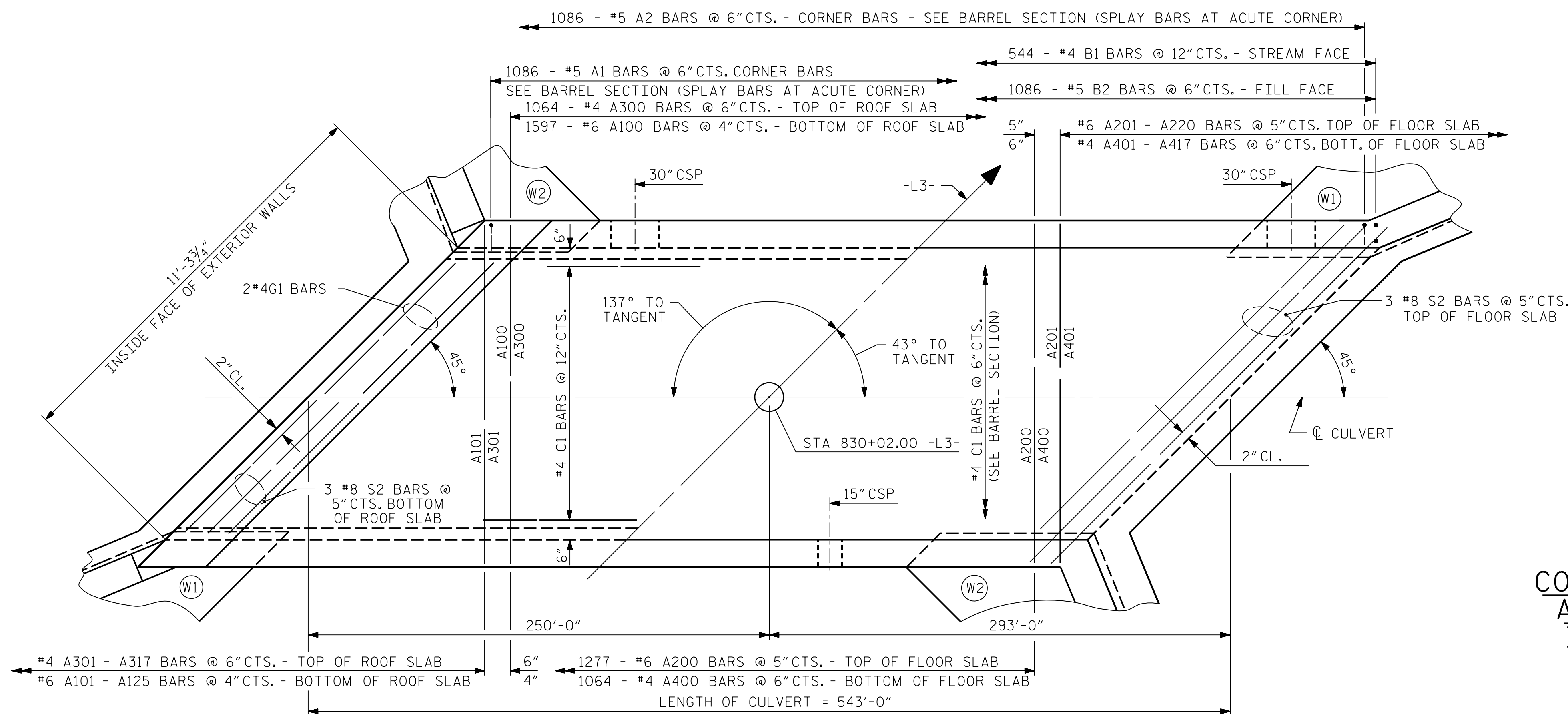
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 Jason R Doughty
 SF73FA2DEA874E8...



CULVERT SECTION NORMAL TO ROADWAY

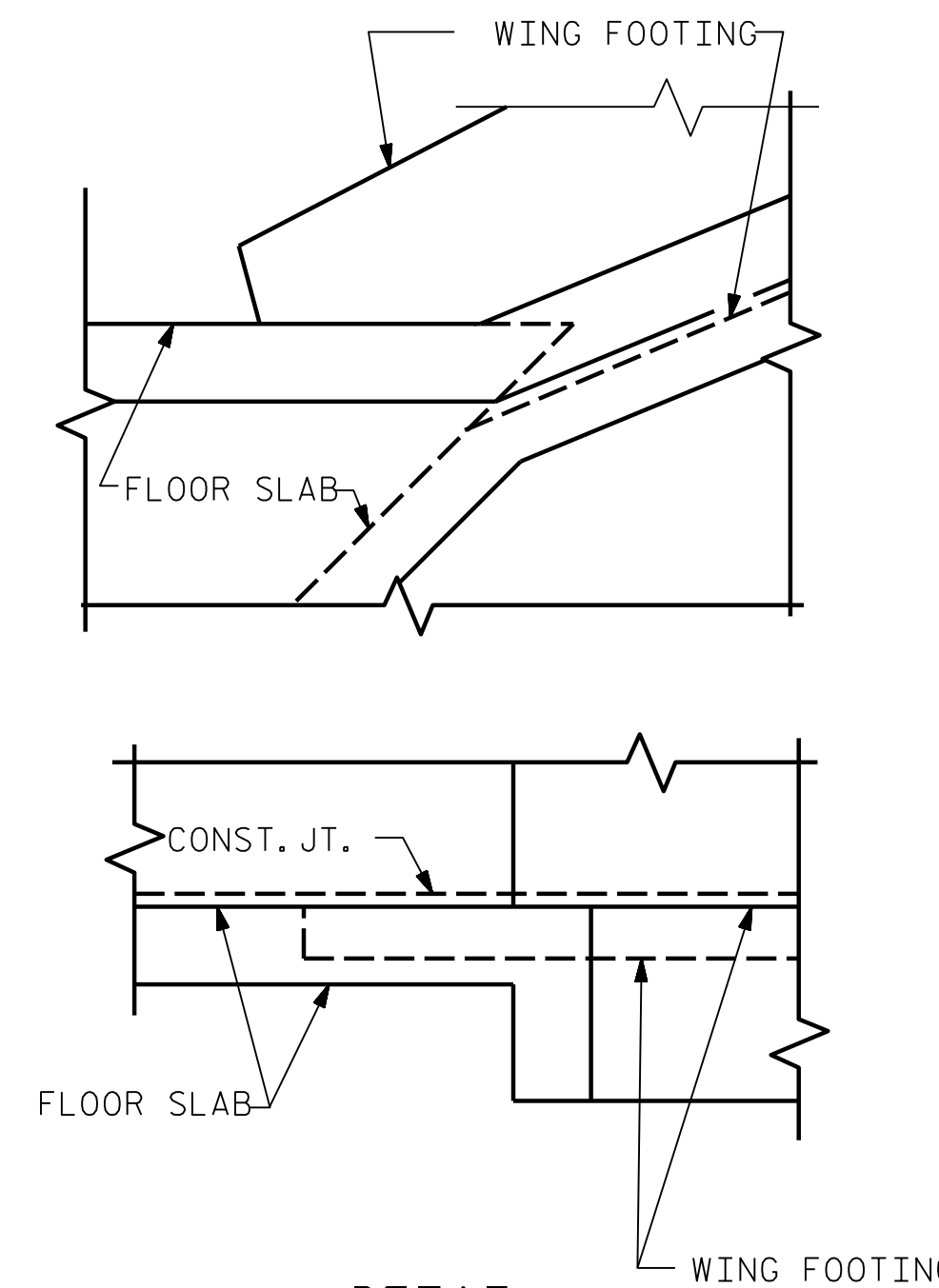


END ELEVATION NORMAL TO SKEW



PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB



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

PROJECT NO. R-2233BB
RUTHERFORD COUNTY
STATION: 830+02.00 -L3-

SHEET 2 OF 5

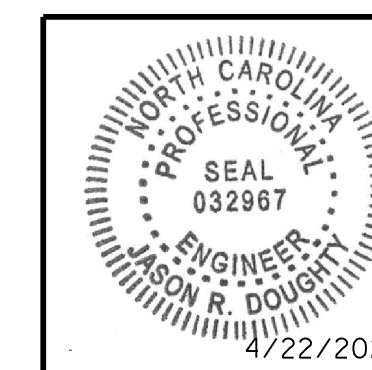
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
BARREL STANDARD
SINGLE 8 FT. X 6 FT.
CONCRETE BOX CULVERT
43°-00'-00" SKEW

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



333 FAYETTEVILLE STREET, SUITE 500
RALEIGH, NC 27601
NC LICENSE NO. C-2979

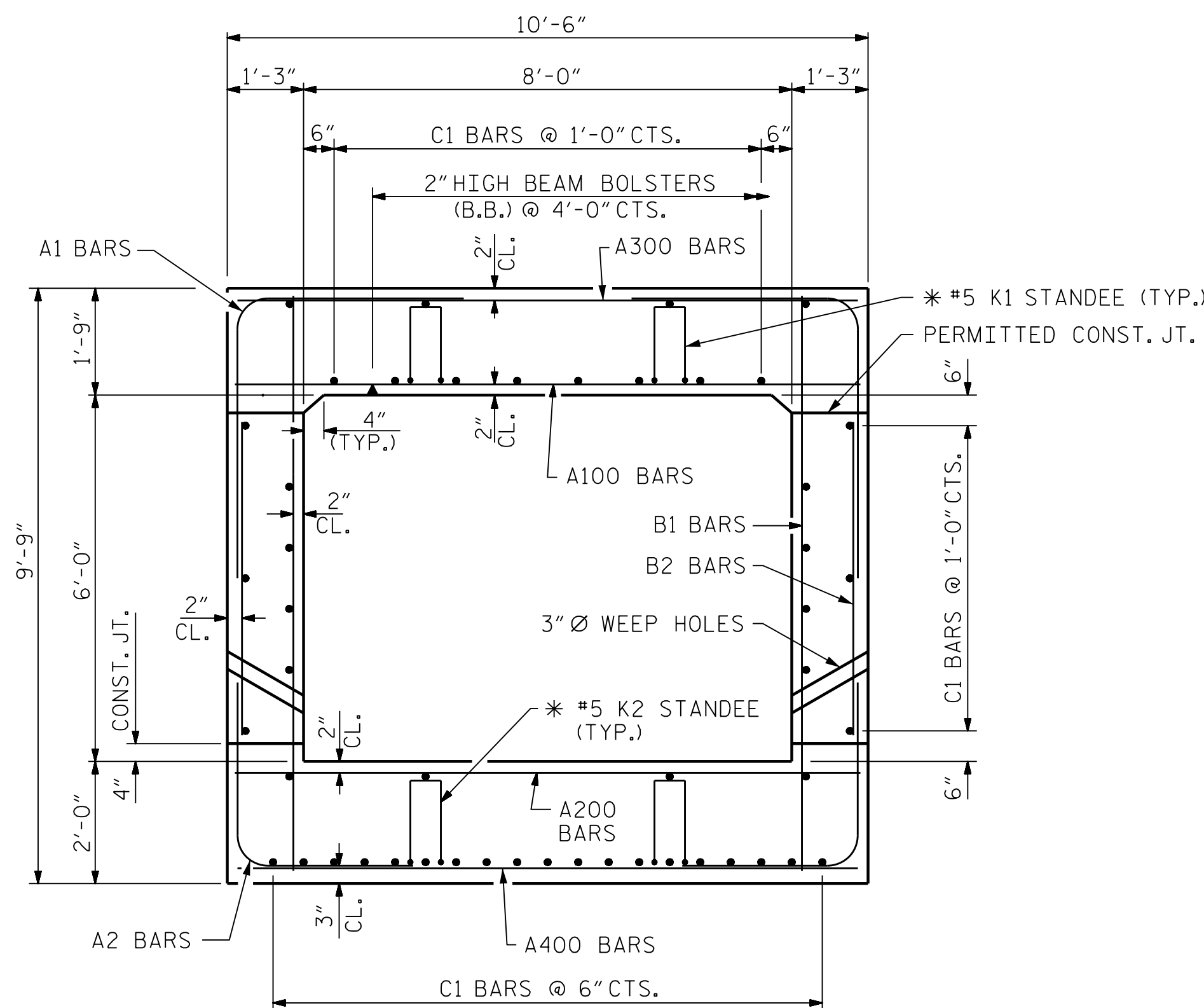
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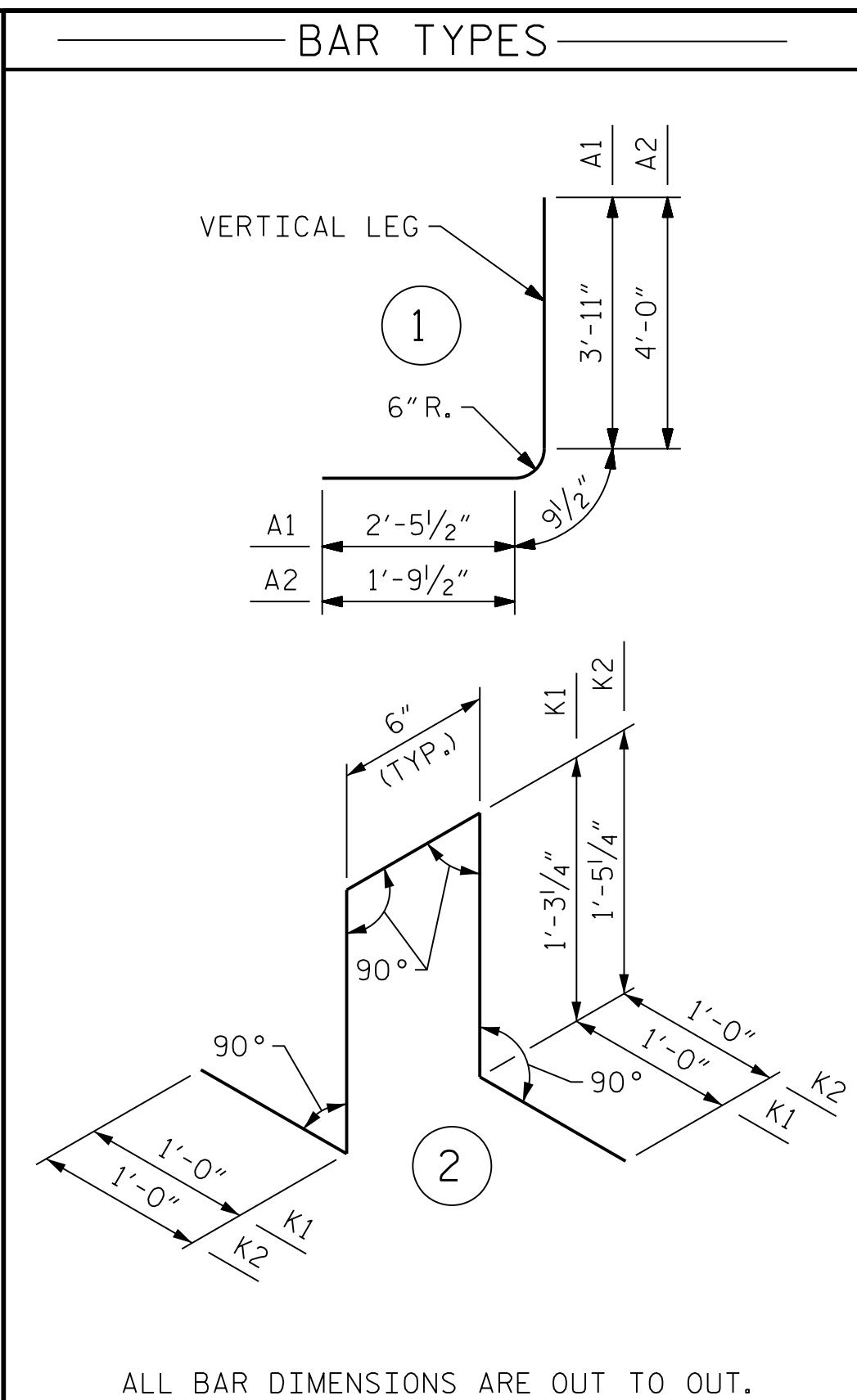
4/22/2020
411_003_R2233BB_SML_CEG.dgn

DESIGNED BY: J. BORUTA DATE: MAR 2019
DRAWN BY: K. WHITE DATE: MAR 2019
CHECKED BY: B. LOFLIN DATE: APR 2019
DESIGN ENGINEER OF RECORD: J. DOUGHTY DATE: NOV 2019



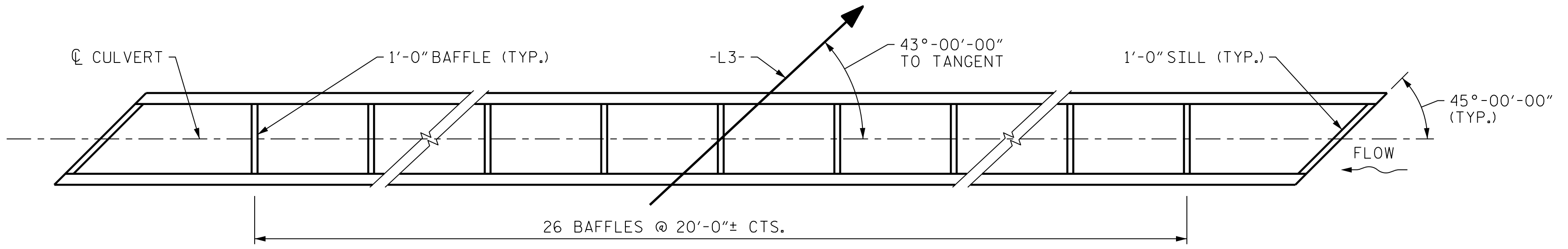
RIGHT ANGLE SECTION OF BARREL

THERE ARE 49 C1 BARS IN SECTION OF BARREL
* ALL STANDEE BARS @ 4'-0" CTS.

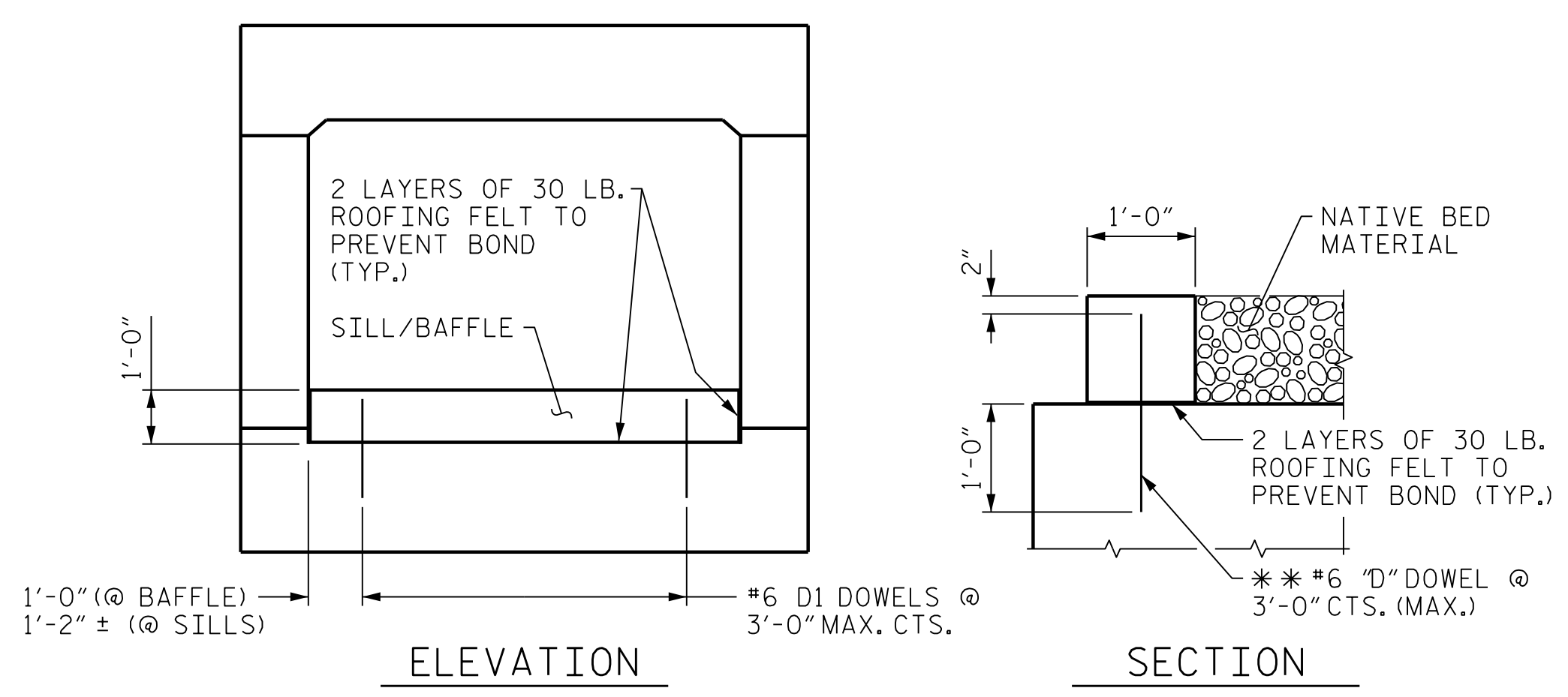


BAR	NUMBER	SIZE	TYPE	LENGTH	WEIGHT
A1	2172	#5	1	7'-2"	16235
A2	2172	#5	1	6'-7"	14914
A100	1597	#6	STR	10'-1"	24187
A101	2	#6	STR	10'-0"	30
A102	2	#6	STR	9'-4"	29
A103	2	#6	STR	9'-4"	28
A104	2	#6	STR	9'-0"	27
A105	2	#6	STR	8'-8"	26
A106	2	#6	STR	8'-4"	25
A107	2	#6	STR	8'-0"	24
A108	2	#6	STR	7'-8"	23
A109	2	#6	STR	7'-4"	22
A110	2	#6	STR	7'-0"	21
A111	2	#6	STR	6'-8"	20
A112	2	#6	STR	6'-4"	19
A113	2	#6	STR	6'-0"	18
A114	2	#6	STR	5'-8"	17
A115	2	#6	STR	5'-4"	16
A116	2	#6	STR	5'-0"	15
A117	2	#6	STR	4'-8"	14
A118	2	#6	STR	4'-4"	13
A119	2	#6	STR	4'-0"	12
A120	2	#6	STR	3'-8"	11
A121	2	#6	STR	3'-4"	10
A122	2	#6	STR	3'-0"	9
A123	2	#6	STR	2'-8"	8
A124	2	#6	STR	2'-4"	7
A125	2	#6	STR	2'-0"	6
A200	1277	#6	STR	10'-1"	19340
A201	2	#6	STR	10'-0"	30
A202	2	#6	STR	9'-7"	29
A203	2	#6	STR	9'-2"	28
A204	2	#6	STR	8'-9"	26
A205	2	#6	STR	8'-4"	25
A206	2	#6	STR	7'-11"	24
A207	2	#6	STR	7'-6"	23
A300	1064	#4	STR	10'-1"	7167
A301	2	#4	STR	10'-0"	13
A302	2	#4	STR	9'-6"	13
A303	2	#4	STR	9'-0"	12
A304	2	#4	STR	8'-6"	11
A305	2	#4	STR	8'-0"	11
A306	2	#4	STR	7'-6"	10
A307	2	#4	STR	7'-0"	9
A308	2	#4	STR	6'-6"	9
A309	2	#4	STR	6'-0"	8
A310	2	#4	STR	5'-6"	7
A311	2	#4	STR	5'-0"	7
A312	2	#4	STR	4'-6"	6
A313	2	#4	STR	4'-0"	5
A314	2	#4	STR	3'-6"	5
A315	2	#4	STR	3'-0"	4
A316	2	#4	STR	2'-6"	3
A317	2	#4	STR	2'-0"	3
B1	1088	#4	STR	9'-4"	6783
B2	2172	#5	STR	5'-4"	12082
C1	980	#4	STR	29'-0"	18985
D1	86	#6	STR	1'-10"	237
E1	32	#5	STR	4'-10"	161
E2	16	#5	STR	3'-7"	60
G1	4	#4	STR	14'-4"	38
K1	272	#5	2	5'-1"	1442
K2	272	#5	2	5'-5"	1537
S2	12	#8	STR	14'-4"	459

					LBS. 131881
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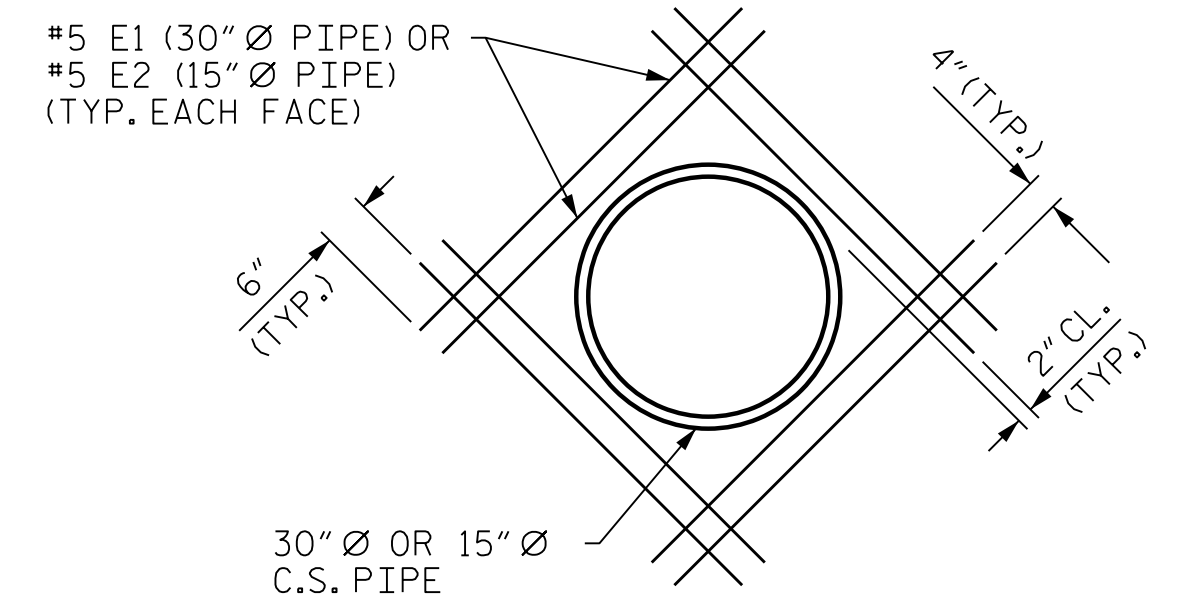


PLAN VIEW SHOWING SILL/BAFFLE LOCATIONS



SILL/BAFFLE DETAILS

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



DETAIL OF REINFORCING AROUND 30" Ø AND 15" Ø PIPE

FOR PIPE THROUGH EXTERIOR WALL, FIELD CUT AND BEND "B" AND "C" BARS AS NEEDED TO CLEAR PIPE.
SHIFT A100 BARS AS NECESSARY TO CLEAR "E" BARS.

PROJECT NO. R-2233BB
RUTHERFORD COUNTY
STATION: 830+02.00 -L3-

SHEET 3 OF 5

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SINGLE 8 FT. X 6 FT. CONCRETE BOX CULVERT
43°-00'-00" SKEW

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

SHEET NO. C2-3
TOTAL SHEETS 5

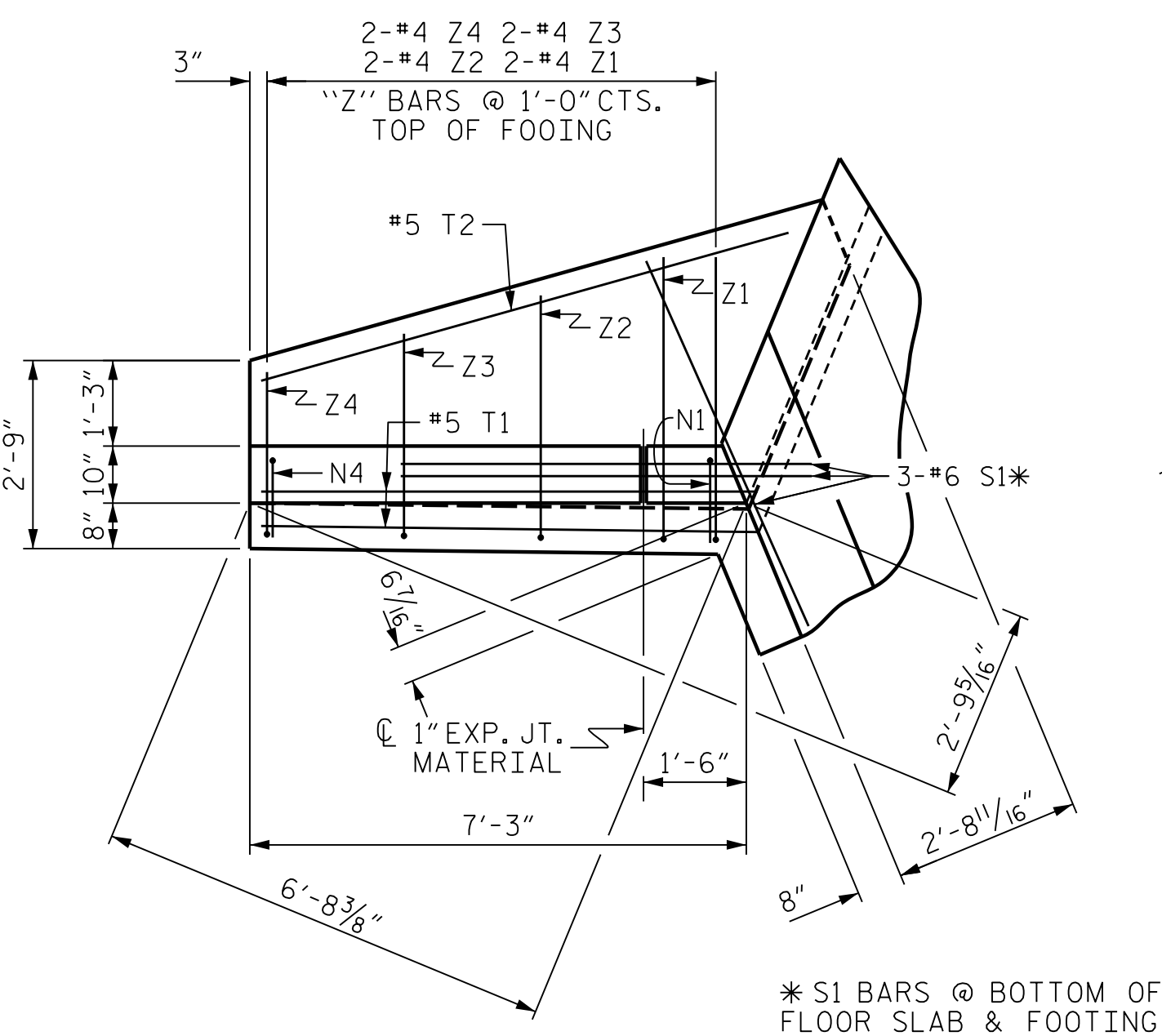
MODJESKI and MASTERS
Experience great bridges.
333 FAYETTEVILLE STREET, SUITE 500
RALEIGH, NC 27601
NC LICENSE NO. C-2979

PROFESSIONAL ENGINEER
SEAL 032987
JASON R. DOUGHTY
4/22/2020
DocuSigned by:
Jason R Doughty
5F73FA2DEA874E8...

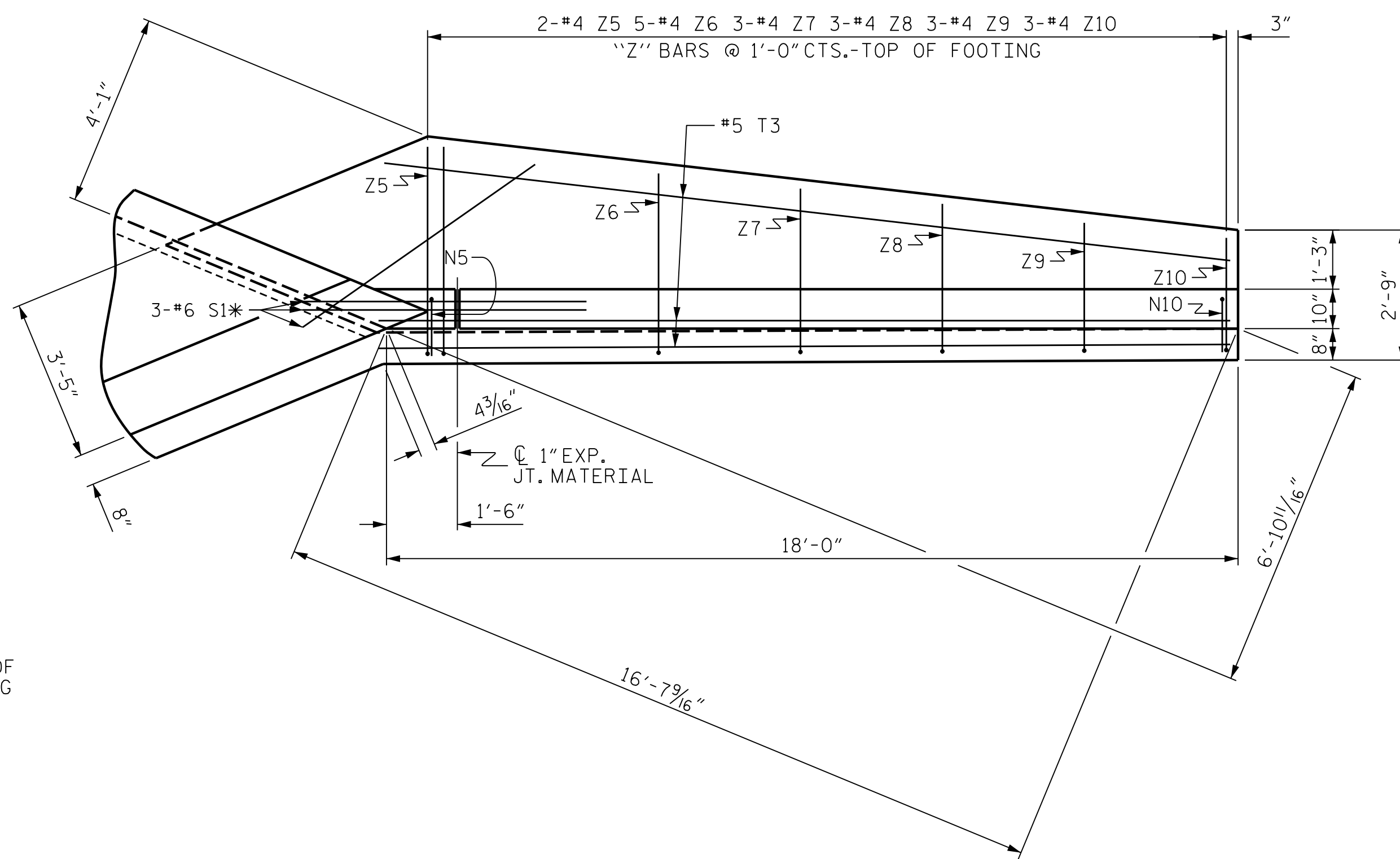
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DESIGNED BY: J. BORUTA DATE: MAR 2019
DRAWN BY: K. WHITE DATE: MAR 2019
CHECKED BY: B. LOFLIN DATE: APR 2019
DESIGN ENGINEER OF RECORD: J. DOUGHTY DATE: NOV 2019

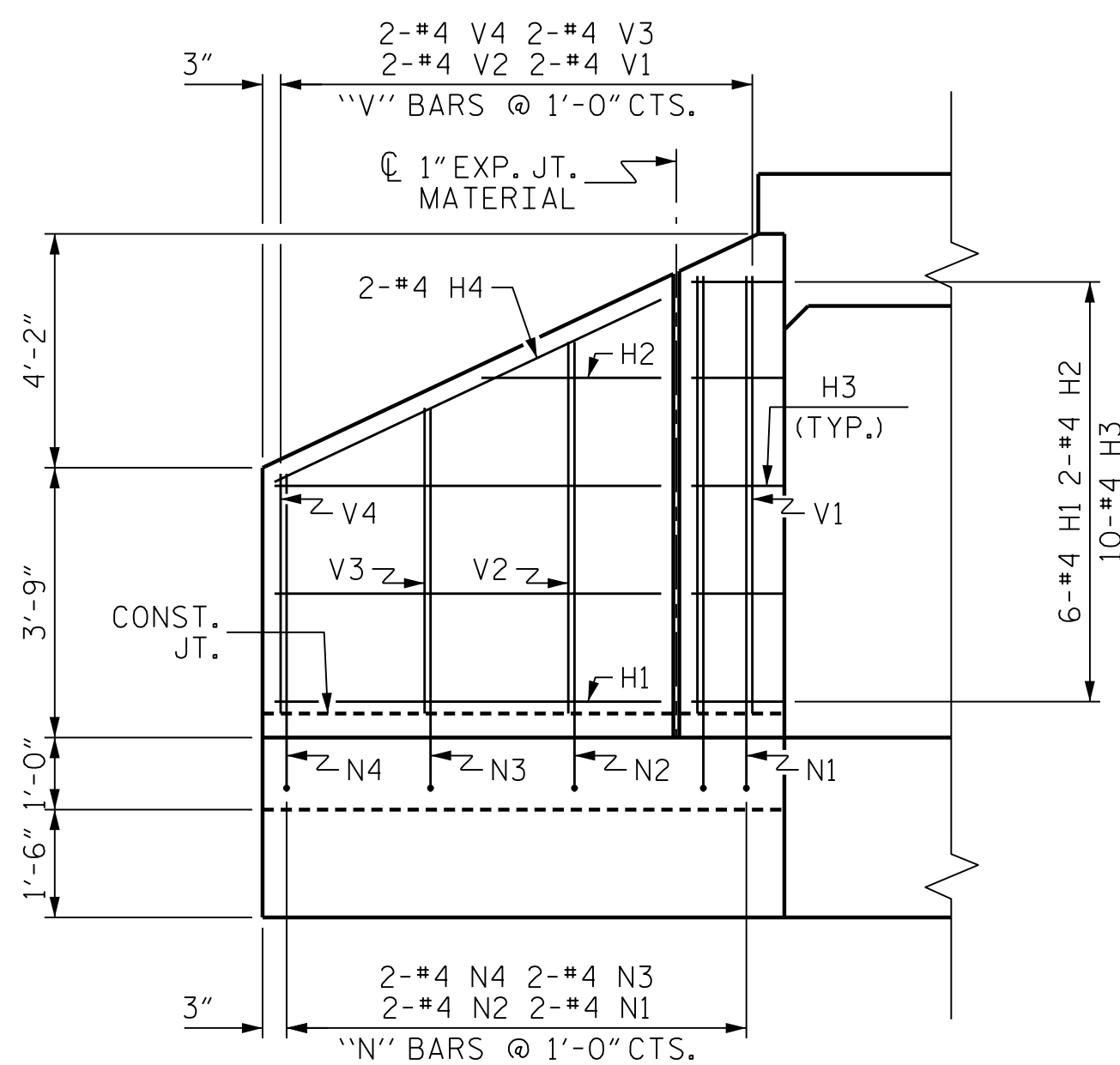
4/22/2020
411_005_R2233BB_SML_DET.dgn



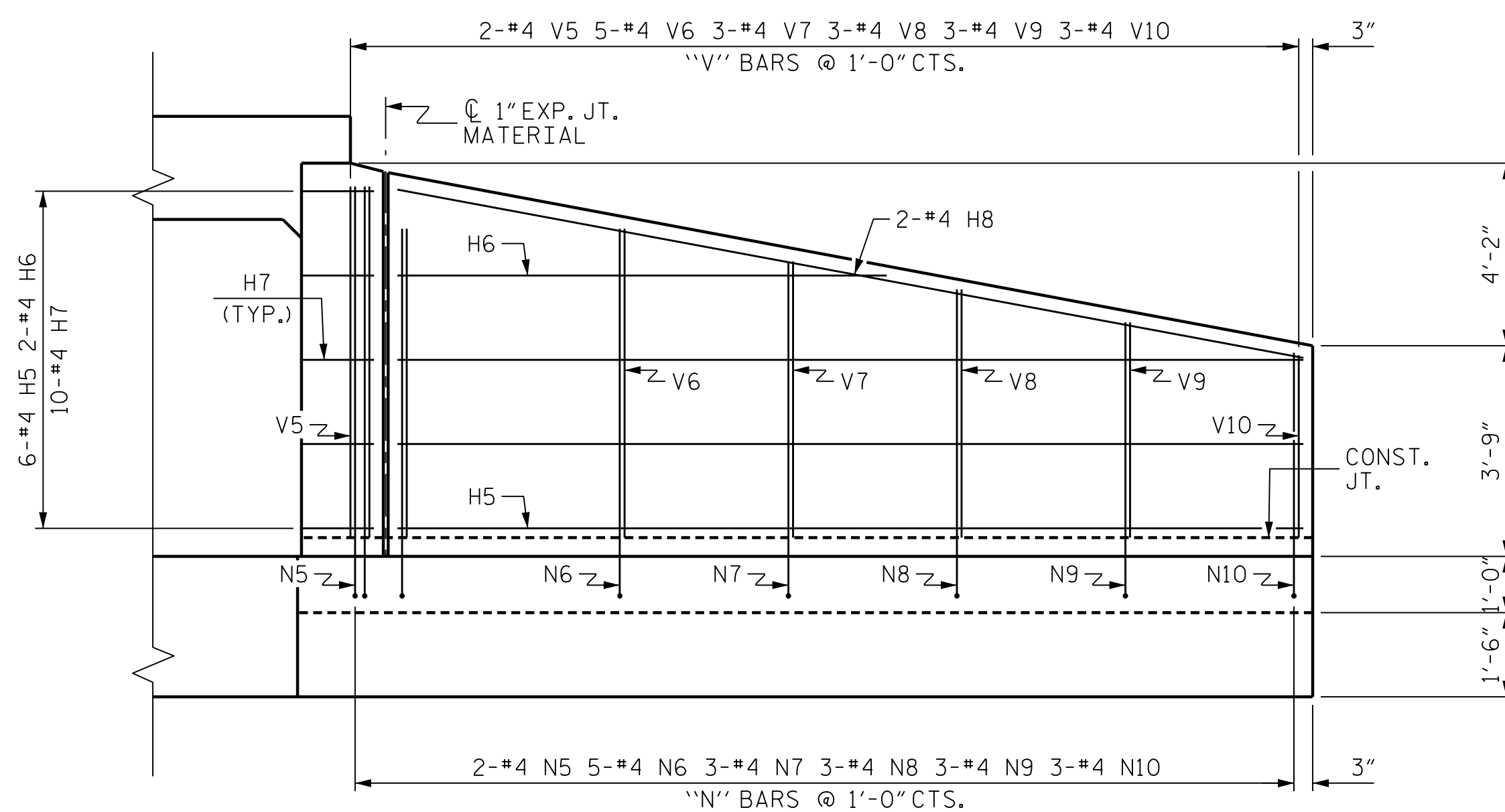
PLAN W2



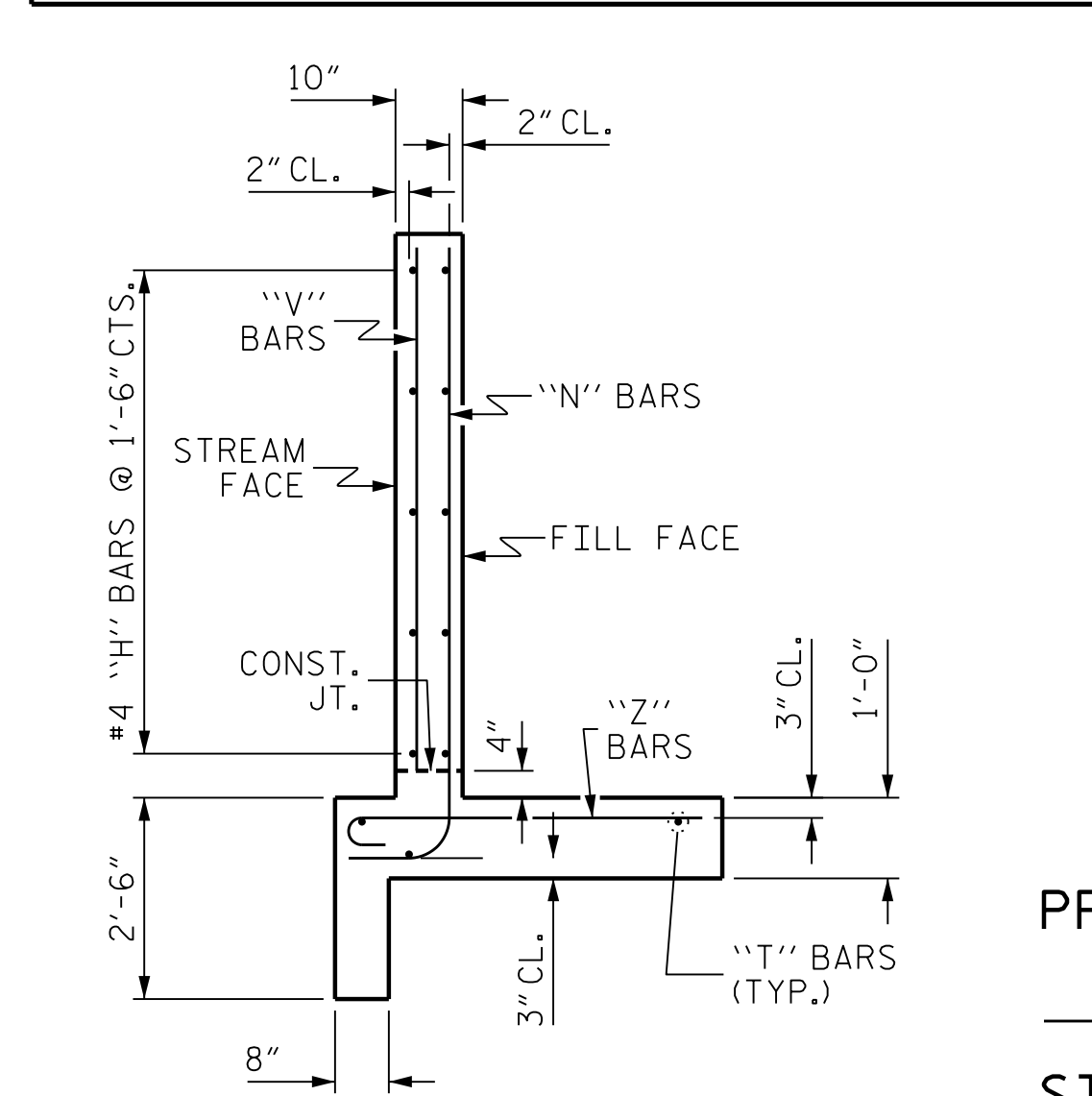
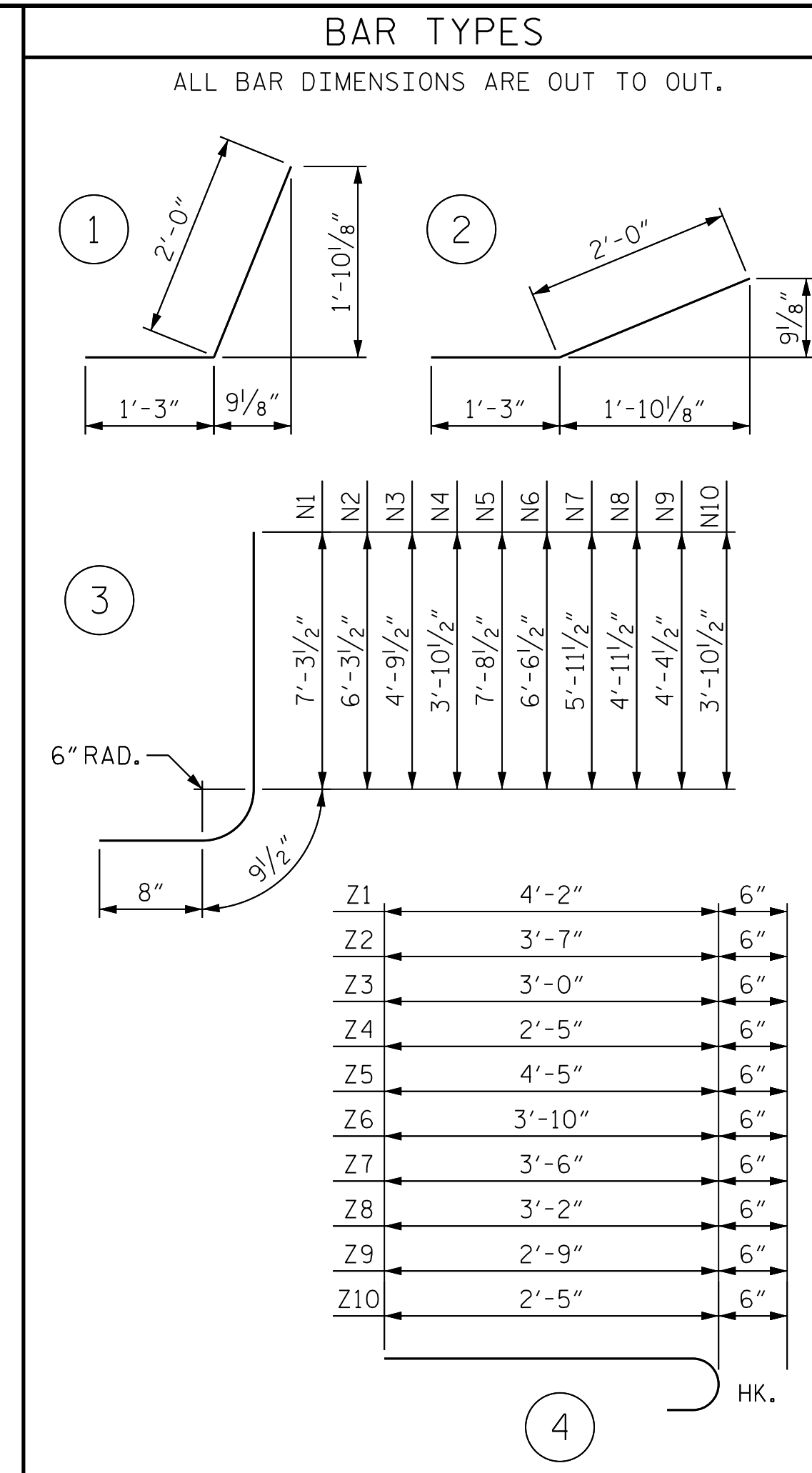
PLAN W1



ELEVATION W2



ELEVATION W1



TYPICAL WING SECTION

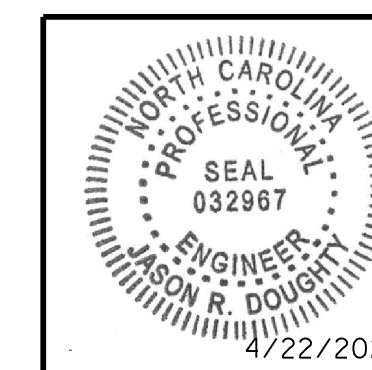
BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	5'-4"	43
H2	4	#4	STR	2'-6"	7
H3	20	#4	1	3'-3"	43
H4	4	#4	STR	5'-11"	16
H5	12	#4	STR	16'-1"	129
H6	4	#4	STR	8'-8"	23
H7	20	#4	2	3'-3"	43
H8	4	#4	STR	16'-4"	44
N1	4	#4	3	8'-9"	23
N2	4	#4	3	7'-9"	21
N3	4	#4	3	6'-3"	17
N4	4	#4	3	5'-4"	14
N5	4	#4	3	9'-2"	24
N6	10	#4	3	8'-0"	53
N7	6	#4	3	7'-5"	30
N8	6	#4	3	6'-5"	26
N9	6	#4	3	5'-10"	23
N10	6	#4	3	5'-4"	21
S1	12	#6	STR	6'-0"	108
T1	4	#5	STR	7'-3"	30
T2	2	#5	STR	8'-0"	17
T3	6	#5	STR	18'-0"	113
V1	4	#4	STR	6'-9"	18
V2	4	#4	STR	5'-8"	15
V3	4	#4	STR	4'-3"	11
V4	4	#4	STR	3'-4"	9
V5	4	#4	STR	7'-1"	19
V6	10	#4	STR	6'-0"	40
V7	6	#4	STR	5'-4"	21
V8	6	#4	STR	4'-5"	18
V9	6	#4	STR	3'-10"	15
V10	6	#4	STR	3'-3"	13
Z1	4	#4	4	4'-8"	12
Z2	4	#4	4	4'-1"	11
Z3	4	#4	4	3'-6"	9
Z4	4	#4	4	2'-11"	8
Z5	4	#4	4	4'-11"	13
Z6	10	#4	4	4'-4"	29
Z7	6	#4	4	4'-0"	16
Z8	6	#4	4	3'-8"	15
Z9	6	#4	4	3'-3"	13
Z10	6	#4	4	2'-11"	12
REINFORCING STEEL				1185	LBS
FOR 4 WINGS					
CLASS A CONCRETE					
4 WINGS				18.5	CY
2 HEADWALLS				1.4	CY
2 END CURTAIN WALLS				1.3	CY
TOTAL				21.2	CY

PROJECT NO. R-2233BB
 RUTHERFORD COUNTY
 STATION: 830+02.00 -L3-

SHEET 4 OF 5

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

SHEET NO. C2-4
 TOTAL SHEETS 5



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 Jason R. Doughty
 SF73FA2DEA874E8...

CUL 2 STD. NO. CW4506

4/22/2020 4:11:00 PM R2233BB_SWL_WING.dgn

DESIGNED BY: J. BORUTA DATE: MAR 2019
 DRAWN BY: K. WHITE DATE: MAR 2019
 CHECKED BY: B. LOFLIN DATE: APR 2019
 DESIGN ENGINEER OF RECORD: J. DOUGHTY DATE: NOV 2019

PERMANENT LOAD FACTORS:

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

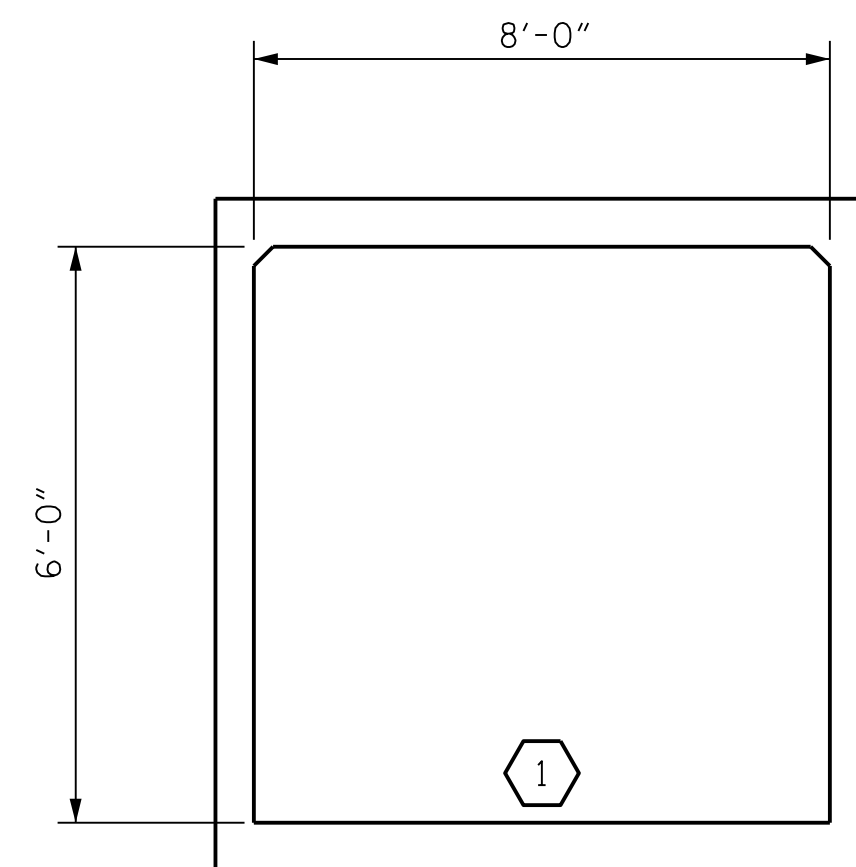
LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS										
	CONTROLLING LOAD RATING	MINIMUM RATING FACTOR (RF)	STRENGTH I LIMIT STATE							
			MOMENT				SHEAR			
			RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)
PERMANENT LOAD RATING	①	1.09	1.09	1	BOTTOM SLAB	4.00	1.14	1	TOP SLAB	1.50

NOTES:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

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

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



LRFR SUMMARY
(LOOKING DOWNSTREAM)

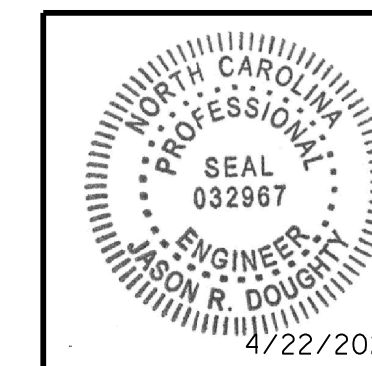
PROJECT NO. R-2233BB
RUTHERFORD COUNTY
 STATION: 830+02.00 -L3-

SHEET 5 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STANDARD
 LRFR SUMMARY FOR
 REINFORCED CONCRETE
 BOX CULVERTS
 (DEEP FILLS)

REVISIONS

NO.	BY:	DATE:	NO.	BY:	DATE:	SHEET NO.
1			3			C2-5
2			4			TOTAL SHEETS 5



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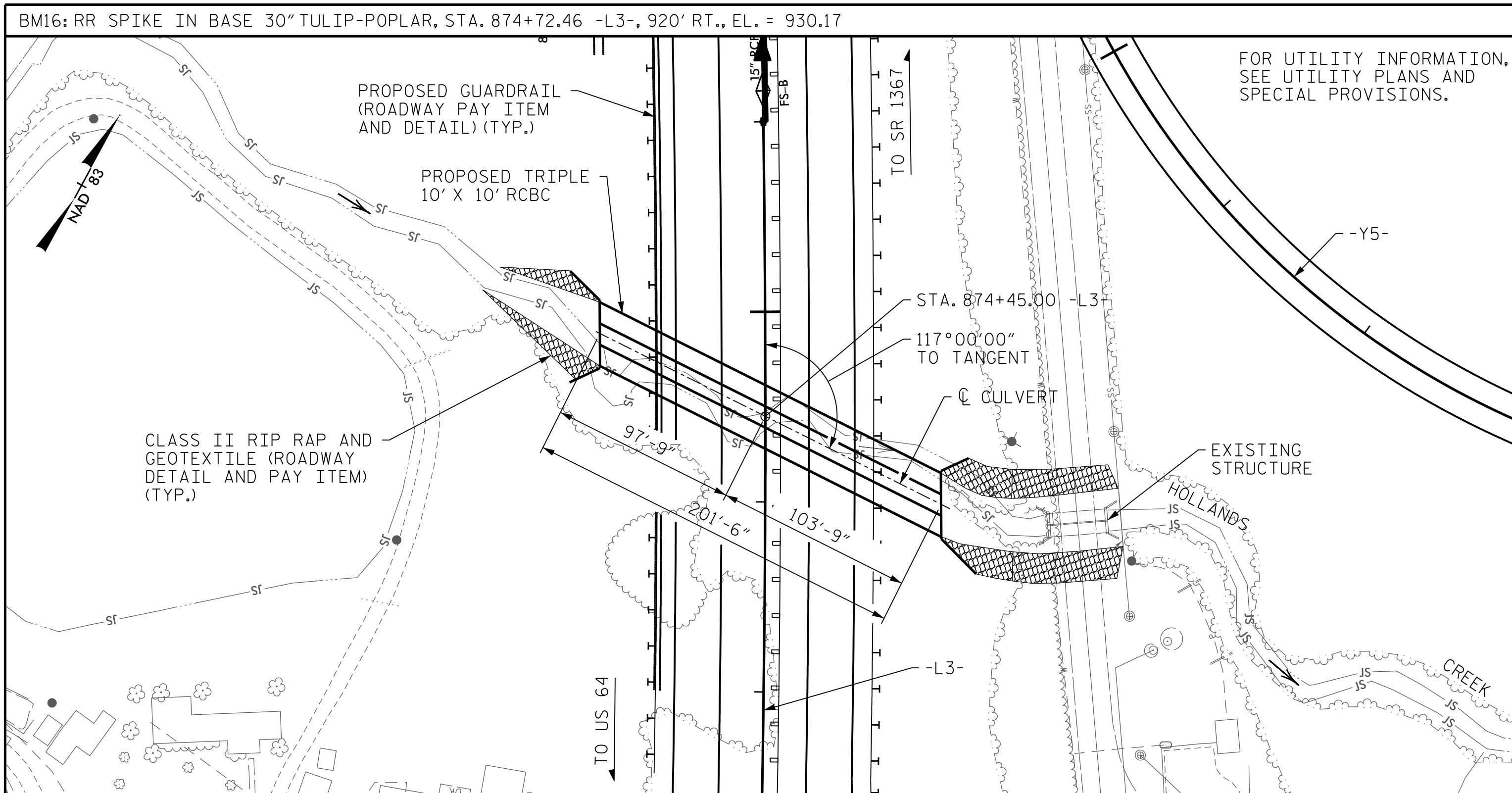
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CUL 2

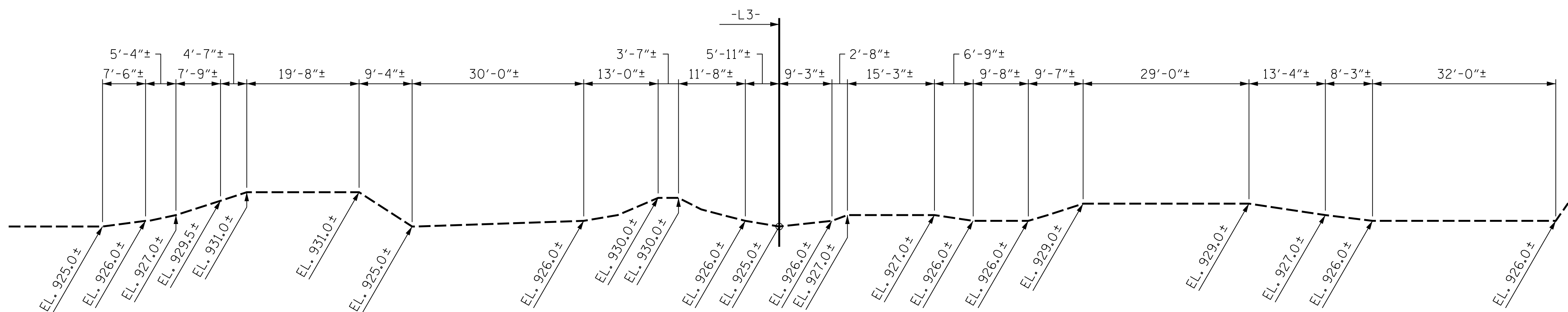
STD. NO. LRFR7

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DESIGNED BY: J. BORUTA DATE : APR 2019
 DRAWN BY: K. WHITE DATE : APR 2019
 CHECKED BY: B. LOFLIN DATE : APR 2019
 DESIGN ENGINEER OF RECORD: J. DOUGHTY DATE : NOV 2019



LOCATION SKETCH



PROFILE ALONG CULVERT

ROADWAY DATA

GRADE PT. EL. @ STA. 874+45.00 -L3- = 952.0
 BED EL. @ STA. 874+45.00 -L3- = 924.5
 ROADWAY SLOPES @ STA. 874+45.00 -L3- = 2:1

HYDRAULIC DATA

DESIGN DISCHARGE = 940 C.F.S.
 FREQUENCY OF DESIGN FLOOD = 50 YR.
 DESIGN HIGH WATER ELEVATION = 934.3
 DRAINAGE AREA = 1.81 SQ. MI.
 BASE DISCHARGE (Q100) = 1,260 C.F.S.
 BASE HIGH WATER ELEVATION = 935.6

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE = 4,700 C.F.S.
 FREQUENCY OF OVERTOPPING FLOOD = 500+ YR.
 OVERTOPPING FLOOD ELEVATION = 950.8

DESIGNED BY: J. BORUTA DATE: MAY 2019
 DRAWN BY: K. WHITE DATE: MAY 2019
 CHECKED BY: B. LOFLIN DATE: MAY 2019
 DESIGN ENGINEER OF RECORD: J. DOUGHTY DATE: NOV 2019

TOTAL STRUCTURE QUANTITIES	
REMOVAL OF EXISTING STRUCTURE	LUMP SUM
CULVERT EXCAVATION	LUMP SUM
ASBESTOS ASSESSMENT	LUMP SUM
FOUNDATION COND. MATERIAL	533 TONS
CLASS A CONCRETE	
BARREL @ 5.13 CY/FT	1,034.5 C.Y.
WING ETC.	44.2 C.Y.
BAFFLES / SILLS ETC.	4.3 C.Y.
TOTAL	1,083.0 C.Y.
REINFORCING STEEL	
BARREL @	112,029 LBS.
WING ETC.	2,829 LBS.
TOTAL	114,858 LBS.

NOTES:

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

DESIGN FILL ----- 19.0 FT.

FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTES SHEET.

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

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

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

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

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

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

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

DETAILED DRAWINGS FOR FALSEWORK AND FORMS FOR THIS CULVERT SHALL BE SUBMITTED. SEE SHEET SN.

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

NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.

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

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.

BACKFILL BARRELS WITH NATIVE BED MATERIAL. NATIVE BED MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED OR FLOODPLAIN AT THE PROJECT SITE DURING CULVERT CONSTRUCTION. ONLY MATERIAL THAT IS EXCAVATED FROM THE STREAM BED MAY BE USED TO LINE THE CULVERT BARREL. RIP RAP MAY BE USED TO SUPPLEMENT THE NATIVE MATERIAL IN THE HIGH FLOW CULVERT BARRELS. IF RIP RAP IS USED TO LINE THE HIGH FLOW CULVERT BARRELS, 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.

THE ENTIRE COST OF WORK REQUIRED TO PLACE NATIVE BED MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE CONTRACT LUMP SUM PRICE BID FOR CULVERT EXCAVATION.

AFTER SERVING AS A TEMPORARY STRUCTURE, THE EXISTING 32'-0" LONG DUAL 6FT. X 6FT. REINFORCED BOX CULVERT LOCATED AT THE OUTLET END OF THE PROPOSED CULVERT SHALL BE REMOVED.

FOR BOX CULVERT EXCAVATION, SEE SECTION 414 OF THE STANDARD SPECIFICATIONS.

THE REINFORCED CONCRETE BOX CULVERT SHALL BE PLACED ON THE STANDARD 1.0 FOOT BLANKET OF FOUNDATION CONDITIONING MATERIAL.

UNDERCUT SOFT/VERY LOOSE SOILS THAT MAY BE ENCOUNTERED BENEATH THE BOTTOM OF THE FOUNDATION CONDITIONING MATERIAL. BACKFILL UNDERCUT AREAS WITH FOUNDATION CONDITIONING MATERIAL. IF MORE THAN 1 FT. UNDERCUT IS REQUIRED, CONTACT OPERATIONS ENGINEER FOR APPROVAL.

THE REINFORCED CONCRETE BOX CULVERT SHALL BE CONSTRUCTED WITH 6" OF CAMBER TO ACCOUNT FOR THE ANTICIPATED SETTLEMENT.

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

PROJECT NO. R-2233BB
RUTHERFORD COUNTY
 STATION: 874+45.00 -L3-

SHEET 1 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

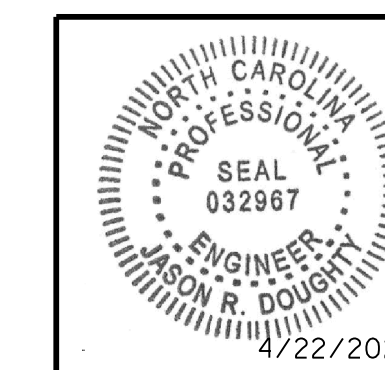
TRIPLE 10 FT. X 10 FT.
 CONCRETE BOX CULVERT
 117°-00'-00" SKEW

REVISIONS

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

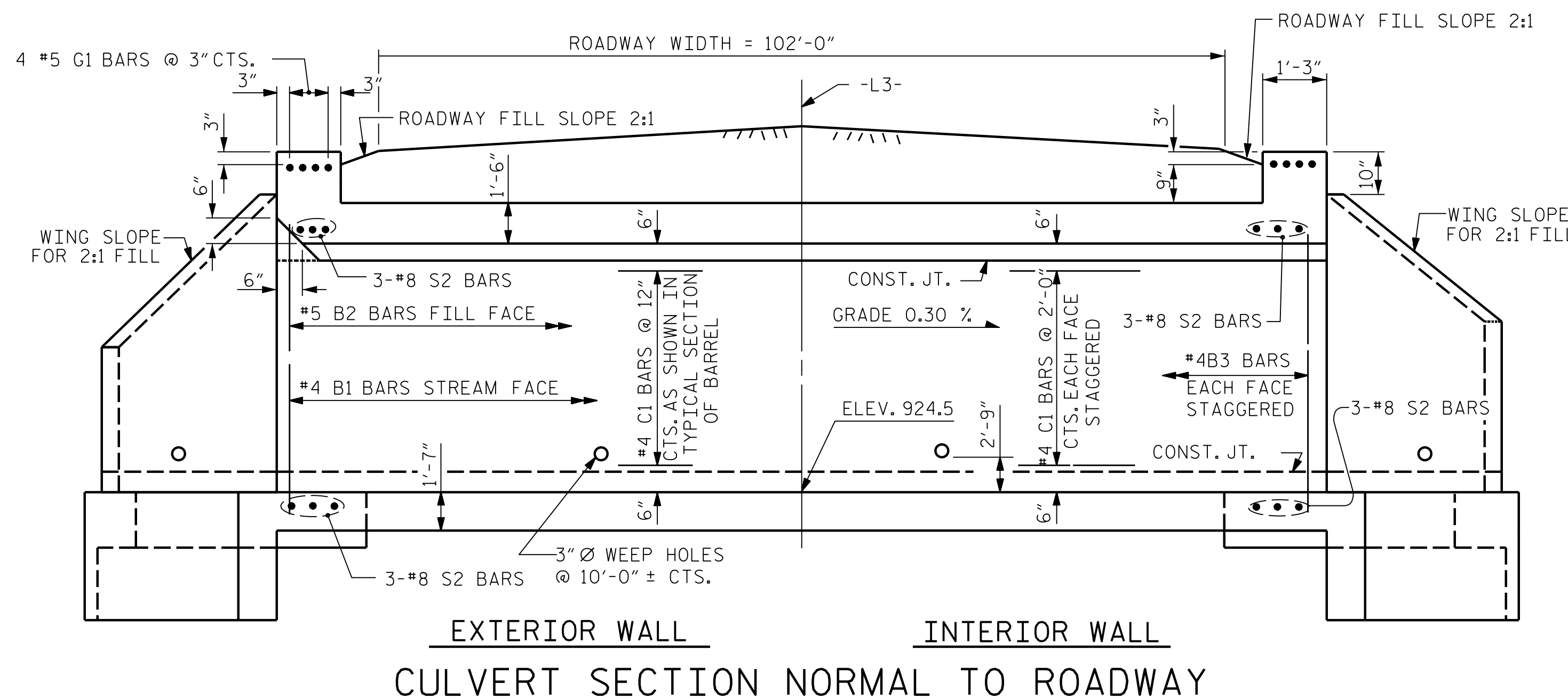
SHEET NO. C3-1

TOTAL SHEETS 5

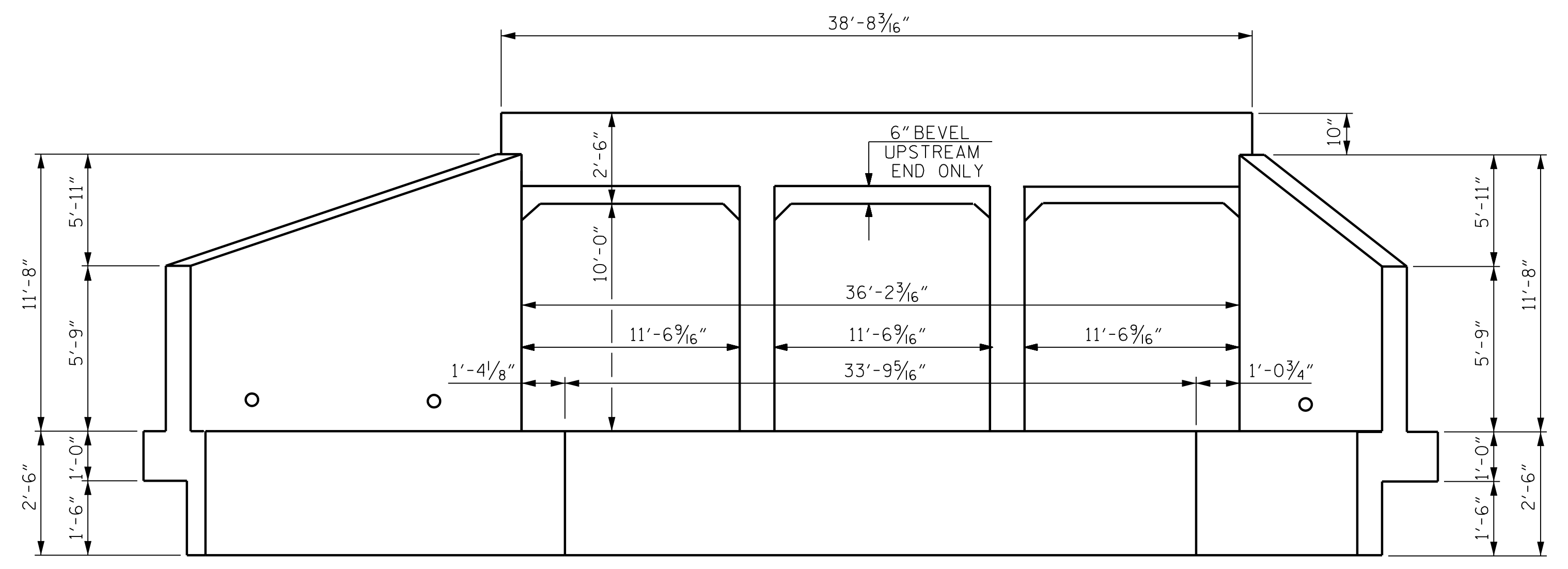


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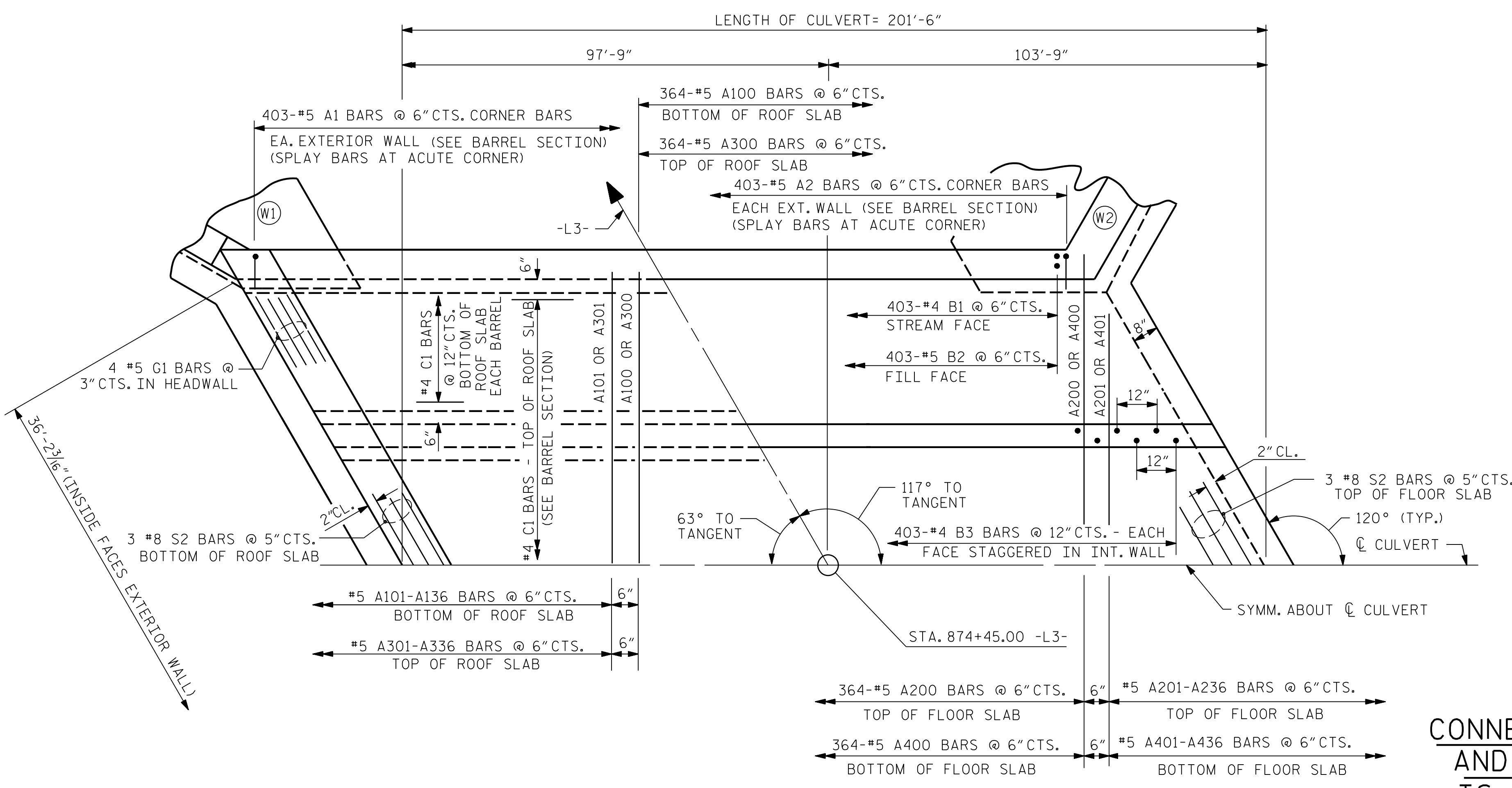
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 Jason R. Doughty
 SF73FA2DEA974E8...



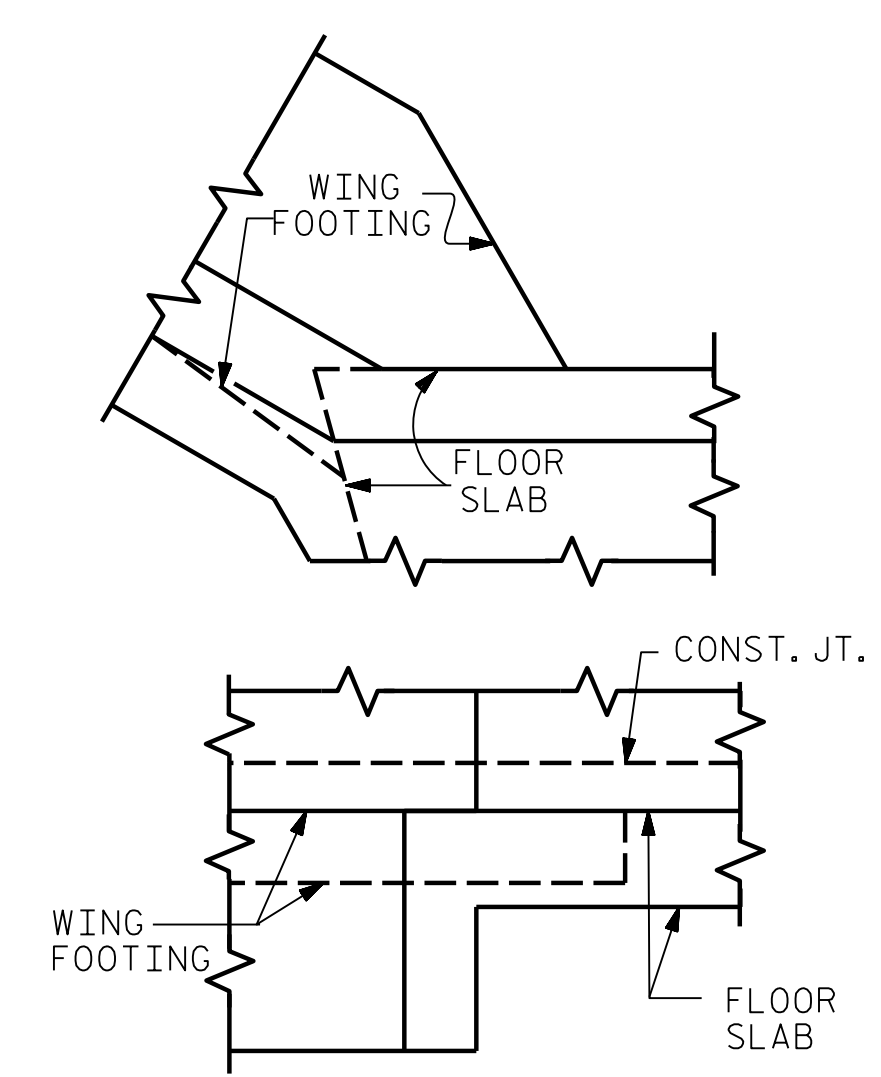
EXTERIOR WALL INTERIOR WALL
CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION-NORMAL TO SKEW



PART PLAN - ROOF SLAB PART PLAN - FLOOR SLAB



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

PROJECT NO. R-2233BB
RUTHERFORD COUNTY
STATION: 874+45.00 -L3-
SHEET 2 OF 5

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
BARREL STANDARD
TRIPLE 10 FT. X 10 FT.
CONCRETE BOX CULVERT
117°-00'-00" SKEW

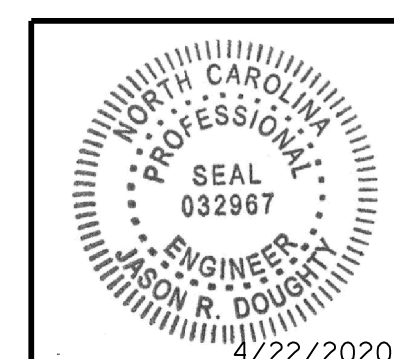
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO.
C3-2
TOTAL SHEETS
5



333 FAYETTEVILLE STREET, SUITE 500
RALEIGH, NC 27601
NC LICENSE NO. C-2979

**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**



DocuSigned by:
Jason R. Dougherty
SF73FA2DEA874E8...

DESIGNED BY: J. BORUTA DATE: MAY 2019
DRAWN BY: K. WHITE DATE: MAY 2019
CHECKED BY: B. LOFLIN DATE: MAY 2019
DESIGN ENGINEER OF RECORD: J. DOUGHTY DATE: NOV 2019

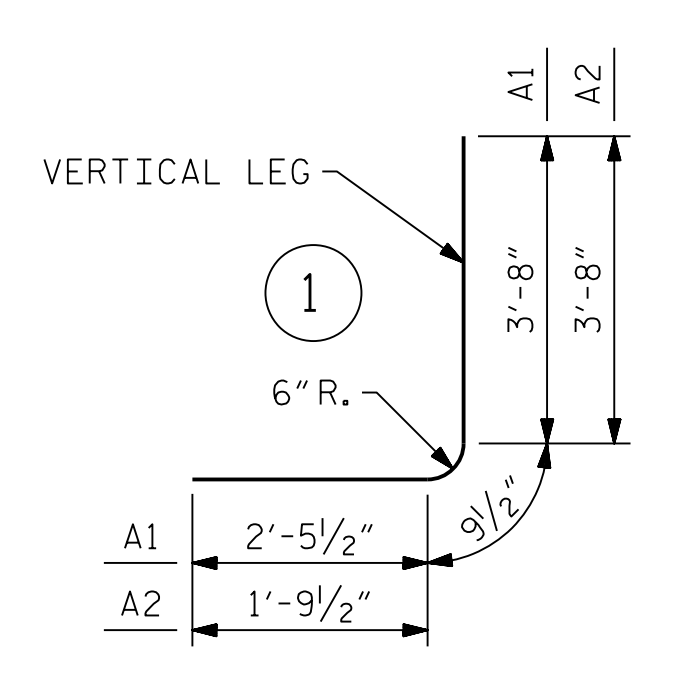
4/22/2020
412_003_R2233BB_SML_CBC_80064.dgn

BILL OF MATERIAL

BAR	NUMBER	SIZE	TYPE	LENGTH	WEIGHT	BAR	NUMBER	SIZE	TYPE	LENGTH	WEIGHT	BAR	NUMBER	SIZE	TYPE	LENGTH	WEIGHT
A1	806	#5	1	6'-11"	5815	A233	2	#5	STR	5'-2"	11	A431	2	#5	STR	6'-10"	14
A2	806	#5	1	6'-3"	5254	A234	2	#5	STR	4'-3"	9	A432	2	#5	STR	6'-0"	13
A235	2	#5	STR	3'-5"	7	A236	2	#5	STR	2'-6"	5	A433	2	#5	STR	5'-2"	11
A434	2	#5	STR	4'-3"	9	A300	364	#5	STR	33'-1"	12560	A435	2	#5	STR	3'-5"	7
A436	2	#5	STR	2'-6"	5	A301	2	#5	STR	32'-10"	68	A436	2	#5	STR	2'-6"	5
A101	2	#5	STR	32'-10"	68	A302	2	#5	STR	32'-0"	67	B1	806	#4	STR	12'-8"	6820
A102	2	#5	STR	32'-0"	67	A303	2	#5	STR	31'-1"	65	B2	806	#5	STR	9'-2"	7706
A103	2	#5	STR	31'-1"	65	A304	2	#5	STR	30'-3"	63	B3	806	#4	STR	12'-8"	6820
A104	2	#5	STR	30'-3"	63	A305	2	#5	STR	29'-5"	61	C1	1240	#4	STR	27'-1"	22434
A105	2	#5	STR	29'-5"	61	A306	2	#5	STR	28'-6"	59	D1	16	#6	STR	2'-10"	68
A106	2	#5	STR	28'-6"	59	A307	2	#5	STR	27'-8"	58	D2	8	#6	STR	1'-10"	22
A107	2	#5	STR	27'-8"	58	A308	2	#5	STR	26'-9"	56	G1	8	#5	STR	38'-1"	318
A108	2	#5	STR	26'-9"	56	A309	2	#5	STR	25'-11"	54	S2	12	#8	STR	38'-1"	1220
A109	2	#5	STR	25'-11"	54	A310	2	#5	STR	25'-1"	52						
A110	2	#5	STR	25'-1"	52	A311	2	#5	STR	24'-2"	50						
A111	2	#5	STR	24'-2"	50	A312	2	#5	STR	23'-4"	49						
A112	2	#5	STR	23'-4"	49	A313	2	#5	STR	22'-5"	47						
A113	2	#5	STR	22'-5"	47	A314	2	#5	STR	21'-6"	45						
A114	2	#5	STR	21'-6"	45	A315	2	#5	STR	20'-9"	43						
A115	2	#5	STR	20'-9"	43	A316	2	#5	STR	19'-10"	41						
A116	2	#5	STR	19'-10"	41	A317	2	#5	STR	19'-0"	40						
A117	2	#5	STR	19'-0"	40	A318	2	#5	STR	18'-1"	38						
A118	2	#5	STR	18'-1"	38	A319	2	#5	STR	17'-3"	36						
A119	2	#5	STR	17'-3"	36	A320	2	#5	STR	16'-5"	34						
A120	2	#5	STR	16'-5"	34	A321	2	#5	STR	15'-6"	32						
A121	2	#5	STR	15'-6"	32	A322	2	#5	STR	14'-8"	31						
A122	2	#5	STR	14'-8"	31	A323	2	#5	STR	13'-9"	29						
A123	2	#5	STR	13'-9"	29	A324	2	#5	STR	12'-11"	27						
A124	2	#5	STR	12'-11"	27	A325	2	#5	STR	12'-1"	25						
A125	2	#5	STR	12'-1"	25	A326	2	#5	STR	11'-2"	23						
A126	2	#5	STR	11'-2"	23	A327	2	#5	STR	10'-4"	22						
A127	2	#5	STR	10'-4"	22	A328	2	#5	STR	9'-5"	20						
A128	2	#5	STR	9'-5"	20	A329	2	#5	STR	8'-7"	18						
A129	2	#5	STR	8'-7"	18	A330	2	#5	STR	7'-9"	16						
A130	2	#5	STR	7'-9"	16	A331	2	#5	STR	6'-10"	14						
A131	2	#5	STR	6'-10"	14	A332	2	#5	STR	6'-0"	13						
A132	2	#5	STR	6'-0"	13	A333	2	#5	STR	5'-2"	11						
A133	2	#5	STR	5'-2"	11	A334	2	#5	STR	4'-3"	9						
A134	2	#5	STR	4'-3"	9	A335	2	#5	STR	3'-5"	7						
A135	2	#5	STR	3'-5"	7	A336	2	#5	STR	2'-6"	5						
A136	2	#5	STR	2'-6"	5												
A200	364	#5	STR	33'-1"	12560	A400	364	#5	STR	33'-1"	12560						
A201	2	#5	STR	32'-10"	68	A401	2	#5	STR	32'-10"	68						
A202	2	#5	STR	32'-0"	67	A402	2	#5	STR	32'-0"	67						
A203	2	#5	STR	31'-1"	65	A403	2	#5	STR	31'-1"	65						
A204	2	#5	STR	30'-3"	63	A404	2	#5	STR	30'-3"	63						
A205	2	#5	STR	29'-5"	61	A405	2	#5	STR	29'-5"	61						
A206	2	#5	STR	28'-6"	59	A406	2	#5	STR	28'-6"	59						
A207	2	#5	STR	27'-8"	58	A407	2	#5	STR	27'-8"	58						
A208	2	#5	STR	26'-9"	56	A408	2	#5	STR	26'-9"	56						
A209	2	#5	STR	25'-11"	54	A409	2	#5	STR	25'-11"	54						
A210	2	#5	STR	25'-1"	52	A410	2	#5	STR	25'-1"	52						
A211	2	#5	STR	24'-2"	50	A411	2	#5	STR	24'-2"	50						
A212	2	#5	STR	23'-4"	49	A412	2	#5	STR	23'-4"	49						
A213	2	#5	STR	22'-5"	47	A413	2	#5	STR	22'-5"	47						
A214	2	#5	STR	21'-6"	45	A414	2	#5	STR	21'-6"	45						
A215	2	#5	STR	20'-9"	43	A415	2	#5	STR	20'-9"	43						
A216	2	#5	STR	19'-10"	41	A416	2	#5	STR	19'-10"	41						
A217	2	#5	STR	19'-0"	40	A417	2	#5	STR	19'-0"	40						
A218	2	#5	STR	18'-1"	38	A418	2	#5	STR	18'-1"	38						
A219	2	#5	STR	17'-3"	36	A419	2	#5	STR	17'-3"	36						
A220	2	#5	STR	16'-5"	34	A420	2	#5	STR	16'-5"	34						
A221	2	#5	STR	15'-6"	32	A421	2	#5	STR	15'-6"	32						
A222	2	#5	STR	14'-8"	31	A422	2	#5	STR	14'-8"	31						
A223	2	#5	STR	13'-9"	29	A423	2	#5	STR	13'-9"	29						
A224	2	#5	STR	12'-11"	27	A424	2	#5	STR	12'-11"	27						
A225	2	#5	STR	12'-1"	25	A425	2	#5	STR	12'-1"	25						
A226	2	#5	STR	11'-2"	23	A426	2	#5	STR	11'-2"	23						
A227	2	#5	STR	10'-4"	22	A427	2	#5	STR	10'-4"	22						
A228	2	#5	STR	9'-5"	20	A428	2	#5	STR	9'-5"	20						
A229	2	#5	STR	8'-7"	18	A429	2	#5	STR	8'-7"	18						
A230	2	#5	STR	7'-9"	16	A430	2	#5	STR	7'-9"	16						
A231	2	#5	STR	6'-10"	14												
A232	2	#5	STR	6'-0"	13												

REINFORCING STEEL = 112,029 LBS.

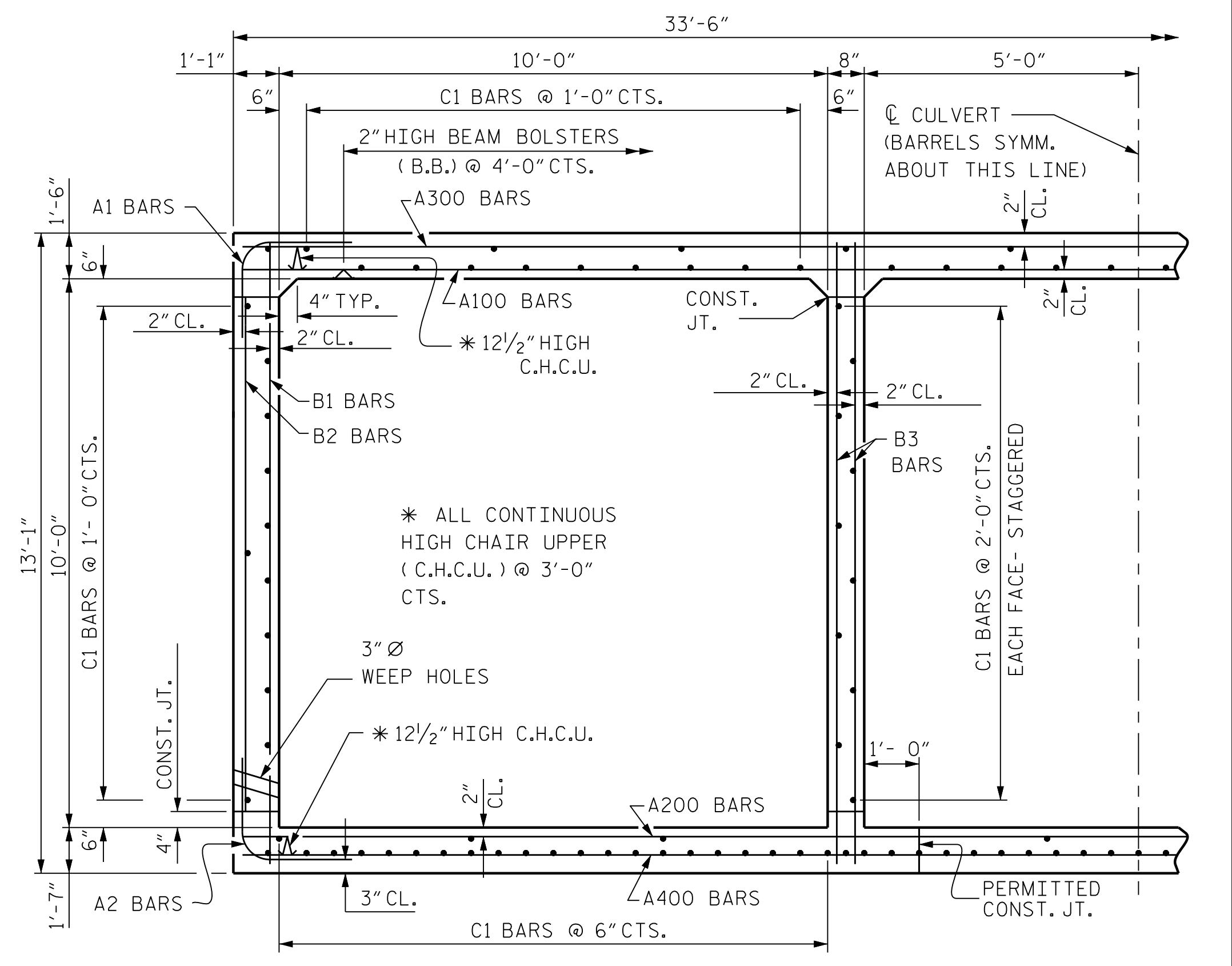
BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT.

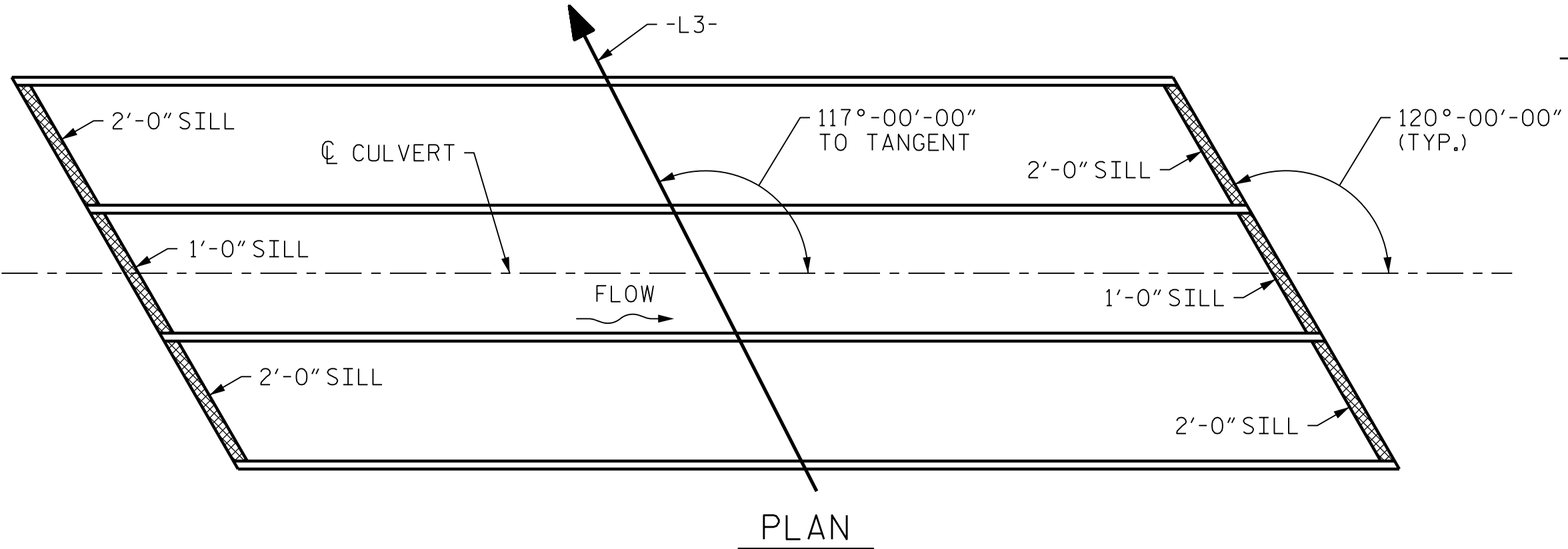
SPLICE LENGTH CHART

BAR	SIZE	SPLICE LENGTH
C1	#4	1'-11"
B1, B3	#4	1'-5"
A200	#5	2'-5"
A400	#5	1'-9"

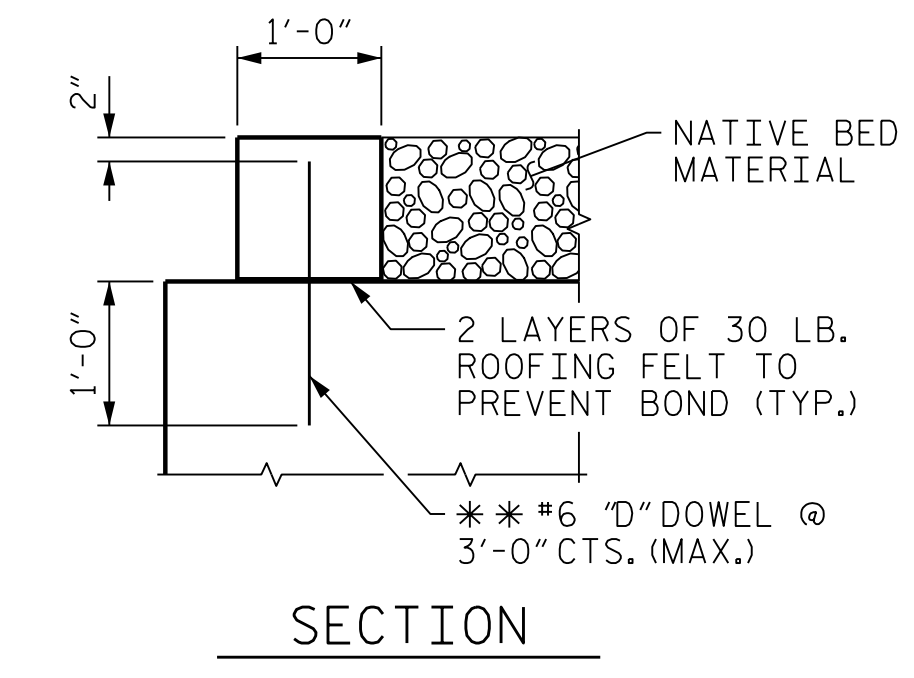


RIGHT ANGLE SECTION OF BARREL

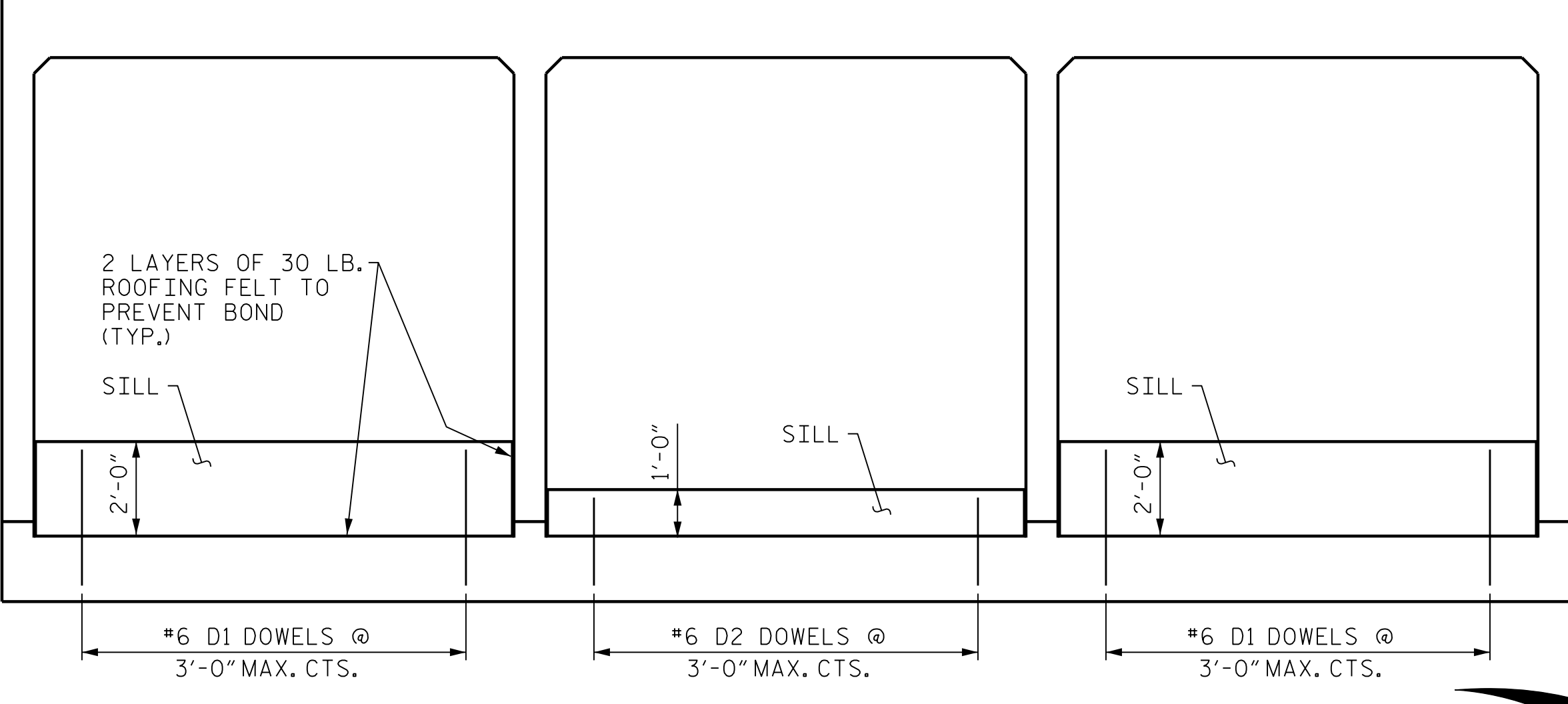
THERE ARE 155 "C" BARS IN SECTION OF BARREL



PLAN



SECTION



ELEVATION

(LOOKING DOWNSTREAM)

SILL DETAILS

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

MODJESKI and MASTERS
Experience great bridges.
333 FAYETTEVILLE STREET, SUITE 500
RALEIGH, NC 27601
NC LICENSE NO. C-2979

DocuSigned by:
Jason R. Doughty
4/22/2020

PROJECT NO. R-2233BB
RUTHERFORD COUNTY
STATION: 874+45.00 -L3-

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

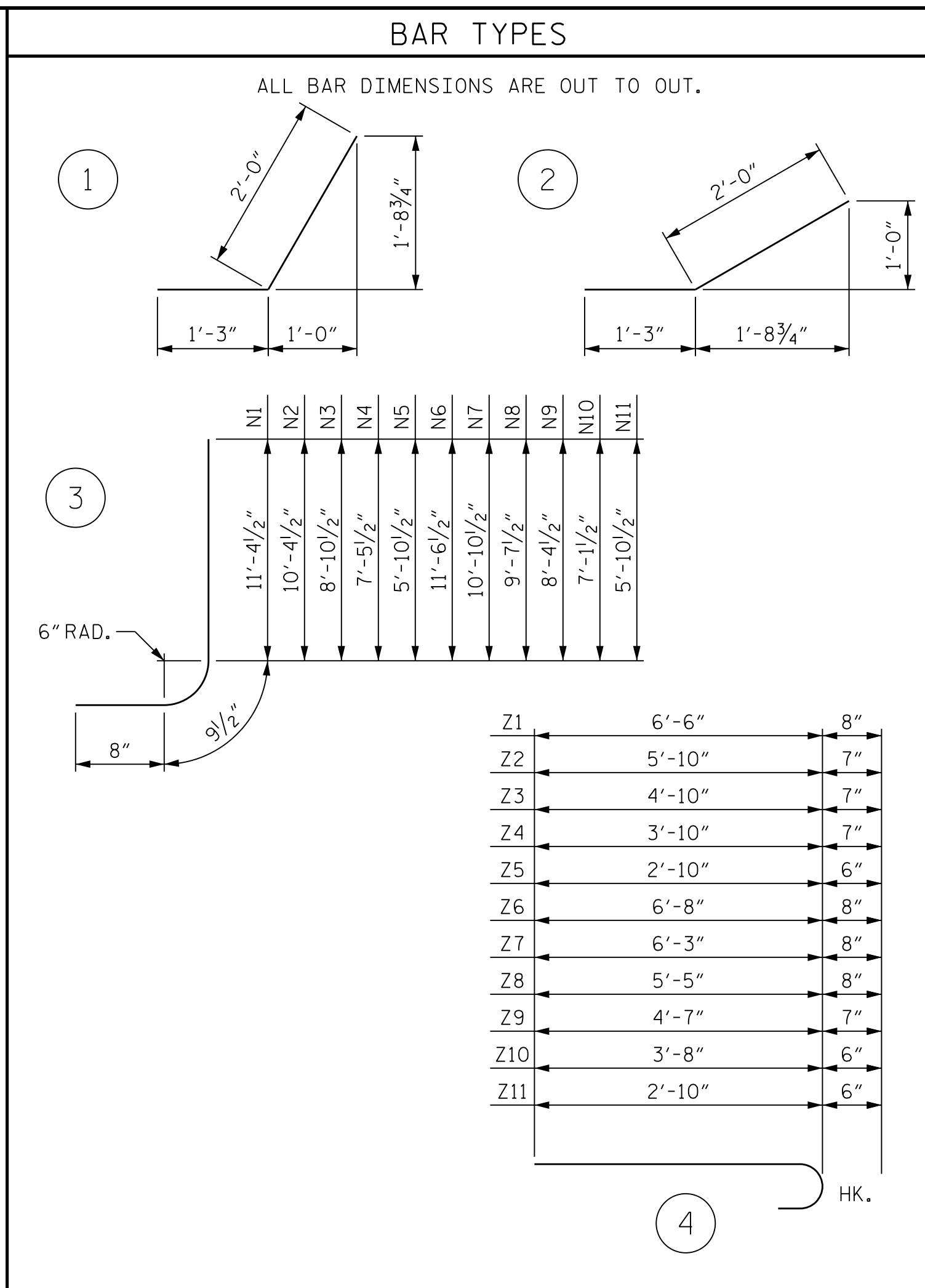
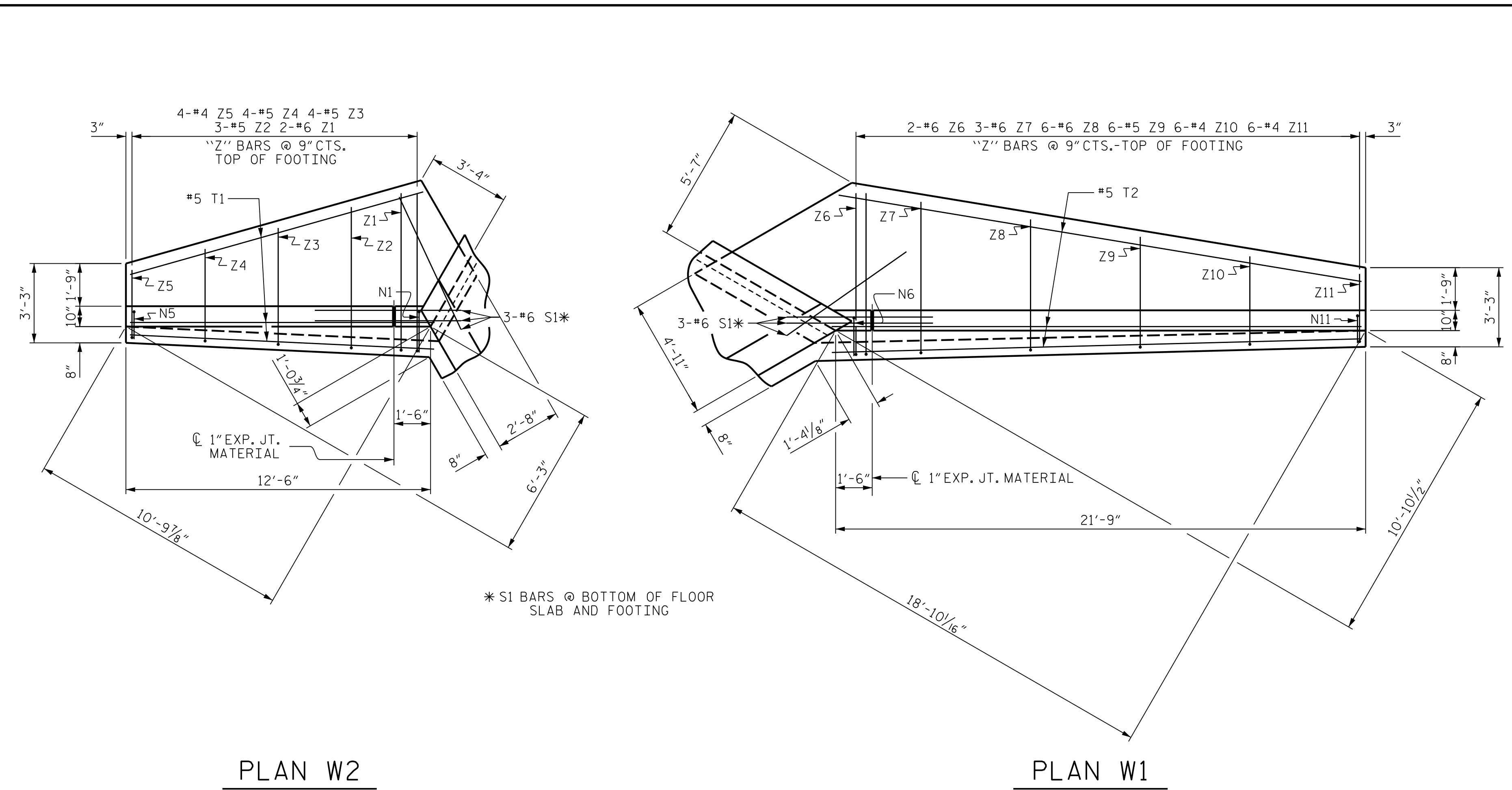
TRIPLE 10 FT. X 10 FT. CONCRETE BOX CULVERT
117°-00'-00" SKEW

SHEET 3 OF 5

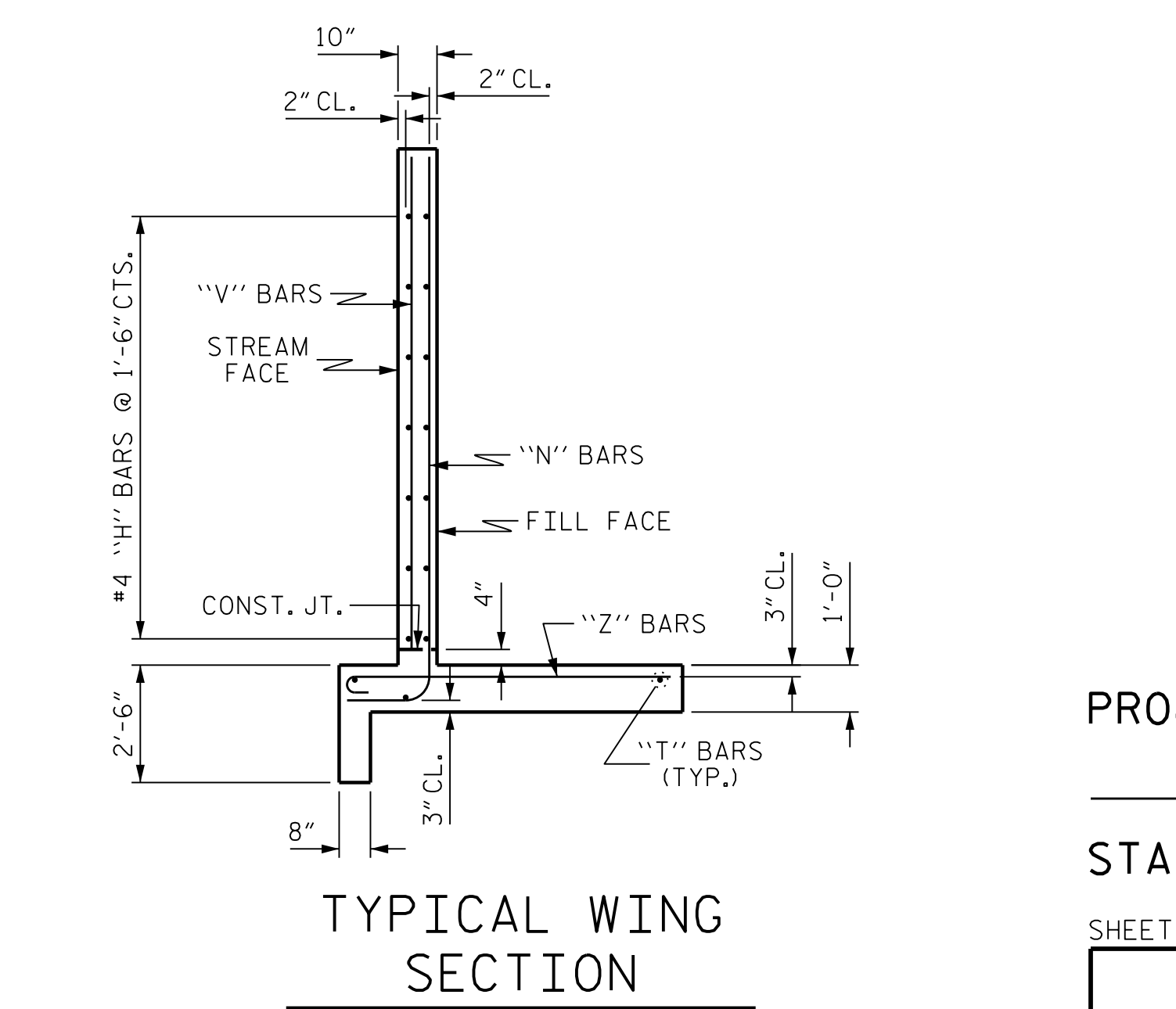
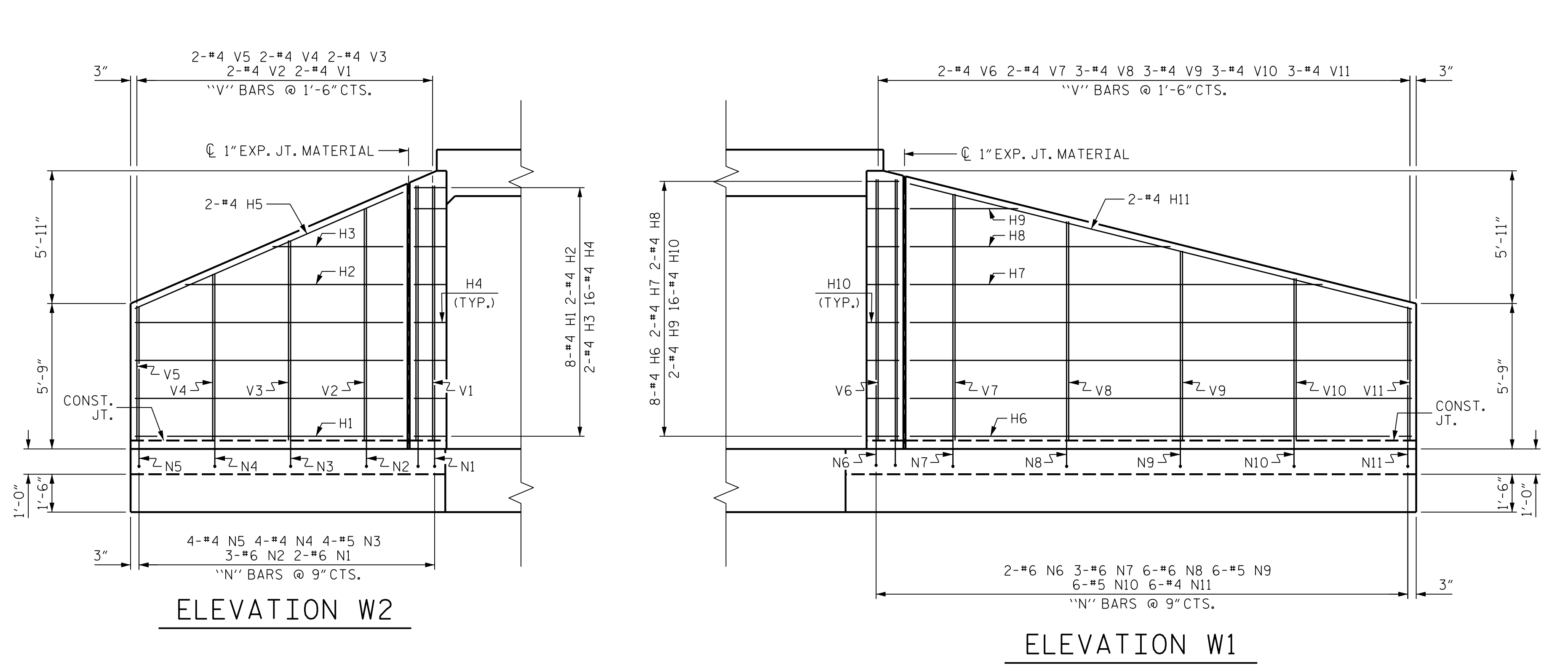
REVISIONS		SHEET NO.	
NO.	BY:	NO.	DATE:
1		3	
2		4	

TOTAL SHEETS: 5

DESIGNED BY: J. BORUTA DATE: MAY 2019
DRAWN BY: K. WHITE DATE: MAY 2019
CHECKED BY: B. LOFLIN DATE: MAY 2019
DESIGN ENGINEER OF RECORD: J. DOUGHTY DATE: NOV 2019



BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	16	#4	STR	10'-7"	113
H2	4	#4	STR	8'-7"	23
H3	4	#4	STR	5'-2"	14
H4	32	#4	1	3'-3"	69
H5	4	#4	STR	11'-7"	31
H6	16	#4	STR	19'-10"	212
H7	4	#4	STR	16'-4"	44
H8	4	#4	STR	10'-3"	27
H9	4	#4	STR	4'-3"	11
H10	32	#4	2	3'-3"	69
H11	4	#4	STR	20'-5"	55
N1	4	#6	3	12'-10"	77
N2	6	#6	3	11'-10"	107
N3	8	#5	3	10'-4"	86
N4	8	#4	3	8'-11"	48
N5	8	#4	3	7'-4"	39
N6	4	#6	3	13'-0"	78
N7	6	#6	3	12'-4"	111
N8	12	#6	3	11'-1"	200
N9	12	#5	3	9'-10"	123
N10	12	#5	3	8'-7"	107
N11	12	#4	3	7'-4"	59
S1	12	#6	STR	6'-0"	108
T1	6	#5	STR	12'-6"	78
T2	6	#5	STR	21'-9"	136
V1	4	#4	STR	10'-9"	29
V2	4	#4	STR	9'-9"	26
V3	4	#4	STR	8'-3"	22
V4	4	#4	STR	6'-10"	18
V5	4	#4	STR	5'-4"	14
V6	4	#4	STR	11'-0"	29
V7	4	#4	STR	10'-4"	28
V8	6	#4	STR	9'-1"	36
V9	6	#4	STR	7'-10"	31
V10	6	#4	STR	6'-7"	26
V11	6	#4	STR	5'-3"	21
Z1	4	#6	4	7'-2"	43
Z2	6	#5	4	6'-5"	40
Z3	8	#5	4	5'-5"	45
Z4	8	#5	4	4'-5"	37
Z5	8	#4	4	3'-4"	18
Z6	4	#6	4	7'-4"	44
Z7	6	#6	4	6'-11"	62
Z8	12	#6	4	6'-1"	110
Z9	12	#5	4	5'-2"	65
Z10	12	#4	4	4'-2"	33
Z11	12	#4	4	3'-4"	27
REINFORCING STEEL FOR 4 WINGS					2829 LBS
CLASS A CONCRETE					
4 WINGS					37.0 CY
2 HEADWALLS					3.6 CY
2 END CURTAIN WALLS					3.6 CY
TOTAL					44.2 CY



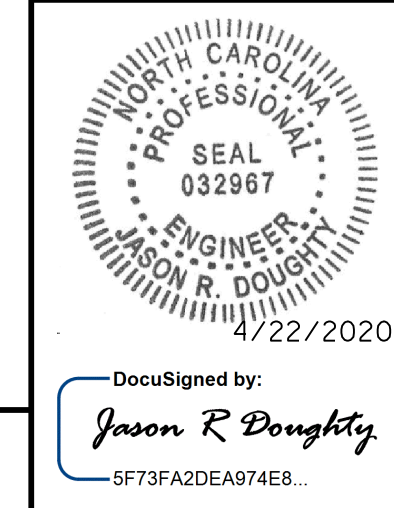
PROJECT NO. R-2233BB
RUTHERFORD COUNTY
 STATION: 874+45.00 -L3-
 SHEET 4 OF 5

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

STANDARD WINGS FOR CONCRETE BOX CULVERT
 H = 10'-0" SLOPE = 2:1
 120° SKEW

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

SHEET NO. C3-4
 TOTAL SHEETS 5



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

DESIGNED BY: J. BORUTA DATE: MAY 2019
 DRAWN BY: K. WHITE DATE: MAY 2019
 CHECKED BY: B. LOFLIN DATE: MAY 2019
 DESIGN ENGINEER OF RECORD: J. DOUGHTY DATE: NOV 2019

4/22/2020
 412_DOT_R2233BB_SML_WING_800664.dgn

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	1.99	--	1.75	3.83	1	EXTERIOR WALL	5.00	1.99	1	EXTERIOR WALL	9.17		
	HL-93 (OPERATING)	N/A		2.59	--	1.35	4.96	1	EXTERIOR WALL	5.00	2.59	1	EXTERIOR WALL	9.17		
	HS-20 (INVENTORY)	36,000	②	1.99	71.81	1.75	3.83	1	EXTERIOR WALL	5.00	1.99	1	EXTERIOR WALL	9.17		
	HS-20 (OPERATING)	36,000		2.59	93.08	1.35	4.96	1	EXTERIOR WALL	5.00	2.59	1	EXTERIOR WALL	9.17		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		2.68	36.18	1.40	5.49	1	EXTERIOR WALL	5.00	2.68	1	EXTERIOR WALL	9.17		
		SNGARBS2	20,000		2.61	52.20	1.40	5.27	1	EXTERIOR WALL	5.00	2.61	1	EXTERIOR WALL	9.17	
		SNAGRIS2	22,000		2.59	56.89	1.40	5.23	1	EXTERIOR WALL	5.00	2.59	1	EXTERIOR WALL	9.17	
		SNCOTTS3	27,250		2.60	70.73	1.40	4.88	1	EXTERIOR WALL	5.00	2.60	1	EXTERIOR WALL	9.17	
		SNAGGRS4	34,925		2.50	87.41	1.40	4.77	1	EXTERIOR WALL	5.00	2.50	1	EXTERIOR WALL	9.17	
		SNS5A	35,550		2.53	89.78	1.40	4.77	1	EXTERIOR WALL	5.00	2.53	1	EXTERIOR WALL	9.17	
		SNS6A	39,950		2.52	100.71	1.40	4.75	1	EXTERIOR WALL	5.00	2.52	1	EXTERIOR WALL	9.17	
		SNS7B	42,000		2.52	105.69	1.40	4.68	1	EXTERIOR WALL	5.00	2.52	1	EXTERIOR WALL	9.17	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33,000		2.52	83.19	1.40	4.89	1	EXTERIOR WALL	5.00	2.52	1	EXTERIOR WALL	9.17	
		TNT4A	33,075		2.55	84.29	1.40	4.88	1	EXTERIOR WALL	5.00	2.55	1	EXTERIOR WALL	9.17	
		TNT6A	41,600		2.52	104.87	1.40	4.75	1	EXTERIOR WALL	5.00	2.52	1	EXTERIOR WALL	9.17	
		TNT7A	42,000		2.51	105.31	1.40	4.67	1	EXTERIOR WALL	5.00	2.51	1	EXTERIOR WALL	9.17	
		TNT7B	42,000		2.52	105.69	1.40	4.71	1	EXTERIOR WALL	5.00	2.52	1	EXTERIOR WALL	9.17	
		TNAGRIT4	43,000		2.47	106.29	1.40	4.68	1	EXTERIOR WALL	5.00	2.47	1	EXTERIOR WALL	9.17	
	TNAGT5A	45,000		2.46	110.65	1.40	4.60	1	EXTERIOR WALL	5.00	2.46	1	EXTERIOR WALL	9.17		
	TNAGT5B	45,000	③	2.44	109.88	1.40	4.55	1	EXTERIOR WALL	5.00	2.44	1	EXTERIOR WALL	9.17		

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

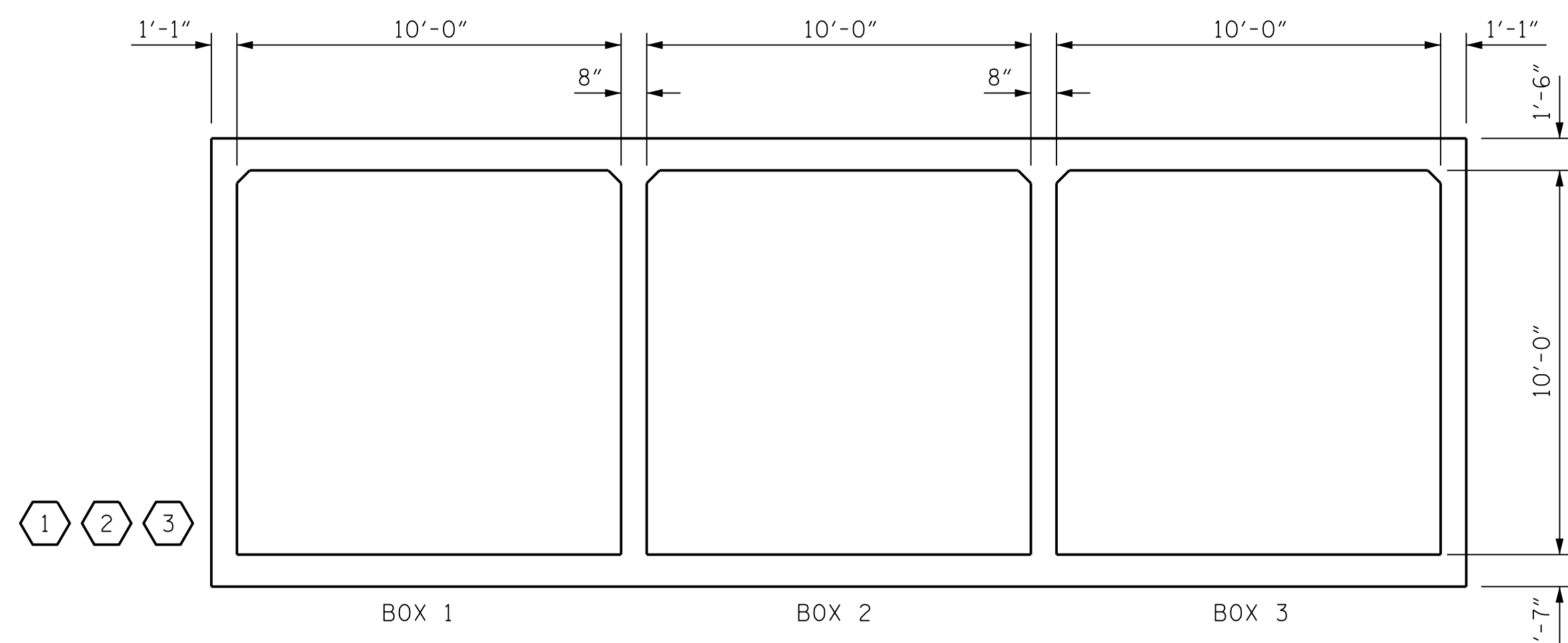
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DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.50
ES	1.35	0.90
LS	1.75	--
WA	1.00	--

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

DISTANCE ALONG EXTERIOR WALL MEASURED FROM BOTTOM OF TOP SLAB.

#	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-2233BB
RUTHERFORD COUNTY
 STATION: 874+45.00 -L3-

SHEET 5 OF 5

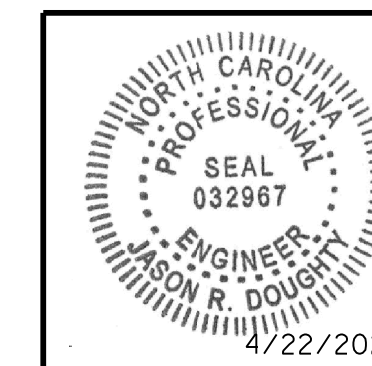
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 STANDARD
**LRFR SUMMARY FOR
 REINFORCED CONCRETE
 BOX CULVERTS**
 (NON-INTERSTATE TRAFFIC)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C3-5
1			3			TOTAL SHEETS
2			4			5



333 FAYETTEVILLE STREET, SUITE 500
 RALEIGH, NC 27601
 NC LICENSE NO. C-2979

**DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED**



DocuSigned by:
Jason R. Doughty
 SF73FA2DEA974E8...

CUL 3

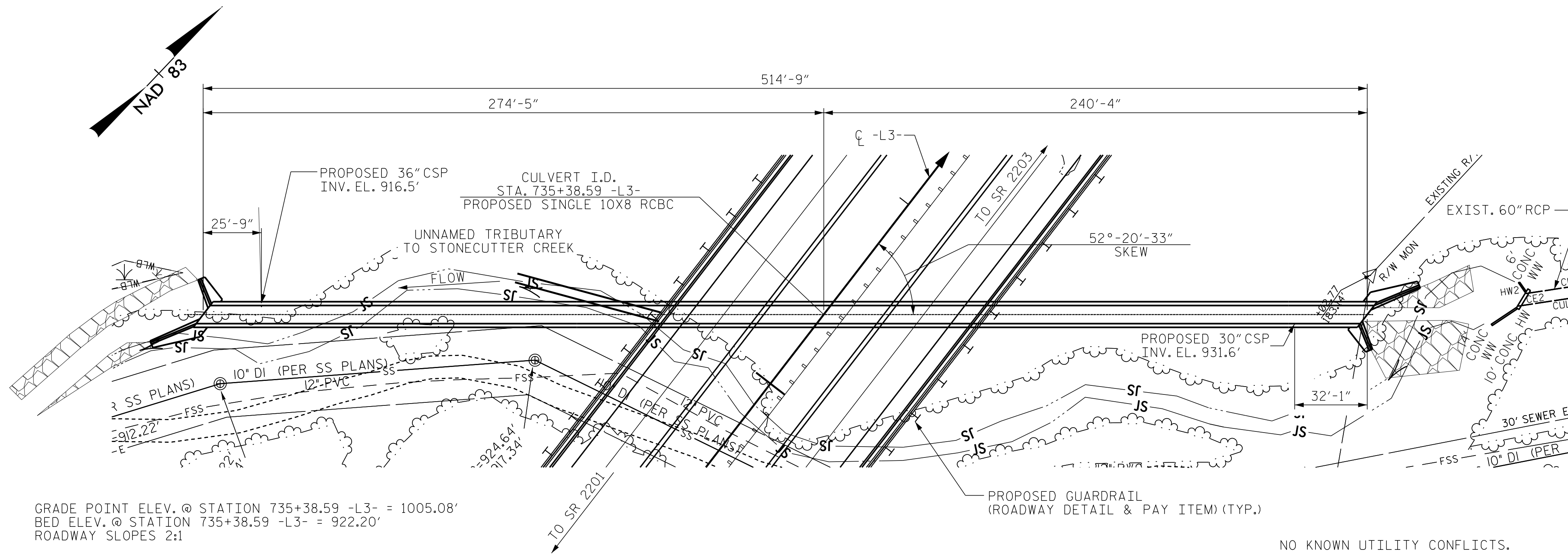
STD. NO. LRFR5

DESIGNED BY: J. BORUTA DATE: MAY 2019
 DRAWN BY: K. WHITE DATE: MAY 2019
 CHECKED BY: B. LOFLIN DATE: AUG 2019
 DESIGN ENGINEER OF RECORD: J. DOUGHTY DATE: NOV 2019

BENCHMARK #8: RR SPIKE IN BASE 6" DBL OAK. N 596840, E 1121659, EL. 985.97, STA. 736+48.31 -L3- 364.49' LEFT

GENERAL NOTES

- ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING.
- DESIGN FILL----- 85 FT.
- FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.
- 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:
 1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
 2. THE CONCRETE SILLS, AND THE REMAINING PORTIONS OF THE WALLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.
- THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.
- DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.
- TRANSVERSE CONSTRUCTION JOINTS SHALL BE USED IN THE BARREL, SPACED TO LIMIT THE POURS TO A MAXIMUM OF 70 FT. LOCATION OF JOINTS SHALL BE SUBJECT TO APPROVAL OF THE ENGINEER.
- AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALL ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.
- FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
- FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
- FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
- FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.
- A 3' STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
- STEEL IN THE BOTTOM SLAB MAY BE SPLICED AT THE PERMITTED CONSTRUCTION JOINT AT THE CONTRACTOR'S OPTION. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES WILL BE PAID FOR BY THE CONTRACTOR.
- FOR CHANNEL CHANGE DETAILS AND PAY ITEMS, SEE EROSION CONTROL PLANS.



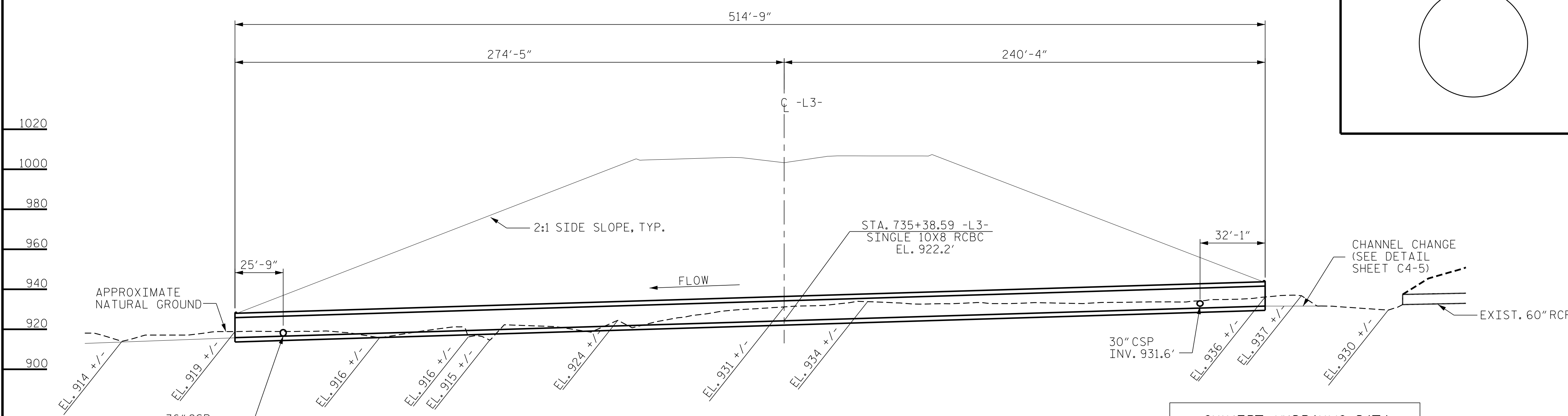
LOCATION SKETCH

GRADE POINT ELEV. @ STATION 735+38.59 -L3- = 1005.08'
 BED ELEV. @ STATION 735+38.59 -L3- = 922.20'
 ROADWAY SLOPES 2:1

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

TOTAL STRUCTURE QUANTITIES	
CLASS A CONCRETE	
BARREL @ 3.13 - CY/FT	1611.2 - C.Y.
WINGS ETC.	37.4 - C.Y.
TOTAL	1648.6 - C.Y.
REINFORCING STEEL	
BARREL	415,909 - LBS.
WINGS ETC.	1,815 - LBS.
TOTAL	417,724 - LBS.
CULVERT EXCAVATION	LUMP SUM
FOUNDATION COND. MATERIAL	629 - TONS
CLASS II RIP RAP	32 TONS
GEOTEXTILE FOR DRAINAGE	1695 SY

PROJECT NO. R-2233BB
RUTHERFORD COUNTY
 STATION: 735+38.59 -L3-



PROFILE ALONG CULVERT

CULVERT HYDRAULIC DATA	
DESIGN DISCHARGE	= 360 CFS
DESIGN FREQUENCY	= 50 YRS
DESIGN HW ELEVATION	= 936.3 FT
BASE DISCHARGE	= 400 CFS
BASE FREQUENCY	= 100 YRS
BASE HW ELEVATION	= 936.7 FT
OVERTOPPING DISCHARGE	= 860 CFS
OVERTOPPING FREQUENCY	= 500+ YRS
OVERTOPPING ELEVATION	= 994.0 FT
DRAINAGE AREA	= 0.39 SQ. MI.

Dewberry
 2610 WYCLIFF ROAD
 SUITE 410
 RALEIGH, NC 27607
 PHONE: 919.881.9939
 NC COA No. F-09229

STATE OF NORTH CAROLINA PROFESSIONAL SEAL 030046
 ENGINEER MATTHEW PAYNE
 10/7/2021

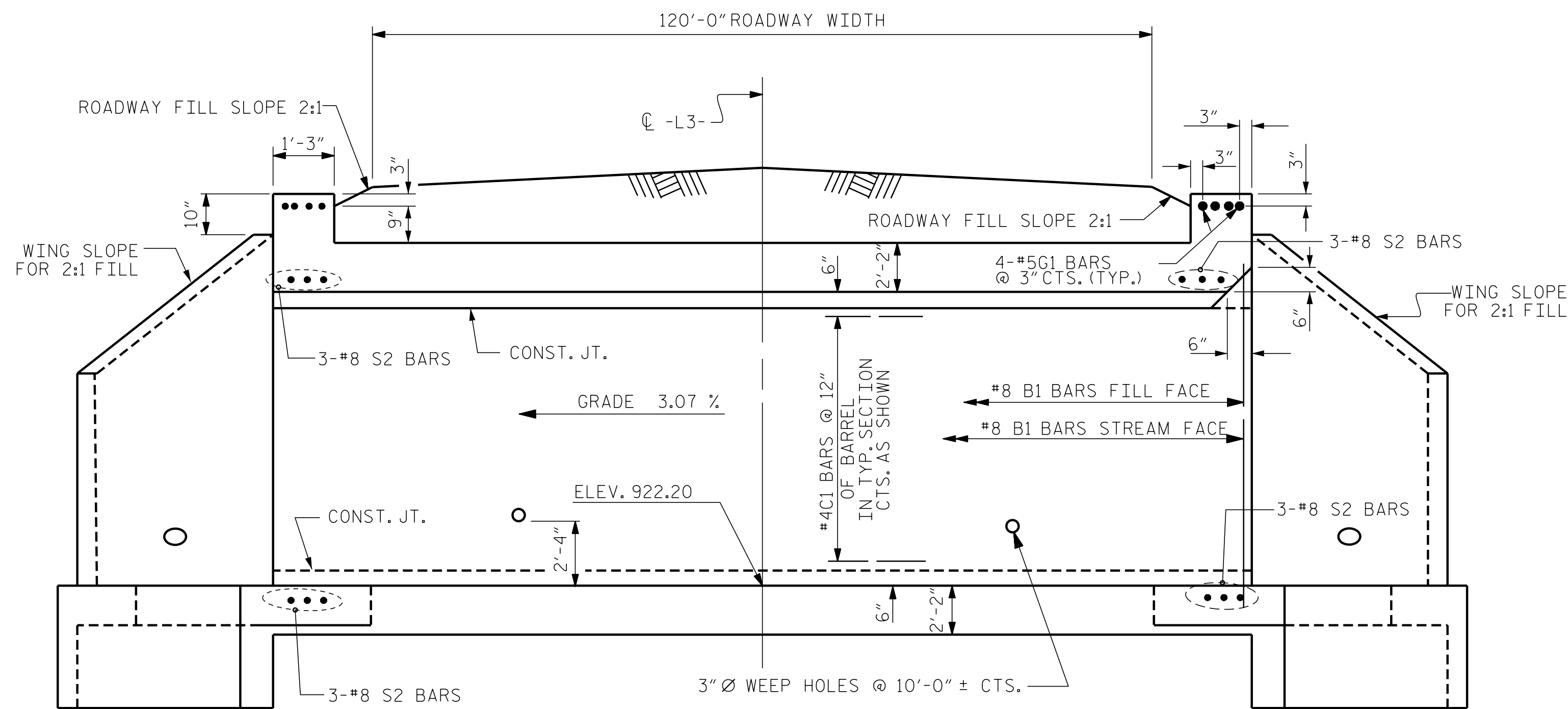
STATE OF NORTH CAROLINA
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 RALEIGH

SINGLE 10 FT. X 8 FT.
 CONCRETE BOX CULVERT

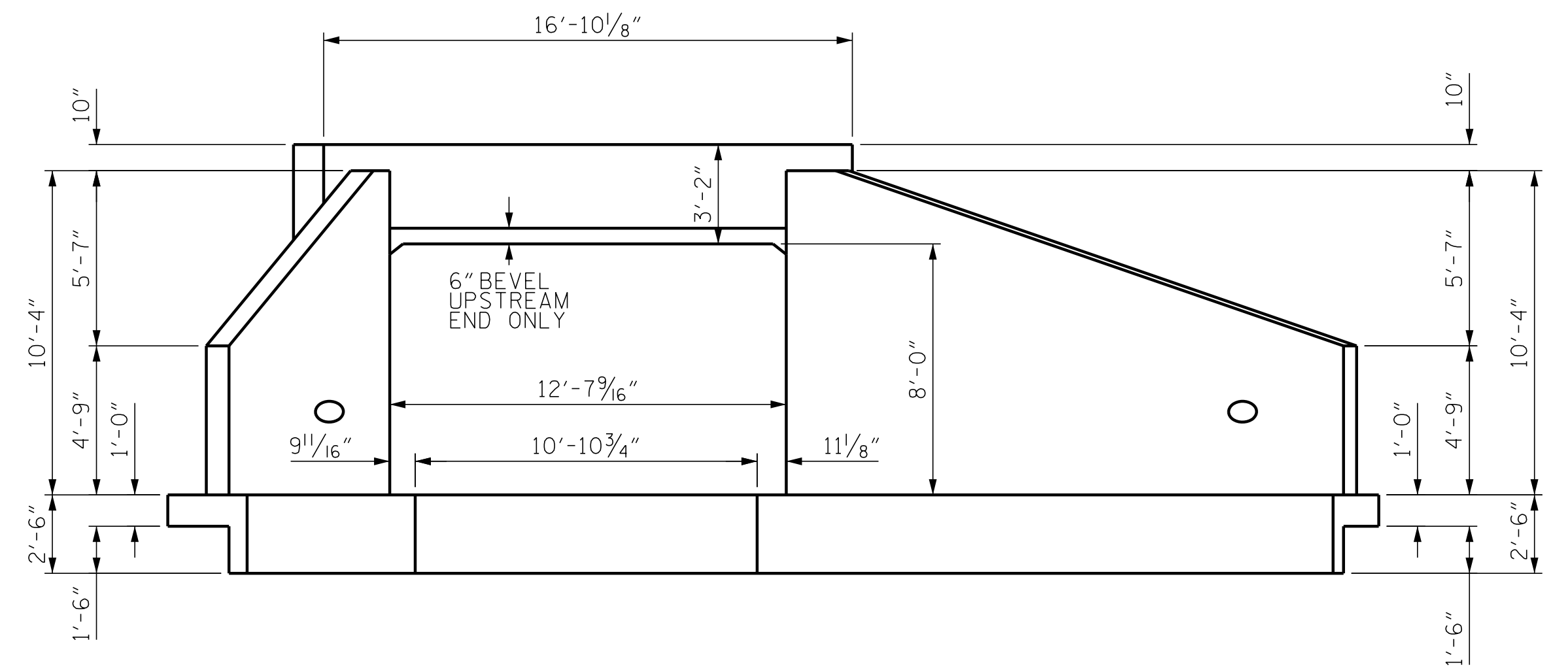
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1			3			TOTAL SHEETS 6
2			4			

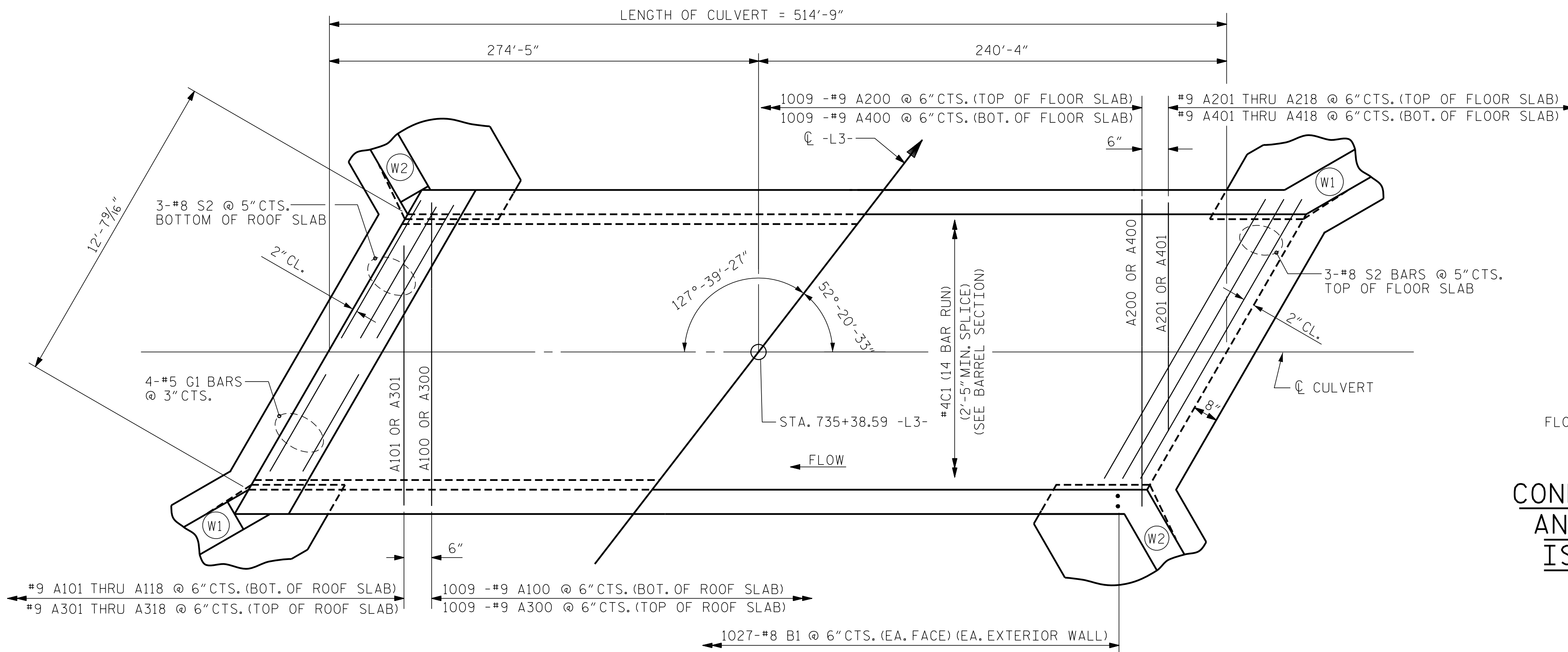
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 *****USERNAME*****



CULVERT SECTION NORMAL TO ROADWAY

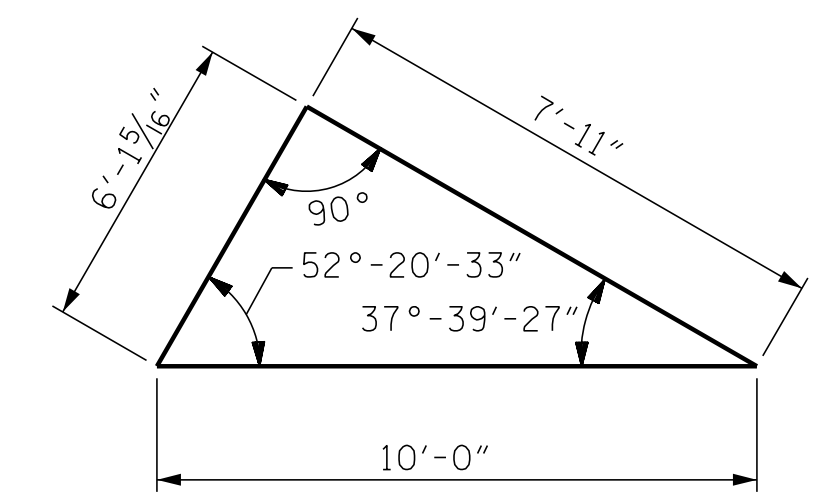
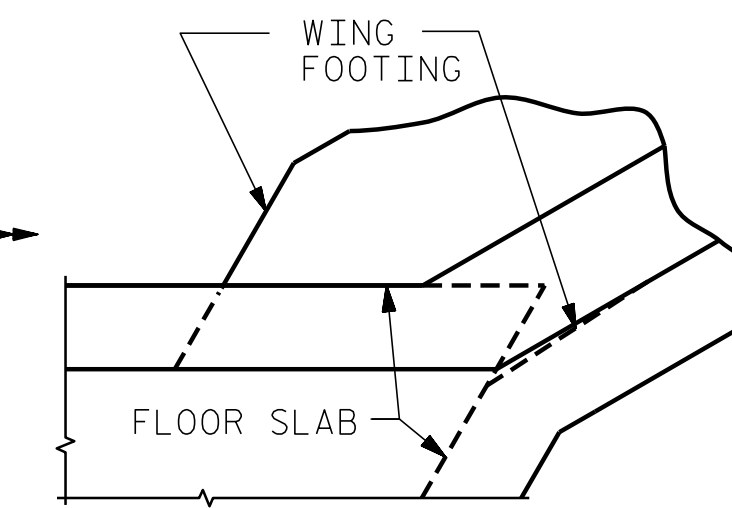


END ELEVATION NORMAL TO SKEW

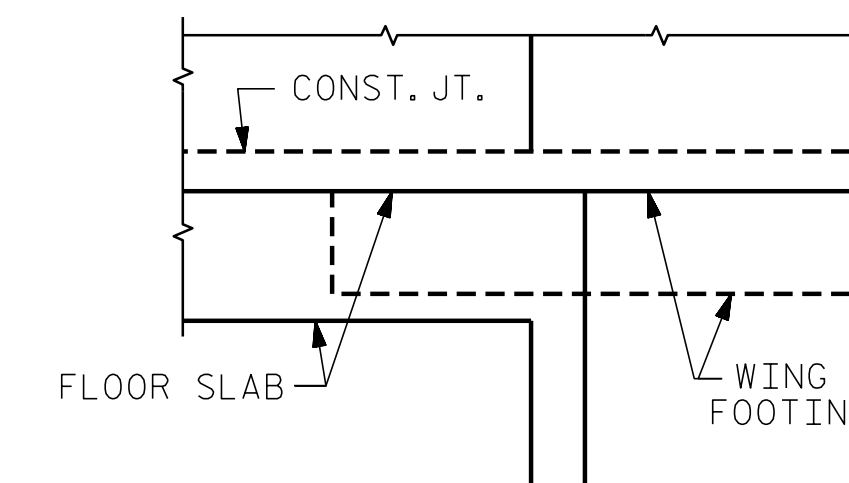


PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB



SKEW TRIANGLE



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

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NORTH CAROLINA PROFESSIONAL ENGINEER
 SEAL 030046
 ENGINEER MATTHEW PAYNE
 10/7/2021

STATE OF NORTH CAROLINA
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 RALEIGH

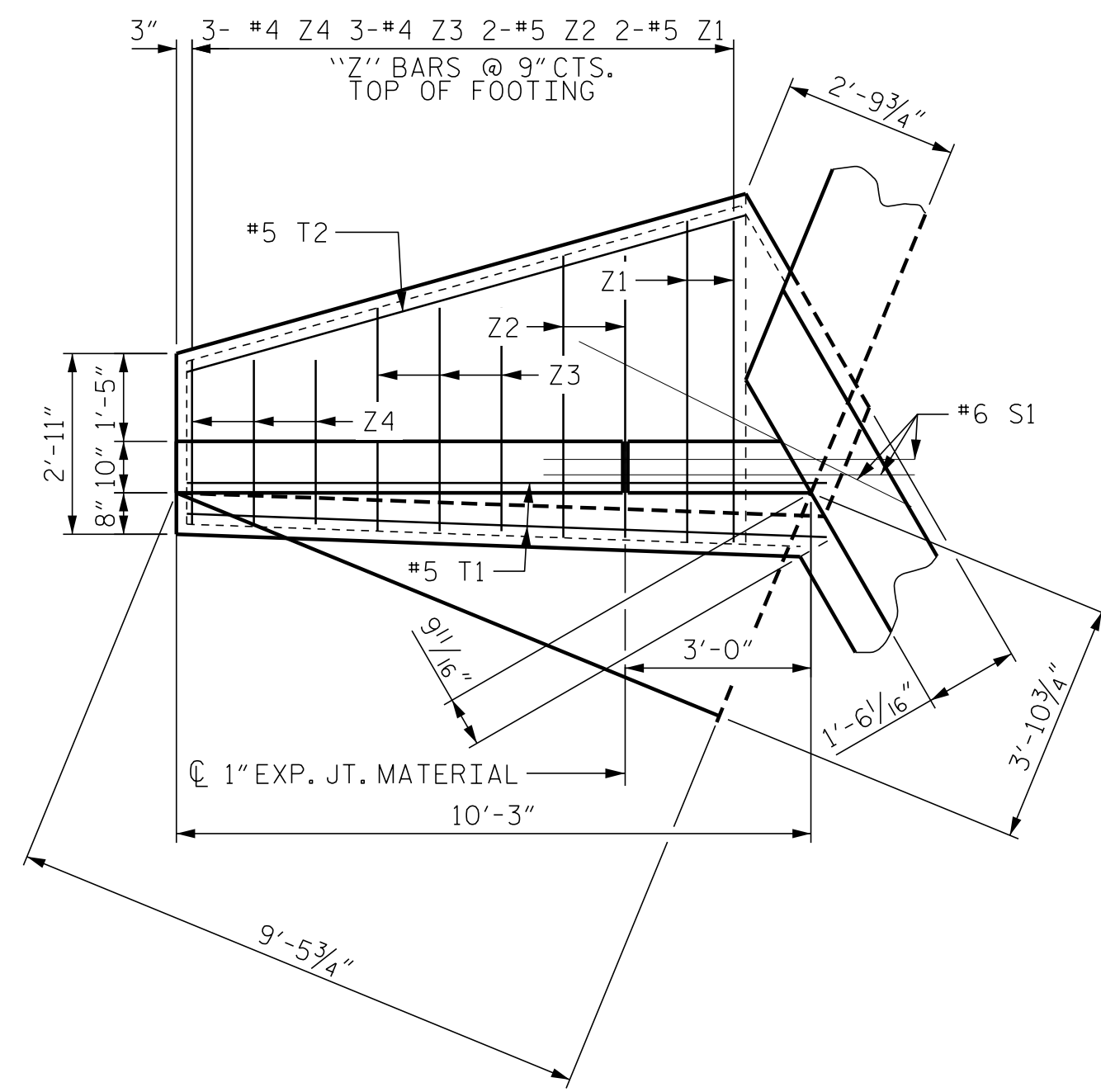
SINGLE 10 FT. X 8 FT.
 CONCRETE BOX CULVERT

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 DESIGN ENGINEER OF RECORD: MTP DATE: 05/2021

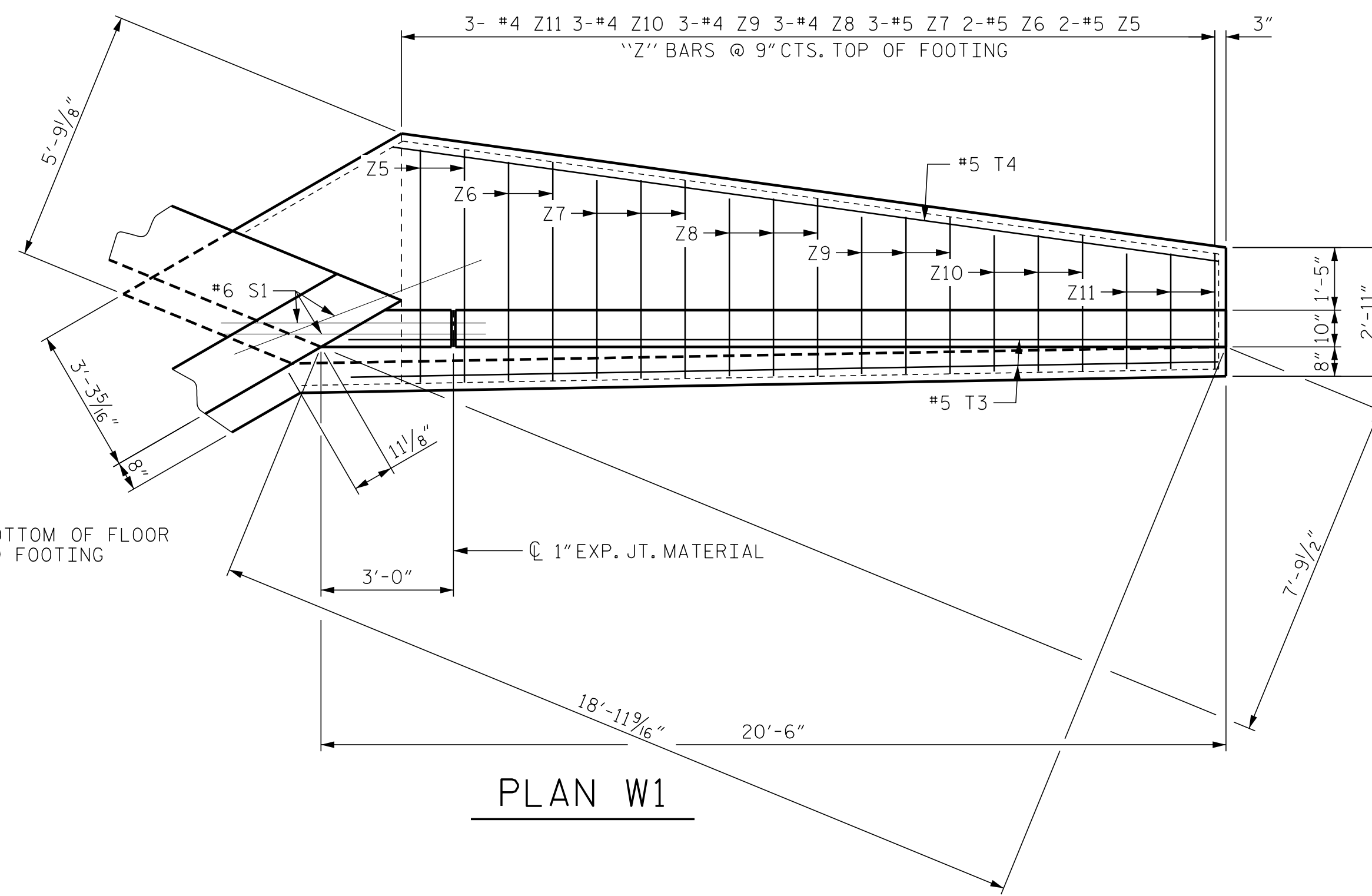
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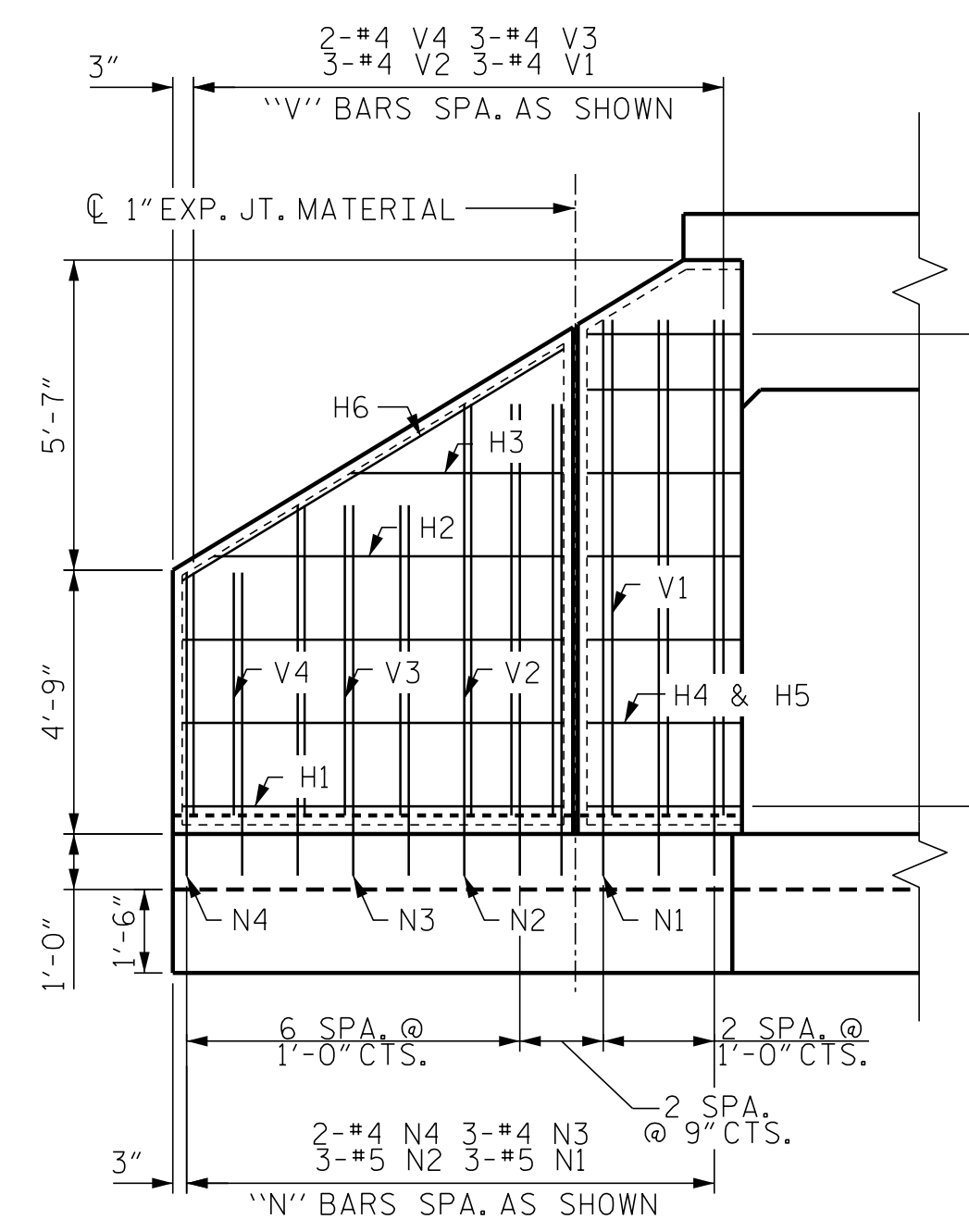
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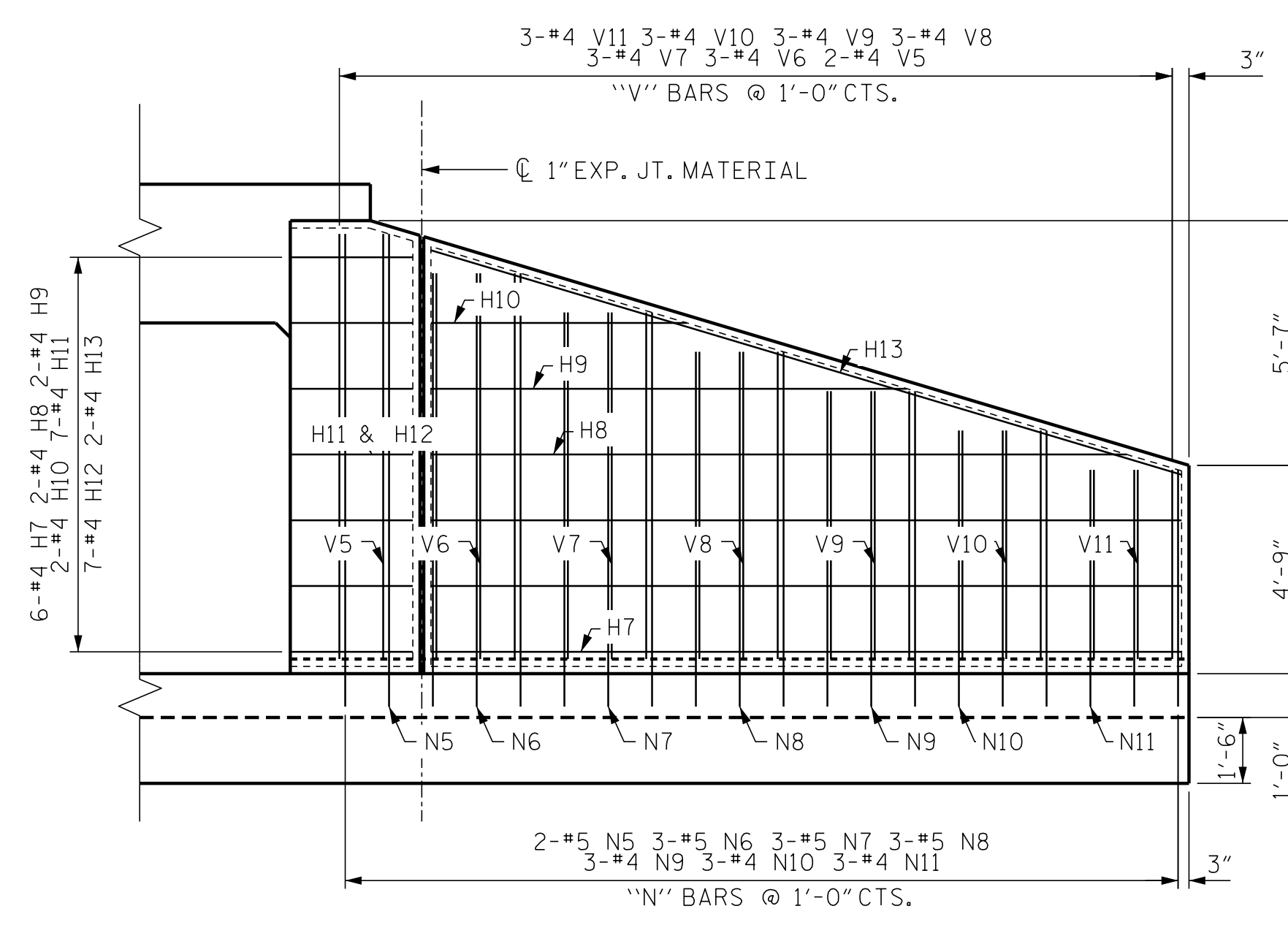
PLAN W2



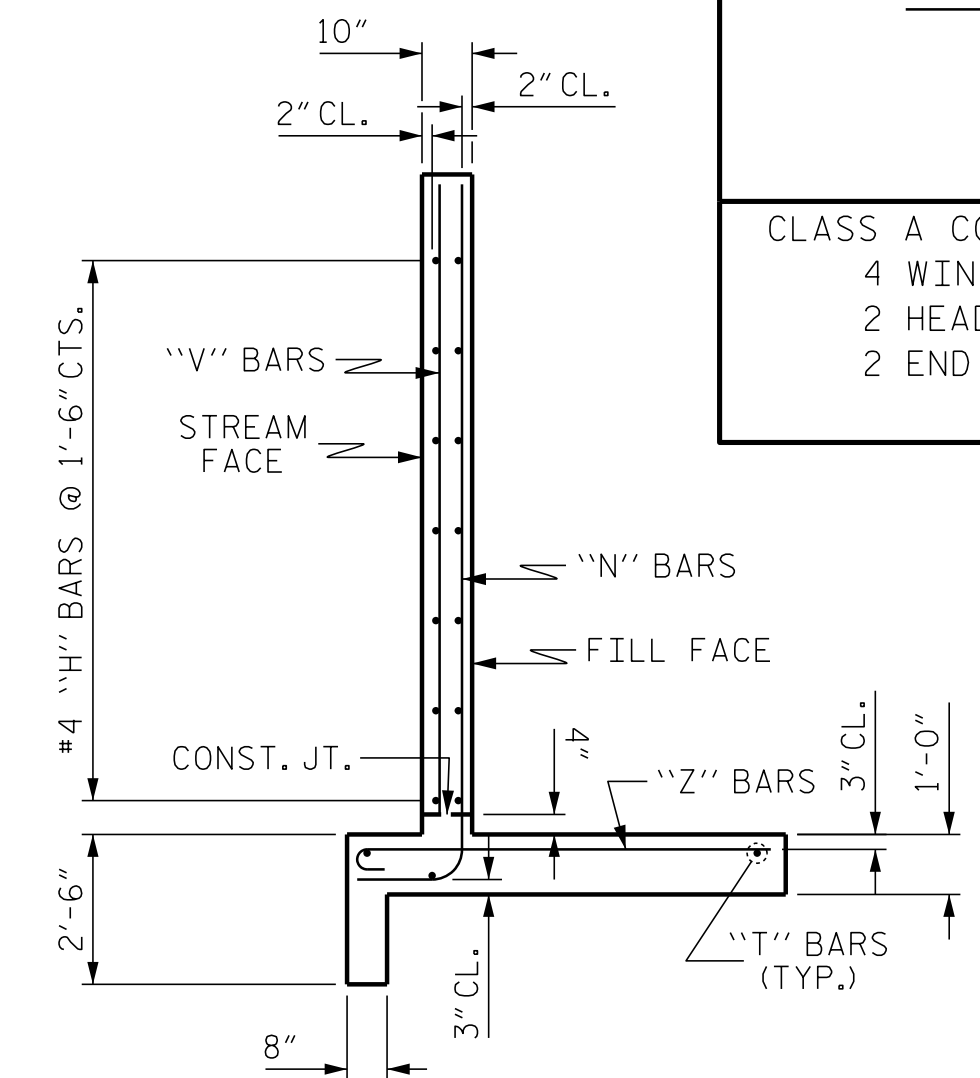
PLAN W1



ELEVATION W2



ELEVATION W1

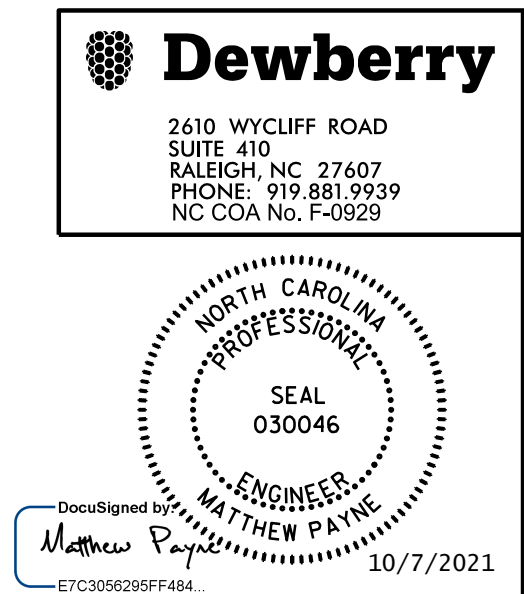


TYPICAL WING SECTION

BILL OF MATERIAL					
BAR NO.	SIZE	TYPE	LENGTH	WEIGHT	
H1	12	#4	STR	6'-10"	55
H2	4	#4	STR	6'-3"	17
H3	4	#4	STR	3'-10"	10
H4	14	#4	1	4'-8"	44
H5	14	#4	1	4'-5"	41
H6	4	#4	STR	8'-0"	21
H7	12	#4	STR	17'-1"	137
H8	4	#4	STR	15'-10"	42
H9	4	#4	STR	10'-10"	29
H10	4	#4	STR	5'-10"	16
H11	14	#4	2	4'-6"	42
H12	14	#4	2	3'-9"	35
H13	4	#4	STR	17'-10"	48
N1	6	#5	3	10'-11"	68
N2	6	#5	3	9'-5"	59
N3	6	#4	3	7'-7"	30
N4	4	#4	3	6'-5"	17
N5	4	#5	3	11'-9"	49
N6	6	#5	3	10'-10"	68
N7	6	#5	3	9'-11"	62
N8	6	#5	3	9'-0"	56
N9	6	#4	3	8'-1"	32
N10	6	#4	3	7'-3"	29
N11	6	#4	3	6'-4"	25
S1	12	#6	STR	6'-0"	108
T1	4	#5	STR	10'-4"	43
T2	2	#5	STR	9'-4"	19
T3	4	#5	STR	19'-8"	82
T4	2	#5	STR	18'-10"	39
V1	6	#4	STR	8'-11"	36
V2	6	#4	STR	7'-4"	29
V3	6	#4	STR	5'-7"	22
V4	4	#4	STR	4'-4"	12
V5	4	#4	STR	9'-8"	26
V6	6	#4	STR	8'-9"	35
V7	6	#4	STR	7'-10"	31
V8	6	#4	STR	7'-0"	28
V9	6	#4	STR	6'-1"	24
V10	6	#4	STR	5'-2"	21
V11	6	#4	STR	4'-3"	17
Z1	4	#5	4	5'-9"	24
Z2	4	#5	4	5'-1"	21
Z3	6	#4	4	4'-1"	16
Z4	6	#4	4	3'-1"	12
Z5	4	#5	4	5'-10"	24
Z6	4	#5	4	5'-6"	23
Z7	6	#5	4	5'-0"	31
Z8	6	#4	4	4'-6"	18
Z9	6	#4	4	4'-0"	16
Z10	6	#4	4	3'-7"	14
Z11	6	#4	4	3'-1"	12
REINFORCING STEEL				1815 LBS	
FOR 4 WINGS					

CLASS A CONCRETE	
4 WINGS	26.1 CY
2 HEADWALLS	1.6 CY
2 END CURTAIN WALLS	1.9 CY
TOTAL	29.6 CY

PROJECT NO. R-2233BB
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STATE OF NORTH CAROLINA
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 WINGS FOR CONCRETE BOX CULVERT
 H = 8'-0" SLOPE = 2:1

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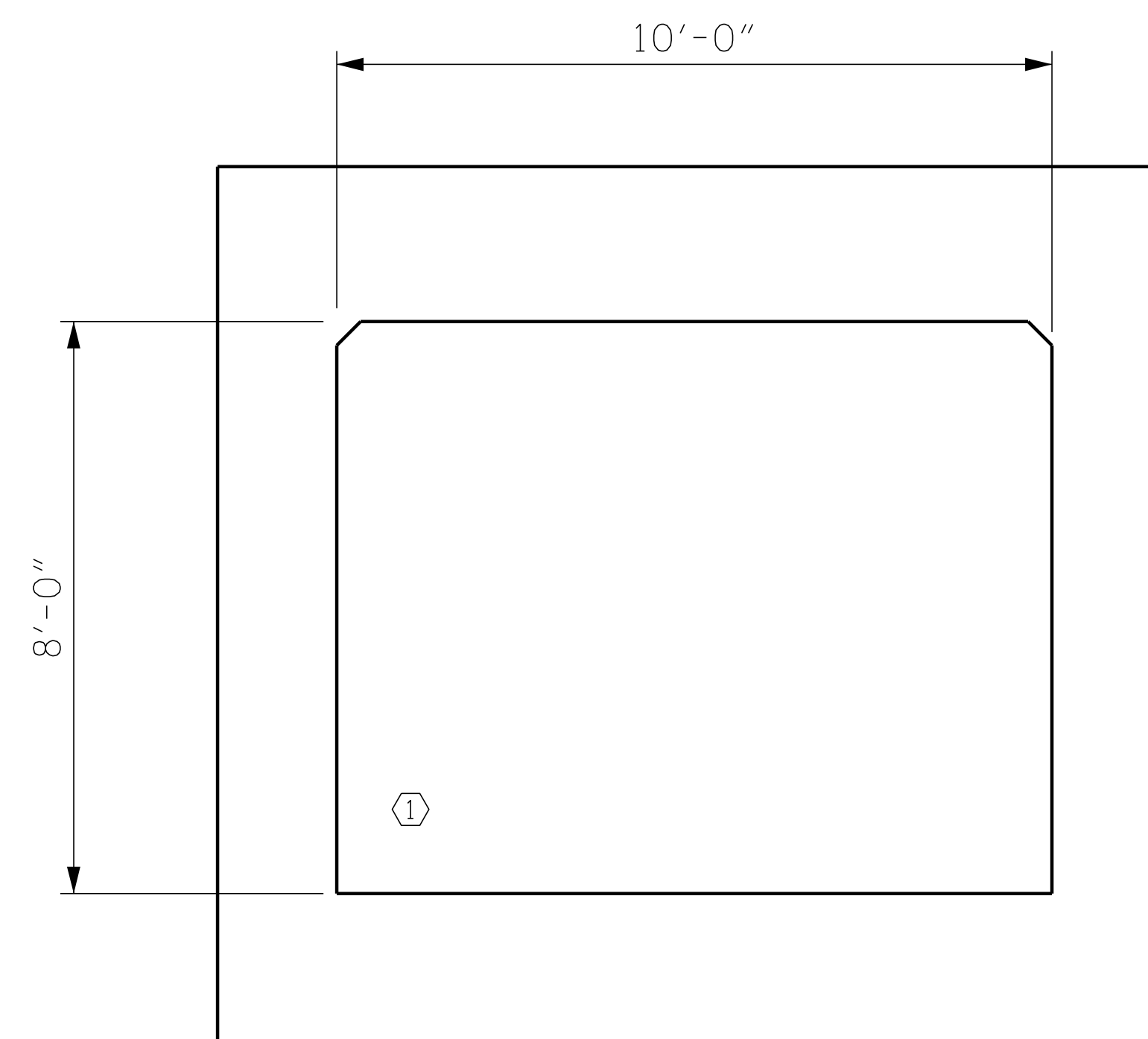
PERMANENT LOAD FACTORS:

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

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS										
	CONTROLLING LOAD RATING	MINIMUM RATING FACTOR (RF)	STRENGTH I LIMIT STATE							
			MOMENT				SHEAR			
			RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)
PERMANENT LOAD RATING	①	12.57	12.57	1	WALL	2.00	22.56	1	WALL	2.00

NOTES:

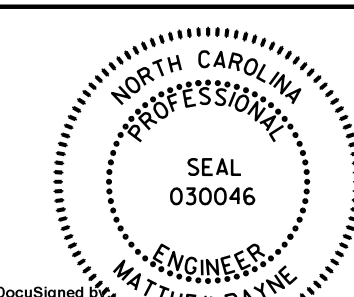
RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.
 THE EFFECTS OF LIVE LOAD ON DESIGN AND LOAD RATING MAY BE NEGLECTED FOR CULVERTS WITH CERTAIN FILL DEPTHS DESCRIBED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
 CULVERTS WITH NEGLIGIBLE LIVE LOAD SHOULD BE LOAD RATED FOR PERMANENT LOADS ONLY IN ACCORDANCE WITH THE AASHTO MANUAL FOR BRIDGE EVALUATION.



LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. R-2233BB
RUTHERFORD COUNTY
 STATION: 735+38.59 -L3-

Dewberry
 2610 WYCLIFF ROAD
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 NC COA No. F-0929



STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

LRFR SUMMARY FOR
 REINFORCED CONCRETE
 BOX CULVERTS
 (DEEP FILLS)

NO.	BY:	DATE:	REVISIONS			SHEET NO.
			NO.	BY:	DATE:	
1			3			C4-6
2			4			TOTAL SHEETS 6

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