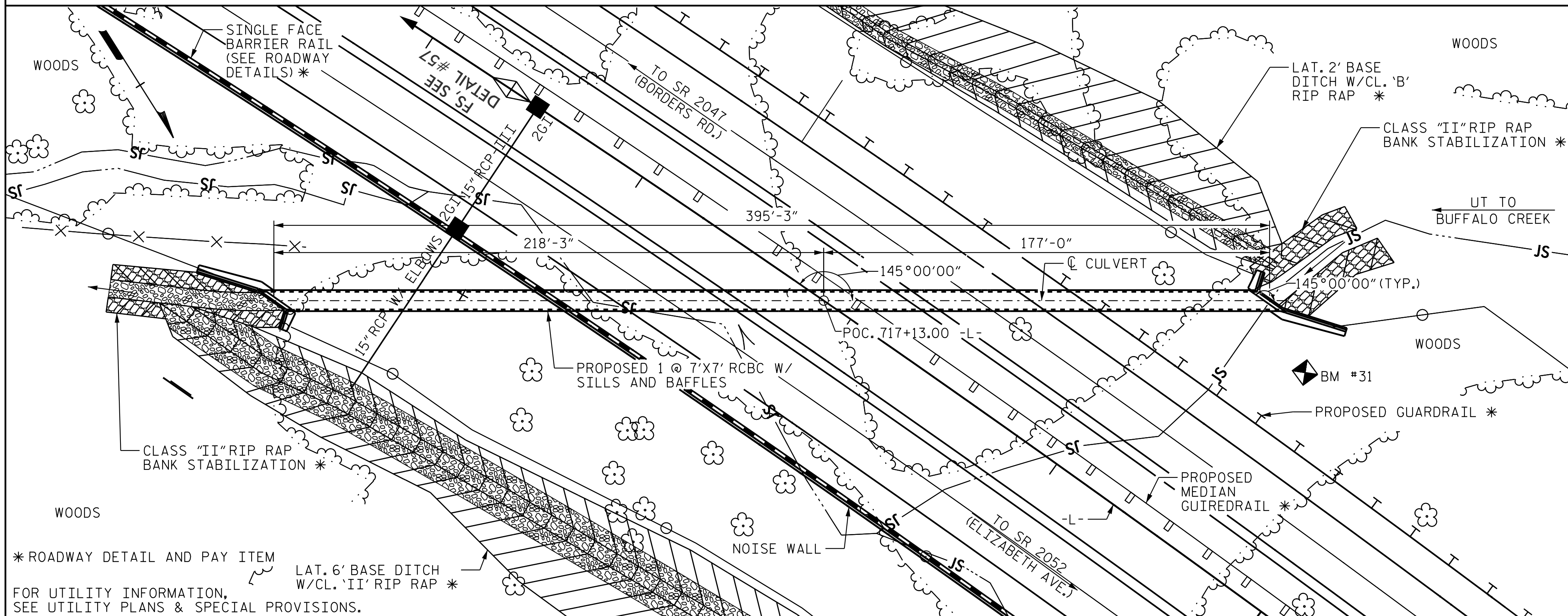


BM #31: 8" NAIL IN ROOT OF 30" WHITE OAK. N568741.8 E1259465.9, STA. 715+41.45 -L-, 86.96' RT. EL. 814.22



LOCATION SKETCH

ROADWAY DATA

GRADE POINT ELEV. @ STA. 717+13.00 -L- = 832.48  
 BED ELEV. @ STA. 717+13.00 -L- = 800.53  
 ROADWAY SLOPES = 2:1

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE = >360 C.F.S.  
 FREQUENCY OF OVERTOPPING FLOOD = >500 YR.  
 OVERTOPPING FLOOD ELEVATION = 826.80

HYDRAULIC DATA

DESIGN DISCHARGE = 280 C.F.S.  
 FREQUENCY OF DESIGN FLOOD = 50 YR.  
 DESIGN HIGH WATER ELEVATION = 814.80  
 BASIC DISCHARGE (Q100) = 300 C.F.S.  
 BASIC HIGH WATER ELEVATION = 815.10  
 DRAINAGE AREA = 0.27 SQ. MI.

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
BARREL @ 0.941 CY/FT	371.9 C.Y.
SILLS, BAFFLES	8.6 C.Y.
WINGS	30.3 C.Y.
TOTAL	410.8 C.Y.

REINFORCING STEEL	
BARREL	78,311 LBS.
WINGS	1,824 LBS.
TOTAL	80,135 LBS.

FOUNDATION CONDITIONING MATERIAL = 344 TONS

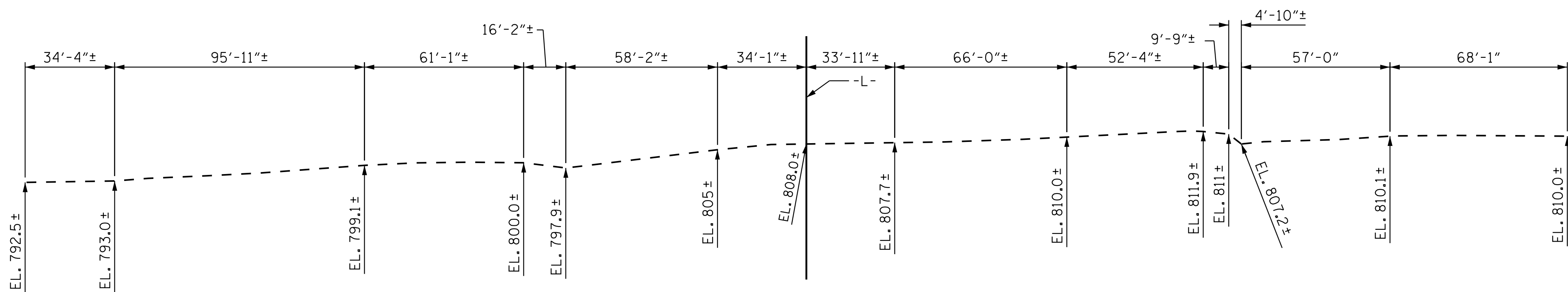
CULVERT EXCAVATION = LUMP SUM

NOTES

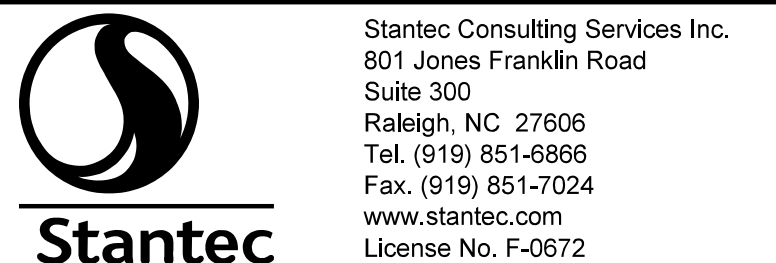
- ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING.
- DESIGN FILL----- 26.5 FT.
- FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.
- 3"Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:
  1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
  2. THE REMAINING PORTIONS OF THE WALLS 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 CONTRACTORS 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.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
- A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
- 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.
- FOR NOISE WALL AND BARRIER INFORMATION, SEE ROADWAY PLANS.
- THE ENTIRE COST OF WORK REQUIRED TO PLACE EXCAVATED OR SUPPLEMENTAL MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE LUMP SUM PRICE FOR CULVERT EXCAVATION.

FOUNDATION NOTES

- EXCAVATE FOUNDATION A MINIMUM OF 1.0 FT. BELOW CULVERT BEARING ELEVATION. PLACE 1.0 FT. OF CLASS VI FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH SECTION 414 OF THE STANDARD SPECIFICATIONS.
- OVEREXCAVATE LOOSE/SOFT MATERIAL IF PRESENT TO SUITABLE BEARING MATERIALS AND REPLACE WITH ADDITIONAL CLASS VI FOUNDATION CONDITIONING MATERIAL.



PROFILE ALONG CULVERT



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 Fax. (919) 851-7024  
 www.stantec.com  
 License No. F-0672

DRAWN BY : J. B. GEILE DATE : 08/27/18  
 CHECKED BY : M. B. ISENHOUR DATE : 02/17/23

DESIGN ENGINEER OF RECORD : M. B. ISENHOUR DATE : 04/18/23



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. R-2707D  
 CLEVELAND COUNTY  
 STATION: 717+13.00 -L-

SHEET 1 OF 5

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

SINGLE 7 FT. X 7 FT.  
 CONCRETE BOX CULVERT

145° SKEW

REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-01	
1			3			TOTAL SHEETS	5
2			4				

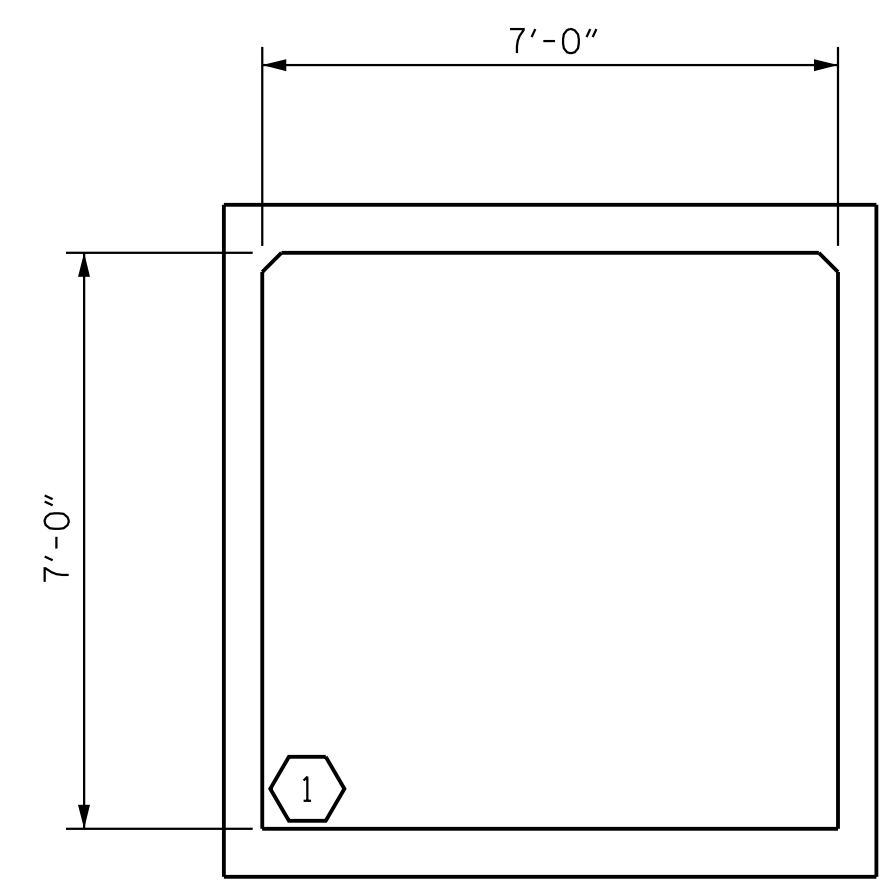
PERMANENT LOAD FACTORS:

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	1.10	1.16	1	BOTTOM SLAB (MID)	3.50	1.10	1	LEFT END - BOTTOM SLAB	0.00

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-2707D  
CLEVELAND COUNTY  
 STATION: 717+13.00 -L-

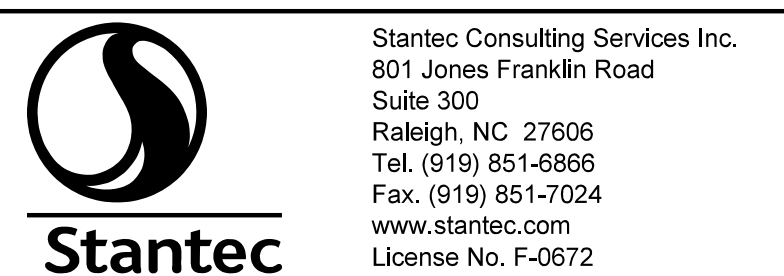
SHEET 2 OF 5  
 STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 STANDARD  
 LRFR SUMMARY FOR  
 REINFORCED CONCRETE  
 BOX CULVERTS  
 (NON-INTERSTATE TRAFFIC)



REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-02
1			3			TOTAL SHEETS
2			4			5

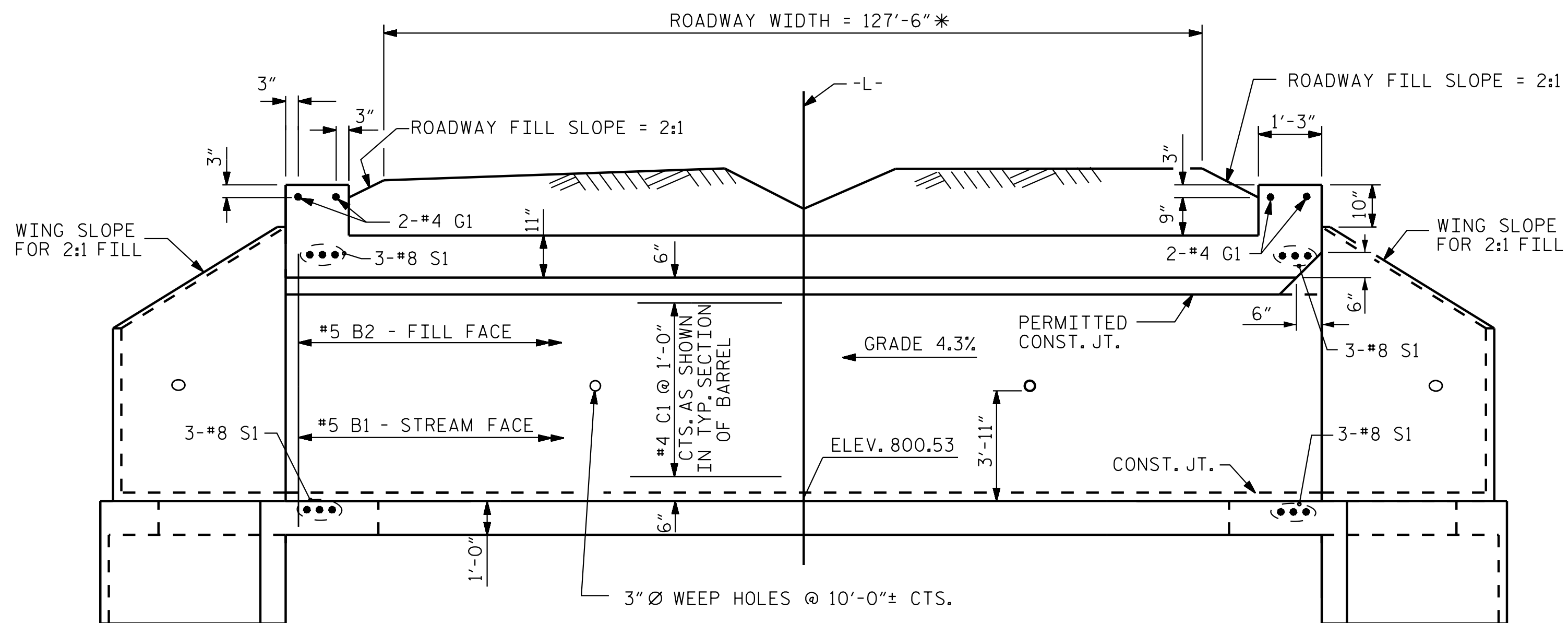
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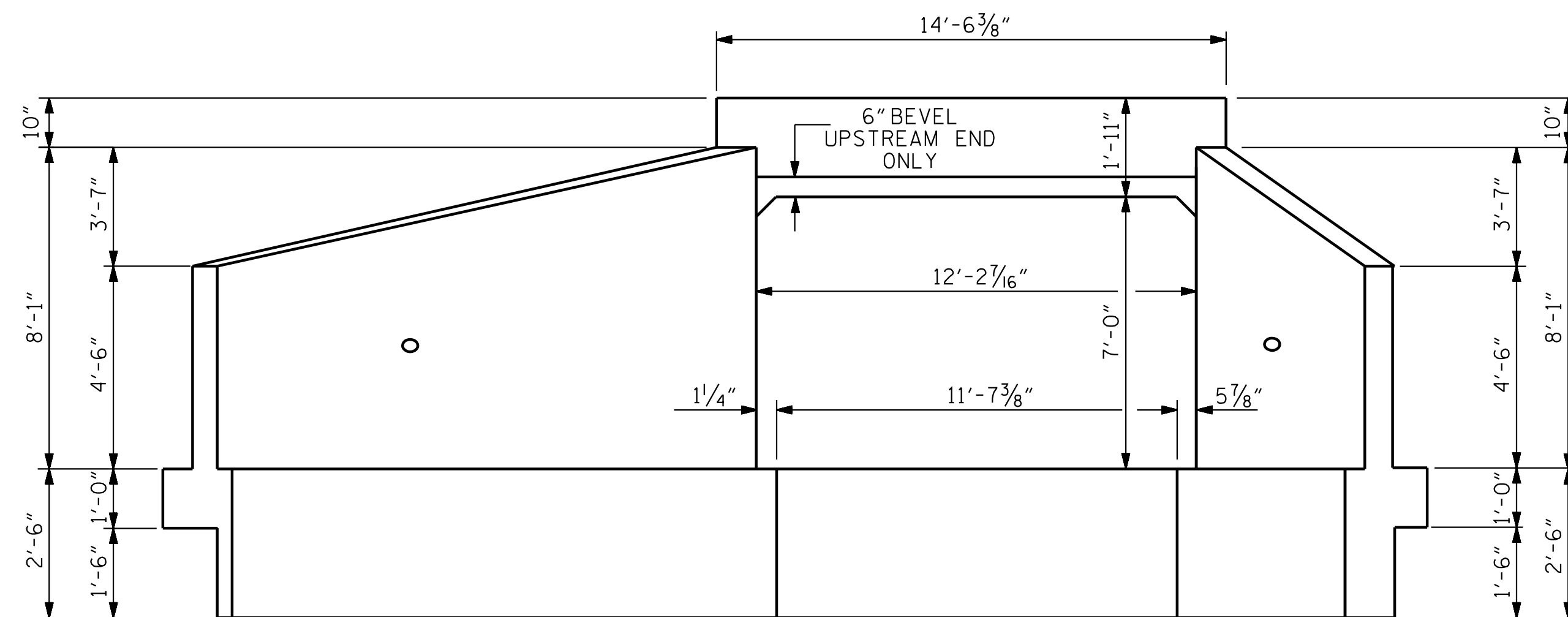
DRAWN BY : J. B. GEILE DATE : 02/17/23  
 CHECKED BY : M. B. ISENHOUR DATE : 02/17/23  
 DESIGN ENGINEER OF RECORD: M. B. ISENHOUR DATE : 04/18/23



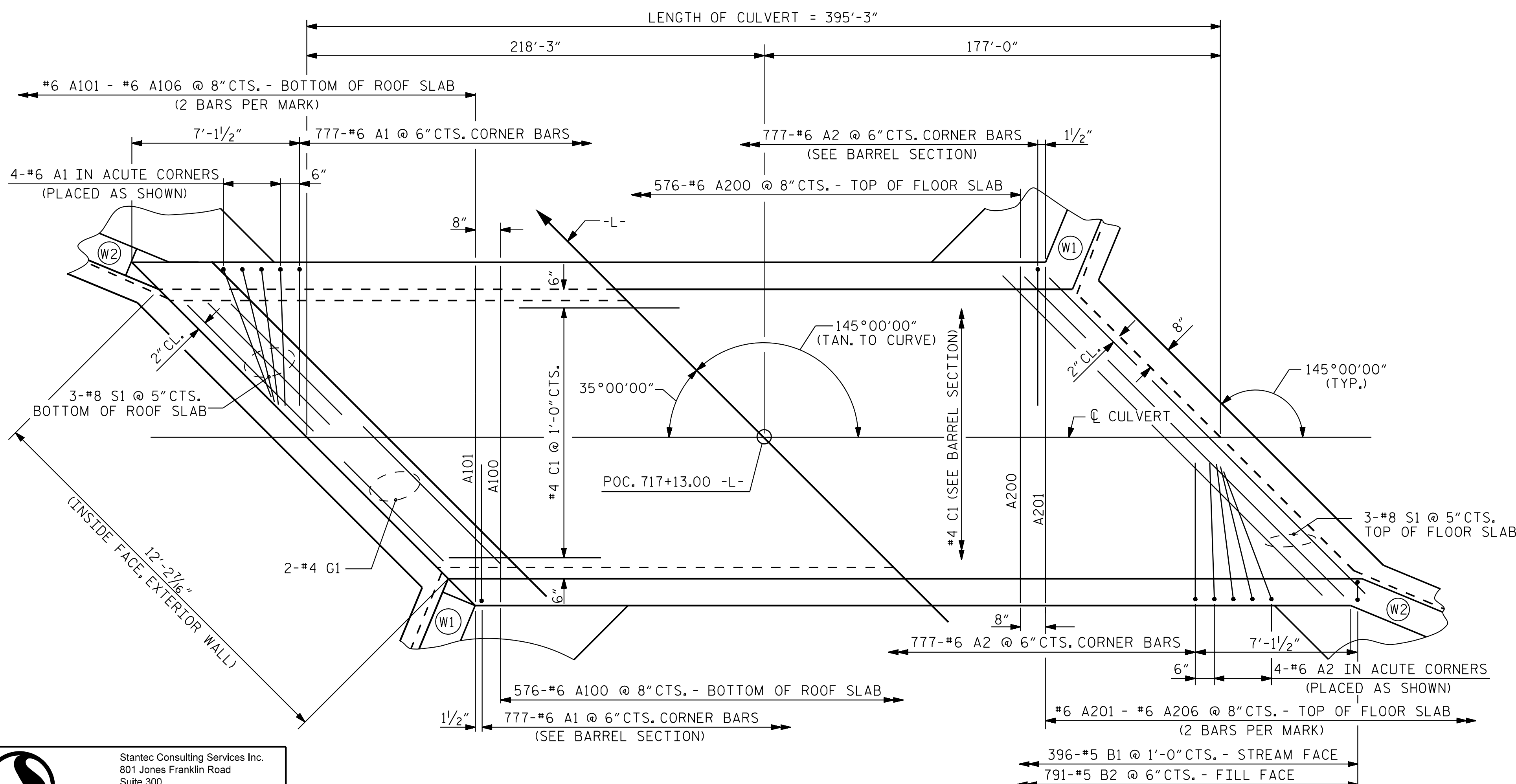


\* RADIAL DIMENSION @ CULVERT STATION

CULVERT SECTION NORMAL TO ROADWAY

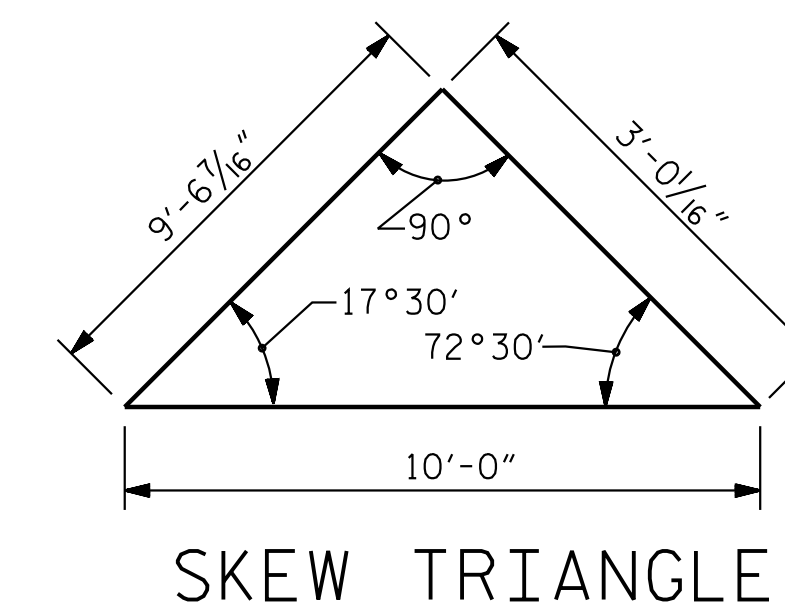


END ELEVATION NORMAL TO SKEW  
(LOOKING DOWNSTREAM) (SILLS NOT SHOWN FOR CLARITY)



PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB



SKEW TRIANGLE

PROJECT NO. R-2707D  
CLEVELAND COUNTY  
STATION: 717+13.00 -L-

SHEET 3 OF 5



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

**SINGLE 7 FT. X 7 FT.  
CONCRETE BOX CULVERT**

145° SKEW

REVISIONS

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

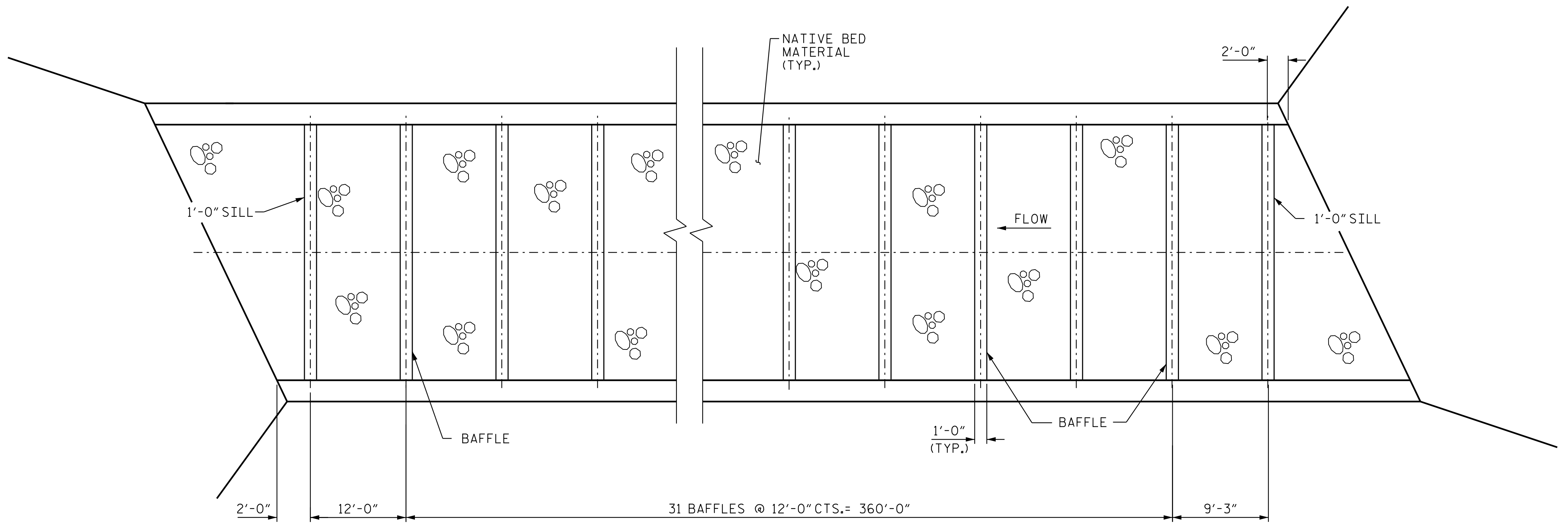
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C1-03  
TOTAL SHEETS  
5

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FINAL UNLESS ALL  
SIGNATURES COMPLETED

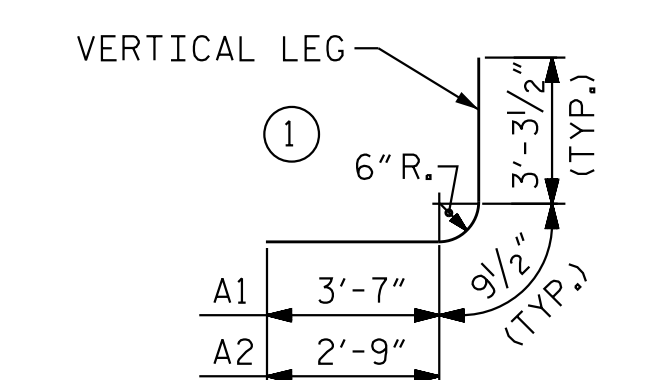
Stantec Consulting Services Inc.  
801 Jones Franklin Road  
Suite 300  
Raleigh, NC 27606  
Tel. (919) 851-6866  
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www.stantec.com  
License No. F-0672

DRAWN BY : J. B. GEILE DATE : 02/15/23  
CHECKED BY : M. B. ISENHOUR DATE : 02/17/23

DESIGN ENGINEER OF RECORD : M. B. ISENHOUR DATE : 04/18/23

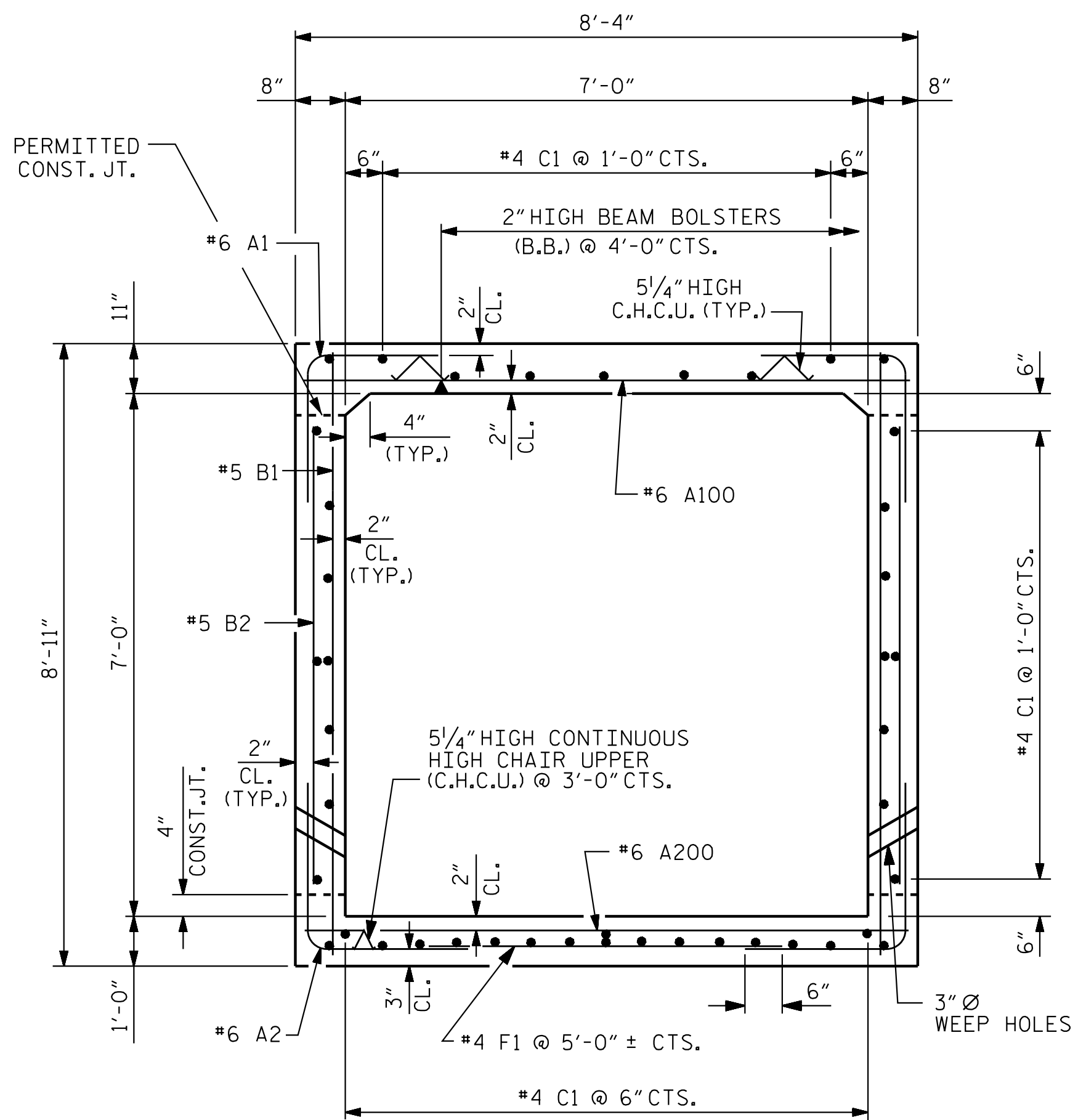
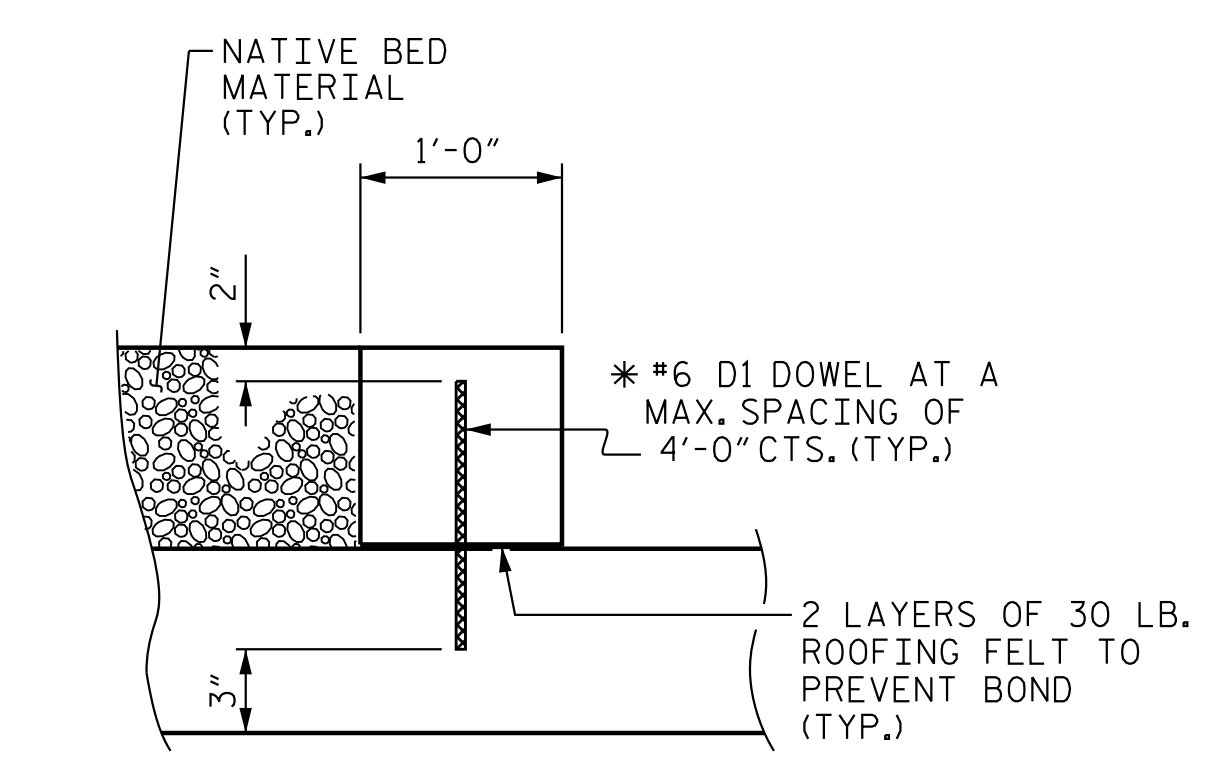
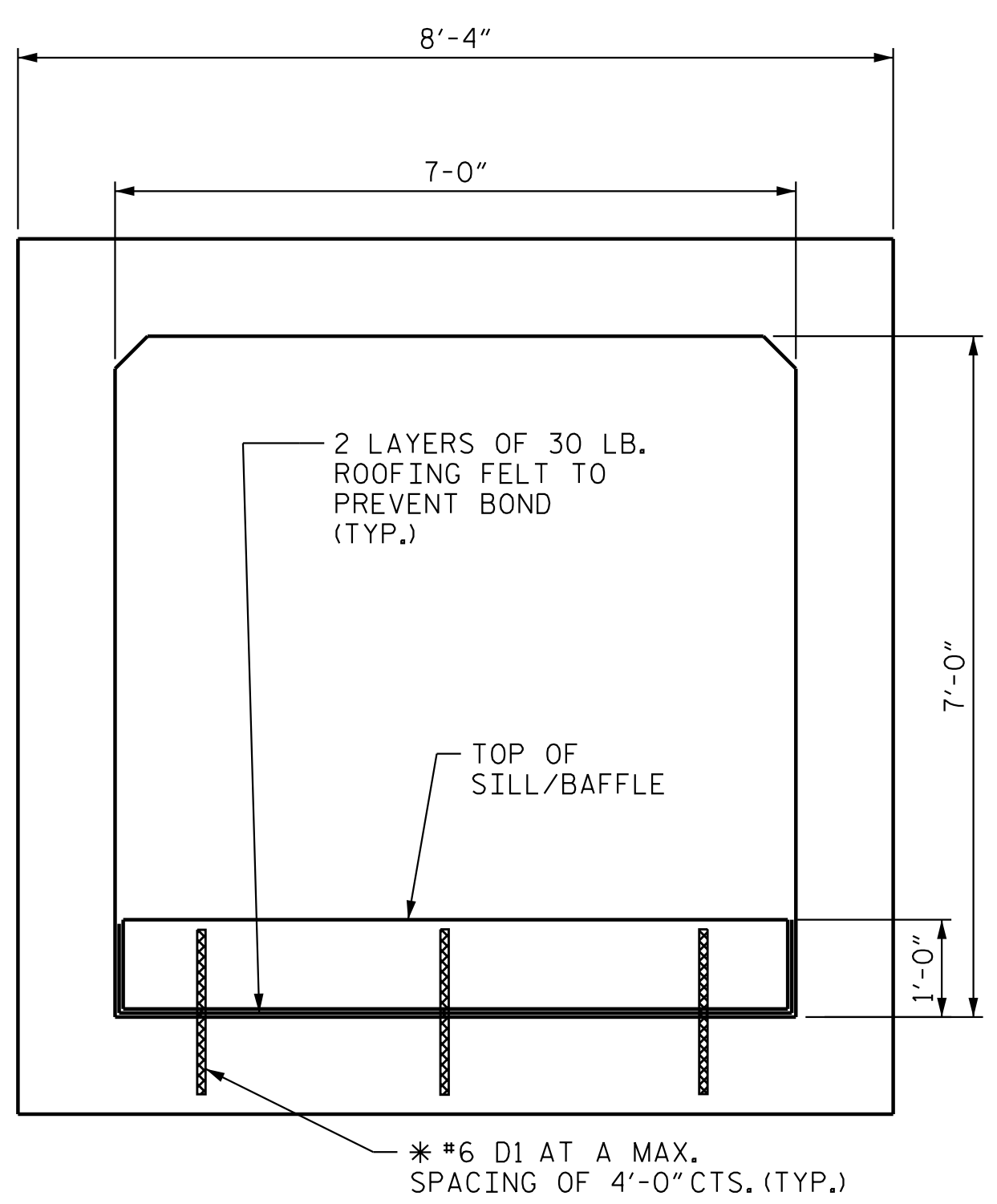


BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	1562	#6	1	7'-8"	17,987
A2	1562	#6	1	6'-10"	16,032
A100	576	#6	STR.	8'-0"	6,921
A101	4	#6	STR.	7'-0"	42
A102	4	#6	STR.	6'-1"	37
A103	4	#6	STR.	5'-2"	31
A104	4	#6	STR.	4'-2"	25
A105	4	#6	STR.	3'-3"	20
A106	4	#6	STR.	2'-4"	14
A200	576	#6	STR.	8'-0"	6,921
A201	4	#6	STR.	7'-0"	42
A202	4	#6	STR.	6'-1"	37
A203	4	#6	STR.	5'-2"	31
A204	4	#6	STR.	4'-2"	25
A205	4	#6	STR.	3'-3"	20
A206	4	#6	STR.	2'-4"	14
B1	792	#5	STR.	8'-6"	7,021
B2	1582	#5	STR.	6'-1"	10,038
C1	473	#4	STR.	38'-2"	12,059
D1	99	#6	STR.	1'-7"	235
F1	80	#4	STR.	5'-2"	276
G1	4	#4	STR.	13'-11"	37
S1	12	#8	STR.	13'-11"	446
REINFORCING STEEL					78,311 LBS.



BAR TYPES  
 BAR DIMENSIONS ARE OUT TO OUT  
 MIN. SPLICE LENGTHS CHART

BAR	SPLICE LENGTH
#6 B2	2'-9"
#4 C1	2'-5"
#6 A1	3'-7"
#6 A2	2'-9"



- 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 LINE THE CULVERT BARREL. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.
  - SILLS/BAFFLES ARE TO BE 1.0 FT. WIDE, CAST SEPARATELY AND ATTACHED BY DOWELS.
  - TOP OF LOW FLOW SILLS/BAFFLES SHOULD MATCH STREAM BED ELEVATION IN LOW FLOW CHANNEL OF STREAM. (THALWEG)

PROJECT NO. R-2707D  
 CLEVELAND COUNTY  
 STATION: 717+13.00 -L-

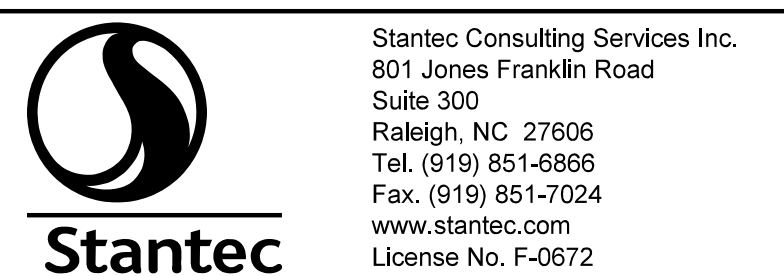
SHEET 4 OF 5  
 STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 SINGLE 7 FT. X 7 FT. CONCRETE BOX CULVERT  
 145° SKEW



REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C1-04
1			3			TOTAL SHEETS
2			4			5

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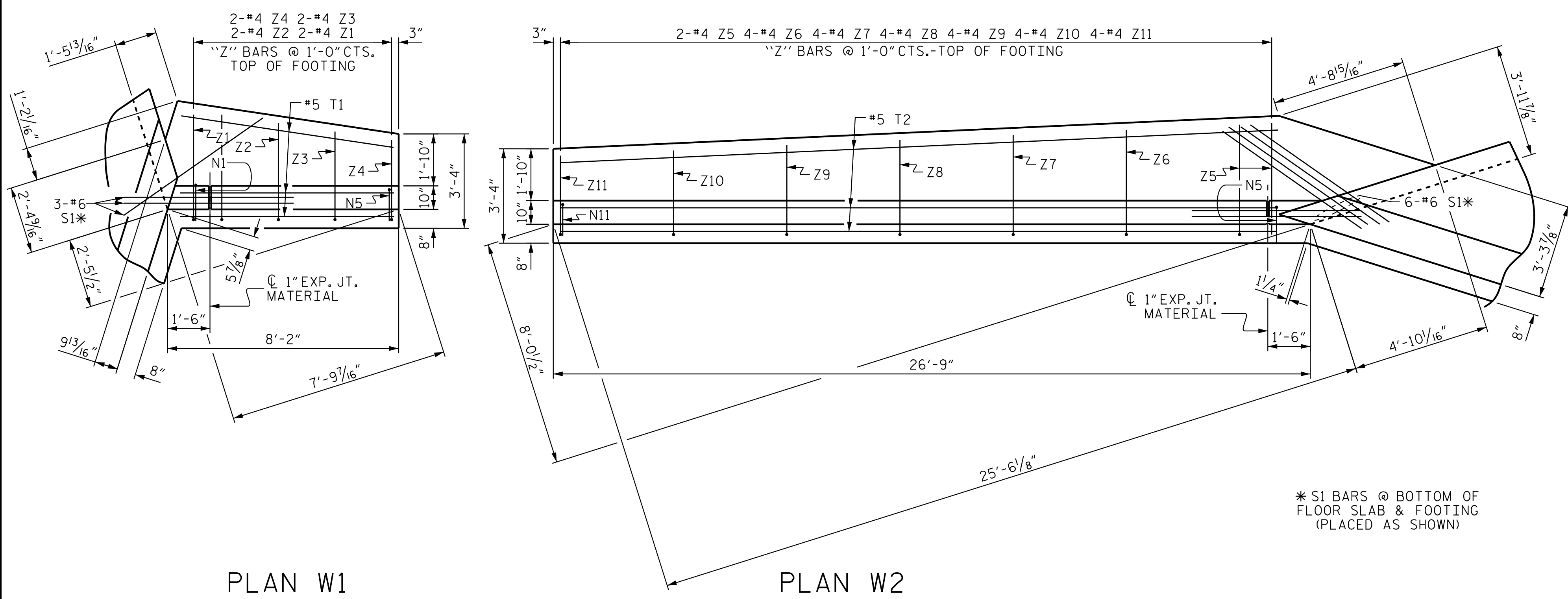
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DRAWN BY: J. B. GEILE DATE: 02/15/23  
 CHECKED BY: M. B. ISENHOUR DATE: 02/17/23  
 DESIGN ENGINEER OF RECORD: M. B. ISENHOUR DATE: 04/18/23

CULVERT SILL/BAFFLE DETAILS

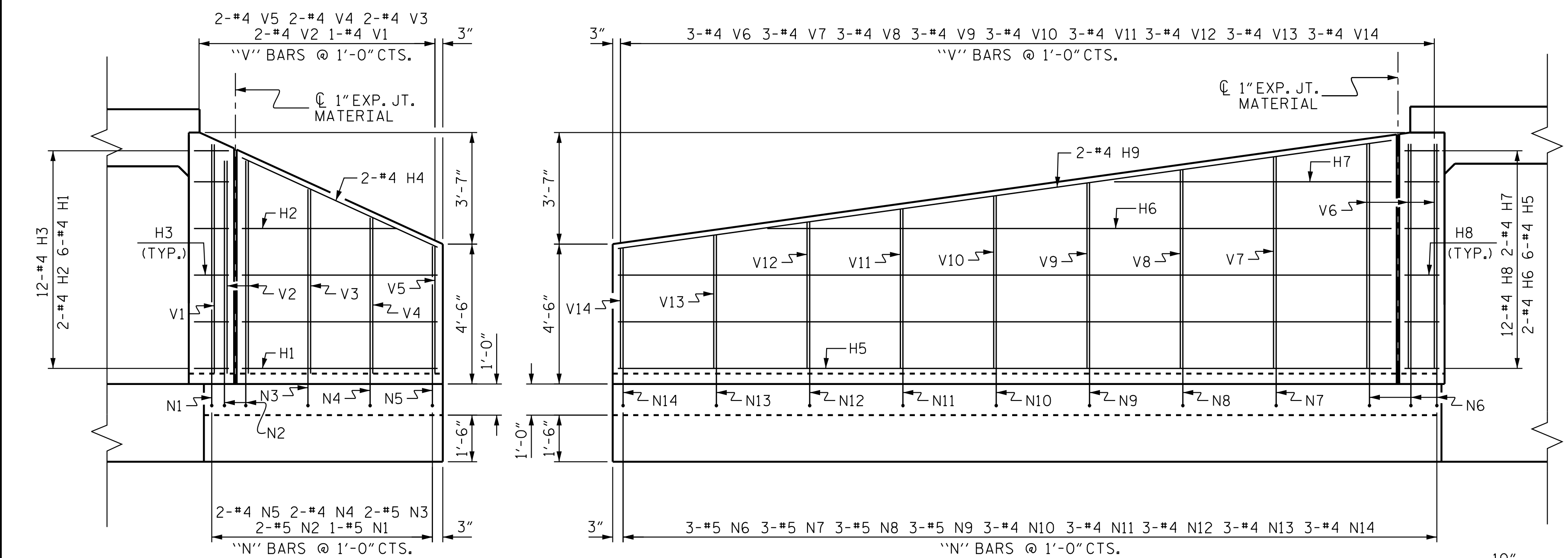




PLAN W1

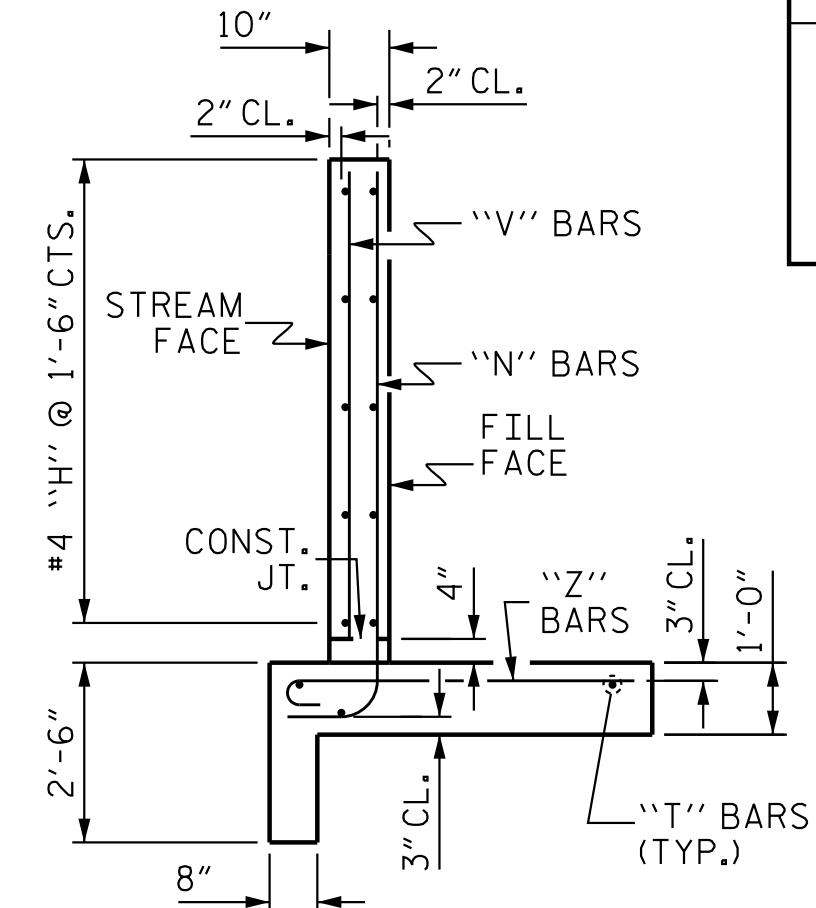
PLAN W2

\* S1 BARS @ BOTTOM OF FLOOR SLAB & FOOTING (PLACED AS SHOWN)



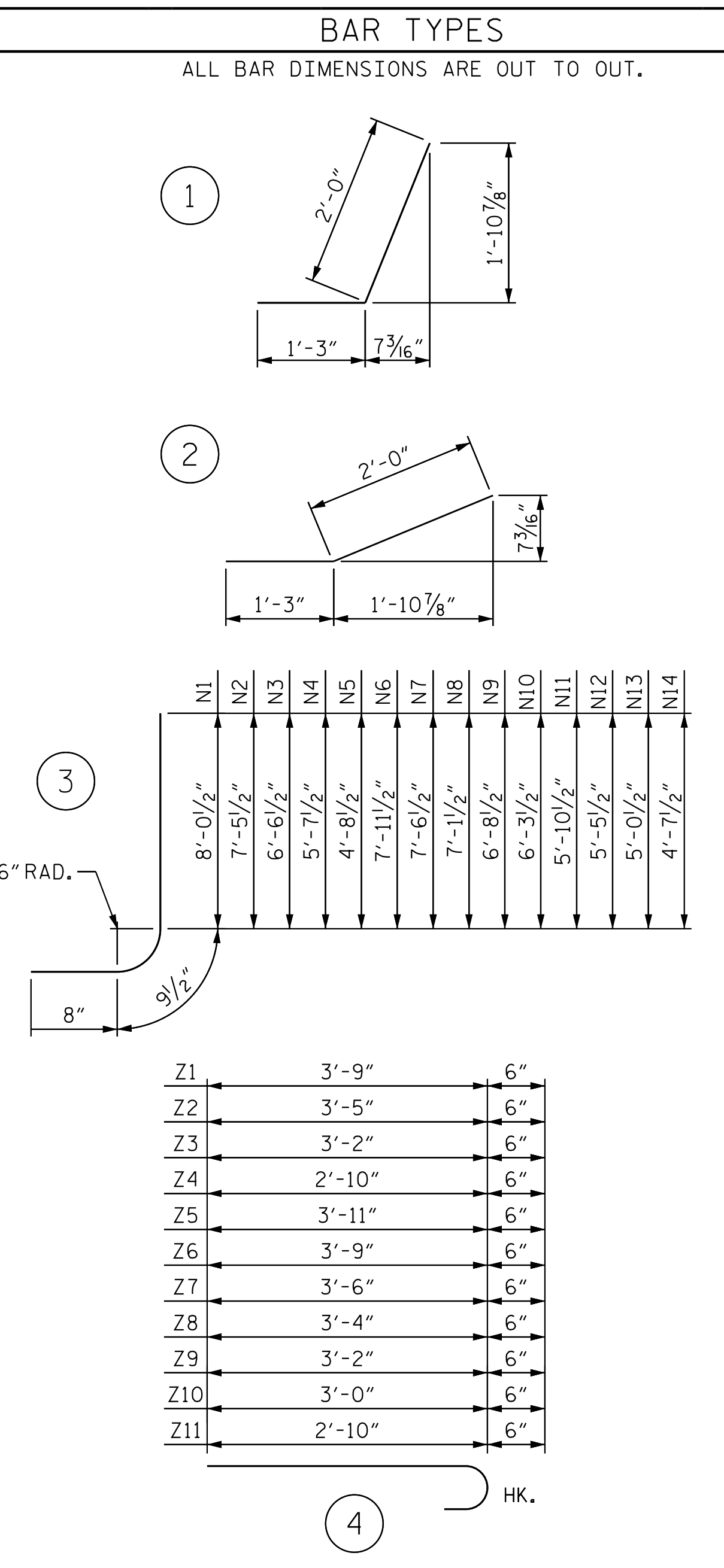
ELEVATION W1

ELEVATION W2



TYPICAL WING SECTION

BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR	6'-3"	50
H2	4	#4	STR	5'-0"	13
H3	24	#4	1	3'-3"	52
H4	4	#4	STR	6'-11"	18
H5	12	#4	STR	24'-10"	199
H6	4	#4	STR	20'-0"	53
H7	4	#4	STR	8'-11"	24
H8	24	#4	2	3'-3"	52
H9	4	#4	STR	25'-1"	67
N1	2	#5	3	9'-6"	20
N2	4	#5	3	8'-11"	37
N3	4	#5	3	8'-0"	33
N4	4	#4	3	7'-1"	19
N5	4	#4	3	6'-2"	16
N6	6	#5	3	9'-5"	59
N7	6	#5	3	9'-0"	56
N8	6	#5	3	8'-7"	54
N9	6	#5	3	8'-2"	51
N10	6	#4	3	7'-9"	31
N11	6	#4	3	7'-4"	29
N12	6	#4	3	6'-11"	28
N13	6	#4	3	6'-6"	26
N14	6	#4	3	6'-1"	24
S1	18	#6	STR	6'-0"	162
T1	6	#5	STR	7'-8"	48
T2	6	#5	STR	26'-3"	164
V1	2	#4	STR	7'-5"	10
V2	4	#4	STR	6'-10"	18
V3	4	#4	STR	5'-11"	16
V4	4	#4	STR	5'-0"	13
V5	4	#4	STR	4'-1"	11
V6	6	#4	STR	7'-2"	29
V7	6	#4	STR	6'-9"	27
V8	6	#4	STR	6'-4"	25
V9	6	#4	STR	5'-11"	24
V10	6	#4	STR	5'-6"	22
V11	6	#4	STR	5'-1"	20
V12	6	#4	STR	4'-8"	19
V13	6	#4	STR	4'-3"	17
V14	6	#4	STR	3'-10"	15
Z1	4	#4	4	4'-3"	11
Z2	4	#4	4	3'-11"	10
Z3	4	#4	4	3'-8"	10
Z4	4	#4	4	3'-4"	9
Z5	4	#4	4	4'-5"	12
Z6	8	#4	4	4'-3"	23
Z7	8	#4	4	4'-0"	21
Z8	8	#4	4	3'-10"	20
Z9	8	#4	4	3'-8"	20
Z10	8	#4	4	3'-6"	19
Z11	8	#4	4	3'-4"	18
REINFORCING STEEL				1,824 LBS	
FOR 4 WINGS					
CLASS A CONCRETE					
4 WINGS				27.5	CY
2 HEADWALLS				1.3	CY
2 END CURTAIN WALLS				1.4	CY
TOTAL				30.3	CY



PROJECT NO. R-2707D  
 CLEVELAND COUNTY  
 STATION: 717+13.00 -L-

SHEET 5 OF 5

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RAI FTGH

WINGS FOR CONCRETE BOX CULVERT  
 H = 7'-0" SLOPE = 2:1  
 35° OR 145° SKEW



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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

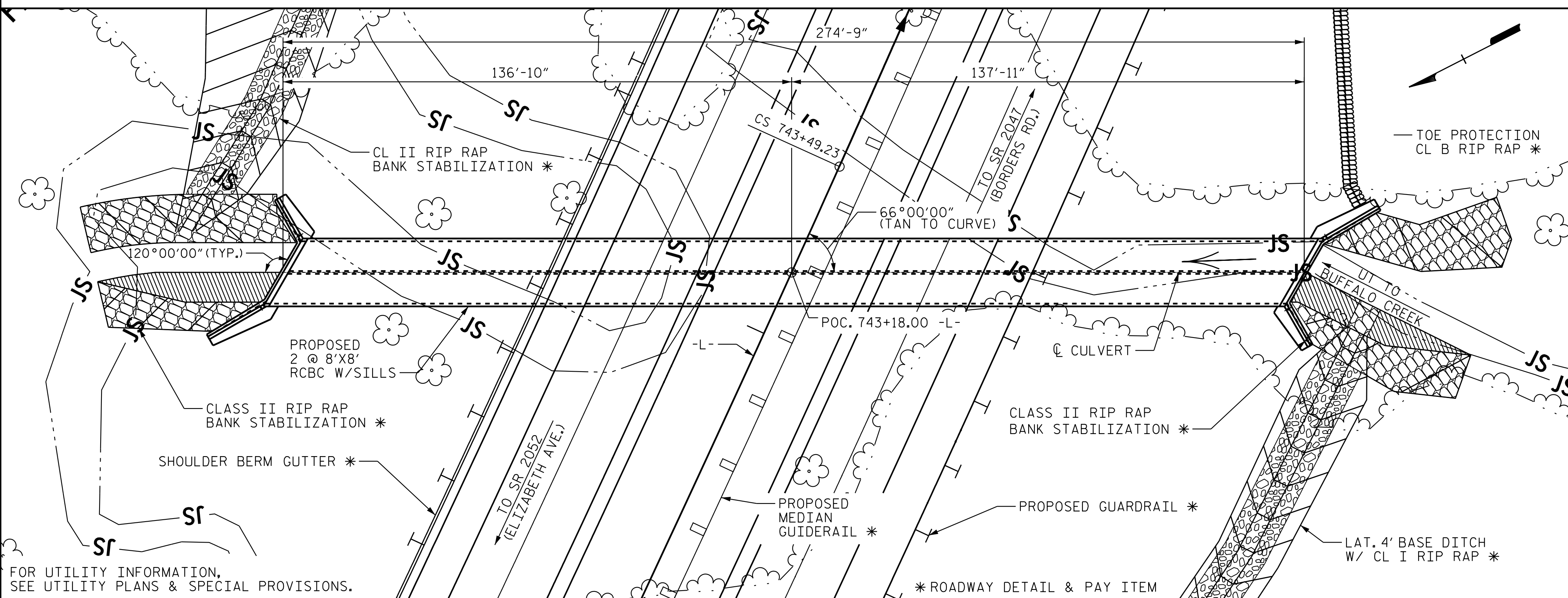
Stantec Consulting Services Inc.  
 801 Jones Franklin Road  
 Suite 300  
 Raleigh, NC 27606  
 Tel. (919) 851-6866  
 Fax. (919) 851-7024  
 www.stantec.com  
 License No. F-0672

DRAWN BY: J. B. GEILE DATE: 02/17/23  
 CHECKED BY: M. B. ISENHOUR DATE: 02/17/23  
 DESIGN ENGINEER OF RECORD: M. B. ISENHOUR DATE: 04/18/23

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BM #33: 8" NAIL IN ROOT OF 8" RED OAK, STA. 744+49.56 -L- 107.13' LT., ELEV. 784.14



**NOTES**

- ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING.
- DESIGN FILL----- 33.9 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 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 CONTRACTORS 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.
- 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 SHALL BE PAID FOR BY THE CONTRACTOR.
- DETAILED DRAWINGS FOR FALSEWORK AND FORMS FOR THIS DOUBLE BARREL 8 FT. X 8 FT. REINFORCED CONCRETE BOX CULVERT SHALL BE SUBMITTED. SEE SHEET (SN).

**ROADWAY DATA**

GRADE POINT ELEV. @ STA. 743+18.00 -L- = 794.96  
 BED ELEV. @ STA. 743+18.00 -L- = 753.70  
 ROADWAY SLOPES = 2:1

**OVERTOPPING FLOOD DATA**

OVERTOPPING DISCHARGE = >700 C.F.S.  
 FREQUENCY OF OVERTOPPING FLOOD = >500 YR.  
 OVERTOPPING FLOOD ELEVATION = 794.10

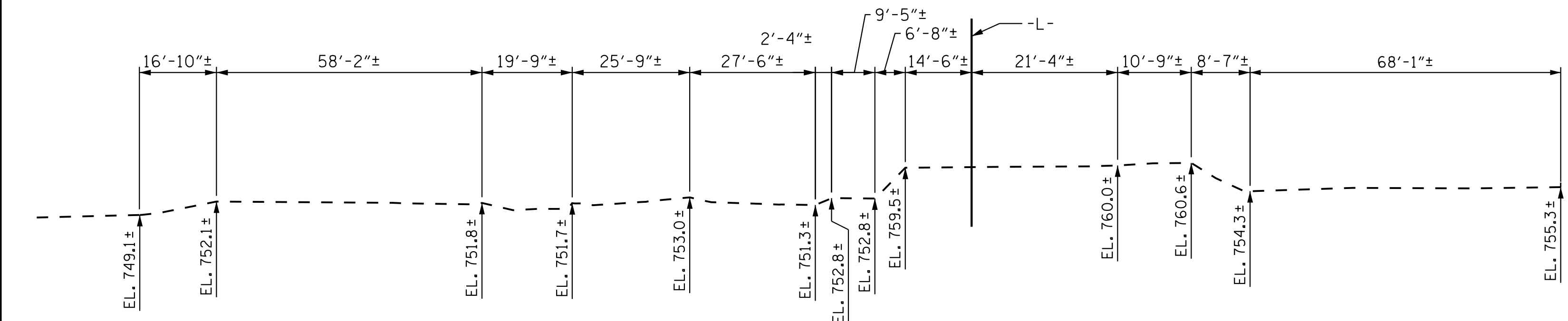
**HYDRAULIC DATA**

DESIGN DISCHARGE = 650 C.F.S.  
 FREQUENCY OF DESIGN FLOOD = 50 YR.  
 DESIGN HIGH WATER ELEVATION = 761.90  
 BASIC DISCHARGE (Q100) = 660 C.F.S.  
 BASIC HIGH WATER ELEVATION = 762.00  
 DRAINAGE AREA = 0.6 SQ. MI.

**TOTAL STRUCTURE QUANTITIES**

CLASS A CONCRETE	
BARREL @ 2,984 CY/FT	820.0 C.Y.
SILLS	1.8 C.Y.
WINGS, ETC.	30.8 C.Y.
<b>TOTAL</b>	<b>852.6 C.Y.</b>
REINFORCING STEEL	
BARREL	115,980 LBS.
WINGS, ETC.	2,085 LBS.
<b>TOTAL</b>	<b>118,065 LBS.</b>
FOUNDATION CONDITIONING MATERIAL = 1294 TONS	
CULVERT EXCAVATION = LUMP SUM	

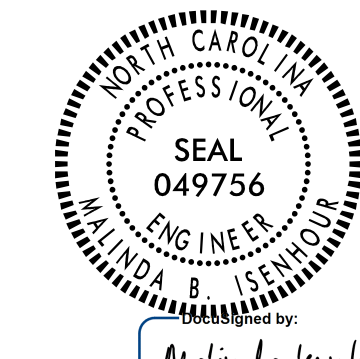
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
  - A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.
  - NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
  - FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
  - FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
  - FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.
  - FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.
  - THE ENTIRE COST OF WORK REQUIRED TO PLACE EXCAVATED OR SUPPLEMENTAL MATERIAL AS SHOWN ON THE PLANS SHALL BE INCLUDED IN THE LUMP SUM PRICE FOR CULVERT EXCAVATION.
- FOUNDATION NOTES**
- EXCAVATE FOUNDATION A MINIMUM OF 3.0 FT. BELOW CULVERT BEARING ELEVATION.
  - PLACE 3.0 FT. OF CLASS VI FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH SECTION 414 OF THE STANDARD SPECIFICATIONS.
  - INSTALL GEOTEXTILE FOR SOIL STABILIZATION, TYPE 4, TO A MINIMUM DISTANCE OF 1.5 FT. BEYOND THE EXTENTS OF THE CULVERT FOUNDATION IN ACCORDANCE WITH SECTION 270 OF THE STANDARD SPECIFICATIONS.



PROJECT NO. R-2707D  
 CLEVELAND COUNTY  
 STATION: 743+18.00 -L-

SHEET 1 OF 5

STATE OF NORTH CAROLINA  
 RALEIGH  
**BARREL STANDARD  
 DOUBLE 8 FT. X 8 FT.  
 CONCRETE BOX CULVERT  
 66° SKEW**



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

ASSEMBLED BY : J. B. GEILE DATE : 02/14/23	<b>SPECIAL</b>
CHECKED BY : M. B. ISENHOUR DATE : 02/21/23	
DRAWN BY : R. W. WRIGHT DATE : AUG. 1989	<b>STANDARD</b>
CHECKED BY : A. R. BISSETTE DATE : AUG. 1989	
DESIGN ENGINEER OF RECORD : M. B. ISENHOUR DATE : 04/18/23	

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	REVISIONS						SHEET NO. C2-01 TOTAL SHEETS 5
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	1			3			
	2			4			

PERMANENT LOAD FACTORS:

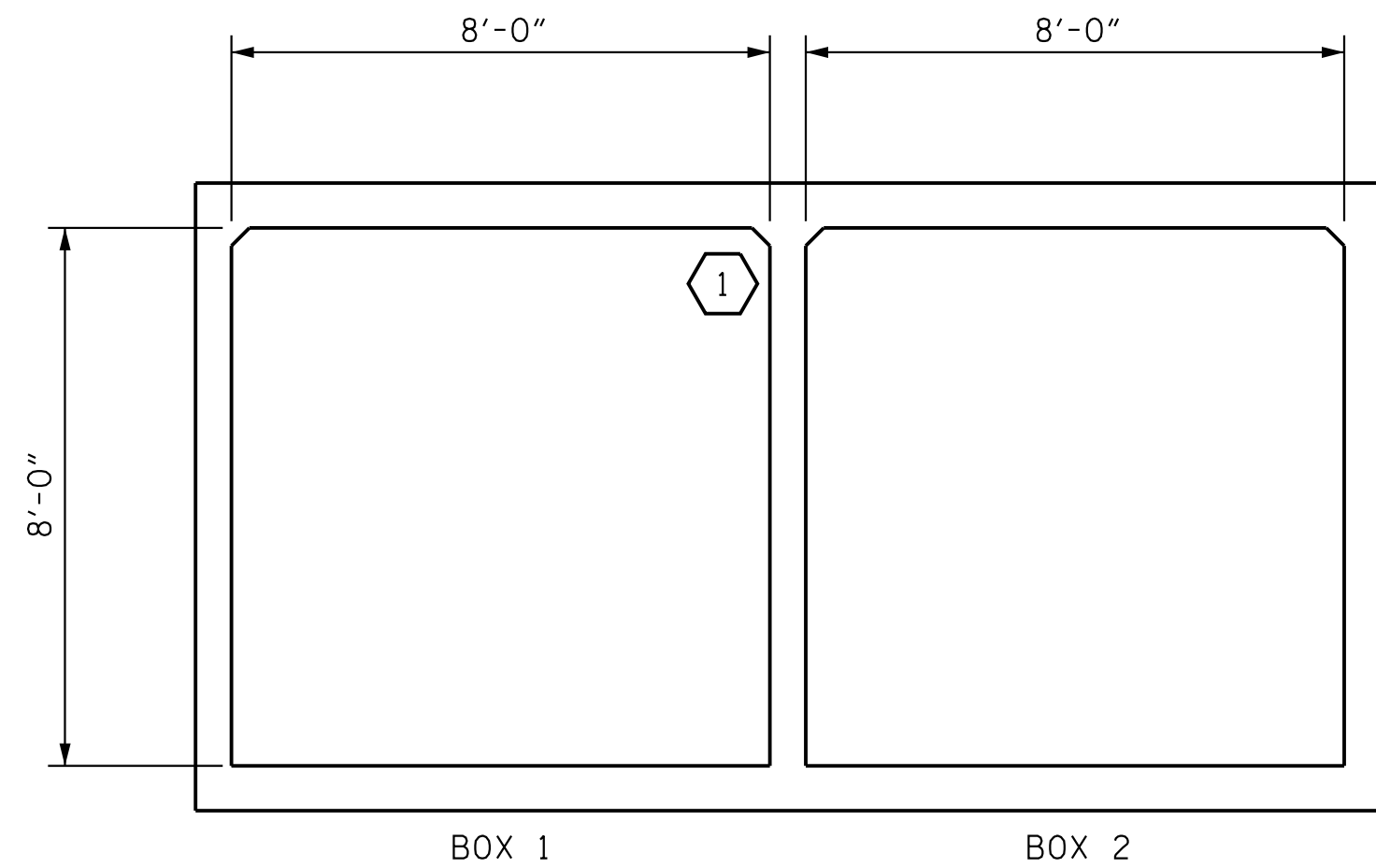
LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
WA	1.00	--

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	1.04	1.34	1	EXT. WALL TOP	0.00	1.04	1	RIGHT END - TOP SLAB	8.00

NOTES:

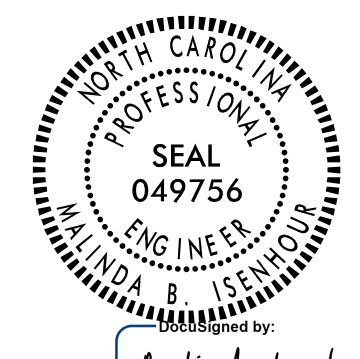
RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.  
THE EFFECTS OF LIVE LOAD ON DESIGN AND LOAD RATING MAY BE NEGLECTED FOR CULVERTS WITH CERTAIN FILL DEPTHS DESCRIBED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.  
CULVERTS WITH NEGLIGIBLE LIVE LOAD SHOULD BE LOAD RATED FOR PERMANENT LOADS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



LRFR SUMMARY  
(LOOKING DOWNSTREAM)

PROJECT NO. R-2707D  
CLEVELAND COUNTY  
STATION: 743+18.00 -L-

SHEET 2 OF 5



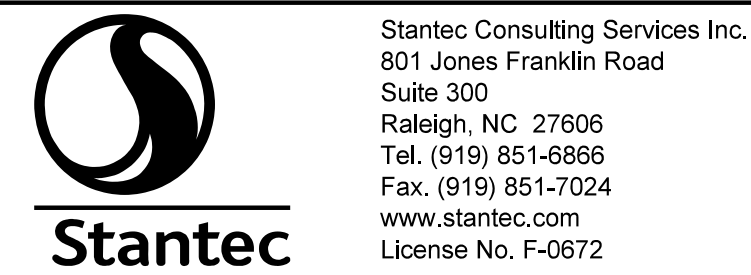
STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
STANDARD  
LRFR SUMMARY FOR  
REINFORCED CONCRETE  
BOX CULVERTS  
(NON-INTERSTATE TRAFFIC)

NO.	BY:	DATE:	REVISIONS			SHEET NO.
			NO.	BY:	DATE:	
1			3			C2-02
2			4			TOTAL SHEETS 5

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STR. C2

STD. NO. LRFR5

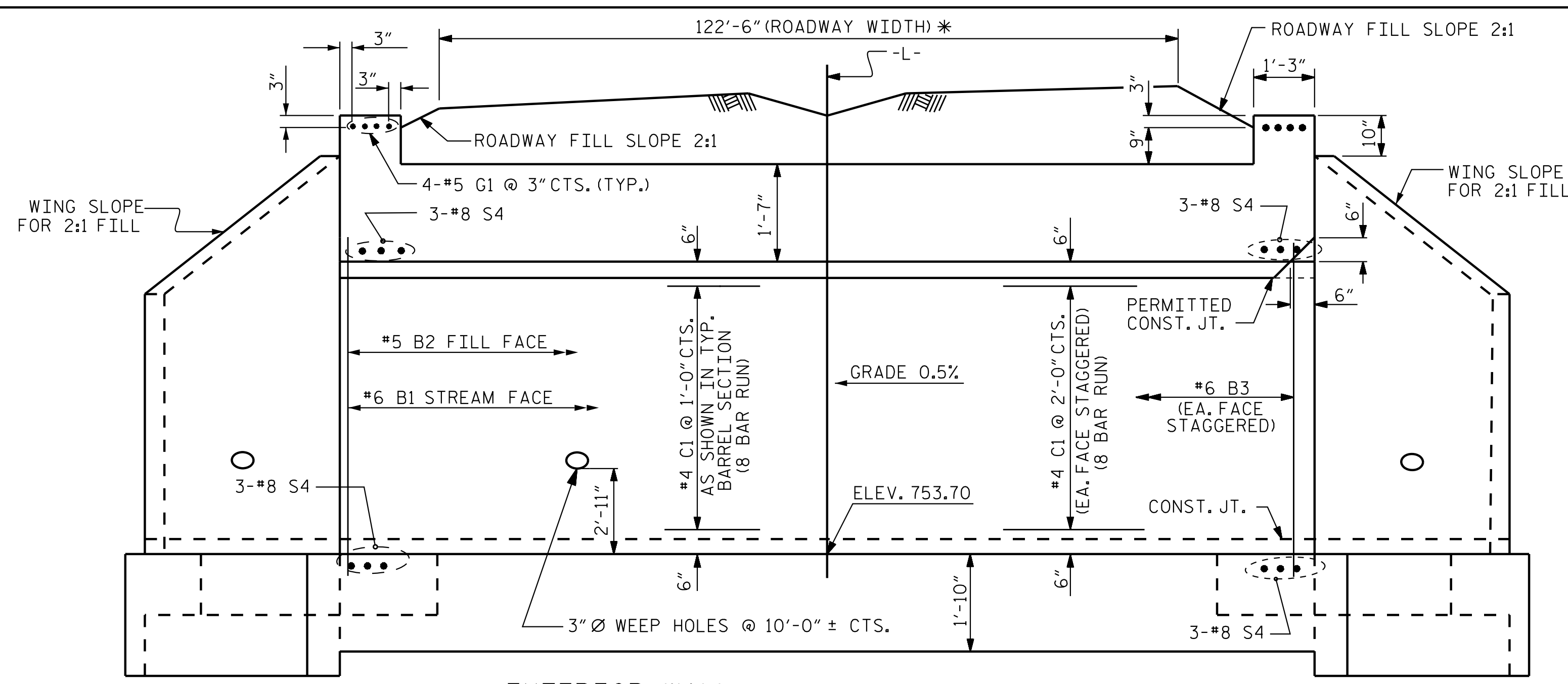


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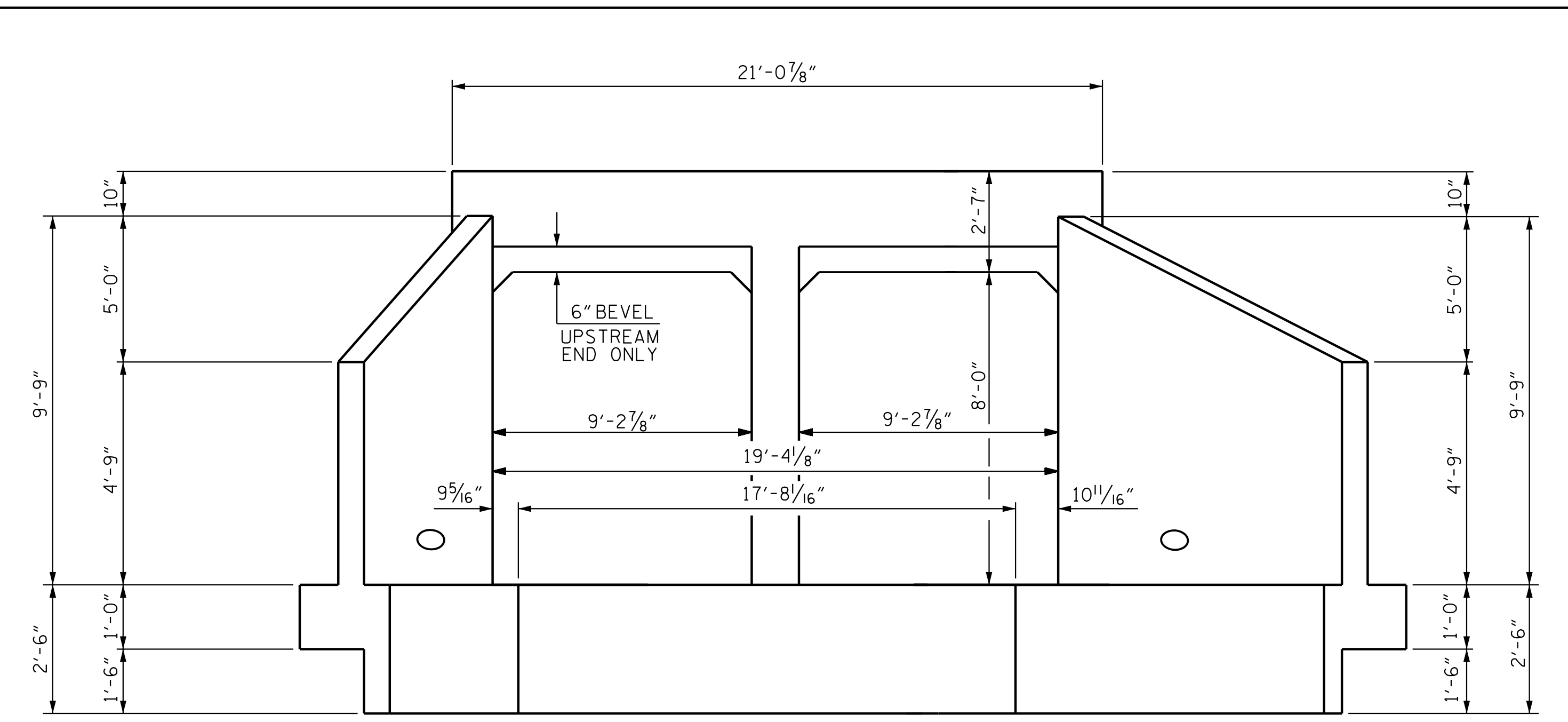
ASSEMBLED BY : J. B. GEILE DATE : 02/20/23  
CHECKED BY : M. B. ISENHOUR DATE : 02/22/23  
DRAWN BY : WMC 7/II REV. 10/1/II MAA/GM  
CHECKED BY : GM 7/II REV. 12/17 MAA/THC  
DESIGN ENGINEER OF RECORD: M. B. ISENHOUR DATE : 04/18/23

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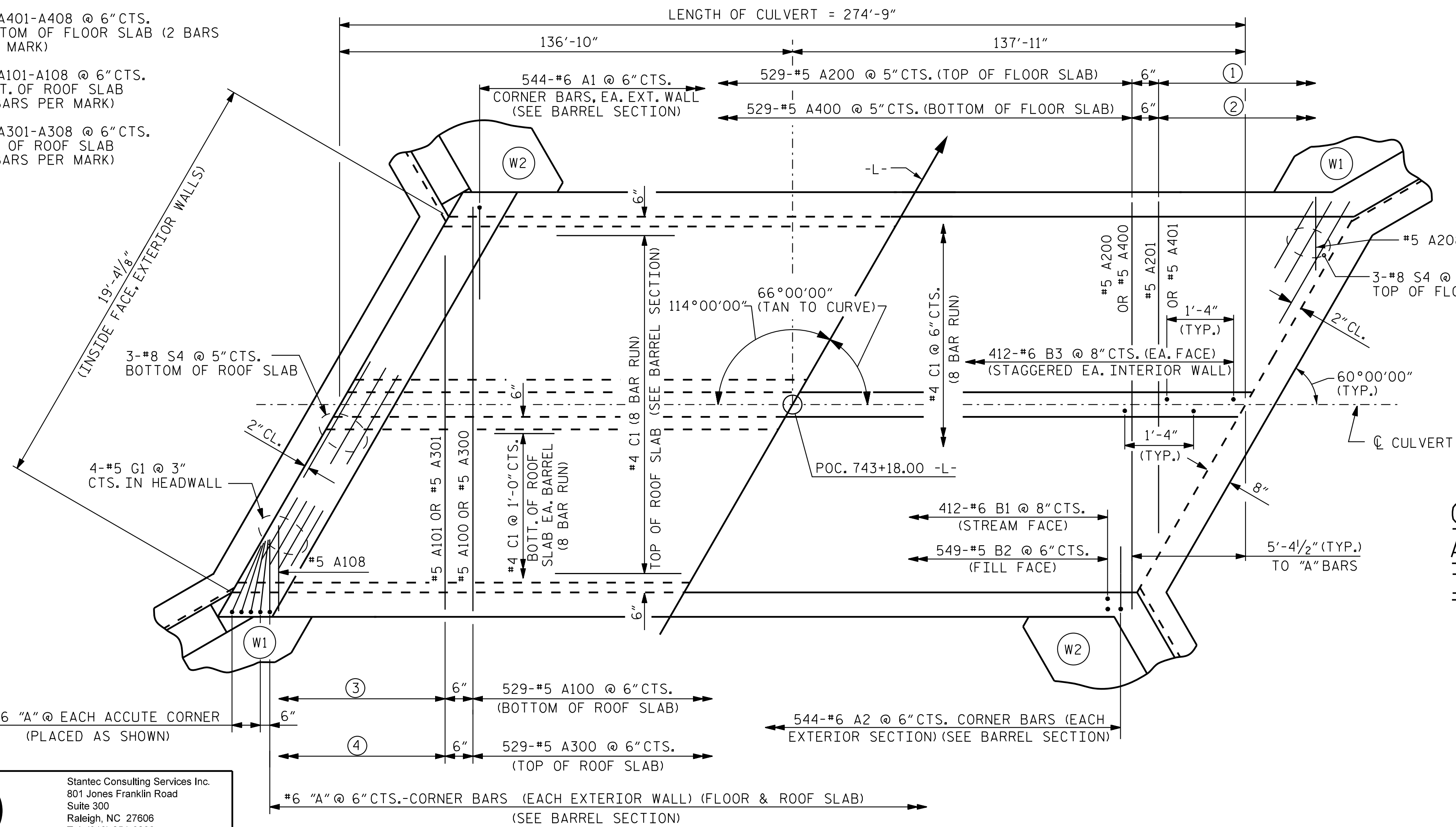
EXTERIOR WALL INTERIOR WALL  
CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION NORMAL TO SKEW  
(LOOKING DOWN STREAM) (SILLS NOT SHOWN)

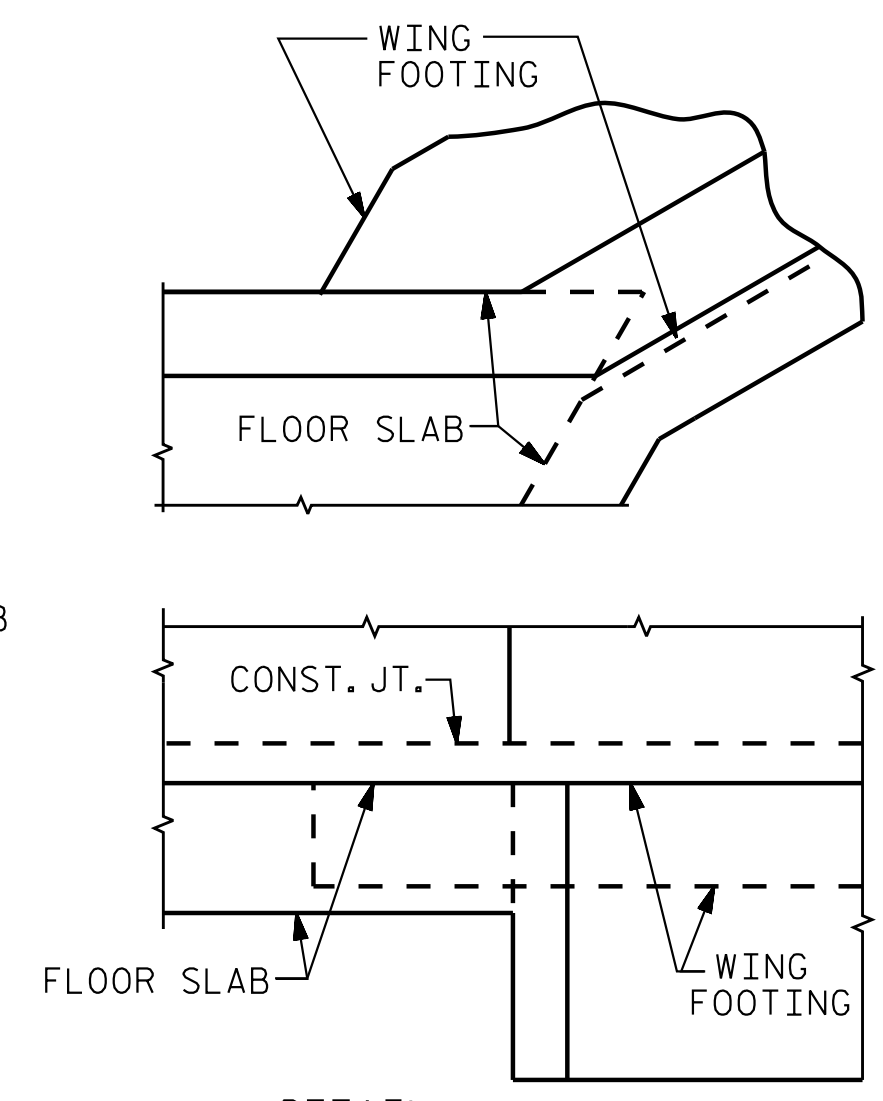
- ① #5 A201-A208 @ 6" CTS. TOP OF FLOOR SLAB (2 BARS PER MARK)
- ② #5 A401-A408 @ 6" CTS. BOTTOM OF FLOOR SLAB (2 BARS PER MARK)
- ③ #5 A101-A108 @ 6" CTS. BOTT. OF ROOF SLAB (2 BARS PER MARK)
- ④ #5 A301-A308 @ 6" CTS. TOP OF ROOF SLAB (2 BARS PER MARK)

\* RADIAL DIMENSION @ CULVERT STATION

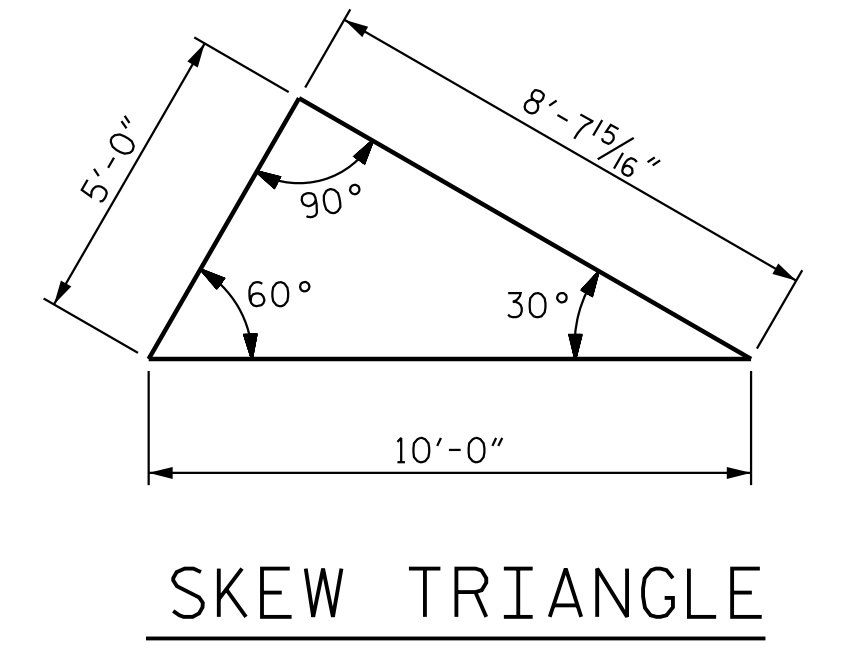


PART PLAN - ROOF SLAB

PART PLAN - FLOOR SLAB



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



SKEW TRIANGLE

PROJECT NO. R-2707D  
CLEVELAND COUNTY  
STATION: 743+18.00 -L-

SHEET 3 OF 5

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STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
**BARREL STANDARD**  
DOUBLE 8 FT. X 8 FT.  
CONCRETE BOX CULVERT  
66° SKEW

ASSEMBLED BY: J. B. GEILE	DATE: 02/20/23
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DRAWN BY: R. WRIGHT	DATE: AUG. 1989
CHECKED BY: A.R. BISSETTE	DATE: AUG. 1989

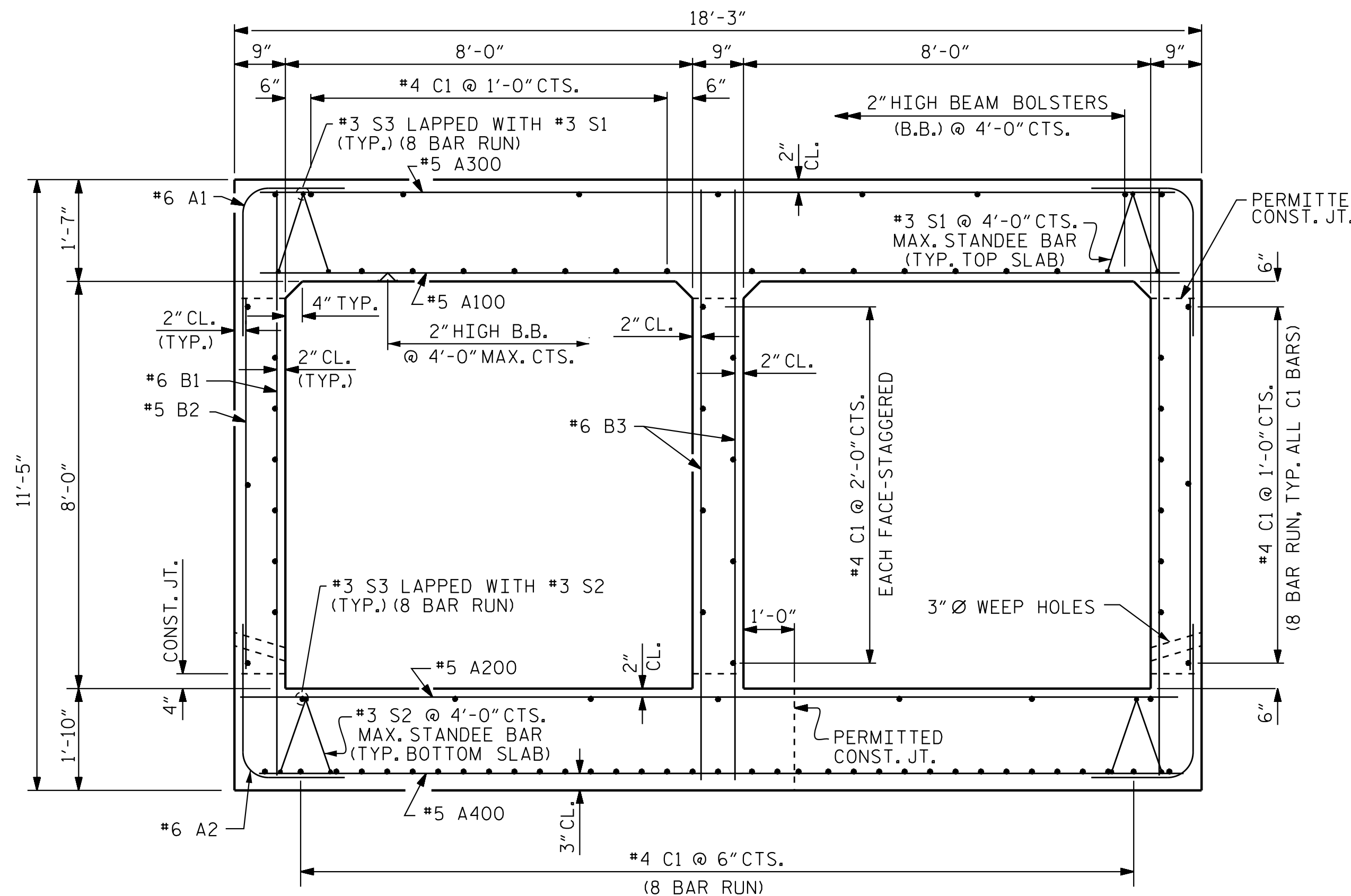
<b>SPECIAL</b>	DESIGN ENGINEER OF RECORD: M. B. ISENHOUR	DATE: 04/18/23
<b>STANDARD</b>		

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REVISIONS					SHEET NO.
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2			4		

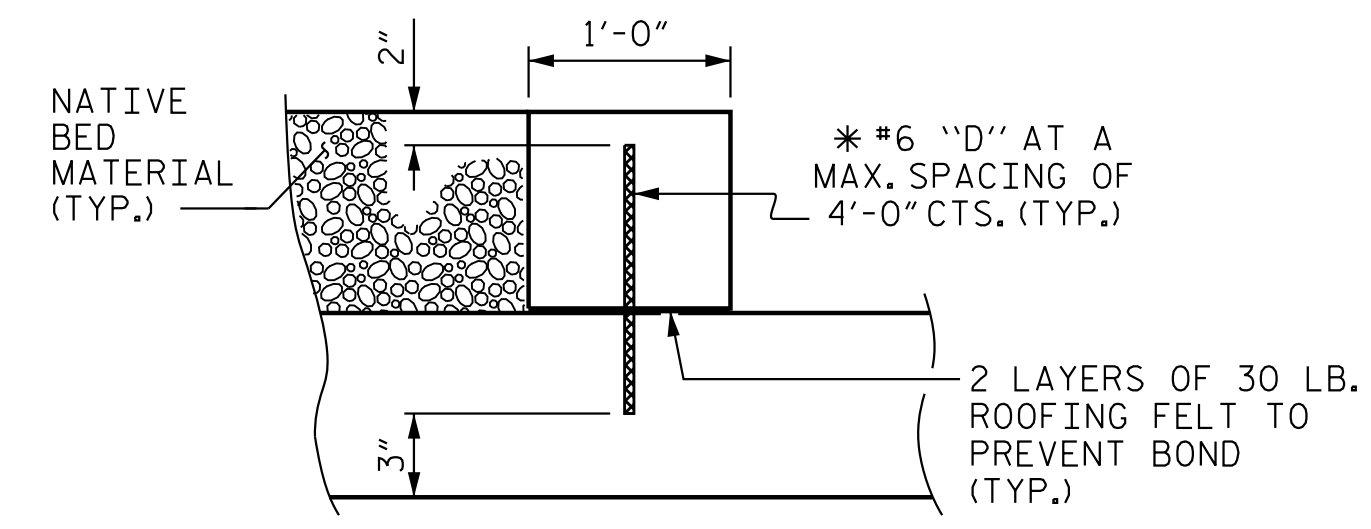
TOTAL SHEETS: 5



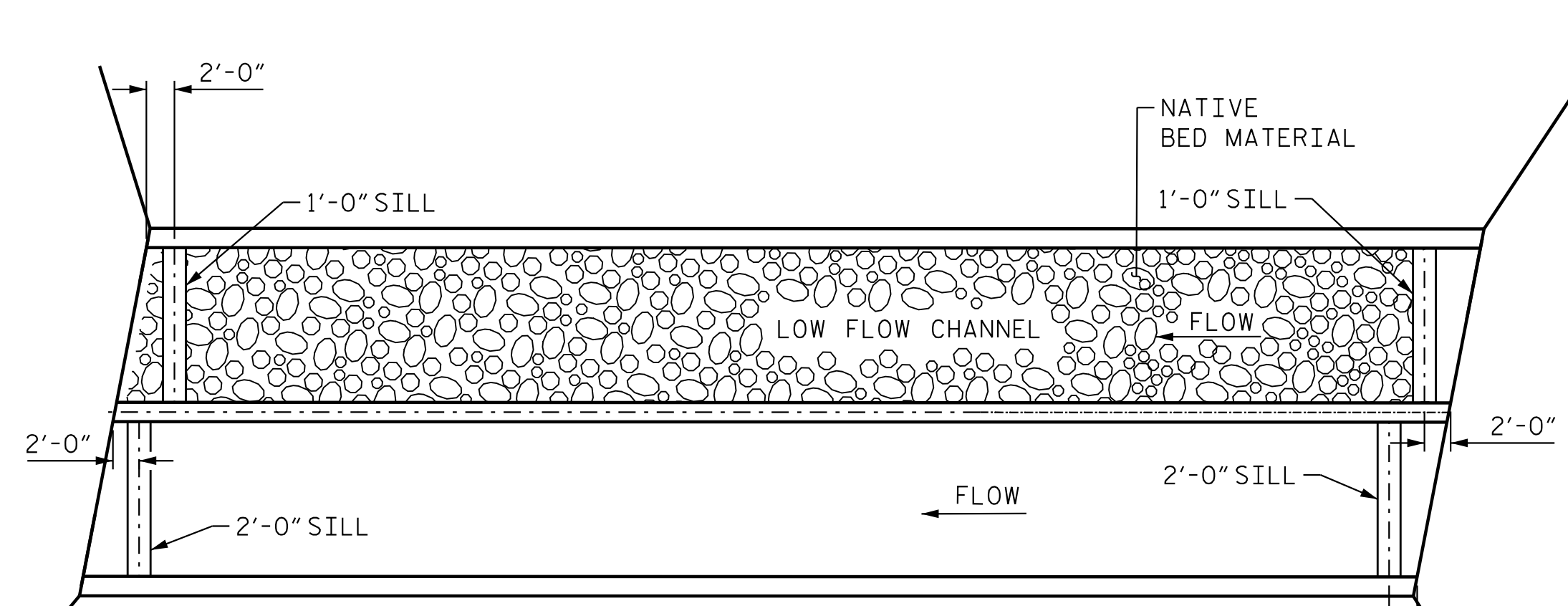


**RIGHT ANGLE SECTION OF BARREL**  
THERE ARE 90 C1 IN SECTION OF BARREL

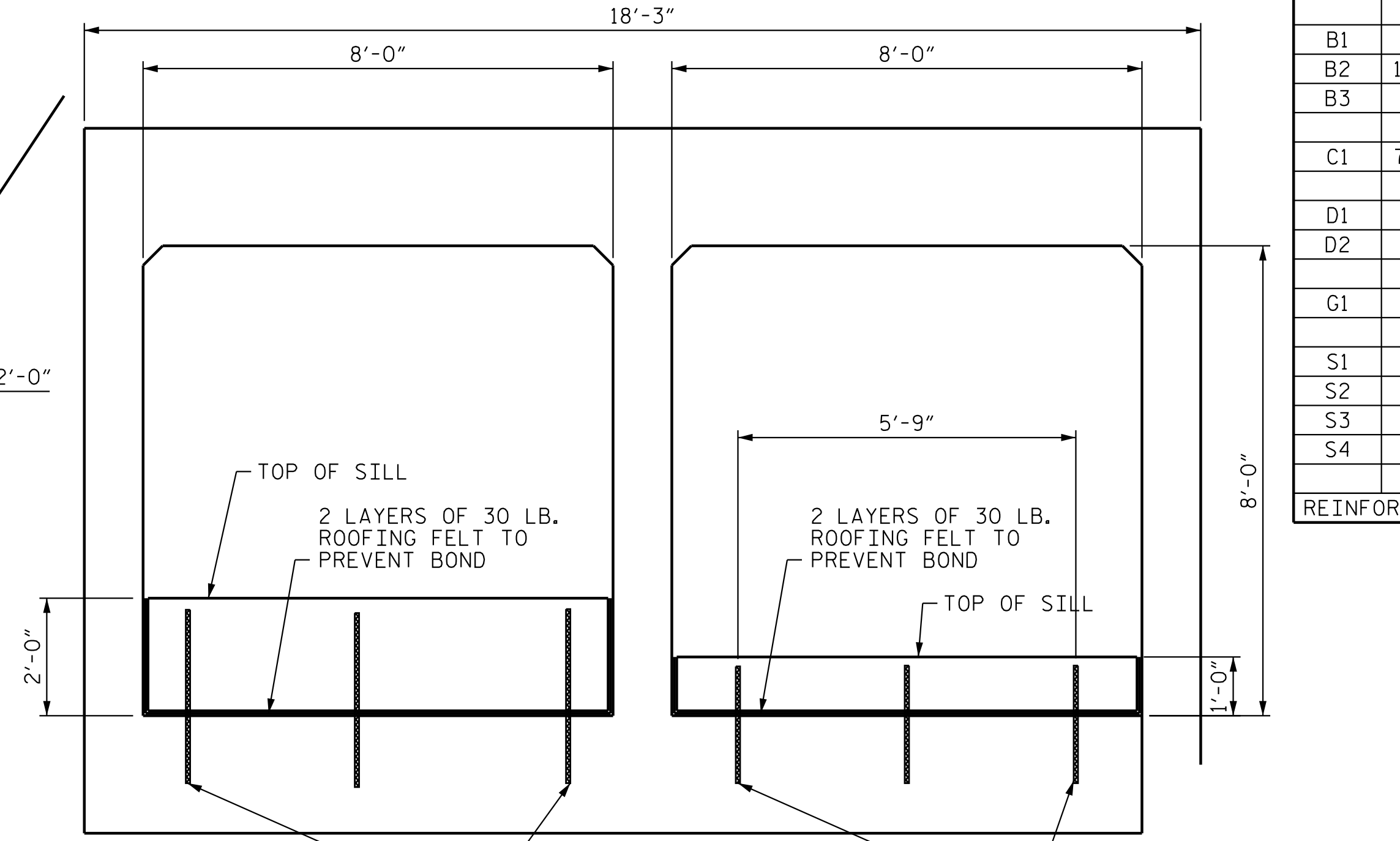
- NOTES**
1. NATIVE MATERIAL BETWEEN SILLS/Baffles IN THE CULVERT SHALL PROVIDE A CONTINUOUS LOW FLOW CHANNEL. NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM OR FLOODPLAIN AT THE PROJECT SITE DURING CONSTRUCTION. ONLY MATERIAL THAT IS EXCAVATED FROM THE STREAM BED MAY BE USED TO LINE THE LOW FLOW CULVERT BARREL. RIP-RAP MAY BE USED TO SUPPLEMENT THE NATIVE MATERIAL IN THE HIGH FLOW CULVERT BARREL(S). IF RIP-RAP IS USED TO LINE THE HIGH FLOW CULVERT BARREL(S), NATIVE MATERIAL SHOULD BE PLACED ON TOP TO FILL VOIDS AND PROVIDE A FLAT SURFACE FOR ANIMAL PASSAGE. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.
  2. SILLS/Baffles ARE TO BE 1.0 FT. WIDE, CAST SEPARATELY AND ATTACHED BY DOWELS.
  3. TOP OF LOW FLOW SILLS/Baffles SHOULD MATCH STREAM BED ELEVATION IN LOW FLOW CHANNEL OF STREAM. (THALWEG)
  4. DO NOT SET ELEVATION OF HIGH SILL ABOVE BANK FULL.
  5. FOR ADDITIONAL DETAILS, SEE CULVERT SURVEY REPORT.



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



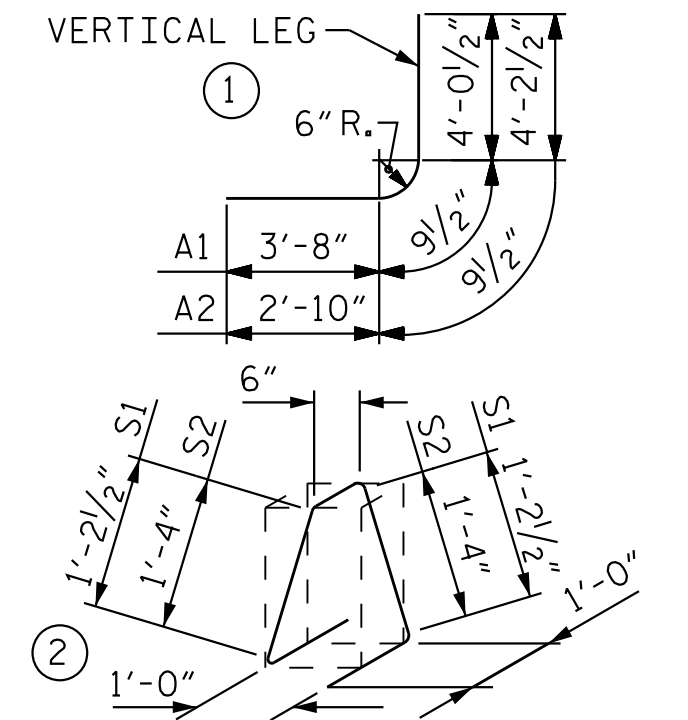
**PLAN VIEW**  
BACKFILL LOW FLOW CHANNEL W/NATIVE BED MATERIAL TO MATCH TOP OF SILL



**CULVERT SILL DETAILS**

**BILL OF MATERIAL**

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	1096	#6	1	8'-6"	13,993
A2	1096	#6	1	7'-10"	12,895
A100	529	#5	STR	17'-11"	9,885
A101	4	#5	STR	16'-3"	68
A102	4	#5	STR	14'-5"	60
A103	4	#5	STR	12'-7"	52
A104	4	#5	STR	11'-0"	46
A105	4	#5	STR	9'-3"	39
A106	4	#5	STR	7'-6"	31
A107	4	#5	STR	5'-9"	24
A108	4	#5	STR	4'-0"	17
A200	529	#5	STR	17'-11"	9,885
A201	4	#5	STR	16'-3"	68
A202	4	#5	STR	14'-5"	60
A203	4	#5	STR	12'-7"	52
A204	4	#5	STR	11'-0"	46
A205	4	#5	STR	9'-3"	39
A206	4	#5	STR	7'-6"	31
A207	4	#5	STR	5'-9"	24
A208	4	#5	STR	4'-0"	17
A300	529	#5	STR	17'-11"	9,885
A301	4	#5	STR	16'-3"	68
A302	4	#5	STR	14'-5"	60
A303	4	#5	STR	12'-7"	52
A304	4	#5	STR	11'-0"	46
A305	4	#5	STR	9'-3"	39
A306	4	#5	STR	7'-6"	31
A307	4	#5	STR	5'-9"	24
A308	4	#5	STR	4'-0"	17
A400	529	#5	STR	17'-11"	9,885
A401	4	#5	STR	16'-3"	68
A402	4	#5	STR	14'-5"	60
A403	4	#5	STR	12'-7"	52
A404	4	#5	STR	11'-0"	46
A405	4	#5	STR	9'-3"	39
A406	4	#5	STR	7'-6"	31
A407	4	#5	STR	5'-9"	24
A408	4	#5	STR	4'-0"	17
B1	824	#6	STR	11'-0"	13,614
B2	1098	#5	STR	7'-4"	8,398
B3	412	#6	STR	11'-0"	6,807
C1	720	#4	STR	36'-6"	17,555
D1	6	#6	STR	3'-5"	31
D2	6	#6	STR	2'-5"	22
G1	8	#5	STR	20'-8"	172
S1	136	#3	2	4'-11"	251
S2	136	#3	2	5'-2"	264
S3	32	#3	STR	35'-7"	428
S4	12	#8	STR	20'-8"	662
<b>REINFORCING STEEL</b>				<b>115,980 LBS.</b>	



**BAR TYPES**  
BAR DIMENSIONS ARE OUT TO OUT  
MIN. SPLICE LENGTHS CHART

BAR	SPLICE LENGTH
#3 S3	1'-5"
#4 C1	2'-5"
#6 A1	3'-7"
#6 A2	2'-9"
#5 B2	2'-4"

PROJECT NO. R-2707D  
CLEVELAND COUNTY  
STATION: 743+18.00 -L-

SHEET 4 OF 5  
STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
**DOUBLE 8 FT. X 8 FT.  
CONCRETE BOX CULVERT  
66° SKEW**

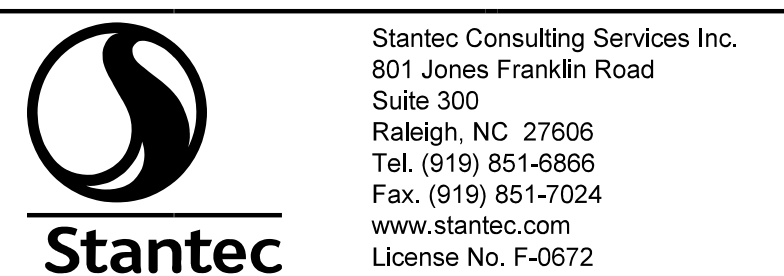


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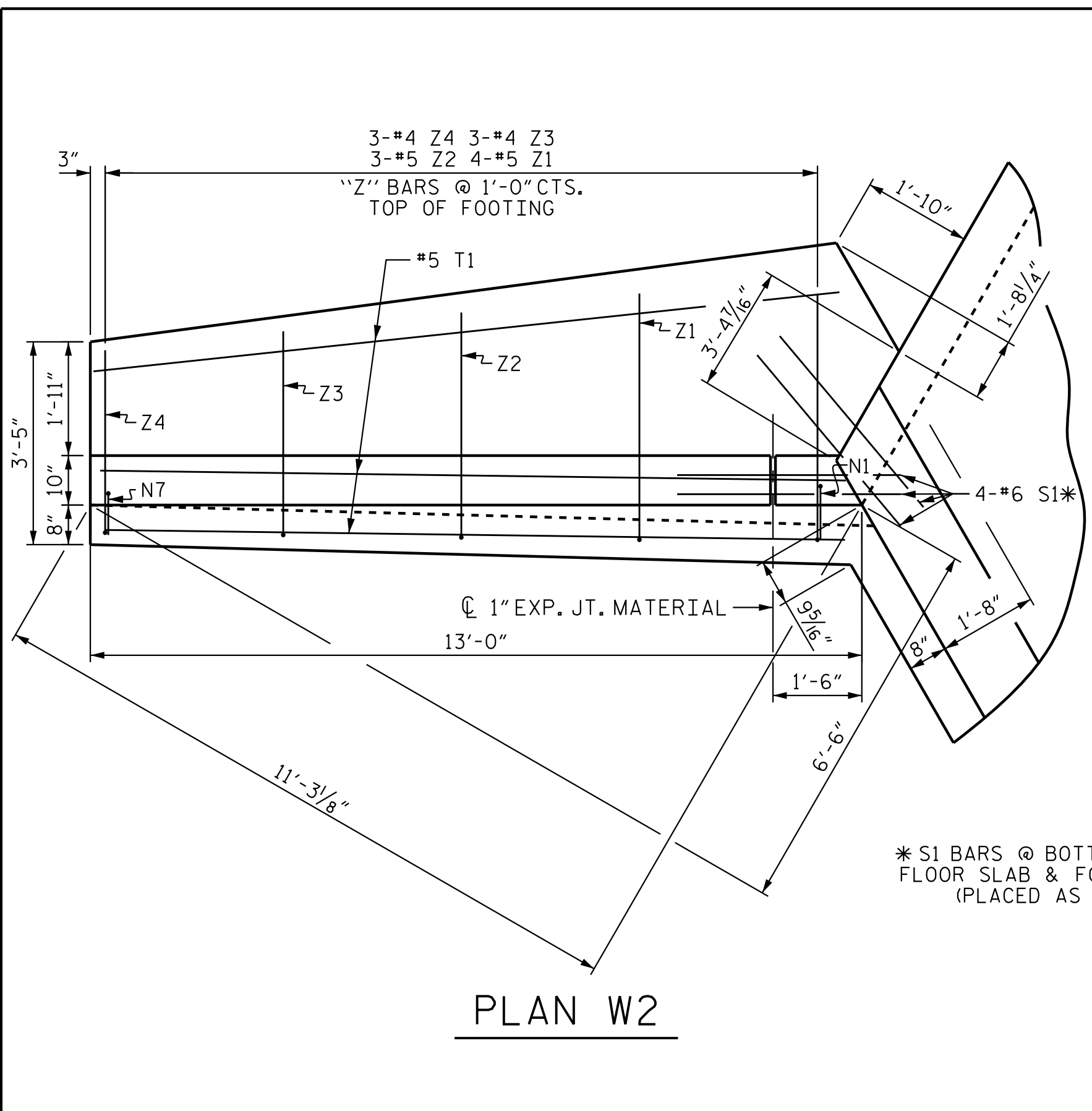
SHEET NO. C2-04  
TOTAL SHEETS 5



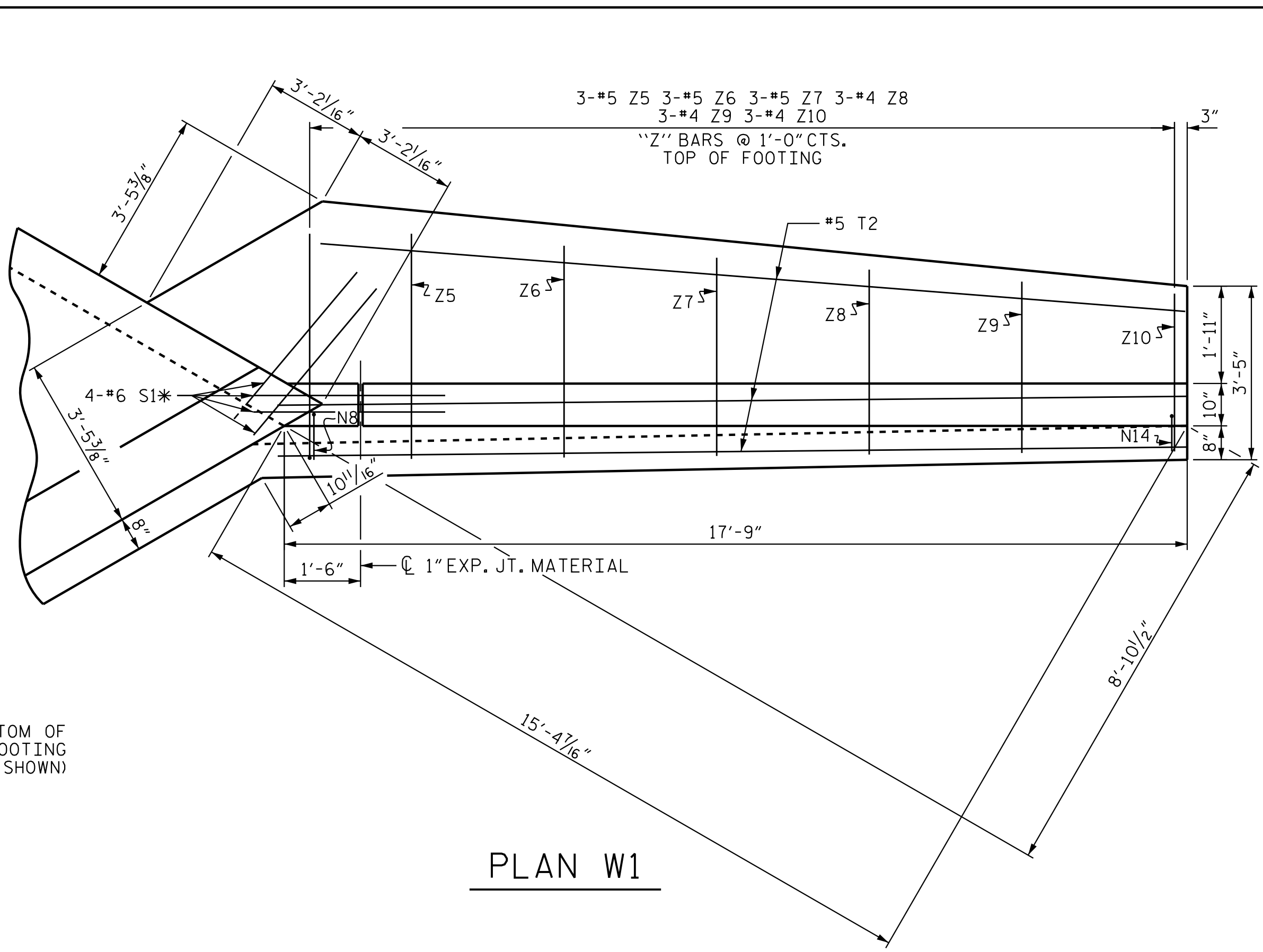
DRAWN BY: J. B. GEILE DATE: 02/20/23 DESIGN ENGINEER OF RECORD: M. B. ISENHOUR DATE: 04/18/23  
CHECKED BY: M. B. ISENHOUR DATE: 02/22/23

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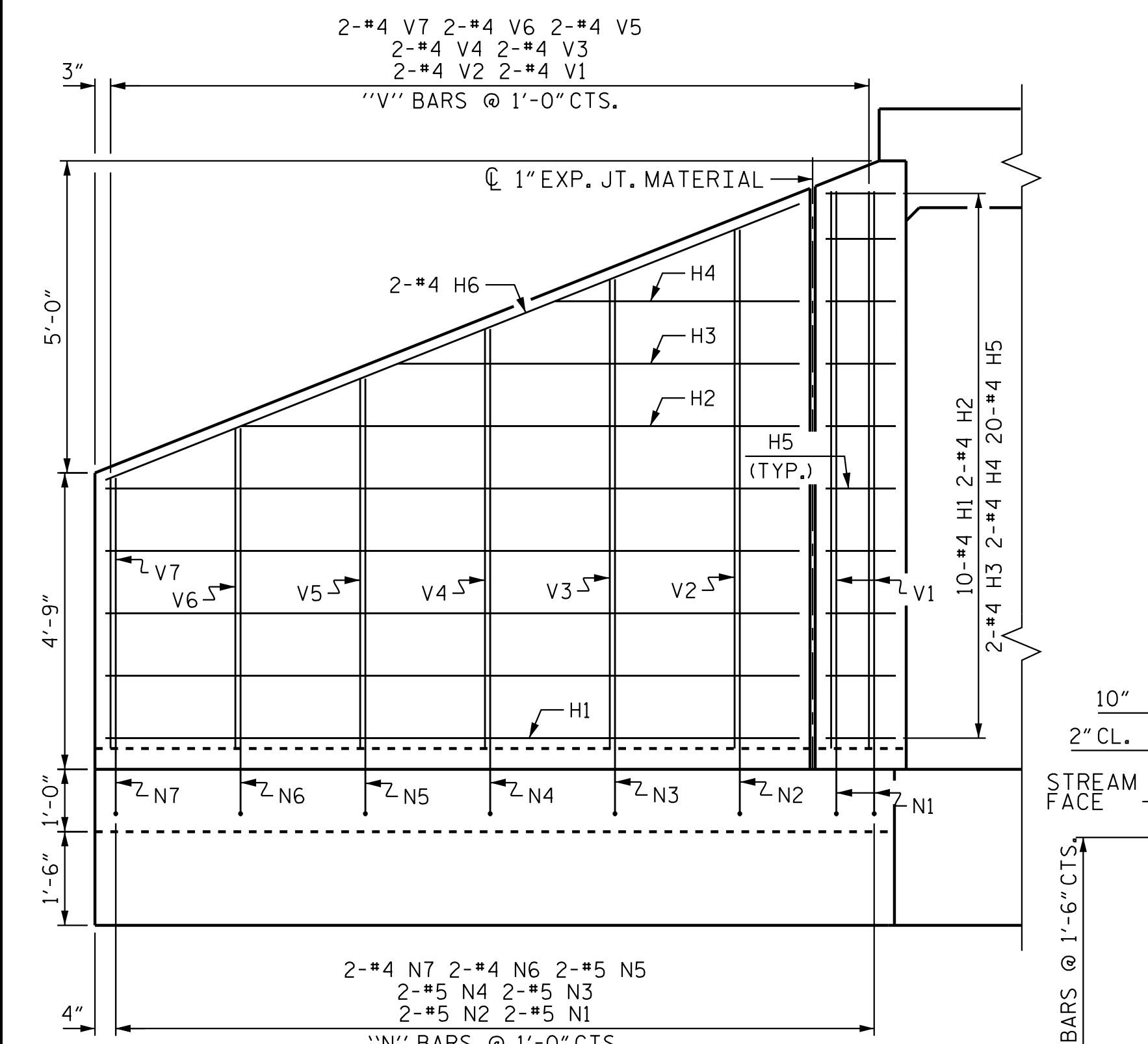




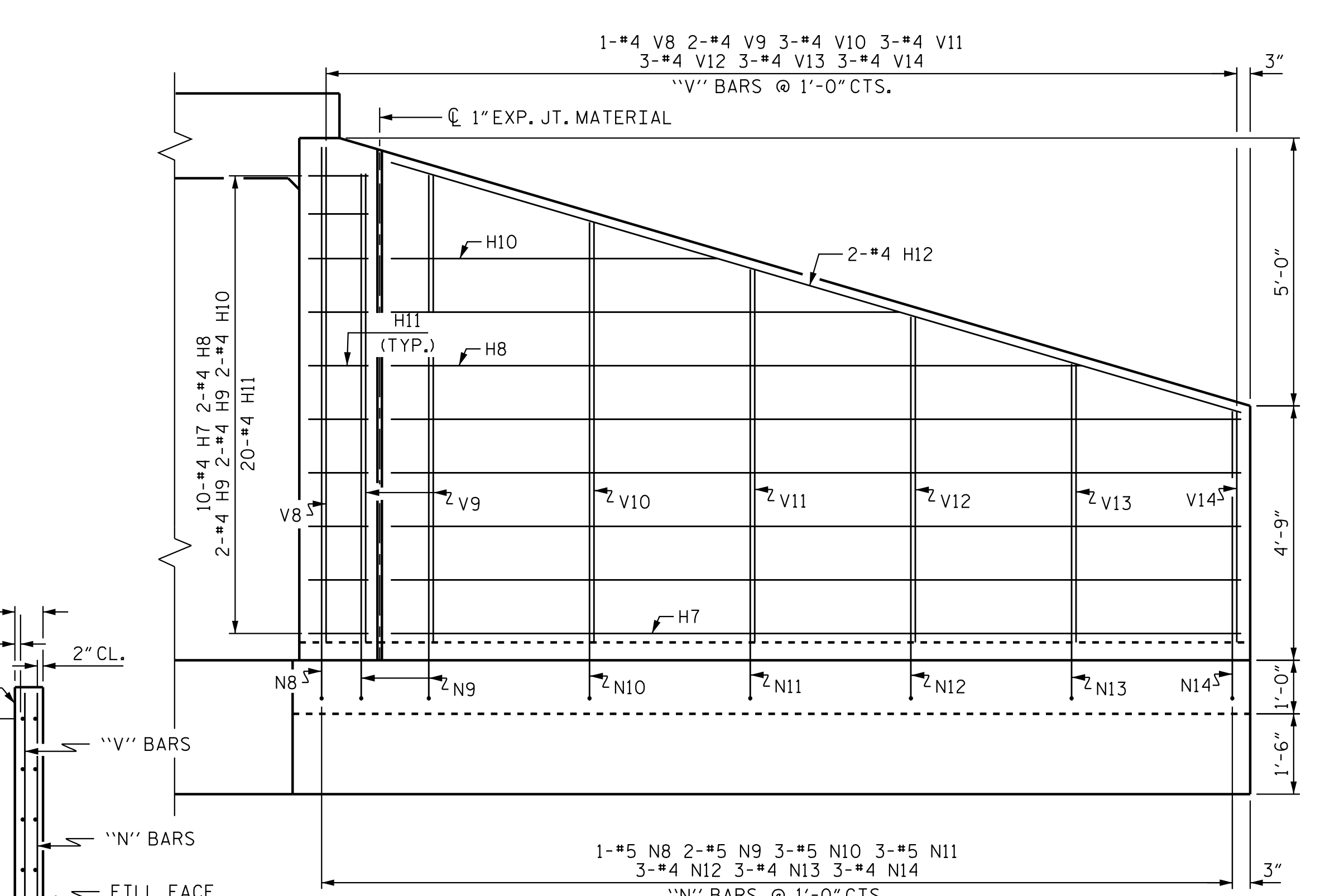
PLAN W2



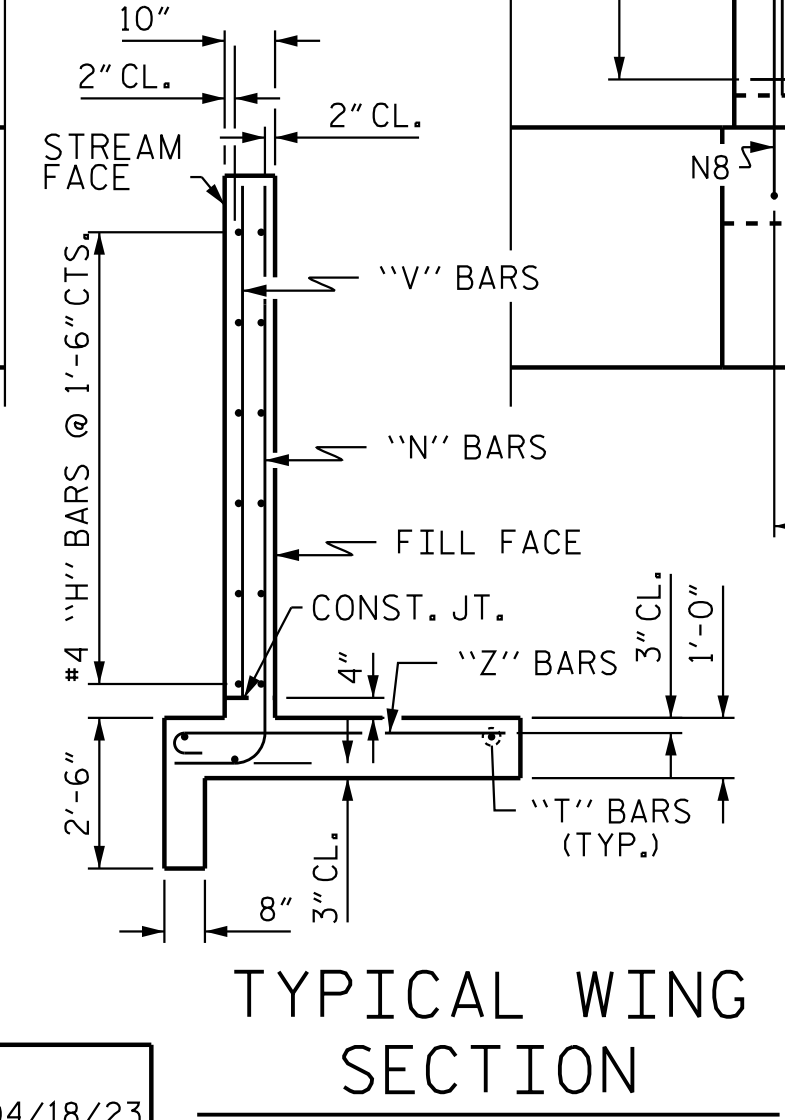
PLAN W1



ELEVATION W2

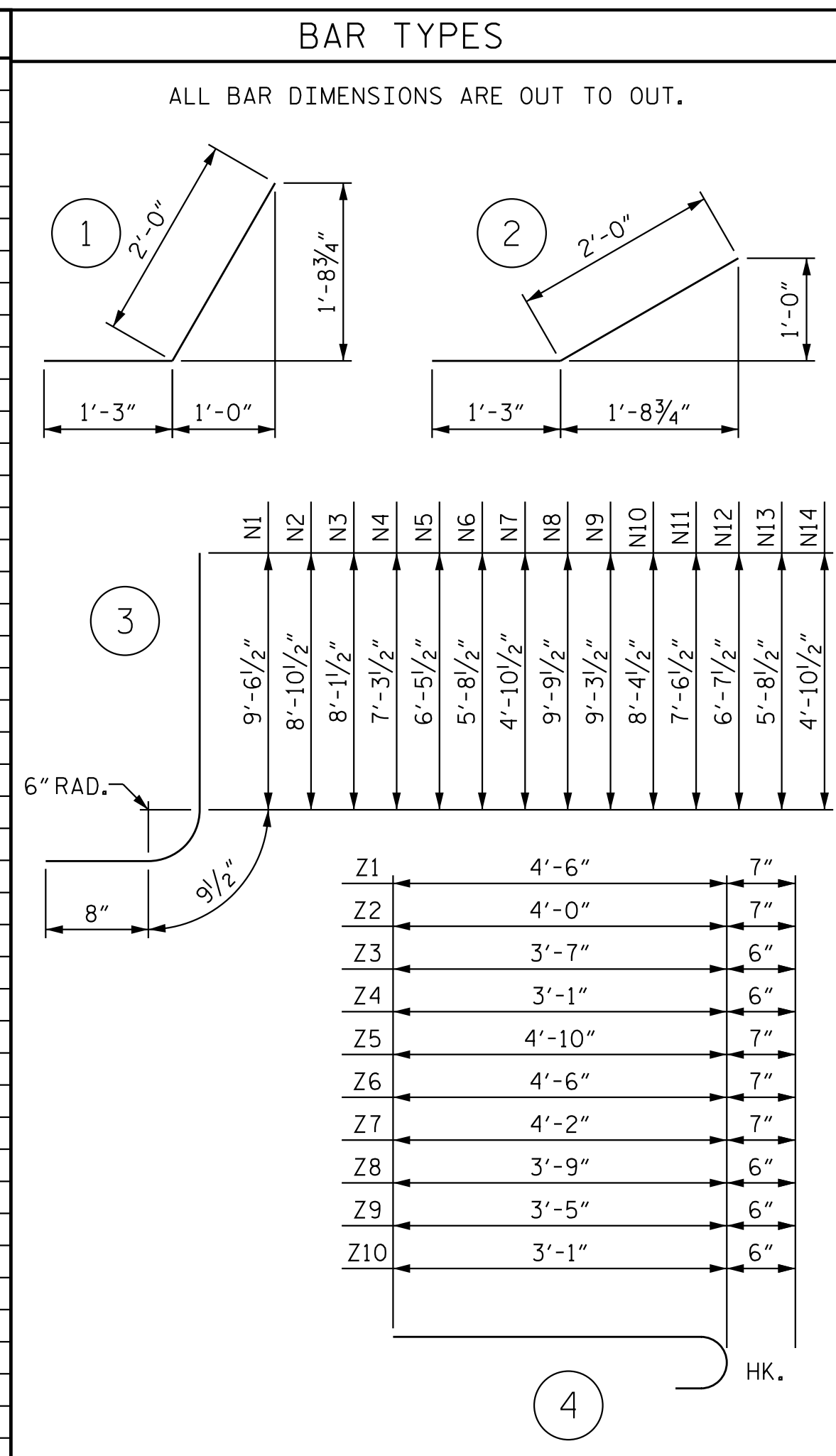


ELEVATION W1



TYPICAL WING SECTION

BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	20	#4	STR	11'-1"	148
H2	4	#4	STR	8'-4"	22
H3	4	#4	STR	6'-5"	17
H4	4	#4	STR	3'-11"	10
H5	40	#4	1	3'-3"	87
H6	4	#4	STR	11'-11"	32
H7	20	#4	STR	15'-10"	212
H8	4	#4	STR	12'-8"	34
H9	4	#4	STR	9'-6"	25
H10	4	#4	STR	6'-0"	16
H11	40	#4	2	3'-3"	87
H12	4	#4	STR	16'-6"	44
N1	4	#5	3	11'-0"	46
N2	4	#5	3	10'-4"	43
N3	4	#5	3	9'-7"	40
N4	4	#5	3	8'-9"	37
N5	4	#4	3	7'-11"	21
N6	4	#4	3	7'-2"	19
N7	4	#4	3	6'-4"	17
N8	2	#5	3	11'-3"	23
N9	4	#5	3	10'-9"	45
N10	6	#5	3	9'-10"	62
N11	6	#5	3	9'-0"	56
N12	6	#4	3	8'-1"	32
N13	6	#4	3	7'-2"	29
N14	6	#4	3	6'-4"	25
S1	16	#6	STR	6'-0"	144
T1	6	#5	STR	12'-6"	78
T2	6	#5	STR	17'-3"	108
V1	4	#4	STR	8'-11"	24
V2	4	#4	STR	8'-3"	22
V3	4	#4	STR	7'-6"	20
V4	4	#4	STR	6'-8"	18
V5	4	#4	STR	5'-11"	16
V6	4	#4	STR	5'-1"	14
V7	4	#4	STR	4'-4"	12
V8	2	#4	STR	9'-3"	12
V9	4	#4	STR	8'-8"	23
V10	6	#4	STR	7'-10"	31
V11	6	#4	STR	6'-11"	28
V12	6	#4	STR	6'-1"	24
V13	6	#4	STR	5'-2"	21
V14	6	#4	STR	4'-3"	17
Z1	8	#5	4	5'-1"	42
Z2	6	#5	4	4'-7"	29
Z3	6	#4	4	4'-1"	16
Z4	6	#4	4	3'-7"	14
Z5	6	#5	4	5'-5"	34
Z6	6	#5	4	5'-1"	32
Z7	6	#5	4	4'-9"	30
Z8	6	#4	4	4'-3"	17
Z9	6	#4	4	3'-11"	16
Z10	6	#4	4	3'-7"	14
REINFORCING STEEL FOR 4 WINGS					2,085 LBS



CLASS A CONCRETE		
4 WINGS	26.6	CY
2 HEADWALLS	2.0	CY
2 END CURTAIN WALLS	2.2	CY
<b>TOTAL</b>	<b>30.8</b>	<b>CY</b>

PROJECT NO. R-2707D

CLEVELAND COUNTY

STATION: 743+18.00 -L-

SHEET 5 OF 5

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

**WINGS FOR CONCRETE BOX CULVERT**  
H = 8'-0" SLOPE = 2:1  
66° SKEW



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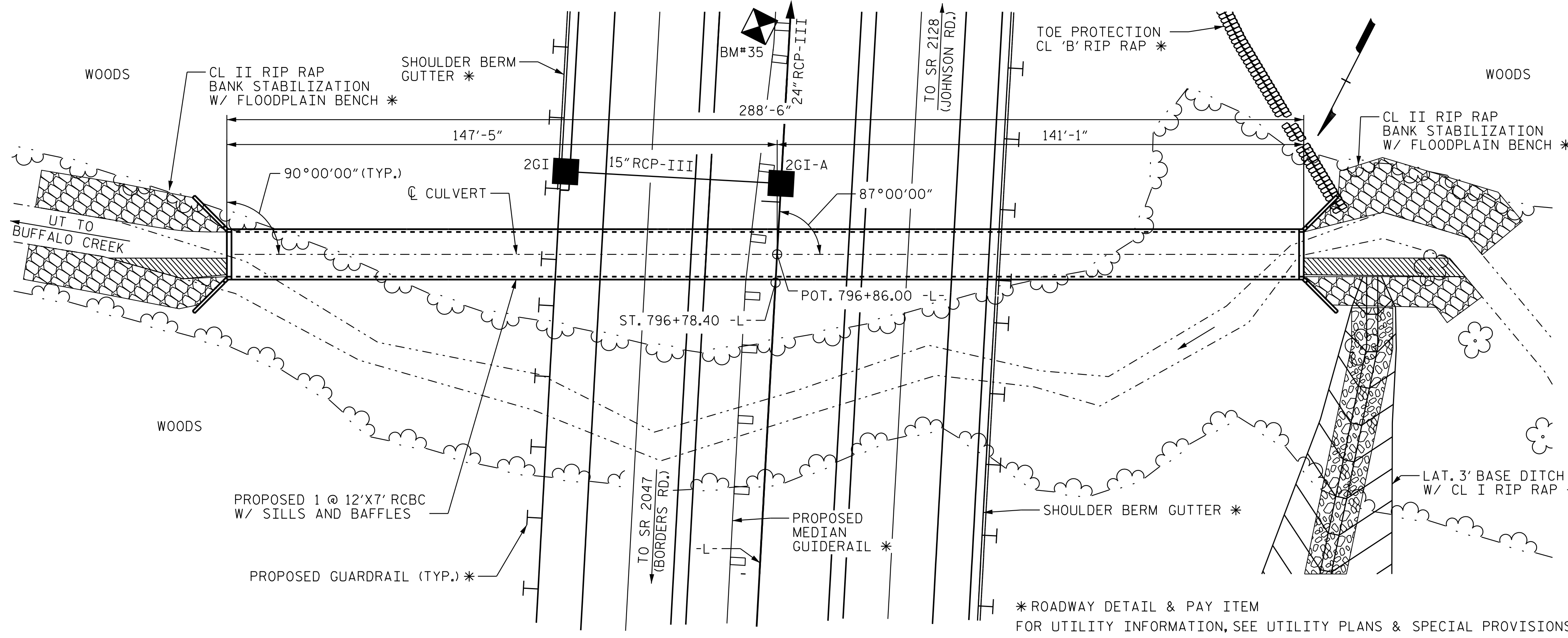
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www.stantec.com  
License No. F-0672

ASSEMBLED BY: J. B. GEILE DATE: 02/20/23  
CHECKED BY: M. B. ISENHOUR DATE: 02/22/23  
DESIGN ENGINEER OF RECORD: M. B. ISENHOUR DATE: 04/18/23

4/18/2023 jgeille C:\Users\jgeille\documents\pwr\working\mms5559\2707D\_SMLL\_CU\_05\_2200C2.dgn



BM #35: 8" NAIL IN TOP OF 8" BEECH STUMP, STA. 797+46.66 -L-, 8.12' LT. EL. 697.69



LOCATION SKETCH

ROADWAY DATA

GRADE POINT ELEV. @ STA. 796+86.00 -L- = 722.43  
 BED ELEV. @ STA. 796+86.00 -L- = 671.74  
 ROADWAY SLOPES = 2:1

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE = >550 C.F.S.  
 FREQUENCY OF OVERTOPPING FLOOD = >500 YR.  
 OVERTOPPING FLOOD ELEVATION = 719.50

HYDRAULIC DATA

DESIGN DISCHARGE = 450 C.F.S.  
 FREQUENCY OF DESIGN FLOOD = 50 YR.  
 DESIGN HIGH WATER ELEVATION = 680.00  
 DRAINAGE AREA = 0.43 SQ. MI.  
 BASIC DISCHARGE (Q100) = 470 C.F.S.  
 BASIC HIGH WATER ELEVATION = 680.20

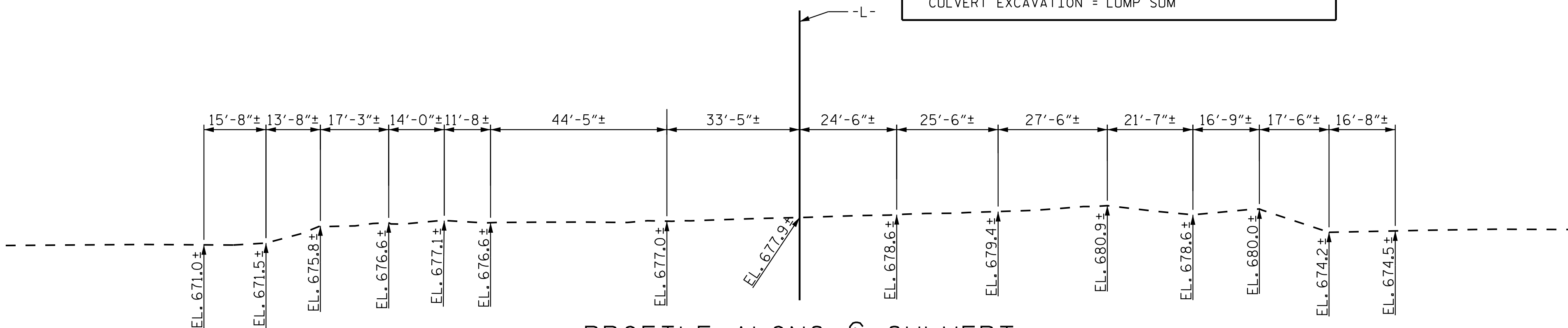
TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE	
BARREL @ 2,351 CY/FT	678.4 C.Y.
SILLS	8.2 C.Y.
WINGS, ETC.	24.8 C.Y.
TOTAL	711.4 C.Y.

REINFORCING STEEL	
BARREL	111,974 LBS.
WINGS, ETC.	1,530 LBS.
TOTAL	113,504 LBS.

FOUNDATION CONDITIONING MATERIAL = 357 TONS

CULVERT EXCAVATION = LUMP SUM



NOTES

- ASSUMED LIVE LOAD ----- HL-93 OR ALTERNATE LOADING.
- DESIGN FILL----- 44.01 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 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 CONTRACTORS 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.
- NO PRECAST REINFORCED BOX CULVERT OPTION WILL BE ALLOWED.
- 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.
- DETAILED DRAWINGS FOR FALSEWORK AND FORMS FOR THIS SINGLE BARREL 12 FT. X 7 FT. REINFORCED CONCRETE BOX CULVERT SHALL BE SUBMITTED. SEE SHEET (SN).
- FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.
- 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.
- THE ENTIRE COST OF WORK REQUIRED TO PLACE EXCAVATED OR SUPPLEMENTAL MATERIAL AS SHOW ON THE PLANS SHALL BE INCLUDED IN THE LUMP SUM PRICE FOR CULVERT EXCAVATION.

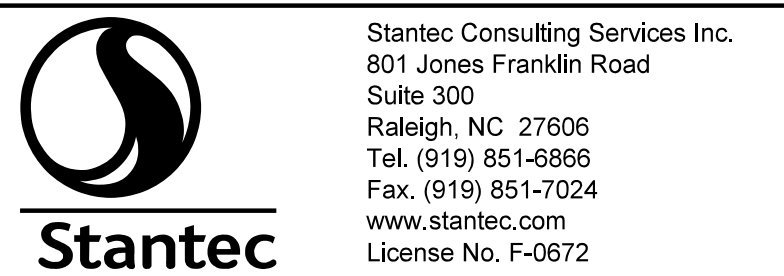
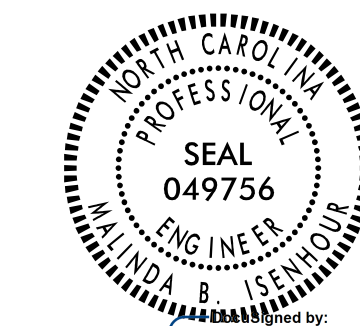
FOUNDATION NOTES

- EXCAVATE FOUNDATION A MINIMUM OF 1.0 FT. BELOW CULVERT BEARING ELEVATION. PLACE 1.0 FT. OF CLASS VI FOUNDATION CONDITIONING MATERIAL IN ACCORDANCE WITH SECTION 414 OF THE STANDARD SPECIFICATIONS.
- OVEREXCAVATE LOOSE/SOFT MATERIAL IF PRESENT TO SUITABLE BEARING MATERIALS AND REPLACE WITH ADDITIONAL CLASS VI FOUNDATION CONDITIONING MATERIAL.

PROJECT NO. R-2707D  
 CLEVELAND COUNTY  
 STATION: 796+86.00 -L-

SHEET 1 OF 5

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 BARREL STANDARD  
 SINGLE 12 FT. X 7 FT.  
 CONCRETE BOX CULVERT  
 87° SKEW



ASSEMBLED BY: J. B. GEILE DATE: 07/10/18  
 CHECKED BY: V. E. FRAGA DATE: 02/17/23  
 DRAWN BY: R. W. WRIGHT DATE: AUG. 1989  
 CHECKED BY: A. R. BISSETTE DATE: AUG. 1989

SPECIAL STANDARD  
 DESIGN ENGINEER OF RECORD: M. B. ISENHOUR DATE: 04/18/23

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

PERMANENT LOAD FACTORS:

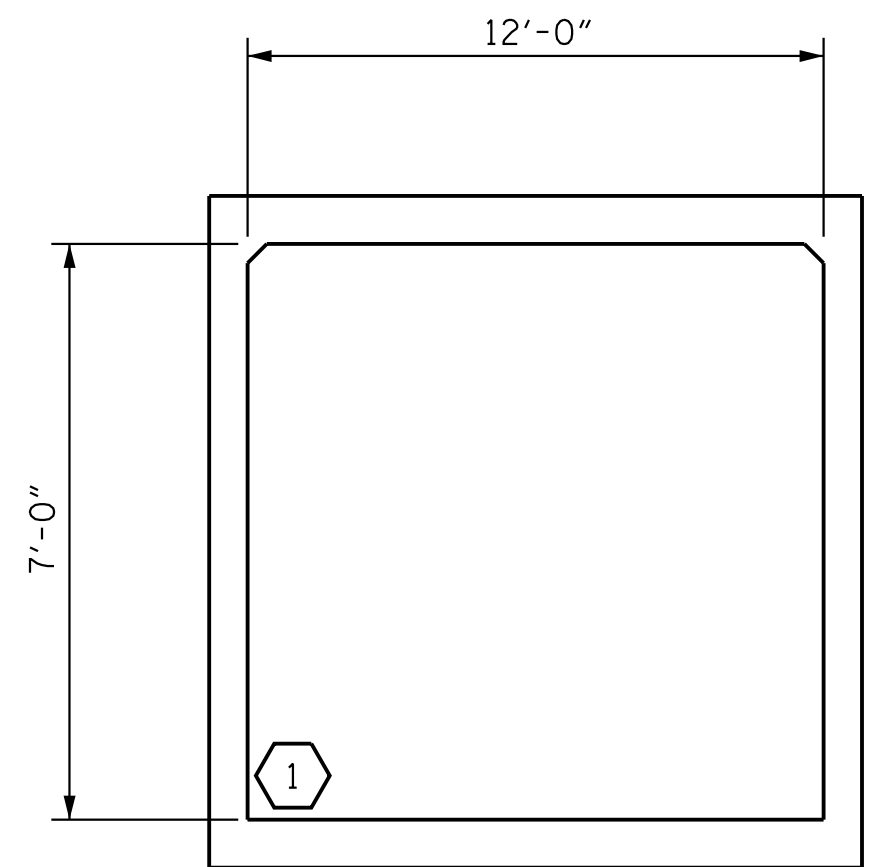
LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
WA	1.00	--

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	1.05	1.08	1	TOP SLAB (MID)	6.00	1.07	1	LEFT END - BOTT. SLAB	0.00

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-2707D  
CLEVELAND COUNTY  
STATION: 796+86.00 -L-

SHEET 2 OF 5



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



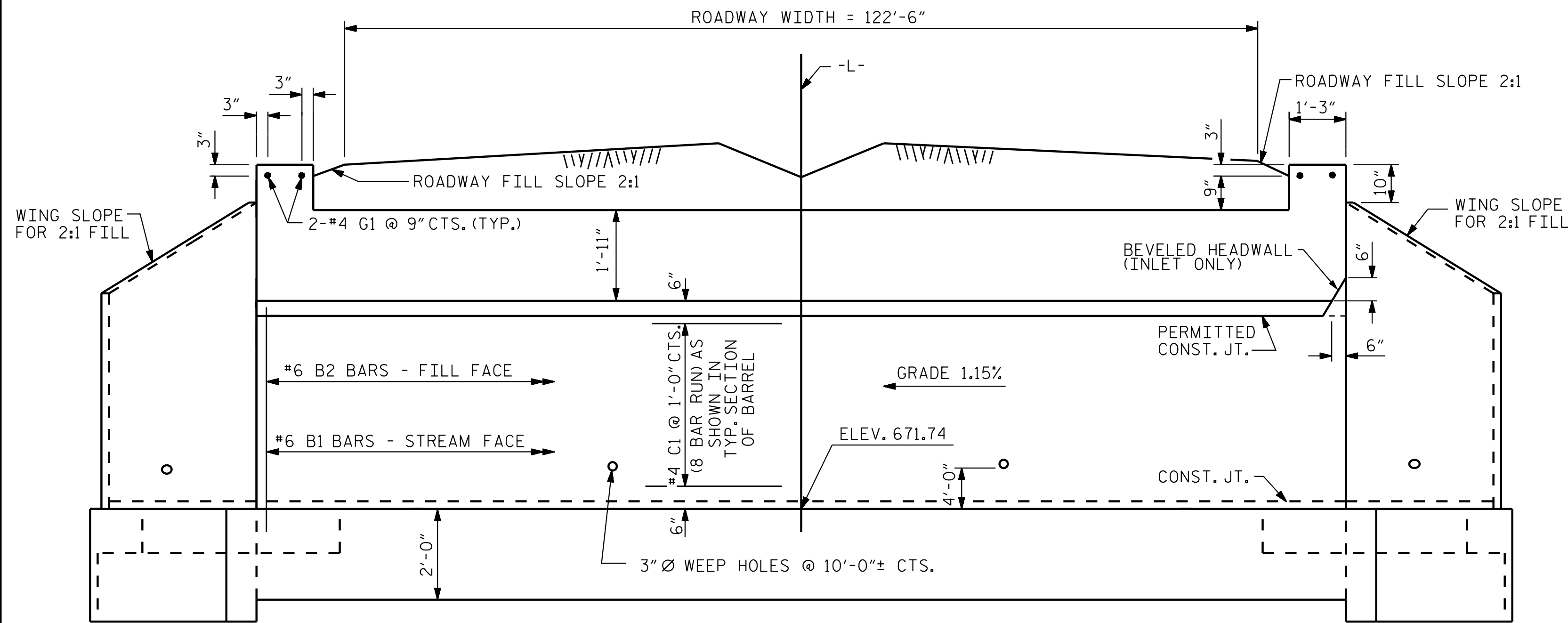
ASSEMBLED BY : J. B. GEILE DATE : 07/18/18  
CHECKED BY : V. E. FRAGA DATE : 02/17/23  
DRAWN BY : WMC 7/II  
CHECKED BY : GM 7/II

REV. 10/1/11 MAA/GM  
REV. 12/17 MAA/THC  
DESIGN ENGINEER OF RECORD: M. B. ISENHOUR DATE : 04/18/23

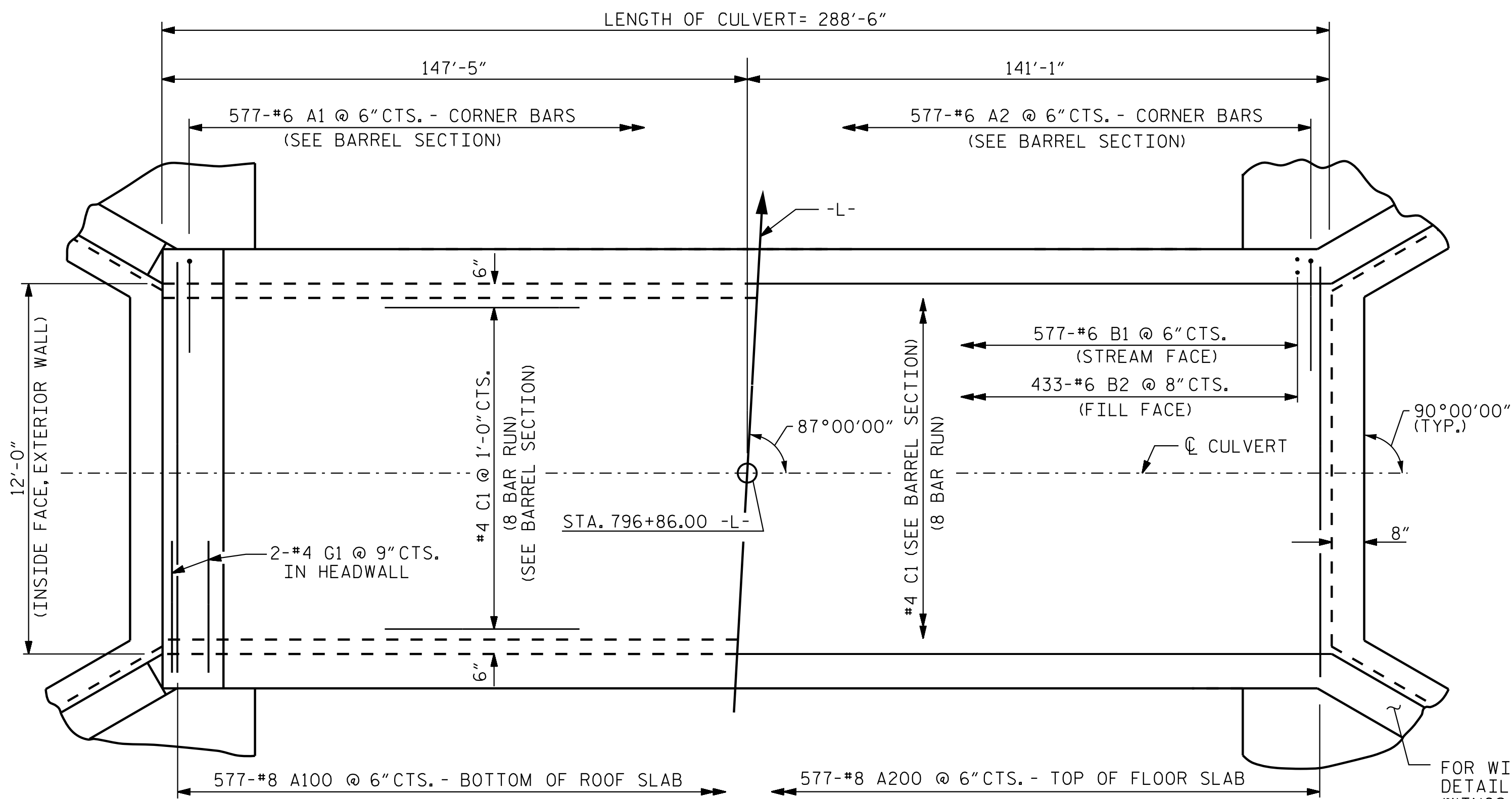
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FINAL UNLESS ALL  
SIGNATURES COMPLETED

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2			4			



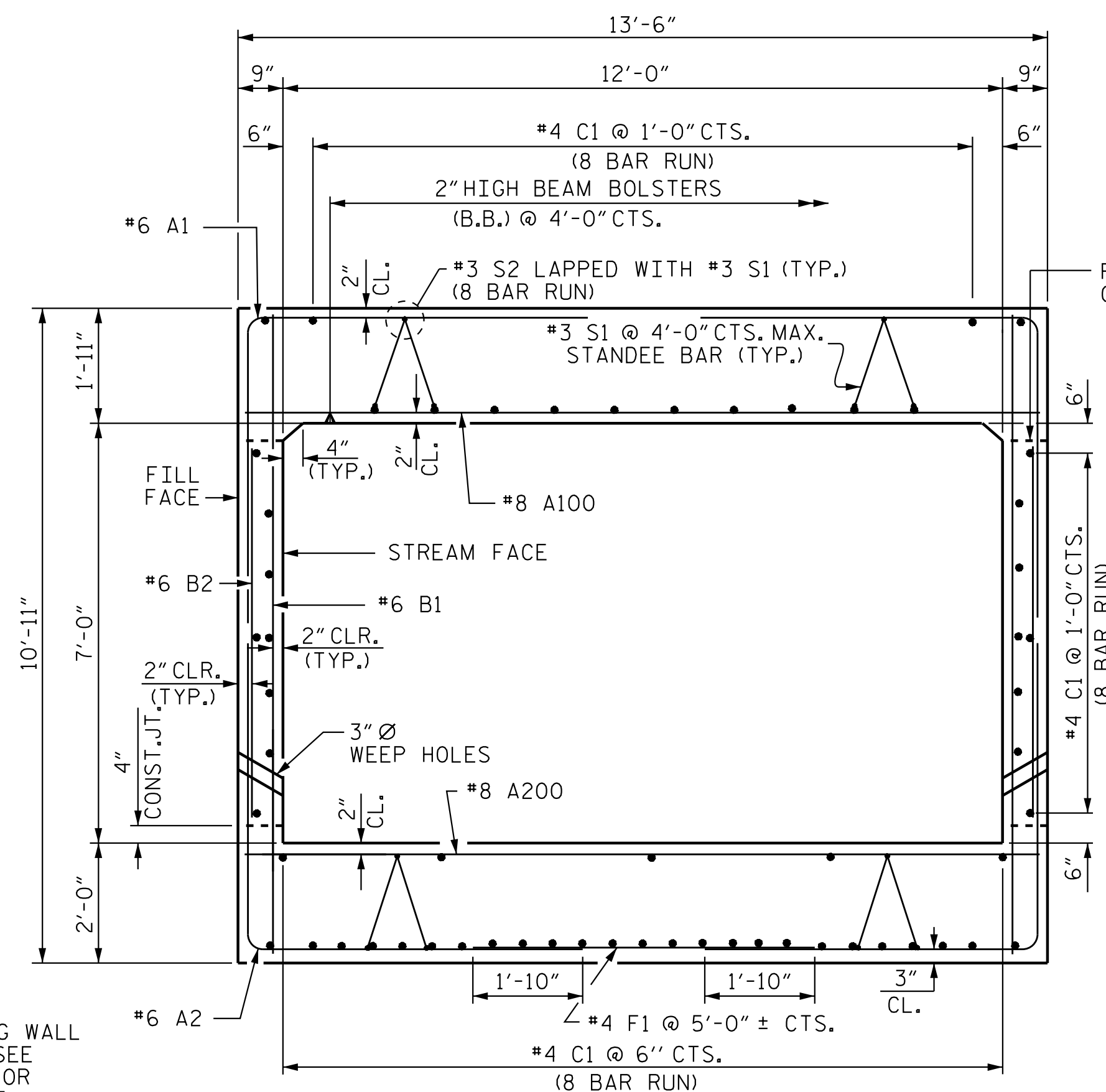


**CULVERT SECTION NORMAL TO ROADWAY**

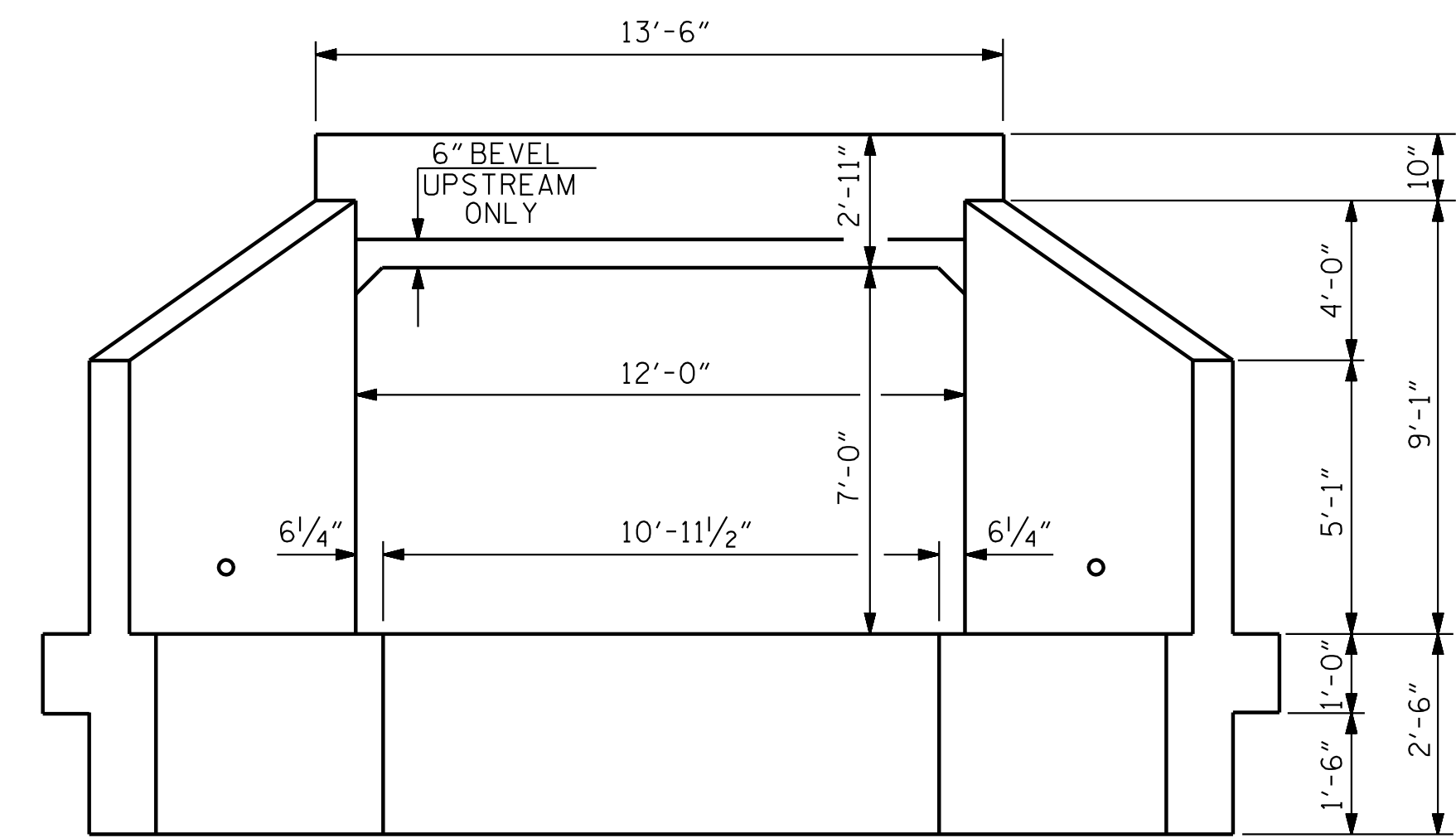


**PART PLAN ROOF SLAB**

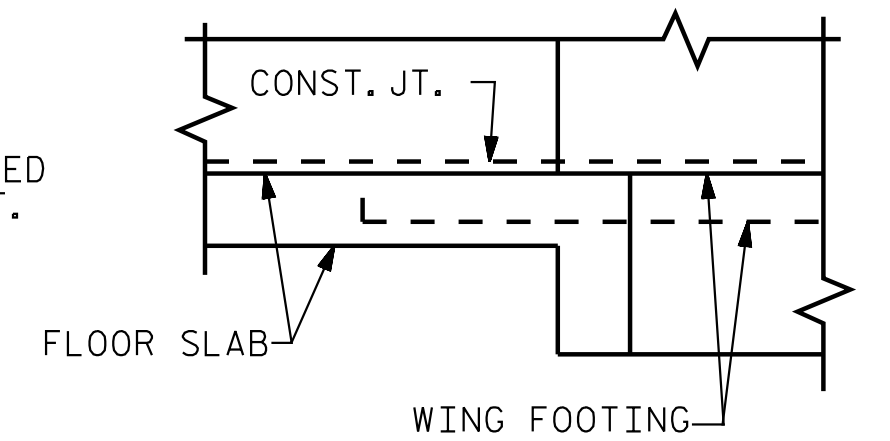
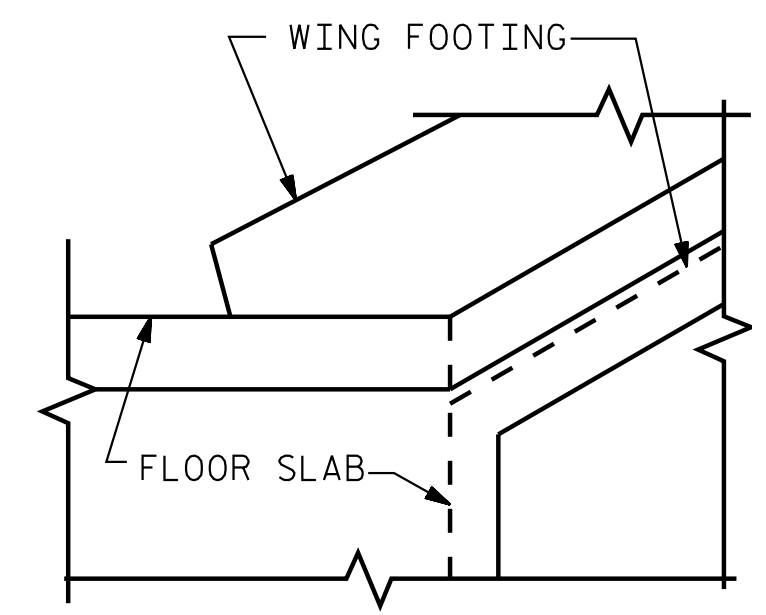
**PART PLAN FLOOR SLAB**



**RIGHT ANGLE SECTION OF BARREL**  
THERE ARE 60 C1 BARS IN SECTION OF BARREL



**END ELEVATION**  
(LOOKING DOWNSTREAM) (SILLS NOT SHOWN FOR CLARITY)



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

PROJECT NO. R-2707D  
CLEVELAND COUNTY  
STATION: 796+86.00 -L-

SHEET 3 OF 5

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
**BARREL STANDARD**  
**SINGLE 12 FT. X 7 FT.**  
**CONCRETE BOX CULVERT**  
**87° SKEW**



DESIGN NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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

TOTAL SHEETS: 5



ASSEMBLED BY: J. B. GEILE DATE: 07/11/18  
CHECKED BY: V. E. FRAGA DATE: 02/17/23  
DRAWN BY: R. WRIGHT DATE: AUG. 1989  
CHECKED BY: A.R. BISSETTE DATE: AUG. 1989

**SPECIAL**

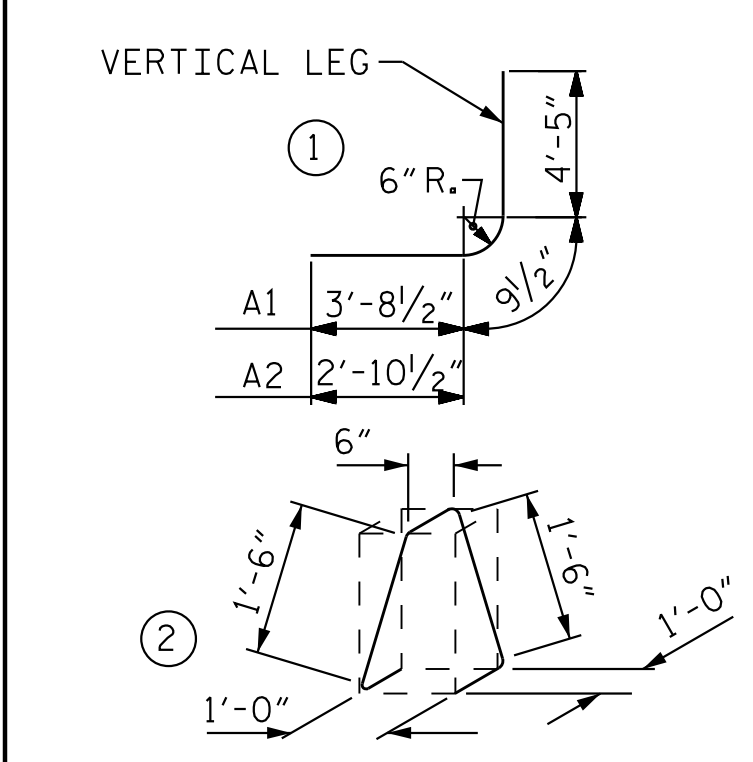
**STANDARD**

DESIGN ENGINEER OF RECORD: M. B. ISENHOUR DATE: XX/XX/XX

REVISED 8-28-92 BY E.L.R. CHECKED BY G.R.P.  
REVISED 8-22-89 BY A.R.B. CHECKED BY C.R.K.  
REVISED 11-19-99 BY M.M. CHECKED BY R.W.W.

STR. C3

STD. NO. CB11



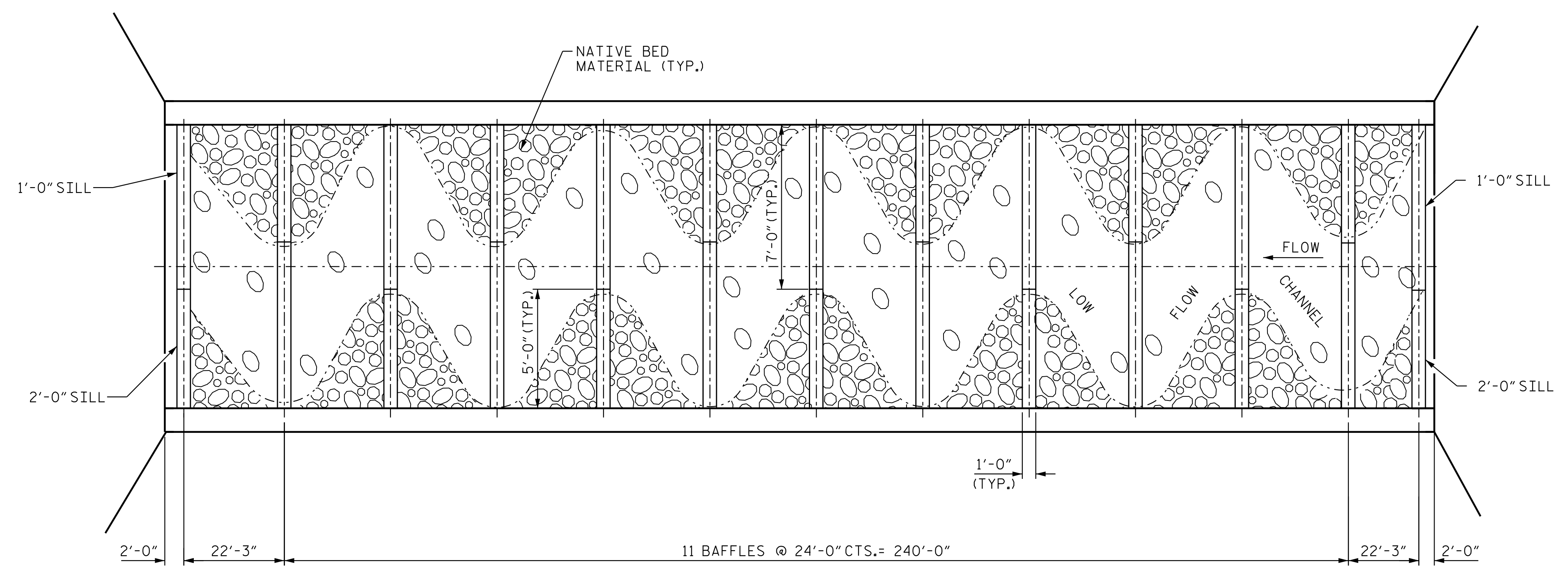
**BAR TYPES**

BAR DIMENSIONS ARE OUT TO OUT  
MIN. SPLICE LENGTHS CHART

BAR	SPLICE LENGTH
#3 S2	1'-5"
#4 C1	2'-5"
#6 A1	3'-7"
#6 A2, #6 B2	2'-9"

**BILL OF MATERIAL**

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	1154	#6	1	9'-8"	16,755
A2	1154	#6	1	8'-1"	14,011
A100	577	#8	STR.	13'-2"	20,284
A200	577	#8	STR.	13'-2"	20,284
B1	1154	#6	STR.	10'-7"	18,344
B2	866	#6	STR.	6'-5"	8,346
C1	480	#4	STR.	38'-2"	12,238
D1	26	#6	STR.	3'-7"	140
D2	26	#6	STR.	2'-7"	101
F1	58	#4	STR.	10'-1"	391
G1	4	#4	STR.	13'-2"	35
S1	288	#3	2	5'-6"	596
S2	32	#3	STR.	37'-4"	449
<b>REINFORCING STEEL</b>					<b>111,974 LBS.</b>

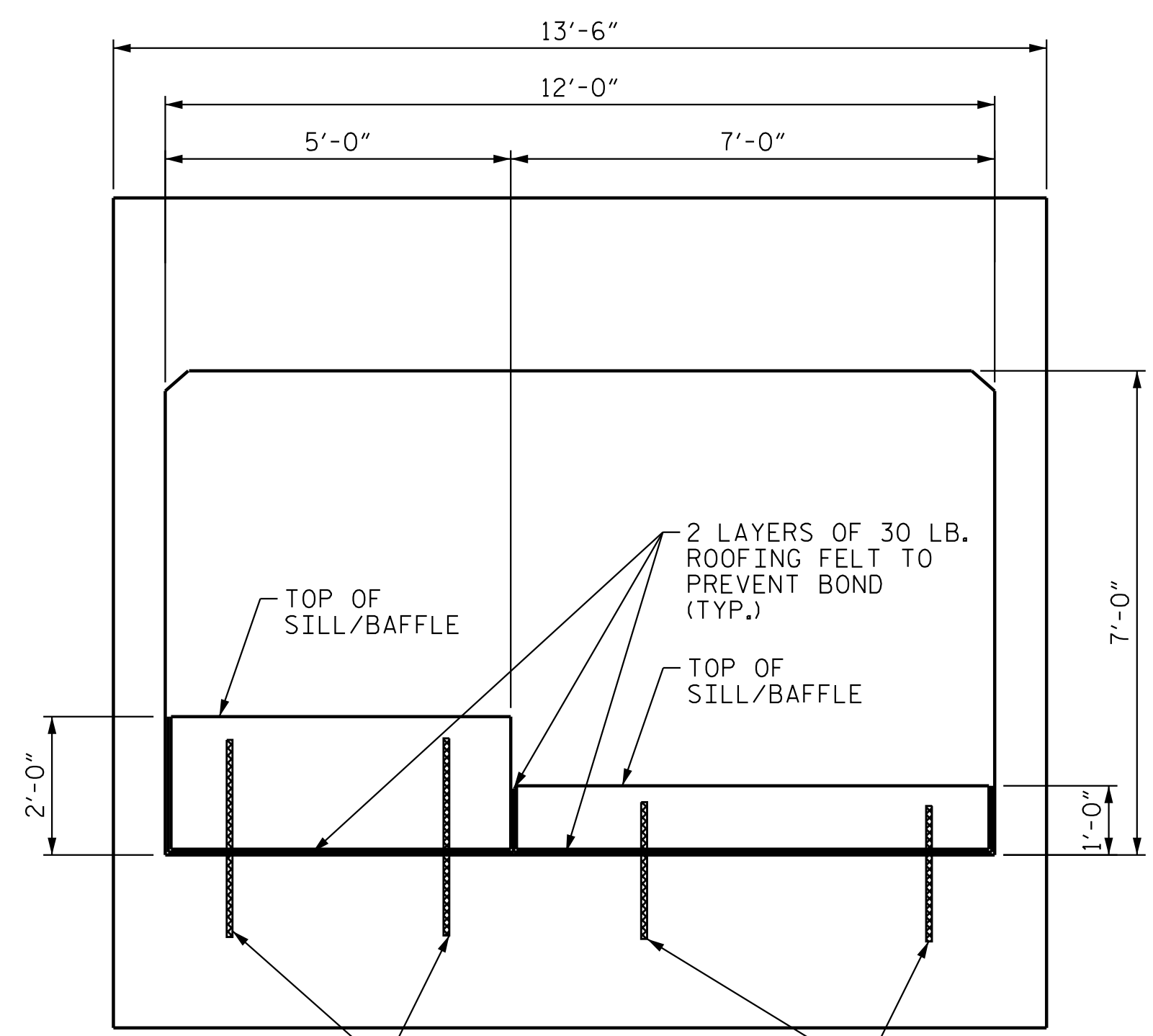


**PLAN VIEW**

NOTE: 2'-0" & 1'-0" SILLS & BAFFLES ARE STAGGERED.  
BACKFILL WITH NATIVE BED MATERIAL TO MATCH TOP OF LOW SILL/BAFFLE

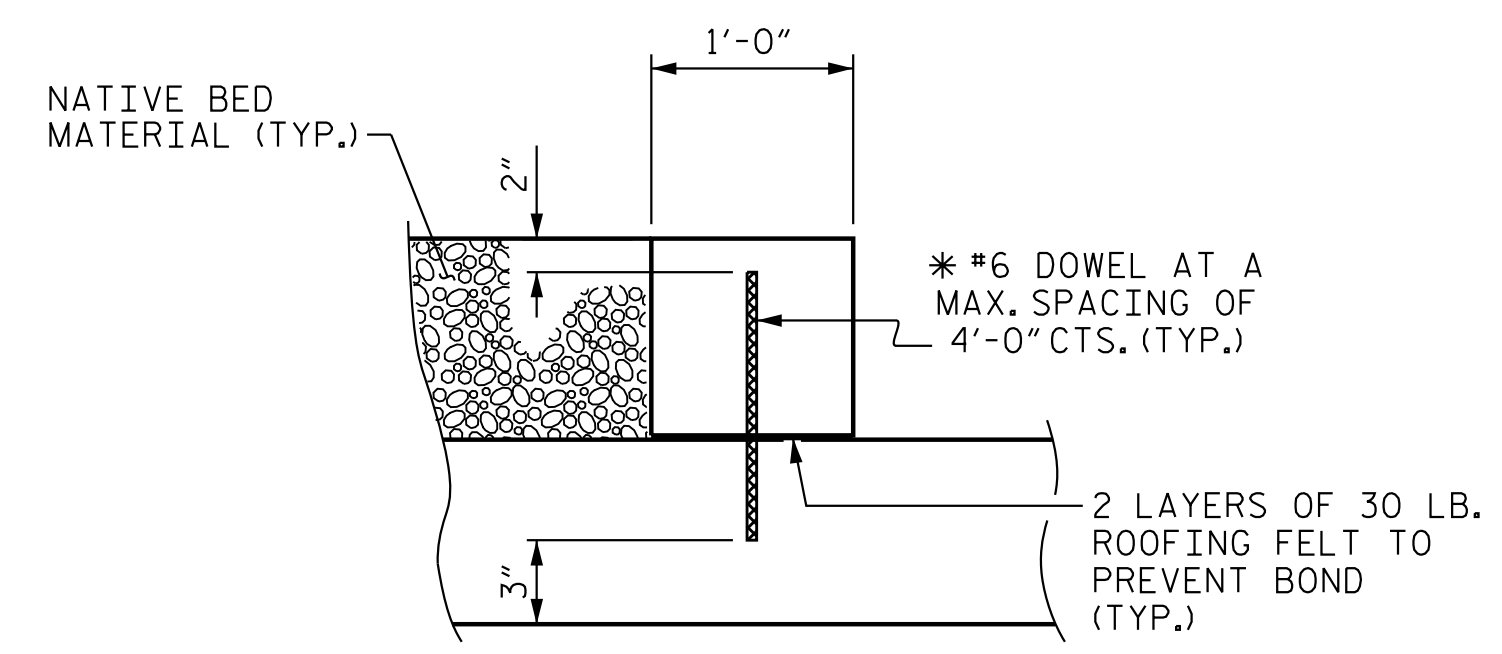
**NOTES:**

- 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 BED AT THE PROJECT SITE DURING CONSTRUCTION. NATIVE MATERIAL IS SUBJECT TO APPROVAL BY THE ENGINEER AND MAY BE SUBJECT TO PERMIT CONDITIONS.
- SILLS/BAFFLES ARE TO BE 1.0 FT. WIDE, CAST SEPARATELY AND ATTACHED BY DOWELS.
- TOP OF LOW FLOW SILLS/BAFFLES SHOULD MATCH STREAM BED ELEVATION IN LOW FLOW CHANNEL OF STREAM. (THALWEG)
- DO NOT SET ELEVATION OF HIGH SILL/BAFFLES ABOVE BANK FULL.



**SILL/BAFFLE DETAIL**  
(LOOKING DOWNSTREAM)

\* #6 D1 AT A MAX. SPACING OF 4'-0" CTS. (TYP.)  
\* #6 D2 AT A MAX. SPACING OF 4'-0" CTS. (TYP.)



**SECTION THROUGH SILL/BAFFLE**

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

**CULVERT SILL/BAFFLE DETAILS**

PROJECT NO. R-2707D  
CLEVELAND COUNTY  
STATION: 796+86.00 -L-

SHEET 4 OF 5

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

SINGLE 12 FT. X 7 FT.  
CONCRETE BOX CULVERT  
87° SKEW



REVISIONS

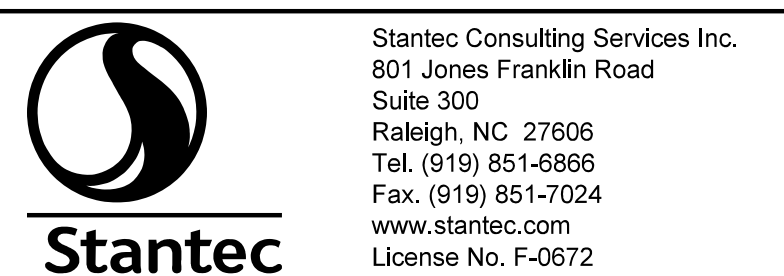
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SHEET NO. C3-04  
TOTAL SHEETS 5

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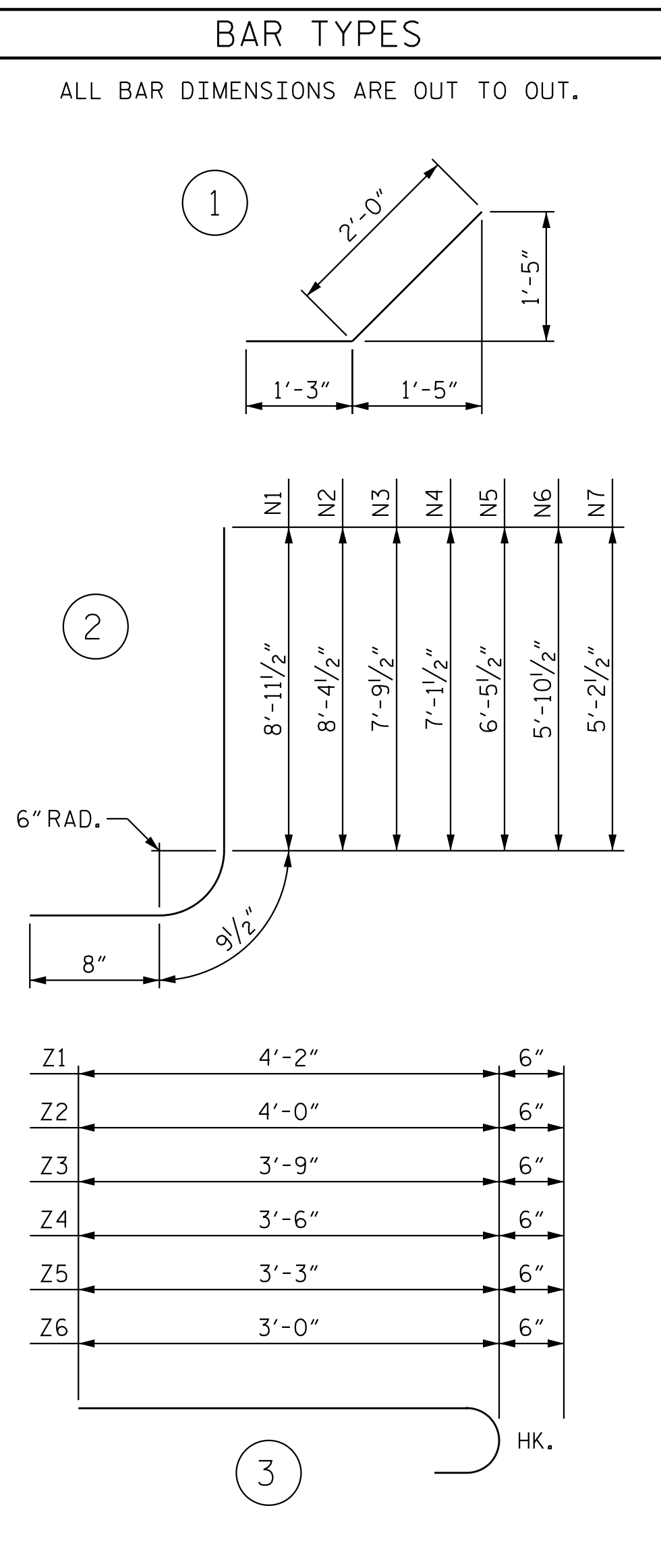
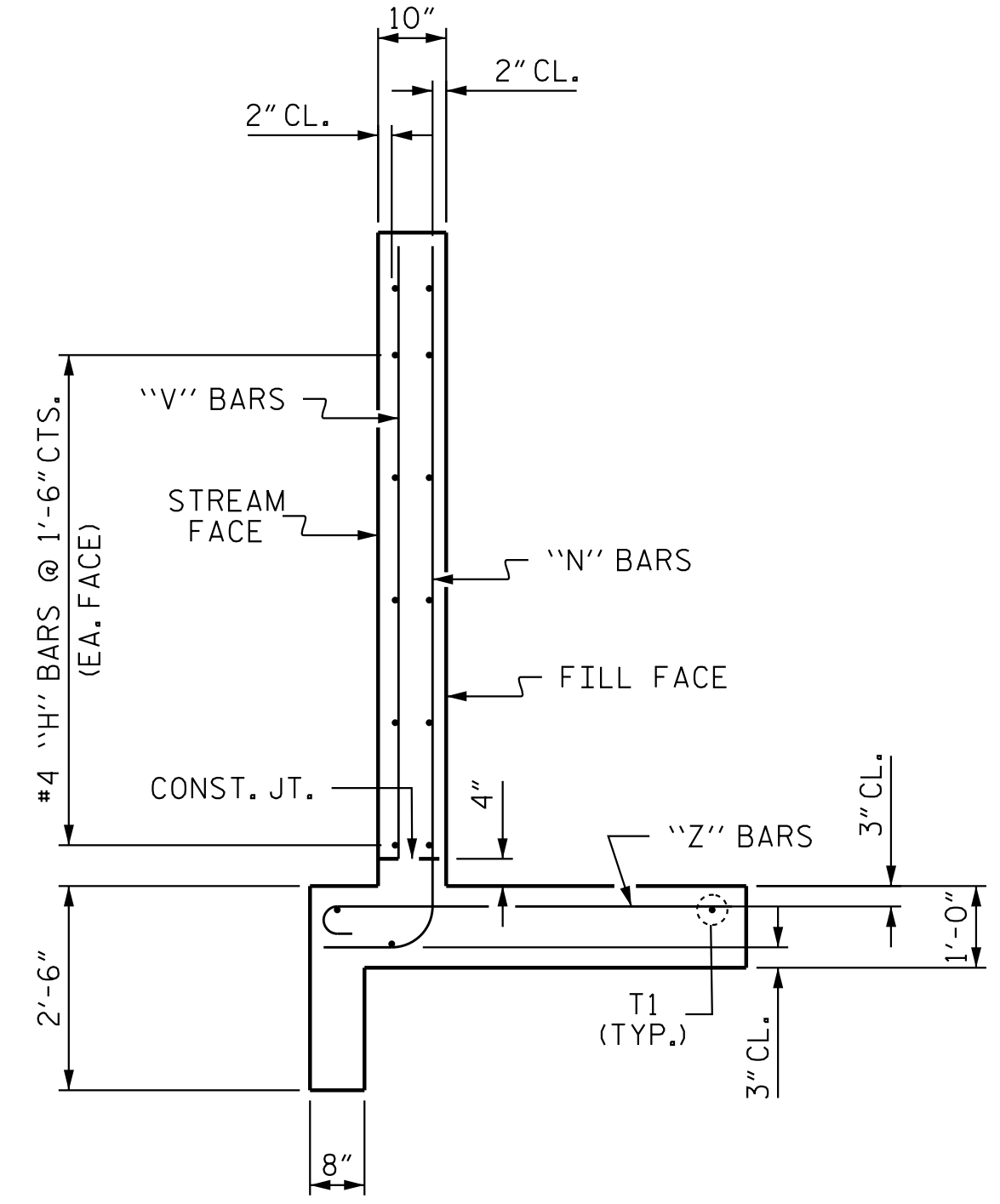
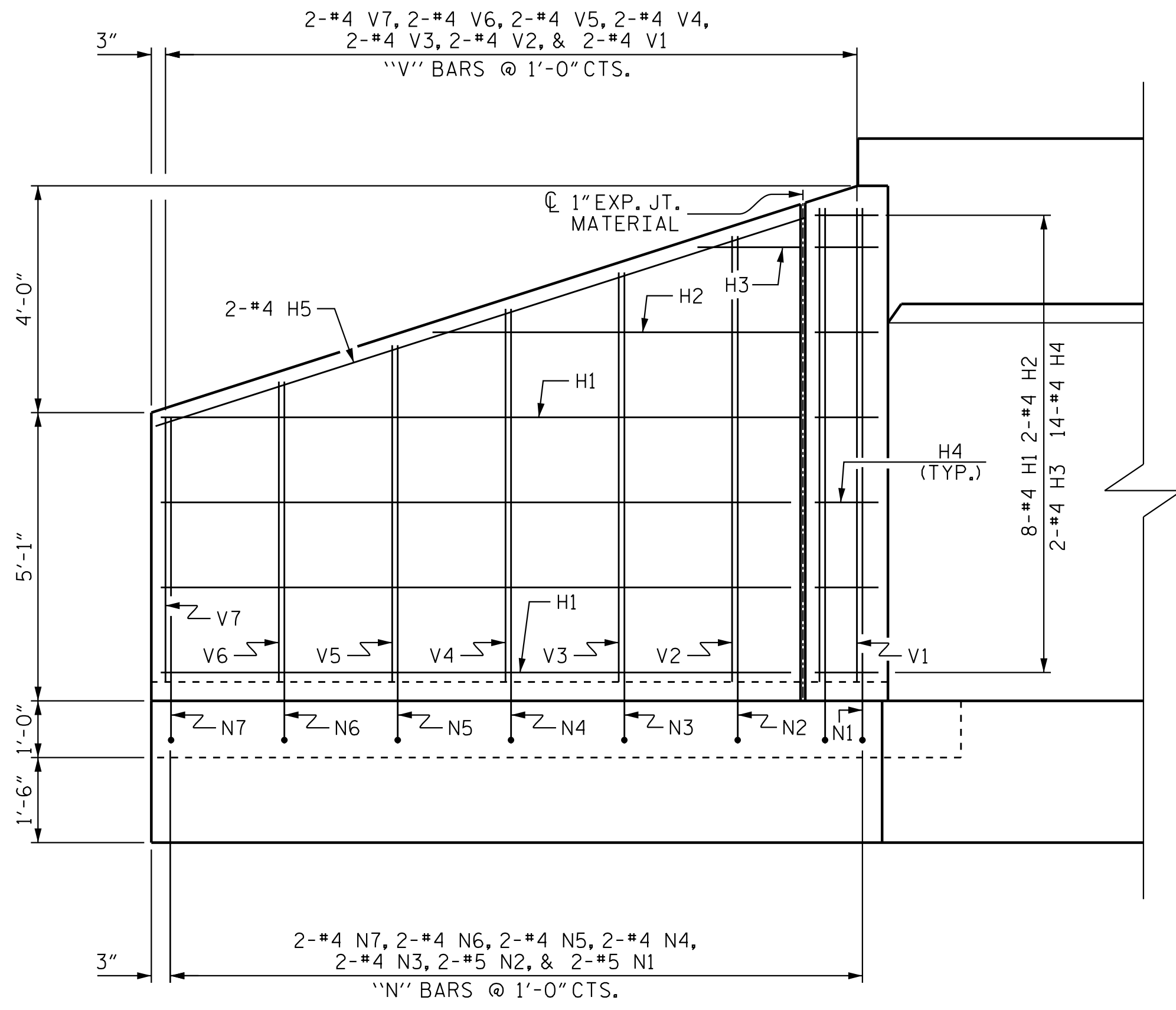
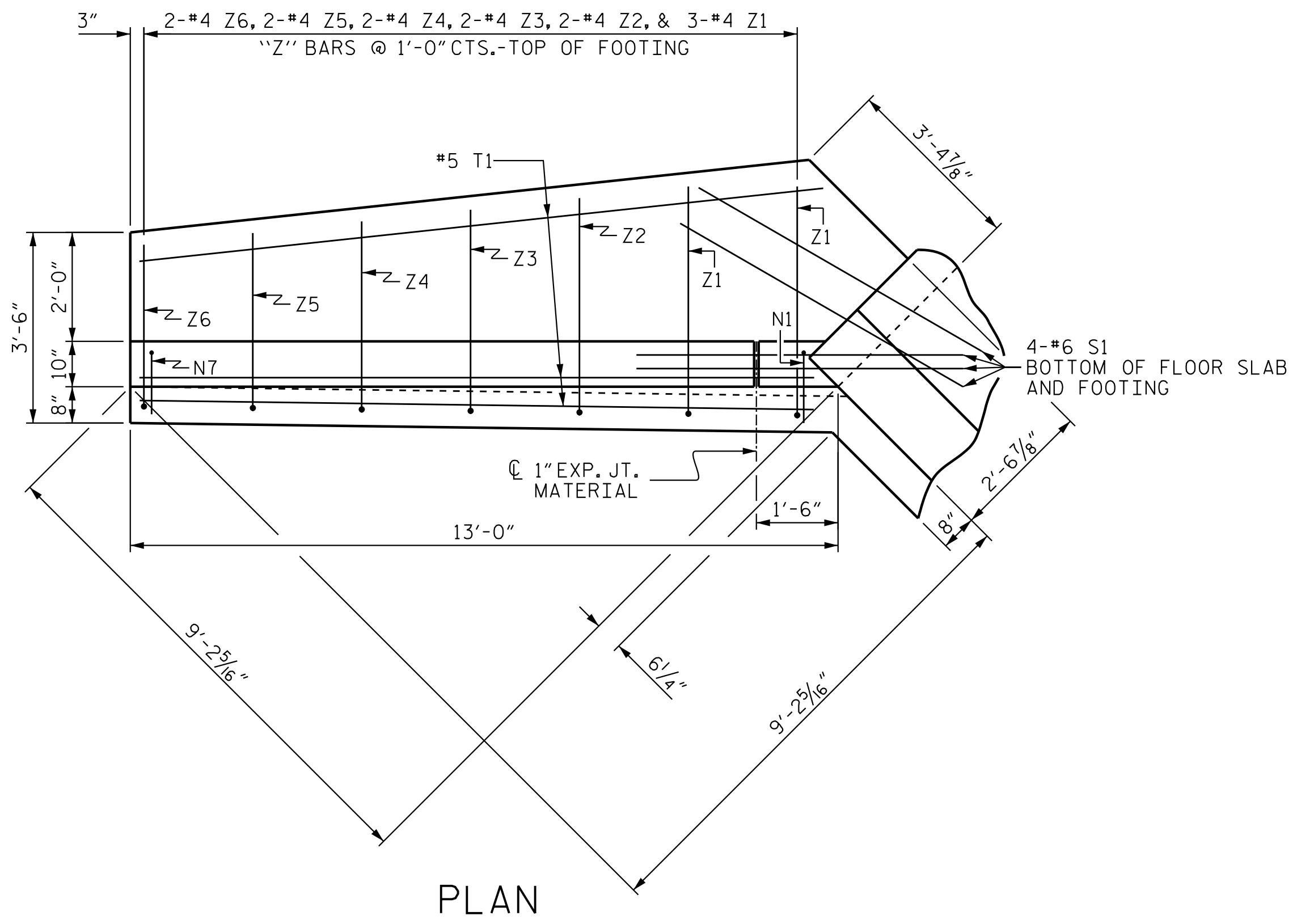
STR. C3

4/18/2023 5:20:17 PM jgeille  
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DRAWN BY: J. B. GEILE DATE: 06/27/18  
CHECKED BY: V. E. FRAGA DATE: 02/17/23  
DESIGN ENGINEER OF RECORD: M. B. ISENHOUR DATE: 04/18/23





BILL OF MATERIAL					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	32	#4	STR	11'-1"	237
H2	8	#4	STR	6'-3"	33
H3	8	#4	STR	1'-7"	8
H4	56	#4	1	3'-3"	122
H5	8	#4	STR	11'-8"	62
N1	8	#5	2	10'-5"	87
N2	8	#5	2	9'-10"	82
N3	8	#4	2	9'-3"	49
N4	8	#4	2	8'-7"	46
N5	8	#4	2	7'-11"	42
N6	8	#4	2	7'-4"	39
N7	8	#4	2	6'-8"	36
S1	16	#6	STR	6'-0"	144
T1	12	#5	STR	12'-5"	155
V1	8	#4	STR	8'-4"	45
V2	8	#4	STR	7'-10"	42
V3	8	#4	STR	7'-2"	38
V4	8	#4	STR	6'-7"	35
V5	8	#4	STR	5'-11"	32
V6	8	#4	STR	5'-3"	28
V7	8	#4	STR	4'-7"	24
Z1	12	#4	3	4'-8"	37
Z2	8	#4	3	4'-6"	24
Z3	8	#4	3	4'-3"	23
Z4	8	#4	3	4'-0"	21
Z5	8	#4	3	3'-9"	20
Z6	8	#4	3	3'-6"	19
TOTAL REINFORCING STEEL FOR 4 WINGS					1,530 LBS
CLASS A CONCRETE					
4 WINGS					22.1 CY
2 HEADWALLS					1.3 CY
2 END CURTAIN WALLS					1.4 CY
TOTAL					24.8 CY

PROJECT NO. R-2707D  
CLEVELAND COUNTY  
 STATION: 796+86.00 -L-

SHEET 5 OF 5

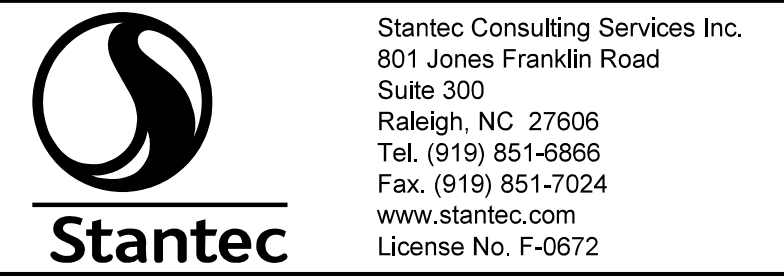
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

WINGS  
 FOR  
 CONCRETE BOX CULVERT  
 H = 7'-0" SLOPE = 2:1  
 87° SKEW



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1			3			TOTAL SHEETS	
2			4			5	

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ASSEMBLED BY : J. B. GEILE DATE : 07/11/18  
 CHECKED BY : V. E. FRAGA DATE : 02/17/23  
 DESIGN ENGINEER OF RECORD: M. B. ISENHOUR DATE : 04/18/23

4/18/2023  
 jgeille  
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