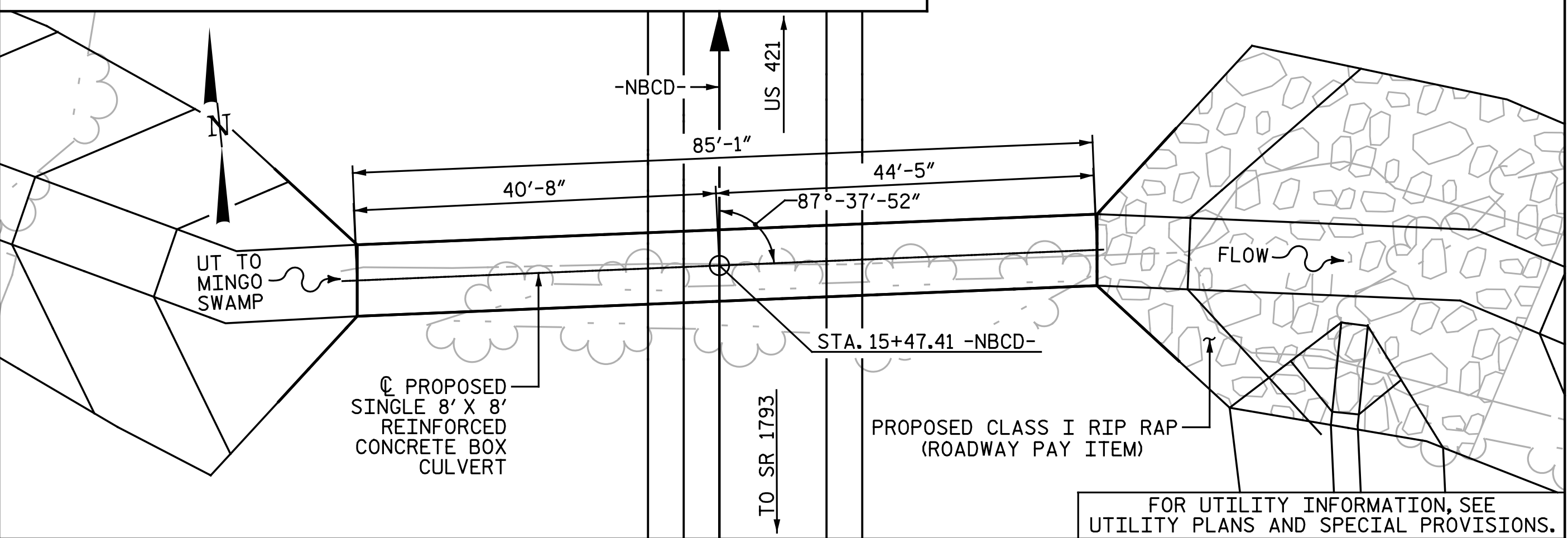


B.M. #62 - BENCH TIE SET IN 24" BEECH, STA. 27+31.89 -Y14-, 28.40' LEFT, EL. 198.28



LOCATION SKETCH

ROADWAY DATA

GRADE POINT ELEV. @ STATION 15+47.41 -NBCD-	= 192.51
BED ELEV. @ STATION 15+47.41 -NBCD-	= 177.10
ROADWAY SLOPES	= 4:1 (LEFT), 3:1 (RIGHT)

HYDRAULIC DATA

DESIGN DISCHARGE	= 340 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 100 YRS.
DESIGN HIGH WATER ELEVATION	= 184.40
DRAINAGE AREA	= 0.55 SQ. MI.
BASE DISCHARGE (Q100)	= 340 C.F.S.
BASE HIGH WATER ELEVATION	= 184.40

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 754 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 500+ YR.
OVERTOPPING FLOOD ELEVATION	= 189.20

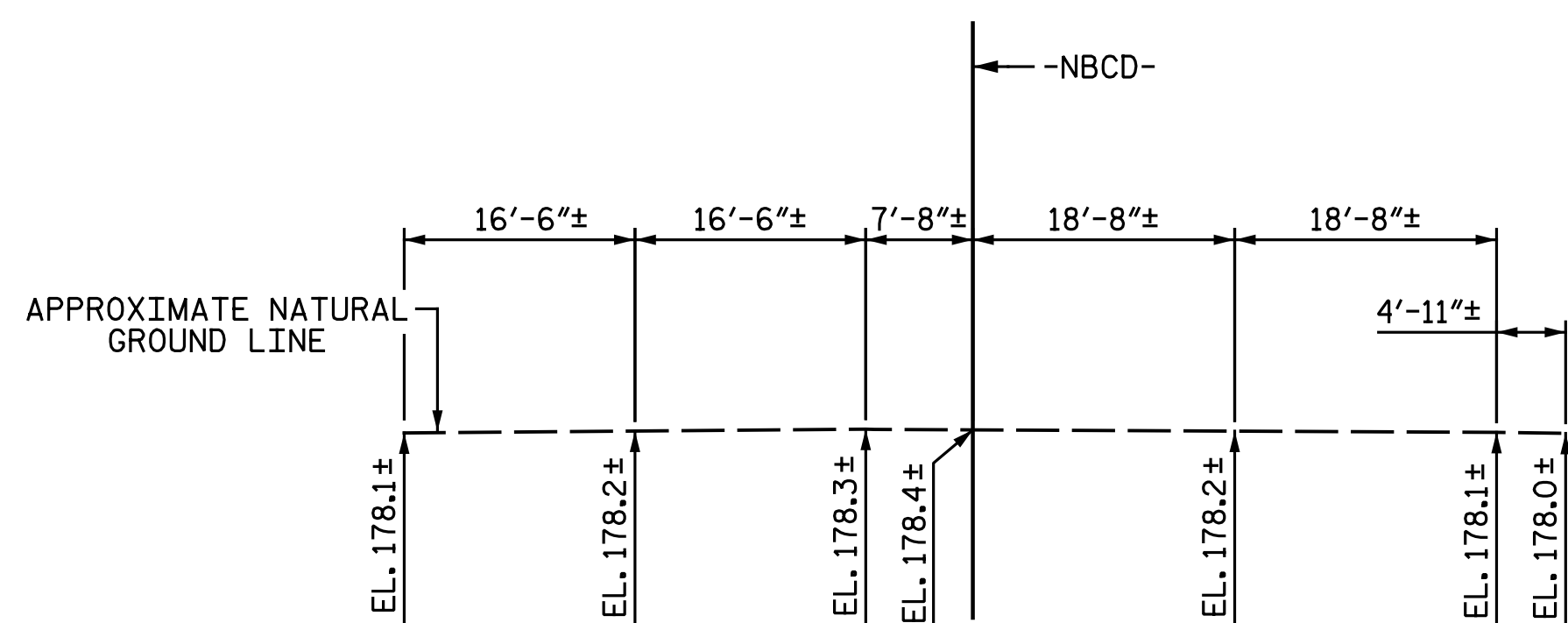
NOTE: OVERTOPS SP @ STA. -NBCD- 18+71.00 LT (SAG)

TOTAL STRUCTURE QUANTITIES

CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL 80 TONS	
CLASS A CONCRETE	
BARREL @ 0.918 CY/FT	78.1 C.Y.
WINGS ETC.	40.2 C.Y.
TOTAL	118.3 C.Y.
REINFORCING STEEL	
BARREL	11,430 LBS.
WINGS ETC.	2,718 LBS.
TOTAL	14,148 LBS.

NOTES:

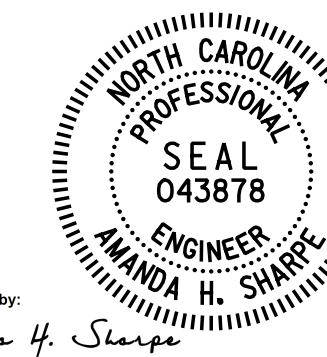
- ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
- MAXIMUM DESIGN FILL = 7.56'.
- MINIMUM DESIGN FILL = 7.12'.
- FOR OTHER DESIGN DATA AND NOTES SEE STANDARD NOTE SHEET.
- 3" Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:
 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.
- 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 GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.
- FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.
- FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.
- FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.



PROFILE ALONG CULVERT

PROJECT NO. I-5878
 HARNETT COUNTY
 STATION: 15+47.41 -NBCD-

SHEET 1 OF 3



DocuSigned by:
 Amanda H. Sharpe
 8106FFFAECEF4D2
 4/27/2021

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

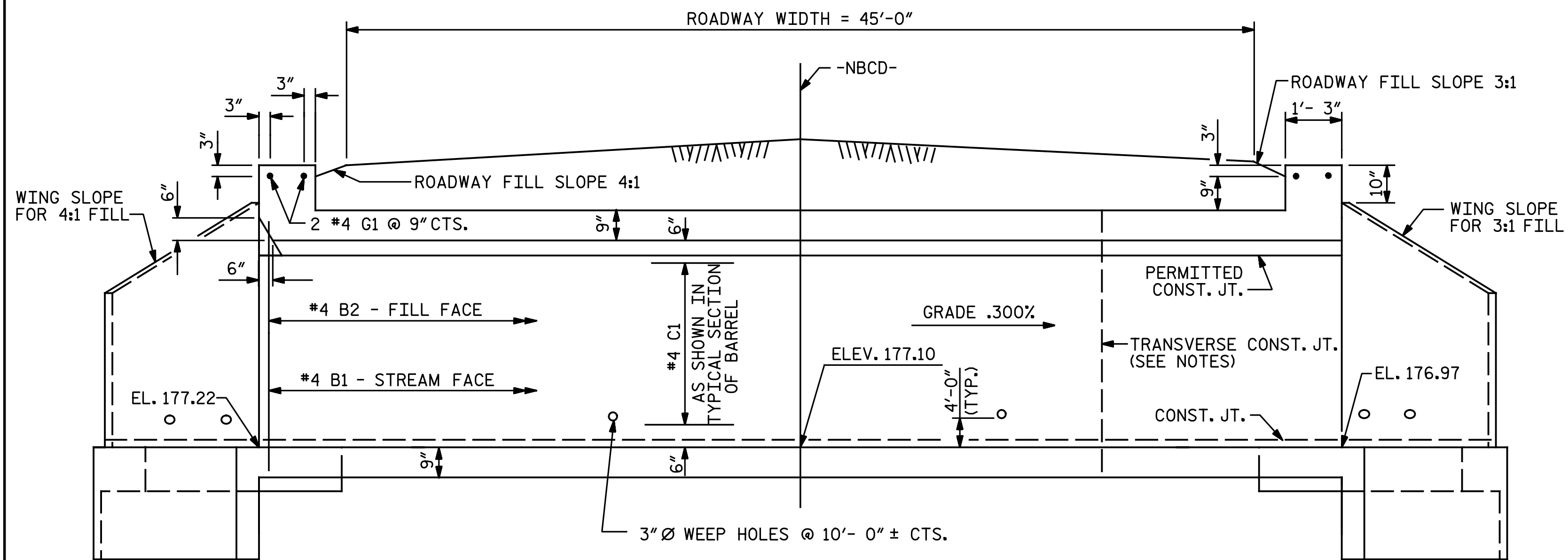
SINGLE 8 FT. X 8 FT.
 CONCRETE BOX CULVERT
 87°-37'-52" SKEW

DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED

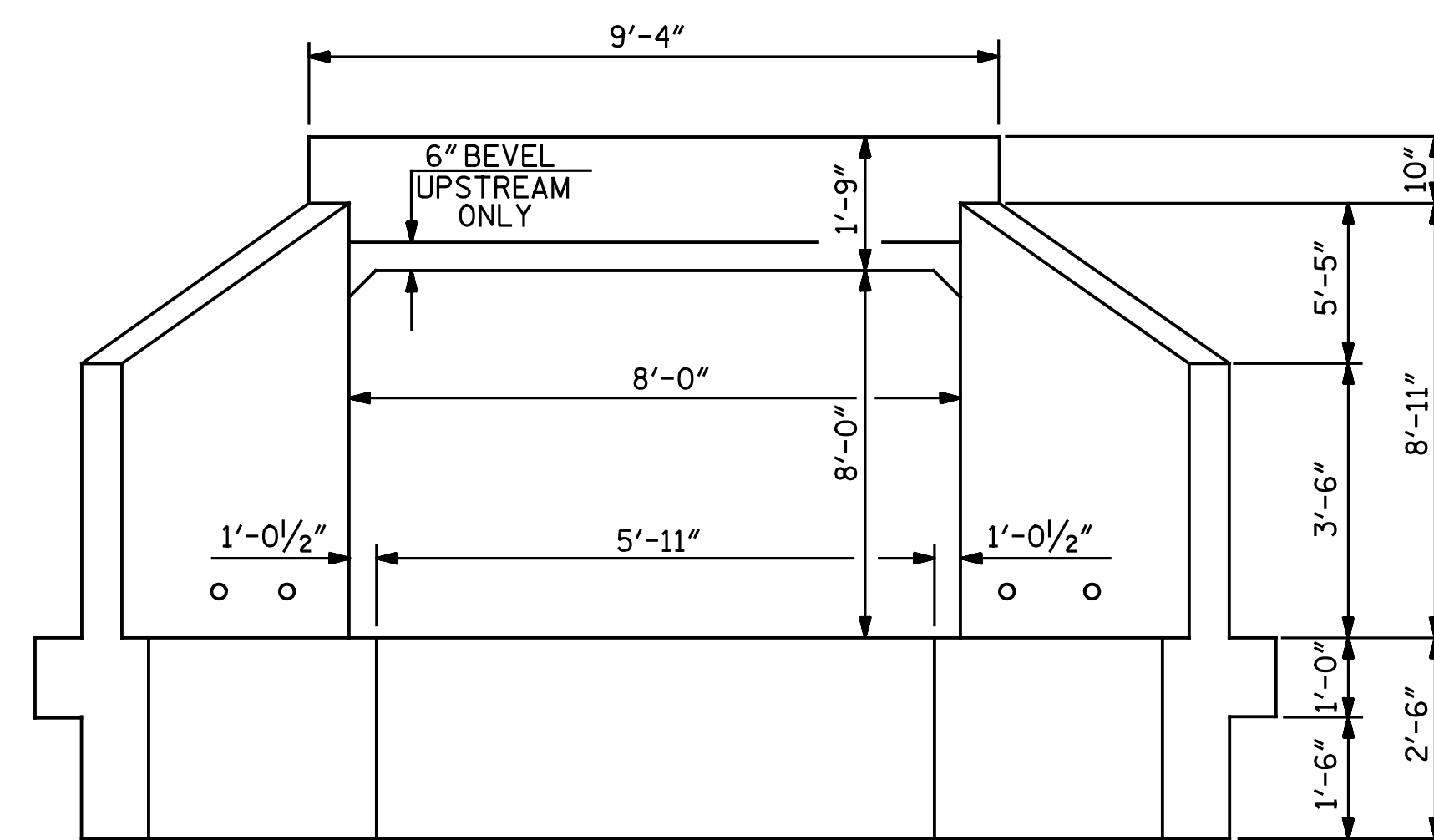
Michael Baker International
 Michael Baker Engineering
 8000 Regency Parkway, Suite 600
 Cary, North Carolina 27518
 NC License No.: F-1084

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

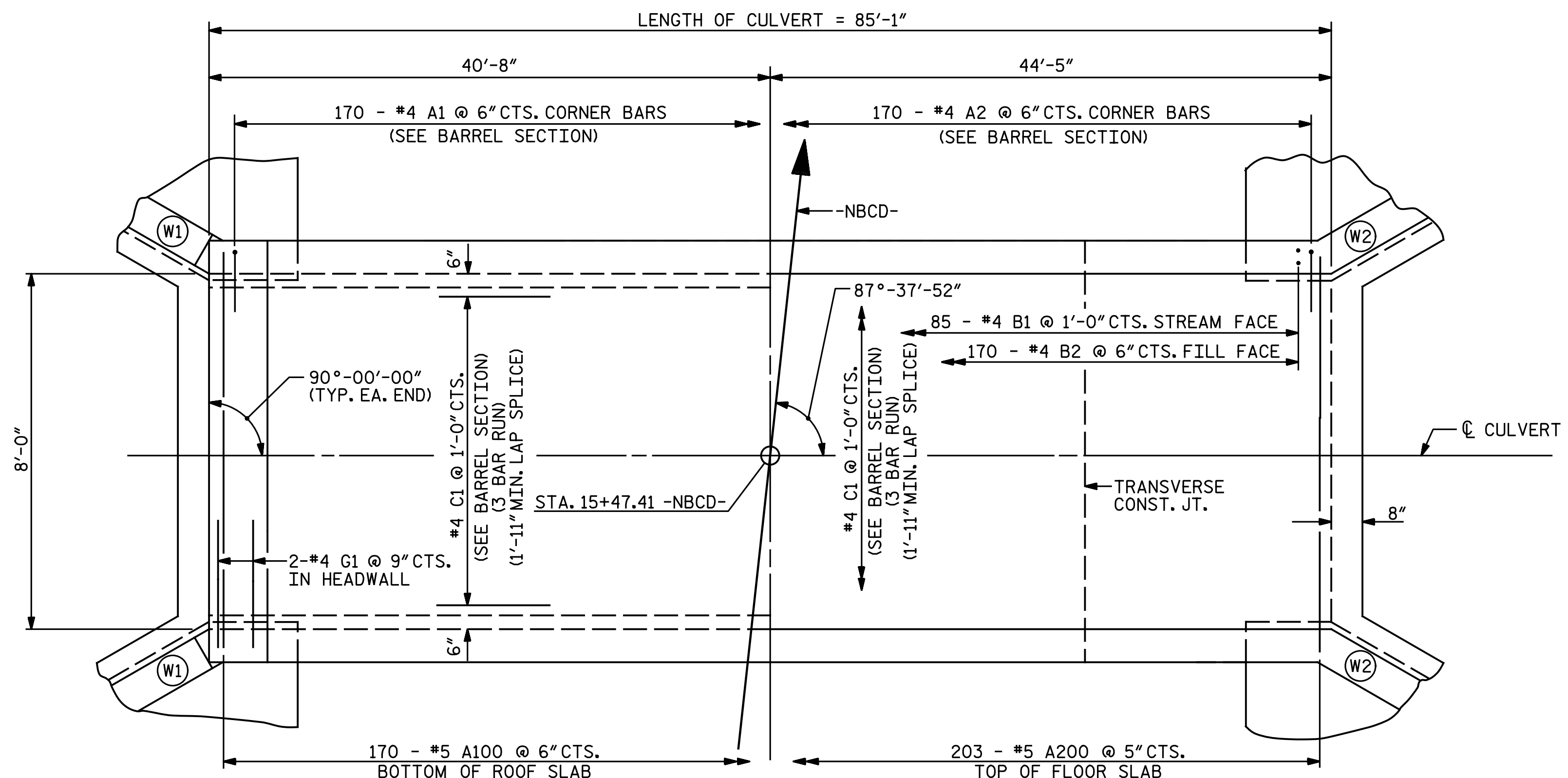
DRAWN BY: N. B. SPEAKS DATE: 1-29-20
 CHECKED BY: A. H. SHARPE DATE: 4-26-21



CULVERT SECTION NORMAL TO -NBCD-



END ELEVATION
(INLET END OF CULVERT SHOWN)



PART PLAN ROOF SLAB

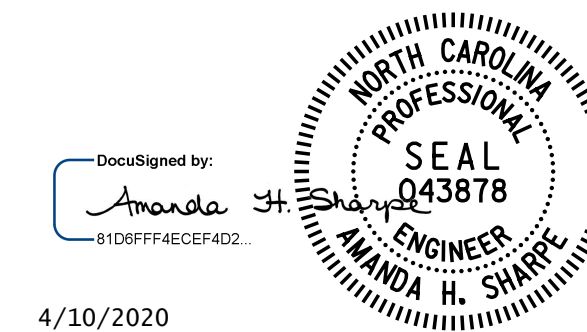
PART PLAN FLOOR SLAB

PROJECT NO. I-5878
HARNETT COUNTY
 STATION: 15+47.41 -NBCD-

SHEET 2 OF 3

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

SINGLE 8 FT. X 8 FT.
 CONCRETE BOX CULVERT
 87°-37'-52" SKEW



4/10/2020

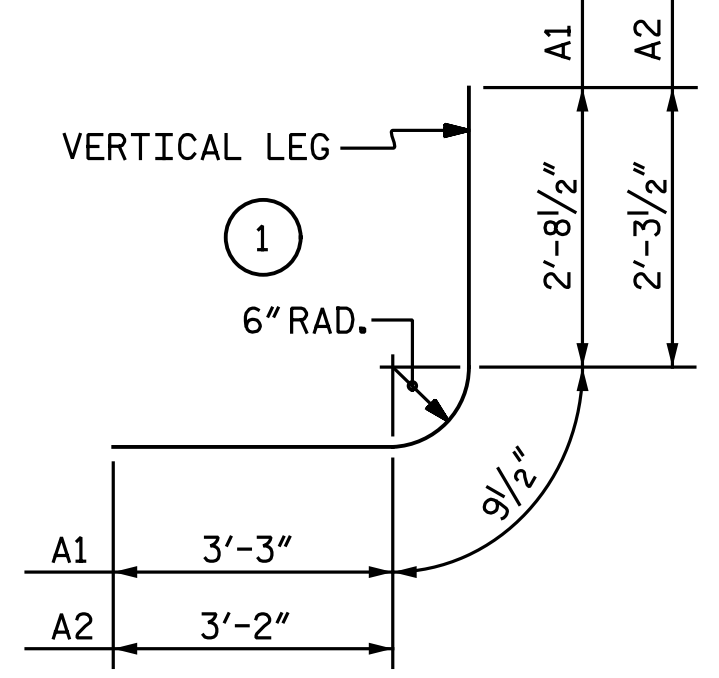
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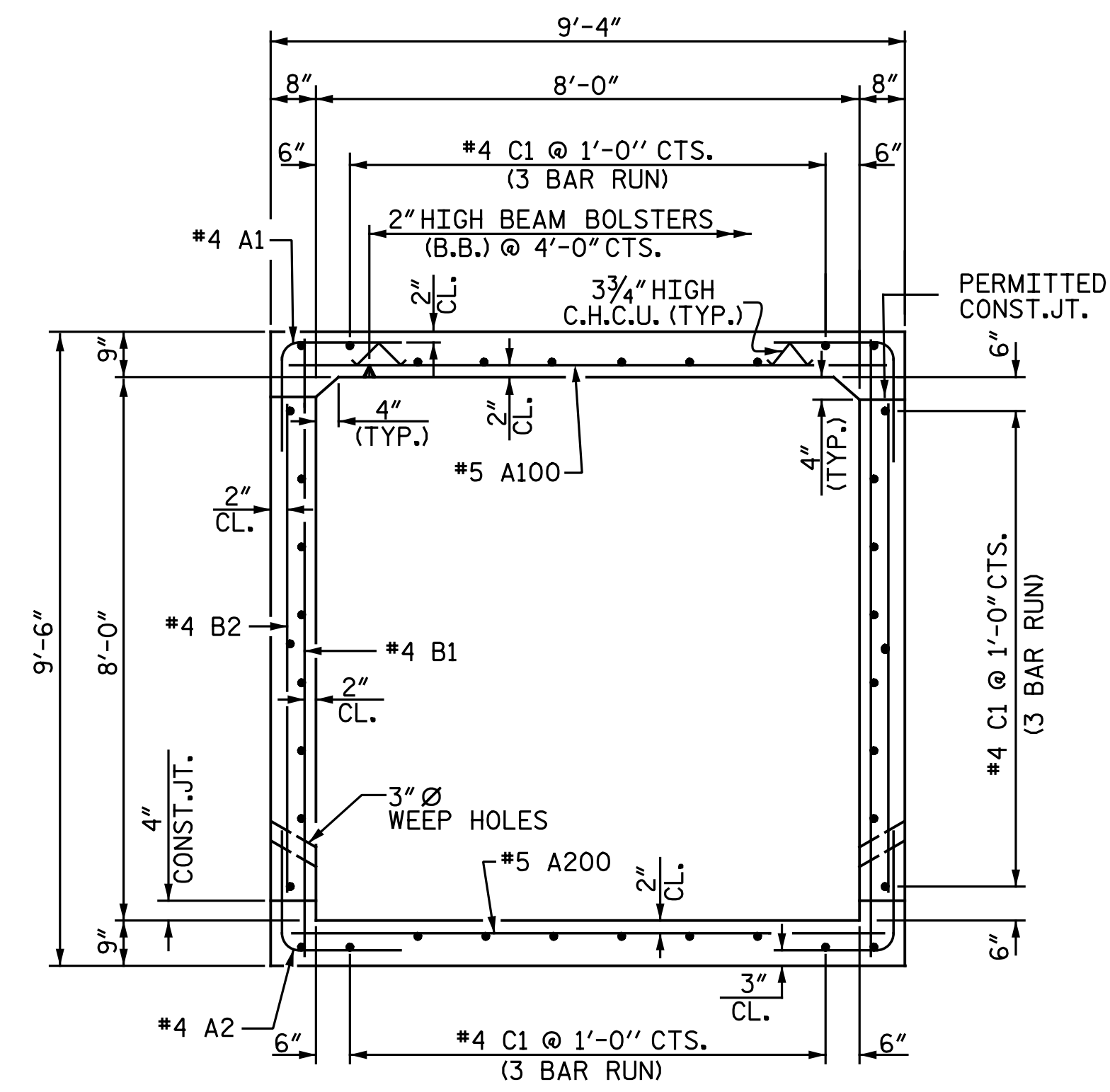
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	CI-2
1			3			TOTAL SHEETS
2			4			6

DRAWN BY : N. B. SPEAKS DATE : 1-31-20
 CHECKED BY : A. H. SHARPE DATE : 4-7-20

BAR TYPE		BILL OF MATERIAL				
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	
A1	340	#4	1	6' - 9"	1,533	
A2	340	#4	1	6' - 3"	1,420	
A100	170	#5	STR.	9' - 0"	1,596	
A200	203	#5	STR.	9' - 0"	1,906	
B1	170	#4	STR.	9' - 1"	1,032	
B2	340	#4	STR.	7' - 4"	1,666	
C1	114	#4	STR.	29' - 7"	2,253	
G1	4	#4	STR.	9' - 0"	24	
REINFORCING STEEL				LBS.	11,430	



ALL BAR DIMENSIONS ARE OUT TO OUT.

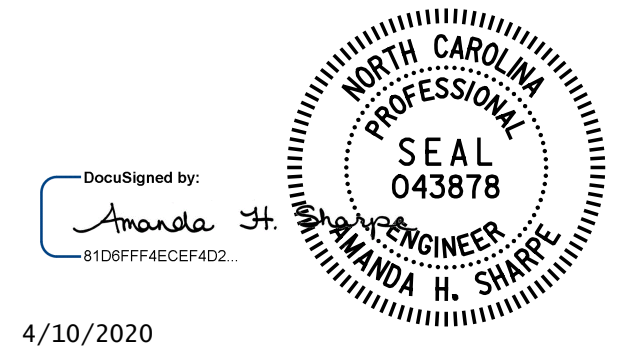


RIGHT ANGLE SECTION OF BARREL
THERE ARE 38 C1 BARS IN SECTION OF BARREL

SPLICE LENGTH CHART		
BAR	SIZE	SPLICE LENGTH
B1	#4	1'-5"
C1	#4	1'-11"

PROJECT NO. I-5878
HARNETT COUNTY
STATION: 15+47.41 -NBCD-

SHEET 3 OF 3
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
SINGLE 8 FT. X 8 FT.
CONCRETE BOX CULVERT
87°-37'-52" SKEW



4/10/2020

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	CI-3
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2			4			6

DRAWN BY : N. B. SPEAKS DATE : 1-30-20
CHECKED BY : A. H. SHARPE DATE : 4-7-20

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NC License No. : F-1084

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 (%LL)	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	1.55	--	1.75	1.63	1	TOP SLAB	4.33	1.55	1	BOTTOM SLAB	0.87		
	HL-93 (OPERATING)	N/A		2.01	--	1.35	2.11	1	TOP SLAB	4.33	2.01	1	BOTTOM SLAB	0.87		
	HS-20 (INVENTORY)	36.000	2	2.11	75.96	1.75	2.22	1	TOP SLAB	4.33	2.11	1	BOTTOM SLAB	0.87		
	HS-20 (OPERATING)	36.000		2.73	98.28	1.35	2.88	1	TOP SLAB	4.33	2.73	1	BOTTOM SLAB	0.87		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH		3.73	50.36	1.40	3.73	1	EXTERIOR WALL	0.38	3.83	1	BOTTOM SLAB	0.87		
		SNGARBS2	20.000		3.58	71.60	1.40	3.60	1	EXTERIOR WALL	0.38	3.58	1	BOTTOM SLAB	0.87	
		SNAGRIS2	22.000		3.73	82.06	1.40	3.73	1	EXTERIOR WALL	0.38	3.83	1	BOTTOM SLAB	0.87	
		SNCOTTS3	27.250	3	2.04	55.59	1.40	2.04	1	TOP SLAB	4.33	2.18	1	BOTTOM SLAB	0.87	
		SNAGGRS4	34.925		2.23	77.88	1.40	2.35	1	TOP SLAB	4.33	2.23	1	BOTTOM SLAB	0.87	
		SNS5A	35.550		2.24	79.63	1.40	2.26	1	TOP SLAB	4.33	2.24	1	BOTTOM SLAB	0.87	
		SNS6A	39.950		2.20	87.89	1.40	2.26	1	TOP SLAB	4.33	2.20	1	BOTTOM SLAB	0.87	
		SNS7B	42.000		2.20	92.40	1.40	2.26	1	TOP SLAB	4.33	2.20	1	BOTTOM SLAB	0.87	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		3.73	123.09	1.40	3.73	1	EXTERIOR WALL	0.38	3.83	1	BOTTOM SLAB	0.87	
		TNT4A	33.075		2.42	80.04	1.40	2.42	1	TOP SLAB	4.33	2.60	1	BOTTOM SLAB	0.87	
		TNT6A	41.600		2.29	95.26	1.40	2.33	1	TOP SLAB	4.33	2.29	1	BOTTOM SLAB	0.87	
		TNT7A	42.000		2.38	99.96	1.40	2.38	1	TOP SLAB	4.33	2.44	1	BOTTOM SLAB	0.87	
		TNT7B	42.000		2.24	94.08	1.40	2.32	1	TOP SLAB	4.33	2.24	1	BOTTOM SLAB	0.87	
		TNAGRIT4	43.000		2.42	104.06	1.40	2.42	1	TOP SLAB	4.33	2.60	1	BOTTOM SLAB	0.87	
TNAGT5A	45.000		2.42	108.90	1.40	2.42	1	TOP SLAB	4.33	2.60	1	BOTTOM SLAB	0.87			
TNAGT5B	45.000		2.42	108.90	1.40	2.42	1	TOP SLAB	4.33	2.60	1	BOTTOM SLAB	0.87			

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

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

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

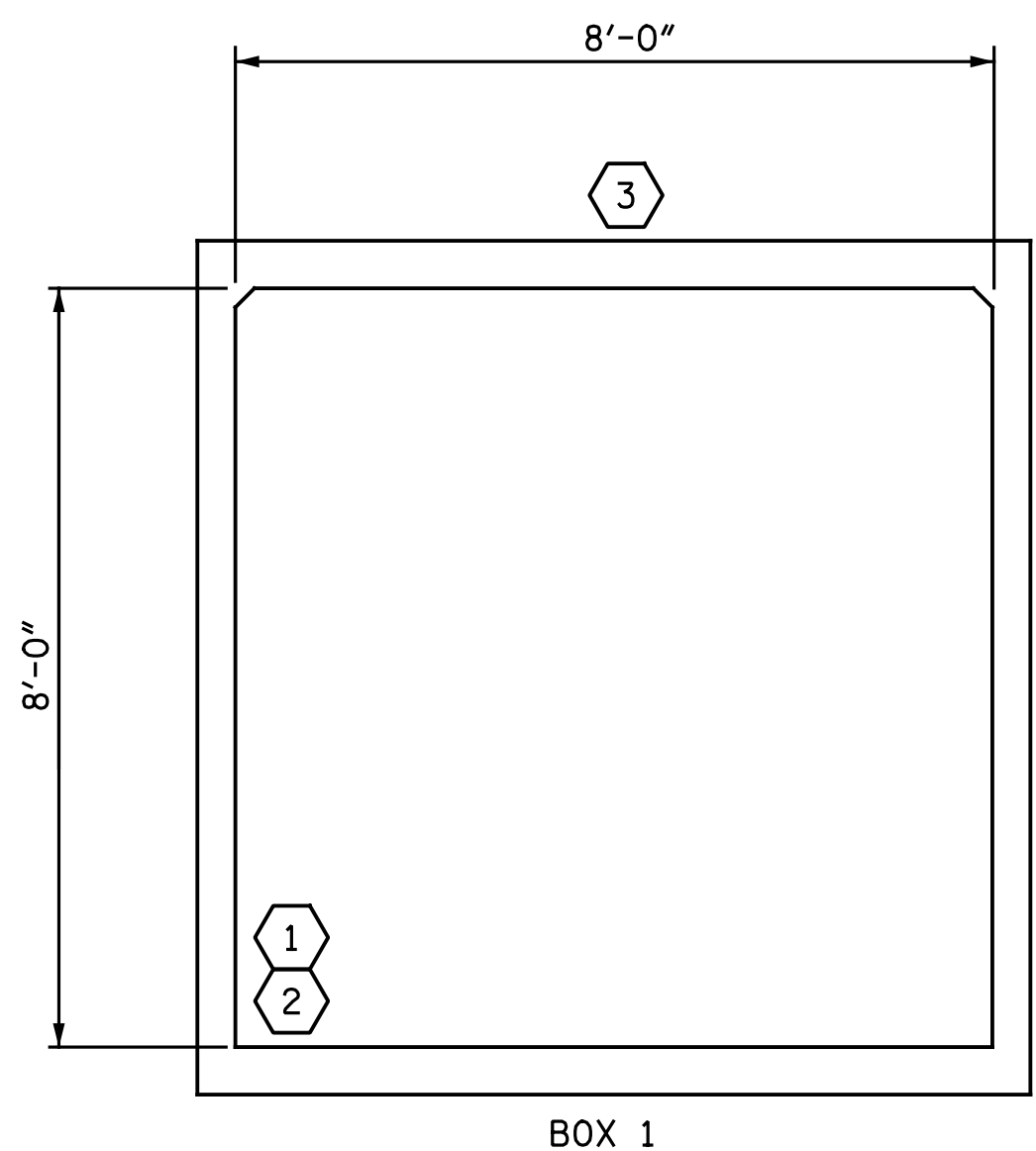
CONTROLLING LOAD RATING

1 DESIGN LOAD RATING (HL-93)

2 DESIGN LOAD RATING (HS-20)

3 LEGAL LOAD RATING ***

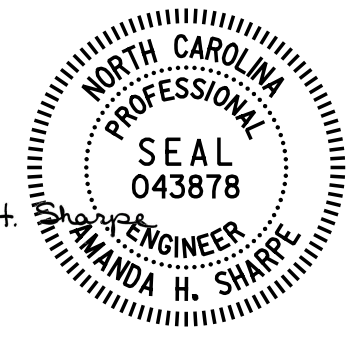
*** SEE CHART FOR VEHICLE TYPE



LRFR SUMMARY
(LOOKING DOWNSTREAM)

PROJECT NO. I-5878
HARNETT COUNTY
 STATION: 15+47.41 -NBCD-

DocuSigned by:
Amanda H. Sharpe
 4108FF4E2E402
 4/10/2020



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

DOCUMENT NOT CONSIDERED FINAL
 UNLESS ALL SIGNATURES COMPLETED

Michael Baker INTERNATIONAL

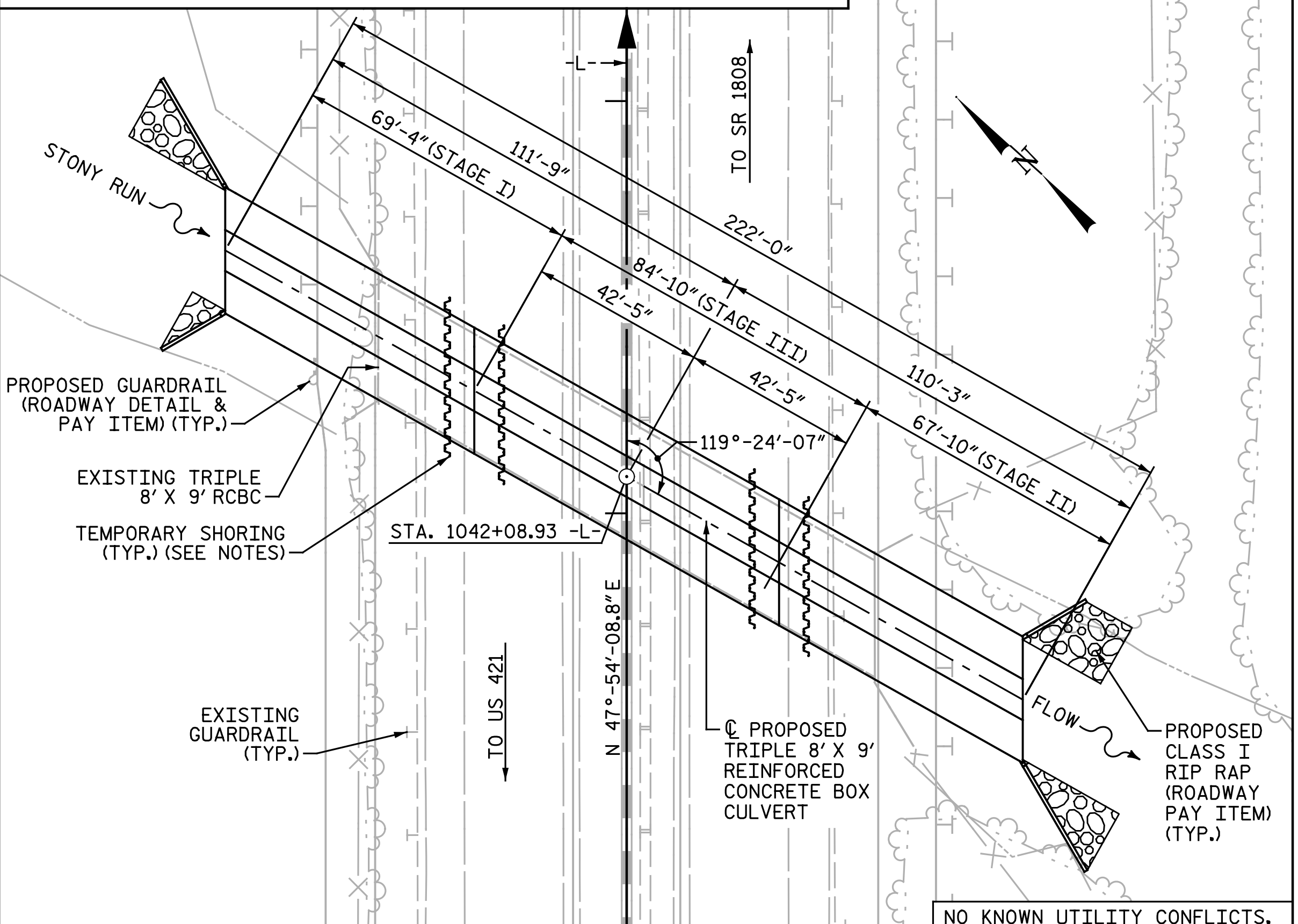
Michael Baker Engineering
 8000 Regency Parkway, Suite 600
 Cary, North Carolina 27518
 NC License No.: F-1084

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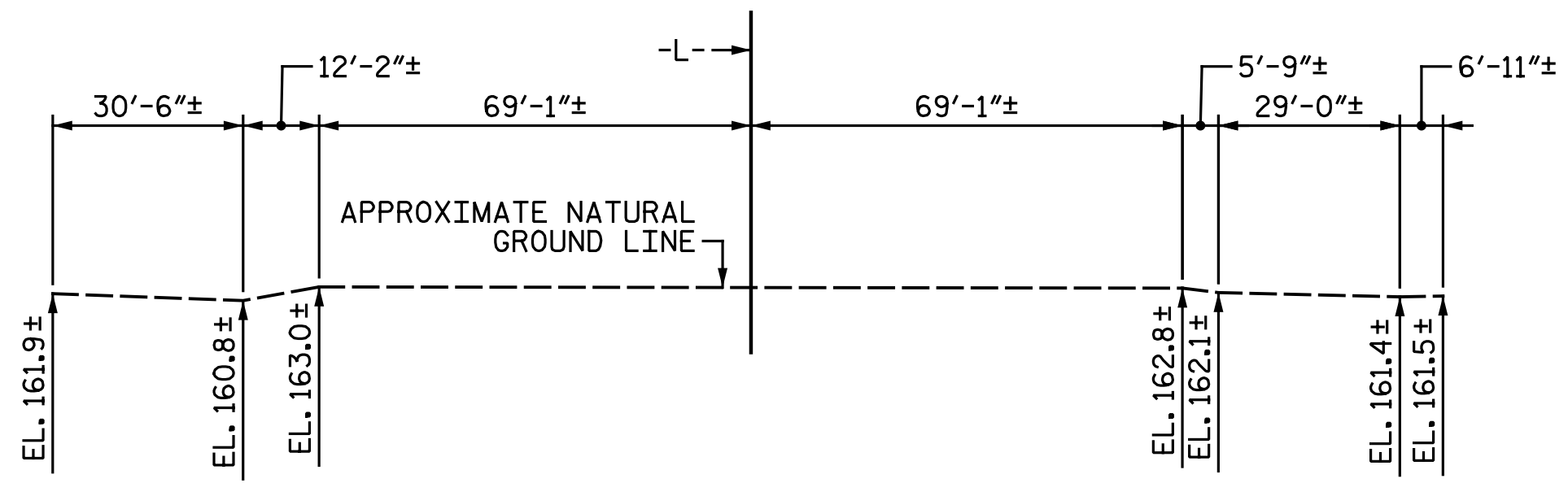
ASSEMBLED BY : N. B. SPEAKS DATE : 1-31-20
 CHECKED BY : A. H. SHARPE DATE : 2-6-20

DRAWN BY : WMC 7/11 REV. 10/1/11 MAA/GM
 CHECKED BY : GM 7/11 REV. 12/17 MAA/THC

B.M. #65 - BENCH TIE IN 12" PECAN, STA. 1035+49.29 -L-, 125.7' LEFT, EL. 176.05



LOCATION SKETCH



PROFILE ALONG CULVERT

ROADWAY DATA	
GRADE POINT ELEV. @ STATION 1042+08.93 -L-	= 180.23
BED ELEV. @ STATION STA. 1042+08.93 -L-	= 162.70
ROADWAY SLOPES	= 3:1

HYDRAULIC DATA	
DESIGN DISCHARGE	= 2580 C.F.S.
FREQUENCY OF DESIGN FLOOD	= 100 YR.
DESIGN HIGH WATER ELEVATION	= 174.10
DRAINAGE AREA	= 7.64 SQ. MI.
BASE DISCHARGE (Q100)	= 2580 C.F.S.
BASE HIGH WATER ELEVATION	= 174.10

OVERTOPPING FLOOD DATA	
OVERTOPPING DISCHARGE	= 3295 C.F.S.
FREQUENCY OF OVERTOPPING FLOOD	= 100+ YR.
OVERTOPPING FLOOD ELEVATION	= 176.80

NOTE: OVERTOPS ROADWAY CROWN POINT @ STA. -L- 1036+44.00 LT (SAG)

DRAWN BY : M. D. MAYHEW DATE : 1-28-20
 CHECKED BY : A. H. SHARPE DATE : 4-26-21

NOTES:

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.
 MAXIMUM DESIGN FILL = 8.89'.
 MINIMUM DESIGN FILL = 7.81'.
 FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTE SHEET.

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

CONCRETE IN STAGE I AND STAGE II OF CULVERT 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.

CONCRETE IN STAGE III OF CULVERT TO BE POURED IN THE FOLLOWING ORDER:

1. FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE WALLS FOLLOWED BY ROOF SLAB.

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.

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.

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.

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

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

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 GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

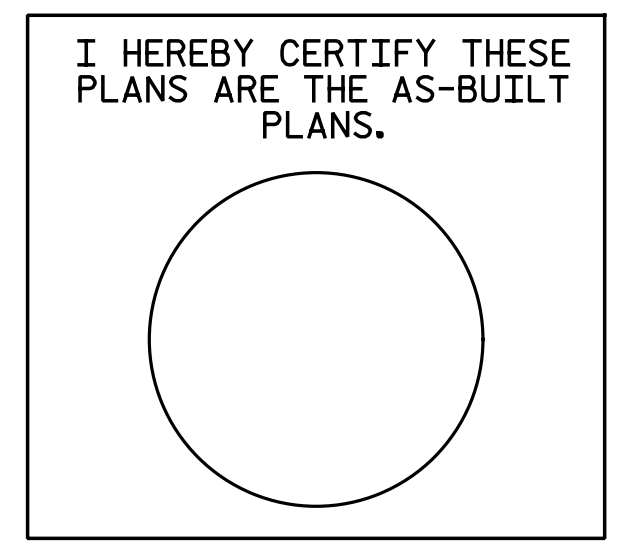
FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

THE EXISTING STRUCTURE CONSISTING OF A TRIPLE BARREL REINFORCED CONCRETE BOX CULVERT, 8' WIDE X 9' DEEP X 140'± LONG AND LOCATED AT THE PROPOSED STRUCTURE, SHALL BE REMOVED. THE EXISTING STRUCTURE IS PRESENTLY NOT POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE STRUCTURE DETERIORATE DURING CONSTRUCTION OF THE PROPOSED STRUCTURE, A LOAD LIMIT MAY BE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.

FOR ASBESTOS ASSESSMENT FOR CULVERT DEMOLITION, SEE "ASBESTOS ASSESSMENT FOR BRIDGE DEMOLITION AND RENOVATION ACTIVITIES" SPECIAL PROVISION.

TOTAL STRUCTURE QUANTITIES	
CULVERT EXCAVATION	LUMP SUM
FOUNDATION CONDITIONING MATERIAL	
STAGE I	150 TONS
STAGE II	147 TONS
STAGE III	183 TONS
TOTAL	480 TONS
CLASS A CONCRETE	
STAGE I	207.0 C.Y.
STAGE II	203.2 C.Y.
STAGE III	220.6 C.Y.
TOTAL	630.8 C.Y.
REINFORCING STEEL	
STAGE I	27,552 LBS.
STAGE II	27,030 LBS.
STAGE III	31,182 LBS.
TOTAL	85,764 LBS.
REMOVAL OF EXISTING STRUCTURE	LUMP SUM
ASBESTOS ASSESSMENT	LUMP SUM



PROJECT NO. I-5878
 HARNETT COUNTY
 STATION: 1042+08.93 -L-

SHEET 1 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH
 TRIPLE 8 FT. X 9 FT.
 CONCRETE BOX CULVERT
 119°-24'-07" SKEW

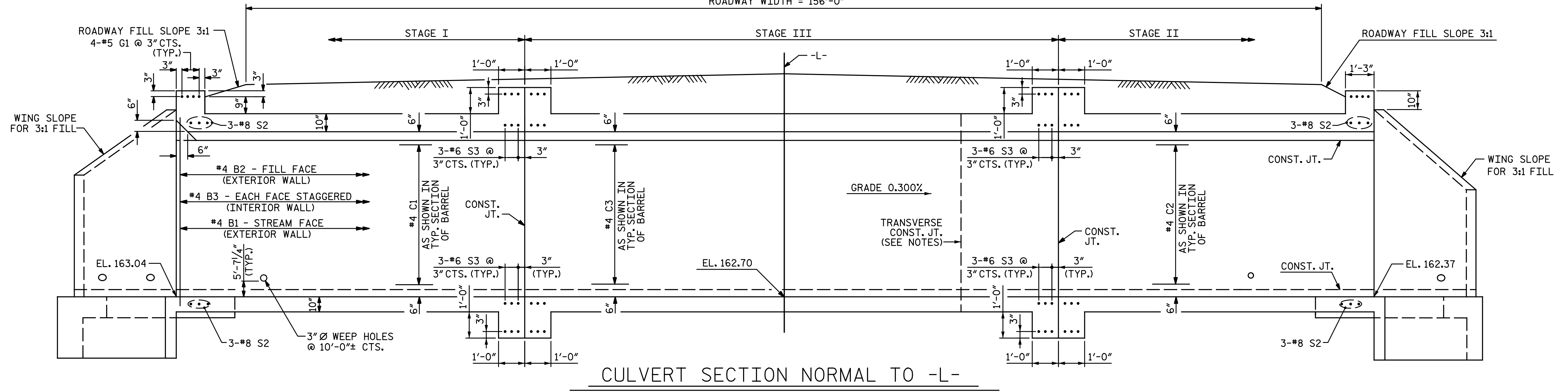
Document Not Considered Final Unless All Signatures Completed

Michael Baker International

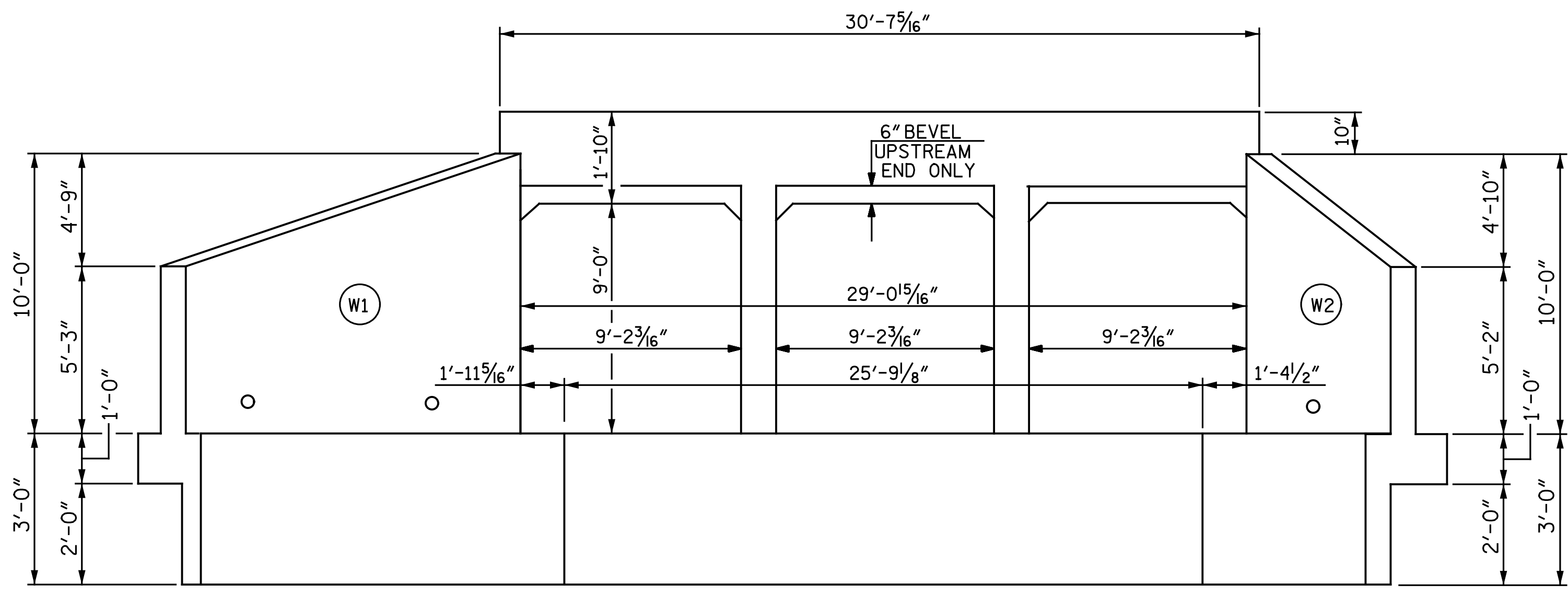
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 8000 Regency Parkway, Suite 600
 Cary, North Carolina 27518
 NC License No.: F-1084

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1			3			TOTAL SHEETS
2			4			8

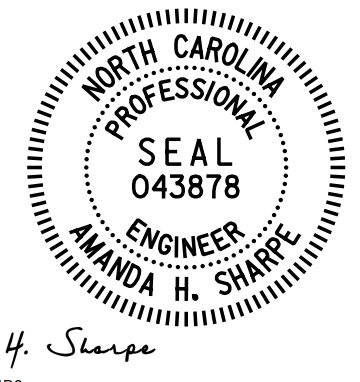
ROADWAY WIDTH = 156'-0"



I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS.



PROJECT NO. I-5878
HARNETT COUNTY
 STATION: 1042+08.93 -L-
 SHEET 2 OF 6



DocuSigned by:
 Amanda H. Sharpe
 4/9/2020

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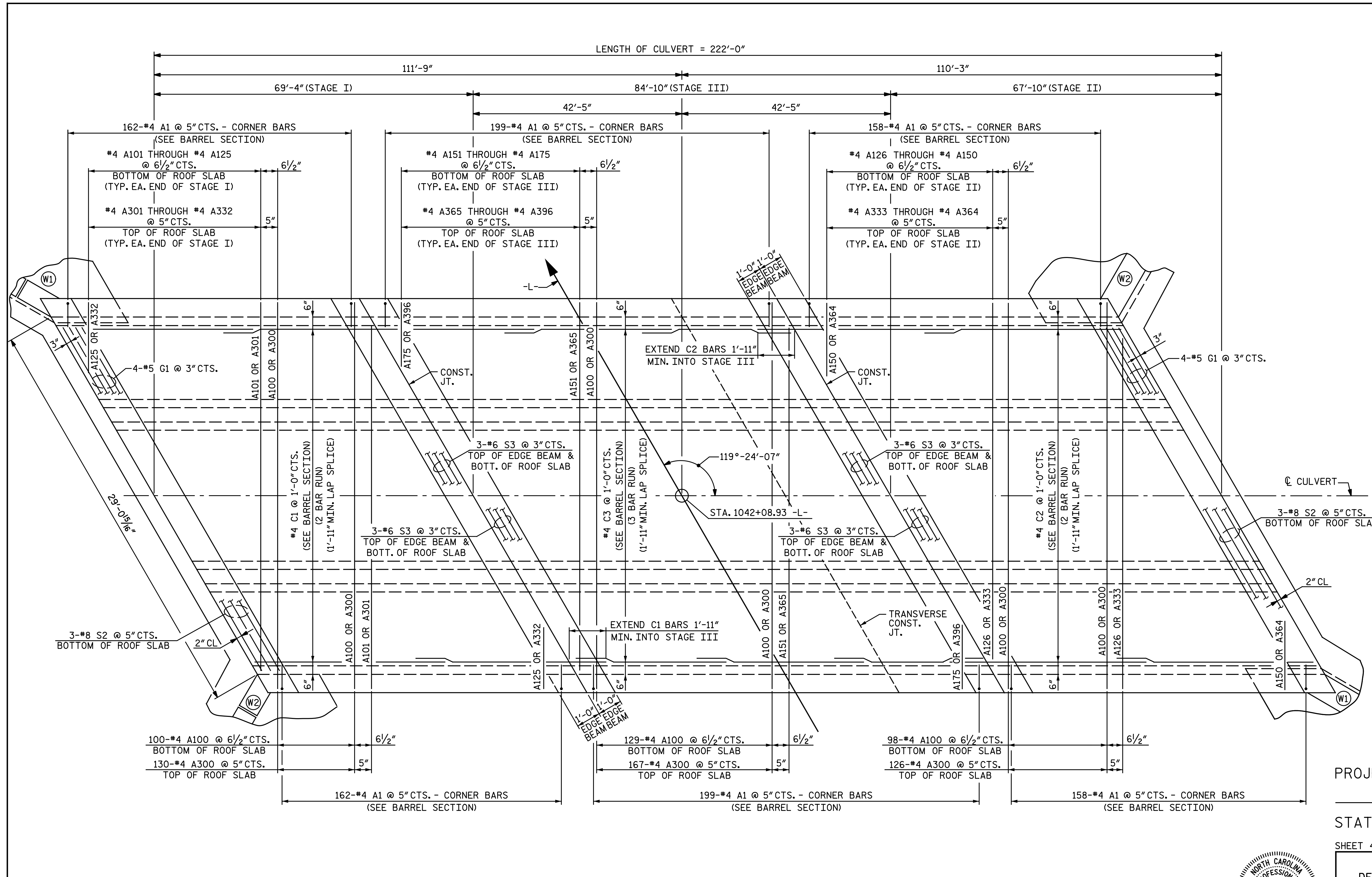
STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

TRIPLE 8 FT. X 9 FT.
 CONCRETE BOX CULVERT
 119°-24'-07" SKEW

DRAWN BY : M. D. MAYHEW DATE : 1-28-20
 CHECKED BY : A. H. SHARPE DATE : 4-7-20

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-2
1			3			TOTAL SHEETS
2			4			8

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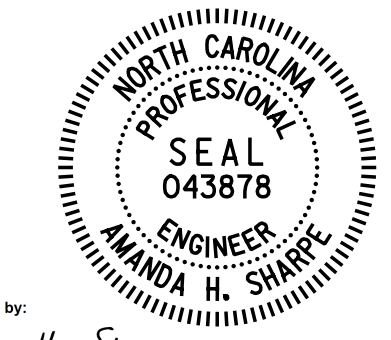


PLAN OF ROOF SLAB

PROJECT NO. I-5878
HARNETT COUNTY
 STATION: 1042+08.93 -L-
 SHEET 4 OF 6

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

TRIPLE 8 FT. X 9 FT.
 CONCRETE BOX CULVERT
 119°-24'-07" SKEW



DocuSigned by:
 Amanda H. Sharpe
 8106FFFAE6CEFA02
 4/9/2020

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 UNLESS ALL SIGNATURES COMPLETED

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-4
1			3			TOTAL SHEETS
2			4			8

DRAWN BY : M. D. MAYHEW DATE : 1-28-20
 CHECKED BY : A. H. SHARPE DATE : 4-7-20

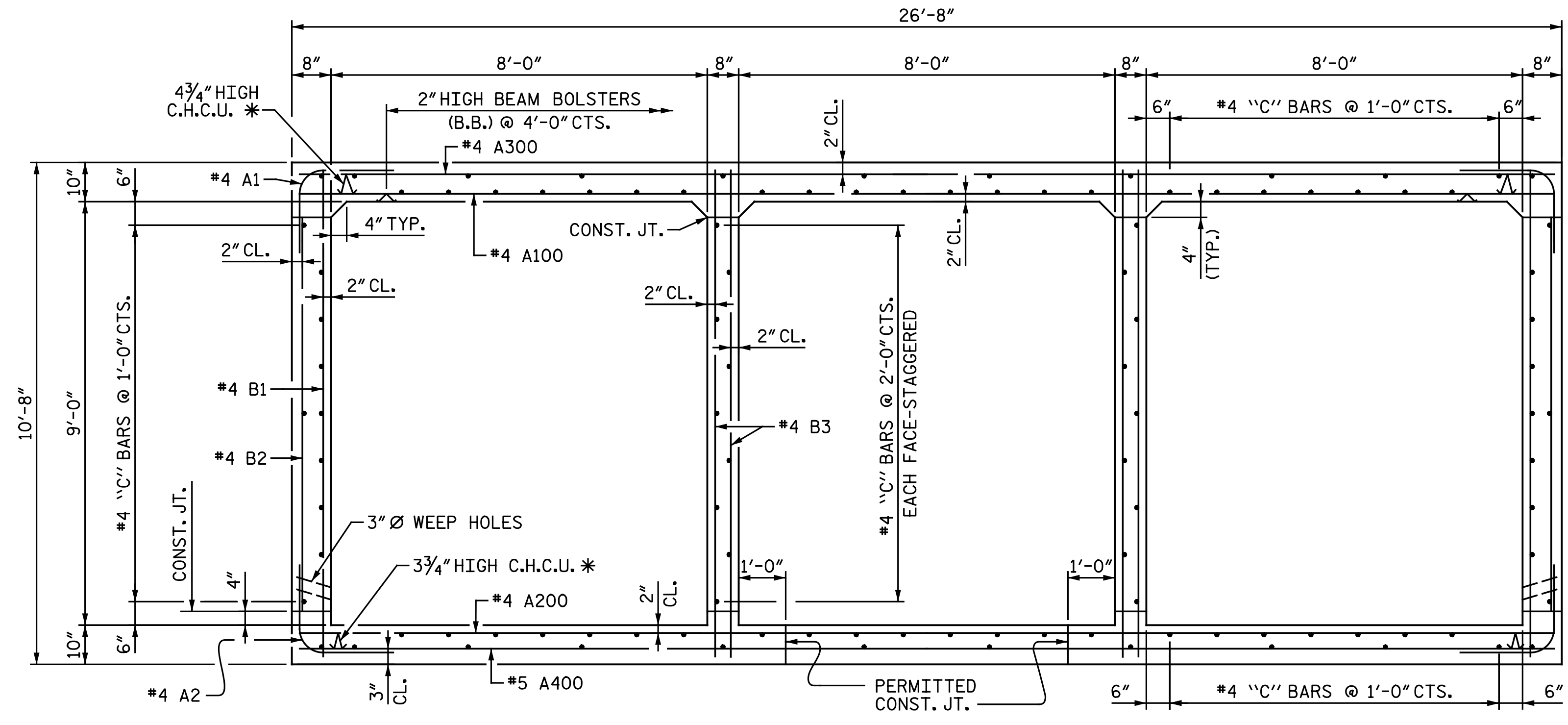
Michael Baker
 INTERNATIONAL

Michael Baker Engineering
 8000 Regency Parkway, Suite 600
 Cary, North Carolina 27518
 NC License No. : F-1084

STAGE I QUANTITIES		
CULVERT EXCAVATION	LUMP SUM	
FOUNDATION CONDITIONING MATERIAL	150 TONS	
CLASS A CONCRETE		
BARREL @ 2.547 CY/FT	176.6	C.Y.
EDGE BEAMS	2.3	C.Y.
WINGS, ETC.	28.1	C.Y.
TOTAL	207.0	C.Y.
REINFORCING STEEL		
BARREL	25,737	LBS.
WINGS, ETC.	1,815	LBS.
TOTAL	27,552	LBS.

STAGE II QUANTITIES		
CULVERT EXCAVATION	LUMP SUM	
FOUNDATION CONDITIONING MATERIAL	147 TONS	
CLASS A CONCRETE		
BARREL @ 2.547 CY/FT	172.8	C.Y.
EDGE BEAMS	2.3	C.Y.
WINGS, ETC.	28.1	C.Y.
TOTAL	203.2	C.Y.
REINFORCING STEEL		
BARREL	25,215	LBS.
WINGS, ETC.	1,815	LBS.
TOTAL	27,030	LBS.

STAGE III QUANTITIES		
CULVERT EXCAVATION	LUMP SUM	
FOUNDATION CONDITIONING MATERIAL	183 TONS	
CLASS A CONCRETE		
BARREL @ 2.547 CY/FT	216.1	C.Y.
EDGE BEAMS	4.5	C.Y.
WINGS, ETC.	0	C.Y.
TOTAL	220.6	C.Y.
REINFORCING STEEL		
BARREL	31,182	LBS.
WINGS, ETC.	0	LBS.
TOTAL	31,182	LBS.

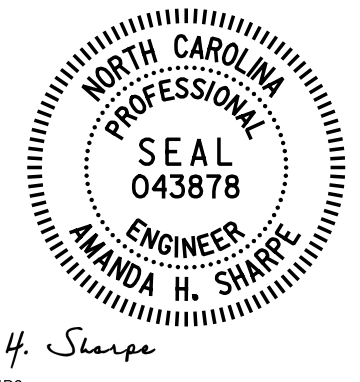


RIGHT ANGLE SECTION OF BARREL

THERE ARE 106 #4 BARS IN SECTION OF BARREL
 * ALL CONTINUOUS HIGH CHAIR UPPER (C.H.C.U.) @ 3'-0" CTS.

PROJECT NO. I-5878
HARNETT COUNTY
 STATION: 1042+08.93 -L-

SHEET 5 OF 6



DocuSigned by:
Amanda H. Sharpe
 81D6FFFAE6CEFA02
 4/9/2020

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STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

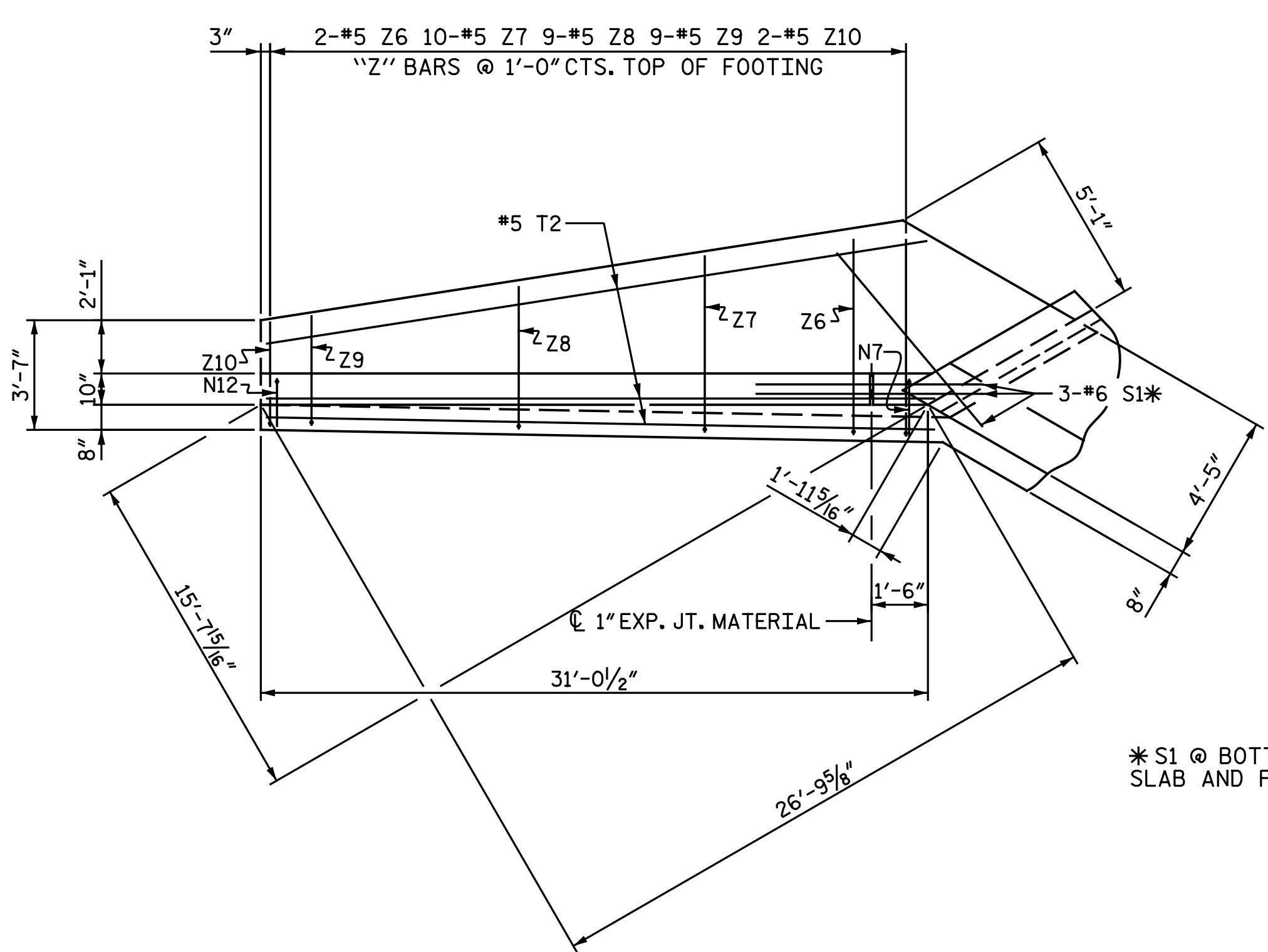
TRIPLE 8 FT. X 9 FT.
 CONCRETE BOX CULVERT
 119°-24'-07" SKEW

DRAWN BY : M. D. MAYHEW DATE : 1-28-20
 CHECKED BY : A. H. SHARPE DATE : 4-7-20

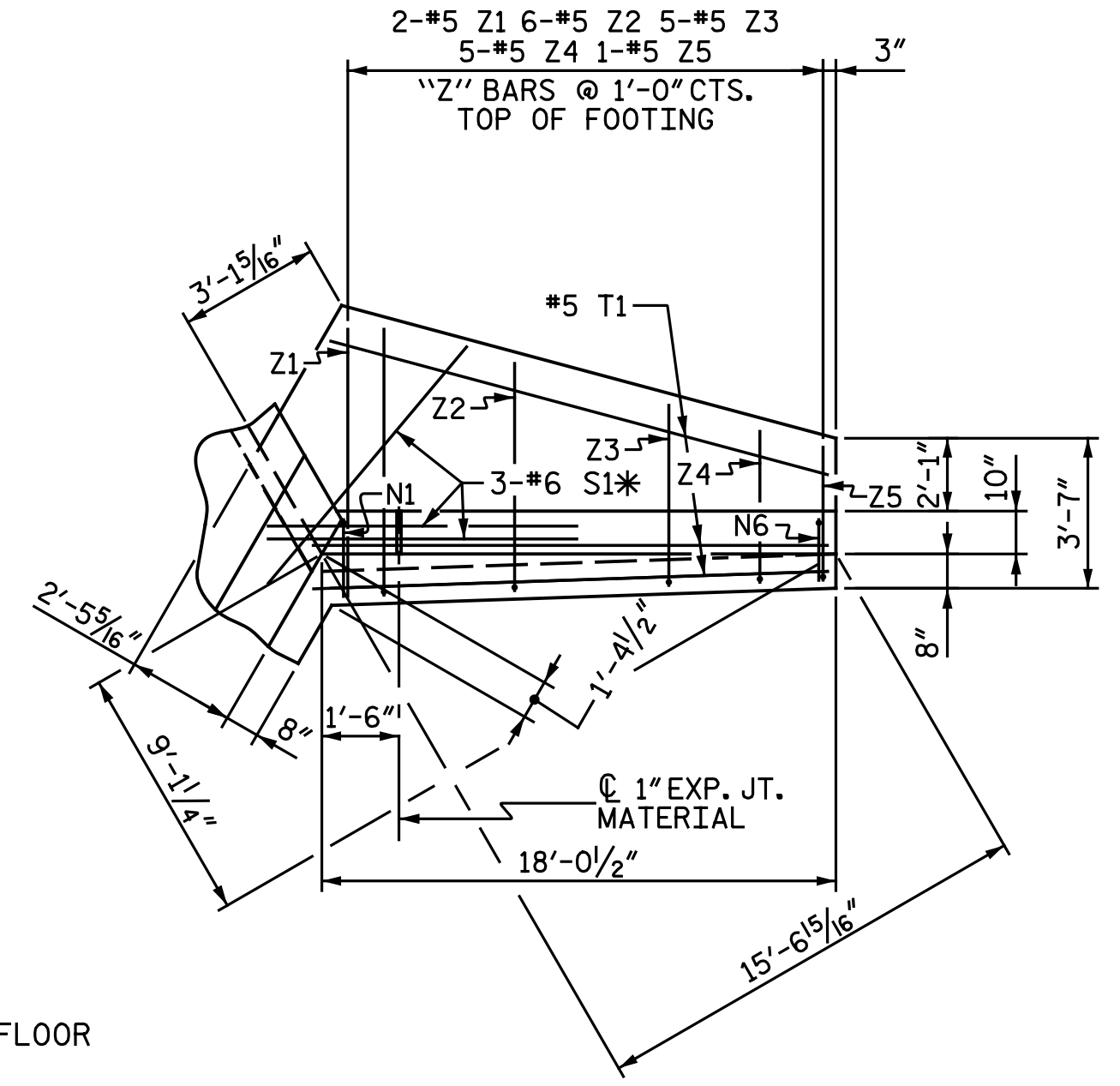
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-5
1			3			TOTAL SHEETS
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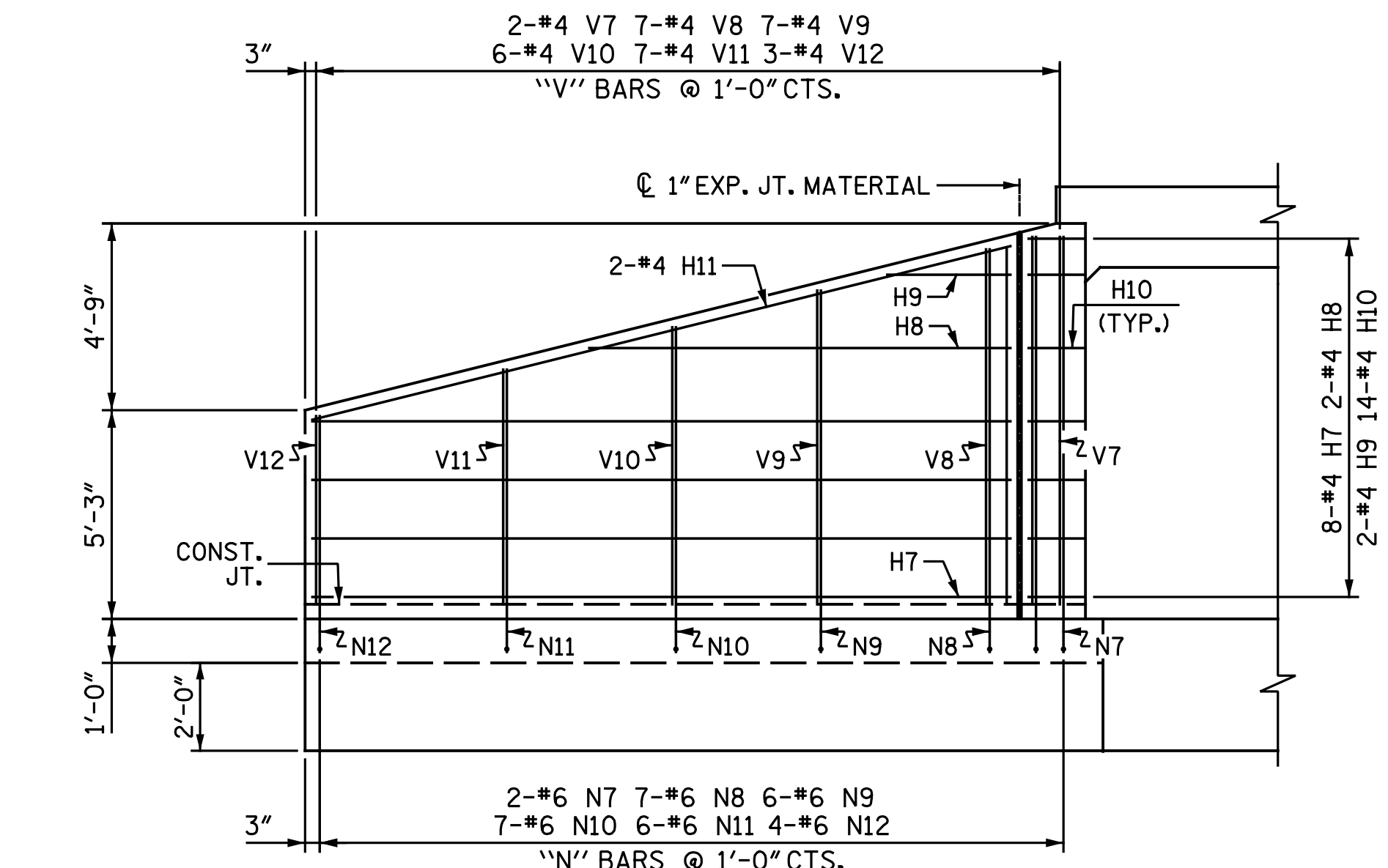
BILL OF MATERIAL						BILL OF MATERIAL						BILL OF MATERIAL						BILL OF MATERIAL						BILL OF MATERIAL						BAR TYPE													
STAGE I						STAGE I CONTINUED						STAGE II						STAGE II CONTINUED						STAGE III						STAGE III CONTINUED													
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT		
A1	324	#4	1	5' - 10"	1,263	A314	2	#4	STR.	16' - 3"	22	A1	316	#4	1	5' - 10"	1,231	A346	2	#4	STR.	16' - 5"	22	A1	398	#4	1	5' - 10"	1,551	A380	2	#4	STR.	14' - 10"	20								
A2	324	#4	1	5' - 5"	1,172	A315	2	#4	STR.	15' - 6"	21	A2	316	#4	1	5' - 5"	1,143	A347	2	#4	STR.	15' - 8"	21	A2	398	#4	1	5' - 5"	1,440	A381	2	#4	STR.	14' - 1"	19								
A100	100	#4	STR.	26' - 4"	1,759	A316	2	#4	STR.	14' - 9"	20	A100	98	#4	STR.	26' - 4"	1,724	A348	2	#4	STR.	14' - 11"	20	A100	129	#4	STR.	26' - 4"	2,269	A382	2	#4	STR.	13' - 4"	18								
A101	2	#4	STR.	25' - 9"	34	A317	2	#4	STR.	14' - 0"	19	A101	98	#4	STR.	26' - 4"	1,724	A349	2	#4	STR.	14' - 2"	19	A100	129	#4	STR.	26' - 4"	2,269	A383	2	#4	STR.	12' - 8"	17								
A102	2	#4	STR.	24' - 10"	33	A318	2	#4	STR.	13' - 4"	18	A126	2	#4	STR.	25' - 5"	34	A350	2	#4	STR.	13' - 5"	18	A151	2	#4	STR.	25' - 7"	34	A384	2	#4	STR.	11' - 11"	16								
A103	2	#4	STR.	23' - 10"	32	A319	2	#4	STR.	12' - 7"	17	A127	2	#4	STR.	24' - 5"	33	A351	2	#4	STR.	12' - 8"	17	A152	2	#4	STR.	24' - 7"	33	A385	2	#4	STR.	11' - 2"	15								
A104	2	#4	STR.	22' - 11"	31	A320	2	#4	STR.	11' - 10"	16	A128	2	#4	STR.	23' - 6"	31	A352	2	#4	STR.	12' - 0"	16	A153	2	#4	STR.	23' - 8"	32	A386	2	#4	STR.	10' - 5"	14								
A105	2	#4	STR.	21' - 11"	29	A321	2	#4	STR.	11' - 1"	15	A129	2	#4	STR.	22' - 6"	30	A353	2	#4	STR.	11' - 3"	15	A154	2	#4	STR.	22' - 8"	30	A387	2	#4	STR.	9' - 8"	13								
A106	2	#4	STR.	20' - 11"	28	A322	2	#4	STR.	10' - 4"	14	A130	2	#4	STR.	21' - 7"	29	A354	2	#4	STR.	10' - 6"	14	A155	2	#4	STR.	21' - 9"	29	A388	2	#4	STR.	8' - 11"	12								
A107	2	#4	STR.	20' - 0"	27	A323	2	#4	STR.	9' - 7"	13	A131	2	#4	STR.	20' - 7"	27	A355	2	#4	STR.	9' - 9"	13	A156	2	#4	STR.	20' - 9"	28	A389	2	#4	STR.	8' - 2"	11								
A108	2	#4	STR.	19' - 0"	25	A324	2	#4	STR.	8' - 10"	12	A132	2	#4	STR.	19' - 7"	26	A356	2	#4	STR.	9' - 0"	12	A157	2	#4	STR.	19' - 10"	26	A390	2	#4	STR.	7' - 5"	10								
A109	2	#4	STR.	18' - 1"	24	A325	2	#4	STR.	8' - 1"	11	A133	2	#4	STR.	18' - 8"	25	A357	2	#4	STR.	8' - 3"	11	A158	2	#4	STR.	18' - 10"	25	A391	2	#4	STR.	6' - 9"	9								
A110	2	#4	STR.	17' - 1"	23	A326	2	#4	STR.	7' - 5"	10	A134	2	#4	STR.	17' - 8"	24	A358	2	#4	STR.	7' - 6"	10	A159	2	#4	STR.	17' - 6"	24	A392	2	#4	STR.	6' - 0"	8								
A111	2	#4	STR.	16' - 2"	22	A327	2	#4	STR.	6' - 8"	9	A135	2	#4	STR.	16' - 9"	22	A359	2	#4	STR.	6' - 10"	9	A160	2	#4	STR.	16' - 11"	23	A393	2	#4	STR.	5' - 3"	7								
A112	2	#4	STR.	15' - 2"	20	A328	2	#4	STR.	5' - 11"	8	A136	2	#4	STR.	15' - 9"	21	A360	2	#4	STR.	6' - 1"	8	A161	2	#4	STR.	16' - 0"	21	A394	2	#4	STR.	4' - 6"	6								
A113	2	#4	STR.	14' - 3"	19	A329	2	#4	STR.	5' - 2"	7	A137	2	#4	STR.	14' - 10"	20	A361	2	#4	STR.	5' - 4"	7	A162	2	#4	STR.	15' - 0"	20	A395	2	#4	STR.	3' - 9"	5								
A114	2	#4	STR.	13' - 3"	18	A330	2	#4	STR.	4' - 5"	6	A138	2	#4	STR.	13' - 10"	18	A362	2	#4	STR.	4' - 7"	6	A163	2	#4	STR.	14' - 0"	19	A396	2	#4	STR.	3' - 0"	4								
A115	2	#4	STR.	12' - 4"	16	A331	2	#4	STR.	3' - 8"	5	A139	2	#4	STR.	12' - 11"	17	A363	2	#4	STR.	3' - 10"	5	A164	2	#4	STR.	13' - 1"	17														
A116	2	#4	STR.	11' - 4"	15	A332	2	#4	STR.	2' - 11"	4	A140	2	#4	STR.	11' - 11"	16	A364	2	#4	STR.	3' - 1"	4	A165	2	#4	STR.	12' - 1"	16	A400	167	#5	STR.	26' - 4"	4,587								
A117	2	#4	STR.	10' - 5"	14	A400	130	#5	STR.	26' - 4"	3,571	A141	2	#4	STR.	11' - 0"	15	A141	2	#4	STR.	11' - 0"	15	A166	2	#4	STR.	11' - 2"	15	A401	2	#5	STR.	25' - 11"	54								
A118	2	#4	STR.	9' - 5"	13	A401	2	#5	STR.	25' - 10"	54	A142	2	#4	STR.	10' - 0"	13	A142	2	#4	STR.	10' - 0"	13	A167	2	#4	STR.	10' - 2"	14	A402	2	#5	STR.	25' - 2"	52								
A119	2	#4	STR.	8' - 5"	11	A402	2	#5	STR.	25' - 2"	52	A143	2	#4	STR.	9' - 1"	12	A143	2	#4	STR.	9' - 1"	12	A168	2	#4	STR.	9' - 3"	12	A403	2	#5	STR.	24' - 6"	51								
A120	2	#4	STR.	7' - 6"	10	A403	2	#5	STR.	24' - 5"	51	A144	2	#4	STR.	8' - 1"	11	A144	2	#4	STR.	8' - 1"	11	A169	2	#4	STR.	8' - 3"	11	A404	2	#5	STR.	24' - 5"	51								
A121	2	#4	STR.	6' - 6"	9	A404	2	#5	STR.	23' - 8"	49	A145	2	#4	STR.	7' - 2"	10	A145	2	#4	STR.	7' - 2"	10	A170	2	#4	STR.	7' - 4"	10	A405	2	#5	STR.	23' - 0"	48								
A122	2	#4	STR.	5' - 7"	7	A405	2	#5	STR.	22' - 11"	48	A146	2	#4	STR.	6' - 2"	8	A146	2	#4	STR.	6' - 2"	8	A171	2	#4	STR.	6' - 4"	8	A406	2	#5	STR.	23' - 3"	46								
A123	2	#4	STR.	4' - 7"	6	A406	2	#5	STR.	22' - 2"	46	A147	2	#4	STR.	5' - 2"	7	A147	2	#4	STR.	5' - 2"	7	A172	2	#4	STR.	5' - 5"	7	A407	2	#5	STR.	22' - 6"	45								
A124	2	#4	STR.	3' - 8"	5	A407	2	#5	STR.	21' - 5"	45	A148	2	#4	STR.	4' - 3"	6	A148	2	#4	STR.	4' - 3"	6	A173	2	#4	STR.	4' - 5"	6	A408	2	#5	STR.	20' - 9"	43								
A125	2	#4	STR.	2' - 8"	4	A408	2	#5	STR.	20' - 8"	43	A149	2	#4	STR.	3' - 3"	4	A149	2	#4	STR.	3' - 3"	4	A174	2	#4	STR.	3' - 6"	5	A409	2	#5	STR.	19' - 11"	42								
A200	100	#4	STR.	26' - 4"	1,759	A409	2	#5	STR.	19' - 11"	42	A150	2	#4	STR.	2' - 4"	3	A150	2	#4	STR.	2' - 4"	3	A175	2	#4	STR.	2' - 6"	3	A410	2	#5	STR.	19' - 3"	40								
A201	2	#4	STR.	25' - 9"	34	A410	2	#5	STR.	19' - 3"	40	A200	98	#4	STR.	26' - 4"	1,724	A441	2	#5	STR.	20' - 1"	42	A441	2	#5	STR.	20' - 1"	42	A411	2	#5	STR.	18' - 6"	39								
A202	2	#4	STR.	24' - 10"	33	A411	2	#5	STR.	18' - 6"	39	A226	2	#4	STR.	25' - 5"	34	A442	2	#5	STR.	19' - 4"	40	A442	2	#5	STR.	19' - 4"	40	A412	2	#5	STR.	17' - 9"	37								
A203	2	#4	STR.	23' - 10"	32	A412	2	#5	STR.	17' - 9"	37	A227	2	#4	STR.	24' - 5"	33	A443	2	#5	STR.	18' - 7"	39	A443	2	#5	STR.	18' - 7"	39	A228	2	#4	STR.	23' - 6"	31								
A204	2	#4	STR.	22' - 11"	31	A413	2	#5	STR.	17' - 0"	35	A228	2	#4	STR.	23' - 6"	31	A444	2	#5	STR.	17' - 11"	37	A444	2	#5	STR.	17' - 11"	37	A229	2	#4	STR.	22' - 6"	30								
A205	2	#4	STR.	21' - 11"	29	A414	2	#5	STR.	16' - 3"	34	A229	2	#4	STR.	22' - 6"	30	A445	2	#5	STR.	17' - 2"	36	A445	2	#5	STR.	17' - 2"	36	A230	2	#4	STR.	21' - 7"	29								
A206	2	#4	STR.	20' - 11"	28	A415	2	#5	STR.	15' - 6"	32	A230	2	#4	STR.	21' - 7"	29	A446	2	#5	STR.	16' - 5"	34	A446	2	#5	STR.	16' - 5"	34	A231	2	#4	STR.	20' - 7"	27								
A207	2	#4	STR.	20' - 0"	27	A416	2	#5	STR.	14' - 9"	31	A231	2	#4	STR.	20' - 7"	27	A447	2	#5	STR.	15' - 8"	33	A447	2	#5	STR.	15' - 8"	33	A232	2	#4	STR.	19' - 7"	26								
A208	2	#4	STR.	19' - 0"	25	A417	2	#5	STR.	14' - 0"	29	A232	2	#4	STR.	19' - 7"	26	A448	2	#5	STR.	14' - 11"	31	A448	2	#5	STR.	14' - 11"	31	A233	2	#4	STR.	18' - 8"	25								
A209	2	#4	STR.	18' - 1"	24	A418	2	#5	STR.	13' - 4"	28	A233	2	#4	STR.	18' - 8"	25	A449	2	#5	STR.	14' - 2"	30	A449	2	#5	STR.	14' - 2"	30	A234	2	#4	STR.	17' - 8"	24								
A210	2	#4	STR.	17' - 1"	23	A419	2	#5	STR.	12' - 7"	26	A234	2	#4	STR.	17' - 8"	24	A450	2	#5	STR.	13' - 5"	28	A450	2	#5	STR.	13' - 5"	28	A235	2	#4	STR.	16' - 9"	22								
A211	2	#4	STR.	16' - 2"	22	A420	2	#5	STR.	11' - 10"	25	A235	2	#4	STR.	16' - 9"	22	A451	2	#5	STR.	12' - 8"	26	A451	2	#5	STR.	12' - 8"	26	A236	2	#4	STR.	15' - 9"	21								
A212	2	#4	STR.	15' - 2"	20	A421	2	#5	STR.	11' - 1"	23	A236	2	#4	STR.	15' - 9"	21	A452	2	#5	STR.	12' - 0"	25	A452	2	#5	STR.	12' - 0"	25	A237	2	#4	STR.	14' - 10"	20								
A213	2	#4	STR.	14' - 3"	19	A422	2	#5	STR.	10' - 4"	22	A237	2	#4	STR.	14' - 10"	20	A453	2	#5	STR.	11' - 3"																					



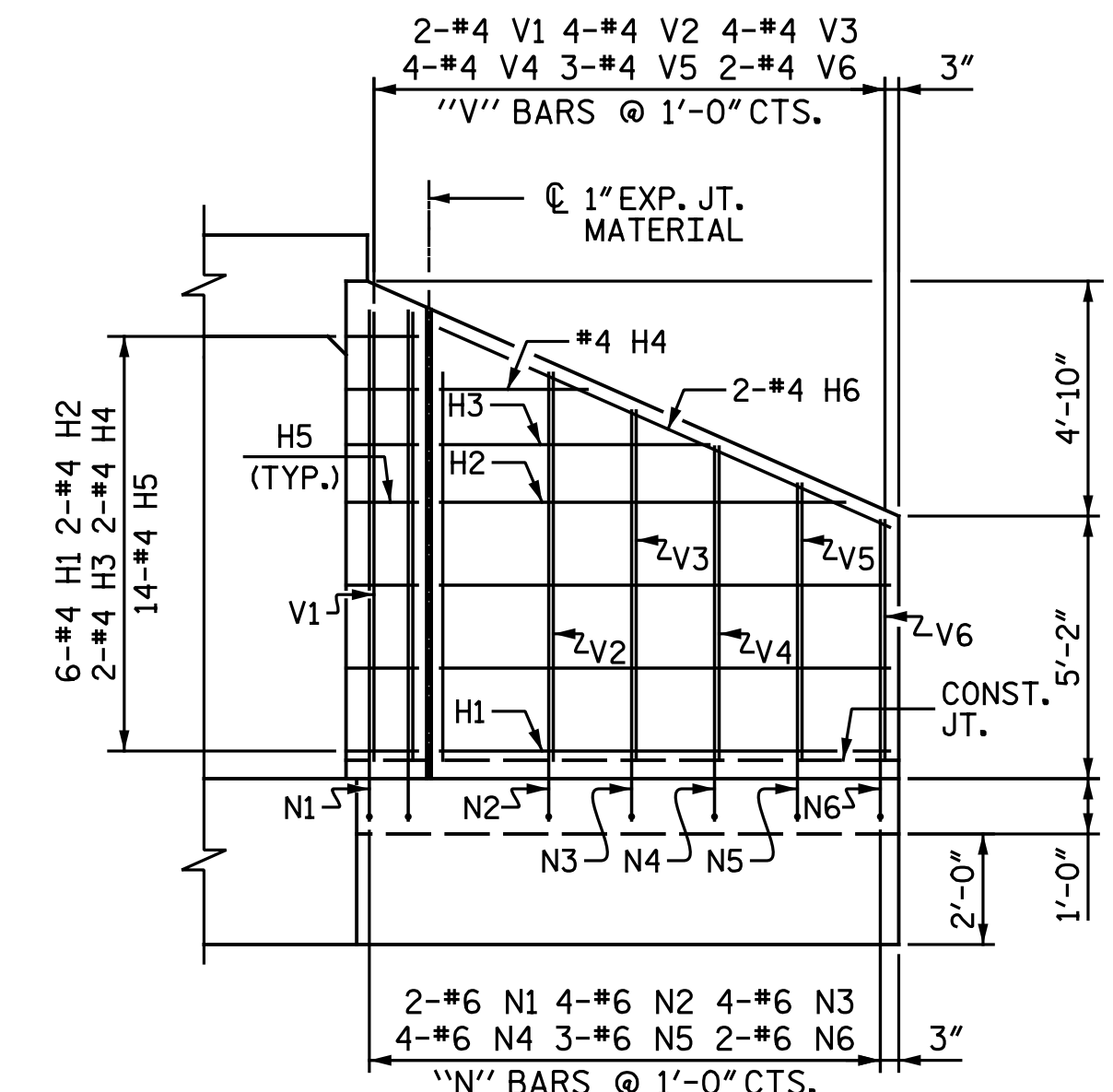
PLAN W1



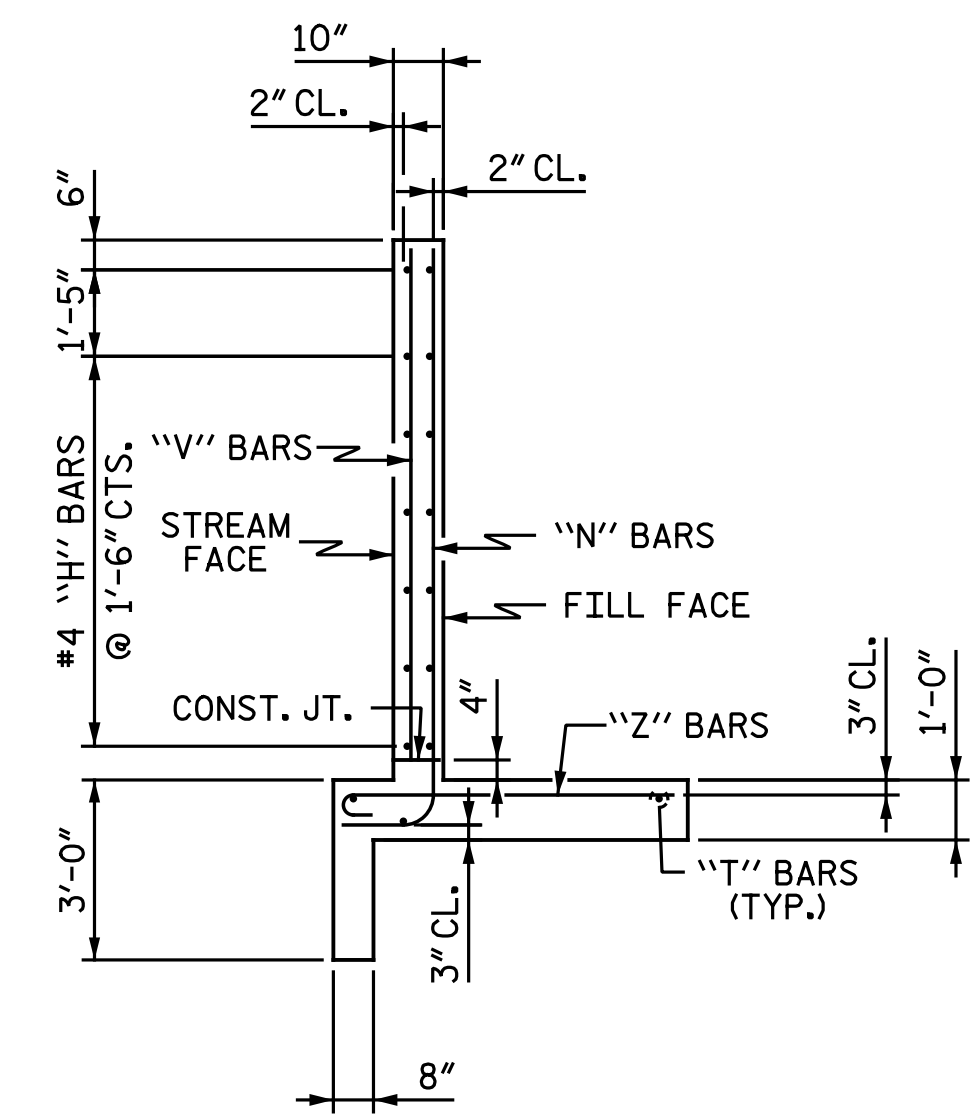
PLAN W2



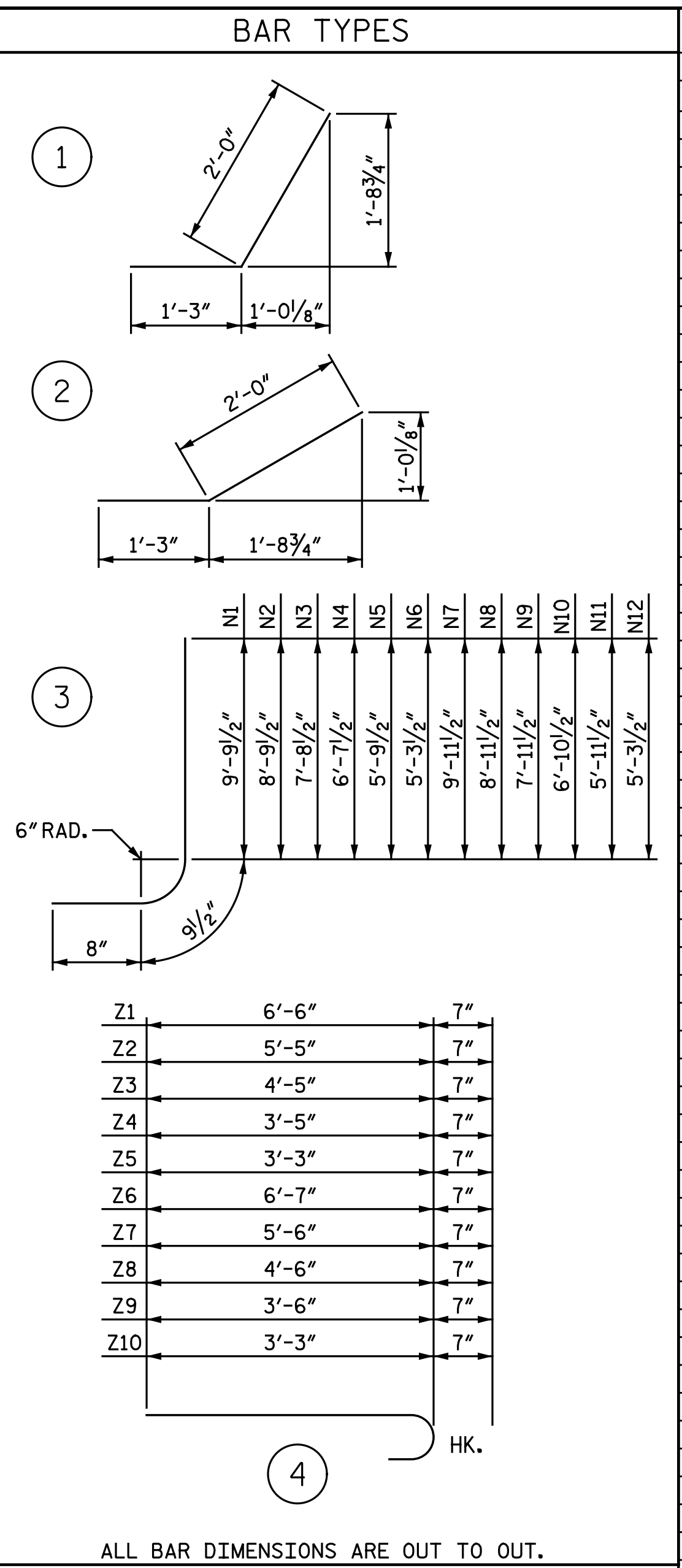
ELEVATION W1



ELEVATION W2



TYPICAL WING SECTION

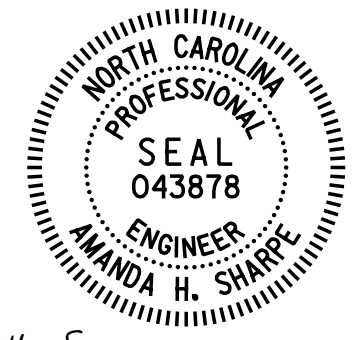


ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL					
BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	12	#4	STR.	16' - 2"	130
H2	4	#4	STR.	16' - 0"	43
H3	4	#4	STR.	10' - 6"	28
H4	4	#4	STR.	5' - 0"	13
H5	28	#4	1	3' - 3"	61
H6	4	#4	STR.	16' - 9"	45
H7	16	#4	STR.	29' - 2"	312
H8	4	#4	STR.	19' - 8"	53
H9	4	#4	STR.	10' - 1"	27
H10	28	#4	2	3' - 3"	61
H11	4	#4	STR.	29' - 6"	79
N1	4	#6	3	11' - 3"	68
N2	8	#6	3	10' - 3"	123
N3	8	#6	3	9' - 2"	110
N4	8	#6	3	8' - 1"	97
N5	6	#6	3	7' - 3"	65
N6	4	#6	3	6' - 9"	41
N7	4	#6	3	11' - 5"	69
N8	14	#6	3	10' - 5"	219
N9	12	#6	3	9' - 5"	170
N10	14	#6	3	8' - 4"	175
N11	12	#6	3	7' - 5"	134
N12	8	#6	3	6' - 9"	81
S1	12	#6	STR.	6' - 0"	108
T1	6	#5	STR.	17' - 8"	111
T2	6	#5	STR.	30' - 7"	191
V1	4	#4	STR.	9' - 3"	25
V2	8	#4	STR.	8' - 3"	44
V3	8	#4	STR.	7' - 2"	38
V4	8	#4	STR.	6' - 1"	33
V5	6	#4	STR.	5' - 3"	21
V6	4	#4	STR.	4' - 8"	12
V7	4	#4	STR.	9' - 4"	25
V8	14	#4	STR.	8' - 4"	78
V9	14	#4	STR.	7' - 3"	68
V10	12	#4	STR.	6' - 4"	51
V11	14	#4	STR.	5' - 3"	49
V12	6	#4	STR.	4' - 9"	19
Z1	4	#5	4	7' - 1"	30
Z2	12	#5	4	6' - 0"	75
Z3	10	#5	4	5' - 0"	52
Z4	10	#5	4	4' - 0"	42
Z5	2	#5	4	3' - 10"	8
Z6	4	#5	4	7' - 2"	30
Z7	20	#5	4	6' - 1"	127
Z8	18	#5	4	5' - 1"	95
Z9	18	#5	4	4' - 1"	77
Z10	4	#5	4	3' - 10"	16

REINFORCING STEEL FOR 4 WINGS		LBS.	3,629
CLASS A CONCRETE			
4 WINGS	C.Y.	49.6	
2 HEADWALLS	C.Y.	2.8	
2 END CURTAIN WALLS	C.Y.	3.8	
TOTAL	C.Y.	56.2	

PROJECT NO. I-5878
HARNETT COUNTY
 STATION: 1042+08.93 -L-



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

STATE OF NORTH CAROLINA
 DEPARTMENT OF TRANSPORTATION
 RALEIGH

WINGS FOR CONCRETE BOX CULVERT

H = 9'-0" SLOPE = 3:1
 119°-24'-07" SKEW

DRAWN BY : M. D. MAYHEW DATE : 1-31-20
 CHECKED BY : A. H. SHARPE DATE : 4-7-20

REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	C2-7	
1			3			TOTAL SHEETS	
2			4			8	

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 Michael Baker Engineering
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 Cary, North Carolina 27518
 NC License No. : F-1084

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 (%LL)	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	1.35	---	1.75	1.54	1	TOP SLAB	3.47	1.35	1	BOTTOM SLAB	7.73		
	HL-93 (OPERATING)	N/A		1.75	---	1.35	2.00	1	TOP SLAB	3.47	1.75	1	BOTTOM SLAB	7.73		
	HS-20 (INVENTORY)	36.000	②	1.69	60.84	1.75	2.16	1	TOP SLAB	3.47	1.69	1	BOTTOM SLAB	7.73		
	HS-20 (OPERATING)	36.000		2.19	78.84	1.35	2.80	1	TOP SLAB	3.47	2.19	1	BOTTOM SLAB	7.73		
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SH		3.03	37.88	1.40	4.36	1	TOP SLAB	3.47	3.03	1	EXTERIOR WALL	0.90		
		S3C		2.54	54.61	1.40	2.54	1	TOP SLAB	3.47	2.85	1	TOP SLAB	7.73		
		S3A		2.54	57.79	1.40	2.54	1	TOP SLAB	3.47	2.82	1	TOP SLAB	7.73		
		S4A		2.49	66.61	1.40	2.49	1	TOP SLAB	3.47	2.57	1	BOTTOM SLAB	7.73		
		S5A		2.34	71.37	1.40	2.42	1	TOP SLAB	3.47	2.34	1	BOTTOM SLAB	7.73		
		S6A		2.20	75.90	1.40	2.42	1	TOP SLAB	3.47	2.20	1	BOTTOM SLAB	7.73		
	TRUCK-TRAILER SEMI-TRAILER (TTST)	S7B		③	2.09	80.47	1.40	2.44	1	TOP SLAB	3.47	2.09	1	BOTTOM SLAB	7.73	
		S7A			2.20	88.00	1.40	2.41	1	TOP SLAB	3.47	2.20	1	BOTTOM SLAB	7.73	
		T4A			2.54	71.76	1.40	2.54	1	TOP SLAB	3.47	2.69	1	BOTTOM SLAB	7.73	
		T5B			2.36	75.52	1.40	2.59	1	TOP SLAB	3.47	2.36	1	BOTTOM SLAB	7.73	
		T6A			2.30	82.80	1.40	2.49	1	TOP SLAB	3.47	2.30	1	BOTTOM SLAB	7.73	
		T7A			2.18	87.20	1.40	2.49	1	TOP SLAB	3.47	2.18	1	BOTTOM SLAB	7.73	
	T7B			2.40	96.00	1.40	2.46	1	TOP SLAB	3.47	2.40	1	BOTTOM SLAB	7.73		

LOAD FACTORS:

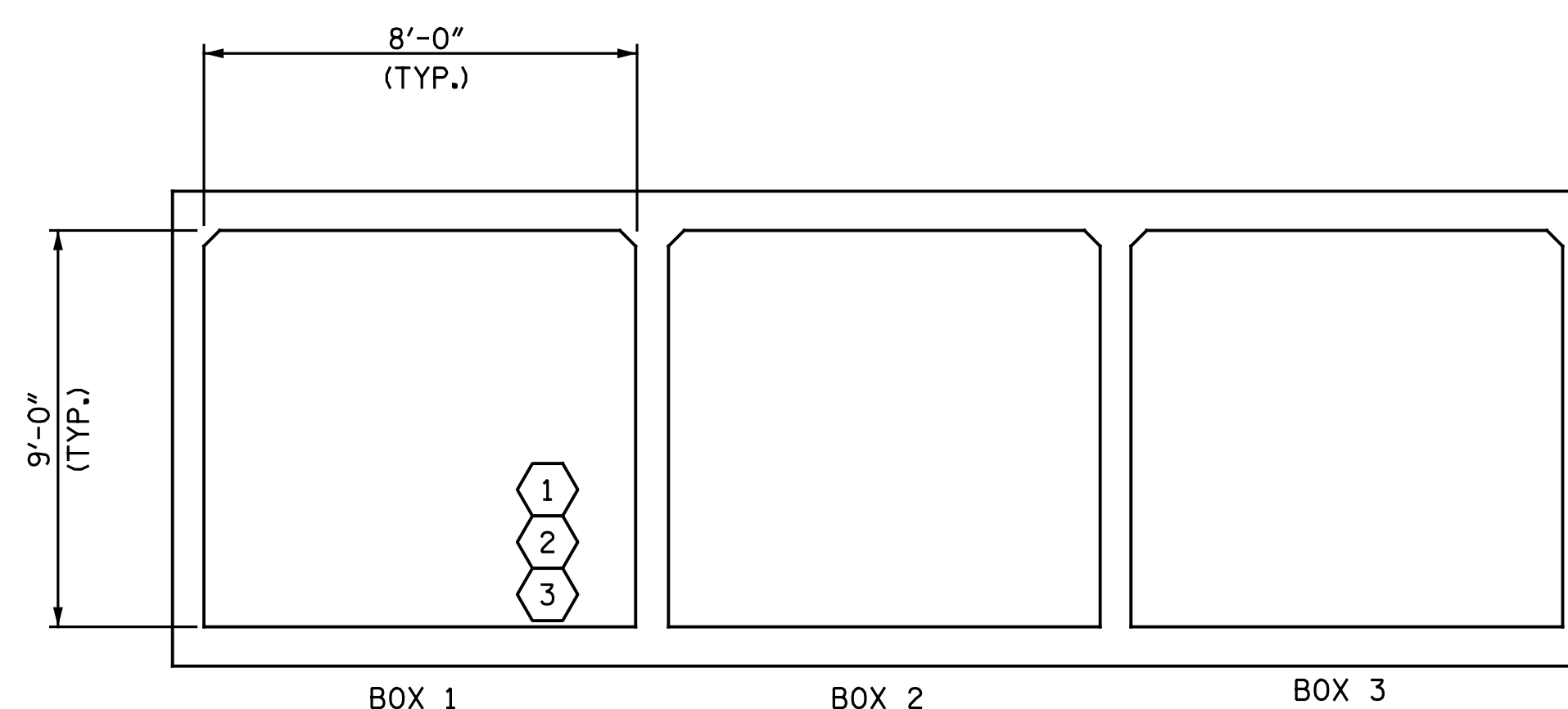
DESIGN LOAD RATING FACTORS

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

NOTE:

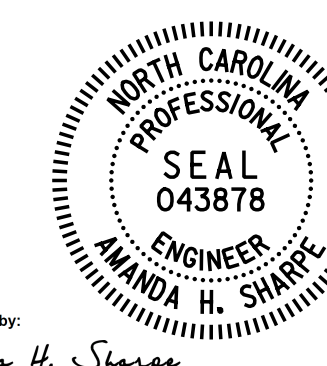
RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

#	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. I-5878
HARNETT COUNTY
STATION: 1042+08.93 -L-



DocuSigned by:
Amanda H. Sharpe
4/9/2020

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

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

ASSEMBLED BY : N. B. SPEAKS	DATE : 7-18-19
CHECKED BY : A. H. SHARPE	DATE : 2-7-20
DRAWN BY : WMC 7/11	REV. 10/11/11 MAA/GM
CHECKED BY : GM 7/11	REV. 12/17 MAA/THC

Michael Baker INTERNATIONAL	REVISIONS						SHEET NO. C2-8 TOTAL SHEETS 8
	NO.	BY:	DATE:	NO.	BY:	DATE:	
	1			3			
	2			4			

