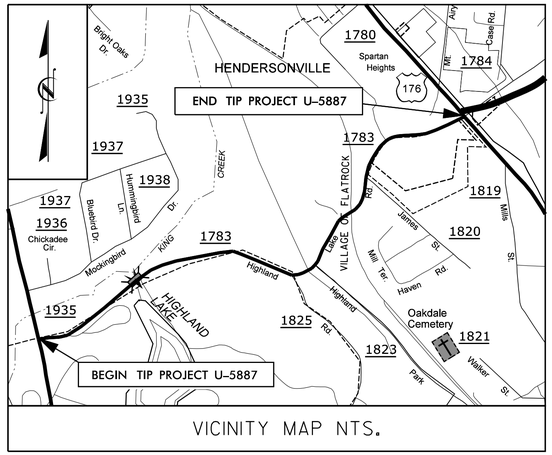
TIP NO: U-5887

CONTRACT: C204631



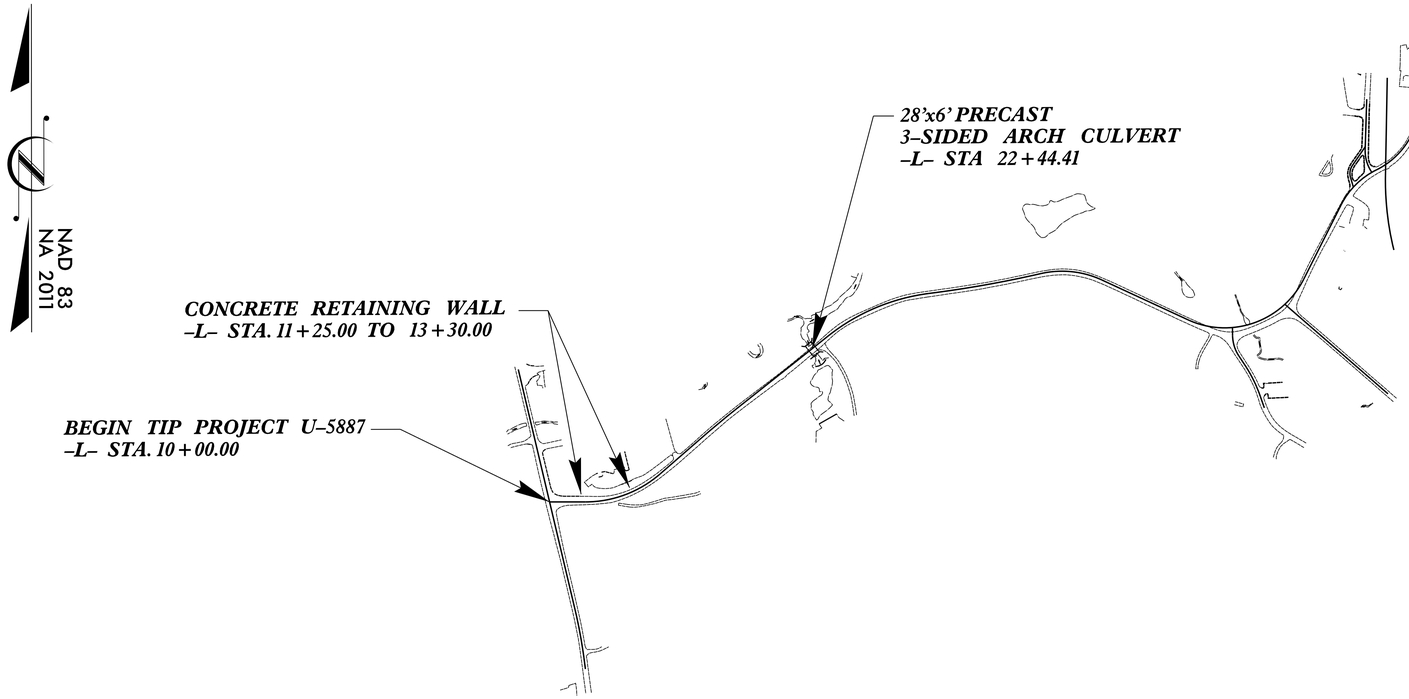
VICINITY MAP NTS.

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS
HENDERSON COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-5887		36

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
44634.1.1	——	PE
44634.2.1	——	R/W
44634.3.1	——	CONST.

NEW STRUCTURE NO. 440394 OVER KING CREEK ON SR 1783 (NORTH HIGHLAND LAKE ROAD)



CULVERT & RETAINING WALL

DocuSigned by:
Hardy Willis
C0287FCF0223461...
3/18/2021

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

V&M Vaughn & Melton
Consulting Engineers
Asheville, North Carolina 828·253·2796
Charlotte, North Carolina 704·357·0488
Tri-Cities, Tennessee 423·467·8401
Knoxville, Tennessee 865·546·5800
Middlesboro, Kentucky 606·248·6600
Spartanburg, South Carolina 864·574·4775

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DESIGN DATA

ADT 2010 = 6700
ADT 2040 = 7200

T = 5 %
V = 35 MPH

FUNC CLASS = MAJOR COLLECTOR

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT U-5887 = 1.058 MI
LENGTH STRUCTURE TIP PROJECT U-5887 = 0.006 MI
TOTAL LENGTH OF TIP PROJECT U-5887 = 1.064 MI

Prepared in the Office of:
VAUGHN & MELTON
1318-F PATTON AVE.
ASHEVILLE NC. 28806
FOR THE NORTH CAROLINA DIVISION OF HIGHWAYS

2018 STANDARD SPECIFICATIONS

LETTING DATE :

MAY 18, 2021

HARDY WILLIS, PE
PROJECT ENGINEER

CHRIS CORDELL, PE
PROJECT DESIGN ENGINEER

STRUCTURES MANAGEMENT UNIT
1000 BIRCH RIDGE DR.
RALEIGH, N.C. 27610

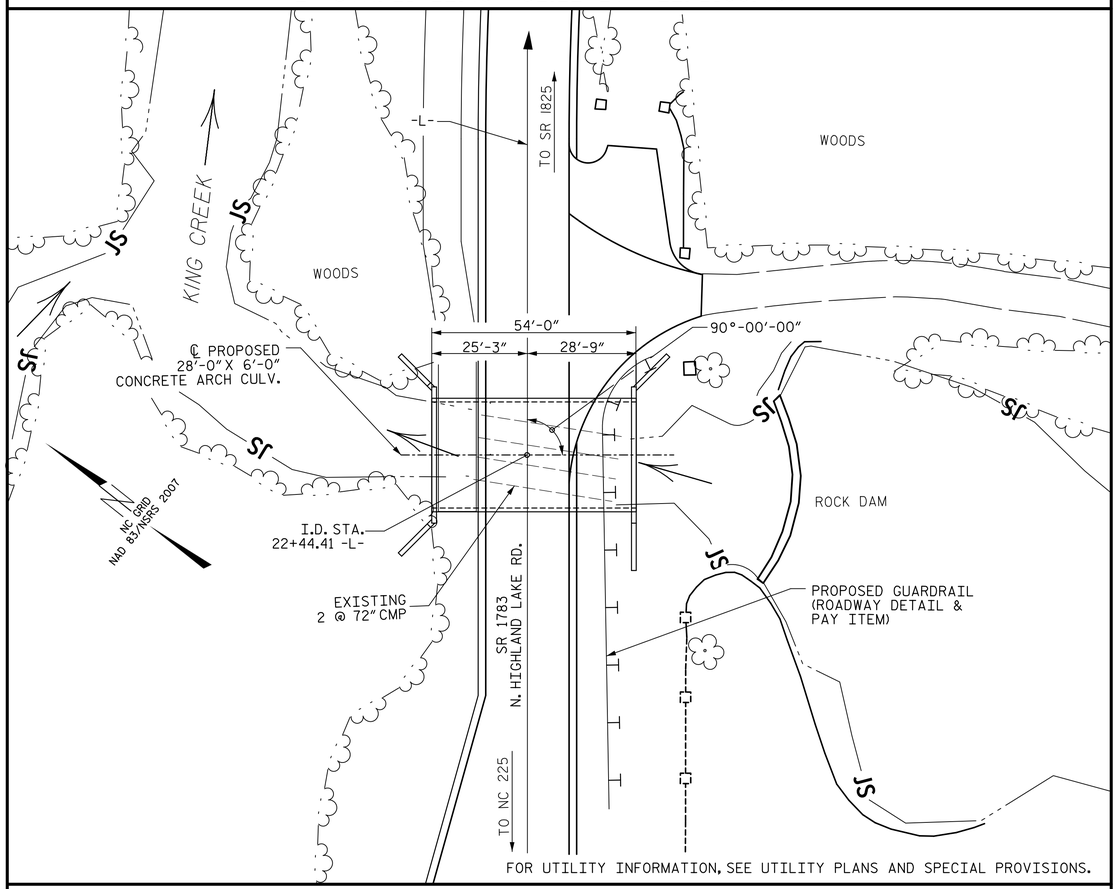
DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA

P.E.
STATE DESIGN ENGINEER

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED
DIVISION ADMINISTRATOR *DATE*

BM #3: NAIL SET IN BASE OF 48" DBL. POPLAR
-L- STA. 21+22.46 52.22' LT EL. 2109.70'



FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.

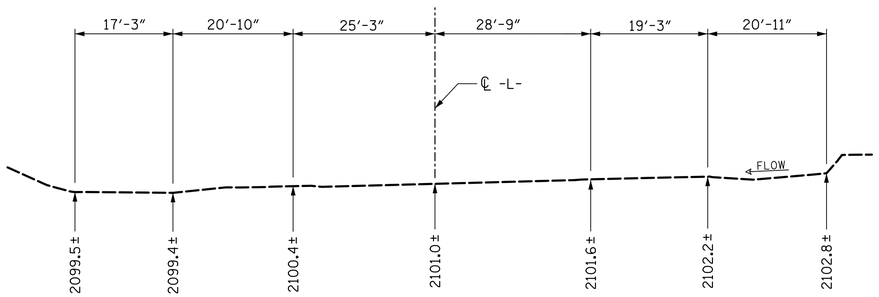
LOCATION SKETCH

GRADE DATA

GRADE POINT ELEV. @ STATION 22+44.41 = 2111.23±

BED ELEV. @ STATION 22+44.41 = 2100.82±

ROADWAY SLOPES 2:1



PROFILE ALONG ℄ CULVERT

NOTES

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

DESIGN FILL ----- MAX.=4.83' MIN.=4.08'

FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.

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.

CAST-IN-PLACE CONCRETE SHALL BE POURED IN THE FOLLOWING ORDER:

1. FOOTINGS.
2. HEADWALL FOOTINGS, WALLS AND WINGS FULL HEIGHT, EXCEPT FOR RAIL PARAPET PORTION OF OUTLET HEADWALL.
3. RAIL PARAPET ON OUTLET HEADWALL.
4. A 3'-0" STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENDING LENGTH OF THE EXPANSION JOINT.

FOR MAINTENANCE OF TRAFFIC, SEE TRAFFIC MANAGEMENT PLANS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR PILES SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.

TEMPORARY SHORING MAY BE REQUIRED. SEE STANDARD DRAWING NO. 1801.01 FOR STANDARD TEMPORARY SHORING.

THE EXISTING STRUCTURE, CONSISTING OF TWO LINES OF 72" CMP AND LOCATED AT THE PROPOSED STRUCTURE, SHALL BE REMOVED.

ARCHITECTURAL SURFACE TREATMENT IS REQUIRED FOR THE EXPOSED FACES OF THE WINGWALLS, THE FRONT FACE OF HEADWALLS, INTERIOR AND EXTERIOR FACES OF THE CONCRETE PARAPET AND END POSTS. FOR ARCHITECTURAL SURFACE TREATMENT, SEE SPECIAL PROVISIONS.

FOR PRECAST REINFORCED THREE-SIDED CULVERT, SEE SPECIAL PROVISIONS.

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

FOOTING IS DESIGNED FOR ASSUMED PRECAST CULVERT WALL THICKNESS OF 1'-0". HEADWALL IS DESIGNED FOR ASSUMED PRECAST CULVERT TOP SLAB THICKNESS OF 10" AT CROWN. ANY CHANGE IN DESIGN DIMENSIONS WILL REQUIRE ADJUSTMENT OF DETAILS AND REINFORCEMENT LENGTHS.

FOR 18" STEEL SHEET PILES, SEE SPECIAL PROVISIONS.

(NOTES CONTINUED ON SHEET C-4)

TOTAL CULVERT QUANTITIES

REMOVAL OF EXISTING STRUCTURE AT STA. 22+44.41 -L-	LUMP SUM
PRECAST REINFORCED CONCRETE THREE SIDED CULVERT AT STA. 22+44.41 -L-	LUMP SUM
PILE EXCAVATION IN SOIL	64 LIN. FT.
PILE EXCAVATION NOT IN SOIL	80 LIN. FT.
UNCLASSIFIED STRUCTURE EXCAVATION AT STATION 22+44.41 -L-	LUMP SUM
CLASS 'A' CONCRETE	175.4 CU. YDS.
REINFORCING STEEL	16,844 LBS.
HP12x53 STEEL PILES	152 LIN. FT.
ANODIZED TWO BAR METAL RAIL	28.5 LIN. FT.
18" STEEL SHEET PILES	440 SQ. FT.
FOUNDATION EXCAVATION	629 CU. YDS.
ARCHITECTURAL SURFACE TREATMENT	1274 SQ. FT.
EPOXY COATED REINFORCING STEEL	396 LBS.
1'-3" X 2'-6" CONCRETE PARAPET	36.0 LIN. FT.
PILE DRIVING EQUIPMENT SETUP FOR HP 12X53 STEEL PILES	8 EA.

FOUNDATION RECOMMENDATIONS:

THE SPREAD FOOTINGS ARE DESIGNED FOR A FACTORED RESISTANCE OF 4 TSF. CHECK FIELD CONDITIONS FOR THE REQUIRED RESISTANCE OF 9 TSF JUST BEFORE PLACING CONCRETE.

KEY SPREAD FOOTINGS AT LEAST 12" INTO WEATHERED ROCK or ROCK WITH MINIMUM THICKNESS AS SHOWN ON THE PLANS.

THE SCOUR CRITICAL ELEVATION IS THE BOTTOM OF FOOTING. SCOUR CRITICAL ELEVATIONS ARE USED TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.

SPREAD FOOTINGS MUST BE PLACED ON NON-SCOURABLE ROCK. IF ADEQUATE MATERIAL IS NOT ENCOUNTERED AT THE PLAN BOTTOM OF FOOTING EXCAVATION, EXCAVATE DOWN AND 1-FOOT INTO NON-SCOURABLE ROCK.

IF THE TOP OF NON-SCOURABLE ROCK IS LOCATED AT A DEPTH GREATER THAN 3 FEET BELOW PLAN BOTTOM OF FOOTING ELEVATION, DRILLED-IN PILES ARE RECOMMENDED.

DRILLED-IN- PILES SHALL BE INSTALLED VERTICAL, WITH A CENTER -TO-CENTER SPACING NO GREATER THAN 5 FEET, AND WITH A PENETRATION OF AT LEAST 10 FEET INTO WEATHERED ROCK/CRYSTALLINE ROCK. FOR PILE EXCAVATION, SEE SECTION 450 OF THE STANDARD SPECIFICATION.

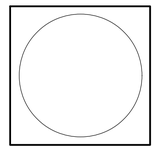
CONCRETE IS REQUIRED TO FILL HOLES FOR PILE EXCAVATIONS.

IF THE TOP OF NON-SCOURABLE ROCK IS LOCATED BELOW THE PLANNED BOTTOM OF FOOTING ELEVATION, PZ27 SHEETING SHALL BE USED TO PROVIDE SCOUR PROTECTION. SHEETING SHALL BE DRIVEN TO REFUSAL AND THE TOP CAST DIRECTLY INTO THE FOOTING CONCRETE. REFUSAL ELEVATIONS ARE EXPECTED TO BE VARIABLE, RANGING FROM APPROXIMATELY 2,108 FEET TO 2,088 FEET ALONG THE EAST FOOTING TO APPROXIMATELY 2,101 FEET TO 2,102 FEET ALONG THE WEST FOOTING.

HYDRAULIC DATA

DESIGN DISCHARGE	= 1000	CFS
DESIGN FREQUENCY	= 25	YRS
DESIGN HW ELEVATION	= 2108.1	FT
DRAINAGE AREA	= 3.8	SQ. MI.
BASE DISCHARGE	= 1500	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 2111.2	FT
OVERTOPPING DISCHARGE	= 1350	CFS
OVERTOPPING FREQUENCY	= 50+	YRS
OVERTOPPING ELEVATION	= 2110.8	FT

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



DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Vaughn & Melton Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-9900
Asheville, North Carolina 828-253-2796

PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

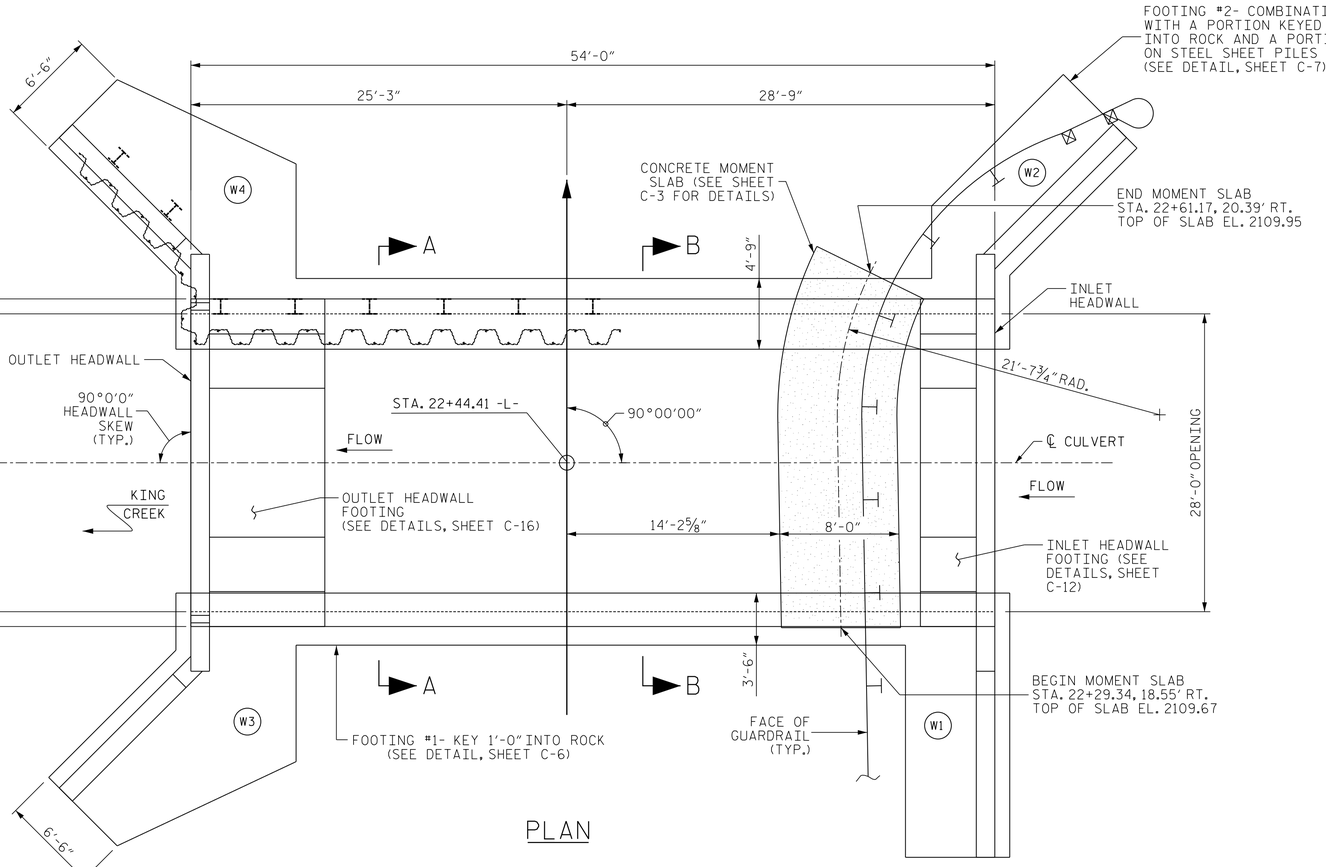
SHEET 1 OF 21 NEW STRUCTURE 440394

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

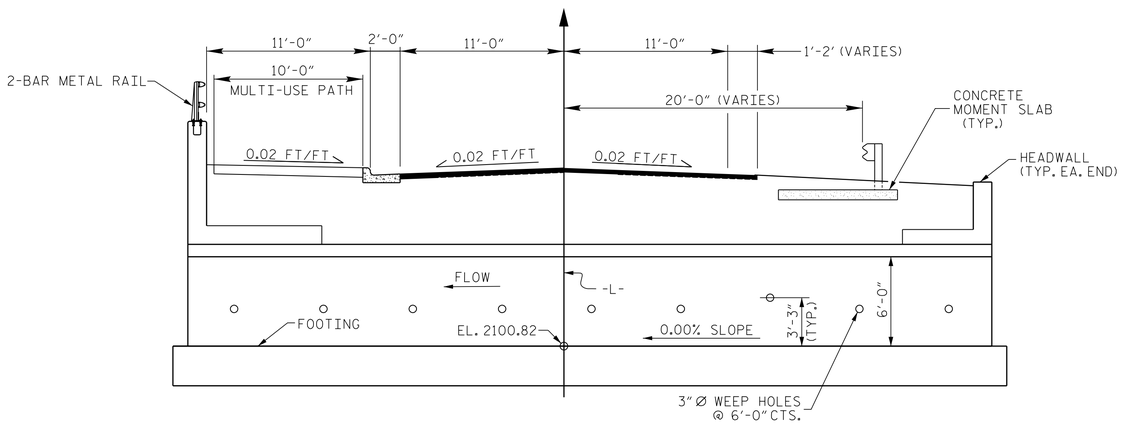
GENERAL DRAWING
28'-0" X 6'-0" PRECAST
CONCRETE ARCH CULVERT
ALONG KING CREEK
ON SR 1783 (N. HIGHLAND LAKE RD)
90° SKEW

DRAWN BY: HL	DATE: 03/2020
CHECKED BY: CBC	DATE: 03/2020
ENG. OF RECORD: CBC	DATE: 03/2020

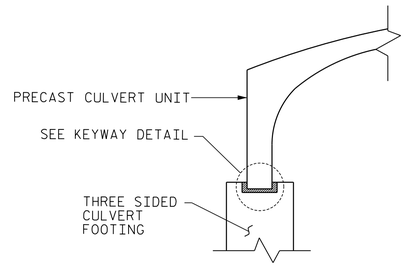
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-1
1			3			TOTAL SHEETS
2			4			36



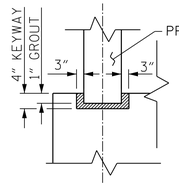
PLAN



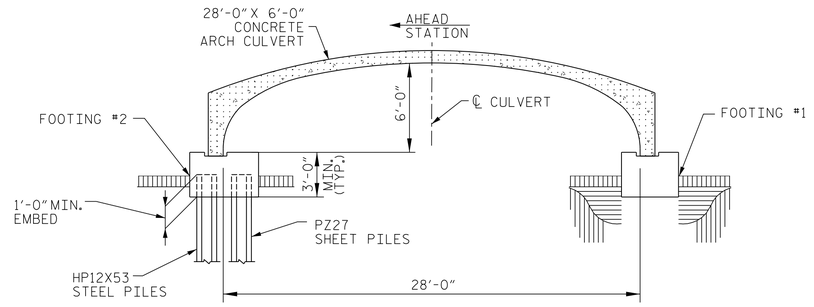
CULVERT SECTION NORMAL TO ROADWAY



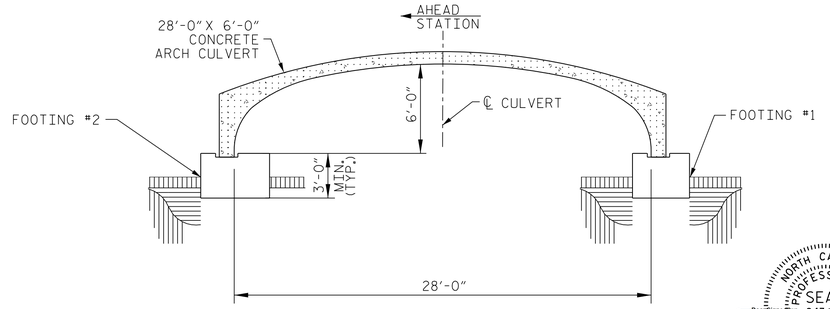
SECTION THRU FOOTING



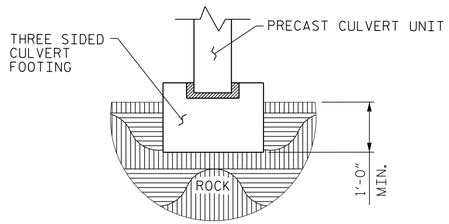
KEYWAY DETAIL



SECTION A-A
FACING UPSTREAM



SECTION B-B
FACING UPSTREAM



KEYED FOOTING DETAIL

SIDES OF FOOTING SHALL BE IN CONTACT WITH UNDISTURBED MATERIAL FOR MINIMUM DIMENSION SHOWN

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

NORTH CAROLINA PROFESSIONAL SEAL 043143 ENGINEER CHRISTOPHER B. CONDELL
Docusigned By: Christopher B. Conduff
8/19/2020

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

PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

SHEET 2 OF 21

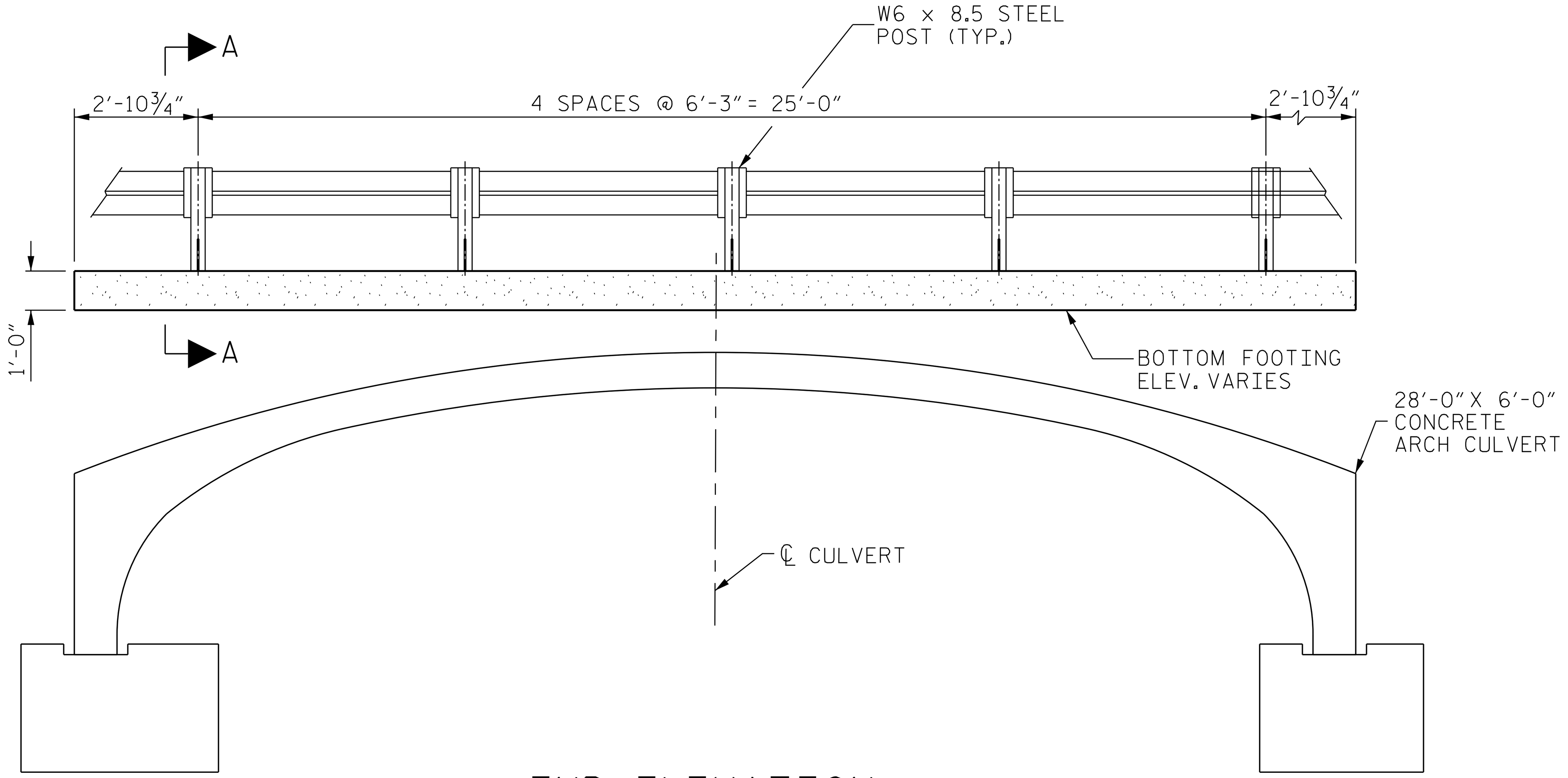
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

28'-0" X 6'-0" PRECAST CONSPAN ARCH CULVERT ALONG KING CREEK ON SR 1783 (N. HIGHLAND LAKE RD)

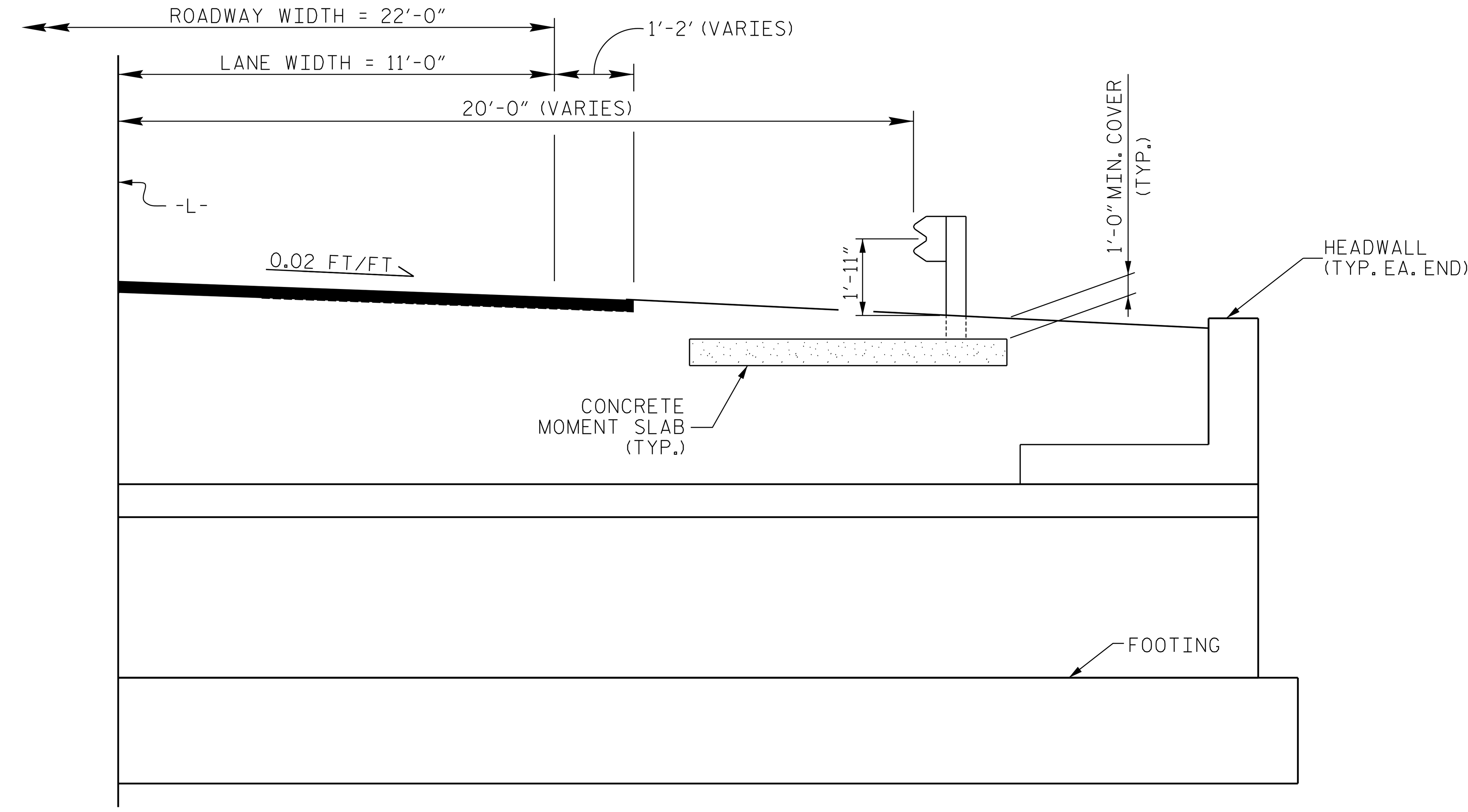
V&M Vaughn & Melton Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-1900
Asheville, North Carolina 828-253-2796

DRAWN BY: HL DATE: 03/2020
CHECKED BY: CBC DATE: 03/2020
ENG. OF RECORD: CBC DATE: 03/2020

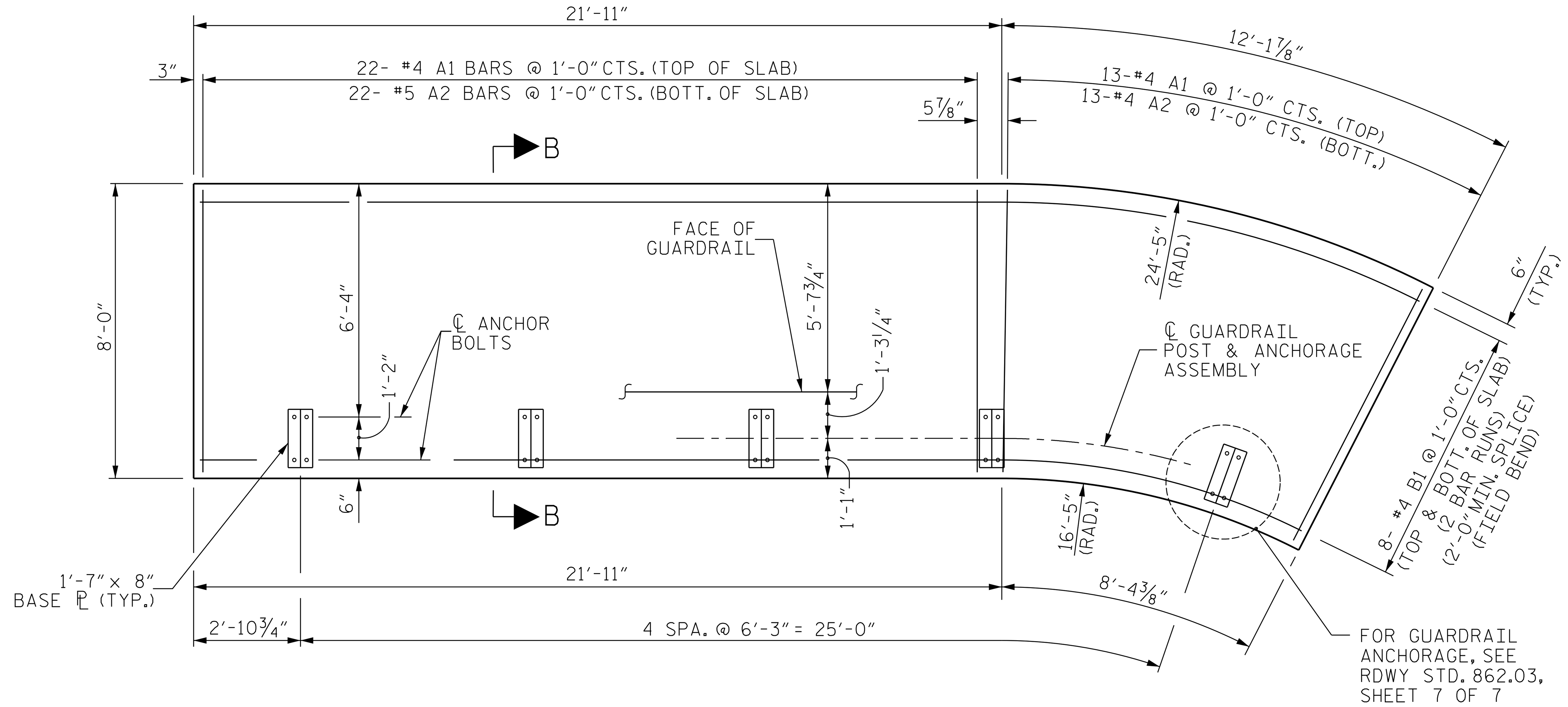
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-2
1			3			TOTAL SHEETS
2			4			36



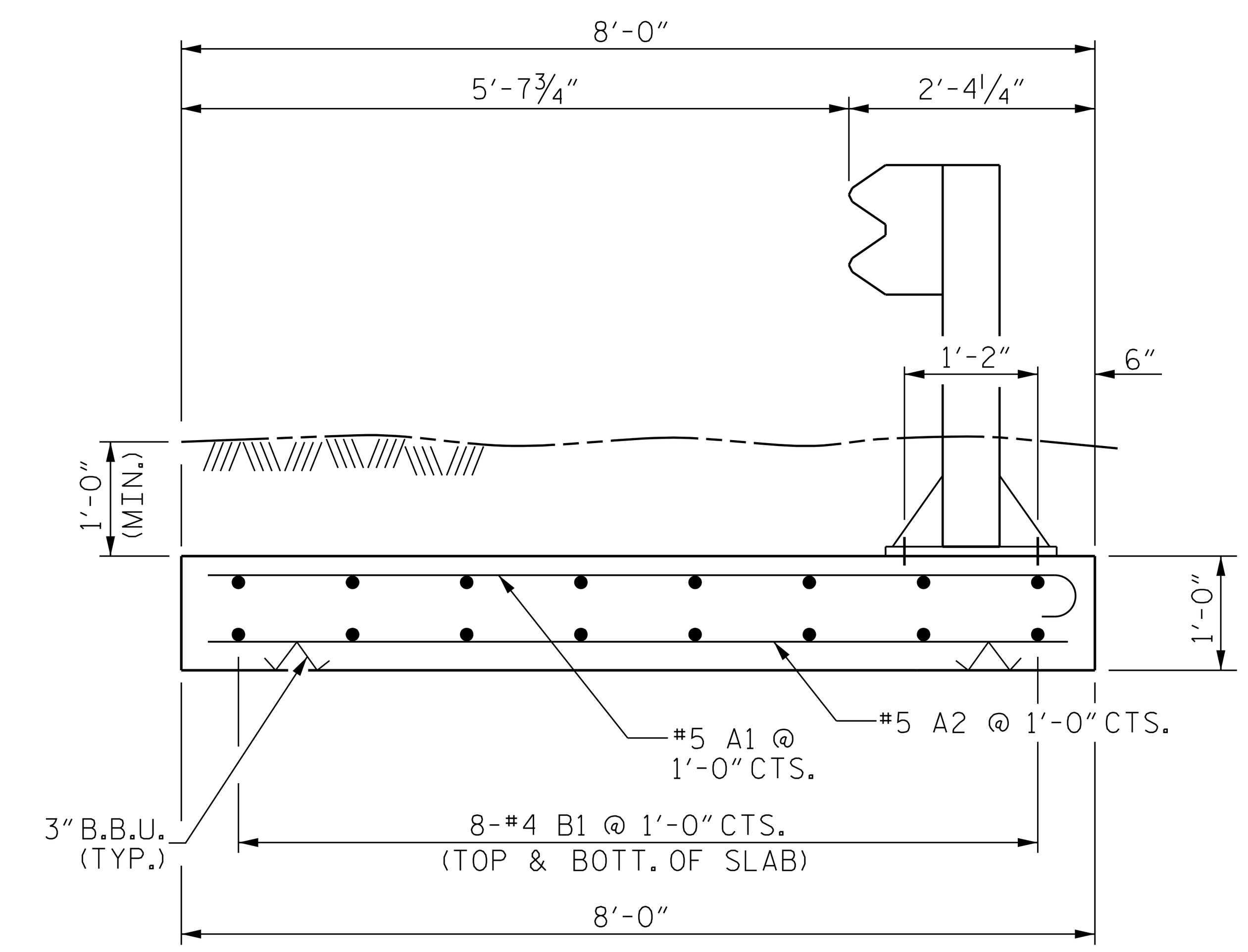
END ELEVATION



SECTION A-A



MOMENT SLAB PLAN

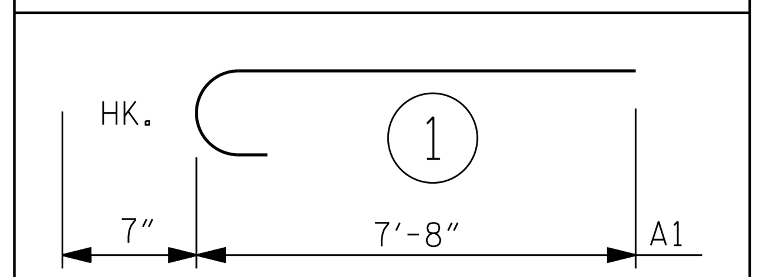


SECTION B-B

BILL OF MATERIAL FOR MOMENT SLAB

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	35	5	1	8'-3"	301
A2	35	5	STR	7'-8"	280
B1	16	4	STR	17'-9"	190
REINFORCING STEEL LBS. = 771					
CLASS A CONCRETE CU. YDS. = 9.5					

BAR TYPE



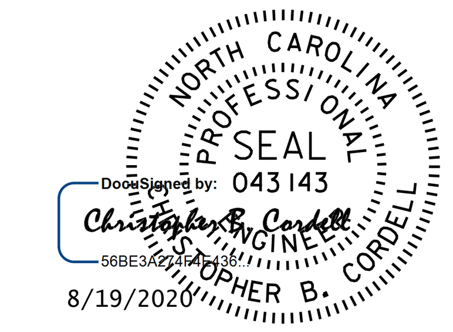
BAR DIMENSIONS ARE OUT TO OUT

PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

SHEET 3 OF 21



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V&M Vaughn & Melton Consulting Engineers
Middlesboro, Kentucky
Knoxville, Tennessee
Asheville, North Carolina

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

CONCRETE MOMENT SLAB DETAILS

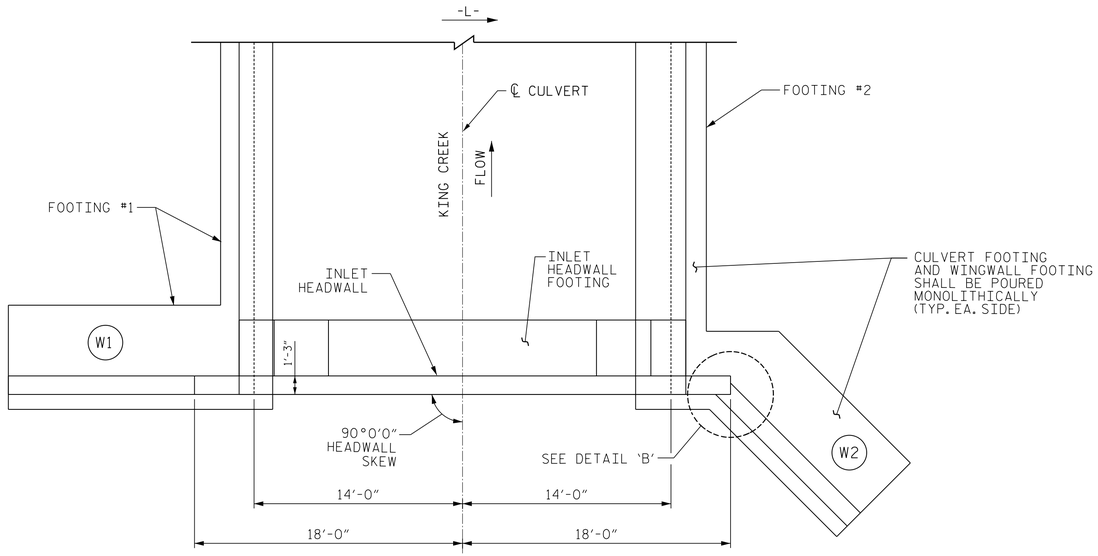
DRAWN BY: HL	DATE: 03/2020
CHECKED BY: CBC	DATE: 03/2020
ENG. OF RECORD: CBC	DATE: 03/2020

REVISIONS

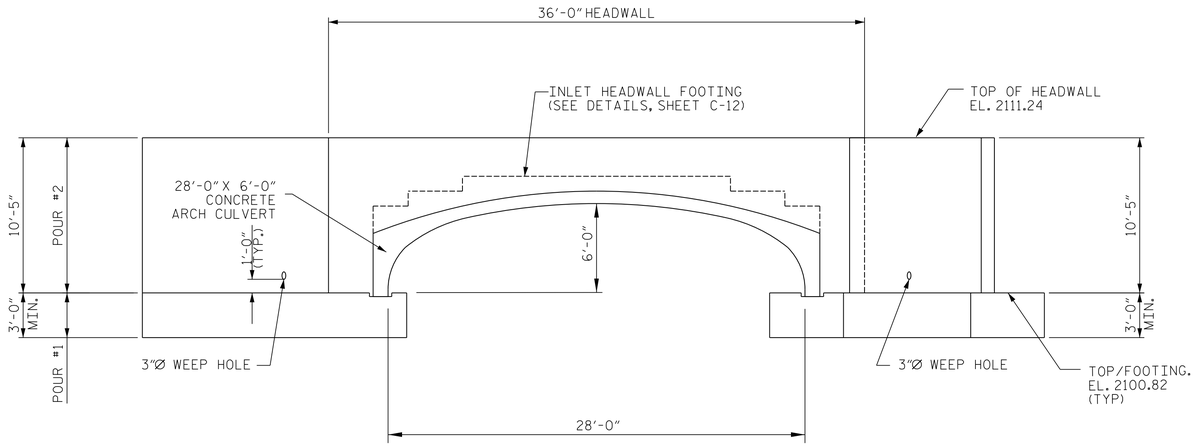
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO. C-3

TOTAL SHEETS 36



PLAN



END ELEVATION-NORMAL TO SKEW

APPROXIMATE FOOTING DEPTH. MAINTAIN 1'-0" MIN. ROCK EMBEDMENT

NOTES (CONT.)

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

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

THE CONCRETE FOR THE PRECAST UNITS SHALL ATTAIN A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 5000 P.S.I.. THE CONCRETE FOR THE HEADWALLS, WINGS AND END CURTAIN WALLS SHALL BE CLASS "A" CONCRETE AS PER THE STANDARD SPECIFICATIONS.

ALL PRECAST UNITS SHALL BE PLACED PRIOR TO POURING THE WINGS, END CURTAIN WALLS AND HEADWALLS. THE EXTERIOR PRECAST UNITS SHALL BE UNDERMINED TO PROVIDE FOR THE WING FOOTINGS TO BE POURED TO THE DEPTH AND DIMENSIONS AS SHOWN ON THIS PLAN SHEET.

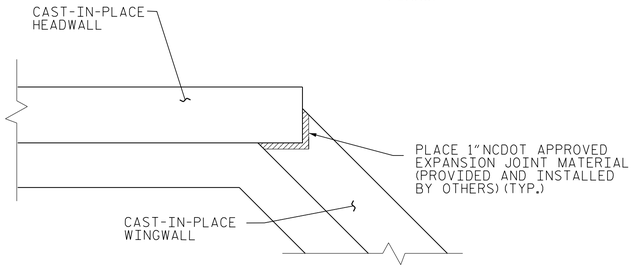
FOUNDATION CONDITIONING MATERIAL SHALL HAVE A THICKNESS OF AT LEAST 1'-0" BELOW THE BOTTOM OF THE PRECAST UNITS. THE MATERIAL SHALL BE FORMED AND SCREEDED TO THE PROPER ELEVATION AT LEAST 1'-0" BEYOND THE SIDES OF THE PRECAST UNITS.

THE PRECAST UNITS SHALL BE CAREFULLY POSITIONED ON THE PREPARED FOUNDATION CONDITIONING MATERIAL, FEMALE END UPGRADE WITH THE MALE END FULLY INSERTED AND EACH JOINT CHECKED FOR ALIGNMENT PRIOR TO JACKING THE UNIT INTO PLACE. SATISFACTORY FITTING AND PROPER GRADE SHALL BE MAINTAINED AS THE WORK PROCEEDS.

WHEN ANY PRECAST UNIT IS DAMAGED DURING HANDLING, THE ENGINEER AT HIS DISCRETION SHALL REJECT THE UNIT AS BEING UNFIT FOR INSTALLATION AND THE CONTRACTOR SHALL REMOVE SUCH REJECTED UNIT FROM THE PROJECT. MINOR DAMAGE TO THE UNIT MAY BE REPAIRED BY THE CONTRACTOR WHEN PERMITTED BY THE ENGINEER.

CARE SHALL BE TAKEN DURING BACKFILL AND COMPACTION OPERATION TO MAINTAIN ALIGNMENT AND PREVENT DAMAGE TO THE JOINTS. UNITS WHICH BECOME MISALIGNED, SHOW EXCESSIVE SETTLEMENT, OR HAVE OTHERWISE BEEN DAMAGED BY THE CONTRACTOR'S OPERATION SHALL AT THE DISCRETION OF THE ENGINEER BE REMOVED AND REPLACED BY THE CONTRACTOR AT NO COST TO THE DEPARTMENT OF TRANSPORTATION.

CONCRETE CHAMFERS ON EXTERIOR LONGITUDINAL EDGES OF THE PRECAST UNITS MAY BE AS PER THE FABRICATORS RECOMMENDATION, HOWEVER ALL WORKMANSHIP SHALL PROVIDE CONCRETE COVER OVER THE WELDED WIRE FABRIC AS SPECIFIED ON THE PLANS AND THE CONCRETE CHAMFERS CHOSEN SHALL IN NO WAY FUNCTIONALLY LESSEN THE DESIGN SHOWN ON THE PLANS.



DETAIL "B"

NORTH CAROLINA PROFESSIONAL SEAL 043143 ENGINEER CHRISTOPHER B. CORDELL
Digitally Signed by Christopher B. Cordell
SEBES Inc.
8/19/2020

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

PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

SHEET 4 OF 21

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

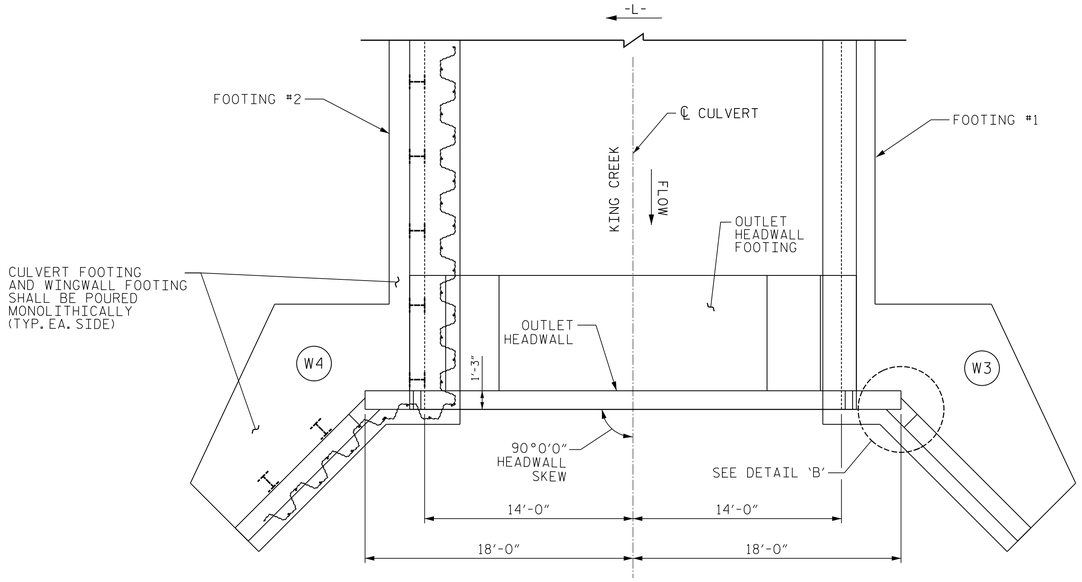
V&M Vaughn & Melton Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-5800
Asheville, North Carolina 828-253-2796

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

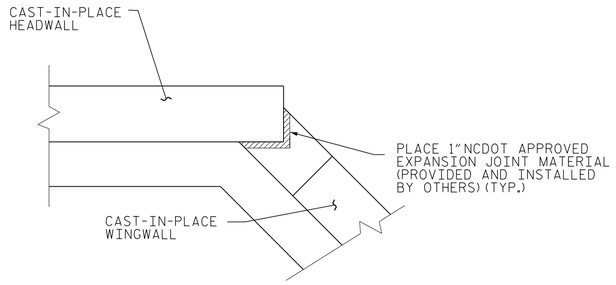
INLET HEADWALL

DRAWN BY: HL	DATE: 03/2020	
CHECKED BY: CBC	DATE: 03/2020	
ENG. OF RECORD: CBC	DATE: 03/2020	

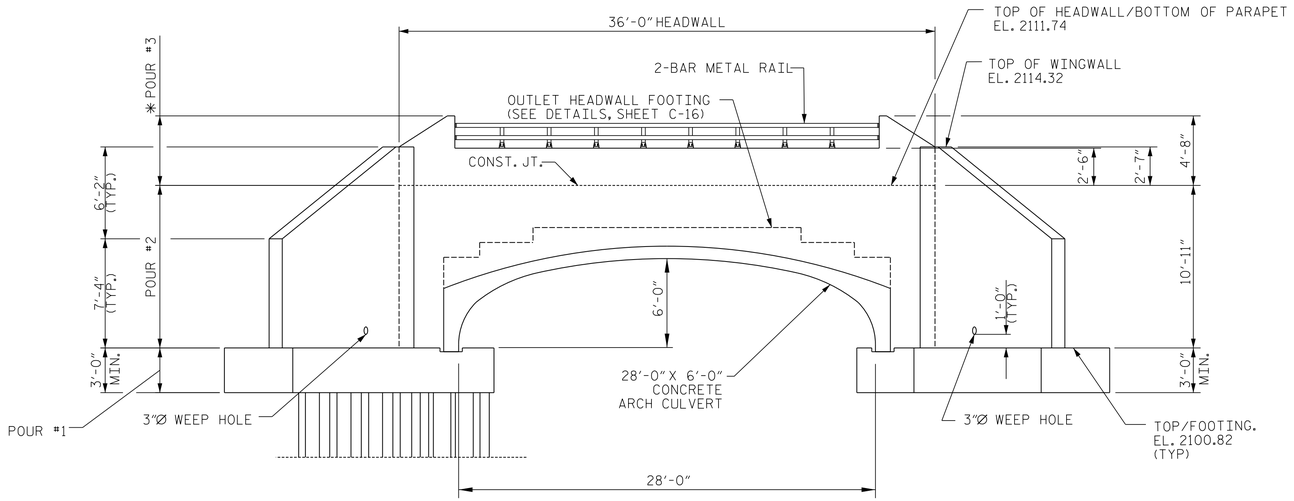
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-4
1			3			TOTAL SHEETS
2			4			36



PLAN



DETAIL "B"



END ELEVATION-NORMAL TO SKEW

APPROXIMATE FOOTING DEPTH. MAINTAIN 1'-0" MIN. ROCK EMBEDMENT
* UPPER PORTION OF WINGS TO BE INCLUDED IN POUR 2

NORTH CAROLINA PROFESSIONAL SEAL 043143 ENGINEER CHRISTOPHER B. CORDELL
Digitally signed by Christopher B. Cordell
DN: cn=Christopher B. Cordell, o=Vaughn & Melton, ou=Engineering, email=ccordell@vaughnmelton.com, c=US
8/19/2020

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PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

SHEET 5 OF 21

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

OUTLET HEADWALL

Vaughn & Melton Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-1800
Asheville, North Carolina 828-253-2796

DRAWN BY: HL DATE: 03/2020
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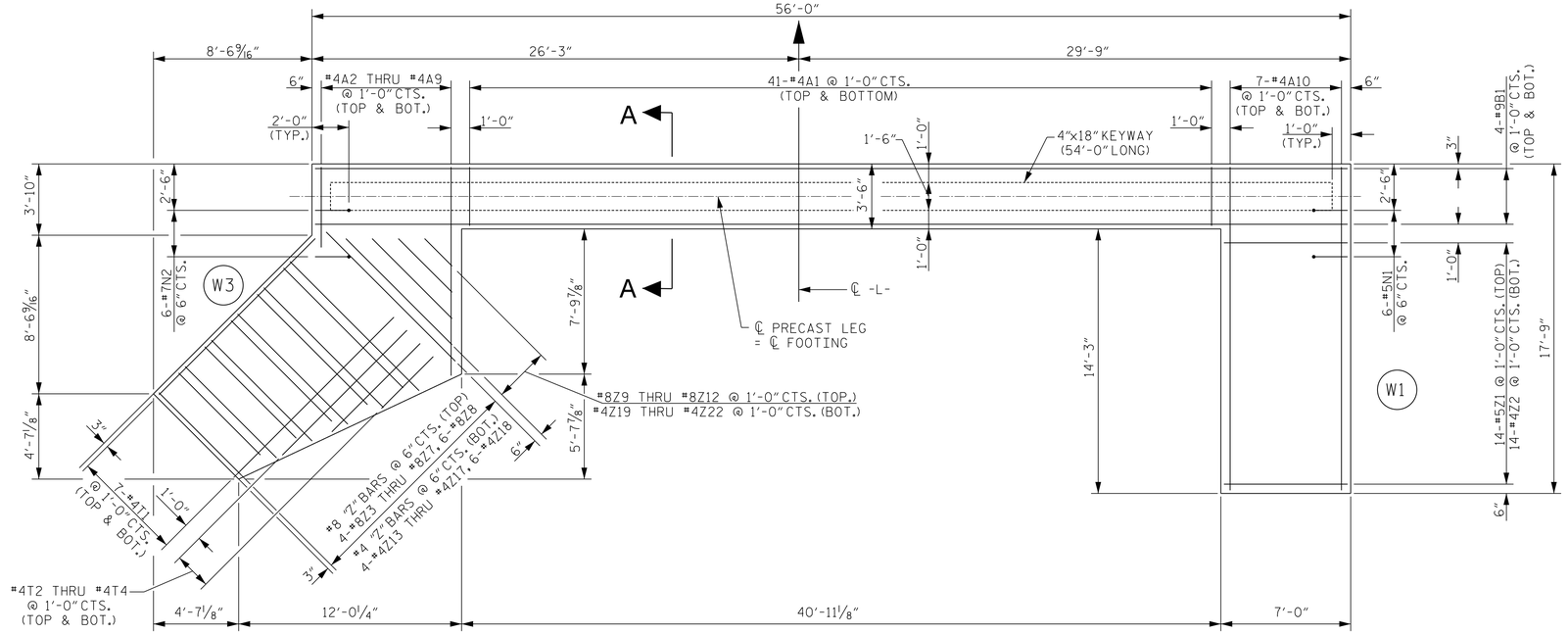
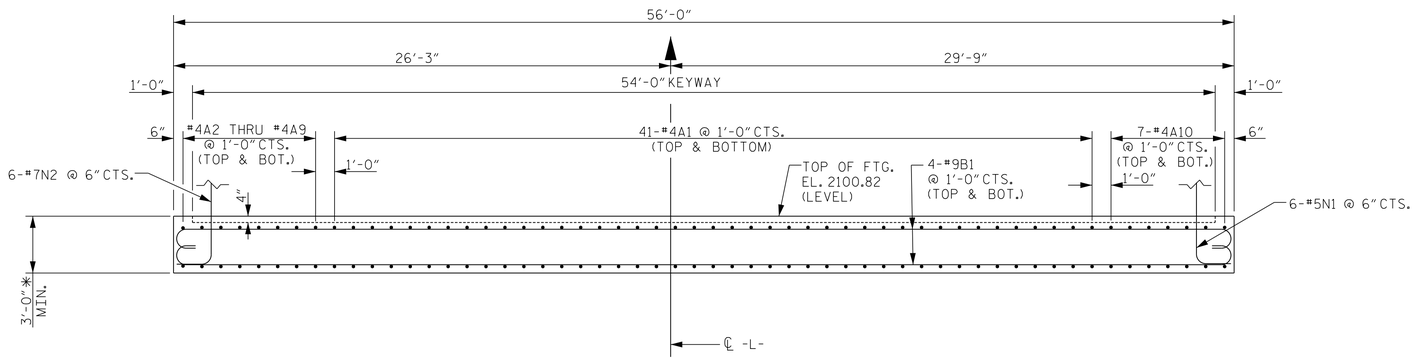
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-5
1			3			TOTAL SHEETS
2			4			36



FOOTING #1 PLAN



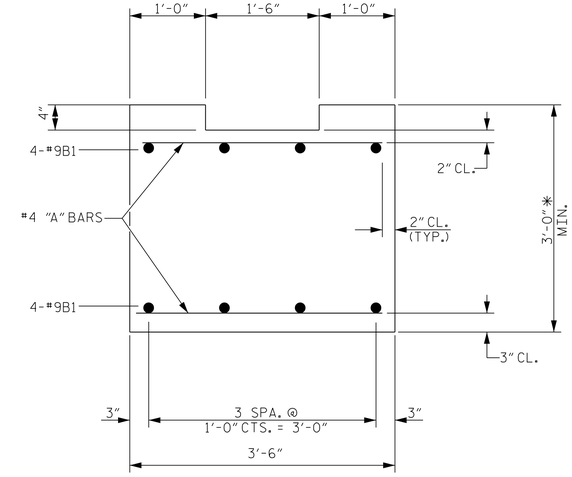
* MAINTAIN 1'-0" EMBEDMENT INTO ROCK

FOOTING #1 ELEVATION

WING FOOTINGS NOT SHOWN

NOTES

FOR WING DETAILS, SEE SHEET C-9.



SECTION A-A

NORTH CAROLINA PROFESSIONAL SEAL 043143 ENGINEER CHRISTOPHER B. CORDELL
Digitally signed by Christopher B. Cordell
8/19/2020

PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

SHEET 6 OF 21

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

FOOTING #1 DETAILS

V&M Vaughn & Melton Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-5800
Asheville, North Carolina 828-253-2796

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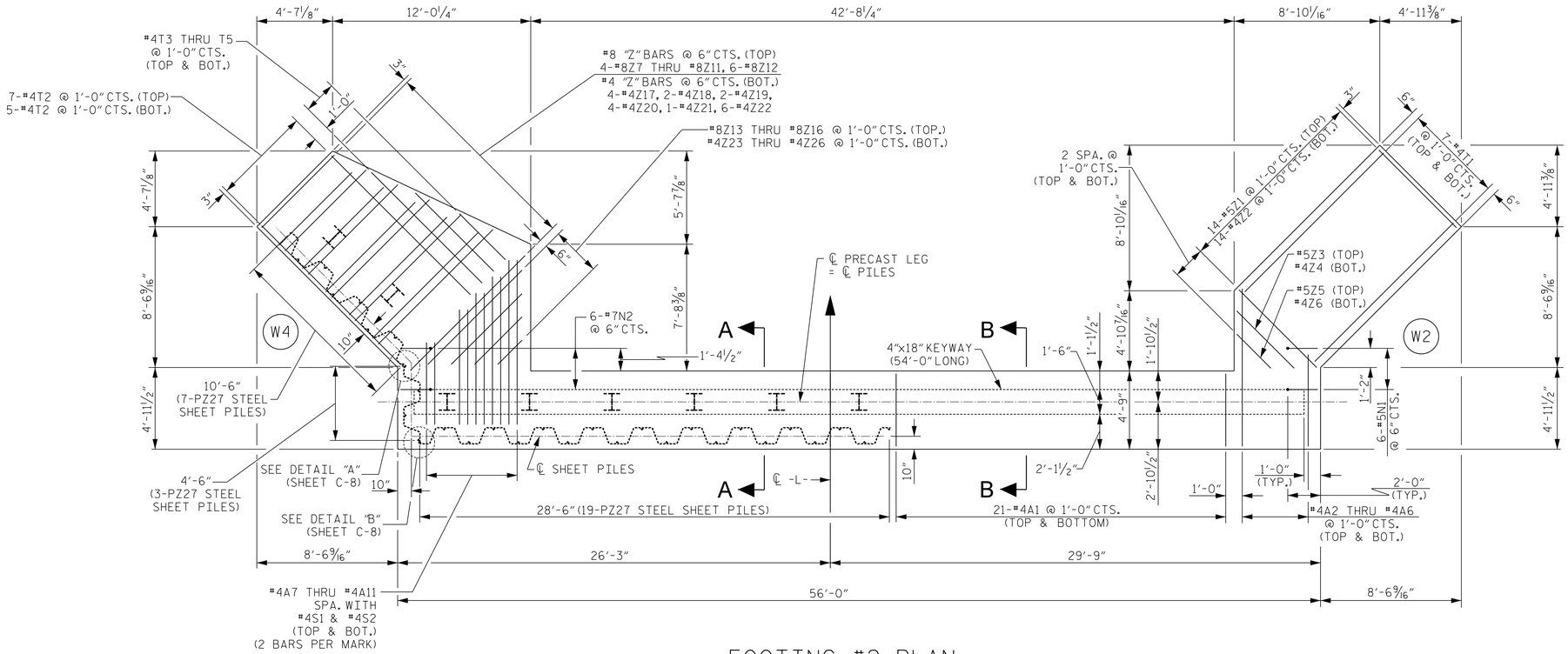
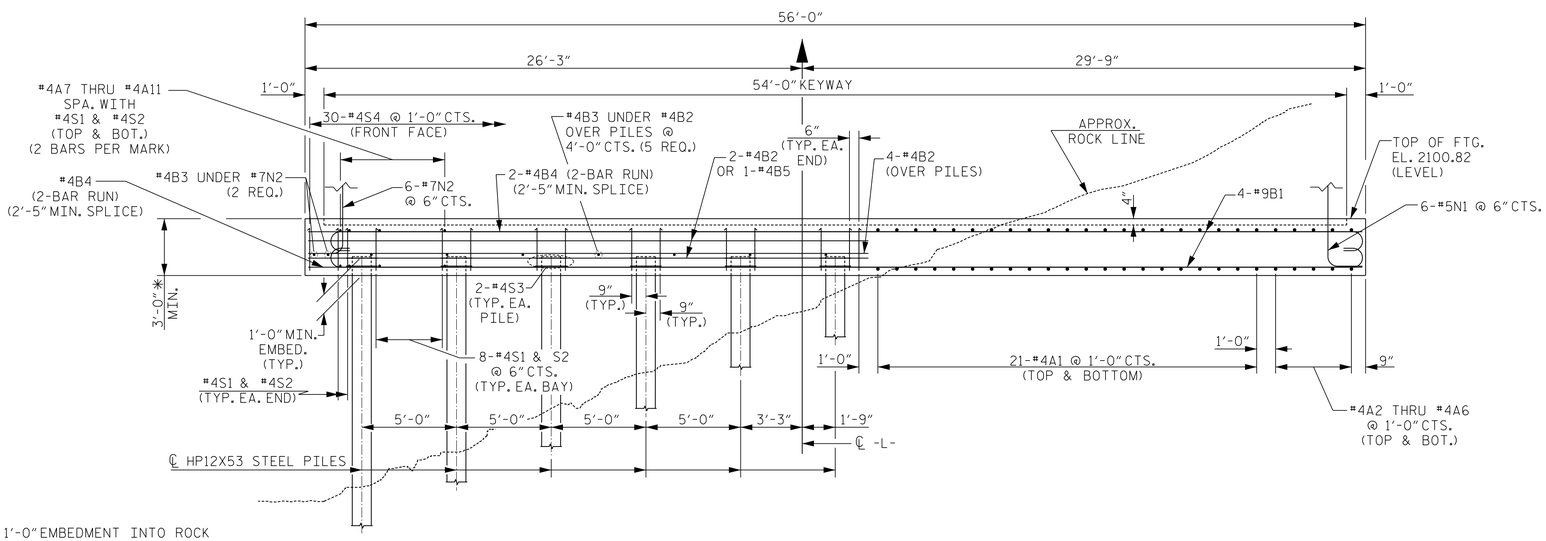
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-6
1			3			TOTAL SHEETS
2			4			36



FOOTING #2 PLAN



FOOTING #2 ELEVATION

WING FOOTINGS NOT SHOWN

*MAINTAIN 1'-0" EMBEDMENT INTO ROCK

NOTES

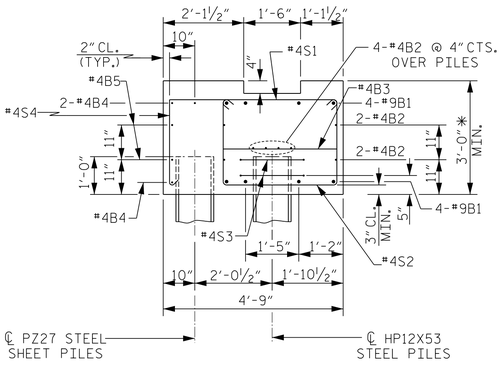
WING #4 BOTTOM "Z" AND "T" BARS MATCH TOP "Z" AND "T" BAR HORIZONTAL LOCATIONS, BUT ARE OMITTED WHERE THEY ARE COINCIDENT WITH SHEET PILES AND H-PILES.

STIRRUPS IN PILE CAP PORTION OF FOOTING MAY BE SHIFTED AS NECESSARY.

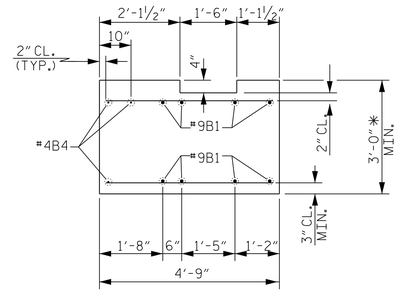
FOR PILE SPLICE DETAILS, SEE SHEET C-8.

FOR SHEET PILE DETAILS, SEE SHEET C-8.

FOR WING DETAILS, SEE SHEET C-10.



SECTION A-A



SECTION B-B

PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

SHEET 7 OF 21

NORTH CAROLINA PROFESSIONAL SEAL 043143 ENGINEER CHRISTOPHER B. CORDELL
DocuSigned by: Christopher B. Cordell 56BE3A2D...
8/19/2020

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

FOOTING #2 DETAILS

V&M Vaughn & Melton Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-5800
Asheville, North Carolina 828-253-2796

DRAWN BY: HL DATE: 03/2020
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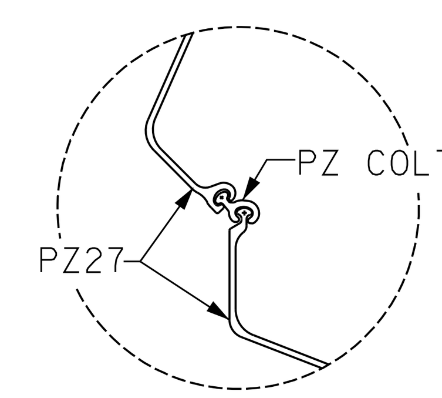
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-7
1			3			TOTAL SHEETS
2			4			36



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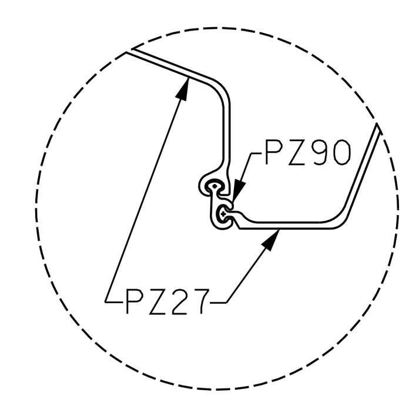

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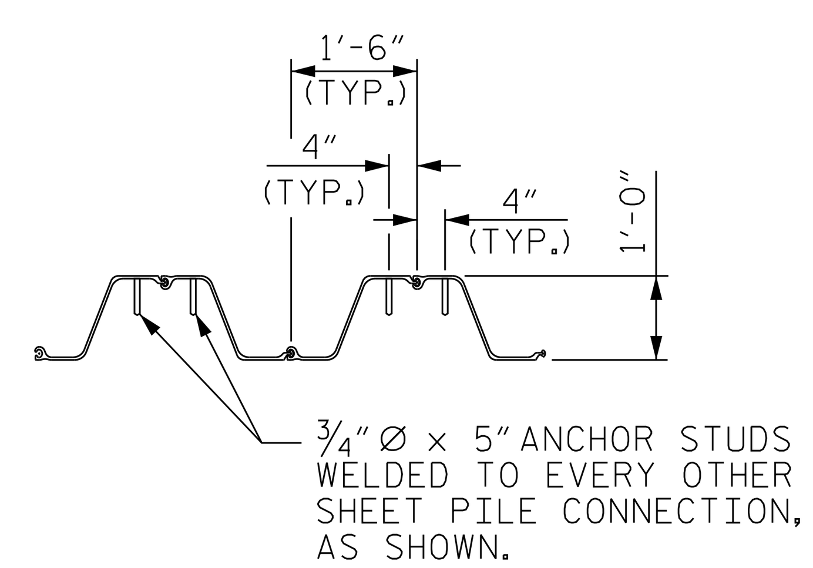
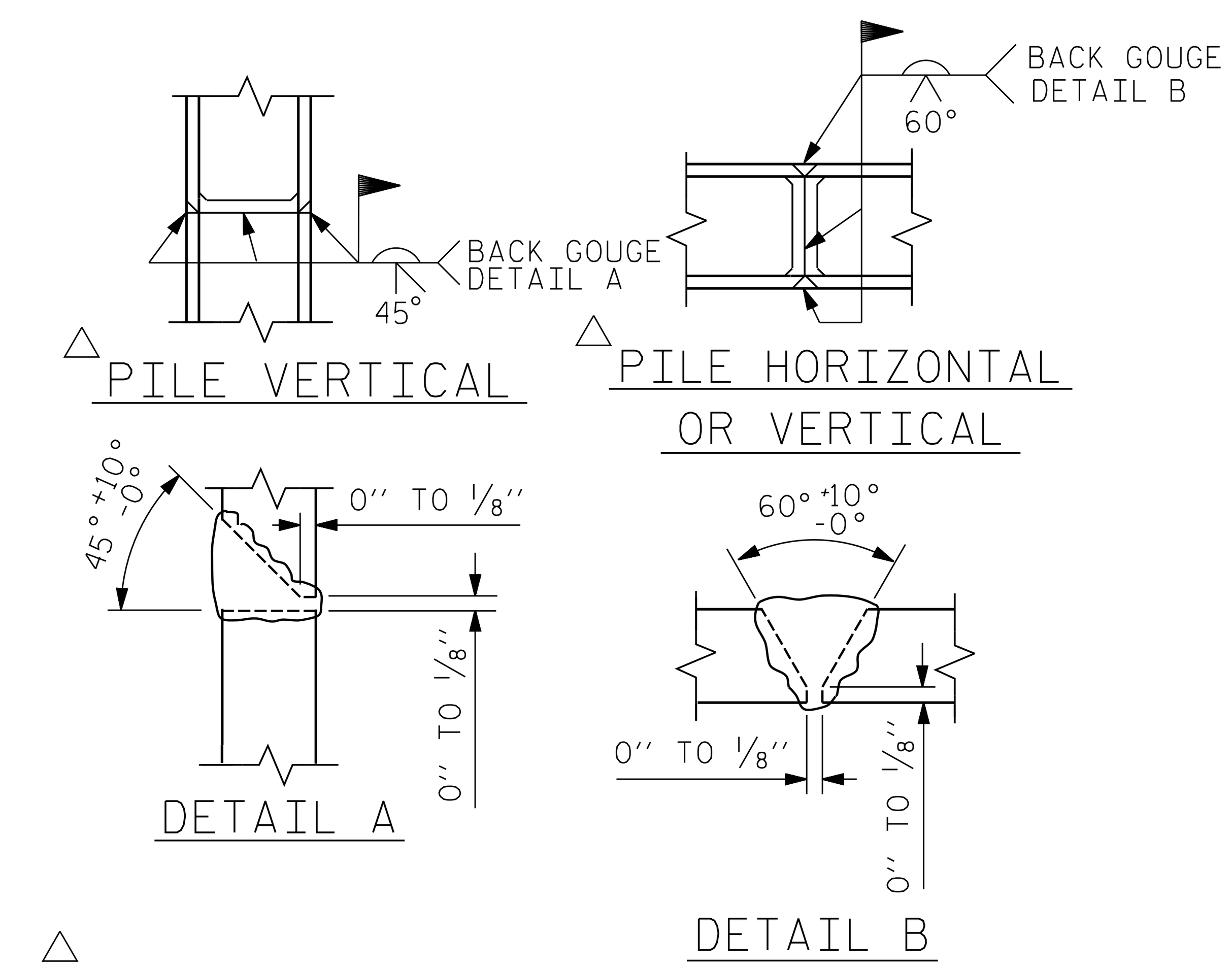


ANCHOR STUD DETAIL

SHEET PILE CONNECTION DETAILS



△ POSITION OF PILE DURING WELDING.

PILE SPLICE DETAILS

PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

SHEET 8 OF 21

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

FOOTING #2 DETAILS

Vaughn & Melton Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-5800
Asheville, North Carolina 828-253-2796

DRAWN BY: HL DATE: 03/2020
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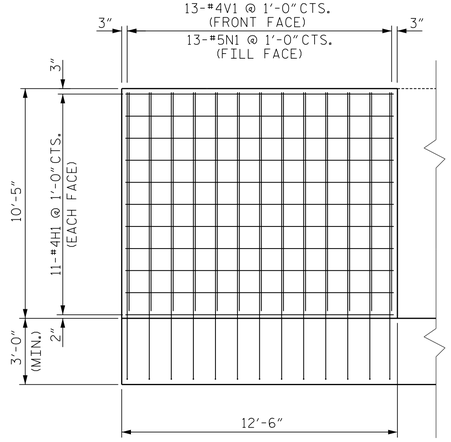
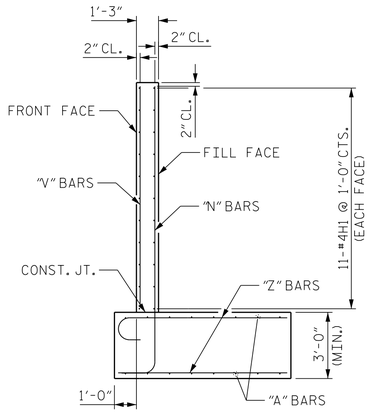
1			3			TOTAL SHEETS	36
2			4				

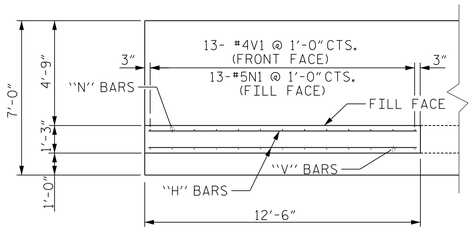
NORTH CAROLINA PROFESSIONAL SEAL 043143 ENGINEER CHRISTOPHER B. CORDELL
Christopher B. Cordell 8/19/2020



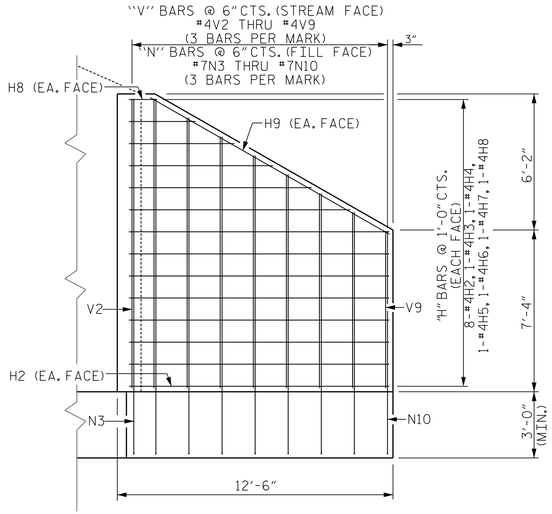
W1 ELEVATION



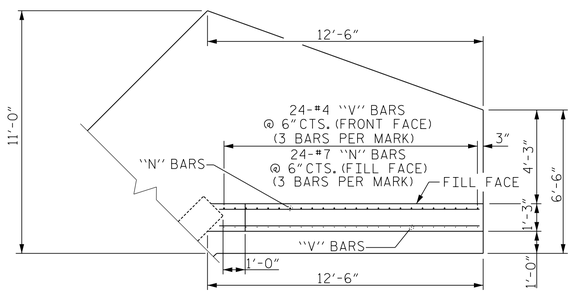
W1 SECTION



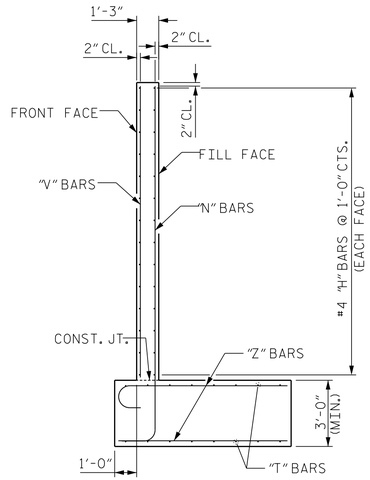
W1 PLAN



W3 ELEVATION

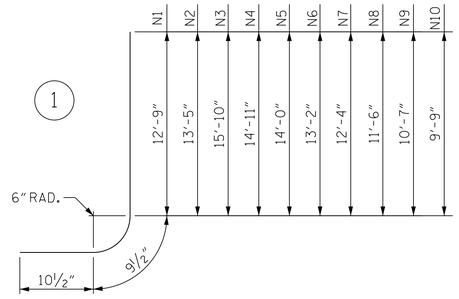


W3 PLAN



W3 SECTION

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

FOOTING #1 AND WINGWALLS W1 & W3

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	82	4	STR	3'-2"	173
A2	2	4	STR	4'-4"	6
A3	2	4	STR	5'-4"	7
A4	2	4	STR	6'-4"	8
A5	2	4	STR	7'-4"	10
A6	2	4	STR	8'-4"	11
A7	2	4	STR	9'-4"	12
A8	2	4	STR	10'-4"	14
A9	2	4	STR	11'-2"	15
A10	14	4	STR	17'-5"	163
B1	8	9	2	58'-2"	1582
H1	22	4	STR	12'-1"	178
H2	16	4	STR	11'-7"	124
H3	2	4	STR	9'-10"	13
H4	2	4	STR	8'-1"	11
H5	2	4	STR	6'-4"	8
H6	2	4	STR	4'-7"	6
H7	2	4	STR	2'-10"	4
H8	2	4	STR	1'-1"	1
H9	2	4	STR	12'-5"	17
N1	19	5	1	14'-5"	286
N2	6	7	1	15'-1"	185
N3	3	7	1	17'-6"	107
N4	3	7	1	16'-7"	102
N5	3	7	1	15'-8"	96
N6	3	7	1	14'-10"	91
N7	3	7	1	14'-0"	86
N8	3	7	1	13'-2"	81
N9	3	7	1	12'-3"	75
N10	3	7	1	11'-5"	70

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
T1	14	4	STR	11'-11"	111
T2	2	4	STR	9'-6"	13
T3	2	4	STR	6'-8"	9
T4	2	4	STR	3'-11"	5
V1	13	4	STR	10'-3"	89
V2	3	4	STR	13'-4"	27
V3	3	4	STR	12'-5"	25
V4	3	4	STR	11'-6"	23
V5	3	4	STR	10'-8"	21
V6	3	4	STR	9'-10"	20
V7	3	4	STR	9'-0"	18
V8	3	4	STR	8'-1"	16
V9	3	4	STR	7'-3"	15
Z1	14	5	3	7'-7"	111
Z2	14	4	STR	6'-8"	62
Z3	4	8	3	7'-1"	75
Z4	4	8	3	7'-10"	84
Z5	4	8	3	8'-7"	92
Z6	4	8	3	9'-3"	99
Z7	4	8	3	10'-0"	107
Z8	6	8	3	10'-9"	172
Z9	1	8	STR	8'-1"	22
Z10	1	8	STR	6'-1"	16
Z11	1	8	STR	4'-1"	11
Z12	1	8	STR	2'-1"	6
Z13	4	4	STR	6'-2"	16
Z14	4	4	STR	6'-11"	18
Z15	4	4	STR	7'-8"	20
Z16	4	4	STR	8'-4"	22
Z17	4	4	STR	9'-1"	24
Z18	6	4	STR	9'-10"	39
Z19	1	4	STR	8'-1"	5
Z20	1	4	STR	6'-1"	4
Z21	1	4	STR	4'-1"	3
Z22	1	4	STR	2'-1"	1

REINFORCING STEEL	4943 LBS.

CLASS A CONCRETE BREAKDOWN

POUR #1 FOOTING (CULVERT & WINGS)	47.4 C.Y.
POUR #2 WING WALL STEMS	12.3 C.Y.
TOTAL CLASS A CONCRETE	59.7 C.Y.

NORTH CAROLINA PROFESSIONAL SEAL 043143 ENGINEER CHRISTOPHER B. CORDELL
DocuSigned by: Christopher B. Cordell 56BE3A27[illegible]
8/19/2020

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V&M Vaughan & Melton Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-5800
Asheville, North Carolina 828-253-2796

PROJECT NO. U-5887
HENDERSON COUNTY
STATION: 22+44.41 -L-
SHEET 9 OF 21

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

FOOTING #1 WINGWALL DETAILS

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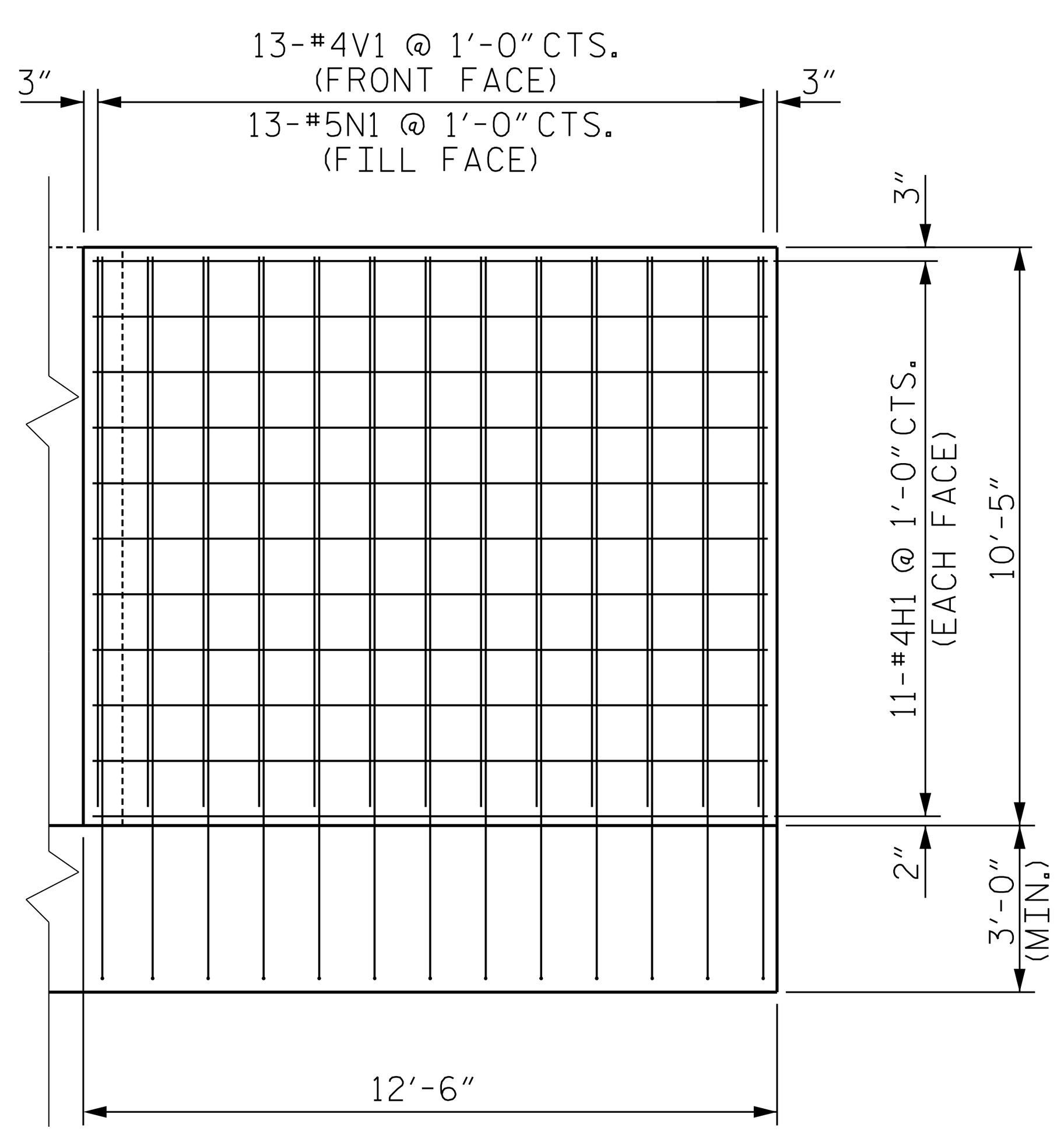
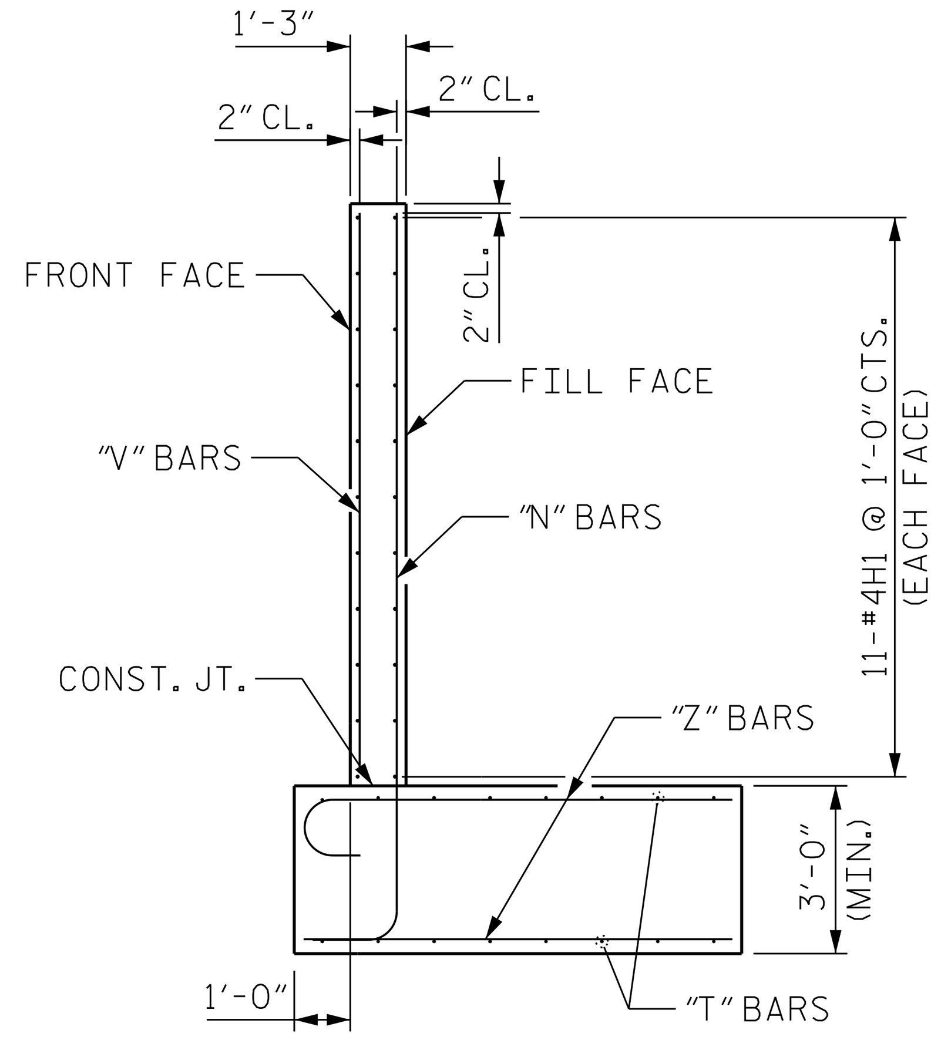
ENG. OF RECORD: CBC DATE: 03/2020

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-9
1			3			TOTAL SHEETS
2			4			36

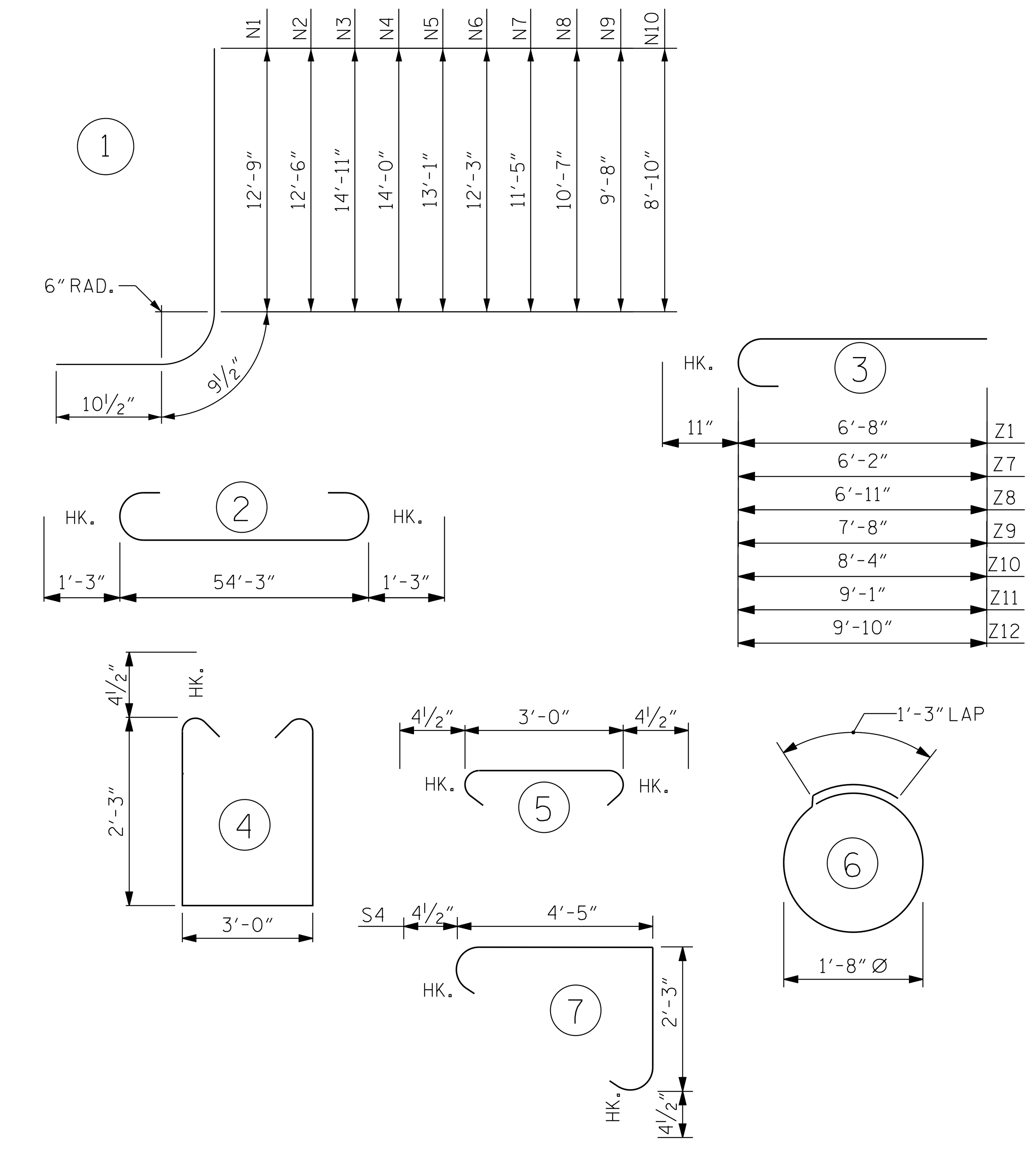


W2 ELEVATION

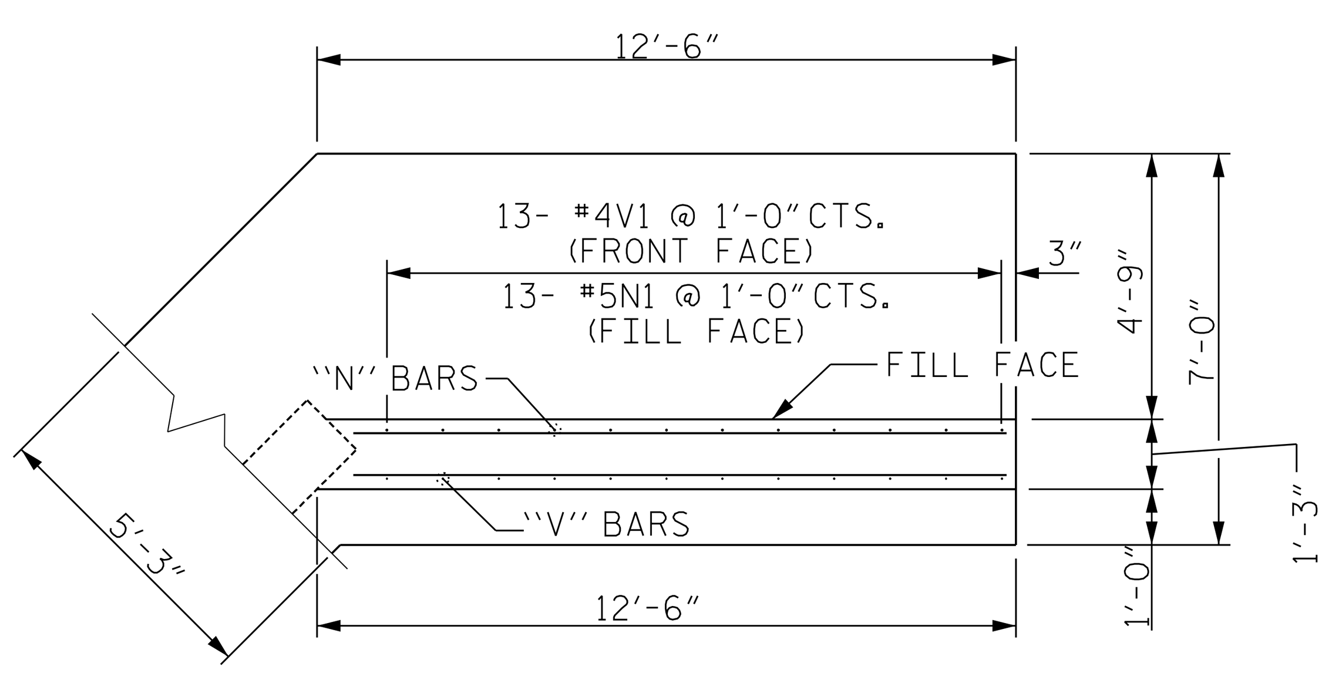


W2 SECTION

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT



W2 PLAN

BILL OF MATERIAL

FOOTING #2 AND WINGWALLS W2 & W4

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	42	4	STR	4'-5"	124	T1	14	4	STR	11'-11"	111
A2	2	4	STR	5'-7"	7	T2	12	4	STR	11'-11"	96
A3	2	4	STR	6'-7"	9	T3	2	4	STR	9'-6"	13
A4	2	4	STR	7'-7"	10	T4	2	4	STR	6'-8"	9
A5	2	4	STR	8'-7"	11	T5	2	4	STR	3'-11"	5
A6	2	4	STR	9'-7"	13						
A7	4	4	STR	5'-0"	13	V1	13	4	STR	10'-3"	89
A8	4	4	STR	7'-0"	19	V2	3	4	STR	13'-4"	27
A9	4	4	STR	8'-0"	21	V3	3	4	STR	12'-5"	25
A10	4	4	STR	9'-0"	24	V4	3	4	STR	11'-6"	23
A11	4	4	STR	10'-0"	27	V5	3	4	STR	10'-8"	21
						V6	3	4	STR	9'-10"	20
B1	8	9	2	56'-9"	1544	V7	3	4	STR	9'-0"	18
B2	8	4	STR	28'-4"	151	V8	3	4	STR	8'-1"	16
B3	7	4	STR	4'-5"	21	V9	3	4	STR	7'-3"	15
B4	6	4	STR	29'-1"	117						
B5	2	4	STR	29'-7"	40	Z1	14	5	3	7'-7"	111
						Z2	14	4	STR	6'-8"	62
H1	22	4	STR	11'-7"	170	Z3	1	5	STR	4'-10"	5
H2	16	4	STR	11'-7"	124	Z4	1	4	STR	4'-10"	3
H3	2	4	STR	9'-10"	13	Z5	1	5	STR	2'-10"	3
H4	2	4	STR	8'-1"	11	Z6	1	4	STR	2'-10"	2
H5	2	4	STR	6'-4"	8	Z7	4	8	3	7'-1"	76
H6	2	4	STR	4'-7"	6	Z8	4	8	3	7'-10"	84
H7	2	4	STR	2'-10"	4	Z9	4	8	3	8'-7"	92
H8	2	4	STR	1'-1"	1	Z10	4	8	3	9'-3"	99
H9	2	4	STR	12'-5"	17	Z11	4	8	3	10'-0"	107
						Z12	6	8	3	10'-9"	172
N1	19	5	1	14'-5"	286	Z13	1	8	STR	8'-1"	22
N2	6	7	1	14'-2"	174	Z14	1	8	STR	6'-1"	16
N3	3	7	1	16'-7"	102	Z15	1	8	STR	4'-1"	11
N4	3	7	1	15'-8"	96	Z16	1	8	STR	2'-1"	6
N5	3	7	1	14'-9"	91	Z17	4	4	STR	4'-11"	13
N6	3	7	1	13'-11"	85	Z18	2	4	STR	5'-8"	8
N7	3	7	1	13'-1"	80	Z19	2	4	STR	6'-5"	9
N8	3	7	1	12'-3"	75	Z20	4	4	STR	7'-1"	19
N9	3	7	1	11'-4"	69	Z21	1	4	STR	7'-10"	5
N10	3	7	1	10'-6"	64	Z22	6	4	STR	8'-7"	34
						Z23	1	4	STR	8'-1"	5
S1	44	4	5	3'-9"	110	Z24	1	4	STR	6'-1"	4
S2	44	4	4	8'-3"	242	Z25	1	4	STR	4'-1"	3
S3	16	4	6	6'-6"	69	Z26	1	4	STR	2'-1"	1
S4	30	4	7	7'-5"	149						

REINFORCING STEEL 5657 LBS.

HP12X53 STEEL PILES

NO.: 8	LIN. FT.= 152.0
PILE EXCAVATION (IN SOIL)	LIN. FT.= 64.0
PILE EXCAVATION (NOT IN SOIL)	LIN. FT.= 80.0

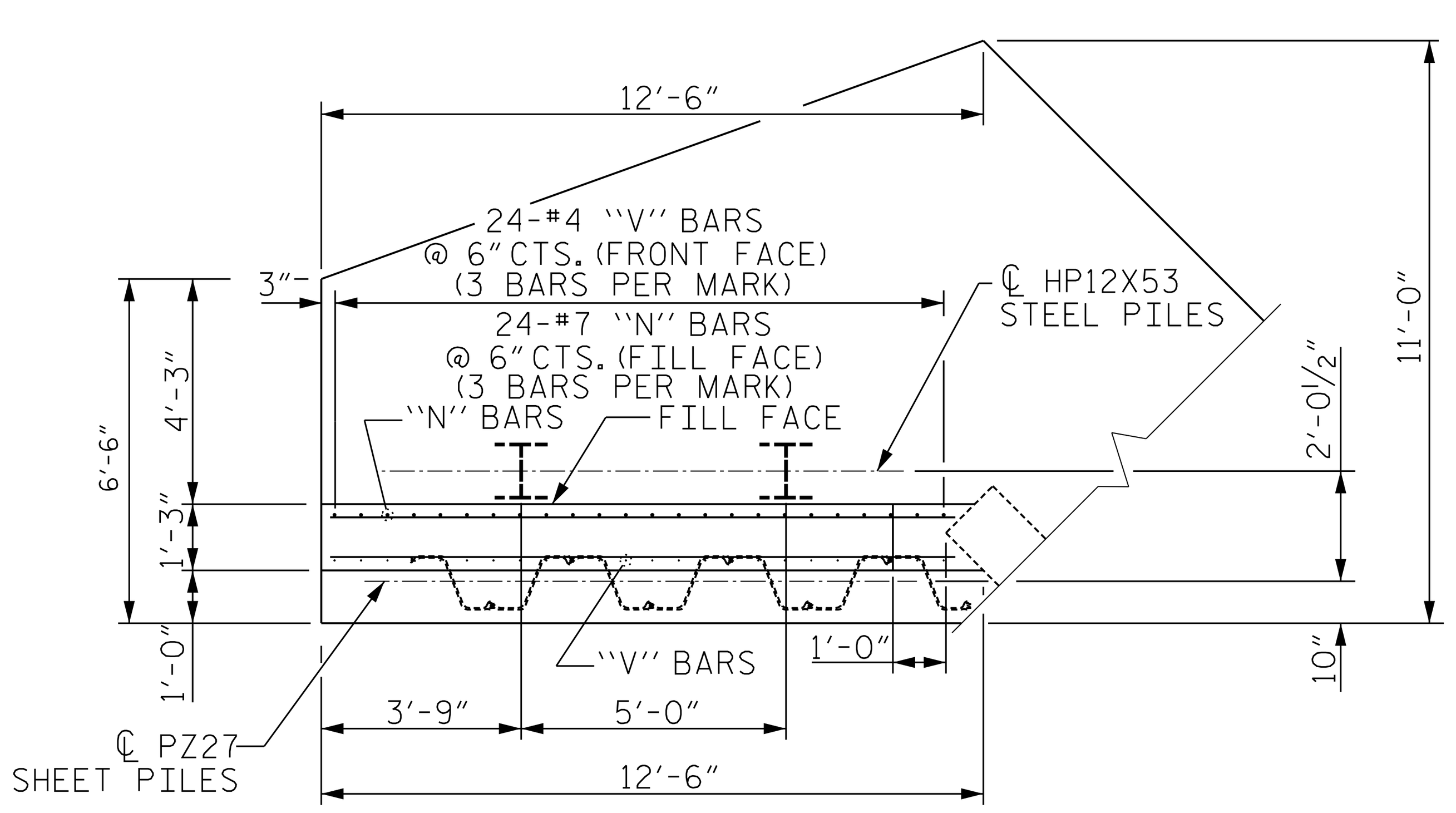
CLASS A CONCRETE BREAKDOWN

POUR #1	FOOTING (CULVERT & WINGS)	55.0 C.Y.
POUR #2	WING WALL STEMS	12.3 C.Y.
	TOTAL CLASS A CONCRETE	67.3 C.Y.

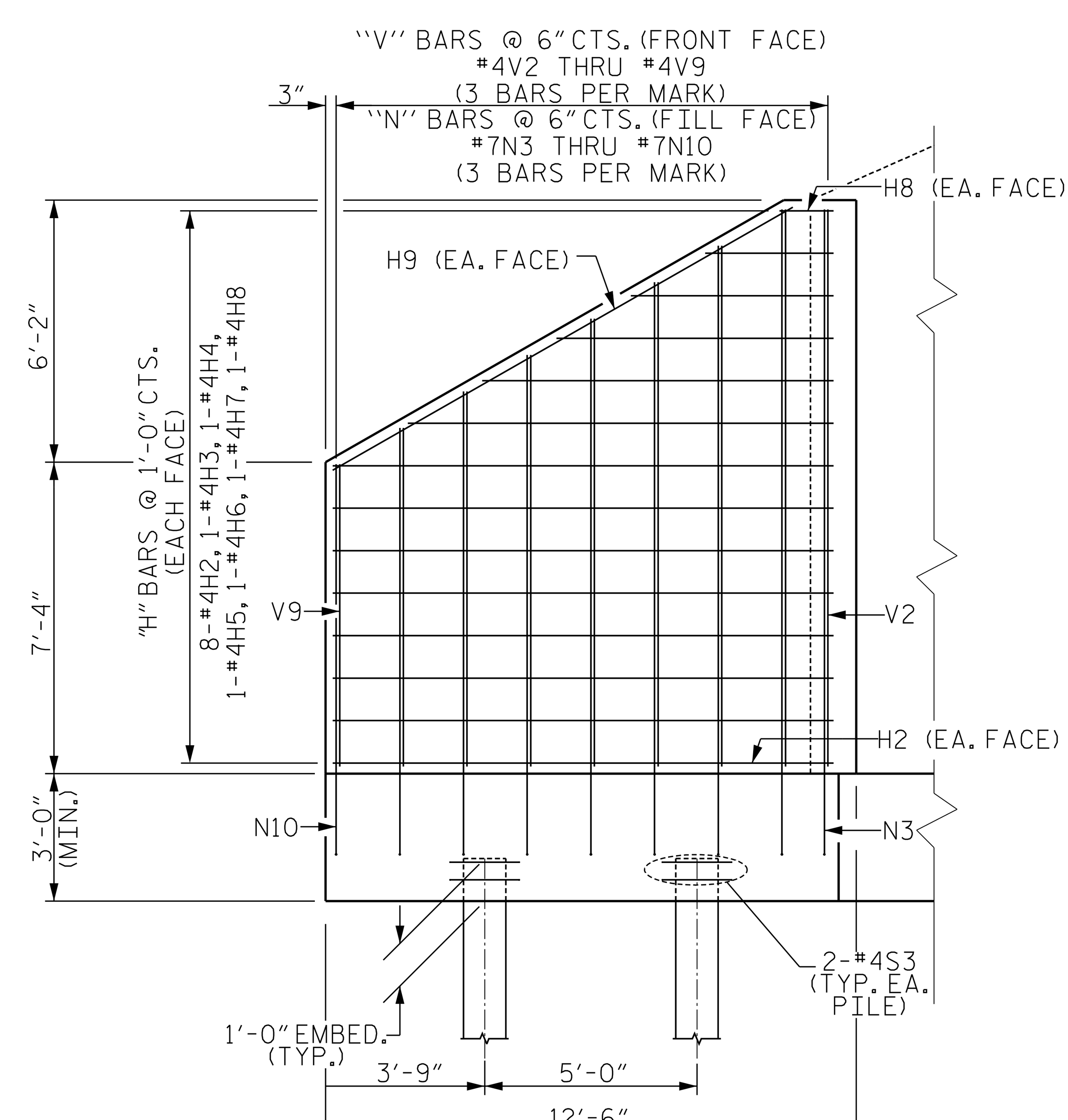
18" STEEL SHEET PILES

NO. PZ27 = 29
NO. PZ90 = 1
NO. PZ COLT = 1
TOTAL = 31

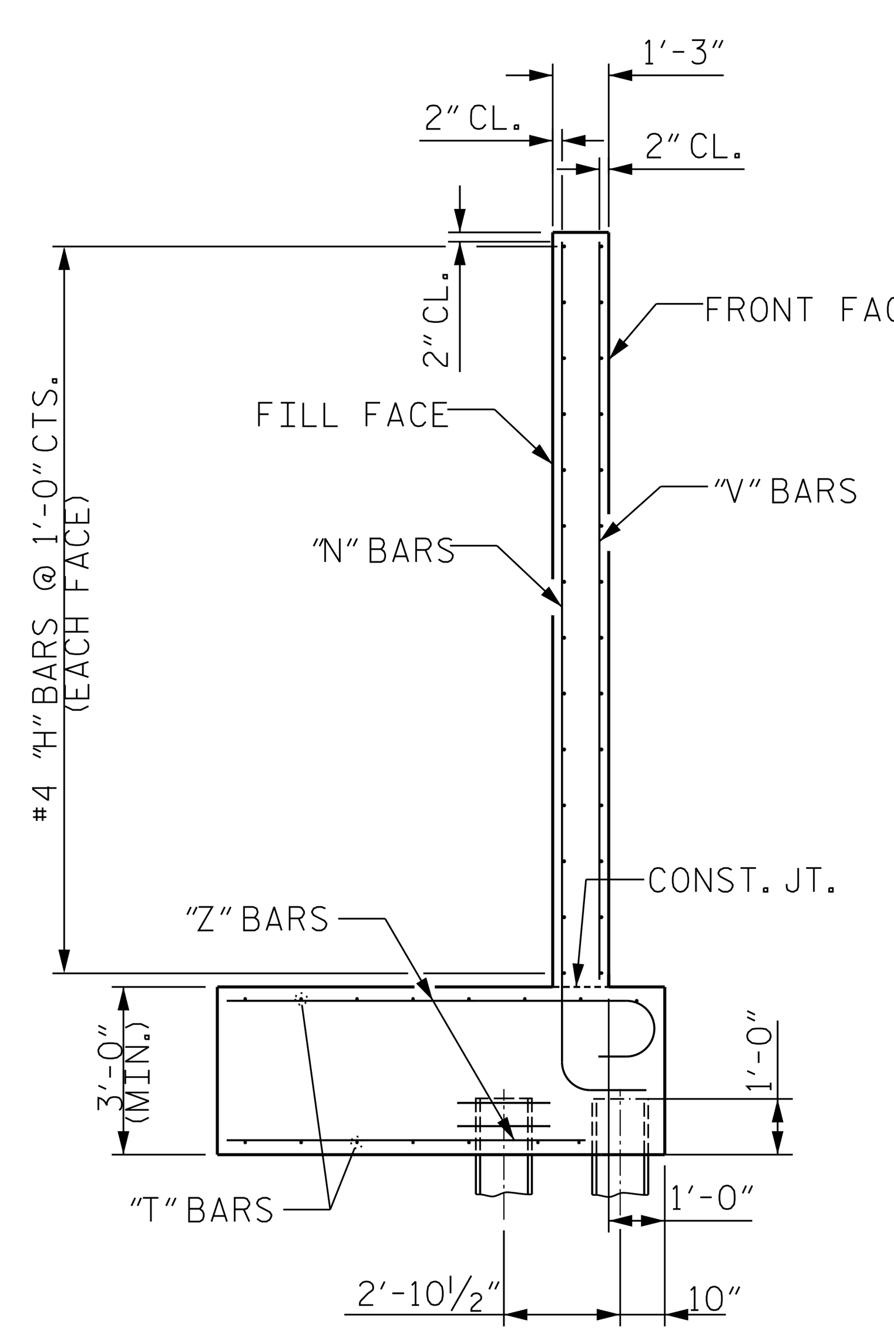
SQ. FT. = 440



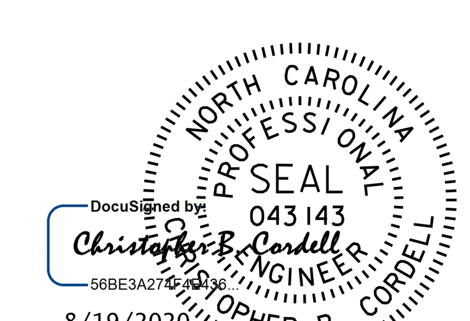
W4 PLAN



W4 ELEVATION



W4 SECTION



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V&M Vaughn & Melton Consulting Engineers
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Knoxville, Tennessee 865-546-5800
Asheville, North Carolina 828-253-2796

PROJECT NO. U-5887
HENDERSON COUNTY
STATION: 22+44.41 -L-

SHEET 10 OF 21

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

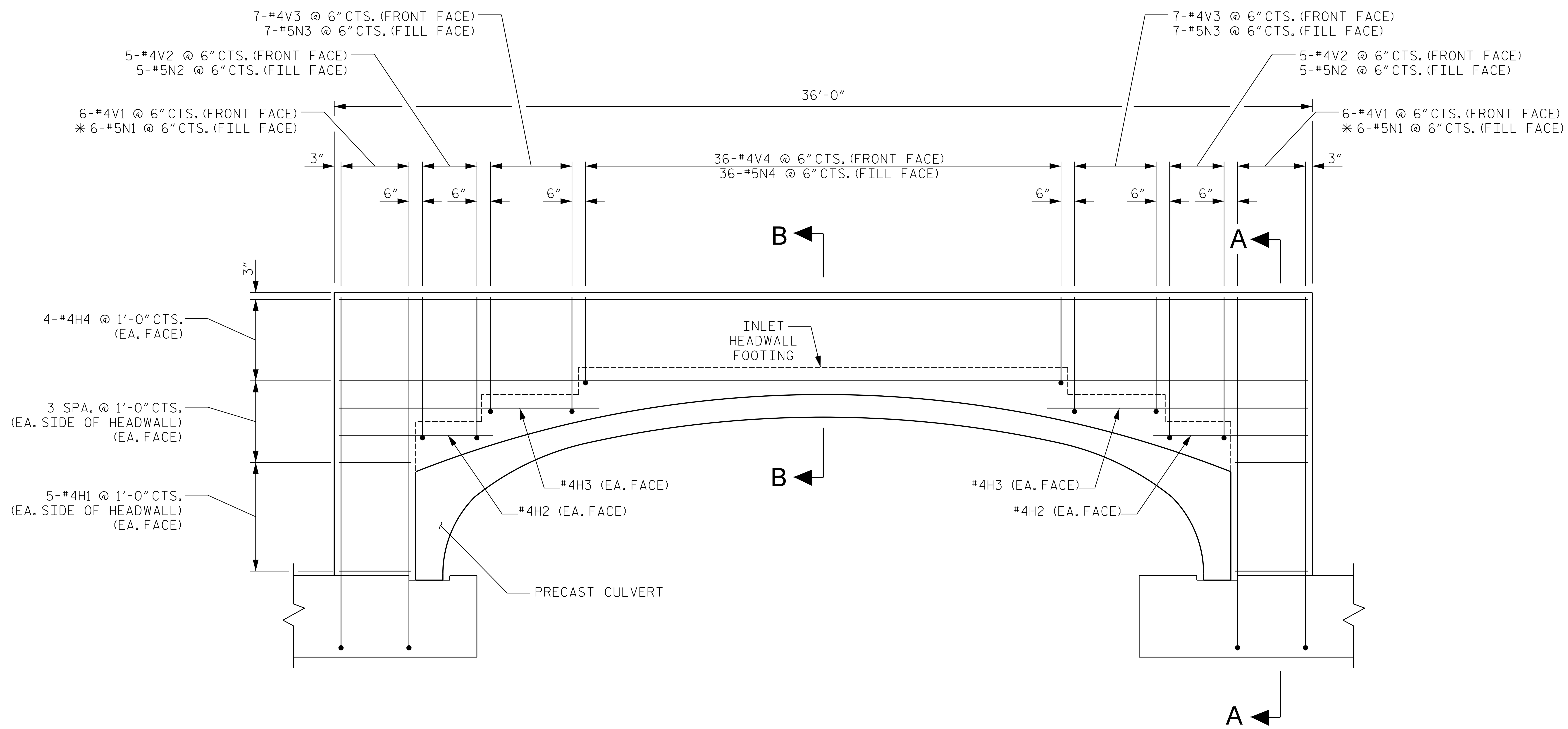
FOOTING #2
WINGWALL DETAILS

DRAWN BY: HL	DATE: 03/2020
CHECKED BY: CBC	DATE: 03/2020
ENG. OF RECORD: CBC	DATE: 03/2020

REVISIONS

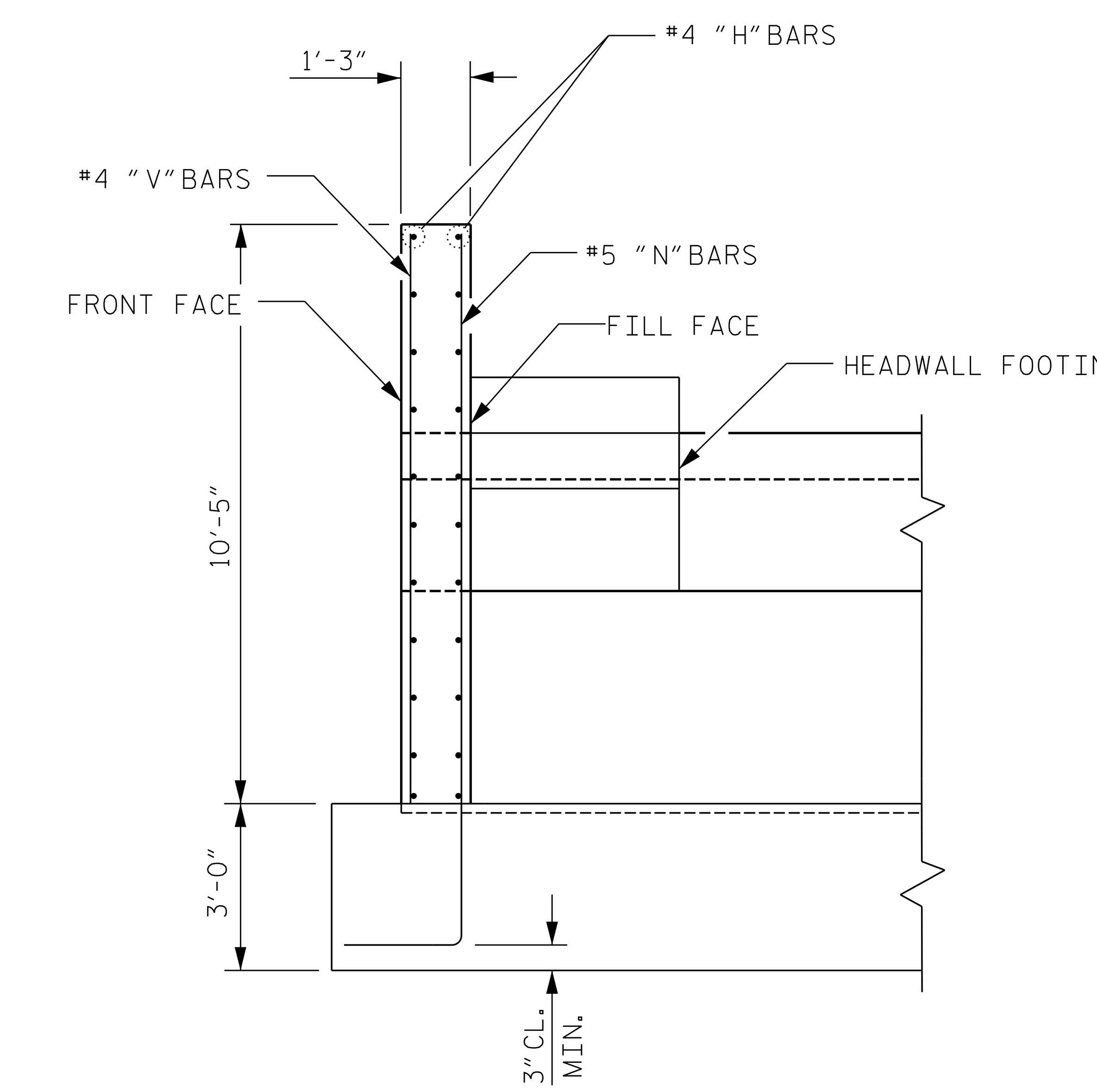
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO. C-10
TOTAL SHEETS 36

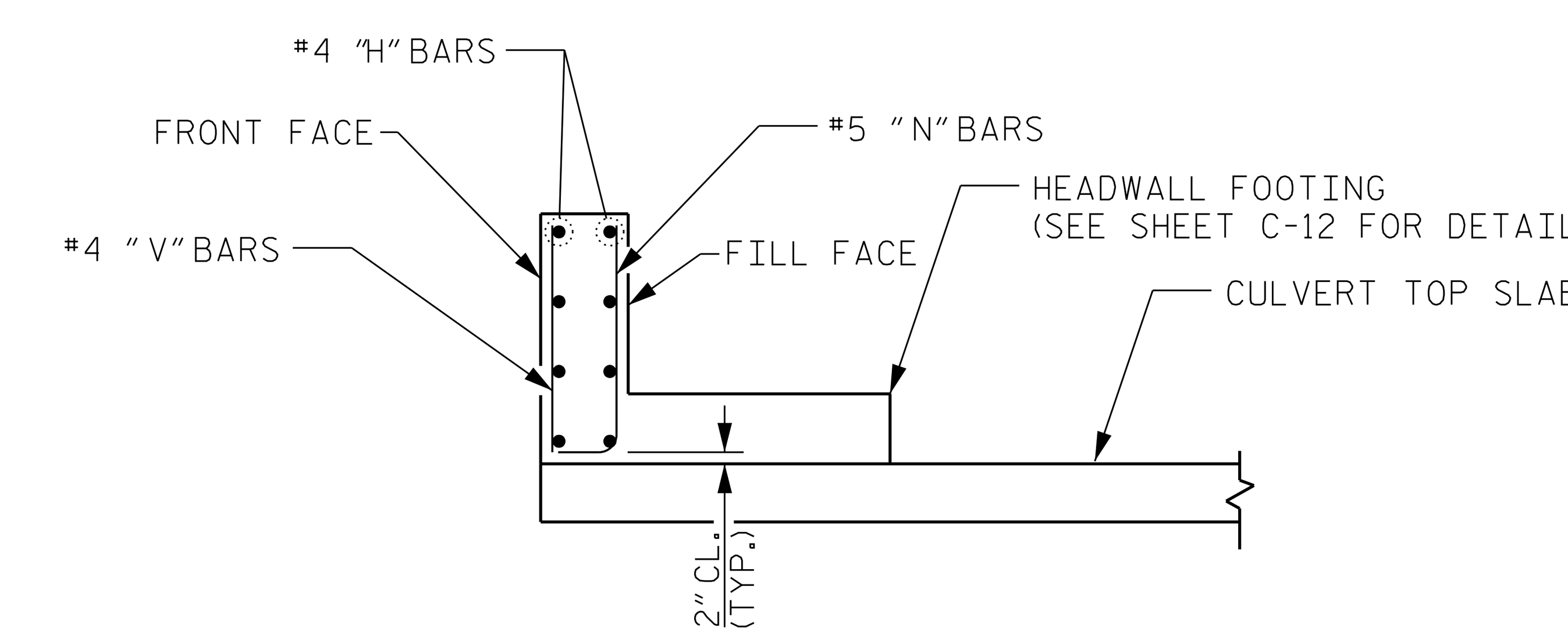


INLET HEADWALL ELEVATION

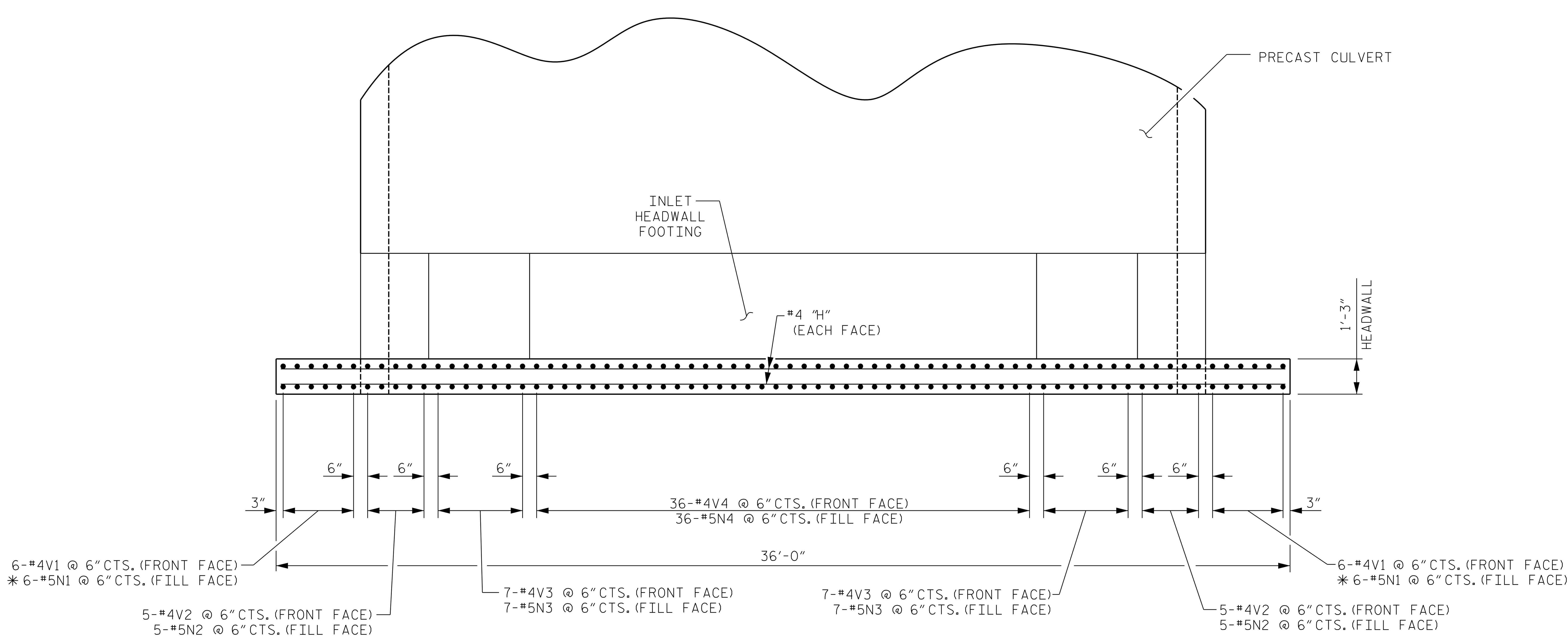
✻N1 BARS INCLUDED IN FOOTING BILL OF MATERIALS



SECTION A-A



SECTION B-B



INLET HEADWALL PLAN

CULVERT FOOTINGS NOT SHOWN

NOTE: WINGS NOT SHOWN FOR CLARITY.

NORTH CAROLINA PROFESSIONAL SEAL 043143 ENGINEER CHRISTOPHER B. CORDELL

Christopher B. Cordell 8/19/2020

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

SHEET 11 OF 21

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

INLET HEADWALL
REINFORCING DETAILS

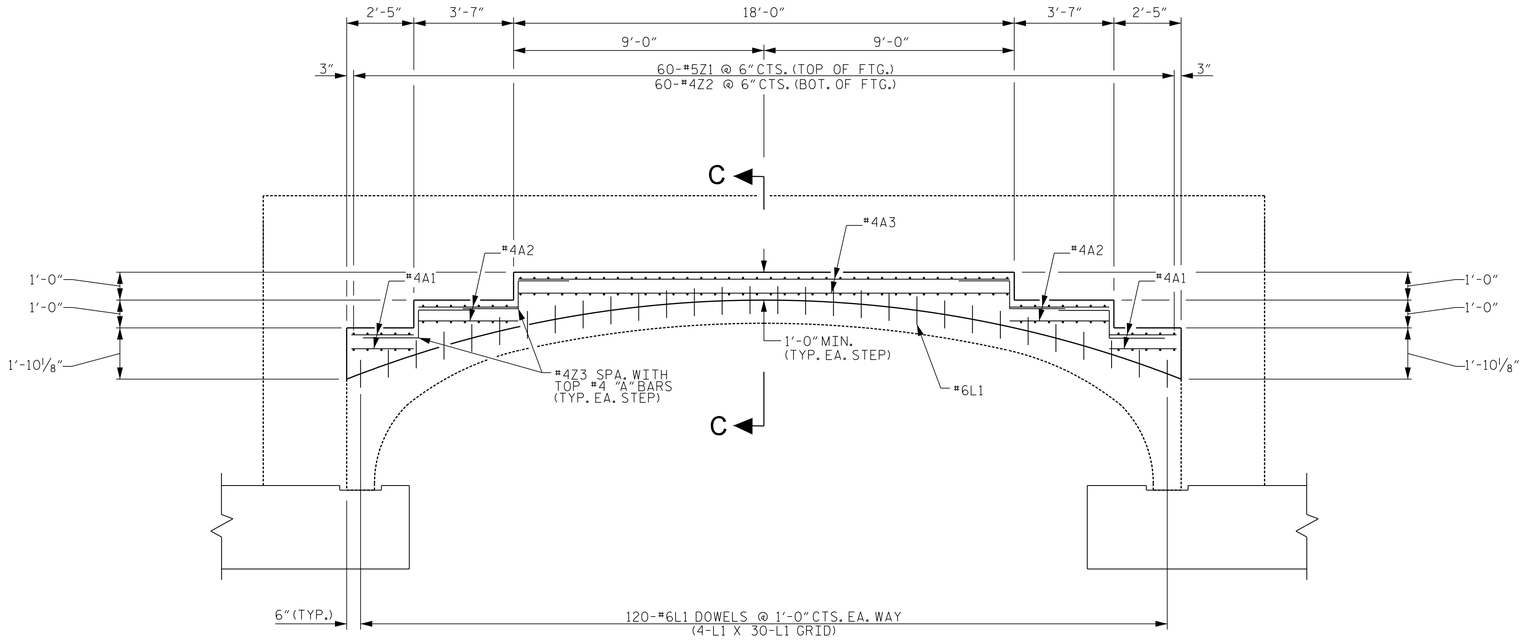
V&M Vaughn & Melton Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-5800
Asheville, North Carolina 828-253-2796

DRAWN BY: HL	DATE: 03/2020
CHECKED BY: CBC	DATE: 03/2020
ENG. OF RECORD: CBC	DATE: 03/2020

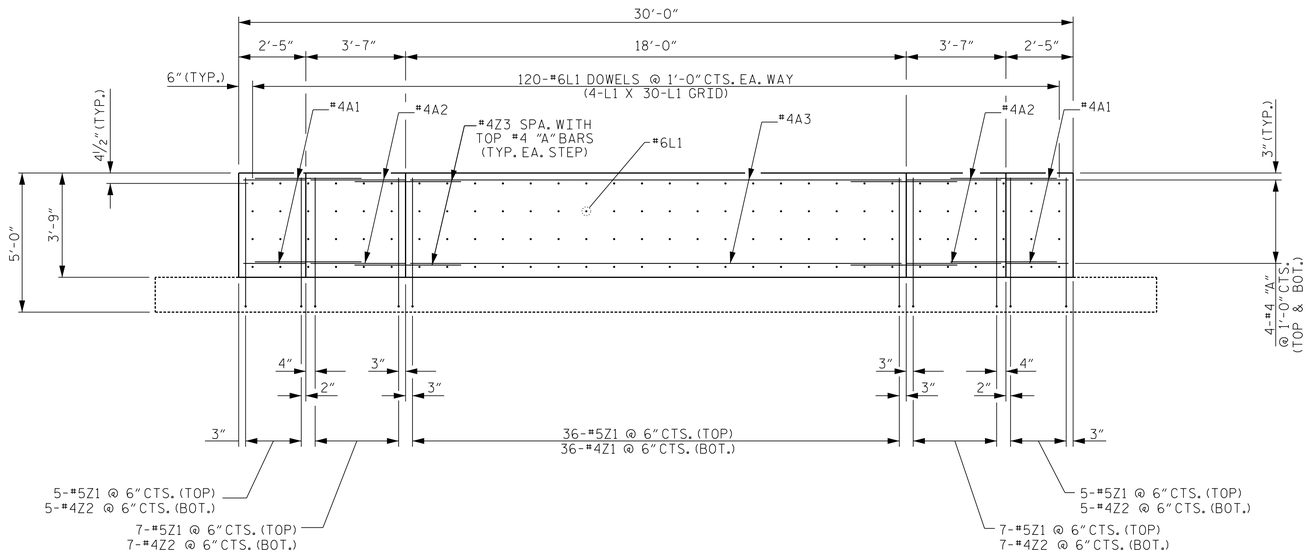
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO. C-11

TOTAL SHEETS 36

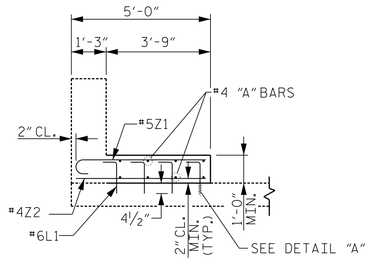


INLET HEADWALL FOOTING ELEVATION

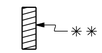


INLET HEADWALL FOOTING PLAN

NOTE: WINGS NOT SHOWN FOR CLARITY.



SECTION C-C



** STRUCTURAL CONNECTION INSERTS
2 STRUT OR EQUAL;
LENGTH = 4 1/2", INSERT WIDTH = 2",
DIA. = 3/4". 120 INSERTS REQ'D.

DETAIL "A"

NORTH CAROLINA PROFESSIONAL SEAL 043143 ENGINEER CHRISTOPHER B. CORDELL
DocuSigned by: Christopher B. Cordell 56BE3A27...
8/19/2020

PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

SHEET 12 OF 21

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

INLET HEADWALL FOOTING DETAILS

Vaughn & Melton
Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-5800
Asheville, North Carolina 828-253-2796

DRAWN BY: HL	DATE: 03/2020	
CHECKED BY: CBC	DATE: 03/2020	
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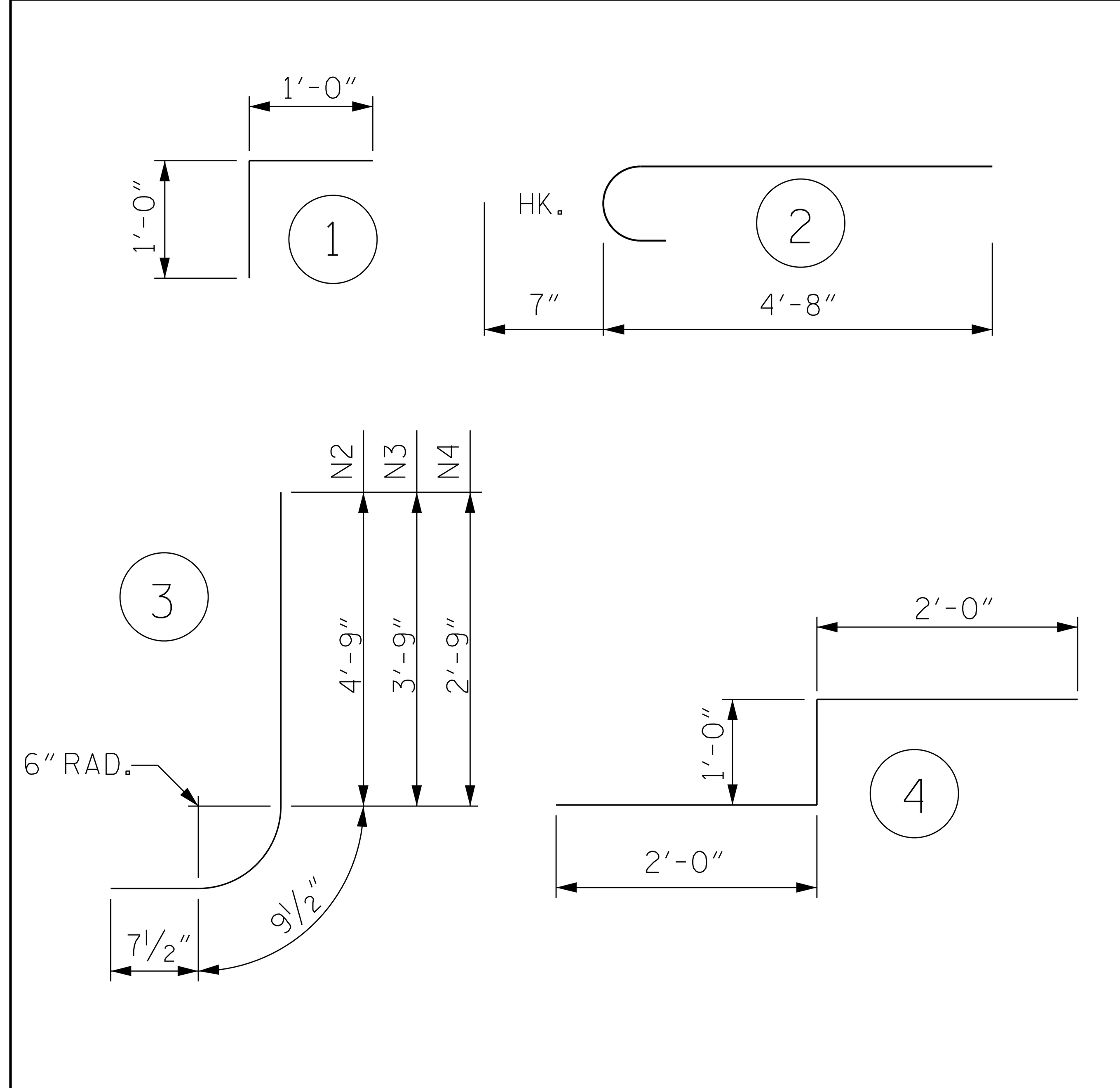
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-12
1			3			TOTAL SHEETS
2			4			36

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	16	4	STR	2'-3"	24
A2	16	4	STR	3'-5"	37
A3	8	4	STR	17'-8"	94
H1	20	4	STR	2'-8"	36
H2	4	4	STR	5'-8"	15
H3	4	4	STR	9'-7"	26
H4	8	4	STR	35'-8"	191
L1	120	6	1	2'-0"	360
N2	10	5	3	6'-2"	64
N3	14	5	3	5'-2"	75
N4	36	5	3	4'-2"	156
V1	12	4	STR	5'-3"	42
V2	10	4	STR	4'-3"	28
V3	14	4	STR	3'-3"	30
V4	36	4	STR	2'-3"	54
Z1	60	5	2	5'-3"	329
Z2	60	4	STR	4'-8"	187
Z3	16	4	4	5'-0"	53

REINFORCING STEEL 1801 LBS.

CLASS A CONCRETE BREAKDOWN

POUR #2 HEADWALL (HEADWALL STEM & HEADWALL FOOTING) 14.9 C.Y.

TOTAL CLASS A CONCRETE 14.9 C.Y.

NORTH CAROLINA PROFESSIONAL SEAL 043143 ENGINEER CHRISTOPHER B. CORDELL
DocuSigned by: Christopher B. Cordell 8/19/2020

PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

SHEET 13 OF 21

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

INLET HEADWALL AND HEADWALL FOOTING BILL OF MATERIAL

Vaughn & Melton Consulting Engineers — Middlesboro, Kentucky 606-248-6600; Knoxville, Tennessee 865-546-5800; Asheville, North Carolina 828-253-2796

DRAWN BY: HL DATE: 03/2020
CHECKED BY: CBC DATE: 03/2020
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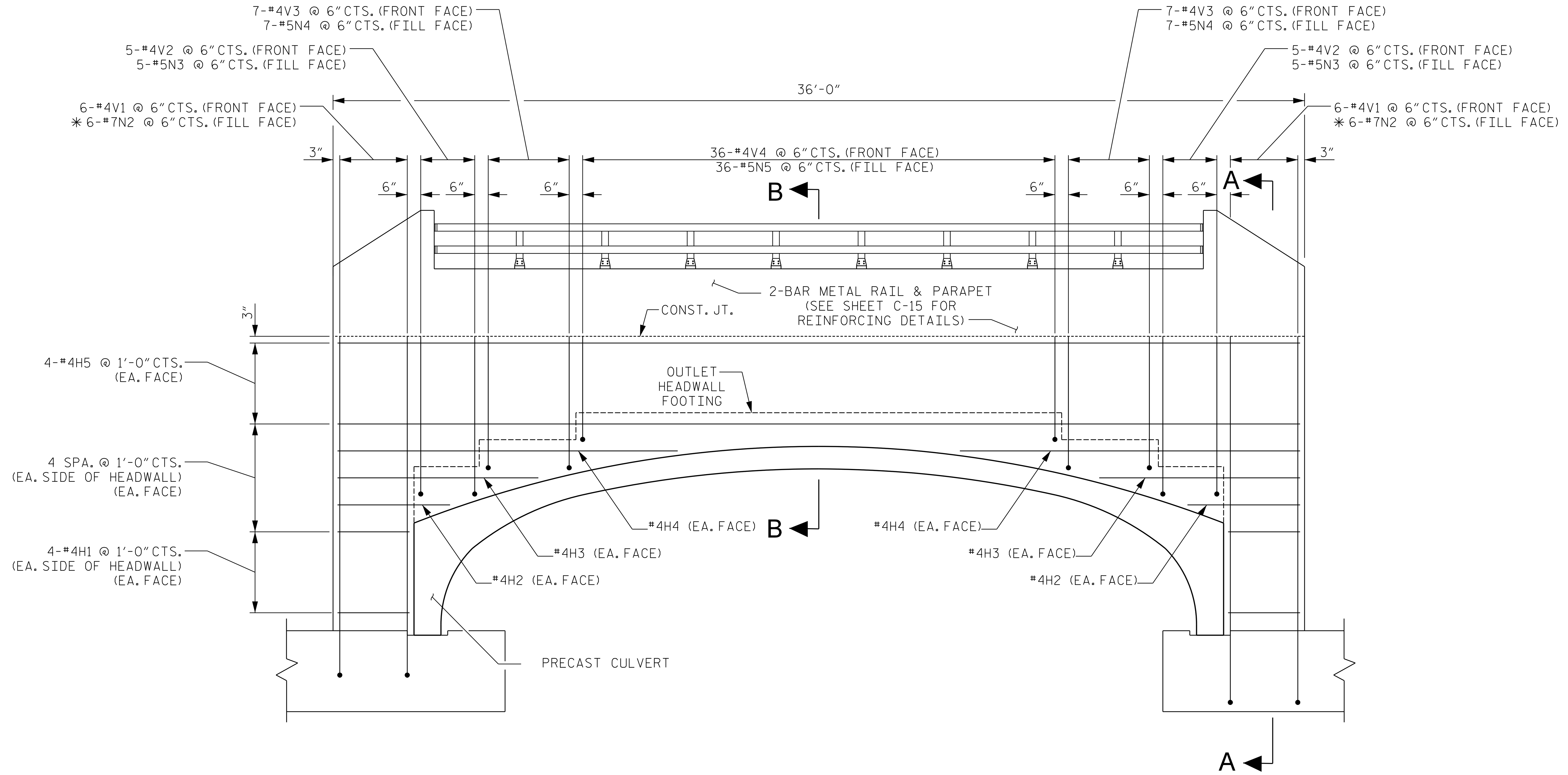
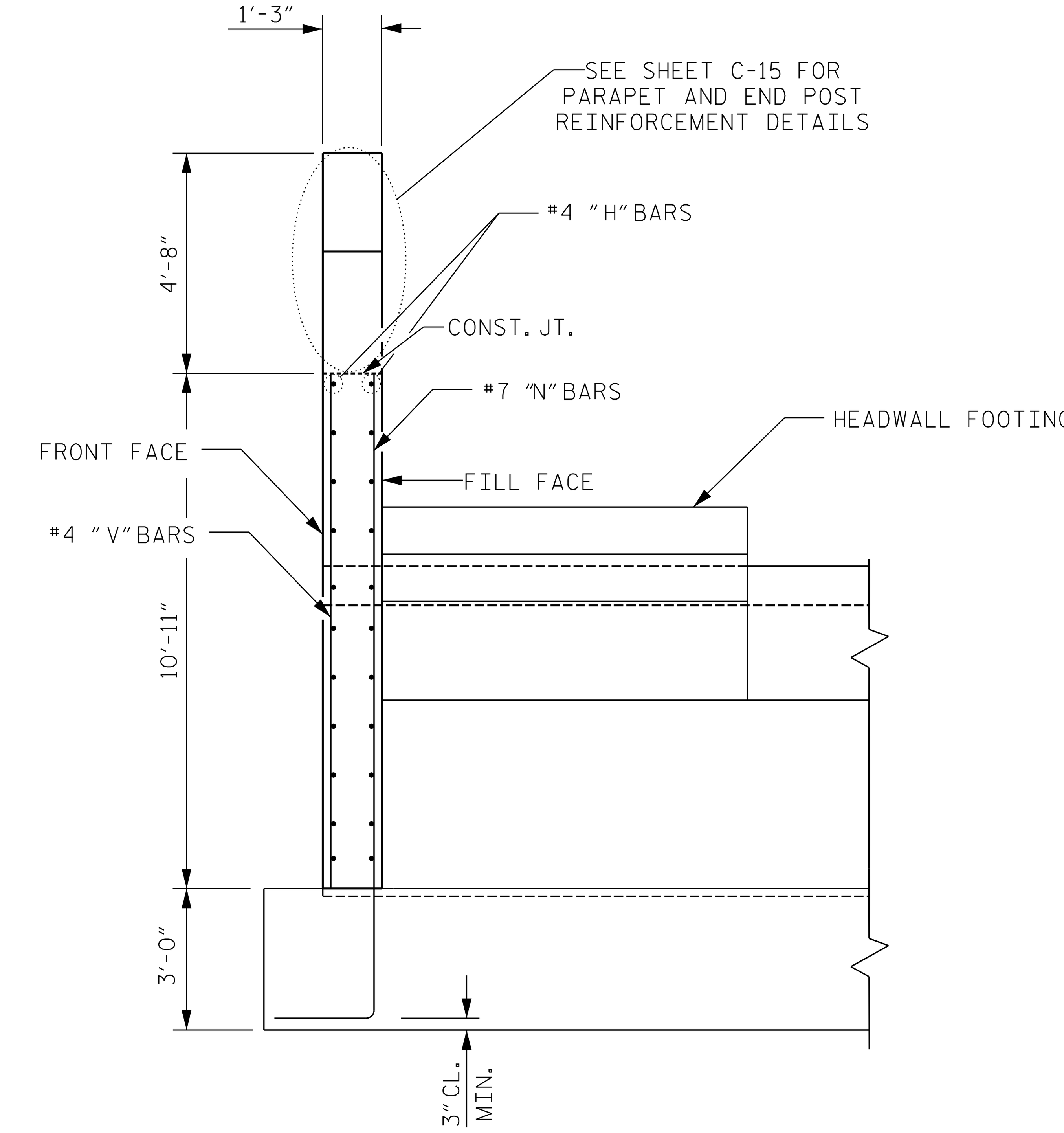
1			3		
2			4		

SHEET NO. C-13
TOTAL SHEETS 36

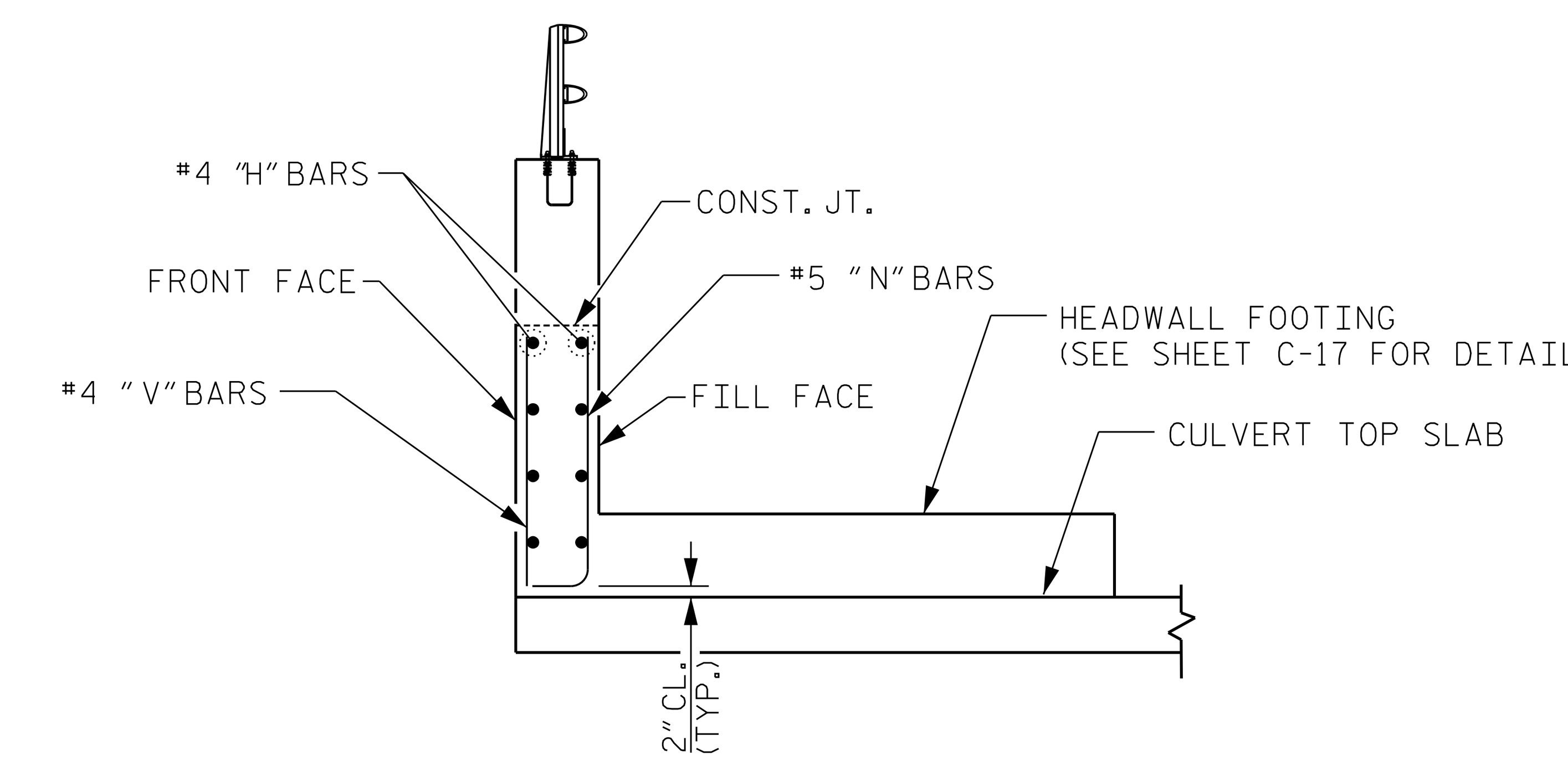


OUTLET HEADWALL ELEVATION

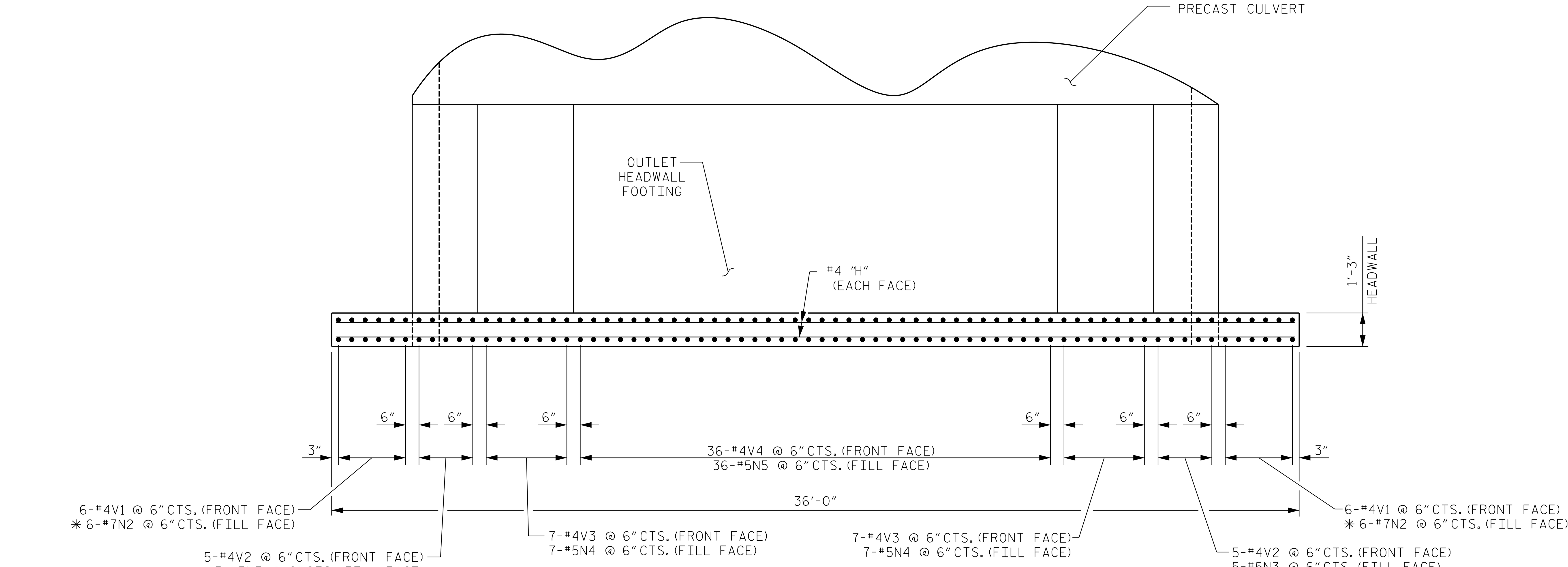
✱ N2 BARS INCLUDED IN FOOTING BILL OF MATERIALS



SECTION A-A



SECTION B-B



OUTLET HEADWALL PLAN

CULVERT FOOTINGS NOT SHOWN

NOTE: WINGS NOT SHOWN FOR CLARITY.

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 043143 CHRISTOPHER B. CORDELL

DocuSigned by: Christopher B. Cordell

8/19/2020

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PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

SHEET 14 OF 21

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

V&M
Vaughn & Melton
Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-5800
Asheville, North Carolina 828-253-2796

OUTLET HEADWALL REINFORCING DETAILS

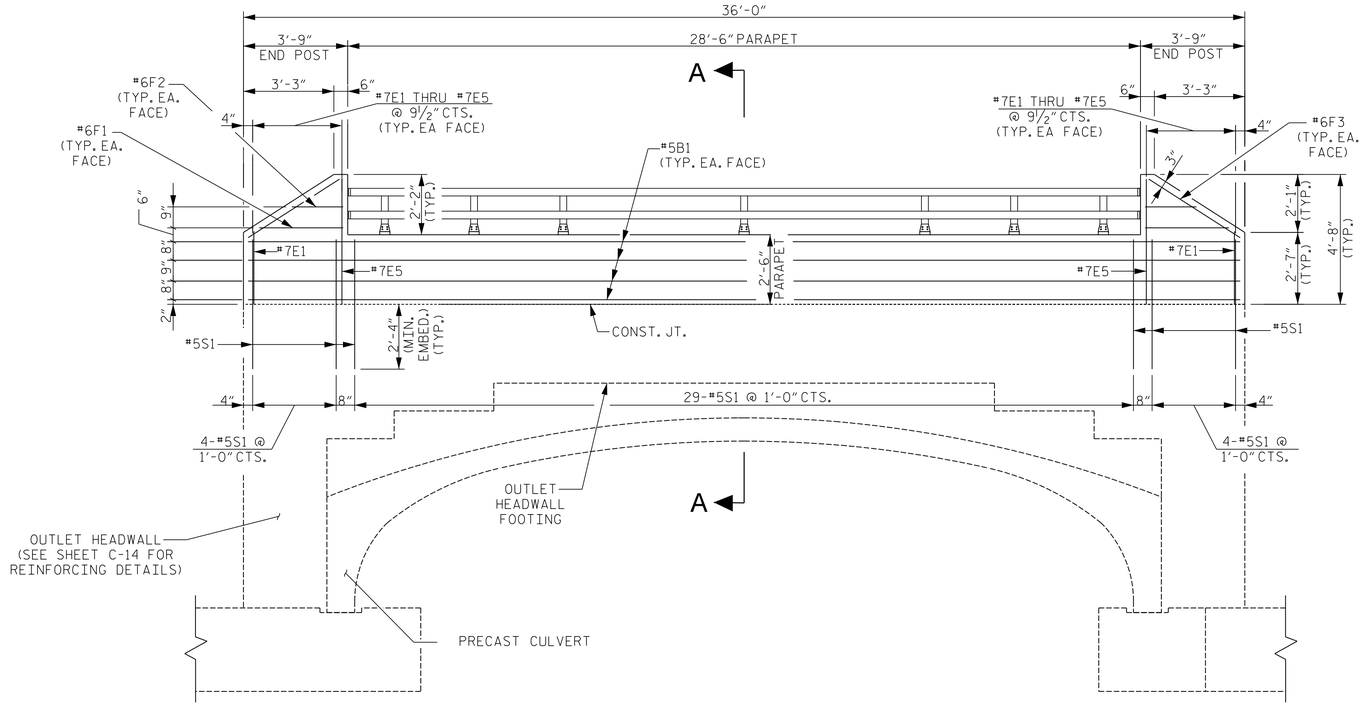
DRAWN BY: HL	DATE: 03/2020
CHECKED BY: CBC	DATE: 03/2020
ENG. OF RECORD: CBC	DATE: 03/2020

REVISIONS

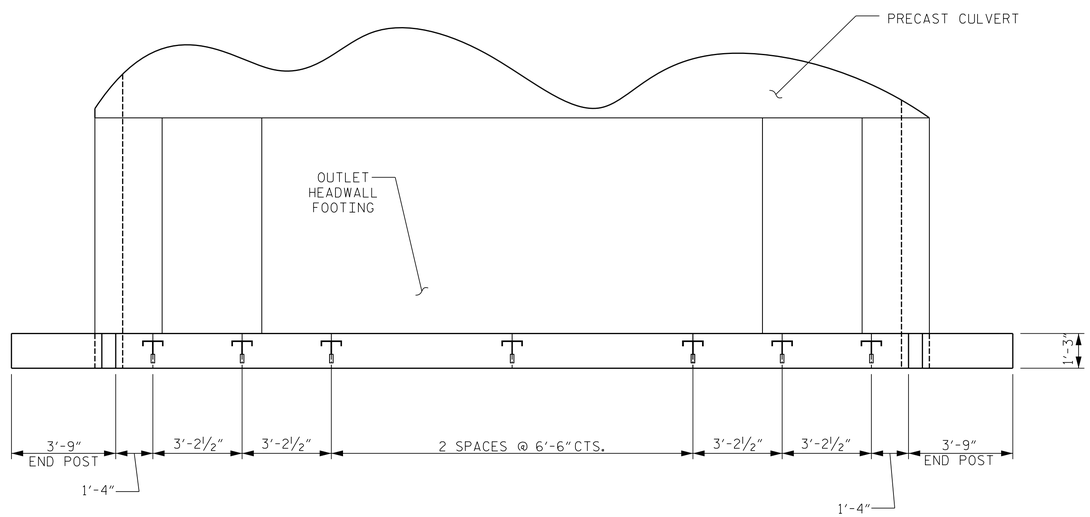
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO. C-14

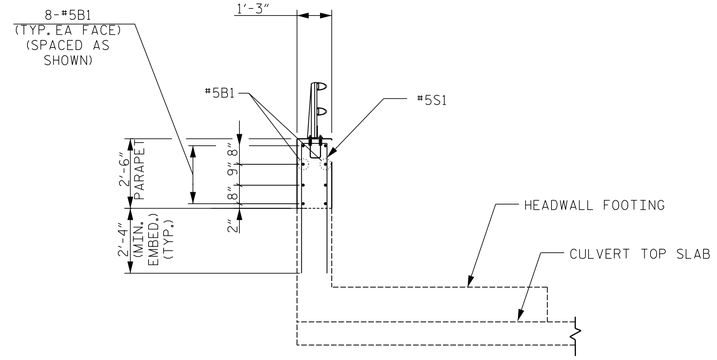
TOTAL SHEETS 36



OUTLET HEADWALL ELEVATION



PLAN OF RAIL POST SPACING



SECTION A-A

NOTE: WINGS NOT SHOWN FOR CLARITY.

NORTH CAROLINA PROFESSIONAL SEAL 043143 ENGINEER CHRISTOPHER B. CORDELL
DocuSigned by: Christopher B. Cordell 56BE3A27...
8/19/2020

PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

SHEET 15 OF 21

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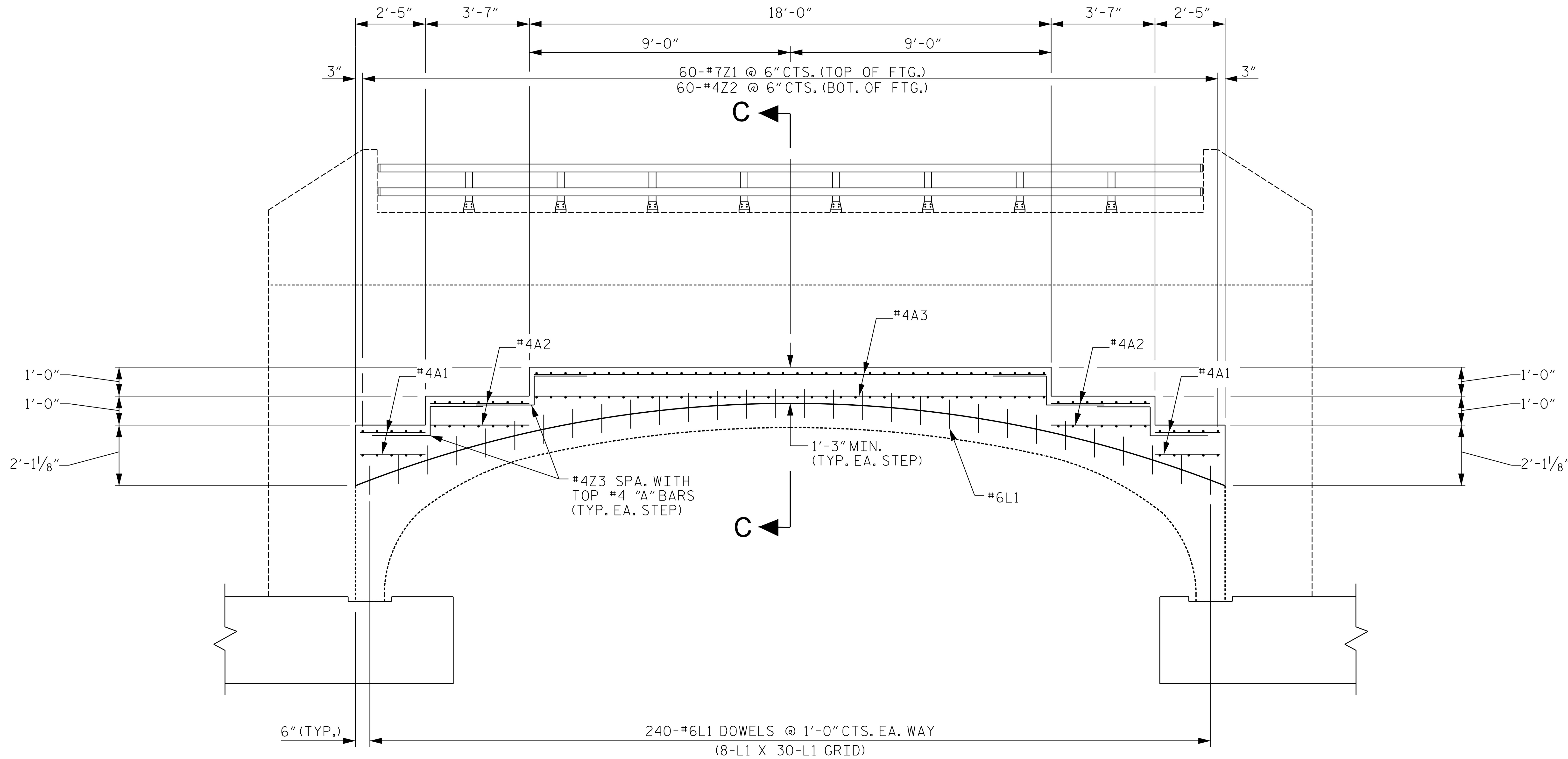
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

OUTLET HEADWALL PARAPET REINFORCING DETAILS & RAIL POST SPACING

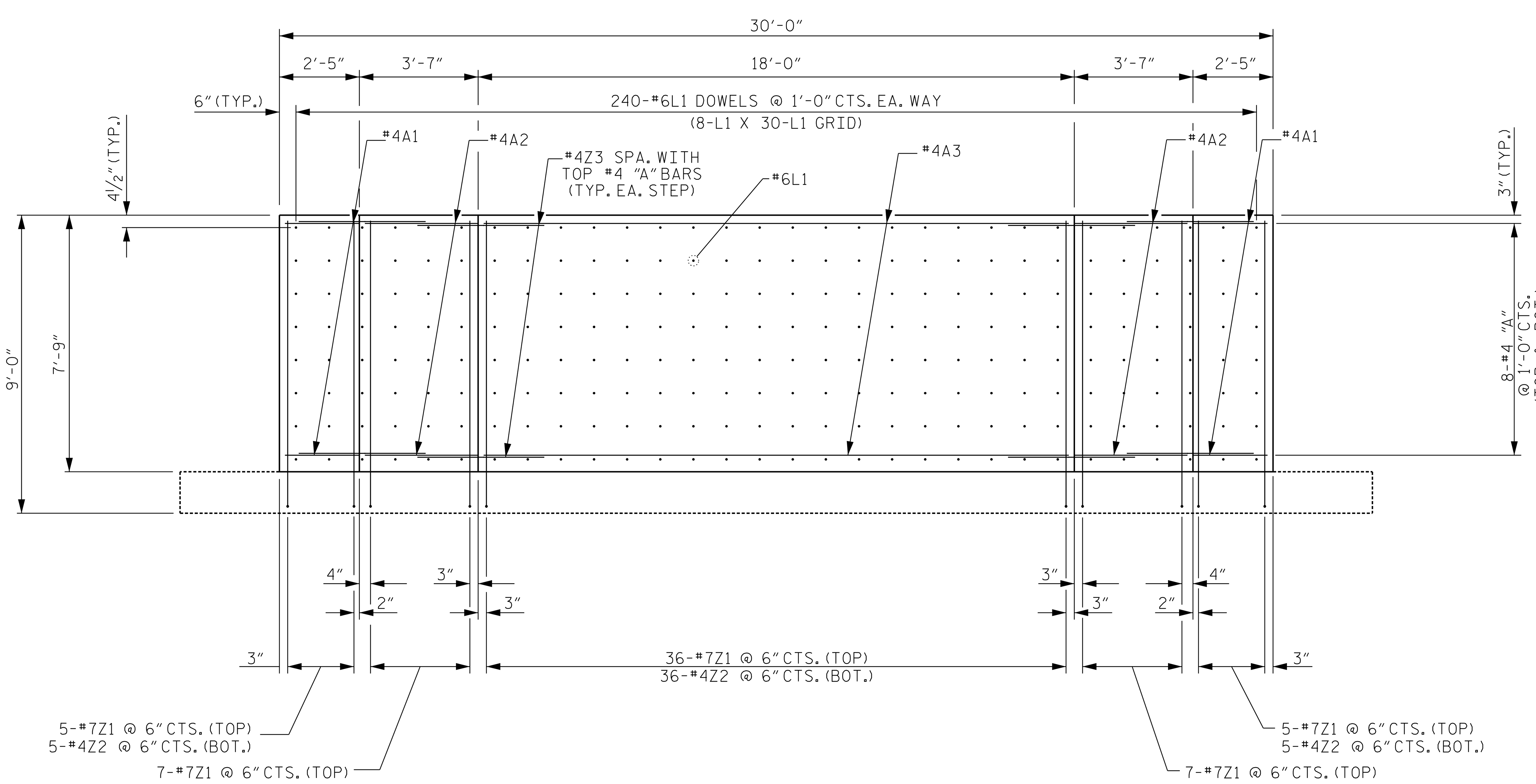
V&M Vaughn & Melton Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-5800
Asheville, North Carolina 828-253-2796

DRAWN BY: HL	DATE: 03/2020
CHECKED BY: CBC	DATE: 03/2020
ENG. OF RECORD: CBC	DATE: 03/2020

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-15
1			3			TOTAL SHEETS
2			4			36

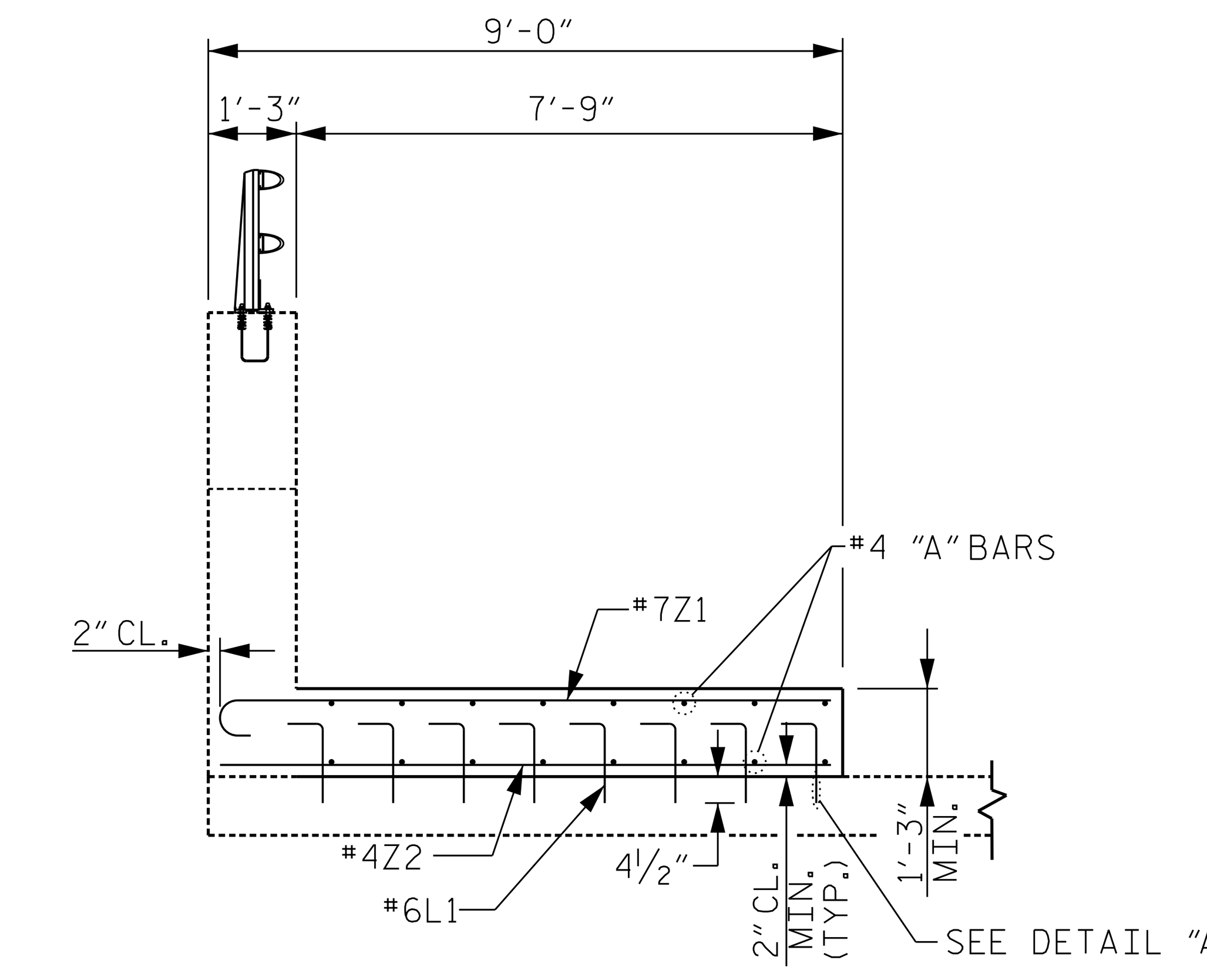


OUTLET HEADWALL ELEVATION

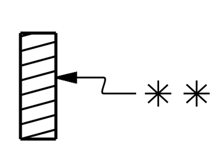


OUTLET HEADWALL FOOTING PLAN

NOTE: WINGS NOT SHOWN FOR CLARITY.

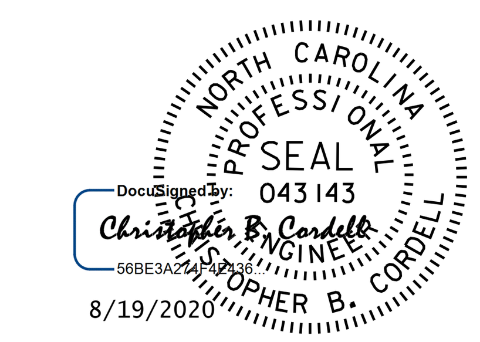


SECTION C-C



** STRUCTURAL CONNECTION INSERTS
2 STRUT OR EQUAL;
LENGTH = 4 1/2", INSERT WIDTH = 2",
DIA. = 3/4". 240 INSERTS REQ'D.

DETAIL A



PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

SHEET 16 OF 21

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

OUTLET HEADWALL
FOOTING DETAILS

Vaughn & Melton
Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-5800
Asheville, North Carolina 828-253-2796

DRAWN BY: HL	DATE: 03/2020		
CHECKED BY: CBC	DATE: 03/2020		
ENG. OF RECORD: CBC	DATE: 03/2020		

REVISIONS

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

SHEET NO. C-16

TOTAL SHEETS 36

NOTES

STRUCTURAL CONCRETE INSERT

THE STRUCTURAL CONCRETE INSERT ASSEMBLY SHALL CONSIST OF THE FOLLOWING COMPONENTS:

A. FERRULES SHALL BE MADE FROM STEEL MEETING THE REQUIREMENTS OF AASHTO M169, GRADE 12L14 AND SHALL HAVE A MINIMUM LENGTH OF THREADS OF 1½''.

B. 1 - ¾'' Ø X 1⅝'' BOLT WITH WASHER. BOLT SHALL CONFORM TO THE REQUIREMENTS OF ASTM A307. BOLT AND WASHER SHALL BE GALVANIZED. (AT THE CONTRACTOR'S OPTION, STAINLESS STEEL BOLT AND WASHER MAY BE USED AS AN ALTERNATE FOR THE ¾'' Ø X 1⅝'' GALVANIZED BOLT AND WASHER. THEY SHALL CONFORM TO OR EXCEED THE MECHANICAL REQUIREMENTS OF ASTM A307. THE USE OF THIS ALTERNATE SHALL BE APPROVED BY THE ENGINEER.)

C. WIRE STRUT SHOWN IN THE CONCRETE INSERT ASSEMBLY DETAIL IS THE MINIMUM ALLOWABLE SIZE AND SHALL HAVE A MINIMUM TENSILE STRENGTH OF 100,000 PSI. AS AN OPTION, A 7/16'' Ø WIRE STRUT WITH A MINIMUM TENSILE STRENGTH OF 90,000 PSI IS ACCEPTABLE.

NOTES

METAL RAIL TO END POST CONNECTION

THE METAL RAIL TO END POST CONNECTION SHALL CONSIST OF THE FOLLOWING COMPONENTS:

A. ½'' PLATES SHALL CONFORM TO AASHTO M270 GRADE 36 AND SHALL BE GALVANIZED AFTER FABRICATION.

B. ¾'' STRUCTURAL CONCRETE INSERT SHALL HAVE A WORKING LOAD SHEAR CAPACITY OF 4800 LBS. THE FERRULES SHALL ENGAGE A ¾''Ø X 1⅝'' BOLT WITH 2'' O.D. WASHER IN PLACE. THE ¾''Ø X 1⅝'' BOLT SHALL HAVE N. C. THREADS.

C. CAP SCREWS FOR RAIL ATTACHMENT TO ANGLE SHALL CONFORM TO THE REQUIREMENTS OF ASTM F593 ALLOY 305 STAINLESS STEEL. CAP SCREWS TO BE CENTERED IN SLOTS AT 60°F.

D. STANDARD CLAMP BARS (SEE METAL RAIL SHEET).

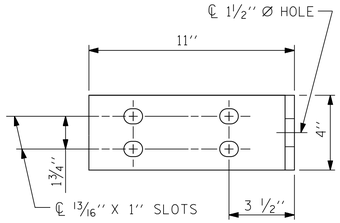
E. ½'' Ø PIPE SLEEVES (IF REQUIRED) TO BE GALVANIZED.

THE COST OF THE STANDARD CLAMP BARS AND CAP SCREWS USED IN THE METAL RAIL TO END POST CONNECTION SHALL BE INCLUDED IN THE UNIT CONTRACT PRICE BID FOR LINEAR FEET OF 1 OR 2 BAR METAL RAILS.

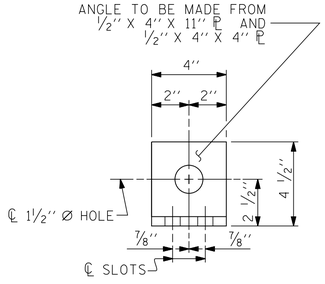
THE ¾'' STRUCTURAL CONCRETE INSERT WITH BOLT SHALL BE ASSEMBLED IN THE SHOP.

THE COST OF THE ¾'' STRUCTURAL CONCRETE INSERT ASSEMBLY, AND THE ½'' PLATES COMPLETE IN PLACE SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.

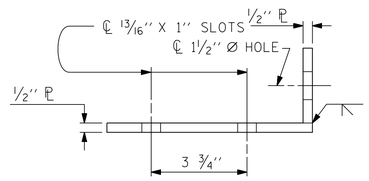
THE CONTRACTOR, AT HIS OPTION, MAY USE AN ADHESIVE BONDING SYSTEM IN LIEU OF THE STRUCTURAL CONCRETE INSERT EMBEDDED IN THE END POST. IF THE ADHESIVE BONDING SYSTEM IS USED, THE ¾'' Ø X 1⅝'' BOLT WITH WASHER SHALL BE REPLACED WITH A ¾''Ø X 6½'' BOLT AND 2'' O.D. WASHER. ALL SPECIFICATIONS THAT APPLY TO THE ¾'' Ø X 1⅝'' BOLT SHALL APPLY TO THE ¾''Ø X 6 ½'' BOLT. FIELD TESTING OF THE ADHESIVE BONDING SYSTEM IS NOT REQUIRED.



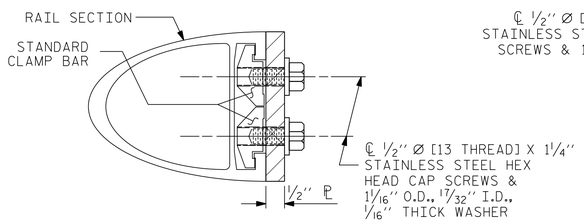
ELEVATION



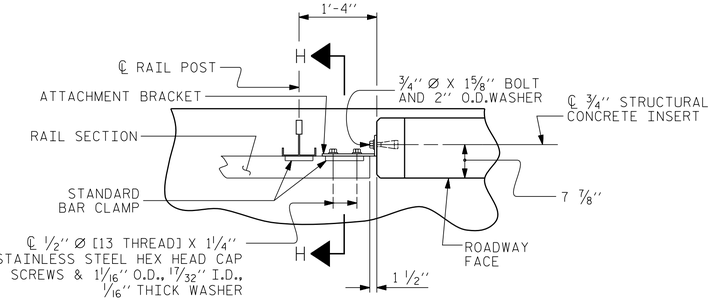
END VIEW (FIX AND EXP.)



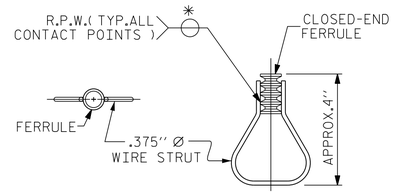
TOP VIEW



SECTION H-H (FIX)



PLAN - RAIL AND END POST



PLAN ELEVATION

STRUCTURAL CONCRETE INSERT

* EACH WELDED ATTACHMENT OF WIRE TO FERRULE SHALL DEVELOP THE TENSILE STRENGTH OF THE WIRE.

PROJECT NO. U-5887

HENDERSON COUNTY

STATION: 22+44.41 -L-

SHEET 17 OF 21

NORTH CAROLINA PROFESSIONAL SEAL 043143 ENGINEER CHRISTOPHER B. CORDELL
Documents not considered final unless sealed
Christopher B. Cordell
56BE3A2...
8/19/2020

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

V&M Vaughn & Melton Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-5800
Asheville, North Carolina 828-253-2796

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH
STANDARD

RAIL POST SPACINGS AND END OF RAIL DETAILS
FOR ONE OR TWO BAR METAL RAILS

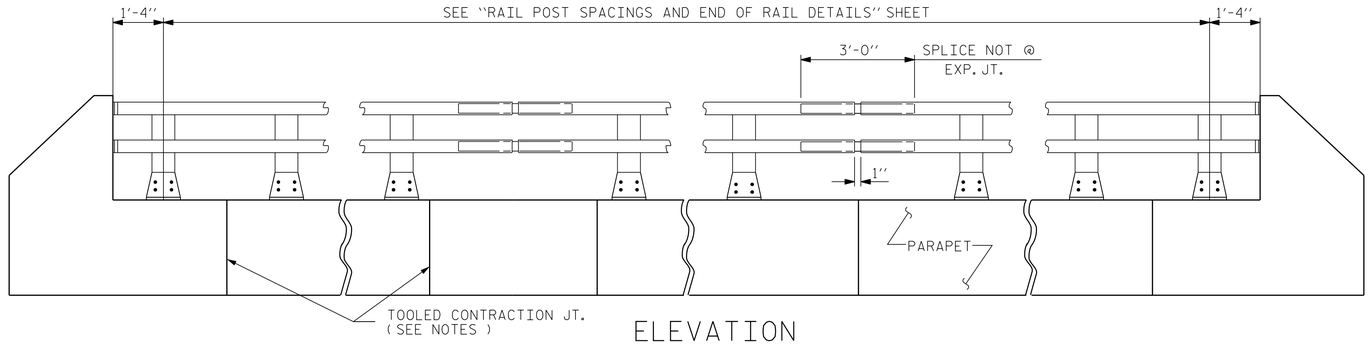
DRAWN BY: HL DATE: 03/2020
CHECKED BY: CBC DATE: 03/2020
ENG. OF RECORD: CBC DATE: 03/2020

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-17
1			3			TOTAL SHEETS
2			4			36

DETAILS FOR ATTACHING METAL RAIL TO END POST

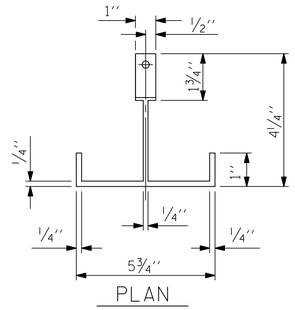
DRAWN BY : FCJ 1/88	REV. 5/1/06 TLA/GM
CHECKED BY : CRK 3/89	REV. 10/1/11 MAA/GM
	REV. 12/17 MAA/THC

STD. NO. BMR2

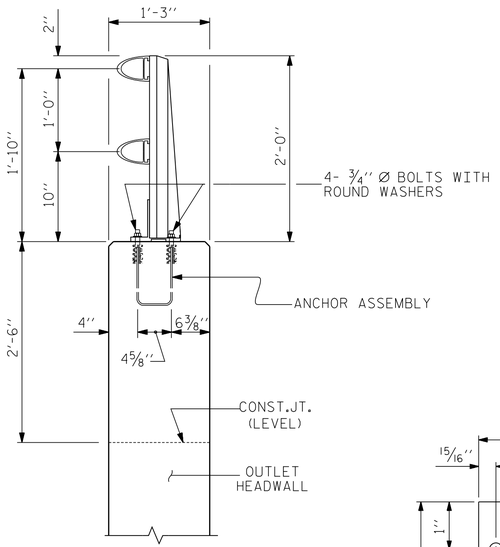


ELEVATION

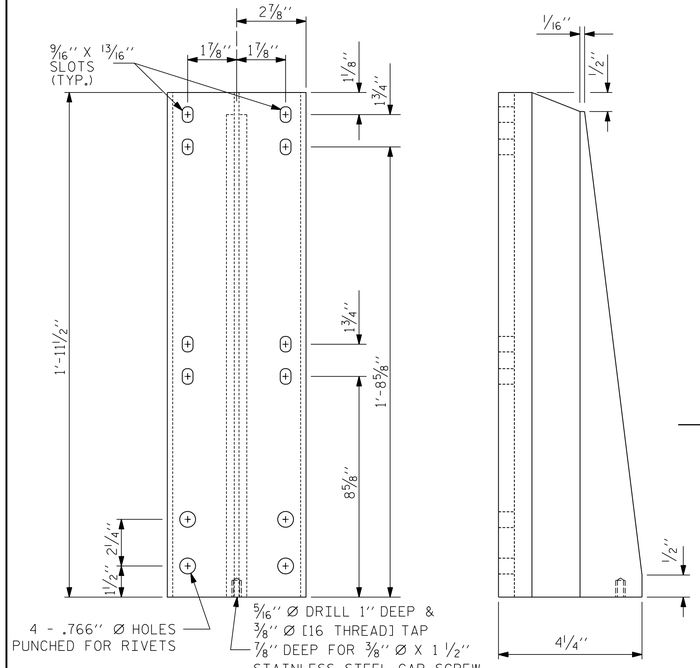
NOTE : FOR ATTACHMENT OF METAL RAIL TO END POST, SEE STANDARD NO. BMR2.



PLAN



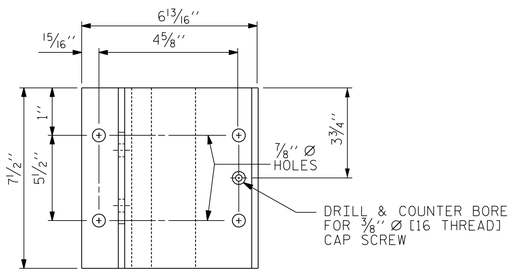
SECTION THRU PARAPET AND RAIL



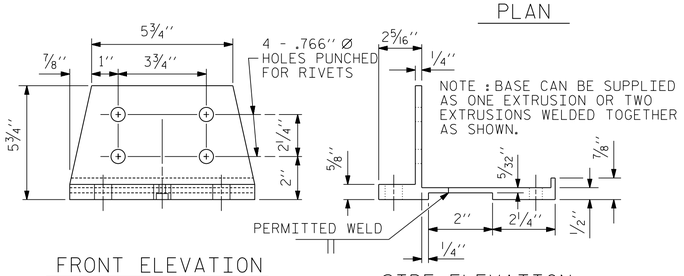
FRONT ELEVATION

SIDE ELEVATION

DETAILS OF POST



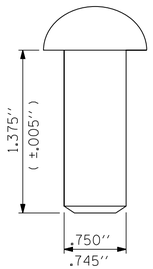
PLAN



FRONT ELEVATION

SIDE ELEVATION

POST BASE DETAILS



RIVET DETAIL

NOTES

METAL RAIL SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 460 OF THE STANDARD SPECIFICATIONS AND METAL RAIL COMPONENTS SHALL MEET THE REOUIREMENTS OF ARTICLE 1074-5 OF THE STANDARD SPECIFICATIONS.

RAILING SHALL BE CONTINUOUS FROM END POST TO END POST OF BRIDGE. EACH JOINT IN RAIL LENGTH SHALL BE SPLICED AS DETAILED. PANEL LENGTHS OF RAIL SHALL BE ATTACHED TO A MINIMUM OF THREE POSTS.

FOR END OF RAIL TO CLEAR FACE OF CONCRETE END POST DIMENSION, SEE STD. NO. BMR2.

CAP SCREWS SHALL BE ASTM F593 ALLOY 305 STAINLESS STEEL. WASHERS SHALL MEET THE REOUIREMENTS OF ASTM F844 EXCEPT THEY SHALL BE MADE FROM ALLOY 304 STAINLESS STEEL.

METAL RAIL POSTS SHALL BE SET NORMAL TO CURB GRADE.

ALLOY 6351-15 MAY BE SUBSTITUTED FOR ALLOY 6061-16 WHERE APPLICABLE.

MINOR VARIATIONS IN DETAILS OF METAL RAIL WILL BE CONSIDERED. DETAILS OF SUCH VARIATIONS, IF DESIRED, SHALL BE SUBMITTED FOR APPROVAL.

GROOVED CONTRACTION JOINTS, 1/2" IN DEPTH, SHALL BE TOOLED IN ALL EXPOSED FACES OF THE PARAPET AND IN ACCORDANCE WITH ARTICLE 825-10(B) OF THE STANDARD SPECIFICATIONS. CONTRACTION JOINTS SHALL BE LOCATED 9 FEET ON EACH SIDE OF PARAPET EXPANSION JOINTS WITH NO MORE THAN 12 FEET BETWEEN CONTRACTION JOINTS.

ANODIZING

FOR ANODIZED 2 BAR METAL RAIL, SEE SPECIAL PROVISIONS.

ALUMINUM FOR POSTS, BASES, RAILS, EXPANSION BARS, RIVETS, CAPS, AND SHIMS SHALL BE ANODIZED. THE CONTRACTOR SHALL SUBMIT THREE SETS OF ASTM B-21 6061-T6 ALUMINUM SAMPLES ANODIZED MEDIUM BROWN, DARK BROWN, AND EXTRA DARK BROWN TO THE ENGINEER. THE ENGINEER SHALL SELECT THE COLOR FROM THE SAMPLES FURNISHED BY THE CONTRACTOR.

AFTER A SHADE OF BROWN HAS BEEN SELECTED FOR THE RAILING, THE CONTRACTOR SHALL SUBMIT A SAMPLE OF COMPATIBLE EXTERIOR ACRYLIC HOUSE PAINT TO THE ENGINEER. THIS PAINT SHALL MATCH THE ANODIZED RAIL COLOR AS CLOSELY AS POSSIBLE. AFTER ERECTION OF THE ANODIZED ALUMINUM RAILING, ALL EXPOSED ANCHOR BOLTS, NUTS, WASHERS, MACHINE SCREWS, CAP SCREWS, BOLTS, ATTACHMENT BRACKETS, HOLD-DOWN PLATES, AND BUILT UP ANGLES SHALL BE COATED WITH TWO COATS OF THIS ACTYLIC PAINT.

ANY DAMAGE TO THE ANODIZED SURFACES OF THE RAIL OR COMPONENTS DURING THE CONSTRUCTION SHALL BE REPAIRED ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS AT THE DIRECTION OF THE ENGINEER AND AT THE CONTRACTOR'S EXPENSE.

PAY LENGTH = 28.5 LIN. FT.

NORTH CAROLINA PROFESSIONAL SEAL 043143 ENGINEER CHRISTOPHER B. CORDELL
Document Signed By: Christopher B. Cordell
56BE3A7...
8/19/2020

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Vaughn & Melton Consulting Engineers
Middlesboro, Kentucky 606-248-6606
Knoxville, Tennessee 865-546-5800
Asheville, North Carolina 828-253-2796

DRAWN BY: HL DATE: 03/2020
CHECKED BY: CBC DATE: 03/2020
ENG. OF RECORD: CBC DATE: 03/2020

PROJECT NO. U-5887
HENDERSON COUNTY
STATION: 22+44.41 -L-
SHEET 18 OF 21

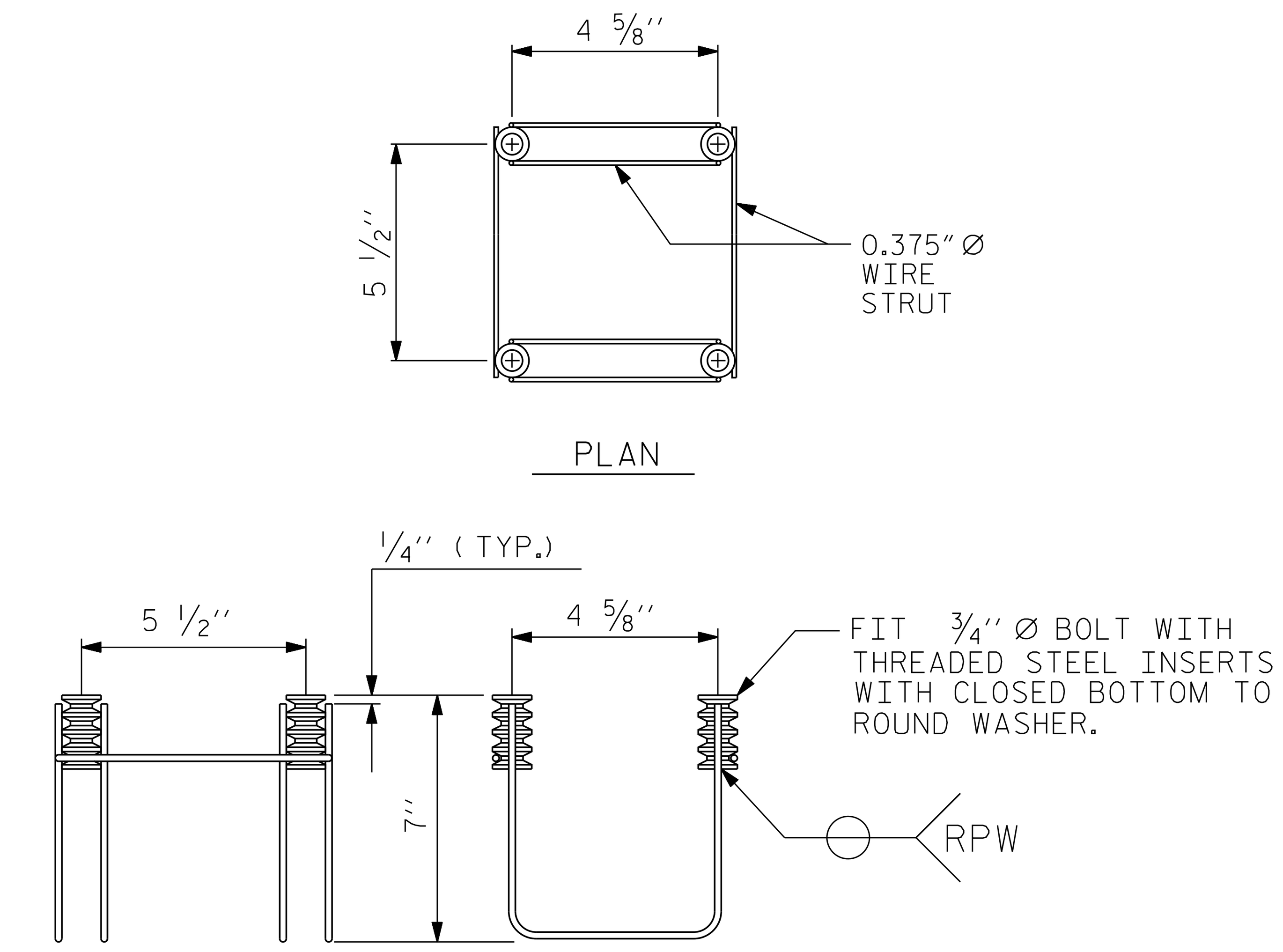
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

ANODIZED 2 BAR METAL RAIL

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-18
1			3			TOTAL SHEETS
2			4			36

DRAWN BY : EEM 6/94
CHECKED BY : RGW 6/94

REV. 10/1/11 MAA/GM
REV. 6/13 MAA/GM
REV. 12/17 MAA/THC



4-BOLT METAL RAIL ANCHOR ASSEMBLY

(7 ASSEMBLIES REQUIRED)

NOTES

STRUCTURAL CONCRETE ANCHOR ASSEMBLY

THE STRUCTURAL CONCRETE ANCHOR ASSEMBLY SHALL CONSIST OF THE FOLLOWING COMPONENTS :

A. FERRULES SHALL BE MADE FROM STEEL MEETING THE REQUIREMENTS OF AASHTO M169, GRADE 12L14 AND SHALL HAVE A MINIMUM LENGTH OF THREADS OF 2'' FOR 3/4'' FERRULES.

B. 4 - 3/4'' Ø X 2 1/2'' BOLTS WITH WASHERS. BOLTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A307. BOLTS AND WASHERS SHALL BE GALVANIZED. AT THE CONTRACTOR'S OPTION, STAINLESS STEEL BOLTS AND WASHERS MAY BE USED AS AN ALTERNATE FOR THE 3/4'' Ø X 2 1/2'' GALVANIZED BOLTS AND WASHERS. THEY SHALL CONFORM TO OR EXCEED THE MECHANICAL REQUIREMENTS OF ASTM A307. THE USE OF THIS ALTERNATE SHALL BE APPROVED BY THE ENGINEER.

C. WIRE STRUT SHOWN IN THE CONCRETE ANCHOR ASSEMBLY DETAIL IS THE MINIMUM ALLOWABLE SIZE AND SHALL HAVE A MINIMUM TENSILE STRENGTH OF 100,000 PSI. AS AN OPTION, A 7/16'' Ø WIRE STRUT WITH A MINIMUM TENSILE STRENGTH OF 90,000 PSI IS ACCEPTABLE.

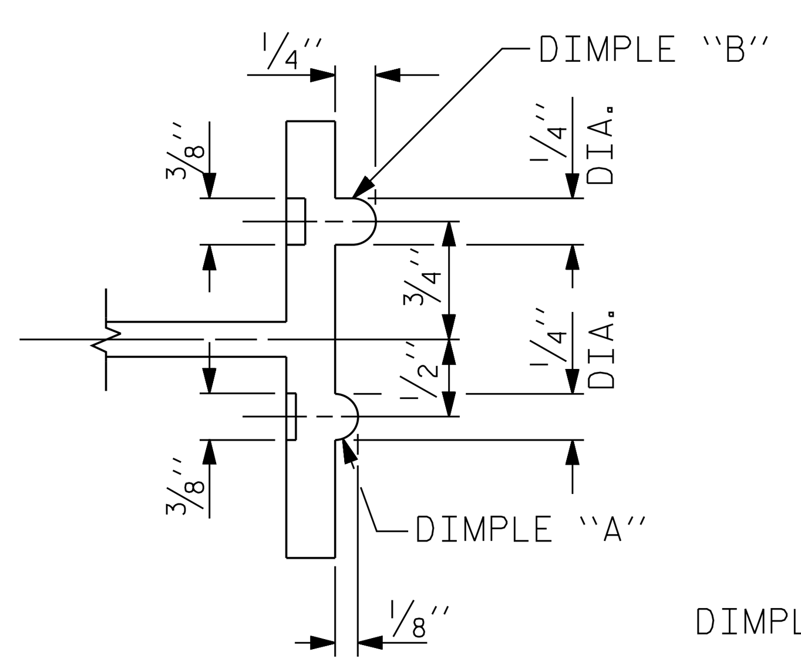
D. THE METAL RAIL ANCHOR ASSEMBLIES TO BE HOT DIPPED GALVANIZED TO CONFORM TO REQUIREMENTS OF AASHTO M111.

E. THE COST OF THE METAL RAIL ANCHOR ASSEMBLY WITH BOLTS AND WASHERS COMPLETE IN PLACE SHALL BE INCLUDED IN THE PRICE BID FOR LINEAR FEET OF METAL RAIL.

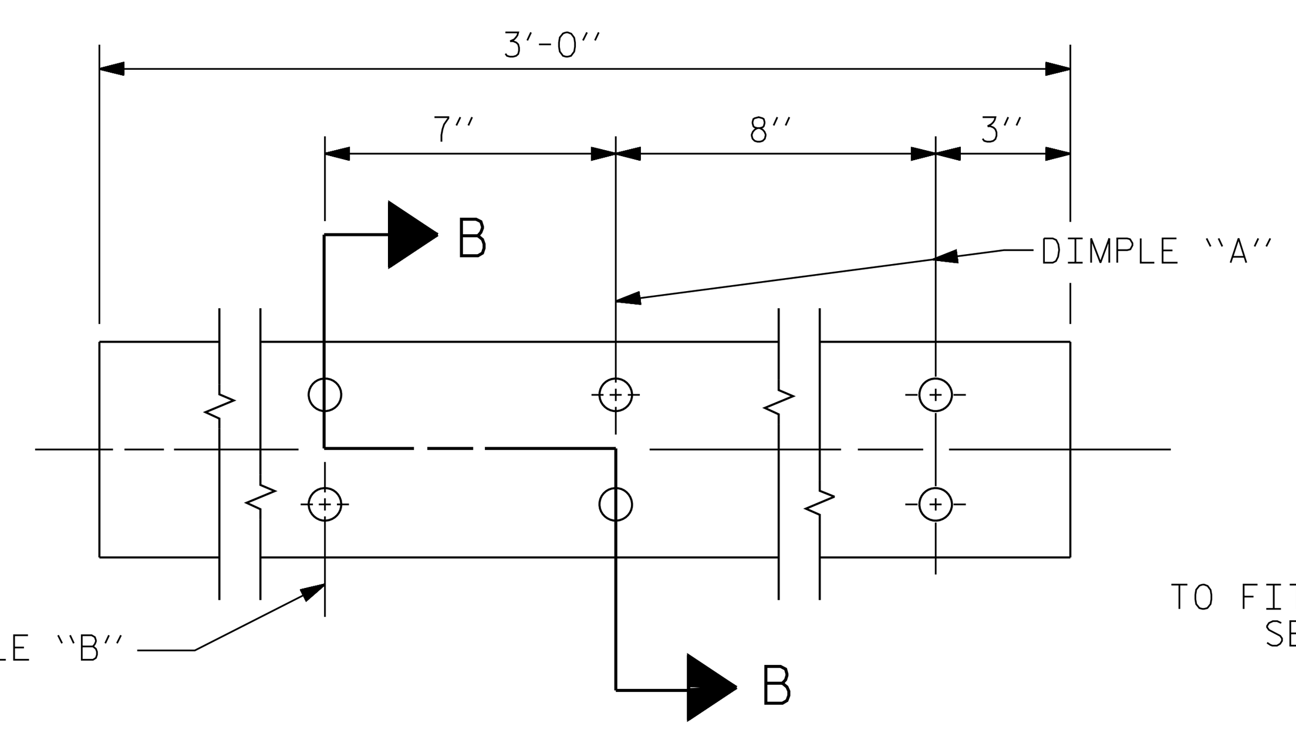
F. BOLTS TO BE TIGHTENED ONE-HALF TURN WITH A WRENCH FROM A FINGER-TIGHT POSITION.

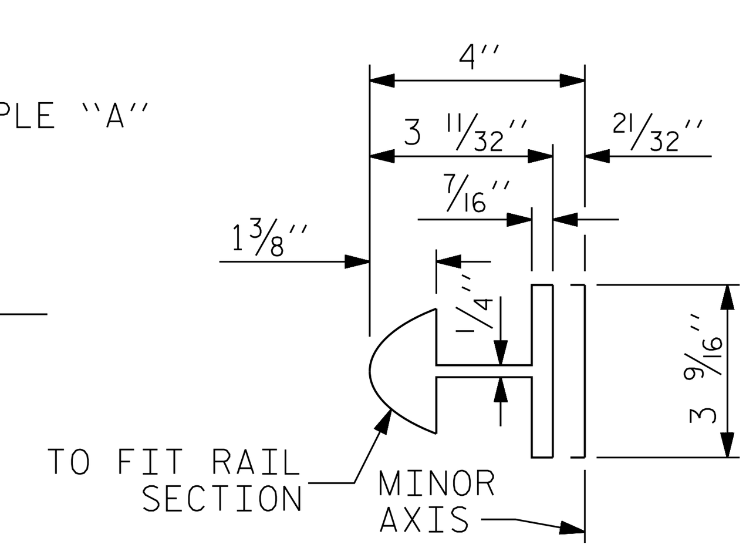
THE CONTRACTOR MAY USE ADHESIVELY ANCHORED ANCHOR BOLTS IN PLACE OF THE METAL RAIL ANCHOR ASSEMBLY. LEVEL ONE FIELD TESTING IS REQUIRED, AND THE YIELD LOAD OF THE 3/4'' Ø BOLT IS 10 KIPS. FOR ADHESIVELY ANCHORED ANCHOR BOLTS OR DOWELS, SEE THE STANDARD SPECIFICATIONS.

WHEN ADHESIVELY ANCHORED ANCHOR BOLTS ARE USED, BOLTS SHALL MEET THE REQUIREMENTS OF ASTM F593 ALLOY 304 STAINLESS STEEL WITH MINIMUM 75,000 PSI ULTIMATE STRENGTH. NUTS SHALL MEET THE REQUIREMENTS OF ASTM F594 ALLOY 304 STAINLESS STEEL AND WASHERS SHALL MEET THE REQUIREMENTS OF ASTM F844 EXCEPT THEY SHALL BE MADE FROM ALLOY 304 STAINLESS STEEL.



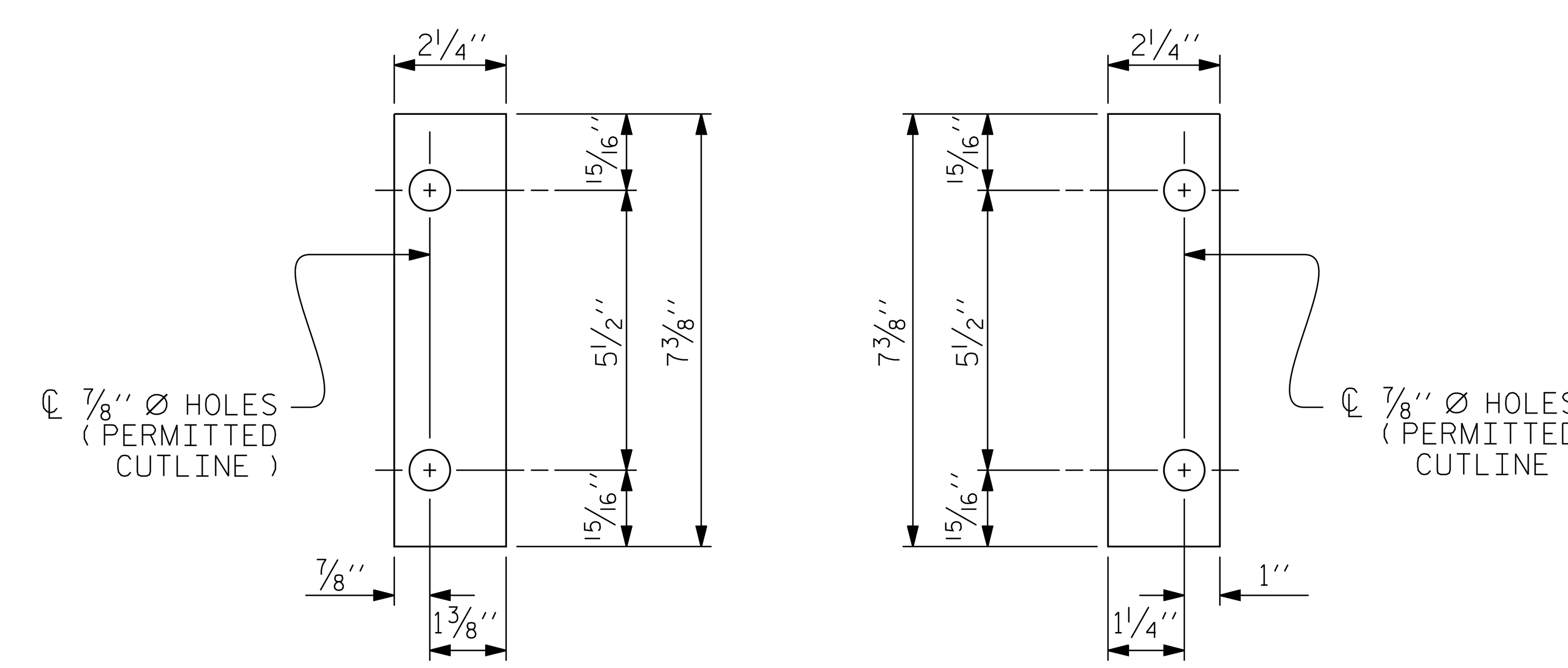
SECTION B - B





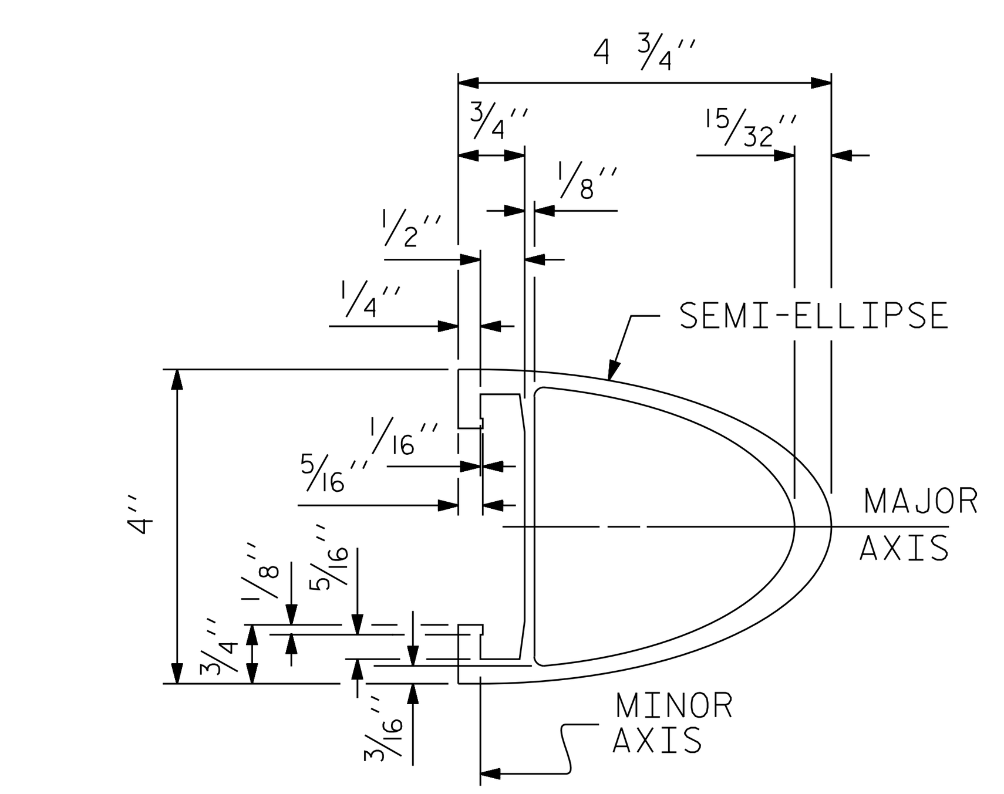
BAR SECTION

EXPANSION BAR DETAILS

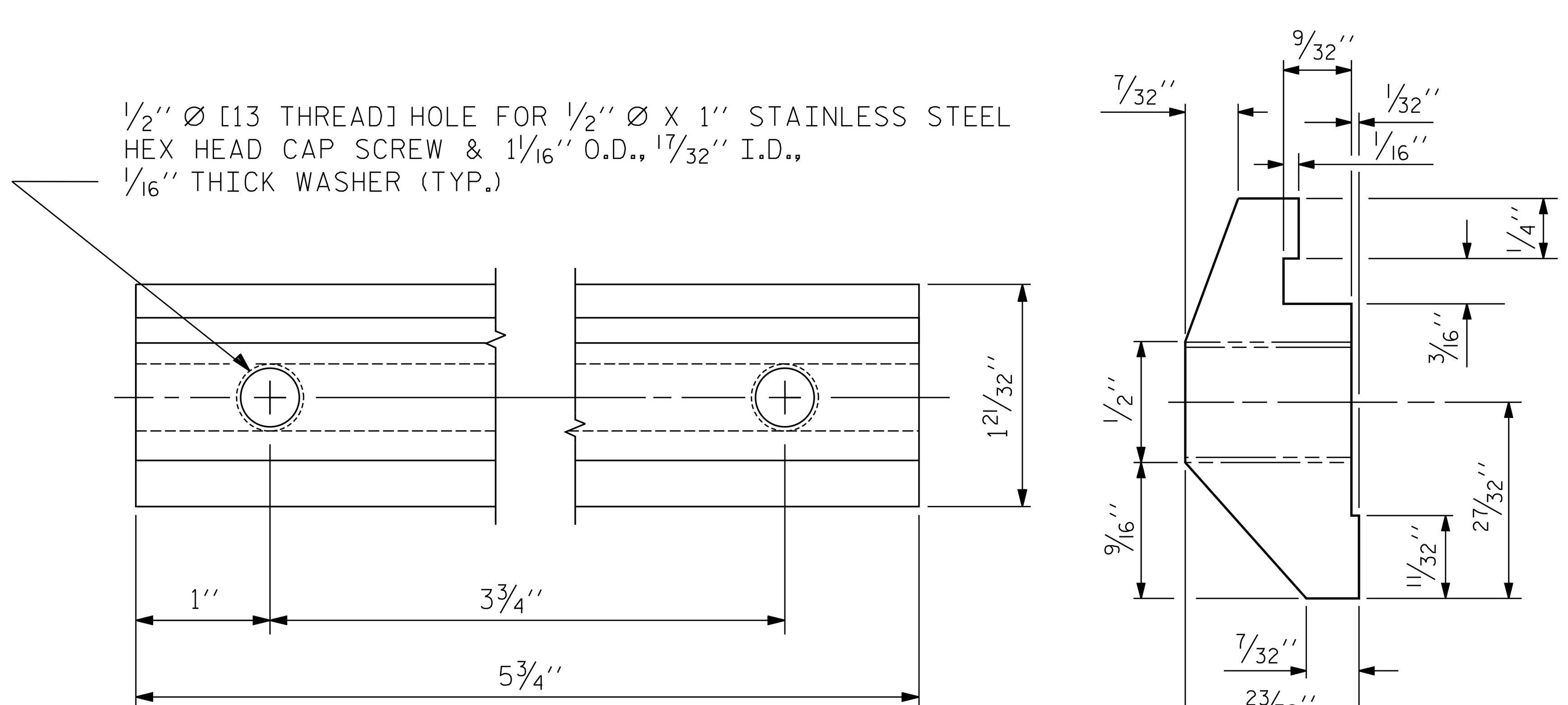


SHIM DETAILS

NOTE :
SHIMS MAY BE CUT ALONG PERMITTED CUTLINE OR SLOTTED TO EDGE OF PLATE TO FACILITATE PLACEMENT.

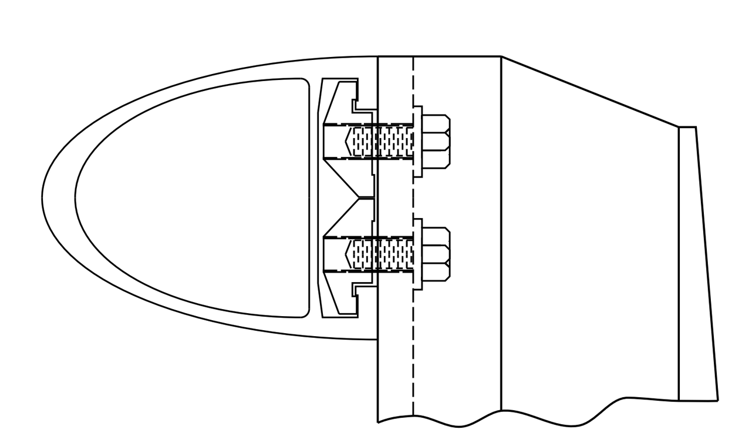


RAIL SECTION

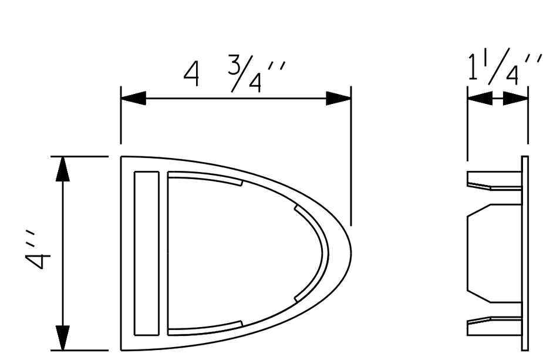


CLAMP BAR DETAIL

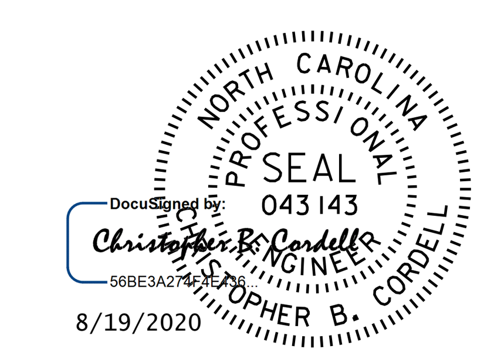
(4 REQUIRED PER POST)



CLAMP ASSEMBLY



RAIL CAP



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PROJECT NO. U-5887
HENDERSON COUNTY
STATION: 22+44.41 -L-
SHEET 19 OF 21

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

2 BAR METAL RAIL

DRAWN BY: HL	DATE: 03/2020
CHECKED BY: CBC	DATE: 03/2020
ENG. OF RECORD: CBC	DATE: 03/2020

REVISIONS

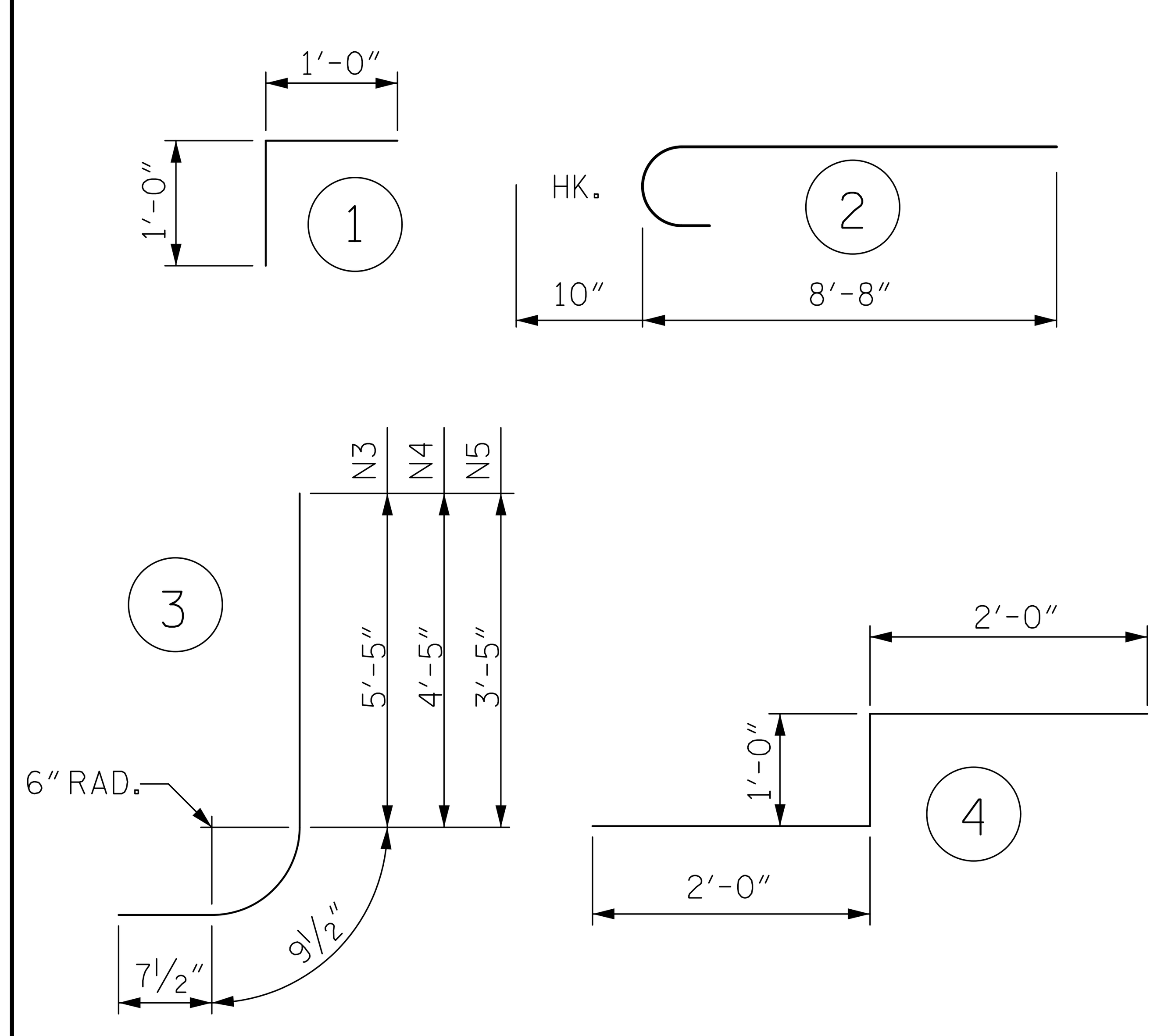
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO. C-19
TOTAL SHEETS 36

DRAWN BY : EEM 6/94	CHECKED BY : RGW 6/94	REV. 5/1/06R	KMM/GM
		REV. 10/1/11	MAA/GM
		REV. 12/17	MAA/THC

STD. NO. BMR4

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

FOR OUTLET HEADWALL AND HEADWALL FOOTING

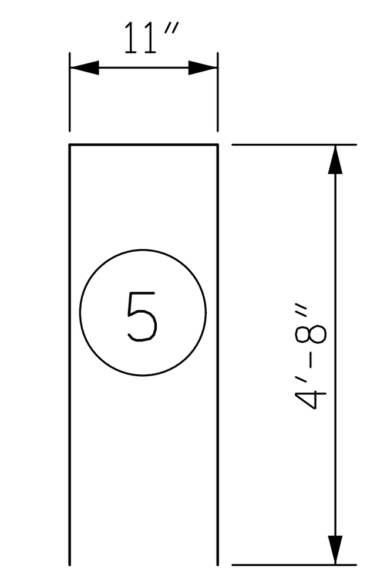
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	32	4	STR	2'-3"	48
A2	32	4	STR	3'-5"	73
A3	16	4	STR	17'-8"	189
H1	16	4	STR	2'-8"	29
H2	4	4	STR	4'-2"	11
H3	4	4	STR	7'-5"	20
H4	4	4	STR	12'-7"	34
H5	8	4	STR	35'-8"	191
L1	240	6	1	2'-0"	721
N3	10	5	3	8'-11"	93
N4	14	5	3	7'-11"	116
N5	36	5	3	6'-11"	260
✳ S1	37	5	5	10'-3"	396
V1	12	4	STR	10'-11"	88
V2	10	4	STR	5'-11"	40
V3	14	4	STR	4'-11"	46
V4	36	4	STR	3'-11"	94
Z1	60	7	2	9'-6"	1165
Z2	60	4	STR	8'-8"	347
Z3	32	4	4	5'-0"	107

REINFORCING STEEL 3672 LBS.

EPOXY COATED REINFORCING STEEL 396 LBS.

CLASS A CONCRETE
POUR #2 HEADWALL (HEADWALL STEM & HEADWALL FOOTING) 24.0 C.Y.

BAR TYPE



ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

FOR PARAPET AND END POSTS

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
✳ B1	8	5	STR	35'-8"	298
✳ E1	4	7	STR	2'-7"	21
✳ E2	4	7	STR	3'-1"	25
✳ E3	4	7	STR	3'-7"	29
✳ E4	4	7	STR	4'-1"	33
✳ E5	4	7	STR	4'-6"	37
✳ F1	4	6	STR	3'-0"	18
✳ F2	4	6	STR	1'-10"	11
✳ F3	4	6	STR	3'-10"	23

EPOXY COATED REINFORCING STEEL 495 LBS.

CLASS A CONCRETE
POUR #3 PARAPET AND END POSTS 4.6 C.Y.

1'-3" x 2'-6" CONCRETE PARAPET 36.0 LIN. FT.

PROJECT NO. U-5887
HENDERSON COUNTY
STATION: 22+44.41 -L-

SHEET 20 OF 21

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DEPARTMENT OF TRANSPORTATION
RALEIGH

OUTLET HEADWALL AND HEADWALL FOOTING BILL OF MATERIAL

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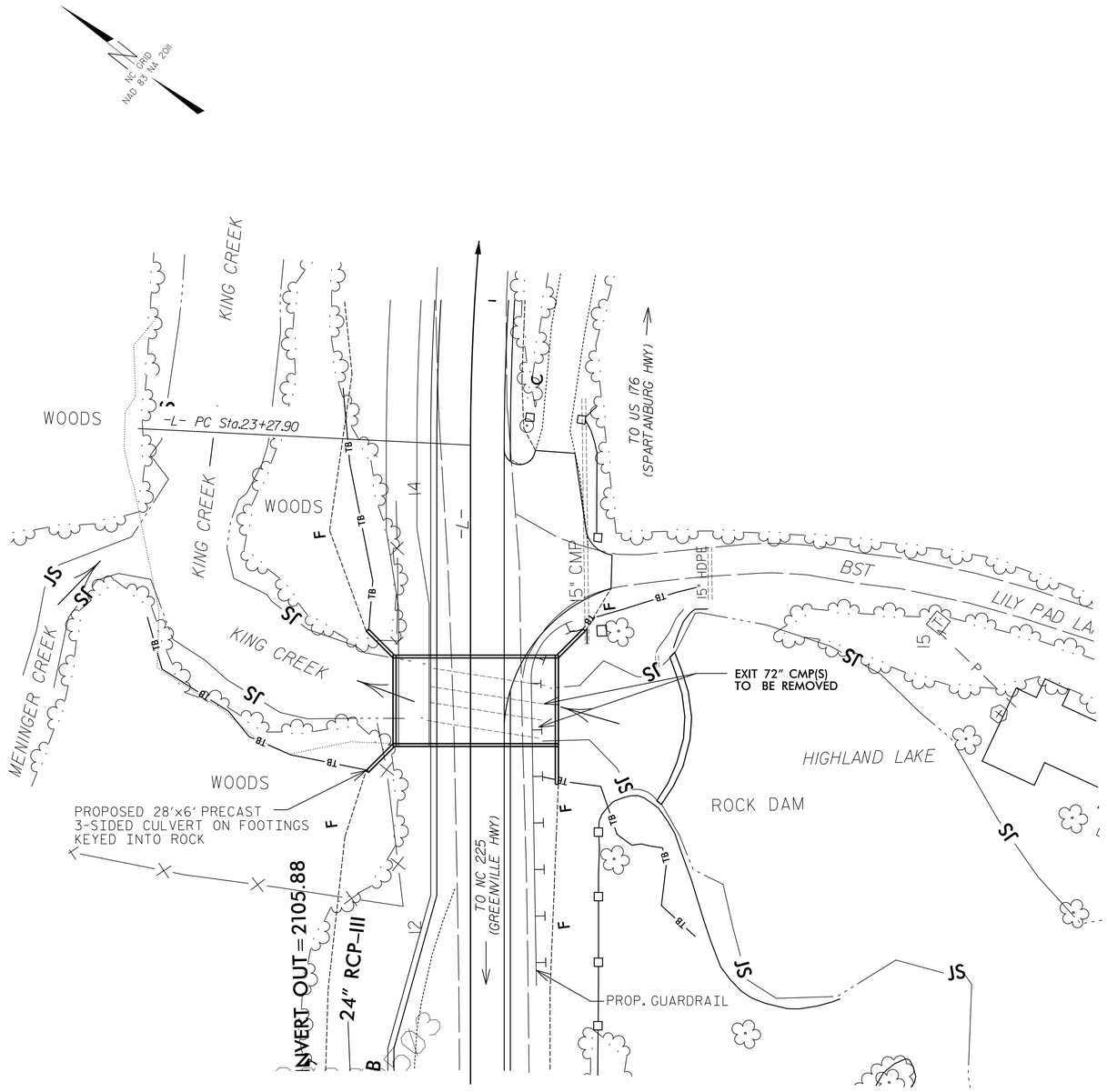
NO.	BY:	DATE:	NO.	BY:	DATE:	C-20
1			3			TOTAL SHEETS
2			4			36

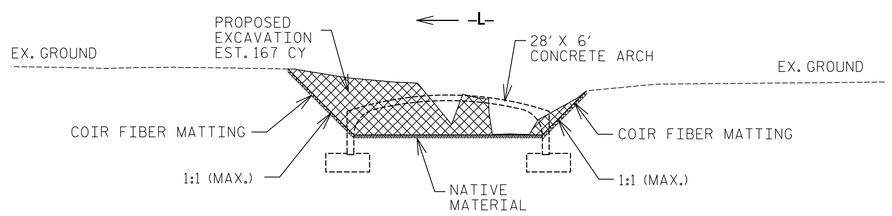


PLAN

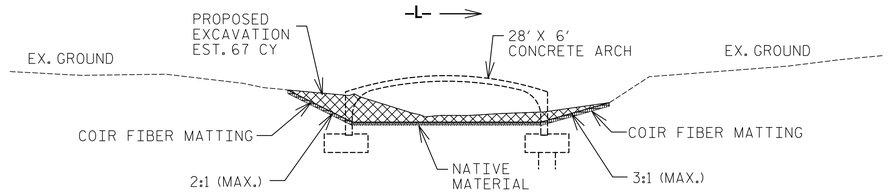
NOTES:

NATIVE MATERIAL CONSISTS OF MATERIAL THAT IS EXCAVATED FROM THE STREAM BED OR FLOODPLAIN AT THE PROJECT SITE DURING CULVERT CONSTRUCTION. RIP RAP MAY BE USED TO SUPPLEMENT THE NATIVE MATERIAL. IF RIP RAP IS USED, 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 EXCAVATED MATERIAL OR SUPPLEMENTAL MATERIAL, SHALL BE INCLUDED IN THE LUMP SUM PRICE BID FOR "UNCLASSIFIED STRUCTURE EXCAVATION".



INLET CHANNEL
& FLOODPLAIN BENCH PROFILE
(LOOKING UPSTREAM)



OUTLET CHANNEL
& FLOODPLAIN BENCH PROFILE
(LOOKING DOWNSTREAM)

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 046056 RYAN TYLER SHIPMAN
DocuSigned by: Ryan Shipman
3/26/2021

PROJECT NO. U-5887
HENDERSON COUNTY
STATION: 22+44.41 -L-
SHEET 21 OF 21

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

FLOODPLAIN BENCH DETAILS

V&M Vaughn & Melton Consulting Engineers
Middlesboro, Kentucky 606-248-6600
Knoxville, Tennessee 865-546-5800
Asheville, North Carolina 828-253-2796

DRAWN BY: HL DATE: 03/2020
CHECKED BY: CBC DATE: 03/2020
ENG. OF RECORD: CBC DATE: 03/2020

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-21
1			3			TOTAL SHEETS
2			4			36