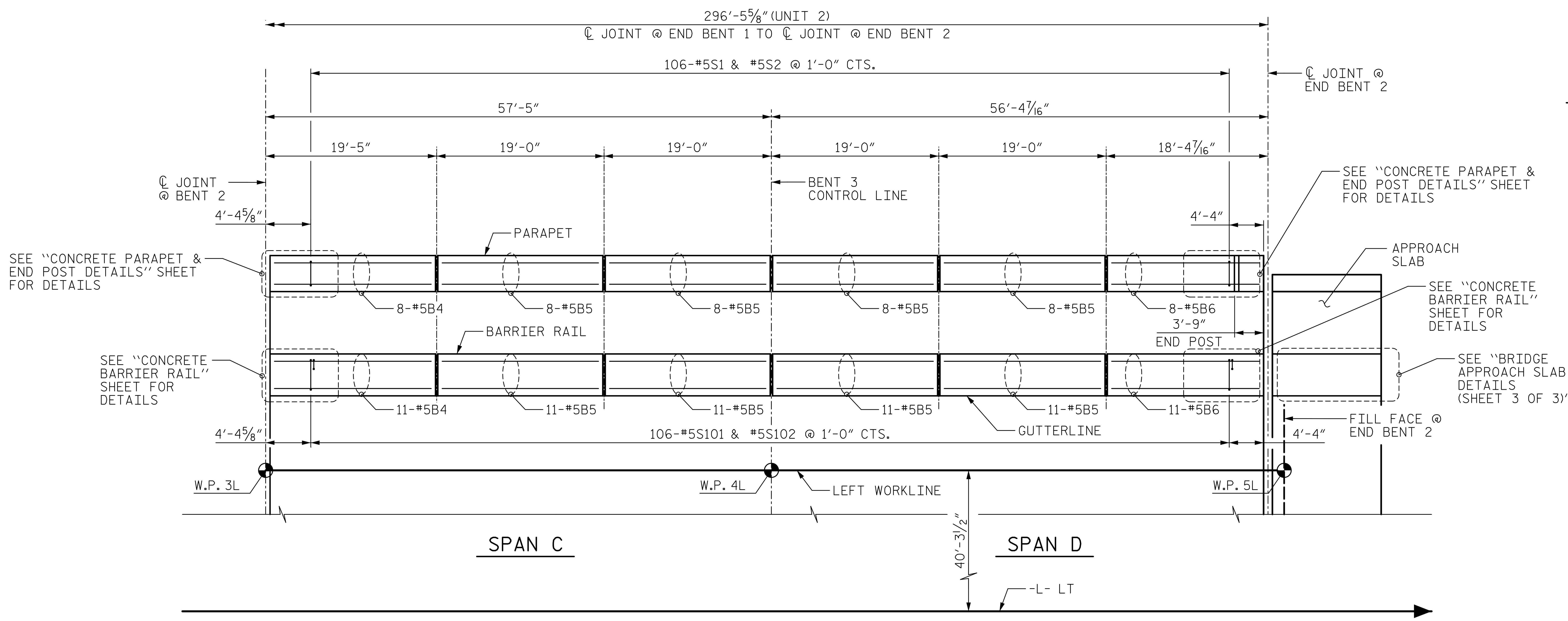

DECK DRAIN LOCATIONS

8" X 4" SLOTTED OPENINGS IN CONCRETE BARRIER RAIL

6 TOTAL LOCATIONS AT STA. 23+66, 23+83, 23+88, 23+98, 24+08, AND 25+53

8" X 4" SLOTTED OPENINGS IN CONCRETE PARAPET

23 TOTAL LOCATIONS AT STA. 24+14, 24+19, 24+24, 24+36 TO 25+16 AT 5'-0" CTS., 25+26, 25+36, 25+46

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

PLAN

DIMENSIONS SHOWN ALONG OUTSIDE OF DECK

OUTSIDE EDGE OF DECK NOT SHOWN FOR CLARITY

DRAWN BY :	D.R. DRUM	DATE :	06/2021
CHECKED BY :	J.C. MORRISON	DATE :	06/2021
DESIGNED BY :	D.R. DRUM	DATE :	06/2021
DESIGN CHECKED BY :	J.C. MORRISON	DATE :	06/2021

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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RALEIGH, NC 27607
(919) 854-6200 www.aecom.com
AECOM License No. F-0342

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 030474 JOHN C. MORRISON

DocuSigned by: John C. Morrison 2/10/2023

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

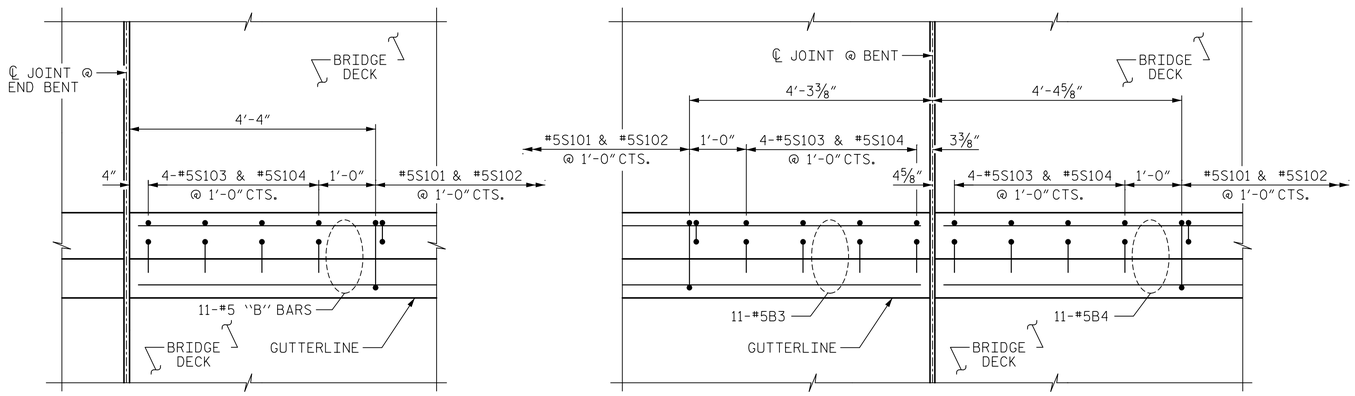
SUPERSTRUCTURE

CONCRETE BARRIER RAIL & PARAPET (SOUTHBOUND LANES)

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

SHEET NO. S2-27

TOTAL SHEETS 119



@ END BENT

END BENT 1 SHOWN, END BENT 2 SIMILAR.

@ BENT 2

PLAN OF BARRIER RAIL

NOTES

THE BARRIER RAIL IN EACH SPAN SHALL NOT BE CAST UNTIL ALL SLAB CONCRETE IN THAT SPAN HAS BEEN CAST AND HAS REACHED A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI.

WHEN FOAM JOINT SEAL IS REQUIRED, THE JOINT IN THE DECK SHALL BE SAWED PRIOR TO THE CASTING OF BARRIER RAIL.

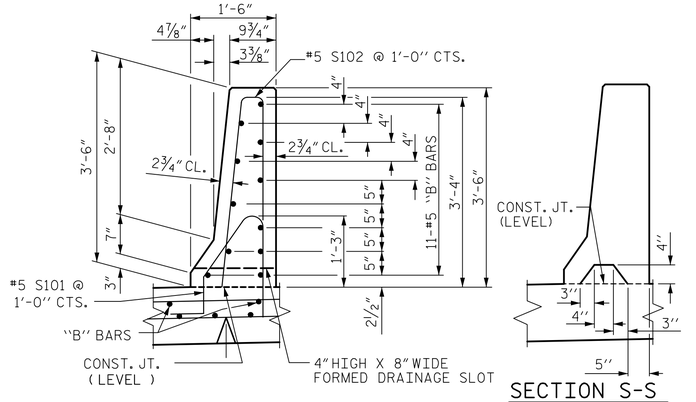
ALL REINFORCING STEEL IN BARRIER RAILS SHALL BE EPOXY COATED.

THE #5 S103 AND S104 BARS SHALL BE INSTALLED USING AN ADHESIVE ANCHORING SYSTEM AFTER SAWING THE JOINT. THE YIELD LOAD FOR THE #5 S103 AND S104 BARS IS 18.6 KIPS. FIELD TESTING FOR THE ADHESIVE BONDING SYSTEM IS NOT REQUIRED.

GROOVED CONTRACTION JOINTS, ½″ IN DEPTH, SHALL BE TOOLED IN ALL EXPOSED FACES OF THE BARRIER RAIL AND IN ACCORDANCE WITH ARTICLE 825-10(B) OF THE STANDARD SPECIFICATIONS. THE CONTRACTION JOINT SHALL BE LOCATED AT EACH THIRD POINT BETWEEN BARRIER RAIL EXPANSION JOINTS. ONLY ONE CONTRACTION JOINT IS REQUIRED AT MIDPOINT OF BARRIER RAIL SEGMENTS LESS THAN 20 FEET IN LENGTH AND NO CONTRACTION JOINTS ARE REQUIRED FOR THOSE SEGMENTS LESS THAN 10 FEET IN LENGTH.

THE 8″ WIDE X 4″ HIGH FORMED DRAINAGE SLOTS MAY BE SHIFTED SLIGHTLY, AS NECESSARY, TO CLEAR THE ″S″ BARS IN THE BARRIER.

THE #5S103 & #5S104 BARS SHALL BE INSTALLED USING AN ADHESIVE ANCHORING SYSTEM, AFTER SAWING THE JOINT. THE YIELD LOAD FOR THE #5S103 & #5S104 BARS IS 18.6 KIPS. FIELD TESTING FOR THE ADHESIVE BONDING SYSTEM IS NOT REQUIRED.

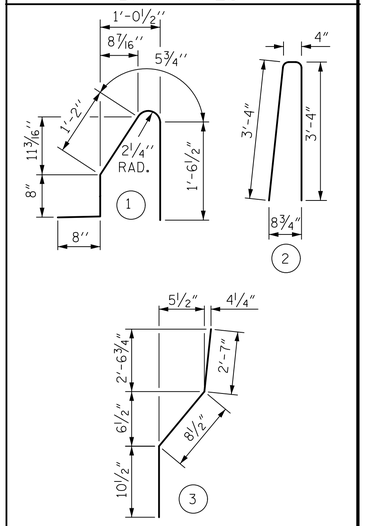


SECTION THRU RAIL

SECTION S-S

AT DAM IN OPEN JOINT (THIS IS TO BE USED ONLY WHEN SLIP FORM IS USED)

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

FOR CONCRETE BARRIER RAIL ONLY

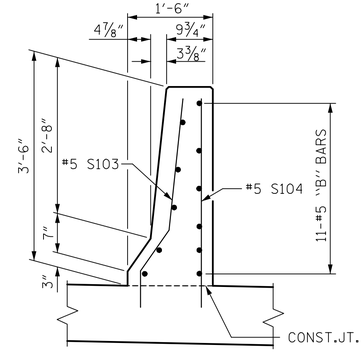
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
✱ B1	11	#5	STR	12′-4″	142
✱ B2	66	#5	STR	25′-7″	1761
✱ B3	11	#5	STR	13′-5″	154
✱ B4	11	#5	STR	18′-11″	217
✱ B5	44	#5	STR	18′-7″	853
✱ B6	11	#5	STR	17′-11″	206
✱S101	281	#5	1	4′-6″	1325
✱S102	281	#5	2	7′-0″	2052
✱S103	16	#5	3	4′-2″	70
✱S104	16	#5	STR	3′-6″	58

✱ EPOXY COATED REINFORCING STEEL 6836 LBS.

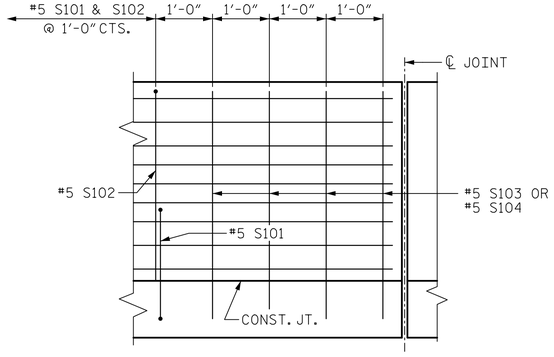
CLASS AA CONCRETE 40.4 CU. YDS.

✱✱CONCRETE BARRIER RAIL 296.56 LIN. FT.

✱✱ DOES NOT INCLUDE APPROACH SLAB. FOR LENGTH OF CONCRETE BARRIER RAIL ON APPROACH SLAB, SEE APPROACH SLAB SHEETS.



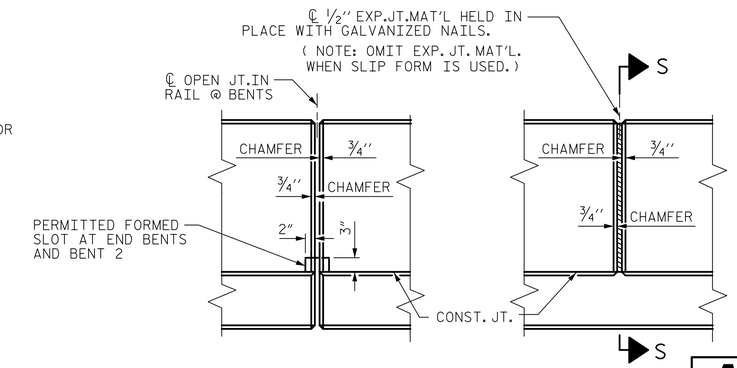
END VIEW



SIDE VIEW

END OF RAIL DETAILS @ EXP. JOINT

FOR ADHESIVE ANCHORING AT SAWED JOINTS



ELEVATION AT EXPANSION JOINTS

BARRIER RAIL DETAILS

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

AECOM
AECOM TECHNICAL SERVICES OF NC, INC.
7843 Six Forks Road, Suite 101
RALEIGH, NC 27615
(919) 854-6200 www.aecom.com
AECOM License No. F-0342

NORTH CAROLINA PROFESSIONAL SEAL 030474 ENGINEER JOHN C. MORRISON

DocuSigned by: John C. Morrison 2/10/2023
A2FDE142C82F4AB...

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

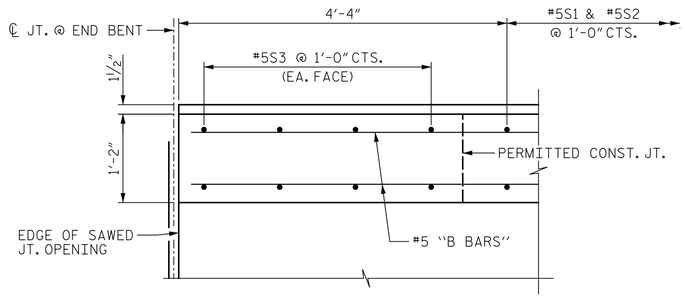
CONCRETE BARRIER RAIL

(SOUTHBOUND LANES)

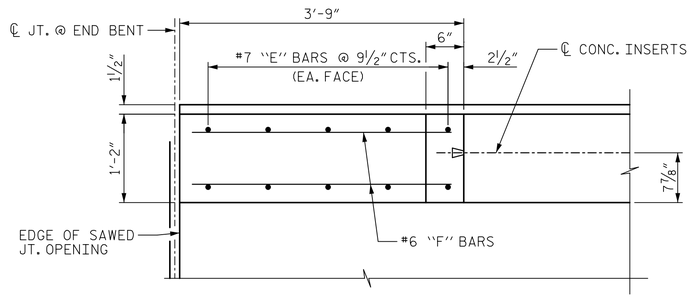
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-28
1			3			TOTAL SHEETS
2			4			119

ASSEMBLED BY : D.R. DRUM	DATE : 06/2021	
CHECKED BY : J.C. MORRISON	DATE : 06/2021	
DRAWN BY : ARB 5/87	REV. 7/12	MAA/GM
CHECKED BY : SJD 9/87	REV. 6/13	MAA/GM
	REV. 12/17	MAA/THC

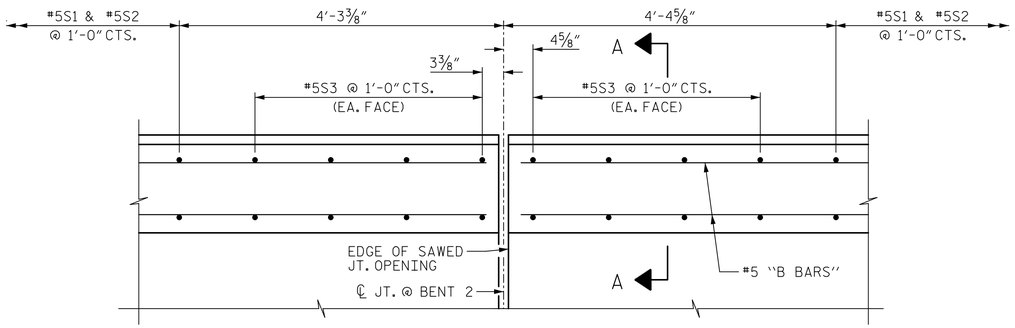
STD. NO. CBR1



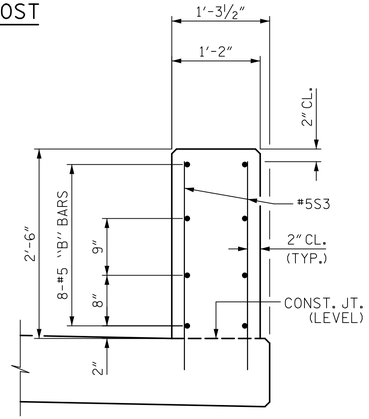
PLAN OF PARAPET @ END BENT



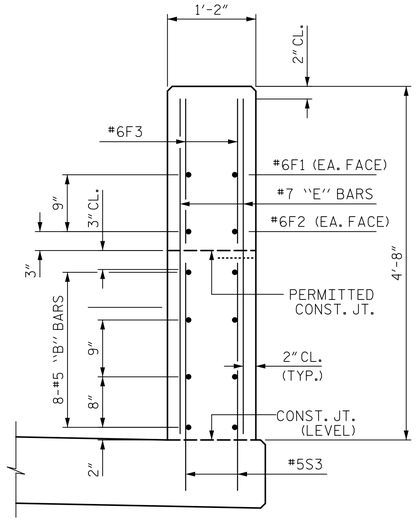
PLAN OF END POST



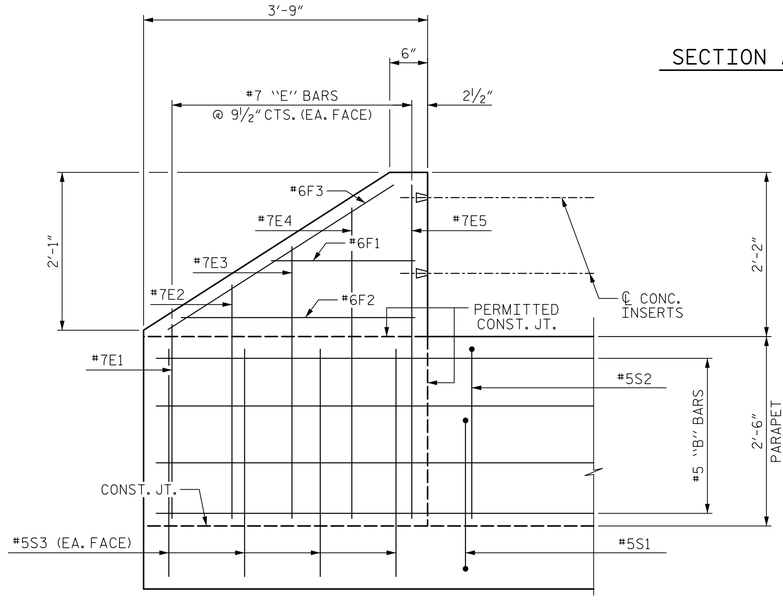
PLAN OF PARAPET @ BENT 2



SECTION A-A

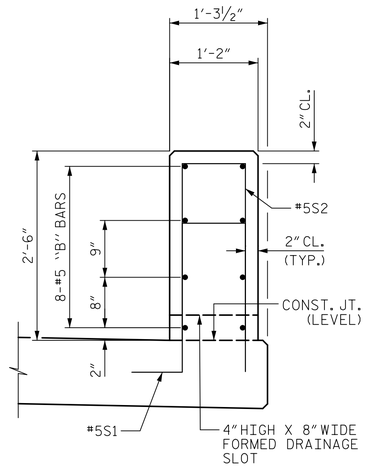


END VIEW



ELEVATION

PARAPET AND END POST FOR TWO BAR RAIL



SECTION THRU PARAPET

NOTES:

CONCRETE PARAPET IN A CONTINUOUS UNIT SHALL NOT BE CAST UNTIL ALL SLAB CONCRETE IN THAT UNIT HAS BEEN CAST AND HAS REACHED A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI.

ALL REINFORCING STEEL IN PARAPETS AND END POSTS SHALL BE EPOXY COATED.

FOR DETAILS OF CONCRETE INSERTS IN END POSTS, SEE "RAIL POST SPACINGS AND END OF RAIL DETAILS" SHEET.

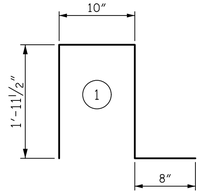
THE #5 S1 AND S2 BARS MAY BE SHIFTED SLIGHTLY IN ORDER TO MAINTAIN A 2" MIN. CLEARANCE TO THE ½" EXPANSION JOINT MATERIAL IN PARAPET.

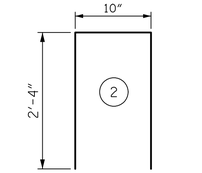
GROOVED CONTRACTION JOINTS ½" IN DEPTH SHALL BE TOOLED IN ALL EXPOSED FACES OF THE PARAPET AND IN ACCORDANCE WITH ARTICLE 825-10(B) OF THE STANDARD SPECIFICATIONS. THE CONTRACTION JOINT SHALL BE LOCATED AT EACH THIRD POINT BETWEEN EXPANSION JOINTS. ONLY ONE CONTRACTION JOINT IS REQUIRED AT MIDPOINT OF PARAPET SEGMENTS LESS THAN 20 FEET IN LENGTH AND NO CONTRACTION JOINTS ARE REQUIRED FOR THOSE SEGMENTS LESS THAN 10 FEET IN LENGTH.

FOR DETAILS AND LOCATION OF GUARDRAIL ANCHORAGE ASSEMBLIES, SEE "GUARDRAIL ANCHORAGE DETAILS FOR METAL RAILS" SHEETS.

THE 8" WIDE X 4" HIGH FORMED DRAINAGE SLOTS MAY BE SHIFTED SLIGHTLY, AS NECESSARY, TO CLEAR THE "S" BARS IN THE PARAPET.

THE #5 S3 BARS SHALL BE INSTALLED, USING AN ADHESIVE ANCHORING SYSTEM, AFTER SAWING THE JOINT. THE YIELD LOAD FOR THE #5 S3 BARS IS 18.6 KIPS. FIELD TESTING FOR THE ADHESIVE BONDING SYSTEM IS NOT REQUIRED.





ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

FOR CONCRETE PARAPET AND END POST ONLY

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
* B1	8	#5	STR	12'-4"	103
* B2	48	#5	STR	25'-7"	1281
* B3	8	#5	STR	13'-5"	112
* B4	8	#5	STR	18'-11"	158
* B5	32	#5	STR	18'-7"	620
* B6	8	#5	STR	17'-11"	149
* E1	4	#7	STR	2'-6"	20
* E2	4	#7	STR	3'-0"	25
* E3	4	#7	STR	3'-6"	29
* E4	4	#7	STR	4'-0"	33
* E5	4	#7	STR	4'-4"	35
* F1	4	#6	STR	1'-9"	11
* F2	4	#6	STR	2'-11"	18
* F3	4	#6	STR	3'-9"	23
* S1	281	#5	1	5'-5"	1588
* S2	281	#5	2	5'-6"	1612
* S3	32	#5	STR	3'-0"	100

* EPOXY COATED REINFORCING STEEL	5,917 LBS.
CLASS AA CONCRETE	32.7 CU. YDS.
2'-6" CONCRETE PARAPET	296.33 LIN. FT.

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

AECOM
AECOM TECHNICAL SERVICES OF NC, INC.
7041 SKWOOD PARK DRIVE, SUITE 305
RALEIGH, NC 27607
(919) 854-6200 www.aecom.com
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NORTH CAROLINA PROFESSIONAL SEAL 030474 ENGINEER JOHN C. MORRISON

DocuSigned by: John C. Morrison A2FDE142C82F4AB... 2/10/2023

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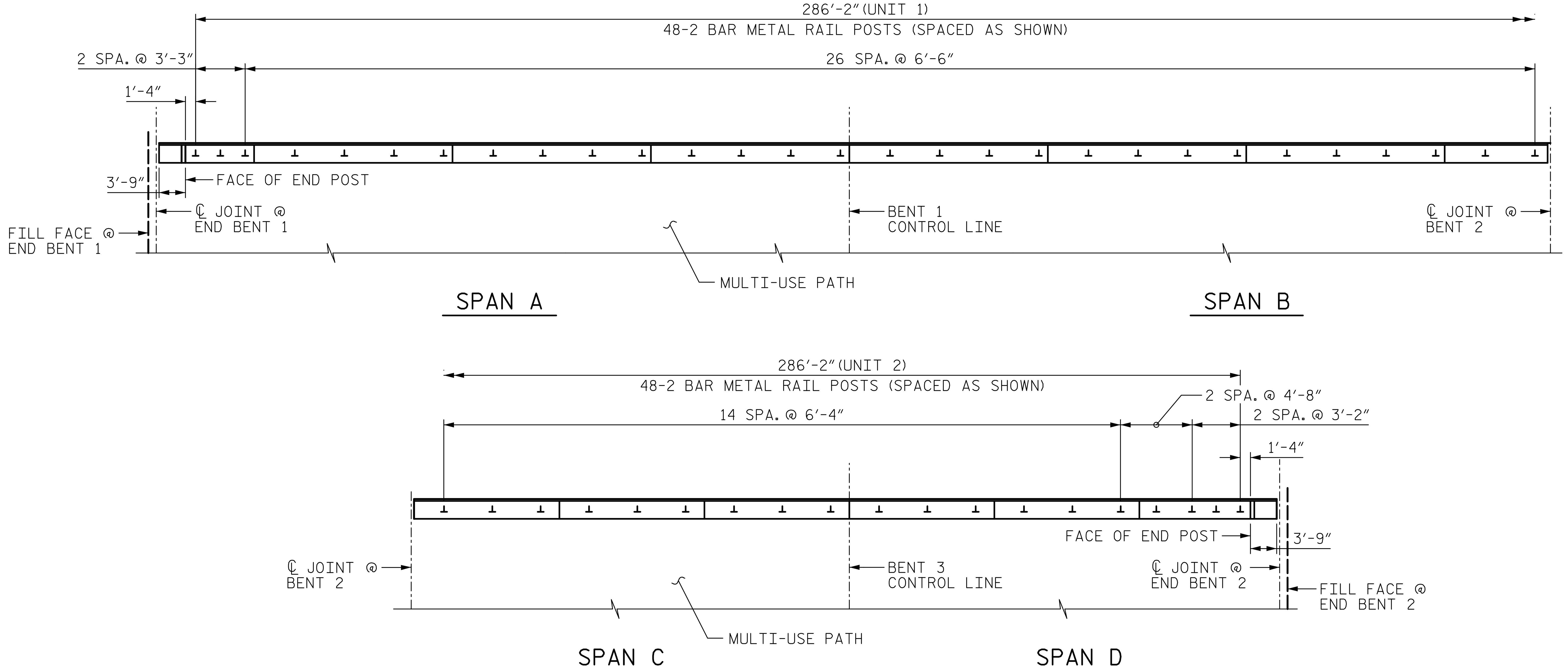
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SUPERSTRUCTURE

CONCRETE PARAPET & END POST DETAILS
(SOUTHBOUND LANES)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-29
1			3			TOTAL SHEETS
2			4			119

DRAWN BY :	D.R. DRUM	DATE :	06/2021
CHECKED BY :	J.C. MORRISON	DATE :	06/2021
DESIGNED BY :	D.R. DRUM	DATE :	06/2021
DESIGN CHECKED BY :	J.C. MORRISON	DATE :	06/2021



PLAN OF RAIL POST SPACINGS

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).

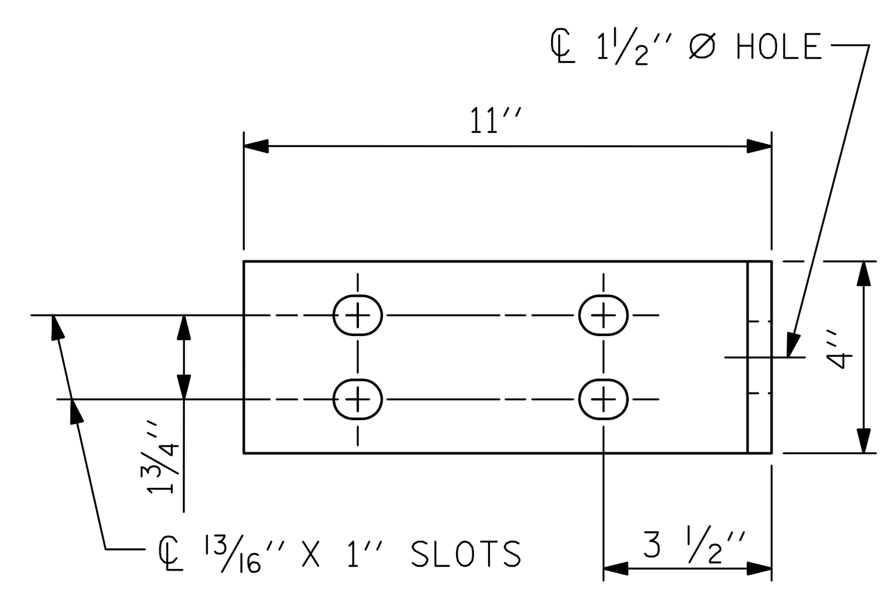
E. ½" Ø PIPE SLEEVES (IF REQUIRED) TO BE GALVANIZED.

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.

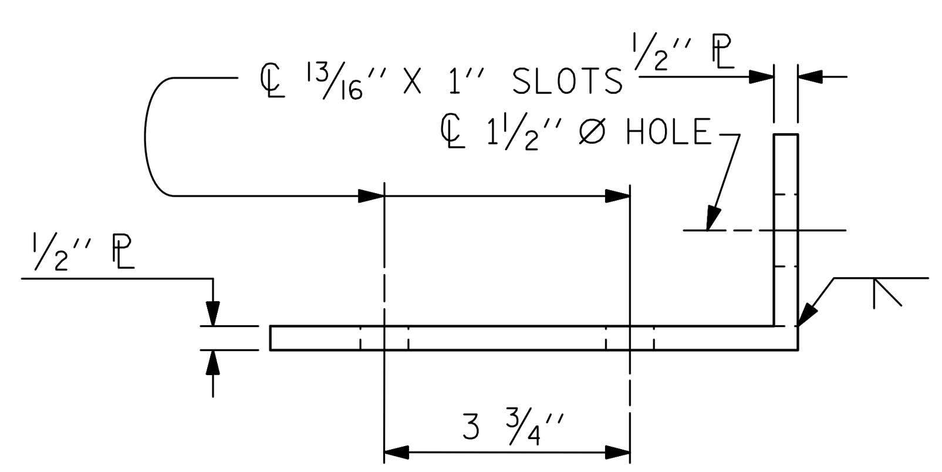
THE ¾" STRUCTURAL CONCRETE INSERT WITH BOLT SHALL BE ASSEMBLED IN THE SHOP.

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

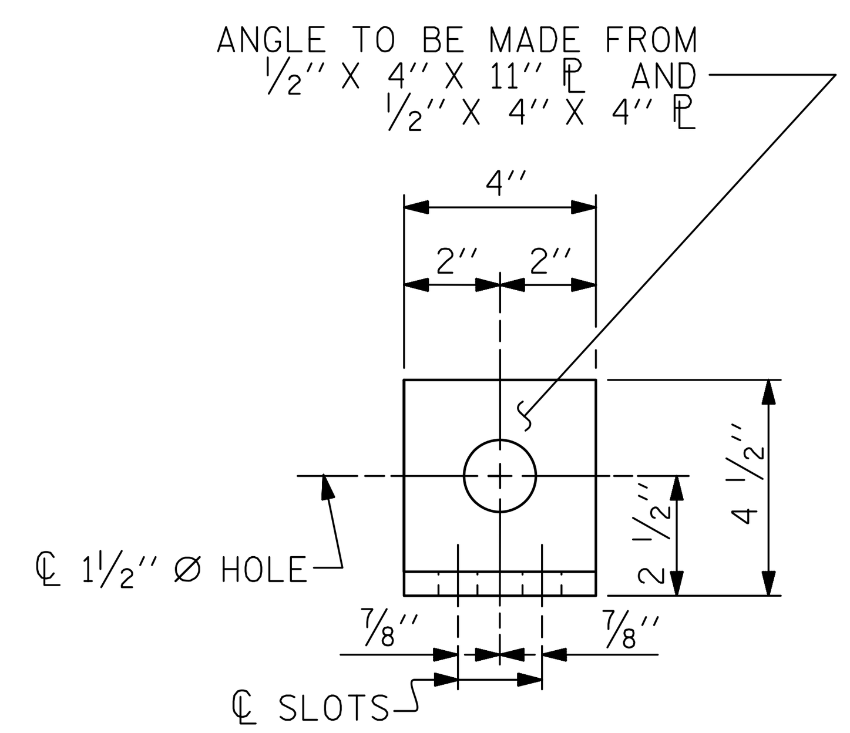
THE CONTRACTOR, AT HIS OPTION, MAY USE AN ADHESIVE BONDING SYSTEM IN LIEU OF THE STRUCTURAL CONCRETE INSERT EMBEDDED IN THE END POST. IF THE ADHESIVE BONDING SYSTEM IS USED, THE ¾" Ø X 1⅝" BOLT WITH WASHER SHALL BE REPLACED WITH A ¾"Ø X 6½" BOLT AND 2" O.D. WASHER. ALL SPECIFICATIONS THAT APPLY TO THE 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.



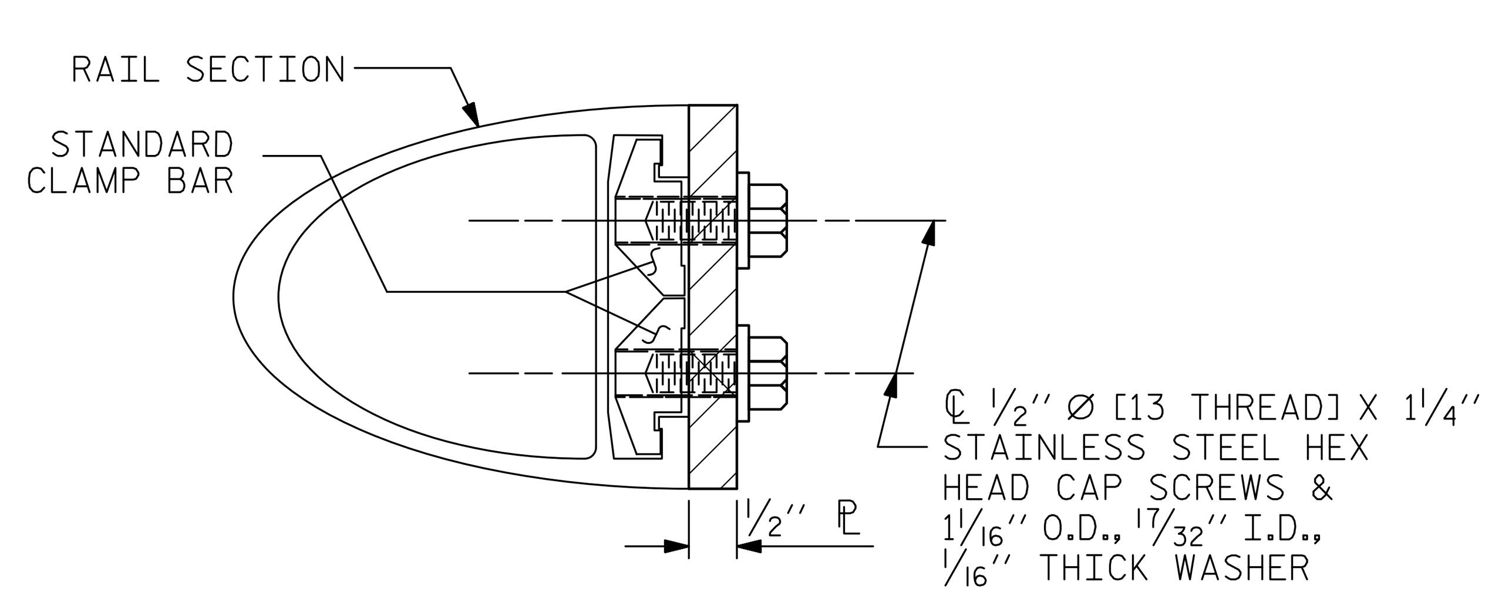
ELEVATION



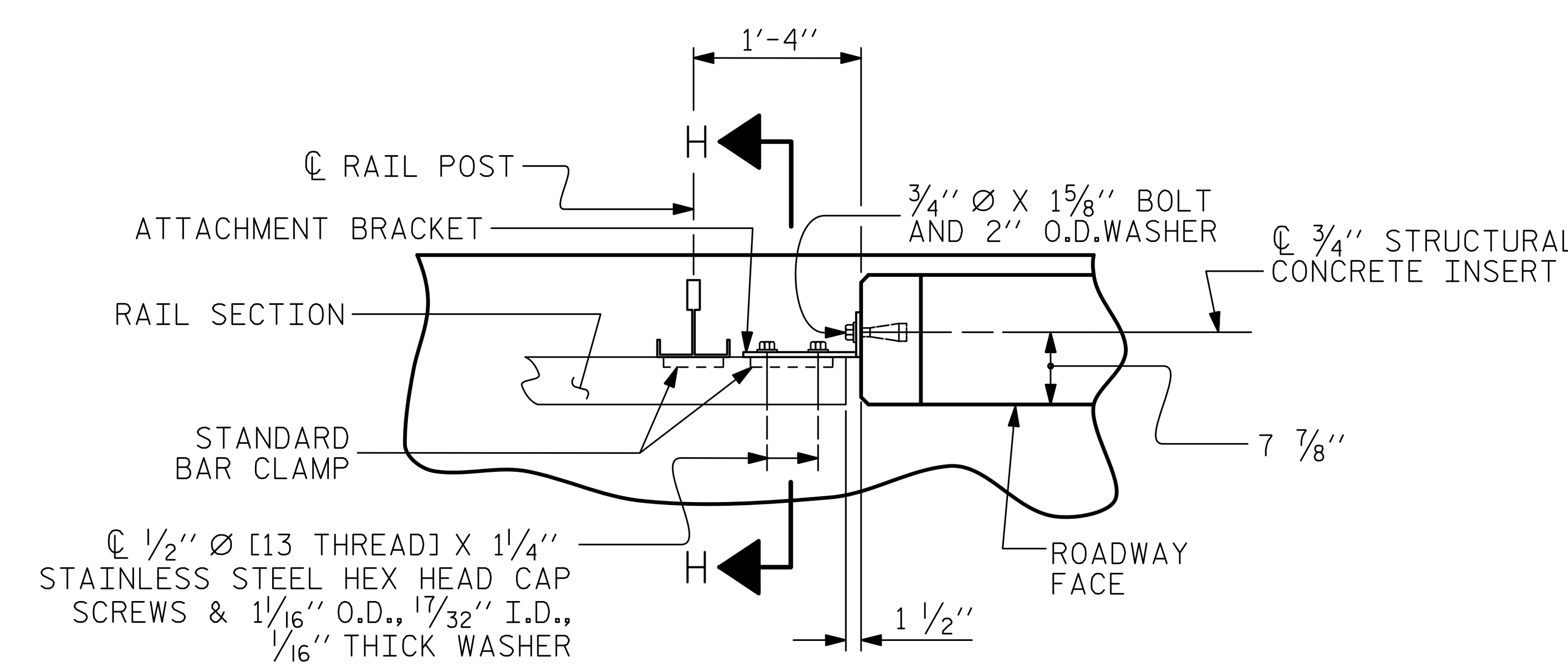
TOP VIEW



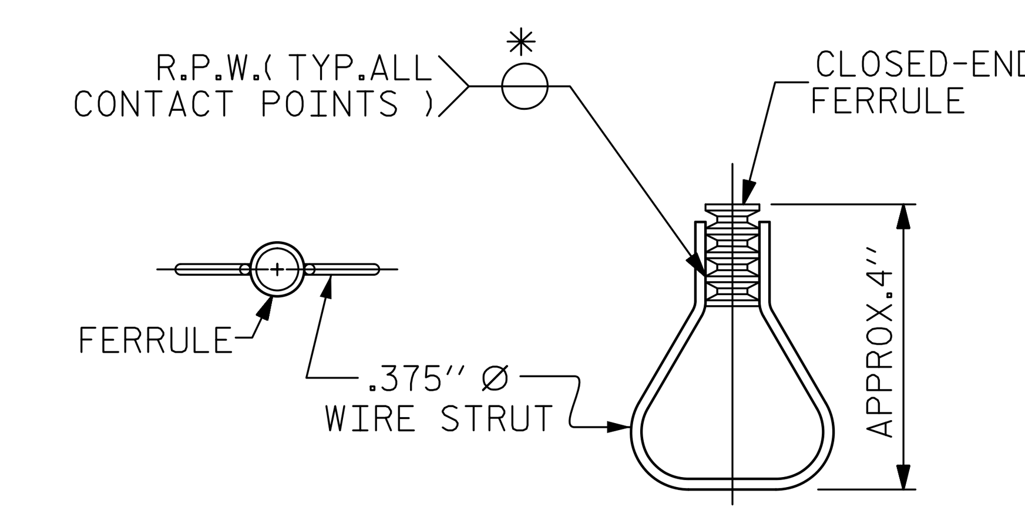
END VIEW (FIX AND EXP.)



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.

FIXED

DETAILS FOR ATTACHING METAL RAIL TO END POST

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

SHEET 1 OF 3

AECOM
AECOM TECHNICAL SERVICES OF NC, INC.
5438 WADE PARK BOULEVARD, SUITE 200
RALEIGH, NC 27607
(919) 854-6200 www.aecom.com
AECOM License No. F-0342

NORTH CAROLINA PROFESSIONAL SEAL 030474 ENGINEER JOHN C. MORRISON

DocuSigned by: John C. Morrison 2/10/2023
A2FDE142C82F4AB...

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

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

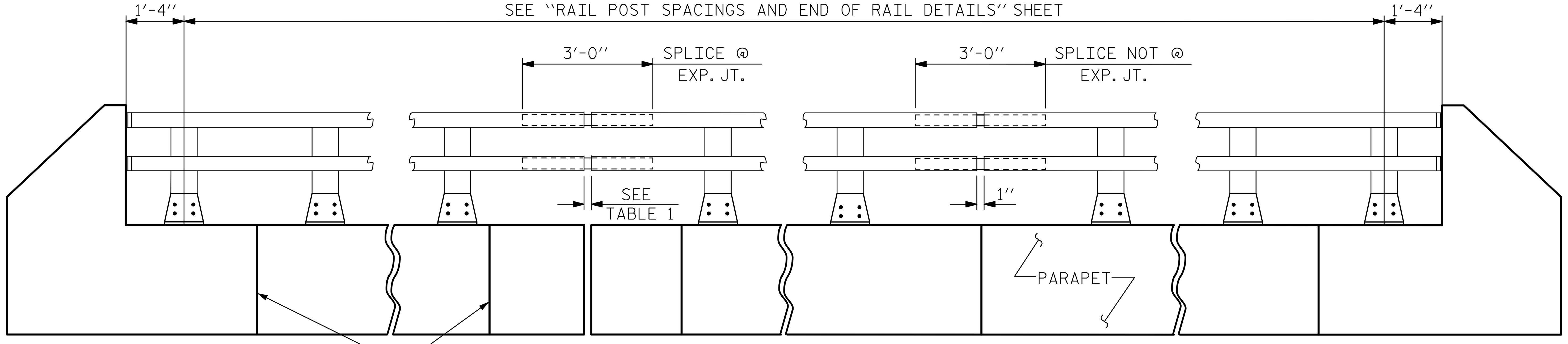
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ASSEMBLED BY : D.R. DRUM	DATE : 06/2021
CHECKED BY : J.C. MORRISON	DATE : 06/2021

DRAWN BY : TLA 6/05	REV. 5/1/06RRR KMM/GM
CHECKED BY : VC 6/05	REV. 10/1/11 MAA/GM
	REV. 12/17 MAA/THC

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-30
1			3			TOTAL SHEETS
2			4			119

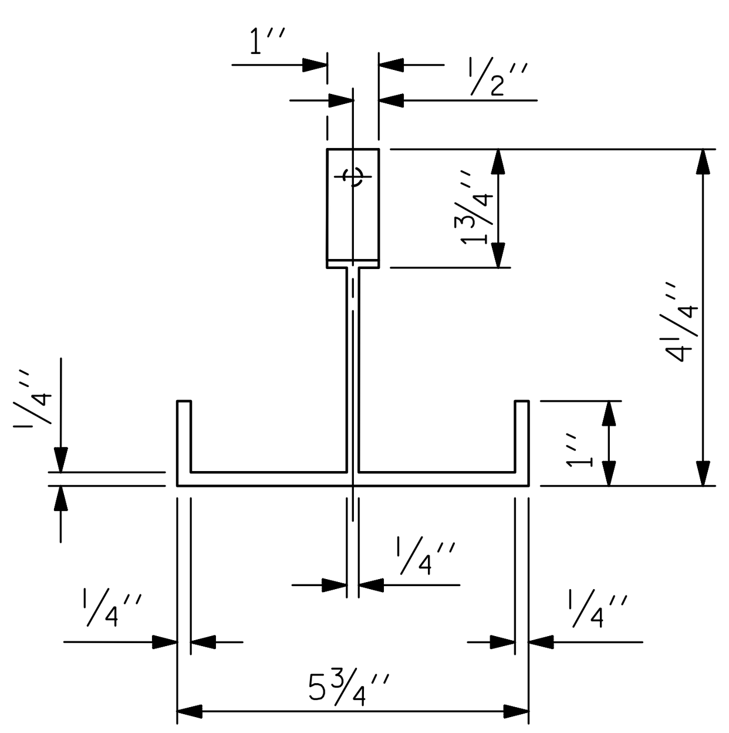
STD. NO. BMR2



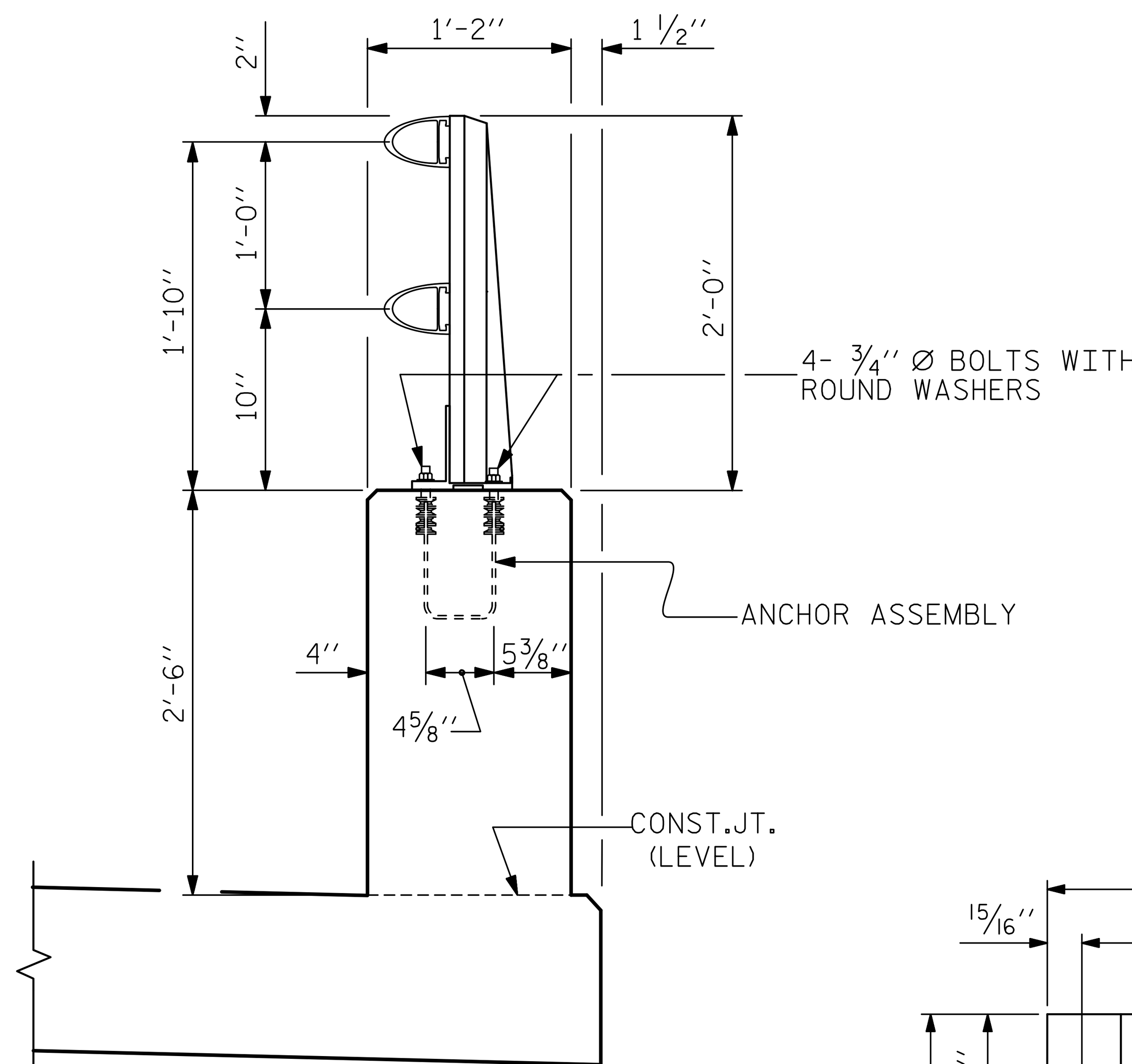
ELEVATION

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

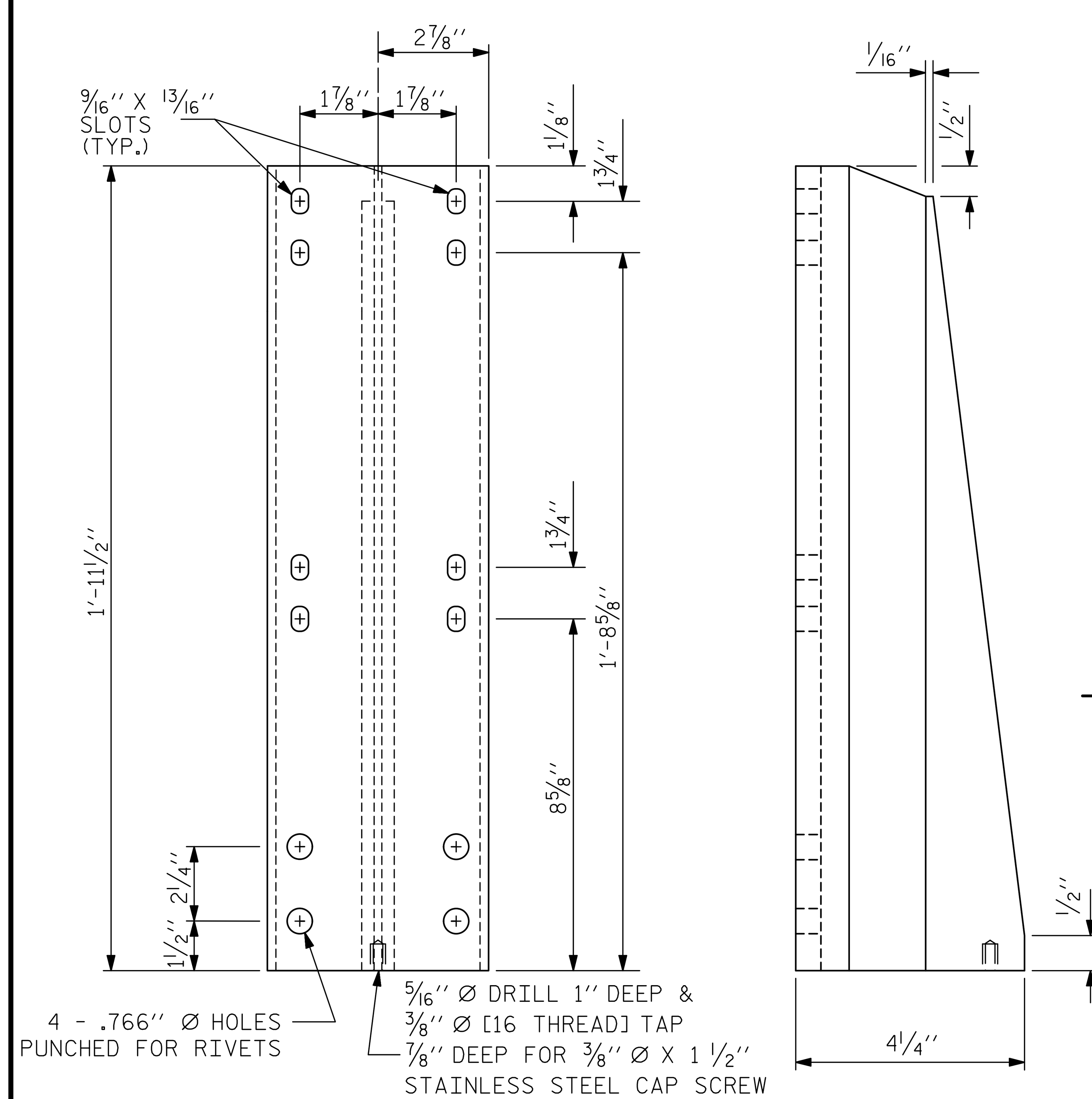
TABLE 1	
℄ EXP. JT. @	RAIL OPENING
BENT 1	1 9/16"



PLAN

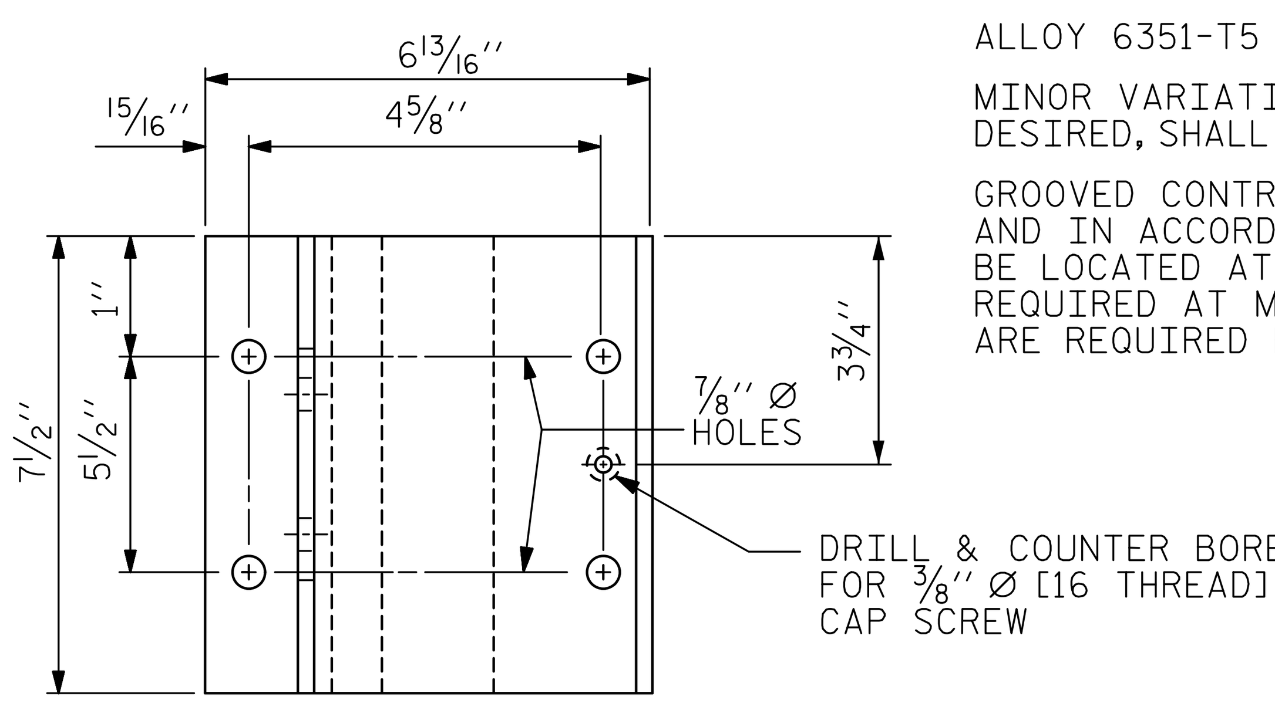


SECTION THRU PARAPET AND RAIL

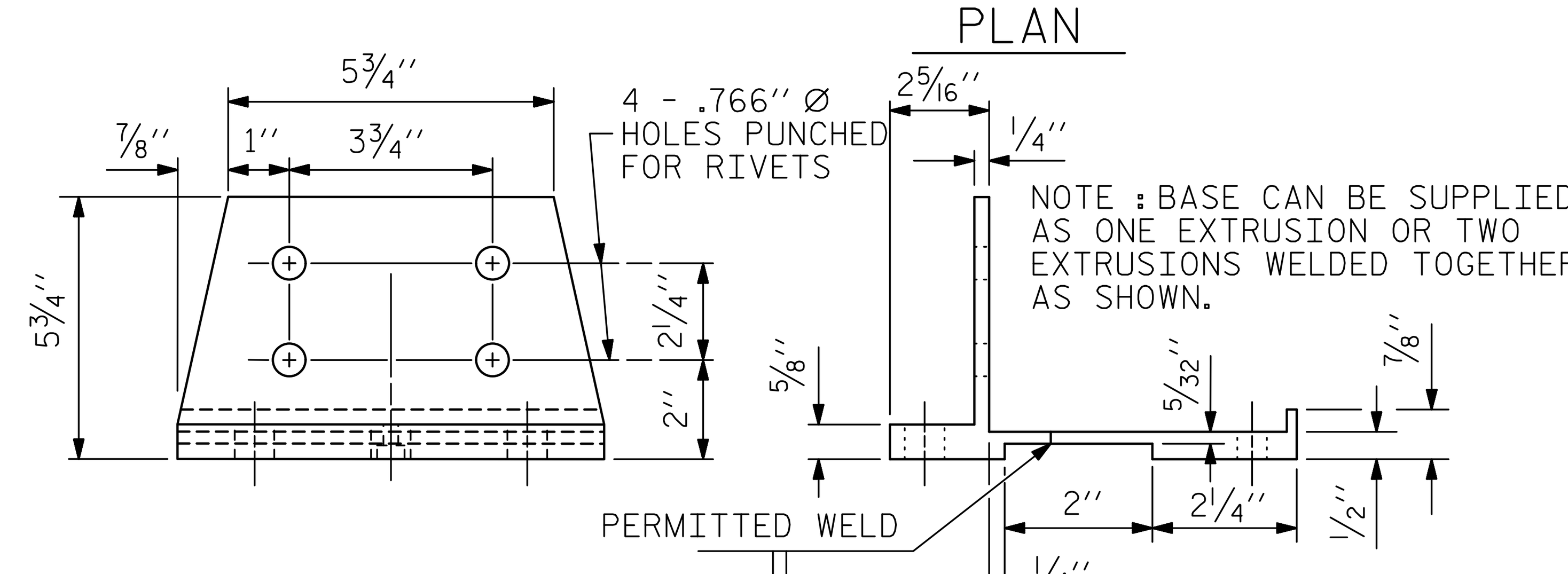


FRONT ELEVATION SIDE ELEVATION

DETAILS OF POST

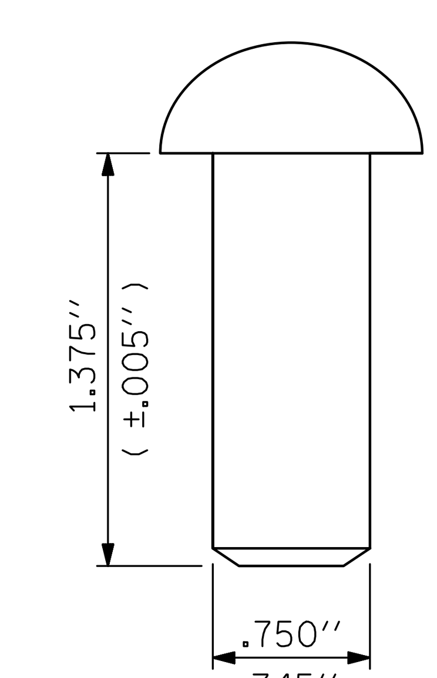


PLAN



FRONT ELEVATION SIDE ELEVATION

POST BASE DETAILS



RIVET DETAIL

NOTES

AT THE CONTRACTOR'S OPTION, METAL RAIL MAY BE EITHER ALUMINUM OR GALVANIZED STEEL IN ACCORDANCE WITH THE REQUIREMENTS OF THE GENERAL NOTES AND THE FOLLOWING SPECIFICATIONS FOR THE ALTERNATE MATERIALS; HOWEVER, THE CONTRACTOR WILL BE REQUIRED TO USE THE SAME RAIL MATERIAL ON ALL STRUCTURES ON THE PROJECT FOR WHICH METAL RAIL IS DESIGNATED.

UNLESS OTHERWISE REQUIRED IN THE CONTRACT DOCUMENTS, THE CONTRACTOR HAS THE OPTION TO USE AN ALTERNATE TO THE 2 BAR METAL RAIL. THE ALTERNATE RAIL SHALL MEET THE REQUIREMENTS OF THE AASHTO LRFDBRIDGE DESIGN SPECIFICATIONS AND MUST BE LISTED ON THE DEPARTMENT'S APPROVED PRODUCTS LIST (APL) UNDER "2 BAR METAL RAIL ALTERNATE". ADJUSTMENTS TO THE CONCRETE PARAPET WILL NOT BE ALLOWED.

ALUMINUM RAILS

MATERIAL FOR POSTS, BASES AND RAILS, EXPANSION BARS AND CLAMP BARS SHALL BE ASTM B-221 ALLOY 6061-T6.

MATERIAL FOR RIVETS SHALL BE ASTM B316 ALLOY 6061-T6. RIVETS SHALL BE STANDARD BUTTON HEAD AND CONE POINT COLD DRIVEN AS PER DRAWING.

THE BASE OF RAIL POSTS, OR ANY OTHER ALUMINUM SURFACE IN CONTACT WITH CONCRETE SHALL BE THOROUGHLY COATED WITH AN ALUMINUM IMPREGNATED CAULKING COMPOUND OF APPROVED QUALITY.

MATERIAL FOR SHIMS TO BE ASTM B209 ALLOY 6061-T6.

GALVANIZED STEEL RAILS

MATERIAL AND GALVANIZING ARE TO CONFORM TO THE FOLLOWING SPECIFICATIONS:

POST, POST BASES, RAILS, EXPANSION BARS AND CLAMP BARS: AASHTO M270 GRADE 36 STRUCTURAL STEEL - GALVANIZED TO AASHTO M111.

RIVETS: RIVETS SHALL MEET THE REQUIREMENTS OF ASTM A502 FOR GRADE 1 RIVETS.

THE CUT ENDS OF GALVANIZED STEEL RAILING, AFTER GRINDING SMOOTH SHALL BE GIVEN TWO COATS OF ZINC RICH PAINT MEETING THE REQUIREMENTS OF FEDERAL SPECIFICATION MIL-P-26915 USAF TYPE 1, OR OF FEDERAL SPECIFICATIONS TT-P-641.

SHIMS: SHIMS SHALL MEET THE REQUIREMENTS OF ASTM A570 FOR GRADE 33 OR A611 FOR GRADE C AND SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M111.

RAIL CAPS: RAIL CAPS SHALL MEET THE REQUIREMENTS OF ASTM A570 FOR GRADE 33 OR A611 FOR GRADE C AND SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M111.

GENERAL NOTES

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 STANDARD NO. BMR2.

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

CERTIFIED MILL REPORTS ARE REQUIRED FOR RAILS AND POSTS. SHOP INSPECTION IS NOT REQUIRED.

METAL RAIL POSTS SHALL BE SET NORMAL TO CURB GRADE.

METHOD OF MEASUREMENT FOR METAL RAILS: FOR LENGTH OF METAL RAILS TO BE PAID FOR, SEE THE STANDARD SPECIFICATIONS.

CURVED RAIL USAGE: WHERE RAILS ARE TO BE USED ON BRIDGES ON HORIZONTAL AND/OR VERTICAL CURVATURE THE CONTRACTOR MAY, AT HIS OPTION, HAVE THE REQUIRED CURVATURE IN THE RAIL FORMED IN THE SHOP OR IN THE FIELD. IN EITHER EVENT, THE RAIL SHALL CONFORM WITHOUT BUCKLING OR KINKING TO THE REQUIRED CURVATURE IN A UNIFORM MANNER ACCEPTABLE TO THE ENGINEER.

TO INSURE FUTURE IDENTIFICATION OF THE FABRICATOR, A PERMANENT IDENTIFYING MARK SHALL BE PLACED ON EACH POST. THE METHOD OF MARKING AND LOCATION SHALL BE SUCH THAT IT DOES NOT DETRACT FROM THE APPEARANCE OF THE POST, BUT REMAINS VISIBLE AFTER RAIL PLACEMENT.

SHIMS SHALL BE USED AS NECESSARY FOR POST ALIGNMENT.

ALLOY 6351-T5 MAY BE SUBSTITUTED FOR ALLOY 6061-T6 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. A CONTRACTION JOINT SHALL BE LOCATED AT EACH THIRD POINT BETWEEN PARAPET EXPANSION JOINTS. ONLY ONE CONTRACTION JOINT IS REQUIRED AT MIDPOINT OF PARAPET SEGMENTS LESS THAN 20 FEET IN LENGTH AND NO CONTRACTION JOINTS ARE REQUIRED FOR THOSE SEGMENTS LESS THAN 10 FEET IN LENGTH.

PAY LENGTH = 288.83 LIN. FT.

PROJECT NO. U-5748
WAKE COUNTY
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SHEET 2 OF 3

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NORTH CAROLINA PROFESSIONAL SEAL 030474 ENGINEER JOHN C. MORRISON

DocuSigned by: John C. Morrison 2/10/2023
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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

2 BAR METAL RAIL

(SOUTHBOUND LANES)

REVISIONS							SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:		S2-31
1			3				TOTAL SHEETS
2			4				119

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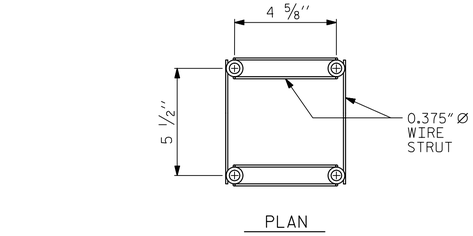
ASSEMBLED BY : D.R. DRUM	DATE : 06/2021
CHECKED BY : J.C. MORRISON	DATE : 06/2021
DRAWN BY : TLA 6/05	REV. 5/1/06RRR KMM/GM
CHECKED BY : VC 6/05	REV. 10/1/11 MAA/GM
	REV. 12/17 MAA/THC

STD. NO. BMR3



4-BOLT METAL RAIL ANCHOR ASSEMBLY

(48 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.

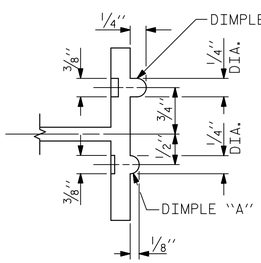
D. THE METAL RAIL ANCHOR ASSEMBLIES TO BE HOT DIPPED GALVANIZED TO CONFORM TO REQUIREMENTS OF AASHTO M111.

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.

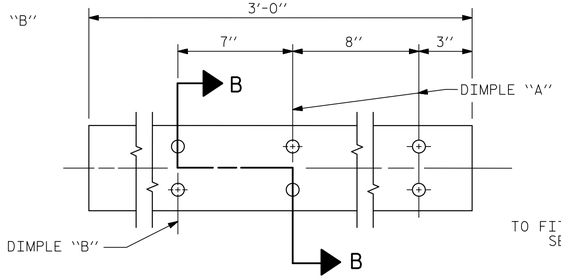
F. BOLTS TO BE TIGHTENED ONE-HALF TURN WITH A WRENCH FROM A FINGER-TIGHT POSITION.

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.

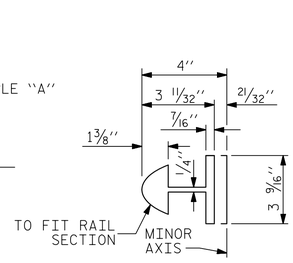
WHEN ADHESIVELY ANCHORED ANCHOR BOLTS ARE USED, BOLTS SHALL MEET THE REQUIREMENTS OF ASTM F593 ALLOY 304 STAINLESS STEEL WITH MINIMUM 75,000 PSI ULTIMATE STRENGTH. NUTS SHALL MEET THE REQUIREMENTS OF ASTM F594 ALLOY 304 STAINLESS STEEL AND WASHERS SHALL MEET THE REQUIREMENTS OF ASTM F844 EXCEPT THEY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



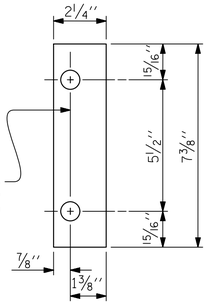
SECTION B - B



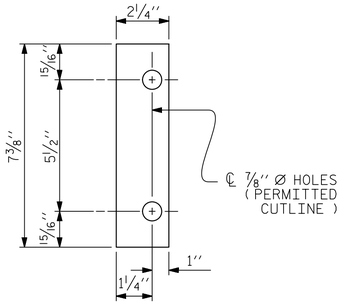
EXPANSION BAR DETAILS



BAR SECTION



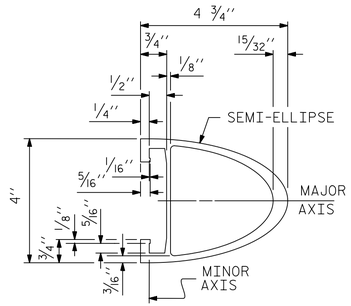
FRONT PLATE



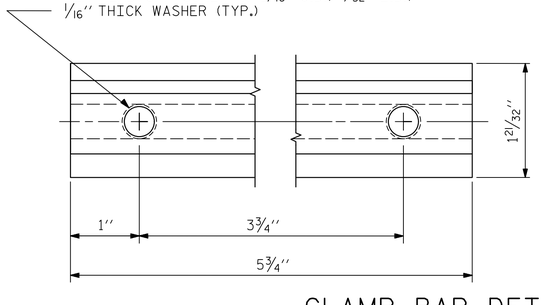
REAR PLATE

SHIM DETAILS

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

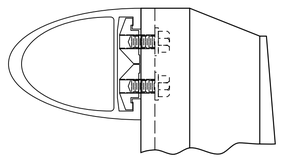


RAIL SECTION

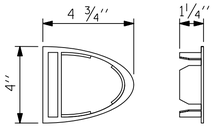


CLAMP BAR DETAIL

(4 REQUIRED PER POST)



CLAMP ASSEMBLY



RAIL CAP

PROJECT NO. U-5748

WAKE COUNTY

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SHEET 3 OF 3

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

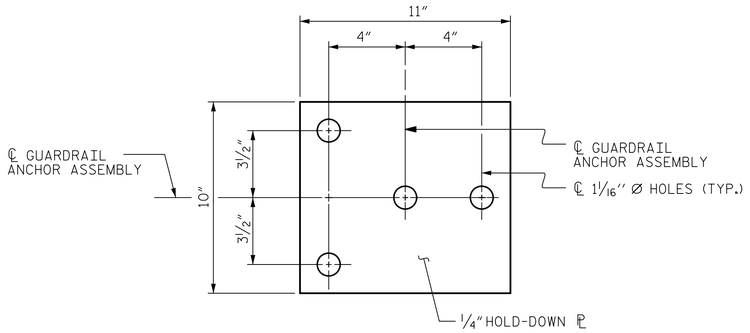
2 BAR METAL RAIL

(SOUTHBOUND LANES)

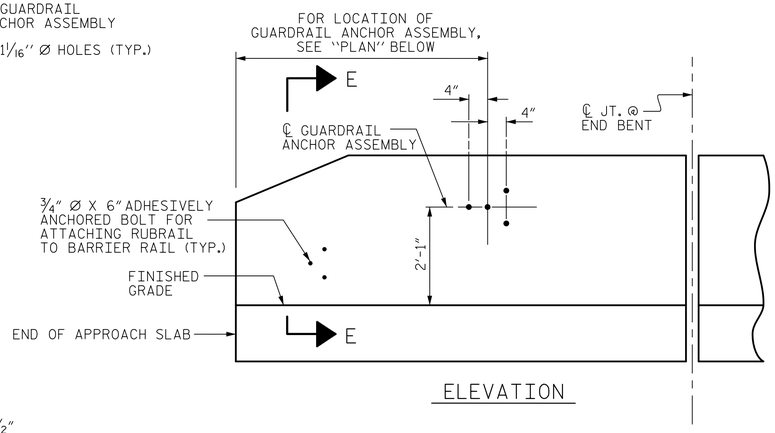
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-32
1			3			TOTAL SHEETS
2			4			119

ASSEMBLED BY : D.R. DRUM		DATE : 06/2021
CHECKED BY : J.C. MORRISON		DATE : 06/2021
DRAWN BY : TLA 6/05	REV. 5/1/06RRR	KMM/GM
CHECKED BY : VC 6/05	REV. 10/1/11	MAA/GM
	REV. 12/17	MAA/THC

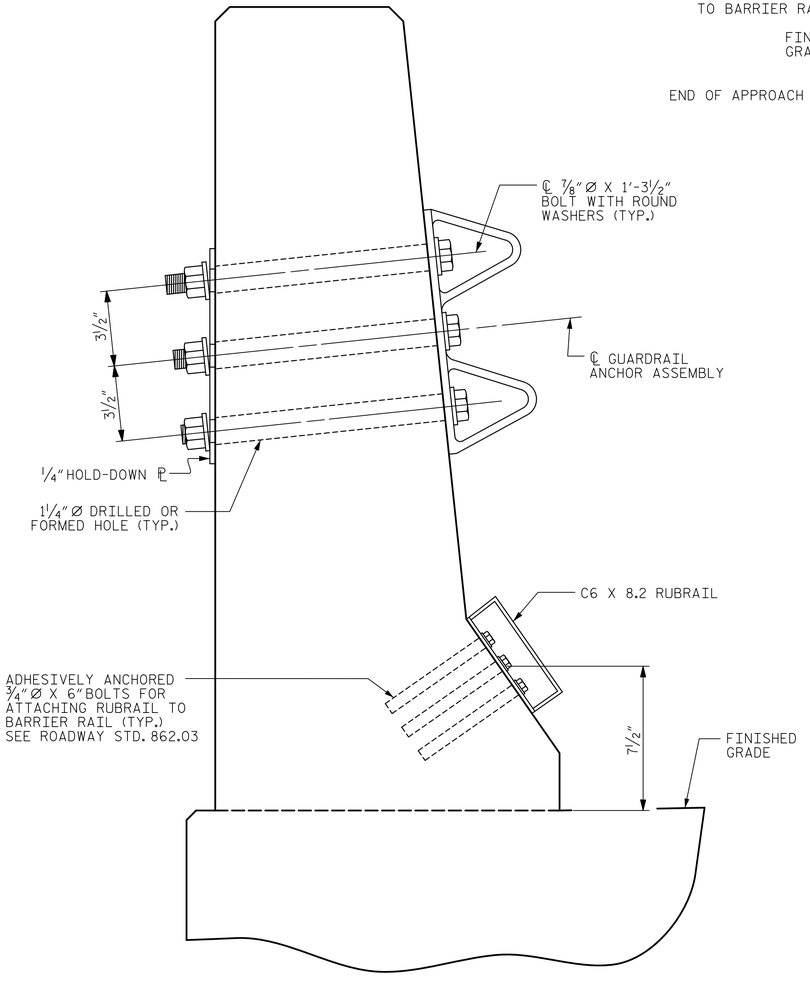
STD. NO. BMR4



PLAN

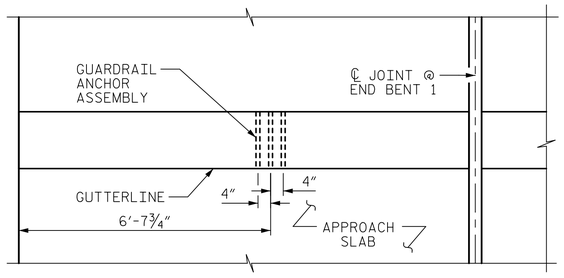


ELEVATION



SECTION E-E

GUARDRAIL ANCHOR ASSEMBLY DETAILS



PLAN

LOCATION OF ANCHORS FOR GUARDRAIL

END BENT 1 SHOWN, END BENT 2 SIMILAR.

NOTES

THE GUARDRAIL ANCHOR ASSEMBLY SHALL CONSIST OF A 1/4″ HOLD-DOWN PLATE AND 4 - 7/8″ Ø BOLTS WITH NUTS AND WASHERS, RUBRAIL, AND ADHESIVELY ANCHORED BOLTS.

THE HOLD-DOWN PLATE SHALL CONFORM TO AASHTO M270 GRADE 36. AFTER FABRICATION, THE HOLD-DOWN PLATE SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH AASHTO M111.

BOLTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A307 AND NUTS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M291. BOLTS, NUTS AND WASHERS SHALL BE GALVANIZED. (AT THE CONTRACTOR'S OPTION, STAINLESS STEEL BOLTS, NUTS AND WASHERS MAY BE USED AS AN ALTERNATE FOR THE 7/8″ Ø GALVANIZED BOLTS, NUTS 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.)

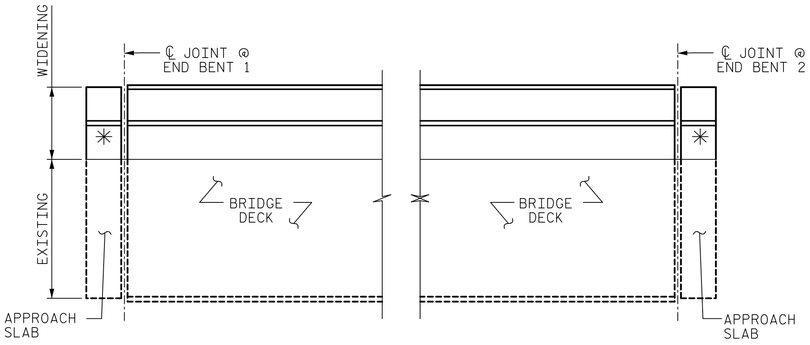
THE GUARDRAIL ANCHOR ASSEMBLY IS REQUIRED AT ALL POINTS WHERE APPROACH GUARDRAIL IS TO BE ATTACHED TO THE END OF BARRIER RAIL. FOR POINTS OF ATTACHMENT, SEE SKETCH.

AFTER INSTALLATION, THE EXPOSED THREAD OF THE BOLT SHALL BE BURRED WITH A SHARP POINTED TOOL.

THE COST OF THE GUARDRAIL ANCHOR ASSEMBLY SHALL BE INCLUDED IN THE UNIT CONTRACT PRICE BID FOR CONCRETE BARRIER RAIL.

THE 1 1/4″ Ø HOLES SHALL BE FORMED OR DRILLED WITH A CORE BIT. IMPACT TOOLS WILL NOT BE PERMITTED. ANY CONCRETE DAMAGED BY THIS WORK SHALL BE REPAIRED TO THE SATISFACTION OF THE ENGINEER.

THE C6 X 8.2 RUBRAIL IS TO BE ADHESIVELY ANCHORED TO THE RAIL USING THREE 3/4″Ø X 6″BOLTS WITH WASHERS. LEVEL ONE FIELD TESTING IS REQUIRED, AND THE YIELD LOAD OF THE 3/4″Ø BOLT IS 12 KIPS. FOR ADHESIVELY ANCHORED ANCHOR BOLTS OR DOWELS, SEE STANDARD SPECIFICATIONS. SEE ROADWAY STANDARD 862.03 FOR DETAILS AND LOCATION OF THE RUBRAIL.



SKETCH SHOWING POINTS OF ATTACHMENTS

✳ DENOTES GUARDRAIL ANCHOR ASSEMBLY

PROJECT NO. U-5748

WAKE COUNTY

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DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

GUARDRAIL ANCHORAGE FOR BARRIER RAIL

(SOUTHBOUND LANES)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-33
1			3			TOTAL SHEETS
2			4			119

ASSEMBLED BY : D.R. DRUM	DATE : 6/2021	
CHECKED BY : J.C. MORRISON	DATE : 6/2021	
DRAWN BY : TLA 6/05	REV. 5/1/06RRR	KMM/GM
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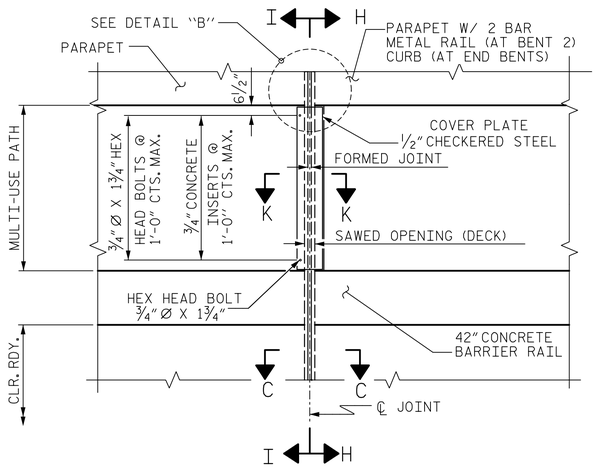
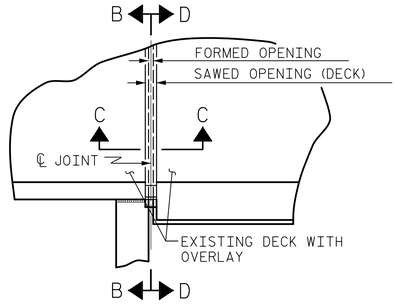
	REV. 12/17	MAA/THC

STD. NO. GRA2

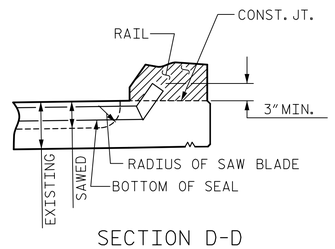


PLAN AT WIDENING

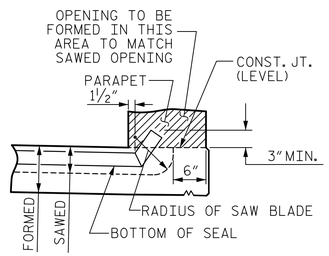


PLAN AT EXISTING BARRIER

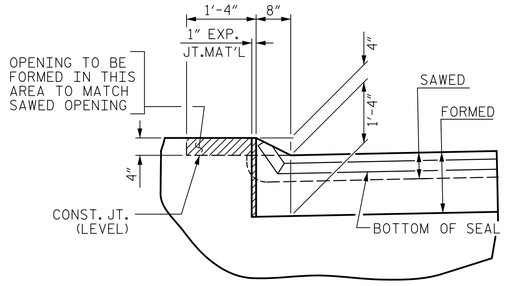
SHOWN AT END BENT, SIMILAR AT BENT 2



SECTION D-D



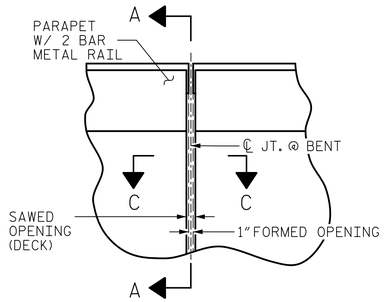
SECTION A-A



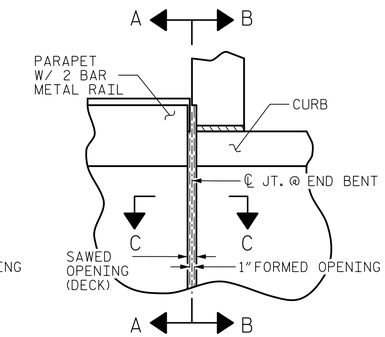
SECTION B-B

FOAM JOINT SEAL DETAILS

FOAM JOINT SEAL TO BE CUT, HEAT WELDED AND TURNED UP PARALLEL TO SLOPED FACE OF THE PARAPET.



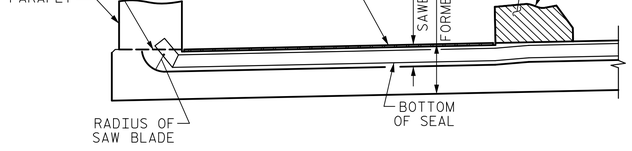
PLAN AT INTERIOR BENT



PLAN AT END BENT

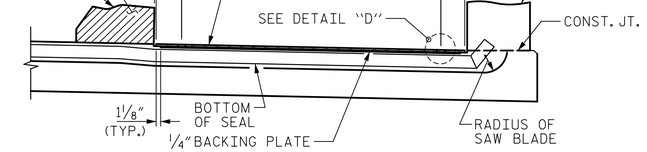
DETAIL "B"

SIDEWALK COVER PLATE, ANCHOR BOLTS, BACKING PLATE, AND RECESS NOT SHOWN

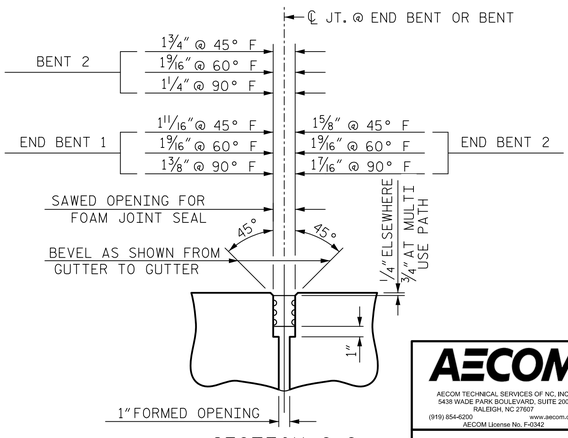


SECTION H-H

SHOWN AT INTERIOR BENT
SIMILAR AT END BENT



SECTION I-I



SECTION C-C

FOAM JOINT SEAL (EXPANSION)

FOAM JOINT SEAL NOTES:

THE NOMINAL UNCOMPRSSED SEAL WITH OF THE FOAM JOINT SEAL SHALL BE 2".

FOR FOAM JOINT SEALS, SEE SPECIAL PROVISIONS.

FOAM JOINT SEALS SHALL NOT BE INSTALLED UNTIL PC OVERLAY IS COMPLETE.

ELASTOMERIC CONCRETE IS NOT REQUIRED.

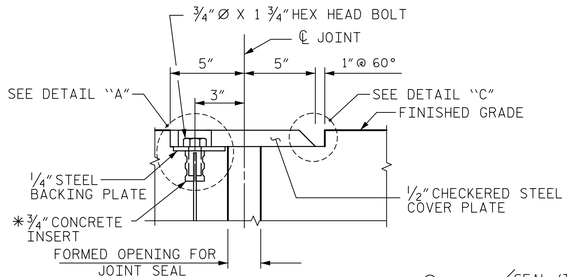
COVER PLATE SYSTEM NOTES:

*THE ¾" CONCRETE INSERTS SHALL BE CLOSED-END FERRULES WITH LOOPED WIRE STRUTS ATTACHED TO THEM. THE INSERTS SHALL CONFORM TO AASHTO M169, GRADE 12L14 AND SHALL HAVE A TENSILE WORKING LOAD CAPACITY OF 3000 LBS.

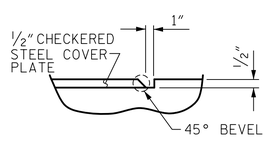
THE STEEL PLATES SHALL CONFORM TO AASHTO M270 GRADE 36 OR APPROVED EQUAL. AFTER FABRICATION, THE PLATES SHALL BE COMMERCIALLY BLAST CLEANED AND EITHER COATED WITH A MINIMUM THICKNESS OF 4 MILS (DRY) OF ZINC-RICH PAINT, GALVANIZED OR METALLIZED TO A MINIMUM THICKNESS OF 6 MILS INACCORDANCE WITH THE STANDARD SPECIFICATIONS. FOR THERMAL SPRAYED COATINGS (METALLIZATION), SEE SPECIAL PROVISIONS.

THE ¾" DIAMETER HEX HEAD BOLTS SHALL CONFORM TO ASTM F593 ALLOY 304 STAINLESS STEEL.

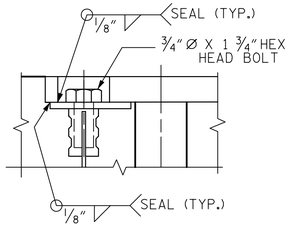
NO SEPARATE PAYMENT WILL BE MADE FOR FURNISHING AND INSTALLING THE COVER PLATE. THE ENTIRE COST OF THIS WORK SHALL BE INCLUDED IN THE LUMP SUM PRICE FOR "FOAM JOINT SEALS".



SECTION K-K



DETAIL "C"



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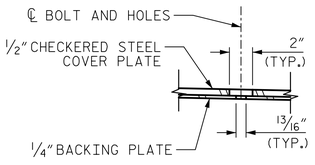

DETAIL "D"

MULTI-USE PATH COVER PLATE DETAILS

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

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RALEIGH, NC 27607
(919) 854-6200 www.aecom.com
AECOM License No. F-0342

NORTH CAROLINA PROFESSIONAL SEAL 030474 ENGINEER JOHN C. MORRISON

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SUPERSTRUCTURE

FOAM JOINT SEAL DETAILS

(SOUTHBOUND LANES)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-34
1			3			TOTAL SHEETS
2			4			119

DRAWN BY : G. COLS	DATE :	12/2022
CHECKED BY : J.C. MORRISON	DATE :	12/2022
DESIGNED BY : G. COLS	DATE :	12/2022
DESIGN CHECKED BY : J.C. MORRISON	DATE :	12/2022

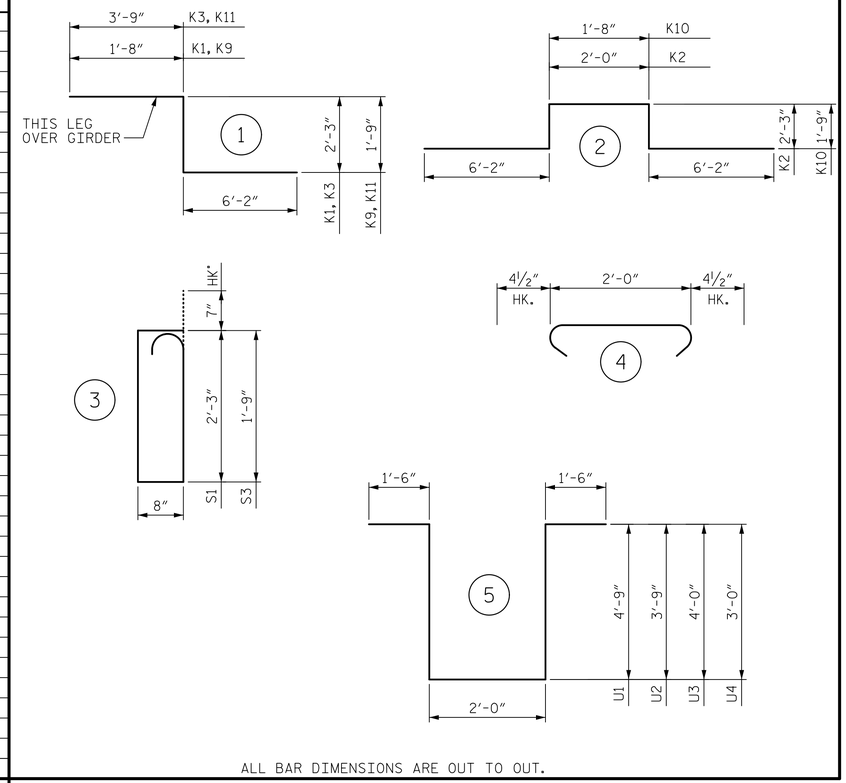
BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
✳ A1	592	5	STR	20′-2″	12452
A2	592	5	STR	20′-2″	12452
✳ B1	72	4	STR	31′-10″	1531
✳ B2	54	6	STR	23′-9″	1926
✳ B3	28	6	STR	30′-8″	1290
B4	116	5	STR	47′-6″	5747
✳ B5	36	4	STR	37′-5″	900
✳ B6	18	6	STR	44′-7″	1205
✳ B7	28	6	STR	20′-4″	855
B8	58	5	STR	58′-4″	3529
✳ D1	1184	5	STR	5′-3″	6483
✳ D2	1184	5	STR	3′-6″	4322
✳ G1	4	5	STR	20′-2″	84
✳ G2	4	5	STR	2′-8″	11
✳ K1	4	8	1	10′-1″	108
✳ K2	4	8	2	18′-10″	201
✳ K3	4	8	1	12′-2″	130
K4	9	4	STR	16′-4″	98
K5	8	4	STR	5′-10″	31
K6	8	4	STR	7′-0″	37
K7	16	4	STR	7′-4″	78
K8	8	4	STR	7′-8″	41
✳ K9	4	8	1	9′-7″	102
✳ K10	4	8	2	17′-6″	187
✳ K11	4	8	1	11′-8″	125
✳ S1	28	5	3	6′-5″	187
S2	94	4	4	2′-9″	173
✳ S3	28	5	3	5′-5″	158
U1	10	4	5	14′-6″	97
U2	4	4	5	12′-6″	33
U3	10	4	5	13′-0″	87
U4	4	4	5	11′-0″	29

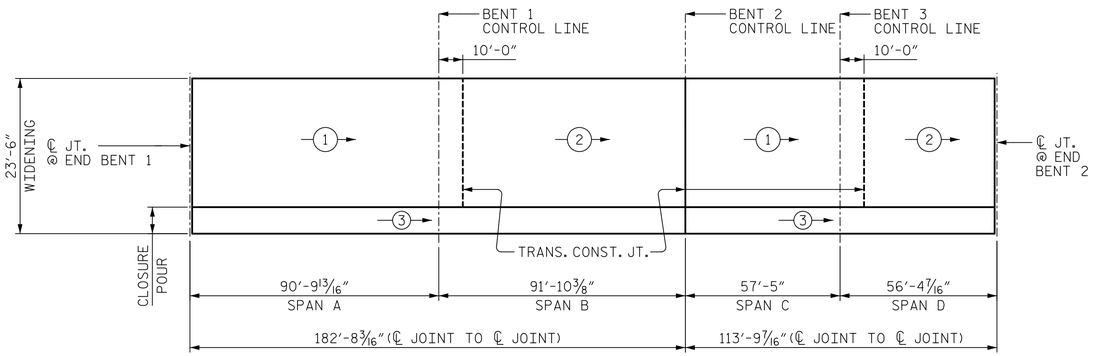
REINFORCING STEEL LBS. 22,353

EPOXY COATED REINFORCING STEEL LBS. 32,596

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT.



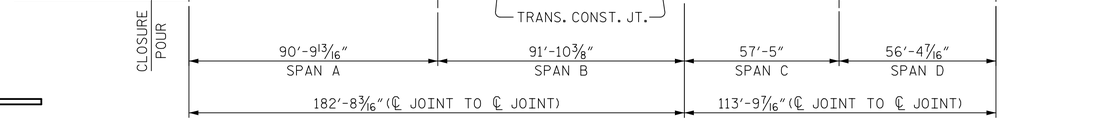
UNIT 1 UNIT 2

POURING SEQUENCE - PLAN

(#) → INDICATES POUR NUMBER AND POUR DIRECTION

POUR (2) SHALL NOT BE STARTED UNTIL BOTH ADJACENT POURS (1) REACH A MINIMUM OF 3,000 PSI.

ALL DIMENSIONS MEASURED ALONG -L-



UNIT 1 UNIT 2

OPTIONAL POURING SEQUENCE - PLAN

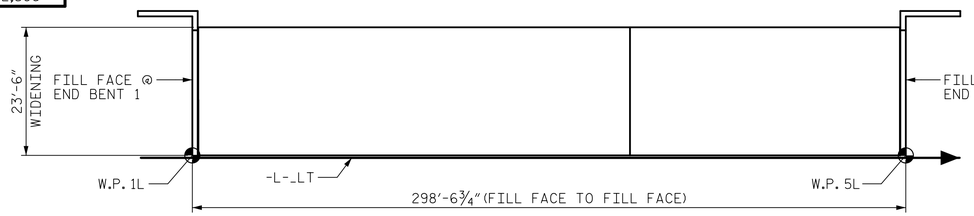
(#) → INDICATES POUR NUMBER AND POUR DIRECTION

POUR (2) SHALL NOT BE STARTED UNTIL BOTH ADJACENT POURS (1) REACH A MINIMUM OF 3,000 PSI.

ALL DIMENSIONS MEASURED ALONG -L-

NOTES:

QUANTITIES FOR GROOVING BRIDGE FLOORS ARE INCLUDED IN PRESERVATION SHEETS.



LAYOUT FOR COMPUTING AREA REINFORCED CONCRETE DECK SLAB

(SQ. FT. =6,963)

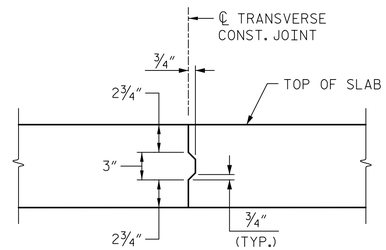
SUPERSTRUCTURE BILL OF MATERIAL

	CLASS AA CONCRETE	REINFORCING STEEL	EPOXY COATED REINFORCING STEEL
	(CU. YDS.)	(LBS.)	(LBS.)
SPANS A-D		22,353	32,596
UNIT 1 - POUR #1	74.9	---	---
UNIT 1 - POUR #2	56.6	---	---
UNIT 2 - POUR #1	50.3	---	---
UNIT 2 - POUR #2	31.7	---	---
CLOSURE POUR	17.7	---	---
TOTAL	231.2	22,353	32,596

✳ QUANTITIES FOR BARRIER RAIL AND PARAPET ARE NOT INCLUDED

SUPERSTRUCTURE REINFORCING STEEL LENGTHS ARE BASED ON THE FOLLOWING MINIMUM SPLICE LENGTHS

BAR SIZE	SUPERSTRUCTURE EXCEPT APPROACH SLABS, PARAPET, AND BARRIER RAIL		APPROACH SLABS		PARAPET AND BARRIER RAIL
	EPOXY COATED	UNCOATED	EPOXY COATED	UNCOATED	
#4	1′-11″	1′-7″	1′-11″	1′-7″	2′-6″
#5	2′-5″	2′-0″	2′-5″	2′-0″	3′-1″
#6	2′-10″	2′-5″	3′-7″	2′-5″	3′-8″
#7	4′-2″	2′-9″			
#8	4′-9″	3′-2″			



TRANSVERSE CONSTRUCTION JOINT DETAIL

NOTES: REINFORCING STEEL IN SLAB NOT SHOWN.

LONGITUDINAL REINFORCING STEEL SHALL BE CONTINUOUS THRU JOINT.

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

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5438 WADE PARK BOULEVARD, SUITE 200
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RALEIGH

STANDARD

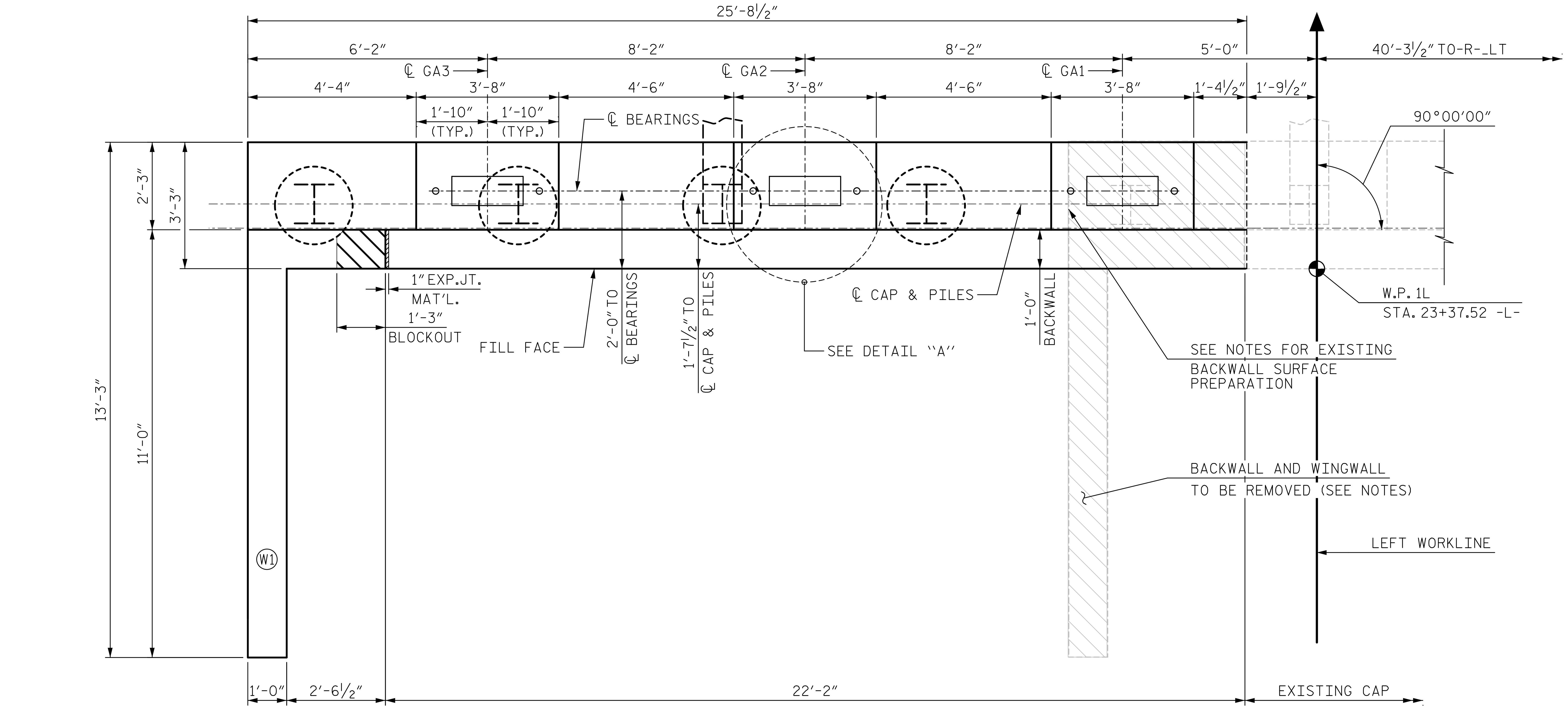
SUPERSTRUCTURE BILL OF MATERIAL

(SOUTHBOUND LANES)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-35
1			3			TOTAL SHEETS
2			4			119

STD. NO. BOM2

DRAWN BY : M.L. CATER DATE : 12/2022
CHECKED BY : J.C. MORRISON DATE : 12/2022
DESIGNED BY : D.R. DRUM DATE : 06/2021
DESIGN CHECKED BY : J.C. MORRISON DATE : 12/2022



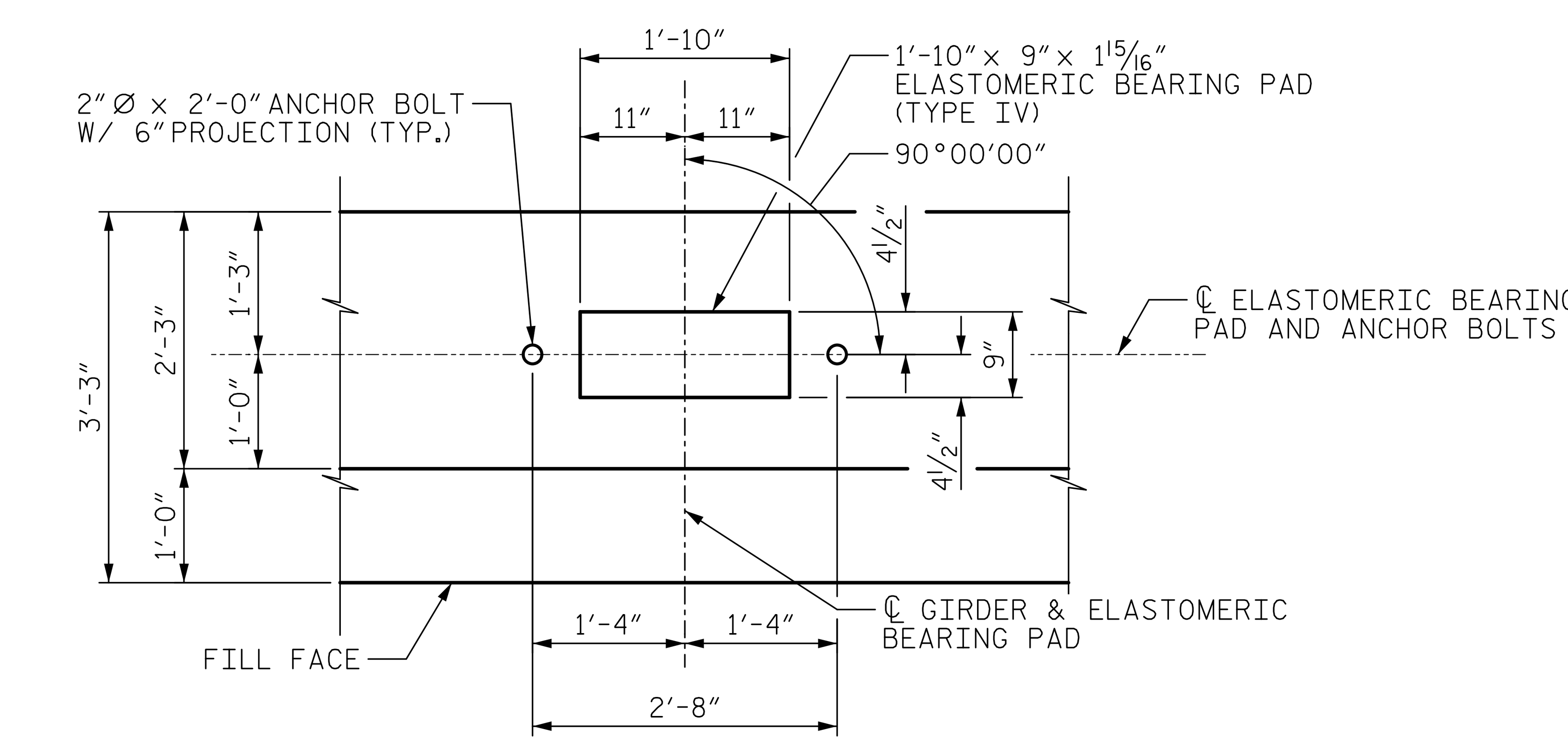
NOTES:

FOR ADDITIONAL NOTES AND PILE SPLICE DETAILS, SEE SHEET 3 OF 3.

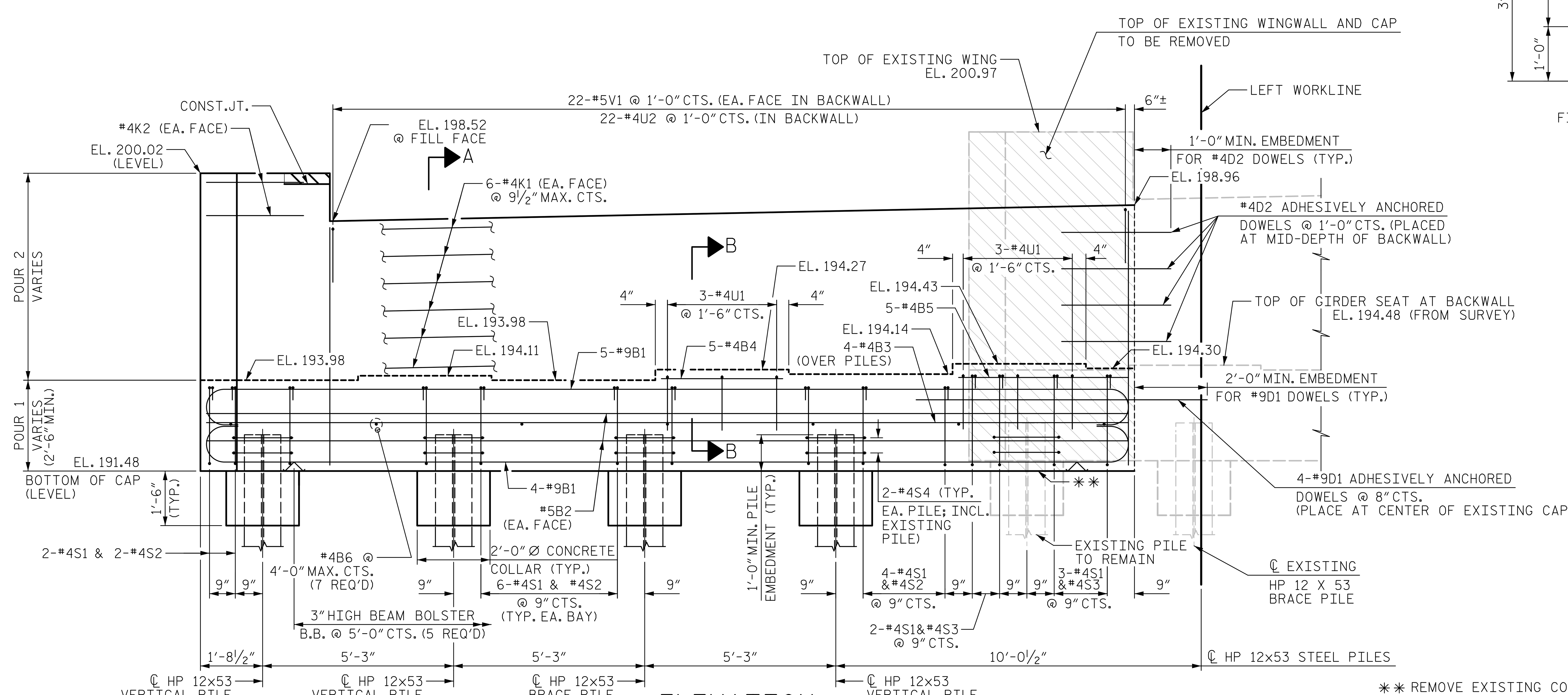
FOR WINGWALL DETAILS AND SECTION A-A SEE SHEET 2 OF 3.

INDICATES 3:12 PILE BATTER IN DIRECTION SHOWN.

DENOTES LIMIS OF REMOVAL OF EXISTING CAP, BACKWALL AND WINGWALL



DETAIL "A"



ELEVATION

FOR ELEVATIONS BETWEEN BRIDGE SEATS, SEE SECTION A-A, SHEET 2 OF 3

** REMOVE EXISTING CONCRETE COLLAR TO DESIRED CAP ELEVATION

PROJECT NO. U-5748
WAKE COUNTY
STATION: 24+88.00 -L-

SHEET 1 OF 3

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SUBSTRUCTURE

END BENT 1

(SOUTHBOUND LANES)

REVISIONS								SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:			S2-36
1			3					TOTAL SHEETS
2			4					119

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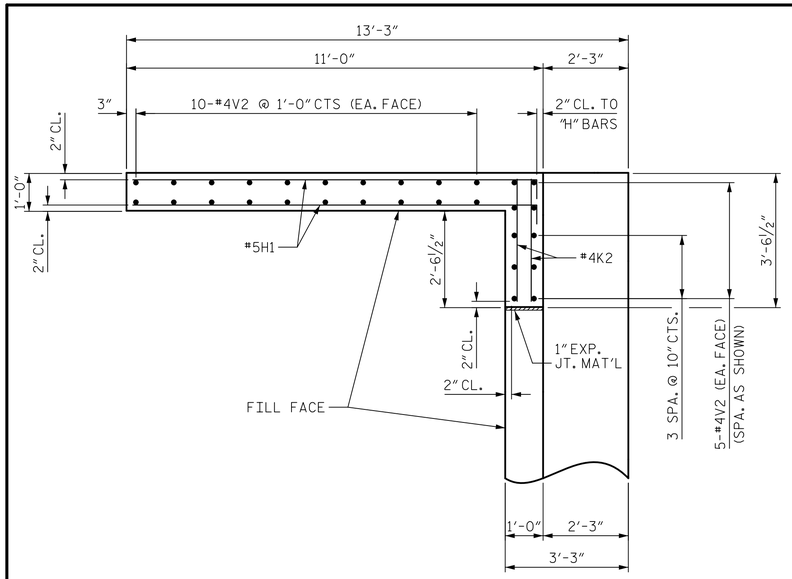
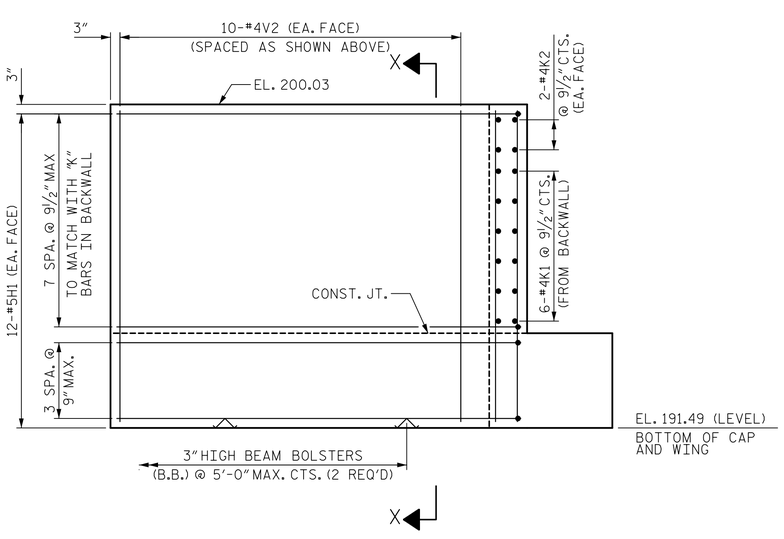
CHECKED BY :	J.C. MORRISON	DATE :	12/2022
DESIGNED BY :	M.L. CATER	DATE :	12/2020
DESIGN CHECKED BY :	J.C. MORRISON	DATE :	12/2022

DATE: 2/9/2023
TIME: 16:59 PM

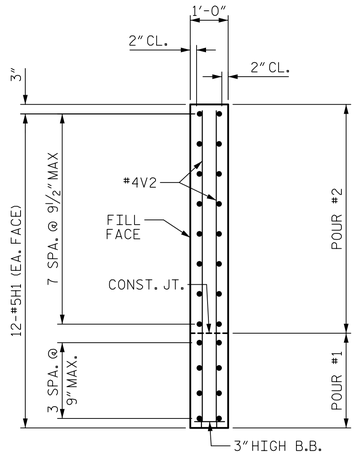
USER: catkrm
DGN: pw:\\aecom-na-pw.bentley.com:AECOM_DS21_NA_2020\Documents\60609754-U-5748 Upgr. Mtl\900-CAD GIS\90_CADD\70_NCDOT_TIP\Structure\04 Drawings\402_073_U-5748_SMU_EB1_S2-36_90131



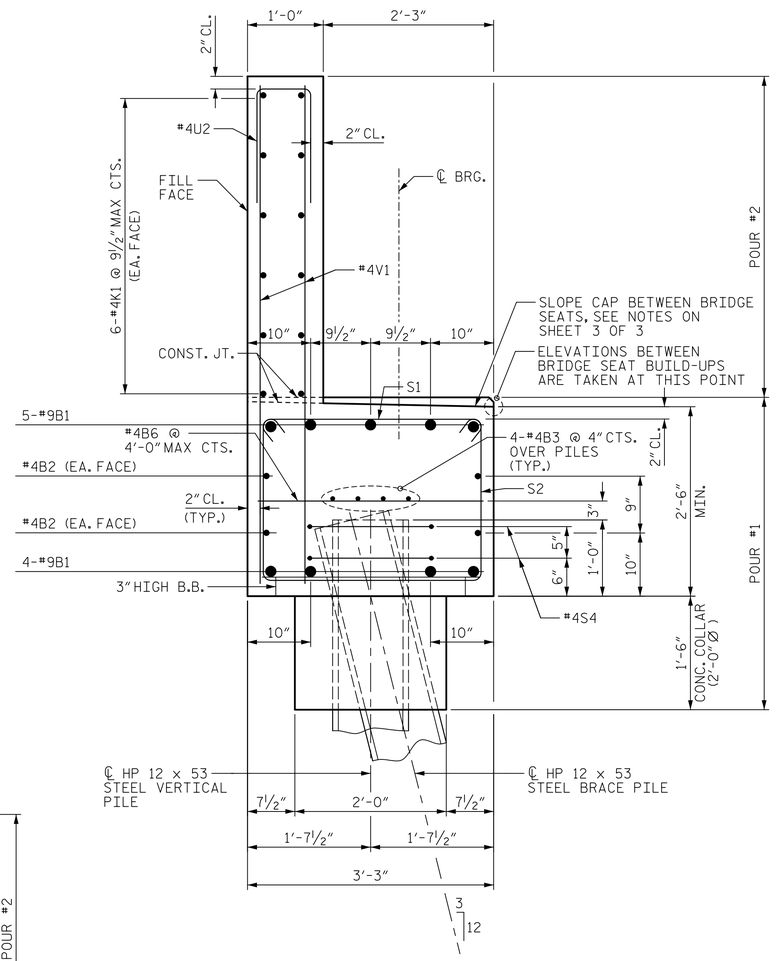
PLAN OF WING W1



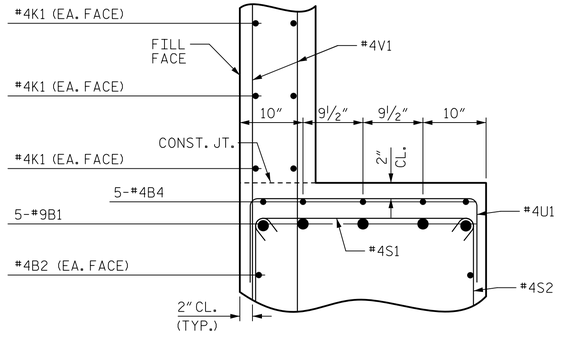
ELEVATION OF WING W1



SECTION X-X



SECTION A-A



SECTION B-B

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

SHEET 2 OF 3

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RALEIGH

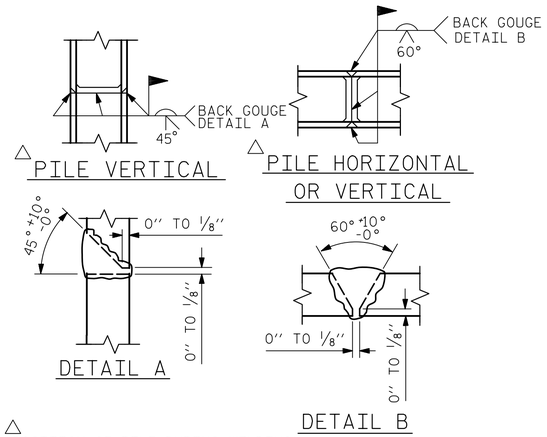
SUBSTRUCTURE

END BENT 1

(SOUTHBOUND LANES)

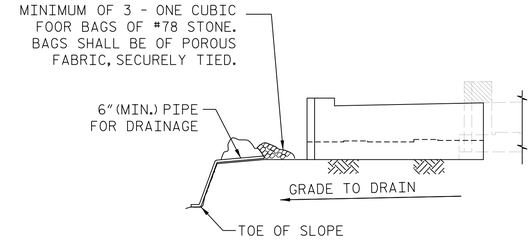
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-37
1			3			TOTAL SHEETS
2			4			119

DRAWN BY :	A.R. VAN VUREN	DATE : 12/2022
CHECKED BY :	J.C. MORRISON	DATE : 12/2022
DESIGNED BY :	A.R. VAN VUREN	DATE : 12/2022
DESIGN CHECKED BY :	J.C. MORRISON	DATE : 12/2022



△ POSITION OF PILE DURING WELDING.

PILE SPLICE DETAILS

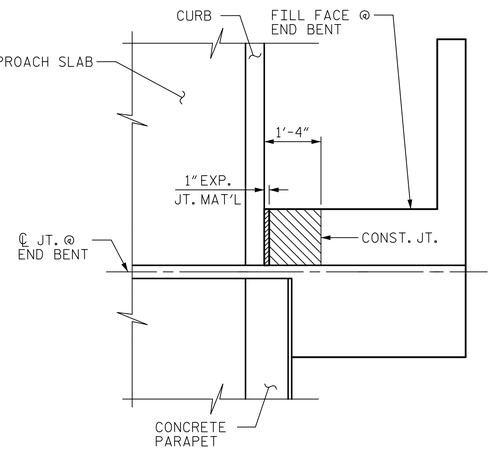


BAGGED STONE AND PIPE SHALL BE PLACED IMMEDIATELY AFTER COMPLETION OF END BENT EXCAVATION. PIPE MAY BE EITHER CONCRETE, CORRUGATED STEEL, CORRUGATED ALUMINUM ALLOY, OR CORRUGATED PLASTIC. PERFORATED PIPE WILL NOT BE ALLOWED.

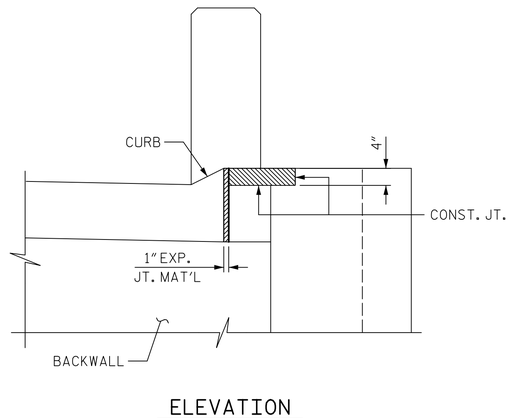
BAGGED STONE SHALL REMAIN IN PLACE UNTIL THE ENGINEER DIRECTS THAT IT BE REMOVED. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF SILT ACCUMULATIONS AT BAGGED STONE WHEN SO DIRECTED BY THE ENGINEER. BAGS SHALL BE REMOVED AND REPLACED WHENEVER THE ENGINEER DETERMINES THAT THEY HAVE DETERIORATED AND LOST THEIR EFFECTIVENESS.

NO SEPARATE PAYMENT WILL BE MADE FOR THIS WORK AND THE ENTIRE COST OF THIS WORK SHALL BE INCLUDED IN THE UNIT CONTRACT PRICE FOR THE SEVERAL PAY ITEMS.

TEMPORARY DRAINAGE AT END BENT 1



PLAN



ELEVATION

BLOCKOUT IN WINGWALL

NOTES:

REMOVE EXISTING CAP, BACKWALL AND WINGWALL AS SHOWN AND REPAIR WITH CLASS A CONCRETE OR GROUT FOR STRUCTURES. THE COST OF CLASS A CONCRETE OR GROUT SHALL BE CONSIDERED INCIDENTAL TO THE LUMP SUM COST FOR REMOVAL OF EXISTING STRUCTURE.

FACE OF EXISTING END BENT CAP AND BACKWALL SHALL BE ROUGHENED TO 1/4" MIN. AMPLITUDE PRIOR TO PLACEMENT OF PROPOSED END BENT CAP OR BACKWALL.

THE CONTRACTOR SHALL USE AN ADHESIVE ANCHOR SYSTEM FOR THE #9D1 DOWELS AND #4D2 DOWELS. LEVEL 1 FIELD TESTING IS REQUIRED. THE YIELD LOAD FOR #9D1 DOWELS IS 60.0 KIPS. THE YIELD LOAD FOR THE #4D2 DOWELS IS 12.0 KIPS. ADHESIVE ANCHOR SYSTEM SHALL DEVELOP 125% OF THE YIELD LOAD OF THE BAR. FOR ADHESIVELY ANCHORED BOLTS OR DOWELS, SEE SECTION 420-13 OF THE STANDARD SPECIFICATIONS.

STIRRUPS AND U1 BARS IN CAP MAY BE SHIFTED AS NECESSARY TO CLEAR ANCHOR BOLTS.

#5 V1 BARS IN BACKWALL SHALL BE PLACED 2" CLEAR FROM TOP OF BACKWALL.

BACKWALL SHALL BE PLACED BEFORE APPLYING THE EPOXY PROTECTIVE COATING.

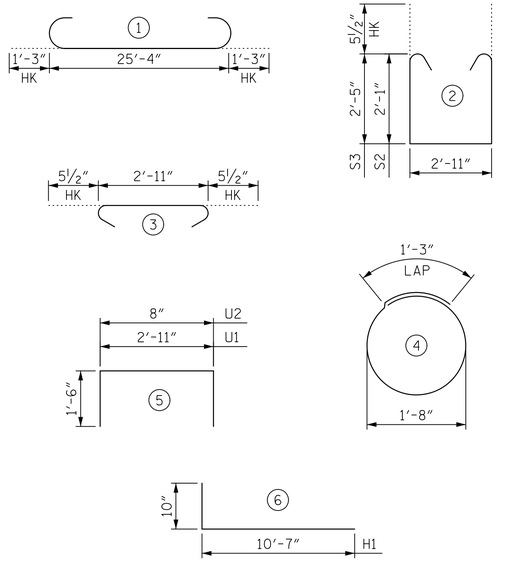
THE TOP SURFACE OF THE END BENT CAP, EXCEPT THE BRIDGE SEAT BUILDUPS, SHALL BE SLOPED TRANSVERSELY FROM THE FILL FACE TO THE FRONT FACE AT THE RATE OF 2%.

THE TOP SURFACE AREAS OF THE END CAP SHALL BE CURED IN ACCORDANCE WITH THE STANDARD, EXCEPT THE MEMBRANE CURING COMPOUND METHOD SHALL NOT BE USED.

THE CONCRETE IN THE SHADED AREA OF THE WINGWALL SHALL BE POURED AFTER THE JOINT BETWEEN THE DECK AND THE APPROACH SLAB HAS BEEN SAWED AND PARAPET IS CAST IF SLIP FORMING IS USED.

FOR WING DETAILS, SEE SHEET 2 OF 3.

BAR TYPE



ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

END BENT 1

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
B1	9	#9	1	27'-11"	854
B2	4	#5	STR	25'-5"	106
B3	4	#4	STR	25'-5"	68
B4	5	#4	STR	3'-4"	11
B5	5	#4	STR	4'-8"	16
B6	7	#4	STR	2'-11"	14
D1	4	#9	STR	7'-6"	102
D2	4	#4	STR	3'-0"	8
H1	24	#5	6	11'-5"	286
K1	12	#4	STR	25'-9"	206
K2	4	#4	STR	3'-3"	9
S1	29	#4	3	3'-10"	74
S2	24	#4	2	8'-0"	128
S3	5	#4	2	8'-10"	30
S4	10	#4	4	6'-6"	43
U1	6	#4	5	5'-11"	24
U2	22	#4	5	3'-8"	54
V1	44	#5	STR	6'-8"	306
V2	30	#4	STR	8'-2"	164

REINFORCING STEEL	2,520 LBS.
CLASS A CONCRETE	
POUR #1 (CAP, COLLARS & LOWER WINGWALLS)	9.2 C.Y.
POUR #2 (BACKWALL & UPPER WINGWALL)	6.9 C.Y.
TOTAL =	16.1 C.Y.

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

SHEET 3 OF 3

DRAWN BY :	A.R. VAN VUREN	DATE :	12/2022
CHECKED BY :	J.C. MORRISON	DATE :	12/2022
DESIGNED BY :	A.R. VAN VUREN	DATE :	12/2022
DESIGN CHECKED BY :	J.C. MORRISON	DATE :	12/2022

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RALEIGH, NC 27607
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RALEIGH

SUBSTRUCTURE

END BENT 1

(SOUTHBOUND LANES)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-38
1			3			TOTAL SHEETS
2			4			119

NOTES:

STIRRUPS AND "U" BARS IN CAP MAY BE SHIFTED AS NECESSARY TO CLEAR ANCHOR BOLTS.

HOOKS ON "V" BARS MAY BE TURNED AS NECESSARY FOR PLACING REINFORCING STEEL.

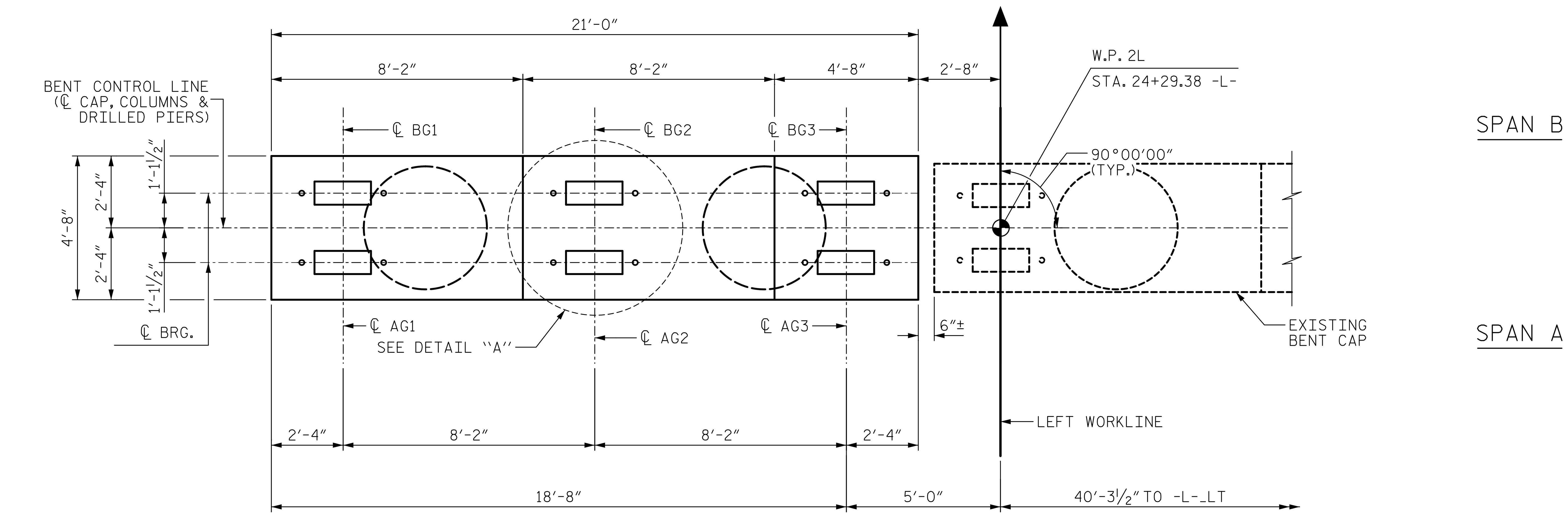
ALL STEEL IN THE DRILLED PIERS IS INCLUDED IN THE PAY ITEMS FOR "REINFORCING STEEL" AND "SPIRAL COLUMN REINFORCING STEEL".

DRILLED PIERS SHALL BE TERMINATED ONE FOOT± ABOVE NORMAL WATER SURFACE ELEVATION FOR SHAFTS LOCATED IN WATER.

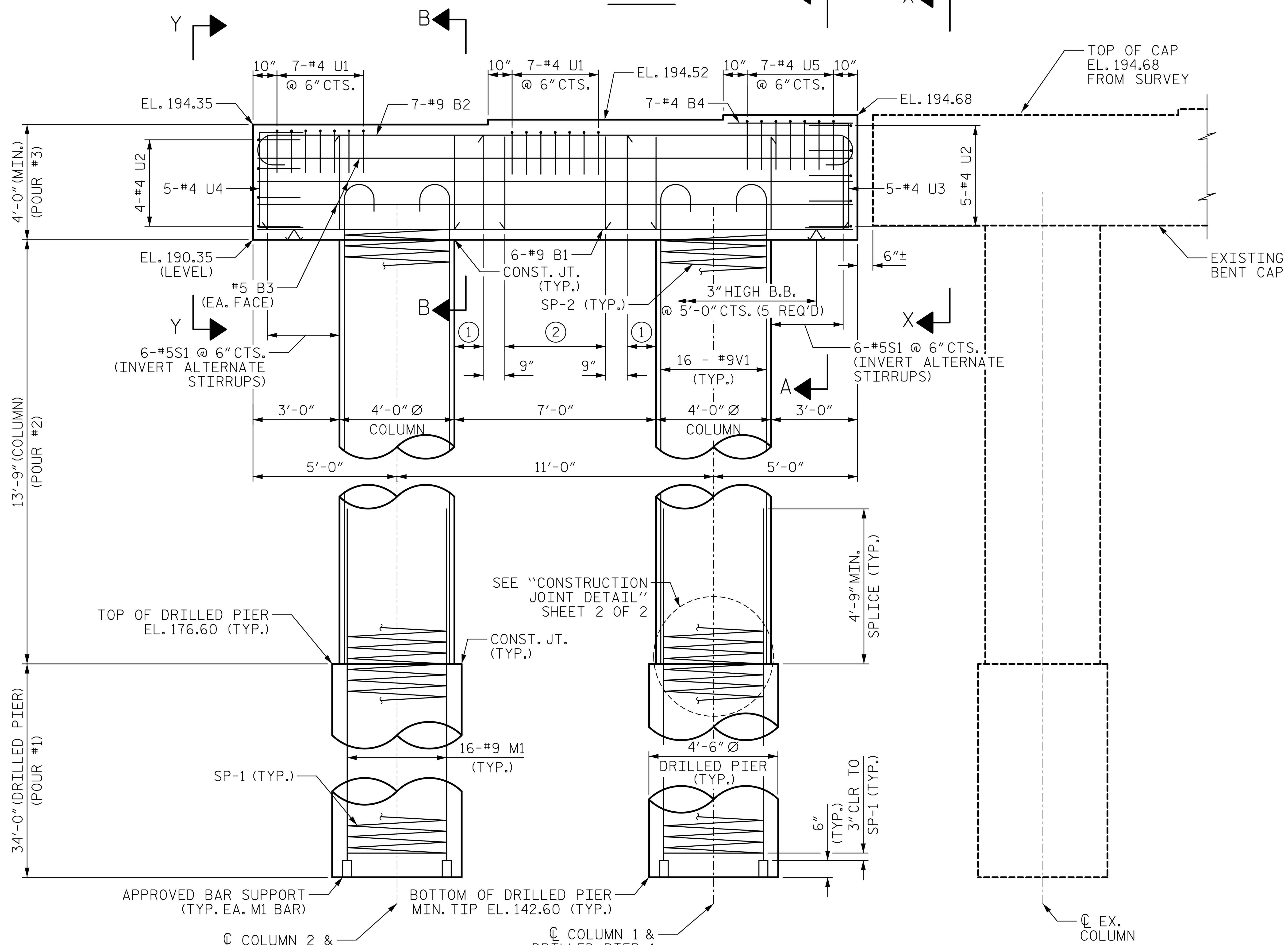
THE CONTRACTOR'S ATTENTION IS CALLED TO THE FACT THAT THE LONGITUDINAL REINFORCEMENT FOR THE DRILLED PIERS IS DETAILED WITH 3 FEET OF EXTRA LENGTH.

FOR DRILLED PIERS, SEE SECTION 411 OF THE STANDARD SPECIFICATIONS.

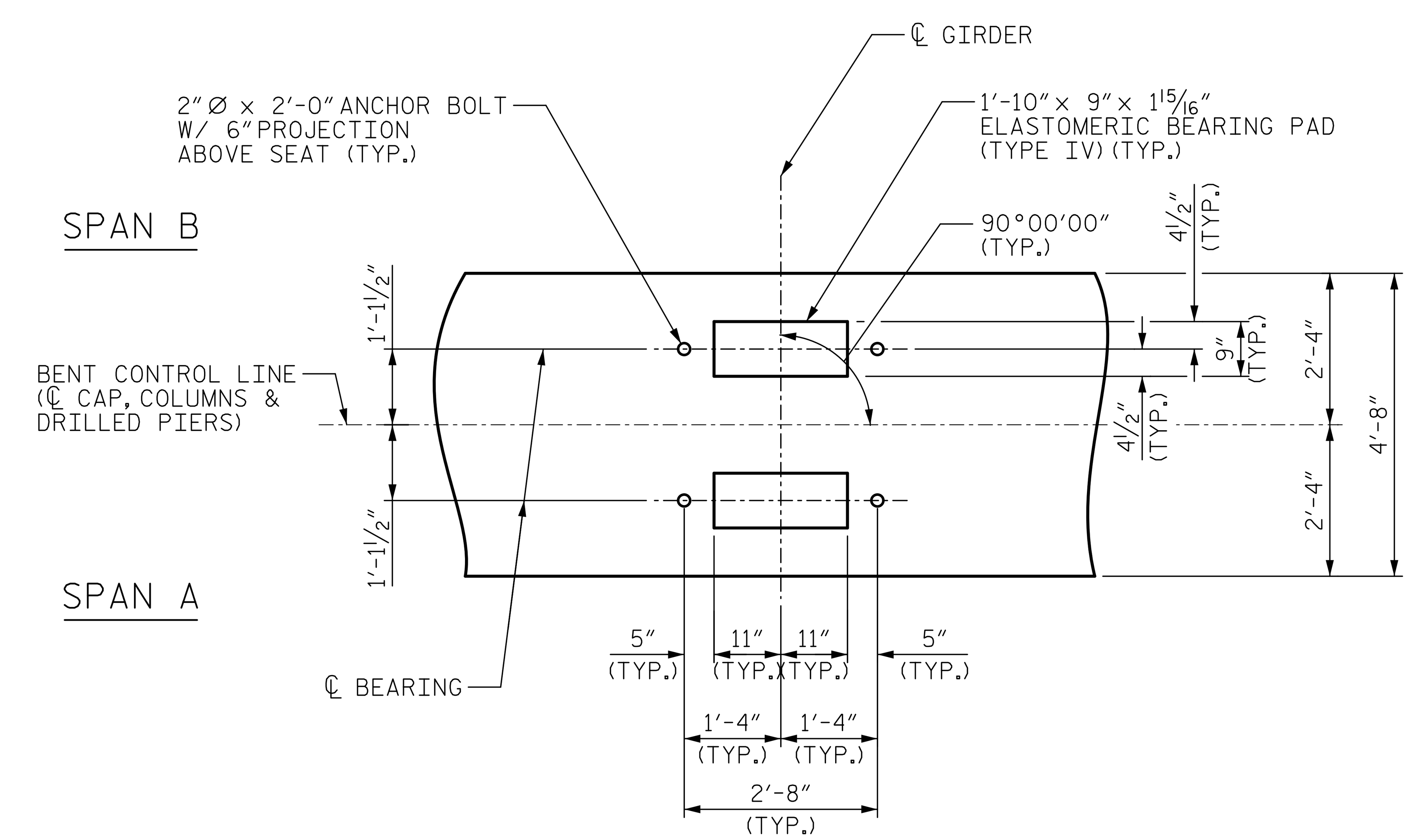
THE TOP SURFACE AREA OF THE BENT CAPS SHALL BE CURED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS EXCEPT THE MEMBRANE CURING COMPOUND METHOD SHALL NOT BE USED.



PLAN



ELEVATION



DETAIL "A"

TYP. EA. BEARING

① 2-#5S1 @ 6" CTS. (INVERT ALTERNATE STIRRUPS)

② 7-#5S1 @ 9" CTS. (INVERT ALTERNATE STIRRUPS)

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

SHEET 1 OF 2

AECOM

AECOM TECHNICAL SERVICES OF NC, INC.
5438 WADE PARK BOULEVARD, SUITE 200
RALEIGH, NC 27607
(919) 854-6200 www.aecom.com
AECOM License No. F-0342

NORTH CAROLINA PROFESSIONAL SEAL 030474 ENGINEER JOHN C. MORRISON

DocuSigned by: John C. Morrison 2/10/2023

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SUBSTRUCTURE

BENT 1

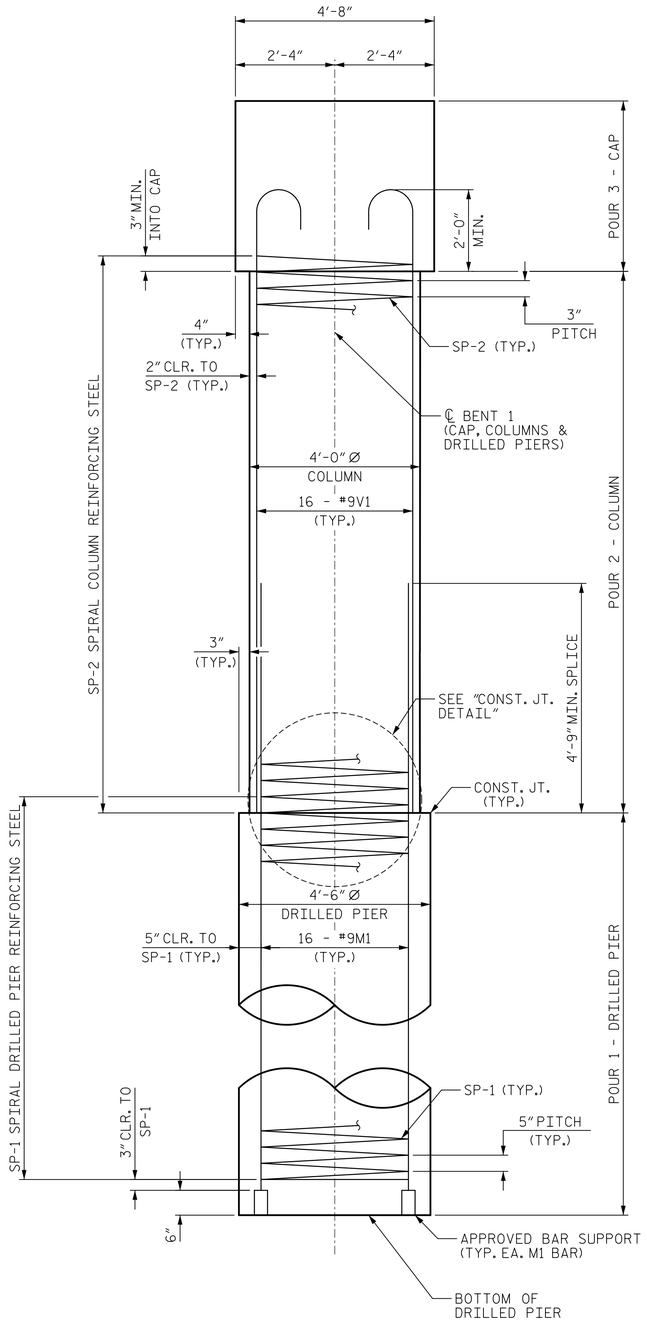
(SOUTHBOUND LANES)

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISIONS								SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:			S2-39
1			3					TOTAL SHEETS
2			4					119

DRAWN BY :	M. CATER	DATE :	12/2022
CHECKED BY :	J. MORRISON	DATE :	12/2022
DESIGNED BY :	B. LEROY	DATE :	11/2022
DESIGN CHECKED BY :	J. MORRISON	DATE :	11/2022

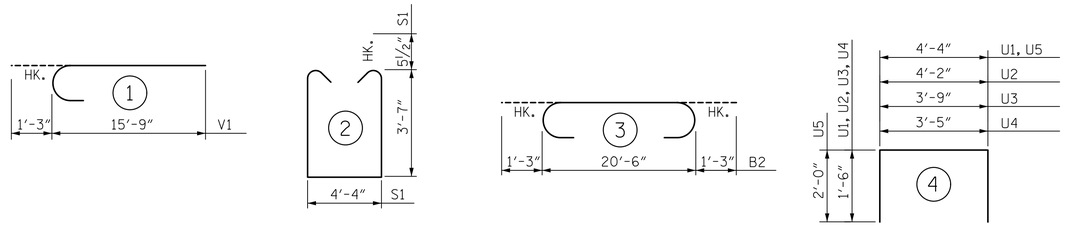
SPAN A



END ELEVATION

SPAN B

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

BENT 1

BAR	No.	SIZE	TYPE	LENGTH	WEIGHT
B1	6	9	STR	20'-8"	422
B2	7	9	3	23'-0"	547
B3	6	5	STR	20'-8"	129
B4	7	4	STR	4'-4"	20
M1	32	9	STR	41'-3"	4,488
V1	32	9	1	17'-0"	1,850
S1	23	5	2	12'-5"	298
U1	14	4	4	7'-4"	69
U2	9	4	4	7'-2"	43
U3	5	4	4	6'-9"	23
U4	5	4	4	6'-5"	21
U5	7	4	4	8'-4"	39
SP-1	2	**	5	929'-4"	1,939
SP-2	2	*	6	654'-1"	874

REINFORCING STEEL	7,949 LBS.
SPIRAL COLUMN REINFORCING STEEL	2,813 LBS.

CLASS A CONCRETE BREAKDOWN

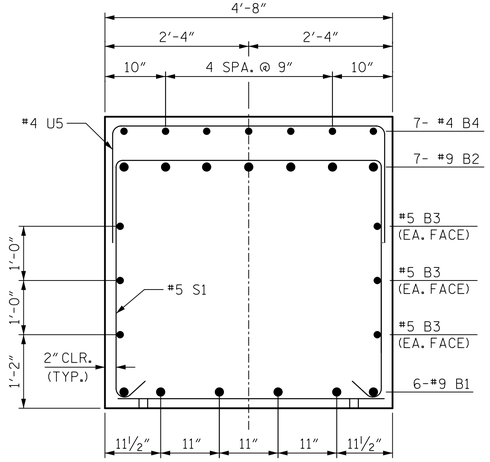
POUR #2 (COLUMNS)	12.8 C.Y.
POUR #3 (CAP)	15.0 C.Y.
TOTAL CLASS A CONCRETE	27.8 C.Y.

DRILLED PIERS

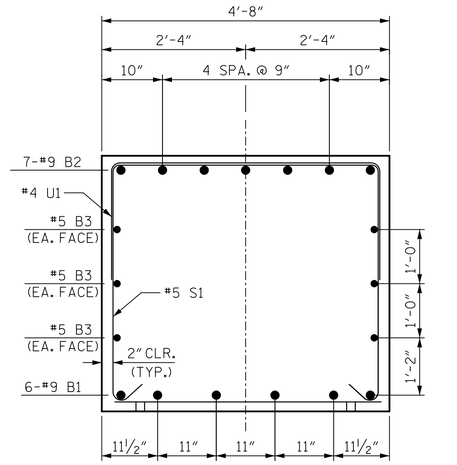
DRILLED PIER CONCRETE POUR 1 (DRILLED PIERS)	40.1 C.Y.

**THE "SP-1" SPIRAL REINFORCING STEEL SHALL BE W21 OR D-31 COLD DRAWN WIRE OR #5 PLAIN OR DEFORMED BAR.

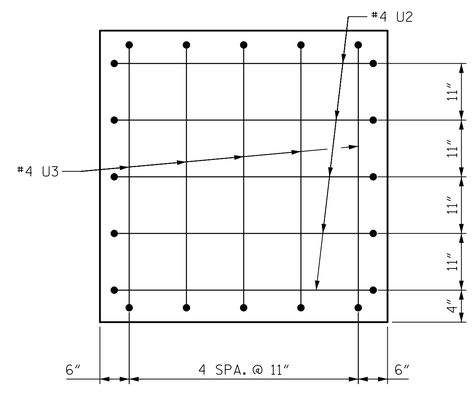
*THE "SP-2" SPIRAL REINFORCING STEEL SHALL BE W20 OR D-20 COLD DRAWN WIRE OR #4 PLAIN OR DEFORMED BAR.



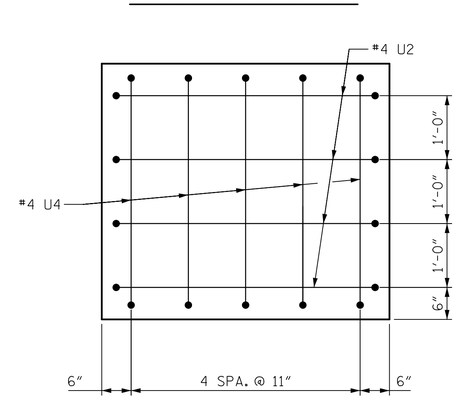
SECTION A-A



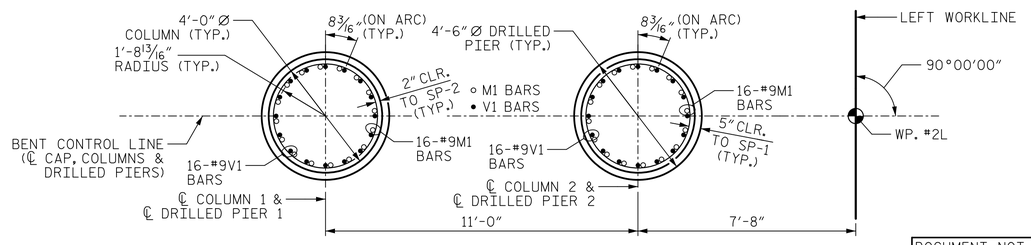
SECTION B-B



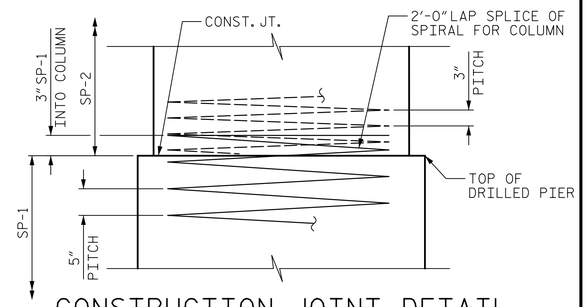
VIEW X-X



VIEW Y-Y



PLAN OF DRILLED PIERS & COLUMNS



CONSTRUCTION JOINT DETAIL

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

SHEET 2 OF 2

DRAWN BY :	M. CATER	DATE :	12/2022
CHECKED BY :	J. MORRISON	DATE :	12/2022
DESIGNED BY :	B. LEROY	DATE :	11/2022
DESIGN CHECKED BY :	J. MORRISON	DATE :	11/2022

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NORTH CAROLINA PROFESSIONAL SEAL 030474 ENGINEER JOHN C. MORRISON

DocuSigned by: John C. Morrison 2/10/2023
A2FDE142C82F4AB...

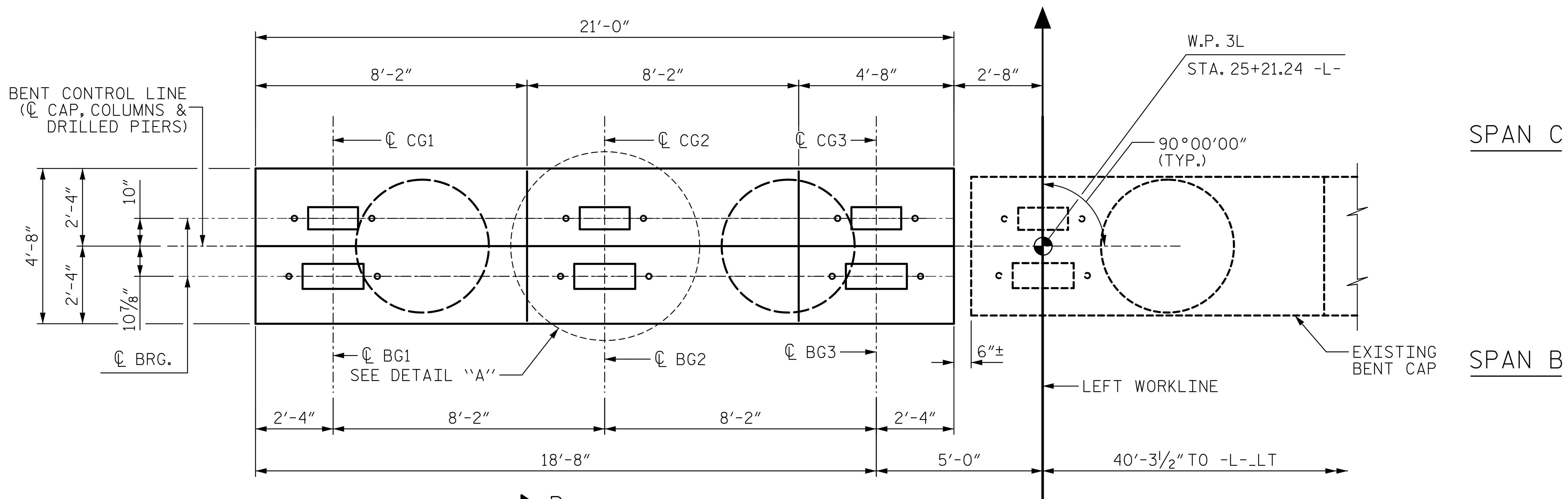
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SUBSTRUCTURE

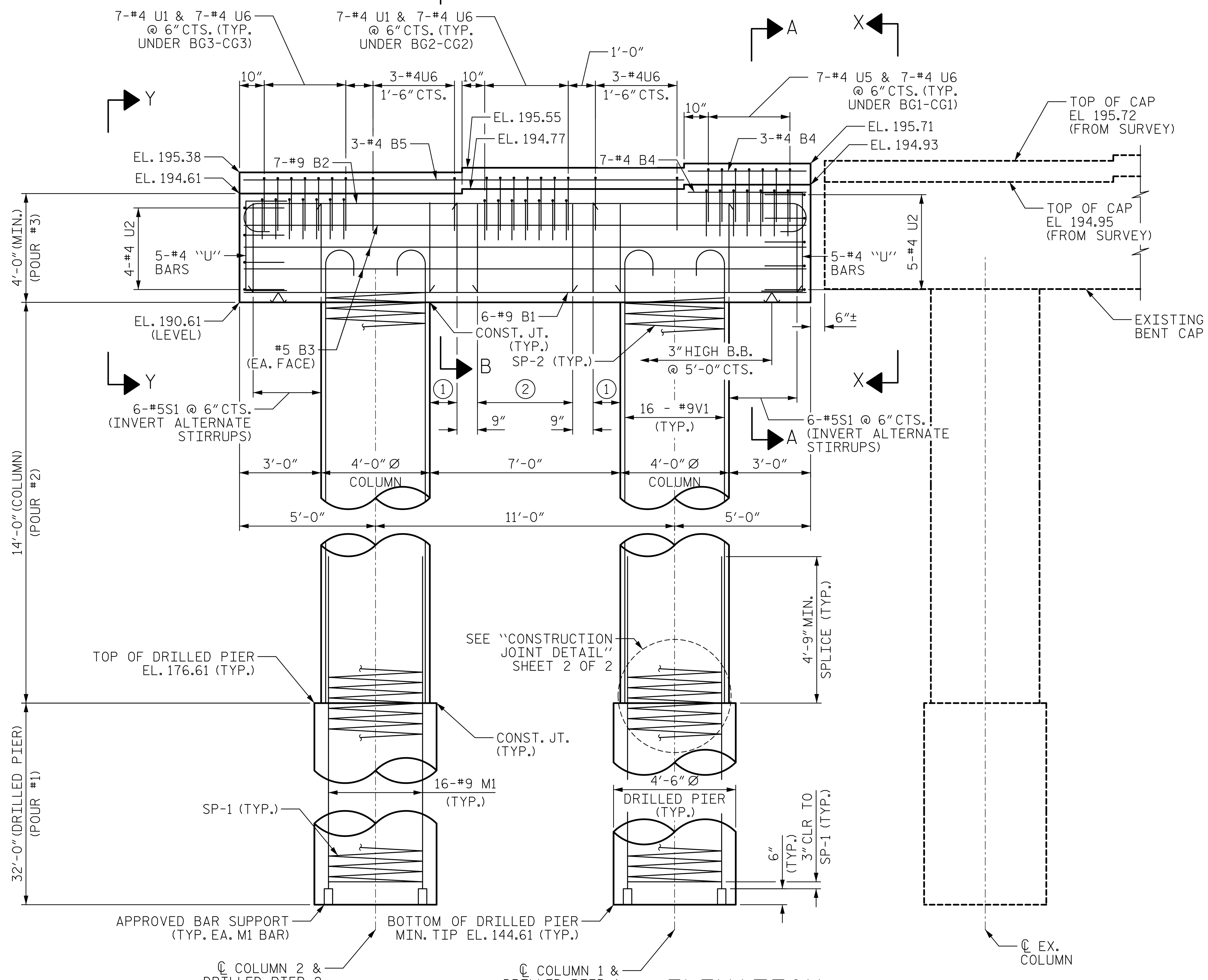
BENT 1

(SOUTHBOUND LANES)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-40
1			3			TOTAL SHEETS
2			4			119



PLAN



ELEVATION

NOTES:

STIRRUPS AND "U" BARS IN CAP MAY BE SHIFTED AS NECESSARY TO CLEAR ANCHOR BOLTS.

HOOKS ON "V" BARS MAY BE TURNED AS NECESSARY FOR PLACING REINFORCING STEEL.

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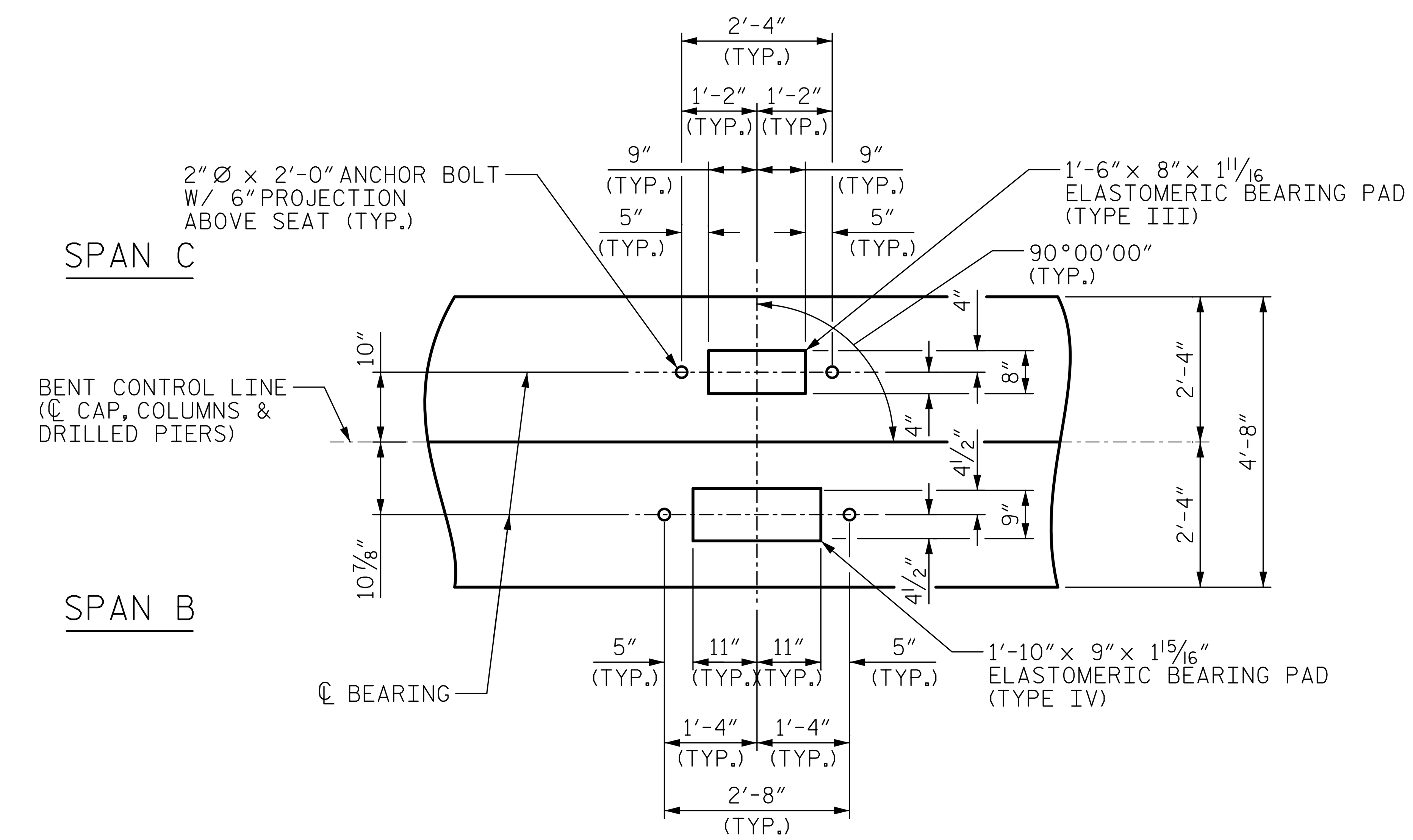

DETAIL "A"

TYP. EA. BEARING

① 2-#5S1 @ 6" CTS. (INVERT ALTERNATE STIRRUPS)

② 7-#5S1 @ 9" CTS. (INVERT ALTERNATE STIRRUPS)

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

SHEET 1 OF 2

AECOM

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5438 WADE PARK BOULEVARD, SUITE 200
RALEIGH, NC 27607
(919) 854-6200 www.aecom.com
AECOM License No. F-0342

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SUBSTRUCTURE

BENT 2

(SOUTHBOUND LANES)

NORTH CAROLINA PROFESSIONAL SEAL 030474 ENGINEER JOHN C. MORRISON

DocuSigned by: John C. Morrison 2/10/2023

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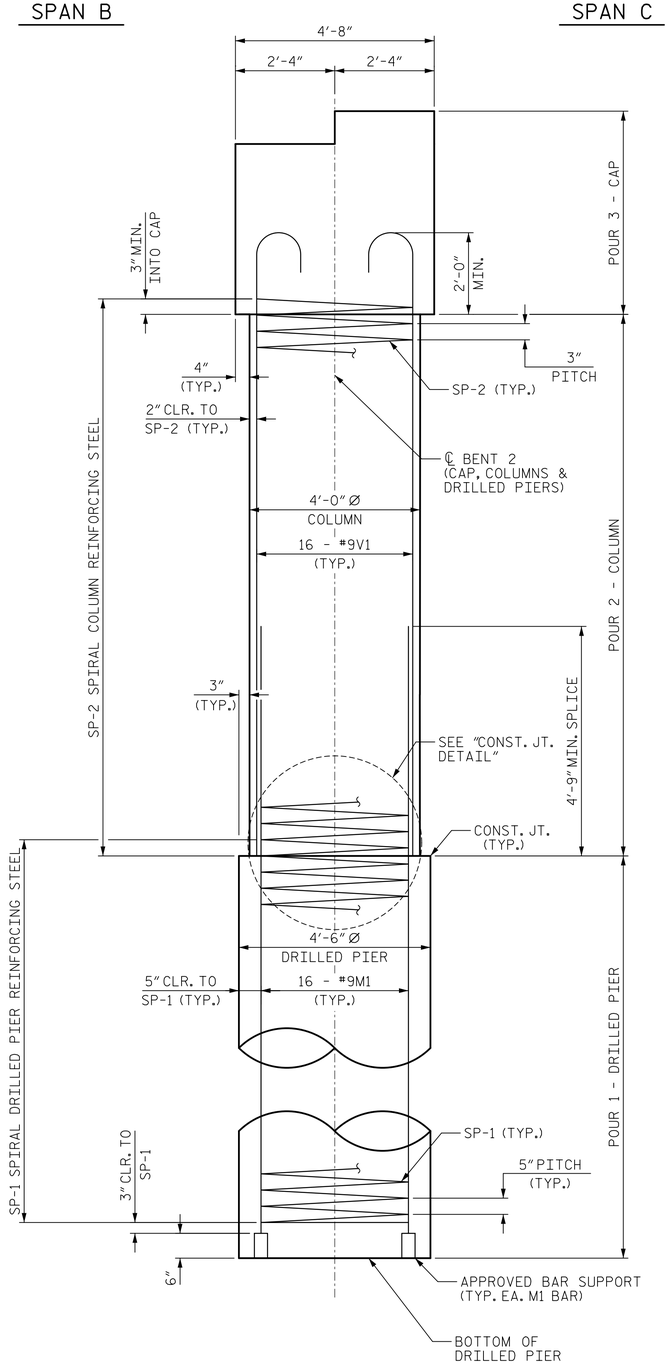
REVISIONS								SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:			S2-41
1			3					TOTAL SHEETS
2			4					119

DRAWN BY : M. CATER	DATE : 12/2022
CHECKED BY : J. MORRISON	DATE : 12/2022
DESIGNED BY : B. LEROY	DATE : 11/2022
DESIGN CHECKED BY : J. MORRISON	DATE : 11/2022

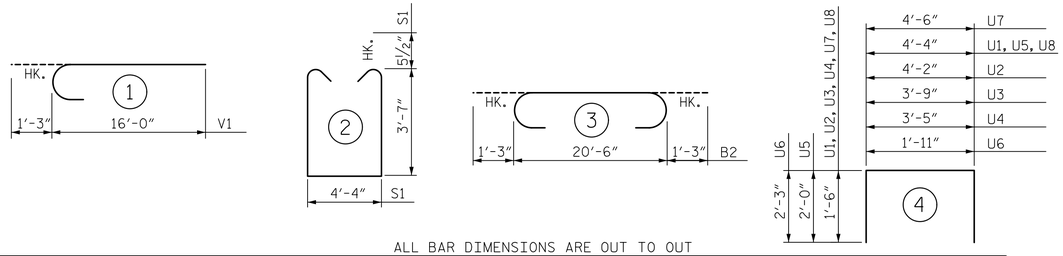
SPAN B

SPAN C

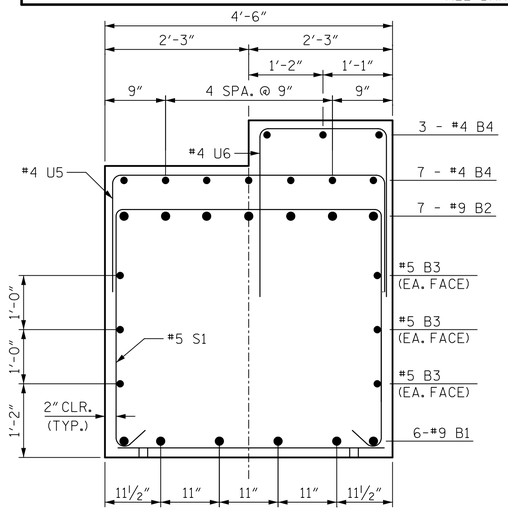


END ELEVATION

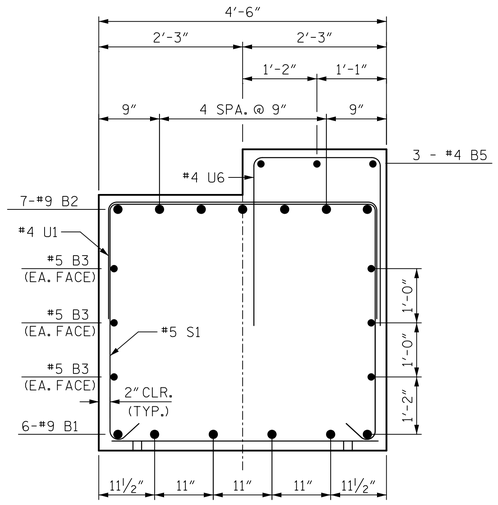
BAR TYPES



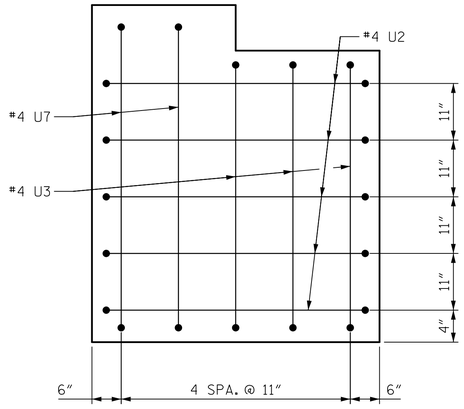
ALL BAR DIMENSIONS ARE OUT TO OUT



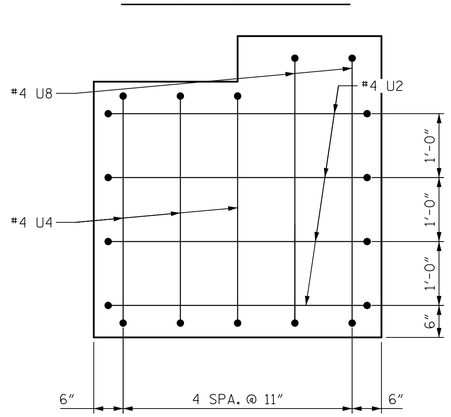
SECTION A-A



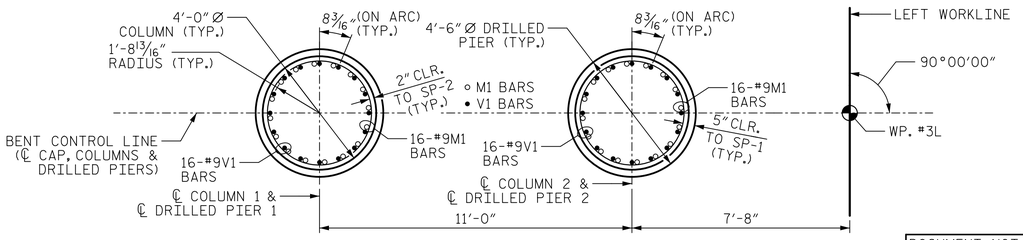
SECTION B-B



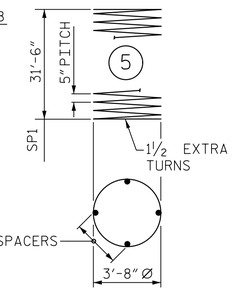
VIEW X-X

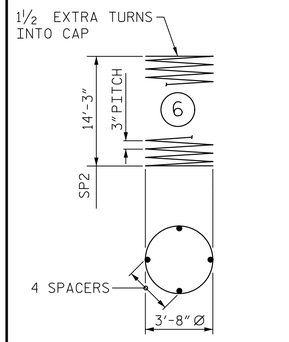


VIEW Y-Y



PLAN OF DRILLED PIERS & COLUMNS





BILL OF MATERIAL

BENT 2

BAR	No.	SIZE	TYPE	LENGTH	WEIGHT
B1	6	9	STR	20'-8"	422
B2	7	9	3	23'-0"	547
B3	6	5	STR	20'-8"	129
B4	10	4	STR	4'-4"	29
B5	3	4	STR	16'-0"	32
M1	32	9	STR	39'-3"	4,270
V1	32	9	1	17'-3"	1,877
S1	23	5	2	12'-5"	298
U1	14	4	4	7'-4"	69
U2	9	4	4	7'-2"	43
U3	3	4	4	6'-9"	14
U4	3	4	4	6'-5"	13
U5	7	4	4	8'-4"	39
U6	27	4	4	6'-5"	116
U7	2	4	4	7'-6"	10
U8	2	4	4	7'-2"	10
SP-1	2	**	5	874'-10"	1,825
SP-2	2	*	6	665'-5"	889

REINFORCING STEEL	7,918	LBS.
SPIRAL COLUMN REINFORCING STEEL	2,714	LBS.

CLASS A CONCRETE BREAKDOWN

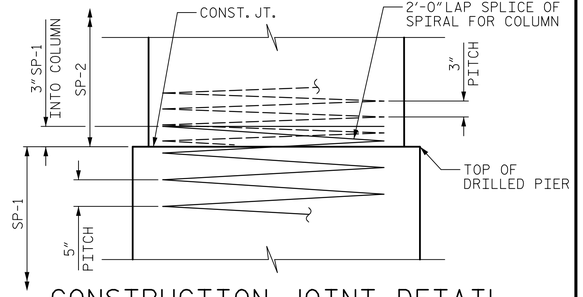
POUR #2 (COLUMNS)	13.0	C.Y.
POUR #3 (CAP)	16.4	C.Y.
TOTAL CLASS A CONCRETE	29.4	C.Y.

DRILLED PIERS

DRILLED PIER CONCRETE POUR 1 (DRILLED PIERS)	37.7	C.Y.

**THE "SP-1" SPIRAL REINFORCING STEEL SHALL BE W21 OR D-31 COLD DRAWN WIRE OR #5 PLAIN OR DEFORMED BAR.

*THE "SP-2" SPIRAL REINFORCING STEEL SHALL BE W20 OR D-20 COLD DRAWN WIRE OR #4 PLAIN OR DEFORMED BAR.



CONSTRUCTION JOINT DETAIL

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

SHEET 2 OF 2

AECOM
AECOM TECHNICAL SERVICES OF NC, INC.
5438 WADE PARK BOULEVARD, SUITE 200
RALEIGH, NC 27607
(919) 854-6200 www.aecom.com
AECOM License No. F-0342

NORTH CAROLINA PROFESSIONAL SEAL 030474 ENGINEER JOHN C. MORRISON

DocuSigned by: John C. Morrison 2/10/2023
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DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SUBSTRUCTURE

BENT 2

(SOUTHBOUND LANES)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-42
1			3			TOTAL SHEETS
2			4			119

DRAWN BY :	M. CATER	DATE :	12/2022
CHECKED BY :	J. MORRISON	DATE :	12/2022
DESIGNED BY :	B. LEROY	DATE :	11/2022
DESIGN CHECKED BY :	J. MORRISON	DATE :	11/2022

DATE: 2/9/2023
TIME: 10:20 PM

USER: cafarm
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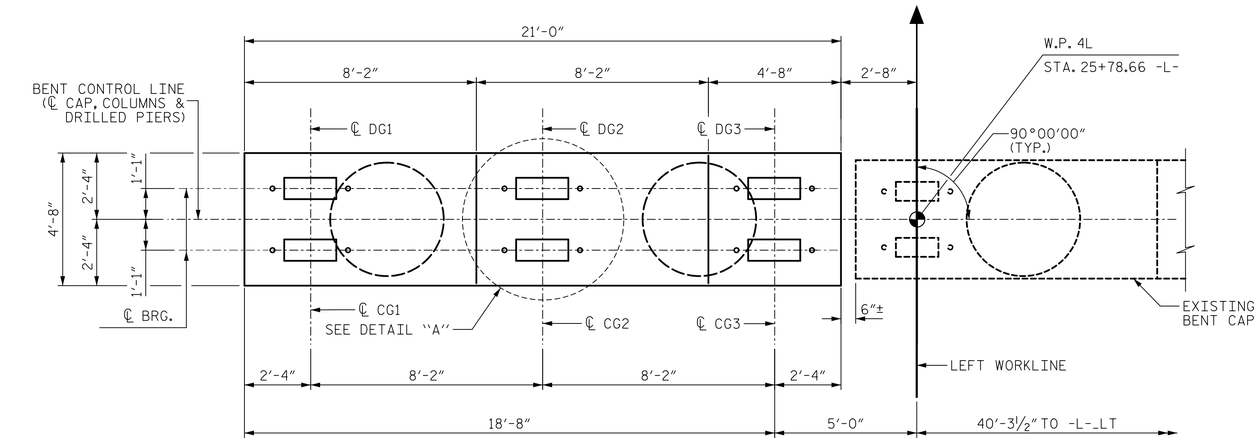
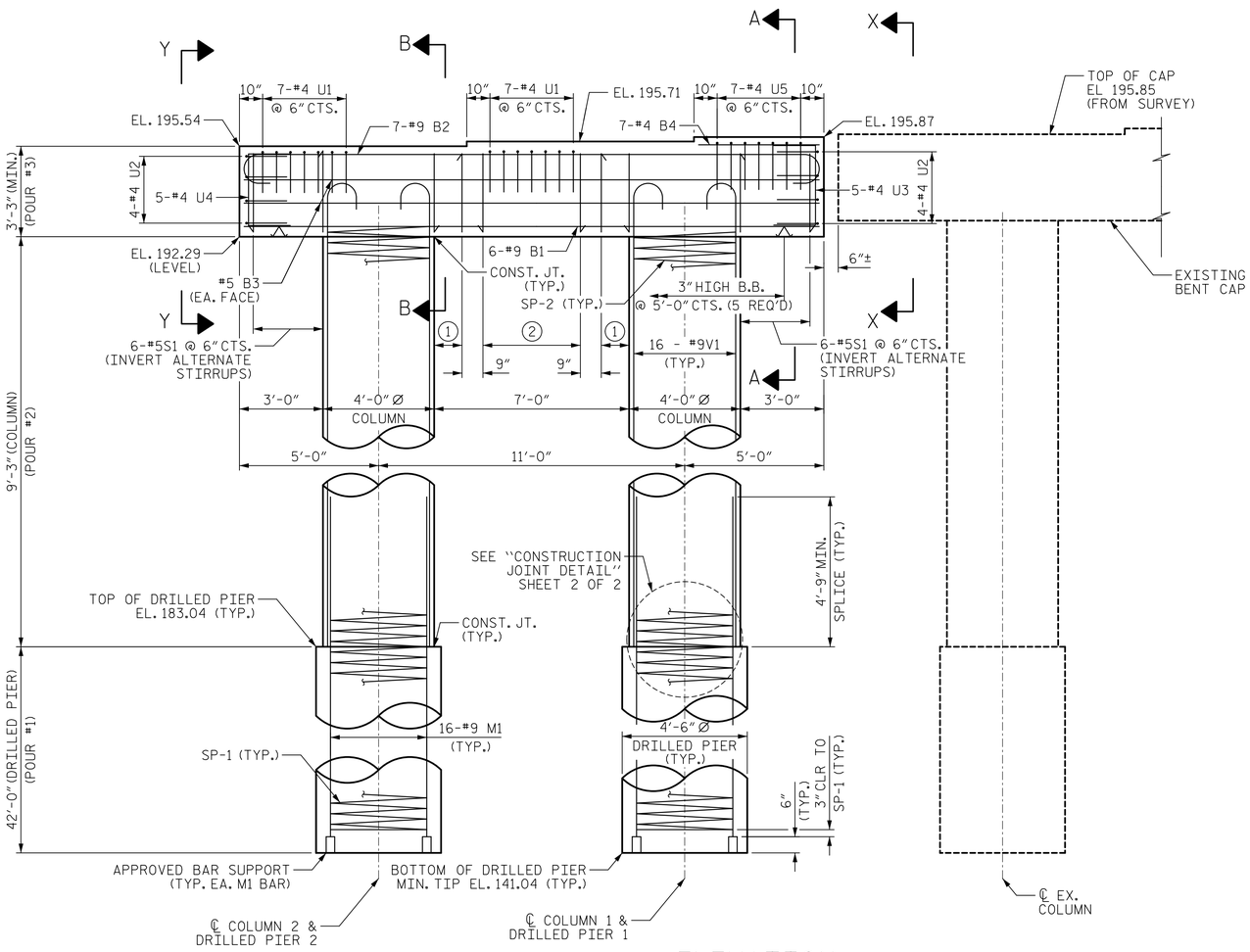


PLAN



ELEVATION

SPAN D

SPAN C

NOTES:

STIRRUPS AND "U" BARS IN CAP MAY BE SHIFTED AS NECESSARY TO CLEAR ANCHOR BOLTS.

HOOKS ON "V" BARS MAY BE TURNED AS NECESSARY FOR PLACING REINFORCING STEEL.

ALL STEEL IN THE DRILLED PIERS IS INCLUDED IN THE PAY ITEMS FOR "REINFORCING STEEL" AND "SPIRAL COLUMN REINFORCING STEEL".

DRILLED PIERS SHALL BE TERMINATED ONE FOOT± BELOW GROUND LINE.

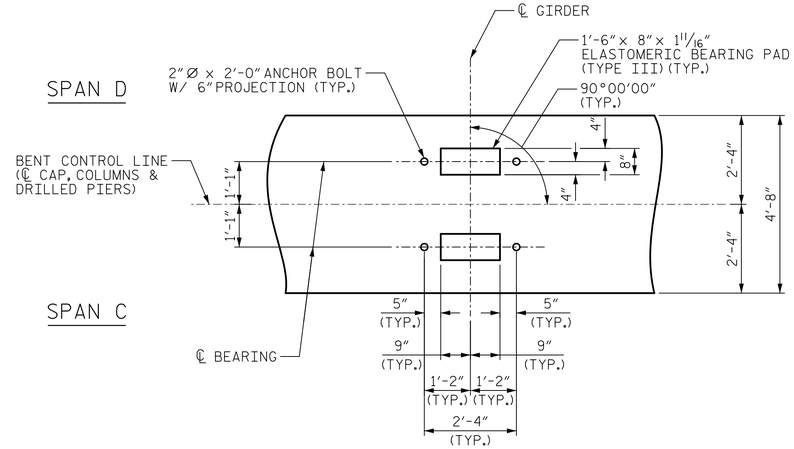
THE CONTRACTOR'S ATTENTION IS CALLED TO THE FACT THAT THE LONGITUDINAL REINFORCEMENT FOR THE DRILLED PIERS IS DETAILED WITH 3 FEET OF EXTRA LENGTH.

FOR DRILLED PIERS, SEE SECTION 411 OF THE STANDARD SPECIFICATIONS.

THE TOP SURFACE AREA OF THE BENT CAPS SHALL BE CURED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS EXCEPT THE MEMBRANE CURING COMPOUND METHOD SHALL NOT BE USED.

SPAN D

SPAN C



DETAIL "A"
TYP. EA. BEARING

1. 2-#5S1 @ 6"CTS.
(INVERT ALTERNATE STIRRUPS)
2. 7-#5S1 @ 9"CTS.
(INVERT ALTERNATE STIRRUPS)

PROJECT NO. U-5748
WAKE COUNTY
STATION: 24+88.00 -L-

SHEET 1 OF 2

DRAWN BY : M. CATER	DATE : 12/2022
CHECKED BY : J. MORRISON	DATE : 12/2022
DESIGNED BY : B. LEROY	DATE : 11/2022
DESIGN CHECKED BY : J. MORRISON	DATE : 11/2022

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DocuSigned by: John C. Morrison 2/10/2023
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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SUBSTRUCTURE

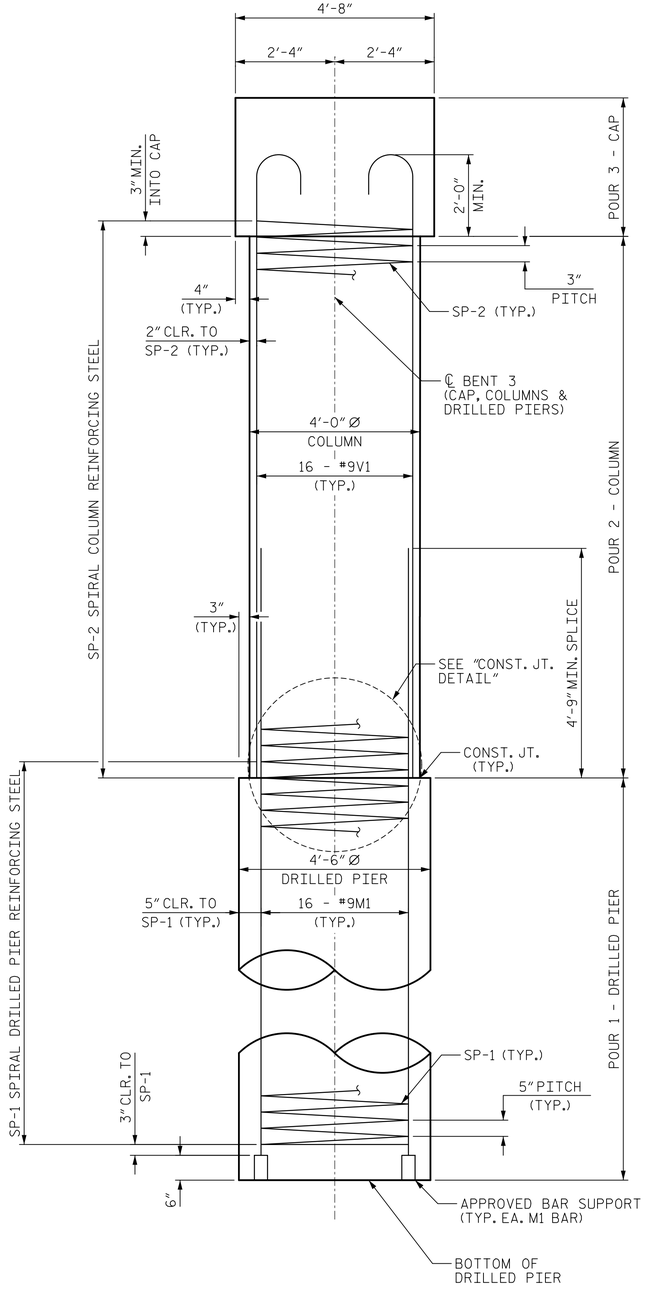
BENT 3

(SOUTHBOUND LANES)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-43
1			3			TOTAL SHEETS
2			4			119

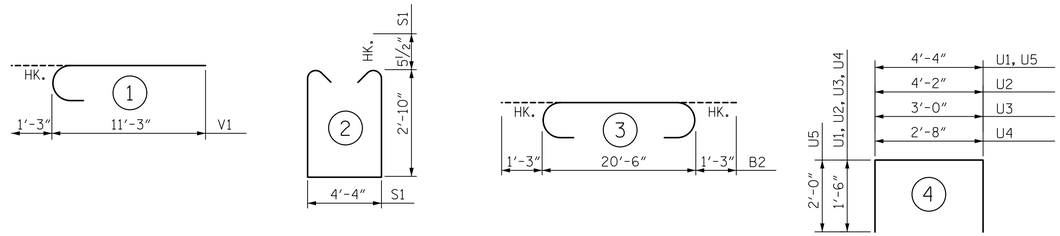
SPAN C

SPAN D



END ELEVATION

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

BENT 3

BAR	No.	SIZE	TYPE	LENGTH	WEIGHT
B1	6	9	STR	20'-8"	422
B2	7	9	3	23'-0"	547
B3	6	5	STR	20'-8"	129
B4	7	4	STR	4'-4"	20
M1	32	9	STR	49'-3"	5,358
V1	32	9	1	12'-6"	1,360
S1	23	5	2	10'-11"	262
U1	14	4	4	7'-4"	69
U2	8	4	4	7'-2"	38
U3	5	4	4	6'-0"	20
U4	5	4	4	5'-8"	19
U5	7	4	4	8'-4"	39
SP-1	2	**	5	1147'-2"	2,393
SP-2	2	*	6	449'-4"	600

REINFORCING STEEL	8,283 LBS.
SPIRAL COLUMN REINFORCING STEEL	2,993 LBS.

CLASS A CONCRETE BREAKDOWN

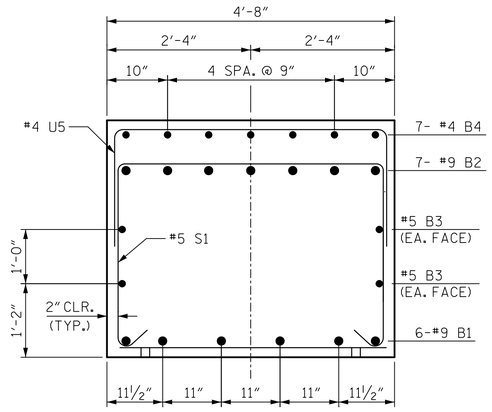
POUR #2 (COLUMNS)	8.6 C.Y.
POUR #3 (CAP)	12.2 C.Y.
TOTAL CLASS A CONCRETE	20.8 C.Y.

DRILLED PIERS

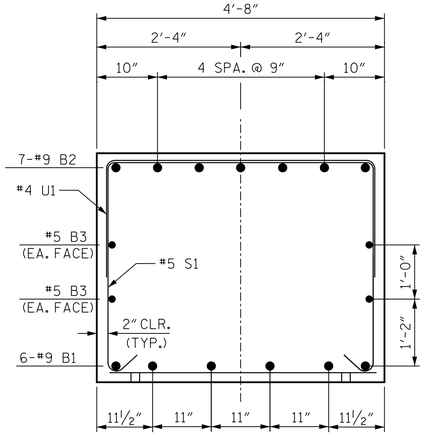
DRILLED PIER CONCRETE POUR 1 (DRILLED PIERS)	49.5 C.Y.

** THE "SP-1" SPIRAL REINFORCING STEEL SHALL BE W21 OR D-31 COLD DRAWN WIRE OR #5 PLAIN OR DEFORMED BAR.

* THE "SP-2" SPIRAL REINFORCING STEEL SHALL BE W20 OR D-20 COLD DRAWN WIRE OR #4 PLAIN OR DEFORMED BAR.



SECTION A-A



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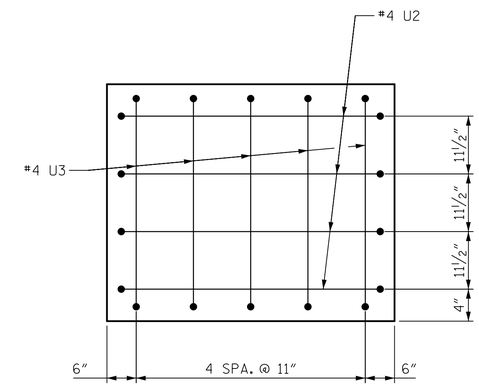
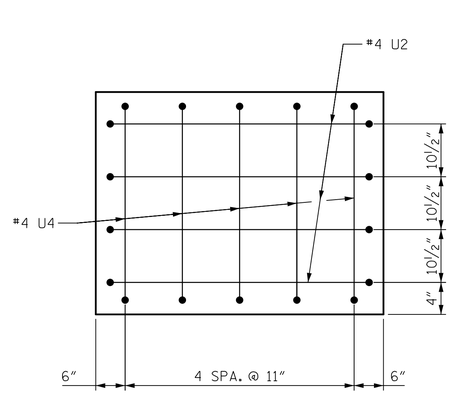
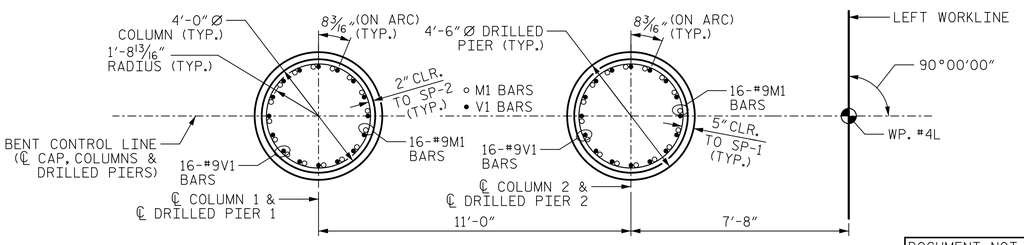


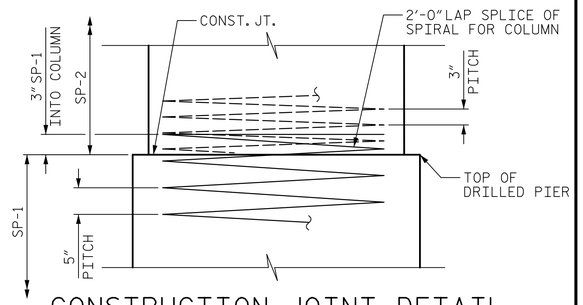
VIEW X-X



VIEW Y-Y



PLAN OF DRILLED PIERS & COLUMNS



CONSTRUCTION JOINT DETAIL

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

SHEET 2 OF 2

DRAWN BY : M. CATER DATE : 12/2022
CHECKED BY : J. MORRISON DATE : 12/2022
DESIGNED BY : B. LEROY DATE : 11/2022
DESIGN CHECKED BY : J. MORRISON DATE : 11/2022

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NORTH CAROLINA PROFESSIONAL SEAL 030474 ENGINEER JOHN C. MORRISON
DocuSigned by: John C. Morrison 2/10/2023
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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

SUBSTRUCTURE

BENT 3

(SOUTHBOUND LANES)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-44
1			3			TOTAL SHEETS
2			4			119

DATE: 2/9/2023
TIME: 10:04:41 PM

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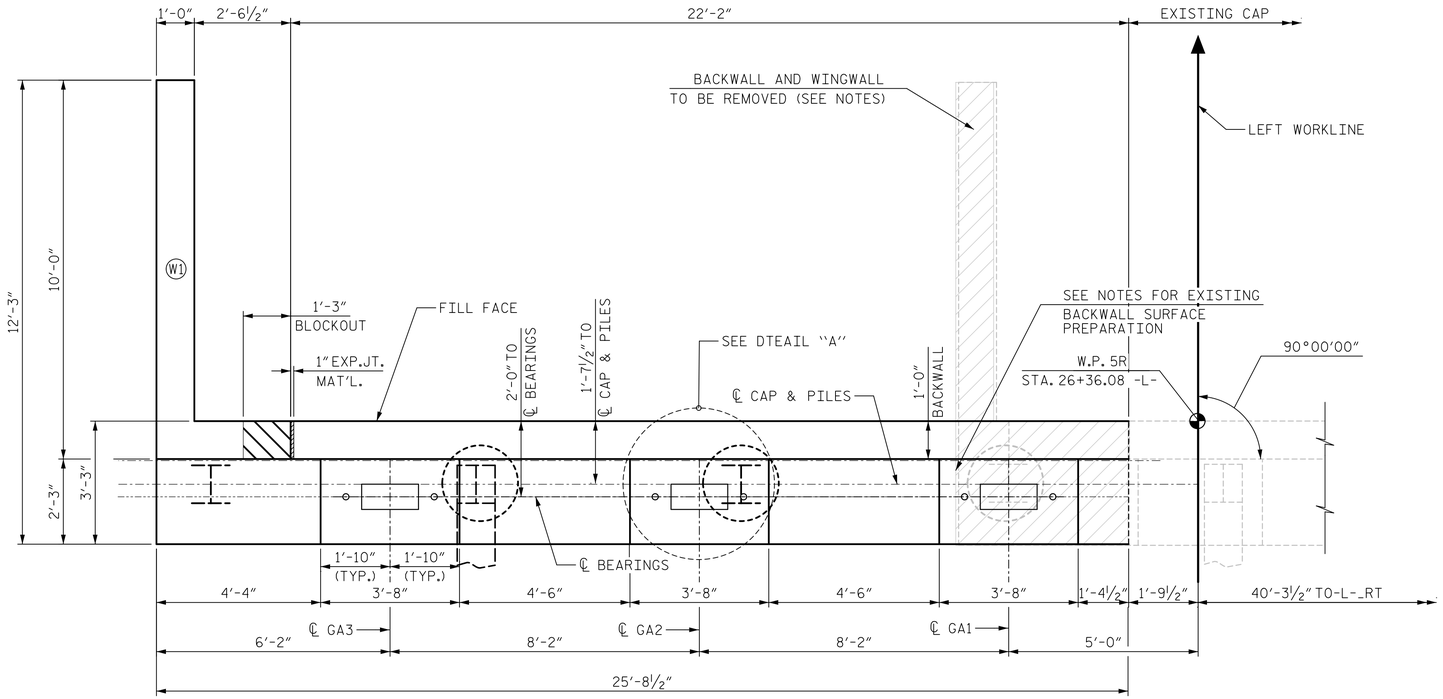


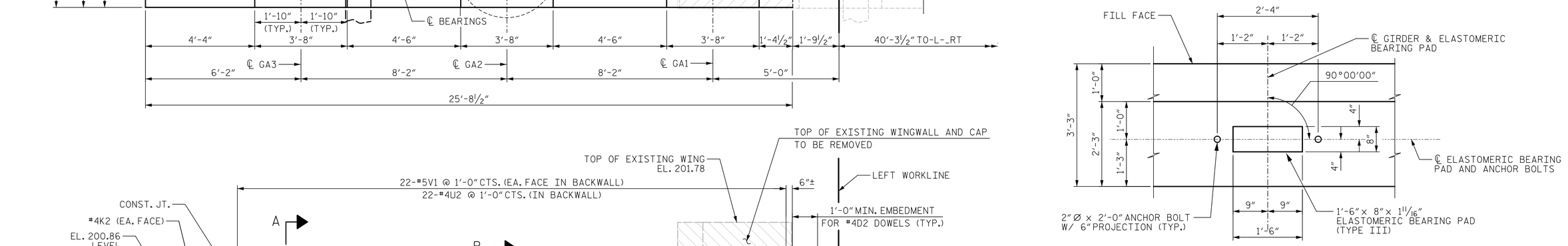
NOTES:

FOR ADDITIONAL NOTES AND PILE SPLICE DETAILS, SEE SHEET 3 OF 3.

FOR WINGWALL DETAILS AND SECTION A-A SEE SHEET 2 OF 3.

INDICATES 3:12 PILE BATTER IN DIRECTION SHOWN.

DENOTES LIMIS OF REMOVAL OF EXISTING CAP, BACKWALL AND WINGWALL



ELEVATION

FOR ELEVATIONS BETWEEN BRIDGE SEATS, SEE SECTION A-A, SHEET 2 OF 3

** REMOVE EXISTING CONCRETE COLLAR TO DESIRED CAP ELEVATION

DETAIL "A"

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

SHEET 1 OF 3

DRAWN BY : A.R. VAN VUREN	DATE : 12/2022
CHECKED BY : J.C. MORRISON	DATE : 12/2022
DESIGNED BY : A.R. VAN VUREN	DATE : 12/2022
DESIGN CHECKED BY : J.C. MORRISON	DATE : 12/2022

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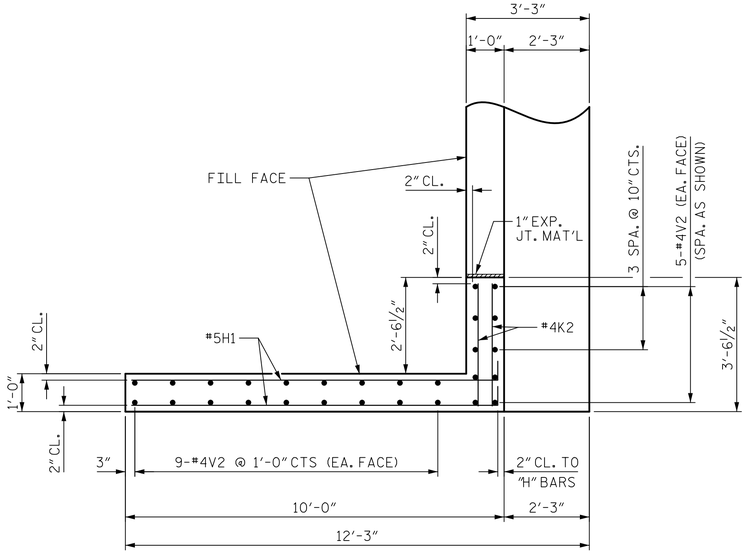
SUBSTRUCTURE

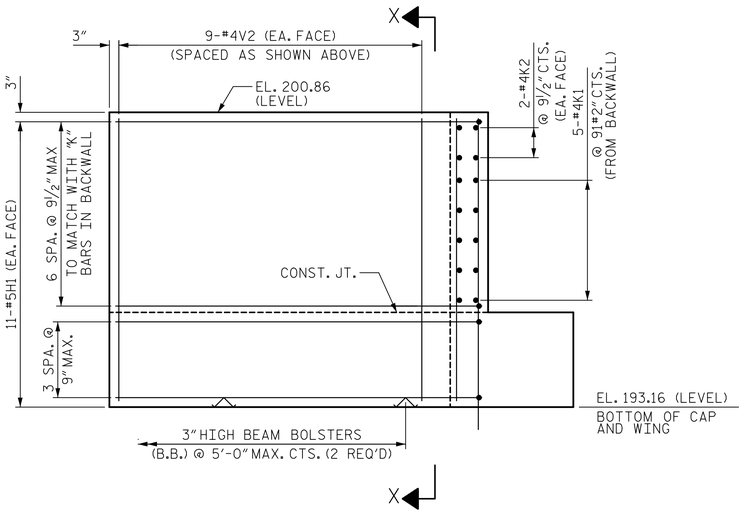
END BENT 2

(SOUTHBOUND LANES)

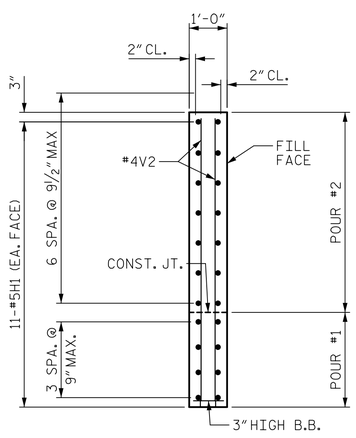
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-45
1			3			TOTAL SHEETS
2			4			119



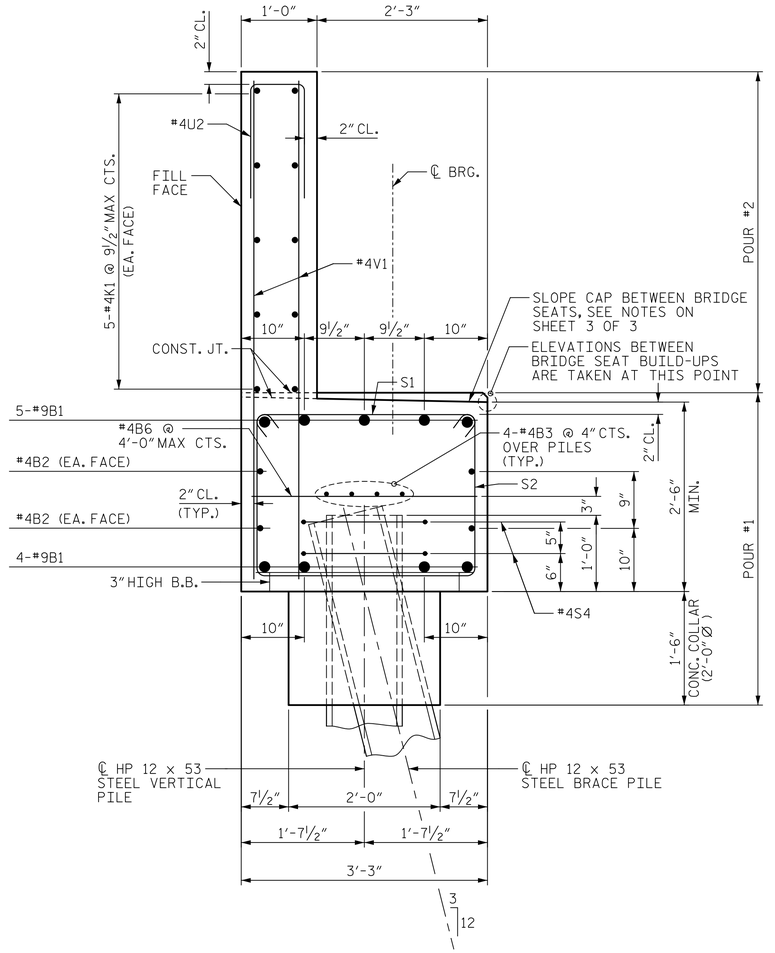
PLAN OF WING W1



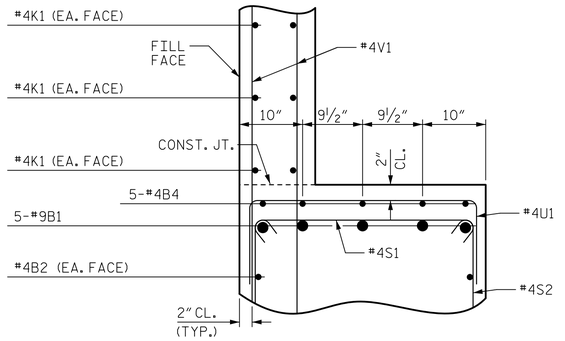
ELEVATION OF WING W2



SECTION X-X



SECTION A-A



SECTION B-B

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

SHEET 2 OF 3

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SUBSTRUCTURE

END BENT 2

(SOUTHBOUND LANES)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-46
1			3			TOTAL SHEETS
2			4			119

DRAWN BY :	A.R. VAN VUREN	DATE :	12/2022
CHECKED BY :	J.C. MORRISON	DATE :	12/2022
DESIGNED BY :	A.R. VAN VUREN	DATE :	12/2022
DESIGN CHECKED BY :	J.C. MORRISON	DATE :	12/2022

DATE: 2/9/2023
TIME: 10:08:3 PM

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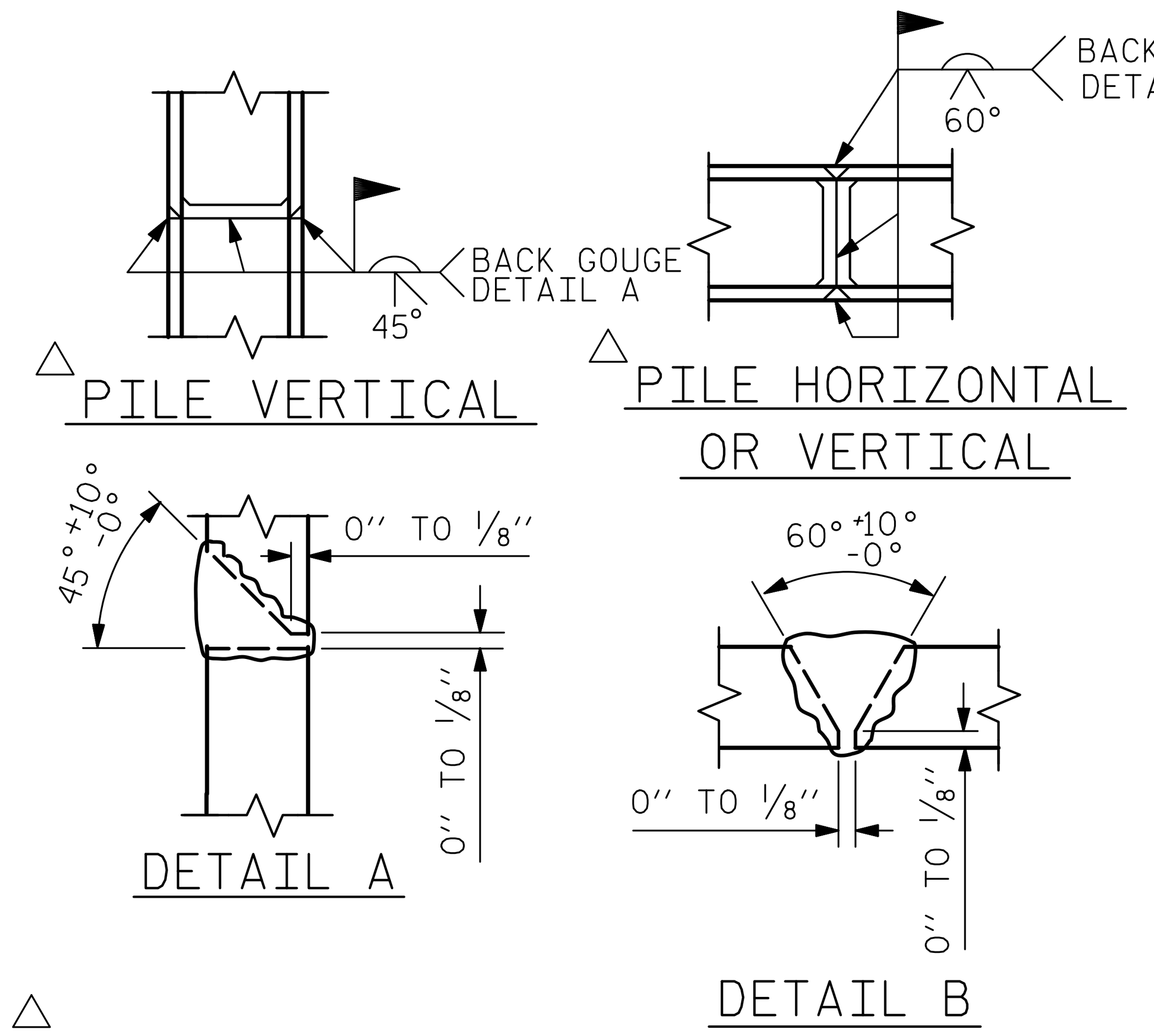
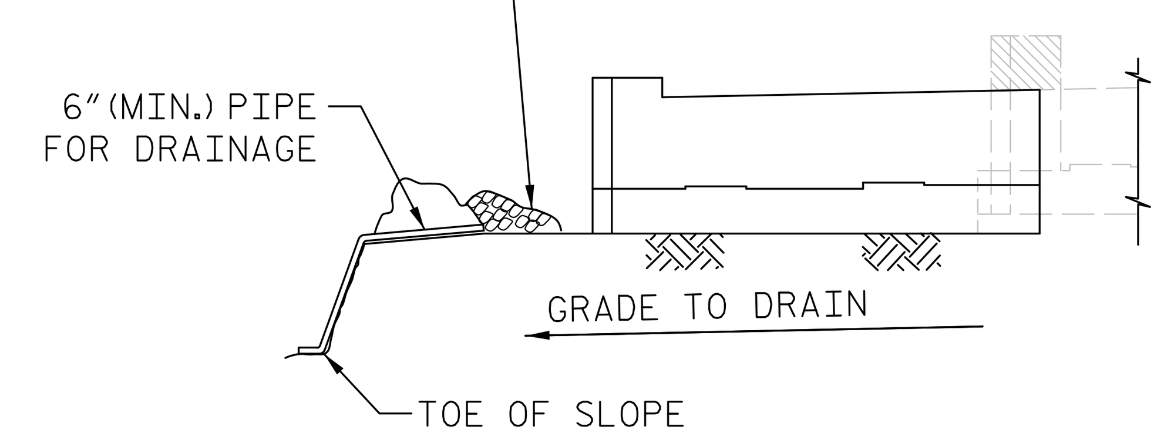


△ POSITION OF PILE DURING WELDING.

PILE SPLICE DETAILS



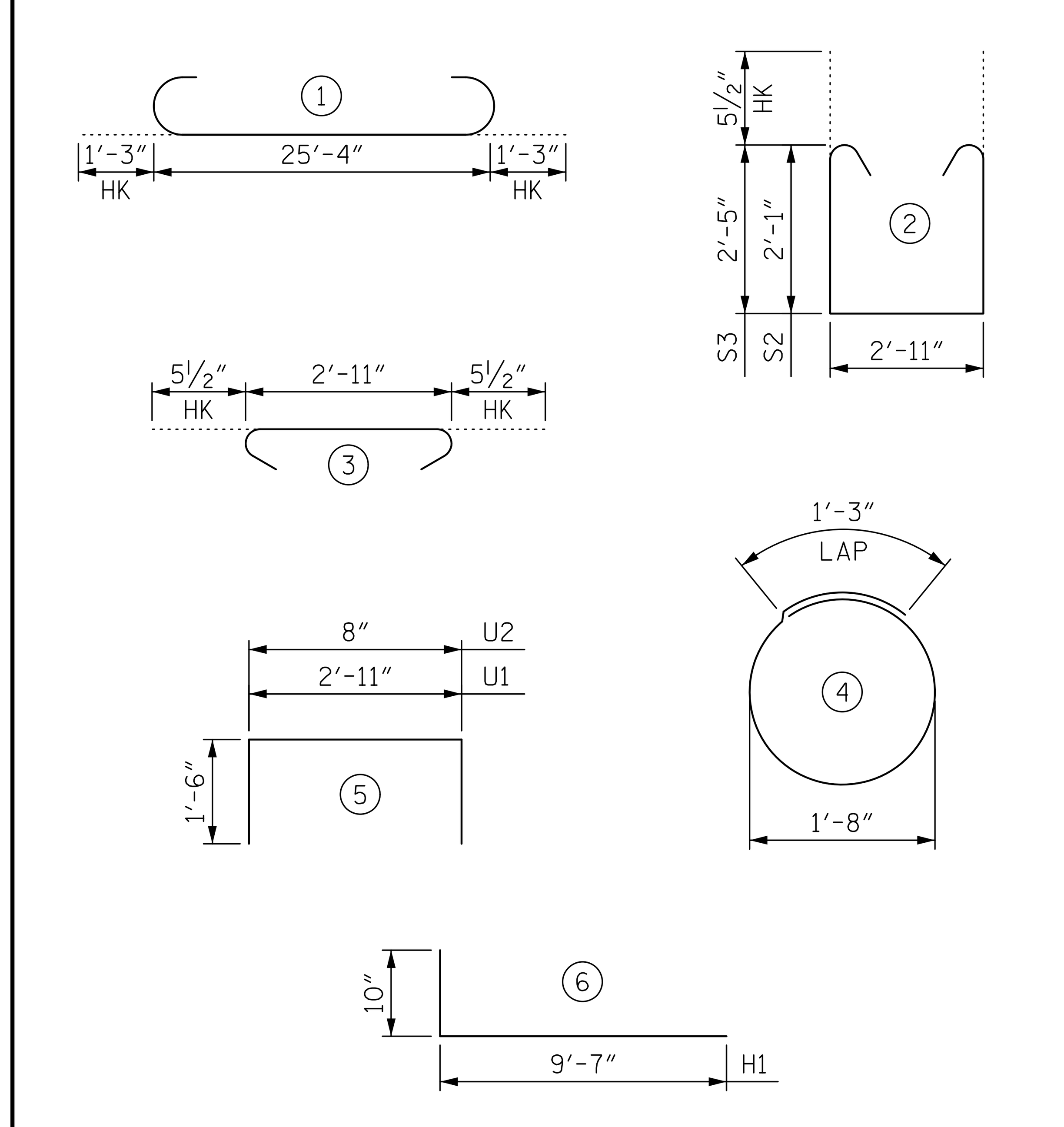
BAGGED STONE AND PIPE SHALL BE PLACED IMMEDIATELY AFTER COMPLETION OF END BENT EXCAVATION. PIPE MAY BE EITHER CONCRETE, CORRUGATED STEEL, CORRUGATED ALUMINUM ALLOY, OR CORRUGATED PLASTIC. PERFORATED PIPE WILL NOT BE ALLOWED.

BAGGED STONE SHALL REMAIN IN PLACE UNTIL THE ENGINEER DIRECTS THAT IT BE REMOVED. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF SILT ACCUMULATIONS AT BAGGED STONE WHEN SO DIRECTED BY THE ENGINEER. BAGS SHALL BE REMOVED AND REPLACED WHENEVER THE ENGINEER DETERMINES THAT THEY HAVE DETERIORATED AND LOST THEIR EFFECTIVENESS.

NO SEPARATE PAYMENT WILL BE MADE FOR THIS WORK AND THE ENTIRE COST OF THIS WORK SHALL BE INCLUDED IN THE UNIT CONTRACT PRICE FOR THE SEVERAL PAY ITEMS.

TEMPORARY DRAINAGE AT END BENT 2

BAR TYPE



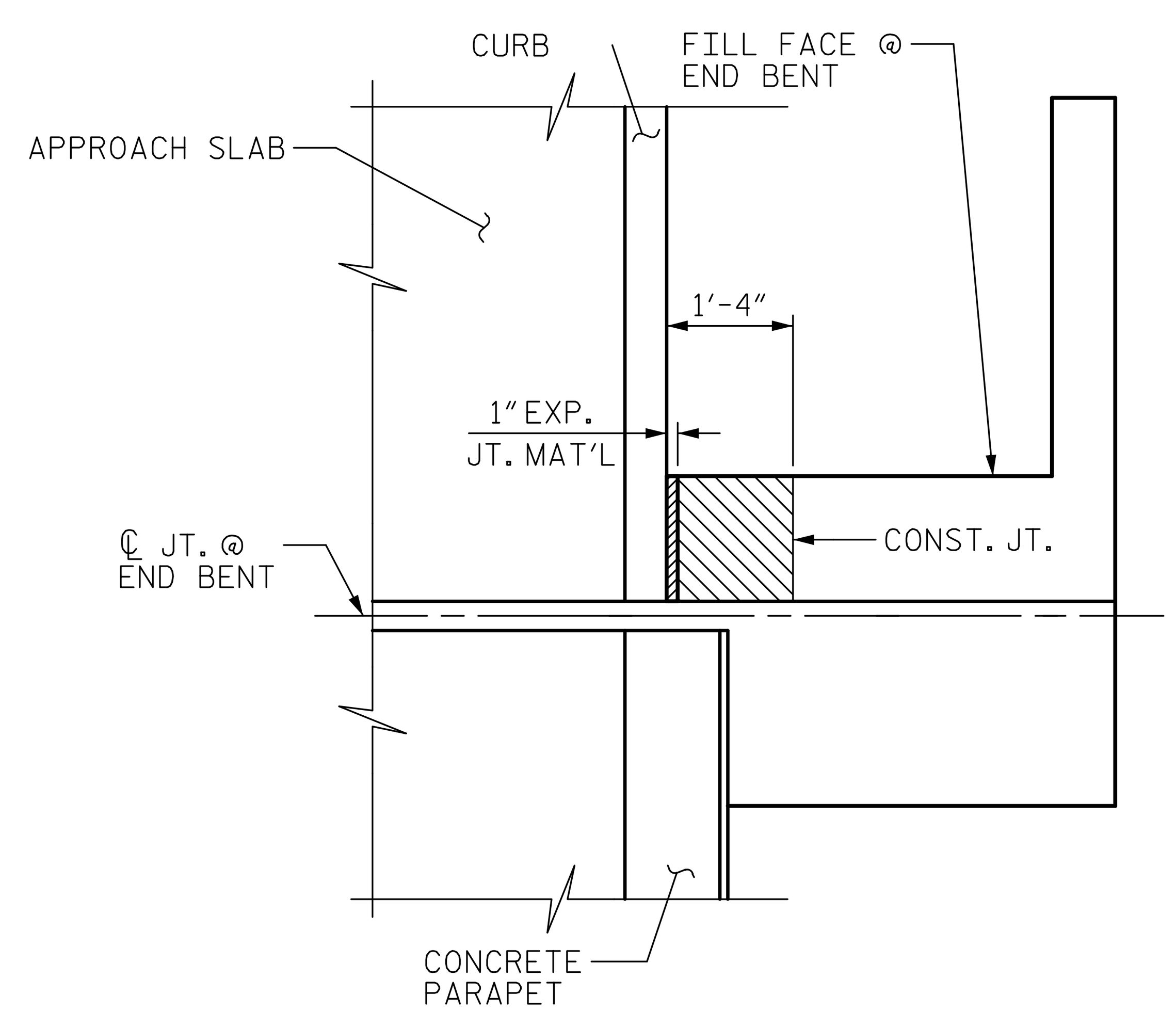
ALL BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL

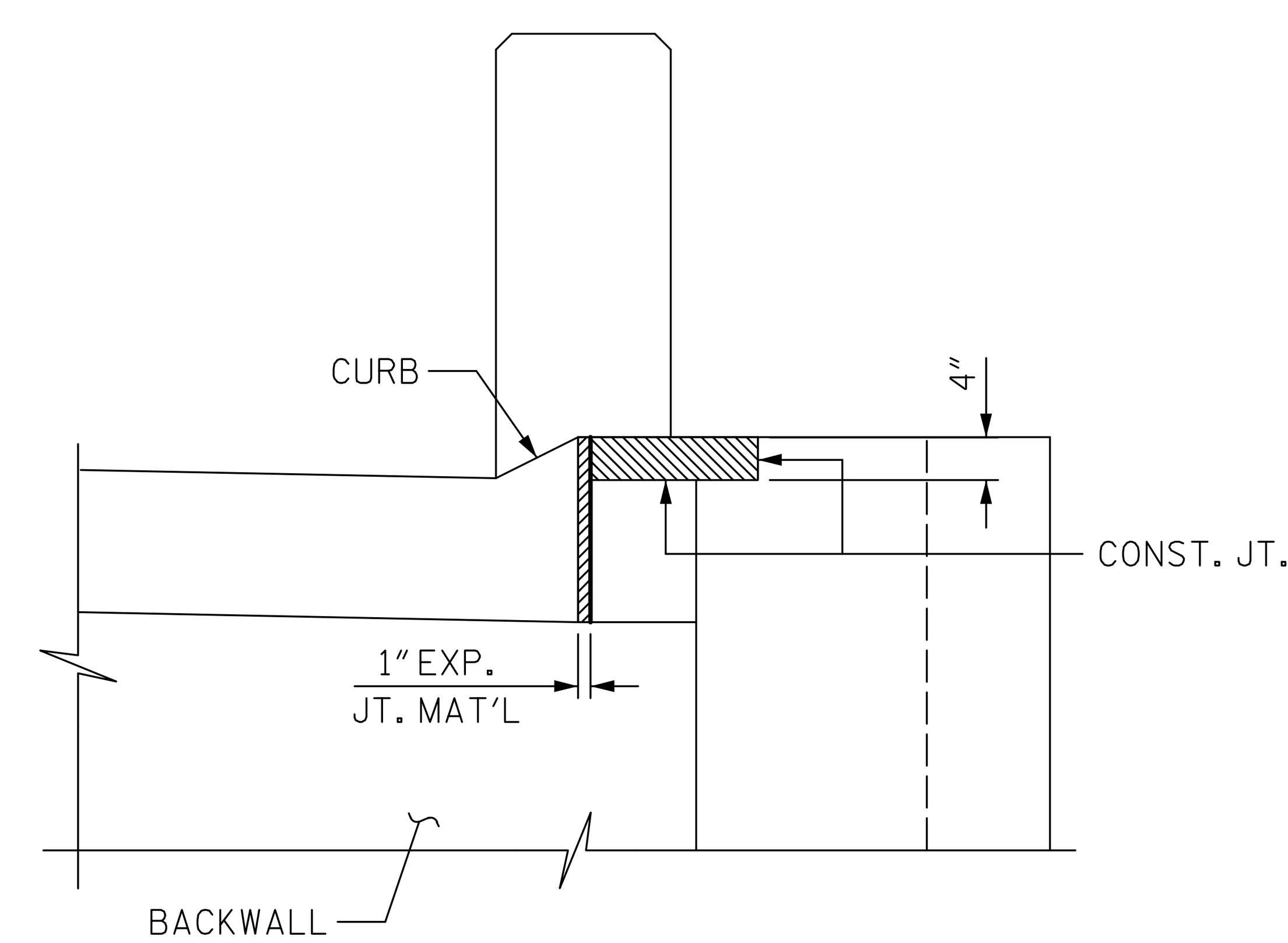
END BENT 2

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
B1	9	#9	1	27'-11"	854
B2	4	#5	STR	25'-5"	106
B3	4	#4	STR	25'-5"	68
B4	5	#4	STR	3'-4"	11
B5	5	#4	STR	4'-9"	16
B6	7	#4	STR	2'-11"	14
D1	4	#9	STR	7'-6"	102
D2	4	#4	STR	3'-0"	8
H1	24	#5	6	10'-5"	239
K1	12	#4	STR	25'-9"	206
K2	4	#4	STR	3'-3"	9
S1	32	#4	3	3'-10"	82
S2	26	#4	2	8'-0"	139
S3	6	#4	2	8'-10"	54
S4	8	#4	4	6'-6"	35
U1	6	#4	5	5'-11"	24
U2	22	#4	5	3'-8"	54
V1	44	#5	STR	5'-11"	272
V2	28	#4	STR	7'-5"	139

REINFORCING STEEL	2,612 LBS.
CLASS A CONCRETE	
POUR #1 (CAP, COLLARS & LOWER WINGWALLS)	9.1 C.Y.
POUR #2 (BACKWALL & UPPER WINGWALL)	5.7 C.Y.
TOTAL =	14.8 C.Y.



PLAN



ELEVATION

BLOCKOUT IN WINGWALL

NOTES:

REMOVE EXISTING CAP, BACKWALL AND WINGWALL AS SHOWN AND REPAIR WITH CLASS A CONCRETE OR GROUT FOR STRUCTURES. THE COST OF CLASS A CONCRETE OR GROUT SHALL BE CONSIDERED INCIDENTAL TO THE LUMP SUM COST FOR REMOVAL OF EXISTING STRUCTURE.

FACE OF EXISTING END BENT CAP AND BACKWALL SHALL BE ROUGHENED TO 1/4" MIN. AMPLITUDE PRIOR TO PLACEMENT OF PROPOSED END BENT CAP OR BACKWALL.

THE CONTRACTOR SHALL USE AN ADHESIVE ANCHOR SYSTEM FOR THE #9D1 DOWELS AND #4D2 DOWELS. LEVEL 1 FIELD TESTING IS REQUIRED. THE YIELD LOAD FOR #9D1 DOWELS IS 60.0 KIPS. THE YIELD LOAD FOR THE #4D2 DOWELS IS 12.0 KIPS. ADHESIVE ANCHOR SYSTEM SHALL DEVELOP 125% OF THE YIELD LOAD OF THE BAR. FOR ADHESIVELY ANCHORED BOLTS OR DOWELS, SEE SECTION 420-13 OF THE STANDARD SPECIFICATIONS.

STIRRUPS AND U1 BARS IN CAP MAY BE SHIFTED AS NECESSARY TO CLEAR ANCHOR BOLTS.

#5 V1 BARS IN BACKWALL SHALL BE PLACED 2" CLEAR FROM TOP OF BACKWALL.

BACKWALL SHALL BE PLACED BEFORE APPLYING THE EPOXY PROTECTIVE COATING.

THE TOP SURFACE OF THE END BENT CAP, EXCEPT THE BRIDGE SEAT BUILDUPS, SHALL BE SLOPED TRANSVERSELY FROM THE FILL FACE TO THE FRONT FACE AT THE RATE OF 2%.

THE TOP SURFACE AREAS OF THE END CAP SHALL BE CURED IN ACCORDANCE WITH THE STANDARD, EXCEPT THE MEMBRANE CURING COMPOUND METHOD SHALL NOT BE USED.

THE CONCRETE IN THE SHADED AREA OF THE WINGWALL SHALL BE POURED AFTER THE JOINT BETWEEN THE DECK AND THE APPROACH SLAB HAS BEEN SAWED AND PARAPET IS CAST IF SLIP FORMING IS USED.

FOR WING DETAILS, SEE SHEET 2 OF 3.

PROJECT NO. U-5748
WAKE COUNTY
STATION: 24+88.00 -L-

SHEET 3 OF 3

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DEPARTMENT OF TRANSPORTATION
RALEIGH

SUBSTRUCTURE

END BENT 2

(SOUTHBOUND LANES)

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

REVISIONS

SHEET NO. S2-47
TOTAL SHEETS 119

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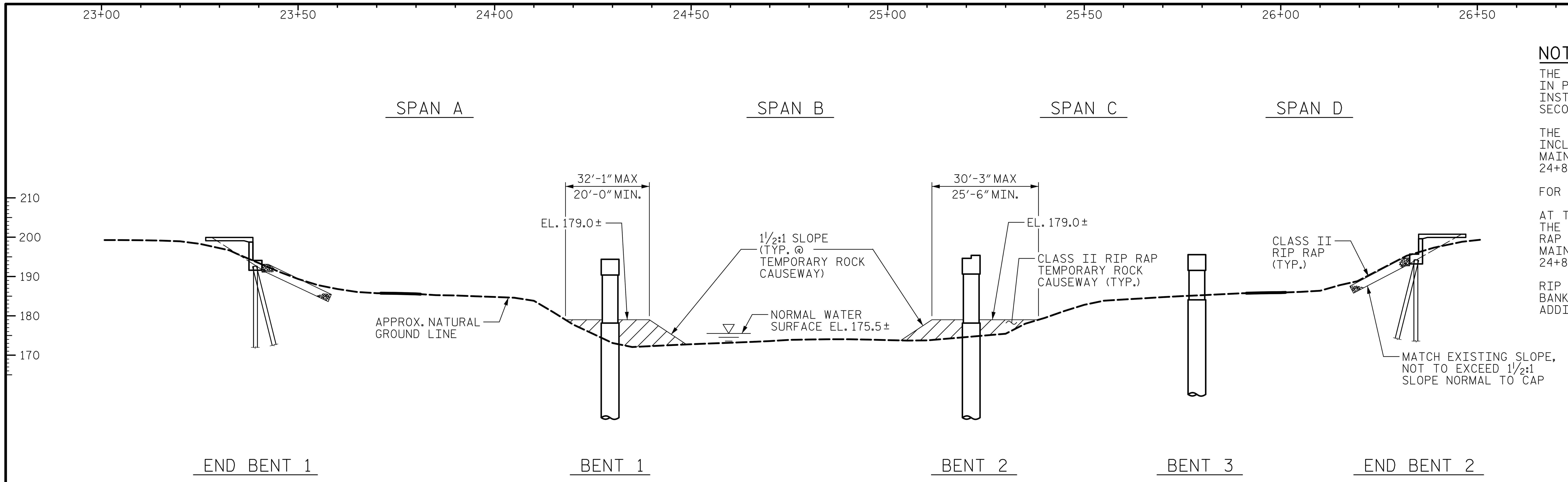
CHECKED BY :	J.C. MORRISON	DATE :	12/2022
DESIGNED BY :	A.R. VAN VUREN	DATE :	12/2022
DESIGN CHECKED BY :	J.C. MORRISON	DATE :	12/2022



SECTION ALONG LEFT WORKLINE

NOTES:

THE TEMPORARY ROCK CAUSEWAYS AT BENT 1 AND BENT 2 SHALL NOT BE IN PLACE AT THE SAME TIME. THE FIRST TEMPORARY ROCK CAUSEWAY INSTALLED MUST BE COMPLETELY REMOVED PRIOR TO INSTALLING THE SECOND TEMPORARY ROCK CAUSEWAY.

THE COST OF INSTALLING AND REMOVING TEMPORARY ROCK CAUSEWAY IS INCLUDED IN THE LUMP SUM BID PRICE FOR CONSTRUCTION, MAINTENANCE, AND REMOVAL OF TEMPORARY ACCESS AT STATION 24+88.00 -L-.

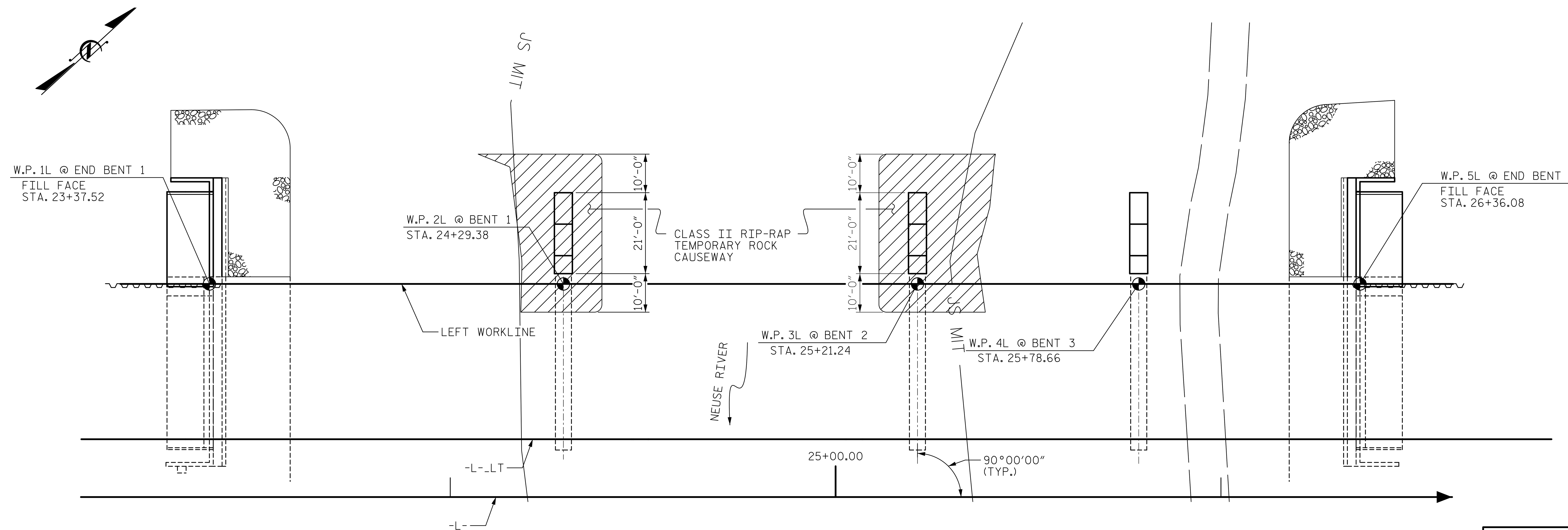
FOR TEMPORARY ROCK CAUSEWAY, SEE SPECIAL PROVISIONS.

AT THE CONTRACTOR'S OPTION, AND UPON REMOVAL OF THE CAUSEWAY, THE CLASS II RIP RAP USED IN THE CAUSEWAY MAY BE PLACED AS RIP RAP SLOPE PROTECTION. SEE SPECIAL PROVISIONS FOR CONSTRUCTION, MAINTENANCE, AND REMOVAL OF TEMPORARY ACCESS AT STATION 24+88.00 -L-.

RIP RAP USED FOR TEMPORARY ROCK CAUSEWAY MAY BE USED FOR FINAL BANK STABILIZATION. SEE ROADWAY PLAN SHEET PSH 04 FOR ADDITIONAL INFORMATION.

ESTIMATED QUANTITIES

CLASS II RIP RAP FOR TEMPORARY ROCK CAUSEWAY (SBL) (TONS)		
BENT 1	BENT 2	TOTAL
352	416	768



PLAN

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

SHEET 1 OF 1

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RALEIGH

TEMPORARY ROCK CAUSEWAY (SOUTHBOUND LANES)

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 030474 JOHN C. MORRISON

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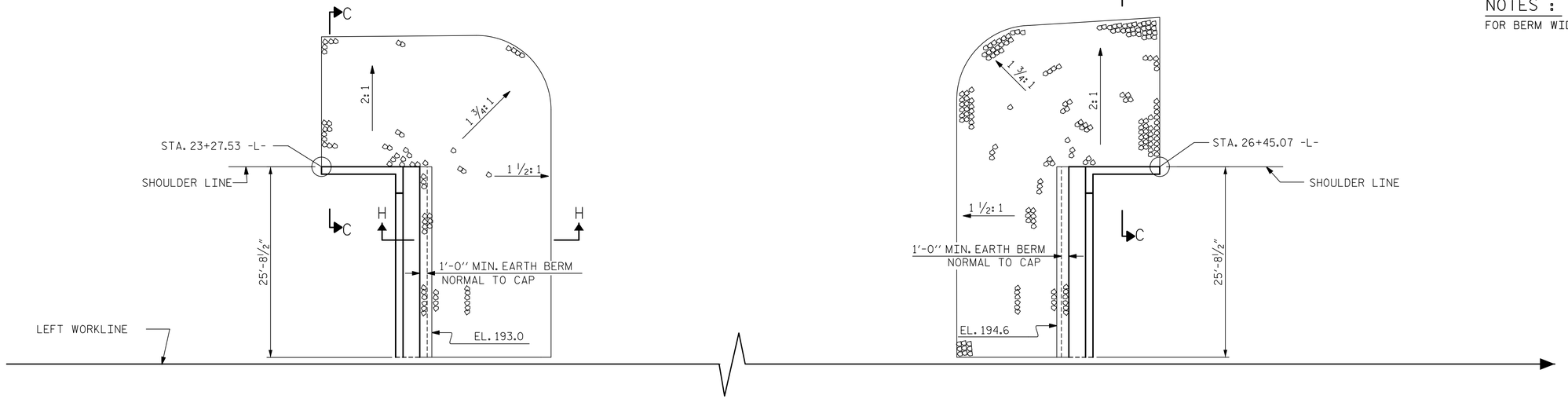
1				3				TOTAL SHEETS
2				4				119

DRAWN BY :	A.R. VAN VUREN	DATE :	12/2022
CHECKED BY :	J.C. MORRISON	DATE :	12/2022
DESIGNED BY :	D. RITACCO	DATE :	09/2020
DESIGN CHECKED BY :	J.C. MORRISON	DATE :	09/2020



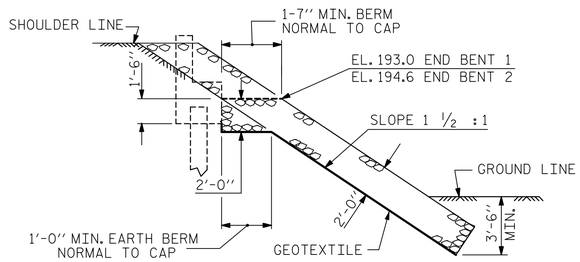
END BENT 1

END BENT 2

NOTES :

FOR BERM WIDTH DIMENSIONS, SEE GENERAL DRAWING.

ESTIMATED QUANTITIES		
BRIDGE @ STA. 24+88.00 -L- LEFT LANE	RIP RAP CLASS II (2'-0" THICK)	GEOTEXTILE FOR DRAINAGE
	TONS	SQUARE YARDS
END BENT 1	112	124
END BENT 2	122	135



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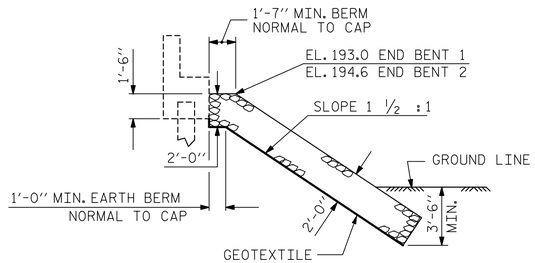
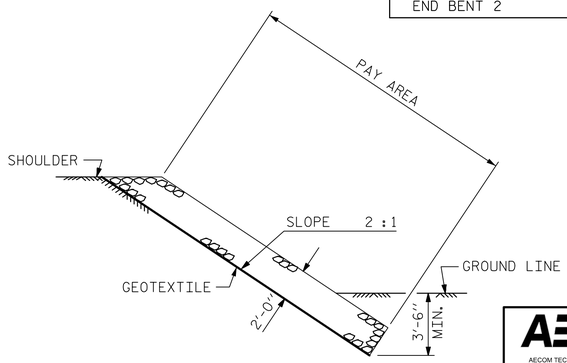


℄ SECTION
BERM RIP RAPPED



SECTION C-C

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

RIP RAP DETAILS

(SOUTHBOUND LANES)

NORTH CAROLINA PROFESSIONAL SEAL 030474 ENGINEER JOHN C. MORRISON

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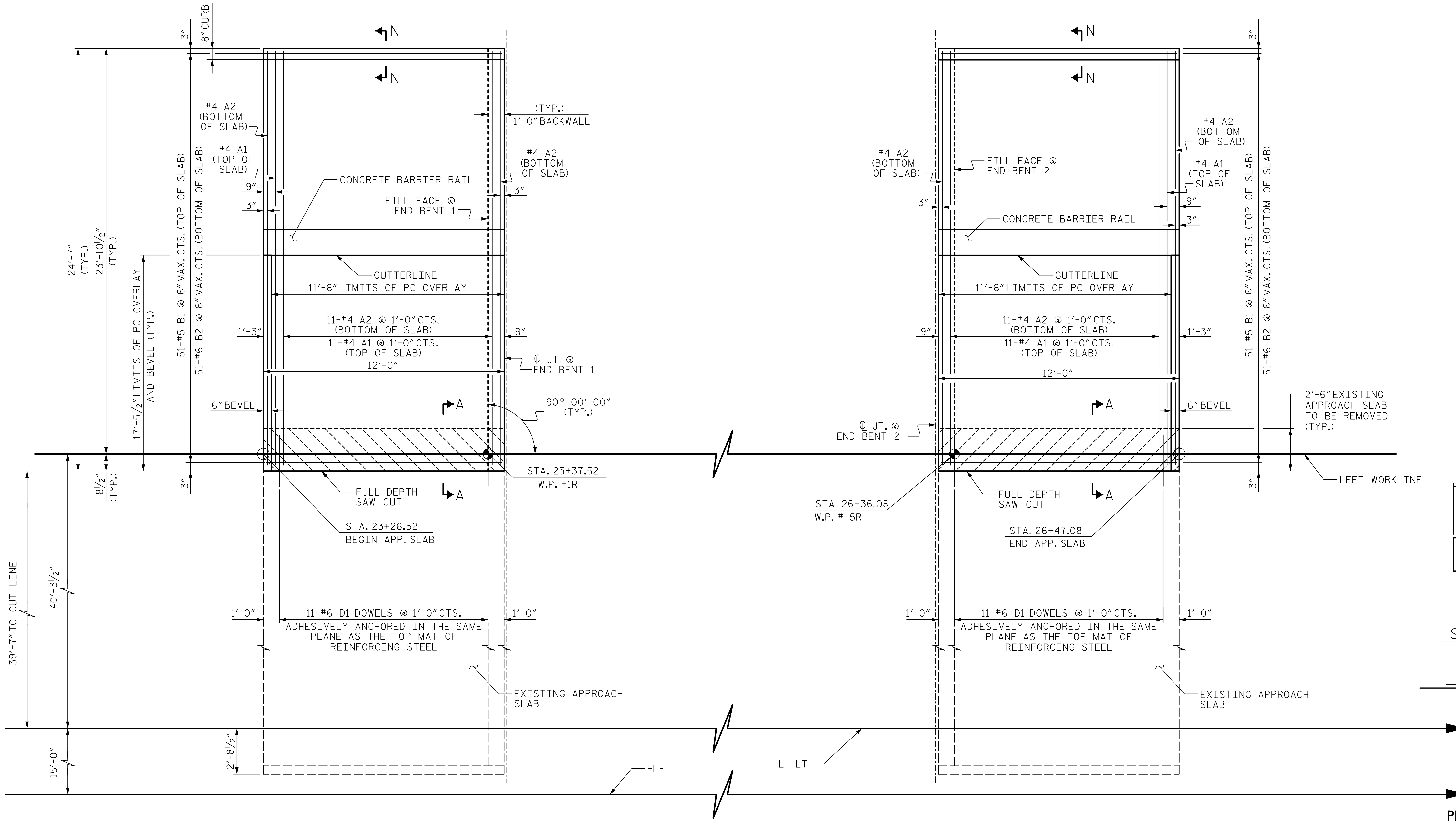
1			3			TOTAL SHEETS
2			4			119

ASSEMBLED BY : A.R. VAN VUREN	DATE : 12/2022
CHECKED BY : J.C. MORRISON	DATE : 12/2022
DRAWN BY : REK 1/84	REV. 10/1/11 MAA/GM
CHECKED BY : RDU 1/84	REV. 12/21/11 MAA/GM
	REV. 12/17 MAA/THC

STD. NO. RR1

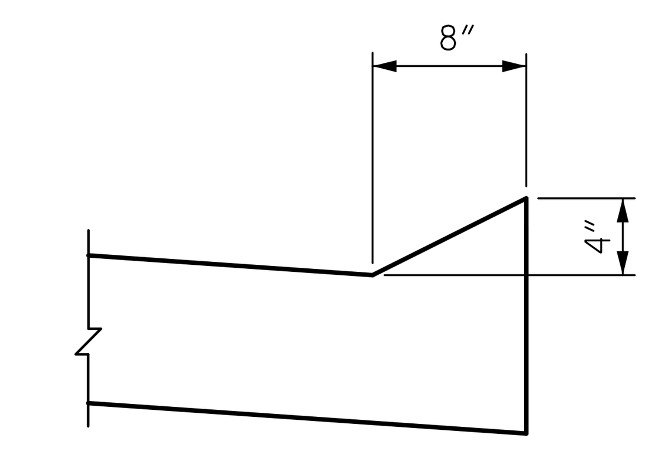
NOTES:

FOR NOTES, SEE SHEET 2 OF 3

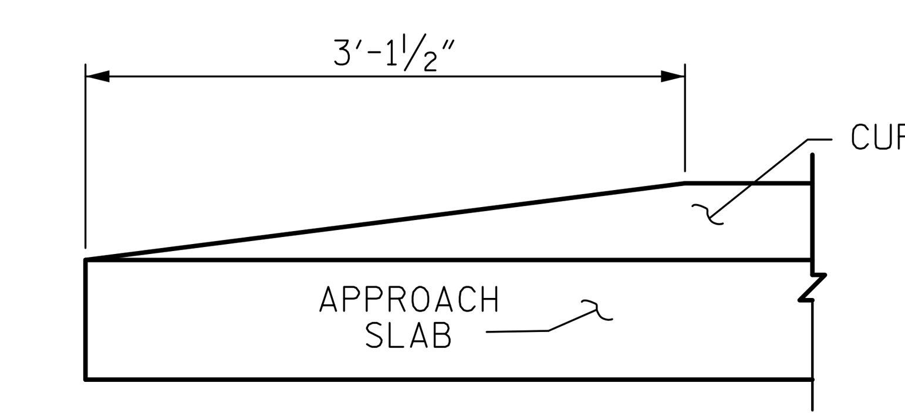


PLAN @ END BENT 1

PLAN @ END BENT 2

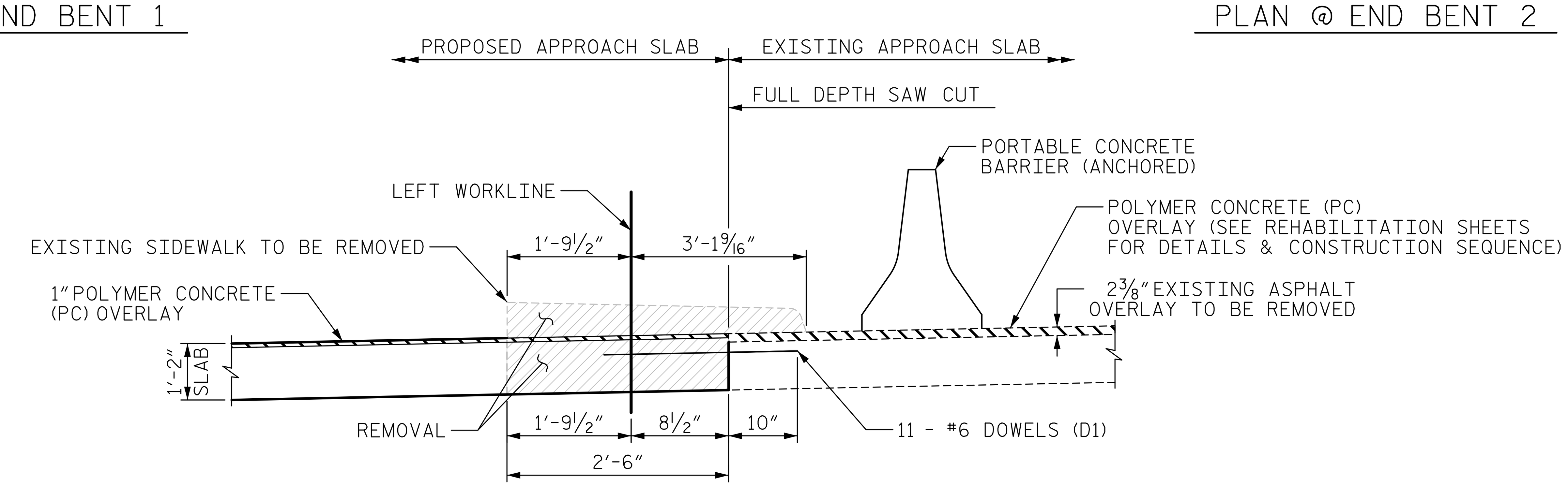


SECTION N-N



END OF CURB WITHOUT SHOULDER BERM GUTTER

CURB DETAILS



SECTION A-A

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

SHEET 1 OF 3

AECOM

AECOM TECHNICAL SERVICES OF NC, INC.
5438 WADE PARK BOULEVARD, SUITE 200
RALEIGH, NC 27607
(919) 854-6200 www.aecom.com
AECOM License No. F-0342

NORTH CAROLINA PROFESSIONAL SEAL 030474 ENGINEER JOHN C. MORRISON

DocuSigned by: John C. Morrison 2/10/2023

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BRIDGE APPROACH SLAB FOR FLEXIBLE PAVEMENT

(SOUTHBOUND LANES)

REVISIONS								SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:			S2-50
1			3					TOTAL SHEETS
2			4					119

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DRAWN BY :	M. CATER	DATE :	08/2021
CHECKED BY :	J.C. MORRISON	DATE :	08/2021
DESIGNED BY :	M. CATER	DATE :	08/2021
DESIGN CHECKED BY :	J.C. MORRISON	DATE :	08/2021

FOR PLAN FOR BRIDGE APPROACH SLAB FOR FLEXIBLE PAVEMENT, SEE SHEET 1 OF 3

NOTES:

FOR REINFORCED BRIDGE APPROACH FILL FABRIC WALL, INCLUDING GEOTEXTILE, IMPERMEABLE GEOMEMBRANE, 4" DIA. DRAINAGE PIPE, #78M STONE, AND SELECT MATERIAL, SEE ROADWAY PLANS.

GEOTEXTILE SHALL BE TYPE 1 IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS SECTION 1056.

EXISTING 4" DIA. CORRUGATED PERFORATED DRAINAGE PIPE SHALL BE EXTENDED. COORDINATE DRAIN EXTENSION WITH CONSTRUCTION SEQUENCING AND TEMPORARY SHORING REQUIREMENTS.

APPROACH SLAB SHALL NOT BE CONSTRUCTED PRIOR TO COMPLETION OF THE BRIDGE DECK.

THE JOINT SHALL BE SAWED PRIOR TO THE CASTING OF THE BARRIER RAIL AND PARAPET AND END POST.

AREA BETWEEN THE WINGWALL AND APPROACH SLAB SHALL BE GRADED TO DRAIN THE WATER AWAY FROM THE FILL FACE OF THE BRIDGE AND SHALL BE PAVED. SEE ROADWAY PLANS.

#6 D1 DOWELS TO BE ADHESIVELY ANCHORED IN THE EXISTING APPROACH SLAB. LEVEL ONE FIELD TESTING IS REQUIRED AND THE YIELD LOAD OF THE DOWELS IS 13.2 KIPS FOR ADHESIVELY ANCHORED ANCHOR BOLTS OR DOWELS, SEE SECTION 420-13 OF THE STANDARD SPECIFICATIONS. OVERALL DOWEL LENGTH SHALL BE DETERMINED BY THE MANUFACTURER OF THE ADHESIVELY ANCHORED ANCHOR SYSTEM. PLAN LENGTH OF #6 D1 DOWELS BASED ON 10" EMBEDMENT.

FOR FOAM JOINT SEALS, SEE SPECIAL PROVISIONS.

THE NOMINAL UNCOMPRESSED SEAL WIDTH OF THE FOAM JOINT SEAL SHALL BE 2".

THE #5 S104 AND S105 BARS SHALL BE INSTALLED, USING AN ADHESIVE ANCHORING SYSTEM, AFTER SAWING THE JOINT. THE YIELD LOAD FOR THE #5 S104 AND S105 BARS IS 18.6 KIPS. FIELD TESTING FOR THE ADHESIVE BONDING SYSTEM IS NOT REQUIRED.

THE COST OF TEMPORARY DRAINAGE AND TEMPORARY BERM AND SLOPE DRAINS WILL BE PAID FOR UNDER THE LUMP SUM PRICE FOR BRIDGE APPROACH SLABS.

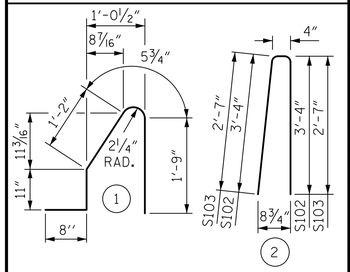
THE COST OF THE BARRIER RAIL ON THE APPROACH SLAB SHALL BE INCLUDED IN THE LINEAR FOOT CONTRACT PRICE BID FOR "CONCRETE BARRIER RAIL".

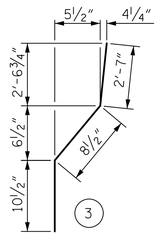
THE BARRIER RAIL ON EACH APPROACH SLAB SHALL NOT BE CAST UNTIL ALL APPROACH SLAB CONCRETE HAS BEEN CAST AND REACHED A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI.

ALL REINFORCING STEEL IN THE BARRIER RAILS SHALL BE EPOXY COATED.

SEE PRESERVATION SHEETS FOR PC OVERLAY DETAILS, QUANTITIES AND CONSTRUCTION SEQUENCING.

BAR TYPES





ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL FOR ONE APPROACH SLAB (2 REQ'D)

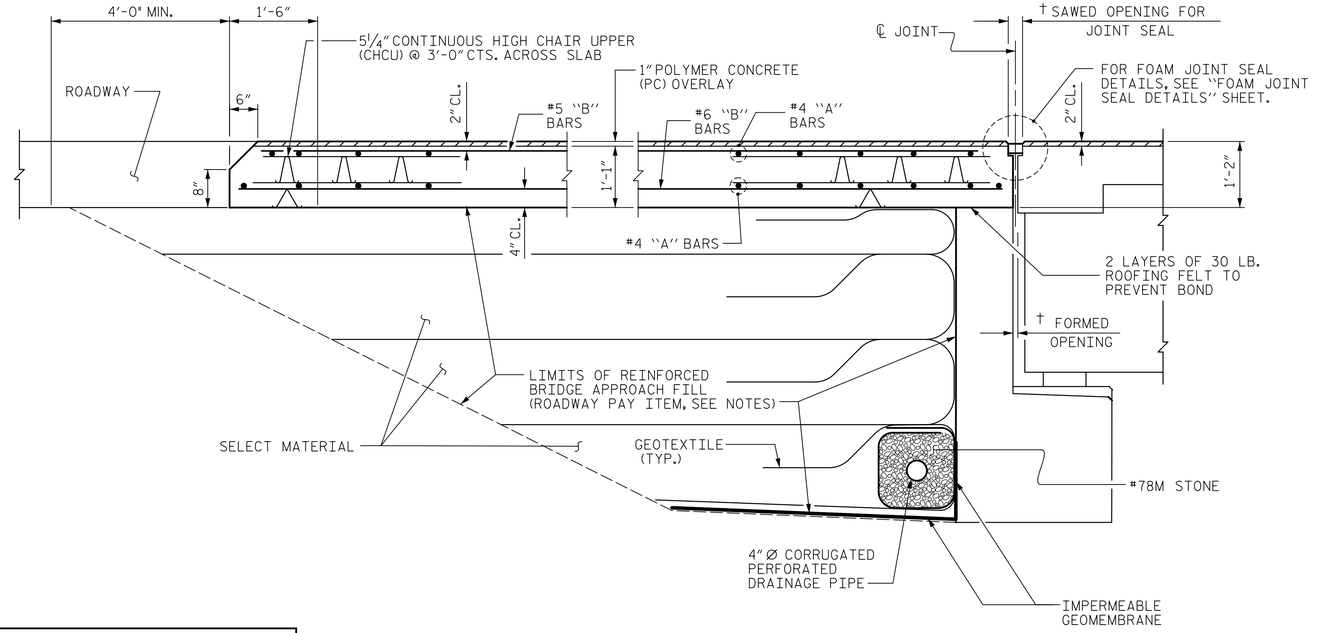
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
✳A1	12	#4	STR	24'-3"	194
A2	14	#4	STR	24'-3"	227
✳B1	51	#5	STR	11'-2"	594
B2	51	#6	STR	11'-8"	894
✳D1	11	#6	STR	2'-4"	39
REINFORCING STEEL				LBS.	1,121
✳EPOXY COATED REINFORCING STEEL				LBS.	827
CLASS AA CONCRETE				C. Y.	13.2

BILL OF MATERIAL FOR ONE BARRIER RAIL (2 REQ'D)

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
✳B101	11	#5	STR	11'-6"	132
✳S101	8	#5	1	5'-0"	42
✳S102	6	#5	2	7'-0"	44
✳S103	2	#5	2	5'-6"	11
✳S104	4	#5	3	4'-2"	17
✳S105	4	#5	STR	3'-4"	14
✳EPOXY COATED REINFORCING STEEL				LBS.	260
CLASS AA CONCRETE				C. Y.	1.7
CONCRETE BARRIER RAIL				LIN. FT.	12.0

SPLICE LENGTHS

BAR SIZE	EPOXY COATED	UNCOATED
#4	2'-0"	1'-9"
#5	2'-6"	2'-2"
#6	3'-10"	2'-7"



SECTION THRU SLAB

PAYMENT FOR BARRIER RAIL TO BE ADDED TO THE LINEAR FOOT QUANTITY ON THE BARRIER RAIL SHEET (BR) AND INCLUDED IN THE "TOTAL BILL OF MATERIAL" ON THE GENERAL DRAWING

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SHEET 2 OF 3

ASSEMBLED BY : M.L. CATER	DATE : 08/2021
CHECKED BY : J.C. MORRISON	DATE : 08/2021
DRAWN BY : FCJ 11/88	REV. 6/13 MAA/GM
CHECKED BY : ARB 11/88	REV. 12/17 MAA/THC
	REV. 5/18 MAA/THC

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

BRIDGE APPROACH SLAB FOR FLEXIBLE PAVEMENT

(SOUTHBOUND LANES)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-51
1			3			TOTAL SHEETS
2			4			119

STD. NO. BAS2

DATE: 2/9/2023
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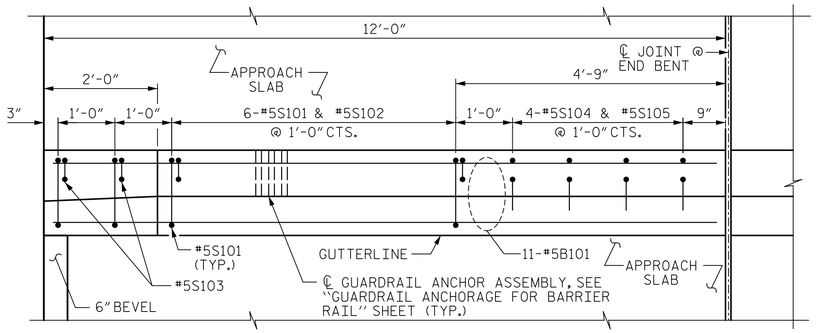
DGN: pw:\\aecom-nc-pw.bentley.com:aECOM_DS2_NA_2020\Documents\60509754-U-5748 Ligon Mill\900-CAD GIS\900_CADD_NCDOT_TIP\Structures\04 Drawings\402_103.J-5748_SMU_AS2_S2-51_90131

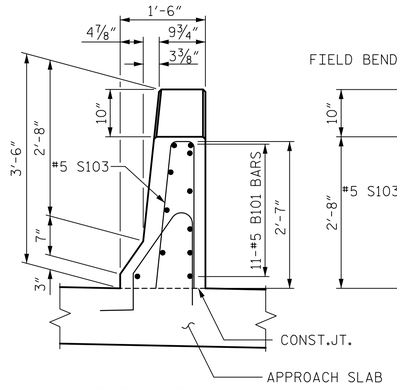


PLAN OF BARRIER RAIL

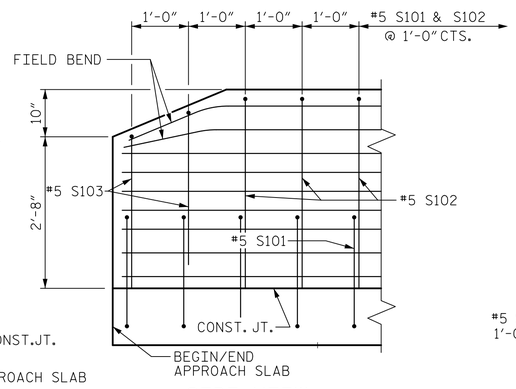
END BENT 1 SHOWN, END BENT 2 SIMILAR.

NOTES:

FOR NOTES, SEE SHEET 2 OF 3

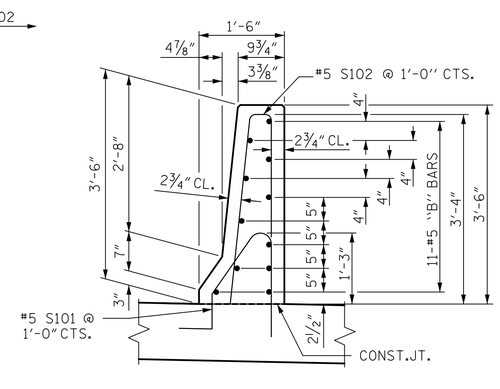


END VIEW

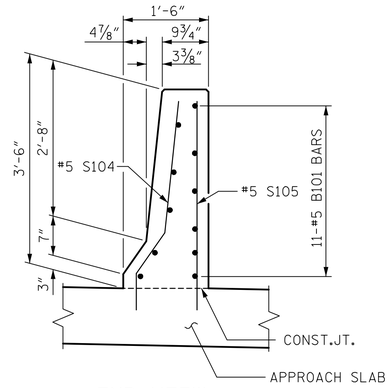


SIDE VIEW

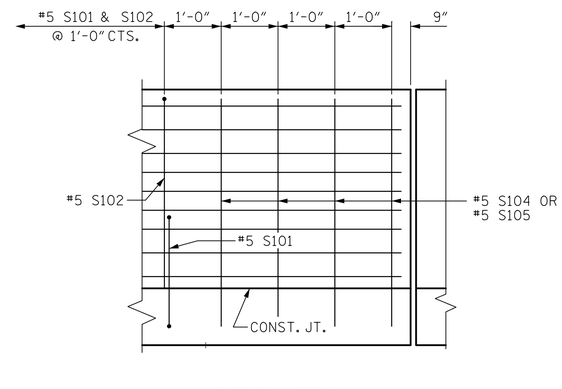
END OF RAIL DETAILS



SECTION THRU RAIL



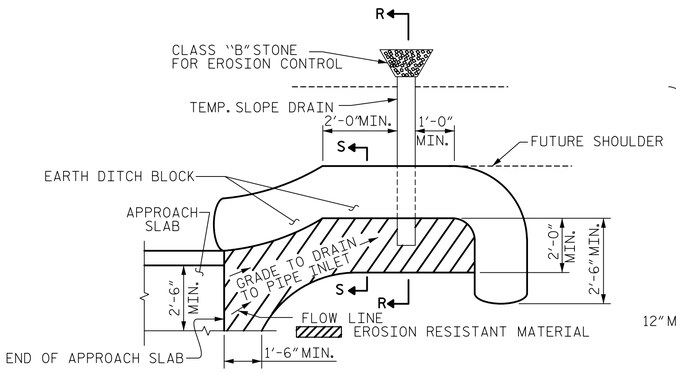
END VIEW



SIDE VIEW

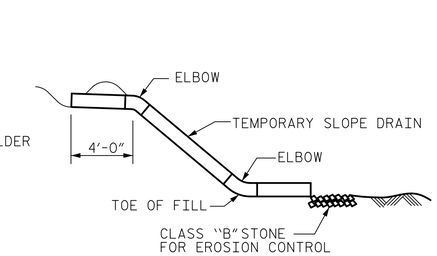
END OF RAIL DETAILS @ EXP. JOINT

FOR ADHESIVE ANCHORING AT SAWED JOINTS

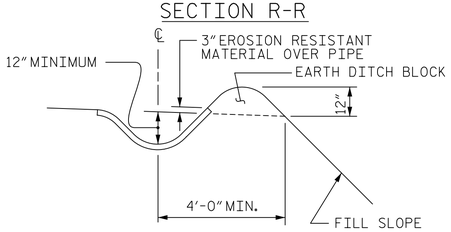


NOTE: IMMEDIATELY AFTER THE CONSTRUCTION OF THE APPROACH SLAB, THE CONTRACTOR SHALL PROVIDE TEMPORARY BERM AND SLOPE DRAIN. CONTRACTOR SHALL GRADE TO PIPE INLET AND PROVIDE EROSION RESISTANT MATERIAL AS SHOWN. THE EROSION RESISTANT MATERIAL SHALL BE EITHER 1) ASPHALT PLANT MIX, TYPE 1 OR TYPE 2, MIN. 2" DEPTH, 2) EROSION CONTROL MAT, OR 3) CONCRETE, AS DIRECTED BY THE ENGINEER. THE SLOPE DRAIN SHALL CONSIST OF A NON-PERFORATED TEMPORARY DRAINAGE PIPE, 12 INCHES IN DIAMETER.

PLAN VIEW



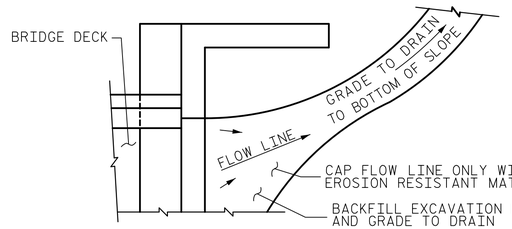
SECTION R-R



SECTION S-S

TEMPORARY BERM AND SLOPE DRAIN DETAILS

(TO BE USED WHEN SHOULDER BERM GUTTER IS REQUIRED)



NOTE: IF THE APPROACH SLAB IS NOT CONSTRUCTED IMMEDIATELY AFTER THE BACKFILLING OF THE END BENT EXCAVATION, GRADE TO DRAIN TO THE BOTTOM OF THE SLOPE AND PROVIDE EROSION RESISTANT MATERIAL, SUCH AS FIBERGLASS ROVING OR AS DIRECTED BY THE ENGINEER TO PREVENT SOIL EROSION AND TO PROTECT THE AREA ADJACENT TO THE STRUCTURE. THE CONTRACTOR WILL BE REQUIRED TO REMOVE THESE MATERIALS PRIOR TO CONSTRUCTION OF THE APPROACH SLAB.

TEMPORARY DRAINAGE DETAIL

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SHEET 3 OF 3

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5438 WADE PARK BOULEVARD, SUITE 200
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RALEIGH

STANDARD

BRIDGE APPROACH SLAB DETAILS

(SOUTHBOUND LANES)

REVISIONS						SHEET NO.
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1			3			TOTAL SHEETS
2			4			119

STD. NO. BAS4

ASSEMBLED BY : D.R. DRUM, M. CATER		DATE : 08/2021	
CHECKED BY : J.C. MORRISON		DATE : 06/2021	
DRAWN BY : FCJ	11/88	REV. 6/13	MAA/GM
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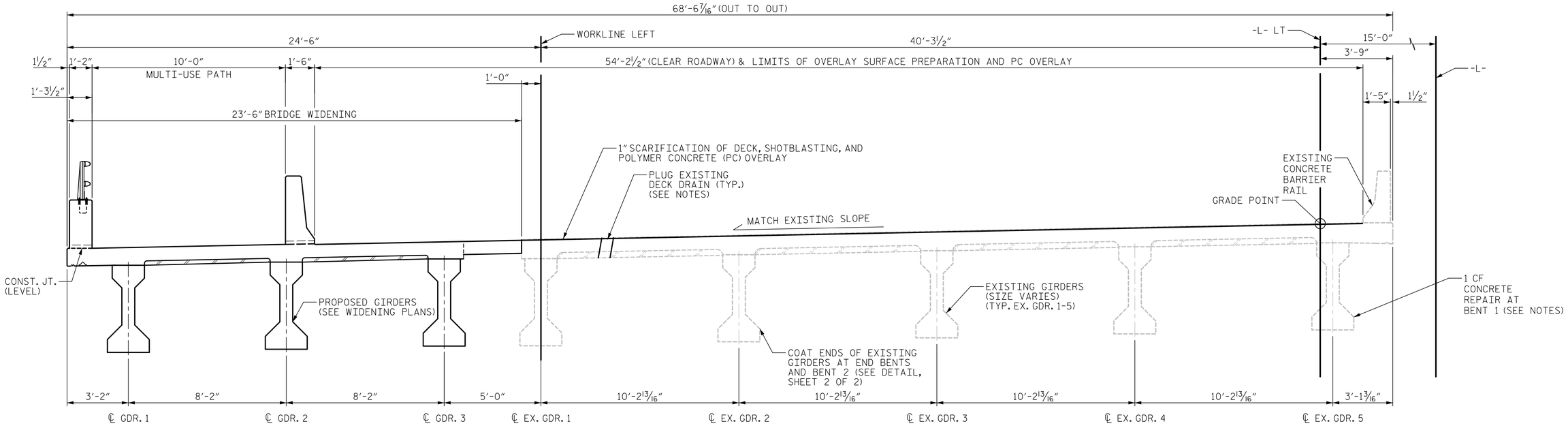
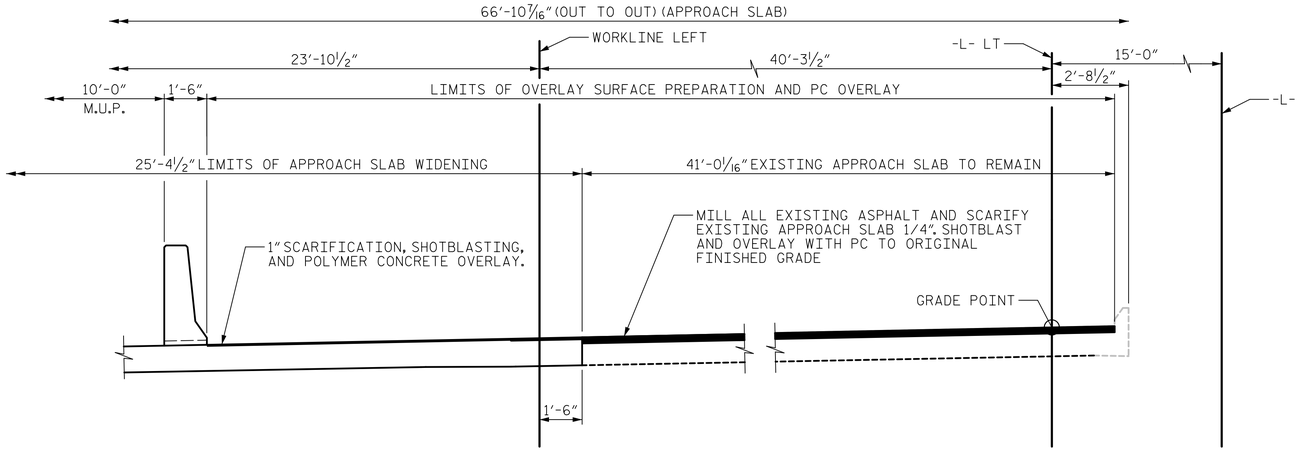


TYPICAL SECTION OF BRIDGE SUPERSTRUCTURE



TYPICAL SECTION OF APPROACH SLAB

NOTES (GIRDERS):

AT THE DIRECTION OF THE ENGINEER, THE CONTRACTOR SHALL PERFORM A CONCRETE REPAIR ON THE EXISTING BENT DIAPHRAGM BETWEEN EXISTING GIRDERS A5 AND B5 AT BENT 1. SAW-CUTTING OR DEMOITION OF THE PRECAST GIRDER SHALL NOT BE ALLOWED. NO SUPPLEMENTAL REINFORCING SHALL BE INSTALLED.

ESTIMATED QTY ''CONCRETE REPAIRS''= 1 CF

NOTES (SUBSTRUCTURE):

THE CONTRACTOR SHALL CLEAN AND EPOXY-COAT THE TOPS OF THE EXISTING END BENT CAPS AT END BENTS 1 AND 2, AND THE TOP OF THE CAP AT BENT 2. THE ENTIRE HORIZONTAL SURFACE OF THE CAP SHALL BE COATED EXCEPT UNDER ELASTOMERIC BEARING PADS. THIS OPERATION SHALL BE COMPLETED AFTER BEARING REPLACEMENTS ARE MADE. SEE SPECIAL PROVISIONS.

ESTIMATED QTY ''EPOXY COATING AND DEBRIS REMOVAL'' = 410 SF

NOTES (DECK, OVERLAY, AND GENERAL PRESERVATION):

EXISTING BRIDGE CONCRETE DECK SHALL BE REPAIRED PRIOR TO THE SURFACE PREPARATION AND APPLICATION OF THE PC OVERLAY AT LOCATIONS SHOWN ON THE PLANS OR AS DETERMINED BY THE ENGINEER. IF NECESSARY, SUCH LOCATIONS MAY BE REPAIRED WITH PC.

REPAIR LOCATIONS AND ESTIMATED QUANTITIES ARE GIVEN WITH THE BEST INFORMATION AVAILABLE. IF ADDITIONAL REPAIRS NOT SHOWN ON THE DRAWINGS ARE DEEMED NECESSARY BY THE ENGINEER, THE ENGINNER WILL NOTE ON THE DRAWINGS THE APPROXIMATE LOCATIONS AND DESCRIPTION OF THE REPAIRS AND ADJUST THE ACTUAL QUANTITIES ENTERED INTO THE AS-BUILT REPAIR QUANTITY TABLE.

QUANTITIES IN TABLES REPRESENT ESTIMATED VALUES OF CLASS II SURFACE PREPARATION AND CONCRETE DECK REPAIR FOR PC OVERLAY AFTER REMOVAL OF UNSOUND CONCRETE (MIN.2″CLEAR TO SAW CUT). SEE SPECIAL PROVISIONS.

LONGITUDINAL CONSTRUCTION JOINTS OF OVERLAYS SHALL BE LOCATED ALONG THE EDGE OF TRAVEL LANES.

SEE TRAFFIC MANAGEMENT PLANS FOR LANE WIDTHS, SEQUENCING AND OTHER TRAFFIC CONTROL MEASURES FOR STAGING OF POLYMER CONCRETE OVERLAY AND SURFACE PREPARATION.

FOR LIMITS OF SHOTBLASTING AND CLASS II REPAIR, SURFACE PREPARATION, AND PC OVERLAY, SEE SURFACE PREPARATION SHEETS.

MILLING OF ASPHALT ON APPRAOCH SLAB IS CONSIDERED INCIDENTAL TO SCARIFICATION OF BRIDGE DECK. NO SEPARATE MEASUREMENT OR PAYMENT SHALL BE MADE.

PRESERVATION PLANS ARE PRESENTED TO SHOW THE CONFIGURATION OF THE BRIDGE ASSUMED AT THE TIME OF CONSTRUCTION, IN ACCORDANCE WITH THE REQUIRED CONSTRUCTION SEQUENCE.

FOR PLUGGING OF EXISTING DECK DRAINS, SEE SPECIAL PROVISIONS.

FOR STANDARD REPAIR DETAILS AND NOTES, SEE SHEET S1-61.

FOR FLOWABLE FILL (PRESERVATION), SEE SPECIAL PROVISIONS.

A 1″GROOVE SHALL BE SAWED IN THE TOP OF EXISTING DECK SLAB AND APPROACH SLAB BEFORE REMOVING EXISTING CONCRETE. IN THE EVENT THE 1″SAW CUT RESULTS IN DAMAGE TO THE REINFORCING STEEL, THE DEPTH OF THE SAW CUT SHALL BE REDUCED TO AVOID SUCH DAMANGE AS DIRECTED BY THE ENGINEER. CARE SHALL BE TAKEN TO OBTAIN A STRAIGHT LINE AT THE TOP AND BOTTOM OF OLD AND NEW CONCRETE. RETAIN EXISTING STEEL AS SHOWN.

FOR PC MATERIALS AND PLACING AND FINISHING OF POLYMER CONCRETE OVERLAY, SEE ''POLYMER CONCRETE BRIDGE DECK OVERLAY'' SPECIAL PROVISION.

FOR SHOTBLASTING BRIDGE DECK, SCARIFYING BRIDGE DECK, AND CLASS II SURFACE PREPARATION, SEE ''OVERLAY SURFACE PREPARATION FOR POLYMER CONCRETE'' SPECIAL PROVISION.

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RALEIGH, NC 27607
(919) 854-6200 www.aecom.com
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RALEIGH

PRESERVATION

TYPICAL SECTION & DETAILS

(SOUTHBOUND)

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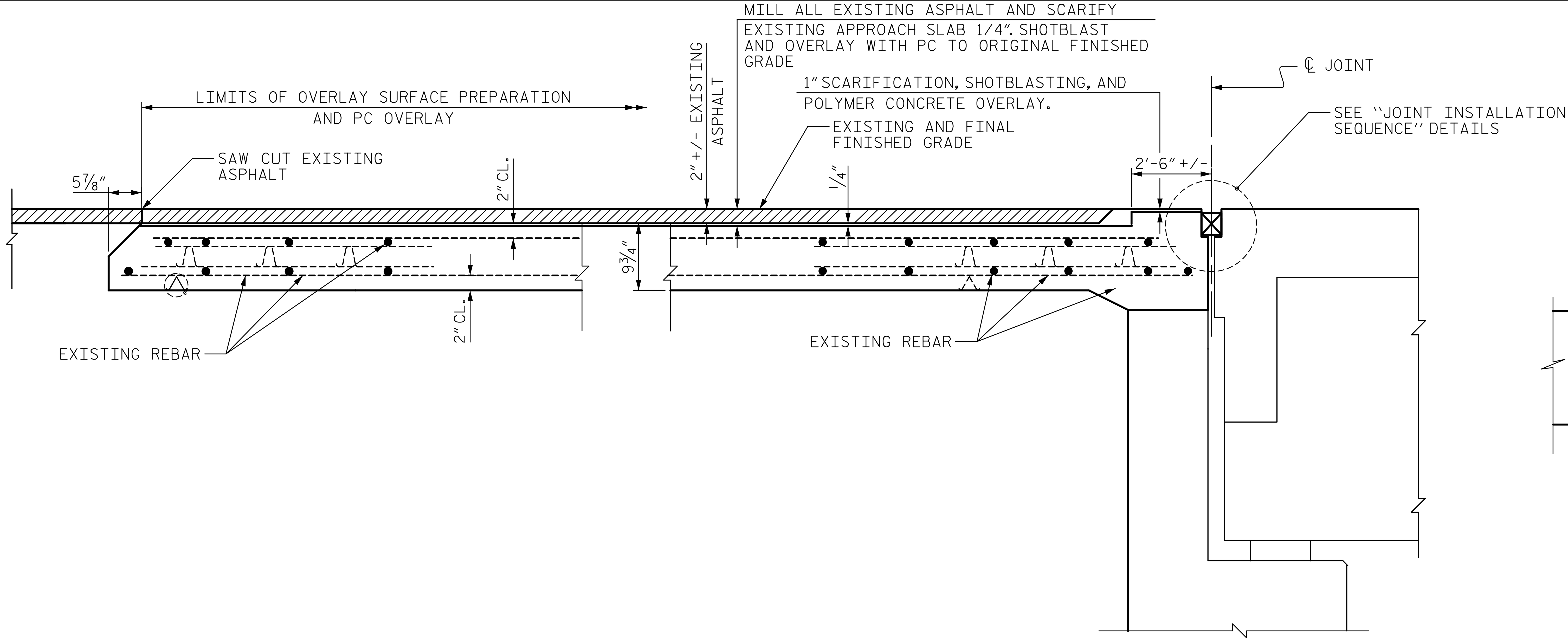
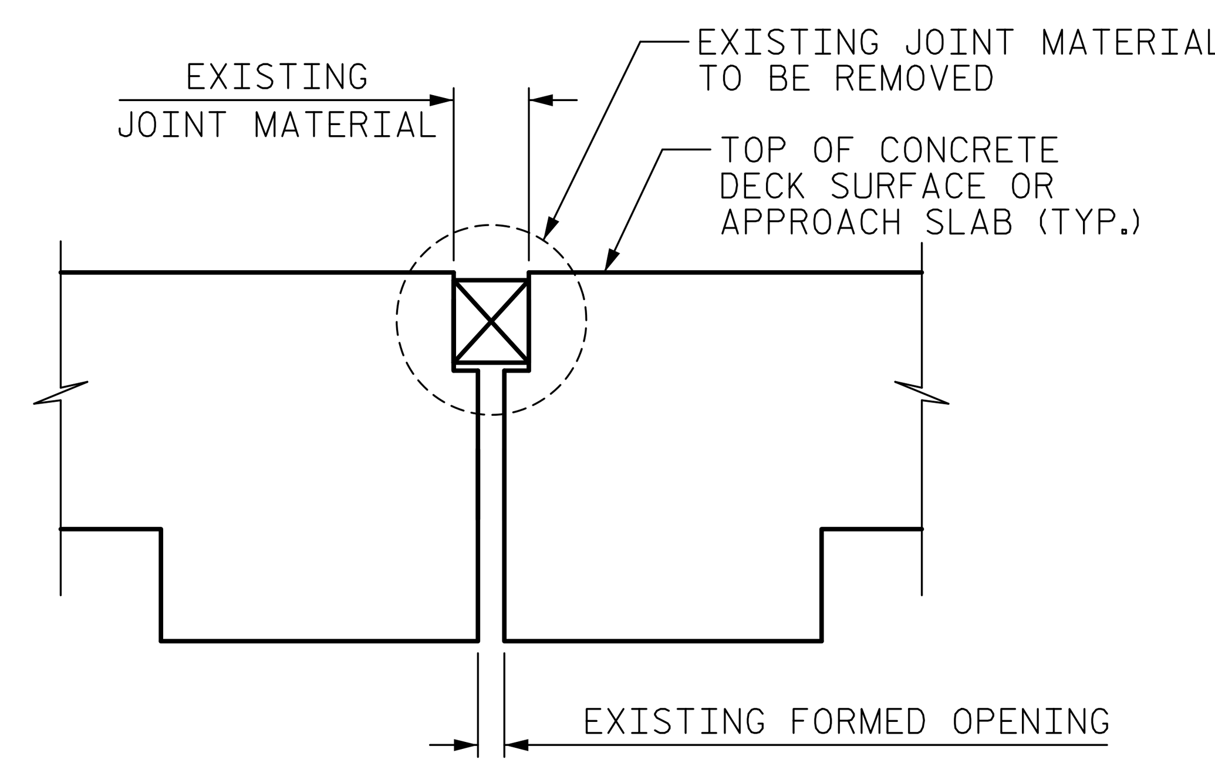


SECTION THRU EXISTING APPROACH SLAB



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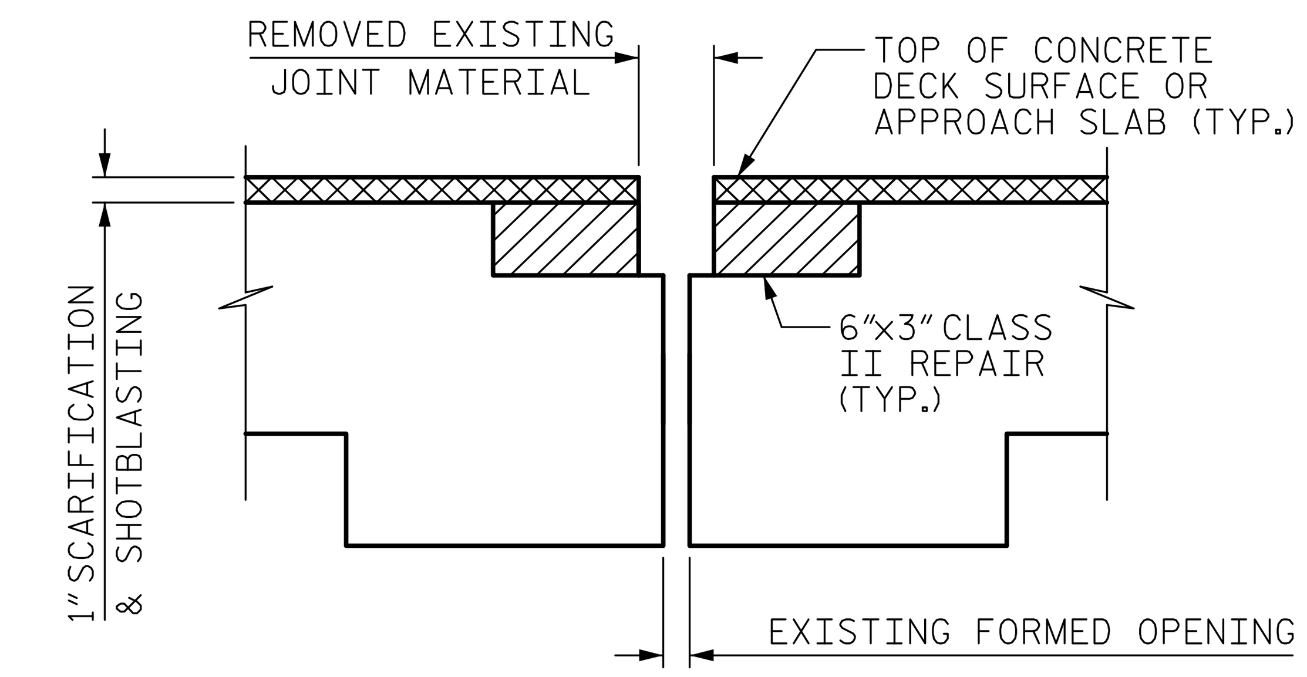
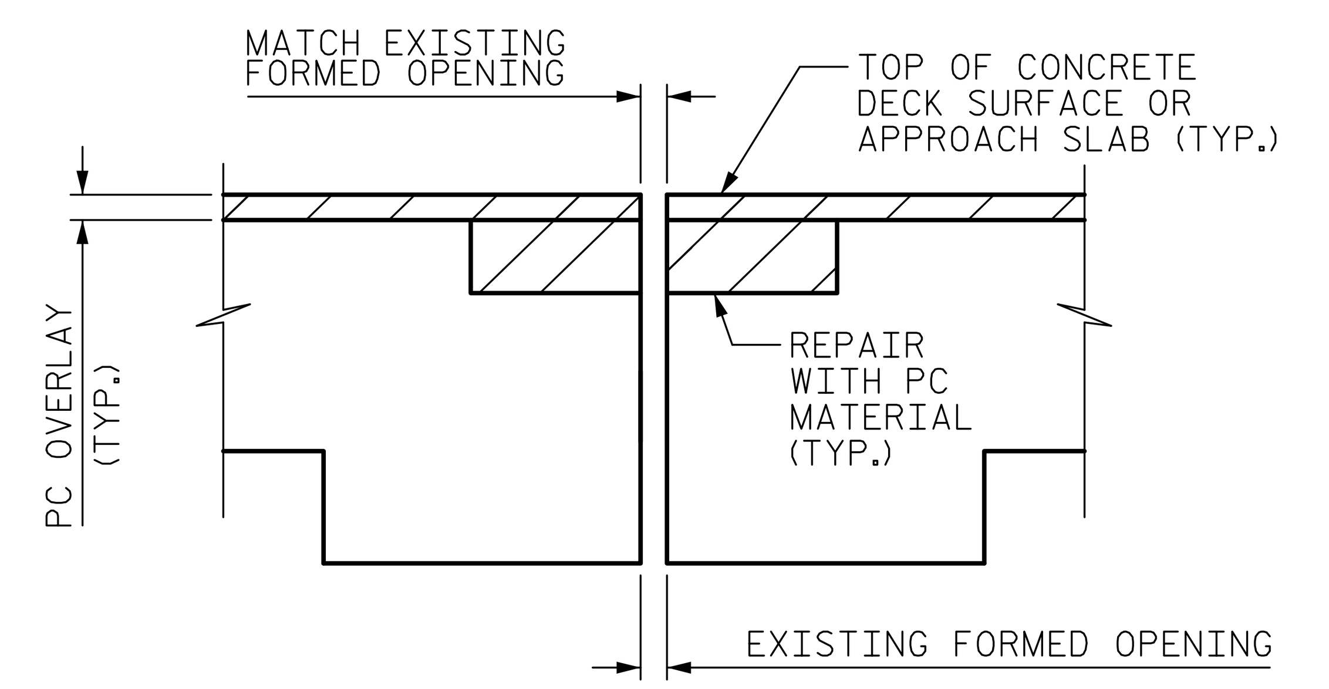
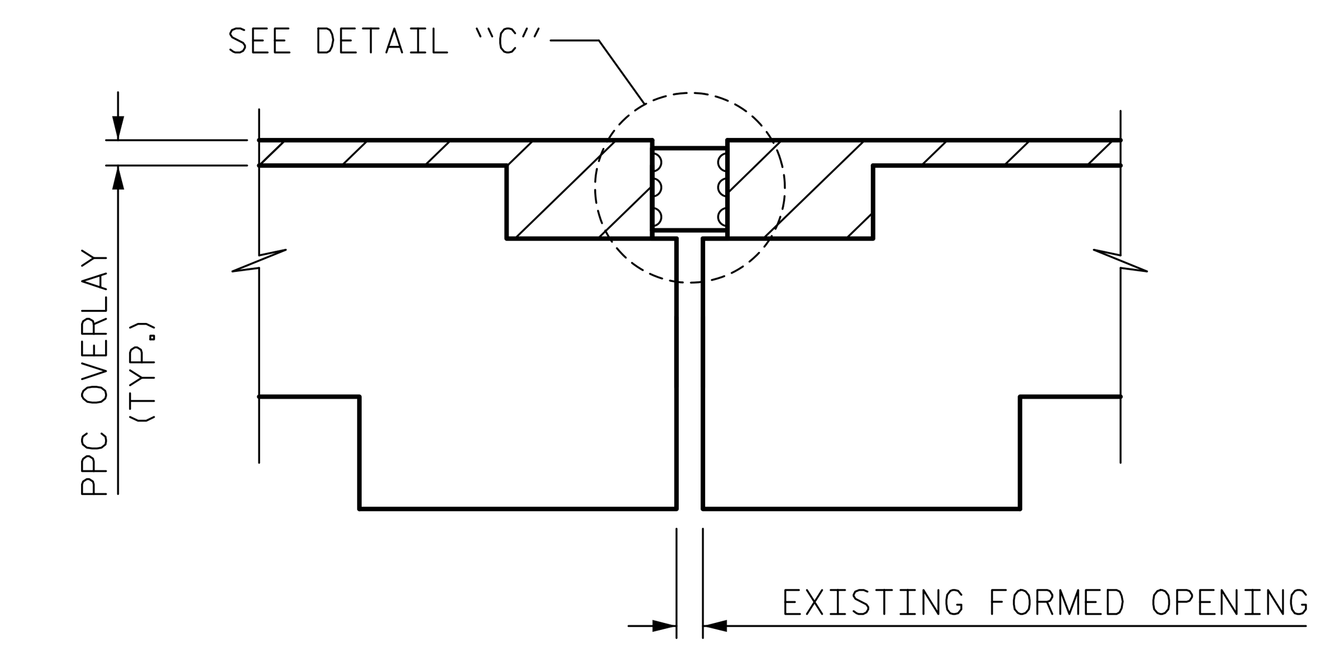


2. MINIMUM EXISTING JOINT DEMOLITION



3. PC JOINT REPAIR

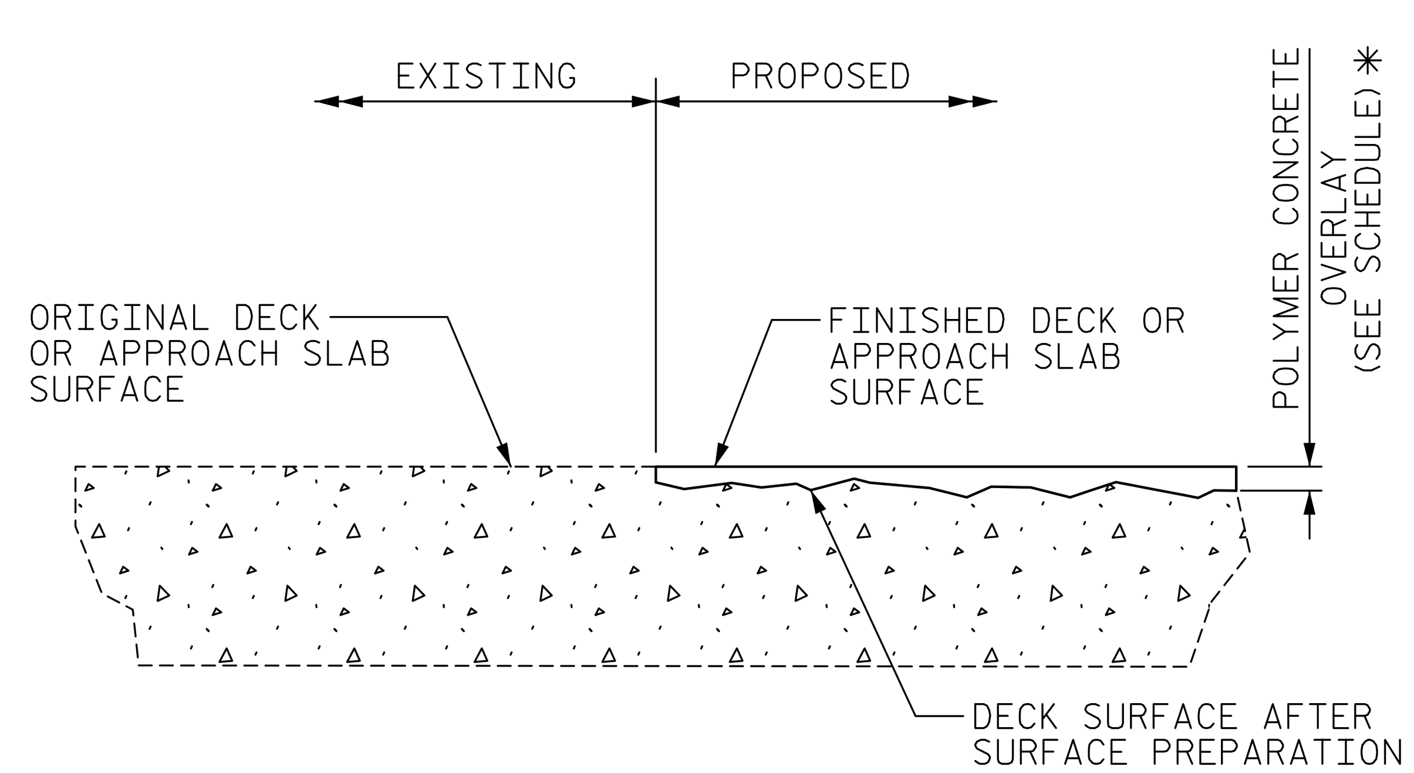


4. PROPOSED FOAM JOINT

FOAM JOINT SEAL SHALL BE INSTALLED IN EXISTING AND WIDENED PORTION AS PART OF A SINGLE OPERATION. SEE "FOAM JOINT SEAL DETAILS" SHEET AND TMP PLANS.

JOINT INSTALLATION SEQUENCE

FOR PPC OVERLAY THICKNESS, SEE "DETAIL FOR POLYMER CONCRETE OVERLAY"

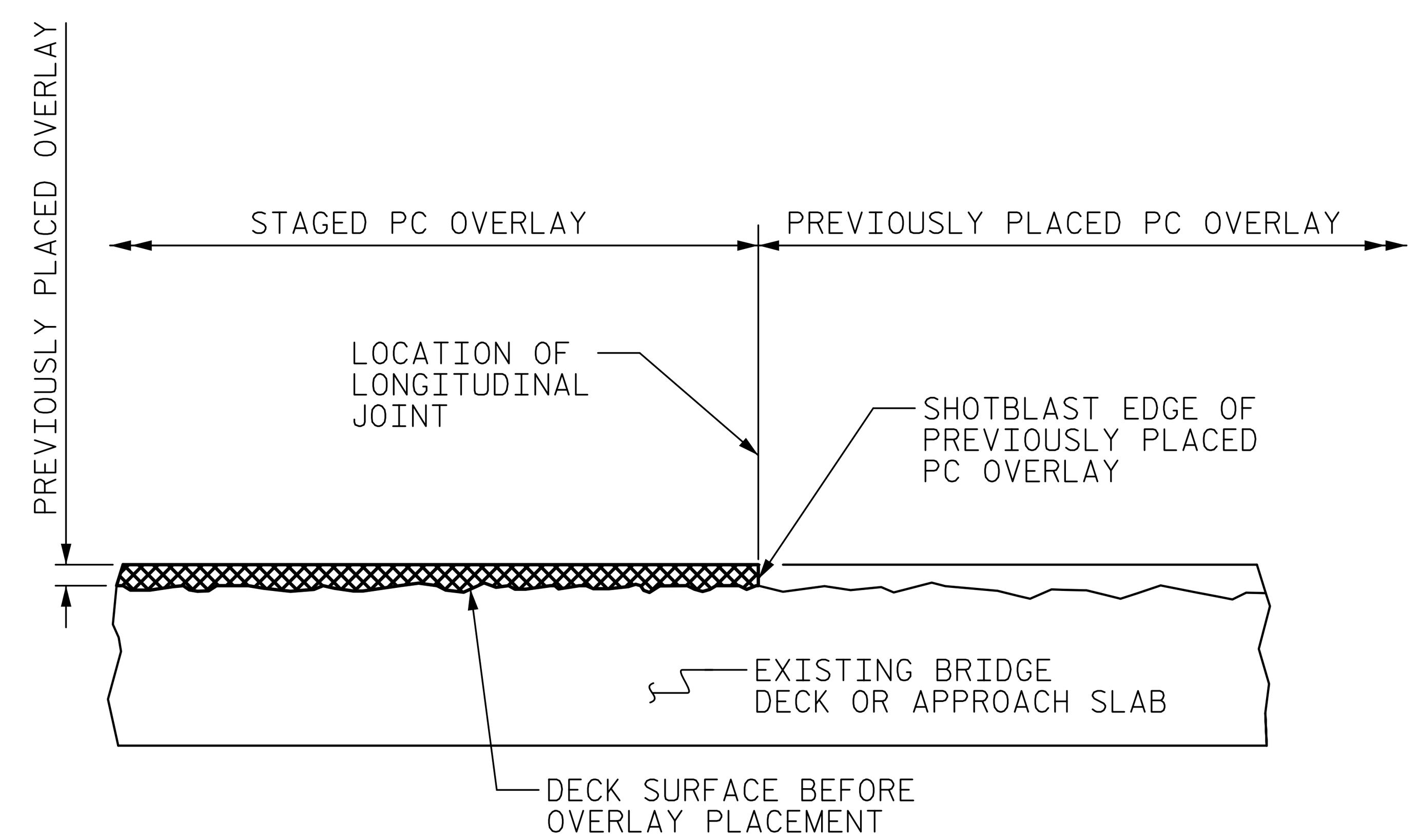


DETAIL FOR POLYMER CONCRETE OVERLAY

* POLYMER CONCRETE OVERLAY SCHEDULE

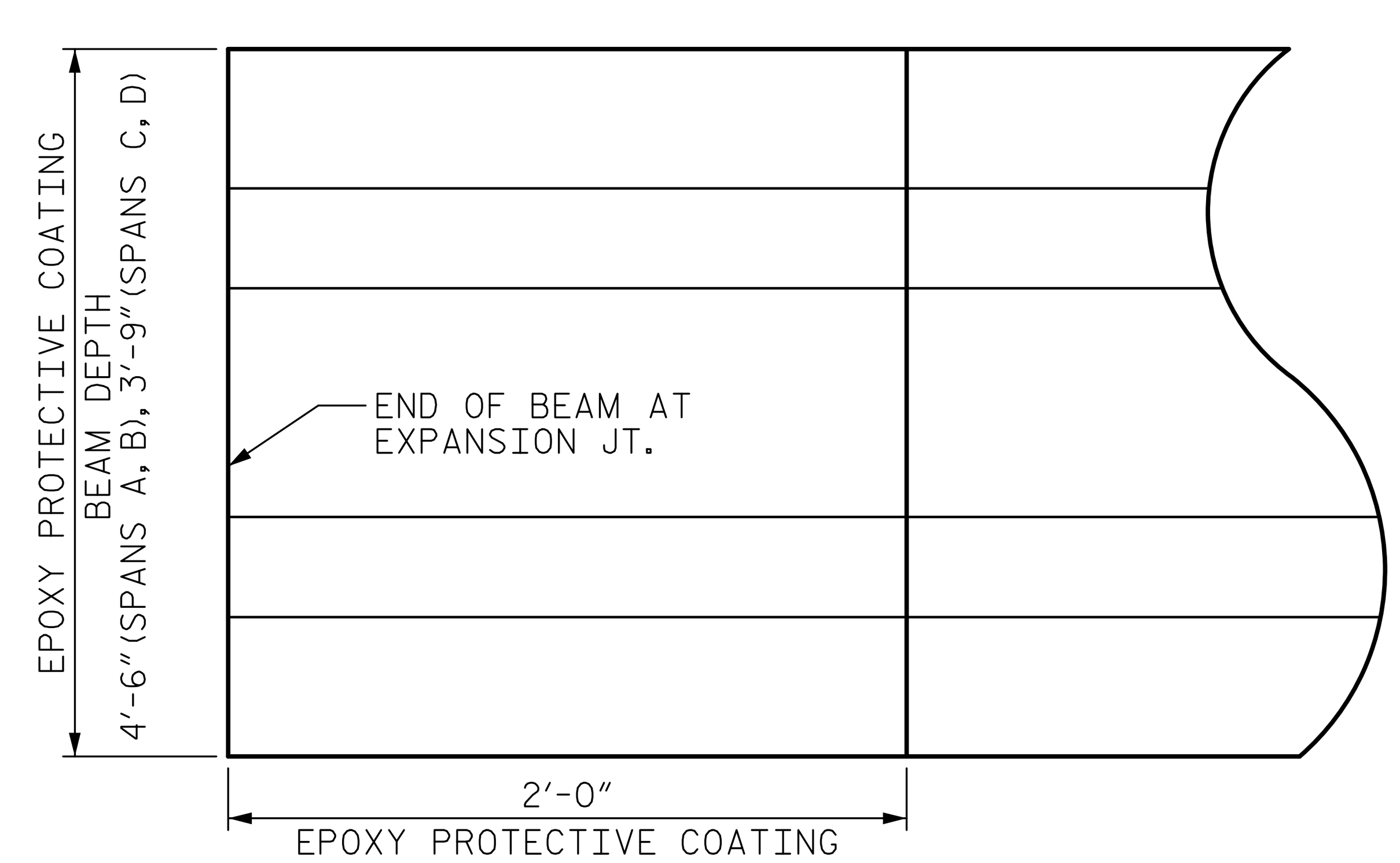
ON EXISTING AND PROPOSED BRIDGE DECK, EXISTING APPROACH SLAB WITH EXPOSED CONCRETE, AND PROPOSED APPROACH SLAB:
1" REMOVAL AND OVERLAY.

ON EXISTING APPROACH SLAB WITH EXISTING ASPHALT OVERLAY:
2 1/4" +/- REMOVAL AND OVERLAY



STAGED PC OVERLAY JOINT

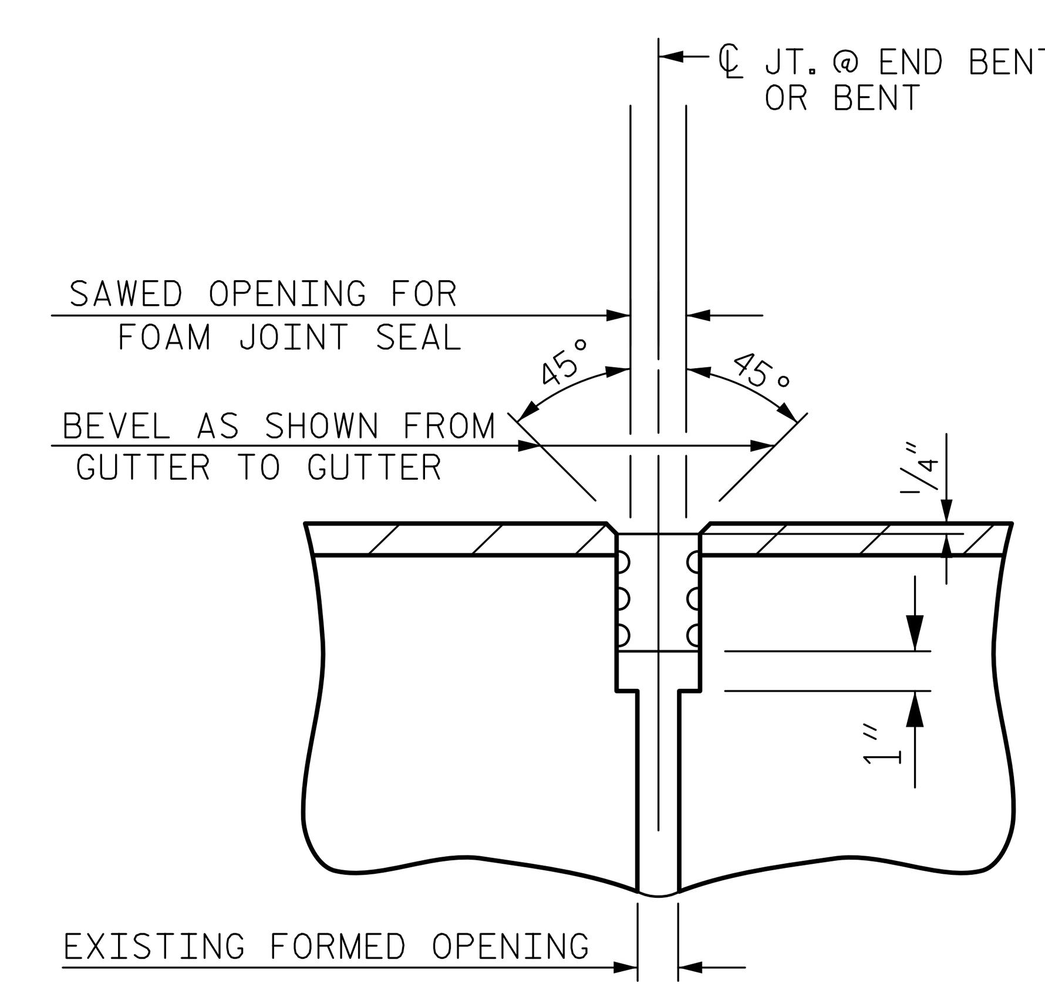
(AS NEEDED)



EPOXY-COAT EXISTING BEAM ENDS (END FACE, BOTTOM, SIDES) AT END BENTS 1 AND 2 AND AT BENT 2. SEE SPECIAL PROVISIONS.

EPOXY COATING DETAIL

EST. QTY. "EPOXY COATING CONCRETE GIRDER ENDS" = 550SF



DETAIL "C"

FOAM JOINT SEAL

FOR SAWED OPENING WIDTH AT BENTS AND END BENTS, SEE "FOAM JOINT SEAL DETAILS" SHEET.

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SHEET 2 OF 2

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5438 WADE PARK BOULEVARD, SUITE 200
RALEIGH, NC 27607
(919) 854-6200 www.aecom.com
AECOM License No. F-0342

NORTH CAROLINA PROFESSIONAL SEAL 041343 ENGINEER GREGORY R. COLS

DocuSigned by: 2/10/2023

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PRESERVATION

TYPICAL SECTION DETAILS
(SOUTHBOUND)

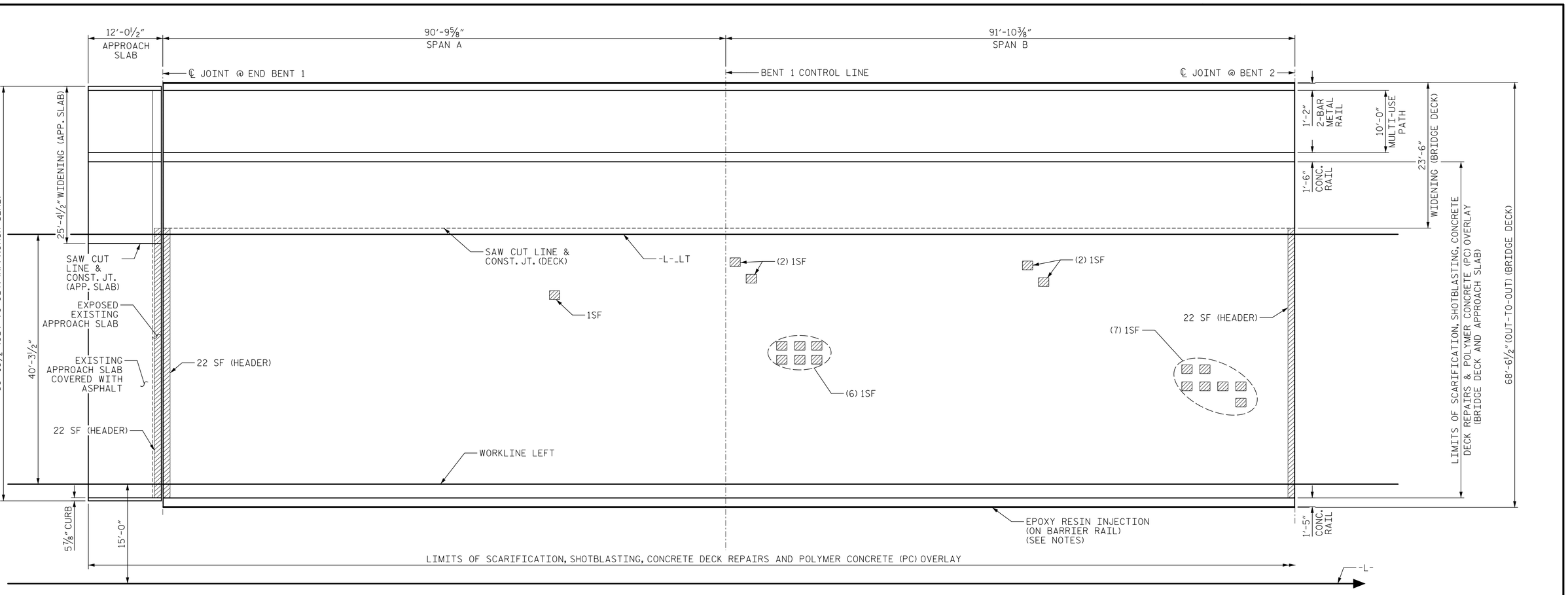
DRAWN BY : M. CATER	DATE : 01/2021
CHECKED BY : G. COLS	DATE : 10/2022
DESIGNED BY : G. COLS	DATE : 10/2022
DESIGN CHECKED BY : J. SLOAN	DATE : 10/2022

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

REVISIONS

SHEET NO. S2-54

TOTAL SHEETS 119



APPROACH SLAB 1 | SPAN A | SPAN B

PART PLAN OF BRIDGE DECK & APPROACH SLAB

TOTAL BRIDGE DECK & APPROACH SLAB QUANTITIES

	ESTIMATE	ACTUAL
SCARIFYING BRIDGE DECK	1924.8 SY	
CLASS II SURFACE PREPARATION	18 SY	
CONCRETE DECK REPAIR FOR PC OVERLAY	18 SY	
SHOTBLASTING BRIDGE DECK	1924.8 SY	
POLYESTER POLYMER CONCRETE MATERIALS	58.8 CY	
PLACING AND FINISHING PC OVERLAY	1924.8 SY	
GROOVING BRIDGE FLOORS	16,296.4 SF	
PLUGGING OF EXISTING DECK DRAINS	30 EA	
EPOXY RESIN INJECTION	110 LF	
EPOXY POLYMER CONCRETE MATERIALS (ALTERNATE)	58.8 CY	

CLASS II SURFACE PREPARATION AND CONCRETE DECK REPAIR FOR PC OVERLAY

EPOXY RESIN INJECTION: PERFORM EPOXY RESIN INJECTION ON ALL CRACKS IN BARRIER WITH WIDTH 1/32" OR WIDER AT THE DIRECTION OF THE ENGINEER. A TOTAL QUANTITY ESTIMATE IS PROVIDED. SEE SPECIAL PROVISIONS.

DRAWN BY : M. CATER DATE : 10/2022
CHECKED BY : G. COLS DATE : 11/2022
DESIGNED BY : G. COLS DATE : 10/2022
DESIGN CHECKED BY : J. SLOAN DATE : 11/2022

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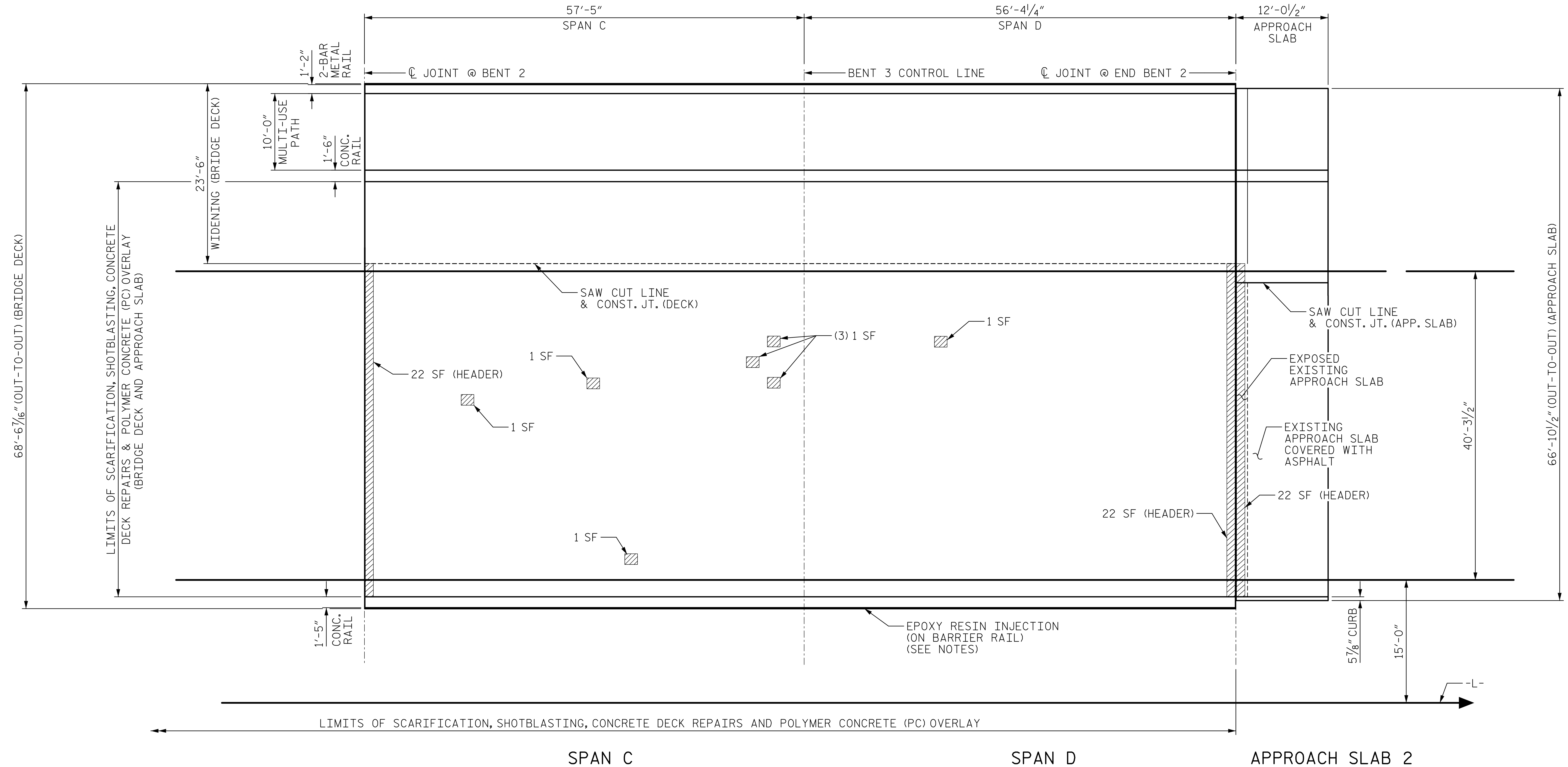
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PRESERVATION
DECK SURFACE PREPARATION
SPANS A & B
(SOUTHBOUND)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-55
1			3			TOTAL SHEETS
2			4			119

PROJECT NO. U-5748
WAKE COUNTY
STATION: 24+88.00 -L-

SHEET 1 OF 2



PART PLAN OF BRIDGE DECK & APPROACH SLAB

CLASS II SURFACE PREPARATION AND CONCRETE DECK REPAIR FOR PC OVERLAY

EPOXY RESIN INJECTION: PERFORM EPOXY RESIN INJECTION ON ALL CRACKS IN BARRIER WITH WIDTH 1/32" OR WIDER AT THE DIRECTION OF THE ENGINEER. A TOTAL QUANTITY ESTIMATE IS PROVIDED. SEE SPECIAL PROVISIONS.

PROJECT NO. U-5748
WAKE COUNTY
STATION: 24+88.00 -L-

SHEET 2 OF 2

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PRESERVATION
DECK SURFACE PREPARATION
SPANS C & D
(SOUTHBOUND)

NORTH CAROLINA PROFESSIONAL SEAL 041343 ENGINEER GREGORY R. COLS
DocuSigned by: 2/10/2023

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DESIGN CHECKED BY :	J. SLOAN	DATE :	11/2022

REVISIONS

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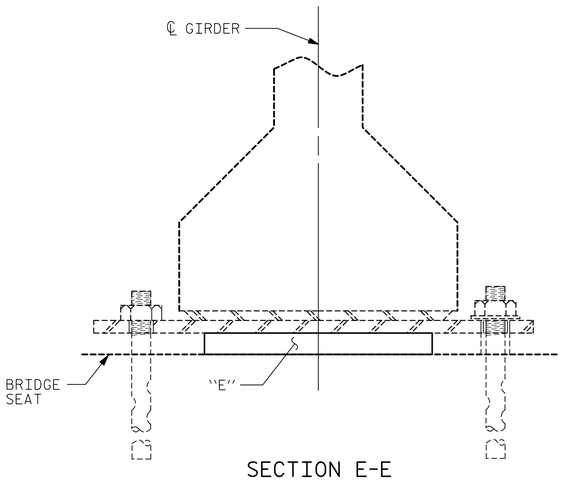
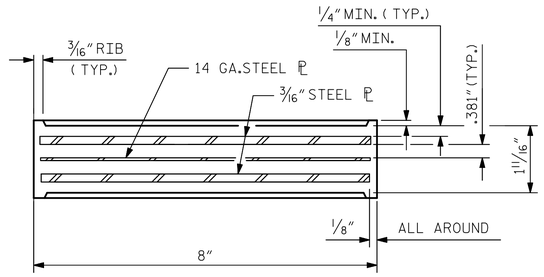
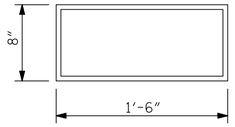
SHEET NO. S2-56
TOTAL SHEETS 119



SECTION E-E



TYPICAL SECTION OF ELASTOMERIC BEARINGS

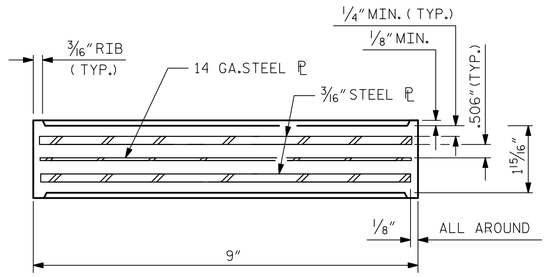


E5 (20 REQ'D)

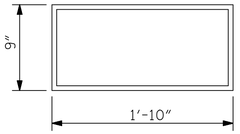
PLAN VIEW OF ELASTOMERIC BEARING

TYPE III

REPLACE ALL EXISTING BEARINGS IN SPANS C AND D



TYPICAL SECTION OF ELASTOMERIC BEARINGS



E6 (20 REQ'D)

PLAN VIEW OF ELASTOMERIC BEARING

TYPE IV

REPLACE ALL EXISTING BEARINGS IN SPANS A AND B

ELASTOMERIC BEARING NOTES

AT ALL FIXED POINTS OF SUPPORT, NUTS FOR ANCHOR BOLTS ARE TO BE TIGHTENED FINGER TIGHT AND THEN BACKED OFF 1/2 TURN. THE THREAD OF THE NUT AND BOLT SHALL THEN BE BURRED WITH A SHARP POINTED TOOL.

ALL SURFACES OF BEARING PLATES SHALL BE SMOOTH AND STRAIGHT.

THE ELASTOMER IN THE STEEL REINFORCED BEARINGS SHALL HAVE A SHEAR MODULUS OF 0.160 KSI, IN ACCORDANCE WITH AASHTO M251.

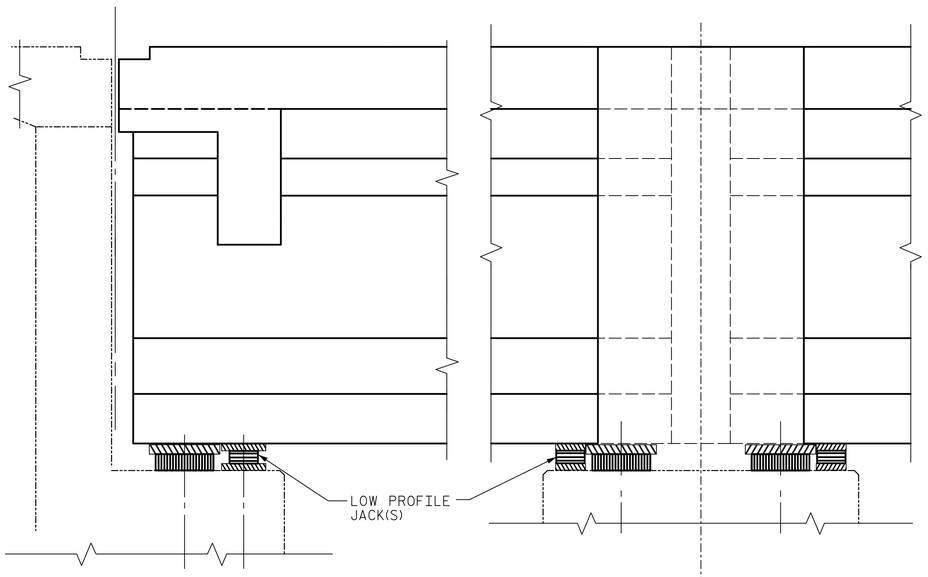
FOR STEEL REINFORCED ELASTOMERIC BEARINGS, SEE SPECIAL PROVISIONS.

MAXIMUM ALLOWABLE SERVICE LOADS	
D.L.+L.L. (NO IMPACT)	
TYPE II	145K
TYPE III	205K
TYPE IV	225K

ESTIMATED JACKING LOADS

VALUES ARE FOR ENTIRE SUPERSTRUCTURE, ADDITIONAL LOAD TO DEFLECT CONTINUOUS UNIT. LIVE LOADS ARE NOT INCLUDED.

END BENT 1	557K
BENT 1	1150K
BENT 2	555k (SPAN B ONLY)
BENT 2	335k (SPAN C ONLY)
BENT 3	700K
END BENT 2	337K



JACKING AT END BENT

(DETAIL IS FOR ILLUSTRATION ONLY)

JACKING AT INTERIOR BENT

(DETAIL IS FOR ILLUSTRATION ONLY)
(SHOWN AT BENT 1 OR 3, SIMILAR AT BENT 2)

NOTES (BRIDGE JACKING):

FOR BRIDGE JACKING, SEE SPECIAL PROVISIONS.

THE CONTRACTOR SHALL SUBMIT JACKING PLANS AND CALCULATIONS FOR REVIEW AND APPROVAL PRIOR TO MATERIAL PURCHASE OR FABRICATION OF THE JACKING SYSTEM. JACKING PLANS AND CALCULATIONS SHALL BE SEALED BY A PROFESSIONAL ENGINEER LICENSED IN NORTH CAROLINA.

ALL BEAMS AT A SUBSTRUCTURE UNIT WITHIN A SUPERSTRUCTURE UNIT SHALL BE LIFTED AT THE SAME TIME WITH A HYDRAULIC JACKING SYSTEM AND THE SAME DISPLACEMENT (TYPE II JACKING).

THE BEAMS SHALL BE LIFTED ENOUGH THAT THE BEAMS CLEAR THE BEARINGS AND ALL LOAD IS SUPPORTED BY THE JACKS. AFTER JACKING IS COMPLETE THE CONTRACTOR SHALL PROVIDE A METHOD TO SUPPORT THE BEAM FOR DEAD AND LIVE LOADS AND REMOVE THE JACKS DURING REPAIR OPERATIONS. IF THE JACKS REMAIN IN PLACE DURING THE ENTIRE JACKING AND REPAIR OPERATION, THEY SHALL HAVE MECHANICAL LOCK-OFF CAPABILITIES.

IF DURING THE JACKING PROCESS, OR WHILE THE BEAM IS BEING SUPPORTED, THE BEAM SHIFTS FROM ITS ORIGINAL POSITION, ALL WORK SHALL CEASE, THE BRIDGE SHALL BE CLOSED TO TRAFFIC, AND THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY.

PRIOR TO JACKING, THE CONTRACTOR SHALL ENSURE THERE ARE NO OBSTACLES PREVENTING THE BEAMS FROM BEING LIFTED.

THE MAXIMUM JACKING AT THE END BENTS OR BENT 2 IS 1/4" WITHOUT INSTALLING TRAFFIC BEARING SHIM PLATES. SEE SPECIAL PROVISIONS.

REACTIONS AND ESTIMATED JACKING FORCES LISTED ARE FOR THE CONVENIENCE OF THE CONTRACTOR AND SHALL NOT RELIEVE THE CONTRACTOR FROM THE RESPONSIBILTY TO PREPARE AND SUBMIT JACKING PLANS AND CALCULATIONS PRIOR TO BEGINNING WORK.

JACKING SCHEMATICS SHOWN ARE FOR REPRESENTATION ONLY AND ARE NOT WORKING DETAILS. CONTRACTOR SHALL COMPLETELY DESIGN JACKING PLAN. SEE SPECIAL PROVISIONS.

BRIDGE SHALL BE CLOSED TO TRAFFIC DURING HYDRAULIC LIFTING OPERATIONS UNTIL LIFTING IS COMPLETE AND BEAMS ARE SUPPORTED BY MEANS OTHER THAN HYDRAULICS, UNLESS ALLOWED BY THE ENGINEER. ALL TRAFFIC CLOSURES SHALL BE COORDINATED WITH THE ENGINEER TWO WEEKS PRIOR TO JACKING OPERATIONS.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING ANY DAMAGE CAUSED TO THE EXISTING STRUCTURE BY THE BRIDGE JACKING OPERATIONS AT NO ADDITIONAL COST TO THE DEPARTMENT.

THE CONTRACTOR SHALL PROVIDE BLOCKING FOR ALL JACKS AS NECESSARY. A BLOCKING PLAN SHALL BE INCLUDED AS PART OF THE JACKING PLAN.

THE CONTRACTOR SHALL MONITOR THE PLAN LOCATION OF THE GIRDERS FROM INITIAL JACKING UNTIL GIRDERS ARE SECURED ON THEIR PERMANENT BEARINGS. IF THE PLAN LOCATION OF THESE GIRDERS SHIFT FROM ITS ORIGINAL POSITION. THE CONTRACTOR SHALL SECURE FROM ADDITIONAL MOVEMENT IMMEDIATELY. NOTIFY ENFINEER PRIOR TO PROCEEDING WORK OPERATIONS.

CONTRACTOR TO TAKE APPROPRIATE MEANS TO REMOVE NUT ON ANCHOR BOLT WITHOUT DAMAGING THE ANCHOR BOLT. CONTRACTOR SHALL SUBMIT NUT REMOVAL METHOD TO INCLUDE PROCEDURES THAT WILL LOOSEN BOND BETWEEN INTERLOCKING THREADS TO ENGINEER FOR APPROVAL PRIOR TO REMOVING ANCHOR BOLT NUTS.

JACKING SHALL BE CONDUCTED IN A MANNER SUCH THAT THE SUPERSTRUCTURE WILL NOT BE DAMAGED.

EFFECT OF VIBRATIONS FROM TRAFFIC SHOULD BE CONSIDERED DURING JACKING AND WHEN JACKS ARE LOCKED.

PROVISIONS SHALL BE MADE TO ACCOUNT FOR THERMAL MOVEMENTS DURING THE PERIOD THAT THE STRUCTURE IS RESTING ON TEMPORARY SUPPORTS.

THE BRIDGE SHALL BE INSPECTED PRIOR TO JACKING TO VERIFY THAT ITEMS CONNECTED TO THE SUPERSTRUCTURE WILL NOT BE DAMAGED DURING THE JACKING AND BEARING REPLACEMENT PROCEDURE.

IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR PERFORMING THE JACKING TO DETERMINE A JACKING LOCATION AT EACH BEARING AND PROVIDE A DESIGN FOR THE JACKING LOADS. JACKS SHALL HAVE A MINIMUM SAFE LOAD CAPACITY OF 125% OF THE LOAD SPECIFIED IN THE JACKING LOAD TABLE. THE CONTRACTOR SHALL SUBMIT THE JACKING PLAN, DETAILS, PROCEDURES AND SUPPORTING CALCULATIONS TO THE ENGINEER FOR REVIEW AND APPROVAL.

JACKING SHALL BE COMPLETED PRIOR TO WIDENING OF THE EXISTING BRIDGE AND PC OVERLAY.

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

DRAWN BY : D. KIM	DATE : 10/2022		
CHECKED BY : G.COLS	DATE : 10/2022		
DESIGNED BY : G.COLS	DATE : 10/2022		
DESIGN CHECKED BY : D. TUTTLE	DATE : 10/2022		

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PRESERVATION

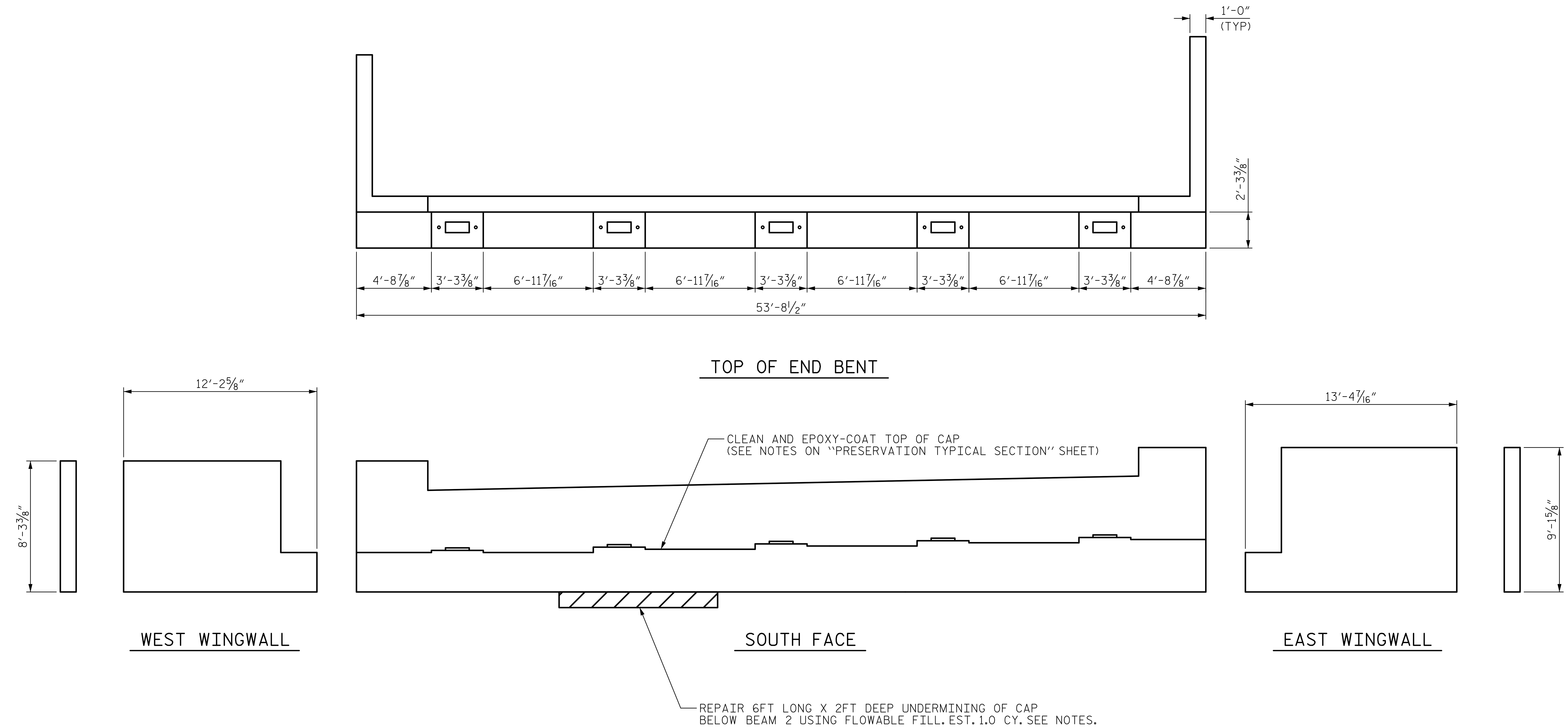
ELASTOMERIC BEARING DETAILS AND JACKING

(SOUTHBOUND)

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S2-57
1			3			TOTAL SHEETS
2			4			119

NOTES:

EXISTING STRUCTURE SHOWN PRIOR TO WIDENING.



FLOWABLE FILL NOTES:

PLACE FLOWABLE FILL IN VOID AREAS BELOW END BENT CAP AS DIRECTED BY THE ENGINEER.

THE ENGINEER SHALL INSPECT THE REPAIR AREA PRIOR TO INSTALLATION OF FLOWABLE FILL AND DELINEATE THE LENGTH OF REPAIR ALONG THE FACE OF THE END BENT CAP.

RIPRAP SHALL BE REMOVED AS REQUIRED FOR PLACEMENT OPERATION. ANY RIPRAP REMOVED SHALL BE REPLACED TO THE SATISFACTION OF THE ENGINEER AT NO ADDITIONAL COST TO THE DEPARTMENT.

FLOWABLE FILL SHALL BE PLACED BEGINNING AT THE BACK OF THE VOID AREA, WORKING TOWARDS THE FRONT FACE OF THE CAP. VOIDS SHALL BE FILLED TO THE SATISFACTION OF THE ENGINEER.

FORMWORK SHALL BE USED TO CONTAIN FLOWABLE FILL. FLOWABLE FILL MAY BE ALLOWED TO EXTEND UP TO 6" BEYOND THE FRONT FACE OF THE CAP.

CARE SHALL BE TAKEN TO PREVENT FLOWABLE FILL FROM FLOWING DOWN THE SLOPE, CONTACTING THE SUPERSTRUCTURE, OR ENTERING ANY WATERWAY. A METHOD OF CONTAINMENT SHALL BE SUBMITTED BY THE CONTRACTOR TO THE ENGINEER PRIOR TO BEGINNING WORK.

AN ESTIMATE OF FLOWABLE FILL IS PROVIDED ON THE PLANS BASED ON THE BEST INFORMATION AVAILABLE. AFTER INSPECTION BY THE ENGINEER, THE ESTIMATE SHALL BE REVISED. DURING PLACEMENT OPERATION, IF THE PLACED VOLUME OF FLOWABLE FILL EXCEEDS THE ESTIMATE BY 20%, WORK SHALL STOP AND THE ENGINEER SHALL BE NOTIFIED.

FLOWABLE FILL SHALL BE IN ACCORDANCE WITH SECTION 1000-6 OF THE STANDARD SPECIFICATIONS.

FLOWABLE FILL SHALL BE MEASURED AND PAID FOR PER CUBIC YARD INSTALLED. INSTALLATION EQUIPMENT, FORMWORK, LABOR, AND OTHER ITEMS NECESSARY FOR THE INSTALLATION SHALL BE CONSIDERED INCIDENTAL TO THE OPERATION.

FOR FLOWABLE FILL (PRESERVATION), SEE SPECIAL PROVISIONS.

REPAIR TABLE

PAY ITEM	EST.	ACTUAL
FLOWABLE FILL (PRESERVATION) (CY)	1.0	

PROJECT NO. U-5748

WAKE COUNTY

STATION: 24+88.00 -L-

DRAWN BY : G. COLS	DATE : 12/2022		
CHECKED BY : D. DRUM	DATE : 12/2022		
DESIGNED BY : G. COLS	DATE : 12/2022		
DESIGN CHECKED BY : D. DRUM	DATE : 12/2022		

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PRESERVATION

END BENT 2

(SOUTHBOUND)

REVISIONS

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

SHEET NO. S2-58

TOTAL SHEETS 119

STANDARD NOTES

DESIGN DATA:

SPECIFICATIONS	A.A.S.H.T.O. (CURRENT)
LIVE LOAD	SEE PLANS
IMPACT ALLOWANCE	SEE A.A.S.H.T.O.
STRESS IN EXTREME FIBER OF STRUCTURAL STEEL - AASHTO M270 GRADE 36	20,000 LBS. PER SQ. IN.
- AASHTO M270 GRADE 50W	27,000 LBS. PER SQ. IN.
- AASHTO M270 GRADE 50	27,000 LBS. PER SQ. IN.
REINFORCING STEEL IN TENSION - GRADE 60	24,000 LBS. PER SQ. IN.
CONCRETE IN COMPRESSION	1,200 LBS. PER SQ. IN.
CONCRETE IN SHEAR	SEE A.A.S.H.T.O.
STRUCTURAL TIMBER - TREATED OR UNTREATED EXTREME FIBER STRESS	1,800 LBS. PER SQ. IN.
COMPRESSION PERPENDICULAR TO GRAIN OF TIMBER	375 LBS. PER SQ. IN.
EQUIVALENT FLUID PRESSURE OF EARTH	30 LBS. PER CU. FT. (MINIMUM)

MATERIAL AND WORKMANSHIP:

EXCEPT AS MAY OTHERWISE BE SPECIFIED ON PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE 2018 "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" OF THE N. C. DEPARTMENT OF TRANSPORTATION.

STEEL SHEET PILING FOR PERMANENT OR TEMPORARY APPLICATIONS SHALL BE HOT ROLLED.

CONCRETE:

UNLESS OTHERWISE REQUIRED ON PLANS, CLASS A CONCRETE SHALL BE USED FOR ALL PORTIONS OF ALL STRUCTURES WITH THE EXCEPTION THAT: CLASS AA CONCRETE SHALL BE USED IN BRIDGE SUPERSTRUCTURES, ABUTMENT BACKWALLS, AND APPROACH SLABS; AND CLASS B CONCRETE SHALL BE USED FOR SLOPE PROTECTION AND RIP RAP.

CONCRETE CHAMFERS:

UNLESS OTHERWISE NOTED ON THE PLANS, ALL EXPOSED CORNERS ON STRUCTURES SHALL BE CHAMFERED ¾" WITH THE FOLLOWING EXCEPTIONS: TOP CORNERS OF CURBS MAY BE ROUNDED TO 1½" RADIUS WHICH IS BUILT INTO CURB FORMS; CORNERS OF TRANSVERSE FLOOR EXPANSION JOINTS SHALL BE ROUNDED WITH A ¼" FINISHING TOOL UNLESS OTHERWISE REQUIRED ON PLANS; AND CORNERS OF EXPANSION JOINTS IN THE ROADWAY FACES AND TOPS OF CURBS AND SIDEWALKS SHALL BE ROUNDED TO A ¼" RADIUS WITH A FINISHING STONE OR TOOL UNLESS OTHERWISE REQUIRED ON PLANS.

DOWELS:

DOWELS WHEN INDICATED ON PLANS AS FOR CULVERT EXTENSIONS, SHALL BE EMBEDDED AT LEAST 12" INTO THE OLD CONCRETE AND GROUTED INTO PLACE WITH 1:2 CEMENT MORTAR.

ALLOWANCE FOR DEAD LOAD DEFLECTION, SETTLEMENT, ETC. IN CASTING SUPERSTRUCTURES:

BRIDGES SHALL BE BUILT ON THE GRADE OR VERTICAL CURVE SHOWN ON PLANS. SLABS, CURBS AND PARAPETS SHALL CONFORM TO THE GRADE OR CURVE.

ALL DIMENSIONS WHICH ARE GIVEN IN SECTION AND ARE AFFECTED BY DEAD LOAD DEFLECTIONS ARE DIMENSIONS AT CENTER LINE OF BEARING UNLESS OTHERWISE NOTED ON PLANS. IN SETTING FORMS FOR STEEL BEAM BRIDGES AND PRESTRESSED CONCRETE GIRDER BRIDGES, ADJUSTMENTS SHALL BE MADE DUE TO THE DEAD LOAD DEFLECTIONS FOR THE ELEVATIONS SHOWN. WHERE BLOCKS ARE SHOWN OVER BEAMS FOR BUILDING UP TO THE SLAB, THE VERTICAL DIMENSIONS OF THE BLOCKS SHALL BE ADJUSTED BETWEEN BEARINGS TO COMPENSATE FOR DEAD LOAD DEFLECTIONS, VERTICAL CURVE ORDINATE, AND ACTUAL BEAM CAMBER. WHERE BOTTOM OF SLAB IS IN LINE WITH BOTTOM OF TOP FLANGES, DEPTH OF SLAB BETWEEN BEARINGS SHALL BE ADJUSTED TO COMPENSATE FOR DEAD LOAD DEFLECTION, VERTICAL CURVE ORDINATE, AND ACTUAL BEAM CAMBER.

IN SETTING FALSEWORK AND FORMS FOR REINFORCED CONCRETE SPANS, AN ALLOWANCE SHALL BE MADE FOR DEAD LOAD DEFLECTIONS, SETTLEMENT OF FALSEWORK, AND PERMANENT CAMBER WHICH SHALL BE PROVIDED FOR IN ADDITION TO THE ELEVATIONS SHOWN. AFTER REMOVAL OF THE FALSEWORK, THE FINISHED STRUCTURES SHALL CONFORM TO THE PROFILE AND ELEVATIONS SHOWN ON THE PLANS AND CONSTRUCTION ELEVATIONS FURNISHED BY THE ENGINEER.

DETAILED DRAWINGS FOR FALSEWORK OR FORMS FOR BRIDGE SUPERSTRUCTURE AND ANY STRUCTURE OR PARTS OF A STRUCTURE AS NOTED ON THE PLANS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL BEFORE CONSTRUCTION OF THE FALSEWORK OR FORMS IS STARTED.

REINFORCING STEEL:

ALL REINFORCING STEEL SHALL BE DEFORMED. DIMENSIONS RELATIVE TO PLACEMENT OF REINFORCING ARE TO CENTERS OF BARS UNLESS OTHERWISE INDICATED IN THE PLANS. DIMENSIONS ON BAR DETAILS ARE TO CENTERS OF BARS OR ARE OUT TO OUT AS INDICATED ON PLANS.

WIRE BAR SUPPORTS SHALL BE PROVIDED FOR REINFORCING STEEL WHERE INDICATED ON THE PLANS. WHEN BAR SUPPORT PIECES ARE PLACED IN CONTINUOUS LINES, THEY SHALL BE SO PLACED THAT THE ENDS OF THE SUPPORTING WIRES SHALL BE LAPPED TO LOCK LEGS ON ADJOINING PIECES.

STRUCTURAL STEEL:

AT THE CONTRACTOR'S OPTION, HE MAY SUBSTITUTE ⅞" Ø SHEAR STUDS FOR THE ¾" Ø STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - ⅞" Ø STUDS FOR 4 - ¾" Ø STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF ⅞" Ø STUDS ALONG THE BEAM AS SHOWN FOR ¾" Ø STUDS BASED ON THE RATIO OF 3 - ⅞" Ø STUDS FOR 4 - ¾" Ø STUDS. STUDS OF THE LENGTH SPECIFIED ON THE PLANS MUST BE PROVIDED. THE MAXIMUM SPACING SHALL BE 2'-0".

EXCEPT AT THE INTERIOR SUPPORTS OF CONTINUOUS BEAMS WHERE THE COVER PLATE IS IN CONTACT WITH BEARING PLATE, THE CONTRACTOR MAY, AT HIS OPTION, SUBSTITUTE FOR THE COVER PLATES DESIGNATED ON THE PLANS COVER PLATES OF THE EQUIVALENT AREA PROVIDED THESE PLATES ARE AT LEAST 5/16" IN THICKNESS AND DO NOT EXCEED A WIDTH EQUAL TO THE FLANGE WIDTH LESS 2" OR A THICKNESS EQUAL TO 2 TIMES THE FLANGE THICKNESS. THE SIZE OF FILLET WELDS SHALL CONFORM TO THE REQUIREMENTS OF THE CURRENT ANSI/AASHTO/AWS "BRIDGE WELDING CODE". ELECTROSLAG WELDING WILL NOT BE PERMITTED.

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

HANDRAILS AND POSTS:

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

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

SPECIAL NOTES:

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

ENGLISH

JANUARY, 1990