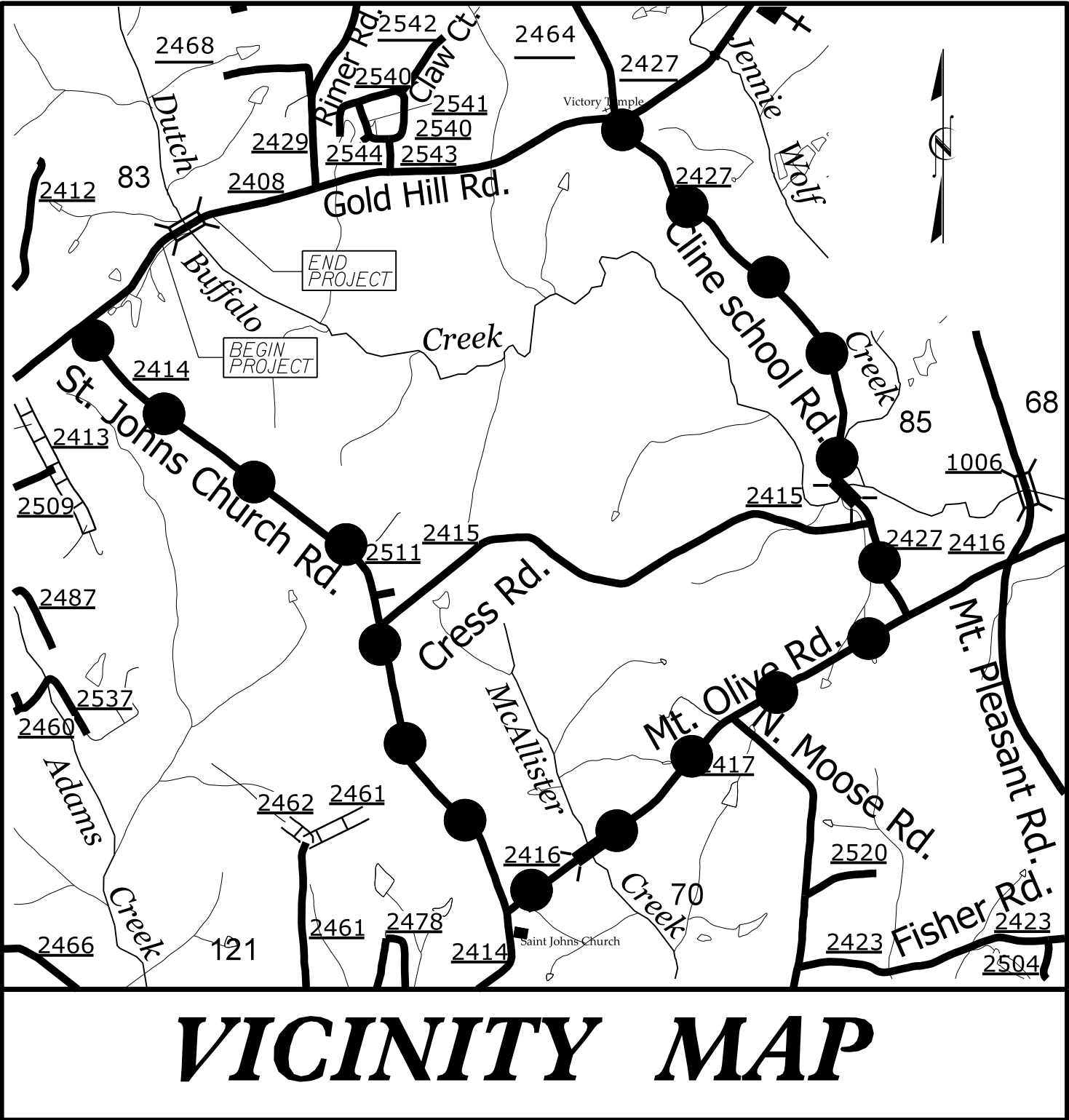


PROJECT: BP10-R047

CONTRACT: DJ00583

STRUCTURE



VICINITY MAP

OFF-SITE DETOUR ROUTE

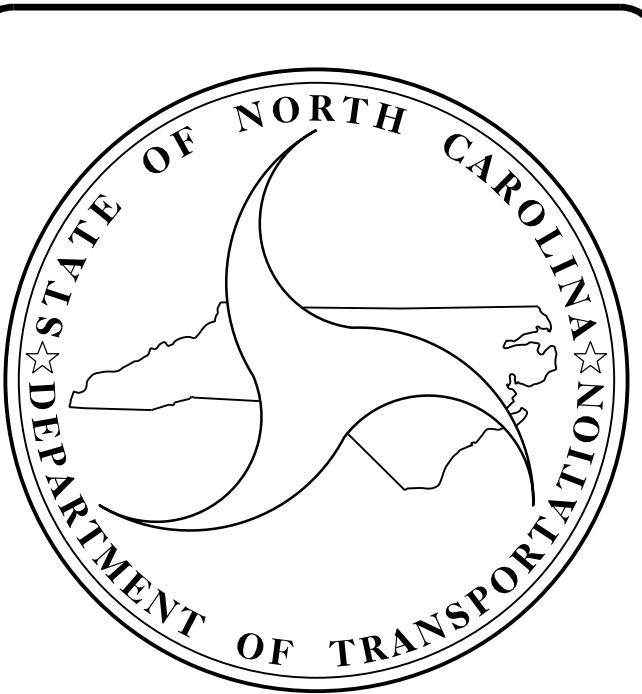
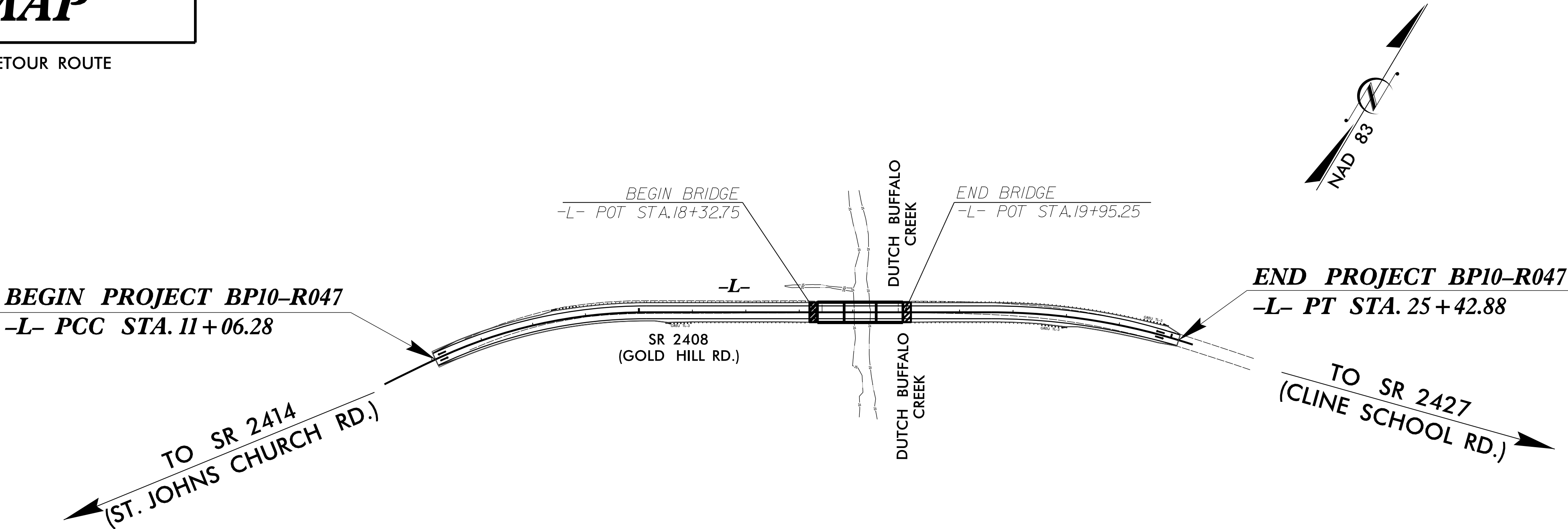
STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

CABARRUS COUNTY

LOCATION: REPLACE BRIDGE 120083 OVER DUTCH BUFFALO CREEK  
ON SR 2408 (GOLD HILL ROAD)

TYPE OF WORK: GRADING, DRAINAGE, PAVING, AND STRUCTURE

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	BP10-R047		25
STATE PROJ.NO.	F.A.PROJ.NO.	DESCRIPTION	
BP10.R047.1	N/A	P.E.	
BP10.R047.2	N/A	UTIL & R/W	
BP10.R047.3	N/A	CONST.	



DESIGN DATA

ADT 2025 = 3,200 VPD  
ADT 2045 = 4,300 VPD  
K = N/A  
D = N/A  
T = 6 %  
V = 50 MPH  
TTST = 3% DUALS = 3%  
FUNC CLASS =  
MINOR COLLECTOR  
SUB-REGIONAL TIER

PROJECT LENGTH

LENGTH ROADWAY PROJECT BP10-R047 = 0.241 MILES  
LENGTH ROADWAY PROJECT BP10-R047 = 0.031 MILES  
LENGTH ROADWAY PROJECT BP10-R047 = 0.272 MILES



Prepared in the Office of:  
CDM SMITH  
5400 Glenwood Avenue, Suite 400  
Raleigh, NC 27612-3228  
NC COA No. F-1255

FOR THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

2024 STANDARD SPECIFICATIONS

LETTING DATE : NOVEMBER 5, 2025

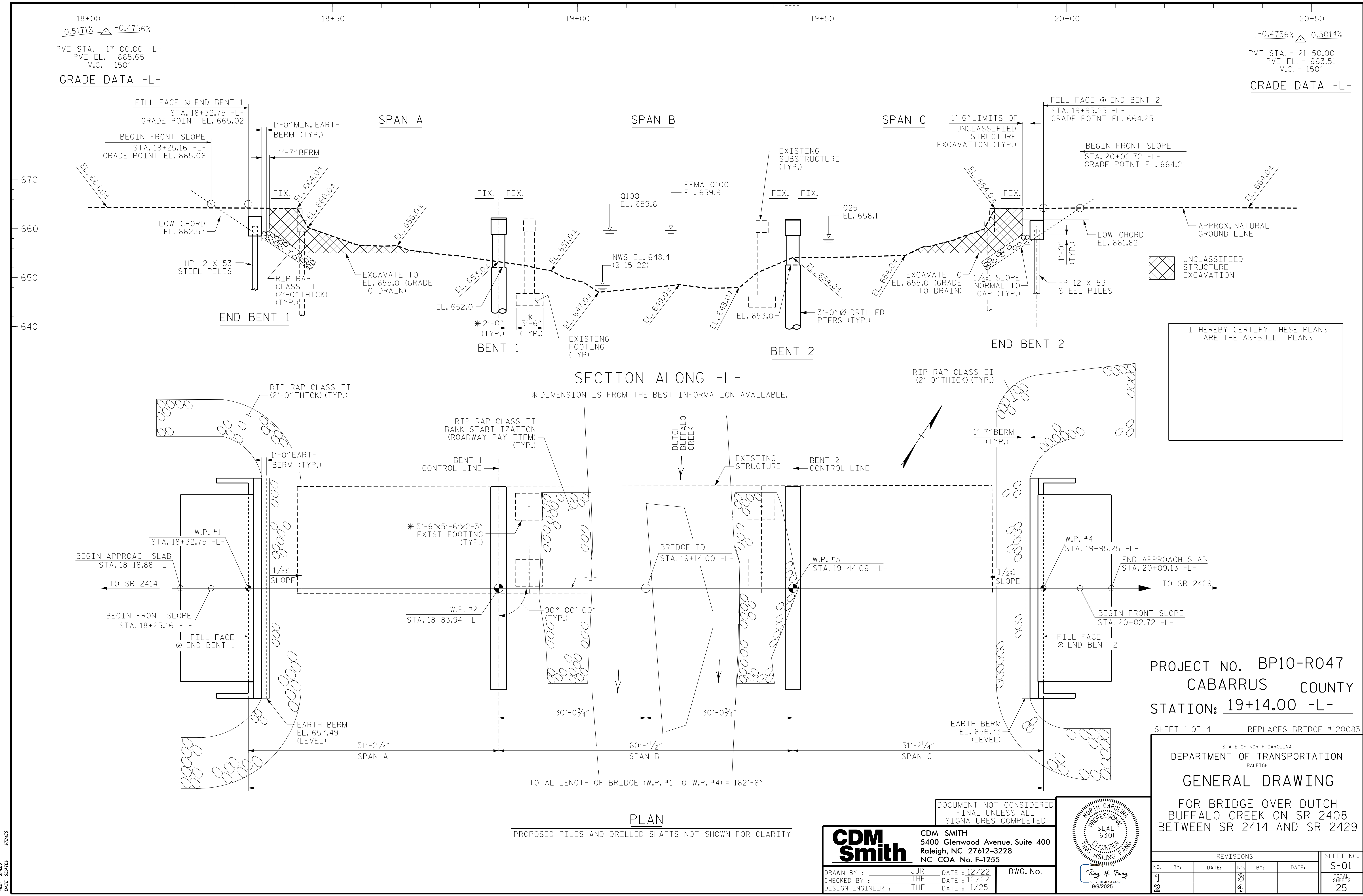
KIT PERSIANI, PE  
PROJECT ENGINEER

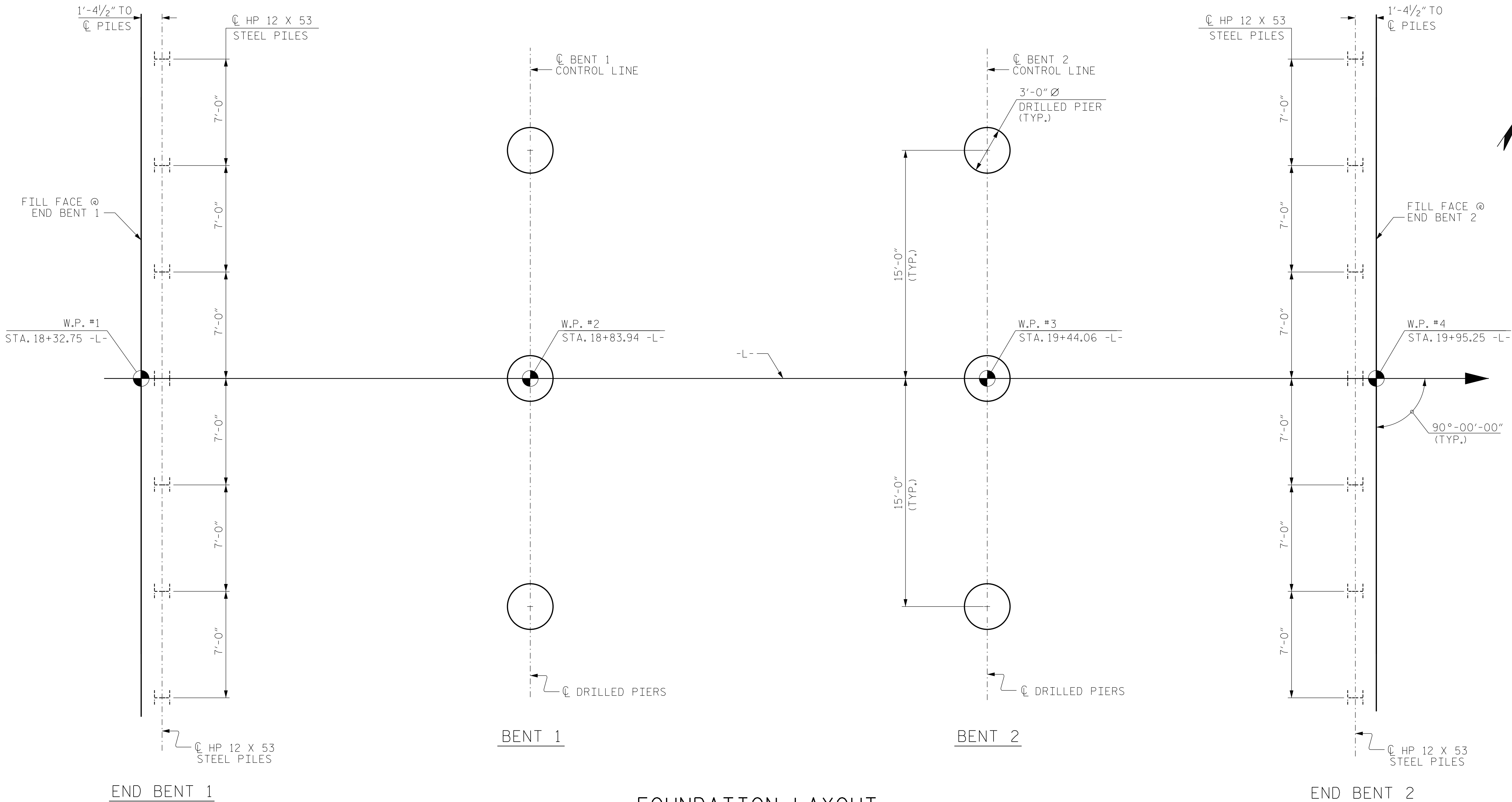
TING H. FANG, P.E.  
PROJECT DESIGN ENGINEER

YANWEI MA, P.E.  
NCDOT CONTACT



DocuSigned by:  
Ting H. Fang  
68E7EC4F5AA469  
9/9/2025





## FOUNDATION LAYOUT

DIMENSIONS LOCATING PILES AND DRILLED PIERS ARE  
SHOWN TO THE CENTERLINE OF PILES & DRILLED PIERS.  
ALL PILES ARE VERTICAL.

### NOTES

FOR PILES, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.

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

PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

SHEET 2 OF 4

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
GENERAL DRAWING					
FOR BRIDGE OVER DUTCH BUFFALO CREEK ON SR 2408 BETWEEN SR 2414 AND SR 2429					
REVISIONS					SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
TOTAL SHEETS					S-02
					25

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED		
CDM SMITH 5400 Glenwood Avenue, Suite 400 Raleigh, NC 27612-3228 NC COA No. F-1255		
DRAWN BY : JJR	DATE : 12/22	DWG. No.
CHECKED BY : THF	DATE : 12/22	
DESIGN ENGINEER : THF	DATE : 1/25	

NORTH CAROLINA  
PROFESSIONAL  
SEAL  
16301  
ENGINEER  
TING HSILUNG FENG  
DocuSigned by  
Ting H. Feng  
086780C4F8A469  
9/9/2025



$+$ 

WOODS

DUTCH BUFFALO CREEK

BRIDGE ID  
STA. 19+14.00

SR 2408

TO SR 2414

TO SR 2429

RIP RAP CLASS II  
(2'-0" THICK) (TYP.)

PROPOSED GUARDRAIL  
(RDWY. DETAIL & PAY  
ITEM) (TYP.)

EXISTING  
STRUCTURE

RIP RAP CLASS II  
BANK STABILIZATION  
(ROADWAY PAY ITEM)

90°-00'-00"  
(TYP.)

14'-6"

WET LANDS

B.M. #1

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.



DocuSign Envelope ID: 68E7E9C4F9AA469...

*Ting H. Fang*

9/9/2025

REVISIONS						SHEET NO S-04
NO.	BY:	DATE:	NO.	BY:	DATE:	
1	_____	_____	3	_____	_____	TOTAL SHEETS 25
2	_____	_____	4	_____	_____	

LOAD FACTORS:

DESIGN LOAD RATING FACTORS	LIMIT STATE	$\gamma_{DC}$	$\gamma_{DW}$
	STRENGTH I	1.25	1.50
	SERVICE III	1.00	1.00

NOTES:

MINIMUM RATING FACTORS ARE BASED ON THE STRENGTH I AND SERVICE III LIMIT STATES.

ALLOWABLE STRESSES FOR SERVICE III LIMIT STATE ARE AS REQUIRED FOR DESIGN.

COMMENTS:

1.
2.
3.
4.

#

CONTROLLING LOAD RATING

1

DESIGN LOAD RATING (HL-93)

2

DESIGN LOAD RATING (HS-20)

3

LEGAL LOAD RATING \*\*

4

EMERGENCY VEHICLE LOAD RATING \*\*

\*\* SEE CHART FOR VEHICLE TYPE

GIRDER LOCATION

I - INTERIOR GIRDER  
EL - EXTERIOR LEFT GIRDER  
ER - EXTERIOR RIGHT GIRDER

PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

SHEET 1 OF 2

DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED

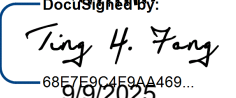
CDM  
Smith

CDM SMITH  
5400 Glenwood Avenue, Suite 400  
Raleigh, NC 27612-3228  
NC COA No. F-1255

DRAWN BY : JJR DATE : 12/22  
CHECKED BY : THF DATE : 12/22  
DESIGN ENGINEER : THF DATE : 1/25

DWG. No.

NORTH CAROLINA  
PROFESSIONAL  
SEAL  
16301  
ENGINEER  
TRIG HSILUNG FENG  
08/2025

  
08/2025

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
LRFR SUMMARY FOR  
50' CORED SLAB UNIT  
90°SKEW  
SPANS A & C  
(NON-INTERSTATE TRAFFIC)

REVISIONS

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

SHEET NO.  
S-05

TOTAL  
SHEETS  
25

STD. NO. 24LRFR1\_90S\_50L (TOP DOWN)

LOAD AND RESISTANCE FACTOR RATING (LRFD) SUMMARY FOR PRESTRESSED CONCRETE CORED SLAB UNITS																								
LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING	MINIMUM RATING FACTORS (RF)	TONS = W X RF	STRENGTH I LIMIT STATE										SERVICE III LIMIT STATE						COMMENT NUMBER		
						LIVELOAD FACTORS	MOMENT					SHEAR					LIVELOAD FACTORS	MOMENT						
							DISTRIBUTION FACTORS (DF)	RATING FACTOR	SPAN	GIRDER LOCATION	DISTANCE FROM LEFT END OF SPAN (ft)	DISTRIBUTION FACTORS (DF)	RATING FACTOR	SPAN	GIRDER LOCATION	DISTANCE FROM LEFT END OF SPAN (ft)		DISTRIBUTION FACTORS (DF)	RATING FACTOR	SPAN	GIRDER LOCATION	DISTANCE FROM LEFT END OF SPAN (ft)		
DESIGN LOAD RATING	HL-93(Inv)	N/A	1	2.053	--	1.75	0.276	2.26	50'	EL	29.5	0.52	2.05	50'	EL	5.9	0.80	0.276	2.22	50'	EL	29.5		
	HL-93(0pr)	N/A	--	2.661	--	1.35	0.276	2.93	50'	EL	29.5	0.52	2.66	50'	EL	5.9	N/A	--	--	--	--	--		
	HS-20(Inv)	36.000	2	2.470	88.930	1.75	0.276	2.86	50'	EL	29.5	0.52	2.47	50'	EL	5.9	0.80	0.276	2.81	50'	EL	29.5		
	HS-20(0pr)	36.000	--	3.202	115.279	1.35	0.276	3.71	50'	EL	29.5	0.52	3.20	50'	EL	5.9	N/A	--	--	--	--	--		
LEGAL LOAD RATING	SV	SNSH	13.500	--	6.053	81.711	1.4	0.276	7.70	50'	EL	29.5	0.52	7.14	50'	EL	5.9	0.80	0.276	6.05	50'	EL	29.5	
		SNGARBS2	20.000	--	4.634	92.672	1.4	0.276	5.89	50'	EL	29.5	0.52	5.14	50'	EL	5.9	0.80	0.276	4.63	50'	EL	29.5	
		SNAGRIS2	22.000	--	4.430	97.466	1.4	0.276	5.65	50'	EL	29.5	0.52	4.80	50'	EL	5.9	0.80	0.276	4.43	50'	EL	29.5	
		SNCOTTS3	27.250	--	3.015	82.171	1.4	0.276	3.84	50'	EL	29.5	0.52	3.57	50'	EL	5.9	0.80	0.276	3.02	50'	EL	29.5	
		SNAGGRS4	34.925	--	2.567	89.643	1.4	0.276	3.27	50'	EL	29.5	0.52	3.01	50'	EL	5.9	0.80	0.276	2.57	50'	EL	29.5	
		SNS5A	35.550	--	2.507	89.116	1.4	0.276	3.19	50'	EL	29.5	0.52	3.07	50'	EL	5.9	0.80	0.276	2.51	50'	EL	29.5	
		SNS6A	39.950	--	2.320	92.685	1.4	0.276	2.95	50'	EL	29.5	0.52	2.82	50'	EL	5.9	0.80	0.276	2.32	50'	EL	29.5	
		SNS7B	42.000	--	2.210	92.825	1.4	0.276	2.81	50'	EL	29.5	0.52	2.80	50'	EL	5.9	0.80	0.276	2.21	50'	EL	29.5	
	TTST	TNAGRIT3	33.000	--	2.835	93.559	1.4	0.276	3.61	50'	EL	29.5	0.52	3.34	50'	EL	5.9	0.80	0.276	2.84	50'	EL	29.5	
		TNT4A	33.075	--	2.853	94.369	1.4	0.276	3.63	50'	EL	29.5	0.52	3.24	50'	EL	5.9	0.80	0.276	2.85	50'	EL	29.5	
		TNT6A	41.600	--	2.352	97.863	1.4	0.276	2.99	50'	EL	29.5	0.52	3.03	50'	EL	5.9	0.80	0.276	2.35	50'	EL	29.5	
		TNT7A	42.000	--	2.375	99.744	1.4	0.276	3.02	50'	EL	29.5	0.52	2.89	50'	EL	5.9	0.80	0.276	2.37	50'	EL	29.5	
		TNT7B	42.000	--	2.475	103.971	1.4	0.276	3.16	50'	EL	29.5	0.52	2.71	50'	EL	5.9	0.80	0.276	2.48	50'	EL	29.5	
		TNAGRIT4	43.000	--	2.343	100.737	1.4	0.276	2.98	50'	EL	29.5	0.52	2.62	50'	EL	5.9	0.80	0.276	2.34	50'	EL	29.5	
		TNAGT5A	45.000	--	2.200	98.988	1.4	0.276	2.80	50'	EL	29.5	0.52	2.63	50'	EL	5.9	0.80	0.276	2.20	50'	EL	29.5	
		TNAGT5B	45.000	3	2.165	97.428	1.4	0.276	2.75	50'	EL	29.5	0.52	2.49	50'	EL	5.9	0.80	0.276	2.17	50'	EL	29.5	
EMERGENCY VEHICLE (EV)	EV2	28.750	-	4.011	115.328	1.3	0.276	5.83	50'	EL	29.5	0.52	4.01	50'	EL	5.9	0.80	0.276	4.68	50'	EL	24.5		
	EV3	43.000	4	2.715	116.728	1.3	0.276	3.78	50'	EL	29.5	0.52	2.71	50'	EL	5.9	0.80	0.276	3.02	50'	EL	24.5		

1

2

4

3

LRFR SUMMARY  
FOR SPANS A AND C

FILE: SPILES  
DATE: SDATES  
STIMES

+

+

FILE: SPILES  
DATE: SDATES  
STIMES

LOAD AND RESISTANCE FACTOR RATING (LRFD) SUMMARY FOR PRESTRESSED CONCRETE CORED SLAB UNITS																								
LEVEL	VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING	MINIMUM RATING FACTORS (RF)	TONS = W X RF	STRENGTH I LIMIT STATE										SERVICE III LIMIT STATE						COMMENT NUMBER		
						LIVELOAD FACTORS	MOMENT				SHEAR					LIVELOAD FACTORS	MOMENT							
							DISTRIBUTION FACTORS (DF)	RATING FACTOR	SPAN	GIRDER LOCATION	DISTANCE FROM LEFT END OF SPAN (ft)	DISTRIBUTION FACTORS (DF)	RATING FACTOR	SPAN	GIRDER LOCATION		DISTANCE FROM LEFT END OF SPAN (ft)	DISTRIBUTION FACTORS (DF)	RATING FACTOR	SPAN	GIRDER LOCATION		DISTANCE FROM LEFT END OF SPAN (ft)	
DESIGN LOAD RATING	HL-93(Inv)	N/A	1	2.073	--	1.75	0.28	3.04	60'	EL	24.5	0.534	2.07	60'	EL	2.45	0.80	0.28	2.85	60'	EL	24.5		
	HL-93(0pr)	N/A	--	2.687	--	1.35	0.28	3.93	60'	EL	24.5	0.534	2.69	60'	EL	2.45	N/A	--	--	--	--	--		
	HS-20(Inv)	36.000	2	2.479	89.250	1.75	0.28	3.76	60'	EL	24.5	0.534	2.48	60'	EL	2.45	0.80	0.28	3.52	60'	EL	24.5		
	HS-20(0pr)	36.000	--	3.214	115.694	1.35	0.28	4.88	60'	EL	24.5	0.534	3.21	60'	EL	2.45	N/A	--	--	--	--	--		
LEGAL LOAD RATING	SV	SNSH	13.500	--	6.997	94.455	1.4	0.28	9.57	60'	EL	24.5	0.534	7.00	60'	EL	2.45	0.80	0.28	7.20	60'	EL	24.5	
		SNGARBS2	20.000	--	5.091	101.826	1.4	0.28	7.56	60'	EL	24.5	0.534	5.09	60'	EL	2.45	0.80	0.28	5.65	60'	EL	24.5	
		SNAGRIS2	22.000	--	4.772	104.980	1.4	0.28	7.26	60'	EL	19.6	0.534	4.77	60'	EL	2.45	0.80	0.28	5.45	60'	EL	19.6	
		SNCOTTS3	27.250	--	3.505	95.499	1.4	0.28	4.78	60'	EL	24.5	0.534	3.50	60'	EL	2.45	0.80	0.28	3.59	60'	EL	24.5	
		SNAGGRS4	34.925	--	2.991	104.445	1.4	0.28	4.15	60'	EL	24.5	0.534	2.99	60'	EL	2.45	0.80	0.28	3.12	60'	EL	24.5	
		SNS5A	35.550	--	3.044	108.209	1.4	0.28	4.05	60'	EL	24.5	0.534	3.07	60'	EL	2.45	0.80	0.28	3.04	60'	EL	24.5	
		SNS6A	39.950	--	2.840	113.453	1.4	0.28	3.79	60'	EL	24.5	0.534	2.84	60'	EL	2.45	0.80	0.28	2.85	60'	EL	24.5	
		SNS7B	42.000	--	2.712	113.918	1.4	0.28	3.61	60'	EL	24.5	0.534	2.84	60'	EL	2.45	0.80	0.28	2.71	60'	EL	24.5	
	TTST	TNAGRIT3	33.000	--	3.351	110.572	1.4	0.28	4.64	60'	EL	24.5	0.534	3.35	60'	EL	2.45	0.80	0.28	3.49	60'	EL	24.5	
		TNT4A	33.075	--	3.228	106.768	1.4	0.28	4.68	60'	EL	24.5	0.534	3.23	60'	EL	2.45	0.80	0.28	3.52	60'	EL	24.5	
		TNT6A	41.600	--	2.930	121.871	1.4	0.28	3.90	60'	EL	24.5	0.534	3.10	60'	EL	2.45	0.80	0.28	2.93	60'	EL	24.5	
		TNT7A	42.000	--	2.892	121.477	1.4	0.28	3.96	60'	EL	24.5	0.534	2.89	60'	EL	2.45	0.80	0.28	2.97	60'	EL	24.5	
		TNT7B	42.000	--	2.736	114.922	1.4	0.28	4.12	60'	EL	24.5	0.534	2.74	60'	EL	2.45	0.80	0.28	3.08	60'	EL	24.5	
		TNAGRIT4	43.000	--	2.637	113.381	1.4	0.28	3.91	60'	EL	24.5	0.534	2.64	60'	EL	2.45	0.80	0.28	2.94	60'	EL	24.5	
		TNAGT5A	45.000	--	2.676	120.405	1.4	0.28	3.66	60'	EL	24.5	0.534	2.68	60'	EL	2.45	0.80	0.28	2.75	60'	EL	24.5	
		TNAGT5B	45.000	3	2.502	112.570	1.4	0.28	3.58	60'	EL	24.5	0.534	2.50	60'	EL	2.45	0.80	0.28	2.69	60'	EL	24.5	
EMERGENCY VEHICLE (EV)	EV2	28.750	--	3.754	107.931	1.3	0.28	4.36	60'	EL	29.5	0.534	3.75	60'	EL	2.45	0.80	0.28	3.94	60'	EL	29.5		
	EV3	43.000	4	2.536	109.056	1.3	0.28	2.84	60'	EL	29.5	0.534	2.54	60'	EL	2.45	0.80	0.28	2.56	60'	EL	29.5		

LOAD FACTORS:

DESIGN LOAD RATING FACTORS	LIMIT STATE	$\gamma_{DC}$	$\gamma_{DW}$
	STRENGTH I	1.25	1.50
	SERVICE III	1.00	1.00

NOTES:

MINIMUM RATING FACTORS ARE BASED ON THE STRENGTH I AND SERVICE III LIMIT STATES.

ALLOWABLE STRESSES FOR SERVICE III LIMIT STATE ARE AS REQUIRED FOR DESIGN.

COMMENTS:

1.
2.
3.
4.

# CONTROLLING LOAD RATING

1 DESIGN LOAD RATING (HL-93)

2 DESIGN LOAD RATING (HS-20)

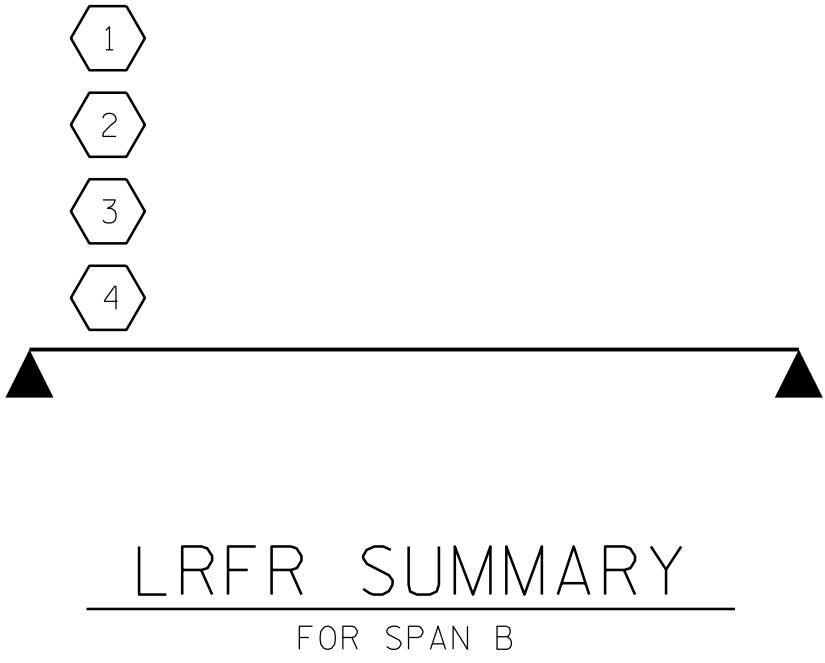
3 LEGAL LOAD RATING \*\*

4 EMERGENCY VEHICLE LOAD RATING \*\*

\*\* SEE CHART FOR VEHICLE TYPE

GIRDER LOCATION

I - INTERIOR GIRDER  
EL - EXTERIOR LEFT GIRDER  
ER - EXTERIOR RIGHT GIRDER



PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

SHEET 2 OF 2

DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED

CDM  
Smith

CDM SMITH  
5400 Glenwood Avenue, Suite 400  
Raleigh, NC 27612-3228  
NC COA No. F-1255

DWG. No.

NORTH CAROLINA  
PROFESSIONAL  
SEAL  
16301  
ENGINEER  
TIG HSILUNG FENG  
0001699991

*Tig H. Feng*  
BRETERCAFBA4489..  
9/9/2025

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

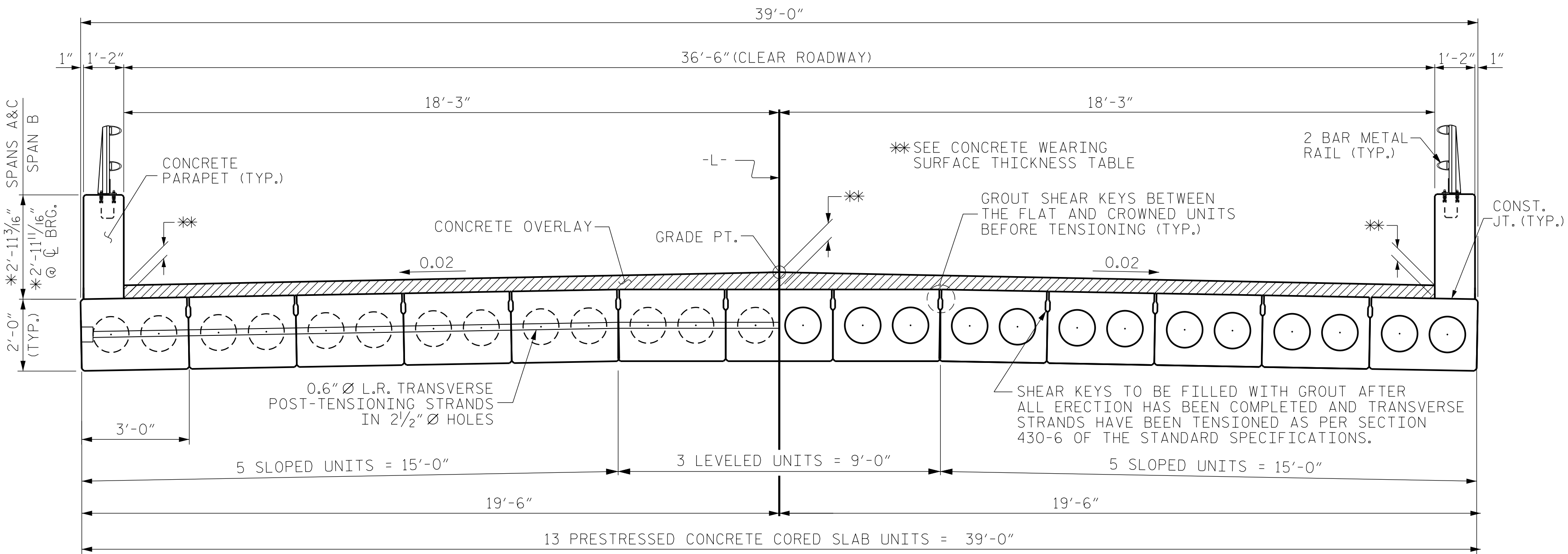
LRFR SUMMARY FOR  
60' CORED SLAB UNIT  
90° SKEW  
SPAN B  
(NON-INTERSTATE TRAFFIC)

REVISIONS

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

SHEET NO.  
S-06

TOTAL  
SHEETS  
25

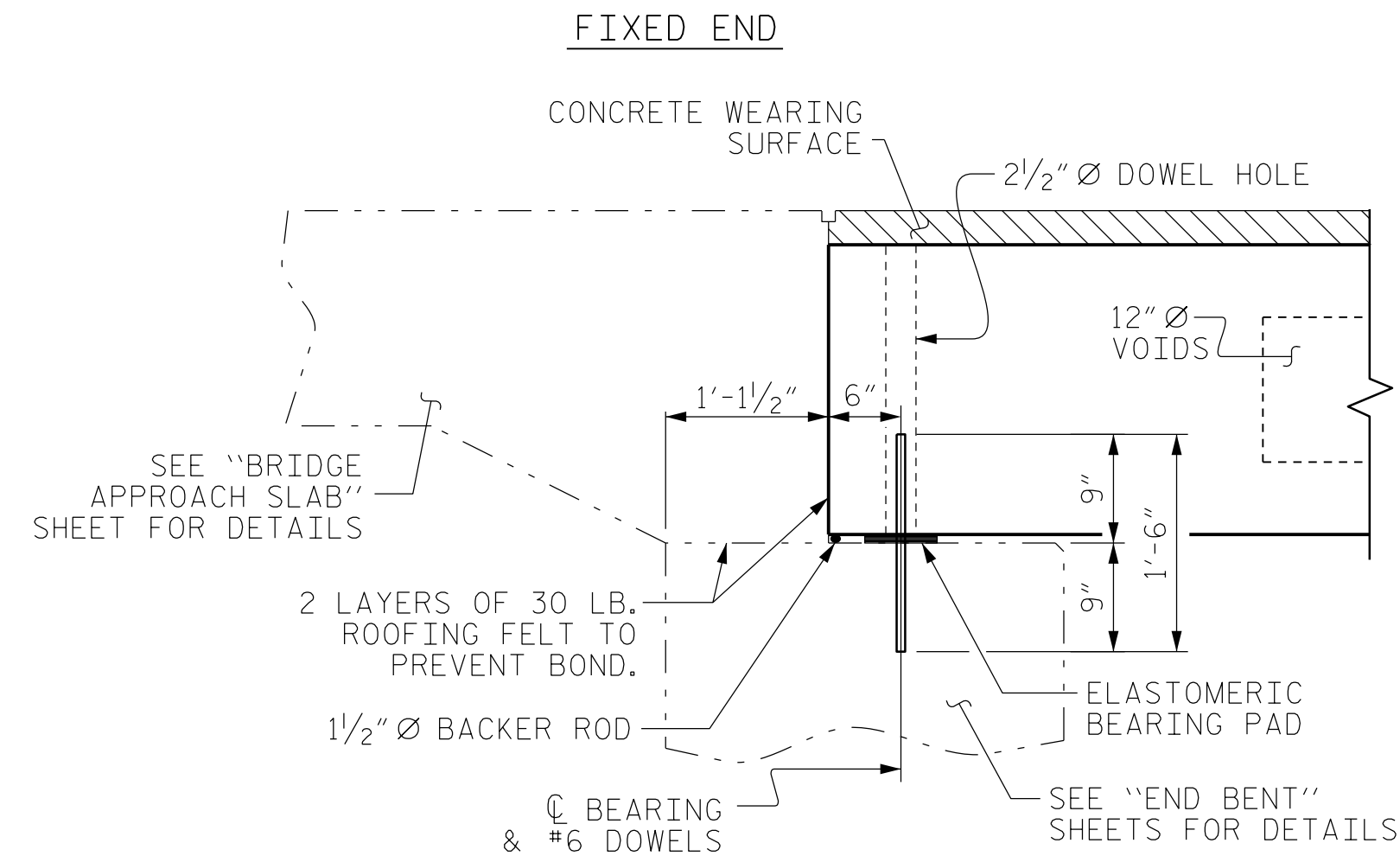


HALF SECTION  
AT INTERMEDIATE DIAPHRAGMS

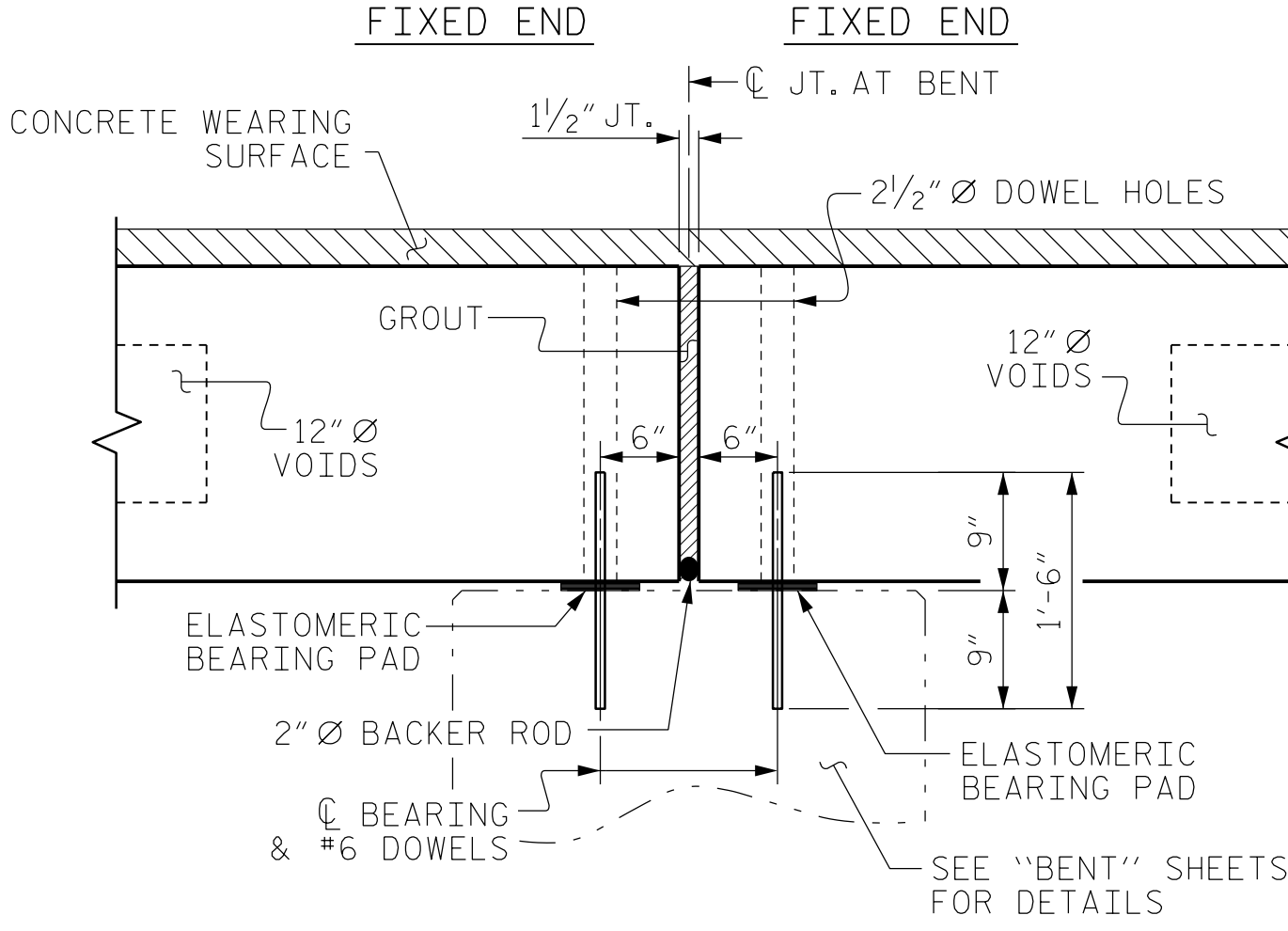
HALF SECTION  
THROUGH VOIDS

### TYPICAL SECTION

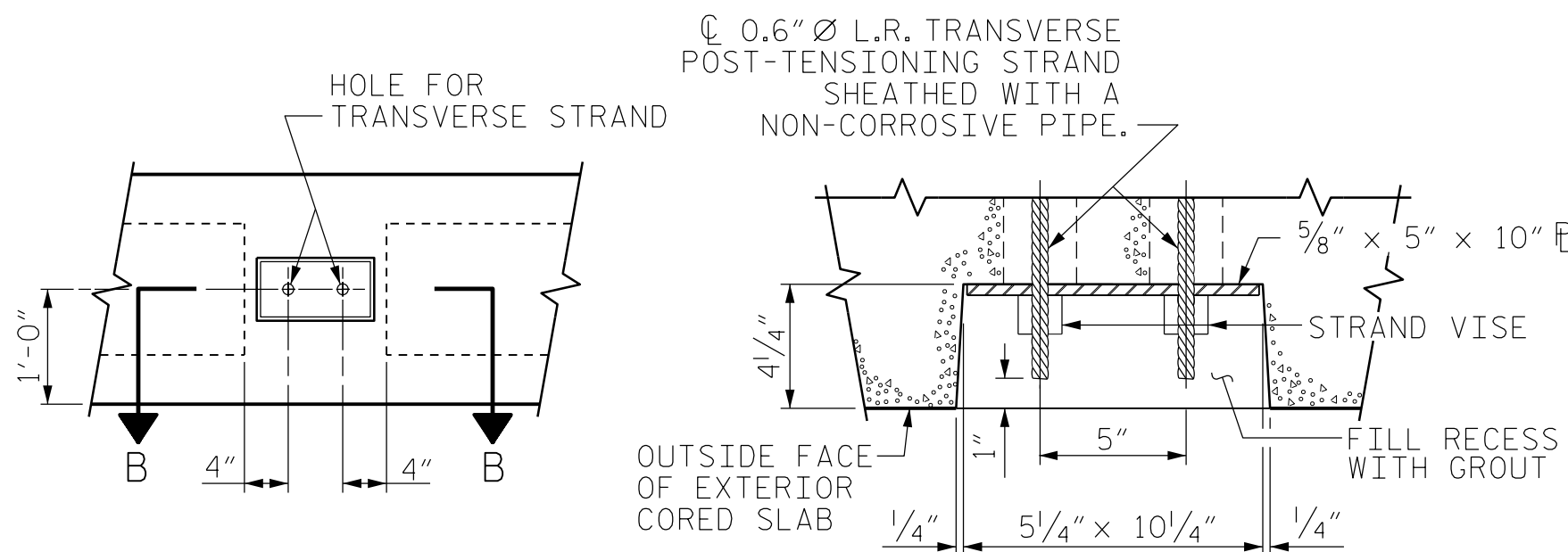
\*THE MAXIMUM BARRIER RAIL HEIGHT AND ASPHALT THICKNESS IS SHOWN. THE HEIGHT OF THE BARRIER RAIL AND ASPHALT THICKNESS VARIES WHILE THE TOP OF THE BARRIER RAIL FOLLOWS THE PROFILE OF THE CUTTERLINE. FOR RAIL HEIGHT DETAILS AND ASPHALT THICKNESS, SEE THE "VERTICAL CONCRETE BARRIER RAIL SECTION" DETAIL.



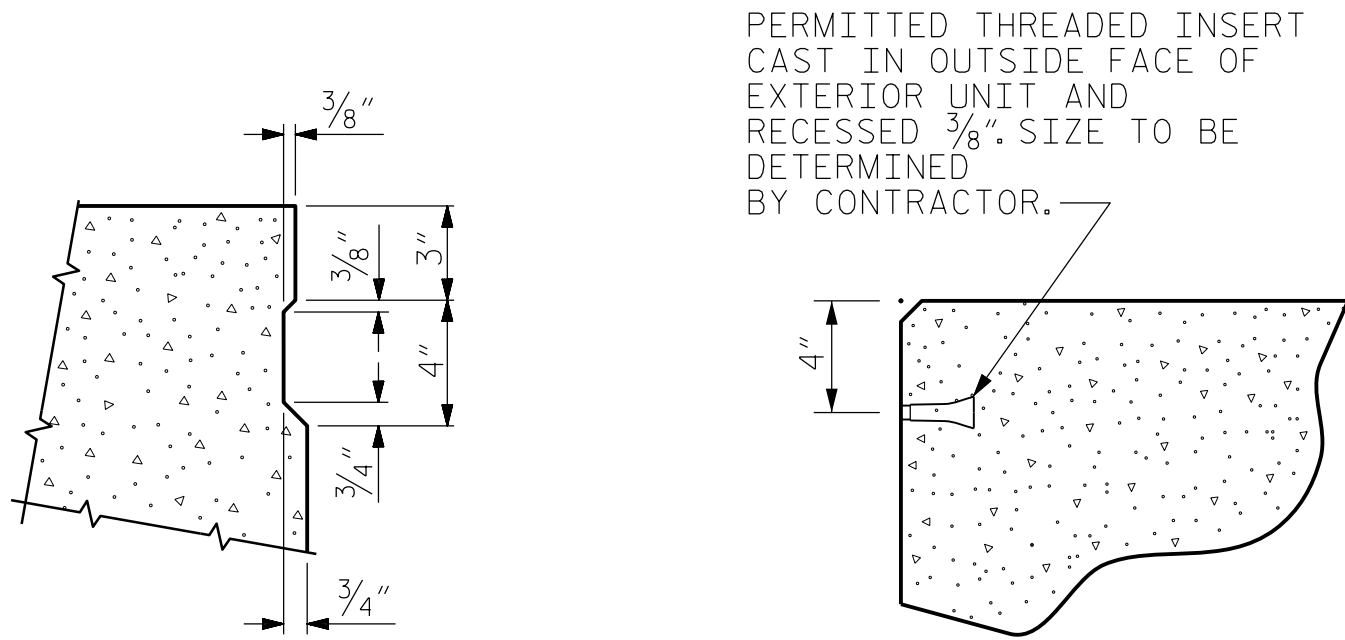
### SECTION AT END BENT



### SECTION AT BENT

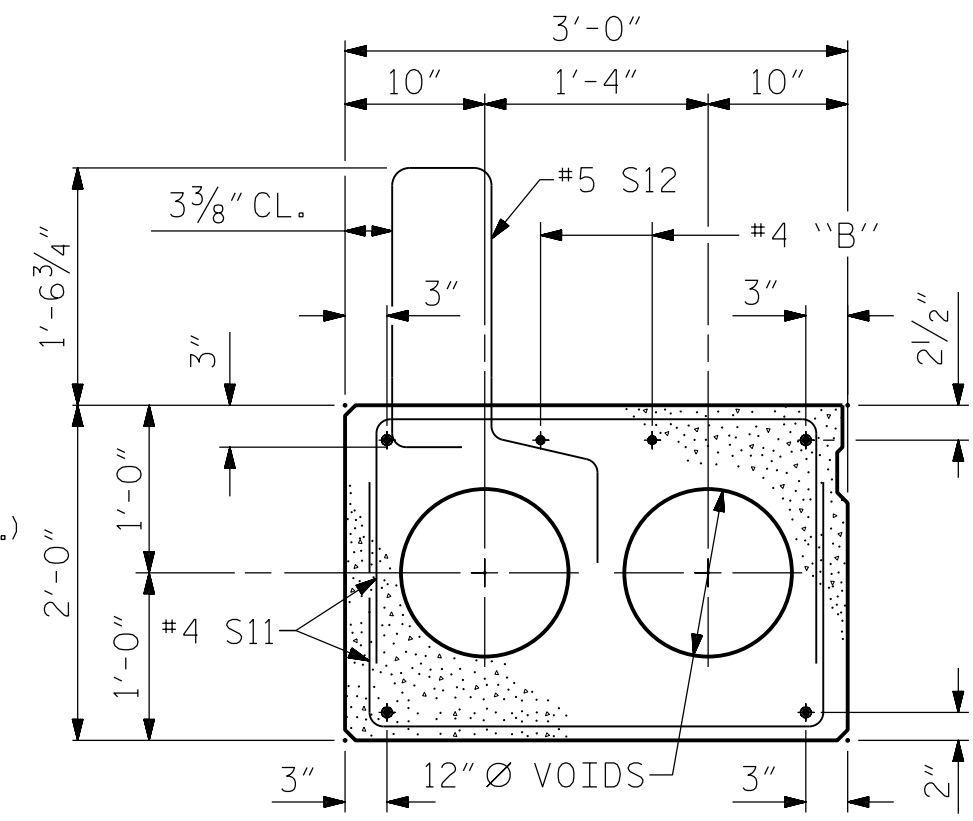


### ROUTED RECESS AT END OF POST-TENSIONED STRAND-CORED SLABS



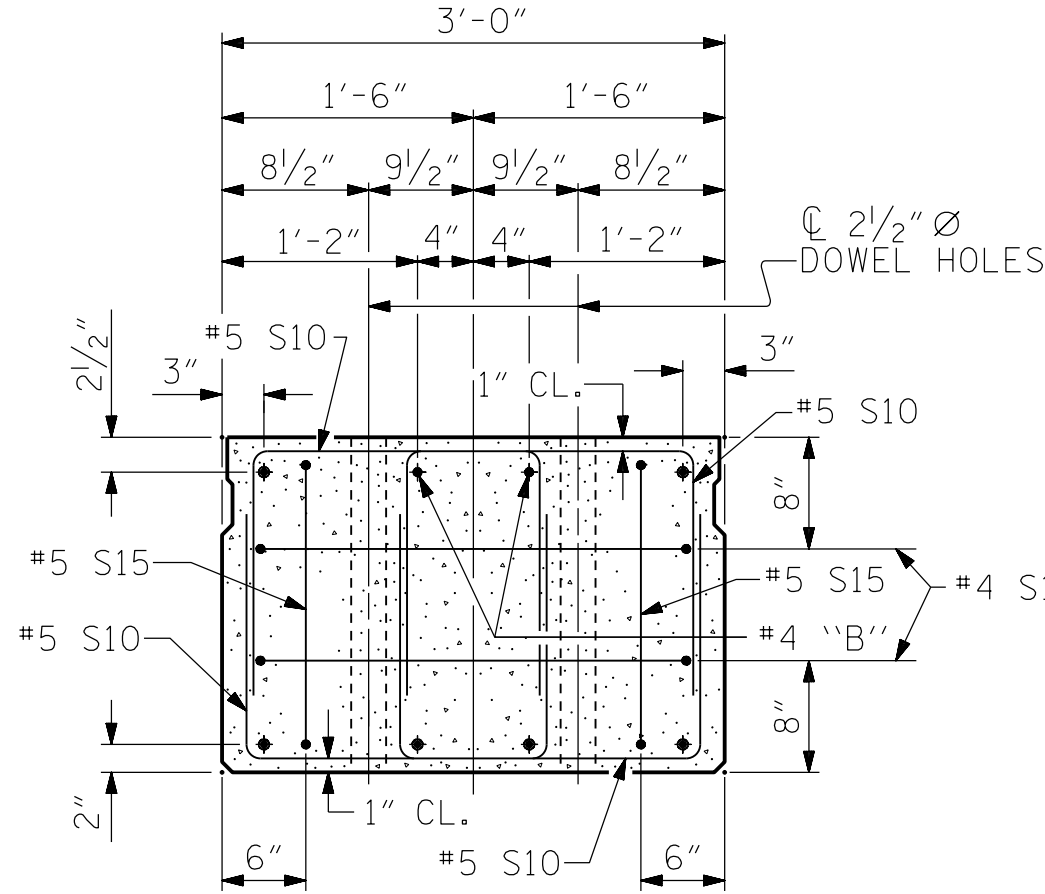
### SHEAR KEY DETAIL

NOTE: OMIT SHEAR KEY ON OUTSIDE FACE  
OF EXTERIOR CORED SLABS.



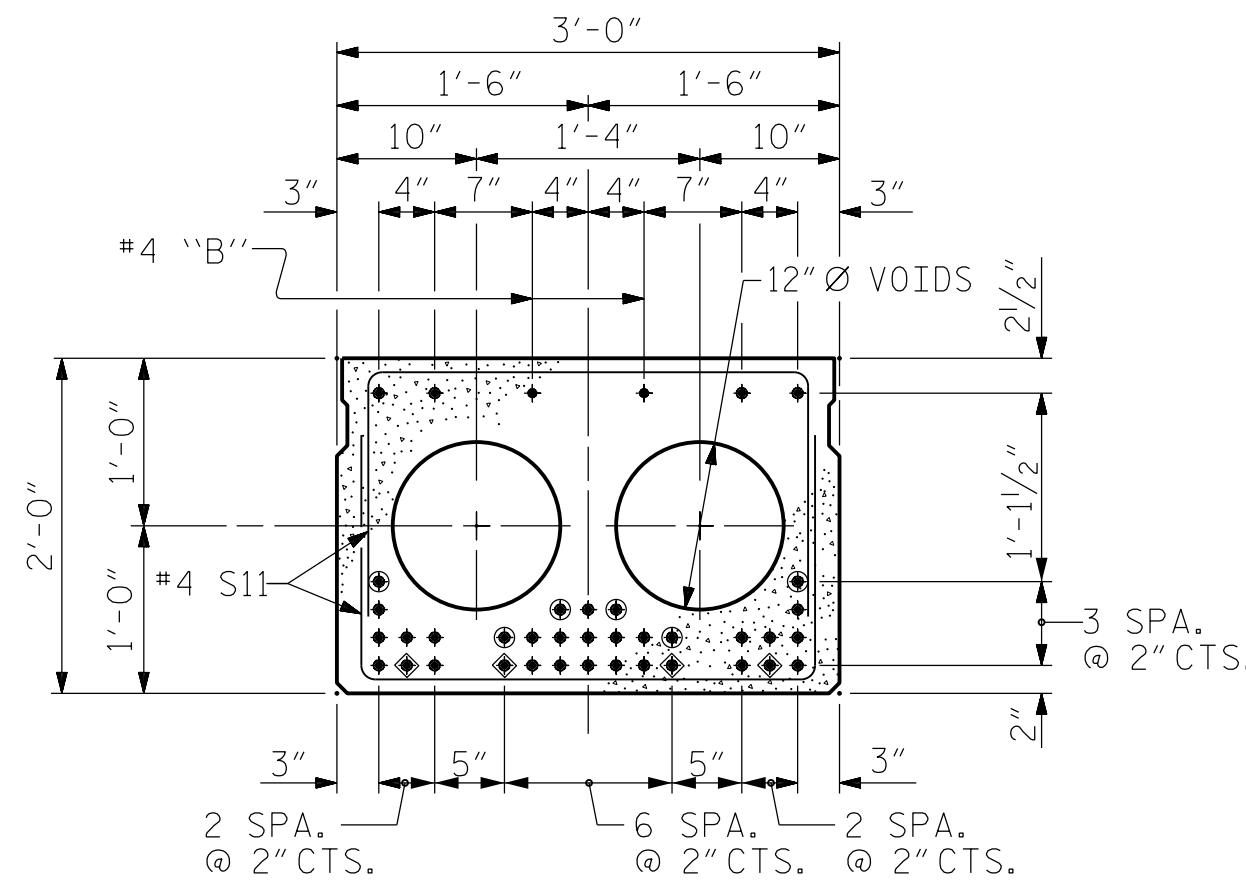
### EXTERIOR SLAB SECTION

(FOR PRESTRESSED STRAND LAYOUT, SEE  
INTERIOR SLAB SECTION.)



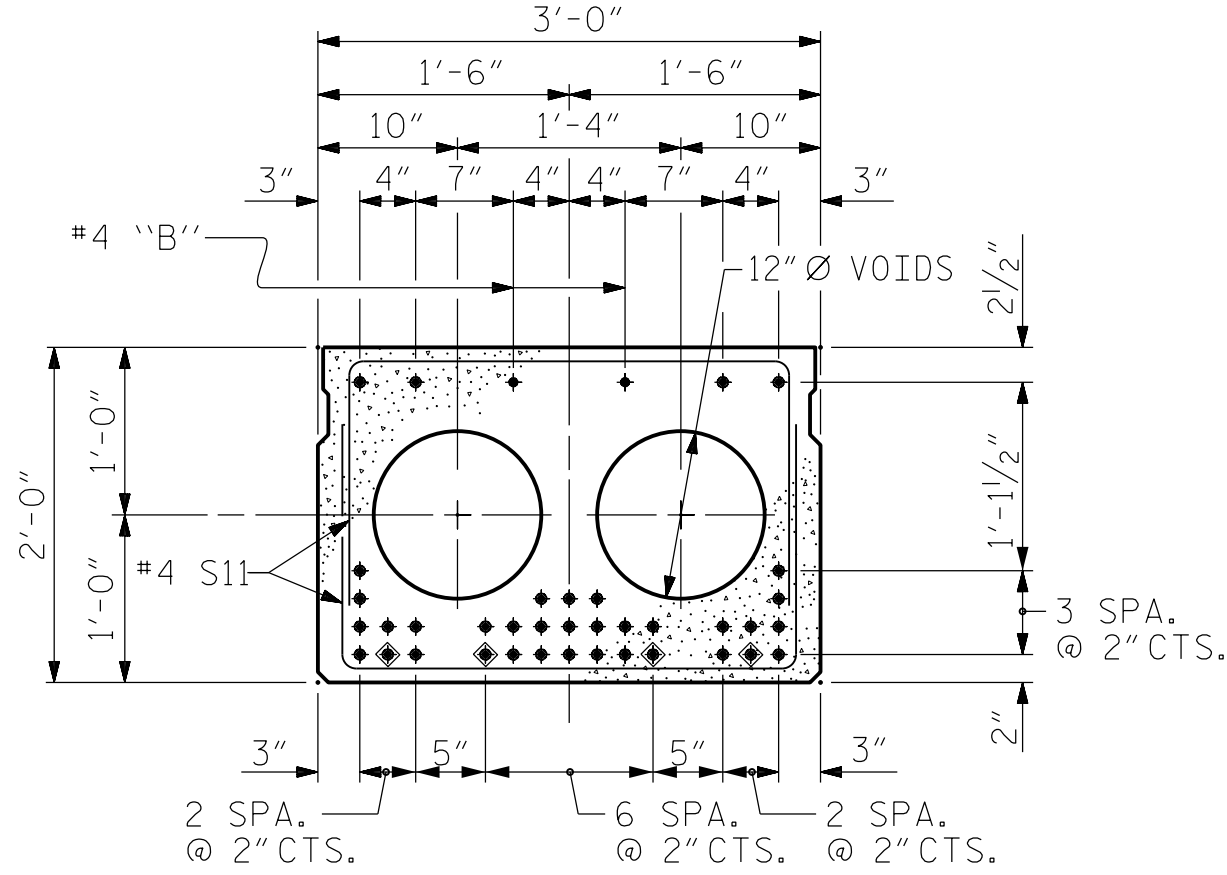
### END ELEVATION

SHOWING PLACEMENT OF DOUBLE STIRRUPS  
AND LOCATION OF DOWEL HOLES.  
(STRAND LAYOUT NOT SHOWN.)  
INTERIOR SLAB UNIT SHOWN-EXTERIOR SLAB  
UNIT SIMILAR EXCEPT SHEAR KEY LOCATION.



### INTERIOR SLAB SECTION

(50' UNIT) (31 STRANDS REQUIRED)



### INTERIOR SLAB SECTION

(60' UNIT) (37 STRANDS REQUIRED)

### 0.6" Ø LOW RELAXATION STRAND LAYOUT

- ◆ BOND SHALL BE BROKEN ON THESE STRANDS FOR A DISTANCE OF 12'-0" FROM END OF CORED SLAB UNIT. SEE STANDARD SPECIFICATIONS, ARTICLE 1078-7.
- OPTIONAL FULL LENGTH DEBONDED STRANDS. THESE STRANDS ARE NOT REQUIRED. IF THE FABRICATOR CHOOSES TO INCLUDE THESE STRANDS IN THE CORED SLAB UNIT, THE STRANDS SHALL BE DEBONDED FOR THE FULL LENGTH OF THE UNIT AT NO ADDITIONAL COST. SEE STANDARD SPECIFICATIONS, ARTICLE 1078-7.

### DEBONDING LEGEND

PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

SHEET 1 OF 4

DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED

**CDM Smith**  
CDM SMITH  
5400 Glenwood Avenue, Suite 400  
Raleigh, NC 27612-3228  
NC COA No. F-1255

DRAWN BY : JJR DATE : 12/22  
CHECKED BY : THF DATE : 12/22  
DESIGN ENGINEER : THF DATE : 1/25

DWG. No.

NORTH CAROLINA  
PROFESSIONAL  
SEAL  
16301  
ENGINEER  
TIG HSILUNG FANG

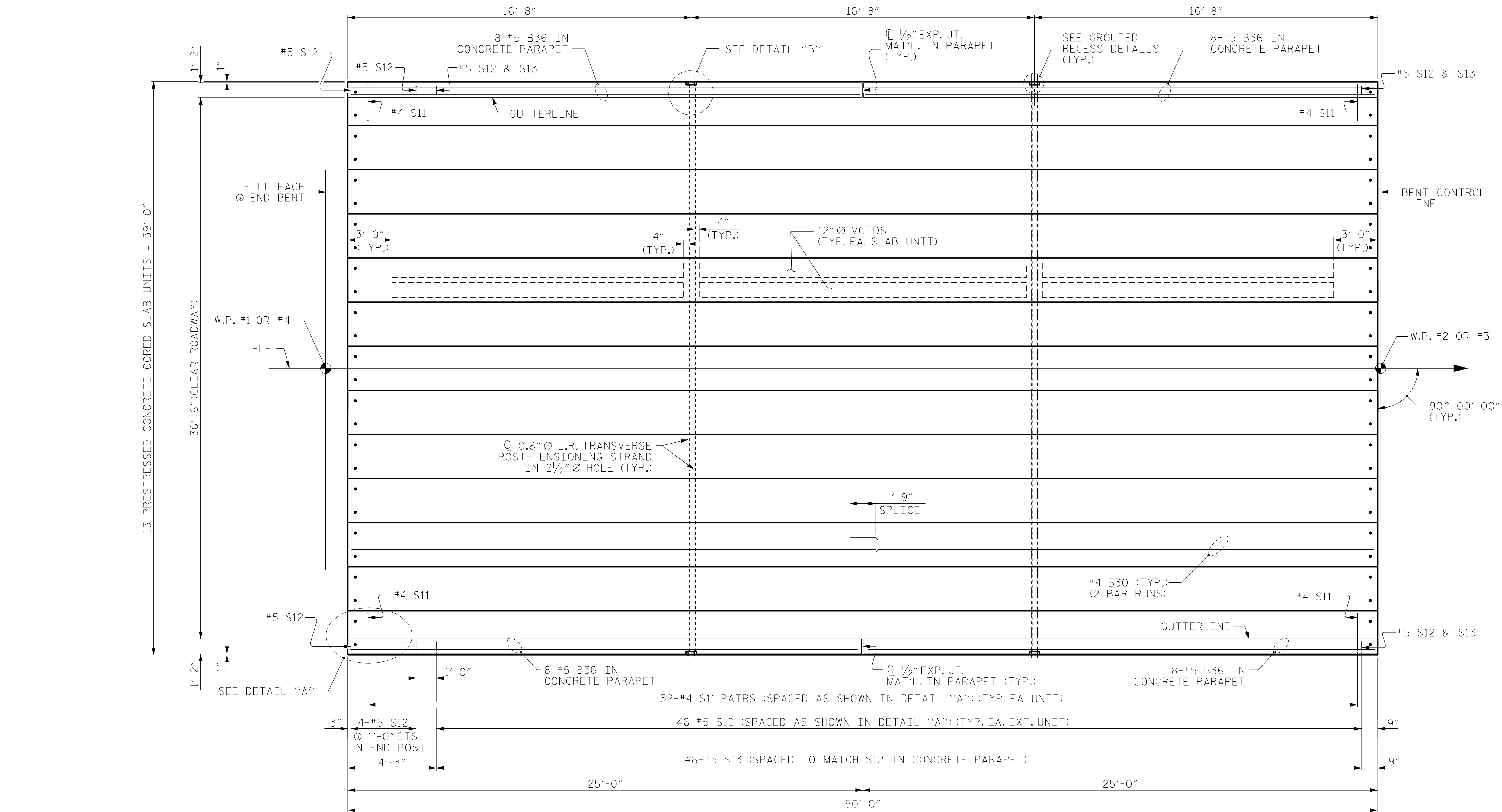
DocuSigned by:  
Tig H. Fang  
9/9/2025

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
STANDARD  
3'-0" X 2'-0"  
PRESTRESSED CONCRETE  
CORED SLAB UNIT  
90° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	TOTAL SHEETS
1			3			25
2			4			

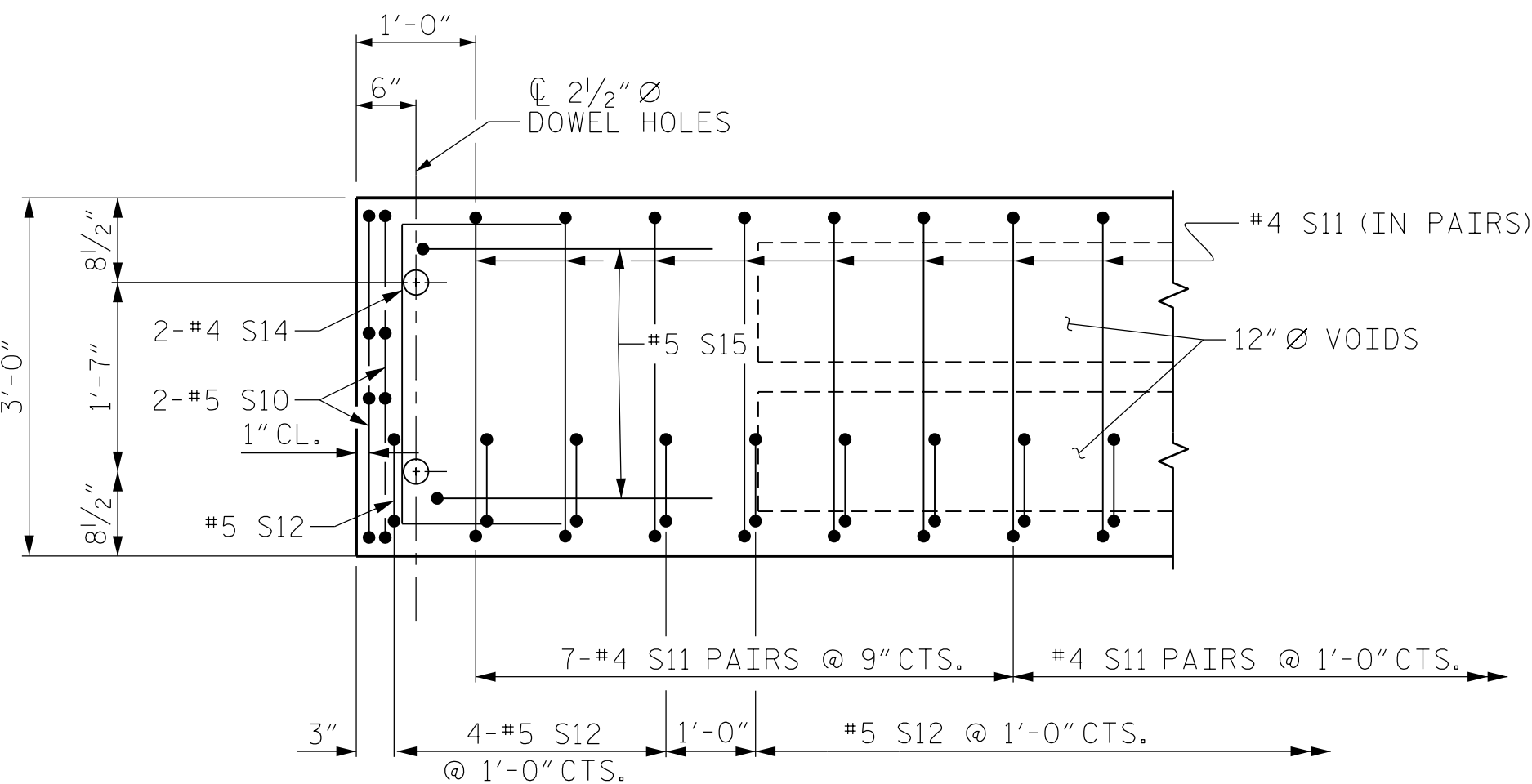
S-07

FILE: SFILES  
DATE: 5/24/25  
STIMES



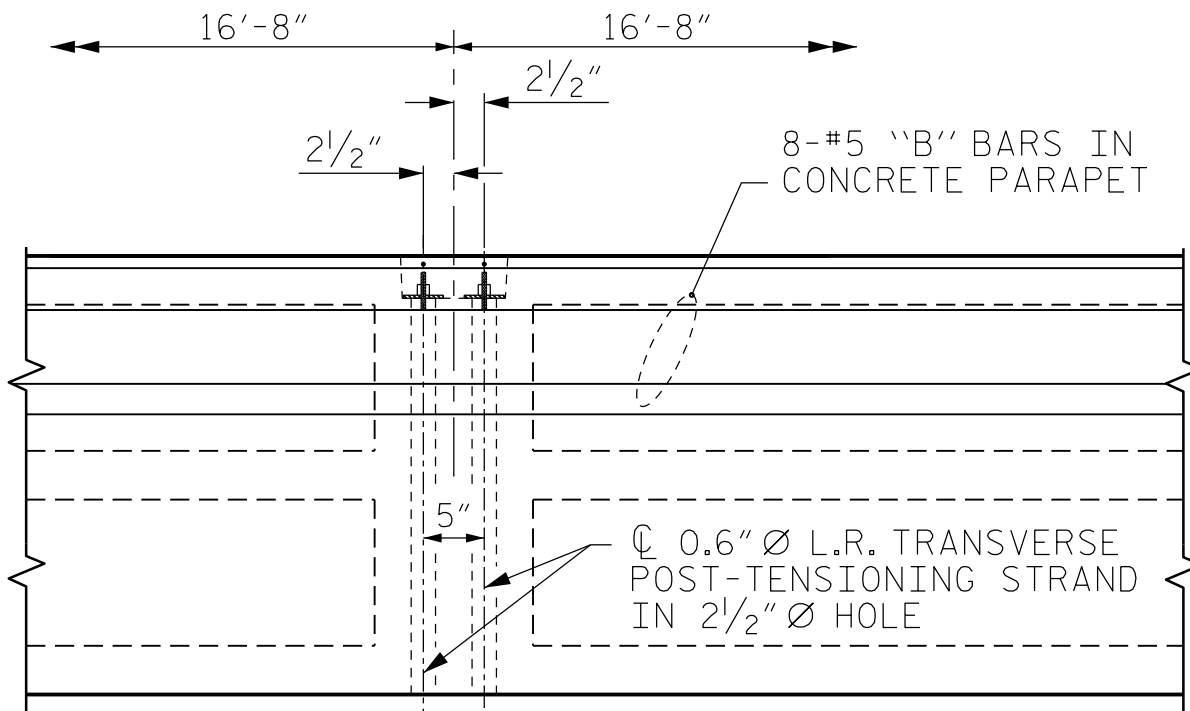
### PLAN OF UNIT

SPAN A SHOWN, SPAN C SIMILAR BY ROTATION.



### DETAIL "A"

SHOWING UNIT END AT END POST  
NOTE: EXTERIOR UNIT SHOWN - INTERIOR UNIT SIMILAR EXCEPT OMIT #5 S12 BARS.



### DETAIL "B"

#4 S11 BARS MAY BE SHIFTED AS NECESSARY TO MAINTAIN 1" CLEAR TO GROUTED RECESS AND 2 1/2" Ø TRANSVERSE POST-TENSIONING STRAND HOLES

DOCUMENT NOT CONSIDERED  
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**CDM Smith**

CDM SMITH  
5400 Glenwood Avenue, Suite 400  
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NC COA No. F-1255

DRAWN BY : JJR DATE : 12/22  
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PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

SHEET 2 OF 4

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

PLAN OF 50' UNIT  
36'-6" CLEAR ROADWAY  
90° SKEW  
SPANS A & C

#### REVISIONS

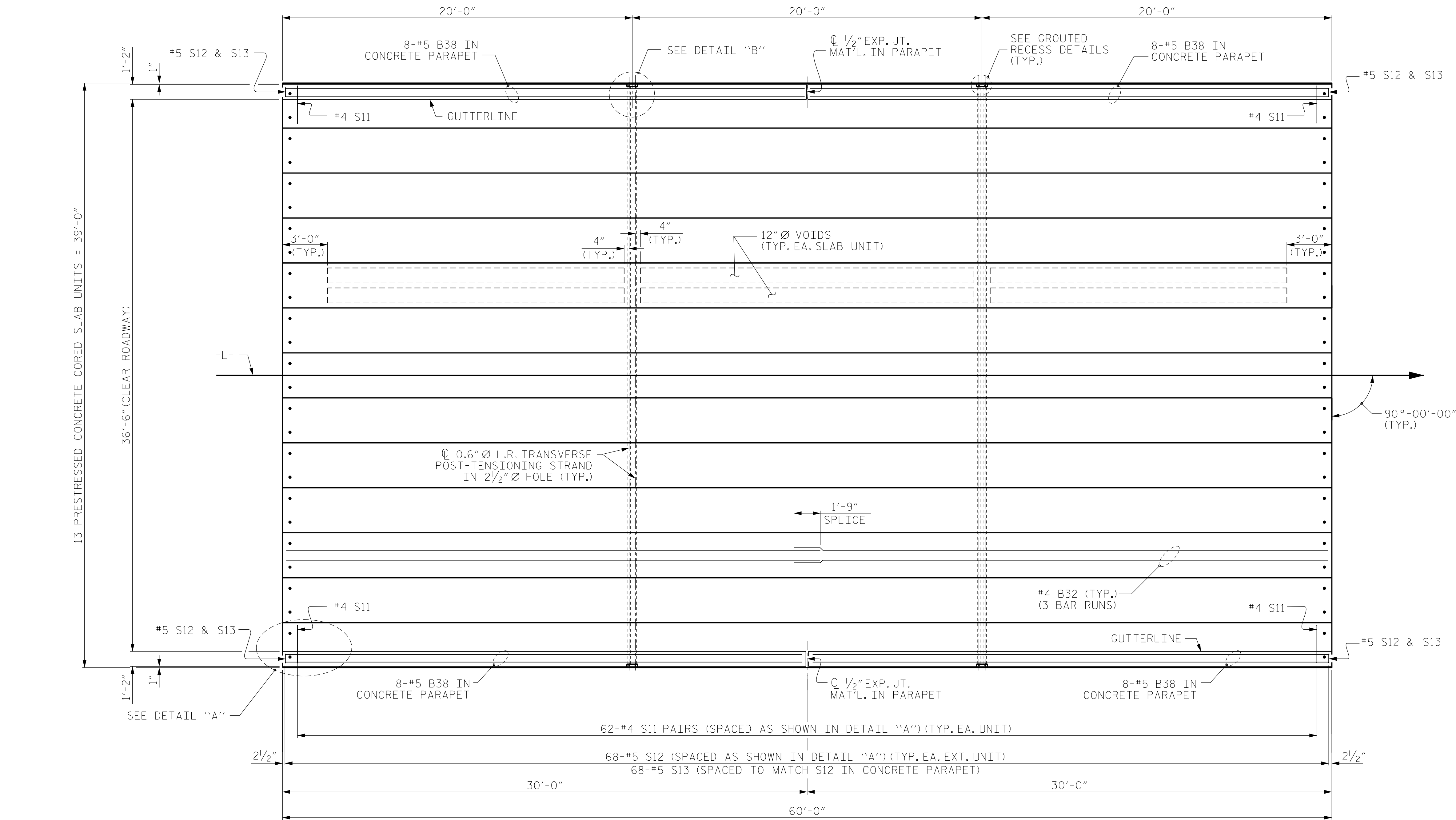
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO.

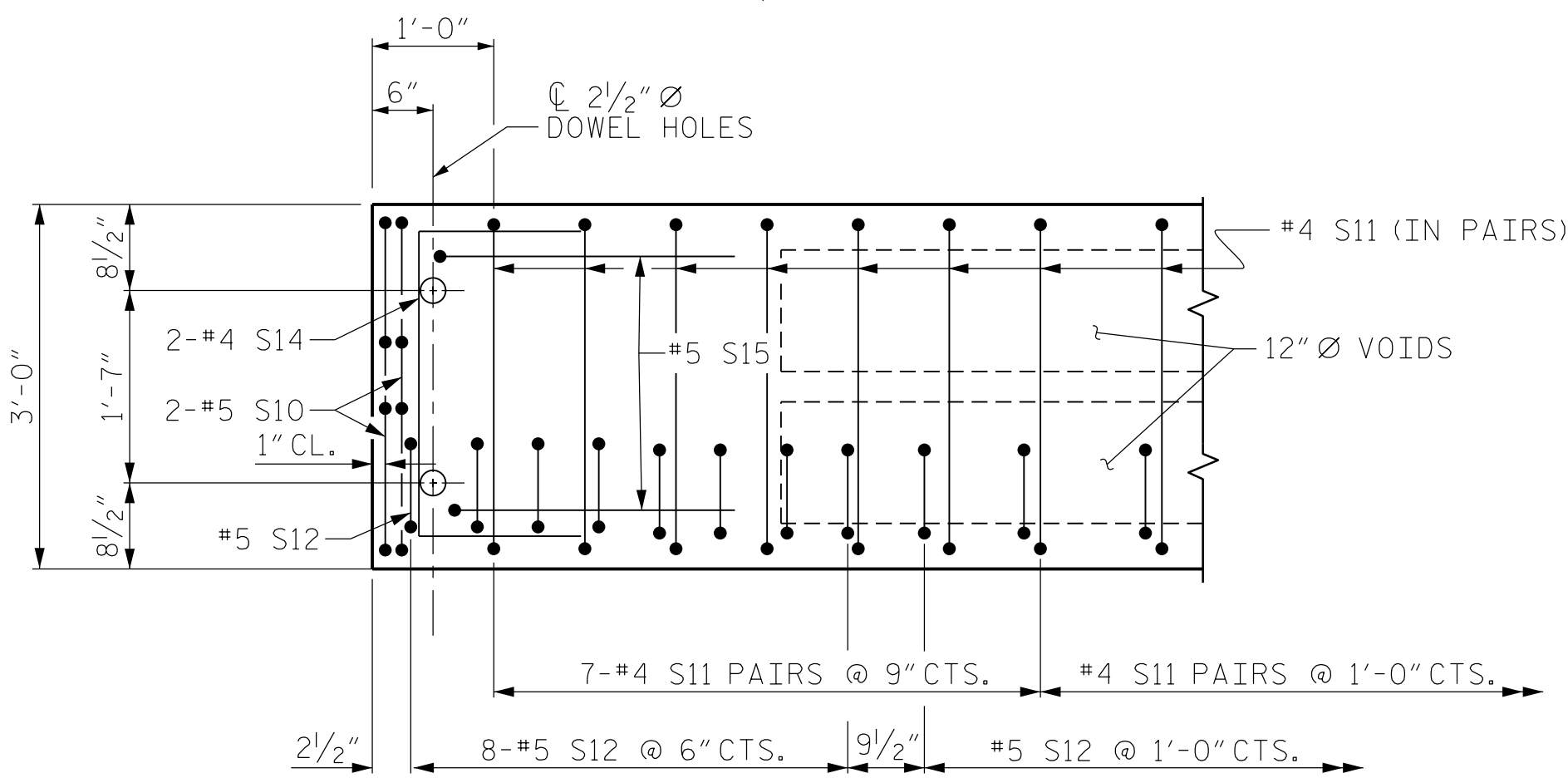
S-08

TOTAL SHEETS

25

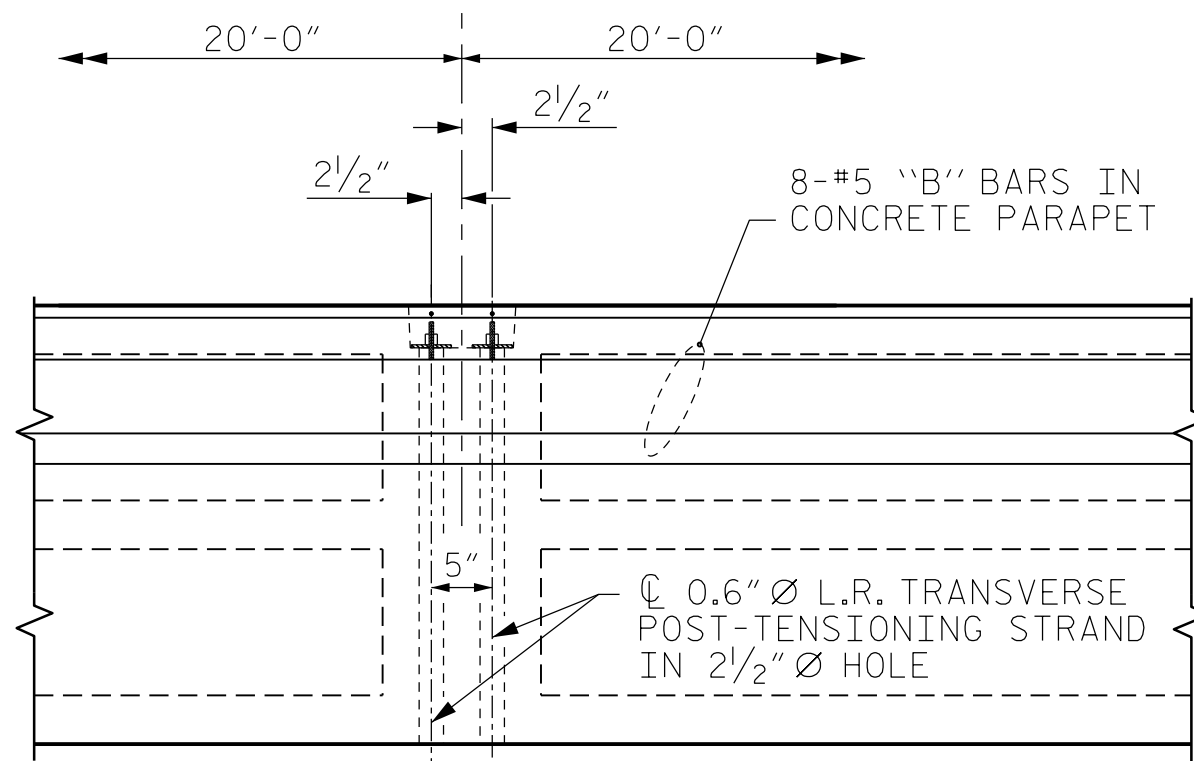


PLAN OF UNIT  
FOR SPAN B



DETAIL "A"

(TYPICAL EACH END OF UNIT)  
NOTE: EXTERIOR UNIT SHOWN - INTERIOR  
UNIT SIMILAR EXCEPT OMIT #5 S12 BARS.



DETAIL "B"

#4 S11 BARS MAY BE SHIFTED AS NECESSARY  
TO MAINTAIN 1" CLEAR TO GROUTED RECESS AND  
2 1/2" Ø TRANSVERSE POST-TENSIONING STRAND HOLES

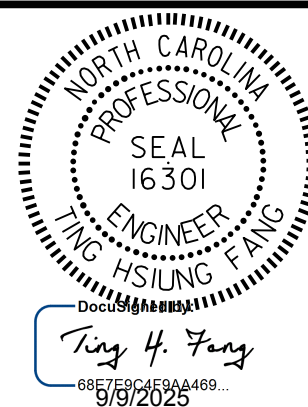
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**CDM  
Smith**

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DWG. No.



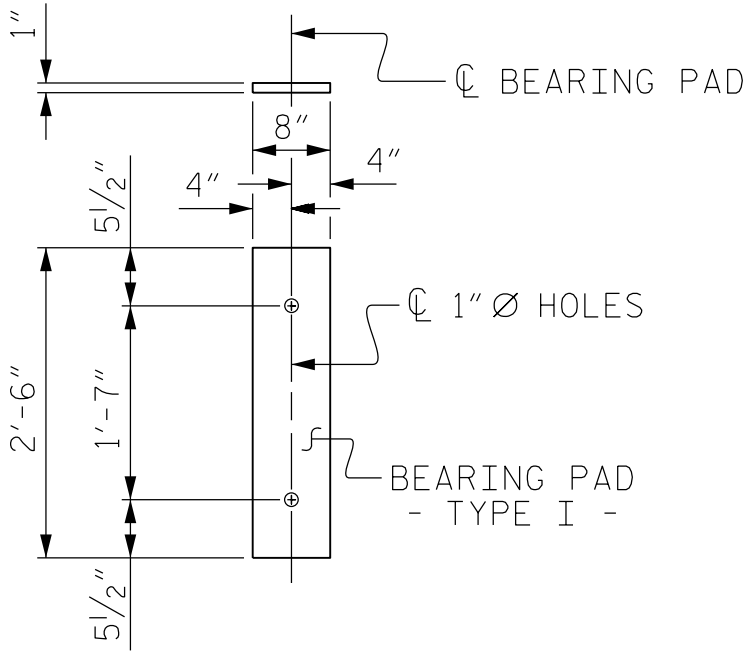
PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

SHEET 3 OF 4

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

PLAN OF 60' UNIT  
36'-6" CLEAR ROADWAY  
90° SKEW  
SPAN B

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S-09
1			3			TOTAL SHEETS
2			4			25



FIXED END  
(TYPE I - 78 REQ'D)

## ELASTOMERIC BEARING DETAILS

ELASTOMER IN ALL BEARINGS SHALL BE 60 DUROMETER HARDNESS.

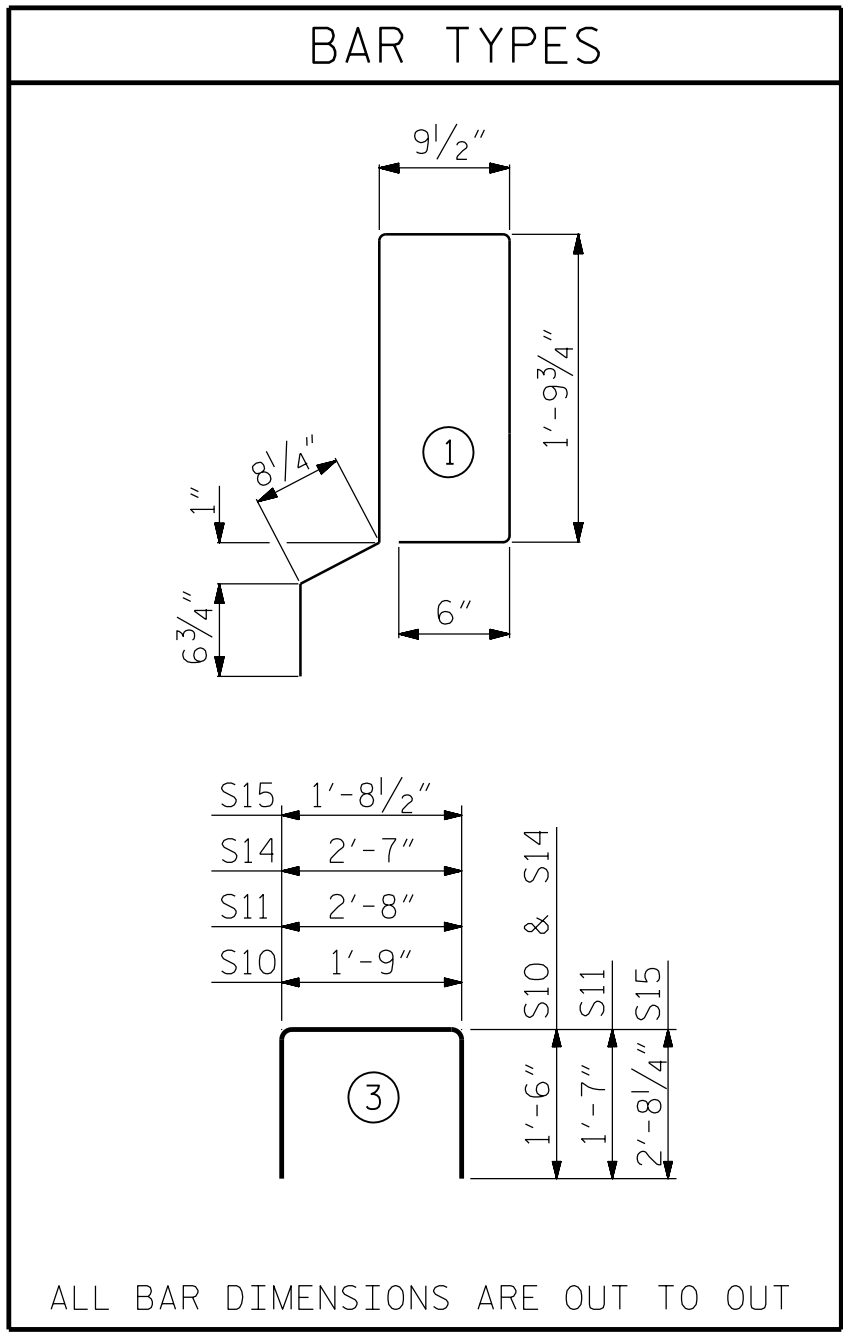
DEAD LOAD DEFLECTION AND CAMBER		
ALL UNITS, 0.6" Ø L.R. STRAND	SPANS A & C 50' CS UNIT	SPAN B 60' CS UNIT
CAMBER (SLAB ALONE IN PLACE)	1½" ↑	2¼" ↑
DEFLECTION DUE TO SUPERIMPOSED DEAD LOAD **	⅛" ↓	¾" ↓
FINAL CAMBER	1⅜" ↑	1⅞" ↑

\*\* INCLUDES FUTURE WEARING SURFACE

CORED SLABS REQUIRED			
SPAN A (50' UNITS)			
	NUMBER	LENGTH	TOTAL LENGTH
EXTERIOR C.S.	2	50'-0"	100'-0"
INTERIOR C.S.	11	50'-0"	550'-0"
TOTAL			650'-0"
SPAN B (60' UNITS)			
	NUMBER	LENGTH	TOTAL LENGTH
EXTERIOR C.S.	2	60'-0"	120'-0"
INTERIOR C.S.	11	60'-0"	660'-0"
TOTAL			780'-0"
SPAN C (50' UNITS)			
	NUMBER	LENGTH	TOTAL LENGTH
EXTERIOR C.S.	2	50'-0"	100'-0"
INTERIOR C.S.	11	50'-0"	550'-0"
TOTAL			650'-0"

TOTAL LENGTH OF CORED SLAB UNITS = 2080 LN.FT.

BILL OF MATERIAL FOR ONE CORED SLAB UNIT							
SPAN A 50' - 24" CORED SLAB UNIT							
				EXTERIOR UNIT		INTERIOR UNIT	
BAR	NUMBER	SIZE	TYPE	LENGTH	WEIGHT	LENGTH	WEIGHT
B30	4	#4	STR	25'-9"	69	25'-9"	69
S10	8	#5	3	4'-9"	40	4'-9"	40
S11	104	#4	3	5'-10"	405	5'-10"	405
* S12	50	#5	1	6'-2"	322		
S14	4	#4	3	5'-7"	15	5'-7"	15
S15	4	#5	3	7'-1"	30	7'-1"	30
REINFORCING STEEL				LBS.	559	559	
* EPOXY COATED							
REINFORCING STEEL				LBS.	322		
8500 P.S.I. CONCRETE				CU. YDS.	8.6	8.6	
0.6" Ø L.R. STRANDS				No.	31	31	
SPAN B 60' - 24" CORED SLAB UNIT							
				EXTERIOR UNIT		INTERIOR UNIT	
BAR	NUMBER	SIZE	TYPE	LENGTH	WEIGHT	LENGTH	WEIGHT
B32	6	#4	STR	21'-2"	85	21'-2"	85
S10	8	#5	3	4'-9"	40	4'-9"	40
S11	124	#4	3	5'-10"	483	5'-10"	483
* S12	68	#5	1	6'-2"	437		
S14	4	#4	3	5'-7"	15	5'-7"	15
S15	4	#5	3	7'-1"	30	7'-1"	30
REINFORCING STEEL				LBS.	653	653	
* EPOXY COATED							
REINFORCING STEEL				LBS.	437		
9500 P.S.I. CONCRETE				CU. YDS.	10.3	10.3	
0.6" Ø L.R. STRANDS				No.	37	37	
SPAN C 50' - 24" CORED SLAB UNIT							
				EXTERIOR UNIT		INTERIOR UNIT	
BAR	NUMBER	SIZE	TYPE	LENGTH	WEIGHT	LENGTH	WEIGHT
B30	4	#4	STR	25'-9"	69	25'-9"	69
S10	8	#5	3	4'-9"	40	4'-9"	40
S11	104	#4	3	5'-10"	405	5'-10"	405
* S12	50	#5	1	6'-2"	322		
S14	4	#4	3	5'-7"	15	5'-7"	15
S15	4	#5	3	7'-1"	30	7'-1"	30
REINFORCING STEEL				LBS.	559	559	
* EPOXY COATED							
REINFORCING STEEL				LBS.	322		
8500 P.S.I. CONCRETE				CU. YDS.	8.6	8.6	
0.6" Ø L.R. STRANDS				No.	31	31	



CONCRETE RELEASE STRENGTH	
UNIT	PSI
50' UNIT	6200
60' UNIT	7200

GRADE 270 STRANDS	
AREA ( SQUARE INCHES )	0.6" Ø L.R.
ULTIMATE STRENGTH ( LBS. PER STRAND )	0.217
APPLIED PRESTRESS ( LBS. PER STRAND )	58,600
	43,950

## NOTES

ALL PRESTRESSING STRANDS SHALL BE 7-WIRE LOW RELAXATION GRADE 270 STRANDS AND SHALL CONFORM TO AASHTO M203 EXCEPT FOR SAMPLING REQUIREMENTS WHICH SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.

ALL REINFORCING STEEL CAST WITH THE CORED SLAB SECTIONS SHALL BE GRADE 60 AND SHALL BE INCLUDED IN THE UNIT PRICE BID FOR PRESTRESSED CONCRETE CORED SLABS.

RECESSES FOR TRANSVERSE STRANDS SHALL BE GROUTED AFTER THE TENSIONING OF THE STRANDS.

THE 2½" Ø DOWEL HOLES AT FIXED ENDS OF SLAB SECTIONS SHALL BE FILLED WITH NON-SHRINK GROUT.

THE BACKER RODS SHALL CONFORM TO THE REQUIREMENTS OF TYPE M BOND BREAKER. SEE SECTION 1028 OF THE STANDARD SPECIFICATIONS.

WHEN CORED SLABS ARE CAST, AN INTERNAL HOLD-DOWN SYSTEM SHALL BE EMPLOYED TO PREVENT VOIDS FROM RISING OR MOVING SIDWAYS. AT LEAST SIX WEEKS PRIOR TO CASTING CORED SLABS, THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR REVIEW AND COMMENT, DETAILED DRAWINGS OF THE PROPOSED HOLD-DOWN SYSTEM, IN ADDITION TO STRUCTURAL DETAILS, LOCATION AND SPACING OF THE HOLD-DOWNS SHALL BE INDICATED.

THE TRANSFER OF LOAD FROM THE ANCHORAGES TO THE CORED SLAB UNIT SHALL BE DONE WHEN THE CONCRETE HAS REACHED A COMPRESSIVE STRENGTH OF NOT LESS THAN THE REQUIRED STRENGTH SHOWN IN THE "CONCRETE RELEASE STRENGTH" TABLE.

ALL REINFORCING STEEL IN CONCRETE PARAPET SHALL BE EPOXY COATED.

PRESTRESSING STRANDS SHALL BE CUT FLUSH WITH THE CORED SLAB UNIT ENDS.

APPLY EPOXY PROTECTIVE COATING TO CORED SLAB UNIT ENDS.

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. A 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.

FLAME CUTTING OF THE TRANSVERSE POST-TENSIONING STRAND IS NOT ALLOWED.

MAINTAIN A SYMMETRIC TENSION FORCE BETWEEN EACH PAIR OF TRANSVERSE POST TENSIONING STRANDS IN THE DIAPHRAGM.

THE #4 S11 STIRRUPS MAY BE SHIFTED AS NECESSARY TO MAINTAIN 1" CLEAR TO THE GROUTED RECESS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

THE PERMITTED THREADED INSERTS ARE DETAILED AS AN OPTION FOR THE CONTRACTOR TO ATTACH FALSEWORK AND FORMWORK DURING CONSTRUCTION.

THE PERMITTED THREADED INSERTS IN THE EXTERIOR UNITS SHALL BE SIZED BY THE CONTRACTOR, SPACED AT 4'-0" CENTERS AND GALVANIZED IN ACCORDANCE WITH SECTION 1076 OF THE STANDARD SPECIFICATIONS. STAINLESS STEEL THREADED INSERTS MAY BE USED AS AN ALTERNATE.

THE PERMITTED THREADED INSERTS SHALL BE GROUTED BY THE CONTRACTOR IMMEDIATELY FOLLOWING REMOVAL OF THE FALSEWORK.

THE COST OF THE PERMITTED THREADED INSERTS SHALL BE INCLUDED IN THE PRICE BID FOR THE PRECAST UNITS.

PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

SHEET 4 OF 4

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DRAWN BY : JJR DATE : 12/22  
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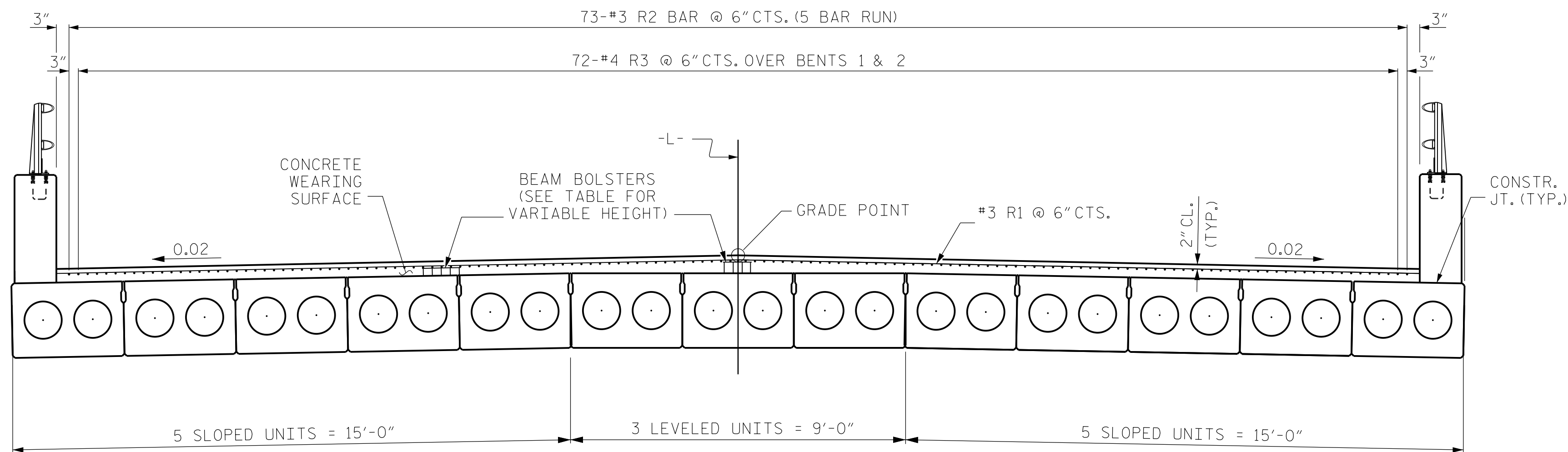
DWG. No.

NORTH CAROLINA  
PROFESSIONAL  
SEAL  
16301  
ENGINEER  
TIG HSILUNG FENG  
Do Not Renew  
Tig H. Feng  
00E7E9C4FBA4469  
9/9/2025

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

3'-0" X 2'-0"  
PRESTRESSED CONCRETE  
CORED SLAB UNIT  
90 ° SKEW

REVISIONS						SHEET NO. S-10
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 25
2			4			



## REINFORCING FOR CONCRETE WEARING SURFACE

BEAM AND SLAB BOLSTER HEIGHTS BASED ON PREDICTED FINAL CAMBER AND THEORETICAL GRADE LINE ELEVATION AND VARY BETWEEN C BEARING AND MID-SPAN.

BEAM OR SLAB BOLSTER HEIGHTS				
SPAN	LOCATION	LT. GUTTERLINE	GRADE PT.	RT. GUTTERLINE
A	BEARING (NEAR)	2"	3"	2"
	MID-SPAN	¾" **	1¾"	¾" **
	BEARING (FAR)	2"	3"	2"
B	BEARING (NEAR)	2½"	3½"	2½"
	MID-SPAN	¾" **	1¾"	¾" **
	BEARING (FAR)	2½"	3½"	2½"
C	BEARING (NEAR)	2"	3"	2"
	MID-SPAN	¾" **	1¾"	¾" **
	BEARING (FAR)	2"	3"	2"

✱✱ USE SLAB BOLSTER

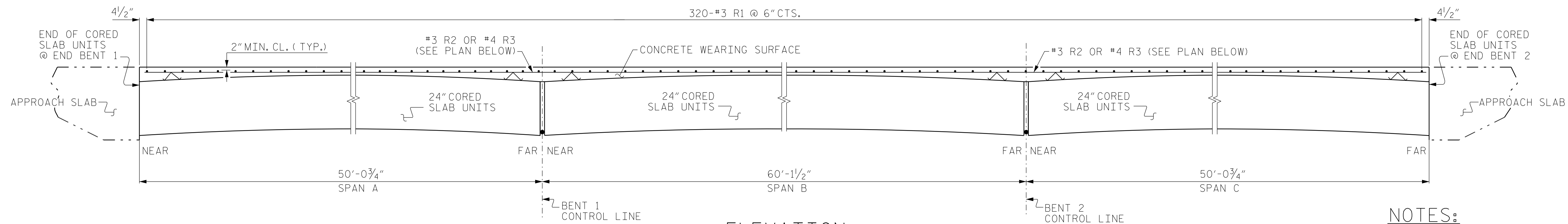
GROOVING BRIDGE FLOORS		
APPROACH SLABS	950	SQ.FT.
BRIDGE DECK	5,433	SQ.FT.
TOTAL	6,383	SQ.FT.

## BILL OF MATERIAL

CONCRETE WEARING SURFACE					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
* R1	320	#3	STR	36'-2"	4563
* R2	365	#3	STR	33'-3"	1083
* R3	144	#4	STR	20'-0"	1924
* EPOXY COATED REINFORCING STEEL					7,570 LBS
CONCRETE WEARING SURFACE					5,903 SQ. FT.

## SPLICE LENGTH CHART

BAR SIZE	EPOXY COATED
#3	1'-6"

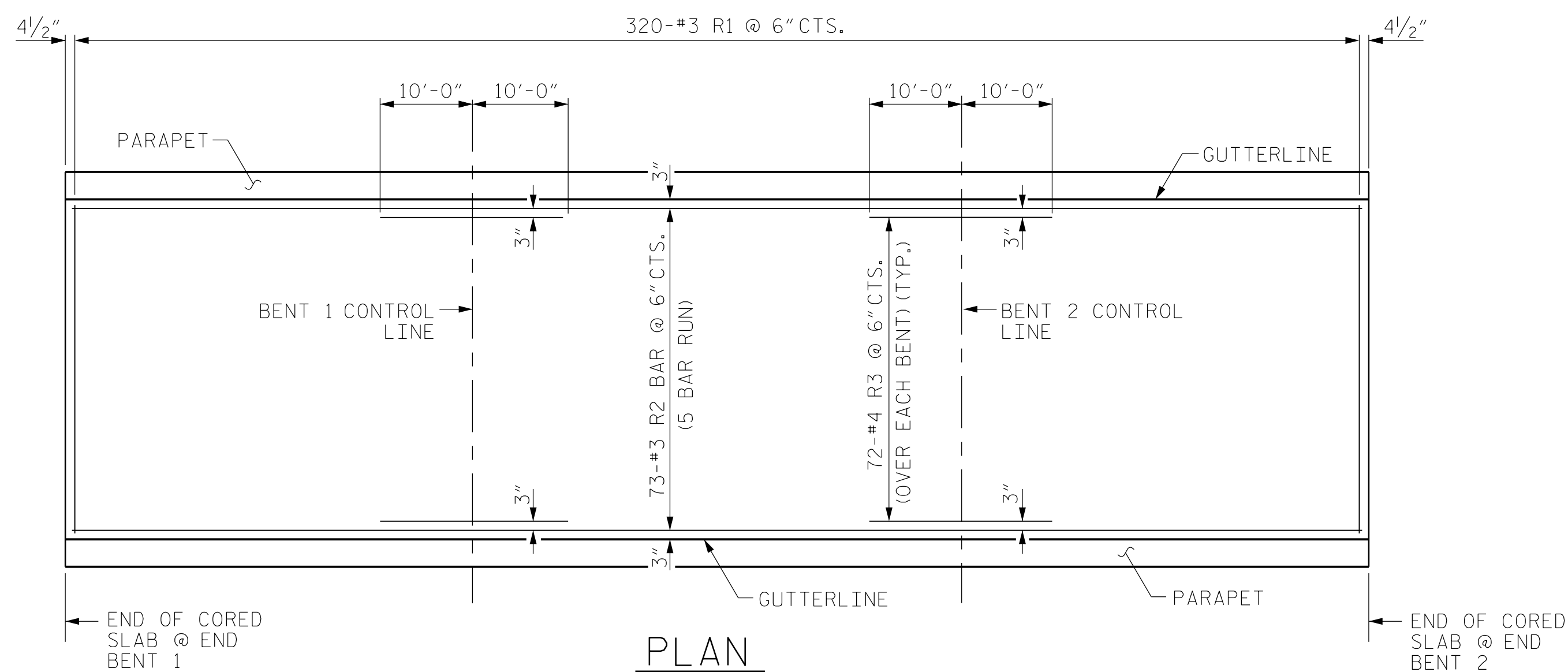


### ELEVATION

NOTES:

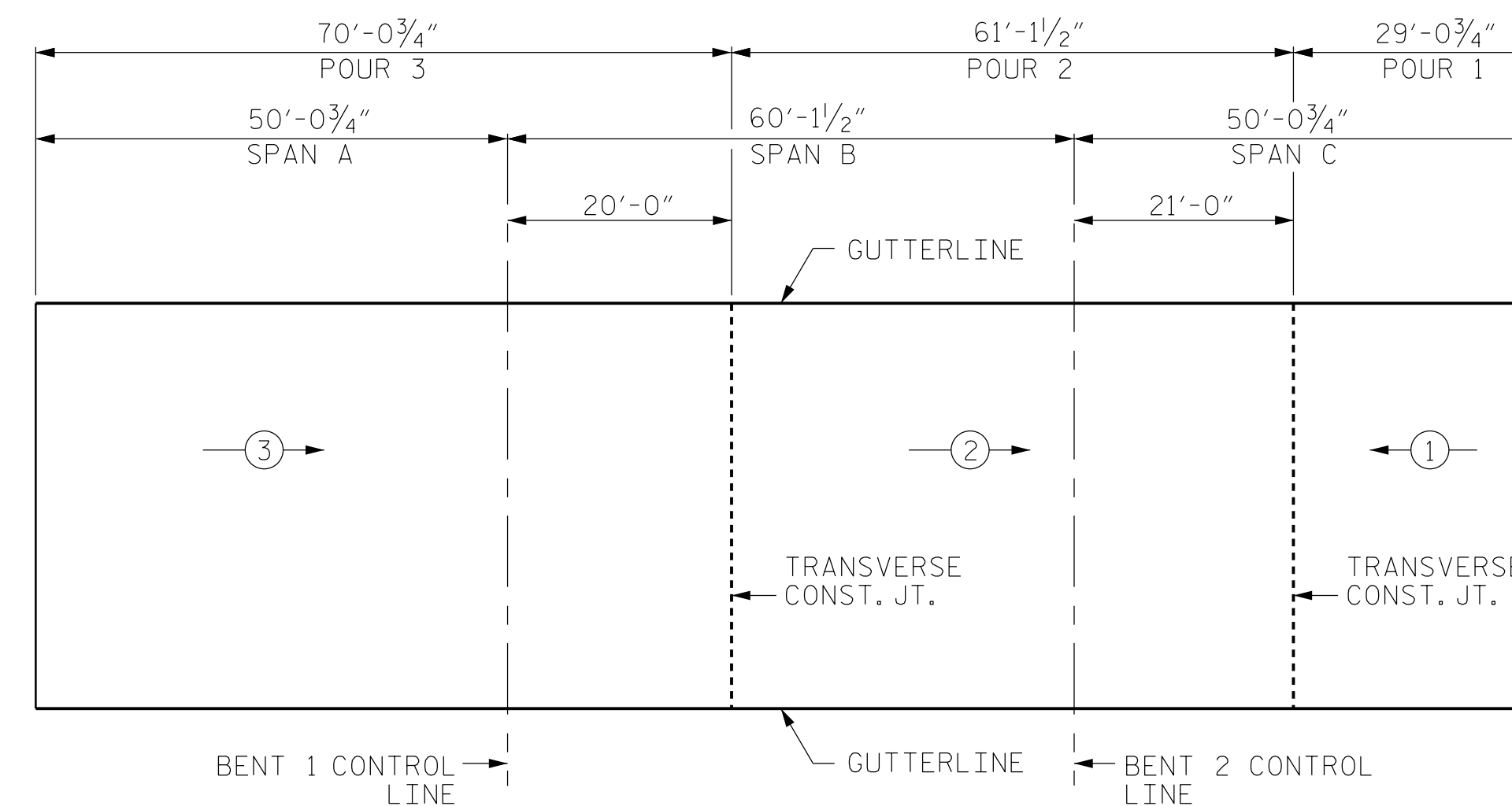
PLACEMENT OF THE CONCRETE WEARING SURFACE SHALL OCCUR AFTER CASTING THE PARAPETS. THE COST OF THE REINFORCING STEEL CAST WITH THE CONCRETE WEARING SURFACE SHALL BE INCLUDED IN THE UNIT PRICE BID FOR CONCRETE WEARING SURFACE. FOR CONCRETE WEARING SURFACE, SEE SPECIAL PROVISIONS.

ALL REINFORCING STEEL FOR THE CONCRETE WEARING SURFACE SHALL BE EPOXY COATED.



## PLAN


SHOWING CONTINUOUS CONCRETE WEARING SURFACE OVER BENTS 1 & 2



## OPTIONAL POURING SEQUENCE

← ⊕ = INDICATES POUR NUMBER  
AND DIRECTION OF POUR

DOCUMENT NOT CONSIDERED  
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SIGNATURES COMPLETED

	CDM SMITH 5400 Glenwood Avenue, Suite 400 Raleigh, NC 27612-3228 NC COA No. F-1255		DWG. No.	
	DRAWN BY :	JJR		DATE : 12/22
	CHECKED BY :	THF		DATE : 12/22
	DESIGN ENGINEER :	THF		DATE : 1/25



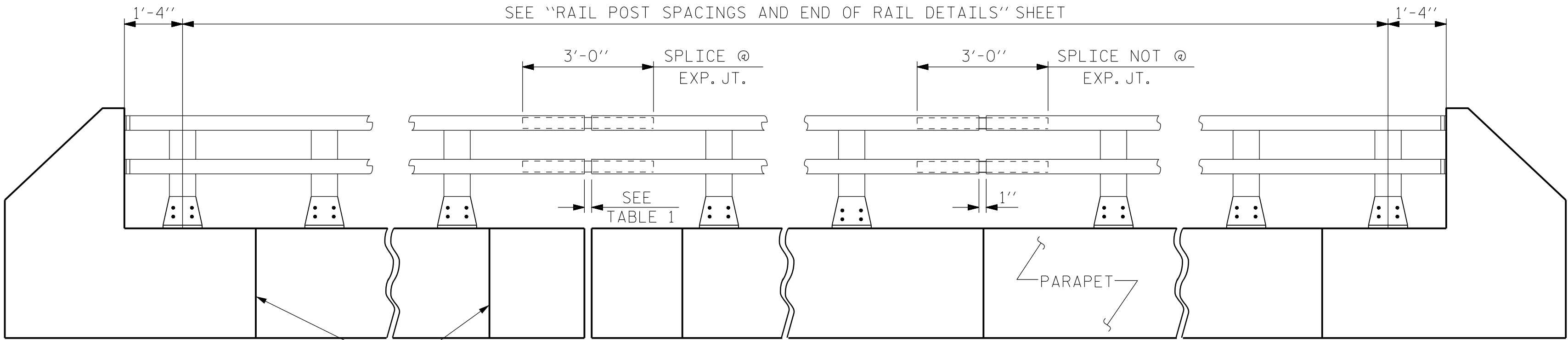
PROJECT NO. BP10-R047  
CABARRUS COUNTY  
 STATION: 19+14.00 -L-

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

## SUPERSTRUCTURE

## CONCRETE WEARING SURFACE DETAILS

REVISIONS						SHEET NO. S-II
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 25
2			4			



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

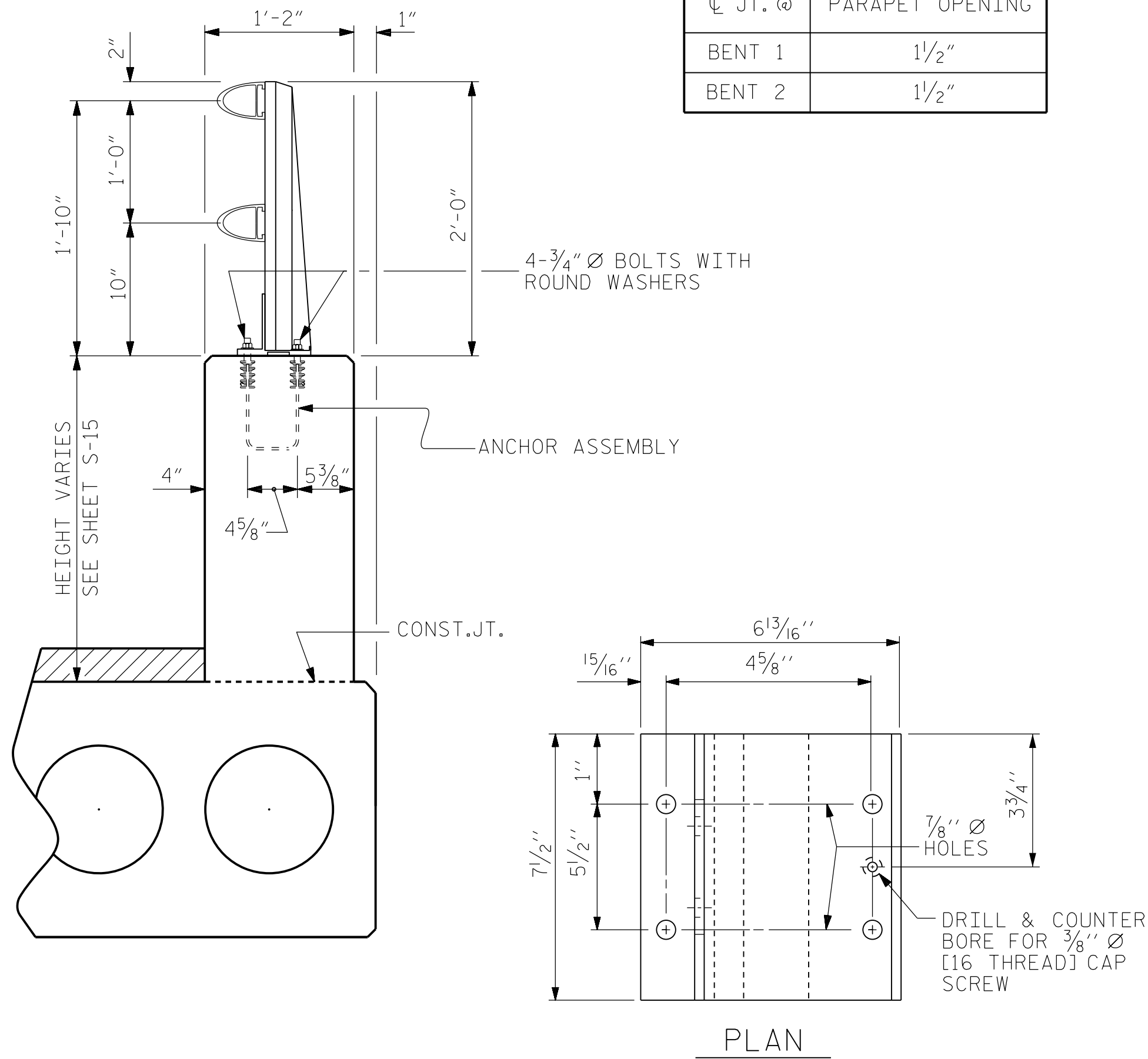
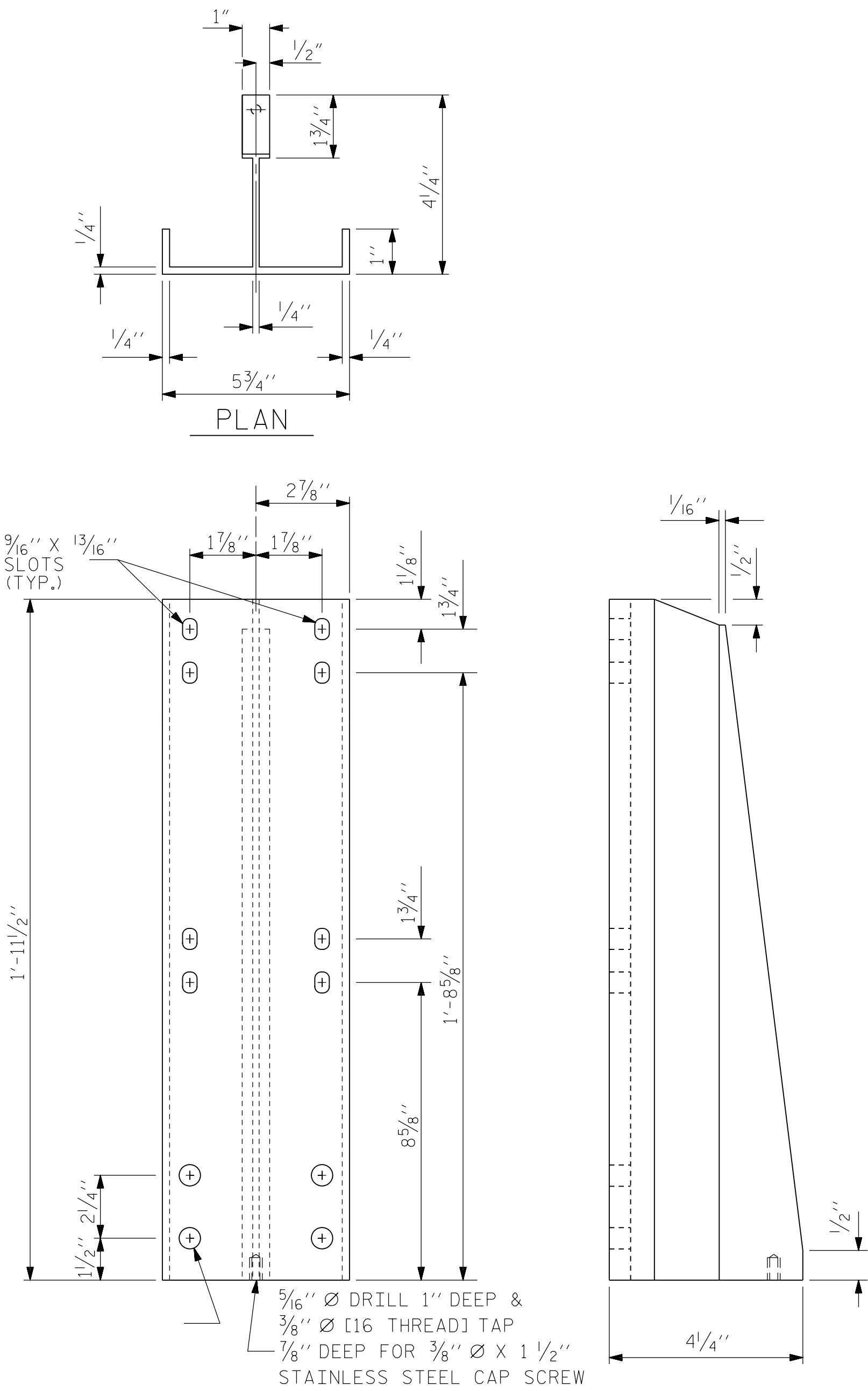


TABLE 1	
CL JT. @	PARAPET OPENING
BENT 1	1 1/2"
BENT 2	1 1/2"

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 LRFD BRIDGE 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.

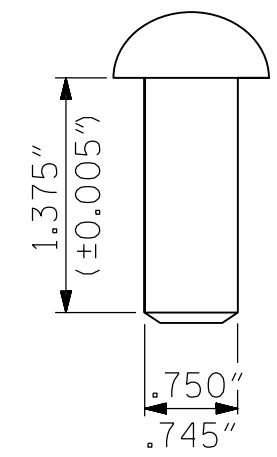
SHIMS SHALL BE USED AS NECESSARY FOR POST ALIGNMENT.

ALLOY 6351-T5 MAY BE SUBSTITUTED FOR ALLOY 6061-T6 WHERE APPLICABLE.

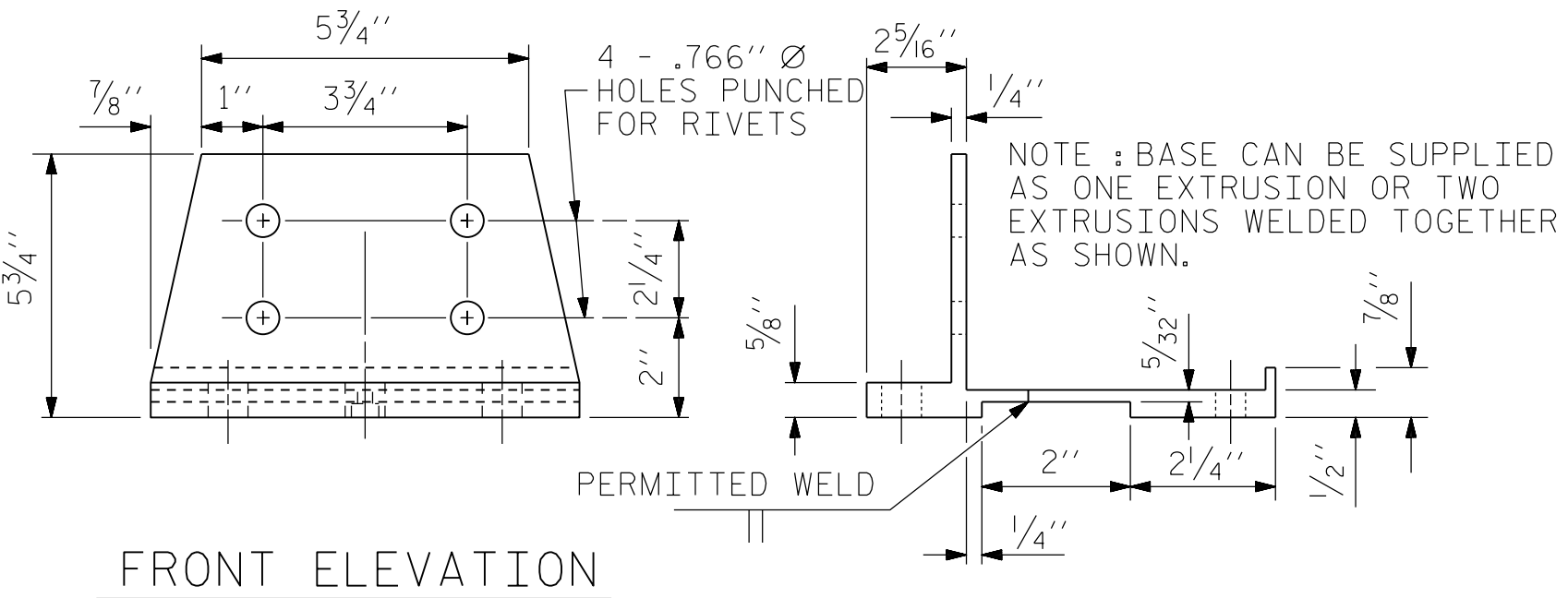
MINOR VARIATIONS IN DETAILS OF METAL RAIL WILL BE CONSIDERED. DETAILS OF SUCH VARIATIONS, IF DESIRED, SHALL BE SUBMITTED FOR APPROVAL.

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 = 305.5 LIN. FT.



#### RIVET DETAIL



#### FRONT ELEVATION

#### SIDE ELEVATION

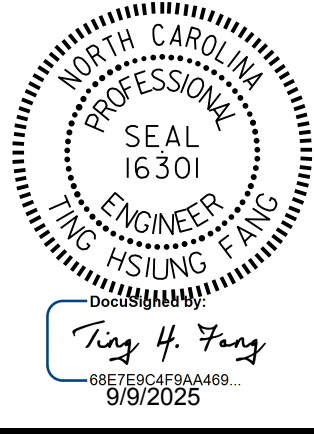
#### POST BASE DETAILS

PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

SHEET 1 OF 3

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
STANDARD 2 BAR METAL RAIL					
REVISIONS					SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
TOTAL SHEETS					25

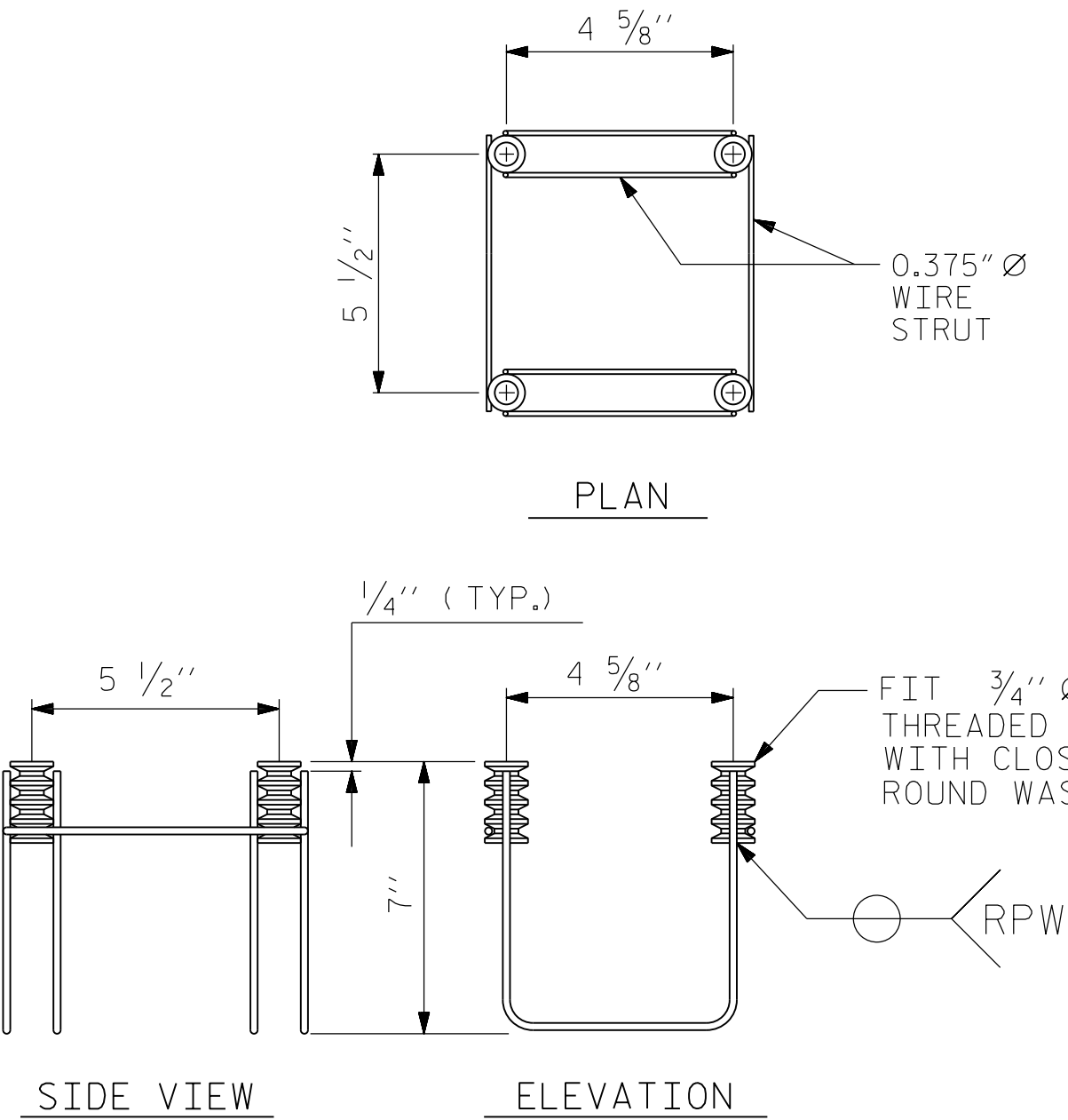
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	
CDM Smith 400 Glenwood Avenue, Suite 400 Raleigh, NC 27612-3228 NC COA No. F-1255	
DRAWN BY : CHECKED BY : DESIGN ENGINEER :	JJR THF THF DATE : 12/22 DATE : 12/22 DATE : 1/25
DWG. No.	



+

+

FILE: SFILES  
DATE: 8/24/25  
STAGES



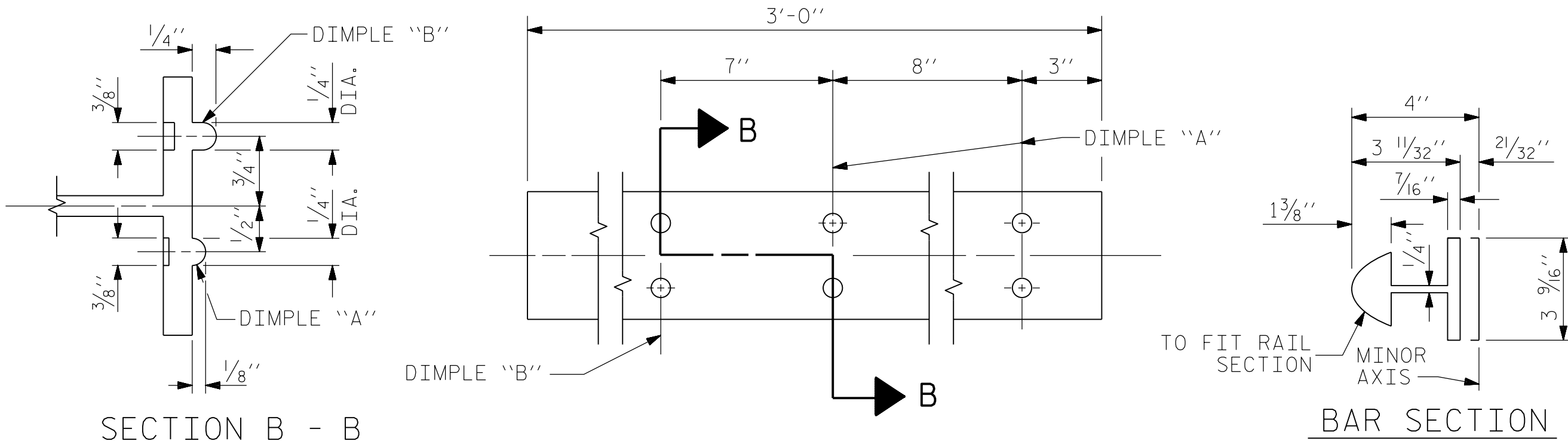
## 4-BOLT METAL RAIL ANCHOR ASSEMBLY

(56 ASSEMBLIES REQUIRED)

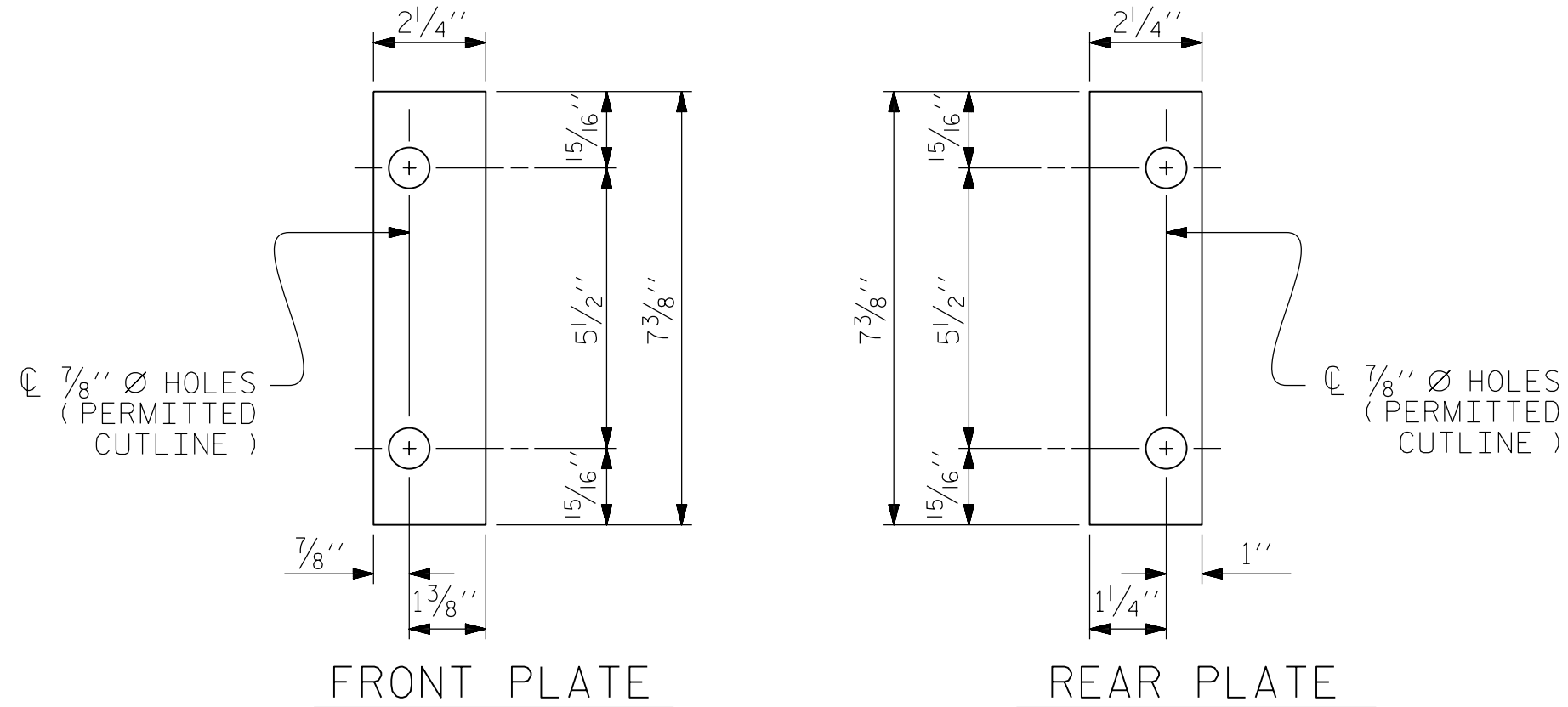
- NOTES
- STRUCTURAL CONCRETE ANCHOR ASSEMBLY
- THE STRUCTURAL CONCRETE ANCHOR ASSEMBLY SHALL CONSIST OF THE FOLLOWING COMPONENTS :
- FERRULES SHALL BE MADE FROM STEEL MEETING THE REQUIREMENTS OF AASHTO M169, GRADE 12L14 AND SHALL HAVE A MINIMUM LENGTH OF THREADS OF 2" FOR 3/4" FERRULES.
  - 4 - 3/4" 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.
  - 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 1/6" Ø WIRE STRUT WITH A MINIMUM TENSILE STRENGTH OF 90,000 PSI IS ACCEPTABLE.
  - THE METAL RAIL ANCHOR ASSEMBLIES TO BE HOT DIPPED GALVANIZED TO CONFORM TO REQUIREMENTS OF AASHTO M111.
  - 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.
  - 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.

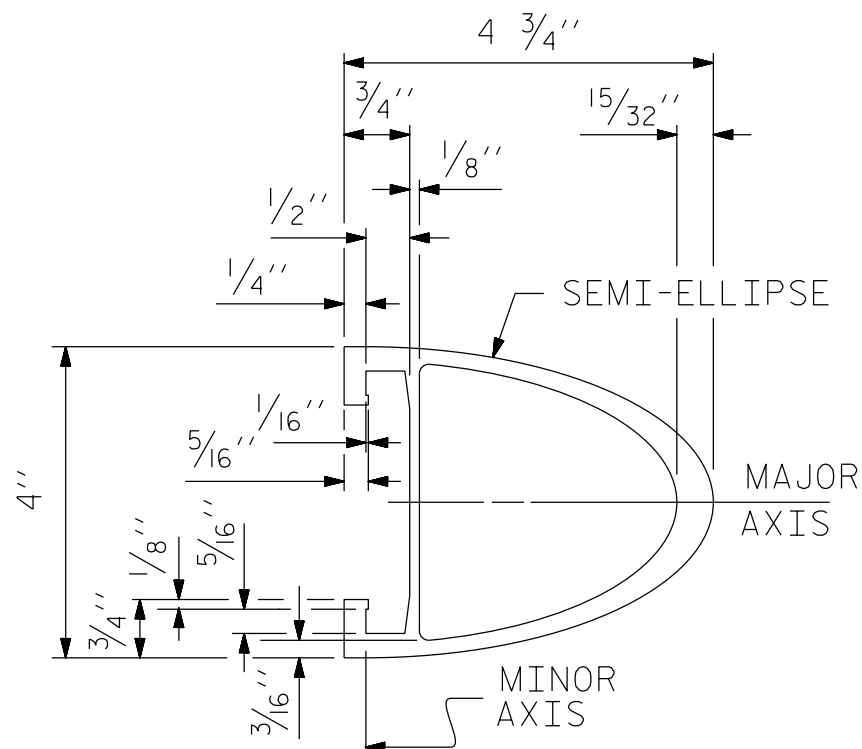


## EXPANSION BAR DETAILS

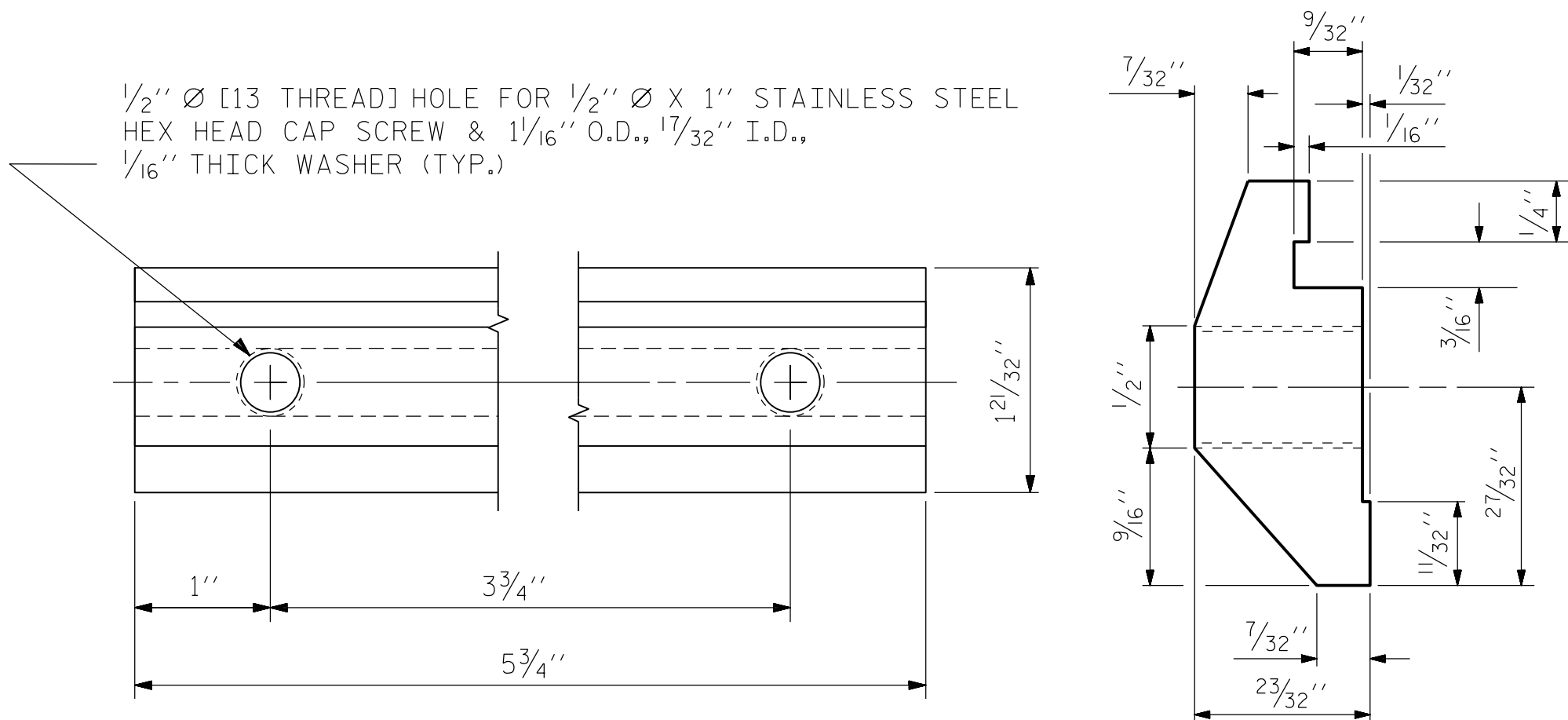


## SHIM DETAILS

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

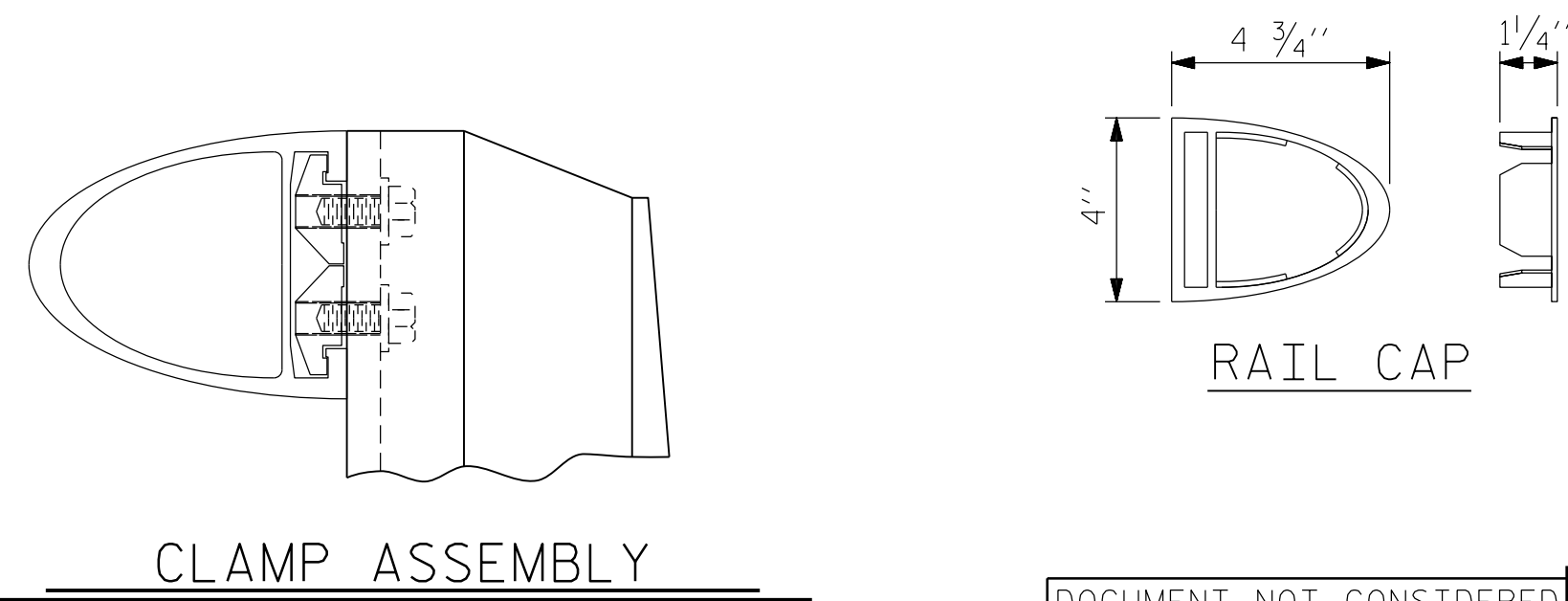


## RAIL SECTION



## CLAMP BAR DETAIL

( 4 REQUIRED PER POST )



## RAIL CAP

PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

SHEET 2 OF 3

DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED

**CDM Smith**  
CDM SMITH  
5400 Glenwood Avenue, Suite 400  
Raleigh, NC 27612-3228  
NC COA No. F-1255

DRAWN BY : JJR DATE : 12/22  
CHECKED BY : THF DATE : 12/22  
DESIGN ENGINEER : THF DATE : 1/25

DWG. No.

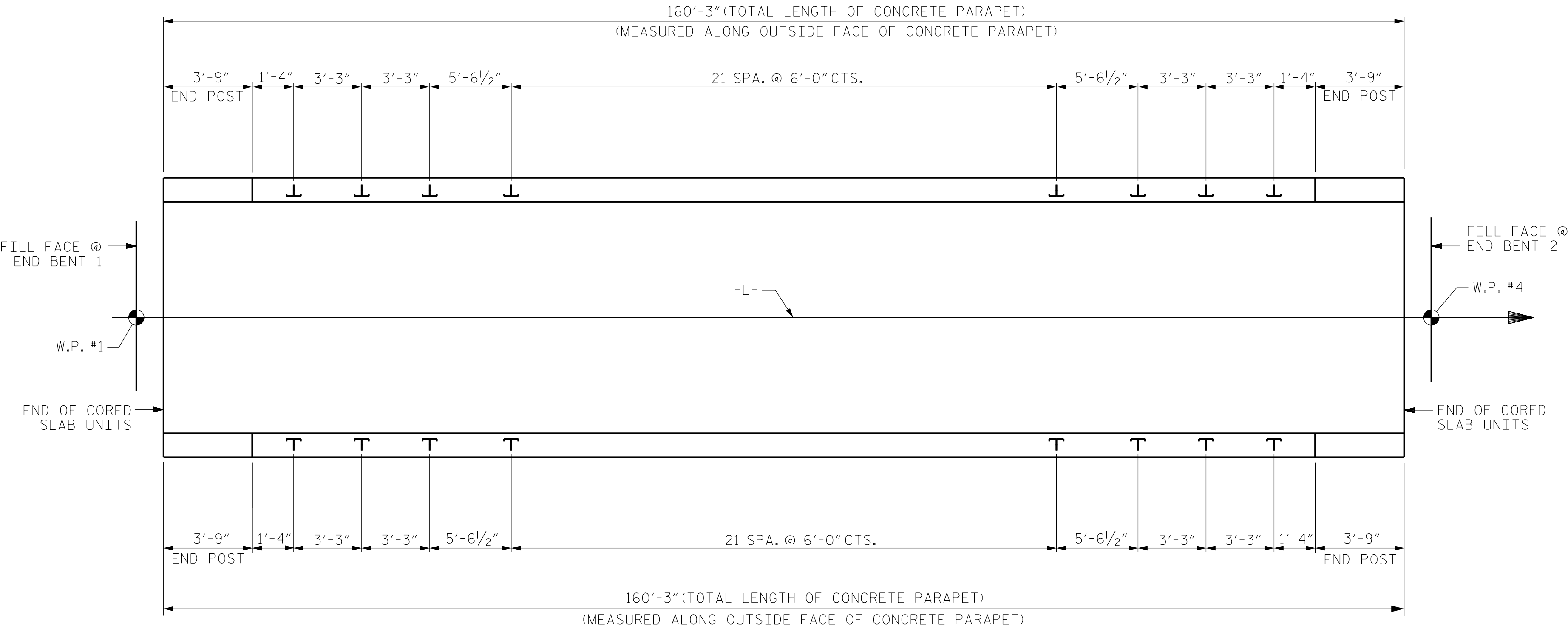
NORTH CAROLINA  
PROFESSIONAL  
SEAL  
16301  
ENGINEER  
TRIG  
HSILUNG FENG  
9/9/2025

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

STANDARD  
2 BAR METAL RAIL

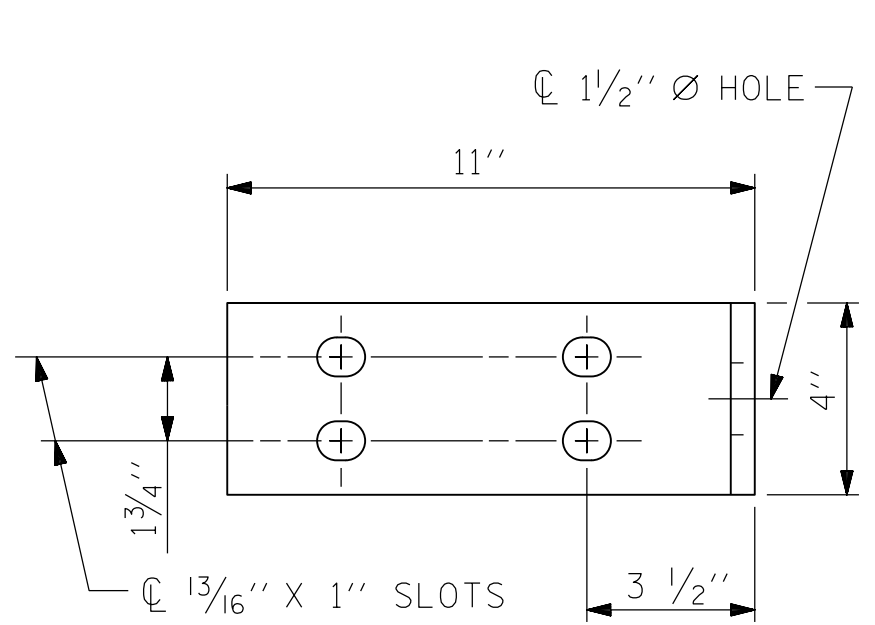
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S-13
1			3			TOTAL SHEETS
2			4			25

STD. NO. BMR4

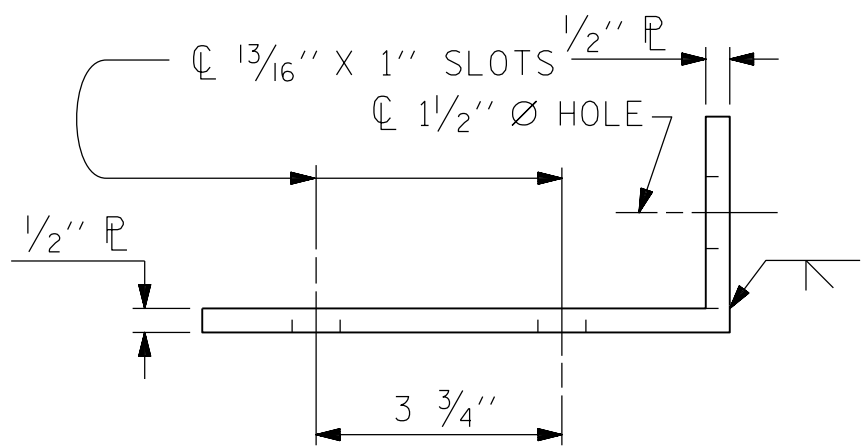


PLAN OF RAIL POST SPACINGS

TOTAL NUMBER OF RAIL POSTS = 56

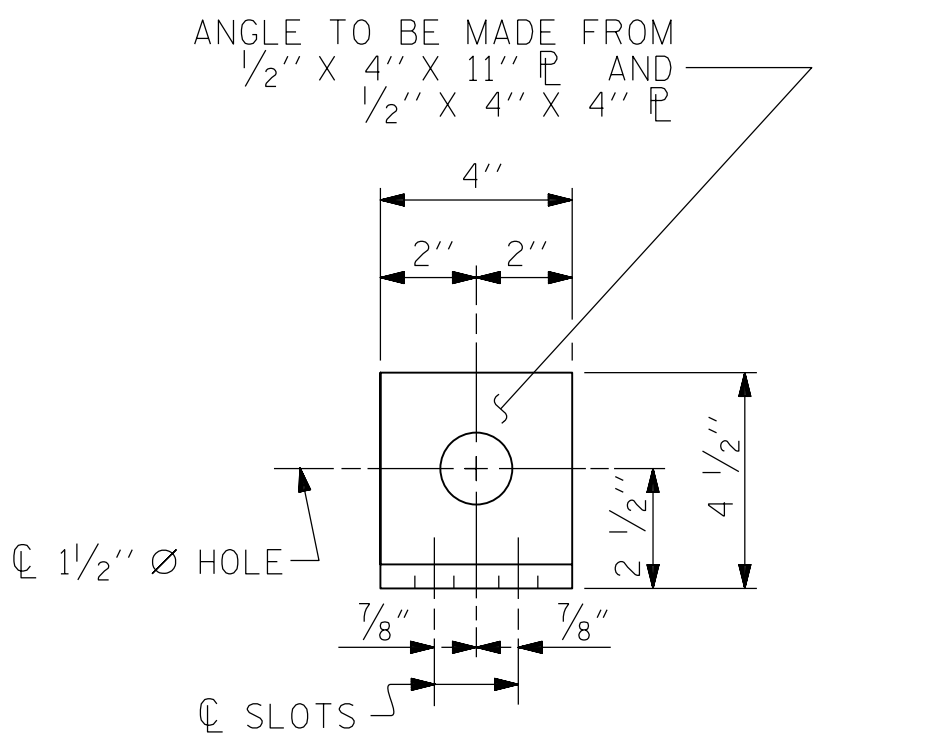


ELEVATION

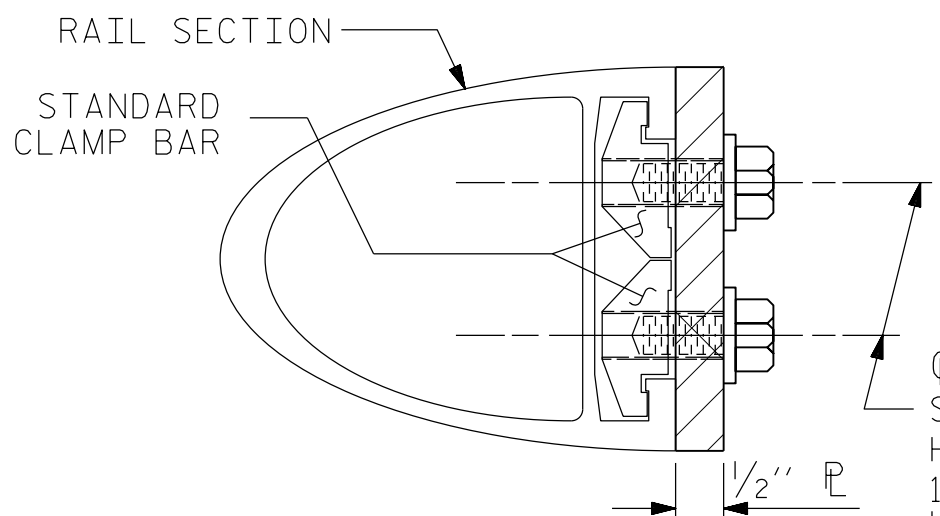


TOP VIEW

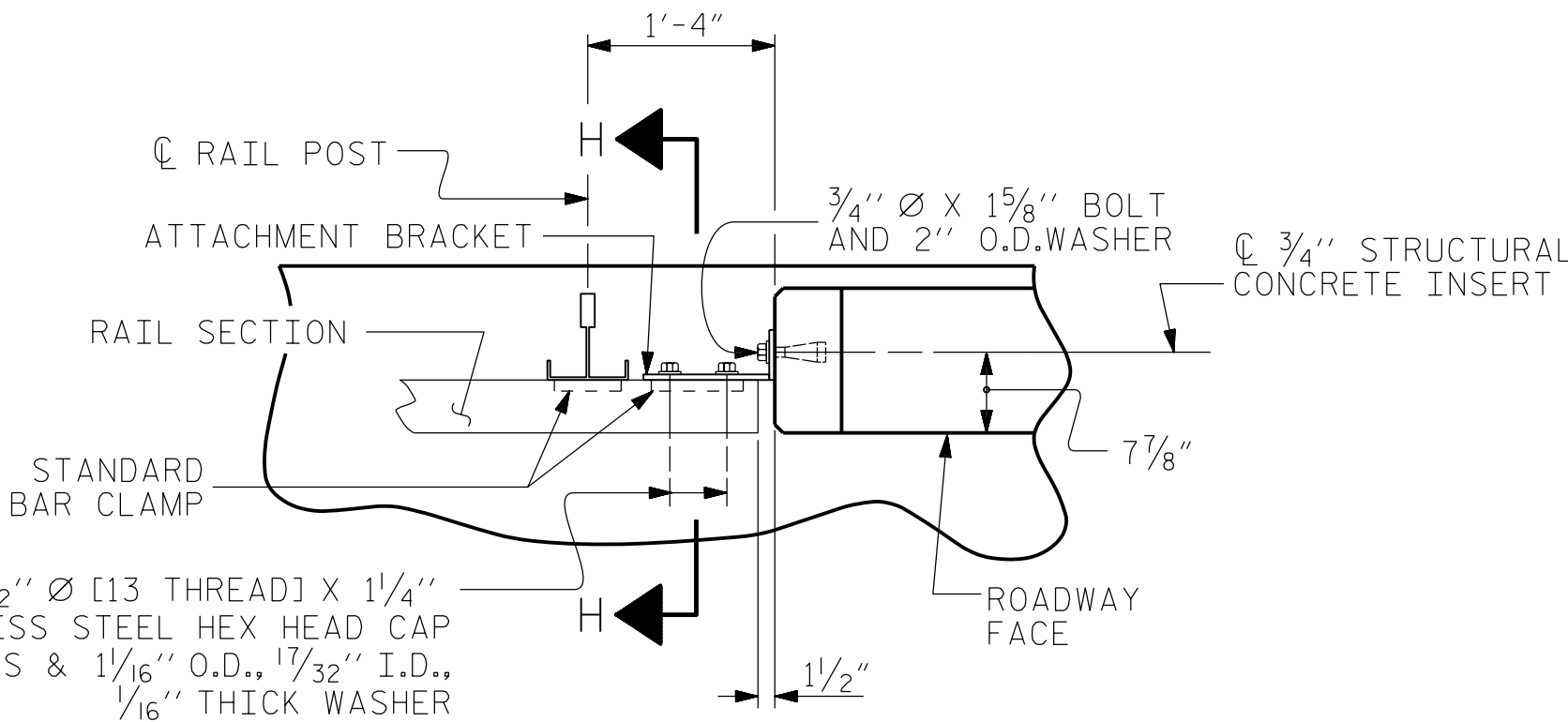
FIXED



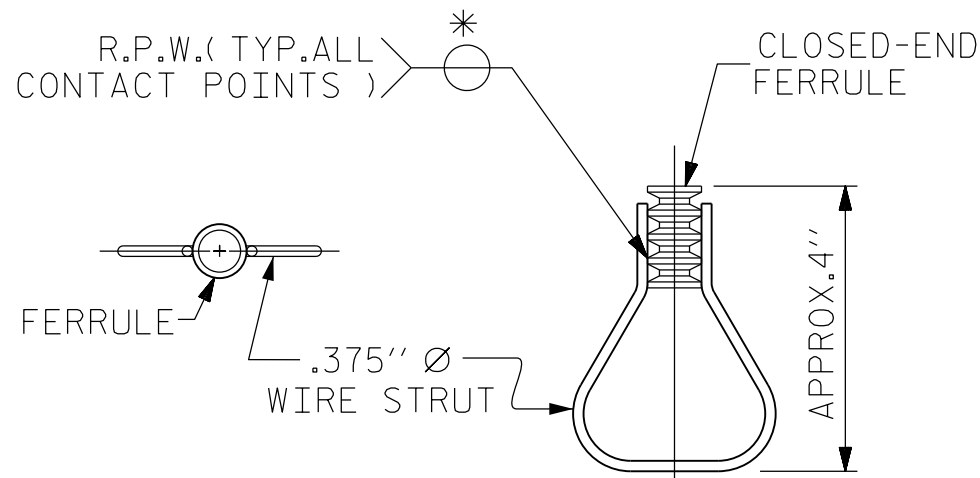
END VIEW (FIX AND EXP.)



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.

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 1 1/2".
- B. 1 - 3/4" Ø X 1 5/8" 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 3/4" Ø X 1 5/8" 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. 1/2" PLATES SHALL CONFORM TO AASHTO M270 GRADE 36 AND SHALL BE GALVANIZED AFTER FABRICATION.
- B. 3/4" STRUCTURAL CONCRETE INSERT SHALL HAVE A WORKING LOAD SHEAR CAPACITY OF 4800 LBS. THE FERRULES SHALL ENGAGE A 3/4" Ø X 1 5/8" BOLT WITH 2" O.D. WASHER IN PLACE. THE 3/4" Ø X 1 5/8" 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. 1/2" 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 3/4" STRUCTURAL CONCRETE INSERT WITH BOLT SHALL BE ASSEMBLED IN THE SHOP.

THE COST OF THE 3/4" STRUCTURAL CONCRETE INSERT ASSEMBLY, AND THE 1/2" 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 3/4" Ø X 1 5/8" BOLT WITH WASHER SHALL BE REPLACED WITH A 3/4" Ø X 6 1/2" BOLT AND 2" O.D. WASHER. ALL SPECIFICATIONS THAT APPLY TO THE 3/4" Ø X 1 5/8" BOLT SHALL APPLY TO THE 3/4" Ø X 6 1/2" BOLT. FIELD TESTING OF THE ADHESIVE BONDING SYSTEM IS NOT REQUIRED.

PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

SHEET 3 OF 3

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

STANDARD

RAIL POST SPACINGS

AND

END OF RAIL DETAILS

FOR TWO BAR METAL RAILS

REVISIONS

NO.	BY:	DATE:	NO.	BY:	DATE:	SHEET NO.
1			3			S-14
2			4			TOTAL SHEETS
						25

DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED

**CDM Smith**

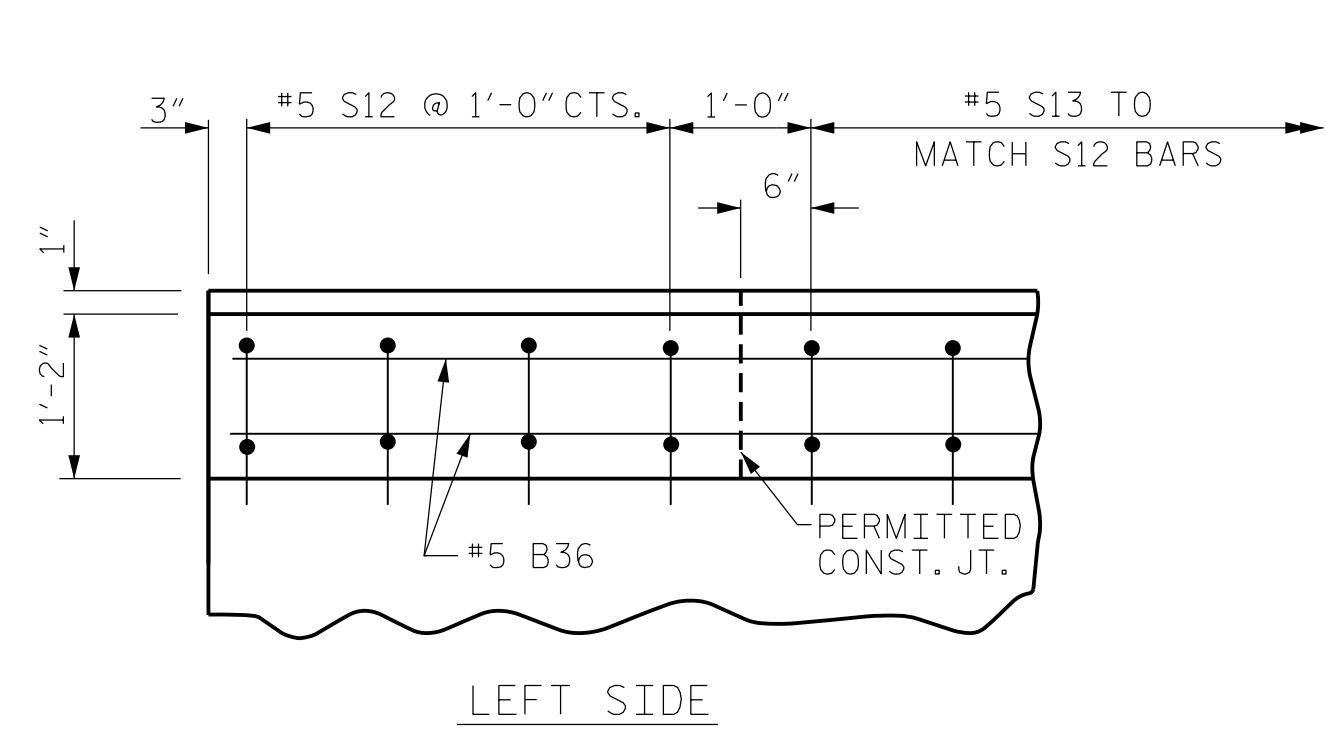
CDM SMITH  
5400 Glenwood Avenue, Suite 400  
Raleigh, NC 27612-3228  
NC COA No. F-1255

DRAWN BY : JJR DATE : 12/22  
CHECKED BY : THF DATE : 12/22  
DESIGN ENGINEER : THF DATE : 1/25

DWG. No.

NORTH CAROLINA  
PROFESSIONAL  
SEAL  
16301  
ENGINEER  
TIG HSUNG FENG

DocuSigned by:  
Tig H. Feng  
9/8/2025

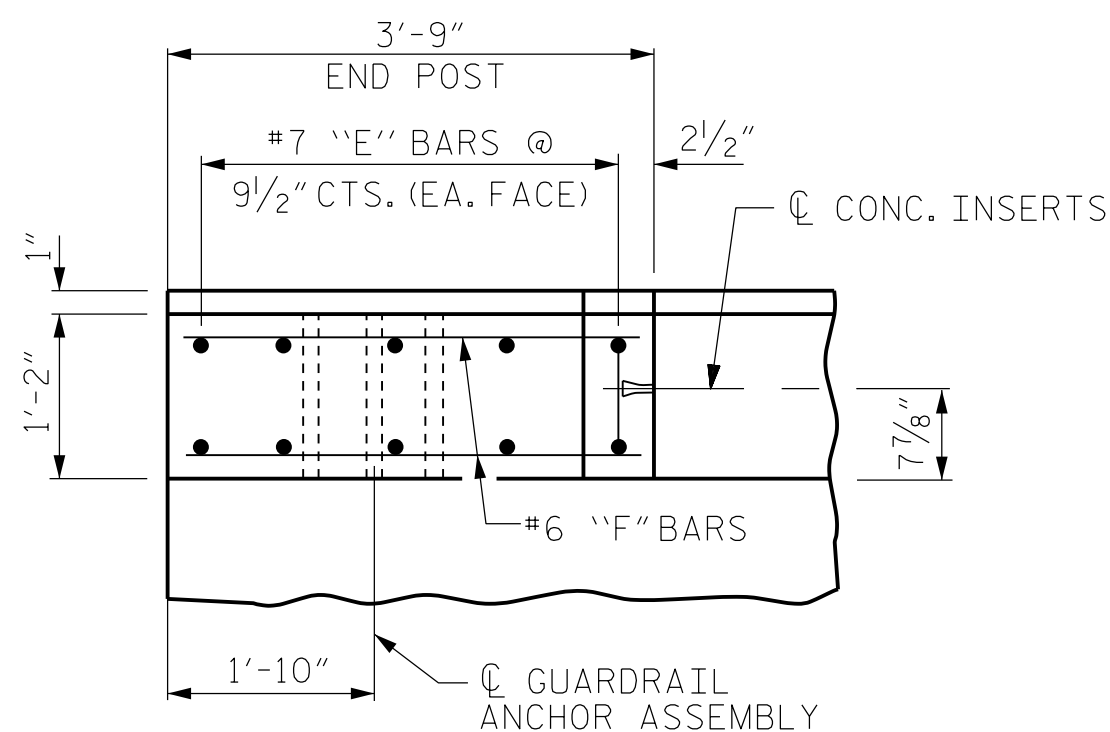


LEFT SIDE

LEFT SIDE SHOWN,RIGHT  
SIDE SIMILAR BY ROATATIONS

PLAN OF PARAPET

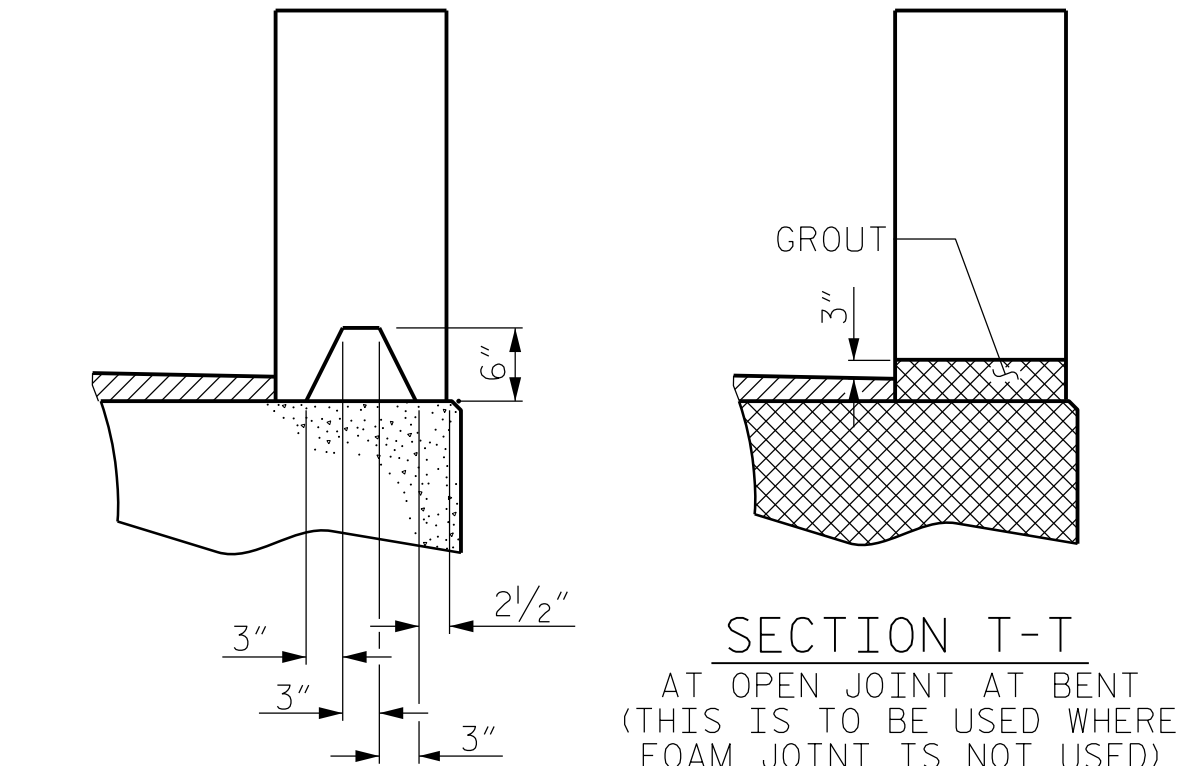
END BENT 1 SHOWN,END BENT 2 SIMILAR BY ROATATIONS



LEFT SIDE

PLAN OF END POST

END BENT 1 SHOWN,END BENT 2 SIMILAR BY ROATATIONS



SECTION S-S

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

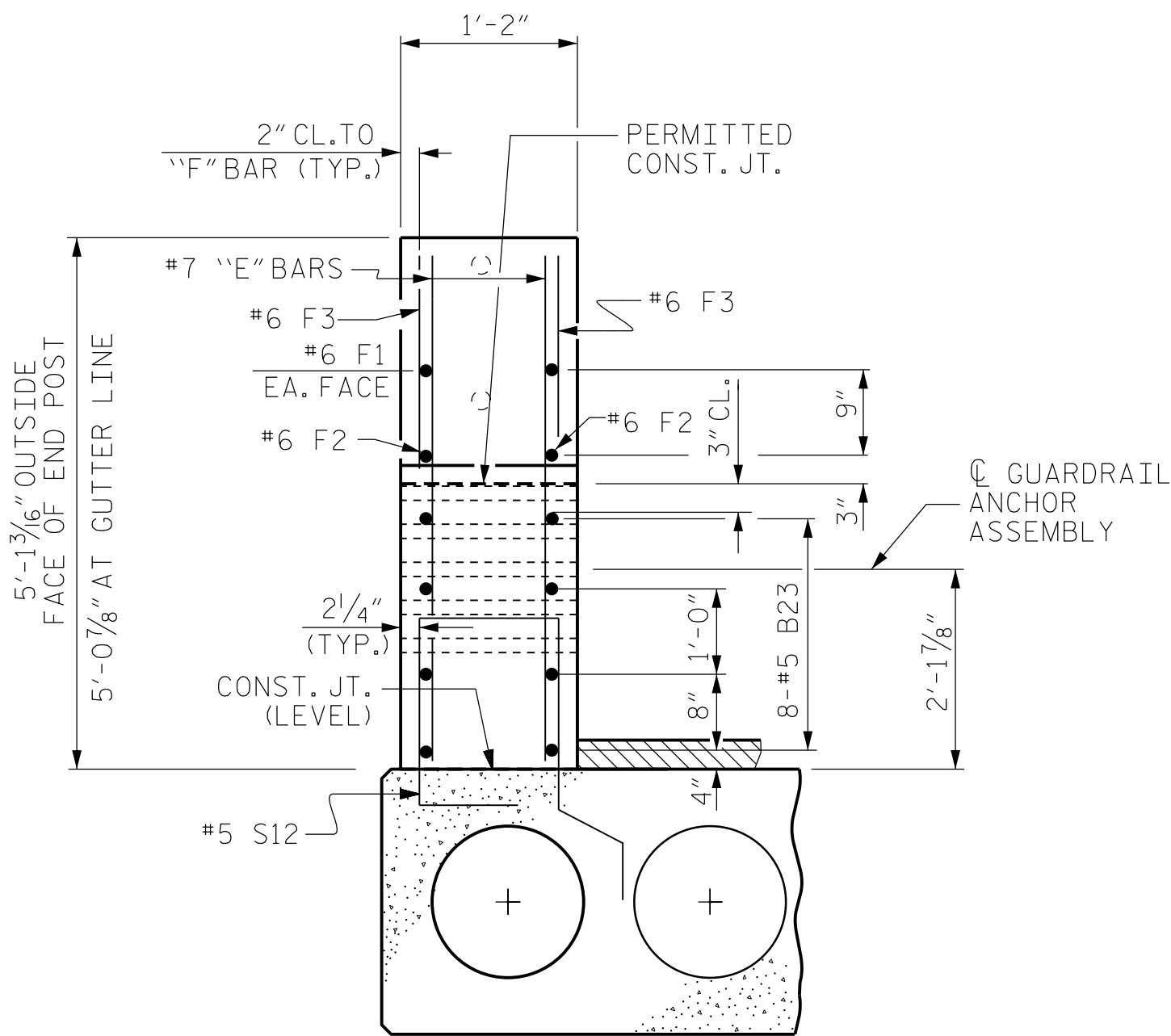
BAR TYPES		BILL OF MATERIAL					
		FOR 2 PARAPETS & 4 END POSTS					
		BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
		* B36	64	#5	STR	24'-8"	1647
		* B38	32	#5	STR	29'-8"	990
		* E1	8	#7	STR	2'-11"	48
		* E2	8	#7	STR	3'-5"	56
		* E3	8	#7	STR	3'-11"	64
		* E4	8	#7	STR	4'-5"	72
		* E5	8	#7	STR	4'-9"	78
		* F1	8	#6	STR	1'-10"	22
		* F2	8	#6	STR	3'-0"	36
		* F3	8	#6	STR	3'-9"	45
		* S13	320	#5	1	5'-11"	1975
		*EPOXY COATED REINFORCING STEEL					
		LBS. 5,032					
		CLASS AA CONCRETE					
		CU.YDS. 40.9					
		TOTAL LIN.FT.OF CONCRETE PARAPET					
		320.5					

THE REINFORCING STEEL AND CONCRETE IN THE  
END POSTS ARE INCLUDED IN THE UNIT PRICE  
BID FOR THE CONCRETE PARAPET.

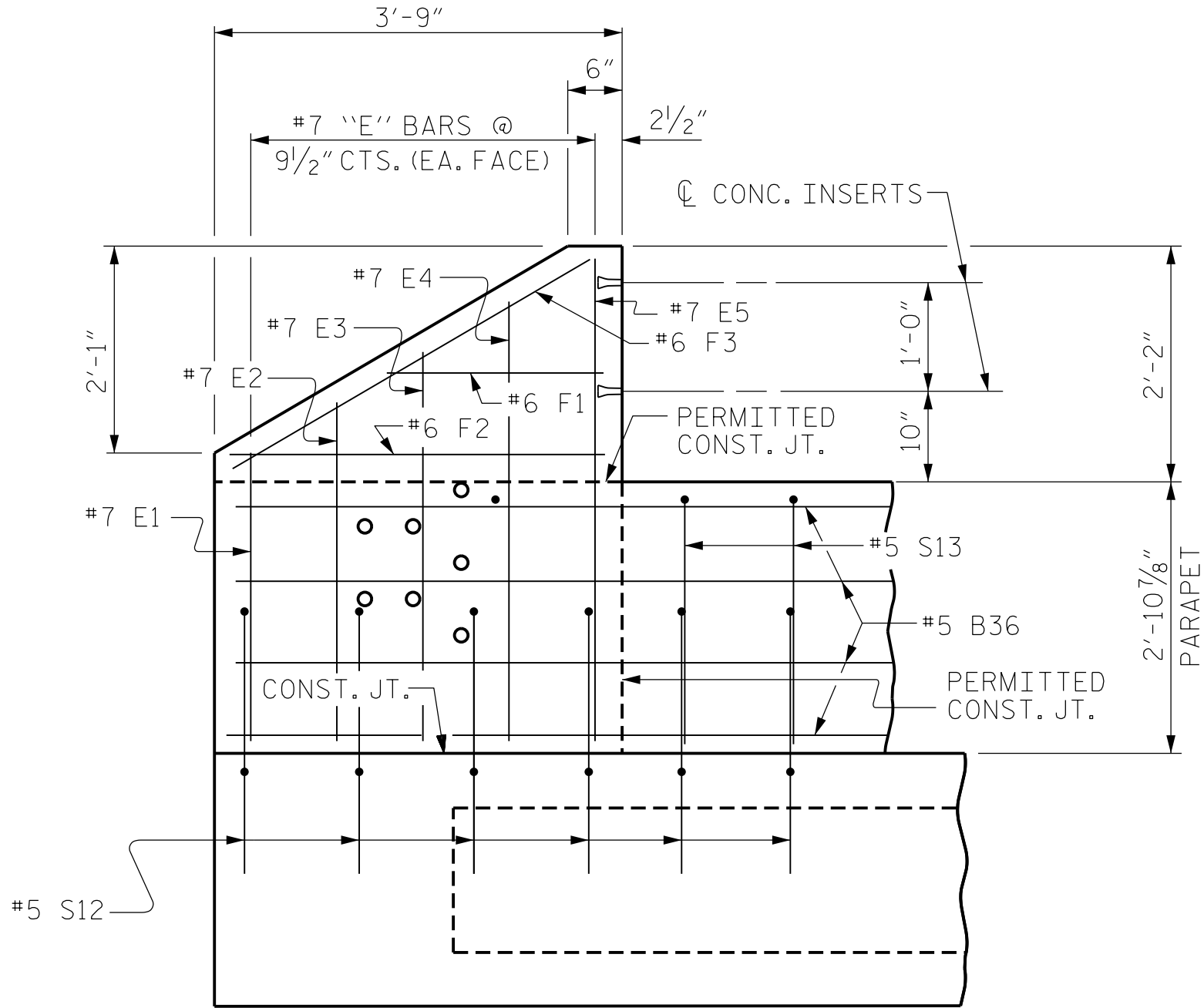
NOTES

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

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.

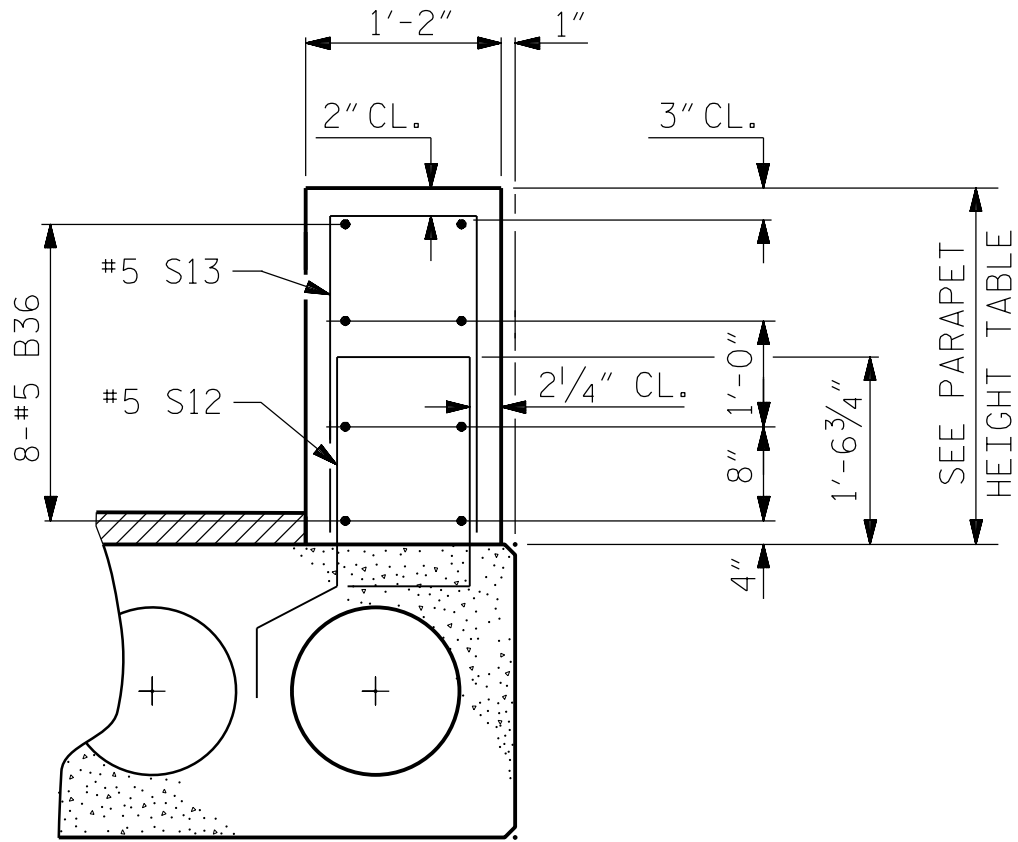


END VIEW



ELEVATION

ELEVATION AT EXPANSION JOINTS



SECTION THRU PARAPET

CONCRETE PARAPET DETAILS

FOR PLAN VIEW OF CONCRETE PARAPET, SEE "PLAN OF SPAN" SHEET

PARAPET HEIGHT TABLE		
MEASURED ALONG GUTTER LINE		
	AT BEARING	AT MID-SPAN
SPAN A	2'-10 7/8"	2'-9 1/2"
SPAN B	2'-11 3/8"	2'-9 1/2"
SPAN C	2'-10 7/8"	2'-9 1/2"
AT THE OUTSIDE FACE OF PARAPET		
	AT BEARING	AT MID-SPAN
SPAN A	2'-11 3/8"	2'-9 13/16"
SPAN B	2'-11 11/16"	2'-9 13/16"
SPAN C	2'-11 3/8"	2'-9 13/16"

PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
  
1'-2" X 2'-11 3/16"  
CONCRETE PARAPET  
AND END POSTS

REVISIONS

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

SHEET NO.

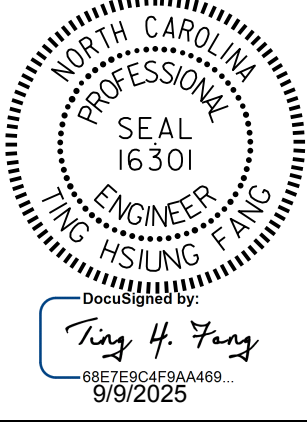
S-15

TOTAL SHEETS

25

DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED

<b>CDM Smith</b>		CDM SMITH 5400 Glenwood Avenue, Suite 400 Raleigh, NC 27612-3228 NC COA No. F-1255
DRAWN BY : <u>JJR</u>	DATE : <u>12/22</u>	DWG. No.
CHECKED BY : <u>THF</u>	DATE : <u>12/22</u>	
DESIGN ENGINEER : <u>THF</u>	DATE : <u>1/25</u>	



NOTES

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

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.

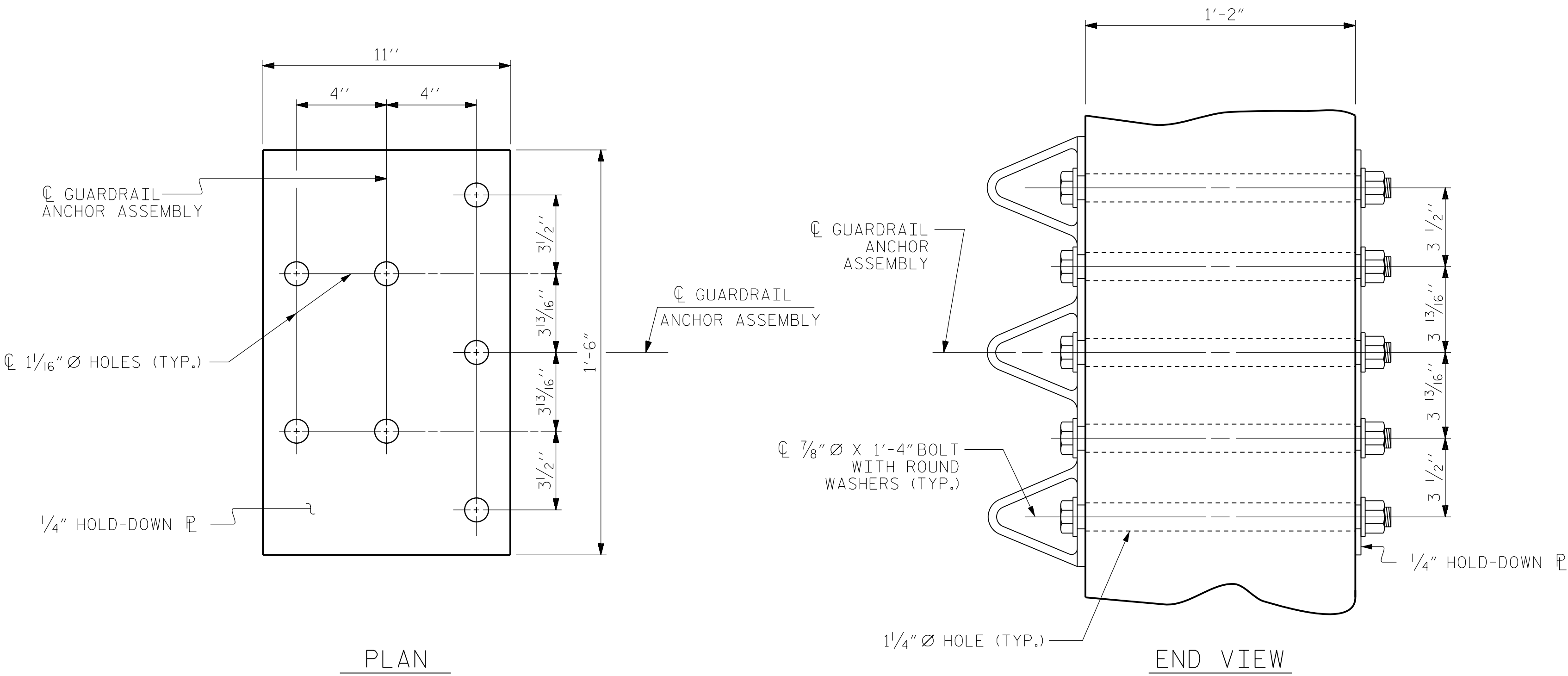
THE GUARDRAIL ANCHOR ASSEMBLY IS REQUIRED AT ALL POINTS WHERE APPROACH GUARDRAIL IS TO BE ATTACHED TO THE END OF THE PARAPET. FOR POINTS OF ATTACHMENT, SEE SKETCH.

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

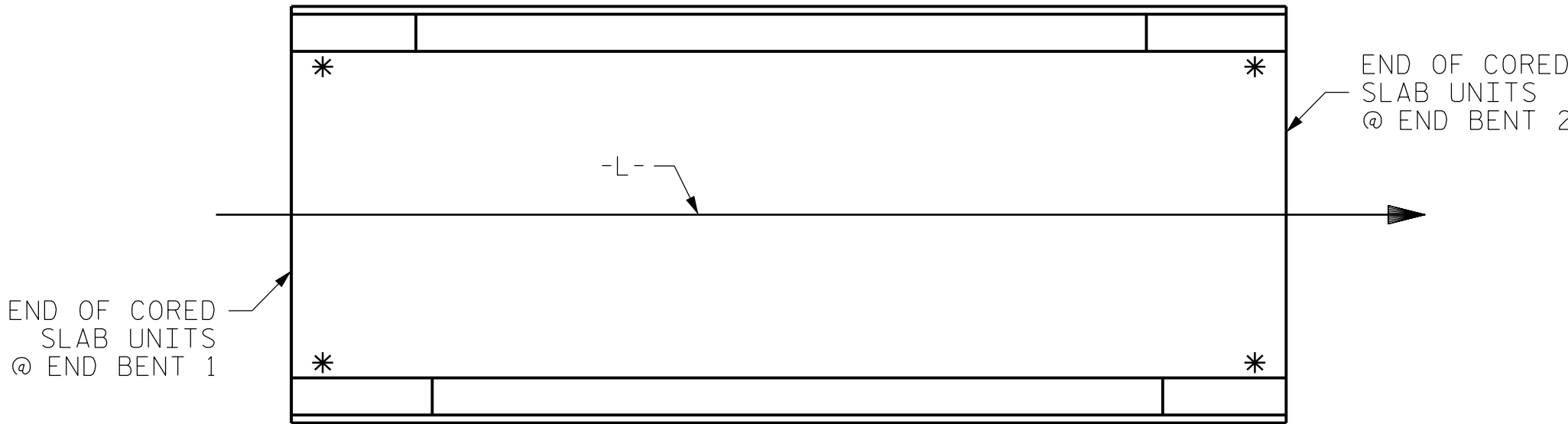
THE COST OF THE GUARDRAIL ANCHOR ASSEMBLIES WITH BOLTS, NUTS AND WASHERS COMPLETE IN PLACE, SHALL BE INCLUDED IN THE VARIOUS PAY ITEMS.

THE VERTICAL REINFORCING BARS MAY BE SHIFTED SLIGHTLY IN THE END POST TO CLEAR ASSEMBLY BOLTS.

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.

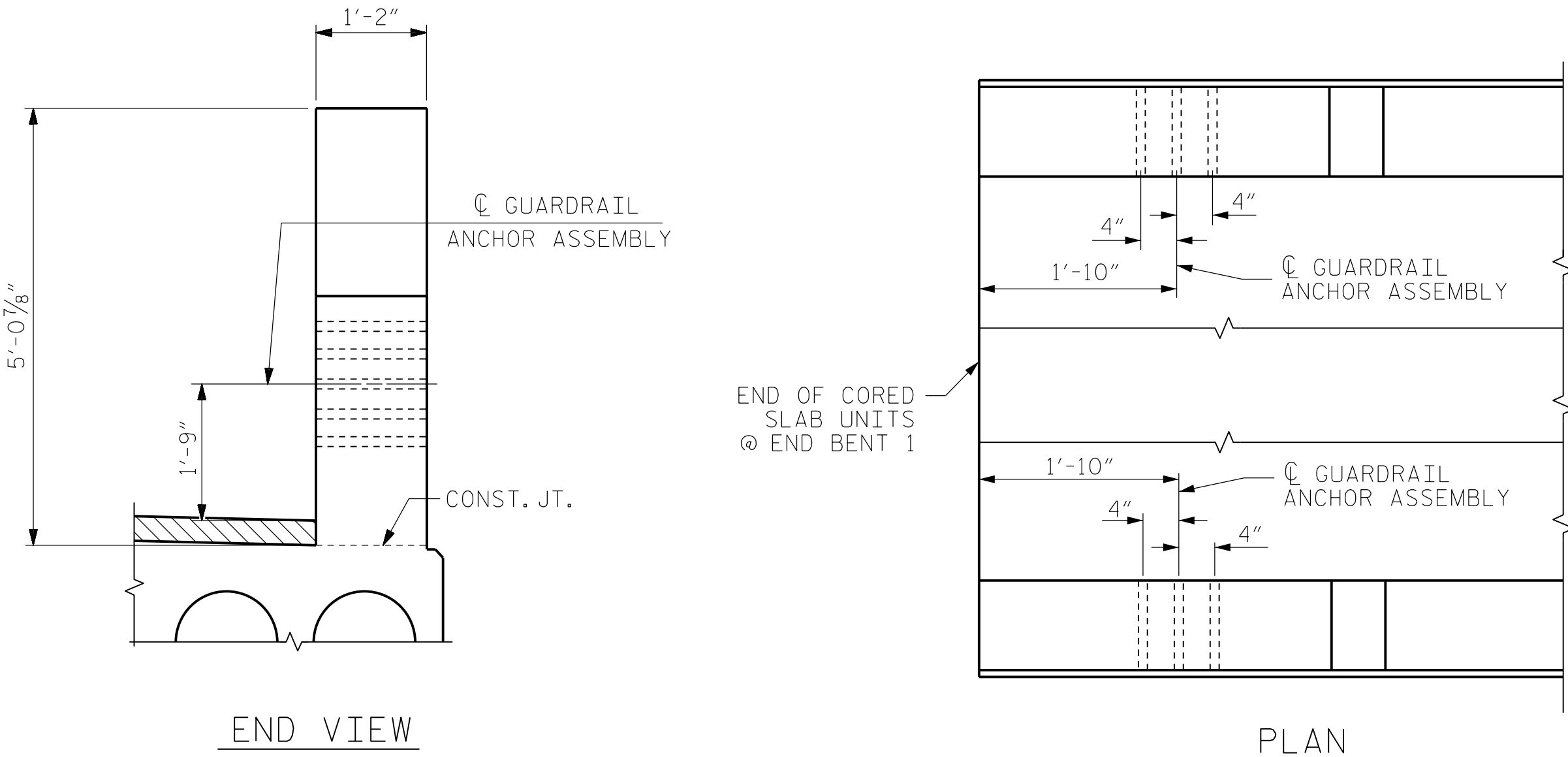


GUARDRAIL ANCHOR ASSEMBLY DETAILS



SKETCH SHOWING POINTS OF ATTACHMENTS

\* LOCATION OF GUARDRAIL ANCHOR ATTACHMENT



LOCATION OF GUARDRAIL ANCHOR AT END POST

END BENT 1 SHOWN, END BENT 2 SIMILAR

PROJECT NO. BP10-R047

CABARRUS COUNTY

STATION: 19+14.00 -L-

DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED

**CDM Smith**

CDM SMITH  
5400 Glenwood Avenue, Suite 400  
Raleigh, NC 27612-3228  
NC COA No. F-1255

DRAWN BY : JJR DATE : 12/22  
CHECKED BY : THF DATE : 12/22  
DESIGN ENGINEER : THF DATE : 1/25

DWG. No.

NORTH CAROLINA  
PROFESSIONAL  
SEAL  
16301  
ENGINEER  
TIG HSILUNG FANG  
05/01/2025

*Tig H. Fang*  
05/01/2025

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
STANDARD  
GUARDRAIL ANCHORAGE  
DETAILS FOR  
2-BAR METAL RAILS

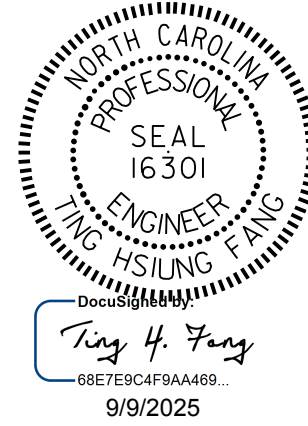
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S-16
1			3			TOTAL SHEETS
2			4			25



DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED

**CDM  
Smith**

DWG. No.



PROJECT NO. BP10-R047  
CABARRUS COUNTY  
 STATION: 19+14.00 -L-

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
SUBSTRUCTURE

END BENT 1

REVISIONS						SHEET NO. S-17
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 25
2			4			



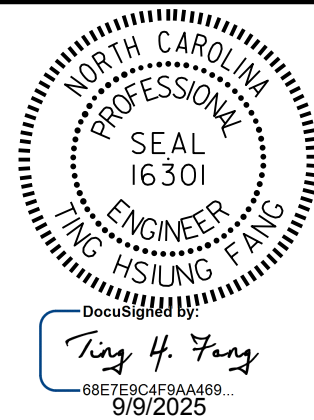
WINGS NOT SHOWN FOR CLARITY. FOR SECTION A-A, SEE SHEET 4 OF 4.  
CONCRETE COLLARS FOR STEEL PILES NOT SHOWN IN PLAN AND ELEVATION VIEWS FOR CLARITY.  
SEE "CORROSION PROTECTION FOR STEEL PILES DETAIL", SHEET 4 OF 4.

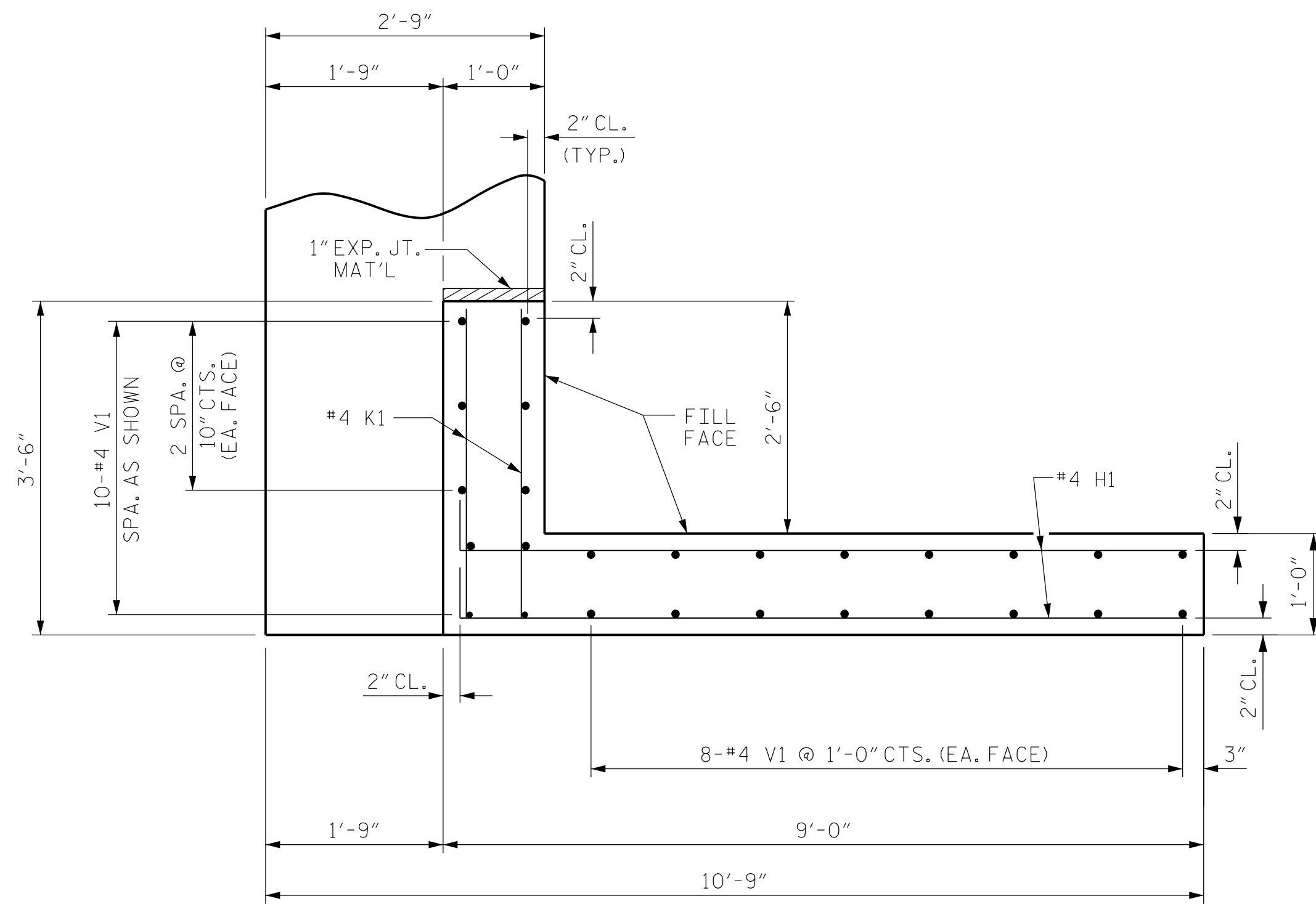
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FINAL UNLESS ALL  
SIGNATURES COMPLETED

**CDM  
Smith** CDM SMITH  
5400 Glenwood Avenue, Suite 400  
Raleigh, NC 27612-3228  
NC COA No. F-1255

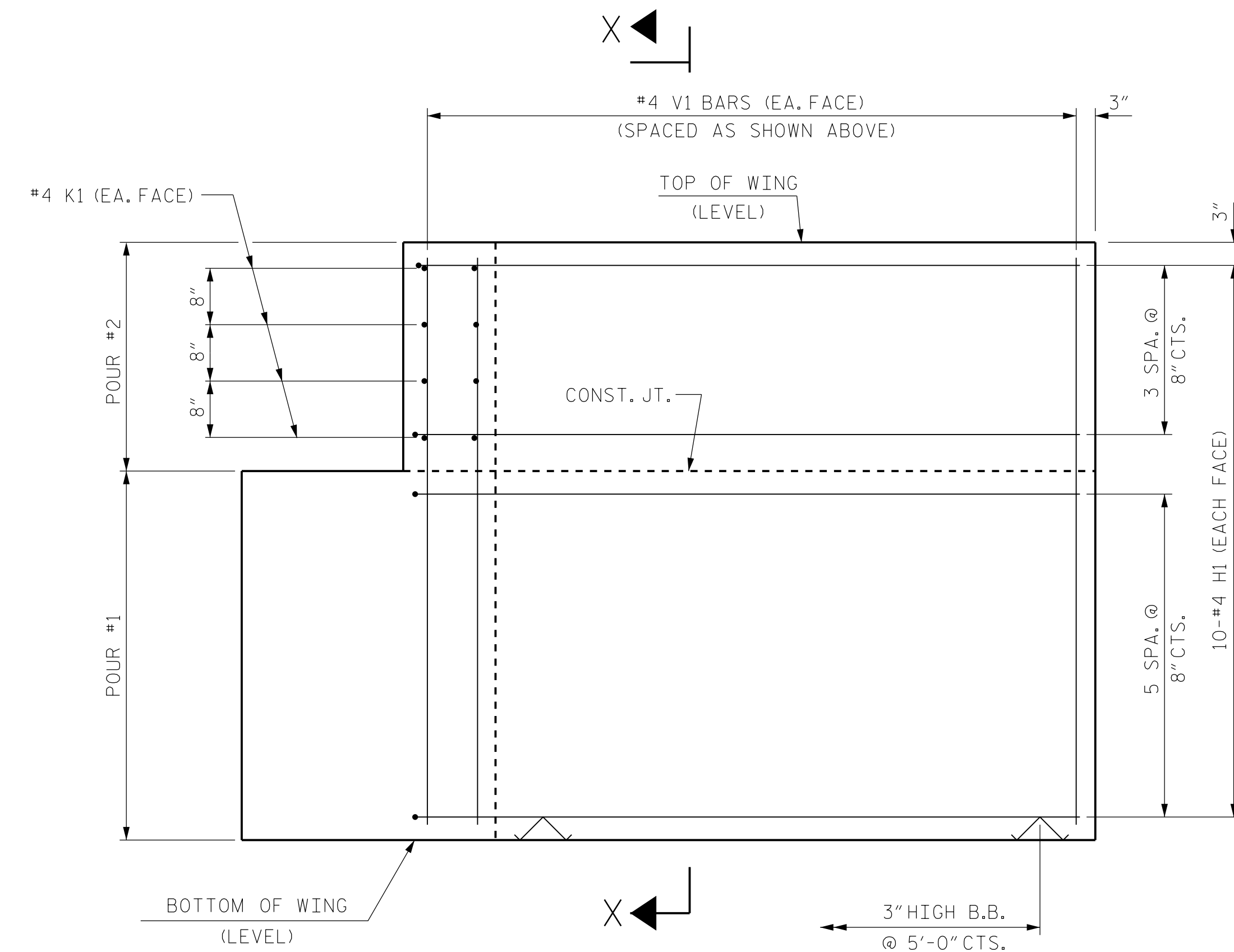
DRAWN BY : JJR DATE : 12/22  
 CHECKED BY : THF DATE : 12/22  
 DESIGN ENGINEER : THF DATE : 1/25

DWG. No.

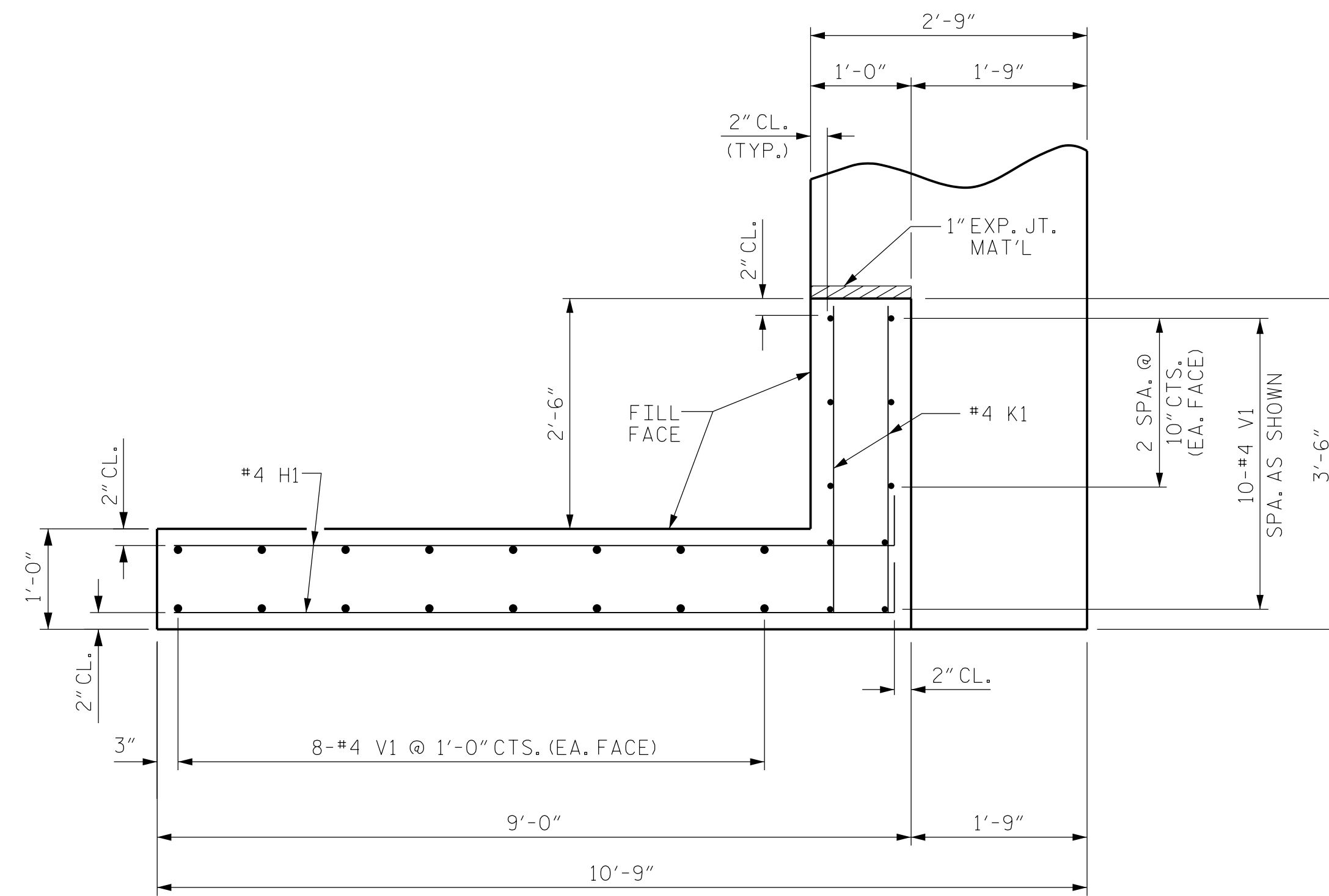




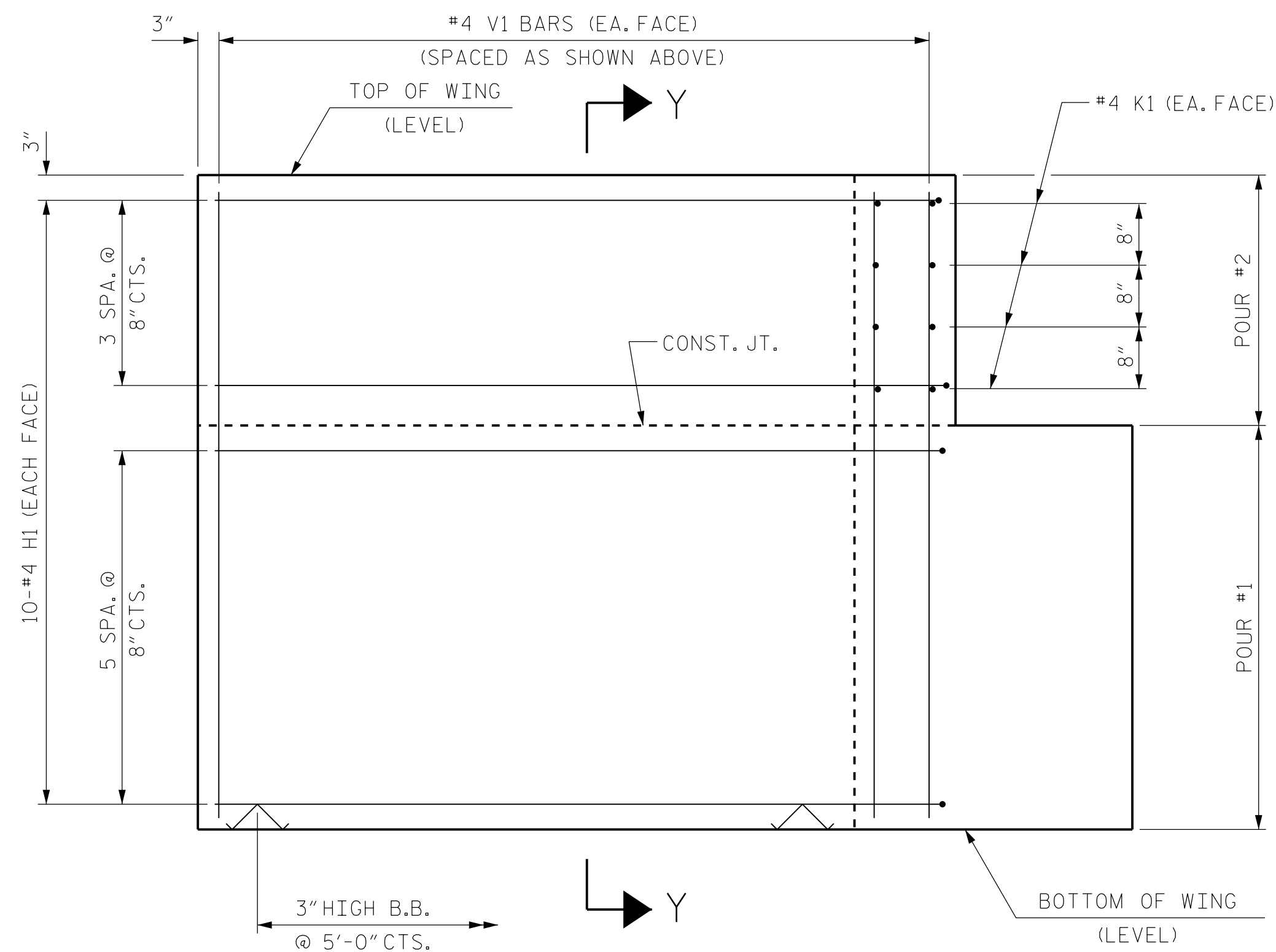
PLAN OF WING (W1)



ELEVATION OF WING (W1)

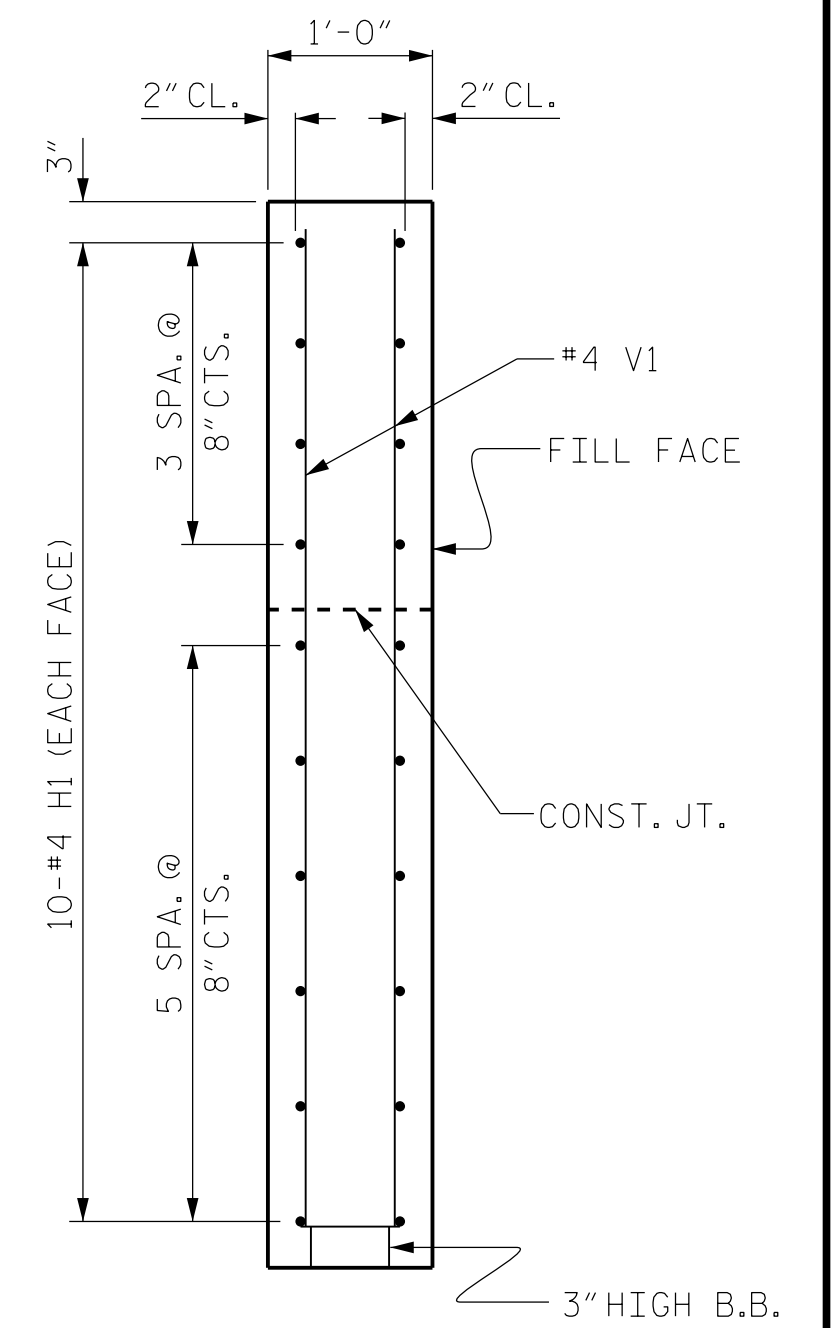


PLAN OF WING (W2)

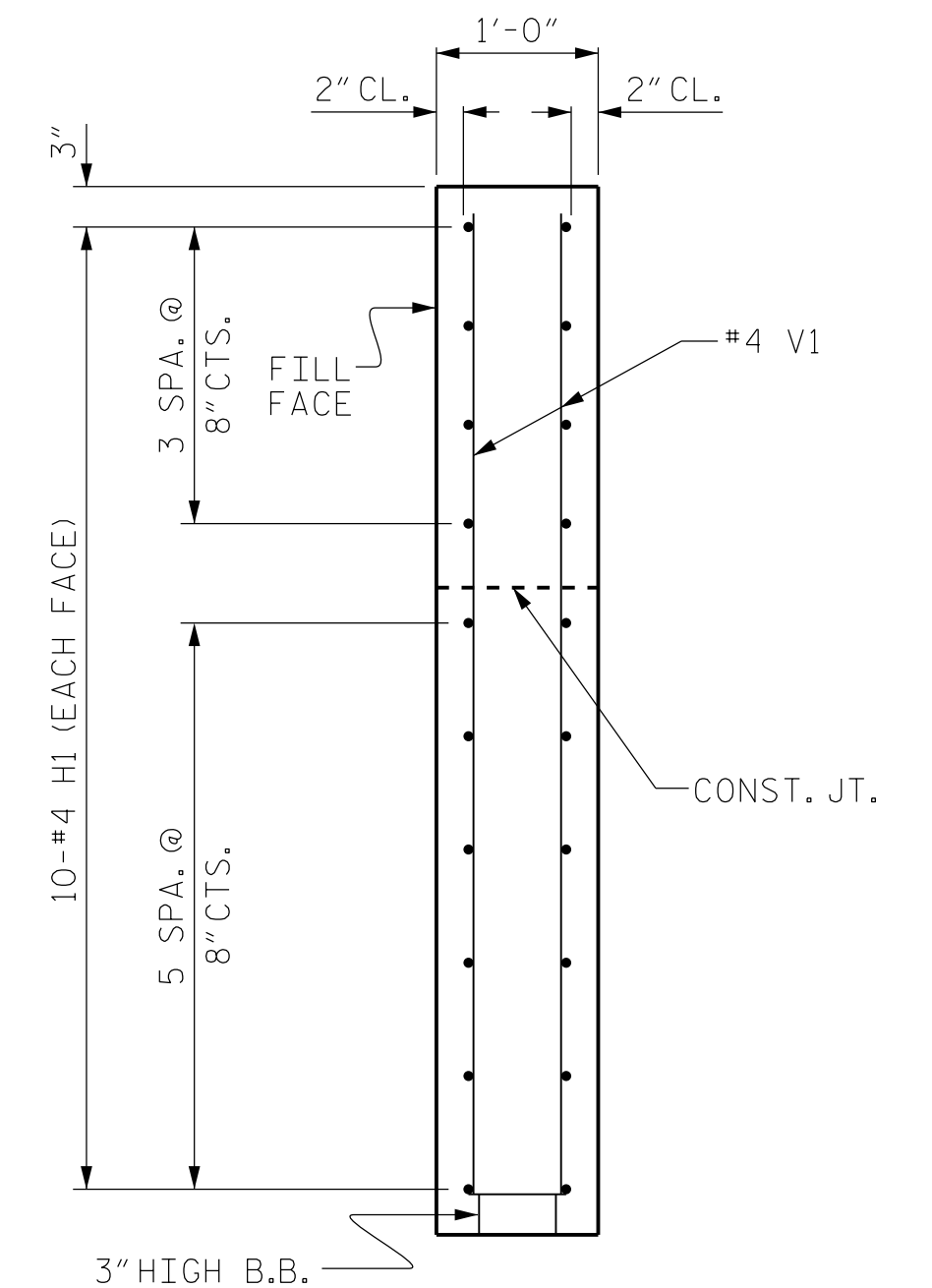


ELEVATION OF WING (W2)

## WING DETAILS



SECTION X-X



SECTION Y-Y

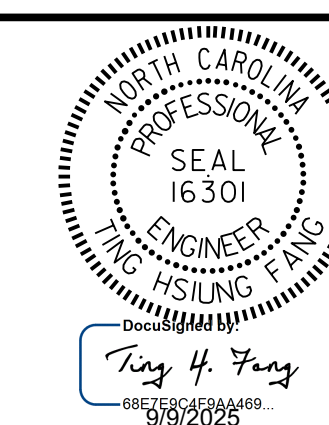
PROJECT NO. BP10-R047  
CABARRUS COUNTY  
 STATION: 19+14.00 -L-

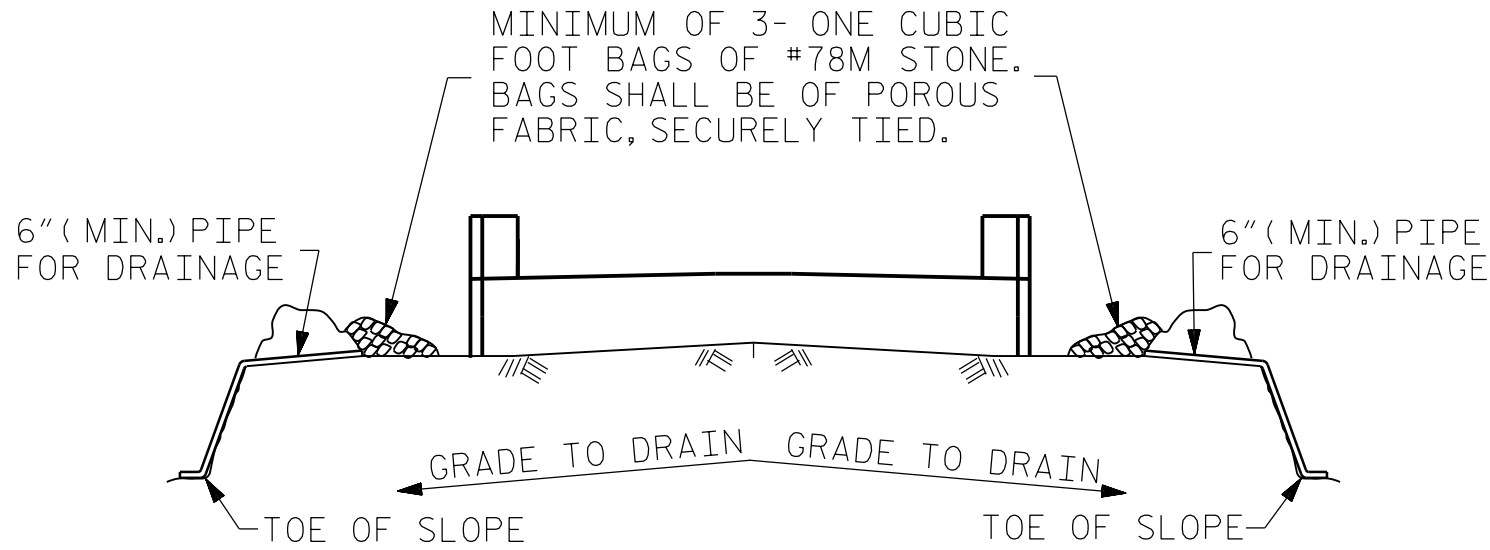
SHEET 3 OF 4

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
SUBSTRUCTURE  
  
END BENTS 1 & 2  
WING DETAILS

DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED

<b>CDM Smith</b>	CDM SMITH 5400 Glenwood Avenue, Suite 400 Raleigh, NC 27612-3228 NC COA No. F-1255
DRAWN BY : JJR	DATE : 12/22
CHECKED BY : THF	DATE : 12/22
DESIGN ENGINEER : THF	DATE : 1/25
DWG. No.	



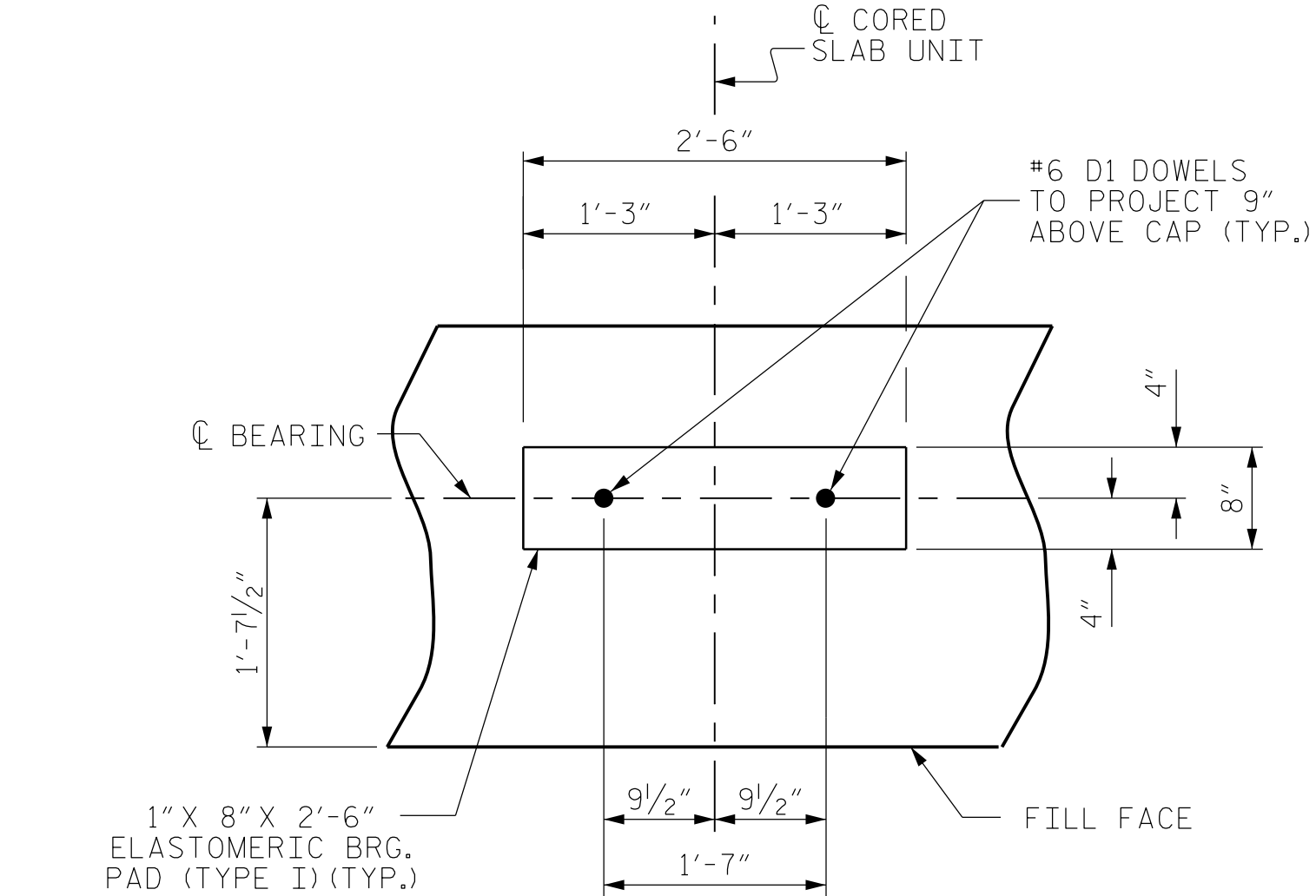


BAGGED STONE AND PIPE SHALL BE PLACED IMMEDIATELY AFTER COMPLETION OF END BENT EXCAVATION. PIPE MAY BE EITHER CONCRETE, CORRUGATED STEEL, CORRUGATED ALUMINUM ALLOY, OR CORRUGATED PLASTIC. PERFORATED PIPE WILL NOT BE ALLOWED.

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.

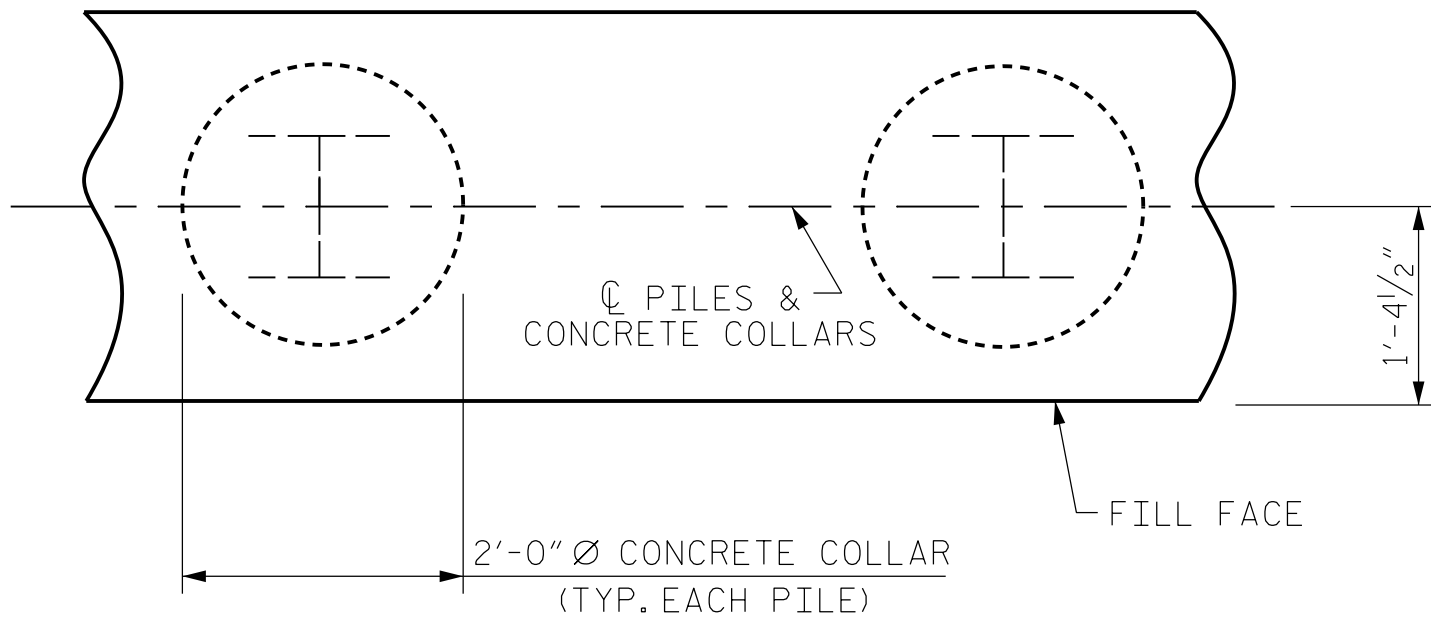
NO SEPARATE PAYMENT WILL BE MADE FOR THIS WORK AND THE ENTIRE COST OF THIS WORK SHALL BE INCLUDED IN THE UNIT CONTRACT PRICE BID FOR THE SEVERAL PAY ITEMS.

### TEMPORARY DRAINAGE AT END BENT

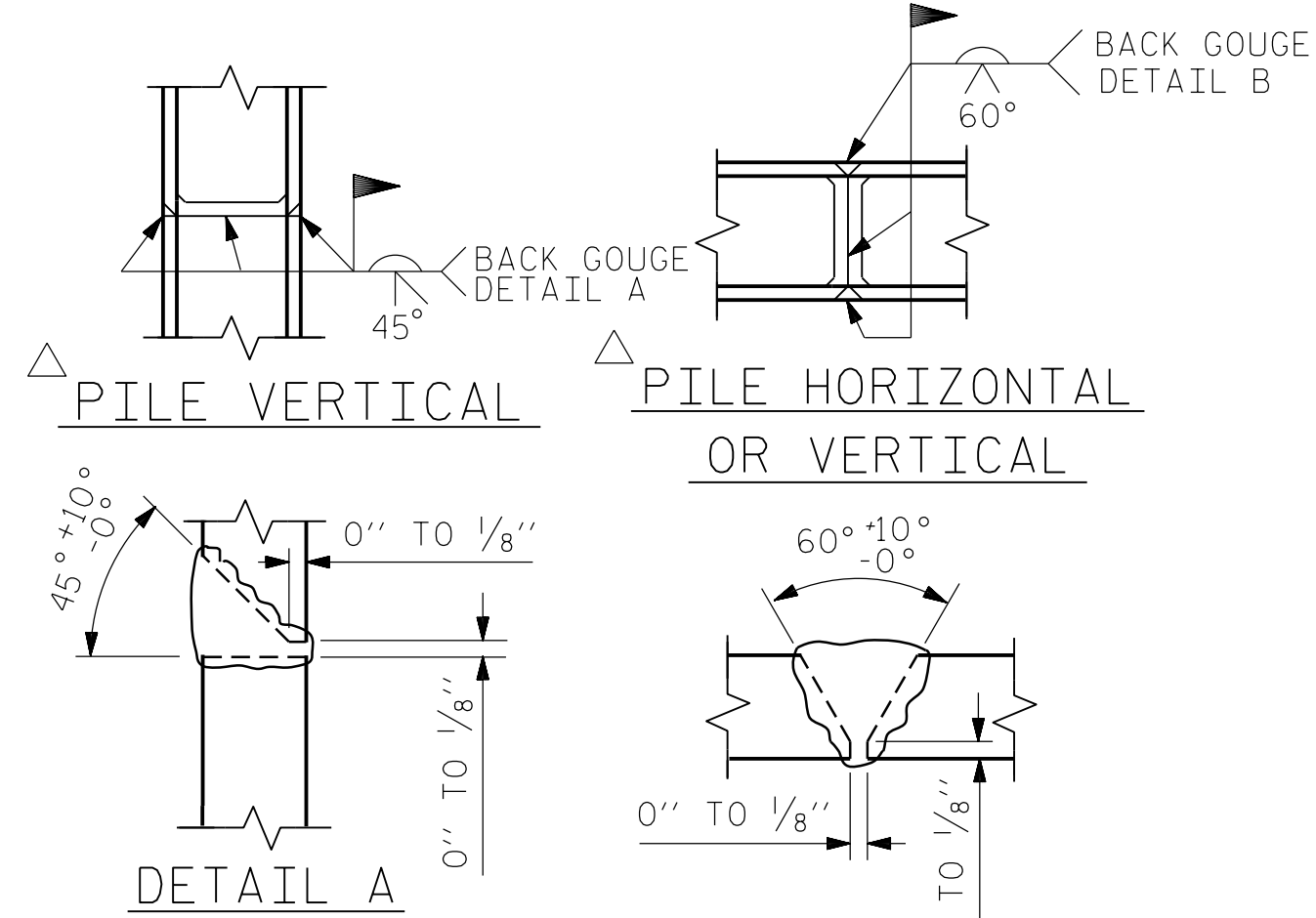


DETAIL "A"

END BENT 1 SHOWN, END BENT 2 SIMILAR BY ROTATION



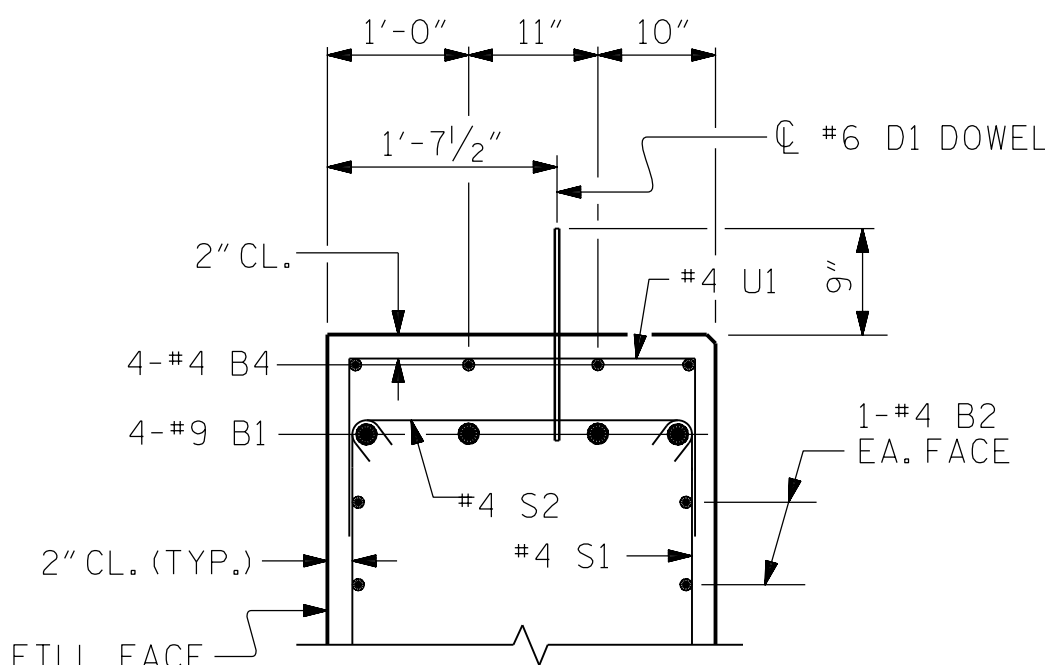
PLAN



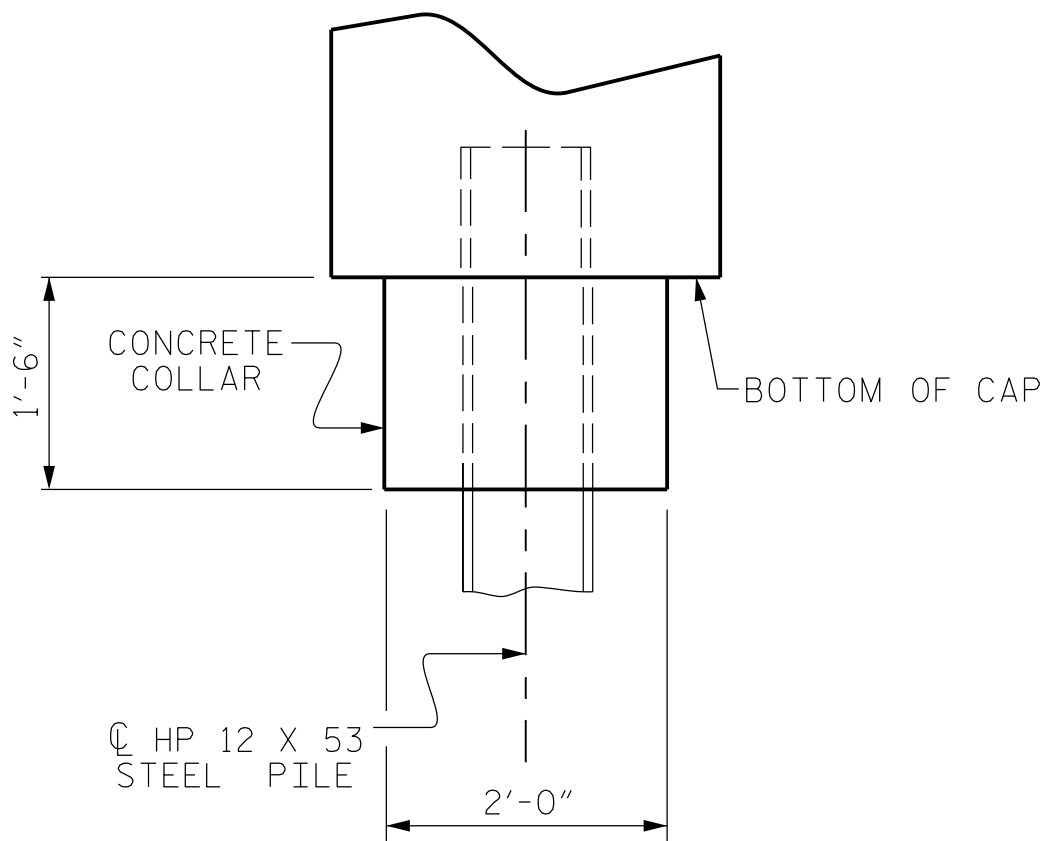
POSITION OF PILE DURING WELDING.

### PILE SPLICE DETAILS

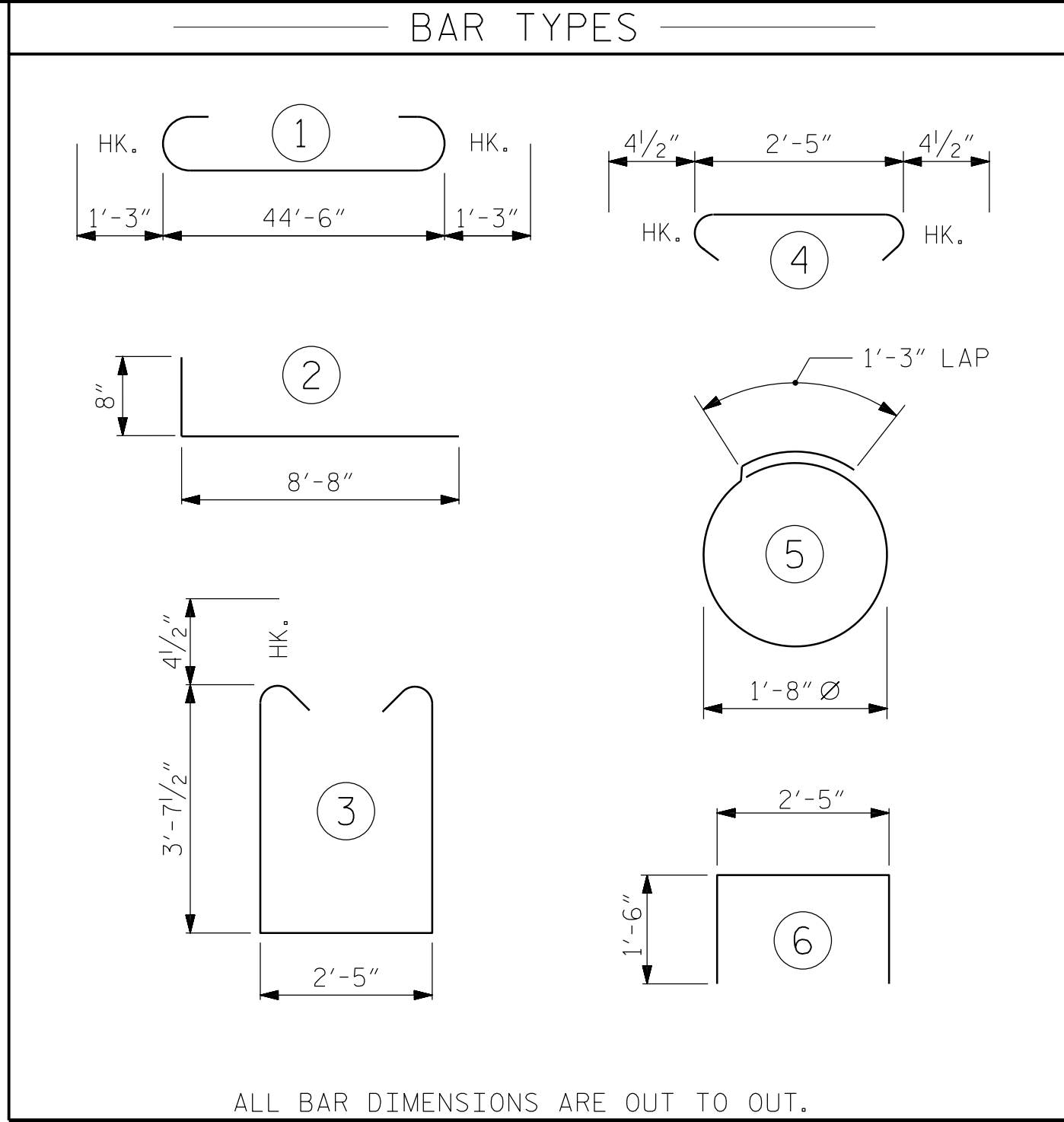
SCALE- 7/16" = 1'-0"



SECTION B-B



ELEVATION



### BILL OF MATERIAL

#### FOR ONE END BENT

(2 REQUIRED)					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
B1	8	#9		47'-0"	1278
B2	28	#4	STR	23'-7"	441
B3	12	#4	STR	2'-5"	19
B4	4	#4	STR	25'-0"	67
D1	26	#6	STR	1'-6"	59
H1	40	#4	2	9'-4"	249
K1	16	#4	STR	3'-2"	34
S1	56	#4	3	10'-5"	390
S2	56	#4	4	3'-2"	118
S3	28	#4	5	6'-6"	122
U1	17	#4	STR	5'-5"	62
V1	52	#4	STR	6'-5"	223

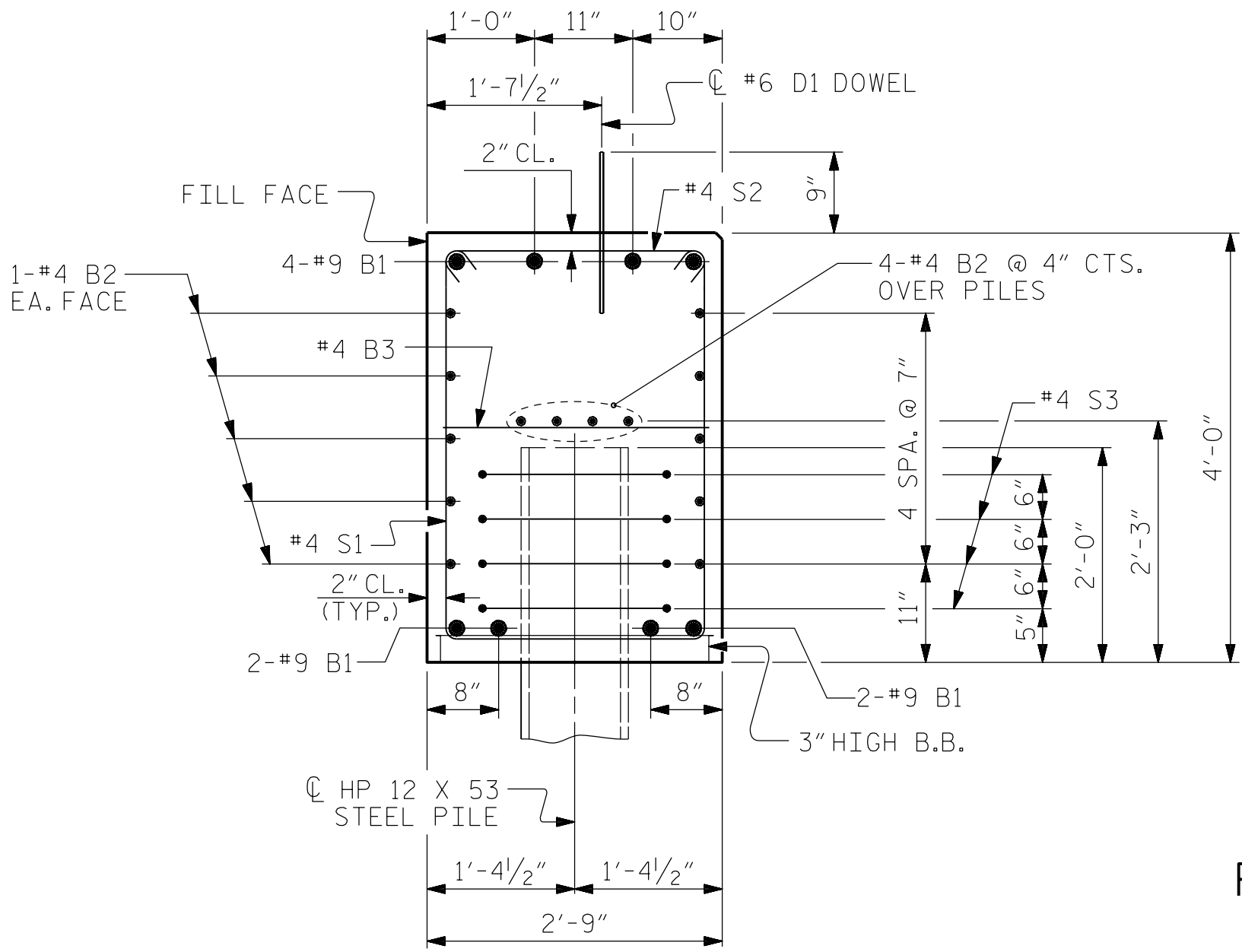
REINFORCING STEEL (FOR ONE END BENT) 3062 LBS.

CLASS A CONCRETE BREAKDOWN (FOR ONE END BENT)

POUR #1 CAP, LOWER PART OF WINGS & COLLARS 22.9 C.Y.

POUR #2 UPPER PART OF WINGS 2.4 C.Y.

TOTAL CLASS A CONCRETE 25.3 C.Y.



SECTION A-A

(CONCRETE COLLAR NOT SHOWN FOR CLARITY. SEE "CORROSION PROTECTION FOR STEEL PILES DETAIL.")

PROJECT NO. BP10-R047

CABARRUS COUNTY

STATION: 19+14.00 -L-

SHEET 4 OF 4

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

SUBSTRUCTURE

END BENTS 1 & 2  
DETAILS

#### REVISIONS

NO.	BY:	DATE:	NO.	BY:	DATE:	SHEET NO.
1			3			S-20
2			4			TOTAL SHEETS 25

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SIGNATURES COMPLETED

**CDM Smith**

CDM SMITH  
5400 Glenwood Avenue, Suite 400  
Raleigh, NC 27612-3228  
NC COA No. F-1255

DRAWN BY : JUR DATE : 12/22  
CHECKED BY : THF DATE : 12/22  
DESIGN ENGINEER : THF DATE : 1/25

DWG. No.



Documented by  
Ting H. Yang  
REGISTERED PROFESSIONAL ENGINEER  
9/9/2025

NOTES

STIRRUPS IN CAP MAY BE SHIFTED AS NECESSARY TO CLEAR DOWELS.

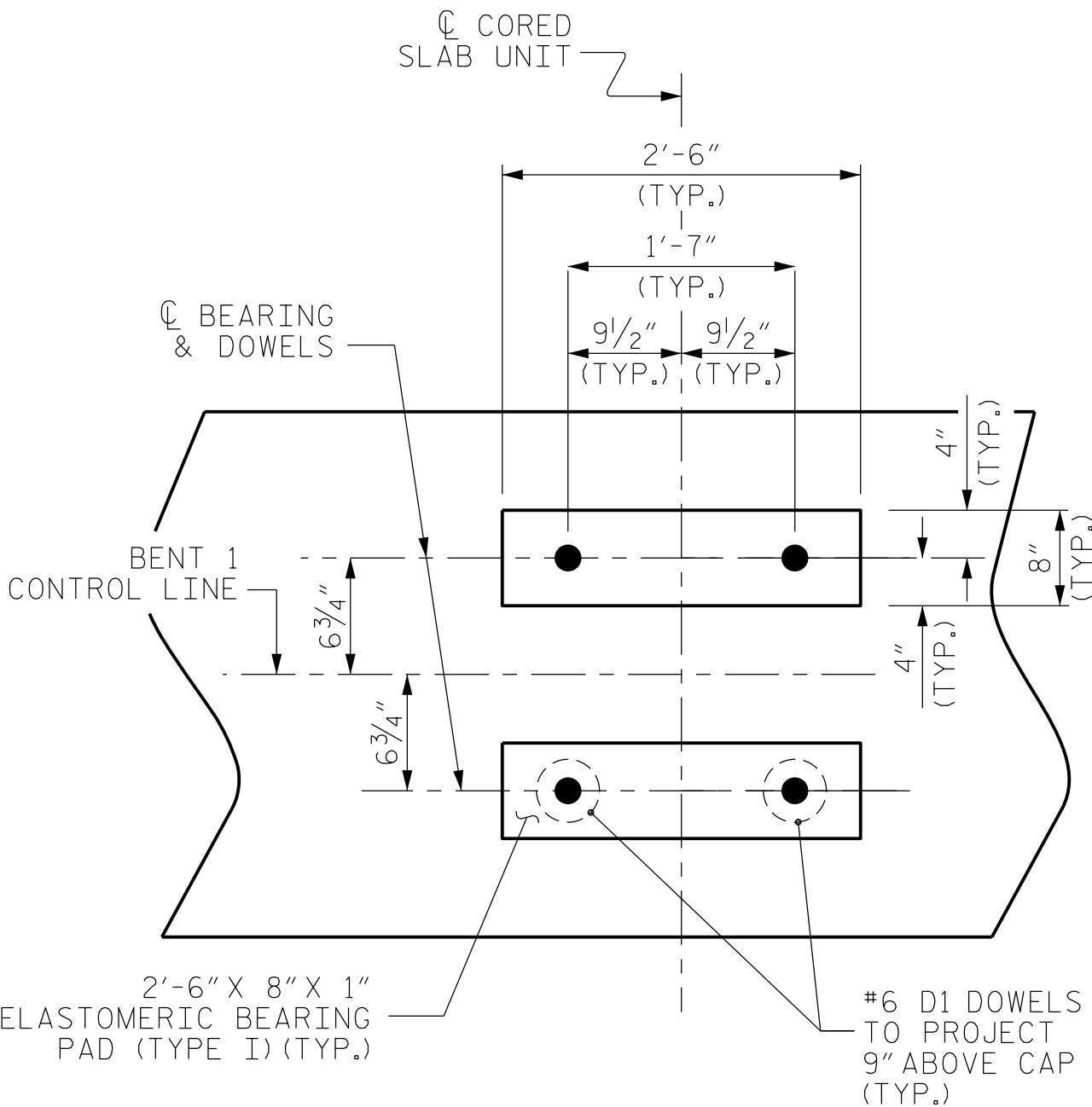
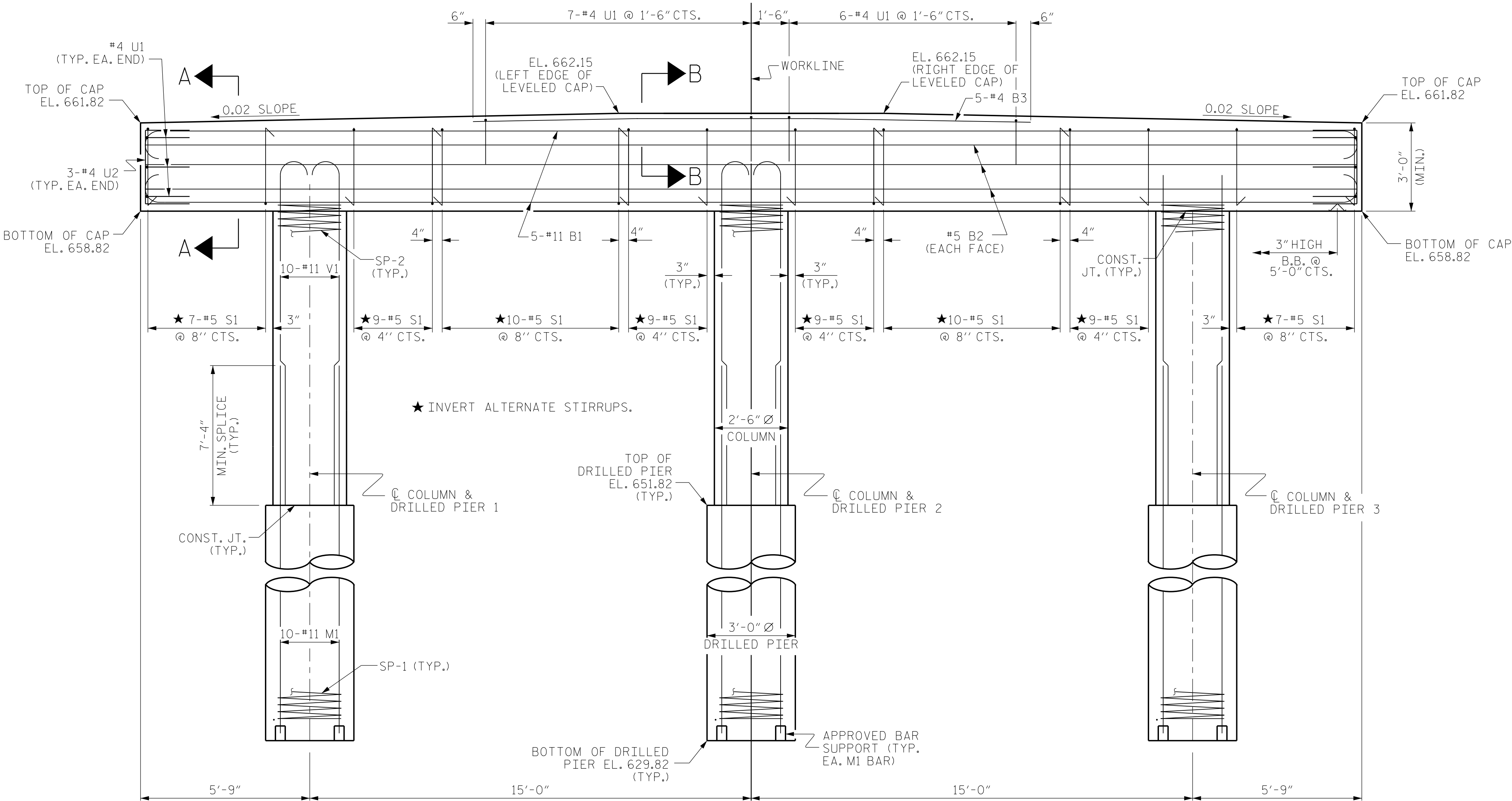
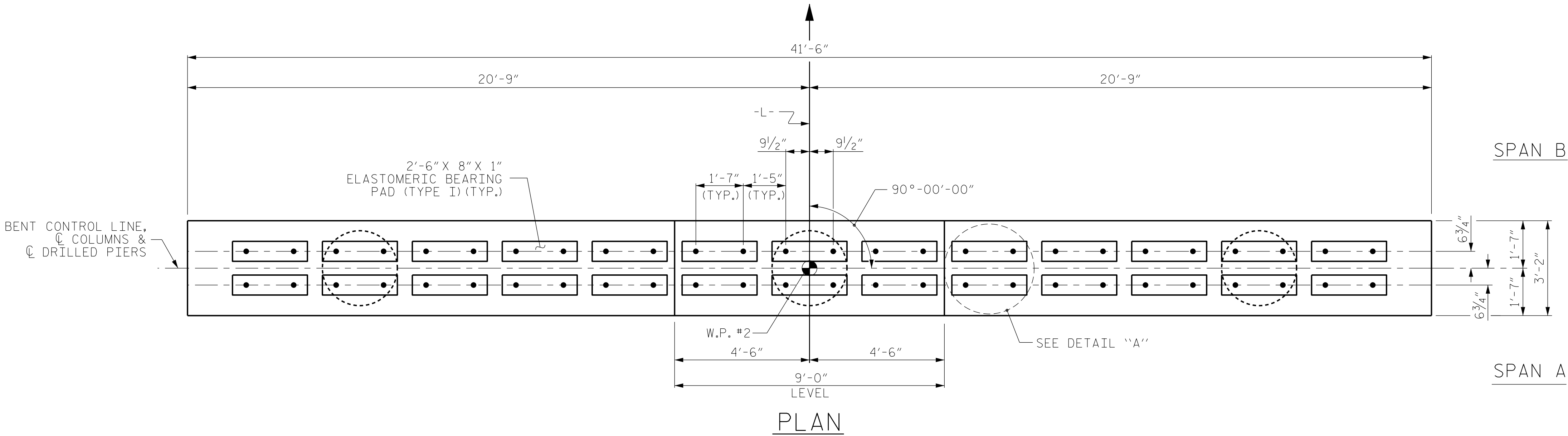
HOOKS ON "V" BARS MAY BE TURNED AS NECESSARY FOR PLACING REINFORCING STEEL.

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

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

THE LOCATION OF THE CONSTRUCTION JOINT IN THE DRILLED PIERS IS BASED ON AN APPROXIMATE GROUND LINE ELEVATION. IF THE CONSTRUCTION JOINT IS ABOVE THE ACTUAL GROUND LINE ELEVATION, THE CONTRACTOR SHALL PLACE THE CONSTRUCTION JOINT ONE FOOT BELOW THE GROUND LINE.

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



DETAIL "A"  
(DIMENSIONS ARE TYPICAL EACH BEARING)

PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

SHEET 1 OF 3

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
SUBSTRUCTURE

BENT 1

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S-21
1			3			TOTAL SHEETS
2			4			25

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FINAL UNLESS ALL  
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**CDM Smith**

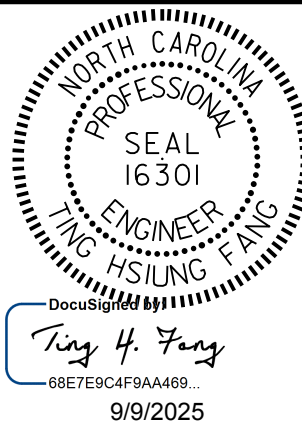
CDM SMITH  
5400 Glenwood Avenue, Suite 400  
Raleigh, NC 27612-3228  
NC COA No. F-1255

DWG. No.

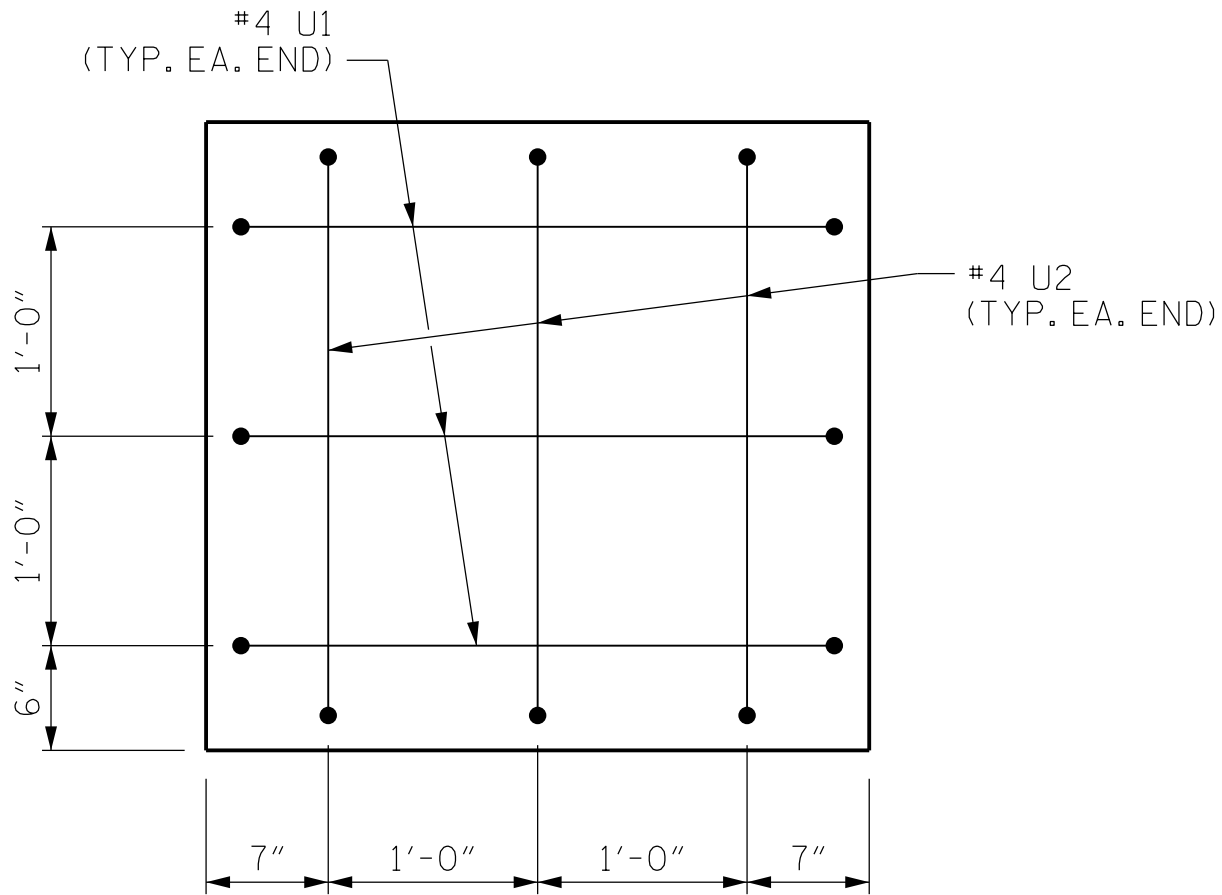
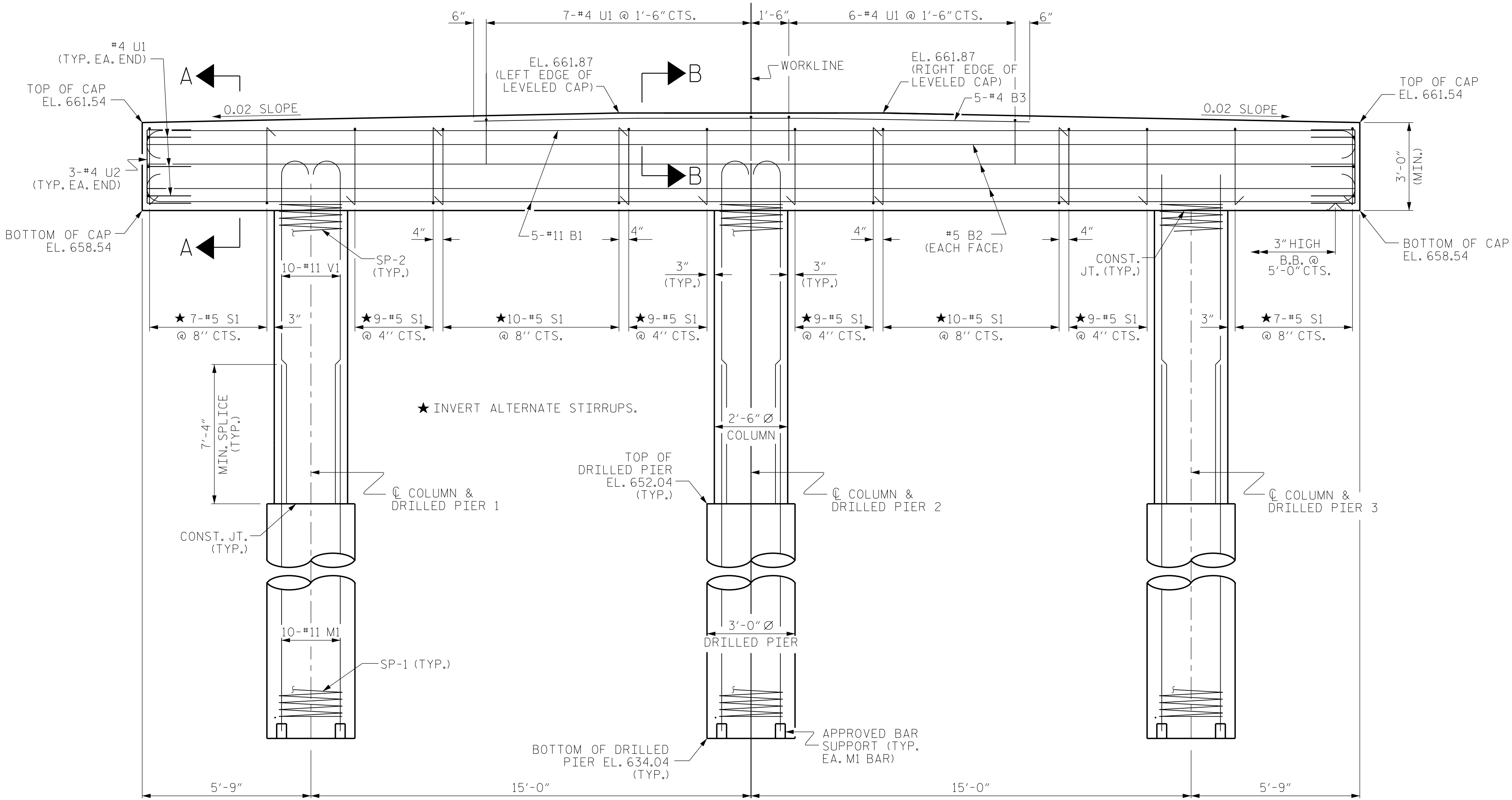
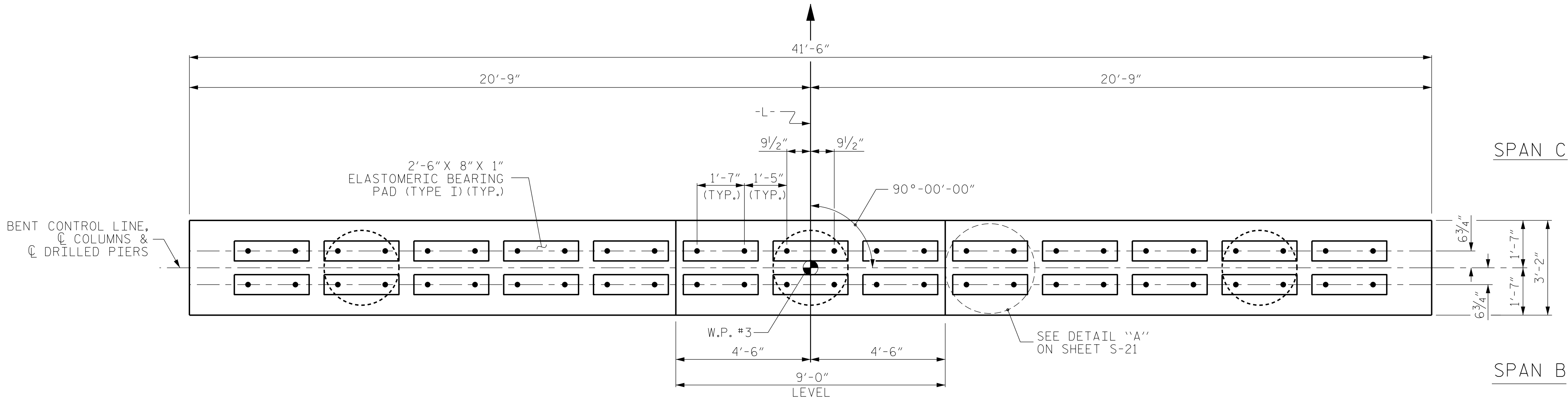
DRAWN BY : JJR DATE : 12/22

CHECKED BY : THF DATE : 12/22

DESIGN ENGINEER : THF DATE : 1/25



NOTES  
FOR NOTES, SEE SHEET 1 OF 3.



PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

SHEET 2 OF 3

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
SUBSTRUCTURE

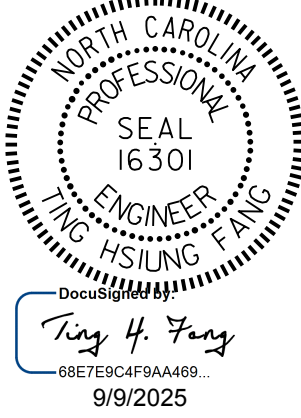
BENT 2

DOCUMENT NOT CONSIDERED  
FINAL UNLESS ALL  
SIGNATURES COMPLETED

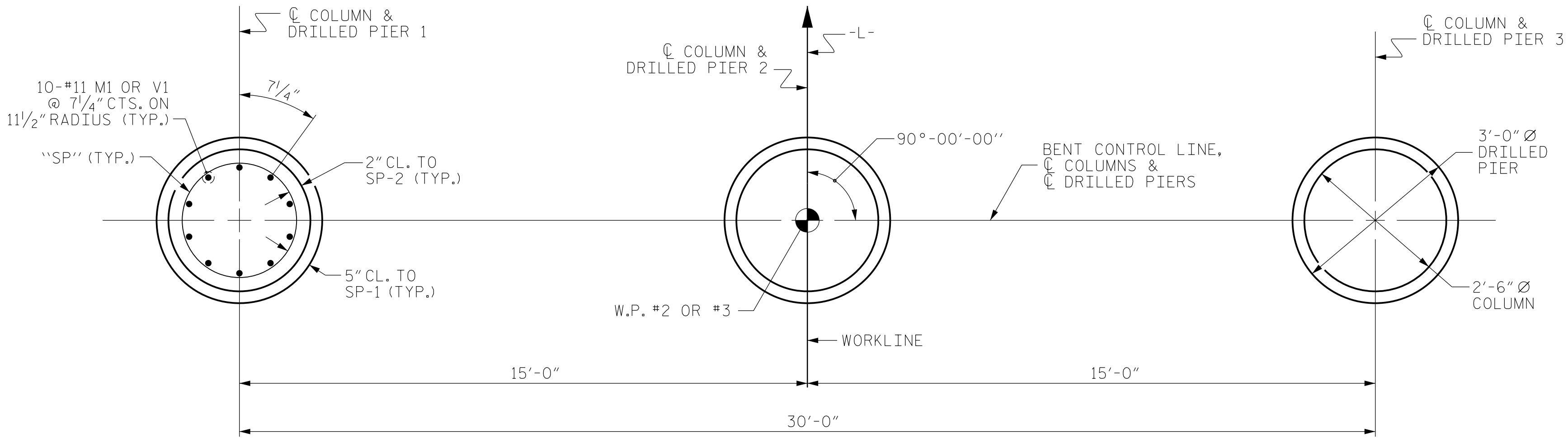
**CDM Smith**  
CDM SMITH  
5400 Glenwood Avenue, Suite 400  
Raleigh, NC 27612-3228  
NC COA No. F-1255

DRAWN BY : JJR DATE : 12/22  
CHECKED BY : THF DATE : 12/22  
DESIGN ENGINEER : THF DATE : 1/25

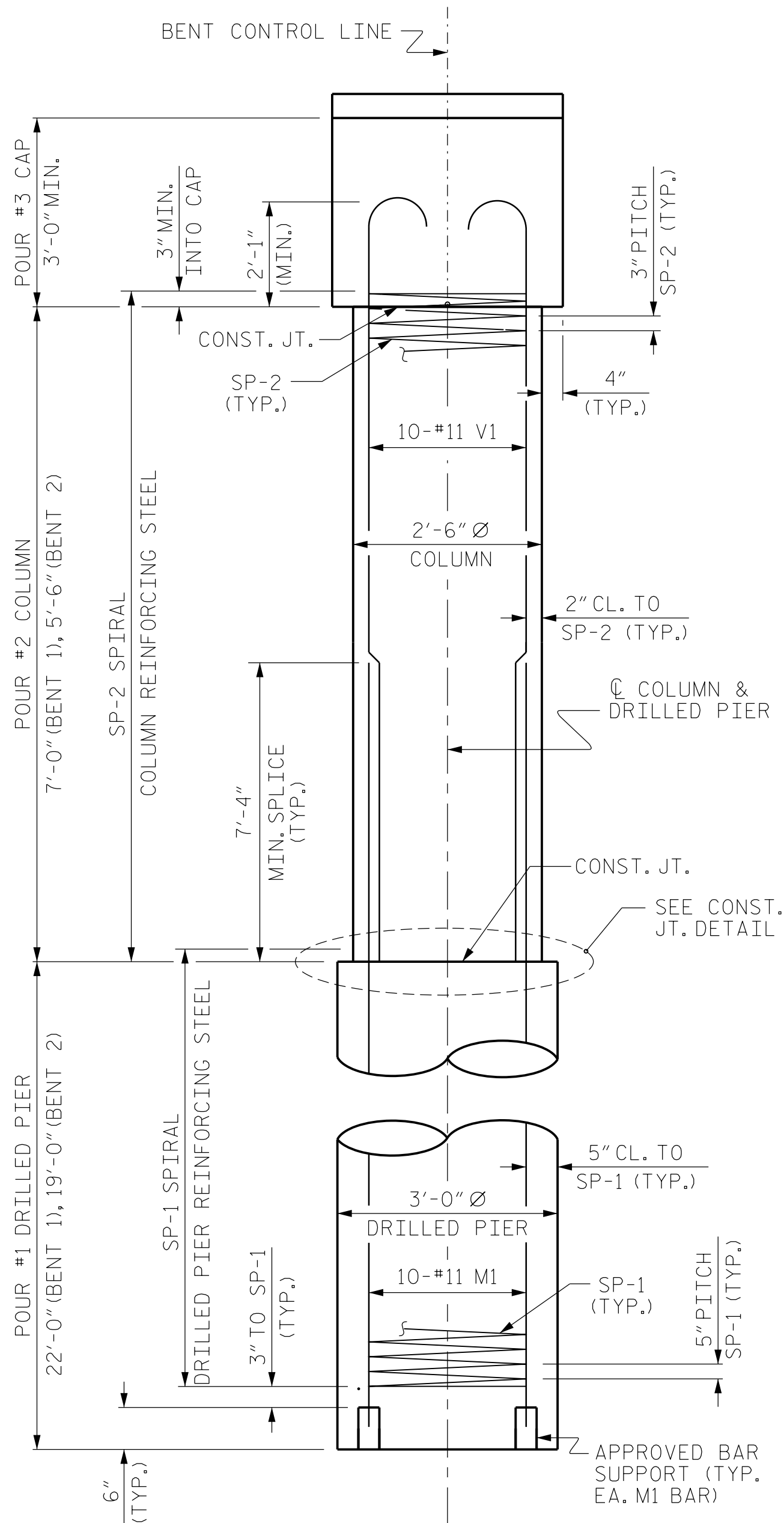
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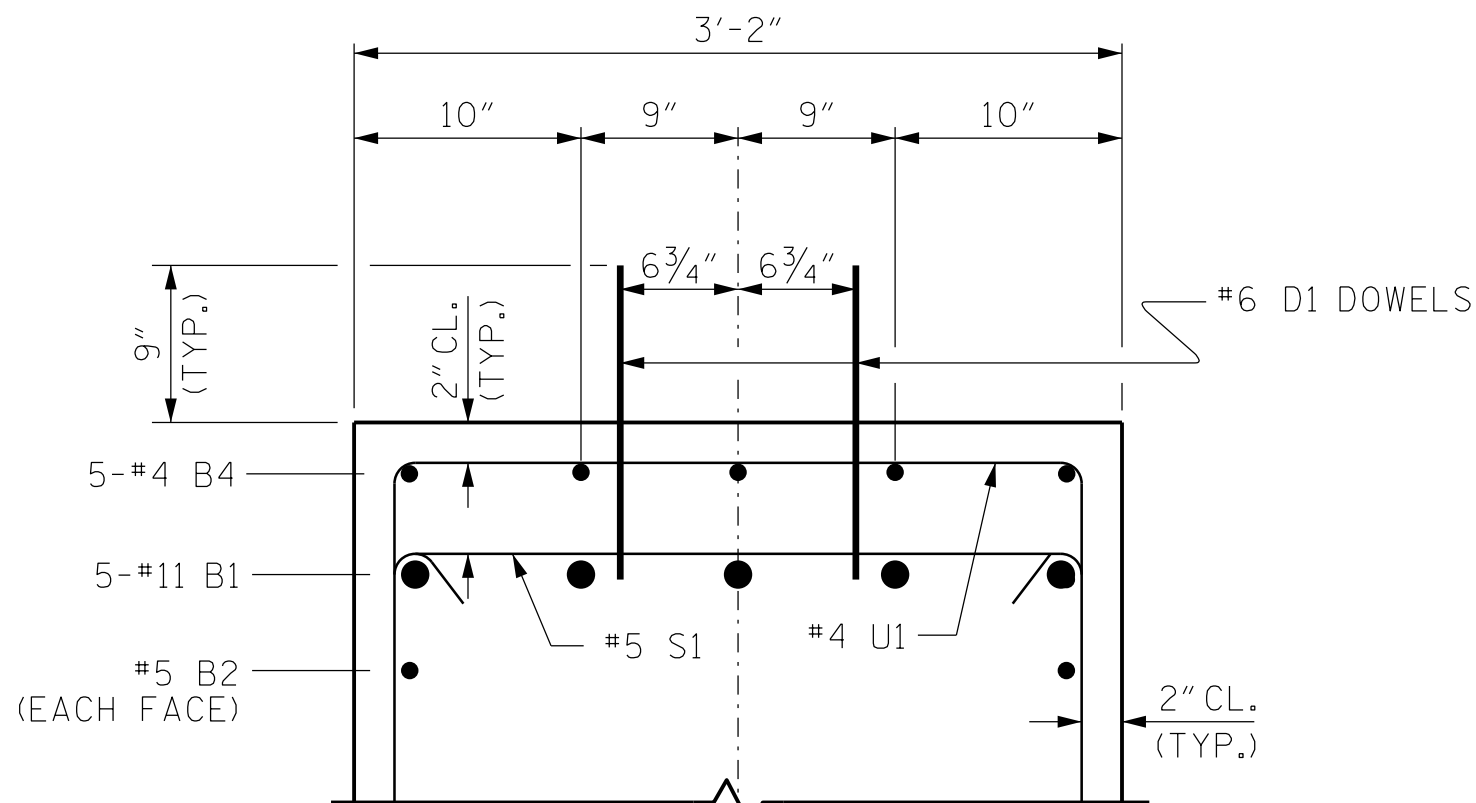
REVISIONS						SHEET NO. S-22
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 25
2			4			



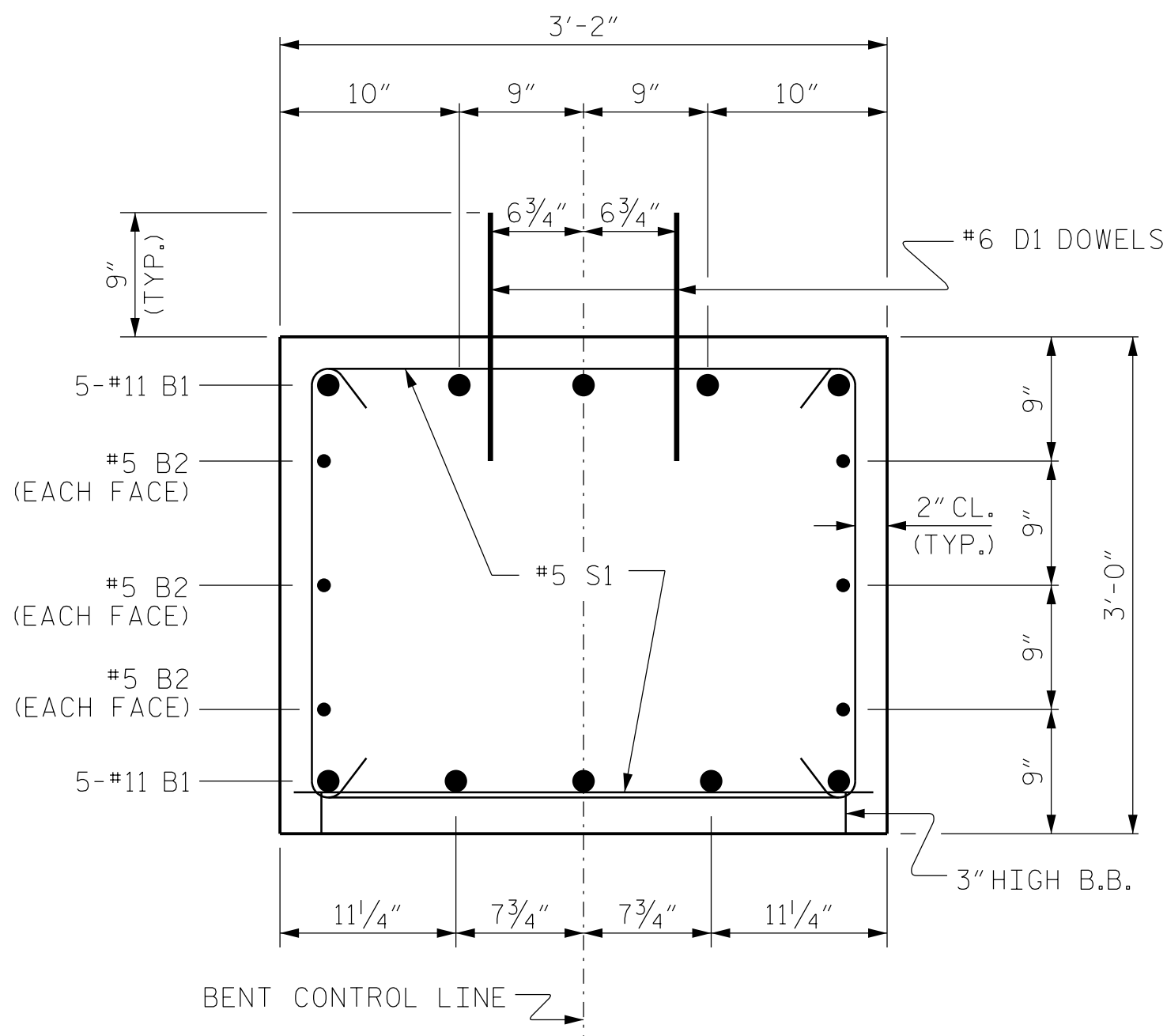
PLAN OF DRILLED PIERS & COLUMNS



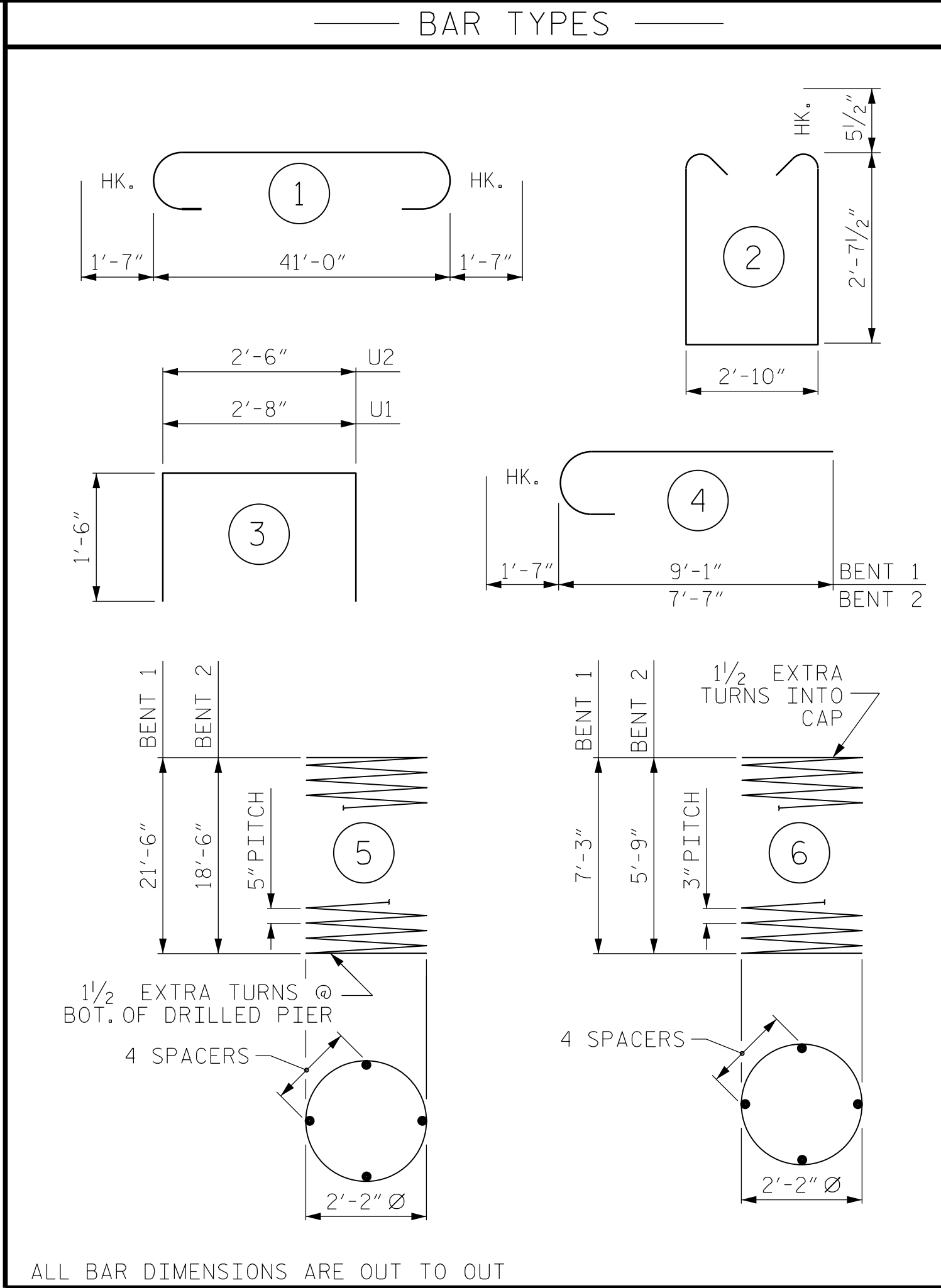
END ELEVATION



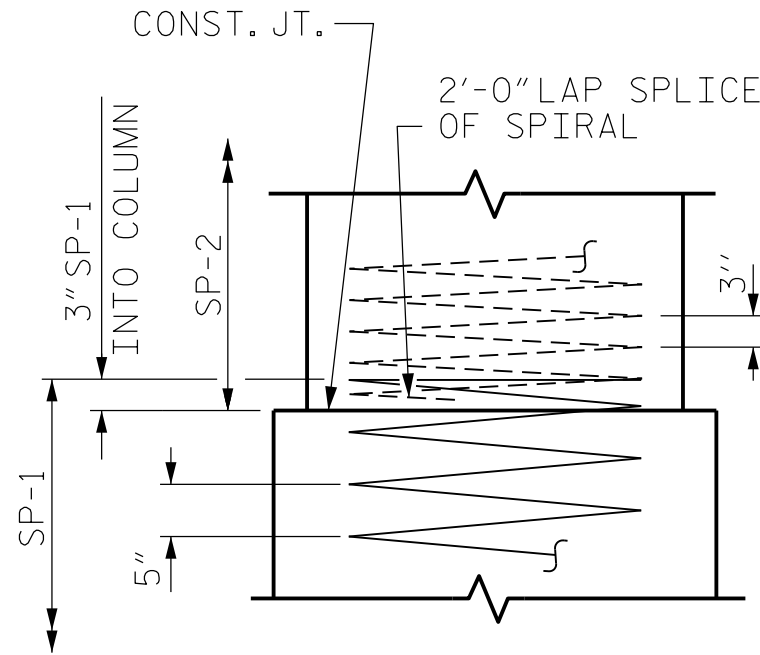
SECTION B-B  
PARTIAL SECTION



SECTION A-A



ALL BAR DIMENSIONS ARE OUT TO OUT



CONSTRUCTION JOINT DETAIL

BILL OF MATERIAL

BENT 1

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
B1	10	#11	1	44'-2"	2347
B2	6	#5	STR	41'-2"	258
B3	5	#4	STR	19'-0"	63

D1	52	#6	STR	1'-6"	117
M1	30	#11	STR	32'-1"	5114
S1	70	#5	2	9'-0"	657
U1	19	#4	3	5'-8"	72
U2	6	#4	3	5'-6"	22
V1	30	#11	4	10'-8"	1700

REINFORCING STEEL 10,350 LBS.

SP-1	3	*	5	443'-3"	1387
SP-2	3	**	6	257'-3"	516

SPIRAL COLUMN REINFORCING STEEL 1,903 LBS.

BENT 2

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
B1	10	#11	1	44'-2"	2347
B2	6	#5	STR	41'-2"	258
B3	5	#4	STR	19'-0"	63

D1	52	#6	STR	1'-6"	117
M1	30	#11	STR	29'-1"	4636
S1	70	#5	2	9'-0"	657
U1	19	#4	3	5'-8"	72
U2	6	#4	3	5'-6"	22
V1	30	#11	4	9'-2"	1461

REINFORCING STEEL 9,633 LBS.

SP-1	3	*	5	377'-7"	1182
SP-2	3	**	6	207'-10"	417

SPIRAL COLUMN REINFORCING STEEL 1,599 LBS.

CLASS A CONCRETE BREAKDOWN

	BENT 1	BENT 2
POUR #2 (COLUMNS)	3.8 C.Y.	3.0 C.Y.
POUR #3 (CAP)	15.3 C.Y.	15.2 C.Y.
TOTAL CLASS A CONCRETE	19.1 C.Y.	18.2 C.Y.

\* THE SP-1 SPIRAL REINFORCING STEEL SHALL BE W31 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

PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

SHEET 3 OF 3

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
SUBSTRUCTURE

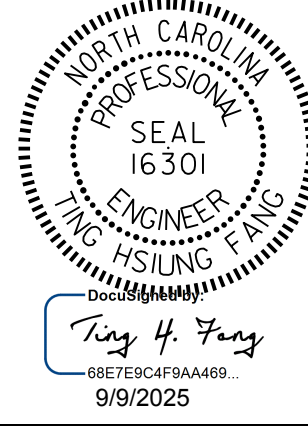
BENTS 1 AND 2

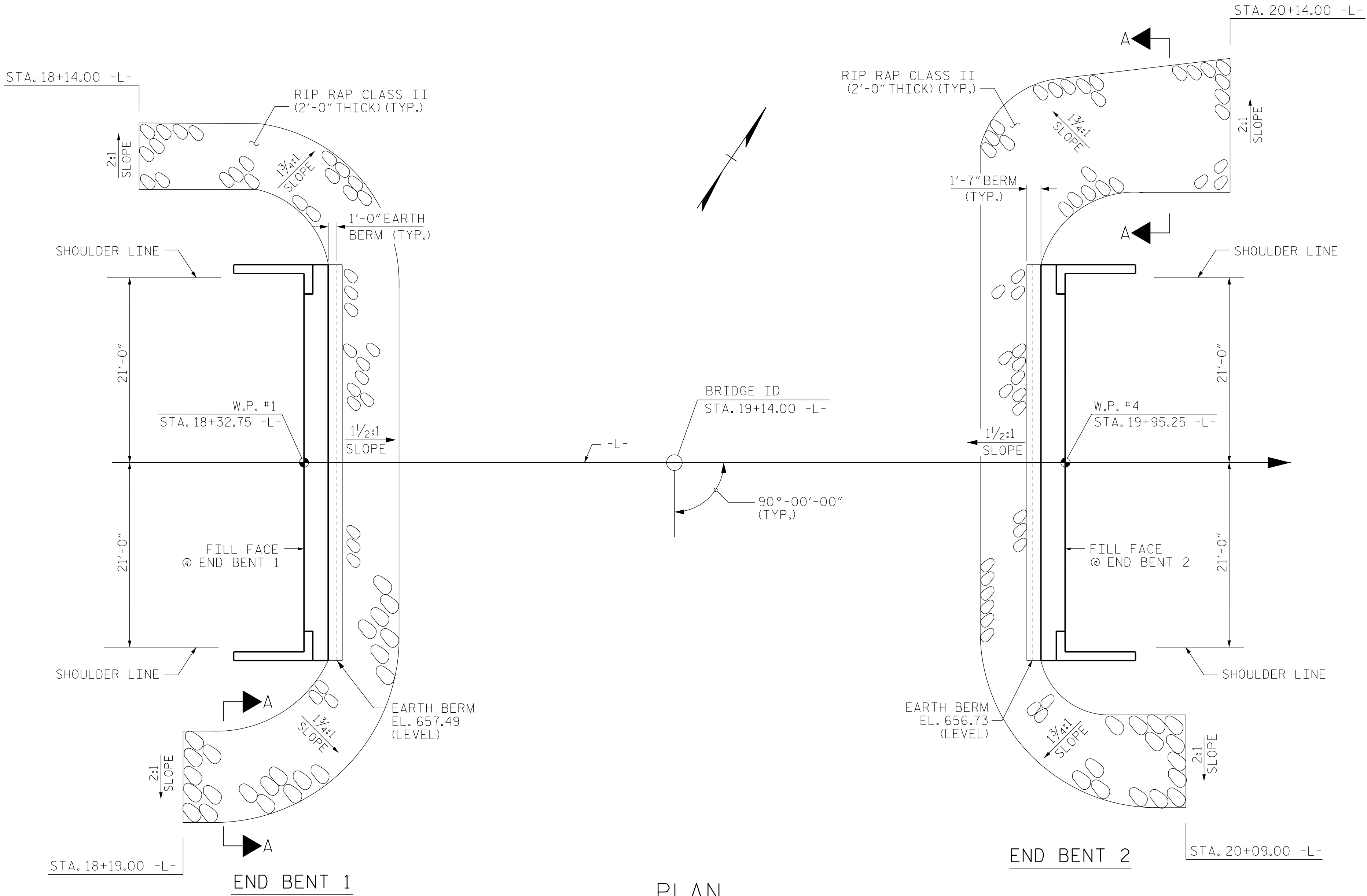
REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	TOTAL SHEETS	S-23
1			3				
2			4			25	

STD. NO. DP\_BT\_39\_90S\_<50'

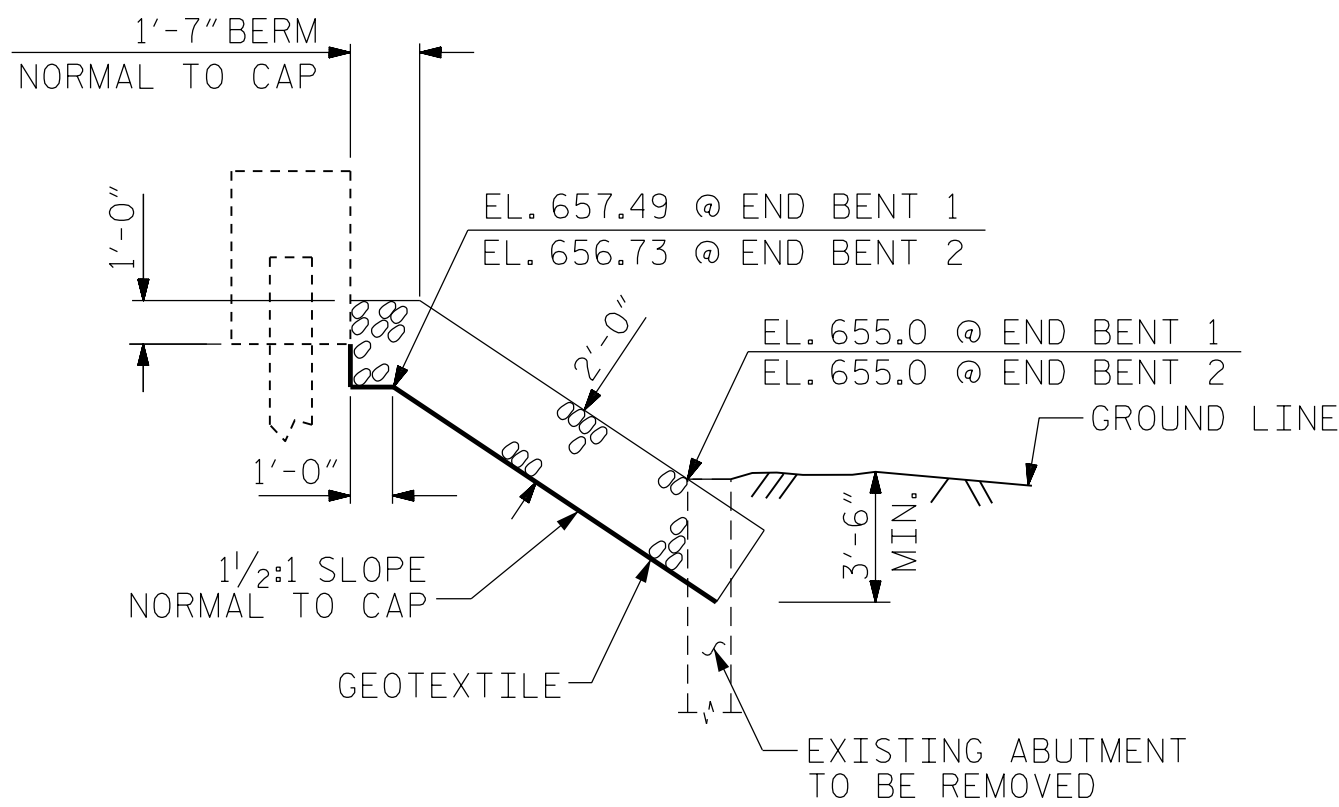
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SIGNATURES COMPLETED

<b>CDM Smith</b>		CDM SMITH 5400 Glenwood Avenue, Suite 400 Raleigh, NC 27612-3228 NC COA No. F-1255	
DRAWN BY :	JJR	DATE :	12/22
CHECKED BY :	THF	DATE :	12/22
DESIGN ENGINEER :	THF	DATE :	12/25
DWG. No.			

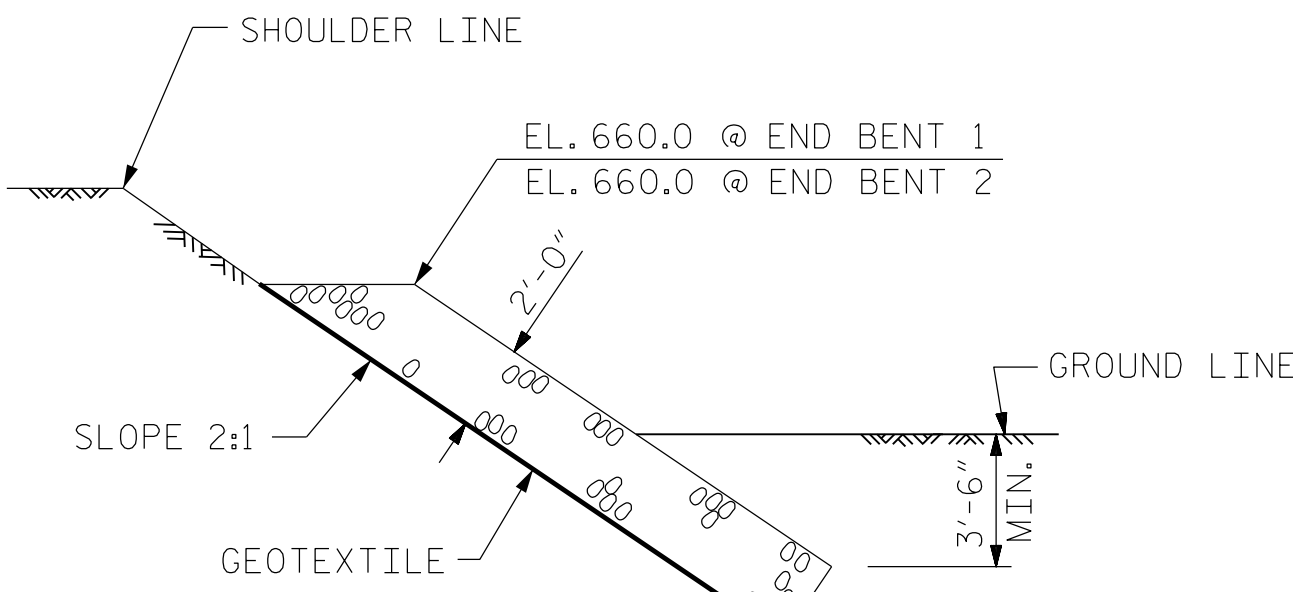




PLAN



SECTION @ END BENTS  
BERM RIP RAPPED



SECTION A-A

ESTIMATED QUANTITIES		
BRIDGE @ STA. 19+14.00 -L-	RIP RAP CLASS II	GEOTEXTILE FOR DRAINAGE
	TONS	SQUARE YARDS
END BENT 1	160	178
END BENT 2	188	209
TOTAL	348	387

PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

STANDARD

== RIP RAP DETAILS ==

DOCUMENT NOT CONSIDERED  
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SIGNATURES COMPLETED

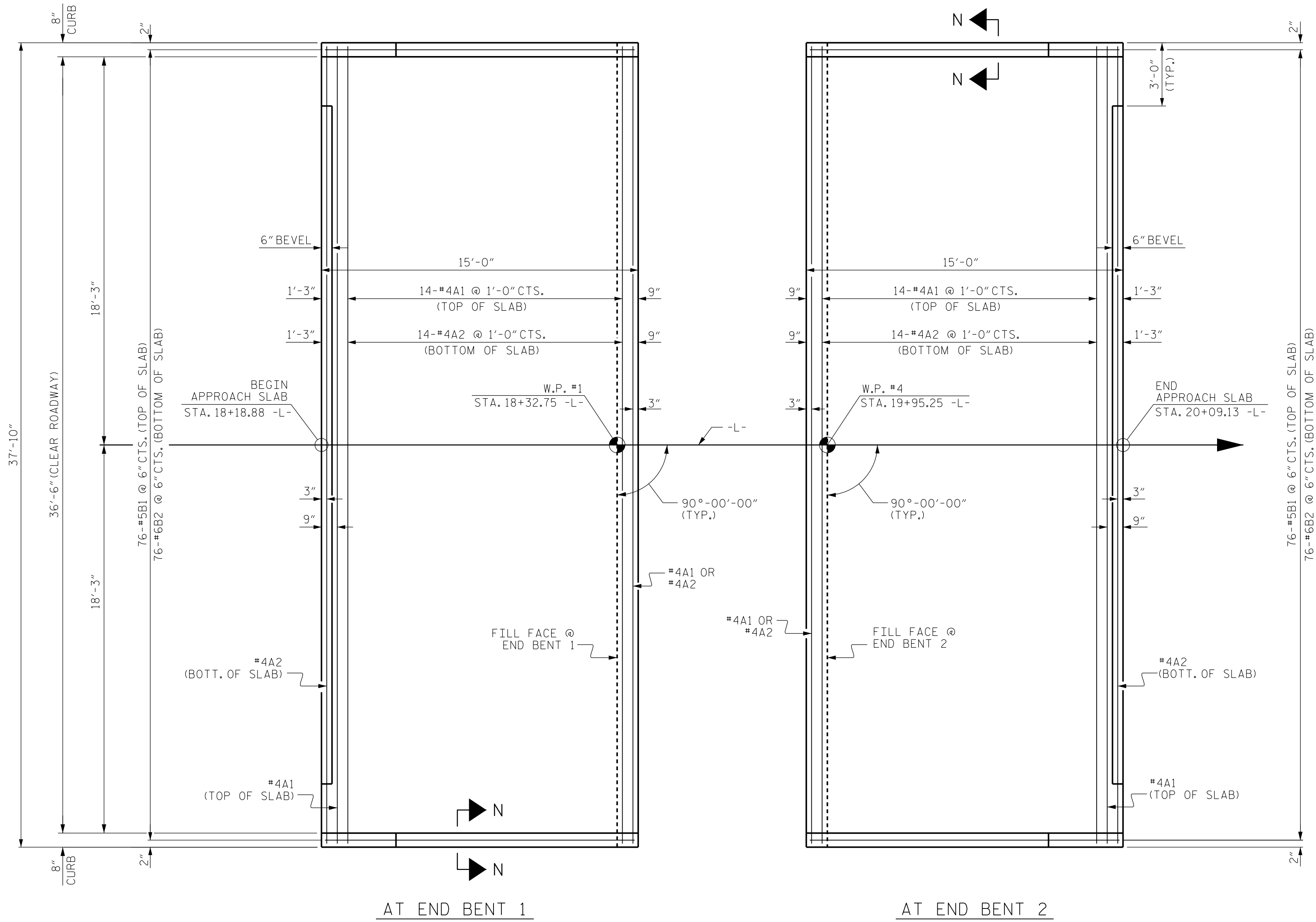
**CDM Smith**  
CDM SMITH  
5400 Glenwood Avenue, Suite 400  
Raleigh, NC 27612-3228  
NC COA No. F-1255

CHECKED BY : THF DATE : 12/22  
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DWG. No.

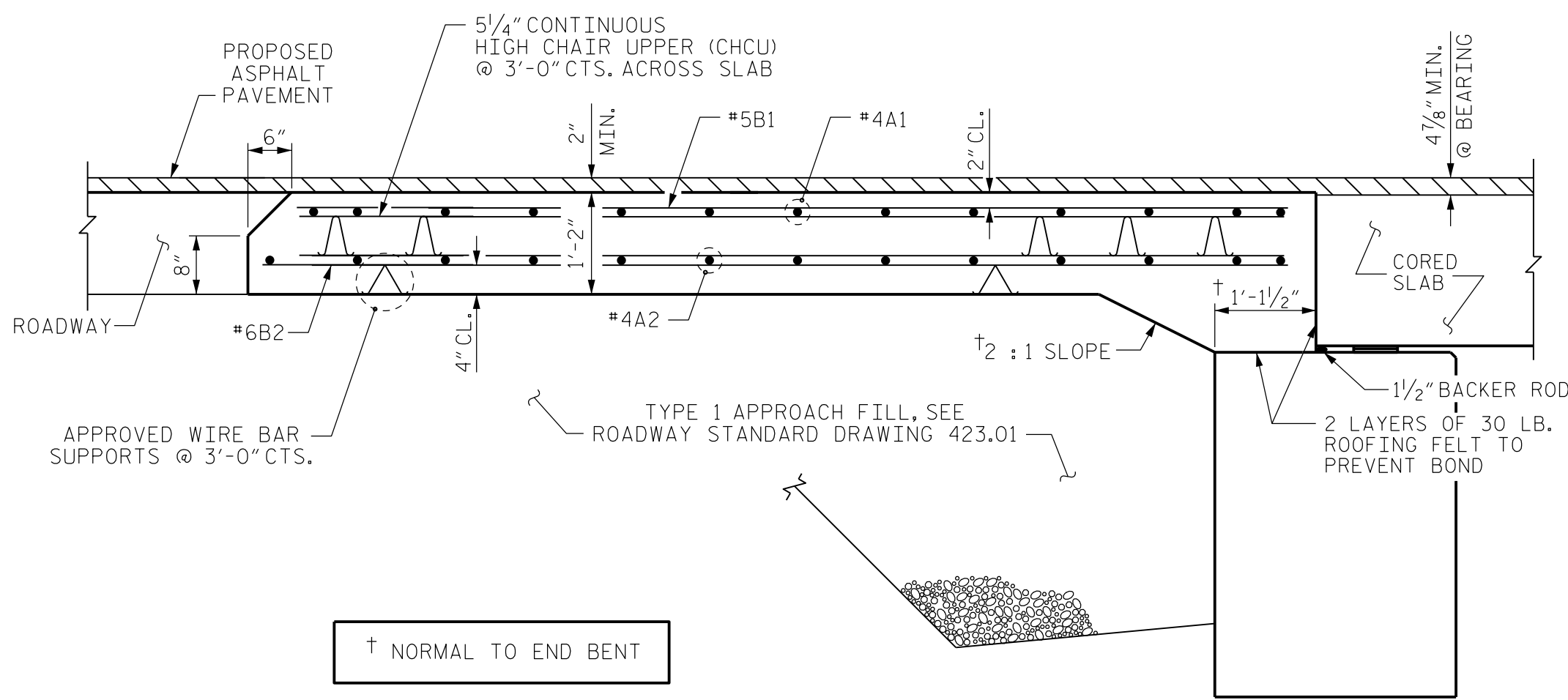
Ting H. Fung  
9/9/2025

REVISIONS						SHEET NO. S-24
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 25
2			4			

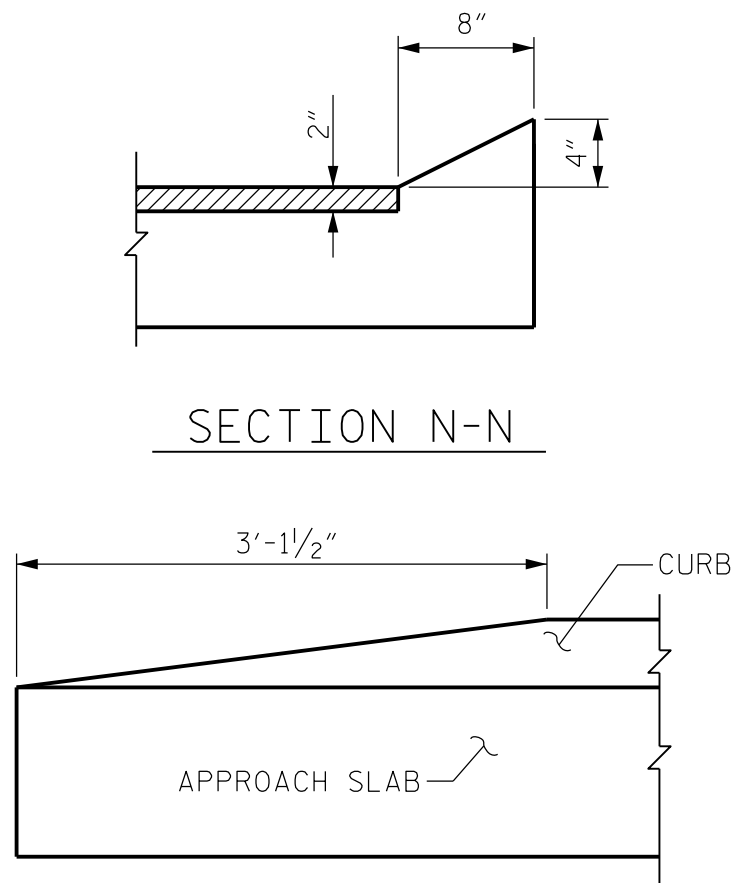


PLAN

DIMENSIONS SHOWN ARE TYPICAL FOR BOTH APPROACH SLABS



SECTION THRU SLAB



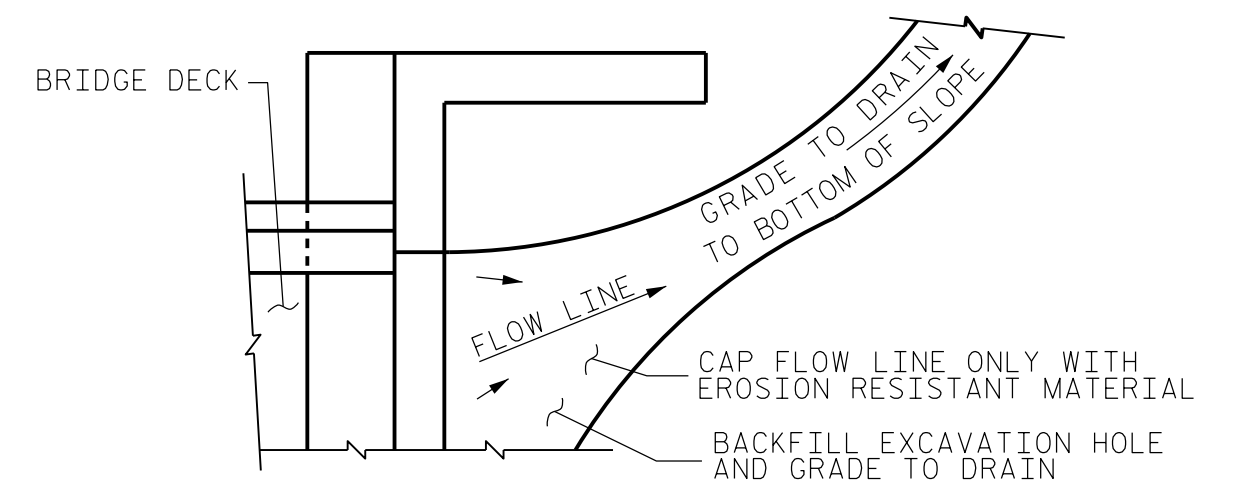
CURB DETAILS

NOTES

FOR BRIDGE APPROACH FILL, SEE ROADWAY PLANS.

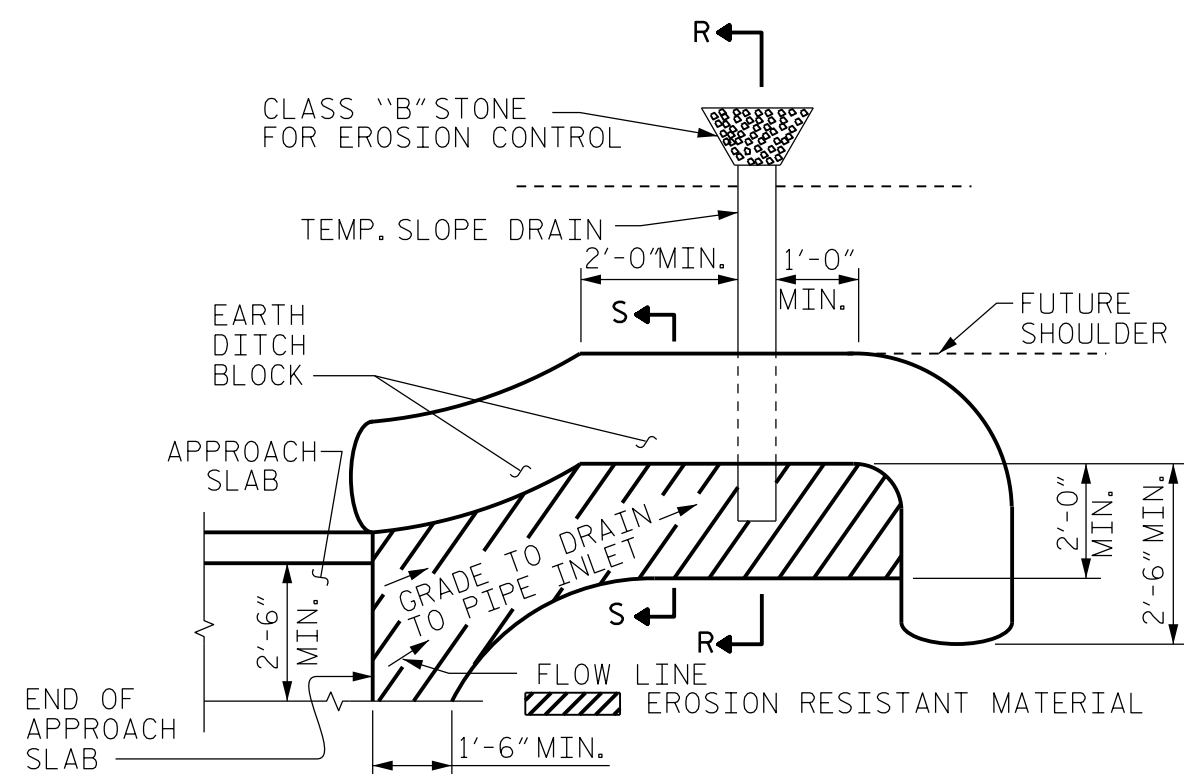
AREA BETWEEN THE WINGWALL AND APPROACH SLAB SHALL BE GRADED TO DRAIN THE WATER AWAY FROM THE FILL FACE OF THE BRIDGE AND SHALL BE PAVED. SEE ROADWAY PLANS.

APPROACH SLAB GROOVING IS NOT 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

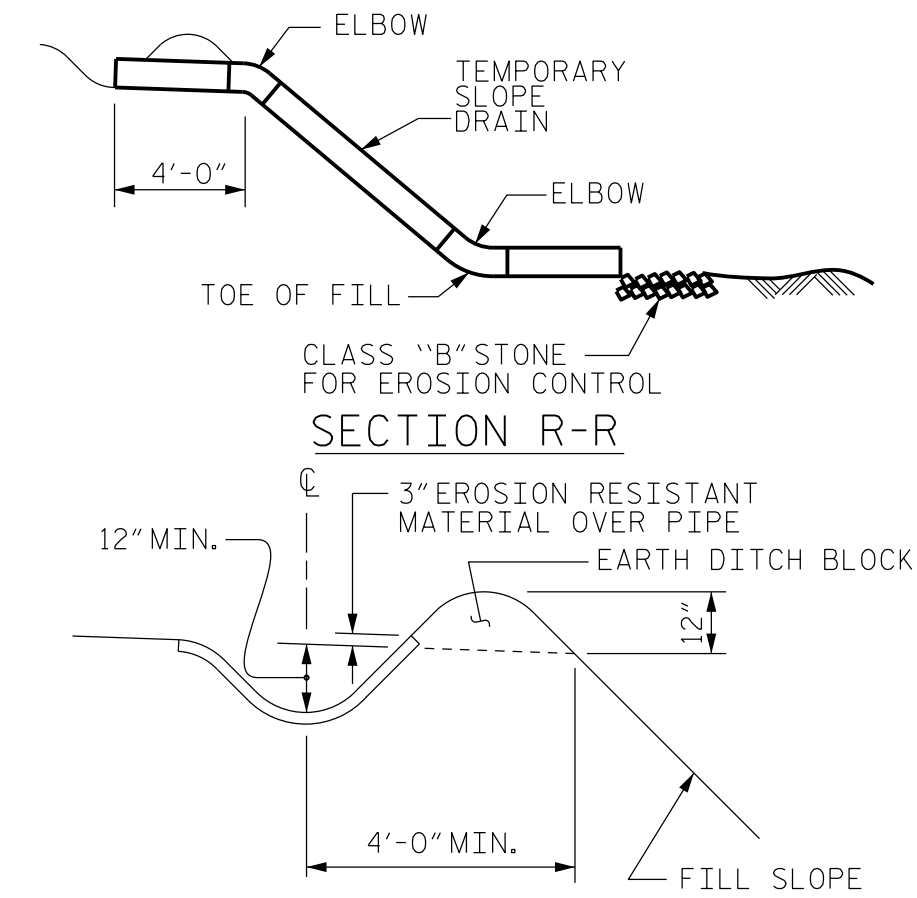


NOTE: IMMEDIATELY AFTER THE CONSTRUCTION OF THE APPROACH SLAB, THE CONTRACTOR SHALL PROVIDE TEMPORARY BERM AND SLOPE DRAIN. CONTRACTOR SHALL GRADE TO PIPE INLET AND PROVIDE EROSION RESISTANT MATERIAL AS SHOWN. THE EROSION RESISTANT MATERIAL SHALL BE EITHER 1) ASPHALT PLANT MIX, TYPE 1 OR TYPE 2, MIN. 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

TEMPORARY BERM AND SLOPE DRAIN DETAILS

(TO BE USED WHEN SHOULDER BERM GUTTER IS REQUIRED)



SECTION S-S

PROJECT NO. BP10-R047  
CABARRUS COUNTY  
STATION: 19+14.00 -L-

BILL OF MATERIAL					
FOR ONE APPROACH SLAB (2 REQUIRED)					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
* A1	16	#4	STR	37'-6"	401
A2	16	#4	STR	37'-6"	401
* B1	76	#5	STR	14'-2"	1123
B2	76	#6	STR	14'-8"	1674
REINFORCING STEEL				LBS.	2075
* EPOXY COATED REINFORCING STEEL				LBS.	1524
CLASS AA CONCRETE				C. Y.	28.9

SPlice LENGTHS		
BAR SIZE	EPOXY COATED	UNCOATED
#4	1'-11"	1'-7"
#5	2'-5"	2'-0"
#6	3'-7"	2'-5"

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

SHEET NO.	
S-25	
TOTAL SHEETS	
25	

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

**CDM Smith**

CDM SMITH  
5400 Glenwood Avenue, Suite 400  
Raleigh, NC 27612-3228  
NC COA No. F-1255

CHECKED BY : THF  
DESIGN ENGINEER : THF

DATE : 12/22  
DATE : 12/22  
DATE : 1/25

DWG. No.

NORTH CAROLINA PROFESSIONAL SEAL 16301

ENGINEER

TRUNG H. FANG

686750486A000 9/9/2025

STANDARD NOTES

DESIGN DATA:

SPECIFICATIONS	AASHTO (CURRENT)
LIVE LOAD	SEE PLANS
IMPACT ALLOWANCE	SEE AASHTO
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 AASHTO
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 2024 "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 ⅝" 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 ⅛" 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. FINIS 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.