

09/08/99

**TIP PROJECT: B-5163**

**CONTRACT: C203307**

**CONTRACT: C203307**

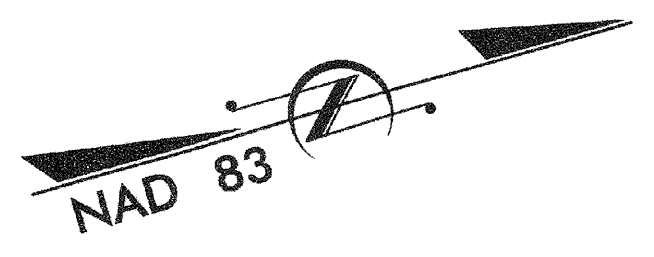
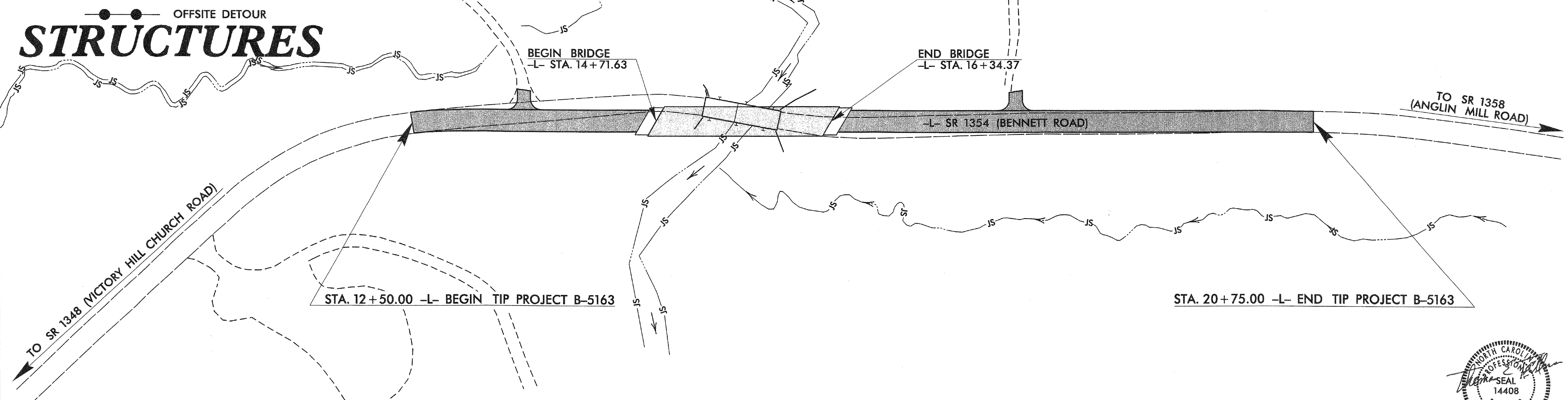
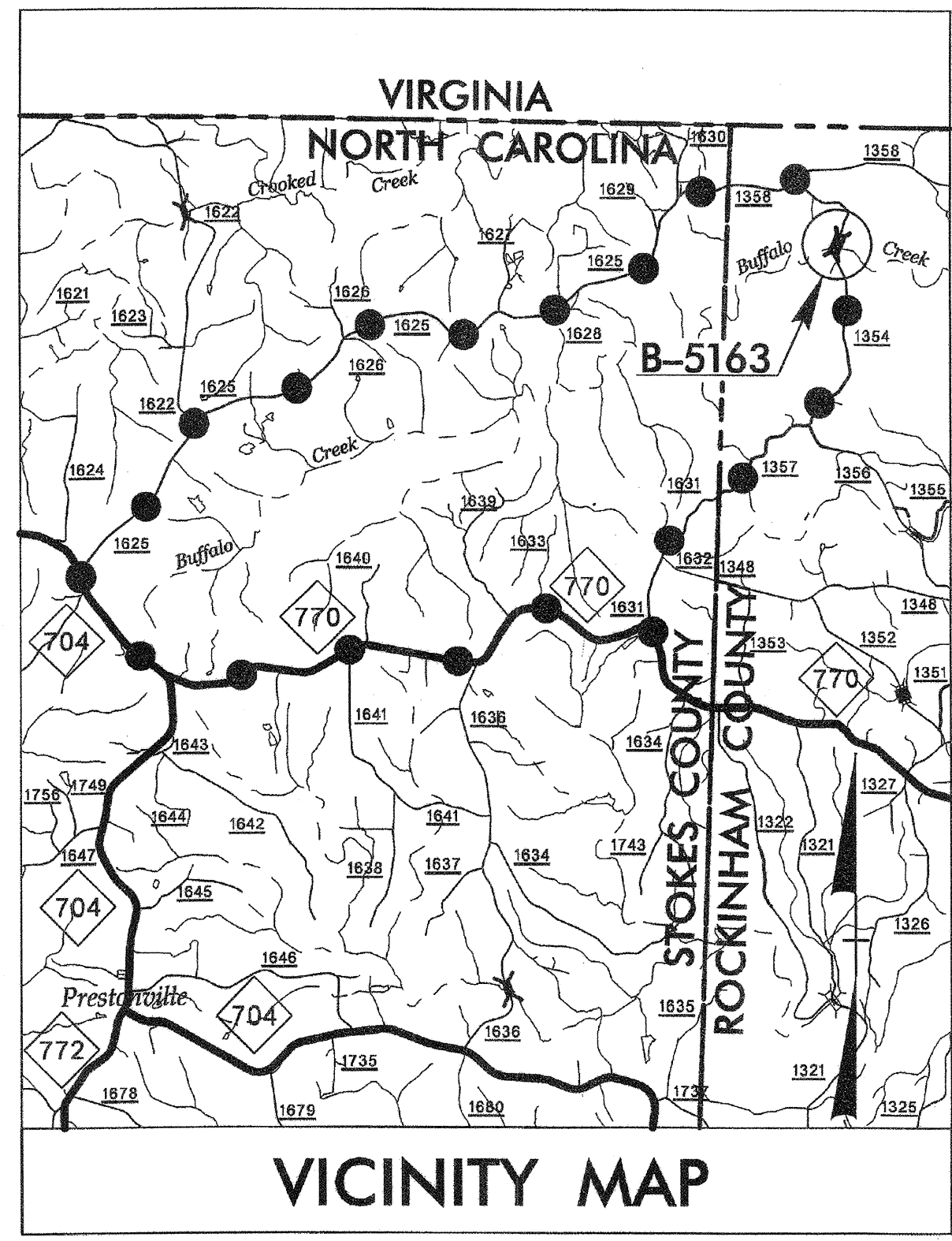
STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

**ROCKINGHAM COUNTY**

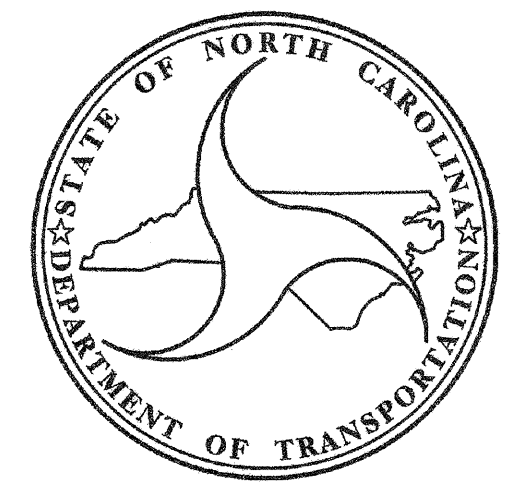
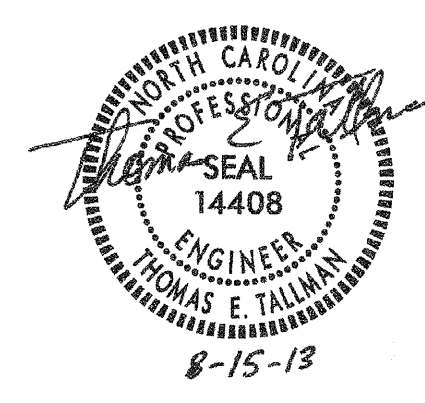
**LOCATION: BRIDGE NO. 160 ON SR 1354 (BENNETT ROAD)  
OVER BUFFALO CREEK**

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-5163		
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
42338.1.1	BRZ-1354(2)	PE	
42338.2.1	BRZ-1354(2)	RW & UTILITIES	
42338.1.FD1	BRZ-1354(2)	CONST	



DESIGN EXCEPTION REQUIRED FOR SAG VERTICAL CURVES AND ASSOCIATED STOPPING SIGHT DISTANCES.  
THIS PROJECT IS NOT WITHIN ANY MUNICIPAL BOUNDARIES.  
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.



**DESIGN DATA**

ADT 2014 =	120
ADT 2035 =	200
DHV =	10 %
D =	60 %
T =	5 % *
V =	55 MPH
* TTST =	2% DUAL = 3%
FUNC CLASS =	RURAL LOCAL
SUB-REGIONAL TIER	

**PROJECT LENGTH**

LENGTH ROADWAY TIP PROJECT B-5163 =	0.126 MILES
LENGTH STRUCTURE TIP PROJECT B-5163 =	0.030 MILES
TOTAL LENGTH OF TIP PROJECT B-5163 =	0.156 MILES

Prepared In the Office of:

**ICA Engineering**  
f/k/a Florence & Hutcheson, Inc.  
5124 Kingshire Way, Suite 100 Raleigh, NC 27607  
NC License No. P-0058

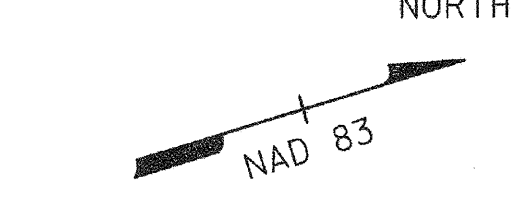
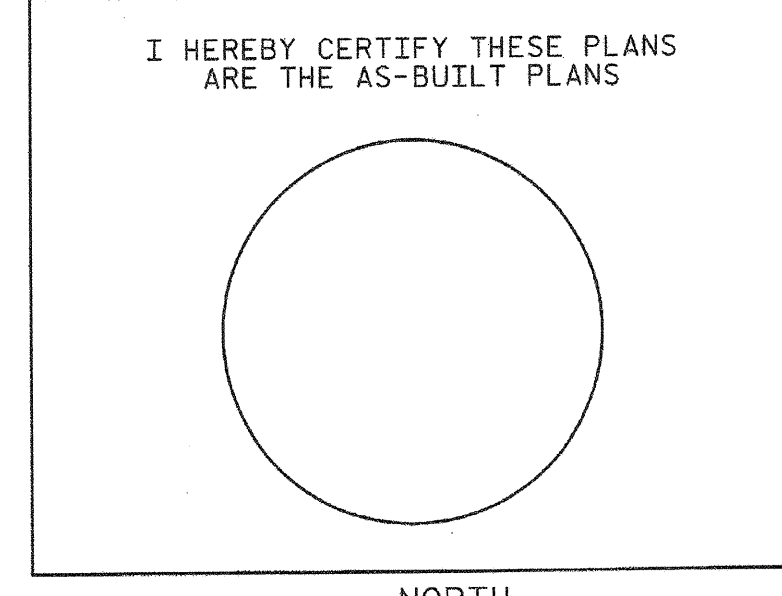
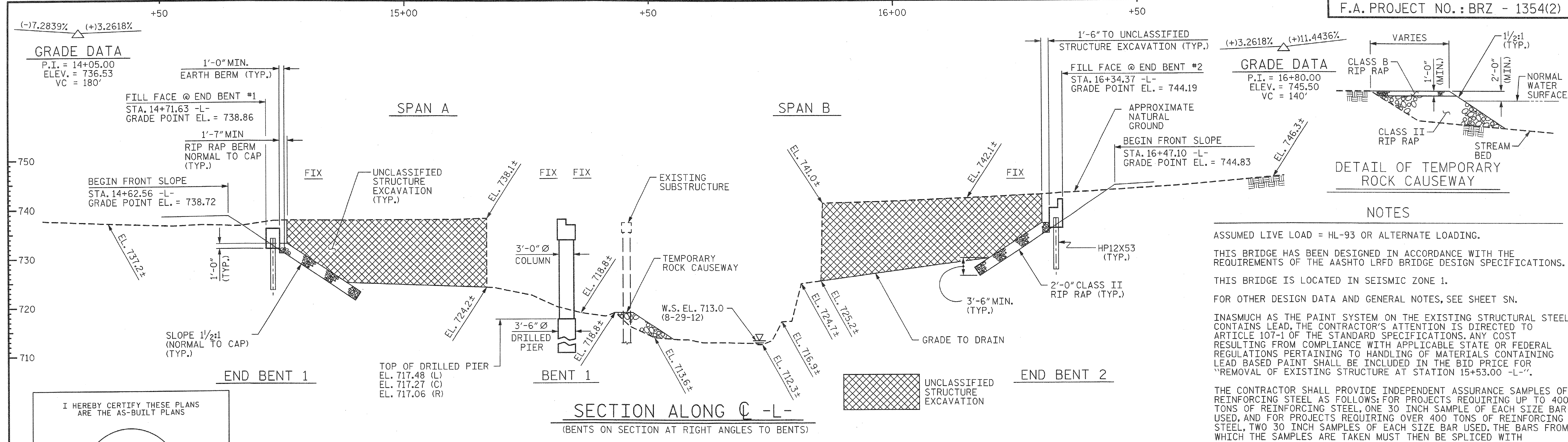
for the  
**DIVISION OF HIGHWAYS**

2012 STANDARD SPECIFICATIONS

LETTING DATE:  
**OCTOBER 15, 2013**

8/15/2013  
B-5163-SC-TS.dgn  
ICA Engineering f/k/a Florence & Hutcheson, Inc.

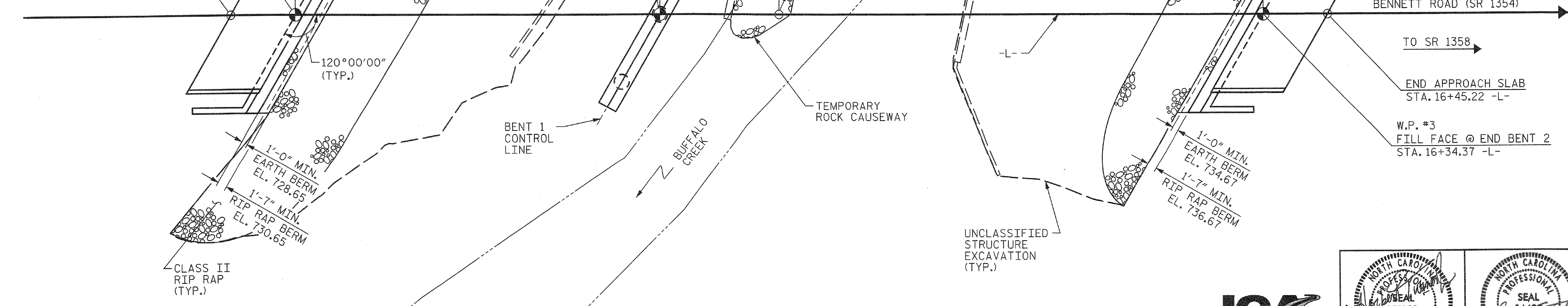




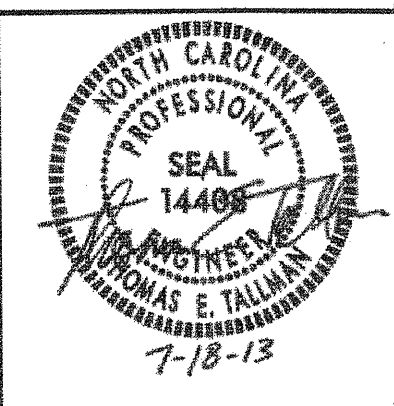
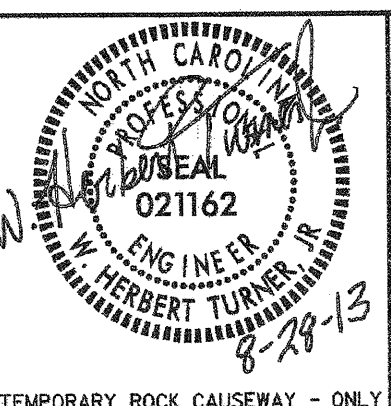
W.P. #1  
 FILL FACE @ END BENT 1  
 STA. 14+71.63 -L-

BEGIN APPROACH SLAB  
 STA. 14+60.78 -L-

TO SR 1348



DRAWN BY: D. H. CARTER DATE: JUL 2013  
 CHECKED BY: T. E. TALLMAN DATE: JUL 2013  
 DESIGN ENGINEER OF RECORD: T. E. TALLMAN DATE: JUL 2013



PROJECT NO. B-5163  
 ROCKINGHAM COUNTY  
 STATION: 15+53.00 -L-

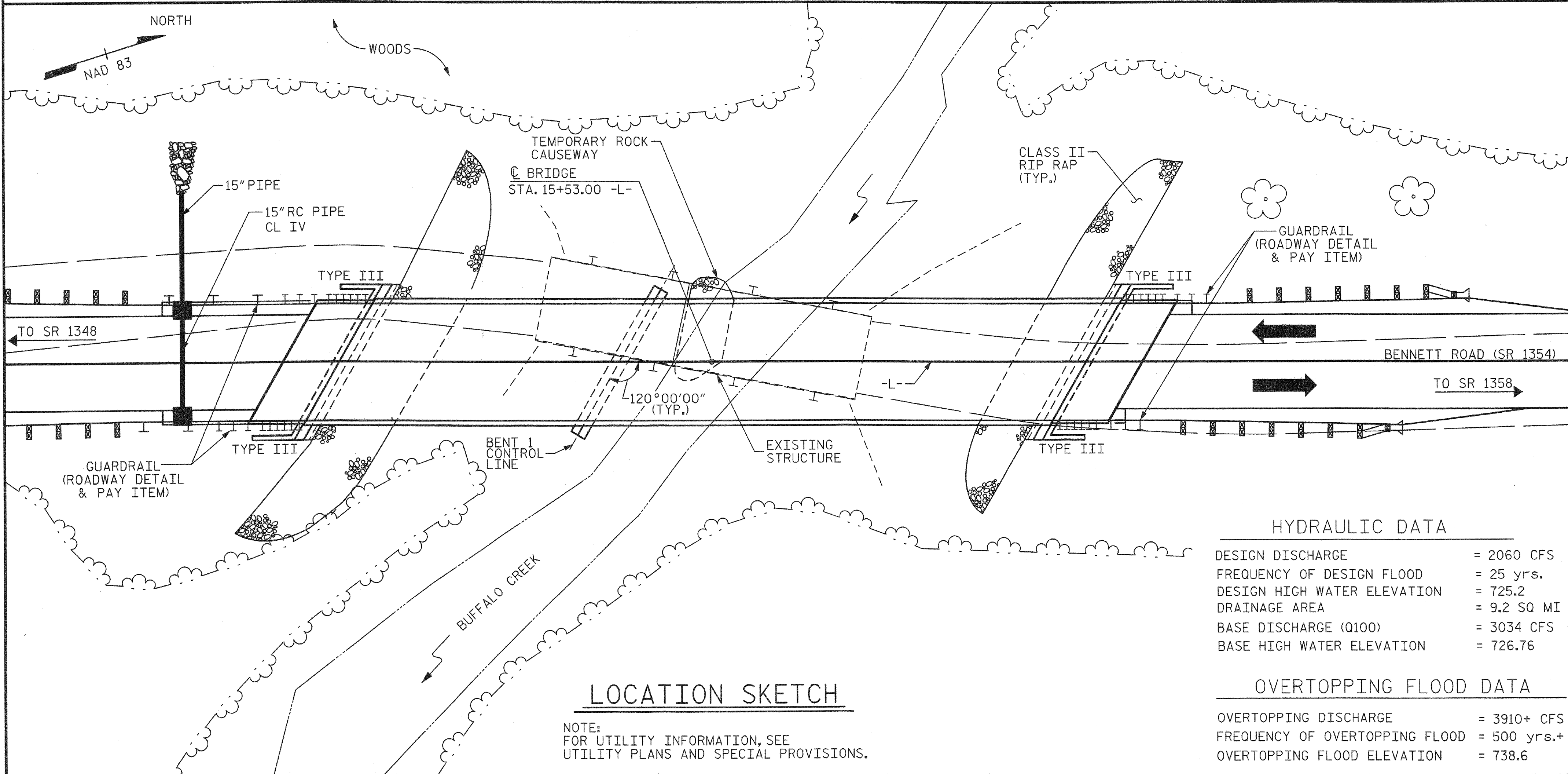
SHEET 1 OF 2 REPLACES BRIDGE NO. 160

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
<b>GENERAL DRAWING</b>					
BRIDGE ON SR 1354 (BENNETT RD.) OVER BUFFALO CREEK BETWEEN SR 1348 & SR 1358					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
					SHEET NO. S-1 TOTAL SHEETS 24

8/28/2013 V:\Structures\Structure Design\TIP-5163 Rockingham 160\Plans\B-5163.sd.dwg - P1.dgn  
 TCA Engineering F/K/a Florence & Hutcheson, Inc.



BENCH MARK : BM 1, -L- STA. 16+55.00, 105.00' RT, R/R SPIKE IN 19" OAK, EL. 731.09



**LOCATION SKETCH**

NOTE:  
FOR UTILITY INFORMATION, SEE  
UTILITY PLANS AND SPECIAL PROVISIONS.

**HYDRAULIC DATA**

DESIGN DISCHARGE	= 2060 CFS
FREQUENCY OF DESIGN FLOOD	= 25 yrs.
DESIGN HIGH WATER ELEVATION	= 725.2
DRAINAGE AREA	= 9.2 SQ MI
BASE DISCHARGE (Q100)	= 3034 CFS
BASE HIGH WATER ELEVATION	= 726.76

**OVERTOPPING FLOOD DATA**

OVERTOPPING DISCHARGE	= 3910+ CFS
FREQUENCY OF OVERTOPPING FLOOD	= 500 yrs.+
OVERTOPPING FLOOD ELEVATION	= 738.6

**NOTES (CONT.)**

THE EXISTING STRUCTURE CONSISTING OF TWO 30.5 & 40.0 FOOT LONG STEEL BEAM SPANS; 18.2' CLEAR ROADWAY; 2" ASPHALT WEARING SURFACE ON 7" CONCRETE DECK SLAB ON MASS CONCRETE BENT AND MASS CONCRETE ABUTMENTS LOCATED ON THE PROPOSED ALIGNMENT SHALL BE REMOVED. THE EXISTING BRIDGE IS PRESENTLY POSTED FOR LOAD LIMIT. SHOULD THE STRUCTURAL INTEGRITY OF THE BRIDGE DETERIORATE DURING CONSTRUCTION OF THE PROPOSED BRIDGE, A LOAD LIMIT MAY BE POSTED AND MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT.

FOR PILES, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS

PILES AT END BENT NO.1 ARE DESIGNED FOR A FACTORED RESISTANCE OF 85 TONS PER PILE.

PILES AT END BENT NO.2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 130 TONS PER PILE.

DRIVE PILES AT END BENT NO.1 TO A REQUIRED DRIVING RESISTANCE OF 145 TONS PER PILE.

DRIVE PILES AT END BENT NO.2 TO A REQUIRED DRIVING RESISTANCE OF 175 TONS PER PILE.

STEEL H-PILE POINTS ARE REQUIRED FOR STEEL H-PILES AT END BENT NO.1 AND END BENT NO.2 FOR STEEL PILE POINTS, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS.

TESTING THE FIRST TWO PRODUCTION PILES WITH THE PDA DURING DRIVING, RESTRIKING OR REDRIVING IS REQUIRED AT END BENT NO.2. FOR PDA TESTING SEE SECTION 450 OF THE STANDARD SPECIFICATIONS AND FOR PILE DRIVING CRITERIA, SEE PILE DRIVING CRITERIA PROVISIONS.

IT HAS BEEN ESTIMATED THAT A HAMMER WITH AN EQUIVALENT RATED ENERGY IN THE RANGE OF 20,000 TO 30,000 FT-LBS PER BLOW WILL BE REQUIRED TO DRIVE PILES AT END BENT 1 AND END BENT 2. THIS ESTIMATED ENERGY RANGE DOES NOT RELEASE THE CONTRACTOR FROM PROVIDING DRIVING EQUIPMENT IN ACCORDANCE WITH SUBARTICLE 450-3 (D) (2) OF THE STANDARD SPECIFICATIONS.

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

INSTALL DRILLED PIERS AT BENT NO.1 THAT EXTEND TO AN ELEVATION NO HIGHER THAN 693 FT, (CENTER AND RIGHT), AND SATISFY THE REQUIRED TIP RESISTANCE.

INSTALL DRILLED PIER AT BENT NO.1 THAT EXTENDS TO AN ELEVATION NO HIGHER THAN 702 FT, (LEFT), SATISFY THE REQUIRED TIP RESISTANCE AND HAVE A PENETRATION OF AT LEAST 10.5 FEET INTO ROCK AS DEFINED BY ARTICLE 411-1 OF THE STANDARD SPECIFICATIONS.

DRILLED PIERS AT BENT NO.1 ARE DESIGNED FOR A FACTORED RESISTANCE OF 422 TONS PER PIER. CHECK FIELD CONDITIONS FOR THE REQUIRED TIP RESISTANCE OF 20 TSF.

PERMANENT STEEL CASING MAY BE REQUIRED FOR DRILLED PIERS AT BENT NO.1. IF REQUIRED, DO NOT EXTEND PERMANENT CASING BELOW ELEVATION 711.5 FEET, (CENTER AND RIGHT), AND 712.5 FEET, (LEFT), WITHOUT PRIOR APPROVAL FROM THE ENGINEER. THE ENGINEER WILL DETERMINE THE NEED FOR PERMANENT CASING.

CSL TUBES ARE REQUIRED AND CSL TESTING MAY BE REQUIRED FOR DRILLED PIERS. THE ENGINEER WILL DETERMINE THE NEED FOR CSL TESTING. FOR CSL TESTING, SEE SECTION 411 OF THE STANDARD SPECIFICATIONS.

SID INSPECTIONS MAY BE REQUIRED FOR DRILLED PIERS. THE ENGINEER WILL DETERMINE THE NEED FOR SID INSPECTIONS. FOR SID INSPECTIONS, SEE SECTION 411 OF THE STANDARD SPECIFICATIONS.

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 15+53.00 -L-.

**NOTES - CONTINUED**

FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

ASPHALT WEARING SURFACE IS INCLUDED IN ROADWAY QUANTITY ON ROADWAY PLANS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

THIS STRUCTURE HAS BEEN DESIGNED IN ACCORDANCE WITH HEC 18, "EVALUATING SCOUR AT BRIDGES", MAY, 2001.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

**TOTAL BILL OF MATERIAL**

	CONSTRUCTION, MAINTENANCE, AND REMOVAL OF TEMPORARY ACCESS	REMOVAL OF EXISTING STRUCTURE AT STATION 15+53.00 -L-	3'-6" DIA DRILLED PIERS IN SOIL	3'-6" DIA DRILLED PIERS NOT IN SOIL	PERMANENT STEEL CASING FOR 3'-6" DIA. DRILLED PIER	SID INSPECTION	CSL TESTING	PDA TESTING	UNCLASSIFIED STRUCTURE EXCAVATION	CLASS A CONCRETE	BRIDGE APPROACH SLABS	REINFORCING STEEL	SPIRAL COLUMN REINFORCING STEEL	HP 12 X 53 STEEL PILES	STEEL PILE POINTS	VERTICAL CONCRETE BARRIER RAIL	RIP RAP CLASS II	GEOTEXTILE FOR DRAINAGE	ELASTOMERIC BEARINGS	3'-0" X 2'-0" PRESTRESSED CONCRETE CORED SLABS	3'-0" X 3'-3" PRESTRESSED CONCRETE BOX BEAMS			
	LUMP SUM	LUMP SUM	LIN. FT.	LIN. FT.	LIN. FT.	EA.	EA.	EA.	LUMP SUM	CU. YDS.	LUMP SUM	LBS.	LBS.	NO.	LIN. FT.	NO.	LIN. FT.	TONS	SQ. YDS.	LUMP SUM	NO.	LIN. FT.	NO.	LIN. FT.
SUPERSTRUCTURE																					9	540	9	900
END BENT NO. 1					16.4		1			21.3		2,596	2,463	5	175	5		159	176					
BENT NO. 1			16.2	48.0	16.4		1			30.4		11,747	2,463											
END BENT NO. 2										29.1		4,526		5	75	5		112	125					
TOTAL	LUMP SUM	LUMP SUM	16.2	48.0	16.4	1	1	2	LUMP SUM	80.8	LUMP SUM	18,869	2,463	10	250	10	320.3	271	301	LUMP SUM	9	540	9	900

PROJECT NO. B-5163

ROCKINGHAM COUNTY

STATION: 15+53.00 -L-

SHEET 2 OF 2

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

**GENERAL DRAWING**

BRIDGE ON SR 1354  
(BENNETT RD.) OVER  
BUFFALO CREEK BETWEEN  
SR 1348 & SR 1358

**REVISIONS**

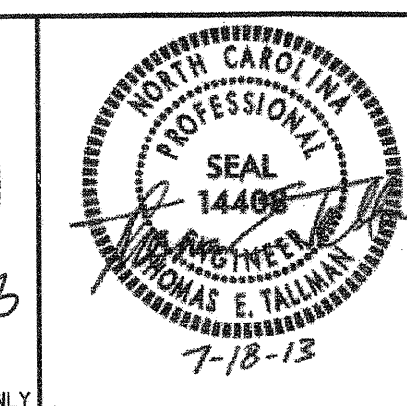
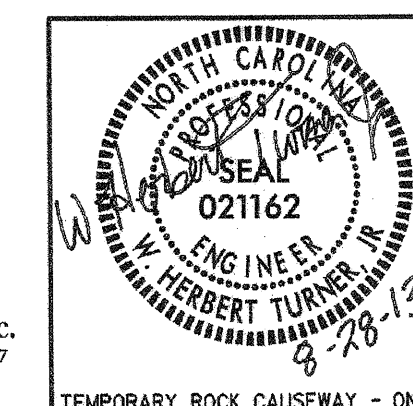
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO. S-2

TOTAL SHEETS 24



f/k/a Florence & Hutcheson, Inc.  
5121 Kingdom Way, Suite 100 Raleigh, NC 27607  
NC License No: F-0258



TEMPORARY ROCK CAUSEWAY - ONLY

9/26/2013 C:\Users\Structure\Desktop\TTPAB-5163\_Rockingham\_160\Plans\B-5163.sdl.LS - r1.dgn ICA Engineering f/k/a Florence & Hutcheson, Inc.

DRAWN BY : D. H. CARTER DATE : JUL 2013  
CHECKED BY : T. E. TALLMAN DATE : JUL 2013  
DESIGN ENGINEER OF RECORD: T. E. TALLMAN DATE : JUL 2013



LOAD AND RESISTANCE FACTOR RATING (LRFD) SUMMARY FOR PRESTRESSED CONCRETE GIRDERS

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	1.133	--	1.75	0.249	1.48	60'	EL	29.423	0.649	1.13	60'	EL	5.885	0.80	0.249	1.52	60'	EL	29.423		
	HL-93(0pr)	N/A	--	1.468	--	1.35	0.249	1.91	60'	EL	29.423	0.649	1.47	60'	EL	5.885	N/A	--	--	--	--	--		
	HS-20(Inv)	36.000	2	1.364	49.098	1.75	0.249	1.87	60'	EL	29.423	0.649	1.36	60'	EL	5.885	0.80	0.249	1.92	60'	EL	29.423		
	HS-20(0pr)	36.000	--	1.768	63.645	1.35	0.249	2.42	60'	EL	29.423	0.649	1.77	60'	EL	5.885	N/A	--	--	--	--	--		
LEGAL LOAD RATING	SV	SNSH	13.500	--	3.938	53.159	1.4	0.249	5.03	60'	EL	29.423	0.649	3.94	60'	EL	5.885	0.80	0.249	4.13	60'	EL	29.423	
		SNGARBS2	20.000	--	2.837	56.744	1.4	0.249	3.85	60'	EL	29.423	0.649	2.84	60'	EL	5.885	0.80	0.249	3.17	60'	EL	29.423	
		SNAGRIS2	22.000	--	2.648	58.256	1.4	0.249	3.69	60'	EL	29.423	0.649	2.65	60'	EL	5.885	0.80	0.249	3.03	60'	EL	29.423	
		SNCOTTS3	27.250	--	1.97	53.671	1.4	0.249	2.5	60'	EL	29.423	0.649	1.97	60'	EL	5.885	0.80	0.249	2.06	60'	EL	29.423	
		SNAGRS4	34.925	--	1.661	58.001	1.4	0.249	2.13	60'	EL	29.423	0.649	1.66	60'	EL	5.885	0.80	0.249	1.75	60'	EL	29.423	
		SNS5A	35.550	--	1.696	60.293	1.4	0.249	2.08	60'	EL	29.423	0.649	1.7	60'	EL	5.885	0.80	0.249	1.71	60'	EL	29.423	
		SNS6A	39.950	--	1.558	62.257	1.4	0.249	1.93	60'	EL	29.423	0.649	1.56	60'	EL	5.885	0.80	0.249	1.58	60'	EL	29.423	
	TTST	TNAGRIT3	33.000	--	1.846	60.907	1.4	0.249	2.36	60'	EL	29.423	0.649	1.85	60'	EL	5.885	0.80	0.249	1.94	60'	EL	29.423	
		TNT4A	33.075	--	1.787	59.108	1.4	0.249	2.37	60'	EL	29.423	0.649	1.79	60'	EL	5.885	0.80	0.249	1.95	60'	EL	29.423	
		TNT6A	41.600	--	1.607	66.863	1.4	0.249	1.96	60'	EL	29.423	0.649	1.67	60'	EL	5.885	0.80	0.249	1.61	60'	EL	29.423	
		TNT7A	42.000	--	1.598	67.1	1.4	0.249	1.97	60'	EL	29.423	0.649	1.6	60'	EL	5.885	0.80	0.249	1.62	60'	EL	29.423	
		TNT7B	42.000	--	1.499	62.942	1.4	0.249	2.06	60'	EL	29.423	0.649	1.5	60'	EL	5.885	0.80	0.249	1.69	60'	EL	29.423	
		TNAGRIT4	43.000	--	1.447	62.223	1.4	0.249	1.95	60'	EL	29.423	0.649	1.45	60'	EL	5.885	0.80	0.249	1.60	60'	EL	29.423	
		TNAGT5A	45.000	--	1.455	65.474	1.4	0.249	1.83	60'	EL	29.423	0.649	1.45	60'	EL	5.885	0.80	0.249	1.50	60'	EL	29.423	
TNAGT5B	45.000	3	1.374	61.845	1.4	0.249	1.8	60'	EL	29.423	0.649	1.37	60'	EL	5.885	0.80	0.249	1.48	60'	EL	29.423			

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)

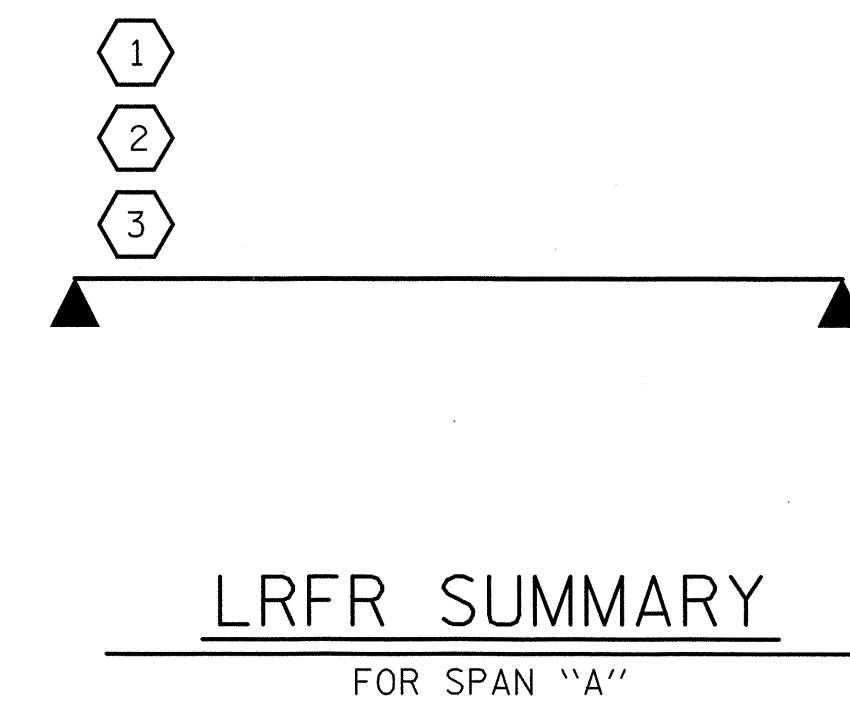
2 DESIGN LOAD RATING (HS-20)

3 LEGAL LOAD RATING \*\*

\*\* SEE CHART FOR VEHICLE TYPE

GIRDER LOCATION

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



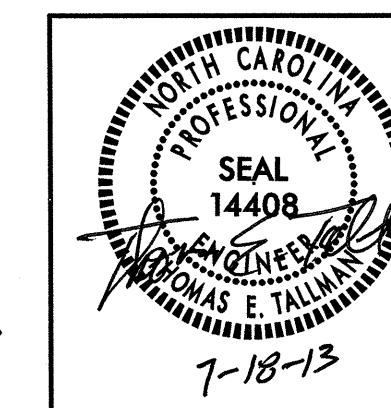
PROJECT NO. B-5163  
ROCKINGHAM COUNTY  
 STATION: 15+53.00 -L-

SHEET 1 OF 2

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

STANDARD  
 LRFR SUMMARY FOR  
 60' CORED SLAB UNIT  
 120° SKEW  
 (NON-INTERSTATE TRAFFIC)

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



T:\15\2013\151200\structure\design\1p\B-5163\_rckingham\_160\plans\B-5163.ed.3.dgn  
 ICA Engineering f/k/a Florence & Hutcheson, Inc.

ASSEMBLED BY : M. T. MOBLEY DATE : APR 2013  
 CHECKED BY : J. E. MONDOLFI DATE : APR 2013  
 DRAWN BY : CVC 6/10  
 CHECKED BY : DNS 6/10



LOAD AND RESISTANCE FACTOR RATING (LRFD) SUMMARY FOR PRESTRESSED CONCRETE GIRDERS

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	1.146	--	1.75	0.246	1.4	A	EL	49.134	0.614	1.15	A	EL	9.827	0.80	0.246	1.15	A	EL	49.134		
	HL-93(0pr)	N/A	--	1.486	--	1.35	0.246	1.81	A	EL	49.134	0.614	1.49	A	EL	9.827	N/A	--	--	--	--	--		
	HS-20(Inv)	36.000	2	1.519	54.686	1.75	0.246	1.95	A	EL	49.134	0.614	1.52	A	EL	9.827	0.80	0.246	1.60	A	EL	49.134		
	HS-20(0pr)	36.000	--	1.969	70.889	1.35	0.246	2.52	A	EL	49.134	0.614	1.97	A	EL	9.827	N/A	--	--	--	--	--		
LEGAL LOAD RATING	SV	SNSH	13.500	--	3.795	51.239	1.4	0.246	5.76	A	EL	49.134	0.614	4.67	A	EL	9.827	0.80	0.246	3.80	A	EL	49.134	
		SNGARBS2	20.000	--	2.75	55	1.4	0.246	4.18	A	EL	49.134	0.614	3.27	A	EL	9.827	0.80	0.246	2.75	A	EL	49.134	
		SNAGRIS2	22.000	--	2.573	56.599	1.4	0.246	3.91	A	EL	49.134	0.614	3.02	A	EL	9.827	0.80	0.246	2.57	A	EL	49.134	
		SNCOTTS3	27.250	--	1.886	51.405	1.4	0.246	2.86	A	EL	49.134	0.614	2.32	A	EL	9.827	0.80	0.246	1.89	A	EL	49.134	
		SNAGGRS4	34.925	--	1.546	54.002	1.4	0.246	2.35	A	EL	49.134	0.614	1.9	A	EL	9.827	0.80	0.246	1.55	A	EL	49.134	
		SNS5A	35.550	--	1.514	53.825	1.4	0.246	2.3	A	EL	49.134	0.614	1.9	A	EL	9.827	0.80	0.246	1.51	A	EL	49.134	
		SNS6A	39.950	--	1.377	55.004	1.4	0.246	2.09	A	EL	49.134	0.614	1.72	A	EL	9.827	0.80	0.246	1.38	A	EL	49.134	
	SNS7B	42.000	--	1.311	55.05	1.4	0.246	1.99	A	EL	49.134	0.614	1.68	A	EL	9.827	0.80	0.246	1.31	A	EL	49.134		
	TTST	TNAGRIT3	33.000	--	1.675	55.287	1.4	0.246	2.54	A	EL	49.134	0.614	2.06	A	EL	9.827	0.80	0.246	1.68	A	EL	49.134	
		TNT4A	33.075	--	1.679	55.547	1.4	0.246	2.55	A	EL	49.134	0.614	2.02	A	EL	9.827	0.80	0.246	1.68	A	EL	49.134	
		TNT6A	41.600	--	1.362	56.644	1.4	0.246	2.07	A	EL	49.134	0.614	1.76	A	EL	9.827	0.80	0.246	1.36	A	EL	49.134	
		TNT7A	42.000	--	1.362	57.22	1.4	0.246	2.07	A	EL	49.134	0.614	1.73	A	EL	9.827	0.80	0.246	1.36	A	EL	49.134	
		TNT7B	42.000	--	1.395	58.575	1.4	0.246	2.12	A	EL	49.134	0.614	1.65	A	EL	9.827	0.80	0.246	1.39	A	EL	49.134	
		TNAGRIT4	43.000	--	1.338	57.52	1.4	0.246	2.03	A	EL	49.134	0.614	1.6	A	EL	9.827	0.80	0.246	1.34	A	EL	49.134	
TNAGT5A		45.000	--	1.266	56.99	1.4	0.246	1.92	A	EL	49.134	0.614	1.57	A	EL	9.827	0.80	0.246	1.27	A	EL	49.134		
TNAGT5B	45.000	3	1.256	56.51	1.4	0.246	1.91	A	EL	49.134	0.614	1.53	A	EL	9.827	0.80	0.246	1.26	A	EL	49.134			

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)

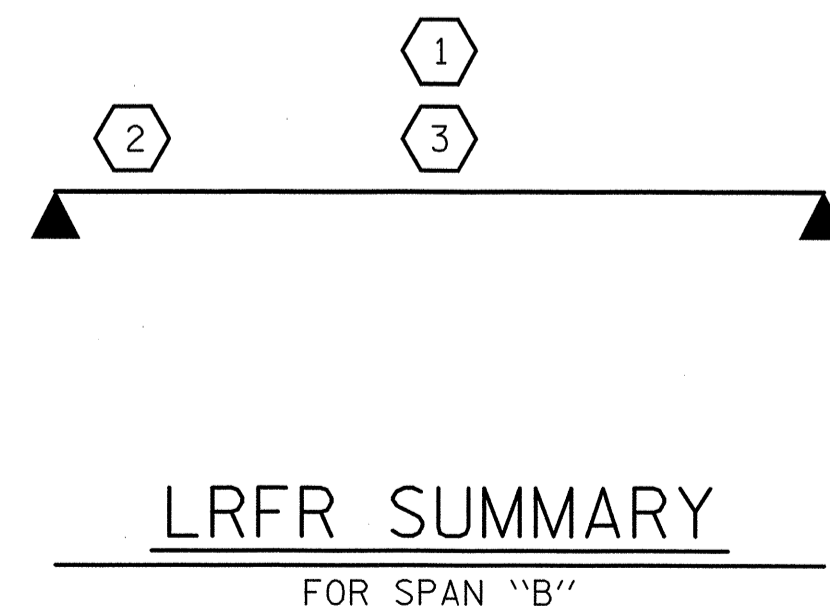
3 LEGAL LOAD RATING \*\*

\*\* SEE CHART FOR VEHICLE TYPE

---

GIRDER LOCATION

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



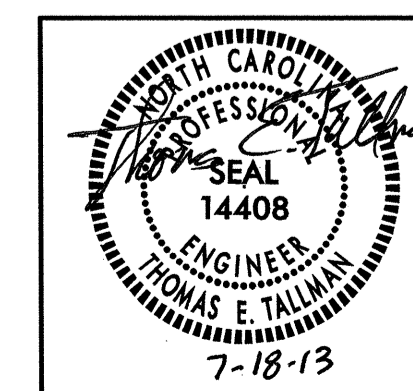
PROJECT NO. B-5163

ROCKINGHAM COUNTY

STATION: 15+53.00 -L-

SHEET 2 OF 2

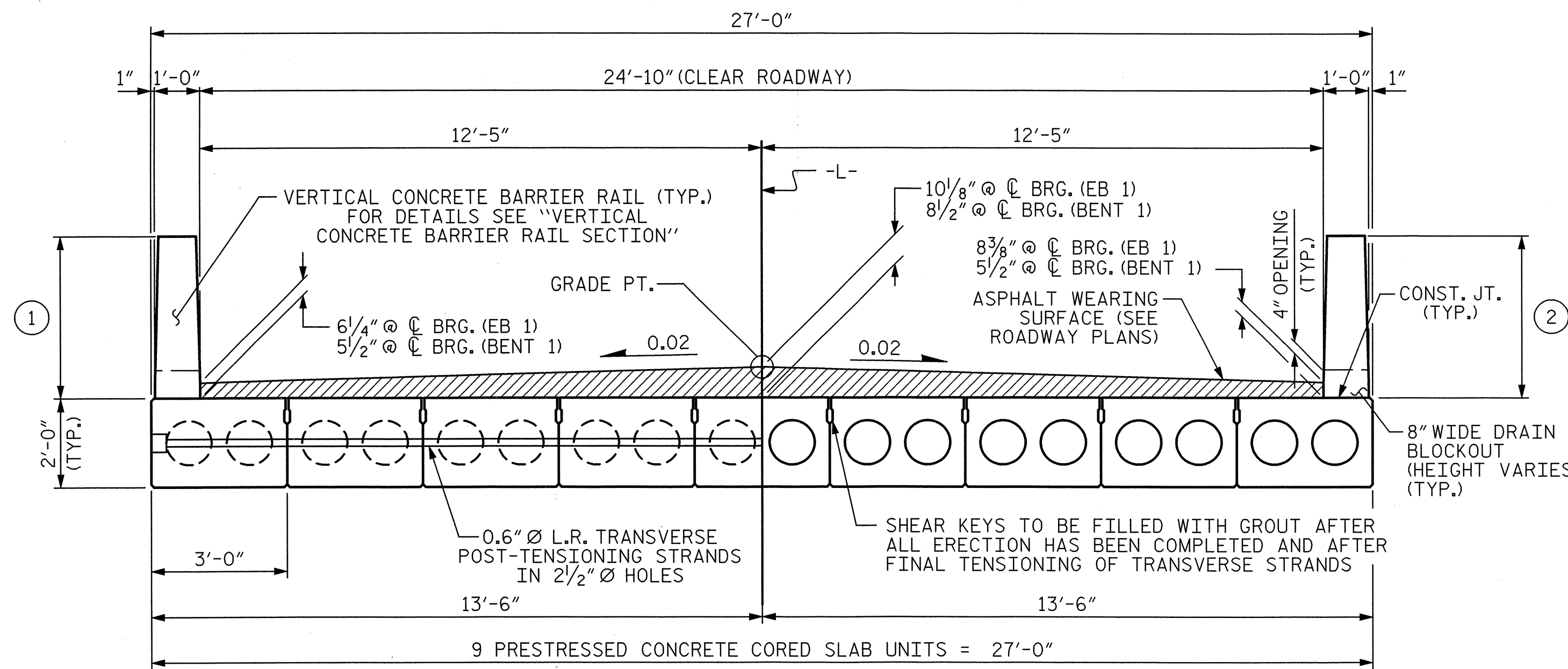
STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
STANDARD  
LRFR SUMMARY FOR  
100' BOX BEAM UNIT  
120° SKEW  
(NON-INTERSTATE TRAFFIC)



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

ASSEMBLED BY: M. T. MOBLEY	DATE: APR 2013
CHECKED BY: J. E. MONDOLFI	DATE: APR 2013
DRAWN BY: TMG	11/11
CHECKED BY: AAC	11/11

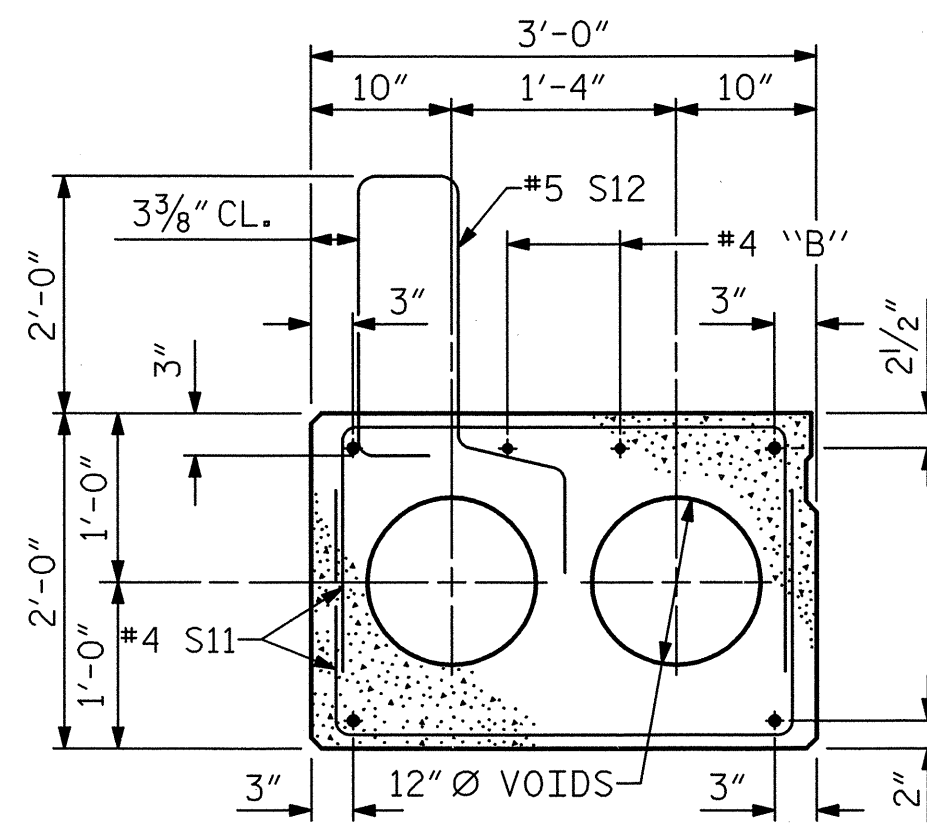




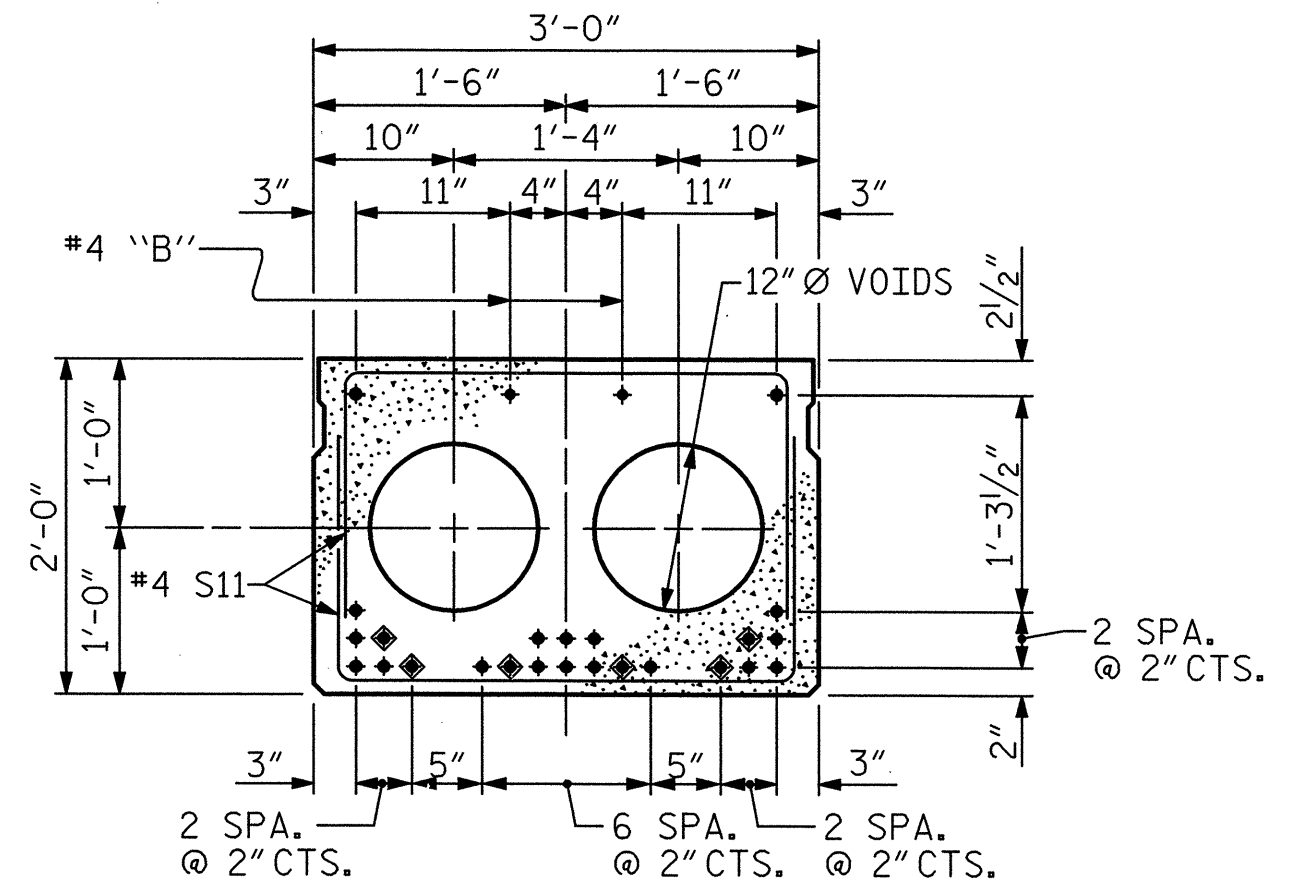
HALF SECTION  
AT INTERMEDIATE DIAPHRAGMS

TYPICAL SECTION

HALF SECTION  
THROUGH VOIDS



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



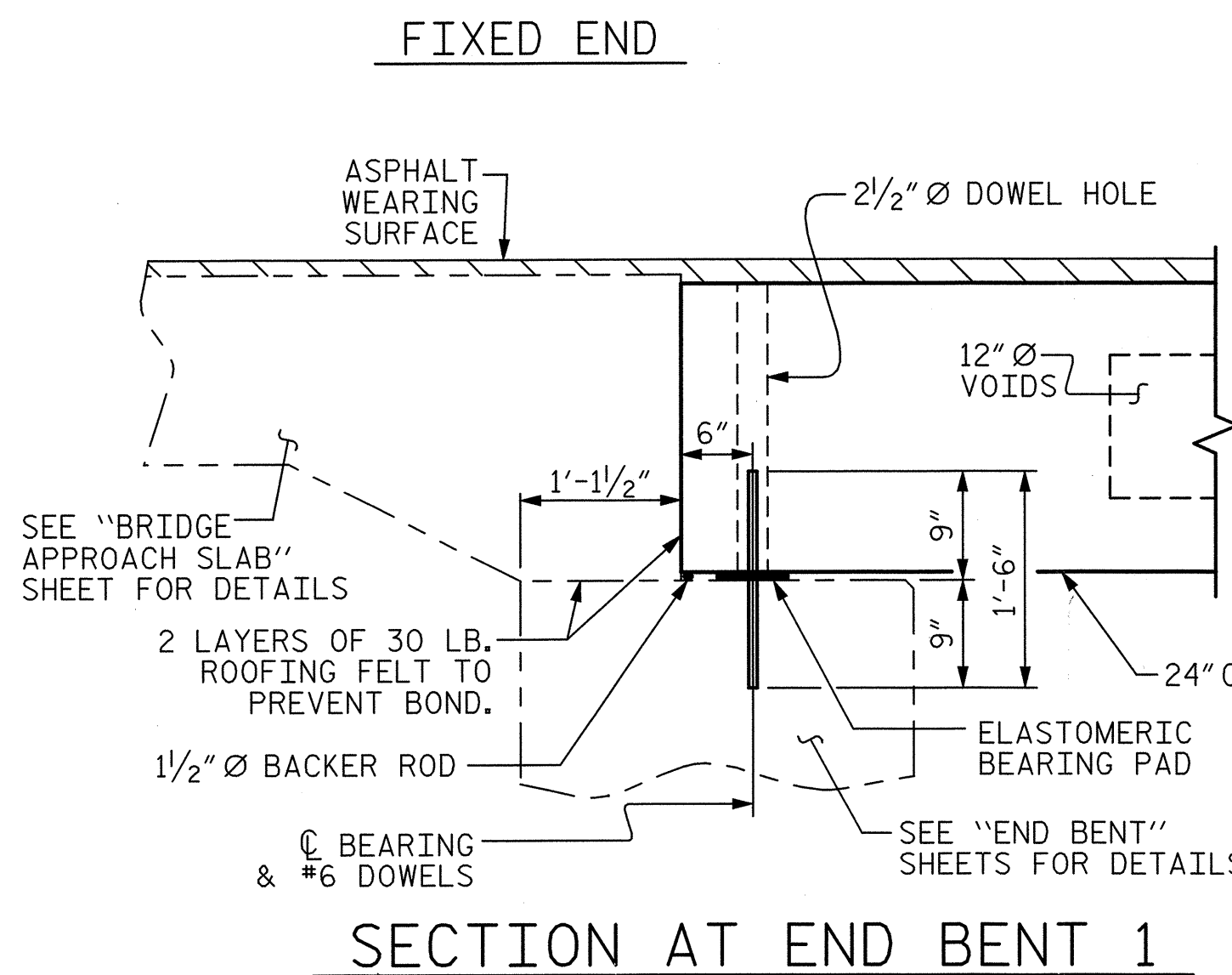
INTERIOR SLAB SECTION (60')  
(24 STRANDS REQUIRED)

0.6" Ø LOW RELAXATION STRAND LAYOUT

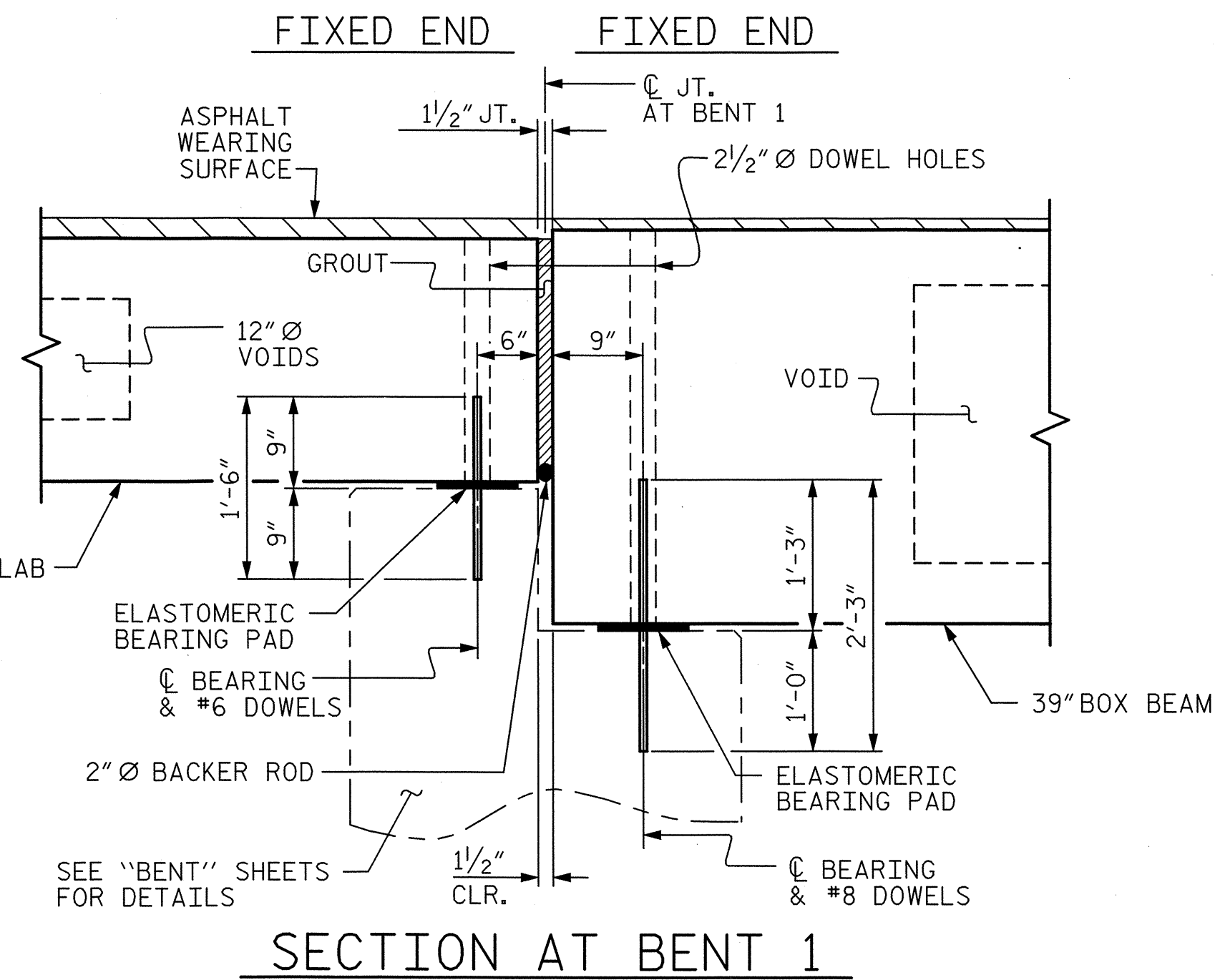
- ① 4'-0 1/4" @ C BRG. (EB 1) \*
- 3'-11 1/2" @ C BRG. (BENT 1)

\* - 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 GUTTERLINE. FOR RAIL HEIGHT DETAILS AND ASPHALT THICKNESS, SEE THE "VERTICAL CONCRETE BARRIER RAIL SECTION" DETAIL.

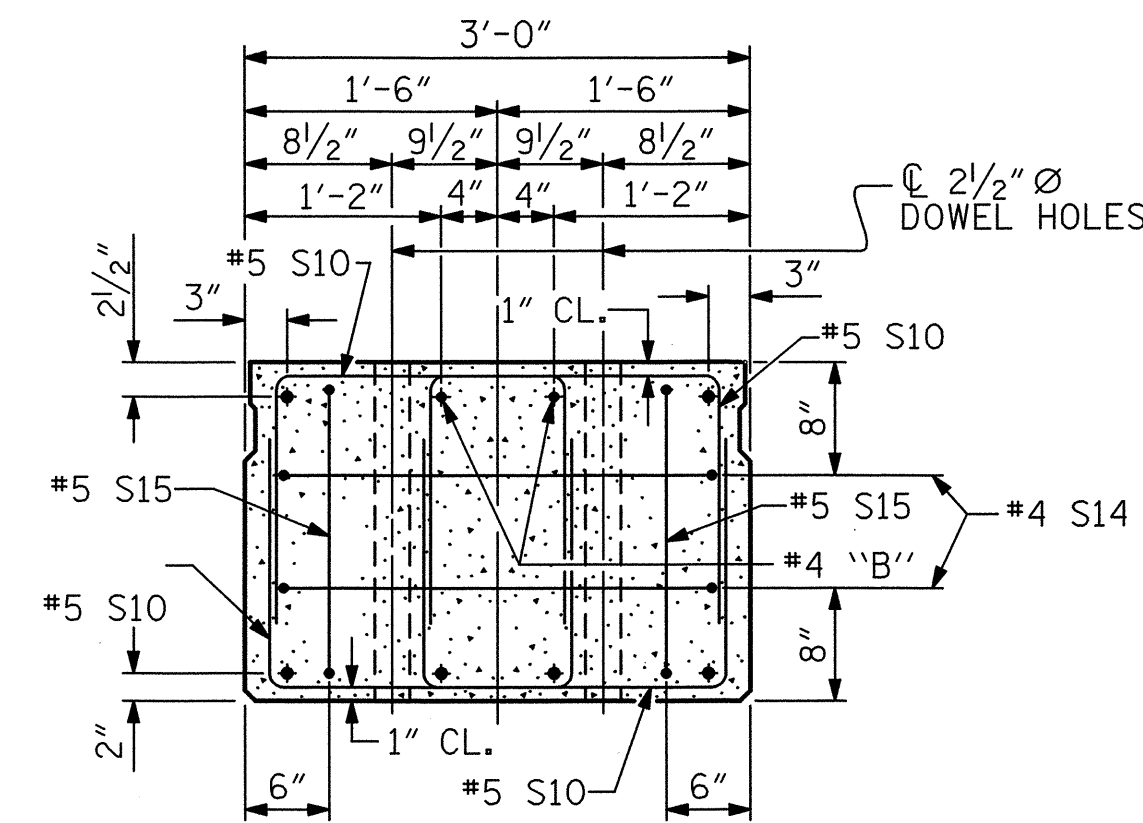
- ② 4'-2 3/8" @ C BRG. (EB 1) \*
- 3'-11 1/2" @ C BRG. (BENT 1)



SECTION AT END BENT 1



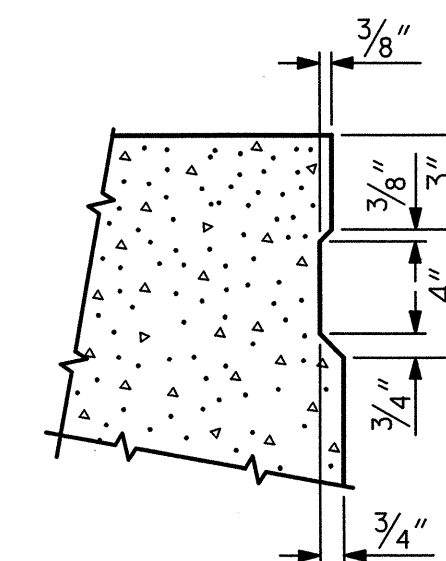
SECTION AT BENT 1



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.

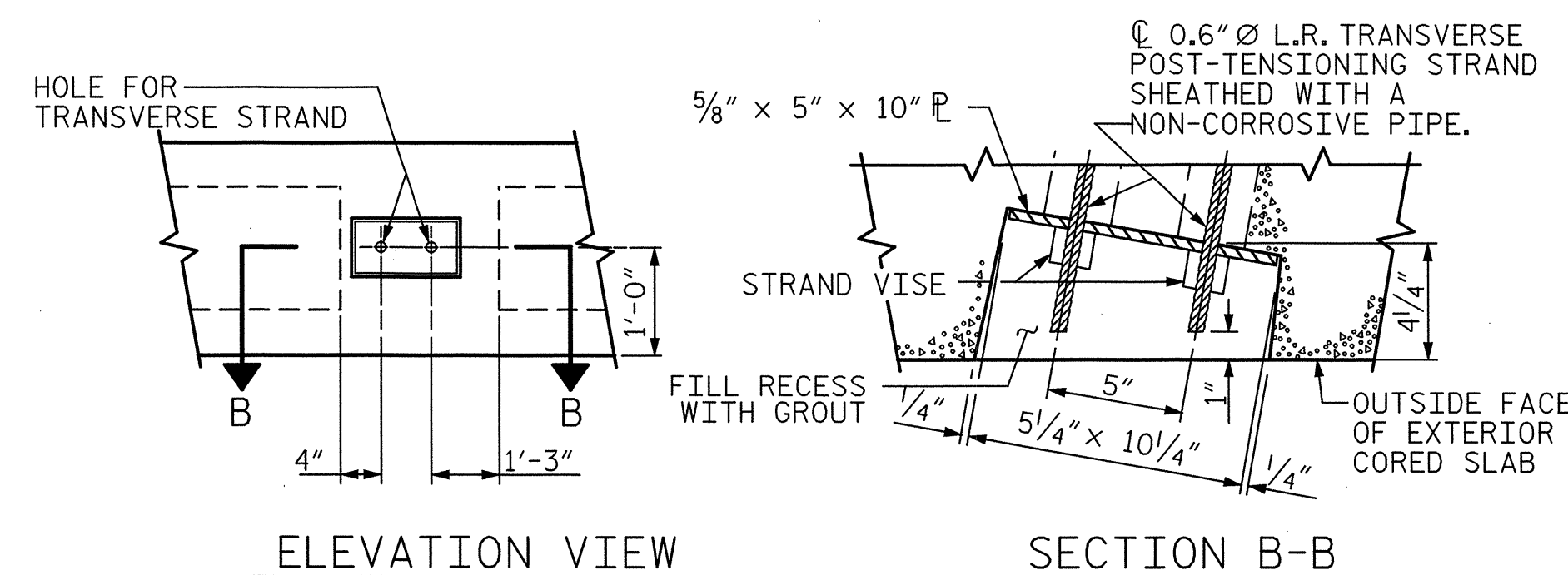
◆ BOND SHALL BE BROKEN ON THESE STRANDS FOR A DISTANCE OF 12'-0" FROM END OF CORED SLAB UNIT. SEE STANDARD SPECIFICATIONS, ARTICLE 1078-7.

DEBONDING LEGEND



SHEAR KEY DETAIL

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



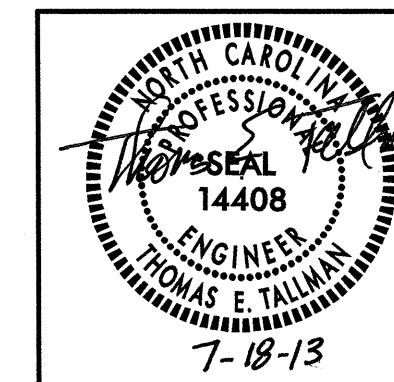
ELEVATION VIEW

SECTION B-B

GROUTED RECESS AT END OF POST-TENSIONED STRAND CORED SLABS



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5121 Kingdom Way, Suite 100 Raleigh, NC 27607  
NO License No: P-0288



PROJECT NO. B-5163  
ROCKINGHAM COUNTY  
STATION: 15+53.00 -L-

SHEET 1 OF 9

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
3'-0" X 2'-0"  
PRESTRESSED CONCRETE  
CORED SLAB UNIT  
SPAN "A"

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S-5
1			3			TOTAL SHEETS
2			4			24

7/15/2013  
V:\structures\structure\_design\hpb-5163\_rockingham\_160\plans\B-5163.ed.5.dgn  
ICA Engineering f/k/a Florence & Hutcheson, Inc.

DRAWN BY: D. H. CARTER DATE: JUL 2013  
CHECKED BY: T. E. TALLMAN DATE: JUL 2013  
DESIGN ENGINEER OF RECORD: T. E. TALLMAN DATE: JUL 2013



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 BOX BEAM SECTIONS SHALL BE GRADE 60 AND SHALL BE INCLUDED IN THE UNIT PRICE BID FOR PRESTRESSED CONCRETE BOX BEAMS.

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

THE 2 1/2" Ø DOWEL HOLES AT FIXED ENDS OF BOX BEAM SECTIONS SHALL BE FILLED WITH NON-SHRINK GROUT.

THE BACKERS ROD SHALL CONFORM TO THE REQUIREMENTS OF TYPE M BOND BREAKER, SEE SECTION 1028 OF THE STANDARD SPECIFICATIONS.

THE TRANSFER OF LOAD FROM THE ANCHORAGES TO THE BOX BEAM UNIT SHALL BE DONE WHEN THE CONCRETE HAS REACHED A COMPRESSIVE STRENGTH OF NOT LESS THAN 5500 PSI.

ALL REINFORCING STEEL IN VERTICAL CONCRETE BARRIER RAILS SHALL BE EPOXY COATED.

PRESTRESSING STRANDS SHALL BE CUT FLUSH WITH THE BOX BEAM UNIT ENDS.

APPLY EPOXY PROTECTIVE COATING TO BOX BEAM UNIT ENDS.

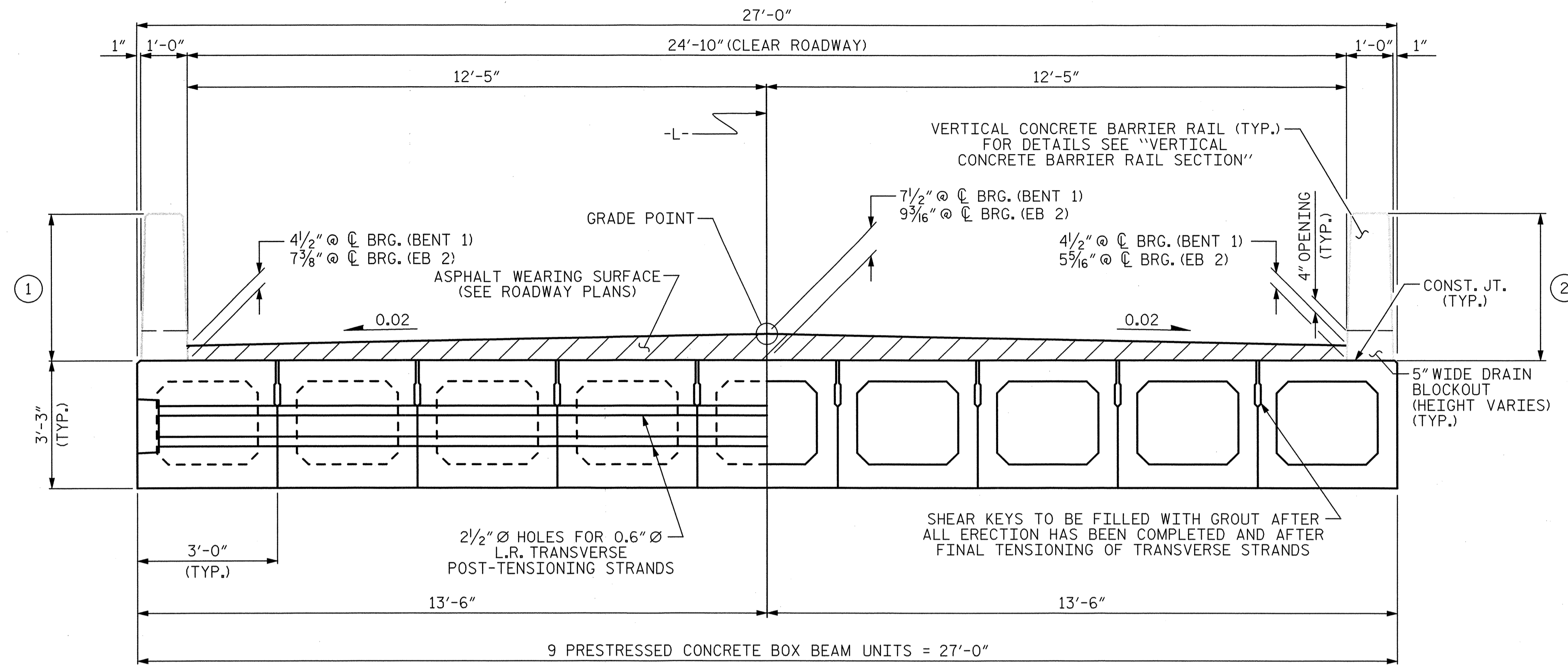
VERTICAL GROOVED CONTRACTION JOINTS, 1/2" IN DEPTH, SHALL BE TOOLED IN ALL EXPOSED FACES OF THE BARRIER RAIL AND IN ACCORDANCE WITH ARTICLE 825-10(B) OF THE STANDARD SPECIFICATIONS. A VERTICAL CONTRACTION JOINT SHALL BE LOCATED AT EACH THIRD POINT BETWEEN BARRIER RAIL EXPANSION JOINTS. ONLY ONE CONTRACTION 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 LOCATION OF THE VOID DRAINS MAY BE SHIFTED SLIGHTLY WHERE NECESSARY TO CLEAR PRESTRESSING STRANDS OR TRANSVERSE REINFORCING STEEL.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

THE DRAIN OPENING AT THE GUTTERLINE SHALL BE 4" X 5". THE HEIGHT OF THE BLOCKOUT IN THE VERTICAL CONCRETE BARRIER RAIL SHALL EXTEND FROM THE TOP OF THE BOX BEAM UNIT TO THE TOP OF THE DRAIN OPENING.

APPLY EPOXY PROTECTIVE COATING TO EXTERIOR FACE OF THE EXTERIOR BOX BEAM UNITS THAT REQUIRE DRAINS IN THE BARRIER RAIL.



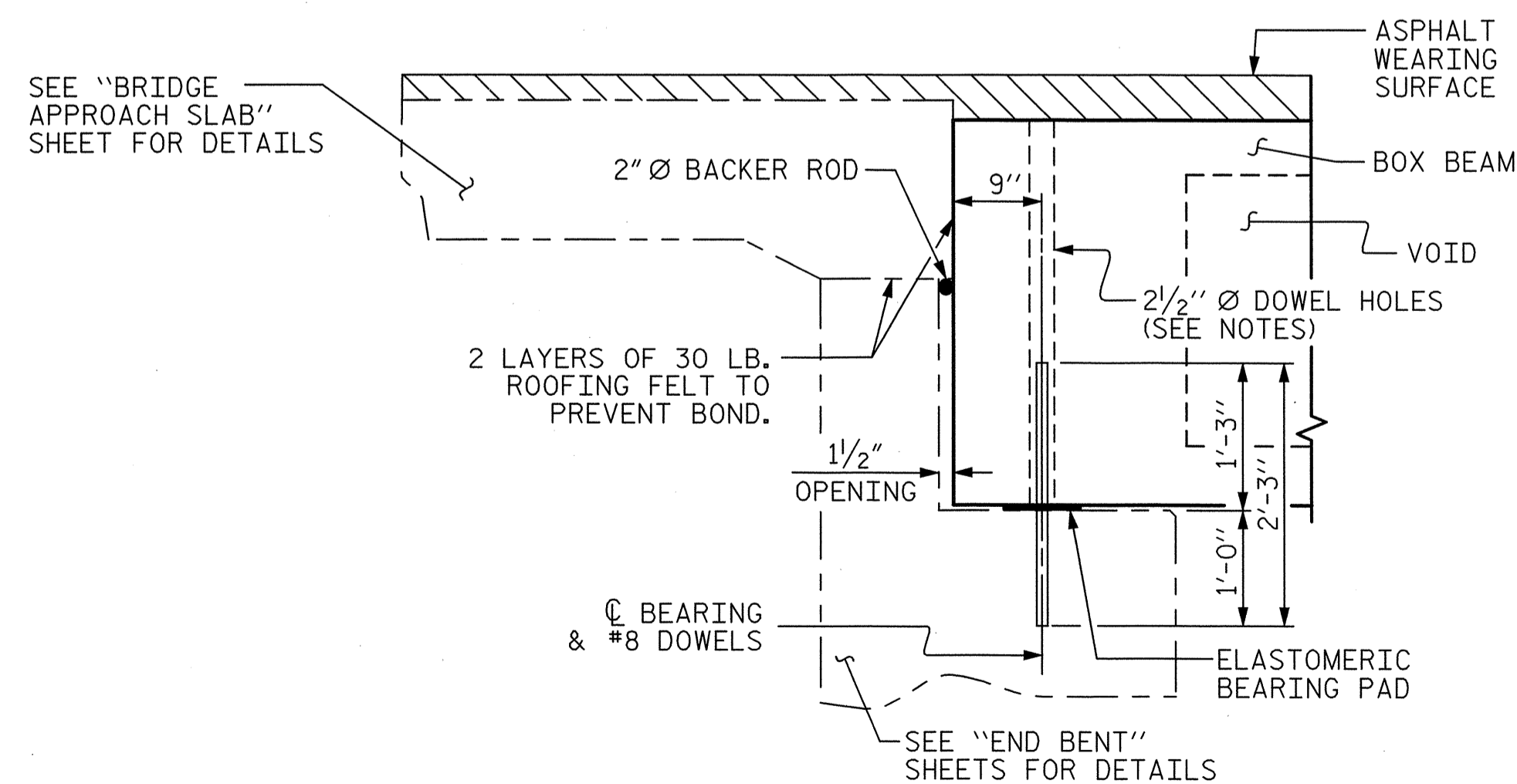
HALF SECTION AT INTERMEDIATE DIAPHRAGMS  
**TYPICAL SECTION**  
 HALF SECTION THROUGH VOIDS

① 3'-10 1/2" @ C BRG. (BENT 1)  
 4'-1 3/8" @ C BRG. (EB 2) \*

\* 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 GUTTERLINE. FOR RAIL HEIGHT DETAILS AND ASPHALT THICKNESS, SEE THE "VERTICAL CONCRETE BARRIER RAIL SECTION" DETAIL.

② 3'-10 1/2" @ C BRG. (BENT 1)  
 3'-11 5/16" @ C BRG. (EB 2) \*

**FIXED END**



**SECTION AT END BENT**

PROJECT NO. B-5163

ROCKINGHAM COUNTY

STATION: 15+53.00 -L-

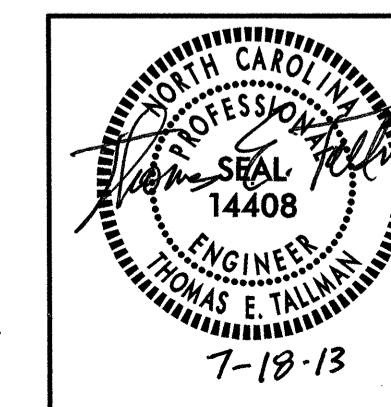
SHEET 2 OF 9

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 STANDARD  
 3'-0" X 3'-3"  
 PRESTRESSED CONCRETE  
 BOX BEAM UNIT  
 SPAN "B"

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



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 5121 Kingdom Way, Suite 100 Raleigh, NC 27607  
 NC License No: F-0258



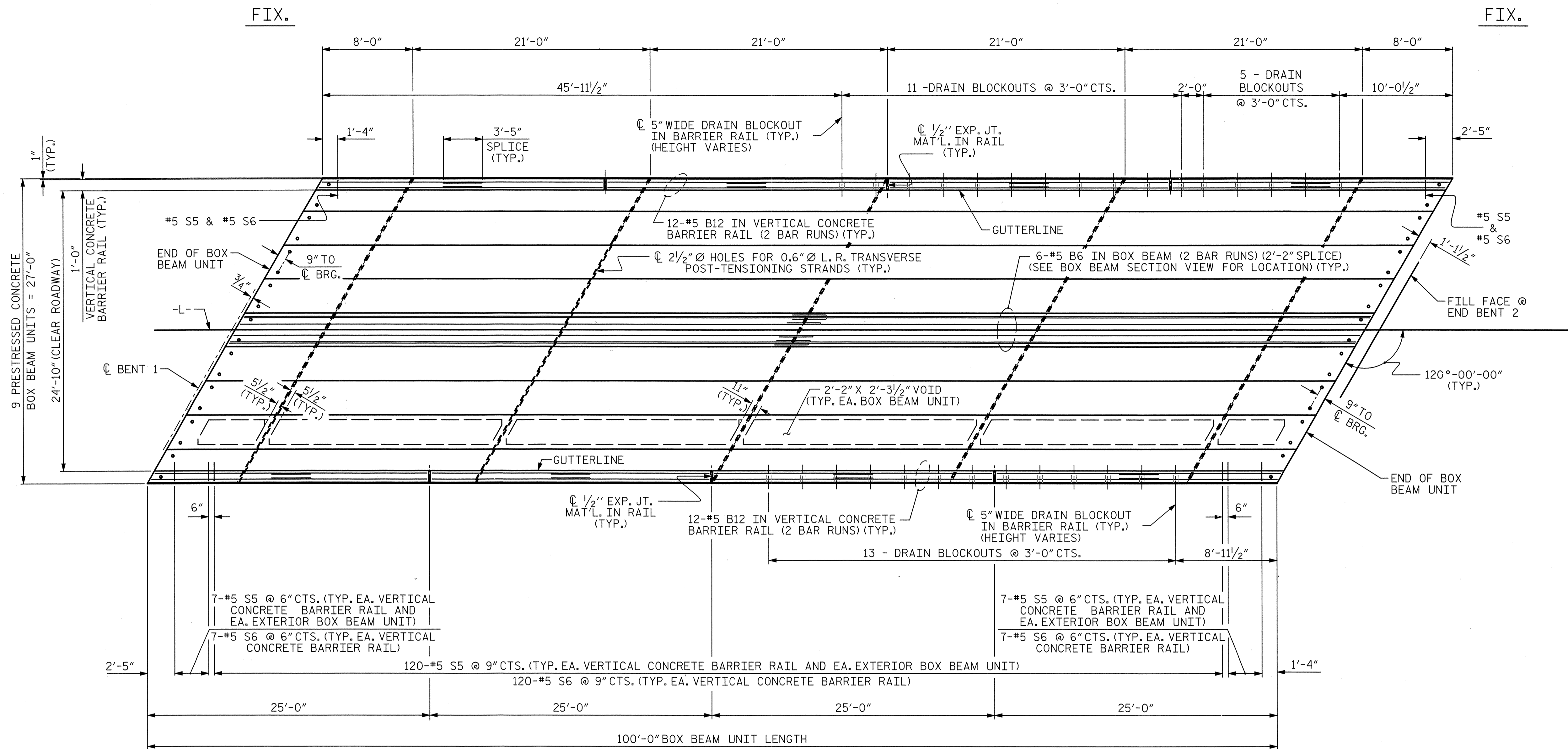
ASSEMBLED BY: D. H. CARTER DATE: JUL 2013  
 CHECKED BY: T. E. TALLMAN DATE: JUL 2013  
 DRAWN BY: DGE 8/11  
 CHECKED BY: TMG 11/11

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 ICA Engineering f/k/a Florence & Hutcheson, Inc.

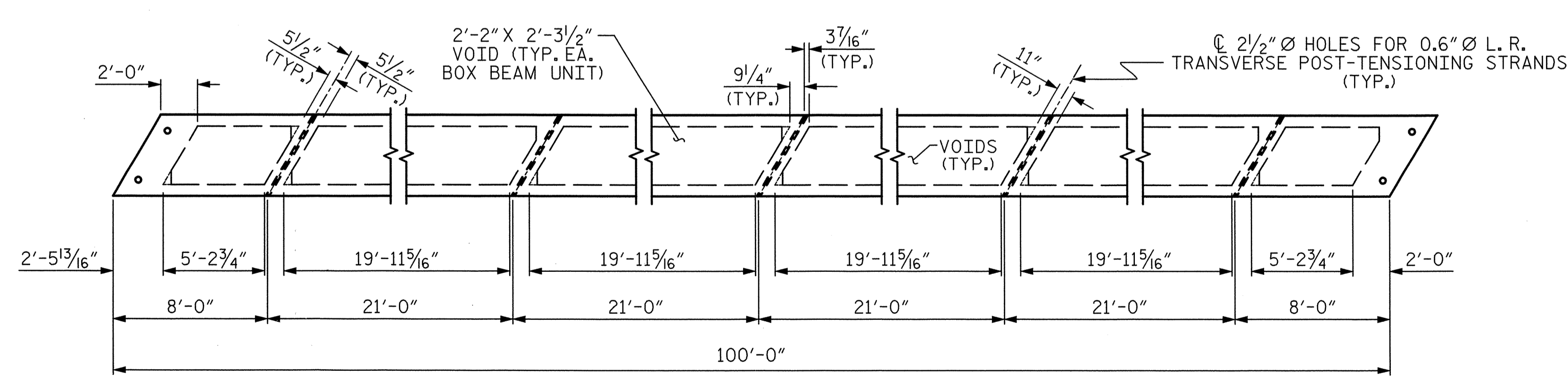








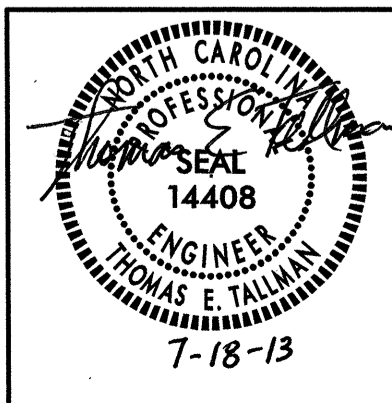
PLAN OF UNIT



DIAPHRAGM AND VOID LAYOUT

PROJECT NO. B-5163  
 ROCKINGHAM COUNTY  
 STATION: 15+53.00 -L-  
 SHEET 4 OF 9

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 PLAN OF 100' UNIT  
 24'-10" CLEAR ROADWAY  
 120° SKEW  
 SPAN "B"



**ICA**  
 Engineering  
 f/k/a Florence & Hutcheson, Inc.  
 5121 Kingdom Way, Suite 100 Raleigh, NC 27607  
 NC License No. P-0268

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S-8
1			3			TOTAL SHEETS
2			4			24

7/15/2013  
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 ICA Engineering f/k/a Florence & Hutcheson, Inc.

ASSEMBLED BY : D. H. CARTER DATE : APR 2013  
 CHECKED BY : J. E. MONDOLFI DATE : APR 2013  
 DRAWN BY : DGE IO/II  
 CHECKED BY : TMG II/II



**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 2 1/2" 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 VERTICAL CONCRETE BARRIER RAILS 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, 1/2" 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.

TRANSVERSE POST TENSIONING OF THE CORED SLAB UNITS SHALL BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.

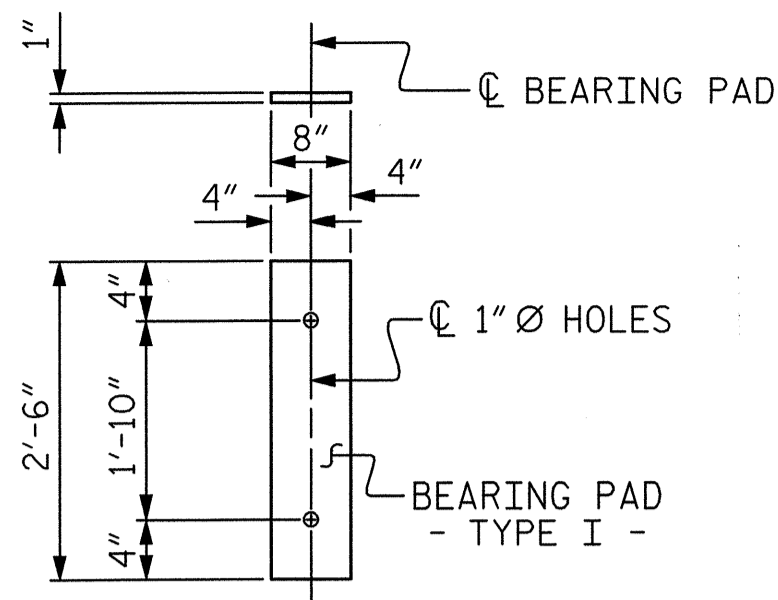
MAINTAIN A SYMMETRIC TENSION FORCE BETWEEN EACH PAIR OF TRANSVERSE POST TENSIONING STRANDS IN THE DIAPHRAGM.

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 DRAIN OPENING AT THE GUTTERLINE SHALL BE 4" X 8". THE HEIGHT OF THE BLOCKOUT IN THE VERTICAL CONCRETE BARRIER RAIL SHALL EXTEND FROM THE TOP OF THE CORED SLAB UNIT TO THE TOP OF THE DRAIN OPENING.

APPLY EPOXY PROTECTIVE COATING TO EXTERIOR FACE OF THE EXTERIOR CORED SLAB UNITS THAT REQUIRE DRAINS IN THE BARRIER RAIL.



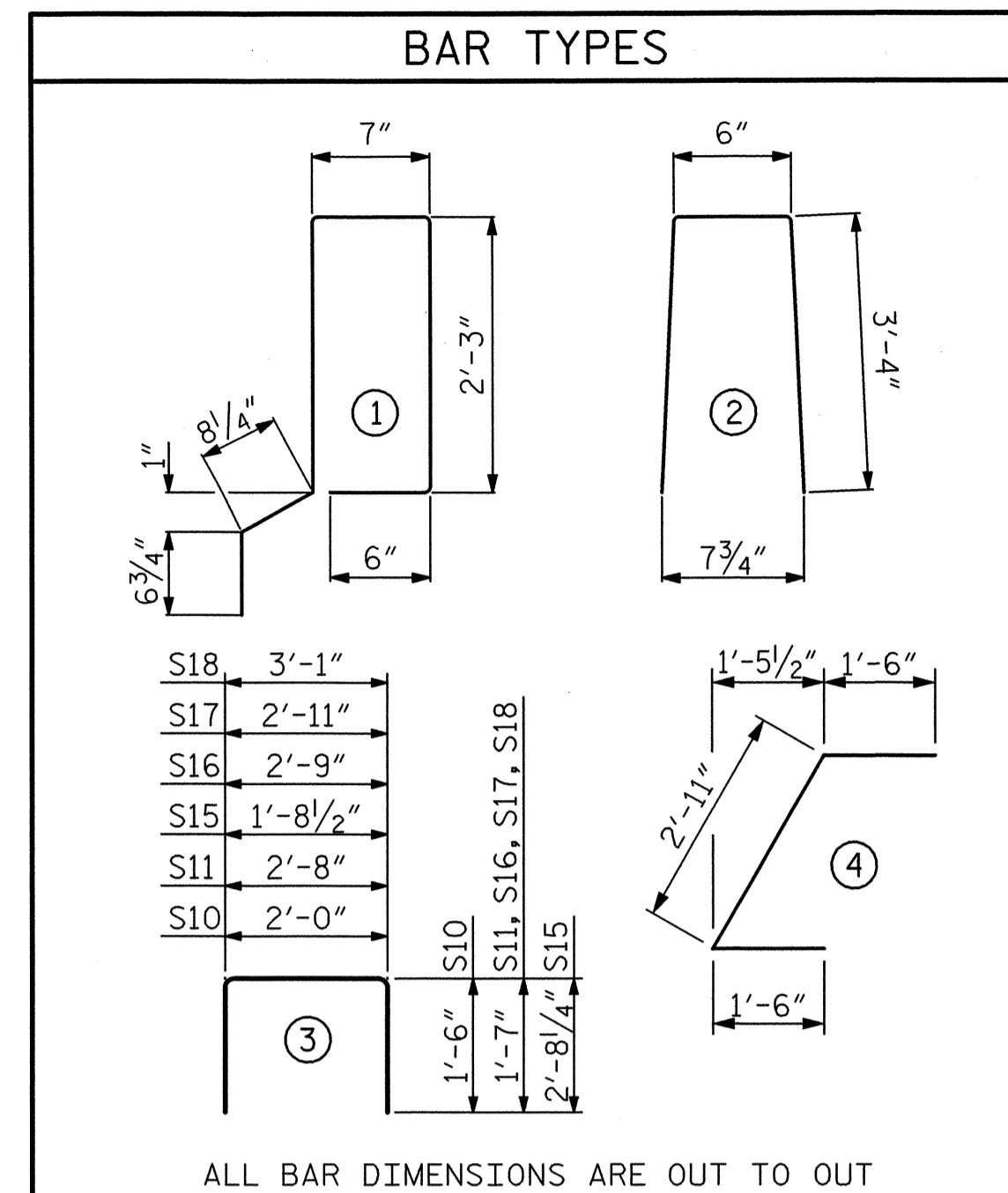
**FIXED END**  
(TYPE I - 18 REQ'D)

**ELASTOMERIC BEARING DETAILS**

ELASTOMER IN ALL BEARINGS SHALL BE 60 DUROMETER HARDNESS.

**BILL OF MATERIAL FOR ONE 60' CORED SLAB UNIT**

				EXTERIOR UNIT		INTERIOR UNIT	
BAR	NUMBER	SIZE	TYPE	LENGTH	WEIGHT	LENGTH	WEIGHT
B20	6	#4	STR	21'-2"	85	21'-2"	85
S10	8	#5	3	5'-0"	42	5'-0"	42
S11	146	#4	3	5'-10"	569	5'-10"	569
*S12	69	#5	1	6'-10"	492		
S14	4	#4	4	5'-11"	16	5'-11"	16
S15	4	#5	3	7'-1"	30	7'-1"	30
S16	4	#4	3	5'-11"	16	5'-11"	16
S17	4	#4	3	6'-1"	16	6'-1"	16
S18	4	#4	3	6'-3"	17	6'-3"	17
REINFORCING STEEL				LBS.	791		791
*EPOXY COATED REINFORCING STEEL				LBS.	492		
6,000 P.S.I. CONCRETE				CU. YDS.	10.4		10.4
0.6" Ø L.R. STRANDS				No.	24		24



**CORED SLABS REQUIRED**

60' UNIT	NUMBER	LENGTH	TOTAL LENGTH
EXTERIOR C.S.	2	60'-0"	120'-0"
INTERIOR C.S.	7	60'-0"	420'-0"
TOTAL	9	-	540'-0"

**GUTTERLINE ASPHALT THICKNESS & RAIL HEIGHT**

	ASPHALT OVERLAY THICKNESS @ MID-SPAN	RAIL HEIGHT @ MID-SPAN
60' UNITS	2 3/8"	3'-8 5/8"

**DEAD LOAD DEFLECTION AND CAMBER**

	3'-0" X 2'-0"
60' CORED SLAB UNIT	0.6" Ø L.R. STRAND
CAMBER (SLAB ALONE IN PLACE)	3 3/8" ↑
DEFLECTION DUE TO SUPERIMPOSED DEAD LOAD**	1/2" ↓
FINAL CAMBER	2 7/8" ↑

\*\* INCLUDES FUTURE WEARING SURFACE

**BILL OF MATERIAL FOR VERTICAL CONCRETE BARRIER RAIL**

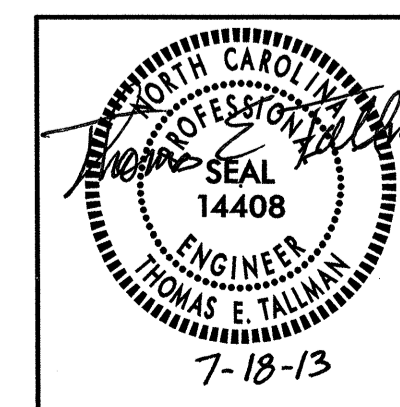
BAR	BARS PER PAIR OF EXTERIOR UNITS	TOTAL NO.	SIZE	TYPE	LENGTH	WEIGHT
60' UNIT						
*B23	80	80	#5	STR	16'-11"	1,412
*S13	138	138	#5	2	7'-2"	1,032
*EPOXY COATED REINFORCING STEEL					LBS.	2,444
CLASS AA CONCRETE					CU. YDS.	16.2
TOTAL VERTICAL CONCRETE BARRIER RAIL					LN. FT.	120.15

**GRADE 270 STRANDS**

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

**CONCRETE RELEASE STRENGTH**

UNIT	PSI
60' UNITS	4,800



PROJECT NO. B-5163  
ROCKINGHAM COUNTY  
 STATION: 15+53.00 -L-

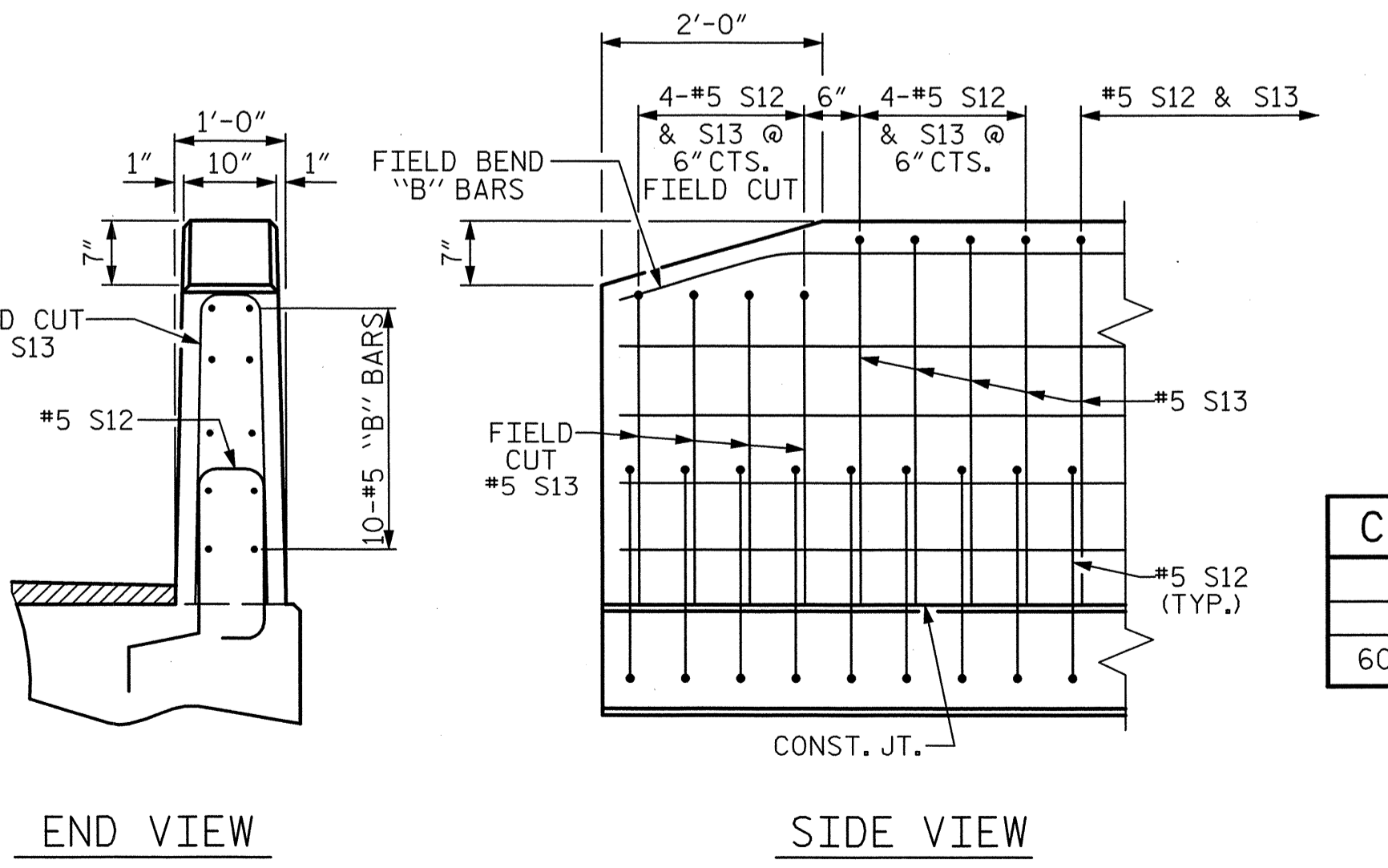
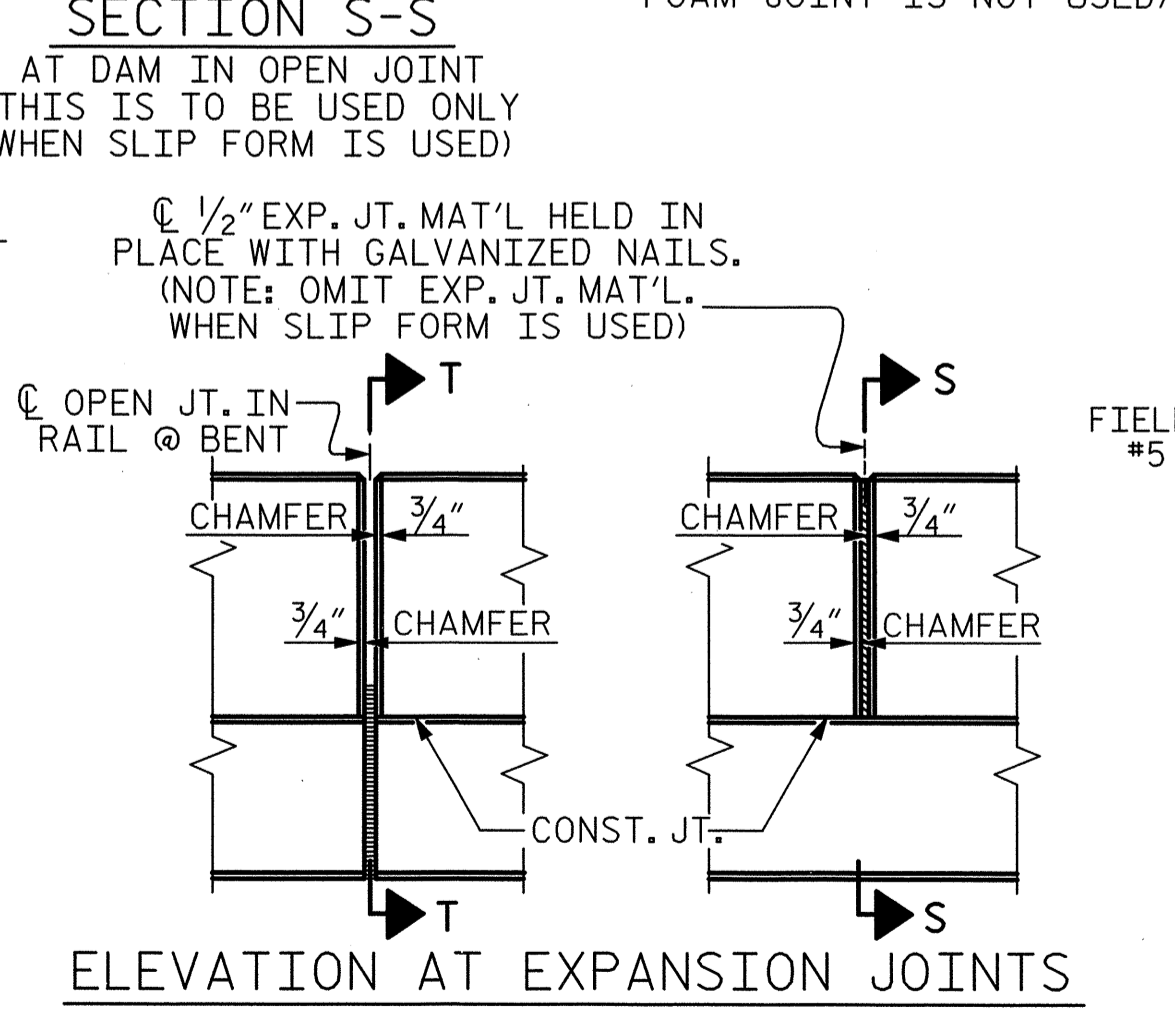
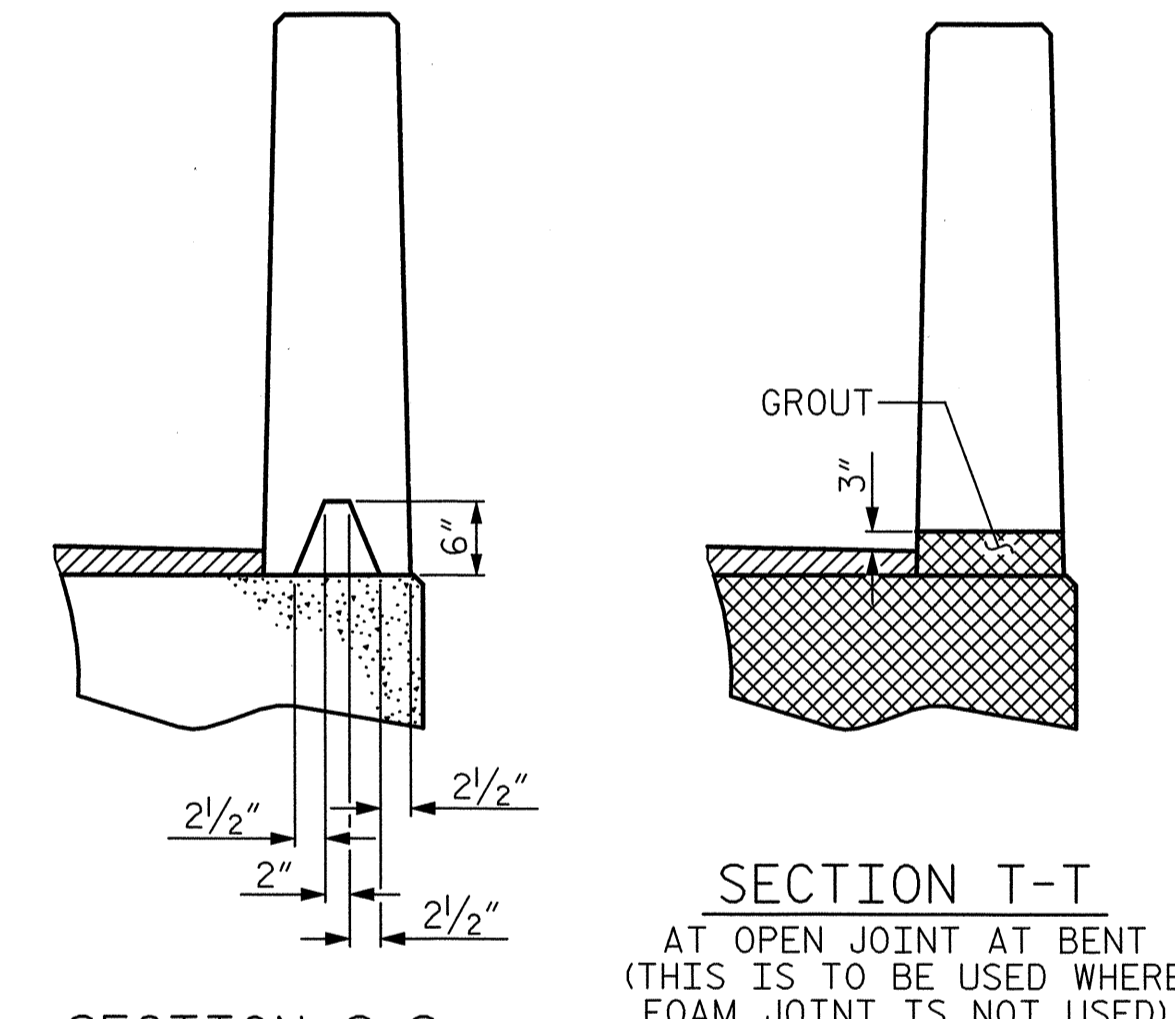
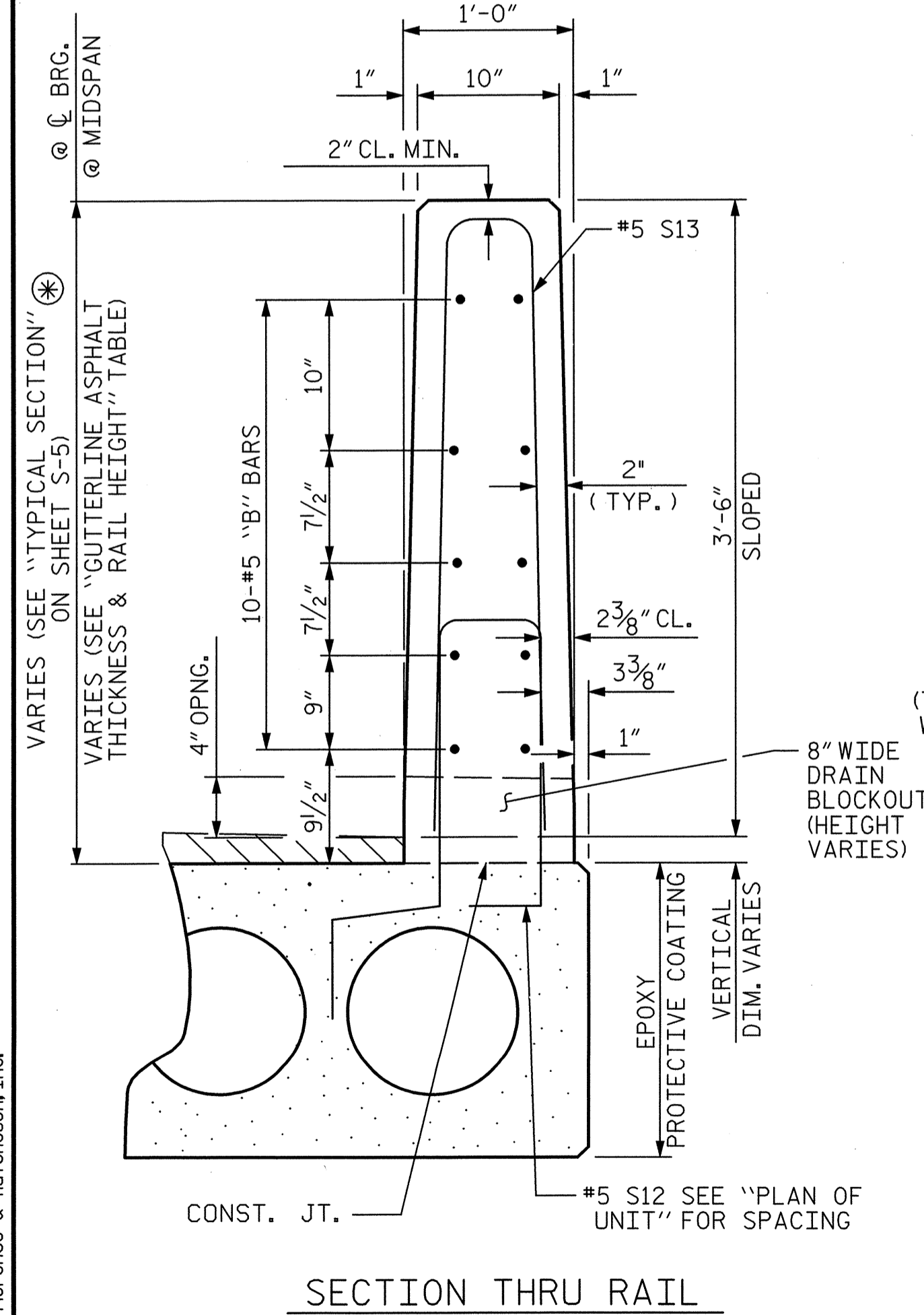
SHEET 5 OF 9

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

**STANDARD**  
 3'-0" X 2'-0"  
 PRESTRESSED CONCRETE  
 CORED SLAB UNIT  
 SPAN "A"

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S-9
1			3			TOTAL SHEETS 24
2			4			24

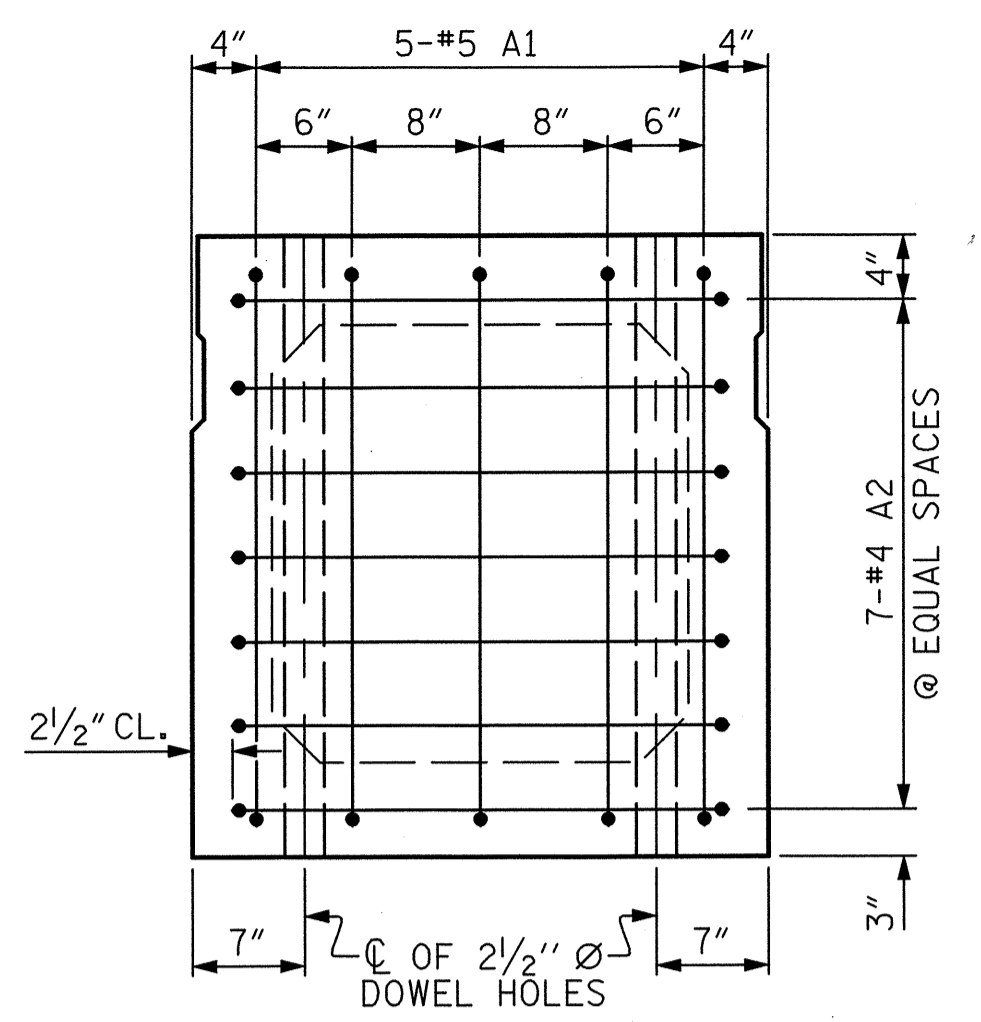
INCREASE IN ASPHALT THICKNESS AND RAIL HEIGHTS REQUIRED AT BEGINNING OF SPAN "A" TO ACCOMMODATE VERTICAL CURVE ON PORTION OF SPAN "A".



ASSEMBLED BY: M. T. MOBLEY DATE: JUL 2013  
 CHECKED BY: T. E. TALLMAN DATE: JUL 2013  
 DRAWN BY: MAA 6/10 REV. 12/11 MAA/AAC  
 CHECKED BY: MKT 7/10

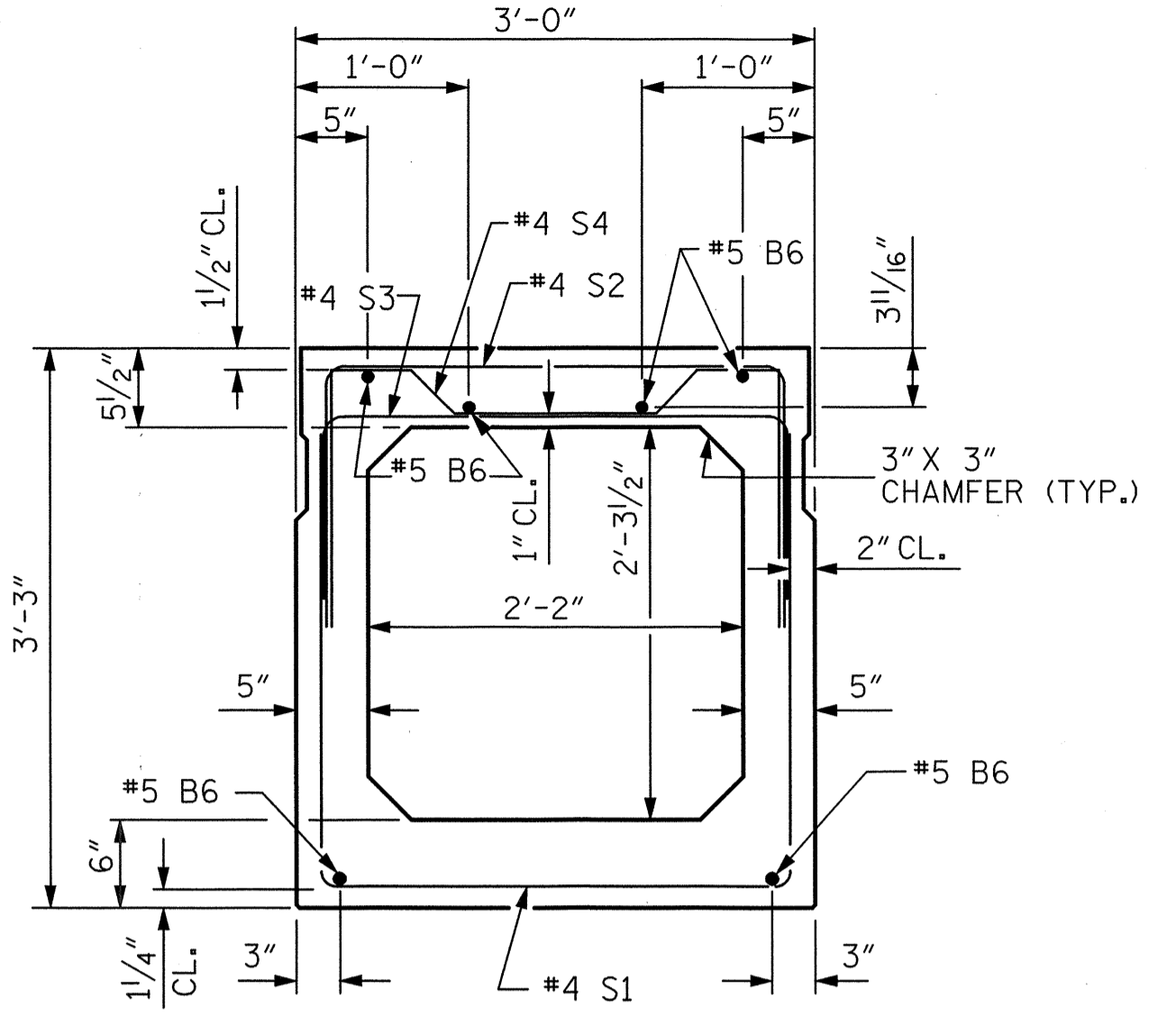
**ICA Engineering**  
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 5121 Kingdom Way, Suite 100 Raleigh, NC 27607  
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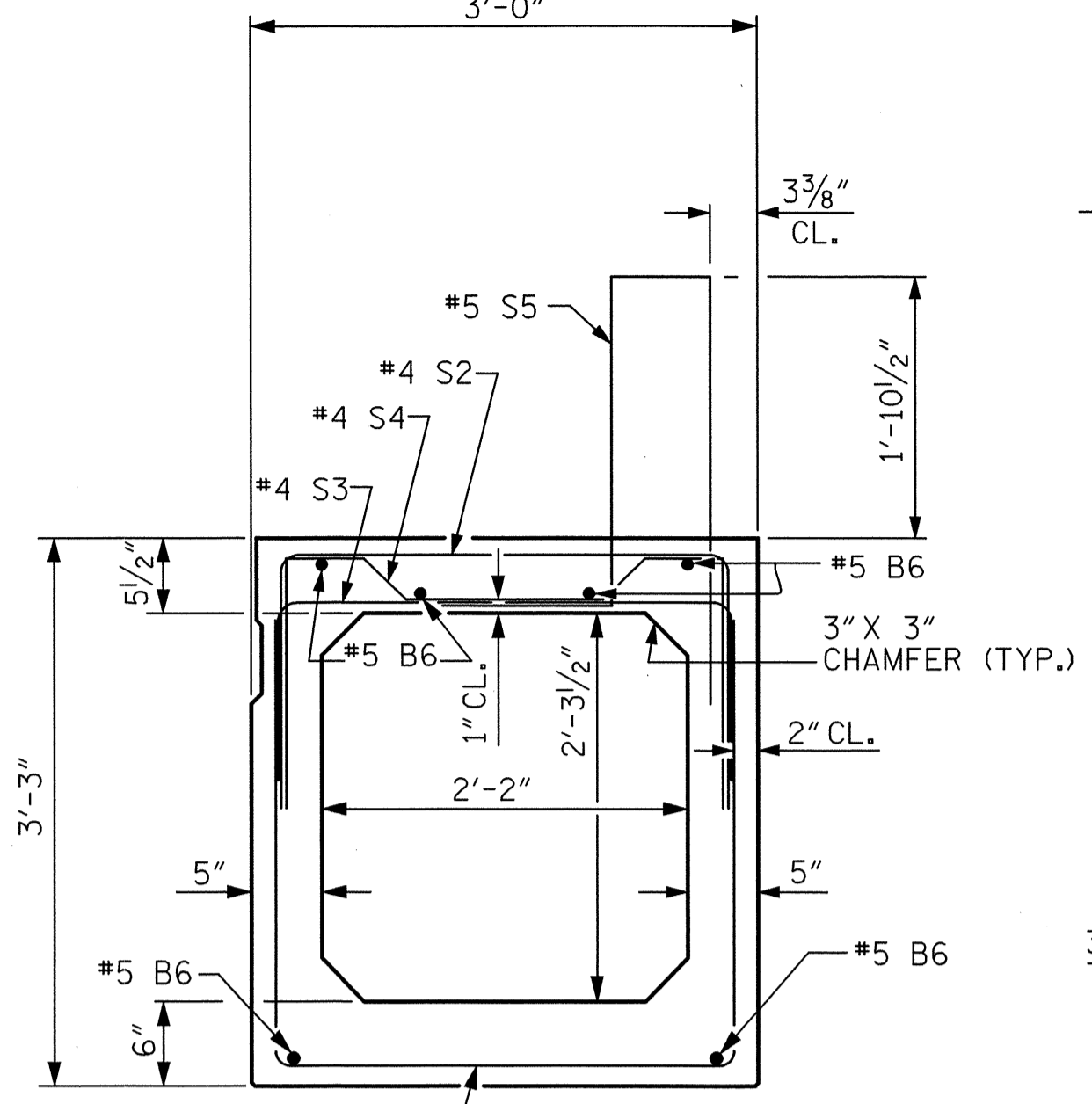
**END ELEVATION**

SHOWING PLACEMENT OF #5 & #4 "A" BARS AND LOCATION OF DOWEL HOLES. (INTERIOR BOX BEAM SECTION SHOWN-EXTERIOR SECTION SIMILAR EXCEPT SHEAR KEY LOCATION, STRAND LAYOUT NOT SHOWN.)



**INTERIOR BOX BEAM SECTION**

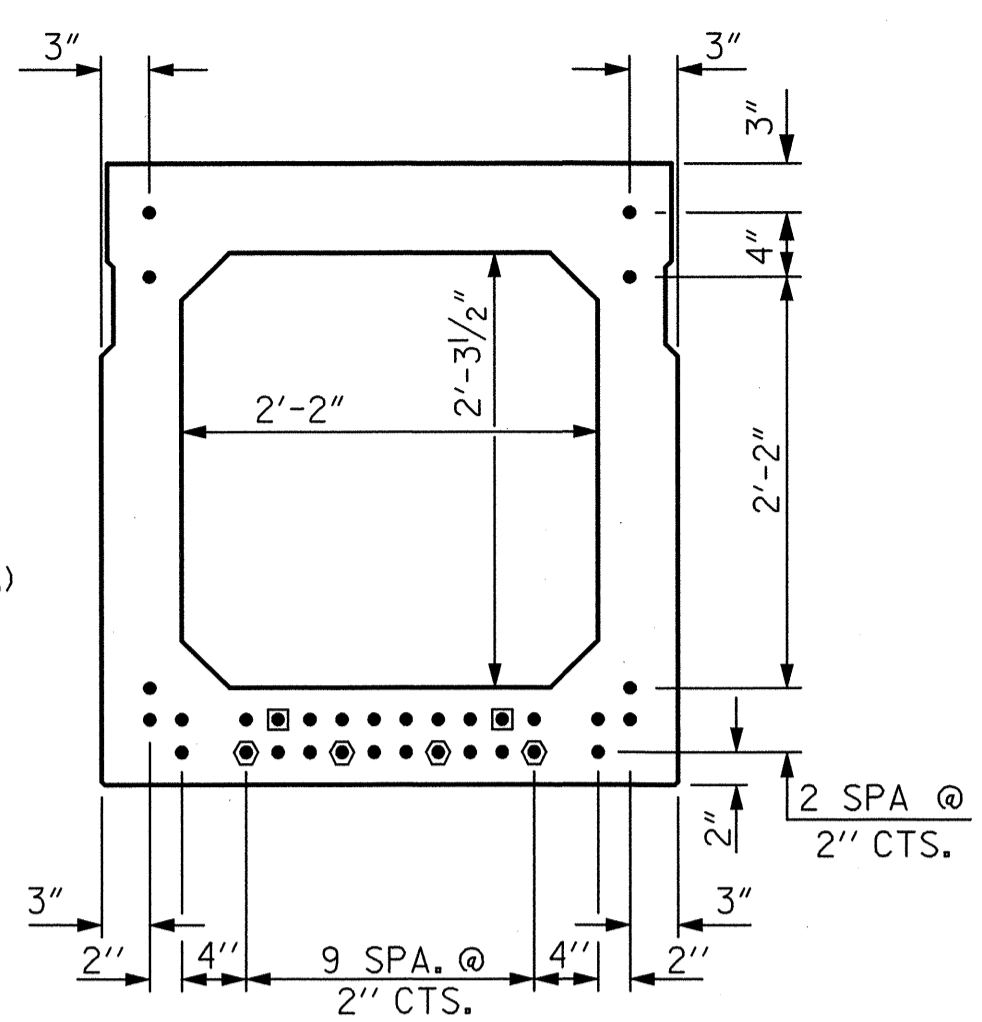
(STRAND LAYOUT NOT SHOWN)



**EXTERIOR BOX BEAM SECTION**

(STRAND LAYOUT NOT SHOWN)

**0.6" Ø LOW RELAXATION STRAND LAYOUT**



**TYPICAL STRAND LOCATION**

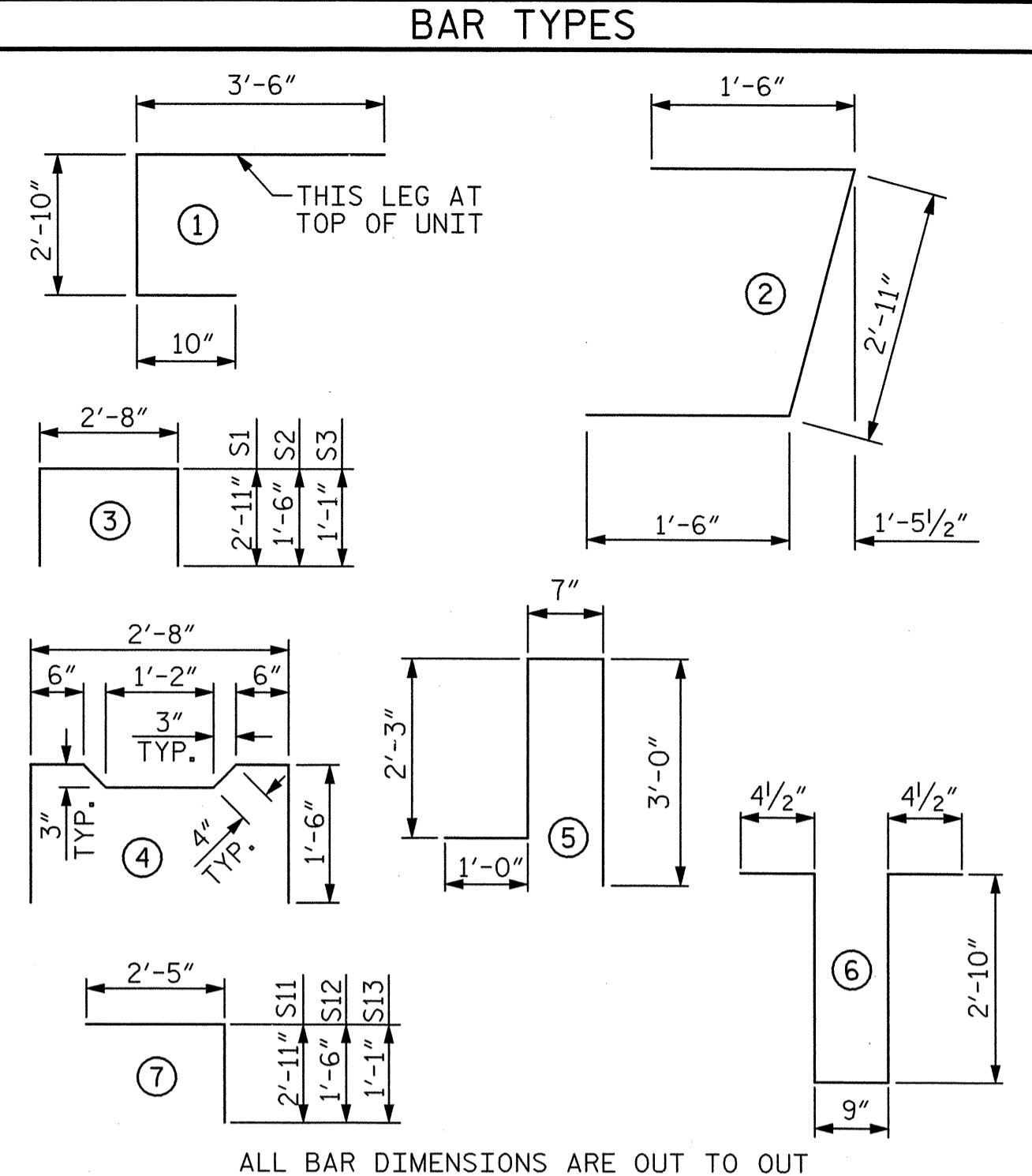
(32 STRANDS REQUIRED)

**DEBONDING LEGEND**

- FULLY BONDED STRANDS
- ◐ STRANDS DEBONDED FOR 4'-0" FROM END OF GIRDER
- ◑ STRANDS DEBONDED FOR 12'-0" FROM END OF GIRDER

BOND SHALL BE BROKEN ON STRANDS AS SHOWN FOR THE SPECIFIED LENGTH FROM EACH END OF THE BOX BEAM. SEE STANDARD SPECIFICATIONS ARTICLE 1078-7.

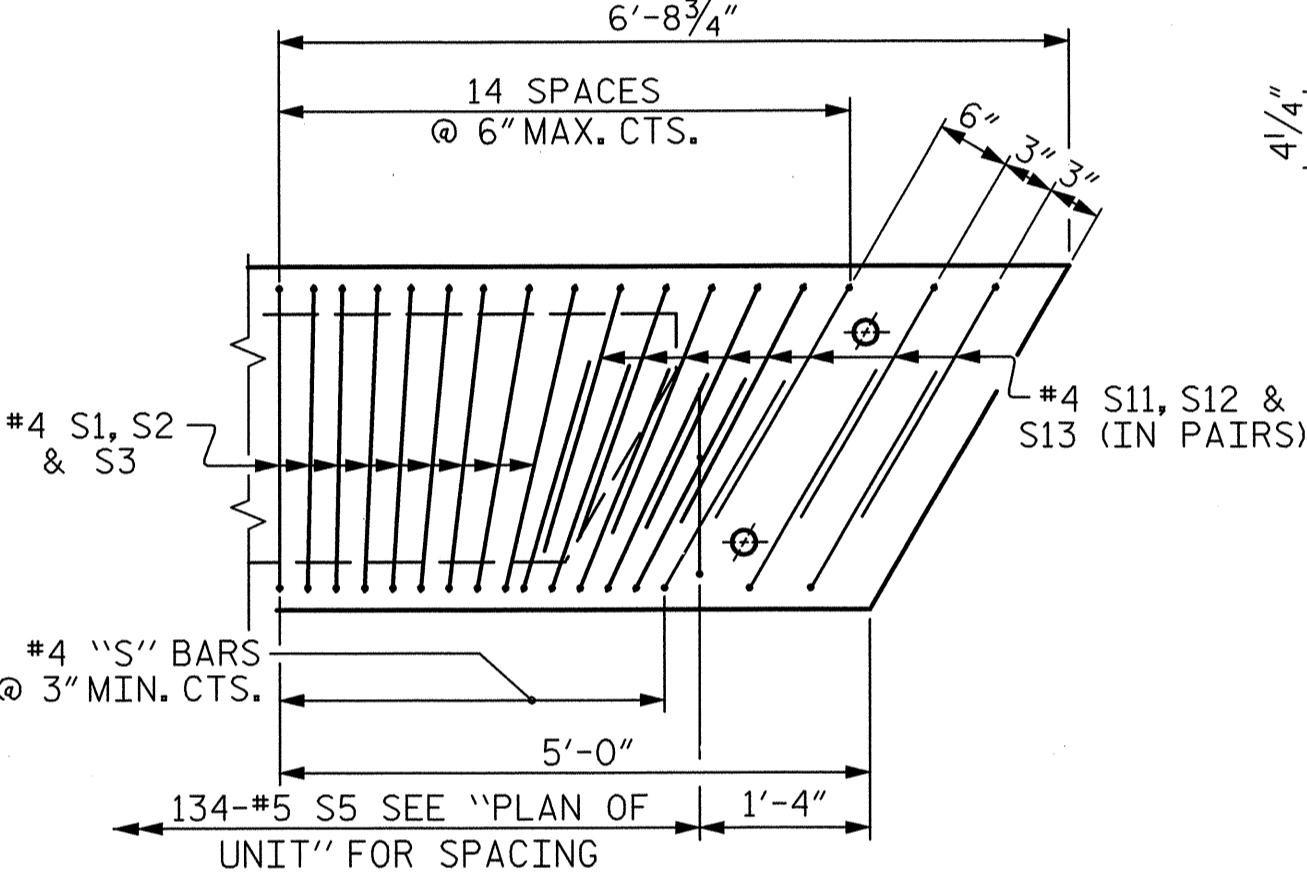
GRADE 270 STRANDS	
AREA ( SQUARE INCHES )	0.217
ULTIMATE STRENGTH ( LBS. PER STRAND )	58,600
APPLIED PRESTRESS ( LBS. PER STRAND )	43,950



ALL BAR DIMENSIONS ARE OUT TO OUT

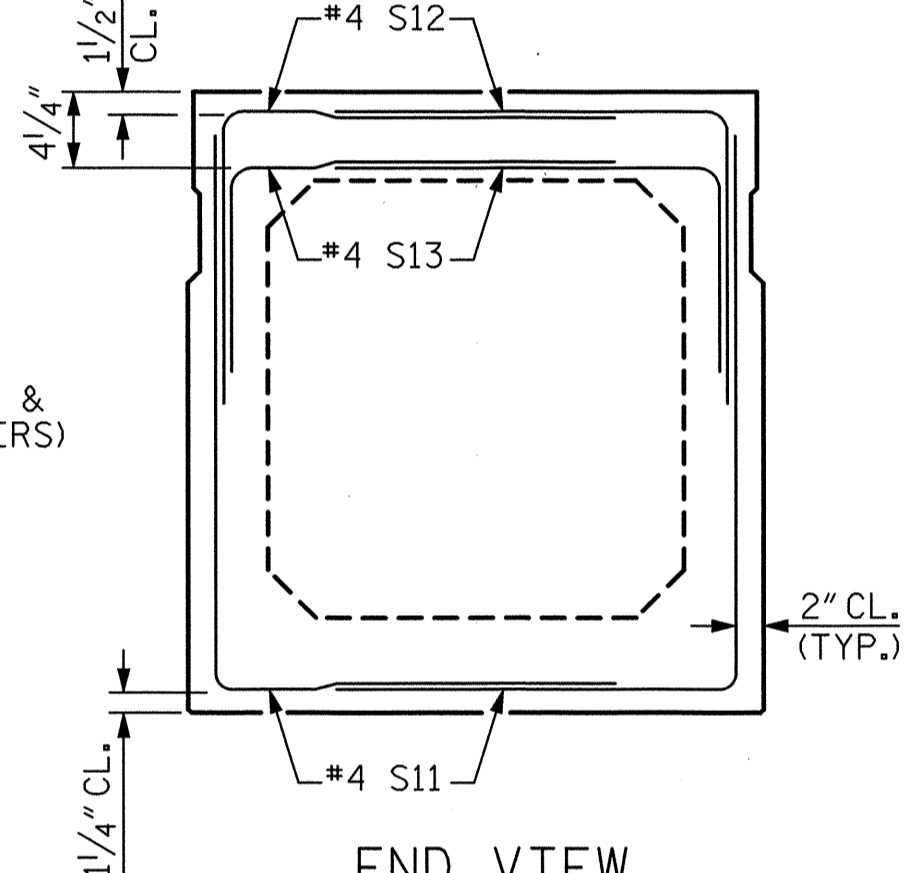
**BILL OF MATERIAL FOR ONE BOX BEAM SECTION**

BAR	NUMBER	SIZE	TYPE	EXTERIOR UNIT		INTERIOR UNIT	
				LENGTH	WEIGHT	LENGTH	WEIGHT
A1	10	#5	1	7'-2"	75	7'-2"	75
A2	44	#4	2	5'-11"	174	5'-11"	174
B6	12	#5	STR	50'-11"	637	50'-11"	637
K1	15	#4	6	7'-2"	72	7'-2"	72
K2	10	#4	STR	2'-10"	19	2'-10"	19
S1	77	#4	3	8'-6"	437	8'-6"	437
S2	77	#4	3	5'-8"	291	5'-8"	291
S3	135	#4	3	4'-10"	436	4'-10"	436
S4	58	#4	4	5'-10"	226	5'-10"	226
S11	32	#4	7	5'-4"	114	5'-4"	114
S12	32	#4	7	3'-11"	84	3'-11"	84
S13	32	#4	7	3'-6"	75	3'-6"	75
*S5	134	#5	5	6'-10"	955	--	--
REINFORCING STEEL				2640	LBS.	2640	LBS.
*EPOXY COATED REINF. STEEL				955	LBS.		
7500 P.S.I. CONCRETE				19.7	CU. YDS.	19.6	CU. YDS.
0.6" Ø L.R. STRANDS				No.	32	No.	32



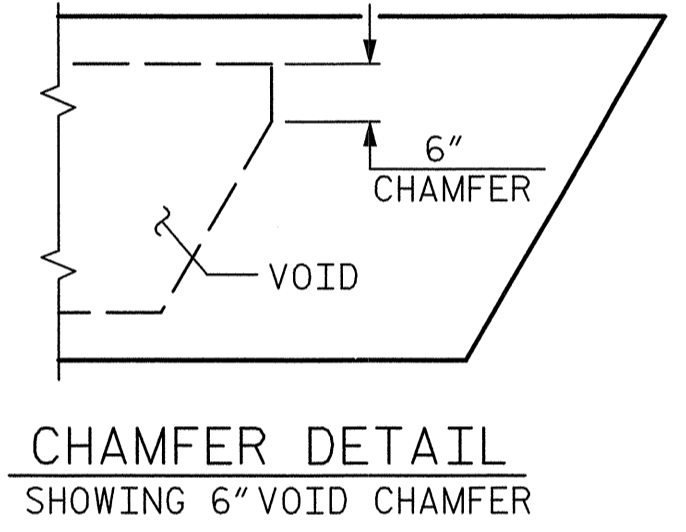
**DETAIL "B"**

EXTERIOR UNIT SHOWN, INTERIOR UNIT SIMILAR EXCEPT OMIT #5 S5 BARS, "B" BARS AND "A" BARS NOT SHOWN.



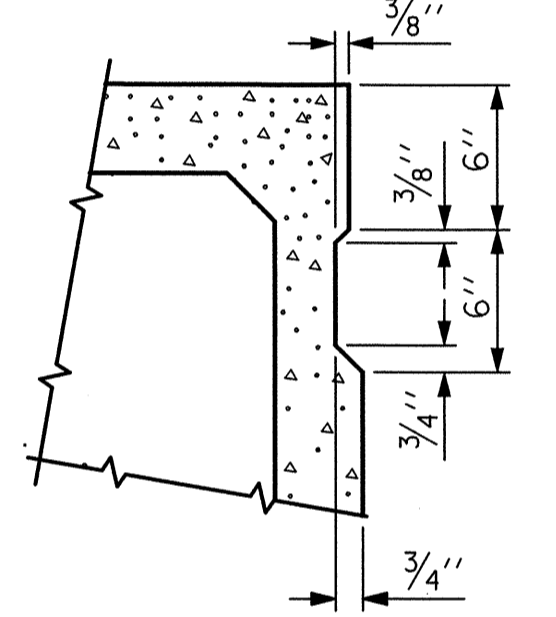
**END VIEW**

(SHOWING #4 "S" BARS IN END OF BEAM)



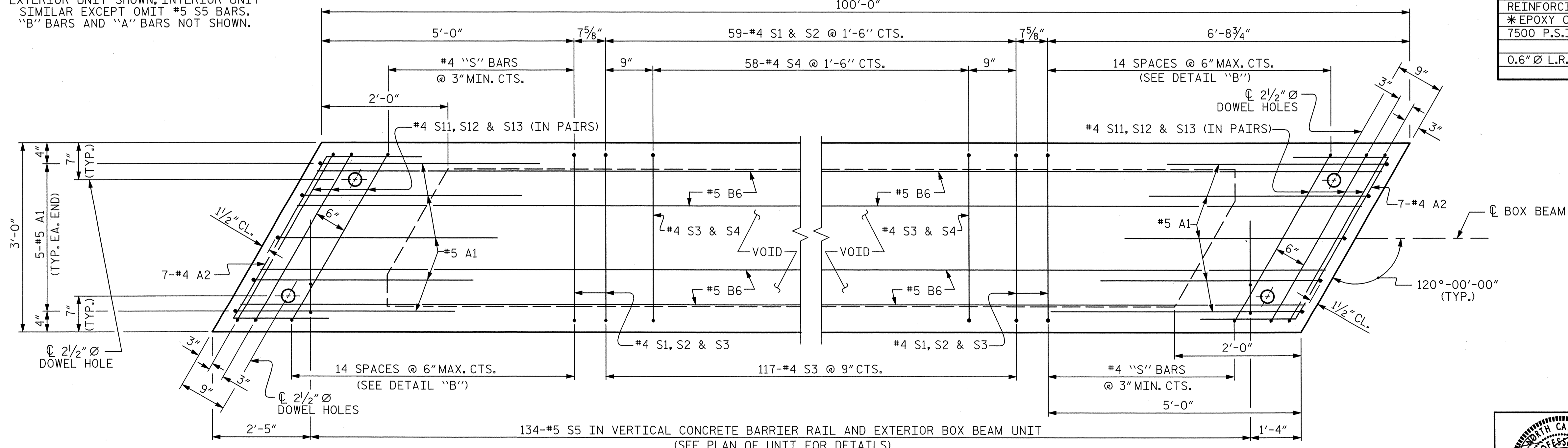
**CHAMFER DETAIL**

SHOWING 6" VOID CHAMFER



**SHEAR KEY DETAIL**

NOTE: OMIT SHEAR KEY ON OUTSIDE FACE OF EXTERIOR BOX BEAMS.

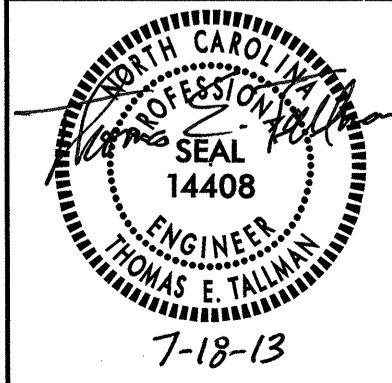


**PLAN OF BOX BEAM**

EXTERIOR UNIT SHOWN, INTERIOR UNIT SIMILAR EXCEPT OMIT #5 S5 BARS. FOR LOCATION OF DIAPHRAGMS, SEE PLAN OF UNIT. FOR REINFORCING STEEL IN DIAPHRAGMS, SEE DIAPHRAGM DETAILS.

7/15/2013 ICA Engineering 1/k/c Florence & Hutcheson, Inc. design:\p\ba-5163 rockingham 160\plans\B-5163.ed.10.dgn

ASSEMBLED BY : D. H. CARTER	DATE : JUL 2013
CHECKED BY : T. E. TALLMAN	DATE : JUL 2013
DRAWN BY : DGE II/II	
CHECKED BY : TMG II/II	

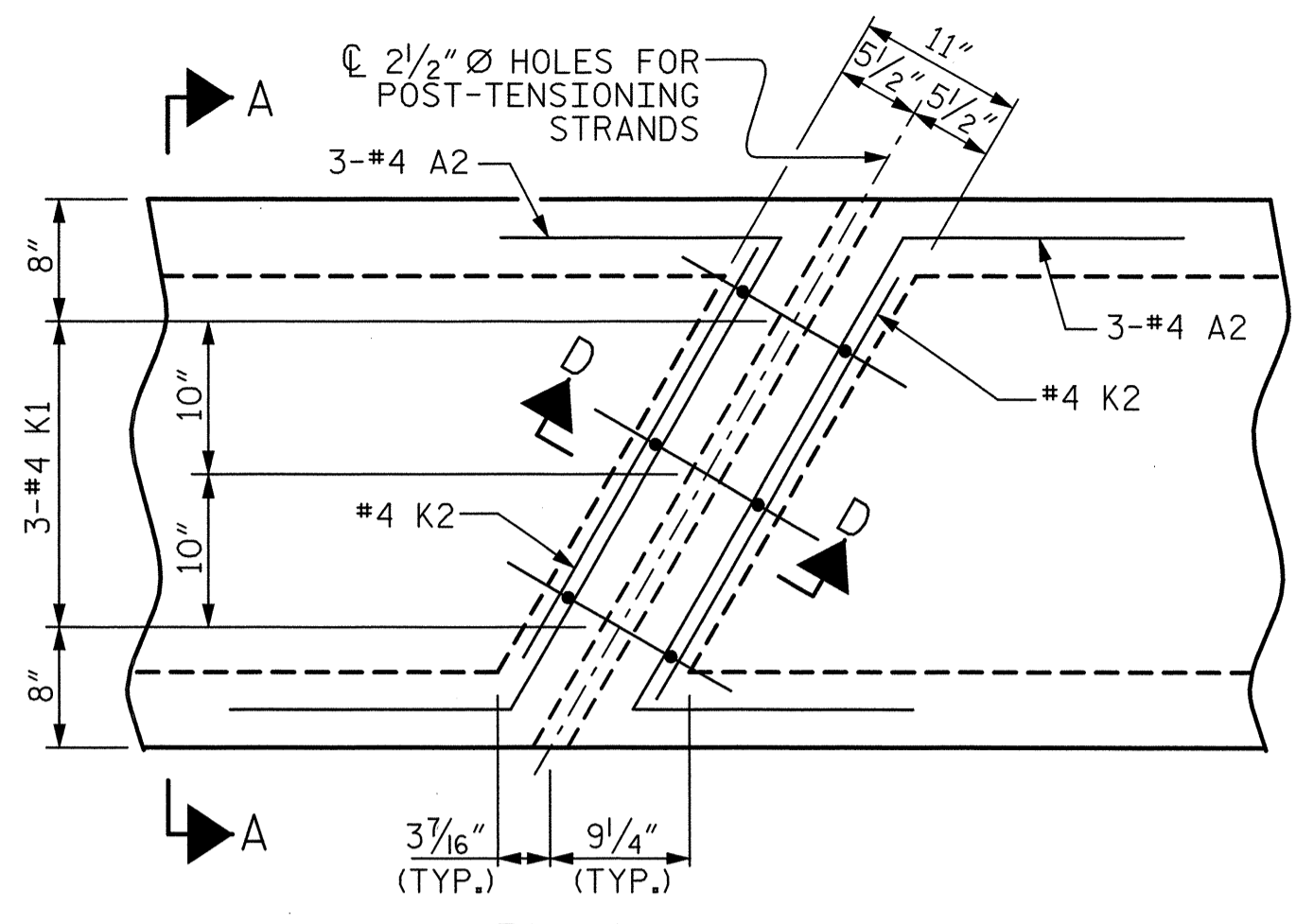


PROJECT NO. B-5163  
 ROCKINGHAM COUNTY  
 STATION: 15+53.00 -L-  
 SHEET 6 OF 9

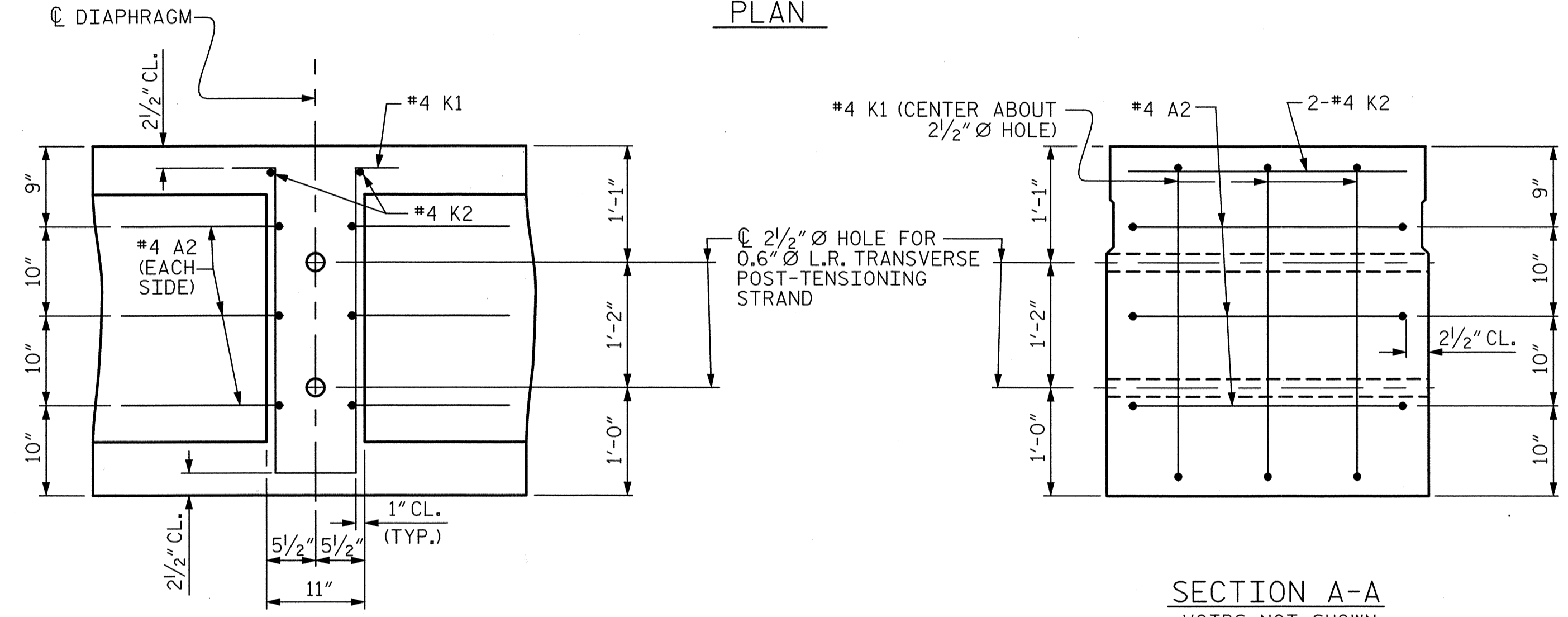
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 STANDARD  
 3'-0" X 3'-3"  
 PRESTRESSED CONCRETE  
 BOX BEAM UNIT  
 SPAN "B"

REVISIONS				SHEET NO. S-10
NO.	BY:	DATE:		
1				TOTAL SHEETS 24
2				

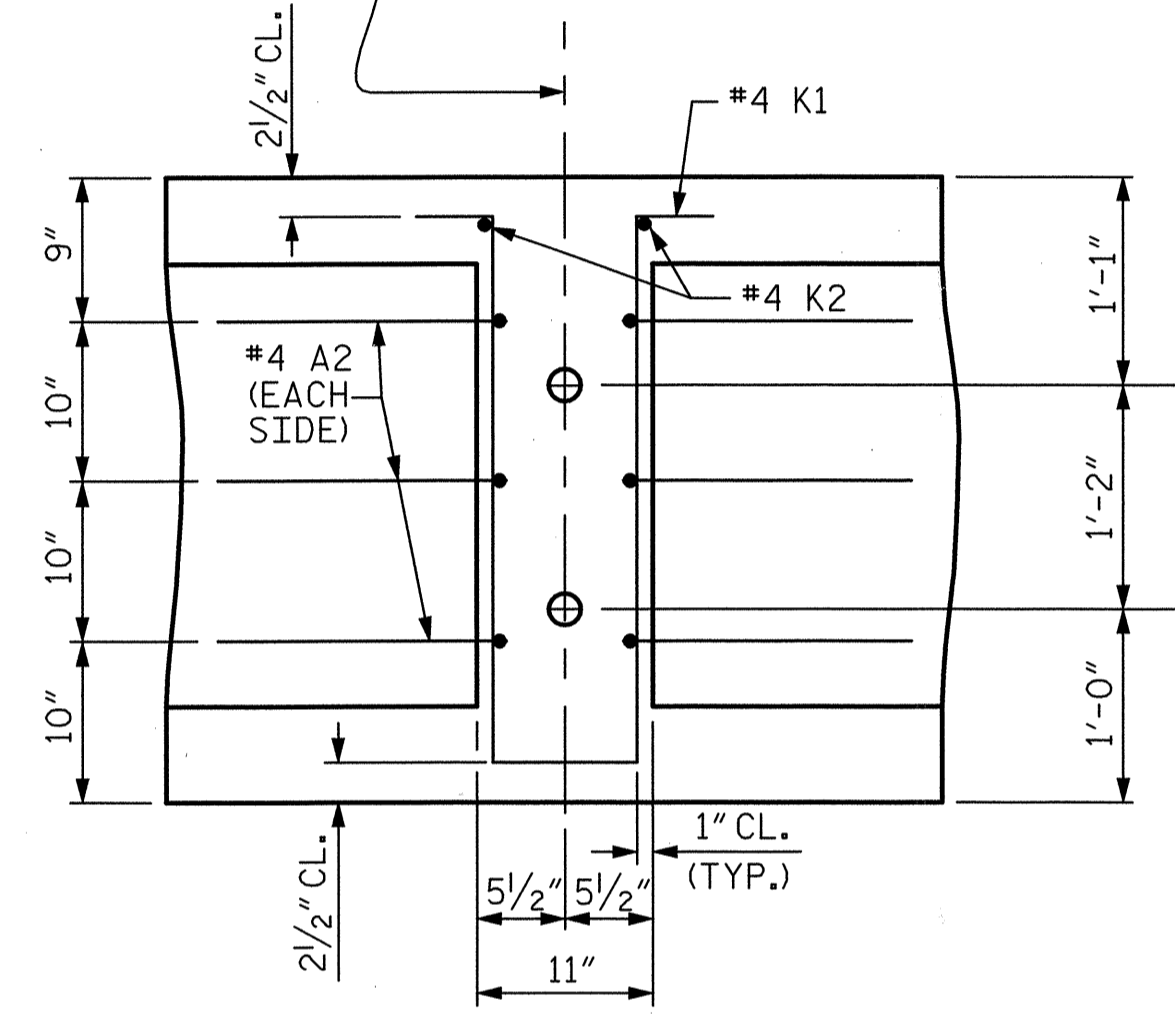




PLAN



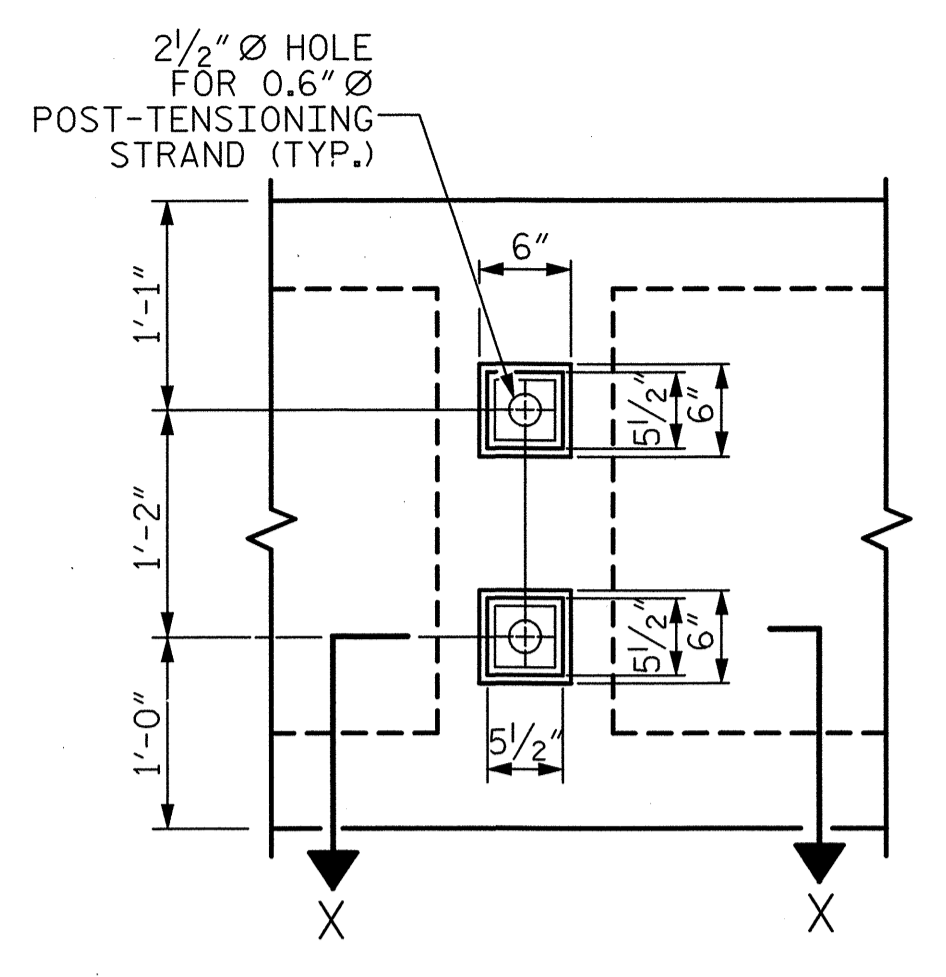
SECTION A-A  
VOIDS NOT SHOWN



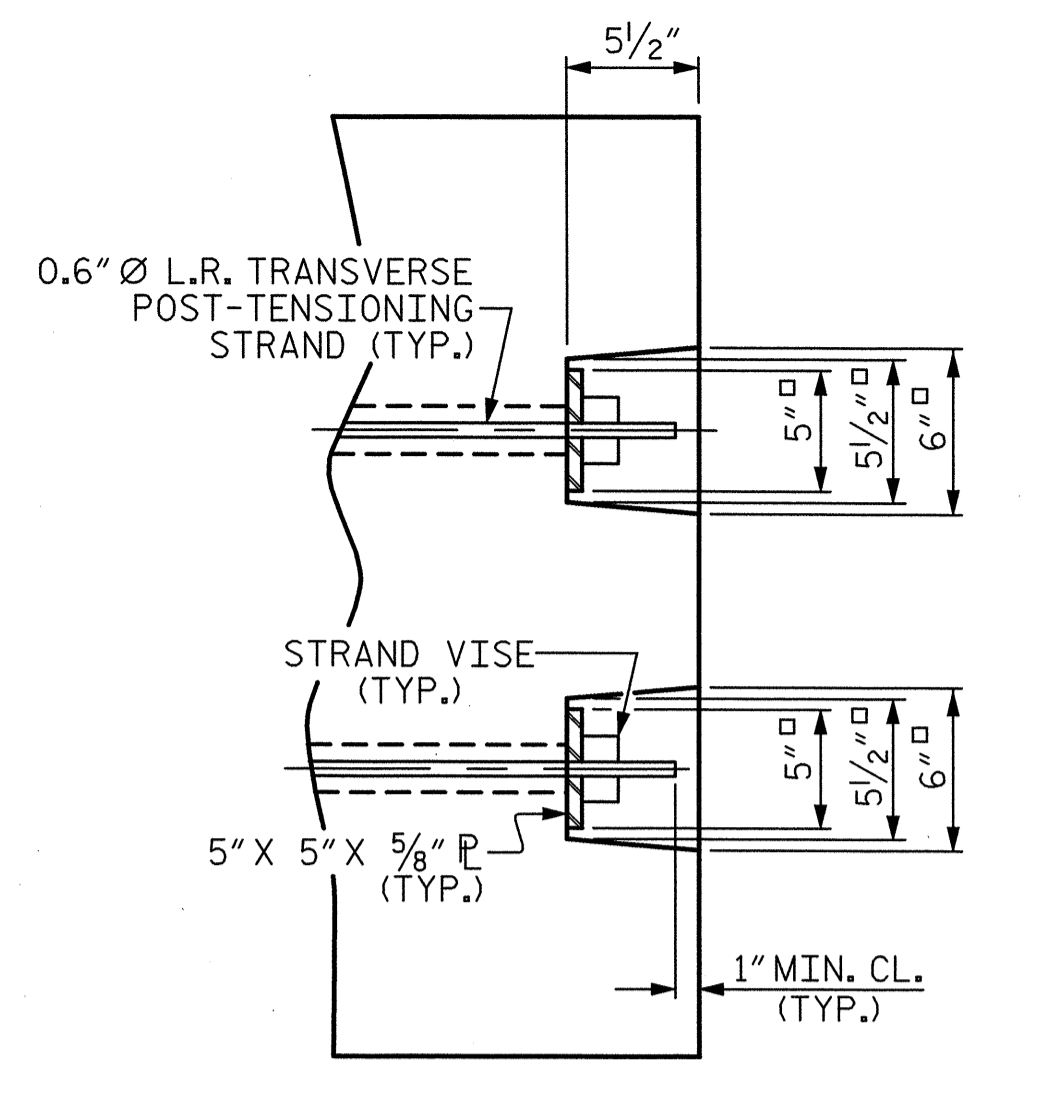
SECTION D-D

DOUBLE DIAPHRAGM DETAILS

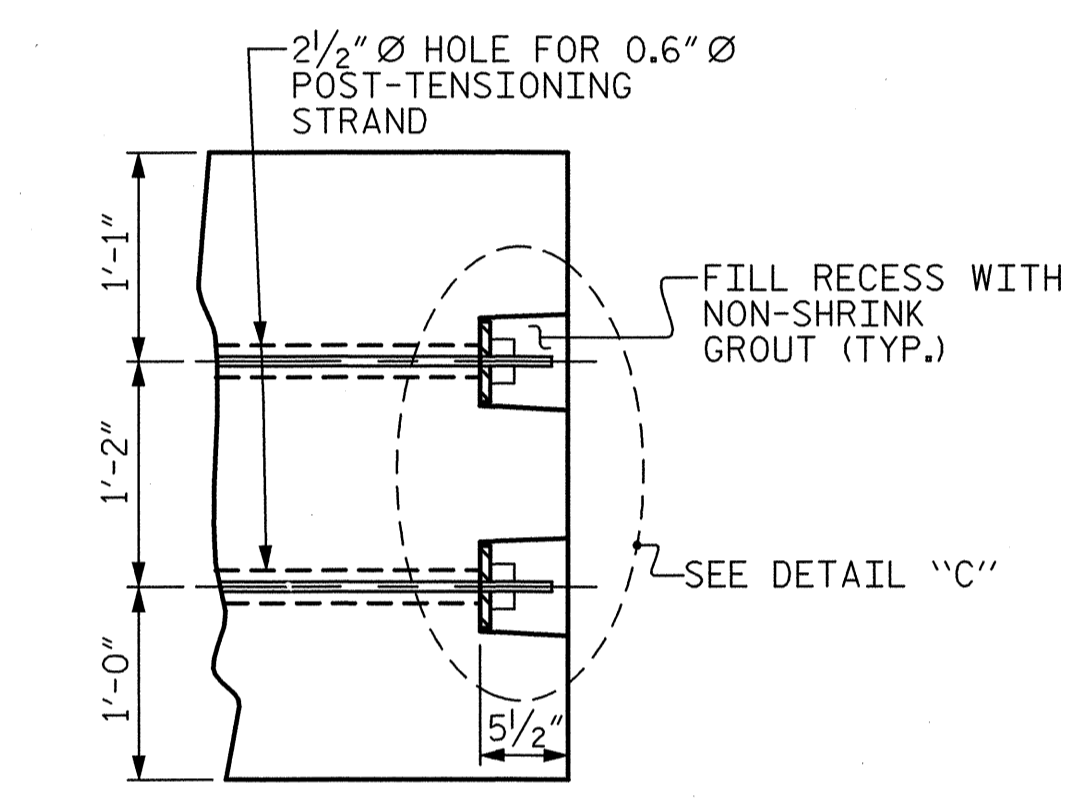
\*4 "S" BARS NOT SHOWN. #4 "S" BARS MAY BE SHIFTED SLIGHTLY TO CLEAR 2 1/2" Ø HOLE.



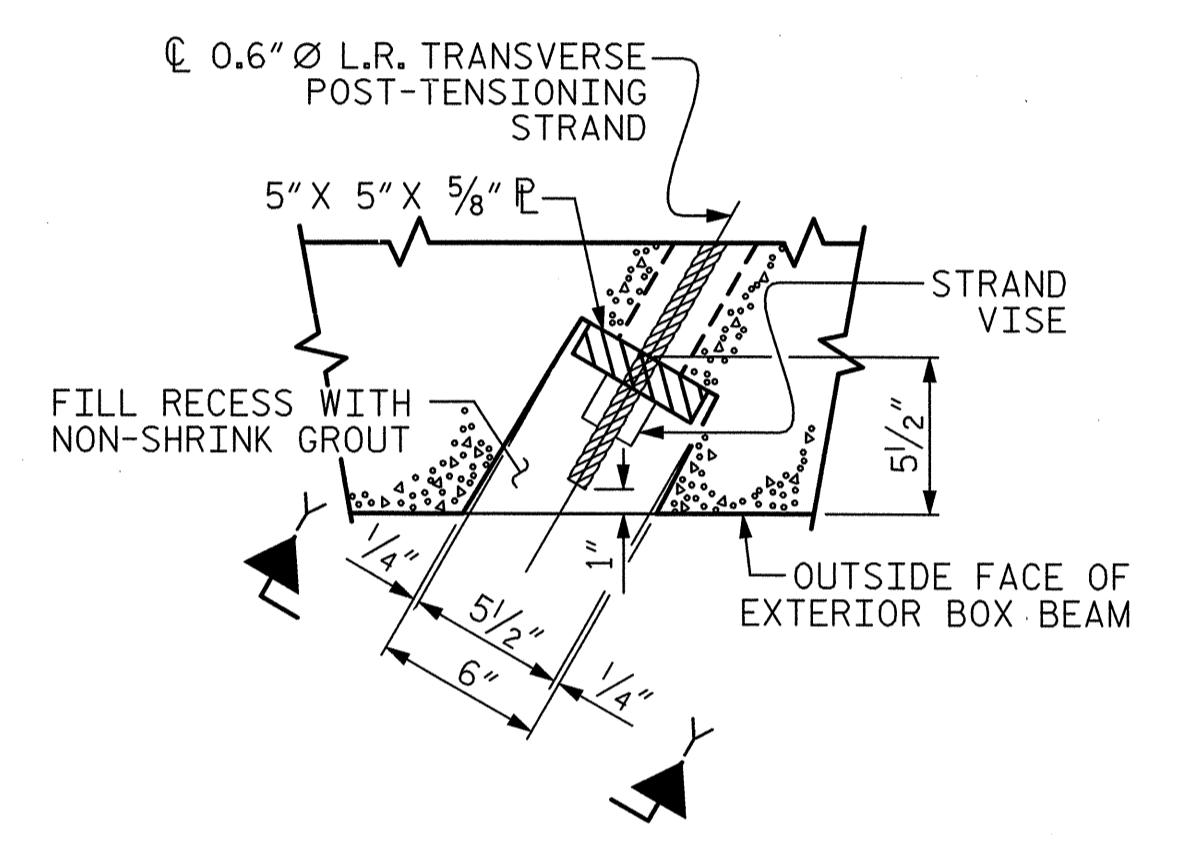
VIEW Y-Y  
SHOWING ELEVATION VIEW OF GROUTED RECESS



DETAIL "C"

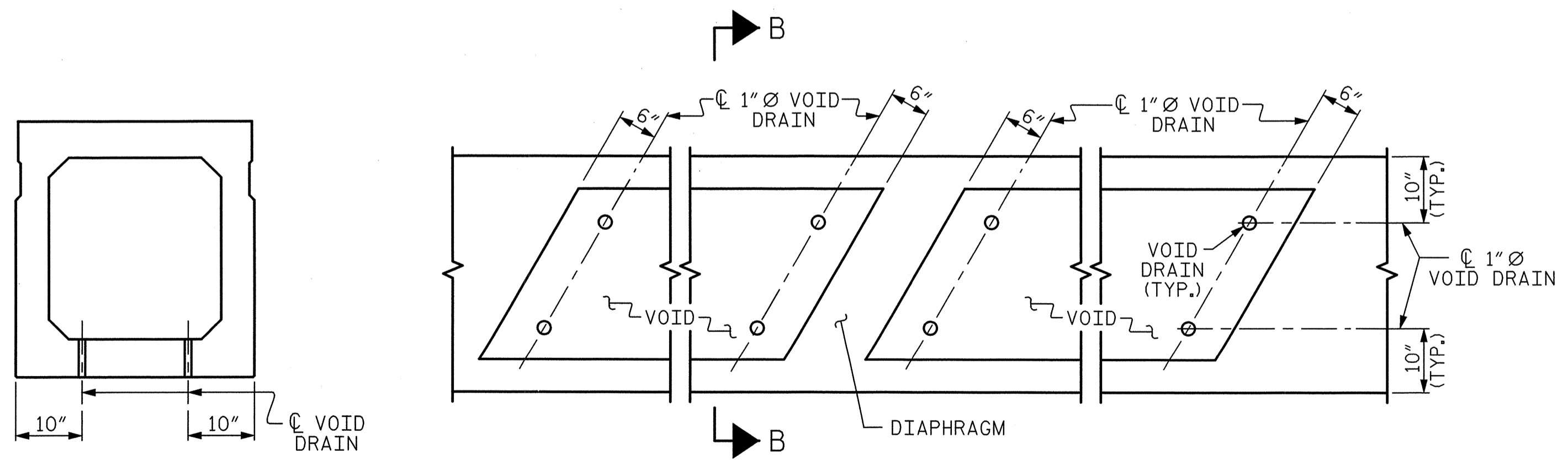


PART SECTION AT RECESS



SECTION X-X  
SHOWING PLAN VIEW OF GROUTED RECESS

ROUTED RECESS DETAIL AT  
END OF POST-TENSIONED STRANDS  
OF EXTERIOR BOX BEAM



SECTION B-B

PART PLAN

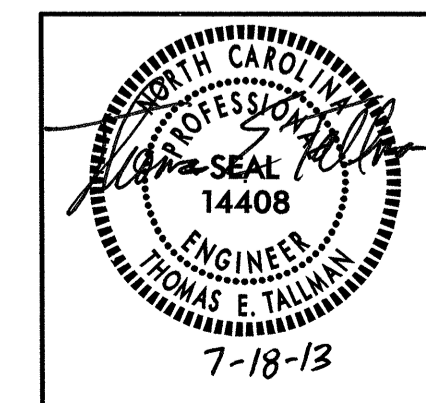
VOID DRAIN DETAILS

(DIMENSIONS SHOWN ARE TYPICAL FOR EACH VOID)

DEAD LOAD DEFLECTION AND CAMBER	
100' BOX BEAM UNIT	3'-0" x 3'-3" 0.6" Ø L.R. STRAND
CAMBER (SLAB ALONE IN PLACE)	3/2" ↑
DEFLECTION DUE TO SUPERIMPOSED DEAD LOAD**	1" ↓
FINAL CAMBER	2 1/2" ↑

\*\* INCLUDES FUTURE WEARING SURFACE

PROJECT NO. B-5163  
ROCKINGHAM COUNTY  
STATION: 15+53.00 -L-  
SHEET 7 OF 9

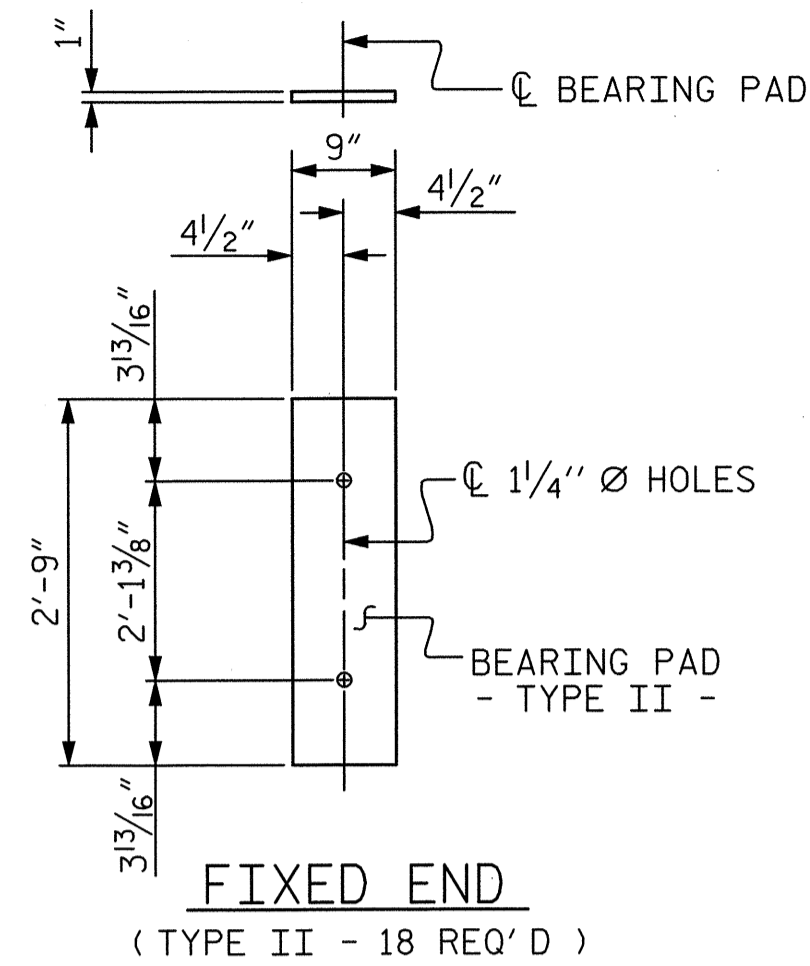


STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
STANDARD  
3'-0" X 3'-3"  
PRESTRESSED CONCRETE  
BOX BEAM UNIT  
SPAN "B"

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S-11
1			3			TOTAL SHEETS
2			4			24

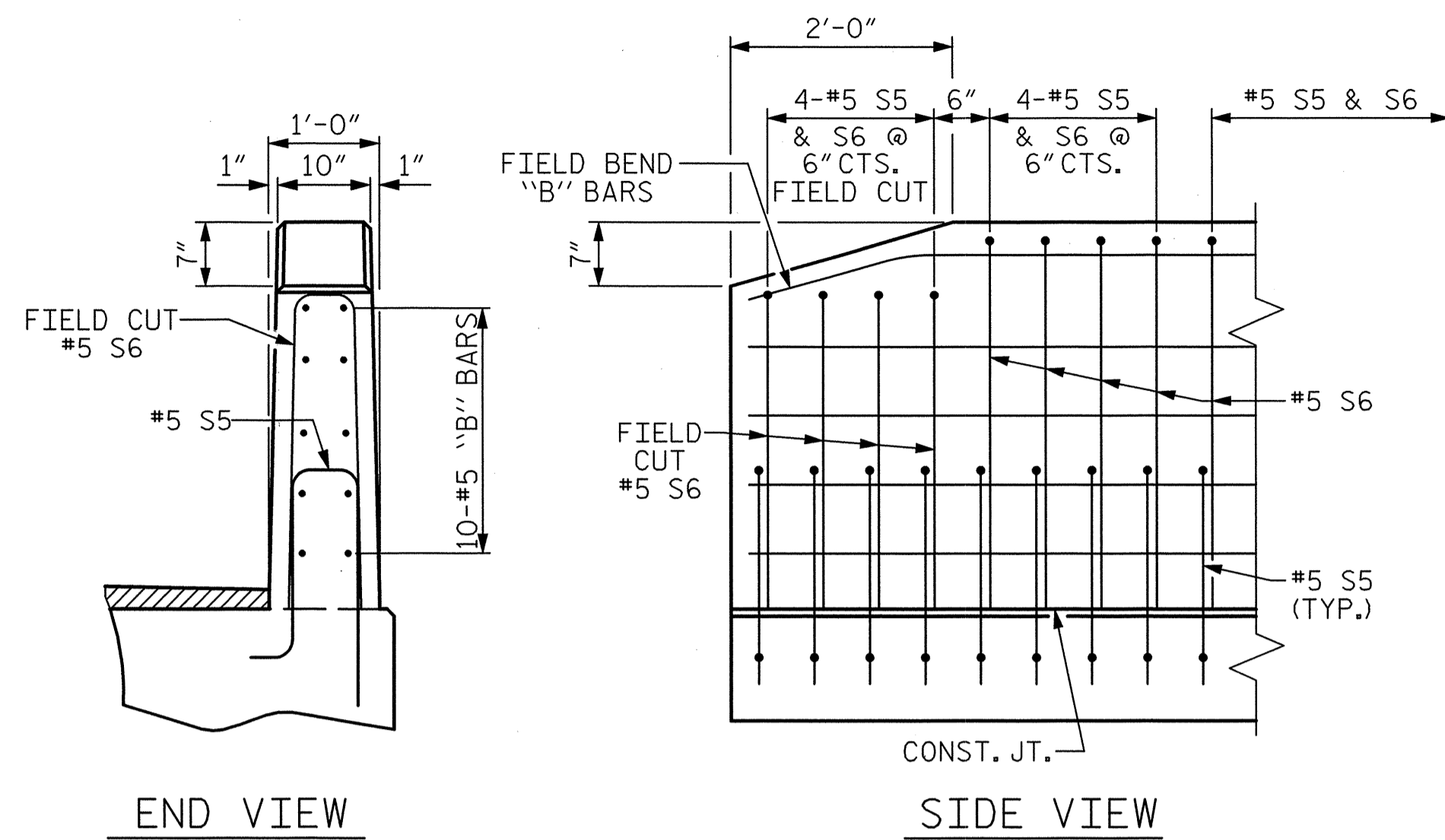
7/15/2013 C:\Users\structure\_design\fp\p-5163-rockingham\_160\plans\B-5163.ed.11.dgn  
 ICA Engineering f/k/a Florence & Hutcheson, Inc.

ASSEMBLED BY : D. H. CARTER DATE : APR 2013  
 CHECKED BY : J. E. MONDOLFI DATE : APR 2013  
 DRAWN BY : DGE 11/11  
 CHECKED BY : TMG 11/11



**ELASTOMERIC BEARING DETAILS**

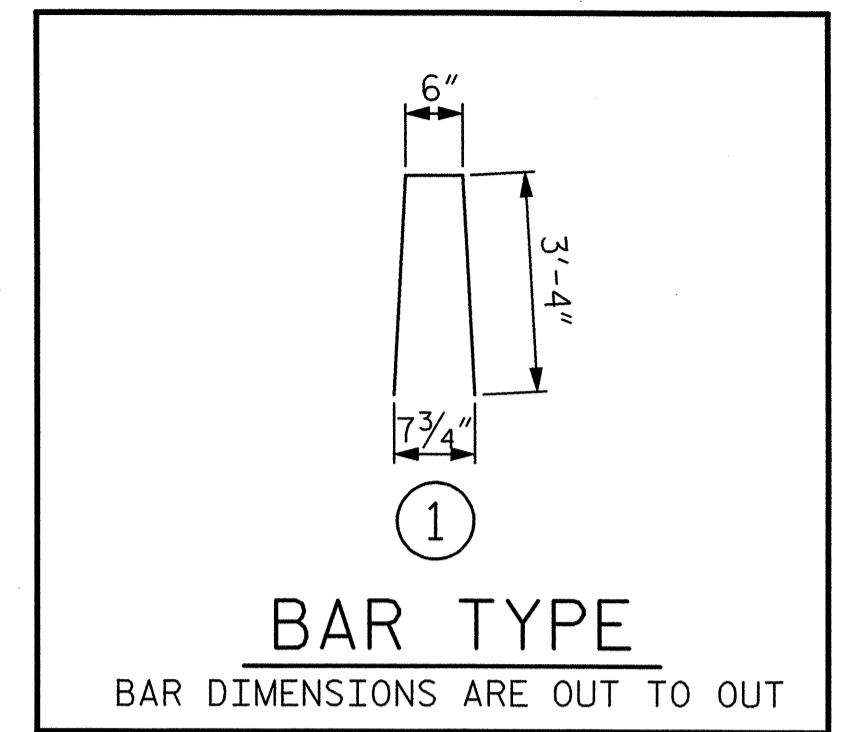
ELASTOMER IN ALL BEARINGS SHALL BE 60 DUROMETER HARDNESS.



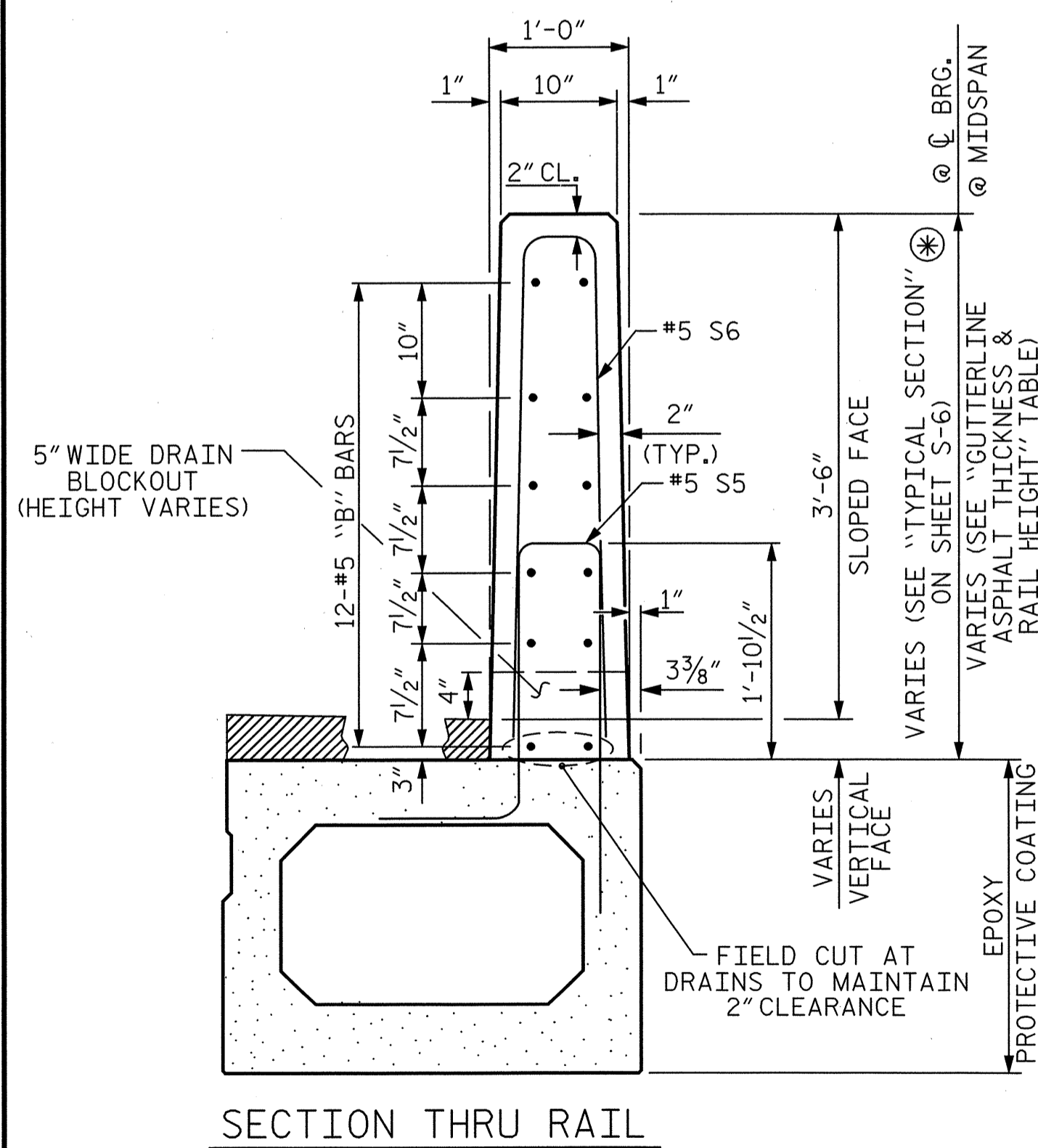
**END OF RAIL DETAILS**

**BOX BEAM UNITS REQUIRED**

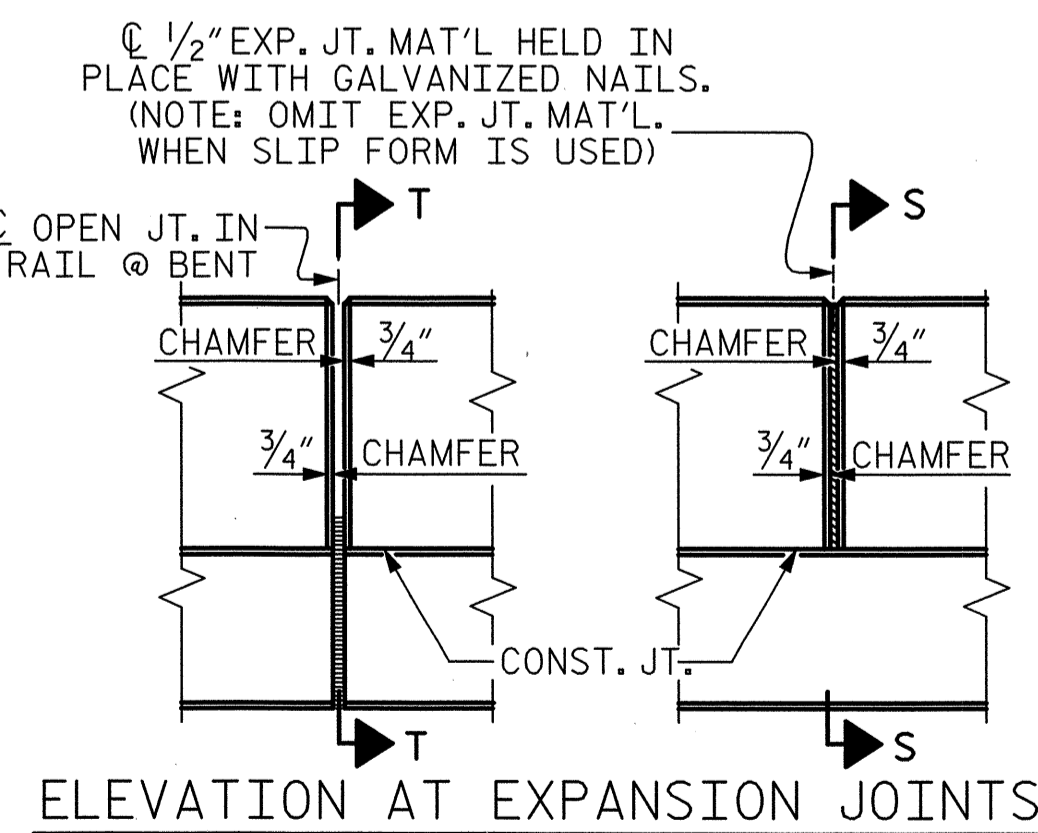
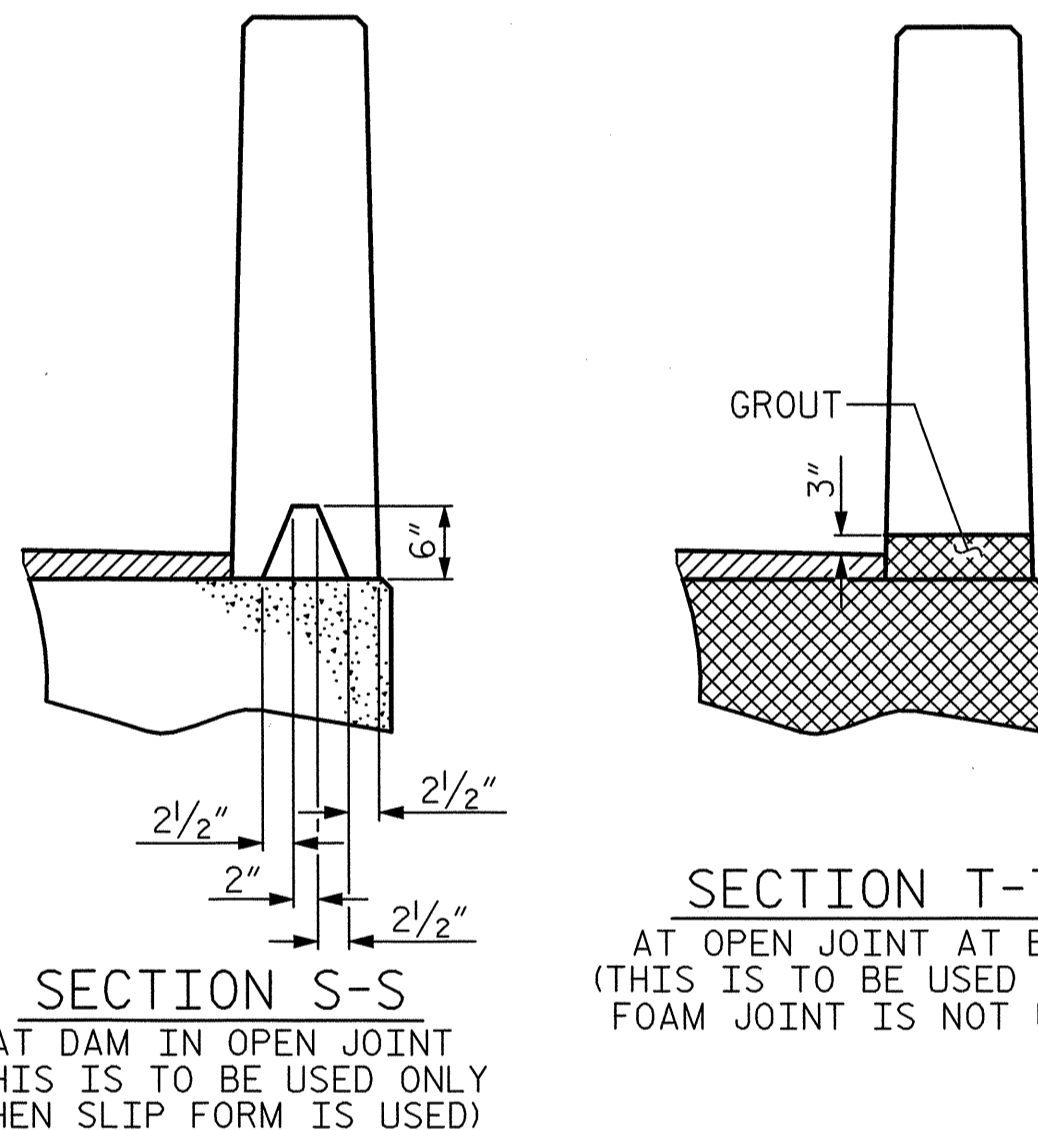
	NUMBER	LENGTH	TOTAL LENGTH
EXTERIOR B.B.	2	100'-0"	200'-0"
INTERIOR B.B.	7	100'-0"	700'-0"
TOTAL	9		900'-0"



⊛ INCREASE IN ASPHALT THICKNESS AND RAIL HEIGHTS REQUIRED AT END OF SPAN "B" TO ACCOMMODATE VERTICAL CURVE ON PORTION OF SPAN "B".



**SECTION THRU RAIL**



**ELEVATION AT EXPANSION JOINTS**

**BILL OF MATERIAL FOR VERTICAL CONCRETE BARRIER RAIL**

BAR	BARS PER PAIR OF EXTERIOR UNITS	SIZE	TYPE	LENGTH	WEIGHT
	100' UNIT				
*B12	192	#5	STR	14'-3"	2854
*S6	268	#5	1	7'-2"	2003
*EPOXY COATED REINFORCING STEEL				LBS.	4857
CLASS AA CONCRETE				CU.YDS.	26.9
TOTAL VERTICAL CONCRETE BARRIER RAIL				LN. FT.	200.15

**GUTTERLINE ASPHALT THICKNESS & RAIL HEIGHT**

	ASPHALT OVERLAY THICKNESS @ MID-SPAN	RAIL HEIGHT @ MID-SPAN
	NORMAL CROWN	
100' UNITS	2"	3'-8 1/2"

**VERTICAL CONCRETE BARRIER RAIL DETAILS**

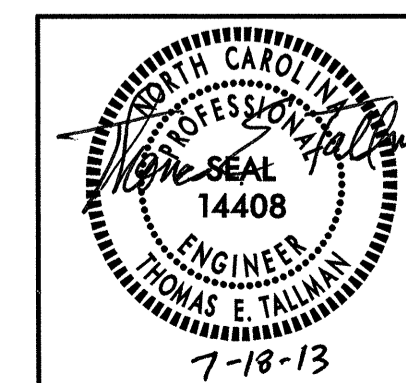
THE DRAIN OPENING AT THE GUTTERLINE SHALL BE 4" X 8". THE HEIGHT OF THE BLOCKOUT IN THE VERTICAL CONCRETE BARRIER RAIL SHALL EXTEND FROM THE TOP OF THE CORED SLAB UNIT TO THE TOP OF THE DRAIN OPENING.

APPLY EPOXY PROTECTIVE COATING TO EXTERIOR FACE OF THE EXTERIOR CORED SLAB UNITS THAT REQUIRE DRAINS IN THE BARRIER RAIL.

7/15/2013 1:48:53 PM C:\Users\jflawrence\Documents\Projects\5163\rockingham\160\plans\B-5163.sd.12.dgn ICA Engineering f/k/a Florence & Hutcheson, Inc.

ASSEMBLED BY : D. H. CARTER DATE : JUL 2013  
 CHECKED BY : T. E. TALLMAN DATE : JUL 2013  
 DRAWN BY : DGE 10/11  
 CHECKED BY : TMG 11/11

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ROCKINGHAM COUNTY  
 STATION: 15+53.00 -L-  
 SHEET 8 OF 9

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 STANDARD  
 3'-0" X 3'-3"  
 PRESTRESSED CONCRETE  
 BOX BEAM UNIT  
 SPAN "B"

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	5-12
1			3			TOTAL SHEETS 24
2			4			



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.)

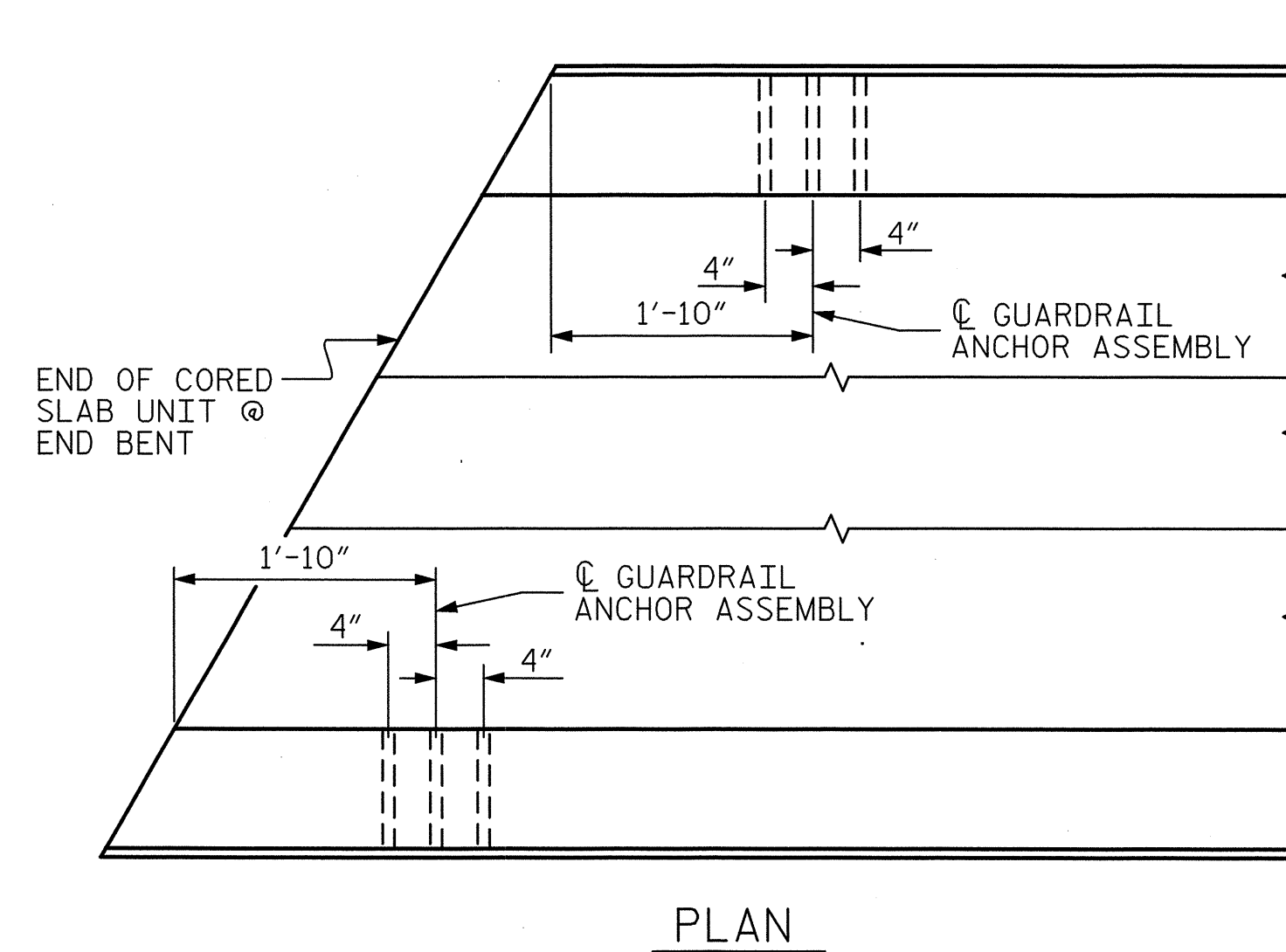
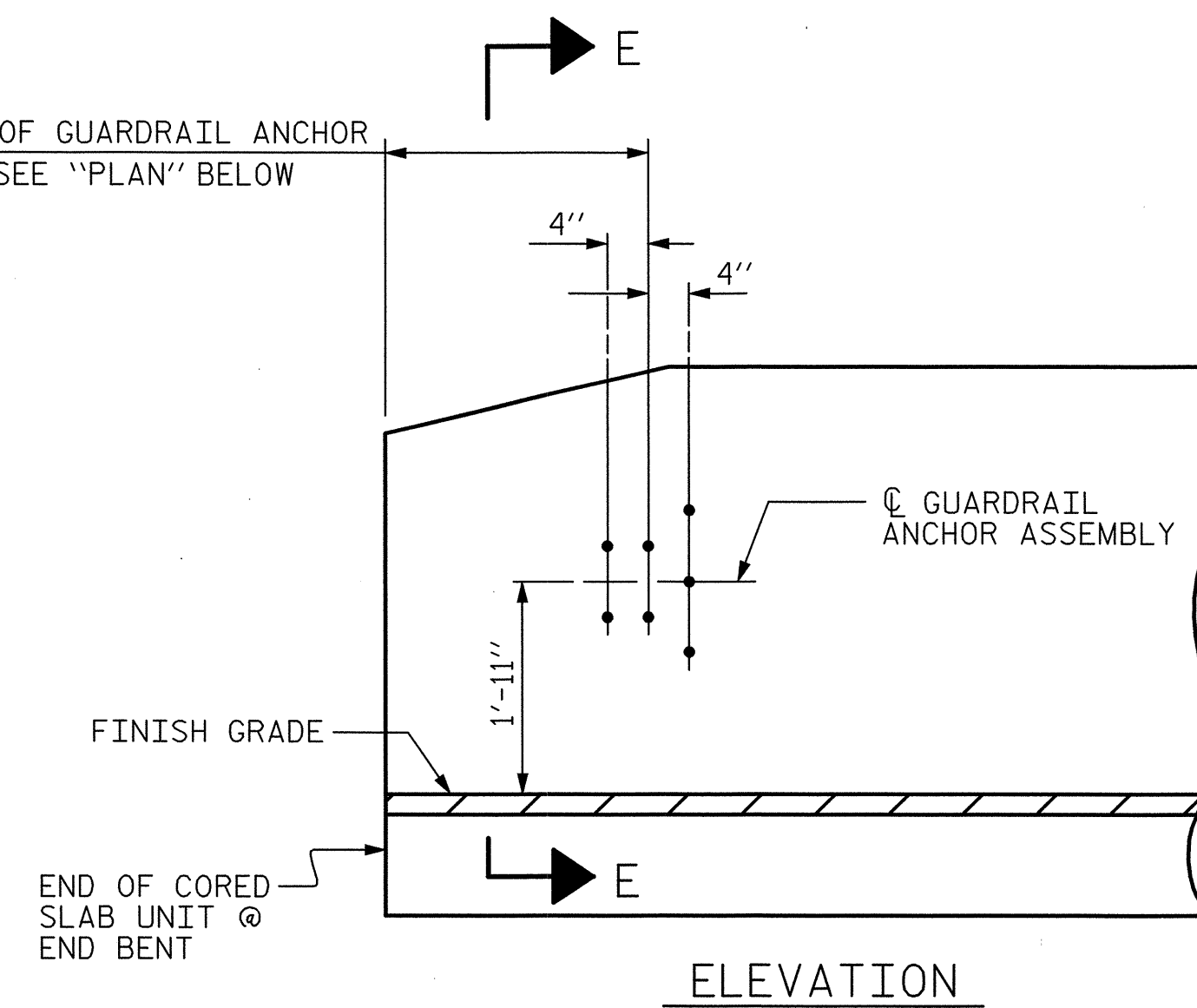
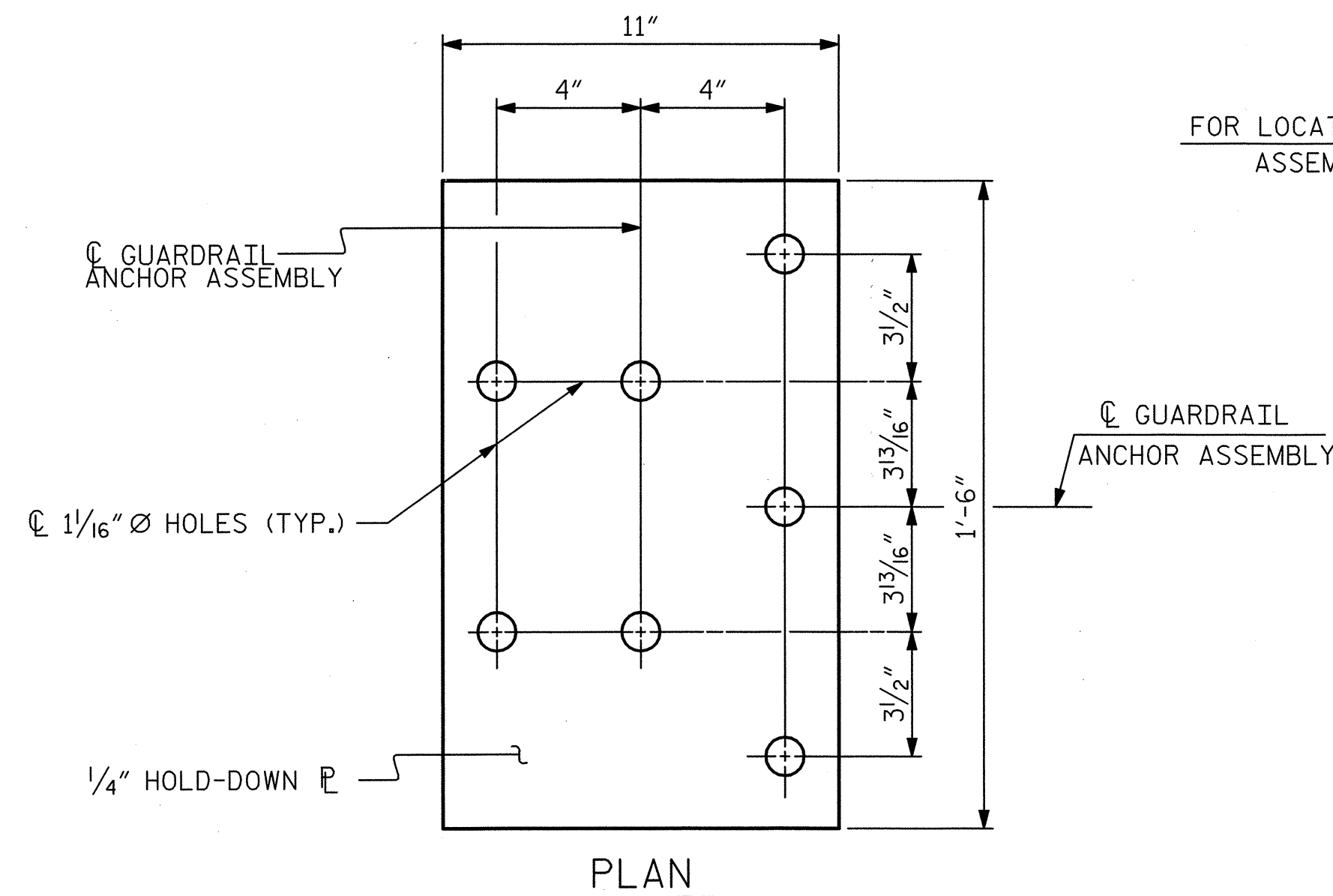
THE GUARDRAIL ANCHOR ASSEMBLY IS REQUIRED AT ALL POINTS WHERE APPROACH GUARDRAIL IS TO BE ATTACHED TO THE END OF BARRIER RAIL. FOR POINTS OF ATTACHMENT, SEE SKETCH.

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 VERTICAL CONCRETE BARRIER RAIL.

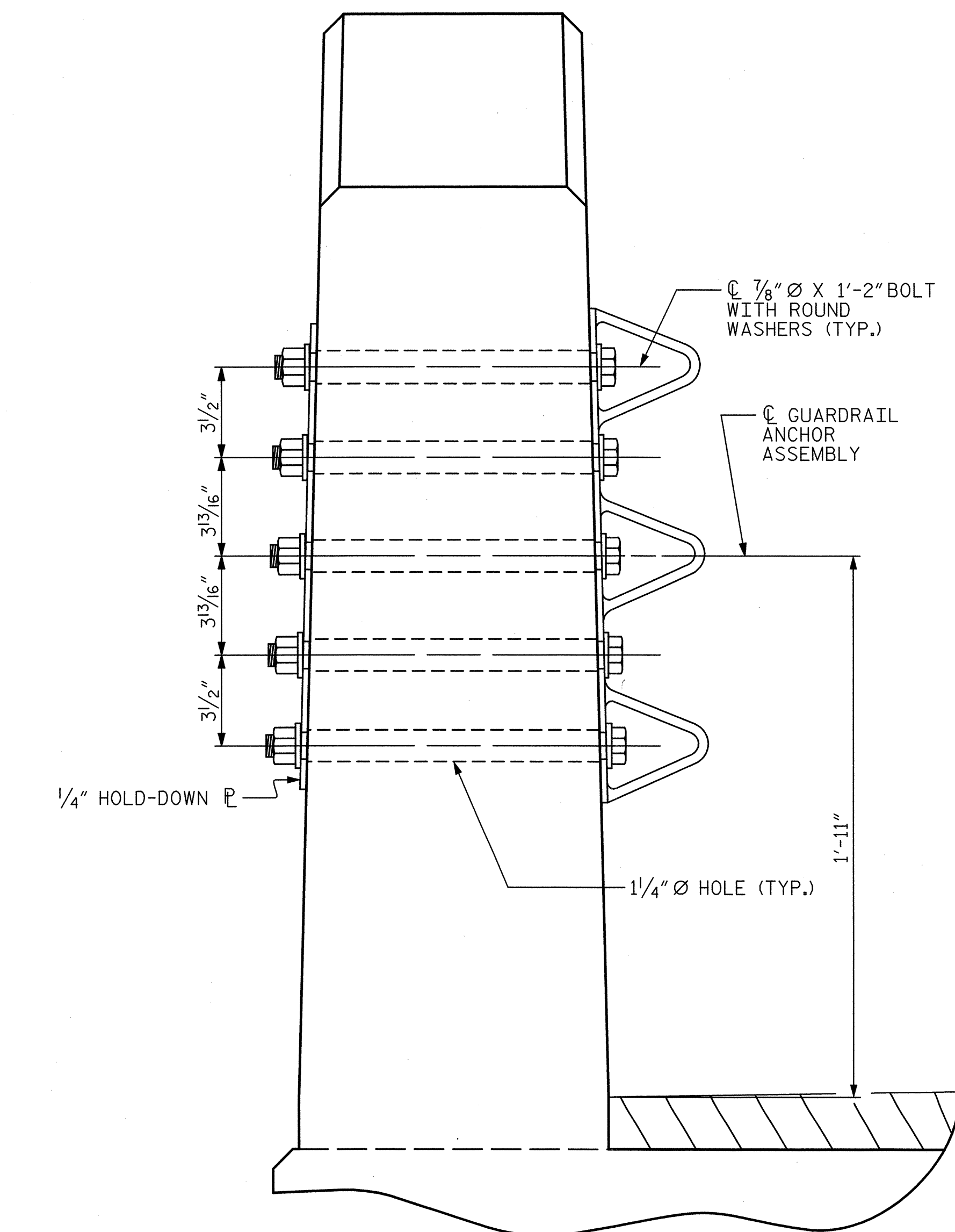
THE VERTICAL REINFORCING BARS MAY BE SHIFTED SLIGHTLY IN THE VERTICAL CONCRETE BARRIER RAIL TO CLEAR ASSEMBLY BOLTS.

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.



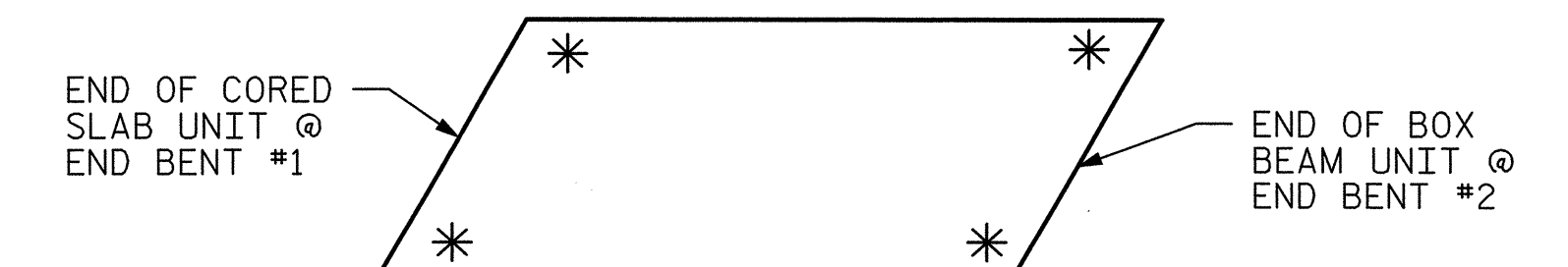
LOCATION OF ANCHORS FOR GUARDRAIL

END BENT #1 SHOWN, END BENT #2 SIMILAR.



SECTION E-E

GUARDRAIL ANCHOR ASSEMBLY DETAILS



SKETCH SHOWING POINTS OF ATTACHMENT

\* DENOTES GUARDRAIL ANCHOR ASSEMBLY

PROJECT NO. B-5163

ROCKINGHAM COUNTY

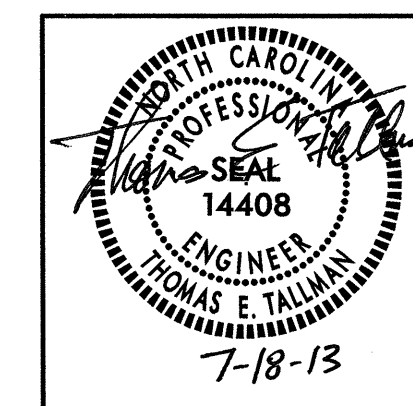
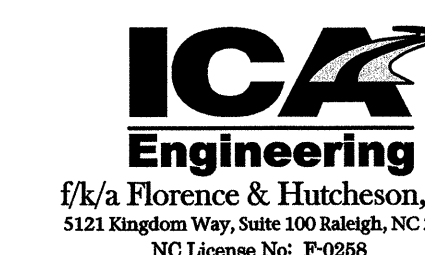
STATION: 15+53.00 -L-

SHEET 9 OF 9

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

GUARDRAIL ANCHORAGE FOR VERTICAL CONCRETE BARRIER RAIL

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S-13
1			3			TOTAL SHEETS
2			4			24



7/15/2013 c:\pures\structure\_design\110-b-5163\_rockingham\_160\plans\B-5163.ed.13.dgn ICA Engineering f/k/a Florence & Hutcheson, Inc.

DRAWN BY : D. H. CARTER DATE : JUL 2013  
 CHECKED BY : T. E. TALLMAN DATE : JUL 2013  
 DESIGN ENGINEER OF RECORD: T. E. TALLMAN DATE : JUL 2013

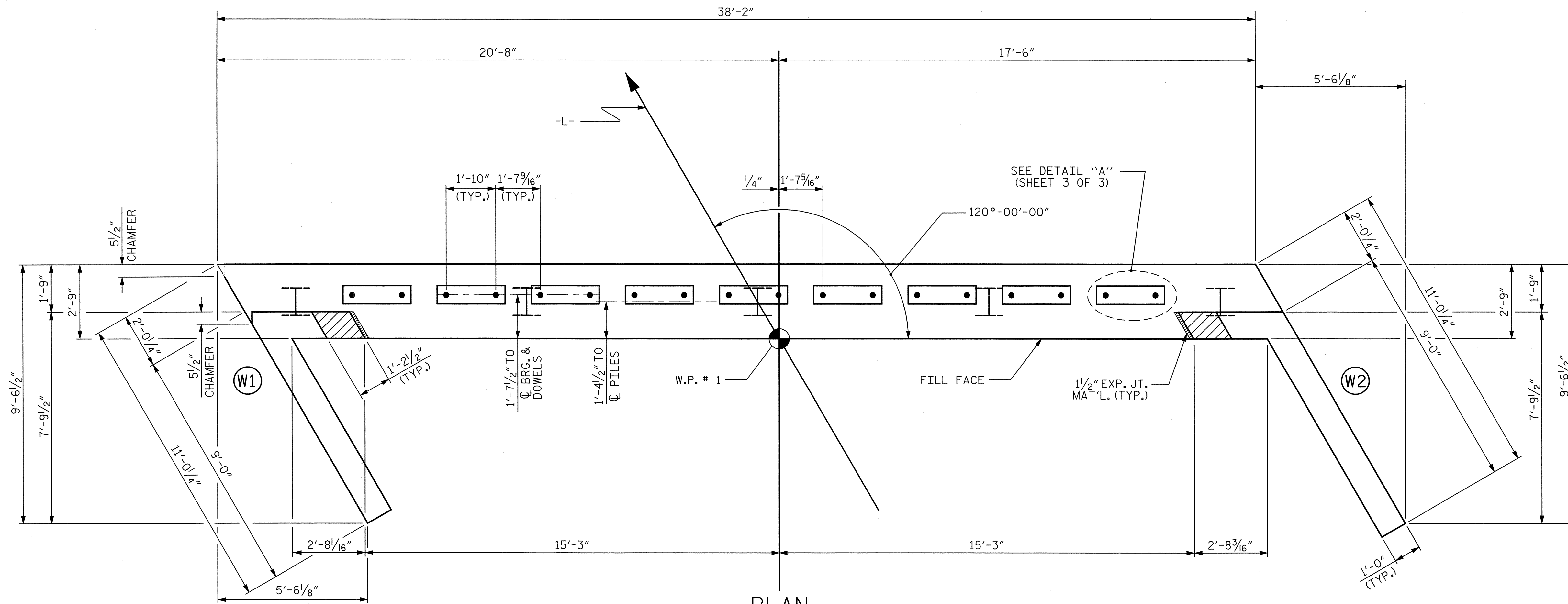
NOTES

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

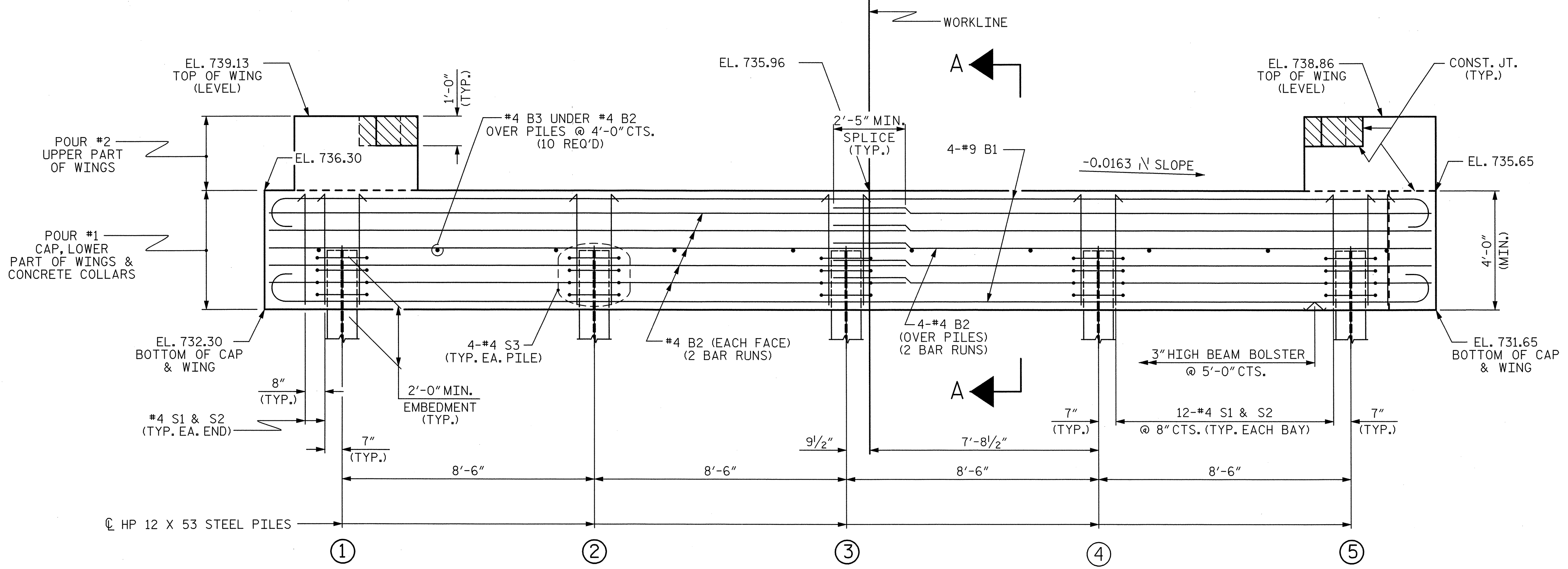
THE CONCRETE IN THE SHADED AREA OF THE WING SHALL BE POURED AFTER THE VERTICAL CONCRETE BARRIER RAIL IS CAST IF SLIP FORMING IS USED.

FOR PILE SPLICE DETAILS, SEE SHEET 3 OF 3.

FOR WING DETAILS, SEE SHEET 2 OF 3.



PLAN



ELEVATION

WINGS NOT SHOWN FOR CLARITY.  
FOR SECTION A-A, SEE SHEET 3 OF 3.  
CONCRETE COLLARS FOR STEEL PILES NOT SHOWN IN PLAN AND ELEVATION VIEWS FOR CLARITY.  
SEE "CORROSION PROTECTION FOR STEEL PILES DETAIL", SHEET 3 OF 3.

TOP OF PILE ELEVATIONS	
①	734.24
②	734.10
③	733.96
④	733.83
⑤	733.69

PROJECT NO. B-5163

ROCKINGHAM COUNTY

STATION: 15+53.00 -L-

SHEET 1 OF 3

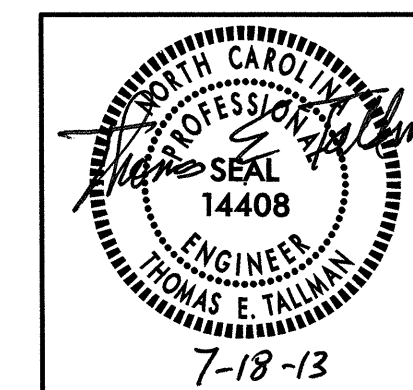
STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

SUBSTRUCTURE  
END BENT No. 1

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S-14
1			3			TOTAL SHEETS
2			4			24



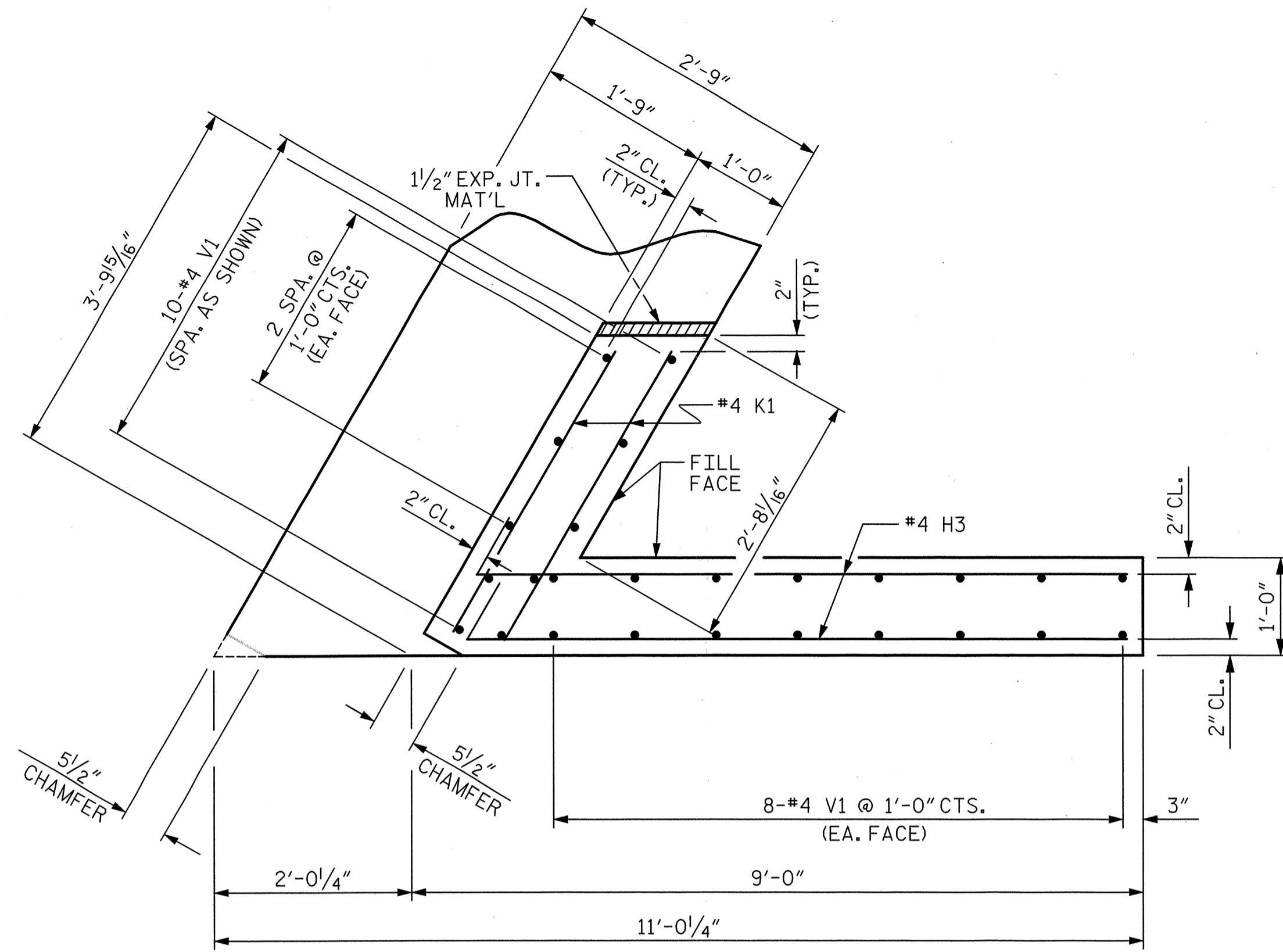
f/k/a Florence & Hutcheson, Inc.  
5121 Kingdom Way, Suite 100 Raleigh, NC 27607  
NC License No: F-0288



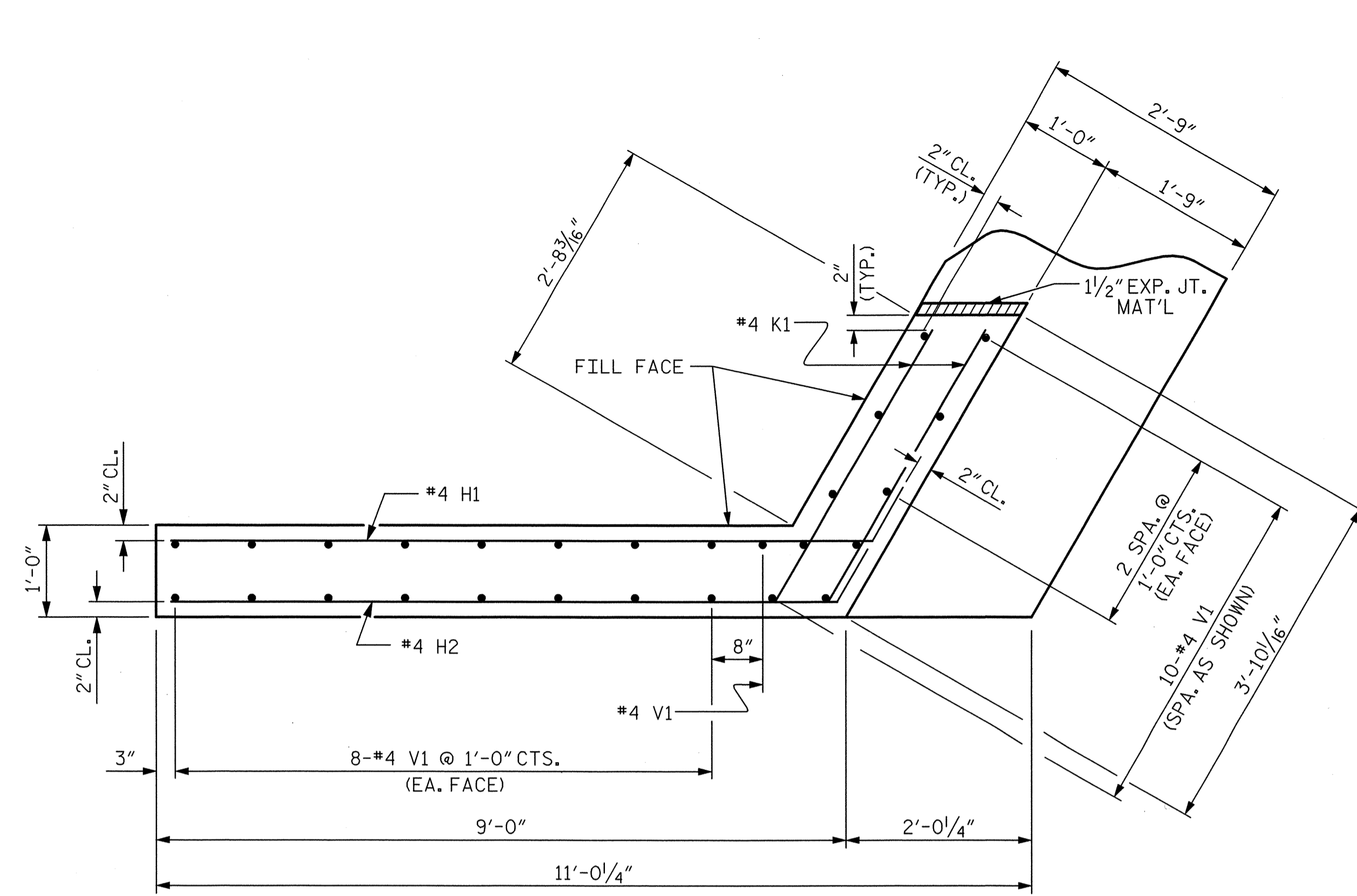
T:\52013\Substructure\design\1p\p-5163\_rockingham\_160\plans\B-5163.ed.14.dgn  
 ICA Engineering f/k/a Florence & Hutcheson, Inc.

ASSEMBLED BY: D. H. CARTER DATE: APR 2013  
 CHECKED BY: J. E. MONDOLFI DATE: APR 2013  
 DRAWN BY: WJH 12/11  
 CHECKED BY: AAC 12/11

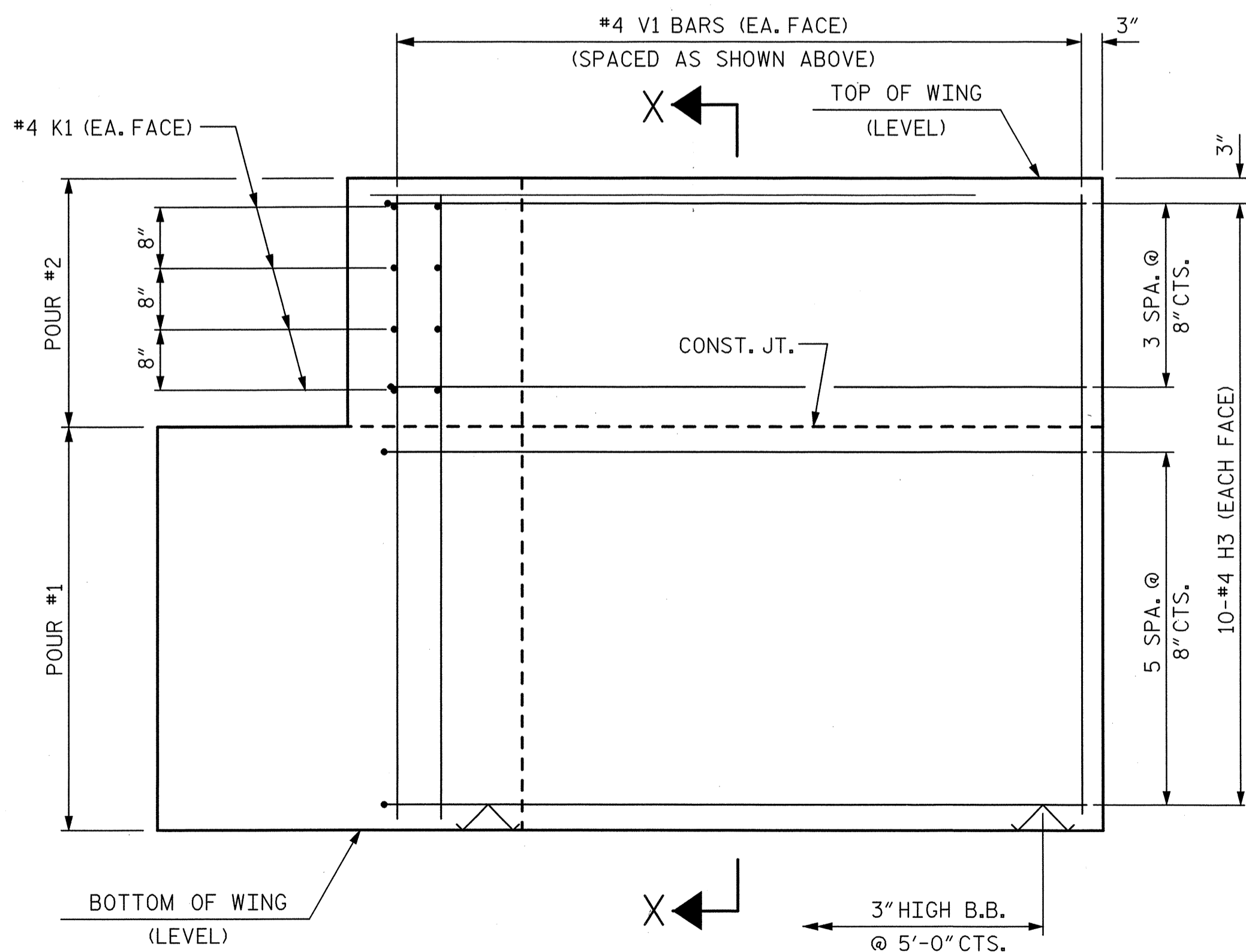




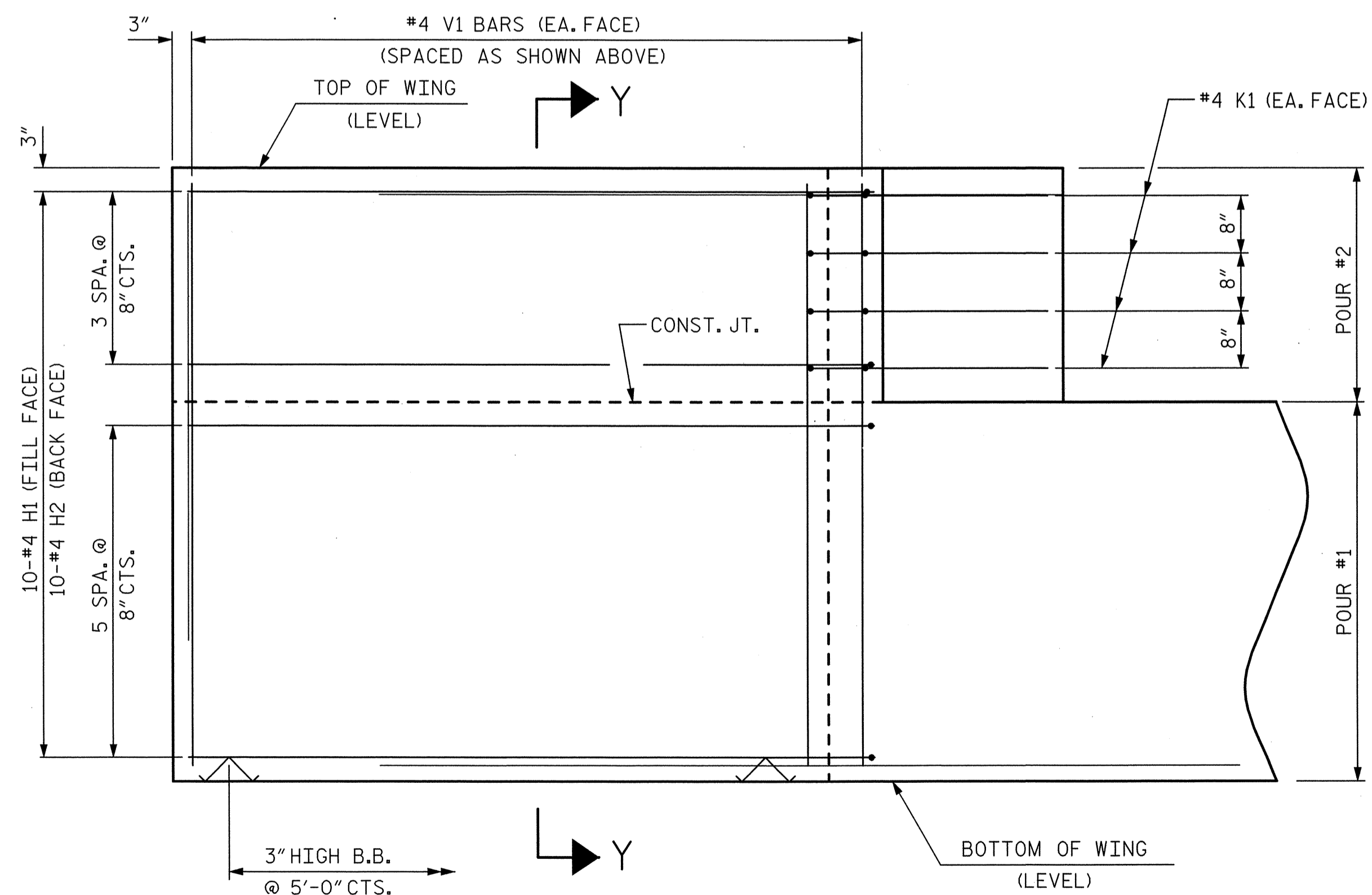
PLAN OF WING (W1)



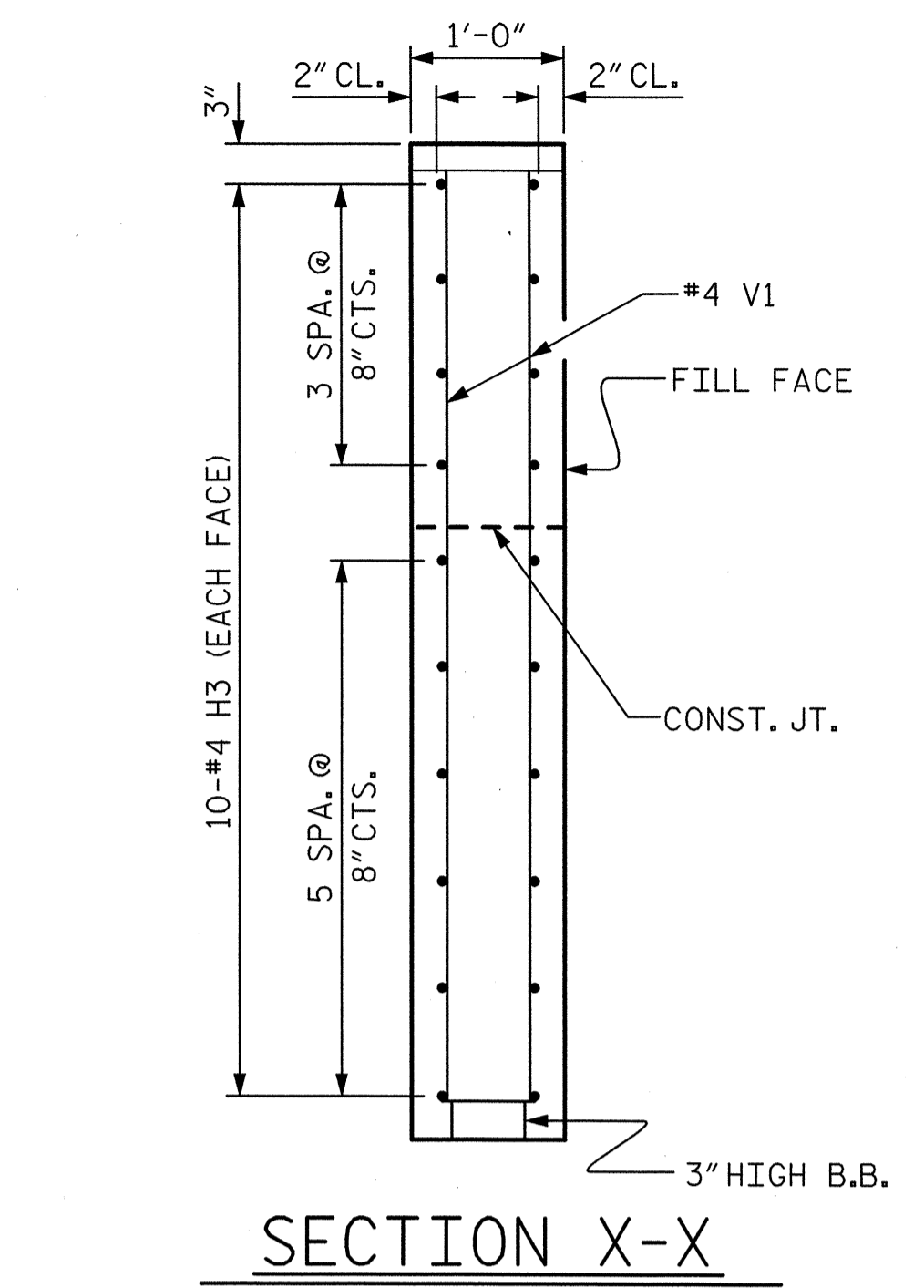
PLAN OF WING (W2)



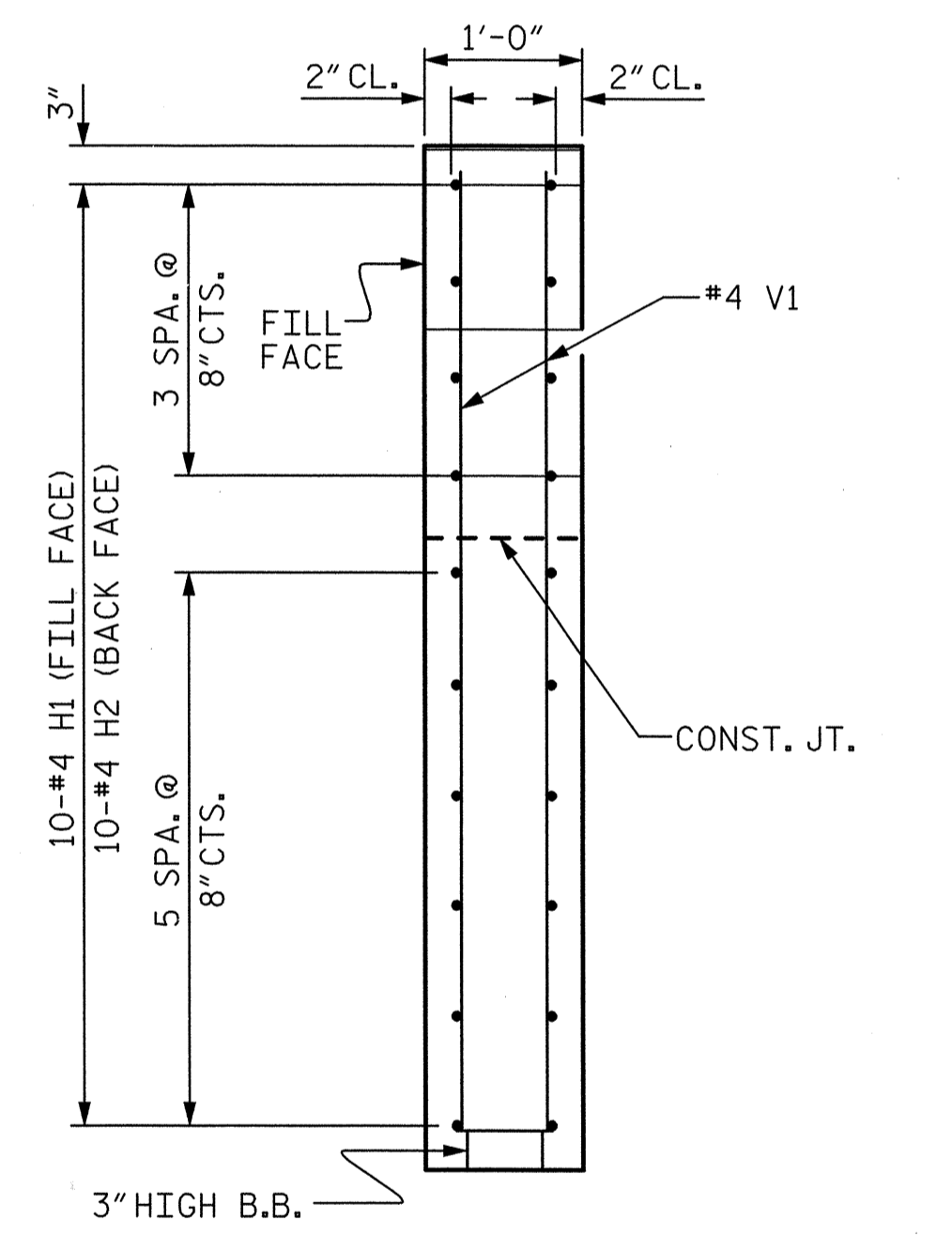
ELEVATION OF WING (W1)



ELEVATION OF WING (W2)



SECTION X-X



SECTION Y-Y

PROJECT NO. B-5163  
 ROCKINGHAM COUNTY  
 STATION: 15+53.00 -L-

SHEET 2 OF 3

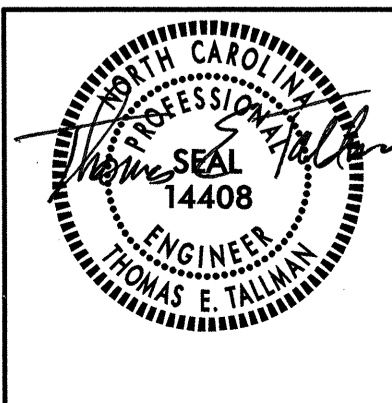
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 SUBSTRUCTURE  
 END BENT No. 1  
 WING DETAILS

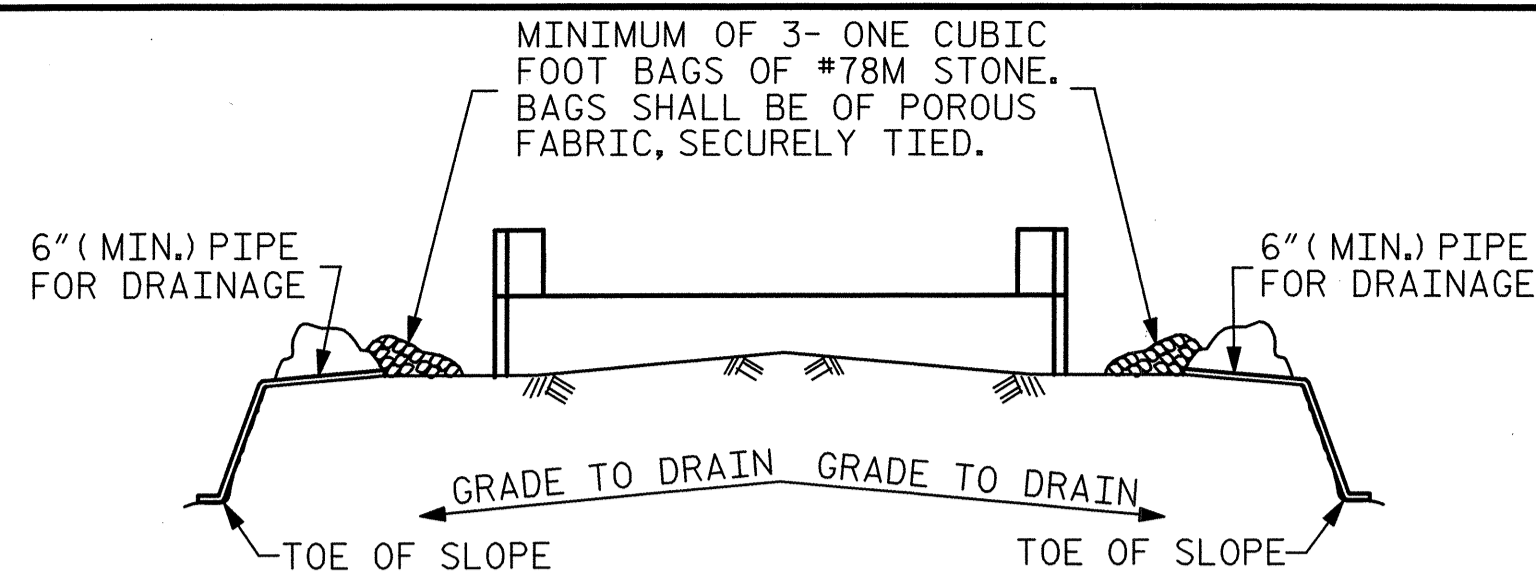
REVISIONS						SHEET NO.	
NO.	BY:	DATE:	NO.	BY:	DATE:	S-15	
1			3			TOTAL SHEETS 24	
2			4				

7/15/2013  
 V:\Structure\structure\_design\10-5163\_rockingham\_160\plans\B-5163.ed15.dgn  
 ICA Engineering f/k/a Florence & Hutcheson, Inc.

ASSEMBLED BY : D. H. CARTER DATE : APR 2013  
 CHECKED BY : J. E. MONDOLFI DATE : APR 2013  
 DRAWN BY : WJH 12/11  
 CHECKED BY : AAC 12/11

WING DETAILS



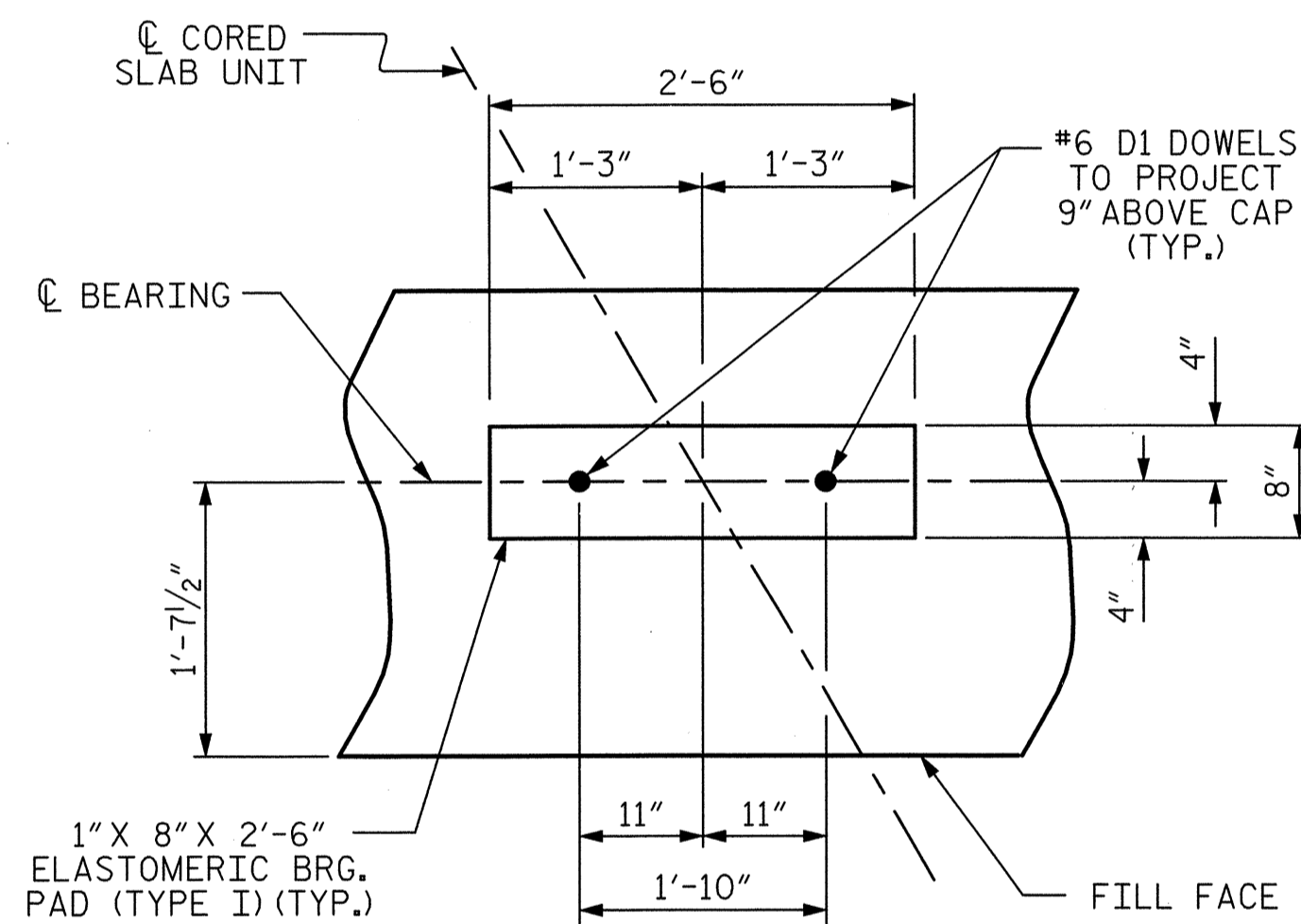


BAGGED STONE AND PIPE SHALL BE PLACED IMMEDIATELY AFTER COMPLETION OF END BENT EXCAVATION. PIPE MAY BE EITHER CONCRETE, CORRUGATED STEEL, CORRUGATED ALUMINUM ALLOY, OR CORRUGATED PLASTIC. PERFORATED PIPE WILL NOT BE ALLOWED.

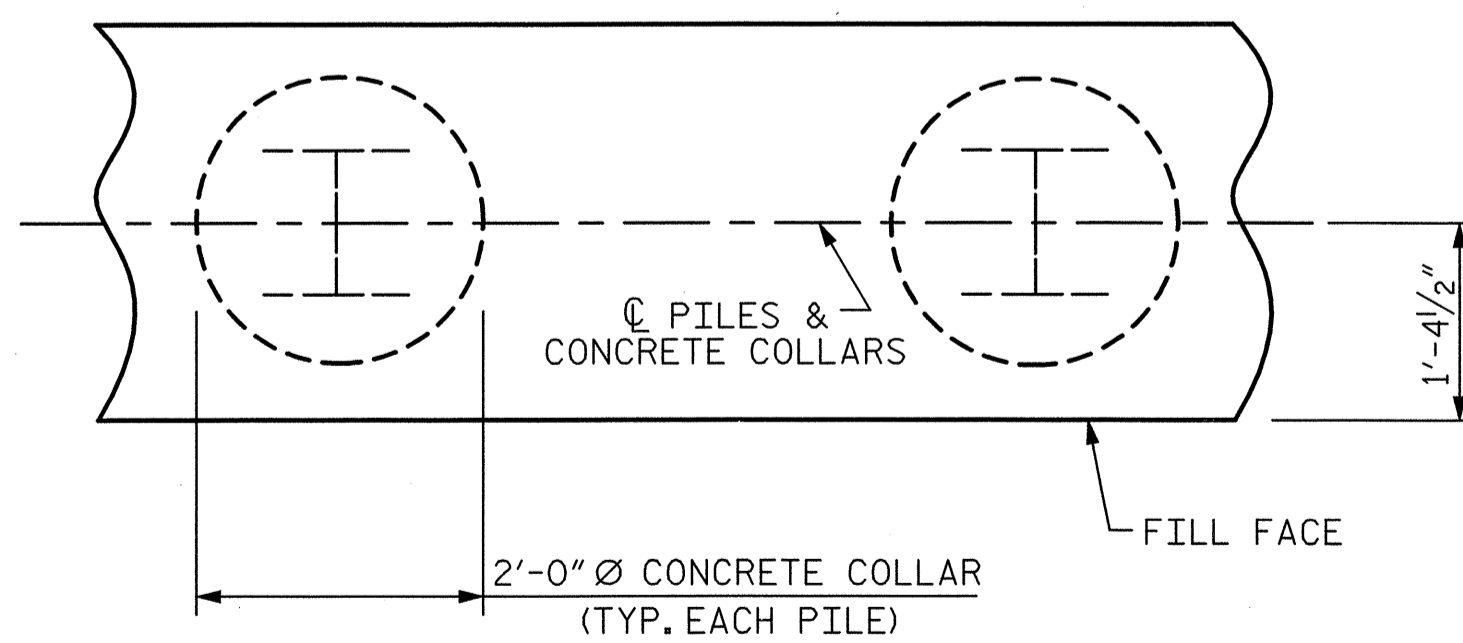
BAGGED STONE SHALL REMAIN IN PLACE UNTIL THE ENGINEER DIRECTS THAT IT BE REMOVED. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF SILT ACCUMULATIONS AT BAGGED STONE WHEN SO DIRECTED BY THE ENGINEER. BAGS SHALL BE REMOVED AND REPLACED WHENEVER THE ENGINEER DETERMINES THAT THEY HAVE DETERIORATED AND LOST THEIR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

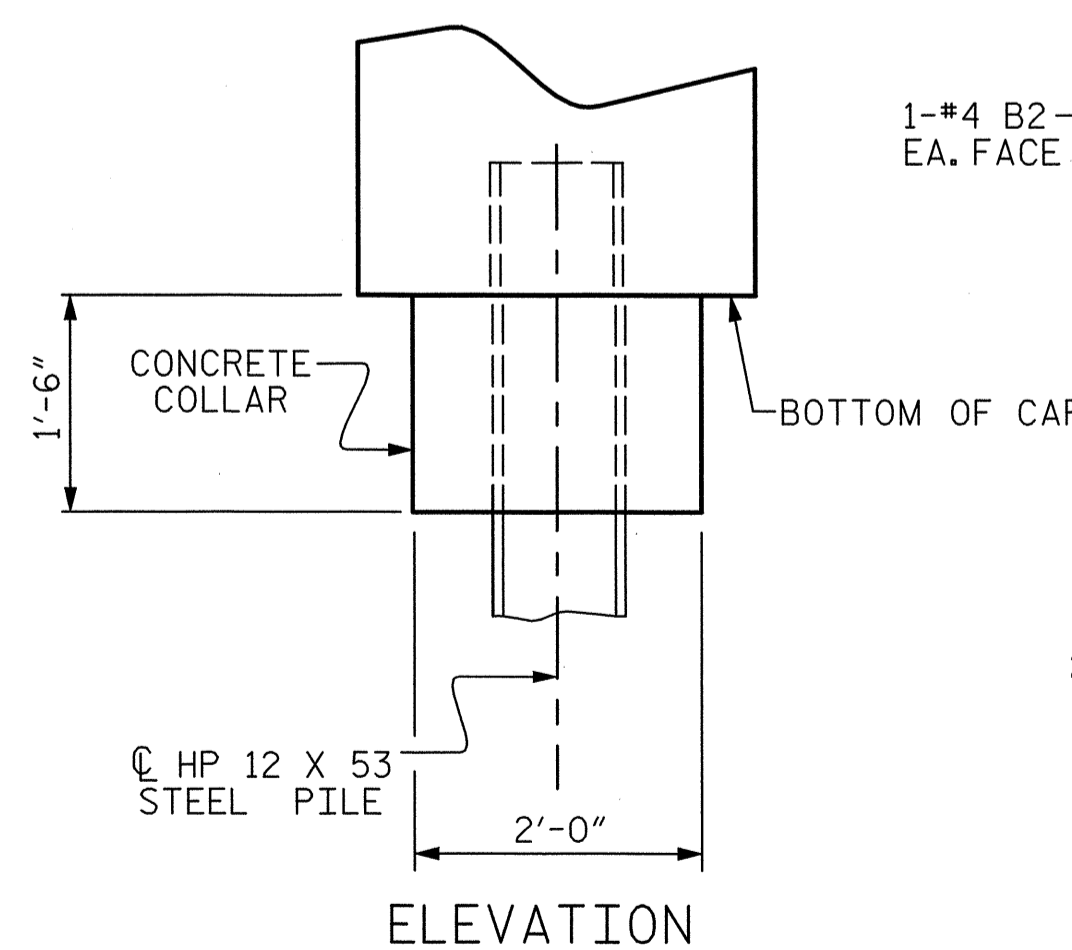
### TEMPORARY DRAINAGE AT END BENT



DETAIL "A"

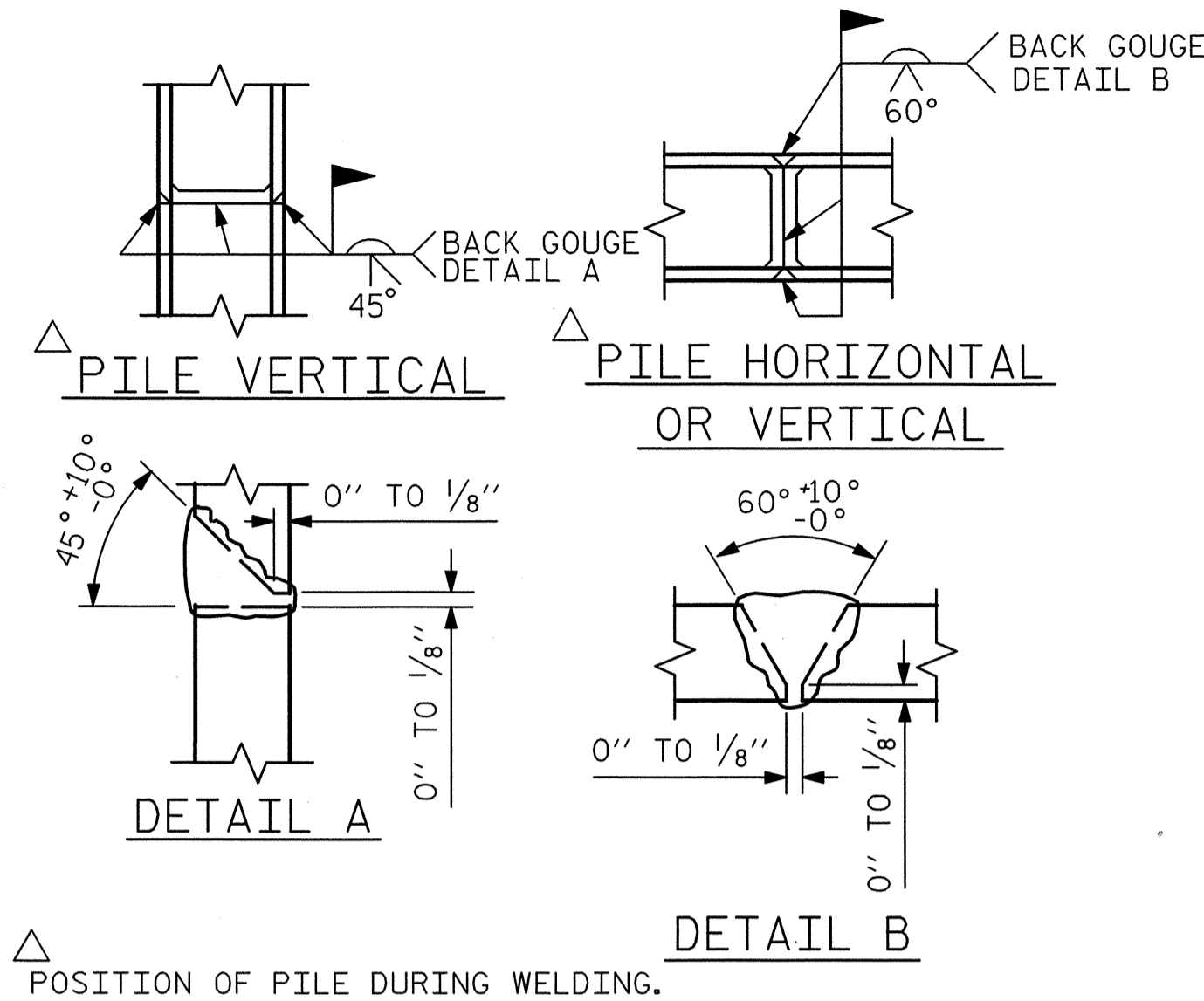


PLAN

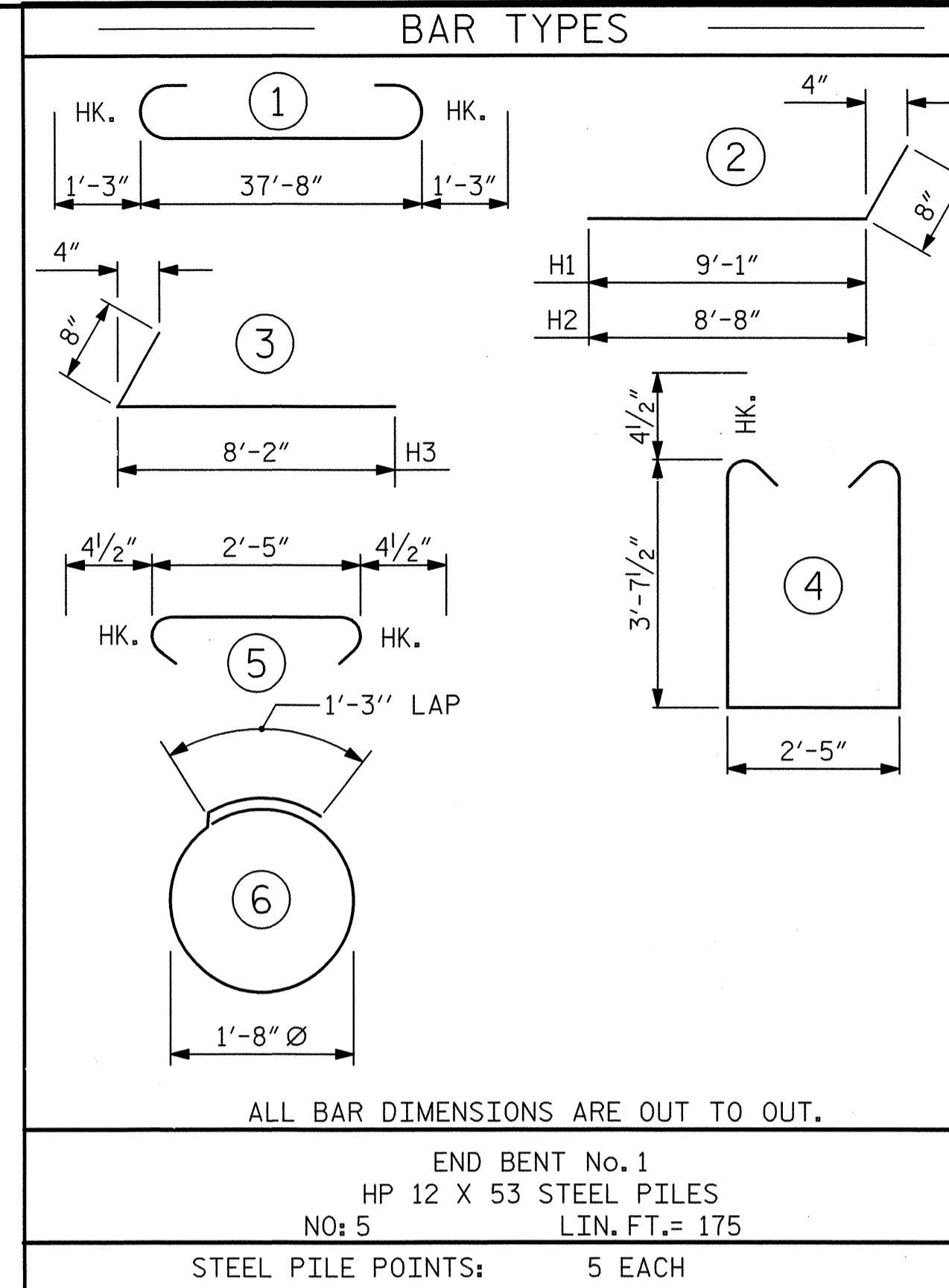


ELEVATION

### CORROSION PROTECTION FOR STEEL PILES DETAIL

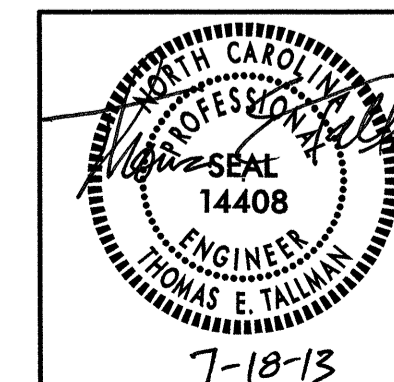


### PILE SPLICE DETAILS



BILL OF MATERIAL FOR END BENT 1						
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	
B1	8	#9	1	40'-2"	1093	
B2	28	#4	STR	20'-2"	377	
B3	10	#4	STR	2'-5"	16	
D1	18	#6	STR	1'-6"	41	
H1	10	#4	2	9'-9"	65	
H2	10	#4	2	9'-4"	62	
H3	20	#4	3	8'-10"	118	
K1	16	#4	STR	3'-3"	35	
S1	52	#4	4	10'-5"	362	
S2	52	#4	5	3'-2"	110	
S3	20	#4	6	6'-6"	87	
V1	53	#4	STR	6'-6"	230	
REINFORCING STEEL (FOR END BENT 1)					2596 LBS.	
CLASS A CONCRETE BREAKDOWN (FOR END BENT 1)						
POUR #1 CAP, LOWER PART OF WINGS & COLLARS					18.7 C.Y.	
POUR #2 UPPER PART OF WINGS					2.6 C.Y.	
TOTAL CLASS A CONCRETE					21.3 C.Y.	

ASSEMBLED BY : D. H. CARTER DATE : APR 2013  
 CHECKED BY : J. E. MONDOLFI DATE : APR 2013  
 DRAWN BY : WJH 12/11  
 CHECKED BY : AAC 12/11

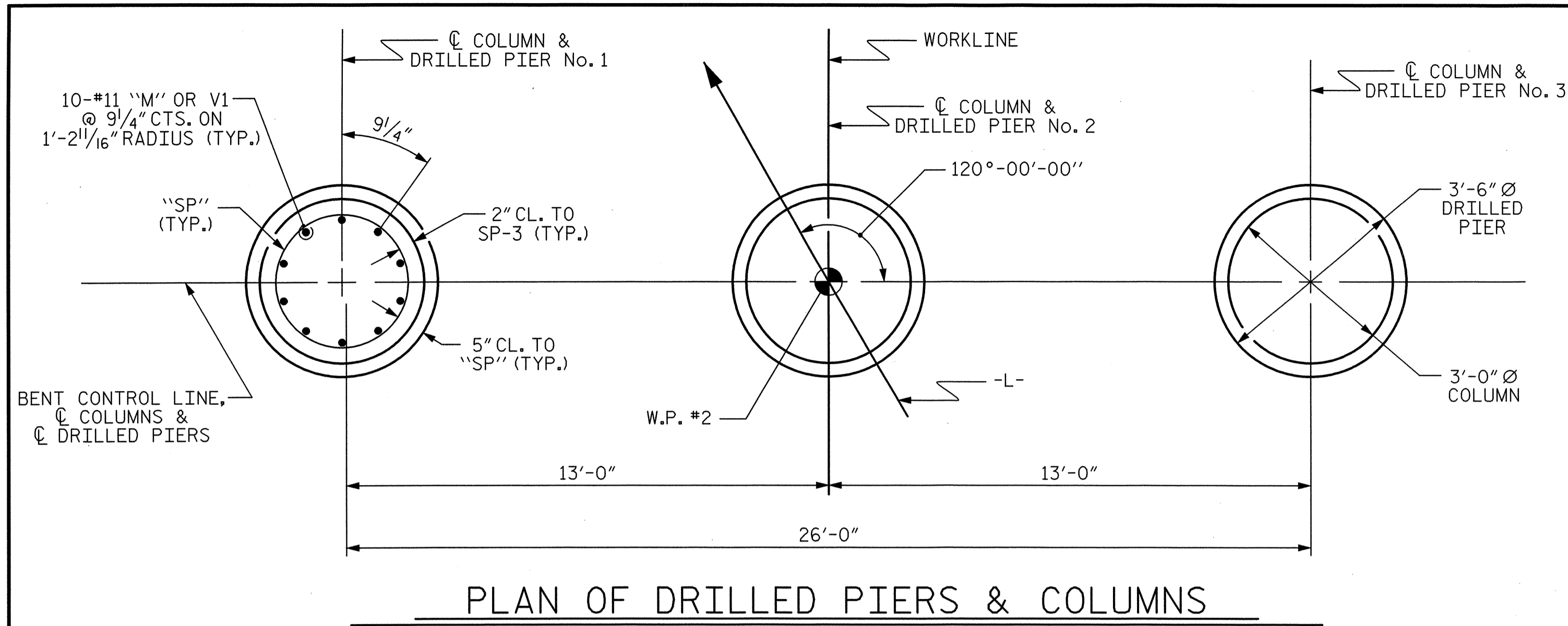


PROJECT NO. B-5163  
 ROCKINGHAM COUNTY  
 STATION: 15+53.00 -L-  
 SHEET 3 OF 3

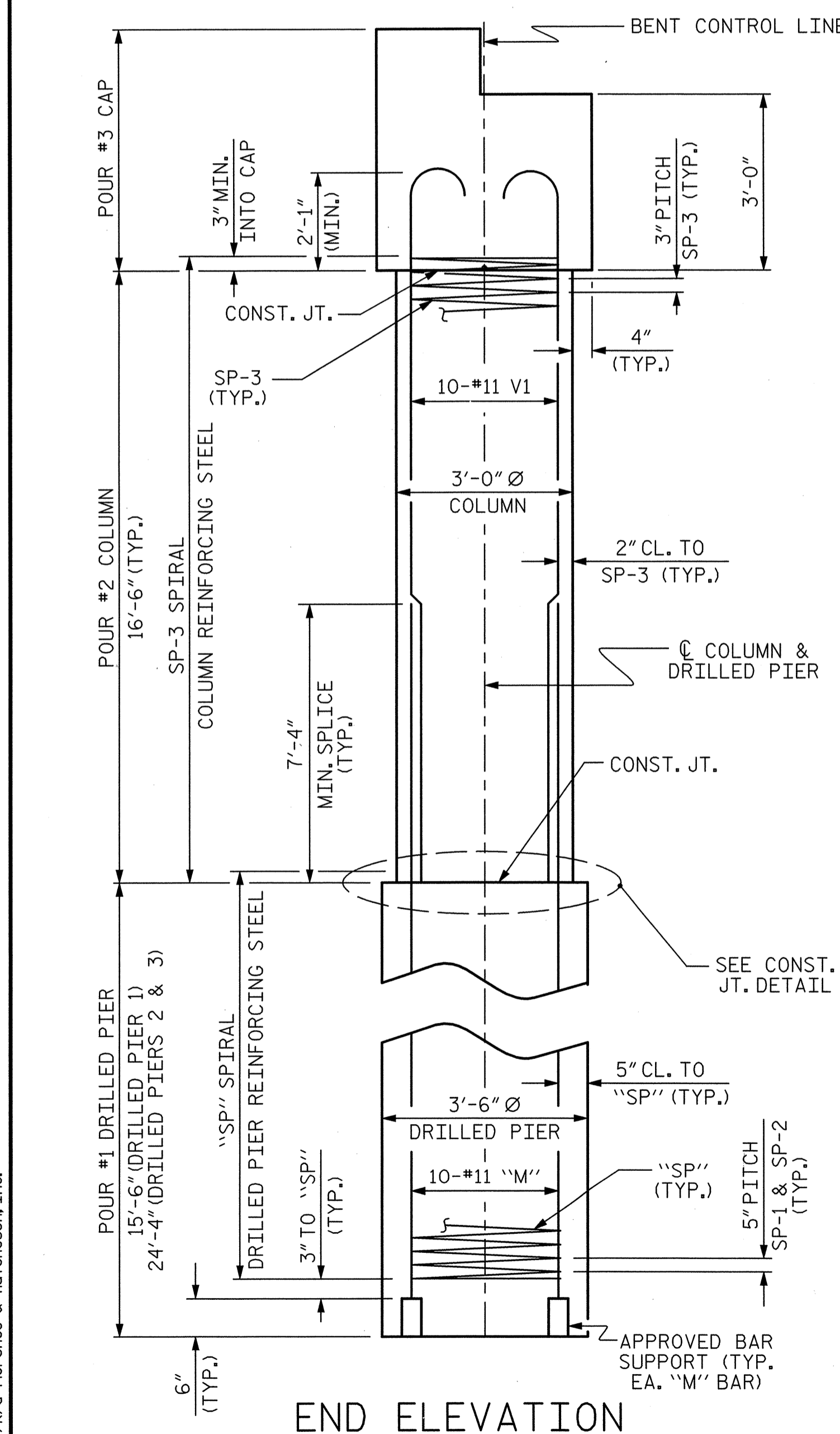
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH					
SUBSTRUCTURE					
END BENT No. 1 DETAILS					
REVISIONS					SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
					S-16
					TOTAL SHEETS 24



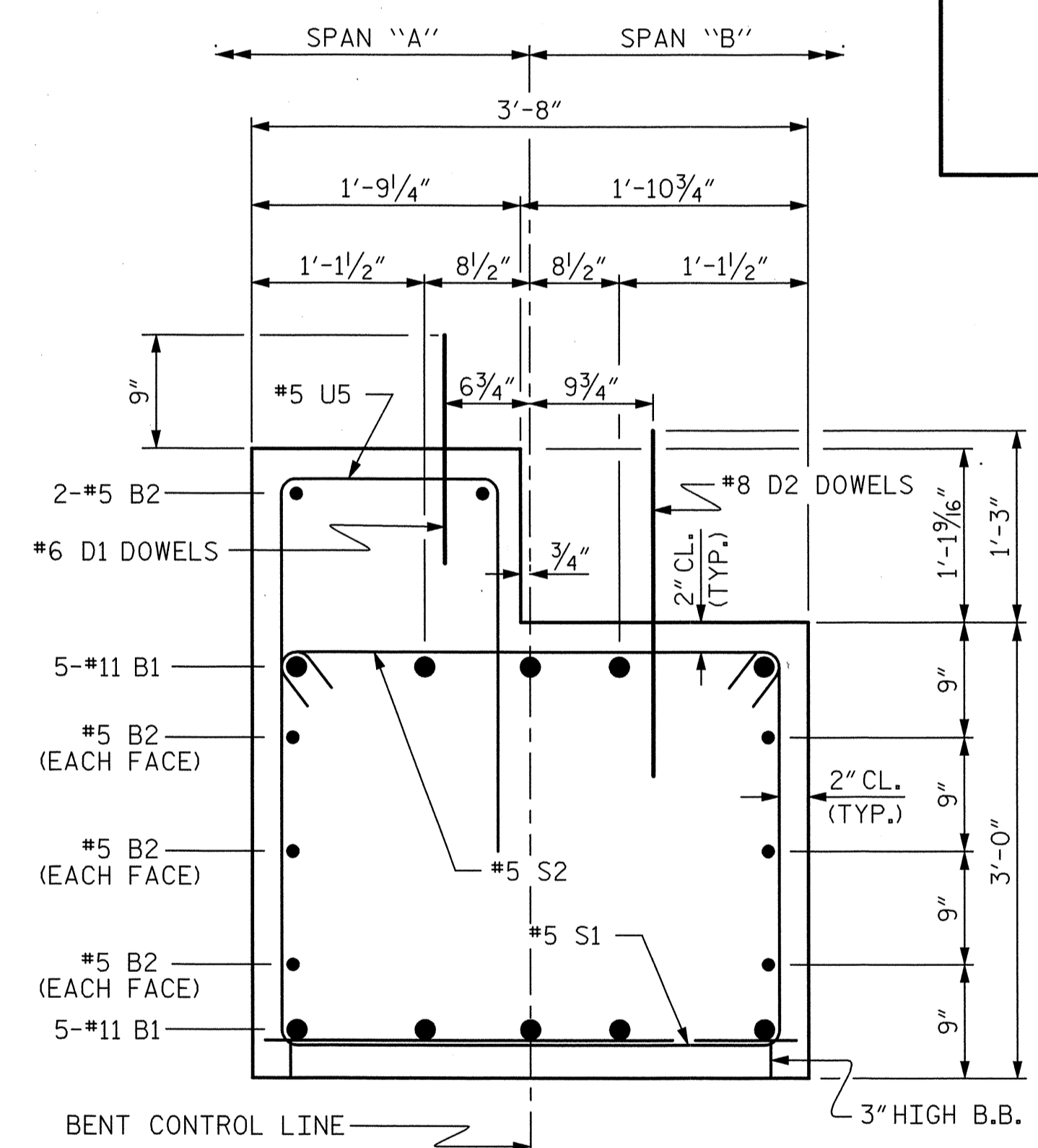




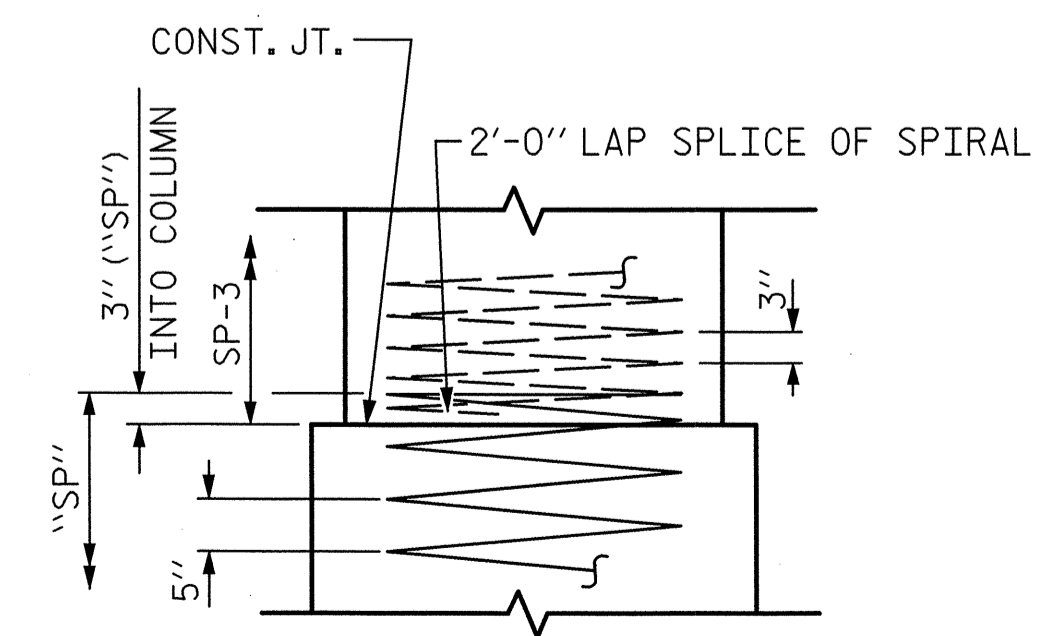
PLAN OF DRILLED PIERS & COLUMNS



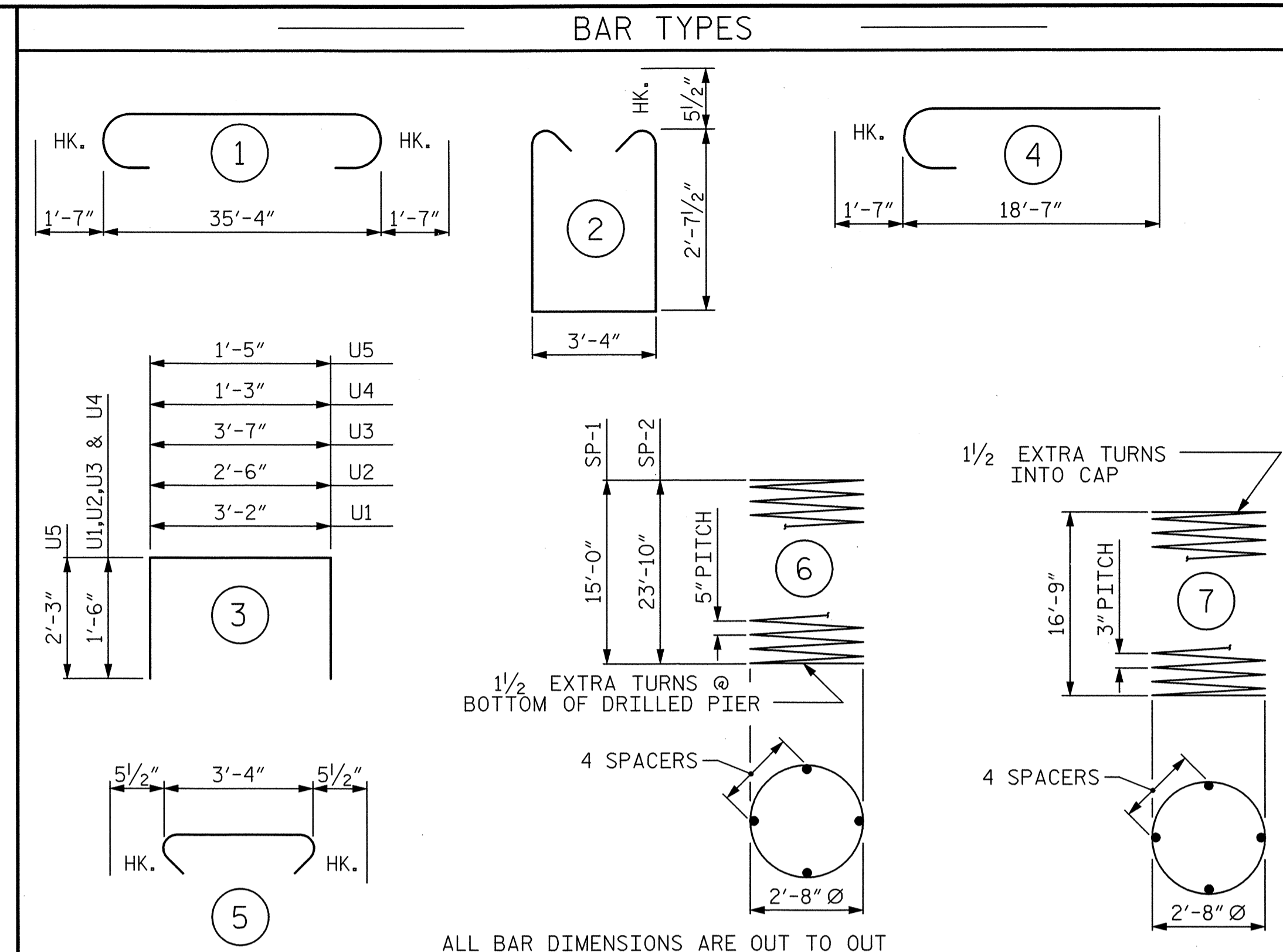
END ELEVATION



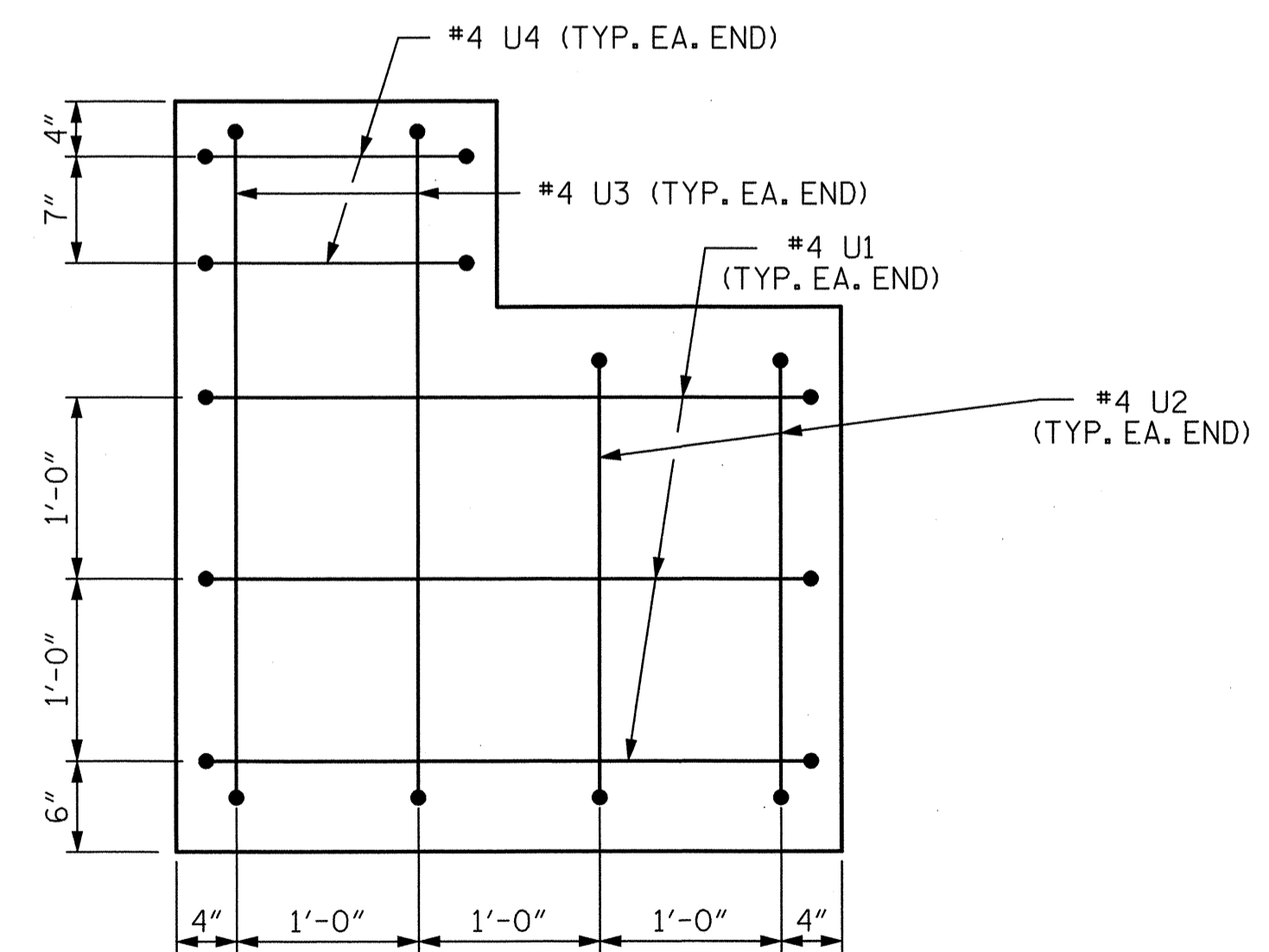
SECTION THRU CAP



CONSTRUCTION JOINT DETAIL



ALL BAR DIMENSIONS ARE OUT TO OUT



BILL OF MATERIAL

FOR BENT 1

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
B1	10	#11	1	38'-6"	2046
B2	8	#5	STR	35'-6"	296
D1	18	#6	STR	1'-6"	41
D2	18	#8	STR	2'-3"	108
M1	10	#11	STR	25'-4"	1346
M2	20	#11	STR	34'-2"	3631
S1	54	#5	2	9'-6"	535
S2	54	#5	5	4'-3"	239
U1	6	#4	3	6'-2"	25
U2	4	#4	3	5'-6"	15
U3	4	#4	3	6'-7"	18
U4	4	#4	3	4'-3"	11
U5	36	#5	3	5'-11"	222
V1	30	#11	4	20'-2"	3214
REINFORCING STEEL (FOR BENT 1)					11,747 LBS.
SPIRAL COLUMN REINFORCING STEEL (FOR BENT 1)					2463 LBS.
SP-1	1	*	6	308'-5"	322
SP-2	2	*	6	483'-3"	1008
SP-3	3	**	7	565'-2"	1133
TOTAL CLASS A CONCRETE					30.4 C.Y.

\* THE SP-1 & SP-2 SPIRAL REINFORCING STEEL SHALL BE W31 OR D-31 COLD DRAWN WIRE OR #5 PLAIN OR DEFORMED BAR  
 \*\* THE SP-3 SPIRAL REINFORCING STEEL SHALL BE W20 OR D-20 COLD DRAWN WIRE OR #4 PLAIN OR DEFORMED BAR

CLASS A CONCRETE BREAKDOWN (FOR BENT 1)

POUR #2 (COLUMNS)	13.0 C.Y.
POUR #3 (CAP)	17.4 C.Y.
TOTAL CLASS A CONCRETE	30.4 C.Y.

DRILLED PIERS: (FOR BENT 1)

DRILLED PIER CONCRETE POUR #1 (DRILLED PIERS)	22.9 C.Y.
3'-6" Ø DRILLED PIER NOT IN SOIL	48.0 LIN. FT.
3'-6" Ø DRILLED PIER IN SOIL	16.2 LIN. FT.
PERMANENT STEEL CASING FOR 3'-6" Ø DRILLED PIER	16.4 LIN. FT.
CSL TUBES	275 LIN. FT.

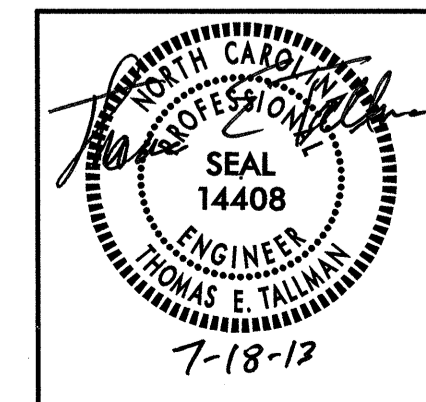
PROJECT NO. B-5163  
 ROCKINGHAM COUNTY  
 STATION: 15+53.00 -L-

SHEET 2 OF 2

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

SUBSTRUCTURE  
 BENT No. 1

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S-18
1			3			TOTAL SHEETS
2			4			24



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DRAWN BY : D. H. CARTER DATE : JUL 2013  
 CHECKED BY : T. E. TALLMAN DATE : JUL 2013  
 DESIGN ENGINEER OF RECORD: T. E. TALLMAN DATE : JUL 2013



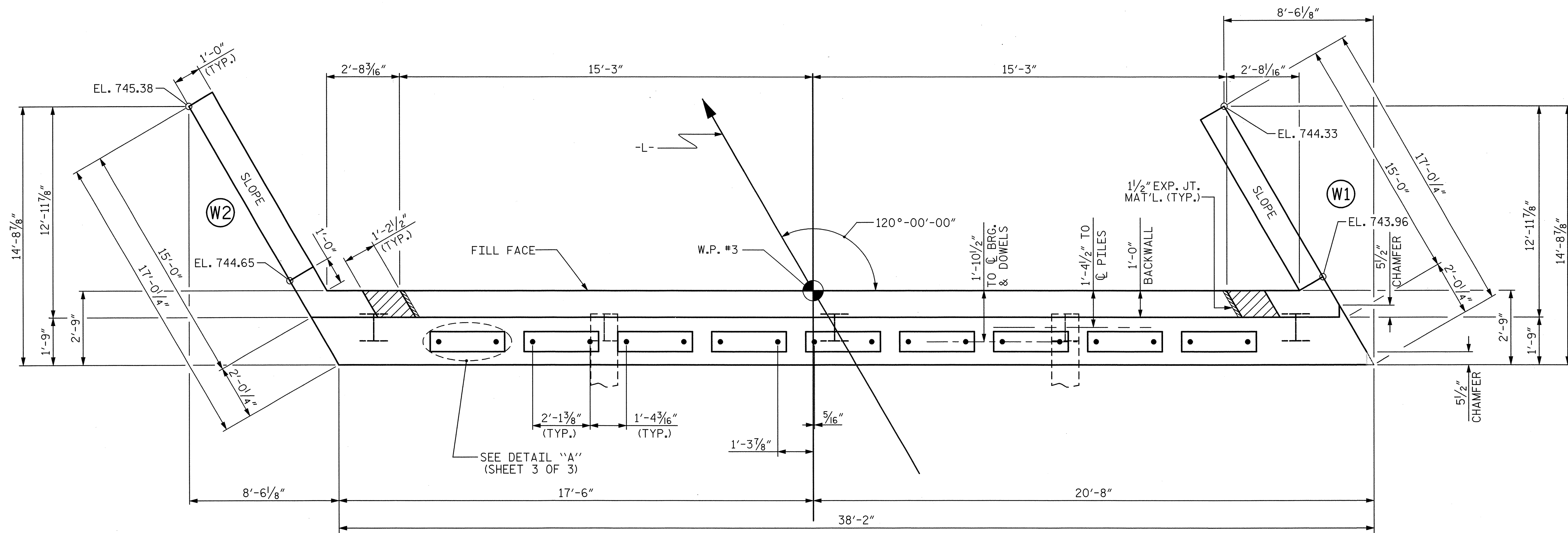
**NOTES**

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

THE CONCRETE IN THE SHADED AREA OF THE WING SHALL BE POURED AFTER THE VERTICAL CONCRETE BARRIER RAIL IS CAST IF SLIP FORMING IS USED.

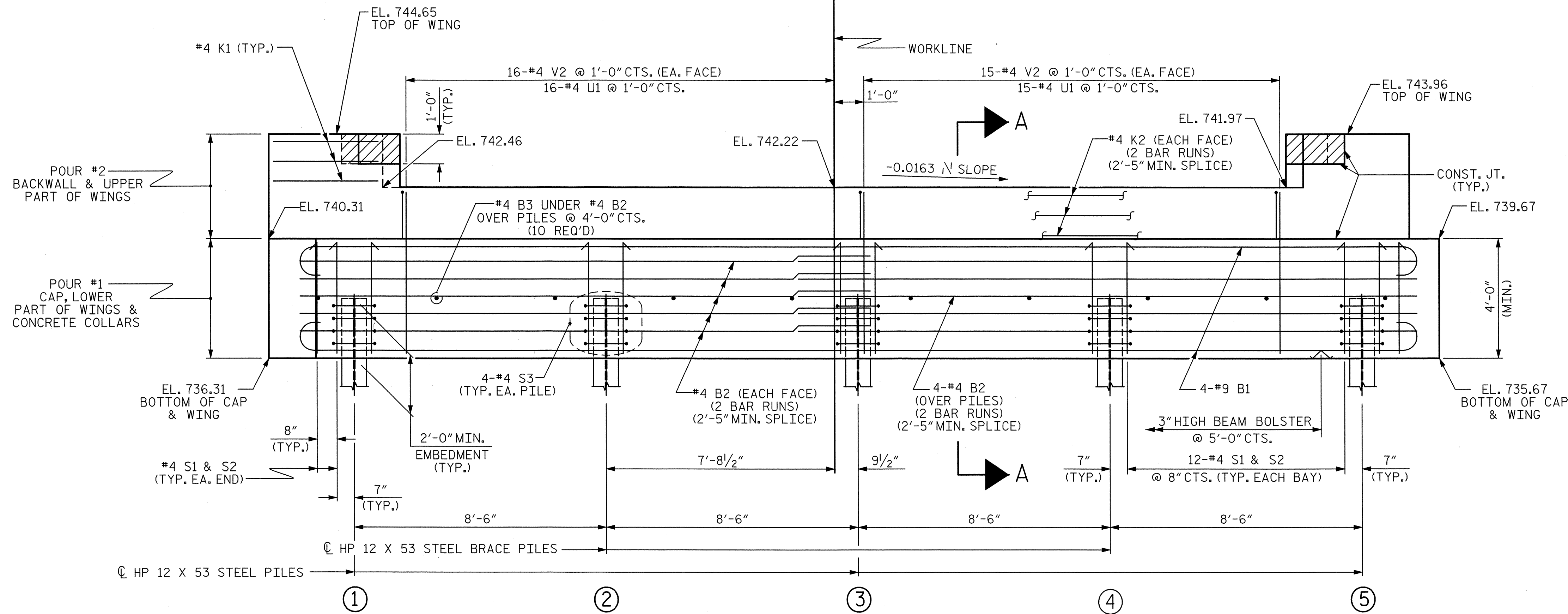
FOR PILE SPLICE DETAILS, SEE SHEET 3 OF 3.

FOR WING DETAILS, SEE SHEET 2 OF 3.



**PLAN**

TOP OF PILE ELEVATIONS	
①	738.26
②	738.12
③	737.98
④	737.84
⑤	737.70



**ELEVATION**

WINGS NOT SHOWN FOR CLARITY.  
FOR SECTION A-A, SEE SHEET 3 OF 3.  
CONCRETE COLLARS FOR STEEL PILES NOT SHOWN IN PLAN AND ELEVATION VIEWS FOR CLARITY.  
SEE "CORROSION PROTECTION FOR STEEL PILES DETAIL", SHEET 3 OF 3.

PROJECT NO. B-5163  
ROCKINGHAM COUNTY  
 STATION: 15+53.00 -L-

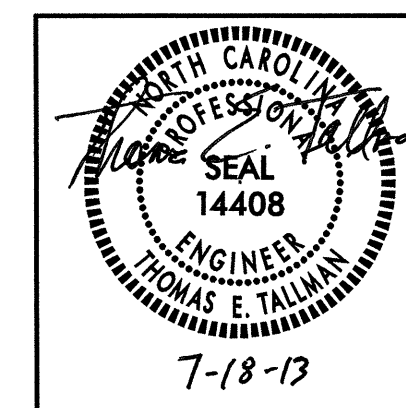
SHEET 1 OF 3

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

SUBSTRUCTURE  
 END BENT No. 2



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 NC License No. P-0268



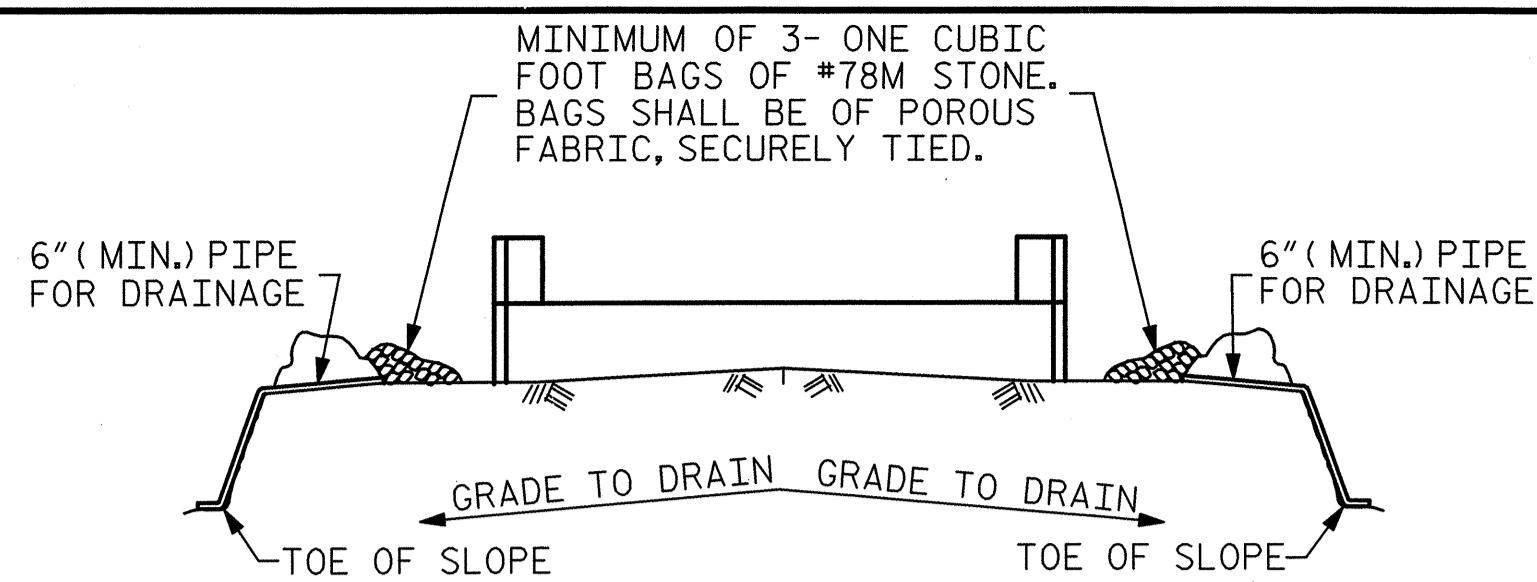
REVISIONS						SHEET NO. S-19
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 24
2			4			

7/15/2013  
 ICA Engineering  
 f/k/a Florence & Hutcheson, Inc.  
 5121 Kingston Way, Suite 100 Raleigh, NC 27607  
 160:plans\B-5163.ed.19.dgn

ASSEMBLED BY : D. H. CARTER DATE : APR 2013  
 CHECKED BY : J. E. MONDOLFI DATE : APR 2013  
 DRAWN BY : WJH 12/11  
 CHECKED BY : AAC 12/11





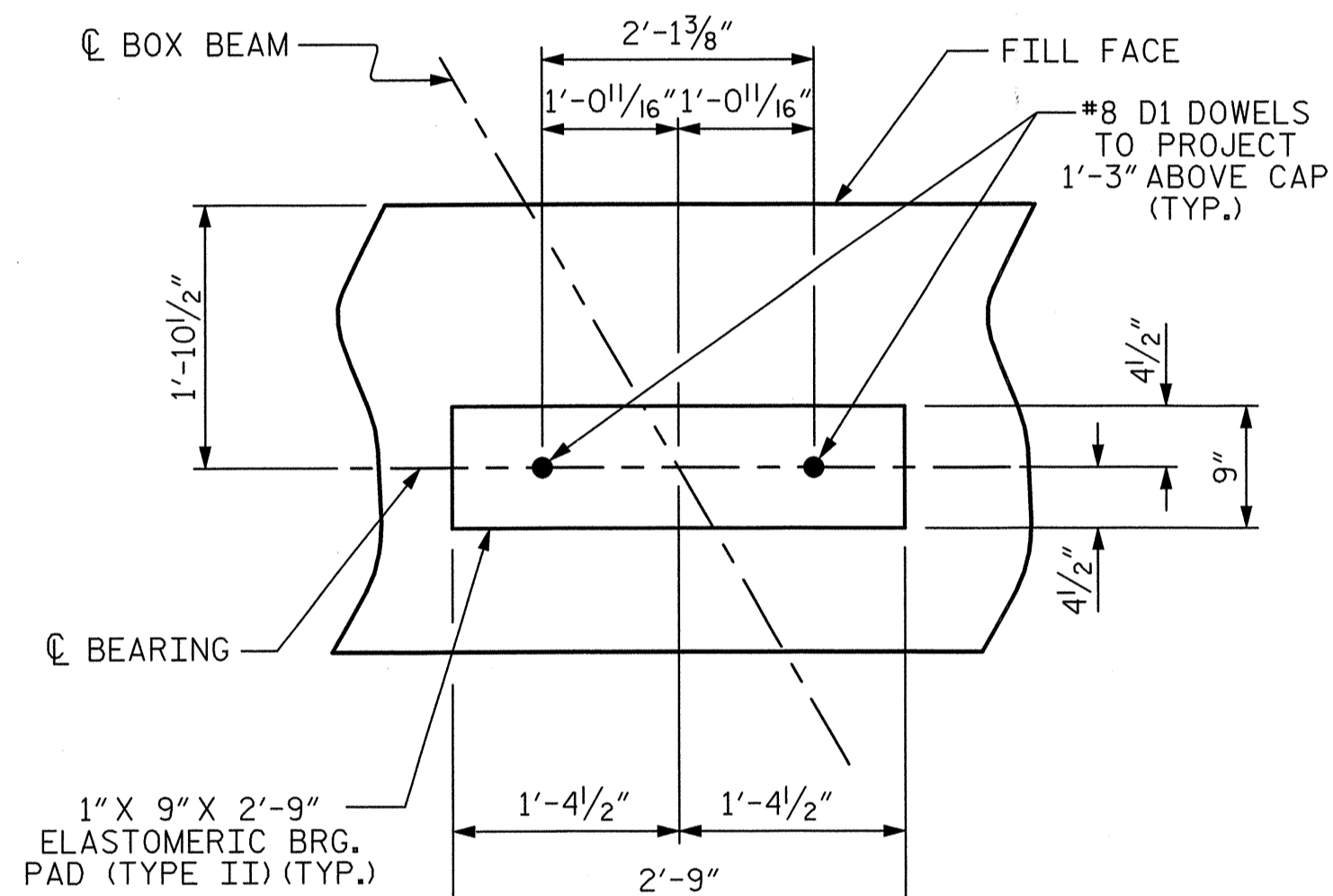


BAGGED STONE AND PIPE SHALL BE PLACED IMMEDIATELY AFTER COMPLETION OF END BENT EXCAVATION. PIPE MAY BE EITHER CONCRETE, CORRUGATED STEEL, CORRUGATED ALUMINUM ALLOY, OR CORRUGATED PLASTIC. PERFORATED PIPE WILL NOT BE ALLOWED.

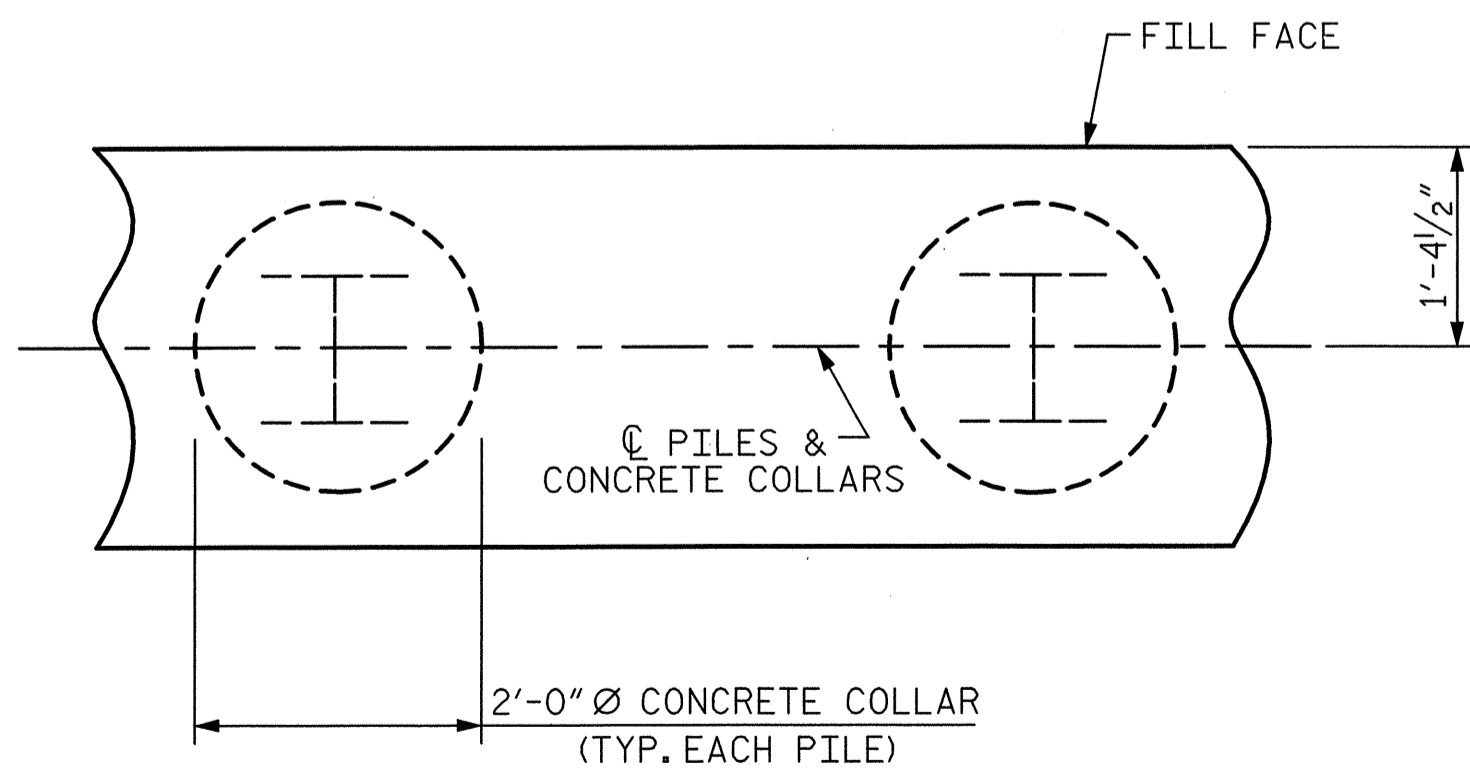
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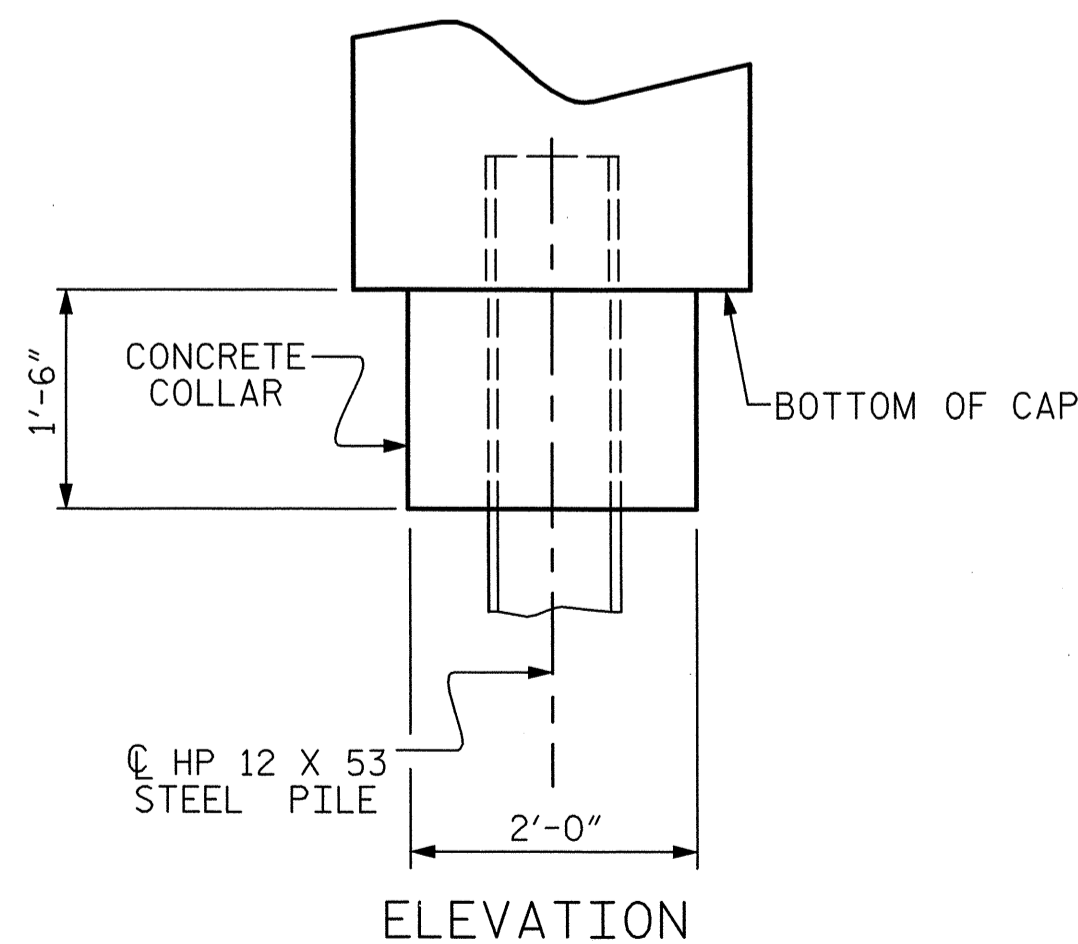
### TEMPORARY DRAINAGE AT END BENT



DETAIL "A"

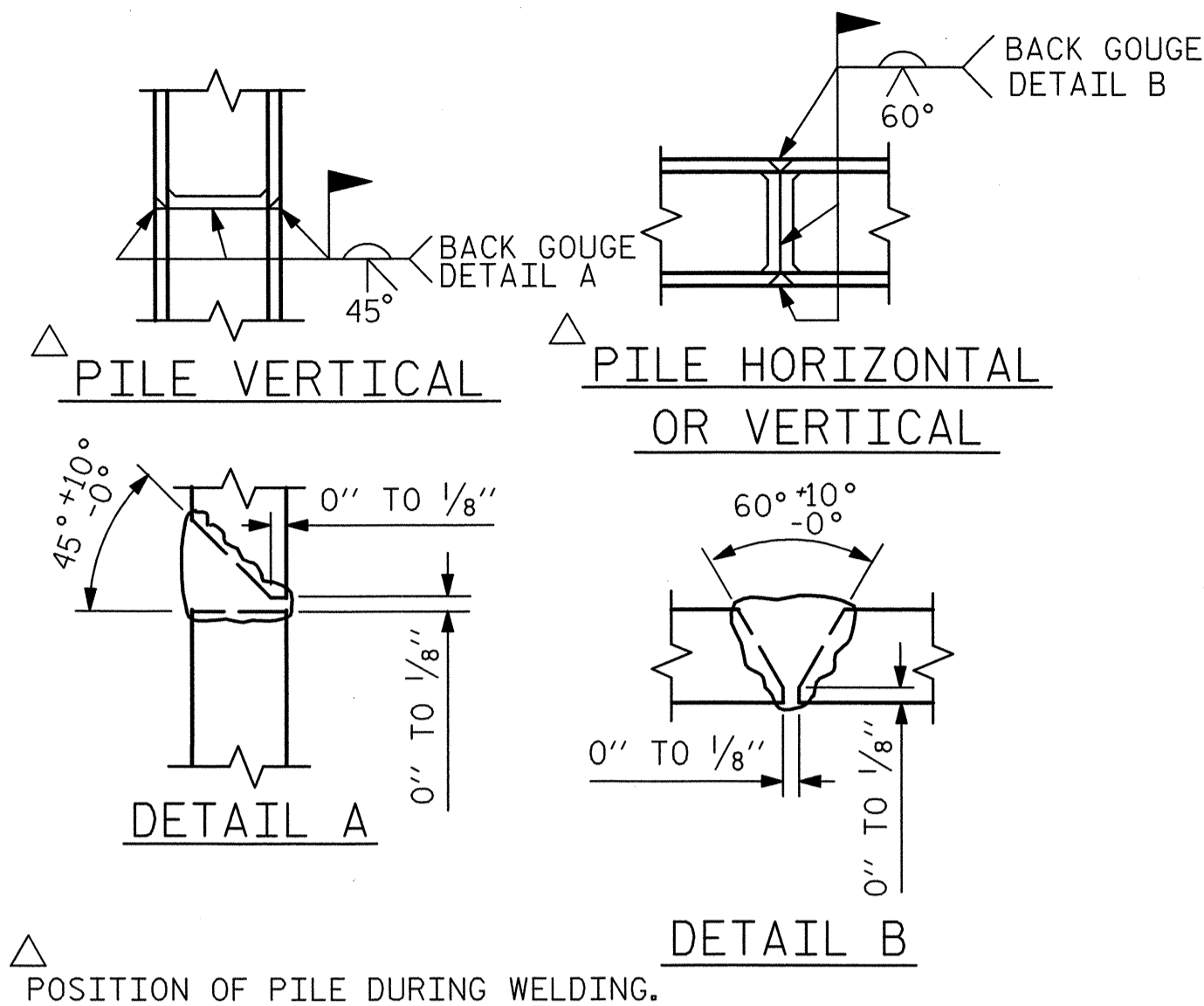


PLAN

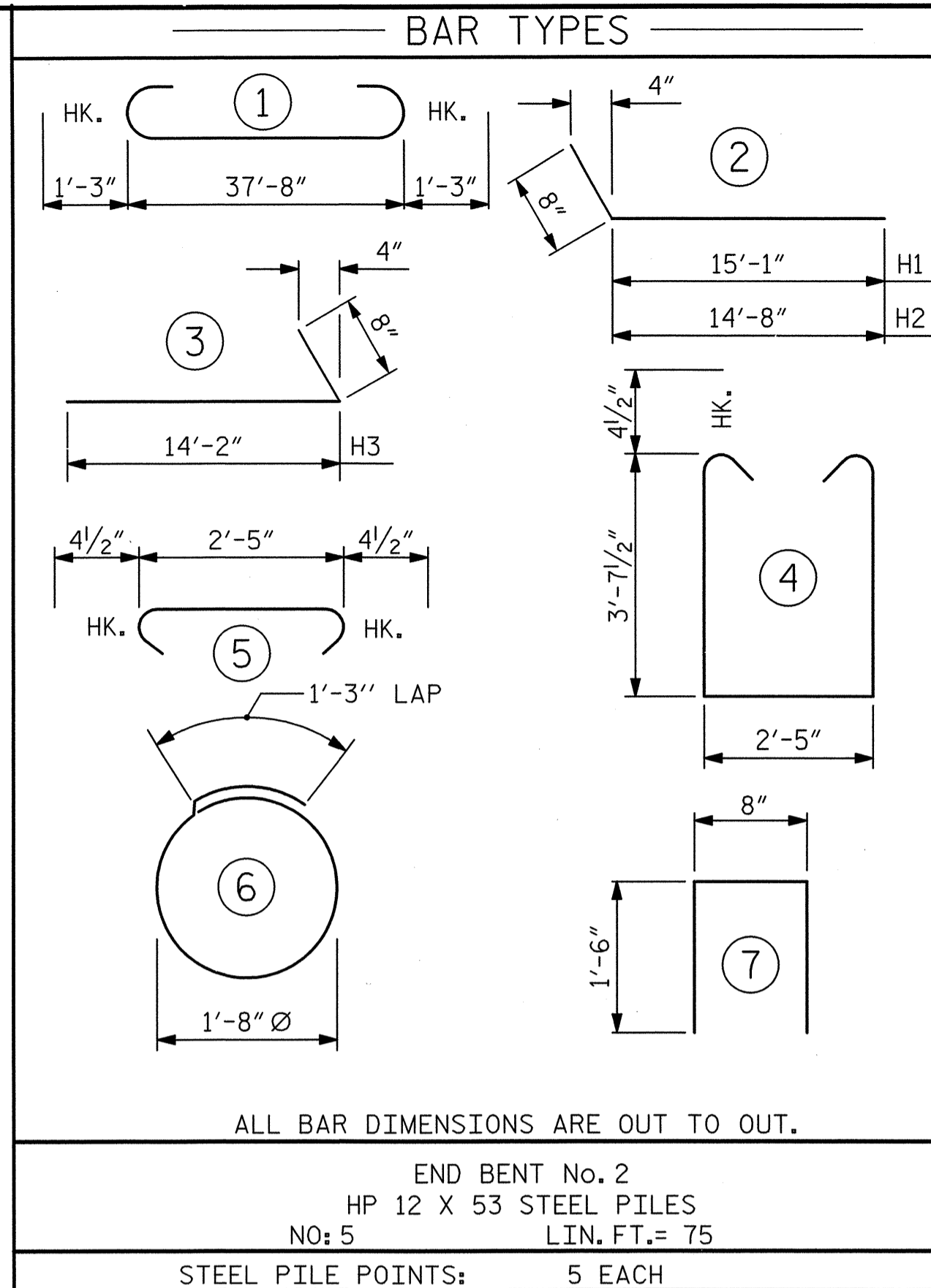


ELEVATION

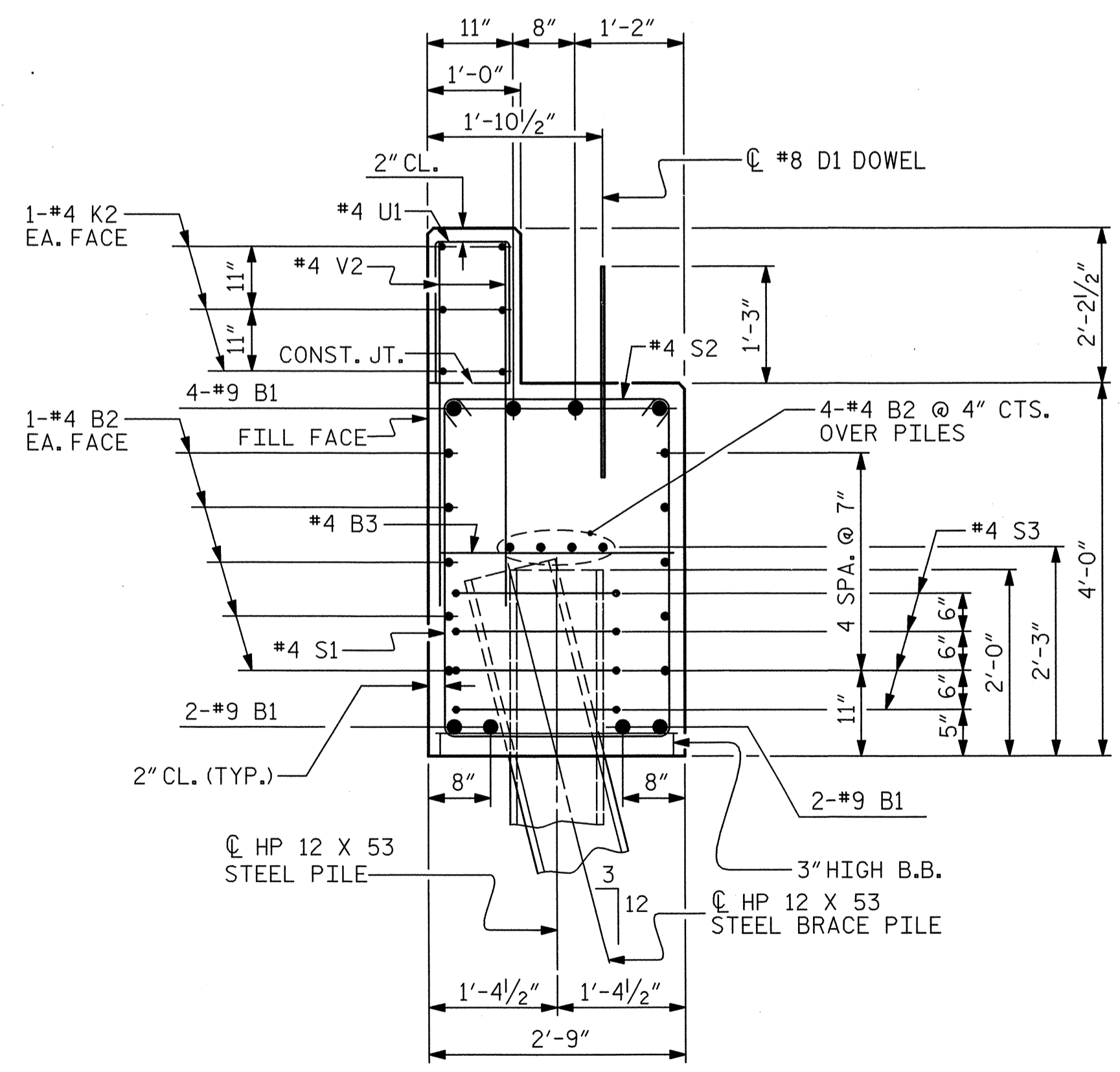
### CORROSION PROTECTION FOR STEEL PILES DETAIL



### PILE SPLICE DETAILS

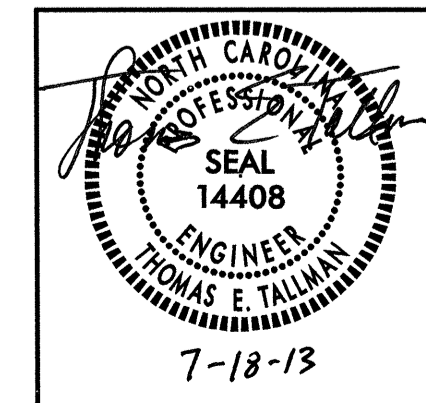


BILL OF MATERIAL FOR END BENT 2						
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	
B1	8	#9	1	40'-2"	1093	
B2	28	#4	STR	20'-2"	377	
B3	10	#4	STR	2'-5"	16	
D1	18	#8	STR	2'-3"	108	
H1	16	#6	2	15'-9"	379	
H2	16	#6	2	15'-4"	368	
H3	32	#6	3	14'-10"	713	
K1	12	#4	STR	3'-3"	26	
K2	12	#4	STR	20'-2"	162	
S1	52	#4	4	10'-5"	362	
S2	52	#4	5	3'-2"	110	
S3	20	#4	6	6'-6"	87	
U1	31	#4	7	3'-8"	76	
V1	77	#4	STR	7'-11"	407	
V2	62	#4	STR	5'-10"	242	
REINFORCING STEEL (FOR END BENT 2)				4526 LBS.		
CLASS A CONCRETE BREAKDOWN (FOR END BENT 2)						
POUR #1 CAP, LOWER PART OF WINGS & COLLARS				20.6 C.Y.		
POUR #2 BACKWALL & UPPER PART OF WINGS				8.5 C.Y.		
TOTAL CLASS A CONCRETE				29.1 C.Y.		



### SECTION A-A

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



PROJECT NO. B-5163

ROCKINGHAM COUNTY

STATION: 15+53.00 -L-

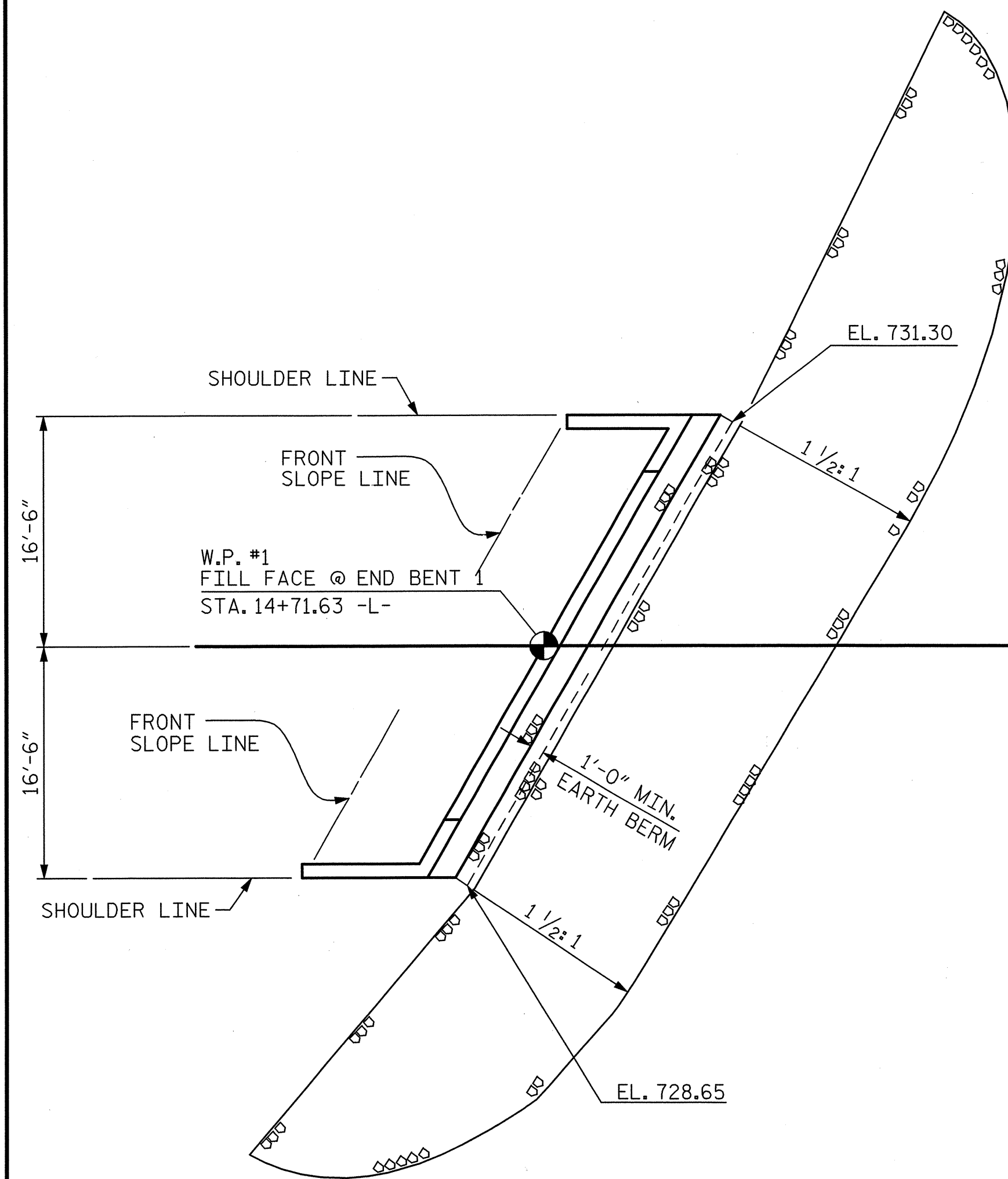
SHEET 3 OF 3

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH						
SUBSTRUCTURE						
END BENT No. 2						
DETAILS						
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S-21
1			3			TOTAL SHEETS 24
2			4			

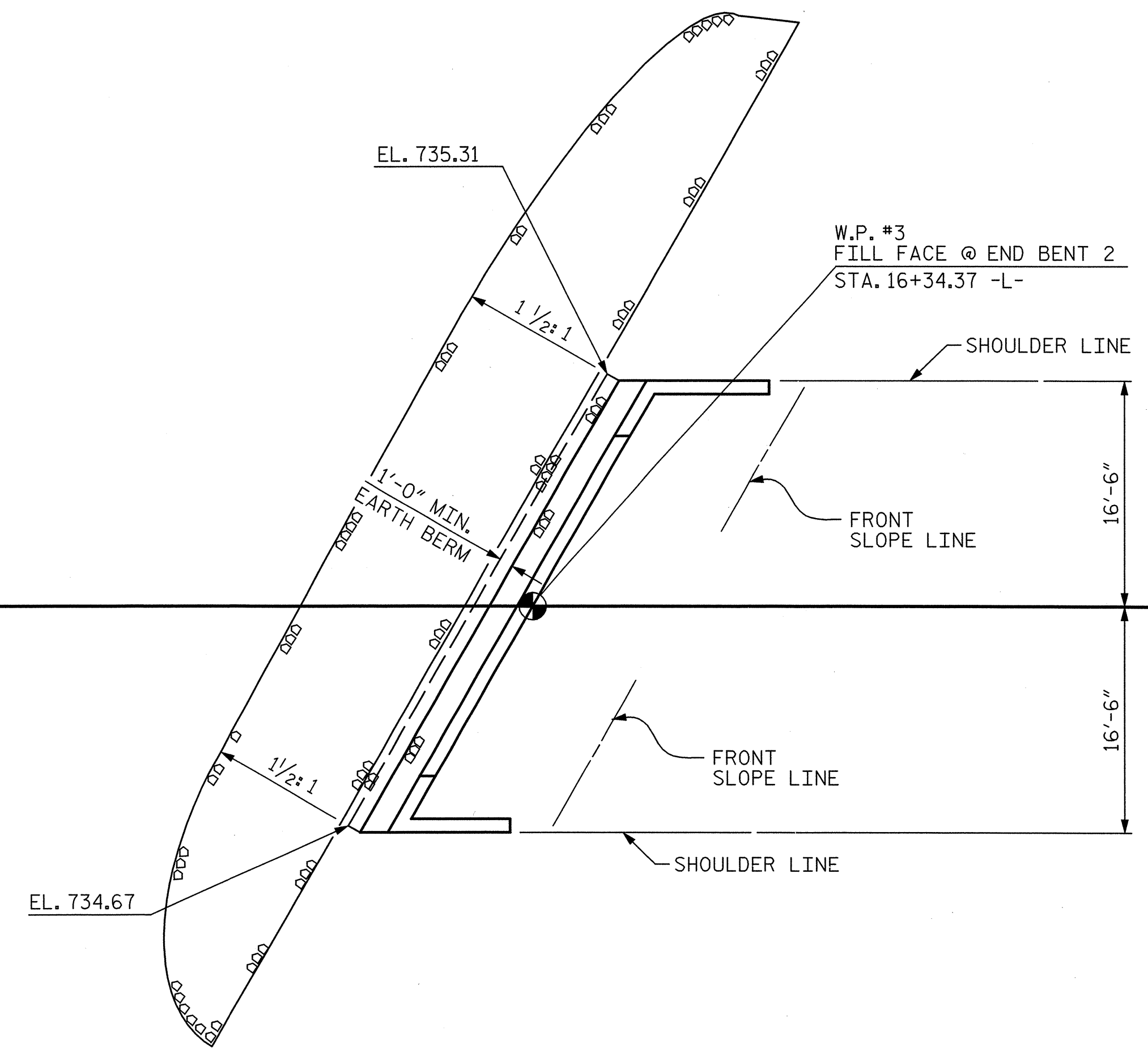
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 ICA Engineering f/k/a Florence & Hutcheson, Inc.

ASSEMBLED BY : D. H. CARTER DATE : APR 2013  
 CHECKED BY : J. E. MONDOLFI DATE : APR 2013  
 DRAWN BY : WJH 12/11  
 CHECKED BY : AAC 12/11

NOTES :  
FOR BERM WIDTH DIMENSIONS, SEE GENERAL DRAWING.

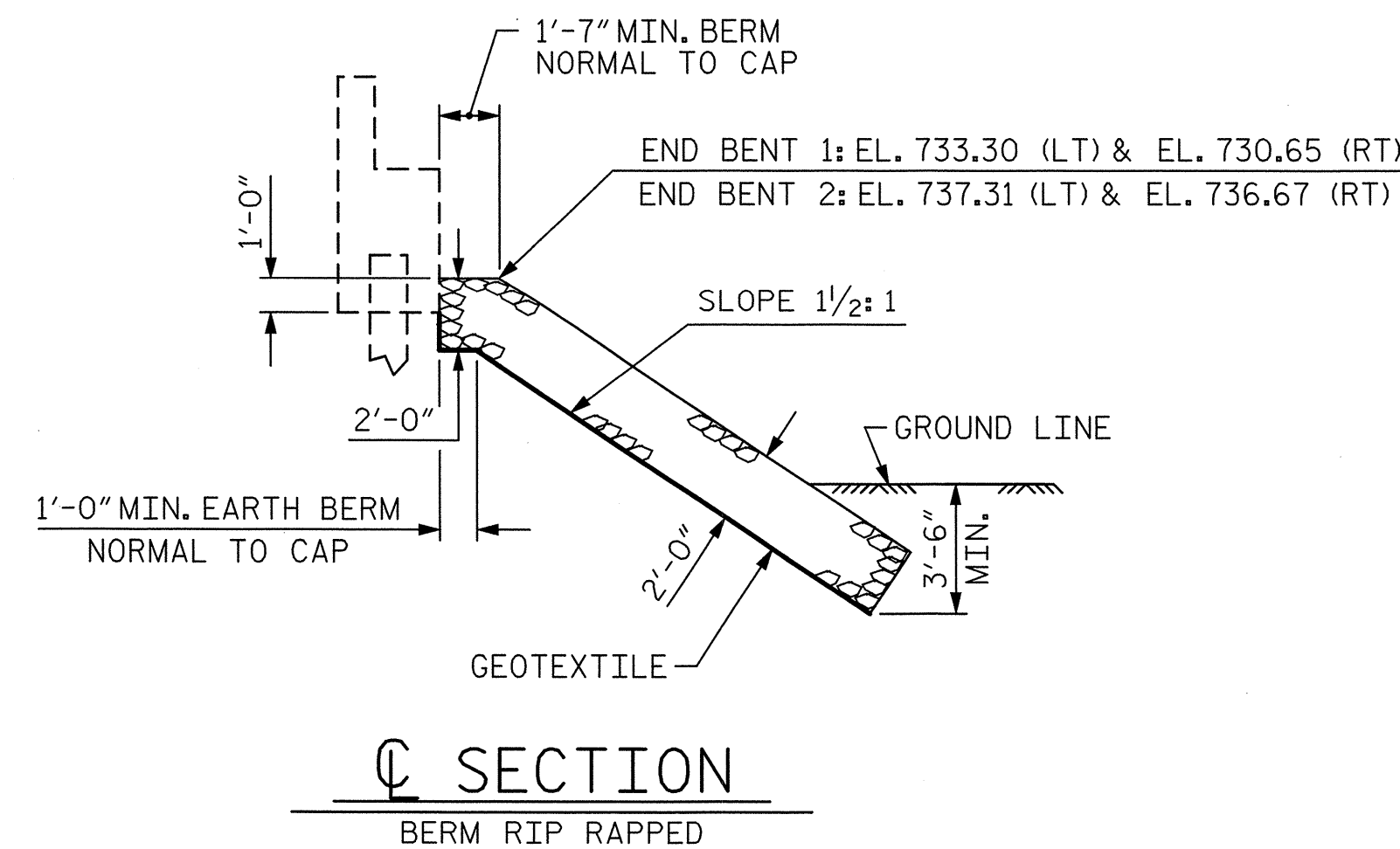


END BENT 1



END BENT 2

ESTIMATED QUANTITIES		
BRIDGE @ STA. 15+53.00 -L-	RIP RAP CLASS II (2'-0" THICK)	GEOTEXTILE FOR DRAINAGE
	TONS	SQUARE YARDS
END BENT 1	159	176
END BENT 2	112	125



C SECTION  
BERM RIP RAPPED

PROJECT NO. B-5163  
ROCKINGHAM COUNTY  
STATION: 15+53.00 -L-

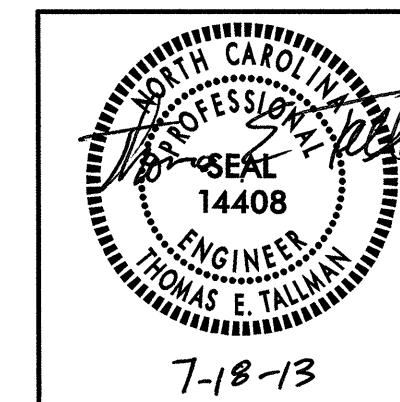
STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

—RIP RAP DETAILS—

REVISIONS						SHEET NO. S-22
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 24
2			4			

**ICA**  
Engineering

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5121 Kingdom Way, Suite 100 Raleigh, NC 27607  
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ICA Engineering f/k/a Florence & Hutcheson, Inc.

DRAWN BY : D. H. CARTER DATE : JUL 2013  
CHECKED BY : T. E. TALLMAN DATE : JUL 2013  
DESIGN ENGINEER OF RECORD: T. E. TALLMAN DATE : JUL 2013



NOTES

FOR BRIDGE APPROACH FILL INCLUDING GEOTEXTILE, 4" Ø DRAINAGE PIPE, AND #78M STONE BACKFILL, SEE ROADWAY PLANS.

GEOTEXTILE SHALL BE TYPE 11N ACCORDANCE WITH THE STANDARD SPECIFICATIONS SECTION 1056.

#78M STONE BACKFILL (CLASS V SELECT MATERIAL) SHALL BE IN ACCORDANCE WITH STANDARD SPECIFICATIONS SECTION 1016.

#78M STONE BACKFILL IS TO BE CONTINUOUS ALONG FILL FACE OF BACKWALL FROM OUTSIDE EDGE TO OUTSIDE EDGE OF APPROACH SLAB.

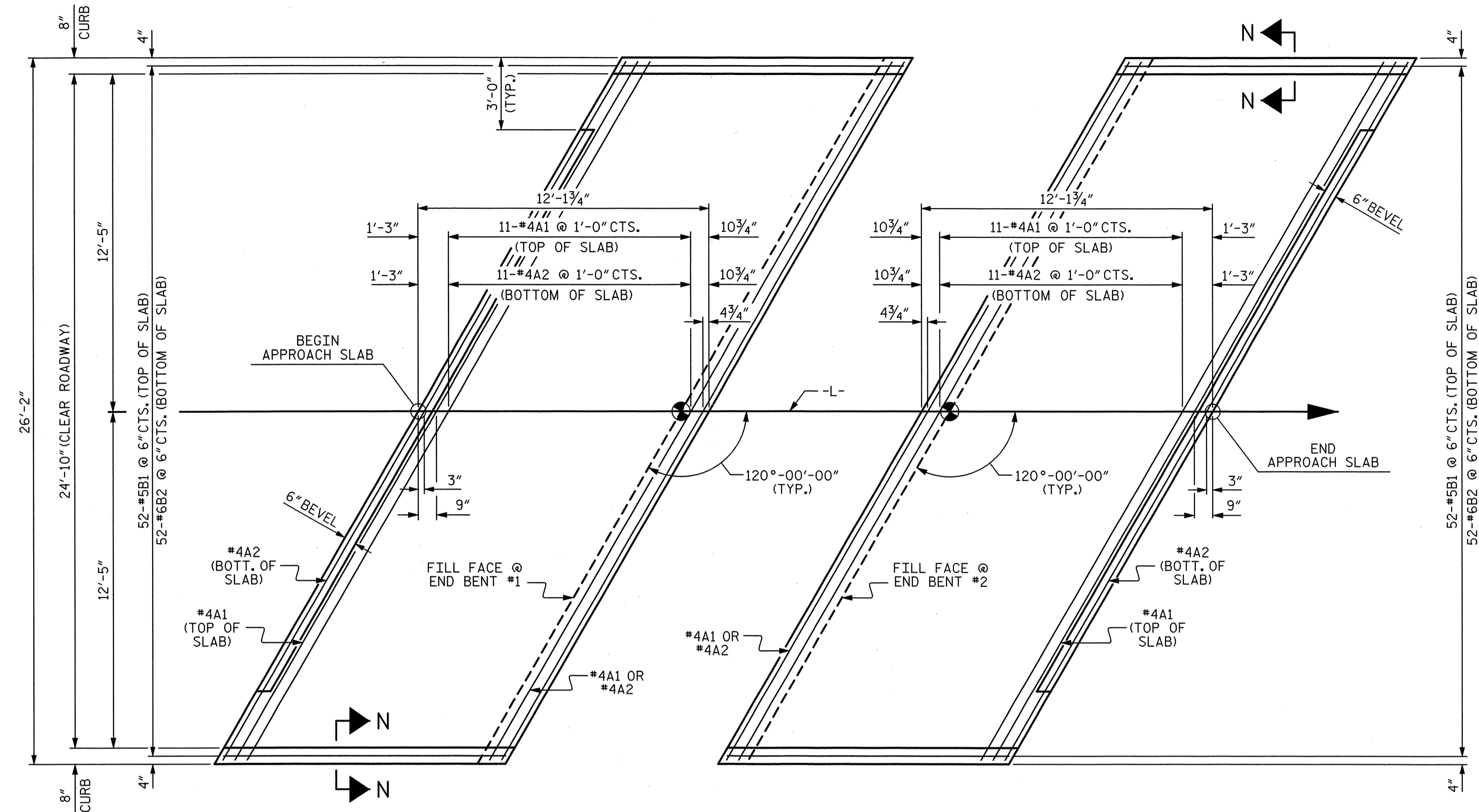
FOR THE 4" Ø DRAINAGE PIPE OUTLET(S), SEE ROADWAY STANDARD DRAWINGS.

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.

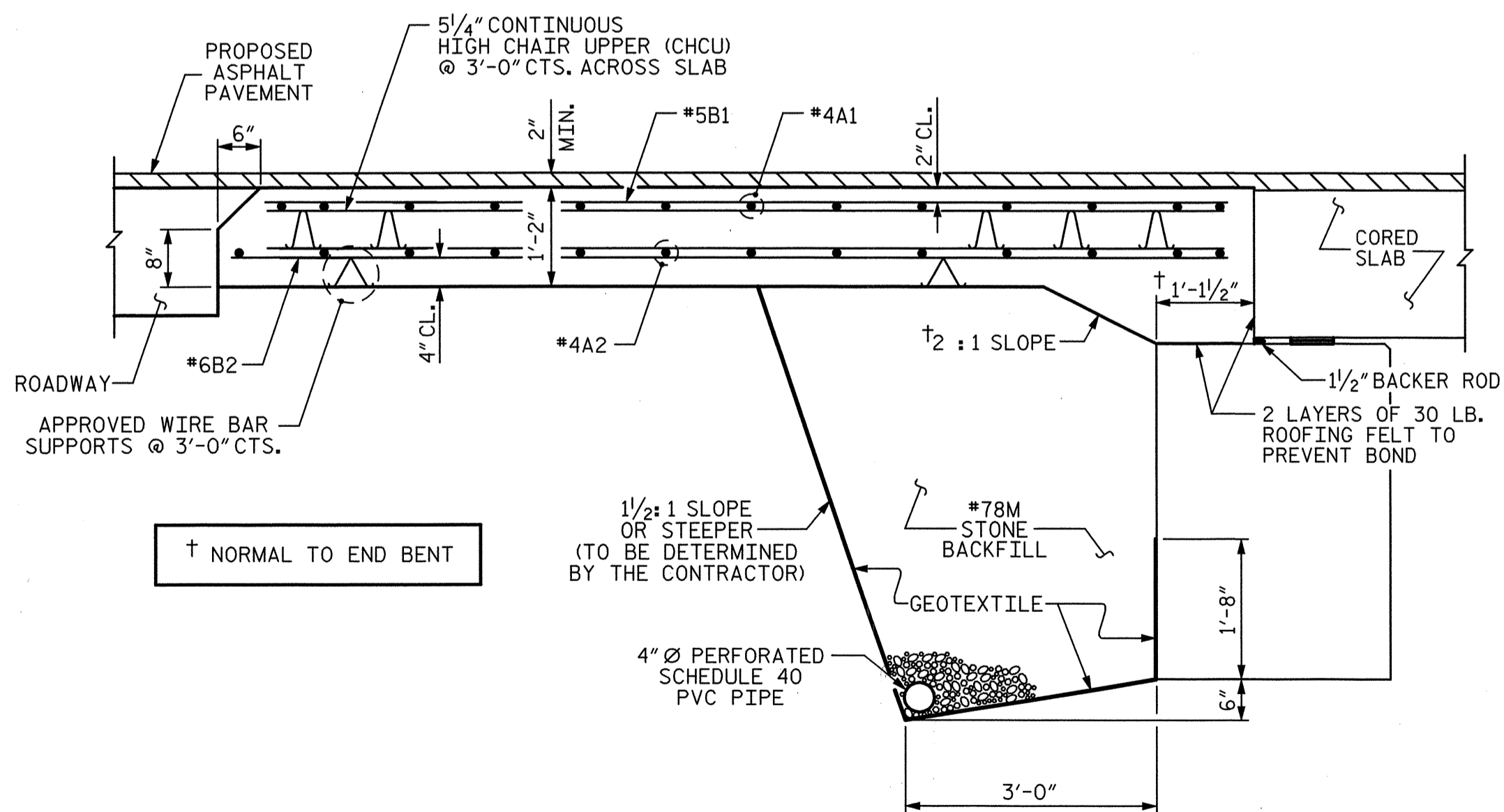
BILL OF MATERIAL

APPROACH SLAB AT EB #1						
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	
*A1	13	#4	STR	29'-9"	258	
A2	13	#4	STR	29'-9"	258	
*B1	52	#5	STR	11'-1"	601	
B2	52	#6	STR	11'-7"	905	
REINFORCING STEEL					LBS.	1163
* EPOXY COATED REINFORCING STEEL					LBS.	859
CLASS AA CONCRETE					C. Y.	16.7
APPROACH SLAB AT EB #2						
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT	
*A1	13	#4	STR	29'-9"	258	
A2	13	#4	STR	29'-9"	258	
*B1	52	#5	STR	11'-1"	601	
B2	52	#6	STR	11'-7"	905	
REINFORCING STEEL					LBS.	1163
* EPOXY COATED REINFORCING STEEL					LBS.	859
CLASS AA CONCRETE					C. Y.	14.0

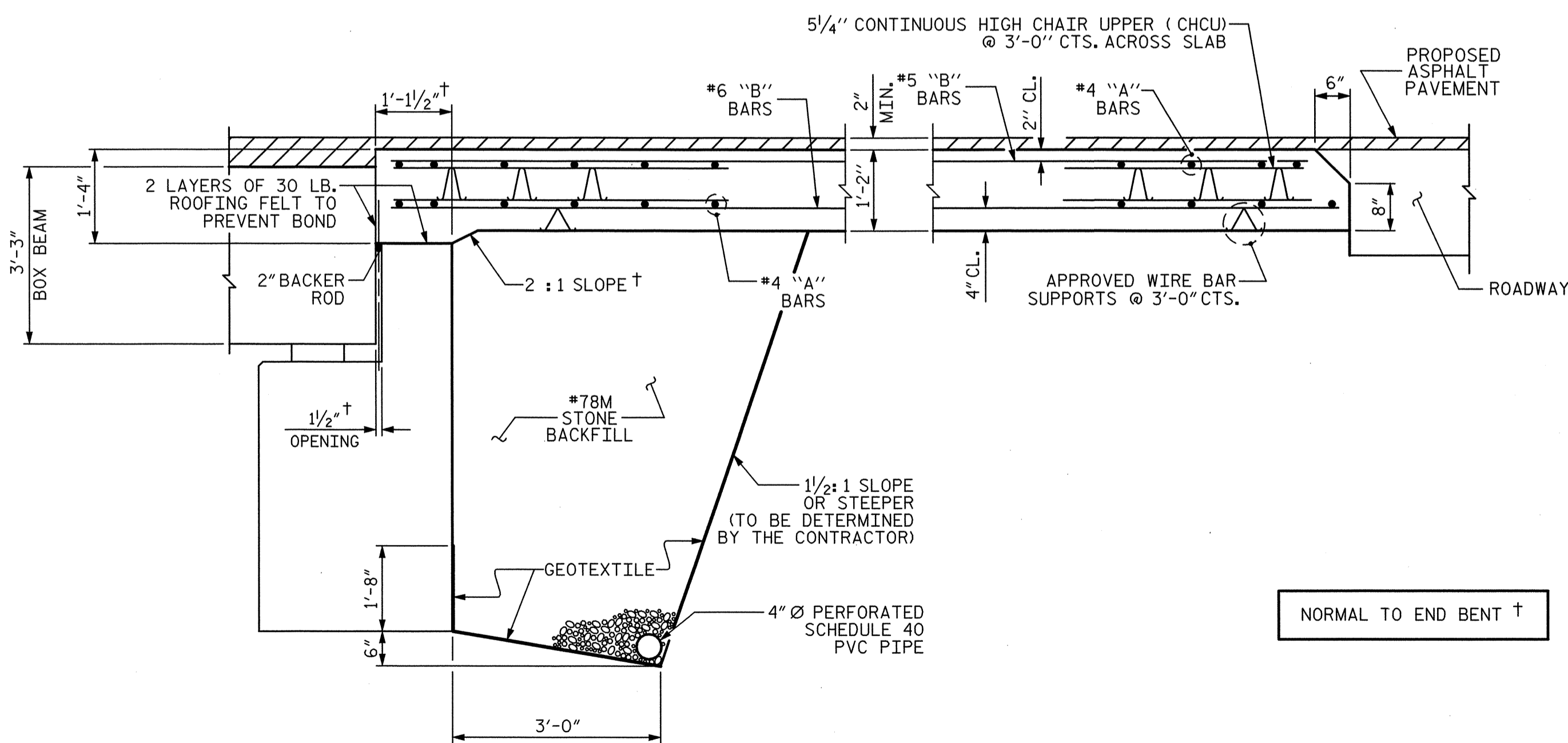


PLAN @ END BENT #1      PLAN @ END BENT #2

DIMENSIONS SHOWN ARE TYPICAL FOR BOTH APPROACH SLABS



SECTION THRU SLAB AT END BENT 1



SECTION THRU SLAB AT END BENT 2

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

PROJECT NO. B-5163

ROCKINGHAM COUNTY

STATION: 15+53.00 -L-

SHEET 1 OF 2

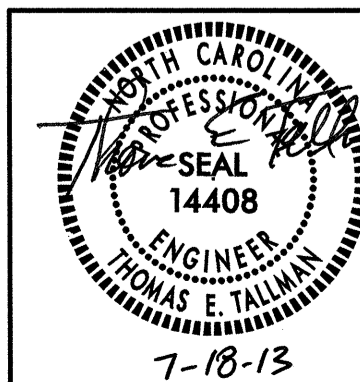
STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

BRIDGE APPROACH SLAB  
(SUB-REGIONAL TIER)  
120° SKEW

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S-23
1			3			TOTAL SHEETS
2			4			24

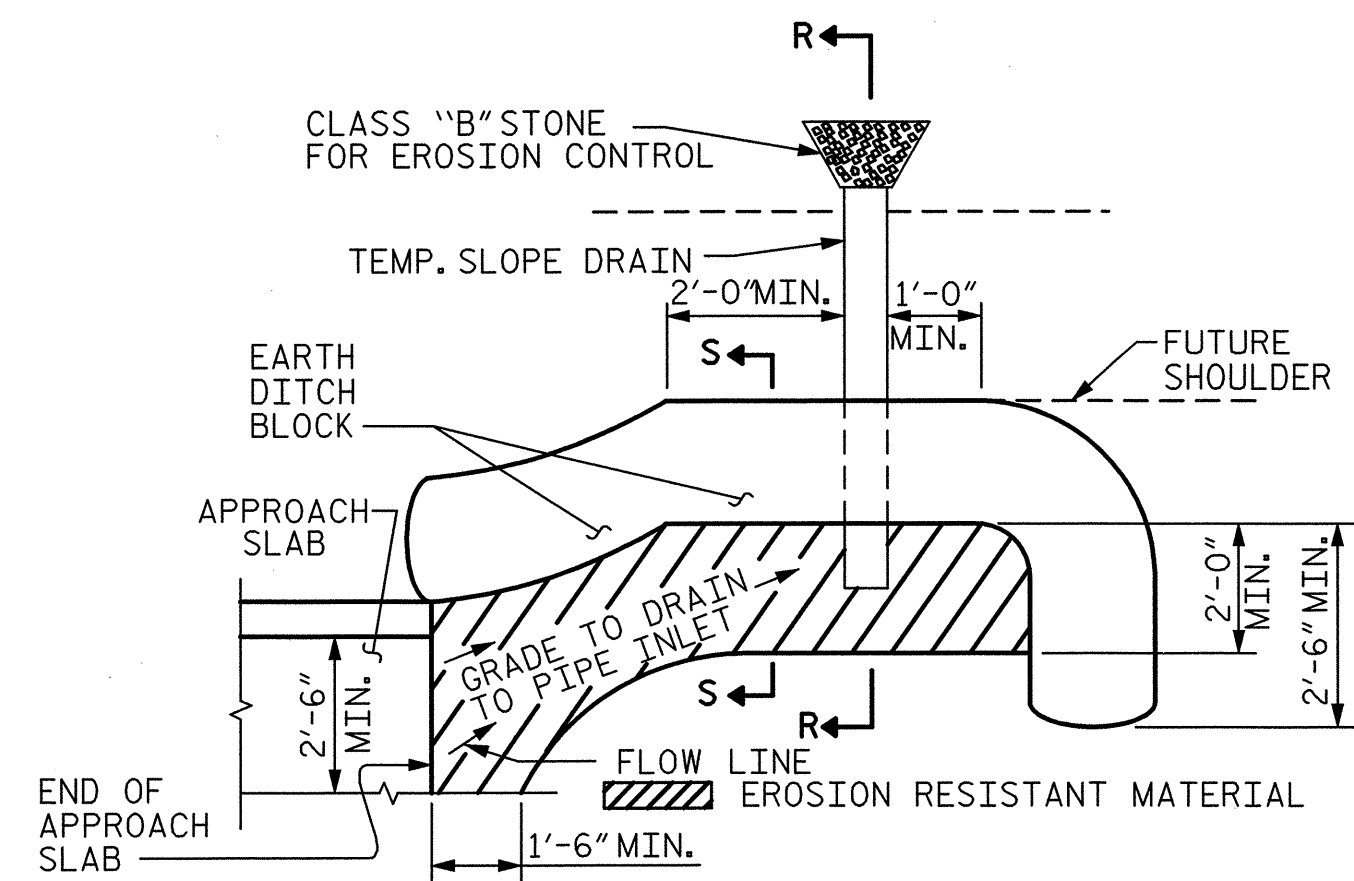


f/k/a Florence & Hutcheson, Inc.  
5121 Kingdom Way, Suite 100 Raleigh, NC 27607  
NC License No. F-0288



DRAWN BY : D. H. CARTER      DATE : JUL 2013  
CHECKED BY : T. E. TALLMAN      DATE : JUL 2013  
DESIGN ENGINEER OF RECORD: T. E. TALLMAN      DATE : JUL 2013

7/15/2013 c:\pures\structure\_design\15163\_rockingham\_160\plans\B-5163\_s.dwg  
ICA Engineering f/k/a Florence & Hutcheson, Inc.

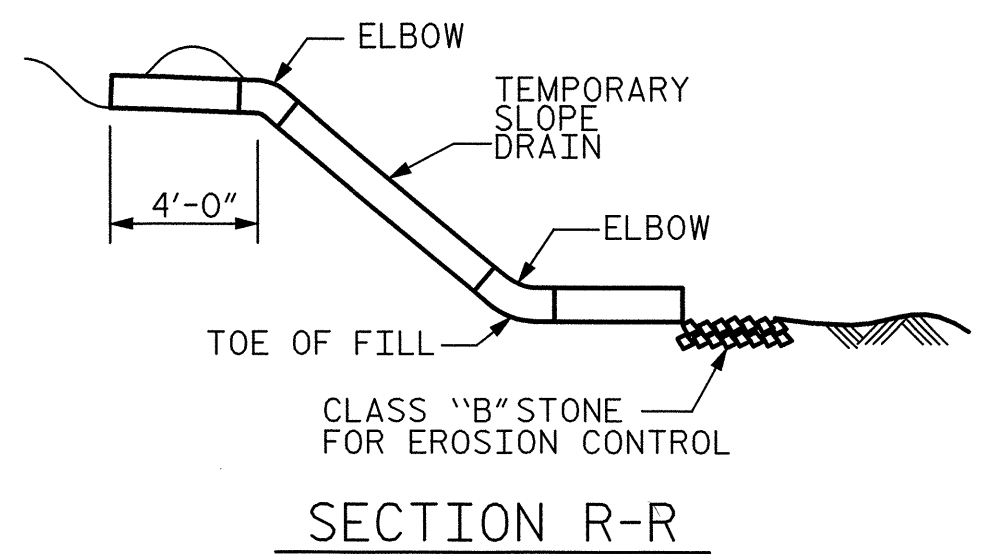


NOTE: IMMEDIATELY AFTER THE CONSTRUCTION OF THE APPROACH SLAB, THE CONTRACTOR SHALL PROVIDE TEMPORARY BERM AND SLOPE DRAIN. CONTRACTOR SHALL GRADE TO PIPE INLET AND PROVIDE EROSION RESISTANT MATERIAL AS SHOWN. THE EROSION RESISTANT MATERIAL SHALL BE EITHER 1) ASPHALT PLANT MIX, TYPE 1 OR TYPE 2, MIN.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

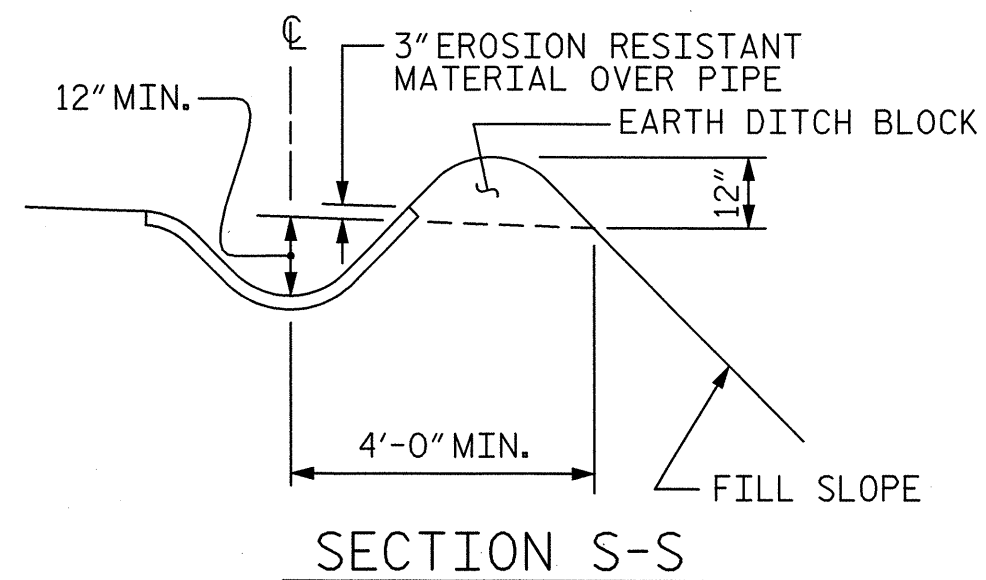
PLAN VIEW

TEMPORARY BERM AND SLOPE DRAIN DETAILS

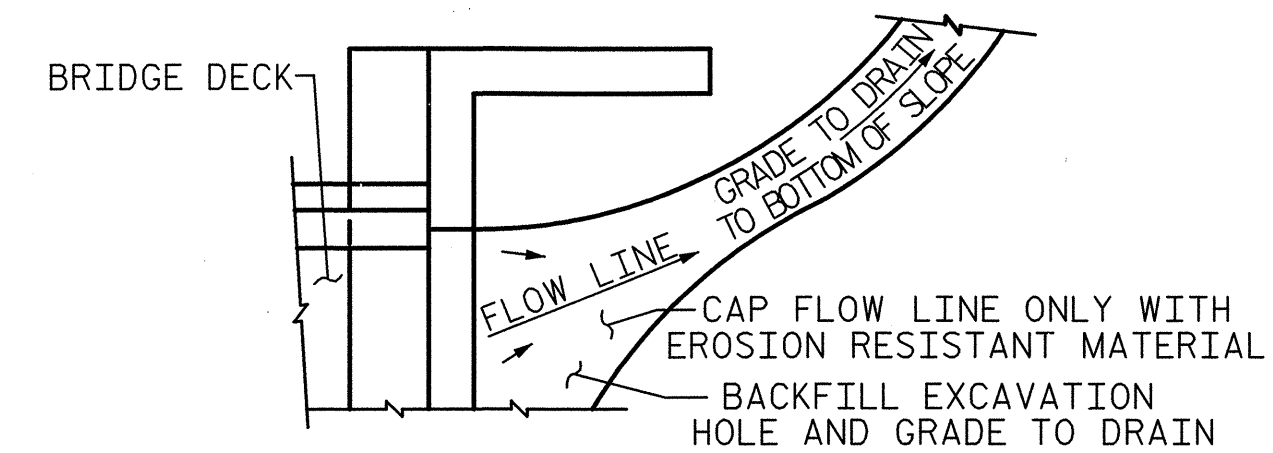
(TO BE USED WHEN SHOULDER BERM GUTTER IS REQUIRED)



SECTION R-R

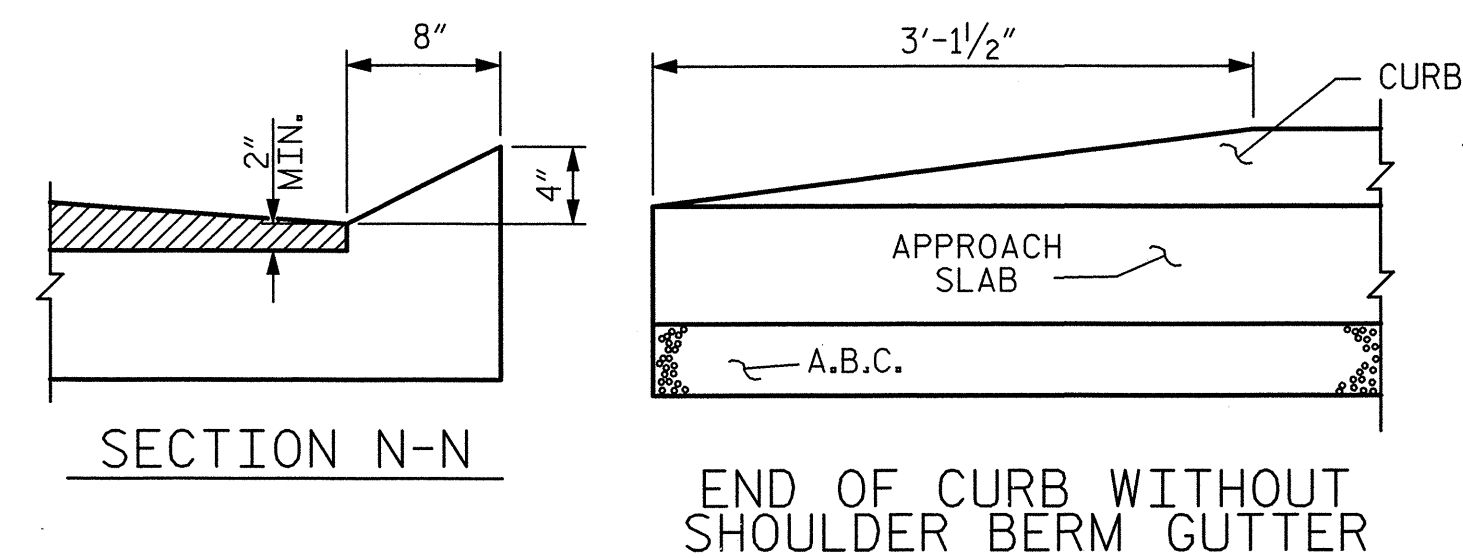


SECTION S-S



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



SECTION N-N

END OF CURB WITHOUT SHOULDER BERM GUTTER

CURB DETAILS

PROJECT NO. B-5163

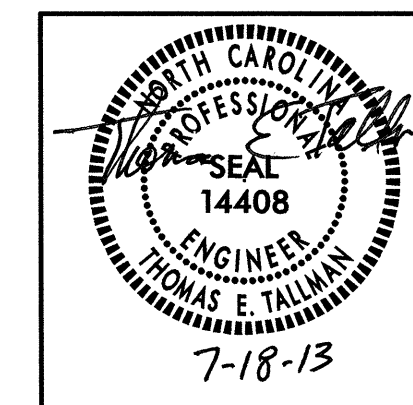
ROCKINGHAM COUNTY

STATION: 15+53.00 -L-

SHEET 2 OF 2

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
BRIDGE APPROACH SLAB  
DETAILS  
(SUB-REGIONAL TIER)

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



DRAWN BY : D. H. CARTER DATE : JUL 2013  
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DESIGN ENGINEER OF RECORD: T. E. TALLMAN DATE : JUL 2013

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## 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 2012 "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 3/4" WITH THE FOLLOWING EXCEPTIONS: TOP CORNERS OF CURBS MAY BE ROUNDED TO 1-1/2" RADIUS WHICH IS BUILT INTO CURB FORMS; CORNERS OF TRANSVERSE FLOOR EXPANSION JOINTS SHALL BE ROUNDED WITH A 1/4" 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 1/4" 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 7/8" Ø SHEAR STUDS FOR THE 3/4" Ø STUDS SPECIFIED ON THE PLANS. THIS SUBSTITUTION SHALL BE MADE AT THE RATE OF 3 - 7/8" Ø STUDS FOR 4 - 3/4" Ø STUDS, AND STUD SPACING CHANGES SHALL BE MADE AS NECESSARY TO PROVIDE THE SAME EQUIVALENT NUMBER OF 7/8" Ø STUDS ALONG THE BEAM AS SHOWN FOR 3/4" Ø STUDS BASED ON THE RATIO OF 3 - 7/8" Ø STUDS FOR 4 - 3/4" 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. 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.

ENGLISH

JANUARY, 1990