

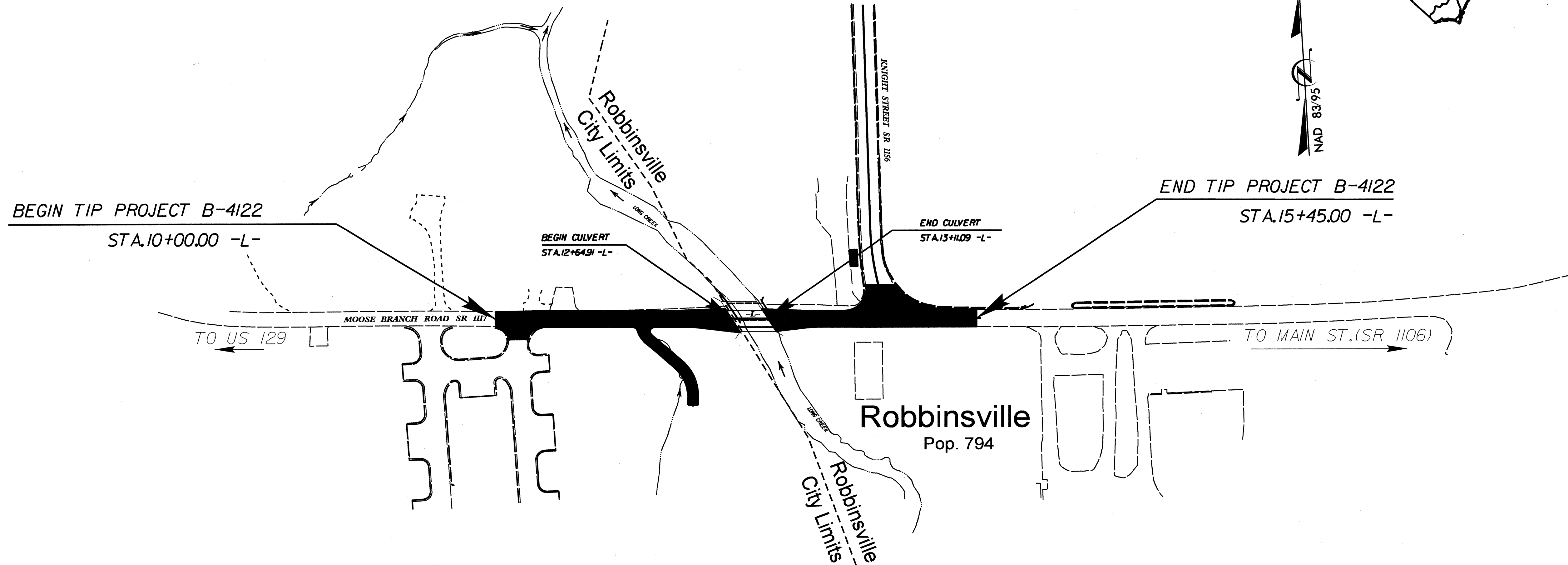
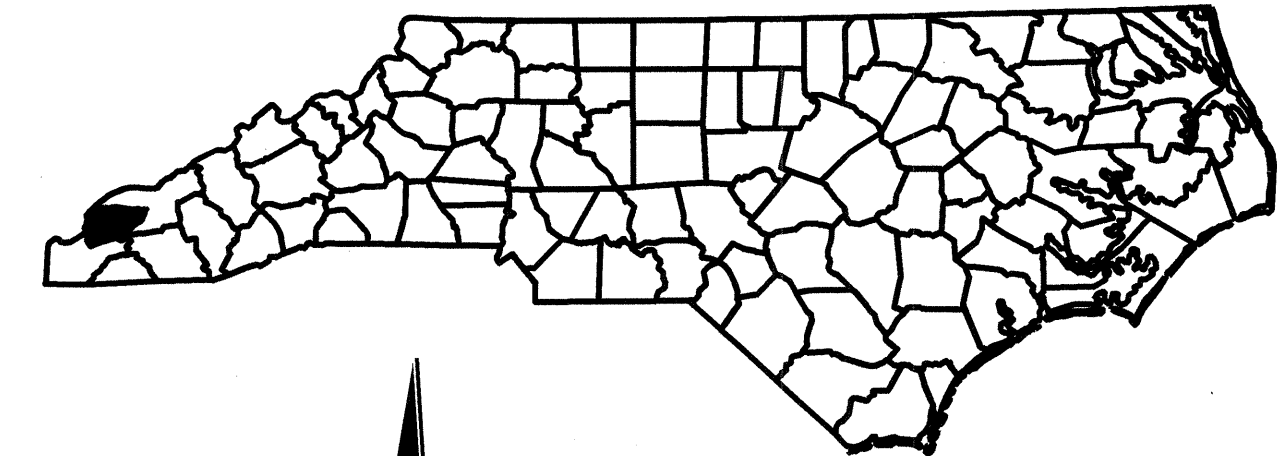
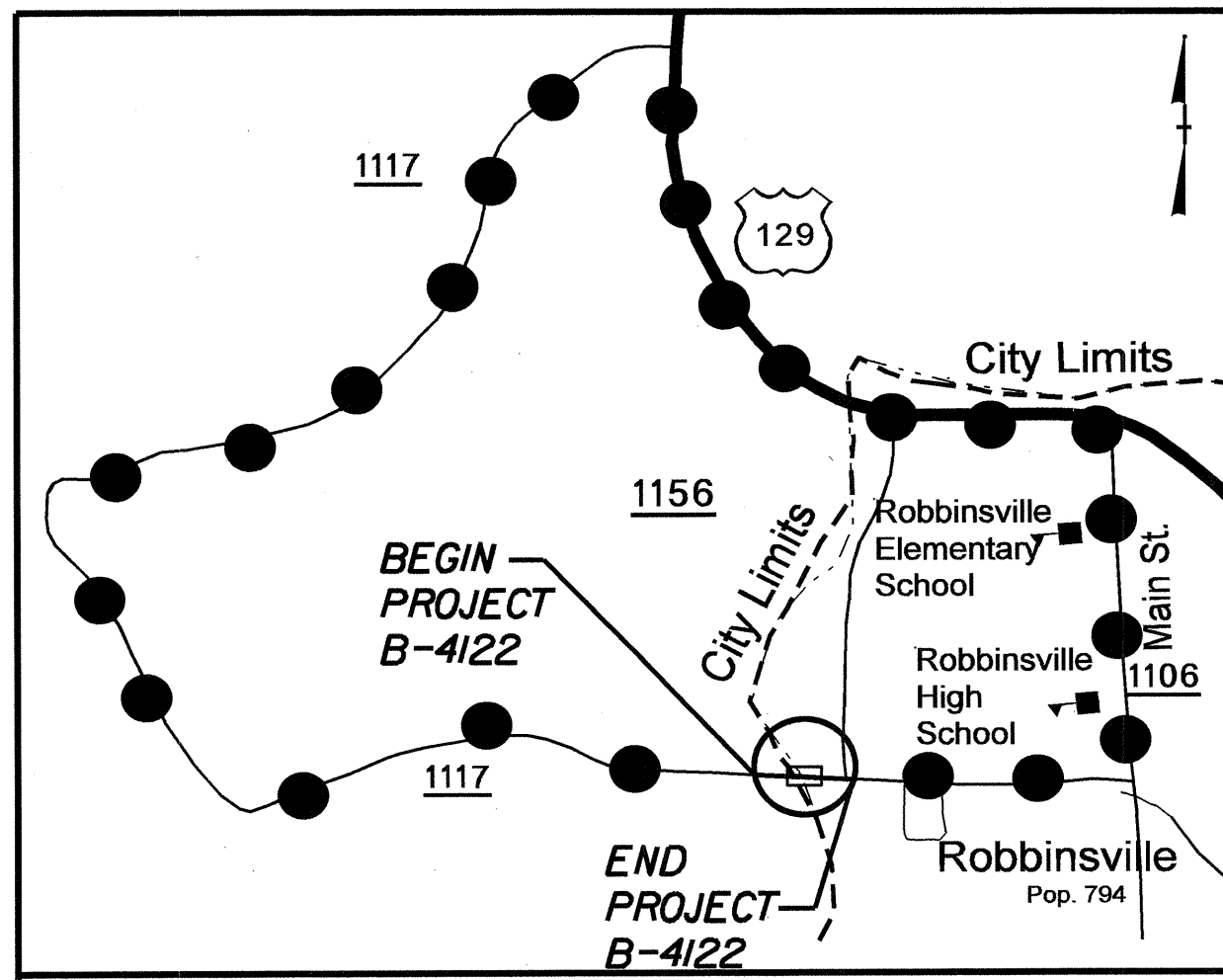
STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

**GRAHAM COUNTY**

LOCATION: BRIDGE No. 81 OVER LONG CREEK ON SR 1117

TYPE OF WORK: GRADING, PAVING, DRAINAGE, GUARDRAIL,  
AND CULVERT

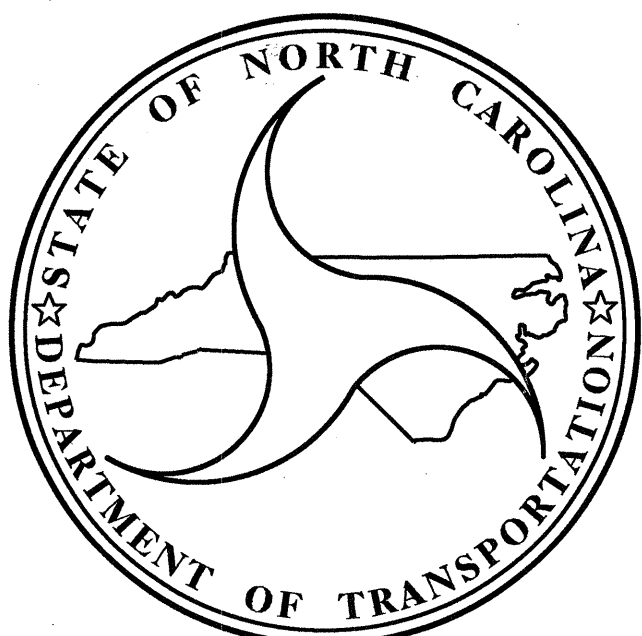
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4122		
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
33475.1.1	BRZ-1117(8)	PE	
33475.2.1	BRZ-1117(8)	R/W, UTIL.	
33475.3.1	BRZ-1117(8)	CONSTRUCTION	



TIP PROJECT: B-4122

CONTRACT: C202429

CULVERT



**DESIGN DATA**

ADT 2010 = 740 VPD  
 ADT 2030 = 1087 VPD  
 DHV = 10 %  
 D = 60 %  
 T = 4 % \*  
 V = 40 MPH  
 CLASS = LOCAL  
 \* TTST 2% DUAL 2%

**PROJECT LENGTH**

LENGTH OF ROADWAY  
TIP PROJECT B-4122 = 0.094 MI.  
 LENGTH OF STRUCTURE  
TIP PROJECT B-4122 = 0.009 MI.  
 TOTAL LENGTH OF  
TIP PROJECT B-4122 = 0.103 MI.

Prepared In the Office of:

**DIVISION OF HIGHWAYS**

2012 STANDARD SPECIFICATIONS

LETTING DATE :

DECEMBER 18, 2012

Q.H. NGUYEN, P.E.  
PROJECT ENGINEER

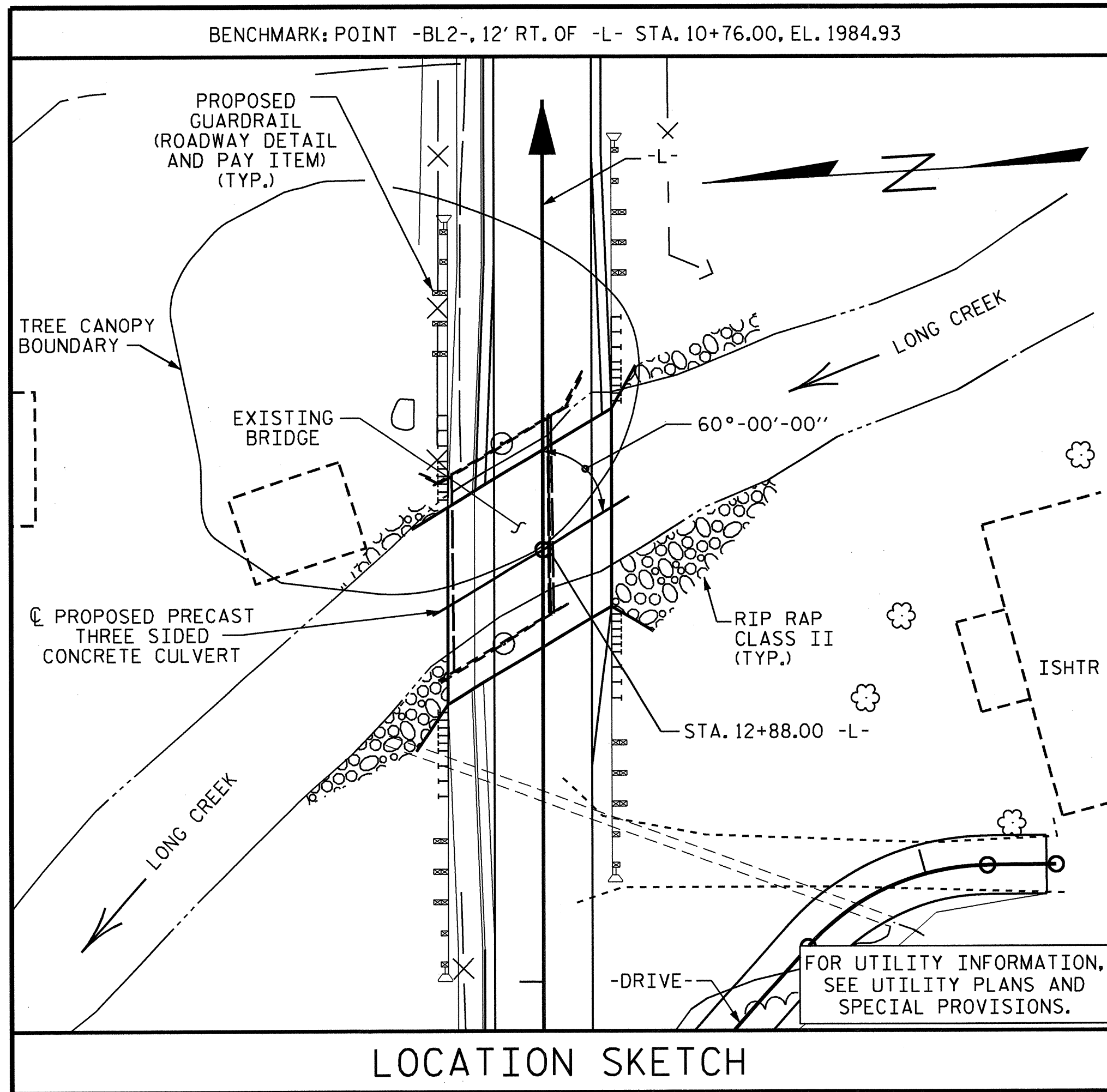
MARC G. CHEEK, P.E.  
PROJECT DESIGN ENGINEER

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

DIVISION OF HIGHWAYS  
STATE OF NORTH CAROLINA

STATE DESIGN ENGINEER  
DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION

APPROVED  
DIVISION ADMINISTRATOR DATE



LOCATION SKETCH

GENERAL NOTES

ASSUMED LIVE LOAD -----HL-93 OR ALTERNATE LOADING.  
 FOR OTHER DESIGN DATA AND NOTES, SEE STANDARD NOTES SHEET.

A 3 FOOT STRIP OF FILTER FABRIC SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.

THE SCOUR CRITICAL ELEVATION FOR END BENT NO.1 AND NO.2 IS ELEVATION 1960. THE SCOUR CRITICAL ELEVATIONS ARE FOR USE BY MAINTENANCE FORCES TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.

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

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

THE EXISTING STRUCTURE CONSISTING OF 1-SPAN AT 40'-6" WITH A TIMBER DECK ON STEEL I-BEAMS SUPERSTRUCTURE AND A CLEAR ROADWAY WIDTH OF 19'-2" ON A SUBSTRUCTURE CONSISTING OF TIMBER CAP ON TIMBER POST AND SILLS AND LOCATED AT THE SITE OF THE PROPOSED STRUCTURE SHALL BE REMOVED. THE EXISTING BRIDGE IS PRESENTLY POSTED BELOW THE LEGAL LOAD LIMIT. SHOULD THE STRUCTURE INTEGRITY OF THE BRIDGE FURTHER DETERIORATE, THIS LOAD LIMITATION MAY BE REDUCED AS FOUND NECESSARY DURING THE LIFE OF THE PROJECT. SEE SPECIAL PROVISION FOR "REMOVAL OF EXISTING STRUCTURE".

REMOVAL OF THE EXISTING BRIDGE SHALL BE PERFORMED SO AS NOT TO ALLOW DEBRIS TO FALL INTO THE WATER. THE CONTRACTOR SHALL REMOVE THE BRIDGE AND SUBMIT PLANS FOR DEMOLITION IN ACCORDANCE WITH ARTICLE 402-2 OF THE STANDARD SPECIFICATION.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.  
 FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.  
 FOR EROSION CONTROL MEASURES, SEE EROSION CONTROL PLANS.  
 FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.  
 FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.  
 FOR PRESERVATION OF TREE AT APPROXIMATE STA. 13+15 -L- (LEFT), SEE ROADWAY PLANS.

THE ENTIRE COST OF THE WORK REQUIRED TO CONSTRUCT THE CULVERT FOOTINGS, INCLUDING THE COST OF CONCRETE AND REINFORCING STEEL, SHALL BE INCLUDED IN THE PRICE BID FOR "SHEET PILE FOUNDATION".

A STRIP FOOTING ON STEEL SHEET PILES IS REQUIRED FOR THE PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT FOUNDATION. THE CONTRACTOR SHALL PROVIDE THE FOOTING DESIGN TO THE ENGINEER FOR REVIEW AND APPROVAL.

THE ENTIRE COST TO CONSTRUCT THE CULVERT WINGS, INCLUDING CONCRETE AND REINFORCING STEEL, SHALL BE INCLUDED IN THE LUMP SUM PRICE BID FOR "PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT".

FOR ALASKA RAIL - CURB MOUNTED, SEE SPECIAL PROVISIONS.

INASMUCH AS THE PAINT SYSTEM ON THE EXISTING STRUCTURAL STEEL CONTAINS LEAD, THE CONTRACTOR'S ATTENTION IS DIRECTED TO ARTICLE 107-1 OF THE STANDARD SPECIFICATIONS. ANY COST RESULTING FROM COMPLIANCE WITH APPLICABLE STATE OR FEDERAL REGULATIONS PERTAINING TO HANDLING OF MATERIALS CONTAINING LEAD BASED PAINT SHALL BE INCLUDED IN THE BID PRICE FOR "REMOVAL OF EXISTING STRUCTURE."

THE CONTRACTOR SHALL PROVIDE INDEPENDENT ASSURANCE SAMPLES OF REINFORCING STEEL AS FOLLOWS: FOR PROJECTS REQUIRING UP TO 400 TONS OF REINFORCING STEEL, ONE 30 INCH SAMPLE OF EACH SIZE BAR USED, AND FOR PROJECTS REQUIRING OVER 400 TONS OF REINFORCING STEEL, TWO 30 INCH SAMPLES OF EACH SIZE BAR USED. THE BARS FROM WHICH THE SAMPLES ARE TAKEN MUST THEN BE SPLICED WITH REPLACEMENT BARS OF THE SIZE AND LENGTH OF THE SAMPLE, PLUS A MINIMUM LAP SPLICE OF THIRTY BAR DIAMETERS. PAYMENT FOR THE SAMPLES OF REINFORCING STEEL SHALL BE CONSIDERED INCIDENTAL TO VARIOUS PAY ITEMS.

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

THE PRECAST CULVERT SECTIONS AND WINGS SHALL BE DESIGNED TO HANDLE FULL DEPTH HYDROSTATIC PRESSURE IF WEEP HOLES ARE NOT UTILIZED. IF PROVIDED WEEP HOLES SHALL BE LOCATED A MINIMUM HEIGHT OF 6 INCHES ABOVE THE NORMAL FLOW LINE AND HAVE A MAXIMUM SPACING OF 10 FEET.

FOUNDATION NOTES

FOR SHEET PILE FOUNDATIONS, SEE SHEET PILE FOUNDATIONS SPECIAL PROVISION AND SECTION 450 OF THE STANDARD SPECIFICATIONS AS REQUIRED.

PILES AT FOOTING NO.1 AND 2 ARE DESIGNED FOR A FACTORED RESISTANCE OF 5 TONS PER PILE.

DRIVE SHEET PILES TO A REQUIRED DRIVING RESISTANCE OF 12.5 TONS PER SHEET PILE. THIS REQUIRED DRIVING RESISTANCE INCLUDES ADDITIONAL RESISTANCE FOR DOWNDRAG OR SCOUR.

INSTALL SHEET PILES AT FOOTING NO.1 TO A TIP ELEVATION NO HIGHER THAN 1950 FT (LT) AND 1945 (RT).

INSTALL SHEET PILES AT FOOTING NO.2 TO A TIP ELEVATION NO HIGHER THAN 1945 FT (LT) AND 1950 (RT).

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

THE SCOUR CRITICAL ELEVATION FOR FOOTING NO.1 AND 2 IS ELEVATION 1962 FT. SCOUR CRITICAL ELEVATIONS ARE USED TO MONITOR POSSIBLE SCOUR PROBLEMS DURING THE LIFE OF THE STRUCTURE.

IT HAS BEEN ESTIMATED THAT A HAMMER WITH AN EQUIVALENT RATED ENERGY IN THE RANGE OF 15,000-25,000 FT-LBS PER BLOW WILL BE REQUIRED TO DRIVE SHEET PILES AT FOOTING NO.1 AND 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.

TESTING SHEET PILES WITH THE PDA DURING DRIVING, RESTRIKING OR REDRIVING MAY BE REQUIRED. THE ENGINEER WILL DETERMINE THE NEED FOR PDA TESTING. FOR PDA TESTING, SEE SECTION 450 OF THE STANDARD SPECIFICATIONS (AND FOR PILE DRIVING CRITERIA, SEE PILE DRIVING CRITERIA PROVISION).

IF NECESSARY, PREDRILL SHEET PILE LOCATIONS AT FOOTING NO.1 AND 2 TO ELEVATION 1960 FT WITH EQUIPMENT THAT WILL RESULT IN A MAXIMUM PREDRILLING DIAMETER OF 12". FOR PREDRILLING FOR SHEET PILES, SEE SHEET PILE FOUNDATIONS SPECIAL PROVISION.

HYDRAULIC DATA

DESIGN DISCHARGE	= 2300 CFS
FREQUENCY OF DESIGN FLOOD	= 25 YRS.
DESIGN HIGH WATER ELEVATION	= 1983.30
DRAINAGE AREA	= 11.4 SQ. MI.
BASE DISCHARGE (Q100)	= 3470 CFS
BASE HIGH WATER ELEVATION	= 1986.44

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 2870 CFS
FREQUENCY OF OVERTOPPING FLOOD	= 50 YRS.
OVERTOPPING FLOOD ELEVATION	= 1985.50

GRADE DATA

GRADE POINT ELEVATION @ STA. 12+88.00 -L-	= 1985.87
BED ELEVATION @ STA. 12+88.00 -L-	= 1977.9

TOTAL STRUCTURE QUANTITIES

REMOVAL OF EXISTING STRUCTURE	LUMP SUM
PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT @ STA. 12+88.00 -L-	LUMP SUM
CLASS AA CONCRETE	13.5 CU.YDS.
RIP RAP CLASS II	46 TONS
GEOTEXTILE FOR DRAINAGE	51 SQ.YDS.
EPOXY COATED REINFORCING STEEL	1,287 LBS.
3 BAR METAL RAIL	40.20 LIN.FT.
ALASKA RAIL - CURB MOUNTED	40.00 LIN.FT.
SHEET PILE FOUNDATIONS	3,472 SQ.FT.

I HEREBY CERTIFY THESE PLANS ARE THE AS-BUILT PLANS

PROJECT NO. B-4122  
 GRAHAM COUNTY  
 STATION: 12+88.00 -L-

SHEET 1 OF 12 REPLACES BRIDGE NO. 81

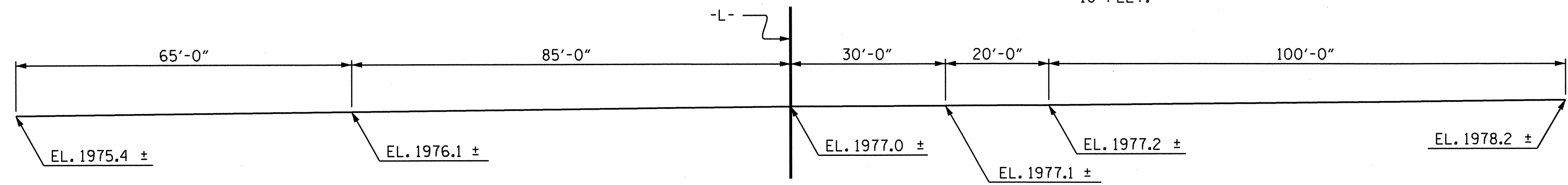


Quang H. Nguyen 11-1-12



STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT  
 60° SKEW

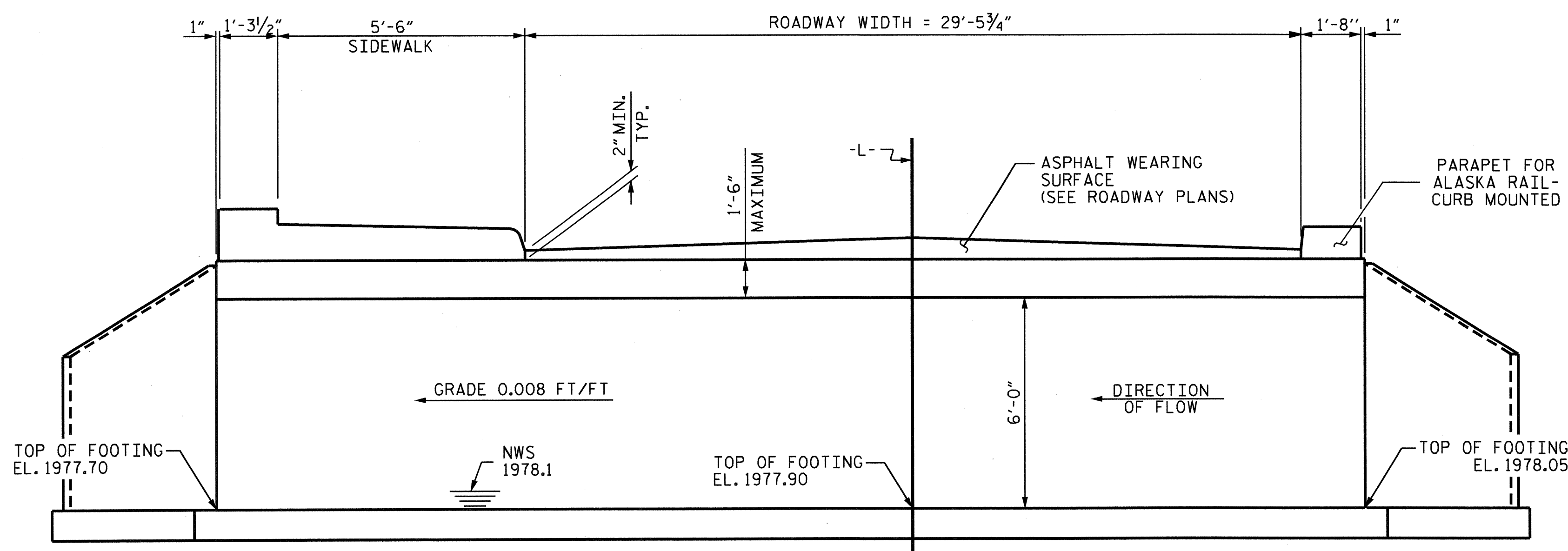
REVISIONS						SHEET NO. C-1
NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			TOTAL SHEETS 12
2			4			



PROFILE ALONG CULVERT

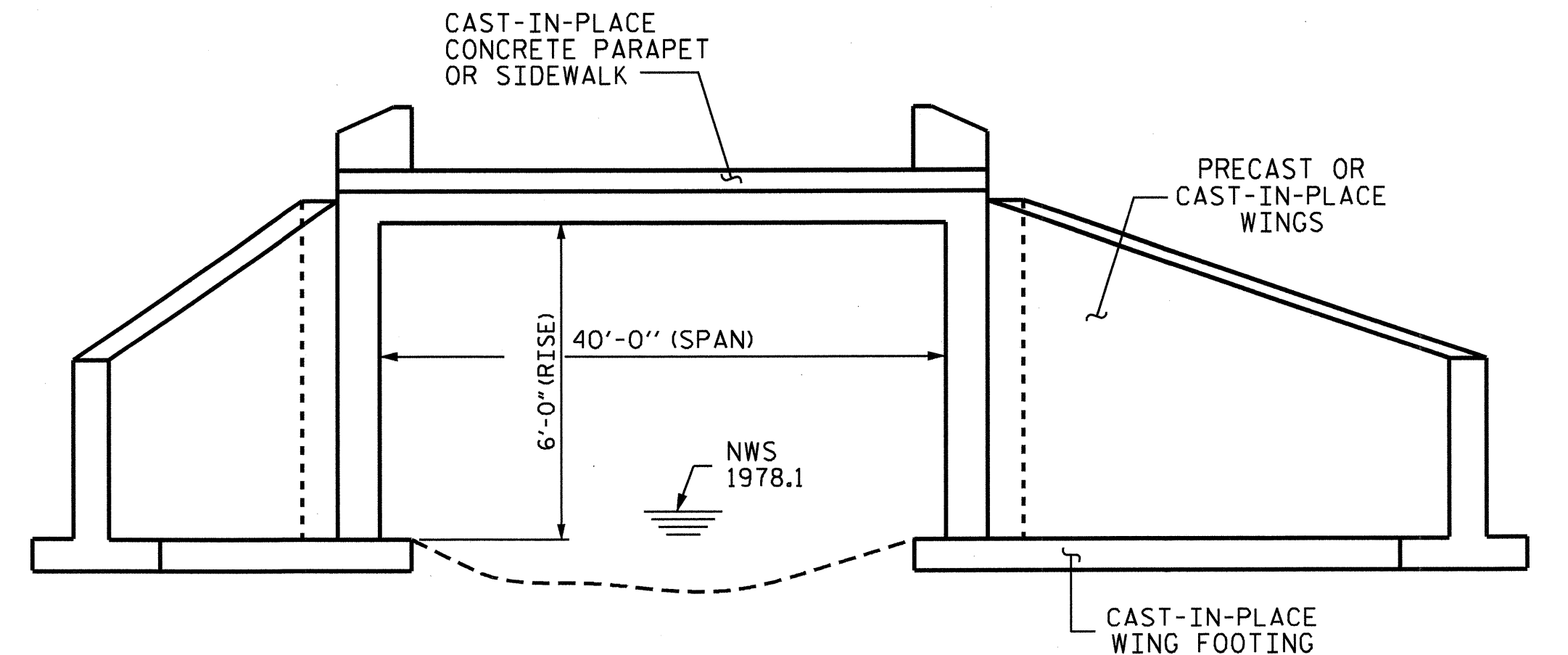
DRAWN BY : Z.H. BROWN/DAH      DATE : 7/12  
 CHECKED BY : M.G. CHEEK      DATE : 8/12





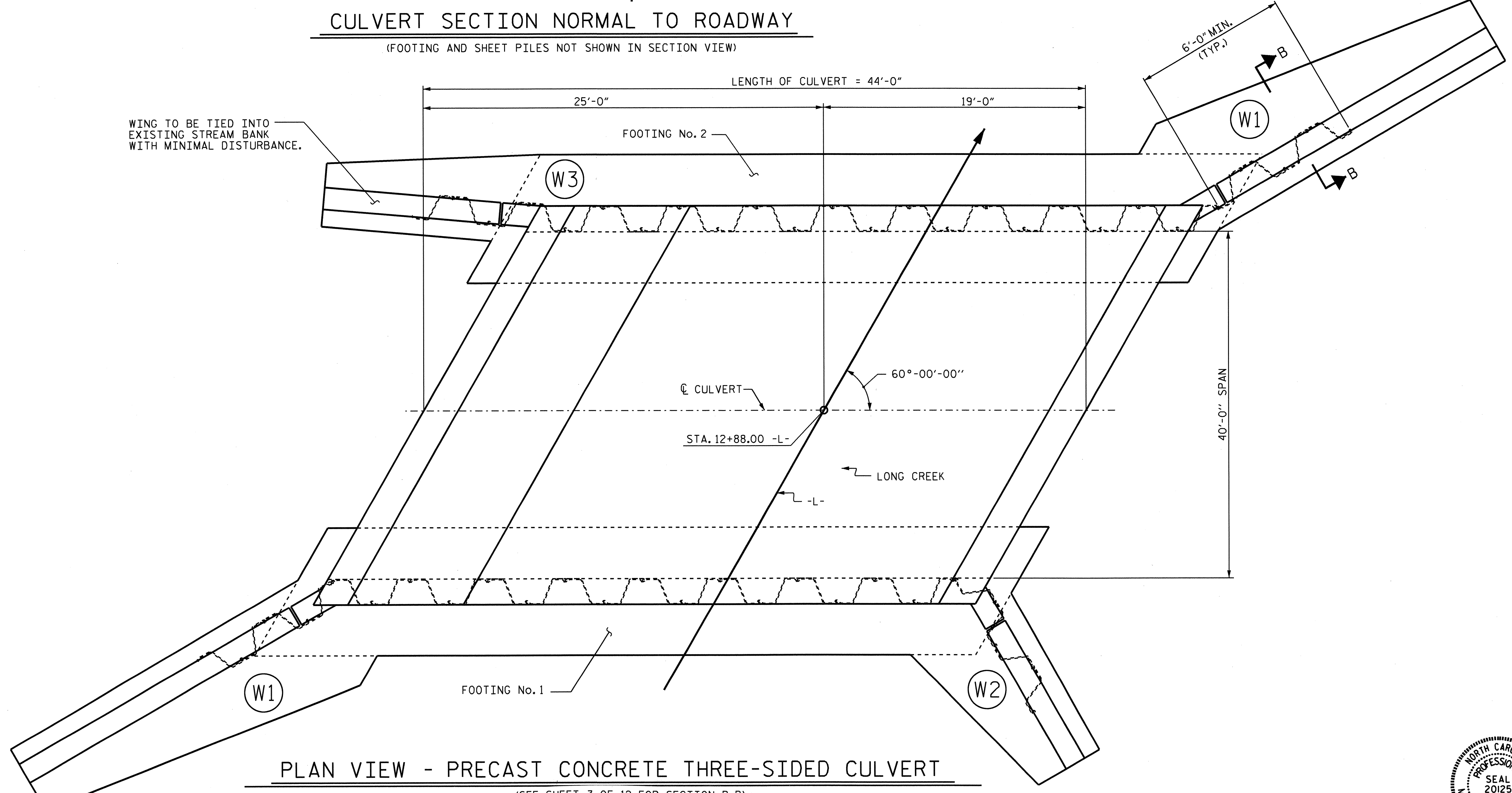
**CULVERT SECTION NORMAL TO ROADWAY**

(FOOTING AND SHEET PILES NOT SHOWN IN SECTION VIEW)



**END ELEVATION NORMAL TO SKEW**

STEEL SHEET PILES NOT SHOWN FOR CLARITY



**PLAN VIEW - PRECAST CONCRETE THREE-SIDED CULVERT**

(SEE SHEET 3 OF 12 FOR SECTION B-B)  
 STEEL SHEET PILES SHALL BE CONTINUOUS BETWEEN CULVERT FOOTINGS TO WING FOOTINGS.

PROJECT NO. B-4122  
GRAHAM COUNTY  
 STATION: 12+88.00 -L-

SHEET 2 OF 12

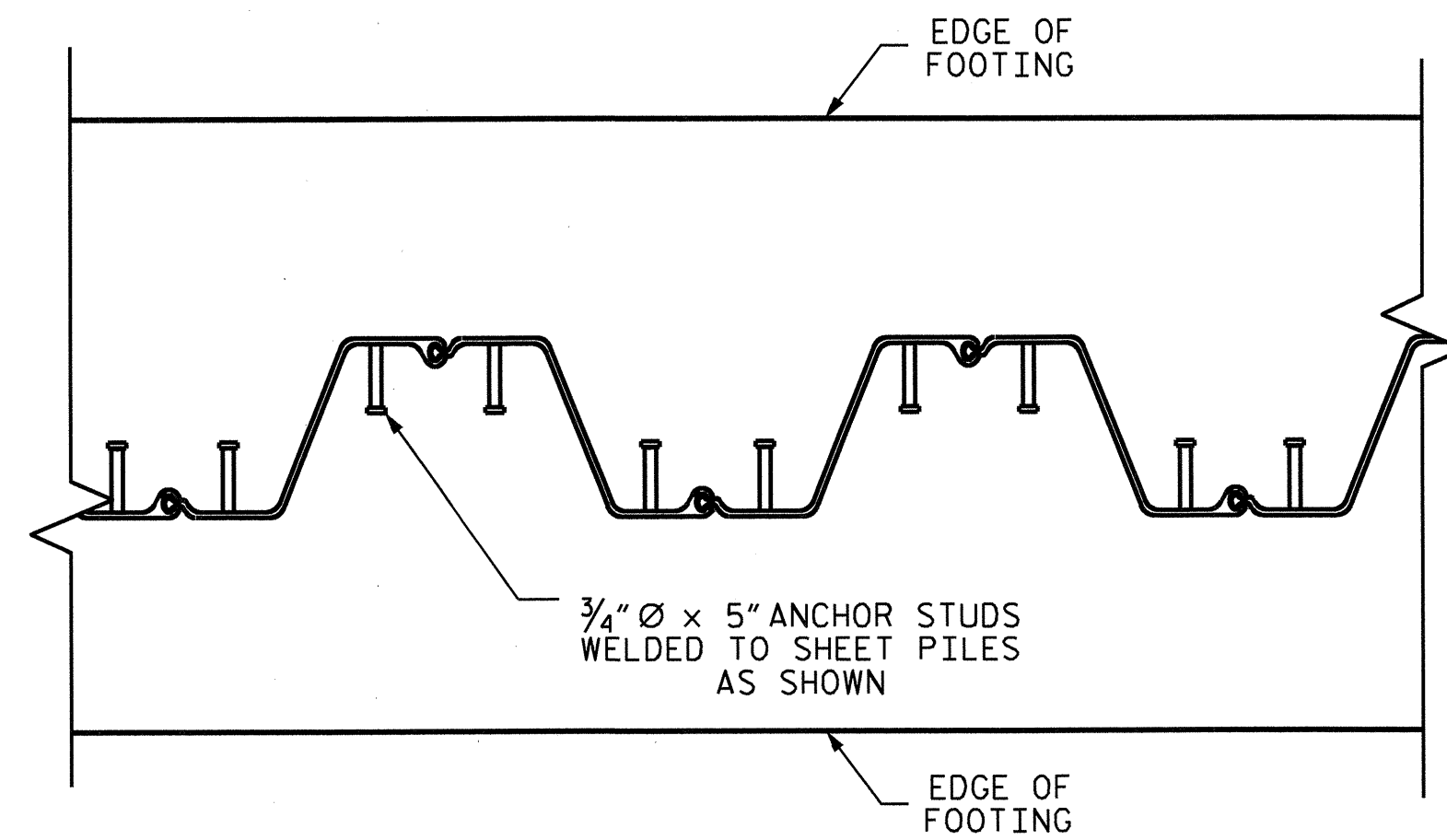
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 PRECAST REINFORCED  
 CONCRETE THREE-SIDED  
 CULVERT

60° SKEW

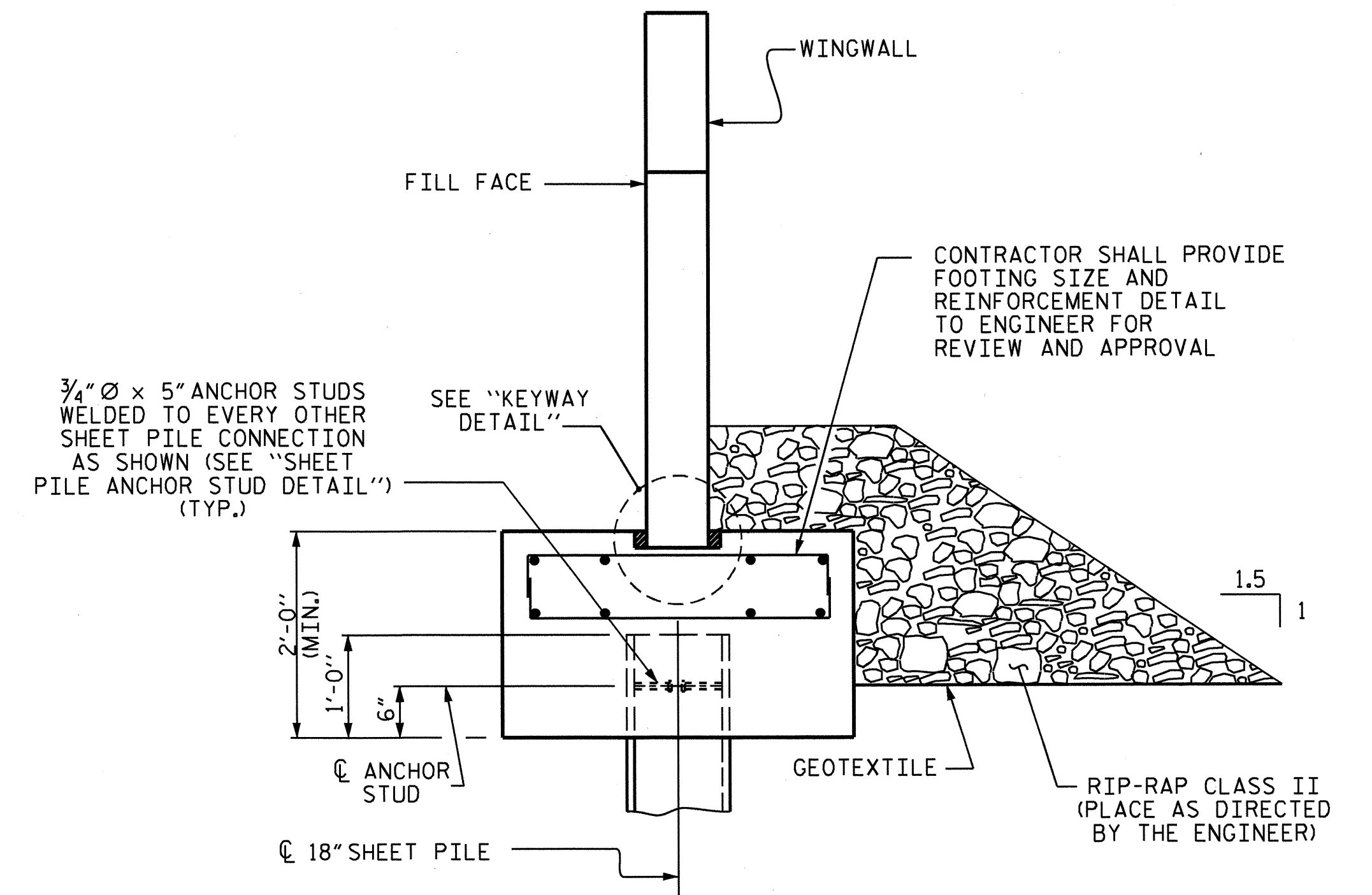


DRAWN BY: Z. H. BROWN/DAH DATE: 7/12  
 CHECKED BY: M.G. CHEEK DATE: 9/12

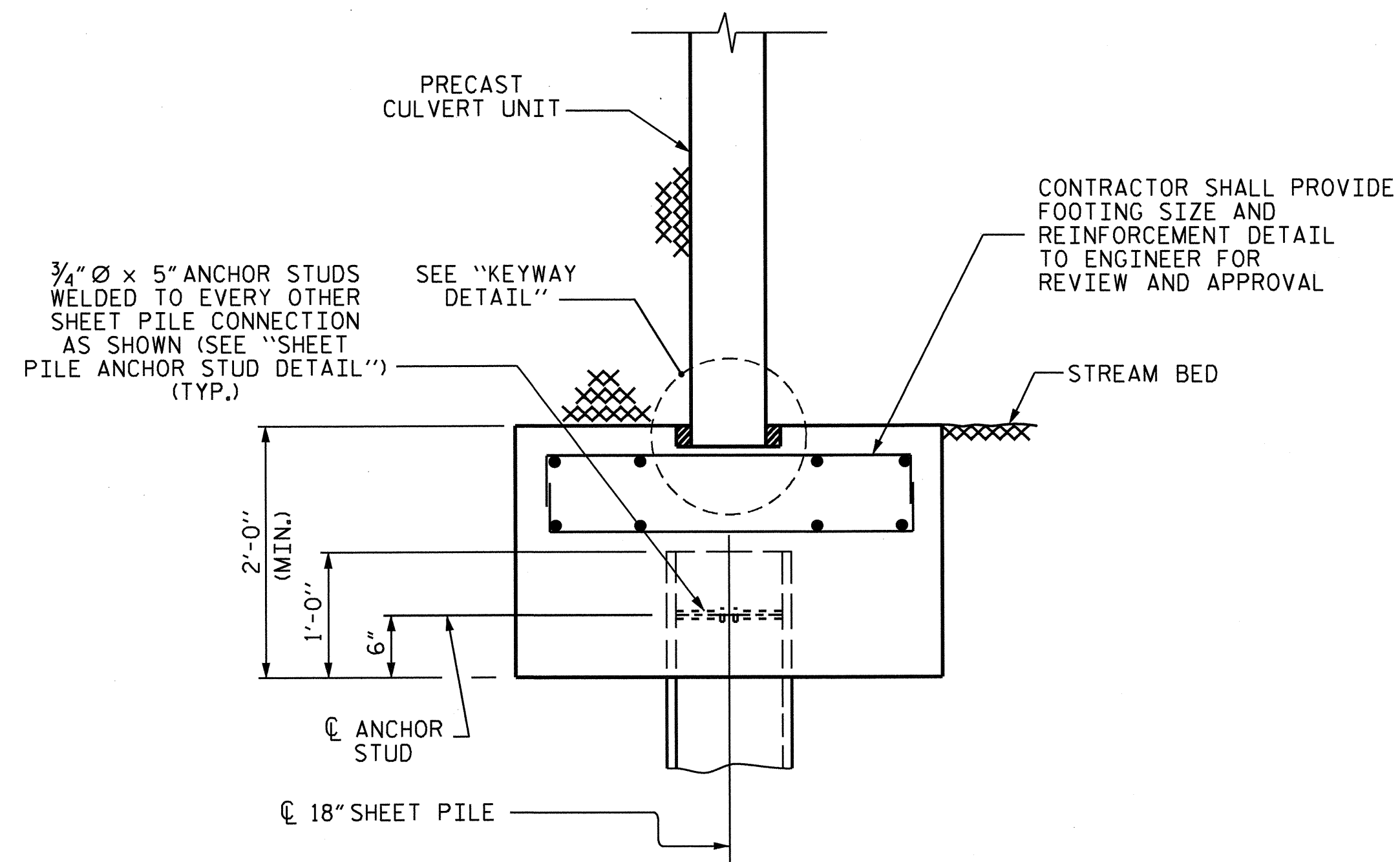
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-2
1			3			TOTAL SHEETS
2			4			12



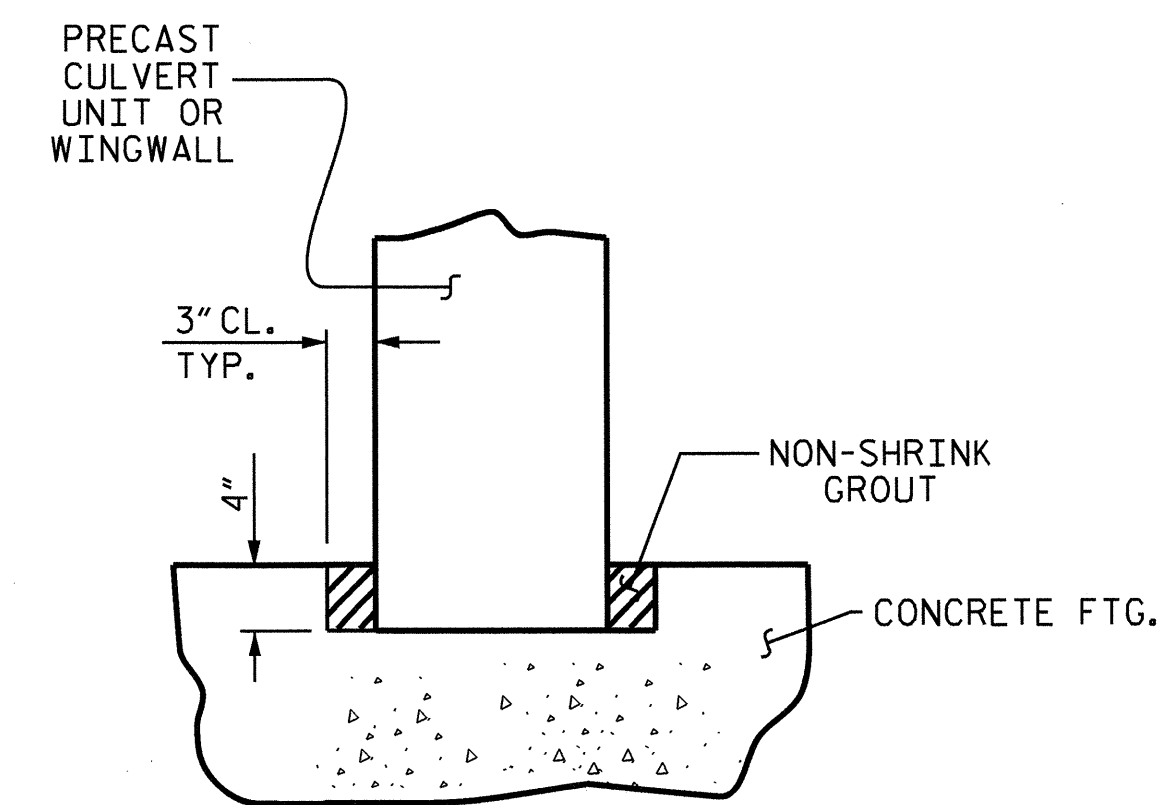
SHEET PILE ANCHOR STUD DETAIL



WINGWALL DETAIL  
SECTION B-B



FOOTING DETAIL



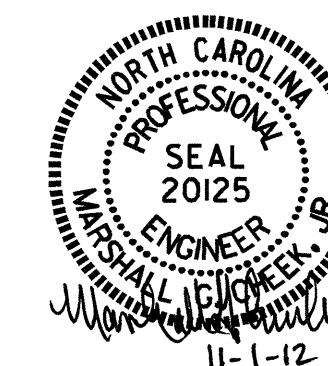
KEYWAY DETAIL

PROJECT NO. B-4122  
GRAHAM COUNTY  
 STATION: 12+88.00 -L-

SHEET 3 OF 12

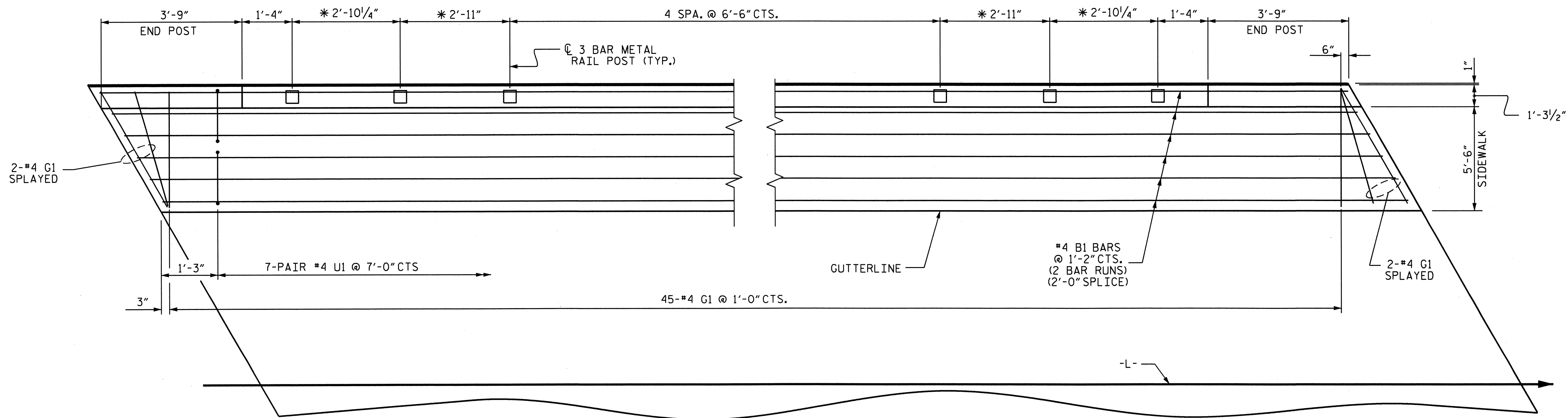
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 PRECAST REINFORCED  
 CONCRETE THREE-SIDED  
 CULVERT

60° SKEW



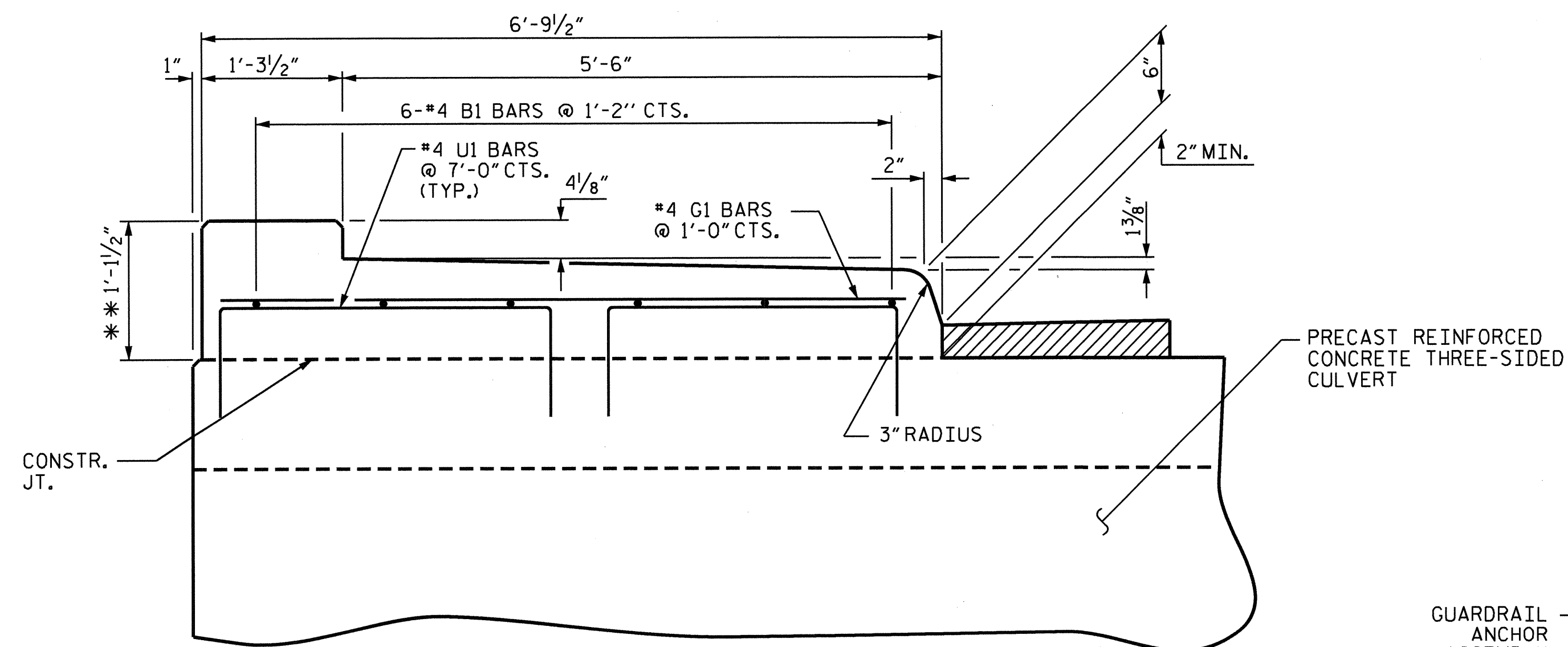
ASSEMBLED BY : D. HODGE DATE : 7/12  
 CHECKED BY : M.G. CHEEK DATE : 8/12

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



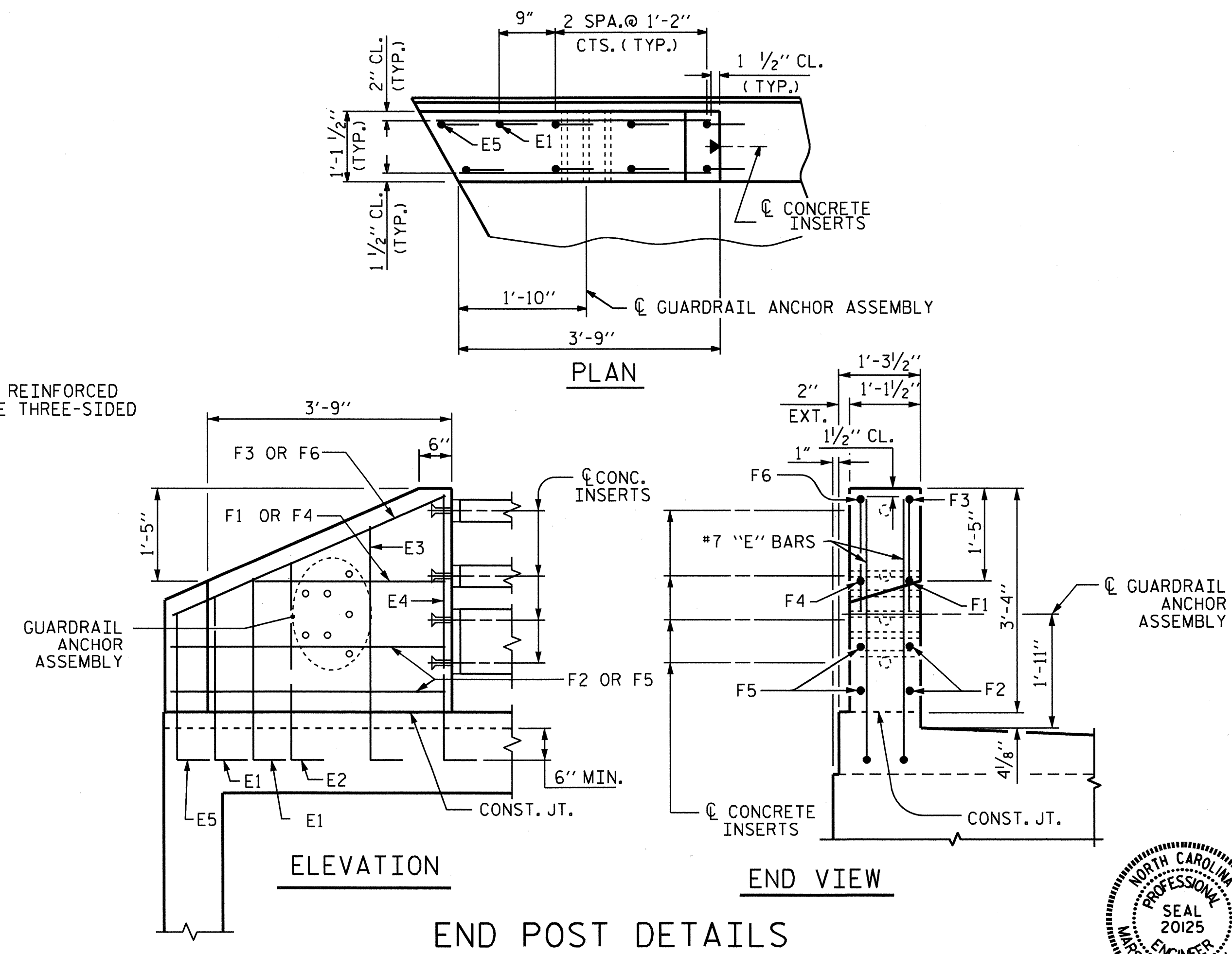
### RAIL POST SPACING AND REINFORCING PLACEMENT FOR SIDEWALK (LEFT SIDE)

\* SPACING MAY BE ADJUSTED BASED ON OVERALL WIDTH OF PRECAST THREE-SIDED CULVERT, NOT TO EXCEED 3'-3"



SECTION THROUGH SIDEWALK (LEFT SIDE)

\*\* NOTE: DIMENSIONS ARE BASED ON AN ASSUMED 2" MINIMUM OVERLAY THICKNESS AT THE GUTTERLINE. SHOULD THE OVERLAY THICKNESS VARY, THESE DIMENSIONS SHALL BE ADJUSTED.



END POST DETAILS

BAR TYPES					
ALL BAR DIMENSIONS ARE OUT TO OUT					
BILL OF MATERIAL					
BAR NO.	NO.	SIZE	TYPE	LENGTH	WEIGHT
*B1	12	#4	STR	25'-1"	201
*E1	4	#7	2	3'-5"	28
*E2	4	#7	2	4'-0"	33
*E3	4	#7	2	4'-7"	37
*E4	4	#7	2	5'-1"	42
*E5	2	#7	2	3'-3"	13
*F1	2	#6	STR	2'-10"	9
*F2	4	#6	STR	4'-0"	24
*F3	2	#6	STR	4'-2"	13
*F4	2	#6	STR	2'-10"	9
*F5	4	#6	STR	3'-5"	21
*F6	2	#6	STR	3'-5"	10
*G1	49	#4	STR	6'-4"	207
*U1	14	#4	1	5'-4"	50
* EPOXY COATED REINFORCING STEEL					697 LBS
CLASS AA CONCRETE					
SIDEWALK					9.4 CU. YDS.
END POSTS					0.9 CU. YDS.
TOTAL					10.3 CU. YDS.

PROJECT NO. B-4122  
 GRAHAM COUNTY  
 STATION: 12+88.00 -L-  
 SHEET 4 OF 12

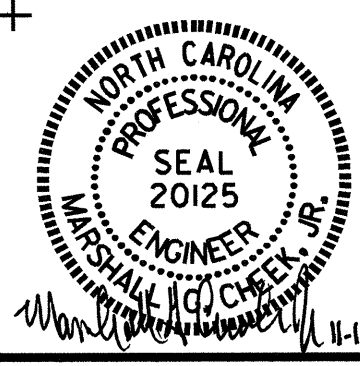
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

## SIDEWALK AND THREE BAR METAL RAIL DETAILS

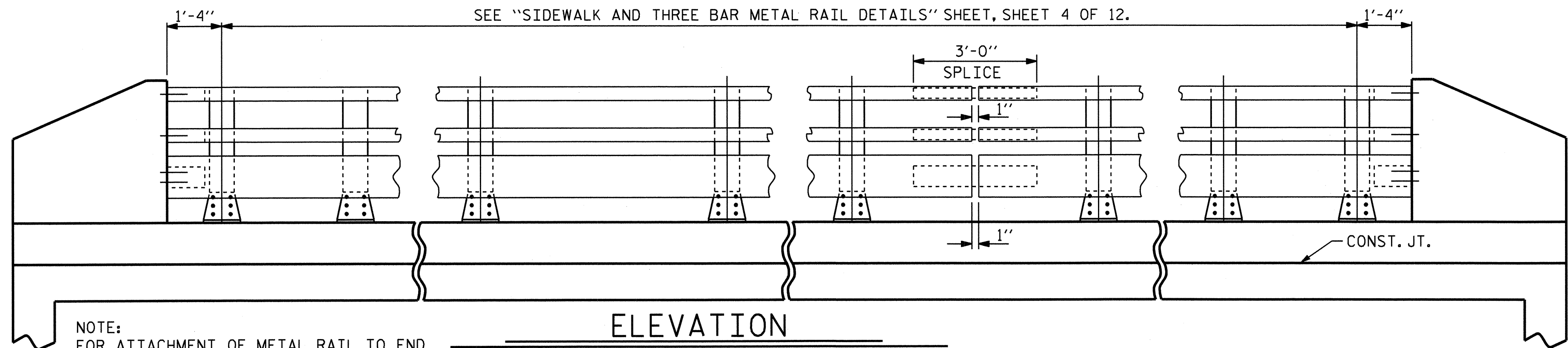
REVISIONS				SHEET NO.
NO.	BY:	DATE:	NO.	DATE:
1			3	
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C-4  
 TOTAL SHEETS 12

DRAWN BY: D. HODGE DATE: 8/12  
 CHECKED BY: M.G. CHEEK DATE: 8/12

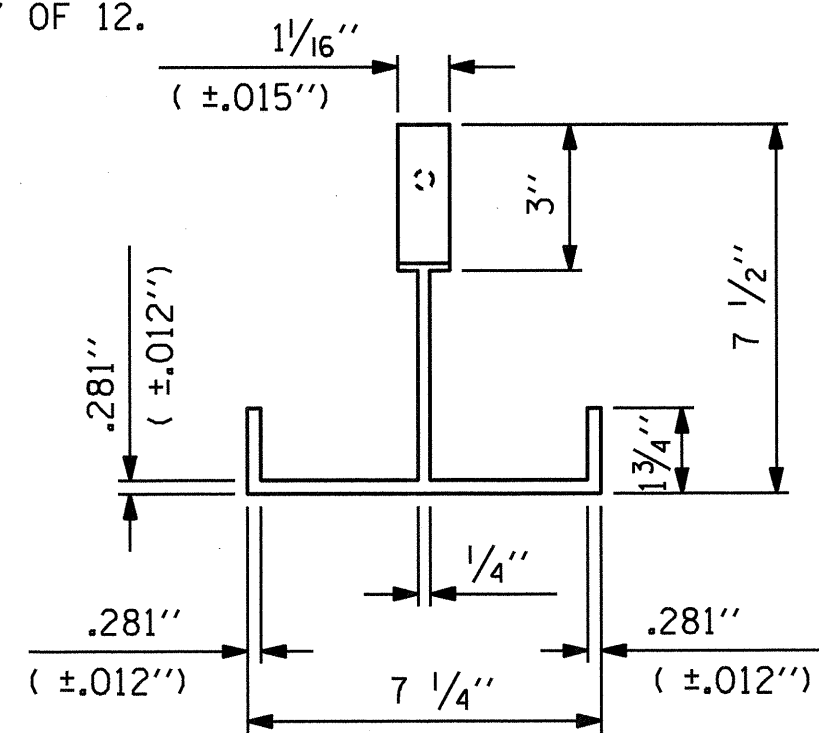






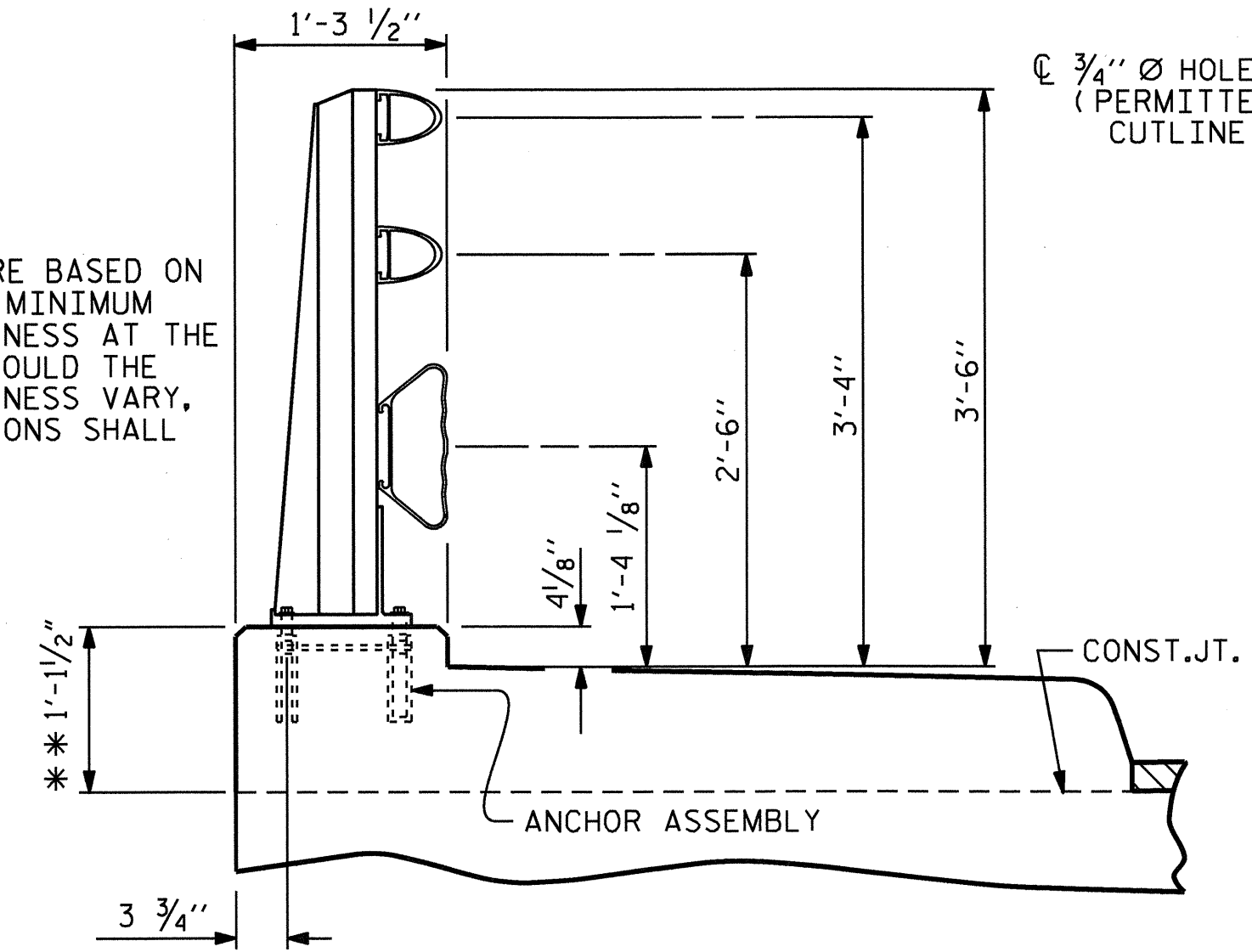
NOTE:  
FOR ATTACHMENT OF METAL RAIL TO END  
POST, SEE SHEET 7 OF 12.

ELEVATION



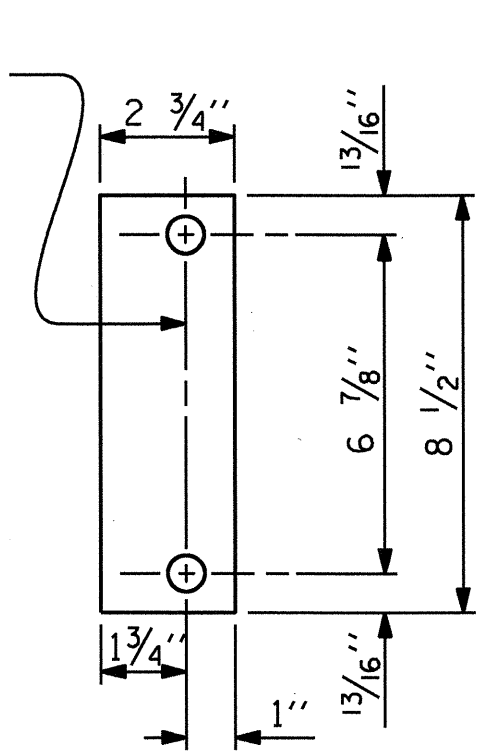
PLAN

\*\* NOTE:  
DIMENSIONS ARE BASED ON  
AN ASSUMED 2" MINIMUM  
OVERLAY THICKNESS AT THE  
GUTTERLINE. SHOULD THE  
OVERLAY THICKNESS VARY,  
THESE DIMENSIONS SHALL  
BE ADJUSTED.

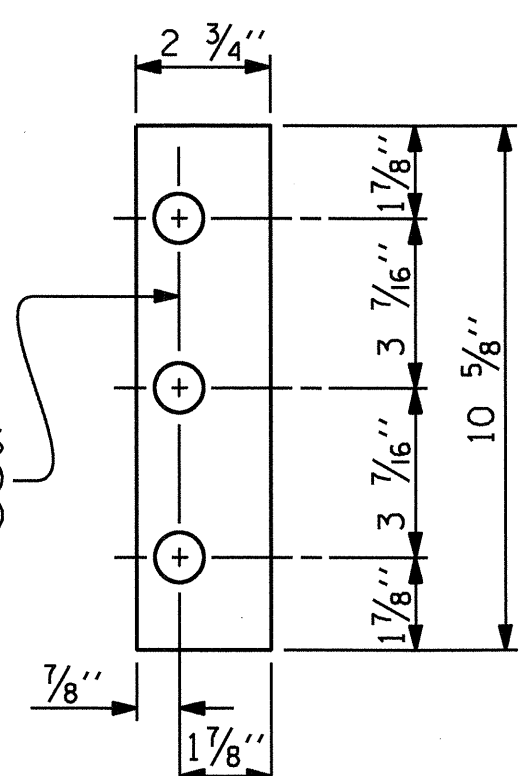


SECTION THRU RAIL

FOR ANCHOR ASSEMBLY, SEE "3 BAR METAL RAIL"  
SHEET 6 OF 12

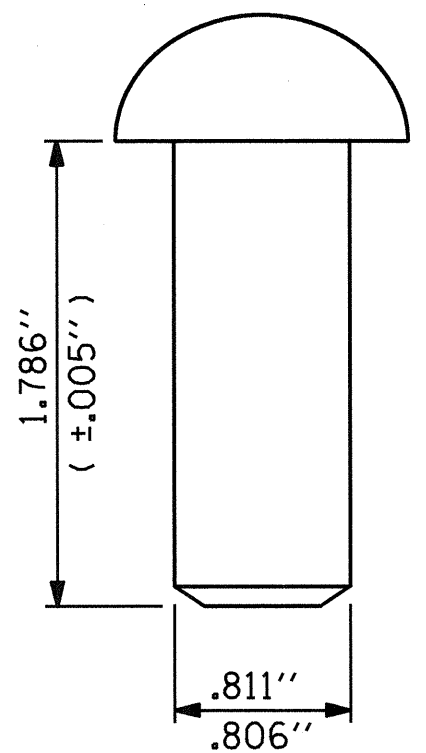


REAR PLATE

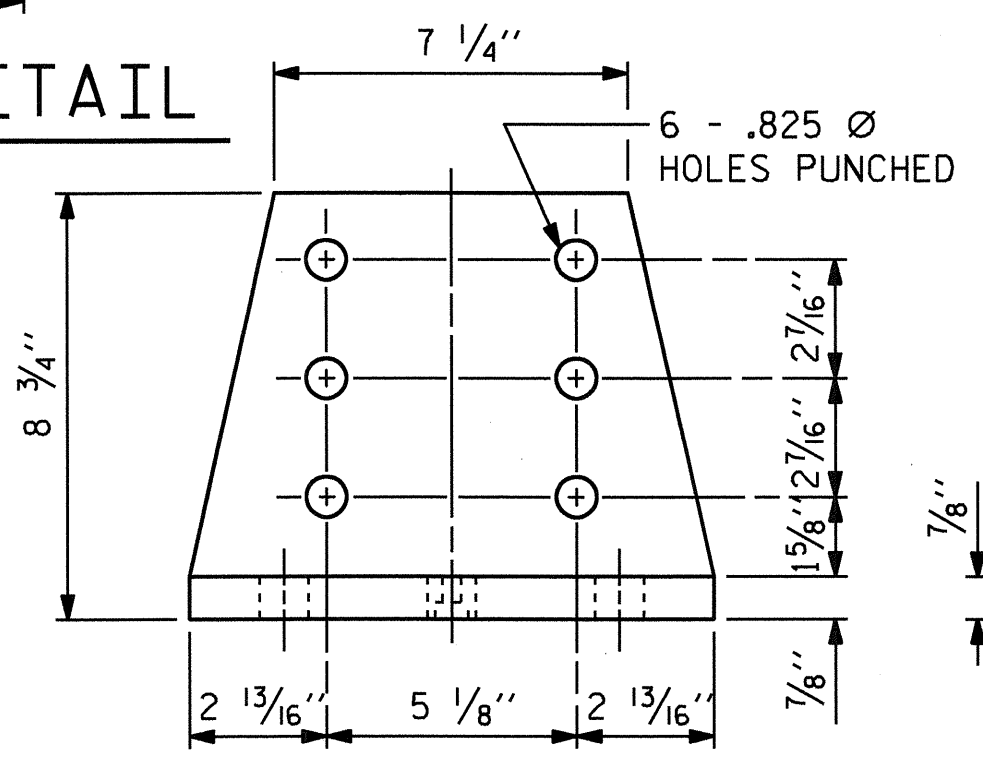


FRONT PLATE  
SHIM DETAILS

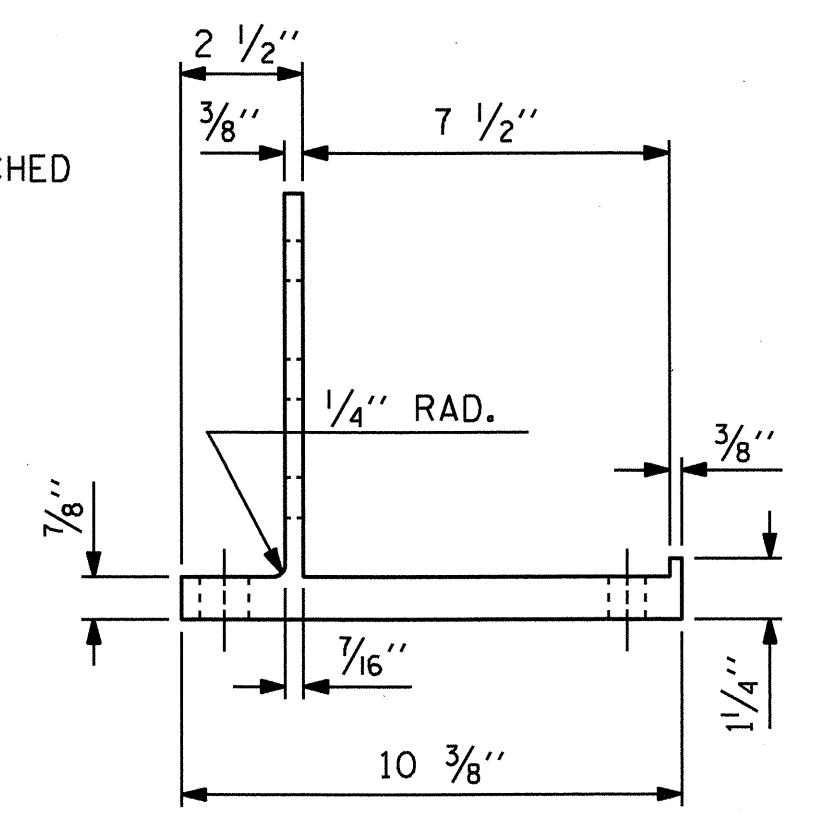
NOTE:  
SHIMS MAY BE CUT ALONG PERMITTED CUTLINE OR  
SLOTTED TO EDGE OF PLATE TO FACILITATE PLACEMENT.



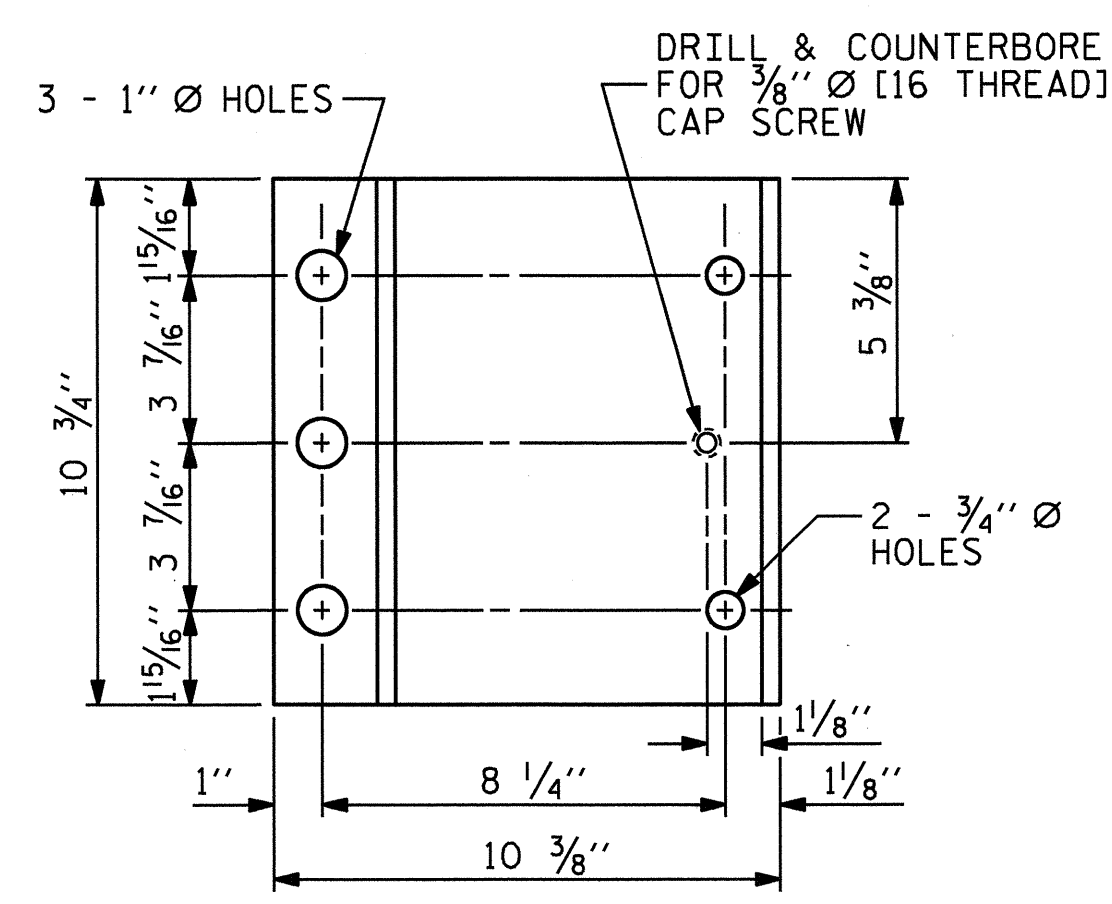
RIVET DETAIL



FRONT ELEVATION

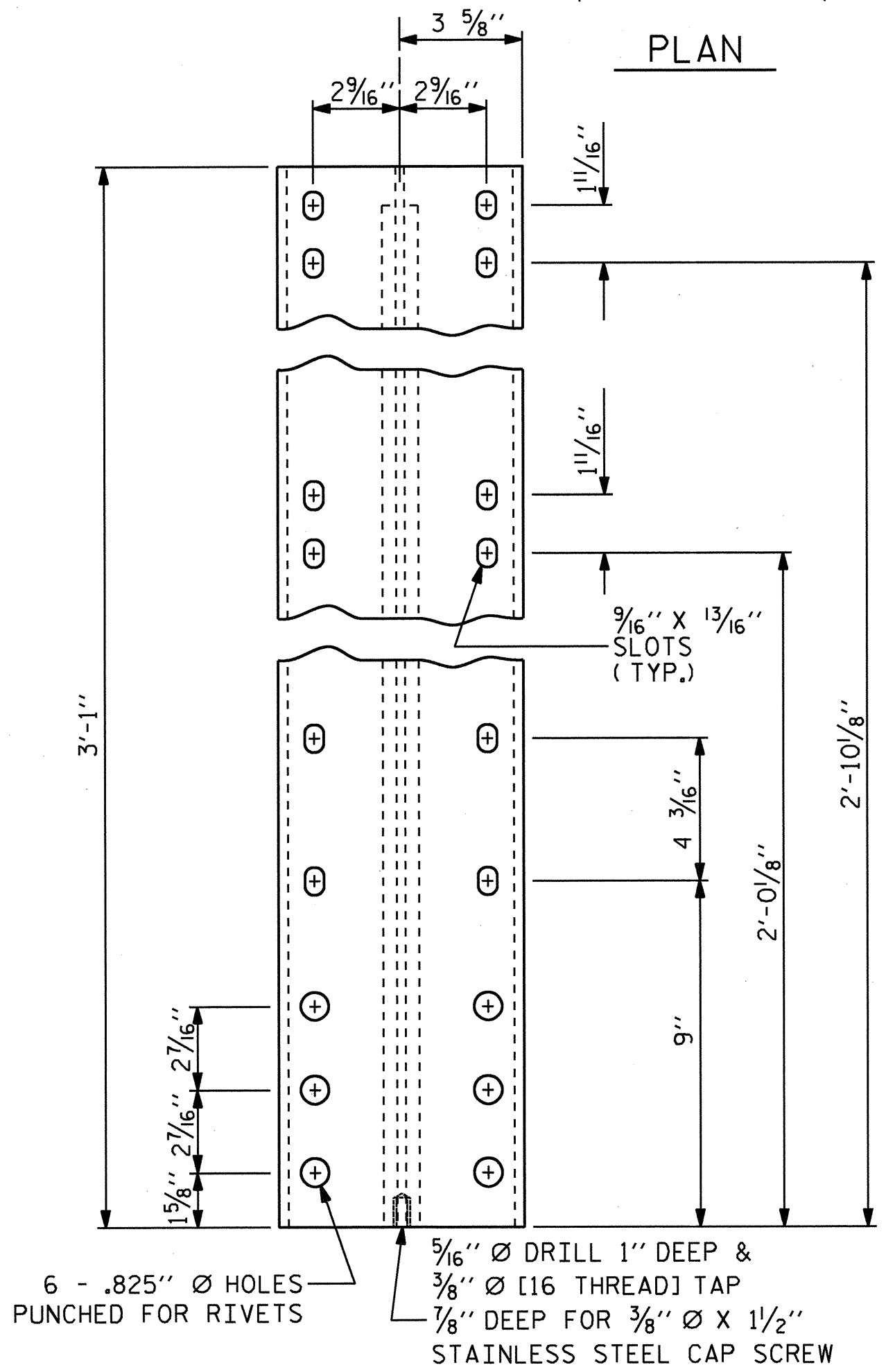


SIDE ELEVATION

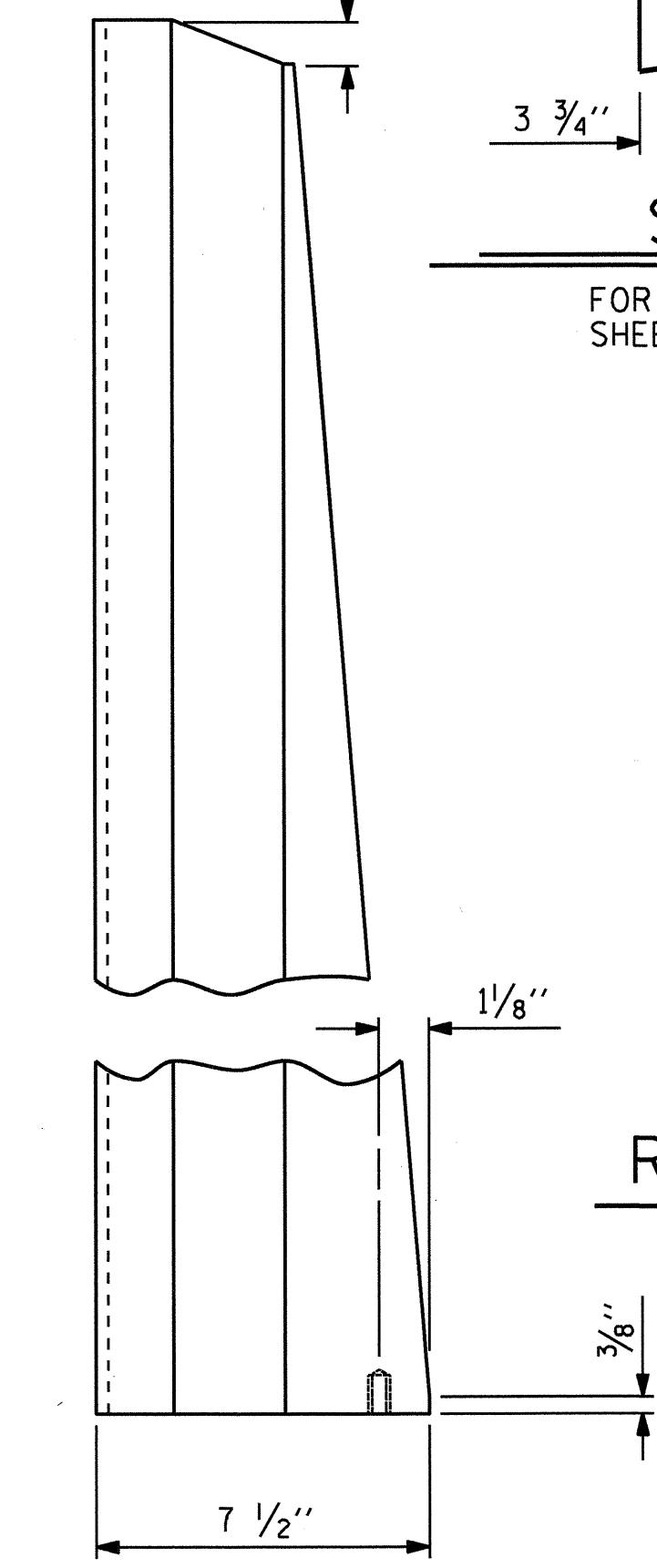


PLAN

POST BASE DETAILS



FRONT ELEVATION



SIDE ELEVATION

DETAILS OF POST

6 - .825" Ø HOLES  
PUNCHED FOR RIVETS  
5/16" Ø DRILL 1" DEEP &  
3/8" Ø [16 THREAD] TAP  
7/8" DEEP FOR 3/8" Ø X 1 1/2"  
STAINLESS STEEL CAP SCREW

PAY LENGTH = 40.20 LIN.FT.

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.

ALUMINUM RAILS

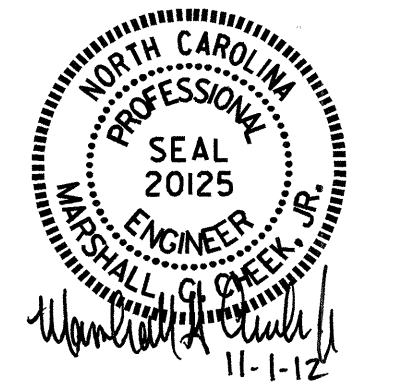
MATERIAL FOR POSTS, BASES AND RAILS, EXPANSION BARS AND CLAMP BARS SHALL BE ASTM B221 ALLOY 6061-T6. MATERIAL FOR RIVETS SHALL BE ASTM B316 ALLOY 6061-T6. RIVETS SHALL BE STANDARD BUTTON HEAD AND CONE POINT COLD DRIVEN AS PER DRAWING. THE BASE OF RAIL POSTS, OR ANY OTHER ALUMINUM SURFACE IN CONTACT WITH 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 PRECAST THREE-SIDED CULVERT. EACH JOINT IN RAIL LENGTH SHALL BE SPLICED AS DETAILED. PANEL LENGTHS OF RAIL SHALL BE ATTACHED TO A MINIMUM OF THREE POSTS. PLACE ONE JOINT SPLICE JUST BEYOND THE 3RD RAIL POST FROM EACH END, TYPICALLY 14' FROM THE END. PLACE OTHER JOINTS AS NEEDED. FOR END OF RAIL TO CLEAR FACE OF CONCRETE END POST DIMENSION, SEE SHEET 7 OF 12. CAP SCREWS SHALL BE ASTM F593 ALLOY 305 STAINLESS STEEL. WASHERS FOR RAIL ATTACHMENT 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 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 REMAIN 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.

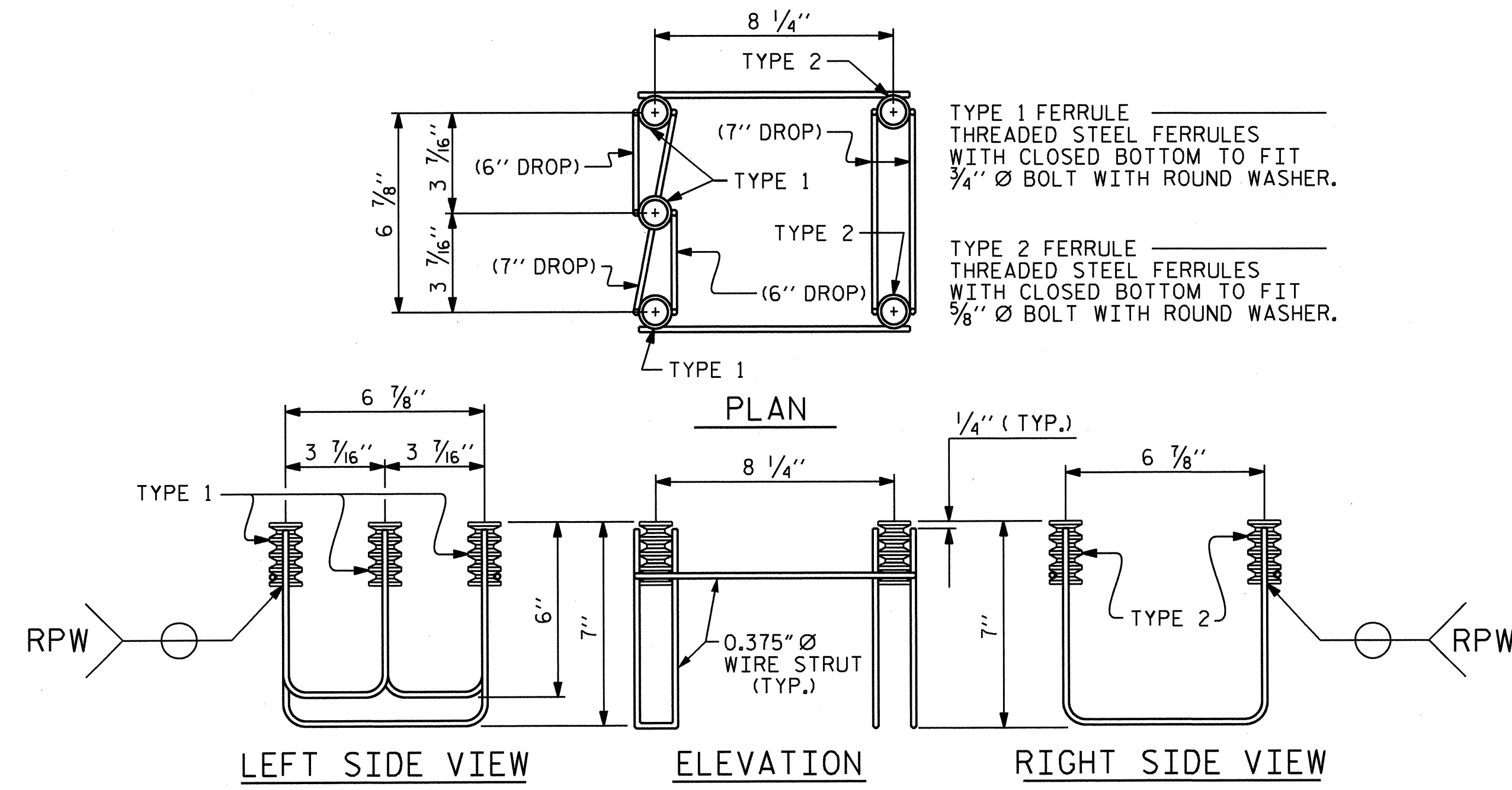


PROJECT NO. B-4122  
GRAHAM COUNTY  
STATION: 12+88.00 -L-  
SHEET 5 OF 12

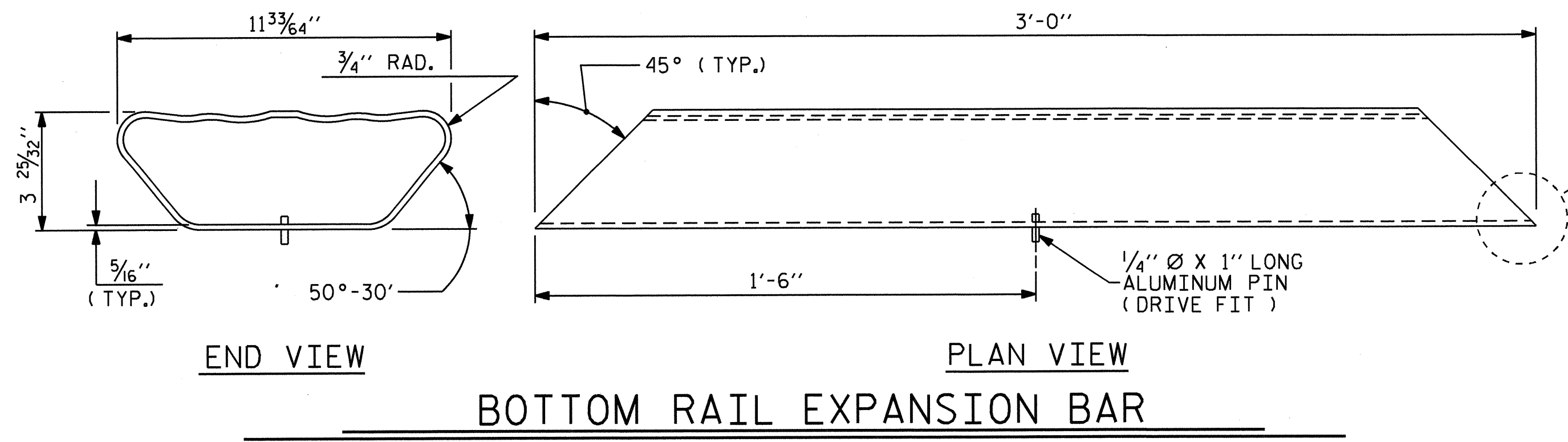
STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
STANDARD  
3 BAR METAL RAIL  
PRECAST REINFORCED  
CONCRETE THREE-SIDED  
CULVERT

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

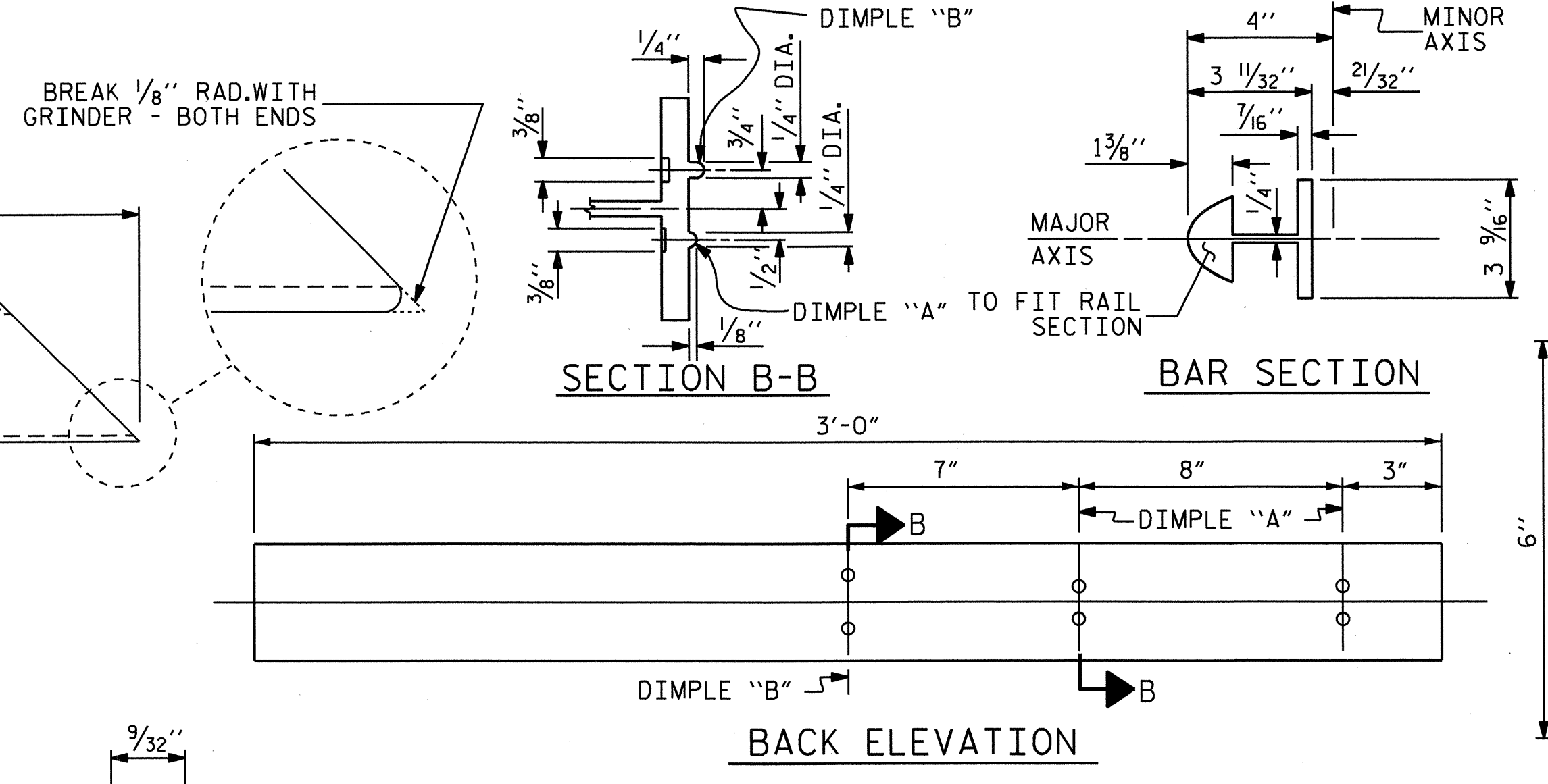
ASSEMBLED BY : D. HODGE	DATE : 8/12
CHECKED BY : M.G. CHEEK	DATE : 8/12
DRAWN BY : JMB 1/88	REV. 5/7/03 RWW/JTE
CHECKED BY : GCH 1/88	REV. 5/1/06 TLA/GM
	REV. 10/1/11 MAA/GM



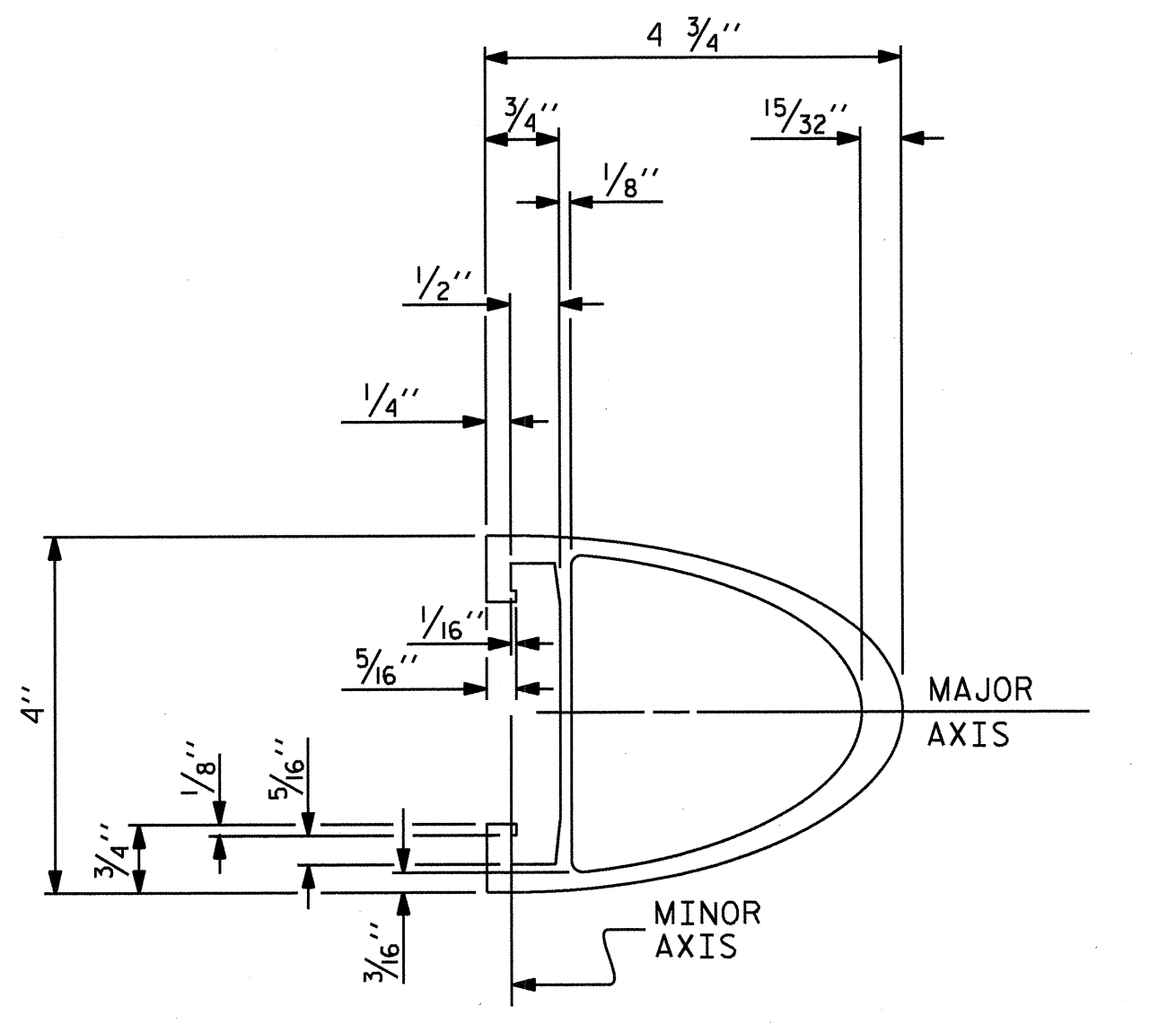
**5-BOLT METAL RAIL ANCHOR ASSEMBLY**  
( 9 ASSEMBLIES REQUIRED )



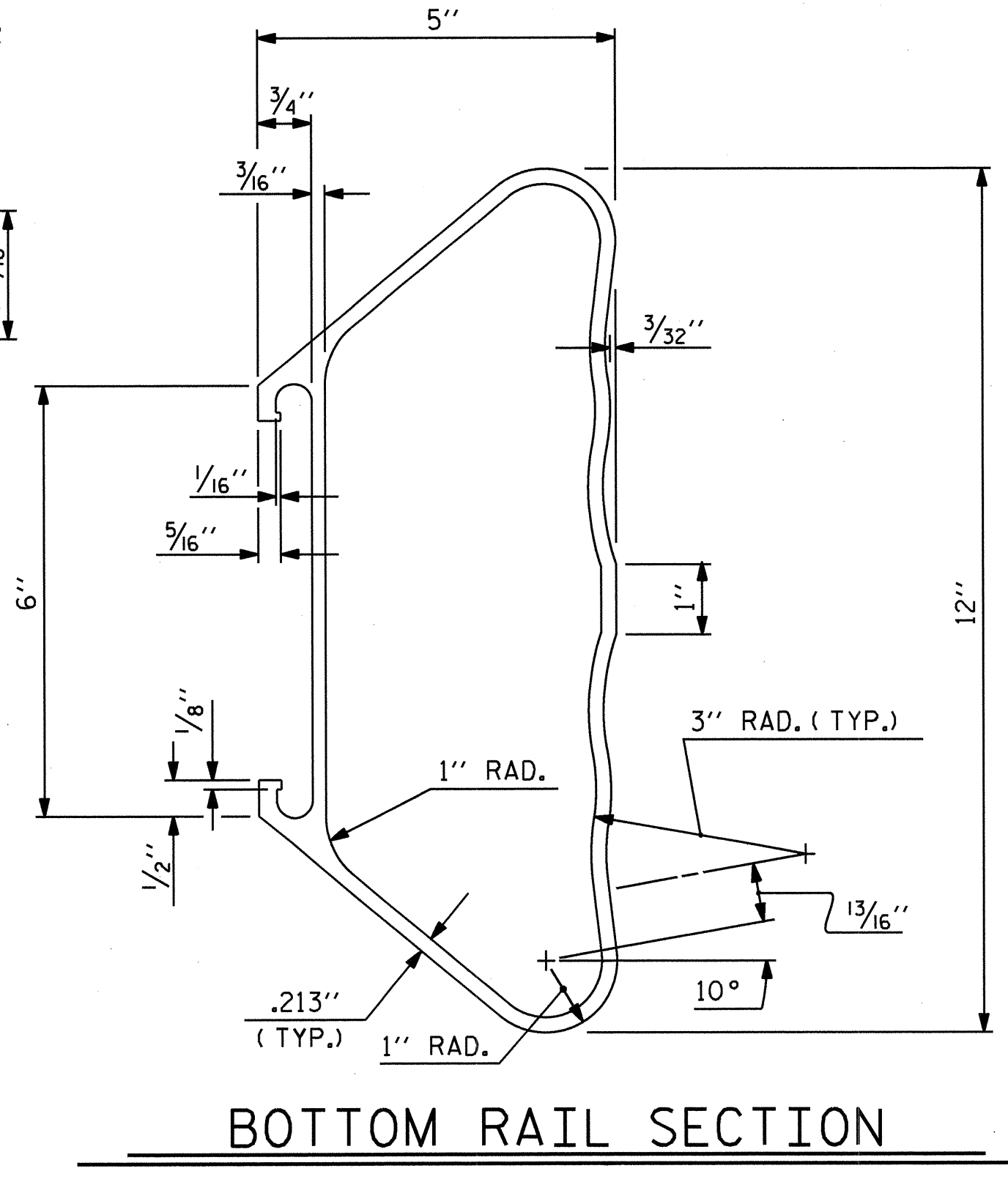
**BOTTOM RAIL EXPANSION BAR**



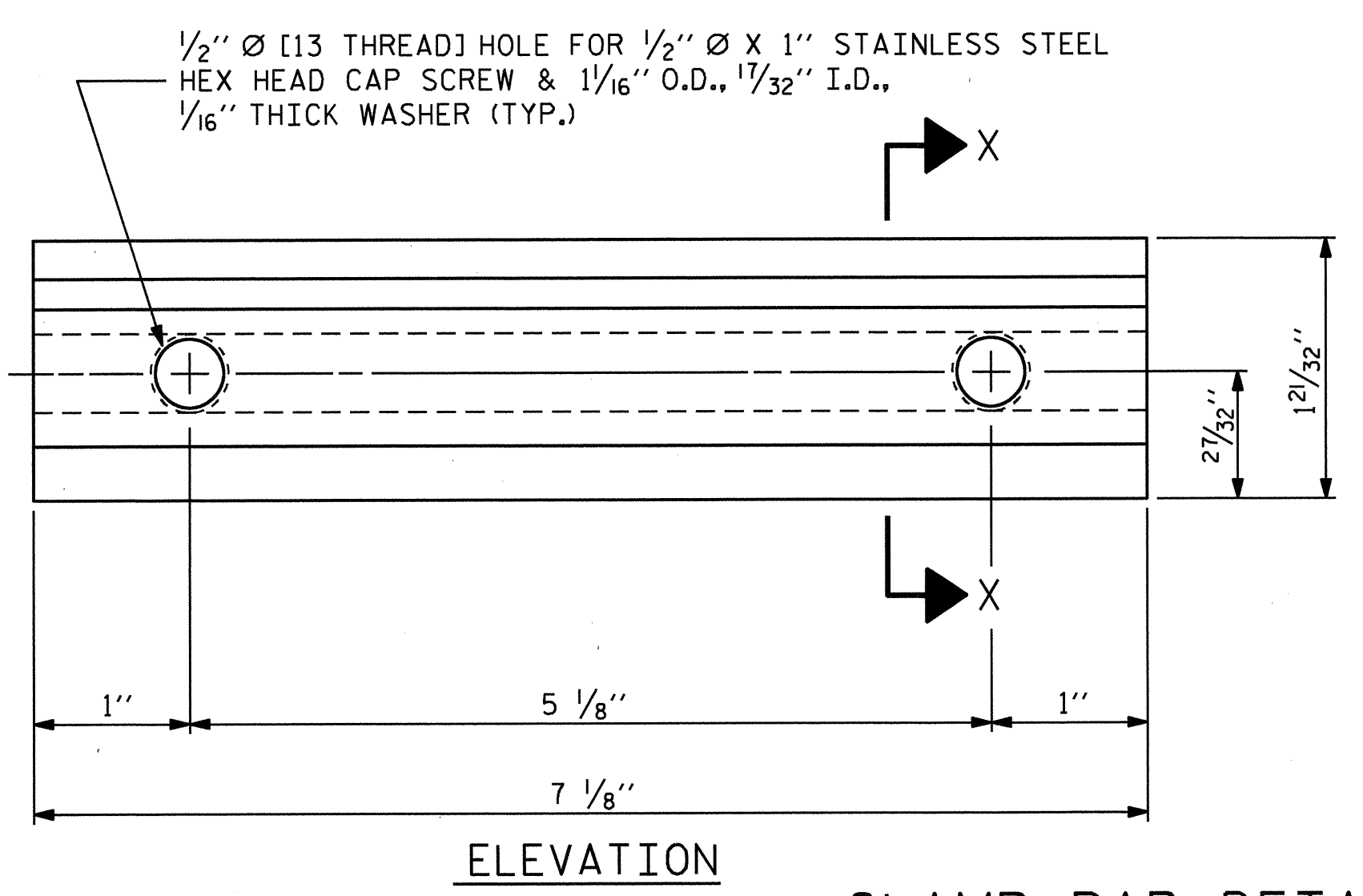
**TOP & MIDDLE RAIL EXPANSION BAR**



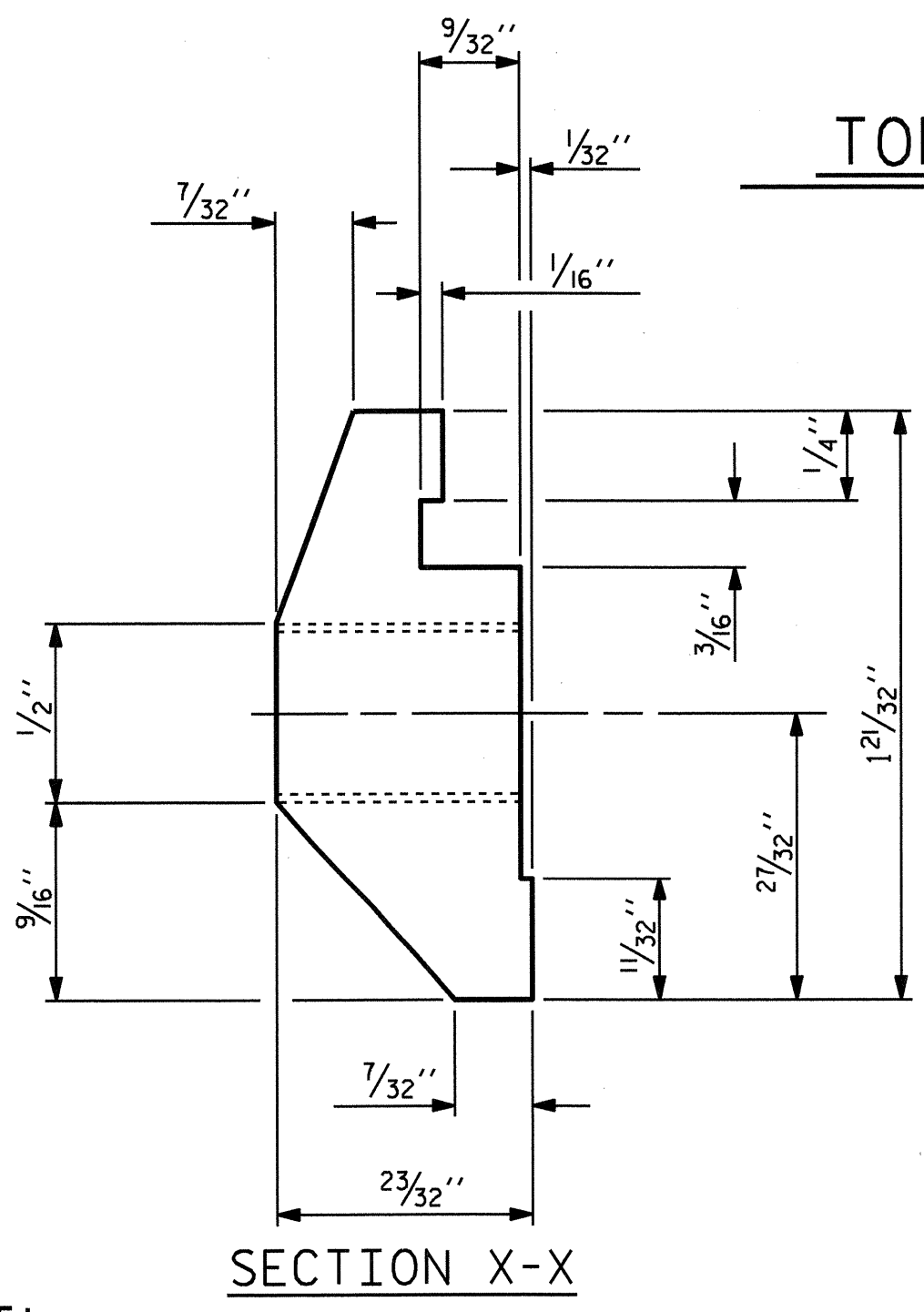
**TOP & MIDDLE RAIL SECTION**



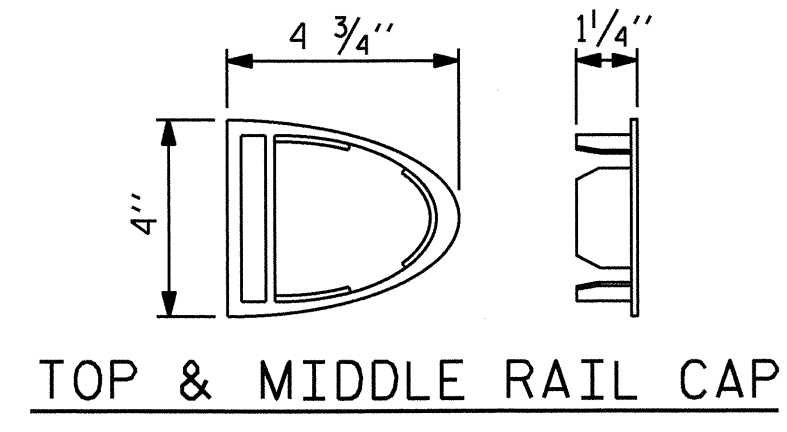
**BOTTOM RAIL SECTION**



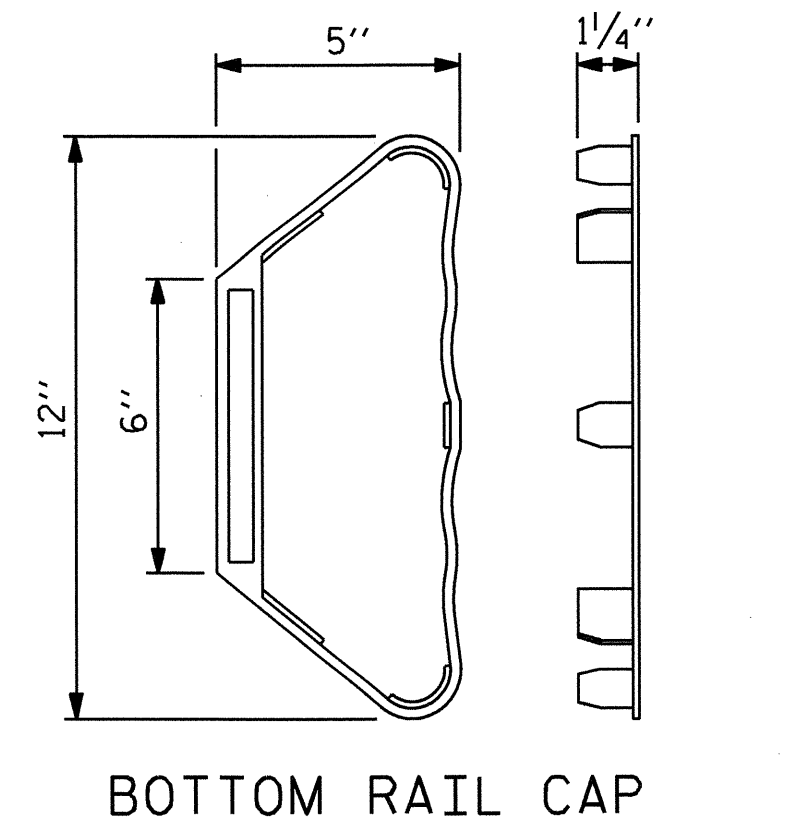
**CLAMP BAR DETAIL**  
( 6 REQUIRED PER POST )



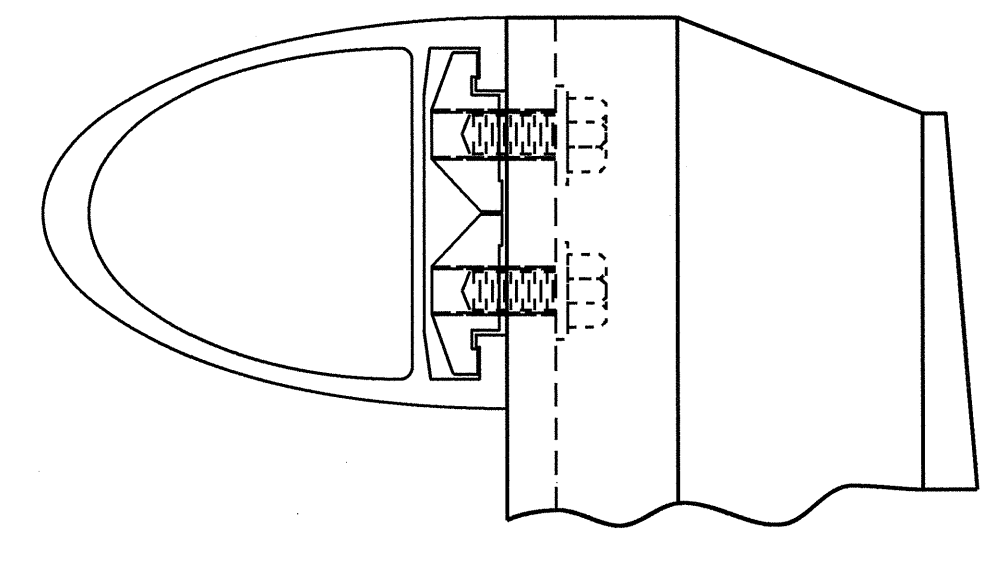
**SECTION X-X**



**TOP & MIDDLE RAIL CAP**



**BOTTOM RAIL CAP**



**CLAMP ASSEMBLY**  
TOP RAIL SHOWN  
(MIDDLE & BOTTOM RAIL ARE SIMILAR)

ASSEMBLED BY : D. HODGE	DATE : 8/12
CHECKED BY : M.G. CHEEK	DATE : 8/12
DRAWN BY : JMB 1/88	REV. 5/7/03 RWW/JTE
CHECKED BY : GGH 1/88	REV. 5/1/06 TLA/GM
	REV. 10/1/11 MAA/GM

- 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 AND 1 1/4" FOR 5/8" FERRULES.
  - 3 - 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.
  - 2 - 5/8" Ø X 2 1/4" 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 5/8" Ø X 2 1/4" 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 7/16" 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.

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GRAHAM COUNTY  
STATION: 12+88.00 -L-  
SHEET 6 OF 12

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH				
STANDARD 3 BAR METAL RAIL PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT				
REVISIONS				
NO.	BY:	DATE:	NO.	DATE:
1			3	
2			4	
				SHEET NO. C-6 TOTAL SHEETS 12





NOTES

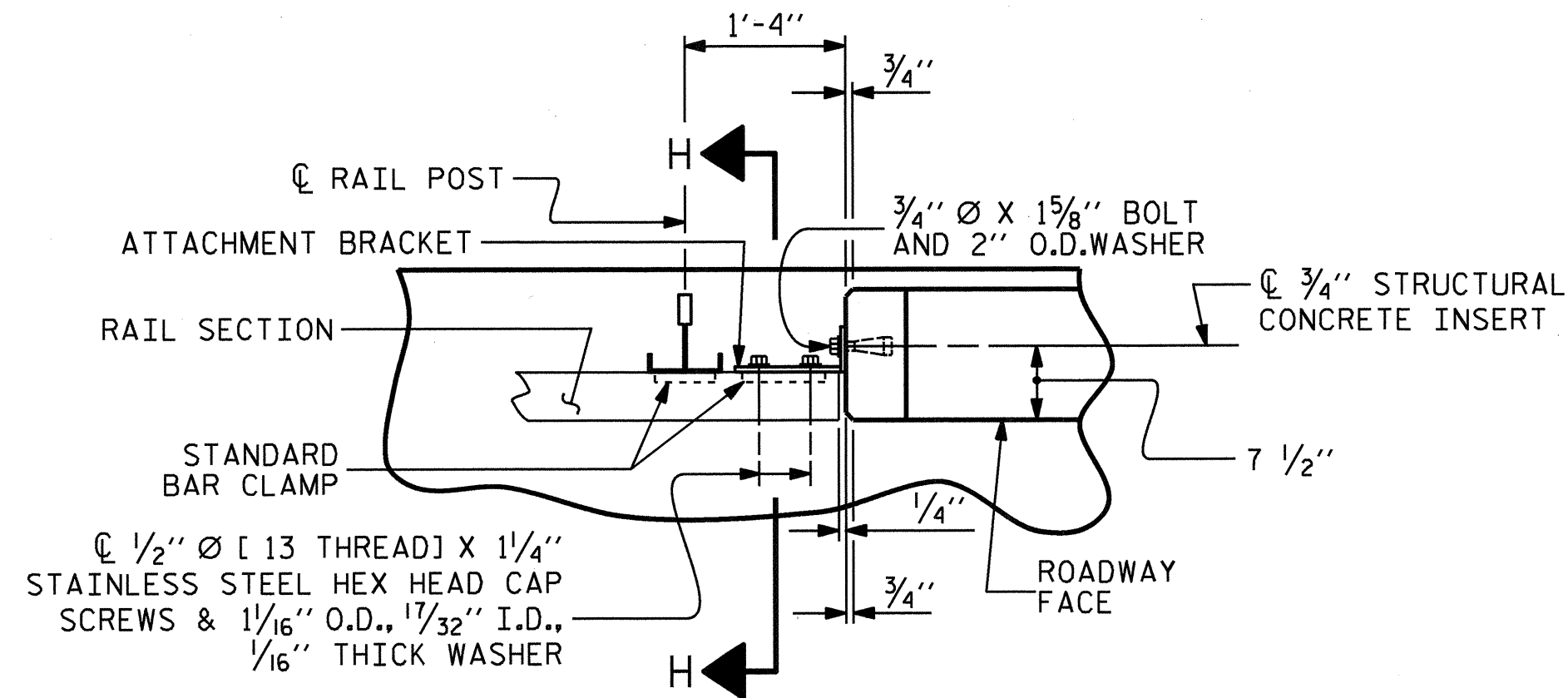
METAL RAIL TO END POST CONNECTION

- 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. WASHERS FOR RAIL ATTACHMENT SHALL MEET THE REQUIREMENTS OF ASTM F844 EXCEPT THEY SHALL BE MADE FROM ALLOY 304 STAINLESS STEEL.
  - D. STANDARD CLAMP BARS (STD. No. BMR6).
- 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 3 BAR METAL RAIL.
- 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.

NOTES

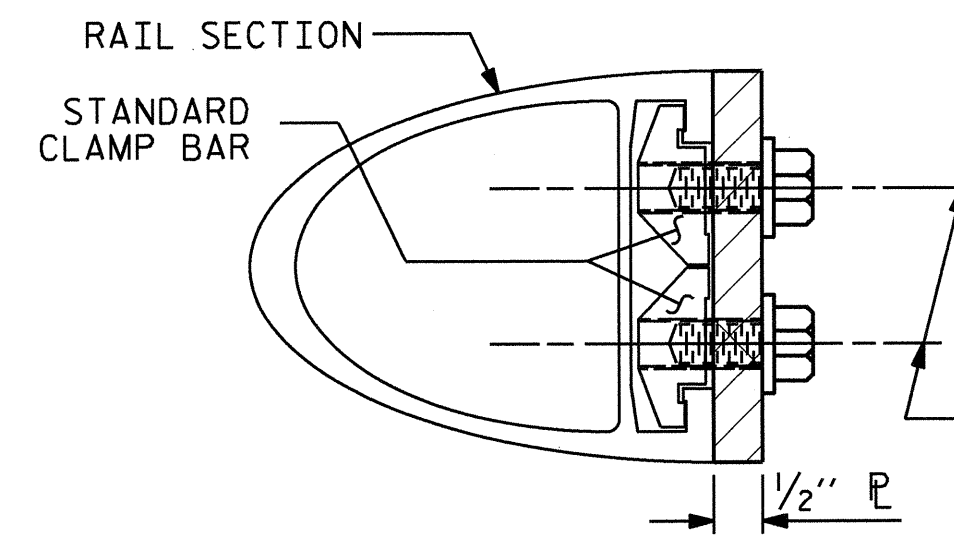
STRUCTURAL CONCRETE INSERT

- 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 CONTRACTORS 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 1/16" Ø WIRE STRUT WITH A MINIMUM TENSILE STRENGTH OF 90,000 PSI IS ACCEPTABLE.



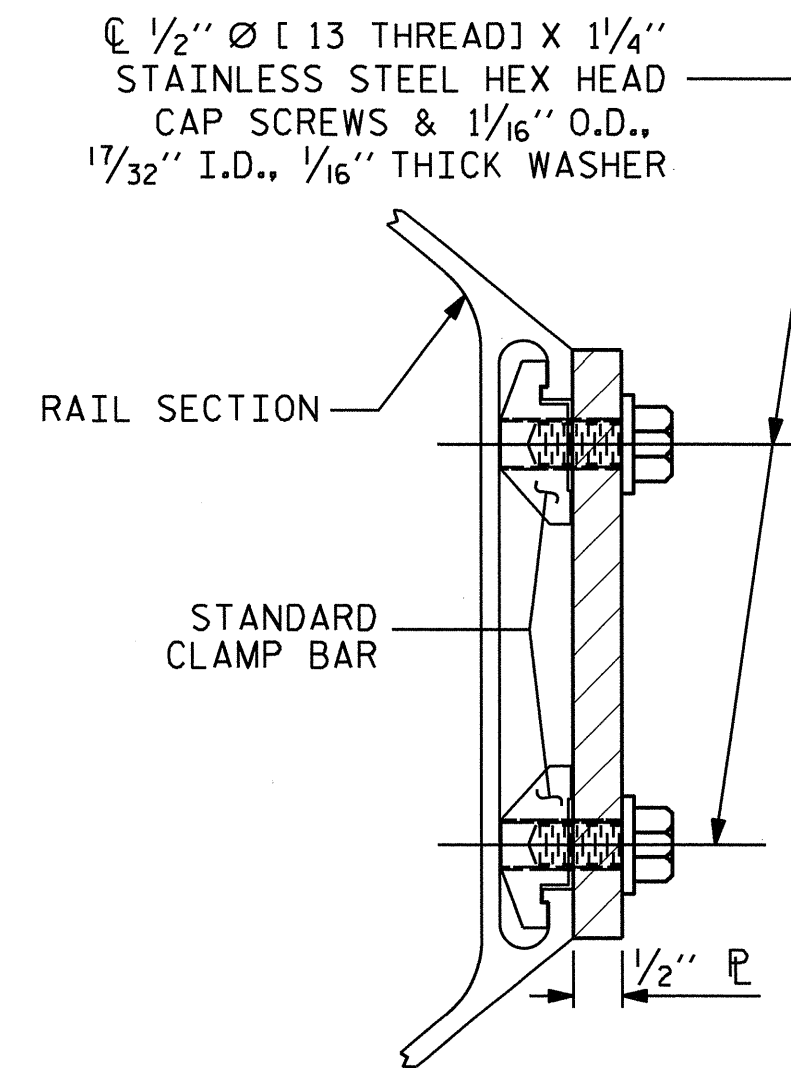
PLAN OF RAIL AND END POST

(STIFFENER ON 1/2" P NOT SHOWN FOR CLARITY)



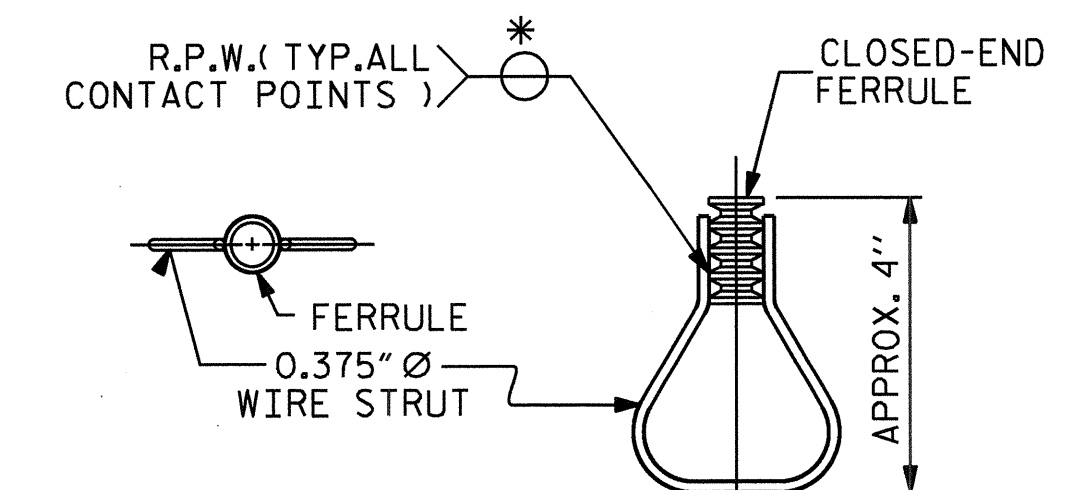
SECTION H-H

(FOR TOP & MIDDLE RAIL)



SECTION H-H

(FOR BOTTOM RAIL)



STRUCTURAL CONCRETE INSERT

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

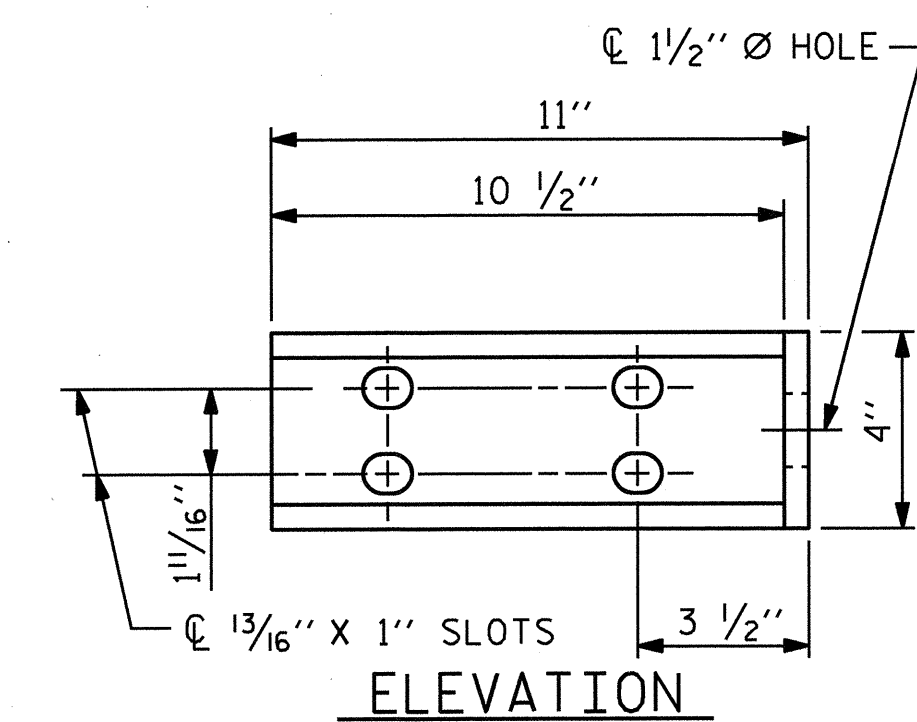
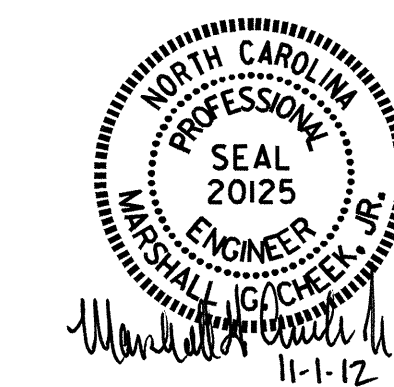
PROJECT NO. B-4122  
 GRAHAM COUNTY  
 STATION: 12+88.00 -L-

SHEET 7 OF 12

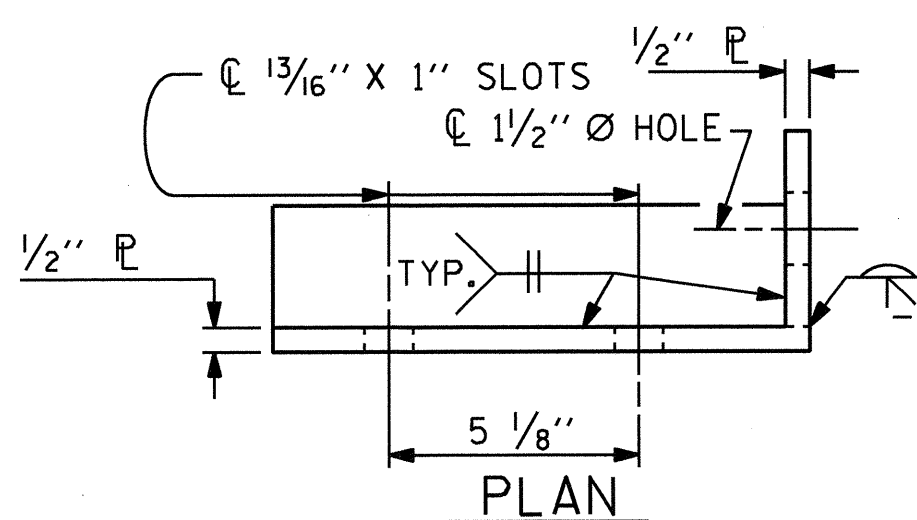
STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH  
 STANDARD  
 3 BAR METAL RAIL  
 PRECAST REINFORCED  
 CONCRETE THREE-SIDED  
 CULVERT

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

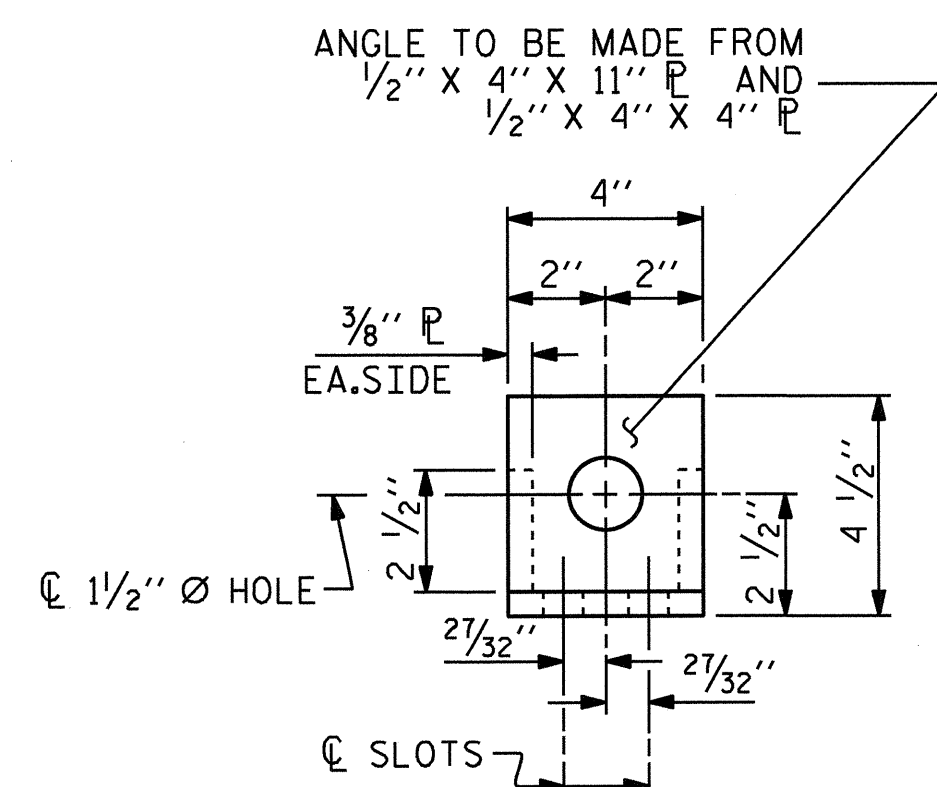
TOTAL SHEETS 12



ELEVATION



PLAN

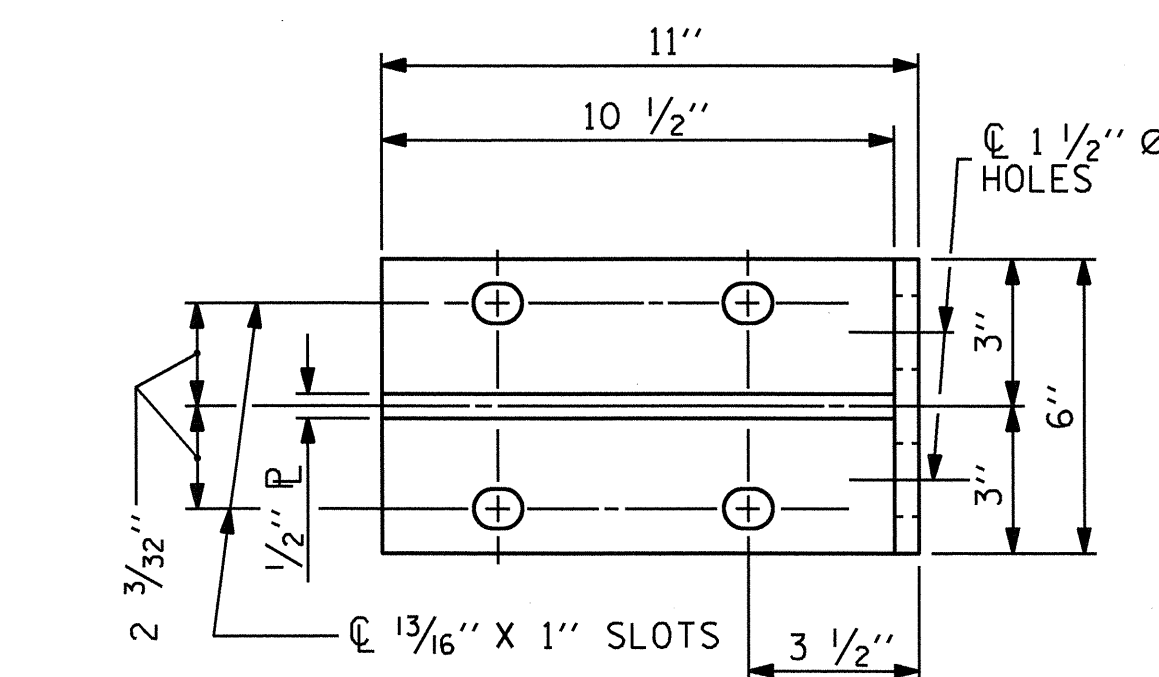


END VIEW

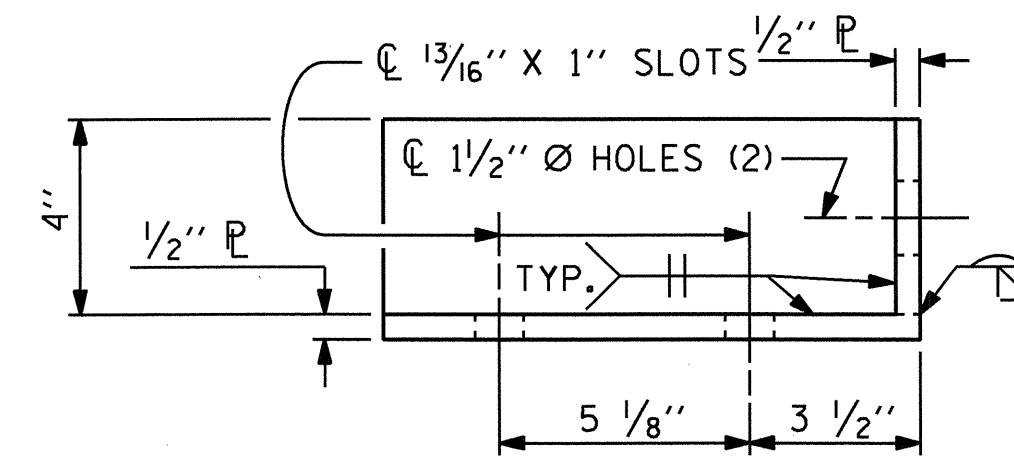
(FIX. AND EXP.)

DETAILS FOR ATTACHMENT BRACKET

(TOP & MIDDLE RAIL ONLY)



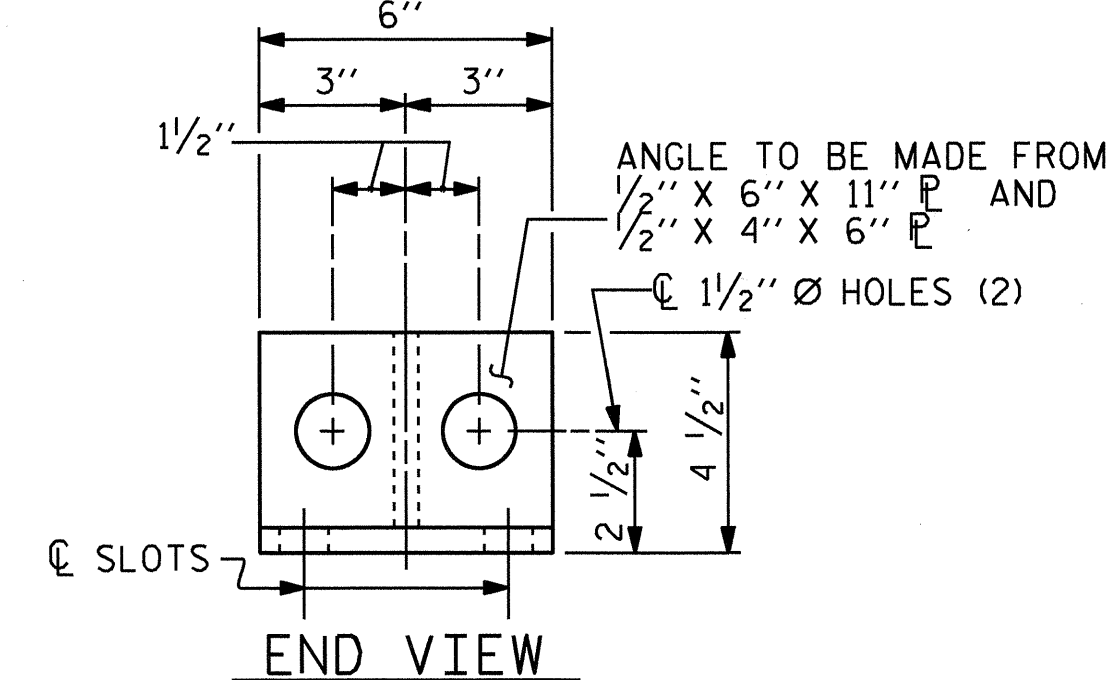
ELEVATION



PLAN

DETAILS FOR ATTACHMENT BRACKET

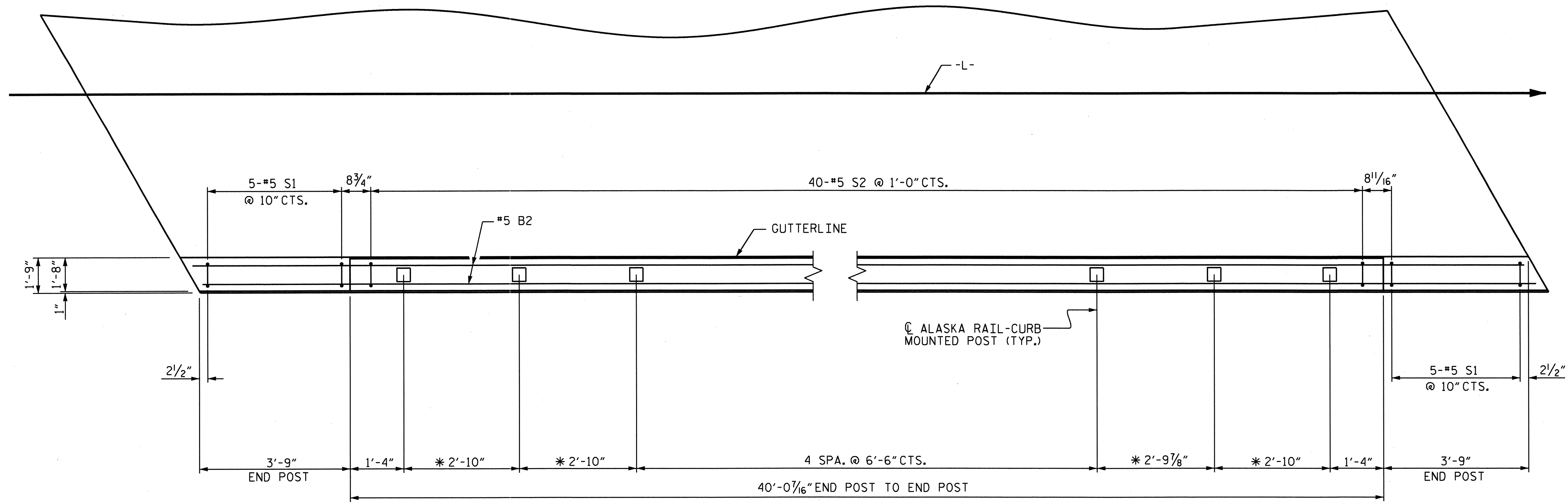
(BOTTOM RAIL ONLY)



END VIEW

ASSEMBLED BY : D. HODGE	DATE : 8/12
CHECKED BY : M.G. CHEEK	DATE : 8/12
DRAWN BY : JMB 1/88	REV. 5/7/03 RWW/JTE
CHECKED BY : GCH 1/88	REV. 5/1/06 TLA/GM
	REV. 10/1/11 MAA/GM

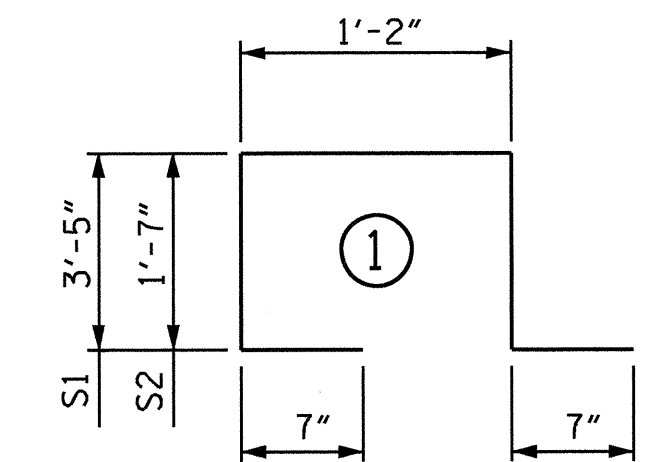




### RAIL POST SPACING AND REINFORCING PLACEMENT- (RIGHT SIDE)

\* SPACING MAY BE ADJUSTED BASED ON OVERALL WIDTH OF PRECAST THREE-SIDED CULVERT, NOT TO EXCEED 3'-3"

#### BAR TYPES



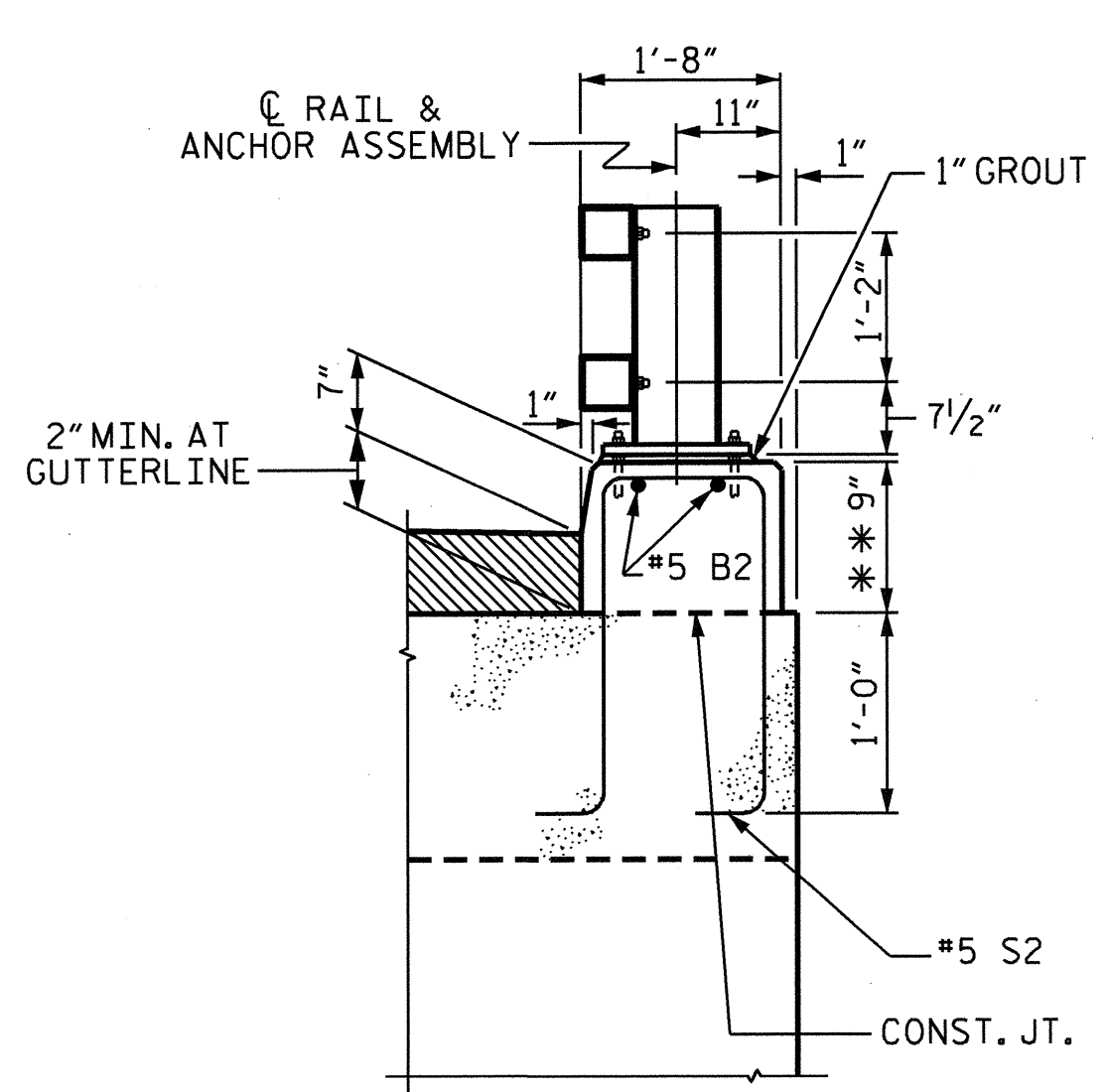
ALL BAR DIMENSIONS ARE OUT TO OUT

#### BILL OF MATERIAL

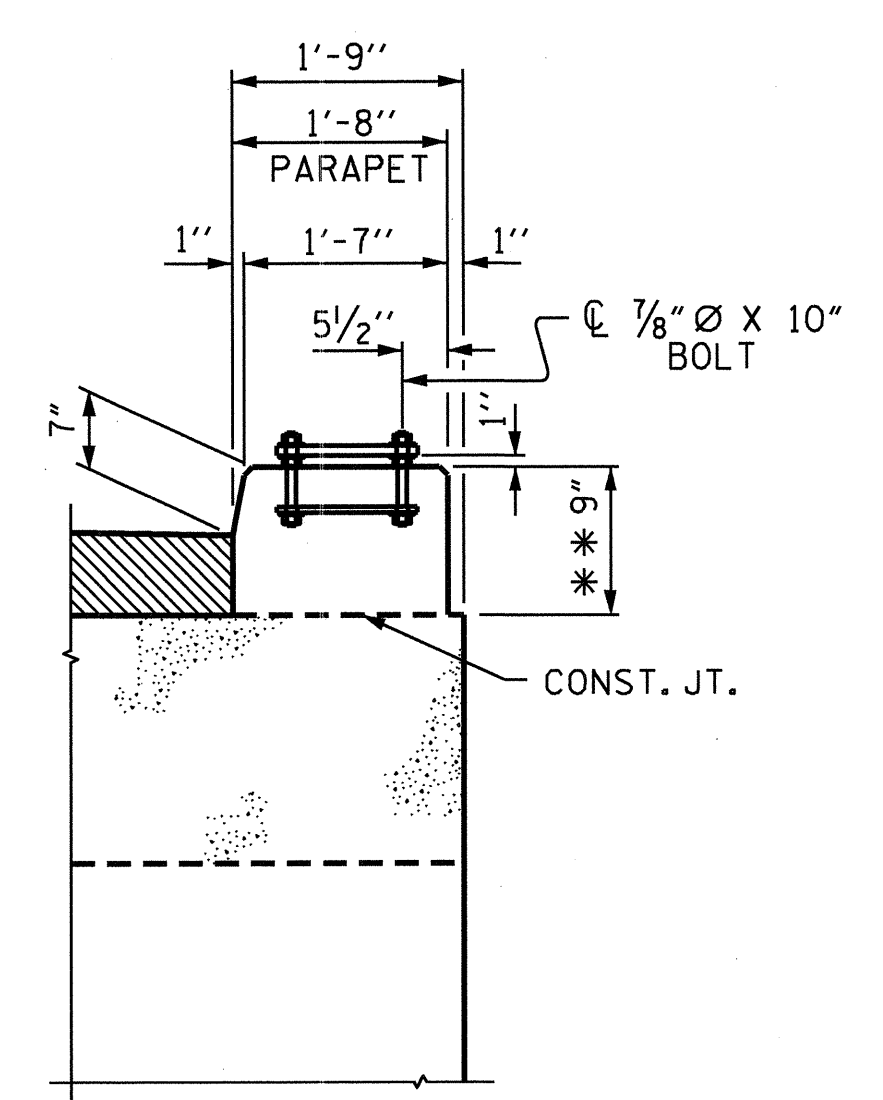
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
* B2	2	#5	STR	48'-0"	100
* S1	10	#5	1	9'-2"	96
* S2	40	#5	1	5'-6"	229
* E6	18	#7	STR	2'-7"	95
* F7	6	#6	STR	3'-6"	32
* F8	6	#6	STR	4'-2"	38

\* EPOXY COATED REINFORCING STEEL 590 LBS.

CLASS AA CONCRETE	
PARAPET	2.1 CU. YDS.
END POSTS	1.1 CU. YDS.
TOTAL	3.2 CU. YDS.

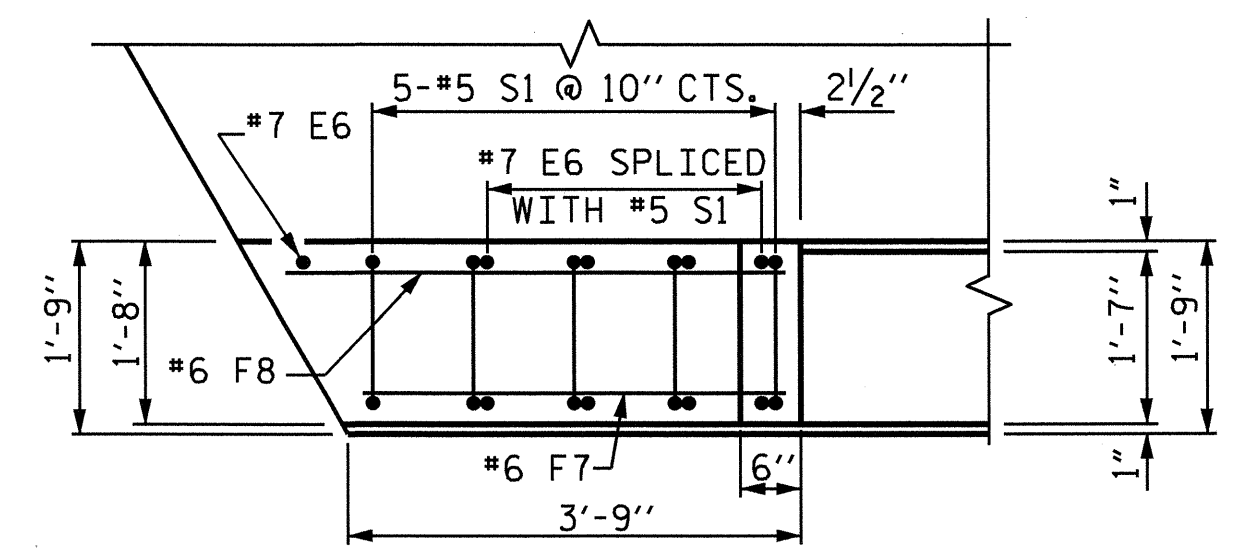


SECTION THROUGH RAIL (RIGHT SIDE)

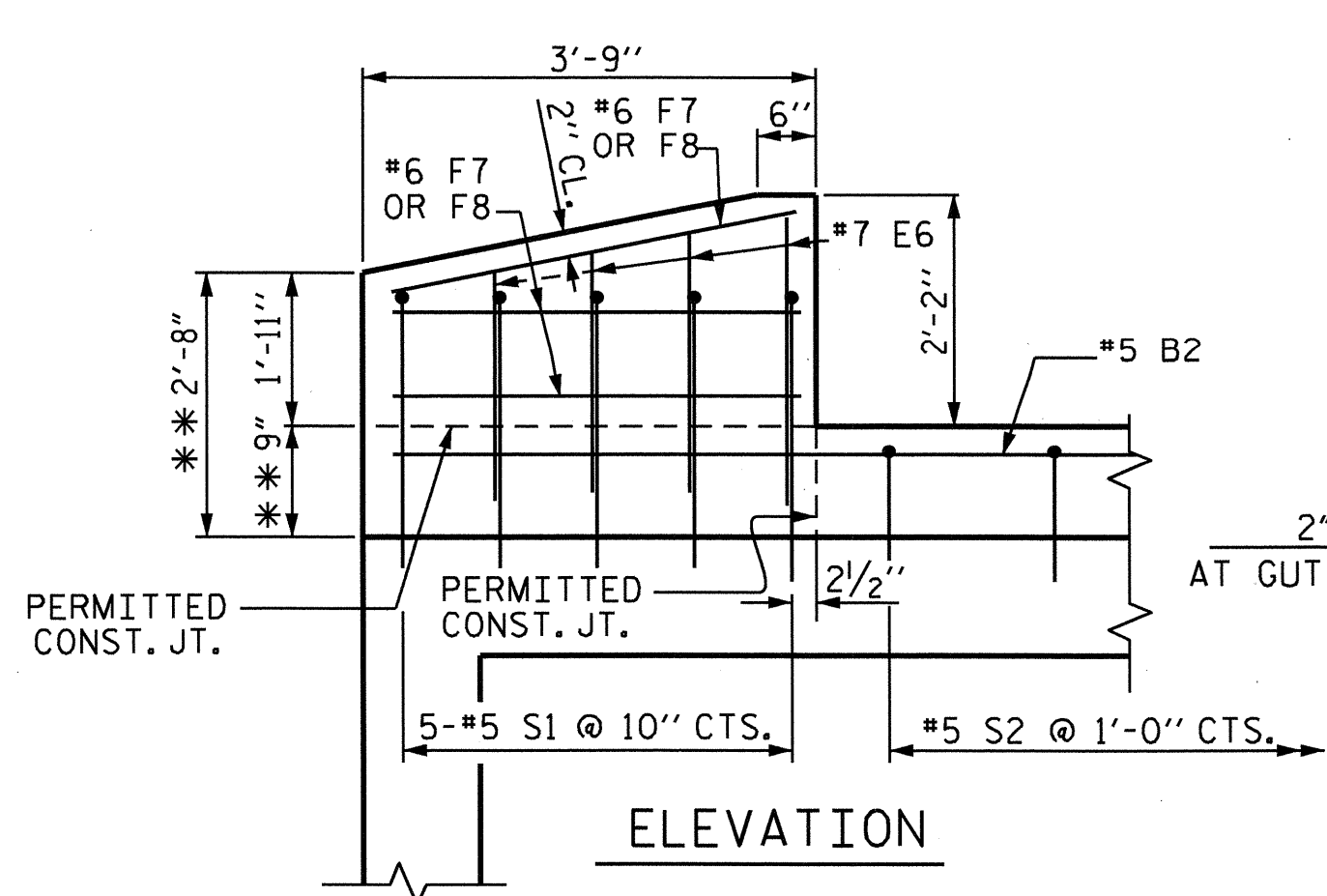


ANCHOR DETAILS

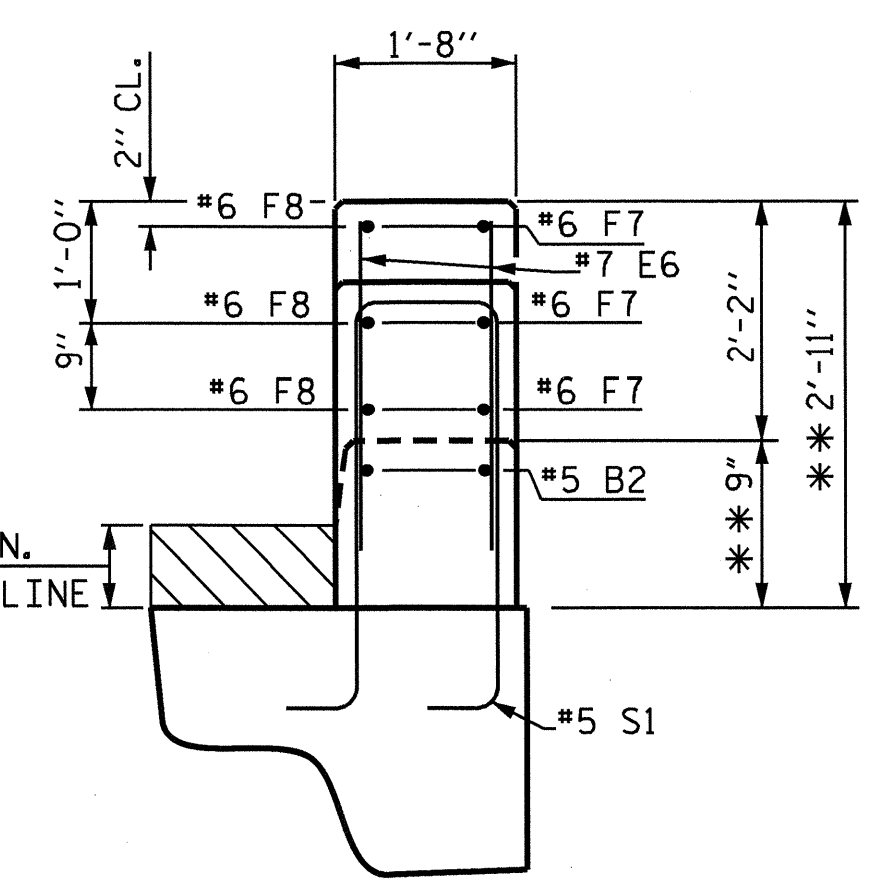
\*5 B2 BARS MAY BE SHIFTED AS NECESSARY TO CLEAR ANCHOR ASSEMBLY



PLAN OF END POST



ELEVATION



END VIEW

### PARAPET AND END POST DETAILS

\*\* NOTE: DIMENSIONS ARE BASED ON AN ASSUMED 2" MINIMUM OVERLAY THICKNESS AT THE GUTTERLINE. SHOULD THE OVERLAY THICKNESS VARY, THESE DIMENSIONS SHALL BE ADJUSTED.

PROJECT NO. B-4122  
GRAHAM COUNTY  
STATION: 12+88.00 -L-

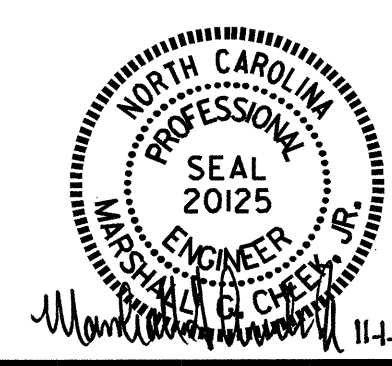
SHEET 8 OF 12

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH

CONCRETE PARAPET  
DETAILS FOR PRECAST  
REINFORCED CONCRETE  
THREE-SIDED CULVERT

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

DRAWN BY: D. HODGE DATE: 8/12  
CHECKED BY: M.G. CHEEK DATE: 9/12



NOTES

METAL RAIL SHALL BE GALVANIZED STEEL IN ACCORDANCE WITH THE REQUIREMENTS OF THE GENERAL NOTES AND THE FOLLOWING SPECIFICATIONS.

GALVANIZED STEEL RAILS

MATERIAL AND GALVANIZING ARE TO CONFORM TO THE FOLLOWING SPECIFICATIONS:

ANCHOR PLATE: AASHTO M270 GRADE 250 STRUCTURAL STEEL

POST, POST BASES AND RAIL SPLICE BARS: AASHTO M270 GRADE 250 STRUCTURAL STEEL GALVANIZED TO AASHTO M111

SHIMS: SHIMS SHALL MEET THE REQUIREMENTS OF ASTM A570 FOR GRADE 230 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 230 OR A611 FOR GRADE C AND SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M111.

RAILS: ASTM A500, A501 OR A618 - GALVANIZED TO AASHTO M111. ALUMINUM WILL NOT BE ALLOWED.

THE REDUCED BASE WELDED STUDS AND THE CUT ENDS OF THE GALVANIZED 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.

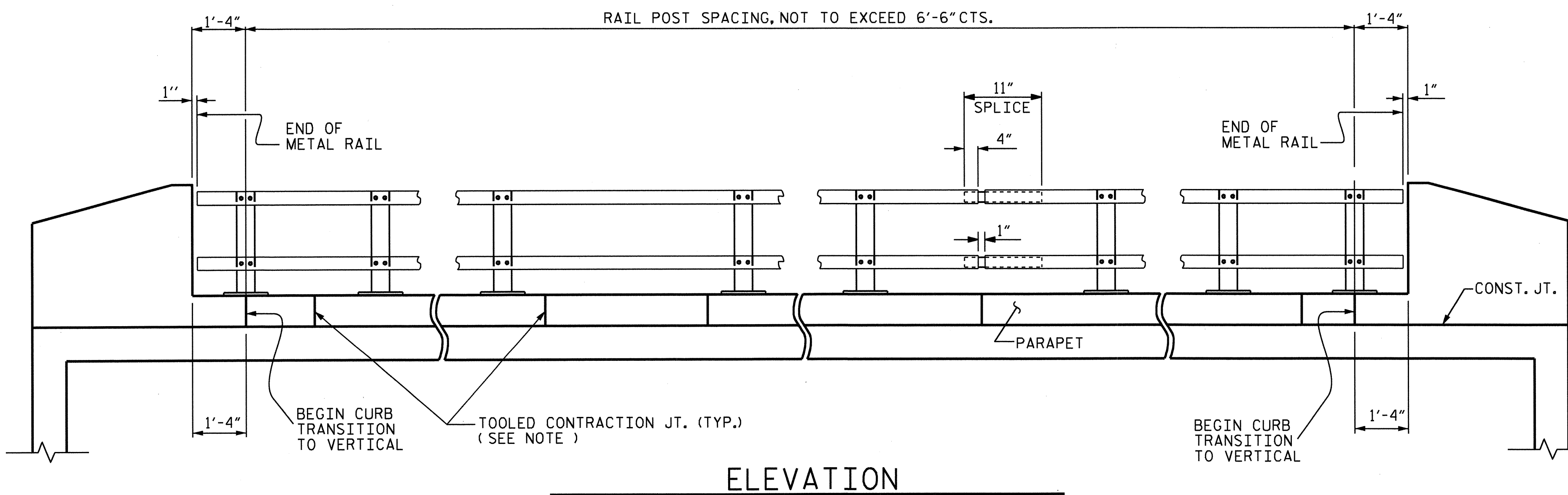
STUDS, NUTS, AND WASHERS: REDUCED BASE WELDED STUDS SHALL MEET THE REQUIREMENTS OF ASTM A108. NUTS SHALL CONFORM TO ASTM A563 DH AND WASHERS TO A436. NUTS AND WASHERS SHALL BE GALVANIZED.

ANCHOR BOLTS SHALL BE ASTM A325 AND SHALL BE GALVANIZED.

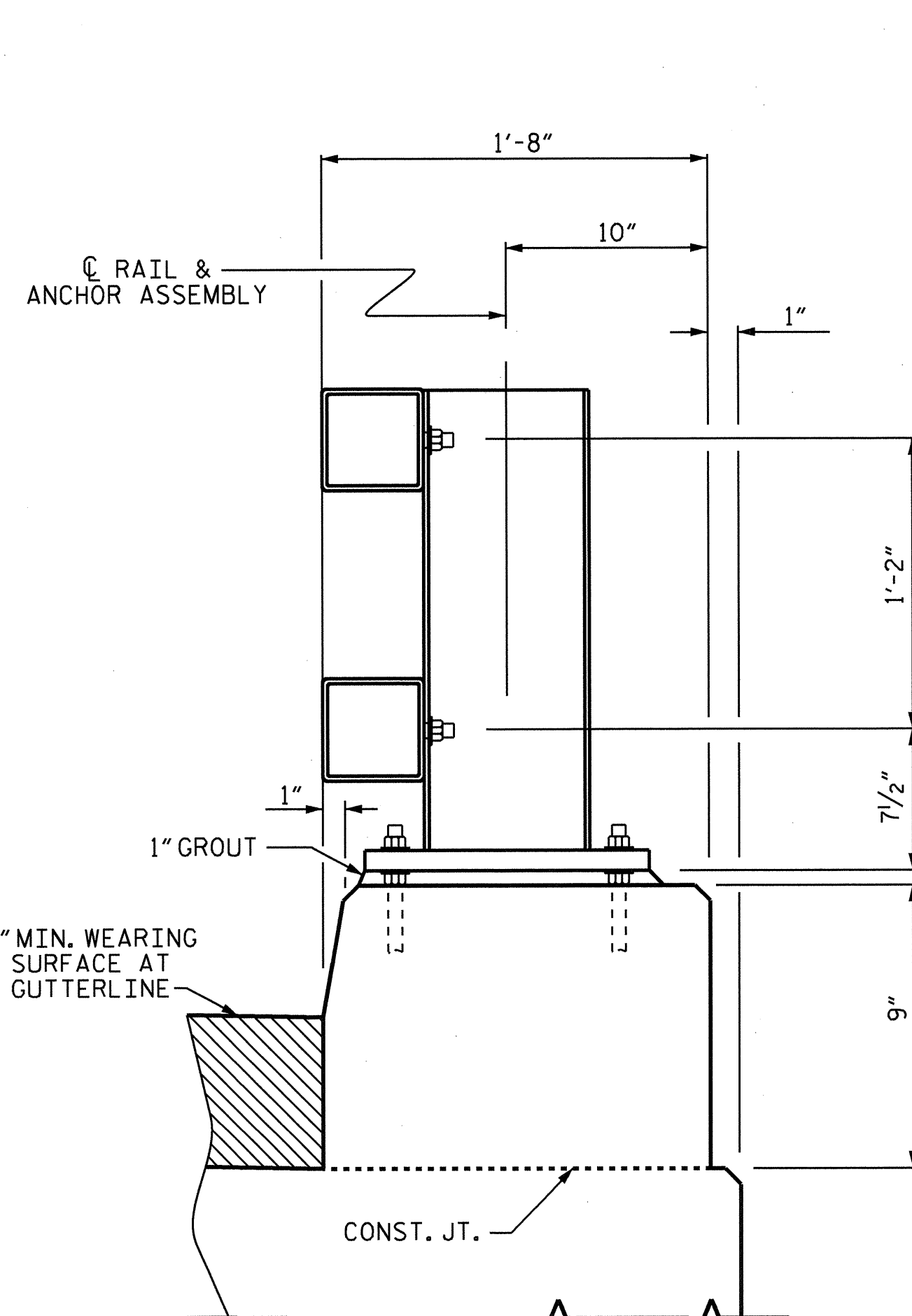
GENERAL NOTES

1. RAILING SHALL BE CONTINUOUS FROM END POST TO END POST. EACH JOINT IN RAIL LENGTH SHALL BE SPLICED AS DETAILED. PANEL LENGTHS OF RAIL SHALL BE ATTACHED TO A MINIMUM OF THREE POSTS.
2. FOR END OF RAIL TO CLEAR FACE OF CONCRETE END POST DIMENSION, SEE "ELEVATION"
3. CERTIFIED MILL REPORTS ARE REQUIRED FOR RAILS AND POSTS. SHOP INSPECTION IS NOT REQUIRED.
4. METAL RAIL POSTS SHALL BE SET NORMAL TO CURB GRADE.
5. METHOD OF MEASUREMENT FOR METAL RAILS: FOR LENGTH OF METAL RAILS TO BE PAID FOR, SEE THE STANDARD SPECIFICATIONS.
6. CURVED RAIL USAGE: WHERE RAILS ARE LOCATED IN AREAS OF 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.
7. 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.
8. MINOR VARIATIONS IN DETAILS OF METAL RAIL WILL BE CONSIDERED. DETAILS OF SUCH VARIATIONS, IF DESIRED, SHALL BE SUBMITTED FOR APPROVAL.
9. GROOVED CONTRACTION JOINTS, 1/2" IN DEPTH, SHALL BE TOOLED IN ALL EXPOSED FACES OF THE PARAPET IN ACCORDANCE WITH ARTICLE 825-10(B) OF THE STANDARD SPECIFICATIONS. THE CONTRACTION JOINT SHALL BE LOCATED AT A SPACING OF 8 FT. TO 10 FT. BETWEEN EXPANSION JOINTS. NO CONTRACTION JOINTS WILL BE REQUIRED FOR SEGMENTS LESS THAN 10 FT. IN LENGTH.
10. THE GROUT BED SHALL BE PLACED PRIOR TO INSTALLING THE END POSTS. GROUT SHALL BE NON-SHRINK, NON-METALLIC GROUT, SEE SPECIAL PROVISIONS.
11. TORQUE NUTS ON REDUCED BASE WELDED STUDS TO 100 FT.-LBS.

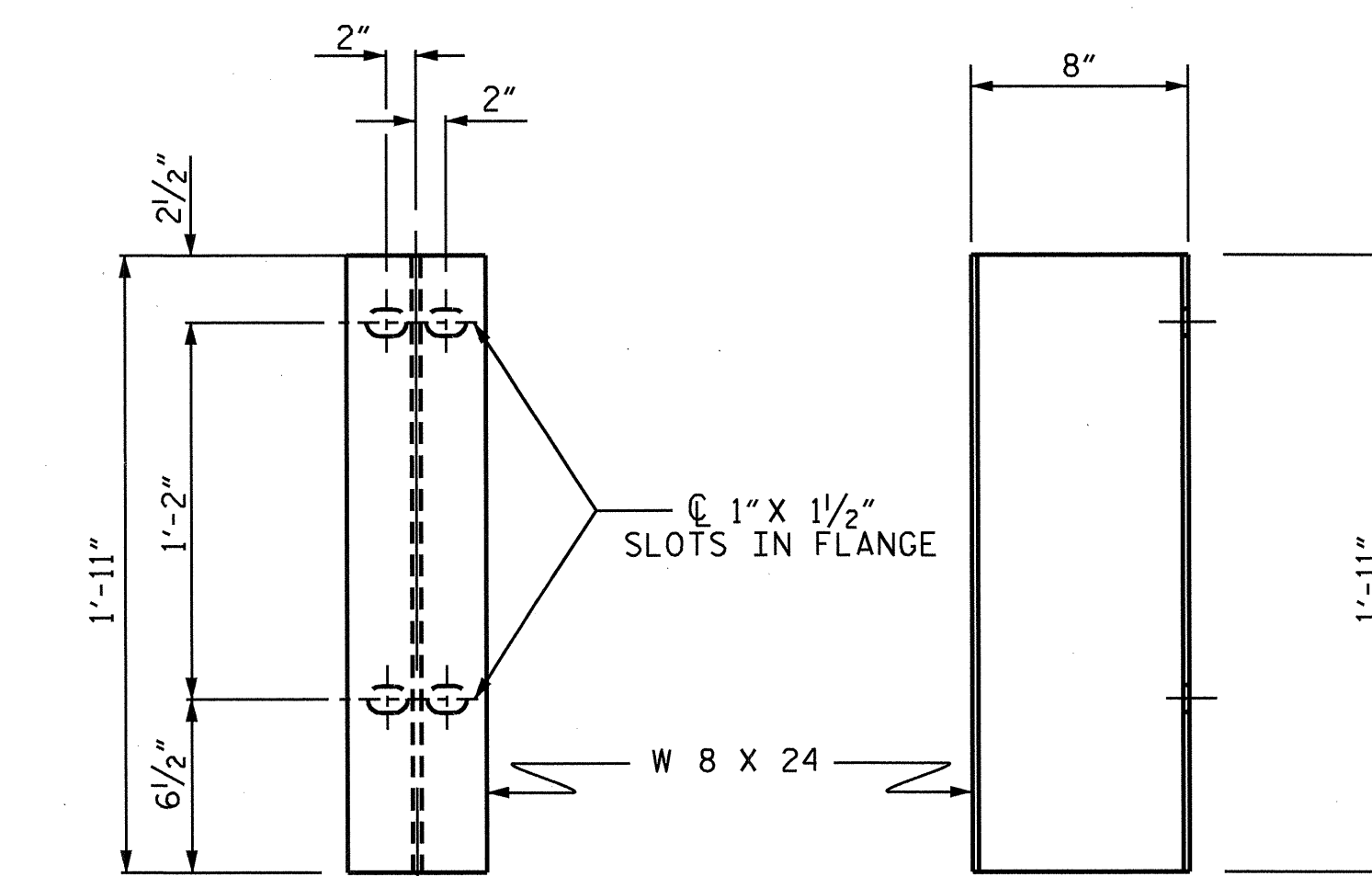
PAY LENGTH = 40.00 LIN. FT.



ELEVATION

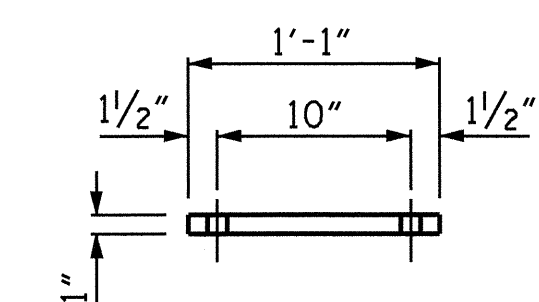


SECTION THRU RAIL

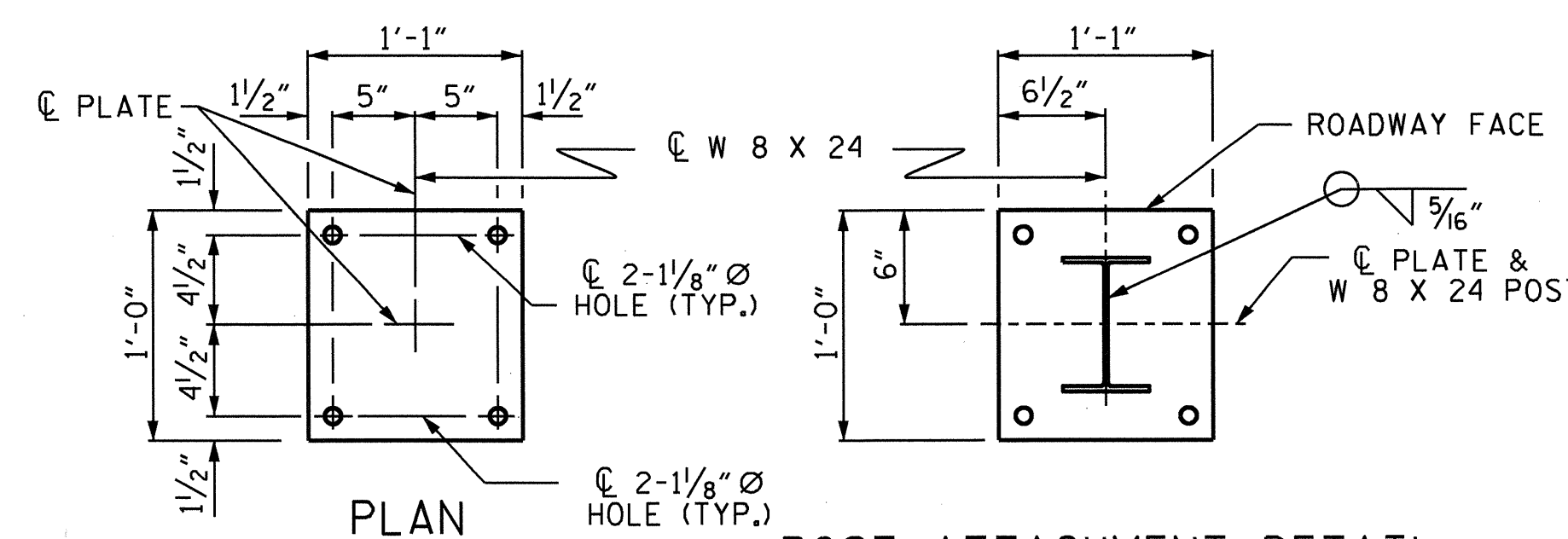


FRONT ELEVATION SIDE ELEVATION

DETAILS OF POST



FRONT ELEVATION



PLAN

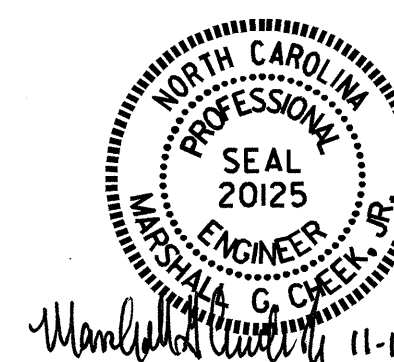
POST ATTACHMENT DETAIL

POST BASE DETAILS

PROJECT NO. B-4122  
GRAHAM COUNTY  
STATION: 12+88.00 -L-

SHEET 9 OF 12

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
RALEIGH  
ALASKA RAIL-CURB MOUNTED FOR PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT

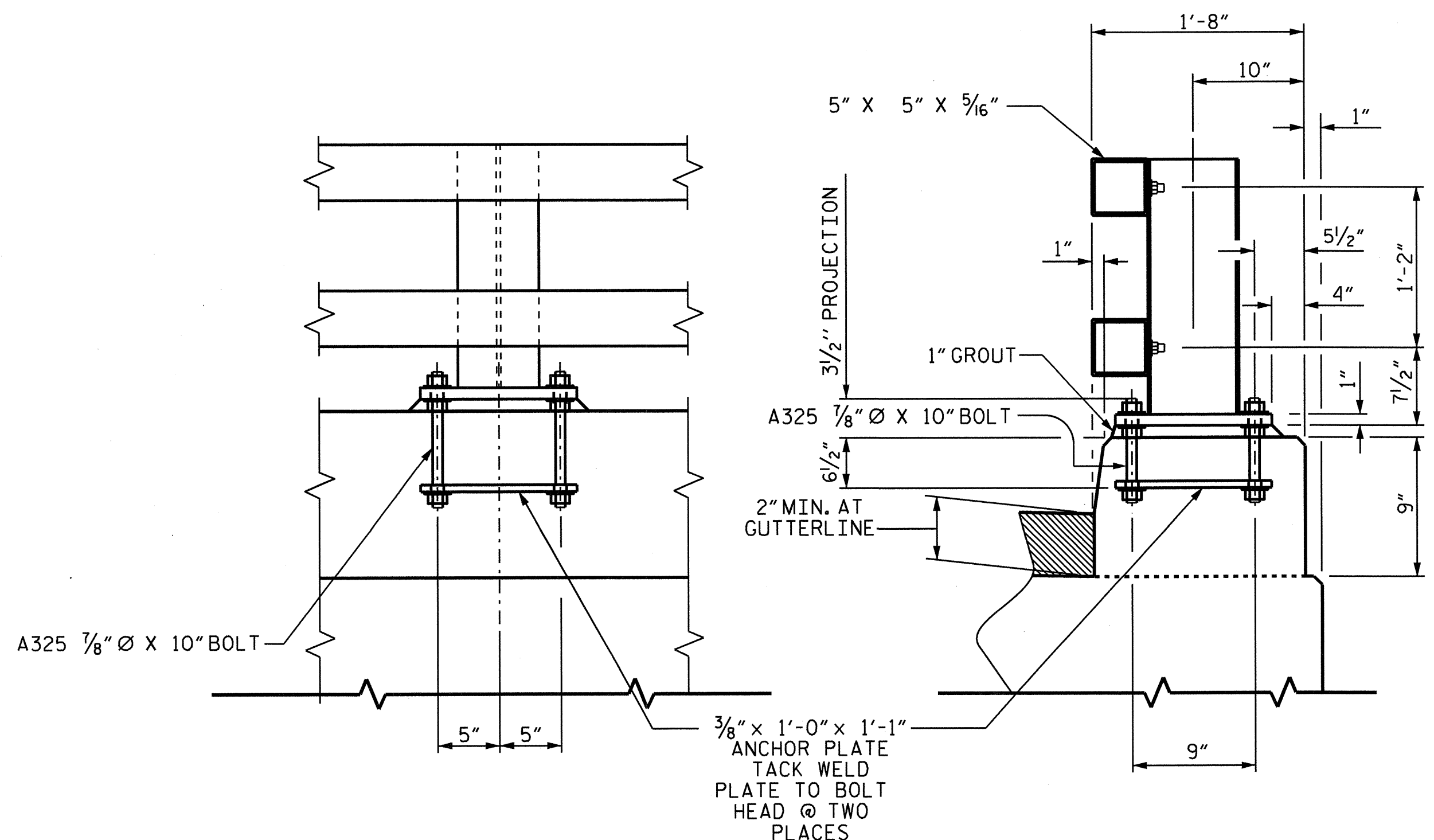


REVISIONS					SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

TOTAL SHEETS 12

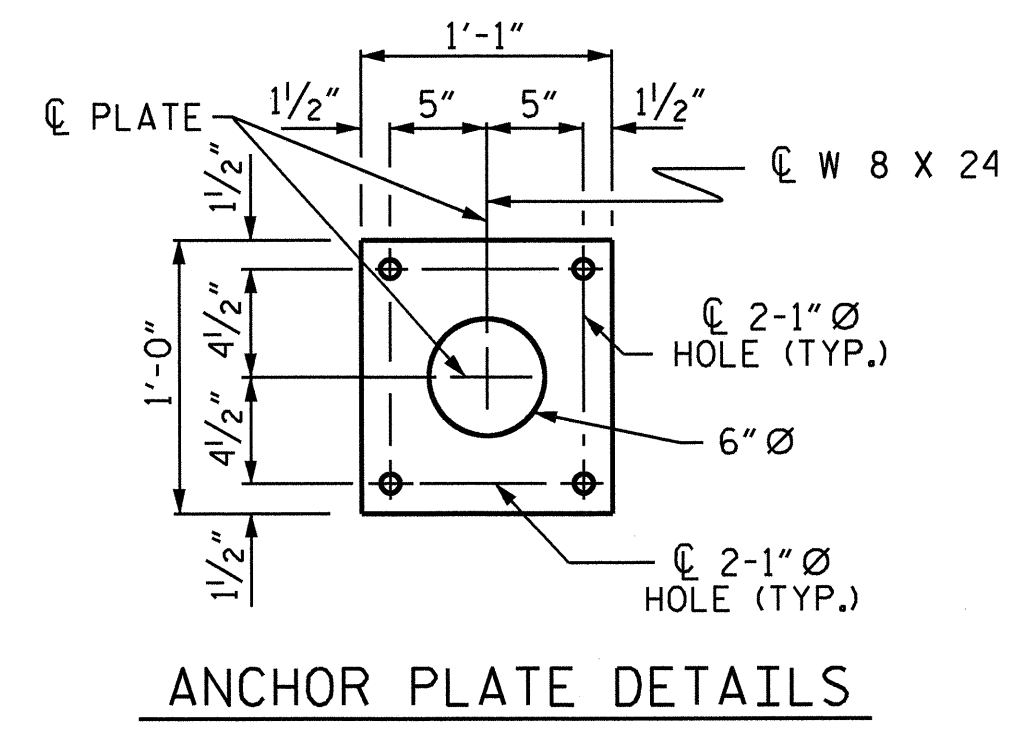
DRAWN BY : D. HODGE DATE : 8/12  
CHECKED BY : M.G. CHEEK DATE : 8/12



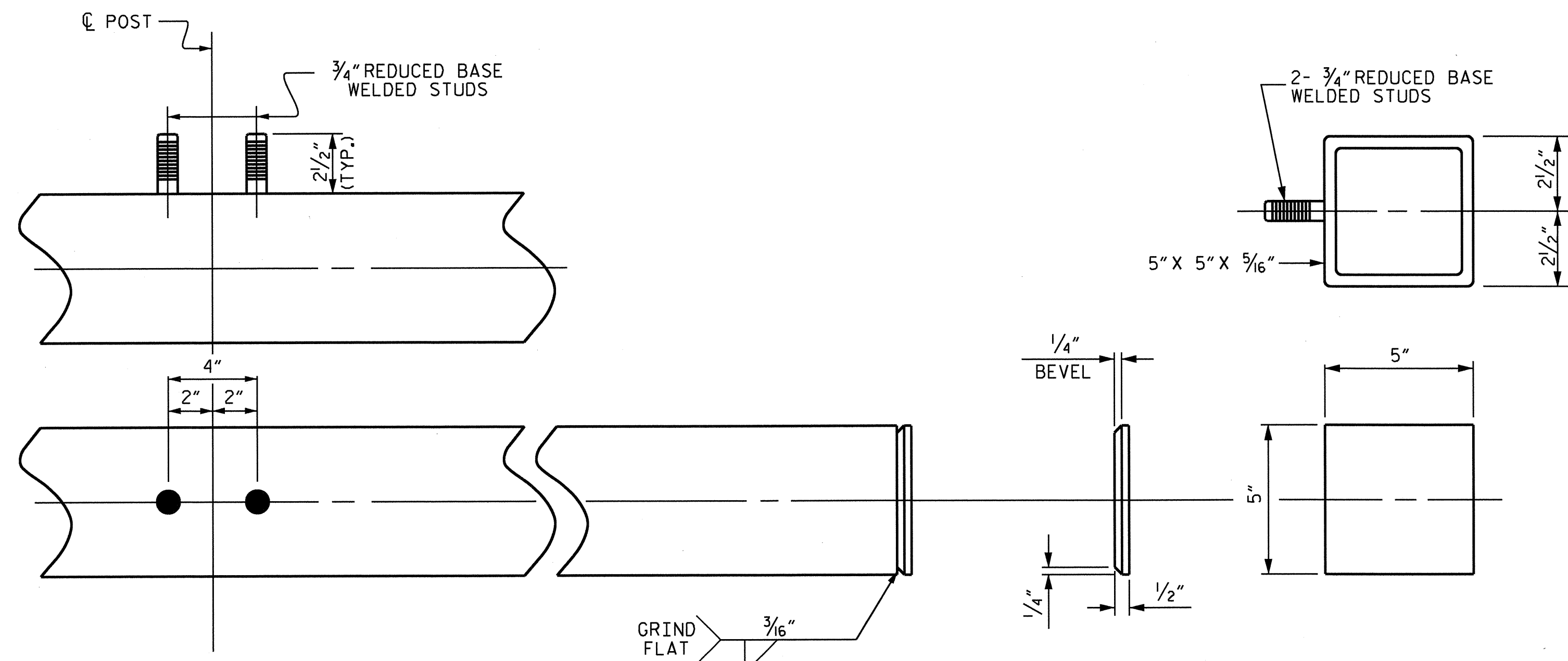


**RAIL POST ATTACHMENT DETAILS**

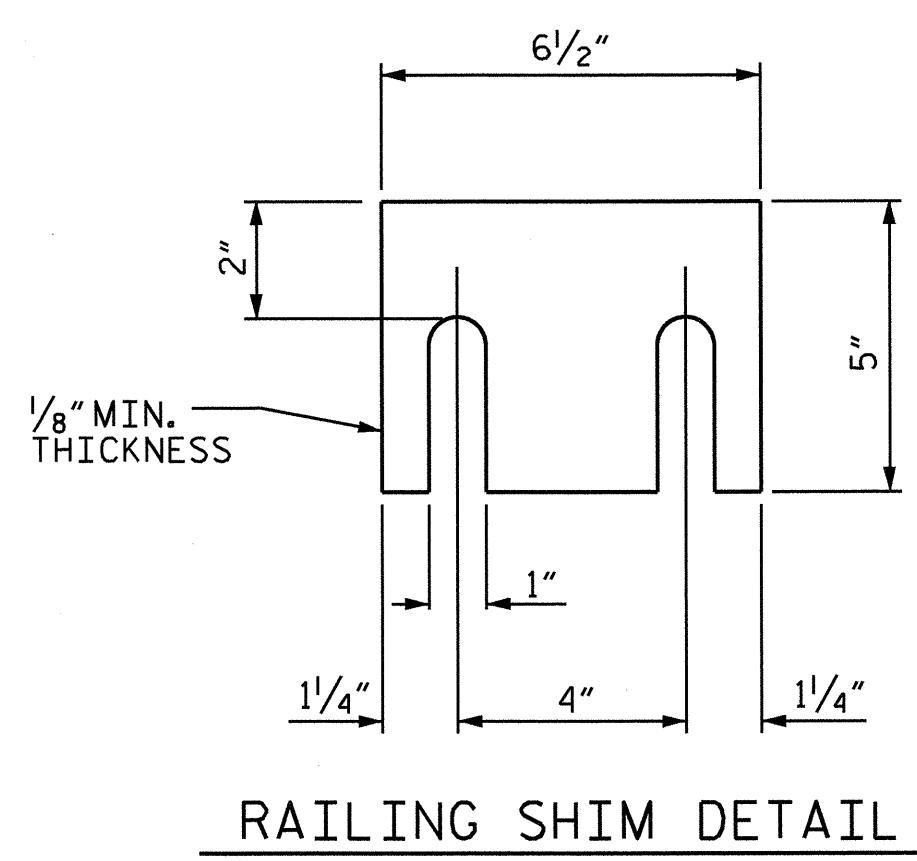
(9 ATTACHMENT ASSEMBLIES REQUIRED)



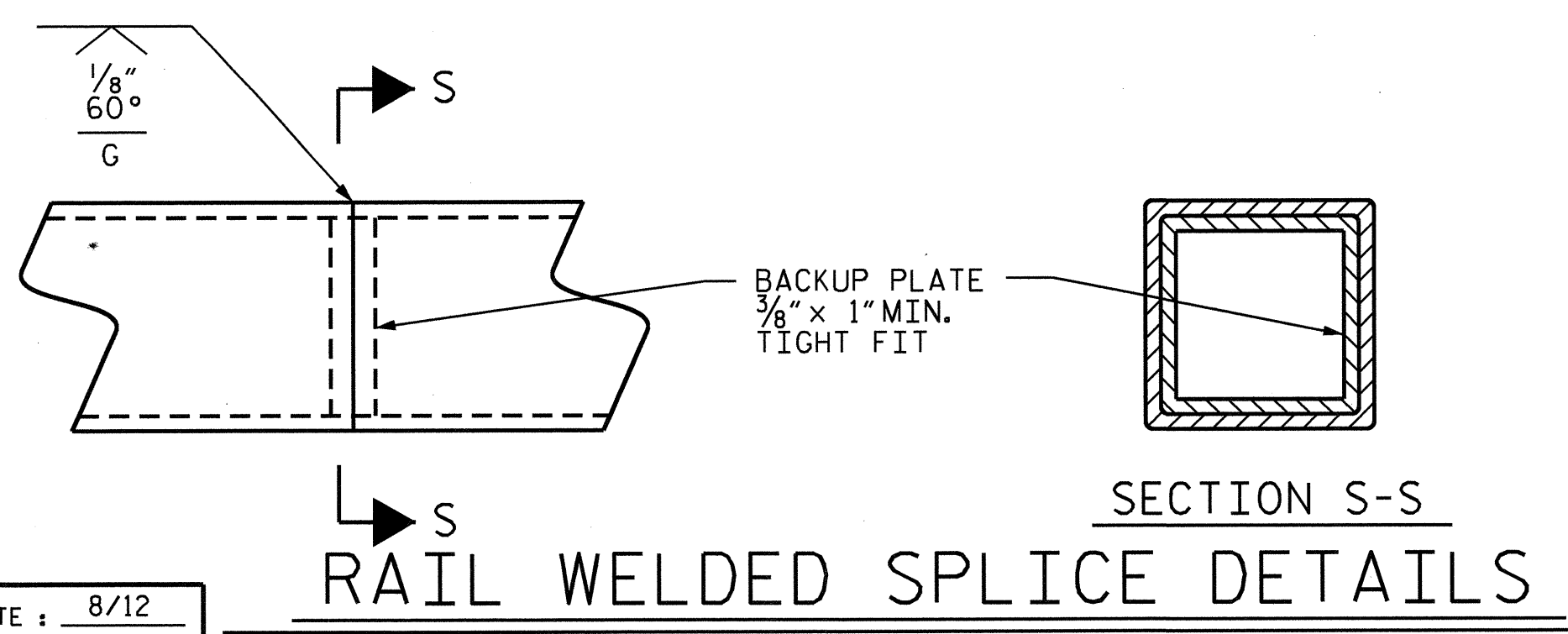
**ANCHOR PLATE DETAILS**



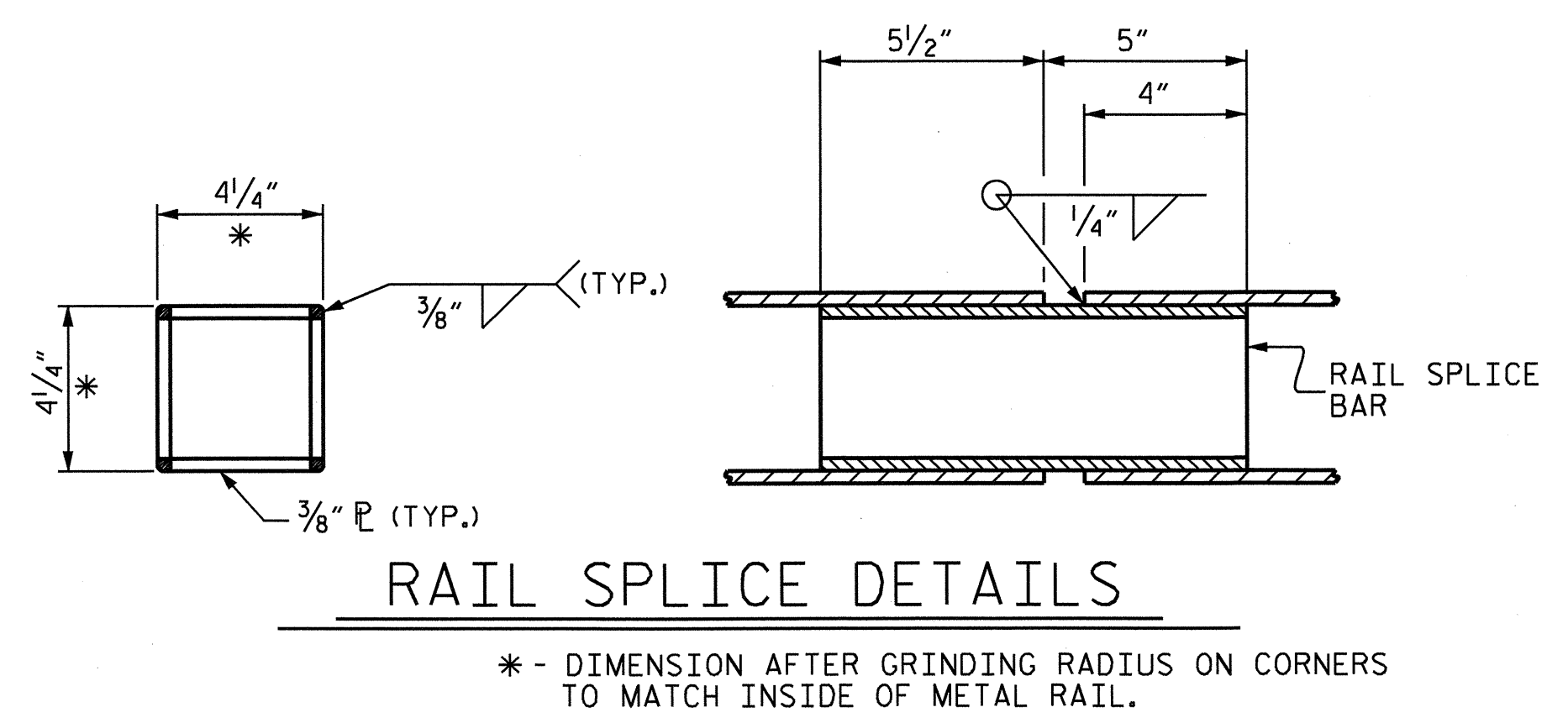
**RAIL CAP AND ATTACHMENT STUD DETAILS**



**RAILING SHIM DETAIL**



**RAIL WELDED SPLICE DETAILS**



**RAIL SPLICE DETAILS**

\* - DIMENSION AFTER GRINDING RADIUS ON CORNERS TO MATCH INSIDE OF METAL RAIL.

PROJECT NO. B-4122  
GRAHAM COUNTY  
 STATION: 12+88.00 -L-  
 SHEET 10 OF 12

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION RALEIGH						SHEET NO. C-10	
ALASKA RAIL- CURB MOUNTED FOR PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT						TOTAL SHEETS 12	
REVISIONS							
NO.	BY:	DATE:	NO.	BY:	DATE:		
1			3				
2			4				

DRAWN BY : D. HODGE DATE : 8/12  
 CHECKED BY : M.G. CHEEK DATE : 8/12



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.

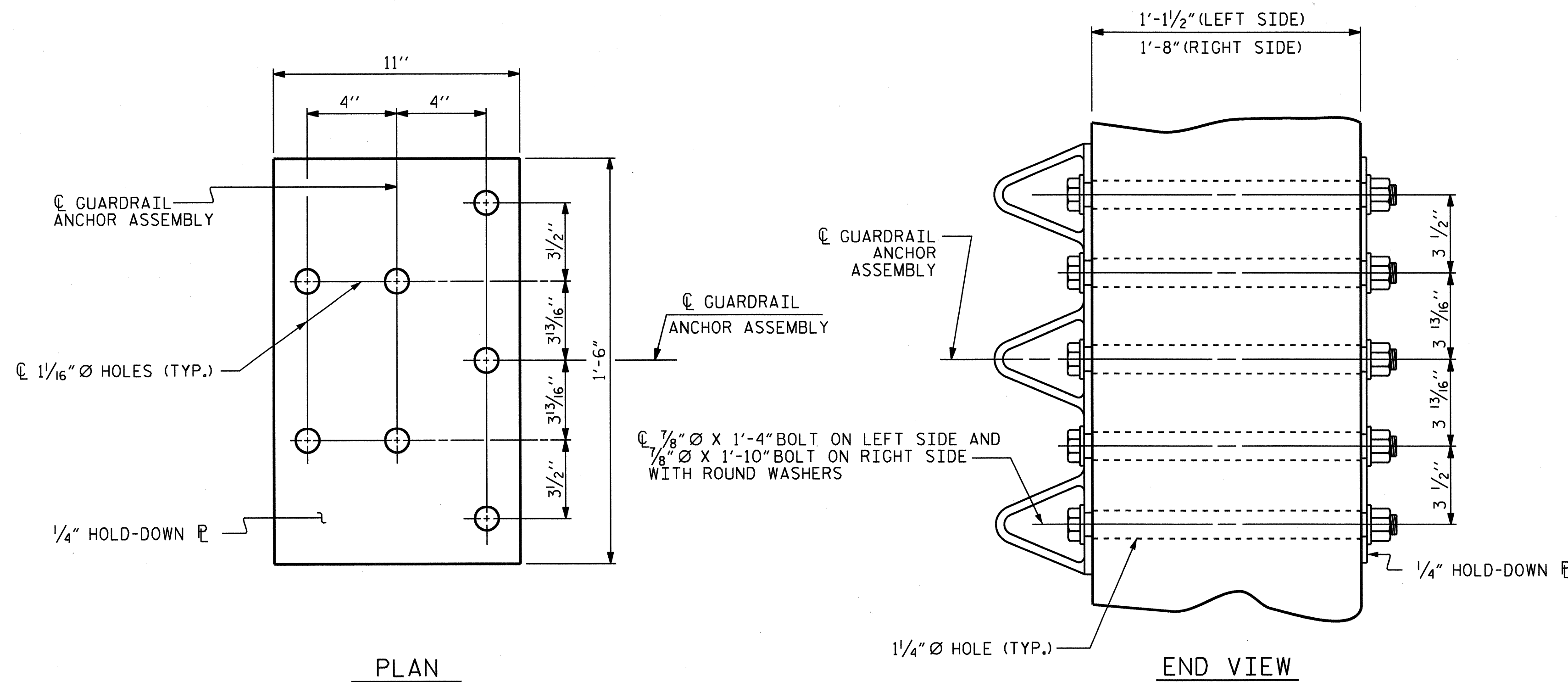
THE GUARDRAIL ANCHOR ASSEMBLY IS REQUIRED AT ALL POINTS WHERE APPROACH GUARDRAIL IS TO BE ATTACHED TO THE END POST. FOR POINTS OF ATTACHMENT, SEE SKETCH.

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.

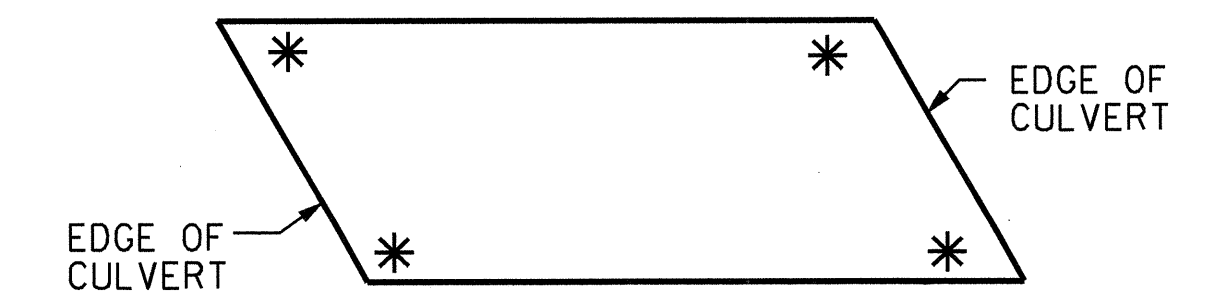
THE 1 1/4" Ø HOLES SHALL BE FORMED OR DRILLED WITH A CORE BIT. IMPACT TOOLS WILL NOT BE PERMITTED. ANY CONCRETE DAMAGED BY THIS WORK SHALL BE REPAIRED TO THE SATISFACTION OF THE ENGINEER.



PLAN

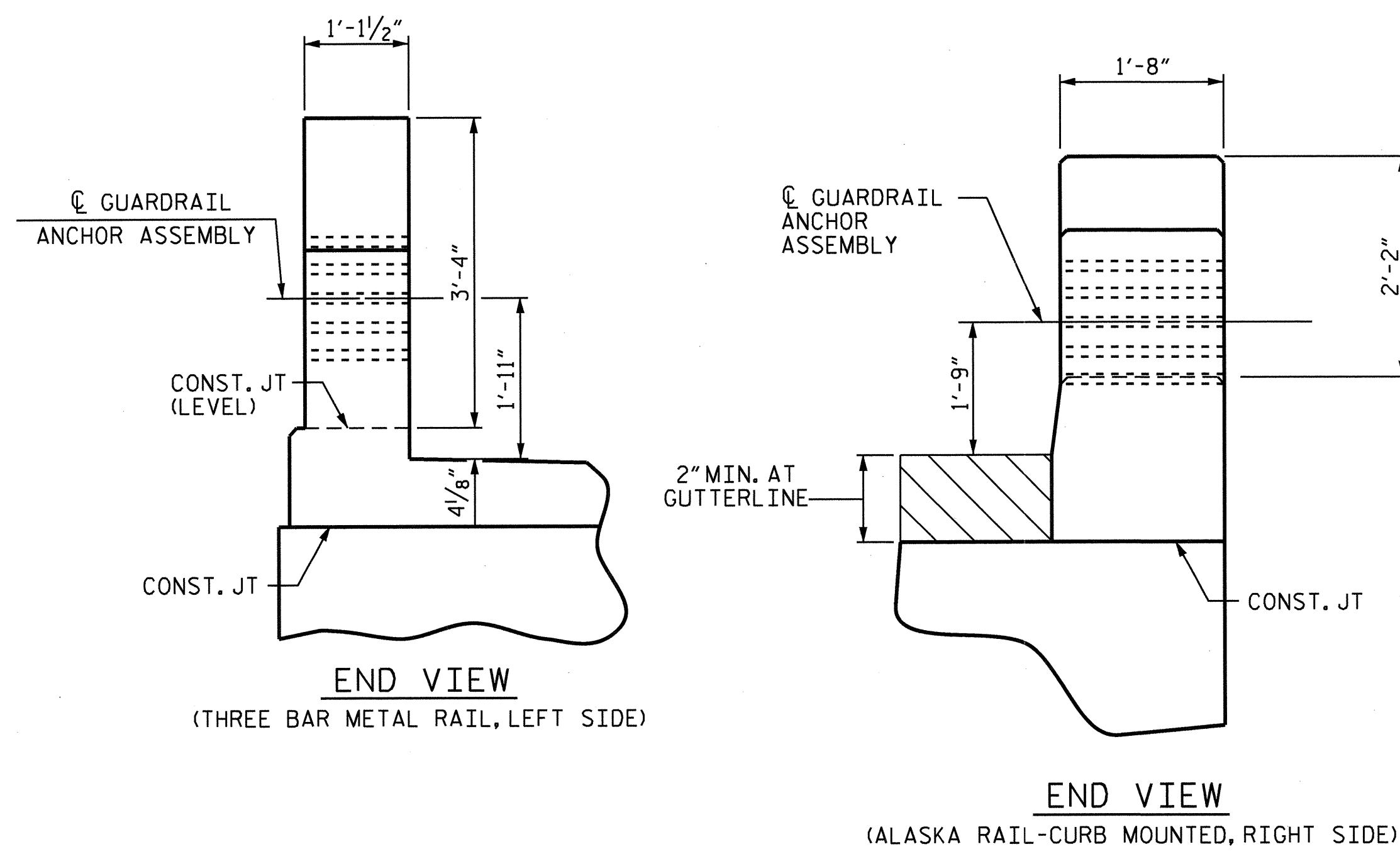
END VIEW

GUARDRAIL ANCHOR ASSEMBLY DETAILS



SKETCH SHOWING POINTS OF ATTACHMENT

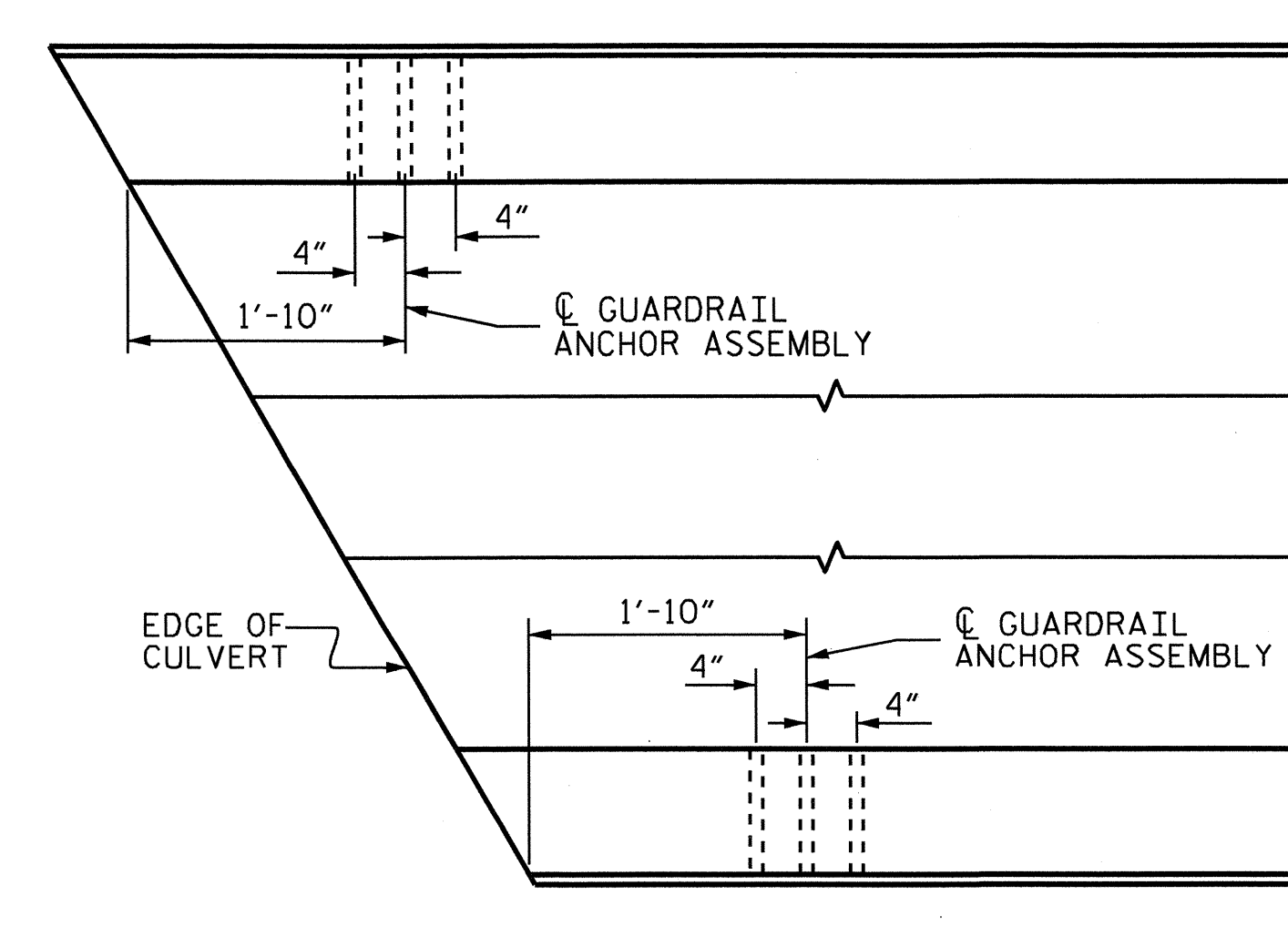
\* LOCATION OF GUARDRAIL ATTACHMENT



END VIEW  
(THREE BAR METAL RAIL, LEFT SIDE)

END VIEW  
(ALASKA RAIL-CURB MOUNTED, RIGHT SIDE)

LOCATION OF GUARDRAIL ANCHOR AT END POSTS



PLAN

PROJECT NO. B-4122  
GRAHAM COUNTY  
 STATION: 12+88.00 -L-

SHEET 11 OF 12

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



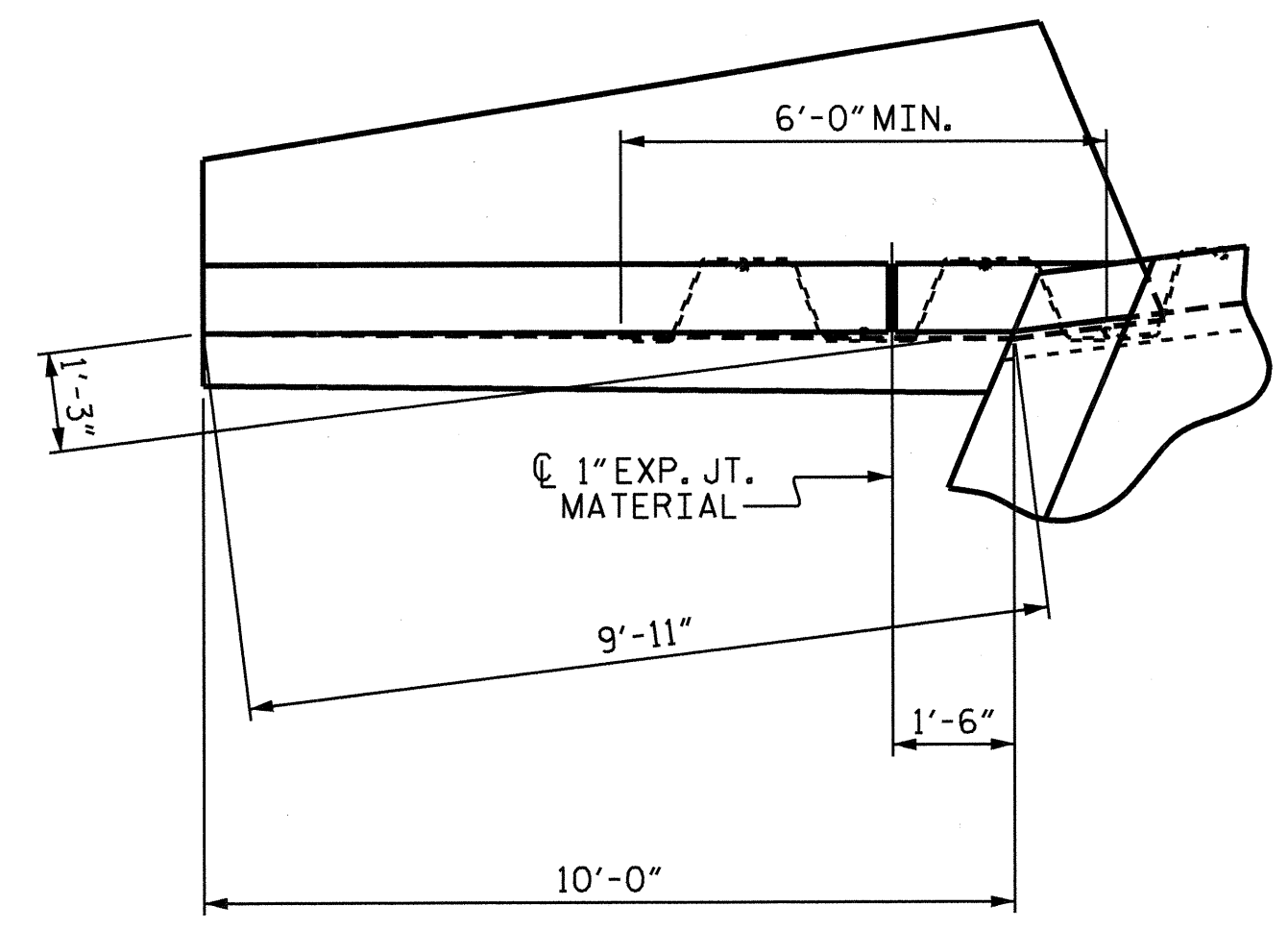
ASSEMBLED BY : D. HODGE	DATE : 8/12
CHECKED BY : M.G. CHEEK	DATE : 9/12
DRAWN BY : MAA 5/10	ADDED 5/6/10
CHECKED BY : GM 5/10	REV. 10/1/11
	REV. 12/5/11
	MAA/GM
	MAA/GM

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

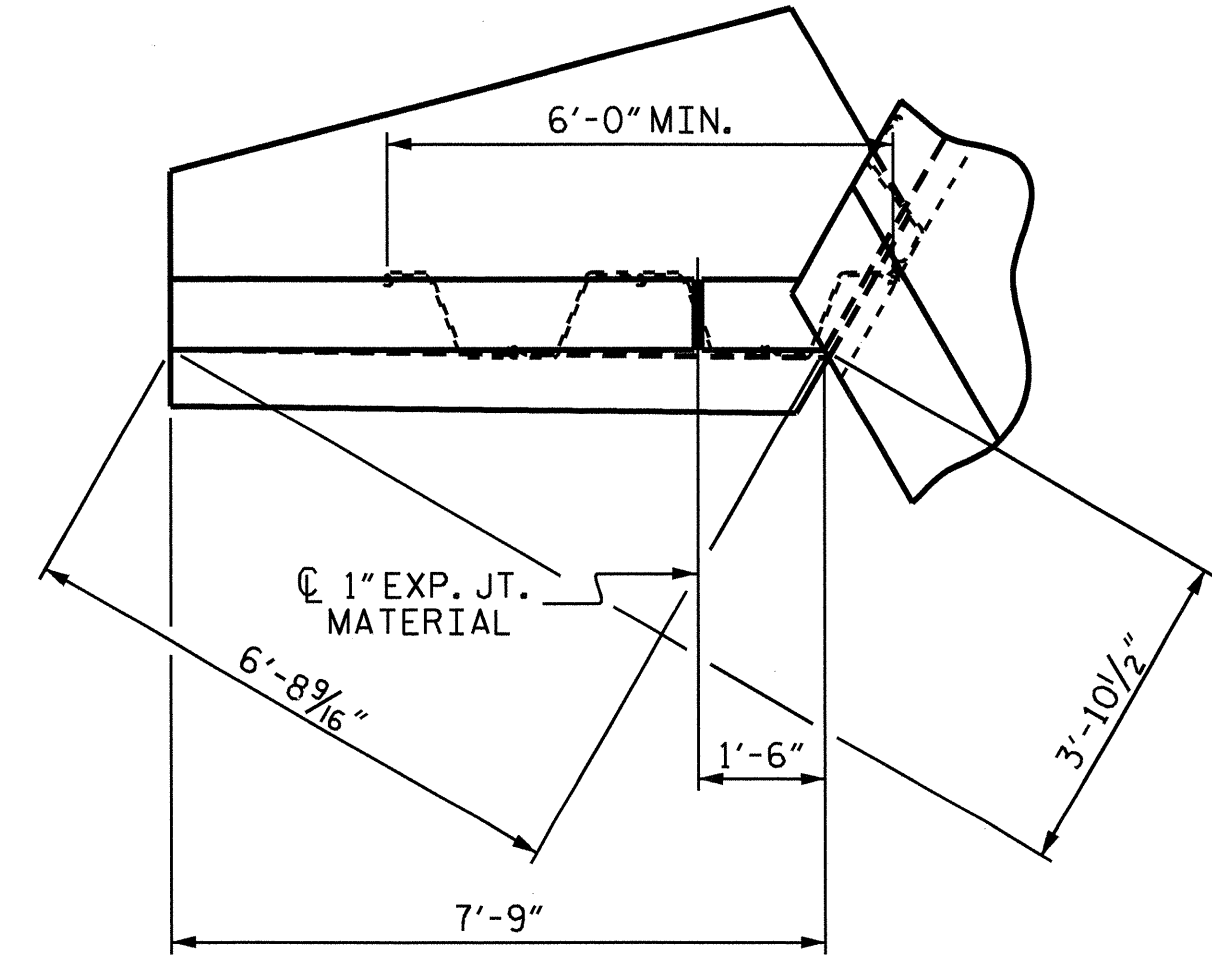
C-11
TOTAL SHEETS
12

STD. NO. GRA3

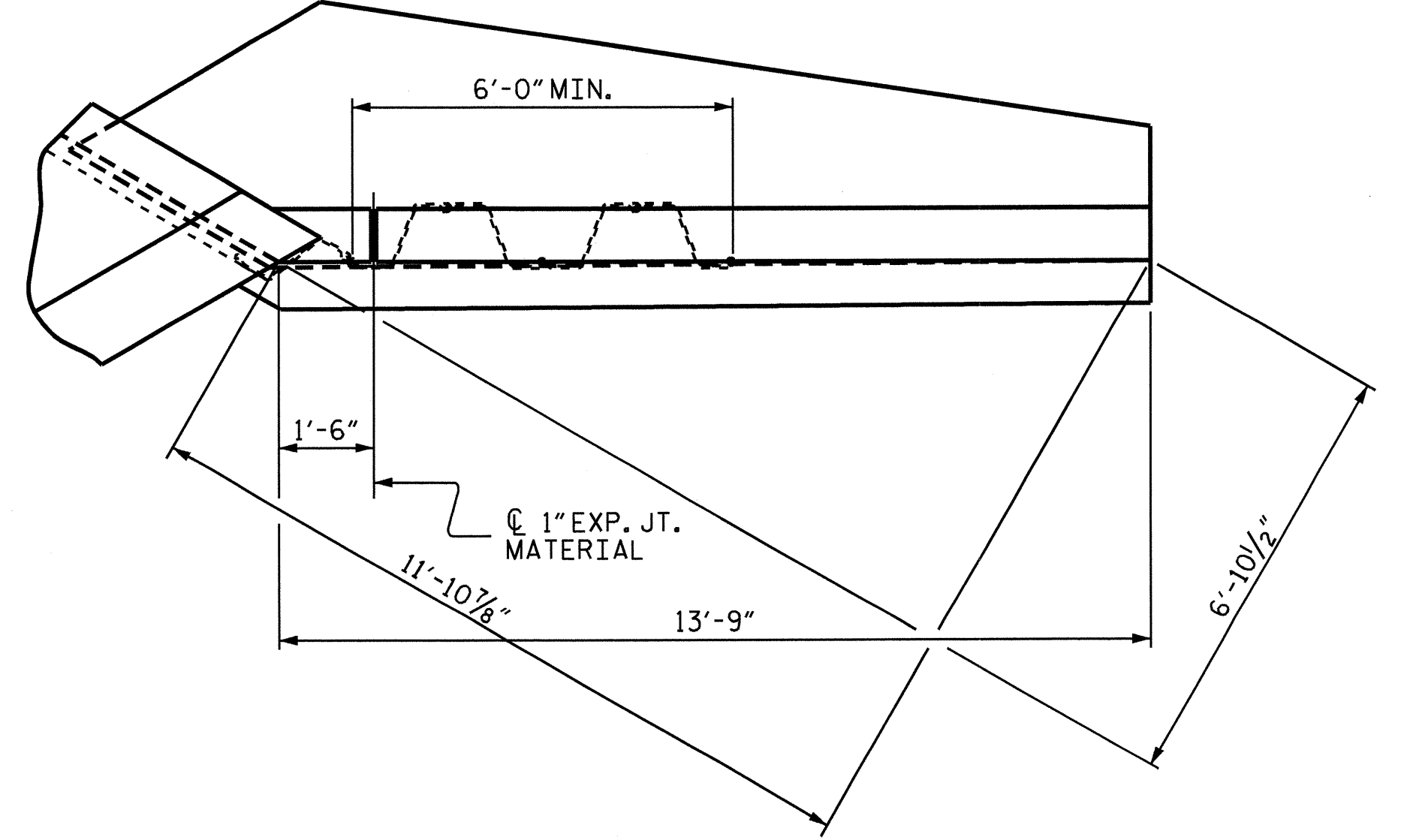




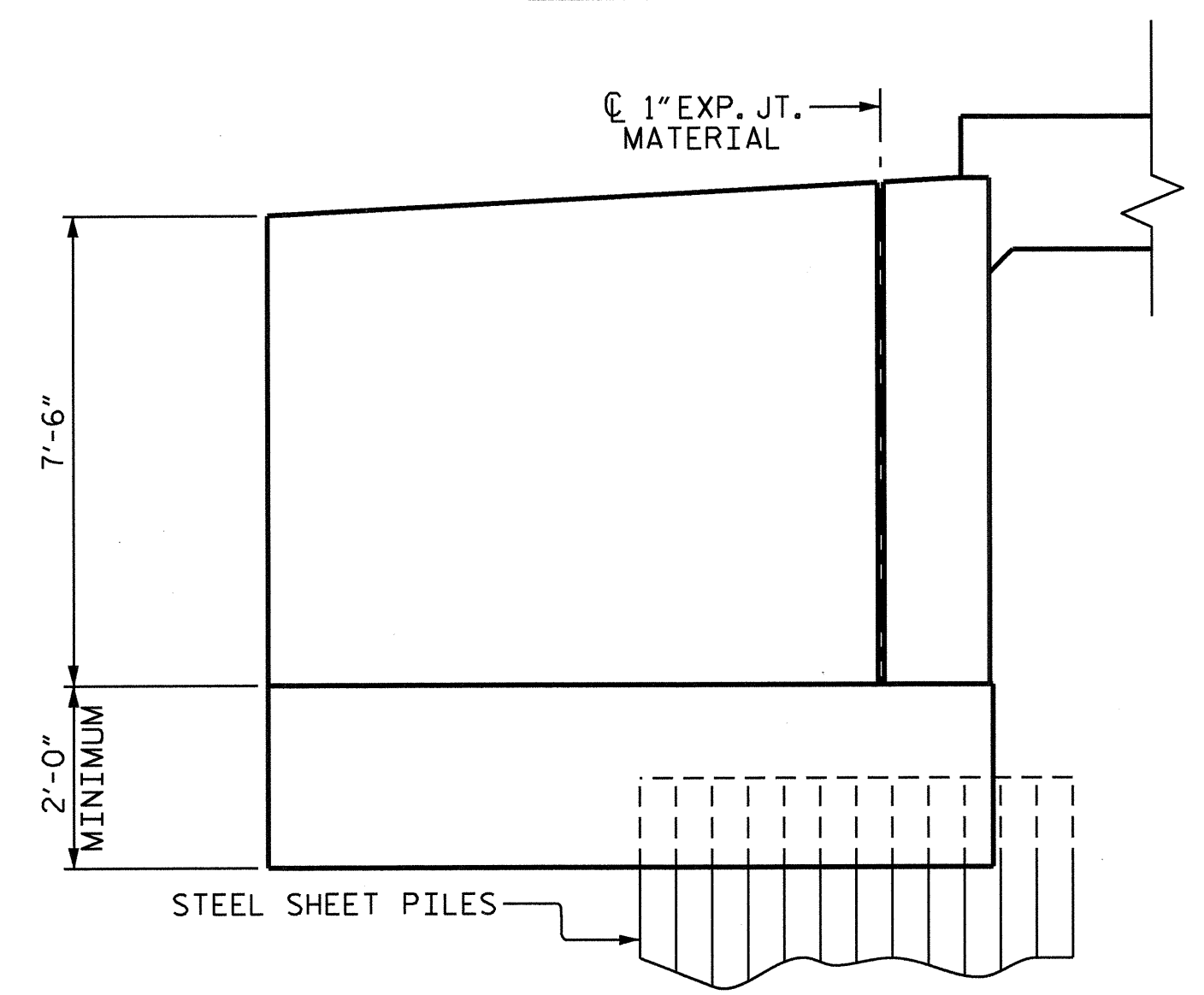
PLAN W3



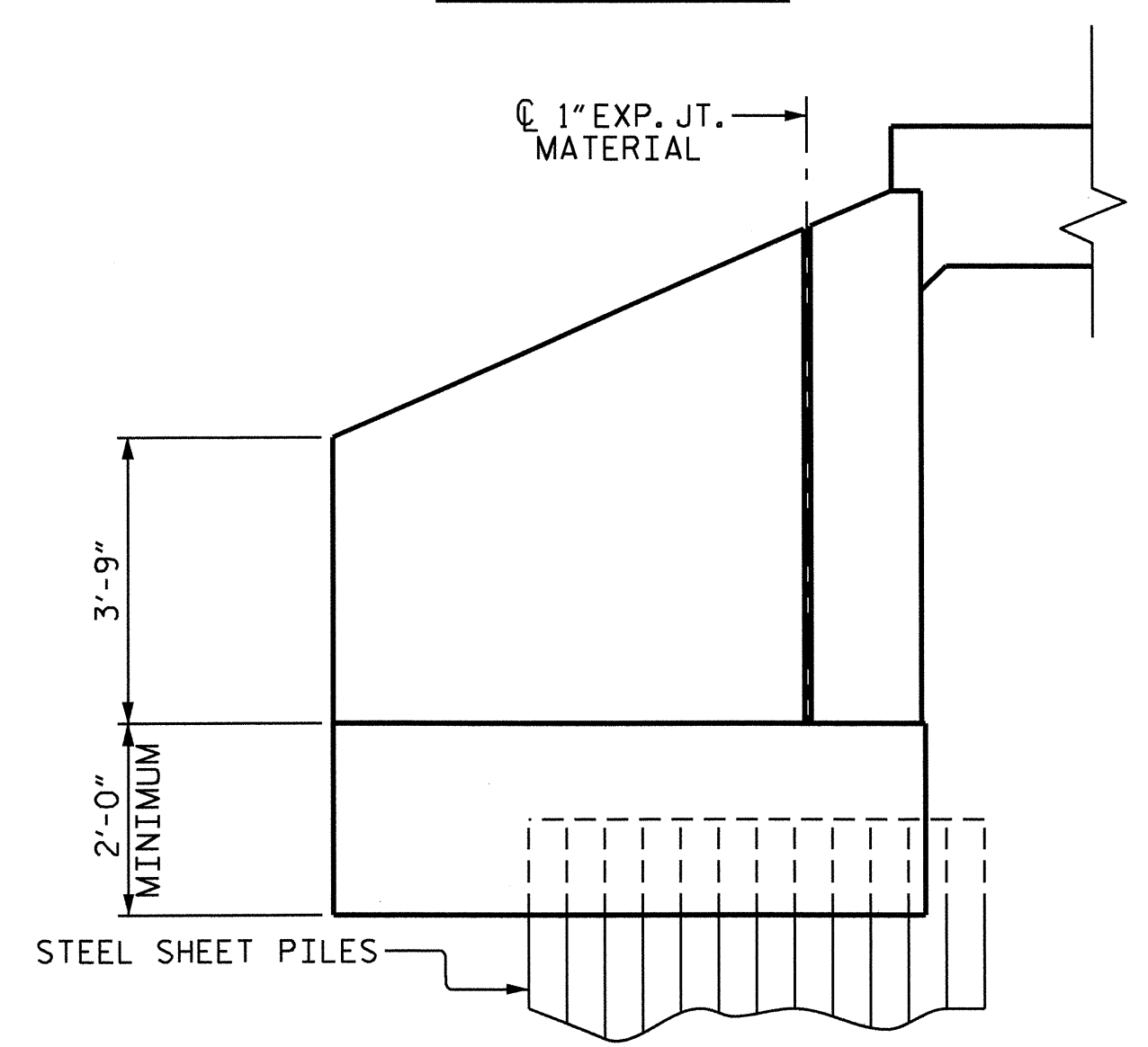
PLAN W2



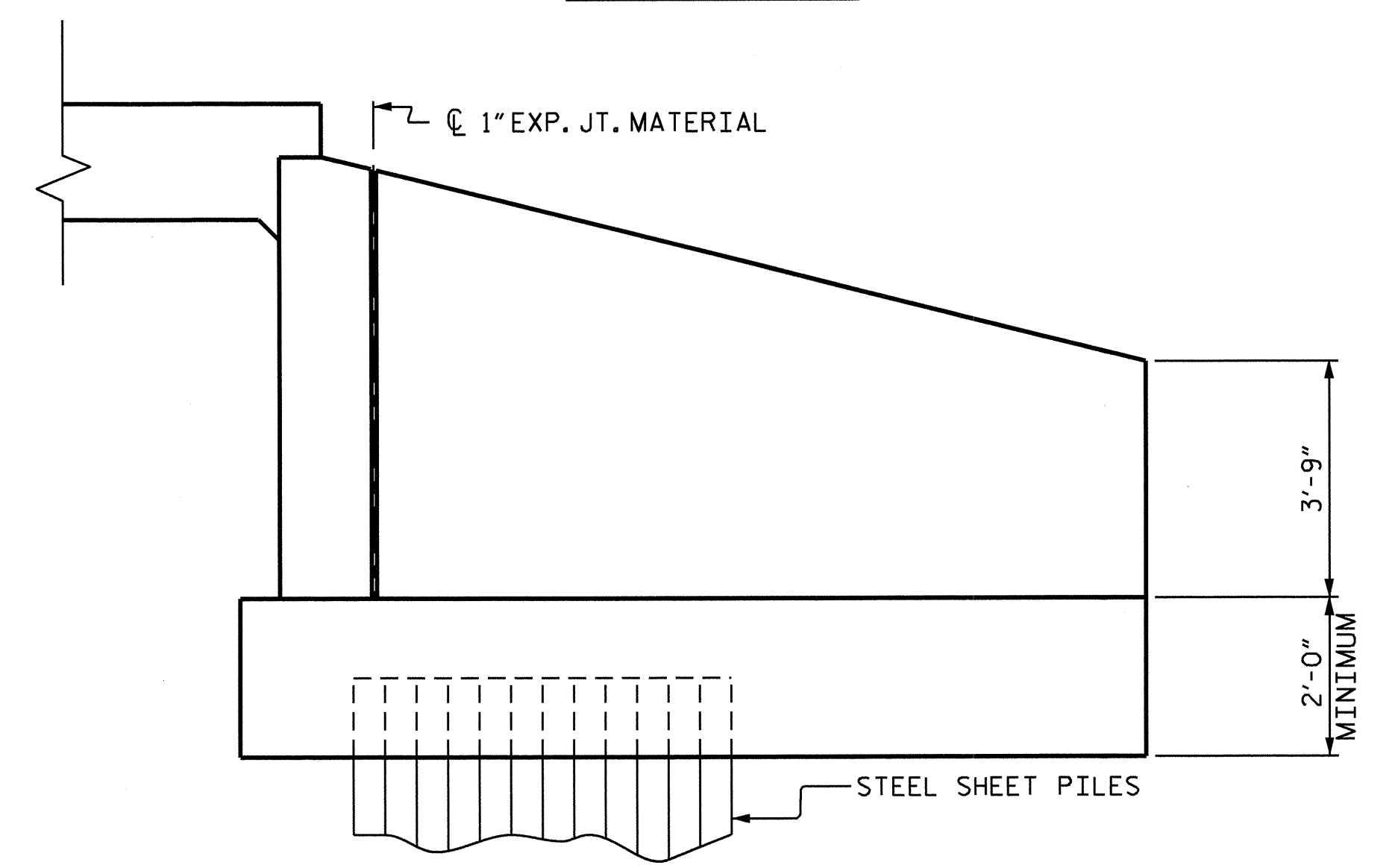
PLAN W1



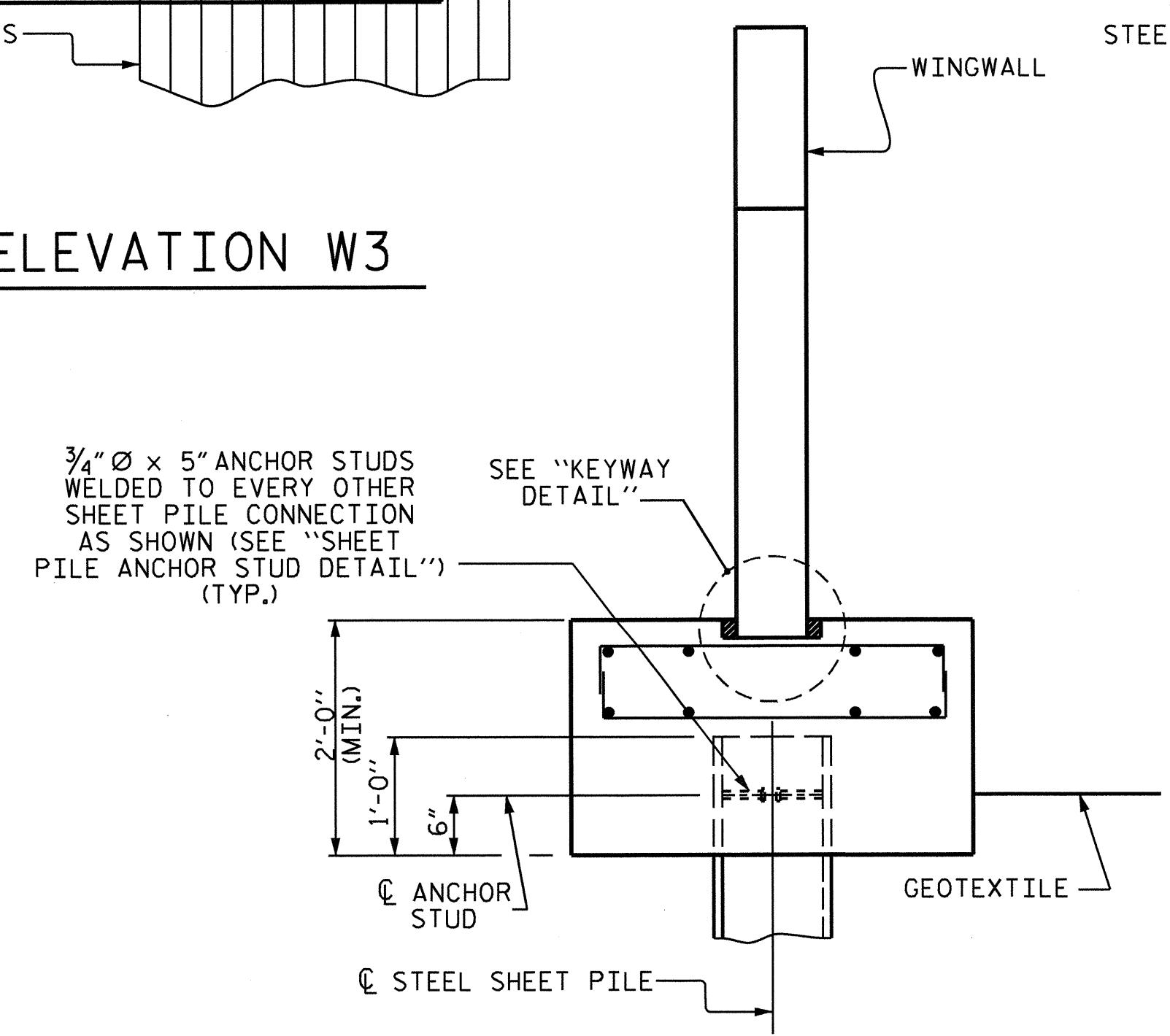
ELEVATION W3



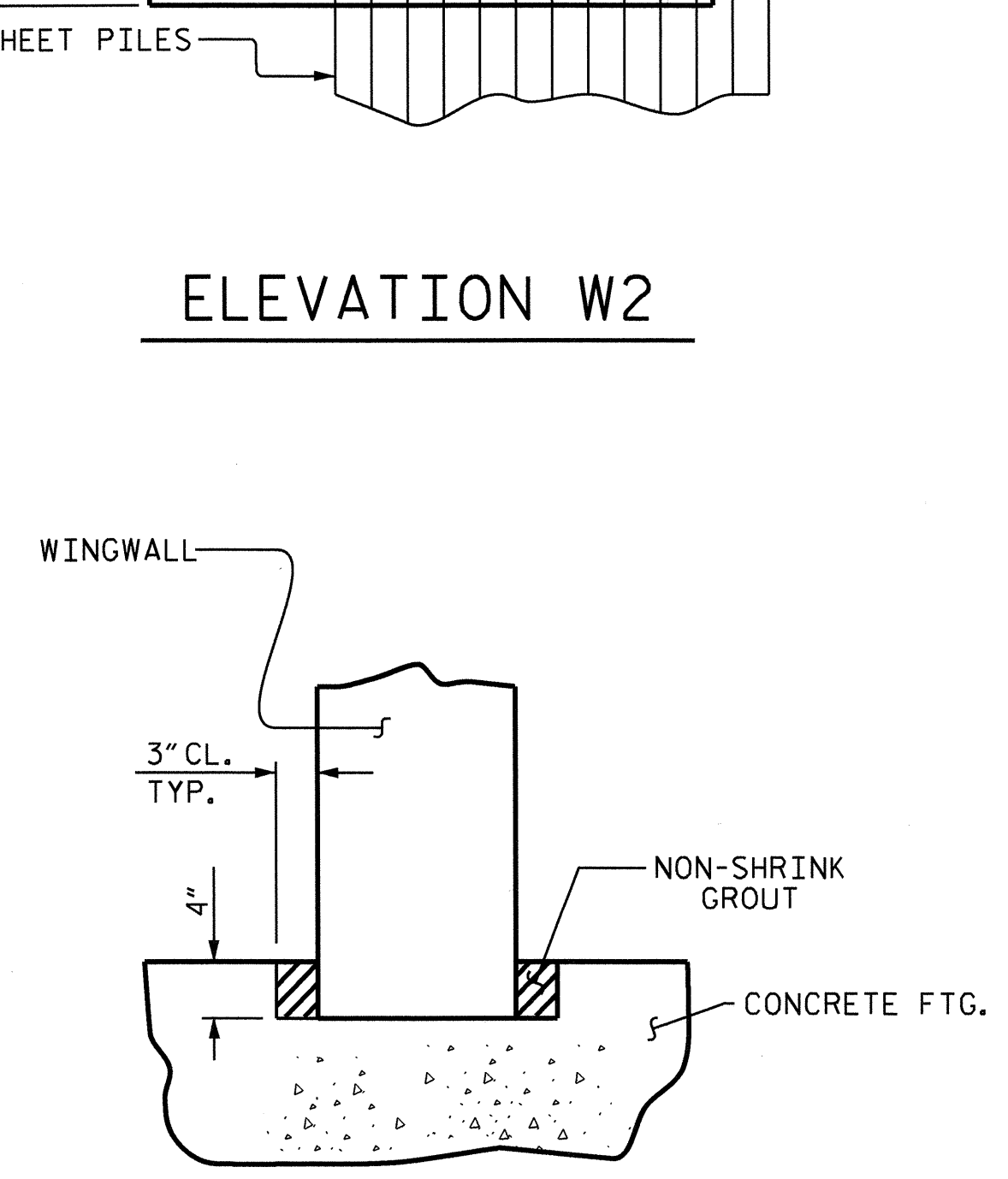
ELEVATION W2



ELEVATION W1



WINGWALL DETAIL  
SECTION B-B



KEYWAY DETAIL

NOTES

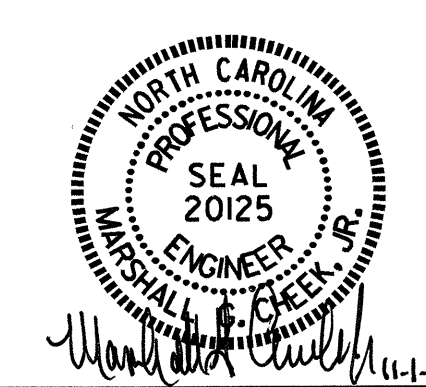
- THE CONTRACTOR SHALL SUBMIT THE FOOTING DESIGN TO THE ENGINEER FOR REVIEW AND APPROVAL. PRECAST OR CAST-IN-PLACE WINGS WILL BE ALLOWED.
- FOR SHEET PILE FOUNDATION, SEE SPECIAL PROVISIONS.
- STEEL SHEET PILES SHALL BE CONTINUOUS FROM THREE-SIDED CULVERT FOOTING TO WING FOOTINGS.
- AT THE DIRECTION OF THE ENGINEER, WING W3 TO BE TIED INTO EXISTING STREAM BED WITH MINIMAL DISTURBANCE.
- THE CONTRACTOR SHALL SUBMIT THE WING DESIGN TO THE ENGINEER FOR REVIEW AND APPROVAL. THE ENTIRE COST TO CONSTRUCT THE CULVERT WINGS, INCLUDING CONCRETE AND REINFORCING STEEL, SHALL BE INCLUDED IN THE LUMP SUM PRICE BID FOR "PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT".

PROJECT NO. B-4122  
GRAHAM COUNTY  
 STATION: 12+88.00 -L-

SHEET 12 OF 12

STATE OF NORTH CAROLINA  
 DEPARTMENT OF TRANSPORTATION  
 RALEIGH

WINGS FOR  
 PRECAST CONCRETE THREE  
 SIDED CULVERT



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

## 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