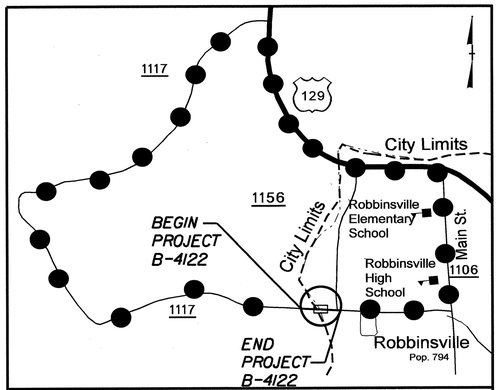
TIP PROJECT: B-4122

CONTRACT: C203277

CULVERT



DETOUR

VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

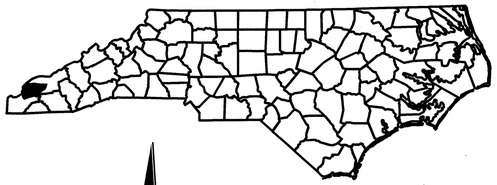
GRAHAM COUNTY

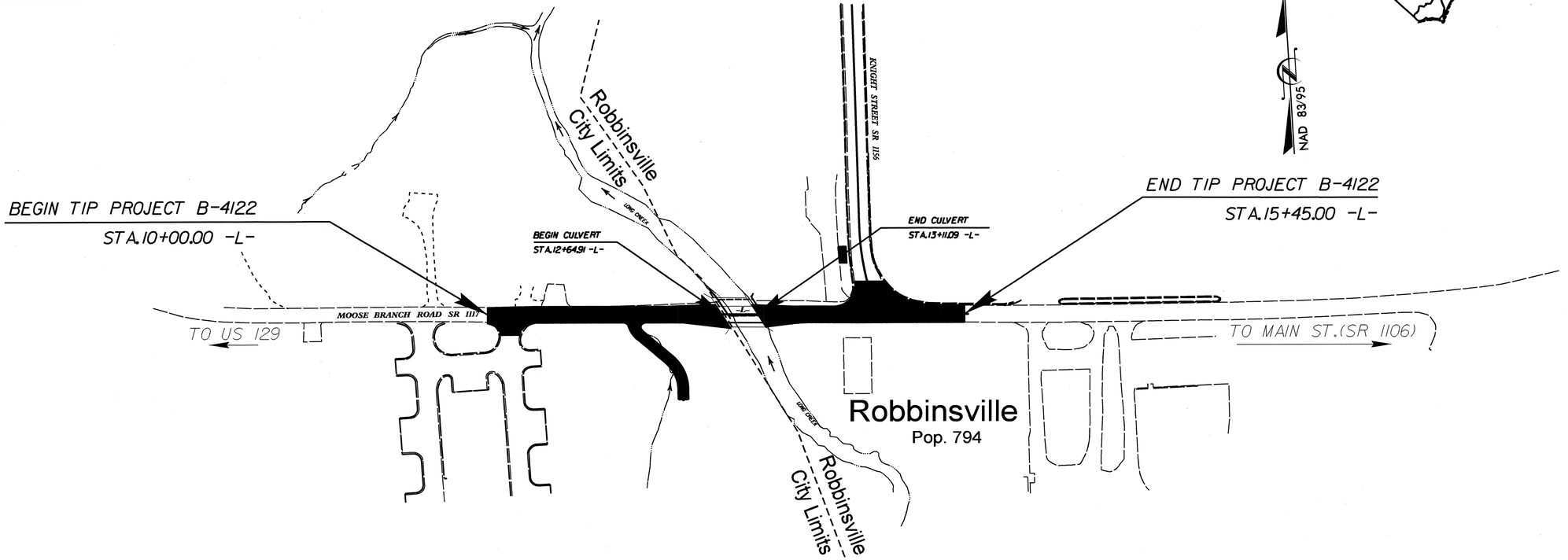
LOCATION: BRIDGE No. 81 OVER LONG CREEK ON SR 1117

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





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 :

FEBRUARY 19 2013

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

P.E.
STATE DESIGN ENGINEER

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED
DIVISION ADMINISTRATOR *DATE*

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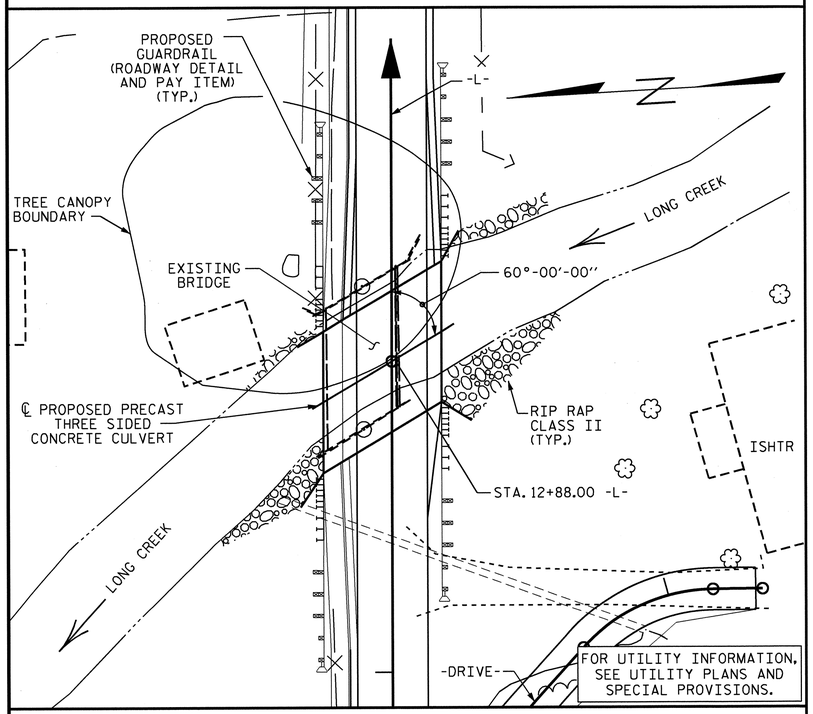
dahodge

F.A. PROJECT NO. : BRZ-1117 (8)

BENCHMARK: POINT -BL2-, 12' RT. OF -L- STA. 10+76.00, EL. 1984.93



LOCATION SKETCH

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.

HYDRAULIC DATA

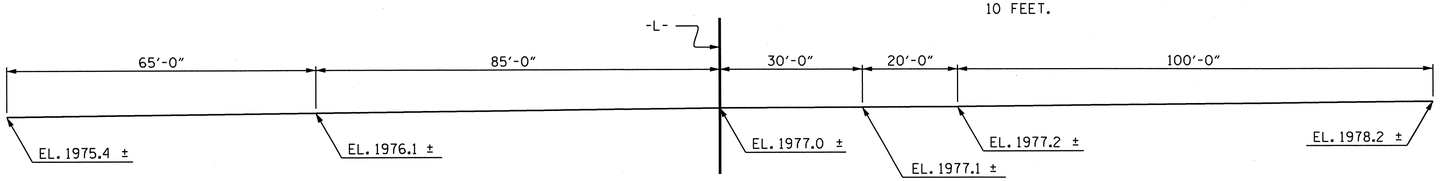
DESIGN DISCHARGE	= 2300 CFS
FREQUENCY OF DESIGN FLOOD	= 25 YRS.
DESIGN HIGH WATER ELEVATION	= 1983.30
DRAINAGE AREA	= 11.4 SQ. MI.
BASE DISCHARGE (Q100)	= 3470 CFS
BASE HIGH WATER ELEVATION	= 1986.44

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



PROFILE ALONG ℄ CULVERT

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 APPLICABE 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 FORM 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.

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

NORTH CAROLINA PROFESSIONAL SEAL 13014 ENGINEER QUANG H. NGUYEN

Quang H. Nguyen 11-1-12

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL G. CHEEK, JR.

11-1-12

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT

60° SKEW

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

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

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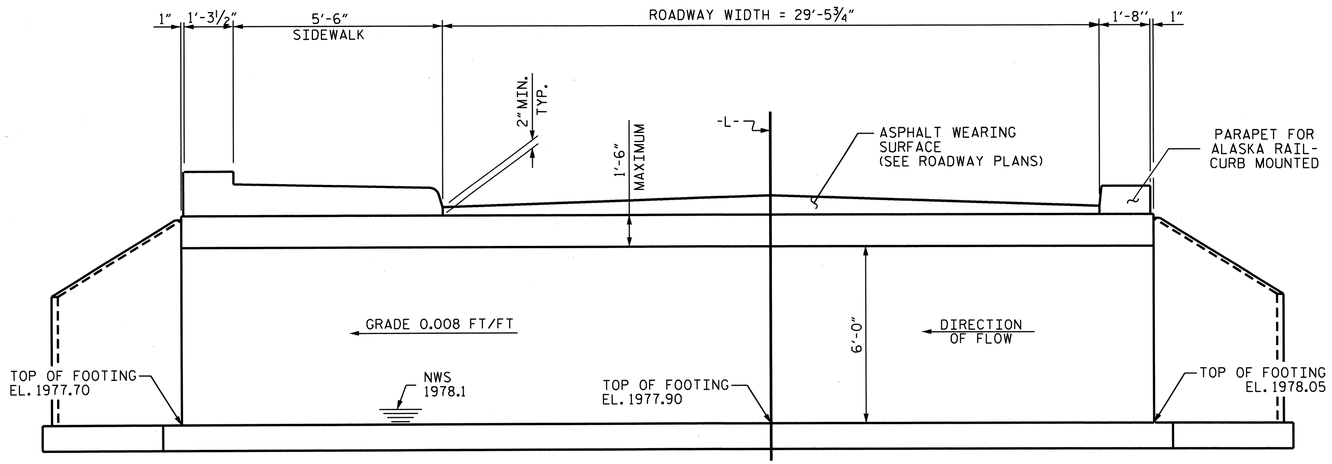
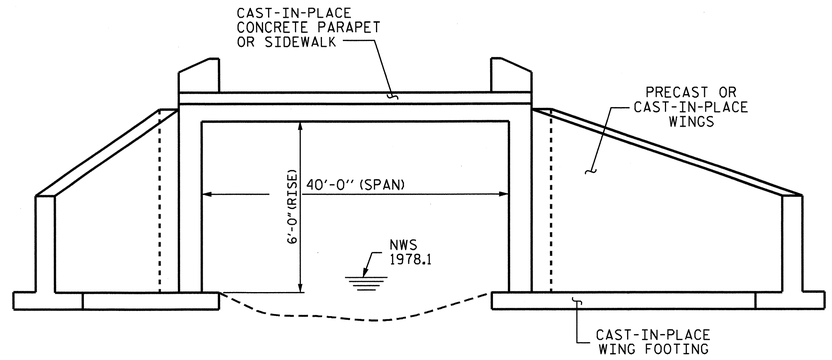


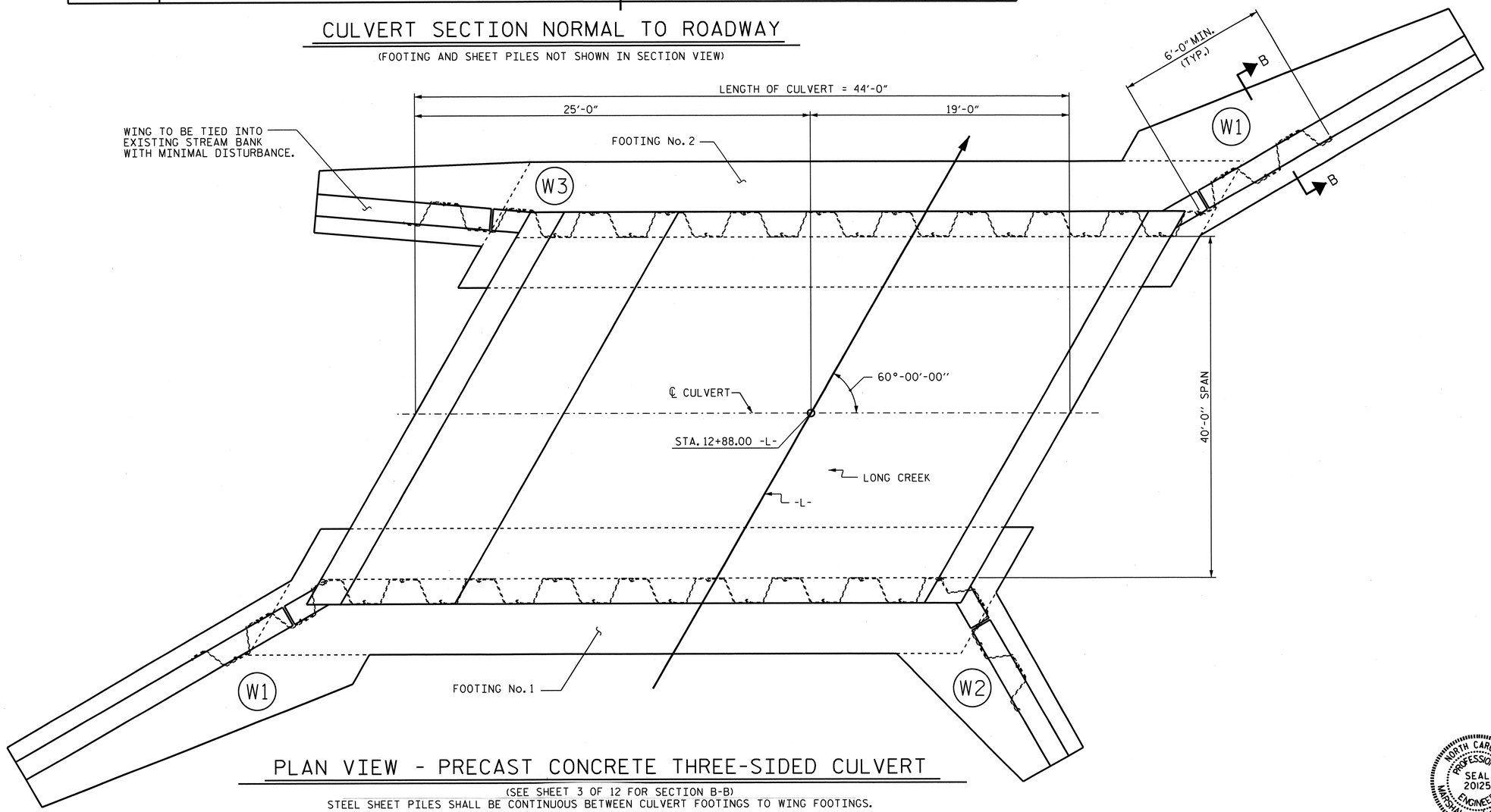
CULVERT SECTION NORMAL TO ROADWAY

(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.

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

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL GUICHEEK, JR.
11-1-12

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

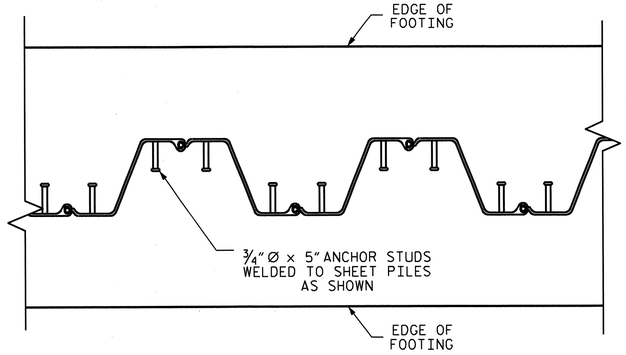
SHEET 2 OF 12

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

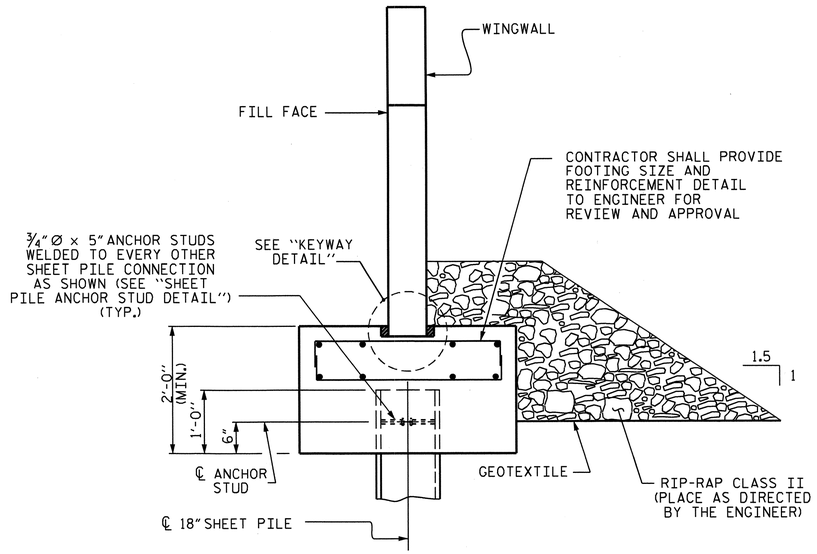
PRECAST REINFORCED CONCRETE THREE-SIDED CULVERT

60° SKEW

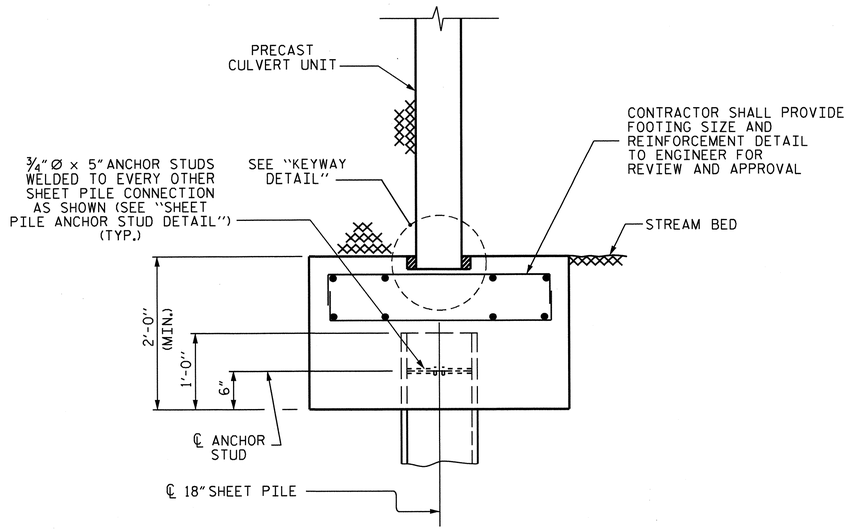
REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-2
1			3			TOTAL SHEETS
2			4			12



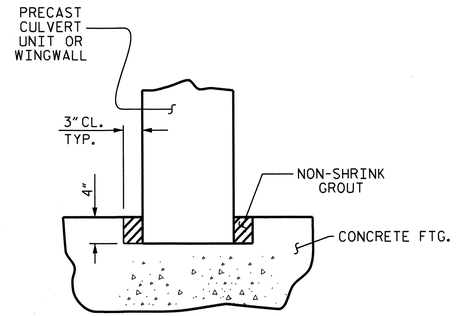
SHEET PILE ANCHOR STUD DETAIL



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

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL G. CHEEK, JR.
11-1-12

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

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

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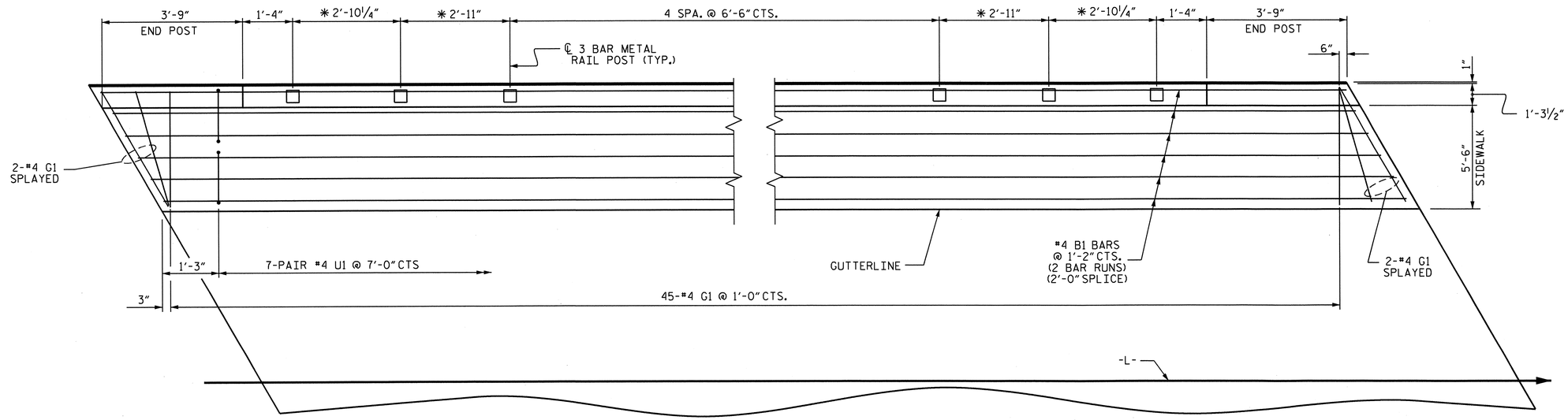
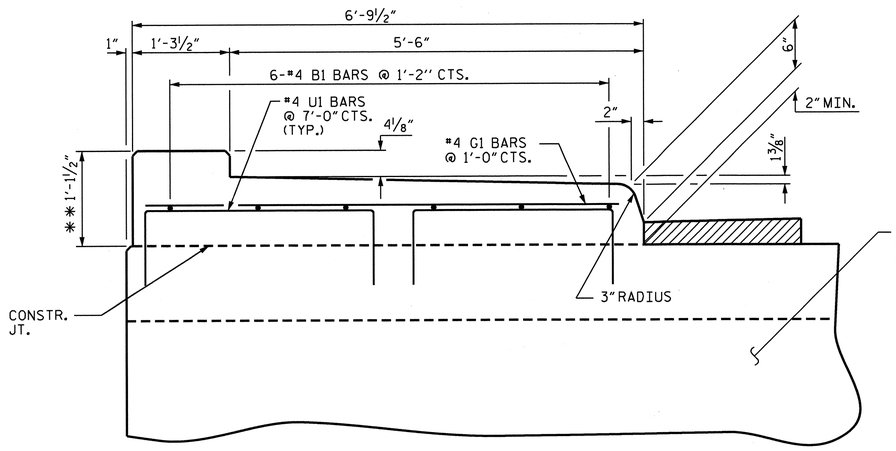


RAIL POST SPACING AND REINFORCING PLACEMENT FOR SIDEWALK (LEFT SIDE)

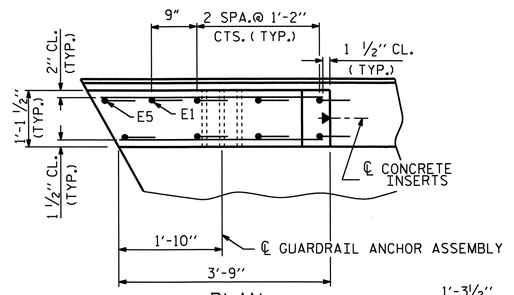
✱ SPACING MAY BE ADJUSTED BASED ON OVERALL WIDTH OF PRECAST THREE-SIDED CULVERT, NOT TO EXCEED 3'-3"



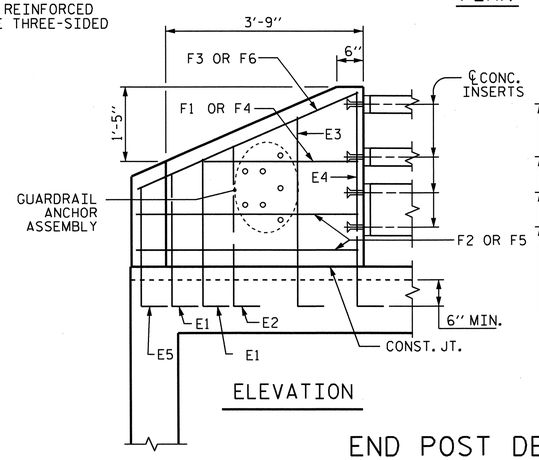
SECTION THROUGH SIDEWALK

(LEFT SIDE)

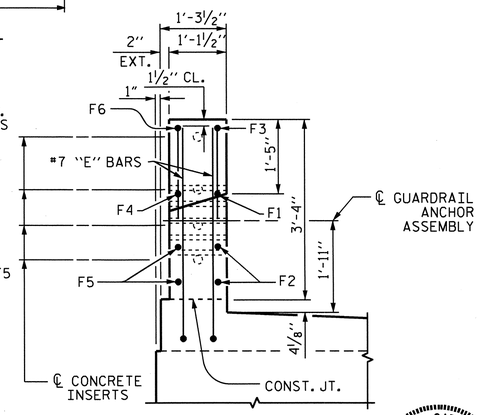
✱✱ NOTE: DIMENSIONS ARE BASED ON AN ASSUMED 2" MINIMUM OVERLAY THICKNESS AT THE GUTTERLINE. SHOULD THE OVERLAY THICKNESS VARY, THESE DIMENSIONS SHALL BE ADJUSTED.



PLAN



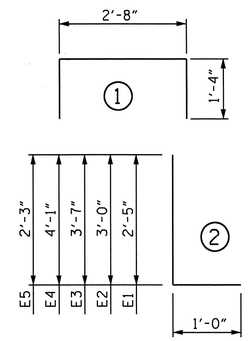
ELEVATION



END VIEW

END POST DETAILS

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT

BILL OF MATERIAL

BAR	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.	BY:	DATE:	C-4
1			3			TOTAL SHEETS
2			4			12

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL G. CHEEK, JR. 11-1-12

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

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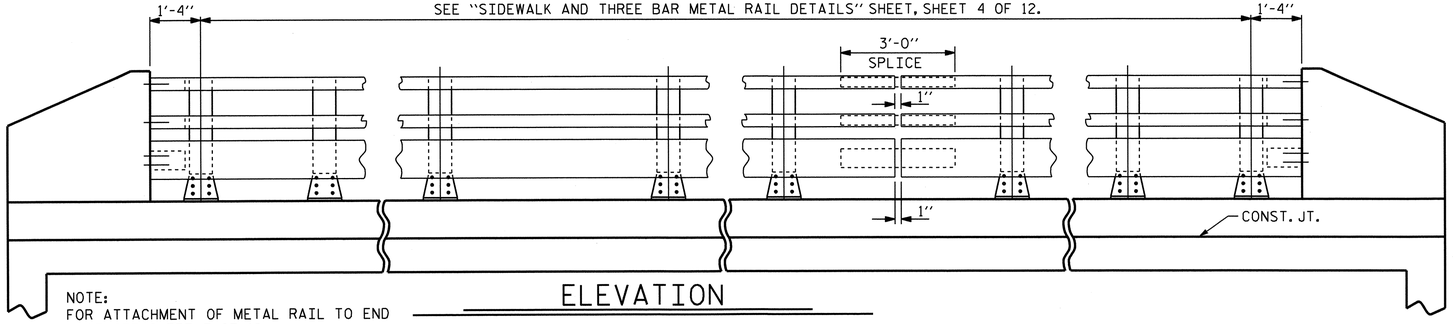
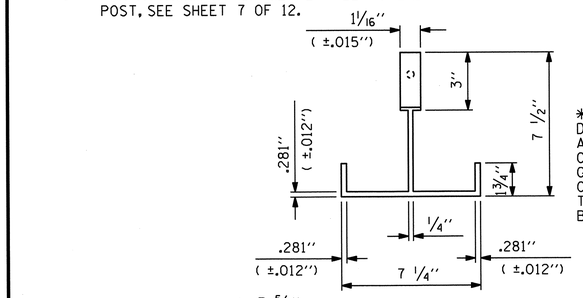


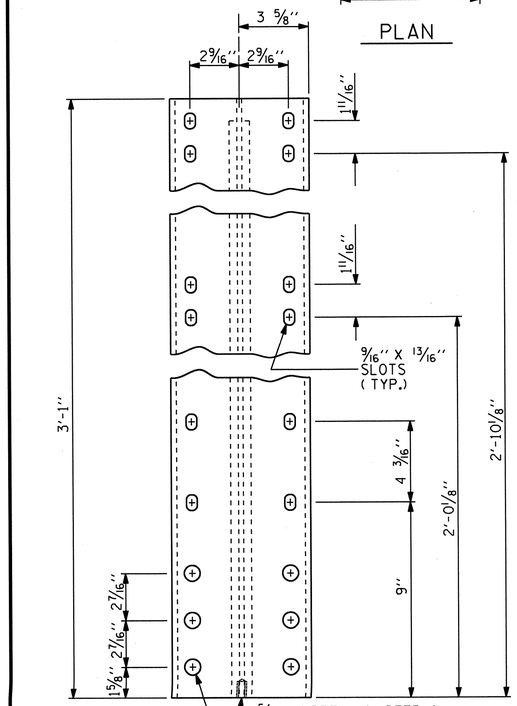
ELEVATION

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

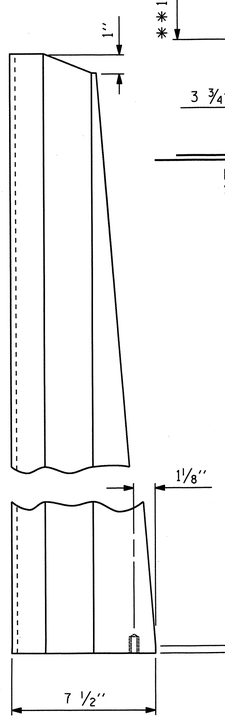


** NOTE:
DIMENSIONS ARE BASED ON AN ASSUMED 2" MINIMUM OVERLAY THICKNESS AT THE GUTTERLINE. SHOULD THE OVERLAY THICKNESS VARY, THESE DIMENSIONS SHALL BE ADJUSTED.

PLAN

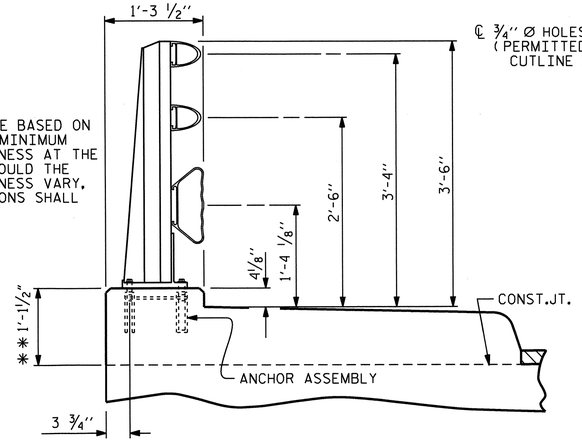


FRONT ELEVATION



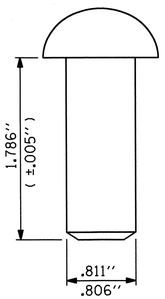
SIDE ELEVATION

DETAILS OF POST

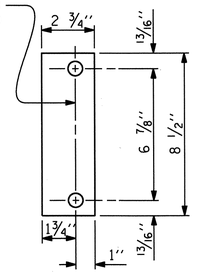


SECTION THRU RAIL

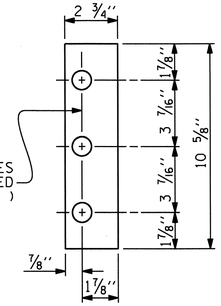
FOR ANCHOR ASSEMBLY, SEE "3 BAR METAL RAIL" SHEET 6 OF 12



RIVET DETAIL



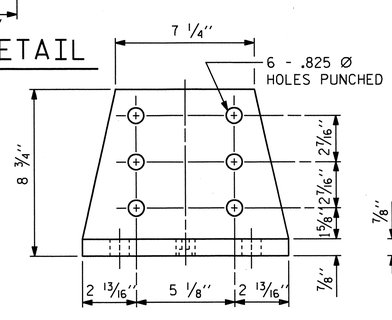
REAR PLATE



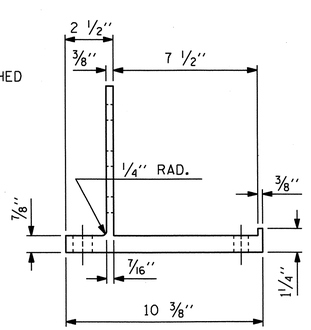
FRONT PLATE

SHIM DETAILS

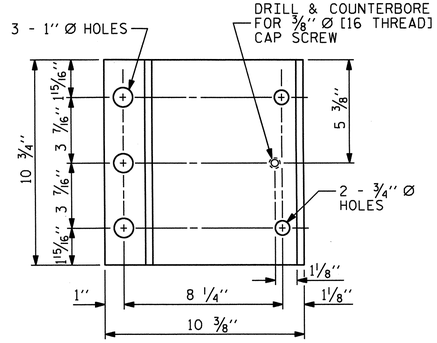
NOTE :
SHIMS MAY BE CUT ALONG PERMITTED CUTLINE OR SLOTTED TO EDGE OF PLATE TO FACILITATE PLACEMENT.



FRONT ELEVATION



SIDE ELEVATION



PLAN

POST BASE DETAILS

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.

PAY LENGTH = 40.20 LIN.FT.

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL G. CHEEK, JR.
11-1-12

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:	C-5
1			3			TOTAL SHEETS
2			4			12

STD. NO. BMR5

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

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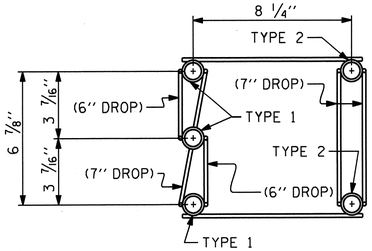
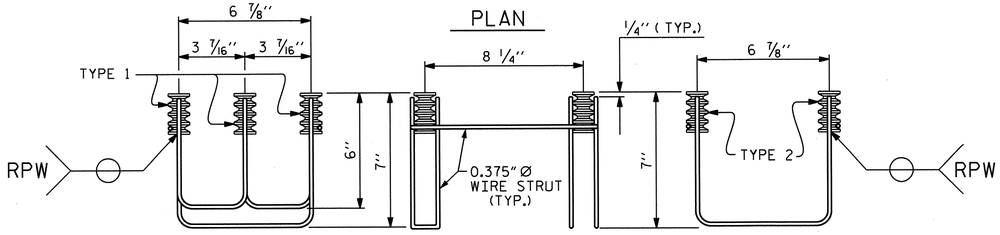
dahodge



TYPE 1 FERRULE — THREADED STEEL FERRULES WITH CLOSED BOTTOM TO FIT 3/4'' Ø BOLT WITH ROUND WASHER.

TYPE 2 FERRULE — THREADED STEEL FERRULES WITH CLOSED BOTTOM TO FIT 5/8'' Ø BOLT WITH ROUND WASHER.

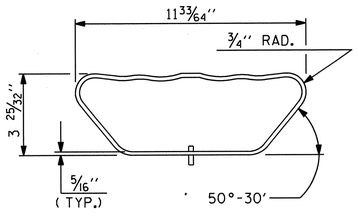
PLAN



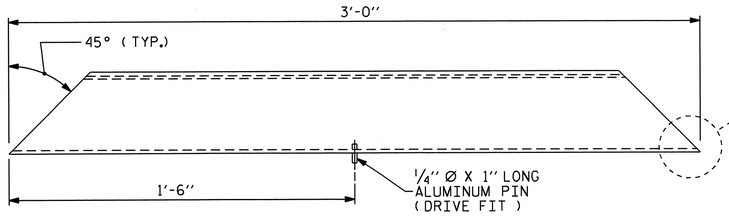
LEFT SIDE VIEW ELEVATION RIGHT SIDE VIEW

5-BOLT METAL RAIL ANCHOR ASSEMBLY

(9 ASSEMBLIES REQUIRED)

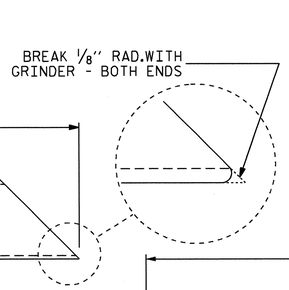


END VIEW



PLAN VIEW

BOTTOM RAIL EXPANSION BAR



NOTES

STRUCTURAL CONCRETE ANCHOR ASSEMBLY

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

A. FERRULES SHALL BE MADE FROM STEEL MEETING THE REQUIREMENTS OF AASHTO M169, GRADE 12L14 AND SHALL HAVE A MINIMUM LENGTH OF THREADS OF 2'' FOR 3/4'' FERRULES AND 1 3/4'' FOR 5/8'' FERRULES.

B. 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.

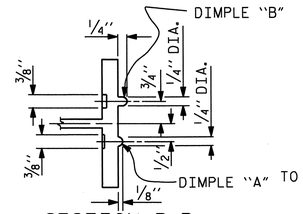
C. 2 - 5/8'' Ø X 2 1/4'' BOLTS WITH WASHERS. BOLTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A307. BOLTS AND WASHERS SHALL BE GALVANIZED. AT THE CONTRACTOR'S OPTION, STAINLESS STEEL BOLTS AND WASHERS MAY BE USED AS AN ALTERNATE FOR THE 5/8'' Ø X 2 1/4'' GALVANIZED BOLTS AND WASHERS. THEY SHALL CONFORM TO OR EXCEED THE MECHANICAL REQUIREMENTS OF ASTM A307. THE USE OF THIS ALTERNATE SHALL BE APPROVED BY THE ENGINEER.

D. 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.

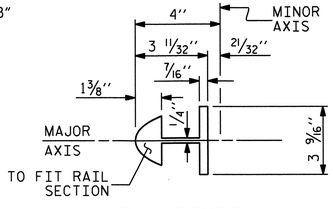
E. THE METAL RAIL ANCHOR ASSEMBLIES TO BE HOT DIPPED GALVANIZED TO CONFORM TO REQUIREMENTS OF AASHTO M111.

F. 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.

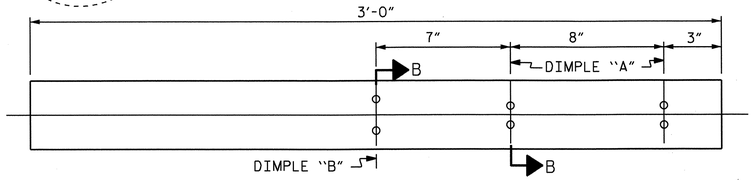
G. BOLTS TO BE TIGHTENED ONE-HALF TURN WITH A WRENCH FROM A FINGER-TIGHT POSITION.



SECTION B-B

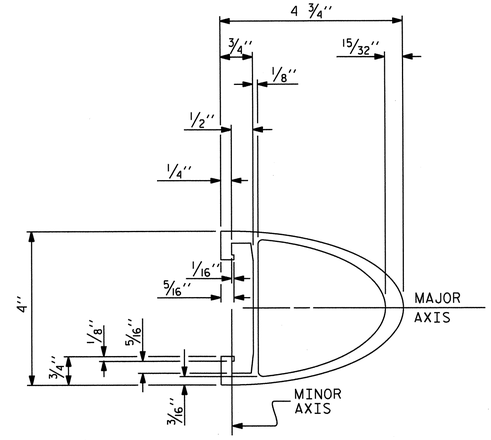


BAR SECTION

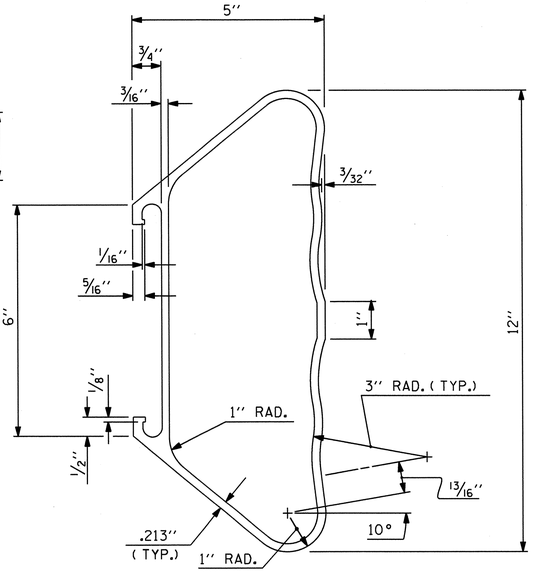


BACK ELEVATION

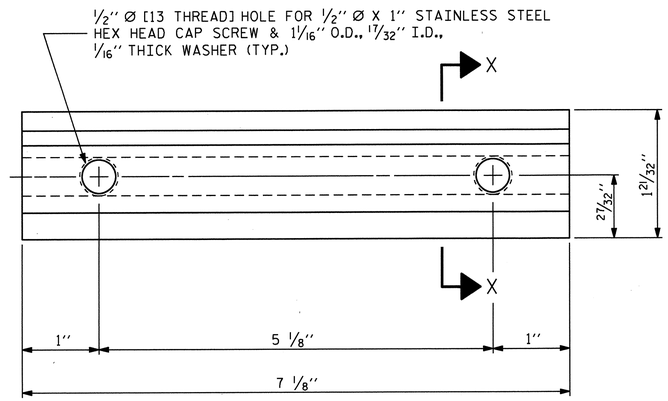
TOP & MIDDLE RAIL EXPANSION BAR



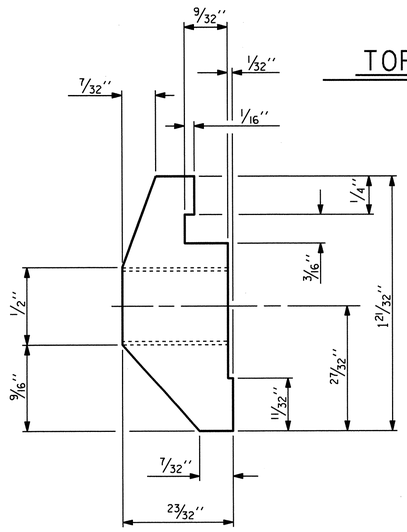
TOP & MIDDLE RAIL SECTION



BOTTOM RAIL SECTION



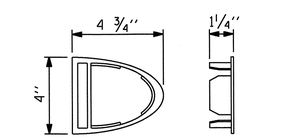
ELEVATION



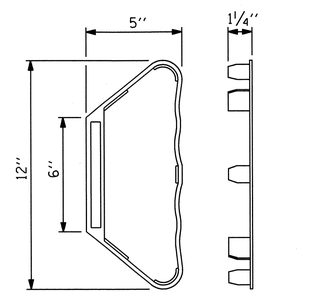
SECTION X-X

CLAMP BAR DETAIL

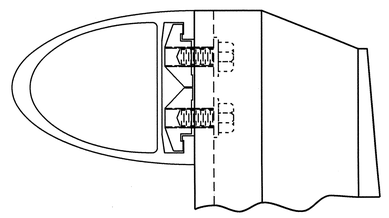
(6 REQUIRED PER POST)



TOP & MIDDLE RAIL CAP



BOTTOM RAIL CAP



CLAMP ASSEMBLY

TOP RAIL SHOWN
(MIDDLE & BOTTOM RAIL ARE SIMILAR)

PROJECT NO. B-4122

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						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-6
1			3			TOTAL SHEETS
2			4			12

STD. NO. BMR6

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	

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL A. CHEEK, JR. 11-1-12

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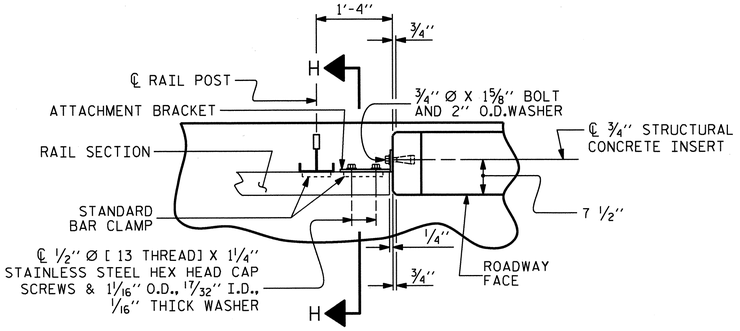
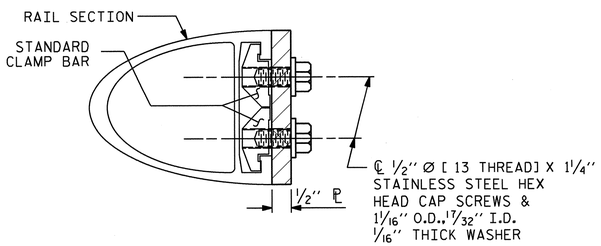


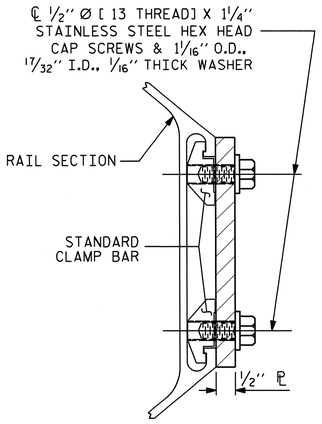
PLAN OF RAIL AND END POST

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



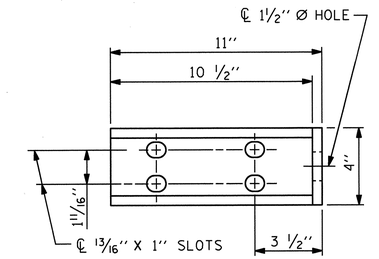
SECTION H-H

(FOR TOP & MIDDLE RAIL)

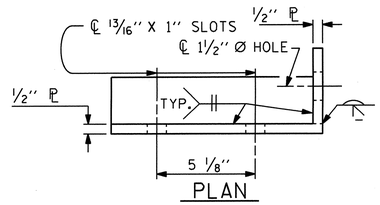


SECTION H-H

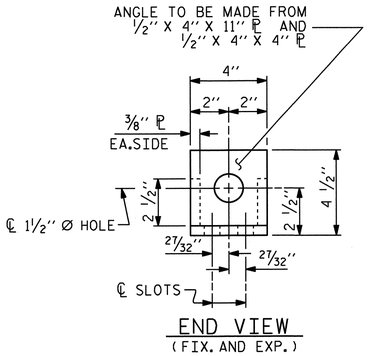
(FOR BOTTOM RAIL)



ELEVATION



PLAN

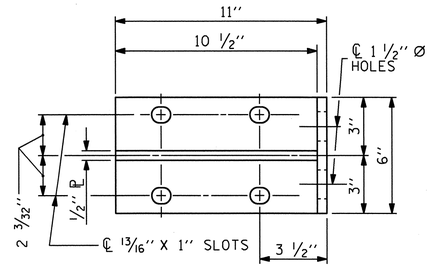


END VIEW

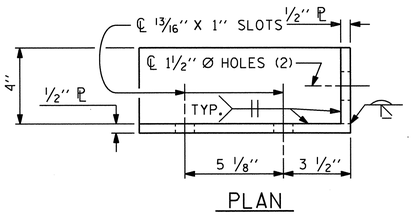
(FIX. AND EXP.)

DETAILS FOR ATTACHMENT BRACKET

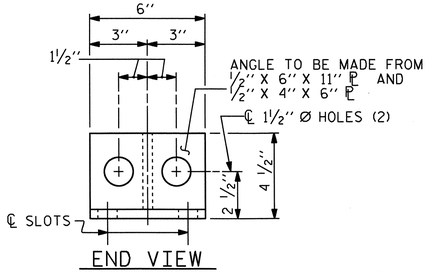
(TOP & MIDDLE RAIL ONLY)



ELEVATION



PLAN



END VIEW

DETAILS FOR ATTACHMENT BRACKET

(BOTTOM RAIL ONLY)

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

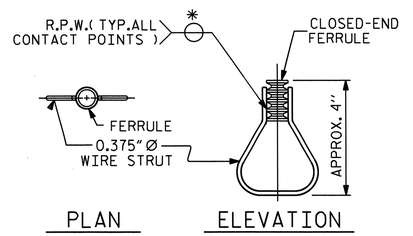
STRUCTURAL CONCRETE INSERT

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 7/16" Ø WIRE STRUT WITH A MINIMUM TENSILE STRENGTH OF 90,000 PSI IS ACCEPTABLE.



PLAN ELEVATION

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.	BY:	DATE:	C-7
1			3			TOTAL SHEETS
2			4			12

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL GAYCHEEK JR.
11-1-12

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 : GGH 1/88	REV. 5/1/06	TLA/GM	
	REV. 10/1/11	MAA/GM	

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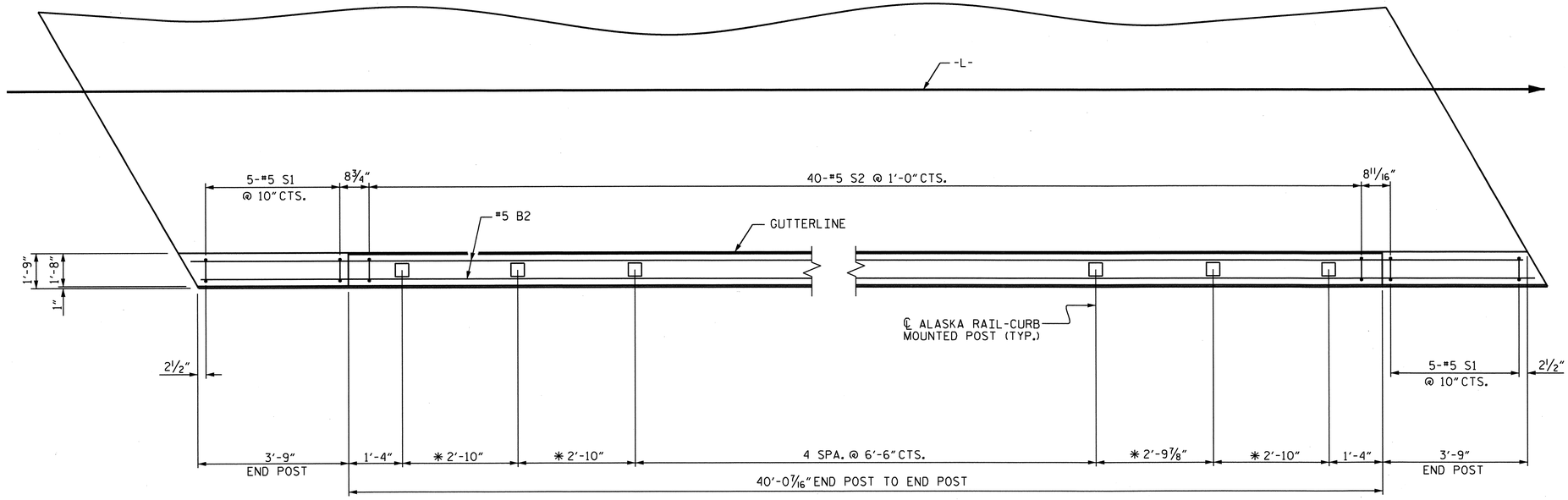
dahodge

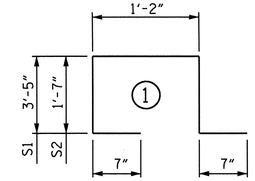
STD. NO. BMR7



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

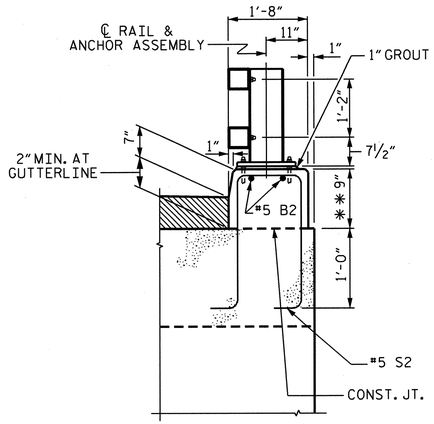


ALL BAR DIMENSIONS ARE OUT TO OUT

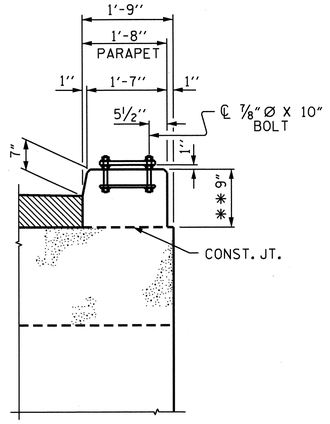
BILL OF MATERIAL

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.

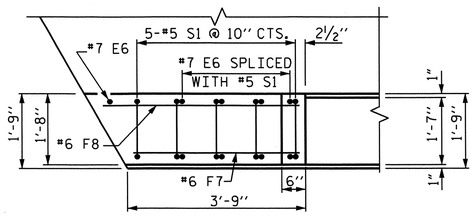


SECTION THROUGH RAIL
(RIGHT SIDE)

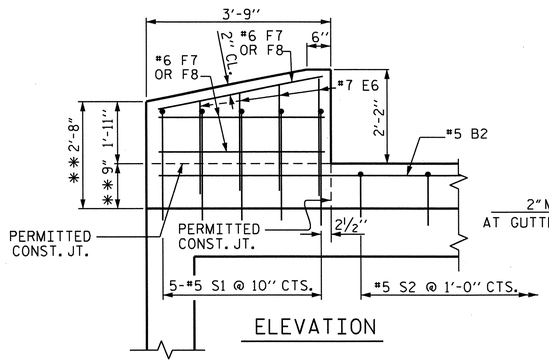


ANCHOR DETAILS

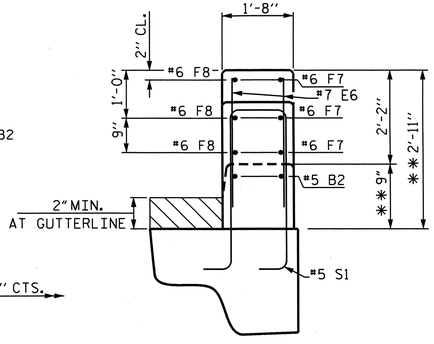
#5 B2 BARS MAY BE SHIFTED AS NECESSARY TO CLEAR ANCHOR ASSEMBLY



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:	C-8
1			3			TOTAL SHEETS
2			4			12

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL G. CHEEK, JR.
11-1-12

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

01-NOV-2012 11:49
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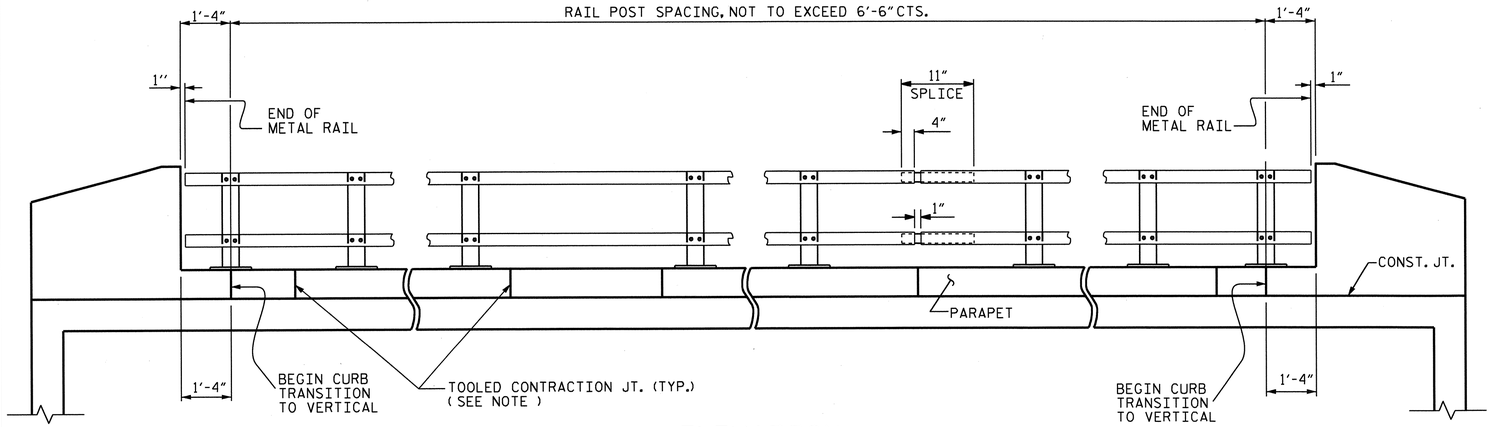
dahodge



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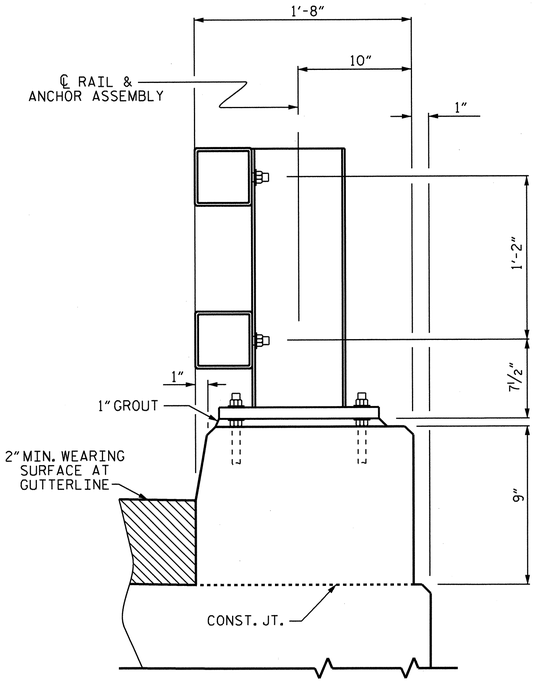
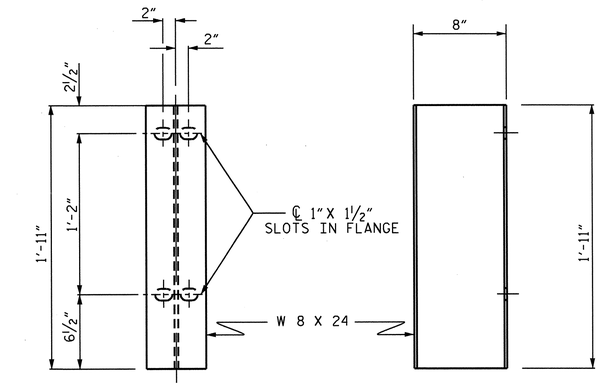
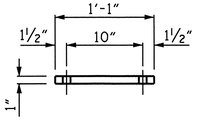


SECTION THRU RAIL

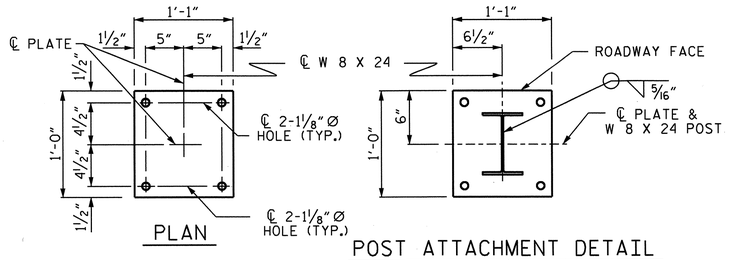


FRONT ELEVATION SIDE ELEVATION

DETAILS OF POST



FRONT ELEVATION



PLAN POST ATTACHMENT DETAIL

POST BASE DETAILS

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, ½" 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.

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:	C-9
1			3			TOTAL SHEETS
2			4			12

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL G. CHEEK, JR.
11-1-12

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

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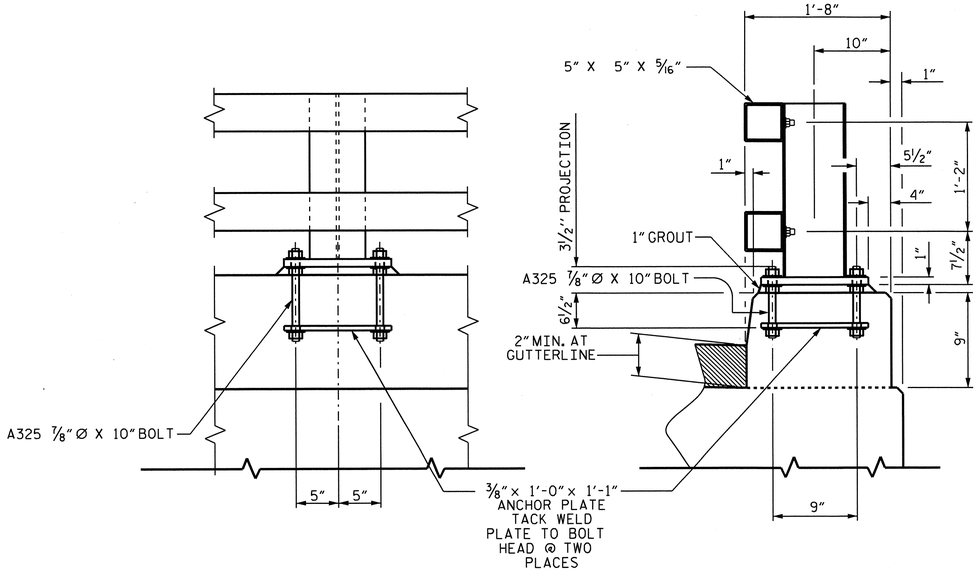
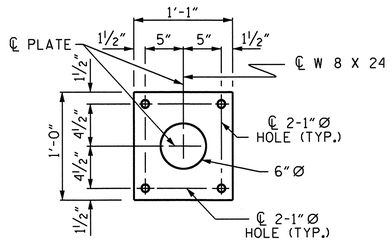
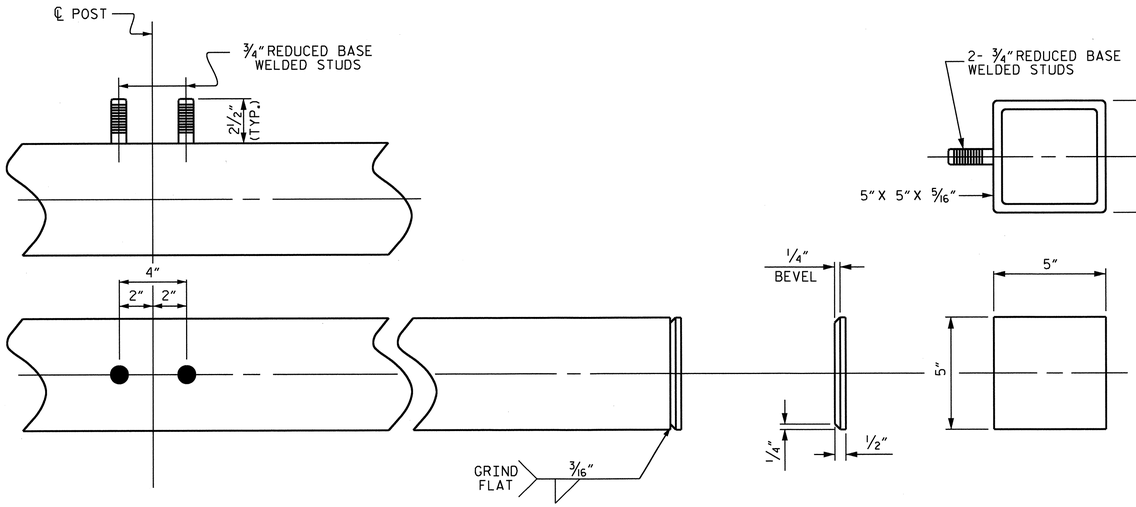


RAIL POST ATTACHMENT DETAILS

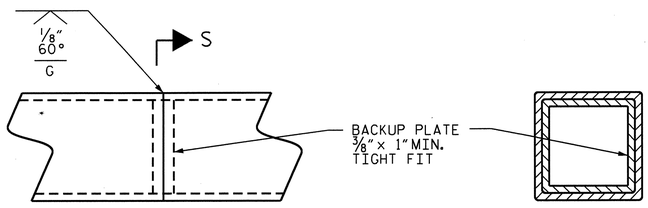
(9 ATTACHMENT ASSEMBLIES REQUIRED)



ANCHOR PLATE DETAILS

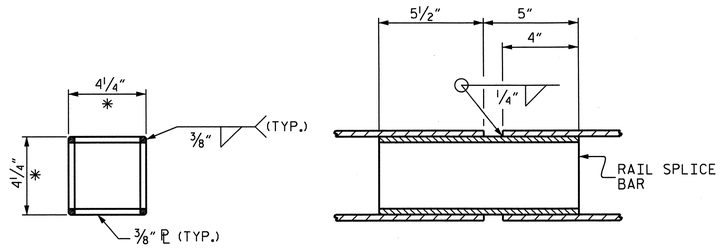


RAIL CAP AND ATTACHMENT STUD DETAILS



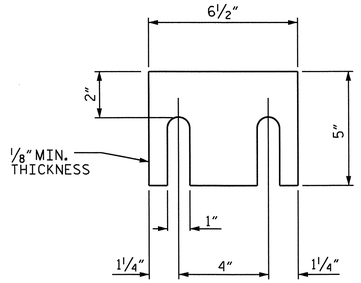
SECTION S-S

RAIL WELDED SPLICE DETAILS



RAIL SPLICE DETAILS

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



RAILING SHIM DETAIL

PROJECT NO. B-4122

GRAHAM COUNTY

STATION: 12+88.00 -L-

SHEET 10 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:	C-10
1			3			TOTAL SHEETS
2			4			12

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER M.G. CHEEK
11-1-12

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

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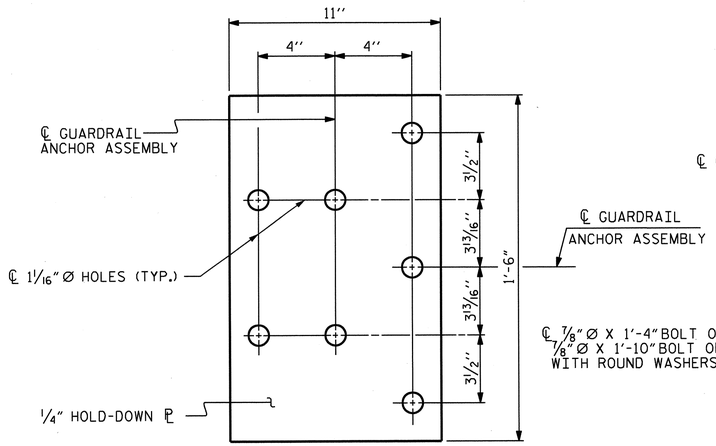
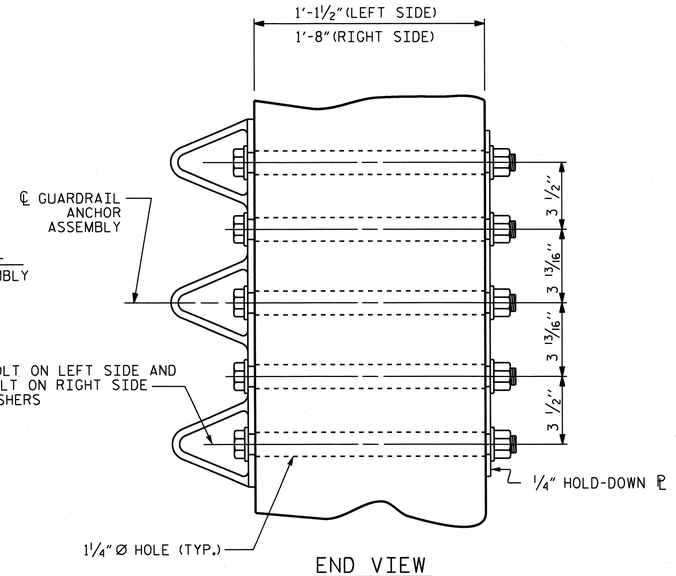


PLAN



END VIEW

GUARDRAIL ANCHOR ASSEMBLY DETAILS

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.

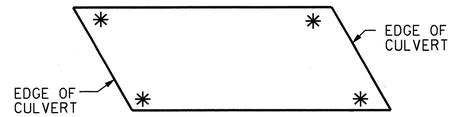
THE GUARDRAIL ANCHOR ASSEMBLY IS REQUIRED AT ALL POINTS WHERE APPROACH GUARDRAIL IS TO BE ATTACHED TO THE END POST. FOR POINTS OF ATTACHMENT, SEE SKETCH.

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.

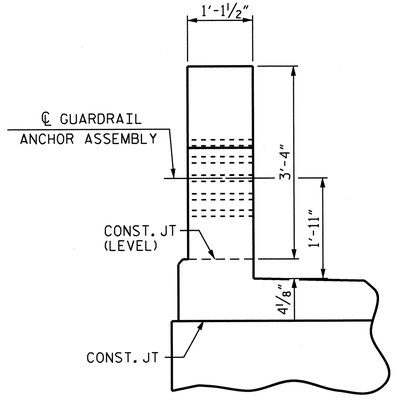
THE VERTICAL REINFORCING BARS MAY BE SHIFTED SLIGHTLY IN THE END POST TO CLEAR ASSEMBLY BOLTS.

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.



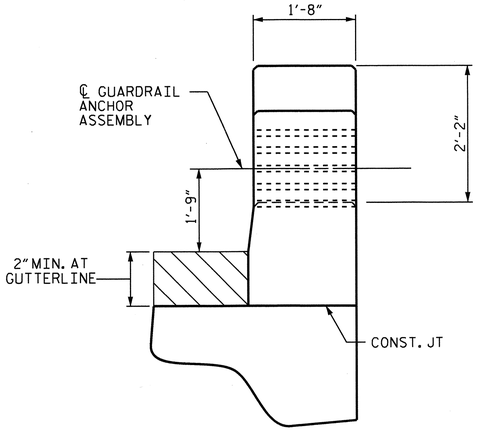
SKETCH SHOWING POINTS OF ATTACHMENT

* LOCATION OF GUARDRAIL ATTACHMENT



END VIEW

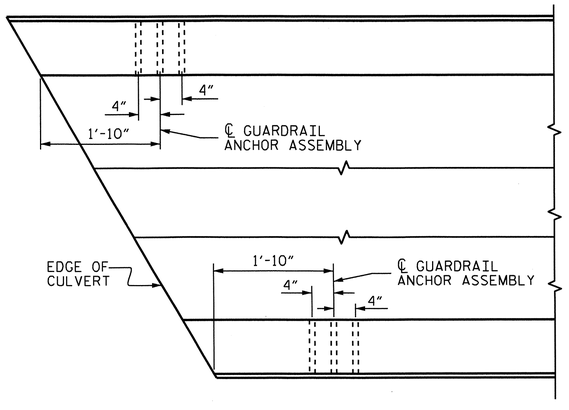
(THREE BAR METAL RAIL, LEFT SIDE)



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

REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	C-11
1			3			TOTAL SHEETS
2			4			12

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 MAA/GM
	REV. 12/5/11 MAA/GM

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL G. CHEEK JR.
11-1-12

01-NOV-2012 11:49
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dahodge

STD. NO. GRA3

12-SEP-2012 11:32
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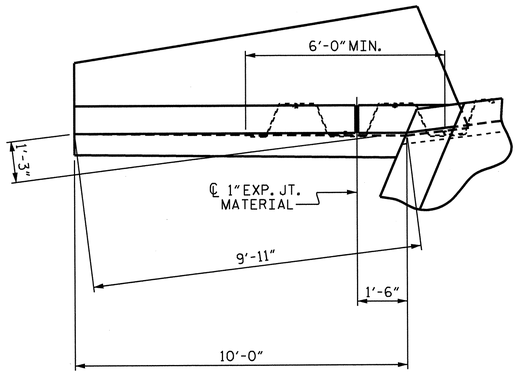
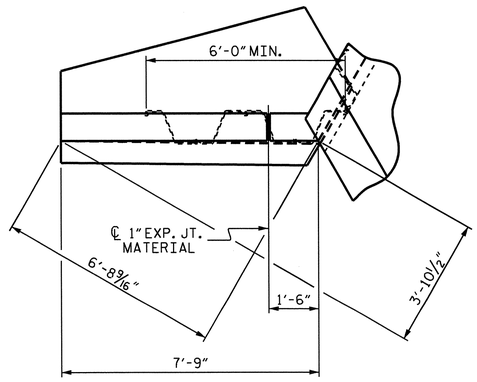
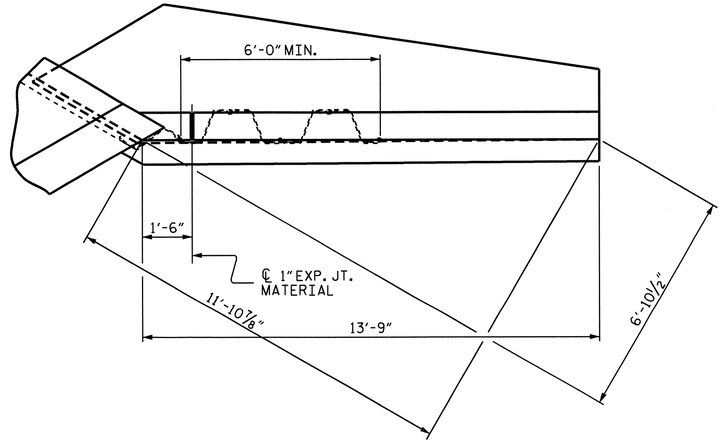


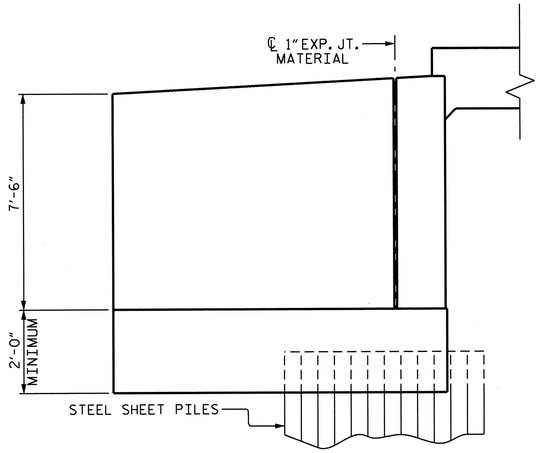
PLAN W3



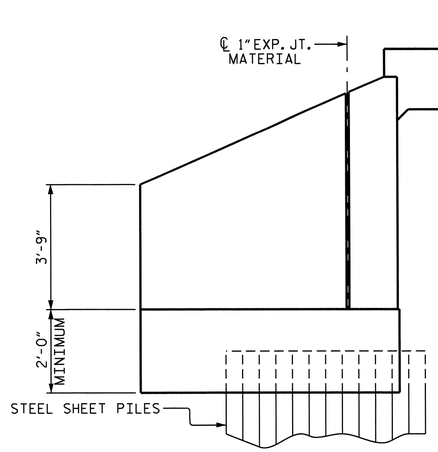
PLAN W2



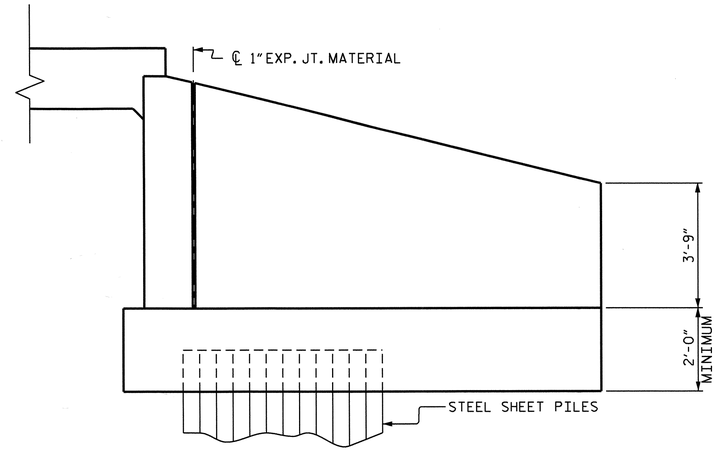
PLAN W1



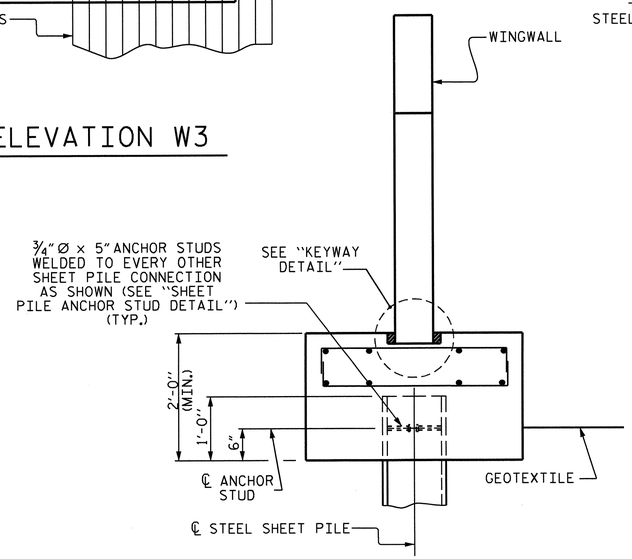
ELEVATION W3



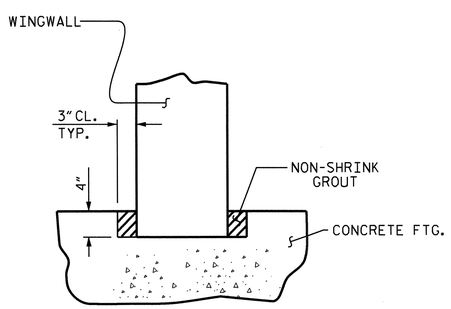
ELEVATION W2



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 SHEETS
2			4			12

NORTH CAROLINA PROFESSIONAL SEAL 20125 ENGINEER MARSHALL G. CHEEK, JR.
11-1-12

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

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

SPECIAL NOTES:

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

ENGLISH

JANUARY, 1990

STD. NO. SN

REV. 6-16-95 EEM ω RGW REV. 5-7-03 RWW ω JTE REV. 10-1-11 MAA ω GM
REV. 8-16-99 RWW ω LES REV. 5-1-06 TLA ω GM