

STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION  
**JEF-152-(5.04)**  
**BRIDGE N° JEF-152-0504**  
**SMITHFIELD TOWNSHIP**  
**JEFFERSON COUNTY**

L&D

OHIO	1
FHWA REGION 5	8
FEDERAL PROJECT	

PLATE NO BR-36-86

CULVERT REPLACEMENT

**1985 SPECIFICATIONS**

The standard specifications of the State of Ohio, Department of Transportation, including changes and supplemental specifications listed in the proposal shall govern this improvement.

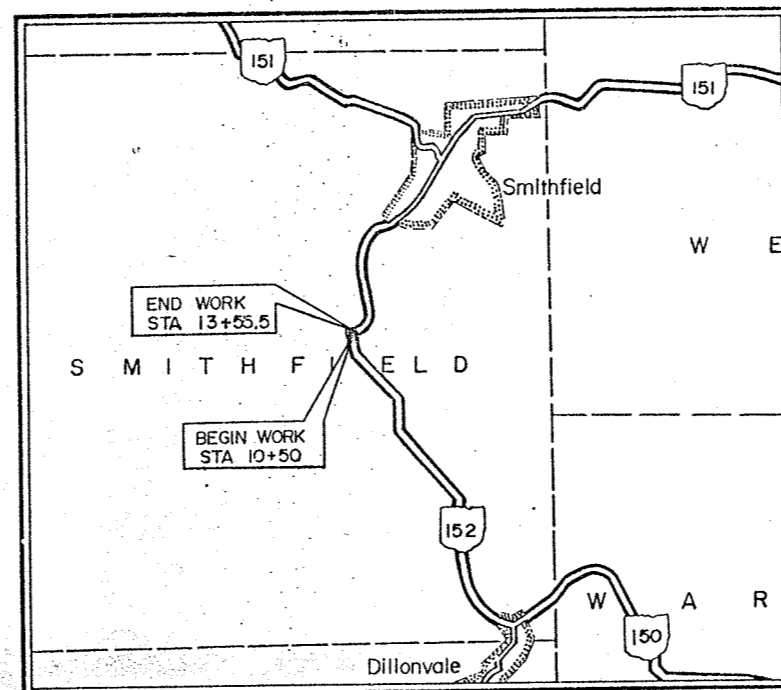
I hereby approve these plans and declare that the making of this improvement will require the closing to traffic of the highway and that detours will be provided as indicated on the plans.

**CONVENTIONAL SIGNS**

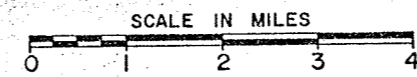
County Line	-----	Limited Access (only)	-----	LA
Township Line	-----	Right of Way (only)	-----	RW
Section Line	-----	Limited Access & Right of Way	-----	LA & RW
Corporation Line	----- or -----	Existing Right of Way	-----	
Fence Line (existing)	-x-x-	Property Line	----- (in existing fence)	-x-x-
Center Line	-----	Railroad	----- or -----	
Trees, Stumps (to be removed)	⊗	Guardrail (existing)	-----	(proposed) -----
Utility Poles: Telephone	⊕			
Power	⊕			
Light	⊕			

**INDEX OF SHEETS**

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GENERAL PLAN AND ELEVATION	-----	6
STRUCTURE FOUNDATION INVESTIGATION	-----	7-8



**LOCATION MAP**



Portion to be improved: -----  
State & Federal Routes: -----  
Other Roads: -----

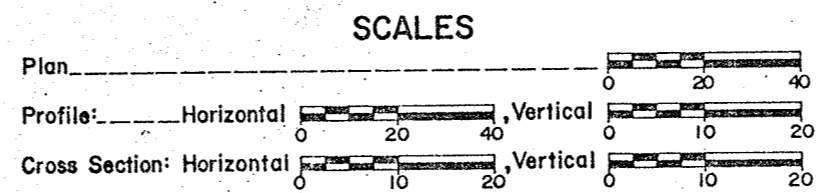
**LINE DATA**

BEGIN WORK ----- STA 10+50  
END WORK ----- STA 13+55.5  
NET LENGTH OF WORK = 305.5 IN.FT. or 0.06 MI.

**UNDERGROUND UTILITIES**

48 HOURS  
**BEFORE YOU DIG**  
Call 800-362-2764 (Toll free)  
OHIO UTILITIES PROTECTION SERVICE

NON-MEMBERS  
MUST BE CALLED DIRECTLY



SUPPLEMENTAL SPECIFICATIONS	
955	6-3-78

Approved: *[Signature]*  
Date: *[Date]* District Deputy Director of Transportation

Approved: *[Signature]*  
Date: *[Date]* Engineer, Bureau of Bridges and Structural Design

Approved: *[Signature]*  
Date: *[Date]* Deputy Director, Operations

Approved: *[Signature]*  
Date: *[Date]* Director, Department of Transportation

SUPPLEMENTAL PRINTS OF STANDARD CONSTRUCTION DRAWINGS

GR-1	1-11-85			
GR-2B	2-5-82			
GR-4	2-5-82			
HW-4A	4-1-80			
DBR-2-73	4-10-73			

Prepared By:  
OHIO DEPARTMENT OF TRANSPORTATION  
DISTRICT 11

SEAL

DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION

APPROVED:

DIVISION ADMINISTRATOR      DATE

Project: JEF-152-(5.04)      Contract No. \_\_\_\_\_  
Date of Letting: \_\_\_\_\_ 19 \_\_\_\_

# GENERAL NOTES

FHWA REGION	STATE	PROJECT	2
5	OHIO		8

JEF-152-(5.04) PLAN NO BR-36-86

## WORK REQUIRED

1. REMOVE EXISTING STRUCTURE, AS PER PLAN
2. INSTALL 12'x4' CONCRETE BOX SECTIONS, AS PER PLAN
3. BUILD HEADWALLS AND PLACE CHANNEL PROTECTION
4. BACKFILL AROUND CULVERT
5. PERFORM PAVEMENT WORK
6. PERFORM EMBANKMENT WORK
7. INSTALL GUARDRAIL
8. CLEAN-UP AND SEED

## DESIGN DATA

DESIGN LOADING - HS20-44  
CONCRETE - CLASS C - UNIT STRESS = 1333 p.s.i.

## ITEM 202 - STRUCTURES REMOVED AS PER PLAN

THE EXISTING BRIDGE SHALL BE REMOVED AS PER CMS 202.03.

## ROUNDING OF CORNERS

THE ROUNDED CORNERS SHOWN ON THE TYPICAL SECTIONS, APPLY TO ALL CROSS SECTIONS EVEN THOUGH OTHERWISE SHOWN ON THESE PLANS.

## FIELD OFFICE

THE CONTRACTOR SHALL PROVIDE A SUITABLE FIELD OFFICE HAVING A MINIMUM OF 500 SQ. FT. OF FLOOR SPACE. PAYMENT SHALL BE AT THE LUMP SUM PRICE BID FOR ITEM 619, FIELD OFFICE.

## SEEDING

QUANTITIES FOR SEEDING ARE CALCULATED FOR SOIL AREAS BETWEEN THE WORK LIMITS AS SHOWN ON THE CROSS SECTIONS.

## LOCATION OF GUARDRAIL

THE LOCATIONS OF GUARDRAIL RUNS, AS SHOWN IN THESE PLANS, ARE SUBJECT TO ADJUSTMENT PRIOR TO FINAL ACCEPTANCE. THE ENGINEER SHALL BE SATISFIED THAT ALL INSTALLATIONS WILL AFFORD MAXIMUM PROTECTION FOR TRAFFIC.

## CONDUIT END TREATMENT

IMMEDIATELY AFTER PLACEMENT OF ANY CONDUITS, THE CONTRACTOR SHALL CONSTRUCT THE END TREATMENTS REQUIRED BY THE PLANS AT BOTH THE OUTLET AND INLET ENDS. THIS SHALL INCLUDE HEADWALLS, CONCRETE RIPRAP, ROCK CHANNEL PROTECTION, SODDING, ETC.

## RIGHT-OF-WAY

ALL WORK SHALL BE PERFORMED WITHIN THE EXISTING RIGHT-OF-WAY AND AREAS INDICATED ON THE SITE PLAN TO BE COVERED BY A MAINTENANCE WORK AGREEMENT SIGNED WITH THE RESPECTIVE OWNERS. AREAS COVERED BY THE WORK AGREEMENT(S) SHALL BE GRADED TO MEET THE LINE OF THE CHANNEL CROSS SECTIONS, OR SHALL BE RESTORED TO ORIGINAL CONDITION UNDER ITEM 203, EXCAVATION FOR PAYMENT, AFTER OTHER WORK HAS BEEN COMPLETED.

## ITEM 603 - 12'-0" x 4'-0" PRECAST REINFORCED CONCRETE BOX SECTIONS (AS PER S.S.955) C-850, AS PER PLAN

### DESCRIPTION:

THIS ITEM SHALL CONSIST OF FURNISHING AND CONSTRUCTING PRECAST REINFORCED CONCRETE BOX SECTIONS AS PER SUPPLEMENTAL SPECIFICATION 955 AT THE LOCATION INDICATED.

### MATERIALS:

MATERIAL FOR THE PRECAST REINFORCED CONCRETE BOX SECTIONS SHALL BE IN ACCORDANCE WITH SUPPLEMENTAL SPECIFICATION 955. GRANULAR BEDDING AND BACKFILL MATERIAL SHALL MEET THE REQUIREMENTS OF 603.02 AND FILL MATERIAL, WHEN SPECIFIED, SHALL BE IN ACCORDANCE WITH 203.

### INSTALLATION:

THE STRUCTURE SHALL BE INSTALLED IN ACCORDANCE WITH SPECIFICATIONS FOR TYPE A CONDUIT, SECTION 603 OF THE CONSTRUCTION AND MATERIAL SPECIFICATIONS STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, EXCEPT AS MODIFIED HEREIN.

### 603.03

WHERE THE BOX SECTION IS TO BE PLACED IN A TRENCH, A MINIMUM TRENCH WIDTH OF 2 FEET ON EACH SIDE OF THE BOX SECTION SHALL BE REQUIRED. WHERE THE BOX SECTION IS TO BE PLACED WITHIN AN EMBANKMENT OR THE BOX SECTION IS ABOVE THE EXISTING GROUND, THE REQUIREMENT THAT THE EMBANKMENT SHALL BE CONSTRUCTED AT LEAST TO THE SPRINGLINE BEFORE TRENCHING IS WAIVED.

### 603.04

THE BEDDING SHALL CONSIST OF A BED OF GRANULAR MATERIAL HAVING A THICKNESS OF AT LEAST 6 INCHES BELOW THE BOTTOM OF THE BOX SECTION AND EXTENDING 2 FEET ON EACH SIDE OF THE BOX SECTION.

### 603.06

THE JOINTS SHALL BE SEALED WITH A FLEXIBLE PLASTIC MATERIAL CONFORMING TO AASHTO M-198 TYPE B. THE CROSS SECTION OF THE JOINT SEALING MATERIAL SHALL HAVE A MINIMUM HEIGHT OF TWICE THE ANNULAR SPACE OF THE JOINT AND A MINIMUM WIDTH OF 150% THE HEIGHT. THE CONCRETE JOINT SHALL BE PRIMED WITH A PRIMER AS RECOMMENDED BY THE MANUFACTURER BEFORE INSTALLATION. BOX SECTIONS SHALL BE FORCED TO A MAXIMUM OF 1/2" GAP BETWEEN SECTIONS. THE EXTERIOR JOINT GAP ON THE TOP OF THE BOX SHALL BE FILLED WITH PORTLAND CEMENT MORTAR. SHEAR CONNECTORS AS SPECIFIED AND ILLUSTRATED ON SUPPLEMENTAL SPECIFICATION 955 ARE NOT REQUIRED.

THE UPSTREAM END SHALL BE A RECESSED TYPE JOINT.

### 603.08

WHEN THE TOP OF THE TRENCH IS ABOVE THE TOP OF THE BOX, BACKFILLING SHALL BE IN ACCORDANCE WITH TYPE A OR TYPE B CONDUIT. WHEN THE TOP OF THE BOX SECTION IS ABOVE THE TOP OF THE TRENCH, GRANULAR MATERIAL SHALL BE PLACED AND COMPACTED TO A MINIMUM DEPTH OF 2 FEET OVER THE TOP OF THE BOX SECTIONS (WHERE APPLICABLE) AND FOR A WIDTH OF 4 FEET ON EACH SIDE OF THE BOX SECTION OR AS DIRECTED BY THE ENGINEER. THE REMAINDER OF THE ADJACENT EMBANKMENT MATERIAL SHALL BE FURNISHED, PLACED AND PAID FOR IN ACCORDANCE WITH 203. BACKFILL AND FILL MATERIAL SHALL BE PLACED UNIFORMLY ON BOTH SIDES OF THE BOX SECTION.

FILL MATERIAL AT THE SIDES OF THE BOX SECTIONS MAY BE COMPACTED BY HEAVY COMPACTION EQUIPMENT.

TYPE D WATERPROOFING SHALL BE PROVIDED ON THE TOP SURFACE OF THE BOX SECTIONS AND SHALL EXTEND 1 FOOT VERTICALLY DOWN EACH SIDE. THE WATERPROOFING SHALL BE PROVIDED FOR THE FULL LENGTH OF THE STRUCTURE OR WITHIN THE LIMITS WHICH ARE IN CONTACT WITH THE BACKFILL (APPLICABLE TO C-850 ONLY).

### BASIS FOR PAYMENT

PAYMENT SHALL BE MADE AT THE CONTRACT UNIT PRICE FOR ITEM 603 - 12'-0" x 4'-0" PRECAST REINFORCED CONCRETE BOX SECTIONS (AS PER S.S.955) C-850, AS PER PLAN. PAYMENT SHALL BE FULL COMPENSATION FOR ALL MATERIAL, LABOR AND EQUIPMENT NECESSARY TO COMPLETE THE INSTALLATION.

## ANCHOR BOLTS

ANCHOR BOLTS ARE TYPICAL AS PER STD.DWG. HW-4A, EXCEPT THAT BOLTS NEED NOT BE GALVANIZED AND INSTEAD OF THE NUTS, THE BOLTS SHALL BE CONNECTED WITH ANCHOR INSERTS CAST INTO THE END SECTIONS. ALL COSTS SHALL BE INCLUDED UNDER ITEM 603 FOR PAYMENT.

## BRIDGE IDENTIFICATION SIGNS

THE EXISTING BRIDGE IDENTIFICATION SIGNS SHALL BE REMOVED FOR RE-USE BY THE CONTRACTOR. IF THE EXISTING SIGNS ARE DETERMINED TO BE UNSUITABLE FOR RE-USE BY THE ENGINEER, NEW SIGNS WILL BE PROVIDED BY THE STATE. AFTER THE NEW RAIL HAS BEEN ERECTED THE CONTRACTOR SHALL DRILL HOLES AND INSTALL THE SIGN(S) AS DIRECTED BY THE ENGINEER. PAYMENT FOR THE ABOVE SHALL BE INCLUDED IN THE UNIT PRICE BID FOR ITEM 606 - GUARDRAIL, TYPE 5.

## MAINTAINING TRAFFIC

WHEN NO LONGER NEEDED TO MAINTAIN TRAFFIC THE EXISTING STRUCTURE SHALL BE REMOVED, AS PER PLAN. THE ROAD CAN BE CLOSED TO TRAFFIC FOR A PERIOD NOT TO EXCEED 30 CALENDAR DAYS. BEFORE CLOSING THE ROAD THE CONTRACTOR SHALL HAVE ON SITE THE MATERIALS REQUIRED TO IMMEDIATELY PROCEED WITH THE WORK.

## ITEM 601 - DUMPED ROCK FILL, TYPE B

DUMPED ROCK FILL SHALL BE PLACED AT THE INLET AND OUTLET OF CULVERT AS PER 601.07 AND AS DIRECTED BY THE ENGINEER.

## UNDERGROUND UTILITIES

THE LOCATIONS OF UNDERGROUND UTILITIES SHOWN ON THE PLANS ARE AS OBTAINED FROM THE OWNERS OF THE UTILITY AS REQUIRED BY SECTION 153.64 ORC.

## UTILITY NOTIFICATION

IN ADDITION TO THE REQUIREMENTS OF SPECIFICATION 105.06, THE CONTRACTOR SHALL NOTIFY, AT LEAST TWO WORKING DAYS BEFORE BREAKING GROUND, ALL PUBLIC SERVICE CORPORATIONS HAVING WIRES, POLES, CONDUIT OR OTHER STRUCTURES, WHICH MAY BE AFFECTED BY THE OPERATION. HE SHALL CONDUCT HIS OPERATIONS IN SUCH A MANNER TO AVOID DAMAGES TO ANY AND ALL UTILITIES. ANY AND ALL WORK REQUIRED FOR PUBLIC OR PRIVATE UTILITIES WILL BE DONE BY AND AT THE EXPENSE OF THEIR RESPECTIVE OWNERS, UNLESS OTHERWISE NOTED ON THESE PLANS. FOLLOWING ARE OWNERS KNOWN TO BE WITHIN THE AREA OF THE PROJECT:

OHIO POWER COMPANY  
301 CLEVELAND AVE. S.W.  
P.O. BOX 400  
CANTON, OHIO 44701  
PHONE (216) 438-7040

GENERAL TELEPHONE CO. OF OHIO  
715 COMMERCIAL PARKWAY  
P.O. BOX 399  
DOVER, OHIO 44622  
PHONE (216) 364-0363

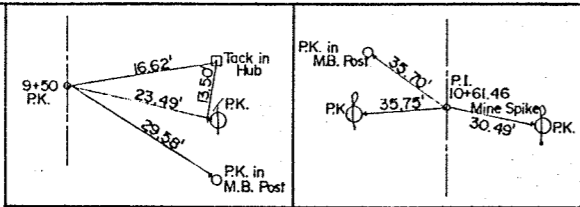
### UNDERGROUND UTILITIES

2 WORKING DAYS  
BEFORE YOU DIG  
CALL...800-362-2764 (TOLL FREE)  
OHIO UTILITIES PROTECTION SERVICE  
NON-MEMBERS  
MUST BE CALLED DIRECTLY

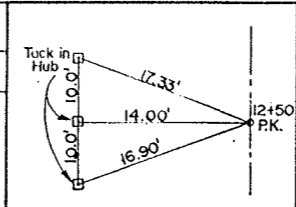
## GENERAL SUMMARY

ITEM	TOTAL	UNIT	DESCRIPTION
202	LUMP	LUMP	STRUCTURES REMOVED
202	156	SQ.YD.	WEARING COURSE REMOVED
202	1	EACH	ANCHOR ASSEMBLY REMOVED
203	204	CU.YD.	EMBANKMENT
301	24	CU.YD.	BITUMINOUS AGGREGATE BASE, AC-20, RT-11 OR RT-12
402	6.5	CU.YD.	ASPHALT CONCRETE, AC-20
404	6.5	CU.YD.	ASPHALT CONCRETE, AC-20
407	16	GAL.	TACK COAT
512	80	SQ.YD.	TYPE D WATERPROOFING
517	48	LIN.FT.	RAILING, DEEP BEAM W/TUBULAR BACKUP, AS PER PLAN
601	50	CU.YD.	DUMPED ROCK FILL, TYPE B (24" THICK)
602	<del>240</del>	CU.YD.	CONCRETE MASONRY
603	64.0	LIN.FT.	12'-0" x 4'-0" PRECAST REINFORCED CONCRETE BOX SECTIONS AS PER SS955, C-850, AS PER PLAN
606	241.5	LIN.FT.	GUARDRAIL, TYPE 5
606	2	EACH	ANCHOR ASSEMBLY, STANDARD TYPE A
659	311	SQ.YD.	SEEDING AND MULCHING
659	0.14	TON	AGRICULTURAL LIMING
659	0.03	TON	COMMERCIAL FERTILIZER
614	LUMP	LUMP	MAINTAINING TRAFFIC
619	LUMP	LUMP	FIELD OFFICE
623	LUMP	LUMP	CONSTRUCTION LAYOUT STAKES
624	LUMP	LUMP	MOBILIZATION

30

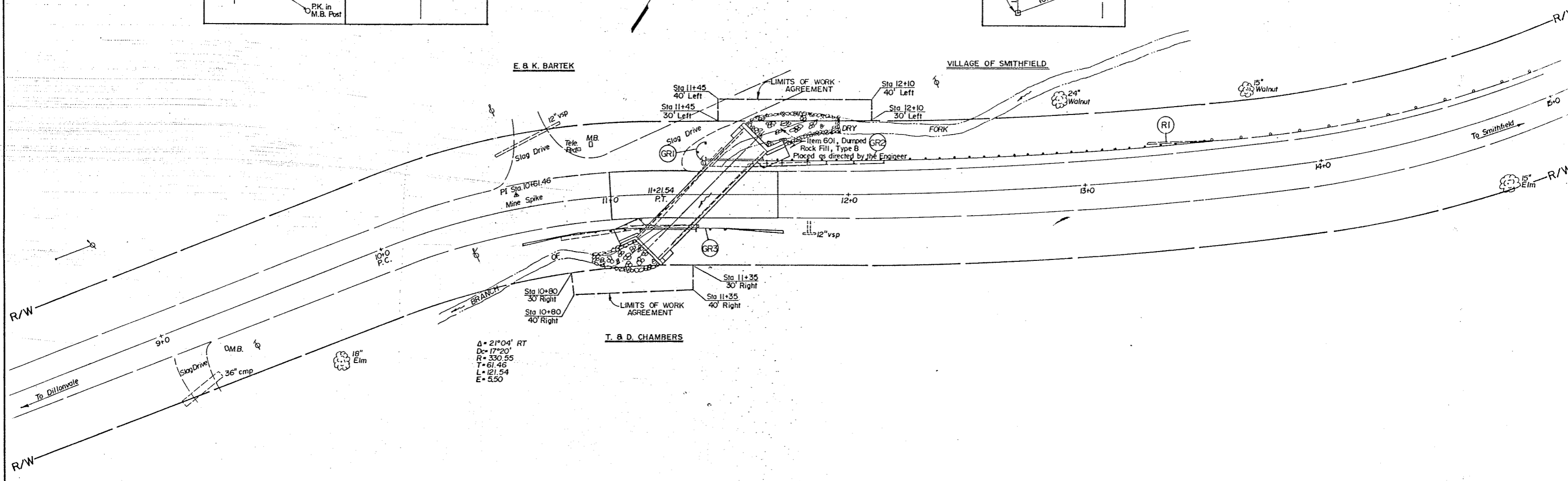


B.M. Elev. 1100.00 (Assumed) Mine Spike in 42.10' Left Sta 10+57  
 B.M. Elev. 1105.63 (Assumed) Mine Spike in 46.20' Left Sta 12+39



PHWA REGION	STATE	PROJECT	4
5	OHIO		8

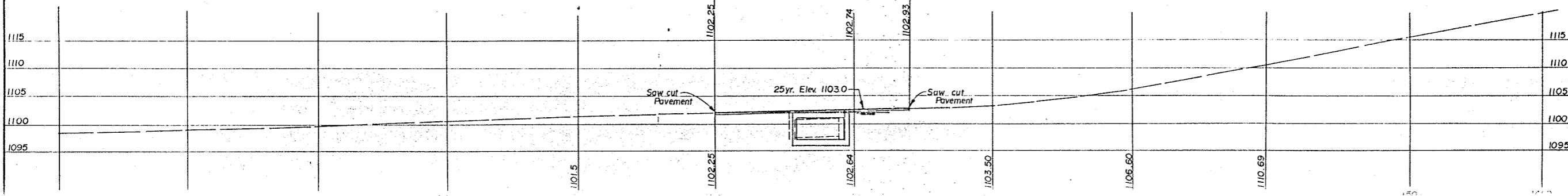
JEF-152-(0504) BR-3C-86



$\Delta = 21^{\circ}04'$  RT  
 $D_c = 17^{\circ}20'$   
 $R = 330.55$   
 $T = 61.46$   
 $L = 121.54$   
 $E = 5.50$

GUARDRAIL								
REF	LOCATION		SIDE of $\phi$	ITEM 202	ITEM 606	ITEM 517		
	STATION			ANCHOR ASSEMBLY REMOVED	GUARDRAIL TYPE 5	ANCHOR ASSEMBLY TYPE A	DEEP BEAM RAIL W/TUBULAR BACKUP AS PER PLAN	
	FROM	TO		EACH	LIN.FT.	EACH	LIN.FT.	
GR1	11+36	11+40	LT		12.5 on 4'R			
GR2	11+40	13+55.5	LT		191.5		24.0	
GR3	10+60	11+71.5	RT		37.5	2	24.0	
R1	13+20.5	13+55.5	LT	1				
TOTALS				1	241.5	2	48.0	

EXISTING STRUCTURE
TYPE: Concrete slab simple SPAN LENGTH: 16'-7" ROADWAY WIDTH: 25'-0" /f guardrail LOADING: H-15 ALIGNMENT: Tan SKEW: 45° L.F. WEARING SURFACE: Bituminous
PROPOSED STRUCTURE
TYPE: 12'x4' Precast reinforced concrete box sections as per SS 955 C-850, as per plan 64'-0" Long ROADWAY WIDTH: 28'-0" /f guardrail LOADING: HS20-44 ALIGNMENT: Tan SKEW: 45° L.F. WEARING SURFACE: Bituminous



DRAINAGE AREA = 1.28 Sq.Mi.  
 $Q_{25} = 420$  c.f.s.  
 $Q_{100} = 610$  c.f.s.

STATE OF OHIO  
 DEPARTMENT OF TRANSPORTATION  
 DIVISION OF HIGHWAYS  
 BUREAU OF MAINTENANCE

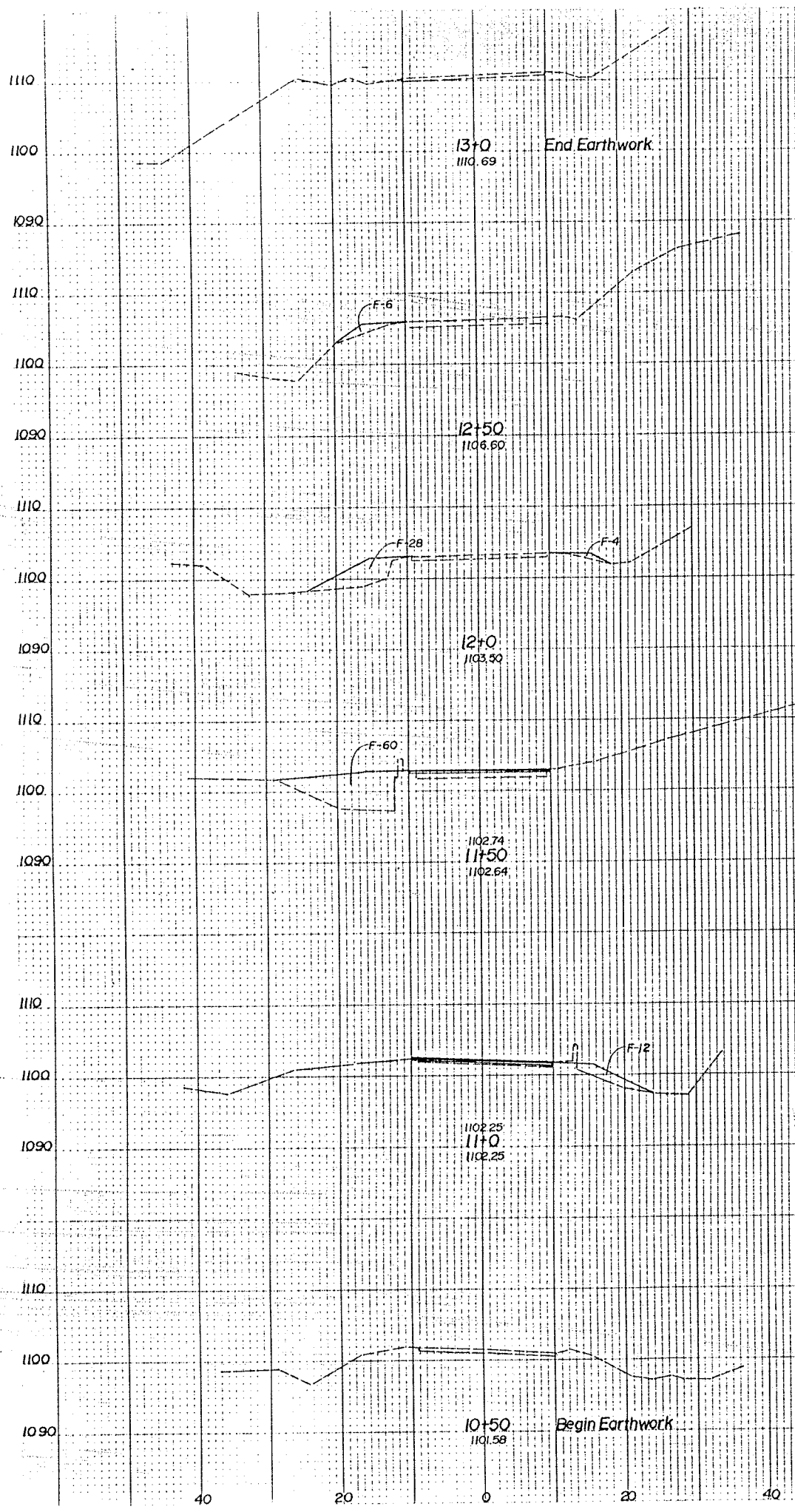
**SITE PLAN**  
 BRIDGE N<sup>o</sup> JEF-152-0504  
 OVER BRANCH OF DRY FORK CREEK  
 JEFFERSON COUNTY

PRESENT TOPOGRAPHY SURVEYED	DRAWN	DESIGNED	PROPOSED WORK DRAWN	CHECKED	REVIEWED
			W/RG		

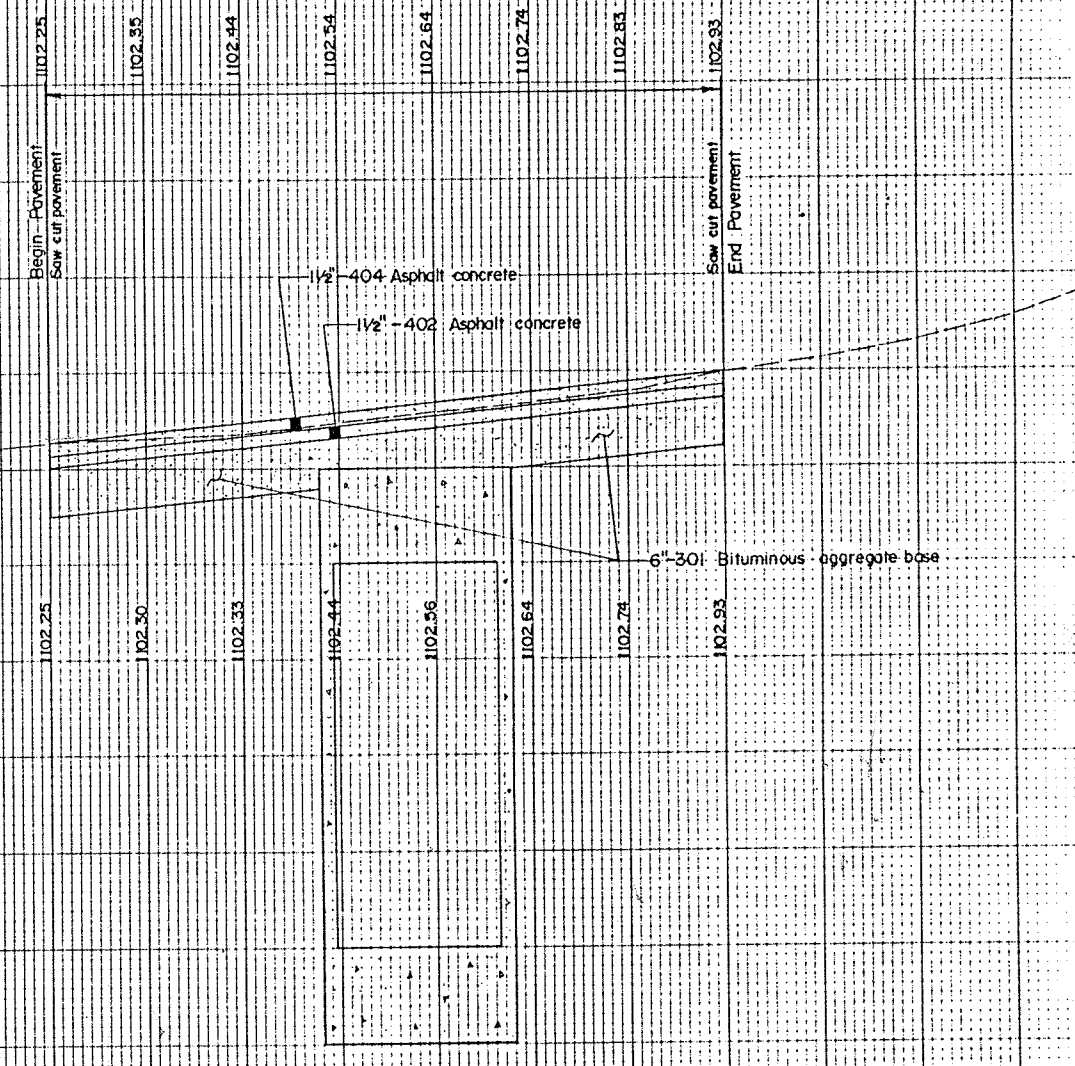
CALC BY: W.R.G.  
 DATE: 4/15/86  
 CHKD BY: E.B.D.  
 DATE: 4/16/86

JEF-152-(5.04)

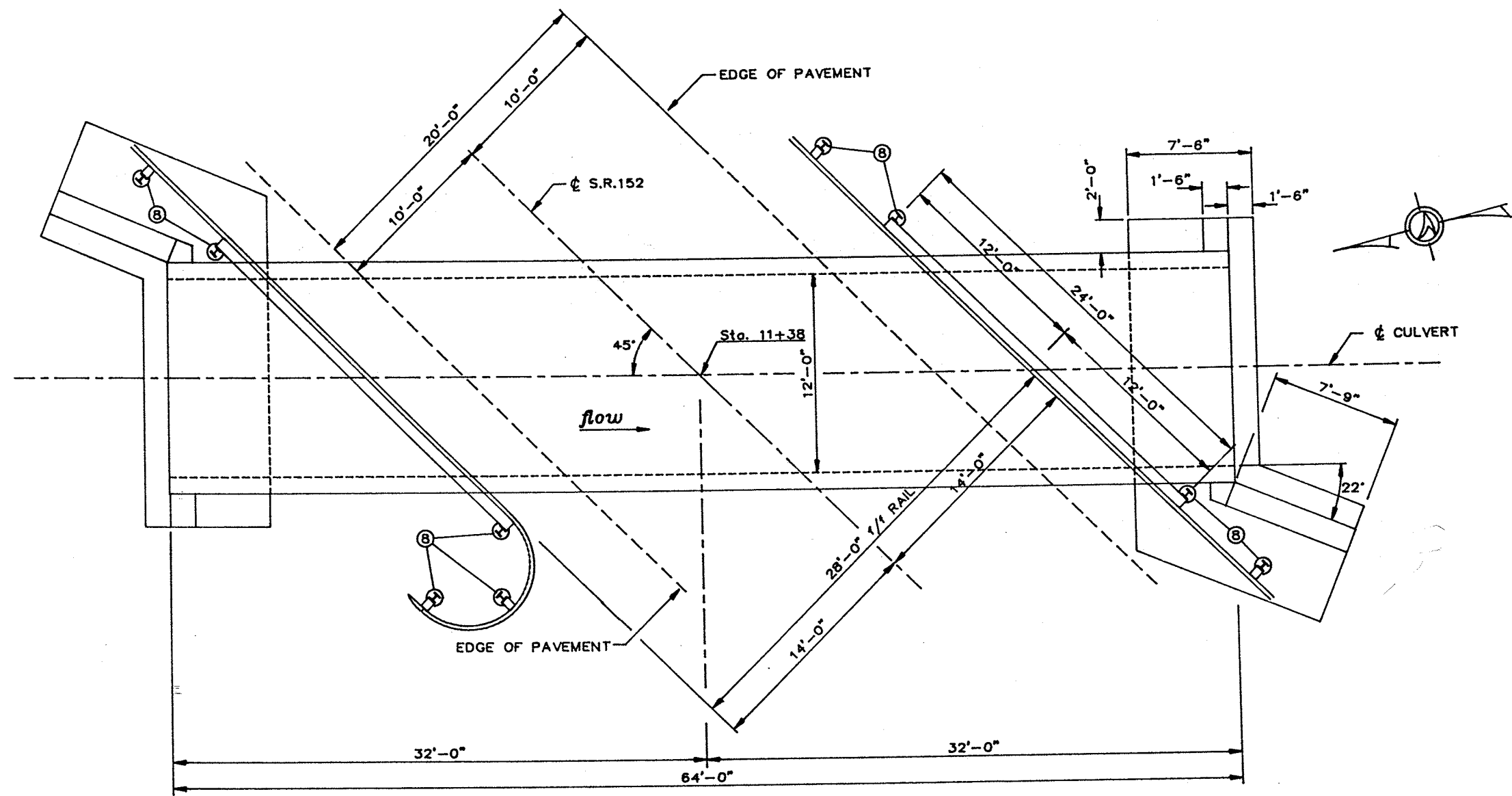
OHIO 5  
 FHWA REGION 5 8  
 BR-BC-8C



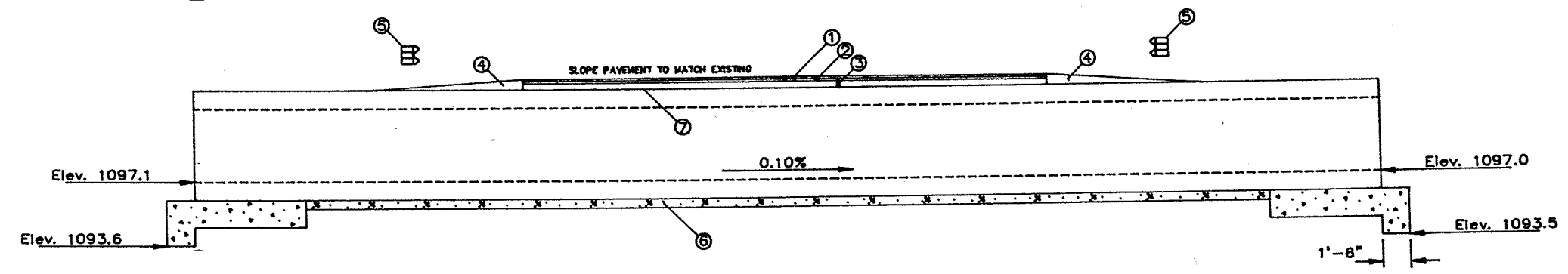
SEEDING	END AREA		CU. YDS.	
	WIDTH SQYD	CUT	FILL	EXC. EMB.
	0	0	0	
	3		0	6
	11		0	6
	72		0	35
	15		0	32
	86		0	85
	6		0	60
	83		0	67
	14		0	12
	39		0	11
	0		0	



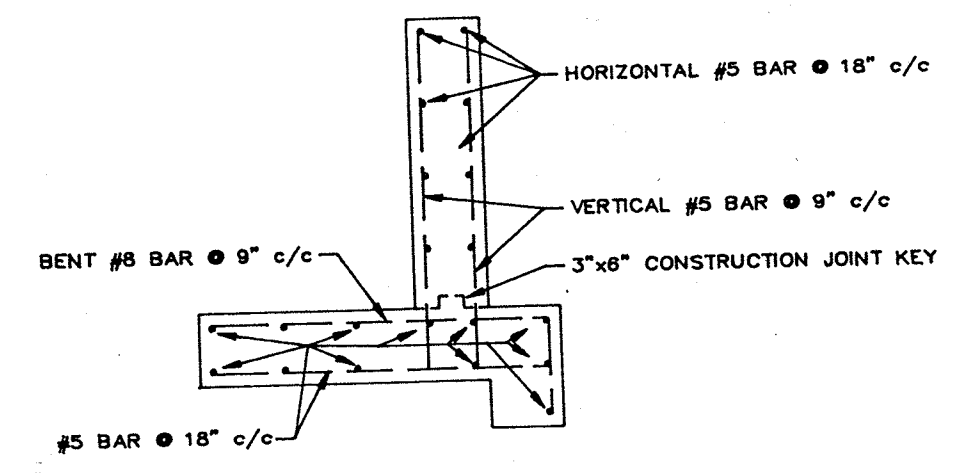
ROADWAY CROSS SECTIONS & PROFILE DETAIL



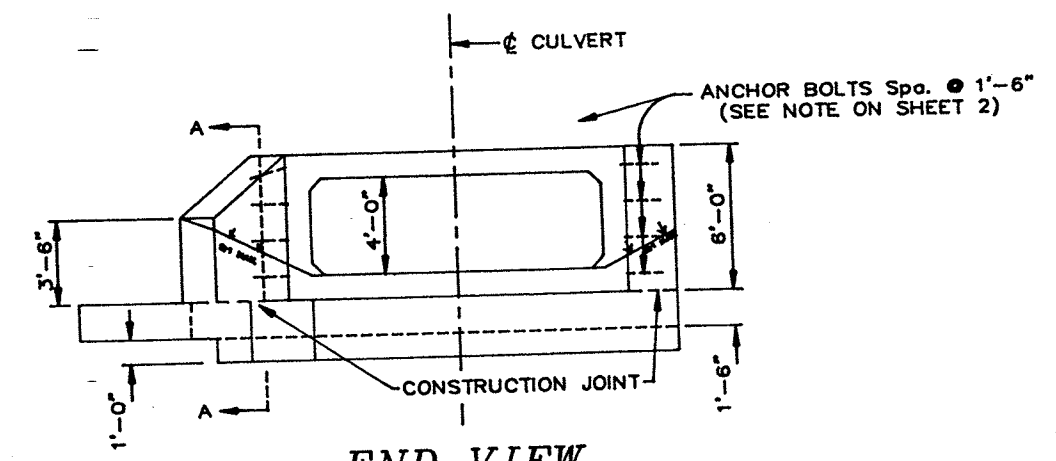
PLAN



ELEVATION  
(ALONG  $\phi$  OF CULVERT)



SECTION A-A



END VIEW  
(TYPICAL FOR BOTH ENDS)

LEGEND

- ① - ITEM 404, ASPHALT CONCRETE, AC-20 (1-1/2" THICK)
- ② - ITEM 402 ASPHALT CONCRETE, AC-20 (1-1/2" THICK)
- ③ - ITEM 301, BITUMINOUS AGGREGATE BASE (THICKNESS VARIES)
- ④ - ITEM 617, COMPACTED AGGREGATE
- ⑤ - ITEM 517, DEEP BEAM RAIL W/TUBULAR BACKUP, AS PER PLAN (TUBE SIZE = 8"x10"x1/4" TO BE BOLTED EVERY 6'-3")
- ⑥ - 6" CLASS B BEDDING
- ⑦ - ITEM 512, TYPE D WATERPROOFING, AS PER PLAN
- ⑧ - W10x25 POSTS, ENCASED IN CONCRETE

NOTE: FOR ADDITIONAL PAVEMENT DETAILS SEE PROFILE ON SHEET \_\_\_\_\_ .  
 \* COST OF THE LARGER POST AND THE CONCRETE ENCASEMENT SHALL BE INCLUDED UNDER ITEM 606, GUARDRAIL, TYPE 5 FOR PAYMENT.

STATE OF OHIO DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS BUREAU OF MAINTENANCE					
GENERAL PLAN & ELEVATION					
BRIDGE No. JEF-152-0504 OVER BRANCH OF DRY FORK CREEK					
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED	DATE/REVISION
W.R.G.	W.R.G.	W.R.G.			

**GEOLOGY OF THE SITE**

THE STRUCTURE SITE IS LOCATED IN THE HIGHLY DISSECTED UNGLACIATED PORTION OF THE FLUSHING ESCARPMENT REGION, ON THE NARROW FLOODPLAIN OF AND OVER A BRANCH OF DRY FORK, IN AN AREA WHERE RELATIVELY SHALLOW VALLEY AND ALLUVIAL DEPOSITS OVERLIE BEDROCK, OF PENNSYLVANIAN AGE.

**EXPLORATION**

THE EXPLORATION CONSISTED OF ONE DRIVE-PRESS SAMPLE-CORE BORING AND ONE DRIVE SAMPLE BORING MADE BY MEANS OF A MECHANICALLY-POWERED HOLLOW STEM ROTARY AUGER MOUNTED ON A MOBILE PLATFORM, PERFORMED ON OCTOBER 2 AND 3, 1985.

**INVESTIGATIONAL FINDINGS AND OBSERVATIONS**

THE TEST BORINGS DISCLOSED THAT INTERVALS OF MEDIUM-DENSE UNSTRATIFIED BASIC SILTS AND CLAYS MODIFIED WITH SAND, GRAVEL AND VARYING PERCENTAGES OF EACH OTHER OVERLIE STEEPLY SLOPING BEDROCK SURFACE. TEST BORING NO. B-1 (MADE IN THE GENERAL VICINITY OF THE REAR ABUTMENT) ENCOUNTERED BEDROCK SURFACE AT 10.0-FOOT DEPTH, ELEVATION 1090.0 FEET AND WAS TERMINATED AT 20.2-FOOT DEPTH, ELEVATION 1079.8 FEET AFTER HAVING PENETRATED 10.2 FEET BELOW BEDROCK SURFACE. TEST BORING NO. B-2 (MADE IN THE GENERAL VICINITY OF THE FORWARD ABUTMENT) ENCOUNTERED BEDROCK SURFACE AT 5.0-FOOT DEPTH, ELEVATION 1095.7 FEET AND WAS TERMINATED AT 16.0-FOOT DEPTH, ELEVATION 1084.7 FEET AFTER HAVING PENETRATED 11.0 FEET BELOW BEDROCK SURFACE.

NO FREE WATER OBSERVATIONS WERE MADE IN EITHER OF THE TEST BORINGS PERFORMED DURING, OR AT THE CONCLUSION OF DRILLING OPERATIONS.

**LEGEND**

- Auger Boring Location - Plan View.
- Press and / or Drive Sample and / or Core Boring Location - Plan View.
- Drive Rod Penetration Resistance Sounding Location - Plan View.
- Capped Pile
- Footing
- Footing on Pile
- Top of Rock

- Horizontal Bar on Boring Log Indicates the Depth the Sample Was Taken.
- Figures Beside the Boring Log in Profile Indicate the Number of Blows for Standard Penetration Test.  
X = Number of Blows for First 6 inches.  
Y = Number of Blows for Second 6 inches.  
Z = Number of Blows for Third 6 inches.
- Drive Rod Penetration Resistance Sounding Log - Profile
- Casing  
Resistance "R" < 10,000 lbs.  
Resistance "R" > 10,000 lbs.
- Indicates Final Measurement of Penetration, in Inches.
- Indicates Free Water Elevation.
- Indicates Static Water Elevation.

**SYMBOLS OF ROCK TYPES**

- Coal
- Weathered Mudstone or Claystone
- Mudstone or Claystone
- Weathered Shale
- Shale
- Fire Clay
- Siltstone
- Weathered Sandstone
- Sandstone
- Leached Dolomite
- Dolomite
- Leached Limestone
- Limestone
- Boulders or Cobbles

**GENERAL INFORMATION**

**Drive Rod Penetration Sounding Tests**

Drive rod penetration resistance tests constitute driving a 1.315-inch diameter steel rod, with a 45° cone point, into the ground, using a 122-pound drop-hammer with a free fall of five feet. At one or two-foot depth intervals, a measurement is taken to determine the amount of penetration achieved in three hammer drops. This reading is converted to an empirical value for capacity "R", in thousands of pounds (which is a measure of both the point resistance and frictional resistance on the rod), by using charts prepared by the Ohio Department of Highways, Bureau of Bridges, on the basis of correlation study of rod penetration with past performance of pile driving. For interpretation, a graph is prepared by plotting the value "R" against the depth at which the reading was taken, and connecting the plotted points. The curve so obtained reflects the density of subsurface materials in a manner that can be readily compared with data from similar tests at other locations on the structure site. From this comparison, the overall uniformity of subsurface condition may be evaluated.

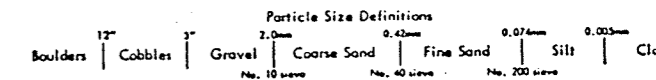
**Drive Sample Borings - Drive-Press Sample Borings**

Drive sample borings are made by means of a rotary-type drill rig, employing a 2" O.D., 1-3/8" I.D. sampler, at 2-1/2 and / or 5-foot depth intervals, driven by means of a 140 - pound drop-hammer with a free fall of 30 inches. The number of blows required to drive the sampler 18 inches is considered the standard penetration test.

Drive-press sample borings are made by means of a rotary-type drill rig, employing a 2" O.D., 1-3/8" I.D. drive sampler, and 3" O.D. thin-wall press sampler. The press sampler is advanced by continuous uniform pressure, applied by the drill rig.

The boring log sheets show a graphic plot of the information obtained, including depth and elevation of the sample, number of blows for the standard penetration tests in three 6-inch increments, depth of press samples, field sample number, sample description - based on laboratory tests and the Casagrande AC classification system - and gradation, plasticity, and moisture content determinations. Results of strength and consolidation testing, if performed, appear on separate enclosures.

At depths where materials are bouldery or gravelly to the extent that the sampler can not be driven, a wash sample is procured for visual classification, in order to determine the general character of the material. These samples are not considered sufficiently representative to warrant laboratory testing.



**LOG OF BORING**

Date Started 10-2-85    Sampler Type SS    Dia 1 3/8"    Water Elev. \_\_\_\_\_  
 Date Completed 10-3-85    Casing Length \_\_\_\_\_    Dia \_\_\_\_\_  
 Boring No. B-1    Station & Offset 11+38 18' LT. (REAR ABUTMENT)    Surface Elev. 1100.0'

Elev.	Depth	Std. Pen. (N)	Rec. Loss ft.	Description	Sample No.	Physical Characteristics										SHTL Class.	
						% Agg.	% C.S.	% F.S.	% Silt	% Clay	LL	PI	WC	Other	Other		Other
1100.0	0			BROWN SILTY CLAY AND GRAVEL (DRILLER'S DESCRIPTION)	-	-	-	-	-	-	-	-	-	-	-	-	VISUAL
1097.5	2			AUGERED													
1095.0	4	9/10/12		BROWN SANDY GRAVELLY CLAY	1	29	12	12	25	22	37	12	19				A-6a
1092.5	6			BROWN AND GRAY SANDY GRAVELLY CLAY	2	24	8	10	29	29	34	12	16				A-6a
1091.6	8			BROWN WITH GRAY SANDY GRAVELLY CLAY	3	24	10	11	27	28	36	12	19				A-6a
1090.0	10			GRAY SILT AND CLAY-SLIGHTLY ORGANIC TOP OF ROCK	3A	0	2	9	38	51	36	13	23				A-6a
1087.5	12			GRAY EXTREMELY WEATHERED CLAY SHALE	4	-	-	-	-	-	-	-	-	22			VISUAL
1085.0	14			GRAY WEATHERED CLAY SHALE	5	-	-	-	-	-	-	-	-	-			VISUAL
1084.8	16			GRAY WEATHERED CLAY SHALE	6	54	5	4	22	15	NP	NP	16				VISUAL
1079.8	20		4.7 0.3	CLAY SHALE, GRAY, FIRM WITH THIN SCATTERED CLAY SEAMS, BROKEN. CORE LOSS 6%.													

#BOTTOM OF BORING

**LOG OF BORING**

Date Started 10/3/85    Sampler Type SS    Dia 1 3/8"    Water Elev. \_\_\_\_\_  
 Date Completed 10-3-85    Casing Length \_\_\_\_\_    Dia \_\_\_\_\_  
 Boring No. B-2    Station & Offset 11+73 17' RT. (FORWARD ABUTMENT)    Surface Elev. 1100.2'

Elev.	Depth	Std. Pen. (N)	Rec. Loss ft.	Description	Sample No.	Physical Characteristics										SHTL Class.	
						% Agg.	% C.S.	% F.S.	% Silt	% Clay	LL	PI	WC	Other	Other		Other
1100.2	0			AUGERED													
1098.2	2			BROWN AND GRAY SANDY CLAYEY SILT WITH GRAVEL (DRILLER'S DESCRIPTION)													VISUAL
1095.7	5	5/6/8		BROWN GRAVELLY CLAY	7	18	4	9	37	32	47	18	12				A-7-6
1093.2	8			BLACK COAL	8	-	-	-	-	-	-	-	-	19			VISUAL
1090.7	10			BLACK COAL	9	-	-	-	-	-	-	-	-	3			VISUAL
1088.2	12			LIGHT GRAY FIRE CLAY	10	-	-	-	-	-	-	-	-	7			VISUAL
1085.7	14			LIGHT GRAY FIRE CLAY	11	-	-	-	-	-	-	-	-	11			VISUAL
1084.7	16			GRAY WEATHERED CLAY SHALE	12	-	-	-	-	-	-	-	-	11			VISUAL

#BOTTOM OF BORING

NOTE - ALL AVAILABLE SOIL AND BEDROCK INFORMATION WHICH CAN BE CONVENIENTLY SHOWN ON THE STRUCTURE FOUNDATION INVESTIGATION SHEETS HAS BEEN SO REPORTED. ADDITIONAL SUBSURFACE INVESTIGATIONS MAY HAVE BEEN MADE TO STUDY SOME SPECIAL ASPECT OF THE PROJECT. COPIES OF THIS DATA, IF ANY, MAY BE INSPECTED IN THE DISTRICT DEPUTY DIRECTOR'S OFFICE, THE BUREAU OF TESTS AT 1600 WEST BROAD STREET, THE PAVEMENT AND SOILS SECTION OF THE BUREAU OF LOCATION AND DESIGN OR IN THE BRIDGE BUREAU AT 25 SOUTH FRONT STREET.

OHIO DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS - TESTING LABORATORY  
1600 WEST BROAD STREET, COLUMBUS, OHIO 43223

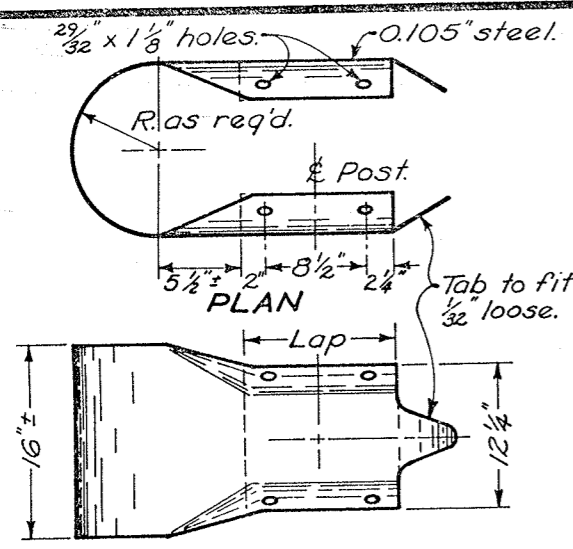
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BRIDGE NO. JEF-152-0504  
OVER BRANCH OF DRY FORK  
SEC. JEF-152-5.04

CHECKED BY L. N. L.    REVIEWED BY R. D. R.    DATE 11/7/85

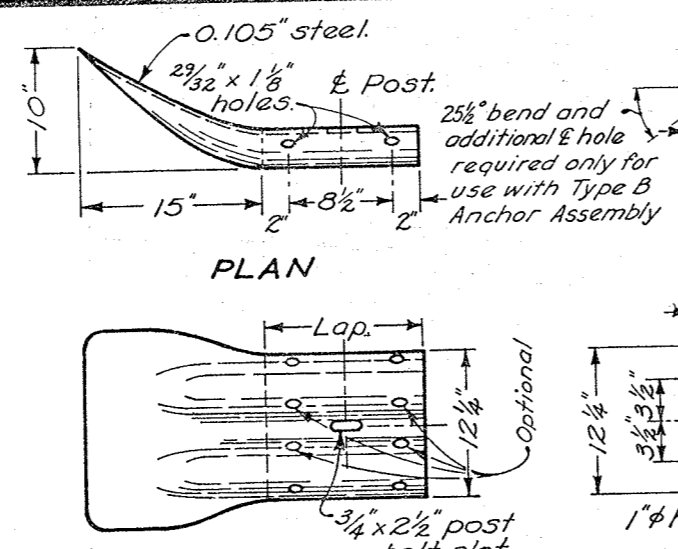




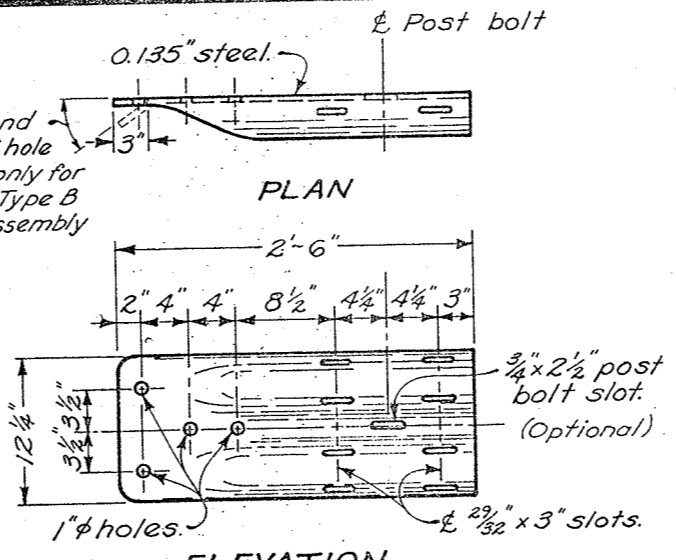
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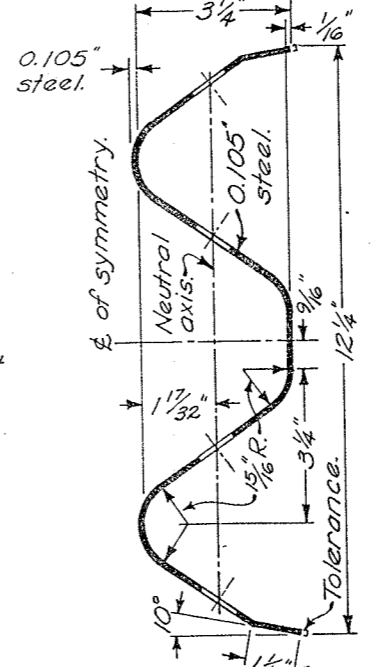
**BUFFER END SECTION**



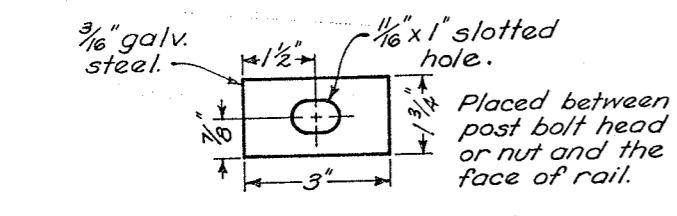
**FLARED END SECTION**



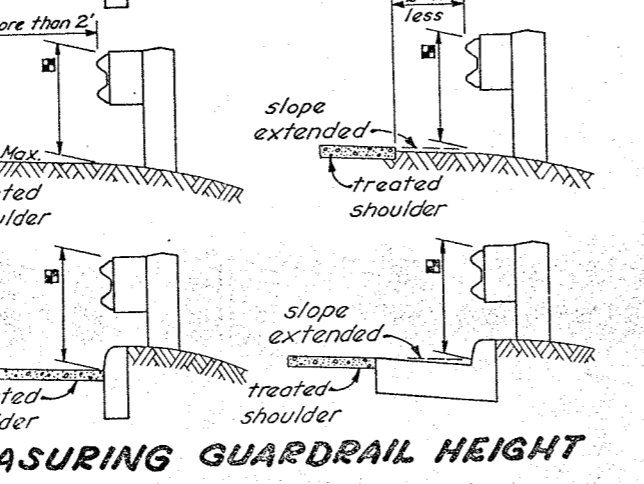
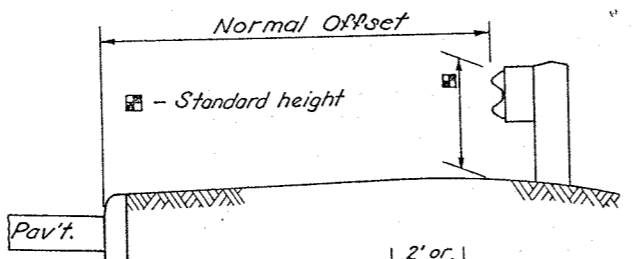
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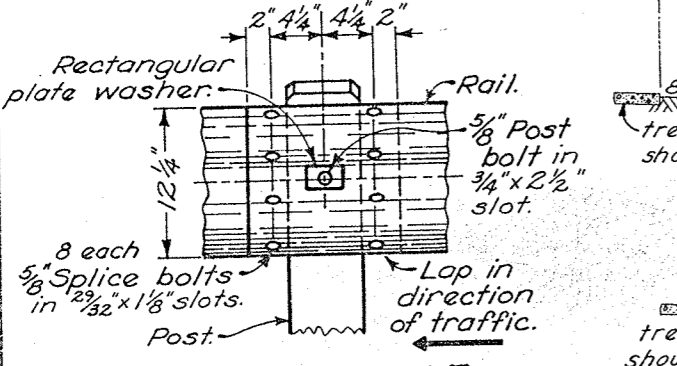
**SECTION BEAM RAIL**



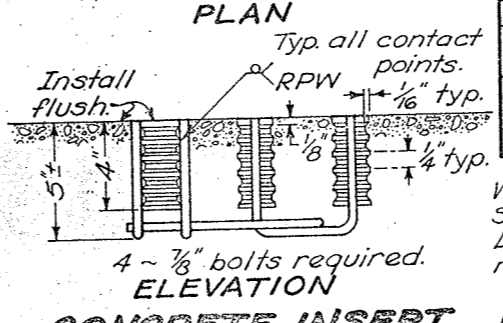
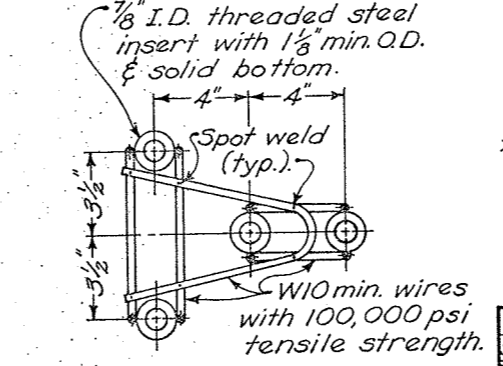
**RECTANGULAR PLATE WASHER**



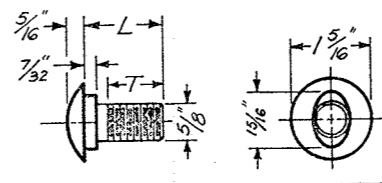
**MEASURING GUARDRAIL HEIGHT**



**BEAM RAIL SPLICE**



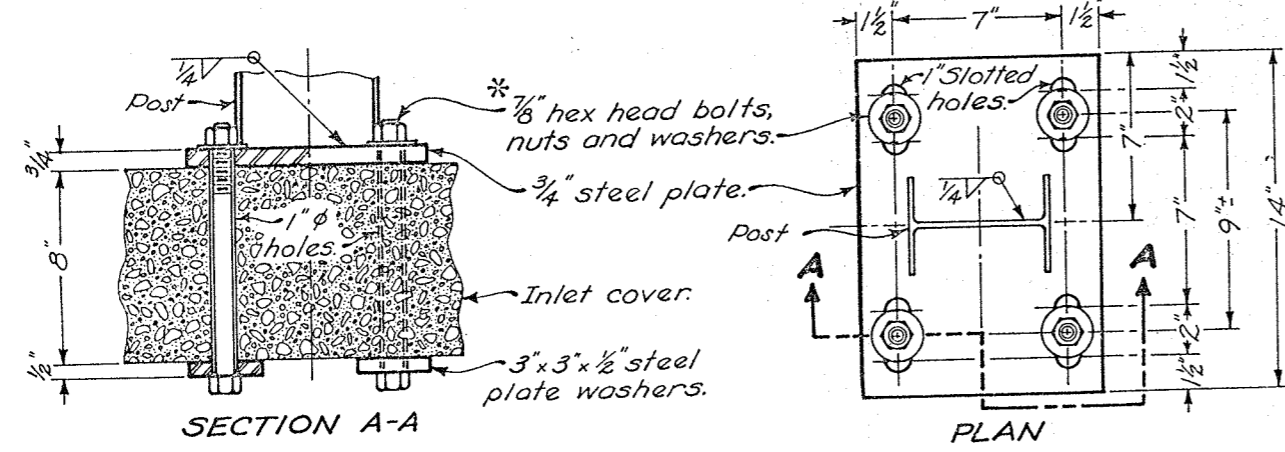
**CONCRETE INSERT ANCHOR ASSEMBLY**



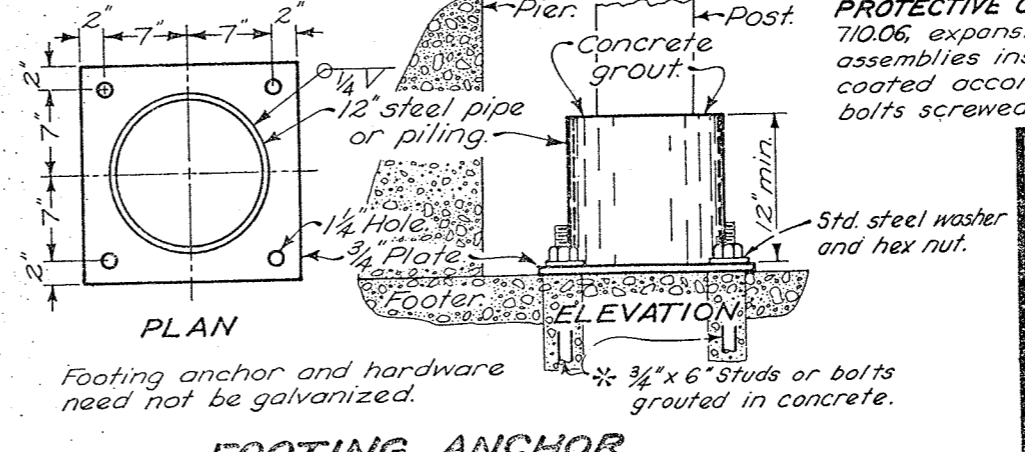
L (in.)	T (in.)	Bolt Use
18	2 1/2	Type 5: WP/WB
10	2 1/2	Type 4: WP Type 5: SP/WB
2	1 1/2	Type 4: SP Type 5: SP/SB
1 1/4	Full	Splice bolt

WP=wood post WB=wood block  
SP=steel post SB=steel block  
Longer bolt may be needed for round WP larger than 8" dia.

**BUTTON HEAD BOLT**  
(For post and splice bolts)



**INLET MOUNTED POST**



**FOOTING ANCHOR**  
Footing anchor and hardware need not be galvanized.  
3/4" x 6" studs or bolts grouted in concrete.

**NOTES**  
**BEAM RAIL ELEMENTS** shall be 12'-6" effective length, unless otherwise specified, with 3/4" x 2 1/2" post bolt slots on 6'-3" centers regardless of post spacing. Field punching or drilling of bolt holes or slots for irregularly spaced posts shall be according to 606.05.  
**BEAM RAIL SPLICE** between two rail elements, or rail and terminal connector shall be lapped in the direction of traffic. The buffer or flared end sections shall lap on the traffic face. A 12" length of beam rail (Back-Up Plate), with a 3/4" dia. bolt hole or a 3/4" x 2 1/2" slot, shall be provided at posts not having a rail splice.  
**SPECIAL POST MOUNTINGS:** Inlet mounted posts are required for guardrail posts located on a drainage inlet. Footing anchors are required for guardrail posts located on footers with less than 3'-5" cover except that for footer cover of 2'-6" to 3'-5" the posts may be installed by using a 4" minimum concrete encasement. The inlet mounted post may be used for footing anchors in runs with steel posts.  
 When standard post depth is not available due to a culvert, the guardrail posts directly over the culvert shall not be driven, but set in holes with a 4" minimum concrete encasement for the maximum post depth available.  
 Cost of the inlet mounted posts, footing anchors, and concrete encasement shall be included in the unit price bid for guardrail of the type required by the plan.  
**STEEL POST SIZES:** The W6 x 8.5 and W6 x 15.5 posts may be used in lieu of the W6 x 9 and W6 x 15 respectively which are shown on the various Standard Construction Drawings for guardrail.  
**ANCHORS** conforming to 712.01, or anchors per FF-5-325 Group II, Type 4, Class 1 or 2 or Group VIII, Type 1 or 2 with proof load certification per 712.01, may be substituted with the same bolt diameter specified. If there is any question of deteriorated concrete, expansion anchors will not be allowed, as determined by the Engineer. Where self-drilling anchors are permitted and used for guardrail construction, the holes shall be drilled with the expansion shield (not by a drill bit) and the shield shall be installed flush with the concrete surface.  
 The Engineer shall visually inspect, after installation, all expansion anchors used in guardrail construction. The Engineer may require the Contractor to test load any expansion anchor to 1/4 the certified proof load in direct pull. The equipment and method used shall meet the approval of the Engineer. Each expansion anchor that fails to meet the test requirements shall be reset or removed and replaced with bolts extending through the concrete or grouted in place, as directed by the Engineer.  
**PROTECTIVE COATING:** In lieu of the requirements of 710.06, expansion shields, anchors and insert anchor assemblies installed (embedded) in concrete may be coated according to good commercial practices. Any bolts screwed into these embedded devices shall meet 710.06.

**BUREAU OF LOCATION AND DESIGN**  
**OHIO DEPARTMENT OF TRANSPORTATION**  
**GUARDRAIL**  
**DETAILS**  
 STANDARD CONSTRUCTION DRAWING  
 APPROVED: *[Signature]* ENGR., L. & D.  
 DATE: 12-6-76  
 2-5-82  
 1-11-85  
**GR-1**

# NOTES

**POSTS** may be round (single rail only) or 6"x8" square-sawed pressure-treated wood or W6x9 galvanized steel. The same type post shall be used throughout the length of project unless otherwise required by the plans or permitted by the Engineer. Round posts shall be 8" plus or minus 1" in diameter at the top and not more than 3" larger at the butt with a uniform taper.

Posts may be set in drilled holes or may be driven to grade.

Wood posts shall be fabricated with square ends. Posts and spacer blocks shall be pressure-treated as per 710.14. Bolt holes shall be bored and tops of posts trimmed, if required, after posts are set.

**FOR DETAILS** not shown see GR-1.

**SPACER BLOCKS:** When wood spacer blocks are used with the steel post, a roofing nail shall be driven through the hole in the adjacent flange to prevent blocks from turning.

**WASHERS:** Place a rectangular plate washer between the face of rail and post bolt head or nut. All other washers indicated are standard galvanized steel of the appropriate size.

**WELDED BEAM** guardrail posts and spacer blocks may be used for Item 606, Guardrail, provided the web and flange sizes are as shown hereon. Welding of the web to the flanges shall conform to ASTM A769, Class 1 using A36 steel with the following exceptions:

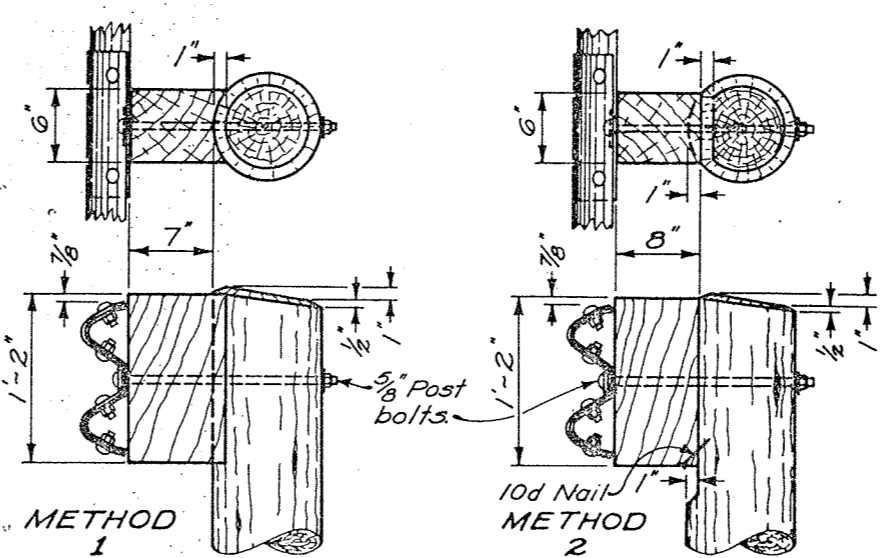
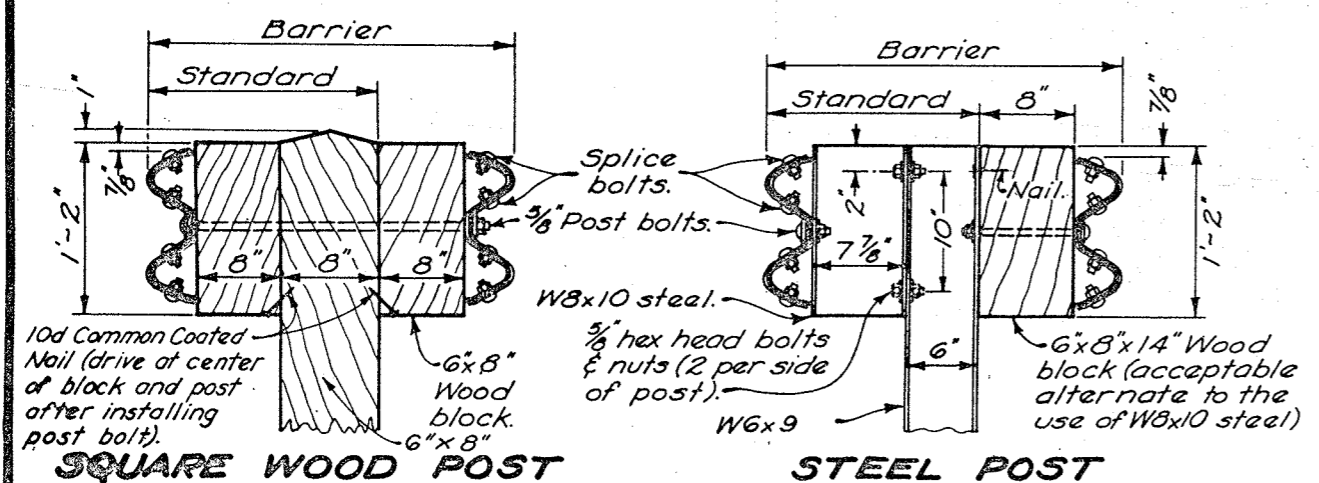
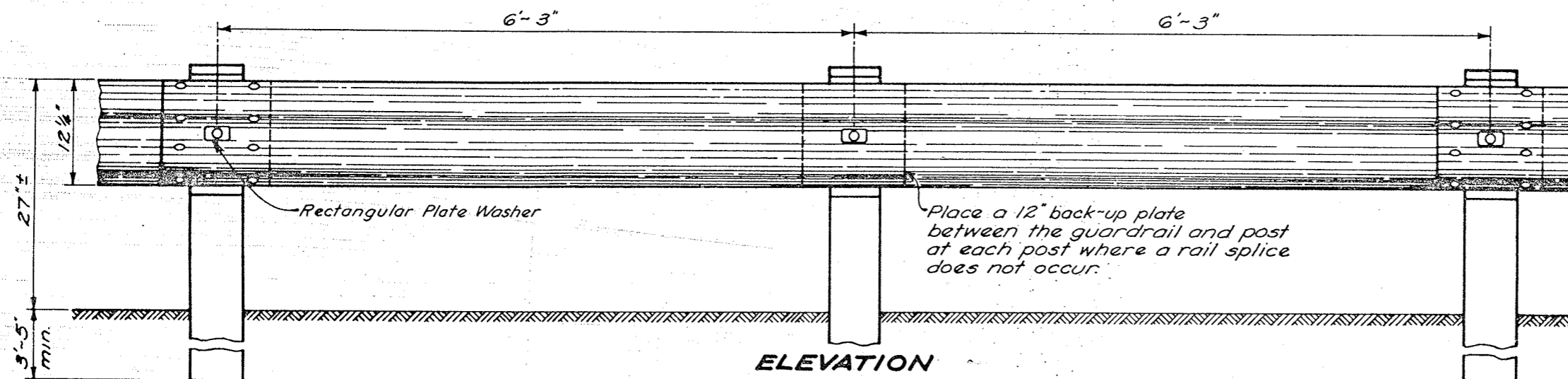
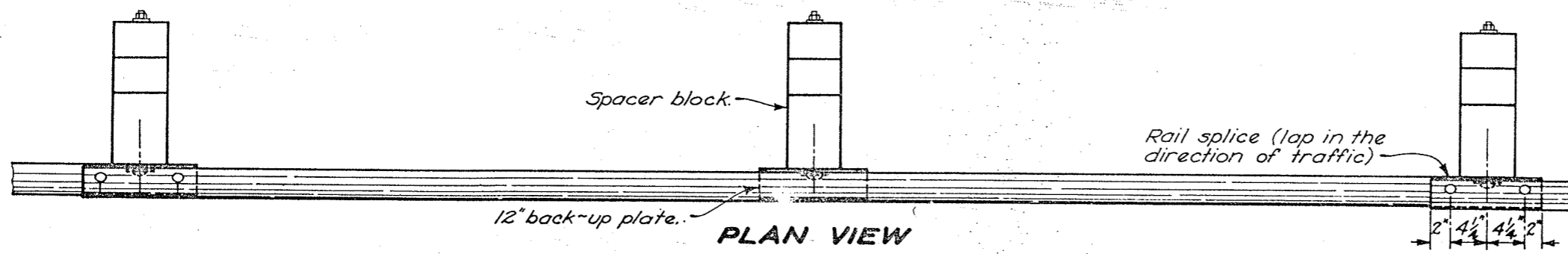
7.2 Test reports of tensile properties for each lot shall accompany each shipment.

11. Ultrasonic inspection need not be performed on welded beams used for Item 606.

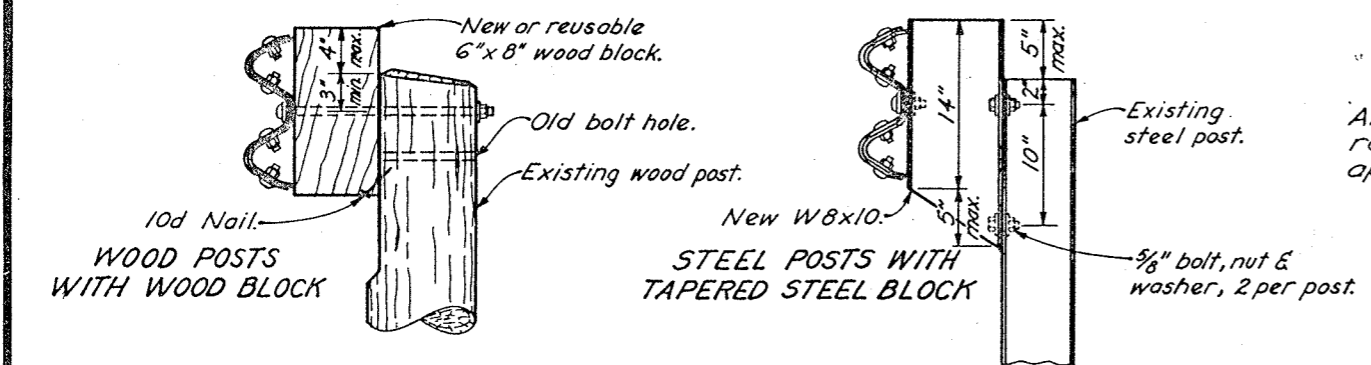
12. Beams which have imperfections repaired by welding shall not be accepted for use in Item 606.

15. Random samples shall be tested by the Department from materials delivered to the project site or other locations designated by the Laboratory.

STEEL BEAM POSTS & BLOCKS				
Size	Beam depth	Flange width	Flange thickness	Web thickness
Rolled W 6x8.5	5.83"	3.94"	.194"	.170
Rolled W 6x9	5.90"	3.94"	.215"	.170
Rolled W 8x10	7.89"	3.94"	.205"	.170
Welded 6x8.5	6.10"	3.94"	.194"	.170
Welded 6x9	6.0"	3.94"	.215"	.170
Welded 8x10	8.0"	3.94"	.205"	.170



Alternate methods of placing the spacer blocks on the round posts may be submitted for consideration and approval by the Engineer.



## RAISING EXISTING GUARDRAIL HEIGHT

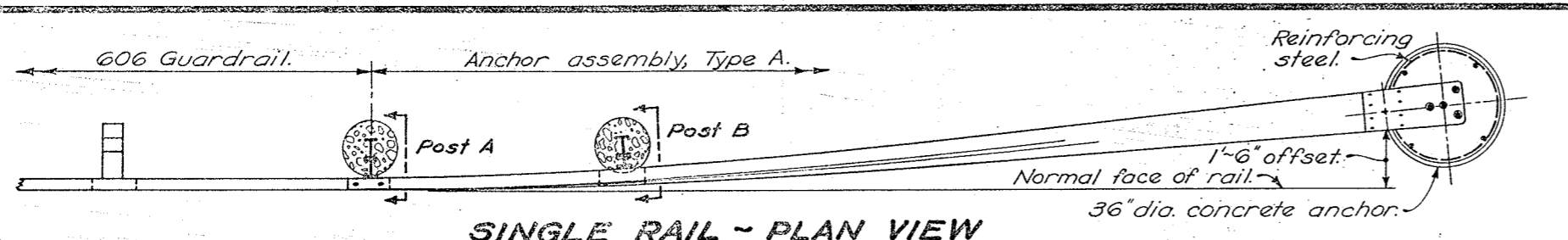
BUREAU OF LOCATION AND DESIGN  
OHIO DEPARTMENT OF TRANSPORTATION

**GUARDRAIL TYPE 5**

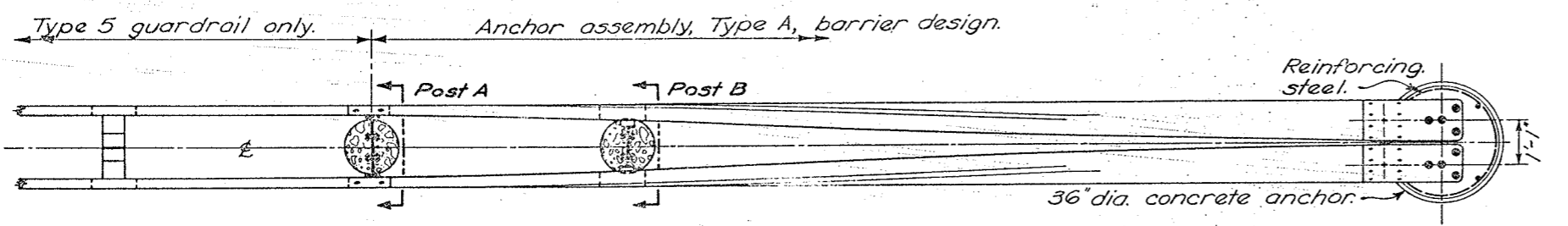
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1-1-71  
11-9-71  
12-6-76  
2-5-82

STANDARD CONSTRUCTION DRAWING GR-2B

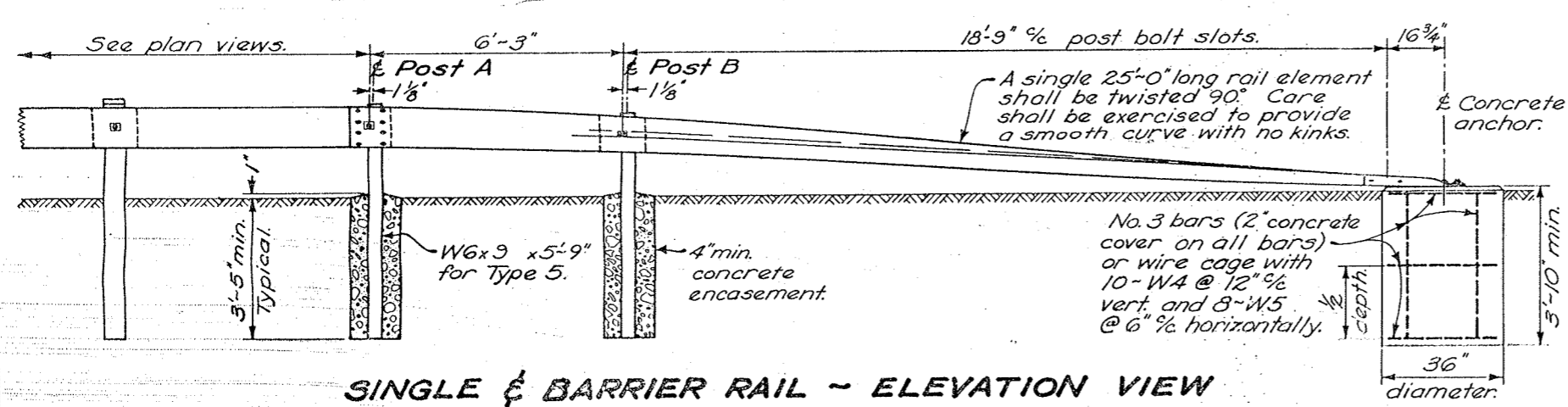
APPROVED: [Signature] ENGR, L.&D.



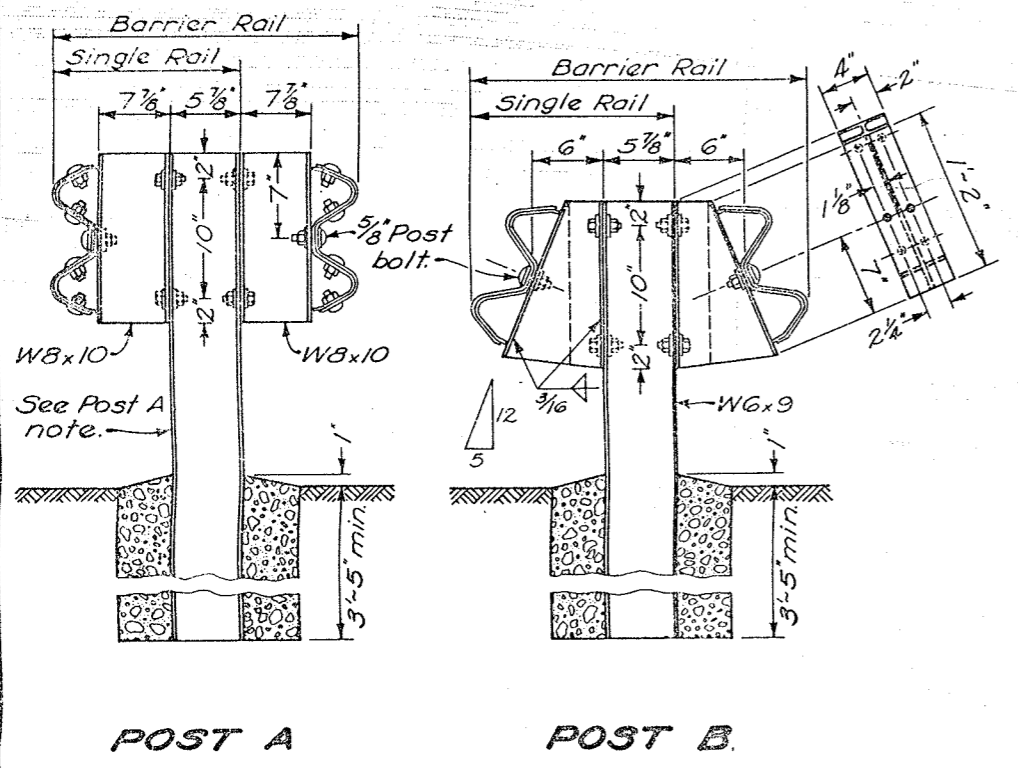
**SINGLE RAIL - PLAN VIEW**



**BARRIER RAIL - PLAN VIEW**

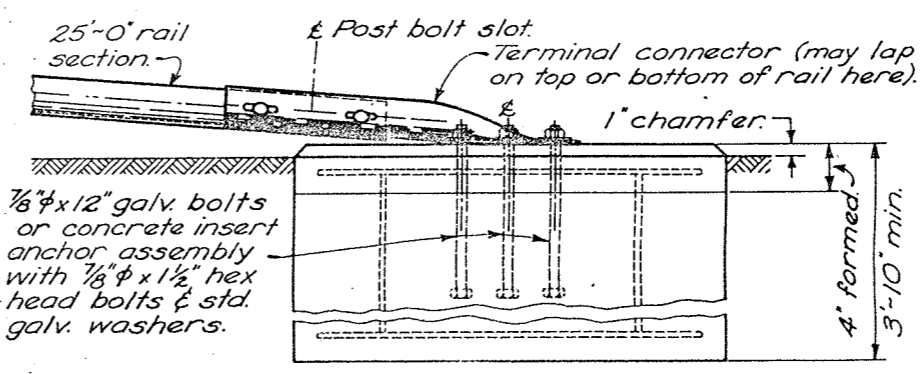


**SINGLE & BARRIER RAIL - ELEVATION VIEW**



**POST A**

**POST B**



**CONCRETE ANCHOR**

**NOTES**

**GENERAL:** For details not shown, see GR-1 and other Standard Construction Drawings pertaining to specific guardrail type. All steel parts shall be galvanized.

**ANCHOR ASSEMBLY TYPE A** can be used at each free end of Type 4, 5 or 7 guardrail or barrier rail. It is primarily an approach end.

The 1'-6" flare offset from normal face of rail, shown in the plan view (for single rail installations), will be utilized only where shoulder width is insufficient for providing standard offsets shown on GR-5 and GR-6. Use of the 1'-6" offset will generally be limited to upgrading existing highways for safety or the construction or reconstruction of highways with design traffic less than 1000 ADT or design speeds less than 50 mph.

**SPACERS** for Post B shall be made of 3/16" steel plate 710.15, or two sections of W6x9 or W8x10 cut in the web (see dashed line) and welded together on both sides.

All steel spacers and posts may be provided with additional bolt holes so that these items will not be required to be made right and left handed.

Spacers shall be fastened to their posts with two 5/8" hexhead bolts and nuts with standard washers on both sides.

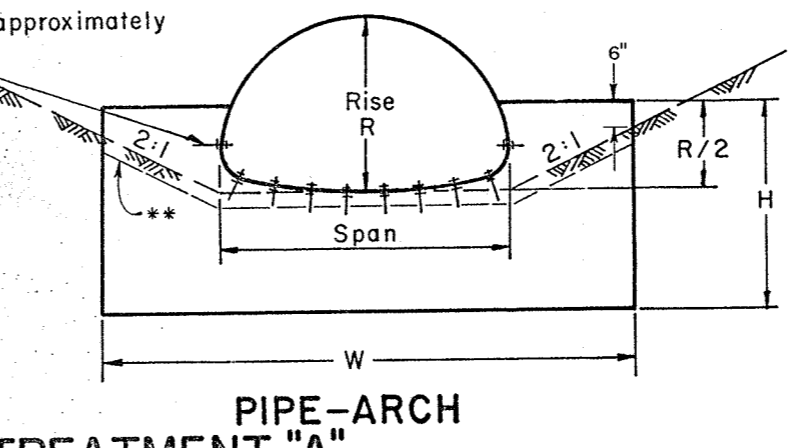
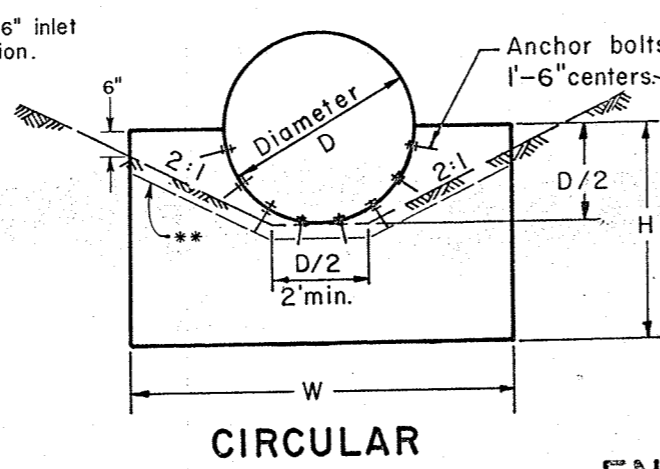
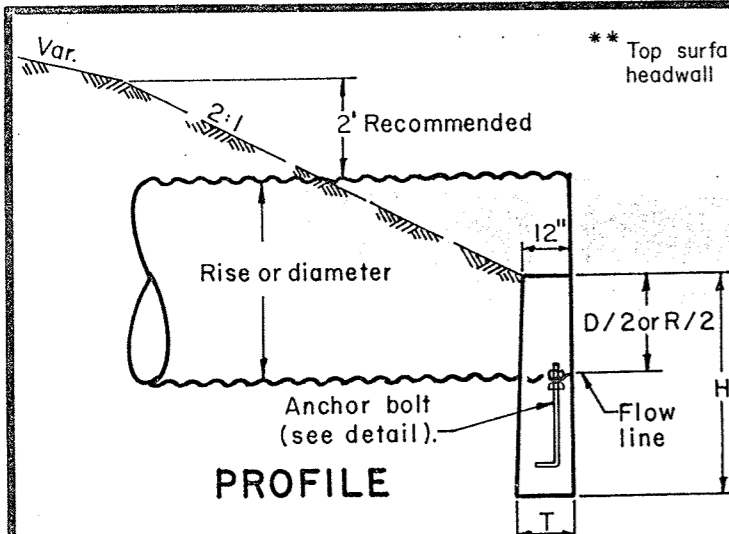
**POST BOLT WASHERS:** Place a rectangular plate washer between the face of rail and post bolt head.

All other washers indicated on this drawing are standard galvanized steel of the appropriate size.

**CONCRETE ANCHOR:** Form top 4' of anchor and slope the top to conform to slope of the adjacent ground. The 36" diameter anchor may be replaced by a 2'-6" square anchor at the contractor's option.

**POST A:** Rail details are shown for Type 5 guardrail. Where anchor assembly is attached to Type 4 or 7 guardrail, Post A shall be a standard Type 4 or 7 line post set in concrete, and the spacer block shall be omitted. Post bolt shall be 5/8" φ.

BUREAU OF LOCATION AND DESIGN OHIO DEPARTMENT OF TRANSPORTATION	
<b>TYPE A ANCHOR ASSEMBLY</b>	
STANDARD CONSTRUCTION DRAWING	<b>GR-4</b>
APPROVED _____	ENGR., L&D.
DATE 1-1-71 11-9-71 12-6-76 2-5-82	



END TREATMENT "A"

HEADWALL FOR CORRUGATED METAL PIPE																
CIRCULAR					PIPE ARCH					PIPE ARCH						
D	W	H	T	CONCRETE CU. YDS.	SPAN	RISE	W	H	T	CONCRETE CU. YDS.	SPAN	RISE	W	H	T	CONCRETE CU. YDS.
2 2/3" x 1/2" Corrugations																
12"	2'-0"	3'-0"	12"	.21			3'-0"	3'-0"	12"	.31	87"	63"	13'-0"	5'-7"	17"	2.50
15"	2'-6"	3'-2"	12"	.27	17"	13"	3'-0"	3'-0"	12"	.35	95"	67"	14'-0"	5'-9"	20"	3.14
18"	3'-0"	3'-3"	12"	.33	21"	15"	3'-6"	3'-0"	12"	.43	103"	71"	15'-0"	5'-11"	22"	3.54
21"	3'-6"	3'-4"	12"	.39	24"	18"	4'-0"	3'-2"	12"	.48	112"	75"	16'-0"	6'-1"	24"	3.96
24"	4'-0"	3'-6"	12"	.46	28"	20"	4'-6"	3'-3"	12"	.61	117"	79"	17'-9"	6'-3"	25"	4.89
27"	4'-6"	3'-8"	12"	.53	35"	24"	5'-6"	3'-5"	12"	.73	128"	83"	18'-0"	6'-5"	26"	5.01
30"	5'-0"	3'-9"	12"	.60	42"	29"	6'-6"	3'-7"	12"	.90	137"	87"	19'-0"	6'-7"	27"	5.45
33"	5'-6"	3'-10"	12"	.68	49"	33"	7'-8"	3'-9"	12"	1.10	142"	91"	20'-9"	6'-9"	27"	6.31
6" x 2" Corrugations (18" Corner Radius)																
36"	6'-0"	4'-0"	12"	.76	57"	38"	9'-0"	4'-0"	12"	1.31	*6'-1"	4'-7"	11'-8"	5'-7"	12"	1.89
39"	6'-6"	4'-2"	12"	.84	64"	43"	10'-0"	4'-4"	12"	1.54	*6'-4"	4'-9"	12'-0"	5'-8"	14"	2.12
42"	7'-0"	4'-3"	12"	.92	71"	47"	11'-0"	4'-8"	12"	1.84	*6'-9"	4'-11"	12'-4"	5'-9"	15"	2.42
48"	8'-0"	4'-6"	12"	1.10	*77"	52"	11'-8"	5'-3"	12"	2.46	*7'-0"	5'-1"	12'-8"	5'-10"	16"	2.44
54"	9'-3"	4'-9"	12"	1.33	*83"	57"	12'-4"	5'-5"	15"							
6" x 2" Corrugations (31" Corner Radius)																
60"	10'-6"	5'-6"	12"	1.78	13'-3"	9'-4"	23'-11"	7'-11"	32"	9.63	7'-8"	5'-5"	13'-2"	6'-0"	18"	2.77
66"	11'-9"	5'-9"	12"	2.06	13'-6"	9'-6"	24'-9"	8'-0"	32"	10.12	7'-11"	5'-7"	14'-0"	6'-1"	20"	3.15
72"	13'-0"	6'-0"	12"	2.37	14'-0"	9'-8"	24'-10"	8'-1"	33"	10.33	8'-2"	5'-9"	14'-8"	6'-2"	21"	3.45
78"	14'-3"	6'-3"	14"	2.94	14'-2"	9'-10"	25'-9"	8'-2"	33"	10.87	8'-7"	5'-11"	15'-0"	6'-3"	22"	3.75
84"	15'-6"	6'-6"	14"	3.30	14'-5"	10'-0"	26'-7"	8'-3"	33"	11.39	8'-10"	6'-1"	15'-10"	6'-4"	23"	4.15
90"	16'-9"	6'-9"	16"	4.00	14'-11"	10'-2"	26'-9"	8'-4"	34"	11.68	9'-4"	6'-3"	16'-0"	6'-5"	24"	4.65
96"	18'-0"	7'-0"	16"	4.40	15'-4"	10'-4"	26'-11"	8'-5"	34"	11.96	9'-6"	6'-5"	16'-10"	6'-6"	26"	4.93
102"	19'-3"	7'-3"	18"	5.28	15'-7"	10'-6"	27'-9"	8'-6"	34"	12.51	9'-9"	6'-7"	17'-9"	6'-7"	27"	5.41
108"	20'-6"	7'-6"	20"	6.21	15'-10"	10'-8"	28'-7"	8'-7"	35"	13.06	10'-3"	6'-9"	17'-10"	6'-8"	27"	5.45
114"	21'-9"	7'-9"	22"	7.25	16'-3"	10'-10"	28'-8"	8'-8"	35"	13.34	10'-8"	6'-11"	17'-11"	6'-9"	27"	5.59
120"	23'-0"	8'-0"	24"	8.38	16'-6"	11'-0"	29'-7"	8'-9"	35"	13.94	10'-11"	7'-1"	18'-10"	6'-10"	28"	5.97
*126"	23'-0"	8'-3"	26"	8.64	16'-6"	11'-0"	29'-7"	8'-9"	35"	13.94	10'-11"	7'-1"	18'-10"	6'-10"	28"	5.97
132"	23'-0"	8'-6"	28"	9.23	17'-0"	11'-2"	29'-8"	8'-10"	36"	14.24	11'-5"	7'-3"	18'-11"	6'-11"	28"	6.12
138"	24'-1"	8'-9"	30"	10.50	17'-2"	11'-4"	30'-7"	8'-11"	36"	14.84	11'-7"	7'-5"	19'-9"	7'-0"	28"	6.52
144"	25'-2"	9'-0"	32"	11.89	17'-5"	11'-6"	31'-5"	9'-0"	36"	15.42	11'-10"	7'-7"	20'-9"	7'-1"	29"	6.94
150"	26'-4"	9'-3"	34"	13.38	17'-11"	11'-8"	31'-7"	9'-1"	37"	15.83	12'-4"	7'-9"	20'-10"	7'-2"	29"	7.12
156"	27'-5"	9'-6"	36"	15.01	18'-1"	11'-10"	32'-5"	9'-2"	37"	16.43	12'-6"	7'-11"	21'-8"	7'-3"	29"	7.53
162"	28'-7"	9'-9"	38"	16.75	18'-7"	12'-0"	32'-6"	9'-3"	37"	16.78	12'-8"	8'-1"	22'-7"	7'-4"	30"	7.95
168"	29'-8"	10'-0"	40"	18.61	18'-9"	12'-2"	33'-4"	9'-4"	38"	17.43	12'-10"	8'-4"	23'-7"	7'-5"	30"	8.48
174"	30'-9"	10'-3"	42"	20.28	19'-3"	12'-4"	33'-5"	9'-5"	38"	17.78	13'-5"	8'-5"	23'-7"	7'-6"	30"	8.63
180"	31'-11"	10'-6"	43"	21.87	19'-6"	12'-6"	34'-5"	9'-6"	38"	18.49	13'-11"	8'-7"	23'-7"	7'-7"	31"	8.81
186"	33'-0"	10'-9"	44"	23.54	19'-8"	12'-8"	35'-3"	9'-7"	39"	19.19	14'-1"	8'-9"	25'-1"	7'-8"	31"	9.29
192"	34'-2"	11'-0"	45"	25.30	19'-11"	12'-10"	36'-3"	9'-8"	39"	19.95	14'-3"	8'-11"	25'-6"	7'-9"	31"	9.78
198"	35'-3"	11'-3"	46"	27.12	20'-5"	13'-0"	36'-3"	9'-9"	39"	20.30	14'-10"	9'-1"	25'-6"	7'-10"	32"	10.25
204"	36'-4"	11'-6"	47"	29.15	20'-7"	13'-2"	37'-2"	9'-10"	40"	21.05	15'-4"	9'-3"	25'-6"	7'-11"	32"	10.25
210"	37'-6"	11'-9"	48"	31.03							15'-6"	9'-5"	26'-5"	8'-0"	32"	10.74
3" x 1" Corrugations																
216"	38'-7"	12'-0"	49"	33.43	40"	31"	6'-6"	3'-7"	12"	0.70	15'-8"	9'-7"	27'-5"	8'-1"	33"	11.28
222"	39'-9"	12'-3"	50"	36.26	46"	36"	7'-8"	3'-9"	12"	0.85	15'-10"	9'-10"	28'-5"	8'-2"	33"	12.00
228"	40'-10"	12'-6"	51"	37.52	53"	41"	9'-0"	4'-0"	12"	1.06	16'-5"	9'-11"	28'-5"	8'-3"	33"	12.09
234"	42'-0"	12'-9"	52"	39.86	60"	46"	10'-0"	4'-4"	12"	1.27	16'-7"	10'-1"	29'-4"	8'-4"	34"	12.64
240"	43'-1"	13'-0"	53"	42.28	66"	51"	11'-0"	4'-8"	12"	1.54						
246"	44'-2"	13'-3"	54"	44.83	*73"	55"	11'-8"	5'-3"	12"	1.81						
252"	45'-4"	13'-6"	55"	47.44	*81"	59"	12'-4"	5'-5"	15"	2.14						

NOTES

CONCRETE for headwalls shall be Class C.

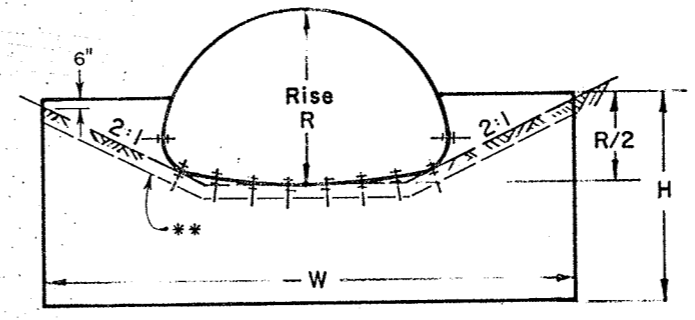
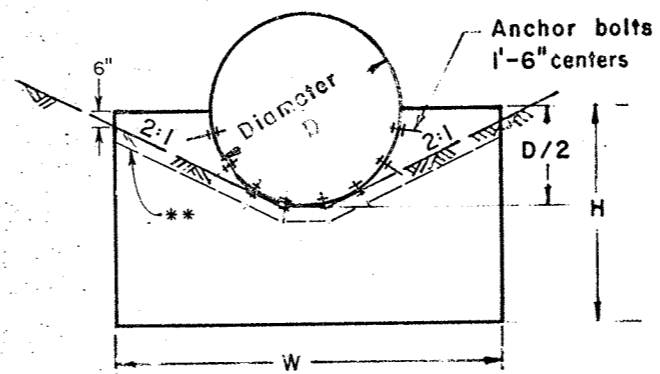
ANCHOR BOLTS (as detailed) for anchoring both ends of metal pipes shall meet ASTM A307. The top 6" min. of bolt shall be galvanized according to ASTM A153. Cost of anchors shall be included in the unit price bid per linear foot of 603 Conduit. Unless otherwise specified, anchor bolts shall be used only on pipes with span or rise greater than 24 inches.

Concrete quantities are based on headwalls without the 6" extension shown under the channel protection detail.

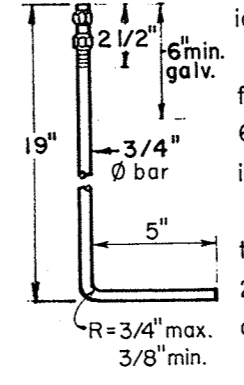
Headwall dimensions are based on end treatment "A" for pipe sizes up to and including 120", 71"x47" and 66"x51" and on end treatment "B" for sizes over and including 132", 13'-3"x9'-4", 87"x63", and 7'-3"x5'-3".

\* Channel configuration for pipe sizes between end treatment "A" and end treatment "B" is determined by 2:1 slopes passing through a point 6" below the top and at each side of the headwall.

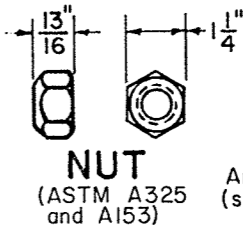
For end treatment "B" 2:1 slopes are tangent to pipe.



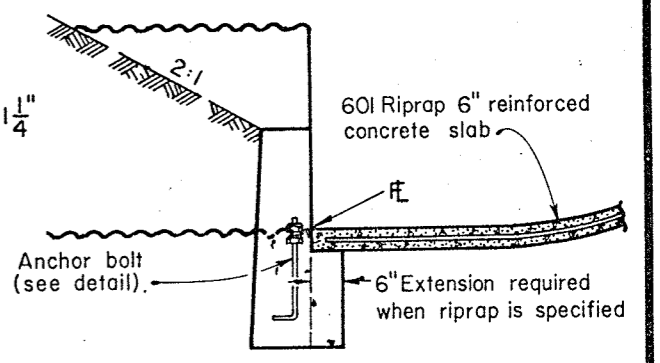
END TREATMENT "B"



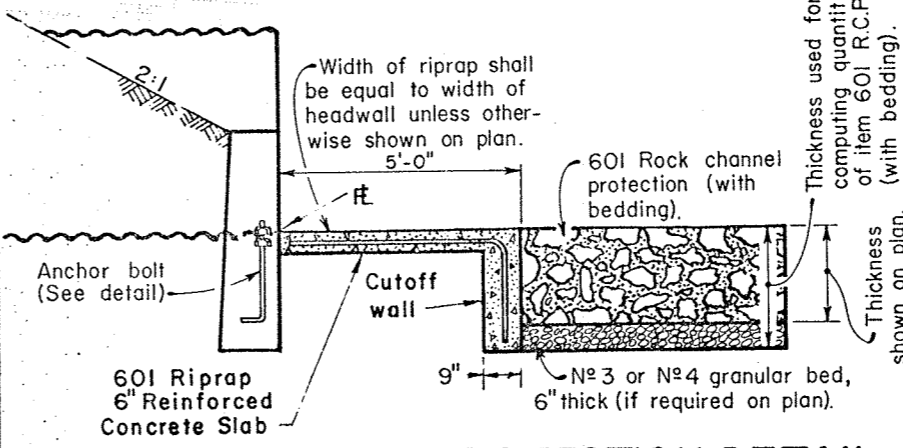
ANCHOR BOLT



NUT (ASTM A325 and A153)



INLET CHANNEL PROTECTION DETAIL



OUTLET CHANNEL PROTECTION DETAIL

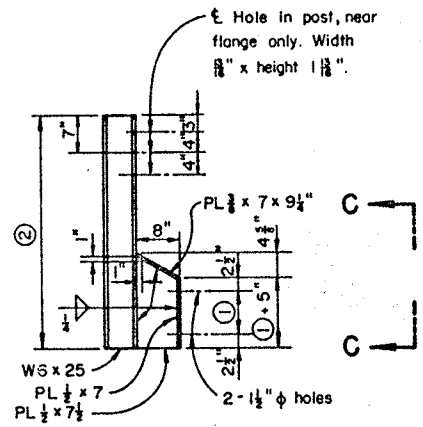
BUREAU OF LOCATION AND DESIGN  
OHIO DEPARTMENT OF TRANSPORTATION

CORRUGATED METAL PIPE HEADWALLS

STANDARD CONSTRUCTION DRAWING HW-4A

APPROVED *L. D. Cunningham* ENGR., L. & D.

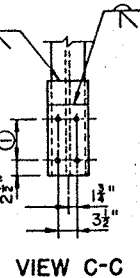
DATE 4-1-80



Dimension ① is 6" or 8" depending on box beam depth. See project plans and POST ANCHORAGE DETAILS, PRESTRESSED CONCRETE BOX BEAMS. For Dimension ② see project plans.

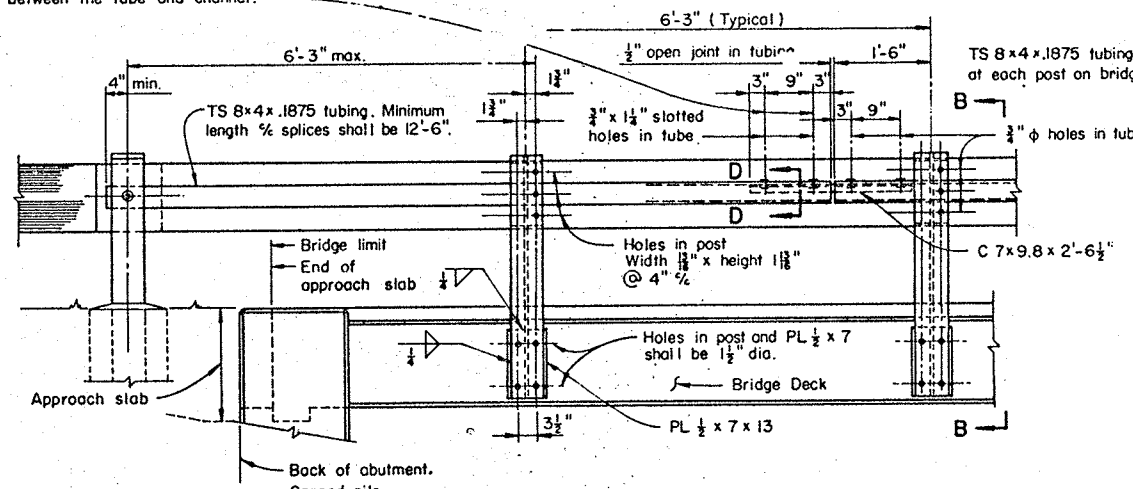
**SECTION B-B  
TYPE 2 POST**

(For use with prestressed concrete box beams)

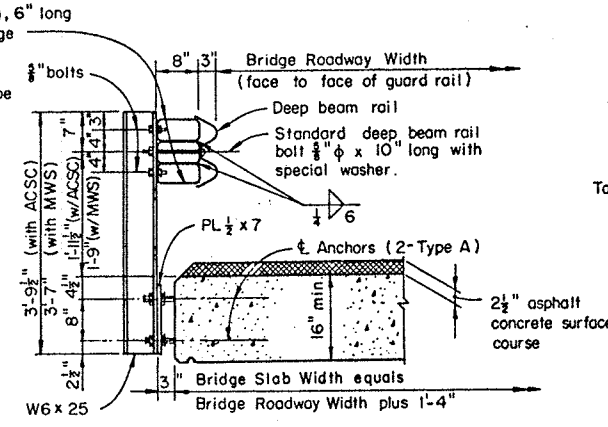


**VIEW C-C**

Bolts in slotted holes shall not be drawn up so tight as to prevent sliding between the tube and channel.

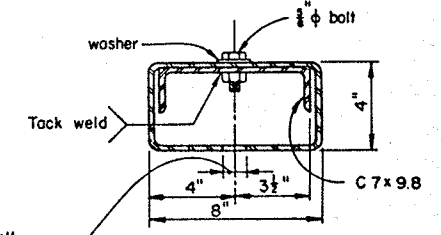


**RAILING ELEVATION  
(Type I posts shown)**



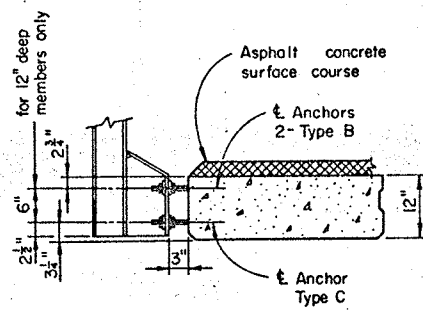
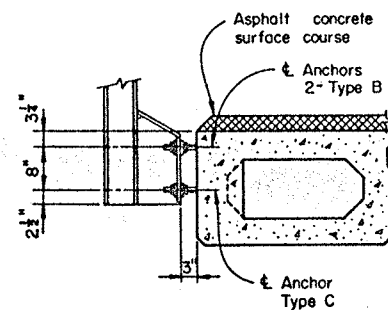
**SECTION B-B  
TYPE I POST**

ACSC indicates Asphalt Concrete Surface Course. MWS indicates Monolithic Wearing Surface.

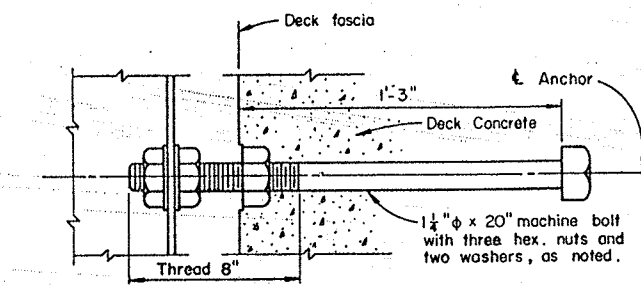


**SECTION D-D**

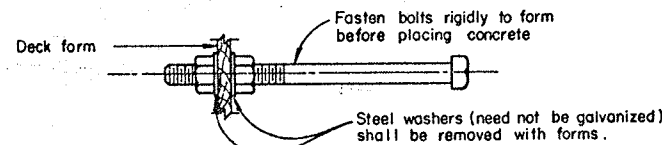
1" phi drain hole (only in tube at lowest point when sag vertical curves are encountered). Location to be shown on project plans.



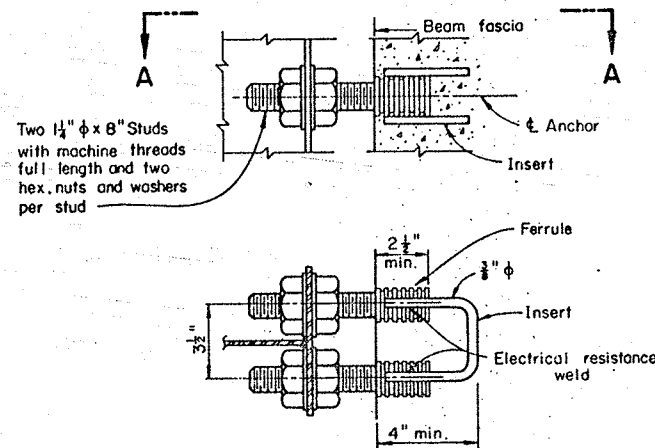
**POST ANCHORAGE DETAILS  
PRESTRESSED CONCRETE BOX BEAMS**



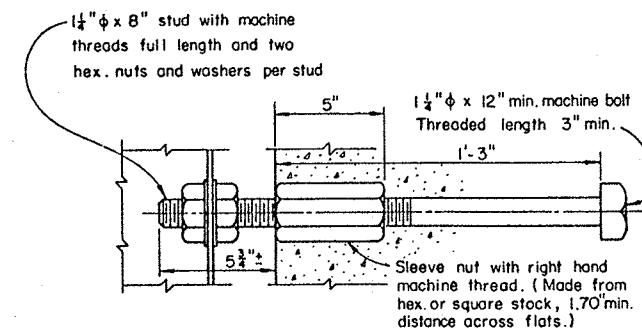
**TYPE A ANCHOR DETAIL**



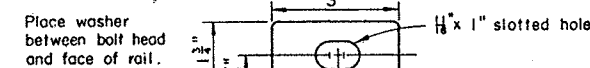
**TYPE A ANCHORS SUPPORTED BY FORMS**



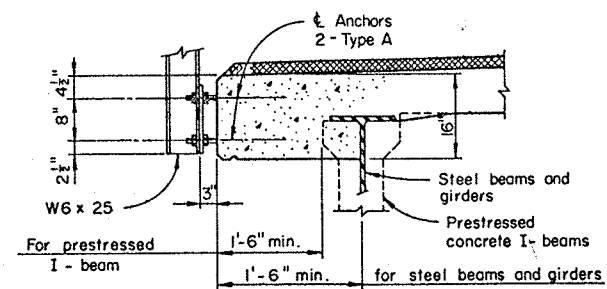
**SECTION A-A  
TYPE C ANCHOR DETAIL**



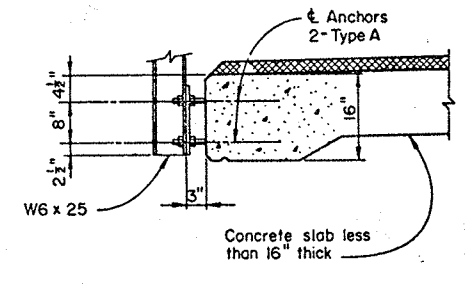
**TYPE B ANCHOR DETAIL**



**SPECIAL WASHER**



**LONGITUDINAL BEAM BRIDGES**



**CONCRETE SLABS**

**POST ANCHORAGE DETAILS  
(Not for use with prestressed concrete box beams)**

**MATERIAL:** All anchor bolts, nuts and studs shall conform to the physical properties of ASTM-A325 except that the minimum elongation shall be 10%. The chemical properties are waived.

**GALVANIZING:** All guard rail posts, tubes, hardware and accessories shall be galvanized in accordance with ASTM A123 or ASTM A153, except as otherwise noted.

**TYPE C ANCHOR INSERTS** of a different type may be provided if approved by the Director.

REVISIONS		STATE OF OHIO DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS BUREAU OF BRIDGES	
		STANDARD	
		DEEP BEAM BRIDGE GUARD RAIL WITH TUBULAR BACKUP	
APPROVED:		DRAWING NO.	
DATE: 4/10/73		DBR-2-73	
PREPARED	TRACED	CHECKED	REVIEWED
INNES	TGC	CPD	BFG FHR MFW