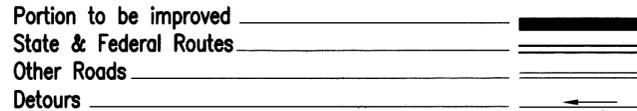
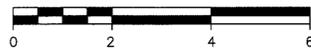


**LOCATION MAP**

LATITUDE = 40°-11'-10"N  
 LONGITUDE = 80°-41'-10"W

SCALE IN KILOMETERS



STATE OF OHIO  
 DEPARTMENT OF TRANSPORTATION  
**JEF-150-20.808**

WARREN TOWNSHIP  
 VILLAGE OF RAYLAND  
 JEFFERSON COUNTY

INDEX OF SHEETS

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Cross Sections	8-10
Structure	11-19



PROJECT DESCRIPTION

This project will replace the existing deficient three (3) span prestressed concrete box beam structure over Short Creek with a three (3) span steel beam structure with minimal roadway work. The project length is 72 meters.

1997 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 Sheet 5.

DESIGN DESIGNATION

Current ADT (1999)	2132
Design Year ADT (2019)	2988
DHV	299
D	55%
T	9%
Design Speed	90 kph
Legal Speed	55 mph (89 kph)
Functional Classification	Rural Collector

DESIGN EXCEPTIONS:

None Required

**UNDERGROUND UTILITIES**

TWO WORKING DAYS  
**BEFORE YOU DIG**  
 Call...800-362-2764 (Toll free)  
 OHIO UTILITIES PROTECTION SERVICE

NON-MEMBERS  
 MUST BE CALLED DIRECTLY

PLANS PREPARED BY  
**BARR ENGINEERING, INC.**

8748 BRECKSVILLE ROAD, SUITE 214  
 BRECKSVILLE, OHIO 44141  
 TEL. 440-526-6455 FAX 440-526-6457

*Engineers Seal*

Signed: *Thomas J. Powell*  
 Date: *June 4, 1999*

SUPPLEMENTAL PRINTS OF STANDARD CONSTRUCTION DRAWINGS						SUPPLEMENTAL SPECIFICATIONS			
BP-3.1M	10/28/94	RM-4.3M	10/21/97	TC-65.10M	11/01/95	AS-1-81M	10/25/94	806	09/09/97
		RM-4.5M	10/21/97	MT-101.60M	04/25/94	BR-1M	01/06/99	844	01/06/99
GR-1.1M	10/21/97					GSD-1-96M	11/21/97	863	09/09/97
GR-1.2M	01/03/96	DM-4.3	04/29/99			ICD-1-82M	03/20/95	877	04/13/99
GR-1.3M	11/30/94	DM-4.4	04/29/99			CPP-2-94M	12/19/94	905	04/01/98
GR-2.1M	04/14/98					DS-1-94M	12/15/94	907	10/21/98
GR-3.1M	10/21/97							954	09/09/97
GR-3.3M	10/21/97					TST-I-99	07/06/99		
GR-4.1M	11/30/94								
GR-4.3M	10/21/97								
GR-4.4M	11/30/94								
GR-5.1M	04/21/95								
RM-1.1	04/28/99								

SPECIAL PROVISIONS  
 WATERWAY PERMITS  
 NWP # 3 MAINTENANCE  
 NWP # 14 ROAD CROSSINGS  
 2/3/99

Approved: *Michael D. Bove*  
 Date: *7/6/99* District Deputy Director of Transportation

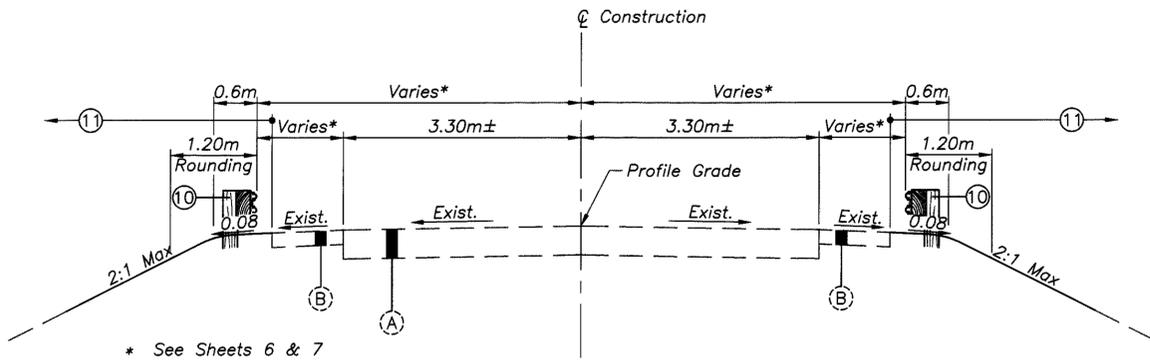
Approved: *Jordan Proctor, Jr.*  
 Date: *9-9-99* Director, Department of Transportation

JEF - SR 150 - 20.808  
 990762  
 PID#13589

12/15/99  
 DIST 11

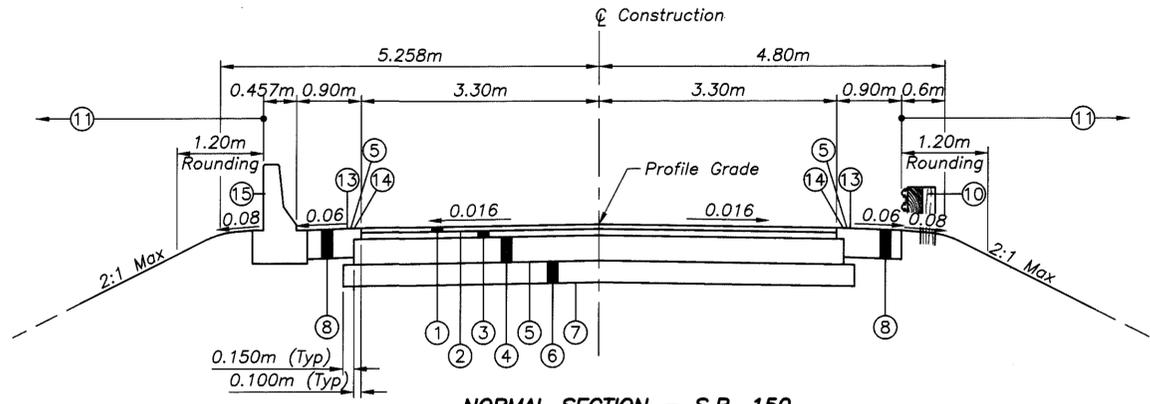
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 XREF#2 = NONE  
 PLOT SCALE = 1"=1'  
 CAD: JEF150.DWG ROADWAY.GT.DWG JUNE-04-1999

FEDERAL PROJECT NO. JEF-150-20.808 (32)  
 CONSTRUCTION PROJECT NO. 13589  
 RAILROAD INVOLVEMENT NONE  
 JEF-150-20.808  
 1/19



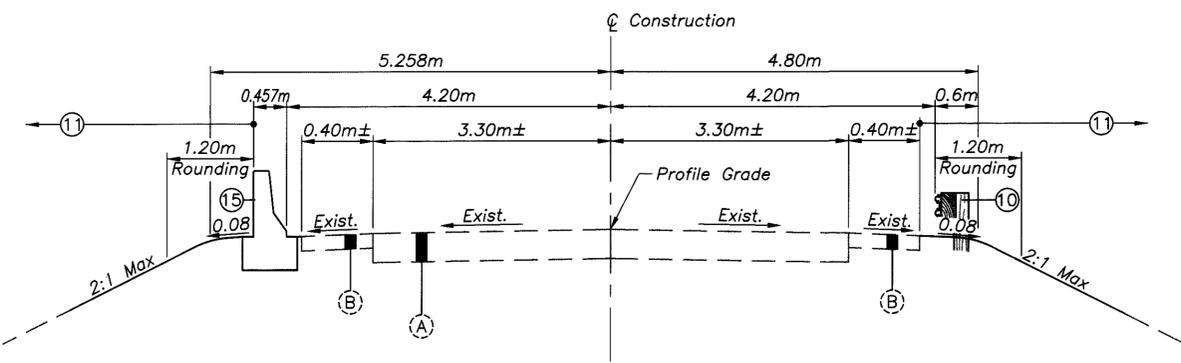
**GUARDRAIL SECTION - S.R. 150**

Section Applies:  
 Sta. 20+765.892 to Sta. 20+795.600 = 29.708m  
 Sta. 20+884.190 to Sta. 20+967.238 = 83.048m  
 Total Length = 112.756m



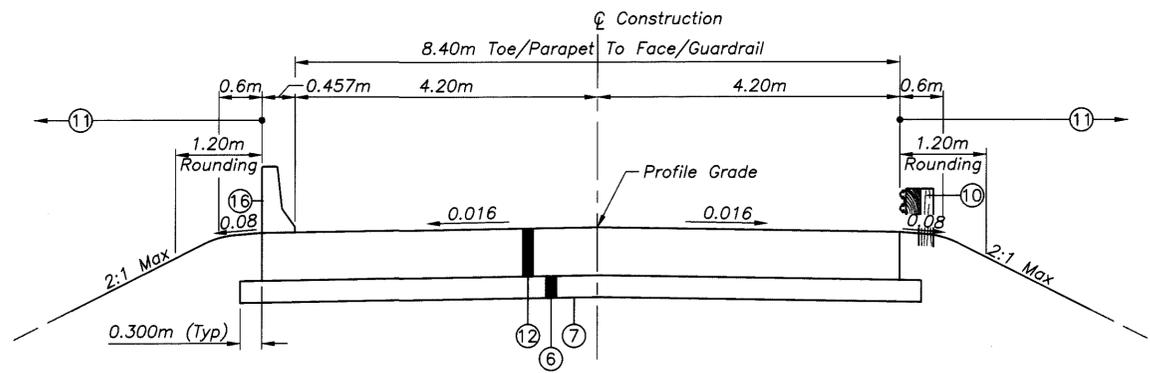
**NORMAL SECTION - S.R. 150**

Section Applies:  
 Sta. 20+808.000 to Sta. 20+813.350 = 5.350m  
 Sta. 20+866.440 to Sta. 20+880.000 = 13.560m  
 Total Length = 18.910m



**CONCRETE BARRIER / GUARDRAIL SECTION - S.R. 150**

Section Applies:  
 Sta. 20+795.600 to Sta. 20+808.000 = 12.400m  
 Sta. 20+880.000 to Sta. 20+884.190 = 4.190m  
 Total Length = 16.590m

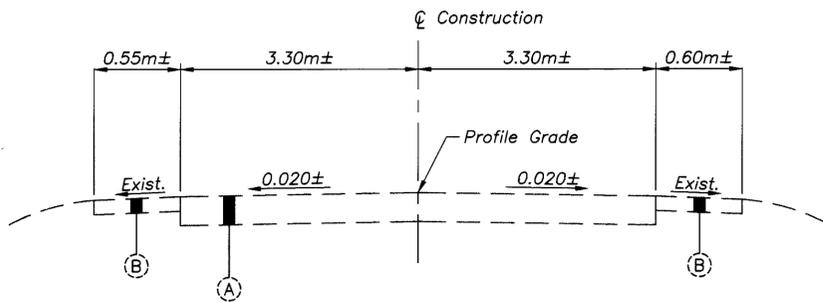


**APPROACH SLAB TYPICAL SECTION - S.R. 150**

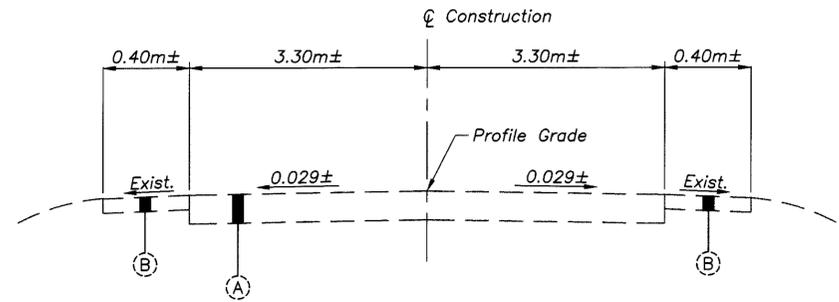
Section Applies:  
 Sta. 20+813.350 to Sta. 20+817.950 = 4.600m  
 Sta. 20+861.840 to Sta. 20+866.440 = 4.600m  
 Total Length = 9.200m

**Legend**

- ① Item 448 - 32mm Asphalt Concrete Surface Course, Type 1, PG 64-22, As Per Plan
- ② Item 407 - Tack Coat for Intermediate Course (See General Note)
- ③ Item 448 - 45mm Asphalt Concrete Intermediate Course, Type 2, PG 64-22
- ④ Item 301 - 175mm Bituminous Aggregate Base, PG 64-22
- ⑤ Item 408 - Bituminous Prime Coat (Applied @ 1.8 Liters/Square Meter)
- ⑥ Item 304 - 150mm Aggregate Base
- ⑦ Item 203 - Subgrade Compaction
- ⑧ Item 304 - 200mm Aggregate Base
- ⑨ Not Used
- ⑩ Item 606 - Guardrail, Type 5
- ⑪ Item 659 - Seeding and Mulching
- ⑫ Item 611 - Reinforced Concrete Approach Slab, As Per Plan (T = 305mm)
- ⑬ Item 409 - Seal Coat Bituminous Material (Applied @ 1.35 Liters/Square Meter)
- ⑭ Item 409 - Seal Coat Cover Aggregate No. 8 (Applied @ 0.008 Cubic Meters/Square Meter)
- ⑮ Item 622 - Concrete Barrier, Type D
- ⑯ Item 844 - High Performance Concrete Superstructure (Parapet) (See Structure Plans for Quantities & Details)
- (A) Existing Asphalt Pavement
- (B) Existing Aggregate Shoulder



**EXISTING PAVEMENT SECTION - S.R. 150  
 Sta. 20+808.000**



**EXISTING PAVEMENT SECTION - S.R. 150  
 Sta. 20+880.000**

PLOTTED NEW = PLAN  
 XREF#1 = NONE  
 XREF#2 = NONE  
 PLOT SCALE = 1"=1'  
 CAD: F:\JEF150.DWG:ROADWAY.GXDWG APRIL-28-1999

TYPICAL SECTIONS

JEF-150-20.808

ROUNDING

THE ROUNDING AT SLOPE BREAKPOINTS SHOWN ON THE TYPICAL SECTIONS APPLIES TO ALL CROSS-SECTIONS EVEN THOUGH SHOWN OTHERWISE.

UTILITIES

LISTED BELOW ARE ALL UTILITIES LOCATED WITHIN THE PROJECT CONSTRUCTION LIMITS TOGETHER WITH THEIR RESPECTIVE OWNERS:

AT&T RD 1 BOX 33 SYCAMORE, PA 15364 (724) 627-8122	COLUMBIA GAS OF OHIO, INC. 157 EAST MAIN STREET ST. CLAIRSVILLE, OH 43950 (740) 695-0502
WHEELING-PITTSBURGH STEEL ADMINISTRATIVE OFFICES 1134 MARKET STREET WHEELING, WV 26003 (304) 234-2400	AEP OHIO POWER COMPANY P.O. BOX 520 ST. EUBENVILLE, OH 43952 (740) 266-6280

THE LOCATION OF THE UNDERGROUND UTILITIES SHOWN ON THE PLANS ARE AS OBTAINED FROM THE OWNERS AS REQUIRED BY SECTION 153.64 O.R.C.

CONTINGENCY QUANTITIES

THE CONTRACTOR SHALL NOT ORDER MATERIALS OR PERFORM WORK FOR ITEMS DESIGNATED BY PLAN NOTE TO BE USED "AS DIRECTED BY THE ENGINEER" UNLESS AUTHORIZED BY THE ENGINEER. THE ACTUAL WORK LOCATIONS AND QUANTITIES USED FOR SUCH ITEMS SHALL BE INCORPORATED INTO THE FINAL CHANGE ORDER GOVERNING COMPLETION OF THIS PROJECT.

ELEVATION DATUM

ALL ELEVATIONS ARE BASED ON U.S.G.S. DATUM NAVD 1988.

WORK LIMITS

THE WORK LIMITS SHOWN ON THESE PLANS ARE FOR PHYSICAL CONSTRUCTION ONLY. THE INSTALLATION AND OPERATION OF ALL TEMPORARY TRAFFIC CONTROL AND TEMPORARY TRAFFIC CONTROL DEVICES REQUIRED BY THESE PLANS SHALL BE PROVIDED BY THE CONTRACTOR WHETHER INSIDE OR OUTSIDE THESE WORK LIMITS.

CLEARING AND GRUBBING

ALTHOUGH THERE ARE NO TREES OR STUMPS SPECIFICALLY MARKED FOR REMOVAL WITHIN THE LIMITS OF THE PROJECT, A LUMP SUM QUANTITY HAS BEEN INCLUDED IN THE GENERAL SUMMARY FOR ITEM 201, CLEARING AND GRUBBING. ALL PROVISIONS AS SET FORTH IN THE SPECIFICATIONS UNDER THIS ITEM SHALL BE INCLUDED IN THE LUMP SUM PRICE BID FOR ITEM 201, CLEARING AND GRUBBING.

CONNECTION BETWEEN EXISTING AND PROPOSED GUARDRAIL

WHEN IT IS NECESSARY TO SPLICE PROPOSED GUARDRAIL TO EXISTING GUARDRAIL, ONLY THE EXISTING GUARDRAIL SHALL BE CUT, DRILLED, OR PUNCHED. THE CONNECTION SHALL BE MADE USING A "W-BEAM RAIL SPLICE" AS SHOWN IN AASHTO M 180. PAYMENT SHALL BE INCLUDED IN THE CONTRACT PRICE FOR THE RESPECTIVE GUARDRAIL ITEMS.

ITEM 659 - SEEDING AND MULCHING

SEEDING AND MULCHING SHALL BE APPLIED TO ALL AREAS OF EXPOSED SOIL BETWEEN THE RIGHT-OF-WAY LINES, AND WITHIN THE CONSTRUCTION LIMITS FOR AREAS OUTSIDE THE RIGHT-OF-WAY LINES COVERED BY WORK AGREEMENT OR SLOPE EASEMENT. QUANTITY CALCULATIONS FOR ITEM 659, SEEDING AND MULCHING, ARE BASED ON THESE LIMITS.

WATERING PERMANENT SEEDED AREAS

THE FOLLOWING ESTIMATED QUANTITY IS TO BE USED AS DIRECTED BY THE ENGINEER TO PROMOTE GROWTH AND TO CARE FOR PERMANENT SEEDED AREAS PER 659.09:  
659, WATER, 6 CU. METER

ITEM 407 - TACK COAT FOR INTERMEDIATE COURSE

THE RATE OF APPLICATION OF THE 407 TACK COAT SHALL BE SUBJECT TO ADJUSTMENT AS DIRECTED BY THE ENGINEER. FOR ESTIMATING PURPOSES ONLY, THE PLAN QUANTITIES INDICATE AN AVERAGE APPLICATION RATE OF 0.34 LITER PER SQ. METER.

ITEM 611 - REINFORCED CONCRETE APPROACH SLAB (T=305mm), AS PER PLAN

THE REINFORCING STEEL FOR THE APPROACH SLABS OF THIS STRUCTURE SHALL BE EPOXY COATED IN CONFORMANCE WITH 509.

THE APPROACH SLAB SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE DETAILS AS SHOWN ON THE STRUCTURE PLANS INCLUDING THE PARAPET.

MATERIALS, PARAPET, LABOR AND INSTALLATION SHALL BE INCLUDED WITH THE APPROACH SLABS FOR PAYMENT.

STREAM CHANNEL EXCAVATION

THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PREVENT ANY INCIDENTAL DISCHARGES ASSOCIATED WITH THE EXCAVATION AND HAULING OF MATERIAL FROM THE STREAM CHANNEL. THIS PERTAINS TO ANY EXCAVATION OPERATIONS SUCH AS, FOUNDATION PIER OR ABUTMENT EXCAVATION, CHANNEL CLEAN OUT, EXCAVATION FOR ROCK CHANNEL PROTECTION AND REMOVAL OF ANY TEMPORARY FILL ASSOCIATED WITH CONSTRUCTION OPERATIONS.

DEMOLITION DEBRIS

THE CONTRACTOR SHALL TAKE PRECAUTIONS TO AVOID AND/OR LIMIT DEMOLITION DEBRIS FROM ENTERING THE STREAM. ANY MATERIAL THAT DOES FALL INTO THE STREAM SHALL BE REMOVED AS SOON AS POSSIBLE.

INSTREAM WORK

INSTREAM WORK WILL BE LIMITED WHERE PRACTICABLE AND ONLY CLEAN NON-ERODIBLE MATERIAL WILL BE USED FOR FORDS OR COFFERDAMS. THIS TEMPORARY PLACED MATERIAL WILL BE REMOVED AND THE STREAM BOTTOM RESTORED TO NEAR NATURAL CONDITIONS WHEN THE WORK IS COMPLETED.

ITEM 448 - ASPHALT CONCRETE SURFACE COURSE, TYPE 1, PG 64-22, AS PER PLAN

MATERIALS FURNISHED FOR FINE AND COARSE AGGREGATES USED IN THIS ITEM SHALL EXCLUDE ALL STONE AND CRUSHED CARBONATE STONE.

TEMPORARY SOIL EROSION AND SEDIMENT CONTROL

THE FOLLOWING ESTIMATED QUANTITIES ARE TO BE USED AS DIRECTED BY THE ENGINEER FOR TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES:  
**877 TEMPORARY PERIMETER, DITCH CHECK, OR INLET PROTECTION  
FILTER FABRIC FENCE 100 METER**

DUST CONTROL

THE CONTRACTOR SHALL FURNISH AND APPLY WATER AND CALCIUM CHLORIDE FOR DUST CONTROL AS DIRECTED BY THE ENGINEER. THE FOLLOWING CONTINGENCY QUANTITIES HAVE BEEN INCLUDED FOR DUST CONTROL PURPOSES:  
616, WATER, 40 CU. METER  
616, CALCIUM CHLORIDE, 1 METRIC TON

NOTIFICATION OF WORK ZONE LANE RESTRICTIONS

THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT LEAST EIGHTEEN (18) DAYS PRIOR TO IMPLEMENTING ANY WORK ZONE RESTRICTIONS THAT WILL REDUCE THE WIDTH OR VERTICAL CLEARANCE OF ANY LANE ON WHICH TRAFFIC WILL BE MAINTAINED DURING CONSTRUCTION. THE ENGINEER SHALL IMMEDIATELY NOTIFY THE DISTRICT ROADWAY SERVICES MANAGER TO ADVISE THE OFFICE OF HIGHWAY MANAGEMENT OF THE RESTRICTIONS.

MAINTAINING TRAFFIC

LENGTH AND DURATION OF LANE CLOSURES AND RESTRICTIONS SHALL BE AT THE APPROVAL OF THE ENGINEER. IT IS THE INTENT TO MINIMIZE THE IMPACT TO THE TRAVELING PUBLIC. LANE CLOSURES OR RESTRICTIONS OVER SEGMENTS OF THE PROJECT IN WHICH NO WORK IS ANTICIPATED WITHIN A REASONABLE TIME FRAME, AS DETERMINED BY THE ENGINEER, SHALL NOT BE PERMITTED. THE LEVEL OF UTILIZATION OF MAINTENANCE OF TRAFFIC DEVICES SHALL BE COMMENSURATE WITH THE WORK IN PROGRESS.

NOTICE OF CLOSURE SIGNS, AS DETAILED IN THESE PLANS, SHALL BE ERECTED BY THE CONTRACTOR AT LEAST ONE WEEK IN ADVANCE OF THE SCHEDULED ROAD OR RAMP CLOSURE. THE SIGNS SHALL BE ERECTED ON THE RIGHT HAND SIDE OF THE ROAD/RAMP FACING TRAFFIC. THEY SHALL BE PLACED SO AS NOT TO INTERFERE WITH THE VISIBILITY OF ANY OTHER TRAFFIC CONTROL SIGNS. ON ROADWAYS, THEY SHOULD BE ERECTED AT THE POINT OF CLOSURE. THE SIGNS MAY BE ERECTED ANYWHERE ON RAMPS AS LONG AS THEY ARE VISIBLE TO THE MOTORISTS USING THE RAMP. ON ENTRANCE RAMPS, THE SIGN SHALL BE ERECTED WELL IN ADVANCE OF THE MERGE AREA TO AVOID DISTRACTING MOTORISTS.

S.R. 150 WILL BE  
CLOSED [ ]  
FOR [ ] DAYS  
INFO: [ ]

OC-60A  
(1500x900)

THE FOLLOWING ESTIMATED QUANTITIES HAVE BEEN INCLUDED IN THE GENERAL SUMMARY FOR USE AS DIRECTED BY THE ENGINEER FOR THE MAINTENANCE OF TRAFFIC.

614, BITUMINOUS CONCRETE FOR MAINTAINING TRAFFIC, 3 CU. METER

THE CONTRACTOR SHALL PROVIDE, ERECT AND MAINTAIN STANDARD 1200mm X 750mm "ROAD CLOSED" SIGNS, SIGN SUPPORTS, BARRICADES, GATES, AND LIGHTS, AS DETAILED IN STANDARD CONSTRUCTION DRAWING MT-101.60M AT THE FOLLOWING LOCATIONS DURING PERIODS IN WHICH THE AFFECTED ROADS ARE CLOSED TO TRAFFIC:

INTERSECTION OF STATE ROUTE 150 AND STATE ROUTE 7  
300 METERS NORTH OF THE PROJECT LOCATION ON STATE ROUTE 150

THE CONTRACTOR SHALL PROVIDE, ERECT AND MAINTAIN SIGNS AND SIGN SUPPORTS, AS DETAILED IN THE OHIO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES AND IN ACCORDANCE WITH THE DETOUR PLAN AS SHOWN ON SHEET 5, AND TYPE III BARRICADES OF THE TYPE AND LOCATION AS FOLLOWS:

STA. 20+760, TYPE III BARRICADE  
STA. 20+980, TYPE III BARRICADE

ALL WORK AND TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH 614 AND OTHER APPLICABLE PORTIONS OF THE SPECIFICATIONS, AS WELL AS THE OHIO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES. PAYMENT FOR ALL LABOR, EQUIPMENT AND MATERIALS SHALL BE INCLUDED IN THE LUMP SUM CONTRACT PRICE FOR 614, MAINTAINING TRAFFIC, UNLESS SEPARATELY ITEMIZED IN THE PLAN.

CALC. BY: T.J.E.  
DATE: 12/08/98  
CHKD. BY: M.J.C.  
DATE: 12/17/98

GENERAL NOTES

JEF-150-20.808

3  
19

PLOTTED VIEW = PLANT  
XREF#1 = NONE  
XREF#2 = NONE  
PLOT SCALE = 1"=1'  
CAOT: F:\JEF150\DWG\ROADWAY\GN001.DWG APRIL-28-1999



## Calculations

**Item 203 - Subgrade Compaction**  
 Sta. 20+808.000 To Sta. 20+813.350  
 5.350m X 6.600m = 35.310 Sq. Meter

Sta. 20+813.350 To Sta. 20+817.950  
 4.600m X 8.858m = 40.747 Sq. Meter

Sta. 20+861.840 To Sta. 20+866.440  
 4.600m X 8.858m = 40.747 Sq. Meter

Sta. 20+866.440 To Sta. 20+880.000  
 13.560m X 6.600m = 89.496 Sq. Meter

Total For Item 203 = 206 Sq. Meter

**Item 304 - 150mm Aggregate Base**  
 Sta. 20+808.000 To Sta. 20+813.350  
 5.350m X 7.100m X 0.150m = 5.698 Cu. Meter

Sta. 20+813.350 To Sta. 20+817.950  
 4.600m X 9.458m X 0.150m = 6.526 Cu. Meter

Sta. 20+861.840 To Sta. 20+866.440  
 4.600m X 9.458m X 0.150m = 6.526 Cu. Meter

Sta. 20+866.440 To Sta. 20+880.000  
 13.560m X 7.100m X 0.150m = 14.441 Cu. Meter

Total For Item 304 = 33 Cu. Meter

**Item 408 - Bituminous Prime Coat**  
 Sta. 20+808.000 To Sta. 20+813.350  
 5.350m X 6.800m X 1.80 l/sq. m. = 65.484 Liter

Sta. 20+866.440 To Sta. 20+880.000  
 13.560m X 6.800m X 1.80 l/sq. m. = 165.974 Liter

Total For Item 408 = 232 Liter

**Item 301 - 175mm Bituminous Aggregate Base, PG 64-22**  
 Sta. 20+808.000 To Sta. 20+813.350  
 5.350m X 6.800m X 0.175m = 6.367 Cu. Meter

Sta. 20+866.440 To Sta. 20+880.000  
 13.560m X 6.800m X 0.175m = 16.136 Cu. Meter

Total For Item 301 = 23 Cu. Meter

**Item 448 - 45mm Asphalt Concrete Intermediate Course, Type 2, PG 64-22**  
 Sta. 20+808.000 To Sta. 20+813.350  
 5.350m X 6.600m X 0.045m = 1.589 Cu. Meter

Sta. 20+866.440 To Sta. 20+880.000  
 13.560m X 6.600m X 0.045m = 4.027 Cu. Meter

Total For Item 448 = 6 Cu. Meter

**Item 407 - Tack Coat For Intermediate Course**  
 Sta. 20+808.000 To Sta. 20+813.350  
 5.350m X 6.600m X 0.34 l/sq. m. = 12.005 Liter

Sta. 20+866.440 To Sta. 20+880.000  
 13.560m X 6.600m X 0.34 l/sq. m. = 30.429 Liter

Total For Item 407 = 43 Liter

**Item 448 - 32mm Asphalt Concrete Surface Course, Type 1, PG 64-22**  
 Sta. 20+808.000 To Sta. 20+813.350  
 5.350m X 6.600m X 0.032m = 1.130 Cu. Meter

Sta. 20+866.440 To Sta. 20+880.000  
 13.560m X 6.600m X 0.032m = 2.864 Cu. Meter

Total For Item 448 = 4 Cu. Meter

**Item 611 - Reinforced Concrete Approach Slab, As Per Plan (T = 305mm)**  
 Sta. 20+813.350 To Sta. 20+817.950  
 4.600m X 8.858m = 40.747 Sq. Meter

Sta. 20+861.840 To Sta. 20+866.440  
 4.600m X 8.858m = 40.747 Sq. Meter

Total For Item 611 = 82 Sq. Meter

**Item 304 - 200mm Aggregate Base (Shoulder)**  
 Sta. 20+808.000 To Sta. 20+813.350  
 5.350m X 1.650m X 0.200m = 1.766 Cu. Meter

Sta. 20+866.440 To Sta. 20+880.000  
 13.560m X 1.650m X 0.200m = 4.475 Cu. Meter

Total For Item 304 = 7 Cu. Meter

**Item 408 - Bituminous Prime Coat (Shoulder)**  
 Sta. 20+808.000 To Sta. 20+813.350  
 5.350m X 1.650m X 1.8 l/sq. m. = 15.890 Liter

Sta. 20+866.440 To Sta. 20+880.000  
 13.560m X 1.650m X 1.8 l/sq. m. = 40.273 Liter

Total For Item 408 = 56 Cu. Meter

**Item 409 - Seal Coat Bituminous Material (Shoulder)**  
 Sta. 20+808.000 To Sta. 20+813.350  
 5.350m X 1.650m X 1.35 l/sq. m. = 11.917 Liter

Sta. 20+866.440 To Sta. 20+880.000  
 13.560m X 1.650m X 1.35 l/sq. m. = 30.205 Liter

Total For Item 409 = 42 Liter

**Item 409 - Seal Coat Cover Aggregate No. 8 (Shoulder)**  
 Sta. 20+808.000 To Sta. 20+813.350  
 5.350m X 1.650m X 0.008 cu. m./sq. m. = 0.071 Cu. Meter

Sta. 20+866.440 To Sta. 20+880.000  
 13.560m X 1.650m X 0.008 cu. m./sq. m. = 0.179 Cu. Meter

Total For Item 409 = 1 Cu. Meter

**Item 659 - Agricultural Liming**  
 508 sq. m. SEEDING X 256 kg/1000 sq. m. X 2.2 = 286.10 kg

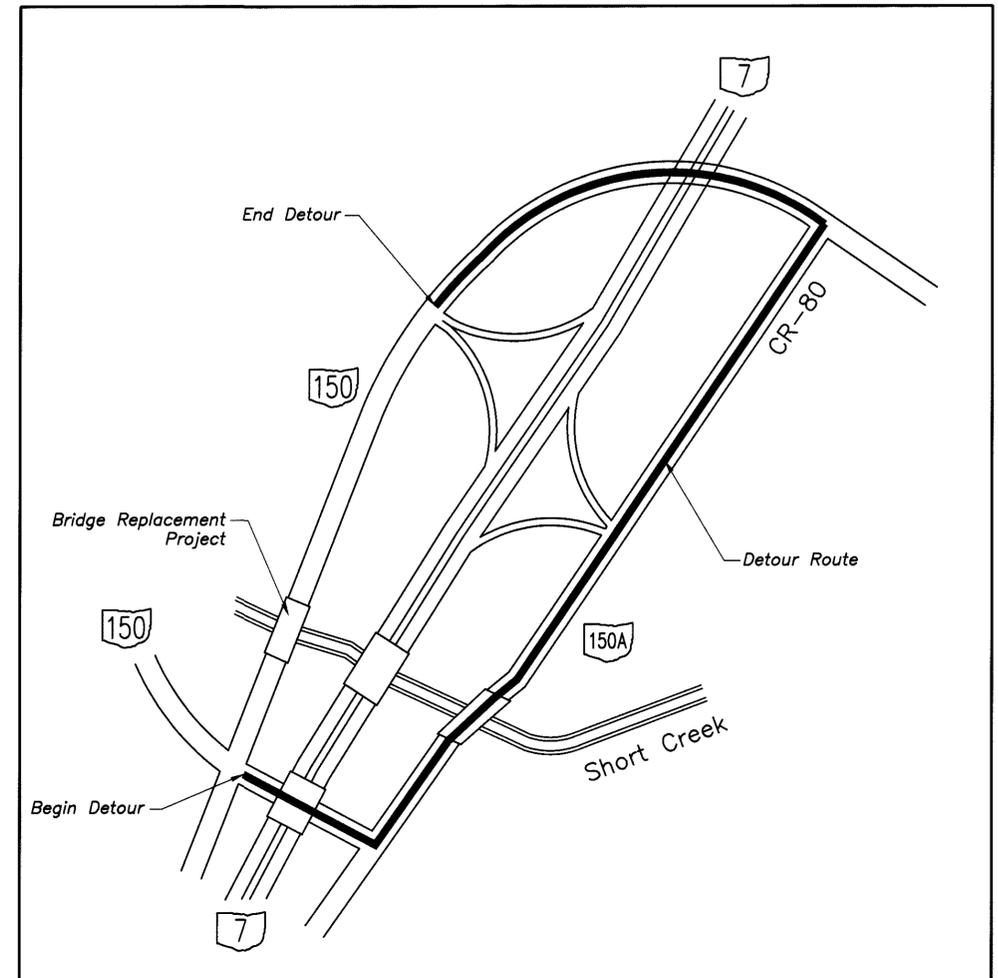
Total For Item 659 = 287 Kilogram

**Item 659 Commercial Fertilizer**  
 508 sq. m. SEEDING X 0.1 kg/sq. m. = 50.80 kg

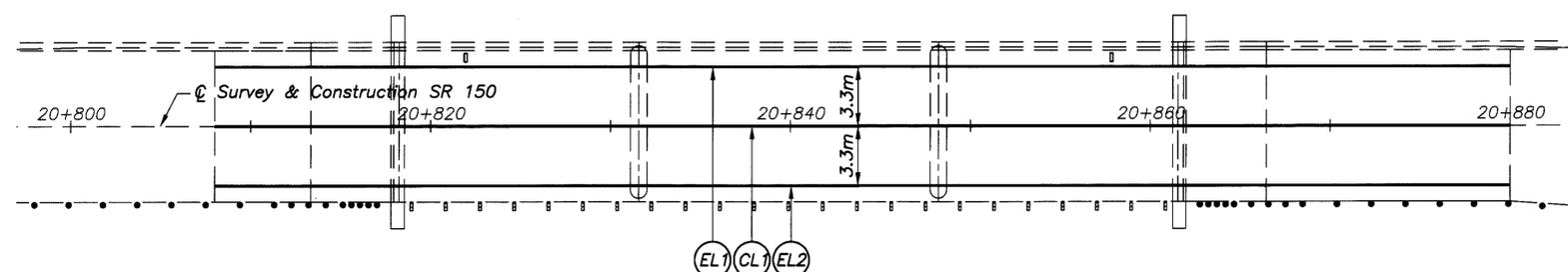
Total For Item 659 = 51 Kilogram

**Item 659 - Water**  
 508 sq. m. SEEDING X 0.01 cu. m./sq. m. = 5.08 cu. m.

Total For Item 659 = 6 Cu. Meter  
 Carried To General Notes



**Detour Map**  
 (Not to scale)



**Pavement Marking Plan**



REF. NO.	STATION		SIDE	621	642	642
	FROM	TO		Raised Pavement Marker	Edge Line, Type 1	Center Line, Type 1
CL1	20+808.000	20+880.000	CL	Each 3	Kilometer	Kilometer
EL1	20+808.000	20+880.000	Lt		0.07	
EL2	20+808.000	20+880.000	Rt		0.07	
TOTALS CARRIED TO GENERAL SUMMARY				3	0.14	0.07

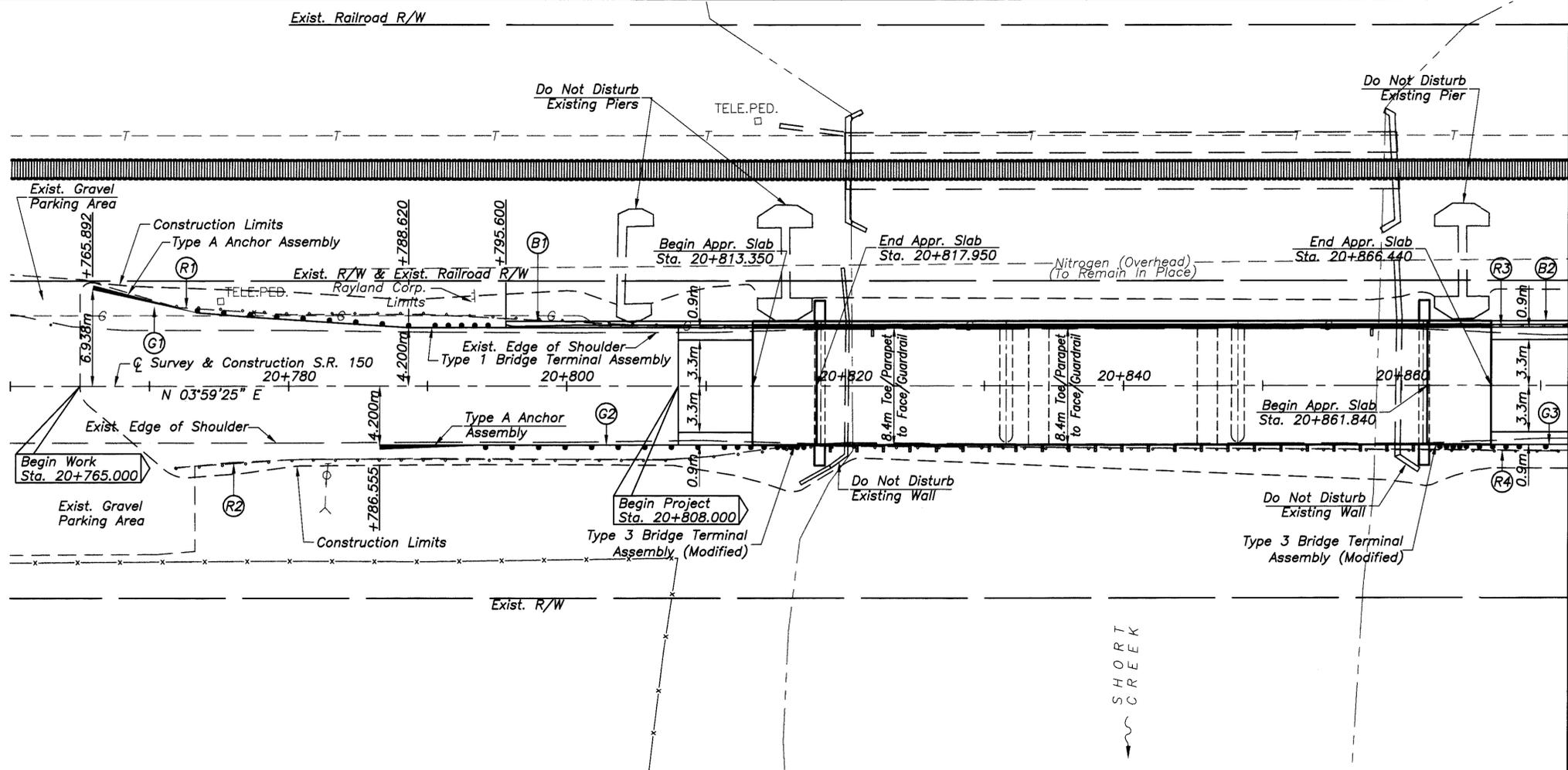
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 PLOT SCALE = 1=1  
 CAD: JEF150.DWG:ROADWAY.GC001.DWG  
 APRIL-28-1999

CALC. BY: T.J.L.  
 DATE: 12/09/98  
 CHKD. BY: R.J.S.  
 DATE: 12/10/98

CALCULATIONS, DETOUR MAP, & PAVEMENT MARKING PLAN

JEF-150-20.808

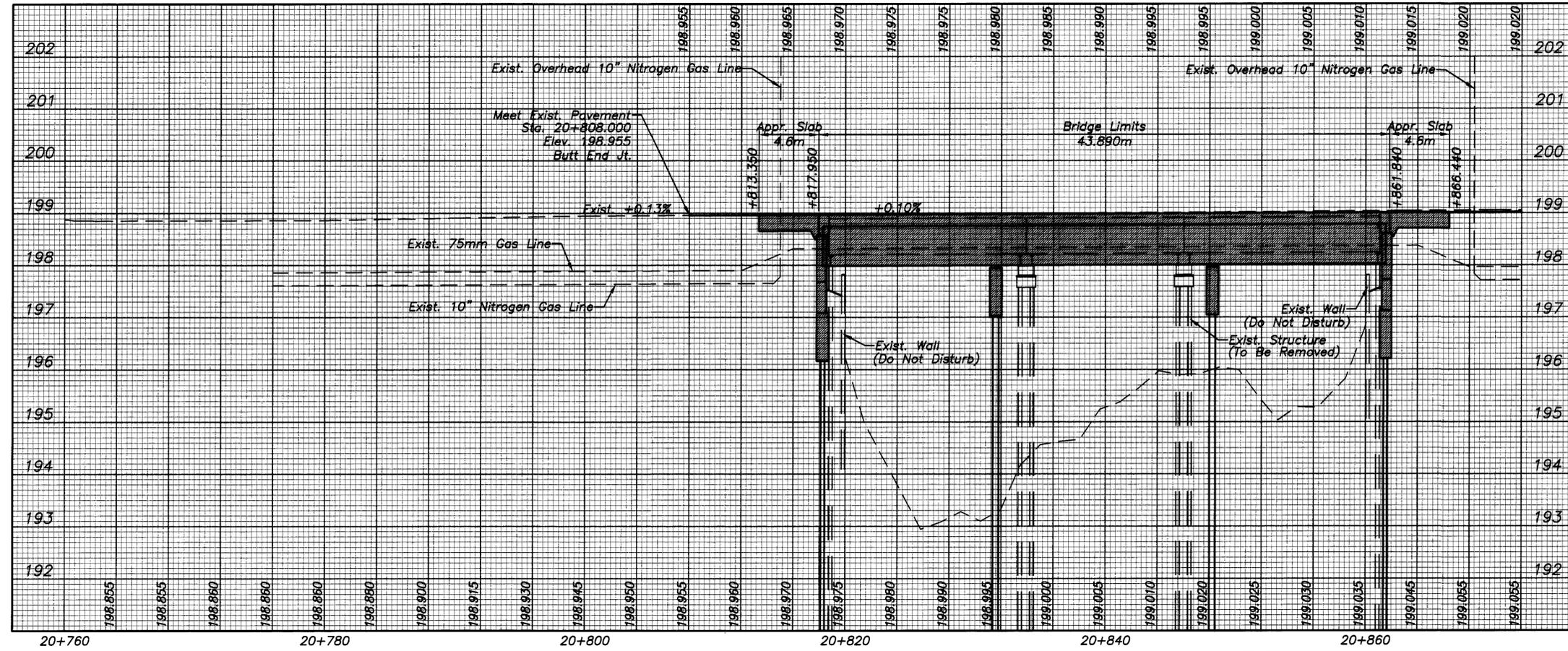
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 XREF# = NONE  
 PLOT SCALE = 1"=1'  
 CAD: F:\JEF150\DWG\ROADWAY\GPO01.DWG JUNE-04-1999



**BENCHMARKS**

T.B.M. #1 = Iron Pin  
Sta. 20+762.830, 12.051m Rt  
Elev. 198.483

T.B.M. #2 = Iron Pin  
Sta. 20+916.233, 11.847m Lt  
Elev. 198.362



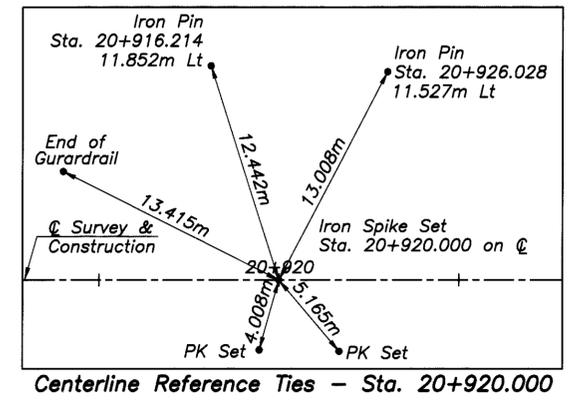
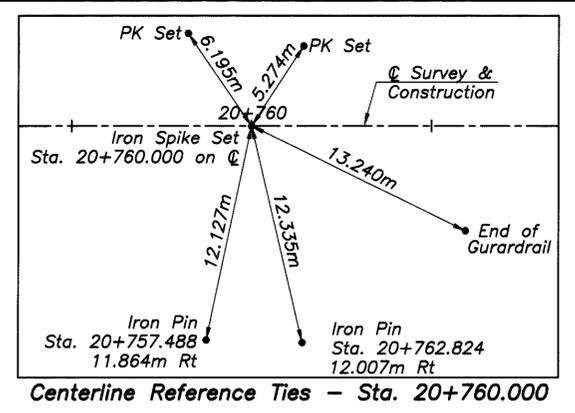
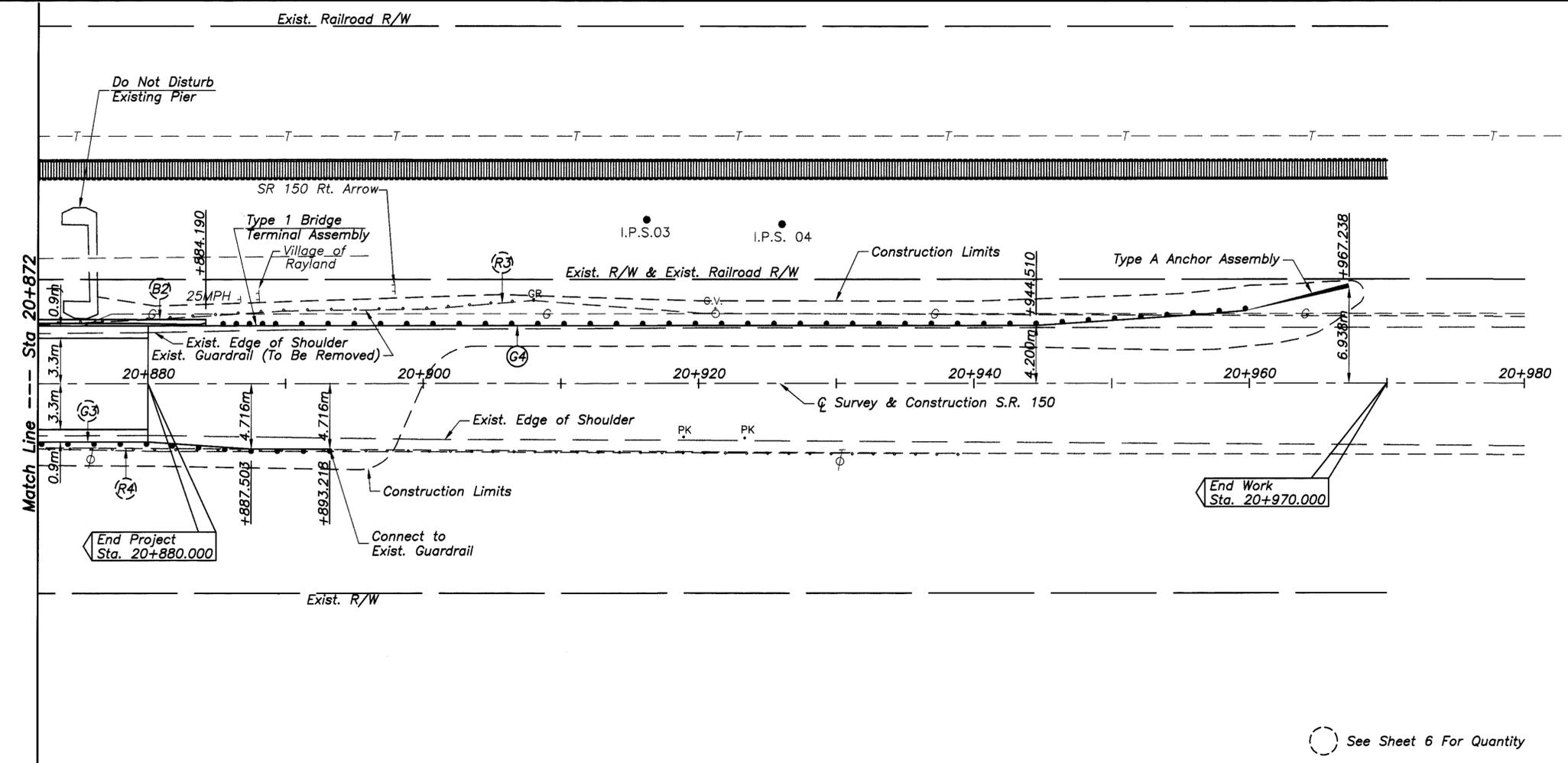
REF. NO.	STATION	SIDE	MATERIAL		QUANTITY	UNIT	TOTALS CARRIED TO GENERAL SUMMARY
			FROM	TO			
G1	20+765.892	Lt					
G2	20+786.555	Rt					
G3	20+862.755	Rt					
B1	20+795.600	Lt					
B2	20+866.440	Lt					
R1	20+771.924	Lt					
R2	20+771.914	Rt					
R3	20+860.904	Lt					
R4	20+860.527	Rt					
606	Guardrail, Type 5	Meter	22.860	30.480	76.200		
606	Anchor Assembly, Type A	Each	1	1	2		
606	Bridge Terminal Assembly, Type 1	Each	1	1	1		
606	Bridge Terminal Assembly, Type 3 (Modified)	Each	1	1	2		
622	Concrete Barrier, Type D	Meter	17.75	17.75	36		
626	Barrier Reflector, Type A	Each	2	3	7		
626	Barrier Reflector, Type B	Each					
626	Barrier Reflector, Type B	Each					
202	Guardrail Removed	Meter					183
TOTALS CARRIED TO GENERAL SUMMARY							183

PLAN AND PROFILE  
 STA. 20+760 to Sta. 20+772

JEF-150-20.808



PLOTTED VIEW = PLAN  
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 XREF#2 = NONE  
 PLOT SCALE = 1"=1'  
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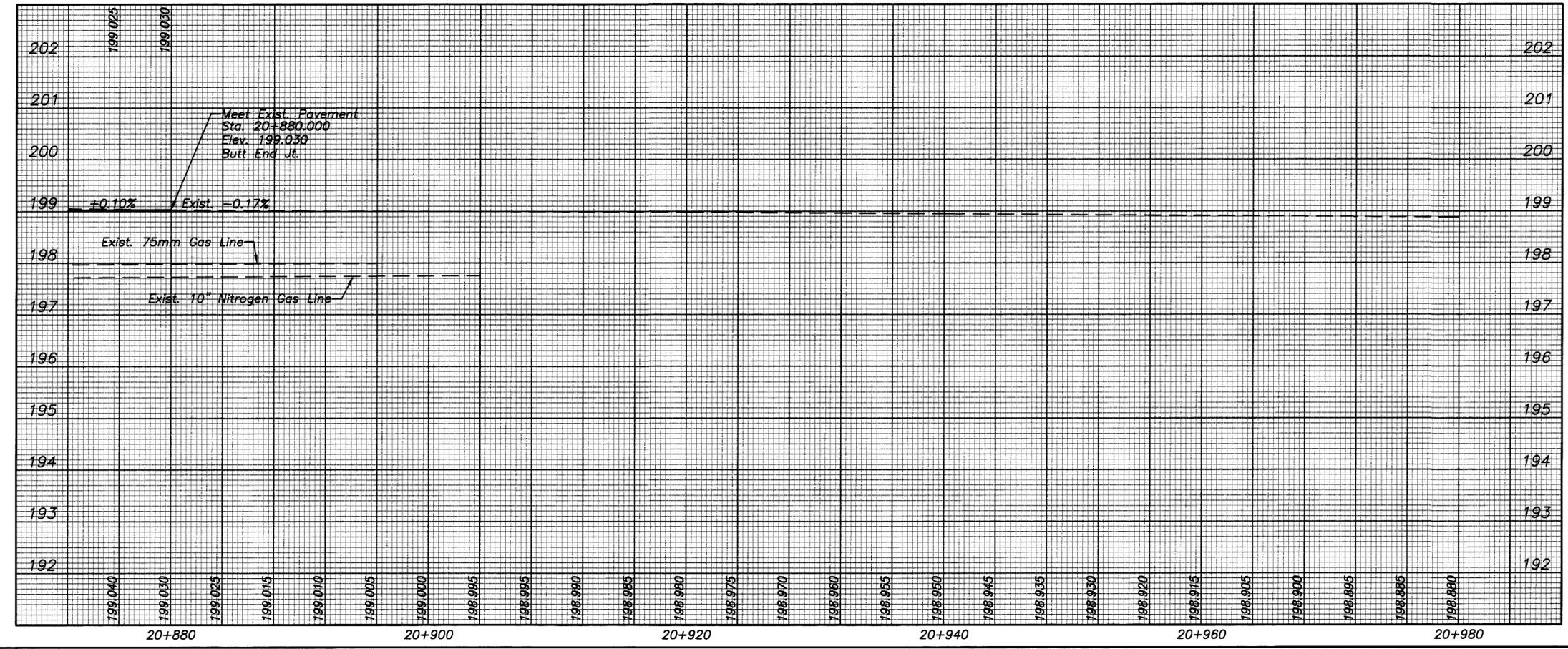


**BENCHMARKS**

T.B.M. #1 = Iron Pin  
 Sta. 20+762.830, 12.051m Rt  
 Elev. 198.483

T.B.M. #2 = Iron Pin  
 Sta. 20+916.233, 11.847m Lt  
 Elev. 198.362

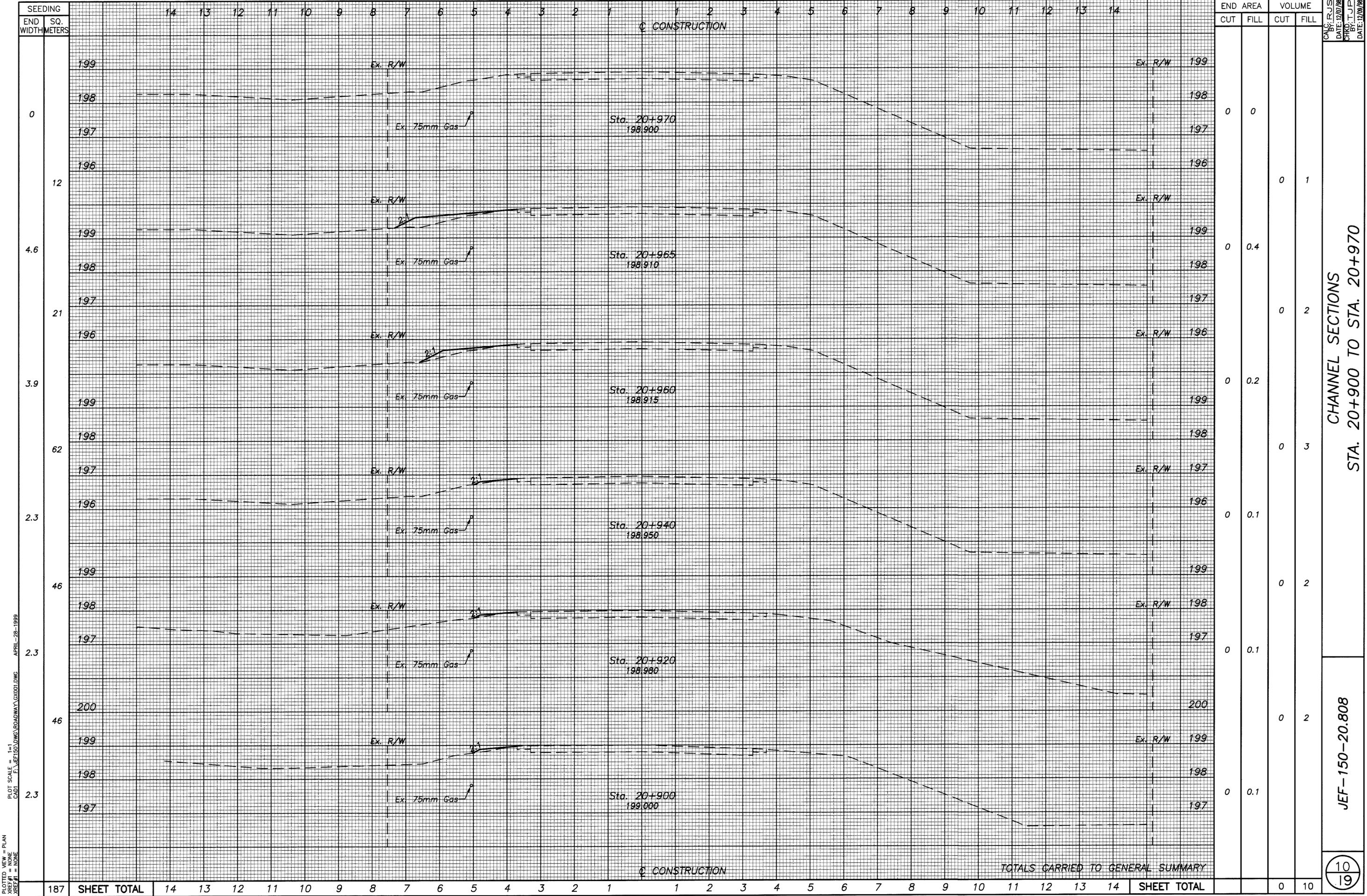
See Sheet 6 For Quantity



REF. NO.	STATION	DESCRIPTION	QUANTITY	
			TO	FROM
626		Barrier Reflector, Type A	Each	4
606		Bridge Terminal Assembly, Type 1	Each	1
606		Anchor Assembly, Type A	Each	1
606		Guardrail, Type 5	Meter	76.200
	SIDE		Lt	
	STATION		TO	20+967.238
			FROM	20+883.550
CARRIED				





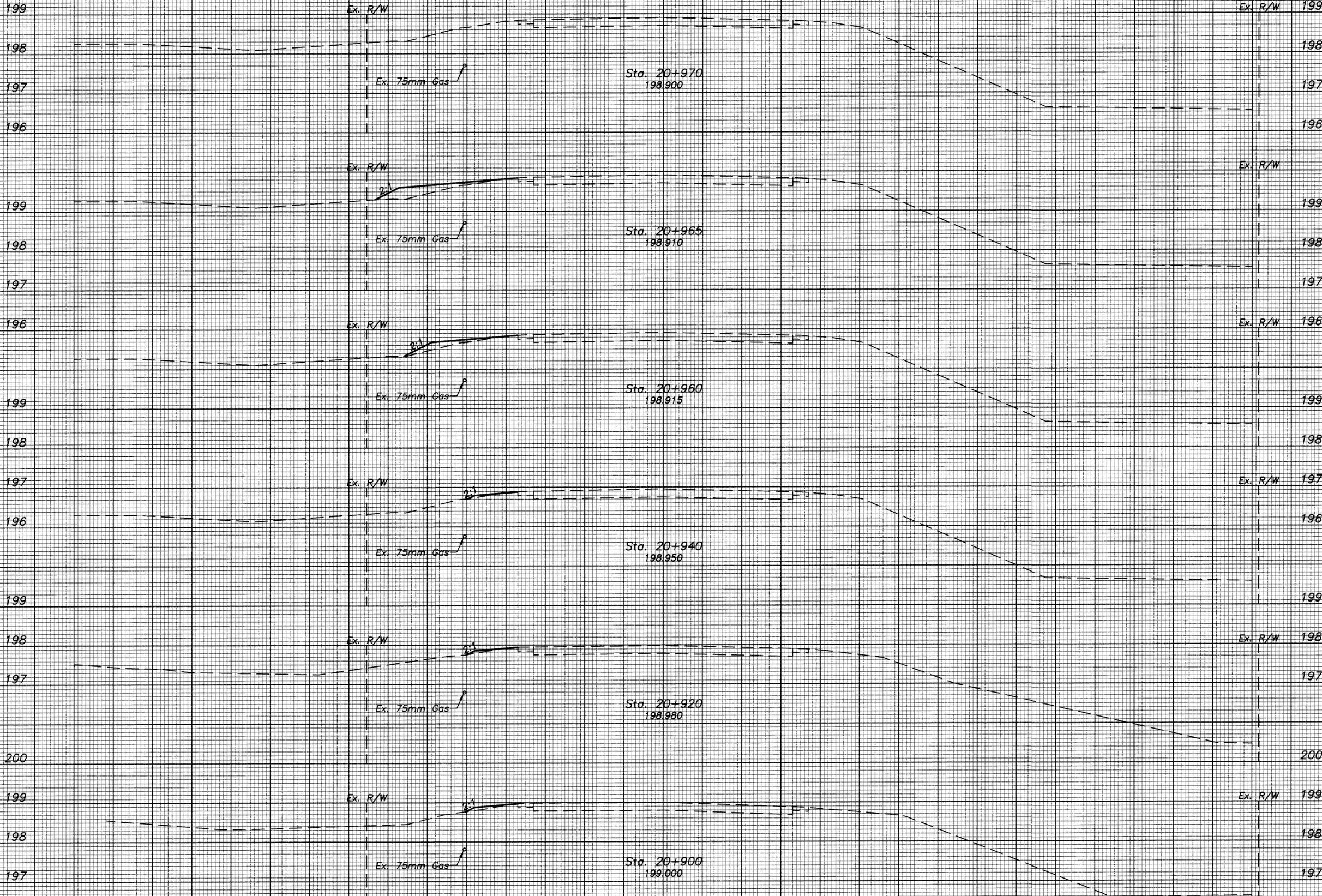


PLOTTED VIEW = PLAN  
 PLOT SCALE = 1"=1'  
 CAD: F:\EF150\DWG\ROADWAY\G0001.DWG APRIL-28-1999  
 XREF #1 = NONE

C CONSTRUCTION

C CONSTRUCTION

TOTALS CARRIED TO GENERAL SUMMARY



Exist. Railroad R/W

Exist. Railroad R/W



metric units

NOTE: DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. ELEVATIONS AND STATIONS HOWEVER ARE IN METERS.

EARTHWORK LIMITS: EARTHWORK LIMITS ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.

OVERTOPPING DISCHARGE: THE PROPOSED ROADWAY WILL BE OVERTOPPED BY THE 8 YEAR FLOOD AT AN EL. OF 198.955.

INDICATES BORING LOCATION

TRAFFIC DATA

CURRENT YEAR (1999) ADT = 2132  
DESIGN YEAR (2019) ADT = 2988  
DESIGN YEAR (2019) ADTT = 269

TEMPORARY BENCHMARKS

TOP OF R.R. BRIDGE ABUT. EL. 198.928  
Sta. 20+820.363, 11.513 Lt.  
IRON PIN SET EL. 198.483  
Sta. 20+762.830, 12.051 Rt.  
IRON PIN SET EL. 198.362  
Sta. 20+916.233, 11.847 Lt.

HYDRAULIC DATA

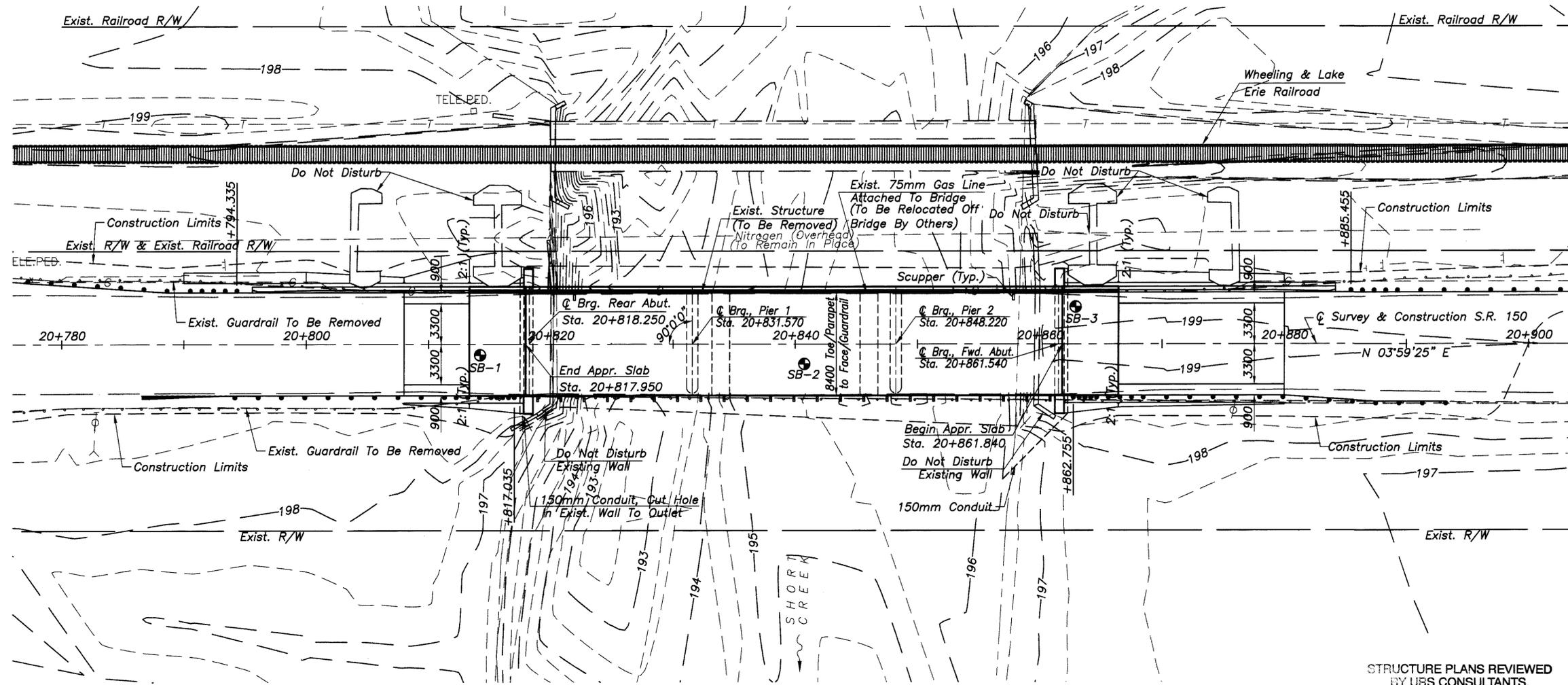
DRAINAGE AREA = 370.37 km<sup>2</sup>  
Q<sub>25</sub> = 238 m<sup>3</sup>/s  
Q<sub>100</sub> = 371 m<sup>3</sup>/s  
PROPOSED STRUCTURE  
HW<sub>25</sub> EL. = 200.63 m  
V<sub>25</sub> = 2.17 m/s  
HW<sub>100</sub> EL. = 201.47 m  
V<sub>100</sub> = 2.80 m/s

EXISTING STRUCTURE

TYPE: THREE SPAN PRESTRESSED CONCRETE BOX BEAM WITH STEEL CAPPED PILE ABUTMENTS AND DOUBLE PILE PIERS.  
SPANS: 14 325±, 11 025±, 14 238±  
C/C BEAM BRGS  
ROADWAY: 82305± F/F RAIL  
DESIGN LOADING: MS18  
SKEW: 0±  
WEARING SURFACE: ASPHALT  
ALIGNMENT: TANGENT  
YEAR BUILT: 1968  
APPROACH SLABS: NONE  
STRUCTURE FILE NUMBER: 4100077

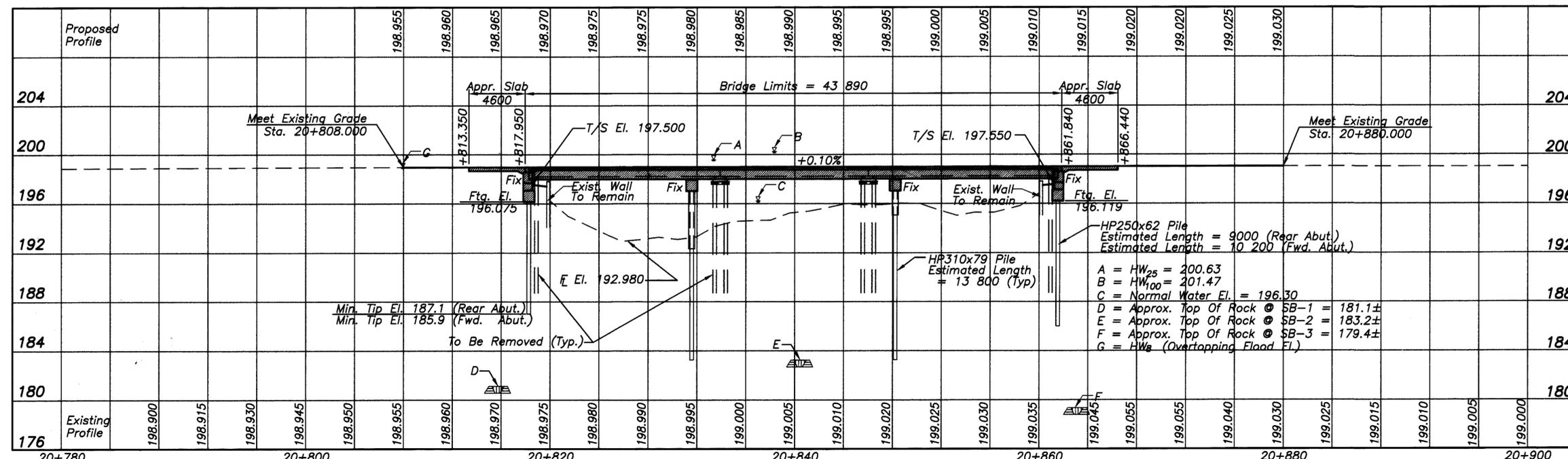
PROPOSED STRUCTURE

TYPE: THREE SPAN STEEL BEAM (A588) WITH COMPOSITE DECK ON REINFORCED CONCRETE INTEGRAL ABUTMENTS AND CAPPED PILE PIERS.  
SPAN: 13 320 , 16 650, 13 320 C/C BRGS  
ROADWAY: 8400 TOE/PARAPET TO FACE/GUARDRAIL  
SKEW: NONE  
DESIGN LOADING: MS18 CASE II AND ALTERNATE MILITARY LOADING  
APPROACH SLABS: AS-1-81M (4600 mm LONG)  
ALIGNMENT: TANGENT  
CROWN: 0.016  
WEARING SURFACE: MONOLITHIC CONCRETE  
LATITUDE: 40°-11'-10" N  
LONGITUDE: 80°-41'-10" W



PLAN

STRUCTURE PLANS REVIEWED BY URS CONSULTANTS, DAK DATE 6-18-99



PROFILE ALONG C CONSTRUCTION

PLOTTED VIEW = PLAN  
XREF NAME = NONE  
XREF # = NONE  
PLOT SCALE = 1=1  
CAD: F:\JEF150\UNWC\BRIDGE\SP001.DWG MAY-21-1999

DESIGN AGENCY: Barr Engineering, Inc. 8748 Brecksville Road, Suite 130 Brecksville, OH 44141 (440) 526-6455 Fax: (440) 526-6452  
REVIEWED DATE: 12/18/98  
DRAWN: TJP  
CHECKED: EDW  
DESIGNED: TJP  
JEFFERSON COUNTY: Sta. 20+817.950  
SITE PLAN: Bridge No. JEF-150-20818 Over Short Creek  
JEF-150-20.808  
1/13  
11/9

**General Notes**

REFERENCE shall be made to the Standard Drawing(s):

- AS-1-81M Dated 10/25/94
- GSD-1-96M Dated 11/21/97
- ICD-1-82M Dated 03/20/95
- BR-1M Dated 01/06/99
- CPP-2-94M Dated 12/19/94
- DS-1-94M Dated 12/15/94
- TST-1-99 Dated 07/06/99

and to Supplemental Specification(s):

- 844 Dated 01/06/99
- 863 Dated 09/09/97
- 905 Dated 04/01/98
- 907 Dated 10/21/98
- 954 Dated 09/09/97

DESIGN SPECIFICATIONS: This structure conforms to "Standard Specifications for Highway Bridges" adopted by the American Association of State Highway Transportation Officials, 1996, including the 1997 and 1998 Interim Specifications and the ODOT Bridge Design Manual.

DESIGN LOADING: MS18, Case II and the Alternate Military Loading.

DESIGN DATA:

High Performance Concrete - compressive strength 31.0MPa (superstructure)

High Performance Concrete - compressive strength 31.0MPa (substructure)

Reinforcing Steel - ASTM A615M, A616M or A617M  
Grade 400 minimum yield strength 400MPa

Structural Steel - ASTM A588M - yield strength 350 MPa

DECK PROTECTION METHOD:

- Epoxy Coated Reinforcing Steel
- High Performance Concrete
- 65mm Concrete Cover
- Sealing of Concrete Surfaces
- Steel Drip Strip
- High Molecular Weight Methacrylate (HMWM)

MONOLITHIC WEARING SURFACE is assumed, for design purposes, to be 25mm thick.

REMOVAL OF EXISTING STRUCTURE: When no longer needed to maintain traffic the existing structure shall be removed upon receiving permission from the Engineer.

PILE DESIGN LOADS (ULTIMATE BEARING VALUE): The Ultimate Bearing Value is 335kN per pile for the abutment piles.

Rear Abutment Piles (HP250x62):

- 6 Piles 11 meters long, estimated length
- 6 Piles of order length 11 meters long
- 3 Splices

Forward Abutment Piles (HP250x62):

- 6 Piles 12 meters long, estimated length
- 6 Piles of order length 12 meters long
- 3 Splices

PILES TO BEDROCK Piles shall be driven to refusal on bedrock. Refusal shall be considered as obtained by penetrating soft bedrock for several millimeters with a minimum resistance of 20 blows per 25mm or refusal shall be considered as obtained after the pile has contacted hard bedrock and the pile has then received at least 20 blows. The Ultimate Bearing Value is 523kN per pile for the pier piles.

Pier Piles (HP310x79):

- 10 Piles 16 meters long, estimated length
- 10 Piles of order length 16 meters long
- 5 Splices

UTILITY LINES: All expense involved in relocation (installing) the affected utility lines shall be borne by the Utility(ies). The Contractor and Utility(ies) are to cooperate by arranging their work in such a manner that inconvenience to either will be held to a minimum.

ITEM 844 HIGH PERFORMANCE CONCRETE SUBSTRUCTURE, AS PER PLAN: Install a 900 mm wide strip, 2.5 mm thick, general purpose, heavy duty neoprene sheet with nylon fabric reinforcement at locations shown in the plans. Secure the 1 meter wide neoprene sheeting to the concrete with 32 x 3 mm (length x shank diameter) galvanized button head spikes through a 25 mm outside diameter, 3 mm galvanized washer. Maximum fastener spacing is 225 mm. Other similar galvanized devices which will not damage either the neoprene or the concrete may be used subject to the approval of the Engineer.

Center the neoprene strips on all joints. For horizontal joints, secure the horizontal neoprene strip by using a single line of fasteners, starting at 150 mm (+/-) from the top of the neoprene strip. For the vertical joints secure the vertical neoprene strip by using a single vertical line of fasteners, starting at 150 mm (+/-) from the vertical edge of the neoprene strip nearest to the centerline of roadway. For vertical joints, install 2 additional fasteners at 150 mm center to center across the top of the neoprene strip on the same side of the vertical joint as the single vertical row of fasteners is located.

The vertical neoprene strips should completely overlap the horizontal strips. Laps in the length of the horizontal strips due to material manufacturing shall be at least 300 mm in length, if not vulcanized or adhesive bonded, or 150 mm in length if the lap is vulcanized or adhesive bonded. No laps are acceptable in vertically installed neoprene strips.

**ESTIMATED QUANTITIES**

Calculated by: TJP Date: 12/09/98

Checked by: MJC Date: 12/11/98

ITEM	ITEM EXT.	GRAND TOTAL	UNIT	DESCRIPTION	ABUTMENTS	PIERS	SUPER.	GEN.	A.P.P. REF.
202	11002	Lump		Structure Removed, Over 6 Meter Span				Lump	
503	11100	Lump		Cofferdams, Cribs And Sheeting				Lump	
503	21300	Lump		Unclassified Excavation	Lump				
505	11100	Lump		Pile Driving Mobilization				Lump	
507	00100	138	Meter	Steel Piles HP250x62, Furnished	138				
507	00150	138	Meter	Steel Piles HP250x62, Driven	138				
507	00200	160	Meter	Steel Piles HP310x79, Furnished		160			
507	00250	160	Meter	Steel Piles HP310x79, Driven		160			
507	50500	11	Each	Steel Pile Splices	6	5			
507	93300	10	Each	Steel Point (or Shoe)		10			
Special	507.71200	35	Meter	Pile Encasement		35			2
Special	512.67502	279	Sq. Meter	Sealing Of Concrete Surfaces (Epoxy) (See Proposal Note)	42	54	183		
516	44001	8	Each	Elastomeric Bearing With Internal Laminates And Load Plate (Neoprene), As Per Plan (44.5mm X 310mm X 300mm) (See Proposal Note)		8			6
517	70000	45.720	Meter	Railing (Twin Steel Tube)			45.720		2, 10-13
518	12200	2	Each	Scupper, Including Supports (See Proposal Note)			2		
518	21230	Lump	Lump	Porous Backfill With Filter Fabric	Lump				
Special	518.22300	42.69	Meter	Steel Drip Strip			42.69		
518	40000	24.0	Meter	150mm Perforated Corrugated Plastic Pipe	24.0				
518	40010	6.0	Meter	150mm Non-Perforated Corrugated Plastic Pipe, Including Specials	6.0				
844	48010	389	Sq Meter	High Performance Concrete Superstructure (Deck)			389		
844	48020	13	Cu Meter	High Performance Concrete Superstructure (Parapet)			13		
844	48041	52	Cu Meter	High Performance Concrete Substructure, As Per Plan	36	16			2
844	49000	Lump		High Performance Concrete Trial Mix			Lump		
844	49010	Lump		High Performance Concrete Testing			Lump		
863	10041	Lump		Structural Steel Members, Level Two (2) Fabrication, As Per Plan			Lump		6
863	20000	1632	Each	Welded Stud Shear Connector			1632		

The neoprene sheeting shall be 2.5 mm thick general purpose, heavy duty neoprene sheet with nylon fabric reinforcement. The sheeting shall be "Fairprene Number NN-0003", by E. I. Dupont De Nemours and Company, Inc., "Wingprene" by the Goodyear Tire and Rubber Company, or an approved alternate. The neoprene sheeting shall conform to the following:

Description of Test	ASTM Method	Requirement
Thickness, mm	D751	2.5 +/- 0.25
Breaking strength, grab WXF, N, minimum	D751	3130 x 3130
Adhesive 25mm strip, 50mm minimum, N minimum	D751	27
Burst strength (mullen) MPa, minimum	D751	9.65
Heat aging 70 hours T 100 °C, 180 without cracking	D2136	No Cracking of Coating
Low temperature brittleness 1 hour at -40 °C, bend around 6mm mandrel	D2136	No Cracking of Coating

Payment for labor, materials and installation of these items shall be included in Item 844 High Performance Concrete Substructure, As Per Plan.

CONCRETE PARAPETS: As soon as a concrete saw can be operated without damaging the freshly placed concrete, 32 mm deep control joints shall be sawed into the perimeter of the concrete parapet. The saw cut shall be made in the complete circumference of the parapet, starting and ending at the elevation of the concrete deck. The sawcuts shall be placed at a minimum of 1800 mm and a maximum of 3050mm centers. The use of an edge guide, fence, or jig is required to insure that the cut joint is

straight, true, and aligned on all faces of the parapet. The joint width shall be the width of the saw blade, a nominal width of 6mm. The perimeter of the deflection control joint shall be sealed with a caulking material conforming to Federal Specification, TT-S-00227E to a minimum depth of 25 mm. The bottom 13 mm of the inside and outside face should be left unsealed to allow water to escape.

ITEM SPECIAL - PILE ENCASEMENT: All piles for the capped pile piers shall be encased in Class S or Class C concrete (499.03) and shall be in accordance with 511, except as modified herein. The required slump is 150 mm, plus or minus 12 mm. The maximum water to cement ratio shall be 0.50. If concrete is placed under water, the requirements of adding 10 percent more cement to the concrete shall be waived. The concrete shall be placed within a form that consists of polyethylene pipe (707.33), or PVC pipe (707.42). The encasement shall extend from 1 meter below the finished ground surface up to the concrete pier cap and shall be positioned so that at least 75 mm of concrete cover is provided around the exterior of the pile.

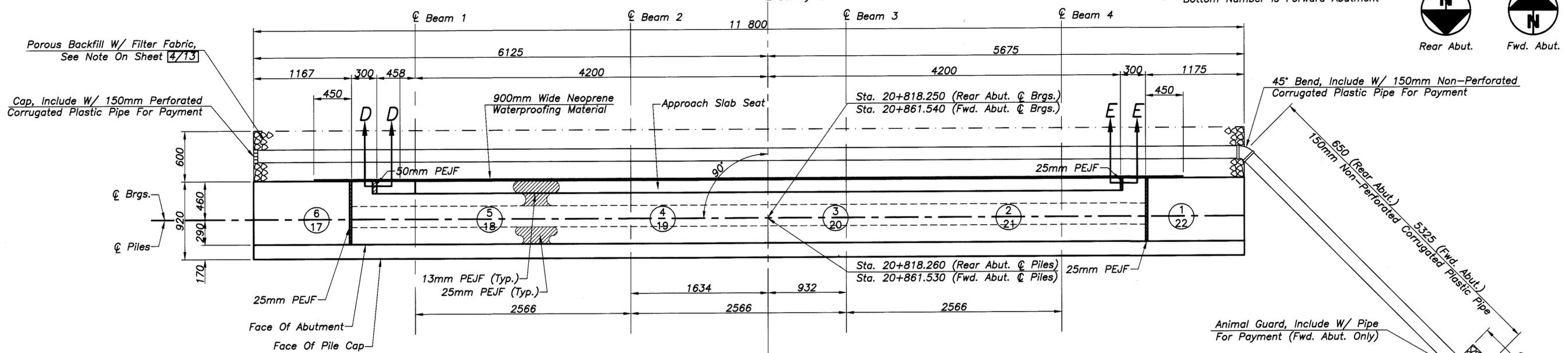
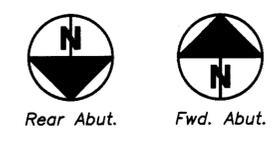
The length of pile encasement shall be measured in meters along the length of the pile. This item includes all work and materials necessary to furnish the required encasement. Payment will be made at the contract unit price per meter of pile encasement approved in place.

In lieu of encasing the pile in concrete, at the option of the Contractor, the pile may be galvanized as per 711.02. The galvanizing shall be continuous from a minimum of 1 meter below the finish ground surface up to the concrete pier cap. The galvanized coating thickness shall be a minimum of 100 µm (0.1 mm). All gouges, scrapes, scratches or other surface imperfections caused by the handling or the driving of the pile shall be repaired to the satisfaction of the Engineer. Payment for the galvanizing will be made at the contract unit price for Item Special, Pile Encasement. Payment will only be made for the galvanized length of pile as required by the plan and/or approved by the Engineer. All galvanizing provided beyond the project requirements is at the Contractor's expense.

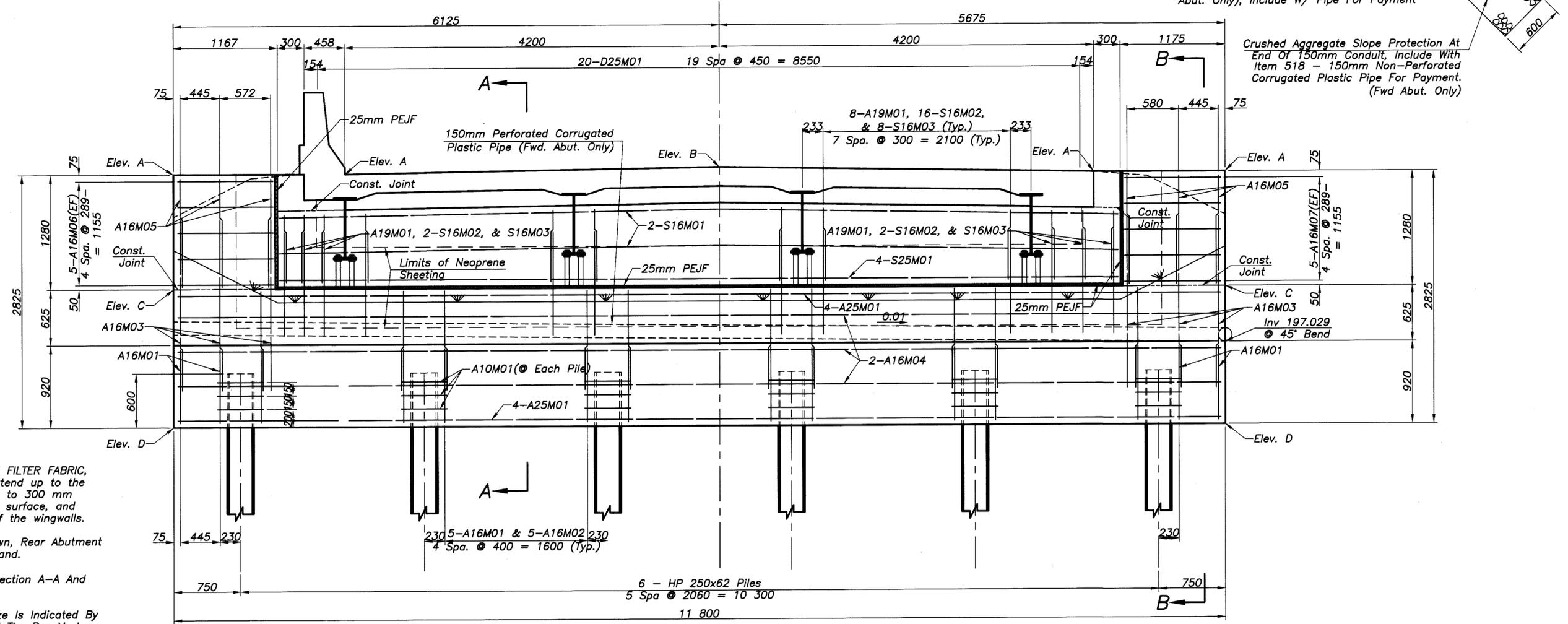
PLOT SCALE = 1" = 10' (SEE PLAN) DATE: MAY-21-1999

DESIGN AGENCY: **Barr Engineering, Inc.**  
 8748 Brecksville Road, Suite 130  
 Brecksville, OH 44141  
 (440) 526-6455 Fax: (440) 526-6457  
 REVIEWED DATE: 12/18/98  
 DRAWN: TJP  
 CHECKED: EDW  
 STRUCTURE FILE NO: 4102274  
**ESTIMATED QUANTITIES & GENERAL NOTES**  
 Bridge No. JEF-150-20818  
 S.R. 150 Over Short Creek  
**JEF-150-20.808**  
 2/13  
 12/9

(R) Indicates Pile w/ Pile Number  
 (F) Top Number Is Rear Abutment  
 Bottom Number Is Forward Abutment



**PLAN**  
 (At Deck Elev)



**ELEVATION**

**Note:**  
 POROUS BACKFILL WITH FILTER FABRIC, 600 mm thick shall extend up to the plane of the subgrade, to 300 mm below the embankment surface, and laterally to the ends of the wingwalls.  
 Forward Abutment Shown, Rear Abutment Similar But Opposite Hand.  
 See Sheet 4/13 For Section A-A And Section B-B  
 The Reinforcing Bar Size Is Indicated By The First Two Digits Of The Bar Mark, For Example A16M01 Is A 16 Bar.  
 All Dimensions are in Millimeters, unless otherwise noted.

Location	Elevation			
	A	B	C	D
Rear Abut.	198.900	198.967	197.620	196.075
Fwd. Abut.	198.944	199.011	197.664	196.119

PLOTTED VIEW = PLAN  
 XREF # = NONE  
 CAD: J:\JEFF150\DWG\BRIDGE\SA001.DWG MAY-21-1999

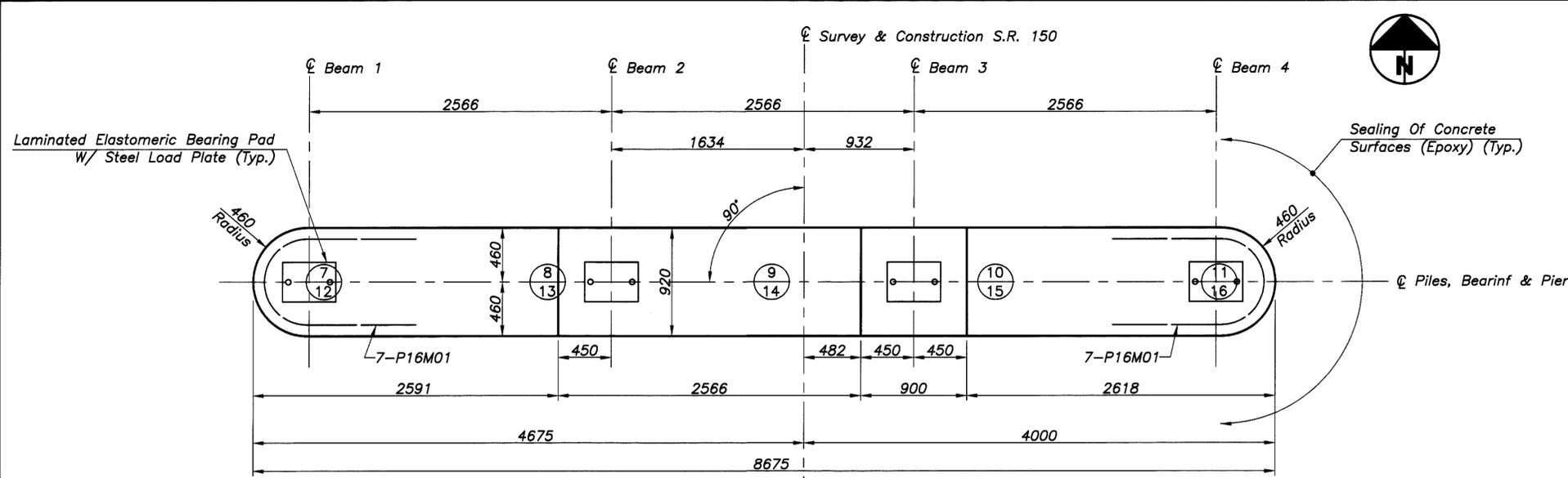
**DESIGN AGENCY**  
**Bar Engineering, Inc.**  
 Brecksville, Ohio 44141  
 (440) 526-6457 Fax: (440) 526-6457

DESIGNED	TJP	CHECKED	EDW
DRAWN	TJP	REVISED	
REVIEWED	GTB	STRUCTURE FILE NO	4102274
DATE	12/18/98		

**ABUTMENT DETAILS**  
 Bridge No. JEF-150-20818  
 S.R. 150 Over Short Creek

JEF-150-20.808  
 3/13  
 13/19





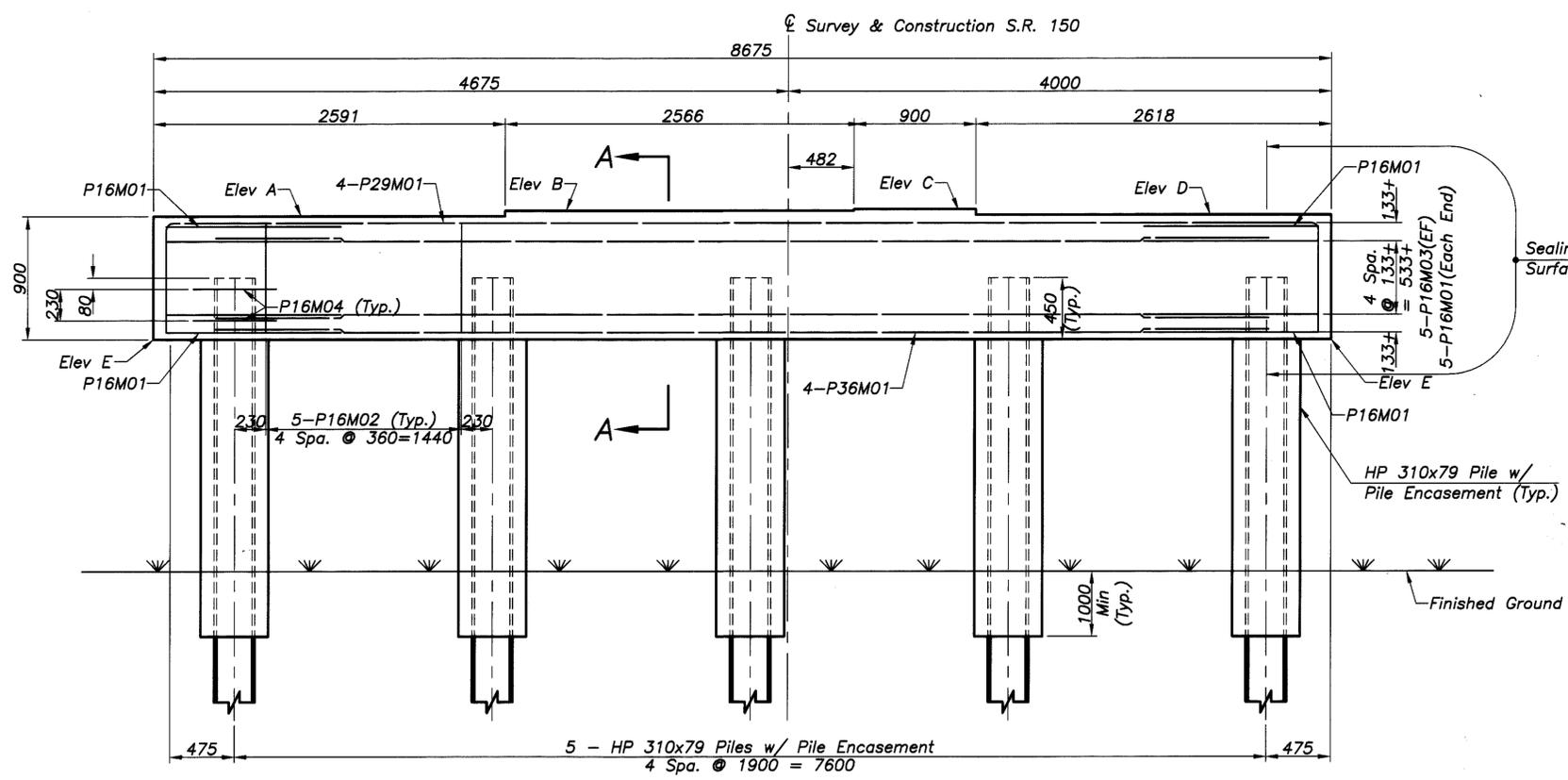
**PLAN**

① Indicates Pile w/ Pile Number  
 Top Number Is Pier 1  
 Bottom Number Is Pier 2

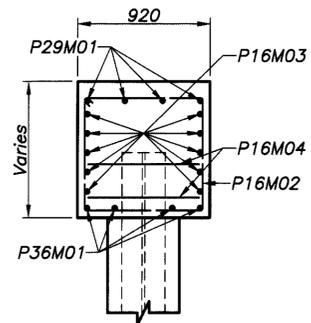
**Notes:**  
 BRIDGE SEAT REINFORCING: Reinforcing steel in the vicinity of the bridge seat shall be accurately placed to avoid interference with the drilling of bearing anchor holes or the pre-setting of bearing anchors.  
 The Reinforcing Bar Size Is Indicated By The First Two Digits Of The Bar Mark, For Example A16M01 Is A 16 Bar.  
 All Dimensions Are In Millimeters, Unless Otherwise Noted.

Location	Elevation				
	A	B	C	D	E
Pier 1	197.860	197.901	197.912	197.871	196.960
Pier 2	197.877	197.918	197.929	197.888	196.977

Elevations Taken At Centerline Bearing Of Pier



**ELEVATION**



**SECTION A-A**

- The Following Legend Shall Be Used Throughout These Plans:
- |        |                  |        |                |
|--------|------------------|--------|----------------|
| Abut.  | Abutment         | Clr.   | Clear          |
| Appr.  | Approach         | Spa.   | Spacing        |
| Brgs.  | Bearings         | Fwd.   | Forward        |
| C/C    | Center to Center | FF     | Far Face       |
| C      | Centerline       | NF     | Near Face      |
| Conc.  | Concrete         | EF     | Each Face      |
| Sta.   | Station          | Min.   | Minimum        |
| Ref.   | Reference        | Super. | Superstructure |
| El.    | Elevation        | O/O    | Out to Out     |
| Temp.  | Temporary        | F/F    | Face to Face   |
| Exist. | Existing         | Bot.   | Bottom         |
| Inc.   | Increment        |        |                |
| RA     | Rear Abutment    |        |                |
| FA     | Forward Abutment |        |                |

**REINFORCING STEEL SPLICE LENGTHS:** Minimum splice lengths for reinforcing bars will be as follows unless shown otherwise:  
 #13M 600mm  
 #16M 750mm

PLOTTED NEW PLAN  
 XREF#1 = NONE  
 XREF#2 = NONE  
 PLOT SCALE = 1"=1'  
 E:\JEF\150\DWG\BRIDGE\SB001.DWG MAY-24-1999

DESIGN AGENCY  
**Barr Engineering, Inc**  
 8748 Brecksville Road, Suite 130  
 Brecksville, OH 44141  
 (440) 526-6455 Fax: (440) 526-6457

DATE  
 12/18/98  
 REVIEWED  
 GTB  
 DRAWN  
 TJP  
 CHECKED  
 EDW

STRUCTURE FILE NO  
 4102274

**PIERS DETAILS**  
 Bridge No. JEF-150-20818  
 S.R. 150 Over Short Creek

**JEF-150-20.808**

5/13

15/19

**Notes:**

WELDED ATTACHMENT of supports for concrete deck finishing machine may be made to areas of the fascia stringer flanges designated "Compression". Attachments shall not be made to areas designated "Tension". Fillet welds to compression flanges shall be not closer than 25 mm from edge of flange, be not more than 50 mm long, and be not smaller than the minimum size required by AWS D1.5.

BEAM SPLICES Shall Be As Per Detail Shown on Sheet 8/13.

INTERMEDIATE CROSS FRAMES shall be as per Standard Construction Drawing GSD-1-96M (Type 1: Intermediate Welded Cross Frame Details For Rolled Beam Bridges AASHTO Case II).

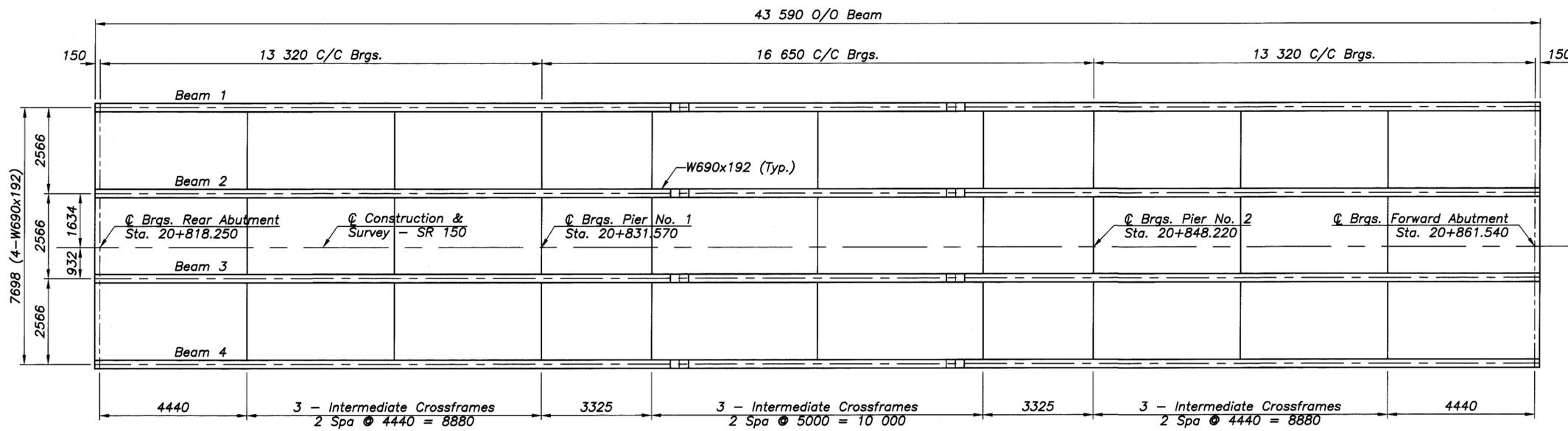
HIGH STRENGTH BOLTS shall be 27mm diameter A325M unless otherwise noted.

Where a shape or plate is designated (CVN) the material shall meet specified minimum notch toughness as specified in 711.01.

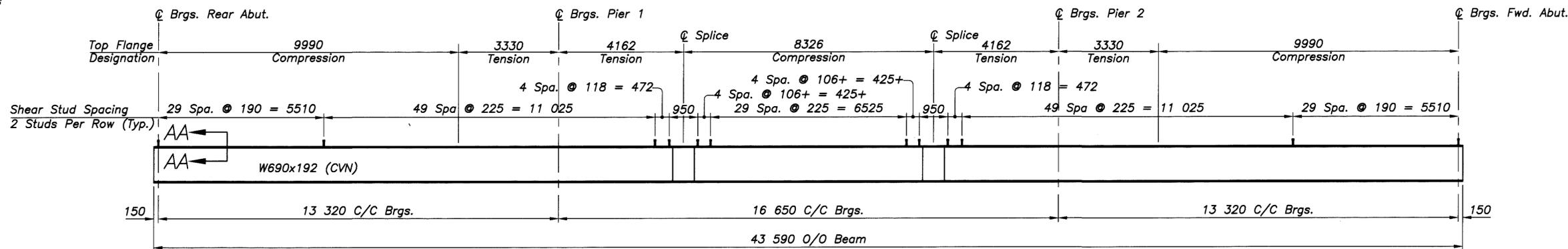
See Abutment Details, sheet 4/13, for details of the holes to be provided in the beams

ITEM 863 - STRUCTURAL STEEL MEMBERS, LEVEL TWO (2) FABRICATION, AS PER PLAN  
A 588M Steel is to be left unpainted. See CMS 513.22 for final field cleaning requirements. Payment shall be included in Item 863, Structural Steel Members, Level Two (2) Fabrication, As Per Plan.

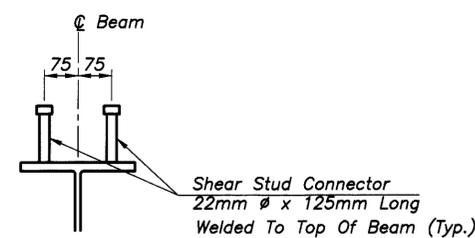
All Dimensions Are In Millimeters, Unless Otherwise Noted.



**STEEL FRAMING PLAN**

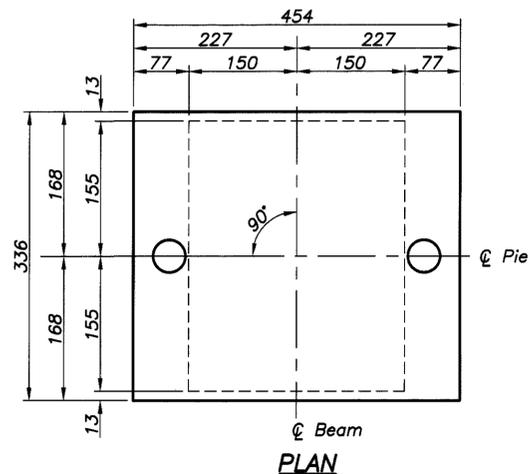
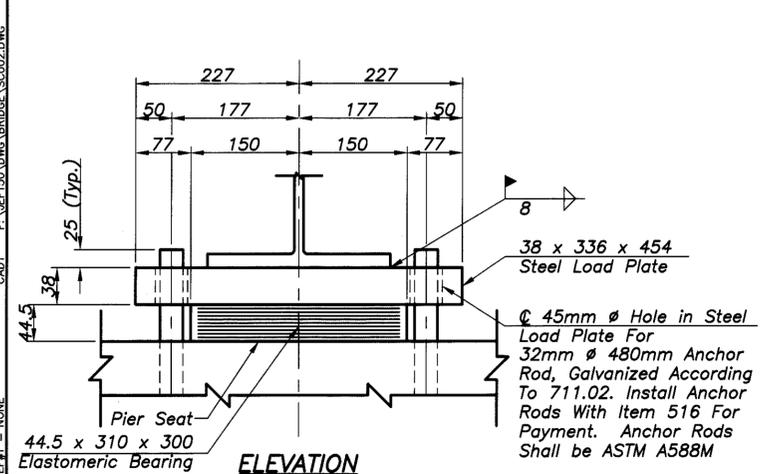


**BEAM ELEVATION**



**SECTION AA-AA**

**LAMINATED ELASTOMERIC FIXED BEARING DETAIL**



**Notes:**

Steel Load Plates Shall Be A588M

The Unit Price For The Bearing Shall Include All Necessary Materials, Labor, Testing, Anchor Rods And Incidentals Necessary To Furnish And Install Laminated Elastomeric Bearings. Payment will be made at the Contract Price for Item 516, Each, Elastomeric Bearings With Internal Laminates And Load Plate (Neoprene), As Per Plan (44.5mm X 310mm X 300mm)

Tolerances:  
Individual Elastomer: ±20% Of Design Value (Not To Exceed ±3mm)  
Plan Dimensions: -0mm + 6mm  
Design Thickness: -0mm + 6mm  
Edge Cover Of Embedded Laminate: -0mm + 3mm

The Steel Load Plate Shall Be The Same Material As The Attached Structural Steel And Be Similarly Cleaned And Coated. Surface Preparation And Priming Shall Be Done In The Shop And Be Included In The Price Bid For The Bearings. Field Coats Shall Be Included In The Price Bid For Painting The Main Structural Steel.

The Steel Load Plate Shall Be Bonded By Vulcanization To The Elastomer During The Molding Process. The Welding Of The Load Plate To The

Superstructure Shall Be Controlled So That The Plate Temperature At The Elastomer Bonded Surface Shall Not Exceed 150° C As Determined By The Use Of Pyrometric Sticks Or Other Temperature Monitoring Devices.

Elastomeric Bearings Shall Comply With Item 516 And AASHTO Standard Specifications For Highway Bridges, Section 18, Bearing Devices, Division II, Construction, Articles 18.4.5.1 And 18.5.6.2. Bearings Shall Be Grade 3, 50 Durometer Elastomer, And Shall Be Subjected To The Load Testing Requirements Defined In Article 18.7.4.5 Of The AASHTO Document Listed Above. Bearings Were Designed Under Section 14.6.6 Of Section 14, Bearings Division I, Design. Testing Shall Be Included In The Unit Price Bid For The Bearings, Each.

Bearing Repositioning, If Deck Concrete Is Placed At An Ambient Temperature Higher Than 27° C Or Lower Than 4° C And The Bearing Deflection Exceeds One-Sixth Of The Bearing Height At 16° C ± -12° C, The Beams Shall Be Raised To Allow The Bearings To Return To Their Undeformed Shape At 16° C ± -12° C.

**LAMINATED ELASTOMERIC BEARING DATA (50 Durometer)**

	Pier	
	Thickness	No.
Dead Load	244 kN	2
Live Load	316 kN	4
Design Load	560 kN	5
Exterior Elastomeric Layer	4.5mm	2
Interior Elastomeric Layer	6.5mm	4
Steel Plate Laminate	1.9mm	5

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DESIGN AGENCY: Barr Engineering, Inc. 8748 Brecksville Road, Suite 130 Brecksville, OH 44141 (440) 526-6455 Fax: (440) 526-6457  
 DATE: 12/18/98  
 DRAWN: TJP  
 CHECKED: EDW  
 STRUCTURE FILE NO: 4102274  
 BRIDGE NO. JEF-150-20818  
 S.R. 150 Over Short Creek  
 JEF-150-20.808  
 6/13  
 16/9

PLOTTED VIEW = PLAN  
 XREF #1 = NONE  
 XREF #2 = NONE  
 XREF #3 = NONE  
 PLOT SCALE = 1"=1"  
 CADD: JEF150.DWG BRIDGE.SC001.DWG MAY-21-1999

**Notes:**

A HAUNCH WIDTH of 225 mm shall be used for computing quantity of concrete. However, the haunch width may vary between 150 mm and 300 mm.

DECK SLAB DEPTH: The distance shown from top of deck slab to top of steel beam is the theoretical design dimension including the design haunch thickness of 50mm. The quantity of deck concrete to be paid for shall be based on this dimension, minus the design haunch thickness, even though deviation from it may be necessary because the top flange of the beam may not have the exact camber or conformation required to place it parallel to the finished grade.

Intermediate Cross Frames: Shall Be As Per Standard Construction Drawing GSD-1-96M (Type 1: Intermediate Welded Cross Frame Details For Rolled Beam Bridges AASHTO Case II).

For Screed Elevations See Sheet **8/13**

For Reinforcing Steel Schedule See Sheet **9/13**

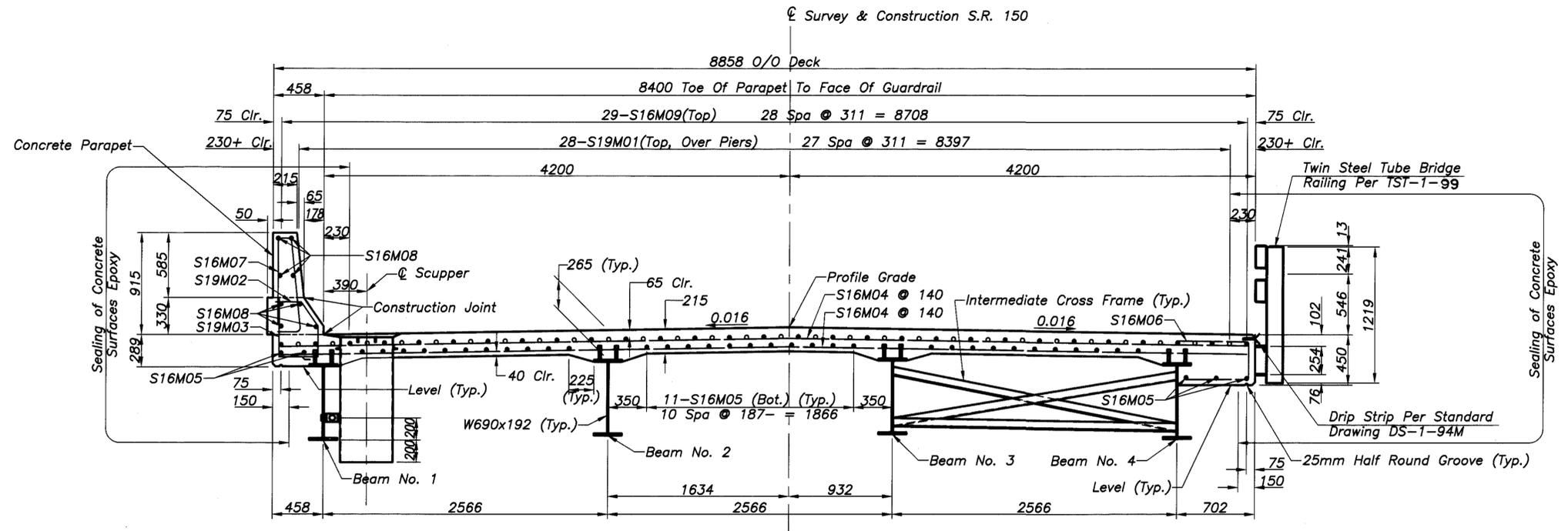
For Scupper Details See Standard Drawing GSD-1-96M.

For Scupper Locations See Sheet **8/13**

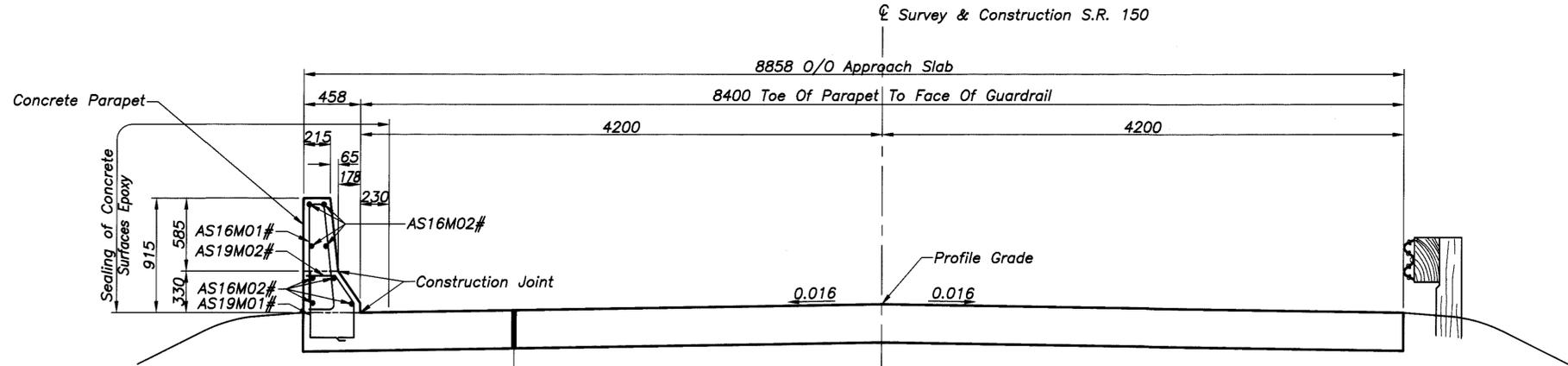
For Shear Stud Details See Sheet **6/13**

The Reinforcing Bar Size Is Indicated By The First Two Digits Of The Bar Mark, For Example A16M01 Is A 16 Bar.

All Dimensions Are In Millimeters, Unless Otherwise Noted.



**TRANSVERSE SECTION**



**APPROACH SLAB SECTION**

Payment For Concrete Parapet On Approach Slabs, Construct Per Item 844 - High Performance Concrete Superstructure (Parapet), Shall Be included with Item 611 Reinforced Concrete Approach Slab, As Per Plan For Payment.

Item 611 - Reinforced Concrete Approach Slab, As Per Plan (T = 305mm)

Reinforced Concrete Approach Slab Shall Include All Reinforcing Steel As Shown On Standard Construction Drawing AS-1-81M. (Even Though Not Shown Here).

# Payment For The Reinforcing Steel On The Approach Slab Parapet Shall Be Included With The Approach Slab For Payment.

**APPROACH SLAB PARAPET STEEL REINFORCING LIST**

MARK	TOTAL NO.	WEIGHT (kg)	LENGTH	TYPE	A	B	C
AS16M01	22	62	1825	8			
AS16M02	16	111	4450	St			
AS19M01	22	38	775	6	300	525	
AS19M02	22	41	825	7	275		
<b>TOTAL</b>		<b>252</b>					

**Notes:**

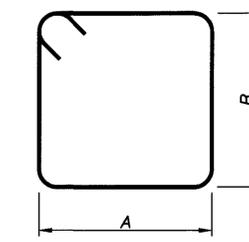
- All Reinforcing Steel To Be Epoxy Coated.
- All Dimensions Are Out To Out Unless Otherwise Noted.
- All Dimensions Are Shown In Millimeters, Except Where Noted.
- The Reinforcing Bar Size Is Indicated By The First Two Digits Of The Bar Mark, For Example A16M01 Is A 16 Bar.
- Standard Bends Are To Be Provided, Except Where Noted.
- For Bar Types See Sheet **9/13**
- \* The Weight of Reinforcing Steel Shown Is For Informational Purposes Only. The Cost Of Reinforcing Steel Is Included In The Approach Slab For Payment.

DESIGN AGENCY  
**Barr Engineering, Inc**  
 8748 Brecksville Road, Suite 130  
 Brecksville, OH 44141  
 (440) 526-6455 Fax: (440) 526-6457  
 DRAWN TJP  
 CHECKED TJP  
 REVIEWED TJP  
 DATE 4/10/27  
 STRUCTURE FILE NO 4102274  
**TRANSVERSE & APPROACH SLAB SECTION**  
 Bridge No. JEF-150-20818  
 S.R. 150 Over Short Creek  
**JEF-150-20.808**  
 7/13  
 17/19

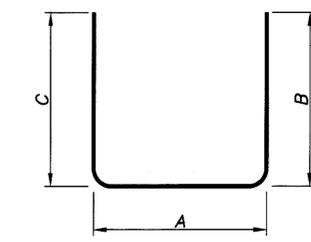


# STEEL REINFORCING LIST

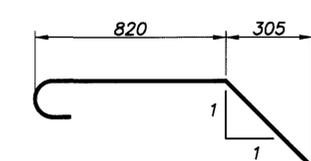
MARK	TOTAL NO.	WEIGHT (kg)	LENGTH	TYPE	A	B	C	REAR ABUT.	FWD. ABUT.	PIER 1	PIER 2	SUPER.
<b>ABUTMENTS</b>												
A10M01	36	49	2435	1	740	515		18	18			
A16M01	58	293	3250	1	770	770		29	29			
A16M02	50	212	2725	2	600	1100	1100	25	25			
A16M03	12	82	4375	2	600	1925	1925	6	6			
A16M04	12	217	11650	St				6	6			
A16M05	12	53	2825	2	600	1150	1150	6	6			
A16M06	20	31	1000	St				10	10			
A16M07	20	32	1025	St				10	10			
A19M01	60	416	3100	5				30	30			
A25M01	16	741	11650	St				8	8			
D25M01	40	242	1525	3				20	20			
<b>SUB-TOTAL (ABUTMENTS)</b>		<b>2,368</b>										
<b>PIERS</b>												
P16M01	28	106	2450	4						14	14	
P16M02	40	174	2800	1	820	500				20	20	
P16M03	20	237	7650	St						10	10	
P16M04	20	91	2925	1	770	610				10	10	
P29M01	8	380	9375	2	8000	775	775			4	4	
P36M01	8	484	7650	St						4	4	
<b>SUB-TOTAL (PIERS)</b>		<b>1,472</b>										
<b>SUPERSTRUCTURE</b>												
S13M01	4	4	900	St								4
S16M01	8	116	9325	St								8
S16M02	120	331	1775	2	600	625	625					120
S16M03	60	221	2375	2	450	1000	1000					60
S16M04	626	8,453	8700	St								626
S16M05	152	2,719	11525	St								152
S16M06	111	241	1400	2	300	550	625					111
S16M07	98	278	1825	8								98
S16M08	32	572	11525	St.								32
S16M09	116	2,052	11400	St								116
S19M01	56	939	7500	St								56
S19M02	98	181	825	7	275							98
S19M03	98	170	775	6	300	525						98
S25M01	8	296	9325	St								8
<b>SUB-TOTAL (SUPERSTRUCTURE)</b>		<b>16,573</b>										
<b>GRAND TOTAL</b>		<b>20,413</b>										



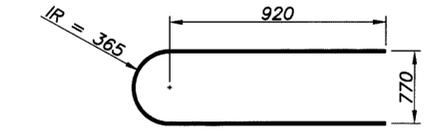
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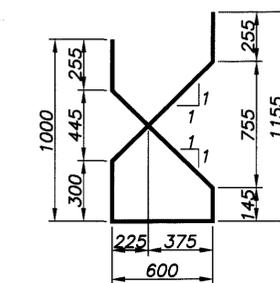
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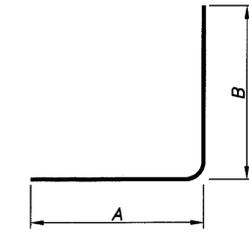
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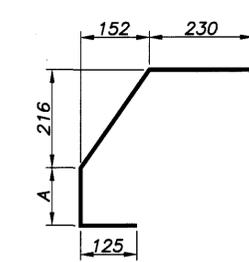
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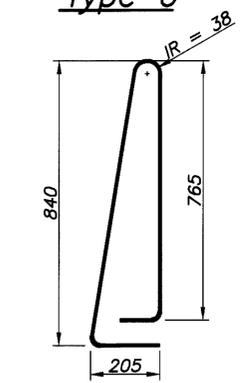
Type 5



Type 6



Type 7



Type 8

**Notes:**  
 All Reinforcing Steel To Be Epoxy Coated.  
 All Dimensions Are Out To Out Unless Otherwise Noted.  
 All Dimensions Are Shown In Millimeters, Except Where Noted.  
 The Reinforcing Bar Size Is Indicated By The First Two Digits Of The Bar Mark, For Example A16M01 Is A 16 Bar.  
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 \* The Weight of Reinforcing Steel Shown Is For Informational Purposes Only. The Cost Of Reinforcing Steel Is Included In Their Appropriate Concrete Items For Payment.

PLOTTED VIEW = PLAN  
 XREF# = NONE  
 XREF# = NONE  
 PLOT SCALE = 1:1  
 CAD: E:\JEF150.DWG BRIDGE.S0001.DWG MAY-24-1999

DESIGN AGENCY: **Barr Engineering, Inc.**  
 8748 Brecksville Road, Suite 130  
 Brecksville, OH 44141  
 (440) 526-6455 Fax: (440) 526-6457

REVIEWED DATE: **12/18/98**  
 GTB  
 STRUCTURE FILE NO: **4102274**

DRAWN: **TJP**  
 CHECKED: **EDW**

**STEEL REINFORCING LIST**  
 Bridge No. **JEF-150-20818**  
 S.R. 150 Over Short Creek

**JEF-150-20.808**

9/13

# SPECIAL PROVISIONS

## WATERWAY PERMITS FOR

CRS: JEF-150-20.808 PID 13589

U.S. ARMY CORPS OF ENGINEERS  
PERMIT NUMBER: 3 and 14

OHIO EPA  
PERMIT NUMBER: \_\_\_\_\_

DATE: 2/3/99

### NATIONWIDE PERMIT

**3. Maintenance.** The repair, rehabilitation, or replacement of any previously authorized, currently serviceable, structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3, provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area including those due to changes in materials, construction techniques, or current construction codes or safety standards which are necessary to make repair, rehabilitation, or replacement, are permitted provided the environmental effects resulting from such repair, rehabilitation, or replacement are minimal. Currently serviceable means useable as is or with some maintenance but not so degraded as to essentially require reconstruction. This NWP authorizes the repair, rehabilitation, or replacement of those structures destroyed by storms, floods, fire or other discrete events, provided the repair, rehabilitation, or replacement is commenced or under contract to commence within two years of the date of their destruction or damage. In cases of catastrophic events, such as hurricanes or tornadoes, this two-year limit may be waived by the District Engineer, provided the permittee can demonstrate funding, contract, or other similar delays. Maintenance dredging and beach restoration are not authorized by this NWP. (Sections 10 and 404)

For activities involving a discharge, the Ohio State Certification General Conditions apply to this nationwide permit.

NWP-3: 1/1

Project # 762

## NATIONWIDE PERMIT

**14. Road Crossings.** Fills for roads crossing waters of the United States (including wetlands and other special aquatic sites) provided the activity meets all of the following criteria:

- a. The width of the fill is limited to the minimum necessary for the actual crossing;
- b. The fill placed in waters of the United States is limited to a filled area of no more than 1/3 acre. Furthermore, no more than a total of 200 linear feet of the fill for the roadway can occur in special aquatic sites, including wetlands;
- c. The crossing is culverted, bridged or otherwise designed to prevent the restriction of, and to withstand, expected high flows and tidal flows, and to prevent the restriction of low flows and the movement of aquatic organisms;
- d. The crossing, including all attendant features, both temporary and permanent, is part of a single and complete project for crossing of a water of the United States; and,
- e. For fills in special aquatic sites, including wetlands, the permittee notifies the District Engineer in accordance with the "Notification" general condition. The notification must also include a delineation of affected special aquatic sites, including wetlands.

This NWP may not be combined with NWP 18 or NWP 26 for the purpose of increasing the footprint of the road crossing. Some road fills may be eligible for an exemption from the need for a Section 404 permit altogether (see 33 CFR 323.4). Also, where local circumstances indicate the need, District Engineers will define the term "expected high flows" for the purpose of establishing applicability of this NWP. (Sections 10 and 404)

The Ohio State Certification General Conditions apply to this nationwide permit.

## OHIO STATE CERTIFICATION GENERAL CONDITIONS FOR NATIONWIDE PERMITS.

The following general conditions apply to Nationwide Permits 3, 4, 5, 6, 7, 12, 13, 14, 15, 16, 18, 19, 20, 22, 23, 25, 26, 27, 29, 30, 31, 32, 33, 34, 36, 37, 38, and 40.

Steps shall be taken, upon completion of the projects, to ensure bank stability. This may include, but is not limited to, the placement of riprap or bank seeding.

Any damages to the immediate environment of the project by equipment needed for construction or hauling will be repaired immediately.

Care must be employed throughout the course of this project to avoid the creation of unnecessary turbidity which may degrade water quality or adversely affect aquatic life outside the project areas.

For Nationwide Permits 14, 21, 26 (1-3 acres), 29, 33, 37, and 38, that require Agency coordination, in accordance with the Nationwide Permit General Condition entitled "Notification", Number 13(e)(i), the Corps shall submit a pre-construction notification to Ohio EPA for review and comment.

## NATIONWIDE PERMIT CONDITIONS

### GENERAL CONDITIONS:

The following general conditions must be followed in order for any authorization by a NWP to be valid:

- 1. Navigation.** No activity may cause more than a minimal adverse effect on navigation.
- 2. Proper maintenance.** Any structure or fill authorized shall be properly maintained, including maintenance to ensure public safety.
- 3. Erosion and siltation controls.** Appropriate erosion and siltation controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date.
- 4. Aquatic life movements.** No activity may substantially disrupt the movement of those species of aquatic life indigenous to the waterbody, including those species which normally migrate through the area, unless the activity's primary purpose is to impound water.
- 5. Equipment.** Heavy equipment working in wetlands must be placed on mats, or other measures must be taken to minimize soil disturbance.
- 6. Regional and case-by-case conditions.** The activity must comply with any regional conditions which may have been added by the Division Engineer (see 33 CFR 330.4(e) and with any case specific conditions added by the Corps or by the State or tribe in its section 401 water quality certification.
- 7. Wild and Scenic Rivers.** No activity may occur in a component of the National Wild and Scenic River System; or in a river officially designated by Congress as a "study river" for possible inclusion in the system, while the river is in an official study status, unless the appropriate Federal agency, with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely effect the Wild and Scenic River designation, or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency in the area (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service.)
- 8. Tribal rights.** No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.
- 9. Water quality certification.** In certain states, an individual Section 401 water quality certification must be obtained or waived (see 33 CFR 330.4(c)).

**10. Coastal zone management.** In certain states, an individual State coastal zone management consistency concurrence must be obtained or waived (see Section 330.4(d))

### 11. Endangered Species.

(a) No activity is authorized under any NWP which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act, or which is likely to destroy or adversely modify the critical habitat of such species. Non-federal permittees shall notify the District Engineer if any listed species or critical habitat might be affected or is in the vicinity of the project, and shall not begin work on the activity until notified by the District Engineer that the requirements of the Endangered Species Act have been satisfied and that the activity is authorized.

(b) Authorization of an activity by a nationwide permit does not authorize the "take" of a threatened or endangered species as defined under the Federal Endangered Species Act. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, both lethal and non-lethal "takes" of protected species are in violation of the Endangered Species Act. Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the U.S. Fish and Wildlife Service and National Marine Fisheries Service or their world wide web pages at <http://www.fws.gov/~r9endspp/endspp.html> and [http://kingfish.spp.mnfs.gov/tmcintyr/prot\\_res.html#ES](http://kingfish.spp.mnfs.gov/tmcintyr/prot_res.html#ES) and Recovery, respectively.

**12. Historic properties.** No activity which may affect historic properties listed, or eligible for listing, in the National Register of Historic Places is authorized, until the DE has complied with the provisions of 33 CFR Part 325, Appendix C. The prospective permittee must notify the District Engineer if the authorized activity may affect any historic properties listed, determined to be eligible, or which the prospective permittee has reason to believe may be eligible for listing on the National Register of Historic Places, and shall not begin the activity until notified by the District Engineer that the requirements of the National Historic Preservation Act have been satisfied and that the activity is authorized. Information on the location and existence of historic resources can be obtained from the State Historic Preservation Office and the National Register of Historic Places (see 33 CFR 330.4(g)).

### 13. Notification.

(a) **Timing:** Where required by the terms of the NWP, the prospective permittee must notify the District Engineer with a Pre-Construction Notification (PCN) as early as possible and shall not begin the activity: (1) Until notified by the District Engineer that the activity may proceed under the NWP with any special conditions imposed by the District or Division

Engineer; or (2) If notified by the District or Division Engineer that an individual permit is required; or (3) Unless 30 days (or 45 days for NWP 26 only) have passed from the District Engineer's receipt of the notification and the prospective permittee has not received notice from the District or Division Engineer Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) Contents of Notification: The notification must be in writing and include the following information:

- (1) Name, address and telephone numbers of the prospective permittee;
- (2) Location of the proposed project;
- (3) Brief description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause; any other NWP(s), regional general permit(s) or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity; and
- (4) For NWPs S 18, 21, 26, 29, 34, and 38, the PCN must also include a delineation of affected special aquatic sites, including wetlands (see paragraph 13(f));
- (5) For NWP 21 - Surface Coal Mining Activities, the PCN must include an OSM or State approved mitigation plan.
- (6) For NWP 29-Single-Family Housing, the PCN must also include:
  - (i) Any past use of this NWP by the individual permittee and/or the permittee's spouse;
  - (ii) A statement that the single-family housing activity is for a personal residence of the permittee;
  - (iii) A description of the entire parcel, including its size, and a delineation of wetlands. For the purpose of this NWP, parcels of land measuring 0.5 acre or less will not require a formal on-site delineation. However, the applicant shall provide an indication of where the wetlands are and the amount of wetlands that exists on the property. For parcels greater than 0.5 acre in size, a formal wetland delineation must be prepared in accordance with the current method required by the Corps. (See paragraph 13(f));
  - (iv) A written description of all land (including, if available, legal descriptions) owned by the prospective permittee and/or the prospective permittee's spouse, within a one mile radius of the parcel, in any form of ownership (including any land owned as a partner, corporation, joint tenant, co-tenant, or as a tenant-by-the-entirety) and any land on which a purchase and sale agreement or other contract for sale or purchase has been executed;

(7) For NWP 31 Maintenance of Existing Flood Control Projects, the prospective permittee must either notify the District Engineer with a Pre-Construction Notification (PCN) prior to each maintenance activity or submit a five year (or less) maintenance plan. In addition, the PCN must include all of the following:

- (I) Sufficient baseline information so as to identify the approved channel depths and configurations and existing facilities. Minor deviations are authorized, provided that the approved flood control protection or drainage is not increased;
  - (ii) A delineation of any affected special aquatic sites, including wetlands; and,
  - (iii) Location of the dredged material disposal site.
- (8) For NWP 33-Temporary Construction, Access, and Deterring, the PCN must also include a restoration plan of reasonable measures to avoid and minimize adverse effects to aquatic sources.

(c) **Form of Notification:** The standard individual permit application form (Form ENG 4345) may be used as the notification but must clearly indicate that it is a PCN and must include all of the information required in (b) (1)-(7) of General Condition 13. A letter may also be used.

(d) **District Engineer's Decision:** In reviewing the pre-construction notification for the proposed activity, the District Engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative-adverse environmental effects or may be contrary to the public interest. The prospective permittee may, optionally, submit a proposed mitigation plan with the pre-construction notification to expedite the process and the District Engineer will consider any optional mitigation the applicant has included in the proposal in determining whether the net adverse environmental effects of the proposed work are minimal. If the District Engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse effects are minimal, the District Engineer will notify the permittee and include any conditions the DE deems necessary.

Any mitigation proposal must be approved by the District Engineer prior to commencing work. If the prospective permittee elects to submit a mitigation plan, the District Engineer will expeditiously review the proposed mitigation plan, but will not commence a second 30-day (or 45-day for NWP 26) notification procedure. If the net adverse effects of the project (with the mitigation proposal) are determined by the District Engineer to be minimal, the District Engineer will provide a timely written response to the applicant stating that the project can proceed under the terms and conditions of the nationwide permit

If the District Engineer determines that the adverse effects of the proposed work are more than minimal, then he will notify the applicant either: (1) that the project does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (2) that the project is authorized under the NWP subject to the applicant's submitting a mitigation proposal that would reduce the adverse effects to the minimal level; or (3) that the project is authorized under the NWP with specific modifications or conditions.

(e) **Agency Coordination:** The District Engineer will consider any comments from Federal and State agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the project's adverse environmental effects to a minimal level.

(i) For NWP 14, 21, 26 (between 1 and 3 acres of impact), 29, 33, 37, and 38. The District Engineer will, upon receipt of a notification, provide immediately, e.g., facsimile transmission, overnight mail or other expeditious manner, a copy to the appropriate offices of the Fish and Wildlife Service, State natural resource or water quality agency, EPA, State Historic Preservation Officer (SHPO), and, if appropriate, the National Marine Fisheries Service. With the exception of NWP 37, these agencies will then have 5 calendar days from the date the material is transmitted to telephone or fax the District Engineer notice that they intend to provide substantive, site-specific comments. If so contacted by an agency, the District Engineer will wait an additional 10 calendar days (16 calendar days for NWP 26 PCNs) before making a decision on the notification. The District Engineer will fully consider agency comments received within the specified time frame, but will provide no response to the resource agency. The District Engineer will indicate in the administrative record associated with each notification that the resource agencies' concerns were considered. Applicants are encouraged to provide the Corps multiple copies of notifications to expedite agency notification.

(ii) Optional Agency Coordination For NWPs 5, 7, 12, 13, 17, 18, 27, 31, and 34, where a Regional Administrator of EPA, a Regional Director of USFWS, or Regional Director of NMFS has formally requested general notification from the District Engineer for the activities covered by any of these NWPs, the Corps will provide the requesting agency with notification on the particular NWPs. However, where the agencies have a record of not generally submitting substantive comments on activities covered by any of these NWPs, the Corps district may discontinue providing notification to those regional agency offices. The District Engineer will coordinate with the resource agencies to identify which activities involving a PCN that the agencies will provide substantive comments to the Corps. The District Engineer may also request comments from the agencies on a case by case basis when the District Engineer determines that such comments would assist the Corps in reaching a decision whether effects are more than minimal either individually or cumulatively.

(iii) Optional Agency Coordination, 401 Denial. For NWP 26 only, where the State has denied its 401 water quality certification for activities with less than 1 acre of wetland impact, the EPA regional administrator may request agency coordination of PCNs between 1/3 and 1 acre. The request may only include acreage limitations within the 1/3 to 1 acre range for which the state has denied water quality certification. In cases where the EPA has requested coordination of projects as described here, the Corps will forward the PCN to EPA only. The PCN will then be forwarded to the Fish and Wildlife Service and the National Marine Fisheries Service by EPA under agreements among those agencies. Any agency receiving the PCN will be bound by the time frames for providing comments to the Corps.

**(f) Wetlands Delineations:** Wetland delineations must be prepared in accordance with the current method required by the Corps. For NWP 29 see paragraph (b)(6)(iii) for parcels less than 0.5 acres in size. The permittee may ask the Corps to delineate the special aquatic site. There may be some delay if the Corps does the delineation. Furthermore, the 30-day period (45 days for NWP 26) will not start until the wetland delineation has been completed and submitted to the Corps, where appropriate.

**(g) Mitigation:** Factors that the District Engineer will consider when determining the acceptability of appropriate and practicable mitigation include, but are not limited to:

(i) To be practicable, the mitigation must be available and capable of being done considering costs, existing technology, and logistics in light of the overall project purposes;

(ii) To the extent appropriate, permittees should consider mitigation banking and other forms of mitigation including contributions to wetland trust funds, "in lieu fees" to organizations such as The Nature Conservancy, state or county natural resource management agencies, where such fees contribute to the restoration, creation, replacement, enhancement, or preservation of wetlands. Furthermore, examples of mitigation that may be appropriate and practicable include but are not limited to: reducing the size of the project; establishing wetland or upland buffer zones to protect aquatic resource values; and replacing the loss of aquatic resource values by creating, restoring, and enhancing similar functions and values. In addition, mitigation must address wetland impacts, such as functions and values, and cannot be simply used to offset the acreage of wetland losses that would occur in order to meet the acreage limits of some of the NWPs (e.g., for NWP 26, 5 acres of wetlands cannot be created to change a 6-acre loss of wetlands to a 1 acre loss; however, 2 created acres can be used to reduce the impacts of a 3-acre loss.).

**14. Compliance certification.** Every permittee who has received a Nationwide permit verification from the Corps will submit a signed certification regarding the completed work and any required mitigation. The certification will be forwarded by the Corps with the authorization letter and will include:

- a. A statement that the authorized work was done in accordance with the Corps authorization, including any general or specific conditions;
- b. A statement that any required mitigation was completed in accordance with the permit conditions;
- c. The signature of the permittee certifying the completion of the work and mitigation.

**15. Multiple use of Nationwide permits.** In any case where any NWP number 12 through 40 is combined with any other NWP number 12 through 40, as part of a single and complete project, the permittee must notify the District Engineer in accordance with paragraphs a, b, and c on the "Notification General Condition number 13. Any NWP number 1 through 11 may be combined with any other NWP without notification to the Corps, unless notification is otherwise required by the terms of the NWPs. As provided at 33 CFR 330.6(c) two or more different NWPs can be combined to authorize a single and complete project. However, the same NWP cannot be used more than once for a single and complete project.

NWP-Cond: 6/7

NWP-Cond: 5/7

## SECTION 404 ONLY CONDITIONS:

In addition to the General Conditions, the following conditions apply only to activities that involve the discharge of dredged or fill material into waters of the U.S., and must be followed in order for authorization by the NWP to be valid:

**1. Water supply intakes.** No discharge of dredged or fill material may occur in the proximity of a public water supply intake except where the discharge is for repair of the public water supply intake structures or adjacent bank stabilization.

**2. Shellfish production.** No discharge of dredged or fill material may occur in areas of concentrated shellfish production, unless the discharge is directly related to a shellfish harvesting activity authorized by NWP 4.

**3. Suitable material.** No discharge of dredged or fill material may consist of unsuitable material (e.g. trash, debris, car bodies, asphalt, etc.) and material discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

**4. Mitigation.** Discharges of dredged or fill material into waters of the United States must be minimized or avoided to the maximum extent practicable at the project site (i.e. on-site), unless the District Engineer approves a compensation plan that the District Engineer determines is more beneficial to the environment than on-site minimization or avoidance measures.

**5. Spawning areas.** Discharges in spawning areas during spawning seasons must be avoided to the maximum extent practicable.

**6. Obstruction of high flows.** To the maximum extent practicable, discharges must not permanently restrict or impede the passage of normal or expected high flows or cause the relocation of the water (unless the primary purpose of the fill is to impound waters).

**7. Adverse effects from impoundments.** If the discharge creates an impoundment of water, adverse effects on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow shall be minimized to the maximum extent practicable.

**8. Waterfowl breeding areas.** Discharges into breeding areas for migratory waterfowl must be avoided to the maximum extent practicable.

**9. Removal of temporary Fills.** Any temporary fills must be removed in their entirety and the affected areas returned to their preexisting elevation.

**GEOLOGY OF THE SITE**

GEOLOGICALLY, THE SITE LIES ON THE MARIETTA PLATEAU, A DISSECTED, MODERATELY HIGH RELIEF FORMER PLATEAU. THE AREA IS UNGLACIATED, LOCATED FAR BEYOND THE GLACIAL BOUNDARY. THE QUATERNARY GEOLOGY OF THE OHIO CANTON QUADRANGLE, OBTAINED FROM THE OHIO DEPARTMENT OF NATURAL RESOURCES (ODNR), INDICATES THE OVERBURDEN SOILS CONSIST OF COLLUVIUM DERIVED FROM LOCAL BEDROCK. THE UNDERLYING BEDROCK CONSISTS OF PENNSYLVANIAN-AGE CYCLIC SEQUENCES OF RED AND GRAY SHALE, MUDSTONE, SILTSTONE, SANDSTONE, AND COAL.

**EXPLORATION**

THREE (3) TEST BORINGS, DESIGNATED SB-1 THROUGH SB-3, WERE DRILLED AT THE LOCATIONS ILLUSTRATED ON THE ATTACHED BORING LOGS (SEE APPENDIX C). THE BORING LOCATIONS WERE STAKED BY REPRESENTATIVES OF RESOURCE INTERNATIONAL, AND THE STATIONS, OFFSETS, AND GROUND ELEVATIONS WERE SURVEYED BY REPRESENTATIVES OF BARR ENGINEERING. HOWEVER, DUE TO THE PRESENCE OF CONCRETE AND BRICK BENEATH THE ASPHALT PAVEMENT IN SB-1 AND SB-3, THE BORINGS WERE OFFSET FROM THE ORIGINAL STAKED LOCATIONS. BORING SB-1, DRILLED TO A DEPTH OF 21.3 METERS, WAS DRILLED JUST SOUTH OF THE EXISTING BRIDGE IN REFERENCE TO THE PROPOSED REAR ABUTMENT. BORING SB-2, DRILLED TO A DEPTH OF 15.7 METERS, WAS DRILLED THROUGH THE BRIDGE DECK IN REFERENCE TO THE CONSTRUCTION OF THE PIERS. BORING SB-3, DRILLED TO A DEPTH OF 21.3 METERS, WAS DRILLED JUST NORTH OF THE EXISTING BRIDGE IN REFERENCE TO THE PROPOSED FORWARD ABUTMENT. THE BORINGS WERE ADVANCED WITH A TRUCK MOUNTED ROTARY DRILLING MACHINE UTILIZING 9.5-CENTIMETER (3.75-INCH) HOLLOW STEM AUGERS TO ADVANCE THE HOLES. A DOUBLE TUBE DIAMOND BIT CORE BARREL WAS USED TO CORE THE BEDROCK ENCOUNTERED. CORING PRODUCED NX-SIZED (5.3-CENTIMETER DIAMETER) CORES, FROM WHICH THE TYPE OF ROCK AND ITS GEOLOGICAL CHARACTERISTICS WERE DETERMINED. THE DRILLING WAS PERFORMED BETWEEN APRIL 1 AND APRIL 3, 1998.

**INVESTIGATIONAL FINDINGS AND OBSERVATIONS**

TEST BORINGS SB-1 AND SB-3, DRILLED THROUGH THE EXISTING ROADWAY, EXHIBITED 36.0 CENTIMETERS OF ASPHALT. BENEATH THE ASPHALT, SB-1 EXHIBITED A 5.0-CENTIMETER THICK SAND, GRAVEL, AND BRICK BASE. BORING SB-3 EXHIBITED 15.0 CENTIMETERS OF CONCRETE (APPROACH SLAB) OVERLYING A 5.0-CENTIMETER THICK SAND, GRAVEL, AND BRICK BASE. BORINGS SB-1 AND SB-3 EXHIBITED COHESIVE SOILS IN APPROXIMATELY THE TOP 8.5 METERS, DESCRIBED AS GRAY CLAYEY SILT (SILT AND CLAY) WITH "LITTLE" SAND, OVERLYING PRIMARILY GRANULAR SOILS. THE GRANULAR SOILS ARE GENERALLY DESCRIBED AS GRAY FINE GRAVEL WITH "SOME" COARSE TO FINE SAND AND VARYING PERCENTAGES OF SILT AND CLAY. BORING SB-2, DRILLED THROUGH THE CREEK BED, ENCOUNTERED PREDOMINANTLY GRANULAR SUBSURFACE SOILS TO THE TOP OF BEDROCK, DESCRIBED AS GRAY FINE GRAVEL WITH "SOME" FINE TO COARSE SAND AND "TRACE" AMOUNTS OF SILT. A SINGLE LENS OF GRAY SILTY COARSE TO FINE SAND WITH "SOME" CLAY WAS ENCOUNTERED IN SB-2 BETWEEN 3.6 AND 5.2 METERS (ELEVATIONS 191.8 AND 190.2 METERS). A MORE COMPREHENSIVE DESCRIPTION OF WHAT WAS ENCOUNTERED DURING THE DRILLING PROCESS MAY BE FOUND ON THE ATTACHED BORING LOGS AT THE END OF THE SUBSURFACE INVESTIGATION REPORT. LABORATORY TEST RESULTS AND VISUAL INSPECTION OF REPRESENTATIVE SAMPLES INDICATE THAT THE SOILS ENCOUNTERED ARE CLASSIFIED AS ODOT A-1-a, A-2-4, A-4a, AND A-6a.

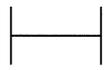
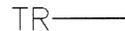
MANY SOIL PROPERTIES, INCLUDING SOIL CONSISTENCY AND SHEAR STRENGTH (OF COHESIVE SAMPLES), ARE PRIMARILY DERIVED FROM STANDARD PENETRATION BLOW COUNTS AND HAND PENETROMETER READINGS. THE STANDARD PENETRATION BLOW COUNTS INDICATED MEDIUM STIFF TO HARD COHESIVE SOILS AND LOOSE TO VERY DENSE GRANULAR SOILS. THE BLOW COUNTS RECORDED DURING THE DRILLING PROCESS RANGED FROM 5 BLOWS PER 30 CENTIMETERS TO REFUSAL. REFUSAL IS DEFINED AS OBTAINING IN EXCESS OF 50 BLOWS WITH LESS THAN 15 CENTIMETERS OF PENETRATION. THE UNCONFINED COMPRESSIVE STRENGTH OF THE COHESIVE SOILS, AS OBTAINED FROM THE HAND PENETROMETER, RANGED FROM 48 KILOPASCALS TO IN EXCESS OF 431 KILOPASCALS (THE LIMIT OF THE INSTRUMENT).

NATURAL MOISTURE CONTENTS OF THE SOIL SAMPLES TESTED RANGED FROM 7% TO 34%. THE MOISTURE CONTENTS FOR THE COHESIVE SAMPLES TESTED RANGED FROM 4% TO 7% ABOVE THEIR CORRESPONDING PLASTIC LIMITS. IN GENERAL, THE MOISTURE CONTENTS ARE CONSIDERED TO AT TO WELL ABOVE THEIR CORRESPONDING OPTIMUM MOISTURE CONTENTS (AS DETERMINED FROM CORRELATION CHARTS).

GROUNDWATER WAS INITIALLY ENCOUNTERED ON THE DRILL ROD IN SB-1 AT 6.4 METERS (ELEVATION 192.5 METERS), AND IN SB-3 AT 8.7 METERS (ELEVATION 190.3 METERS). NO GROUNDWATER MEASUREMENTS WERE OBTAINED IN SB-2 DUE TO THE FACT THAT THE BORING WAS DRILLED THROUGH SHORT CREEK. DUE TO THE USE OF WASH WATER DURING THE CORING PROCESS, NO GROUNDWATER LEVELS UPON COMPLETION OF THE DRILLING PROCESS WERE DETERMINED IN SB-1 AND SB-3. GROUNDWATER LEVELS AND/OR THE PRESENCE OF GROUNDWATER ARE CONSIDERED TO BE DEPENDENT ON THE ADJACENT CREEK LEVEL AND THE SEASONAL FLUCTUATIONS IN PRECIPITATION. AT THE TIME OF THIS INVESTIGATION, RECENT PRECIPITATION WAS CONSIDERED TO BE NORMAL.

THE TOP OF BEDROCK WAS ENCOUNTERED AT ELEVATION 181.1 METERS IN SB-1, ELEVATION 183.2 METERS IN SB-2, AND ELEVATION 179.4 METERS IN SB-3. THE TOP 2.0 METERS OF BEDROCK IN SB-1 AND 1.7 METERS OF BEDROCK IN SB-2 IS DESCRIBED AS BROWN, SOFT, ARGILLACEOUS, WEATHERED (AUGERABLE) SILTSTONE. THE CORED BEDROCK IN ALL THREE TEST BORINGS IS DESCRIBED AS GRAY, MEDIUM TO MODERATELY HARD, SLIGHTLY TO HIGHLY BROKEN, ARGILLACEOUS SILTSTONE. THE OVERALL QUALITY OF THE CORED BEDROCK, AS INDICATED BY THE ROCK QUALITY DESIGNATION (RQD), WAS VERY POOR TO POOR, WITH RQD VALUES RANGING FROM 0% TO 30%.

**LEGEND**

-  Press and/or Drive Sample and/or Core Boring Location-Plan View.
-  Horizontal Bar on Boring Log indicates the Depth the Sample was Taken.
-  X/Y/Z  
  - X = Number of Blows for First 150 Millimeters
  - Y = Number of Blows for Second 150 Millimeters
  - Z = Number of Blows for Third 150 Millimeters
-  TR ——— Top of Rock
-  W ——— Indicates Free Water level

Particle Size Definitions

20.32cm	7.62cm	2.0mm	0.42mm	0.074mm	0.005mm
Boulders	Cobbles	Gravel	C.Sand No. 10	F.Sand No. 40	Silt Clay

**Symbol Of Rock Type**

-  SILTSTONE
-  WEATHERED SILTSTONE

**GENERAL INFORMATION**

Borings are made by means of a truck mounted rotary drilling machine. Standard Penetration testing was performed at 0.75 to 1.5 meter intervals. The Standard Penetration Test (ASTM D 1586) is conducted by using a 63.5 kg hammer falling 760 millimeters to drive a 51 millimeter O.D. split-barrel sampler 450 millimeters. Driving resistance is recorded on the boring logs in terms of blows per 150 millimeter interval of the driving distance. The second and third intervals are added to obtain the number of blows per 300 millimeters.

The boring log sheet shows graphic plot of the information obtained, including depth and elevation of the sample, number of blows for the Standard Penetration Tests in three 150 millimeter increments, field sample number, and sample description based on laboratory tests and the Ohio Department of Transportation Classification System. 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 sample cannot be driven, a wash sample is procured for visual classification to determine the general character of the material. These samples are not considered sufficiently representative to warrant laboratory testing.

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 the data, if any, may be inspected in the District Deputy Director's Office (District 11), The Soils Section of the Office of Roadway Engineering, or in the Office of Bridges at 25 South Front Street, Columbus, Ohio 43215.

The purpose of this subsurface investigation is to develop soils information specifically for foundation design purposes and is not intended to be used for construction estimating or bidding. Information shown was obtained for use in establishing design criteria for the project. The accuracy of the data presented is not guaranteed by the State of Ohio or Consultant and is not to be construed as part of the plans governing construction of the project.

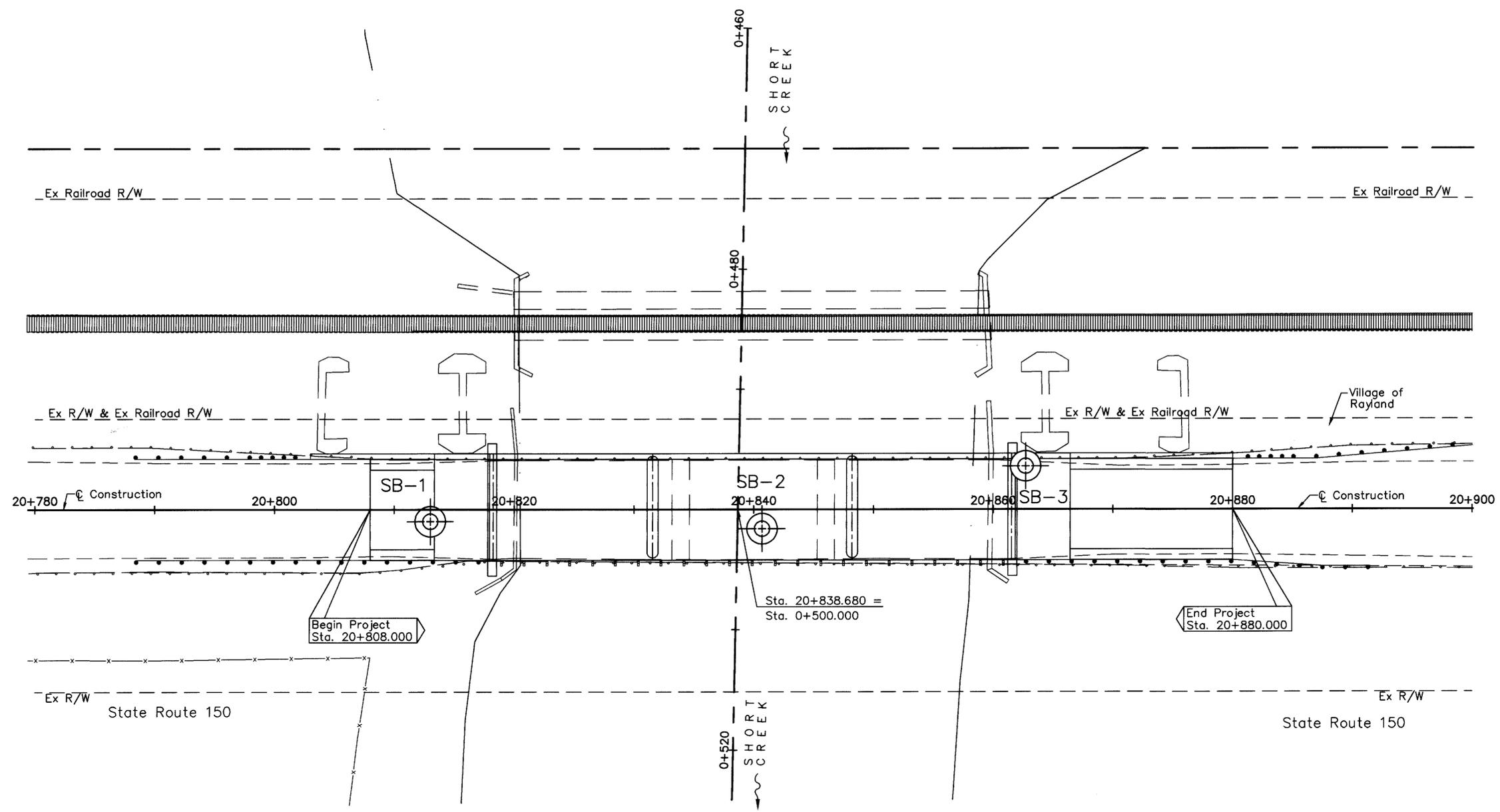


DRAWN	EMC	CHECKED	DLK
DATE	DATE	DATE	DATE
6/18/98	6/18/98	6/18/98	6/18/98





CALCULATED	EMC	CHECKED	DLK
DATE 6/16/98	DATE 6/17/98	DATE 6/17/98	DATE 6/17/98



200	SB-1 1.0M RT	SB-2 1.6M RT	SB-3 3.6M LT	200	
195	50~5CM 4/6/7 3/3/4 3/5/6 3/4/4 4/5/4 2/4/5 3/3/5 4/3/5 3/3/3	3/3/2 2/3/7 11/7/8 5/5/5 5/6/8 2/4/9 4/6/6 4/10/17 9/11/10	50~8CM 4/5/4 7/7/8 3/7/4 2/2/3 3/3/3 3/3/3 2/3/4	195	
190	8/7/8	25/24/31 50~8CM	3/7/5 6/8/8	190	
185	11/9/10 13/22/21	21/8/25 50~8CM	14/16/17 16/31/42	185	
180	13/15/15 16/16/18 19/21/21 30/50~3CM 50~3CM	TR	19/20/40 24/33/47 50~13CM 50~0CM TR	180	
175				175	
	20+800	20+820	20+840	20+860	20+880

RESOURCE INTERNATIONAL, INC. FILENAME: 800751-2.DWG  
 PROJECT NO. W-8007 DATE: 16 JUN 1998

STRUCTURE FOUNDATION INVESTIGATION  
 BRIDGE NO. JEF-150-20818 OVER SHORT CREEK

JEF-150-20.808



BORING LOG: SB-1  
 STATION AND OFFSET: 20+813.0, 1.0M RT  
 SURFACE ELEVATION: 198.9M  
 WATER ENCOUNTERED: SEEPAGE @ 6.4M \*

DATE STARTED: 4/1/98  
 DATE FINISHED: 4/1/98  
 SAMPLER TYPE: HSA/RC

ELEV.	SAMPLE NUMBER	BLOWS PER 15 cm	REC (%)	DEPTH	SOIL DESCRIPTION	WC	PHYSICAL CHARACTERISTIC						ODOT CLASS
							ATT LIMITS		%				
						LL	PI	AGG	CS	FS	SI	CL	
198.3	SS-1	50~5CM	11	1	36cm - ASPHALT 0.4M 5cm - SAND, GRAVEL, AND BRICK BASE 0.5M GRAY CLAYEY SILT, LITTLE SAND, LITTLE TO TRACE GRAVEL	3							VISUAL
197.3	SS-2	4/6/7	67	2		26	36	15	2	4	14	43	A-6a
196.6	SS-3	3/3/4	67	2		28							VISUAL
195.8	SS-4	3/5/6	83	3		29							VISUAL
195.1	SS-5	3/4/4	100	4		28							VISUAL
194.3	SS-6	4/5/4	100	5		31							VISUAL
193.5	SS-7	2/4/6	100	5		28	36	15	12	8	14	66	A-6a
192.8	SS-8	3/3/5	78	6		29							VISUAL
192.0	SS-9	4/3/5	67	7		31							VISUAL
191.1	SS-10	3/3/3	100	8		34							VISUAL
189.9	SS-11	8/7/8	56	9	BROWN GRAVEL, SOME SAND, TRACE SILT AND CLAY.	12							VISUAL
188.2	SS-12	11/9/10	100	11		14		67	12	12	9		A-1-a
186.7	SS-13	13/22/21	56	12		12							VISUAL
185.2	SS-14	13/15/15	78	14		8							VISUAL
183.6	SS-15	16/16/18	78	15		11		63	13	13	11		A-1-a
182.1	SS-16	19/21/21	89	17		17							VISUAL
180.8	SS-17	30/50~3CM	28	18	BROWN, ARGILLACEOUS, WEATHERED, SILTSTONE.	9							VISUAL
179.4	SS-18	50~3CM	6	19		7							VISUAL
	RC-1		90	20	AUGER REFUSAL @ 19.8M SILTSTONE; GRAY, MEDIUM HARD, SLIGHTLY BROKEN, AND ARGILLACEOUS.								
177.6				21	- CORE LOSS = 10% - RQD = 30%								

BOTTOM OF BORING = 21.3M

\* AN ACCURATE DETERMINATION OF THE GROUNDWATER LEVEL UPON COMPLETION COULD NOT BE MADE DUE TO THE USE OF WASH WATER DURING THE ROCK CORING PROCESS.

BORING LOG: SB-2  
 STATION AND OFFSET: 20+840.7, 1.6M RT  
 SURFACE ELEVATION: 195.4M  
 WATER ENCOUNTERED: N/A \*\*

DATE STARTED: 4/3/98  
 DATE FINISHED: 4/3/98  
 SAMPLER TYPE: HSA/RC

ELEV.	SAMPLE NUMBER	BLOWS PER 15 cm	REC (%)	DEPTH	SOIL DESCRIPTION	WC	PHYSICAL CHARACTERISTIC						ODOT CLASS
							ATT LIMITS		%				
						LL	PI	AGG	CS	FS	SI	CL	
194.9	SS-1	2/3/7	56		DARK GRAY GRAVEL, SOME SAND, TRACE SILT AND CLAY.	18			72	17	7	4	A-1-a
194.5	SS-2	3/3/2	61	1		32		68	19	7	6		A-1-a
194.0	SS-3	5/7/8	83			25		63	19	9	8	1	A-1-a
193.6	SS-4	11/7/7	83	2		18		56	23	11	10		A-1-a
192.8	SS-5	5/5/5	56			15							VISUAL
192.0	SS-6	5/6/8	83	3		17							VISUAL
191.3	SS-7	2/4/9	89	4	GRAY SILTY SAND, SOME CLAY.	16		0	22	23	30	25	VISUAL
190.5	SS-8	4/6/6	100	5		24							VISUAL
189.7	SS-9	4/10/17	83	6	BROWN GRAVEL, SOME SAND, TRACE SILT.	15							VISUAL
189.0	SS-10	9/11/10	100	7		13		61	14	17	8		A-1-a
187.3	SS-11	25/24/31	56	8		10							VISUAL
186.1	SS-12	50~8CM	17	9		9							VISUAL
184.2	SS-13	21/8/25	100	11		9							VISUAL
183.0	SS-14	50~8CM	17	12	BROWN, ARGILLACEOUS, WEATHERED, SILTSTONE.	12							VISUAL
				13									
				14	AUGER REFUSAL @ 13.9M SILTSTONE; GRAY, MEDIUM HARD, SLIGHTLY BROKEN, AND ARGILLACEOUS.								
	RC-1		100	14									
				15	- NO CORE LOSS - RQD = 25%								
179.7													

BOTTOM OF BORING = 15.7M

\*\* AN ACCURATE DETERMINATION OF THE GROUNDWATER LEVEL UPON COMPLETION COULD NOT BE MADE BECAUSE THE BORING WAS DRILLED THROUGH SHORT CREEK.



DATE	DATE
6/16/98	6/17/98
EMC	DLK
CHECKED	



BORING LOG: SB-3  
 STATION AND OFFSET: 20+862.7, 3.6M LT  
 SURFACE ELEVATION: 199.0M  
 WATER ENCOUNTERED: SEEPAGE @ 8.7M \*

DATE STARTED: 4/1/98  
 DATE FINISHED: 4/1/98  
 SAMPLER TYPE: HSA/RC

ELEV.	SAMPLE NUMBER	BLOWS PER 15 cm	REC (%)	DEPTH	SOIL DESCRIPTION	WC	PHYSICAL CHARACTERISTIC						ODOT CLASS
							ATT LIMITS		%	%	%	%	
						LL	PI	AGG	CS	FS	SI	CL	
198.3	SS-1	50~8CM	17	1	36cm - ASPHALT 0.4M 15cm - CONCRETE 0.5M 10cm - SAND, GRAVEL, AND BRICK BASE 0.6M GRAY SILT AND CLAY, LITTLE SAND, LITTLE GRAVEL	10							VISUAL
197.4	SS-2	4/5/4	78	2		21	31	14					VISUAL
196.7	SS-3	7/7/8	100	2		17							VISUAL
195.9	SS-4	5/7/4	100	3		21							VISUAL
195.2	SS-5	3/3/4	100	4		19							VISUAL
194.4	SS-6	2/2/3	100	5		34		14	4	14	34	34	VISUAL
193.6	SS-7	3/3/3	89	5		26							VISUAL
192.9	SS-8	3/3/3	100	6		26							VISUAL
192.1	SS-9	3/3/3	100	7		34							VISUAL
191.2	SS-10	2/3/4	94	8		34							VISUAL
190.0	SS-11	3/7/5	100	9	8.4M GRAY GRAVEL, SOME SAND, SOME CLAYEY SILT.	27		41	10	22	14	13	VISUAL
188.3	SS-12	6/8/8	100	10		25							VISUAL
186.8	SS-13	14/16/17	17	11	11.7M BROWN SILTY CLAY, SOME SAND, TRACE GRAVEL.	8							VISUAL
185.3	SS-14	16/31/42	56	12		10							VISUAL
183.7	SS-15	19/20/40	83	13	14.8M BROWN GRAVEL, SOME SAND, TRACE SILT.	9							VISUAL
182.2	SS-16	24/33/47	78	14		12		71	11	12	-6-		A-1-a
181.0	SS-17	50~13CM	100	15		8							VISUAL
179.5	SS-18	50~0CM	0	16									VISUAL
	RC-1		90	17	19.6M AUGER REFUSAL @ 19.8M								VISUAL
177.7				18	SILTSTONE; GRAY, MEDIUM TO MODERATELY HARD, HIGHLY BROKEN, AND ARGILLACEOUS. - CORE LOSS = 10% - RQD = 0%								VISUAL
				19									
				20									
				21									

BOTTOM OF BORING = 21.3M

\* AN ACCURATE DETERMINATION OF THE GROUNDWATER LEVEL UPON COMPLETION COULD NOT BE MADE DUE TO THE USE OF WASH WATER DURING THE CORING PROCESS



**STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION  
SUPPLEMENTAL SPECIFICATION 806**

**FIELD OFFICE  
September 9, 1997**

**806.01 Description**

**806.02 General**

**806.03 Computer Equipment for Field Office**

**806.04 Basis of Payment**

**806.01 Description.** This item shall consist of providing, maintaining and subsequently removing a field office for the exclusive use of the Department for the duration of the contract at a location approved by the Engineer. The field office will be designated as Type A, B or C.

**806.02 General.** The field office shall be available and completely functional at a time directed by the Engineer. The office shall have a minimum ceiling height of 2.1 m (7 feet) and have provisions for maintaining room temperature between 20 and 27 C (68 and 80 F). The Type C field office shall have a separate enclosed room for the Engineer. The Contractor shall provide and maintain telephone and electric service. One phone shall be connected to a recorded answering device. One speaker phone shall be required for Type B or Type C facilities. All field office types shall have one copying machine ;the copier shall be provided with all necessary maintenance and paper supplies, and be capable of producing multiple copies of documents up to 216 by 356 mm (8 1/2 by 14-inch) in size. The Type B and Type C field offices shall have a facsimile machine.

The office shall be provided with potable hot and cold water. The office shall also have neat, sanitary, enclosed toilet accommodations; associated lavatory and sanitary supplies shall be furnished. Portable facilities may be provided with the approval of the Engineer.

On all projects requiring moisture and density control of construction materials, the field office shall contain a storage box for a nuclear density gauge in accordance with drawings on file with the Director.

Additional requirements for field office and office equipment are as specified in the following table:

**FIELD OFFICE**

Item	Type A	Type B	Type C
Floor Space, m <sup>2</sup> (sq. ft.).....	14 (150)	46 (500)	93 (1000)
Telephone .....	2	4	4
Base Radio & 4-Hand Held Units <sup>1</sup> .....	--	--	1
10 Column Electronic Calculator with Tape .....	1	2	3
Desk and Chair Set .....	1	3	5
Work Tables, 750 by 1800 mm (30 by 72-inch) .....	1	2	3
4 Drawer, Legal Size, Lockable Metal File Cabinet .....	--	1	2
2 Drawer, Metal File Cabinet ...	1	2	2
Portable Fire Extinguishers - Type 2A10BC-5# .....	1	1	2
All Weather Parking Spaces ...	4	8	10
Plan Rack <sup>2</sup> .....	1	1	2

1. Units shall be capable of transmitting and receiving voice communication between office and any area on the project site.

2. Capable of handling the breakdown of 559x864 mm (22x34 inch) sized plans in to 10 sections.

The preceding requirements for the field office may be modified only upon written approval of the Engineer.

**806.03 Computer Equipment for Field Office.** Where required, the Contractor shall furnish, install, and maintain the following computer hardware and software in the field office required by this item for the life of the contract. All computer hardware and software furnished shall be for the exclusive use of the Engineer and staff and shall be operable at the same time as the field office.

This system shall not experience down time exceeding 48 hours from notification by the Engineer. The Contractor shall replace stolen, vandalized, or units otherwise inoperable within 48 hours after notification by the Engineer. Upon completion of the contract, the hardware and software furnished by the Contractor shall remain the property of the Contractor.

**Computer Hardware**

- (1) One IBM PC compatible computer with an Intel Pentium processor (or equal) operating at a minimum 200 MHz. The computer shall be provided with the following **minimum** requirements:
  - a. 2.1 Gigabyte hard disk
  - b. 32 Megabytes RAM

- c. one 3.5 inch., 1.44 MB floppy drive
- d. one 8x CD-ROM drive
- e. 101 key keyboard
- f. 15 inch Hi-Res Super VGA Color Monitor 1024 X 768 resolution with .28 dot pitch and Hi-Res Super VGA Card with 2 Megabytes of Video RAM.
- g. 2 Button Microsoft compatible mouse with appropriate software, compatible with required software.
- h. At least 1 parallel port and 1 serial interface port and 1 mouse port.
- i. one 56K firmware upgradeable 3Com compatible modem

(2) Hewlett Packard LaserJet compatible (PCL3 emulation) 6 page per minute printer or approved equal and parallel printer cable.

(3) Surge Protector. 15 amp six outlet with circuit breaker control, phone line circuit surge protection and a surge indicator light.

**Computer Software**

The Contractor shall furnish, load, and maintain the following software on the computers provided in the field offices: Microsoft Windows 95 (with games removed) and the Corel Professional Edition Office Suite Version 8.

All computer hardware and software shall be maintained by the Contractor during the life of the contract. Information for proposed "equal" equipment shall be submitted to the Engineer and be approved prior to use.

Along with the furniture under 806.02, the Contractor shall also provide the necessary stands, tables, etc. to accommodate the computer system.

**806.04 Basis of Payment.** The field office will be paid for at the contract price bid, which price shall be full compensation for furnishing, maintaining and subsequently removing the field office and all incidentals necessary to complete this item. The field office and any required computer equipment shall be paid on a monthly basis. The contract bid price shall be full compensation for furnishing, setting up, maintaining, and subsequently removing the specified computer hardware and software from the field office.

Item	Unit	Description
806	Month	Field office, Type _____
806	Month	Computer equipment for field office

STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION  
SUPPLEMENTAL SPECIFICATION 844

HIGH PERFORMANCE CONCRETE FOR STRUCTURES

January 6, 1999

- 844.01 Description
- 844.02 Material
- 844.03 Proportioning
- 844.031 Proportioning, Slipforming
- 844.04 Mix Options
- 844.05 Provisions
- 844.06 Placement Limitations
- 844.07 Equipment for Bridge Decks
- 844.08 Superstructure Deck Curing and Texturing
- 844.09 Curing and Loading
- 844.10 Sealing Joints and Cracks
- 844.11 Chloride Resistance, Drying Shrinkage, and Heat of Hydration Testing
- 844.12 Method of Measurement
- 844.13 Basis of Payment

**844.01 DESCRIPTION.** This item consists of supplying, placing, curing, broom texturing, sealing joints and cracks and diamond grinding a high performance concrete that is workable, finishable, and when necessary, pumpable.

The probability of higher than normal dosage rates of Type F or G admixtures is likely. The need for chemical admixtures or aggregates or both, different from the Contractor's normal sources is a distinct possibility.

All provisions of Supplemental Specification 899 (Concrete - General) and Supplemental Specification 842 (Concrete for Structures) shall apply, except as modified herein.

**844.02 MATERIAL.** The maximum sodium sulfate soundness loss for coarse aggregate will be 10 percent.

Fly ash will meet 705.13 Class C.

Ground granulated blast furnace (GGBF) slag will meet ASTM C 989, grade 100 minimum (manufacturer's certification is required). The one day cube strength results of ASTM C 1073 may be used in lieu of the 7 and 28 day cube strengths required by ASTM C 989.

Only one source of fly ash or GGBF slag will be used in any one structure, unless otherwise authorized by the Engineer. Bulk fly ash or GGBF slag will be stored in waterproof bins.

Micro-silica admixture will meet ASTM C 1240 and be from a source approved

by the Office of Materials Management, 1600 W. Broad Street, Columbus, Ohio.

Cement will be Type 1 only (701.04); only one brand, grade or kind shall be used in any given superstructure except upon permission of the Engineer.

High molecular weight methacrylate resin sealer shall meet the requirements of Supplemental Specification 954.

The Contractor will obtain a written statement from the manufacturers of the chemical admixtures verifying the compatibility of the combination of materials and the sequence in which they are combined. The manufacturers will further designate a technical representative from its company or the ready-mix supplier to be in charge of the dispensing of the admixture products. The technical representatives will act in an advisory capacity and will report to the Contractor and the Engineer any operations and procedures which are considered by the representative as being detrimental to the integrity of the placement. The manufacturer's technical representative will be present during concrete placement unless his presence is waived by the Engineer.

**844.03 PROPORTIONING.** The proportioning options of 899.04 will not be permitted.

At least 3 days prior to placing the test slab, the Contractor will submit in writing the specific mix design and batching sequence for the project. This design is for the Engineer's information and review and only subject to approval for meeting the specification proportions.

If any proportioning or batching sequence modifications are needed, the Contractor will submit a revised mix design or batching sequence to the Engineer and perform another test slab at no additional cost to the State. A successful test slab pour, as determined by the Engineer, must be completed before any concrete is placed.

**844.031 PROPORTIONING, SLIPFORMING.** The Contractor is allowed the option of slipforming bridge parapets. A mix will be developed and a 20 foot (6m) section of parapet will be slipformed as a test section. Up to two thirds of the No. 8 Size coarse aggregate may be replaced with No. 57 Size coarse aggregate. The Engineer will approve the test section before any additional parapet concrete is allowed to be slipformed. The approved slipform concrete mix design will be submitted to The Office of Materials Management for record purposes.

Dimensional Tolerances and Acceptance Criteria.

Dimensions will not be in excess of the construction tolerances listed below:

Reinforcing steel cover	- 1/2 inch (- 13 mm) + 1/2 inch (+ 13 mm)
Top width dimension	-0 + 1/4 inch (+ 6 mm)
Bottom width dimension	-0 + 1/2 inch (+ 13 mm)
Surface flatness	1/4 inch in 10 feet(6 mm in 3 meters)
Vertical alignment	1/2 inch in 20 feet
(Deviation from a line parallel to the grade line)	(13 mm in 6 meters)

All reinforcing steel joints and/or splices in the bridge railing steel shall be tied. A dry run to check for reinforcing clearance and rigidity of the reinforcing cages shall be required before any concrete is placed. The Contractor shall verify reinforcing clearances and make any adjustments to the cage to establish the required clearances during the dry run. Reinforcing steel cages are to be rigid (defined as no movement during the slipforming dry run). If the Engineer determines the cages are not rigid, the Contractor must stabilize the cages before any slipforming is performed. The Contractor may add any additional diagonal reinforcing steel between the front and rear vertical reinforcing faces to establish the required rigidity. Any additional reinforcing steel required to adequately stabilize the cages shall be the Contractor's expense.

Honeycombing, cracking, tearing and other defects shall be repaired or patched immediately upon exit from the slipform equipment. Defects shall be completely filled with concrete.

Control joints shall be constructed by sawing 1 1/4 inches (32 mm) deep the perimeter of the parapet, after the concrete has taken its initial set but before any shrinkage cracks develop. Generally initial set is within 6 hours of batching of the concrete. All joints shall be sawed within 24 hours of placement. Joints shall be sawed by using an edge guide, fence or jig to insure that the joint is straight, true and aligned on all faces of the parapet. The joint width shall be the width of the saw blade, a nominal 1/4 inch (6 mm).

Slip formed concrete will require different slumps than those listed in 899 or other plan specified concrete. The consistency of the concrete should be such that the concrete exiting the slipform does not pull but is stiff enough to prevent waviness and sags in the finished surfaces. Method A, Water Curing, 842.14 is required. As slipformed concrete has a low water-cement ratio, timely application of the water cure is critical in helping control shrinkage cracks.

No water shall be added or applied to the concrete after it has left the truck.

The Contractor shall furnish all necessary platforms to protect against falling debris during the slipforming operation, to allow access for completing the finishing operation and to allow the inspector access.

Concrete control joints will be sawed 1 1/2 inch (35mm) into the concrete by use of an edge guide, fence or jig to assure the cut joint is straight, true and aligned on all faces of the parapet. The joint will be a saw blade wide, (nominal 1/4 inch (6mm)). The perimeter of the control joint will be caulked with a polyurethane or polymeric material meeting Federal Specification TT-S-00227E.

The Engineer will inspect the slipformed surface for horizontal cracking no earlier than 21 days after completion of the slipforming operation. All horizontal cracks shall be repaired by epoxy injection. If a concrete sealer has been applied, any damage to the sealer shall be repaired after the epoxy injection has been completed. The aforementioned repairs shall be made at no additional cost to the State.

**844.04 MIX OPTIONS.** Unless specific concrete mixes are specified in the pay item descriptions, the following provisions will apply:

All superstructure concrete except for parapet concrete will consist of mix 3 or mix 4. If mix 3 is used for the deck, then all other concrete will be mix 1 or mix 3 concrete. If mix 4 is used for the deck, then all other concrete will be mix 2 or mix 4 concrete.

Any 899 calendar time restrictions regarding the use of fly ash will be waived for this concrete.

The following proportions will be used as a starting mix design.

**CONCRETE TABLE**  
Quantities Per Cubic Yard  
Aggregates (SSD)

<b>Mix 1 (Fly Ash)</b>								
Aggregate Type	Fine Aggregate (lb)	#8 Coarse Aggregate (lb)	Total (lb)	Cement Content (lb)	Fly Ash (lb)	Water to Cementitious Ratio Max	Air Content +/-2%	
Gravel	1320	1480	2800	530	170	0.38	7	
Limestone	1320	1495	2815	530	170	0.38	7	
Slag	1320	1300	2620	530	170	0.38	7	
<b>Mix 2 (GGBF Slag)</b>								
Aggregate Type	Fine Aggregate (lb)	#8 Coarse Aggregate (lb)	Total (lb)	Cement Content (lb)	GGBF Slag (lb)	Water to Cementitious Ratio Max	Air Content +/-2%	
Gravel	1335	1480	2815	490	210	0.38	7	
Limestone	1335	1495	2830	490	210	0.38	7	
Slag	1335	1295	2630	490	210	0.38	7	
<b>Mix 3 (Fly Ash + Microsilica)</b>								
Aggregate Type	Fine Aggregate (lb)	#8 Coarse Aggregate (lb)	Total (lb)	Cement Content (lb)	Fly Ash (lb)	Micro-Silica (lb)	Water to Cementitious Ratio Max	Air Content +/-2%
Gravel	1355	1475	2830	480	150	30	0.40	7
Limestone	1355	1490	2845	480	150	30	0.40	7
Slag	1355	1295	2650	480	150	30	0.40	7
<b>Mix 4 (GGBF Slag + Microsilica)</b>								
Aggregate Type	Fine Aggregate (lb)	#8 Coarse Aggregate (lb)	Total (lb)	Cement Content (lb)	GGBF Slag (lb)	Micro-Silica (lb)	Water to Cementitious Ratio Max	Air Content +/-2%
Gravel	1370	1475	2845	440	190	30	0.40	7
Limestone	1370	1490	2860	440	190	30	0.40	7
Slag	1370	1295	2665	440	190	30	0.40	7

8 inch maximum slump at placement for all mixes.

**CONCRETE TABLE**  
Quantities Per Cubic Meter  
Aggregates (SSD)

Aggregate Type	Fine Aggregate (kg)	#8 Coarse Aggregate (kg)	Total (kg)	Mix 1 (Fly Ash)		Water to Cementitious Ratio Max	Air Content +/-2%
				Cement Content (kg)	Fly Ash (kg)		
Gravel	783	878	1661	314	101	0.38	7
Limestone	783	887	1670	314	101	0.38	7
Slag	783	771	1554	314	101	0.38	7

Aggregate Type	Fine Aggregate (kg)	#8 Coarse Aggregate (kg)	Total (kg)	Mix 2 (GGBF Slag)		Water to Cementitious Ratio Max	Air Content +/-2%
				Cement Content (kg)	GGBF Slag (kg)		
Gravel	792	878	1670	291	125	0.38	7
Limestone	792	887	1679	291	125	0.38	7
Slag	792	768	1560	291	125	0.38	7

Aggregate Type	Fine Aggregate (kg)	#8 Coarse Aggregate (kg)	Total (kg)	Mix 3 (Fly Ash + Microsilica)			Water to Cementitious Ratio Max	Air Content +/-2%
				Cement Content (kg)	Fly Ash (kg)	Micro-Silica (kg)		
Gravel	804	875	1679	285	89	18	0.40	7
Limestone	804	884	1688	285	89	18	0.40	7
Slag	804	768	1572	285	89	18	0.40	7

Aggregate Type	Fine Aggregate (kg)	#8 Coarse Aggregate (kg)	Total (kg)	Mix 4 (GGBF Slag + Microsilica)			Water to Cementitious Ratio Max	Air Content +/-2%
				Cement Content (kg)	GGBF Slag (kg)	Micro-Silica (kg)		
Gravel	813	875	1688	261	113	18	0.40	7
Limestone	813	884	1697	261	113	18	0.40	7
Slag	813	768	1581	261	113	18	0.40	7

200mm maximum slump at placement for all mixes.

The weights specified in the concrete table were calculated for materials of the following bulk specific gravities (SSD): natural sand and gravel 2.62, limestone sand 2.68, limestone 2.65, slag 2.30, fly ash 2.65, GGBF slag 2.90, Microsilica solids 2.20, and Portland cement 3.15. For aggregates of specific gravities differing more than plus or minus 0.02 from these, the weights in the table will be corrected.

If, during the progress of work, the specific gravity of one or both of the aggregates changes, the batch weight will be adjusted to conform to the new specific gravity.

The water cement ratio will be calculated based upon the total cementitious material. Cementitious material will include Portland cement, fly ash, GGBF slag and Microsilica (solids).

The proportions of coarse and fine aggregate will be adjusted to provide the maximum amount of coarse aggregate possible and still provide a workable and finishable mix. The Contractor may modify the mixes shown by adjusting the coarse and fine aggregates up to 100 pounds (50 kg) each, unless otherwise approved by the Engineer.

**844.05 PROVISIONS.** An approved high range water reducer (Type F or G) will be used to achieve the desired workability level at the specified water cementitious ratio. These chemical admixtures will conform to 705.12 (ASTM C 494) Type F or G and be approved by the Office of Materials Management. The majority of these admixtures will be added at the plant.

Type A or D chemical admixture conforming to 705.12 (ASTM C494) will be added to the concrete at the plant. The addition of these admixtures will supersede the concrete temperature requirements under items 899.03 and 842.06. The trial batch, as specified below, will be repeated until the mix exhibits the necessary finishability characteristics.

The moisture content of the coarse aggregate will be above the saturated surface dry (SSD) condition immediately prior to being incorporated into the mix.

The cementitious content will be maintained and the maximum water cementitious ratio will not be exceeded. The Type F or G admixture will be added and mixed in accordance with the manufacturer's recommendations. The Contractor will furnish a volumetric dispenser for the Type F or G or have a gage on each truck-mounted Type F or G dispensing tank. After discharging concrete and prior to reloading, all wash water will be removed, by reversing each truck drum at the plant.

If Type F or G admixture is added at the job site, the load will be mixed a minimum of 5 minutes at mixing speed.

If during discharge any mechanical balling or microsilica balling whatsoever is observed, the load shall be rejected and the mixing process revised to prevent further balling.

If slump loss occurs before placement of the concrete, the concrete may be "replasticized" with the admixture to restore plasticity. The slump range and air content will be rechecked to ensure conformance to the specifications. If the consistency of the load after "replasticizing" is such as to cause segregation of the components, this will be cause for rejection of the load. Discharge will be complete within 90 minutes after the combining of the water and the cementitious material.

The Contractor will perform sufficient advance testing to ensure conformance with these specifications prior to placement of the concrete.

Sampling and testing for entrained air content and slump will be measured at the point of placement. For deck pours, this will be at the point of placement on the deck.

The Contractor will make one or more trial batches of concrete meeting these specifications, of the size to be hauled, at least four days before the deck concrete is to be placed. The Contractor will cast one or more test slabs, 8 feet (2.4m) x 4 feet (1.2m) x 4 inches (0.1m), finished and textured in accordance with these requirements. The

Contractor will not be required to saw the texture unless the deck texture is required to be sawn. If the workability of the trial batch is not acceptable, the Contractor will modify the mix design or batching sequence and retest as per 844.03. Payment for the trial batch or batches and test slabs will be at the lump sum price bid for High Performance Concrete Trial Mix.

**844.06 PLACEMENT LIMITATION.** Concrete deck pours will begin only when favorable atmospheric conditions exist and are predicted to stay favorable for the duration of the pour.

Favorable atmospheric conditions exist when the surface evaporation rate, as affected by the ambient air temperature, concrete temperature, relative humidity, and wind velocity is 0.1 pounds per square foot per hour (0.49 kg per square meter per hour) or less. Figure 1 ACI 308 (see Item 842.08) will be used to determine graphically the surface evaporation rate.

To meet favorable atmospheric conditions, the Contractor may be required to place concrete at night. Actual measurement of data required in Figure 1 will be within 10 feet (3 m) of the area where the concrete is to be placed. For piers, abutments, and poured parapets, Figure 1 will not apply. Figure 1 will apply for slip formed parapets.

If placement is to be made at night, the Contractor will submit a plan which provides adequate lighting for the work area at least 15 calendar days in advance, and receive written approval from the Engineer before placing the concrete. The lights will be so directed that they do not affect or distract approaching traffic.

The Contractor will ensure that concrete pumping lines do not displace reinforcing steel during placement.

**844.07 EQUIPMENT FOR BRIDGE DECKS.** Concrete will be mixed in a central mixing plant or by a ready-mixed truck capable of discharging concrete having a maximum water cementitious ratio of 0.38. Mixing equipment will meet the requirements of 899.06(b). Admixtures will be introduced into the concrete in such a manner as to facilitate dispersion throughout entire load. Batch plants will meet the requirements of 899.06(a) and will be located such that the maximum time required from start of mixing to completion of discharge of the concrete at the site will not exceed 90 minutes.

An approved self-propelled finishing machine will be used. The finishing machine will be equipped with forward and reverse drive mechanisms that enable precise velocity control of the machine while it is moving in either direction. It will be equipped with two or more rotating rollers. It will be equipped with augers and either a vibrating pan or vibrating rollers. Vibrating frequency for pan or rollers will vary from 1500 to 5000 pulses per minute. The Contractor will furnish the necessary verification of these vibration frequencies. Screeds will have provisions for raising above the finished concrete surface. Roller tampers attached to finishing machines which have fins protruding more than 1/4 inch (6mm) from the roller are not allowed.

Concrete shall be placed no more than 10 feet (3.1 m) directly in front of the finishing machine.

Standard hand vibration equipment shall be used. Because high performance concretes are more cohesive, more vibration is required for proper consolidation than for

Class C and S mixes. Vibration, often between each rebar, will be required to adequately consolidate a bridge deck even though the surface appears well consolidated.

Finishing machines will be supported by rail and supports made of steel. Rail will be furnished in sections not less than 10 feet (3.1 m) in length and be sufficient cross-section so that the weight of the finishing machine causes zero vertical deflection while in motion. Rail will be straight with no sections exceeding a tolerance of 1/8 inch in 10 feet (3 mm in 3.1 m) in any direction. Rail supports will be screw-type adjustable saddles and will be of sufficient number under the rail so that zero vertical deflection occurs under the weight of the finishing machine.

A flexible blue steel blade with rounded edges is recommended for finishing.

**844.08 SUPERSTRUCTURE DECK CURING AND TEXTURING.** After the concrete is placed, finished and bullfloated if necessary, the surface of the concrete shall immediately receive a broom finish. Immediately after the completed brooming, the finished surface will be covered with a single layer of clean wet burlap. The burlap will be kept wet by a continuous flow of water through soaker hoses and covered with a 4 mils (100 μm) white opaque polyethylene film or a wet burlap - white opaque polyethylene sheet for 7 days. At the end of 7 days, the deck will be allowed to surface dry. After the deck has air dried but within 12 hours, the surface shall be membrane cured as per 842.14 method(b).

When pouring under provision of 842.12, the deck will be kept continuously wet with hoses and the curing will be 7 days with the surface being maintained between 50 °F (10 °C) and 100 °F (38 °C) as specified. At the end of 7 days, the deck will be allowed to surface dry. After the deck has air dried but within 12 hours, the surface shall be membrane cured as per 842.14 method(b).

After the water curing is completed, and prior to the application of the curing compound, the Contractor shall saw transverse grooves into the deck. In lieu of sawing the grooves into the deck prior to the application of the curing compound, the Contractor may elect to saw the grooves into the deck some period after the curing compound is placed. However, in every case it will be necessary to saw the deck prior to opening the bridge to traffic. If the Contractor does elect to saw the deck after the curing compound has been applied, it will be necessary, at no additional costs, to reapply the curing compound immediately after the surface of the deck has air dried but within 12 hours after the sawing operation.

The grooving shall conform to the following requirements: Grooving shall be done utilizing diamond blades, mounted on a multi blade arbor on a self-propelled machine which has been built for grooving of concrete surfaces. The groove machine shall have a depth control device which will detect variations in the pavement surface and adjust the cutting head height to maintain the depth of the groove specified. The grooving machine will be provided with devices to control alignment. Flailing or impact type grooving equipment will not be permitted.

Grooves shall begin and end approximately one foot from any curb, parapet toe or deck edge and shall be perpendicular to the bridge center line.

The Contractor shall provide an experienced technician to supervise the location, alignment, layout, dimension, and grooving of the surface.

Grooves shall run in a continuous pattern across the surface. The grooving shall be terminated a minimum of 1 foot (0.3 m) from any device in place in a bridge deck, such as scuppers or expansion joints. The grooves shall be a random pattern spaced at 3/8 to 1 3/4 inch (10 to 45 mm), with 50 percent of spacings being less than 1 inch (25 mm). The grooves shall be approximately 0.15 inches (4 mm) deep and 0.10 inches (3 mm) wide.

At the beginning of each work shift, all grooving machines shall be equipped with a full complement of grooving blades that are capable of cutting grooves of the specified width, depth and spacing.

If during the course of work, a single grooving blade on any individual grooving machine becomes incapable of cutting a groove, work will be permitted to continue for the remainder of the work shift and the Contractor will not be required to otherwise cut the groove omitted because of the failed blade. Should two or more grooving blades on any individual grooving machine become incapable of cutting grooves, the Contractor shall cease operating such equipment until it is repaired.

The removal of all slurry and any remaining residue resulting from the grooving operation shall be continuous. The bridge deck surface shall be left in clean condition, free of all slurry and residue. Residue from grooving operations shall not be permitted to flow across shoulders or lanes occupied by public traffic or flow into gutters or other drainage facilities. Solid residue, resulting from grooving operations, shall be removed from the surface before such residue is blown by the action of traffic or wind.

The Contractor shall be responsible for providing water as necessary to perform the specified grooving in accordance with the specifications.

**844.09 CURING AND LOADING.** Curing and loading will be per 842.14, except that the deck will not be opened to traffic until the 7 day water cure is completed and the membrane curing compound has been applied and allowed to dry for the minimum time recommended by the manufacturer. Superstructure deck concrete placed between October 15 and March 15 will not be opened to traffic for a minimum of 30 days after placement.

**844.10 SEALING JOINTS AND CRACKS.** After the application of the membrane cure, and the deck has thoroughly dried, the following areas will be sealed with a high molecular weight methacrylate (HMWM) sealer meeting Supplemental Specification 954 prior to opening the deck to traffic: transverse joints in the deck; joints between the concrete deck and steel end dams; longitudinal joints in the deck; longitudinal joints between the deck and safety curb, barriers, and parapets, etc.; and, cracks which are discovered in the deck which will be checked on the top and bottom surface before opening the deck to traffic.

All costs for sealing in accordance with above, will be included with the appropriate concrete item. No separate payment for sealing will be made.

**844.11 CHLORIDE RESISTANCE, DRYING SHRINKAGE, AND HEAT OF HYDRATION TESTING.** When included as a separate pay item, the Contractor will perform rapid chloride permeability tests (AASHTO T 227) for every bridge deck placed

using this concrete. A minimum of 3 tests will be made for decks containing less than 100 cubic yards (75 cubic meters) of superstructure concrete. For all other decks, 6 tests will be required. These tests will be made on the deck superstructure concrete samples obtained from the actual concrete used. The same number of drying shrinkage tests will be performed as per ASTM C 157.

Results of rapid chloride permeability tests will be shown at 28, 56 and 90 days. Results of drying shrinkage tests will be shown at 4, 7, 14, 28, 56 and 90 days.

Concrete heat of hydration testing will be performed to determine the potential for length change due to thermal expansion and contraction. Starting immediately after the placement of the deck, concrete temperatures will be taken and tabulated. A location will be chosen on the deck which is accessible for hourly readings and representative of the overall deck pour. The temperatures will be taken by installing three thermometers into the fresh concrete. The bulb of the thermometers will be located at 1 inch (25mm) below the surface of the concrete, at approximately mid-slab and at 1 inch (25mm) above the bottom deck form. The thermometers will be left in place throughout the testing time. Thermometers may be lubricated and placed in a thin plastic sheath to facilitate eventual removal. After removal, the holes remaining will be drilled out and filled as approved by the Engineer.

The following temperature intervals will be used:

<u>Test Intervals</u>	<u>Time</u>
2 hour	first 12 hours
3 hours	second 12 hours
4 hours	second day
8 hours	third thru fifth day

Ambient air temperatures will also be noted when each concrete temperature is taken. All testing will be performed by a testing laboratory regularly inspected by the "Cement and Concrete Reference Laboratories" (CCRL). A copy of the last CCRL inspection report will be furnished to the Engineer prior to the test slab pour.

If the Contractor uses Mix 1 or Mix 2 concrete for the parapets or substructures, the Contractor will make an additional 3 chloride permeability and drying shrinkage tests for that concrete. If used for the parapets, the Contractor will also test for heat of hydration as described above with one thermometer located at 1 inch (25mm) below the top of the parapet and second thermometer located 19 inches (500mm) below the top of the parapet, approximately midway between the front and back faces of the parapet. For units constructed with the same concrete mix option as the deck, no additional testing will be required.

The results of all tests shall be tabulated on the attached form and forwarded to the following address no later than 10 days following the completion of the tests:

The Office of Structural Engineering  
Ohio Department of Transportation, 3rd Floor  
1980 W. Broad Street  
Columbus, Ohio 43223

All costs of testing as outlined above will be paid for under the lump sum bid price for High Performance Concrete Testing.

**844.12 METHOD OF MEASUREMENT.** The volume will be measured as per 842.18. The area of high performance concrete will be based on plan dimensions. The above items will include all labor, material, equipment and incidentals necessary to complete these items of work. The above items will also include all costs associated with sealing joints and cracks and sawing grooves into the deck.

Payment for high performance concrete testing will not be made until the Office of Structural Engineering has received the results of all tests.

**844.13 BASIS OF PAYMENT.** Payment for the above completed and accepted quantities will be made at the contract bid price for:

<b>Item</b>	<b>Units</b>	<b>Description</b>
844	Cubic yard (cubic meter)	High performance concrete superstructure (deck)
844	Square yard (square meter)	High performance concrete superstructure (deck)
844	Cubic yard (cubic meter)	High performance concrete superstructure (parapet)
844	Cubic yard (cubic meter)	High performance concrete substructure
844	Lump sum	High performance concrete trial mix
844	Lump sum	High performance concrete testing

STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION  
SUPPLEMENTAL SPECIFICATION 863

STRUCTURAL STEEL MEMBERS

SEPTEMBER 9, 1997

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	Appendix I: Facilities Inspection Check List
	Appendix II: Rating Forms
	Shop Drawing Rating Form
	Material Test Report Rating Form

Fabrication Rating Form  
Fracture Critical Fabrication Rating Form  
Appendix III: Rating Calculations

**863.01 Description.** This item shall consist of preparing shop drawings, furnishing, fabricating, nondestructive testing, fabricator performed quality control(QC), documentation, cleaning, shop painting, and erecting of all structural steel, and other structural metals, as specified. It shall also include any work required to move existing steel structures to the plan location, to make necessary repairs and alterations, and to connect or join new with old construction.

**863.02 Fabricator Approval Procedure:** Fabricators performing work under this specification shall be Pre-qualified by the Office of Structural Engineering (OSE). Requests for such Prequalification shall be made by the fabricator in writing. The Prequalification process and its requirements are listed in this specification. The Contractor shall select a fabricator from the Prequalified Fabricator List in effect the date of Contract Letting. The Contractor shall inform the District Construction Engineer and the Office of Structural Engineering of the selected fabricator.

**863.03 Fabricator Pre-qualification:** OSE will perform facilities inspections for prequalification evaluation of a fabricator. Fabricators meeting all qualification requirements will be assigned a fabrication level and will be included on the Prequalified Fabricator List. The Prequalified Fabricator list will be updated as necessary by the OSE.

Fabricators shall perform all fabrication in plants located within the continental limits of the United States.

Final conformance of fabrication to contract requirements is the responsibility of the Contractor. A pre-qualified fabricator does not guarantee the Contractor that work performed will meet quality and conformance requirements of the contract.

**863.04 Levels of Fabrication Qualification:** There are seven(7) levels of fabricator qualification. Each fabricator shall be listed at the highest level of fabrication they are qualified to perform.

Level	Description of Capabilities
Misc.	Miscellaneous products not designed to carry tension live load but requiring , shop drawings, material test reports, and inspection quality assurance by the Department such as; curb plates, bearings, expansion joints, railings, catwalk, inspection access, drainage or other products not covered by ODOT standard bridge drawings. Also retrofit cross frames, retrofit gusset plates or retro fit lateral bracing or other misc. structural members not included below
ONE	Single span, straight, rolled beam bridges without stiffeners, secondary and detail materials such as retrofit moment plates.
TWO	Multiple span, straight, rolled beam bridges without stiffeners

<b>THREE</b>	Single or multiple span, straight, dog legged or curved, rolled beam bridges including stiffeners.
<b>FOUR</b>	Straight or dog legged welded plate girder bridges
<b>FIVE</b>	Straight, curved, haunched or tapered welded plate girder bridges
<b>SIX</b>	Truss bridges, fracture critical bridges or bridges with fracture critical members

**863.05 Fabricators Evaluation and Required Qualifications.** Fabricators requesting pre-qualification shall have a facilities inspection performed by OSE. A facilities inspection check list is included in this specification (Appendix I). During the inspection the fabricator will furnish OSE's representative with documentation to validate the fabricator meets the criteria listed below:

**AISC Certification**

- Misc. - No AISC category required
- Level 1 - Category SBr with P endorsement
- Level 2 thru 5 - Category MBr with P endorsement
- Level 6 - Category MBr with P and F endorsements

Welding procedure qualifications in conformance with 863.23

Qualified welders in conformance with 863.23

Inspection personnel meeting requirements of 863.052

**863.051 Miscellaneous Level required qualifications.** Fabricators requesting qualification for the Miscellaneous Level shall meet requirements listed in all sections of 863 except as follows: Sections 863.052, 863.06, 863.061 and 863.081 shall not apply. Where quality control inspection is required by the QCFS or QCPS per section 863.052 the documentation and quality control shall be the responsibility of one employee designated by the Miscellaneous Level fabricator.

**863.052 Personnel Qualifications.** The fabricator shall designate at least one individual as Quality Control Fabrication Specialist (QCFS). The QCFS shall be a AWS Certified Welding Inspector qualified and certified in accordance with the provisions of AWS QC-1, Standard for Qualification and Certification of Welding Inspectors. The QCFS shall have a thorough understanding of the plans and specifications pertaining to the project. The QCFS shall be responsible for inspecting the work at all quality control (QC) points described in this specification and appendices. The QCFS is also responsible for assuring all equipment is in working order and inspected at the required intervals. The QCFS shall have the direct authority to stop work and report non-conforming work to the Contractor and OSE. The fabricator shall furnish the QCFS with all

tools and equipment necessary to perform quality control (QC) on all facets of the work. The person assigned as QCFS shall be designated the duties full time during the duration of the fabrication work specified in this supplemental specification. No other duties shall be assigned the QCFS that are not quality control inspection.

The fabricator shall designate one individual as Quality Control Paint Specialist (QCPS). The QCPS and the QCFS may be the same person. The QCPS shall have received formal training on paint inspection from one of the following firms: KTA Tator, S. G. Pinney, or Corrosion Control Consultants. The QCPS shall be responsible for all quality control points (QCP) listed in sections 863.29 and 863.30. The QCPS shall have a thorough understanding of the plans and specifications pertaining to this project. The QCPS shall be responsible for inspecting the coating application equipment at required intervals. The QCPS shall have the direct authority to stop work and report non-conforming work to the QCFS, the Contractor and OSE. The person assigned as a QCPS shall be designated the duties full time during the duration of the coating work. The fabricator shall furnish the QCPS with tools and equipment to provide (QC) on all facets of the coating application

Personnel performing nondestructive testing of weldments shall be qualified in accordance with the American Society for Nondestructive Testings (ASNT) ANSI/ASNT CP-189-1995, Standard for Qualification and Certification of Nondestructive Testing Personnel. Only individuals qualified for NDT Level II may perform nondestructive testing. All nondestructive testing shall be under the authority of the QCFS or can be performed by the QCFS if qualified.

The fabricator shall have a minimum QC staff level of one QCFS and one QCPS or one person qualified to perform both the QCFS and QCPS functions and the required NDT technicians to perform the non-destructive testing functions. The QCFS and QCPS shall be full time employees of the fabricator, except level one (1) and two (2) fabricators may choose to use outside personnel who meet the qualifications for the QCFS and/or QCPS. The use of outside QC personnel does not eliminate the requirements for the QCFS and QCPS being full-time during the project.

The qualifications of the QCFS, the QCPS, NDT personnel or outside agency personnel shall be approved prior to the fabricator being pre-qualified. Each QC specialist, NDT personnel or agency shall provide a resume listing, qualifications and work experience. QC specialists or NDT staff shall not be modified without the approval of OSE.

The QCFS and QCPS shall be responsible for documenting all inspection points (Appendix II) for each main material piece to show conformance with the requirements of this specification and contract documents. The fabricator is responsible for providing supervisory and any additional QC inspection personnel to control the work properly and to assure satisfactory materials and workmanship. The use of production staff or additional QC staff for specific quality control functions does not eliminate the QCFS's and/or QCPS's responsibility for documentation, QC and final acceptance of fabricated components at all required points.

**863.06 Rating System.** OSE shall evaluate the fabricator's level of quality during the fabrication

process. This evaluation will include quality assurance reviews of shop drawings, material test reports, QC documentation, and shop QA inspection. The fabricator may also be evaluated by the District construction personnel on fit-up quality during field erection. If field evaluations are performed the results will be incorporated into OSE's final rating.

OSE shall perform random and/or specific QA inspections. OSE may choose to waive any or all parts of the QA inspection. OSE will also perform QA reviews of Contractor approved shop drawings and fabricators material test reports and documentation. The rating forms associated with each process are in the Appendix II of this specification.

The Fabricator shall perform QC and provide documentation for each main material member at specified check, hold or witness points ( Appendix II).

Check points require QC inspection and documentation by the fabricator before the fabrication process continues.

Hold points require QC inspection and documentation by the fabricator before QA inspection can be performed by OSE. The fabrication process can continue after QA inspection.

Witness points require concurrent QC inspection by the fabricator and QA inspection by OSE to physically witness the welding or nondestructive testing .

The results of OSE and field construction QA evaluations shall be the fabricator's rating. This rating shall be reported to the fabricator and shall effect the future qualification of the fabricator as follows:

**A Rated Fabricators:** Fabricators that perform fabrication resulting in ratings of 90% and above, based upon the average of five(5) consecutive reference numbers, within the last 36 months and with no individual rating less than 80% will be defined as an A rated fabricator. These fabricators shall have the A rating hold points and random QA inspection performed. The A rating hold point is a final shop inspection, prior to shipping or storage, for levels one thru five and all hold and witness points concerning level six. A single rating below 80%, or the average of five(5) consecutive ratings dropping below 90%, will result in the fabricator's pre-qualification being lowered to a B rating.

**B Rated Fabricators:** Fabricators that perform fabrication with ratings 89% to 80%, based upon the average of five(5) consecutive reference numbers, within the last 36 months and with no individual rating less than 70% will be defined as a B rated fabricator. These fabricators shall have all B rating hold points and random QA inspection performed. The B rating hold points are: Radiographic film review, Ultrasonic Inspection witnessing, and final shop inspection prior, to shipping or storage, for levels one thru five and all hold and witness points concerning level six. A single rating below 70%, or the average of five(5) consecutive ratings dropping below 80%, will result in the fabricator's pre-qualification being lowered to a C rating.

**C Rated Fabricators:** The C rating is an interim level for fabricators, newly approved, to validate their QC performance and upgrade to the Department's B and/or A rating level. These fabricators shall have all C rating hold points and random QA inspection performed. The C rating hold or witness points are: Radiographic film review, Ultrasonic Inspection witnessing, Magnetic Particle Inspection witnessing, prime painting inspection and final shop inspection prior to shipping or storage for levels one thru five and all hold or witness points concerning level six .

The C rating is not a permanent qualification level for fabricators. Fabricators who fail to achieve an average rating above 79% but average between 70% to 79% based on five(5) consecutive reference numbers within the last 36 months, with no individual rating less than 60%, will be reduced one level on the pre-qualification list. The reduced level fabricator shall then have three(3) additional consecutive reference numbers to be averaged with the previous five(5) to achieve a B rating. Fabricators that still do not achieve a B rating will result in removal from the pre-qualified fabricator list. Any time the average of three(3) consecutive ratings drops below 70%, the fabricator shall be removed from the Pre-qualified Fabricator List. The fabricator can request pre-qualification, 863.03, 36 months after removal.

Any rated fabricator that receives a single rating below 60% shall be removed from the Pre-qualified Fabricator List. The fabricator can request pre-qualification, 863.03, 36 months after removal.

**863.061 Fabricator Rating Review Process.** Fabricator may request in writing a reconsideration of the performance rating by a board created by the Department. The board shall be comprised of the Deputy Director, Division of Engineering Policy or his representative, the Administrator of the Office of Structural Engineering or his representative and the Chief Structural Steel Inspector from the Office of Structural Engineering. The board shall hear appeals concerning the Fabricator's performance rating on a specific bridge reference number. The board has no authority to hear appeals for revocation or suspension of a fabricator from the prequalification list.

Within ten days upon receipt of the Department's performance rating the Fabricator may write to the Office of Structural Engineering requesting that the board evaluate the rating. The Fabricator shall also submit additional documentation or evidence bearing on the performance of the work.

The Office of Structural Engineering shall schedule an informal hearing where the Fabricator shall have an opportunity to present Its case. The Department may have representatives at the hearing offering evidence in rebuttal. The board shall consider the evidence and issue its decision within fifteen days of the hearing.

**863.07 General.** All steel fabrication including the shop application of paint shall be performed in a Pre-qualified structural steel fabricating shop having permanent buildings of adequate size

with equipment, heating and lighting facilities and experienced personnel to satisfactorily perform all necessary operations. Areas where flame cutting, air carbon-arc gouging, welding, cleaning and painting are performed shall be inside permanent buildings. The required air temperature levels shall be maintained while these operations are in progress. Shop assembly of large pieces for fit-up of field connections may be performed outdoors. These provisions will not apply to steel requiring fabrication at the bridge site in the repair, alteration or extension of an existing structure.

Where work consists of repairing and extending or altering existing structures the Contractor shall make such measurements of the original construction as may be required to join accurately old and new work. Shop drawings shall include these measurements. Measurements which may appear upon contract plans to indicate the extent and nature of such repair or extension shall not relieve the Contractor of this responsibility.

Shop inspection or acceptance of shop drawings by the Department shall not relieve the Contractor of responsibility for erroneous or inconsistent dimensions, notations, omissions or other errors. All parts forming a structure shall be built in accordance with the contract. The Contractor will not be responsible for any contract plan errors.

The Fabricator shall notify OSE at least two weeks in advance of the beginning of shop fabrication, and furnish a proposed fabrication schedule for the work.

The Fabricator shall cooperate fully with the QA inspector, in his inspection of the work in progress. This shall include the storage of members completed during the QA inspector's absence, in such a manner, that he can completely and safely inspect the finished work, unless such hold or witness point inspections have received a written waiver.

Fabricated material shall not be shipped from the shop without prior hold point QA inspections unless such QA inspection is waived by OSE. Failure to conform to this requirement will result in a rating for the reference of 60% and reduction of the fabricator's rating to C or loss of pre-qualification if the fabricator's rating is currently a C.

Miscellaneous level structural steel members shall have final inspection performed at the fabrication shop. Miscellaneous structural steel members that are not complete at the scheduled inspection, have been shipped to the job site without shop inspection or do not conform to the shop drawings supplied to the QA inspector will be cause for removal of the fabricator from the pre-qualification list. The miscellaneous level fabricator will be given two written warnings 12 months prior to the third occurrence which causes removal. The fabricator may be reinstated to the prequalified list after 12 months with a request for prequalification from the fabricator and performance of facilities evaluation by the Office of Structural Engineering.

The Fabricator shall provide office accommodations having a minimum floor area of 11 m<sup>2</sup> (120 square feet) and a minimum ceiling height of 2.1 m (7 feet). This office shall be equipped with adequate working and storage facilities, lighting and electrical outlets. It shall also contain a

telephone with direct access to an outside trunk line which shall be for the exclusive use of the QA inspector.

In this specification where the terms "Main," "Secondary" or "Detail" are used, it shall be understood that reference has been made as follows: "Main," refers to material, members and fasteners that are primarily stressed by live load and structure weight; "Secondary," refers to material, members and fasteners that do not directly support live load or main members; "Detail," refers to material, members and fasteners that are essentially non stressed.

Where steel stamps are used for identification purposes, they shall be of the "mini-stress" or "stressless" type.

**863.071 Fabricator Documentation Responsibility.** The fabricator shall keep and maintain documentation records for each project reference number concerning;

1. Fabricator approval
2. Shop drawing approval
3. Material test reports
4. Welding qualifications
5. Quality control inspection
6. Non Destructive Testing of weldments

This documentation shall be made available for auditing, inspection and copying upon the Department's request. The documentation shall be archived for at least a five (5) year period from the date of final shipment from the fabrication shop.

Documentation systems are the fabricator's responsibility to establish. Quality control documentation shall include all material quality checks, dimensional checks, weld quality inspection, coating inspection checks, etc. to document both to the fabricator and to the Department that all fabrication has been thoroughly inspected and meets the specification requirements. Evaluation of the fabricator's performance by Departmental personnel, using forms defined in Appendix II, will include validation of the fabricator's actual records of inspection. This validation is intended to assure that rating of an individual component will reflect the overall quality of all components.

When establishing documentation records, processes and procedures it is recommended the fabricator review the QA rating forms (appendix II) which define the Department's QA requirements. The fabricator must establish sufficient QC requirements to perform quality fabrication.

**863.08 Shop Drawing and Submittal Process.** Structural steel and other metal structural elements which are to be assembled, main and secondary bridge structural steel or main bridge rehabilitation steel, finger joints, modular joints and non-standard joint sealing devices, pot bearings, spherical bearings and non-standard bearing devices and other similar items requiring either shop

or field fabrication shall be detailed on shop drawings by the Contractor or Fabricator in accordance with AASHTO "Standard Specifications for Highway Bridges" and the Ohio "Supplement" to the AASHTO specifications in effect with the contract.

The Contractor shall submit to OSE, 14 days before the pre-fabrication meeting, 863.081, written acceptance and four copies of these drawings, unless additional copies are requested. The written acceptance from the Contractor shall document review and acceptance of the shop drawings. All shop drawings shall be stamped and dated as accepted by a registered professional engineer representing the Contractor. All drawings shall incorporate the engineer's stamp and acceptance date. All drawings shall show detailer's initials. The Contractor shall furnish the fabricator's QCFS with one(1) record set of the checked and Contractor accepted shop drawings. This set will be furnished the QCFS on or before the pre-fabrication meeting.

By submission of shop drawings, the Contractor represents to ODOT that all materials, field measurements, construction requirements, contract requirements, performance criteria and similar data have been verified. By submission, the Contractor further represents that the shop drawings have been coordinated and verified with the details of the work to be performed by other fabricators and entities on the project. No allowance for additional cost or delays will be made to the Contractor for incorrect fabrication as a result of failure to coordinate or perform these verifications.

The prints shall be made from tracings, neatly and accurately drawn on sheets 559 mm x 864 mm (22 x 34 inches).

Shop drawings shall show details, dimensions, size of materials, match mark diagrams for field connections, and other information necessary for the complete fabrication and erection of the metal work. These drawings shall also show a diagram identifying, by some unique mark, each area of a welded splice to be covered by a single radiograph.

The shop drawings for all multiple span beam and girder bridges shall include an overall layout with dimensions showing the relative unloaded vertical and horizontal position of beam or girder segments with respect to a full length base or work line; camber and horizontal curvature of the beams or girders and the effect of deck surface profile shall be accounted for in this relationship. Required offsets for horizontal curvature shall be shown for each 3.0 m (10 feet) of length. Required offsets for vertical curvature shall be shown for each 1/4 of span length, at field splices and bearing points.

Shop drawings shall specifically identify each piece of steel as to grade (ASTM designation), CVN, Fracture Critical or any special testing requirements. Pieces made of different grades of steel shall not be given the same assembling or erecting mark, even though they may be of identical dimensions and detail.

When changes on submitted drawings are requested by the Department, or the Contractor makes changes in addition to those expressly requested, the shop drawings shall be submitted to identify the changes with revision marks, stamped for Contractor acceptance and dated.

Deviation from the contract plans or accepted shop drawings will not be permitted without the written order or consent of the Engineer. Requests for such deviation or change shall be submitted in writing to the Engineer. For changes in location, addition or elimination of splices, acceptance shall be obtained prior to acceptance of shop drawings. After acceptance by the Engineer, such plans shall be taken as supplemental to, but in no sense a substitute for, the contract. The QCFS shall be responsible for having documentation of any revised drawings or changes listed above.

The shop drawings shall indicate the welding procedure (WPS number) to be used for each joint. Locations and identification numbers of all radiographs taken shall be detailed on the shop drawings.

After all fabrication is completed, the Contractor shall have the Fabricator furnish a 35-millimeter microfilm copy of each shop drawing mounted on an aperture card in accordance with Supplement 1002 on file in the Department. If the details shown on a drawing apply to more than one bridge, an aperture card for that drawing shall be furnished for each bridge to which it applies, each card bearing the applicable bridge number. For structures carrying railroad traffic, an additional set of aperture card-mounted films or, at the option of the railroad, a set of full-size drawings on mylar shall be furnished for each railway company involved.

**863.081 Pre-Fabrication Meeting.** A pre-fabrication meeting shall be held at the fabricator's facilities, or another location agreeable to all parties, for review of any fabrication issues, including information on shop drawings, inspection, hold or witness points, unique fabrication items, special processes, etc. for the project. Attendance at the meeting shall include the fabricator, the QCFS, the QCPS, the Contractor, or designated representative, and OSE's QA inspector. The meeting will be conducted by the QCFS, who will also be responsible for distribution of minutes of the meeting documenting all issues discussed.

The time of the meeting shall be agreeable to all parties but no earlier than 14 days after submittal of Contractor approved shop drawings, 863.08. OSE can waive the Pre-fabrication meeting if accepted by the Fabricator and the Contractor.

**863.09 Material.** Structural steel and other structure metals shall conform to CMS section 711 except that steel bar stock utilized for end dams and scuppers may be any weldable grade of low or mild carbon steel commercially available. Welded stud shear connectors shall conform to the AASHTO/AWS Bridge Welding Code, as amended by Supplement 1011. Steel plates for main and secondary members shall be cut and fabricated so that the primary direction of rolling is parallel to the direction of the main tensile or compressive stresses.

The Contractor shall submit to OSE, at least 14 days prior to member shipment, written acceptance that test data for all structural steel, except bar stock enumerated above, cast steel,

aluminum, bronze and sheet lead to be supplied complies with the requirements of CMS section 711. The Contractor's submission shall be accompanied by copies of certified test data, mill shipping notices and invoices showing the quantity and size of material being supplied. Materials will not be accepted for shipment from the fabrication shop until the Contractor's submission has been received by the OSE. Structures that carry railway traffic require that one additional copy be submitted for each railway company involved. The QCFS shall be responsible for checking and recording that the material submissions have been performed per specification.

Additionally, one copy of main material mill test data shall be made available to the QA shop inspector prior to material passing check point one(1).

When electrodes to be used are not included in the Laboratory's list of approved electrodes and combinations of shielding, certified test data showing compliance with CMS section 711.08 shall be submitted to the Office of Materials Management.

**863.10 Material Control.** Each piece of steel to be fabricated shall be properly identified for the Engineer or QA Inspector.

The issuance of cutting instructions by the Fabricator to the shop shall be by cross-referencing of the assembly marks shown on the shop drawings with the corresponding item covered on the mill purchase order. The Fabricator's system of assembly-marking individual pieces of steel and the aforementioned issuance of cutting instructions shall be such as to provide a direct reference to the appropriate mill test report.

The Fabricator may furnish from stock, material that he can identify by heat number and mill test report. Any excess material placed in stock for later use shall be marked with the mill test report number and the ASTM A 6 specification identification color code, if any, when separated from the full-size piece furnished by the supplier.

During fabrication, each piece of steel shall show clearly and legibly its specification identification color code and heat number. Individually marked pieces of steel which are used in furnished size, or reduced from furnished size only by end or edge trim, that does not disturb the heat number or color code or leave any usable piece, may be used without further color coding provided that the heat number and color code remains legible.

Pieces of steel which are to be cut to smaller size pieces shall, before cutting, be legibly marked with the ASTM A 6 specification identification color code and heat number.

Individual pieces of steel which are furnished in tagged lifts or bundles shall be marked with the ASTM A 6 specification identification color code and heat number immediately upon being removed from the bundle or lift. Pieces of steel which will be subject to fabricating operations such as blast cleaning, galvanizing, heating for forming, or other operations which might obliterate paint color code and heat number marking, shall be marked with steel stamps or by a substantial tag firmly

attached or shall be approved by the QA Inspector for obliteration of material identify markings. Main material tested for CVN shall have heat numbers steel stamped into the material. The QCFS shall document that material control is performed per specification.

**863.11 Care of Material.** Structural material shall be stored at the shop or field above the ground, upon platforms, skids or other supports. It shall be straight and have clean and dry surfaces before being worked in the shop. Any rusted or corroded material shall be cleaned prior to use and shall meet ASTM A 6 thickness tolerances after cleaning. The QCFS shall document that care of material is performed per specification.

**863.12 Workmanship and Straightening.** If straightening of rolled material is necessary, it shall be done by methods that will not damage the member. When carefully planned and supervised, the application of localized heat is permitted for straightening. The temperature of the heated area shall not exceed 620 C (1150 F) as controlled by pyrometric stick or thermometers. Quenching to accelerate cooling is prohibited.

Fabricated structural steel shall be within the dimensional tolerances specified by Arts. 3.5 and 9.19 of the AASHTO/AWS Bridge Welding Code except where indicated otherwise in these specifications, and with the following additions: Waviness, the deviation of the top or bottom surface of a flange from a straight line or plan curvature, shall not exceed 3 mm (1/8 inch) when the number of waves in a 3.0 m (10 foot) length is four or less, or 1.6 mm (1/16 inch) when more than four, but sharp kinks or bends shall be cause for rejection. For the measurement of camber during laydown, the bearing points shall be relatively positioned both horizontally and vertically to plan dimensions  $\pm 3$  mm ( $\pm 1/8$  inch). Rolled beams shall be cambered as called for on the plans in the pre-qualified fabricating shop by use of heat or hydraulic jacks. Heating shall be controlled as specified above and follow a formal shop heating procedure. Plate girders shall be cambered by trimming web plates prior to assembly.

Camber shall be measured as the vertical offset between the steel and the common base line extending from abutment bearing to abutment bearing. The maximum camber tolerance at midspan shall be - 0 mm (in.) and the greater of + 19 mm (3/4") or the designed haunch height. The maximum camber tolerance at midspan shall be prorated between the center of the span and each adjacent bearing to provide a smooth unbroken curve. The camber tolerances in Art. 3.5.1.3 of the AASHTO/ AWS Bridge Welding Code shall not apply.

During fabrication, shipping and erection, members shall be so supported and handled that camber is maintained. The QCFS shall document that workmanship and straightness are performed per specification.

**863.13 Finish.** Sheared edges of all main material shall be planed to a minimum depth of 6 mm (1/4 inch) except for ASTM A709 grade 36 material having a thickness of 16 mm (5/8 inch) or less. Burrs shall be removed. All fins, tears, slivers and burred or sharp edges that are present on any steel

member shall be removed by grinding. If these conditions appear during the blasting operation, they shall be removed by grinding and the area re-blasted to the required surface profile.

Structural steel permitted by these specifications may be flame cut, provided a smooth surface free from cracks and notches is secured and provided that an accurate profile is secured by the use of a mechanical guide. Rolled and flame cut surfaces shall meet the requirements of the AASHTO/AWS Bridge Welding Code, as amended by Supplement 1011. The surface finish of bearing and base plates and other bearing surfaces that are to come in contact with each other or with concrete shall meet the ANSI surface roughness requirements as defined in ANSI B46.1, Surface Roughness, Waviness and Lay, Part I:

**ANSI**

Steel slabs .....	50.0a $\mu\text{m}$ (2000)
Heavy plates in contact in shoes to be welded .....	25.0a $\mu\text{m}$ (1000)
Milled ends of compression members, milled or ground ends of stiffeners and fillers .....	12.5a $\mu\text{m}$ (500)
Bridge rollers and rockers .....	6.4a $\mu\text{m}$ (250)
Pins and pin holes .....	3.2a $\mu\text{m}$ (125)
Sliding bearings .....	3.2a $\mu\text{m}$ (125)

The QCFS shall document that material finish is performed per specification.

**863.14 Stiffeners.** The bearing ends of bearing stiffeners shall be flush and square with the web and shall have at least 75 percent of this area in contact with the inner surface of the flange. The other end of the stiffener shall have a tight fit as defined below. Bearing stiffeners shall be positioned to be vertical after erection. Intermediate stiffeners which are not used in pairs shall be welded to the compression flange. Intermediate stiffeners to which crossframe angles are connected shall be welded to the top and bottom flange. A tight fit is defined as one in which the stiffener and flange are in physical contact over some portion of the end of the stiffener and having no gap in excess of 1.6 mm (1/16 inch). Welds attaching stiffeners to the web plate shall not extend into the clip area. All stiffeners shall be clipped to clear flange-web welds and fillet or rolled shapes. The clip shall be 65 mm (2 1/2 inches) along the web and 25 mm (1 inch) along the flange. The QCFS shall document that stiffener details are performed per specification.

**863.15 Fillers.** Fills shown on the shop drawings shall be dimensioned to the nearest 1.6 mm (1/16 inch) in thickness, but not less than 3 mm (1/8 inch) thick, based on the dimensions for detailing and intended relative position of the abutting elements to be spliced. However, in the final shop assembly, fills shall be furnished with thicknesses sufficient to compensate for any misalignment of abutting elements due to standard rolling mill tolerances or differences in thicknesses of flanges and webs at the splice location. The actual fills used shall be such as to compensate for differences in total thickness or relative positions of more than 1.6 mm (1/16 inch).

Fill plates in bolted joints shall be made flush with the perimeter of the splice plates and not be tack welded. The QCFS shall document that fills are performed per specification.

**863.16 Horizontally Curved Beams and Girders.** Beams and girders shall be heat curved as specified by AASHTO Standard Specifications for Highway Bridges, except that flanges for girders may be cut to shape. When members are to be heat curved, the detailed procedure including necessary calculations shall be submitted with the shop drawings for acceptance prior to starting work. The QCFS shall document heat curving procedures are submitted and performed per specification.

**863.17 Joints and Splices.** In bolted construction where tension or flexural members are spliced, not more than 6 mm (1/4 inch) clearance will be allowed between the abutting surfaces of spliced members. For spliced compression members, the abutting surfaces shall be truly faced so as to have a uniform bearing when properly aligned and completely bolted.

In welded construction, all abutting surfaces shall receive the proper joint preparation as shown on approved shop drawings. The preparation for field welded butt joints in main members shall be verified by a complete shop assembly as specified in 863.26. The opening in any joint, which is located in the finished structure so as to permit the entrance of water, shall be filled as directed by the Engineer with an approved caulking before paint is applied.

The QCFS shall document that joints and splices are performed per specification.

**863.18 Pin Holes.** Pin holes shall be bored true to size, at right angles to the axis of the member and parallel to each other. The boring shall be done after the member is completely fabricated. Pin holes for up to 127 mm (5 inch) diameter pins shall not exceed the pin diameter by more than 0.51 mm (0.020 inches); holes for larger pins shall not exceed the pin diameter by more than 0.79 mm (0.031 inches). The QCFS shall document that pin holes are performed per specification.

**863.19 Pins and Rollers.** Pins and rollers shall be of cold rolled steel and accurately turned to size; they shall be straight and smooth and entirely free from flaws. Pins over 230 mm (9 inches) in diameter shall be annealed. In pins larger than 230 mm (9 inches) in diameter, a hole not less than 50 mm (2 inches) in diameter shall be bored full length along the axis. One pilot and one driving nut shall be furnished for each size of pin. The QCFS shall document that pins and rollers are performed per specification.

**863.20 Holes for High-Strength and Bearing Bolts.** Holes shall be cylindrical, perpendicular to the member, clean cut, and free of ragged edges. All burrs shall be removed by countersinking not more than 1.6 mm (1/16 inch) or by grinding. The finished size of the holes for high-strength bolts shall be not larger than nominal diameter of the bolt plus 1.6 mm (1/16 inch), and for bearing type bolts, the holes shall provide a driving fit. The diameter shall not vary by more than 0.8 mm

(1/32 inch) from a true circle for 85 percent of the holes in a contiguous group, and not more than 1.6 mm (1/16 inch) for the remainder.

Punched holes shall be made with a die whose diameter does not exceed that of the punch by more than 1.6 mm (1/16 inch). Reaming and drilling shall be done with twist drills and, wherever possible, the reamer shall be directed by mechanical means. Holes for shop bolts shall be subpunched or subdrilled 5 mm (3/16 inch) less in diameter than the nominal diameter of the bolt, and shall be reamed to size with the parts assembled, except:

1. A709 grade 36 material thicker than 19 mm (3/4 inch) and grade 50 or 50W steel thicker than 16mm (5/8 inch) shall not be punched.
2. Materials assembled and adequately clamped together may be drilled full size.
3. Secondary and detail material of A709 Grade 36 steel not thicker than 19 mm (3/4 inch) and grade 50 or 50W steel not thicker than 16 mm (5/8 inch) fastened with high strength bolts may be punched full size.

Holes for field bolts shall be made in the same manner as holes for shop bolts except:

1. Field splices in and connections to main material shall be reamed or drilled assembled. See 863.26.
2. Assemblies such as floor beams to girders and rolled beam spans connected by diaphragms may be made through steel templates.

All holes punched full size, subpunched, or subdrilled shall be located with sufficient accuracy such that after assembling (before subpunched or subdrilled holes are reamed) a cylindrical pin 3 mm (1/8 inch) less in diameter than the nominal size of the punched hole may be entered perpendicular to the face of the member without drifting in not less than 75 percent of the contiguous holes in the same plane. All holes shall permit a pin 5 mm (3/16 inch) smaller than the nominal size of the punched holes to be inserted in the above manner. After holes are reamed or drilled full size, 85 percent of the holes in any contiguous groups shall have no offset greater than 0.8 mm (1/32 inch) between adjacent plies. The remainder of the holes shall not be offset more than 1.6 mm (1/16 inch) between adjacent plies. Plugging of improperly located holes is not permitted unless written approval has been obtained from The OSE. Steel templates shall have hardened bushings in holes accurately located in relation to the centerline of the connection as inscribed on the template. Where holes are made using a roto-broach, shell drill or other similar tool, hardened bushings need not be used in the template. The template shall be accurately positioned and bolted or clamped firmly in place prior to its use in reaming or drilling full size holes.

Templates used for reaming matching members or the opposite faces of a single member shall be exact duplicates. Templates used for connections on like parts or members shall be located with sufficient accuracy that the parts or members are duplicates and require no individual match marking.

Holes through multiple plies shall be reamed or drilled full size only when the plies of the joint are held tightly together with bolts or clamps. The joint shall also be pinned if the holes have been subpunched or subdrilled. The plies shall be disassembled and cleaned of burrs and shavings prior to final assembly. Other methods of preparing holes for high strength bolts may be given consideration upon written request to the OSE. The QCFS shall document that holes have been performed per specification.

**863.21 High-Strength Steel Bolts, Nuts and Washers.** High strength steel bolts, nuts and washers shall meet the provisions of 711.09.

1. General. The Engineer shall be furnished the necessary access to the work in order to observe the installation, tightening and checking of the bolts.

Based on the experience gained by the Engineer and Contractor during the use of the below described installation and inspection procedures for a particular bridge, the Engineer may elect to modify the amount of testing specified in order to expedite the work while still accomplishing properly compacted joints and tightened bolts. Consideration will be given to the use of other fastening systems or assemblies and bolt tightening procedures, if a written request is submitted to the Office of Structural Engineering in accordance with 108.05. The required bolt length shall be determined by adding to the grip the value shown in Table 1. The table values are generalized, with an allowance for manufacturing tolerances, to provide for the nut and positive "stick-through" at the end of the bolt. For each hardened flat washer that is used, add 4 mm (5/32 inch); and for each beveled washer, add 8 mm (5/16 inch). The length determined by the use of Table 1 should be adjusted to the next longer 6 mm (1/4 inch); when installed, the end of the bolt shall be flush with or project several thread lengths outside the face of the nut.

**TABLE 1**

Bolt Size	To determine required bolt length, add to grip*
mm	mm
M16	24
M20	28
M22	31
M24	35
M27	38
M30	41
M36	47

**TABLE 1**

Bolt Size	To determine required bolt length, add to grip*
inches	inches
½	11/16
5/8	7/8
¾	1
7/8	1-1/8
1	1-1/4
1-1/8	1-1/2
1-1/4	1-5/8
1-3/8	1-3/4
1-1/2	1-7/8

\*Total thickness of all connected material exclusive of washers.

Washers may, when necessary, be clipped at one location not closer than 7/8 of the bolt diameter from the center of the washer.

2. Preparation. Joint surfaces, including those adjacent to the bolt heads, nuts or washers, shall be free of paint (except for inorganic zinc primers), lacquer, dirt, oil, loose scale, rust, burrs, pits and other substances or defects which would prevent solid seating of the parts or would interfere with the development of complete frictional contact. No gaskets or other yielding material shall be interposed.

Bolts, nuts and washers will have a residual coating of lubricant when received. Bolts, nuts and washers without their original lubrication shall not be used.

3. Installation. In the final assembly of the parts to be bolted, drift pins shall be placed in a sufficient number of holes (preferably not less than 25 percent for field erection) to provide and maintain accurate alignment of holes and parts, and sufficient bolts shall be installed and brought to a snug tight condition to bring all parts of the joint into complete contact. However, in each flange and web of each beam or girder a minimum of two drift pins shall be used. Snug tight shall be defined as the tightness attained when an impact wrench begins to impact or when the full effort of a man using an ordinary spud wrench is applied. Bolts shall then be installed in any remaining open holes and tightened to a snug tight fit, after which all bolts shall be tightened completely by the turn-of-nut method. Where difficulty is experienced with the fit of the connection and the bolts are used to draw the elements into contact, the bolts in the affected portion of the connection shall be checked for sustained snug tightness after all the bolts are installed. Drift pins shall then be replaced

with bolts tightened in the same manner. Field Reaming of full sized shop holes shall not be allowed.

After the bolts are snug tight, the outer face of the nut shall be match-marked with the protruding portion of the bolt to provide the Engineer visual means of determining the relative rotation occurring between the bolt and nut during the process of final tightening. Such marks shall be made by the wrench operator with crayon or paint.

Each bolt shall have a hardened washer under the element (nut or bolt head) turned in tightening. Where an outer face of the bolted parts has a slope of more than 1:20 with respect to a plane normal to the bolt axis, a smooth beveled washer shall be used to compensate for the lack of parallelism. Galvanized A 325M (A 325) bolts shall not be reused. Re-tightening previously tightened bolts, which have become loose by tightening adjacent bolts, is not considered a reuse.

4. Tightening. Tightening of the bolts in a joint should commence at the most rigidly fixed or stiffest point, and progress toward the free edges, both in the initial snugging up and in the final tightening. If required because of bolt entering and wrench operation clearances, tightening may be done by turning the bolt. Impact wrenches, if used, shall be of adequate capacity to perform the required tightening of each bolt in approximately ten seconds.

5. Bolt Tension. Each bolt shall be tightened to provide, when all bolts in the joint are tight, at least the minimum bolt tension shown on Table 2 for the size of bolt used.

**TABLE 2**

Bolt Size mm	Bolt Tension* kN, minimum A 325 M
M16	91
M20	142
M22	176
M24	206
M27	267
M30	327
M36	475

**TABLE 2**

Bolt Size inches	Bolt Tension* kips, minimum A 325
1/2	12
5/8	19
3/4	28
7/8	39
1	51
1-1/8	56
1-1/4	71
1-3/8	85
1-1/2	103

\*Equal to 70 percent of specified minimum tensile strengths of bolts, rounded off to the nearest kN (kip).

The bolt tension specified in Table 2 shall be attained by tightening all bolts in the joint the applicable amount of nut rotation specified in Table 3 by the turn-of-nut method.

**TABLE 3  
NUT ROTATION FROM SNUG TIGHT CONDITION**

Bolt Length (as measured from underside of head to extreme end of point)	Disposition of Outer Faces of Bolted Parts		
	Both faces normal to bolt axis	One face Normal to bolt axis and other face sloped not more than 1:20 (bevel washer not used)	Both faces sloped not more than 1:20 from normal to bolt axis (bevel washer not used)
Up to and including 4 diameters	1/3 turn	1/2 turn	2/3 turn
Over 4 diameters but not exceeding 8 diameters	1/2 turn	2/3 turn	5/6 turn
Over 8 diameters but not exceeding 12 diameters	2/3 turn	5/6 turn	1 turn

Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, a tolerance of plus or minus 30 is permitted. For bolts installed by 2/3 turn and more, a tolerance of plus or minus 45 is permitted.

6. Inspection. (a) The first completed connection of each bridge on the project and as many subsequent connections as are deemed necessary by the Engineer shall be inspected as per paragraph (b) below. Thereafter, where the Engineer has approved the joint compactness and snug-tight condition of bolts prior to bolt tightening by the turn-of-nut method, the bolt tension as required in Table 2 shall be considered as attained if the amount of nut rotation specified by Table 3 is verified by the required match-marking.

(b) Bolts shall be inspected by the use of manual torque wrenches furnished by the Contractor. This testing shall be witnessed by the Engineer and shall be performed to his satisfaction. The inspection wrenches shall be calibrated at least once each working day in a device capable of indicating bolt tension. In this device, which shall have been approved by the Engineer, three bolts representative of the grade, size, length and condition used in the structure shall be placed and tensioned individually. A washer shall be used under the part being turned.

(c) Each of the three bolts shall be tightened in any convenient manner to the tension shown in Table 2. Then, the inspection wrench shall be applied by a slow steady pull to the tightened bolt and

the torque required to turn the nut or head 5 degrees, approximately 25 mm (1 inch) at a 300 mm (12 inch) radius, in the tightening direction shall be determined. The average torque measured in the tensioning of the three bolts shall be taken as the job inspection torque.

(d) Bolts represented by the sample described in paragraph (b) which have been tightened in the structure, shall be inspected by applying, in the tightening direction, the inspection wrench and its job inspection torque to 10 percent of the bolts, but not less than two bolts, selected at random in each connection. If no nut or bolt head is turned by this application of the job inspection torque, the connection will be accepted as properly tightened. If any nut or bolt head is turned by the application of the job inspection torque, this torque shall be applied to all the bolts in the connection, and all bolts whose nut or head is turned by the job inspection torque shall be tightened with the inspection wrench to the job inspection torque. The connection shall then be reinspected in the original manner.

7. Calibration Devices. Each calibration device shall be periodically examined by a manufacturer of such devices or by a qualified testing laboratory. Such examination shall be made at least once each year or more often if requested by the Engineer. The testing agency shall certify that each calibration device furnishes, after re-calibration if necessary, an accurate indication of actual bolt tension. The QCFS shall document that any shop applied bolts have been performed per specification.

**863.22 Bearing Bolts.** Turned, ribbed or other approved bearing type bolts shall meet the provisions of CMS 711.10. The bolts shall be of sufficient length to project at least 6 mm (1/4 inch) beyond the nut when tightened, and the threads on the projecting end shall be burred. The thread shall not extend into the shear planes of the contact surfaces between the connected parts. In determining whether the bolt threads are excluded from the shear planes, thread length of bolts shall be calculated as two thread lengths greater than the specified thread length as an allowance for thread run out. A washer not thicker than 6 mm (1/4 inch) may be used under the nut. The QCFS shall document that any shop applied bolts have been performed per specification.

**863.23 Welding.** All welding shall be performed by the shielded metal-arc, submerged arc, flux cored arc, or stud welding process. Consideration will be given to other methods of metal-arc welding if a written request is submitted to the OSE in accordance with CMS 108.05.

In other respects, the AASHTO/AWS Bridge Welding Code, as amended by Supplement 1011 shall govern the work. Welding performed on main members requires procedure testing (PQR) and an approved welding procedure (WPS). The shielded metal arc welding (SMAW) process is considered pre-qualified, and does not require procedure testing (PQR) but requires an approved welding procedure (WPS). The fabricator shall have an approved PQR, WPS and Welder Qualifications prior to Fabricator Pre-qualification.

If after two repairs to the same area of a weld requiring radiographic quality, there is any part of the original defect remaining or there is a new rejectable indication the OSE shall have the right to

have the total joint cut apart, all deposited weld metal removed, joint preparation made and the total joint rewelded.

**863.24 Stud Shear Connectors.** Stud welding shall conform to the requirements of 863.23, to the AASHTO/AWS Bridge Welding Code, as amended by Supplement 1011, and the following. Stud shear connectors that are to be welded to the top flanges of beams or girders shall be placed after the steel has been erected and suitable scaffolding or deck forming has been provided. Studs that are to be welded to beam or girder webs, end dams, bearing plates, or to other secondary members and detail material may be placed in the shop. In addition to the stud bend tests of Article 7.6.6.1 of the AASHTO/AWS Bridge Welding Code, bend tests of stud shear connectors shall also be made at the start of each work day, when welding has been interrupted for an hour or more, when changing grounds, when changing weld settings or when changing cable loop due to arc blow. In any case, no more than 500 studs shall be welded to a beam or girder without the welds being field bend tested in accordance with the specified procedure. All tested studs that show no sign of failure as determined by the Engineer shall be left in the bent position.

**863.25 Threads for Bolts and Pins.** Threads for bolts and pins shall conform to the Unified Standard Series ANSI B1.13M (ANSI B1.1-UNC) Class 6g (2A) for external threads and Class 6H (2B) for internal threads, except that pin ends having a diameter of 35 mm (1 3/8 inches) or more shall be threaded 4.23 mm/thread (6 threads to the inch). The QCFS shall document that threading for bolts has been performed per specification.

**863.26 Shop Assembly.** All contact surfaces shall be free of paint, grease, oil, rust, loose mill scale and protruding edges or burrs. The flanges and webs shall not be assembled and welded to form girders or other similar members, nor shall any fabrication or assembly which would interfere with the repair of a butt weld be accomplished until radiographs of all butt welds in the component parts are examined and approved by the QCFS for the A rated fabricators or the QA inspector for B and C rated fabricators unless waived by the OSE.

All fit-up work shall be done with the members assembled in their unloaded position as shown on the shop drawing layout required by 863.08. While assembled in the shop, members shall be adequately supported to prevent misalignment or deflection, especially at joints. Supports shall be designated to prevent settlement during the fit-up, reaming or drilling of connections. The QCFS shall maintain records of the actual dimensions and relative positions of each assembly for each offset required by 863.08 and furnish a copy to the QA inspector, upon request. This provision shall apply to both horizontal and vertical dimensions. Members that become a part of two assemblies shall be repositioned for the second assembly to the dimensions recorded for the first assembly. All connecting parts assembled in the shop for the purpose of reaming or drilling of holes for field connections or for fit-up of field welded connections shall be match-marked with steel stamps prior to disassembly.

Continuous beam and plate girders including sections adjacent to hinged, pin connected, sliding or rocker bearing joints shall have at least three adjacent segments assembled and holes reamed or drilled while assembled.

The fit-up of field welded connections shall be checked by similar shop assembly.

Longitudinal or transverse beams and girders to which diaphragms and floor beams frame or connect shall be shop assembled to check fit-up of connections to be field welded or to ream or drill holes for bolted connections. Trusses shall be assembled in lengths not less than three abutting panels before field connections are drilled or reamed while assembled.

Deck expansion devices shall be shop assembled after fabrication to check fit-up, straightness and roadway cross slope changes. Where a phased construction sequence is a mandatory part of the contract plans, part-width deck segments may be fabricated without the required shop assembly if shop drawings have incorporated a laydown, similar to 863.08, defining vertical offset dimensions from a full length common baseline to all roadway changes including sidewalks, roundings, crowns and field splice points of the expansion device.

Parts not completely assembled in the shop shall be secured by bolts, as far as practicable, to prevent damage in handling and shipping. Field splice plates shall be bolted in their final position in the shop or shifted laterally with respect to their final position so that the ends of the plates are flush with the ends of the member. Welding or tacking will not be permitted on bolted assemblies unless by written acceptance from OSE. Welding authorized shall be performed according to 863.23. The QCFS shall document that shop assembly has been performed per specification.

**863.27 Nondestructive Testing.** Nondestructive testing (NDT) shall conform to the AASHTO/AWS Bridge Welding Code, as amended by Supplement 1011, and this item. Welded repairs in main members for thick scabs, deep kerfs or nicks and similar gross flaws shall be subject to ultrasonic or radiographic inspection as directed by OSE or Engineer (field repairs). All examined welds and base metal adjacent to a welded joint shall be subject to the quality requirements specified in 863.23. Welds requiring nondestructive testing shall be allowed to cool before they are tested.

Where controversy may arise, regarding the interpretation of radiographs, magnetic particle indications or the acceptability of welds, OSE shall have the final authority to approve the welds. Field radiographic inspection shall be accepted by OSE prior to subsequent construction activities that would make weld repair inaccessible.

1. Radiographic Inspection of Welds. Radiographic inspection shall be made of the following welds:

- (a) The full length of all butt welds in flange material of plate girders or rolled beams.
- (b) The top and bottom one-third of transverse web splices in plate girders or rolled beams including the cope holes, if any.

(c) Butt welds in longitudinal stiffeners attached to tension areas of webs.

(d) Twenty-five percent of each longitudinal web splice as selected by the inspector.

(e) Full length of field flange cut repairs.

(f) Any other weld specified by the plans.

The radiograph identification mark shown on the shop drawing layout shall be steel stamped in the area marked "Weld Identification" of Figures 6.1A thru 6.1D of the AASHTO/AWS Bridge Welding Code in a manner to make it visible in the radiograph of the area without resorting to superimposed like markings. Steel Stamped identification marks on flange plates shall be placed so that after assembly of girders, they will be on the inside of flange, but out of the area to which the web will fasten. Films of repaired welds shall also be identified by the letter "R". Steel Stamped identification numbers shall not be placed within the weld area. Other required markings shall be made by using superimposed characters. Where areas being radiographed are adjacent to the edge of the plate, the film shall be located and a technique employed which will include the top and bottom images of the plate edge. Films 114 by 432 mm (4 ½ by 17 inches) shall be used where practicable. The minimum film size shall be 114 by 254 mm (4 ½ by 10 inches).

Whenever an unacceptable weld occurs in the web sections enumerated, an adjoining 300 mm (12 inch) length of weld not previously examined shall be radiographed. If unacceptable flaws are found in this adjoining segment, the remainder of the weld (if any) shall be examined.

Radiographs shall be submitted to OSE for acceptance and shall be accompanied by certification from the Contractor or Fabricator that the radiographic examination was performed in conformance to these specifications, field sketches and by two copies of the radiographic technician's analysis report listing unacceptable defects and causes for rejection. The technician's report shall include identification and energy level or source strength in becquerels of the radiation source, film to source distance, film type, and exposure time for each radiograph as well as the signature of the technician and his NDT level. The contact films shall become the property of the Department. Field main material repairs shall have sketches which clearly show specific locations, lengths and depths of field cuts or damages repaired by field welding.

2. Magnetic Particle Inspection of Welds. All welding required in the fabrication of each beam or girder shall be completed and all visual defects shall be corrected prior to the examination by magnetic particle inspection. Dry powder magnetic particle inspection shall be made of at least 0.3 m (1 foot) of each 3.0 m (10 feet) or fraction thereof for each size of weld in the following:

- (a) Flange-to-web welds
- (b) Moment plate to flange welds
- (c) Bearing stiffener welds
- (d) Other welds designated by the plans.

Test sections shall be random locations selected by the QA inspector and/or the QCFS, and the examination shall be conducted with the QA inspector observing for C rated fabricators, unless waived by OSE. The Contractor or Fabricator shall notify the Department at least 48 hours in advance of such inspection. Requests for an inspector to observe the examination shall be limited to not less than 150 m (500 feet) of weld unless a lesser amount constitutes the entire project.

The Fabricator shall position the welds as necessary for the inspection with consideration of safety and convenience to the inspecting personnel.

Welds shall be inspected after they have been cleaned. Test equipment shall be provided with a functioning ammeter. The magnetizing current shall be 100 amperes per 25 mm (inch) of prod spacing but not less than 400 amperes. Only aluminum prods shall be permitted.

When unacceptable defects are found in a section, both adjacent 1.5 m (5 foot) segments or the full length of the weld if it is a lesser amount shall be tested. Welds requiring repair shall be retested after repairs are completed.

Not all of the enumerated surface defects of Article 9.21 of the AASHTO/AWS Bridge Welding Code will be located by an inspection of this type. Welds shall be considered unacceptable if they produce such indications that are in the QA inspector's opinion in excess of the above quality standards.

The Fabricator shall record for each structural member the location of inspected areas, the location and description of any defects found, and repairs made.

3. Ultrasonic Testing of Welds. Ultrasonic inspection shall be made of the following:

- (a) At least 0.3 m (1 foot) in each 3.0 m (10 feet) or fraction thereof at locations selected by the Inspector of all complete joint penetration flange-to-web welds.
- (b) Fracture Critical Welds per AWS Bridge Welding Code
- (c) Other welds designated by the plans

The QCFS shall document that all shop NDT has been performed per specification.

**863.28 Shipping, Storage and Erection.** Members damaged by improper handling, storing, transportation or erection shall be repaired or replaced, at the discretion of OSE, at no expense to the Department.

During transport, adequate blocking shall be in place between members to prevent movement and facilitate unloading. Field connection holes shall not be used for tie-down unless they are reinforced

by additional plates, angles or other material bolted in place. Bearing components shall be banded together.

Material to be stored either in the fabricating shop or in the field shall be placed on skids or blocks to prevent the metal from coming in contact with the ground. Girders and beams shall be placed and shored in an upright position for shipment and both field and shop storage. Field splice plates shall be bolted in their final position or shifted laterally with respect to their final position. All material shall be kept clean and properly drained. Bearing devices and anchorages shall be installed according to 516. Bearing surfaces and surfaces to be in permanent contact shall be thoroughly cleaned before the members are assembled.

During erection, drifting will be permitted to draw the parts into position, but the holes shall not be enlarged nor the metal distorted. Erection (drift) pins shall be cylindrical and not more than 0.8 mm (1/32 inch) smaller than the diameter of the hole. Field splices and connections shall have not less than one-half of the holes filled with pins and snug tight bolts (preferably half bolts and half pins) before the member is released from the hoisting equipment. Field splices and connections commenced prior to erection of the connected parts shall be completed before erection. Splices and connections subject to construction loads during erection shall have not less than three-fourths of the holes so filled. Permanent fastening of steel truss tension chord members shall be completed before the falsework is removed, but compression chord members shall not be permanently fastened until the span is released sufficiently from the falsework to bring the compression chord joints into full bearing. Elevations of panel points and ends of floor beams shall be properly regulated and maintained until the falsework is removed.

Enlarging by any method the holes of splices and/or connections between segments or elements of main members is prohibited without approval by OSE.

Structures shall be adjusted to correct alignment and camber before permanent fastening is begun. Cross frames and lateral bracing in continuous beam or girder spans shall not be permanently fastened in any span until all main connections in adjacent spans have been completed; however, sufficient bracing shall be installed to meet the requirements of 501.06. Where erection bolts are used, they shall be not less than 16 mm (5/8-inch) diameter. Bolts for unpainted applications of A709 Grade 50W (A588) steel shall be A 325, Type 3. Erection bolts shall be A 307 bolts with lock washers or nuts tack welded to the bolt, or A 325 bolts tightened to a snug tight condition as described in 863.21 and having nuts tack welded to the bolt. End crossframes and end dams shall be erected in a manner that assures all bearing parts will remain in bearing contact. The QCFS shall document all shipping from the shop and shop storage has been performed per specification.

**863.29 Shop Painting.** This section contains requirements for the application and inspection of the shop prime coat as specified in the contract plans. The payment for the shop prime coat is included in the price bid for structural steel.

The QCPS shall be responsible for being familiar with the applicable paint specifications called for in the contract plans. Where specific shop Quality Control Points (QCP) are established in the specification, the QCPS shall comply with those requirements. If no shop prime coat QCPs are defined in the applicable paint specification, the QCPs in this section shall be the responsibility of the QCPS to assure that all QCPs meet specifications.

Shop Prime coat shall be as specified in the contract documents.

Quality Control Points

Quality control points (QCP) are points in time when one phase of the work is complete and ready for inspection by the fabricator and QA Inspector. The next operational step shall not proceed unless the QCP has been accepted or QA inspection waived by the QA Inspector. At these points the Fabricator shall afford access to inspect all affected surfaces. If QA Inspection indicates a deficiency, that phase of the work shall be corrected in accordance with these specifications prior to beginning the next phase of work. Discovery of defective work or material after a Quality Control Point is past or failure of the final product before final acceptance, shall not in any way prevent rejection or obligate the Department to final acceptance.

<u>Quality Control Points (QCP)</u>	<u>(PURPOSE)</u>
1.) Shop Solvent Cleaning	Remove asphaltic cement, oil, grease salt, dirt, etc.
2.) Shop Grinding Flange Edges	Remove sharp corners, per AWS
3.) Shop Abrasive Blasting	Blasted surface to receive paint, including repair of fins, tears, slivers or sharp edges
4.) Shop Prime Coat Application	Check surface cleanliness apply prime coat check coating thickness

Shop Solvent Cleaning (QCP # 1)

The steel shall be solvent cleaned to remove all traces of asphaltic cement, oil, grease, diesel fuel deposits, and other soluble contaminants per SSPC-SP 1 Solvent Cleaning. Under no circumstances shall any abrasive blasting be done to areas with asphaltic cement, oil, grease, or diesel fuel deposits. Steel shall be allowed to dry before blast cleaning begins.

Shop Grinding Edges (QCP # 2)

All corners of thermally cut or sheared edges shall have a 1/16 inch radius or equivalent flat surface at a suitable angle. Thermally cut material thicker than 1 ½ inch shall have the sides ground to remove the heat effected zone.

Shop Abrasive Blasting (QCP #3)

All steel to be painted shall be blast cleaned according to SSPC-SP10. Steel shall be maintained in a blast cleaned condition until it has received a prime coat of paint.

Metallized or Galvanized steel, and other surfaces not intended to be painted, shall be covered and protected to prevent damage from blasting and painting operations. Any adjacent coatings damaged during the blasting operation shall be repaired at the fabricators expense.

The abrasive shall be a mix of recyclable steel grit and shot that produces an angular profile. After each use and prior to reuse, the steel grit shall be cleaned of paint chips, rust, mill scale and other foreign material by equipment specifically designed for such cleaning.

Abrasives shall also be checked for oil contamination before use. A small sample of abrasives shall be added to ordinary tap water. Any detection of a oil film on the surface of the water shall be cause for rejection. The QCPS shall perform and record this test prior to abrasive blasting and at the start of each shift. The resultant surface profile shall be a minimum of 40 mm (1.5 mils) and a maximum of 90 mm (3.5 mils). The QCPS shall record by the use of replica tape ASTM D4417-93 method C, the profile supplied. Five random readings shall be made for each beam or girder piece. 10% of all secondary material shall have one(1) recorded reading. Abrasives of a size suitable to develop the required surface profile shall be used. Any abrasive blasting which is done when the steel temperature is less than 3° C(5° F) above the dew point shall be re-blasted when the steel temperature is at least 3° C(5° F) above the dew point. The QCPS shall record temperature by the use of a recording Thermometer and Dew point shall be recorded prior to blasting and at the start of each shift.

All abrasives and residue shall be removed from all surfaces to be painted with a vacuum cleaner equipped with a brush-type cleaning tool, or by double blowing. All blast cleaned steel shall be kept dust free, dry and shall be prime coated within 24 hours. The QCPS shall perform and record the following test to ensure that the compressed air is not contaminated: blow air from the nozzle for 30 seconds onto a white cloth or blotter held in a rigid frame. If any oil or other contaminants are present on the cloth or blotter, abrasive blasting shall be suspended until the problem is corrected and the operation is verified by a repeated test. This test shall be done prior to blowing and at the start of each shift.

Abrasive blasting and painting may take place simultaneously as long as abrasive blasting debris and/or dust by the blowing operation does not come in contact with freshly painted surfaces. Work areas for blasting and painting shall be physically separated to eliminate contamination of the priming operation.

All fins, tears, slivers and burred or sharp edges that are present on any steel member or that appear after the blasting operation shall be conditioned per ASTM A6 and the area reblasted to provide the specified surface profile.

Shop Prime Coat Application(QCP # 4)

The surfaces to be painted shall be clean and dry. Paint shall not be applied in rain, snow, fog or mist, or to frosted or ice-coated surfaces. After QCP #3 has been accepted prime painting shall be completed before the cleaned surfaces have degraded from the prescribed standards, but in every case within 24 hours. The QCPS shall record the time between blasting and priming. Failure to prime coat the within 24 hours will require reblasting before prime coating. The QCPS shall record that the paint is applied when the ambient temperature and humidity are as specified. Primer shall be applied by spray methods. The paint may be thinned for spraying. The type of thinner and the amount used shall be as recommended by the printed instructions of the manufacturer.

Before the paint is applied, it shall be mixed to a uniform consistency and maintained during its application. Primer shall be spray applied and continuously agitated by a automated agitation system( hand held mixers are not allowed) during application. The paint shall be mixed with a high shear mixer. Paddle mixers or paint shakers shall not be used. Paint shall also not be mixed or kept in suspension by means of an air stream bubbling under the surface.

The primer shall be applied in a neat workmanlike manner as a continuous film of uniform thickness which is free of holidays, pores, runs or sags. Spray application shall produce a wet coat at all times; the deposition of semidry particles on the surface shall be avoided. The Fabricator shall take precaution to prevent contamination of surfaces that have been prepared for painting and surfaces freshly painted. The prime coat shall be applied within the shop and the steel shall not be handled unnecessarily or removed from the shop until paint has dried sufficiently to allow thickness gaging and to resist being marred in handling and shipping.

A prime coat shall coat all surfaces including insides of holes, behind stiffener clips and contact surfaces of connection or splice material which are to be fastened with shop or field bolts. Surfaces which are to be imbedded in concrete and surfaces within 50 mm (2 inches) of field welds other than those attaching intermediate or end Cross frames to beams or girders shall only receive a mist coat not less than .5 mils( 12.5 um) nor more than 1.5 mils(37.5 um). Pins, pin holes and contact surfaces of bearing assemblies, except those containing self-lubricating bronze inserts, shall be painted with one coat of prime paint. Erection marks shall be applied after the prime coat is dry, using a thinned paint of a type and color which will be completely concealed by and compatible with the second coat.

The QCPS shall record the actual dry film thickness for the prime coat as specified. Thick films shall be reduced by screening, sanding, or sweep blasting. Any re-coating of prime paint that has cured longer than 24 hours with prime paint shall be done as recommended by the paint manufacturer's printed instructions. If "mud cracking" occurs, the affected area shall be scraped to soundly bonded paint and the area re-coated. Uncured paint damaged by rain, snow or condensation shall be permitted to dry; the damaged paint shall then be removed and the surface repainted. The primed coat shall be adequately cured before the intermediate coat is applied. This curing time shall be not less than that recommended by the paint manufacturer's printed instructions.

## TESTING EQUIPMENT

The Fabricator shall provide the QCSP inspector the following testing equipment in good working order, for the duration of the project. When the Fabricator's people are working at different locations simultaneously, additional test equipment shall be provided for each crew for the type of work being performed. When no test equipment is available, no work shall be performed.

1. One Spring micrometer and 3 (unless otherwise specified on plans) rolls of extra-coarse replica tape.
2. One (Positector 2000 or 6000, Quanix 2200, or Elcometer A345FBI1) and the calibration plates, 38-200 mm and 250-625 mm (1.5 -8 mils and 10-25 mils) as per the NBS calibration standards in accordance with ASTM D-1186.
3. One Sling Psychrometer including Psychometric tables - Used to calculate relative humidity and dew point temperature.
4. Two steel surface thermometers accurate within 1° C(2° F) or One portable infrared thermometer available from:

Model:	Raynger ST Series (-18° C to 400°C)
Manufacturer:	Raytek Inc. Santa Cruz, Ca. (800)227-8074

or approved equal to the portable infrared thermometer

5. Flashlight 2-D cell
6. SSPC Visual Standard for Abrasive Blast Cleaned Steel SSPC-Vis 1-89
7. One Recorder Thermometer capable of recording the date, time, and temperature over a period of at least 12 hours.

## HANDLING

All paint and thinner shall be delivered to the fabricator in original, unopened containers with labels intact. Minor damage to containers is acceptable provided the container has not been punctured. Thinner containers shall be a maximum of 19 L (5 gallons).

Paint shall be stored at the temperature recommended by the manufacturer to prevent paint deterioration. The QCPS shall record storage temperatures.

Each container of paint and thinner shall be clearly marked or labeled to show paint identification, component, color, lot number, stock number, date of manufacture, and information and warnings as may be required by Federal and State laws. The QCPS shall record the lot number, stock number and date of manufacture.

All containers of paint and thinner shall remain unopened until required for use. The label information shall be legible and checked at the time of use. Solvent used for cleaning equipment is exempt from the above requirements.

Paint which has livered, gelled or otherwise deteriorated during storage shall not be used. However, thixotropic materials which can be stirred to attain normal consistency may be used. The oldest paint of each kind shall be used first. No paint shall be used which has surpassed its shelf life.

The Fabricator shall provide thermometers capable of monitoring the maximum high and low temperatures within the storage facility. The Fabricator is responsible for properly disposing of all unused paint and paint containers.

The Fabricator shall furnish TE-24 and the QCPS records for all materials used on the project to the QA Inspector.

#### MIXING AND THINNING

All ingredients in any container of paint shall be thoroughly mixed immediately before use and the primer shall be continuously mixed by an automated agitation system (hand held mixers not allowed). Paint shall be carefully examined after mixing for uniformity and to verify that no unmixed pigment remains on the bottom of the container. The paint shall be mixed with a high shear mixer (such as a Jiffy Mixer). Paddle mixers or paint shakers are not allowed. Paint shall not be mixed or kept in suspension by means of an air stream bubbling under the paint surface. The QCPS shall record that all equipment is working correctly.

All paint shall be strained after mixing. Strainers shall be of a type to remove only skins and undesirable matter, but not pigment.

No thinner shall be added to the paint without the QCPS's approval, and only if necessary for proper application as recommended by the manufacturer. When the use of thinner is permissible, thinner shall be added slowly to the paint during the mixing process. All thinning shall be done under supervision of the QCPS. In no case shall more thinner be added than that recommended by the manufacturer's printed instructions. Only thinners recommended and supplied by the paint manufacturer may be added to the paint. No other additives shall be added to the paint.

Catalysts, curing agents, or hardeners which are in separate packages shall be added to the base paint only after the base paint has been thoroughly mixed. The proper volume of catalyst shall then

be slowly poured into the required volume of base with constant agitation. Liquid which has separated from the pigment shall not be poured off prior to mixing. The mixture shall be used within the pot life specified by the manufacturer. Therefore only enough paint shall be catalyzed for prompt use. Most mixed, catalyzed paints cannot be stored, and unused portions of these shall be discarded at the end of each working day.

#### COATING APPLICATION

##### General

Galvanized or metallized surfaces shall not be painted. All new structural steel shall be painted. The following methods of application are permitted for use by this specification, as long as they are compatible with the paint being used: Air-less or Conventional spray. Brushes Daubers, small diameter rollers or sheepskins may be used for places of difficult access when no other method is practical.

Cleaning and painting shall be so programmed that dust or other contaminants do not fall on wet, newly-painted surfaces. Surfaces not intended to be painted shall be suitably protected from the effects of cleaning and painting operations. Over spray shall be removed with a stiff bristle brush or wire screen. Remove overspray without damaging the paint. The Over spray must be removed. No visible abrasives from adjacent work shall be left on the prime. Abrasives on the prime coat shall be removed.

##### Spray Application (General)

All spray application of paint shall be in accordance with the following:

Spray equipment shall be kept clean so dirt, dried paint and other foreign materials are not deposited in the paint film. Any solvent left in the equipment shall be completely removed before using.

Paint shall be applied in a uniform layer with overlapping at the edges of the spray pattern. The border of the spray pattern shall be painted first; with the painting of the interior of the spray pattern to follow, before moving to the next spray pattern area. A spray pattern area is such that the gun shall be held perpendicular to the surface and at a distance which will ensure that a wet layer of paint is deposited on the surface. The trigger of the gun should be released at the end of each stroke. The QCPS shall record that each spray operator demonstrated to the QCPS the ability to apply the paint as specified. Any operator who does not demonstrate this ability shall not spray.

The QCPS shall document that all spray equipment used follows the paint manufacturer's equipment recommendations. Equipment shall be suitable for use with the specified paint. to avoid paint application problems.

If air spray is used, traps or separators shall be provided to remove oil and condensed water from the air. The traps or separators must be of adequate size and must be drained periodically during operations. The following test shall be made by the Fabricator and verified by the QCPS to insure that the traps or separators are working properly.

The QCPS shall perform and record that air is blown from the spray gun for 30 seconds onto a white cloth or blotter held in a rigid frame. If any oil, water or other contaminants are present on the cloth or blotter: painting shall be suspended until the problem is corrected and the operation is verified by repeating this test. This test shall be made at the start of each shift and at 4 hour intervals. This is not required for an airless sprayer.

Application Approval

The end of the application of primer for each beam or girder shall be subject to QCPS inspection and approval to detect any defects which might result from the fabricator's methods. If defects are discovered, the fabricator shall make all necessary adjustments to the method of application to eliminate defects before proceeding with additional prime coat application.

Temperature

Paint shall not be applied when the temperature of the air, steel, or paint is below 10° C (50° F). Paint shall not be applied when the steel surface temperature is expected to drop below 10° C (50° F) before the paint has cured for the minimum times specified below:

	10° C (50° F)	16° C (60° F)	21° C (70° F)
Primer	4 hrs.	3 hrs.	2 hrs.

The QCPS shall record and monitor the above temperatures and times with the recording thermometer.

Moisture

Paint shall not be applied when the steel surface temperature is less than 3° C (5° F) above the dew point. Paint shall not be applied to wet or damp surfaces or on frosted or ice-coated surfaces. Paint shall not be applied when the relative humidity is greater than 85%. Paint shall not be applied outdoors. The QCPS shall record the relative humidity prior to painting, at every shift and 4 hour intervals

Repair Procedures

Damaged areas, and areas which do not comply with the requirements of this specification, shall be repaired in a manner to blend the patched area with the adjacent coating. The finished surface of the patched area shall have a smooth, even profile with the adjacent surface.

The QCPS shall submit his method of conducting repairs, correcting runs, sags, mud cracking and un-workman like conditions in writing to the OSE.

Dry Film Thickness

Prime thickness, shall be determined by use of Type 2 magnetic gage in accordance with the following:

Five separate spot measurements shall be made, spaced evenly over each 9 square meters ( 100 square feet) of new steel surface area to be measured. These measurements shall be taken on flanges, webs, cross bracing, stiffeners, etc. Three gage readings shall be made for each spot measurement of either the substrate or the paint. The probe shall be moved a distance of 25 to 75 mm (1 to 3 inches) for each new gage reading. Any unusually high or low gage reading that cannot be repeated consistently shall be discarded. The average (mean) of the 3 gage readings shall be used as the spot measurement. The average of five spot measurements for each such 9 square meter (100 square foot) area shall not be less than the specified thickness. No single spot measurement in any 9 square meter (100 square foot) area shall be less than 80% of the specified minimum thickness nor greater than 150% of the maximum specified thickness. Any one of 3 readings which are averaged to produce each spot measurement, may under-run or over-run by a greater amount. The 5 spot measurements shall be made for each 9 square meter (100 square feet) of area.

Coating thickness shall meet the requirements of the applicable paint specification.

SAFETY REQUIREMENTS AND PRECAUTIONS

The fabricator shall meet the applicable safety requirements of the Ohio Industrial Commission and the Occupational Safety and Health Administration (OSHA).

INSPECTION ACCESS

In addition to the requirements of CMS 105.11, the fabricator shall furnish, erect, and move scaffolding and other appropriate equipment, to permit the QA Inspector the opportunity to closely observe all affected surfaces. Material shall be separated and braced safely This opportunity shall be provided to the Inspector during all phases of the work.

**863.30 Cleaning A709 Grade 50W Steel (ASTM A 588)** Before the new steel is shipped All the exposed surfaces of A 709 Grade 50W ( A588) steel that are to be left unpainted shall be solvent cleaned to remove all traces of asphaltic cement, oil, grease, diesel fuel deposits, and other soluble contaminants per SSPC-SP 1 Solvent Cleaning. QCP #1 and QCP #2 shall apply per 863.29.

Fascia beams (girders) shall be shop blast cleaned to SSPC- SP6 commercial blast. QCP#3 shall apply per 863.29.

After the placement of the superstructure concrete All the exposed surfaces of A 709 Grade 50W (A588) steel that are to be left unpainted shall be solvent cleaned to remove all traces of asphaltic cement, oil, grease, diesel fuel deposits, and other soluble contaminants per SSPC-SP 1 Solvent Cleaning.

The use of acid for cleaning will not be permitted.

**863.31 Method of Measurement.** Structural steel shall be measured by either lump sum or the plan weight of steel, whichever is stipulated in the contract.

If the quantity of structural steel to be paid is the plan weight of steel, the actual number of kilograms (pounds) shall be computed from the approved shop drawing by using a unit weight of 7850 kg/m<sup>3</sup> (490 pounds per cubic foot). Waste material, such as is removed by burning, cutting, machining, etc., shall not be considered as pay weight except for that material removed in the edge preparation for groove welds. Material removed to form bolt holes shall be included in the pay quantity provided that only those portions of the bolts projecting beyond the holes are included for payment. Only bolts and materials that remain in place shall be included. Any thickness and weight of members in excess of that called for on the plans (due to overweight or other cause) shall not be included in determining the weight to be paid for, unless an increase in size of a member has been requested by the Director.

Pay weight for steel castings shall be based on scale weights of the finished pieces prior to painting. Castings shall be weighed by the Fabricator, in the presence of the inspector, and weights recorded on shop bills.

The weight of paint coat, galvanized coat, run-off bars, and weld metal in all field welds and shop butt welds shall not be included. Fillet welds may be included if completely itemized.

The weight of other metals and preformed bearing pads not separately itemized is to be included with the structural steel. The following unit weights in kg/m<sup>3</sup> (pounds per cubic foot) shall be used: Cast steel and deposited weld metal 7850 (490), cast iron 7210 (450), phosphor or leaded bronze 8810 (550), lead 11370 (710). The weight of preformed bearing pads shall be calculated as an equivalent volume of lead.

The number of welded stud shear connectors to be paid for shall be the actual number installed and accepted.

**863.32 Basis of Payment.** Payment will be made at contract prices for:

Item	Unit	Description
863	Lump Sum	Structural Steel Members, Miscellaneous Level Fabrication
863	Lump Sum	Structural Steel Members, Level One(1) Fabrication
863	Lump Sum	Structural Steel Members, Level Two(2) Fabrication
863	Lump Sum	Structural Steel Members, Level Three(3) Fabrication
863	Lump Sum	Structural Steel Members, Level Four(4) Fabrication
863	Lump Sum	Structural Steel Members, Level Five(5) Fabrication
863	Lump Sum	Structural Steel Members, Fracture Critical, Level (6) Fabrication
863	Kilogram (pound)	Structural Steel Members, Miscellaneous Level Fabrication
863	Kilogram (pound)	Structural Steel Members, Level One(1) Fabrication
863	Kilogram (pound)	Structural Steel Members, Level Two(2) Fabrication
863	Kilogram (pound)	Structural Steel Members, Level Three(3) Fabrication
863	Kilogram (pound)	Structural Steel Members, Level Four(4) Fabrication
863	Kilogram (pound)	Structural Steel Members, Level Five(5) Fabrication
863	Kilogram (pound)	Structural Steel Members, Fracture Critical, Level (6) Fabrication
863	Each	Welded Stud Shear Connectors

**Appendix I**



OHIO DEPARTMENT OF TRANSPORTATION

P.O. Box 899

25 South Front Street

Columbus, OH 43215-0899

614-466-4082 / 614-752-4824 fax / jrandall@ODOT.DOT.Ohio.Gov

Facilities inspection has been performed by \_\_\_\_\_ From the Office of Structural Engineering (OSE) \_\_\_\_/\_\_\_\_/\_\_\_\_ Based upon this report your facility will be evaluated for acceptance into the Prequalified Fabricator List as specified by Ssxxx.02

**Facilities Evaluation Check List**

1. Company Name: \_\_\_\_\_
2. Address: \_\_\_\_\_
3. Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E Mail \_\_\_\_\_
4. AISC Certification, enclose copy of certification: \_\_\_\_\_
  - a. Level 1 Fabricator: S Br category with P endorsement
  - b. Level 2 thru 5 Fabricator: M Br category with P endorsement
  - c. Level 6 Fabricator: M Br category with P and F endorsements
5. Company Representative
  - a. President: \_\_\_\_\_
  - b. Chief Engineer: \_\_\_\_\_
  - c. Shop Superintendent: \_\_\_\_\_
  - d. QCFS, enclose certifications: \_\_\_\_\_
  - e. QCPS, enclose certifications: \_\_\_\_\_
  - f. NDT Staff or Agency, enclose certifications: \_\_\_\_\_
6. Building Facilities:
  - a. Indoor heated fabrication area, length and width (ft): \_\_\_\_\_
  - b. Indoor heated paint area, length and width (ft): \_\_\_\_\_
  - c. Laydown assembly area, length and width (ft): \_\_\_\_\_
  - d. QA Inspection Office area meets specification 863.07
- 7A. Lifting Equipment:
  1. Overhead equipment maximum piece lifting capacity (Lbs.) \_\_\_\_\_
  2. Mobile equipment maximum piece lifting capacity (Lbs.) \_\_\_\_\_
- 7B. Material Preparation:

**Appendix I**

1. Shearing and planed edges, comments: \_\_\_\_\_
2. Cutting, manual guided methods required for levels 1 thru 3
3. Cutting Automated guided methods required for levels 4 thru 6, maximum length: \_\_\_\_\_
4. Bending processes available, comments: \_\_\_\_\_
5. Reentrant corners and rounding edges, comments: \_\_\_\_\_

**7C. Welding Processes**

1. Levels 1 and 2 must have SMAW, check for calibration paperwork: \_\_\_\_\_
2. Level 3 must have SMAW and FCAW, check for calibration paperwork: \_\_\_\_\_
3. Level 4 thru 6 must have SMAW, FCAW and SAW, check for calibration paperwork: \_\_\_\_\_
4. Electrode oven, check operation and calibration paperwork: \_\_\_\_\_
5. Level 6, flux hoppers check for calibration paperwork: \_\_\_\_\_
6. Current approved PQR, separate submission required.
7. Complete package of WPS, separate submission required.
8. Qualified welders, separate submission required.

**7D. NDT Technicians or Agency:**

1. Level 3 fabrication requirements:
  - a. Magnetic Particle Inspection(MPI): Dry powder with aluminum prods check machine calibration per ASTM E709 each 6 month: \_\_\_\_\_
  - b. MPI ANSI/ASNT CP-189-1995 Level I, enclose certifications
2. Level 4 thru 6 fabrication requirements:
  - a. MPI as per level 3 above
  - b. Ultrasonic Testing (UT) Equipment: AWS D1.5-95 section 6.15 and qualification 6.17: \_\_\_\_\_
  - c. UT ANSI/ASNT CP-189-1995 Level II , enclose certifications
  - d. Radiographic Testing (RT) Equipment: AWS D1.5-95 section 6.12 viewer: \_\_\_\_\_
  - e. Evaluation of production sample RT film and report per AWS D1.5-95 section 6.10: \_\_\_\_\_
  - f. RT ANSI/ASNT CP-189-1995 Level II, enclose certifications

**7E. Drilling and Punching Processes, check work in process meets SSxxx.20 and 26:**

\_\_\_\_\_

**7F. Shop Bolting:**

1. Skidmore Tension Devise, calibrated yearly: \_\_\_\_\_
2. Inspection Torque Wrench: \_\_\_\_\_

**7G. Coating:**

1. Methods available for blast cleaning: \_\_\_\_\_
2. Grit and shot mixture, examine sample work for profile: \_\_\_\_\_
3. Methods available for painting: \_\_\_\_\_

**Appendix II**

4. Check for operation of painting and paint inspection equipment see 863.29: \_\_\_\_\_
5. Metallizing methods available: 85% Zinc, 15% Aluminum wire method: \_\_\_\_\_
6. Galvanizing methods available: \_\_\_\_\_

**Appendix II**

**FABRICATOR \_\_\_\_\_ RATING FOR SHOP DRAWINGS**

County: \_\_\_\_\_ Project: \_\_\_\_\_ Reference: \_\_\_\_\_ Date: \_\_\_\_\_ Bridge: \_\_\_\_\_

**Contractor Coordination (15%)**

1. The Contractor's has provided a certification cover letter (1 point)
2. All shop drawings were approved and stamped by the Contractor's PE (1 point)
3. Drawing notes show that the Contractor performed field verification of existing structure as per contract (1 point)
4. Approved shop drawings were received fifteen (15) working days prior to start of fabrication (1 point)
5. Letter from the Contractor addressing any contract changes due to field conditions, plan errors, fabrication substitutions (2 points)

Y	N	NA

**Title Block (1%)**

1. The project number is shown (1 point)
2. The item number is shown (1 point)
3. The reference number(s) are shown and separated (1 point)
4. The county, route and section of the structure is shown (1 point)
5. The initials of the checker/reviewer are shown (1 point)
6. The sheets are numbered sequentially (1 point)


**General Notes (5%)**

1. Correct design specifications are shown, AASHTO, interims and CMS (1 point)
2. The correct type and grade of steel is shown (15 points)
3. Charpy V Notch (CVN) specifications are noted per contract (15 points)
4. Shop and field bolts are specified per contract (10 points)
5. Welding specifications are noted per contract (1 point)
6. The system for producing holes for high strength bolts is specified (1 points)
7. The match marking system is specified (1 point)


**Appendix II**

8. Non destructive testing is specified (5 points)
9. Surface preparation is specified (1 point)
10. The rounding of all corners of sheared or flame cut edges is specified (1 point)
11. The paint or coating system is specified (1 point)


**Framing Plan (10%)**

1. The center/center of bearings is dimensioned along the full length base line (1 point)
2. The skew of substructures is shown. (1 point)
3. A north arrow is shown (1 point)
4. The cross frame spacing is shown (10 points)
5. The transverse or radial center/center of main members is shown (1 point)
6. Center/center member spacing is shown along the skew at the abutments (1 point)
7. The substructures are labeled (1 point)
8. The field splices are shown and dimensioned along the full length base line (1 point)
9. Main member piece marks are shown and correlate to detail drawings (15 points)
10. The field welding details are shown per contract and AWS (5 points)


**Laydown Assemblies (30%)**

**Vertical Laydown Assemblies**

1. The full length base line is from abutment to abutment (15 points)
2. The substructures are dimensioned vertically from the baseline (10 points)
3. 1/4 pts, 1/2 pts and field splices are dimensioned vertically from the baseline (5 points)
4. The center/center of bearings are dimensioned (5 points)
5. The splices are dimensioned from the center line of bearings (1 point)
6. Vertical offsets are dimensioned to a consistent location on each member (top of bottom flange or bottom of bottom flange) (1 point)
7. Transverse and longitudinal main members that frame together are developed for vertical offsets (15 points)




**Appendix II**

**I. General Project Information**

1. County is identified (1 point)
2. Project number is shown (1 point)
3. Reference number is called out (1 point)
4. Bridge number is specified (1 point)
5. Name of fabricator is identified (1 point)
6. Reference numbers are separated (1 point)
7. Test reports are cross referenced to drawing piece marking system (2 point)

Y	N	NA

**II. Complete Mill Test**

1. All materials shown on the shop drawings have test reports and shippers (30 points)
2. The producing mill is domestic (10 points)
3. Test reports meet all contract requirements; CMS, ASTM, CVN or Fracture Critical. (25 points)
4. Material quantity is shown on the Test Reports (2 points)
5. Test reports show material size, shape, & length (3 points)
6. Test reports show mill's name (2 points)
7. Test reports show grade of steel (3 points)
8. Test reports show purchaser of material (2 points)


**IV. Timeliness**

Test report submission was 14 working days prior to release for shipping (15 points)

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**TEST REPORTS RATING TOTAL**

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Y = yes, N = no, NA = not applicable  
 No partial points are available for a yes, no or not applicable section.

**Appendix II**

1. Fax to the fabricator requesting incomplete information.
2. Non-compliance letter and phone call after 30 days from sending fax.
3. IOC to District after 10 days from sending non-compliance letter.
4. District action performed.


**V. FOLLOW-UP SEQUENCE FOR INCOMPLETE MILL TEST**

DATE Performed	DATE DUE	RESULT

**Appendix II**

**FABRICATOR \_\_\_\_\_ RATING FOR SHOP FABRICATION**

County: \_\_\_\_\_ Project: \_\_\_\_\_ Reference: \_\_\_\_\_ Shop ID: \_\_\_\_\_

Office of Structural Engineering QA Inspector: _____			
<b>Check, Hold or Witness Point Descriptions for Levels of Fabrication 1 thru 5</b>	<b>Y</b>	<b>N</b>	<b>NA</b>
<b>ASTM A709, Grade, Physical &amp; Chemical Requirements, CVN : Check point 1</b>			
Record Heat number and member description (1 point)			
Record Yield Strength, Fy (psi) (3 points)			
Record Tensile Strength, Fu (psi) (1 point)			
Record Elongation% and gage length (2 point)			
Record CVN minimum average energy( ft lb.) (1 point)			
Check Chemical Requirements (1 point)			
Heat No. Steel Stamped and matched to Mill Test Report (1 point)			
<b>ASTM A6 Quality and permissible Variations: Check Point 2</b>			
ASTM A6, Permissible variations in cross-section (1 point)			
ASTM A6, Permissible variations in Straightness & Storage (1 point)			
ASTM A6 and 863.11, Surface indications, Pitting due to rusting (1 point)			
ASTM A6, Laminar indications (1 point)			
<b>Material Preparation per AWS D1.5, AASHTO and 863: Check Point 3</b>			
Cutting beyond ( inside) the prescribed lines AWS 3.2.2 (1 point)			
Cutting roughness AWS 3.2.2 (1 point)			
Occasional notches AWS 3.2.2 (document separately) (1 point)			
Cut Edge Discontinuities AWS 3.2.3 (document separately) (1 point)			
Reentrant corners AWS 3.2.4 and Radii of Beam copes 3.2.5 (1 point)			
Rounding of edges AWS 3.2.9 (1 point)			
Shearing distortion 863.13 (1 point)			
Bending , 90 degrees to rolling direction, visual inspection (document any cracking NDT required) AASHTO (1 point)			

**Appendix II**

<b>Cambering and Sweep per 863, AWS and AASHTO: Check Point 4</b>			
Cambering or Straightening, AASHTO shop procedure posted (1 point)			
1200 degrees F pyrometric sticks (follow shop procedure) (5 point)			
location and shape of heats ( follow shop procedure) (1 point)			
location and number of support blocks ( follow shop procedure) (1 point)			
Natural Cooling ( follow shop procedure) (5 point)			
<b>Fitting per AWS, 863 and AASHTO: Check Point 5</b>			
Check size, grade , piece mark and locations of parts to be fitted (1 point)			
Remove all scale, moisture, grease & foreign material AWS 3.2.1 (1 point)			
Standard fillet weld fit up tolerance, 1/16" AWS 3.3 (1 point)			
Groove weld fit up tolerance, AWS 3.3 (1 point)			
Bearing Stiffener, mill fit @ bearing, tight fit @ other end, 863.14 (1 point)			
Intermediate Stiffener without cross frames, tight fit at compression flange, 863.14 (1 point)			
Clearance between clipped stiffener corners and fillets on rolled beams (1 point)			
<b>Flange and Web Butt Splice Welding per AWS, 863 and AASHTO: Check Point 6</b>			
Record Welding Type: SMAW, SAW, FCAW (1 point)			
Record Shop Welding Procedure ( WPS) identification and ODOT approval date. (1 point)			
Record Tackers Name and SS#, ODOT Qualified, procedure (1 point)			
Record Welders Name and SS#, ODOT Qualified, procedure (1 point)			
Record Location of Splices (1 point)			
Record Flux and Wire combination, does it match WPS (1 point)			
Check joint geometry tolerances per AWS figure 2.4 (2 point)			
Record Preheat Temperature (F) Shop Temperature(F) (1 point)			
Record Amperage ( Amps) (1 point)			
Record Voltage (Volts) (1 point)			
Record Travel Speed (IPM) (1 point)			

**Appendix II**

Check backgouge and cleaning per AWS 3.2.6 (5 point)			
Record Second side Amperage (Amps) (1 point)			
Record Second side Voltage ( Volts) (1 point)			
Record Second side Travel Speed (IPM) (1 point)			
Visual inspection width, thickness AWS 3.6.3 (5 point)			
Visual inspection surface finish AWS 3.6.4 125 uin. (5 point)			
<b>Flange to Web Fillet Welds per AWS, 863 and AASHTO: Check Point 7</b>			
Record Welding Type: SMAW, SAW, FCAW (1 point)			
Record Welding Procedure (WPS) identification and ODOT approval date (1 point)			
Record Tackers Name and SS#, ODOT Qualified, procedure (1 point)			
Record Welder Name and SS#, ODOT Qualified, procedure (1 point)			
Record Flux and Wire combination, does it match WPS (1 point)			
Check fit- up flange to weld, AWS 3.3.1 (2 point)			
Check surface cleaning, remove all scale, AWS 3.2.1 (2 point)			
Record Preheat Temperature (F) Shop Temperature(F) (1 point)			
Record Amperage (Amps) (1 point)			
Record Voltage (Volts) (1 point)			
Record Travel Speed (IMP) (1 point)			
Visual inspection weld size and profile, AWS 3.6 (5 point)			
<b>Stiffener Fillet Welds per AWS, 863 and AASHTO: Check Point 8</b>			
Record Welding Type: SMAW, SAW, FCAW (1 point)			
Record Welding Procedure (WPS) identification and ODOT approval date (1 point)			
Record Tackers Name and SS#, ODOT Qualified, procedure (1 point)			
Record Welder Name and SS#, ODOT Qualified, procedure (1 point)			
Record Flux and Wire combination, does it match WPS (1 point)			
Check fit- up, 863.14 and AWS 3.3.1 (2 point)			
Check surface cleaning, AWS 3.2.1 (2 point)			

**Appendix II**

Record Preheat Temperature(F) Shop Temperature(F) (1 point)			
Record Amperage (Amps) (1 point)			
Record Voltage( Volts) (1 point)			
Record Travel Speed (IMP) (1 point)			
Visual inspection weld size and profile, AWS 3.6 (5 point)			
<b>Shop Laydown per AWS, 863, and AASHTO: Check Point 9</b>			
check hole patterns, size, spacing, gage, accuracy, 863.20 (2 point)			
Check hole deburring, 863.20 (1 point)			
Check blocking horizontal & vertical dimensions @ bearings, after all welding is complete. (document) 1/8" + or - 863.26 ( document separately) (5 point)			
Check blocking camber dimensions @ points specified, after all welding is complete SS xxx.12 (document separately) (5 point)			
Check sweep or horizontal curvature, after all welding is complete 1/8"/10'-0" AWS 3.5 (document separately) (2 point)			
Check fitup at bolted splice, 1/4" max gap SS xxx.11 (2 point)			
Check center to center of field splices matches plan dimensions (1 point)			
Check flatness at bearing seats, after all welding is complete AWS 3.5.1.9 (2 point)			
<b>Radiographic Inspection per AWS, 863.27 and AASHTO: Check Point 10, Hold Point for B &amp; C Rated fabricators</b>			
Radiographic inspection flange butt welds , 100%( ODOT review required, Critical process, Document separately) (5 point)			
Radiographic inspection web butt welds, top & bottom 1/3 ( ODOT review required, Critical process ,Document separately) (5 point)			
Radiographic inspection longitudinal stiffeners butt welds, 100% (ODOT review required, Critical process, Document separately) (5 point)			
Radiographic inspection longitudinal web splice, 25% (ODOT review required, Critical process, Document separately) (5 point)			
Radiographic identification marked steel stamped and visible in radiographic film, correct image quality indicator (1 point)			
Top and bottom of plate edges visible in the radiographic film (5 point)			
Removal of weld reinforcement (1 point)			

**Appendix II**

Radiographic technician's signed analysis report (1 point)			
<b>Ultrasonic Inspection per AWS, 863.27 and AASHTO: Check Point 11, Hold and Witness Point for B &amp; C Rated Fabricators</b>			
Ultrasonic inspection 10% of complete penetration flange to web weld (ODOT review required, Critical Process, Document separately) 100% QA witness with B and C rated fabricators (2 point)			
Ultrasonic technician's signed analysis report (1 point)			
Ultrasonic equipment qualification per AWS 6.17 (1 point)			
<b>Magnetic Particle Inspection per AWS, 863.27 and AASHTO: Check Point 12, Hold and Witness point for C Rated Fabricators.</b>			
Magnetic Particle Inspection 10% of flange to web welds (ODOT review required, Critical Process, Document separately) Dry powder prod method. 100% QA witness with C rated fabricators. (2 point)			
Magnetic Particle Inspection 10% of Bearing Stiffener Welds (ODOT review required, Critical process, Document separately) Dry powder prod method. 100% QA witness with C rated fabricators. (2 point)			
Magnetic Particle technician's signed analysis report (1 point)			
Calibration of Magnetic Particle Equipment every 6 months (1 point)			
<b>Cleaning per 863.27, SSPC and ASTM: Check Point 13</b>			
Shop solvent cleaning per SSPC-SP1 (5 point)			
Shop grinding edges 1/16", material thicker than 1 1/2" shall be checked for removal of the heat effected zone. (1 point)			
Shop blast cleaned SSPC-SP10, <u>Automated process</u> : Five(5) each recorded readings at random locations for each beam and One(1) recorded reading for 10% of all secondary material with replica tape ASTM D4417 method C, 1.5 to 3.5 mil profile (10 point)			
Shop blast cleaned SSPC-SP10, <u>Manual process</u> : Twenty(20) each recorded readings at random locations for each beam and Ten(10) recorded reading for 10% of all secondary material with replica tape ASTM D4417 method C, 1.5 to 3.5 mil profile (10 point)			
Steel Ambient (Dry bulb) and Wet bulb Temperatures, Humidity and Dew Point recorded prior to blasting and at the start of each shift (5 degree F above dew point). (2 point)			
Document abrasive mix (shot % & grit % ) and sizes (1 point)			

**Appendix II**

Check abrasive mix for oil contamination start of each shift (1 point)			
Removal of abrasives & residue by vacuum or double blowing (5 point)			
Test blow air for oil or other contaminants. Blotter test for 30 seconds at the start of each shift. Not required with vacuum (1 point)			
Conditioning all fins slivers and burred or sharp edges ASTM A6 then reblast to 1.5 to 3.5 mil profile. (1 point)			
<b>Painting per 863.29, SSPC and ASTM: Check Point 14, Hold Point for C Rated Fabricators</b>			
Record time and dates between blasting and painting (1 point)			
Record ambient temperature & humidity ( minimum 50 deg.F and 5 deg F above dew point) (1 point)			
Record temperature of paint storage location (max/ min) (1 point)			
Record Paint TE-24, manufactures name and lot numbers (1 point)			
Mix paint ( high shear mixer) and strain (5 point)			
Check operation of automated agitation system every 30 min. (5 point)			
Check prime inside of bolt holes, behind stiffener clips (5 point)			
Record prime thickness 3 to 5 mils: 3 gage readings for each spot measurement with 5 spot measurements in each 100 square foot (see additional instructions with paint system notes) (10 point)			
Check of workman like finish; mudcracking, holidays, pores, runs or sags. (5 point)			
Check prime has dried sufficiently prior to handling (1 point)			
<b>Final Shop, Shipping or Storage, QA Inspection: Hold Point 15, Required for all Fabricators</b>			

Y = Yes, N = No, NA = Not Applicable, No partial points are available for a Y, N or NA answer

Sum of {Y/(Y + N) x Section %}

Check Point 1	_____ (Y)	/	_____ (Y + N)*	X	7 = _____
Check Point 2	_____ (Y)	/	_____ (Y + N)	X	2 = _____
Check Point 3	_____ (Y)	/	_____ (Y + N)	X	5 = _____
Check Point 4	_____ (Y)	/	_____ (Y + N)	X	2 = _____
Check Point 5	_____ (Y)	/	_____ (Y + N)*	X	7 = _____
Check Point 6	_____ (Y)	/	_____ (Y + N)*	X	7 = _____

**Appendix II**

Check Point 7 \_\_\_\_\_(Y) / \_\_\_\_\_(Y + N)\* X 7 = \_\_\_\_\_  
 Check Point 8 \_\_\_\_\_(Y) / \_\_\_\_\_(Y + N) X 2 = \_\_\_\_\_  
 Check Point 9 \_\_\_\_\_(Y) / \_\_\_\_\_(Y + N)\* X 2 = \_\_\_\_\_  
 Check Point 10 \_\_\_\_\_(Y) / \_\_\_\_\_(Y + N)\* X 15 = \_\_\_\_\_  
 Check Point 11 \_\_\_\_\_(Y) / \_\_\_\_\_(Y + N)\* X 15 = \_\_\_\_\_  
 Check Point 12 \_\_\_\_\_(Y) / \_\_\_\_\_(Y + N) X 15 = \_\_\_\_\_  
 Check Point 13 \_\_\_\_\_(Y) / \_\_\_\_\_(Y + N) X 7 = \_\_\_\_\_  
 Check Point 14 \_\_\_\_\_(Y) / \_\_\_\_\_(Y + N) X 7 = \_\_\_\_\_

Summation Fabricator rating for performance of QA Inspection = \_\_\_\_\_

\*  $Y / (Y + N) \times 1.0$  for 1, 5, 6, 7, 9, 10, 11 and 12. If any of these individual ratings are lower than the summation fabricator rating. Then the Fabricator rating shall be based upon the lowest individual section rating.

Required Hold or Witness points

A Rating hold points = 15

B Rating hold points = 10, 11 and 15

C Rating hold or witness points = 10,11, 12, 14 and 15

**Appendix II**

**FABRICATOR \_\_\_\_\_ RATING FOR SHOP FABRICATION(FCM)**

County: \_\_\_\_\_ Project: \_\_\_\_\_ Reference: \_\_\_\_\_ Shop ID: \_\_\_\_\_

Office of Structural Engineering QA Inspector: _____			
Check, Hold or Witness Point Descriptions for Level of Fabrication 6 , Fracture Critical Members (FCM)	Y	N	NA
<b>ASTM A709, Grade, Physical &amp; Chemical Requirements, CVN : Check point 1</b>			
Record Heat number and member description ( 1 point)			
Material meet physical requirements of A709 ( 3 points)			
Material killed fine-grain practice (AWS 12.4.2) (5 point)			
Record Zone 2 CVN minimum average energy (A709 Table S1.3) ( 2 point)			
CVN impact testing "P" plate frequency (5 point)			
Check Chemical Requirements (1 point)			
Heat No. Steel Stamped and matched to Mill Test Report (1 point)			
<b>ASTM A6 Quality and permissible Variations: Check Point 2</b>			
ASTM A6, Permissible variations in cross-section (1 point)			
ASTM A6, Permissible variations in Straightness & Storage (1 point)			
ASTM A6 and 863.11, Surface indications, Pitting due to rusting (1 point)			
ASTM A6, Laminar indications (1 point)			
<b>Material Preparation per AWS D1.5, AASHTO and 863: Check Point 3</b>			
Cutting beyond ( inside) the prescribed lines AWS 3.2.2 (1 point)			
Cutting roughness AWS 3.2.2 (1 point)			
Occasional notches AWS 3.2.2 (document separately) (1 point)			
Cut Edge Discontinuities AWS 3.2.3 (document separately) (1 point)			
Reentrant corners AWS 3.2.4 and Radii of Beam copes 3.2.5 (1 point)			
Rounding of edges AWS 3.2.9 (1 point)			
Shearing distortion 863.13 (1 point)			
Heat Bending , 90 degrees to rolling direction, visual inspection (document any cracking NDT required) AASHTO and AWS 12.12 (5 point)			

**Appendix II**

<b>Cambering and Sweep per 863, AWS and AASHTO: Check Point 4</b>			
Cambering or Straightening, AASHTO and AWS 12.12 shop procedure posted (2 points)			
1200 degrees F pyrometric sticks (follow shop procedure) (5 points)			
location and shape of heats ( follow shop procedure) (1 point)			
location and number of support blocks ( follow shop procedure) (1 point)			
Natural Cooling ( follow shop procedure) (5 point)			
<b>Fitting per AWS, 863 and AASHTO: Check Point 5</b>			
Check size, grade , piece mark and locations of parts to be fitted (1 point)			
Remove all scale, moisture, grease & foreign material AWS 3.2.1 (1 point)			
Standard fillet weld fit up tolerance, 1/16" AWS 3.3 (1 point)			
Groove weld fit up tolerance, AWS 3.3 (1 point)			
Bearing Stiffener, mill fit @ bearing, tight fit @ other end, 863.14 (1 point)			
Intermediate Stiffener without cross frames, tight fit at compression flange, 863.14 (1 point)			
Clearance between clipped stiffener corners and fillets on rolled beams (1 point)			
<b>Flange and Web Butt Splice, Web-to-Flange CJP Welding per AWS, 863 and AASHTO: Hold and Witness Point 6</b>			
Record Welding Type: SMAW, SAW, FCAW (1 point)			
Record Shop Welding Procedure ( WPS) identification and ODOT approval date. (1 point)			
Record Tackers Name, ODOT Qualified? (1 point)			
Record Welders Name, ODOT Qualified? (1 point)			
Record Location of Splices (1 point)			
Record Flux and Wire combination, does it match WPS (1 point) Are Flux and Wire lot tested Check Temperature of Flux oven			
Check joint geometry tolerances per AWS figure 2.4 (2 point) witness			
Record Preheat Temperature (F) (1 point) witness			
Record Amperage ( Amps) (1 point) witness			

**Appendix II**

Record Voltage (Volts) (1 point) witness			
Record Travel Speed (IPM) (1 point) witness			
Check backgouge and cleaning per AWS 3.2.6 (5 point) witness			
Record Second side Amperage (Amps) (1 point) witness			
Record Second side Voltage ( Volts) (1 point) witness			
Record Second side Travel Speed (IPM) (1 point) witness			
Visual inspection width, thickness AWS 3.6.3 (5 point) witness			
Visual inspection surface finish AWS 3.6.4 125 uin. (5 point) witness			
<b>Flange to Web Fillet Welds per AWS, 863 and AASHTO: Hold and witness Point 7</b>			
Record Welding Type: SMAW, SAW, FCAW (1 point)			
Record Welding Procedure (WPS) identification and ODOT approval date (1 point)			
Record Tackers Name, ODOT Qualified? (1 point)			
Record Welder Name, ODOT Qualified? (1 point)			
Record Flux and Wire combination, does it match WPS Are Flux and Wire lot tested Check temperature of flux oven			
Check fit- up flange to weld, AWS 3.3.1 (2 point) witness			
Check surface cleaning, remove all scale, AWS 3.2.1 (2 point) witness			
Record Preheat Temperature (F) (1 point) witness			
Record Amperage (Amps) (1 point) witness			
Record Voltage (Volts) (1 point) witness			
Record Travel Speed (IMP) (1 point) witness			
Visual inspection weld size and profile, AWS 3.6 (5 point) witness			
<b>Stiffener Fillet Welds per AWS, 863 and AASHTO: Hold and witness Point 8</b>			
Record Welding Type: SMAW, SAW, FCAW (1 point)			
Record Welding Procedure (WPS) identification and ODOT approval date (1 point)			
Record Tackers Name, ODOT Qualified? (1 point)			

**Appendix II**

Record Welder Name, ODOT Qualified? (1 point)			
Record Flux and Wire combination, does it match WPS (1 point) Are Flux and Wire lot tested Check temperature of flux oven			
Check fit- up, 863.14 and AWS 3.3.1 (2 point) witness			
Check surface cleaning, AWS 3.2.1 (2 point) witness			
Record Preheat Temperature(F) (1 point) witness			
Record Amperage (Amps) (1 point) witness			
Record Voltage(Volts) (1 point) witness			
Record Travel Speed (IMP) (1 point) witness			
Visual inspection weld size and profile, AWS 3.6 (5 point) witness			
<b>Repair procedure per AWS 12.17 hold and witness point 9</b>			
Sketch of discontinuity with member piece mark and location on member (1 point)			
QA witness of discontinuity for determination of critical or non critical repairs (2 point)			
Noncritical repair, WPS and repair procedure pre approved (1 point)			
Critical repair, WPS and repair procedure approved for each repair by OSE (2 point)			
Record Welding Type: SMAW, SAW, FCAW (1 point)			
Record Welders Name, ODOT Qualified? (1 point)			
Record preheat temperature prior to air carbon arc (1 point) * witness			
grind surfaces to be welded smooth and bright (1 point) * witness			
Record Flux and Wire combination, does it match WPS (1 point) Are Flux and Wire lot tested Check Temperature of Flux oven			
Check joint geometry tolerances per AWS figure 2.4 (2 point) *witness			
Record Preheat Temperature (F) (1 point) * witness			
Record Amperage (Amps) (1 point) * witness			
Record Voltage (Volts) (1 point) * witness			
Record Travel Speed (IPM) (1 point) * witness			
Visual inspection width, thickness AWS 3.6.3 (2 point) * witness			
Visual inspection surface finish AWS 3.6.4 125 uin. (2 point) *witness			

**Appendix II**

Visual inspection weld size and profile, AWS 3.6 (2 point) * witness			
* witness required for critical repairs not required for non critical repairs			
<b>Radiographic Inspection per AWS, 863 and AASHTO: Hold Point 10</b>			
Radiographic inspection flange butt welds , 100%( ODOT review required, Critical process, Document separately) (5 point)			
Radiographic inspection 100% tension web butt welds, compression web butt welds, top & bottom 1/3 ( ODOT review required, Critical process ,Document separately) (5 point)			
Radiographic inspection longitudinal stiffeners butt welds, 100% (ODOT review required, Critical process, Document separately) (5 point)			
Radiographic inspection longitudinal web splice, 25% (ODOT review required, Critical process, Document separately) (5 point)			
Radiographic identification marked steel stamped and visible in radiographic film, Hole-type image quality indicator (1 point)			
Top and bottom of plate edges visible in the radiographic film (5 point)			
Removal of weld reinforcement (1 point)			
Radiographic technician's signed analysis report (1 point)			
<b>Ultrasonic Inspection per AWS, 863 and AASHTO: Hold and witness point 11</b>			
Ultrasonic inspection 100% of complete penetration flange to web tension weld, 10% compression weld (ODOT review required, Critical Process, Document separately) (2 point) Ultrasonic inspection 100% tension butt welds, 100% QA witness required			
Ultrasonic technician's signed analysis report (1 point)			
Ultrasonic equipment qualification per AWS 6.17 (1 point)			
<b>Magnetic Particle Inspection per AWS, 863 and AASHTO: Check Point 12, Hold and witness for C rated fabricators.</b>			
Magnetic Particle Inspection 10% of flange to web welds (ODOT review required, Critical Process, Document separately) Dry powder prod method (2 point) 100% QA witness with C rated fabricators.			
Magnetic Particle Inspection 10% of Bearing Stiffener Welds (ODOT review required, Critical process, Document separately) Dry powder prod method (2 point) 100% QA with C rated fabricators.			
Magnetic Particle technician's signed analysis report (1 point)			

**Appendix II**

Calibration of Magnetic Particle Equipment every 6 months (1 point)			
<b>Shop Laydown per AWS, 863, and AASHTO: Check Point 13</b>			
check hole patterns, size, spacing, gage, accuracy, 863.20 (2 point)			
Check hole deburring, 863.20 (1 point)			
Check blocking horizontal & vertical dimensions @ bearings, after all welding is complete. (document) 1/8" + or - 863.12 (document separately) (5 point)			
Check blocking camber dimensions @ points specified, after all welding is complete 863.12 (document separately) (5 point)			
Check sweep or horizontal curvature, after all welding is complete 1/8"/10'-0" AWS 3.5 (document separately) (2 point)			
Check fitup at bolted splice, 1/4" max gap 863.17 (2 point)			
Check center to center of bearings matches plan dimensions (1 point)			
Check flatness at bearing seats, after all welding is complete AWS 3.5.1.9 (2 point)			
<b>Cleaning per 863, SSPC and ASTM: Check Point 14</b>			
Shop solvent cleaning per SSPC-SP1 (5 point)			
Shop grinding edges 1/16", material thicker than 1 1/2" shall be checked for removal of the heat hardened zone. (1 point)			
Shop blast cleaned SSPC-SP10, <u>Automated process</u> : Five(5) each recorded readings at random locations for each beam and One(1) recorded reading for 10% of all secondary material with replica tape ASTM D4417 method C, 1.5 to 3.5 mil profile (10 point)			
Shop blast cleaned SSPC-SP10, <u>Manual process</u> : Twenty(20) each recorded readings at random locations for each beam and Ten(10) recorded reading for 10% of all secondary material with replica tape ASTM D4417 method C, 1.5 to 3.5 mil profile (10 point)			
Steel Ambient (Dry bulb) and Wet bulb Temperatures, Humidity and Dew Point recorded prior to blasting and at the start of each shift (5 degree F above dew point). (2 point)			
Document abrasive mix (shot % & grit %) and sizes (1 point)			
Check abrasive mix for oil contamination start of each shift (1 point)			
Removal of abrasives & residue by vacuum or double blowing (5 point)			

**Appendix II**

Test blow air for oil or other contaminants. Blotter test for 30 seconds at the start of each shift. Not required with vacuum (1 point)			
Conditioning all fins slivers and burred or sharp edges ASTM A6 then reblast to 1.5 to 3.5 mil profile. (1 point)			
<b>Painting per 863, SSPC and ASTM: Hold or Check Point 15</b>			
Record time and dates between blasting and painting (1 point)			
Record ambient temperature & humidity ( minimum 50 deg.F and 5 deg F above dew point) (1 point)			
Record temperature of paint storage location (max/ min) (1 point)			
Record Paint TE-24, manufactures name and lot numbers (1 point)			
Mix paint ( high shear mixer) and strain (5 point)			
Check operation of automated agitation system every 30 min. (5 point)			
Check prime inside of bolt holes, behind stiffener clips (5 point)			
Record prime thickness 3 to 5 mils: 3 gage readings for each spot measurement with 5 spot measurements in each 100 square foot (see additional instructions with paint system notes) (10 point)			
Check of workman like finish; mudcracking, holidays, pores, runs or sags. (5 point)			
Check prime has dried sufficiently prior to handling (1 point)			
<b>Final Shop, Shipping or Storage, QA Inspection: Hold Point 16</b>			

Y = Yes, N = No, NA = Not Applicable, No partial points are available for a Y, N or NA answer

Sum of {Y/( Y + N) x Section %}

Check Point 1	(Y)	/	(Y + N)*	X 7 =	_____
Check Point 2	(Y)	/	(Y + N)	X 2 =	_____
Check Point 3	(Y)	/	(Y + N)	X 5 =	_____
Check Point 4	(Y)	/	(Y + N)	X 2 =	_____
Check Point 5	(Y)	/	(Y + N)*	X 7 =	_____
Check Point 6	(Y)	/	(Y + N)*	X 7 =	_____
Check Point 7	(Y)	/	(Y + N)*	X 7 =	_____
Check Point 8	(Y)	/	(Y + N)	X 2 =	_____
Check Point 9	(Y)	/	(Y + N)*	X 2 =	_____
Check Point 10	(Y)	/	(Y + N)*	X 15 =	_____
Check Point 11	(Y)	/	(Y + N)*	X 15 =	_____
Check Point 12	(Y)	/	(Y + N)	X 15 =	_____

**Appendix II**

Check Point 13 \_\_\_\_\_ (Y) / \_\_\_\_\_ (Y + N) X 7 = \_\_\_\_\_  
 Check Point 14 \_\_\_\_\_ (Y) / \_\_\_\_\_ (Y + N) X 7 = \_\_\_\_\_  
 Check Point 15 \_\_\_\_\_ (Y) / \_\_\_\_\_ (Y + N) X 7 = \_\_\_\_\_  
 Check Point 16 \_\_\_\_\_ (Y) / \_\_\_\_\_ (Y + N) X 7 = \_\_\_\_\_

Summation Fabricator rating for performance of QA Inspection = \_\_\_\_\_

\*  $Y / (Y + N) \times 1.0$  for 1,5, 6, 7, 8,9, 10, 11 and 12. If any of these individual ratings are lower then the summation fabricator rating. Then the Fabricator rating shall be based upon the lowest individual section rating.

Required Hold or witness points

A Rating hold or witness points = 6, 7, 8, 9, 10, 11 and 16, witness points require QC / QA inspection for 10 % of the work in progress.

B Rating hold or witness points = 6, 7, 8, 9, 10, 11 and 16 witness points require QC / QA inspection for 20 % of the work in progress.

C Rating hold or witness points = 6, 7, 8, 9, 10, 11, 12, 15 and 16 witness points require QC/ QA inspection for 40 % of the work in progress

**Appendix III**

Fabricator Rating: Summation of Appendix II check lists

Fabricator Rating For Performance Of Shop Drawings \_\_\_\_\_ x 20% = \_\_\_\_\_

Fabricator Rating For Performance Of Test Reports \_\_\_\_\_ x 10% = \_\_\_\_\_

Fabricator Rating For Performance Of Shop Fabrication \_\_\_\_\_ x 70% = \_\_\_\_\_

Fabricator Rating = \_\_\_\_\_

Fabricator Rating District's Construction Comments

Designer's Note

The selected bid item for 513 should be based on a comparison of the type of structure to be built versus the capability of the level of fabricator as defined in section 863.04. As example a continuous rolled beam bridge with no stiffeners would require a level 2 fabricator. If the rolled beam bridge had stiffeners required to attach crossframes then a level 3 fabricator would be specified.

A supplemental description should be added defining the type of steel

i.e.  
863 Lump Sum                      Structural Steel Members, Level Four (4), A 709, grade 36

For bridges with fracture critical members or fracture critical bridges a level 6 is required (See Section 863.04)

**STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION  
SUPPLEMENTAL SPECIFICATION 877  
TEMPORARY SEDIMENT AND EROSION CONTROL**

April 13, 1999

**877.01 Description**  
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**877.01 Description.** This work shall consist of temporary control measures as detailed in the plans and/or general notes during the life of the contract to control sediment and erosion through the use of straw or hay bales, dikes, slope protection, sediment pits, basins and dams, slope drains, coarse aggregate, mulches, grasses, filter fabrics, ditch lining, inlet protection and other erosion control devices or methods.

The permanent control provisions contained in the contract shall be coordinated with the temporary erosion control features to the extent practical to assure economical, effective and continuous erosion control throughout the construction and post-construction period.

Temporary controls are required for construction work outside the right-of-way in areas such as borrow pit operations, haul roads, equipment and material storage sites, waste areas, and temporary plant sites. This work will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor, with costs included in the contract prices bid for the items to which they apply.

**877.02 Materials.** Commercial fertilizer shall be (10-20-10) and shall conform to Item 659.

Temporary seeding and mulching shall consist of annual ryegrass (*Lolium multifolium*). Seed and mulching materials shall be applied in accordance with Item 659.

Temporary filter fabric ditch checks shall consist of 30 inch [0.8m] wide filter fabric with sound wood supports with maximum spacing of 10 feet [3.0m] on centers. Temporary inlet filter barriers shall consist of 18 inch [0.5m] wide filter fabric fence with a securely nailed 2 x 4 wood frame.

Temporary bale filter dikes and perimeter filter fabric fence shall consist of straw or hay bales, or 30 inch [0.8m] wide filter fabric fence with sound wood supports with a maximum

spacing of 10 feet [3.0m] on centers. All the above filter fabric fence shall meet the requirements of 712.09, Type C.

Temporary dikes shall consist of suitable 203 material.

Temporary slope drains shall consist of pipe, pipe caps, coarse aggregate, riprap, rock channel protection, or other materials. Sediment pits are not paid for separately but are included as part of slope drain construction.

Pipe caps shall be included in the unit bid price for the pipe. Pipe caps shall have a minimum diameter of 1/4 inch (6.4mm) holes and be specifically designed to connect to the pipe. There will be a minimum of one hole per square inch (645 mm<sup>2</sup>) of the cross sectional end area of the pipe cap.

Temporary sediment basins and dams shall be constructed by methods described in Item 203 Excavation and Embankment and Item 601 Rock Channel Protection, Type C or D with filter.

Temporary rock check dams shall be constructed of Item 601 Rock Channel Protection, Type C or D without filter.

Temporary ditch and slope protection shall meet the requirements of Item 670.

**877.03 Construction Requirements.** The Storm Water Pollution Prevention Plan (SWPPP) details the placement, location and description of the temporary and permanent erosion control items. The following descriptions shall be used to supplement the plan. The Contractor shall rearrange and modify the plan quantities to meet the field conditions and the National Pollutant Discharge Elimination System (NPDES) Permit.

When the plan does not have a SWPPP, the Contractor shall submit a plan detailing control feature locations and quantities at the pre-construction meeting.

In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal or State or local agencies, the more restrictive laws, rules, or regulations shall apply.

(A) Clearing and Grubbing. The Contractor shall limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, and borrow and fill operations as determined by the project conditions. The Contractor shall preserve existing vegetation where attainable and temporarily seed and mulch disturbed idle areas as stated.

Inactive cleared and grubbed areas that are scheduled to remain idle for more than 45 days shall be stabilized with vegetation (i.e. temporary seed and mulch) within 7 days following the clearing and grubbing operations. If an area is within 50 feet [15 m] of any water body (i.e. stream, river, pond, etc.), then it shall be vegetated within 2 days following

the clearing and grubbing operations.

(B) Installation of Control Features. Temporary erosion and sediment control items shall be installed as detailed and are to remain functional until the upper slope drainage areas are fully stabilized.

Temporary perimeter, ditch check or inlet filter fabric fence shall be constructed in accordance with Standard Drawing DM-4.4.

1. Temporary Perimeter Controls: Temporary perimeter filter fabric fence shall protect the following from sheet flow runoff: off right of way locations; off construction limit locations; around water bodies, wet lands or around other significant items designated on the plan.

Dikes shall be used to prevent flow from coming on to the project and to barren areas on the project.

The Contractor shall install perimeter filter fabric fence and dikes concurrent with the clearing and grubbing operations.

2. Inlet Protection: The Contractor shall use an 18 inch [0.5m] wide filter fabric fence supported around a storm drain inlet or manhole with securely nailed 2 x 4 inch (50 X 100 mm) lumber. The Contractor shall excavate a six inch (150 mm) trench around the inlet, and drive the posts six inches (150 mm) below the excavated trench bottom. The fabric shall be stretched around the frame, placing six inches of fabric in the trench and secure tightly. The fabric shall overlap on one side of the inlet so that the fabric ends are not attached to the same post. Backfill the excavated soil onto the fabric and compact tightly.

The Contractor shall construct the inlet protection as soon as the inlet is completed.

3. Temporary and Permanent Seeding: Use seed and mulch liberally during and after construction and before or during winter shut down. Temporary seeding areas shall be fertilized at one-half the specified rate of application in Item 659. Temporary seeding shall be annual ryegrass sown at 2 pounds per 1000 square feet [1 kg/100 m<sup>2</sup>] and mulched in accordance with Item 659. When project conditions prevent the incorporation of fertilizer into the soil and preparation of the seed bed cannot be performed in accordance with Item 659, these requirements may be waived. Temporary seed shall not be placed on frozen ground.

The Contractor shall place the permanent seed on all barren areas within 7 days of obtaining final grade. The Contractor shall place the temporary seed and mulch as stated under clearing and grubbing.

4. Slopes: Dikes, slope drains and ditches shall be installed to divert water from bare soil and to protect cut and fill slopes. The Contractor shall place dikes at the top of fill slopes to protect the sides slopes from erosion.

The Contractor shall install dikes and slope drains when no filling activity occurs for three or more weeks and when slope height is greater than 8 feet [2.5m].

The Contractor shall construct a ditch at the top of cut slopes prior to the cutting of the slope to reduce runoff potential.

5. Ditch Checks: Filter fabric fence or rock checks are placed to protect ditches from erosion and to filter sediment from flowing water. The checks are placed across the width of the ditch.

Filter fabric fences are installed for 2 acres (8,000 m<sup>2</sup>) or less of drainage area. Rock ditch checks are installed for 2 to 5 acres (8,000 to 20,000 m<sup>2</sup>) of drainage area. When no rock quantities are denoted for rock checks, use the calculated rock quantities from basins for the rock checks.

Ditch checks shall be installed in conjunction with sediment basins and dams when the above drainage areas are not exceeded.

The Contractor shall place the ditch checks as soon as the ditch is cut.

6. Bale Filter Dikes: Bale filter dikes shall be installed a few feet (meters) from the toe of a slope to filter and/or divert sediment to an appropriate control before it enters a water body on or off the project limits.

It is used to collect sediment for a maximum of:

- a) less than 1/4 acre [1,000 m<sup>2</sup>] without an outlet
- b) slope length of less than 100 feet [30 m] at a maximum slope of 2:1.
- c) use outlet or pit every 100 feet [30 m] for a 2:1 slope. Use a greater spacing for flatter slopes.

Bale filter dikes shall be constructed in accordance with Standard Drawing DM- 4.3. When filter fabric is used for the bale filter dike, the location is accordance with Standard Drawing DM-4.3 and the construction details shown in Standard Drawing DM-4.4 are used.

The Contractor shall construct the bale filter dikes concurrent with the grubbing operations.

7. Sediment Dams or Basins: Basins and dams are placed and used at concentrated and critical flow locations to settle sediment out before leaving the project. Use basins at the bottom of a ravine, at a culvert inlet or outlet, along or at the end of the ditch and at any concentrated sediment exit point of the project. Use a basin quantity of 67 cubic yards for every acre of drainage area (125 m<sup>3</sup> per 10,000 m<sup>2</sup>).

The Contractor shall construct sediment dams and basins at the first step of grading and within 7 days of commencing grubbing operations.

8. River, Stream and Water Body Protection: Protect all streams or water bodies passing through or on the project. Use filter fabric or bale filter dikes to line the water edges. Divert project sediment flow by using dike and slope protection. A combination of the above or other control features can be used.

The Contractor shall construct the above features concurrent with the grubbing operations.

a) Stream Relocation: Fully stabilize the new stream channel prior to diverting flow into the new channel.

b) Stream and River Crossing: Provide a means for construction equipment to cross water courses without causing erosion of streambanks or deposits in the channel. Plan and locate crossings well in advance of needing them. Disturbance to water bodies shall be kept to a minimum. Crossings shall be kept to a minimum and as narrow as practical. Crossings shall be made in shallow areas rather than deep pools where possible. Clearing, grubbing and excavation of streambanks, bed and approach sections shall be kept to a minimum.

The provisions for conveyance shall anticipate high flows and shall not impede the movement of aquatic life.

If culverts are used, the following minimums shall apply: Place culverts on the existing stream bed to avoid a drop in waterfall at the downstream end of the pipe. Culvert diameter shall be at least three times the depth of normal stream flow at the point of the crossing. The minimum size culvert to be used shall be 18 inches [0.5m]. There shall be sufficient number of culverts to completely cross the channel from stream bank to stream bank with no more than 12 inches [0.3m] between each culvert.

All fill and surface material placed in the channel, around the culverts or on the surface of the crossing shall be clean non toxic dump rock fill Type B, C, or D. Extend placed rock up slope from original stream bank to catch and remove erodible material from equipment.

Aggregate used does not need to be removed. Care should be taken to avoid any impoundment or restriction to fish passage. All pipes must be removed upon project completion.

The stream crossing work will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor, with costs included in the contract bid prices for the items to which they apply.

When the normal water elevation is shown on the plan, the Contractor shall construct crossings to accommodate a water elevation at least one foot (0.3m) above the stated normal water elevation. Fording in accordance with 107.21 is not allowed.

**877.04 Maintenance.** Temporary erosion control features shall be properly maintained.

The Contractor shall maintain these items with the concurrence of the Engineer. When the Contractor properly places the erosion control items in the contract in accordance with the contract documents, then the Department will pay for the additional cost to maintain or replace these items of work by the unit bid prices, agreed unit prices or by 109.04. Silt removed from erosion control features shall be disposed of in accordance with 203.05.

The Engineer or appointed inspector will check the temporary and permanent erosion control features every 7 days or within 24 hours of any rainfall of more than ½-inch (10 mm).

(A) Temporary Perimeter, Ditch Checks, Inlet Protection Filter Fabric Fence, Dikes and Bale Filter Dikes. Trapped sediment shall be removed and cleaned when it reaches half the height of the lowest section. The Contractor shall make the appropriate corrections when the above fail or become non functional. The Contractor shall maintain the items until the up slope permanent grass coverage is 70 percent or better. The Contractor shall remove the items when the up slope permanent grass coverage is 70 percent or better.

(B) Temporary and Permanent Seed: The seed bed shall be thoroughly watered in accordance with the requirements of Item 659. The quantity of water will be measured and paid for as Item 659 water. Seeded areas shall be maintained until 70 percent or better cover is established. Temporary seeded areas shall be mowed and paid for in accordance with Item 659.

(C) Sediment Dams and Basins: Deposited sediment shall be removed when the initial volume has been reduced one-half. The Contractor shall make the appropriate corrections when these items fail or non functional. The Contractor shall remove the dams and basins when the permanent seed and mulch is placed on the entire project.

**877.05 Performance.** The Contractor shall install additional erosion control features, make adjustments to meet the field conditions, anticipated future work or corrections based on the weekly storm water inspections with the concurrence of the Engineer. The type and quantity will be paid by the unit bid prices, agreed unit prices or by 109.04.

In the event that the Contractor or its agents refuse or fail to adhere to the requirements of the 404 Permit, the 401 Water Quality Certification and/or the NPDES Storm Water Permit and as a result an assessment or fine is made or levied against the Ohio Department of Transportation, the Contractor shall reimburse the Department within ten (10) calendar days of the assessment or fine or the Department may withhold the amount of the fine from the Contractor's next pay estimate and deliver that sum to the permitting agencies issuing the assessment or fine.

These fines are not to be construed as a penalty but are liquidated damages to recover costs assessed against the Department due to the Contractor's refusal or failure to comply with the permit requirements.

If proper sediment and erosion controls are not being provided by the Contractor, progress estimates shall be withheld until proper controls are placed.

All temporary erosion control items shall be removed before the project is accepted. Removed materials shall become the property of the Contractor and shall be disposed of in accordance with Item 203.

**877.06 Method of Measurement.** Temporary erosion and sediment control work, completed and accepted, will be measured as follows:

- (A) All fertilized areas will be measured and paid for as Item 659 Commercial Fertilizer.
- (B) Temporary seeding and mulching will be measured by the square yard (square meter) of seeded and mulched area completed in accordance with these specifications.
- (C) Temporary slope drains will be measured by the linear foot (meter) complete in place.
- (D) Temporary Perimeter, Inlet Protection, Ditch Check, Filter Fabric Fence will be measured per linear foot (meter) in place. Bale filter dike will be paid under temporary perimeter fabric fence.
- (E) Rock required will be paid for under Item 601 Rock Channel Protection, Type C or D with or without filter.
- (F) Temporary sediment dams, and basins will be measured by the cubic yard (cubic meter) of excavation and embankment complete in place.
- (G) Temporary dikes will be measured by the cubic yard(cubic meter), of excavation and embankment complete in place.
- (H) Temporary slope or ditch protection will be measured by the square yard (square meter), complete in place.
- (I) Sediment Removal will be measured in cubic yards(cubic meters) completed in place. The sediment removed from dams, basins, inlet protection, ditch checks, perimeter filter fabric, bale filter dikes and all other types of filter fabrics, straw or hay bales or any other temporary sediment control items will be paid under this item.

In the event that temporary erosion and sediment control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled, such temporary work shall be performed by the Contractor at his expense.

**877.07 Basis of Payment:** Accepted quantities of temporary sediment and erosion control

work placed and measured as provided above, will be paid for under:

Item	Unit	Description
877	Square yard (square meter)	Temporary seeding and mulching
877	Linear foot (meter)	Temporary slope drains
877	Cubic yard (cubic meter)	Temporary sediment basins and dams
877	Linear foot (meter)	Temporary perimeter, ditch check or inlet protection filter fabric fence
877	Linear foot (meter)	Temporary perimeter filter fabric fence
877	Linear foot (meter)	Temporary ditch check filter fabric fence
877	Linear foot (meter)	Temporary inlet protection filter fabric fence
877	Cubic yard (cubic meter)	Temporary dikes
877	Square yard (square meter)	Temporary ditch protection
877	Square yard (square meter)	Temporary slope protection
877	Cubic yard (cubic meter)	Sediment removal

**STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION**

**SUPPLEMENTAL SPECIFICATION 905  
OPEN HEARTH AND BASIC OXYGEN FURNACE STEEL SLAG AGGREGATE  
USED FOR ITEMS 203, 304, 306, 307, 410, 411, 617, 503 OR 603**

**April 1, 1998**

Open Hearth (OH) or Basic Oxygen Furnace (BOF) slag shall not be used for Aggregate or Soil for Item 603 Bedding or Backfill, for Items 306 Cement Treated Free Draining Base or 307 Non-Stabilized Drainage Base, Item 503.10 Backfill; or under, around or within 15 meters (50 feet) of any structure.

OH and BOF slag may be used in Item 203 Embankment, as defined in 203.02, if the OH or BOF slag is blended in a 3:1 mixture (3 parts natural soil and 1 part OH or BOF slag). The 3:1 mixture shall be placed at least 0.3m (1.0 ft) below the flow line of the underdrains or other drainage items susceptible to runoff as per 203.08. Aging and stock piling requirements of this specification are required.

OH and BOF slag may be used for surface course applications in Items 617, 410 and 411, if the OH and BOF slag meets the above specifications, and meets the aging and stock piling, deleterious substances, and crushing requirements of this specification.

BOF slag shall not be allowed for non-surface course applications in Items 304, 410, 411 or 617.

Recycled OH or BOF slag from Department or non-Department projects may be used in Item 203, or surface course applications in Items 617, 410 or 411, if the material meets the requirements of this specification.

OH slag may be used for Item 304 and for a non-surface course application in Items 617, 410 and 411, if the OH slag meets the above specifications and all the additions and deletions listed below;

Recycled OH or BOF slag from Department or non-Department projects shall not be allowed.

Deleterious substances (soft pieces) shall include soft lime, lime oxide or magnesia agglomerations or any foreign materials prone to rapid disintegration under construction processing and weathering conditions.

Deleterious substances (soft pieces) in accordance with Supplement 1029 (hand crushing of soft pieces) shall be less than 3 percent by weight.

Material passing the 75  $\mu$ m(200 sieve) shall be less than 10 percent by weight.

No crushing of OH or BOF slag shall be allowed.

Identification of OH Slag. Clear, definitive and undisputable identification of the OH slag is required for OH slag used for Item 304 or for a non-surface course application in Items 617, 410 or 411.

The producer shall show the Department evidence that the material supplied is open hearth slag. This information shall consist of but not be limited to the following:

Steel producer, production dates, production rates, stockpiling dates, type of steel produced, and all known Department and non-Department projects where the material was previously used.

This identification of OH slag may be supplemented by other information approved by the Department or by using 10 years of good performance data. The producer shall submit to the Department projects where the OH slag has been used without expansion or tufa problems. The Department will review the above projects as part of the identification approval process.

All OH slag not identified as open hearth slag shall be considered basic oxygen furnace slag unless identified otherwise.

Tufa Performance Verified. Tufa is a precipitate form of calcium carbonate that can clog up the underdrain systems. Some OH slag sources clog up underdrain systems and some do not. Tufa performance verification will be based on field performance and Department's inspection of the underdrain systems.

Tufa performance verification is required for OH slag used for Item 304, or when OH slag is used for a non-surface course applications in Items 617, 410 or 411.

The producer shall submit to the Department past projects that are at least 10 years old that used the proposed OH slag source. The producer shall supply the Department with construction plans with the underdrains and underdrain outlets marked on the plans, or other suitable method, approved by the Department, showing the underdrain system. The producer shall mark the underdrain outlets in the field for inspection. The Department will inspect the underdrain systems for tufa deposits. If tufa deposits are found in the outlets or in the underdrain system, the OH slag source shall be rejected.

The following sources have previously been evaluated for tufa performance: Standard-Lafarge's Cuyahoga Heights and McDonald plants. Tufa performance verification is not required for these sources.

Aging and Stockpiling Requirements. All OH and BOF slag shall be stockpiled and aged as follows:

The material shall be graded and stockpiled into maximum size piles of 23,000 Metric ton (25,000 ton). Prior to and during the stock piling operation, these materials shall have water added to provide a uniform moisture content not less than their absorbed moisture. The stockpile shall be maintained in a moist condition during the required stock piling period.

The producer shall mix the stockpile when the outside surface of the pile has crusted over. The Department will inspect the stock pile every 2 months to ensure no crusting occurs. Frozen stockpile material shall not be mixed. The aging period shall be suspended when the stockpile is frozen for more than one month.

This aging period shall be at least 6 months in duration and shall start over if any new material is added to the pile during the aging period.

Expansion Testing. After the aging and stock piling requirements have been met, expansion testing is required for OH slag used for Item 304 or when OH slag is used for a non surface course applications in Item 617, Item 410 or Item 411.

Expansion Testing shall be performed in accordance with Pennsylvania Department of Transportation PTM No. 130, the ODOT equivalent to this test or expansion testing acceptable to ODOT.

The producer shall hire an independent AASHTO accredited and ODOT approved laboratory to perform at least half of the expansion testing. At the producer's option, up to half of the required expansion testing may be performed by the producer's lab. The Office of Materials Management shall observe the expansion testing and approve each independent and producer laboratory.

The expansion testing shall be performed for every 2300 metric tons (2500 tons) or fraction thereof of the material supplied.

The maximum allowable total expansion for each test shall be less than 0.50 percent. If any one test fails in the stockpile, the entire stockpile shall be rejected.

When sampling for expansion, the producer shall notify the Department at least 48 hours prior to the sampling. The Department will verify that the sample came from the correct stock pile and take independent spit samples , if required.

The expansion test data and a suitably presented summary of the expansion test data shall be submitted to the Department for approval. The Department reserves the right to perform independent testing to verify the laboratory results at any time.

The Department expansion test data shall take precedence over the producer or independent laboratory expansion testing results in the event of a conflict. The Department shall make the final determination on all conflicting data.

If the material fails the expansion testing, the material shall be stock piled for a minimum of 2 additional months from the date of last sampling and retested for expansion. No materials shall be approved for use until the material passes the expansion test.

STATE OF OHIO  
DEPARTMENT OF TRANSPORTATION

SUPPLEMENTAL SPECIFICATION 907

Sulphur Leachate Test for Air Cooled Blast Furnace Slag for Acceptance  
of Items 203, 304, 306, 307, 503, 603 and S.S.855 (Asphalt Treated Free Draining Base)

October 21, 1998

**907.01 Description**

**907.02 Sampling Procedure**

**907.03 Sulphur Leachate Test Procedure and Criteria**

**907.01 Description.** Air cooled blast furnace slag used in Items 203, 304, 306, 307, 503, 603, and S.S.855 (Asphalt Treated Free Draining Base) must meet the requirements of this specification. This specification contains the required sampling procedure; sulphur leachate test procedure; and, the criteria that must be met for the material to be incorporated into the work.

**907.02 Sampling Procedure.** The following sampling method for obtaining samples of air cooled blast furnace slag for leachate tests shall be used:

1. Sampling: The material to be used should be sampled as the stockpile is being built.
2. When obtaining the sample after the stockpile is built: The sample may be taken by shovel or hand. The sample shall be selected randomly from both the exterior and interior of the stockpile. The producer shall use a heavy equipment for the excavation of the interior material.
3. Sampling Frequency: Each sample is to be taken in random increments over each 5200 tons (4720 metric tons) stockpiled.
4. Sample size and sample reduction: The field sample should be 80 to 100 pounds (35 to 45 kg). From this field sample, a test sample of 20 to 25 pounds (9 to 11 kg) shall be quartered out.
5. Documentation : Stockpile location and test results shall be maintained at the plant and shall be available upon request.

6. The Producer shall certify that this test has been performed prior to acceptance.

**907.03 Sulphur Leachate Test Procedure and Criteria.** The test procedure involves soaking the slag material in water for a specified period of time and then observing the color of the water. A greenish-yellow coloration indicates a problem. The smell of hydrogen sulfide (rotten eggs) usually accompanies the observation of colored water.

1. Equipment Needed:

- A. A five-gallon (19-liter) bucket for soaking the sample.
- B. Filter paper for filtering the water.
- C. A funnel through which to filter the water.
- D. A glass container for observing the water.
- E. A rock color chart. This chart is used for color comparisons and is distributed by the Geological Society of America
- F. Water shall be distilled or tap water let set in a bucket for a minimum of 12 hours.

2. Test Procedures.

A. Prepare a test sample of approximately 20 to 25 pounds (9 to 11 kg) from a field sample of approximately 100 pounds (45 kg).

B. For Item 306, Type 3 granular material in Item 603, and S.S.855 (Asphalt Treated Free Draining Base), the test sample should then be rinsed over a No. 4 (4.75mm) sieve to remove any fines that may be clinging to the larger particles.

C. Place the test sample in bucket and fill with water until the sample is covered by at least ½ inch (13 mm) of water. Allow the sample to soak for 24 hours.

D. After soaking for 24 hours, thoroughly mix the water and collect a water sample of approximately 3.4 fl. oz. (100 mL).

E. Filter the water sample to remove the suspended solids which may interfere with the color observation.

F. If the color of the filtered water is equal to or darker than the moderate greenish-yellow color from the rock chart (hue 10Y), the material fails. If the water appears clear or lighter than the moderate greenish-yellow color from the rock chart (hue 10Y), then allow the sample to soak for another 24 hours and repeat steps "D" through "F".

G. If, after 48 hours, the water appears clear or less than the moderate greenish-yellow color from the rock chart (hue 10Y), then the material is acceptable.

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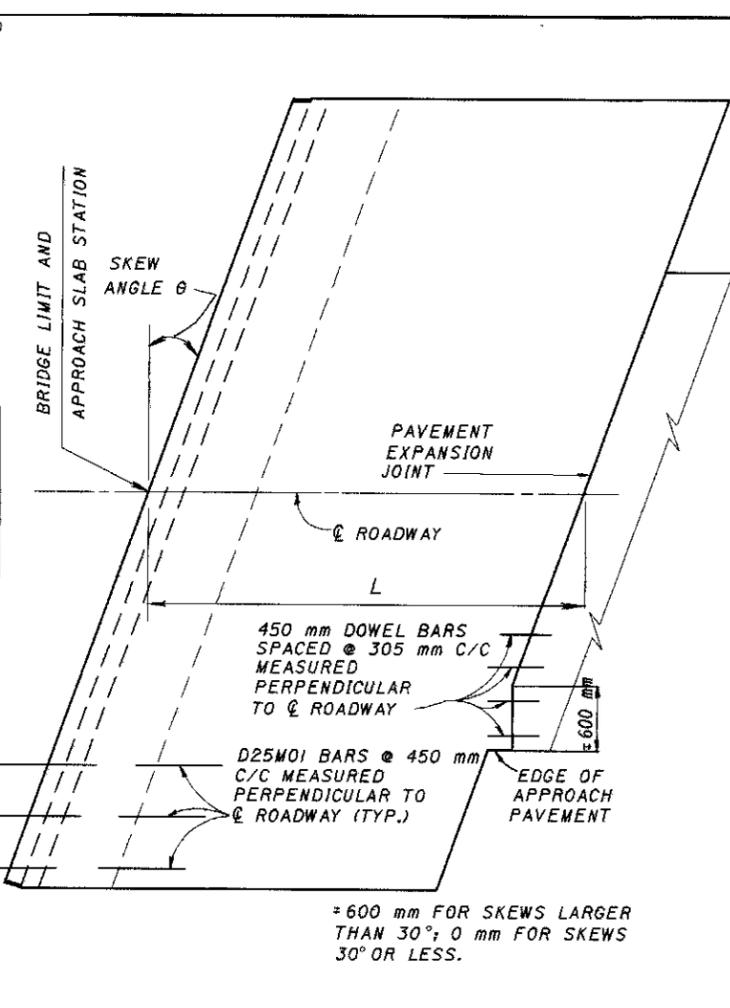
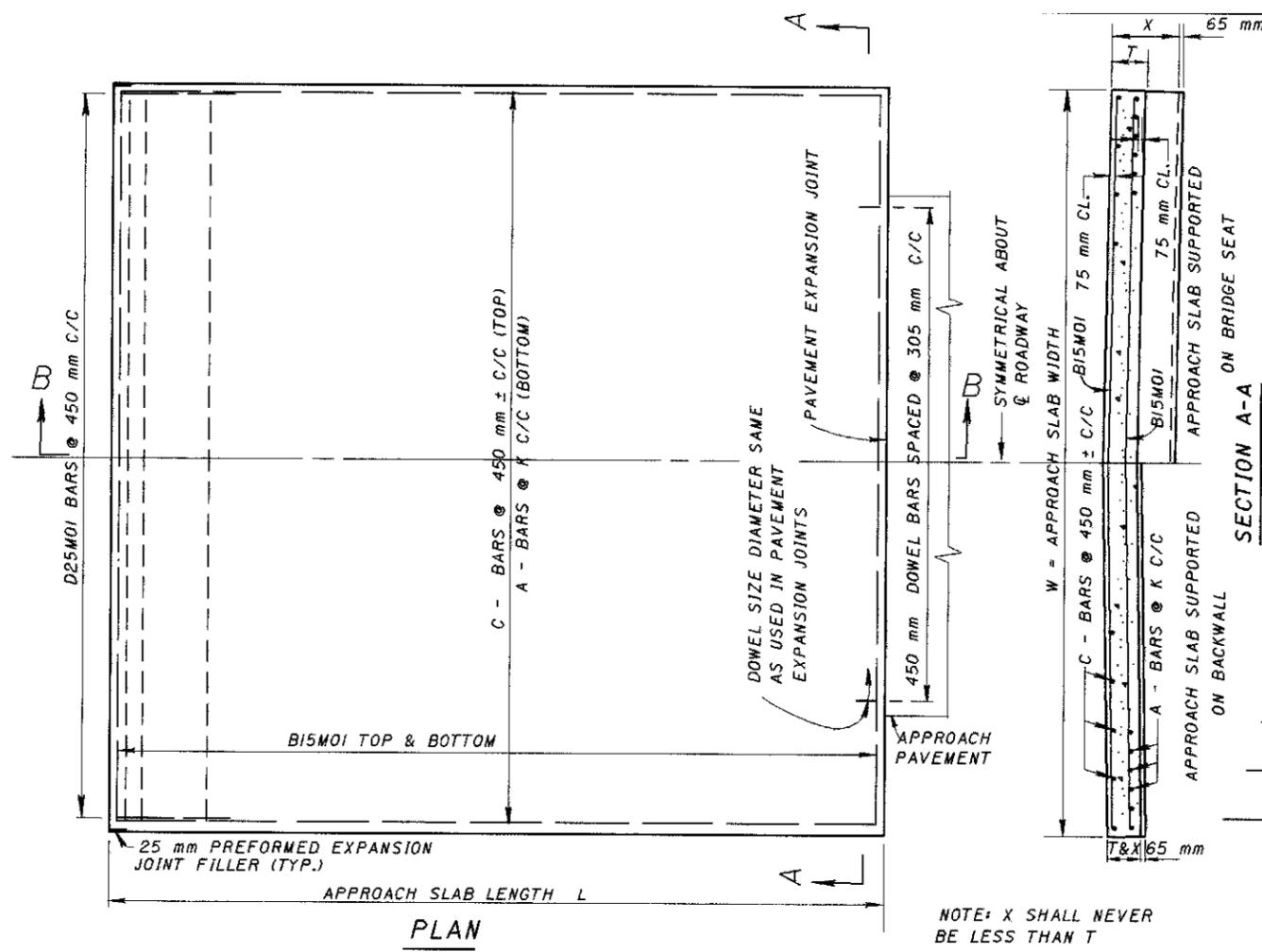
SUPPLEMENTAL SPECIFICATION 954  
HIGH MOLECULAR WEIGHT METHACRYLATE (HMWM) RESIN

September 9, 1997

The high molecular weight methacrylate (HMWM) resin shall be low viscosity, non-fuming, conforming to the following:

Viscosity	Less than 25 cps (brookfield viscometer, Model RVT with UL adaptor or Model LVF, # spindle and UL adaptor C@ 25 °C (77 °F) (ASTM D 2849)
Density	Greater than 8.4 lbs/gal Ca 25 °C (77 °F) (ASTM D 2849)
Flash Point	Greater than 93 °C (200 °F) (PenskyMartens CC) (ASTM D 93)
Vapor Pressure	Less than 1.0 mm Hg C@ 25 °C (77 °F) (ASTM D 323)
TG (DSC)	Greater than 58 °C (135 ° F) (ASTM D3418)
Shelf Life	Must be 1 year minimum at manufacturers recommended environmental considerations.
Gel Time	Greater than 40 min - 100 g mass (ASTM D 2471) (thin film)
Percent Solids	Greater than 90% by weight
Bond Strength	Greater than 10.5MPa (1500 psi) (ASTM C 882)

The resin shall be from the approved list in the Office of Materials Management.



**DESIGN SPECIFICATIONS:** THIS STANDARD DRAWING CONFORMS TO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 1977, INCLUDING THE 1978, 1979, 1980 AND 1981 INTERIM SPECIFICATIONS AND THE OHIO "SUPPLEMENT" TO THESE SPECIFICATIONS.

**DESIGN DATA**  
 DESIGN LOADING: MS18 AND THE ALTERNATE MILITARY LOADING.  
 CONCRETE CLASS C : COMPRESSIVE STRENGTH 28 MPa

**REINFORCING STEEL:** ASTM A615M, A616M OR A617M-GRADE 400; MINIMUM YIELD STRENGTH OF 400 MPa AND SHALL BE EPOXY COATED.

**REINFORCING STEEL:** FOR SKEWED BRIDGES THE A AND C BARS SHALL BE PLACED PARALLEL TO THE CENTER LINE OF ROADWAY AND THE B BARS SHALL BE PLACED PARALLEL TO THE ABUTMENTS.

**PREFORMED EXPANSION JOINT FILLER,** TYPE "A" WATER PROOFING, AND SEALER AT THE CORNERS AND SIDES OF THE APPROACH SLAB SHALL BE INCLUDED IN THE PRICE BID PER SQUARE METER FOR THE APPROACH SLAB.

**PREFORMED ELASTOMERIC JOINT SEALER** SHOWN AT THE BRIDGE LIMIT END OF THE APPROACH SLAB SHALL BE INCLUDED IN THE PRICE BID PER SQUARE METER FOR THE APPROACH SLAB.

**LONGITUDINAL CONSTRUCTION JOINTS** REQUIRED FOR STAGE CONSTRUCTION SHALL BE AS PER 511.09.

**CURBS, BRIDGES WITH SIDEWALKS :** FOR BRIDGES CONSTRUCTED WITH RAISED SIDEWALKS, DEFLECTOR PARAPETS OR OTHER TYPES OF CONSTRUCTION WHICH RETAIN ROADWAY SURFACE DRAINAGE, THE APPROACH SLABS SHALL EITHER INCLUDE INTEGRAL CURBS OR BE CONSTRUCTED IN CONJUNCTION WITH BRIDGE CURBS. CURB HEIGHT SHALL BE TRANSITIONED UNIFORMLY BETWEEN BRIDGE CURB HEIGHT AND APPROACH CURB HEIGHT IN A LENGTH AS FOLLOWS: WHERE WINGWALL EXTENDS BEYOND END OF APPROACH SLAB, USE A MINIMUM LENGTH OF 3000 mm BEYOND END OF WINGWALL. WHERE THE APPROACH SLAB EXTENDS BEYOND THE END OF WINGWALL, TRANSITION IN THIS LENGTH. HOWEVER, THE TRANSITION LENGTH SHALL NOT BE LESS THAN 3000 mm AND THE TRANSITION SHALL EXTEND BEYOND THE END OF APPROACH SLAB IF NECESSARY.

**APPROACH SLAB WIDTH (W):** APPROACH SLABS SHALL BE THE SAME WIDTH AS THE BRIDGE ROADWAY.

**THE LENGTH OF APPROACH SLABS** SHOULD BE BASED ON FACTORS SUCH AS THE SIZE AND AMOUNT OF EXCAVATION BEHIND THE ABUTMENTS, NEW OR EXISTING EMBANKMENTS AND SKEW OF THE BRIDGE.

**CROWN** SHALL CONFORM TO THAT OF THE APPROACH PAVEMENT AND BRIDGE DECK. IF THE RATE OF CROWN OF THE BRIDGE DECK DIFFERS FROM THAT OF THE APPROACH PAVEMENT, A SMOOTH TRANSITION SHALL BE PROVIDED WITHIN THE LIMITS OF THE APPROACH SLAB.

**WEARING SURFACE:** GENERALLY APPROACH SLABS SHALL HAVE AN ASPHALT CONCRETE WEARING SURFACE ONLY WHEN BOTH THE APPROACH PAVEMENT SURFACE AND THE BRIDGE WEARING SURFACE ARE ASPHALT CONCRETE.

**EXPANSION JOINT DETAILS** AT THE APPROACH PAVEMENT END OF THE APPROACH SLAB ARE USED ONLY IN CONJUNCTION WITH CONCRETE PAVEMENT OR CONCRETE BASE COURSE. PAYMENT FOR THE EXPANSION JOINT, INCLUDING DOWEL BARS, PREFORMED EXPANSION JOINT FILLER AND JOINT SEALER, IS INCLUDED IN THE PRICE BID PER SQ. METER FOR THE APPROACH SLAB.

**APPROACH SLAB FOR SKEWED STRUCTURE**

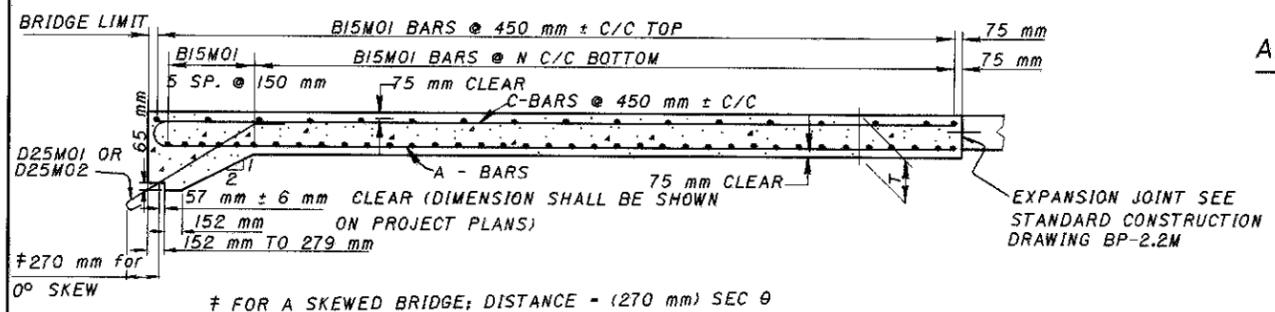
**GENERAL:** THIS DRAWING PROVIDES DESIGN AND GENERAL CONSTRUCTION DETAILS. THE PROJECT PLANS WILL SHOW LENGTH, SKEW, CURBS (IF ANY), ESTIMATED QUANTITY (SQUARE METER), AND SPECIAL NOTES AND DETAILS WHERE NECESSARY. FOR CONDITIONS OTHER THAN THOSE INDICATED HEREON, THE APPROACH SLAB SHALL BE ADAPTED TO FIT THE ENDS OF THE BRIDGE AND THE APPROACH PAVEMENT.

**ANCHOR BARS D25M01 OR D25M02** SHALL BE DETAILED FOR A SPECIFIC BRIDGE AND SHALL BE INCLUDED WITH ITEM 509 UNDER ABUTMENTS OR SUPERSTRUCTURE FOR PAYMENT. D25M01 BARS CANNOT BE USED AS SHOWN WHERE APPROACH SLABS ARE SUPPORTED ON BACKWALLS LESS THAN 350 mm THICK. D25M02 BARS SHALL BE USED ON PRESTRESSED CONCRETE BOX BEAM BRIDGES WHERE THE APPROACH SLAB IS SUPPORTED ON AN 280 mm THICK BACKWALL.

**BAR SIZE IS INDICATED** IN THE BAR MARK. THE FIRST LETTER IDENTIFIES THE BAR LOCATION, NEXT TWO DIGITS AND LETTER INDICATES THE METRIC BAR SIZE DESIGNATION, AND THE REMAINING DIGITS ITS SEQUENCE NUMBER.

- EXAMPLE : A35M01  
 1) A = LOCATION OF THE BAR IN THE STRUCTURE  
 2) 35M = METRIC BAR SIZE DESIGNATION  
 3) 01 = SEQUENCE NUMBER

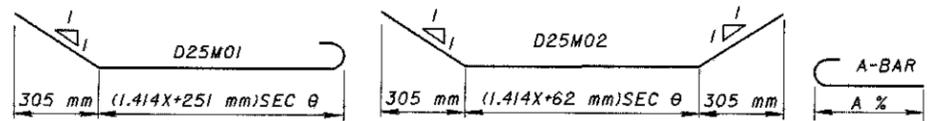
\* AT THE OPTION OF THE CONTRACTOR, B15M01 BARS MAY BE LAPPED 500 mm MINIMUM AT THE CENTERLINE OF ROADWAY, OR WHERE REQUIRED FOR LONGITUDINAL CONSTRUCTION JOINTS.

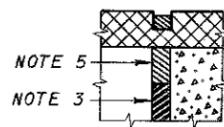


**SECTION B-B**

REINFORCING STEEL (FOR ONE APPROACH SLAB)																	
LENGTH L mm	THICKNESS T mm	A-BARS		B15M01 (BOTTOM)		B15M01 (TOP)		C-BARS		D25M01 OR D25M02							
		SP'C'G K	MARK	LENGTH mm	DIMENSION A mm	NO. REQ'D.	LENGTH mm	SP'C'G N	NO. REQ'D.	LENGTH mm	NO. REQ'D.	MARK	LENGTH mm	NO. REQ'D.	MARK	LENGTH mm	NO. REQ'D.
4600	305	255	A35M01	4880	4450	230	22	11	C15M01	4425	1	1	14	C15M02	5950	1	1
6100	330	190	A35M02	6380	5950	200	31	14	C15M02	5950	1	1	18	C15M03	7450	1	1
7600	380	180	A35M03	7880	7450	200	39	18	C15M03	7450	1	1	21	C15M04	9000	1	1
9150	430	165	A35M04	9430	9000	215	44	21	C15M04	9000	1	1				1	1

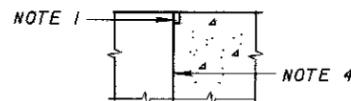
W - APPROACH SLAB WIDTH, OUT TO OUT, IN mm  
 theta - ANGLE OF SKEW  
 K - A-BAR SPACING IN mm  
 N - B-BAR SPACING IN mm  
 X - APPROACH SLAB THICKNESS AT ABUTMENT END IN mm  
 % - OUT TO OUT





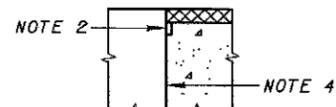
**DETAIL A**

CONCRETE WEARING SURFACE ON BRIDGE DECK AND APPROACH SLAB

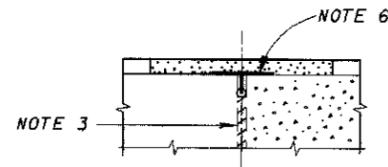


**DETAIL B**

CONCRETE WEARING SURFACE ON BRIDGE DECK AND APPROACH SLAB

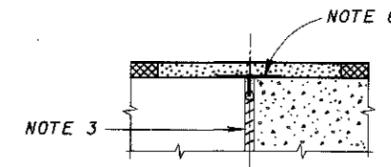


**DETAIL C**

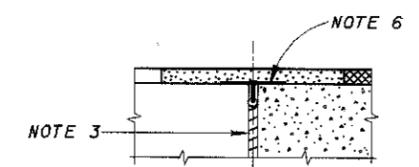


**DETAIL D**

CONCRETE WEARING SURFACE ON BRIDGE DECK ONLY



**DETAIL E**



**DETAIL F**

NOTE 1 : PREFORMED ELASTOMERIC JOINT SEALER 705.11 (32 mm FOR 13 mm JOINT) DEPRESSED 3 mm BELOW ROADWAY. PLACED IN 13 mm x 55 mm GROOVE.

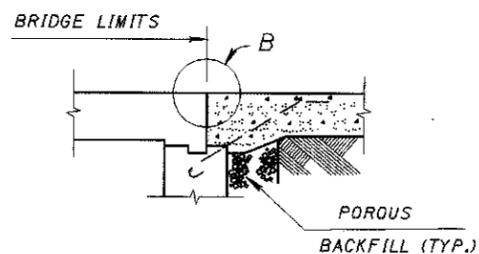
NOTE 2 : PREFORMED ELASTOMERIC JOINT SEALER 705.11 (32 mm FOR 13 mm JOINT) PLACED IN 13 mm x 55 mm GROOVE.

NOTE 3 : 25 mm PREFORMED EXPANSION JOINT FILLER 705.03

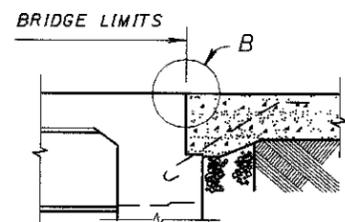
NOTE 4 : TYPE "A" WATERPROOFING.

NOTE 5 : SEE PLAN INSERT SHEET, ABUTMENT JOINTS IN BITUMINOUS CONCRETE BOX BEAM BRIDGES.

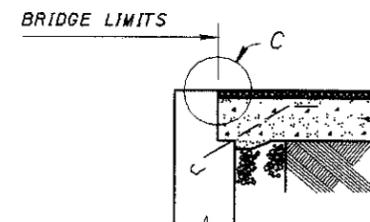
NOTE 6 : SEE PLAN INSERT SHEET, POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM.



**ON SLAB BRIDGES**

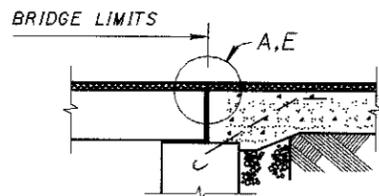


**ON BRIDGES WITH INTEGRAL CONSTRUCTION**

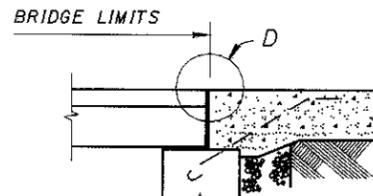


**APPROACH SLAB SUPPORTED ON ABUTMENT BACKWALL**

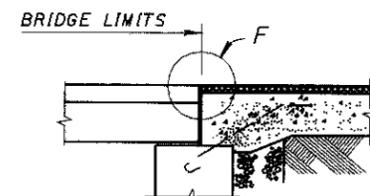
ASPHALT CONCRETE WEARING SURFACE ON BRIDGE DECK AND APPROACH SLAB



**ON PRESTRESSED CONCRETE BOX BEAM BRIDGES**



**ON PRESTRESSED CONCRETE BOX BEAM BRIDGES**



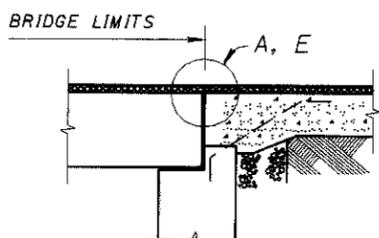
**ON PRESTRESSED CONCRETE BOX BEAM BRIDGES**

TYPE "A" WATERPROOFING SHALL NOT EXTEND ABOVE THE BOTTOM OF THE GROOVE INTO WHICH THE PREFORMED ELASTOMERIC JOINT SEALER IS TO BE PLACED. IT SHALL BE APPLIED TO THE ENTIRE AREA OF THE ABUTMENT OR SUPERSTRUCTURE WHICH COMES INTO CONTACT WITH THE APPROACH SLAB.

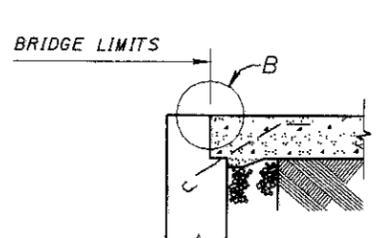
FOR PRESTRESSED CONCRETE BOX BEAM BRIDGES WITH ASPHALT CONCRETE ON BOTH BRIDGE DECK AND APPROACH SLAB, THE TOP OF APPROACH SLAB AT THE BRIDGE END SHALL BE CONSTRUCTED TO THE LEVEL OF THE TOP OF THE BEAMS TO FACILITATE WATERPROOFING OF THE JOINT. THE THICKNESS OF ASPHALT CONCRETE AT THE APPROACH END SHALL BE THE THICKNESS OF ASPHALT CONCRETE USED ON THE ROADWAY PAVEMENT. THE THICKNESS OF ASPHALT CONCRETE SHALL VARY UNIFORMLY, IF NECESSARY, IN THE LENGTH OF THE APPROACH SLAB. THE BASE SHALL BE GRADED TO PERMIT THE BOTTOM OF THE APPROACH SLAB TO BE PARALLEL TO THE TOP.

FOR STRUCTURES HAVING ASPHALT CONCRETE WEARING SURFACE ON BOTH BRIDGE DECK AND APPROACH SLABS AND WHERE NO DECK EXPANSION DEVICES ARE PROVIDED, THE DECK MEMBRANE WATERPROOFING SHALL EXTEND BEYOND THE BRIDGE LIMITS A DISTANCE OF 600 mm.

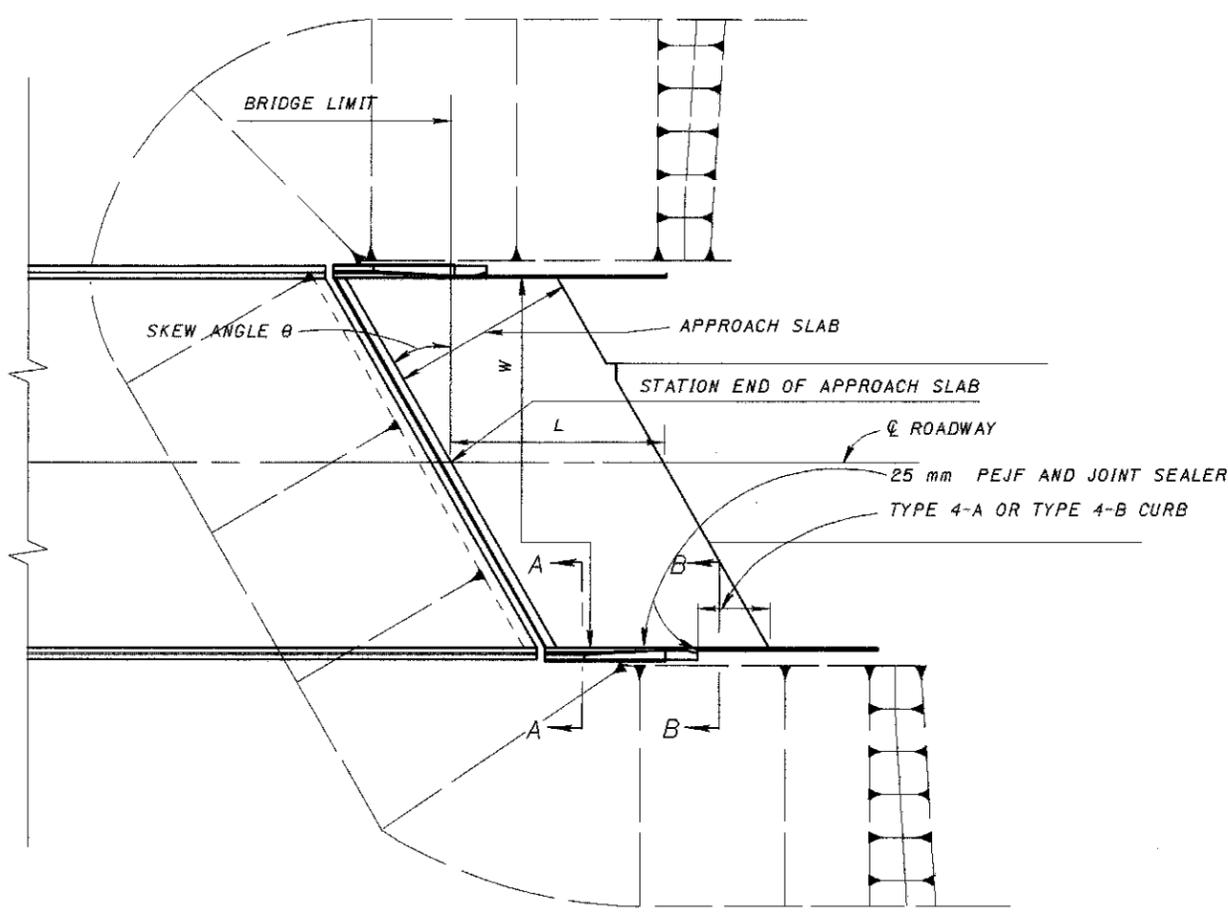
NOTE : APPROACH SLAB SEAT ON PRESTRESSED CONCRETE BOX BEAM BRIDGES IS SHOWN AT SAME ELEVATION AS BEAM SEAT. HOWEVER, IT MAY ACTUALLY BE HIGHER OR LOWER THAN THE BEAM SEAT DEPENDING ON BOX BEAM DEPTH.



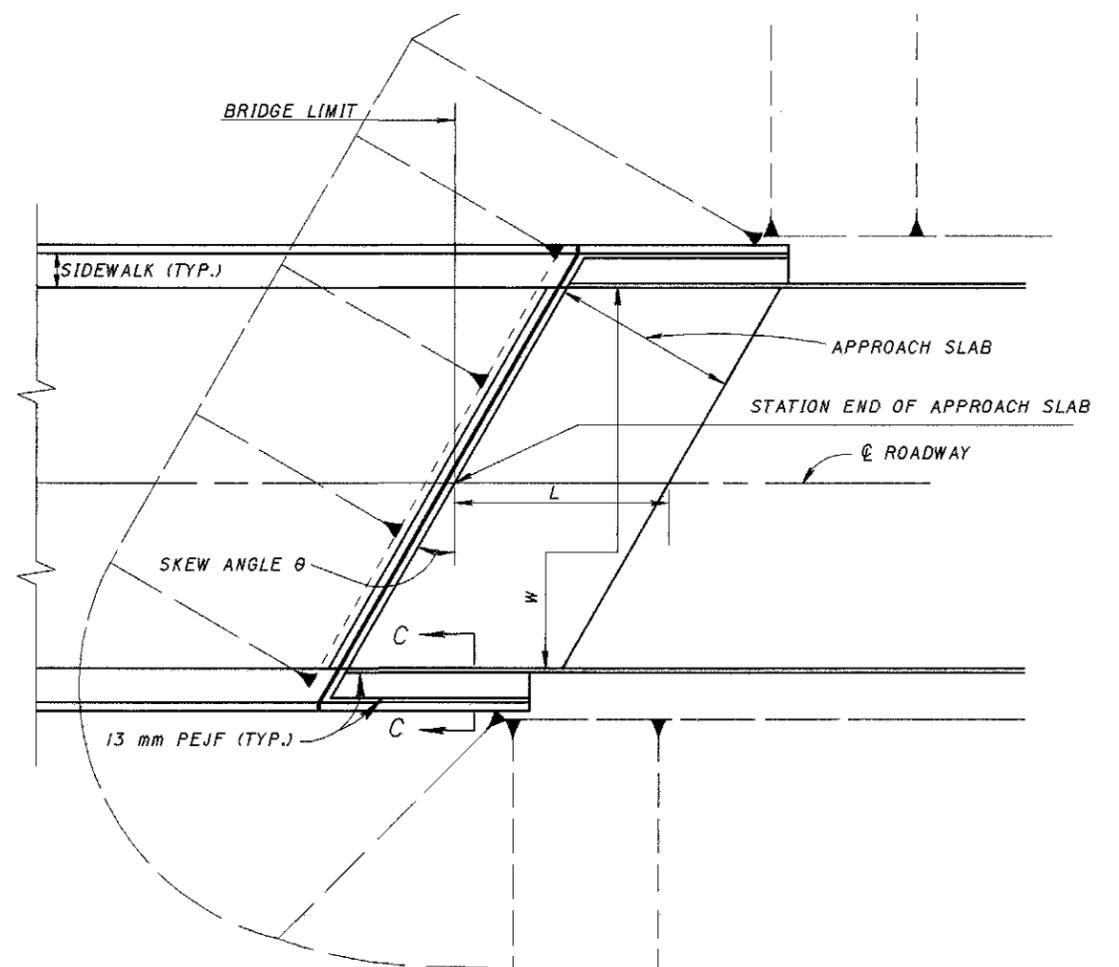
**APPROACH SLAB SUPPORTED ON ABUTMENT BACKWALL**



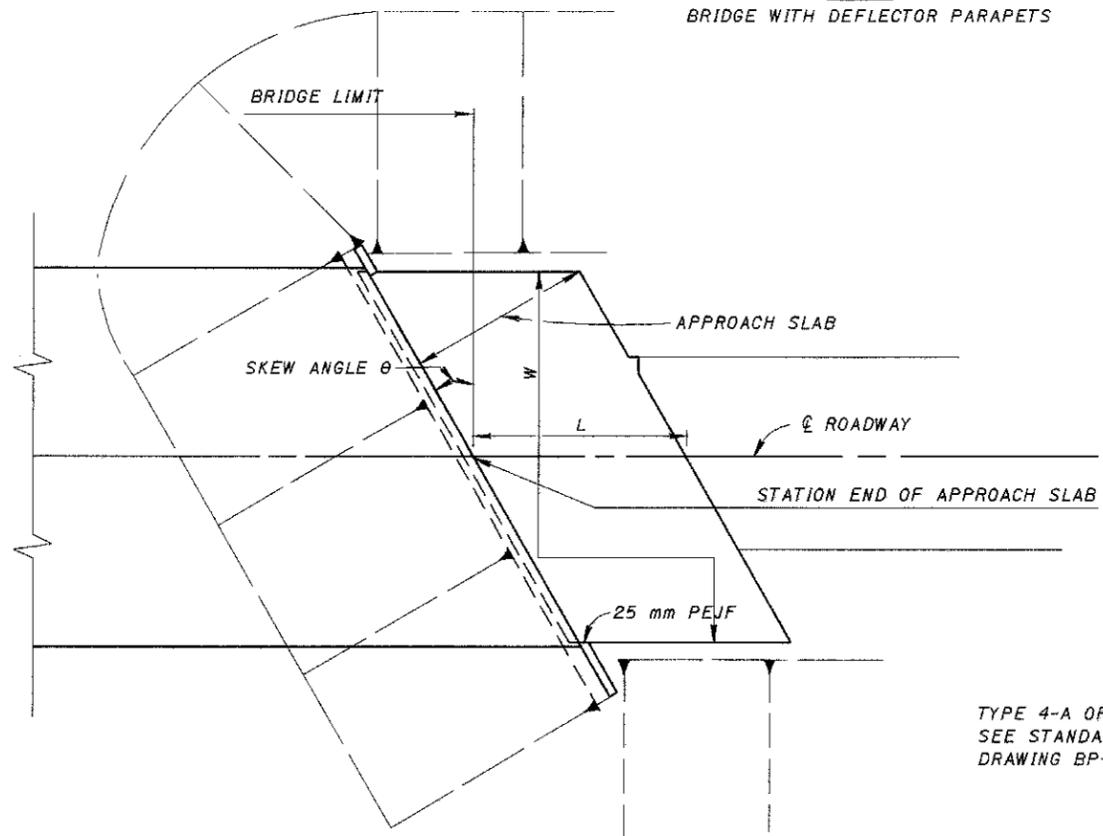
**APPROACH SLAB SUPPORTED ON ABUTMENT BACKWALL**



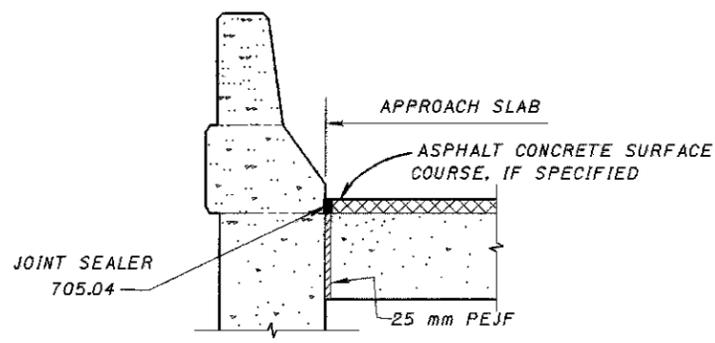
**PLAN**  
BRIDGE WITH DEFLECTOR PARAPETS



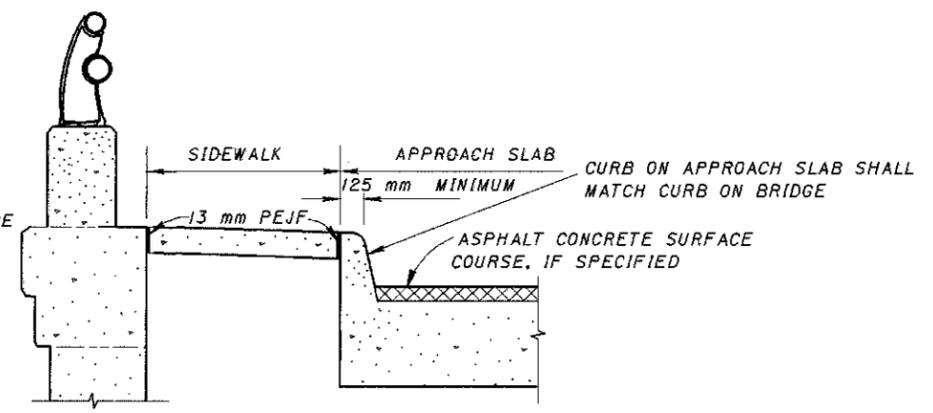
**PLAN**  
BRIDGE WITH SIDEWALKS



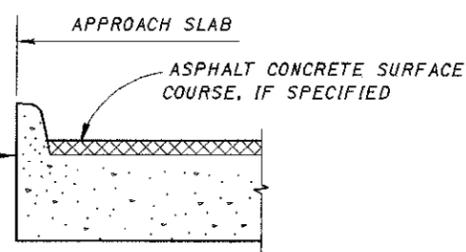
**PLAN**  
BRIDGE WITHOUT CURBS



**SECTION A-A**

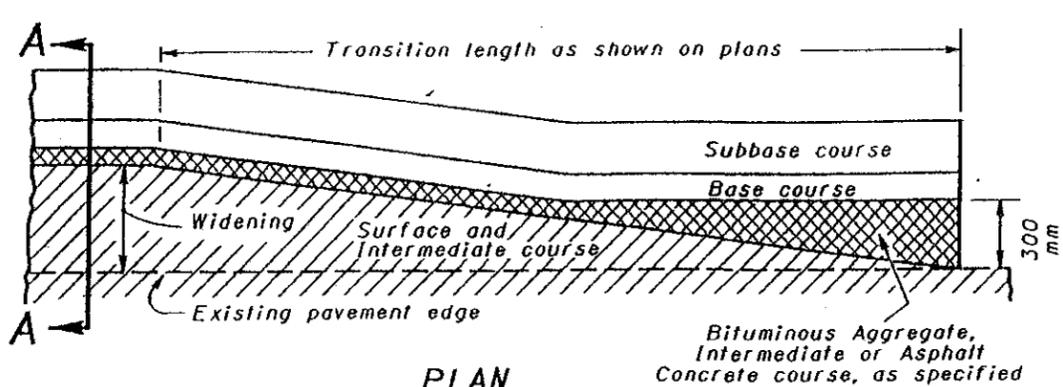


**SECTION C-C**



**SECTION B-B**

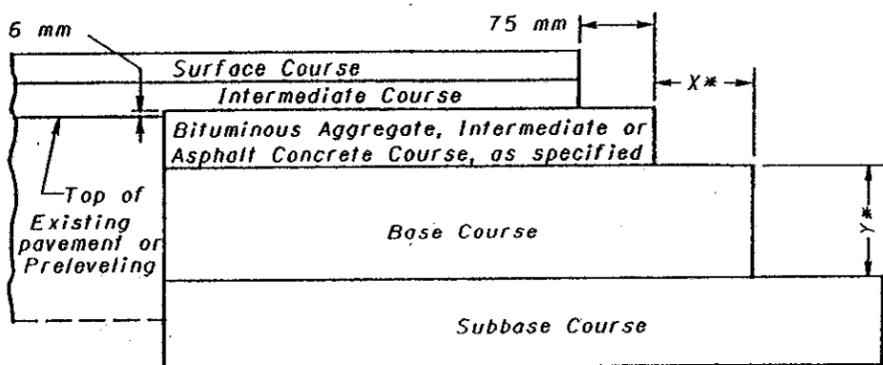
TYPE 4-A OR TYPE 4-B CURB  
SEE STANDARD CONSTRUCTION  
DRAWING BP-5.J M



PLAN

**MERGING EDGE OF PAVEMENT WIDENING WITH EDGE OF EXISTING PAVEMENT**

Bituminous Aggregate, Intermediate or Asphalt Concrete course, as specified



SECTION A-A

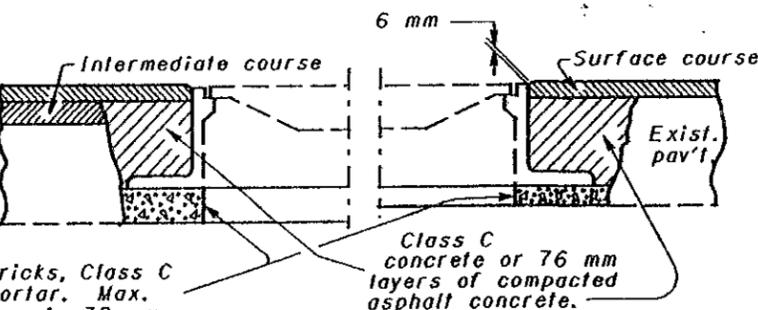
**COURSE DETAIL FOR WIDENING**

The Bituminous Aggregate in the upper part of the base widening shall finish approximately 6 mm above the edge of the existing pavement where no preleveling is used. Where a preleveling (using intermediate course material) is specified it shall be placed prior to excavation of the widening trench and the upper course of the base widening shall finish approximately 6 mm above the preleveling.

\*The extended width (X) of a base or subbase course shall be equal to the depth (Y) of that particular course, unless otherwise specified in the plans.

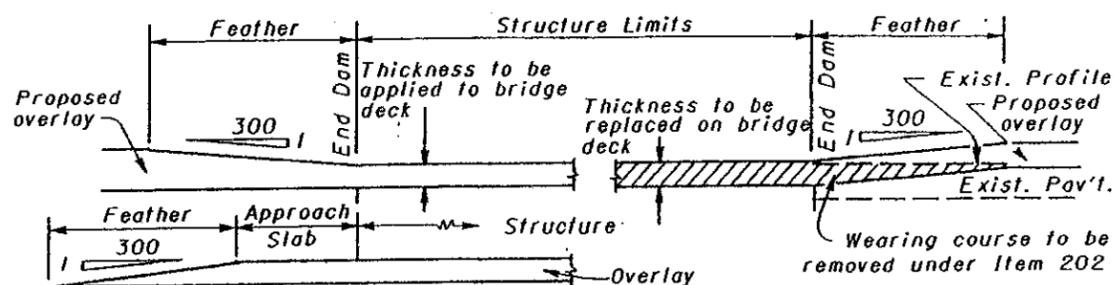
Grade rings, bricks, Class C Concrete or mortar. Max. mortar thickness is 38 mm.

**USING CONCRETE OR MORTAR**



Metal adjusting rings shall: (a) attach securely to the existing frame by welding or mechanical devices; (b) consist either of cast metal having an integral rim and seat, or be fabricated metal with a sturdy connection between the seat and rim; and (c) provide an even seat for the manhole cover. In addition, the adjusting ring type shall be a design acceptable to the local governmental agency responsible for street and sewer maintenance. Any installation unacceptable to the Engineer shall be replaced by the Contractor at his expense.

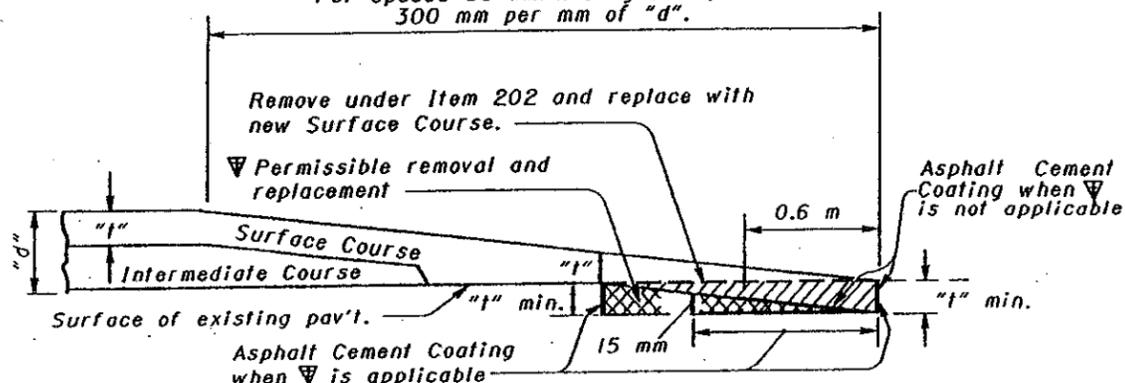
**MANHOLES ADJUSTED TO GRADE**



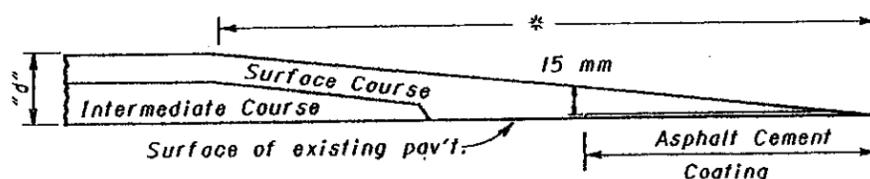
Details assume non-settled approach slabs. Smoothing of the profile for settlement is required per plan grades or as directed by the Engineer.

**FEATHERING AT STRUCTURES**

\* Min length - 120 mm per mm of "d".  
For speeds 80 km/h or greater, use 300 mm per mm of "d".



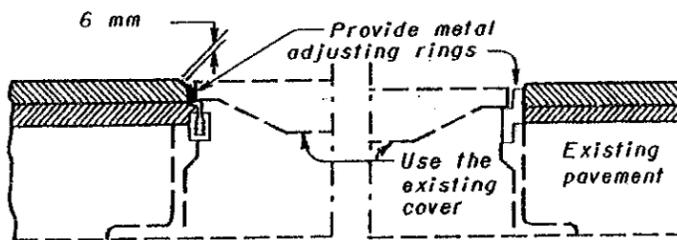
**BUTT JOINT TYPE**



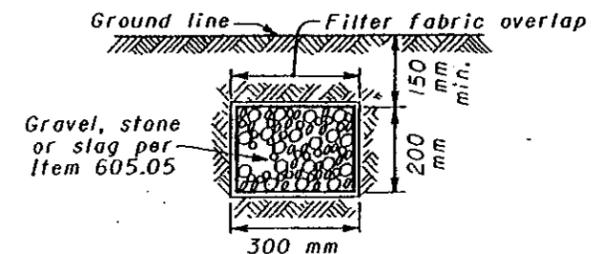
**TAPER EDGE TYPE**

NOTE: Either butt or taper type may be used unless type is specified by the plan.

**PLACING FEATHERED AREAS**

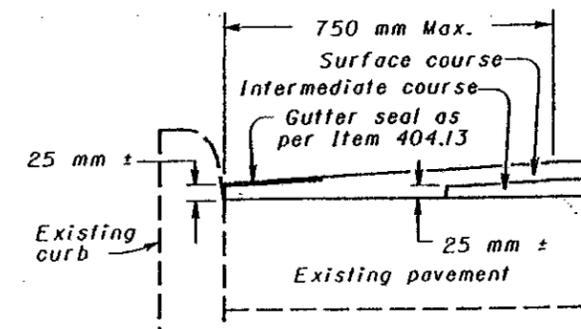


**USING METAL ADJUSTING RINGS**



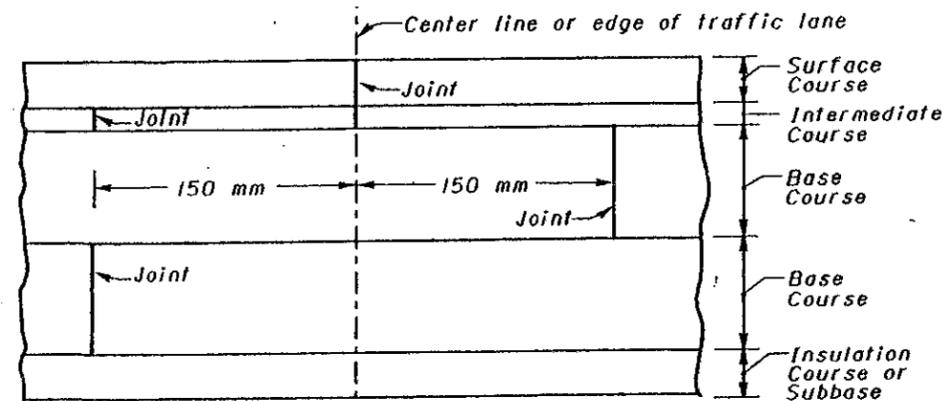
Aggregate drains to be placed where and as directed by Engineer. Provide filter fabric when specified as a separate pay item.

**AGGREGATE DRAIN**



Special care shall be taken during construction to obtain maximum compaction of bituminous concrete in gutters.

**GUTTER FINISH**



**LAPPING LONGITUDINAL JOINTS**

BUREAU OF LOCATION AND DESIGN  
OHIO DEPARTMENT OF TRANSPORTATION

DATE

10-28-94

**RESURFACING**

STANDARD CONSTRUCTION DRAWING  
**BP-3.1M**

APPROVED W.K. Hulman

ENGR., L & D



DESIGN SPECIFICATIONS: "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" ADOPTED BY AASHTO, 1996, INCLUDING THE 1997 INTERIM SPECIFICATION.

DESIGN DATA: CONCRETE CLASS S f'c = 31 MPa, REINFORCING STEEL ASTM A615M, A616M OR A617M GRADE 420 fy = 420 MPa.

CONTROL JOINTS FOR CONCRETE PARAPETS: THE JOINTS SHALL BE CONSTRUCTED BY SAWING 32 mm DEEP ALONG PERIMETER OF THE PARAPET AS SOON AS THE SAW CAN BE OPERATED WITHOUT DAMAGING THE CONCRETE.

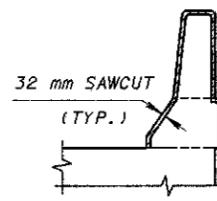
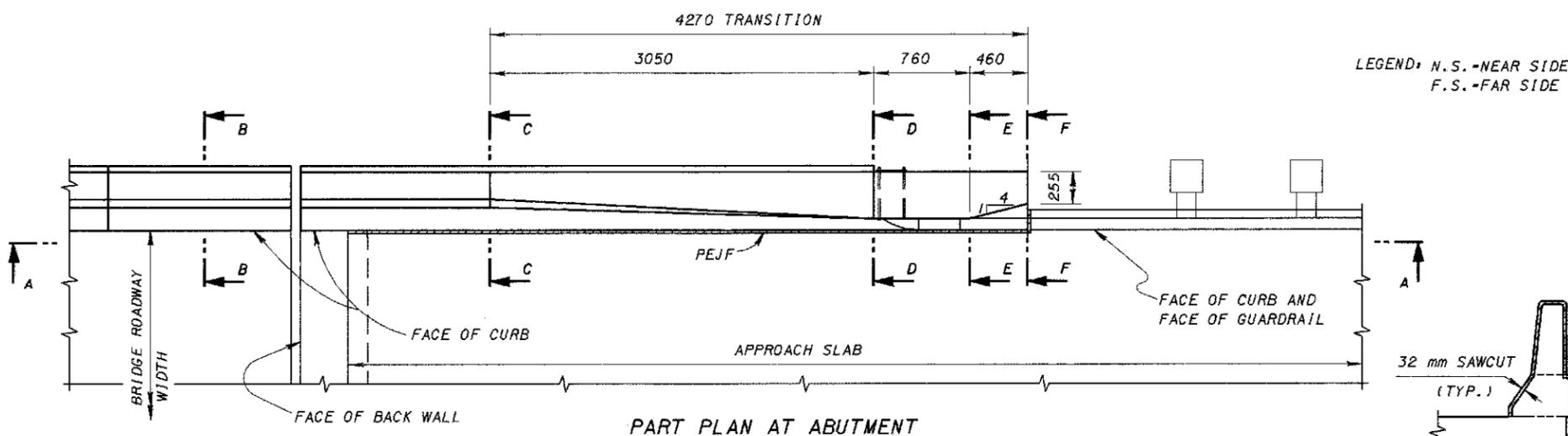
THE USE OF AN EDGE GUIDE, FENCE, OR JIG IS REQUIRED TO INSURE THAT THE CUT JOINT IS STRAIGHT, TRUE, AND ALIGNED ON ALL FACES OF THE PARAPET. THE JOINT WIDTH SHALL BE THE WIDTH OF THE SAW BLADE, A NOMINAL WIDTH OF 6 mm.

THE PERIMETER OF THE DEFLECTION CONTROL JOINT SHALL BE SEALED WITH A CAULKING MATERIAL TO A MINIMUM DEPTH OF 25 mm CONFORMING TO FEDERAL SPECIFICATION TT-S-0027E. THE BOTTOM 13 mm OF BOTH THE INSIDE AND OUTSIDE FACES OF THE PARAPET SHOULD BE LEFT UNSEALED TO ALLOW ANY WATER WHICH MAY ENTER THE JOINT TO ESCAPE.

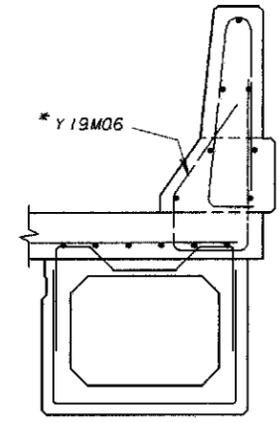
SAWCUT SHALL BE PLACED AT A MINIMUM OF 1800 mm AND MAXIMUM OF 3050 mm CENTERS.

QUANTITIES OF CONCRETE, REINFORCING STEEL, DEFLECTION JOINT SAWCUT AND CAULKING MATERIAL FOR PARAPET ARE INCLUDED WITH APPROPRIATE ITEM UNDER EITHER ABUTMENTS OR SUPERSTRUCTURE FOR PAYMENTS.

FOR BRIDGE TERMINAL ASSEMBLY SEE STANDARD CONSTRUCTION DRAWING GR-3.1M AND GR-3.2M.



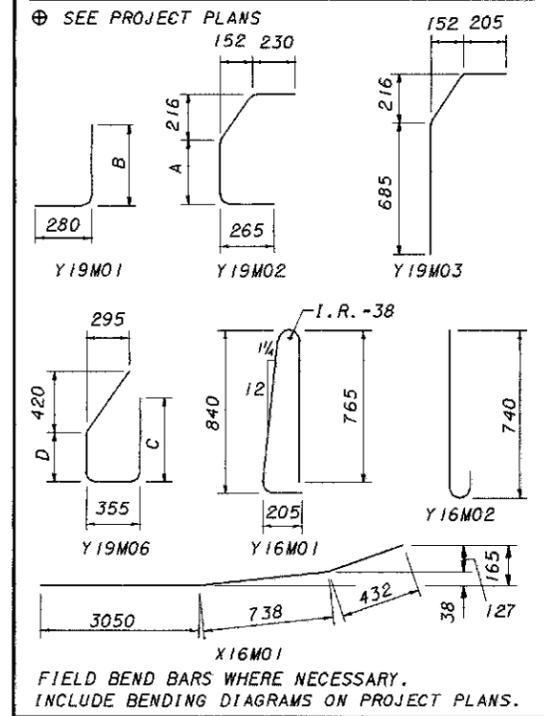
DETAIL A  
(section through sawcut)  
Sawcut Perimeter- 2160 mm



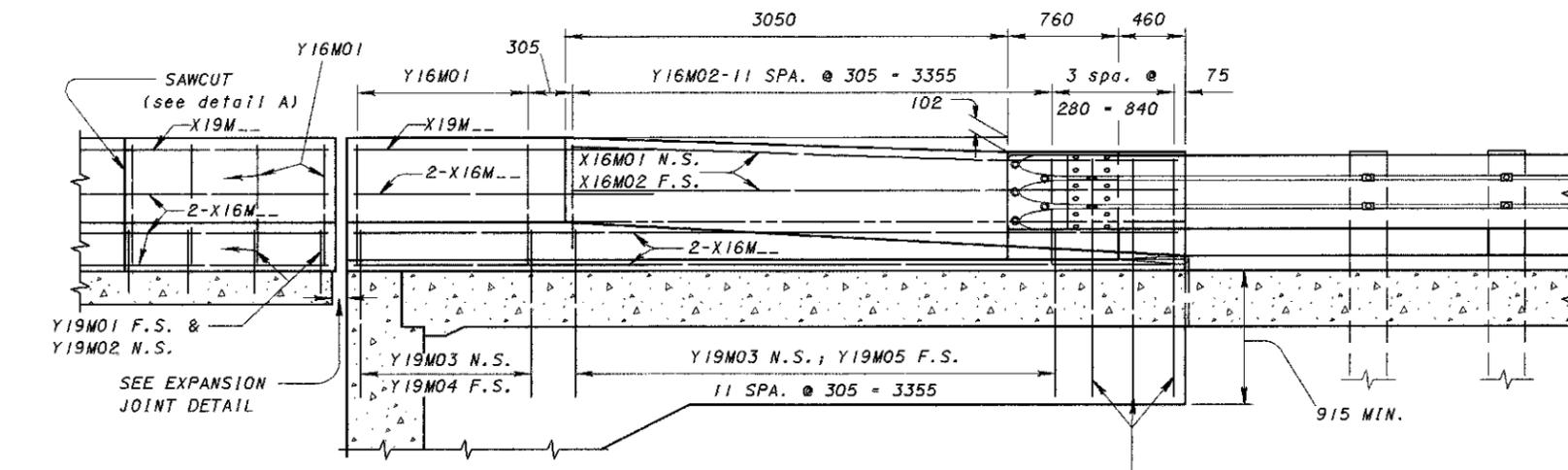
BOX BEAM REINFORCING DETAIL  
(composite deck)

Volume of 4270 mm transition section is 1.3 m<sup>3</sup>

REINFORCING BAR LIST					
MARK	LENGTH	SHP.	MARK	LENGTH	SHP.
X16M01	4220	BT.	Y19M01	B*230	BT.
X16M02	4220	STR.	Y19M02	A*660	BT.
X16M	⊕	STR.	Y19M03	1135	BT.
X19M	⊕	STR.	Y19M04	865	STR.
Y16M01	1825	BT.	Y19M05	1375	STR.
Y16M02	920	BT.	Y19M06	C*D*760	BT.



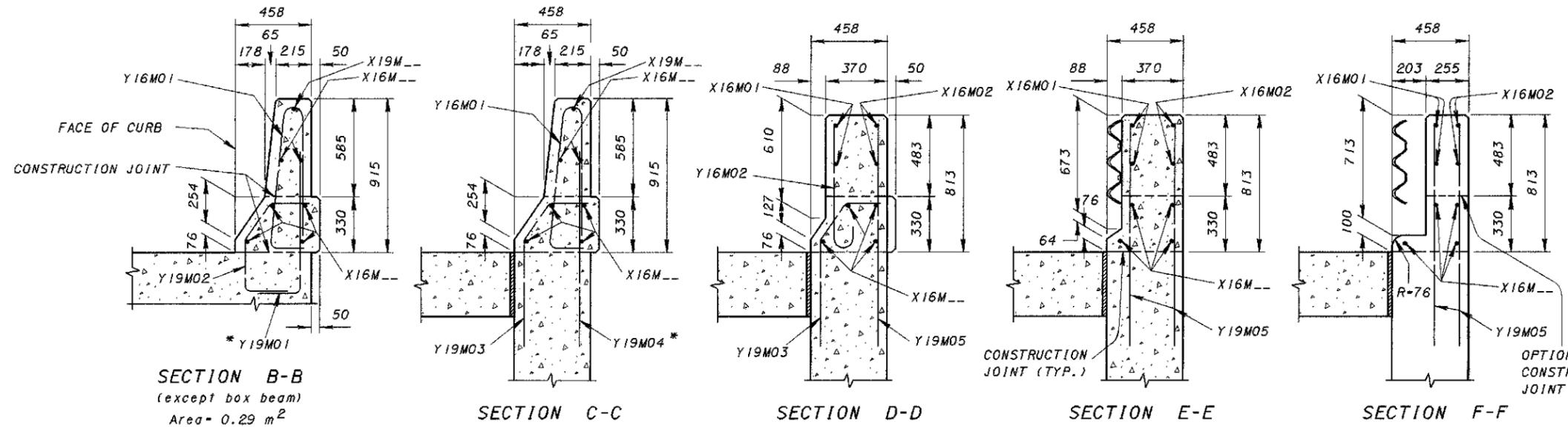
FIELD BEND BARS WHERE NECESSARY. INCLUDE BENDING DIAGRAMS ON PROJECT PLANS.



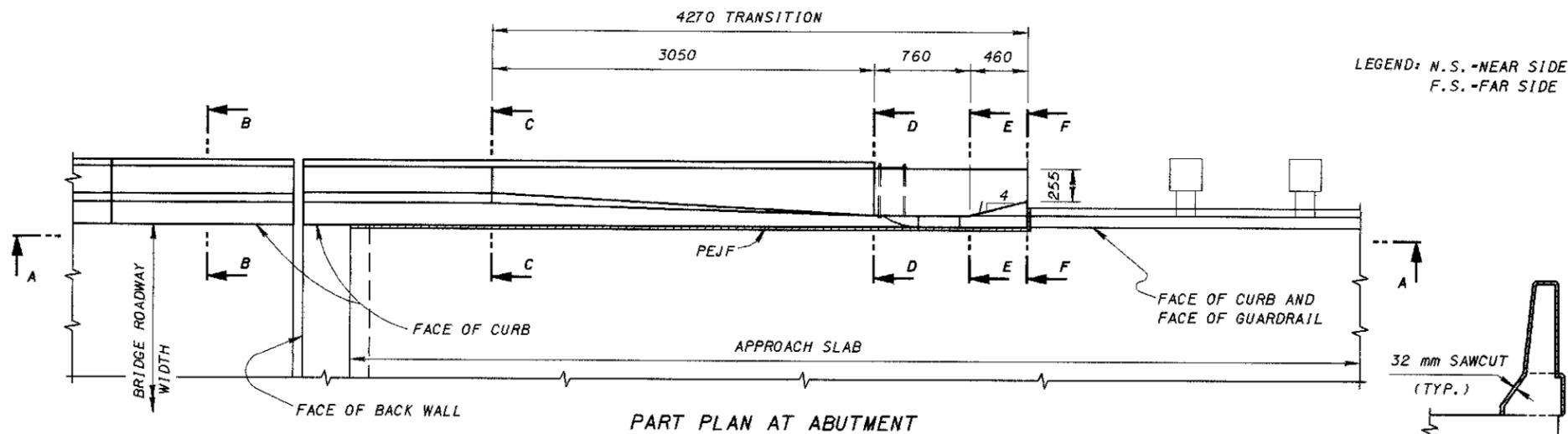
SECTION A-A

VERTICAL BARS SHALL BE SPACED AT 305 mm MAXIMUM.  
(see project plans)

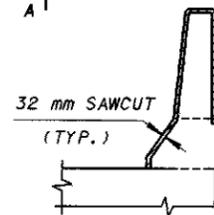
\* BARS Y19M01 (dim. B), Y19M04, Y19M06 (dim. C) SHALL EXTEND 550 mm TO 600 mm ABOVE THE CONSTRUCTION JOINT BETWEEN DECK AND PARAPET.



DESIGN AGENCY: OFFICE OF STRUCTURAL ENGINEERING  
 STATE OF OHIO DEPARTMENT OF TRANSPORTATION  
 REVIEWED: L.M.W.  
 CHECKED: J.S.  
 DESIGNED: REZA  
 REVISIONS: 8-21-98, 01-06-99  
 STANDARD: BRIDGE RAILING DEFLECTOR PARAPET TYPE 915 mm  
 DATE: 12-15-94  
 ADMINISTRATOR: [Signature]



PART PLAN AT ABUTMENT



DETAIL A

(section through sawcut)  
Sawcut Perimeter = 2464 mm

DESIGN SPECIFICATIONS: "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" ADOPTED BY AASHTO, 1996, INCLUDING THE 1997 INTERIM SPECIFICATION.

DESIGN DATA: CONCRETE CLASS S f'c = 31 MPa, REINFORCING STEEL ASTM A615M, A616M OR A617M GRADE 420 fy = 420 MPa.

CONTROL JOINTS FOR CONCRETE PARAPETS: THE JOINTS SHALL BE CONSTRUCTED BY SAWING 32 mm DEEP ALONG PERIMETER OF THE PARAPET AS SOON AS THE SAW CAN BE OPERATED WITHOUT DAMAGING THE CONCRETE.

THE USE OF AN EDGE GUIDE, FENCE, OR JIG IS REQUIRED TO INSURE THAT THE CUT JOINT IS STRAIGHT, TRUE, AND ALIGNED ON ALL FACES OF THE PARAPET. THE JOINT WIDTH SHALL BE THE WIDTH OF THE SAW BLADE, A NOMINAL WIDTH OF 6 mm.

THE PERIMETER OF THE DEFLECTION CONTROL JOINT SHALL BE SEALED WITH A CAULKING MATERIAL TO A MINIMUM DEPTH OF 25 mm CONFORMING TO FEDERAL SPECIFICATION TT-S-00227E. THE BOTTOM 13 mm OF BOTH THE INSIDE AND OUTSIDE FACES OF THE PARAPET SHOULD BE LEFT UNSEALED TO ALLOW ANY WATER WHICH MAY ENTER THE JOINT TO ESCAPE.

SAWCUT SHALL BE PLACED AT A MINIMUM OF 1800 mm AND MAXIMUM OF 3050 mm CENTERS.

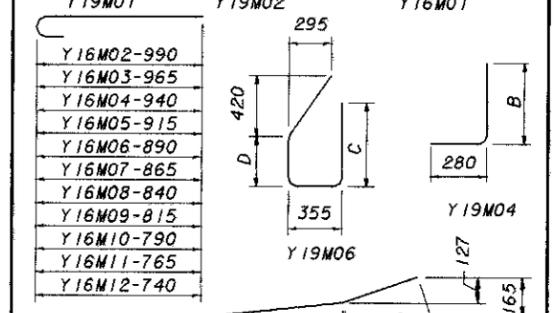
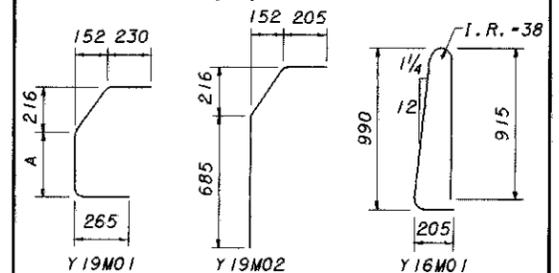
QUANTITIES OF CONCRETE, REINFORCING STEEL, DEFLECTION JOINT SAWCUT AND CAULKING MATERIAL FOR PARAPET ARE INCLUDED WITH APPROPRIATE ITEM UNDER EITHER ABUTMENTS OR SUPERSTRUCTURE FOR PAYMENTS.

FOR BRIDGE TERMINAL ASSEMBLY SEE STANDARD CONSTRUCTION DRAWING GR-3.1M AND GR-3.2M.

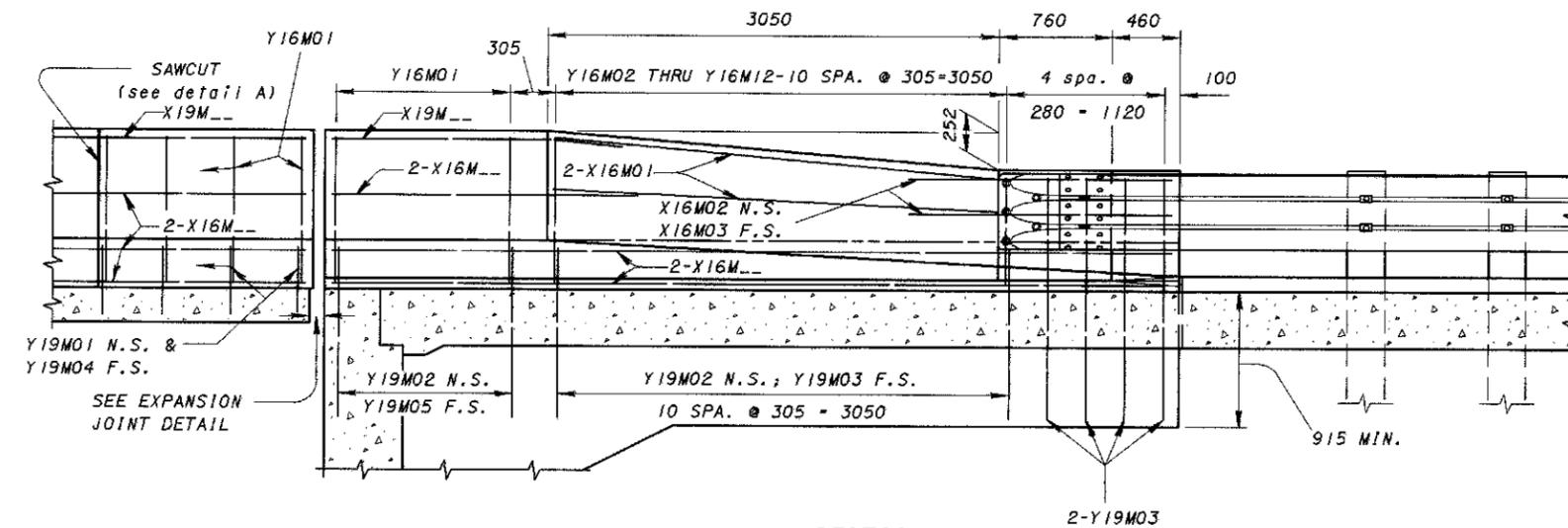
Volume of 4270 mm transition section is 1.36 m<sup>3</sup>

REINFORCING BAR LIST					
MARK	LENGTH	SHP.	MARK	LENGTH	SHP.
X16M01	3050	STR.	Y16M01	2130	BT.
X16M02	1725	BT.	Y16M02	1170	BT.
X16M03	1725	STR.	Y16M03	1165	BT.
X16M	⊕	STR.	Y16M04	1120	BT.
X19M	⊕	STR.	Y16M05	1095	BT.
			Y16M06	1070	BT.
Y19M01	A+660	BT.	Y16M07	1045	BT.
Y19M02	1135	BT.	Y16M08	1020	BT.
Y19M03	1375	STR.	Y16M09	995	BT.
Y19M04	B+230	BT.	Y16M10	970	BT.
Y19M05	865	STR.	Y16M11	945	BT.
Y19M06	C+D+760	BT.	Y16M12	920	BT.

⊕ SEE PROJECT PLANS



FIELD BEND BARS WHERE NECESSARY.  
INCLUDE BENDING DIAGRAMS ON PROJECT PLANS.



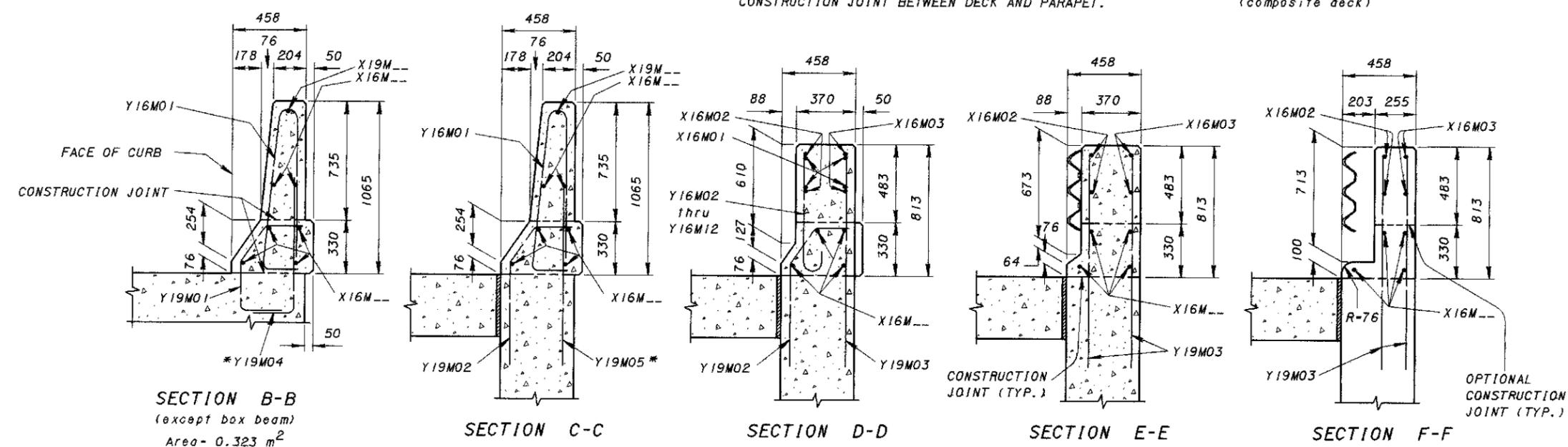
SECTION A-A

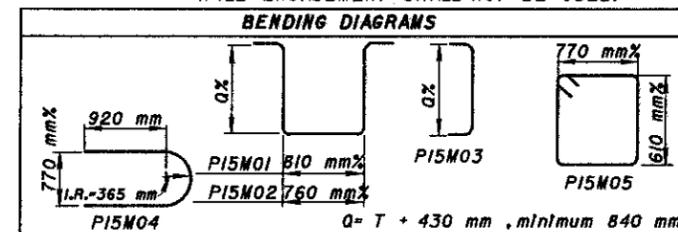
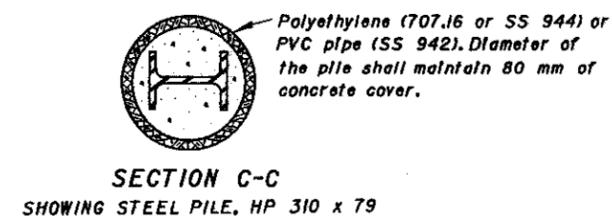
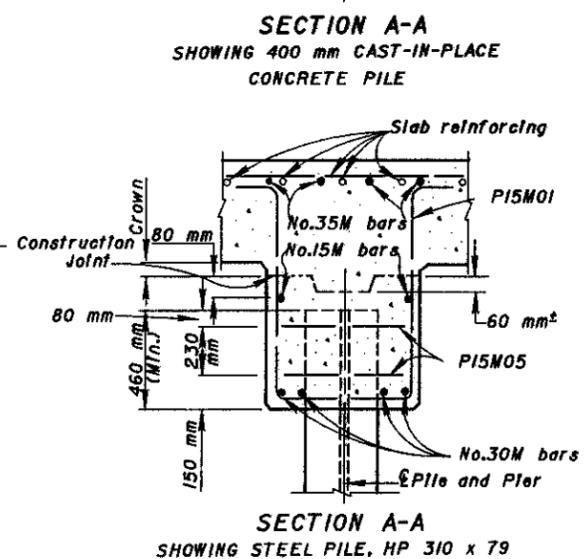
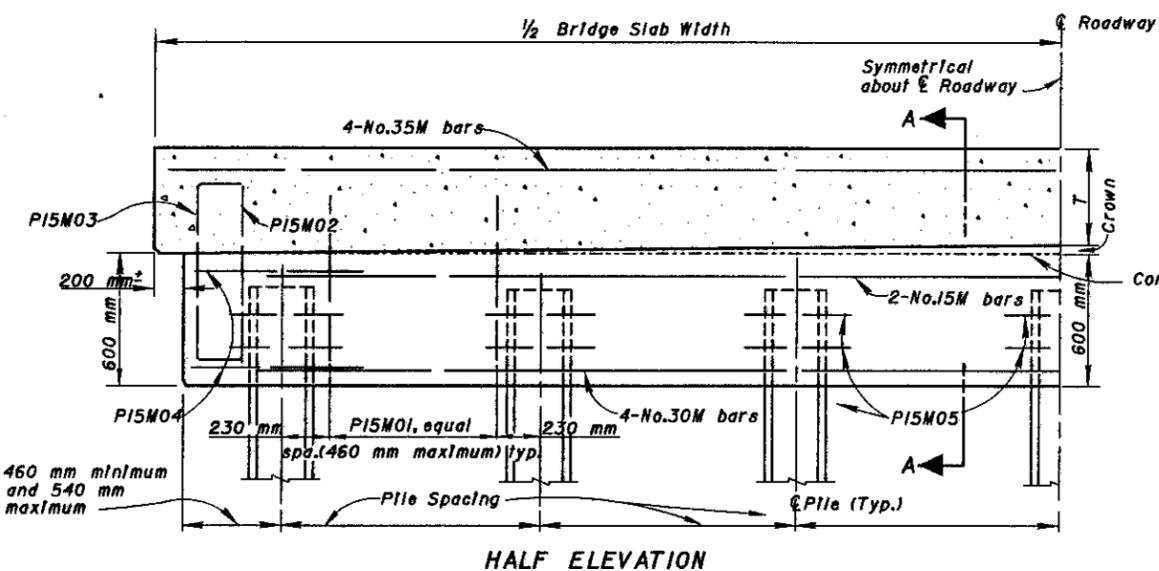
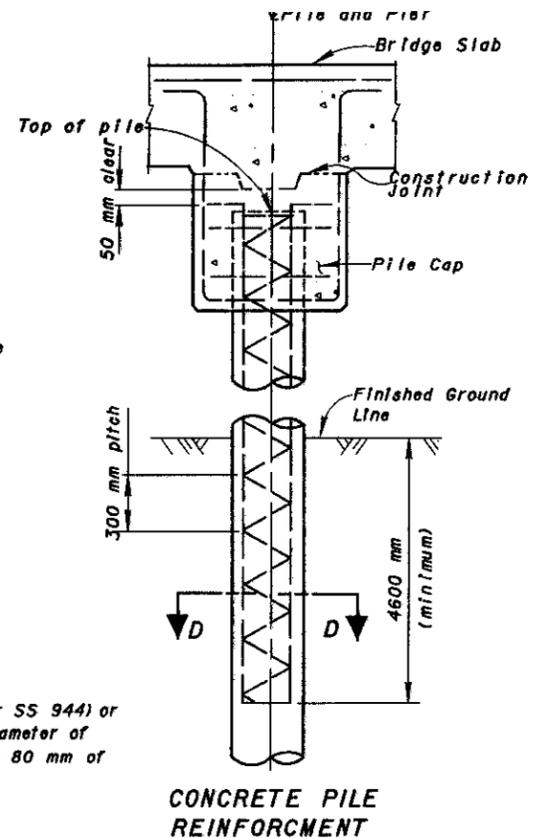
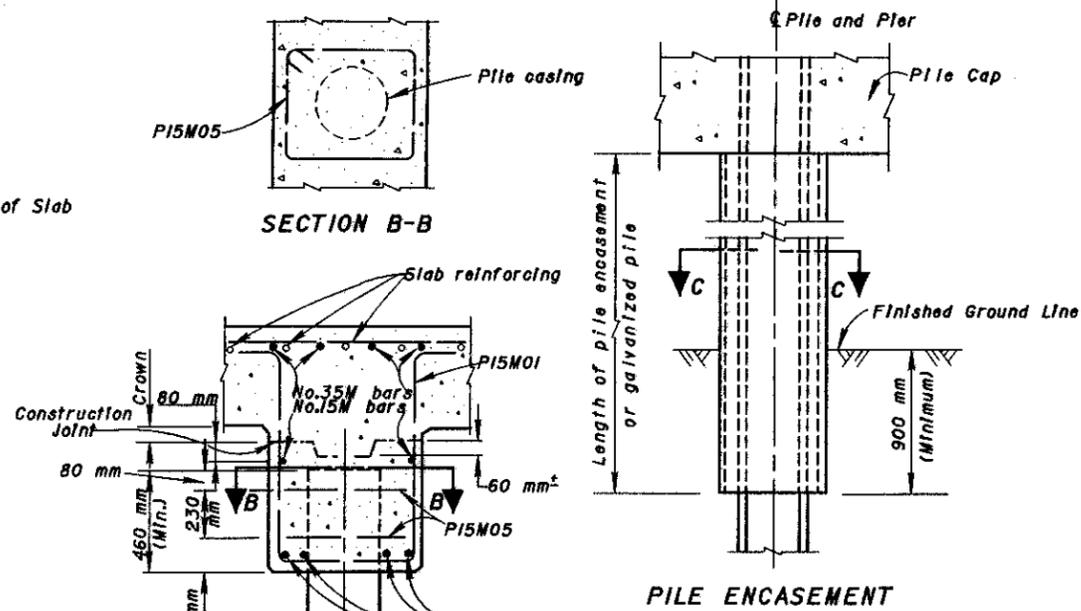
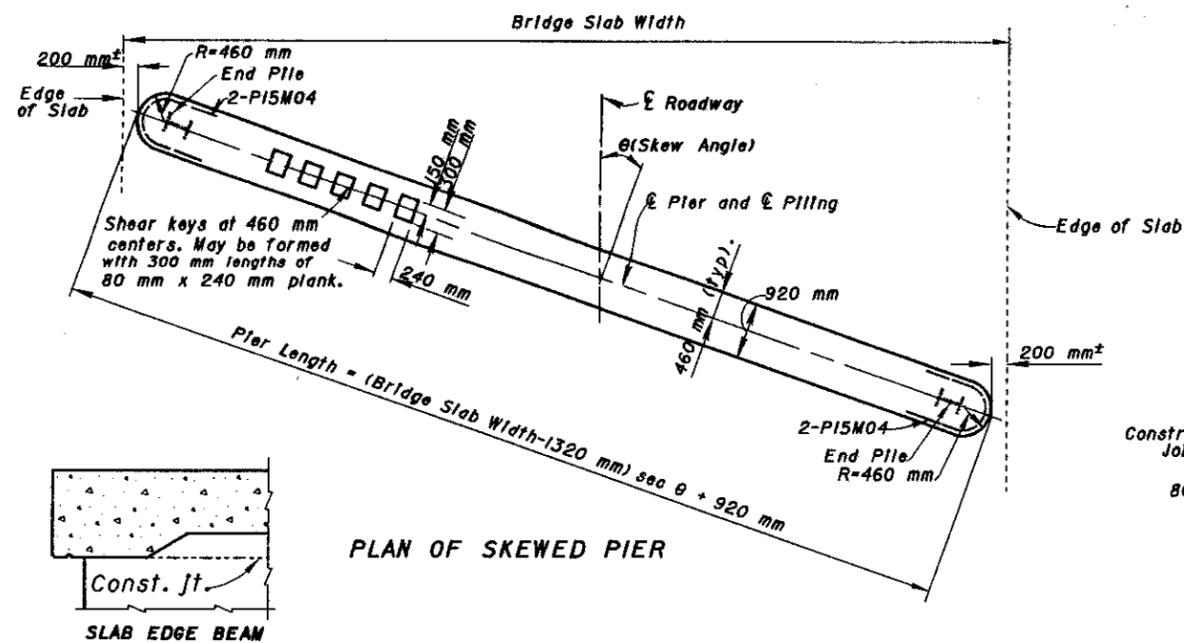
VERTICAL BARS SHALL BE SPACED AT 305 MAXIMUM.  
(see project plans)

\* BARS Y19M04 (dim. B), Y19M05, Y19M06 (dim. C) SHALL EXTEND 550 mm TO 600 mm ABOVE THE CONSTRUCTION JOINT BETWEEN DECK AND PARAPET.

BOX BEAM REINFORCING DETAIL

(composite deck)





**GENERAL NOTES**

**DESIGN SPECIFICATION:**  
This Standard Drawing conforms to "Standard Specifications for Highway Bridges" adopted by the American Association of State Highway and Transportation Officials, 1992, including the 1993 Interim specifications and the ODOT Bridge Design Manual.

**DESIGN LOADING:** MS18 and the Alternate Military Loading.

**DESIGN DATA:**

**CONCRETE CLASS "S"** - Compressive Strength 31 MPa

**REINFORCING STEEL**- ASTM A615M, A616M, or A617M Grade 400, with a minimum yield strength of 400 MPa and shall be epoxy coated.

**SPIRAL REINFORCEMENT** may be plain bars, ASTM A82M or A615M and shall be epoxy coated.

**ITEM SPECIAL- PILE ENCASEMENT:** All steel H piles shall be encased or galvanized as shown.

The encasement option shall consist of a pipe filled with either class C or class S concrete as per 507.06.

The galvanizing option shall be as per 711.02. The galvanizing coating minimum thickness shall be 100 micrometers. Gouges, scrapes,

**GENERAL NOTES (CONTINUED)**

scratches or other surface imperfections caused by handling or driving of the H pile shall be repaired to the satisfaction of the Engineer. Additional galvanizing length beyond plan dimensions shall be at the contractor's expense.

The length of pile encasement shall be measured in meters along the length of the pile. This item shall include all work and materials necessary to furnish the required encasement.

Payment for pile encasement or galvanizing will be made at the contract unit price per linear meter as Item Special, Pile Encasement.

**FALSEWORK SUPPORT:** Attachment of the falsework support members to pier piles will be permitted if the attachment is made to the portion of pile encased in the pier cap. There shall be no eccentric loads produced in the piles by attached falsework support members.

**DESIGN INSTRUCTIONS**

**GENERAL:** This drawing provides general construction details. The project plans for each structure shall show Stations, Span Lengths, Roadway Width, Skew, Curve and Super-elevation (if any) Elevations, Superstructure Details, Estimated Quantities, Reinforcing Steel List, Pile Encasement and other necessary details and special notes.

**REINFORCING STEEL:** The longitudinal No.35M, No.30M and No.15M bars, at the option of the Contractor, may be furnished either

in one length as shown hereon, or spliced. If the splice option is chosen, the No.35M bar shall be lapped 2800 mm, the No.30M bar shall be lapped 2450 mm and the No.15M bar shall be lapped 900 mm. A staggered lap splice arrangement should be used.

Payment for reinforcing shall be the plan quantity. Do not adjust the plan to include bar weights furnished to provide lap splices.

**PILE TYPE AND SIZE:** The pile type and size shall be specified on the project plans. For example a 400 mm diameter cast-in-place reinforced concrete pile as shown in section D-D or a HP 310 x 79 pile.

**PILE DESIGN LOADS:** The pile design loads and estimated pay lengths shall be given in the Structure General Notes. Pile spacing shall not exceed 2300 mm.

**SLAB THICKNESS:** See Slab Standard Drawing for value of "T".

**LIMITS OF DESIGN:** This Standard Drawing should not be used for any bridge in which the following limits are exceeded.

- Skew angle equals 35°.
- Exposed pile height equals 6000 mm (consider scour depths and soil density)
- To support a continuous span arrangement greater than 17 000 mm.
- Slope embankment, debris or ice flow loads which would cause appreciable horizontal force against the pile bent.
- Rock or other firm material would prevent driving piles at least 3000 mm below finished ground line.

Bar Size is Indicated in the bar mark. The first letter identifies the bar location; next two digits and letter indicates the metric bar size designation; and the remaining digits its sequence number.

- Example: P15M01  
a) P = Location of the bar in the structure  
b) 15M = Metric bar size designation  
c) 01 = Sequence

**Legend:**

- I.R. = Inside Radius
- X = Out to Out
- R = Radius
- T = Slab Thickness

DESIGN AGENCY: BUREAU OF BRIDGES AND STRUCTURAL DESIGN  
 STATE OF OHIO DEPARTMENT OF TRANSPORTATION: 12-18-94 DATE  
 ENGINEER OF BRIDGES: Richard L. Englund  
 REVIEWED: LHM  
 CHECKED: SAM  
 PREPARED: JAM  
 DRAWN: GFJ  
 REVISED: CPP-2-94M  
 STANDARD: CAPPED PILE PIER FOR CONTINUOUS SLAB BRIDGES-METRIC  
 1/1

# STRAW OR HAY BALES

**BALE PLACEMENT:** Bales shall be tightly placed adjacently and entrenched 2" [50] to 3" [75] before staking; or a small amount of loose soil shall be lightly compacted along the upstream edge of the bales.

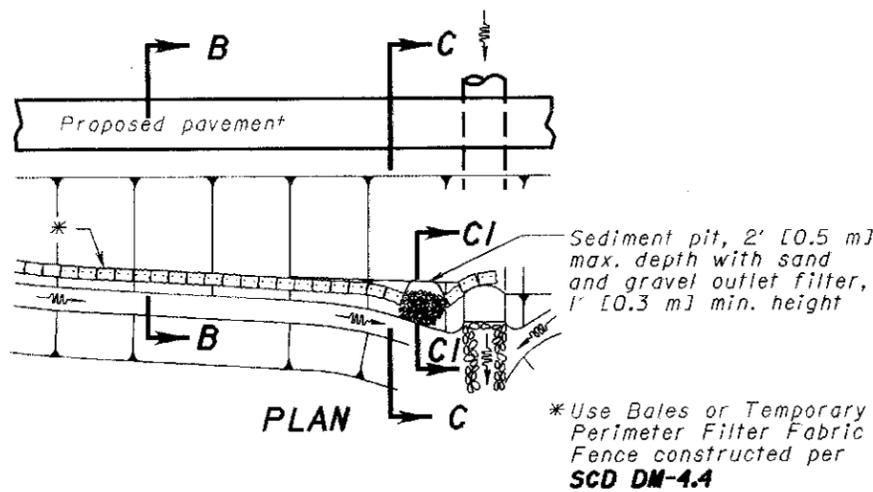
Each bale shall be firmly staked with a minimum of two stakes at least 3' [1 m] in length. Stakes shall be wooden 2"x2" [50x50], reinforcing bars or fence posts.

Loose straw or hay shall be wedged between and under staked bales.

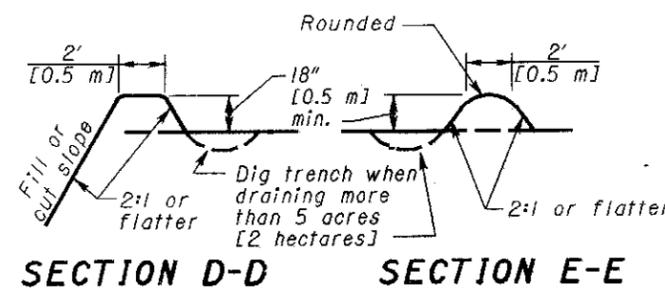
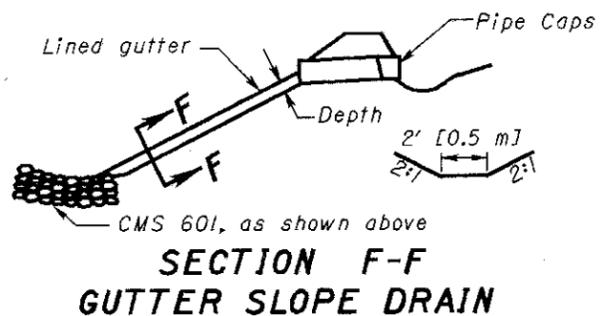
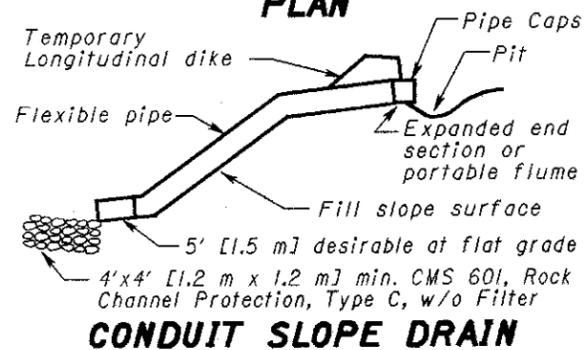
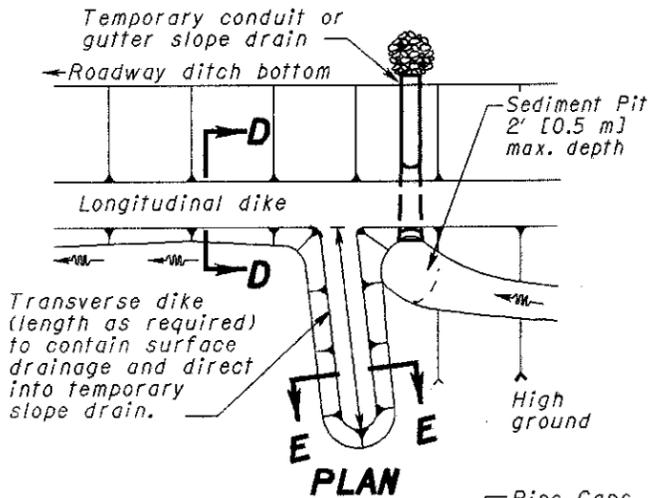
**PITS:** Sediment pits shall be provided and their cost included in the unit price bid for the adjacent SS 877 items.

**MAINTENANCE:** The maintenance or replacement will be paid for by the Department under unit bid prices, agreed unit price, or under 109.04.

**BASIS OF PAYMENT:** Straw or hay bale installation shall be paid for under Item 877 - Temporary Perimeter Filter Fabric Fence. Cost will include placing, staking and removing.



# DIKES AND SLOPE PROTECTION



Area in acres [hectares]	Pipe Sizes			Gutter depth
	Smooth	Corrugated	Half-round	
0-4 [0-1.6]	6" [150]	6" [150]	18" [450]	8" [200]
4-8 [1.6-3.2]	8" [200]	12" [300]	18" [450]	8" [200]
8-12 [3.2-4.9]	10" [250]	15" [375]	21" [525]	12" [300]

**GENERAL:** Dikes & drains shown shall be used when earthwork operations on slopes are higher than 8' [2.5 m] and fill operations are suspended for three weeks or more. Smaller dikes used at the end of a day's operation shall be considered as part of the earthwork. Temporary slope drains shall be suitably positioned and anchored to prevent movement or undermining.

**LONGITUDINAL DIKES:** Longitudinal dikes shall be constructed of suitable material as per CMS 203 and compacted to 85% of maximum density.

**CONDUITS:** Conduits for slope drains shall be corrugated steel pipe, corrugated or smooth plastic pipe, rubber conduit, or an approved equal.

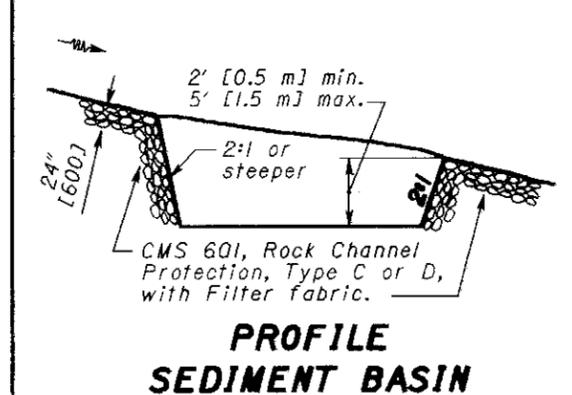
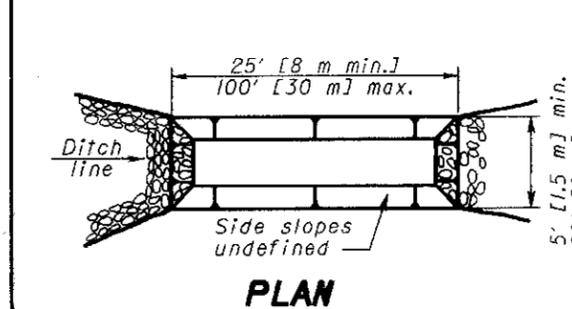
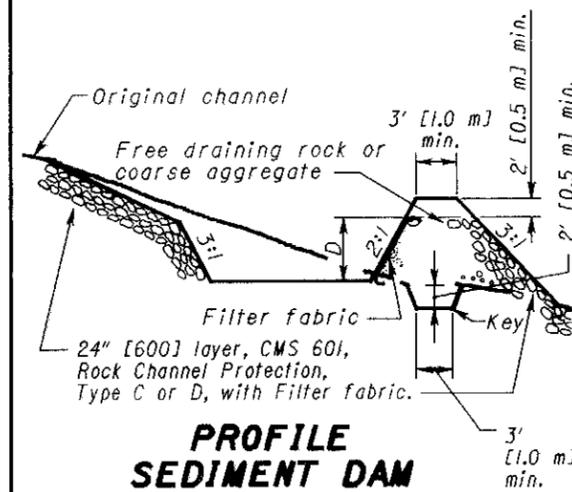
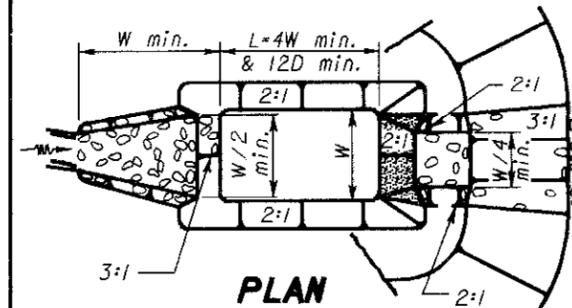
**GUTTERS:** Gutters for slope drains shall be lined with Type C rock channel protection, crushed aggregate slope protection, portland cement concrete, bituminous concrete, plastic sheeting (on slopes 4:1 max.), partial pipe sections or approved equal.

**PITS:** Sediment pits shall be provided and their cost included in the unit price bid for the adjacent items.

**MAINTENANCE:** Dikes and slope protection shall be acceptably maintained. The maintenance or replacement cost will be paid for by the Department under unit bid prices, agreed unit prices, or CMS 109.04.

**BASIS OF PAYMENT:** Temporary dikes shall be paid for under Item 877-Temporary Dikes. Temporary slope drains shall be paid for under Item 877-Temporary Slope Drains. Rock required shall be paid for under Item 601, Rock Channel Protection, Type C, w/o Filter.

# SEDIMENT BASINS & DAMS



**EMBANKMENT:** Sediment basin embankment construction shall be as per CMS 203.

**FILTERS:** Filter fabric shall be per CMS 601.02 and installed per CMS 601.08 or as detailed here. Such fabrics may be cleaned in lieu of replacement. The cost of all filter fabric required to construct the sediment basin or dam shall be included in the cost of the Item 601, Rock Channel Protection, with Filter Fabric.

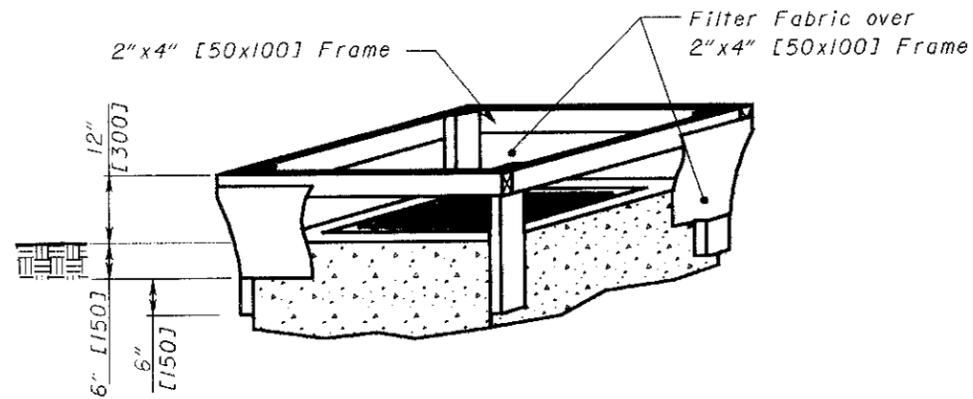
**SIZE:** The volume shown on the plans is the total storage volume required for the sediment basin or dam (67 cubic yards per acre [127 cubic meters per hectare]). A series of smaller basins or dams may be substituted for a larger basin or dam.

**MAINTENANCE:** Sediment pits, dams and basins shall be acceptably maintained. The maintenance or replacement cost will be paid for by the Department under unit bid prices, agreed unit prices, or CMS 109.04.

**BASIS OF PAYMENT:** Sediment Dams and Basins shall be paid for under Item 877-Sediment Basin and Dams. The pay quantity shall be the actual number of cubic yards [cubic meters] of excavation and embankment required to construct the basin or dam. Rock required shall be paid for under Item 601, Rock Channel Protection, Type C or D, with Filter.

THIS DRAWING REPLACES DM-4.3M DATED 6-30-95.

# TEMPORARY INLET PROTECTION FILTER FABRIC FENCE

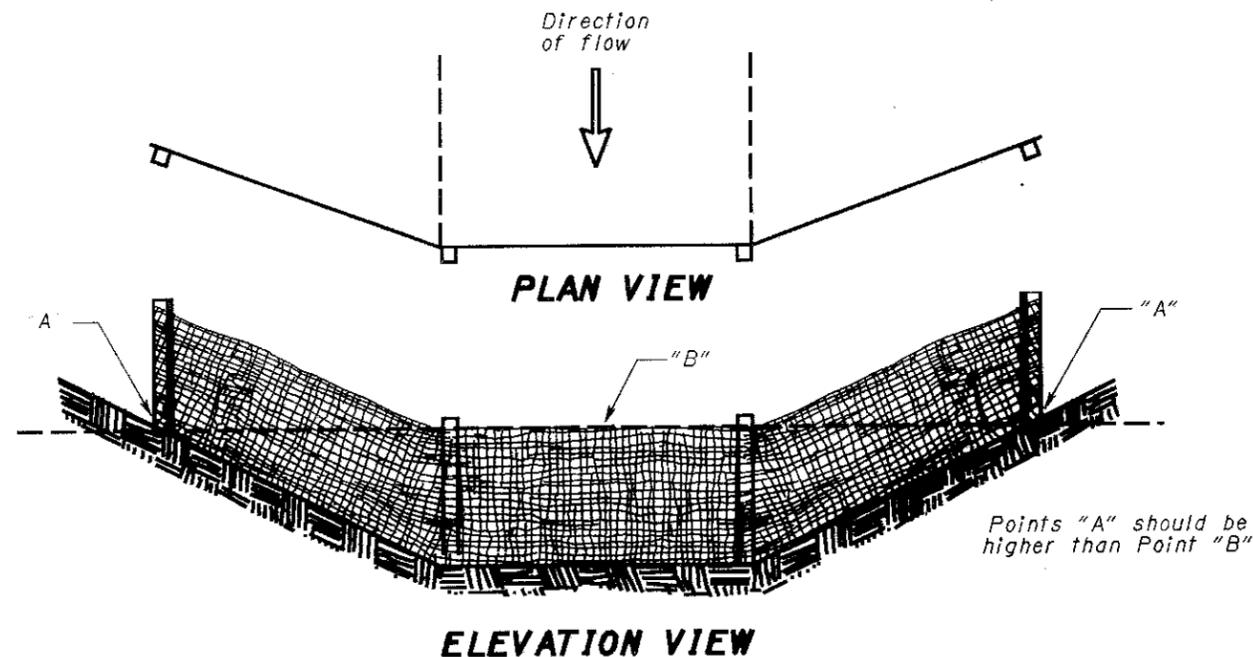


**MATERIALS:** Filter Fabric shall meet the requirements of CMS 712.09, Type C. The framing wood shall be construction grade 2"x4" [50x100] lumber.

**CONSTRUCTION:** Excavate a 6" [150] deep trench around the inlet, then drive the 2"x4" [50x100] posts 6" [150] below the excavated trench. Construct the wooden frame using the overlap joint detail shown above. The filter fabric shall be stretched around the wooden frame and securely fastened. The filter fabric shall overlap across one side of the inlet such that the ends of the filter fabric are not attached to the same post. Backfill and compact the excavated soil. Other devices may be used with the approval of the Director.

**MAINTENANCE:** The filter fabric shall be maintained to be functional. This shall include removal of trapped sediment and required cleaning, repair, and/or replacement of the filter fabric. The maintenance or replacement cost will be paid for by the Department under unit bid prices, agreed unit prices, or under CMS 109.04.

**PAYMENT:** The cost of all materials, construction and removal shall be paid for under **Item 877 - Temporary Inlet Protection Filter Fabric Fence, Linear Foot [Meter]**.



## PLACEMENT AND CONSTRUCTION OF DITCH CHECK FILTER FABRIC FENCE

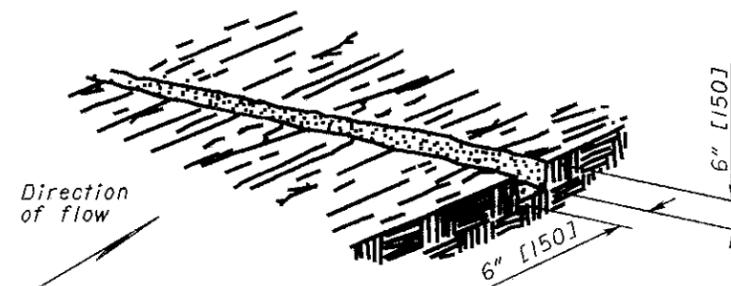
# NOTES

**MATERIALS:** Filter fabric shall meet the requirements of CMS 712.09, Type C. Support stakes shall be a minimum of 1.5"x1.5" [38x38], nominal, and shall be hardwood of sound quality. The stakes shall be driven a minimum of 6" [150] below the bottom of the filter fabric. The maximum spacing between support stakes shall be 10' [3 m].

**CONSTRUCTION:** The bottom of the fabric shall be buried 6" [150] below the ground. The ends of adjacent sections of fence shall be overlapped with the end stake of each section wrapped together prior to installation. The ground elevation of the fence shall be held constant except that the end elevations shall be raised upslope to prevent flow around the end of the fence.

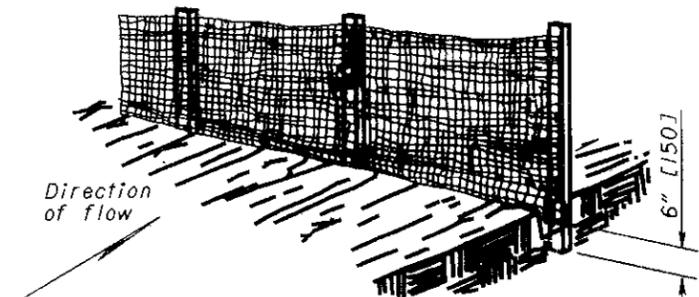
**MAINTENANCE:** The filter fabric fence shall be maintained to be functional. This shall include removal of trapped sediment and required cleaning, repair, and replacement of the filter fabric. The maintenance or replacement cost will be paid for by the Department under unit bid prices, agreed unit prices, or CMS 109.04.

**PAYMENT:** The cost of all materials, construction and removal shall be paid for under **Item 877 - Temporary Perimeter Filter Fabric Fence or Temporary Ditch Check Filter Fabric Fence, Linear Foot [Meter]**.



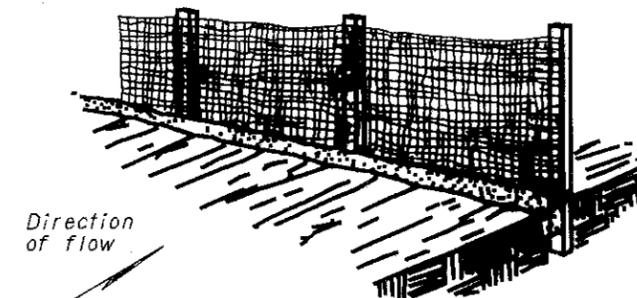
Excavate a 6"x6" [150x150] trench along the proposed fence line.

### STEP 1



Place fabric and support stakes and extend fabric into the trench.

### STEP 2



Backfill and compact the excavated soil.

### STEP 3

## PLACEMENT AND CONSTRUCTION OF PERIMETER FILTER FABRIC FENCE

THIS DRAWING REPLACES DM-4.4M DATED 6-30-95.

NUMBER  
DM-4.4

STANDARD ROADWAY CONSTRUCTION DRAWING  
TEMPORARY EROSION CONTROL

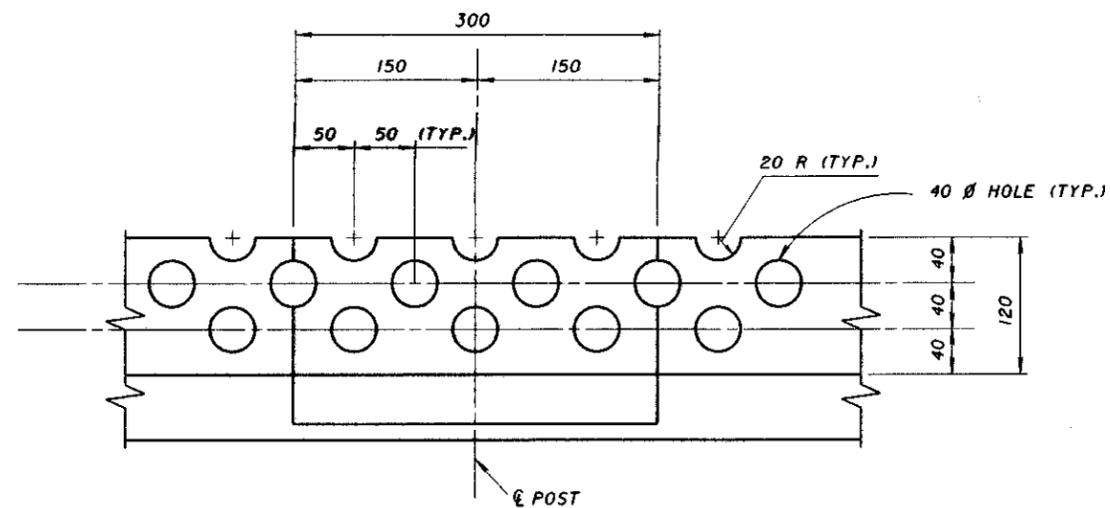
DESIGN CHECK  
OFFICE OF  
PLANNING

All metric dimensions  
(in brackets [ ]) are  
in millimeters unless  
otherwise noted.

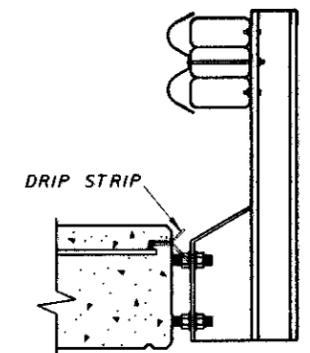
STDS. ENGR.  
M. EVANS  
DRAWN  
D. FOCKE

REVISIONS

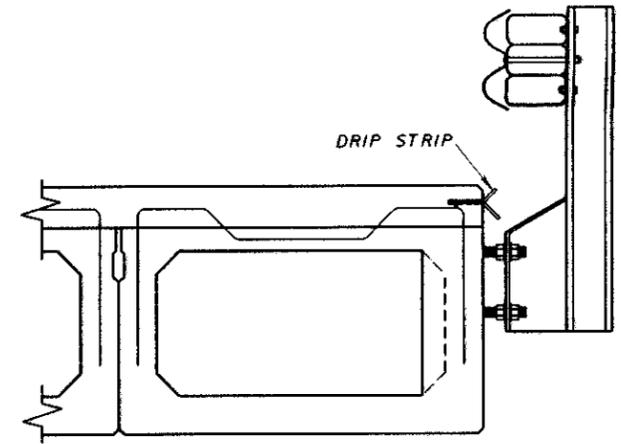
OHIO DEPARTMENT OF TRANSPORTATION  
4-29-99  
DATE  
ROADWAY DESIGN ENGINEER  
L. J. ...



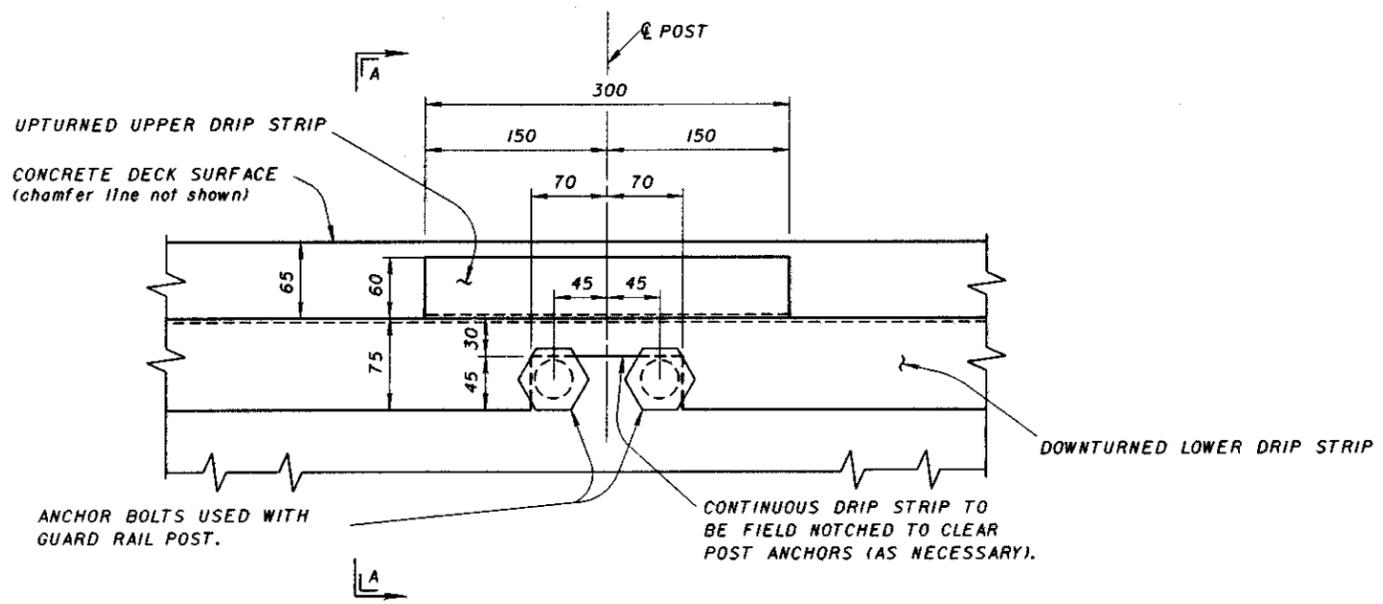
**PARTIAL PLAN**



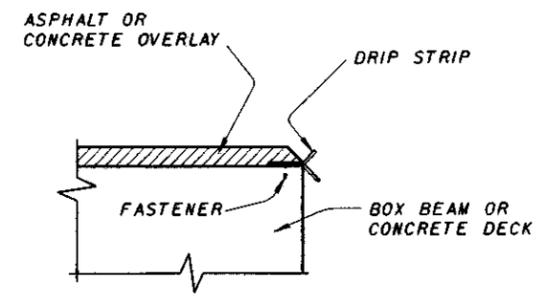
**SECTION AT EDGE OF CONCRETE DECK SLAB**



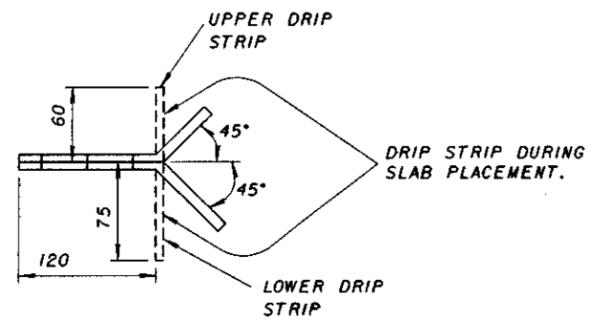
**SECTION AT EDGE OF COMPOSITE PRESTRESSED BOX BEAM DECK**



**ELEVATION**



**SECTION AT EDGE OF ASPHALT OR CONCRETE OVERLAY**



**SECTION A-A**

\* PRIOR TO PLACING AN ASPHALT OR CONCRETE OVERLAY, THE BENT DRIP STRIPS SHALL BE INSTALLED ALONG THE EDGE OF THE SLAB OR PRESTRESSED BOX BEAM AS SHOWN. THE DRIP STRIPS SHALL BE FASTENED WITH (32 mm length, 3 mm shank diameter) BUTTON HEAD SPIKES WITH DEFORMED SHANKS OR EXPANSION ANCHORS AT 450 mm C/C MAX. ALL INSTALLATION DEVICES SHALL EITHER BE GALVANIZED OR STAINLESS STEEL.

OTHER SIMILAR DEVICES WHICH WILL NOT DAMAGE THE CONCRETE MAY BE USED SUBJECT TO THE APPROVAL OF THE ENGINEER.

**DRIP STRIP NOTES:**

LOWER STAINLESS STEEL DRIP STRIP, AS DETAILED, SHALL BE INSTALLED ALONG THE FULL LENGTH OF EACH SIDE OF THE BRIDGE. IF SPLICES ARE REQUIRED IN THE LOWER DRIP STRIP, THE INDIVIDUAL PIECES SHALL BE BUTTED TIGHTLY TOGETHER, NOT LAPPED. A 300 mm LONG UPPER DRIP STRIP SHALL BE INSTALLED AT EACH RAILING POST. STRIPS SHALL BE BENT UP AT 90° AGAINST THE INSIDE FACE OF THE FORMS BEFORE CONCRETE IS PLACED. AFTER THE FORMS ARE REMOVED, THE DRIP STRIPS SHALL BE BENT TO A FINAL POSITION OF 45° AS SHOWN IN SECTION A-A.

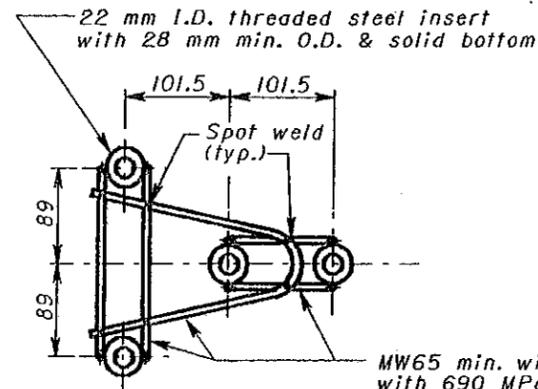
STAINLESS STEEL SHALL BE A MINIMUM OF 0.8 mm ASTM A167, TYPE 304, MILL FINISH.

CARE SHALL BE USED WHEN STRIPPING FORMWORK SO AS NOT TO DAMAGE OR WRINKLE THE STAINLESS STEEL DRIP STRIP. TO FURTHER ENSURE THAT WRINKLING OF THE STRIPS DOES NOT OCCUR, AN ADEQUATE LENGTH BACKUP BAR SHALL BE USED DURING THE BENDING OUT OPERATION.

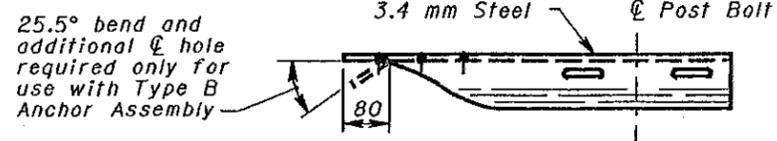
TOTAL QUANTITY FOR BID ITEM SHALL INCLUDE LINEAR FOOTAGE OF BOTH LOWER AND UPPER DRIP STRIPS.

PAYMENT SHALL BE AT THE CONTRACT PRICE BID FOR ITEM SPECIAL, LIN. FT. STEEL DRIP STRIP AND SHALL INCLUDE ALL MATERIALS, LABOR, TOOLS AND INCIDENTALS NECESSARY TO COMPLETE THIS ITEM.

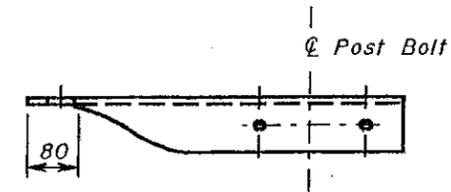
STATE OF OHIO DEPARTMENT OF TRANSPORTATION		12-15-94	
BUREAU OF BRIDGES AND STRUCTURAL DESIGN		DATE	
DESIGNED	REZA	CHECKED	JS
APPROVED	REZA	APPROVED	LWM
STANDARD		DS-1-94M	
DRIP STRIP DETAIL FOR STRUCTURES WITH OVER THE SIDE DRAINAGE			



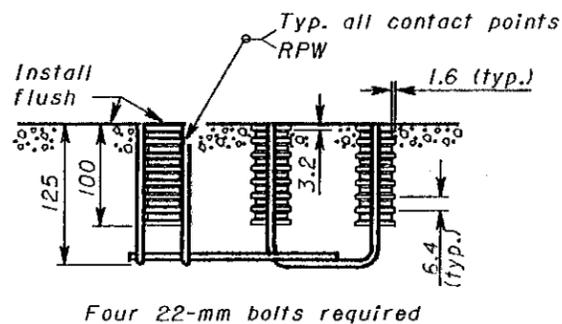
PLAN



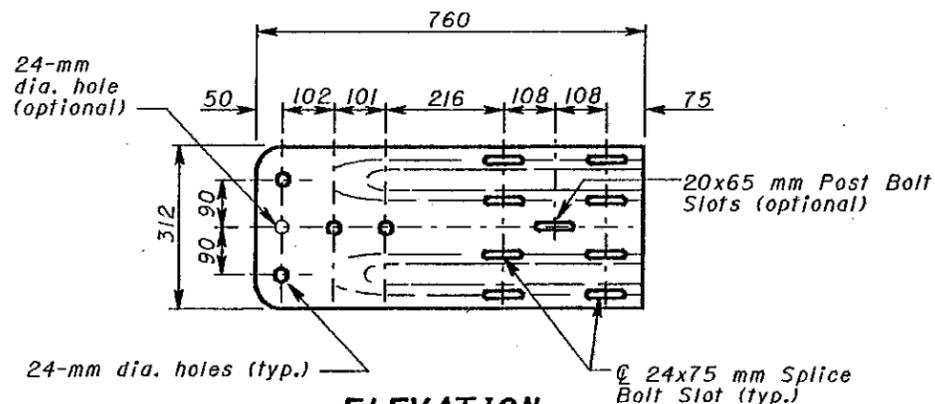
PLAN



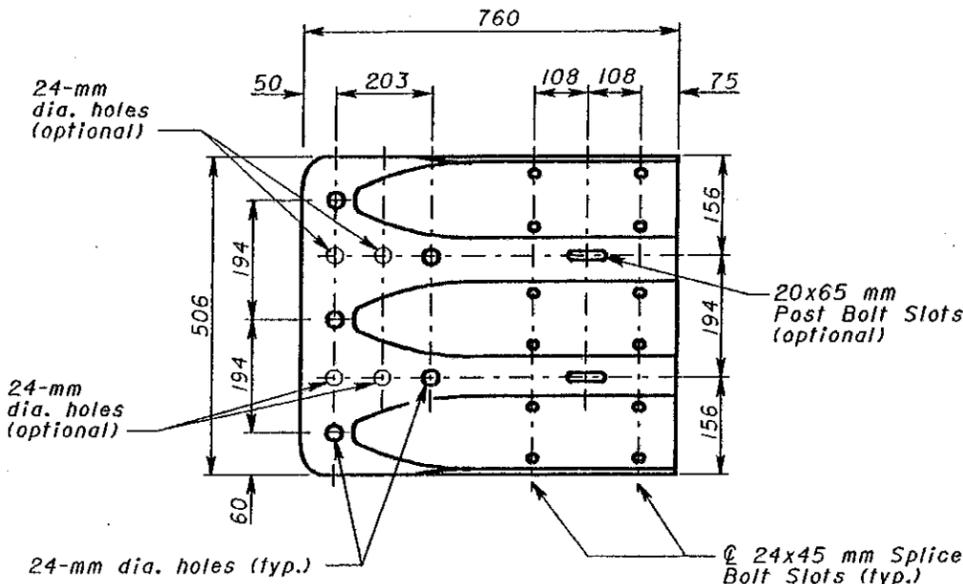
PLAN



ELEVATION



ELEVATION

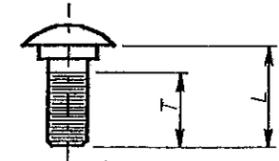


ELEVATION

THRIE-BEAM TERMINAL CONNECTOR

**CONCRETE INSERT ANCHOR ASSEMBLY (W-BEAM ONLY)**

**W-BEAM TERMINAL CONNECTOR**



L (mm)	T min. (mm)	Bolt Use
455 (Standard Rail)	85	Type 5: WP/WB, PB
660 (Barrier Rail)		
255	60	Type 4: WP Type 5: SP/WB, PB
50	35	Type 4: SP
32	Full	Splice Bolt

WP- wood post      WB- wood blackout  
 SP- steel post      PB- plastic blackout  
 Longer bolt may be needed for round WP larger than 200 mm dia.

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

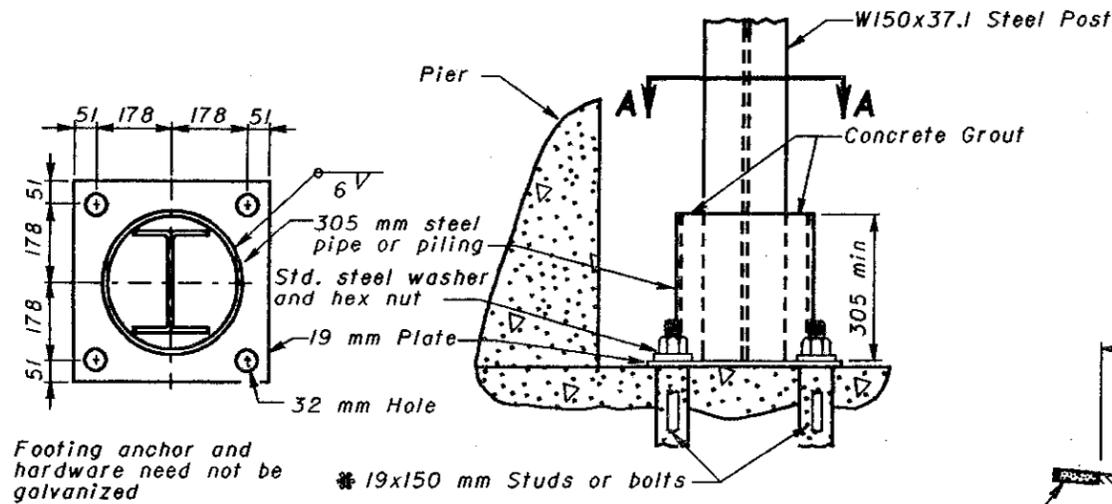
All dimensions are in millimeters unless otherwise noted.

**NOTE**

Refer to AASHTO M 180 for dimensional details of W-Beam and Thrie-Beam rail elements, related buffer and end sections, beam splices, post and splice bolts and nuts, and Type I W-Beam to Thrie-Beam Transition section.



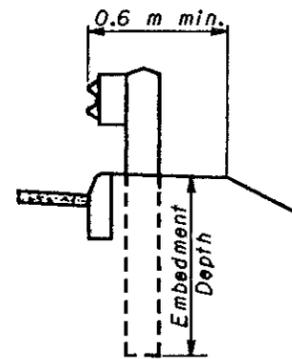
OHIO DEPARTMENT OF TRANSPORTATION	
<b>GUARDRAIL DETAILS</b>	DATE 11-30-94 10-21-97
STANDARD CONSTRUCTION DRAWING APPROVED <i>Randy T. Sutherland</i>	<b>GR-1.1M</b>



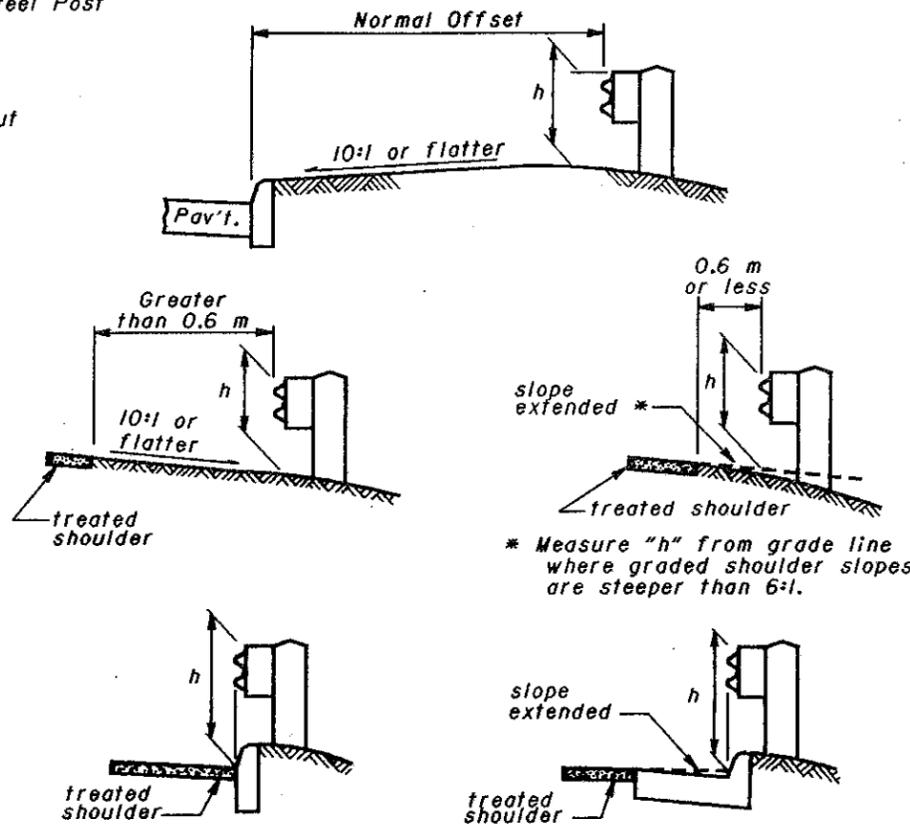
SECTION A-A

ELEVATION

**FOOTING ANCHOR**

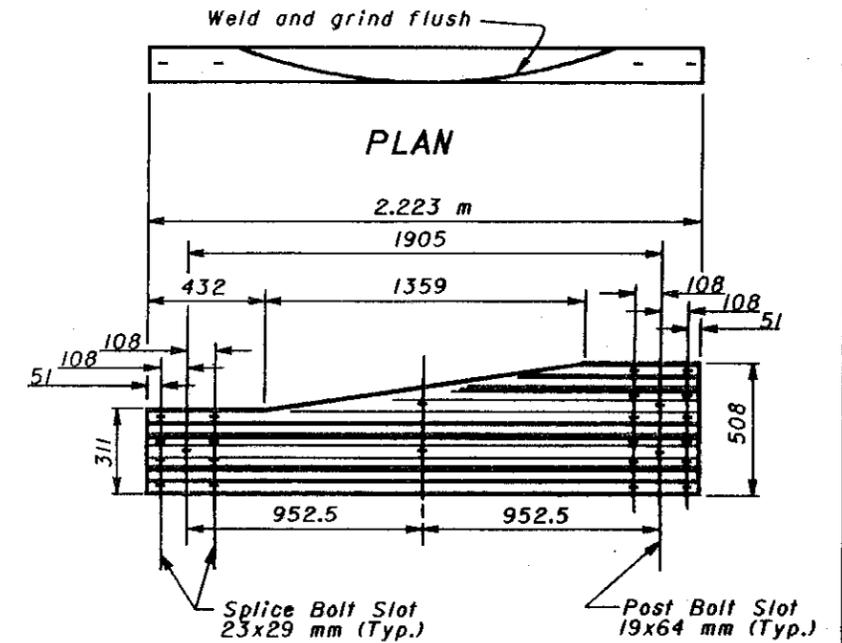


DETAIL A



$h$  = Standard height (Tolerance  $\pm 25$  mm)

**MEASURING GUARDRAIL HEIGHT**



ELEVATION

**TYPE 2 TRANSITION SECTION \* (W-Beam to Thrie-Beam)**

\* For details of Type 1 Transition Section, refer to AASHTO M 180, Figure 4.

**NOTES**

**BEAM RAIL ELEMENTS:** Elements shall be 3.81 m effective length, unless otherwise specified, with 19x64 mm post bolt slots on 1,905 m centers regardless of post spacing. Field punching or drilling of bolt holes or slots for irregularly spaced posts shall be according to CMS 606.05.

**BEAM RAIL SPLICE** between two rail elements or between a 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 305 mm length of beam rail (Back-up Plate), with a 19 mm diameter bolt hole or a 19x64 mm slot, shall be provided at steel posts not having a rail splice.

**EMBEDMENT DEPTH:** Where less than 0.6 m of graded shoulder width (10:1 or flatter) exists, measured from the face of the guardrail (see Detail "A"), longer posts shall be used so that a minimum of 1.65 m embedment depth is provided. Payment for the longer posts will be made at the unit price bid per Each, Item 606 - Guardrail Post, 2.75 m.

**PROTECTIVE COATING:** In lieu of the requirements of CMS 710.06, expansion shields, anchors and insert anchor assemblies installed (embedded) in concrete shall be coated in accordance with ASTM A 153 or be of stainless steel. Any bolts screwed into these embedded devices shall meet CMS 710.06.

**SPECIAL POST MOUNTINGS:**

Posts located over a drainage inlet or structure shall be encased or anchored per the details shown on Standard Construction Drawing GR-2.2M.

Posts located over a footing with a cover of less than 0.75 m shall be installed with a footing anchor as detailed hereon. (A plate, as detailed on Section B-B of Standard Construction Drawing GR-2.2M, may be used as an alternate attachment method.) Where the cover is between 0.75 m and 1.04 m, the footing anchor may be omitted and the post encased instead with 100 mm (min.) of concrete.

Posts located over a culvert with less than 1.3 m of cover shall not be driven, but shall be set in drilled or dug holes. Where the available post embedment depth is less than 1.04 m, the post shall be encased with 100 mm (min.) of concrete.

All costs associated with special post mountings shall be included in the unit price bid for 606 Guardrail of the type specified in the plans.

\* **ANCHORS:** Holes and grouting shall comply with CMS 510. Either cement or nonshrink, nonmetallic grout may be used.

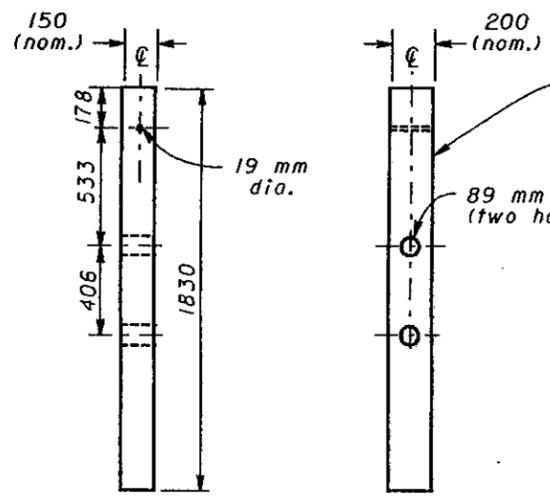
Expansion shield anchors conforming to CMS 712.01 may be substituted except where concrete deterioration has occurred, as determined by the Engineer. The same bolt diameter specified shall be required. Where self-drilling anchors are used, the holes shall be drilled with the expansion shield (not by a drill bit) and the shield installed flush with the concrete surface.

All dimensions are in millimeters unless otherwise noted.

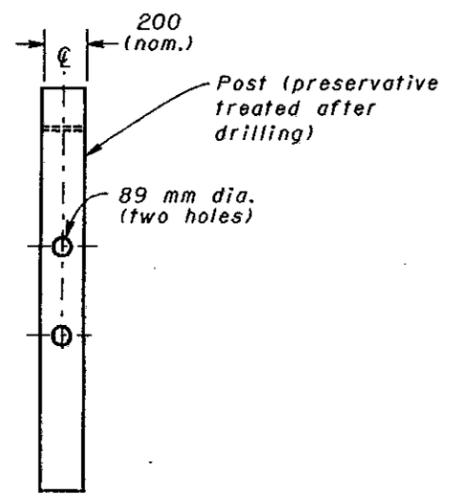


This Drawing Replaces GR-1.2.

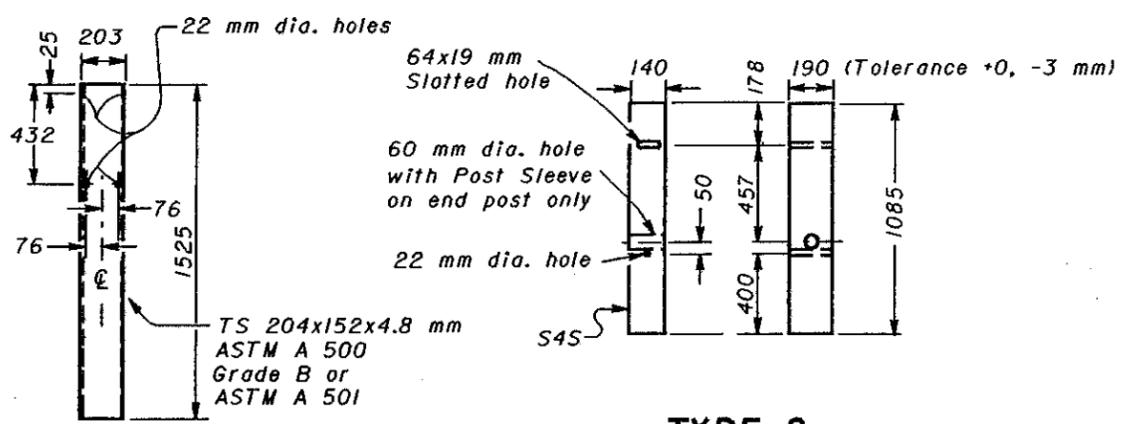
OFFICE OF ROADWAY ENGINEERING OHIO DEPARTMENT OF TRANSPORTATION	
<b>GUARDRAIL DETAILS</b>	DATE 1-3-96
STANDARD CONSTRUCTION <b>GR-1.2M</b> DRAWING	
APPROVED <u>D.K. Hulman, P.E.</u> ADMINISTRATOR	



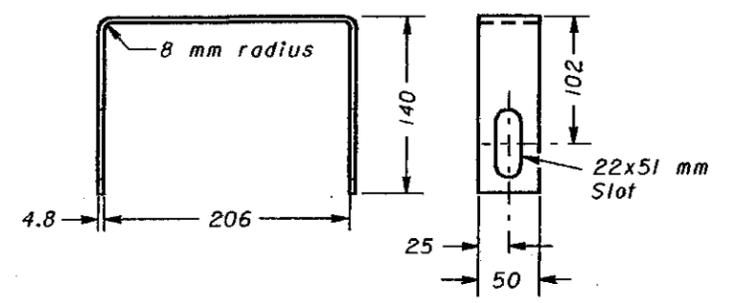
**TYPE 1 BREAKAWAY POST**



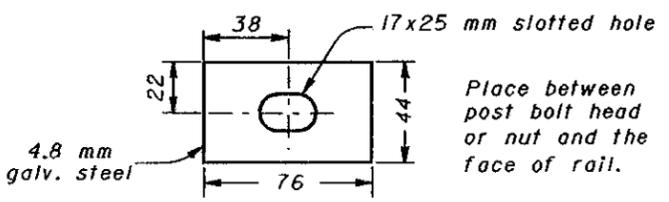
**STEEL TUBE**



**TYPE 2 BREAKAWAY POST**

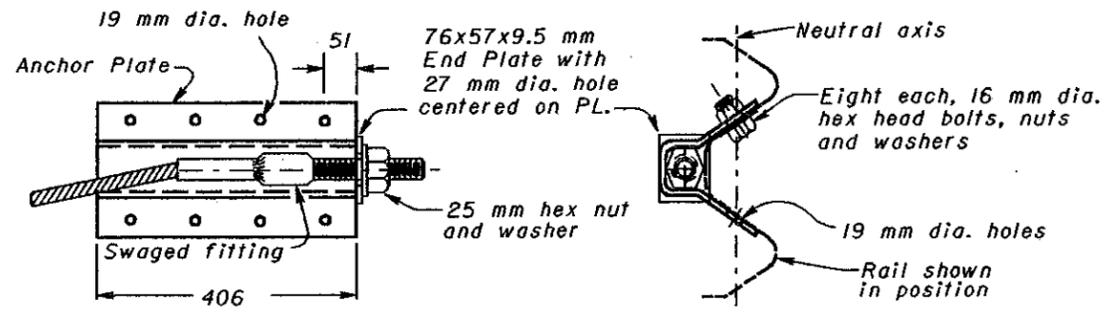


**YOKE DETAILS**

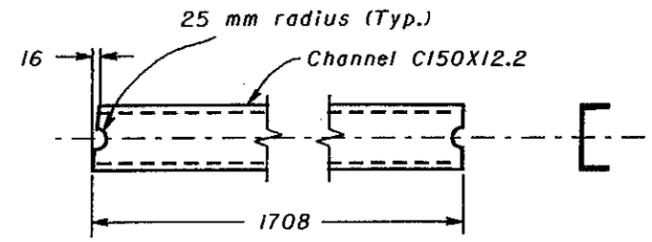


**RECTANGULAR WASHER**

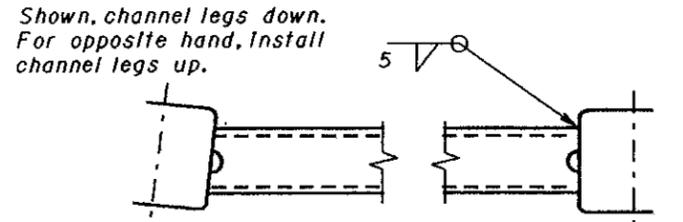
(Not to be used in typical Type 4, 5 or 5A guardrail installations. Use only where specified.)



**ANCHOR PLATE ASSEMBLY DETAILS**

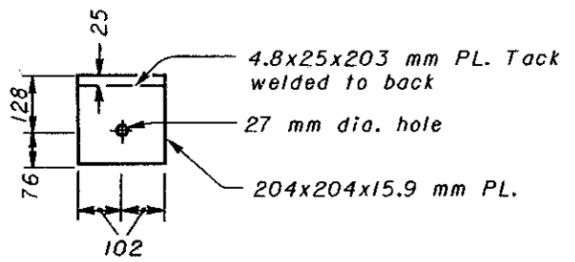


**STRUT DETAILS**

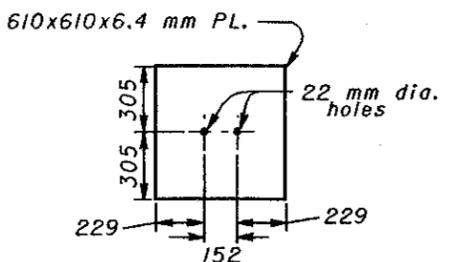


**STRUT AND YOKE ASSEMBLY**

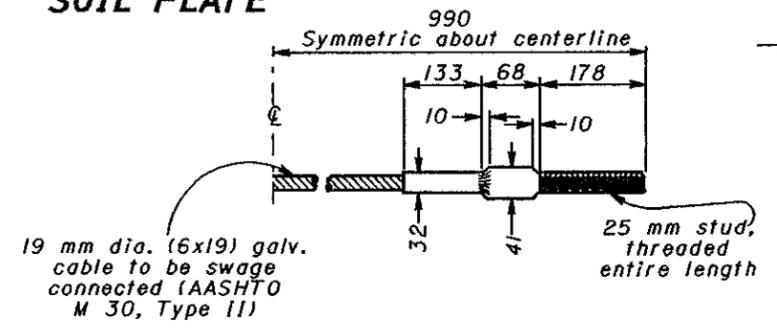
All dimensions are in millimeters unless otherwise noted.



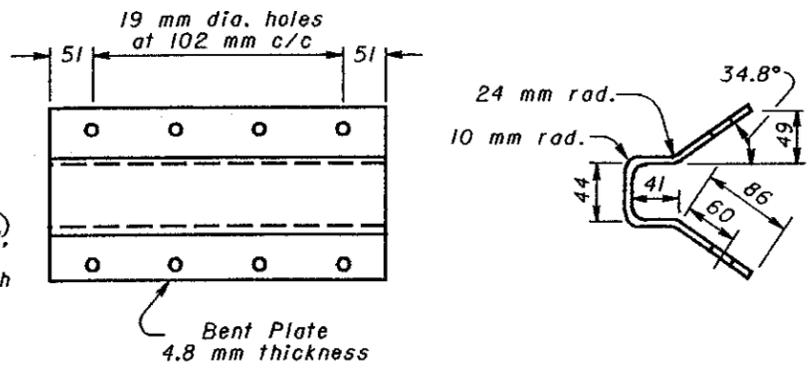
**BEARING PLATE**



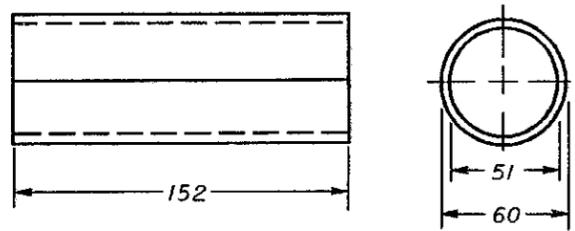
**SOIL PLATE**



**STANDARD SWAGED FITTING AND STUD CABLE ASSEMBLY**



**ANCHOR PLATE**



**POST SLEEVE**



BUREAU OF LOCATION AND DESIGN OHIO DEPARTMENT OF TRANSPORTATION	
<b>GUARDRAIL DETAILS</b>	DATE 11-30-94
STANDARD CONSTRUCTION DRAWING	<b>GR-1.3M</b>
APPROVED <i>R. K. Hulman</i> ENGR., L & D	

# NOTES

**POSTS:** Posts may be round (standard single rail only) or 150x200 mm square-sawn pressure-treated wood or W150x13.5 galvanized steel. The same type post shall be used throughout the length of the project unless otherwise required by the plans or permitted by the Engineer. Round posts shall be 200 mm ± 25 mm in diameter at the top and not more than 75 mm larger at the butt with a uniform taper. Post may be set in drilled holes or may be driven to grade.

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

**ALTERNATE BLOCKOUTS:** Approved plastic blockouts may be used in lieu of the wood blockouts shown. The approved list is maintained by the Office of Materials Management.

**WASHERS:** Standard galvanized steel washers of the appropriate size shall be installed on the nut side of bolts through wood posts.

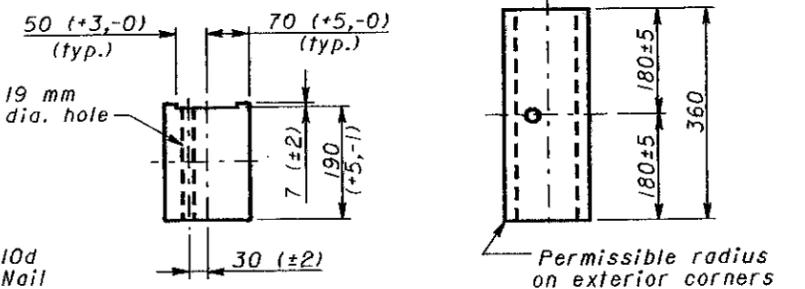
**WELDED BEAMS:** Welded beam guardrail posts may be used for Item 606, Guardrail, provided the web and flange sizes are as shown hereon. Welding of the web to the flanges shall conform to ASTM A 769M, Class 1 using Grade 36 steel (250 MPa yield point) with the following exceptions:

- Sec. 7.2 Test reports of tensile properties for each lot shall accompany each shipment.
- Sec. 12 Beams that have imperfections repaired by welding shall not be accepted for use in Item 606.
- Sec. 13 Random samples shall be tested by the Department from materials delivered to the project site or other locations designated by the Laboratory.

**\* POST EMBEDMENT DEPTH:** For specific depth requirements, see SCD GR-1.2M.

STEEL BEAM POSTS				
Size	Beam depth	Flange width	Flange thickness	Web thickness
Rolled W150x12.6	148 mm	100 mm	4.9 mm	4.3 mm
Rolled W150x13.5	150 mm	100 mm	5.5 mm	4.3 mm
Welded 150x12.6	152 mm	100 mm	4.9 mm	4.3 mm
Welded 150x13.5	152 mm	100 mm	5.5 mm	4.3 mm

**MISCELLANEOUS:** For details not shown see SCD's GR-1.1M and GR-1.2M.



PLAN ELEVATION  
NOTCHED BLOCKOUTS FOR STEEL POSTS

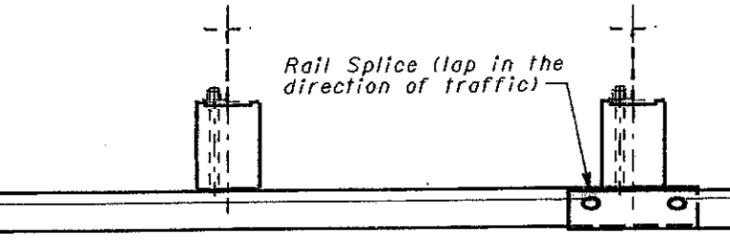
OHIO DEPARTMENT OF TRANSPORTATION

**GUARDRAIL  
TYPE 5 & 5A**

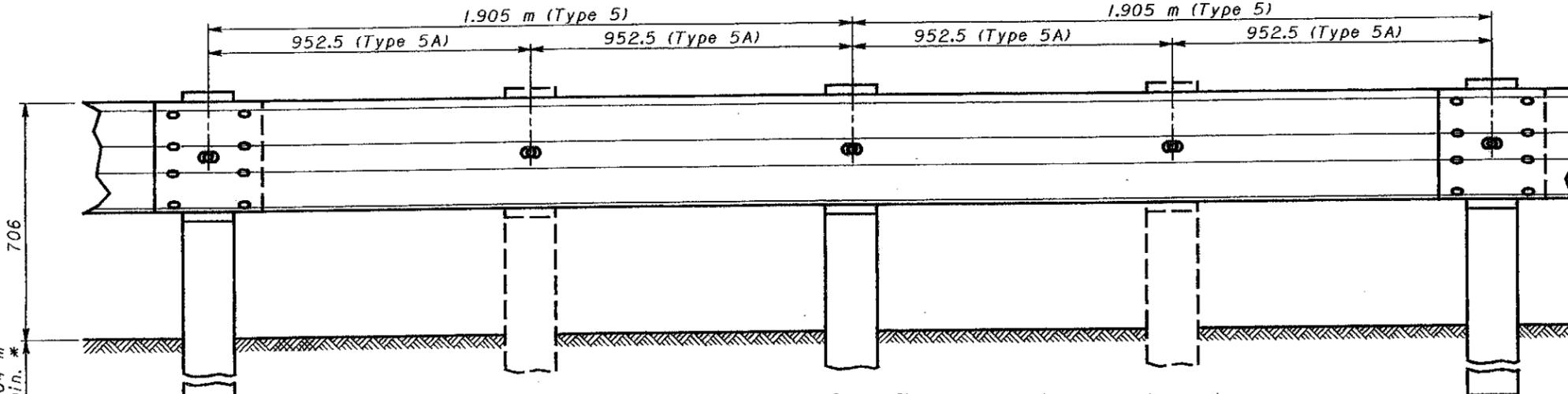
DATE  
11-30-94  
10-21-97  
4-14-98

STANDARD  
CONSTRUCTION  
DRAWING  
**GR-2.1M**

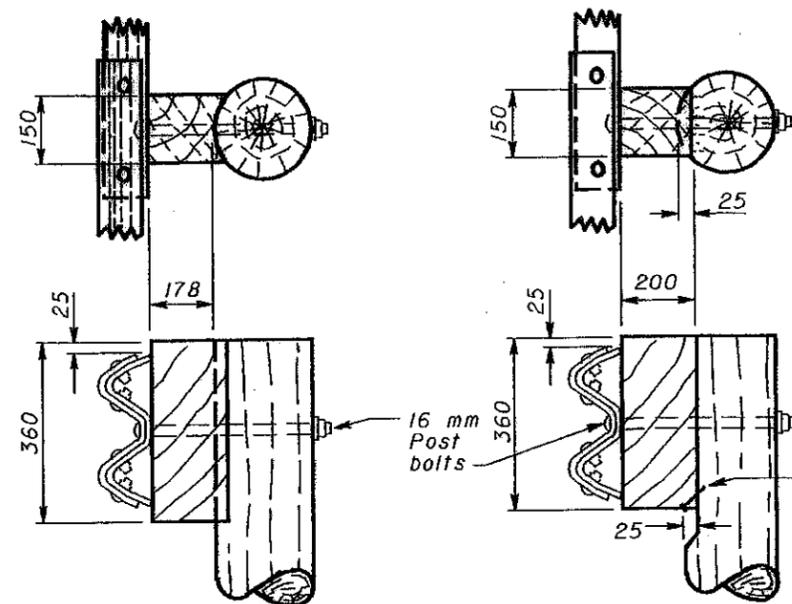
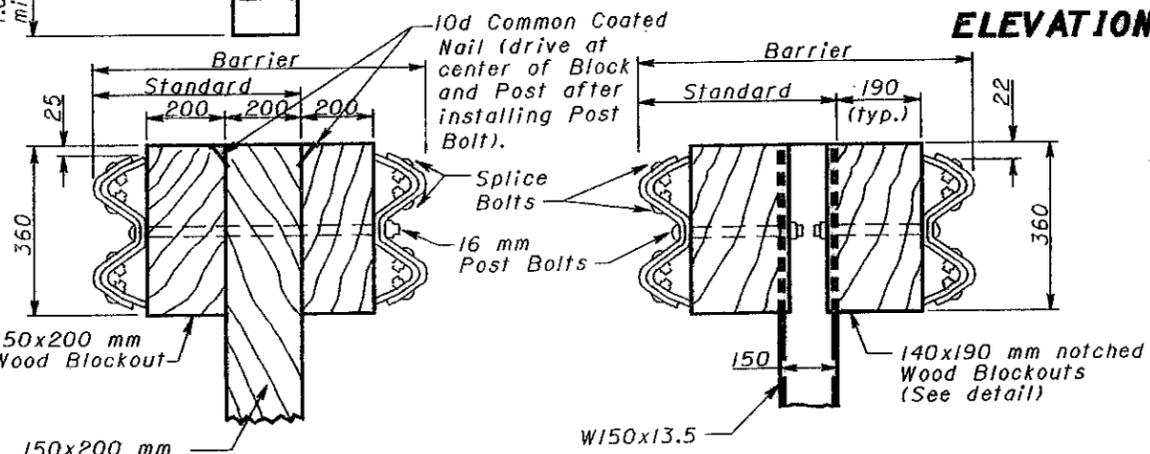
APPROVED *Larry T. ...*



PLAN VIEW (Steel Posts shown)



ELEVATION (Wood Posts shown)

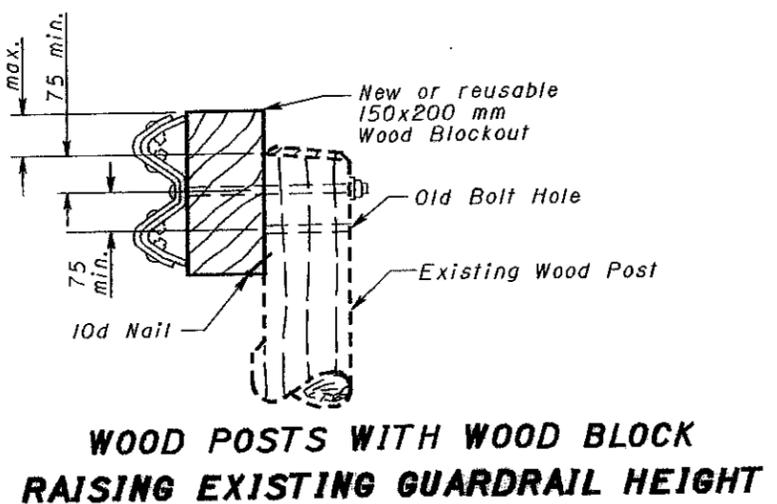


METHOD 1 METHOD 2

Alternate methods of placing the blockouts on round posts may be submitted for consideration and approved by the Engineer.

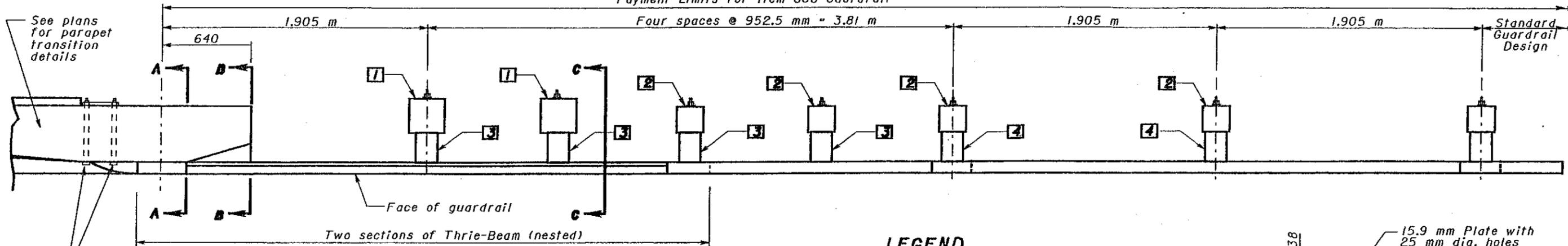
## ROUND WOOD POSTS

All dimensions are in millimeters unless otherwise noted.



WOOD POSTS WITH WOOD BLOCK  
RAISING EXISTING GUARDRAIL HEIGHT

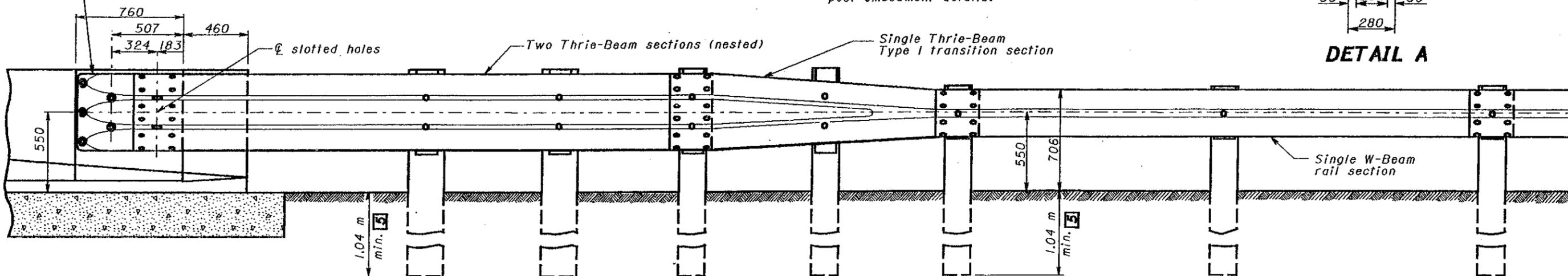
Payment Limits for Item 606 Guardrail



PLAN

22 mm dia. ASTM A 325M through bolts (length to be determined in field in accordance with parapet width) in 25 mm dia. holes with 464 x 280 x 15.9 mm plate with standard washers and hex nuts (See Detail A)

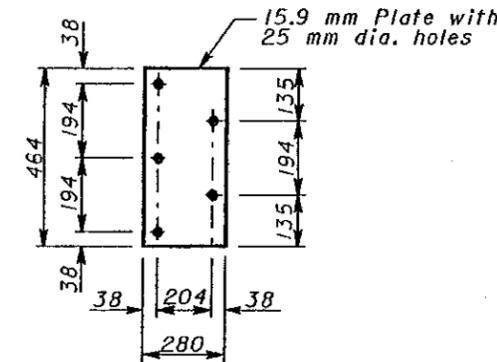
NOTE: The Thrie-Beam terminal connector shall be placed so that the lap is in the direction of traffic.



ELEVATION

LEGEND

- 1 250 x 250 mm wood post
- 2 200 x 200 mm wood post
- 3 150 x 200 x 570 mm wood blockout (See ALTERNATE POSTS AND BLOCKOUTS note)
- 4 150 x 200 x 355 mm wood blockout (See ALTERNATE POSTS AND BLOCKOUTS note)
- 5 See SCD GR-1.2M for additional post embedment details.



DETAIL A

All dimensions are in millimeters unless otherwise noted.

NOTES

**GENERAL:**  
For additional details, see SCD's GR-1.1M, GR-1.2M and other drawings pertaining to the design of specific guardrail types.

**APPLICATION:**  
The Type I Bridge Terminal Assembly shall be used to connect guardrail runs to bridges having concrete deflector parapet railing. It shall be used to connect guardrail runs to the approach end of bridge parapets or other concrete barrier installations and to anchor guardrail runs to the trailing end of bridge parapets or other concrete barrier installations on undivided, bidirectional highways.

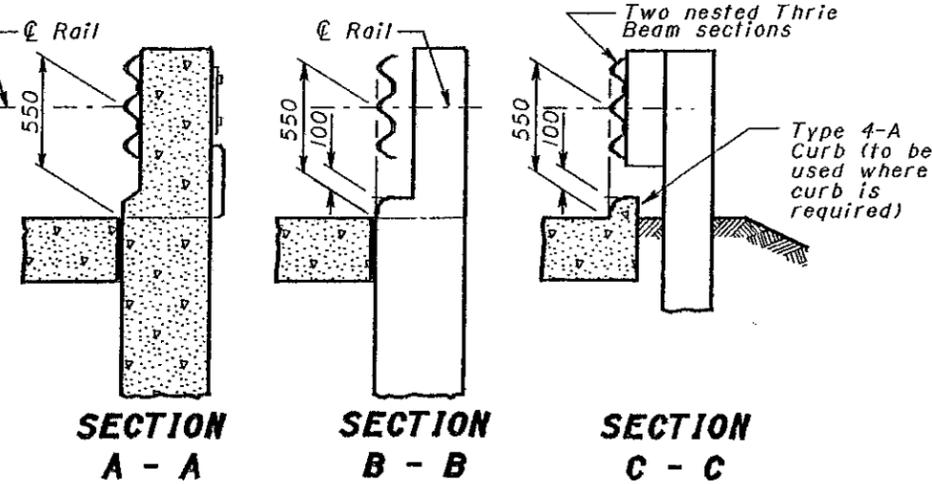
**POSTS:**  
GENERAL - Posts may be set in drilled holes or driven to grade.

**WOOD POSTS** - shall be square sawed pressure treated wood as per CMS 710.14 and fabricated with square ends. Bolt holes shall be bored and tops of posts trimmed, if required, after posts are set.

**ALTERNATE POSTS AND BLOCKOUTS** for Type I Bridge Terminal Assemblies may be furnished according to the following chart. Plastic blockouts shall not be permitted for Type I Bridge Terminal Assemblies.

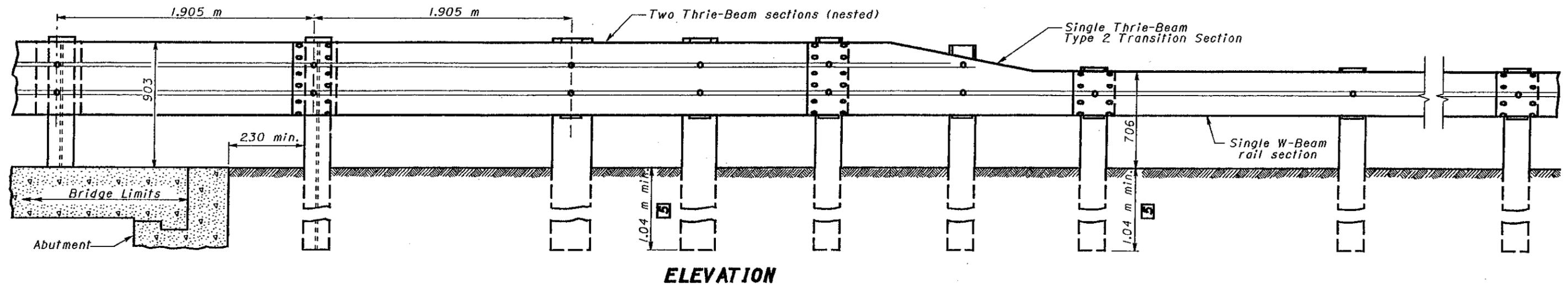
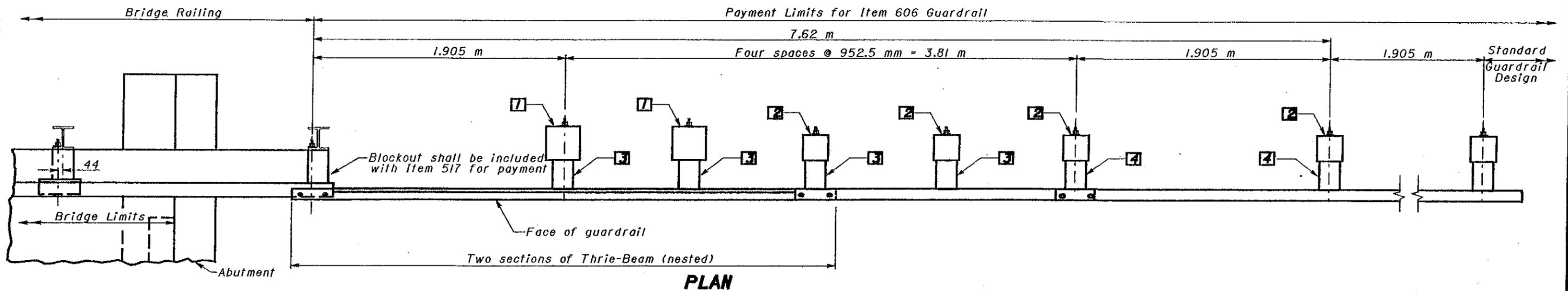
Wood Posts & Blockouts	250x250 mm	200x200 mm
Steel Posts	W200x35.9	W150x37.1
Wood Blockouts	150x200 mm	
Steel Blockouts	W150x13.5	

**PAYMENT:**  
Payment for Item 606 - Each, Bridge Terminal Assembly, Type I, shall include the extra cost, in excess of normal guardrail cost, for additional and different type posts and blockouts, nested Thrie-Beam sections, terminal connector, Thrie-Beam transition section, steel plate, bolts, hex nuts, washers, and other hardware.



This Drawing Replaces GR-3.1.

OHIO DEPARTMENT OF TRANSPORTATION	
BRIDGE TERMINAL ASSEMBLY, TYPE 1	DATE 11-30-94 10-21-97
STANDARD CONSTRUCTION DRAWING GR-3.1M	
APPROVED <i>[Signature]</i>	



All dimensions are in millimeters unless otherwise noted.



### NOTES

#### LEGEND

- 1 250 x 250 mm wood post
- 2 200 x 200 mm wood post
- 3 150 x 200 x 570 mm wood blockout (See ALTERNATE POSTS AND BLOCKOUTS note)
- 4 150 x 200 x 355 mm wood blockout (See ALTERNATE POSTS AND BLOCKOUTS note)
- 5 See SCD GR-1.2M for additional post embedment details.

#### GENERAL:

For additional details, see SCD's GR-1.1M, GR-1.2M and other Drawings pertaining to specific guardrail types.

#### APPLICATION:

The Type 3 Bridge Terminal Assembly shall be used to connect guardrail runs to both the approach and trailing ends of Thrie-Beam bridge railings.

#### POSTS:

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

WOOD POSTS - shall be square-sawed pressure treated wood as per CMS 710.14 and fabricated with square ends. Bolt holes shall be bored and tops of posts trimmed, if required, after posts are set.

ALTERNATE POSTS AND BLOCKOUTS for Type 3 Bridge Terminal Assemblies may be furnished according to the following chart. Plastic blockouts shall not be permitted for Type 3 Bridge Terminal Assemblies.

Wood Posts & Blockouts	250x250 mm	200x200 mm
Steel Posts	W200x35.9	W150x37.1
Wood Blockouts	150x200 mm	
Steel Blockouts	W150x13.5	

#### PAYMENT:

Payment for Item 606 - Each, Bridge Terminal Assembly, Type 3, shall include the extra cost, in excess of normal guardrail costs, for additional and different type posts and blockouts, nested Thrie-Beam sections, Thrie-Beam transition section, and other hardware.

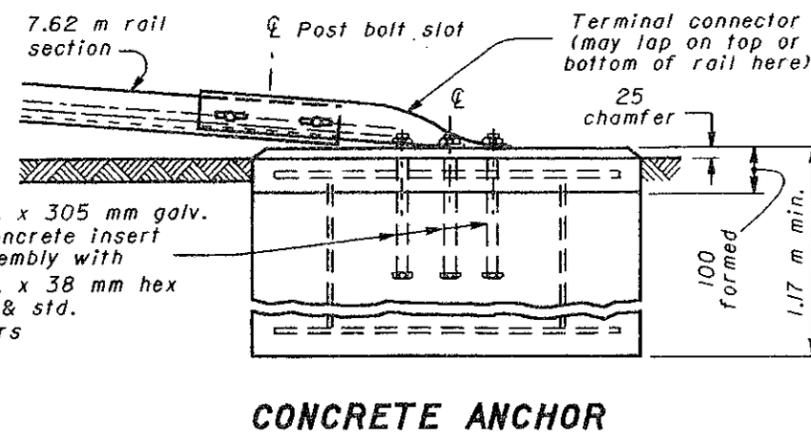
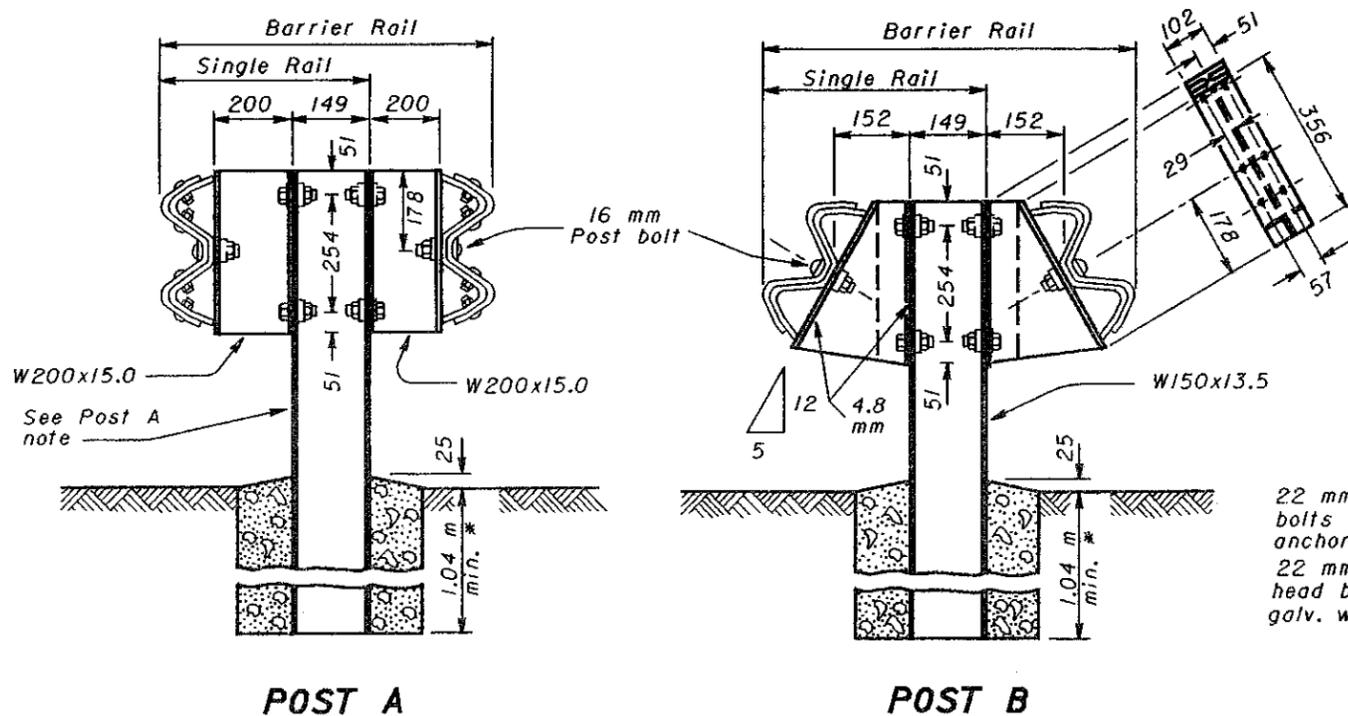
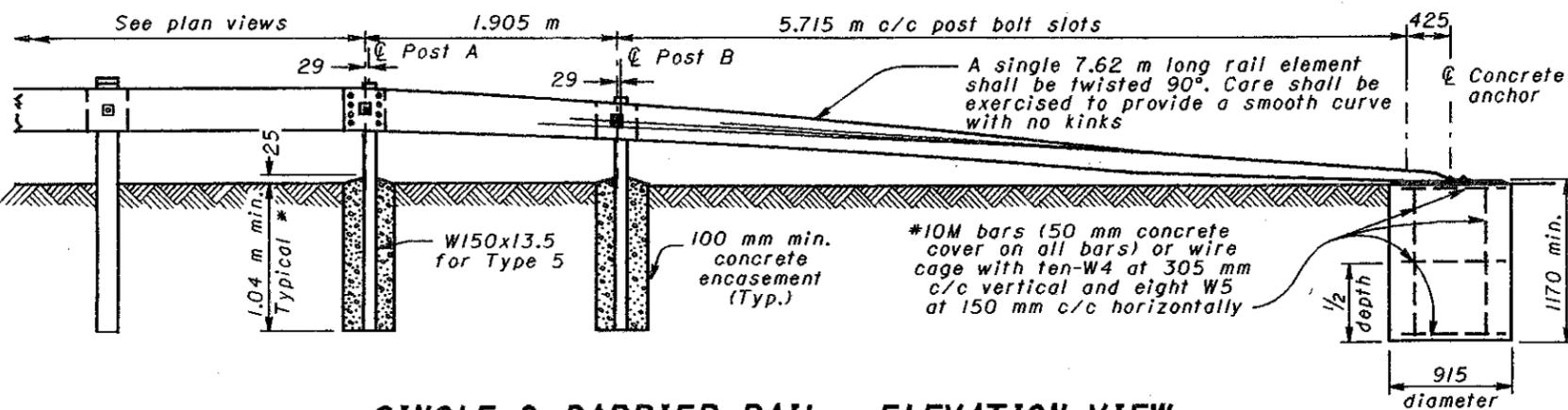
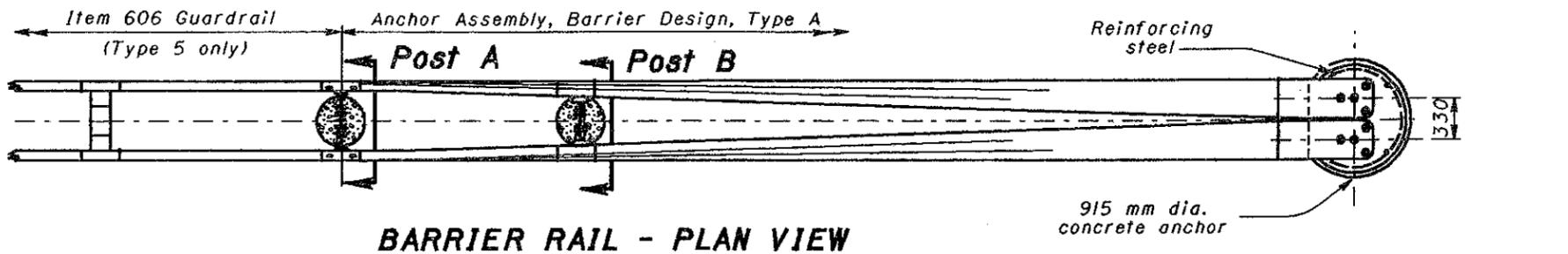
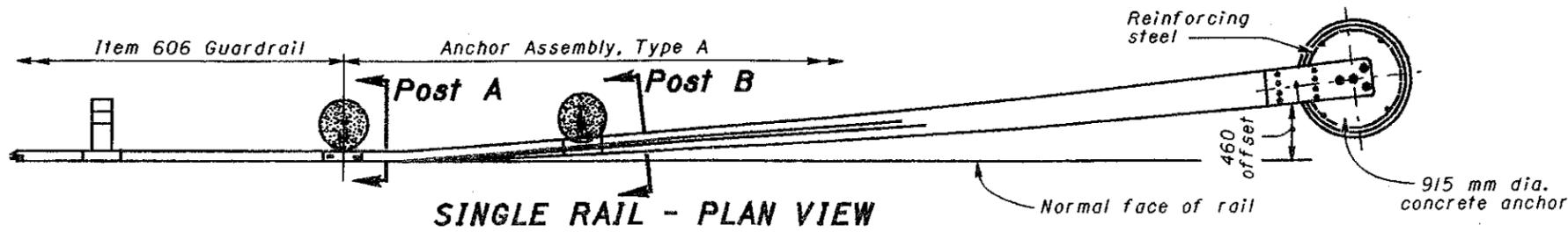
OHIO DEPARTMENT OF TRANSPORTATION

BRIDGE TERMINAL ASSEMBLY, TYPE 3

DATE  
11-30-94  
10-21-97

STANDARD CONSTRUCTION DRAWING GR-3.3M

APPROVED *Louis T. Suberland*



**NOTES**

**GENERAL:** For details not shown, see Std. Constr. Dwgs. GR-1.1M, GR-1.2M and other Drawings pertaining to specific guardrail type. All steel parts shall be galvanized.

The 460 mm 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.

**SPACERS:** Post B spacers shall be made of 4.8 mm steel plate as per CMS 710.15 or two sections of W150x13.5 or W200x15.0 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 16 mm hexhead bolts and nuts with standard washers on both sides.

**WASHERS:** All washers indicated on this drawing are standard galvanized steel of the appropriate size.

**CONCRETE ANCHOR:** Form top 100 mm of anchor and slope the top to conform to slope of the adjacent ground. The 915 mm diameter anchor may be replaced by a 760 mm square anchor at the contractor's option.

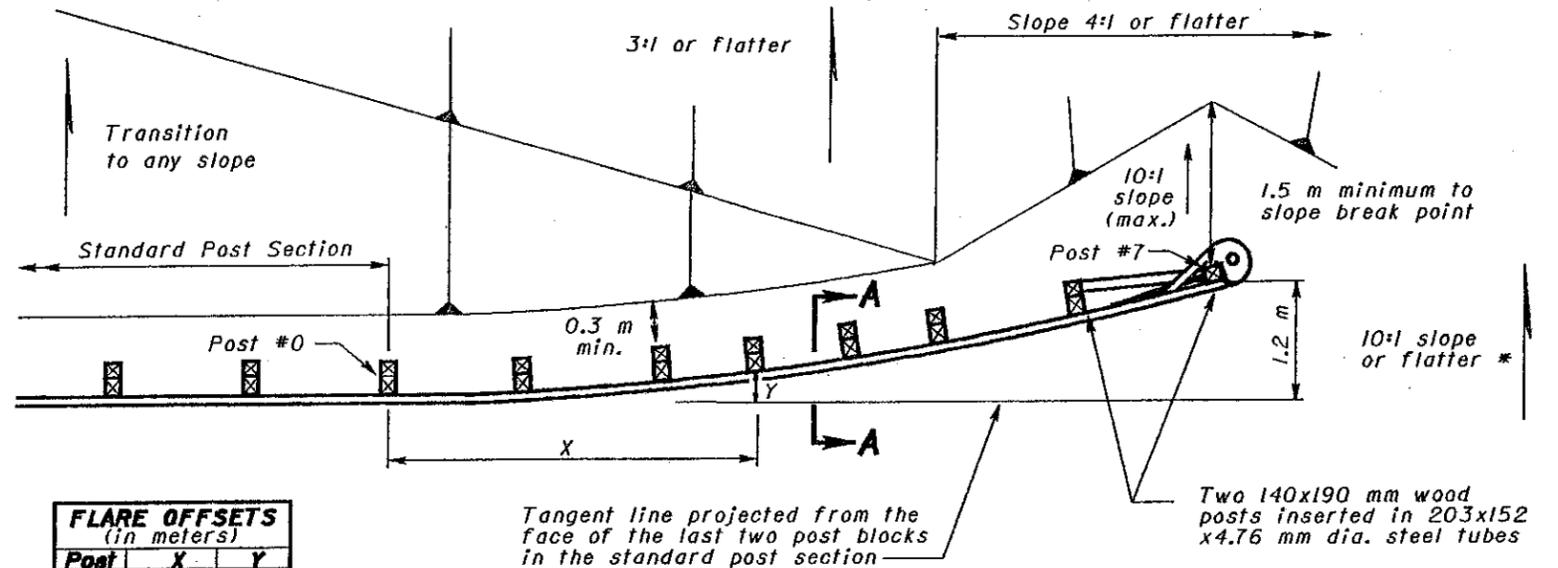
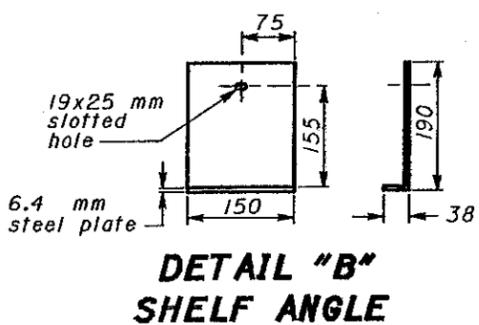
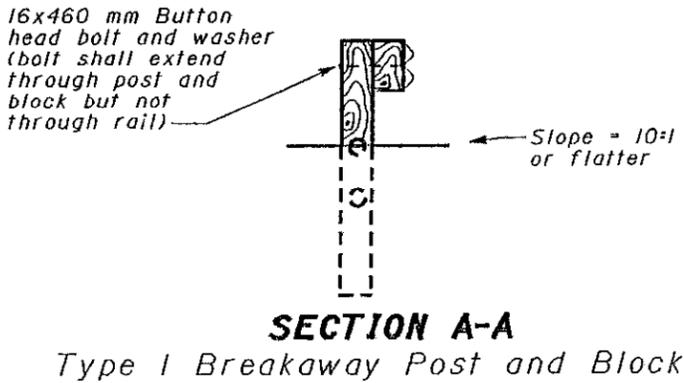
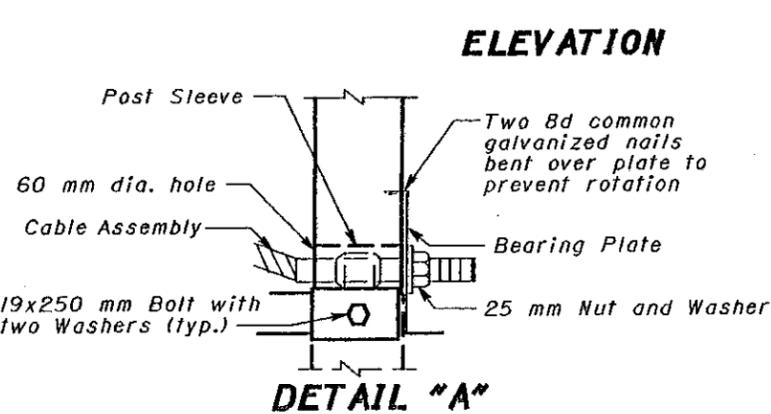
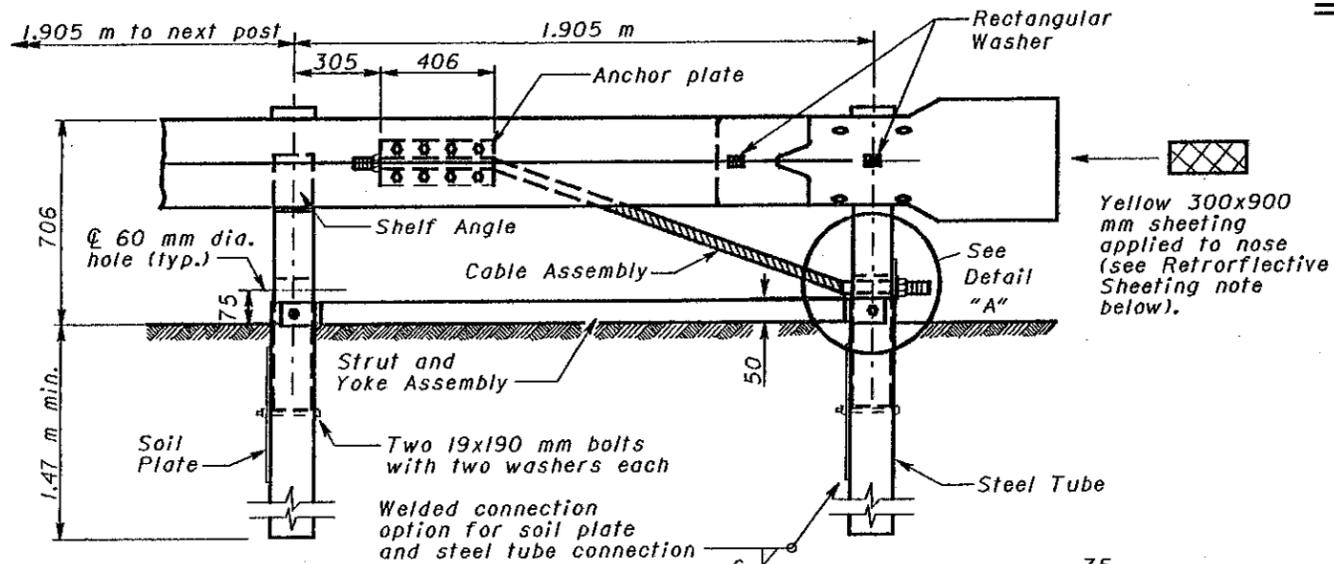
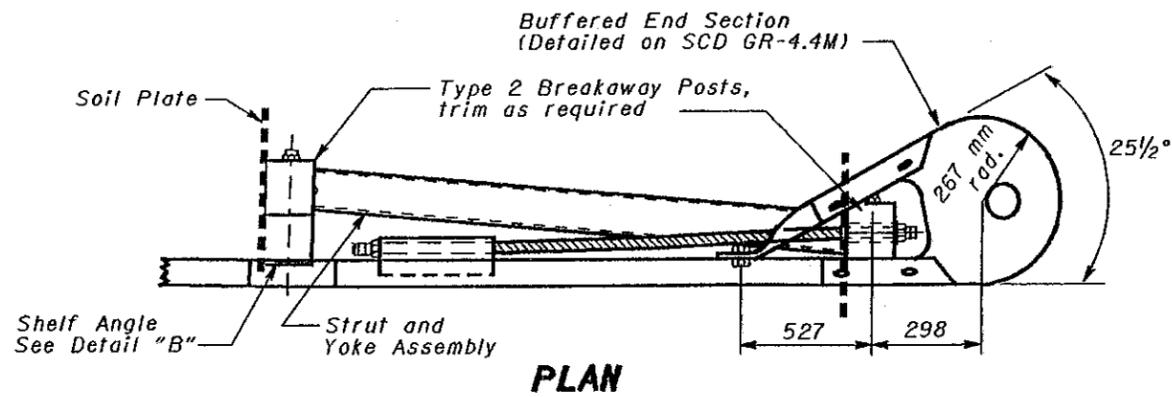
**POST A:** Rail details are shown for Type 5 guardrail. Where anchor assembly is attached to Type 4 guardrail, Post A shall be a standard Type 4 line post set in concrete, and the spacer block shall be omitted. Post bolt shall be 16 mm in diameter.

\* **SINGLE RAIL INSTALLATIONS:** See GR-1.2M for additional post embedment details.

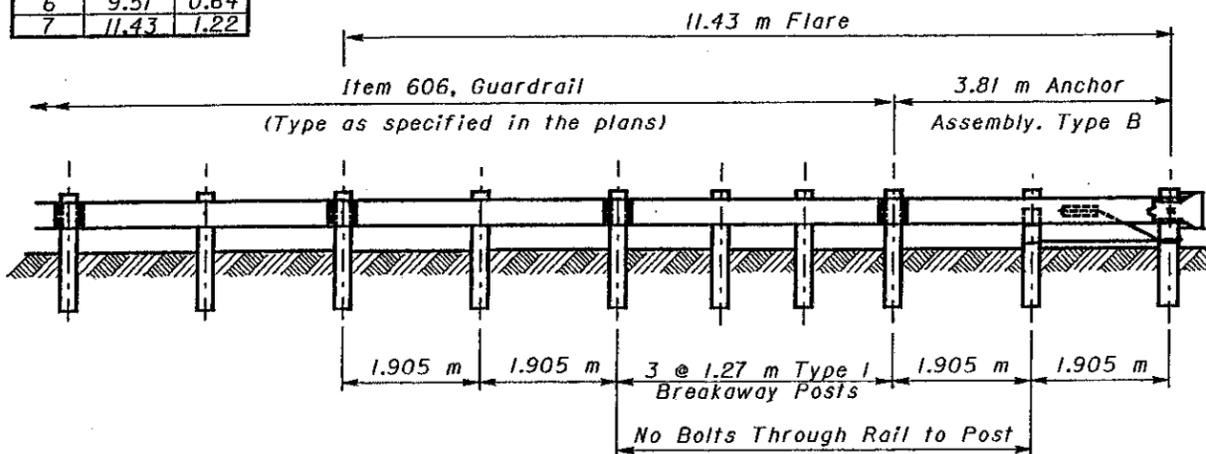
All dimensions are in millimeters unless otherwise noted.



BUREAU OF LOCATION AND DESIGN OHIO DEPARTMENT OF TRANSPORTATION	
<b>TYPE A ANCHOR ASSEMBLY</b>	
STANDARD CONSTRUCTION DRAWING	DATE 11-30-94
<b>GR-4.1M</b>	
APPROVED: <i>D.K. Hulman</i>	ENGR., L & D



FLARE OFFSETS (in meters)		
Post	X	Y
0	0.0	0.0
1	1.89	0.03
2	3.81	0.06
3	5.09	0.09
4	6.34	0.21
5	7.62	0.37
6	9.51	0.64
7	11.43	1.22



**NOTES**

**GENERAL:** For details not shown, see SCD's GR-1.1M, GR-1.2M, GR-1.3M, GR-4.4M and other Drawings pertaining to design of specific guardrail types. All angles, channels and plates shall conform to CMS 711.01. Structural tubing shall conform to CMS 707.10. All structural steel shall be galvanized as per CMS 711.02.

**POST OFFSET:** Dimensions are given to the center of the face of the blockouts, except at Post #7, where the dimension is to the center of the face of the post.

**GRADING OF SLOPES AND TRANSITIONS:** Grading must be provided as shown for the Type B Anchor Assembly to function correctly.

\* **10:1 SLOPE:** This slope shall extend a minimum of 15 m approaching the Assembly where it shall be smoothly transitioned to the graded shoulder slopes shown on the Typical Sections.

**SHEETING:** Retroreflective sheeting shall not be required when the offset distance to the face of the Buffer End Section from the near edge of the adjacent pavement is 6 m, or greater.

The sheeting shall be Standard, Type G, meeting the requirements of CMS 730.19, and shall be applied as per manufacturers' recommended procedure. Sheeting shall not be applied when the ambient temperature is below 4 °C.

**PAYMENT:** All materials and labor for the 3.81 m Type B Anchor Assembly shown, including any extra cost for using Breakaway Line Posts, shall be included in the unit price bid for Item 606, Each, Anchor Assembly, Type B. Payment for grading requirements shown herein shall be made under Item 203 as specified in the plans.

All dimensions are in millimeters unless otherwise noted.



OHIO DEPARTMENT OF TRANSPORTATION

**TYPE B ANCHOR ASSEMBLY**

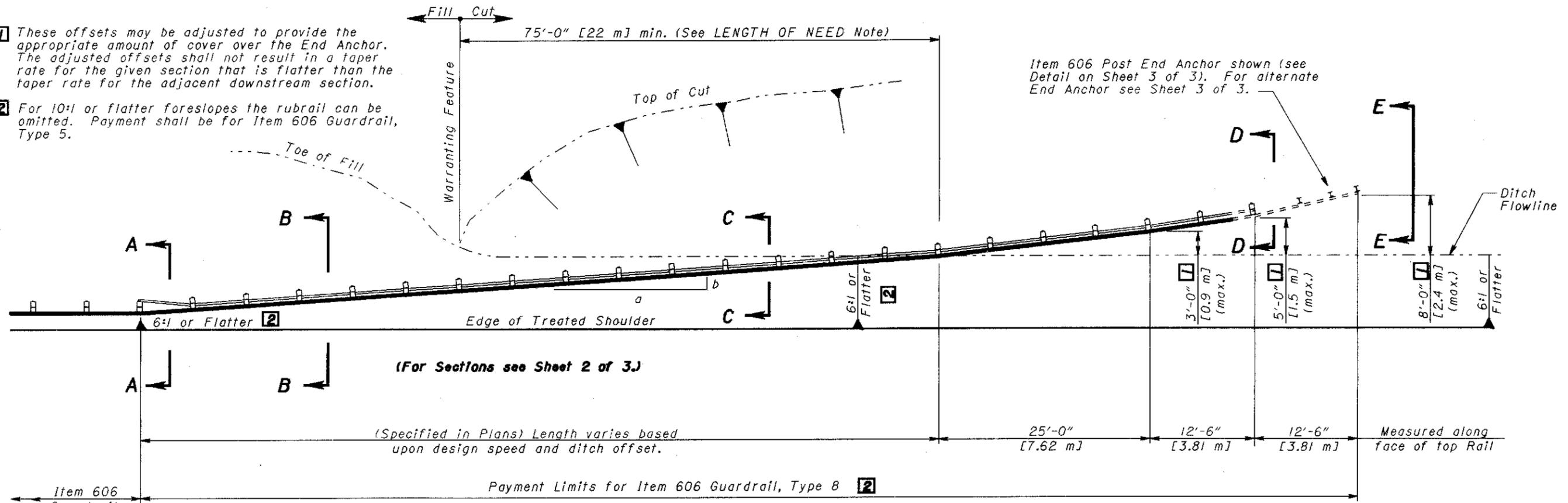
STANDARD CONSTRUCTION **GR-4.3M** DRAWING

APPROVED

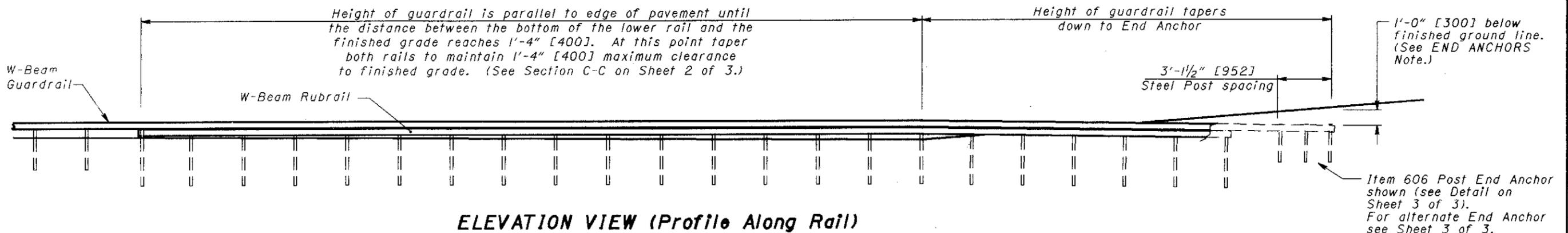
DATE  
11-30-94  
10-21-97

1 These offsets may be adjusted to provide the appropriate amount of cover over the End Anchor. The adjusted offsets shall not result in a taper rate for the given section that is flatter than the taper rate for the adjacent downstream section.

2 For 10:1 or flatter foreslopes the rubrail can be omitted. Payment shall be for Item 606 Guardrail, Type 5.



PLAN VIEW



ELEVATION VIEW (Profile Along Rail)

NOTES

**POSTS & BLOCKOUTS:** Shall comply with Guardrail Type 5 (See SCD 6R-2.J) except posts shall be 8'-0" [2440] long unless otherwise specified.

**LENGTH OF NEED:** Where backslopes along the length of the terminal to the warranting feature are 2:1 or flatter, at least 75'-0" [22 m] of guardrail must be provided upstream from the warranting feature before the guardrail crosses the ditch line. (The warranting feature is often the intersection of the Fill/Cut slopes as shown, but may be at some other point.) Where Backslopes are steeper than 2:1, this minimum distance is not applicable.

**PAYMENT:** Item 606 Guardrail, Type 8, shall be in Linear Feet [Meters] for the length specified in the plans and shall include rails, 8'-0" [2440] posts, grading, excavation, embankment and all other hardware, materials and labor required to construct the guardrail as shown except for the End Anchor. Payment for Item 606 - Post End Anchor (or Concrete Block End Anchor), Each, shall include the extra cost of concrete blocks or steel posts and all other hardware, materials and labor required to construct the End Anchor.

**END ANCHORS:** A Post End Anchor is the preferred end treatment. A Concrete Block End Anchor may be installed in any location that does not permit the installation of posts. Concrete Blocks may be either pre-cast or cast-in-place and shall meet the requirements of CMS 606.02. The guardrail panel in the end anchors shall be pre-drilled and then galvanized per CMS 606.02. The finished ground line over the end anchor should be smooth and consistent with the surrounding topography, i.e. embankment shall not be mounded over the end anchor to achieve the proper amount of cover.

**MISCELLANEOUS:** For details not shown see SCD 6R-2.I.

DESIGN SPEED	$\alpha:b$
60 mph [100 km/h]	13:1*
55 mph [90 km/h]	12:1
50 mph [80 km/h]	11:1
45 mph [70 km/h]	10:1
35-40 mph [60 km/h]	9:1

\* All installations on the National Highway System shall be installed with this maximum flare rate regardless of design speed.

OHIO DEPARTMENT OF TRANSPORTATION  
 REVISIONS  
 STDS. ENGR. M. EVANS  
 DESIGN AGENCY OFFICE OF PLANNING  
 STANDARD ROADWAY CONSTRUCTION DRAWING  
 GUARDRAIL TYPE 8 BURIED IN BACKSLOPE  
 NUMBER 6R-4.5  
 DATE 4-29-99  
 DRAWN BY D. FOCKE  
 1/3

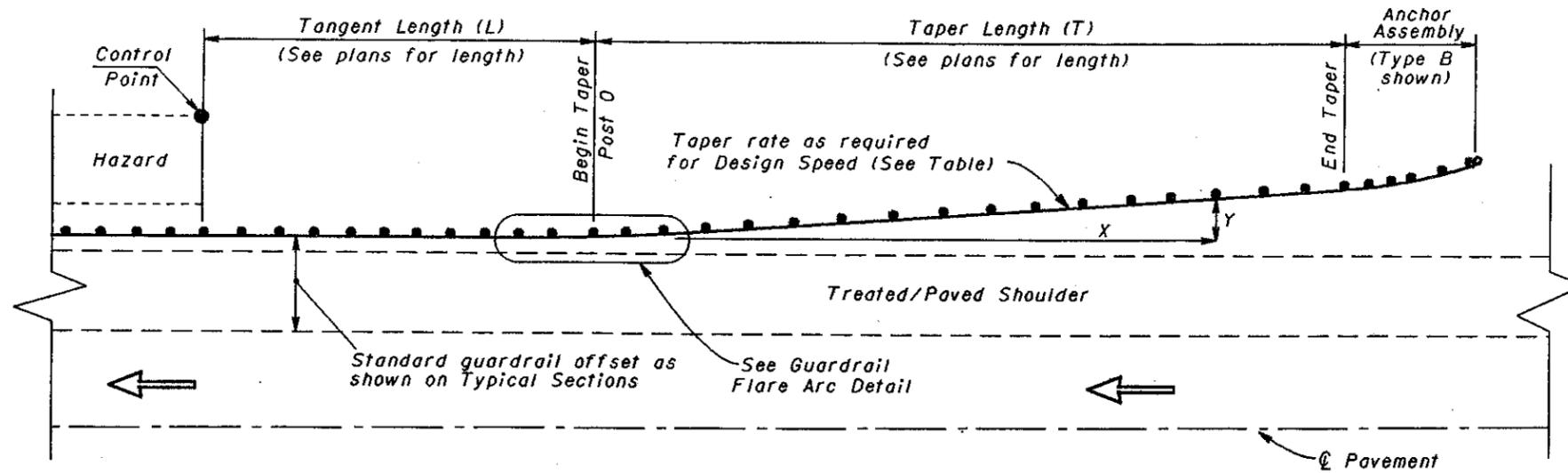
# NOTES

**STANDARD GUARDRAIL FLARE:** The flare shown herein shall be constructed when indicated in the construction plans and in conjunction with Std. Constr. Dwg. GR-5.2M. The Tangent Length and Taper Length used to construct each flare shall be as specified in the plans.

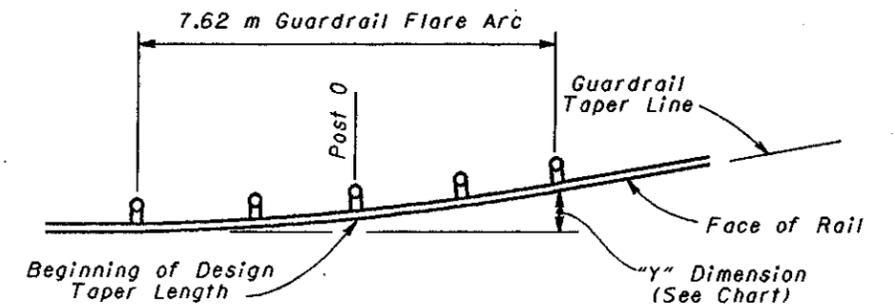
**TAPER RATES AND OFFSET SPEEDS:** Speeds used to determine taper rates and offsets shall be the design speed indicated in the plan. Where a design speed is not shown or available, the legal posted speed limit shall be used. For design speeds below 70 km/h, the tapered guardrail offsets shown for 70 km/h may be used.

**ANCHOR ASSEMBLY:** A Type B Anchor Assembly shall be used with standard guardrail flares unless otherwise specified.

**CONTROL POINT:** The point shown designates the extent of the hazard being protected and is shown for design use only.



**STANDARD GUARDRAIL FLARE**  
(Plan View)



**GUARDRAIL FLARE ARC DETAIL**

## TAPERED GUARDRAIL OFFSETS (in meters)

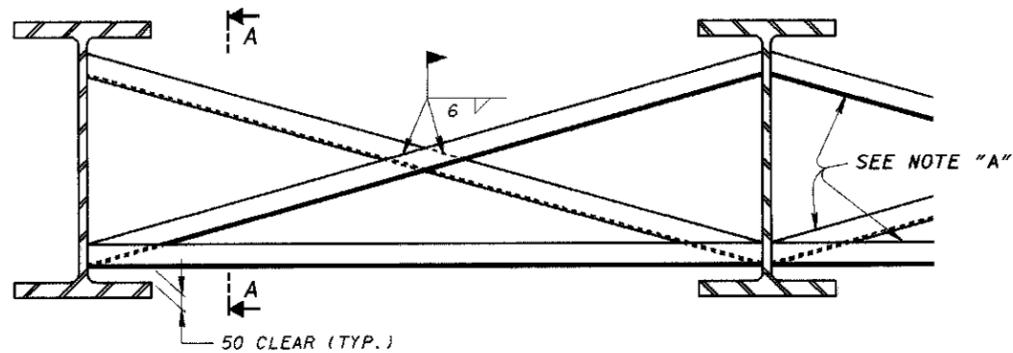
	70 km/h 10:1 Taper		80 km/h 11:1 Taper		90 km/h 12:1 Taper		100 km/h 13:1 Taper		110 km/h 14:1 Taper		120 km/h 15:1 Taper		
	Post	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
	<b>7.62 m Taper Length</b>	0	0	0.09	0	0.09	0	0.08	0	0.07	0	0.07	0
	2	3.79	0.38	3.79	0.35	3.80	0.32	3.80	0.29	3.80	0.27	3.80	0.25
	4	7.58	0.76	7.59	0.69	7.59	0.64	7.60	0.59	7.60	0.54	7.60	0.51
<b>15.24 m Taper Length</b>	6	11.37	1.14	11.38	1.04	11.39	0.95	11.40	0.88	11.40	0.82	11.40	0.76
	8	15.16	1.52	15.18	1.39	15.19	1.27	15.19	1.17	15.20	1.09	15.21	1.02
<b>22.86 m Taper Length</b>	10	18.95	1.91	18.97	1.73	18.98	1.59	18.99	1.47	19.00	1.36	19.01	1.27
	12	22.75	2.29	22.77	2.08	22.78	1.91	22.79	1.76	22.80	1.63	22.81	1.52
<b>30.48 m Taper Length</b>	14	26.54	2.67	26.56	2.42	26.58	2.22	26.59	2.05	26.60	1.91	26.61	1.78
	16	30.33	3.05	30.35	2.77	30.37	2.54	30.39	2.34	30.40	2.18	30.41	2.03
<b>38.10 m Taper Length</b>	18	34.12	3.43	34.15	3.12	34.17	2.86	34.19	2.64	34.20	2.45	34.21	2.29
	20	37.91	3.81	37.94	3.46	37.97	3.18	37.99	2.93	38.00	2.72	38.02	2.54
<b>45.72 m Taper Length</b>	22	41.70	4.19	41.74	3.81	41.76	3.49	41.79	3.22	41.80	2.99	41.82	2.79
	24	45.49	4.57	45.53	4.16	45.56	3.81	45.58	3.52	45.60	3.27	45.62	3.05
<b>53.34 m Taper Length</b>	26	49.28	4.95	49.32	4.50	49.36	4.13	49.38	3.81	49.40	3.54	49.42	3.30
	28	53.07	5.33	53.12	4.85	53.15	4.45	53.18	4.10	53.20	3.81	53.22	3.56
<b>60.96 m Taper Length</b>	30	56.86	5.72	56.91	5.20	56.95	4.76	56.98	4.40	57.00	4.08	57.02	3.81
	32	60.65	6.10	60.71	5.54	60.75	5.08	60.78	4.69	60.80	4.35	60.82	4.06

All "X" dimensions shown are from the centerline of Post 0 to the centerline of the indicated post along the standard guardrail offset line extended.

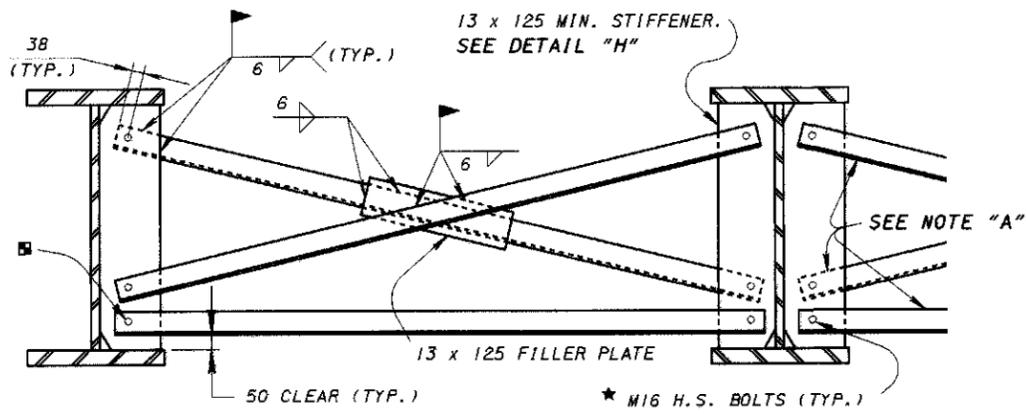
All "Y" dimensions shown are from the standard guardrail offset line extended to the face of rail at the post indicated.



BUREAU OF LOCATION AND DESIGN OHIO DEPARTMENT OF TRANSPORTATION	
<b>GUARDRAIL FLARE DETAILS</b>	DATE 4-21-95
STANDARD CONSTRUCTION DRAWING <b>GR-5.1M</b>	
APPROVED <i>B.K. Hubman</i>	ENGR., L & D

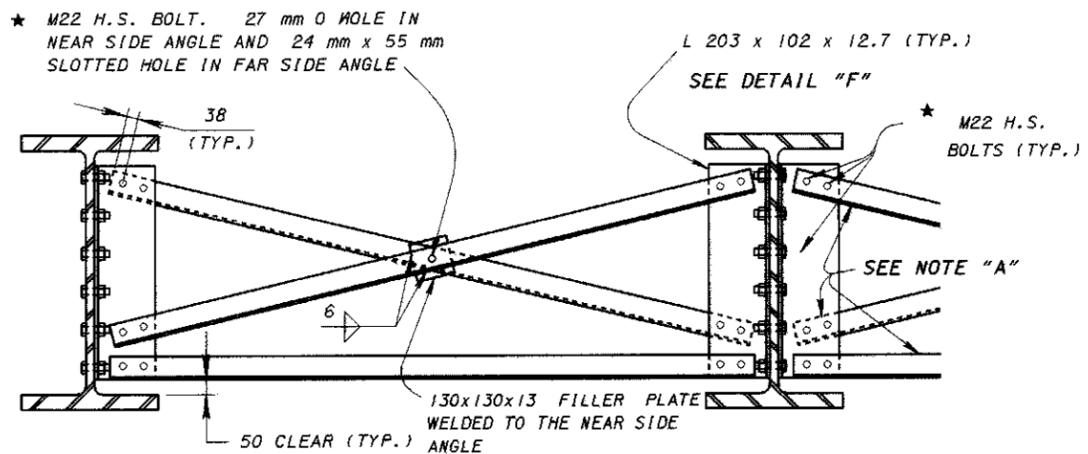


**TYPE 1: INTERMEDIATE WELDED CROSSFRAME DETAILS**  
FOR ROLLED BEAM BRIDGES  
AASHTO CASE 11

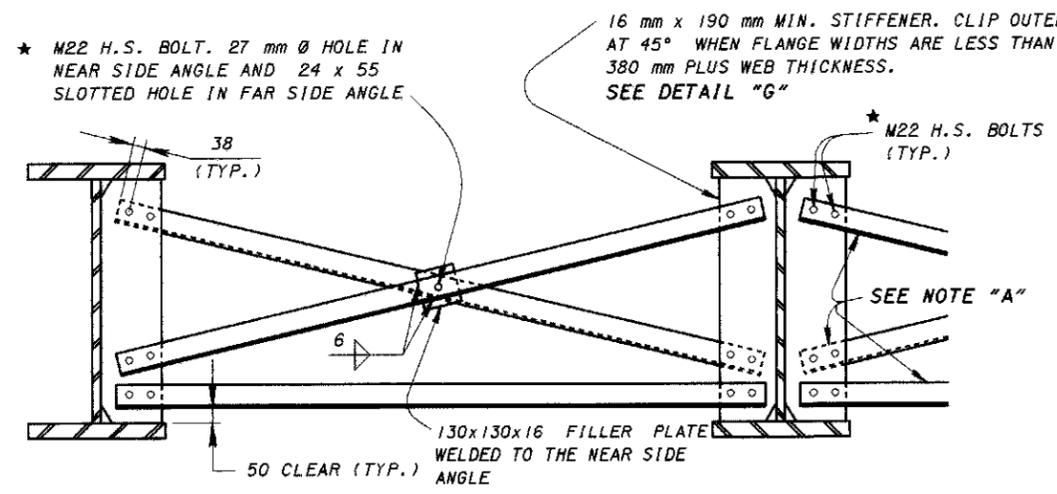


**TYPE 3 INTERMEDIATE WELDED CROSSFRAME DETAILS**  
FOR GIRDER BRIDGES AND AASHTO CASE 1 ROLLED BEAM BRIDGES

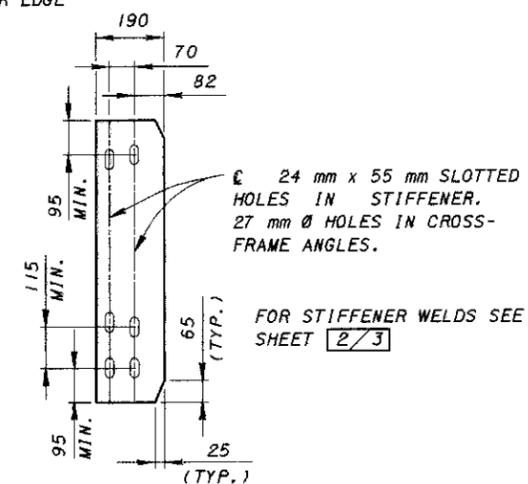
CROSSFRAME ANGLE SIZE	
DEPTH OF BEAM/GIRDER	MINIMUM SIZE ANGLE
D < 1250 mm	76x76x7.9
1200 mm < D < 1350 mm	89x89x9.5
1300 mm < D < 1550 mm	102x102x9.5



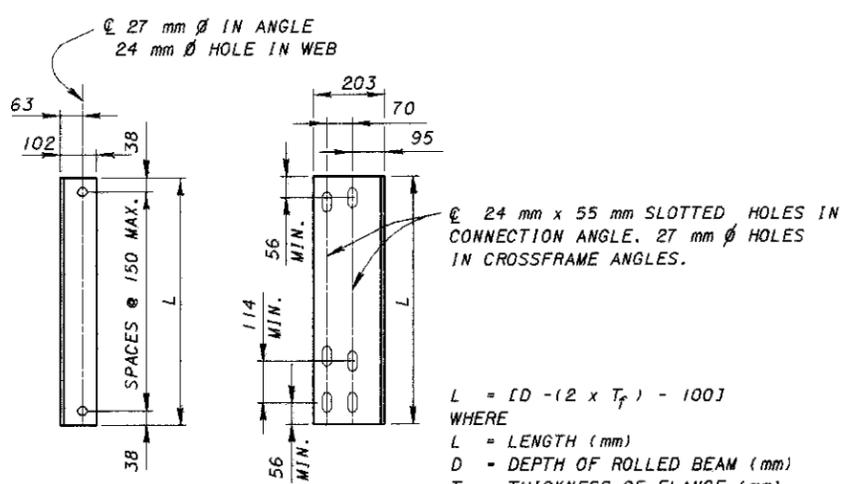
**TYPE 2: INTERMEDIATE BOLTED CROSSFRAME DETAILS**  
FOR ROLLED BEAM BRIDGES  
AASHTO CASE 1 OR CASE 11



**TYPE 4 INTERMEDIATE BOLTED CROSSFRAME DETAILS**  
FOR GIRDER BRIDGES AND AASHTO CASE 1 ROLLED BEAM BRIDGES



**DETAIL "G"**



**DETAIL "F"**

★ ALL BOLTS ARE A325M TYPE 1 GALVANIZED FOR A GALVANIZED OR PAINTED BRIDGE AND A325M TYPE 3 FOR A588M WEATHERING STEEL BRIDGE. EACH ANCHOR ASSEMBLY SHALL INCLUDE A BOLT, NUT AND TWO (2) WASHERS, TIGHTENED PER CMS SECTION 513.15.

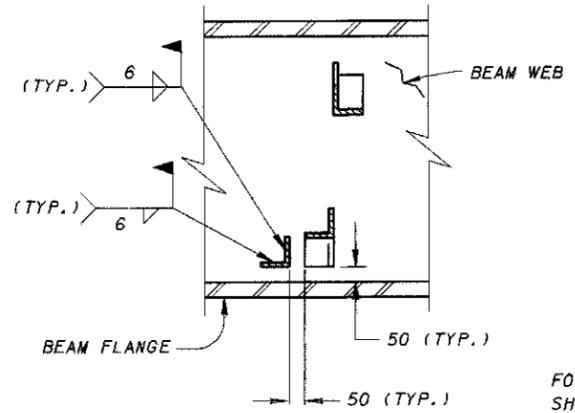
THE FABRICATOR SHALL CHECK LONGITUDINAL CROSSFRAME SPACING SO THAT INTERFERENCE WITH BOLTED SPLICES, ANCHOR BOLTS, COMPLETE PENETRATION WEB OR FLANGE WELDED SPLICES AND BEARING STIFFENERS CAN BE AVOIDED. SPACING SHALL BE ADJUSTED TO PROVIDE AT LEAST 150 mm OF LONGITUDINAL CLEARANCE. THE FABRICATOR MAY ADJUST CROSS-FRAME SPACES UP TO A MAXIMUM OF 5000 mm CENTER TO CENTER UNLESS THE CONTRACT DRAWINGS PROVIDE A NOTED MAXIMUM.

FOR COMPLETELY SHOP PAINTED OR GALVANIZED SYSTEMS, A TYPE 2 OR TYPE 4 CROSSFRAME SHALL BE USED.

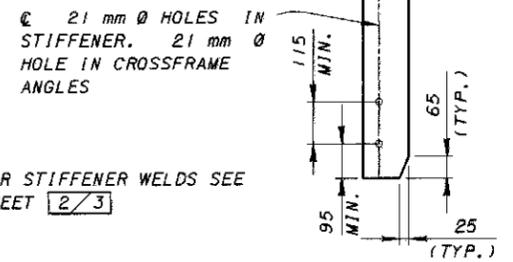
AT THE OPTION OF THE CONTRACTOR, TYPE 2 CROSSFRAME CAN BE USED IN LIEU OF TYPE 1 CROSSFRAME AND TYPE 4 CROSSFRAME CAN BE USED INSTEAD OF TYPE 3 CROSSFRAME.

■ AT SKEWED STRUCTURES THE NEED OF SLOTTED HOLES AT EACH CROSS FRAME LOCATION SHALL BE INVESTIGATED AND SPECIFIED ON THE PLANS AS REQUIRED.

**NOTE "A"**  
MATCH CROSSFRAME LEGS TO EACH SIDE OF THE WEB, SEE CROSSFRAME ANGLE SIZE GUIDE TABLE FOR SIZES

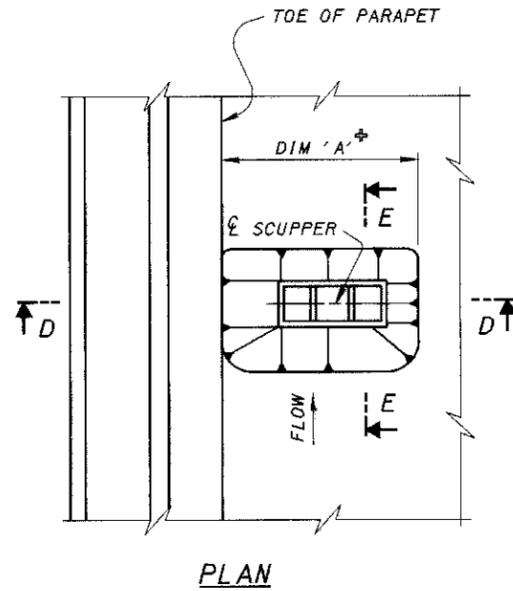


**SECTION A-A**

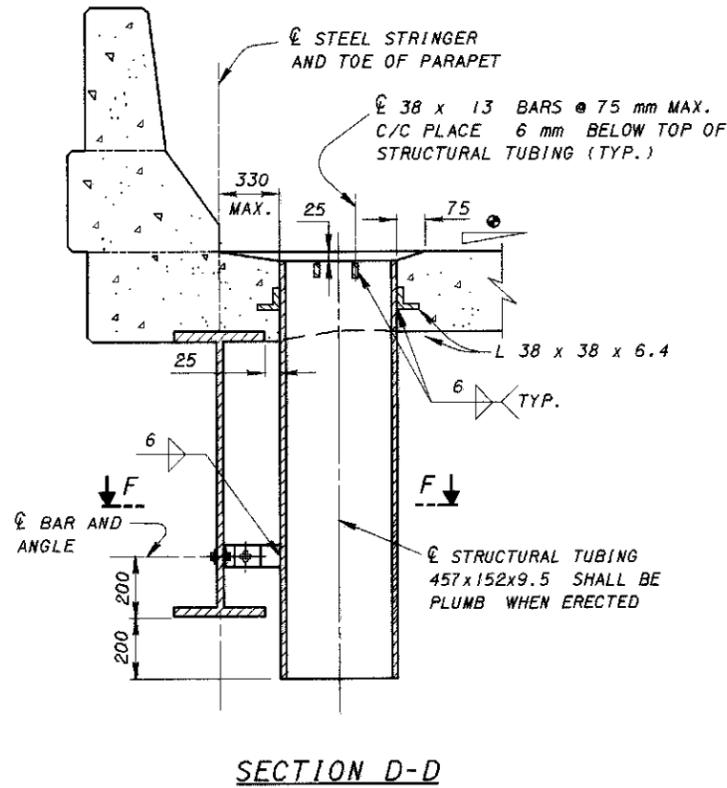


**DETAIL "H"**





⊕ DIMENSION 'A' SHALL NOT EXTEND BEYOND THE LIMITS OF THE SHOULDER (SHALL NOT FALL IN THE TRAFFIC LANE)



THE SCUPPERS SHALL BE LOCATED ON THE BRIDGE DECK BASED ON BRIDGE GEOMETRY AND THE CONTRIBUTING DECK DRAINAGE.

THE CONCRETE DECK, AT THE TWO SCUPPER CORNERS AWAY FROM THE CURB LINE, SHALL BE REINFORCED BY 900 mm LONG #13M BAR, ONE BAR AT EACH CORNER, ORIENTED AT 45° TO THE SCUPPER.

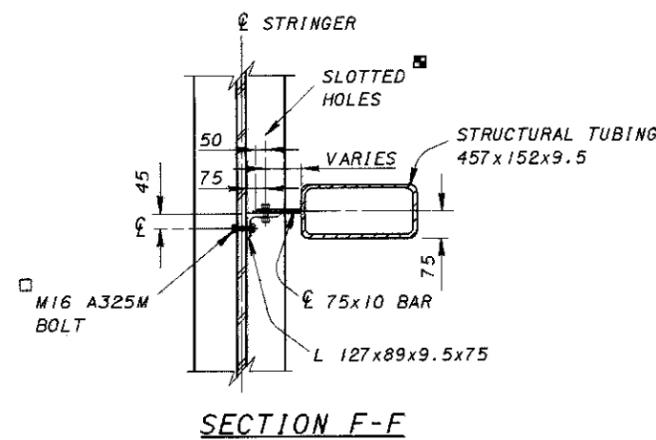
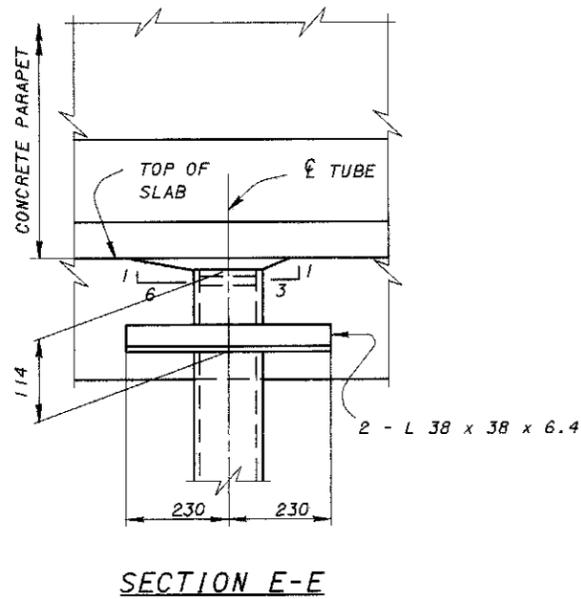
□ SQUARE CUT TOP OF TUBE UNLESS DESIGNER SPECIFIES CROSS SLOPE GREATER THAN 13 mm PER 305 mm IN WHICH CASE THE TOP IS TO BE CUT PARALLEL TO THE CROSS SLOPE.

■ SLOTTED HOLES SHALL BE 17 mm x 39 mm. THE SLOT SHALL BE HORIZONTAL IN THE 75 mm x 10 mm BAR AND VERTICAL IN THE ANGLE. USE A M16 A325M HIGH STRENGTH HEX HEAD BOLT WITH HEX NUT AND WASHERS, TIGHTEN AS PER CMS 513.15.

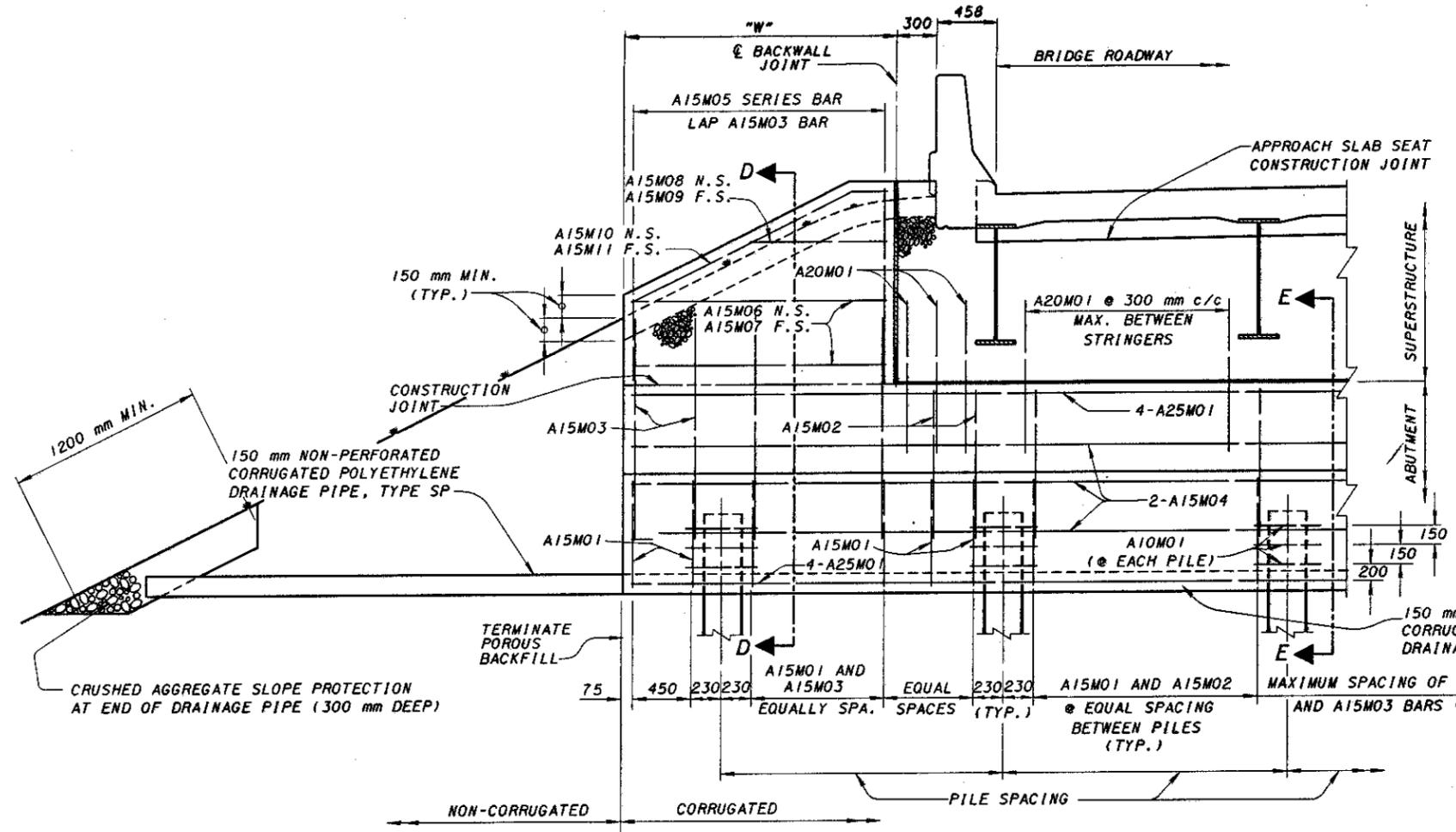
□ M16 A325M TYPE 1 GALVANIZED FOR A GALVANIZED OR PAINTED BRIDGE AND A325M TYPE 3 FOR A588M WEATHERING STEEL BRIDGE. EACH ASSEMBLY SHALL INCLUDE A BOLT, NUT AND TWO (2) WASHERS, TIGHTENED PER CMS SECTION 513.15. FOR A GALVANIZED BRIDGE SYSTEM PROVIDE A 88 mm x 88 mm x 3 mm PREFORMED BEARING PAD WITH A 20 mm Ø HOLE AS PER CMS 711.21 BETWEEN THE BEAM WEB AND THE ANGLE. FIELD DRILL 20 mm DIAMETER HOLE IN THE WEB AFTER THE DECK CONCRETE HAS BEEN POURED.

THE SUPPORT ANGLES, BARS, SUPPORT BOLTS AND RELATED HARDWARE ARE INCLUDED WITH SCUPPERS FOR PAYMENT.

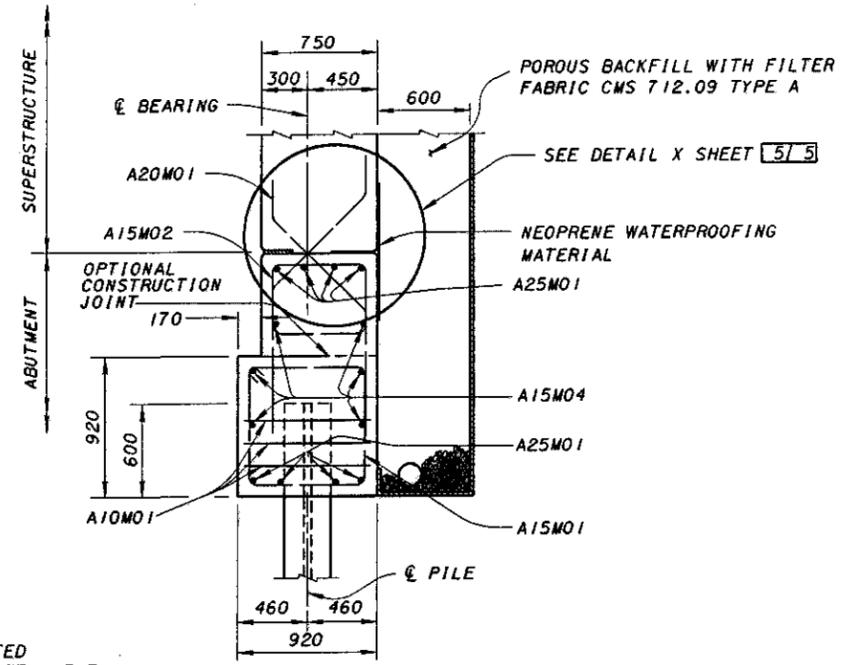
SCUPPERS INCLUDING SUPPORT ANGLES, BARS, BOLTS, NUTS AND WASHERS SHALL BE GALVANIZED IN ACCORDANCE WITH CMS 711.02.



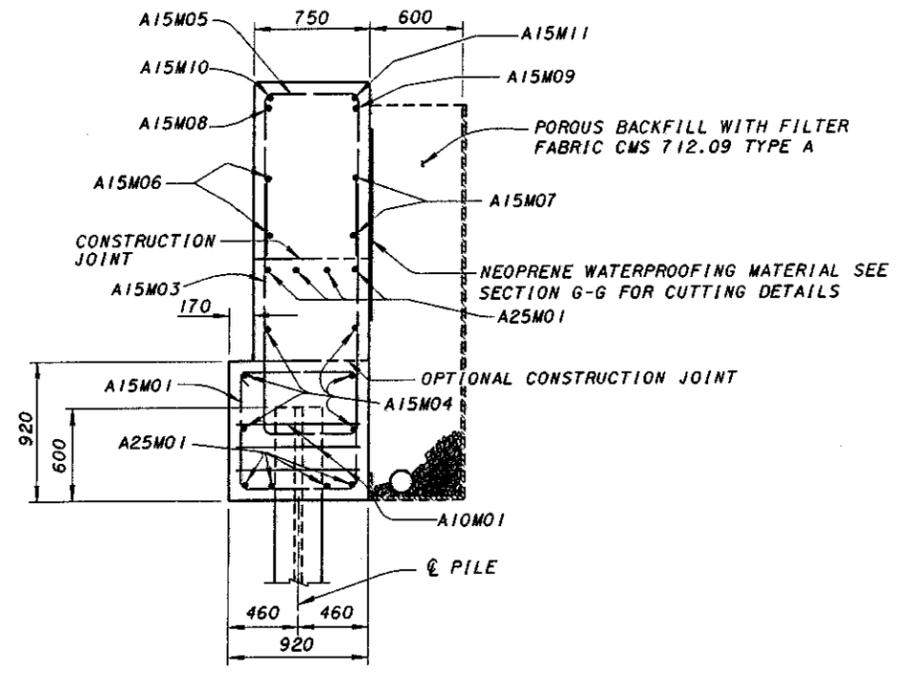




SECTION C-C



SECTION E-E



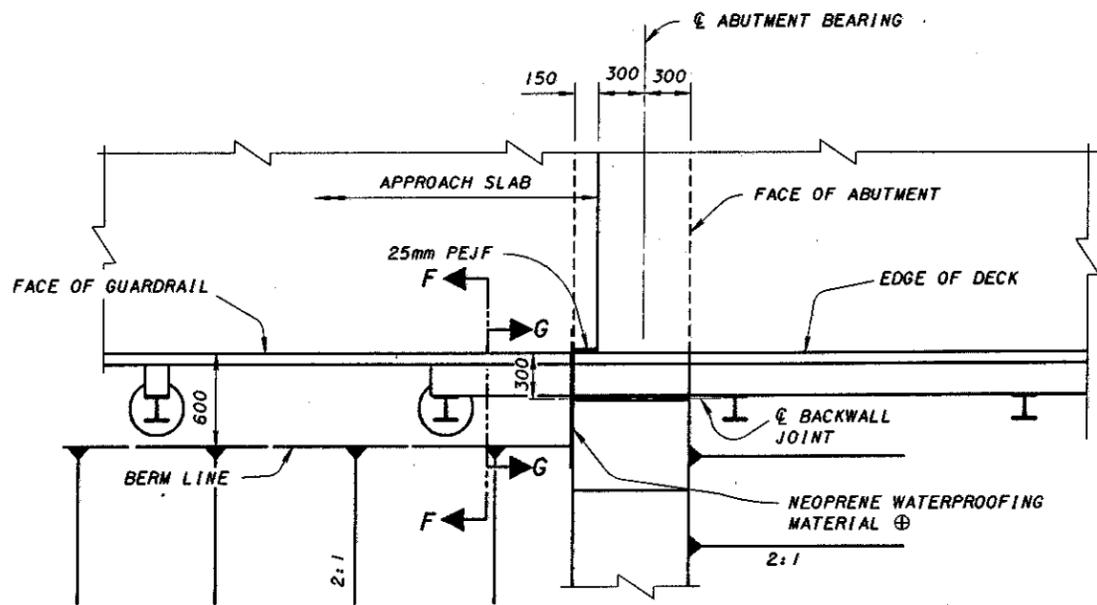
SECTION D-D

REINFORCING STEEL			BENDING DIAGRAMS	
MARK	LENGTH	SHAPE		
A25M01	①	ST.		
A20M01	3100	BT.		
A15M01	3160	BT.		
A15M02	A	BT.		
A15M03	A	BT.		
A15M04	①	ST.		
A15M05	B	BT.		
A15M06	②	ST.		
A15M07	②	ST.		
A15M08	②	ST.		
A15M09	②	ST.		
A15M10	②	BT.		
A15M11	②	BT.		
A10M01	2435	BT.		

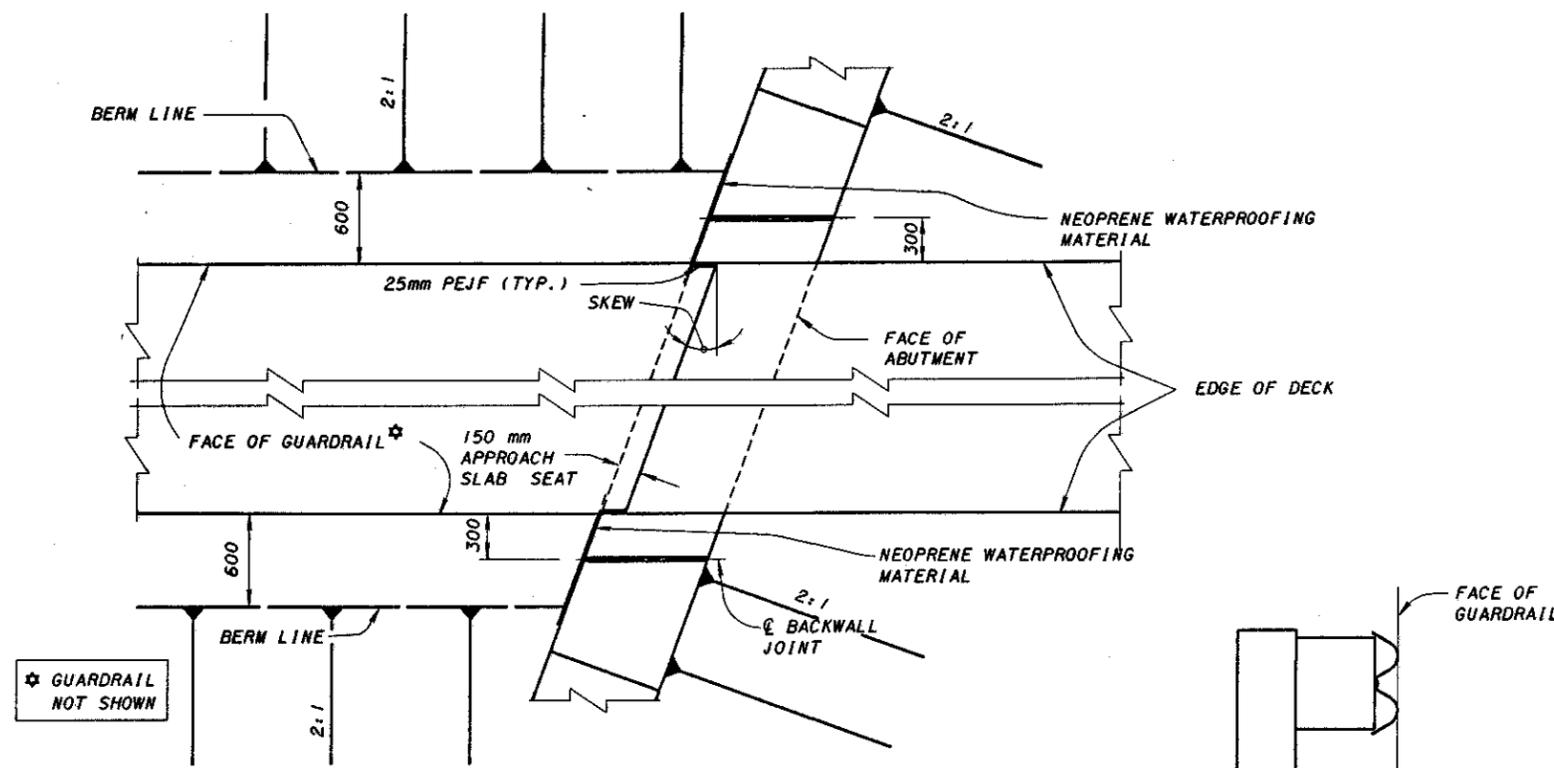
A-LENGTH MAY VARY WITH EACH INDIVIDUAL STRUCTURE.  
B-LENGTH AND INCREMENT (SERIES BAR) MAY VARY WITH EACH INDIVIDUAL STRUCTURE.

ALL STEEL CLEARANCES ARE 75 mm UNLESS OTHERWISE NOTED

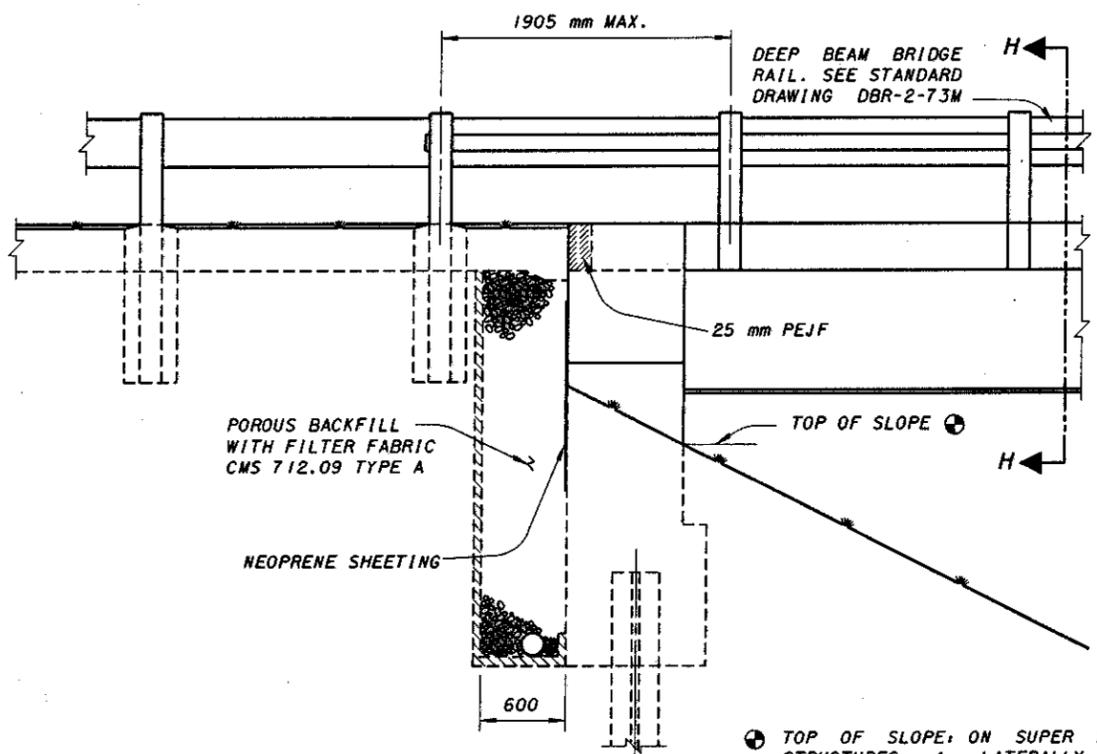
① - 1/2 (LENGTH OF ABUTMENT-100 mm) + 1/2 BAR LAP.  
② - LENGTH IS DEPENDENT UPON DIMENSION "W" (LENGTH OF WINGWALL).



PART PLAN AT ABUTMENT  
SQUARE STRUCTURE

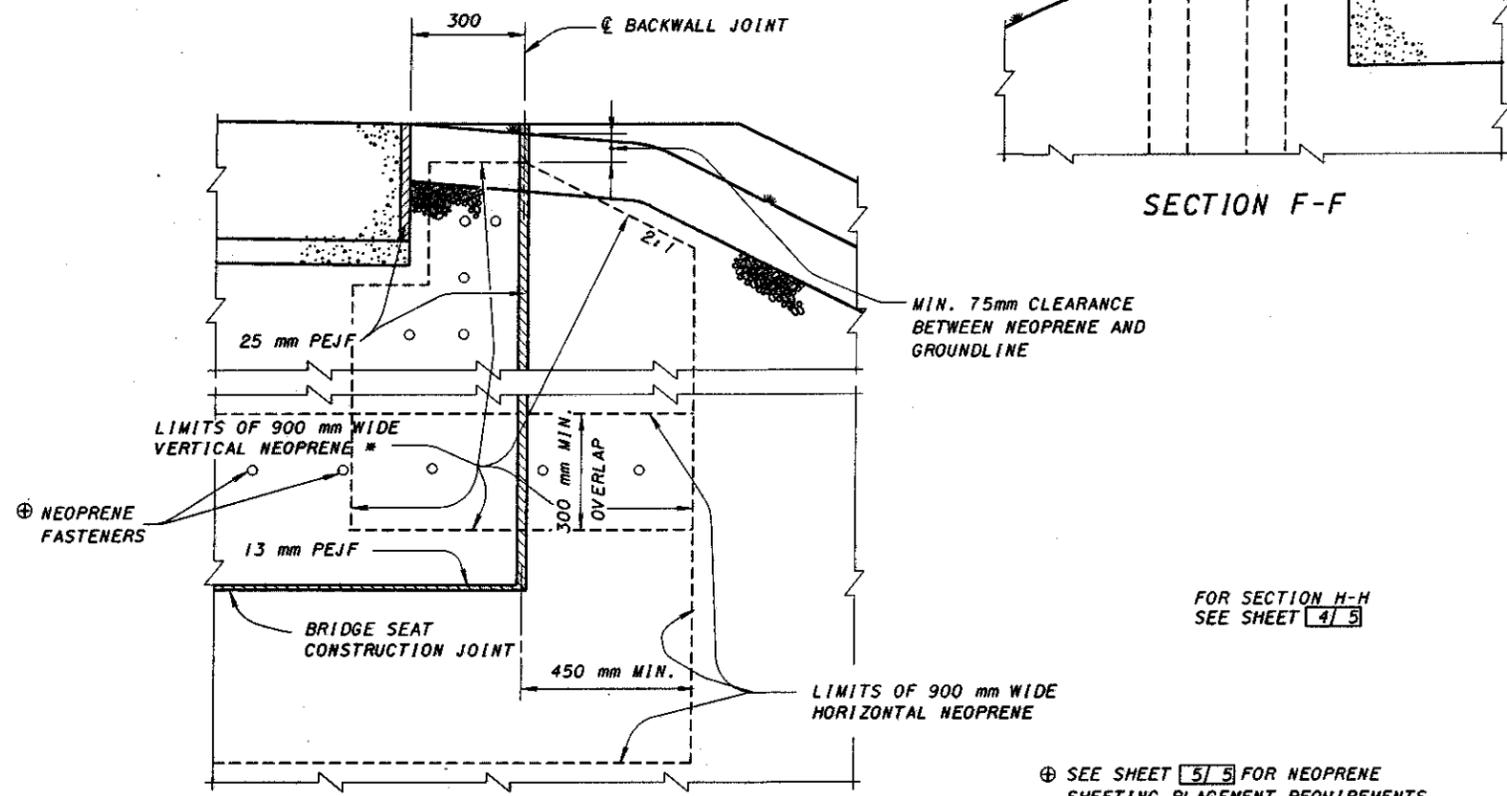


PART PLAN AT ABUTMENT  
SKEWED STRUCTURE



ELEVATION

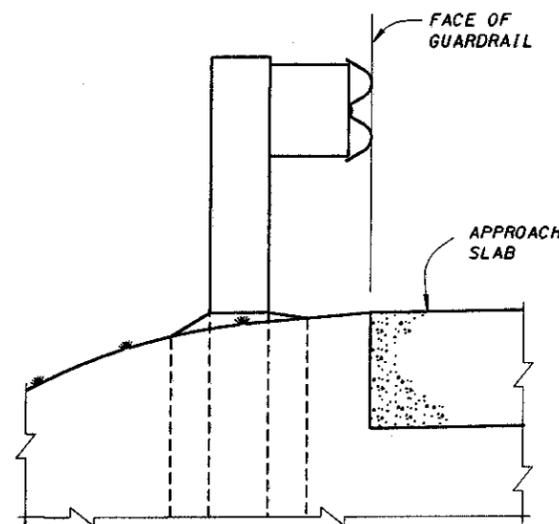
⊕ TOP OF SLOPE, ON SUPER ELEVATED STRUCTURES, A LATERALLY SLOPING "TOP OF SLOPE" SHOULD BE USED TO AVOID EXCESSIVELY LONG WING LENGTHS



SECTION G-G

⊕ SEE SHEET 5/5 FOR NEOPRENE SHEETING PLACEMENT REQUIREMENTS

\* 50 mm MIN. CLEARANCE OF NEOPRENE FROM THE EDGE OF DECK



SECTION F-F

FOR BRIDGES WITH DEEP BEAM RAILING

STANDARD  
INTEGRAL CONSTRUCTION DETAILS  
STEEL STRINGER STRUCTURES  
ON FLEXIBLE ABUTMENTS

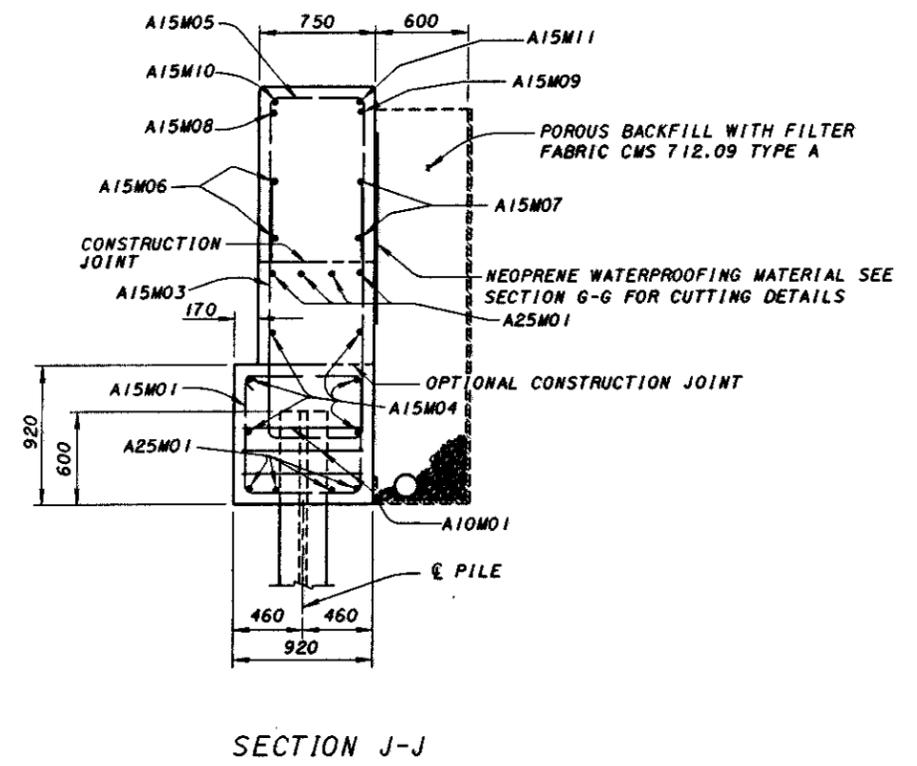
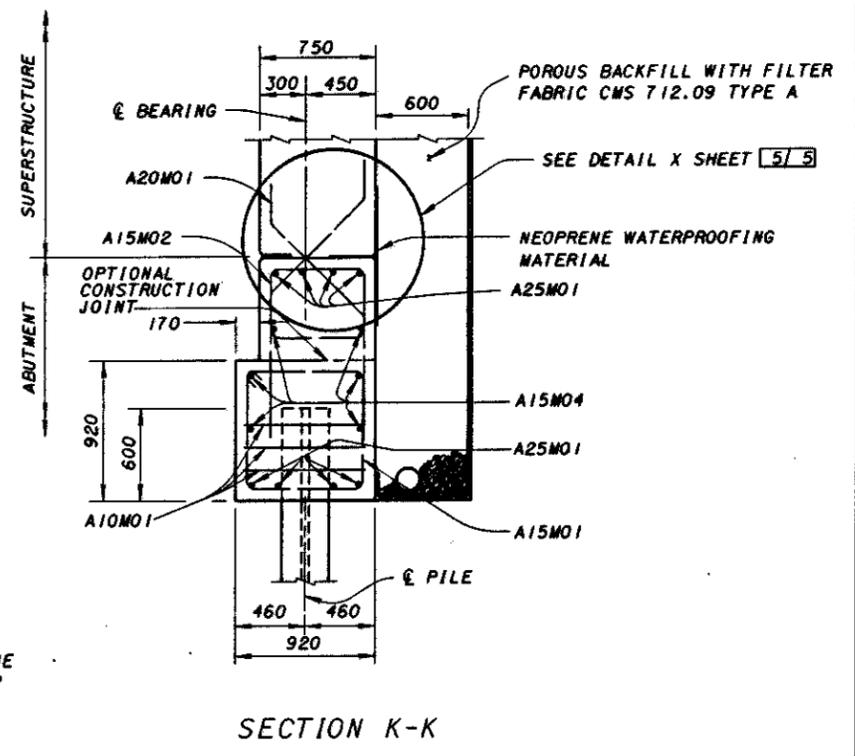
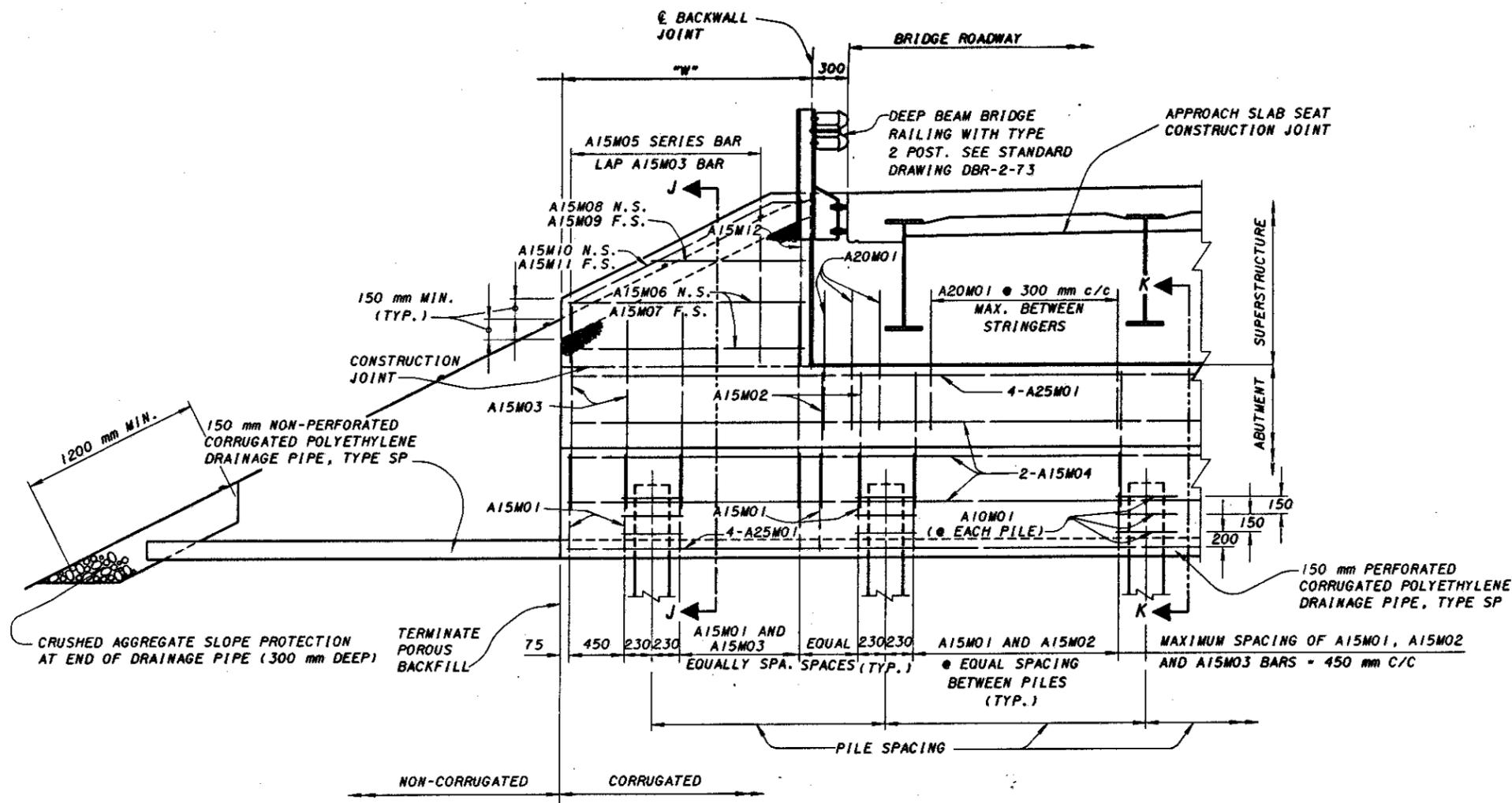
DESIGN AGENCY  
BUREAU OF BRIDGES  
AND  
STRUCTURAL DESIGN

STATE OF OHIO DEPARTMENT OF TRANSPORTATION  
S-20-95  
ENGINEER OF BRIDGES  
DATE

REVISIONS

DESIGNED	MPB/MLM	DRWN	AJM/MLM
CHECKED	RLD/JS		
APPROVED	WJJ/LMW		

ICD-1-82M

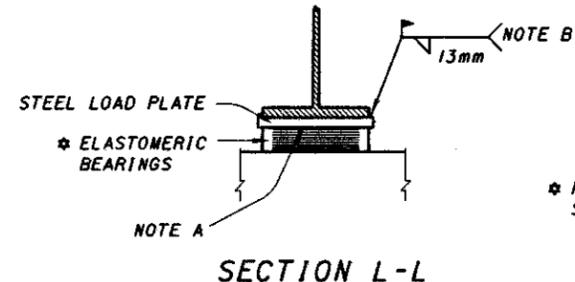
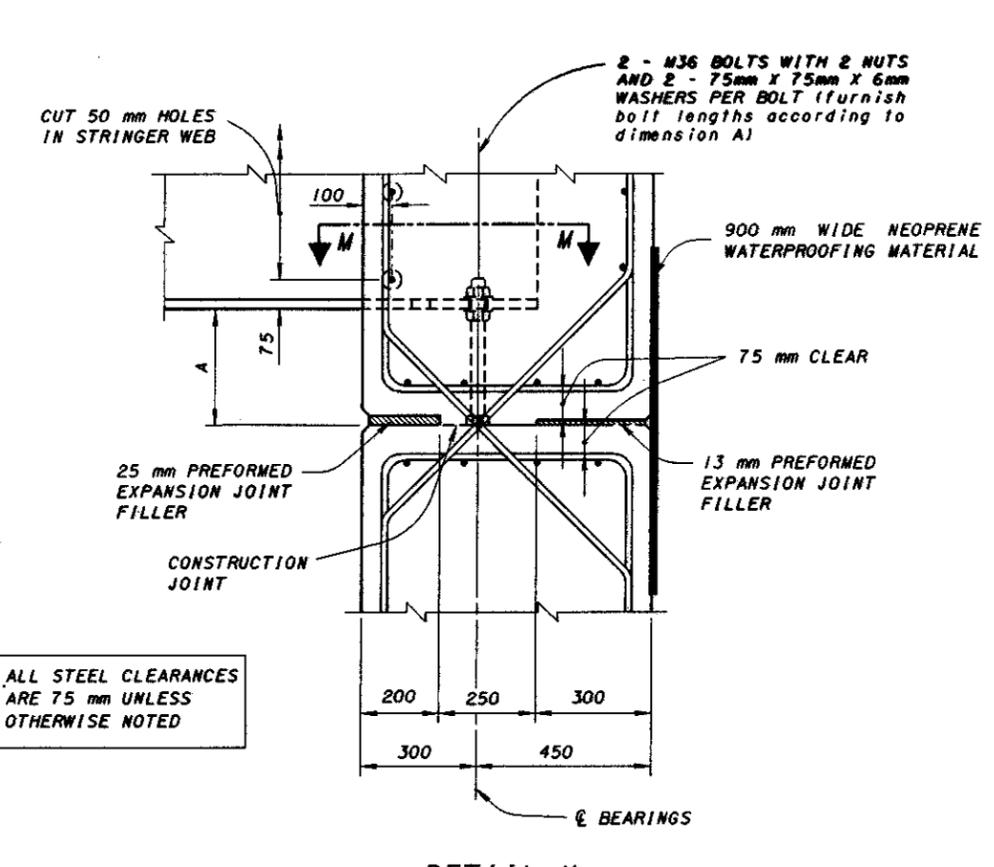
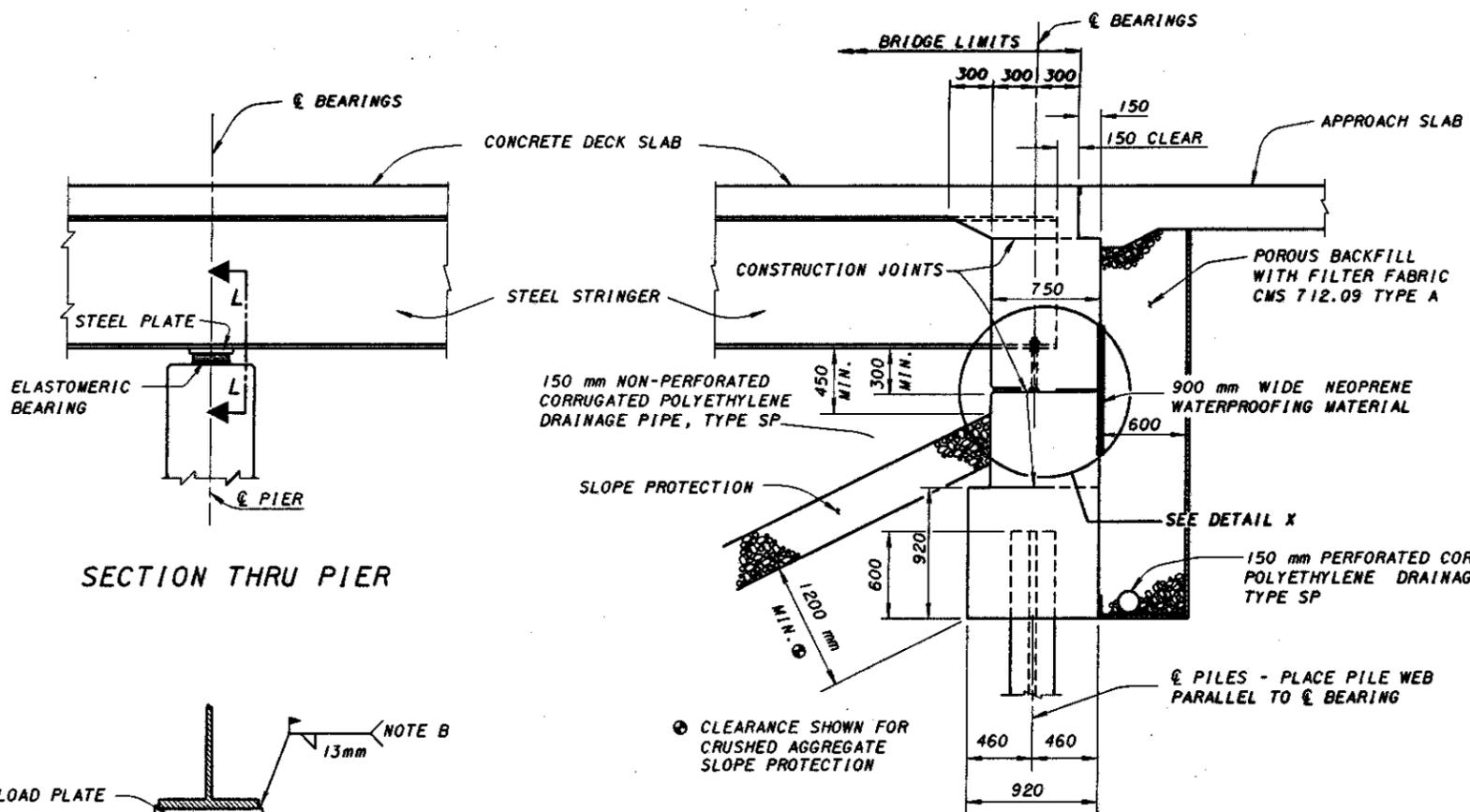


REINFORCING STEEL			BENDING DIAGRAMS	
MARK	LENGTH	SHAPE		
A25M01	①	ST.	A15M02, A15M03 & A15M12	
A20M01	3100	BT.	A15M05	
A15M01	3160	BT.	A20M01	
A15M02	A	BT.	A15M10 A15M11	
A15M03	A	BT.		
A15M04	①	ST.		
A15M05	B	BT.		
A15M06	②	ST.		
A15M07	②	ST.		
A15M08	②	ST.		
A15M09	②	ST.		
A15M10	②	BT.		
A15M11	②	BT.		
A15M12	A	BT.		
A10M01	2435	BT.		

A-LENGTH MAY VARY WITH EACH INDIVIDUAL STRUCTURE.  
B-LENGTH AND INCREMENT (SERIES BAR) MAY VARY WITH EACH INDIVIDUAL STRUCTURE.

ALL STEEL CLEARANCES ARE 75 mm UNLESS OTHERWISE NOTED

① - 1/2 (LENGTH OF ABUTMENT-100 mm) + 1/2 BAR LAP.  
② - LENGTH IS DEPENDENT UPON DIMENSION "W" (LENGTH OF WINGWALL).



RECOMMENDED PIER BEARING

**PIER BEARING NOTES**

STEEL LOAD PLATE: UNLESS OTHERWISE SPECIFIED, STEEL LOAD PLATE MATERIAL SHALL BE THE SAME AS THE ATTACHED STRUCTURAL STEEL AND BE SIMILARLY CLEANED AND COATED.

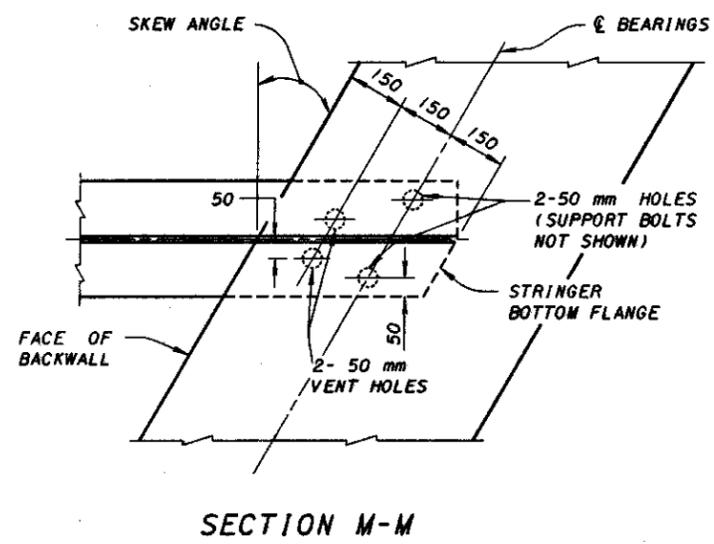
NOTE A: BEARING PARTS SHALL BE VULCANIZED BONDED TOGETHER UNDER HEAT AND PRESSURE.

NOTE B: WELDING SHALL BE CONTROLLED SO THAT THE STEEL LOAD PLATE TEMPERATURE AT THE ELASTOMER BONDED SURFACE DOES NOT EXCEED 300° F AS DETERMINED BY USE OF PYROMETRIC STICKS OR OTHER TEMPERATURE MONITORING DEVICES.

**ABUTMENT NOTES**

LIMITATIONS: THIS DESIGN IS INTENDED FOR SITES WHERE THE PROBABILITY OF SETTLEMENT IS REMOTE, FOR SYMMETRICAL UNCURVED STRUCTURES WITH SKEWS NOT GREATER THAN 30° AND SUM OF SPANS NOT GREATER THAN 75.0 m. IT MAY BE USED FOR UNSYMMETRICAL SPANS PROVIDED THAT EXPANSION BEARINGS ARE USED AT PIERS OR THAT PIERS AT FIXED BEARINGS ARE DESIGNED FOR THE FORCES INDUCED BY UNBALANCED THERMAL MOVEMENTS. WHERE FIXED, RIGID PIERS ARE USED, THE MAXIMUM BRIDGE EXPANSION LENGTH SHALL BE 75.0 m.

BRIDGE SEAT CONSTRUCTION JOINT: SHALL BE STRAIGHT BETWEEN ENDS OF BACKWALL.



**NEOPRENE PLACEMENT**

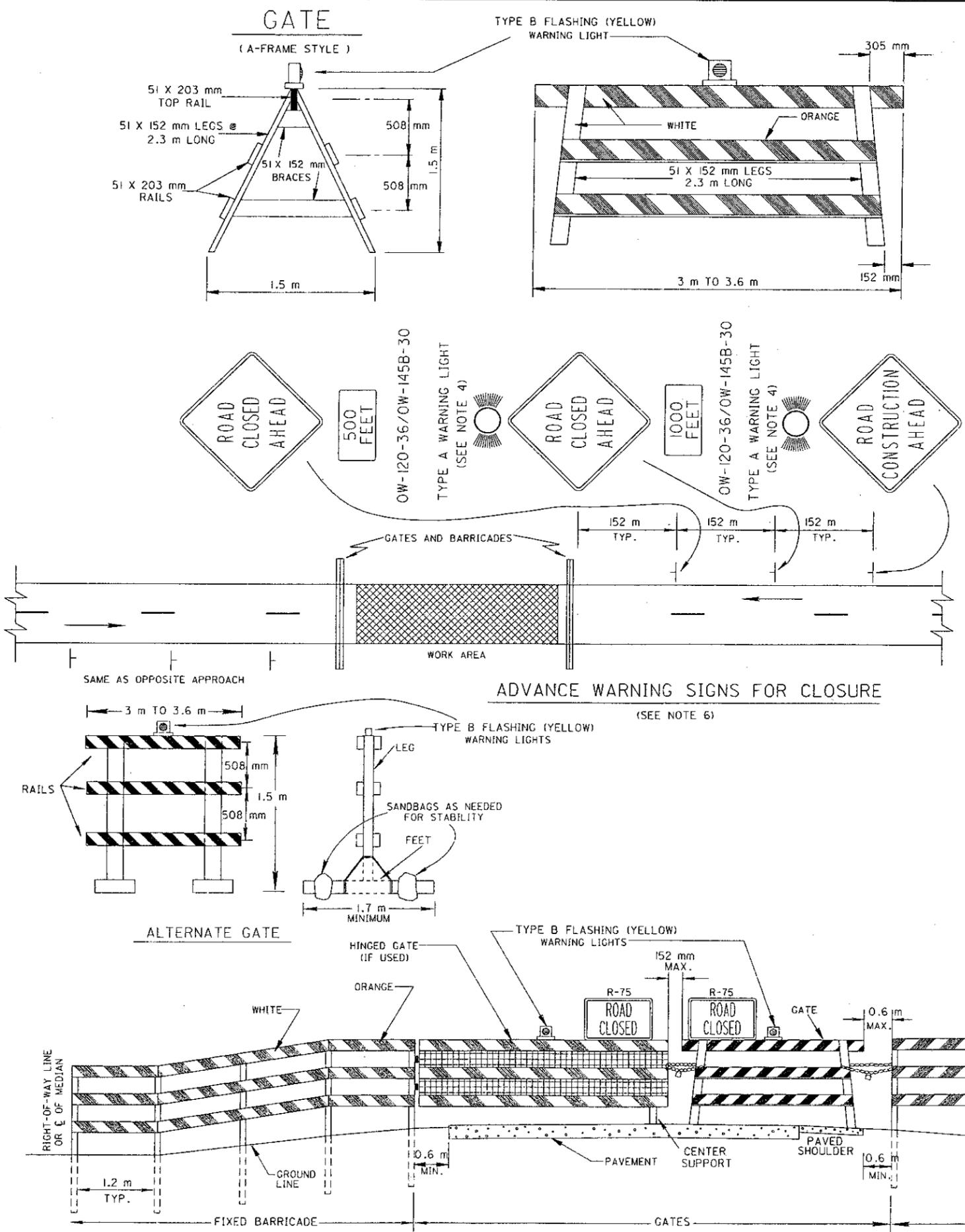
INSTALL A 900 mm WIDE STRIP, 2.5 mm THICK, GENERAL PURPOSE, HEAVY DUTY NEOPRENE SHEET WITH NYLON FABRIC REINFORCEMENT AT LOCATIONS SHOWN IN THE PLANS. SECURE THE 1 METER WIDE NEOPRENE SHEETING TO THE CONCRETE WITH 32 X 3.0 mm (LENGTH X SHANK DIAMETER) GALVANIZED BUTTON HEAD SPIKES THROUGH A 25 mm OUTSIDE DIAMETER, 3mm GALVANIZED WASHER. MAXIMUM FASTENER SPACING IS 225 mm. OTHER SIMILAR GALVANIZED DEVICES WHICH WILL NOT DAMAGE EITHER THE NEOPRENE OR THE CONCRETE MAY BE USED SUBJECT TO THE APPROVAL OF THE ENGINEER.

CENTER THE NEOPRENE STRIPS ON ALL JOINTS. FOR HORIZONTAL JOINTS, SECURE THE HORIZONTAL NEOPRENE STRIP BY USING A SINGLE LINE OF FASTENERS, STARTING AT 150 mm (+/-) FROM THE TOP OF THE NEOPRENE STRIP. FOR THE VERTICAL JOINTS SECURE THE VERTICAL NEOPRENE STRIP BY USING A SINGLE VERTICAL LINE OF FASTENERS, STARTING AT 150 mm (+/-) FROM THE VERTICAL EDGE OF THE NEOPRENE STRIP NEAREST TO THE CENTERLINE OF ROADWAY. FOR VERTICAL JOINTS, INSTALL 2 ADDITIONAL FASTENERS AT 150 mm CENTER TO CENTER ACROSS THE TOP OF THE NEOPRENE STRIP ON THE SAME SIDE OF THE VERTICAL JOINT AS THE SINGLE VERTICAL ROW OF FASTENERS IS LOCATED.

THE VERTICAL NEOPRENE STRIPS SHOULD OVERLAP THE HORIZONTAL STRIPS. LAPS IN THE LENGTH OF THE HORIZONTAL STRIPS DUE TO MATERIAL MANUFACTURING SHALL BE AT LEAST 300 mm IN LENGTH, IF NOT VULCANIZED OR ADHESIVED, OR 150 mm IN LENGTH IF THE LAP IS VULCANIZED OR ADHESIVED NO LAPS ARE ACCEPTABLE IN VERTICALLY INSTALLED NEOPRENE STRIPS.

PAYMENT FOR LABOR, MATERIALS AND INSTALLATION OF THESE ITEMS SHALL BE INCLUDED IN ITEM 511 CLASS C CONCRETE, ABUTMENT, AS PER PLAN.

DESIGN AGENCY	BUREAU OF BRIDGES AND STRUCTURAL DESIGN
STATE OF OHIO DEPARTMENT OF TRANSPORTATION	DATE
DESIGNED BY	3-20-95
CHECKED BY	ENGINEER OF BRIDGES
APPROVED BY	
REVISIONS	
DESIGNED	ICD-1-82N
CHECKED	
APPROVED	
STANDARD	
INTEGRAL CONSTRUCTION DETAILS	
STEEL STRINGER STRUCTURES	
ON FLEXIBLE ABUTMENTS	
5	5



**GENERAL NOTES**

- BARRICADES:** BARRICADES SHALL BE CONSTRUCTED ACCORDING TO DETAILS SHOWN. WHEN THE ROAD IS CLOSED TO TRAFFIC, BARRICADES AND GATES SHALL BE USED TO EFFECTIVELY CLOSE THE ENTIRE ROADWAY INCLUDING THE MEDIAN OF DIVIDED HIGHWAYS. IN URBAN AREAS AND AT LOCATIONS WHERE IT IS IMPRACTICAL TO EXTEND THE BARRICADE TO THE RIGHT-OF-WAY LINE BECAUSE OF A SIDEWALK WHICH IS TO REMAIN OPEN OR OTHER OBSTRUCTION, THE ENDS OF THE BARRICADE SHALL BE LOCATED AS DIRECTED BY THE ENGINEER TO EFFECT THE DESIRED CLOSING OF THE HIGHWAY.
- PAINTING AND REFLECTORIZATION:** IN CONSTRUCTION OR MAINTENANCE AREAS ALL RAILS OF THE BARRICADES AND GATES SHALL BE REFLECTORIZED WITH ORANGE AND WHITE REFLECTORIZED TYPE G SHEETING IN 152 mm WIDE ALTERNATE STRIPES WHICH SLOPE DOWNWARD TOWARD THE CENTER LINE OF THE ROAD AT AN ANGLE OF 45°. THE TOP RAIL OF THE A-FRAME AND ALL THREE RAILS OF THE HINGED GATE SHALL BE STRIPED ON BOTH SIDES. ALL POST, BRACES, GATE LEGS, AND ANY UNSTRIPED RAILS SHALL BE PAINTED WHITE. (GATES AND BARRICADES USED IN PERMANENT OR SEMIPERMANENT APPLICATION SHALL DIFFER ONLY IN THAT THEY SHALL USE RED AND WHITE STRIPES).
- GATES:** ONE GATE SHALL BE ERECTED FOR EACH TRAFFIC LANE. GATES SHALL BE CHAINED AND PADLOCKED TO ONE ANOTHER AND TO ADJACENT POST OF THE BARRICADES. CHAINS SHALL BE 6.4 mm STOCK OR LARGER WITH WELDED LINKS. A HINGED GATE MAY BE USED AND SHALL BE SUPPORTED AT THE CENTER IN AN APPROVED MANNER.
- TYPE A FLASHING WARNING LIGHTS:** TYPE A FLASHING WARNING LIGHTS ARE REQUIRED ON THE OW-128 AND THE FIRST OW-120 SIGNS.
- TYPE B FLASHING WARNING LIGHTS:** EACH GATE SHALL BE EQUIPPED WITH A TYPE B FLASHING WARNING LIGHT, CONSPICUOUSLY VISIBLE AT ALL DISTANCES UP TO 305 m UNDER NORMAL ATMOSPHERIC CONDITIONS. THE LIGHT SHALL BE IN OPERATION AT ALL TIMES DURING THE PERIOD THE HIGHWAY IS CLOSED.
- SIGNS:** WHERE THE ROAD IS CLOSED TO TRAFFIC BY THE ERECTION OF GATES AND BARRICADES, R-75 SIGNS SHALL BE MOUNTED ON THE GATES AS SHOWN. THE ADVANCE WARNING SIGNS SHOWN ON THIS DRAWING WILL NOT BE REQUIRED WHEN ALL TRAFFIC HAS BEEN DIRECTED FROM THE ROADWAY AT OR JUST IN ADVANCE OF THE GATES AND BARRICADES SUCH AS ON A LIMITED ACCESS HIGHWAY OR WHEN A TEMPORARY RUNAROUND SIMILAR TO FIGURE C-24 OF THE OHIO MANUAL IS USED. ADVANCE WARNING SIGNS SHALL BE REQUIRED IN ALL OTHER SITUATIONS AND WHEN REQUIRED IN THE PLANS. ADVANCE WARNING SIGNS ON AN APPROACH SHALL CONSIST OF TWO OW-120 SIGNS WITH DISTANCE PLAQUES PLACED ABOUT 152 m AND 305 m FROM THE CLOSURE AND A OW-128 PLACED ABOUT 457 m FROM CLOSURE, THE SIGNS SHALL BE PLACED ON BOTH SIDES OF THE ROAD (DUALLED) FOR 4-LANE DIVIDED HIGHWAYS OR WHEN REQUIRED BY THE PLANS.

**OPERATION:** ON A 2-LANE 2-WAY ROADWAY THE CONTRACTOR WILL NORMALLY OPEN ONLY THE LEFT HAND GATE AS NECESSARY TO ALLOW VEHICLES TO ENTER AND IMMEDIATELY CLOSE IT. BOTH GATES WILL NOT NORMALLY BE OPENED AT THE SAME TIME. THE CONTRACTOR SHALL ASSIGN AN EMPLOYEE TO ASSURE THAT GATES ARE CLOSED AND CHAINED SHUT AT THE END OF EACH WORKDAY.

**MATERIALS:** GATES OR BARRICADES SHALL BE FABRICATED OF THE FOLLOWING MATERIALS:

**FIXED BARRICADE:**

- POST: - 102 X 102 mm SQUARE OR 127 mm DIA. (MAXIMUM) WOOD (MAY BE TREATED)
  - NO. 3, DRIVE POST (712.20)
  - UP TO 51 mm SQUARE, 14 GAUGE PUNCHED STEEL TUBING
- RAILS: - 25 X 203 mm OR 51 X 203 mm COMMON LUMBER
  - 203 X (16 TO 25 mm) THICK EXTERIOR PLYWOOD
  - EXTRUDED PLASTIC OR FORMED SHEET METAL WITH A 203 mm WIDE SURFACE AND OF SUFFICIENT STIFFNESS TO RESIST TYPICAL WIND LOADS OF UP TO 1436 pascals, BUT HAVING A WEIGHT OF NOT MORE THAN 7.5 kg/m.

**FASTENERS:** - SPIKES (OF SUFFICIENT LENGTH TO CLINCH)  
- SCREWS/BOLTS (8 mm MIN. DIA.) METAL GUSSETT PLATES AND FORMED OR WELDED METAL JOINTS OF SUFFICIENT SIZE AND QUANTITY TO RESIST THE WIND LOAD SPECIFIED ABOVE. ALL SLIPFIT CONNECTIONS SHALL ALSO BE BOLTED TO PREVENT UNAUTHORIZED DISASSEMBLY

**GATES:**

- LEGS: - 51 X 152 mm COMMON LUMBER ("A FRAME" ONLY)
  - 102 X 102 mm WOOD
  - UP TO 51 mm SQUARE, 14 GAUGE PUNCHED STEEL TUBING
  - NO. 3 DRIVE POST (712.20)
- RAILS: - 51 X 203 mm COMMON LUMBER
- FASTENERS: (SAME AS BARRICADES ABOVE)
- FEET: - 152 X 152 mm WOOD
  - NO. 3 DRIVE POST (712.20)
  - UP TO 57 mm SQUARE, 12 GAUGE PUNCHED STEEL TUBING
- BRACES: - 51 X 152 mm (MAXIMUM) COMMON LUMBER
  - 102 mm WIDE X 19 mm THICK PLYWOOD STRIPS
  - NO. 2 DRIVE POST (712.20)

**HINGED GATE:**

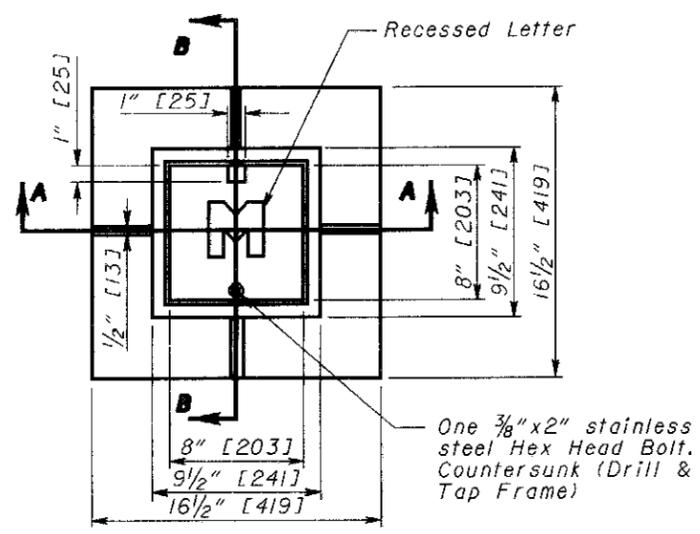
- GATE: - 3.6 m X 1.2 m STEEL FRAME, FARM GATE
- RAILS: (SAME AS FIXED BARRICADES ABOVE)
- HARDWARE: - HINGED SCREWHOOKS FOR HANGING GATE TO POST

**LUMBER:** LUMBER USED IN THE CONSTRUCTION OF GATES AND BARRICADES SHALL BE COMMON YELLOW PINE OR COMMON DOUGLAS FIR, SURFACED ON FOUR SIDES STANDARD, ALL SIZES ARE NOMINAL.

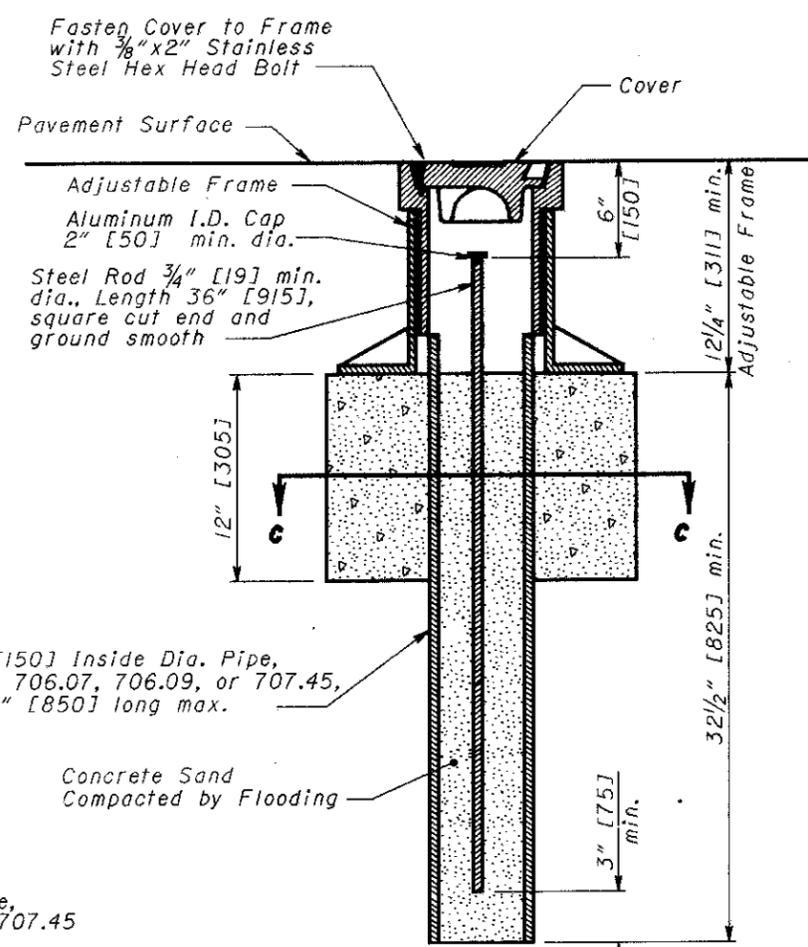
METRIC

ALL WORK AND TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH 614 AND OTHER APPLICABLE PORTIONS OF THE C & M SPECIFICATIONS AS WELL AS IN ACCORDANCE WITH PART 7 OF OMUTCD. PAYMENT FOR ALL LABOR, EQUIPMENT AND MATERIALS TO PROVIDE THIS METHOD OF TRAFFIC CONTROL SHALL BE INCLUDED IN THE LUMP SUM BID FOR 614 MAINTAINING TRAFFIC, UNLESS SEPARATELY ITEMIZED IN THE PLAN.

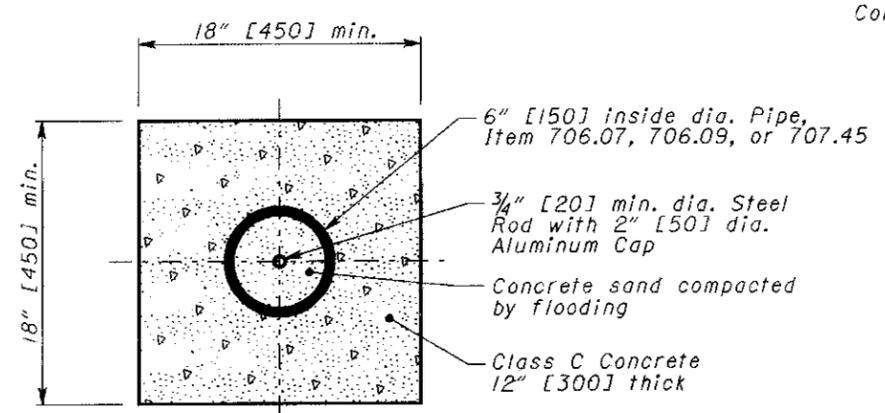
BUREAU OF DESIGN SERVICES DIVISION OF HIGHWAYS OHIO DEPARTMENT OF TRANSPORTATION	
MAINTENANCE OF TRAFFIC	DATE 04/25/94
GATES AND BARRICADES IN POSITION	
STANDARD CONSTRUCTION DRAWING	MT-101.60M
APPROVED <i>[Signature]</i>	ENGR. OF DESIGN SERVICES



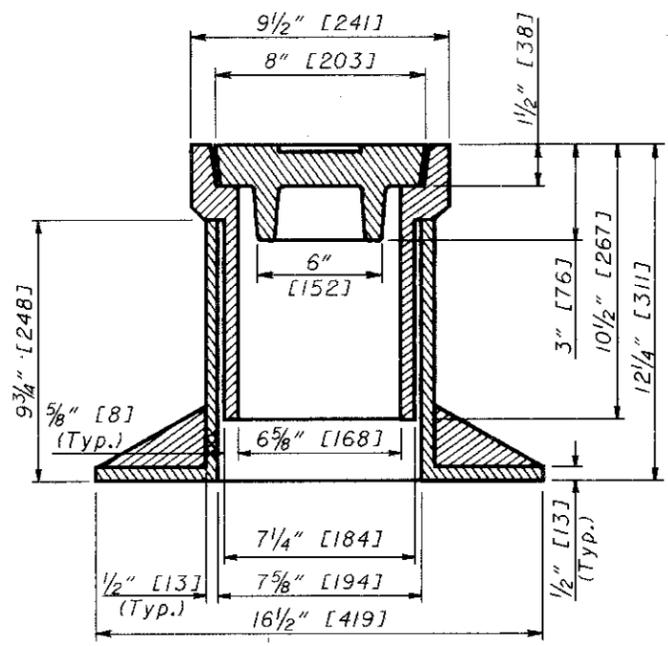
TOP VIEW



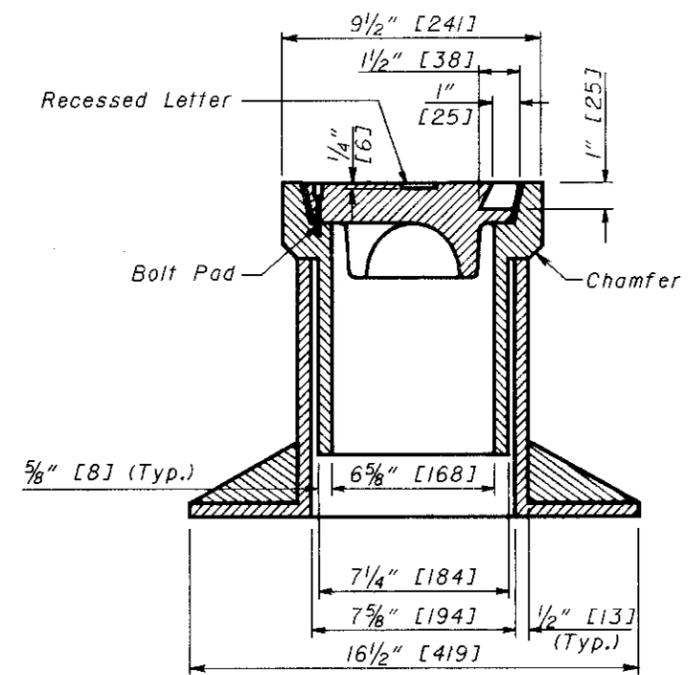
SIDE VIEW



SECTION C-C



SECTION A-A



SECTION B-B

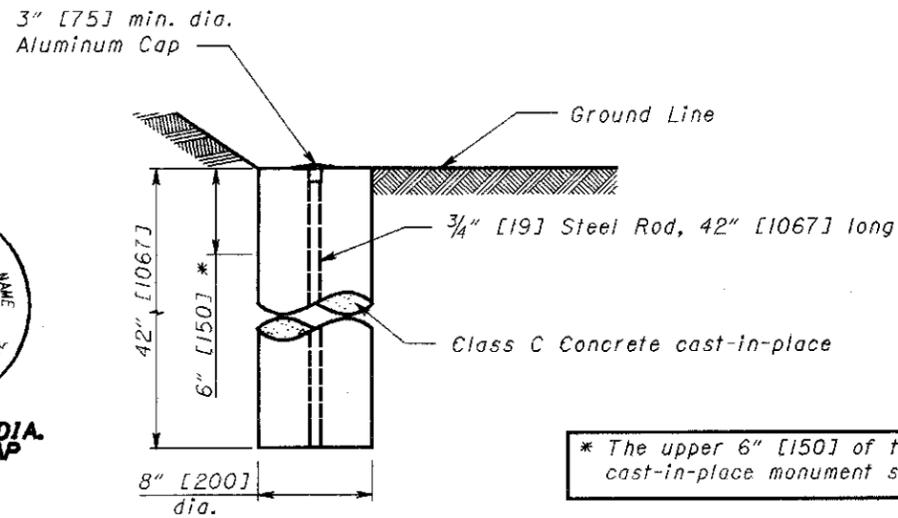
ADJUSTABLE CENTERLINE MONUMENT DETAILS

THIS DRAWING REPLACES RM-1.1M DATED 4-8-97.

NUMBER	RM-1.1	DATE	4-29-99
DESIGN AGENCY	OFFICE OF PLANNING	REVISOR	LAURENCE BETHLEHEM
STANDARD ROADWAY CONSTRUCTION DRAWING	ROADWAY MONUMENTS	STATUS	DESIGN ENGINEER
DESIGNER	OFFICE OF PLANNING	DRAWN	D. FOCKE
REVISOR	OFFICE OF PLANNING	CHECKED	M. EVANS
DESIGN AGENCY	OHIO DEPARTMENT OF TRANSPORTATION	DATE	4-29-99



3" [75] MIN. DIA. ALUMINUM CAP PLAN VIEW



\* The upper 6" [150] of the 42" [xxx] cast-in-place monument shall be formed.

**RIGHT OF WAY MONUMENT DETAILS**

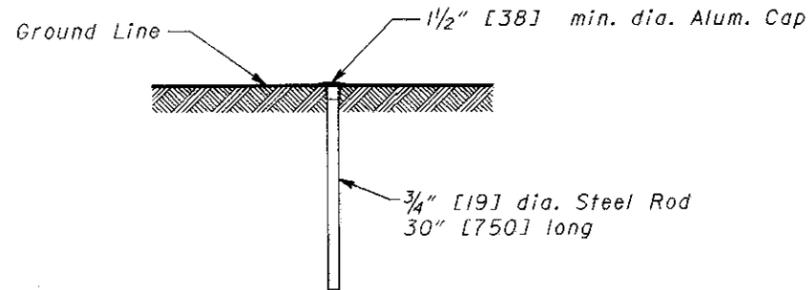
To be used with E parcels and non R/W boundaries.



1-1/2" [38] MIN. DIA. ALUMINUM CAP PLAN VIEW



2" [50] MIN. DIA. ALUMINUM CAP PLAN VIEW

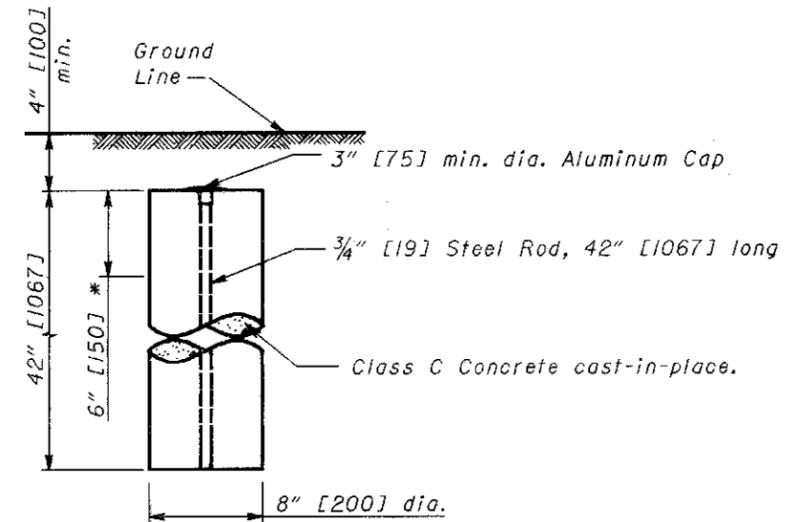


**ELEVATION**

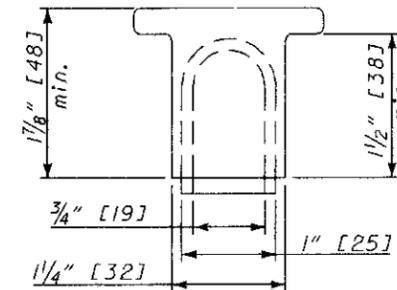
**PROPERTY BOUNDARY MARKER CAP**



3" [75] MIN. DIA. ALUMINUM CAP PLAN VIEW



**REFERENCE MONUMENT DETAILS**



**SIDE VIEW OF CAP**

**NOTES**

Monuments shall be placed under the direction of a Surveyor, registered in the State of Ohio, in accordance with Chapter 4733-37 of the Ohio Administrative Code and ODOT's Survey Manual. Monuments are to be set, as shown, by the highway contractor at the time of construction. If deviations cannot be avoided, the Surveyor shall obtain pre-approval for the new monument locations from the Ohio Department of Transportation and shall notify ODOT of the new monument locations as set.

All aluminum caps used shall have an insulator to eliminate dissimilar metal corrosion.

THIS DRAWING REPLACES RM-1.1M DATED 4-8-97.

STANDARD ROADWAY CONSTRUCTION DRAWING

**ROADWAY MONUMENTS**

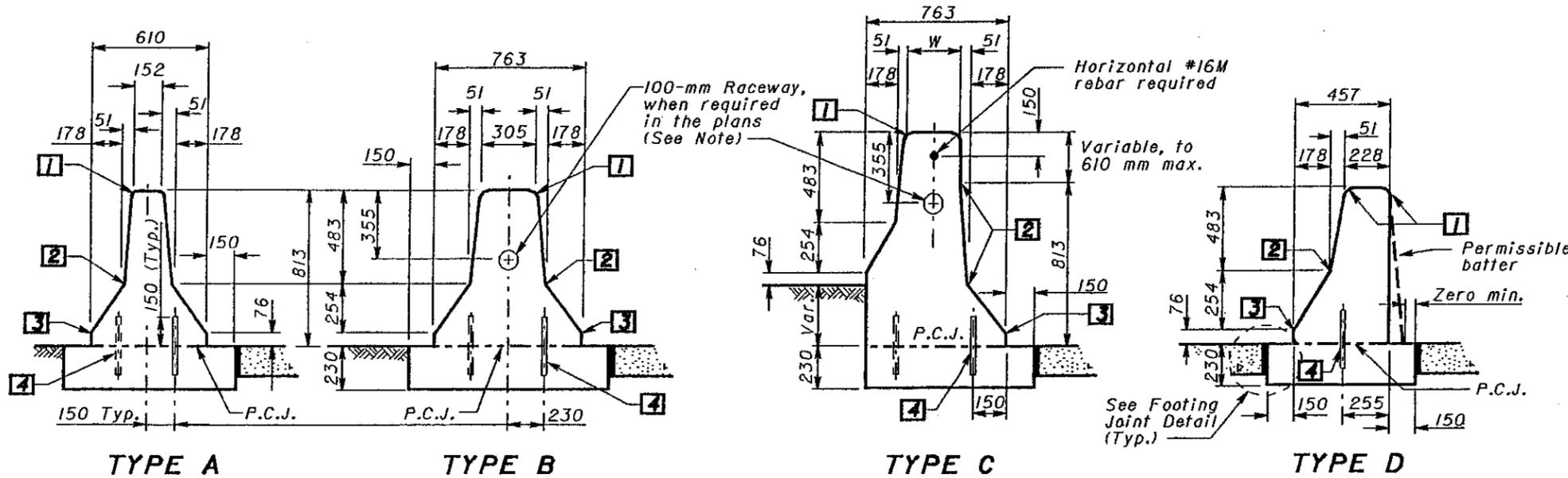
DESIGN AGENCY  
**OFFICE OF PLANNING**

All metric dimensions (in brackets [ ]) are in millimeters unless otherwise noted.

STUD. ENGR.  
M. EVANS  
DRAWN  
D. FOCKE

REVISIONS

OHIO DEPARTMENT OF TRANSPORTATION  
*Paul T. Stetson*  
ROADWAY DESIGN ENGINEER  
4-29-99  
DATE

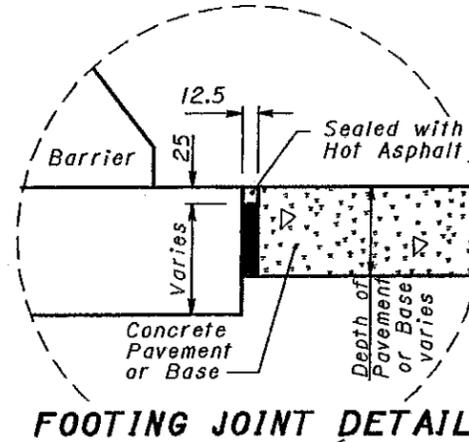


**NORMAL SECTIONS**

**LEGEND**

- 1 25-mm radius or 19-mm chamfer.
- 2 Permissible 250-mm radius.
- 3 Permissible 25-mm radius.
- 4 #25M epoxy coated deformed steel bars, 305 mm long, spaced 1220 mm between successive bars on a staggered pattern except in Type D. Omit dowels when the top is constructed integrally with the base.

W = 152 or 305 mm barrier width, as specified in the plans.



**FOOTING JOINT DETAIL**

**NOTES**

**JOINTS:** Unsealed contraction joints spaced at 6 m maximum shall be constructed throughout the run of Concrete Barrier except that expansion joints shall be used at the center line of and around each bridge pier column and on either side of overhead sign supports, inlets and light pole foundations. If the inlet top is slip formed, the expansion joints adjacent to it may be omitted.

Contraction joints may be constructed with metal inserts inside the forms, preformed full width joint filler, a grooving tool, or by sawing. Inserts, tooled or sawed joints shall have a 75-mm minimum depth. All joints shall be constructed for the full height of the barrier including the footing. Sawing shall be done as soon as curing will allow, to prevent spalling.

**FOOTING JOINTS:** The vertical walls between the barrier footing and a concrete pavement or concrete base shall be provided with a sealed joint as shown. Sealing material shall conform to CMS 705.04.

**P.C.J. - Permissible Construction Joint**

**MEASUREMENT:** Item 622, Concrete Barrier, including transitions and pier sections detailed on SCD RM-4.4M, is paid for in meters as one of the four types (A, B, C or D) or as Type A1 and B1, (for 1270 mm high barrier), with appropriate deductions for other items such as:

**P.C.J. - Permissible Construction Joint**

**MEASUREMENT:** Item 622, Concrete Barrier, including transitions and pier sections detailed on SCD RM-4.4M, is paid for in meters as one of the four types (A, B, C or D) or as Type A1 and B1, (for 1270 mm high barrier), with appropriate deductions for other items such as:

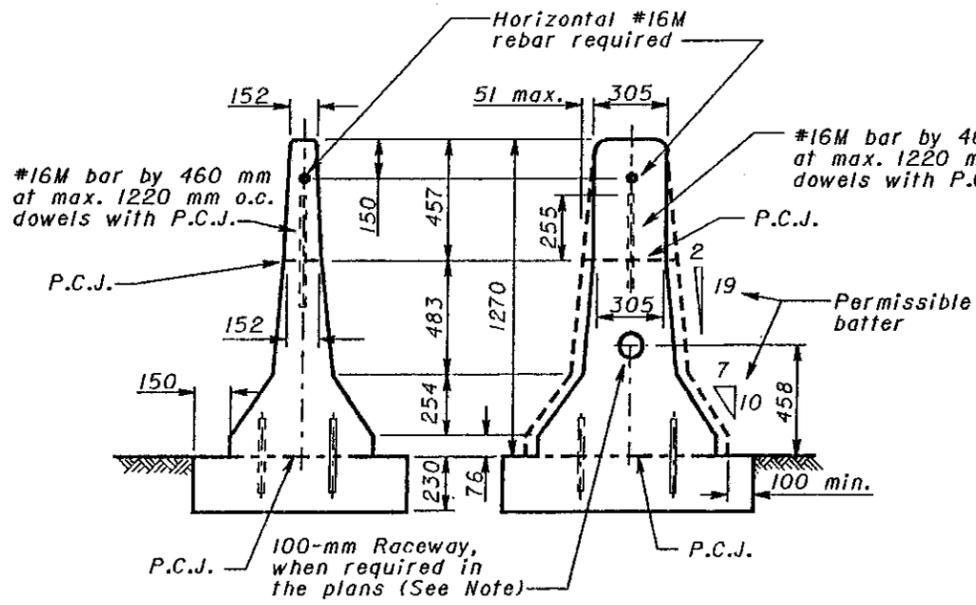
- Item 604 1-3 Median inlet 6 meters.
- Item 625 Light pole foundation or pullbox 1 meter.
- Item 630 Overhead sign support foundation 3 meters.
- Item 630 Barrier wall assembly 3 meters.

**1270-mm BARRIER:** High barrier shall be built in locations specified in the plans. Construct the lower 813 mm of the barrier base using the same dimensions as shown in the corresponding Normal Section. The upper 457 mm may be constructed integral with the bottom, or separately with #15M rebar dowels at 1220 mm maximum spacing. Start and end dowels 150 mm from barrier contraction joints.

**RACEWAY:** The contractor shall ensure that the electrical raceway is clear of internal obstructions. Cost of the 100 mm polyvinyl chloride raceway and No. 10 AWG copper-clad or aluminum-clad wire if needed for future installation of circuits shall be included in the unit cost per meter for Item 622, Concrete Barrier.

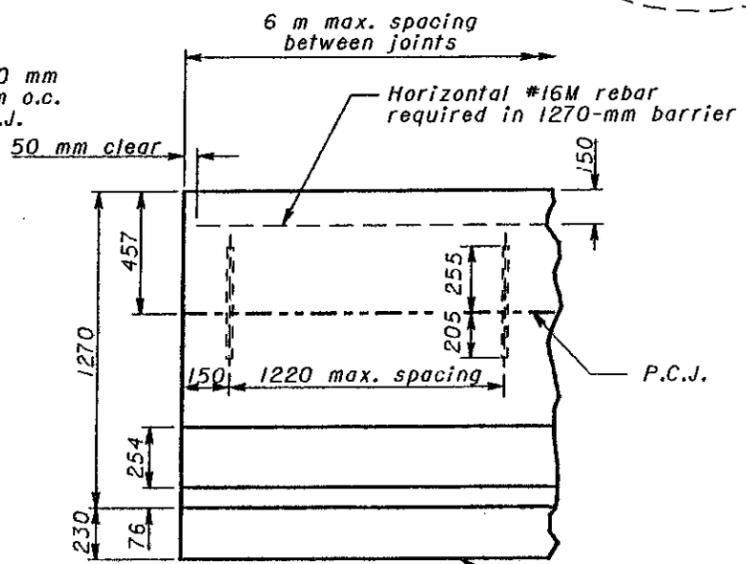
**STATION MARKING:** Marking shall be impressed in the "green" concrete on both sides at the top of the barrier if specified in the plans, which cost shall be incidental to the unit cost per meter bid for Item 622, Concrete Barrier.

All dimensions are in millimeters unless otherwise noted.



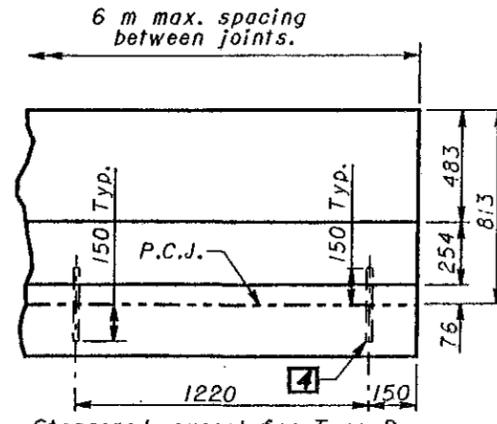
**1270-mm BARRIERS - TYPICAL SECTIONS**

See Type A and Type B Normal Section Details for dimensions that are not shown.



**1270-mm BARRIER**

**BARRIER ELEVATIONS**



**813-mm BARRIER**



This Drawing Replaces MC-9.3.

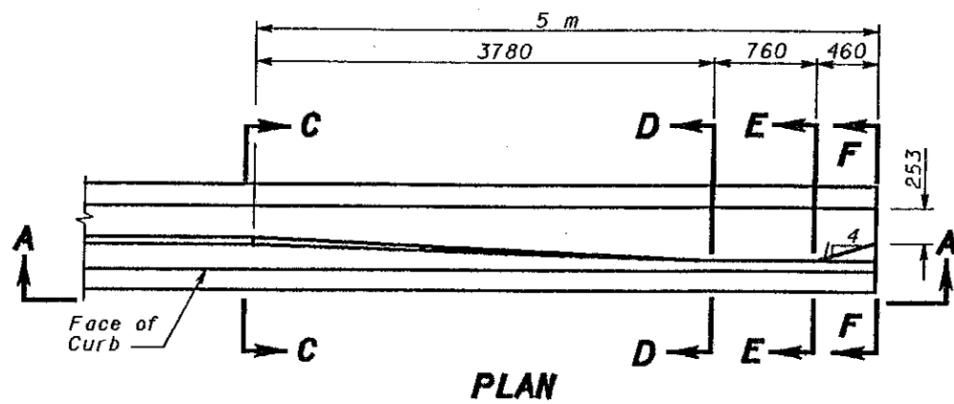
OHIO DEPARTMENT OF TRANSPORTATION

**CONCRETE BARRIERS**

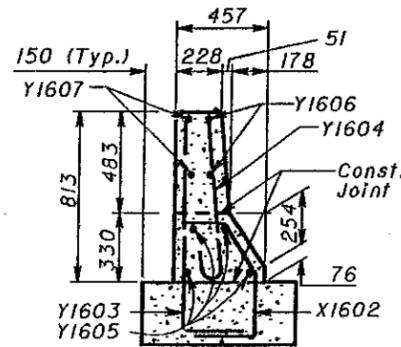
STANDARD CONSTRUCTION DRAWING **RM-4.3M**

APPROVED *[Signature]*

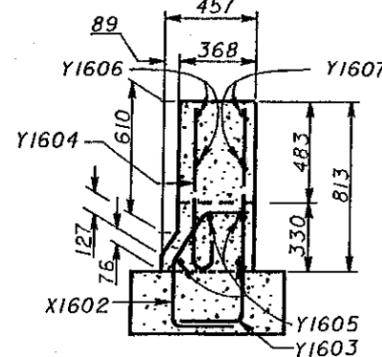
DATE  
6-30-95  
10-21-97



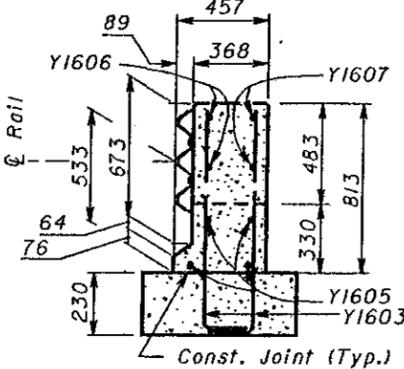
PLAN



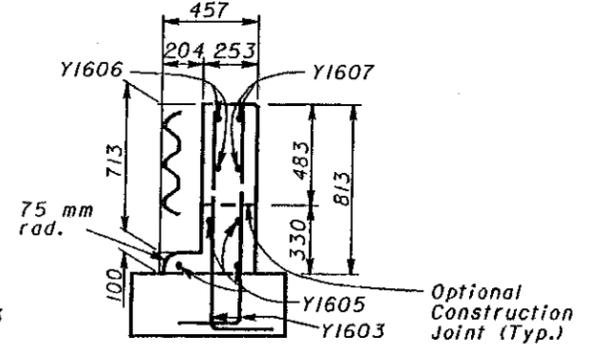
SECTION C-C



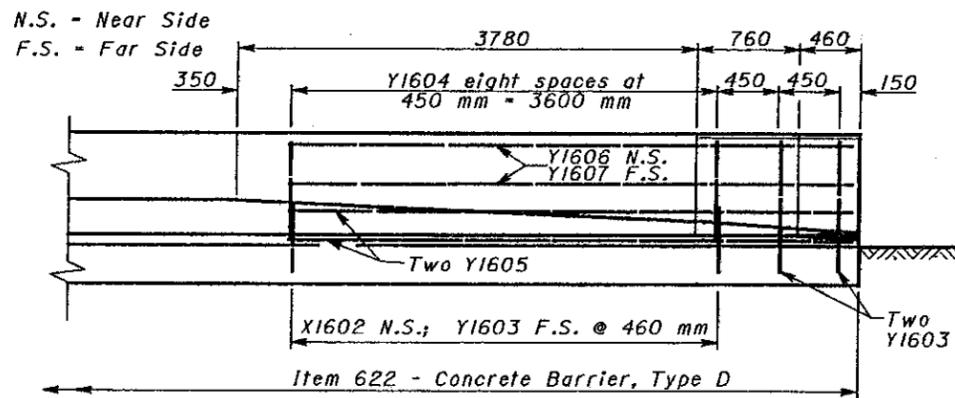
SECTION D-D



SECTION E-E



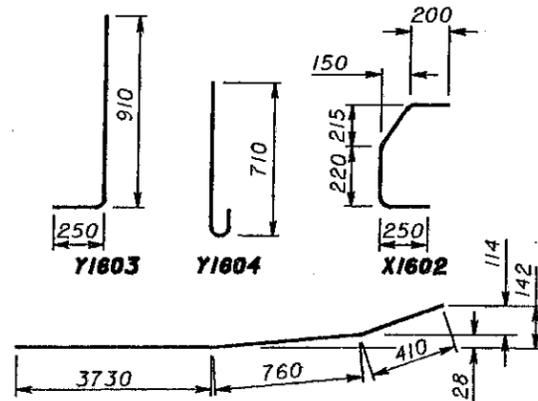
SECTION F-F



SECTION A-A

REINFORCING BAR LIST

MARK	LENGTH (mm)	SHAPE	NO.	MASS (kg)
X1602	850	Bent	9	12
Y1603	1120	Bent	13	23
Y1604	880	Bent	9	13
Y1605	4900	Str.	4	31
Y1606	4900	Bent	2	15
Y1607	4900	Str.	2	15
<b>TOTAL MASS (For Info. only)</b>				<b>109</b>



BENDING DIAGRAMS

NOTES

**LOCATION:** Concrete barrier at obstructions shall be constructed with the toe of the barrier slope at the normal guardrail offset from the roadway. Installations within continuous runs shall be constructed so that no approach or trailing guardrail tapers are required to connect to the barrier.

Installations that cannot be constructed at the normal guardrail offset and are to be connected to approach or trailing guardrail runs shall have a 25% guardrail taper to meet the existing or normal guardrail offset.

Installations that are not to be connected to approach or trailing guardrail runs shall include the standard guardrail flare as per SCD GR-5.1M.

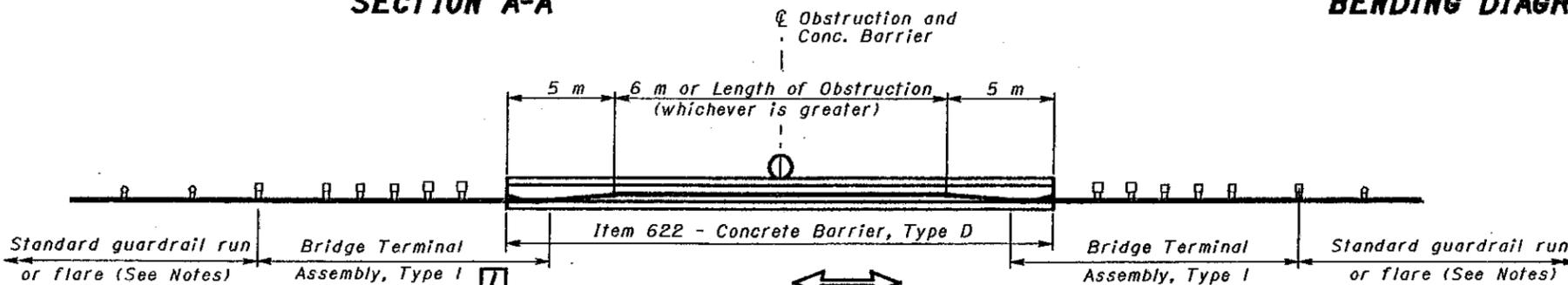
**INCORPORATED INSTALLATIONS:** For barrier installations that cannot be constructed at the normal guardrail offset, the incorporated installations shown may be installed at vertical walls, piers or other similar obstructions. For pier-incorporated installations the contractor may use the optional treatment, forming the back face of the Type D Concrete Barrier to the location shown (between piers only), with any additional cost being included in the cost of Item 622.

**REINFORCING:** All reinforcing bars shall be epoxy coated and shall meet the requirements of CMS 509.

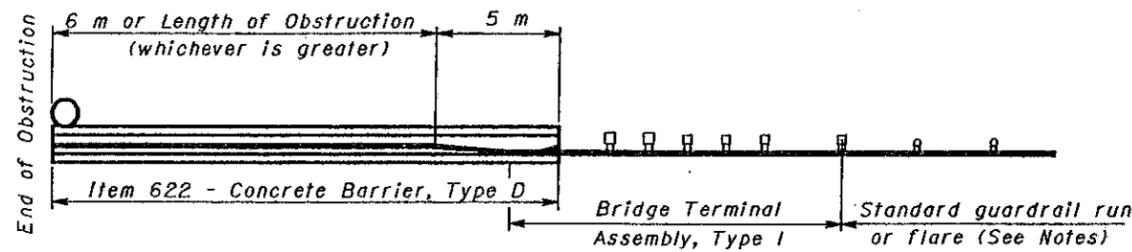
**MISCELLANEOUS:** For Bridge Terminal Assembly, Type 1 and Type 2 details and connections, see SCD's GR-3.1M and GR-3.2M, respectively. For Type D Concrete Barrier details see SCD RM-4.3M.

**PAYMENT:** Payment for Item 622, Concrete Barrier, Type D shall include all materials, labor and reinforcing steel required to construct the barrier as shown.

All dimensions are in millimeters unless otherwise noted.

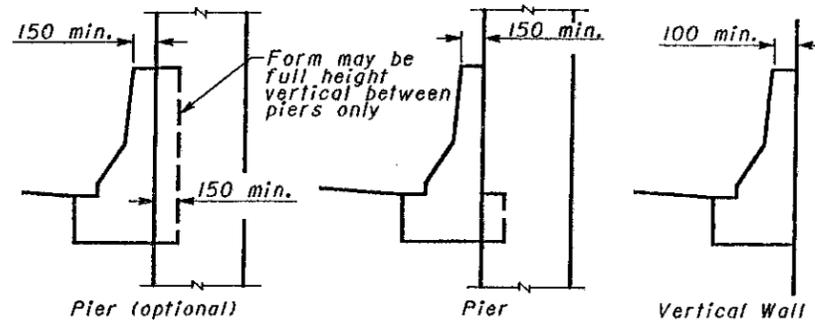


Bi-directional Travel or Directional Travel where trailing guardrail is used.



Directional Travel where no trailing guardrail is used.

TYPICAL INSTALLATIONS



INCORPORATED INSTALLATIONS



This Drawing Replaces GR-8J.

OHIO DEPARTMENT OF TRANSPORTATION

CONCRETE BARRIER AT OBSTRUCTIONS

DATE  
6-30-95  
10-21-97

STANDARD CONSTRUCTION DRAWING RM-4.5M

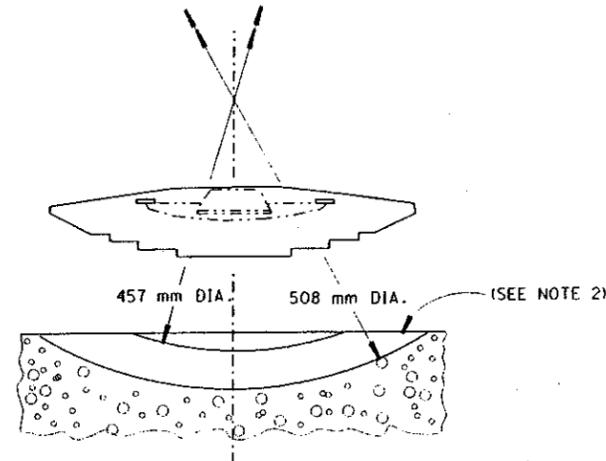
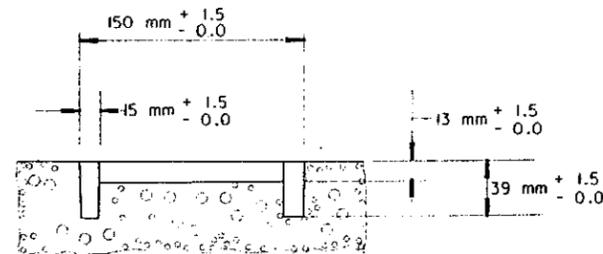
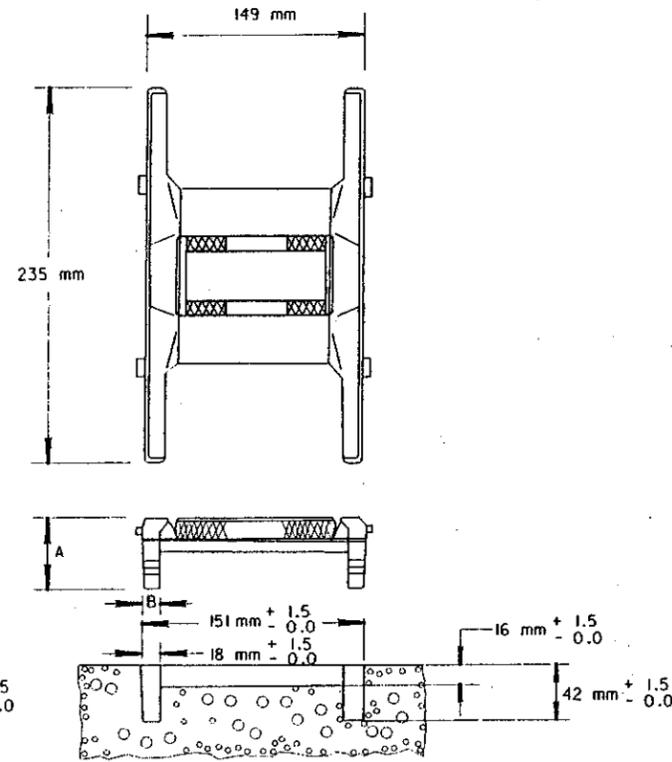
APPROVED: [Signature]

1 Bridge Terminal Assembly, Type 2 shall be used for directional roadways where trailing guardrail is used and is out of the clear zone of opposite direction traffic.

# NOTES

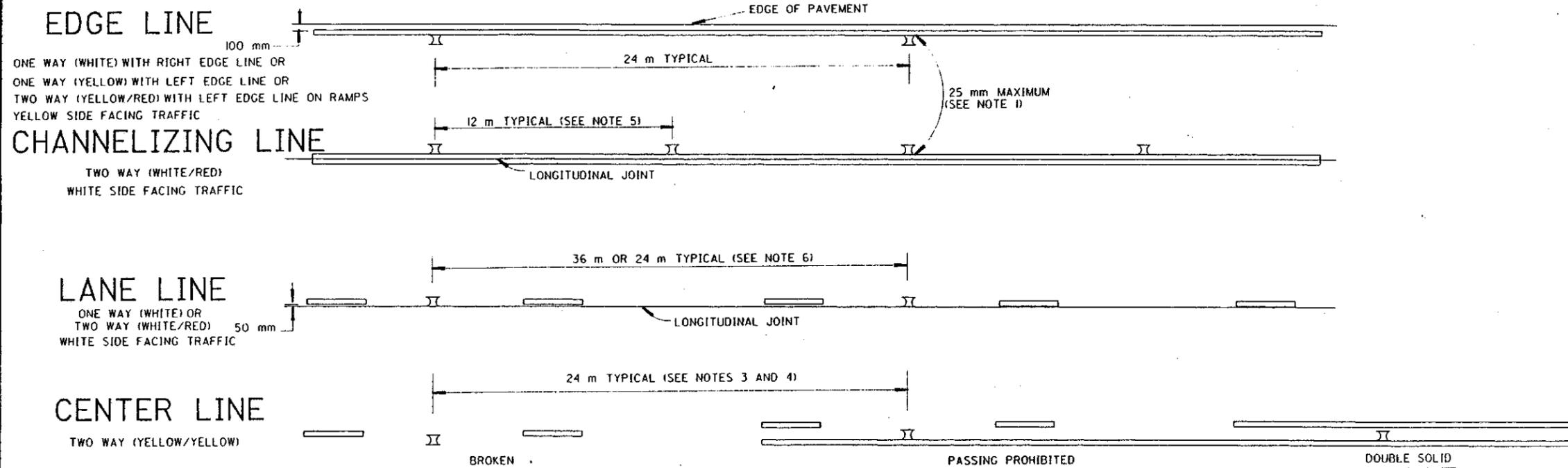
1. CENTER LINE MARKERS SHALL BE PLACED BETWEEN THE TWO LINES. MARKERS INSTALLED ALONG AN EDGE LINE OR CHANNELIZING LINE SHALL BE PLACED SO THAT THE CASTING IS NO MORE THAN 25 mm FROM THE NEAR EDGE OF THE LINE. MARKERS INSTALLED ALONG A LANE LINE OR DASHED YELLOW CENTER LINE SHALL BE PLACED BETWEEN AND IN LINE WITH THE DASHES. MARKERS SHALL NOT BE PLACED OVER THE LINES EXCEPT WHERE THE LINES DEVIATE VISIBLY FROM THEIR CORRECT ALIGNMENT, AND THEN ONLY WITH THE APPROVAL OF THE ENGINEER.
2. TO FACILITATE THE CUTTING OF THE TWO PARALLEL SLOTS AND INTERVENING CONCAVED SURFACE SIMULTANEOUSLY, IT IS RECOMMENDED THAT AN ARBOR AND SAW BLADES ASSEMBLY BE USED. FOR ADDITIONAL DETAILS AND TOLERANCES OF THE CASTING AND ARBOR-SAW ASSEMBLY CONTACT THE CASTING MANUFACTURE.
3. FOR HORIZONTAL CURVE RADIUS OF 380 METERS OR LESS, THE SPACING OF THE CENTER LINE MARKERS SHALL BE REDUCED TO 12 m BETWEEN P.C. OR T.S. AND P.T. OR S.T.
4. FOR HORIZONTAL CURVE RADIUS OF 250 METERS OR LESS, THE SPACING OF THE CENTER LINE MARKERS MAY BE REDUCED TO 6 m BETWEEN P.C. OR T.S. AND P.T. OR S.T. WHEN USING 6m SPACING, 12 RAISED PAVEMENT MARKERS AT 12 m SPACING SHALL BE INSTALLED ON EACH END OF THE 6 m SPACING.
5. WHEN A CHANNELIZING LINE IS LESS THAN 24 m IN LENGTH, ONE RAISED PAVEMENT MARKER SHALL BE PLACED AT EACH END OF THE LINE AND ONE SHALL BE PLACED IN THE CENTER OF THE LINE.
6. RAISED PAVEMENT MARKERS ON LANE LINES ON FREEWAYS SHALL BE ONE WAY WHITE SPACED AT 36 METERS. ALL OTHER RAISED PAVEMENT MARKERS ON LANE LINES ON MULTILANE OR DIVIDED ROADWAYS SHALL BE TWO WAY RED/WHITE SPACED AT 24 METERS.

	CONVENTIONAL TYPE	LOW PROFILE TYPE
A	44 mm	43 mm
B	12 mm	15 mm



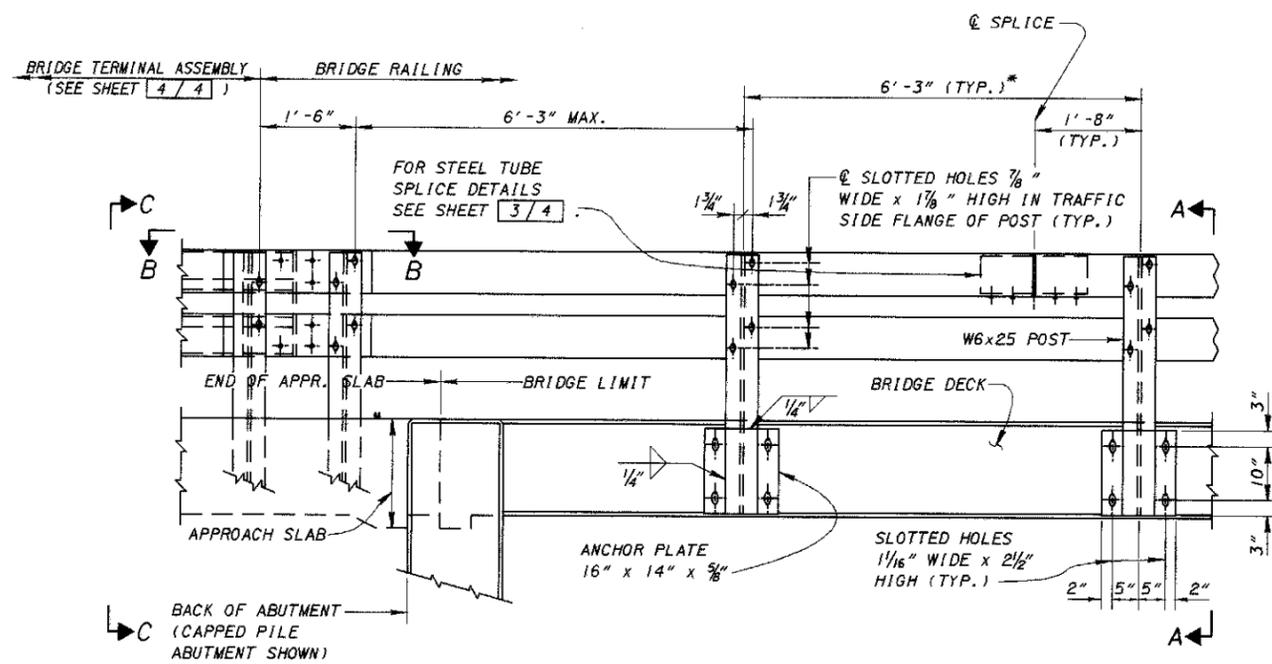
OPTIONAL FOR CONVENTIONAL TYPE

## CASTING AND SAW CUT DETAILS



OFFICE OF TRAFFIC ENGINEERING DIVISION OF ENGINEERING POLICY OHIO DEPARTMENT OF TRANSPORTATION	
TRAFFIC CONTROL	DATE 11/03/93 11/01/95
RAISED PAVEMENT MARKER INSTALLATION DETAILS	
STANDARD CONSTRUCTION DRAWING	TC-65.10M
APPROVED <i>[Signature]</i>	ADMINISTRATOR

## TYPICAL RAISED PAVEMENT MARKER PLACEMENT WITH LONGITUDINAL PAVEMENT MARKINGS

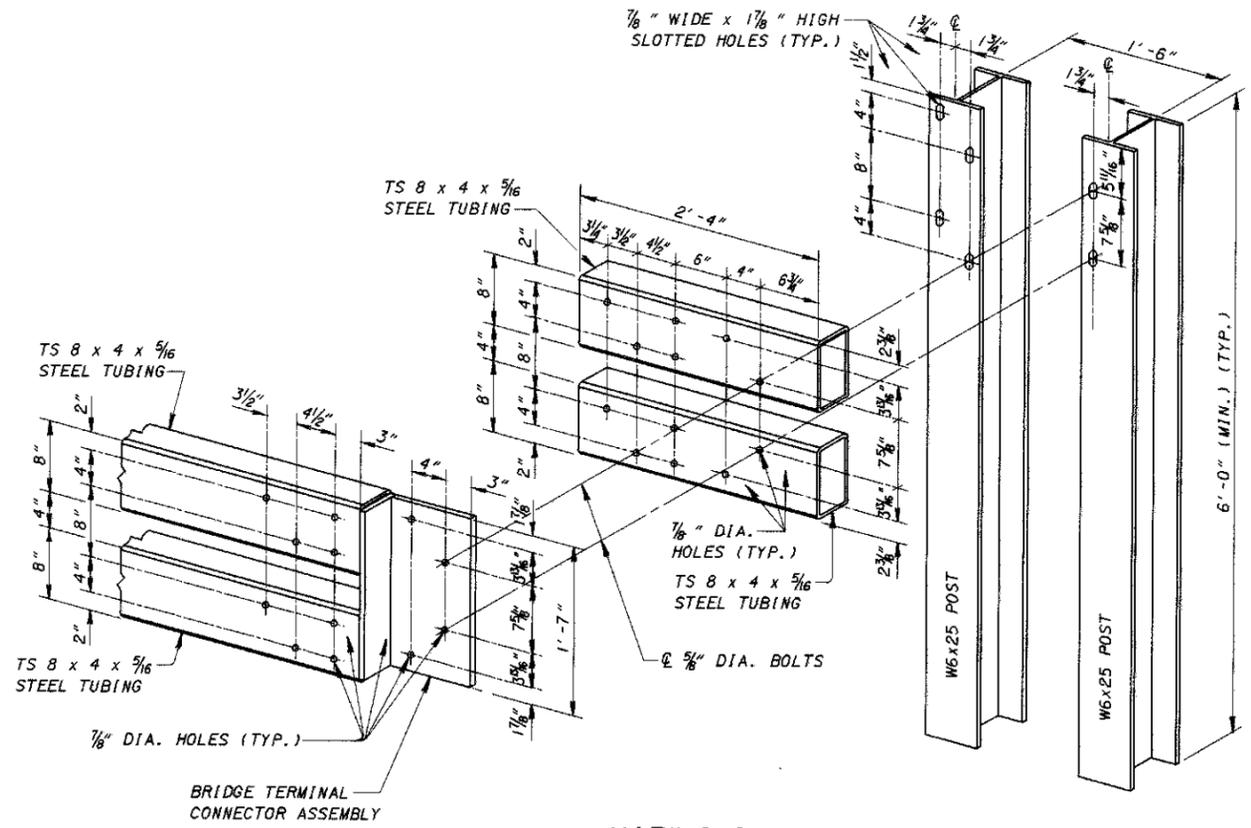


**RAILING ELEVATION ON CONCRETE SLAB**

TWIN TUBE RAILING WITH THRIE BEAM TERMINAL CONNECTION AS SHOWN IN SECTION B-B BELOW.

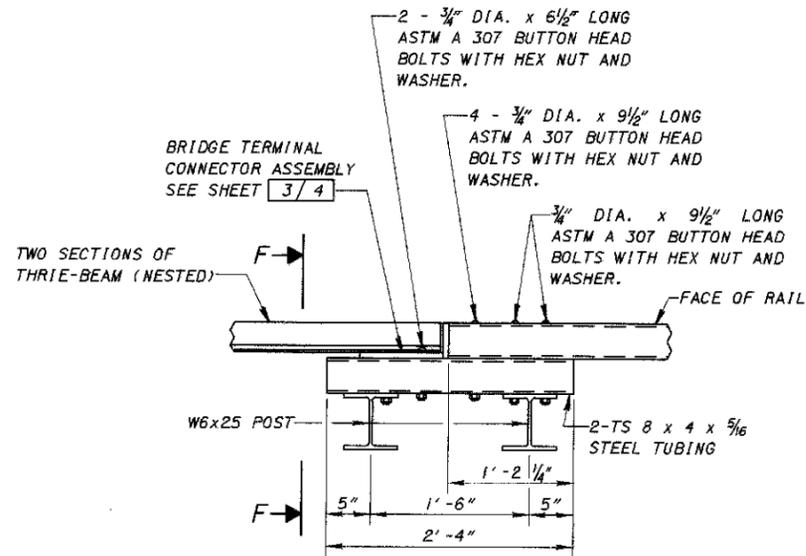
\* - ONE POST SPACING ON THE BRIDGE MAY BE DECREASED TO ACCOUNT FOR ANY REQUIRED CONSTRUCTION CLEARANCES. NO POST SPACING SHALL EXCEED 6'-3".

FOR SECTION A-A SEE SHEET 2/4.

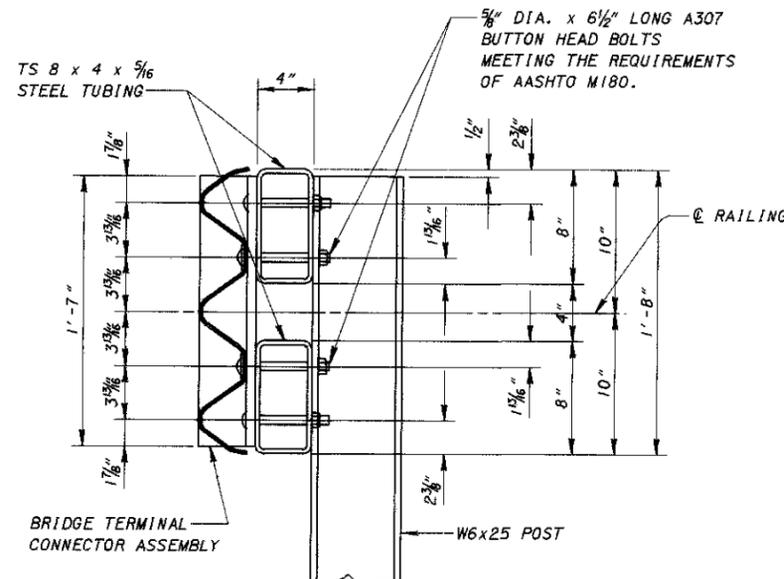


**VIEW C-C**

(NESTED THRIE BEAM RAILING NOT SHOWN)



**SECTION B-B**

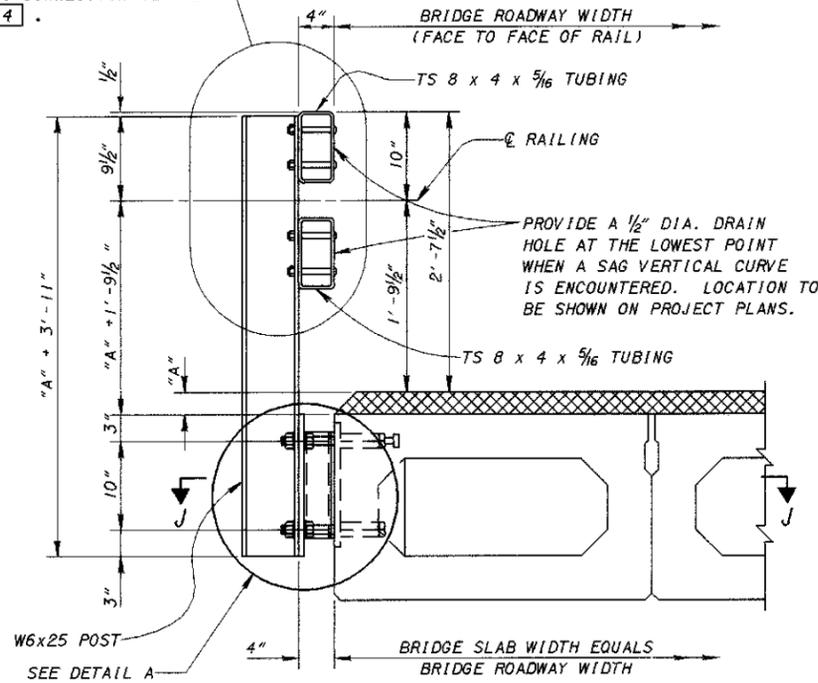


**VIEW F-F**

SECTION THRU RAIL AT THRIE BEAM BRIDGE TERMINAL CONNECTION ASSEMBLY

DESIGN AGENT	OFFICE OF	STRUCTURAL ENGINEERING
DESIGNED BY	STATE OF OHIO DEPARTMENT OF TRANSPORTATION	DATE
DRAWN BY	Brad Taggell	7-06-99
CHECKED BY	J.S.	TST-1-99
REVIEWED BY	WTL	
REVISIONS		
DESIGNED	AJM/SAM	
DRAWN	SAM	
STANDARD	TWIN STEEL TUBE BRIDGE RAILING	
		1/4

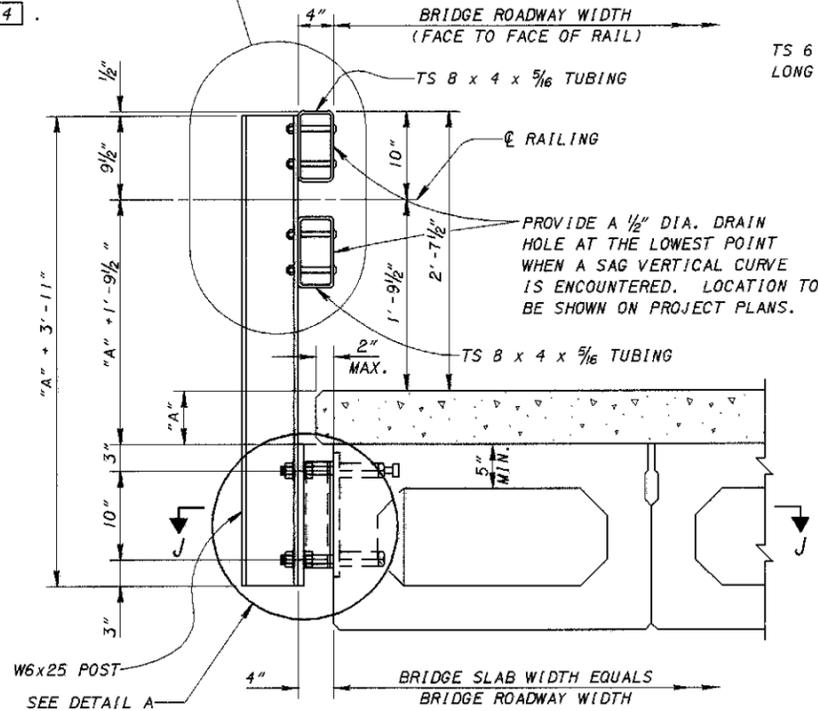
SEE RAILING CONNECTION DETAIL SHEET 3/4



**SECTION A-A**

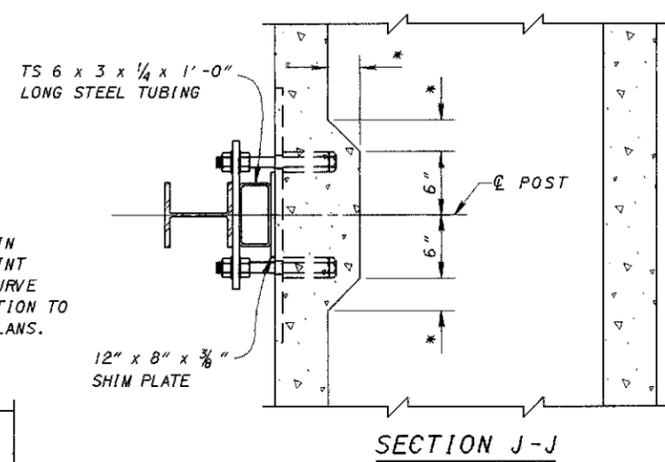
(FOR 17" AND DEEPER NONCOMPOSITE PRESTRESSED BOX BEAM BRIDGES)

SEE RAILING CONNECTION DETAIL SHEET 3/4



**SECTION A-A**

(FOR 17" AND DEEPER COMPOSITE PRESTRESSED BOX BEAM BRIDGES)

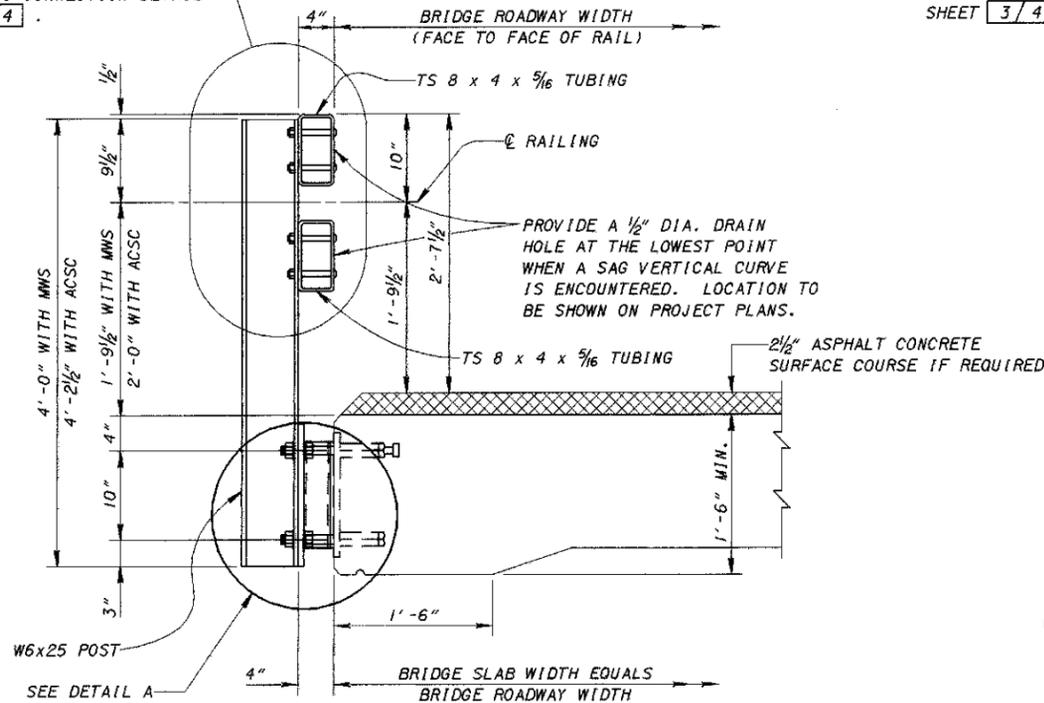


**SECTION J-J**

**LEGEND**

- MWS - MONOLITHIC WEARING SURFACE
- ACSC - ASPHALT CONCRETE SURFACE COURSE
- "A" - OVERLAY THICKNESS, THIS DIMENSION VARIES ACROSS THE LENGTH OF THE BRIDGE.
- \* - THIS DIMENSION IS THE SAME AS THE WIDTH OF FILLET IN THE BOX BEAMS'S VOID.

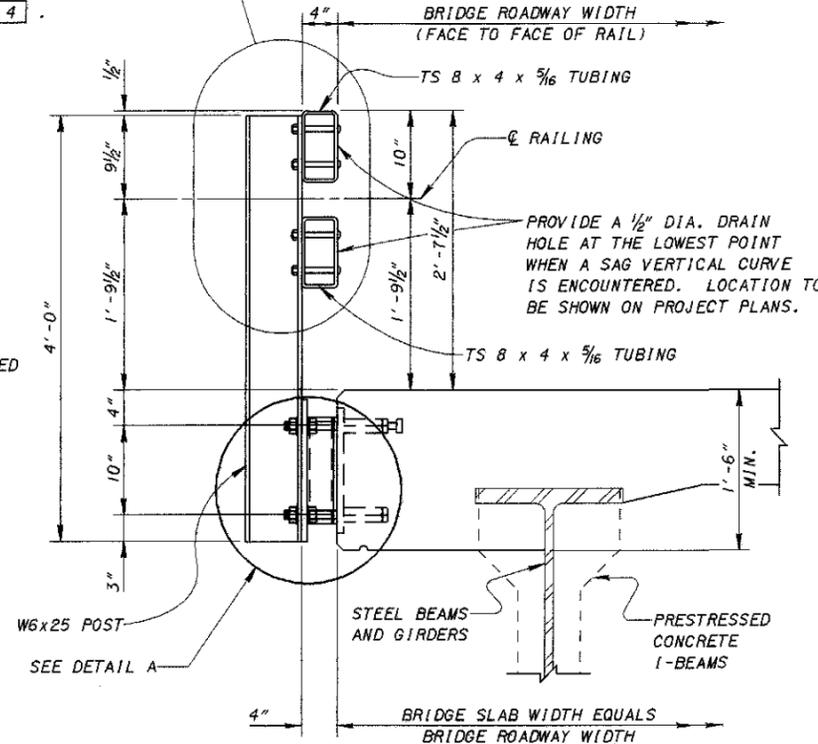
SEE RAILING CONNECTION DETAIL SHEET 3/4



**SECTION A-A**

(FOR SLAB BRIDGES)

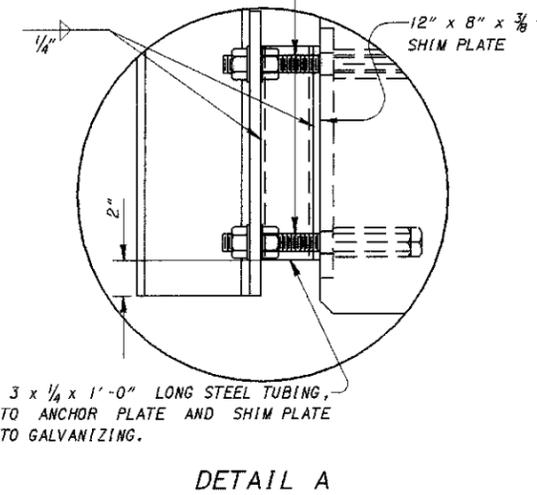
SEE RAILING CONNECTION DETAIL SHEET 3/4



**SECTION A-A**

(FOR CONCRETE OR STEEL I-BEAM BRIDGES)

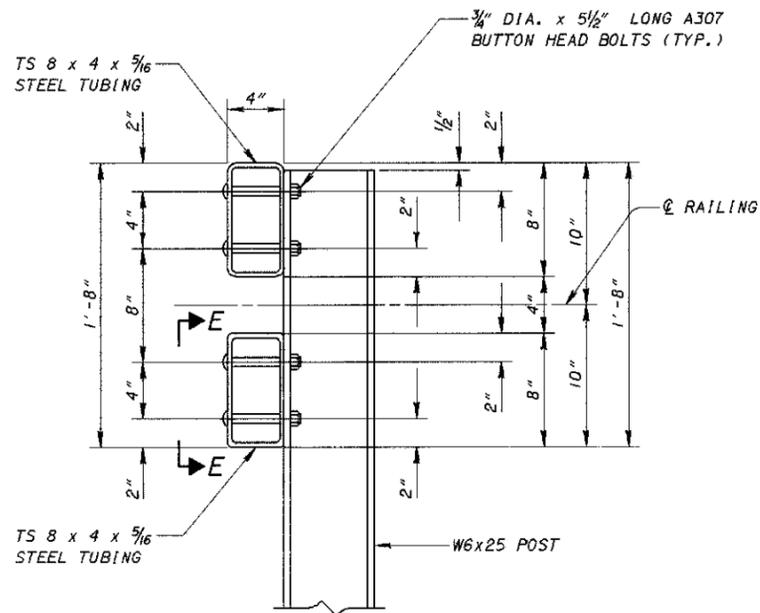
2 - 1" DIA. x 12" LONG ANCHOR BOLTS WITH MACHINE THREADS FULL LENGTH AND TWO HEX NUTS AND TWO WASHERS PER BOLT.



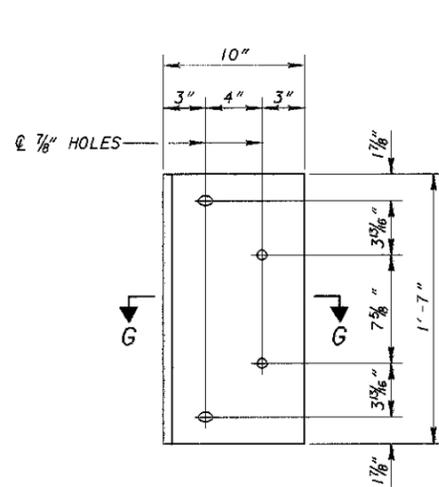
**DETAIL A**

TS 6 x 3 x 1/4 x 1'-0" LONG STEEL TUBING, WELD TO ANCHOR PLATE AND SHIM PLATE PRIOR TO GALVANIZING.

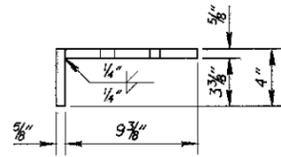
DESIGN AGENCY	OFFICE OF	DATE
STATE OF OHIO DEPARTMENT OF TRANSPORTATION	7-06-99	
ADMINISTRATOR	<i>Brad Fogell</i>	
REVISIONS		
RESIGNED	DRAWN	
CHECKED	SAM	
REVIEWED	WTL	
STANDARD	TST-1-99	
TWIN STEEL TUBE BRIDGE RAILING		
2/4		



**RAILING CONNECTION DETAIL**

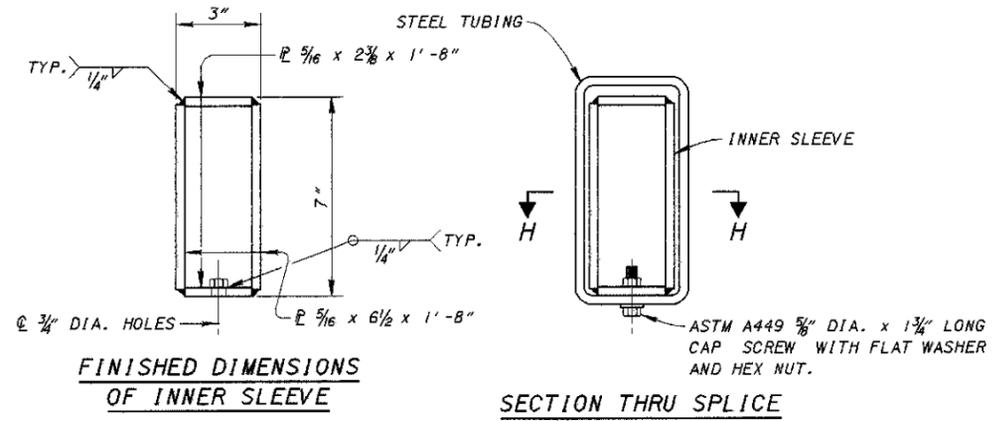


**ELEVATION**



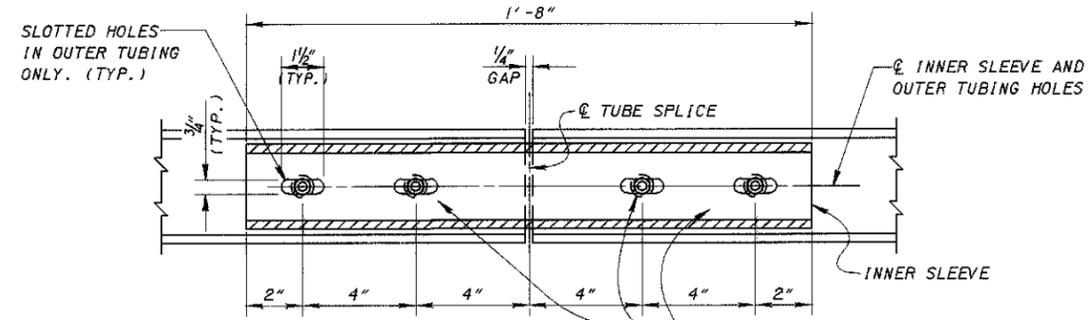
**SECTION G-G**

**BRIDGE TERMINAL CONNECTOR ASSEMBLY**



**FINISHED DIMENSIONS OF INNER SLEEVE**

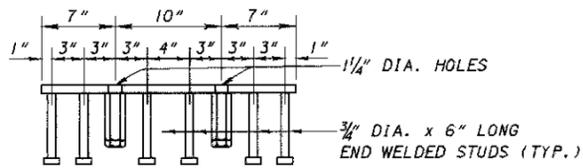
**SECTION THRU SPLICE**



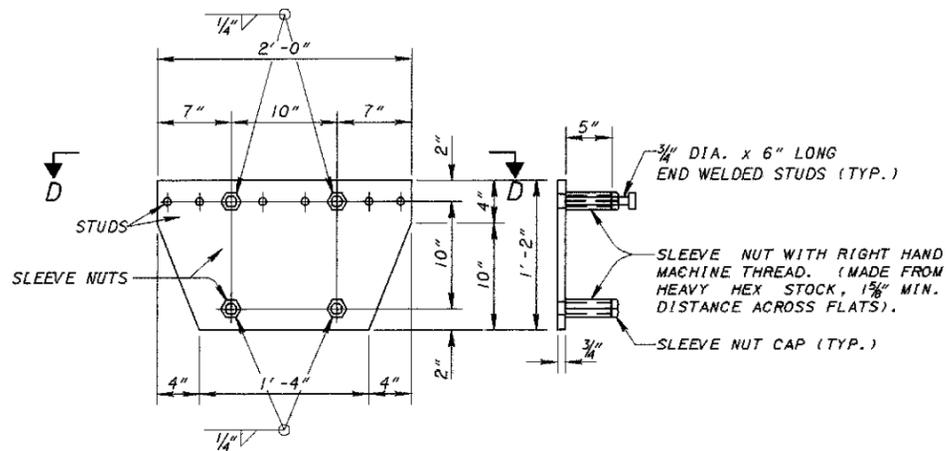
**SECTION H-H**

**STEEL TUBE SPLICE DETAILS**

BOLTS IN SLOTTED HOLES SHALL NOT BE DRAWN UP SO TIGHT AS TO PREVENT SLIDING BETWEEN THE OUTER TUBE AND THE INNER SPLICE.



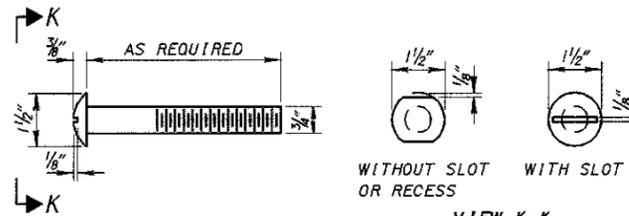
**VIEW D-D**



**ELEVATION**

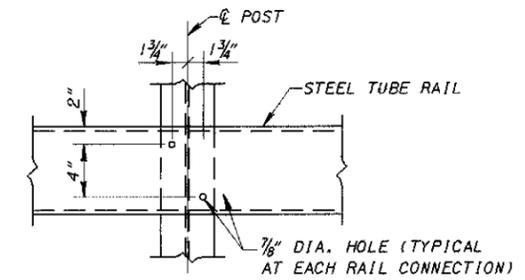
**END VIEW**

**POST ANCHOR DEVICE**

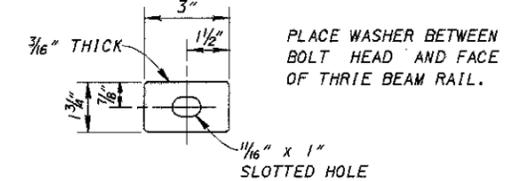


**VIEW K-K**

**DETAIL OF 3/4\"/>**

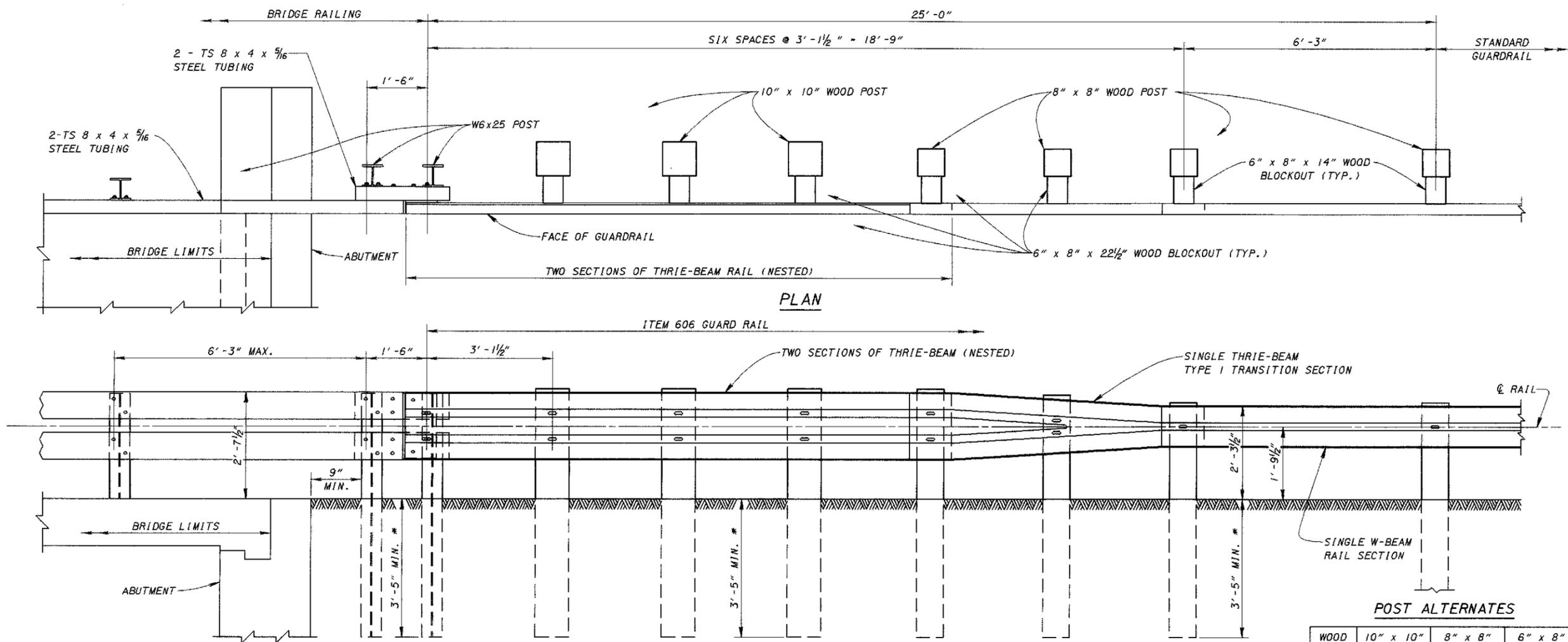


**VIEW E-E**



**SPECIAL WASHER**

DESIGN AGENCY	OFFICE OF	DATE
	STRUCTURAL ENGINEERING	
STATE OF OHIO DEPARTMENT OF TRANSPORTATION	7-06-99	
<i>Brad Fogwell</i>	ADMINISTRATOR	
DESIGNED	CHECKED	REVIEWED
AJM/SAM	JS	WTL
DRAWN		TST-1-99
SAM		
STANDARD	TWIN STEEL TUBE BRIDGE RAILING	



\* SEE STD. CONSTR. DWG. GR-1.2 FOR ADDITIONAL POST EMBEDMENT DETAILS.

**TYPE 3 BRIDGE TERMINAL ASSEMBLY (MODIFIED)**

**TST-1-99 GENERAL NOTES:**

**GENERAL:** THIS DRAWING PROVIDES DESIGN AND CONSTRUCTION DETAILS. THE PROJECT PLANS FOR EACH STRUCTURE SHALL PROVIDE NECESSARY ADDITIONAL RAILING DIMENSIONS INCLUDING RAILING LENGTHS, POST SPACINGS, POST LENGTHS AND ANY OTHER PERTINENT INFORMATION INCLUDING SPECIAL NOTES AND DETAILS. FOR ADDITIONAL GUARDRAIL DETAILS, SEE STD. CONSTR. DWGS. GR-1.1, GR-1.2 AND OTHER DRAWINGS PERTAINING TO DESIGN OF SPECIFIC GUARDRAIL TYPES.

**APPLICATION:** THE TWIN STEEL TUBE RAILING SHALL BE USED ON STRUCTURES DESIGNED TO DRAIN SURFACE WATER OVER THE SIDES OF THE STRUCTURE. THIS RAILING IS NOT APPLICABLE TO COMPOSITE BOX BEAM BRIDGES WITH DESIGN OVERHANGS GREATER THAN 2" OR TOP FLANGE THICKNESSES LESS THAN 5".

THE TYPE 3 BRIDGE TERMINAL ASSEMBLY (MODIFIED) SHALL BE USED TO CONNECT GUARDRAIL RUNS TO BOTH THE APPROACH AND TRAILING ENDS OF TWIN STEEL TUBE BRIDGE RAILINGS.

**DESIGN SPECIFICATIONS:** THIS DESIGN CONFORMS TO THE "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 1996, INCLUDING THE 1997 INTERIM SPECIFICATIONS, AND THE ODOT BRIDGE DESIGN MANUAL.

**DESIGN DATA:**  
 SHAPED STRUCTURAL TUBING: ASTM A 500 GRADE B Fy=46 KSI  
 STRUCTURAL STEEL SHAPES AND PLATES: ASTM A 572 Fy=50 KSI

**MATERIALS:** SHAPED STRUCTURAL TUBING SHALL BE AS PER ODOT CONSTRUCTION AND MATERIALS SPECIFICATIONS (CMS) ITEM 707.10. IN LIEU OF THE "DROP WEIGHT TEAR TEST" AS PER ASTM E 436, THE MANUFACTURER MAY CHOOSE TO SUPPLY TUBING THAT MEETS IMPACT TOUGHNESS ACCORDING TO AASHTO T 266, "NOTCHED BAR IMPACT TESTING OF METALLIC MATERIALS (CVN)". THE CVN IMPACT REQUIREMENTS SHALL BE 15 FT-LBS AT 0°F. FOR EACH HEAT SUPPLIED, THE MANUFACTURER SHALL FURNISH ONE 2" x 18" SPECIMEN, MARKED WITH ITS HEAT NUMBER, FOR IMPACT TESTING.

STRUCTURAL STEEL SHAPES AND PLATES SHALL BE AS PER CMS ITEM 711.01

**GALVANIZING:** ALL SHAPED STRUCTURAL TUBES, POSTS, PLATES HARDWARE AND ACCESSORIES SHALL BE GALVANIZED IN ACCORDANCE WITH CMS 711.02. PRIOR TO GALVANIZING, ALL EXPOSED STRUCTURAL TUBING ENDS SHALL BE ROUNDED, AND BURRS SHALL BE REMOVED FROM ALL STEEL TUBING, SHAPES AND PLATES.

**HORIZONTAL CURVATURE:** THIS STANDARD IS APPLICABLE TO STRUCTURES HAVING A RAILING CURVATURE RADIUS OF 20 FEET OR MORE. FOR A RADIUS OF LESS THAN 20 FEET, THE DESIGN SHALL BE SPECIAL. FOR ALL CURVED STRUCTURES, THE HORIZONTAL RAIL ELEMENTS, SHALL BE HEAT CURVED AS SPECIFIED BY AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES.

**TUBE SPLICES** ARE TO BE LOCATED SO THAT EACH TUBE SEGMENT SHALL BE CONNECTED TO NOT LESS THAN TWO POSTS. SPLICES IN THE TOP AND BOTTOM TUBES SHALL BE STAGGERED AND SHOULD NOT OCCUR IN THE SAME PANEL.

**FASTENERS** SHALL CONFORM TO THE FOLLOWING:

THE ANCHOR BOLTS, SLEEVE NUTS, NUTS, AND WASHERS SHALL CONFORM TO CMS 711.09 (ASTM A 325).

END WELDED STUDS SHALL CONFORM TO ASTM A 108.

THE TUBE STEEL RAIL TO POST CONNECTION BOLTS AND HEX NUTS SHALL CONFORM TO CMS 711.10. THE THRIE BEAM RAIL TO POST CONNECTION BOLTS AND NUTS SHALL CONFORM TO CMS 711.10 AND TO AASHTO M180. THE RECTANGULAR BEAM WASHERS IN AASHTO M180 ARE NOT TO BE USED IN THE TUBULAR STEEL CONNECTIONS. TUBULAR STEEL CONNECTION WASHERS SHALL CONFORM TO ASTM F 436, TYPE 1.

THE HEX CAP SCREWS (BOLTS), HEX NUTS AND WASHERS SHALL CONFORM TO ASTM A 449.

**BOX BEAMS:** THE DISTANCE FROM THE CENTERLINE OF A GUARDRAIL POST TO THE ABUTMENT END OF THE BEAM OR TO THE CENTERLINE OF A TIE ROD SHALL NOT BE LESS THAN 1'-8". THE DISTANCE FROM THE CENTERLINE OF A GUARDRAIL POST TO THE PIER END OF THE BEAM SHALL NOT BE LESS THAN 2'-10". THE LOCATION OF THE HORIZONTAL TIE RODS MAY NEED TO BE ADJUSTED IN ORDER TO ACCOMMODATE EACH POST ANCHOR DEVICE.

POSTS MAY BE SET IN DRILLED HOLES OR DRIVEN TO GRADE.

WOOD POSTS SHALL BE SQUARE - SAWED PRESSURE TREATED WOOD AS PER CMS 710.14 AND FABRICATED WITH SQUARE ENDS. BOLT HOLES SHALL BE BORED AND TOPS OF POSTS TRIMMED, IF REQUIRED, AFTER POSTS ARE SET.

ALTERNATE STEEL POSTS AND STEEL BLOCKOUTS MAY BE FURNISHED ACCORDING TO THE CHART GIVEN ABOVE. PLASTIC BLOCKOUTS SHALL NOT BE PERMITTED.

**PAYMENT FOR ITEM 517 - RAILING (TWIN STEEL TUBE)** SHALL INCLUDE ALL STEEL TUBING, STEEL POSTS, POST ANCHOR DEVICES, ANCHOR PLATES, TUBE SPLICE PLATES, STEEL SHIM PLATES, BRIDGE TERMINAL CONNECTOR ASSEMBLY, ANCHOR BOLTS, 3/4" ROUND HEAD BOLTS, SLEEVE NUTS, NUTS, CAP SCREWS, WASHERS AND OTHER HARDWARE.

**PAYMENT FOR ITEM 606 - BRIDGE TERMINAL ASSEMBLY TYPE 3 (MODIFIED)** SHALL INCLUDE THE EXTRA COST, IN EXCESS OF NORMAL GUARDRAIL COST, FOR ADDITIONAL AND DIFFERENT TYPE POSTS AND BLOCKOUTS, NESTED THRIE BEAM SECTIONS, THRIE BEAM TRANSITION SECTION, 3/8" ROUND HEAD BOLTS, HEX NUTS, WASHERS, AND OTHER HARDWARE.

DESIGN AGENCY: OFFICE OF STRUCTURAL ENGINEERING

STATE OF OHIO DEPARTMENT OF TRANSPORTATION: Brad Fogell, ADMINISTRATOR

DATE: 7-06-99

DESIGNED: WTL  
 CHECKED: J/S  
 DESIGNED: AJM/SAM  
 DRAWN: SAM

REVISED: TST-1-99

STANDARD: TWIN STEEL TUBE BRIDGE RAILING

4 / 4