

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION

JEF-152-13.864

WAYNE TOWNSHIP
JEFFERSON COUNTY

PROJECT DESCRIPTION

IMPROVEMENT OF 0.043 km OF S.R. 152 BY
REHABILITATION OF EXISTING STRUCTURE
JEF-152-13873 (0862 ENGLISH), OVER CROSS
CREEK BY REPLACEMENT OF THE BRIDGE DECK,
APPROACH SLABS, GUARDRAIL, AND PAINTING
THE STEEL GIRDERS.

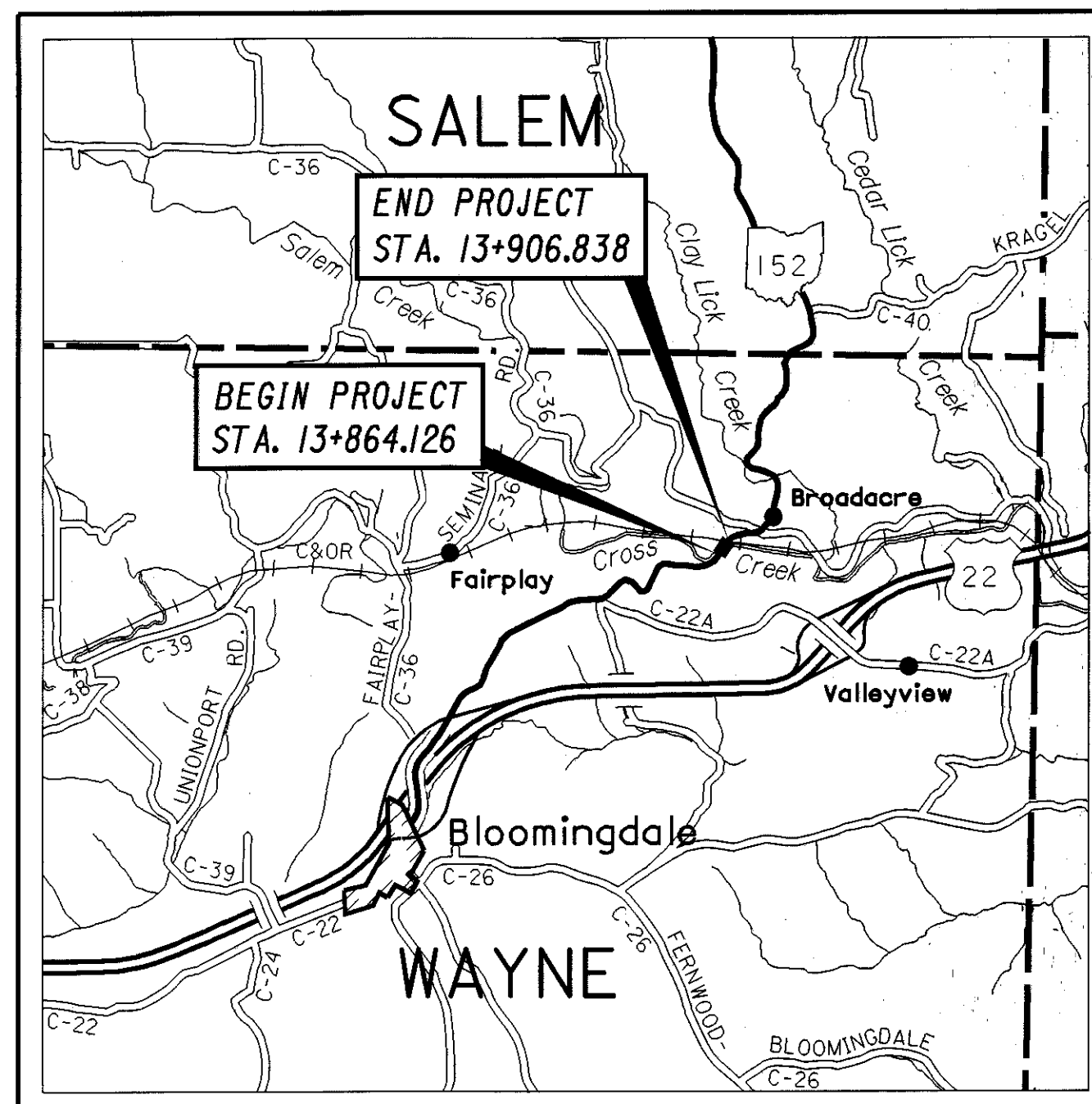
1997 SPECIFICATIONS

THE STANDARD SPECIFICATIONS OF THE STATE
OF OHIO, DEPARTMENT OF TRANSPORTATION,
INCLUDING CHANGES AND SUPPLEMENTAL SPECI-
FICATIONS LISTED IN THE PROPOSAL SHALL
GOVERN THIS IMPROVEMENT.

I HEREBY APPROVE THESE PLANS AND DECLARE
THAT THE MAKING OF THIS IMPROVEMENT WILL
NOT REQUIRE THE CLOSING TO TRAFFIC OF THE
HIGHWAY AND THAT THE PROVISIONS FOR THE
MAINTENANCE AND SAFETY OF TRAFFIC WILL BE
AS SET FORTH ON THE PLANS AND ESTIMATES.

INDEX OF SHEETS

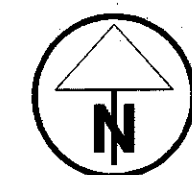
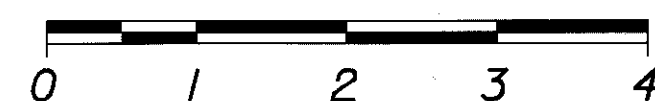
TITLE SHEET	1
TYPICAL SECTIONS	2
GENERAL NOTES	3-4
MAINTENANCE OF TRAFFIC	5-7
GENERAL SUMMARY	8-9
PLAN & PROFILE	10
ESTIMATED QUANTITIES	11
CROSS SECTIONS	12-14
REAR APPROACH SLAB DETAIL	15
STRUCTURE, OVER 6 m SPAN	16-29



LOCATION MAP

LATITUDE: N 40° 22' 00" LONGITUDE: W 80° 46' 55"

SCALE IN KILOMETERS



PORTION TO BE IMPROVED _____
STATE & FEDERAL ROUTES _____
OTHER ROADS _____

DESIGN DESIGNATION

CURRENT ADT (1998) _____ 1200
DESIGN YEAR ADT (2018) _____ 1700
DESIGN HOURLY VOLUME (2018) _____ 170
DIRECTIONAL DISTRIBUTION _____ 0.55
TRUCKS (24 HOUR B&C) _____ 3%
DESIGN SPEED _____ 90 km/h
LEGAL SPEED _____ 55 mph (89 km/h)

DESIGN FUNCTIONAL CLASSIFICATION -
RURAL COLLECTOR

DESIGN EXCEPTION

DESIGN FEATURE	APPROVAL DATE	SHEET NO.
STOPPING SIGHT DISTANCE	8-17-98	10
VERTICAL ALIGNMENT	8-17-98	10

UNDERGROUND UTILITIES

TWO WORKING DAYS
BEFORE YOU DIG
CALL 1-800-362-2764 (TOLL FREE)
OHIO UTILITIES PROTECTION SERVICE
NON-MEMBERS
MUST BE CALLED DIRECTLY

PLAN PREPARED BY:
O.D.O.T.
DISTRICT 11
NEW PHILADELPHIA, OHIO

ENGINEERS SEAL:



SIGNED: Shane A. Locke
DATE: 2-5-99

STANDARD CONSTRUCTION DRAWINGS

BP-3.1M	10-28-94	TC-41.20M	7-1-94	AS-1-81M	10-25-94	806	9-9-97
BP-4.1M	10-28-94	TC-42.20M	3-31-94	DBR-2-73M	8-18-95	815	5-30-96
		TC-65.10M	11-1-95	DS-1-94M	12-15-94	816	4-21-97
				EXJ-4-87M	2-18-97	842	1-6-99
				GSD-1-96M	11-21-97	843	5-5-98
				PCB-91M	3-20-95	844	1-6-99
				RB-1-55M	10-25-94	846	9-9-97
						863	9-9-97
						899	10-21-98
						910	7-28-98
						954	9-9-97
						SPECIAL PROVISIONS	
						NWP #3	9-16-98
GR-1.1M	10-21-97	MT-96.11M	1-30-95				
GR-1.2M	1-3-96	MT-96.20M	1-30-95				
GR-2.1M	4-14-98	MT-96.25M	1-30-95				
GR-3.4M	10-21-97	MT-97.10M	4-25-94				
GR-4.1M	11-30-94	MT-101.20M	3-1-96				
GR-4.2M	10-21-97	MT-101.60M	4-25-94				
		MT-105.10M	4-25-94				
		MT-105.11M	4-25-94				
RM-1.1M	4-8-97						
RM-4.2M	10-21-97						

SUPPLEMENTAL SPECIFICATIONS

APPROVED Michael D. Cope 1538
DATE 2/5/99 DISTRICT DEPUTY DIRECTOR

APPROVED Gordon Proctor JPL
DATE 2-17-99 DIRECTOR, DEPARTMENT OF
TRANSPORTATION

FEDERAL PROJECT NO.
TE21-G990(116)

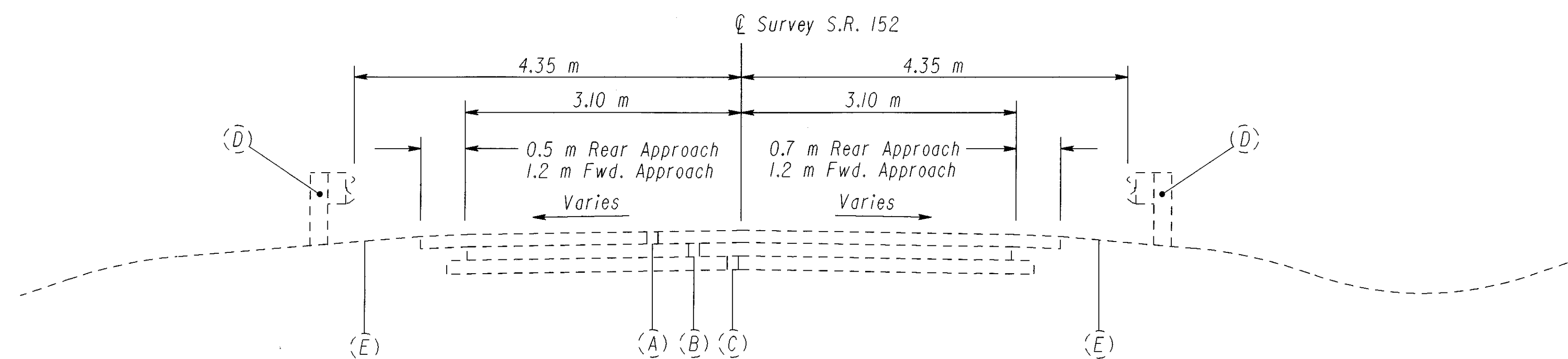
PID NO.
17983

CONSTRUCTION PROJECT NO.

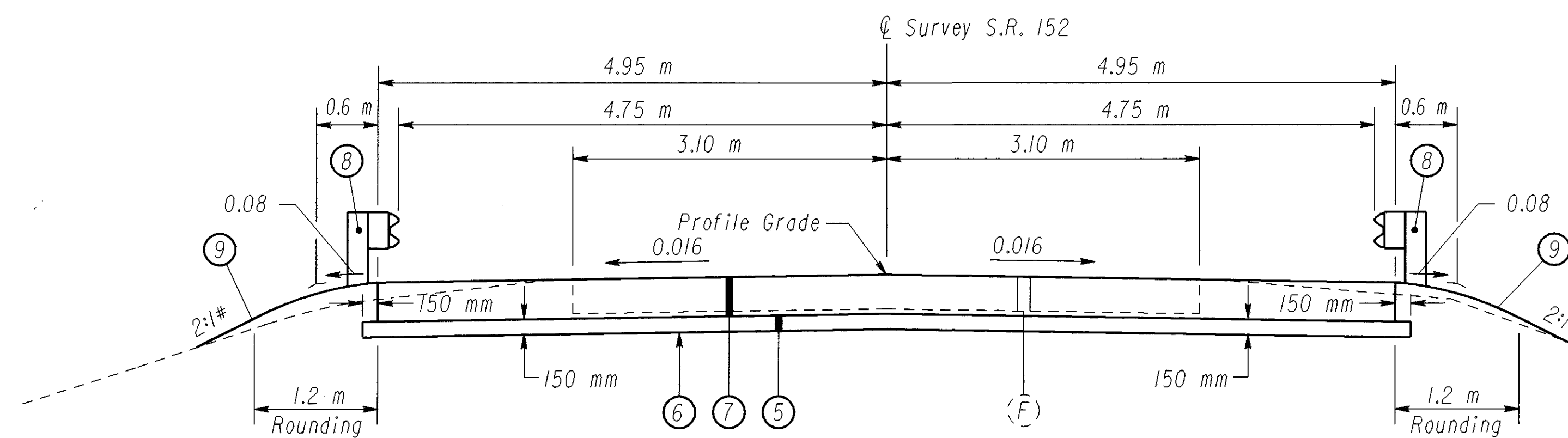
RAILROAD INVOLVEMENT
COLUMBUS & OHIO
RIVER RAILROAD

JEF-152-13.864

1
29



EXISTING SECTION - S.R. 152



APPROACH SLAB TYPICAL SECTION - S.R. 152

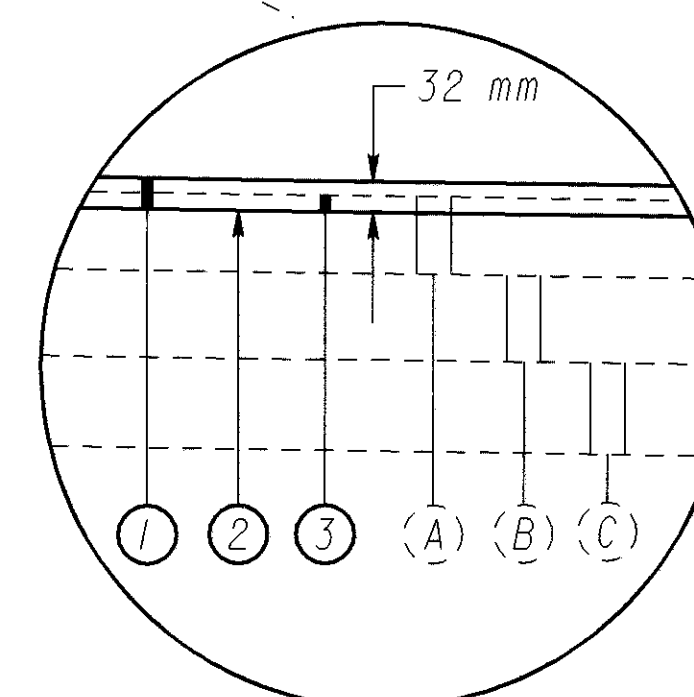
SECTION APPLIES:

$$\text{Sta. } 13+864.126 \text{ to Sta. } 13+906.838 = 42.712 \text{ m}$$

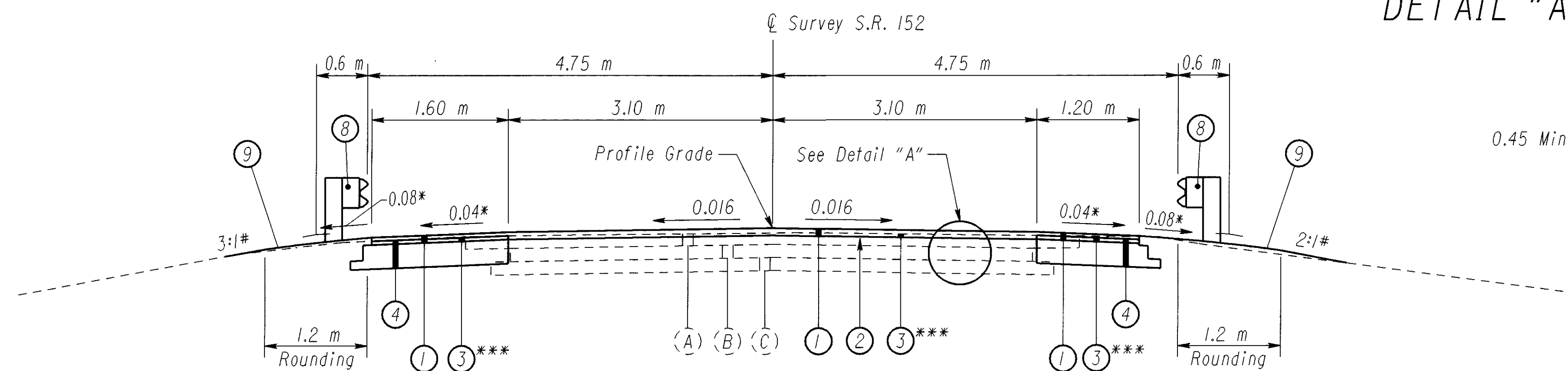
DEDUCT FOR STR. JEF-152-13873

$$\text{Sta. } 13+871.726 \text{ to Sta. } 13+900.738 = -29.012 \text{ m}$$

Total Length = 13.700 m



DETAIL "A"



NORMAL SECTION - S.R. 152

SECTION APPLIES:

$$\text{Sta. } 13+851.000 \text{ to Sta. } 13+864.126 = 13.126 \text{ m}$$

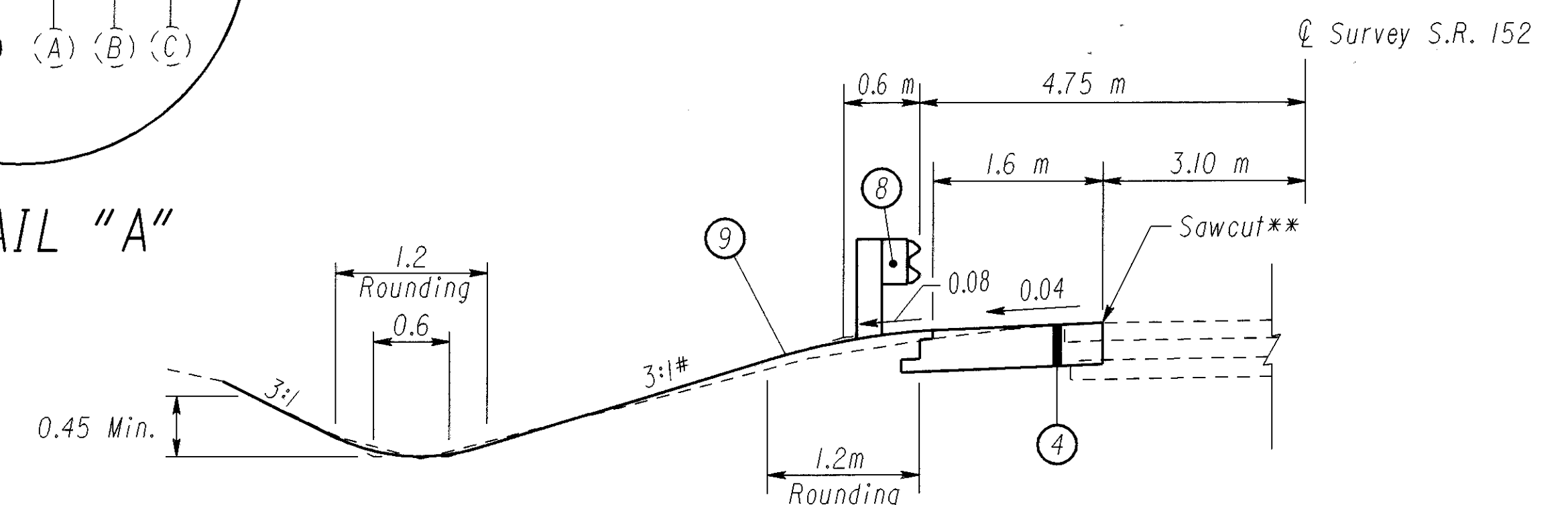
Sta. 13+906.838 to Sta. 13+918.000 = 11.162 m

Total Length = 24.288 m

LEGEND

- ① - Item 448 - 32mm Asphalt Concrete Surface Course, Type I, PG64-22, As Per Plan
- ② - Item 407 - Tack Coat for Intermediate Course
- ③ - Item 254 - Pavement Planing, Bituminous (32 mm Nominal)
- ④ - Item 615 - Temporary Pavement, Class B, As Per Plan
- ⑤ - Item 304 - Aggregate Base
- ⑥ - Item 203 - Subgrade Compaction
- ⑦ - Item 611 - Reinforced Concrete Approach Slab (T= 380 mm Rear & T=330 mm Fwd.), As Per Plan
- ⑧ - Item 606 - Guardrail, Type 5
- ⑨ - Item 659 - Seeding and Mulching

- (A) - 175mm ± Existing Asphalt Concrete
(B) - 125mm ± Existing Aggregate Base
(C) - 100mm ± Existing Subbase
(D) - Existing Guardrail
(E) - Existing Turf Shoulder
(F) - Existing Approach Slab



SHOULDER SECTION

SECTION APPLIES:

Sta. 13+825, Lt. to Sta. 13+851, Lt. = 26.000 m

or as Shown on the Cross Sections

* Provide Smooth Transition to Approach Slab

**** Cut line to be sawed to a finished line.**

*** Pavement Planing Depth Varies 32mm to 50mm from Sta. 13+851 to Sta. 13+864.126

UTILITIES

Listed below are all utilities located within the project construction limits together with their respective owners:

AEP - Ohio Power Company P.O. Box 24630 301 Cleveland Ave. SW Canton, Ohio 44701-4360 Telephone : (330) 438-7721	Columbia Gas of Ohio Inc. P.O. Box 250 216 Highland Ave. Cambridge, Ohio 43725 Telephone : (740) 432-8225
GTE Telephone Operations 1168 Kennel Road Minerva, Ohio 44657 Telephone : (330)-868-4155	TCI Cablevision of Ohio, Inc. 2228 Sunset Blvd. Steubenville, Ohio 43952 Telephone : (740)-264-3212

There are no known underground utilities on this project.

ELEVATION DATUM

All benchmark elevations are assumed elevations.

ROUNDING

The rounding at slope breakpoints shown on the Typical Sections apply to all cross sections even though otherwise shown.

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.

PREVIOUS CONSTRUCTION PLANS

The following previous construction plans are available for inspection at the ODOT District II office:

JEF-152-(7.03-7.11) Original Construction Plan, 1962

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 as per Section 659.09:

Item 659, Water - - - - - 3.0 CU. METER

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:

Item 207, Straw or Hay Bales	- - - - -	50 Each
Item 207, Filter Fabric Fence	- - - - -	60 Meter

CLEARING AND GRUBBING

All trees and stumps specifically marked for removal within the construction limits shall be removed under the lump sum bid for Item 201, Clearing and Grubbing. The following is an approximate estimate of the number of trees and stumps to be removed :

Size	No. of Trees	No. of Stumps	Total
0.5 m	3	0	3

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.

ITEM 407, TACK COAT FOR INTERMEDIATE COURSES

The rate of application of the 407 tack coat shall be subject to adjustment as directed by the Engineer. Plan quantities indicate an average application rate of 0.34 liters per square meter of tack coat for estimating purposes only.

ITEM 448, ASPHALT CONCRETE SURFACE COURSE, TYPE I, 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.

ITEM 611, REINFORCED CONCRETE APPROACH SLAB (T= 380 mm Rear & T=330 mm Forward), AS PER PLAN

The reinforcing steel for the approach slabs for this structure shall be epoxy coated in conformance with Section 509.

The rear approach slab shall be constructed as per the Standard Construction Drawing and the details on Sheet No. 15.

Guardrail post Type B anchor bolts for the deep beam tubular backup railing shall be incorporated into the rear approach slab, left side. Payment for Type B anchor bolts are included with the appropriate 517 pay item.

Additional transverse reinforcing steel shall be included in the rear Phase I approach slab as detailed on Sheet No. 15.

All materials, labor and installation shall be included for payment in the contract price for Item 611, Reinforced Concrete Approach Slab (T=380 mm Rear & T=330 mm Forward), As Per Plan.

EROSION CONTROL

Item 667 is provided in the plans for erosion control. Rock of a stable nature shall not be removed in order to place any of these items, and turf of a stable nature shall not be removed in order to place Item 667. The Engineer shall check and non-perform quantities, or adjust locations and quantities of these items where indicated by field conditions during construction. In addition, these items shall meet the requirement of Section 108.04.

PAVING AT RAILROAD CROSSING

The crown shall be worked out of the proposed pavement on each side of the railroad crossing, beginning 10 meters from the nearest rail, by raising the edges of the new pavement to meet the platform elevation.

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.

ITEM 615, TEMPORARY PAVEMENT, CLASS B, AS PER PLAN

The temporary pavement to be constructed as detailed on sheet no. 7 shall remain in place upon completion of the project, thereby waiving the requirements of Section 615.08.

The composition of the temporary pavement shall be flexible.

MONUMENTS

Centerline reference monuments shall be constructed per the details shown on Standard Construction Drawing RM-1.1M at the following locations and offsets:

P.O.T. Sta. 13+782.141; 7.0 meters each side of C

P.O.T. Sta. 13+820.000; 7.0 meters each side of C

P.T. Sta. 14+007.039; 7.0 meters each side of C

The following quantity has been carried to the General Summary for this purpose:

Item 604, Reference Monument - - - - - 6 Each

ITEM SPECIAL, MAILBOX SUPPORT

This work shall consist of furnishing and erecting mailbox supports, and any associated mounting hardware, according to plan details, and attaching an owner-supplied mailbox at the locations specified in the plan, or otherwise established by the Engineer.

Wood posts shall be nominal 100 mm by 100 mm square, or 115 mm diameter round, and conform to Section 710.14.

Steel posts shall be nominal pipe size 60.3 mm O.D., and conform to AASHTO M 181. Hardware (plates, screws, bolts, etc.) shall be commercial-grade galvanized steel.

Posts shall be set per the first paragraph of Section 606.03, and shall in no instance be encased in concrete.

Support hardware shall accommodate either a single or a double mailbox installation, and no more than two boxes may be mounted on a single post.

The mailbox shall be securely and neatly attached by the Contractor to the new support. The Contractor shall furnish all necessary attachment hardware (nuts, bolts, plates, spacers, and washers) as necessary to accommodate the complete installation.

In the absence of a new mailbox supplied by the owner, the Contractor shall salvage the existing box, and place it on the new support. Due care shall be exercised in such an operation, and the Contractor shall be responsible for repairing or replacing any box damaged by improper handling on his part, as judged and directed by the Engineer.

The Contractor shall be responsible for coordinating with the local post master regarding the timing of the movement of any mailbox to a new location. The local post office is located at Ill High Street, Bloomingdale, Ohio 43910-9998, telephone 740-944-1753. The Contractor shall also be responsible for notifying the property owner three (3) days in advance of the new installation. A form letter will be provided to the Contractor at the pre-construction conference to give to each affected property owner.

Payment under this item shall be limited to final permanent installations. Temporary installations shall be in accordance with Section 107.12. However, the same material and size limitations as for permanent installations shall apply.

Mailbox supports, complete in place, will be paid for at the contract unit price per Each for Item Special, Mailbox support, Single.

ITEM SPECIAL, MAILBOX SUPPORT - 1 Each, Single at Sta. 13+844, Lt.

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.

TEMPORARY MAILBOXES

The Contractor shall erect and maintain temporary mailbox supports at the locations shown on sheet no. 6, per the requirements of 107.12 of the CMS. The Contractor shall erect the temporary supports prior to maintaining traffic via signal control and replace the supports to thier original or proposed location upon completion of Phase 2.

The Contractor shall notify the local postmaster and property owners as set forth in Item Special, Mailbox Support.

The temporary supports, labor and necessary work associated to move the mailboxes shall be included with Item 614, Maintaining Traffic for payment.

ITEM 614, BARRIER REFLECTORS AND OBJECT MARKERS

Barrier reflectors and object markers shall be installed on all portable concrete barrier used for traffic control. Barrier reflectors, object markers and their installation shall conform to Item 626, except that the spacing shall be 7.6 meters.

ITEM 614 - MAINTAINING TRAFFIC

The Contractor shall maintain traffic at all times and in accordance with the requirements of Item 614 and the construction phasing described on sheet nos. 5-7. Traffic shall be maintained at all times by use of the existing pavement, temporary pavement, and portions of the existing and new bridge.

Alternating one-way traffic shall be maintained during phases 1 through 2 by use of temporary signals as shown on Standard Construction Drawings MT-96.11M, MT-96.20M, and MT-96.25M. Traffic shall be separated from the work area by means of Item 622 - Portable Concrete Barrier. Access for local property owners shall be maintained at all times except as noted on the plans.

Prior to the beginning of any construction that will require the closure of existing lanes to traffic, all temporary signals, signs, lights, portable concrete barriers, and temporary pavement markings shall be furnished and installed as shown on Standard Construction Drawing MT-96.11M and sheet nos. 5-7. Temporary pavement markings, raised pavement markings, and portable concrete barrier installation shall be accomplished in one day, with flaggers being utilized for the protection of vehicular traffic during the installation of these items. When the above requirements and the Traffic Signal Preemption requirements have been satisfied, signal controlled alternating one-way traffic may begin.

The Contractor shall not allow traffic to queue across the railroad tracks or stop within 1.8 meters of the the nearest rail at anytime while stopping a one-way traffic lane for any operation. The Contractor shall utilize flaggers to stop traffic from queueing on the tracks during paving operations, lane restrictions and during the one-way traffic operation.

The Contractor shall not operate, drive, or store any equipment within 3.0 meters of the railroad tracks, except to perform the paving operations. The Contractor shall not drive track- or steel- wheeled equipment directly onto the railroad tracks.

The Contractor shall schedule and work in a continuous manner, satisfactory to the Engineer, in order to minimize the closure.

The following estimated quantity has been included in the General Summary, for use as directed by the Engineer, for the maintenance of traffic:

Item 410 - Traffic Compacted Surface, Type C 5 CU. METER
Item 614 - Bituminous Concrete for Maintaining Traffic 3 CU. METER

All work and traffic control devices shall be in acordance 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.

TRAFFIC SIGNAL PREEMPTION

The preemption system shall be at a minimum, a normally energized, double break, fail safe system manufactured by one of the following companies :

Traffic Control Products
4565 Glenbrook Road
Willoughby, Ohio 44094
Phone : 1-800-659-8929

Baldwin & Sours
5263 Trabue Road
Columbus, Ohio 43228
Phone : (614) 851-8800

Path Master, Inc.
1960 Midway Drive
Twinsburg, Ohio 44087
Phone : (330) 425-4994

The Contractor shall provide 20 meters of 4 conductor, No. 8 AWG cable for use by the railroad to wire from their controller to the traffic controller.

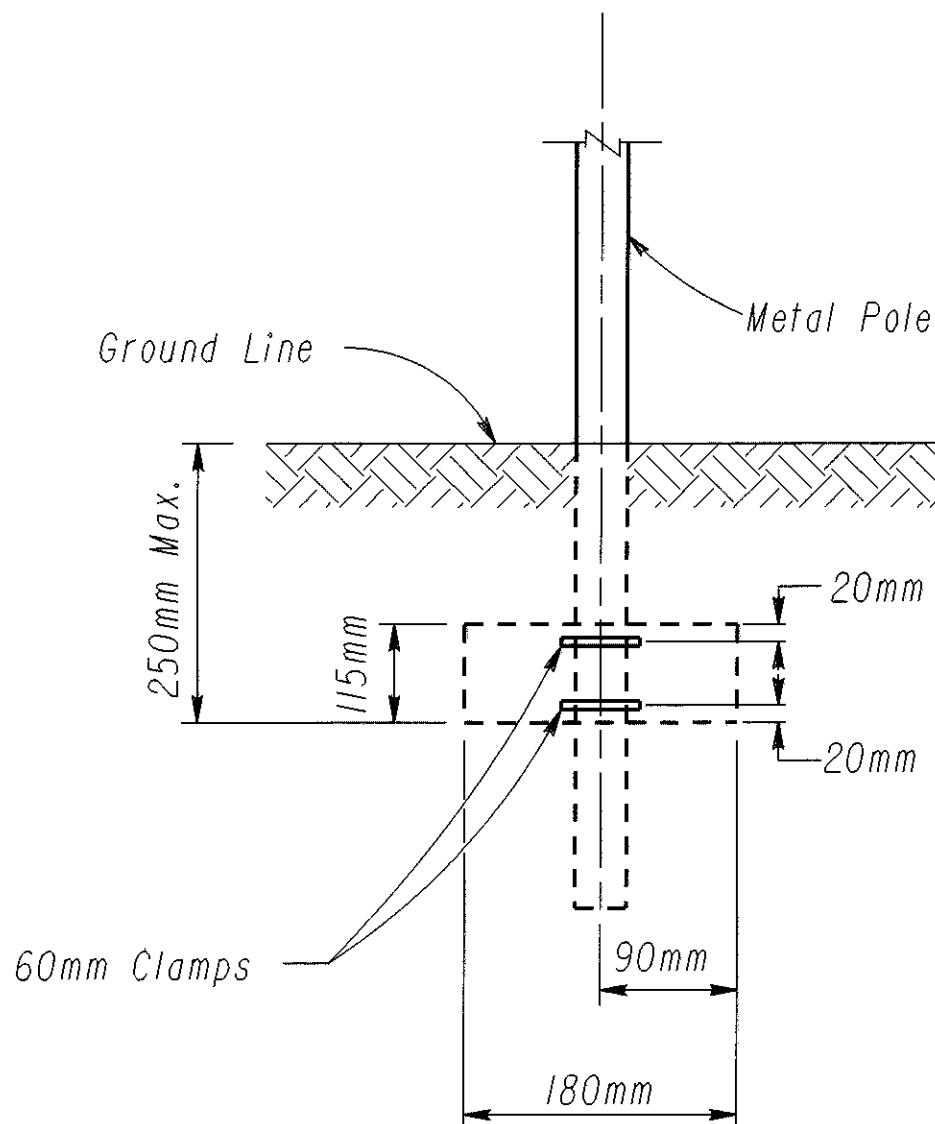
The phasing and intervals shall be as shown on sheet no. 6. The controller shall be capable of returning the traffic signal operation to Phase 1, Interval 1 after the preemption phase is completed.

The Contractor shall cooperate with the railroad at all times and test the traffic signal preemption system operation, with representatives from the State and Railroad present prior to beginning alternating one-way traffic operations.

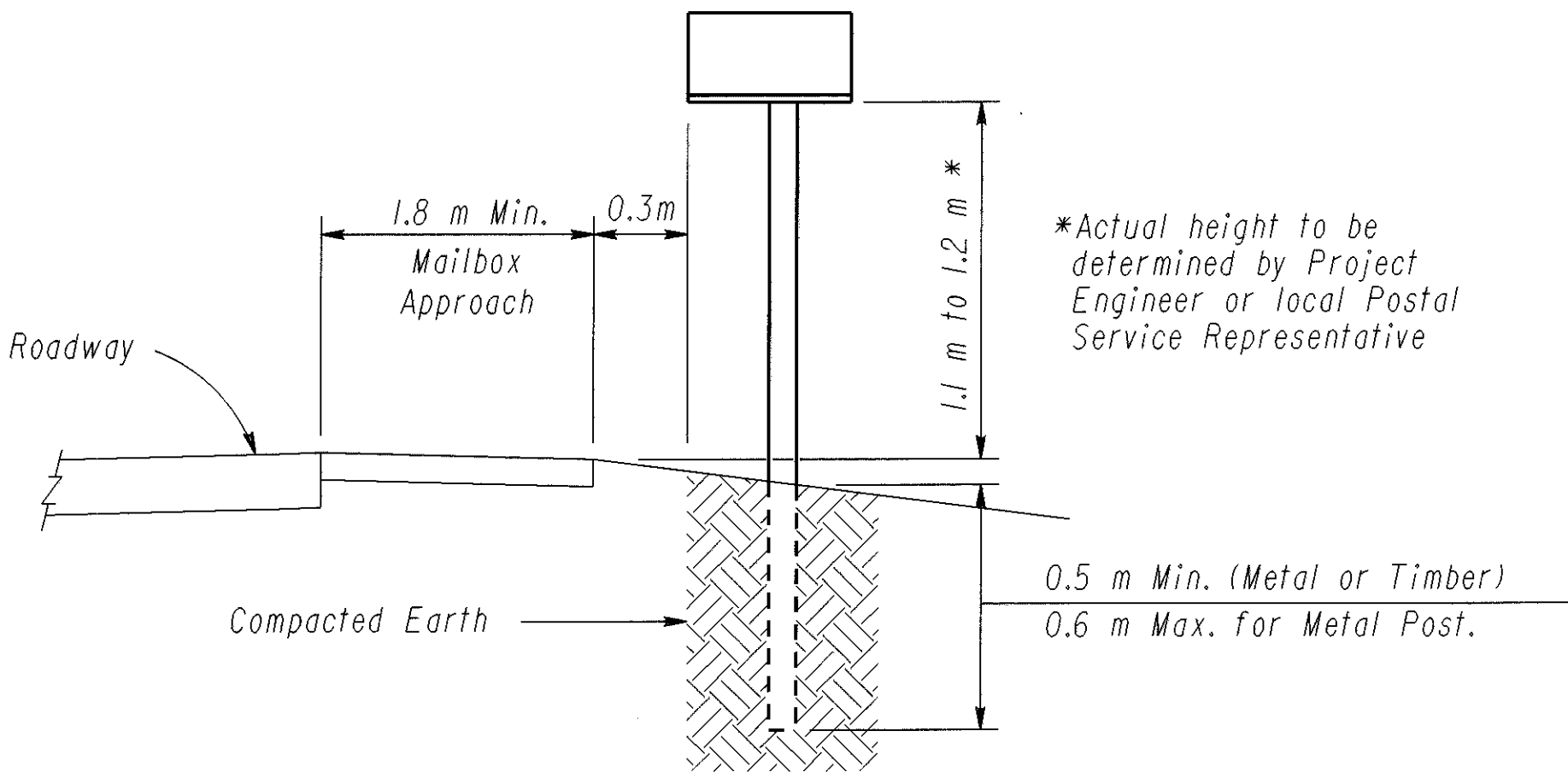
The following quantity has been carried to the General Summary for the 4 conductor cable :

Item 632 - Signal Cable Misc. : 4 Conductor, No. 8 AWG ----- 20 Meters

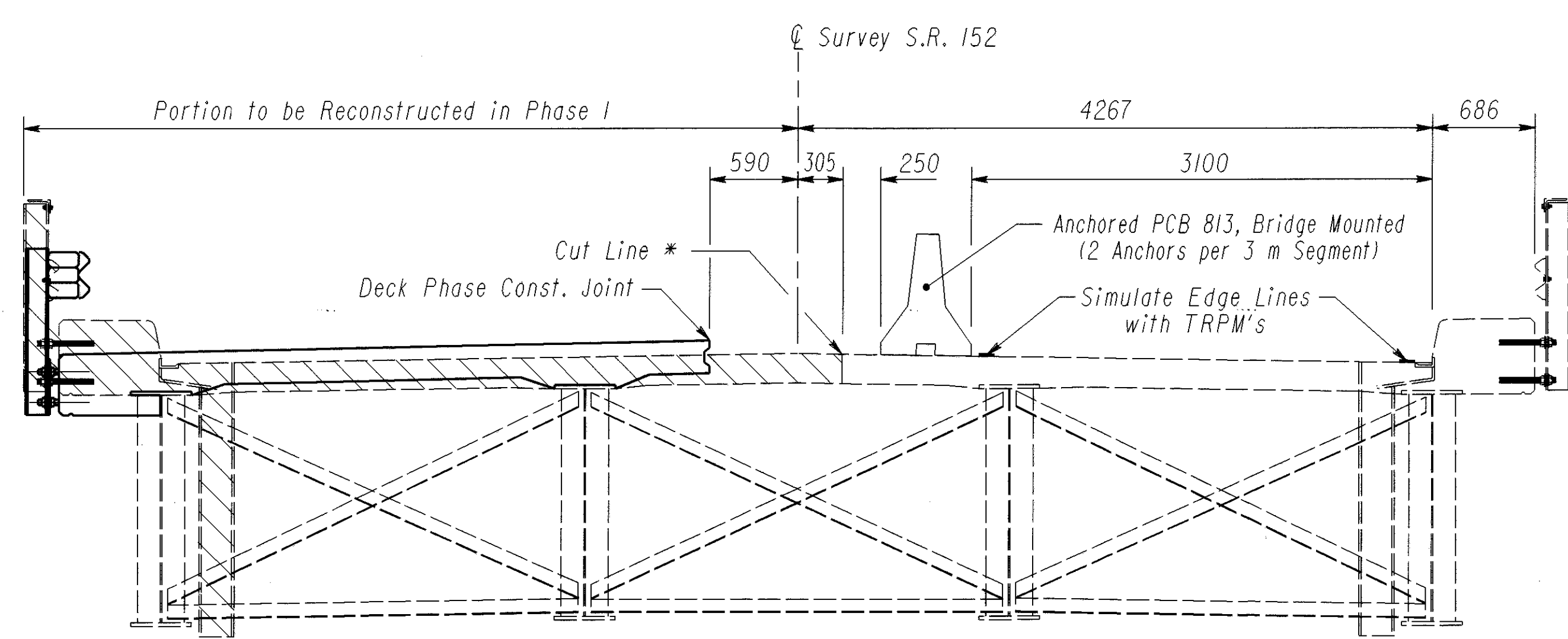
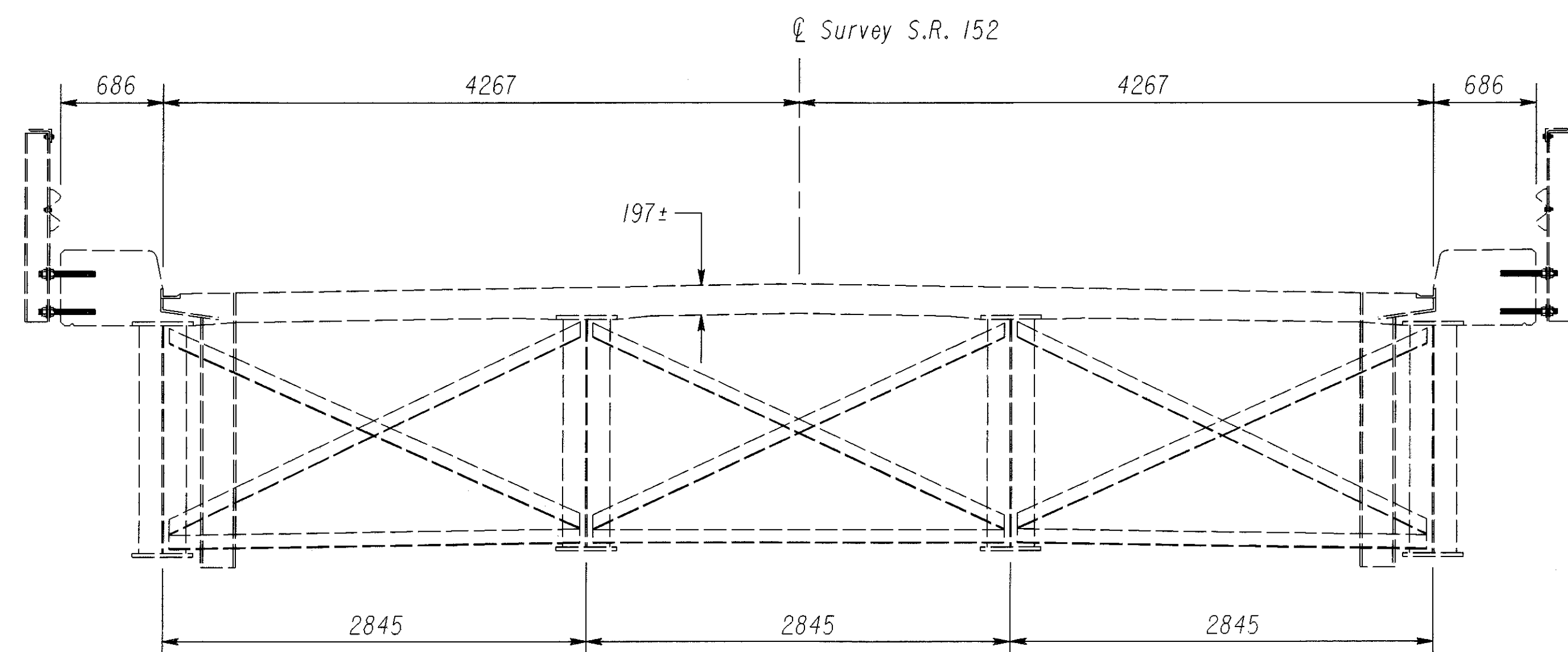
All additional costs associated with the Traffic Preemption System shall be included in the Lump Sum bid for Item 614 - Maintaining Traffic.



ANTI-TWIST PLATE



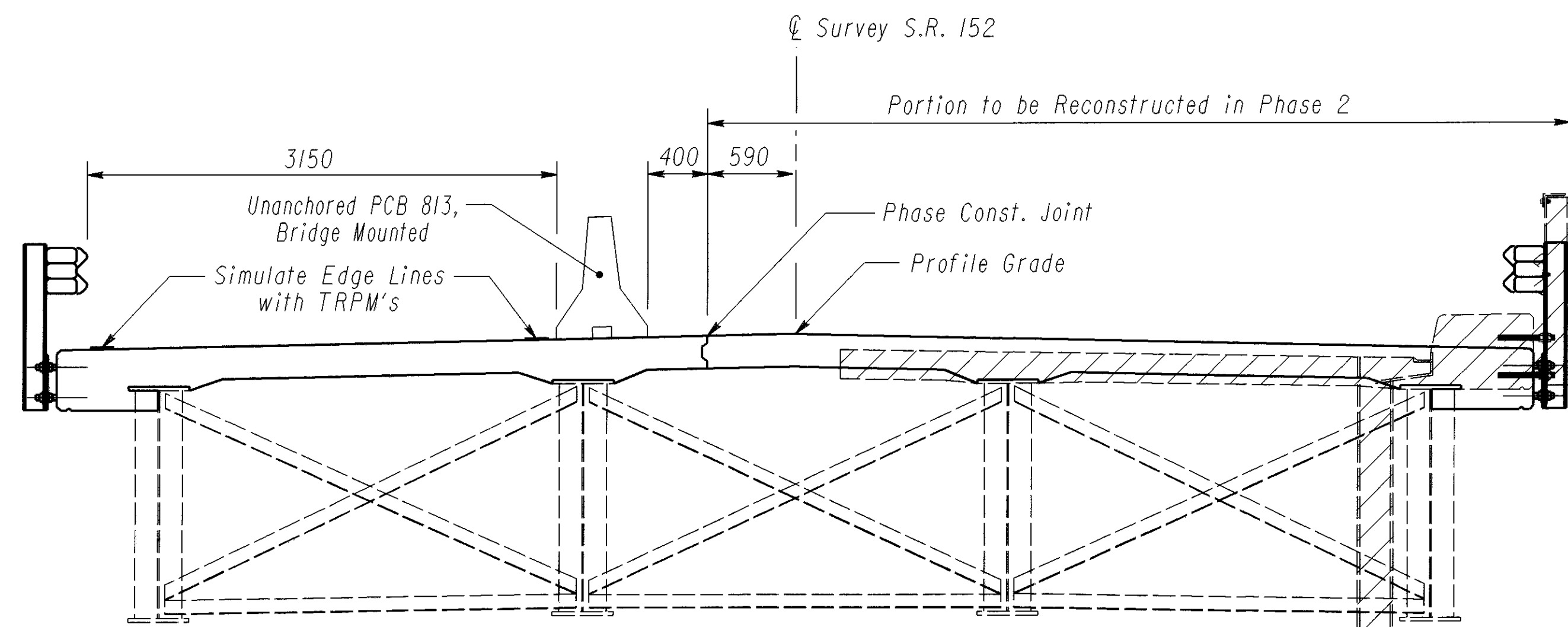
ELEVATION AT MAILBOX APPROACH



Portion to be Removed

PHASE 1

* Cut line to be sawed to a finished line.



Portion to be Removed

PHASE 2

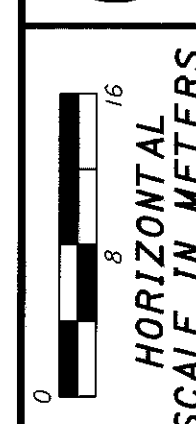
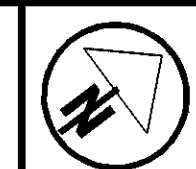
MAINTENANCE OF TRAFFIC QUANTITIES

Sheet No.	Reference	410	614		615		622					
		Traffic Compacted Surface, Type B	Barrier Reflector, Type B2	Object Marker	Temporary Edge Line, Class I, 140.06, Type I	Temporary Stop Line, Class I, 140.06, Type I	Temporary Road	Temporary Pavement, Class B, As Per Plan	Portable Concrete Barrier, 813mm	Portable Concrete Barrier, 813mm, Bridge Mounted		
		Cu. m	EACH	EACH	KILO-METER	METER	LUMP	Sq. m	METER	METER		
6	TP-1							27.00				
6	TP-2							20.58				
6	TP-3							59.20				
6	TP-4							17.87				
6	PCB-1		3	8					30			
6	PCB-2		5	8						33		
6	PCB-3		2	6					12			
6	MT-1					3.10						
6	MT-2				0.01							
6	MT-3					3.10						
6	MT-4					3.00						
Sub-Total		---	10	22	0.01	9.20	---	124.65	42	33		
7	TR-1	25.5					LUMP					
7	PCB-4		5	12					42			
7	PCB-5		5	10						33		
7	PCB-6		2	4					12			
7	MT-5				0.03							
7	MT-6					3.15						
Sub-Total		25.5	12	26	0.03	3.15	LUMP	---	54	33		
Totals Carried to Gen. Summary		25.5	22	48	0.04	12.35	LUMP	124.65	96	66		

ITEM 614 - TEMPORARY RAISED PAVEMENT MARKERS

	STATIONING			SPACING	TYPE A				REMARKS
	FROM	TO	SIDE	METER	W	Y	Y/Y	(LINE TYPE)	
PHASE 1	13+809	13+855	RT.	1.5	31			SIMULATE EDGE LINE	
	13+855	13+960	RT.	1.5	71	71		SIMULATE EDGE LINE	
	13+855	13+920	LT.	1.5	44	44		SIMULATE EDGE LINE	
PHASE 2	13+809	13+915	LT.	1.5	72	72		SIMULATE EDGE LINE	
	13+920	13+960	LT.	1.5	28			SIMULATE EDGE LINE	
	13+860	13+915	RT.	1.5	38	38		SIMULATE EDGE LINE	
Totals Carried to General Summary					284	225			
					509				

All Dimensions are in Millimeters, Unless Otherwise Noted.



CALCULATED
JFB
CHECKED
SAL

MAINTENANCE OF TRAFFIC PLAN

JEF-152-13.864

LEGEND

Temporary Signal Head

Drum

White Edge Line

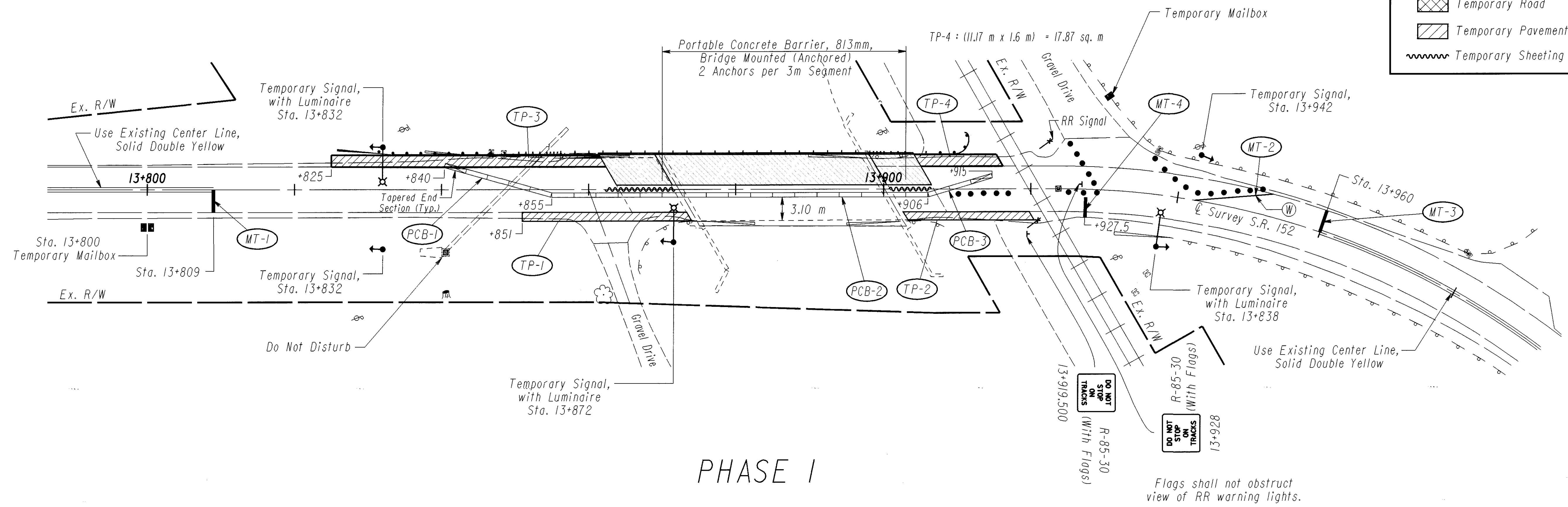
Portable Concrete Barrier

Work Area

Temporary Road

Temporary Pavement

Temporary Sheeting



PHASE I

CALCULATIONS :

- TP-1 : (22.5 m x 1.2 m) = 27 sq. m
- TP-2 : (17.15 m x 1.2 m) = 20.58 sq. m
- TP-3 : (37 m x 1.6 m) = 59.20 sq. m

SIGNAL TIMING

PHASE 1			PHASE 2		
Interval 1	2	3	4	5	6
14 Sec.	13 Sec.	3 Sec.	14 Sec.	13 Sec.	3 Sec.

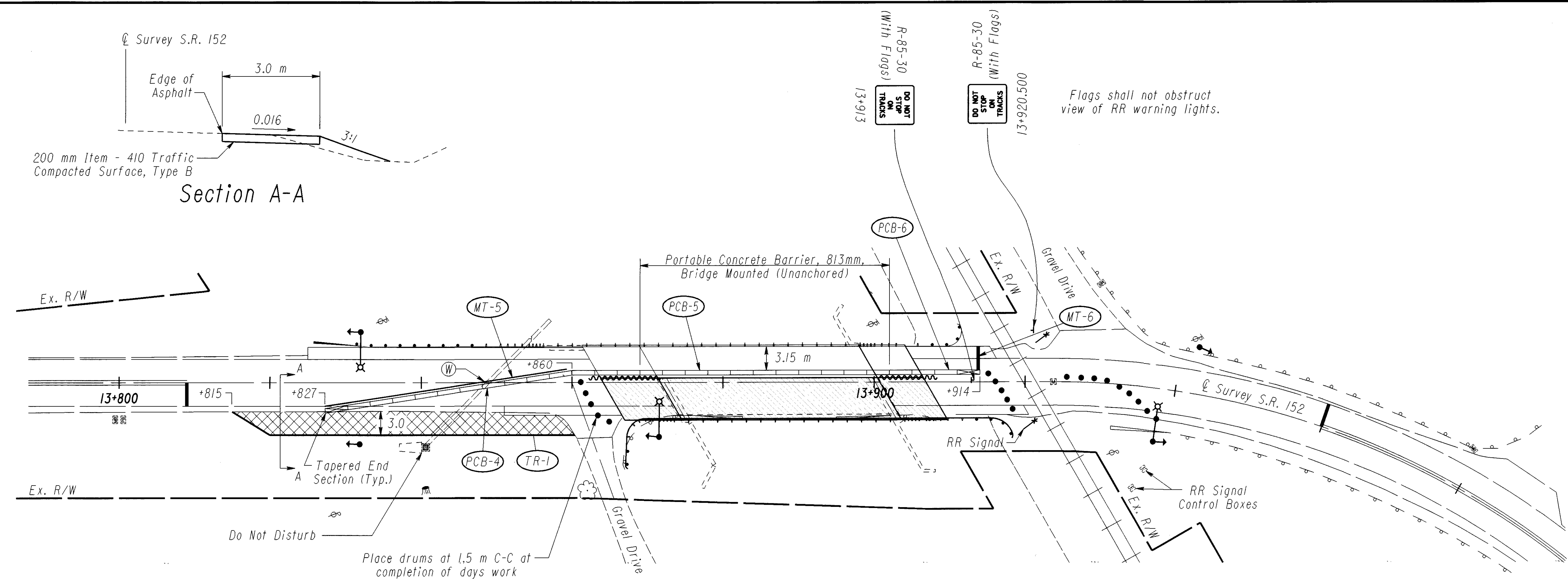
PRE-EMPTION PHASE

		Train
3 Sec.	3 Sec.	Varies

PHASE I

- Construct Temporary Pavement, Class B, As Per Plan for the right side, prior to lane closure.
- Place portable concrete barrier (PCB), use bridge mounted (anchored) on the bridge, provide all maintenance of traffic devices, and place temporary mailboxes.
- Maintain two-way traffic with one lane on northbound portion of bridge, via signal control.
- Remove southbound portion of superstructure, approach slab, retaining wall and abutment, as detailed in plan.
- Construct southbound portion of superstructure, embankment, approach slab, guardrail, and temporary pavement.

1.5 m C-C Drum Spacing, Unless Shown Otherwise.
For Details not Shown, See Standard Construction Drawings MT-96.11M, MT-96.20M, MT-96.25M, MT-101.20M, MT-101.60M, and PCB-91M.
For Quantities, See Sheet No. 5.



Section A-A

PHASE 2

CALCULATIONS :

TR-1 : Item 410 - Traffic Compacted Surface, Type B :
 $0.200 [(10.5 \times 5.0 \times 3.0) + (40.0 \times 3.0)] = 25.5 \text{ cu. m}$

PHASE 2

1. Construct Temporary Road, as per Section A-A and the cross sections to provide access for Residential Drive.
2. Place portable concrete barrier.
3. Maintain two-way traffic with one lane on southbound portion of bridge, via signal control.
4. Remove northbound portion of superstructure, approach slab, and abutment, as detailed in plan.
5. Construct northbound portion of superstructure, embankment, approach slab, and guardrail.

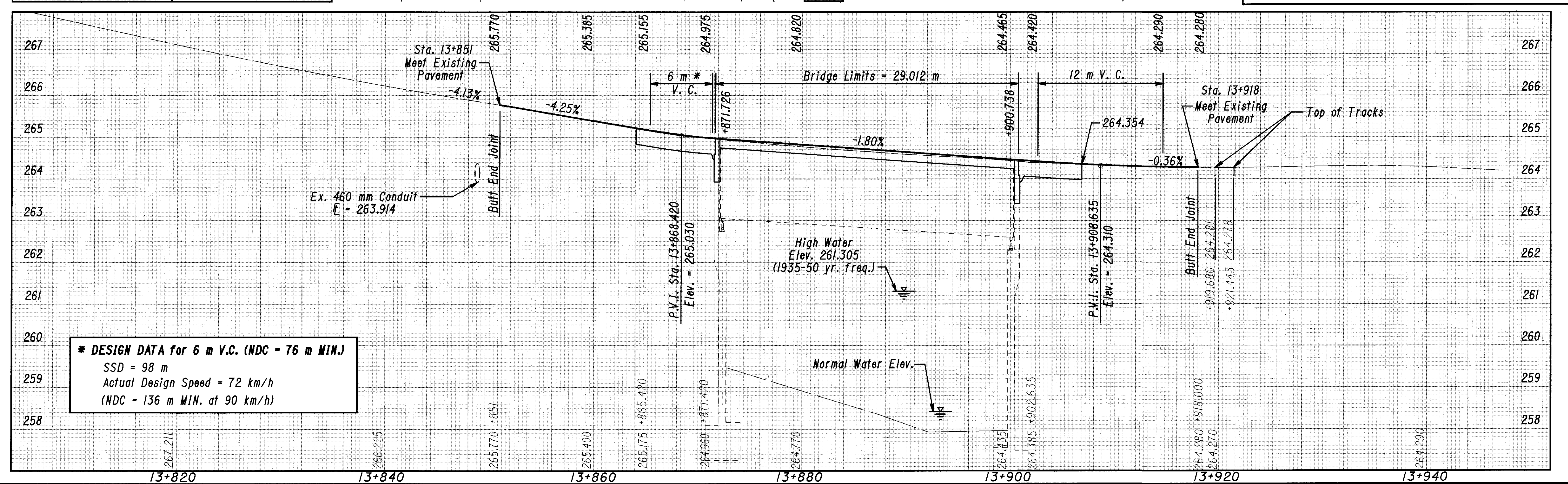
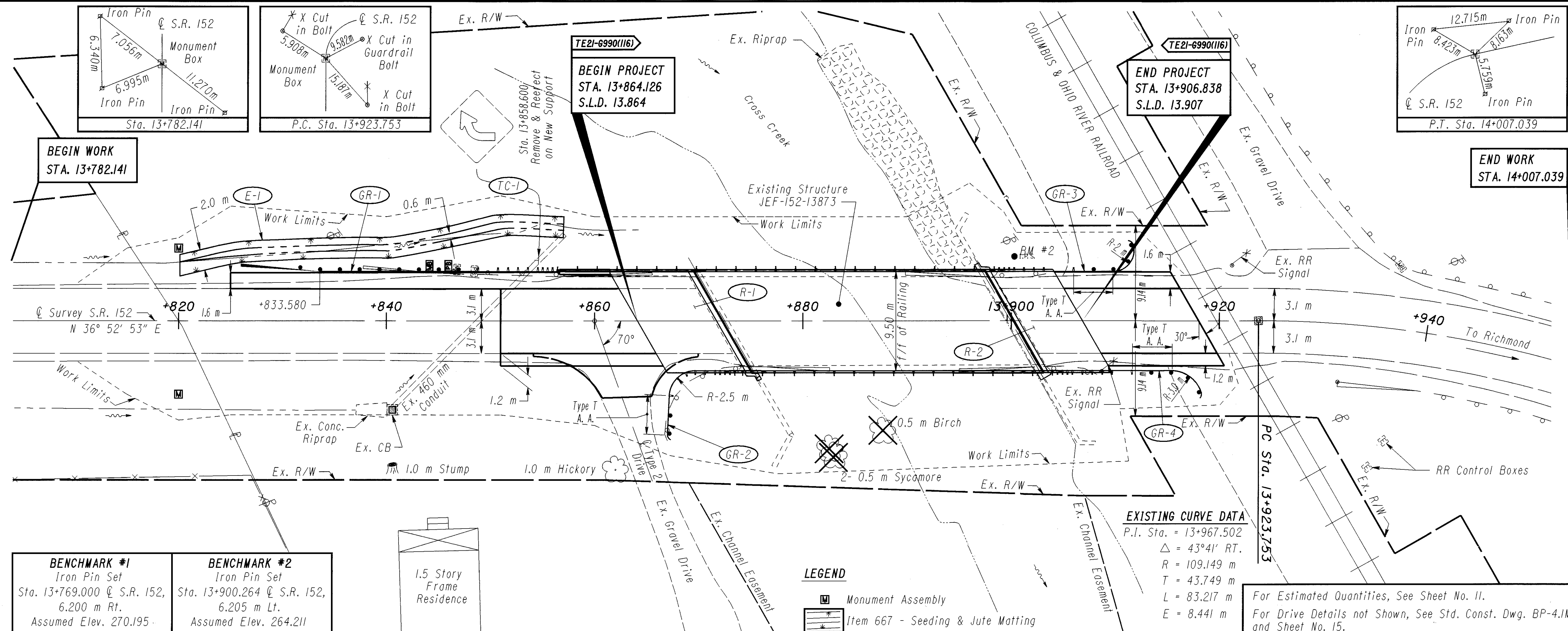
PHASE 3

1. Complete pavement operations (pavement planing and 32 mm overlay) and apply pavement markings. Traffic shall be maintained by use of flaggers during paving operations, as per Standard Construction Drawing MT-97.10M.

1.5 m C-C Drum Spacing, Unless Shown Otherwise.
 For Details not Shown, See Standard Construction Drawings MT-96.11M, MT-96.20M, MT-96.25M, MT-101.20M, MT-101.60M, and PCB-91M.
 For Signal Timing, See Sheet No. 6.
 For Legend, See Sheet No. 6.
 For Quantities, See Sheet No. 5.

[illegible]

[illegible]



REFERENCE NO.	PLAN SHEET NO.	STATION		SIDE	LENGTH	WIDTH	202		203	254	304	407	448	606				611		630			667
							GUARDRAIL REMOVED	APPROACH SLAB REMOVED	SUBGRADE COMPACTION	PAVEMENT PLANING, BITUMINOUS	150mm AGGREGATE BASE	TACK COAT FOR INTERMEDIATE COURSE AT 0.34 L/ Sq. METER	32mm ASPHALT CONCRETE SURFACE COURSE TYPE 1, PG64-22, AS PER PLAN	GUARDRAIL TYPE 5	ANCHOR ASSEMBLY, TYPE A	ANCHOR ASSEMBLY, TYPE T	BRIDGE TERMINAL ASSEMBLY, TYPE 4	REINFORCED CONCRETE APPROACH SLAB (T=380mm), AS PER PLAN	REINFORCED CONCRETE APPROACH SLAB (T=330mm), AS PER PLAN	REMOVAL OF GROUND MOUNTED POST AND DISPOSAL	REMOVAL OF GROUND MOUNTED SIGN AND REERECTION	GROUND MOUNTED SUPPORT, NO. 3 POST	SEEDING AND JUTE MATTING
		FROM	TO		METER	METER	METER	SQ. METER	SQ. METER	SQ. METER	CU. METER	LITER	CU. METER	METER	EACH	EACH	EACH	SQ. METER	SQ. METER	EACH	EACH	METER	SQ. METER
GR-1	10	13+825.955	13+856.435	LT.			19.05							22.86	1		1						
GR-2	10	13+867.007	13+873.488	RT.			11.43							* 7.62		1	1						
GR-3	10	13+898.345	13+911.669	LT.			5.715							11.43		1	1						
GR-4	10	13+903.968	13+918.268	RT.			5.715							** 11.43		1	1						
R-1	10	13+864.126	13+871.726					46.45															
R-2	10	13+900.738	13+906.834					37.16															
E-1	10	13+820.000	13+857.000	LT.	37.25	2.00																	74.5
TC-1	10	13+853.600		LT.																1	1	5.7	
PAVEMENT CALCULATIONS :																							
		13+851.000	13+864.126		13.126	9.00				118.13		40.16	3.78										
		13+864.126	13+871.726		7.600	9.50			72.2		10.4							72.2					
		13+900.738	13+906.838		6.100	9.50			58.0		9.0								58.0				
		13+906.838	13+918.000		11.162	9.00				100.46		34.16	3.21										
		Drive at 13+860.000		RT.						19.80		6.73	0.63										
TOTALS (CARRIED TO GENERAL SUMMARY)							41.91	83.61	130.2	238.39	19.4	81.05	7.62	53.34	1	3	4	72.2	58.0	1	1	5.7	74.5

* 3.81 m on 2.5 m Radius
** 3.81 m on 3.0 m Radius

EARTHWORK SUMMARY TABLE

FROM SHEET NO.	203		659
	EXCAVATION	EMBANKMENT	SEEDING & MULCHING
	CU. METER	CU. METER	SQ. METER
12	39.6	1.4	204.4
13	39.6	3.0	62.8
14	1.1	0.6	46.3
TOTALS	80.3	5.0	313.5

Item 659 - Commercial Fertilizer :
313.5 Sq. Meter x 0.1 kg/Sq. Meter = 31.35 KILOGRAM USE 31 KILOGRAM

Item 659 - Agricultural Liming :
313.5 Sq. Meter x (256 kg ÷ 1000 Sq. Meter) x 220% = 176.6 KILOGRAM USE 177 KILOGRAM

Item 659 - Water : (Quantity Carried to Sheet No. 3.)
313.5 Sq. Meter x (9.8 Cu. Meter ÷ 1000 Sq. Meter) = 3.07 CU. METER USE 3.0 CU. METER

PAVEMENT MARKINGS

Item 642 - Edge Line, Type I
Sta. 13+851 to Sta. 13+916.200, Rt. = 91.200 m
Sta. 13+825 to Sta. 13+919.800, Lt. = 68.800 m
91.200 m + 68.800 m = 160.000 m ÷ 1000 = 0.16 KILOMETER

Item 642 - Center Line, Type I
Sta. 13+851 to Sta. 13+918 = 67.000 m
67 m ÷ 1000 = 0.07 KILOMETER

Item 642 - Stop Line, Type I
Sta. 13+909, Rt. (for Railroad Crossing) - 3.1 METER

BARRIER REFLECTORS

Item 626 - Barrier Reflector, Type A
Sta. 13+825.730 to Sta. 13+911.444, Lt. :
76.2 m ÷ 30 = 2.54 spaces, Use 4 Reflectors
Sta. 13+867.007 to Sta. 13+918.268, Rt. :
49.53 m ÷ 30 = 1.65 spaces, Use 3 Reflectors
TOTAL = 7

RAISED PAVEMENT MARKERS

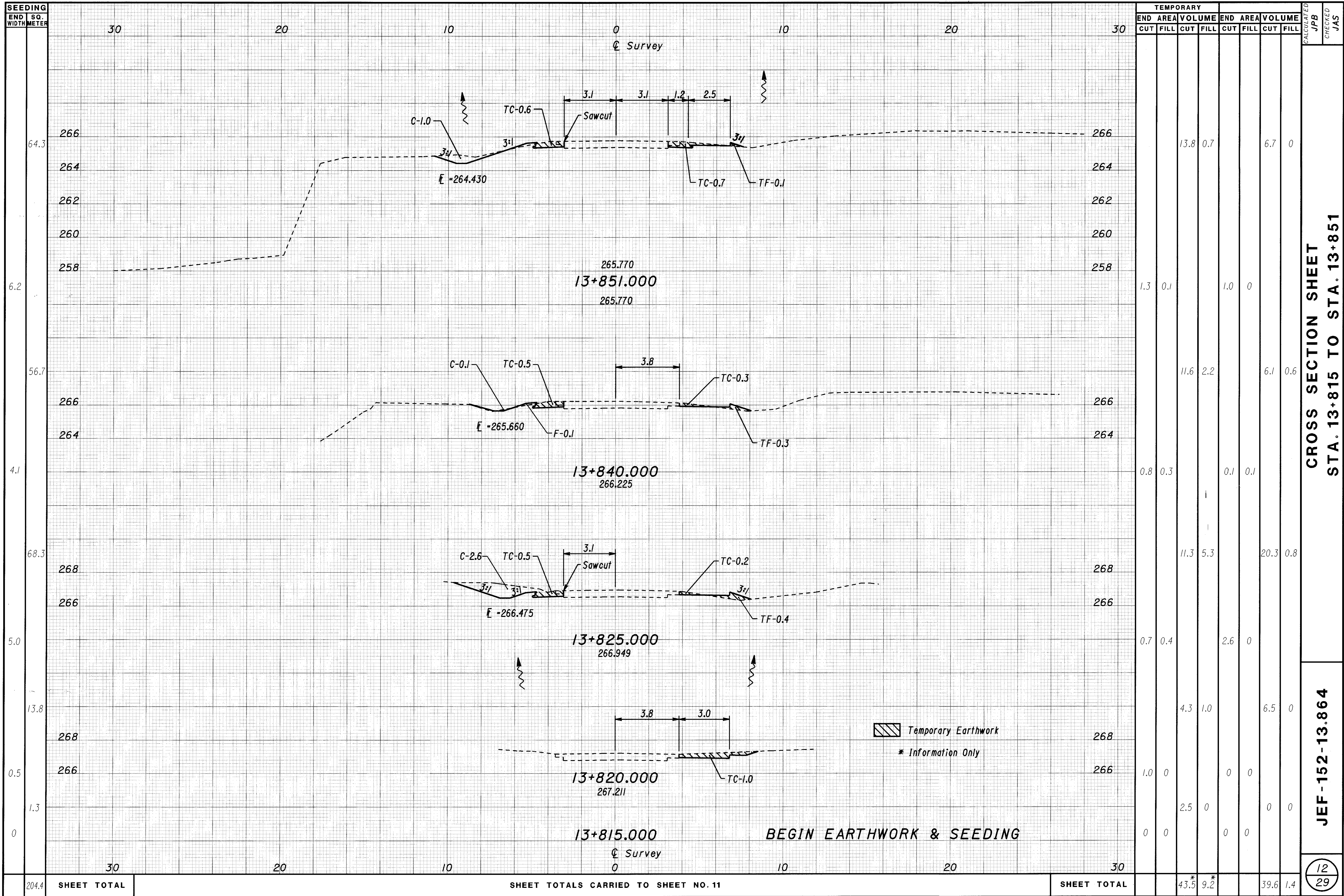
Item 202 - Raised Pavement Marker Removed
Sta. 13+862± and Sta. 13+909± :
TOTAL - 2 EACH

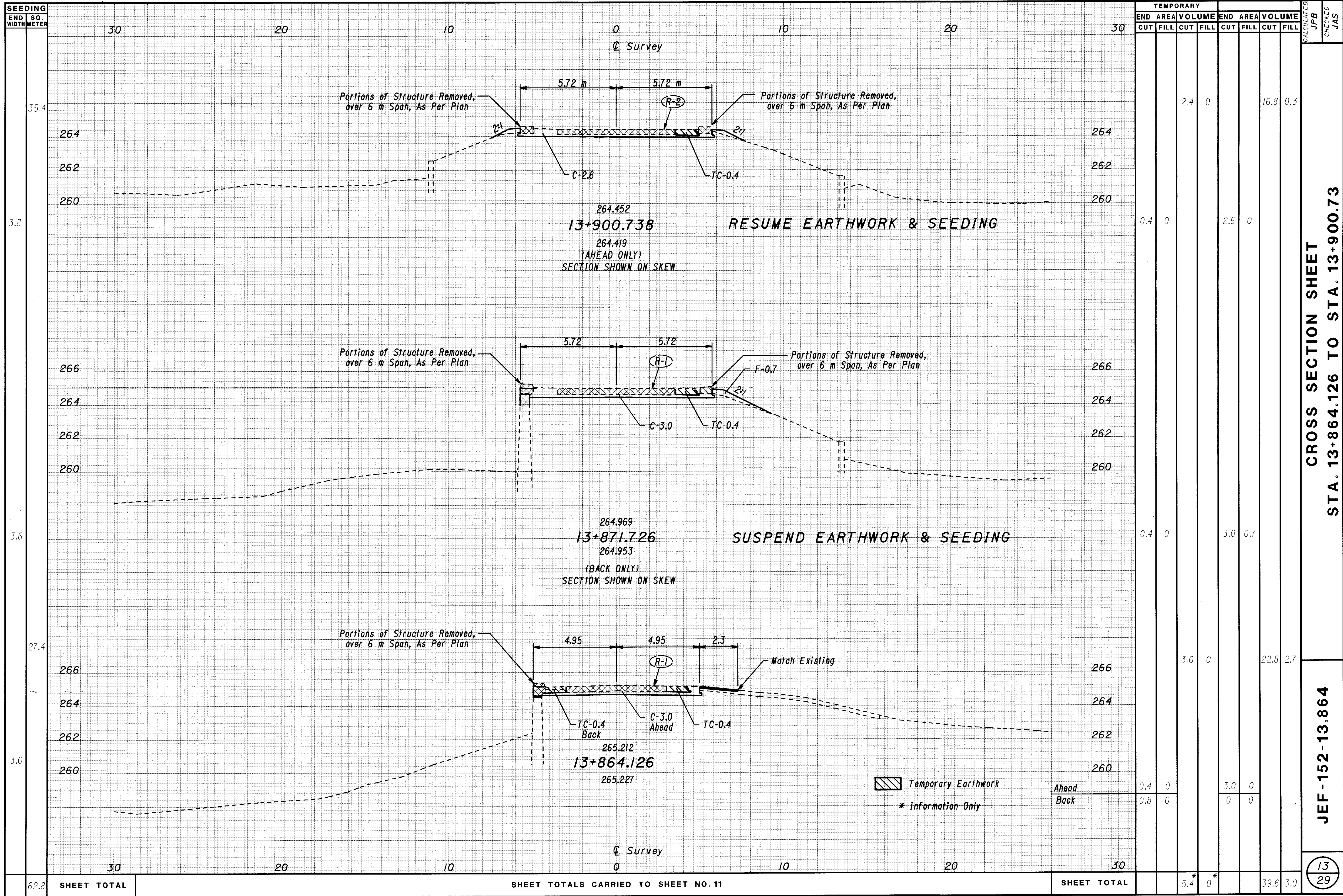
Item 621 - Raised Pavement Marker
Sta. 13+862 and Sta. 13+909 :
TOTAL - 2 EACH

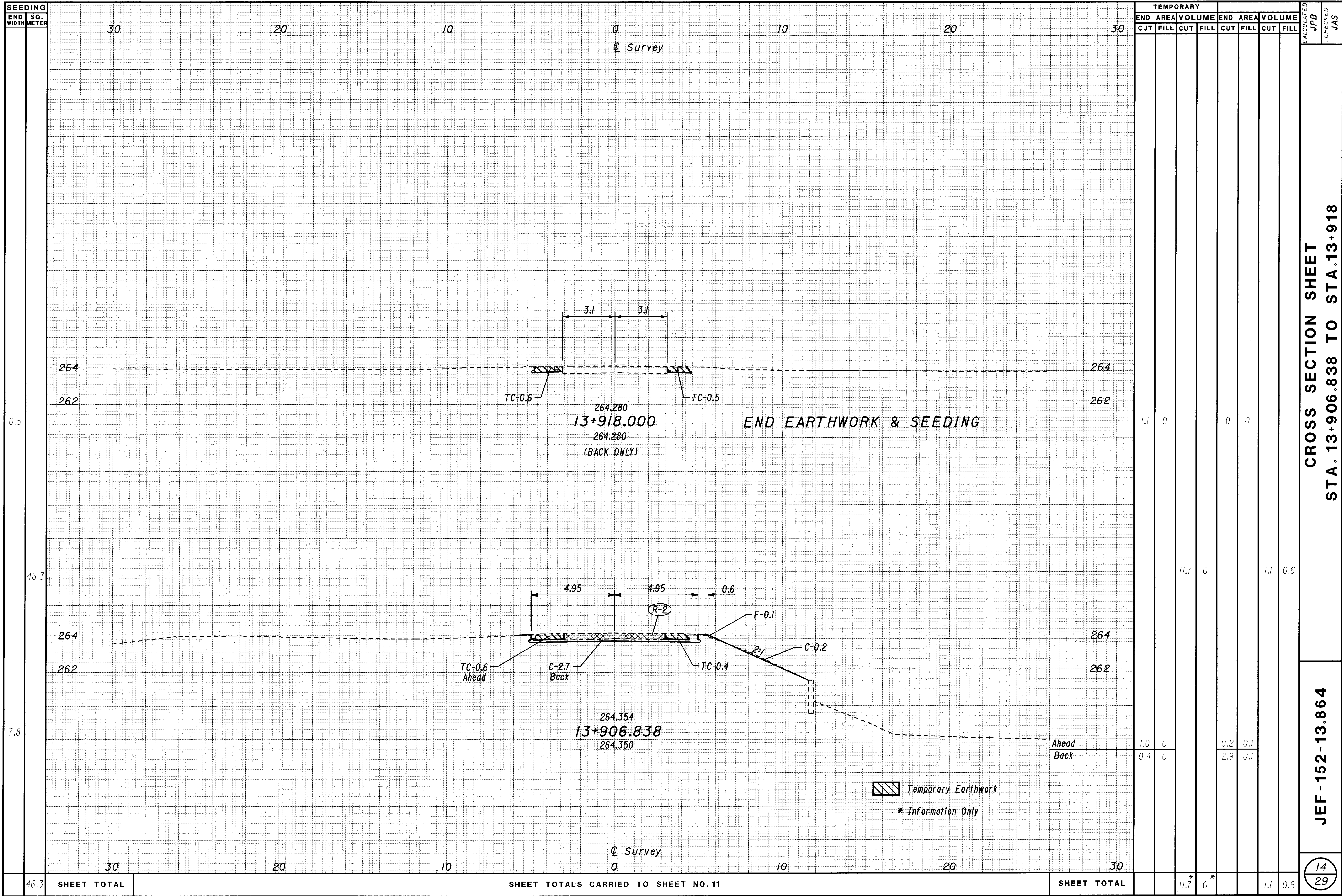
Quantities Carried to General Summary, Unless Otherwise Noted.

ESTIMATED QUANTITIES

JEF-152-13.864

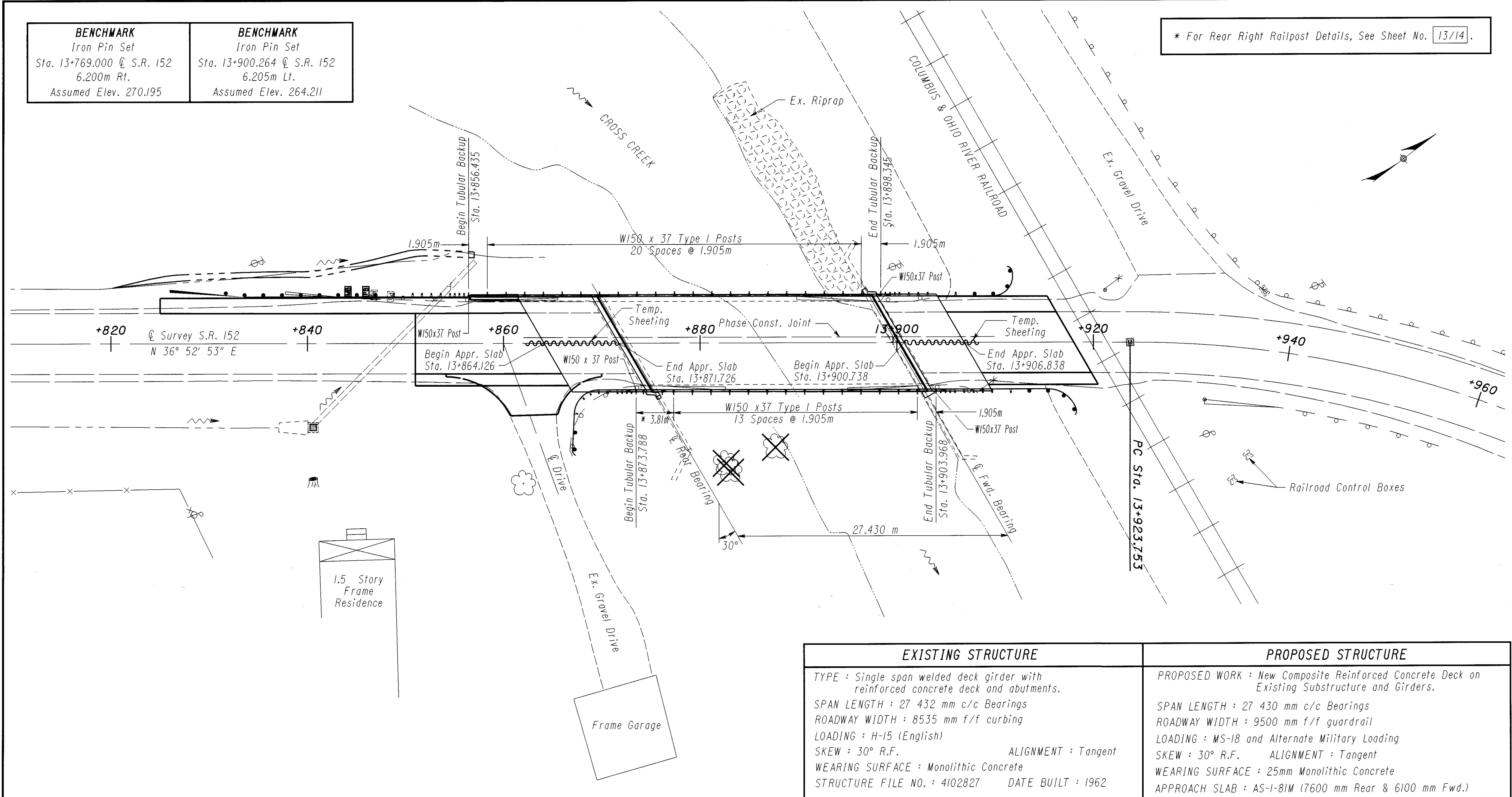




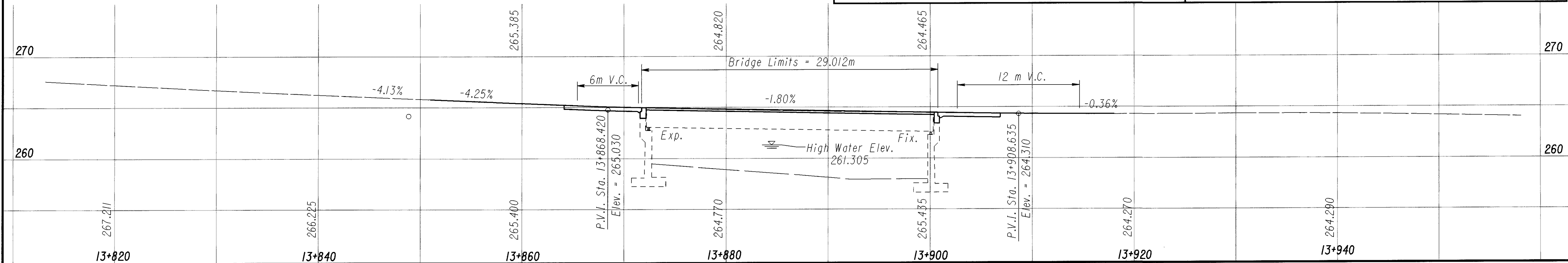


BENCHMARK Iron Pin Set Sta. 13+769.000 @ S.R. 152 6.200m Rt. Assumed Elev. 270.195	BENCHMARK Iron Pin Set Sta. 13+900.264 @ S.R. 152 6.205m Lt. Assumed Elev. 264.211
---	---

* For Rear Right Railpost Details, See Sheet No. 13/14.



EXISTING STRUCTURE	PROPOSED STRUCTURE
TYPE : Single span welded deck girder with reinforced concrete deck and abutments. SPAN LENGTH : 27 432 mm c/c Bearings ROADWAY WIDTH : 8535 mm f/f curbing LOADING : H-15 (English) SKEW : 30° R.F. WEARING SURFACE : Monolithic Concrete STRUCTURE FILE NO. : 4102827 DATE BUILT : 1962	PROPOSED WORK : New Composite Reinforced Concrete Deck on Existing Substructure and Girders. SPAN LENGTH : 27 430 mm c/c Bearings ROADWAY WIDTH : 9500 mm f/f guardrail LOADING : MS-18 and Alternate Military Loading SKEW : 30° R.F. WEARING SURFACE : 25mm Monolithic Concrete APPROACH SLAB : AS-1-81M (7600 mm Rear & 6100 mm Fwd.)



SITE PLAN
 BRIDGE NO. JEF-152-13873
 over CROSS CREEK

JEF-152-13.864
 1/14
 16/29

DESIGN AGENCY
 O.D.O.T.
 DISTRICT II
 PRODUCTION DEPARTMENT

DATE
 1-21-99
 REVIEWED
 DFT
 STRUCTURE FILE NUMBER
 4102827

DRAWN
 JPB
 REVISION
 SAL

DESIGNED
 JPB
 CHECKED
 SAL

JEFFERSON COUNTY
 STA. 13+871.726
 STA. 13+900.738

REFERENCES:

Reference shall be made to Standard Drawings :

AS-1-81M	10-25-94
DBR-2-73M	8-18-95
DS-1-94M	12-15-94
EXJ-4-87M	2-18-97
GSD-1-96M	11-21-97
PCB-91M	3-20-95
RB-1-55M	10-25-94

and to Supplemental Specifications :

815	5-30-96	846	9-9-97
816	4-21-97	863	9-9-97
842	1-6-99	899	10-21-98
843	5-5-98	910	7-28-98
844	1-6-99	954	9-9-97

PROPOSED WORK:

Proposed work includes the following :

- 1.) Remove existing bridge railings, concrete deck, approach slabs, end finishes and portions of substructure concrete.
- 2.) Repair sub-structure concrete, install new end crossframes and refurbish or replace bearings.
- 3.) Install re-steel and place concrete for backwalls.
- 4.) Install re-steel and place concrete for deck.
- 5.) Install porous backfill.
- 6.) Place concrete for approach slabs.
- 7.) Seal concrete surfaces.
- 8.) Install deep beam railing
- 9.) Groove deck.

DESIGN DATA:

Design Loading - MS18 and Alternate Military Loading

High Performance Concrete - compressive strength 31.0 MPa (superstructure)

High Performance Concrete - compressive strength 31.0 MPa (substructure)

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

Structural Steel - A36M, yield strength 250 MPa

DECK PROTECTION METHOD:

Epoxy coated reinforcing steel

65mm concrete cover

Sealing of concrete surfaces

Steel Drip Strip

MONOLITHIC WEARING SURFACE:

Monolithic wearing surface is assumed, for design purposes, to be 25mm thick.

MAINTENANCE OF TRAFFIC:

For Maintenance of Traffic Plan, quantities and notes, See Sheet No's. 4-7/29.

CONSTRUCTION CLEARANCE:

Construction clearances of 2.438 meter horizontally from the center of tracks and 6.401 meter vertically from a point level with the top of the higher rail, shall be maintained at all times.

EXISTING STRUCTURE VERIFICATION:

Details and dimensions of these plans pertaining to the existing structure have been obtained from plans of the existing structure and from field observations and measurements. Consequently, they are indicative of the existing structure and the proposed work, but they shall be considered tentative and approximate. The Contractor is referred to CMS Sections 102.05, 105.02 and 513.02.

Contract bid prices shall be based upon a recognition of the uncertainties described above, and upon a prebid examination of the existing structure by the Contractor. However, all project work shall be based upon actual details and dimensions that have been verified by the Contractor in the field. Plans of the existing bridge are available for reference at the District II Office of the Ohio Department of Transportation, New Philadelphia, Ohio.

PORTIONS OF STRUCTURE REMOVED, OVER 6 METER SPAN, AS PER PLAN:

SUPERSTRUCTURE CONCRETE REMOVAL:

DESCRIPTION: This work shall consist of removal of the concrete deck including the sidewalks, parapets, railing, deck joints and other appurtenances from steel supporting systems (beams, girders, cross frames, etc.), and abutment backwalls. Care shall be taken during deck removals to protect portions of such systems that are to be salvaged and incorporated into the proposed structure. In this respect, the use of explosives, headache balls and/or hoe ram type of equipment is prohibited.

PROTECTION OF TRAFFIC: Prior to demolition of any portions of the existing superstructure, the Contractor shall submit plans for the protection of traffic (vehicular, pedestrian, etc.) adjacent to the structure to the Director for approval. These plans shall include provisions for any devices and structures that may be necessary to ensure such protection.

PROTECTION OF STEEL SUPPORT SYSTEMS : Before deck slab cutting is permitted, the outline of primary steel members in contact with the bottom of the deck shall be drawn on the surface of deck. Small diameter pilot holes shall be drilled 50mm outside these lines to confirm the location of the flanges. Deck cuts over or within 50mm of flange edges shall not extend lower than the bottom layer of deck slab reinforcing steel. Cuts made outside 50mm of flange edges may extend the full depth of the deck. During cutting of the slab, care shall be taken not to damage steel members that are to be incorporated into the proposed structure.

REMOVAL METHODS : Concrete may be removed by cutting and by means of hand operated pneumatic hammers employing pointed or blunted chisel type tools. For removals above steel members, a hammer heavier than 16 kilogram but not to exceed 41 kilogram may be used at the approval of the Engineer, to ensure adequate depth control and to prevent nicking or gouging the primary steel members. Care shall be taken to minimize the amount of waste materials that fall into the stream channel. Any materials that inadvertently fall into the stream shall be immediately removed and properly disposed. Suitable sound waste concrete meeting the requirements of Item 601 and approved by the Engineer, can be salvaged for use as rock channel protection. When removing the existing steel end finishes and sliding plate bearings care shall be taken to not damage or gouge the existing beam flanges. Flange surfaces shall be ground smooth.

DECK REMOVALS : Due to the possible presence of welded attachments to existing structural steel (finishing machine, scupper and form supports, etc.) care shall be taken during deck removal to avoid damaging stringers which are to remain. Stringers damaged by the Contractor's removal operations shall, at no cost to the project, be replaced or repaired. Proposed repairs, developed by a registered professional engineer, shall be submitted in writing for review and approval by the Director. All welded repairs shall be radiographed as per CMS 513.21.

EXTRANEOUS MEMBERS : Existing extraneous members (i.e., finishing machine and form supports, etc., and the support for scuppers and bulb angles which are to be removed) attached by welded connections to portions of the top flanges designated "tension" shall be removed and the flange surfaces ground smooth. Grinding shall be carefully done and parallel to the flanges.

LOADING LIMITATIONS : No part of the structure shall be subjected to unit stresses that exceed 136.5% of the allowable unit stresses given in the AASHTO Standard Specifications for Highway Bridges due either to demolition, erection or construction methods, or to the use or movement of the demolition or erection equipment on or across the structure. Structural analysis computations, by a registered professional engineer, showing the allowable stresses and the maximum stresses produced by the Contractor's methods or equipment shall be submitted to the Director for review and approval at least two weeks prior to the start of the work.

ABUTMENT CONCRETE REMOVAL:

Cut line construction joint preparation :

Saw cut boundaries of proposed concrete removals 25mm deep except where noted. Remove concrete to a rough surface. Unless otherwise specified, at least 300mm length of protruding reinforcing steel shall be left in place. Prior to concrete placement abrasively clean joint surface and exposed reinforcement to remove loose and disintegrated concrete and loose rust. The joint surface and exposed reinforcement shall be thoroughly cleaned of all dirt, dust, or other foreign material by use of water, air under pressure, or other methods that produce satisfactory results.

Substructure concrete removal :

Removal shall be by means of approved pneumatic hammers employing pointed and blunt chisel tools. Hydraulic hoe-ram type hammers will not be permitted. The weight of the hammer shall not be more than 16 kilogram for removal within 450mm of portions to be preserved. Outside the 450mm limit, a hammer heavier than 16 kilogram, but not to exceed 41 kilogram, may be used at the approval of the Engineer. Pneumatic hammers shall not be placed in direct contact with reinforcing steel that is to be retained in the rebuilt structure. When concrete removal has exposed the existing reinforcing steel, the adjacent concrete shall be removed sufficiently to provide a minimum of 20mm clearance around the bar.

MISCELLANEOUS : Any debris or brush that exists beneath the bridge, in the channel bottom or slopes at the time of construction shall be removed by the Contractor with payment to be included in this item.

PAYMENT : This work will be paid for at the contract lump sum price bid, which price and payment shall be full compensation for all labor, equipment, materials and incidentals necessary to complete the work in conformance with these requirements, with pertinent provisions of 202, and to the satisfaction of the Engineer.

INSPECTION OF EXISTING STRUCTURAL STEEL:

After the existing concrete deck has been removed and the deck forms are in place, the Engineer shall visually inspect all existing butt-welded splices and/or top flange cover plate fillet welds to ensure that they are free of defects. The deck slab haunch forms immediately adjacent to such welds shall not be erected until after the Engineer has completed this inspection. This inspection shall not take place until after the top flanges are cleaned as specified in 511.08, but it shall be done before the deck slab reinforcement is installed. The cost associated with this inspection shall be included with Item Special - High Performance Concrete, Superstructure (Deck), for payment.

REPLACEMENT OF EXISTING REINFORCING STEEL:

Any existing reinforcing bars which are to be incorporated into the new work and which are made unusable by concrete removal operations shall be replaced with new steel at the Contractor's cost. Any existing reinforcing bars deemed by the Engineer to be unusable because of corrosion shall be replaced with new steel. Replacement of corroded reinforcing bars shall be included in the unit price bid for the High Performance Concrete Substructure.

SEALING OF CONCRETE SURFACES (EPOXY-URETHANE):

The following concrete surfaces shall be sealed :

- 1.) Outside deck edges including top deck surface to 230mm in from the edge and bottom overhang from deck edge to face of steel girders.
- 2.) All exposed surfaces of both abutments, backwalls, and wingwalls.

The color of the urethane coating shall be Federal Color Standard No. 37722 (White).

HIGH PERFORMANCE CONCRETE SUPERSTRUCTURE (DECK):

Mix Design No. 3 of Supplemental Specification 844 using fly ash and micro-silica shall be used on this project. Concrete for the deck shall not be placed until all superstructure jacking and bearing items are complete.

GENERAL NOTES
BRIDGE NO. JEF-152-13872
OVER CROSS CREEK

JEF-152-13.864

2 / 14

17
29

DESIGNED
JPB
CHECKED
SAL

DRAWN
JPB
REVISED

REVIEWED
DFT
STRUCTURE FILE NUMBER
4102827

DATE
1-21-99

DESIGN AGENCY
O.D.O.T.
DISTRICT II
PRODUCTION DEPARTMENT

CUT LINE CONSTRUCTION JOINT PREPARATION:

Saw cut boundaries of proposed concrete removals 25mm deep except where noted. Remove concrete to a rough surface. Where practicable, the existing reinforcing steel where required in the plans shall be left in place. Install dowel bars if specified. Prior to concrete placement abrasively clean joint surface and exposed reinforcement to remove loose and disintegrated concrete and loose rust. The joint surface and exposed reinforcement shall be thoroughly cleaned of all dirt, dust, or other foreign material by use of water, air under pressure, or other methods that produce satisfactory results. Concrete bonding surfaces shall be wet without free water as concrete is placed.

PAINTING OF STRUCTURAL STEEL:

New structural steel shall be cleaned and prime painted in the shop and field painted with an intermediate and finish coat of paint using System IZEU. The costs for this work shall be paid for as specified in the Proposal Note "Field Painting of New Steel, System IZEU." Existing steel shall be cleaned and painted with a prime, intermediate, and finish coat of paint in the field using System OZEU. The costs of this work shall be included in the several Item 815 OZEU painting items for payment. Removal and placement of the concrete deck will be completed prior to painting the structural steel using System OZEU. If any coat is damaged by any construction operations, it shall be repaired by the Contractor, as directed by the Engineer, at no additional cost to the State. The surface area pay quantity for system OZEU is based on the surface area of the existing main members increased by 30 percent to account for the area of existing crossframes, stiffeners, bearings, and other steel incidentals to be cleaned and painted.

ITEM 863 - STRUCTURAL STEEL MEMBERS MISCELLANEOUS LEVEL FABRICATION, AS PER PLAN (REPLACEMENT OF DETERIORATED END FRAMES) :

All sections of SS 863 apply except as revised herein. The Engineer is responsible for ensuring any fabricated steel supplied under this bid item is acceptable. The requirements for submittal of shop drawings to the Office of Structural Engineering is waived. The Contractor shall supply the Engineer with shop drawings stamped by a Professional Engineer and dated, as per 863.08, prior to any incorporation of fabricated steel at the project. The Engineer shall assure the submitted drawings match the fabricated steel delivered before the steel is incorporated into the work. If the Engineer is satisfied, the Contractor shall supply a copy set, stamped and dated as per 863.08, to the Office of Structural Engineering for record purposes. SS 863's required test data submittal to the Office of Structural Engineering is waived, but the Contractor's written acceptance of the material test reports shall be furnished to both the Engineer and Office of Structural Engineering prior to installation of any steel.

At or before the pre-fabrication meeting the Engineer may choose to request assistance from the Office of Structural Engineering in whatever capacity is required.

Steel members included in this item include end cross frames for Bridge No. JEF-152-13873.

ITEM 516 - JACKING AND TEMPORARY SUPPORT OF STRUCTURE, AS PER PLAN :

This item shall consist of furnishing all necessary labor, materials, and equipment to raise or reposition any existing structures to the dimensions and requirements defined in the project plans.

The Contractor shall be responsible for the design, installation and operation of an adequate jacking system, including any temporary or permanent supports necessary to perform the work described in the project plans. Three (3) sets of jacking plans, which include the information described in this note, shall be submitted to the Director for approval at least thirty (30) days before actual work is to begin. The plans shall be prepared and stamped by a registered professional engineer.

Jacking submittals shall include at least the following:

1. The signature and number, or professional seal, of the registered professional engineer who prepared the submittal.
2. Calculations and analysis of the structure to determine and define the actual loading applied at the contractor's selected jacking points.
3. A drawing showing the physical and dimensional position of the jacks with respect to the structure including clearances and center of lift.
4. A schematic layout of jacks, check valves, pumps with 3 way retractor valve, pressure gages, flow control valves, etc. in accordance with manufacturer's recommendations. All jacks for each abutment or pier shall be connected together. All jacks at each abutment or pier shall be the same size.
5. Analysis and calculations of stresses induced or created in the structure and any temporary or permanent supports. Design calculations for any temporary or permanent supports.
6. Physical dimensions, materials, and fabrication details of any temporary or permanent supports. Horizontal and vertical movement restraint shall be provided.
7. A step by step procedure detailing all steps in the jacking operation.
8. Method of attachment to structural members. Welding to tension areas will not be permitted.

The entire system including jacks shall have 20% more capacity than required based on calculated loads.

For lifts greater than 25mm, jacks shall have locking nuts to positively lock and support the structure during the lift.

Jacks shall have a swivel load cap, a domed piston head or some other device to protect against the effects of side load on the jack.

Jacks alone shall not be used to support loads except during the actual jacking operation. Temporary supports, blocking or other methods approved by the Director shall be used.

Single acting rams with no over-travel protection system shall not be used.

Spare equipment shall be available on site for the required structure raising to proceed in the event of a breakdown. A list of spare equipment shall be provided to the Engineer.

At a minimum, a jacking operation shall lift all beams at any one abutment or pier simultaneously. The only exception is the situation where the work involves replacing or rehabilitating individual bearings; no permanent shimming is required and the height of the lift shall not exceed 6mm.

Maximum differential jacking height between abutments shall be 25mm or less.

If, during the jacking operations, cracking of the concrete superstructure, separation of the concrete deck from the steel stringers, or other damage to the structure is visually observed, the jacking operation shall immediately cease and approved supports shall be installed. The Contractor shall then analyze the damage and submit a method of correction to the Engineer for approval. All jacking operations must be completed and the superstructure in its permanent position before any concrete is placed for the deck or end diaphragms.

The Contractor shall demonstrate to the Engineer that the bridge bearings are fully seated between all contact areas. If full seating is not attained, suitable means of repair, subject to the approval of the Engineer, will be required at the Contractor's expense.

The jacking operation shall be directed by a Professional Engineer employed by the Contractor. Failure to have a Professional Engineer present shall be cause for ceasing jacking operations.

Any asphalt wedges at the approaches that are needed to maintain traffic, as directed by the Engineer, are included in this item for payment.

Payment shall be made at the lump sum price bid for Item 516 - Jacking and Temporary Support of Superstructure, As Per Plan and shall include all necessary tools, labor, equipment and materials necessary to complete this item of work.

ITEM 516 - REFURBISH AND RESET BEARING, AS PER PLAN:

This item shall include all work necessary to properly align, repair and reset bridge bearings as well as their cleaning and painting. Included shall be the disassembly of the bearings, hand tool cleaning (grinding if necessary), painting as required by System OZEU, replacement of any damaged sheet lead (711.19), installation of any necessary steel shims of the same size as the bearings to provide a snug fit, lubricating sliding surfaces, new nuts and washers, and reassembly of the bearings. The Contractor shall be sure that all bearings are shimmed adequately and that no beams and/or bearing devices are "floating". The Contractor may elect to defer the painting of the bearing devices until the girders are painted. At the option of the Contractor and at no additional cost to the State, new bearings of the same type as the existing may be installed in place of refurbishing the bearings. All work shall be to the satisfaction of the Engineer. Payment for all the above described labor and materials will be made at the contract price bid for Item 516 - Refurbish and Reset Bearing, As Per Plan.

ITEM 516 - BEARING DEVICE, BOLSTER, AS PER PLAN:

This item shall include all work necessary to properly remove the existing bolster, with the exception of the upper load plate and anchor bolts, and place a new B-575 bolster as shown in the plans, as per Std. Const. Dwg. RB-1-55M and CMS 516.05. The Contractor shall be sure that all bearings are shimmed adequately and that no beams and/or bearing devices are "floating". Payment for all the above described labor and materials will be made at the contract price bid for Item 516 - Bearing Device, Bolster, As Per Plan.

ITEM 516 - BEARING DEVICE, ROCKER, AS PER PLAN:

This item shall include all work necessary to properly remove the existing rocker, with the exception of the upper load plate and place a new R-575 rocker as shown in the plans, as per Std. Const. Dwg. RB-1-55M and CMS 516.05. The Contractor shall be sure that all bearings are shimmed adequately and that no beams and/or bearing devices are "floating". Payment for all the above described labor and materials will be made at the contract price bid for Item 516 - Bearing Device, Rocker, As Per Plan.

ITEM 843 - PATCHING CONCRETE STRUCTURES WITH TROWELABLE MORTAR:

Areas, shown in the plans, to be patched have been marked in the field with paint. The Contractor shall resound the abutments and wingwalls to verify marked areas and locate any additional areas to be patched.

A quantity of 2.0 Sq. Meter will be carried to the Bridge Summary for any additional patching discovered by the Contractor.

GENERAL NOTES
BRIDGE NO. JEF-152-13872
OVER CROSS CREEK

JEF-152-13.864

3/14

18
29

DESIGNED
JPB
CHECKED
SAL

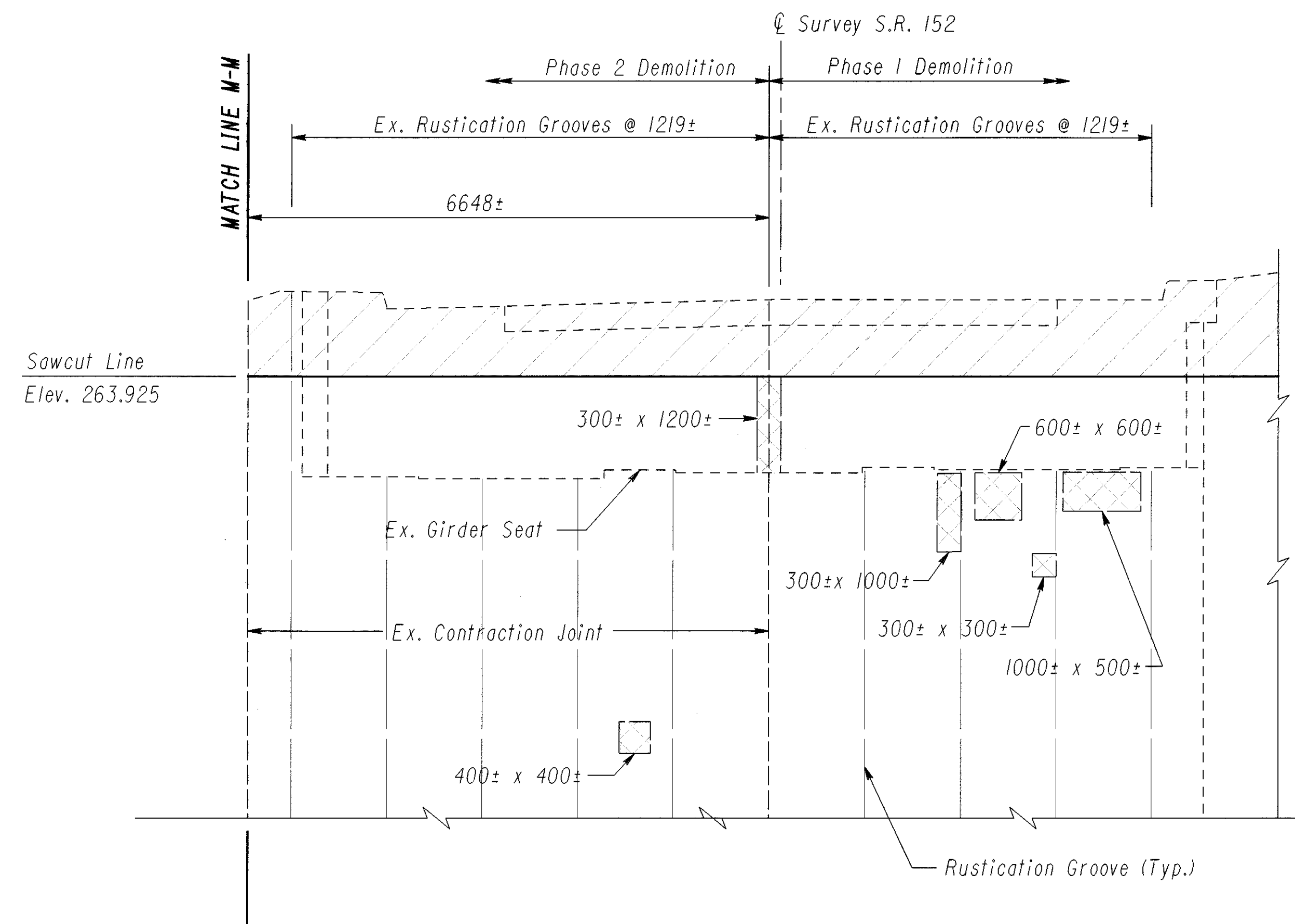
DRAWN
JPB
REVISED

REVIEWED
DFT
STRUCTURE FILE NUMBER
4102827

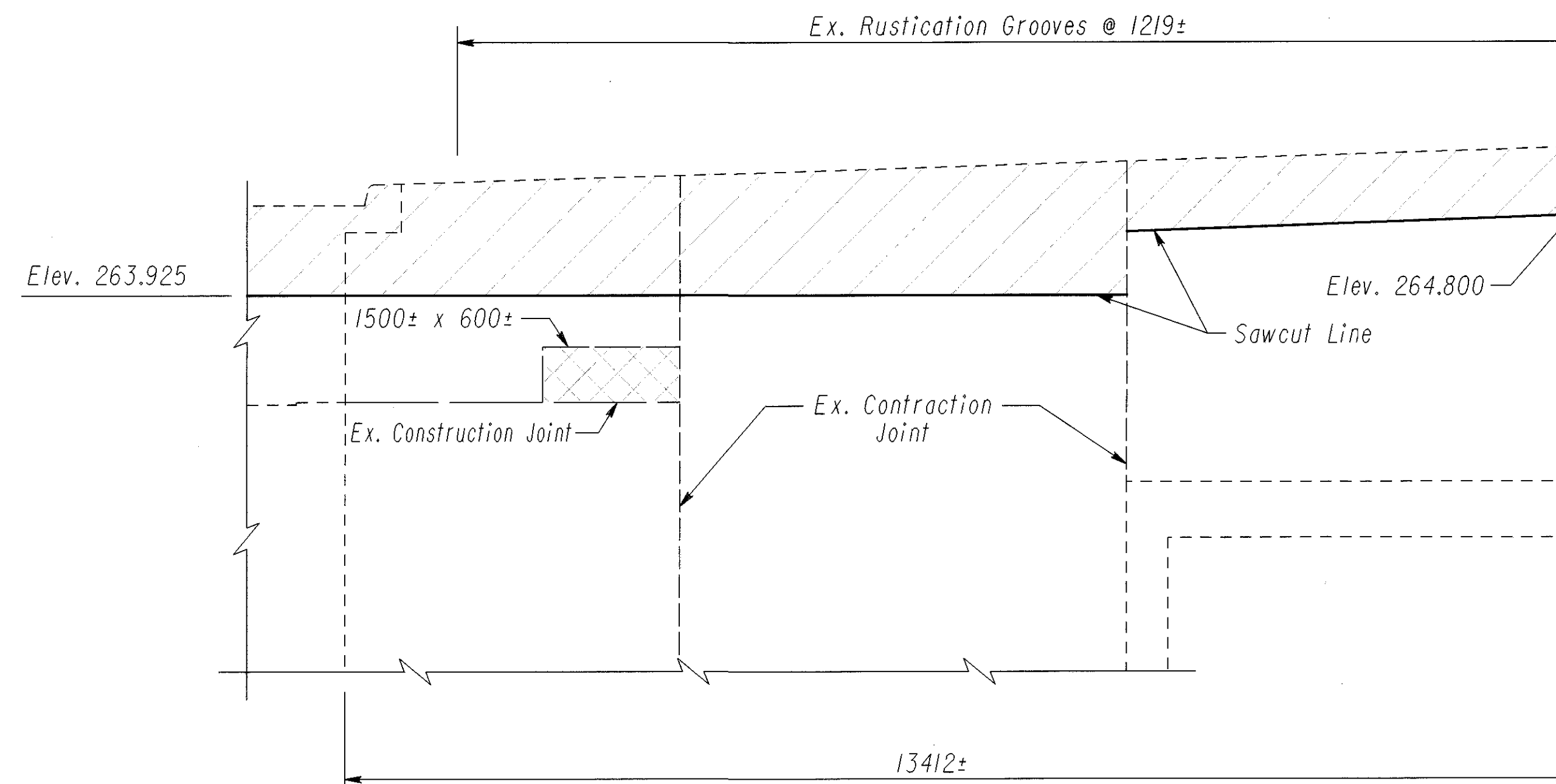
DATE
1-21-99

DESIGN AGENCY
O.D.O.T.
DISTRICT II
PRODUCTION DEPARTMENT

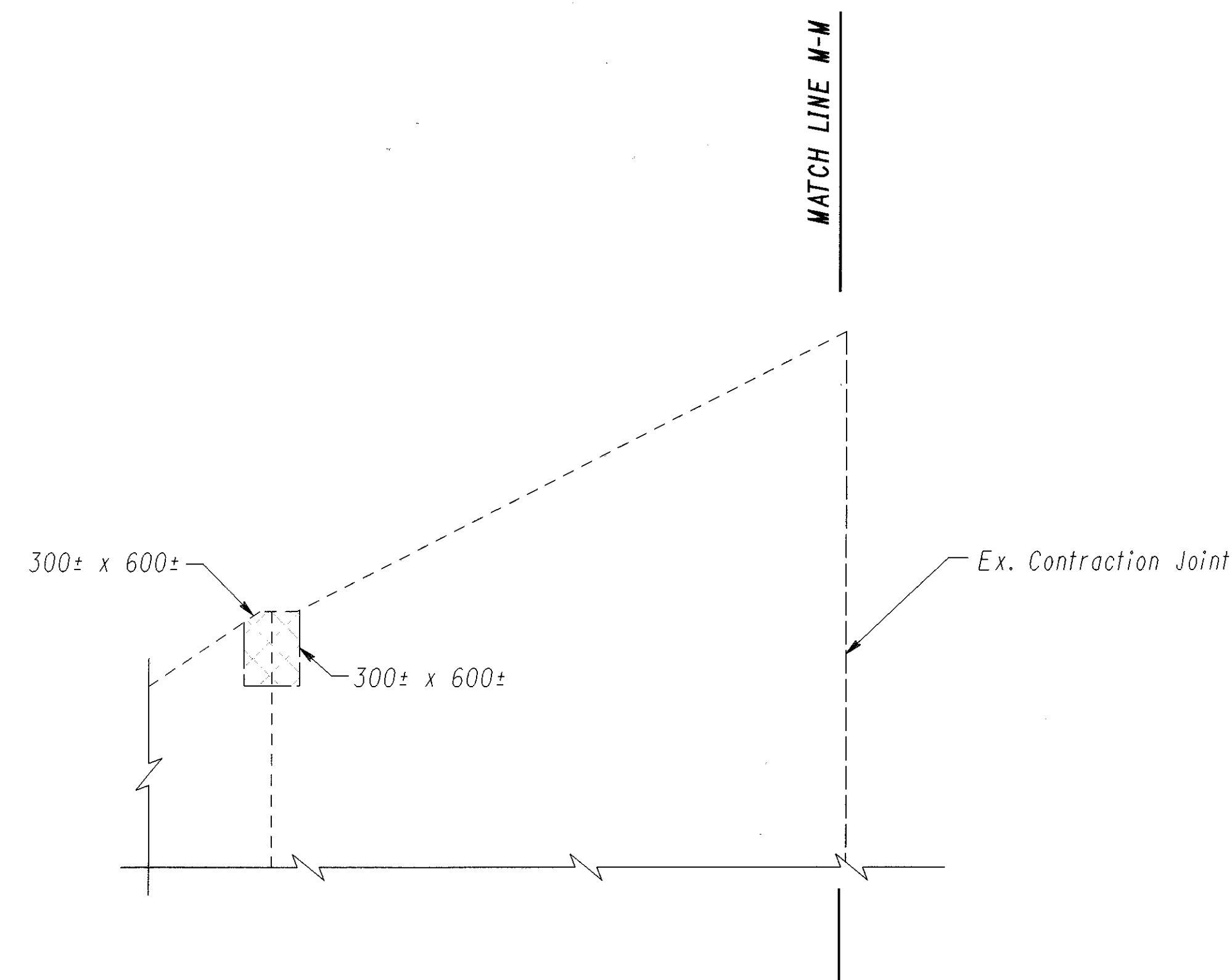
For Epoxy Sealing Details for Wingwalls, See Sheet No. 8 / 14.
All Dimensions are in Millimeters, Unless otherwise Noted.



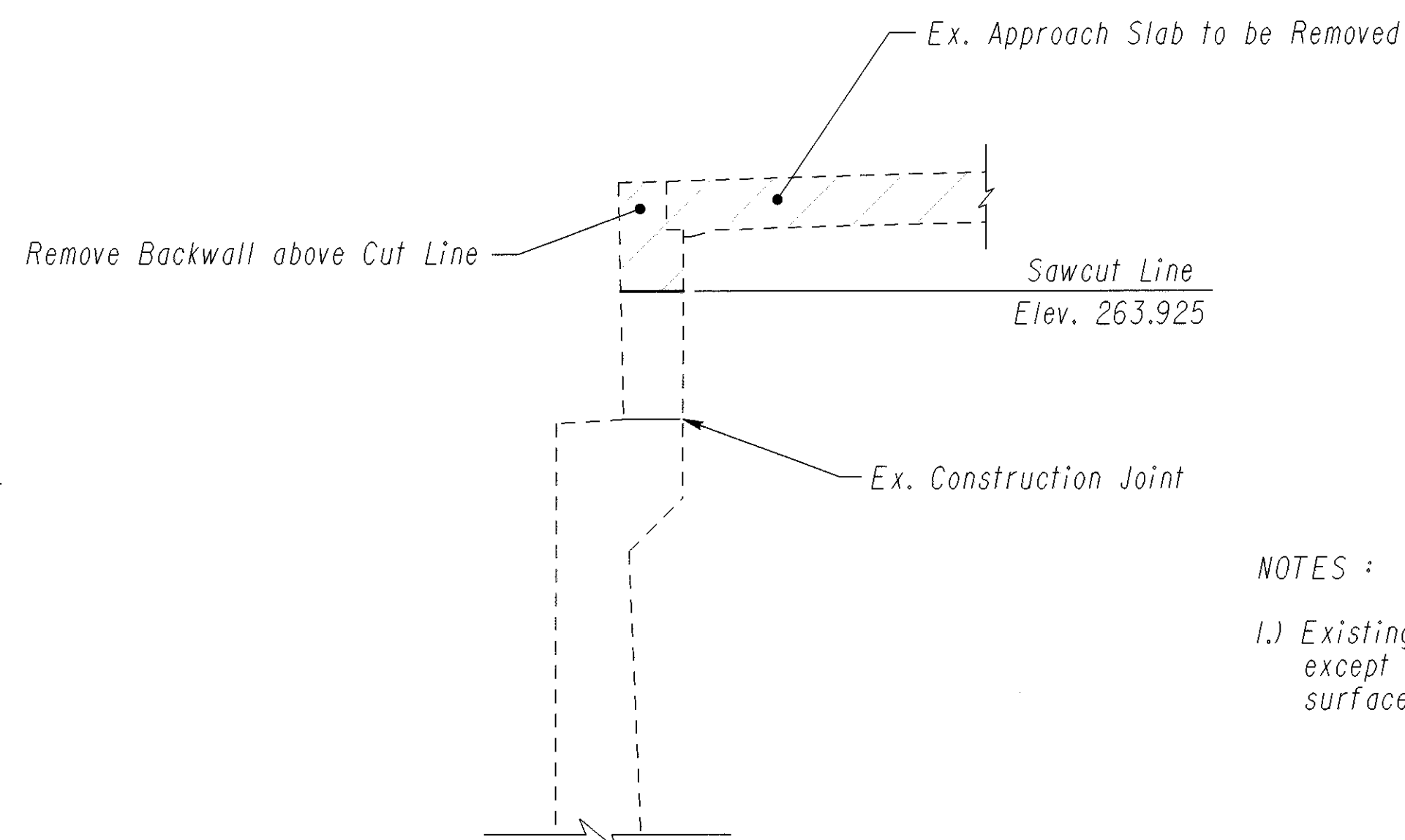
ELEVATION REAR ABUTMENT



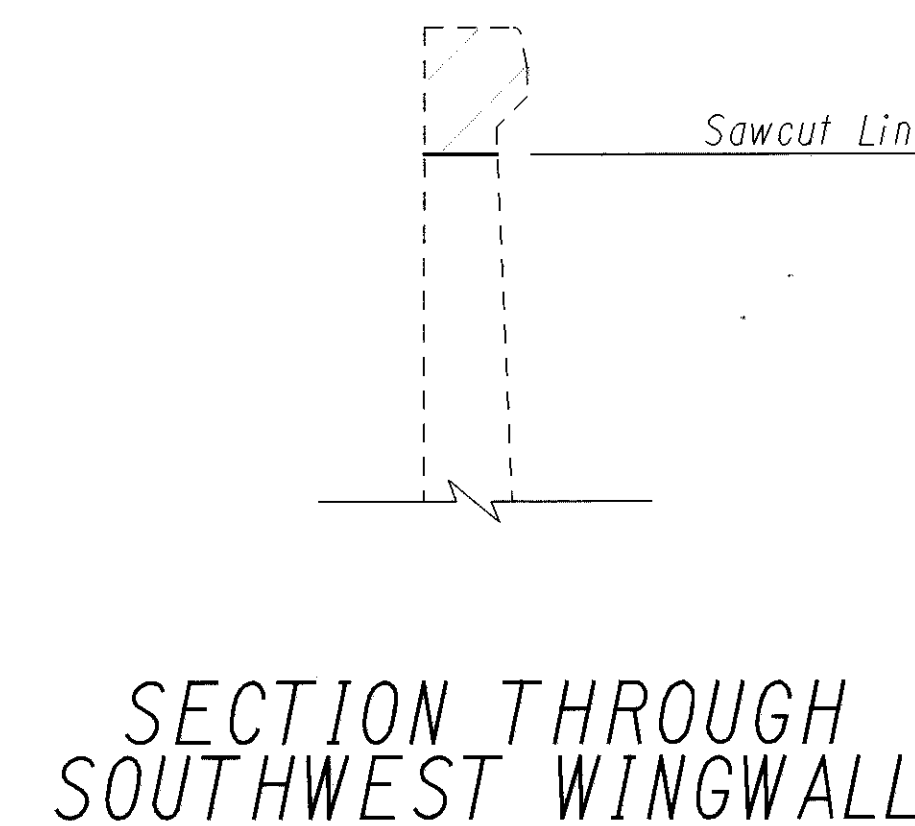
ELEVATION SOUTHWEST WINGWALL



ELEVATION SOUTHEAST WING



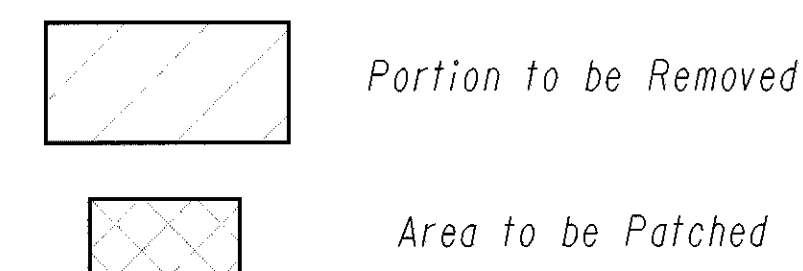
SECTION THROUGH ABUTMENT



SECTION THROUGH SOUTHWEST WINGWALL

NOTES :

- Existing vertical reinforcing steel partially exposed by concrete removal shall be left in place except as noted in the plans, and shall be cut or bent as necessary to clear proposed concrete surfaces by at least 50mm.



DESIGN AGENCY
O.D.O.T.
DISTRICT II
PRODUCTION DEPARTMENT

DATE
1-21-99
REVIEWED
DFT
STRUCTURE FILE NUMBER
4102827

DRAWN
JPB
REVISOR
SAL

REAR ABUTMENT & WINGWALL DEMOLITION
BRIDGE NO. JEF-152-13872
over CROSS CREEK

JEF-152-13.864

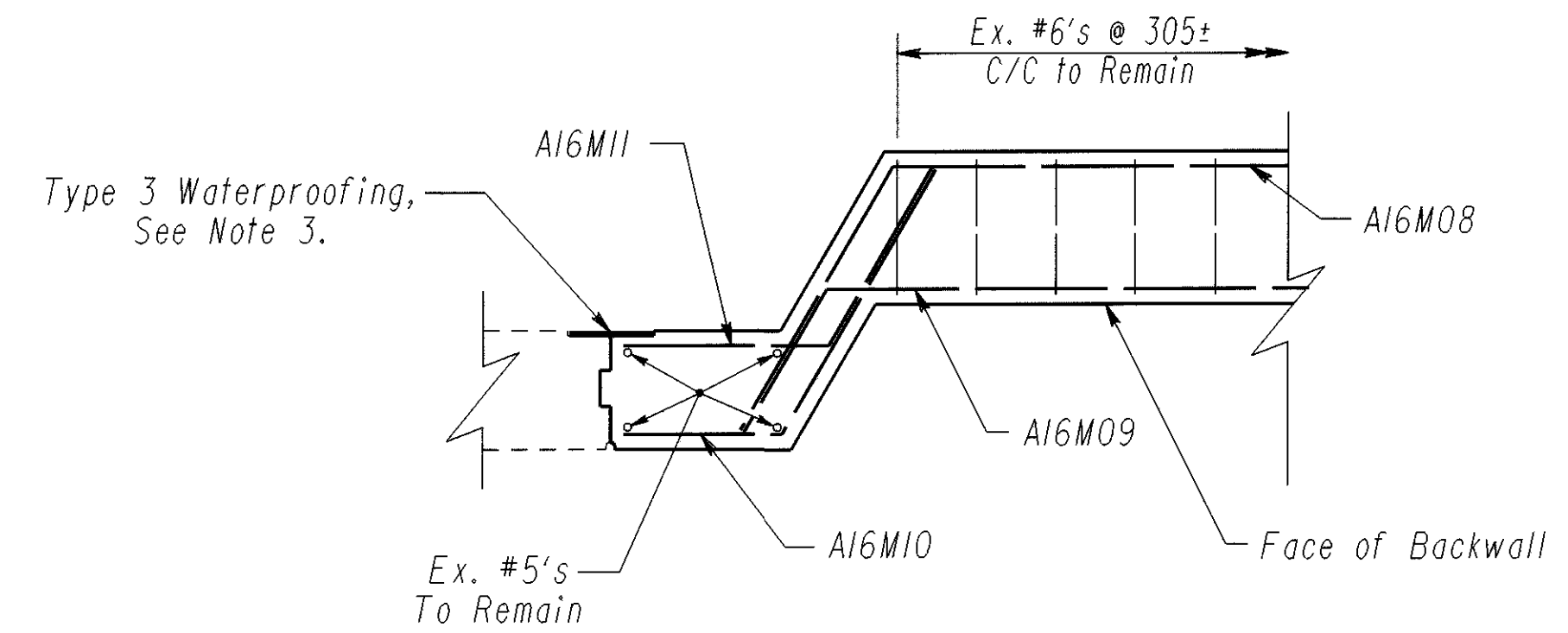
5 / 14

20
29

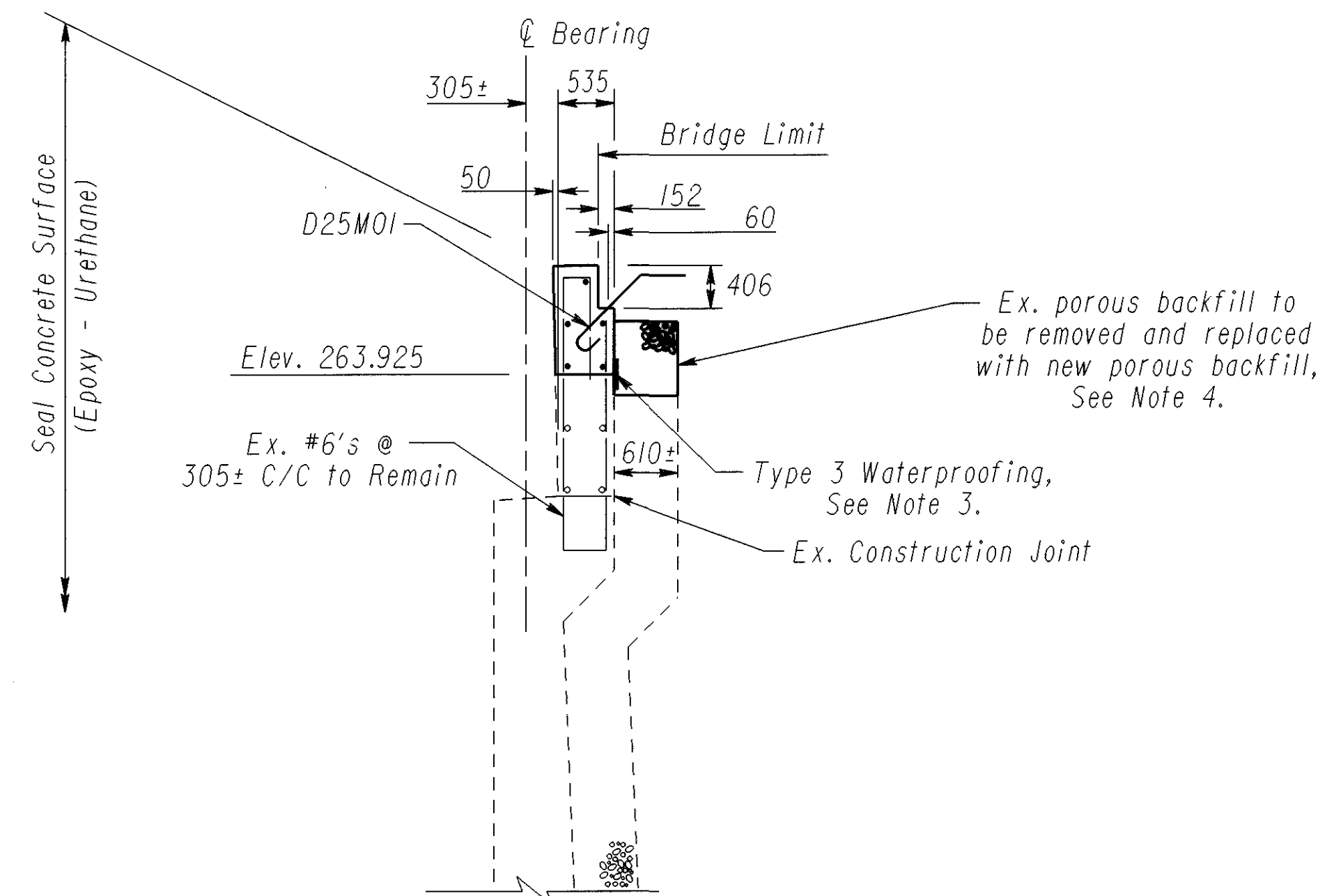
For Rustication Groove and Contraction Joint Details, See Sheet No. 13/14.
All Dimensions are in Millimeters, Unless otherwise Noted.

NOTES :

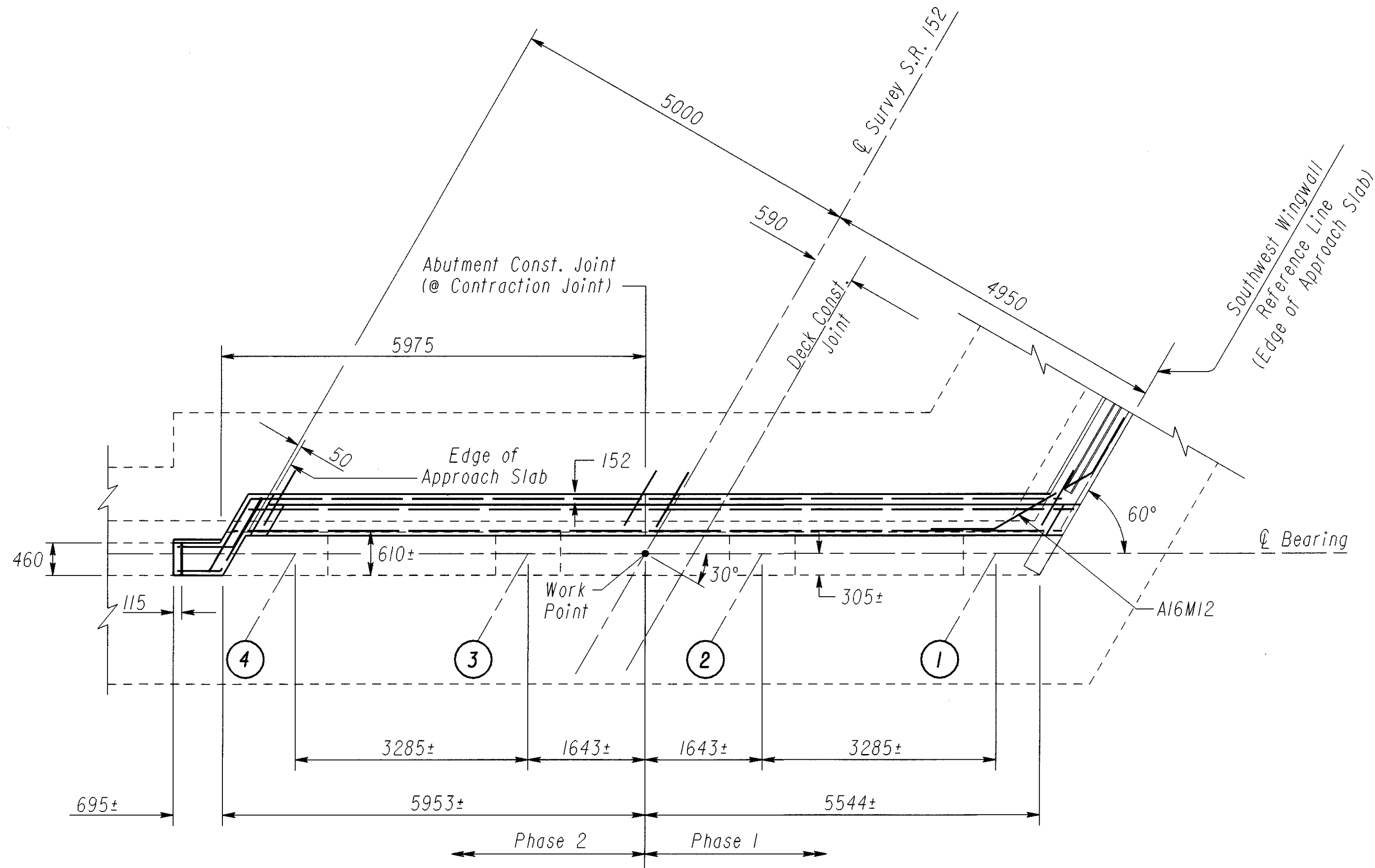
- 1.) Minimum lap length for rebar shall be as per 509.08 of the CMS.
- 2.) Elevations given are at front face of wingwall.
- 3.) Item 512 - Type 3 Waterproofing shall be 300 wide, centered about the Sawcut line and additionally provided for the Contraction joints as shown on sheet no. 13/14. Waterproofing for Contraction joints shall be placed prior to placing horizontal material.
- 4.) Item 518 - Porous Backfill, 610 thick shall extend up to the plane of the subgrade, 200 below the horizontal sawcut line, and laterally to Match line M-M.
- 5.) Slope top of backwall parallel to grade.



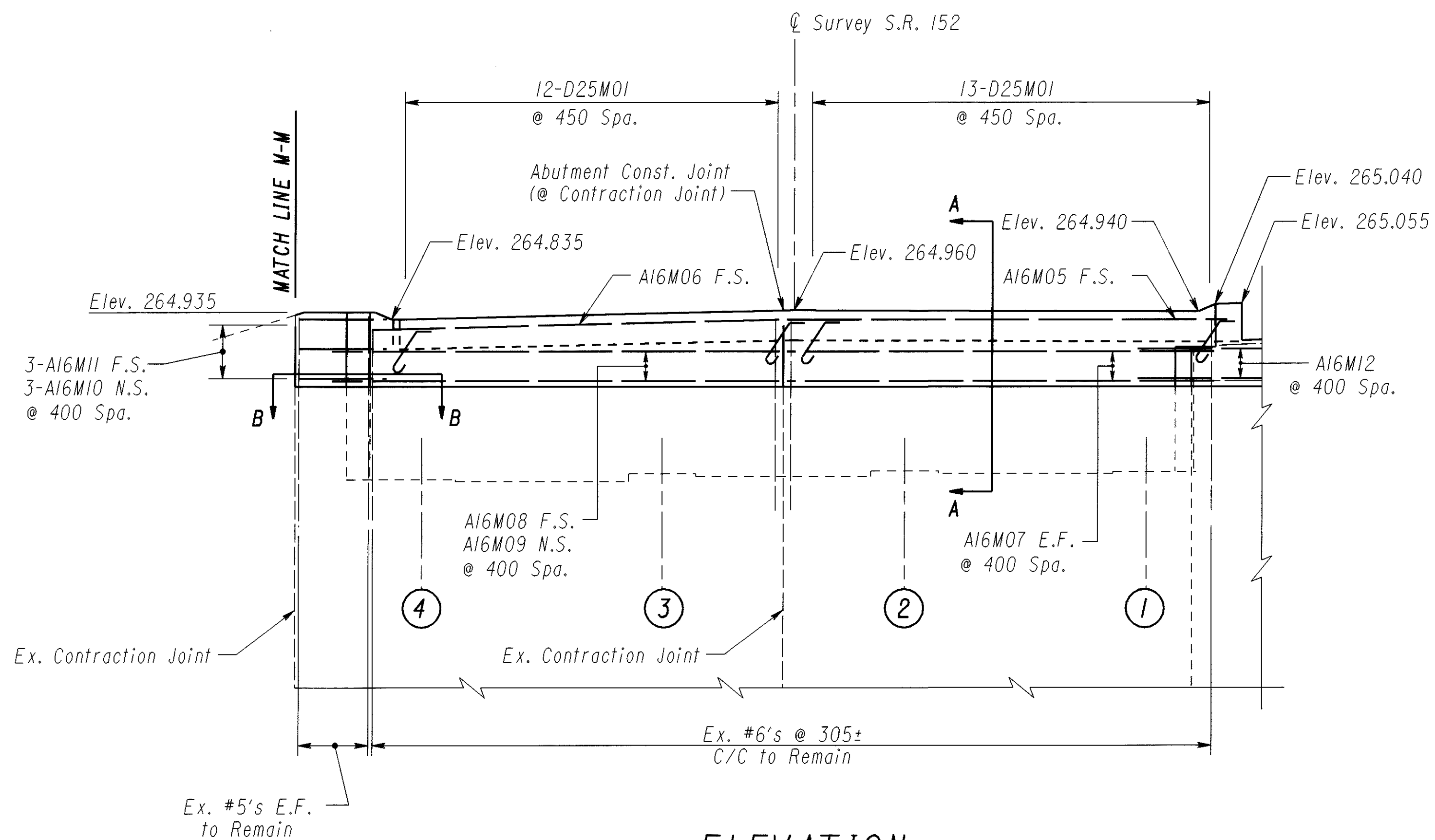
SECTION B-B



SECTION A-A



PLAN



ELEVATION

LEGEND

- N.S. - Near Side
F.S. - Far Side
E.F. - Each Face
Spa. - Spaces
① - Girder Number

DESIGN AGENCY
O.D.O.T.
DISTRICT II
PRODUCTION DEPARTMENT

DATE
1-21-99
REVIEWED
DFT
STRUCTURE FILE NUMBER
4102827
DRAWN
JPB
CHECKED
JPB
REVISOR
SAL

REAR ABUTMENT
BRIDGE NO. JEF-152-13873
over CROSS CREEK

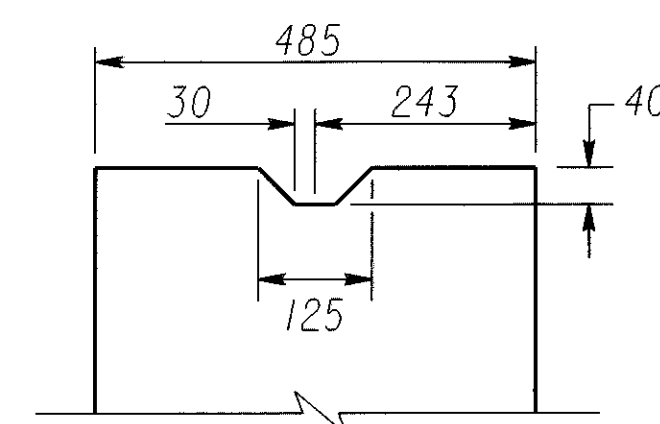
JEF-152-13.864

6/14

21
29

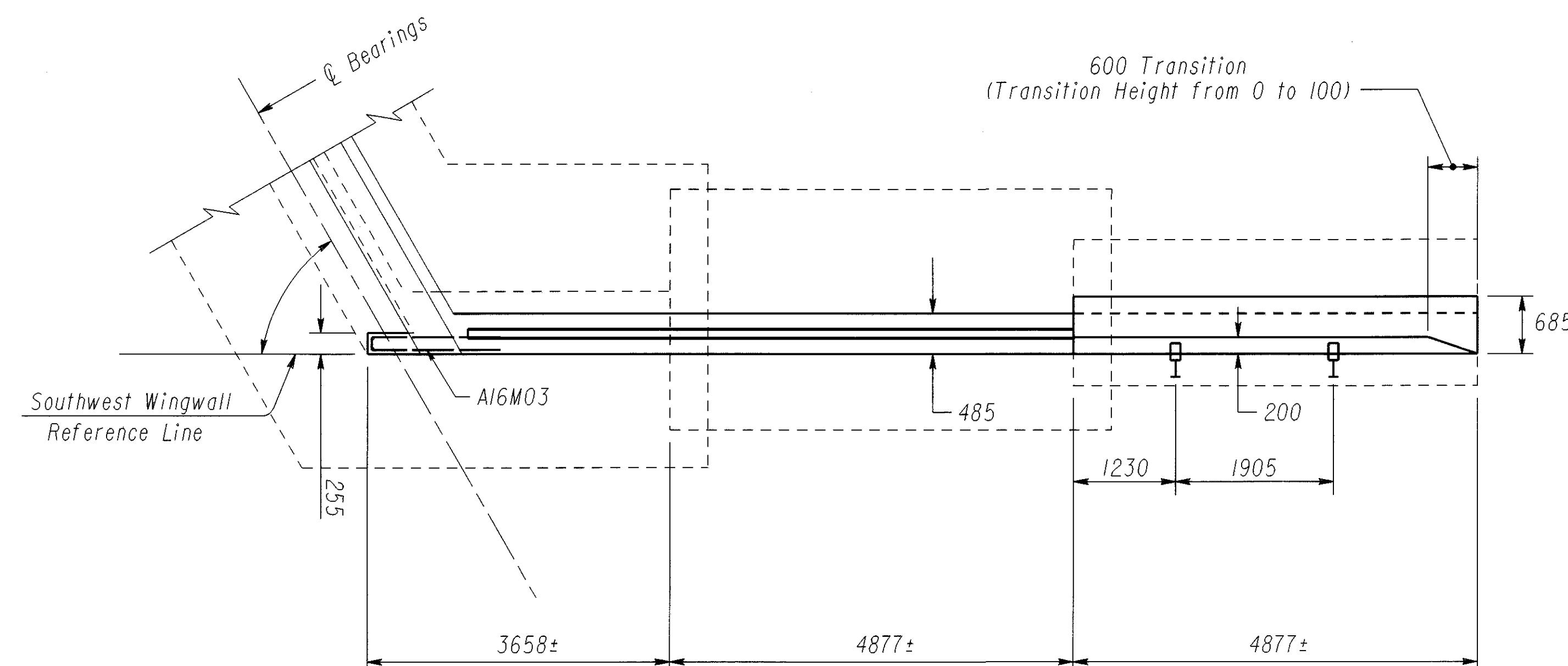
NOTES :

- 1.) Minimum lap length for rebar shall be as per 509.08 of the CMS.
- 2.) Elevations given are at front face of wingwall.
- 3.) Item 512 - Type 3 Waterproofing shall be 300 wide, centered about the Sawcut line and additionally provided for the Contraction joints as shown on sheet no. 13/14. Waterproofing for Contraction joints shall be placed prior to placing horizontal material.
- 4.) Item 518 - Porous Backfill, 610 thick shall extend up to the plane of the subgrade, 200 below the horizontal sawcut line, and laterally to the end of the wingwall.

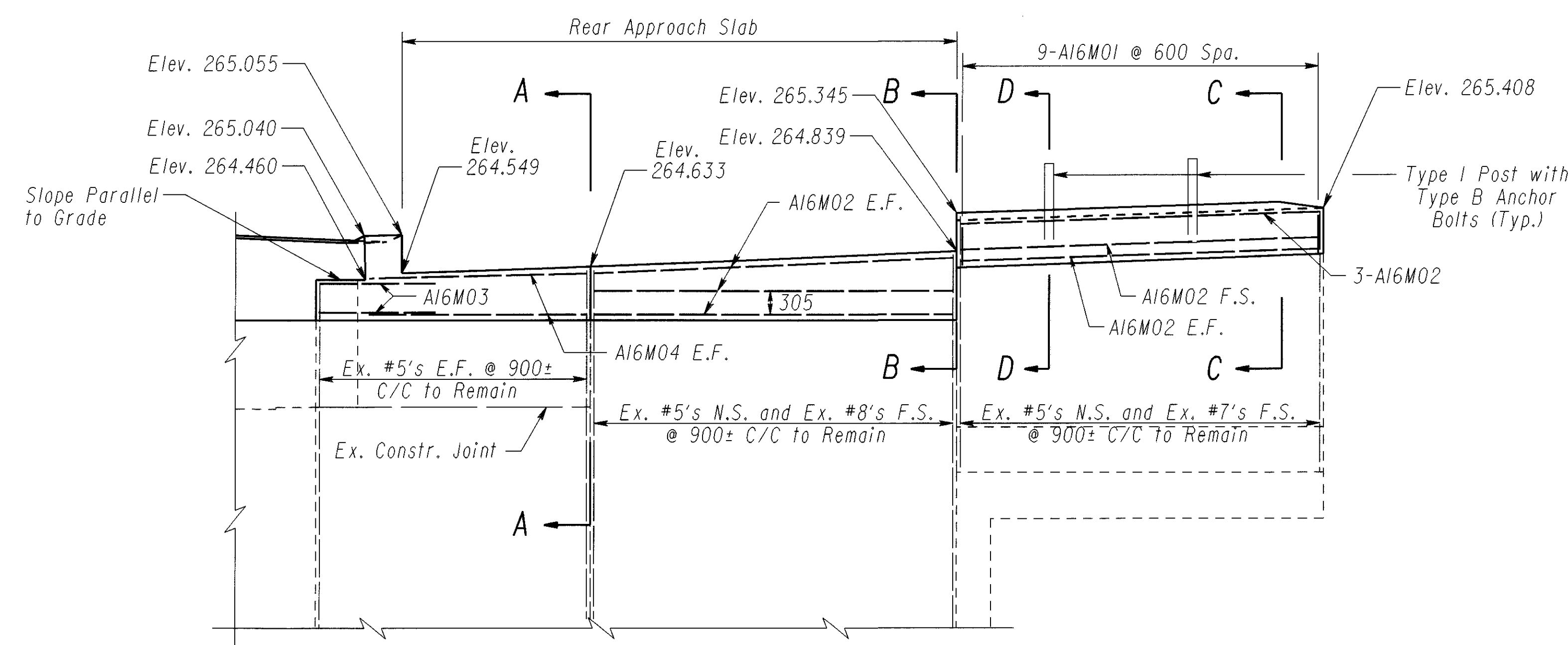


KEY DETAIL
(For Sections A-A and B-B)

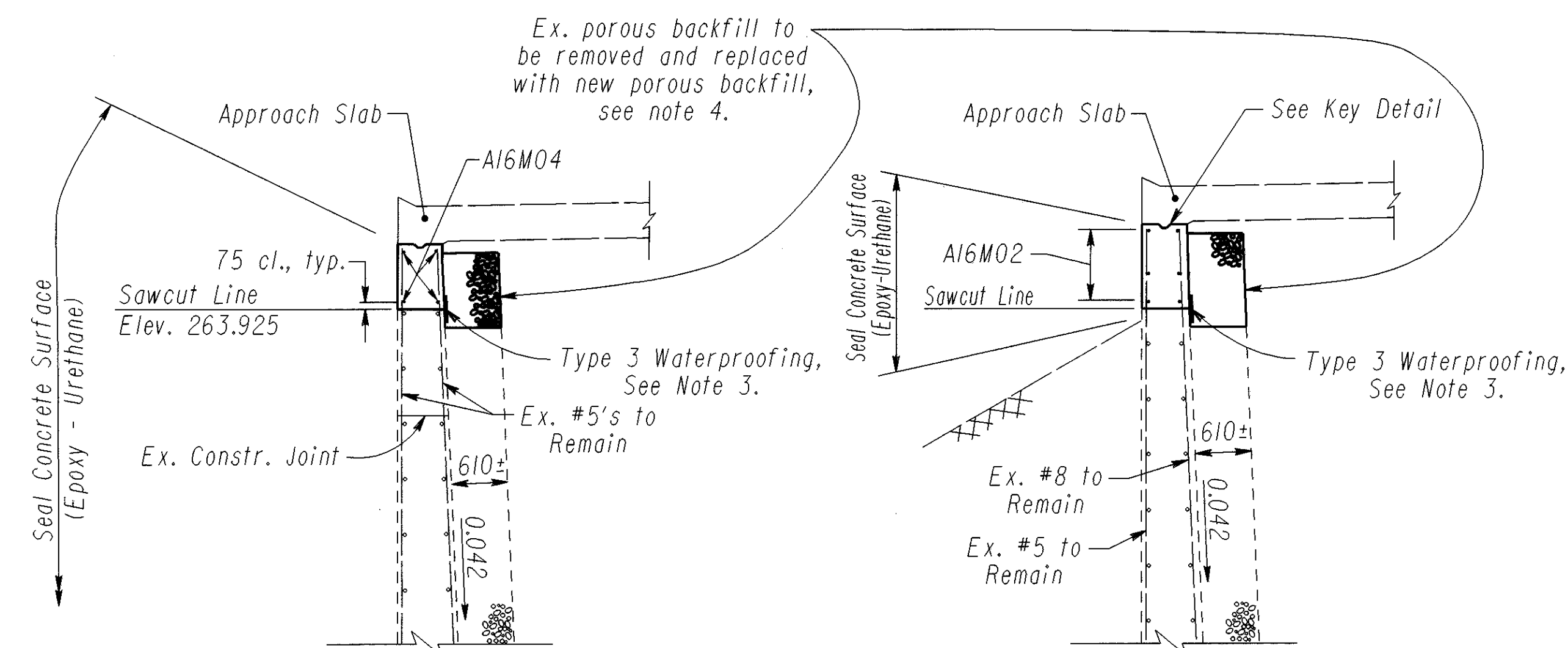
For Rear Approach Slab Details and Guardrail Attachment Details for the Rear Approach Slab, See Sheet No. 15/29.
For Rustication Groove and Contraction Joint Details, See Sheet No. 13/14.
For Legend, See Sheet No. 6/14.
For Deep Beam Railing with Tubular Backup Details not Shown, See Std. Const. Dwg. DBR-2-73M.
All Dimensions are in Millimeters, Unless otherwise Noted.



PLAN



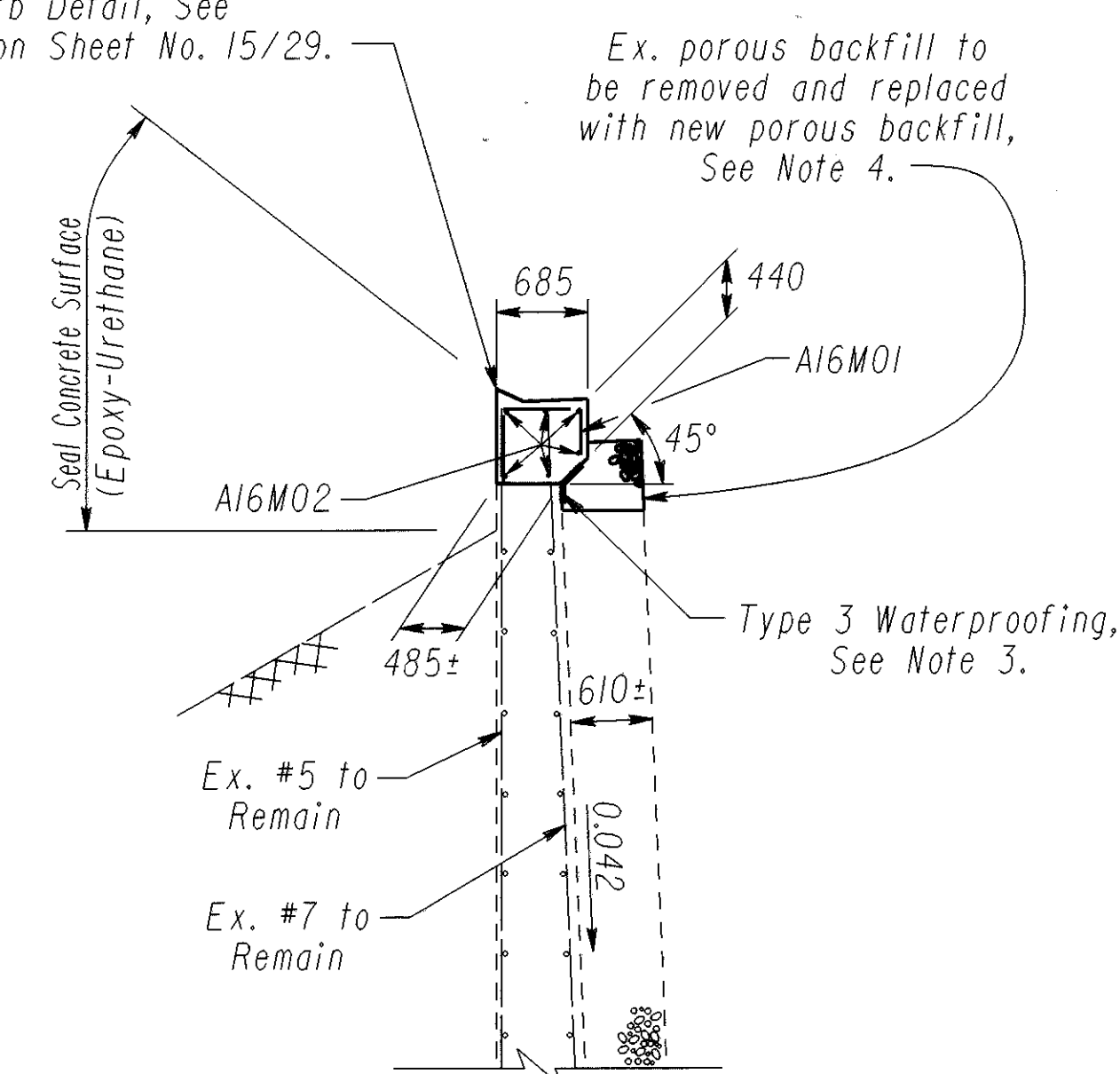
ELEVATION



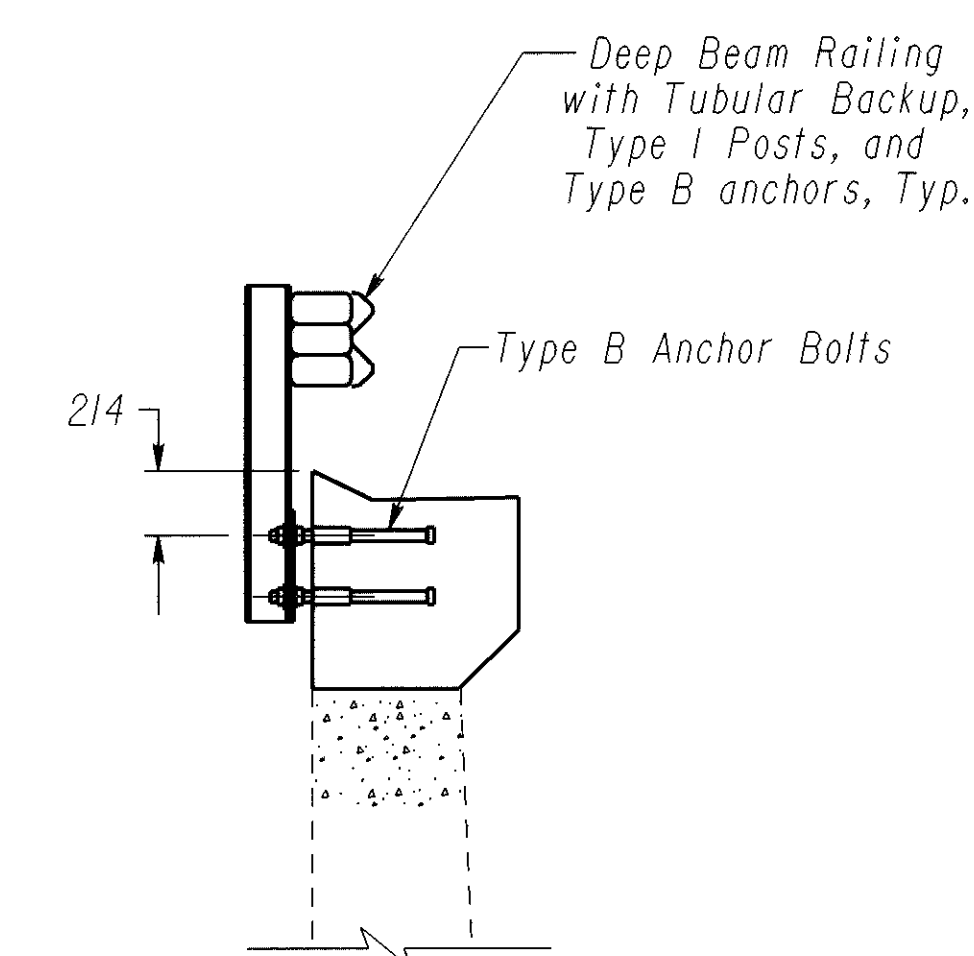
SECTION A-A

SECTION B-B

For Curb Detail, See Section B-B on Sheet No. 15/29.



SECTION C-C



SECTION D-D

DESIGN AGENCY
O.D.O.T.
DISTRICT II
PRODUCTION DEPARTMENT

DATE
1-21-99
REVIEWED
DFT
DRAWN
JPB
DESIGNED
JPB
CHECKED
SAL

SOUTHWEST WINGWALL
BRIDGE NO. JEF-152-13873
over CROSS CREEK

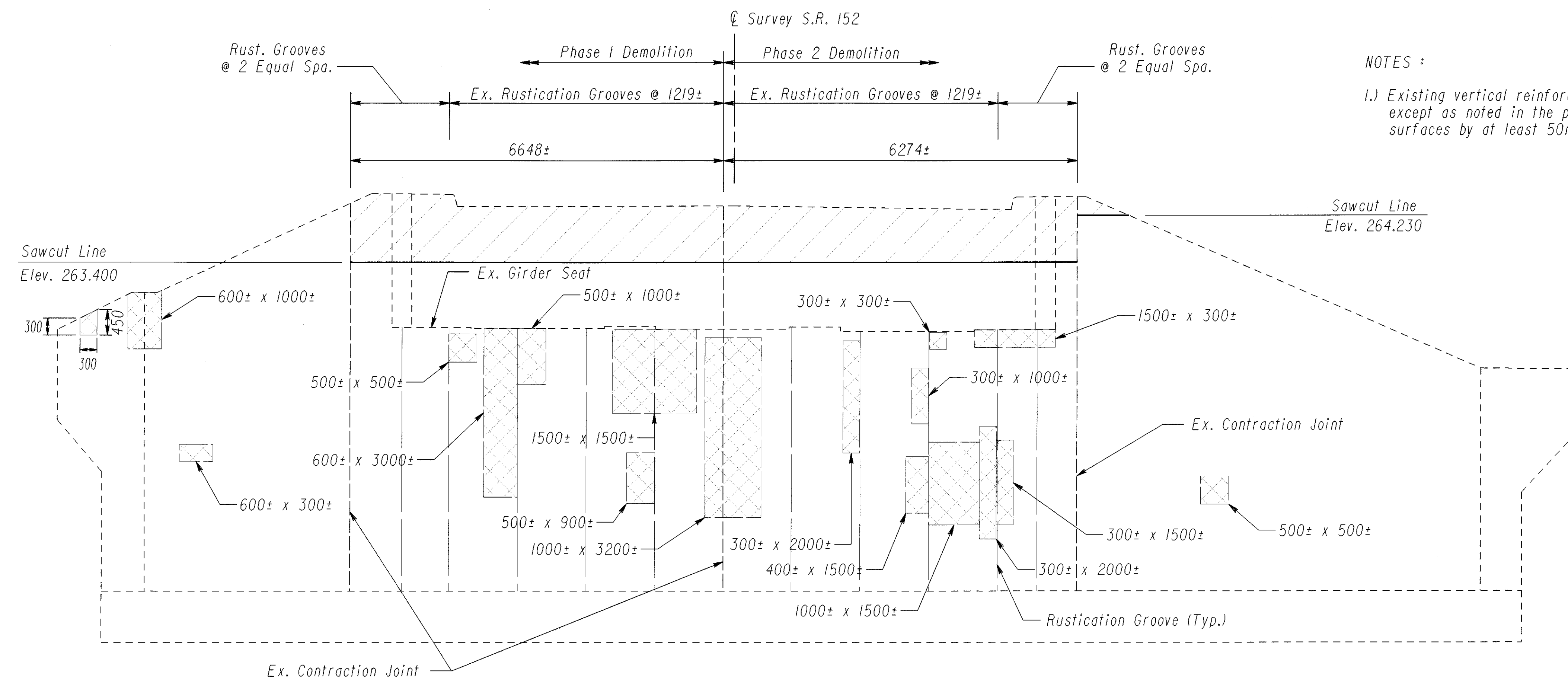
JEF-152-13.864

7/14

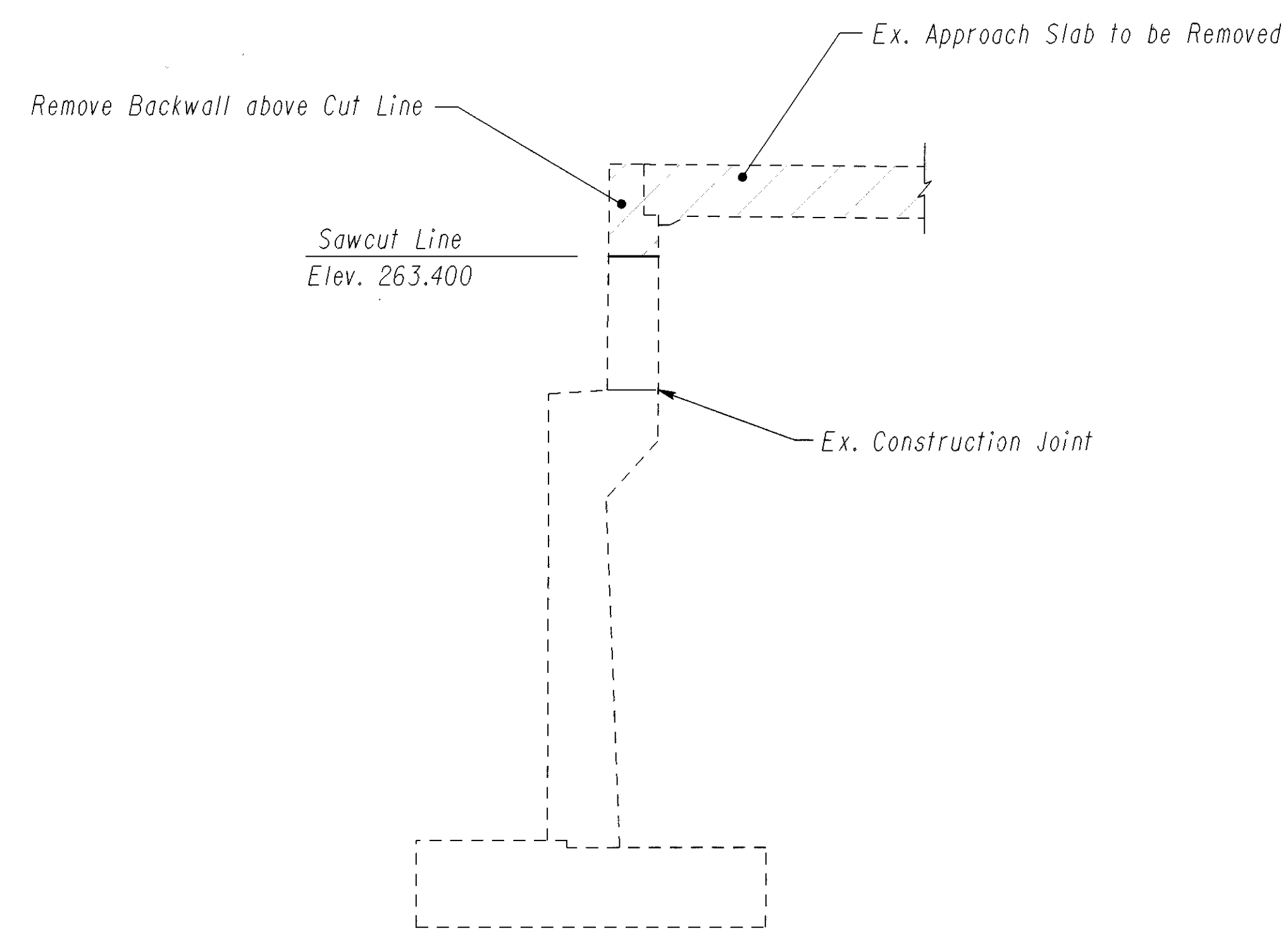
22
29

All Dimensions are in Millimeters, Unless otherwise Noted.

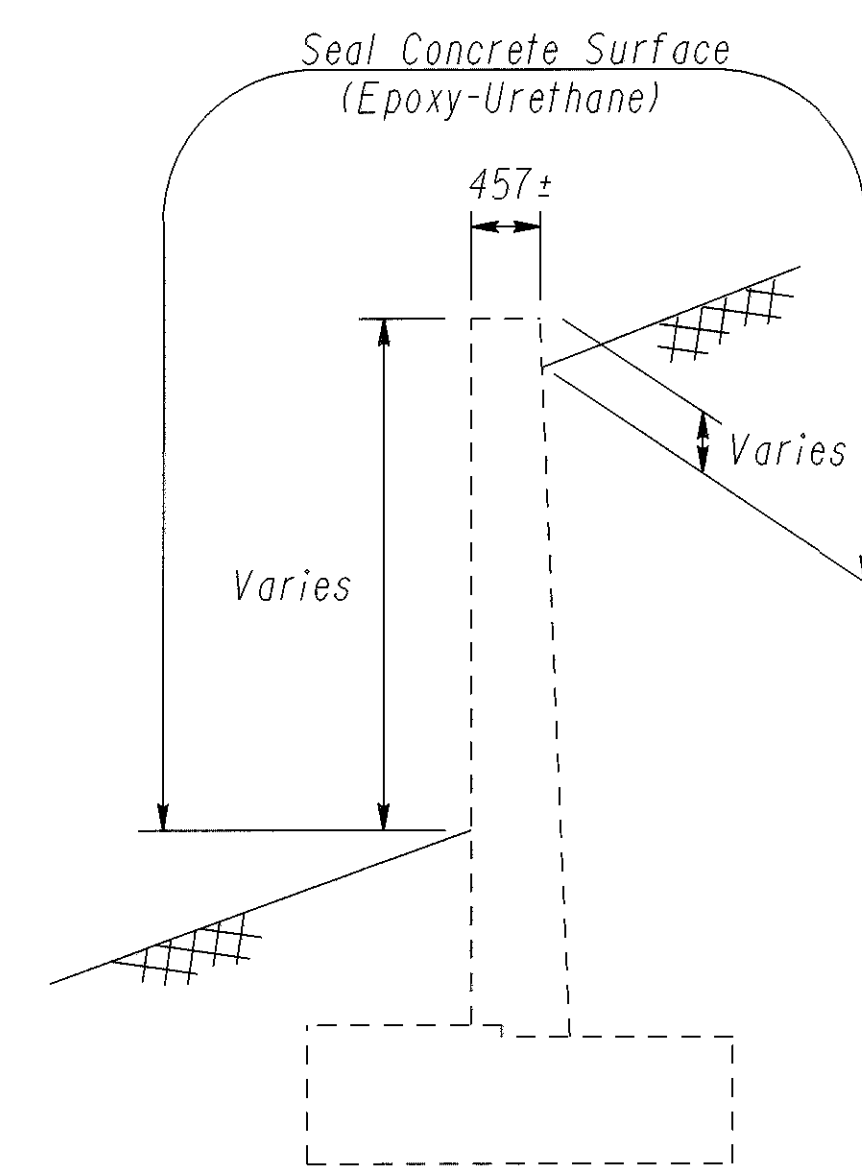
NOTES :
1.) Existing vertical reinforcing steel partially exposed by concrete removal shall be left in place except as noted in the plans, and shall be cut or bent as necessary to clear proposed concrete surfaces by at least 50mm.



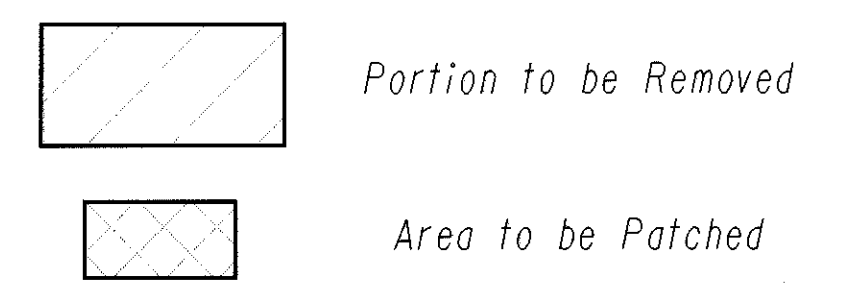
ELEVATION FORWARD ABUTMENT



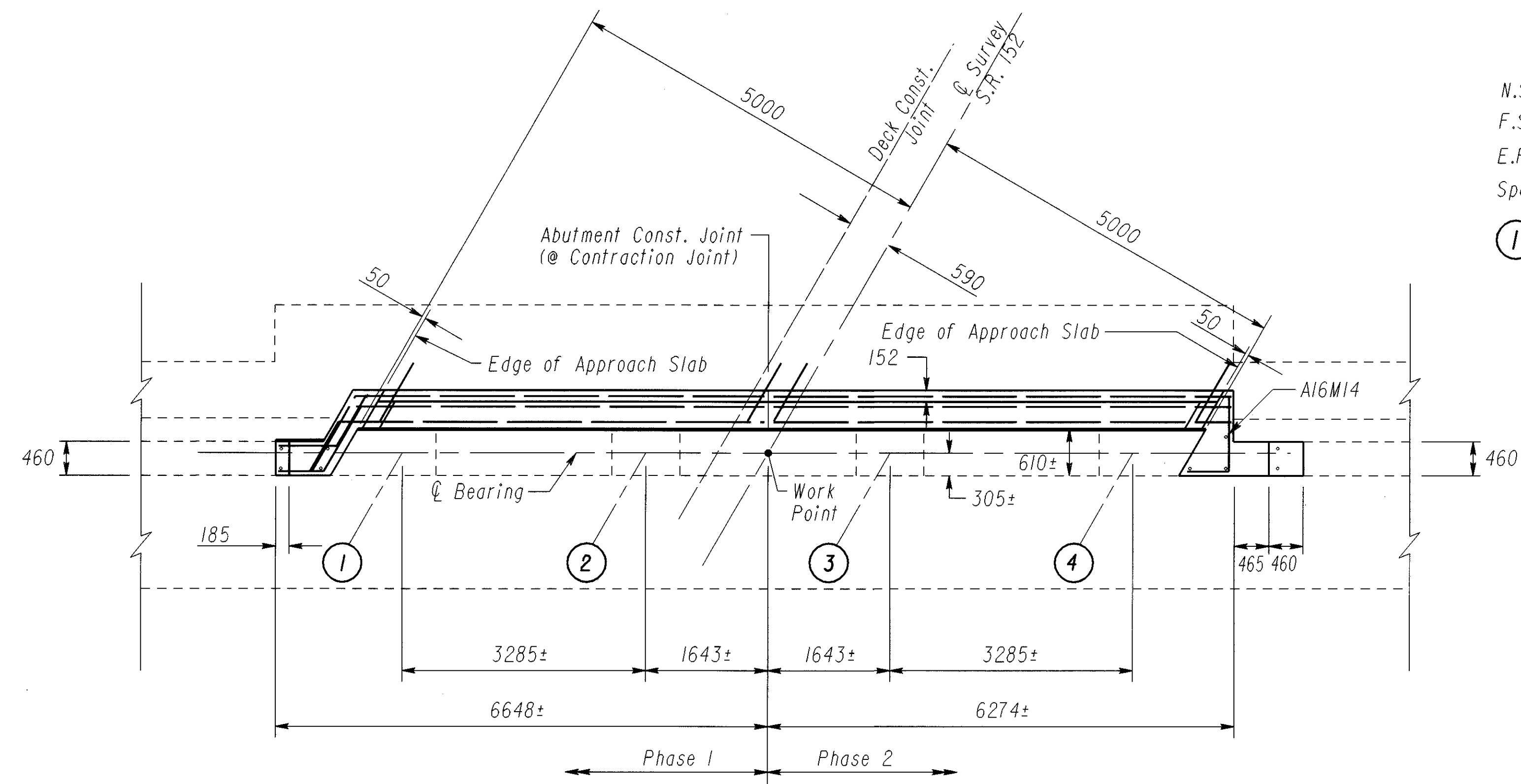
SECTION THROUGH ABUTMENT



EPOXY SEALING DETAIL FOR WINGWALLS



DESIGN AGENCY O.D.O.T. DISTRICT II PRODUCTION DEPARTMENT	DATE 1-21-99	REVIEWED DFT	STRUCTURE FILE NUMBER 4102827
	DRAWN JPB	REVISOR JPB	CHECKED SAL
FORWARD ABUTMENT DEMOLITION BRIDGE NO. JEF-152-13873 over CROSS CREEK			
JEF-152-13.864			
8/14			
23/29			



PLAN

LEGEND

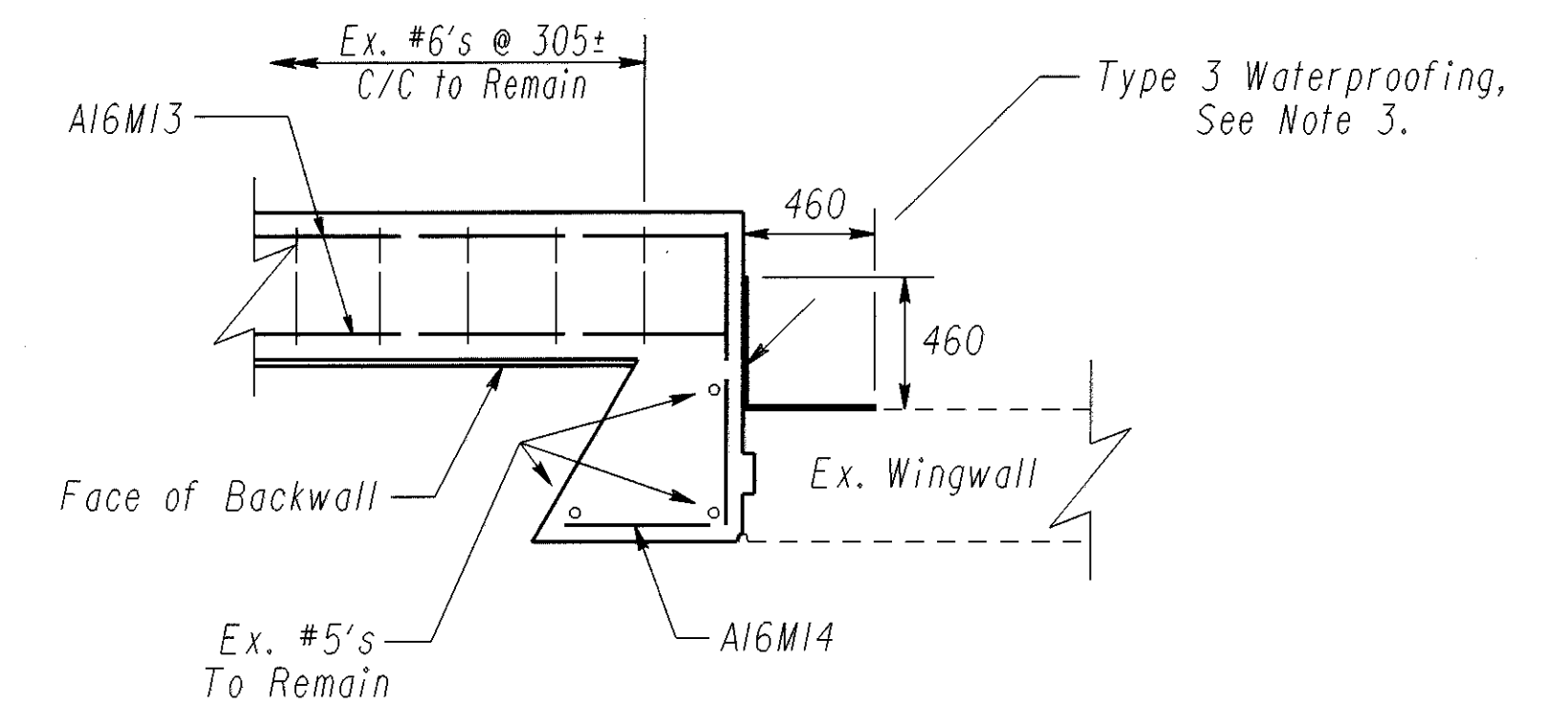
N.S. - Near Side
F.S. - Far Side
E.F. - Each Face
Spa. - Spaces

① - Girder Number

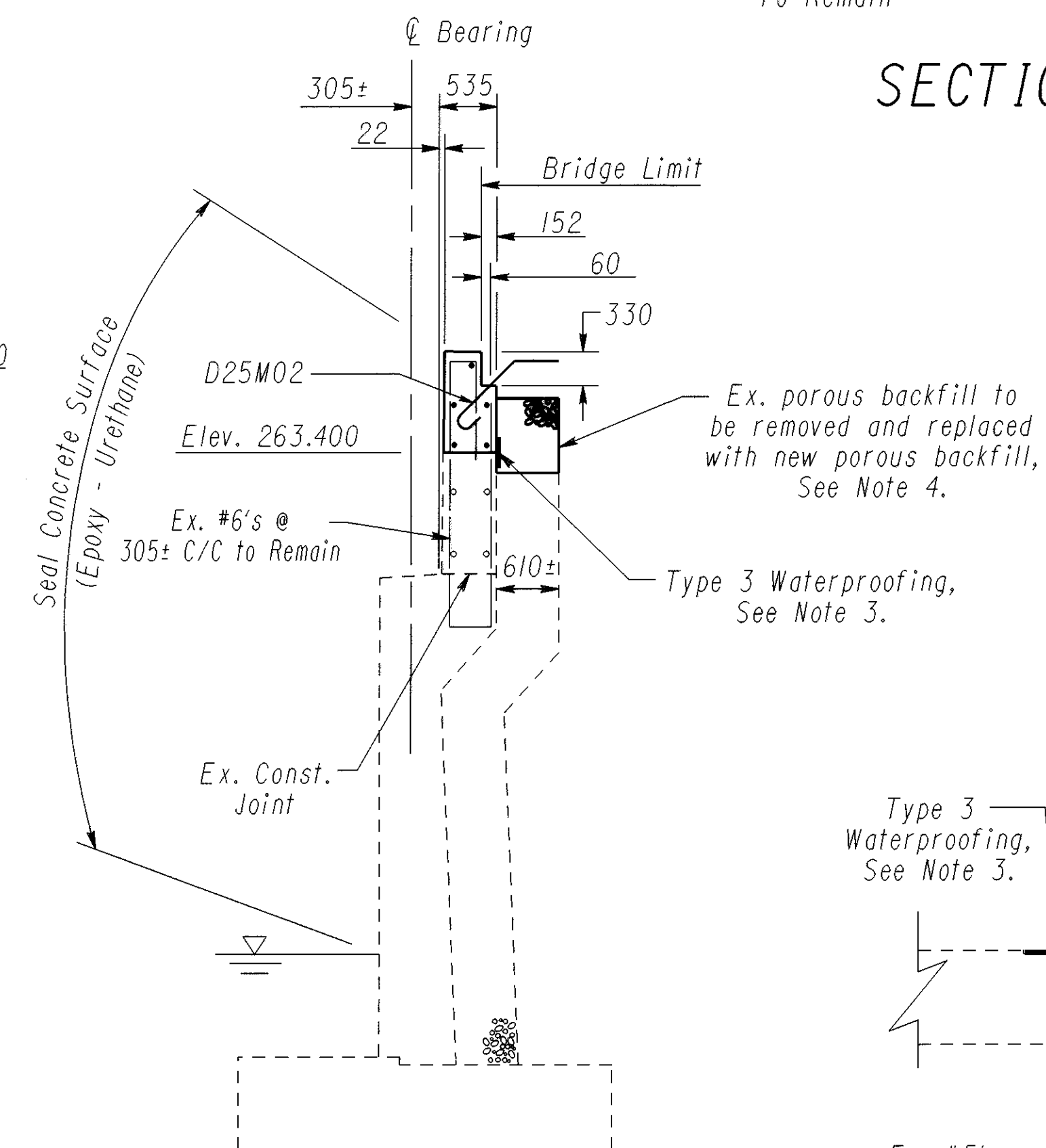
For Rustication Groove and Contraction Joint Details, See Sheet No. 13/14.
All Dimensions are in Millimeters, Unless otherwise Noted.

NOTES :

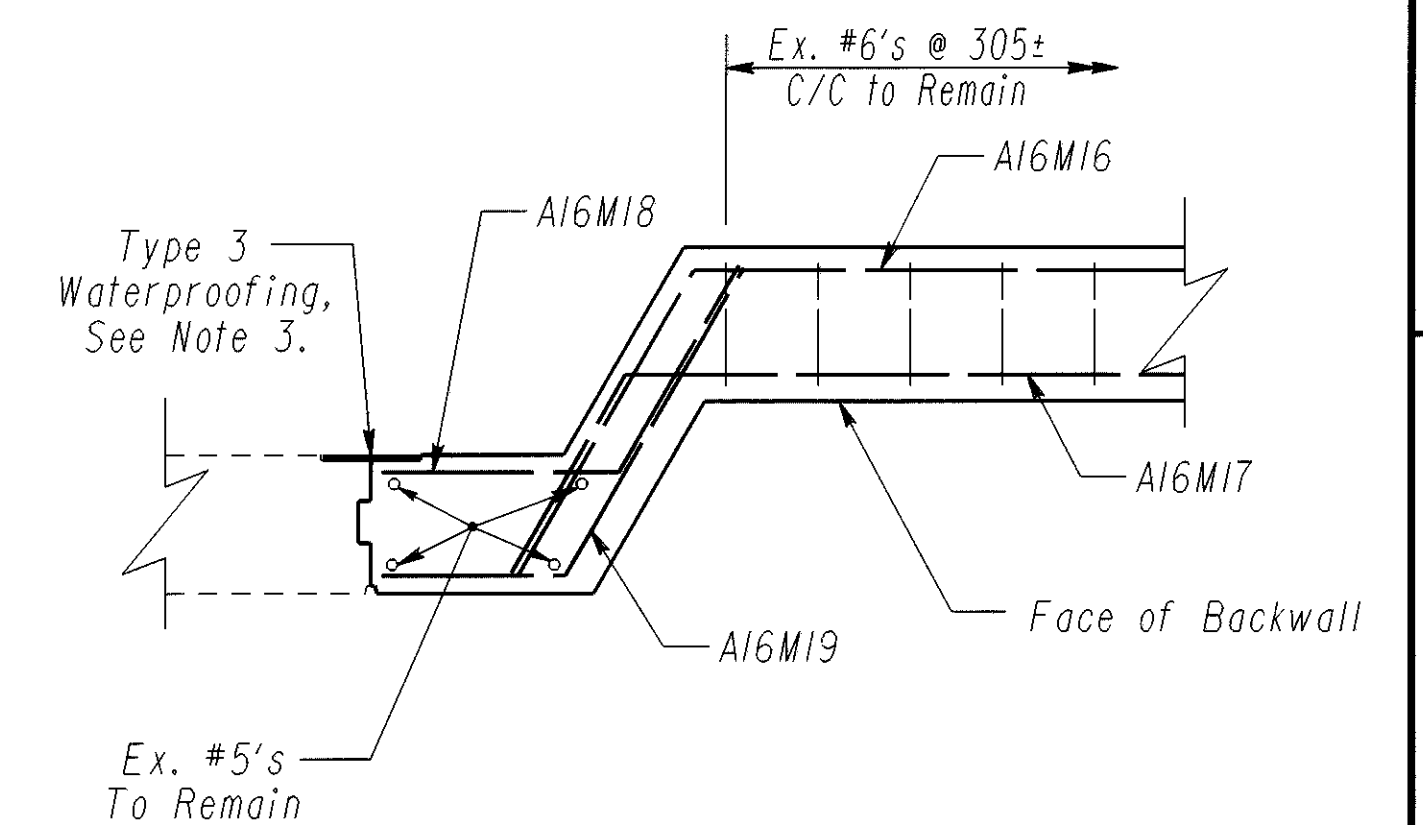
- 1.) Minimum lap length for rebar shall be as per 509.08 of the CMS.
- 2.) Elevations given are at front face of wingwall.
- 3.) Item 512 - Type 3 Waterproofing shall be 300 wide, centered about the Sawcut line and additionally provided for the Contraction joints as shown on sheet no. 13/14. Waterproofing for Contraction joints shall be placed prior to placing horizontal material.
- 4.) Item 518 - Porous Backfill, 610 thick shall extend up to the plane of the subgrade, 200 below the horizontal sawcut line, and laterally from Left Contraction Joint to Right Contraction Joint.
- 5.) Slope top of backwall parallel to grade.



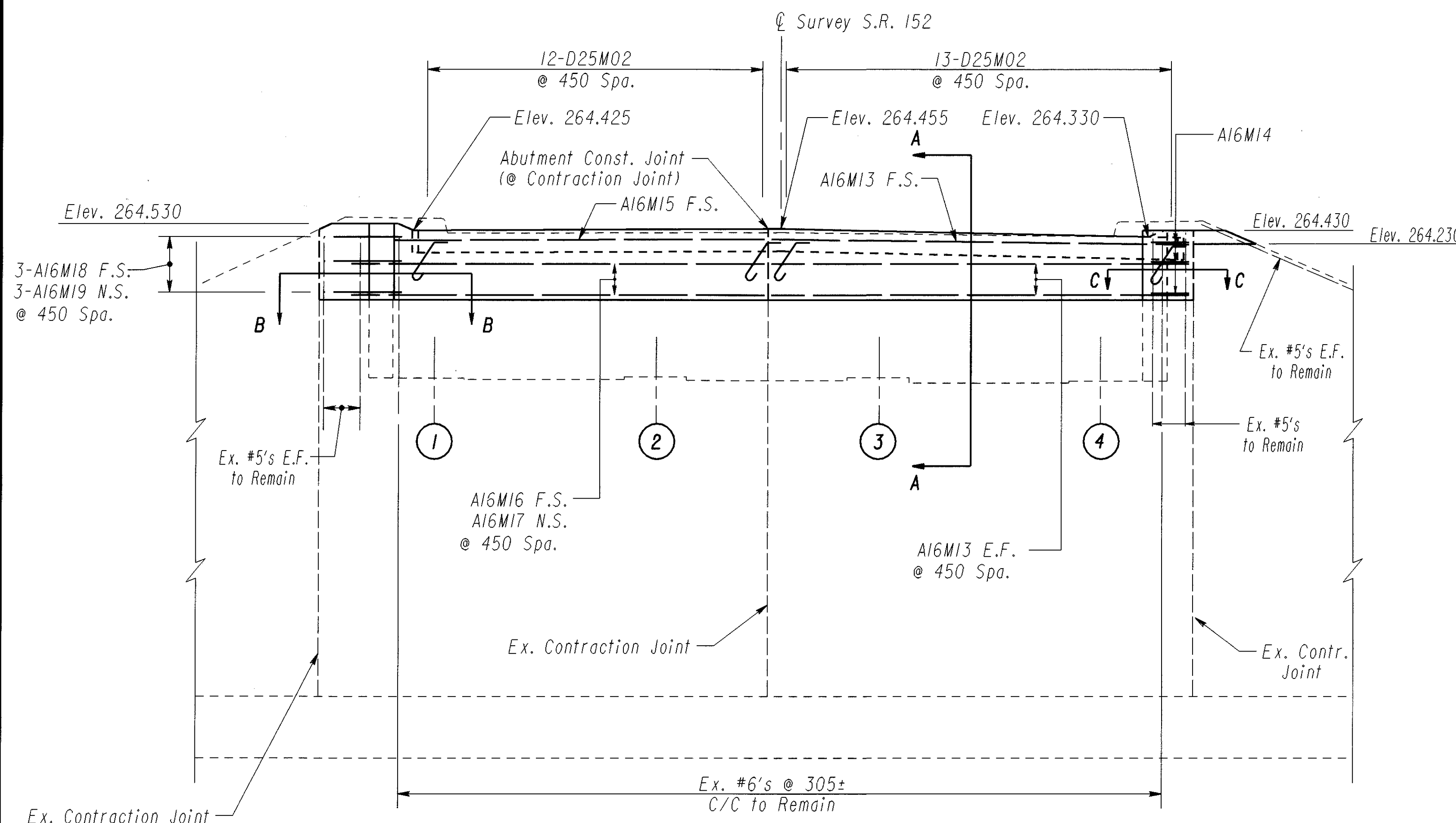
SECTION C-C



SECTION A-A



SECTION B-B



ELEVATION

FORWARD ABUTMENT
BRIDGE NO. JEF-152-13873
over CROSS CREEK

JEF-152-13.864

9/14

24
29

DESIGN AGENCY
O.D.O.T.
DISTRICT II
PRODUCTION DEPARTMENT

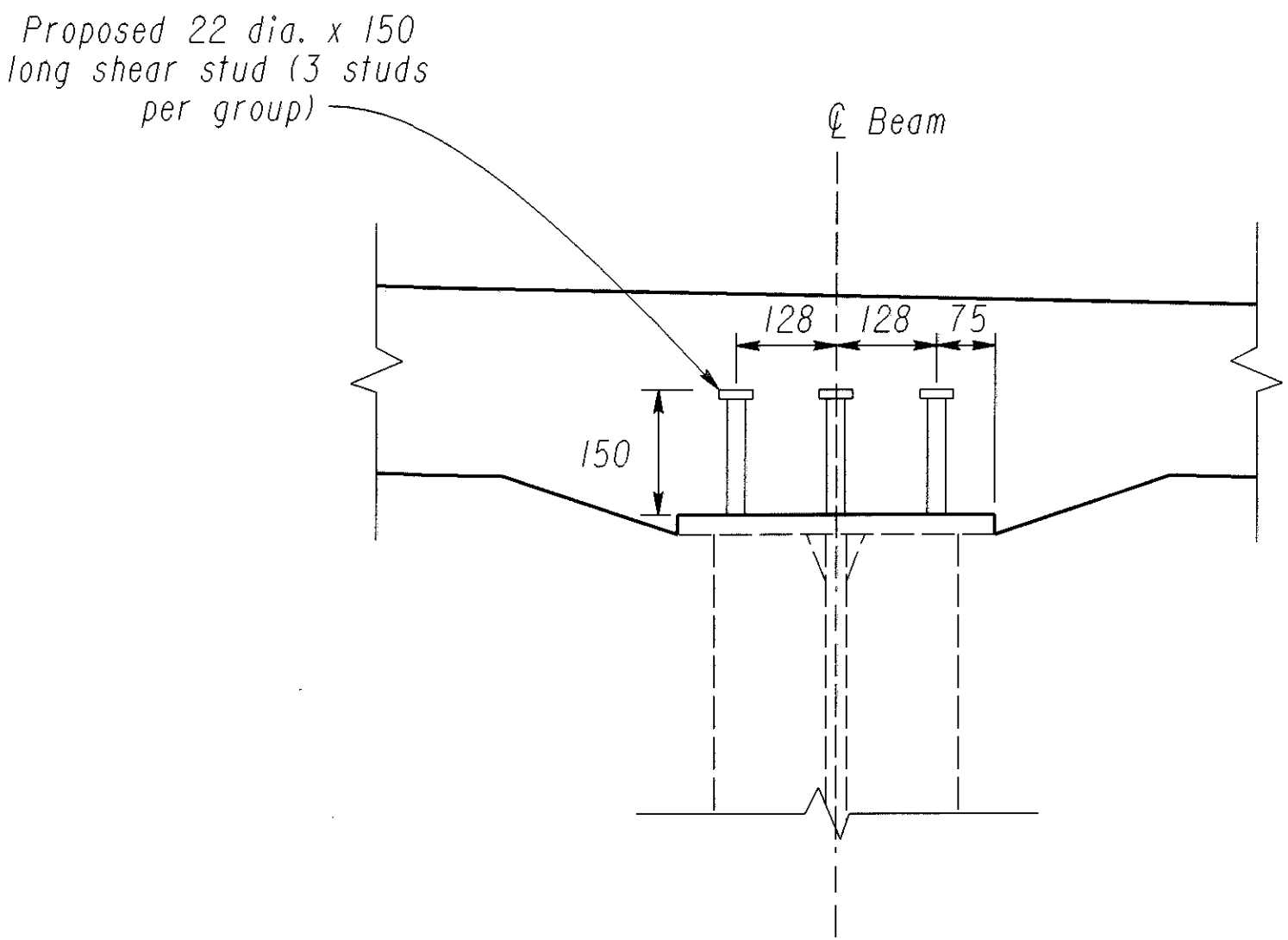
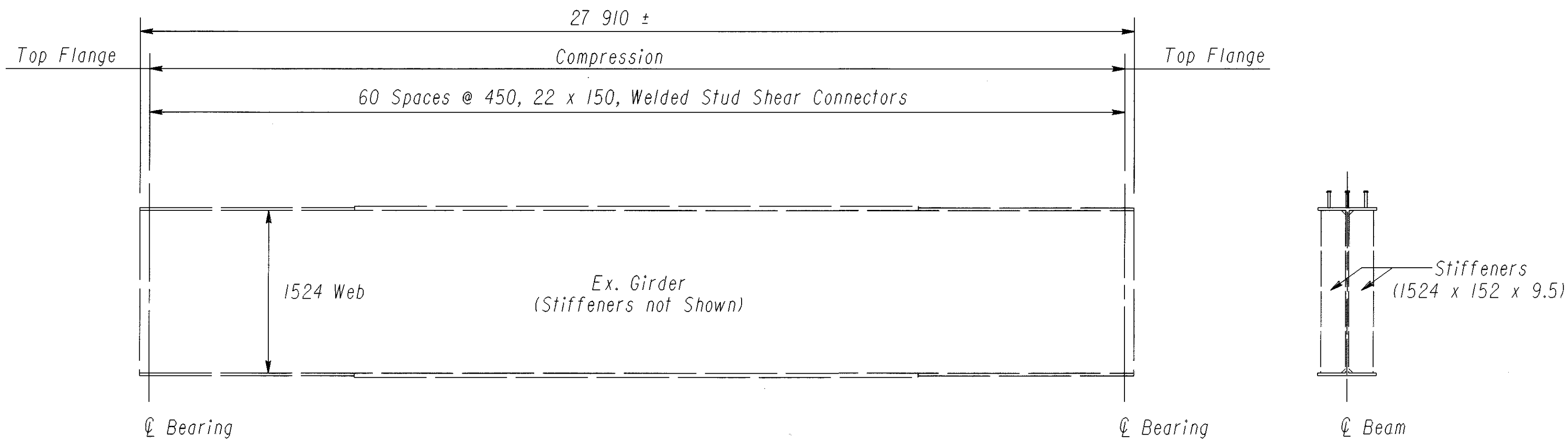
DATE
1-21-99
REVIEWED
DFT
STRUCTURE FILE NUMBER
4102827
DRAWN
JPB
CHECKED
SAL

Notes :

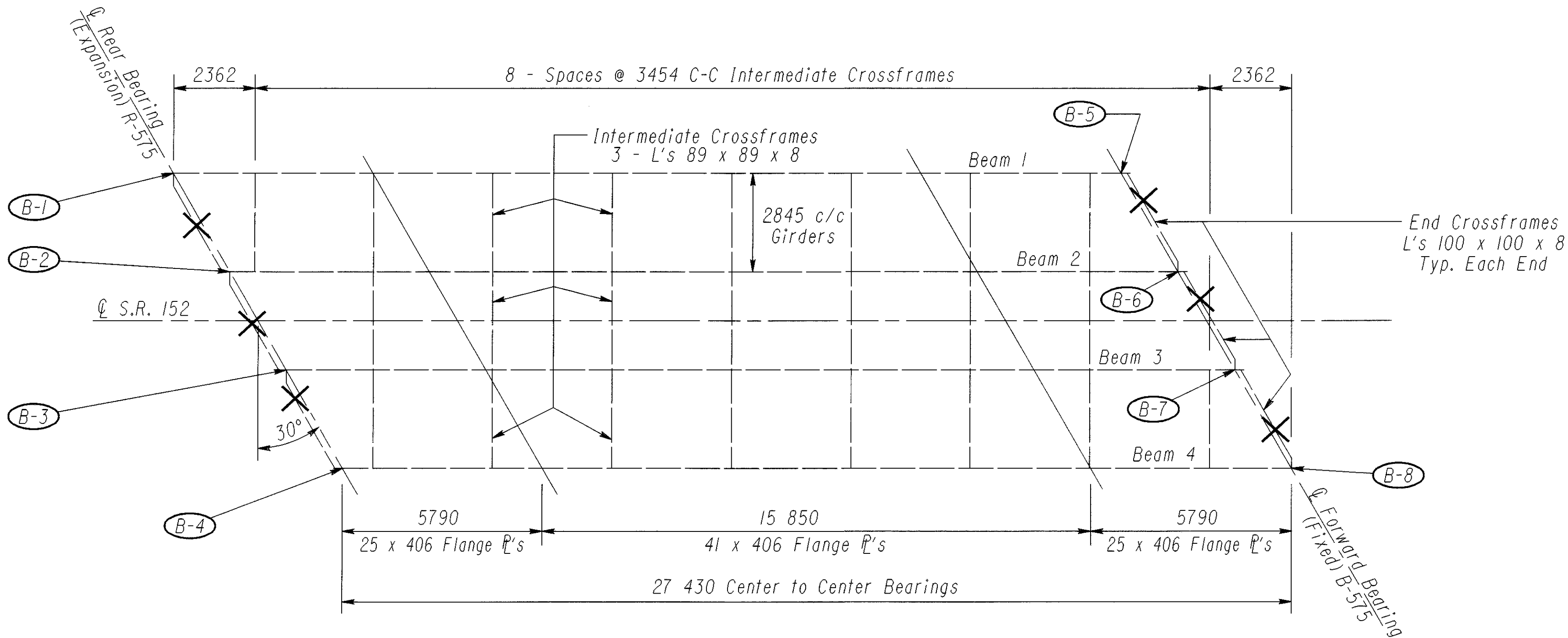
- 1) Welded attachments of supports for the concrete deck finishing machine can be made to areas of the fascia stringer flanges designated "compression". Attachments shall not be made to areas designated "tension". Fillet welds to compression flanges shall not be closer than 25mm to the edge of the flange, be not more than 50mm long, and be not smaller than the minimum size required by AASHTO.
- 2) When removing existing end crossframes, care shall be taken not to gouge or otherwise damage the existing steel girders. End crossframes to be completely removed shall have welds ground smooth. Payment for removal of end crossframes shall be included with Portions of Structure Removed, over 6m Span, As Per Plan.

- 3.) End frames shall be fabricated as per GSD-I-96M, except the proposed gusset plates attaching to the existing bearing stiffeners shall be connected using new 22M (A325M) high strength bolts, nuts and washers, (8 holes per stiffener). The Contractor shall manufacture bent gusset plates to match existing bolt hole patterns on bearing stiffeners. Additional cost associated with bolting the end frames to the existing stiffeners shall be included with Item 863 Structural Steel Members Miscellaneous Fabrication, As Per Plan (Replacement of Deteriorated End Cross Frames).
- 4.) For additional notes and details, see Standard Construction Drawings EXJ-4-87M and GSD-I-96M.

All Dimensions are in Millimeters, Unless otherwise Noted.



SHEAR CONNECTOR DETAIL



EXISTING FRAMING PLAN

X - Indicates removal of existing end frame

REFERENCE NO.	LOCATION	516		
		BEARING DEVICE, ROCKER, AS PER PLAN	BEARING DEVICE, BOLSTER, AS PER PLAN	REFURBISH AND RESET BEARING, AS PER PLAN
		EACH	EACH	EACH
B-1	REAR	1		
B-2	REAR			1
B-3	REAR			1
B-4	REAR	1		
B-5	FWD.		1	
B-6	FWD.			1
B-7	FWD.			1
B-8	FWD.		1	
TOTAL		2	2	4

Totals Carried to BRIDGE SUMMARY Sheet

DESIGN AGENCY
O.D.O.T.
DISTRICT II
PRODUCTION DEPARTMENT

DATE
1-21-99
REVIEWED
DFT
STRUCTURE FILE NUMBER
4102827
DRAWN
JPB
REVISOR
JPB
DESIGNED
JPB
CHECKED
SAL

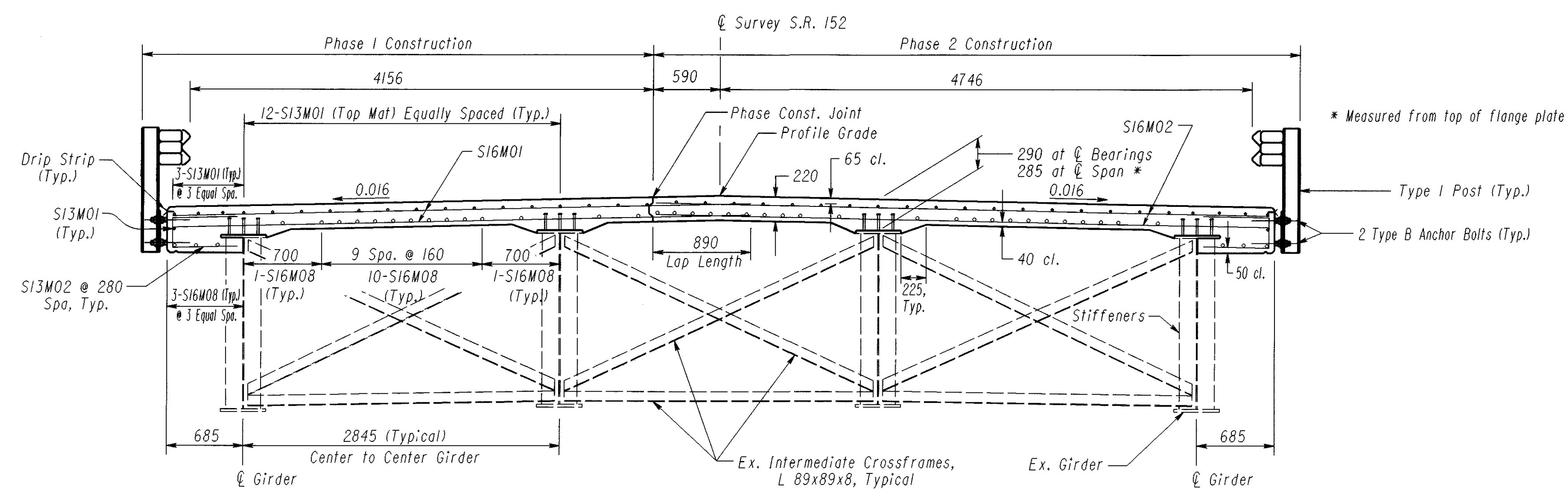
EXISTING STEEL FRAMING PLAN
BRIDGE JEF-152-13872
over CROSS CREEK

JEF-152-13.864

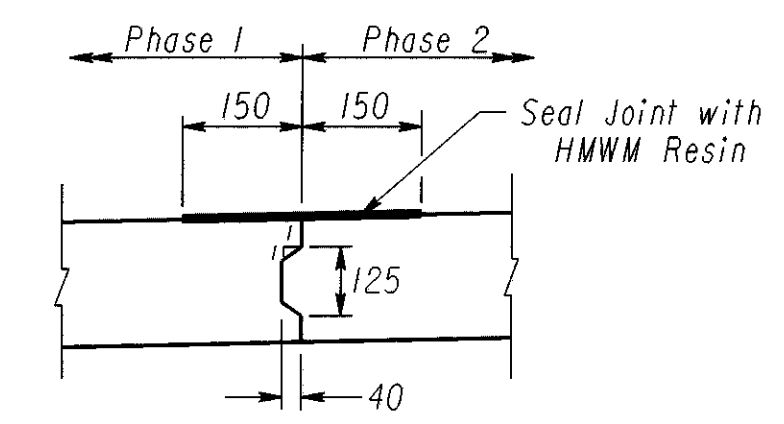
10/14

25
29

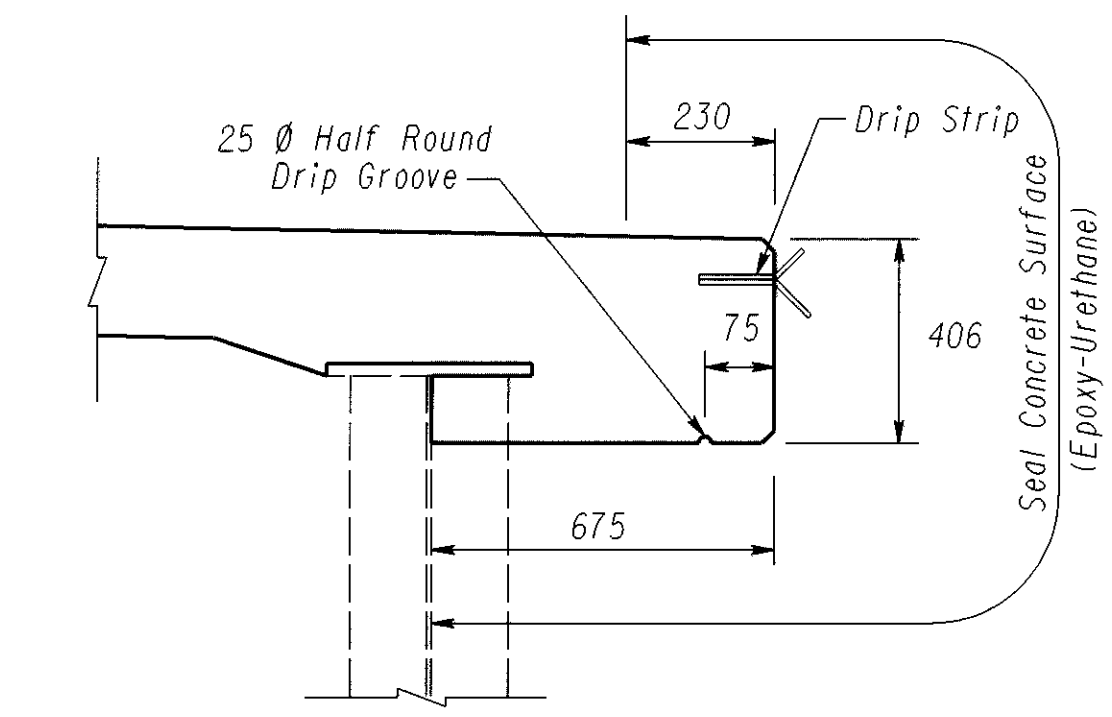
All Dimensions are in Millimeters, Unless otherwise Noted.



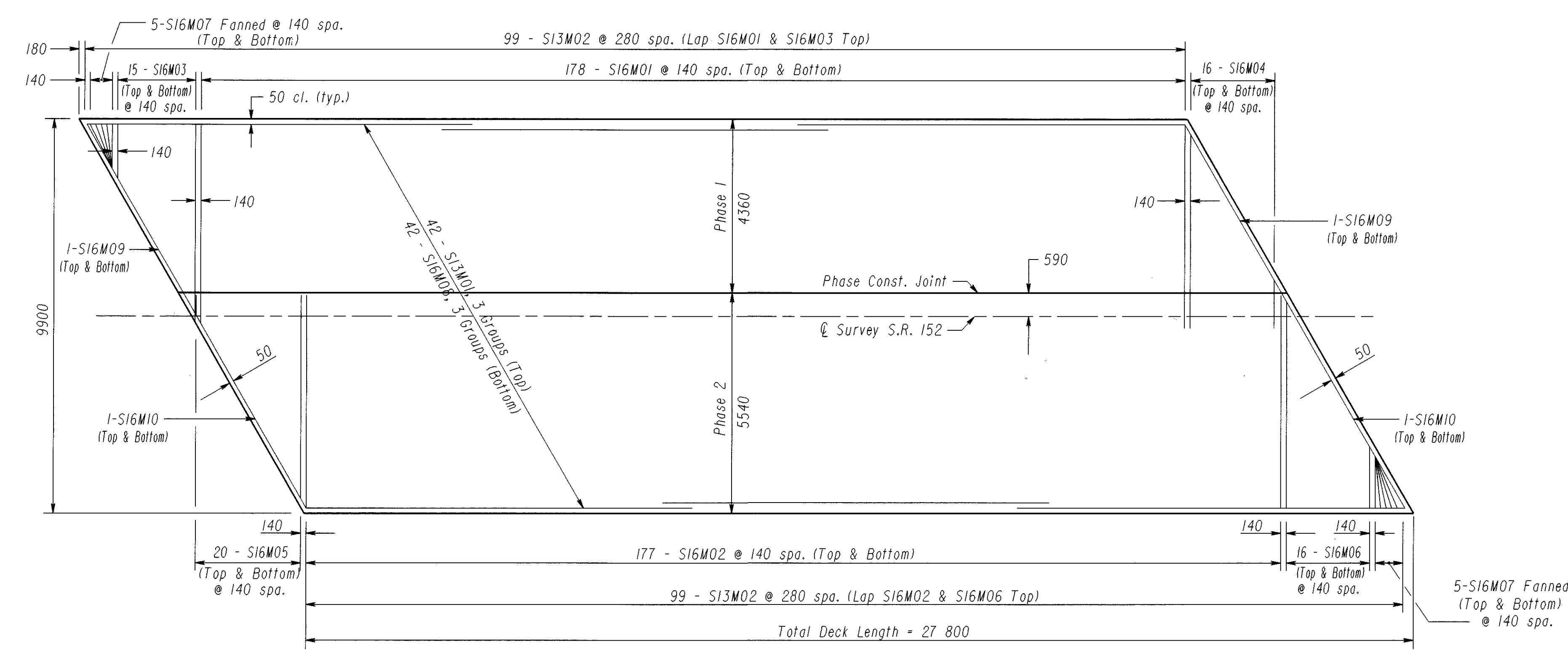
TRANSVERSE SECTION



PHASE CONSTRUCTION JOINT DETAIL



TYPICAL DECK EDGE DETAIL



DECK PLAN

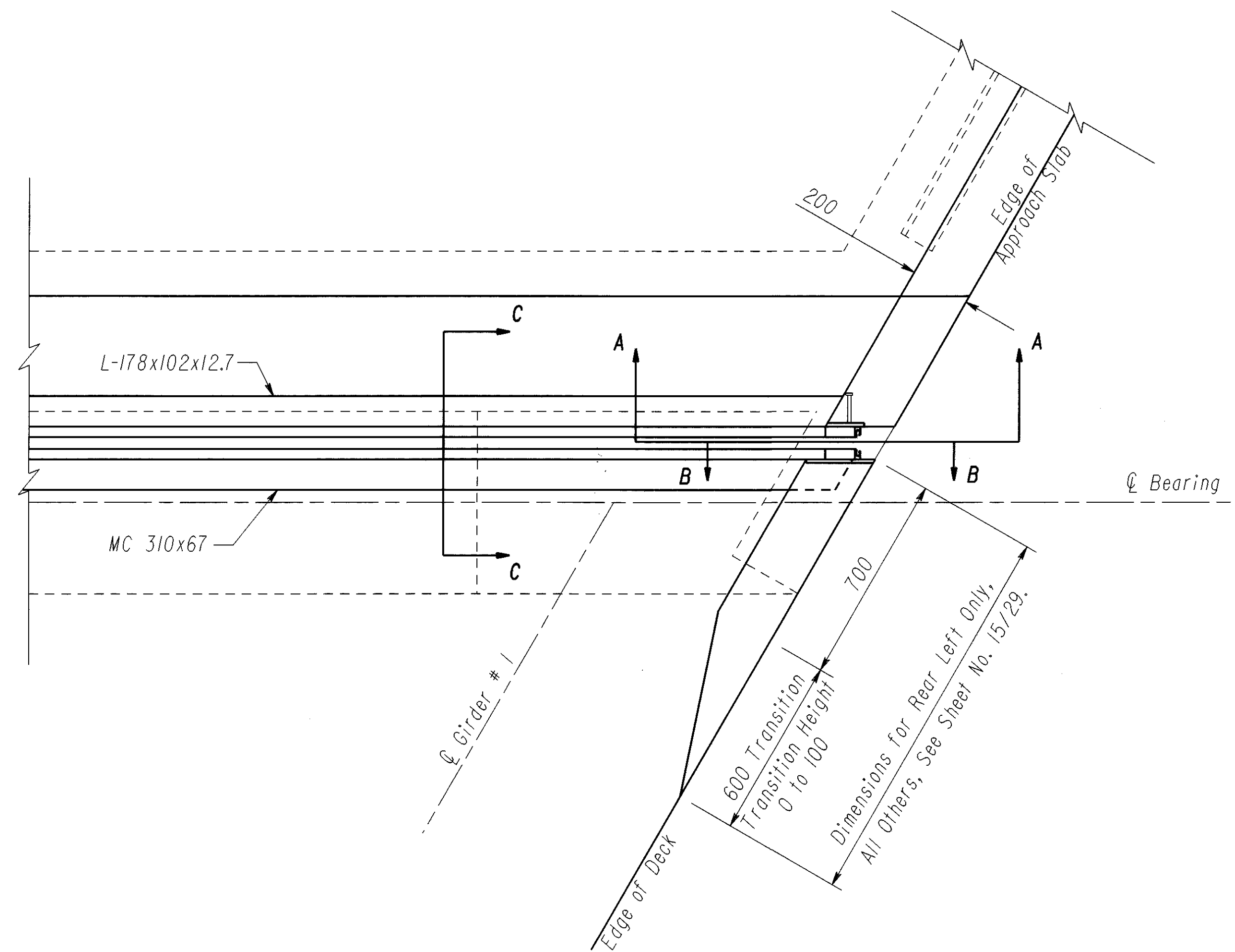
NOTES :

- 1.) The distance shown from top of deck slab to top of steel girder is the theoretical design dimension including the design haunch thickness of 65mm. 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 girder may not have the exact camber or conformation required to place it parallel to the finished grade.
- 2.) A haunch width of 225mm shall be used for computing quantity of concrete. However, the haunch width may vary between 150mm and 300mm.
- 3.) After the complete phase removal of the existing concrete deck, the Contractor shall determine at 1/4 points along each beam the actual top of beam elevations. These elevations will be deducted from the previously determined screed elevations at the same locations to obtain the actual depth of the slab over the beams. If any depths are less than 220mm, the Engineer shall be notified to determine the suitability of the proposed work prior to deck forming and concrete placement. The Contractor's calculations shall be submitted to the Engineer for review prior to placing concrete for the deck. The payment for this work shall be included in the item for the concrete deck.
- 4.) For the Reinforcing Steel List, See Structure Sheet No. 14/14. Bar splice length shall be as follows :
No. 13M Bar - 690
No. 16M Bar - 890
- 5.) See Structure Sheet No. 14/14 for deck screed elevations prior to placement of deck concrete.
- 6.) Prior to the concrete deck placement a bent drip strip shall be installed along the edges of the deck by anchoring the top layer of reinforcing steel and being butted, with 90 degree bend, against the formwork. An additional 300 mm long drip strip shall also be installed centered on each post.

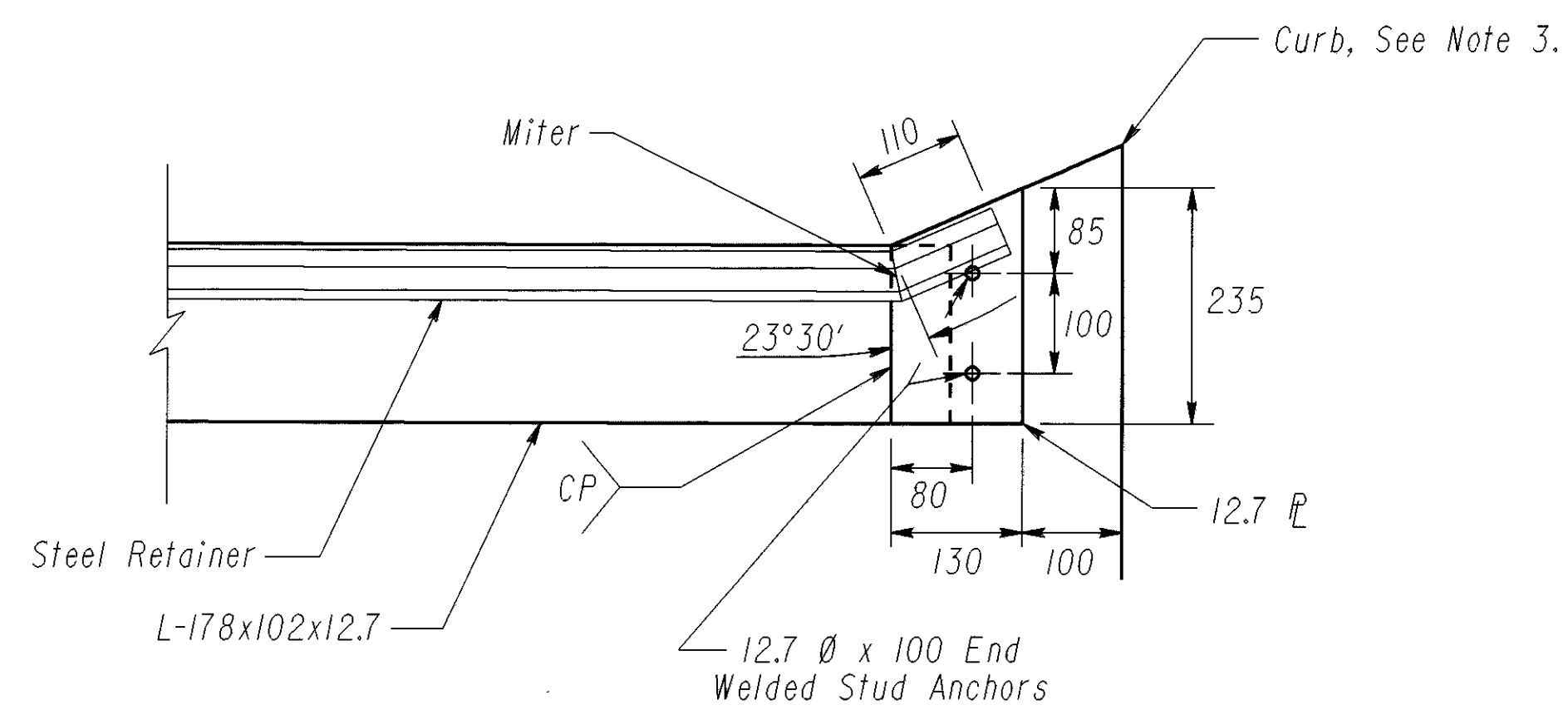
The strips shall be placed the full length of the deck, ending at the abutments. Where splices are required the individual pieces shall be butted together. Stainless steel shall be 0.8 mm ASTM A167, Type 304, mill finish.

The final pay quantity shall be the actual overall length of the drip strip. Additional strips at posts shall not be measured for payment.

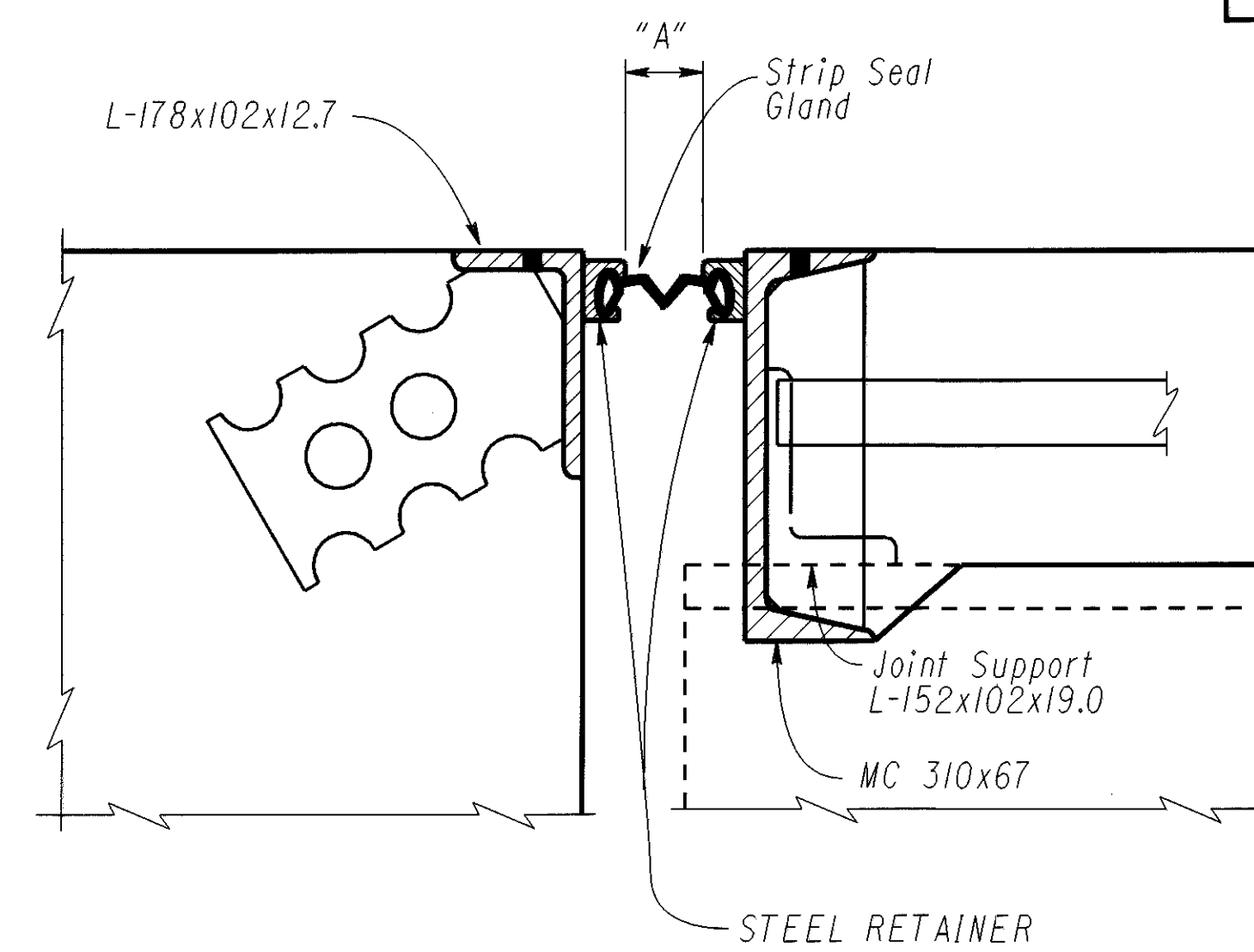
Payment shall be at the contract price bid for Item Special, meter, Steel Drip Strip, which shall include all materials, labor, tools, and incidentals necessary to complete the item.



PLAN



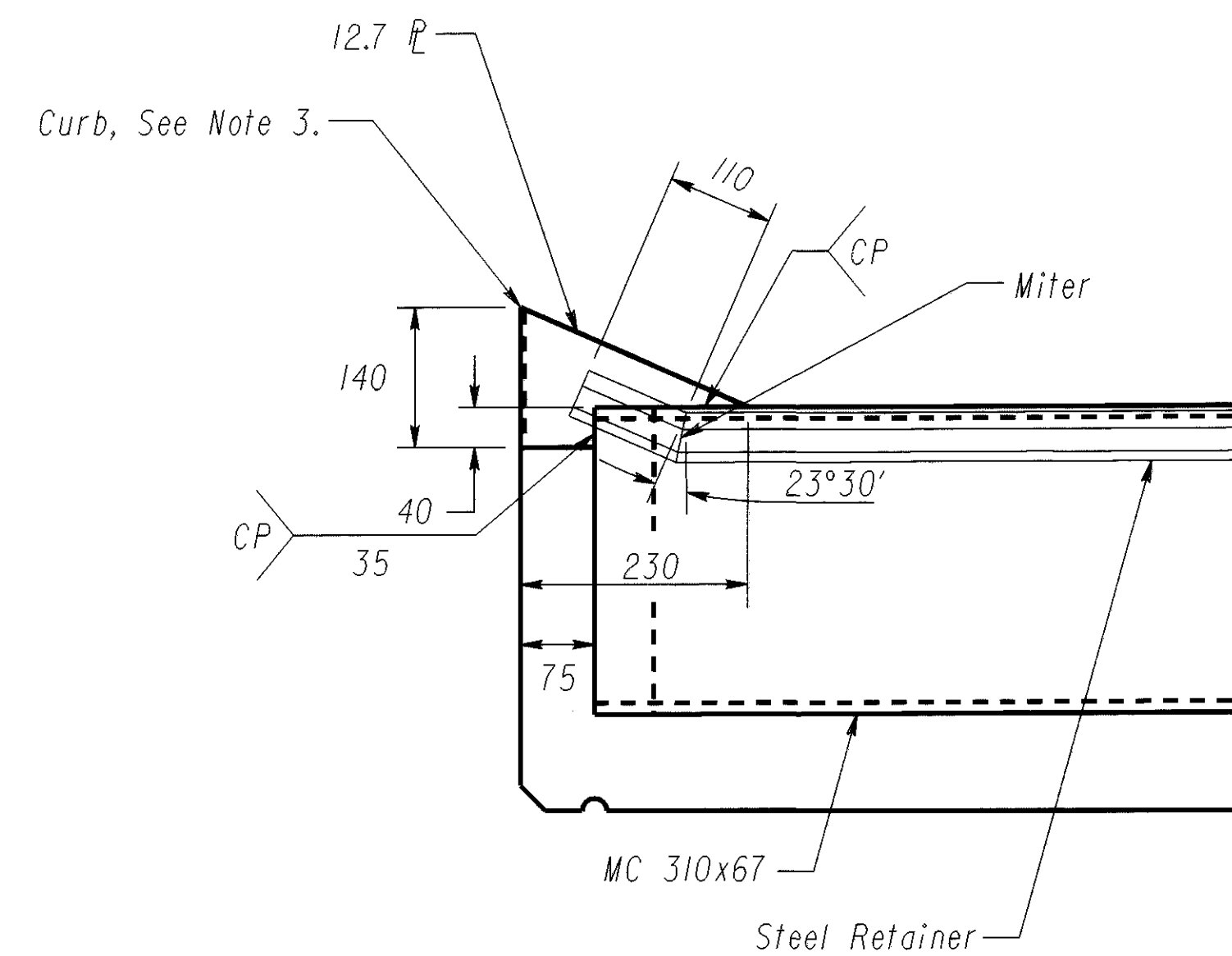
SECTION A-A



SECTION C-C

NOTES :

- 1.) Plan view shows Rear Left expansion joint. Expansion Joint Details are similar at other locations.
- 2.) For Details and Installation Requirements Not Shown, See Standard Construction Drawing EXJ-4-87M.
- 3.) For Curb Detail, See Section B-B on Sheet No. 15/29.
- 4.) Weld Steel Retainer as detailed in EXJ-4-87M.



SECTION B-B

All Dimensions are in Millimeters, Unless Otherwise Noted.

75 mm STRIP SEAL GLAND	
STRIP SEAL JOINT WIDTH	
AMBIENT TEMPERATURE	DIMENSION "A"
0° C	46 mm
5° C	44 mm
10° C	43 mm
15° C	41 mm
20° C	40 mm
25° C	38 mm
30° C	36 mm
35° C	35 mm

EXPANSION JOINT DETAILS

BRIDGE NO. JEF-152-13873

over CROSS CREEK

JEF-152-13.864

12/14

27
29

DESIGN AGENCY
O.D.O.I.
DISTRICT II
PRODUCTION DEPARTMENT

DATE
1-21-99
REVIEWED
DFT
STRUCTURE FILE NUMBER
4102827

DRAWN
JPB
CHECKED
SAL

DESIGNED
JPB

DRAWN
JPB

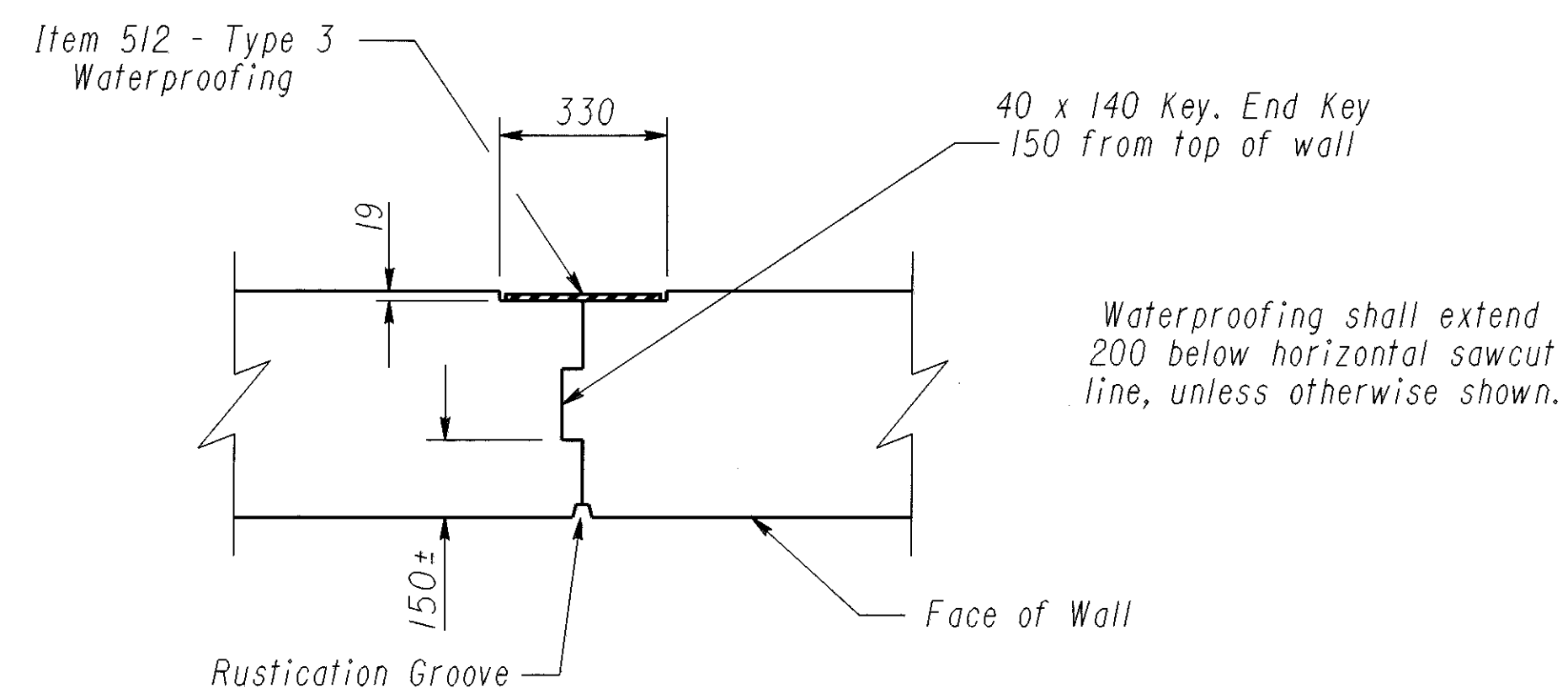
REVIEWED
DFT

DATE
1-21-99

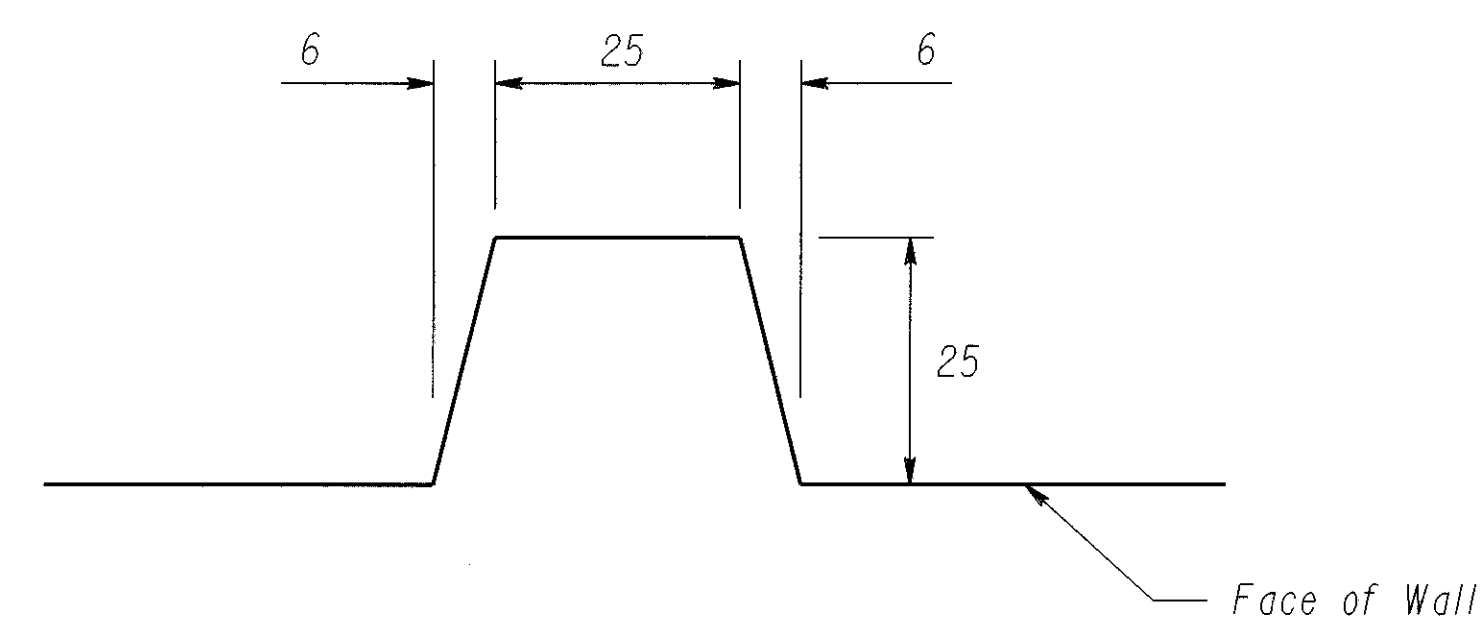
DESIGN AGENCY
O.D.O.I.

DISTRICT II

PRODUCTION DEPARTMENT



CONTRACTION JOINT DETAIL

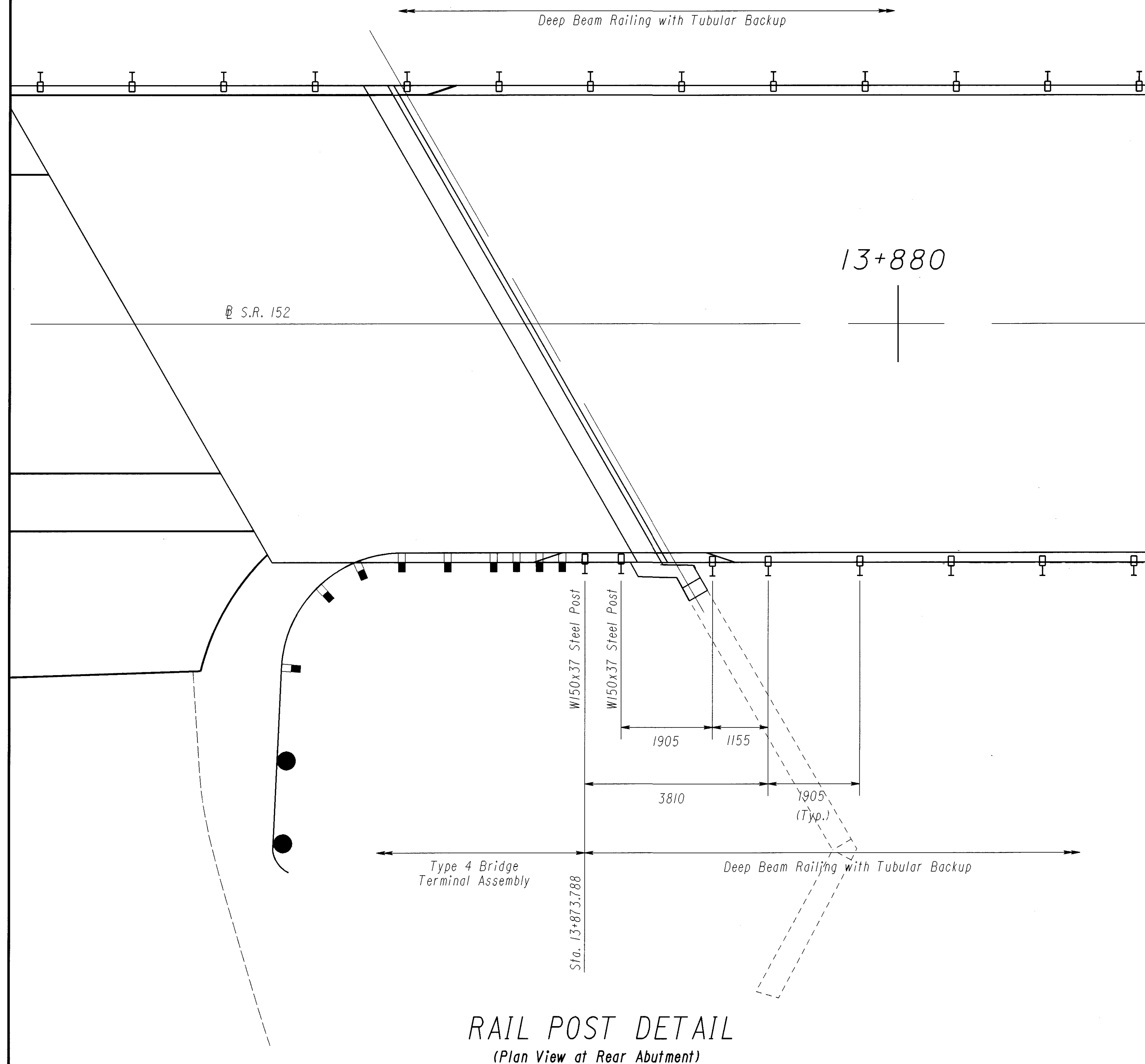


RUSTICATION GROOVE DETAIL

NOTES :

- 1.) All additional cost associated with the installation of the extra post shall be incidental and included with Item 517 for payment.

For Deep Beam Railing with Tubular Backup Details not Shown, See Std. Const. Dwg. DBR-2-73M.
For Type 4 Bridge Terminal Assembly Details not Shown, See Std. Const. Dwg. GR-3.4M.



RAIL POST DETAIL
(Plan View at Rear Abutment)

RAIL POST & MISCELLANEOUS DETAILS
BRIDGE NO. JEF-152-13873
over CROSS CREEK

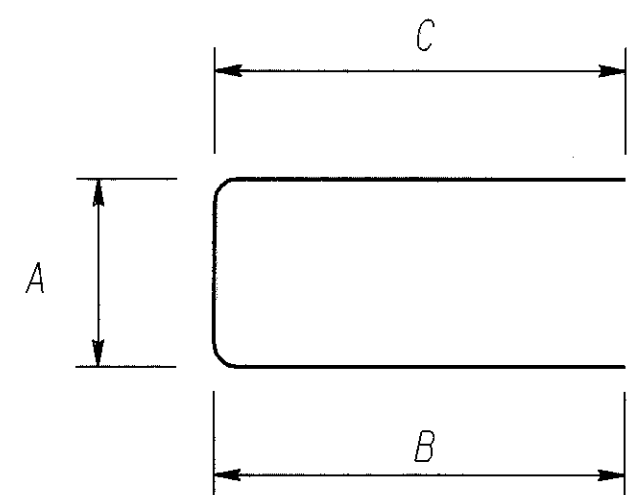
JEF-152-13.864

13/14

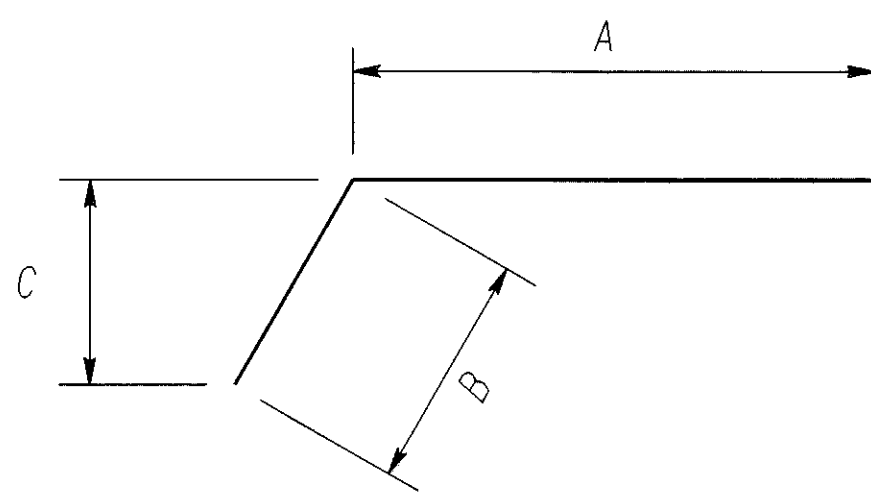
28
29

DESIGNED JPB
CHECKED SAL
DRAWN JPB
REVISED
REVIEWED DFT
DATE 1-21-99
STRUCTURE FILE NUMBER 4102827

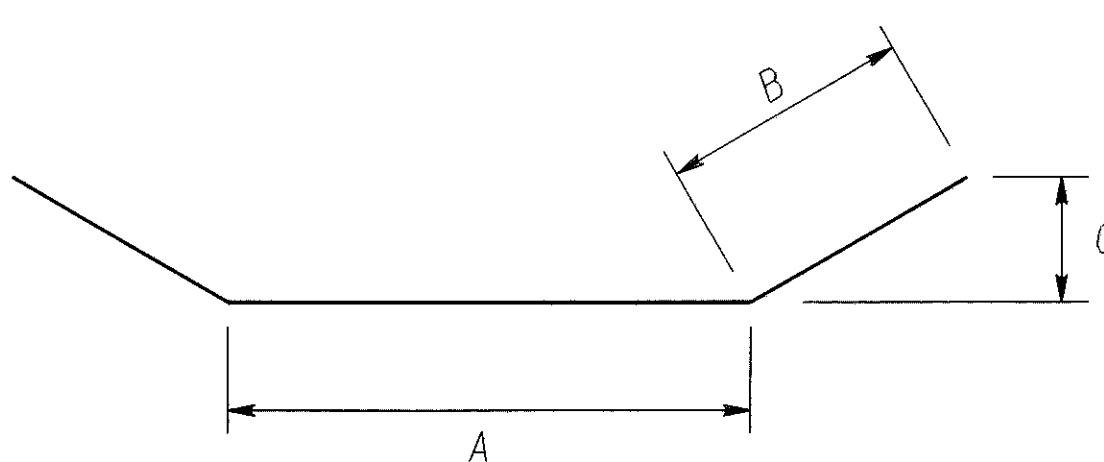
DESIGN AGENCY
O.D.O.T.
DISTRICT II
PRODUCTION DEPARTMENT



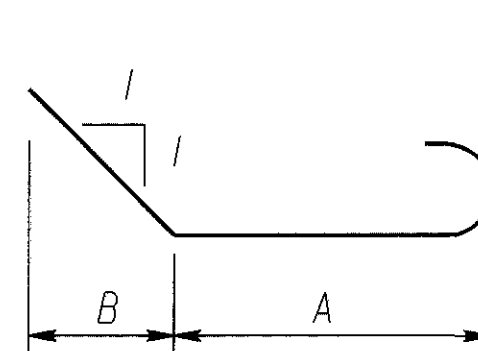
TYPE 1



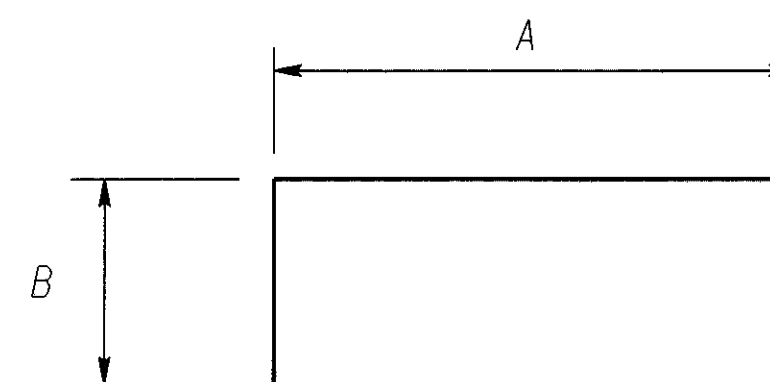
TYPE 2



TYPE 3



TYPE 4



TYPE 5

EPOXY COATED REINFORCING STEEL LIST

MARK	NUMBER			LENGTH	MASS	TYPE	DIMENSION				
	PHASE 1	PHASE 2	TOTAL								
				millimeters	kilograms		A	B	C	D	
SUPERSTRUCTURE :											
SI3M01	57	69	126	9750	1221	ST.					
SI3M02	99	99	298	1350	400	I	280	575	575		
SI6M01	178	---	178	5200	1437	ST.					
SI6M02	---	177	177	5470	1503	ST.					
SI6M03	15	---	15	Varies from 1600 to 4960 by 240	76	ST.					
SI6M04	16	---	16	Varies from 1350 to 4950 by 240	78	ST.					
SI6M05	---	20	20	Varies from 660 to 5220 by 240	91	ST.					
SI6M06	---	16	16	Varies from 1600 to 5200 by 240	85	ST.					
SI6M07	10	10	20	1350	42	ST.					
SI6M08	51	75	126	9850	1926	ST.					
SI6M09	2	---	2	5950	19	ST.					
SI6M10	---	2	2	6275	19	ST.					
REAR ABUTMENT :											
AI6M01	9	---	9	1400	20	I	585	550	345		
AI6M02	12	---	12	4725	88	ST.					
AI6M03	2	---	2	3200	10	I	150	1565	1565		
AI6M04	4	---	4	2900	18	ST.					
AI6M05	1	---	1	5975	9	ST.					
AI6M06	---	1	1	5550	9	ST.					
AI6M07	4	---	4	5800	36	ST.					
AI6M08	---	2	2	6675	21	2	5510	1185	1026		
AI6M09	---	2	2	6400	20	2	5765	655	567		
AI6M10	---	3	3	1575	7	2	790	805	697		
AI6M11	---	3	3	1775	8	2	610	1185	1026		
AI6M12	2	---	2	3350	10	3	1600	885	443		
D25M01	13	12	25	1650	164	4	950	305			
SUB-TOTAL SUPERSTRUCTURE & REAR ABUTMENT					7317						

DECK SCREED ELEVATIONS

	Left Deck Edge	Girder 1	Girder 2	Phase Construction Joint	Q Survey S.R. 152	Girder 3	Girder 4	Right Deck Edge
Q Rear Bearing	* 264.935	264.940	264.950	264.950	264.955	264.915	264.830	* 264.825
1/4 Point	264.820	264.830	264.835	264.845	264.835	264.810	264.720	264.720
1/2 Point	264.705	264.720	264.725	264.730	264.710	264.700	264.615	264.605
3/4 Point	264.575	264.575	264.590	264.600	264.605	264.565	264.495	264.470
Q Fwd. Bearing	* 264.435	264.425	264.445	264.460	264.460	264.430	264.380	* 264.335

EPOXY COATED REINFORCING STEEL LIST

MARK	NUMBER			LENGTH	MASS	TYPE	DIMENSION				
	PHASE 1	PHASE 2	TOTAL								
				millimeters	kilograms		A	B	C	D	
FORWARD ABUTMENT :											
AI6M13	---	5	5	6175	48	ST.					
AI6M14	---	3	3	1525	7	5	1015	550			
AI6M15	1	---	1	5500	9	ST.					
AI6M16	2	---	2	6675	21	2	5515	1180	1022		
AI6M17	2	---	2	6475	20	2	5740	755	654		
AI6M18	3	---	3	1550	7	2	785	785	680		
AI6M19	3	---	3	1775	8	2	605	1190	1030		
D25M02	12	13	25	1525	152	4	825	305			

The reinforcing steel list is for information only.

Elevations are for the proposed deck surface prior to placement of deck concrete. Allowances have been made for anticipated deflection of beams.

* Elevation does not include additional 100 mm curb height.

SPECIAL PROVISIONS

WATERWAY PERMITS FOR

CRS: JEF-152-13.864

U.S. ARMY CORPS OF ENGINEERS
PERMIT NUMBER: NWP #3

OHIO EPA
PERMIT NUMBER: _____

DATE: 9/16/98

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.

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 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 resources 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.

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 NWPs 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.

**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 ² (sq. ft.).....	14 (150)	46 (500)	93 (1000)
Telephone	2	4	4
Base Radio & 4-Hand Held Units ¹	--	--	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 ²	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 815

FIELD PAINTING OF EXISTING STEEL, SYSTEM OZEU

May 30, 1996

- 815.01 Description
- 815.02 Materials
- 815.03 Quality Control
- 815.04 Surface Preparation
- 815.05 Test Equipment
- 815.06 Handling
- 815.07 Mixing and Thinning
- 815.08 Coating Application
- 815.09 Caulking
- 815.10 Safety Requirements and Precautions
- 815.11 Inspection Access
- 815.12 Protection of Persons and Property
- 815.13 Pollution Control
- 815.14 Work Limitations
- 815.15 Method of Measurement
- 815.16 Basis of Payment

815.01 DESCRIPTION. This item shall consist of furnishing all necessary labor, materials, and equipment to clean and paint all existing steel surfaces as specified herein.

815.02 MATERIALS. A three coat paint system consisting of: Organic Zinc Prime Coat, Epoxy Intermediate Coat and a Urethane Finish Coat. The Contractor shall select a coating system meeting the requirements of Supplemental Specification 910 entitled OZEU Structural Steel Paint. The approved list of coatings meeting this specification is on file at the Office of Materials Management and District Office.

815.03 QUALITY CONTROL Quality control will consist of the following items:

A. Contractor Quality Control Specialist. Before any work begins, the Contractor shall designate one individual on each project as a Quality Control Specialist (only one person per project will be necessary unless the Contractor is working at more than 3 sites simultaneously). In which case, it will be necessary to provide an additional Quality Control Specialist for each additional three (or portion of three) sites being painted simultaneously. This person will not be a Foreman or member of the Contractor's production staff (ie. he will not abrasive blast, paint, recover spent abrasives, etc.). He will not be involved in any other miscellaneous tasks (ie. mixing paint, running errands, running or working on equipment, etc.) while any production work is taking place. Documentation that personnel performing quality control related functions are qualified shall be submitted to the Engineer prior to allowing the Quality Control Specialist (QCS) to begin work. Documentation/verification shall be provided to the Engineer that the QCS has received formal training from one of the following: KTA Tator, S. G. Pinney, or Corrosion Control Consultants. He shall be equipped with material safety data sheets, product data sheets, tools and equipment to provide quality control on all facets of the work and shall have a thorough understanding of the plans and specifications pertaining to this project. He shall be responsible for inspecting the equipment at the specified intervals, the abrasives, and the work, at all quality control points. He shall also be responsible for verifying that all work is done within the specified work limitations. He shall cooperate with the Inspector and compare and document quality control readings. He shall have the authority to stop work and the responsibility to inform the Contractor's Foreman of nonconforming work.

B. Quality Control Points. Quality control points (QCP) are points in time when one phase of the work is complete and ready for inspection by both the Contractor and the Engineer prior to continuing with the next operational step. At these points: The Contractor shall afford access to inspect all affected surfaces. If 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 State of Ohio to final acceptance.

Quality Control Points (QCP)	PURPOSE
1. Solvent Cleaning	Remove asphaltic cement, oil, grease, salt, dirt, etc. followed by washdown
2. Grinding Flange Edges	Remove sharp corners, as detailed on plans
3. Containment/Waste Disposal	Contain, collect & dispose of abrasive blasting debris

4. Abrasive Blasting	Blasted surface to receive paint
5. Prime Coat Application	Check surface cleanliness; apply prime coat; check coating thickness
6. Removing Fins, Tears, slivers	Remove surface defects and slivers
7. Caulking	Caulk areas detailed on plans
8. Intermediate Coat Application	Check surface cleanliness; apply intermediate coat, check coating thickness
9. Finish Coat Application	Check surface cleanliness, apply finish coat, check coating thickness
10. Final Review	Visual inspection of system for Acceptance and check total system thickness.

815.04 SURFACE PREPARATION. This item shall also consist of solvent cleaning (if required), abrasive blasting, and providing a wash facility for the Engineer and Inspectors.

A. Solvent Cleaning (QCP #1) If specifically required by plan note, the bridge shall be solvent cleaned to remove all traces of asphaltic cement, oil, grease, diesel fuel deposits, and other soluble contaminants, (QCP #1) (see SSPC-SP 1 Solvent Cleaning for recommended practices). Under no circumstances shall any abrasive blasting be done to areas with asphaltic cement, oil, grease, or diesel fuel deposits. All solvent cleaned areas shall be subsequently washed before abrasive blasting as detailed below.

Washing shall be accomplished with potable water having a nozzle pressure of at least 7 MPa(1,000 PSI)and a delivery rate of not less than 15 L (4 gallon) per minute. The Contractor, shall provide equipment specifications to verify the above. The equipment shall also be equipped with gauges to verify the pressure. The nozzle shall be held at a maximum of 300 mm (12 inches) from the surface being washed.

B. Grinding Flange Edges (QCP #2) . If a pay item for this work is shown on the plans, all exposed bottom flange edges of longitudinal rolled and welded beams in areas designated on the plans shall be rounded to a radius of 3 mm plus or minus 1.5 mm (1/8 inch plus or minus 1/16 inch) before abrasive blasting. This work may be done without weather and temperature restrictions.

C. Containment/Waste Disposal (QCP #3). Waste material generated by abrasive blasting operations is a solid waste and shall be handled as follows: (1) Contained, (2) Collected, (3) Stored, (4) Evaluated, (5) Properly disposed.

All equipment shall be parked on ground covers free of cuts, tears or holes to prevent contamination of pavement or soil and to protect area under and around equipment.

The Contractor shall erect an enclosure to completely surround (around and under) the blasting operations. The ground cannot be used as the bottom of the enclosure unless completely covered with plastic or tarps.

The enclosure shall be constructed of flexible materials such as tarpaulins or containment screens (specifically designed for this purpose), or of rigid materials such as plywood. All materials shall be maintained free of tears, cuts or holes; however, flexible material used for the sides of the enclosure only may be weaved to contain a maximum of 15 percent holes and a minimum of 85 percent material. All seams shall be overlapped a minimum of 150 mm (6 inches) and fastened together at 300 mm (12 inch) centers, or fastened and overlapped in a manner that insures a seal which does not allow openings between the screens in the containment. The vertical sides of the enclosure shall extend completely up to the bottom of the deck on a steel beam bridge. All blasting operations on a truss type bridge shall be completely enclosed, including top side. Bulkheads shall be used between beams to enclose the blasting area.

Vacuum blasting may be used in lieu of containment, providing that the vacuum blasting equipment is manufactured and marketed for this purpose and is equipped with controls which automatically shut down the blasting operation if the blast head brushes are not held in contact with the surface being cleaned.

All debris collected by these operations, removed from equipment or filters, or that has fallen to the ground, shall be collected and stored at the bridge site, if practical, for testing, evaluation and disposal. If not practical, an alternate location shall be mutually agreed upon by the Engineer and Contractor. Additionally, centralized cleaning stations for recyclable steel, ferric oxide, or aluminum oxide grit (if used) shall be set up at a location mutually agreed upon by the Contractor and Engineer. Storage shall be in steel containers and shall have lids which shall be locked at the end of each workday.

The Contractor shall obtain the services of a testing laboratory to obtain directly from the project site and evaluate a composite representative sample of the abrasive blasting debris for each bridge site. The person taking the sample will be an employee of the testing laboratory.

The composite sample shall consist of individual samples taken from all containers which are on the site at the time of the sampling. These individual samples shall be blended together to comprise one composite sample. The individual samples shall be of equal size. There shall be one individual sample taken from each drum and four randomly spaced individual samples taken from each container other than drums.

The individual samples shall be taken with stainless steel tools and placed into either clean glass or plastic containers. All sampling shall be done in the presence of the Engineer. In addition to the above mentioned requirements, the sampling shall also comply with the requirements of U.S. EPA Publication SW 846.

A Chain of Custody must also accompany all composite samples. Included in this document shall be in the name of the person taking the sample, the Company for which he works, the date and time which the sample was taken, the bridge from which it was taken, the Township and Municipality where the bridge is located and signatures of all persons involved in the Chain of Custody, including dates of possession.

The sampling shall be done within the first week of production blasting at each bridge. If the sampling is not done within the time allotted above, all blasting and painting operations on the bridge from which waste was generated, shall promptly cease.

The composite sample shall be tested for lead and chromium in accordance with U.S. EPA Publication SW 846. The test results and Chain of Custody records shall immediately be forwarded to the Director. If the material is hazardous, the Contractor shall also forward the names of the hauler and treatment facility to the Director. Any additional testing required by the hauler, treatment facility, or landfill will be paid for by Contractor.

All federal, state and local environmental protection laws, regulations and ordinances including, but not limited to, air quality, waste containment and waste removal must be observed during the performance of this contract.

In respect to enforcement of the above mentioned laws, bidders are advised that various governmental bodies have this responsibility. It is the responsibility of the bidders to comply with those laws as enforced by those various governmental bodies.

The existing paint being removed from these bridges may contain lead or chromium. The Contractor is responsible to assure that workers take proper safety precautions when working in this environment (see bid proposal note entitled "Safety").

Hazardous Waste: If the tests reveal that the maximum concentration of either lead or chromium exceeds 5.0 milligrams per liter, the waste shall be treated as a hazardous waste and the steel containers shall be labeled as a hazardous waste. The Director will then obtain a generator number assigned to the State.

All containers of waste material which have been classified as hazardous shall be stored in a secured location until proper disposal. The storage site shall be surrounded with 1.5 m (5 foot) high chain link fence fabric supported by traffic sign drive posts at 3 m (10 foot) center to center. Drive posts shall be embedded into the ground at least 0.6 m (2 feet) deep. The fencing shall be secured with padlocks at the end of each day. Signs shall be posted in obvious locations on the enclosure warning of the hazardous material.

The Contractor shall then arrange for hauling, treating and disposal of all hazardous waste. All hazardous waste shall be disposed of after the Director has obtained a generator number. In every case, any and all hazardous waste shall be disposed of within 60 days after it is generated. Failure to comply with the 60 day disposal requirement shall be considered by the Department as a breach of contract by the Contractor and all abrasive blasting and painting of structural steel on the project shall immediately cease until the hazardous waste is properly disposed. Upon such breach, the Department shall cease processing all pay estimates and notification of the breach shall be sent to the Contractor's surety. Further, any fines or liens assessed by any governmental agency which has jurisdiction over the disposal of this material shall be the responsibility of the Contractor. The hauling and disposal shall be by a firm licensed by U.S. EPA and who shall also be responsible for providing the Uniform Hazardous Waste Manifest (EPA Form 8700-22A).

The Contractor shall decontaminate or dispose of all collection/containment equipment in accordance with EPA guidelines.

Non-Hazardous Solid Waste: If the waste is determined to be non-hazardous as verified by test results which have been reviewed by the Director, it shall be hauled and disposed of at a facility which is licensed to accept non-hazardous solid waste. Prior to disposal of any material, the Contractor shall submit the test results and documentation that the disposal facility is licensed by the EPA to accept non-hazardous solid waste, to the Engineer. The Contractor shall obtain and provide the Engineer with a receipt documenting disposal of waste material at the approved landfill.

D. Abrasive Blasting (QCP #4), Prior to any abrasive blasting, all dirt, sand, bird nestings, bird droppings and other debris shall be completely removed from the scuppers, bulb angles, pier and abutment seats.

All steel to be painted shall be blast cleaned according to SSPC-SP10 and as shown SSPC-Vis 1-89 (pictorial surface preparation standards for painting steel surfaces). Steel shall be maintained in a blast cleaned condition until it has received a prime coat of paint.

The back side of end cross frame assemblies which are 75 mm (3 inches) or closer to backwalls may be commercial blast cleaned according to SSPC-SP6.

Galvanized steel (including corrugated steel bridge flooring), adjacent concrete which has been coated or sealed, 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 Contractor's expense.

The abrasive shall be a recyclable steel, ferric oxide, or aluminum oxide grit. After each use and prior to reuse, the grit shall be cleaned of paint chips, rust, mill scale and other foreign material by equipment specifically designed for such cleaning. The Contractor is responsible for assuring recycling and cleaning equipment is capable of operating with the chosen blasting media.

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 an oil film on the surface of the water shall be cause for rejection. This test shall be conducted on each load of abrasives delivered to the job site.

The resultant surface profile shall be a minimum of 40 µm (1.5 mils) and a maximum of 90 µm (3.5 mils). 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 reblasted when the steel temperature is at least 3° C (5° F) above the dew point. Dew point shall be defined as the temperature at which moisture condenses on the steel surfaces.

All abrasives and residue shall be removed from all surfaces to be painted. All steel blast cleaned in any one day shall be kept dust free and prime coated the same day. Failure to prime coat the same day will require reblasting before prime coating. No dust or abrasives from adjacent work shall be left on the finish coat. The Quality Control Specialist shall perform the following test (and the Inspector will verify) to insure that the 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 another test. This test shall be done at the start of each shift and at 4 hour intervals. The abrasive shall be tested for oil contamination at the same time.

Abrasive blasting and painting may take place simultaneously on any one bridge as long as abrasive blasting debris and/or dust by the blowing operation does not come in contact with freshly painted surfaces.

The Material Safety Data Sheet (MSDS) shall be provided at the preconstruction meeting for all abrasives to be used on this project. No work shall start until the MSDS has been submitted.

The Contractor shall provide the Engineer and Inspectors a wash facility with running water to permit washing of face and hands during the surface

preparation operation. It shall at all times contain an adequate supply of potable water, soap and towels. The Contractor shall be responsible to properly contain, test and dispose of the waste water. The wash facility shall be located at each bridge site in an area that will not be contaminated by the blasting debris.

E. Prime, Intermediate and Finish Coat Application (QCP #5, #8, & #9). Each coat of paint shall be in a proper state of cure or dryness before the application of succeeding coats. Paint shall be considered ready for overcoating when an additional coat can be applied without the development of any detrimental film irregularities, such as lifting, wrinkling or loss of adhesion of the undercoat. The time interval between coating applications shall be in compliance with manufacturer's written instructions and no more than 30 days between the prime and intermediate coats and 13 days between the intermediate and finish coats. These maximum recoat times include weather related days. No additional time for weather delays will be allowed. Any coat which has cured more than the above allotted time without overcoating shall be removed and the steel reblasted to SP 10.

The completion date (month and year) of the finish coat and the letters OZEU shall be stenciled on the steel in 100 mm (4 inch) letters with a black urethane paint. This date shall be applied at four locations near the end of each outside beam on the outside web visible from the road or as directed by the Engineer.

F. Removing Fins, Tears, Slivers (QCP #6). All fins, tears, slivers or any other burred or sharp edges that become evident after priming, shall be removed by grinding. All ground surfaces shall be retextured to produce a profile of 40 to 90 µm (1.5 to 3.5 mils) and reprimed prior to application of the intermediate coat. The Contractor may also begin removing fins, tears and slivers after blasting and prior to priming.

Temperature and weather restrictions do not apply to this item. Reapplying primer shall comply with weather restrictions.

G. Caulking (QCP #7). Caulking (if a pay item) will be performed in areas of the bridge where depicted/described in the plans.

H. Job Site Visual Standards. Job site visual standards include preparation of test section, subsequent test section, and photographs of approved test section. Job site visual standards shall be used in addition to the SSPC-Vis-1-89 standard for blasting. Before any abrasive blasting is started, the Contractor will prepare a test section on the first bridge to be painted. The test section will be a representative area to be blast cleaned [approximately 2 - 3 m² (20-30 square feet)]. The test section area shall be photographed and the steel surface checked for the proper profile after the Engineer and the Contractor agree that the area has been blast cleaned according to plan requirements. Only after a test section area has been approved and documented by photographs and replica tape, may the Contractor proceed with his blast cleaning operations. The job site visual standards (photographs) shall be used in addition to plan specifications to determine acceptance of blast cleaning procedures, but in all cases of dispute, the SSPC-Vis-1-89 standard shall govern. If, in the opinion of the Contractor or Engineer, a subsequent bridge is not indicative of the bridge on which the test section was performed, he may request another test section.

815.05 TESTING EQUIPMENT. The Contractor shall provide the Engineer the following testing equipment in good working order, for the duration of the project. When the Contractor'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. A camera with the following features and 5 (unless otherwise specified on plans) rolls of color film: A) Uses self developing color print film, B) Lens with auto focus system, C) Focuses from 0.6 m (2 feet) to infinity, D) Built-in fill flash.
2. One Spring micrometer and 3 rolls of extra-coarse replica tape.
3. One Positector 2000 or 6000, Quanix 2200, or Elcometer A345FBI1; and the calibration plates, 38-200 µm and 250-625 µm (1.5 -8 mils and 10-25 mils) as per the NBS calibration standards in accordance with ASTM D 1186.
4. One Sling Psychrometer including Psychometric tables - Used to relative humidity and dew point temperature.
5. 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

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

815.06 HANDLING. All paint and thinner shall be delivered to the project site 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.

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.

All containers of paint and thinner shall remain unopened until required for use. The label information shall be legible and shall be 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.

Paint may be considered as eligible for payment for material on hand as specified in 109.07. However, only paint which the Contractor can prove to

the Engineer will be used during the construction season shall be eligible for payment. The Contractor shall provide the Engineer calculations indicating the total m² (square feet) of steel to be painted during the construction season. He shall also provide calculations showing the total number of liters (gallons) required. The Contractor shall be responsible to store the paint on the project in such manner to prevent theft and adverse temperatures. He shall provide thermometers capable of monitoring the maximum high and low temperatures within the storage facility. The Contractor is responsible for properly disposing of all unused paint and paint containers.

The Contractor shall furnish shipping invoices for all materials used on the project to the Engineer, prior to use.

815.07 MIXING AND THINNING. All ingredients in any container of paint shall be thoroughly mixed immediately before use and shall be agitated often enough during application to maintain a uniform composition; however, 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.

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 Engineer'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 Engineer. 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.

815.08 COATING APPLICATION. Coating application will be as follows.

A. General All structural steel, scuppers, expansion joints (except top surface), steel railing, exposed steel piling, drain troughs and other areas as indicated in the plans shall be painted. Galvanized surfaces shall not be painted unless otherwise noted on plans.

The following methods of application are permitted for use by this specification, as long as they are compatible with the paint being used: brush, spray, or any combination of these methods unless specified differently in the plans. Daubers, small diameter rollers or sheepskins may be used for places of difficult access when no other method is practical and in all cases shall be used where cross-frame angles are located within 50 mm (2 inches) of the bottom flange and where end cross frames are within 150 mm (6 inches) of the backwall and bottom of bottom flanges around bearings less than 150 mm (6 inches) in height.

If the surface is degraded or contaminated after surface preparation and before painting, the surface shall be restored before painting application. In order to prevent degradation or contamination of cleaned surface, the prime coat of paint shall be applied the same day of blast cleaning as required in surface preparation above.

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. Overspray and pigeon droppings shall be removed with a stiff bristle brush, wire screen, or a water wash with sufficient pressure to remove overspray without damaging the paint. The overspray must be removed before applying the next coat. All abrasives and residue shall be removed from painted surfaces, before recoating, with a vacuum system equipped with a brush type cleaning tool.

No visible abrasives from adjacent work shall be left on the finish coat. Abrasives on the finish coat shall be removed.

If brush application of the coating is used, it shall produce a smooth coat. Care shall be taken to work the paint into all crevices, corners, and around all bolt and rivet heads.

B. Spray Application (General). All spray application of paint shall be in accordance with the following:

Primer ingredients shall be kept uniformly mixed in the spray pot or container during application by continuous, automated mechanical agitation (hand held mixers not allowed).

Spray equipment shall be kept clean so that 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. All bolts and rivet heads shall be sprayed from at least 2 directions or brushed to assure coverage.

Each spray operator shall demonstrate to the Engineer his ability to apply the paint as specified. Any operator who does not demonstrate this ability shall not spray.

If mud cracking occurs, the affected area shall be cleaned to bare metal in accordance with surface preparation above and repainted.

All gaps and crevices 3 mm (1/8 inch) or less shall be filled with primer.

All spray equipment used shall be suitable for use with the specified paint. Paint manufacturer's equipment recommendations shall be followed 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 Contractor and verified by the Engineer to insure that the traps or separators are working properly.

Air shall be 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.

Spray application of all coats shall not be used unless the operation is totally enclosed to prevent overspray damage to the ground, public and private property, any and all vegetation, streams, lakes, etc. This containment shall be accomplished with tarps, plywood or other shields. If brush is used, more than one coat may be necessary to produce the required thickness.

C. Application Approval. The beginning of the application of each of the three different coats shall be subject to inspection and approval to detect any defects which might result from the Contractor's methods. If defects are discovered, the Contractor shall make all necessary adjustments to his method of application to eliminate them before proceeding with coat application.

D. 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.
Intermediate	6 hrs.	5 hrs.	4 hrs.
Finish	8 hrs.	6 hrs.	4 hrs.

The above temperatures and times shall be monitored with the recording thermometer.

A heated enclosure may be used. The heat within the enclosure may be supplied by any means which will maintain the required temperature continuously and uniformly in all parts of the enclosure. The heat will be supplied as required to maintain the required minimum temperature until the coating has cured.

If combustion type heating units are used, they will be vented away from the enclosure, and exhaust fumes will not be permitted to enter the enclosure. No open combustion of any kind will be permitted in the enclosure.

E. 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 during rain, fog or mist unless the above moisture criteria is met.

F. Repair Procedures. Damaged areas, and areas which do not comply with the requirements of this specification, shall have the paint removed and all defects corrected. The steel should then be retextured to a near white condition to produce a profile of between 40 to 90 µm (1.5 to 3.5 mils). This profile should be measured immediately prior to the application of the prime coat to insure that the profile is not destroyed during the feathering procedure.

The existing paint should be feathered to expose a minimum of 13 mm (½ inch) of each coat.

During the reapplication of the paint, care shall be used to insure that each paint coat is applied only within the following areas. The prime coat shall only be applied to the surface of the bare steel and the existing prime coat which has been exposed by feathering. The prime coat shall not be applied to the adjacent intermediate coat. The intermediate coat shall only be applied to the new prime coat and the existing feathered intermediate coat. The intermediate coat shall not be applied to the adjacent finish coat. The finish coat shall only be applied to the new intermediate coat and the existing finish coat which has been feathered or lightly sanded. The finish coat shall not extend beyond the areas which have been feathered or lightly sanded.

At the perimeter of the repair area, the first two coats shall be applied by brush. The finish coat shall be applied by either brush or spray.

It may be necessary to make several applications in order to achieve the proper thickness for each coat.

During the application of the prime coat, the paint shall be continuously mixed.

All surface preparation and painting shall still be done in accordance with the specifications. In lieu of abrasive blasting, alternate methods of surface preparation may be allowed.

All repairs shall be made 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 Contractor shall submit his method of correcting runs in writing to the Director for approval.

G. Continuity. Each coat of paint shall be applied as a continuous film of uniform thickness free of all defects such as holidays, runs, sags, etc. All thin spots or areas missed shall be repainted and permitted to dry before the next coat of paint is applied.

H. Dry Film Thickness. Prime thickness, cumulative prime and intermediate thickness, and cumulative prime, intermediate and finish 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 m² (100 square feet)of 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 m² (100 square foot) area shall not be less than the specified thickness. No single spot measurement in any 9 m² (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 overrun by a greater amount. The 5 spot measurements shall be made for each 9 m² (100 square feet) of area as follows:

1. For structures not exceeding 27 m² (300 square feet) in area, each 9 m² (100 square foot) area shall be measured.
2. For structures not exceeding 90 m² (1,000 square feet) in area, three 9 m² (100 square foot) areas shall be randomly selected and measured.
3. For structures exceeding 90 m² (1,000 square feet) in area, the first 90 m² (1,000 square feet) shall be measured as stated in section 2 and for each additional 90 m² (1,000 square feet), or increment thereof, one 9 m² (100 square foot) area shall be randomly selected and measured.

4. If the dry film thickness for any 9 m² (100 square foot) area (sections 2 & 3) is not in compliance with the requirements of paragraph 1 of this section, then each 9 m² (100 square foot) area shall be measured.

5. Other size areas or number of spot measurements as specified in the contract plans shall be measured.
Each coat of paint shall have the following thickness measured above the peaks:

	Min. Spec. Thickness	Max. Spec. Thickness	Min. Spot	Max. Spot
Prime	75 µm (3.0 mil)	125 µm (5.0 mil)	60 µm (2.4mil)	188 µm (7.5mil)
Intermediate	125 µm (5.0 mil)	175 µm (7.0 mil)	100 µm (4.0 mil)	263 µm (10.5 mil)
Sub Total	200 µm (8.0 mil)	300 µm (12.0 mil)	160 µm (6.4 mil)	450 µm (18.0 mil)
Finish	50 µm (2.0 mil)	100 µm (4.0 mil)	40 µm (1.6 mil)	150 µm (6.0 mil)
Total	250 µm (10.0 mil)	400 µm (16.0 mil)	200 µm (8.0 mil)	600 µm (24.0 mil)

Film thicknesses greater than the maximum specified thicknesses that do not exhibit defects (such as runs, sags, bubbles, mudcracking, etc.) and for which the Contractor has received a written statement from the coating manufacturer stating that this excessive thickness is not detrimental, may remain in place at the discretion of the Director.

For any spot or maximum average thickness over 600 µm (24 mils) it will be necessary for the Contractor to prove to the Department that the excess thickness will not be detrimental to the coating system. This shall be accomplished by providing the Director, for approval, certified test data proving that the excessive thickness will adequately bond to the steel when subjected to thermal expansion and contraction. This thermal expansion and contraction test shall take place over five 5 cycles of a temperature ranges from -29⁰ C to 49 ⁰ C (-20 ⁰ F to 120 ⁰ F). After the thermal contraction and expansion cycles have taken place, the tested system shall be subjected to pull off tests and the results compared to the results of pull off tests which have been performed on a paint system with the proper thicknesses. In addition to the certified test results, it will also be necessary for the Contractor to provide the Director a written statement from the paint manufacturer stating that this excessive thickness is not detrimental.

If the Director does not approve the excessive coating thicknesses or the Contractor elects not to provide the required written statement from the paint manufacturer and the certified test results when required, the Contractor, at his own expense, shall remove and replace the coating. The removal and replacement of the coating shall be done as specified in 815.08 F Repair Procedures.

815.09 CAULKING QCP #7. The material shall be a two component, 100% solids epoxy and shall be one of the following:
MANUFACTURER

Mark 270 Poly-Carb Solon, OH 216-248-1223	KOP-COAT A-788 Splash Zone Compound Carboline Company Hamilton, OH 513-896-1919
Sikadur Injection Gel Sika Chemical Corp. Lyndhurst, N.J. 201-933-8801	OR Other Commercially Available, 100% Solid, Non-Sag, Non-Shrink Epoxy Based System Capable Of Filling Voids Up To 25 mm (1 inch) Wide

815.10 SAFETY REQUIREMENTS AND PRECAUTIONS. The Contractor shall meet the applicable safety requirements of the Ohio Industrial Commission and the Occupational Safety and Health Administration (OSHA), in addition to the scaffolding requirements specified below.

The Material Safety Data Sheets (MSDS) shall be provided at the preconstruction meeting for all paints, thinners and abrasives used on this project. No work shall start until the MSDS has been submitted.

815.11 INSPECTION ACCESS. In addition to the requirements of 105.11, the Contractor shall furnish, erect, and move scaffolding and other appropriate equipment, to permit the Inspector the opportunity to closely observe all affected surfaces. This opportunity shall be provided to the Inspector during all phases of the work and continue for a period of at least 10 working days after each structure has been completely painted.

When scaffolding, or the hangers attached to the scaffolding are supported by horizontal wire ropes, or when scaffolding is placed directly under the

surface to be painted, the following requirements shall be complied with:

A. When scaffolding is suspended 1092 mm (43 inches) or more below the surface to be painted, two guardrails shall be placed on all sides of the scaffolding. One guardrail shall be placed at 1067 mm (42 inches) above the scaffolding and the other guardrail at 508 mm (20 inches) above the scaffolding.

B. When the scaffolding is suspended at least 533 mm (21 inches) but less than 1092 mm (43 inches) below the surface to be painted, one guardrail shall be placed on all sides of the scaffolding at 508 mm (20 inches) above the scaffolding.

C. Two guardrails shall be placed on all sides of scaffolding not previously mentioned. The guardrails shall be placed at 1067 mm (42 inches) and 508 mm (20 inches) above scaffolding, as previously mentioned.

D. All scaffolding must be at least 610 mm (24 inches) wide when guardrail is used and 711 mm (28 inches) wide when the scaffolding is suspended less than 533 mm (21 inches) below the surface to be painted and guardrail is not used. If 2 or more scaffolding are laid parallel to achieve the proper width, they must be rigidly attached to each other to preclude any differential movement.

E. All guardrail shall be constructed as a substantial barrier which is securely fastened in place and is free from protruding objects such as nails, screws and bolts. There shall be an opening in the guardrail, properly located, to allow the Inspector access onto the scaffolding.

F. The rails and uprights shall be either metal or wood. If pipe railing is used, the railing shall have a nominal diameter of no less than 38 mm (1.5 inches). If structural steel railing is used, the rails shall be 50x50x9 mm (2x2x3/8 inch) steel angles or other metal shapes of equal or greater strength. If wood railing is used, the railing shall be 50x100 mm (2x4 inches) (nominal) stock. All uprights shall be spaced at no more than 2.4 m (8 feet) on center. If wood uprights are used, the uprights shall be 50x100 mm (2x4 inches) (nominal) stock.

G. When the surface to be inspected is more than 4.57 m (15 feet) above the ground or water, and the scaffolding is supported from the structure being painted, the Contractor shall provide the Inspector with a safety harness (not a safety belt) and lifeline. The lifeline shall not allow a fall greater than 1.8 m (6 feet). The Contractor shall provide a method of attaching the lifeline to the structure independent of the scaffolding, cables, or brackets supporting the scaffolding.

H. When scaffolding is more than 762 mm (2.5 feet) above the ground, the Contractor shall provide a ladder for access onto the scaffolding. The ladder and any equipment used to attach the ladder to the structure shall be capable of supporting 113 kg (250 pounds) with a safety factor of at least four. All rungs, steps, cleats, or treads shall have uniform spacing and shall not exceed 305 mm (12 inches) on center. At least one side rail shall extend at least 914 mm (36 inches) above the landing near the top of the ladder.

I. An additional landing shall be required when the distance from the ladder to the point where the scaffolding may be accessed, exceeds 305 mm (12 inches). The landing shall be a minimum of at least 610 mm (24 inches) wide and 610 mm (24 inches) long. It shall also be of adequate size and shape so that the distance from the landing to the point where the scaffolding is accessed does not exceed 305 mm (12 inches). The landing shall be rigid and firmly attached to the ladder; however, it shall not be supported by the ladder. The scaffolding shall be capable of supporting a minimum of 454 kg (1000 pounds).

J. In addition to the aforementioned requirements, the Contractor shall be responsible to observe and comply with all Federal, State and local laws, ordinances, regulations, orders and decrees.

K. The Contractor shall furnish all necessary traffic control to permit inspection during and after all phases of the project.

815.12 PROTECTION OF PERSONS AND PROPERTY. The Contractor shall collect, remove and dispose of all buckets, rags or other discarded materials and shall leave the job site in a clean condition.

The Contractor shall protect all portions of the structure, which are not to be painted, against damage or disfigurement by splashes, spatters, and smirches of paint. Deck bottoms and backwalls are exempt from this requirement.

When or where any direct or indirect damage or injury is done to public or private property, the Contractor shall restore, at his own expense, such property, to a condition similar or equal to that existing before such damage or injury was done.

815.13 POLLUTION CONTROL The Contractor shall take all necessary precautions to comply with pollution control laws, rules or regulations of Federal, State or local agencies and as required in this specification.

815.14 WORK LIMITATIONS. Abrasive blasting and painting shall be done between April 1 and October 31. Even though the Contractor is permitted to work prior to May 1, April is considered a winter month and no extension due to adverse weather conditions will be granted for this period. Additional work limitations on specific bridges/projects may be required by plan note.

815.15 METHOD OF MEASUREMENT. Field painting of structural steel is based on a square meter (square foot) pay item. All field painting will include 3 coats of paint; prime coat, intermediate coat, and finish coat.

On steel beam and steel girder bridges, the surface area is based on a nominal measurement of the beams; ie. 2 times the beam depth plus 3 times the flange width. In addition to this nominal measurement, a percentage is added to account for incidentals such as cross frames, bearing assemblies, stiffeners, expansion joints, scuppers, etc. Thus, it is not necessary for the Inspector to field measure every detail of the bridge to verify quantities. Some extremely complex bridges, such as trusses, will be paid for as lump sum. In the case of a quantity dispute, exact field measurements of all painted surfaces and/or calculations will govern.

Grinding fins, tears, slivers is based on the manhours expended only by the workmen who are actually doing the grinding and will include all the time when the workmen are performing grinding and repairing prime coat and not limited to the actual grinding duration (ie. all hours of the workmen when assigned to grinding regardless of actual grinding time).

Grinding of flange edges: This pay item includes all labor and equipment to grind the bottom flange edges denoted in the plans. Each meter (one linear foot) of beam represents 4 m (4 linear feet) of edge grinding.

Caulking: Includes all labor, materials and equipment to caulk areas described in the plans. Each meter (linear foot) of caulk (regardless of width or

thickness) shall be measured for payment.

Surface Preparation: This lump sum or m² (square feet) item includes all labor, materials and equipment necessary to: contain, collect, store, evaluate, ship, treat and dispose of all waste materials generated by this project and to prepare the surface as required by these specifications, prior to applying the prime coat.

815.16 BASIS OF PAYMENT. Payment for field painting will be made at the contract prices for:

Item	Unit	Description
815	Square meter (square foot), lump sum	Surface preparation of existing steel, System OZEU
815	Square meter (square foot), lump sum	Field painting of existing steel, prime coat, System OZEU
815	Square mete, (square foot), Lump sum	Field Painting of existing steel, Intermediate coat, System OZEU
815	Square meter (square foot), Lump sum	Field Painting of existing steel, Finish coat, System OZEU
815	Man Hour	Grinding Fins, Tears, Slivers
815	Meter (Linear foot)	Grinding Flange Edges
815	Meter (Linear foot)	Caulking

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION

SUPPLEMENTAL SPECIFICATION 816

ITEM 816 FIELD PAINTING OF NEW STEEL, SYSTEM IZEU

April 21, 1997

816.01	Description
816.02	Materials
816.03	Quality Control
816.04	Surface Preparation
816.05	Test Equipment
816.06	Handling
816.07	Mixing and Thinning
816.08	Coating Application
816.09	Safety Requirements and Precautions
816.10	Inspection Access
816.11	Protection of People and Property
816.12	Pollution Control
816.13	Work Limitations
816.14	Method of Measurement
816.15	Basis of Payment

816.01 DESCRIPTION

These provisions contain requirements to field apply an **Epoxy Intermediate Coat** and a **Urethane Finish Coat** to new structural steel which has been shop primed with an **Inorganic Zinc Coat**.

816.02 MATERIALS

A. Inorganic Zinc Prime Coat

This coating shall conform to CMS 708.17, Inorganic Zinc Silicate Primer paint. Prime coat shall be applied in accordance with CMS 513.222 and CMS 514.01 through 514.04. Thickness of the prime coat and measurement of the thickness shall conform to Dry Film Thickness requirements in this specification. All bolts, nuts and washers that will be in contact with painted surfaces, shall be galvanized as per 711.02

B. Epoxy Intermediate Coat and Urethane Top Coat

These coatings shall be selected from the list of coatings approved for use under SS 910. Materials for each coat of the intermediate and finish coatings shall be supplied from the same manufacturer.

816.03 QUALITY CONTROL

A. Contractor Quality Control Specialist

At the preconstruction meeting, the Contractor shall designate one individual on each project as a Quality Control Specialist. Only one person per project will be necessary unless the Contractor is working at more than 3 sites simultaneously. In which case, it will be necessary to provide an additional Quality Control Specialist for each additional three (or portion of three) sites being painted simultaneously. This person will not be a foreman or member of the Contractor's production staff: (i.e. he or she will not abrasive blast, paint, recover spent abrasives, etc.) He or she will not be involved in any other miscellaneous tasks (i.e. mixing paint, running errands, running or working on equipment, etc.) while any production work is taking place. Documentation that personnel performing quality control related functions are qualified shall be submitted to the Engineer prior to allowing Quality Control Specialist (QCS) to begin work. Documentation/verification shall be provided to the Engineer that the QCS has received formal training from one of the following: KTA Tator, S.G. Pinney, or Corrosion Control Consultants. He or she shall be trained and equipped with material safety data sheets, product data sheets, tools and equipment to provide quality control on all facets of the work and shall have a thorough understanding of the plans and specifications pertaining to this project. He or she shall be responsible for inspecting the equipment at the specified intervals, the abrasives, and the work at all quality control points. He shall also be responsible for verifying that all work is done within the specified work limitations. He or she shall cooperate with the Inspector and compare and document quality control readings. He or she shall have the authority to stop work and the responsibility to inform the Contractor's foreman of nonconforming work.

B. Quality Control Points

Quality control points (QCP) are points in time when one phase of the work is complete and ready for inspection by both the Contractor and the Engineer prior to continuing with the next operational step. At these points: If 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 State of Ohio to final acceptance.

Quality Control Points (QCP)	(PURPOSE)
1.) Washing	Remove all water soluble materials; salt, dirt, etc.
2.) Solvent Cleaning	Remove asphalt cement, oil, grease, and anything not removed during washing.
3.) Intermediate Coat	Check surface cleanliness; apply intermediate coat; check coating thickness

- 4.) Finish coat Check surface cleanliness; apply finish coat; check coating thickness
- 5.) Final Review Visual inspection of system for acceptance and check total system thickness.

816.04 SURFACE PREPARATION

This work shall consist of washing and solvent cleaning of each structure.

A. Washing (QCP #1)

After steel is delivered, erected, and before painting, all surfaces shall be washed with potable water having a nozzle pressure of at least 7 MPa (1,000 PSI) and a delivery rate of not less than 15 L (4 gallons) per minute. The contractor, shall provide equipment specifications to verify the above. The equipment shall also be equipped with gauges to verify the pressure. The nozzle shall be held at a maximum of 300 mm (12") from the surface being washed or rinsed. Surface shall not be considered as clean until clear rinse water runs off the structure. After the surface is rinsed and allowed to dry, it shall be checked for remaining visible dirt. Surfaces shall be rewashed as necessary to remove all remaining dirt. The intermediate coat shall be applied within one (1) month after washing the structure.

All dirt, sand, bird nestings, bird droppings and debris shall be completely removed from all surfaces of the bridge before field painting.

B. Solvent Cleaning (QCP #2)

After washing, all traces of asphaltic cement, oil, grease, diesel fuel deposits, and other soluble contaminants which remain, shall be removed by solvent cleaning (see SSPC-SP 1 Solvent Cleaning for recommended practices). Under no circumstances shall any painting be done to areas with asphaltic cement, oil, grease, or diesel fuel deposits. All solvent cleaned areas shall be rewashed as previously noted.

816.05 TESTING EQUIPMENT

The Contractor shall provide the Engineer the following testing equipment in good working order, for the duration of the project. When the Contractor'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.) 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.

- 3.) One sling Psychrometer including Psychrometric tables - Used to calculate relative humidity and dew point temperature.
- 4.) One film thickness gauge (Positector 2000 or 6000, Quanix 2200, or Elcometer A345FB11) 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.
- 5.) One Flashlight, 2-D cell batteries.

816.06 HANDLING

All paint and thinner shall be delivered to the project site 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.

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.

All containers of paint and thinner shall remain unopened until required for use. The label information shall be legible and shall be checked at the time of use.

Solvent used for cleaning equipment is exempt from the above requirements.

Paint that 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. In every case, paint shall be used before its' shelf life has expired.

Paint may be considered as eligible for payment for material on hand as specified in 109.07. However, only paint which the Contractor can prove to the Engineer will be used during the construction season shall be eligible for payment. The Contractor shall provide the Engineer calculations indicating the total square meters (square feet) of steel to be painted during the construction season. He shall also provide calculations showing the total number of liters (gallons) required. The Contractor shall be responsible to store the paint on the project in such manner to prevent theft and adverse temperatures. The contractor shall provide thermometers capable of monitoring the maximum high and low temperatures within the storage facility. The Contractor is responsible for properly disposing of all unused paint and empty containers.

The contractor shall furnish the shipping invoice for all materials used on the project to the Engineer, prior to use.

816.07 MIXING AND THINNING

All ingredients in any container of paint shall be thoroughly mixed immediately before use and shall be agitated often enough during application to maintain a uniform composition. 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.

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

No thinner shall be added to the paint without the Engineer'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 Engineer. 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.

816.08 COATING APPLICATION

A. General

All structural steel, expansion joints (except top surfaces), steel railing, drain troughs and other areas (if indicated in the plans) shall be painted. Galvanized or metalized surfaces shall not be painted unless otherwise noted on plans or damaged during erection.

The following methods of application are permitted for use by this specification, as long as they are compatible with the paint being used: brush, spray, or any combination of these methods unless specified differently in the plans. Daubers or sheepskins may be used for places of difficult access when no other method is practical and in all cases shall be used where cross-frame angles are located within 50 mm (2") of the bottom flange and where end cross frames are within 150 mm (6") of the backwall and bottom of bottom flanges around bearings less than 150 mm (6") in height.

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 and pigeon droppings shall be removed with a stiff bristle brush, wire screen or a water wash with sufficient pressure to remove over spray without damaging the paint. The over spray must be removed before applying the next coat.

If brush application of the coating is used, it shall produce a smooth coat. Care shall be taken to work the paint into all crevices, corners, and around all bolt heads.

B. Spray Application (General)

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

Spray equipment shall be kept clean so that 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. All bolts shall be sprayed from at least 2 directions or brushed to insure coverage.

Each spray operator shall demonstrate to the Engineer his ability to apply the paint as specified. Any operator who does not demonstrate this ability shall not spray.

If mud cracking occurs, the affected area shall be cleaned to bare metal in accordance with surface preparation above and repainted.

All spray equipment used shall be suitable for use with the specified paint. Paint manufacturer's equipment recommendations shall be followed 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 Contractor and verified by the Engineer to insure that the traps or separators are working properly.

"Air shall be 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 verified by repeating this test".

This test shall be made at the start of each shift and at four (4) hour intervals. This is not required for an airless sprayer.

Spray application of all coats shall not be used unless the operation is totally contained to prevent over spray damage to public and private property, any and all vegetation, streams,

lakes, etc. This containment shall be accomplished with tarps, plywood or other shields. If brush is used, more that one coat may be necessary to produce the required thickness.

C. Application Approval

The beginning of the application of each of the different coats shall be subject to inspection and approval to detect any defects which might result from the Contractor's methods. If defects are discovered, the Contractor shall make all necessary adjustments to his or her method of application to eliminate them before proceeding with coating application.

D. Temperature

Paint shall not be applied when the temperature of the air, steel, or paint is below 10° C (50° F) (use of heaters is prohibited). 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)
Intermediate	6 hrs.	5 hrs.	4 hrs.
Finish	8 hrs.	6 hrs.	4 hrs.

E. Moisture

Paint shall not be applied during rain, fog, mist, or 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 surface. Paint shall not be applied when the relative humidity is greater than 85%. Paint shall not be applied during rain, fog or mist unless the above moisture criteria is met.

F. Intermediate and Finish Coat Application (QCP #5 & 6)

Each coat of paint shall be in a proper state of cure or dryness before the application of succeeding coats. Paint shall be considered ready for over coating when an additional coat can be applied without the development of any detrimental film irregularities, such as lifting, wrinkling or loss of adhesion of the undercoat. The time interval between coating applications shall be in compliance with manufacturer's written instructions and no more than 13 days between the intermediate and finish coats. Any coat which has cured more than the above allotted time without over coating, shall be removed and the steel reblasted to Sa 2 ½.

The compliance date (month and year) of the finish coat and the letters IZEU shall be stenciled on the steel in 100 mm (4") letters with a black urethane paint. This information shall be applied at 4 locations near the end of each outside beam on the outside web visible from the road or as directed by the Engineer.

G. Repair Procedures

Damaged areas of paint shall have the paint removed and all defects corrected. If the primer is damaged, the steel should then be retextured to a near white condition to produce a profile of between 40 to 90 mm (1.5 to 3.5 mils). This profile should be measured immediately prior to the application of the prime coat to insure that the profile is not destroyed during the feathering procedure.

The existing paint should be feathered to expose a minimum of 13 mm (½") of each coat.

During the reapplication of the paint, care shall be used to insure that each coat of paint is applied only within the following areas. The prime coat shall only be applied to the surface of the bare steel and the existing prime coat which has been exposed by feathering. The prime coat shall not be applied to the adjacent intermediate coat. The intermediate coat shall only be applied to the new prime coat and the existing feathered intermediate coat. The intermediate coat shall only be applied to the new intermediate coat and the existing finish coat which has been feathered or lightly sanded. The finish coat should not extend beyond the areas which have been feathered or slightly sanded.

At the perimeter of the repair area, the first two coats shall be applied by brush. The finish coat shall be applied by either brush or spray.

It may be necessary to make several applications in order to achieve the proper thickness for each coat.

During the application of the prime coat, the paint shall be continuously mixed. The prime coat shall be a prequalified organic zinc as per SS 910.

All surface preparation and painting shall be done in accordance with the specifications. Surface preparation shall be by power tools, steel grit or low dusting abrasive.

All repair shall be made in a manner to blend the patched area with the adjacent coating. The finished surface of the patched area shall leave a smooth, even profile with the adjacent surface.

The Contractor shall submit his or her method of correcting runs in writing to the Director for approval.

H. Continuity

Each coat of paint shall be applied as a continuous film of uniform thickness free of all defects such as holidays, runs, sags, etc.. All thin spots or areas missed shall be repainted and permitted to dry before the next coat of paint is applied.

I. Dry Film Thickness

Prime thickness, cumulative prime and intermediate thickness, intermediate, and finish thickness shall be determined by use of a Type 2 magnetic gage in accordance with the following:

Five separate spot measurements shall be spaced evenly over each 9 square meter (100 square feet) of 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") 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 5 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 three readings which are averaged to produce each spot measurement may under-run by a greater amount. The 5 spot measurements shall be made for each 9 square meter (100 square foot) of area as follows:

- 1. For structures not exceeding 27 square meters (300 square feet) in area, each 9 square meter (100 square foot) area shall be measured.
- 2. For structures not exceeding 90 square meter (1,000 square feet) in area, three 9 square meter (100 square foot) areas shall be randomly selected and measured.
- 3. For structures exceeding 90 square meters (1,000 square feet) in area, the first 90 square meter (1,000 square feet) shall be measured as stated in section 2 and for each additional 90 square meter (1,000 square feet), or increment thereof, one 9 square meter (100 square foot) area shall be randomly selected and measured.
- 4. If the dry film thickness for any 9 square meter (100 square foot) area (sections 2 & 3) is not in compliance with the requirements of paragraph 1 of this section, then each 9 square meter (100 square foot) area shall be measured.
- 5. Other size areas, or number of spot measurements, may be specified in the contract plans or as appropriate for the size and shape of the structure.

Each coat of paint shall have the following mil thickness measured above the peaks:

	Min. Spec. Thickness	Max. Spec. Thickness	Min. Spot	Max. Spot
Prime	75 mm (3.0 mil)	125 mm (5.0 mil)		
Intermediate	125 mm (5.0 mil)	175 mm (7.0 mil)	100 mm (4.0 mil)	263 mm (10.5 mil)
Sub Total	200 mm (8.0 mil)	300 mm (12.0 mil)	160 mm (6.4 mil)	450 mm (18.0 mil)

Finish	50 mm (2.0 mil)	100 mm (4.0 mil)	40 mm (1.6 mil)	150 mm (6.0 mil)
Total	250 mm (10.0 mil)	400 mm (16.0 mil)	200 mm (8.0 mil)	600 mm (24.0 mil)

Film thickness greater than the maximum specified thickness that do not exhibit defects (such as runs, sags, bubbles, mudcracking, etc.) and for which the Contractor has received a written statement from the coating manufacturer stating that this excessive thickness is not detrimental, may remain in place at the discretion of the Director.

For any spot or maximum average thickness over 600 mm (24 mils), it will be necessary for the Contractor to prove to the Department that the excess thickness will not be detrimental to the coating system. This shall be accomplished by providing the Director, for approval, certified test data proving that the excessive thickness will adequately bond to the steel when subjected to thermal expansion and contraction. This thermal expansion and contraction test shall take place over five cycles of a temperature ranges from -29° C to 49° C (-20° F to 120° F). After the thermal contraction and expansion cycles have taken place, the tested system shall be subjected to pull off tests and the results compacted to the results of pull off tests which have been performed on a paint system with the proper thicknesses. In addition to the certified test results, it will also be necessary for the Contractor to provide the Director a written statement from the paint manufacturer stating that this excessive thickness is not detrimental.

If the Director does not approve the excessive coating thicknesses or the Contractor elects not to provide the required written statement from the paint manufacturer and the certified test results when required, the Contractor, at his own expense, shall remove and replace the coating. The removal and replacement of the coating shall be done as specified in 816.08 G Repair Procedures.

816.09 SAFETY REQUIREMENTS AND PRECAUTIONS

The contractor shall meet the applicable safety requirements of the Ohio Industrial Commission in addition to the scaffolding requirements specified below.

Material Safety Data Sheets (MSDS) shall be provided at the preconstruction meeting for all paints and thinners used on this project. No work shall start until the MSDS have been submitted.

816.10 INSPECTION ACCESS

In addition to the requirements of 105.11, the Contractor shall furnish, erect, and move scaffolding and other appropriate equipment, to permit the Inspector the opportunity to closely observe all affected surfaces. This opportunity shall be provided to the Inspector during all phases of the work and continue for a period of at least 10 working days after each structure has been completely painted.

When scaffolding, or the hangers attached to the scaffolding are supported by horizontal wire ropes, or when scaffolding is placed directly under the surface to be painted, the following requirements shall be complied with:

- A. When scaffolding is suspended 1092 mm (43") or more below the surface to be painted, two guardrails shall be placed on all sides of the scaffolding. One guardrail shall be placed at 1067 mm (42") above the scaffolding and the other at 508 mm (20") above the scaffolding.
- B. When the scaffolding is suspended at least 533 mm (21"), but less than 1092 mm (43") below the surface to be painted, a guardrail shall be placed on all sides of the scaffolding at 508 mm (20") above the scaffolding.
- C. Two guardrails shall be placed on all sides of scaffolding not previously mentioned. The guardrails shall be placed at 1067 mm (42") and 508 mm (20") above scaffolding, as previously mentioned.
- D. All scaffolding must be at least 610 mm (24") wide when guardrail is used and 711 mm (28") wide when the scaffolding is suspended less than 533 mm (21") below the surface to be painted and guardrail is not used. If 2 or more scaffolding are laid parallel to achieve the proper width, they must be rigidly attached to each other to preclude any differential movement.
- E. All guardrail shall be constructed as a substantial barrier which is securely fastened in place and is free from protruding objects such as nails, screws and bolts. There shall be an opening in the guardrail, properly located, to allow the Inspector access onto the scaffolding.
- F. The rails and uprights shall be either metal or wood. If pipe railing is used, the railing shall have a nominal diameter of no less than 38 mm (1.5"). If structural steel railing is use, the rails shall be 50x50x9 mm (2x2x3/8") steel angles or other metal shapes of equal or greater strength. If wood railing is used, the railing shall be 50x100 mm (2x4") (nominal) stock. All uprights shall be spaced at no more than 2.4 m (8 feet) on center. If wood uprights are used, the uprights shall be 50x100 mm (2x4") (nominal) stock.
- G. When the surface to be inspected is more than 4.57 m (15 feet) above the ground or water, and the scaffolding is supported from the structure being painted, the Contractor shall provide the Inspector with a safety harness (not a safety belt) and lifeline. The lifeline shall not allow a fall greater than 1.8 m (6 feet). The Contractor shall provide a method of attaching the lifeline to the structure independent of the scaffolding cables, or brackets supporting the scaffolding.
- H. When scaffolding is more than 762 mm (2.5 feet) above the ground, the Contractor shall provide a ladder for access onto the scaffolding. The ladder and any equipment used to attach the ladder to the structure shall be capable of supporting 113 kg. (250 pounds) with a safety factor of at least 4 . All rungs, steps, cleats, or treads shall have uniform spacing and shall not exceed 305 mm (12") on center. At least one side rail shall extend at least 914 mm (36") above the landing near the top of the ladder.
- I. An additional landing shall be required when the distance from the ladder to the point where the scaffolding may be accessed exceeds 305 mm (12"). The landing shall be a minimum of at least 610 mm (24") wide and 610 mm

(24") long. It shall also be of adequate size and shape so that the distance from the landing to the point where the scaffolding is accessed does not exceed 305 mm (12"). The landing shall be rigid and firmly attached to the ladder; however, it shall not be supported by the ladder. The scaffolding shall be capable of supporting a minimum of 454 kg (1,000 pound).

- J. In addition to the aforementioned requirements, the Contractor shall be responsible to observe and comply with all Federal, State and local laws, ordinances, regulations, orders and decrees.
- K. The Contractor shall furnish all necessary traffic control to permit inspection during and after all phases of the project.

816.11 PROTECTION OF PEOPLE AND PROPERTY

The Contractor shall collect, remove and dispose of all buckets, rags or other discarded materials and shall leave the job site in a clean condition.

The Contractor shall protect all portions of the structure which are not to be painted, against damage or disfigurement by splashes, spatters, and smirches of paint. deck bottoms and backwalls are exempt from this requirement.

When or where any direct or indirect damage or injury is done to public or private property, the Contractor shall restore, at his own expense, such property, to a condition similarly or equal to that existing before such damage or injury was done.

816.12 POLLUTION CONTROL

The contractor shall take all necessary precautions to comply with pollution control laws, rules or regulations of Federal, State, or local agencies, and as required in this specification.

816.13 WORK LIMITATIONS

Field painting shall be done between **April 15 and October 31**. Further work limitations shall be as designated in the plans.

816.14 METHOD OF MEASUREMENT

Field cleaning and painting of shop primed new structural steel may be based on a square meter (square foot), Kilogram (pound), or lump sum pay item. All field painting will include 2 coats of paint; intermediate coat, and finish coat on top of a shop applied prime coat.

If measurement is by a square meter (square foot) item on steel beam and girder bridges, then surface area is based on a nominal measurement of the beams; ie. 2 times the beam depth plus 3 times the flange width. In addition to this nominal measurement, a percentage is added to account for incidentals such as cross frames, bearing assemblies, stiffeners, expansion joints, scuppers, etc. Thus, it is not necessary for the Inspector to field measure every detail of the bridge to verify quantities. In the case of a quantity dispute, exact field measurements of all painted surfaces or calculations or both will govern.

816.15 BASIS OF PAYMENT

All labor, materials, and equipment required for surface preparation and prime coat application to steel surfaces to be painted shall be included with the structural steel for payment.

All labor, materials, and equipment required for field washing, cleaning, and application of the intermediate and finish coats of paint and galvanizing of bolts, nuts, and washers shall be included in:

<u>Item</u>	<u>Unit</u>	<u>Description</u>
816	Square meter (Square foot), lump sum, Kilogram (Pound)	Field Painting of New Steel, Intermediate and Finish Coat, System IZEU

Designer note:
This item is intended for all new steel that is to be coated.

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
SUPPLEMENTAL SPECIFICATION 842

CONCRETE FOR STRUCTURES

January 6, 1999

- 842.01 Description
- 842.02 Materials
- 842.03 Proportions
- 842.04 Concrete Test Specimens
- 842.05 High-Early-Strength Concrete
- 842.06 Mixing of Concrete
- 842.07 Slump
- 842.08 Placing Concrete
- 842.081 Slipform Construction of Bridge Railing.
- 842.09 Construction Joints
- 842.10 Emergency
- 842.11 Depositing Concrete Under Water
- 842.12 Depositing, Protecting and Curing Concrete During Cold Weather
- 842.13 Removal of Forms
- 842.14 Curing and Loading
- 842.15 Surface Finish
- 842.16 Roadway Finish
- 842.161 Bridge Deck Grooving
- 842.17 Sidewalk Finish
- 842.18 Method of Measurement
- 842.19 Basis of Payment

842.01 Description. This item shall consist of furnishing and placing portland cement concrete including reinforcing steel in accordance with these specifications and in reasonably close conformity with the lines, grades and dimensions shown on the plans. This item shall also include all costs associated with saw cutting grooves into the surface of superstructure concrete after the concrete has cured. Falsework and forms shall be in accordance with 508.

For prestressed concrete, see Supplemental Specification 865.

Concrete for structures shall meet the requirements of Supplemental Specification 899 (Concrete - General), except as modified herein.

842.02 Materials. Materials shall conform to 899.02 except as follows:

Aggregate; all concrete above the ground line in a given substructure unit or all concrete for any given superstructure shall be made of aggregates of the same kind and colors, except upon permission of the Engineer.

Reinforcing materials; 509.02.

Curing materials; 705.05, 705.06 (white opaque), 705.07 Type 1 or 1D.
Joint filler; 1/4 inch (6 mm) gray sponge 711.28, or preformed filler 705.03.
Seals; preformed elastomeric compression joint seals, 705.11.

842.03 Proportions. Concrete for structures shall be proportioned according to 899.03, using Class C or Class S as specified.

842.04 Concrete Test Specimens. On structures over 20 foot (6.1 m) span, two test cylinders will be made from each 200 cubic yards (150 m³), or fraction thereof, of concrete that is incorporated each day in the work. On structures of 20 foot (6.1 m) span or less, not less than two cylinders will be made for each 50 cubic yards (35 m³) of concrete.

When necessary to permit early removal of falsework or to permit backfilling, concrete test beams shall be made and tested according to standard methods on file in the office of the Director.

842.05 High-Early-Strength Concrete. The use of high-early-strength concrete shall be in accordance with 899.03. Curing and loading shall be in accordance with 842.14.

842.06 Mixing of Concrete. Mixing shall be according to 899.09.

When mixed, all concrete shall have a temperature of not more than 90 °F (32 °C), and the concrete shall be maintained under this temperature until deposited in the work.

When an air temperature of 60 °F (16 °C) or higher prevails at the time of placing concrete in a bridge superstructure over 20 foot (6.1 m) span, the Contractor shall add an approved chemical admixture (705.12, Type B or D) to the concrete.

842.07 Slump. Concrete shall have a slump such that it will be workable in the required position. It shall be of such a consistency that it will flow around reinforcing steel, but individual particles of coarse aggregate, when isolated, shall show a coating of mortar containing its proportionate amount of sand.

The slump of concrete placed by the vibration method shall be in accordance with 899.03, the slump being determined according to ASTM C 143.

842.08 Placing Concrete. The Contractor shall submit according to 501.06, a description of the procedures he proposes to use and notify the Engineer at least 24 hours in advance of placing concrete.

Superstructure concrete shall be placed only when the surface evaporation rate determined by using Figure 1 in ACI 308 is equal to or less than 0.2 lb./sq. ft./hour (1.0 kg/m²/hour). The Contractor shall determine and document the ambient air temperature, concrete temperature, deck surface temperature, relative humidity, and wind velocity, subject to verification by the Engineer. No superstructure concrete shall be placed if the ambient air temperature is 85 °F (30 °C) or higher or predicted to go above 85 °F (30 °C)

during the concrete placement regardless of the surface evaporation rate.

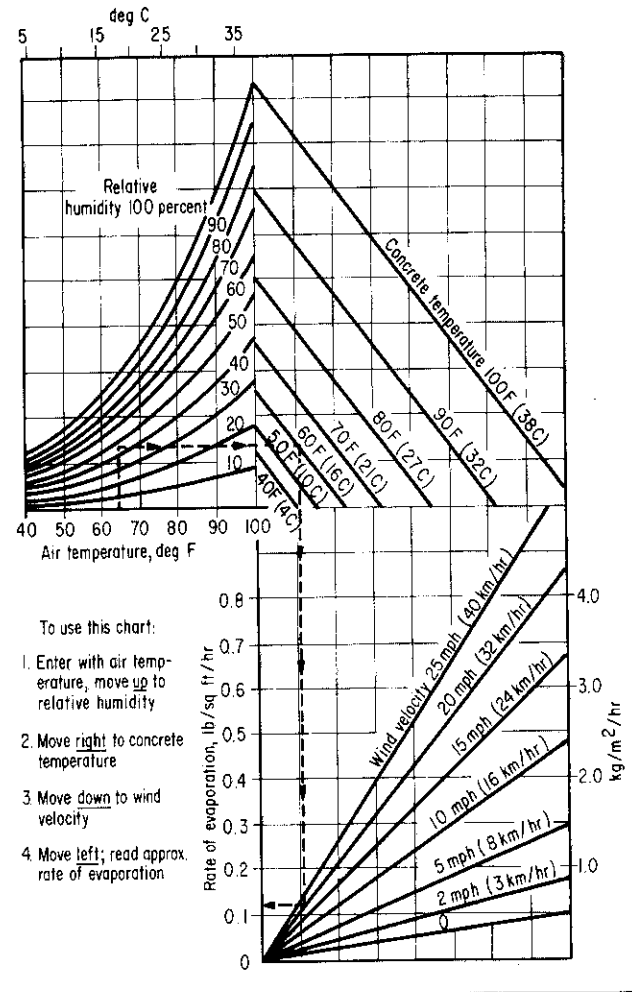
When a concrete deck is to be placed on continuous steel beams or girders, the placing of the concrete deck in any span shall not be started until all of the main beam or girder splices have been completed at least two piers beyond the pier or piers supporting the span in question.

Concrete for backwalls with steel expansion joints shall not be placed until the abutments have been backfilled to within 1 foot (0.3 m) of the bridge seat elevation and all structural steel or prestressed concrete beams have been erected, unless a different procedure is approved by the Director. The steel expansion joint shall serve as a template for the top of the backwall. If temporary bolts are used to support the backwall portion of an expansion device during the placing of the backwall concrete, these bolts shall be removed after the concrete has taken its initial set and before a change in temperature causes superstructure movement sufficient to damage the backwall.

In order that the concrete will be finished during daylight hours, the time of starting the concreting operations shall be subject to the approval of the Engineer.

The Contractor shall furnish assurance to the Engineer of an adequate and uniform source of supply of concrete to permit proper placing and finishing, and of the availability of coverings for protection in case of rain, before work will be permitted to start.

Figure1 ACI 308-81



Before placing the concrete, all forms and structural steel which will be in contact with the concrete shall be thoroughly cleaned and the space to be occupied by the concrete shall be free from all laitance, silt, dirt, shavings, sawdust, loose and built-up rust and other debris. The methods of depositing shall be such as to insure that all reinforcing steel is completely enveloped in concrete mortar and such that this condition can be verified by inspection. The method or device used for conveying the concrete from the mixer to its place in the work shall be such as to insure against separation of the coarse aggregate from the mortar. When concrete is being deposited in shallow members, such as slabs, it shall be placed with as short a vertical drop as practicable. The concrete shall be deposited so as to maintain a surface practically horizontal over the section being placed.

When a chute is used, its slope shall be such as to allow concrete of the proper consistency to flow readily without segregation. Concrete shall be deposited as near as possible to its final position.

Concrete shall not be dropped into the forms a distance of more than 5 feet (1.5 m). Drop chutes shall be used to limit free fall to 5 feet (1.5 m) and the delivery ends shall be as nearly vertical as practicable.

The use of mortar topping for concrete railing caps and other similar surfaces shall not be permitted.

The use of the vibration method of placing all concrete, in structures is required. The Contractor shall furnish and have in use sufficient vibration equipment of an approved type and size to properly compact each batch immediately after it is placed in the forms.

The vibrators shall generally be of a type that is applied directly to the concrete and have a frequency of at least 4500 impulses per minute, but where inaccessibility precludes this method of vibration, the vibrators shall be applied externally to the forms.

The concrete shall be deposited as near its final position as possible and shall not be caused to flow long distances by vibrators. Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete. Vibrators shall be inserted into and withdrawn from the concrete slowly. The vibration shall be of sufficient duration and intensity to thoroughly compact the concrete, but not continued so as to cause segregation. Care must be used not to disturb partially hardened concrete.

Such spading as is necessary to insure smooth surfaces and dense concrete shall be done along form surfaces and in corners and locations impossible to reach with the vibrators, The Engineer shall with the collaboration of the Contractor closely observe the results obtained on the first concrete placed and such alterations shall be made in the mix, as permitted by these specifications, as are necessary to secure the best results.

The surface of the finished concrete shall be covered immediately with wet burlap.

842.081 Slipform Construction of Bridge Railing. Unless the plans eliminate the use of slipforming for this project, the Contractor is permitted the option of slipforming the bridge parapets and medians. If the Contractor elects to slipform, the finished concrete shall meet the following tolerances from plan dimensions:

Reinforcing steel cover	-½ inch (-13mm) + ½ inch (+ 13 inch)
Top width dimension	-0 + 1/4 inch (+ 6 mm)
Bottom width dimension	-0 + ½ inch (+ 13mm)
Surface flatness	1/4 inch in 10 feet (6 mm in 3 meters)
Vertical alignment	½ 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. The use of water to smooth or close the surface is not acceptable.

Control Joints shall be constructed by sawing 1 1/4 inches (32 mm) deep into 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). The control joints shall be caulked with a polyurethane or polymeric material meeting Federal Specification TT-S-00227E.

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.

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.

842.09 Construction Joints. When construction joints are shown on the plans, all concrete between consecutive joints shall be placed in a continuous operation. Concrete shall not be placed against the side of any joint for at least 12 hours, or as required by 842.14.

Approval of the Director must be obtained for placing any construction joint not shown on the plans or permitted by 842.08 and 842.16.

The plans on which a day's work is to terminate shall be predetermined before depositing of concrete begins. They shall in general be perpendicular to the lines of principal stress and in regions of small shear. Horizontal joints will not be permitted in concrete girders and beams. Slabs acting with concrete beams or girders shall be deposited continuously with them unless composite construction is specified.

All construction joints shall be made with bulkheads provided with keys which clear all exposed surfaces approximately one-third the thickness of the joint.

Horizontal joints in piers, abutments and retaining walls generally shall be avoided and, when they are used, shall not be located within 2 feet (0.6 m) of the normal water level.

Construction joints not shown on the plans and above ordinary low water, in abutments, and in retaining walls that retain earth fills shall be waterproofed on the back with a 36 inch (1 m) strip of Type B waterproofing according to 512 at the Contractor's expense.

Joints in cantilevered members shall be avoided.

Horizontal construction joints shall have the surface of the concrete below the joint dampened immediately prior to placing adjoining concrete.

Horizontal construction joints between bridge slabs and superimposed curbs, parapets, sidewalks and median strips, shall be placed and protected the same as the remainder of the slab. They shall be cured in accordance with 842.14.

Care shall be exercised to avoid disturbing the bond of curb reinforcing steel protruding from the concrete. If the curb areas are used by workers when placing the deck concrete, the reinforcing steel shall be tied and/or braced to prevent its movement.

Where walls or columns support slabs or beams, the concrete in the vertical member shall be deposited up to the bottom of the supported member and a period of at least 2 hours shall elapse for settlement before placing concrete in the horizontal member.

842.10 Emergency. When the work is unexpectedly interrupted by break-downs, storms or other causes and the concrete as placed would produce an improper construction joint, the Contractor shall rearrange the freshly deposited concrete to provide a suitable construction joint. When such a joint occurs at a section on which there is shearing stress, he shall provide an adequate mechanical bond across the joint by forming a key, inserting reinforcing steel or by some other means satisfactory to the Engineer, which will prevent a plane of weakness.

842.11 Depositing Concrete Under Water. No concrete except for cofferdam seals shall be deposited under water, unless by special permission of the Director. If such permission is granted, care shall be exercised to prevent the formation of laitance.

Concrete shall not be deposited until any laitance, which may have formed on concrete previously placed, has been removed. Pumping shall be discontinued while depositing foundation concrete if it results in a flow of water inside of forms. If concrete other than cofferdam seals is deposited under water, the proportion of cement used shall be increased at least 10 percent at no extra expense to the State, to compensate for losses due to water. Concrete deposited under water shall be carefully placed in a compact mass in its final position by means of a tremie, a closed bottom dump bucket or other approved method and shall not be disturbed after being deposited.

842.12 Depositing and Curing Concrete During Cold Weather. When an atmospheric temperature of 32 °F (0 °C) or less exists at the time concrete is placed, or is predicted by weather forecasts to occur during the curing period, the following procedures shall apply:

The water or aggregate or both shall be heated as necessary to make the temperature of the concrete not less than 50 °F (10 °C) nor more than 70 °F (21 °C) when placed.

Concrete shall not be placed in contact with materials having a temperature of less than 32 °F (0 °C). If necessary, the forms, reinforcing steel and foundation materials shall be heated before the concrete is placed.

The concrete shall be protected from freezing and specified temperatures for curing shall be maintained by a heated enclosure, insulated forms or by either of these used in combination with flooding, except that insulation alone may not be used to protect and cure deck slabs less than 10 inches (250 mm) thick.

The heated enclosure shall surround the top, sides and bottom of the concrete to be placed during cold weather except that concrete surfaces which have been flooded need not be enclosed.

The concrete shall be cured by maintaining the surface temperature between 50 °F and 100 °F (10 °C and 38 °C) for a period of not less than five days except as modified below for concrete flooded with water. At the end of this curing period, the temperature shall be reduced at a rate not to exceed 20 °F (11 °C) in 24 hours until it is within 20 °F (11 °C) of atmospheric temperature.

Sufficient high-low thermometers shall be furnished and installed by the Contractor in such a manner that the surface temperature of the concrete may be readily determined. For deck slabs, the surface temperature shall include deck bottoms, deck facia and deck top surfaces.

Removal of falsework and opening to traffic shall be not earlier than specified by 842.14.

(a) When a heated enclosure is used. The enclosure and heating devices shall be as nearly complete before any concrete is placed as the placing will permit. Throughout the entire concreting operation, the completion of enclosures and the application of heat shall follow the placing of concrete as closely as possible.

Heat may be supplied by any method which will maintain the required temperature continuously with a reasonable degree of uniformity in all parts of the enclosure without discoloring the concrete.

Combustion-type heating units shall be vented from the enclosure.

If dry heat, other than free steam, is used with method (a) curing, all exposed concrete shall be covered with two thicknesses of burlap as soon after placing the concrete as it can be done without marring the surface. The burlap shall be wetted and kept continuously wet and shall not be removed during the heating period, except as required for rubbing. Wood forms without liners, left in place more than two days after the placing of concrete, shall be thoroughly wet at least once each day for the remainder of the heating period. If forms are removed during the heating period, the concrete shall be thoroughly drenched with water and covered with burlap as noted above for the remainder of the heating period.

Enclosures shall be strong and wind proof, and provide adequate space to allow free circulation of air around the forms and deposited concrete.

(b) When insulation is used. Sufficient thermometers shall be furnished and installed by the Contractor in such a manner that the surface temperature of the concrete may be readily determined. Whenever the surface temperature, as indicated by the thermometer readings, approaches 100 °F (38 °C), the forms or insulation shall be loosened or otherwise vented to keep the surface temperature within the specified limits. If the thermometer readings indicate that the minimum required temperature is not maintained, the structure shall be promptly enclosed and heated as provided above or flooded as specified below.

The insulating material shall be wind and water resistant. Precautions shall be taken at edges and corners to insure that such points of extreme exposure are adequately protected. The top surface of the concrete shall be protected by a tarpaulin, or other approved waterproof cover, placed over the insulation.

(c) When the concrete is to be flooded with water. The concrete may be flooded as soon as it can be done without damaging it. Flooding water shall be heated to a temperature of not less than 50 °F (10 °C) nor more than 100 °F (38 °C). The heated flood water may be discontinued after 48 hours if the concrete remains flooded to a depth of 1 foot (0.3 m) above its highest elevation for at least the subsequent 120-hour period.

842.13 Removal of Forms. In order to facilitate finishing, forms on vertical surfaces which are to receive a rubbed surface finish shall be removed as soon as the concrete has hardened sufficiently that it will not be damaged.

842.14 Curing and Loading. Concrete for structures shall have the falsework removed and be opened to traffic in not less time than is specified by the following table:

	Span (a)	Age of Concrete in Days	
		No Beam Test	Beam Test (b)
Removing	Over 10' (3.0 m)	14	5
Falsework	10' (3.0 m) or less and all pier caps	7	3
Traffic	Any	14	7

(a) Span in this circumstance is defined as the horizontal distance between faces of the supporting elements when measured parallel to the primary reinforcement.

(b) Applicable only when the average modulus of rupture for two tests is not less than 650 psi (4.5 MPa).

When the temperature of the air surrounding the concrete is above and maintained above 32 °F (0 °C) and below 50 °F (10 °C) and the provisions of 842.12 are not in force, the duration of the cure shall be based on a beam test, except that the curing time shall not be less than tabulated above.

When a beam test is not performed, the time specified above for removing falsework and opening to traffic shall be extended one day for each day the temperature of the air surrounding the concrete is below 50 °F (10 °C).

All superstructure concrete, all concrete which is to have a sealer applied, and all construction joints shall be cured in accordance with Method (a) Water Curing. All other concrete shall be cured either by Method (a) Water Curing or Method (b) Membrane Curing. However, if Method (b) is used on areas to be waterproofed, the membrane shall be removed.

Compression rings are not to be installed on pier columns or similar items of construction for the purpose of supporting falsework or subsequent construction until after a 72-hour curing period.

No load shall be applied or other work conducted that will damage new concrete or interfere with its curing. Where work is necessary on new concrete to complete a structure, such as building forms on a footing, workers and materials shall be kept off such concrete until such time as it will not be damaged by the work in progress, but in no case shall the elapsed time between placing the concrete and working on same be less than 36 hours. No work that will interfere with the curing shall be done on concrete placed during cold weather unless insulating material to retain the heat in the mix is placed during periods in the day when the presence of workers will not interfere with the normal curing procedure. When this is done, the normal protection shall be resumed immediately after work is suspended. Proper curing shall have preference and, if necessary, workers shall be kept off so that the concrete may be thoroughly wetted and kept wet until the curing is completed.

Method (a) Water Curing. All surfaces not covered by forms shall be protected immediately after brooming or final finishing with two thicknesses of wet burlap and kept wet by the continuous application of water for a period of not less than 7 days. Formed surfaces shall, after the removal of forms, be cured in like manner for the remainder of the curing period with the entire surface of the concrete being thoroughly drenched with water and covered immediately after forms are removed.

In lieu of continuous sprinkling, wet burlap covered with white polyethylene sheeting or plastic coated burlap blankets 705.06 may be used. They shall be placed wet with the burlap side against the concrete. Adjoining plastic coated blankets or polyethylene sheets used to cover wet burlap shall be lapped sufficiently and held securely in place at laps and edges so that positive moisture seal is provided. White polyethylene sheeting or plastic coated blankets containing holes or tears shall be covered with an additional covering of sheeting or blankets as directed.

Method (b) Membrane Curing. Immediately after the free water has disappeared on

surfaces not protected by forms and immediately after the removal of forms, if such are removed before the end of the 7-day curing period, the concrete shall be sealed by spraying as a fine mist a uniform application of the curing material 705.07, Type 1 or 1D, in such manner as to provide continuous, uniform, water impermeable film without marring the surface of the concrete.

The membrane curing shall be applied in one or more separate coats at the rate of at least 1 gallon per 200 square feet (1 L/5m²) of surface. To assure that the proper amount of the curing material is applied, the number of gallons (liters) of curing material in the spray container shall be noted, and the correct area for that volume laid off so that the area of concrete surface to be covered will be such that the approved application rate will be secured. Curing material shall be thoroughly agitated immediately previous to use. If the film is broken or damaged at any time during the specified curing period, the area or areas affected shall be given a complete duplicate treatment of the curing material applied at the same rate as the first treatment.

Unless adequate precautions are taken to protect the surface of the membrane, workers, materials and equipment shall be kept off the membrane for the duration of the curing period.

842.15 Surface Finish. Immediately after the removal of forms, all cavities produced by form ties and all other holes, honeycomb spots, broken corners or edges and other defects shall be cleaned, dampened and completely filled, pointed or trued with a mortar of the same proportions as used in the concrete being finished. Exposed surfaces which are not satisfactory to the Engineer because of excessive patching and/or other corrective work, shall be grout cleaned or rubbed as required by the Engineer. Other contiguous exposed surfaces on the structure shall be finished in a similar manner to the extent required to produce a uniform appearance.

On all exposed surfaces, all fins and irregular projections shall be removed with a stone or power grinder, care being taken to avoid contrasting surface textures. Sufficient white cement shall be substituted for the regular cement in the filling of holes and other corrective work to produce finished patches of the same color as the surrounding concrete.

Grout Cleaning. Where grout cleaning is called for on the plans or is necessary for corrective work, the surface, after wetting, shall be uniformly covered with a grout consisting of one part cement to 1 1/2 parts fine sand, 703.03 and sufficient water to produce a consistency of thick paint. White portland cement shall be used for all or part of the cement in the grout, as directed by the Engineer, to give the color required to match the concrete. The grout shall be uniformly applied with brushes or a spray gun, and all air bubbles and holes shall be completely filled. Immediately after the application of the grout, the surface shall be vigorously scoured with a cork or other suitable float. While the grout is still plastic the surface shall be finished with a sponge rubber or other suitable float removing all excess grout. The finishing shall be done at the time when grout will not be pulled from the holes or depressions. After being allowed to thoroughly dry, the surface shall be vigorously rubbed with a dry burlap to completely remove any dried grout. There shall be no visible film of grout remaining on the surface after this rubbing and the entire cleaning operations of any area must be completed on the day it is started. If any dark spots or streaks remain after this operation, they shall be removed with a fine grained

silicon carbide stone, but the rubbing shall not be sufficient to change the texture of the surface. Unless otherwise directed by the Engineer, grout cleaning shall be delayed until the final clean up of the project.

Rubbed Finish. Forms shall be removed, if possible, within two days after concrete is placed. Corrections shall be made as outlined above. Rubbing of concrete shall be started as soon as the conditions will permit. Immediately before starting this work, the concrete shall be kept thoroughly saturated with water for a minimum period of two hours. Sufficient time shall have elapsed before wetting down to allow the mortar used in pointing insert holes and defects to be thoroughly set. Surfaces to be finished shall be rubbed with a medium coarse silicon carbide stone until all form marks, projections and irregularities have been removed, all voids filled and a uniform surface has been attained. The paste produced by rubbing shall be left in place at this time. No additional material other than water shall be applied to the surface. After all concrete above the surface being finished has been placed, the final finish shall be obtained by rubbing with a fine silicon carbide stone and water. This rubbing shall be continued until the entire surface is of a smooth texture and uniform in color. Any surfaces which have been given a rubbed finish, shall be protected from subsequent construction operations. Any surfaces which are not protected shall be cleaned and again rubbed, if necessary, to secure a uniform and satisfactory surface.

No extra payment will be made for any type of surface finish, the cost being considered as included in the price bid for concrete.

842.16 Roadway Finish. Concrete deck slabs shall be finished in accordance with the requirements of 451.12 except that construction joints shall not be edged, and a strip of surface 9 to 12 inches (220 to 300 mm) wide adjacent to curbs and barriers shall not be grooved. The use of a broom drag on concrete deck slabs may be in the longitudinal or transverse direction. The requirement for use of a finishing machine may be waived by the Engineer for small bridges where their use is impractical.

The finishing machine shall be approved by the Engineer. It shall be self-propelled and equipped with forward and reverse drive mechanisms that enable precision velocity control of the machine while moving in either direction. It shall be equipped with one or more rotating rollers, leveling augers and either a vibrating pan or vibrating rollers. Vibrating frequency for pans or rollers shall be variable from 1500 to 5000 pulses per minute. The Contractor shall furnish the necessary verification of these frequencies. The finishing machine shall be capable of finishing transversely while traveling in either direction across the deck. Screeds shall have provisions for raising them above the concrete surface. The finishing machine shall be of sufficient size to finish the full width of the decks between curbs or parapet walls. The wheels of the finishing machine shall run on temporary riding rails adequately supported on structural steel or falsework. The rail and rail supports shall be made of steel and shall be arranged so that the weight of the finishing machine and the operator cause zero vertical deflection while traveling across the deck. Rail shall be straight with no sections exceeding a tolerance of 1/8 inch in 10 feet (3 mm in 3.0 m) in any direction. All support rails shall be elevated a sufficient distance above the slab to permit the simultaneous finishing by hand of any portions not finished by the machine. Any rail supports shall be fabricated and installed in such manner

as to permit their removal to at least 2 inches (50 mm) below the top of the slab. Holes formed by the removal of such supports shall be filled during the final finishing of the slab. The concrete shall be delivered and distributed at a uniform and adequate rate ahead of the finishing machine by suitable mechanical equipment. Concrete shall be placed no more than 10 feet (3m) directly in front of the finishing machine.

Bridge decks that are to be waterproofed with a membrane shall be given a burlap drag finish.

842.161 Bridge Deck Grooving. After the concrete has cured, transverse grooves shall be sawed into the deck. 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 (300mm) 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.

842.17 Sidewalk Finish. The concrete shall be struck off after placing with a template and finished with a float to produce a sandy texture.

842.18 Method of Measurement. The volume shall be the number of cubic yards (cubic meters) determined by calculations from plan dimensions, in place, completed and accepted.

Reinforcing steel, supports, mechanical connectors, and tie wires shall be incidental in the price bid for structural concrete.

No deduction will be made for the volume of the reinforcing steel, conduits or structural steel other than beam flanges embedded in deck slabs. No deduction will be made for the volume of any embedded timber or concrete piles.

Superstructure concrete includes the concrete in defluctive parapets not having a metallic railing.

Deck concrete may be measured by either volume or area. The area of concrete shall be based on plan dimensions.

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

Item	Unit	Description
842	Cubic yard (cubic meter)	Class ____ concrete, _____
842	Cubic yard (Cubic meter), Square yard (square meter)	Class ____ concrete, bridge deck

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION

SUPPLEMENTAL SPECIFICATION 843

PATCHING CONCRETE STRUCTURES
WITH TROWELABLE MORTAR

May 5, 1998

843.01 Description
843.02 Materials
843.03 Test Requirements and Prequalification
843.04 Removal of Concrete
843.05 Surface Preparation
843.06 Patching
843.07 Curing
843.08 Inspection and Sounding of Concrete Patches
843.09 Method of Measurement
843.10 Basis of Payment

843.01 Description.

This item consists of the removal of all loose and disintegrated concrete, preparation of the surface, and the mixing, placing, finishing and curing of the patches in the areas shown or noted on the plans or as directed by the Engineer. The work shall be performed upon concrete components in accordance with these specifications, and in reasonably close conformity with the plans and the manufacturer's specifications and recommendations.

843.02 Materials. The manufacturer will specify whether the product is designed for horizontal, vertical, or overhead patching. All materials shall be prepackaged and stored and incorporated in the work as recommended by the manufacturer. A manufacturer's representative shall be present at the job site until such a time as he and the Engineer are sure that the Contractor is qualified in all aspects of patching concrete structures with the selected materials.

843.03 Test Requirements and Prequalification. Trowelable mortar will meet the following test requirements.

Compressive Strength (ASTM C 109 Modified, 50mm [2-inch cubes])

1 DAY.....	12.3 MPa (1800 psi)
7 DAY.....	37.4 MPa (5500 psi)
28 DAY.....	48.3 MPa (7000 psi)

Splitting Tensile Strength (ASTM C 496)

7 DAY.....	3.7 MPa (550 psi)
28 DAY.....	5.2 MPa (750 psi)

Flexural Strength (ASTM C 78)

7 DAY.....	7.6 MPa (1100 psi)
28 DAY.....	10.2 MPa (1500 psi)

Shrinkage (ASTM C 157) at 1,3,14 and 28 days

Max %.....	+ 0.3
Min. %.....	0.0

Bond Strength (ASTM C882 modified*)

28 DAY.....	10.2MPa (1500 psi)
-------------	--------------------

*Mortar scrubbed into substrate or as recommended by the manufacturer.

Chloride Ion Permeability (AASHTO T 277) 500 Coulombs or less

Modulus of Elasticity 24.2 - 27.6 GPa (3,500,000 - 4,000,000 psi)
(ASTM C 469 @ 28 DAYS)

The troweable mortar material proposed for use shall be prequalified. Prior to approval, the manufacturer shall submit independent certified test data showing that the material complies with the performance requirements of this specification to the Office of Materials Management - Cement and Concrete Engineer, 1600 West Broad St., Columbus, Ohio 44223. The certified test data shall also state the following physical properties for the troweable mortar:

1. Color
2. Material Components and Proportions
3. Shelf Life
4. Yield
5. Working Time
6. Final Cure Time
7. Pot Life
8. Consistency

The test data shall be developed by an independent testing laboratory approved by the Office of Materials Management.

The following items shall also be submitted to the Office of Materials Management prior to approval:

1. Manufacturer's technical data sheet for each component.
2. Material safety data sheet for each component.
3. Enough component to produce a liter (quart) sample of troweable mortar
4. A one liter (quart) sample of the solvent to be used for cleanup.

5. Mixing instructions

When the troweable mortar material has been approved by the Office of Materials Management, further performance testing by the manufacturer will not be required unless the formulation or manufacturing process has been changed, in which case new certified test results will be required. Acceptance variances shall be established by the Laboratory.

The Contractor shall furnish the Engineer a copy of the manufacturer’s comprehensive job specific preparation, mixing and application instructions. Any significant changes to these instructions which are recommended by the representative for an unanticipated situation shall be approved by the Engineer prior to the adoption of such changes.

843.04 Removal of Concrete. The Engineer shall sound the structure and outline the areas to be removed. All loose, soft, honey-combed, disintegrated concrete, and 6mm (1/4 inch) depth of sound concrete shall be removed. Where the bond between the concrete and a reinforcing bar has been destroyed, or where more than one-half of the periphery of such a bar has been exposed, the adjacent concrete shall be removed to a depth that will provide a minimum 13mm (½ inch) clearance around the bar except where other reinforcing bars make this impractical. After completion of the secondary removal operation, the Engineer will resound the areas to ensure that only sound concrete remains. All work shall be done in a manner that will not damage or shatter the concrete that is to remain, and will not cut, elongate or damage the reinforcing steel in any way. Concrete may be removed by chipping or hand dressing. Chipping hammers shall not be heavier than the nominal 15.9 kg. (35pound) class. Where existing reinforcing bars would be less than 25mm (1 inch) from the proposed finished surface of concrete, they shall, if practical, be driven back into recesses cut in the masonry to obtain that coverage unless otherwise approved by the Engineer.

843.05 Surface Preparation. Cleaning shall precede application of the patching material by not more than 24 hours. The surface to be patched shall be cleaned by abrasive blasting followed by an air blast or by ultra-high pressure water blasting. Blasting abrasives containing more than 1% free silica will not be allowed. Exposed reinforcing and structural steel shall be cleaned to remove all loose and built-up rust, asphalt residue, and all other contaminants detrimental to achieving an adequate bond. It may be necessary to use hand tools to remove scale from the reinforcing steel or anchor bolts. The surface shall be free of spalls, laitance and all traces of foreign material. If necessary, detergent cleaning shall precede blast cleaning to ensure the removal of containments that are detrimental to achieving an adequate bond. Ultra-high hydro-demolition of 69 MPa (10,000 psi) or more is an acceptable method of total surface preparation. Any additional surface preparation shall be in accordance with the manufacturer’s recommendations for the patching material which is used. All unchipped surfaces that will receive new material shall be mechanically roughened.

843.06 Patching. The mixing, proportioning, placing and curing procedures, as well as, tools, equipment, labor and materials used shall be in accordance with the manufacturer’s specifications and recommendations. The finished surface of the repair area shall be flush with the surrounding area and conform to the original concrete surface.

843.07 Curing. Patches shall be cured in accordance with the manufacturer’s recommendations.

843.08 Inspection and Sounding of Concrete Patches. After curing and before final acceptance, all patches shall be sounded. All unsound or cracked patch areas shall be removed and repatched according to this specification at the Contractor’s expense. Aerosol paint for outlining shall be provided by the Contractor. All sounding and replacement of rejected areas will be the responsibility of the contractor and included in the unit bid price for this item. Sounding and repatching shall continue until only sound, uncracked patches remain.

843.09 Method of Measurement. The quantity shall be the actual area of the exposed surface of all accepted patches, irrespective of depth or thickness of the patch. If the patch includes corners or edges of members, all of the exposed surfaces shall be included. The cost of all labor, equipment, incidentals and materials for sounding and patching shall be included in the unit price bid for this item.

843.10 Basis of Payment. Payment will be made at the contract price bid for:

Item	Unit	Description
843	Square meter (square foot)	Patching concrete structures with trowelable mortar

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
SUPPLEMENTAL SPECIFICATION 844

HIGH PERFORMANCE CONCRETE FOR STRUCTURES

May 5, 1998

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 and placing 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 Item 511-Class S concrete will remain in effect, 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 499.031 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 6m (20 foot) 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	-13 (- ½ inch) + 13 mm (+ ½ inch)
-------------------------	-----------------------------------

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

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 dryrun). 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 32 mm (1 1/4 inches) 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 6 mm (1/4 inch).

Slip formed concrete will require different slumps than those listed in 499 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, 511.14 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 35mm (1½ inch) 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 6mm (¼ inch)). The perimeter of the control joint will be caulked with a polyurethane or polymeric material meeting Federal Specification TT-S-00227E.

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

The following proportions will used as a starting mix design.

CONCRETE TABLE
Quantities Per Cubic Meter
Aggregates (SSD)

Mix 1 (Fly Ash)								
Aggregate Type	Fine Aggregate (kg)	#8 Course Aggregate (kg)	Total (kg)	Cement Content (kg)	Fly Ash (kg)	Water to Cementitious Ratio		Max Air Content +/-2%
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
Mix 2 (GGBF Slag)								
Aggregate Type	Fine Aggregate (kg)	#8 Course Aggregate (kg)	Total (kg)	Cement Content (kg)	GGBF Slag (kg)	Water to Cementitious Ratio		Max Air Content +/-2%
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
Mix 3 (Fly Ash + Microsilica)								
Aggregate Type	Fine Aggregate (kg)	#8 Course Aggregate (kg)	Total (kg)	Cement Content (kg)	Fly Ash (kg)	Micro-Silica (kg)	Water to Cementitious Ratio	Max Air Content +/-2%
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
Mix 4 (GGBF Slag + Microsilica)								
Aggregate Type	Fine Aggregate (kg)	#8 Course Aggregate (kg)	Total (kg)	Cement Content (kg)	GGBF Slag (kg)	Micro-Silica (kg)	Water to Cementitious Ratio	Max Air Content +/-2%
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.

CONCRETE TABLE
Quantities Per Cubic Yard
Aggregates (SSD)

Mix 1 (Fly Ash)								
Aggregate Type	Fine Aggregate (lb)	#8 Course 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	
Mix 2 (GGBF Slag)								
Aggregate Type	Fine Aggregate (lb)	#8 Course 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	
Mix 3 (Fly Ash + Microsilica)								
Aggregate Type	Fine Aggregate (lb)	#8 Course 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
Mix 4 (GGBF Slag + Microsilica)								
Aggregate Type	Fine Aggregate (lb)	#8 Course 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.

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 50.0 kg.(100 pounds) 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 499.03 and 511.06. 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, 2.4m (8 feet) x 1.2m (4 feet) x 0.1m (4 inches), 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 0.49 kg per square meter per hour (0.1 pounds per square foot per hour) or less. Figure 1 ACI 308 (see Item 511.08) 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 3m (10 ft.) 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 insure 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 499.04(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 499.04(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 to mechanically depress aggregate are not allowed.

The placing and finishing equipment will be designed so that the elapsed time between depositing concrete and final finishing will not exceed 10 minutes.

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 3m (10 feet) 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 3mm (1/8 inch) in 3.05m (10 feet) 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. Within 3m (10

feet) of the completed tining operation, 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 100 μ m (4 mils) 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 (joints and cracks sealed as per 844.10 below). Within 12 hours, membrane cure as per 511.14 method(b).

When pouring under provision of 511.12 methods which retard evaporation may be used, but the deck will be kept continuously wet with hoses and the curing will be 7 days with the surface being maintained between 10 °C (50 °F) and 38 °C (100 °F) as specified. At the end of 7 days, the deck will be allowed to surface dry (joints and cracks sealed as per 844.10). Within 12 hours, membrane cure as per 511.14 method(b).

At the Contractor's option, the Contractor may saw texture the deck instead of texturing as per 511. If the texture as required by 511 is not met, the Contractor will saw texture the deck at no cost to the State.

The texture operation will follow as closely as possible behind the placement.

Immediately after finishing, the Contractor will spray an evaporation retardant on the fresh concrete as per manufacturer's written recommendations. Only products specifically marketed for such usage will be utilized. This material will not be finished into the plastic concrete at any time. Application in a stream will not be allowed. The Contractor is not limited in spraying additional evaporation retardant to concrete surfaces.

844.09 CURING AND LOADING. Curing and loading will be per 511.14, 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 water curing period has been completed and prior to the application of the membrane cure, the following areas will be sealed with a high molecular weight methacrylate (HMWM) sealer meeting SS 954: transverse joints in the deck; joints between the concrete deck and steel end dams; longitudinal joints in the deck; and longitudinal joints between the deck and safety curb, barriers, and parapets, etc. Payment for the material and placement of the HMWM sealer will be included in this item.

Prior to opening the deck to traffic, the deck will be checked on the top and bottom surfaces. Any cracking will be sealed from above with same HMWM product, in

accordance with the manufacturer's recommendations.

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 75 cubic meters (100 cubic yards) 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 25mm (1 inch) below the surface of the concrete, at approximately mid-slab and at 25mm (1 inch) 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 25mm (1 inch) below

the top of the parapet and second thermometer located 500mm (19 inches) 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, Room 516
25 South Front Street
Columbus, Ohio 43215

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 quantity will be measured as per 511.18 and will included all labor, material, equipment and incidentals necessary to complete this item of work.

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:

Item	Units	Description
844	Cubic meter (cubic yard)	High performance concrete superstructure (deck)
844	Square meter (square yard)	High performance concrete superstructure (deck)
844	Cubic meter (cubic yard)	High performance concrete superstructure (parapet)
844	Cubic meter (cubic yard)	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 846**

**TREATING CONCRETE BRIDGE DECKS WITH HMWM RESIN
September 9, 1997**

846.01	Description
846.02	Material
846.03	Limitations
846.04	Surface Preparation
846.05	Installation
846.06	Method of Measurement
846.07	Basis of Payment

846.01 DESCRIPTION. This work shall consist of preparing and treating the concrete wearing surfaces of bridge deck with a penetrating sealer in accordance with these specifications, in reasonably close conformity with the plans and the manufacturer's recommendation and as directed by the Engineer.

846.02 MATERIAL. The material used for treating the concrete shall meet Supplemental Specification 954, High Molecular Weight Methacrylate (HMWM) Resin.

846.03 LIMITATIONS. This work item shall not be performed during the period beginning November 1st and ending March 31st.

846.04 SURFACE PREPARATION. Roadway dirt and debris shall first be removed from the area of the deck to be treated. Surfaces to which the sealer is to be applied shall be swept, sandblasted then manual or power broom swept and blown with compressed air so that they shall be dry and free of dust and dirt. High pressure compressed air shall be used to blow all loose material from visible cracks. The cleaning equipment shall be fitted with suitable traps, filters, drip pans, driers and other devices to prevent oil and other foreign material from being deposited on the surface. Traffic shall not be allowed on the clean surface prior to application of the sealer. Existing pavement markings shall be removed according to Section 641.10 of the Specifications. All traces of asphalt or petroleum products and concrete curing seals shall be removed by the abrasive blasting prior to air sweeping.

846.05 INSTALLATION. A compatible promoter/initiator system capable of providing the same physical qualities of the hardened resin as if promoted/initiated with 2% cobalt naphthanate (6%) and 2% cumene hydroperoxide shall also be provided. Materials shall be stored at 18-27 °C (65-80°F). The system shall provide a resin gel time of not less than 40 minutes to not more than 1½ hours at the time and temperature of application.

The gel time shall be adjusted to compensate for the change in temperature throughout the day. The temperature of the surfaces to be treated may range from 10 °C (50°F) to 49°C (120 °F). The Contractor shall arrange to have a technical representative on site to provide mixing proportions equipment suitability, and safety advice to the Contractor and Engineer. Any conflict these provisions and representative's advice shall be resolved at the job site. The technical representative shall remain at the job site until such time as he and the Engineer agree that the Contractor is qualified in all aspects of the application of the sealer.

The promoter and initiator, if supplied separate from the resin, shall not contact each other directly. Containers of promoter or initiators shall not be stored together in a manner that will allow leakage or spillage from one to contact the containers or materials of the other.

Machine application of the resin may be performed by using a two-part resin system utilizing a promoted resin for one part and an initiated resin for the other part. This two-part resin system may be combined at a spray bar through positive displacement atomization of the resin. Compressed air shall not be used to produce the spray.

Cleaning and flushing of equipment, tools, etc., shall be done with an appropriate solvent, as approved by the Engineer, in such a manner to minimize personal and environmental hazards. Workman should be advised the resin will soften gum rubber soles, and a face-mask should be used to protect from accidental splashes. Clothing and leather saturated with resin will harden and become useless.

The surface to be treated shall be visibly dry and its temperature between 10 °C (120°F) prior to resin application. The resin may not be applied within 24 hours after a rain or when rain is forecast within 12 hours or when the ambient air temperature is below 10 °C (50 °F). The deck shall be pre-marked to control mixed material usage and to provide a rate of application of approximately 2.45m²/l (100 square feet per gallon). The exact rate shall be determined by the Engineer prior to commencing full-scale deck treatment operations.

Before using the material the Contractor shall submit to the Director copies of the manufacturer certified test data showing that material complies with the qualitative and quantitative requirements of this specification. The test data shall be developed by an independent approved testing laboratory, and shall include the brand name of the material, name of manufacturer, number of the lot tested and date of manufacture. When the material has been approved by the Director, further testing by the manufacturer will not be required unless the formulation of manufacturing process has been changed, in which case new certified test results will be required. The manufacturer shall certify that the formulation is the same as that for which data has been submitted. The state reserves the right to sample and test delivered lots for compliance.

The deck surfaces shall be flooded with resin, allowing penetration into the concrete and filling of all cracks. The initiated mix of promoted resin shall be limited to 19l (5 gallons) at a time for manual application. A significant increase in viscosity shall be cause for rejection. The treatment shall be applied within 5 minutes after complete mixing. Excess material shall be redistributed by squeegee or brooms within 10 minutes after application.

The Contractor shall take all steps necessary to prevent the resin from flowing into lanes open to traffic. The entire treated area of the bridge deck shall have sand broadcast by mechanical means to effect a uniform coverage of 0.43 kg/m² to 0.65 kg/m² (0.80 to 1.2 pounds per square yard). The sand shall be uniformly graded aggregate conforming to the quality requirements of 703 and shall conform to the following limits for grading:

<u>Sieve Size%</u>	<u>Passing Max.</u>
4.75mm (No. 4)	100
2.36mm (No. 8)	90-100
850 μm (No. 20)	5-15
300 μm (No. 50)	0-5

It is the intention of the specification to allow the use of commercially available blast sands applied by a common lawn broadcast type seeder/spreader. Sand shall be placed between 10 to 15 minutes behind the resin spreading front and before any jelling of the resin occurs. If the surface contains large deep cracks, the low-viscosity liquid could run completely through the concrete slab. In these areas, a second coat will be required after the first coat has started to cure.

Before the monomer hardens, imperfections or spalls with standing liquid shall be filled with commercial quality concrete or sandblast sand, and finished to a uniform surface. The sand shall have a maximum moisture content of 0.5 of the percent of absorption when tested in accordance to a California Test 226.

Traffic and equipment shall not be permitted on the tested deck until it is tack free and a minimum of 6 hours have elapsed since treatment and the sand cover adheres sufficiently to resist brushing by hand. The treatment shall be protected from moisture for not less than 4 hours after placement.

846.06 METHOD OF MEASUREMENT. The area under this item will be the number of square meter (square yards) of concrete bridge deck which are prepared, treated with high molecular weight methacrylate resin and are complete in place and accepted.

The accepted quantities of deck treatment will be paid for at the contract unit price per square meter (square yard), which price and payment shall be full compensation for furnishing all labor, materials including catalysts, tools, equipment and incidentals, and for performing all the work involved in preparing and treating the concrete surfaces

according to specifications.

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

Item	Units	Description
846	Square meter (square yard)	Treating concrete bridge decks with HMWM resin

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
SUPPLEMENTAL SPECIFICATION 863

STRUCTURAL STEEL MEMBERS

SEPTEMBER 9, 1997

863.01	Description
863.02	Fabricator Approval Procedure
863.03	Fabricator Prequalifications
863.04	Levels of Fabrication Qualification
863.05	Fabricators Evaluation and Required Qualifications
863.051	Miscellaneous Level required Qualifications
863.052	Personnel Qualifications
863.06	Rating System
863.061	Fabricator Rating Review Process
863.07	General
863.071	Fabricator Documentation Responsibility
863.08	Shop Drawings and Submittal Process
863.081	Pre-Fabrication Meeting
863.09	Material
863.10	Material Control
863.11	Care of Material
863.12	Workmanship and Straightening
863.13	Finish
863.14	Stiffeners
863.15	Fillers
863.16	Horizontally Curved Beams and Girders
863.17	Joints and Splices
863.18	Pin Holes
863.19	Pins and Rollers
863.20	Holes for High-Strength and Bearing Bolts
863.21	High-Strength Steel Bolts, Nuts and Washers
863.22	Bearing Bolts
863.23	Welding
863.24	Stud Shear Connectors
863.25	Threads for Bolts and Pins
863.26	Shop Assembly
863.27	Nondestructive Testing
863.28	Shipping, Storage and Erection
863.29	Shop Prime Painting
863.30	Cleaning ASTM A 709 Grade 50 W (A588) Steel
863.31	Method of Measurement
863.32	Basis of Payment
	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

THREE	Single or multiple span, straight, dog legged or curved, rolled beam bridges including stiffeners.
FOUR	Straight or dog legged welded plate girder bridges
FIVE	Straight, curved, haunched or tapered welded plate girder bridges
SIX	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 m² (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 ± 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 μ m (2000)
Heavy plates in contact in shoes to be welded	25.0a μ m (1000)
Milled ends of compression members, milled or ground ends of stiffeners and fillers	12.5a μ m (500)
Bridge rollers and rockers	6.4a μ m (250)
Pins and pin holes	3.2a μ m (125)
Sliding bearings	3.2a μ 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 ½ 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 piles 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
½	12
5/8	19
¾	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	½ turn	2/3 turn
Over 4 diameters but not exceeding 8 diameters	½ 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 ½ 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 that 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/m³ (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/m³ (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.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

Horizontal Laydown Assemblies

1. The full length base line is from abutment to abutment (15 points)
2. The substructures are dimensioned horizontally from the baseline (10 points)
3. Points at 10'-0" center/center and field splices are dimensioned horizontally from the baseline (1 point)
4. The center/center of bearings are dimensioned (5 points)
5. The splices are dimensioned from center line of bearings (1 point)
6. Transverse and longitudinal main members that frame together are developed for horizontal offsets (15 points)

Main Member Details (30%)

1. The cross frame and intermediate stiffeners are spaced per the framing plan (1 point)
2. There are section views for the different stiffener conditions (1 point)
3. The stiffeners have proper end fit conditions (10 points)
4. Weld termination details are correct (5 points)
5. Stiffener clips are correct (1 point)
6. Re-entrant corners are provided with a 1" radius (5 points)
7. Rolled beam cross sections have been dimensioned (1 point)
8. Individual member camber diagrams are supplied with offsets at 1/4 points (1 point)
9. Individual member sweep diagrams are supplied with offsets at 10'-0" c/c (1 point)
10. All material sizes, type or grade are per contract; shapes, member plates, splice plates, fills and stiffeners. (20 points)
11. WPS procedure numbers are identified for each weld (1 point)
12. Flange and web transitions are detailed per contract and AWS (10 points)
13. Member weld sizes and details are per contract and AWS (10 points)
14. The splice pattern, edge distance, and 1/4" maximum gap per contract (10 points)
15. The bolt diameters and types are correct per contract (20 points)
16. Piece marks match the framing plan and each piece is unique (1 point)
17. End condition such as integral abutment, flange clips, distances between end of member and center line of bearing or special fit-up are per contract (10 points)
18. Fracture Critical plates are identified per AWS and contract (25 points)

Appendix II

19. Fracture Critical welds are identified by WPS number and FC designation per AWS and contract (15 points)
20. Paint and no paint areas are detailed per contract (1 point)

Secondary Member Details (9%)

1. Material sizes are shown per contract (15 points)
2. Secondary member work points are dimensioned (1 point)
3. Weld sizes, lengths and locations are depicted according to AWS and contract (10 points)
4. Strut and transverse diagonals are shown with legs properly oriented (1 point)
5. There is a piece mark system (1 point)
6. Bolts and hole sizes are correct (1 point)
7. Cross slope and or superelevation has been acknowledged (15 point)

Y= yes, N= no, NA = not applicable

No partial points are available for a Y, N or NA selection

$$\text{Sum of } \{ Y / (Y + N) \} \times \text{Section Factor} = \text{Fabricator Rating}$$

Timeliness _____	(Y) / _____	(Y + N)*	X 15 = _____
Title Block _____	(Y) / _____	(Y + N)	X 1 = _____
General Notes _____	(Y) / _____	(Y + N)	X 5 = _____
Framing Plan _____	(Y) / _____	(Y + N)	X 10 = _____
Laydown _____	(Y) / _____	(Y + N)*	X 30 = _____
Main Member _____	(Y) / _____	(Y + N)*	X 30 = _____
Secondary Member _____	(Y) / _____	(Y + N)	X 9 = _____

Summation Fabricator rating for performance of shop drawings (%) = _____

* $Y / (Y + N) \times 1.0$ for Timeliness, Laydown or Main Members sections. If any of these individual ratings are lower than the summation fabricator rating, the Fabricator rating shall then be based upon the lowest individual section rating.

Fabricator _____ **Rating for Performance of Shop Drawings** _____ %
FABRICATOR _____ **RATING FOR TEST**
REPORTS

County: _____ Project: _____ Reference: _____ Date: _____

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)

--	--	--

TEST REPORTS RATING TOTAL

--	--	--

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

V. FOLLOW-UP SEQUENCE FOR INCOMPLETE MILL TEST

DATE Performed	DATE DUE	RESULT
-------------------	-------------	--------

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.

Appendix II

FABRICATOR _____ RATING FOR SHOP FABRICATION

County: _____ Project: _____ Reference: _____ Shop ID: _____

Office of Structural Engineering QA Inspector: _____			
Check, Hold or Witness Point Descriptions for Levels of Fabrication 1 thru 5	Y	N	NA
ASTM A709, Grade, Physical & Chemical Requirements, CVN : Check point 1			
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)			
ASTM A6 Quality and permissible Variations: Check Point 2			
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)			
Material Preparation per AWS D1.5, AASHTO and 863: Check Point 3			
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

Cambering and Sweep per 863, AWS and AASHTO: Check Point 4			
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)			
Fitting per AWS, 863 and AASHTO: Check Point 5			
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)			
Flange and Web Butt Splice Welding per AWS, 863 and AASHTO: Check Point 6			
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)			
Flange to Web Fillet Welds per AWS, 863 and AASHTO: Check Point 7			
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)			
Stiffener Fillet Welds per AWS, 863 and AASHTO: Check Point 8			
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)			
Shop Laydown per AWS, 863, and AASHTO: Check Point 9			
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)			
Radiographic Inspection per AWS, 863.27 and AASHTO: Check Point 10, Hold Point for B & C Rated fabricators			
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)			
Ultrasonic Inspection per AWS, 863.27 and AASHTO: Check Point 11, Hold and Witness Point for B & C Rated Fabricators			
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)			
Magnetic Particle Inspection per AWS, 863.27 and AASHTO: Check Point 12, Hold and Witness point for C Rated Fabricators.			
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)			
Cleaning per 863.27, SSPC and ASTM: Check Point 13			
Shop solvent cleaning per SSPC-SP1 (5 point)			
Shop grinding edges 1/16", material thicker than 1 ½" 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)			
Painting per 863.29, SSPC and ASTM: Check Point 14, Hold Point for C Rated Fabricators			
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)			
Final Shop, Shipping or Storage, QA Inspection: Hold Point 15, Required for all Fabricators			

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) x 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
ASTM A709, Grade, Physical & Chemical Requirements, CVN : Check point 1			
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)			
ASTM A6 Quality and permissible Variations: Check Point 2			
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)			
Material Preparation per AWS D1.5, AASHTO and 863: Check Point 3			
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

Cambering and Sweep per 863, AWS and AASHTO: Check Point 4			
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)			
Fitting per AWS, 863 and AASHTO: Check Point 5			
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)			
Flange and Web Butt Splice, Web-to-Flange CJP Welding per AWS, 863 and AASHTO: Hold and Witness Point 6			
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			
Flange to Web Fillet Welds per AWS, 863 and AASHTO: Hold and witness Point 7			
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			
Stiffener Fillet Welds per AWS, 863 and AASHTO: Hold and witness Point 8			
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			
Repair procedure per AWS 12.17 hold and witness point 9			
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			
Radiographic Inspection per AWS, 863 and AASHTO: Hold Point 10			
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)			
Ultrasonic Inspection per AWS, 863 and AASHTO: Hold and witness point 11			
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)			
Magnetic Particle Inspection per AWS, 863 and AASHTO: Check Point 12, Hold and witness for C rated fabricators.			
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)			
Shop Laydown per AWS, 863, and AASHTO: Check Point 13			
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)			
Cleaning per 863, SSPC and ASTM: Check Point 14			
Shop solvent cleaning per SSPC-SP1 (5 point)			
Shop grinding edges 1/16", material thicker than 1 ½" 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)			
Painting per 863, SSPC and ASTM: Hold or Check Point 15			
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)			
Final Shop, Shipping or Storage, QA Inspection: Hold Point 16			

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) x 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 899

CONCRETE - GENERAL

October 21, 1998

899.01	Description
899.02	Materials
899.03	Proportioning
899.04	Proportioning Options
899.05	Additional Classes of Concrete for Rigid Replacement
899.06	Equipment
899.07	Handling, Measuring, and Batching Materials
899.08	Batch Plant Tickets
899.09	Mixing Concrete

899.01 Description. This work shall consist of proportioning and mixing portland cement concrete.

899.02 Materials. Materials shall be:

Fine aggregate*	703.02
Fly ash	705.13
Coarse aggregate	703.02, 703.13***
Portland cement	701.01, 701.02, 701.03
	701.04, 701.05****
Ground granulated blast furnace slag	ASTM C 989, grade 100 or 120
Air entraining admixture.	705.10
Chemical admixture for concrete.	705.12**

*703.02 natural sand is required in 255, 451, 452, 453, 611, and 511 deck slabs.

**Admixtures shall contain no more than 50 parts per million chloride ions by weight of cement.

*** Applies only to 451, 452 and 453.

**** Use of Slag-Modified Portland Cement meeting ASTM C 595M, Type I(SM) is permitted; acceptance shall be in accordance with 701 and Supplement 1028. Type I(SM) may be used only between April 1 to October 1, and when 705.10 Air-Entraining Admixture is added at the mixer. Type I(SM) may not be used with Options 1 and 3.

Water used in concrete shall be free from sewage, oil, acid, strong alkalis or vegetable matter, and also shall be free from clay and loam. Water which is potable is satisfactory for use in concrete.

899.03 Proportioning. Proportioning shall be based on pre-determined cement content. Except as otherwise provided herein, each cubic yard (cubic meter) of concrete shall contain the specified weight of cement as determined by the yield calculation. The yield shall be within ± 1 percent of the theoretical yield of 27.00 cubic feet (1 m³). The water-cement ratio shall not exceed the maximum specified. Below this limit, the quantity of water shall be adjusted to meet the slump requirements.

Concrete shall contain 6 ± 2 percent of total air, except as noted herein.

Slump shall be maintained within the range shown as nominal slump in the following table. No concrete shall be used in the work that has a slump greater than that shown as maximum in the table. When the slump is found to exceed the limit of nominal slump but is within the maximum limit, occasional loads of concrete may be used, provided an immediate adjustment is made in the mixture to reduce the slump of succeeding loads to within the nominal range shown.

Type of Work	Nom. Slump inch (mm)*	Max. Slump inch (mm)**
Concrete pavement (305, 451, 452, 453, 611, 615)	1-3 (25-75)	4 (100)
Structural Concrete (511, 610, 622)	1-4 (25-100)	5 (125)
Superstructure concrete (511)	2-4 (50-100)	4 (100)
Non-reinforced concrete (601, 602 603, 604, 608, 609, 612, 622)	1-4 (25-100)	5 (125)

*This slump may be increased to 6 inches (150 mm) provided the increase is achieved by the addition of a chemical admixture meeting the requirements of 705.12, Type F or G.

**This slump may be increased to 7 inches (180 mm) provided the increase is achieved by the addition of a chemical admixture meeting the requirements of 705.12, Type F or G.

Tests on the plastic concrete for pavement shall be made at the paving site or at a location designated by the Engineer. Tests for structure concrete shall be made at the site of the work at the point of placement.

The weights of fine and coarse aggregate shall be determined by the Engineer from the weights given in the Concrete Table. If high early strength concrete is specified, the Contractor may use high-early strength cement, additional cement, approved chemical admixtures, or a combination of these materials to achieve a modulus of rupture of 600 psi (4.2 MPa) in three days or less. If high-early-strength concrete is not specified, but is desirable to expedite the work, the Contractor may use these same materials at no additional cost to the state.

The weights specified in the Concrete Table were calculated for aggregates of the following bulk specific gravities: natural sand and gravel 2.62, limestone sand 2.68, limestone 2.65, and slag 2.30. The assumed specific gravities of fly ash and ground granulated blast furnace slag are 2.30 and 2.90, respectively. For aggregates of specific gravities differing more than plus or minus 0.02 from these, the weights in the table shall be corrected as indicated in paragraph (c).

CONCRETE TABLE					
Quantities Per Cubic Yard (Meter)					
Type of Coarse Aggre- gate	Dry Aggregates			Cement Content lb (kg)	Water- Cement Ratio Maxi- mum
	Fine Aggre- gate	Coarse Aggre- gate	Total		
	lb (kg)	lb (kg)	lb (kg)		
CLASS C (Using No. 57 or No. 67 Size)					
Gravel	1160 (688)	1735(1029)	2895(1717)	600 (356)	0.5
Limestone	1285(762)	1630(967)	2915(1729)	600(356)	0.5
Slag	1350(801)	1360(807)	2710(1608)	600(356)	0.5
CLASS F (Using No. 57 or No. 67 Size)					
Gravel	1270(753)	1810(1074)	3080(1827)	470(288)	0.55
Limestone	1345(798)	1730(1026)	3075(1824)	470(288)	0.55
Slag	1380(819)	1470(872)	2850(1691)	470(288)	0.55
CLASS S (Using No. 57 or No. 67 Size)					
Gravel	1125(667)	1735(1029)	2860(1697)	715(424)	0.44
Limestone	1260(747)	1530(908)	2790(1655)	715(424)	0.44
Slag	1280(759)	1370(813)	2650(1572)	715(424)	0.44

On projects specifying 451, 452, or 453, the following requirements shall apply. If No. 57 or 67 Size is approved, the quantities per cubic yard (cubic meter) will be in accordance with the above concrete table. If sizes No. 7, 78, or 8 are approved, the concrete shall contain 8 plus or minus 2 percent air, and the quantities will be in accordance with the following table:

Quantities Per Cubic Yard (Meter)					
Type of Coarse Aggre- gate	Dry Aggregates			Cement Content lb (kg)	Water- Cement Ratio Maxi- mum
	Fine	Coarse	Total		
	Aggre- gate	Aggre- gate			
	lb (kg)	lb (kg)			
CLASS C (Using No. 7, 78, or No. 8 Size)					
Gravel	1320(783)	1460(866)	2780(1649)	600(356)	0.5
Limestone	1380(819)	1410(837)	2790(1656)	600(356)	0.5

At any time during the construction period, the relative weights of fine and coarse aggregate as determined from the above table may be varied by the Engineer in order to insure a workable mix within the slump range and to control the yield. However, the total weight of aggregate per cubic yard (cubic meter) shall not be changed except as provided in the preceding paragraph as for the following conditions or both.

(a) For batch weights, the weights determined as described above shall be corrected to compensate for moisture contained in the aggregates at the time of use.

(b) If it is found impossible to prepare concrete of the proper consistency without exceeding the maximum water/cement ratio specified, a water reducing admixture conforming to requirements of 705.12 shall be used or the cement content shall be increased. However, the Contractor shall not be compensated for the admixture or additional cement which may be required by reason of such adjustment.

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

(d) Unit weight determinations shall be made and the yield shall be calculated and maintained in accordance with ASTM C 138. Based on these determinations, the batch weights will be adjusted when necessary. However, the specified cement content shall be maintained within a tolerance of ± 1 percent and the maximum water-cement ratio shall not be exceeded.

(e) The amount of mixing water shall be adjusted for the moisture contained in the aggregate and for the moisture which they will absorb, in order to determine the amount of water to be added at the mixer.

(f) An approved set retarding admixture meeting the requirements of 705.12, Type B or Type D shall be required for concrete when the concrete temperature exceeds a nominal temperature of 75° F (24° C).

899.04 Proportioning Options. The Contractor may substitute one of the following options for all concrete items: The dry weights specified in these tables were calculated using the same specific gravities used in 899.03. The specific gravity used for ground granulated blast furnace (GGBF) slag is 2.90. Adjustments shall be made to the mix design due to specific gravities differing by more than 0.02. Other adjustments may be made as allowed in 899.03 and approved by the Engineer.

The requirements for Proportioning Option 1 are as follows. The cement content may be reduced as much as 15 per cent by weight with the substitution of an equivalent weight of fly ash meeting the requirements of 705.13. The water/cement ratio shall be based on the combined weight of cement and fly ash. Proportioning Option 1 shall meet the following Mix Design Concrete Table:

Quantities Per Cubic Yard (Cubic Meter)						
Type of Coarse Aggregate	Dry Aggregates			Cement Content lb (kg)	Fly Ash lb (kg)	Water-CM Ratio Maximum
Fine Aggregate lb (kg)	Coarse Aggregate lb (kg)	Total lb (kg)				
CLASS C Option 1 (Using No. 57 or No. 67 Size)						
Gravel	1140(676)	1700(1009)	2840(1685)	510(303)	90(53)	0.50
Limestone	1260(748)	1595(946)	2855(1694)	510(303)	90(53)	0.50
Slag	1320(783)	1330(789)	2650(1572)	510(303)	90(53)	0.50
CLASS F Option 1(Using No. 57 or No. 67 Size)						
Gravel	1260(748)	1800(1068)	3060(1815)	400(237)	70(42)	0.55
Limestone	1350(801)	1730(1026)	3080(1827)	400(237)	70(42)	0.55
Slag	1380(819)	1475(875)	2855(1694)	400(237)	70(42)	0.55
CLASS S Option 1 (Using No. 57 or No. 67 Size)						
Gravel	1060(629)	1640(973)	2700(1602)	608(361)	107(63)	0.44
Limestone	1230(730)	1490(884)	2720(1614)	608(361)	107(63)	0.44
Slag	1220(724)	1300(771)	2520(1495)	608(361)	107(63)	0.44

CLASS C Option 1 (Using No. 7, 78 or 8 Size)						
Gravel	1310(777)	1440(854)	2750(1631)	510(303)	90(53)	0.50
Limestone	1350(801)	1410(837)	2760(1638)	510(303)	90(53)	0.50

The requirements for Proportioning Option 2 are as follows. The cement content may be reduced as much as 50 pounds per cubic yard(30 kg/ m3), with the substitution of an equivalent volume of aggregate, provided the Contractor uses an approved water reducing admixture meeting the requirements of 705.12; Type A or Type D. Proportioning Option 2 shall meet the following Mix Design Concrete Table:

Quantities Per Cubic Yard (Cubic Meter)					
Type of Coarse Aggregate	Dry Aggregates			Cement Content lb (kg)	Water-Cement Ratio Maximum
	Fine Aggregate lb (kg)	Coarse Aggregate lb (kg)	Total lb (kg)		
CLASS C Option 2 (Using No. 57 or No. 67 Size)					
Gravel	1190(706)	1785(1059)	2975(1765)	550(326)	0.50
Limestone	1320(783)	1675(994)	2995(1777)	550(326)	0.50
Slag	1385(822)	1395(828)	2780(1649)	550(326)	0.50
CLASS F Option 2 (Using No. 57 or No. 67 Size)					
Gravel	1315(780)	1880(1115)	3195(1896)	420(249)	0.55
Limestone	1410(837)	1810(1074)	3220(1910)	420(249)	0.55
Slag	1445(857)	1540(914)	2985(1771)	420(249)	0.55
CLASS S Option 2 (Using No. 57 or No. 67 Size)					
Gravel	1120(664)	1710(1015)	2830(1679)	665(395)	0.44
Limestone	1290(765)	1560(926)	2850(1691)	665(395)	0.44
Slag	1270(753)	1370(813)	2640(1566)	655(395)	0.44

CLASS C Option 2 (Using No. 7, 78 or No. 8 Size)					
Gravel	1370(813)	1510(896)	2880(1709)	550(326)	0.50
Limestone	1420(842)	1480(878)	2900(1720)	550(326)	0.50

The requirements for Proportioning Option 3 are as follows. The Portland cement content may be reduced as much as 50 pounds per cubic yard(30 kg/m3) with the substitution of an equivalent volume of aggregate, provided the Contractor uses an approved water-reducing admixture meeting the requirements of 705.12, Type A or D. The cementitious materials content shall consist of a combination, by weight, of a minimum of 70 percent Type I or Type IA Portland cement (701.04 or 701.01), and a maximum of 30 percent ground granulated blast furnace slag, ASTM C 989, grade 100 or 120. Proportioning Option 3 shall meet the following Mix Design Concrete Table:

Quantities Per Cubic Yard (Cubic Meter).						
Type of Coarse Aggregate	Dry Aggregates			Cement Content lb (kg)	GGBF Slag lb (kg)	Water-CM Ratio Maximum
	Fine Aggregate lb (kg)	Coarse Aggregate lb (kg)	Total lb (kg)			
CLASS C Option 3 (Using No. 57 or No. 67 Size)						
Gravel	1185(703)	1775(1053)	2960(1756)	385(228)	165(98)	0.50
Limestone	1310(777)	1670(991)	2980(1768)	385(228)	165(98)	0.50
Slag	1385(822)	1385(822)	2770(1644)	385(228)	165(98)	0.50
CLASS F Option 3(Using No. 57 or No. 67 Size)						
Gravel	1320(783)	1870(1109)	3190(1892)	294(174)	126(75)	0.55
Limestone	1400(831)	1810(1074)	3210(1905)	294(174)	126(75)	0.55
Slag	1440(854)	1535(911)	2975(1765)	294(174)	126(75)	0.55

CLASS S Option 3 (Using No. 57 or No. 67 Size)						
Gravel	1105(656)	1715(1017)	2820(1673)	465(276)	200(119)	0.44
Limestone	1280(759)	1555(923)	2835(1682)	465(276)	200(119)	0.44
Slag	1270(753)	1360(807)	2630(1560)	465(276)	200(119)	0.44

CLASS C Option 3 (Using No. 7, 78 or No. 8 Size)						
Gravel	1370(813)	1500(890)	2870(1703)	385(228)	165(98)	0.50
Limestone	1410(837)	1480(878)	2890(1715)	385(228)	165(98)	0.50

GGBF = ground granulated blast furnace slag; CM = cementitious material.

The use of coarse aggregate in Portland cement concrete pavements is restricted by 703.13, as modified by the proposal.

Approval of Optional Mix Designs. A request to use any option design must be submitted to the Engineer for approval.

All admixtures used in the concrete mixture must be compatible and shall be dispensed in accordance with the manufacturer's recommendations.

If Portland cement with fly ash as an additive is used as described under Option 1 or ground granulated blast furnace slag is used under Option 3, the mix design shall be used only between April 1 and October 15, unless otherwise authorized by the Director. If Option 1 is used, an approved set retarding admixture meeting the requirements of 705.12, Type B or Type D shall be used if the concrete temperature exceeds a nominal temperature of 75° F (24° C) . If Option 2 or 3 is used, an approved water reducing set retarding admixture meeting the requirements of 705.12, Type D shall be used if the concrete temperature exceeds a nominal temperature of 75° F (24° C).

The proportioning adjustments under Options 1, 2 or 3 shall be the responsibility of the Contractor, and shall be in accordance with the ACI Standard "Recommended Practice for Selecting Proportions for Normal Weight Concrete" (ACI 211.1). The proportioning shall be based on developing an average compressive strength at 28 days of 4000 psi (28.0 MPa) for Class C, 3000 psi (21.0 Mpa) for Class F or 4500 psi (31.0 MPa) for Class S.

Optional mixes are not permitted with concrete bridge deck overlays using microsilica. For mixes used in latex modified and superplasticized dense concrete bridge deck overlays (Supplemental Specifications 847 and 848), and using Option 1 and 2, certified test data shall be provided for all requirements in accordance with Supplement 1045. Option 3 may not be used with concrete bridge deck overlays (Supplemental Specifications 847 and 848). The testing for Absorption, Scaling Resistance, and Volume Change will not be required for mixes used in dense concrete bridge deck overlays.

Only one source of fly ash shall be used in any one structure unless otherwise authorized by the Director. Bulk fly ash shall be stored in waterproof bins.

No option mixes shall be permitted in concrete mixes designed or intended to obtain high early strength.

899.05 Additional Classes of Concrete for Rigid Replacement.

Class FS. This mixture is a fast-setting Portland cement concrete for accelerated setting and strength development. The minimum cement content shall be 900 pounds per cubic yard (534 kg/m³) and the maximum water — cement ratio shall be 0.40. The rigid replacement may be opened to traffic after four hours provided test beams have attained a modulus of rupture of 400 psi (2.8 MPa).

The concrete shall be kept plastic by means of a Type B or D admixture until the surface has been textured. The Type B or D admixture shall be used in accordance with the manufacturer's recommendations.

Calcium chloride shall be added and mixed with each batch of concrete just prior to placement. If calcium chloride with 94-97 percent purity is used, the addition rate shall be 1.6 percent by weight of the cement. If calcium chloride with 70-80 percent purity is used, the addition rate shall be 2.0 percent by weight of the cement. When calcium chloride in a water solution is used, the water used shall be considered as part of the concrete mixing water and appropriate adjustments shall be made for its inclusion in the total concrete mixture.

Any other approved accelerating admixture may be used at the rate recommended by the manufacturer, provided it will produce the required strength in the allotted time.

Immediately after the curing compound has been applied, the replacements shall be

covered with polyethylene sheeting and further covered with building board as specified in ASTM C 208. The building board shall be wrapped in a black polyethylene sheeting and placed tight against the surrounding concrete and weighted down to protect the fresh concrete from the weather.

Class MS. This mixture is a moderate-setting portland cement concrete for accelerated strength development. The rigid replacement may be opened to traffic after 24 hours provided test beams have attained a modulus of rupture of 400 psi (2.8 MPa). The minimum cement content shall be 800 pounds per cubic yard (475 kg/m3) and the maximum water-cement ratio shall be 0.43.

The proportioning of the concrete materials to meet the requirements of each class of rigid replacement concrete specified shall be the responsibility of the Contractor. The coarse aggregate may be any one of the following sizes: No. 57, No. 6, No. 67, or No. 8. When No. 8 size is used, the entrained air content shall be 8 ±2 percent. Otherwise, the entrained air content shall be 6 ±2 percent.

The Engineer's approval of the concrete mix design will be based on the Contractor's submitted proportions and the foregoing information.

899.06 Equipment. Equipment shall be as follows:

(a) Batching Plants. Each plant shall be constructed and operated so that no intermingling of materials occurs prior to batching. The plant shall have weighing mechanisms which provide either a visible means of checking weights or a printed record. Dispensing mechanisms for water and admixtures shall have a visible means of checking quantities or shall produce a printed record.

Weighing mechanisms used for cement and aggregates shall weigh to an accuracy such that the weight indicated on the scale or printed ticket is within ± 0.5 percent of the correct weight. Devices for weighing or metering water shall measure to an accuracy of ± 1.0 percent throughout the range used.

All weighing and metering devices shall have been checked and their accuracy attested to within the 12-month period immediately prior to their use. This service may be performed by the Sealer of Weights and Measures or a scale servicing company. In lieu of the preceeding requirements, the concrete batch facilities may be approved if a Certificate of Performance has been issued by the National Ready Mixed Concrete Association.

To reach a capacity of 500 pounds (227 kg), ten standard test weights or the services of a scale servicing company shall be readily available for testing the weighing devices at the batch plant. All weights used in testing the weighing devices shall be sealed every 3 years by the Ohio Department of Agriculture.

Weighing and dispensing devices shall be tested as often as the Engineer may deem necessary to assure their continued accuracy.

(b) Mixers. Mixers and agitators shall conform to paragraphs 10, 11.2, 11.5 and 11.6 of AASHTO M 157, except that mechanical counters are permitted.

When a truck mixer is used for complete mixing, each batch of concrete shall be mixed for not less than 70 revolutions of the drum or blades at the rate of rotation designated on the metal plate on the mixer as mixing speed.

Bodies of nonagitating hauling equipment for concrete shall be smooth, mortartight, metal containers and shall be capable of discharging the concrete at a satisfactory controlled rate without segregation. Covers shall be provided when required by the Engineer. Trucks having dump bodies with rounded corners and no internal ribs or projections will be permitted for nonagitating hauling.

899.07 Handling, Measuring and Batching Materials. Aggregates from different sources and of different gradings shall not be stockpiled together. Aggregates that have become segregated, or mixed with earth or foreign material, shall be reworked or cleaned as directed by the Engineer, or rejected. Coarse aggregate shall be maintained with a uniform moisture content.

The fine aggregate and coarse aggregate shall be separately weighed in the respective amounts set by the Engineer as outlined in 899.03. Separate weighing devices shall be used for weighing the cement.

Batching shall be so conducted as to result in the weights of each material required within a tolerance of ± 1.0 percent for cement and ± 2.0 percent for aggregates. Water shall be measured by weight or volume to within a tolerance of ± 1.0 percent. Admixtures shall be dispensed to within ± 3.0 percent of the desired amount.

Methods and equipment for adding air-entraining agent or other admixture into the batch, when required, shall be approved by the Engineer.

899.08 Concrete Batch Plant Tickets. The Contractor shall furnish the Engineer a concrete batch

plant ticket for each load of concrete delivered for use on the project. Batch tickets may be computer-generated, handwritten, or a combination. The ticket shall include, at a minimum, the information listed in Table I:

TABLE I - EVERY BATCH TICKET	
Name of ready-mix batch plant	
Batch Plant No	
Batch Plant Location	
Serial number of ticket	
Date	
Truck Number	
Class of Concrete	
JMF#	
Time the load was batched	
Size of Batch [cu yd (cu m)]	
Actual weights of cementitious material:	
Cement [lbs(kg)]	
Fly ash [lbs(kg)]	
Ground granulated blast furnace slag [lbs(kg)]	
Micro-silica [lbs(kg)]	
Other	
Actual weights of aggregates:	
Coarse [lbs(kg)]	
Fine [lbs(kg)]	
Other	
Actual weight of water [lbs(kg)]	
Actual volume of admixtures:	
Air entrainer [fl. oz. (mL)]	
Superplasticizer [fl. oz. (mL)]	
Water reducer [fl. oz. (mL)]	
Retarder [fl. oz. (mL)]	
Other	
Aggregate moisture contents (%):	
Coarse Aggregate	
Fine Aggregate	
Water Cement Ratio, leaving the plant	

Batch tickets for each day's first load of concrete, for each JMF, shall also include the information in Table II below. The Table II information may be either included on the batch ticket or furnished on a separate form. The separate form may be computer-generated or handwritten, but the form must be physically attached to the batch ticket.

If during the concrete manufacturing process any of the information listed in Table II changes, the information in Table II shall be resubmitted with the first concrete batch ticket supplied with the changed concrete.

TABLE II - FIRST TICKET EACH DAY, EACH JMF	
Cementitious Sources and Grade or Type:	
Cement	
Micro - Silica	
Ground granulated Blast Furnace slag	
Fly Ash	
Other	
Admixtures - Brand and Type:	
Air entrainer	
Retarder	
Water reducer	
Superplasticizer	
Other	

Concrete batch ticket information conforms to ASTM C 94, section 13. Supporting data may be required by the Engineer to validate the basis for the furnished aggregate moisture contents. Cost for generating and supplying the information and the concrete batch tickets shall be included in the individual concrete items.

899.09 Mixing Concrete. The concrete may be mixed in a central mix plant or in truck mixers. The mixer shall be of an approved type.

When mixed in central mixers, the mixing time shall not be less than 60 seconds. Mixing time begins when all materials are in the drum and ends when the discharge begins. Transfer time in multiple drum mixers is included in mixing time. The contents of an individual mixer drum shall be removed before a succeeding batch is emptied therein.

Ready-mixed concrete shall be mixed and delivered in accordance with 899.04(b). Mixed concrete from the central mixers shall be transported in truck mixers, truck agitators, or trucks having nonagitating bodies. The concrete shall be delivered to the site of the work and discharge shall be completed within one hour after the combining of the water and the cement. If an approved set-retarding (705.12, Type B) or a water-reducing and set-retarding (705.12, Type D or G) admixture is used at the Contractor's expense, discharge shall be completed within 90 minutes after the combining of the water and the cement.

When concrete is delivered in transit mixers or agitators, additional water within the limits specified may be added and sufficient mixing performed to adjust the slump and to regenerate the specified air content throughout the batch, provided all these operations are performed prior to discharging any of the batch and within the above time limitations. When making these adjustments, the concrete shall be mixed a minimum of 30 revolutions at mixing speed.

Retempering after the start of discharge is permitted by the use of approved admixtures (705.12, Type F or G) when approved by the Engineer.

Admixtures containing more than 50 parts per million chloride by weight of cement will be permitted only when provided for in the contract, or upon written permission of the Director.

The procedure for making and testing of concrete beams shall be in accordance with the requirements of Supplement 1023 on file in the Office of the Director.

When mixed, all concrete shall have a temperature of not more than 90° F (32° C), and the concrete shall be maintained under this temperature until deposited in the work.

**STATE OF OHIO
DEPARTMENT OF TRANSPORTATION**

**SUPPLEMENTAL SPECIFICATION 910
OZEU STRUCTURAL STEEL PAINT**

April 21, 1997

910.01	Description
910.02	Materials
910.03	Performance Requirements
910.04	Prequalification
910.05	Sampling

910.01 Description. This specification covers the formulation and testing of a three coat structural steel paint system consisting of an organic zinc prime coat, an epoxy intermediate coat and a urethane finish coat (OZEU).

910.02 Materials.

Organic Zinc Prime Coat

This coating shall consist of a zinc dust filled, two or three component epoxy polyamide, and selected additives as required:

A. Physical Requirements	Minimum
1. Total Solids, % by weight of paint, ASTM 2369	70
2. Pigment, % by weight of total solids, ASTM D 2371	83
3. Total zinc dust, % by weight of pigment	93
4. Total zinc, % by weight, of total solids, By calculation	77
5. Total solids, % by volume, ASTM D2697	45
6. Color, greenish gray, approximating FS-595B-34159, Visual comparison	
7. Pot Life at 25° C (77° F) and 50% Relative Humidity (R.H.), hours	6
By observation of Ford B cup viscosity, pot life is deemed exceeded if the viscosity rose more than 30% or if gelled particles appear in the mix. A one liter (quart) container of mixed material is used.	
B. Qualitative Requirements	
1. Mixing shall conform to Section 5.2, SSPC-Paint 20 using only a high shear (Jiffy) mixer.	

2. Storage life - Section 5.4, SSPC-Paint 20
3. Mudcracking - Section 5.7, SSPC-Paint 20

C. Material Quality Assurance

1. Hardener Component	Variance*
a. Nonvolatiles, % by weight	± 2
b. Density	± 0.02g/mL (± 0.2 lb. per gal.)
c. Viscosity	± 5 KU or ± 5 sec., Ford Cup
2. Zinc/Resin Component	
a. Total Zinc metal, % by weight	± 2
b. Density	+/- 2%
c. Viscosity	Dependent on test
d. Nonvolatiles, % by weight	± 2

*Variance within the mean of the tests of the previously submitted sample for qualification.

Epoxy Intermediate Coat

This coating shall be a two-part product composed of a base component and a curing agent suitable for application over the epoxy-polyamide zinc rich primer.

The base component shall contain an epoxy resin together with color pigments, mineral fillers, gellant, leveling agent, and volatile solvents. The curing agent component shall contain a liquid polyamide resin and volatile solvent. The coating shall also meet the following:

- A. Physical Requirements**
1. Color: White, meeting or exceeding, FS-595B-37875 as per ASTM E 1347
 2. Components: Two, mixed prior to application
 3. Volume Solids, ASTM D 2697: 50.0% minimum
 4. Potlife: 6 hours, minimum @ 25° C (77°F)

By observation of Ford B cup viscosity, pot life is deemed exceeded if the viscosity rose more than 30% or if gelled particles appear in the mix. A one liter (quart) container of mixed material is used.

- 5. Curing Time:
 - a. Set-to-touch, ASTM D 1640: 4 hours Maximum @ 25°C (77°F)
 - b. DRY To Recoat, ASTM D 1640: 24 hours Maximum @ 25°C (77°F)
 - c. Full cure: 7 days @ 10°C (50°F), Maximum
No pick-up when rubbed with a cloth soaked in MEK
- 6. Fineness of Grind, ASTM D 1210: Hegman 3 minimum
- 7. V.O.C. maximum, ASTM D 3960: 0.419 g/mL (3.5 lbs./gal.), as applied.

B. Material Quality Assurance

Test	Variance*
1. Density	+/- 2%
2. Viscosity	Dependent on test
3. Total Solids, % by weight	± 2
4. Pigment, % by weight	± 2
5. Nonvolatile Vehicle, % by weight	± 2

*Variance shall be within the noted range based upon the test average of the previously submitted sample.

Urethane Finish Coat

This coating shall be a two component polyester and/or acrylic aliphatic urethane and shall be suitable for use as a finish coat over the white epoxy polyamide intermediate coat.

A. Physical Requirements

- 1. Finish: Specular Gloss, 60 degree, ASTM D 523: 85% minimum;
70% minimum after 3000 hours weathering resistance
- 2. Volume Solids, ASTM D 2697: 42% minimum
- 3. Cure (Dry) Time at 25°C (77°F) and 50% RH
Set to touch ASTM D 1640: 30 Minutes, minimum
4 Hours, maximum
- 4. Pot Life: 4 hours minimum at 25°C (77°F)

By observation of Ford B cup viscosity, pot life is deemed exceeded if the viscosity rose more than 30% or if gelled particles appear in the mix. A one liter (quart) container of mixed material is used.

- 5. V.O.C. ASTM D 3960: maximum, 0.419 g/mL (3.5 lbs./gal.), as applied
- 6. Colors**
 - a. Gray FS-595B - 16440 - Use for the gloss test
 - b. Green FS-595B - 14260
 - c. Blue FS-595B - 15450

**Contractor's choice unless specified on plans.

B. Material Quality Assurance

1. Analysis (for each component)

Test	Variance*
a. Density	+/- 2%
b. Viscosity,	Dependent on test
c. Total Solids, by Weight	± 2%
d. Pigment, by Weight	± 2%
e. Nonvolatile Vehicle, by weight	± 2%

*Variance shall be within the noted range based upon the test average of the previously submitted sample.

910.03 Performance Requirements. The coating system, which consists of the organic zinc prime coat, the epoxy intermediate coat, and the urethane topcoat, shall be tested prior to use.

Three panels for each of the specified tests shall be prepared to the requirements of the ASTM D 609 except that the thickness shall be 3 mm (1/8 inch) minimum and the steel shall be ASTM A 36/A 36 M hot rolled steel. The surface shall be blast cleaned (using coal slag abrasive) to equal, as nearly as is practical, the standard Sa 2-1/2 of ASTM D 2200 (Steel Structures Painting Council SSPC-SP10 meets this requirement), and the surface shall have a nominal height of profile of 25 to 88 µm (1 to 3.5) mils verified by using appropriate replica tape. The panels shall be coated and permitted to cure in accordance with the manufacturer's printed instructions. The dry film coating thickness in the system to be tested shall be as follows:

Organic Zinc:	75 - 125 μm (3.0 - 5.0 Mils)
Epoxy:	125 - 175 μm (5.0 - 7.0 Mils)
Urethane:	50 - 100 μm (2.0 - 4.0 Mils)

The coating system shall pass each of the following tests:

(A) Fresh water resistance (ASTM D 870). The panels shall be scribed as per ASTM D 1654 to the depth of the base metal in the form of an "X" having at least 50 mm (2-inch) legs and then immersed in fresh tap water at $25 \pm 3^\circ\text{C}$ ($75 \pm 5^\circ\text{F}$). After 30 days of immersion, the panels shall show no rusting nor shall the coating show any blistering, softening or discoloration. Blistering shall be rated by ASTM D 714.

(B) Salt water resistance (ASTM D 870). The panel shall be scribed as specified in "A" above and then immersed in a water solution of 5 percent sodium chloride at $25 \pm 3^\circ\text{C}$ ($75 \pm 5^\circ\text{F}$). The panels shall show no rust nor shall the coating exhibit any blistering or softening after 7, 14, and 30 days. Blistering shall be rated by ASTM D 714. The sodium chloride solution shall be replaced with a fresh solution after examination at 7 and 14 days.

(C) Weathering resistance. The panels shall be tested in accordance with ASTM D 4587 Method D, utilizing UV A 340 bulbs. The panels shall be placed on test at the beginning of a wet cycle. After 3000 hours continuous exposure, the coating shall show no blistering or loss of adhesion, nor shall the panels show any rusting. The 60 degree specular gloss measurements shall be performed on the sprayed panels utilized for this test. The three initial measurements (one per panel) will be average together. The three final measurements also will be averaged together.

(D) Salt fog resistance. The panels shall be scribed as specified in "A" above, and then tested in accordance with ASTM B 117. After 3000 hours of continuous exposure the coating shall show no loss of bond nor shall it show rusting or blistering beyond 2 mm (1/16 inch) from the center of the scribe mark. Blistering shall be rated by ASTM D 714.

(E) Elcometer adhesion test, ASTM D 4541. The panels shall be tested in accordance with the following: lightly sand the coating surface and aluminum dolly and applied a quick set adhesive. Allow adhesive to cure overnight. Scribe the coating and adhesive around the dolly prior to testing. Make a minimum of four trials to failure and report the four trials. No trial shall be less than 400 psi. Fracture at the primer-blast interface shall be caused for rejection.

910.04 Prequalification. Prior to approval, copies of the manufacturer's certified test data showing that the coating system complies with the performance requirements of this specification shall be submitted to the Engineer of Tests, 1600 W. Broad St., Columbus, Ohio 44223. The certified test data shall also state the following physical properties for each coating:

- 1) Density, g/mL (lbs. per gal.)
- 2) Solids, % by weight
- 3) Solids, % by volume
- 4) Viscosity
- 5) Drying time
- 6) V.O.C. content, g/mL (lb. per gallon)

The test data shall be developed by an independent testing laboratory approved by the Director and shall include the brand name of the paint, name of manufacturer, number of lots tested, and date of manufacture.

The following items shall also be submitted to the Director prior to approval:

- 1) Manufacturer's technical data sheet for each coating.
- 2) Material Safety Data Sheet for each coating.
- 3) Enough components to produce a 4 liter (one gallon) sample of each coating.
- 4) A one liter (one quart) sample of the thinner to be used with each coating.

When the coating has been approved by the Director, further performance testing by the manufacturer will not be required unless the formulation or manufacturing process has been changed, in which case new certified test results will be required.

910.05 Sampling. Acceptance variances shall be established by the Laboratory.

**STATE OF OHIO
DEPARTMENT OF TRANSPORTATION**

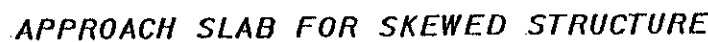
**SUPPLEMENTAL SPECIFICATION 954
HIGH MOLECULAR WEIGHT METHACRYLATE (HMWM) RESIN**

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)

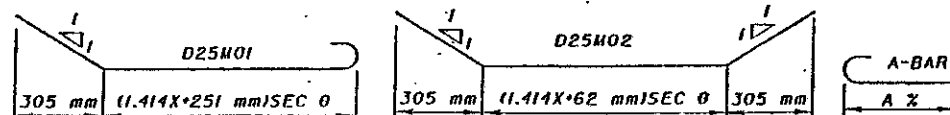
The resin shall be from the approved list in the Office of Materials Management.



* AT THE OPTION OF THE CONTRACTOR, BISMOL
BARS MAY BE LAPPED 500 mm MINIMUM AT
THE CENTERLINE OF ROADWAY, OR WHERE
REQUIRED FOR LONGITUDINAL CONSTRUCTION
JOINTS.

REINFORCING STEEL (FOR ONE APPROACH SLAB)															
LENGTH L mm	THICK- NESS T mm	A-BARS				B15M01 (BOTTOM)		B15M01 (TOP)		C-BARS			D25M01 or D25M02 NO. REQ'D		
		SP'C'G K	MARK	LENGTH mm	DIMENSION A mm	NO. REQ'D	LENGTH	SP'C'G N	NO. REQ'D	LENGTH	NO. REQ'D	MARK		LENGTH mm	NO. REQ'D
4600	305	255	A35M01	4880	4450	$\left[\begin{array}{c} W-150 \\ K \end{array} \right] \cdot 1$	(W-150) sec 0	230	22	$\left[\begin{array}{c} W-150 \\ sec 0 \end{array} \right]$	II	C15M01	4425	$\left[\begin{array}{c} W-150 \\ 450 \end{array} \right] \cdot 1$	
6100	330	190	A35M02	6380	5950			200	31			14	C15M02		5950
7600	380	180	A35M03	7880	7450			200	39			18	C15M03		7450
9150	430	165	A35M04	9430	9000			215	44			21	C15M04		9000

W - APPROACH SLAB WIDTH, OUT TO OUT, IN mm
 θ - ANGLE OF SKEW
 K - A-BAR SPACING IN mm
 N - B-BAR SPACING IN mm
 X - APPROACH SLAB THICKNESS AT
 ABUTMENT END IN mm
 X - OUT TO OUT



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 A615H, A616H OR A617H-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.

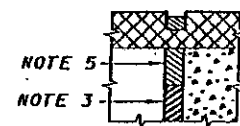
APPROACH SLAB WIDTH (W): APPROACH SLABS SHALL BE THE SAME WIDTH AS THE BRIDGE ROADWAY.

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.



DETAIL A

CONCRETE WEARING
SURFACE ON BRIDGE DECK
AND APPROACH SLAB

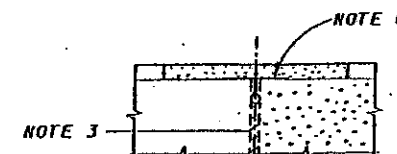


DETAIL B

CONCRETE WEARING
SURFACE ON BRIDGE DECK
AND APPROACH SLAB

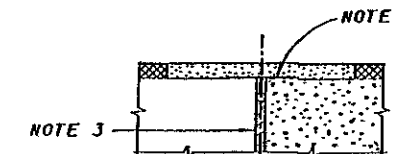


DETAIL C

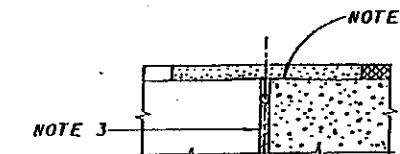


DETAIL D

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.

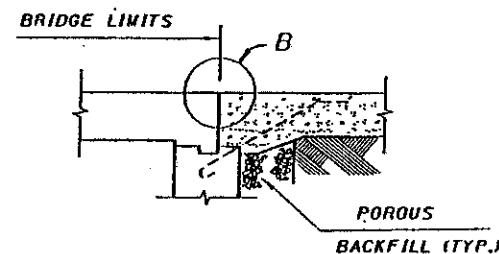
NOTE 6 : SEE PLAN INSERT SHEET. POLYMER MODIFIED
ASPHALT EXPANSION JOINT SYSTEM.

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.

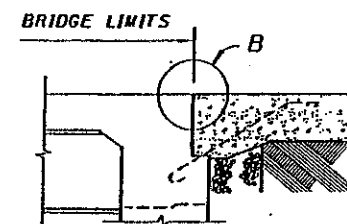
FOR PRESTRESSED CONCRETE BOX BEAM BRIDGES WITH
ASPHALT CONCRETE ON BOTH BRIDGE DECK AND APPROACH
SLAB, THE TOP OF APPROACH SLAB AT THE BRIDGE END
SHALL BE CONSTRUCTED TO THE LEVEL OF THE TOP OF THE
BEAMS TO FACILITATE WATERPROOFING OF THE JOINT. THE
THICKNESS OF ASPHALT CONCRETE AT THE APPROACH END
SHALL 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.

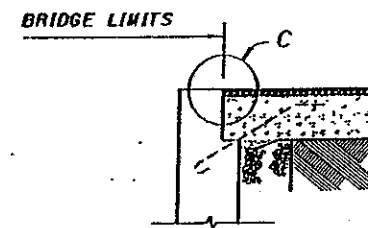
NOTE : APPROACH SLAB SEAT ON PRESTRESSED
CONCRETE BOX BEAM BRIDGES IS SHOWN
AT SAME ELEVATION AS BEAM SEAT.
HOWEVER, IT MAY ACTUALLY BE HIGHER
OR LOWER THAN THE BEAM SEAT DEPENDING
ON BOX BEAM DEPTH.



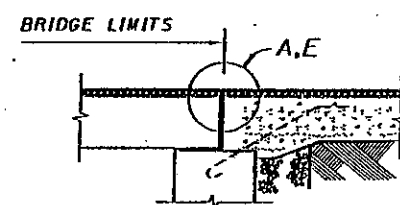
ON SLAB BRIDGES



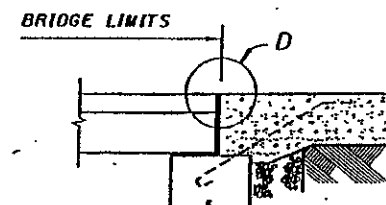
ON BRIDGES WITH INTEGRAL CONSTRUCTION



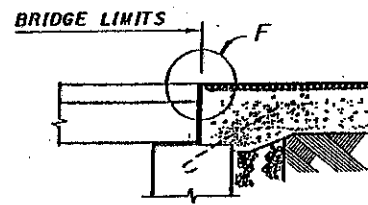
APPROACH SLAB SUPPORTED ON ABUTMENT BACKWALL



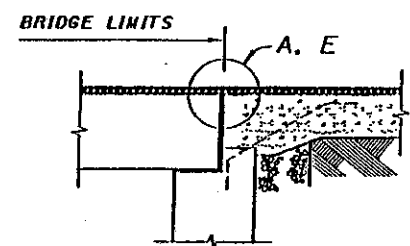
ON PRESTRESSED CONCRETE BOX BEAM BRIDGES



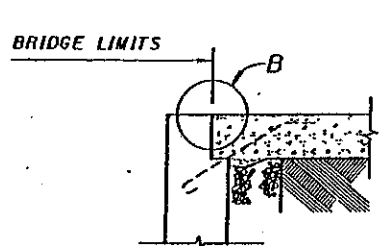
ON PRESTRESSED CONCRETE BOX BEAM BRIDGES



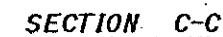
ON PRESTRESSED CONCRETE BOX BEAM BRIDGES



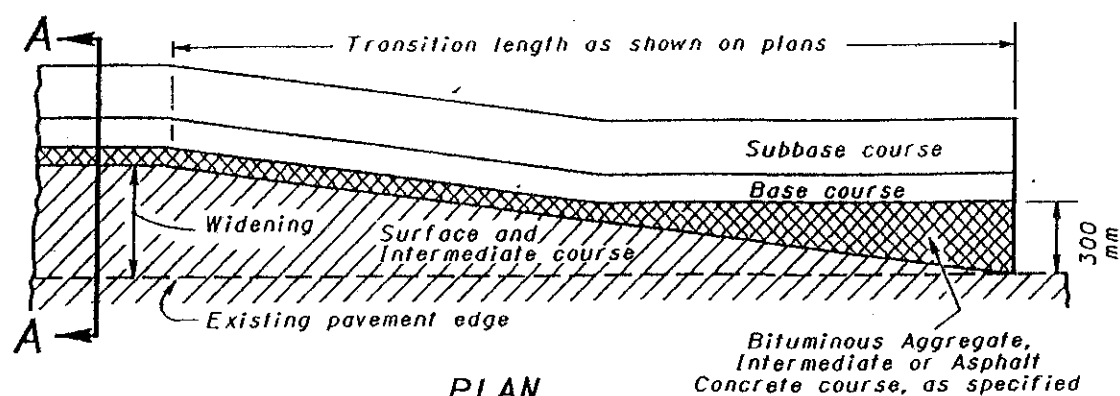
APPROACH SLAB SUPPORTED ON ABUTMENT BACKWALL



APPROACH SLAB SUPPORTED ON ABUTMENT BACKWALL

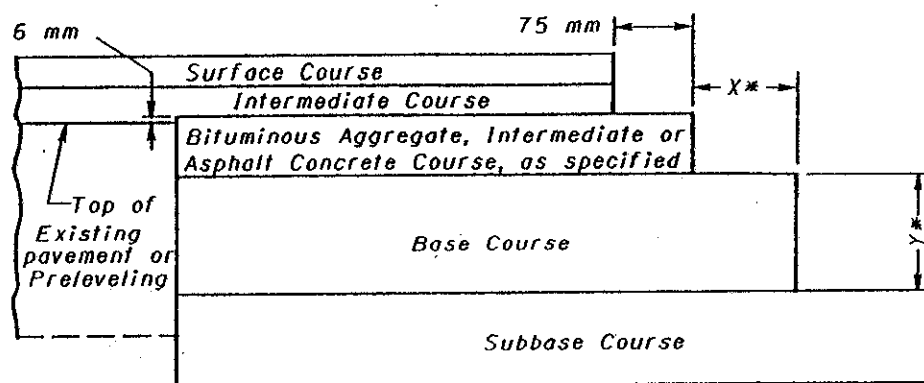


TYPE 4-A OR TYPE 4-B CURB.
SEE STANDARD CONSTRUCTION
DRAWING BP-5.1 M



PLAN

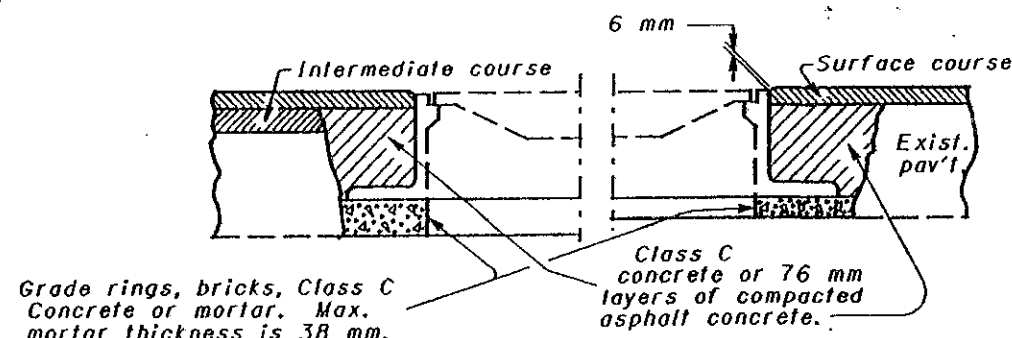
MERGING EDGE OF PAVEMENT WIDENING WITH EDGE OF EXISTING PAVEMENT



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.

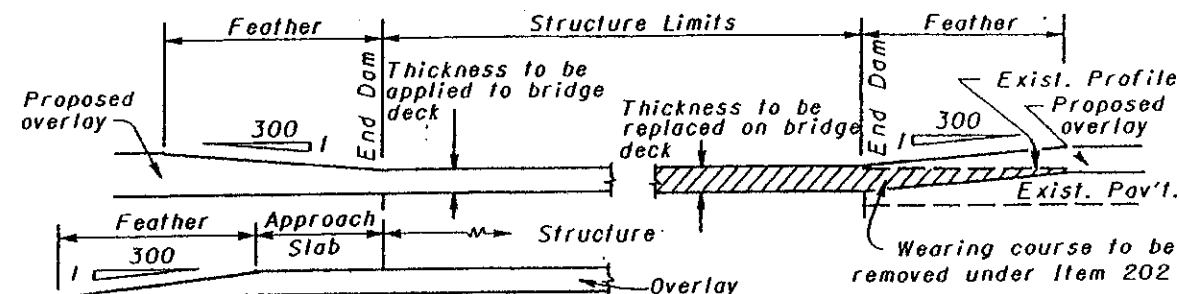
SECTION A-A COURSE DETAIL FOR WIDENING



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.

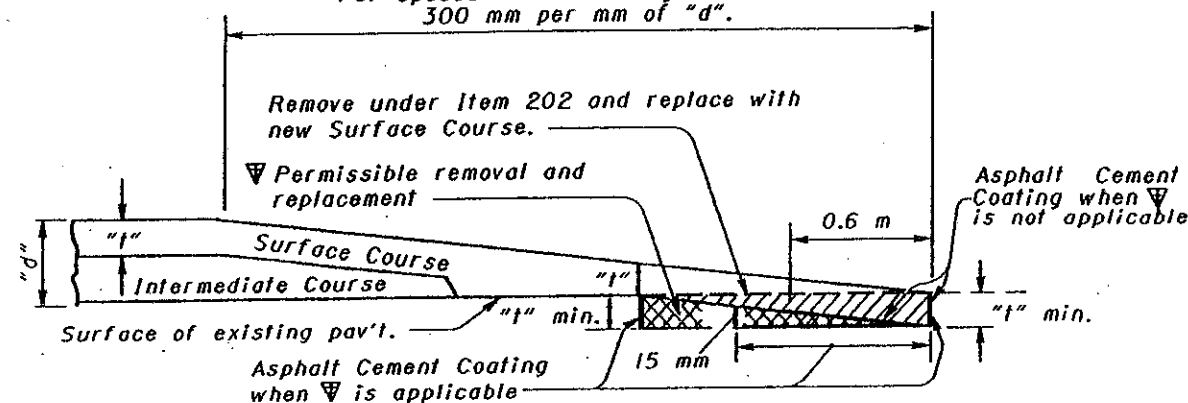
MANHOLES ADJUSTED TO GRADE



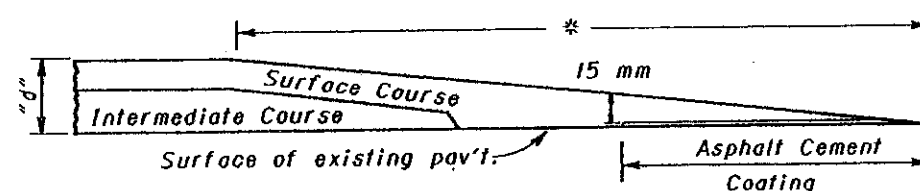
Details assume non-settled approach slabs. Smoothing of the profile for settlement is required per plan grades or as directed by the Engineer.

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".



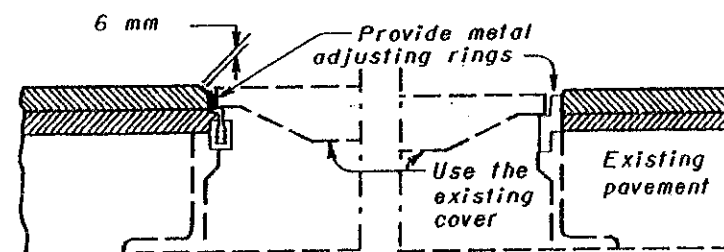
BUTT JOINT TYPE



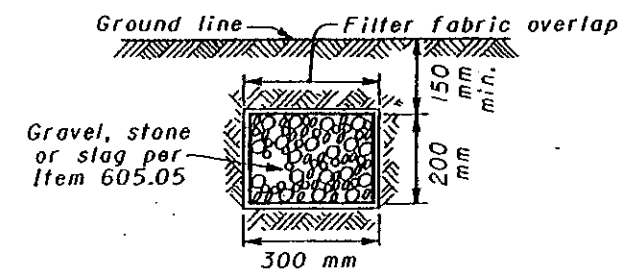
TAPER EDGE TYPE

NOTE: Either butt or taper type may be used unless type is specified by the plan.

PLACING FEATHERED AREAS

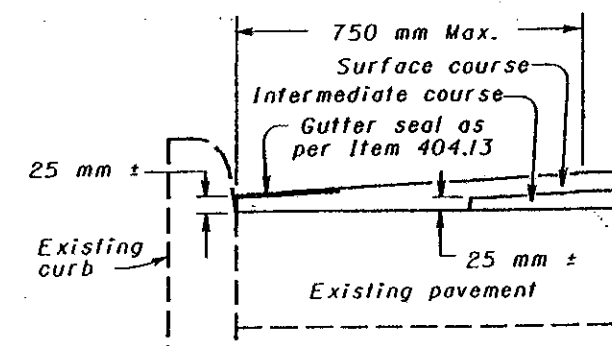


USING METAL ADJUSTING RINGS



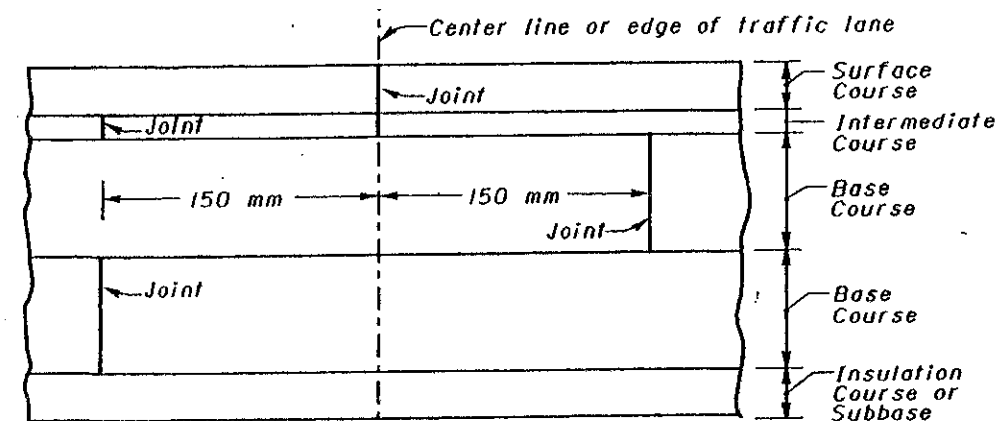
Aggregate drains to be placed where and as directed by Engineer. Provide filter fabric when specified as a separate pay item.

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

RESURFACING

STANDARD CONSTRUCTION DRAWING
BP-3.1M

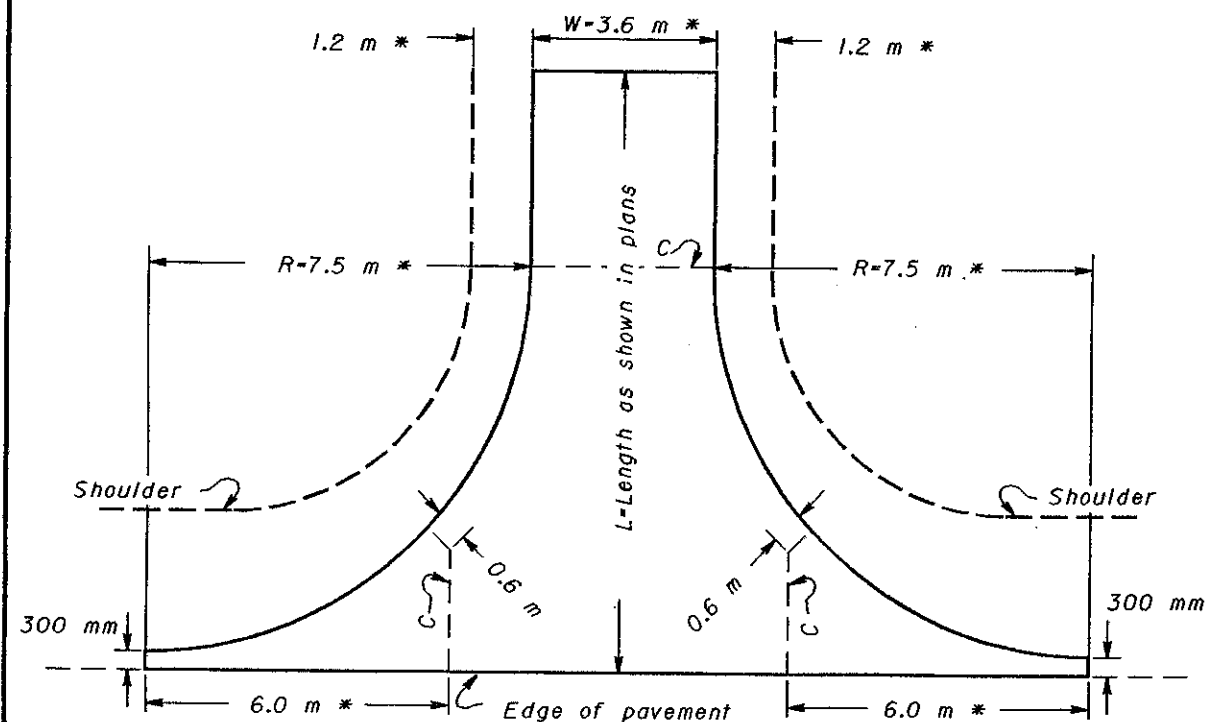
APPROVED *W.K. Hulman*

ENGR., L & D

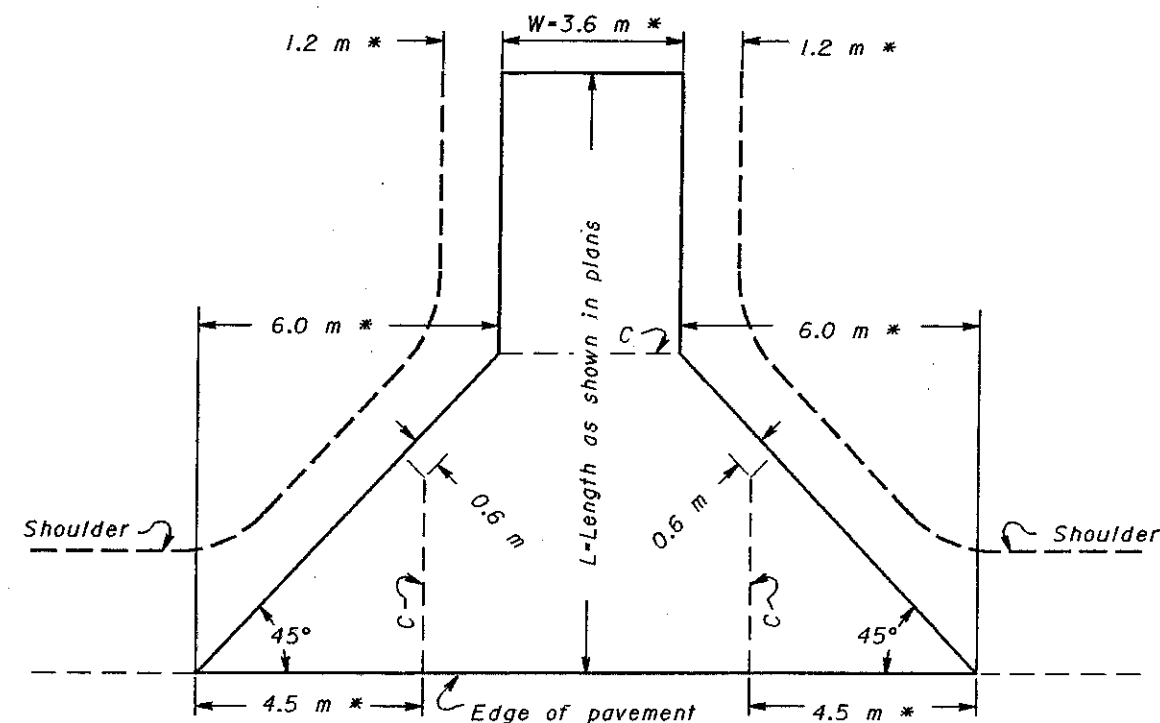
DATE

10-28-94





TYPE 1 DRIVEWAY

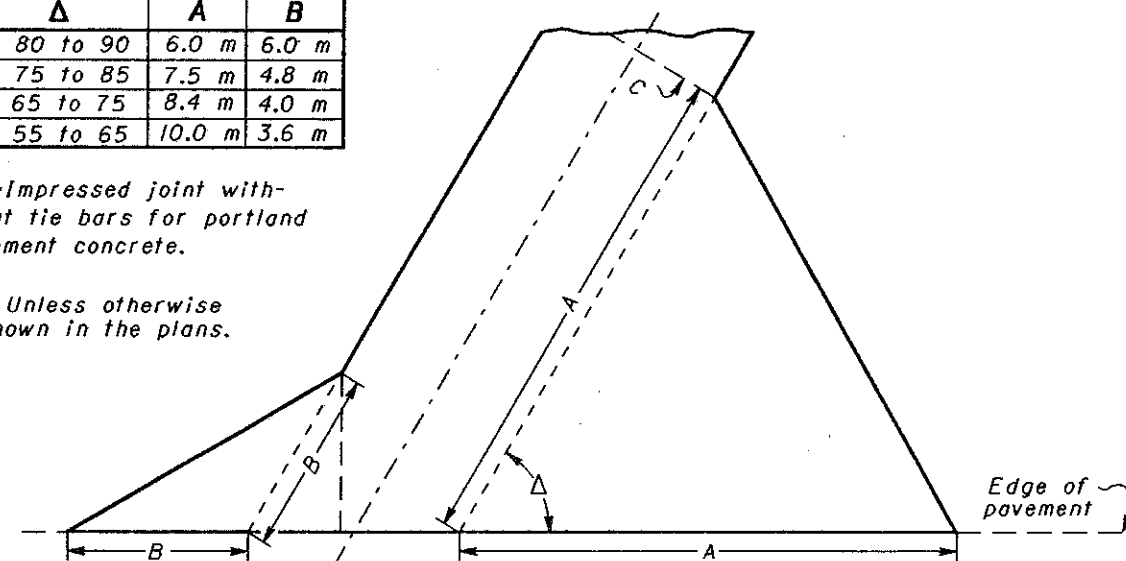


TYPE 2 DRIVEWAY

Δ	A	B
80 to 90	6.0 m	6.0 m
75 to 85	7.5 m	4.8 m
65 to 75	8.4 m	4.0 m
55 to 65	10.0 m	3.6 m

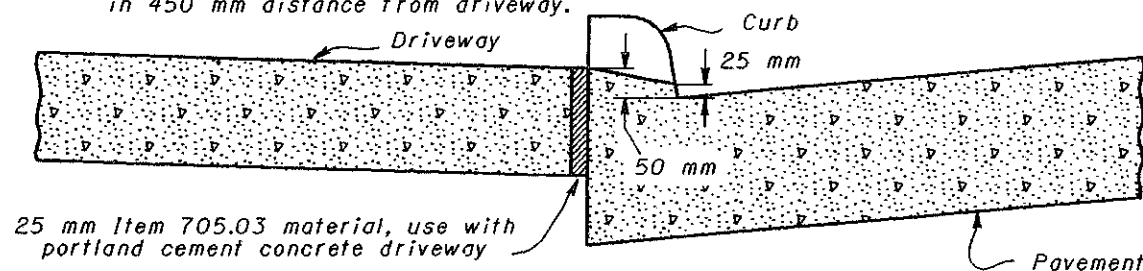
C-Pressed joint with-out tie bars for portland cement concrete.

* Unless otherwise shown in the plans.



TYPE 2 SKEWED DRIVEWAY

Transition from standard curb section to drop curb section to be made in 450 mm distance from driveway.



DROP CURB DETAILS AT DRIVEWAYS

NOTES

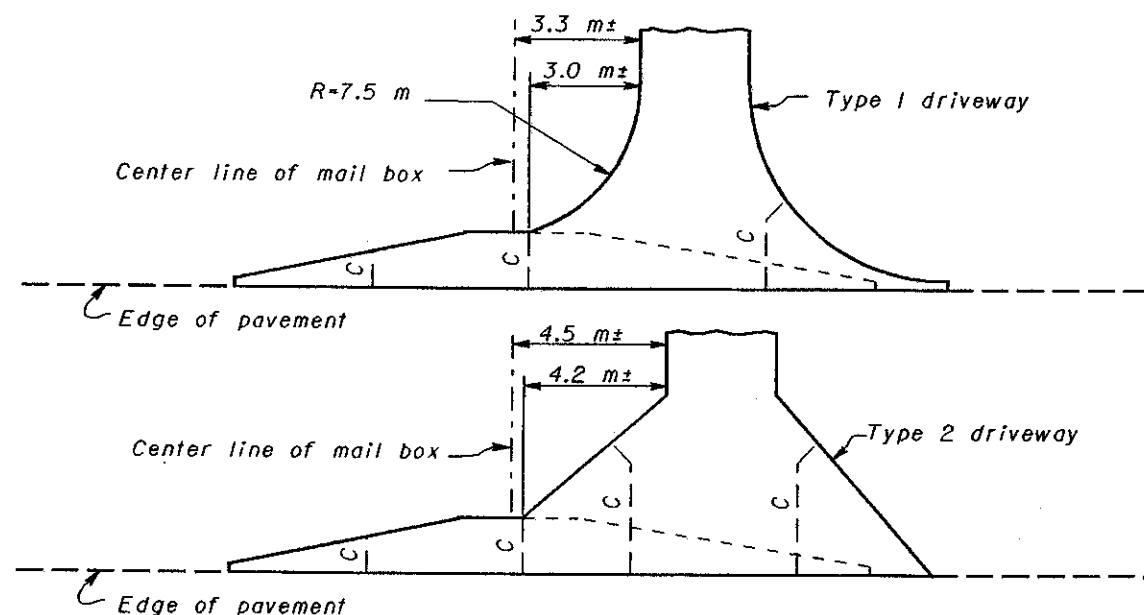
GENERAL: The design details shown hereon shall govern the construction of driveways unless otherwise shown in the project plans.

The pavement type and thickness shall be specified in the project plans.

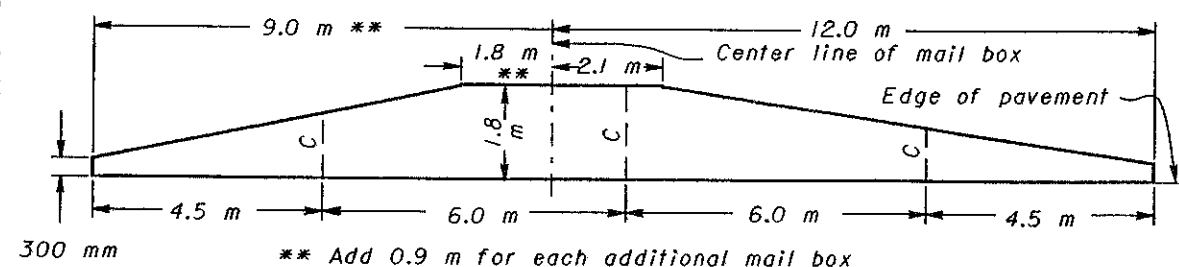
Driveway and mail box approaches shall be combined when feasible.

JOINTS: Impressed joints for portland cement concrete driveways shall be 6 mm minimum width by 75 mm $\pm$ depth and shall be sealed with Item 705.04 or ASTM D 1850.

In addition to the joints shown hereon, impressed joints without tie bars shall be placed in portland cement concrete driveways at intervals not to exceed 5.2 m in the portion of the driveway back of the flare.



COMBINED DRIVEWAY & MAIL BOX APPROACH



** Add 0.9 m for each additional mail box

TYPICAL MAIL BOX APPROACH



BUREAU OF LOCATION AND DESIGN
OHIO DEPARTMENT OF TRANSPORTATION

DRIVEWAYS

DATE

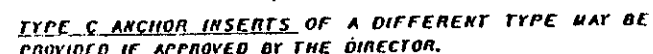
10-28-94

STANDARD
CONSTRUCTION
DRAWING

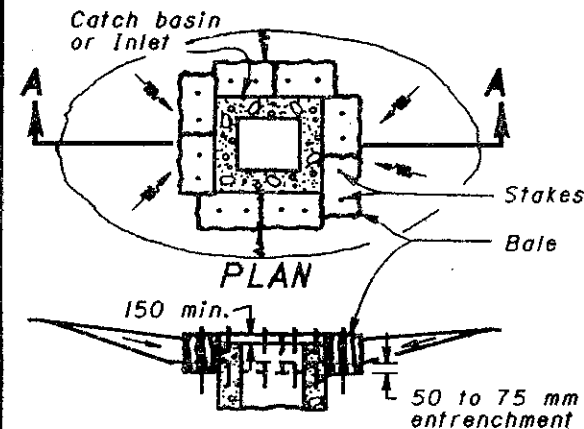
BP-4.1M

APPROVED *W.K. Hulman*

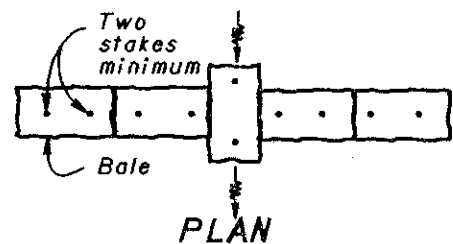
ENGR., L & D



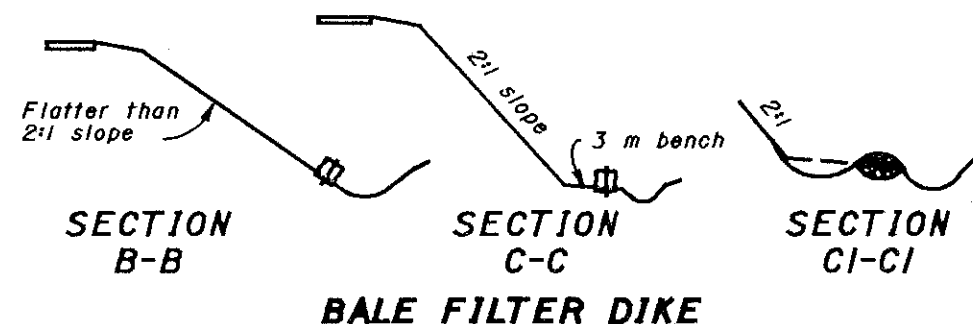
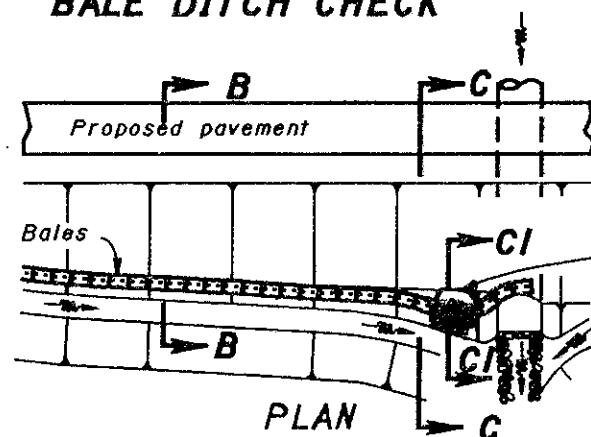
STRAW OR HAY BALES



SECTION A-A
BALE INLET FILTER



ELEVATION
BALE DITCH CHECK



BALE FILTER DIKE

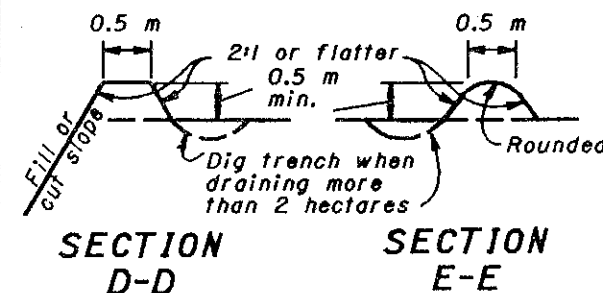
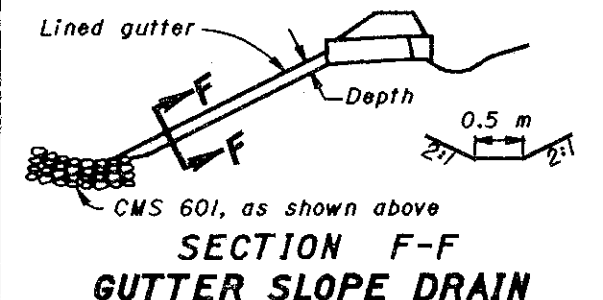
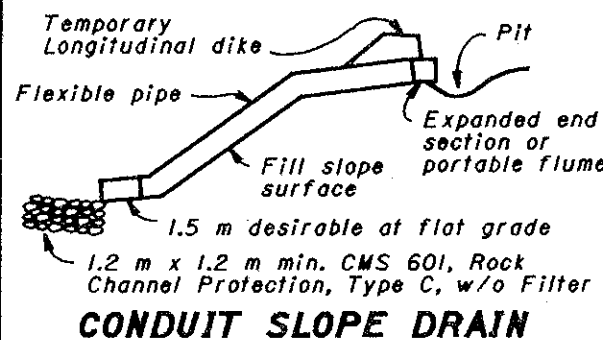
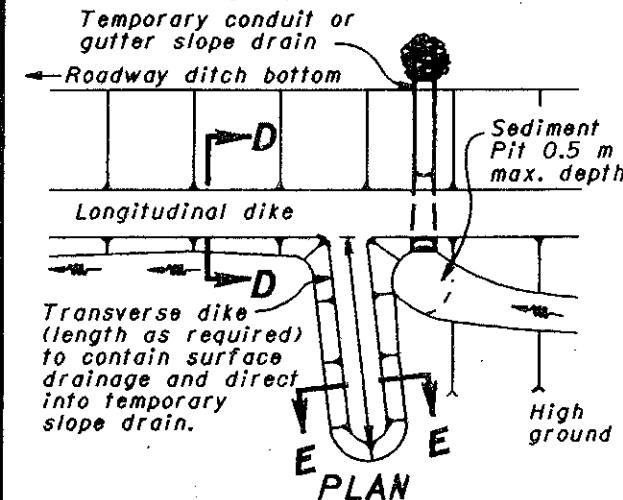
BALE PLACEMENT: Bales shall be tightly placed adjacently and entrenched 50 mm to 75 mm before staking; or a small amount of loose soil shall be lightly compacted along the upstream edge of the bales. Each bale shall be firmly staked with a minimum of two stakes at least 1 m in length. Stakes shall be wooden 50 x 50 mm, reinforcing bars or fence posts, as approved by the Engineer. Loose straw or hay shall be scattered for a distance of 3 m on the upstream side of each ditch check, and shall be wedged between and under staked bales.

PITS: Sediment pits shall be provided where directed by the Engineer, and their cost included in the unit price bid for the adjacent CMS 207 items.

MAINTENANCE: Sediment shall be removed when its depth reaches half the height of the exposed portion of the lowest bale.

BASIS OF PAYMENT: Straw or hay bale installation shall be paid for under Item 207, Straw or Hay Bales. Cost will include placing, staking, maintaining and removing.

DIKES AND SLOPE PROTECTION



TEMPORARY SLOPE DRAINS RECOMMENDED SIZES				
Area (hectares)	Pipe Sizes (mm)			Gutter depth (mm)
	Smooth	Corru- gated	Half- round	
0-1.6	150	150	450	200
1.6-3.2	200	300	450	200
3.2-4.9	250	375	525	300

GENERAL: Dikes & drains shown shall be used when earthwork operations on slopes higher than 2.5 m are suspended for three weeks or more and/or as directed by the Engineer. 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, as directed by the Engineer.

LONGITUDINAL DIKES: shall be constructed of suitable material as per CMS 203 and compacted to 85% maximum density.

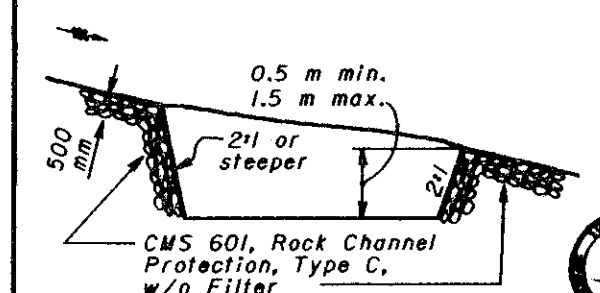
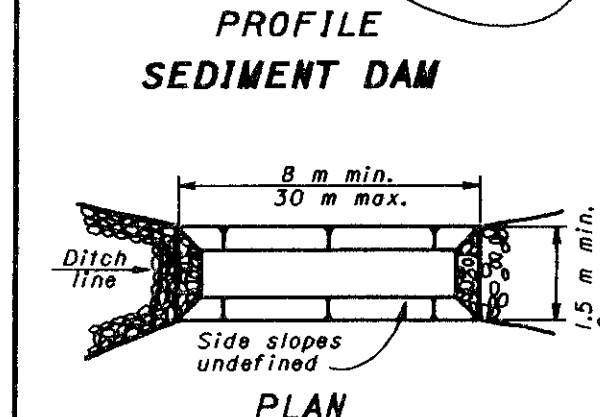
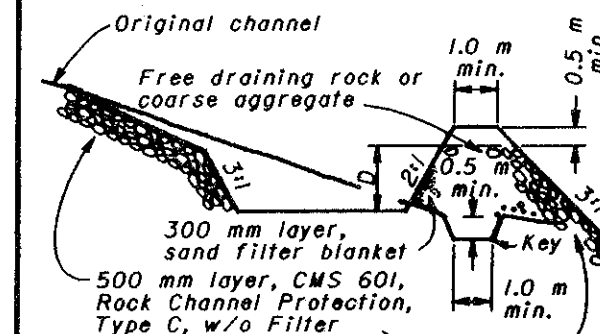
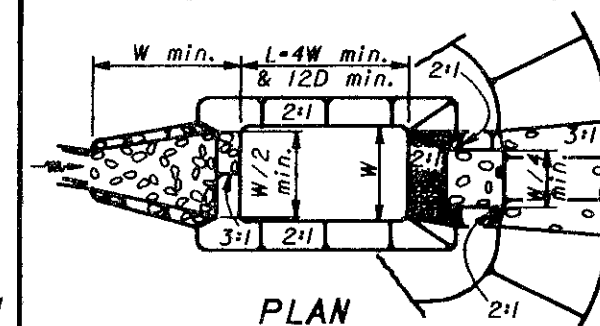
CONDUITS: Conduits for slope drains shall be corrugated steel pipe, corrugated or smooth plastic pipe, rubber conduit, or an approved equal.

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 where directed by the Engineer and their cost included in the price bid for adjacent CMS 207 items.

BASIS OF PAYMENT: Temporary dikes shall be paid for under Item 207, Temporary Dikes. Temporary slope drains shall be paid for under Item 207, Temporary Slope Drains. Rock required shall be paid for under Item 601, Rock Channel Protection, Type C, w/o Filter.

SEDIMENT BASINS & DAMS



PROFILE
SEDIMENT BASIN

EMBANKMENT: Sediment basin embankment construction shall be as per CMS 203 compacted as directed by the Engineer.

MAINTENANCE: Sediment pits, dams and basins shall be acceptably maintained. Deposited sediment shall be removed when the initial volume has been reduced one-half. The sand filter blanket on sediment basins shall be replaced when deposited sediment is removed. The cost of maintenance shall be included in the unit price bid for the appropriate CMS 207 item.

FILTERS: Plastic filter fabric, as approved by the Engineer, may be substituted for the sand filter blanket on sediment dams. Such fabrics may be cleaned in lieu of replacement, when approved by the Engineer.

SIZE: The volume shown on the plans is the total storage volume required for the sediment basin or dam. A series of smaller basins or dams may be substituted for a larger basin or dam when approved by the Engineer.

BASIS OF PAYMENT: Sediment Dams and Basins shall be paid for under Item 207, Temporary Benches, Dams and Sediment Basins. The pay quantity shall be the actual number of 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, w/o Filter.



This Drawing Replaces MC-II.

BUREAU OF LOCATION AND DESIGN
OHIO DEPARTMENT OF TRANSPORTATION

TEMPORARY
EROSION
CONTROL

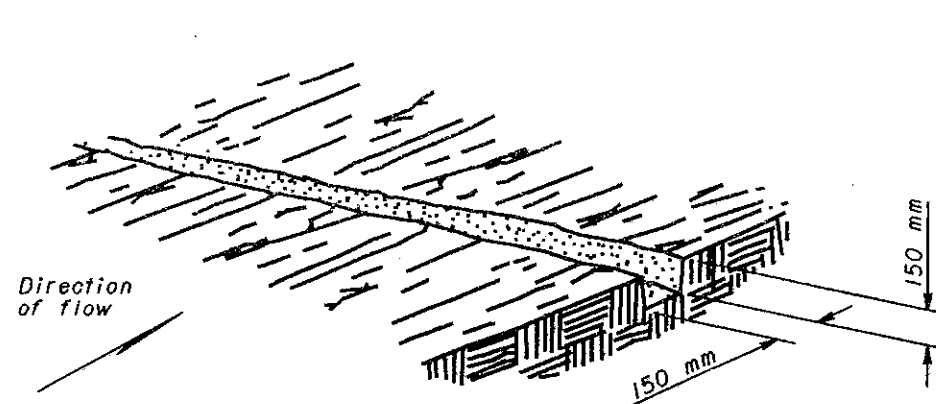
DATE
6-30-95

STANDARD
CONSTRUCTION
DRAWING

DM-4.3M

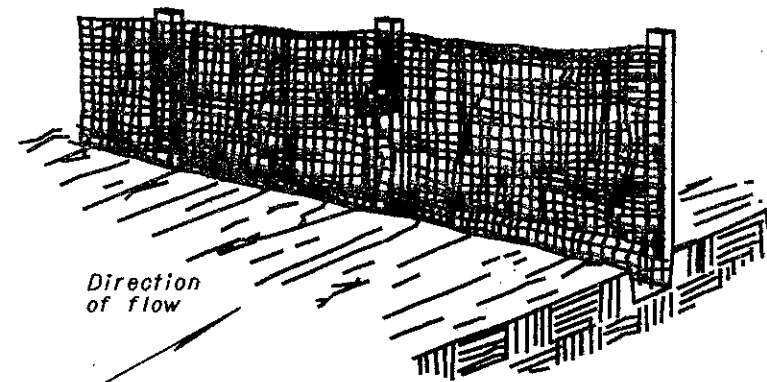
APPROVED

ENGR. L & D



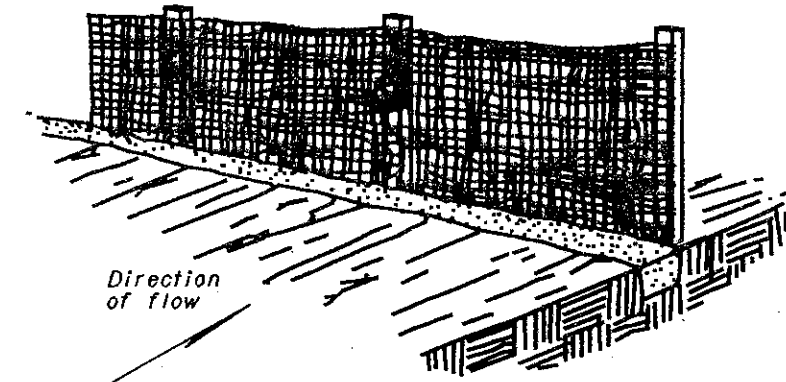
Excavate a 150 mm by 150 mm trench along the proposed fence line.

STEP 1



Place fabric and support stakes and extend fabric into the trench.

STEP 2



Backfill and compact the excavated soil.

STEP 3

CONSTRUCTION OF A FILTER BARRIER

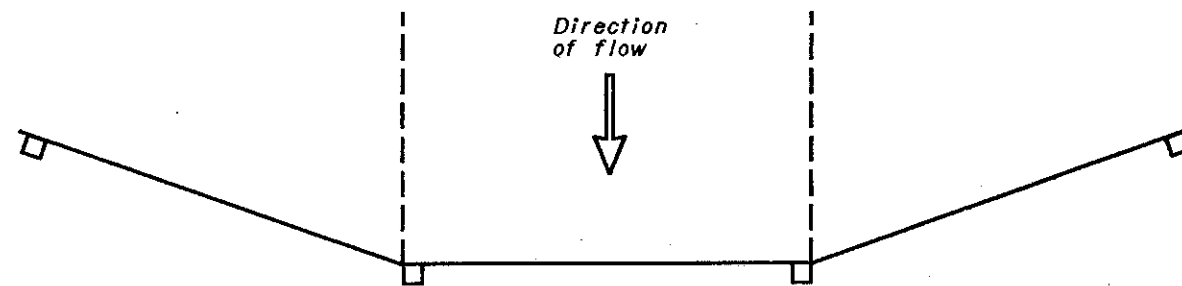
NOTES

MATERIALS: Filter fabric shall meet the requirements of CMS 207.02.

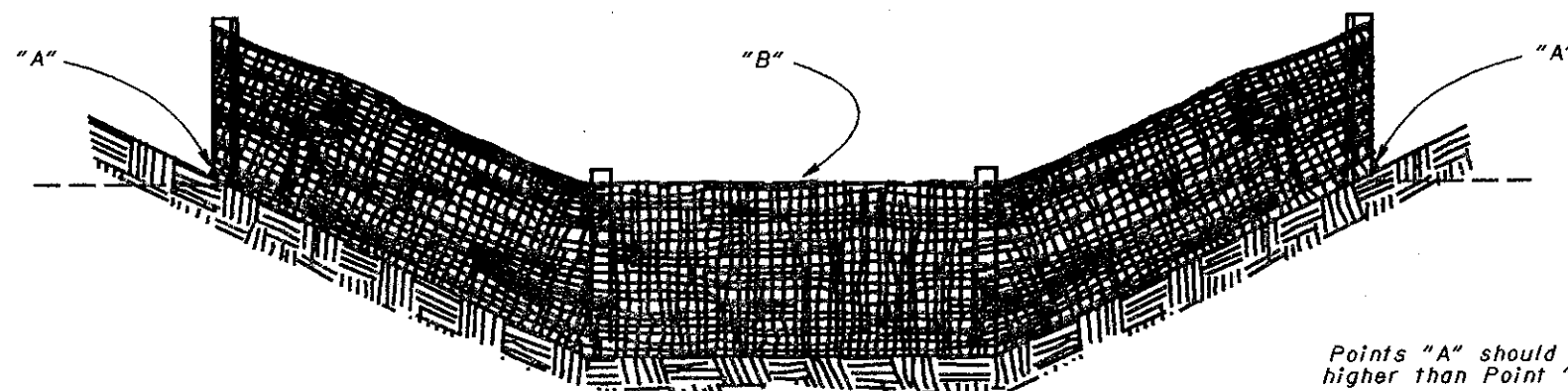
CONSTRUCTION: The bottom of the fabric shall be buried 150 mm below the ground. The fabric shall be high enough to retain sediment-laden water and adequately supported to prevent collapse or bursting. The ground elevation of the fence shall be held constant except that the end elevations shall be raised to prevent flow around the end of the fence.

MAINTENANCE: The filter fabric fence shall be maintained to be functional, at the direction of the Engineer. This shall include removal of trapped sediment and required cleaning, repair, and/or replacement of the filter fabric. Sediment shall be removed when its depth reaches half the height of the lowest section of fence.

PAYMENT: The cost of all materials, construction, maintenance and removal shall be paid for under Item 207, Meter, Filter Fabric Fence.



PLAN VIEW



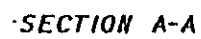
Points "A" should be higher than Point "B"

ELEVATION VIEW

PROPER PLACEMENT OF A FILTER BARRIER IN A DRAINAGE WAY



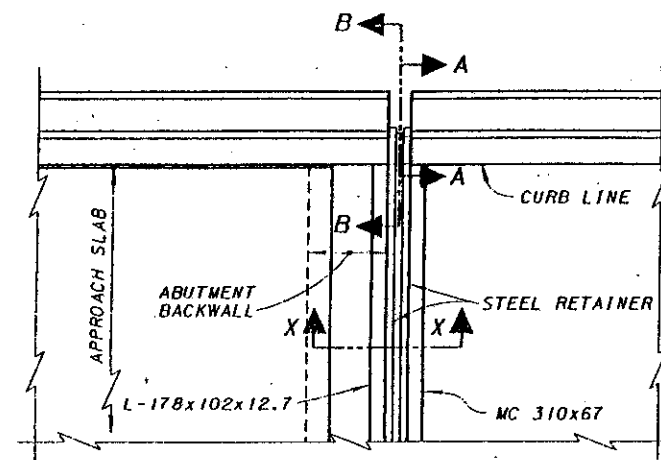
BUREAU OF LOCATION AND DESIGN OHIO DEPARTMENT OF TRANSPORTATION	
TEMPORARY EROSION CONTROL	DATE 6-30-95
STANDARD CONSTRUCTION DRAWING	
APPROVED <i>W. K. Hulman</i> ENGR., L & D	



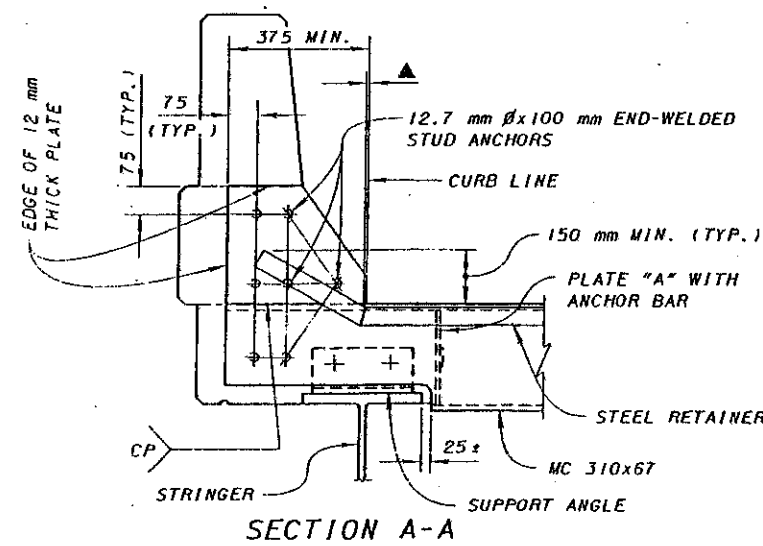
PAYMENT SHALL BE AT THE CONTRACT PRICE BID FOR ITEM SPECIAL, 1/4" FT. STEEL DRIP STRIP AND SHALL INCLUDE ALL MATERIALS, LABOR, TOOLS AND INCIDENTALS NECESSARY TO COMPLETE THIS ITEM.

OTHER SIMILAR DEVICES WHICH WILL NOT DAMAGE THE CONCRETE
MAY BE USED SUBJECT TO THE APPROVAL OF THE ENGINEER.

STANDARD DRIP STRIP DETAIL FOR STRUCTURES WITH OVER THE SIDE DRAINAGE	REVISIONS	DESIGNED	BY	DATE
		REZA	JS	12-15-94
		CHAVE	REZA	12-15-94

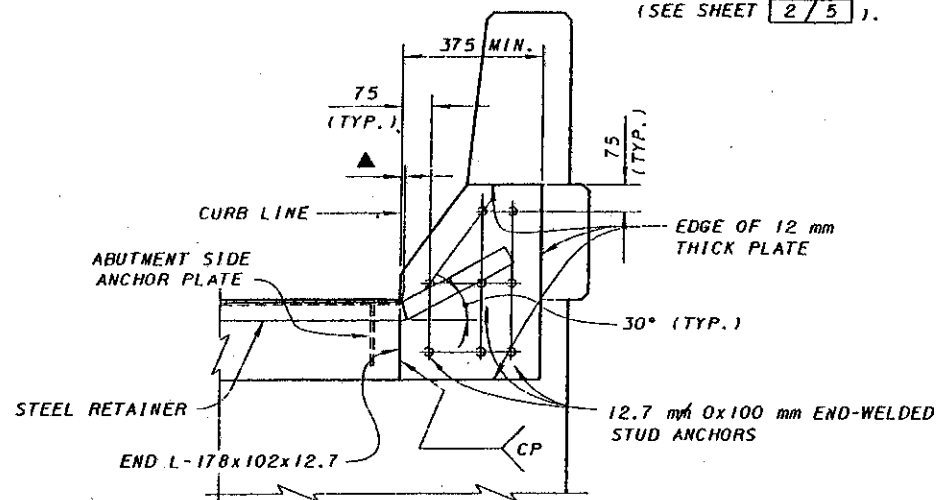


PART PLAN AT ABUTMENT
FOR SQUARE OR LOW SKEWED (15° OR LESS)
BRIDGES WITH DEFLECTOR PARAPET RAILING

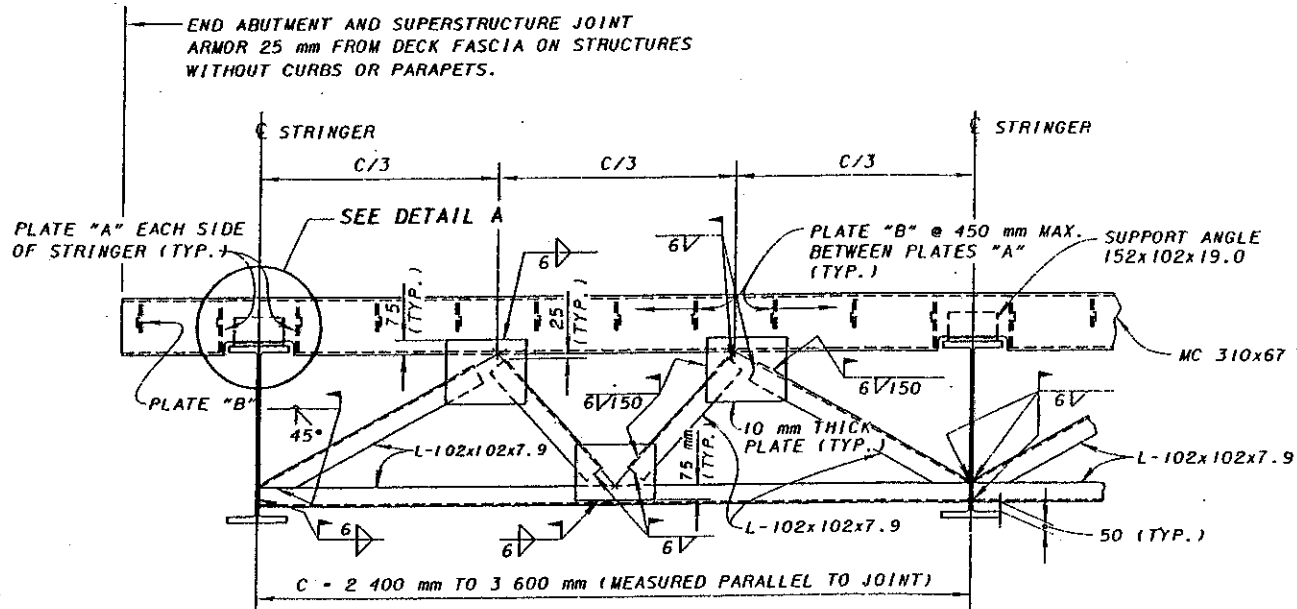


SECTION A-A

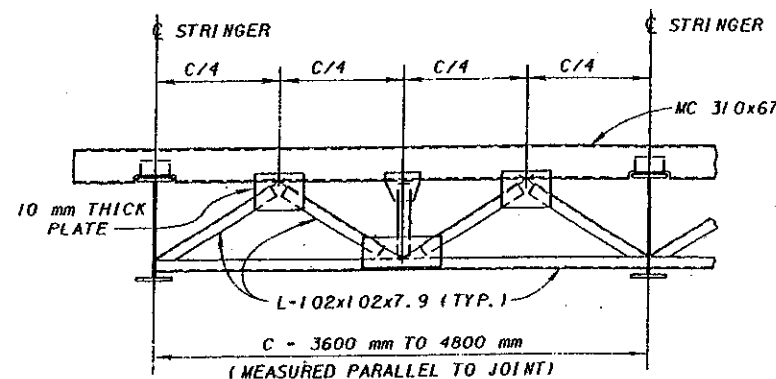
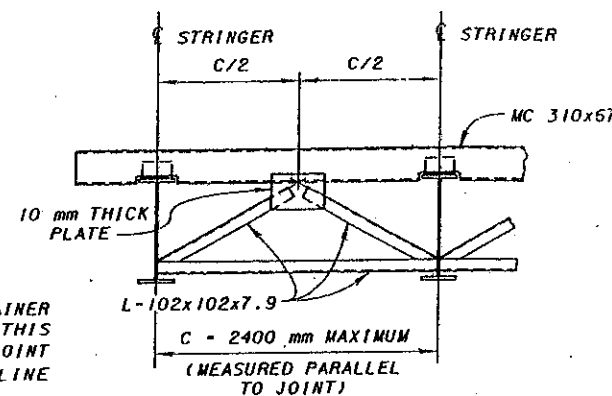
▲ - 0 MIN. TO 13 mm MAX. AT BREAKPOINT IN RETAINER FOR SQUARE BRIDGES. ON SKEWED BRIDGES THIS DIMENSION WILL ONLY APPLY TO THE SIDE OF JOINT ASSEMBLY WHICH IS NEAREST TO THE CURB LINE (SEE SHEET 2/5).



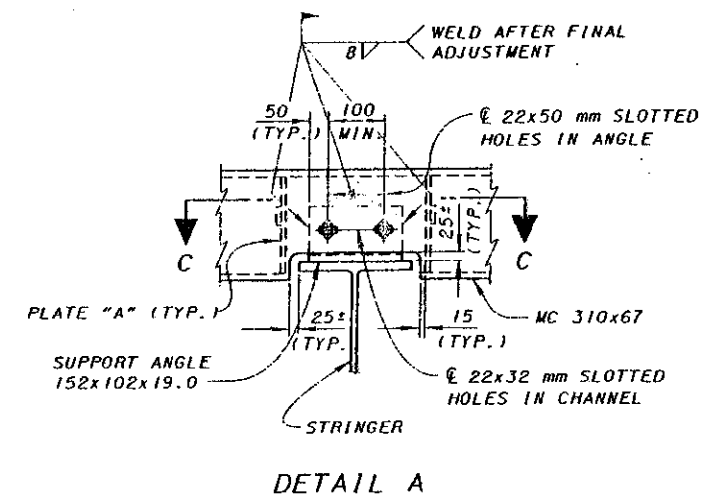
SECTION B-B



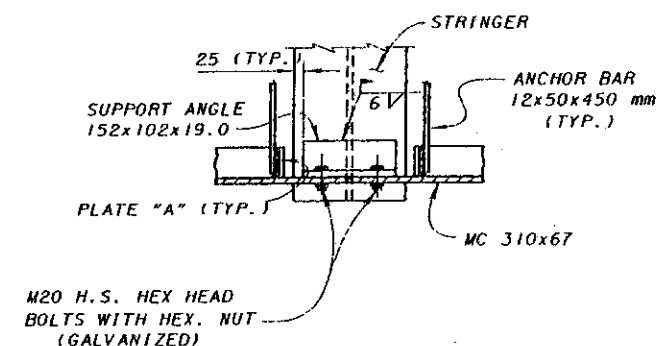
NOTE: THE WELDING SYMBOLS SHOWN ABOVE ARE TYPICAL FOR ALL SIMILAR LOCATIONS OF THIS END CROSSFRAME. ALSO, THE WELDED ATTACHMENT DETAILS AND TYPICAL DIMENSIONS SHOWN ARE TYPICAL FOR THE CROSSFRAMES DETAILED BELOW.



END CROSSFRAME DETAILS
STEEL RETAINERS ARE NOT SHOWN



DETAIL A

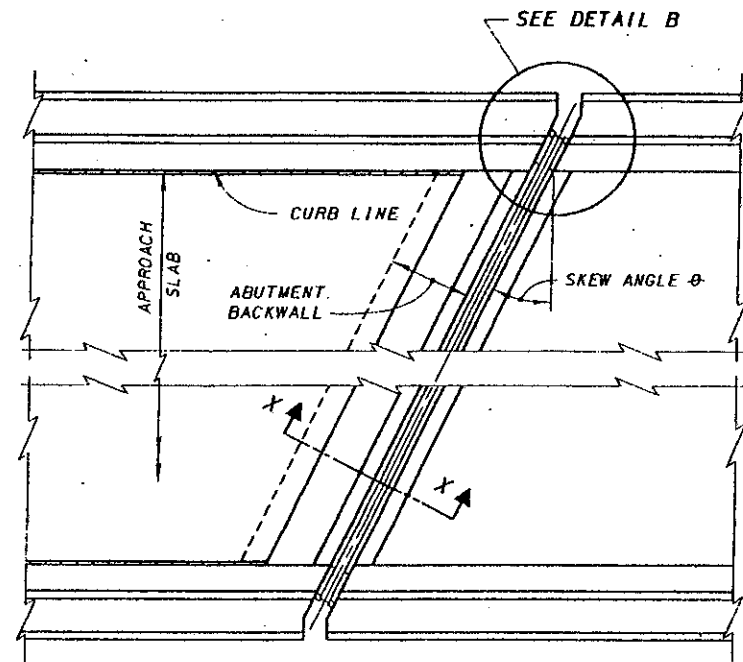


SECTION C-C

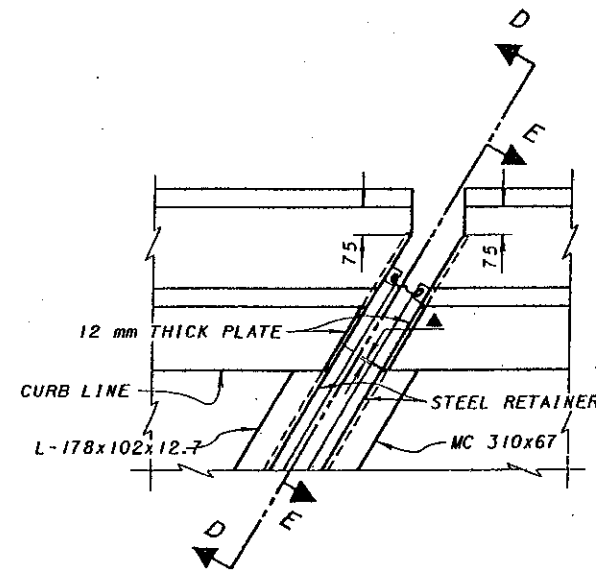
M20 H.S. HEX HEAD BOLTS WITH HEX. NUT (GALVANIZED)

NOTES:
FOR SECTION X-X SEE SHEET 2/5.

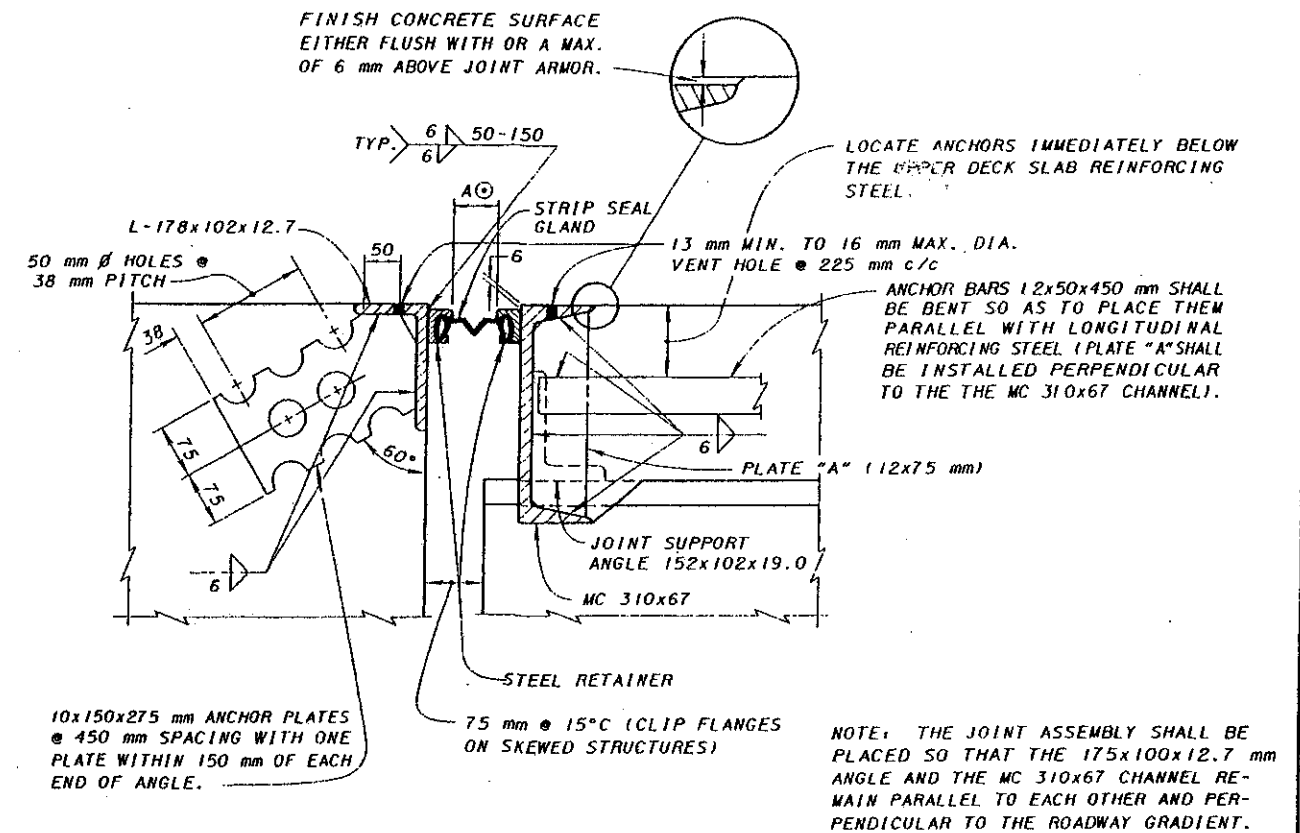
NOTE: THE JOINT ARMOR SHOULD NOT BE PAINTED, EXCEPT FOR THE METALIZED SURFACES DAMAGED DURING CROSSFRAME INSTALLATION. THESE AREAS SHALL BE CLEANED AND PAINTED IN CONFORMANCE WITH THE STRUCTURE'S PAINT SYSTEM REQUIREMENTS. OVERSPRAY FROM PAINTING NEED NOT BE REMOVED. FOR REPAIR OF ALL OTHER METALIZED SURFACES SEE THE JOINT INSTALLATION NOTES ON SHEET 5/5.



PLAN AT ABUTMENT
FOR SKEWED BRIDGES (OVER 15°)
WITH DEFLECTOR PARAPET RAILING

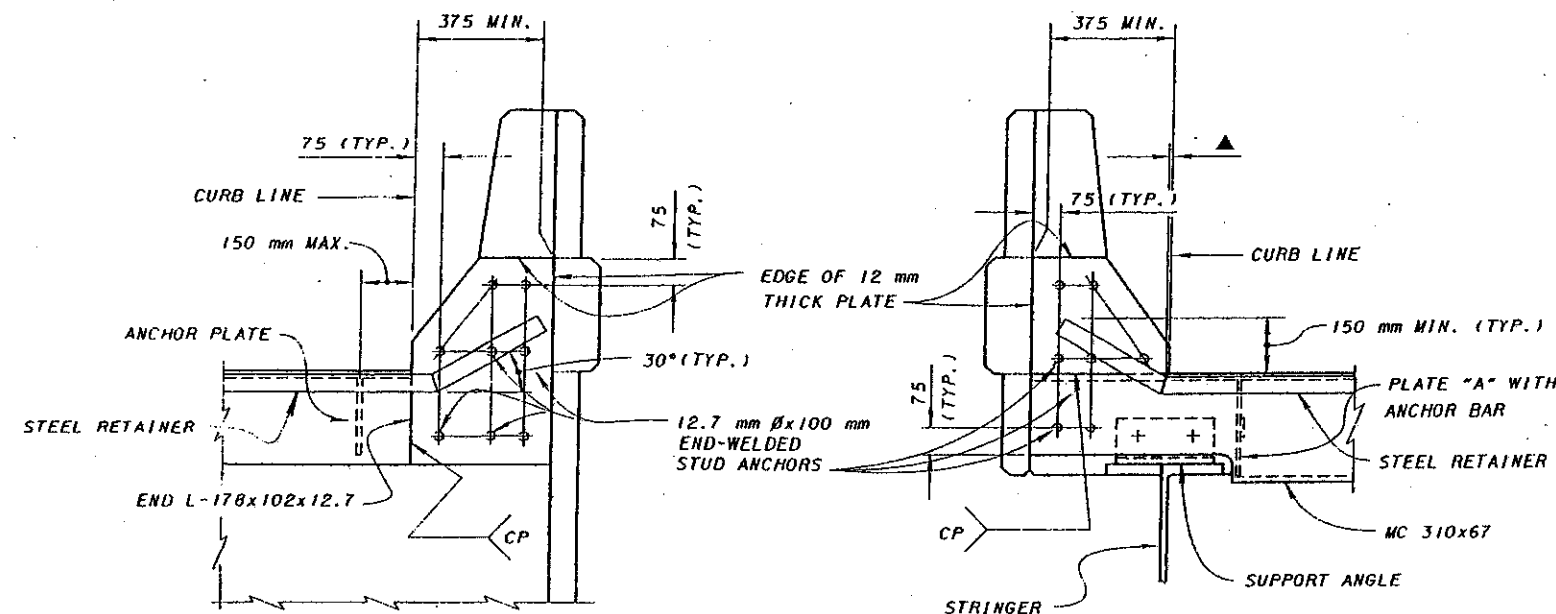


DETAIL B



SECTION X-X

⊙ - DIMENSION "A" SHALL BE DETERMINED FROM TABLE "B", TABLE "C" OR TABLE "D" ON SHEET **5/5**.



SECTION D-D

SECTION E-E

▲ - 0 MIN. TO 13 mm MAX. AT BREAKPOINT IN RETAINER FOR SQUARE BRIDGES. ON SKEWED BRIDGES THIS DIMENSION WILL ONLY APPLY TO THE SIDE OF JOINT ASSEMBLY WHICH IS NEAREST TO THE CURB LINE (SEE DETAIL "B" ABOVE).

DESIGN NOTES:

JOINTS IN END DAM ARMOR: TRANSVERSE JOINTS IN ARMOR SHALL HAVE COMPLETE PENETRATION BUTT WELDS. BUTT WELDS IN CONTACT WITH THE STEEL RETAINERS SHALL BE GROUND FLUSH.

THE MINIMUM LENGTH OF RETAINER SHALL BE 1800 BETWEEN JOINTS UNLESS OTHERWISE SHOWN.

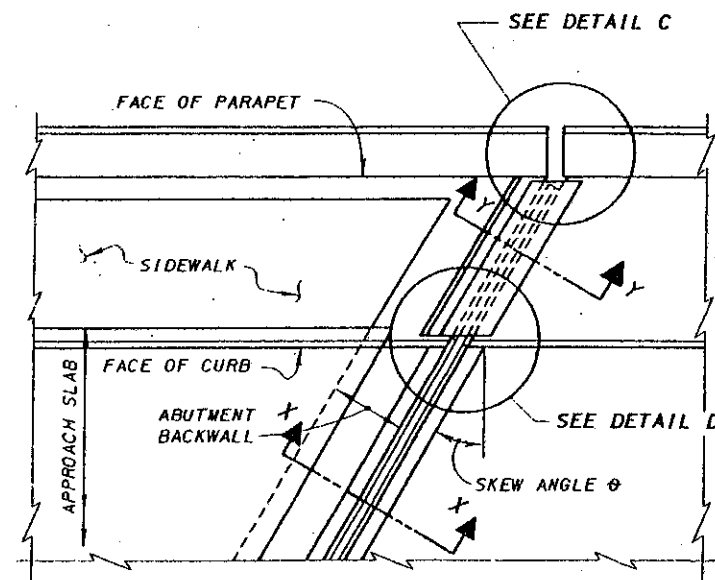
JOINTS IN RETAINERS SHALL HAVE WATERTIGHT, PARTIAL PENETRATION BUTT WELDS COMPLETELY AROUND THE OUTER PERIPHERY OF THE ABUTTING SURFACES. WELDS IN CONTACT WITH THE SEAL GLAND AND/OR JOINT ARMOR SHALL BE GROUND SMOOTH.

PROJECT PLANS SHALL LIST DIMENSION "A" FOR TEMPERATURES BETWEEN 0°C AND 35°C IN 5 DEGREE INCREMENTS.

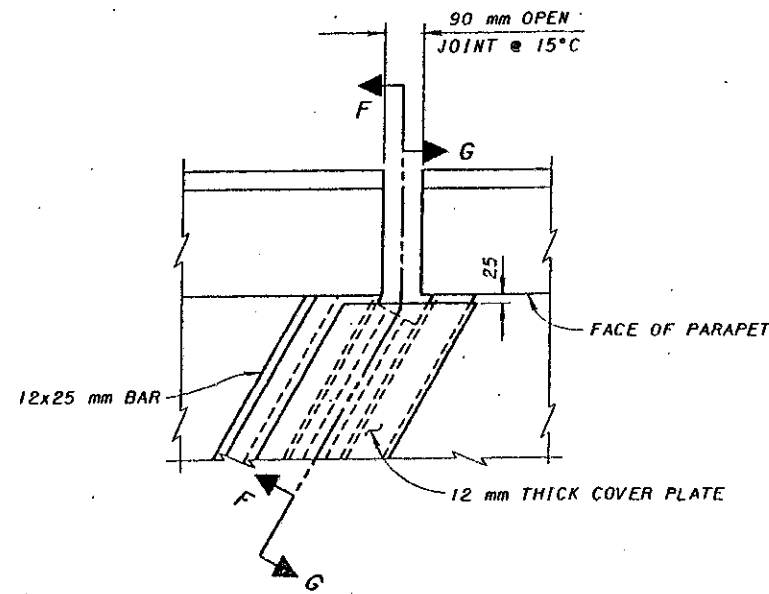
JOINT SEAL GLANDS AT FIXED BEARINGS SHALL BE THE SAME SIZE AS AT THE EXPANSION BEARINGS WITH A DIMENSION "A" OF 50 AT ANY AMBIENT TEMPERATURE.

CONCRETE UNDER JOINT ARMOR SHALL BE HAND PLACED AND VIBRATED TO ACHIEVE SOLID FILLING.

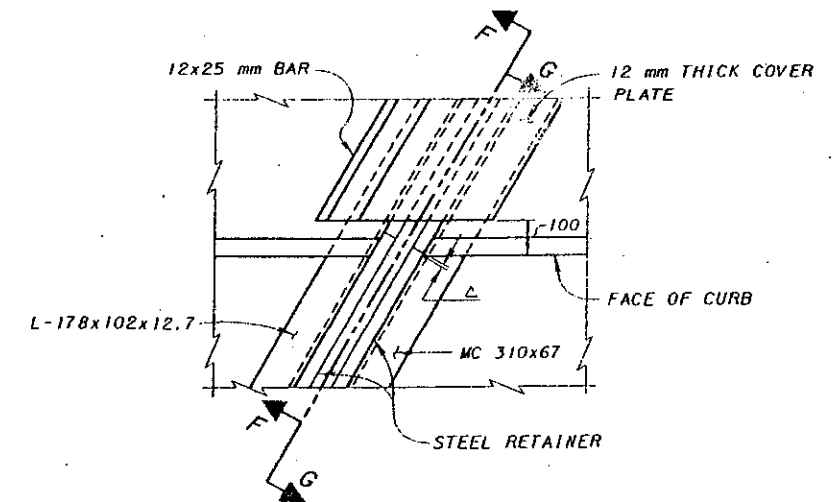
N	5	STRIP SEAL EXPANSION JOINTS FOR STEEL STRINGER STRUCTURES	REVISIONS 2-18-97				DESIGNED AJM	CHECKED JS	REVIEWED WTL/LWW	STATE OF OHIO DEPARTMENT OF TRANSPORTATION <i>Richard L. Engel</i> ENGINEER OF BRIDGES	DATE 3-20-95	DESIGN AGENCY BUREAU OF BRIDGES AND STRUCTURAL DESIGN
			EXJ-4-87W									
			AJM			AJM						
			AJM			AJM						



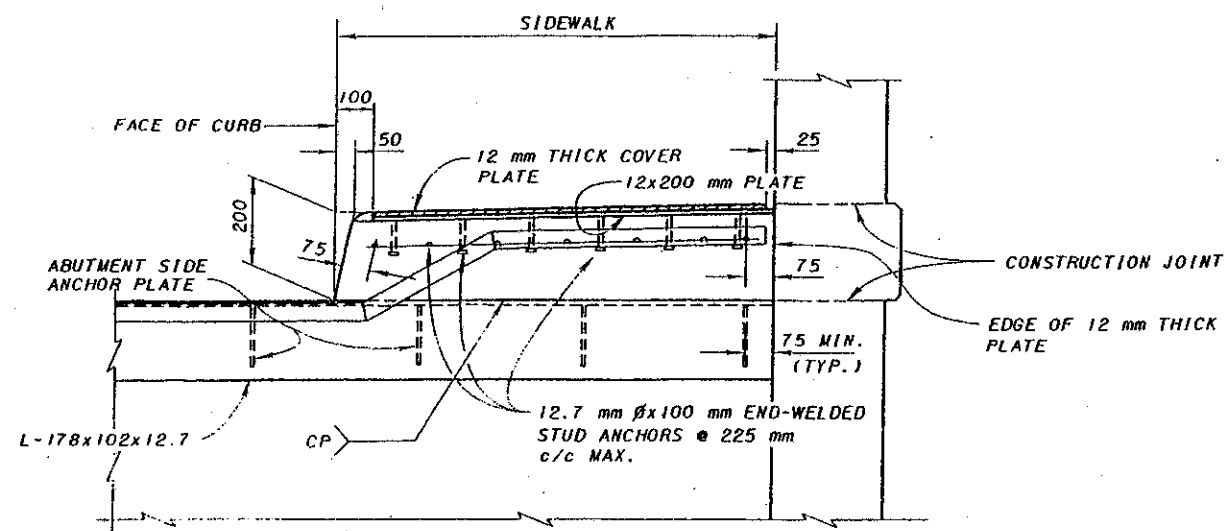
PART PLAN AT ABUTMENT
FOR BRIDGES WITH SIDEWALK
PARAPET RAILING



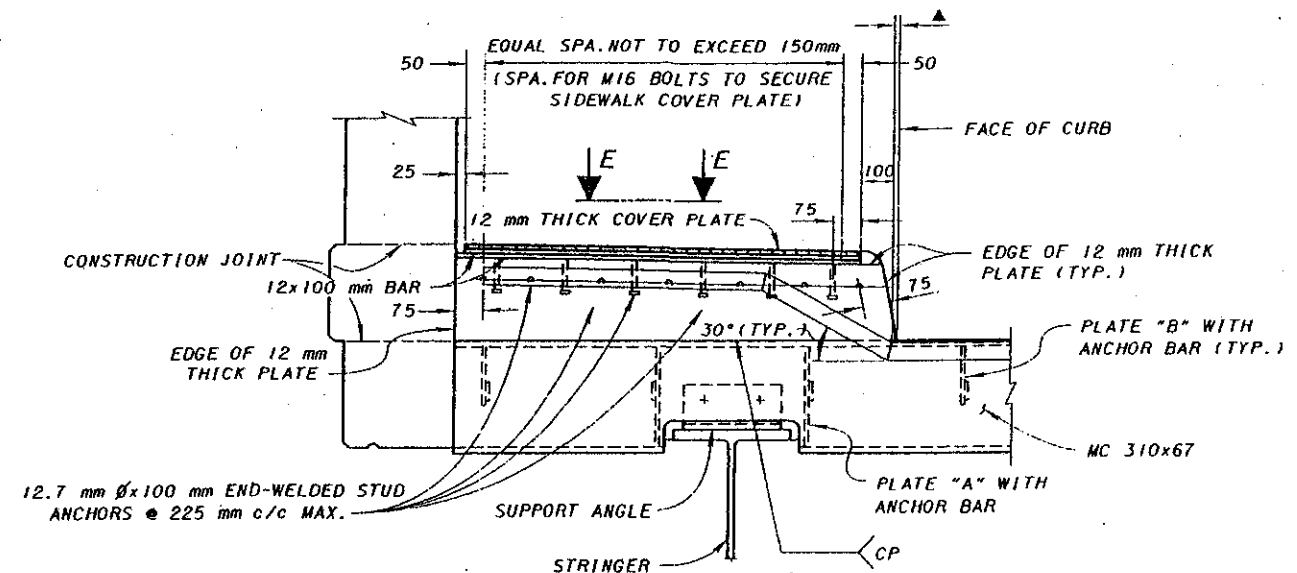
DETAIL C



DETAIL D



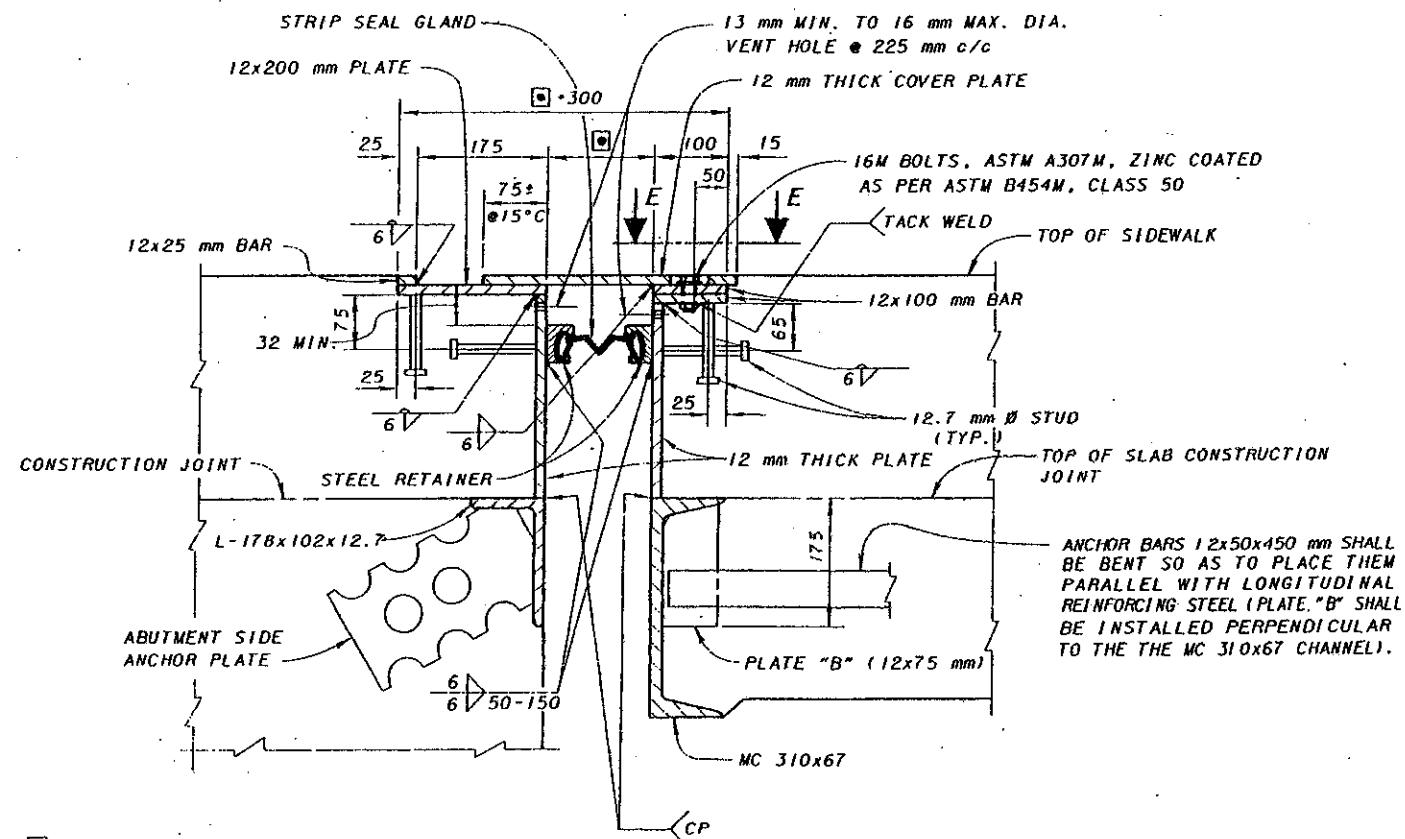
SECTION F-F



SECTION G-G

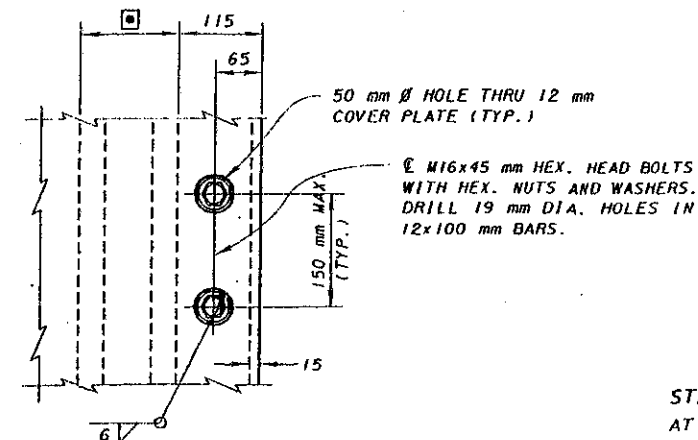
▲ - 0 MIN. TO 13 mm MAX. AT BREAKPOINT IN RETAINER FOR SQUARE BRIDGES. ON SKEWED BRIDGES THIS DIMENSION WILL ONLY APPLY TO THE SIDE OF JOINT ASSEMBLY WHICH IS NEAREST TO THE CURB LINE (SEE DETAIL "D" ABOVE).

NOTES:
FOR VIEW E-E SEE SHEET 4/5.
FOR SECTION X-X SEE SHEET 2/5.
FOR SECTION Y-Y SEE SHEET 4/5.

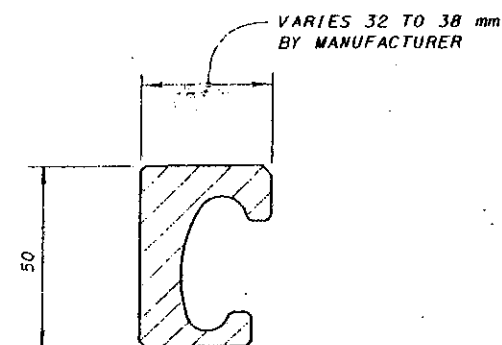


□ - THIS DIMENSION IS THE SUM OF
12xSTEEL RETAINER WIDTH+DIM. "A".

SECTION Y-Y



VIEW E-E



RETAINER DETAIL

STEEL RETAINER REQUIREMENTS:

AT JOINT UPTURNS, ESPECIALLY ON SKEWED BRIDGE DECKS, THE USE OF SPLIT RETAINERS MAY BE NECESSARY TO ENSURE GOOD SEAL GLAND INSTALLATION. WHEN THE SPLIT RETAINER IS USED, THE DESIGN SHALL BE SUBMITTED TO THE DIRECTOR FOR APPROVAL.

THE PROPOSED STEEL RETAINER SHALL CONFORM TO THE DIMENSIONS SHOWN ABOVE. THE RETAINERS SHALL BE PRODUCED AS A SOLID SHAPE EXTRUSION, A HOT ROLLED SOLID SHAPE OR SOLID SHAPE MACHINED FROM A SOLID BAR OF STEEL. STEEL RETAINERS MANUFACTURED BY THE BENDING OF A PLATE OR WELDING OF PIECES TOGETHER ARE NOT ACCEPTABLE. THE INTERNAL DIMENSIONS OF THE STEEL RETAINER SHALL MATCH THE MANUFACTURER'S REQUIREMENTS FOR POSITIVE ANCHORAGE FOR THE GLAND.

ANY DEFECTS IN THE STEEL RETAINER OR THE ACTUAL EXPANSION JOINT THAT COULD CAUSE DAMAGE TO THE GLAND SHALL BE CORRECTED BEFORE THE GLAND IS INSTALLED.

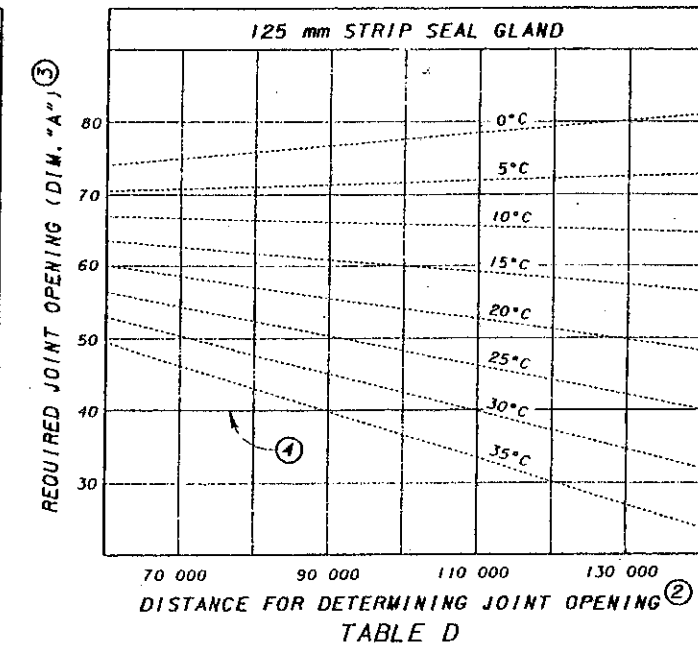
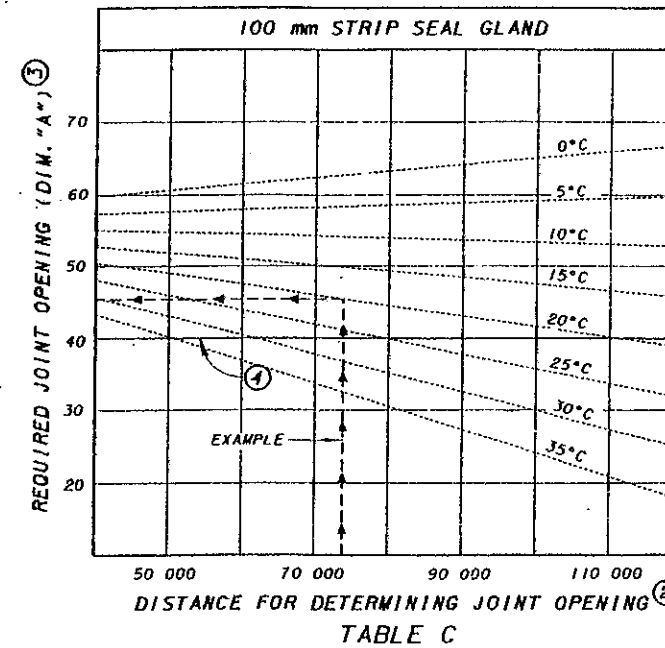
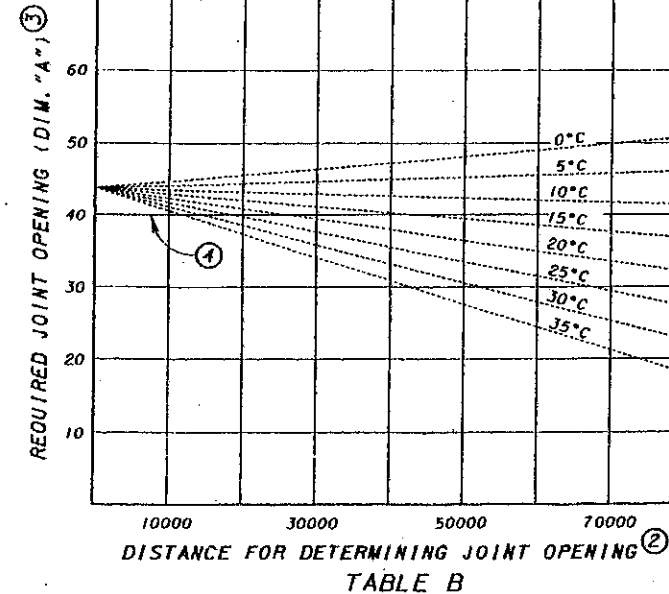
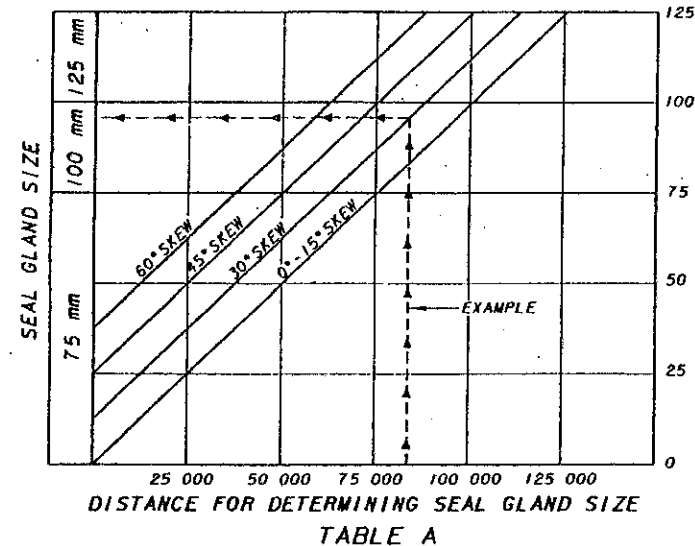
TEMPORARY JOINT ARMOR SUPPORTS

TEMPORARY SUPPORTS SHALL BE INSTALLED THAT ARE CAPABLE OF SUPPORTING SHIPPING AND ERECTION FORCES WITHOUT DAMAGE TO THE EXPANSION DEVICE. FABRICATOR DESIGNED AND INSTALLED TEMPORARY SUPPORTS SHALL BE CAPABLE OF ADJUSTMENT FOR SETTING THE EXPANSION DEVICE IN THE FIELD AND SHALL BE INSTALLED AT THE FABRICATION SHOP AFTER FABRICATION AND COATING IS COMPLETED.

CONSTRUCTION PROCEDURE

1. ABUTMENT BACKWALL CONCRETE SHALL NOT BE PLACED UNTIL AFTER SUPERSTRUCTURE CONCRETE IN THE SPAN ADJACENT TO THE ABUTMENT HAS BEEN PLACED.
2. PLACE BACKWALL CONCRETE DURING STABLE OR RISING AMBIENT TEMPERATURES AND CONCLUDE PLACEMENT AT OR IMMEDIATELY BEFORE THE DAY'S PEAK AMBIENT TEMPERATURE.
3. NOT MORE THAN FOUR HOURS PRIOR TO THE DAY'S PEAK AMBIENT TEMPERATURE, SET ABUTMENT EXPANSION JOINT WIDTH TO DIMENSION "A". SEE DIMENSION "A" TABLE ON PROJECT PLANS.
4. LOOSEN ANY TEMPORARY JOINT ARMOR BOLTS AFTER INITIAL SET OF CONCRETE, PREFERABLY NOT LATER THAN TWO HOURS AFTER CONCLUSION OF CONCRETE PLACEMENT.

NOTES TO DESIGNER: ALL TABLES ARE BASED ON A COEFFICIENT OF THERMAL EXPANSION FOR STEEL OF 0.000117/C. ALL TABULATED DIMENSIONS ARE GIVEN IN MILLIMETERS.



GENERAL NOTES:

MATERIALS: ALL STEEL PARTS OF THE JOINT ASSEMBLY SHALL BE ASTM A709M, GRADE 250. THE FINISHED STEEL ASSEMBLY SHALL BE METALIZED. THE THICKNESS OF THE COATING SHALL BE 150-200 MICROMETERS. THE WIRE USED FOR THE METALLIZING SHALL CONSIST OF 85% ZINC AND 15% ALUMINUM. SURFACE PREPARATION AND APPLICATION SHALL CONFORM TO SSPC COATING SYSTEM GUIDE NO. 2300, "GUIDE FOR THERMAL SPRAY METALLIC COATING SYSTEMS". AN OPAQUE SEAL COAT MEETING SECTION 7.2, SEALERS AND TOPCOATS, SHALL BE APPLIED TO METALIZED SURFACES THAT WILL BE IN CONTACT WITH THE CONCRETE. THERE IS NO NEED TO METALIZE THE SURFACES OF THE RETAINERS TO WHICH THE GLANDS WILL BE BONDED. THESE SURFACES MAY BE MASKED TO PREVENT THE BUILDUP OF OVERSPRAY WITHIN THE RETAINER GROOVE.

THE PREFORMED STRIP SEAL GLAND SHALL BE EXTRUDED POLYCHLOROPRENE MATERIAL MEETING THE REQUIREMENTS OF ASTM D2628M. DUE TO THE CONFIGURATION OF THE STRIP SEAL, THE RECOVERY TEST IS NOT APPLICABLE. PHYSICAL PROPERTIES SHALL MEET THE REQUIREMENTS SPECIFIED IN TABLE "E" ON THIS SHEET.

EACH LOT OF STRIP SEAL GLANDS SHALL BE TESTED BY THE MANUFACTURER OR AN ACCREDITED LABORATORY TO ENSURE COMPLIANCE WITH THESE PROVISIONS. TWO CERTIFIED COPIES OF THE QUALIFICATION TEST DATA INDICATING THAT THE TESTED MATERIALS COMPLY WITH THESE PROVISIONS SHALL BE SUBMITTED TO THE ODOT TESTING LABORATORY.

THE STEEL RETAINER AND POLYCHLOROPRENE GLAND SHALL BE SUPPLIED BY THE SAME MANUFACTURER AND SHALL BE DESIGNED TO FUNCTION AS AN INTEGRAL UNIT.

LUBRICANT-ADHESIVE USED TO INSTALL THE PREFORMED STRIP SEALS SHALL BE A ONE PART MOISTURE CURING POLYURETHANE COMPOUND, MEETING THE REQUIREMENTS OF ASTM D4070M, AND AS SPECIFIED BY THE SEAL GLAND MANUFACTURER. IT SHALL HAVE A SUITABLE CONSISTENCY AT THE TEMPERATURE AT WHICH THE SEALS ARE INSTALLED AND SHALL BE COMPATIBLE WITH THE SEALS AND THE STEEL RETAINERS.

SPLICE OR JOINT IN SEAL GLAND: SEAL GLANDS FOR BRIDGE DECK JOINTS SHALL BE FURNISHED IN ONE CONTINUOUS PIECE UNLESS SHOP FABRICATED SPLICES ARE SHOWN ON THE PLANS OR APPROVED BY THE DIRECTOR. FIELD SPLICING SHALL NOT BE PERMITTED.

COMPLETED SPLICES SHALL HAVE NO OFFSETS ON EXTERIOR SURFACES, AND AFTER INSTALLATION, THERE SHALL BE NO EVIDENCE OF BOND FAILURE AT THE SPLICES.

FOR OTHER THAN STRAIGHT SEALS WITHOUT INTERMEDIATE SPLICES, SEAL GLANDS SHALL BE SHOP FABRICATED IN ACCORDANCE WITH APPROVED SHOP DRAWINGS. SHOP DRAWING DIMENSIONS FOR EXISTING JOINTS OR FOR JOINTS WHICH ARE BEING MODIFIED SHALL BE BASED ON FIELD MEASUREMENTS PROVIDED BY THE CONTRACTOR.

PREPARATION FOR INSTALLATION: TO AVOID THE SUBSEQUENT CONTAMINATION OF THE PREPARED SURFACES, ALL SURFACES OF ELASTOMERIC STRIP SEAL GLANDS SHALL BE CLEANED WITH METHYL ETHYL KETONE (MEK), TOLUENE (T) OR ANOTHER APPROVED SOLVENT USING CLEAN DISPOSABLE CLOTHS.

NO MORE THAN 24 HOURS BEFORE APPLICATION OF THE LUBRICANT ADHESIVE, ONLY THE SURFACES OF THE STEEL RETAINER TO WHICH ADHESIVE IS APPLIED SHALL BE CLEANED TO SSPC VISUAL STANDARD SP-6.

INSTALLATION: IMMEDIATELY PRIOR TO APPLICATION OF LUBRICANT-ADHESIVE, BONDING SURFACES SHALL BE CLEAN, DRY AND WARMER THAN 7 DEGREES C. AND THEY SHALL BE MAINTAINED AT OR ABOVE THIS TEMPERATURE UNTIL THE ADHESIVE HAS CURED. LUBRICANT-ADHESIVE SHALL BE APPLIED LIBERALLY TO BOTH STEEL AND ELASTOMERIC BONDING SURFACES USING A STIFF BRUSH IF NECESSARY TO ACHIEVE A COMPLETE AND RELATIVELY UNIFORM COATING. THE BULBED EDGES OF THE ELASTOMERIC SEAL SHALL BE INSERTED INTO THE RETAINER GROOVES. AFTER INSTALLATION, EXCESS LUBRICANT-ADHESIVE SHALL BE REMOVED FROM THE EXPOSED SEAL SURFACES.

SEAL GLANDS SHALL BE INSTALLED WITH EQUIPMENT DESIGNED OR SPECIFICALLY ADAPTED FOR THE INSTALLATION OF ELASTOMERIC JOINT SEAL GLANDS. THIS EQUIPMENT SHALL NOT ELONGATE THE SEAL GLAND OR CAUSE STRUCTURAL DAMAGE TO THE COMPLETED INSTALLATION.

REPAIRS SHALL BE MADE PRIOR TO THE INSTALLATION OF THE SEAL. METALIZED SURFACES DAMAGED DURING FABRICATION SHALL BE REPAIRED BY REBLASTING AND METALIZING AS PER SSPC GUIDE 23.00. METALIZED SURFACES DAMAGED DURING SHIPMENT OR FIELD WELDING SHALL BE REPAIRED AS PER ASTM A 780-93a, ANNEX A1, REPAIR USING ZINC BASED ALLOYS. THIS FIELD PROCESS REQUIRES REMOVAL OF CONTAMINATES FROM THE SURFACE, PREHEATING THE SURFACE TO 315° C AND APPLICATION OF ZINC COATING BY EITHER RUBBING A PURE ZINC STICK OR SPRINKLING ZINC POWDER ON THE PREHEATED SURFACE. THE ZINC COATING THICKNESS SHALL BE THE SAME AS THAT SPECIFIED FOR THE METALIZING.

MEASUREMENT FOR PAY PURPOSES SHALL BE BASED ON THE LINEAR METERS OF SEALED JOINT SYSTEM, MEASURED HORIZONTALLY ALONG THE JOINT CENTERLINE AND BETWEEN THE OUTER LIMITS OF THE FABRICATED JOINT. THIS PAY ITEM SHALL INCLUDE ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY TO COMPLETE THE JOINT IN PLACE, WHICH INCLUDES: THE JOINT ARMOR, RETAINERS, GLAND, ANCHORING DEVICES, PLATE "A", PLATE "B", TEMPORARY SUPPORTS AND THE END CROSSFRAME TOP GUSSET PLATES. PAYMENT WILL BE MADE PER LINEAR METER FOR ITEM 516, "STRUCTURAL EXPANSION JOINTS, INCLUDING ELASTOMERIC STRIP SEALS".

THERMAL NEUTRAL POINT OF THE SUPERSTRUCTURE IS THAT POINT WHICH HAS ZERO HORIZONTAL MOVEMENT DURING TEMPERATURE CHANGES.

LEGEND

- ① - THIS IS THE ACTUAL DISTANCE FROM THE CENTERLINE OF JOINT TO THE THERMAL NEUTRAL POINT OF THE SUPERSTRUCTURE MEASURED ALONG THE CENTERLINE OF ROADWAY. THIS DIMENSION SHALL BE A MAXIMUM OF 87 985 mm FOR 60° SKEWS, 100 555 mm FOR 45° SKEWS, 113 120 mm FOR 30° SKEWS AND 125 690 mm FOR 0° THRU 15° SKEWS.
- ② - THIS DISTANCE FOR EXPANSION JOINTS HAVING SKEW ANGLES OF 15° OR LESS IS THE ACTUAL DISTANCE TO THE THERMAL NEUTRAL POINT OF THE SUPERSTRUCTURE ALONG CENTERLINE OF ROADWAY. THIS DISTANCE FOR EXPANSION JOINTS HAVING SKEW ANGLES OVER 15° BUT NOT GREATER THAN 60° IS ARRIVED AT BY MULTIPLYING THE ABOVE DEFINED DISTANCE ALONG THE CENTERLINE OF ROADWAY BY THE COSINE OF THE EXPANSION JOINT SKEW ANGLE.
- ③ - THIS IS THE JOINT OPENING (DIMENSION "A") REQUIRED AT THE TIME OF ADJUTMENT BACKWALL CONCRETE PLACEMENT, BASED ON THE DAY'S ANTICIPATED PEAK AMBIENT TEMPERATURE.
- ④ - MINIMUM JOINT OPENING (DIMENSION "A") AT TIME OF SEAL GLAND INSTALLATION SHALL NOT BE LESS THAN 40 mm. IF THE JOINT OPENING IS LESS, INSTALLATION SHALL BE POSTPONED UNTIL THE TEMPERATURE DROPS A SUFFICIENT AMOUNT TO ALLOW THE MINIMUM 40 mm OPENING.

EXAMPLE

GIVEN - DISTANCE FROM THE CENTERLINE OF JOINT TO THERMAL NEUTRAL POINT OF SUPERSTRUCTURE ALONG CENTERLINE OF ROADWAY IS 83 820 mm; SKEW ANGLE OF THE EXPANSION JOINT IS 30°; ANTICIPATED AMBIENT TEMPERATURE AT TIME OF JOINT INSTALLATION IS 20°C.

FIND - REQUIRED STRIP SEAL GLAND SIZE AND JOINT OPENING (DIMENSION "A") AT TIME OF JOINT ARMOR INSTALLATION.

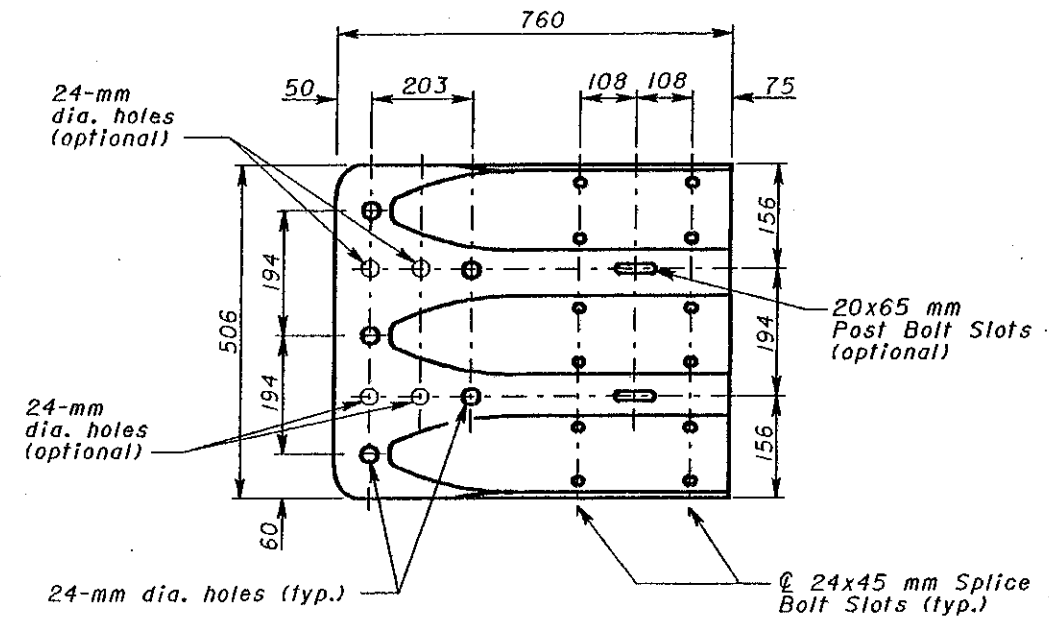
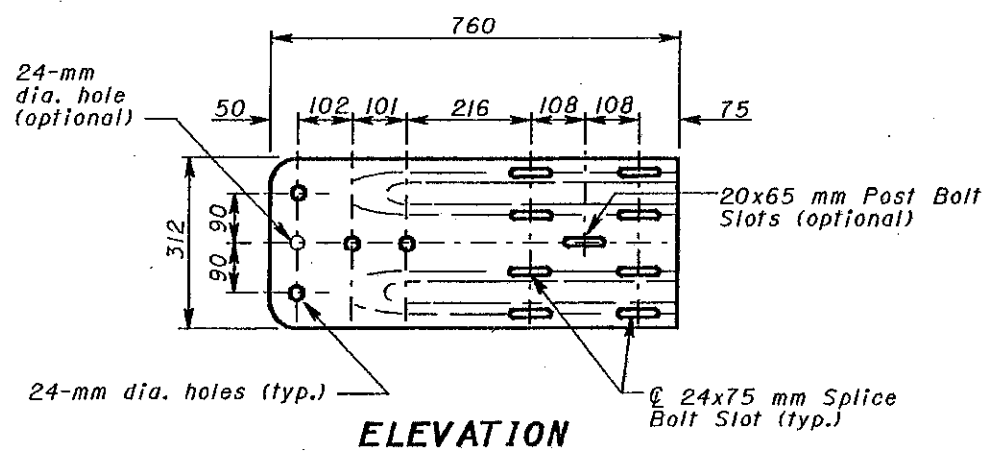
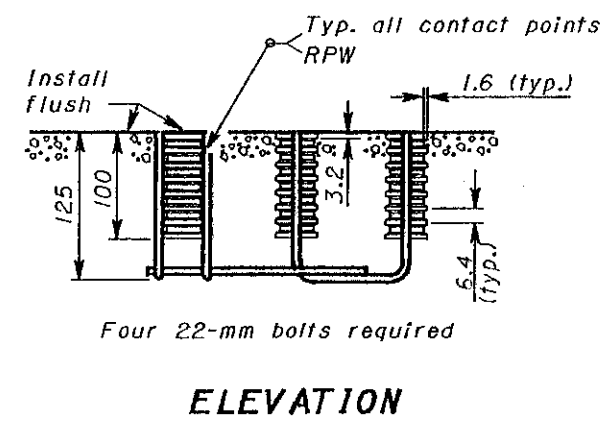
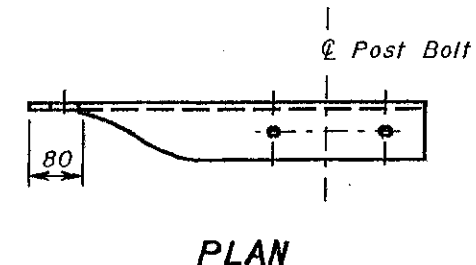
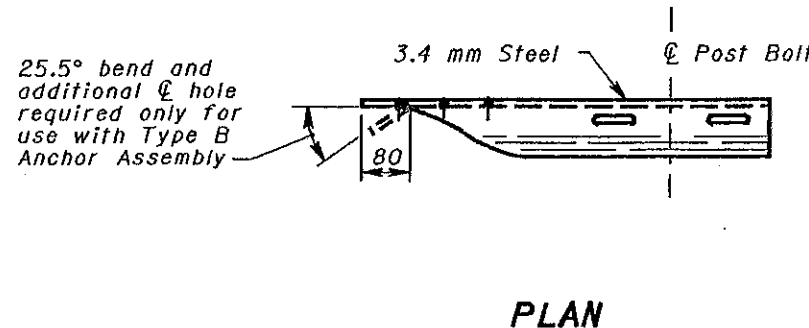
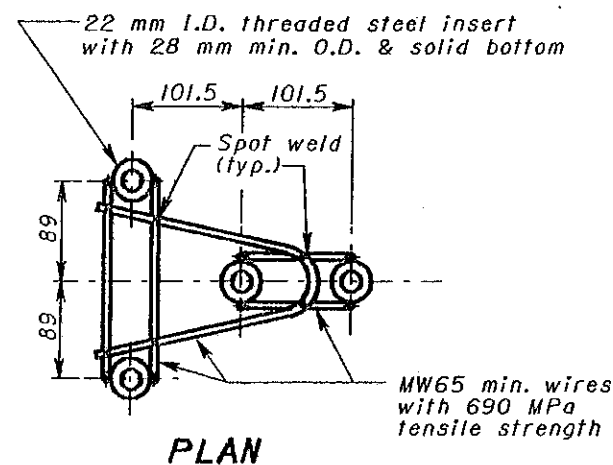
SOLUTION:

(A) - ENTER TABLE "A" AT ① WITH 83 820 mm AND FIND THAT THE REQUIRED STRIP SEAL GLAND SIZE IS 100 mm.

(B) - ENTER TABLE "C" AT ② WITH 83 820 mm x COSINE OF 30° = 72 590 mm AND FIND REQUIRED JOINT OPENING AT 20°C IS 46 mm.

NOTE: STEP (B) REQUIRED ONLY AT TIME OF CONSTRUCTION.

TABLE E (PHYSICAL PROPERTIES OF SEAL ELEMENT)		
PROPERTY	REQUIREMENT	ASTM METHOD
TENSILE STRENGTH, MIN MPa	13.8	D412M
ELONGATION @ BREAK, MIN PERCENT	250	D412M
HARDNESS, TYPE A DUROMETER, POINTS	60 ± 5	D2240M(MODIFIED)
OVEN AGING, 70 HR @ 100°C TENSILE STRENGTH, LOSS, MAX ELONGATION, LOSS, MAX HARDNESS, TYPE A DUROMETER, POINTS CHANGE	20 PERCENT 20 PERCENT 0 TO +10	D573M D2240M(MODIFIED)
OIL SWELL, ASTM OIL 3 70 HR @ 100°C, WEIGHT CHANGE MAX	45 PERCENT	D471M
OZONE RESISTANCE 20 PERCENT STRAIN, 300 PPHM IN AIR, 70 HR @ 40°C (WIPE WITH TOLUENE TO REMOVE SURFACE CONTAMINATION)	NO CRACKS	D1149M
LOW TEMPERATURE STIFFENING 7 DAYS @ -10°C HARDNESS, TYPE A DUROMETER, POINTS CHANGE	0 TO +15	D2240M D2240M(MODIFIED)
COMPRESSION SET, 70 HR @ 100°C MAX	40 PERCENT	D395M METHOD B

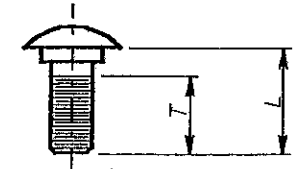


CONCRETE INSERT ANCHOR ASSEMBLY (W-BEAM ONLY)

W-BEAM TERMINAL CONNECTOR

THRIE-BEAM TERMINAL CONNECTOR

All dimensions are in millimeters unless otherwise noted.



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.

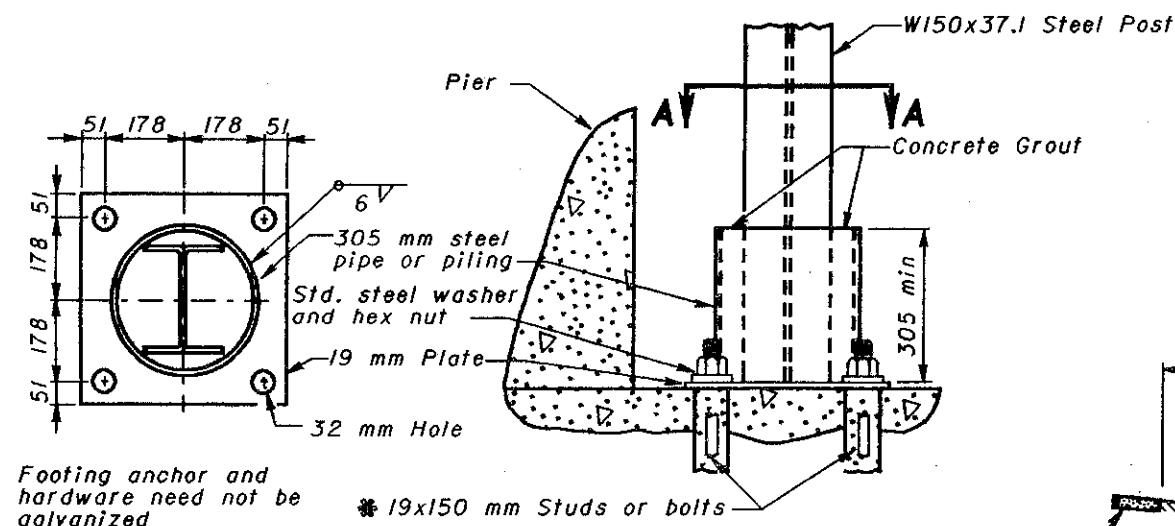
BUTTON HEAD BOLT
(For post and splice bolts)

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.



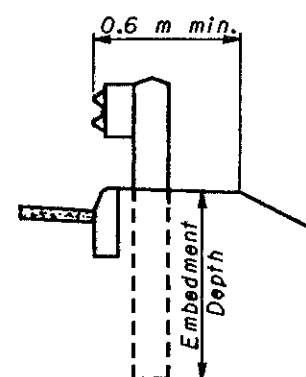
OHIO DEPARTMENT OF TRANSPORTATION	
GUARDRAIL DETAILS STANDARD CONSTRUCTION DRAWING GR-1.1M APPROVED <i>[Signature]</i>	DATE 11-30-94 10-21-97



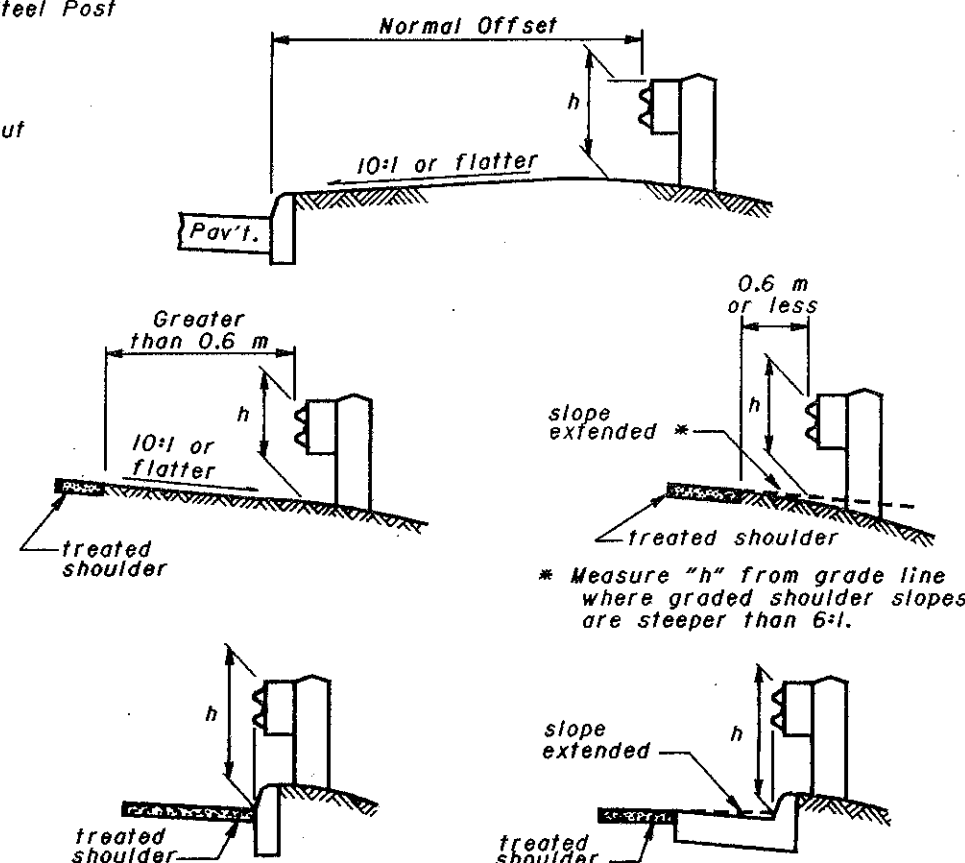
SECTION A-A

ELEVATION

FOOTING ANCHOR

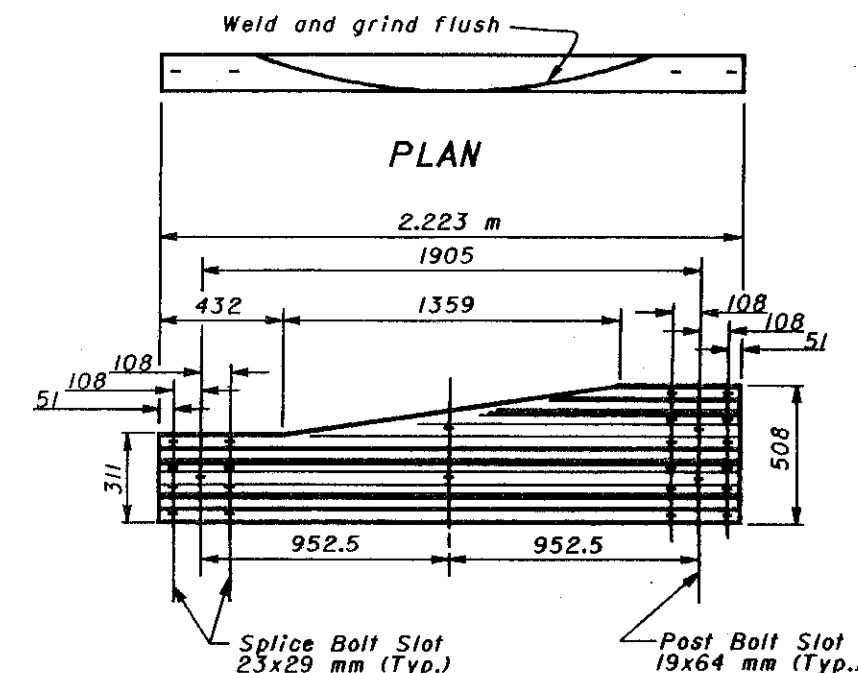


DETAIL A



h = Standard height (Tolerance ± 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.

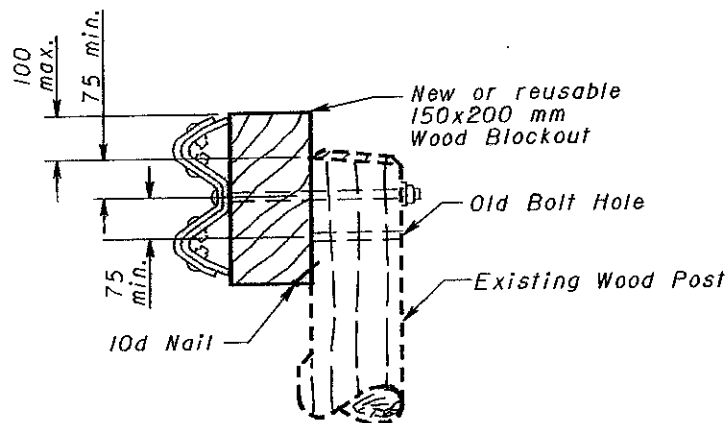
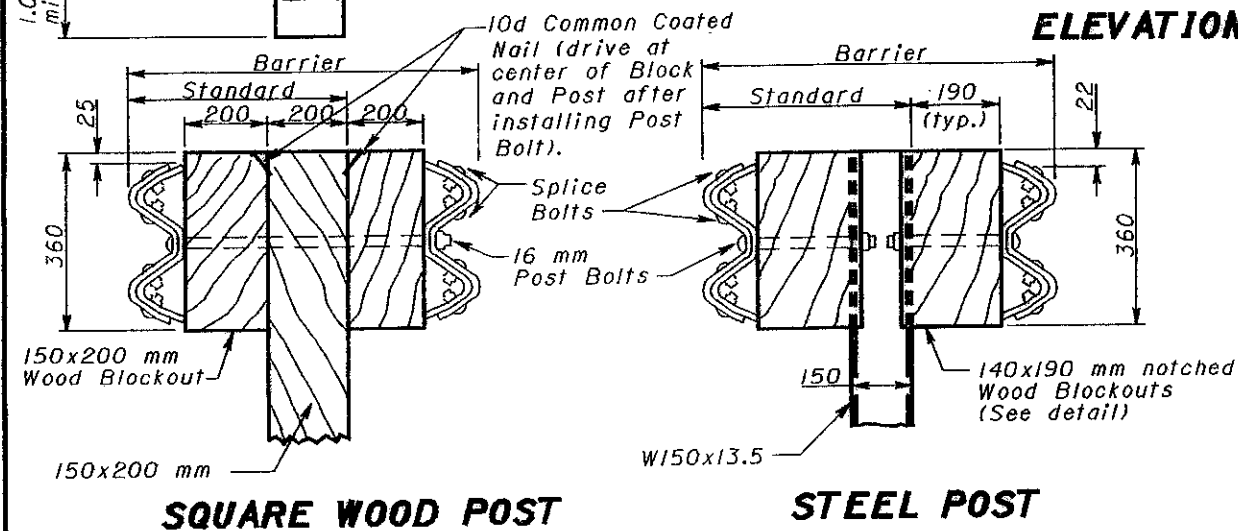
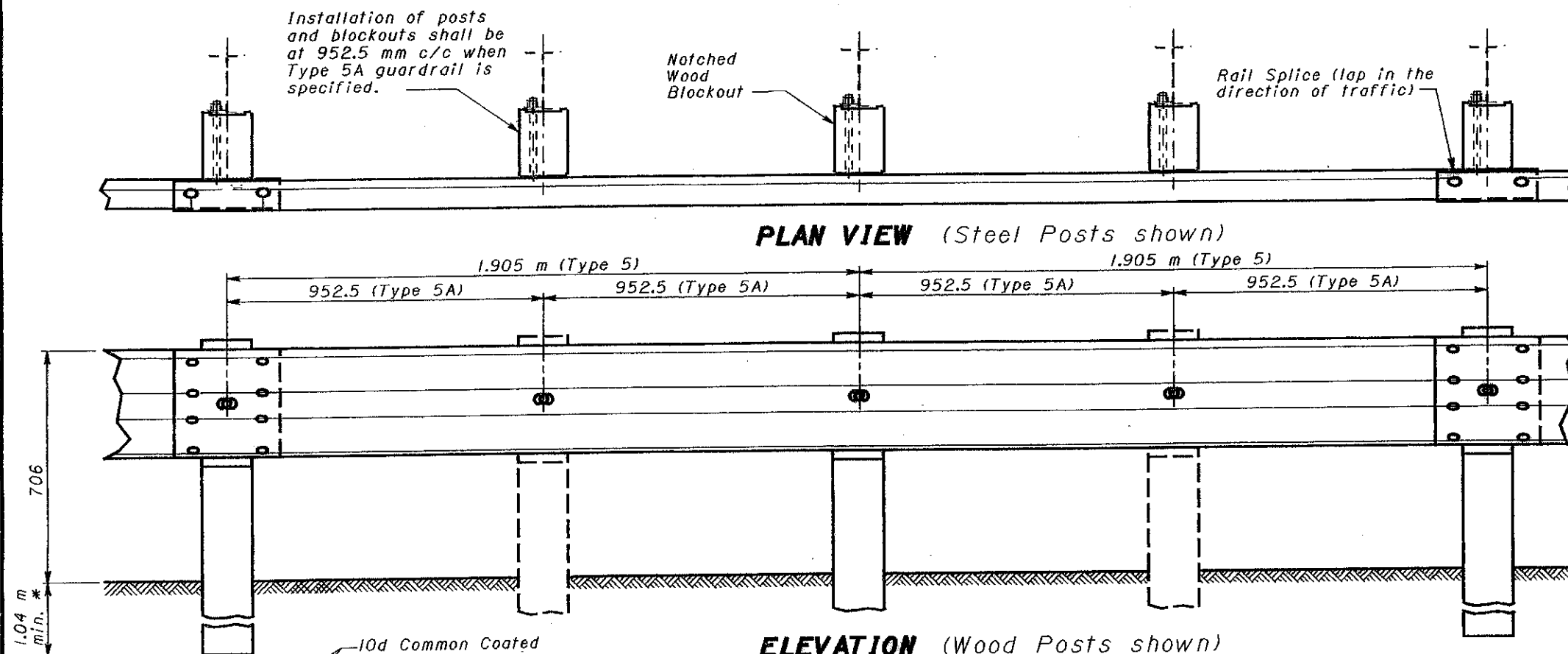
OFFICE OF ROADWAY ENGINEERING
OHIO DEPARTMENT OF TRANSPORTATION

GUARDRAIL
DETAILS

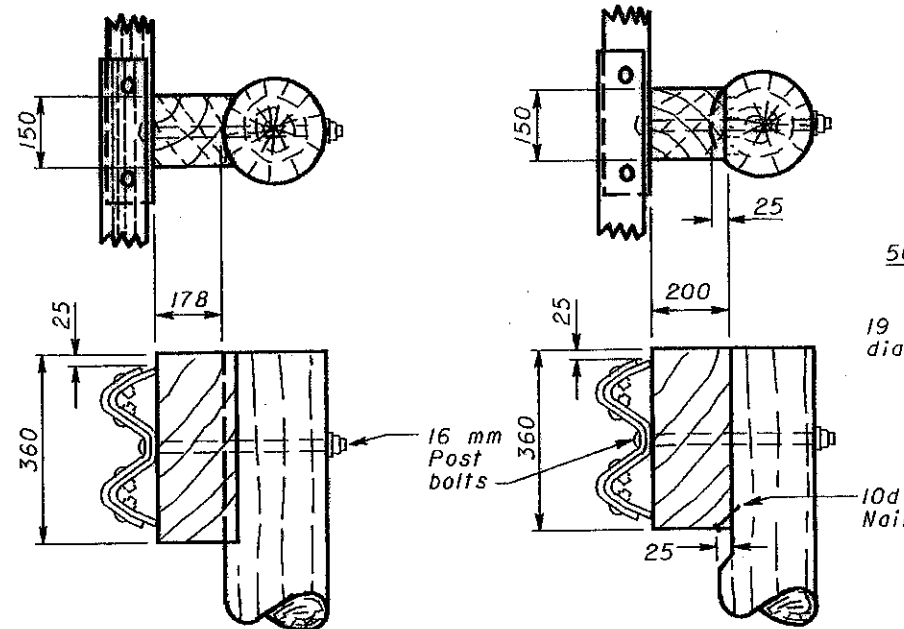
STANDARD
CONSTRUCTION DRAWING
GR-1.2M

APPROVED D.K. Hulman, P.E.
ADMINISTRATOR

DATE
1-3-96



**WOOD POSTS WITH WOOD BLOCK
RAISING EXISTING GUARDRAIL HEIGHT**



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.



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 $\pm$ 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.

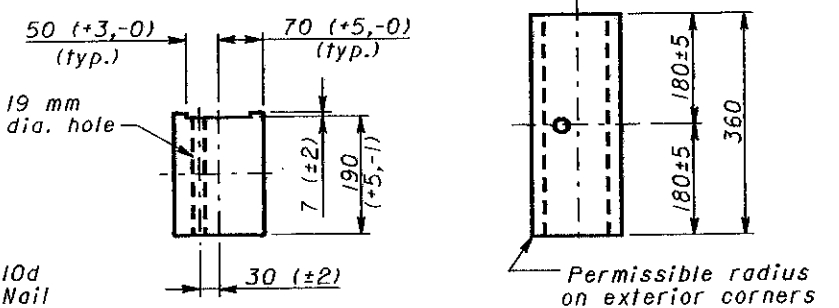
Sec. 12 Beams that have imperfections repaired by welding shall not be accepted for use in Item 606.

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**

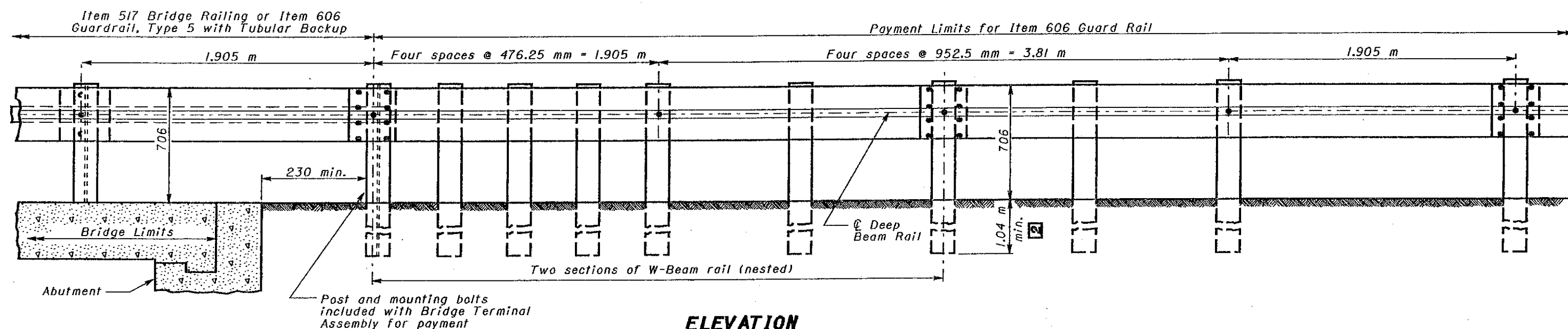
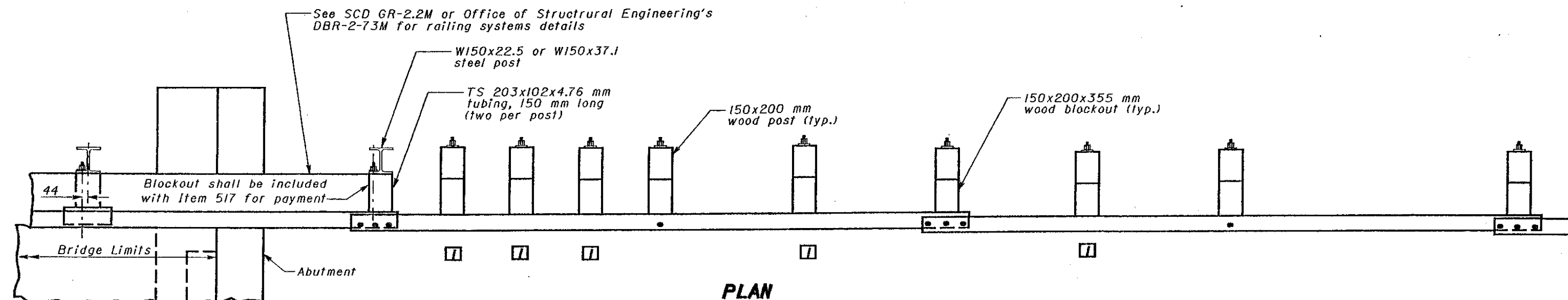
**STANDARD
CONSTRUCTION
DRAWING**

GR-2.1M

DATE

11-30-94
10-21-97
4-14-98

APPROVED *Larry T. Linderland*



1 Guardrail not attached to posts. Blockout fastened to post with standard post bolt.

2 See SCD GR-1.2M for additional post embedment details.

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 4 Bridge Terminal Assembly shall be used to connect guardrail runs to bridges having W-Beam railing with Tubular Backup.

DETAIL INFORMATION: The first post off the bridge shall be steel (W150x22.5 or W150x37.1). All holes in the off-structure end of the approach panel W-Beam rail section that spans the abutment shall be slotted 19x64 mm and the bolts shall be tightened as specified for expansion joints in Item 606.05.

POSTS: General - Posts may be set in drilled holes or driven to grade.

Wood Posts shall be square-sawn 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.

Steel Posts and Blockouts for Type 4 Bridge Terminal Assemblies may be furnished as an alternate. The steel alternate for the 150 mm by 200 mm wood posts and blockouts shall be W150x13.5.

PAYMENT: Payment for Item 606 - Each, Bridge Terminal Assembly, Type 4, shall include the extra cost, in excess of normal guardrail costs, for additional posts and other hardware. The TS 203x102 mm spacers and tubular backup rail extending to the first post off the bridge shall be included with Item 517 - Railing, or Item 606 - Guardrail, Type 5, with Tubular Backup, for payment.

All dimensions are in millimeters unless otherwise noted.



This Drawing Replaces GR-3.4.

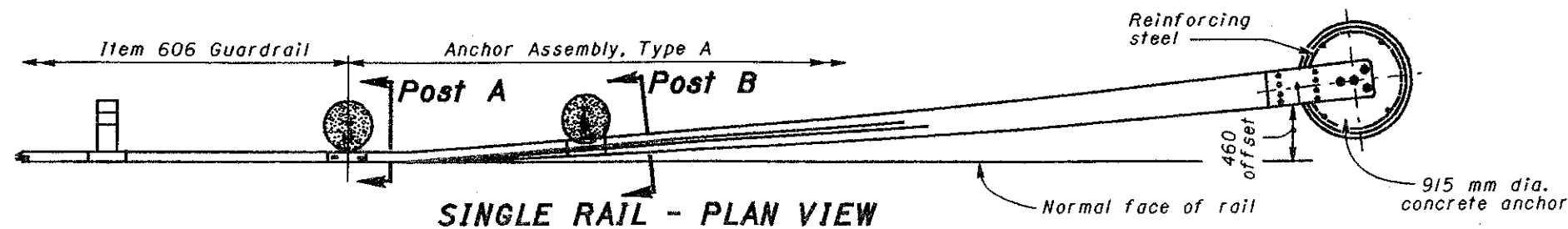
OHIO DEPARTMENT OF TRANSPORTATION

BRIDGE TERMINAL
ASSEMBLY, TYPE 4

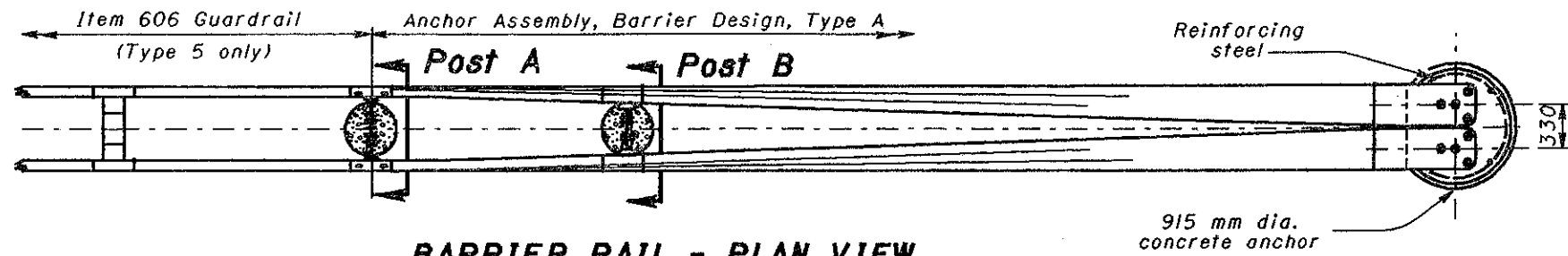
DATE
1-3-96
10-21-97

STANDARD
CONSTRUCTION
DRAWING
GR-3.4M

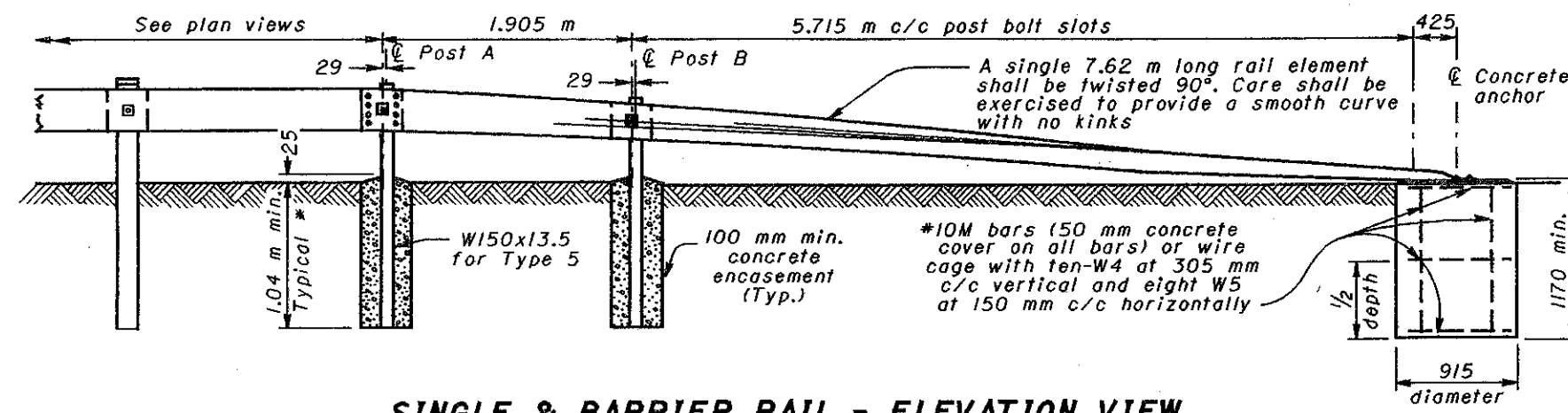
APPROVED: *Ray T. Sutherland*



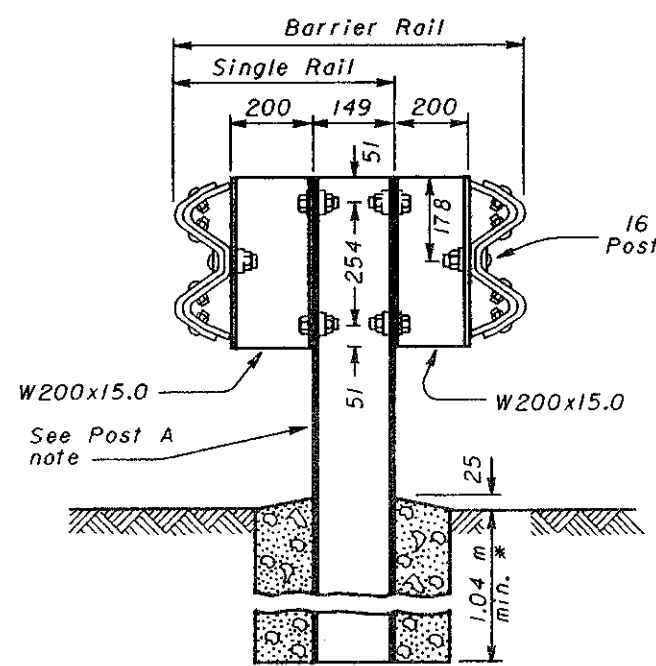
SINGLE RAIL - PLAN VIEW



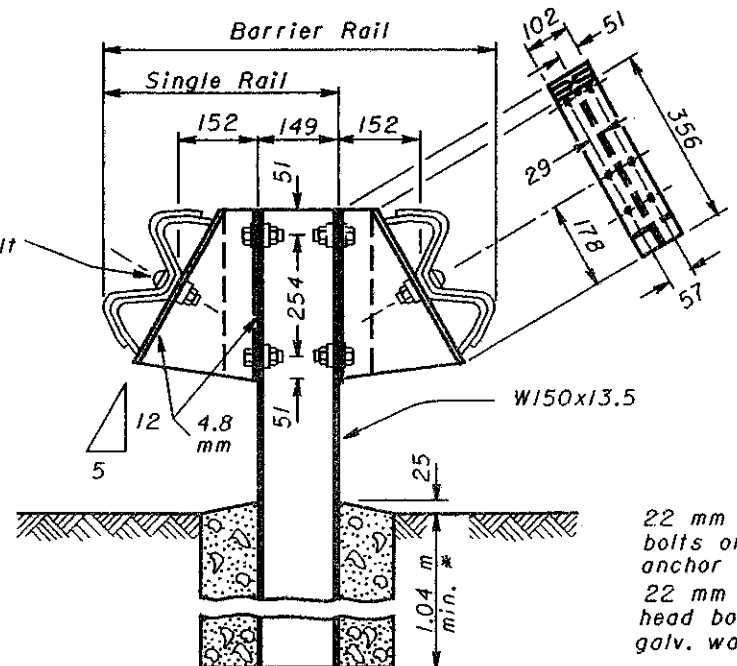
BARRIER RAIL - PLAN VIEW



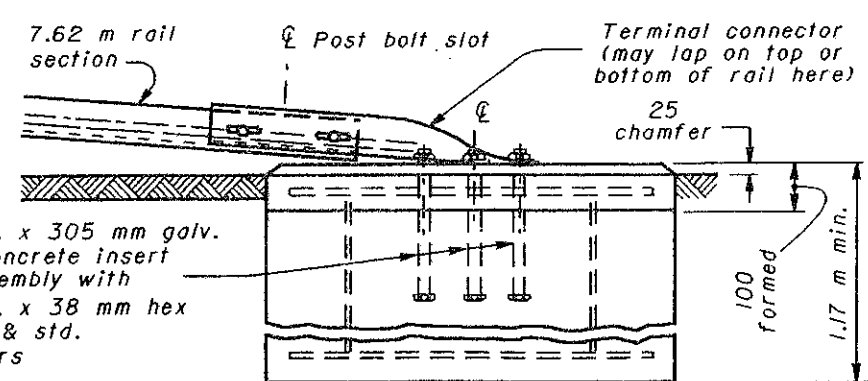
SINGLE & BARRIER RAIL - ELEVATION VIEW



POST A



POST B



CONCRETE ANCHOR

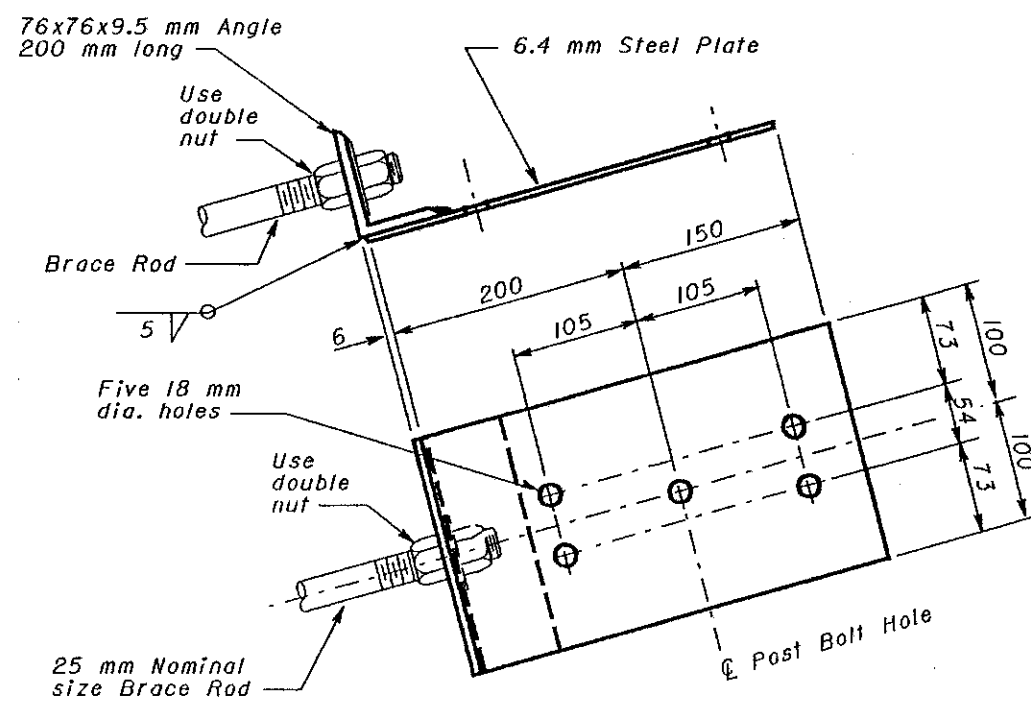
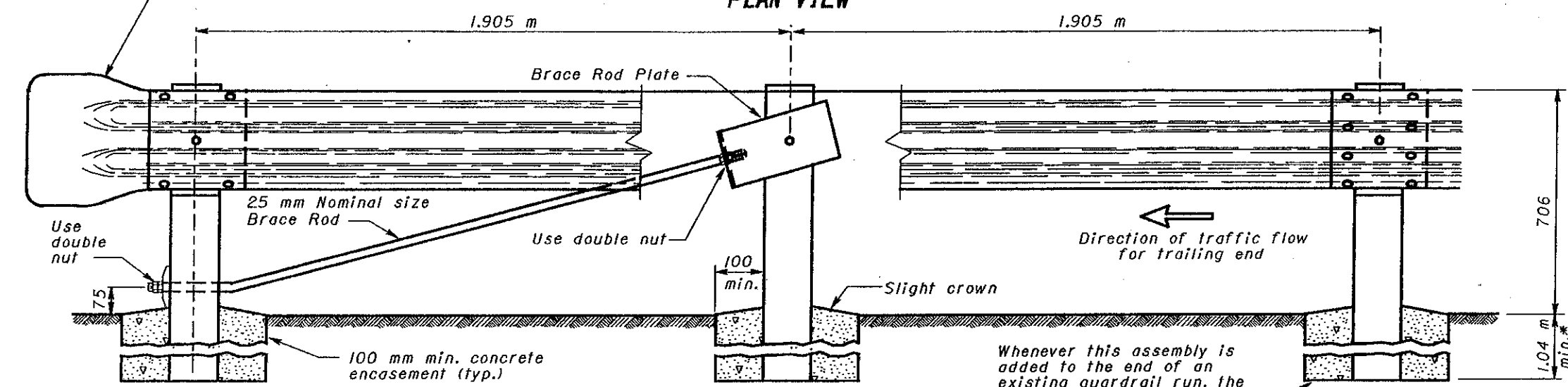
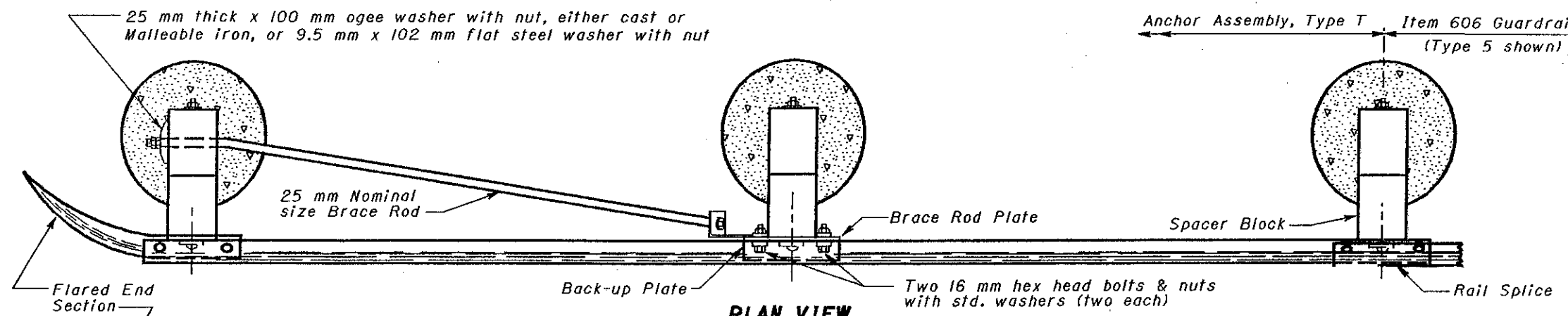
NOTES

- GENERAL:** For details not shown, see 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.

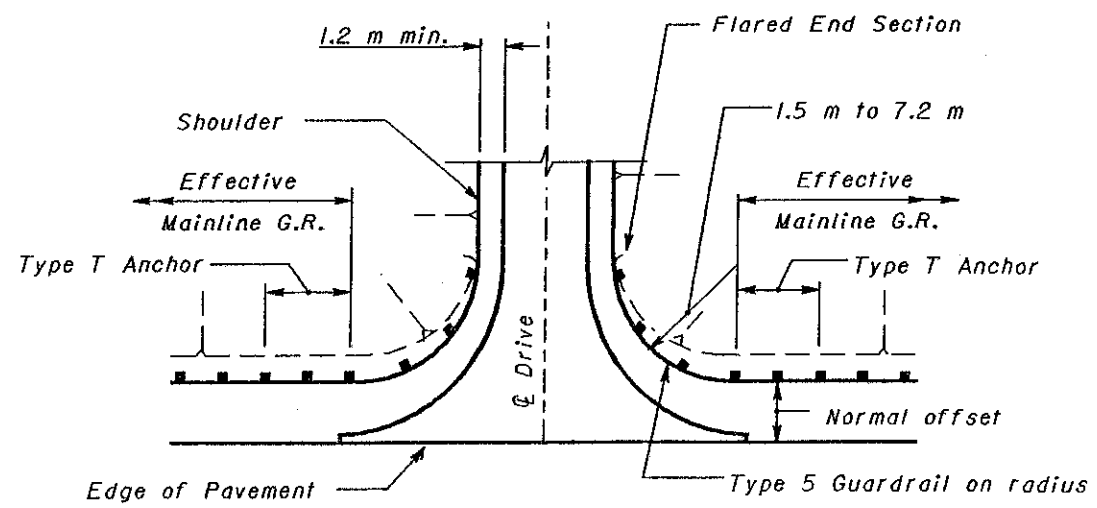


BUREAU OF LOCATION AND DESIGN OHIO DEPARTMENT OF TRANSPORTATION		DATE 11-30-94
TYPE A ANCHOR ASSEMBLY		
STANDARD CONSTRUCTION DRAWING GR-4.1M		
APPROVED: <i>D.K. Hulman</i> ENGR., L & D		



BRACE ROD PLATE

TYPE T



DRIVEWAY OPENING

NOTES

- FOR DETAILS NOT SHOWN:** See SCD's GR-1.1M, GR-1.2M and other Drawings pertaining to design of specific guardrail types.
- WASHERS:** All washers indicated are standard galvanized steel of the appropriate size.
- POSTS:** Posts shall be the same as used on the adjacent guardrail, with 100 mm minim concrete encasement.
- SPACER BLOCKS:** Blocks may be notched in the field, in a manner satisfactory to the Engineer, to accommodate the installation of the brace rod plate 16 mm attachment bolts.
- BRACE ROD ASSEMBLY:** Rods shall be galvanized and develop a tensile strength of at least 178 kN.
- * FOR SPECIFIC POST EMBEDMENT:** See SCD GR-1.2M for depth requirements.

All dimensions are in millimeters unless otherwise noted.



OHIO DEPARTMENT OF TRANSPORTATION	
TYPE T ANCHOR ASSEMBLY	DATE 4-21-95 10-21-97
STANDARD CONSTRUCTION DRAWING APPROVED <i>Randy T. Lumbard</i>	GR-4.2M

614 TEMPORARY RAISED PAVEMENT MARKERS

GENERAL

THIS ITEM OF WORK SHALL CONSIST OF FURNISHING, INSTALLING, MAINTAINING AND SUBSEQUENTLY REMOVING TEMPORARY RAISED PAVEMENT MARKERS (TRPM'S). THE MARKERS SHALL BE YELLOW OR WHITE, AS DESCRIBED IN THE PLAN.

MATERIAL

ALL MARKERS AND RETROREFLECTORS SHALL BE OF SUFFICIENT STRENGTH AND PROPERLY SHAPED SO AS NOT TO BE DISLODGED OR BROKEN, BY IMPACTS FROM VEHICLES TIRES, INCLUDING THOSE OF HIGH PRESSURE TRUCK TIRES LOADED TO 2043 KILOGRAMS.

RETROREFLECTORS SHALL BE PROVIDED IN ONE OR TWO DIRECTIONS ON EACH MARKER AS REQUIRED BY THE USAGE AND SHALL RETURN WHITE OR YELLOW LIGHT AS IS APPROPRIATE FOR THE APPLICATION.

THE REFLECTOR SHALL HAVE AN EFFECTIVE AREA OF 225 SQUARE MILLIMETERS FOR TYPE A OR 1935 SQUARE MILLIMETERS FOR TYPE B. ITS BRIGHTNESS OR SPECIFIC INTENSITY (WHEN TESTED AT 0.2 DEGREE ANGLE OF OBSERVATION AND THE FOLLOWING ANGLES OF INCIDENCE) SHALL MEET OR EXCEED THE FOLLOWING:

SPECIFIC INTENSITY		
INCIDENCE ANGLE (DEGREES)	TYPE A	
	WHITE	YELLOW
0	1.0	0.6
20	0.4	0.24
45	—	—
	TYPE B	
	WHITE	YELLOW
0	3.0	1.8
20	1.2	0.72
45	0.3	0.2

ANGLE OF INCIDENCE FORMED BY A RAY FROM LIGHT SOURCE TO THE MARKER AND THE NORMAL TO THE LEADING EDGE OF THE MARKER FACE (ALSO HORIZONTAL ENTRANCE ANGLE).

ANGLE OF OBSERVATION FORMED BY A RAY FROM LIGHT SOURCE TO THE MARKER AND THE RETURNED RAY FROM THE MARKER TO THE MEASURING RECEPTOR.

SPECIFIC INTENSITY IS THE MEAN CANDLEPOWER OF THE REFLECTED LIGHT (AT GIVEN INCIDENCE AND DIVERGENCE ANGLES) FOR EVERY 10.7 LUX AT THE REFLECTOR (ON A PLANE PERPENDICULAR TO THE INCIDENT LIGHT) .

TYPE A MARKERS ARE INTENDED TO PROVIDE HIGH VISIBILITY BOTH DAY AND NIGHT. THEIR DAYTIME VISIBILITY SHALL BE ASSURED BY SIZE, SHAPE AND COLOR AS FOLLOWS:

- 1) THE MARKERS SHALL BE A HIGH VISIBILITY YELLOW OR WHITE COLOR WHICH WILL NOT DEGRADE SUBSTANTIALLY DUE TO TRAFFIC WEAR AND WHICH WILL MATCH THE COLOR OF THE REFLECTOR.
- 2) WHEN VIEWED FROM ABOVE, THE MARKERS SHALL HAVE A VISIBLE AREA OF NOT LESS THAN 9030 SQUARE MILLIMETERS.
- 3) WHEN VIEWED FROM THE FRONT, PARALLEL TO THE PAVEMENT, AS FROM APPROACHING TRAFFIC, THE MARKER SHALL HAVE A WIDTH OF APPROXIMATELY 100 MILLIMETERS AND A VISIBLE AREA OF NOT LESS THAN 970 SQUARE MILLIMETERS.

TYPE B MARKERS ARE INTENDED TO PROVIDE HIGH VISIBILITY AT NIGHT BY RETROREFLECTING LIGHT FROM AUTOMOTIVE HEADLIGHTS BACK TO THE DRIVER.

INSTALLATION

TEMPORARY RAISED PAVEMENT MARKERS SHALL BE ATTACHED TO CLEAN, DRY PAVEMENT BY A BUTYL ADHESIVE PAD, A BITUMINOUS ADHESIVE OR OTHER CONSTRUCTION GRADE ADHESIVES (SUCH AS FRANKLIN PANEL AND METAL ADHESIVE) SUITABLE TO ANCHOR THE MARKER UNDER THE ABOVE CONDITIONS. WHEN IT IS NECESSARY TO ATTACH MARKERS TO NEW CONCRETE PAVEMENT WITH CURING COMPOUND REMAINING, THE CURING COMPOUND MEMBRANE SHALL BE REMOVED BY SANDBLASTING OR OTHER MECHANICAL CLEANING METHOD. MARKERS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

THE CONTRACTOR SHALL IMMEDIATELY REPLACE, AT HIS EXPENSE, ANY MARKERS WHICH FAIL (BROKEN HOUSING, HOUSING WORN TO THE EXTENT THAT DAYTIME VISIBILITY IS SIGNIFICANTLY DIMINISHED OR OF AN UNACCEPTABLE COLOR, DETACHED OR BROKEN REFLECTOR, HOUSING DETACHED FROM ADHESIVE).

MARKERS ARE LIKELY TO BE REMOVED BY SNOW PLOWING OPERATIONS, THUS THEY ARE NOT CONSIDERED SUITABLE FOR USE DURING THE PERIOD FROM OCTOBER 15 UNTIL APRIL 30. THE CONTRACTOR IS ADVISED TO SCHEDULE HIS WORK AND/OR THE USE OF THESE DEVICES TO AVOID THIS PERIOD. SHOULD THE CONTRACTOR CHOOSE TO USE TRPM'S DURING THIS PERIOD AND THEY ARE SUBSEQUENTLY REMOVED OR DESTROYED BY SNOW AND ICE CONTROL ACTIVITIES. THE CONTRACTOR SHALL IMMEDIATELY, AT HIS EXPENSE, PROVIDE A SUBSTITUTE TRAFFIC GUIDANCE SYSTEM EFFECTIVE DURING DAY AND NIGHT AND WHICH IS ACCEPTABLE TO THE ENGINEER.

THE MARKERS SHALL BE PLACED ACCURATELY TO DEPICT STRAIGHT OR UNIFORMLY CURVING LINES. WHEN USED TO SUPPLEMENT TEMPORARY PAVEMENT MARKINGS, THEY SHALL BE PLACED ON OR IMMEDIATELY ADJACENT TO THE PAVEMENT MARKING. LOCATIONS SHALL BE ADJUSTED UP TO 300 MILLIMETERS LONGITUDINALLY OR 150 MILLIMETERS LATERALLY TO AVOID PLACEMENT ON JOINTS, OR ON CRACKED OR DETERIORATED PAVEMENT. MARKERS SHALL NOT BE PLACED DIRECTLY ON PAVEMENT MARKINGS IF THIS DETRACTS FROM THEIR ABILITY TO REMAIN ATTACHED TO THE PAVEMENT.

APPLICATION

1) WHEN REQUIRED TO SUPPLEMENT PAVEMENT MARKING, TEMPORARY RAISED PAVEMENT MARKERS SHALL BE PLACED AS FOLLOWS:

LINE	TYPE	SPACING
EDGE LINE	A OR B	6 m C/C
LANE LINE	A OR B	12 m C/C*
CENTER LINE (SINGLE BROKEN)	A OR B	12 m C/C*
CENTER LINE (DOUBLE/SOLID)	A OR B	2 UNITS SIDE BY SIDE 100 mm APART 6 m C/C
CHANNELIZING LINE (INCLUDES EXIT GORE NOSE)	A OR B	3 m C/C

* CENTERED IN GAP

2) WHEN USED TO SUBSTITUTE FOR (REPLACE) PAVEMENT MARKING, TEMPORARY RAISED PAVEMENT MARKERS SHALL BE PLACED AS FOLLOWS:

LINE	TYPE	SPACING
EDGE LINE	A	1.5 m C/C
LANE LINE	A	4 @ 0.75 m C/C 9 m GAP (12 m CYCLE)
CHANNELIZING LINE (INCLUDES EXIT GORE NOSE)	A	1.5 m C/C
EDGE LINE (TWO COLOR) (WHITE/YELLOW)	A	BACK TO BACK 1.5 m C/C

YELLOW MARKERS USED TO SEPARATE OPPOSITE FLOWS OF TRAFFIC (CENTER LINES) SHALL INCLUDE RETROREFLECTORS FOR BOTH DIRECTIONS. ALL OTHER YELLOW AND WHITE MARKERS SHALL PROVIDE RETROREFLECTIVITY FOR ONE DIRECTION ONLY.

REMOVAL

REMOVAL SHALL BE ACCOMPLISHED IN A MANNER SUCH THAT LITTLE OR NONE OF THE ADHESIVE REMAINS ON THE PAVEMENT. PERMANENT PAVEMENT SURFACES SHALL NOT BE SCARRED, BROKEN OR ROUGHENED SIGNIFICANTLY.

PAYMENT

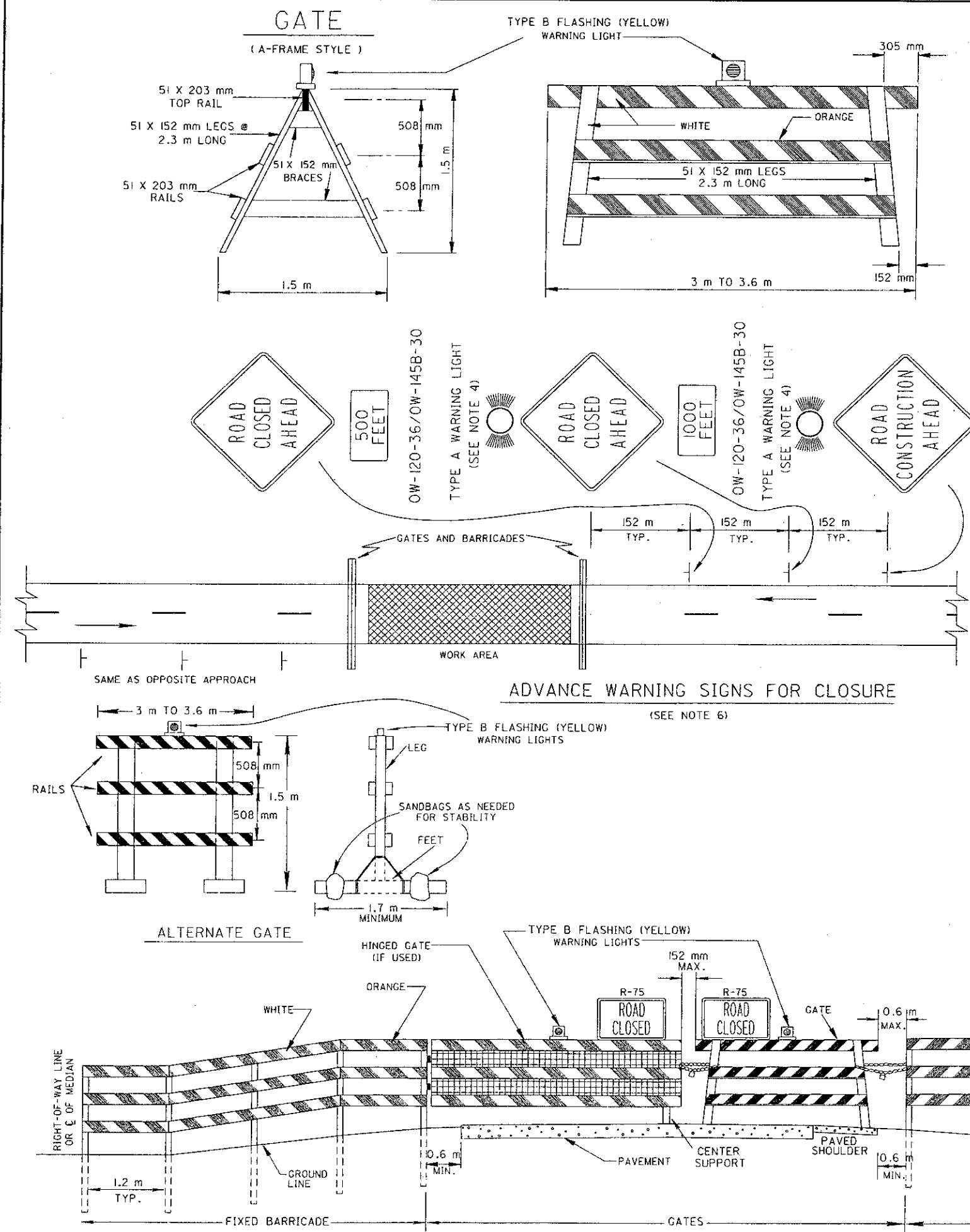
BASIS OF PAYMENT SHALL BE AT THE CONTRACT UNIT PRICE PER EACH MARKER AND SHALL INCLUDE ALL LABOR, EQUIPMENT, HARDWARE AND INCIDENTALS REQUIRED TO PERFORM THE WORK. IT SHALL ALSO INCLUDE REPLACEMENT AT NO ADDITIONAL COST OF ALL TEMPORARY RAISED PAVEMENT MARKERS WHICH, IN THE JUDGEMENT OF THE ENGINEER, FAIL FOR ANY REASON, EXCEPT DUE TO FAILURE OF THE PAVEMENT TO WHICH THEY ARE ATTACHED.

ITEM	UNIT	DESCRIPTION
614	EACH	TEMPORARY RAISED PAVEMENT MARKER



metric units

OFFICE OF TRAFFIC ENGINEERING DIVISION OF ENGINEERING POLICY OHIO DEPARTMENT OF TRANSPORTATION	
MAINTENANCE OF TRAFFIC	DATE 03/01/96
TEMPORARY RAISED PAVEMENT MARKERS	
STANDARD CONSTRUCTION DRAWING MT-101.20M	
APPROVED: <i>[Signature]</i> ADMINISTRATOR	



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.

7. 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.

8. 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 GUSSET 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

9. 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

TEMPORARY SIGN SUPPORT REQUIREMENTS

A. PLACEMENT OF SIGNS WHICH WILL REMAIN MORE THAN ONE DAY:

- 1) LATERAL PLACEMENT TO NEAREST EDGE OF SIGNS SHALL BE AS FOLLOWS:
 - a) ON THE RIGHT SIDE OF THE ROAD FOR APPROACHING TRAFFIC (EXCEPT FOR DUAL MOUNTED SIGNS AND SIGNS DESIGNATED IN THE PLANS FOR LEFT SIDE MOUNTING).
 - b) CURBED ROADWAY - MINIMUM 0.6 m BEHIND FACE OF CURB.
 - c) UNCURBED ROADWAY- 3.7 m FROM EDGE OF TRAFFIC LANE OR 1.8 m FROM EDGE OF PAVED OR USEABLE SHOULDER, WHICHEVER IS GREATER.
 - d) BEHIND GUARDRAIL OR BARRIER - PREFERABLY 0.6 m BEHIND FACE OF GUARDRAIL (MINIMUM 0.3 m) FOR SIGNS ON CLASS A SUPPORTS; 1.2 m FOR CLASS B OR C SUPPORTS; 0.3 m BEHIND FACE OF CONCRETE BARRIER UNLESS BARRIER TOP MOUNTING IS REQUIRED BY THE PLAN.
- 2) VERTICAL CLEARANCE OF SIGNS, MEASURED ABOVE ROADWAY ELEVATION; SHALL BE AS FOLLOWS:
 - a) RURAL - 1.5 m WHEN PARKED CARS, CONSTRUCTION EQUIPMENT, ETC WILL NOT OBSCURE SIGN VISIBILITY.
 - b) RURAL AREAS WITH PARKED CARS OR CONSTRUCTION EQUIPMENT - 2.1m
 - c) URBAN - 2.1m
 - d) CARE SHALL BE TAKEN TO ASSURE THAT SIGNS WILL NOT BE OBSCURED BY CONSTRUCTION EQUIPMENT, TREES, WEEDS OR OTHER OBSTACLES. BRUSH, WEEDS OR GRASS WITHIN THE RIGHT OF WAY SHALL BE TRIMMED AS NECESSARY. SIGNS SHALL NORMALLY BE VISIBLE TO TRAFFIC 122 m TO 183 m IN ADVANCE OF THE SIGN.
- 3) SUPPORTS FOR SIGNS WHICH WILL REMAIN IN PLACE MORE THAN ONE DAY SHALL BE FIXED RATHER THAN PORTABLE EXCEPT IN SITUATIONS WHERE THE SIGN MUST REST ON PERMANENT PAVEMENT OR OTHER SURFACE WHICH WOULD BE DAMAGED BY INSERTION OF POST TYPE SUPPORTS.

B. PLACEMENT OF SIGNS WHICH WILL REMAIN FOR ONE DAY OR LESS:

- 1) SAME AS A-1 ABOVE EXCEPT THAT SIGNS MAY BE PLACED ON THE ROADWAY ONLY IF THEY DO NOT INTRUDE INTO A TRAFFIC LANE IN USE.
- 2) MINIMUM OF 0.3 m ABOVE ROADWAY

C. CLASSES OF SUPPORTS:

ALL TEMPORARY SIGN SUPPORTS SHALL BE OF THE FOLLOWING TYPES:

1) CLASS A:

SUPPORTS SHALL BE USED FOR EXPOSED LOCATIONS ON HIGHWAYS WHERE TRAFFIC APPROACH SPEEDS OF 40 MPH AND HIGHER ARE ENCOUNTERED. THEY ARE ALSO SUITABLE FOR USE IN ALL OTHER LOCATIONS.

2) CLASS B:

SUPPORTS SHALL BE USED FOR EXPOSED LOCATIONS ON HIGHWAYS WHERE TRAFFIC APPROACH SPEEDS OF LESS THAN 40 MPH ARE ENCOUNTERED. THEY ARE ALSO SUITABLE FOR USE IN ALL APPLICATIONS DEFINED FOR CLASS C SUPPORTS.

3) CLASS C:

SUPPORTS MAY ONLY BE USED WHERE FULLY PROTECTED BY GUARDRAIL, CONCRETE BARRIER AND IN LOCATIONS POSITIVELY PROTECTED FROM TRAFFIC SUCH AS ON RETAINING WALLS OR WHERE TRAFFIC APPROACH SPEEDS ARE LESS THAN 25 MPH.

D. TRAFFIC APPROACH SPEEDS:

TRAFFIC APPROACH SPEEDS SHALL BE THE LOCALLY POSTED SPEED (NOT ADVISORY SPEED SIGNS) OR THE MEASURED ACTUAL (85TH PERCENTILE) SPEED (IF AVAILABLE) OF APPROACHING TRAFFIC, WHICHEVER IS HIGHER, ADJACENT TO THE SIGN LOCATION.

TABLE

APPROACH SPEED (MPH)	COMPLETELY PROTECTED BY GUARDRAIL OR BARRIER	PARTLY PROTECTED BY GUARDRAIL OR BARRIER *	GREATER THAN 9 m FROM EDGE OF PAVEMENT	WITHIN 9 m FROM EDGE OF PAVEMENT
40 AND HIGHER	A, B OR C	A OR B	A OR B **	A ONLY
26 TO 39	A, B OR C	A OR B	A OR B	A OR B
0 TO 25	A, B OR C	A, B OR C	A, B OR C	A, B OR C

* IF SUPPORTS ARE BEHIND GUARDRAIL BUT NOT FULLY 1.7 m BEHIND FACE OF RAIL OR IF SIGN IS NOT 0.3 m BEHIND FACE OF CONCRETE BARRIER.

** 9 m CRITERION IS BASED UPON STRAIGHT ROADWAY AND A SLOPE OF 6 TO 1 OR FLATTER. SUPPORTS ON THE OUTSIDE OF CURVES OR LOCATED DOWN A SLOPE (STEEPER THAN 6 : 1) WILL REQUIRE USE OF CLASS A SUPPORTS.

E. BALLASTING

BALLASTING OF PORTABLE SUPPORTS SHALL BE WITH SANDBAGS PLACED WITHIN 0.3 m OF THE GROUND. IN NO CASE SHALL HARD OBJECTS BE USED FOR BALLAST.

F. STRENGTH OF SIGN SUPPORTS

THE CONTRACTOR SHALL CHOOSE SIGN SUPPORTS OF ADEQUATE STRENGTH AND WITH ADEQUATE FOUNDATIONS AND ANCHORAGE TO SUPPORT THE SIGN SIZES ERRECTED. PROPRIETARY DEVICES SHALL NOT BE LOADED BEYOND THE LIMITS RECOMMENDED BY THE MANUFACTURER. SLIP BASE TYPE BREAKAWAY BEAM CONNECTIONS SHALL BE AT LEAST PARTIALLY EMBEDDED IN CONCRETE CONSISTING OF A 0.3 m DEEP BY 0.3 m DIAMETER COLLAR. SIGN SUPPORTS WHICH FAIL UNDER TYPICAL WIND LOAD CONDITIONS SHALL BE IMMEDIATELY MODIFIED OR REPLACED WITH A SUPPORT OF ADEQUATE STRENGTH.

G. PROHIBITED SUPPORTS

THE FOLLOWING SUPPORT TYPES SHALL NOT BE PERMITTED ON PROJECTS:

- 1) SUPPORTS FABRICATED FROM AUTOMOTIVE AXLE DIFFERENTIAL ASSEMBLIES AND SIMILARLY HEAVY ASSEMBLIES WHICH CANNOT BE CONSIDERED BREAKAWAY TYPE.
- 2) SUPPORTS CONSISTING OF VERTICAL POSTS WITH ANGLED BRACES MADE FROM DRIVEPOST OR OTHER RIGID ELEMENTS.

CLASS A SUPPORTS

FIXED SUPPORTS

- 1) ALL #2 AND #3 POST WHEN INSTALLED SINGLY OR IN PAIRS (SIDE BY SIDE) ACCORDING TO THE DETAILS OF TC-41.20M. THE NUMBER OF SUPPORTS SHALL BE AS SHOWN ON TC-52.10M AND TC-52.20M.
- 2) THE FOLLOWING POST TYPES, WHEN INSTALLED SINGLY, BY IMBEDMENT OR DRIVING INTO EARTH TO A DEPTH OF ABOUT 1.1m.
 - a) - UP TO 102 X 102 mm WOOD.
 - b) - UP TO 51mm DIAMETER SCHEDULE 40 STEEL PIPE.
 - c) - UP TO 76 mm DIAMETER SCHEDULE 40 ALUMINUM PIPE.
 - d) - UP TO 56.4 mm SQUARE, 12 GAUGE WALL, PUNCHED STEEL POST.
 - e) - UP TO 152 X 203 mm WOOD WITH BREAKAWAY HOLES SHOWN BELOW.
- 3) THE FOLLOWING POST TYPES WHEN INSTALLED IN PAIRS (SIDE BY SIDE) WITH LESS THAN 2 m BETWEEN POSTS, BY IMBEDMENT OR DRIVING INTO EARTH TO A DEPTH OF ABOUT 1.1m :
 - a) - UP TO 102 X 102 mm WOOD.
 - b) - UP TO 51mm DIAMETER SCHEDULE 40 STEEL PIPE.
 - c) - UP TO 76 mm DIAMETER SCHEDULE 40 ALUMINUM PIPE.
 - d) - UP TO 51mm SQUARE, 14 GAUGE WALL, PUNCHED STEEL POST.
- 4) FIXED TYPE III BARRICADES:
- 5) ALL BREAKAWAY CONNECTION BEAM SUPPORTS, WHEN INSTALLED ACCORDING TO THE PROPER DETAILS SHOWN ON TC-41.10M WITH A MINIMUM CLEAR DISTANCE BETWEEN SUPPORTS OF 2.1m FOR SUPPORTS LARGER THAN W6 X 9.
- 6) ANY BREAKAWAY POST OR POST AND CONNECTION WHICH HAS BEEN CRASH TESTED AND APPROVED BY THE FHWA AS SATISFYING THE BREAKAWAY CRITERIA DESCRIBED IN 630.06.

(CONTINUED ON MT-105.11M)

M E T R I C

BUREAU OF DESIGN SERVICES
DIVISION OF HIGHWAYS
OHIO DEPARTMENT OF TRANSPORTATION

MAINTENANCE OF TRAFFIC

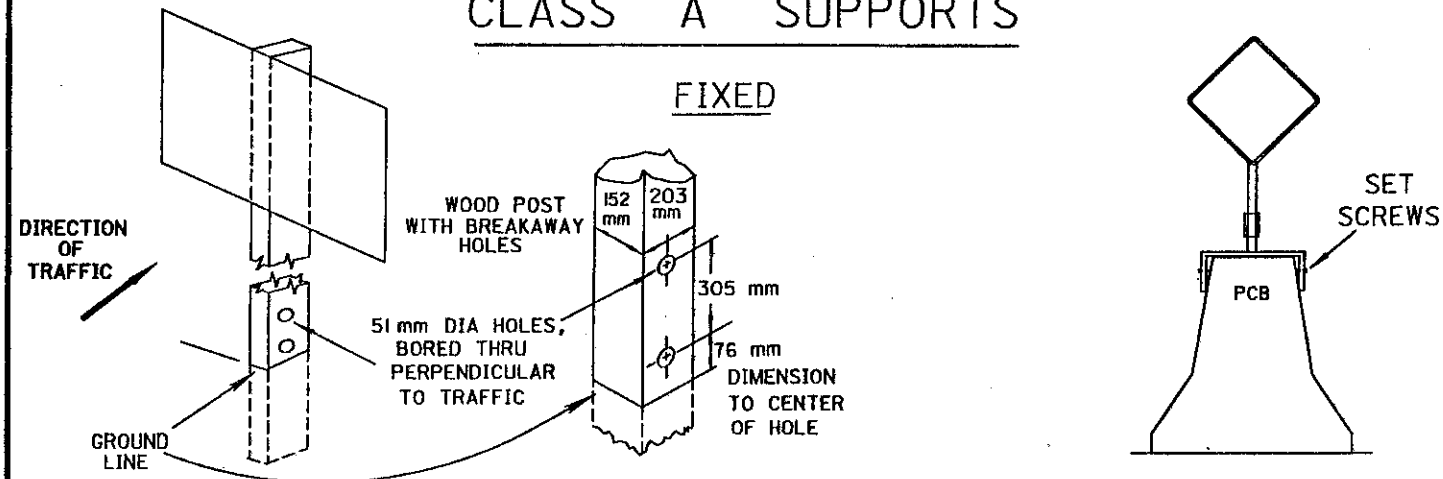
DATE
04/25/94

TEMPORARY SIGN SUPPORT

STANDARD
CONSTRUCTION
DRAWING
APPROVED *[Signature]* ENGR. OF DESIGN SERVICES

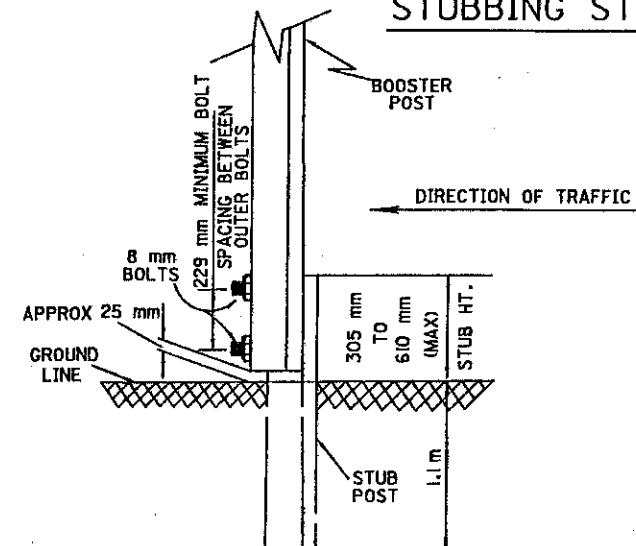
MT-105.10M

CLASS A SUPPORTS



CLASS A SUPPORTS

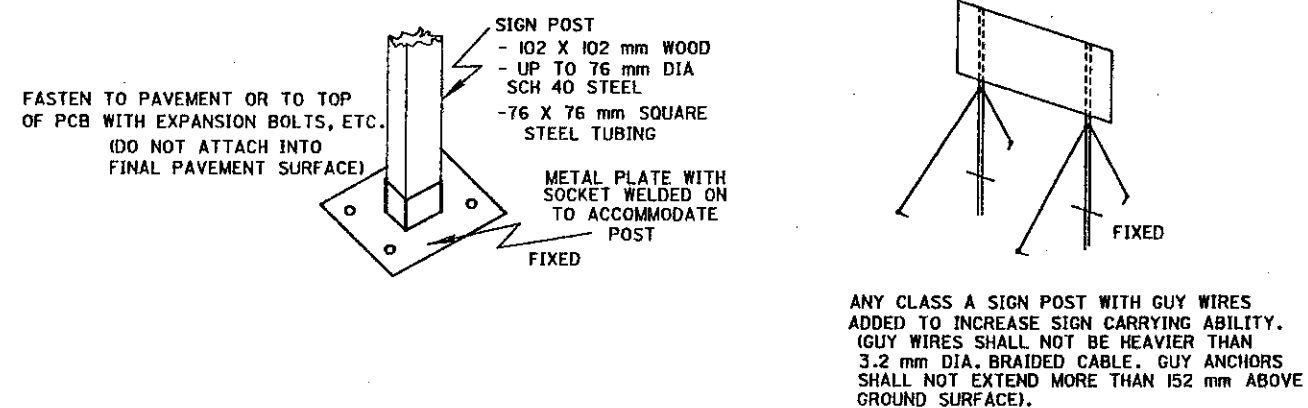
STUBBING STANDARD



NOTES

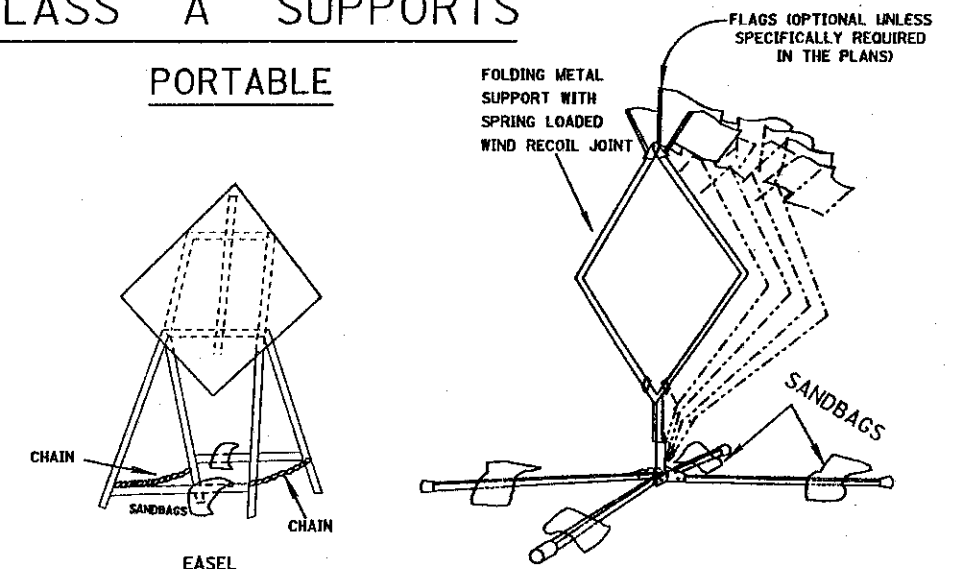
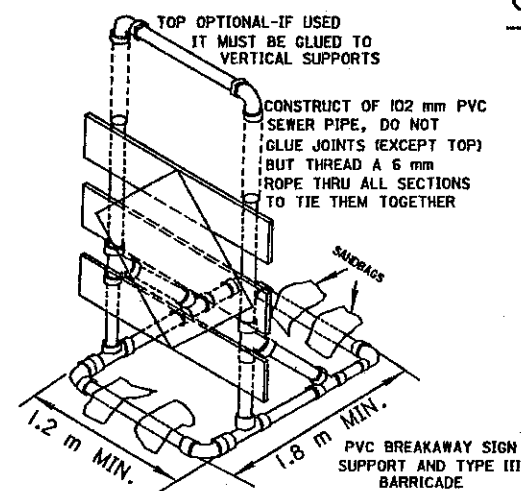
1. FOR USE WITH #3 POST OR SMALLER ONLY
2. BOLTS SHALL BE STEEL OR ALUMINUM
3. A MINIMUM OF TWO FASTENERS SHALL BE USED PER ASSEMBLY
4. BOOSTER POST SHALL BE MOUNTED BEHIND STUB POST
5. BOOSTER POST SHALL BE THE SAME OR 1.5 kg/m LESS THAN STUB POST

CLASS B SUPPORTS



CLASS A SUPPORTS

PORTABLE

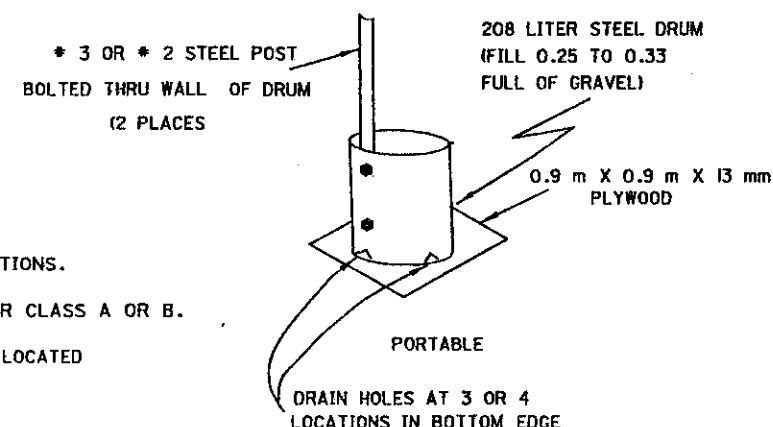


NOTES

RAIL MATERIALS:

- 25 X 203 mm OR 51 X 203 mm COMMON LUMBER
- 203 mm X (16 mm 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 147 kg/m², BUT HAVING A WEIGHT OF NOT MORE THAN 7.5 kg/m.

CLASS C SUPPORTS



1. ALL BEAM TYPE SUPPORTS WITHOUT BREAKAWAY CONNECTIONS.
2. SUPPORTS SIMILAR TO BUT LARGER THAN PERMITTED FOR CLASS A OR B.
3. THE STEEL DRUM(S) SHOWN BELOW MAY BE USED ONLY WHEN LOCATED BEHIND GUARDRAIL OR BARRIER.

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 THE 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

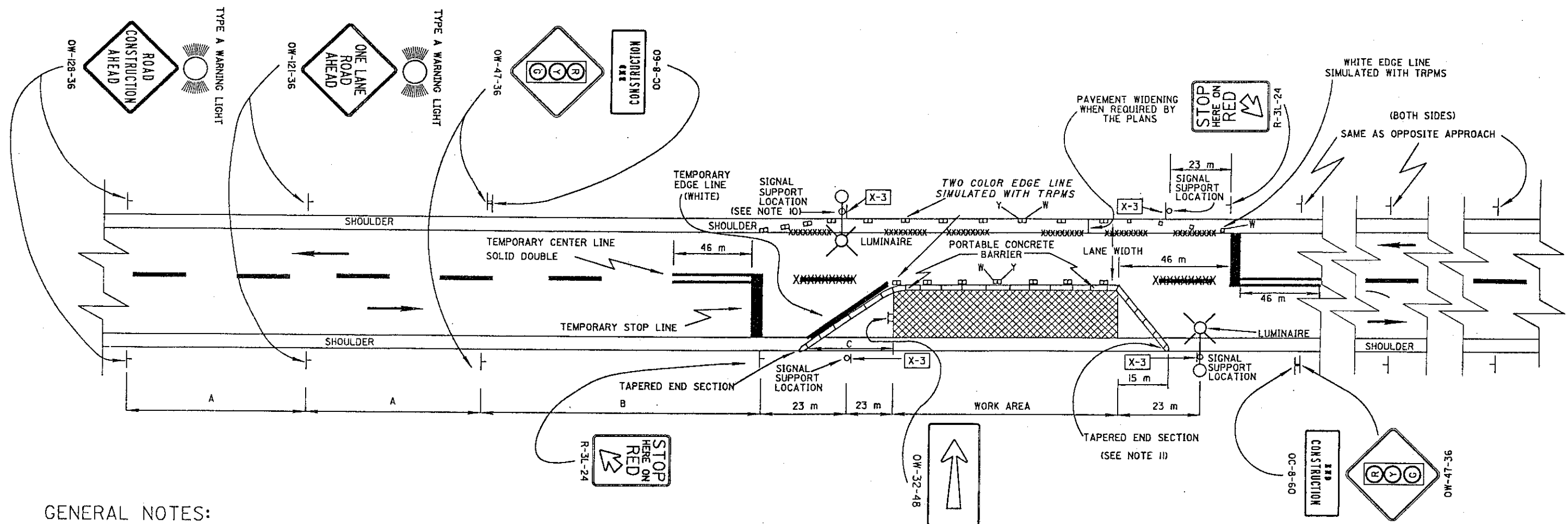
MAINTENANCE OF TRAFFIC

DATE
04/25/94

TEMPORARY SIGN SUPPORT

STANDARD
CONSTRUCTION
DRAWING
APPROVED *David J. Cramer* ENGR. OF DESIGN SERVICES

MT-105.IIM

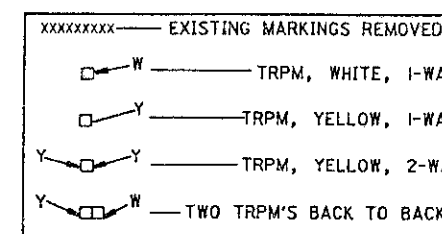


GENERAL NOTES:

- INITIAL SIGNAL TIMING AND PHASING SHALL BE AS SHOWN IN THE PLANS. CHANGES SHALL BE APPROVED BY THE ENGINEER.
- SIGNALS SHALL BE INSTALLED AND OPERATED IN ACCORDANCE WITH THE REQUIREMENTS OF PART 6 OF THE OHIO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.
- TEMPORARY CENTER LINE, SOLID, DOUBLE, SHALL BE INSTALLED AND MAINTAINED WHEN EXISTING CENTER LINE, SOLID DOUBLE IS NOT IN PLACE. 305 mm STOP LINES SHALL BE INSTALLED. TEMPORARY RAISED PAVEMENT MARKERS (TRPMS) TO SIMULATE A TWO COLOR EDGE LINE SHALL BE PROVIDED. EXISTING CONFLICTING PAVEMENT MARKINGS AND RAISED PAVEMENT MARKER REFLECTORS SHALL BE REMOVED. TEMPORARY EDGE LINES WHICH WOULD CONFLICT WITH FINAL TRAFFIC LANES SHALL BE REMOVABLE (740.05 TYPE C) TAPE UNLESS THE AREA WILL BE RESURFACED IN THE NEXT WORK PHASE. AFTER COMPLETION OF THE WORK, PAVEMENT MARKINGS OTHER THAN 740.05 TYPE C SHALL BE REMOVED IN ACCORDANCE WITH 641.10. THE ORIGINAL MARKINGS AND PAVEMENT MARKER REFLECTORS SHALL BE RESTORED AT NO ADDITIONAL COST.
- PCB SHALL BE DELINEATED AS FOLLOWS:

PCB TYPE	DELINEATION
813 mm HIGH WITHOUT GLARE SCREEN	BARRIER REFLECTORS AT 7.6 m C-C (MAX.) ALTERNATED WITH TOP MOUNTED OBJECT MARKERS (229 X 381 mm) AT 7.6 m C-C (MAX.)
813 mm HIGH WITH GLARE SCREEN	BARRIER REFLECTORS AT 7.6 m C-C VERTICAL ORANGE REFLECTORIZED STRIPES ON PADDLES (305 X 305 mm) AT 3.8 m C-C (MAX.)
1270 mm HIGH	BARRIER REFLECTORS AT 3.8 m C-C (MAX.)
TAPERED END SECTION AND EXPOSED END	OBJECT MARKERS (229 X 381 mm) TOP MOUNTED AT EACH END
- THE HORIZONTAL OR VERTICAL ALIGNMENT OF THE ROADWAY MAY REQUIRE ADJUSTMENTS IN THE LOCATION OF THE ADVANCE WARNING SIGNS OR THE SIGNAL HEADS. TREE OR BRUSH TRIMMING TO PROVIDE ADEQUATE SIGHT DISTANCE TO SIGN AND SIGNALS SHALL BE PROVIDED AS DIRECTED BY THE ENGINEER. THE DISTANCES SHOWN FOR ADVANCE WARNING SIGN SPACINGS ARE MINIMUM.
- THE SPACING BETWEEN PROPOSED SIGNS SHOULD BE ADJUSTED TO NOT CONFLICT WITH AND TO PROVIDE A MINIMUM OF 61 m CLEARANCE TO EXISTING SIGNS.
- ALL TRAFFIC SIGNAL AND LIGHTING EQUIPMENT USED IN THIS INSTALLATION, SUCH AS SIGNAL OR LIGHTING CABLE, SIGNAL HEADS, LUMINAIRES OR SIGNAL CONTROLLER SHALL BE IN CONFORMANCE WITH SPECIFICATION ITEMS 625, 632, 633, 713, 732 AND 733. HOWEVER, THE PERFORMANCE TESTS OF 625.22E AND 632.27(6), THE WORKING DRAWING REQUIREMENTS OF 625.04, 632.03 AND 633.03, THE WIRING DIAGRAM AND SERVICE MANUAL REQUIREMENT OF 633.04 AND THE TESTING AND PREQUALIFICATION REQUIREMENT OF 633.05 ARE WAIVED. ALSO THE REQUIREMENTS OF 733.01 CONCERNING EXPANSIBLE 3-DIAL UNITS AND TWELVE SIGNAL CIRCUITS ARE WAIVED. USED EQUIPMENT IS ACCEPTABLE. CONFLICT MONITORS SHALL BE USED EXCEPT WITH ELECTROMECHANICAL PRETIMED CONTROLLERS WITH CAMSHAFT.
- IF THE SIGNAL IS CHANGED TO FLASHING OPERATION, RED SHALL BE FLASHED TO ALL APPROACHES ON ALL SIGNAL HEADS.
- EXISTING BARRIER BETWEEN TEMPORARY STOP LINES SHALL BE DELINEATED WITH ITEM 614-BARRIER REFLECTORS.
- FOR SIDE MOUNTED SIGNALS, SEE MT-96.20M. FOR OVERHEAD MOUNTED SIGNALS, SEE MT-96.21M.
- DURING WORKING HOURS ONLY A LENGTH OF BARRIER SUFFICIENT TO PROVIDE A 3.0 m ACCESS ON THE SHOULDER AND PART OF ROADWAY, MAY BE REMOVED FOR ACCESS. A SIMILAR BARRIER REMOVAL AT THE OPPOSITE END OF THE WORK AREA MAY ALSO BE PERMITTED ONLY WHEN NECESSARY.

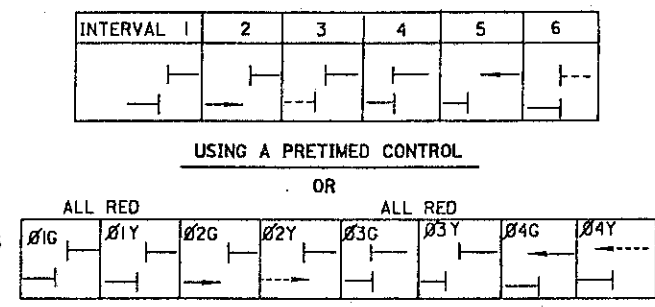
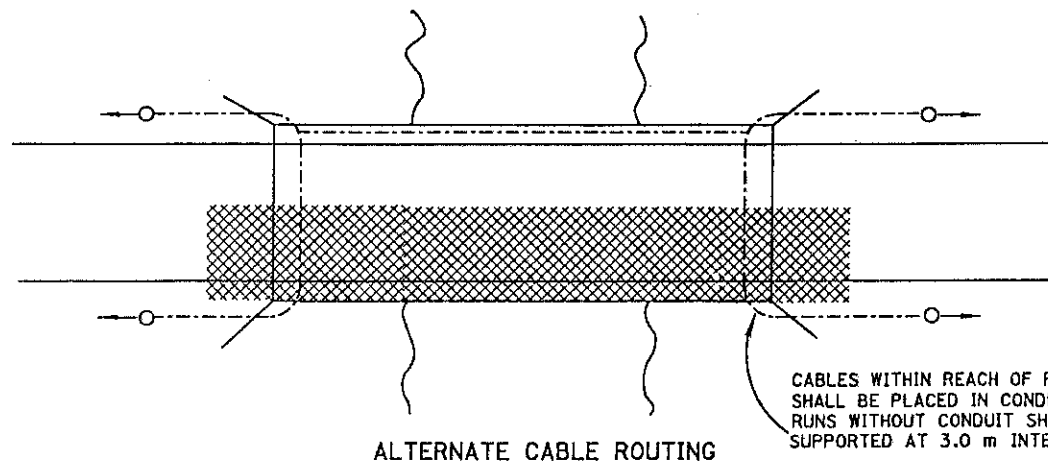
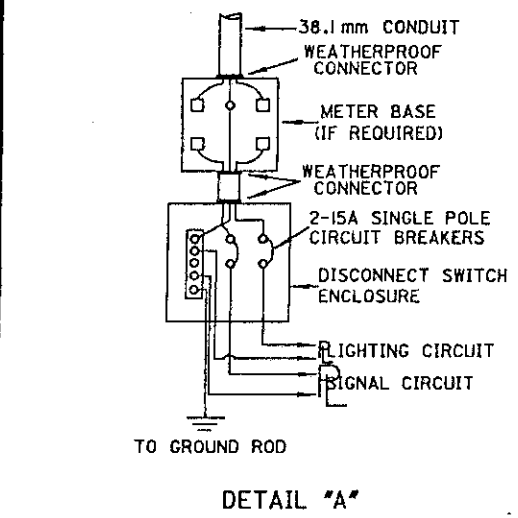
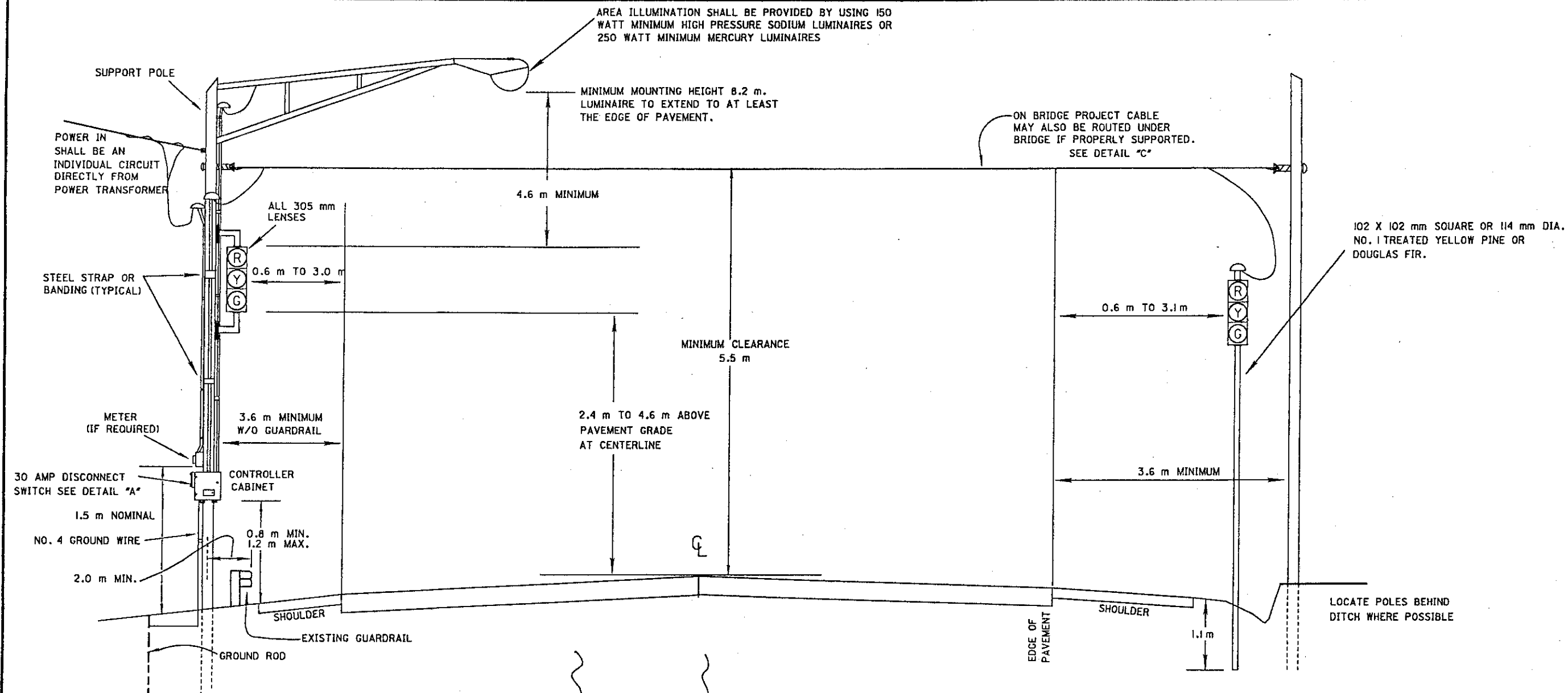
DISTANCE (METERS)	A	B
URBAN	61	107
RURAL	152	229



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 01/30/95
SIGNALIZED CLOSING 1 LANE OF A 2 LANE HIGHWAY WITH PCB	
STANDARD CONSTRUCTION DRAWING	MT-96.11M
APPROVED <i>[Signature]</i> ENGR. OF DESIGN SERVICES	



WHEN CALLED FOR IN THE PLANS, Ø2 GREEN AND Ø4 GREEN SHALL BE ACTUATED BY DETECTORS AT APPROACH TO THE WORK ZONE. Ø1 & Ø3 ARE DUMMY PHASES TO TIME ALL RED INTERVAL. TIMING INITIALIZES ON PHASE ONE.

USING A 4 PHASE ACTUATED CONTROL

DETAIL "B"
SIGNAL PHASING

METRIC

BUREAU OF DESIGN SERVICES
DIVISION OF HIGHWAYS
OHIO DEPARTMENT OF TRANSPORTATION

MAINTENANCE OF TRAFFIC

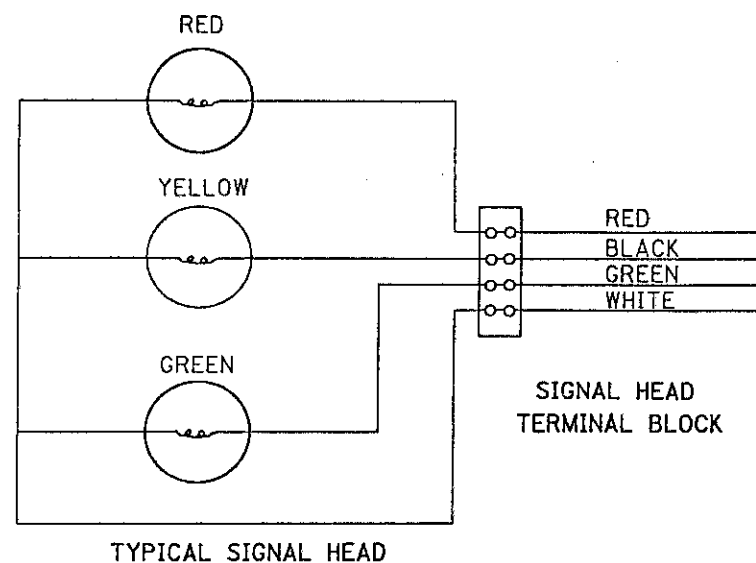
DETAILS FOR SIGNALIZED CLOSING
1 LANE OF A 2 LANE HIGHWAY
-SIDE MOUNTED

STANDARD
CONSTRUCTION
DRAWING

MT-96.20M

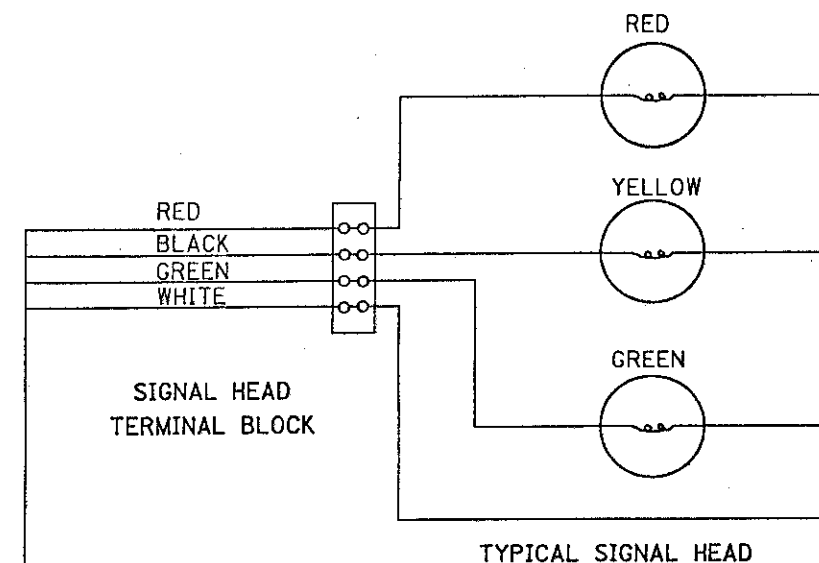
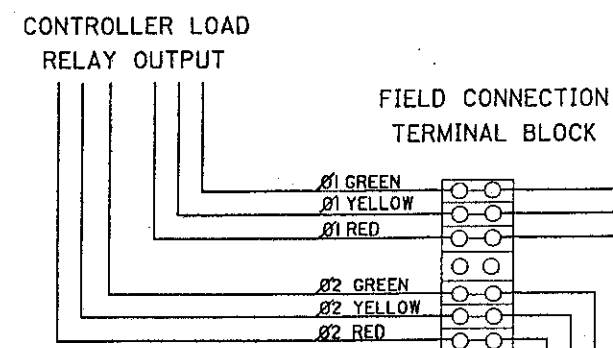
APPROVED *[Signature]* ENGR. OF DESIGN SERVICES

DATE
01/30/95

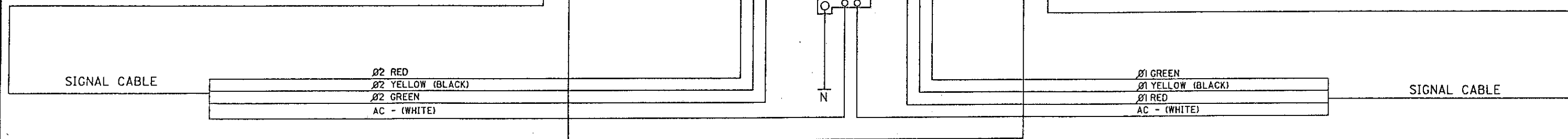


CABLE SHALL BE RUN INTO SIGNAL HEAD AND CONNECTIONS ARE TO BE MADE AT TERMINAL BLOCKS.

CONTROLLER HOUSING



TYPICAL SIGNAL HEAD



TYPICAL SIGNAL HEAD HOOK-UP

GENERAL NOTES:

1. LIGHTNING PROTECTION, AS REQUIRED IN 733.04 SHALL BE PROVIDED FOR SOLID STATE ELECTRONIC CONTROLLERS AND DETECTORS.
2. SIGNAL CABLE SHALL BE 5/C NO. 14 AWG AS SPECIFIED IN 732.19. ALL ELECTRICAL CONNECTIONS TO BE MADE AT TERMINAL BLOCKS USING LOCK FORK TERMINALS. SPLICES IN SIGNAL CABLE SHOULD BE AVOIDED BUT IF NECESSARY SPLICE KITS SHALL BE USED. ALL CONNECTIONS AT SPLICE POINTS SHALL BE SOLDERED.
3. SIGNAL TIMING SETTINGS SHALL BE AS SHOWN IN THE PLANS OR PROVIDED TO THE CONTRACTOR BY THE ENGINEER PRIOR TO IMPLEMENTATION OF SIGNAL CONTROL. THE CONTRACTOR SHALL PERIODICALLY MONITOR THE SIGNAL OPERATION TO DETERMINE FAILURE OR INEFFICIENT OPERATION.

ALL EQUIPMENT FAILURES INCLUDING TIMING MECHANISMS AND DETECTORS SHALL BE REPORTED TO THE ENGINEER AND FULLY REPAIRED BY THE CONTRACTOR AS SOON AS POSSIBLE, BUT IN NO CASE LONGER THAN 8 HOURS FOLLOWING NOTIFICATION OF THE

CONTRACTOR BY THE ENGINEER. ALL FAILURES RESULTING IN UNSAFE OPERATIONS OF THE SIGNAL (i.e., SIGNAL OR LAMP FAILURE, SHORT-TIMING OF YELLOW OR ALL RED INTERVALS, MIS-AIMED SIGNALS, CONFLICTING DISPLAYS) SHALL RESULT IN THE CONTRACTOR 2-WAY RADIOS, TO CONTROL TRAFFIC THROUGH THE WORK AREA UNTILL THE SIGNAL IS FULLY REPAIRED. FAILURES SHALL INCLUDE SITUATIONS CAUSED BY TRAFFIC ACCIDENTS, ACTS OF GOD OR ANY OTHER CAUSE WHETHER UNDER THE CONTROL OF THE CONTRACTOR OR NOT.

IF THE ENGINEER DETERMINES THAT THE SIGNAL OPERATION, ALTHOUGH IN ACCORDANCE WITH THE PLANS AND PREVIOUS ORDERS, IS NOT PROVIDING ACCEPTABLE SAFE AND EFFICIENT MOVEMENT OF TRAFFIC, THE ENGINEER SHALL ORDER THAT APPROPRIATE CHANGES SUCH AS TIMING ALTERATIONS, SIGNAL OR DETECTOR RELOCATIONS, ETC. BE MADE TO REMEDY THE SITUATION, AT NO ADDITIONAL COST TO THE STATE. TIMING CHANGES AND SIGNAL RELOCATIONS SHALL BE IMPLEMENTED WITHIN FOUR HOURS, DETECTOR RELOCATIONS AND CHANGES WITHIN 24 HOURS. FAILURE TO MAKE REQUIRED CHANGES WITHIN THESE TIME LIMITS SHALL RESULT IN THE ASSESSMENT OF LIQUIDATED DAMAGES OF \$100.00 PER CALENDAR DAY UNTILL THE CHANGES ARE COMPLETED.

METRIC

BUREAU OF DESIGN SERVICES
DIVISION OF HIGHWAYS
OHIO DEPARTMENT OF TRANSPORTATION

MAINTENANCE OF TRAFFIC

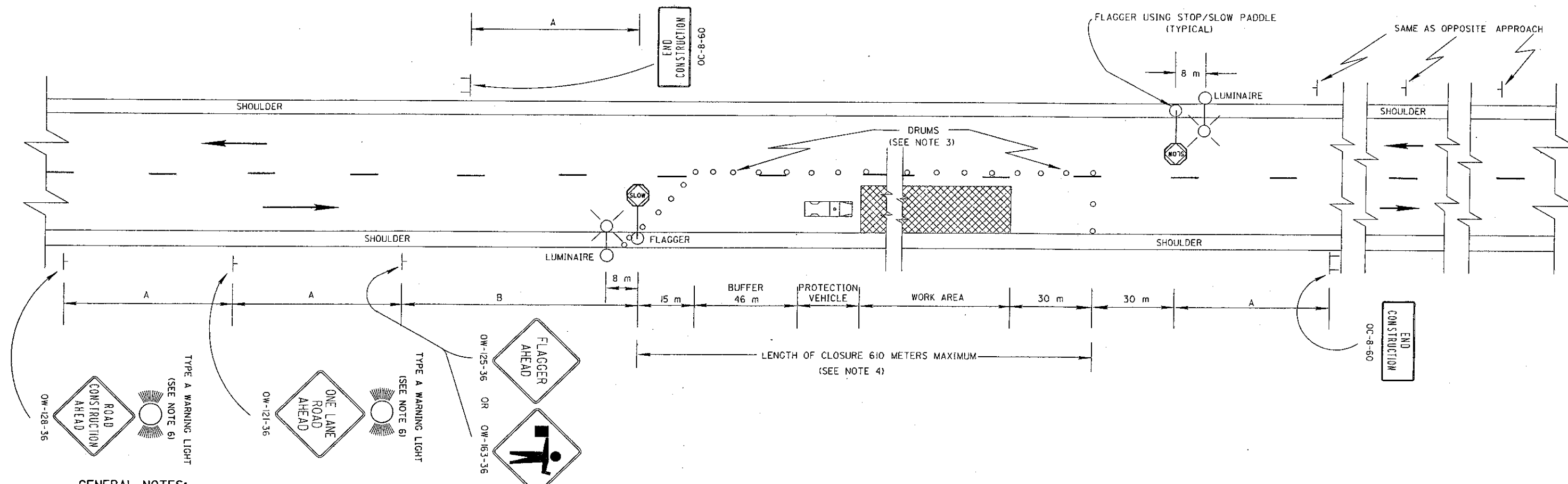
DATE
01/30/95

PRE-TIMED-WIRING DIAGRAM
FOR SIGNALIZED CLOSING 1 LANE
OF A 2 LANE HIGHWAY

STANDARD
CONSTRUCTION
DRAWING

MT-96.25M

APPROVED *[Signature]* ENGR. OF DESIGN SERVICES



GENERAL NOTES:

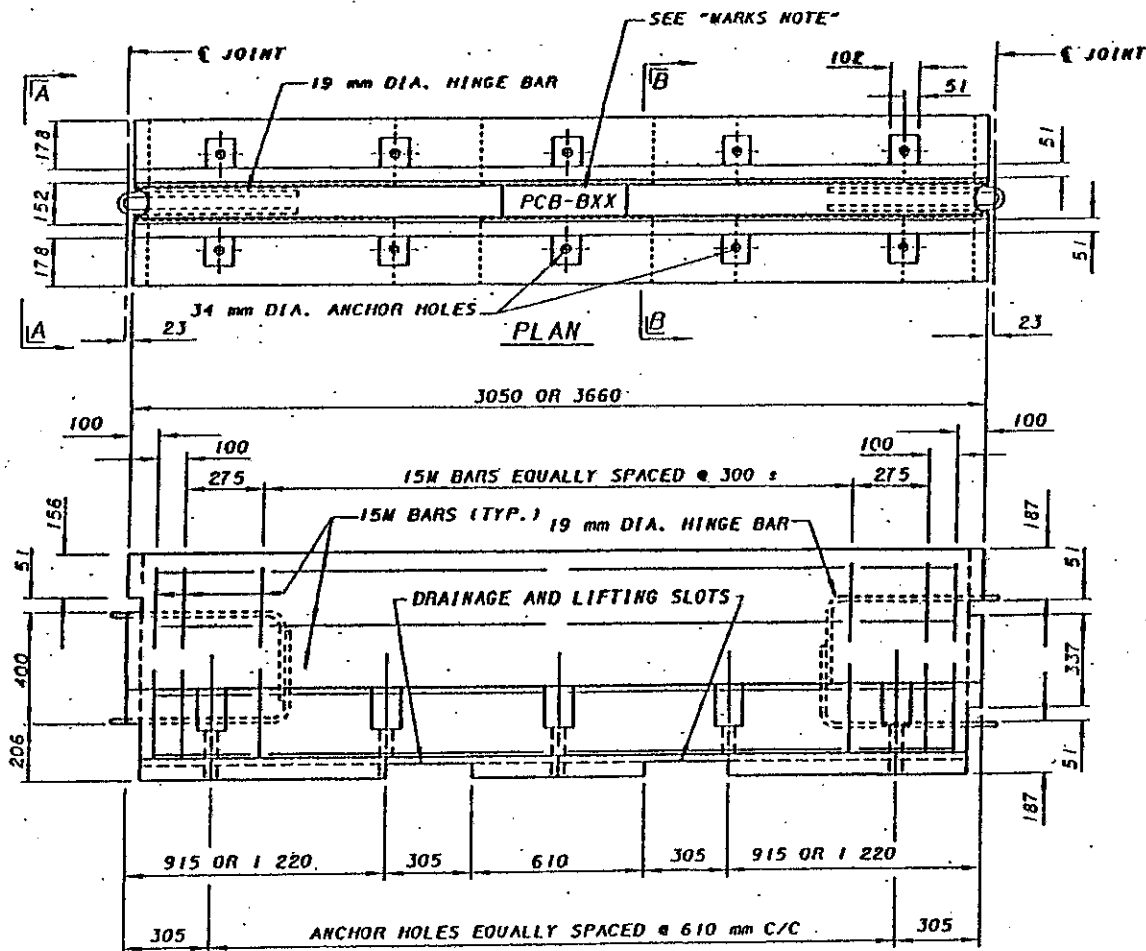
1. THE LOCATION OF THE ADVANCE WARNING SIGNS SHOULD BE ADJUSTED TO PROVIDE FOR ADEQUATE SIGHT DISTANCE FOR THE EXISTING VERTICAL AND HORIZONTAL ROADWAY ALIGNMENT. THE DISTANCES SHOWN ARE MINIMUMS. DISTANCE B MAY ALSO BE INCREASED, PRIOR TO IMPLEMENTATION OF THE CLOSURE OR AFTER IT IS IN EFFECT, AS DIRECTED BY THE ENGINEER FOR SUCH OCCURENCES AS LONG TRAFFIC BACKUPS.
2. FLAGGERS, ONE FOR EACH DIRECTION SHALL BE USED TO CONTROL TRAFFIC CONTINUOUSLY FOR AS LONG AS A ONE LANE OPERATION IS IN EFFECT. THE FLAGGERS SHALL BE ABLE TO COMMUNICATE WITH EACH OTHER AT ALL TIMES.
3. DRUMS SHALL BE SPACED AT 15 m CENTER TO CENTER ALONG THE CLOSURE. DRUMS ON THE ADVANCE TAPER SHALL BE SPACED AT 3 m CENTER TO CENTER. CONES HAVING A MINIMUM HEIGHT OF 0.7 m MAY BE SUBSTITUTED FOR DRUMS FOR DAYTIME LANE CLOSURES. PROVISIONS SHALL BE MADE TO STABILIZE THE CONES TO PREVENT THEM FROM BLOWING OVER.
4. SEVERAL SMALL WORK AREAS CLOSE TOGETHER SHALL BE COMBINED INTO ONE WORK ZONE. HOWEVER, THE CLOSURE SHALL NOT BE MORE THAN 610 m LONG UNLESS APPROVED BY THE ENGINEER. THE MINIMUM LENGTH BETWEEN CLOSURES SHALL BE 610 m. ONLY ONE SIDE OF THE ROAD SHALL BE CLOSED IN ANY ONE WORK ZONE.
5. THE PROTECTION VEHICLE SHOWN AT THE BEGINNING OF THE WORK AREA SHALL BE IN PLACE AND UNOCCUPIED WHENEVER WORKERS ARE IN THE WORK AREA. THIS PROTECTION VEHICLE SHALL BE REMOVED FROM THE PAVEMENT WHEN WORKERS ARE NOT IN THE WORK AREA. OTHER PROTECTIVE DEVICES MAY BE USED IN LIEU OF THE PROTECTION VEHICLE SHOWN WHEN APPROVED BY THE ENGINEER. THE VEHICLE SHALL BE EQUIPPED WITH A 360° ROTATION OR FLASHING AMBER BEACON CLEARLY VISIBLE A MINIMUM OF 402 m.
6. THE TYPE A FLASHING WARNING LIGHTS SHOWN ON THE OW-128 AND THE OW-121 SIGNS ARE REQUIRED WHENEVER A NIGHT LANE CLOSURE IS NECESSARY.
7. ADEQUATE AREA ILLUMINATION OF EACH FLAGGER STATION SHALL BE PROVIDED AT NIGHT BY USING 150 WATT MINIMUM HIGH PRESSURE SODIUM LUMINAIRES OR 250 WATT MINIMUM MERCURY LUMINAIRES. LUMINAIRES SHALL BE LOCATED ADJACENT TO ONE FLAGGER STATION FOR EACH DIRECTION OF TRAFFIC AS SHOWN ABOVE. THE MOUNTING HEIGHT FOR LUMINAIRES SHALL BE A MINIMUM OF 8.2 m ABOVE THE PAVEMENT AND MOUNTED ON A SUPPORT OF ADEQUATE STRENGTH TO PROVIDE A SATISFACTORY INSTALLATION. THE OVERHEAD CONDUCTOR CLEARANCE SHALL BE A MINIMUM OF 5.5 m ABOVE THE PAVEMENT. THE LUMINAIRE ARM SHALL BE OF SUFFICIENT LENGTH TO EXTEND TO THE EDGE OF THE PAVEMENT. POLES SHALL BE ERECTED A MINIMUM OF 1.7 m BEHIND FACE OF GUARDRAIL WHERE EXISTING, OR 3.6 m FROM THE EDGE OF PAVEMENT. WHERE POSSIBLE LOCATE BEHIND DITCH. LIGHTING MATERIAL SHALL COMPLY WITH SPECIFICATION 713.
8. WITHIN THE LENGTH OF CLOSURE, PROVISION SHALL BE MADE TO CONTROL TRAFFIC ENTERING FROM INTERSECTING STREETS AND MAJOR DRIVES AS NECESSARY TO PREVENT WRONG WAY MOVEMENTS AND TO KEEP VEHICLES OFF OF NEW PAVEMENT NOT READY FOR TRAFFIC. THE METHOD OF CONTROL SHALL BE SUBJECT TO THE APPROVAL OF THE ENGINEER.

MINIMUM DISTANCE (METERS)	A	B
URBAN	61	61
RURAL	152	152

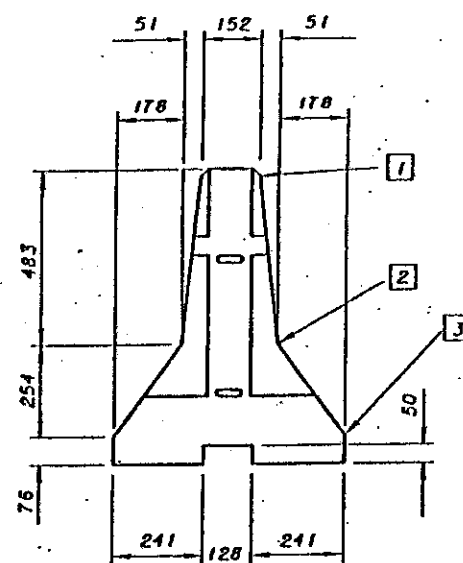
METRIC

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 INCIDENTAL TO 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 FLAGGERS CLOSING 1 LANE OF A 2 LANE HIGHWAY STATIONARY OPERATION	DATE 04/25/94
STANDARD CONSTRUCTION DRAWING APPROVED <i>[Signature]</i> ENGR. OF DESIGN SERVICES	MT-97.10M

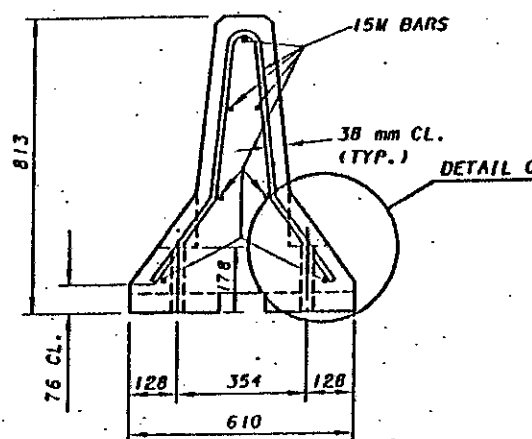


ELEVATION

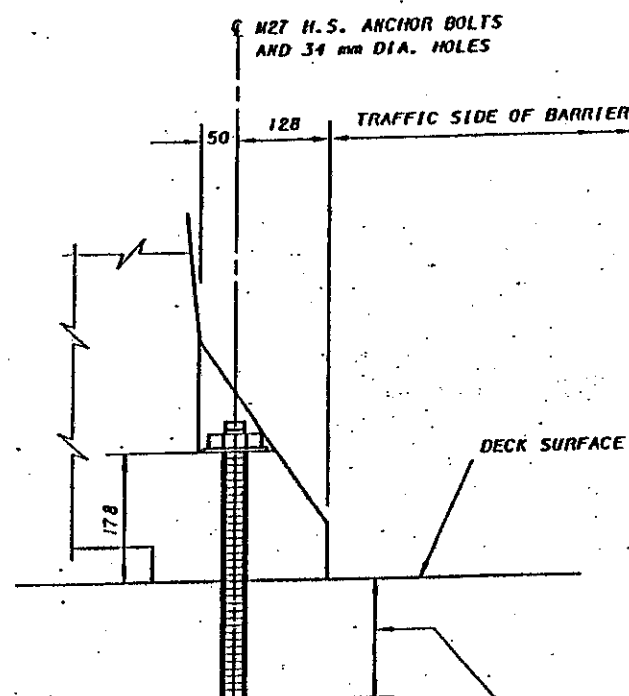


VIEW A-A

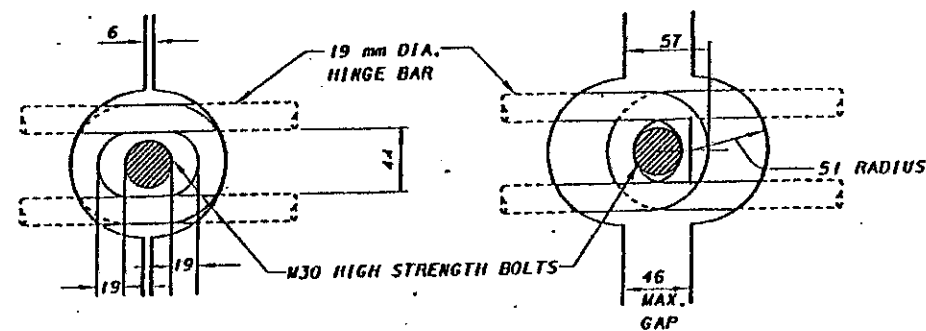
- 1 25 mm RADIUS OR 19 mm CHAMFER, ALL TOP AND END CORNERS.
- 2 PERMISSIBLE 250 mm RADIUS.
- 3 PERMISSIBLE 25 mm RADIUS.



SECTION B-B



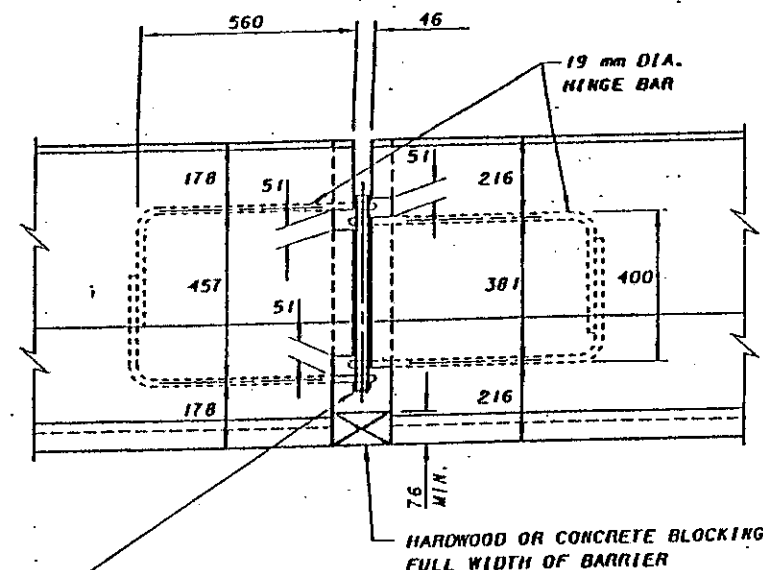
DETAIL C



1 CLOSED JOINT 2 OPEN JOINT

JOINT CONNECTION DETAILS

- 1 BARRIER SHALL INITIALLY BE PLACED CLOSER TOGETHER SO BOLTS CAN BE EASILY INSERTED THROUGH HINGE BAR LOOPS.
- 2 BARRIER JOINTS SHALL BE FULLY OPEN BEFORE NUT IS TIGHTENED ONTO BOLT AND OPENING IS SNUGGLY BLOCKED.



DETAIL AT HINGED CONNECTION

GENERAL NOTES

HARDWARE:
BOLTS, DECK ANCHORING BOLTS AND ALL NUTS AND WASHERS SHALL CONFORM TO ASTM A325M. THEY SHALL BE GALVANIZED IN ACCORDANCE WITH CMS 711.02.

REINFORCING STEEL:
ALL REINFORCING STEEL (INCLUDING THE 19 mm DIAMETER HINGE BARS) SHALL MEET THE REQUIREMENTS OF CMS 509.02. HINGE BARS SHALL BE GALVANIZED AFTER FABRICATION.

CONCRETE:
PORTABLE CONCRETE BARRIER SEGMENTS SHALL BE CONSTRUCTED OF CLASS C CONCRETE WITH A MINIMUM COMPRESSIVE STRESS OF 28 MPa.

BRIDGE DECK SURFACE PREPARATION:
THE SURFACE AREA ON WHICH THE PORTABLE CONCRETE BARRIER WILL REST SHALL BE CLEAR OF ALL LOOSE SAND, GRAVEL, DIRT AND DEBRIS.

ANY IRREGULARITIES IN THE BRIDGE DECK AREAS, UNLESS JUDGED BY THE ENGINEER TO BE INCONSEQUENTIAL, SHALL BE LEVELED WITH GROUT AND/OR ASPHALT.

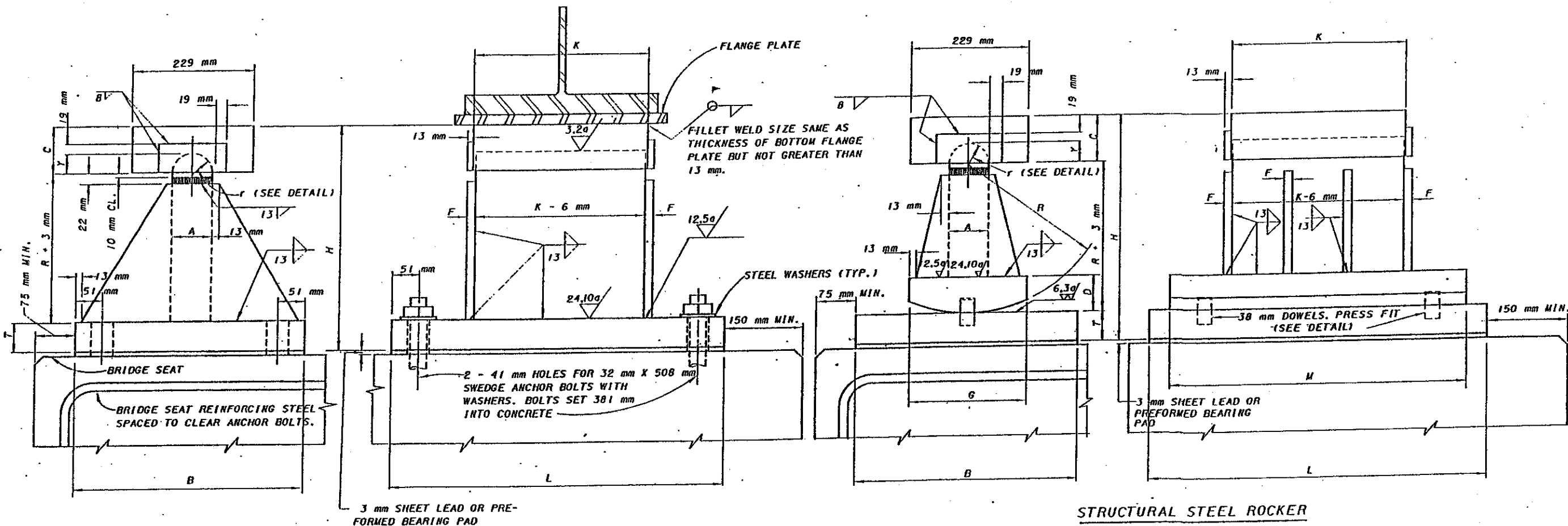
ASPHALT ROLL ROOFING SHALL BE PLACED ON THOSE BRIDGE DECK AREAS, AS JUDGED BY THE ENGINEER, TO HAVE A SURFACE ROUGHNESS WHICH WOULD INHIBIT FRICTION CONTACT BETWEEN BARRIER SEGMENTS AND DECK.

MARKS:
ALL BARRIER SEGMENTS SHALL BE CLEARLY MARKED, WHERE "XX" IS THE YEAR IN WHICH THE BARRIER WAS CAST. EACH SHALL ALSO HAVE, ON IT'S TOP SURFACE, A UNIQUE IDENTIFICATION OF THE MANUFACTURER AND, SOMEWHERE ON THE BARRIER, THE DAY AND MONTH THE BARRIER WAS CAST.

ALL MARKINGS SHALL BE PERMANENTLY IMPRINTED ON THE BARRIER USING A MINIMUM OF 50 mm HIGH LETTERING.

HANDLING DEVICES MAY BE USED IN LIEU OF THE LIFTING SLOTS FOR MOVING THE BARRIER. THEY MAY BE OF ANY DESIGN SUFFICIENT TO HANDLE THE WEIGHT OF THE SECTION BEING LIFTED. NO REMAINING HANDLING DEVICES SHALL PROTRUDE ABOVE THE BARRIER SURFACE.

THE PROJECT PLANS SHALL INDICATE THE NUMBER OF ANCHORS PER SEGMENT, AS WELL AS THE BARRIER LOCATION ON THE BRIDGE DECK, AND ANY SPECIAL ANCHORAGE REQUIREMENTS.



STRUCTURAL STEEL BOLSTER
SEE TABLE BELOW FOR ADDITIONAL DIMENSIONS.

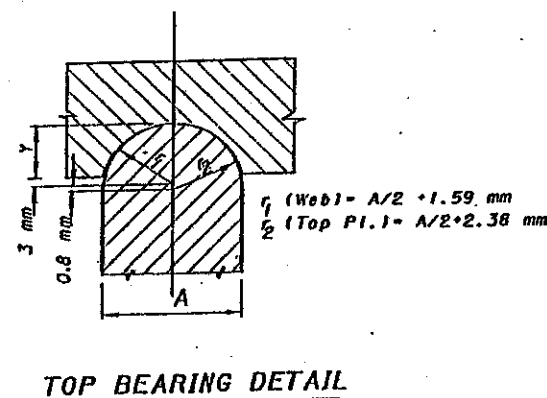
STRUCTURAL STEEL ROCKER
SEE TABLE BELOW FOR ADDITIONAL DIMENSIONS

BOLSTER NO.	ROCKER NO.	DIMENSIONS (MILLIMETERS)													WEIGHT EACH (Kg)		MAXIMUM LOAD (kN)
		A	B	C	D	E	F	G	H	K	L	M	N	O	BOLSTER	ROCKER	
	R-340	64	203	64	44	13	178	244	229	457	406	140	38	30		93	340
B-450	R-450	64	254	64	51	13	191	270	229	483	432	165	38	30	102	114	450
B-575	R-575	76	279	76	51	13	203	308	267	508	457	191	38	37	134	143	575
B-675	R-675	76	305	76	57	13	216	340	292	559	483	216	44	37	164	182	675
B-775	R-775	76	356	89	64	13	229	384	305	584	508	241	51	37	207	230	775
B-900	R-900	76	406	89	70	16	229	416	305	610	533	267	57	37	245	275	900
B-1000	R-1000	76	432	89	70	16	229	429	330	635	559	279	57	37	268	302	1000
B-1100	R-1100	89	457	89	70	19	254	448	330	660	584	292	64	43	316	352	1100
B-1225	R-1225	89	483	89	83	19	305	467	356	686	610	305	70	43	363	429	1225
B-1325	R-1325	89	508	89	83	19	305	486	356	711	635	318	76	43	406	477	1325
B-1550	R-1550	102	559	102	89	19	356	537	381	762	686	343	89	48	610	509	1550

WEIGHTS GIVEN ARE FOR ONE ROCKER OR BOLSTER COMPLETE (INCLUDING SHEET LEAD, ANCHOR BOLTS AND WASHERS).

LEGEND

Kg - KILOGRAM
kN - KILONEWTONS



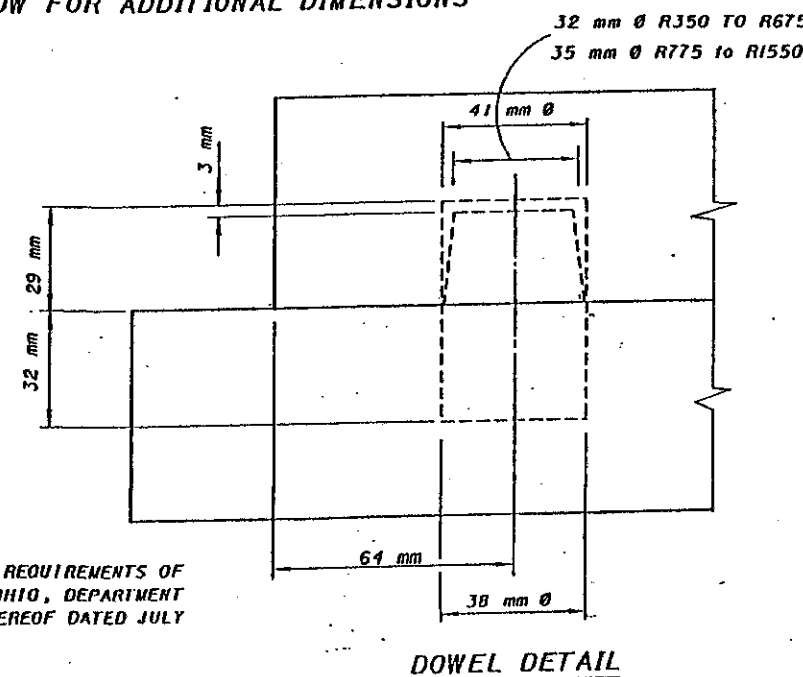
TOP BEARING DETAIL

DESIGN SPECIFICATIONS: THIS STANDARD DRAWING CONFORMS TO THE REQUIREMENTS OF "DESIGN SPECIFICATIONS FOR HIGHWAY STRUCTURES" OF THE STATE OHIO, DEPARTMENT OF HIGHWAYS, DATED OCTOBER 1, 1951, TOGETHER WITH REVISIONS THEREOF DATED JULY 15, 1952, APRIL 1, 1954 AND FEBRUARY 1, 1955.

LIMITATION: THIS ROCKER AND BOLSTER DESIGN SHALL NOT BE USED WHERE THE ANTICIPATED MOVEMENT IN ONE DIRECTION IS IN EXCESS OF 50 mm.

ROADWAY GRADE: IF THE ROADWAY GRADE EXCEEDS 2% THE UPPER LOAD PLATE OF THE BEARING SHALL BE BEVELED TO MATCH THE GRADE. DIMENSION "C" SHALL BE MAINTAINED AT THE CENTER OF THE PLATE.

BOLSTER AND ROCKER CAPACITIES SHOWN ON THIS STANDARD DRAWING ARE BASED ON ACTUAL DEAD LOAD, LIVE LOAD AND IMPACT.



DOWEL DETAIL



SIDE VIEW



RIGHT OF WAY MONUMENT DETAILS

75-mm Alum. Cap

Ground Line

20-mm Steel Rod
1050 mm long
(Alternate: #19M bar)

Class C Concrete
cast-in-place

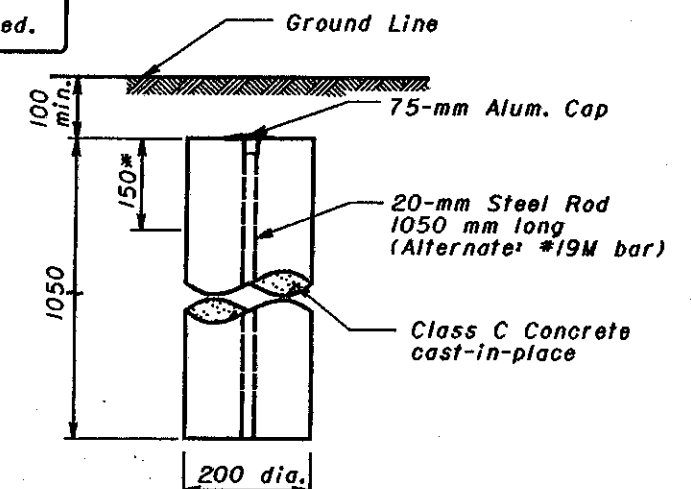
1050

150

200 dia.



REFERENCE MONUMENT DETAILS



**metric
units**

OFFICE OF PLANNING OHIO DEPARTMENT OF TRANSPORTATION	
ROADWAY ITEMS	DATE 6-30-95 4-8-97
STANDARD CONSTRUCTION DRAWING	RM-1.1M
APPROVED <i>Paul F. Sullivan</i> ADMINISTRATOR	

NOTES

PORTABLE CONCRETE BARRIER (PCB): PCB, as shown, shall not be used on bridge deck edges. PCB, Bridge Mounted, shall be used at such locations in accordance with the Office of Structural Engineering's Standard Drawing PCB-91M.

WIRE FABRIC: Shall meet the requirements of CMS 709.10.

CONNECTING HARDWARE: Bolts, washers and hex nuts shall be galvanized after fabrication as per CMS 711.02 and shall meet the requirements of CMS 711.09 except that the Rotational Capacity test specified in ASTM A 325M shall be waived.

In lieu of the pin and loop connections detailed on this Standard Construction Drawing, barrier sections with "J-J Hooks" end connections may be utilized.

Transition barrier sections with pin and loop connections on one end and "J-J Hooks" on the other shall be used to connect runs of "J-J Hooks" barrier to other permitted barrier types. The heights of the transition sections shall be the same as the barrier runs being connected. "J-J Hooks" is a trademark of Easi-Set Industries, P.O. Box 300, Midland, VA 22728. (540) 439-8911 or (800) 547-4045.

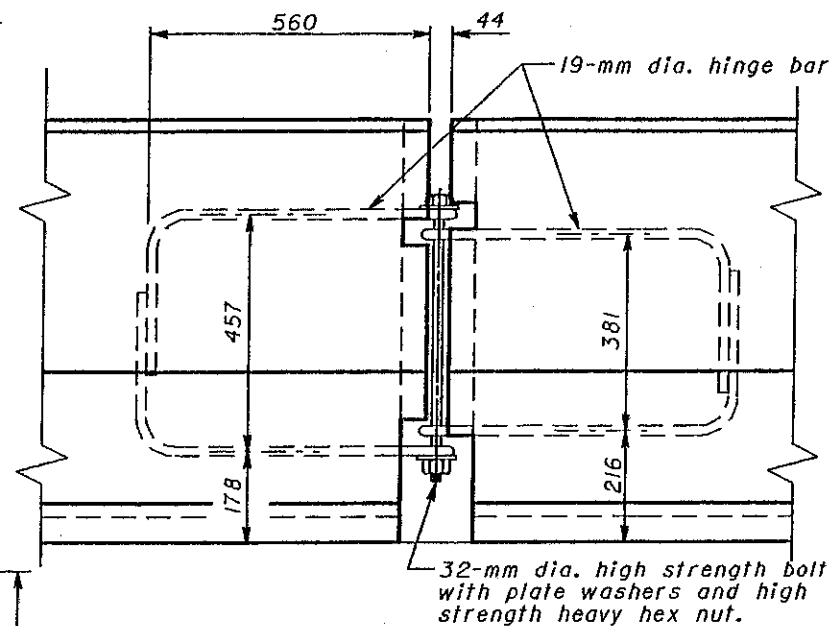
HINGE AND REINFORCING BARS: The 19-mm hinge bars and #16M reinforcing bars shall meet the requirements of CMS 509.

HANDLING DEVICES: Such devices may be used in lieu of the lifting slot for moving the barrier. They may be of any design sufficient to handle the weight of the section being lifted. No handling devices shall protrude from the surface of the barrier when in place.

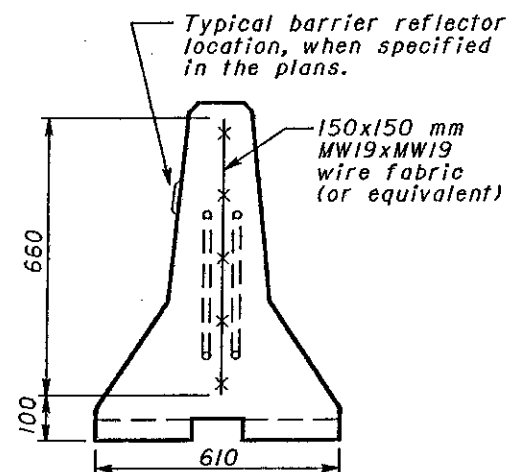
MARKING: All barrier segments shall be marked as shown, where XX indicates the year cast. These markings shall be permanently impressed in the barrier using a minimum of 50-mm high lettering.

Each segment shall have, on its top, a unique identification as to its manufacturer and, somewhere on the barrier, the day and month that the barrier was manufactured.

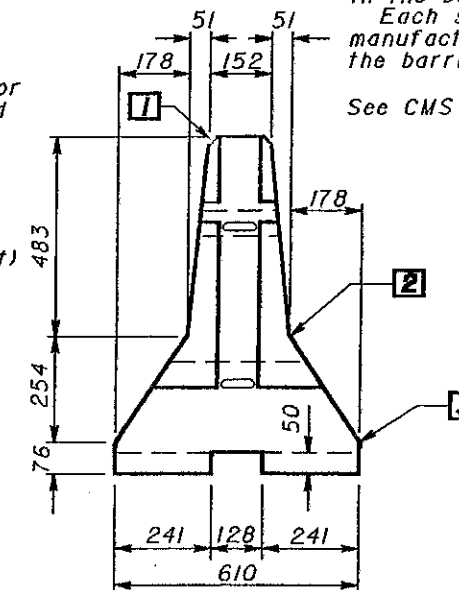
See CMS 622 for additional information.



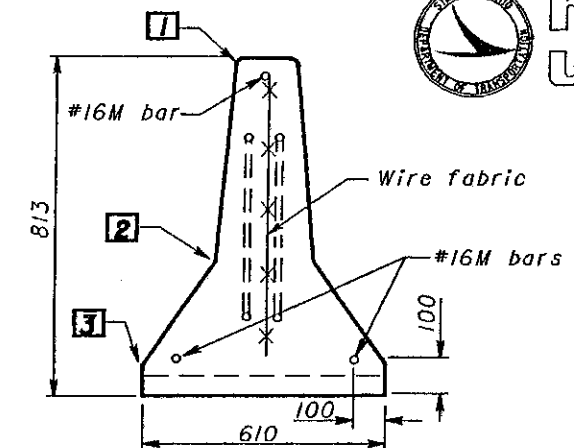
DETAIL AT HINGED CONNECTION



SECTION A-A



VIEW B-B



SECTION C-C

*All dimensions are in millimeters
unless otherwise noted.*

This Drawing Replaces MC-9.2.

OHIO DEPARTMENT OF TRANSPORTATION

**813-mm PORTABLE
CONCRETE BARRIER**

DATE _____

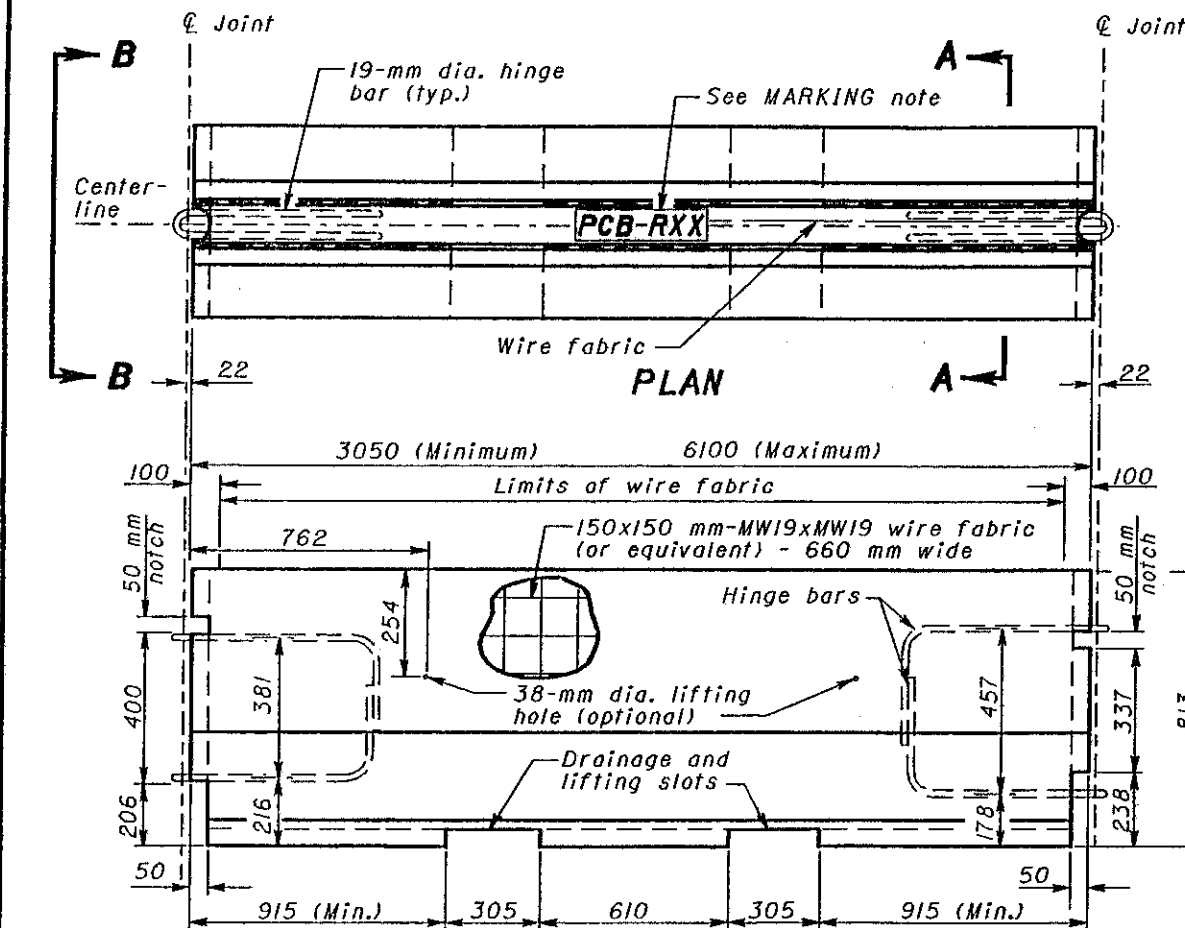
6-30-95
10-21-97

STANDARD
CONSTRUCTION
DRAWING **RM-4.2M**

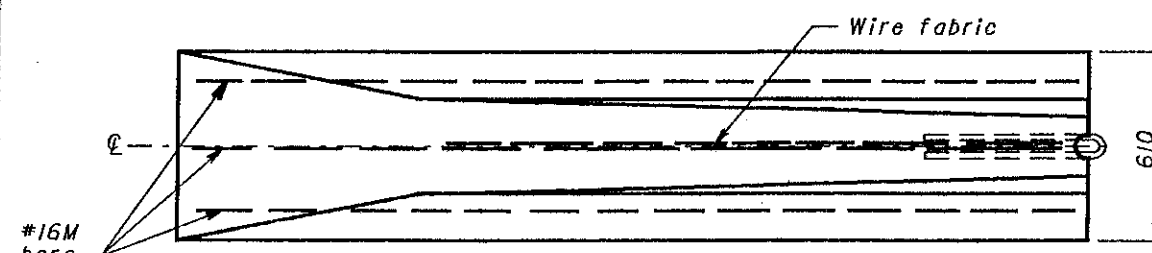
APPROVED: Paul T. Sullivan

LEGEND

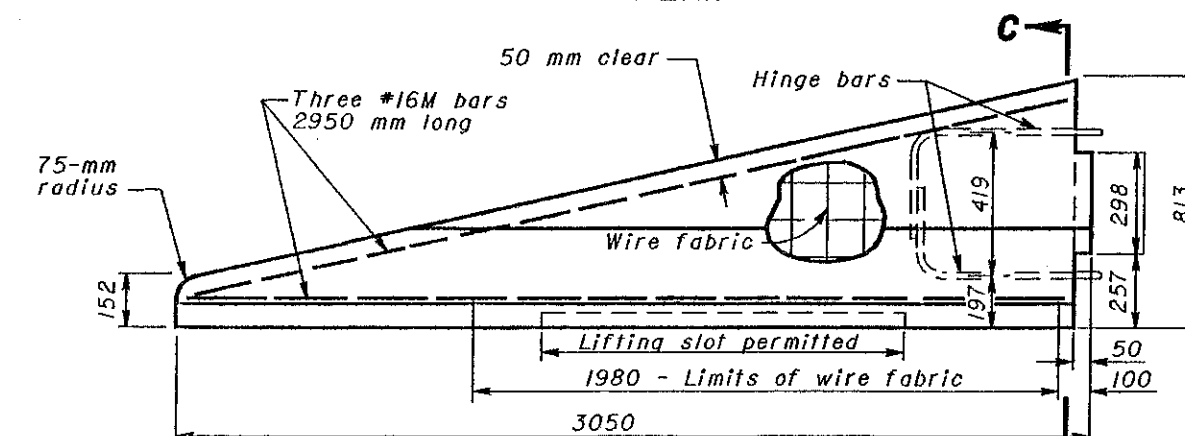
- 1** 25-mm radius or 19-mm chamfer, all top and end corners.
- 2** Permissible 250-mm radius.
- 3** Permissible 25-mm radius.



ELEVATION
BARRIER DETAILS

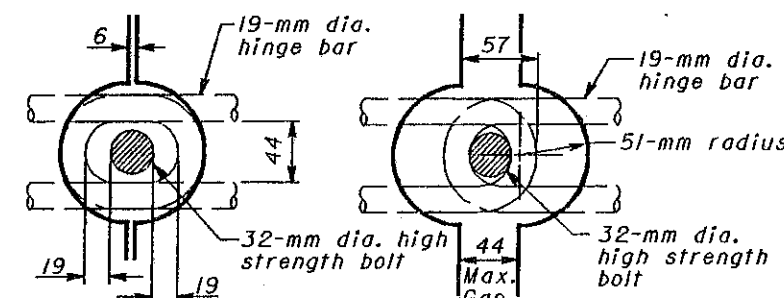


PLAN



ELEVATION

TAPERED END SECTION DETAILS



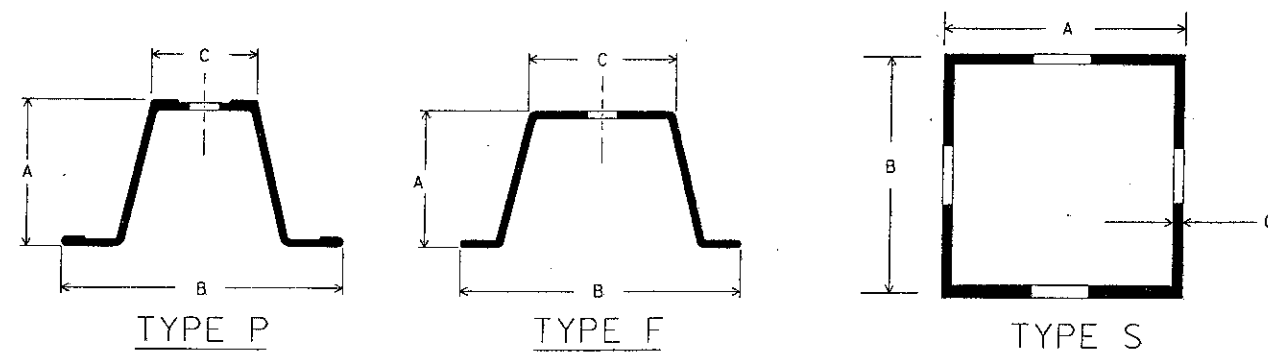
CLOSED JOINT

Barriers shall initially be placed close together so that bolts can be easily inserted through hinge bar loop.

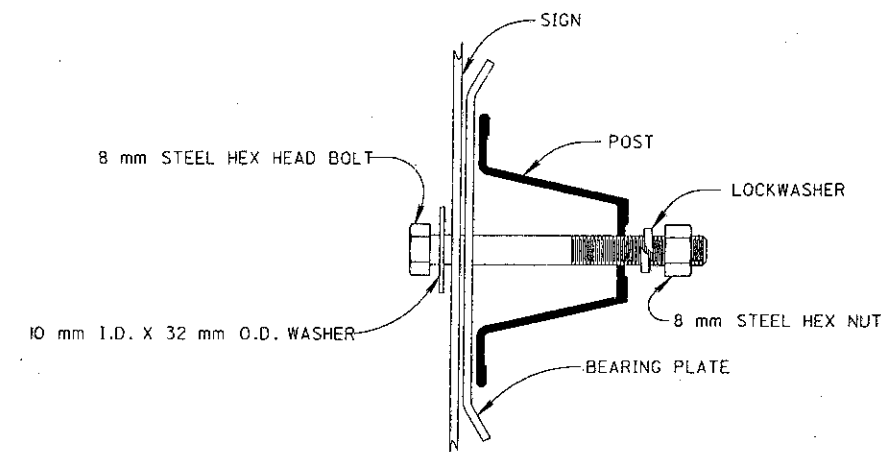
OPEN JOINT

Barrier joints shall be fully open before the nut is tightened onto bolt.

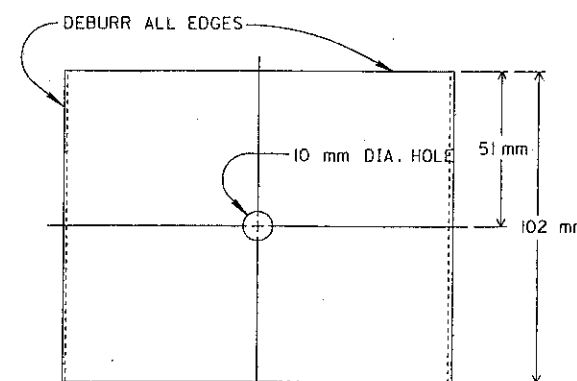
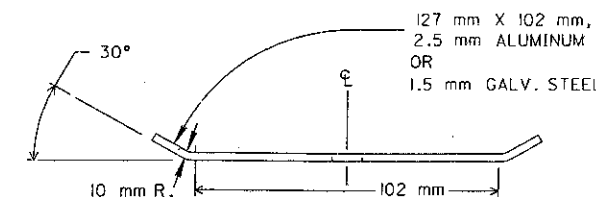
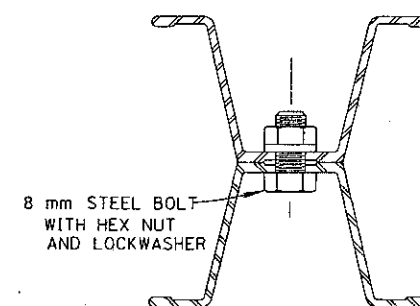
JOINT CONNECTION DETAILS



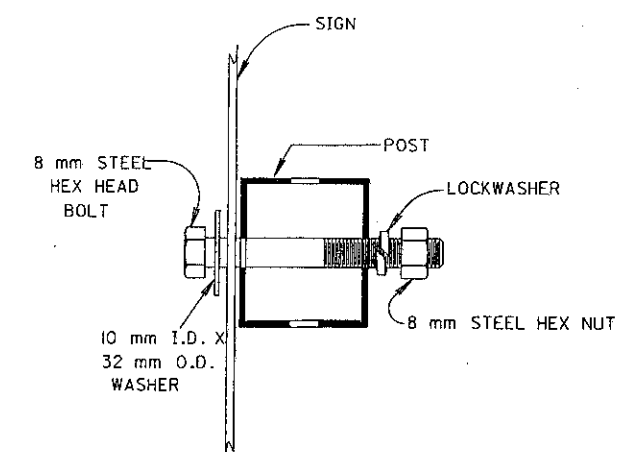
POST NO.	TYPE	Kg/m	POST DIMENSIONS MILLIMETERS			ANCHOR DIMENSIONS			NUMBER OF POSTS PERMITTED IN SEVEN FOOT PATH IN EXPOSED LOCATIONS
			A	B	C	A	B	C	
1	F	1.7	22	52	21				
2	P	3.0	37	78	33				2
	F	3.0	39	79	32				2
	S		51	51	2.1	57	57	2.7	2
3	P	4.5	48	89	33				2
	F	4.5	44	89	41				2
	S		51	51	2.1	57	57	2.7	2
4	P	6.0	TWO NO.2 POST						0
	F	6.0	TWO NO.2 POST						0
	S		63	63	2.7	76	76	4.8	1
6	P	9.0	TWO NO.3 POST						0
	F	9.0	TWO NO.3 POST						0



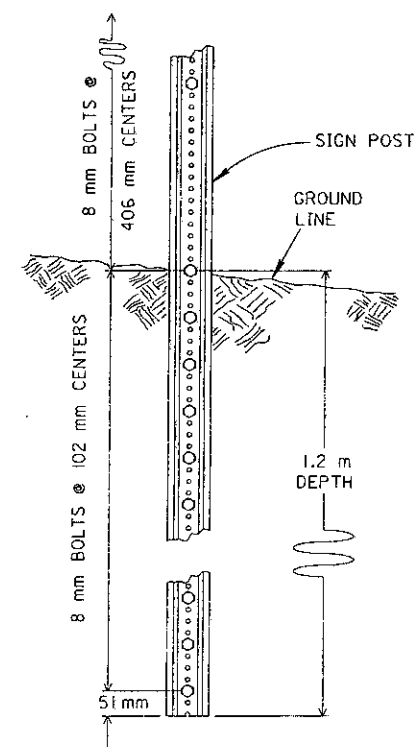
U - CHANNEL
SIGN ATTACHMENT DETAIL



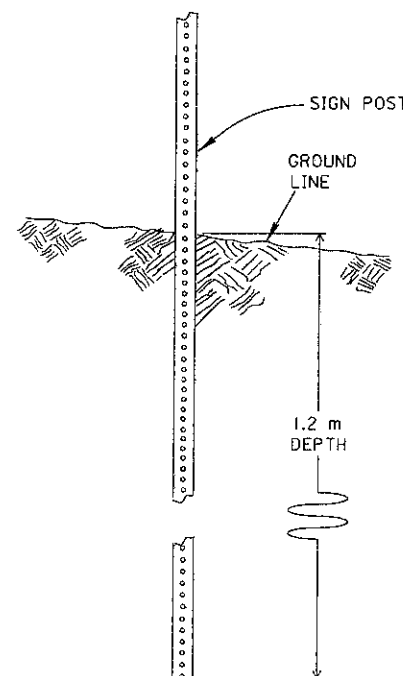
BEARING PLATE



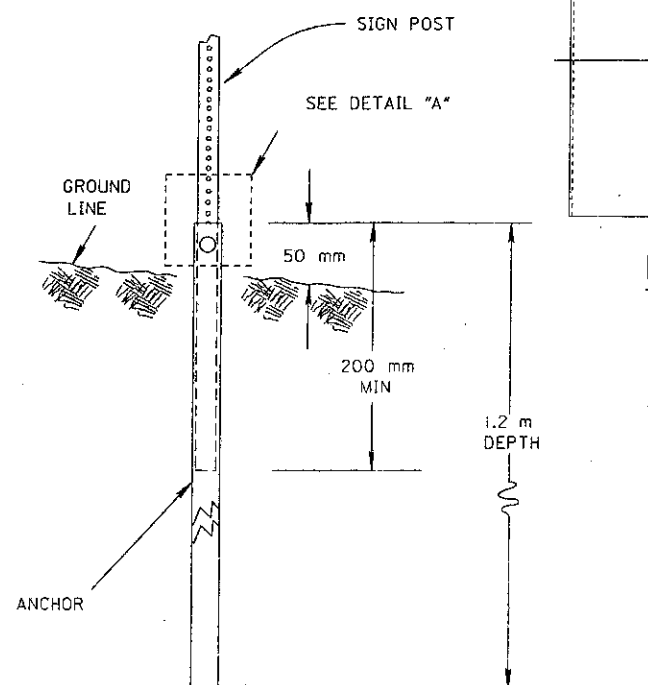
SQUARE POST
SIGN ATTACHMENT DETAIL



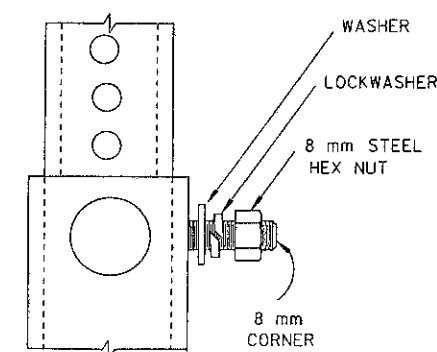
TYPICAL U - CHANNEL
DRIVEN INSTALLATION



TYPICAL SQUARE POST
DRIVEN INSTALLATION



TYPICAL SQUARE POST ANCHOR
BASE INSTALLATION



DETAIL "A"

NOTES

1. NUMBER 4 TYPE P AND F POST, AND NUMBER 6 TYPE P AND F POST, SHALL ONLY BE INSTALLED IN PROTECTED LOCATIONS (e.g. BEHIND GUARDRAIL). TWO POST INSTALLATIONS OF NUMBER 4 TYPE S POST SHALL BE INSTALLED IN PROTECTED LOCATIONS.
2. USE OF ANCHOR BASE WITH SQUARE POST IS OPTIONAL.
3. SQUARE POST MAY HAVE DIE-CUT KNOCKOUTS OR OPEN HOLES.

M E T R I C

BUREAU OF DESIGN SERVICES
DIVISION OF HIGHWAYS
OHIO DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL

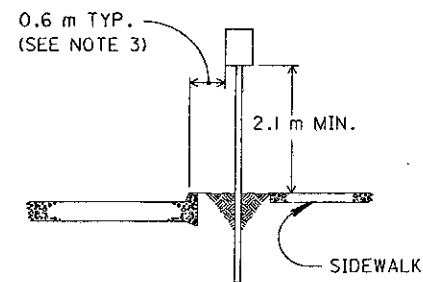
DATE
07/01/94

YIELDING POST

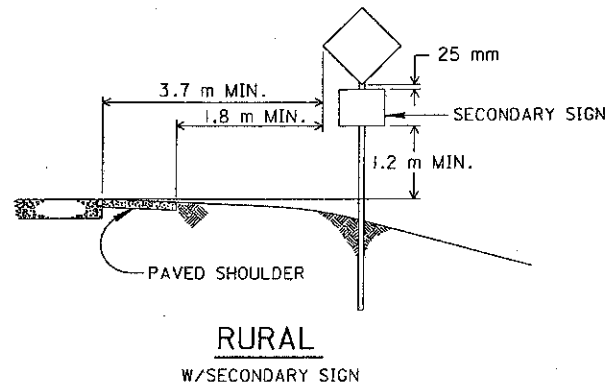
STANDARD
CONSTRUCTION
DRAWING

TC-41.20M

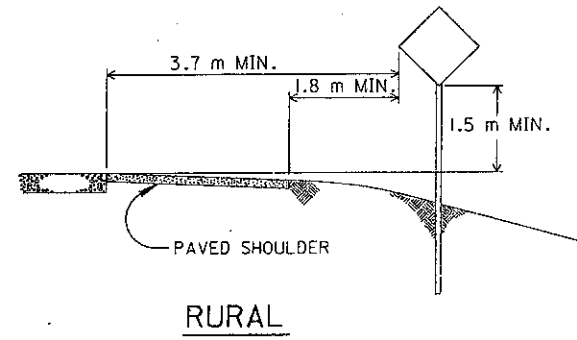
APPROVED: *Ray Hugg* ENGR. OF DESIGN SERVICES



URBAN-RESIDENTIAL AND BUSINESS



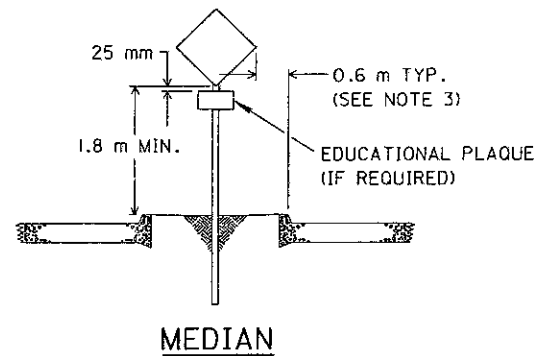
RURAL
W/SECONDARY SIGN



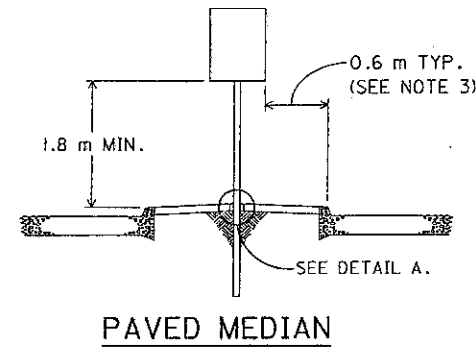
RURAL

NOTES

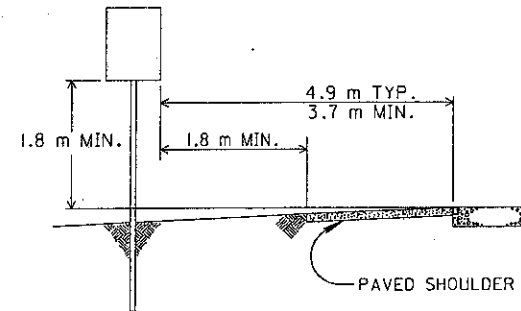
1. SEE DRAWING TC-41.20M FOR DETAILS ON YIELDING SUPPORTS.
2. ALL SIGNS SHALL BE PLACED 90° TO THE ROADWAY, EXCEPT PARKING SIGNS WITH ARROW SHALL BE SET AT AN ANGLE OF NOT LESS THAN 30° NOR MORE THAN 45° WITH A LINE PARALLEL TO THE FLOW OF TRAFFIC.
3. A CLEARANCE OF 0.3 m IS PERMISSIBLE WHERE SIDEWALK WIDTH IS LIMITED OR WHERE EXISTING POLES ARE CLOSE TO THE CURB.
4. SEE DRAWINGS TC-52.10M AND TC-52.20M FOR DIMENSIONS BETWEEN SUPPORTS.



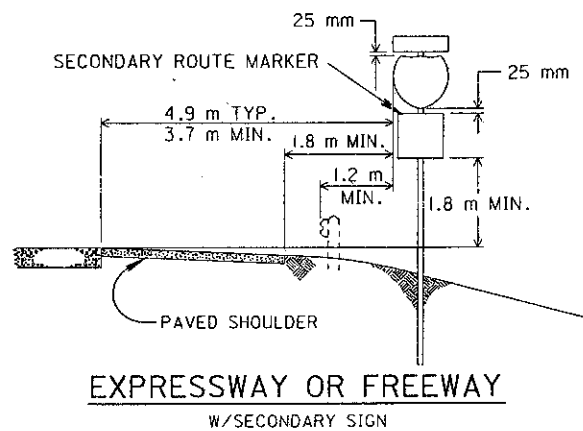
MEDIAN



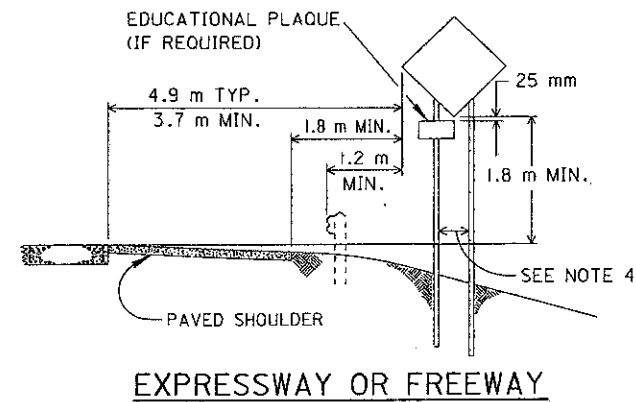
PAVED MEDIAN



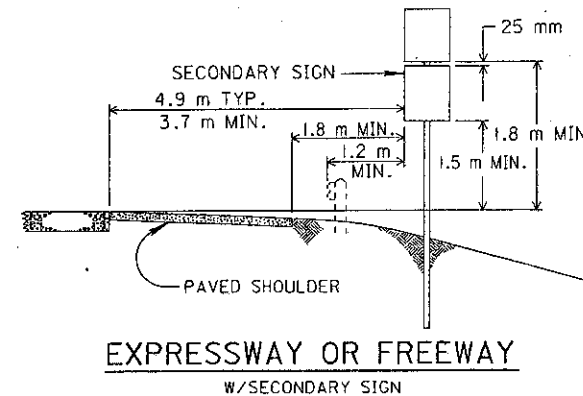
MEDIAN-EXPRESSWAY OR FREEWAY



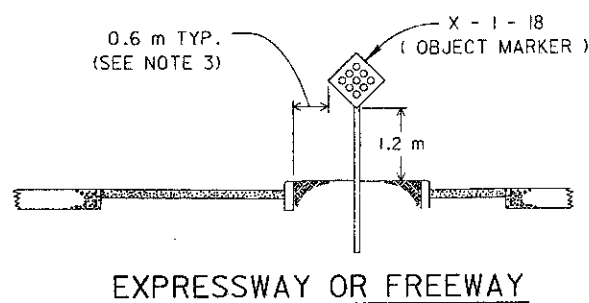
EXPRESSWAY OR FREEWAY
W/SECONDARY SIGN



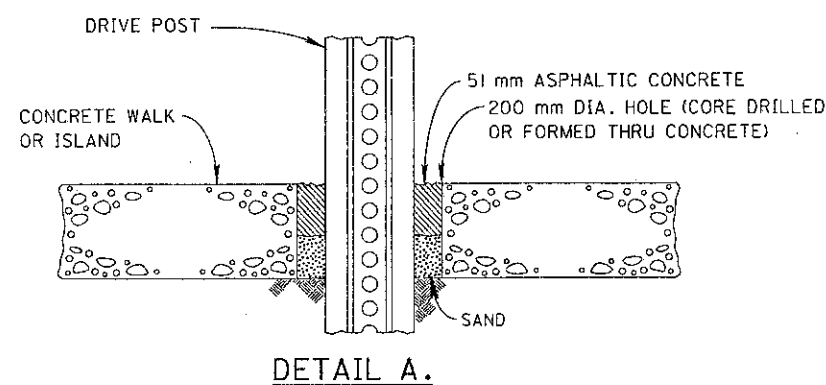
EXPRESSWAY OR FREEWAY



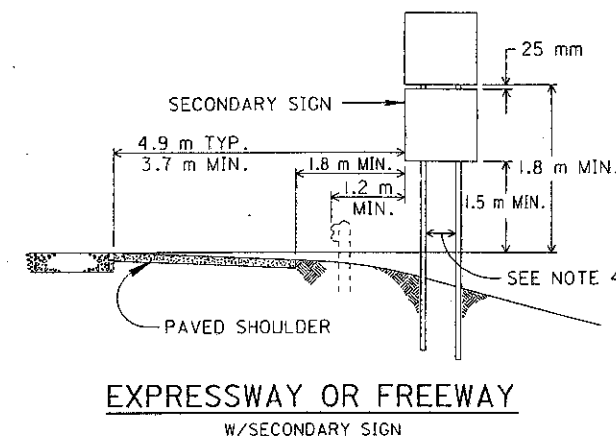
EXPRESSWAY OR FREEWAY
W/SECONDARY SIGN



EXPRESSWAY OR FREEWAY



DETAIL A.



EXPRESSWAY OR FREEWAY
W/SECONDARY SIGN

METRIC

BUREAU OF DESIGN SERVICES
DIVISION OF HIGHWAYS
OHIO DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL

DATE
03/31/94

TYPICAL SIGN PLACEMENT
REGULATORY, WARNING
AND ROUTE MARKER SIGNS

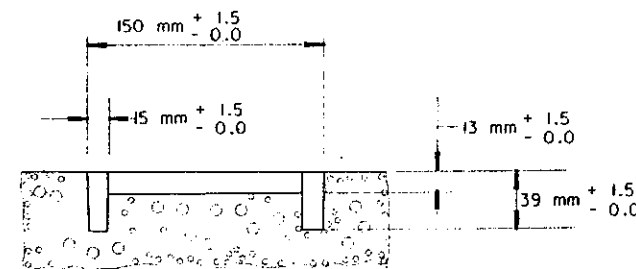
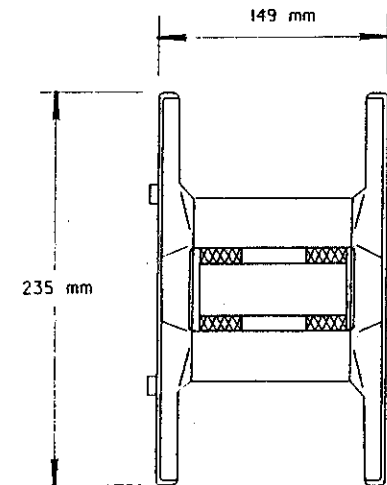
STANDARD
CONSTRUCTION
DRAWING
APPROVED *[Signature]* ENGR. OF DESIGN SERVICES

TC-42.20M

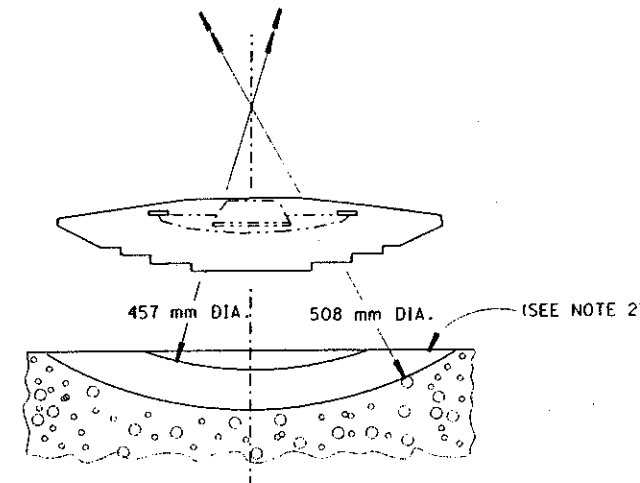
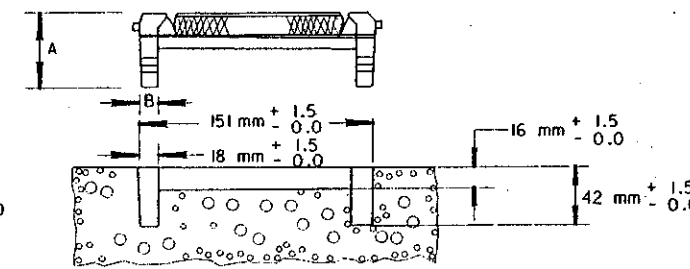
NOTES

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.

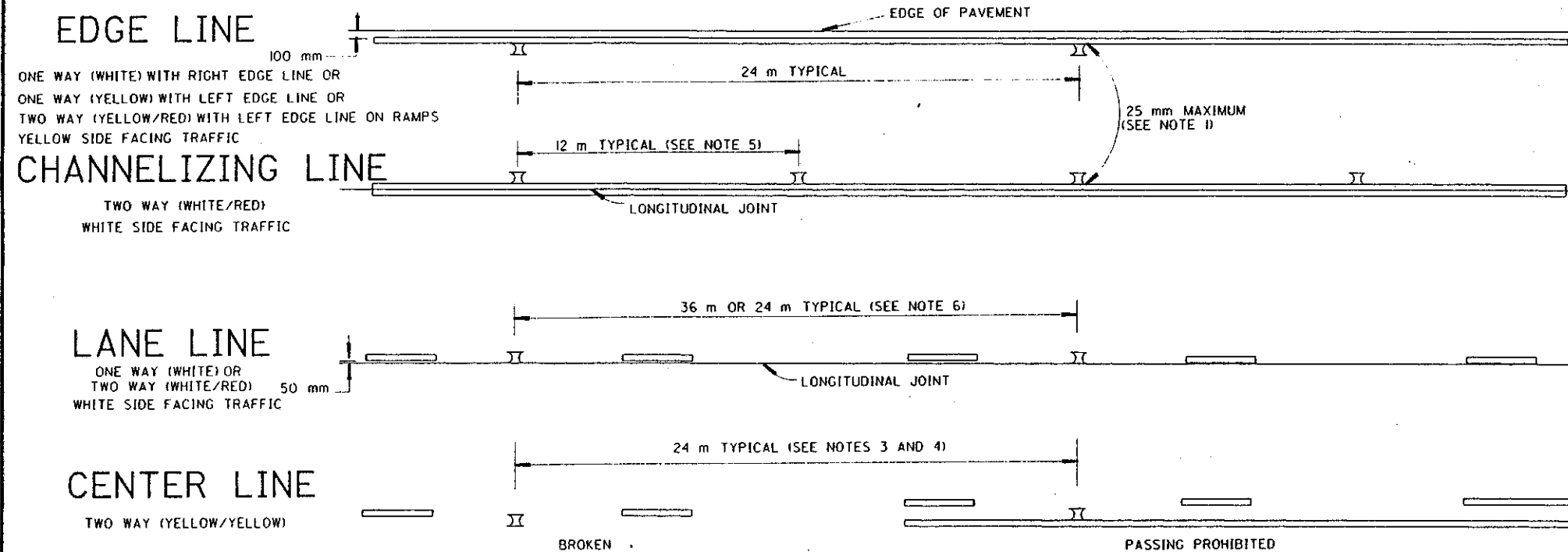
	CONVENTIONAL TYPE	LOW PROFILE TYPE
A	44 mm	43 mm
B	12 mm	15 mm



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 *[Signature]* ADMINISTRATOR

TYPICAL RAISED PAVEMENT MARKER PLACEMENT WITH LONGITUDINAL PAVEMENT MARKINGS