



TRANSMITTAL LETTER

Change # 1
Publication 72M
April 2000 Edition

Date
April 16, 2001

OS-299 (8-72)

Subject:

Revisions to Standards for Roadway Construction RC's 24M, 28M, 31M, 34M, 39M, 52M, 53M, 54M, 57M, 58M, 59M, 66M, 81M 82M.

INFORMATION AND SPECIAL INSTRUCTIONS:

Incorporate the attached revisions into the April 2000 Edition of the Standards for Roadway Construction. These revisions should be adopted as soon as practical on all new and existing designs without affecting any letting schedules. PS&E submissions to Central Office after July 16, 2001 should include these revisions.

The following represents a listing of the major changes or addition to each standard drawing. Only revised sheets are listed. Remaining sheets of the same standard show new dates only.

RC-Sheet#	Change Description
RC - 24M	(1 of 1) Section A-A. Changed Bituminous Binder Course, ID-2 to Bituminous Concrete Base Course.
RC - 28	(1 of 1) Revised Table A. Revised the depth of the paving notch to be the same for bituminous or concrete.
RC - 31M	(1 of 2) The metric dimension, indicating the length of the Outlet Edwall, was changed from 1400 to 1371 mm
RC - 34M	(2 of 10) Revised Notes 1 and 7
	(4 of 10) Revised the dimension in Section B-B.
	(8 of 10) Revised Notes 2 and 9
	(9 of 10) Added Note 6. Existing Note 6 changed to Note 7.
RC - 39M	(3 of 5) Revised Note 1.
	(4 of 5) Revised Note 2.
RC - 52M	(3 of 6) Revised Note 5
	(4 of 6) Added Note 3
	(6 of 6) Added Notes for Case 1 and Case 2 to indicate that "For length of Need, See DM-2, Chapter 12."
RC - 53M	(1 & 2 of 2) The details in RC-53 were changed to reflect the modifications made of the Type 2 Weak Post Guide Rail in order to meet NCHRP Report 350 criteria. The Weak Post system was crash tested at TTI and approved by the Federal Highway Administration. The major changes are: 1) the top rail height was increased by 2" to 32". 2) Rail splices are located at mid-span rather than at a post.

RC - 54M

(1 of 7)

Designers should review RC-53M carefully for these and other minor changes.

(5 of 7)

Revised Note 4
Added Note 6 to indicate pay limits for the backslope Anchor Terminal.

(6 of 7)

Revised Note 3 and added Note 7 to indicate pay limits for the backslope Anchor Terminal.

RC - 57M, RC-58M and RC-59M

(All Sheets)

Most of the details and reinforcement shown on RCs 57M, 58M and 59M have been revised.

Our standard F-shape precast concrete barrier was redesigned and crash tested at TTI. The steel plate was modified to 12" wide and 1/2" thick. Reinforcement was increased around the slot on both ends of the barrier segments to prevent spalling. However, the shape and height of the barrier remained the same.

The barrier met the conditions in NCHRP Report 350 and was approved by the Federal Highway Administration.

Designers and inspectors should review these standards carefully.

RC - 66M

(1 of 1)

Revised Section A-A (Conc. Alt.) to indicate that the corrugations can be milled or formed.

RC - 81M

(1 of 1)

Revised Note 3.

RC - 82M

(1 of 1)

Revised Note 3.

CANCEL THE FOLLOWING:

Index Sheet	April 28, 2000
RC-24M	April 28, 2000
Rc -28M	April 28, 2000
RC - 52M	April 28, 2000
RC - 53M	April 28, 2000
RC - 54M	April 28, 2000
RC - 57M	April 28, 2000
RC - 58M	April 28, 2000
RC - 59M	April 28, 2000
RC - 66M	April 28, 2000
RC - 81M	April 28, 2000
RC - 82M	April 28, 2000

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Deputy Secretary for
Highway Administration

INDEX OF STANDARDS FOR ROADWAY CONSTRUCTION

STANDARD DRAWING NUMBER	DRAWING DATE	DESCRIPTION
<u>EARTHWORK</u>		
RC-10M _____	APR 28, 2000	CLASSIFICATION OF EARTHWORK
RC-11M (2 Sheets) _____	APR 28, 2000	CLASSIFICATION OF EARTHWORK FOR STRUCTURES
RC-12M (2 Sheets) _____	APR 28, 2000	BACKFILL AT STRUCTURES
RC-13M _____	APR 28, 2000	PAY LIMIT OF SUBBASE

PAVEMENTS

RC-20M (3 Sheets) _____	APR 28, 2000	CONCRETE PAVEMENT JOINTS
RC-21M _____	APR 28, 2000	REINFORCED CONCRETE PAVEMENT
RC-23M (3 Sheets) _____	APR 28, 2000	BRIDGE APPROACH SLAB
* RC-24M _____	APR 16, 2001	PAVEMENT RELIEF JOINT
RC-25M (5 Sheets) _____	APR 28, 2000	SHOULDERS
RC-26M (5 Sheets) _____	APR 28, 2000	CONCRETE PAVEMENT REHABILITATION
RC-27M _____	APR 28, 2000	PLAIN CONCRETE PAVEMENT
* RC-28M _____	APR 16, 2001	OVERLAY TRANSITIONS AND PAVING NOTCHES

DRAINAGE

RC-30M (4 Sheets) _____	APR 28, 2000	SUBSURFACE DRAINS
* RC-31M (2 Sheets) _____	APR 16, 2001	ENDWALLS
RC-32M _____	APR 28, 2000	SLOPE PIPE FITTINGS, PIPE CONNECTORS AND CONCRETE COLLAR FOR PIPE EXTENSION
RC-33M (2 Sheets) _____	APR 28, 2000	END SECTIONS FOR PIPE CULVERTS
* RC-34M (10 Sheets) _____	APR 16, 2001	INLETS
RC-35M _____	APR 28, 2000	DRAINAGE DIKE
RC-36M _____	APR 28, 2000	SPRING BOXES
* RC-39M (5 Sheets) _____	APR 16, 2001	STANDARD MANHOLES
RC-40M _____	APR 28, 2000	SLOPE PROTECTION
RC-43M _____	APR 28, 2000	GABIONS

STANDARD DRAWING NUMBER	DRAWING DATE	DESCRIPTION
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GUIDE RAIL AND MEDIAN BARRIER

RC-50M (2 Sheets) _____	APR 28, 2000	GUIDE RAIL TRANSITION AT END OF STRUCTURE
* RC-52M (6 Sheets) _____	APR 16, 2001	TYPE 2 STRONG POST GUIDE RAIL
* RC-53M (2 Sheets) _____	APR 16, 2001	TYPE 2 WEAK POST GUIDE RAIL
* RC-54M (7 Sheets) _____	APR 16, 2001	BARRIER PLACEMENT AT OBSTRUCTIONS
RC-55M _____	APR 28, 2000	TYPE 2 WEAK POST MEDIAN BARRIER
* RC-57M (6 Sheets) _____	APR 16, 2001	CONCRETE MEDIAN BARRIER
* RC-58M (5 Sheets) _____	APR 16, 2001	SINGLE FACE CONCRETE BARRIER
* RC-59M (2 Sheets) _____	APR 16, 2001	CONCRETE GLARE SCREEN

FENCES AND CURBS

RC-60M (3 Sheets) _____	APR 28, 2000	RIGHT-OF-WAY FENCE
RC-61M _____	APR 28, 2000	RIGHT-OF-WAY GATES AND REMOVABLE FENCE SECTIONS
RC-63M (2 Sheets) _____	APR 28, 2000	PERMANENT BARRICADES
RC-64M _____	APR 28, 2000	CURBS AND GUTTERS
RC-65M _____	APR 28, 2000	CONCRETE MOUNTABLE CURBS
* RC-66M _____	APR 16, 2001	CONCRETE TRAFFIC SEPARATOR
RC-67M (2 Sheets) _____	APR 28, 2000	CURB RAMPS

POLLUTION CONTROL

RC-70M (5 Sheets) _____	APR 28, 2000	EROSION AND SEDIMENT POLLUTION CONTROL
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HIGHWAY LIGHTING

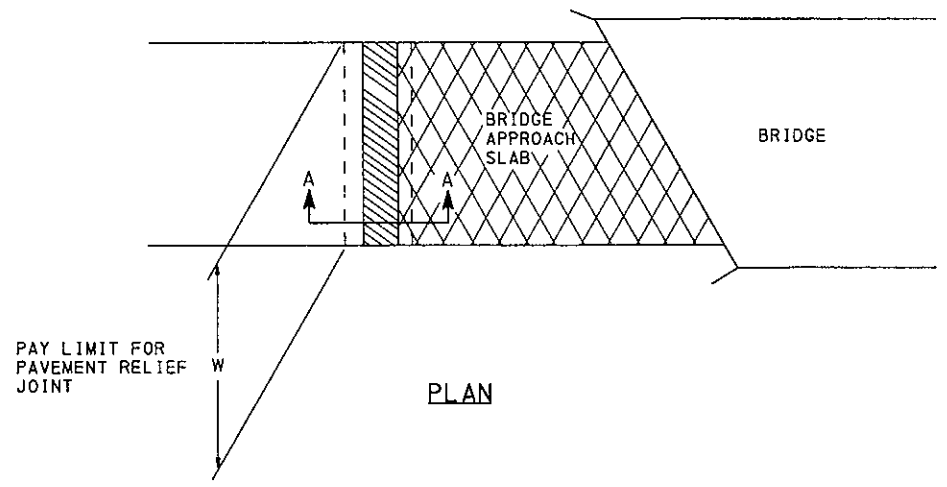
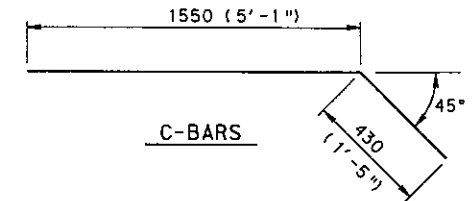
RC-80M (2 Sheets) _____	APR 28, 2000	HIGHWAY LIGHTING-FOUNDATIONS
* RC-81M _____	APR 16, 2001	HIGHWAY LIGHTING-JUNCTION BOXES-LIGHT DUTY
* RC-82M _____	APR 16, 2001	HIGHWAY LIGHTING-JUNCTION BOXES-HEAVY DUTY
RC-83M (2 Sheets) _____	APR 28, 2000	HIGHWAY LIGHTING-LIGHTING POLE DETAILS
RC-84M _____	APR 28, 2000	HIGHWAY LIGHTING-LIGHTING AND ELECTRICAL DETAILS

ROADSIDE DEVELOPMENT AND PLANTING

RC-91M (2 Sheets) _____	APR 28, 2000	BRACING AND PLANTING DETAILS
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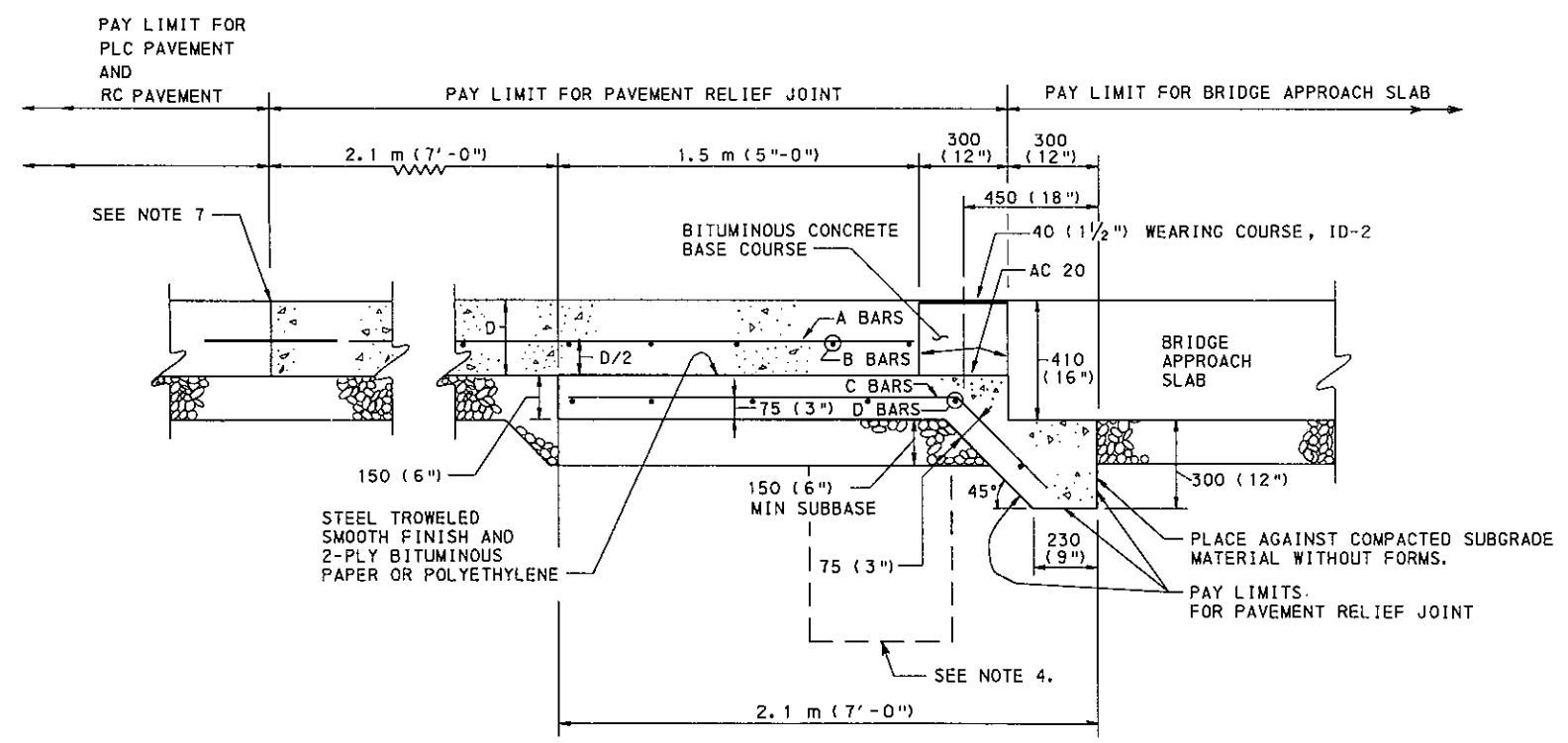
SCHEDULE OF REINFORCEMENT STEEL

MARK	SIZE	SPACING C - C	LENGTH	NUMBER REQUIRED
A	#13 (#4)	300 (12")	3.2 m (10'-6")	W/O. 3
B	#13 (#4)	300 (12")	W-100 (4")	5
C	#13 (#4)	150 (6")	2.0 m (6'-6")	W/O. 3x2
D	#13 (#4)	300 (12")	W-100 (4")	7



NOTES

- PAVEMENT RELIEF JOINTS ARE APPLICABLE FOR ALL CEMENT CONCRETE PAVEMENTS.
- USE CLASS AA CONCRETE IN SUBSLAB. (AT CONTRACTOR'S OPTION, SUBSLAB CONCRETE MAY BE HES.)
- INCLUDE PORTIONS OF REINFORCING BARS WHICH ARE LOCATED OUTSIDE THE INDICATED PAY LINES IN BID PRICE FOR PAVEMENT RELIEF JOINT.
- WHEN THE PAVEMENT GRADE CAUSES DRAINAGE TOWARDS THE BRIDGE, PLACE A SUBGRADE DRAIN (SEE RC-30M.) UNDER THE 150 (6") PORTION OF THE SUBSLAB. MEASURE AND PAY FOR AS SPECIFIED IN PUBLICATION 408, SECTION 612.
- WHERE BRIDGES ARE LOCATED LESS THAN 300 m (900') APART, AS MEASURED FROM THE FACE OF THE NEAREST ABUTMENTS, DO NOT USE A RELIEF JOINT BETWEEN THE BRIDGES.
- WHERE BRIDGES ARE LOCATED BETWEEN 300 m (900') AND 450 m (1350') APART, AND THE PAVEMENT STRUCTURE IS CEMENT CONCRETE, PLACE ONE RELIEF JOINT MIDWAY BETWEEN THE BRIDGES. IN THESE CASES, PROVIDE THE SUBSLAB AS A UNIFORM 150 (6") THICK AND 2.1 m (7') WIDE.
- FOR JOINT DETAILS ON NEW CONSTRUCTION, SEE RC-20M. FOR JOINT DETAILS ON RECONSTRUCTION, SEE RC-26M. IF THE DISTANCE TO THE NEAREST JOINT IS LESS THAN 3.0 m (10'), REMOVE THE EXISTING PAVEMENT TO THE JOINT.
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.



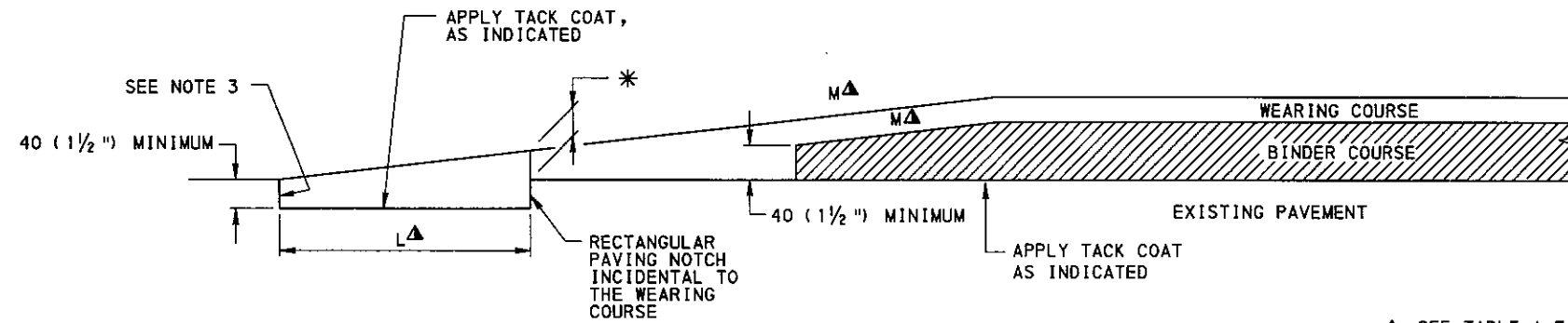
SECTION A-A

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PAVEMENT RELIEF JOINT

DATE



▲ SEE TABLE A FOR DIMENSIONAL REQUIREMENTS
 * SHOULD EQUAL THE THICKNESS OF THE WEARING COURSE.

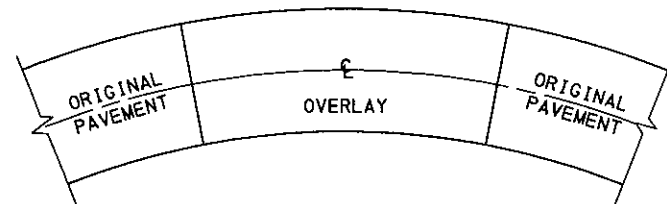
OVERLAY TRANSITION WITH PAVING NOTCH ON CONCRETE AND BITUMINOUS PAVEMENTS

TABLE A

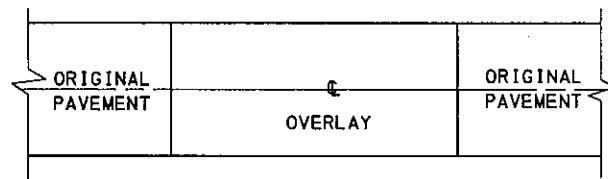
FUNCTIONAL CLASSIFICATION	SLOPE M (MAXIMUM)	PAVING NOTCH L (MINIMUM)
INTERSTATE AND OTHER LIMITED ACCESS FREEWAYS	0.17% (1" IN 50')	15 m (50')
ARTERIALS > 70 km/h (45 MPH) SEE NOTE 2.	0.28% (1" IN 30')	9 m (30')
ARTERIALS < 70 km/h (45 MPH) SEE NOTE 2	0.83% (1" IN 10')	3 m (10')
COLLECTORS AND LOCAL ROADS	0.83% (1" IN 10')	3 m (10')
CROSS STREETS SEE NOTE 1	8.33% (1" IN 12")	0.3 m (1')
DRIVEWAYS	8.33% (1" IN 12")	NO NOTCH

NOTES

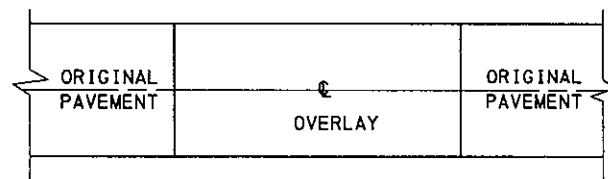
1. USE HIGHER APPROPRIATE CRITERIA IF A CROSS STREET HAS A FUNCTIONAL CLASSIFICATION OF COLLECTORS AND LOCAL ROADS OR HIGHER.
2. USE 85TH PERCENTILE SPEED, IF AVAILABLE. OTHERWISE, USE THE POSTED SPEED.
3. PLACE EDGE FLUSH WITH EXISTING PAVEMENT AND SEAL AS SPECIFIED IN PUBLICATION 408, SECTION 401.3(j)3.
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.



PLAN VIEW SUPERELEVATION SECTION



PLAN VIEW TANGENT SECTION TWO-LANE DIRECTIONAL



PLAN VIEW TANGENT SECTION TWO-LANE, TWO-WAY TRAFFIC

OVERLAY TRANSITIONS

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

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 DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN**

OVERLAY TRANSITIONS AND PAVING NOTCHES

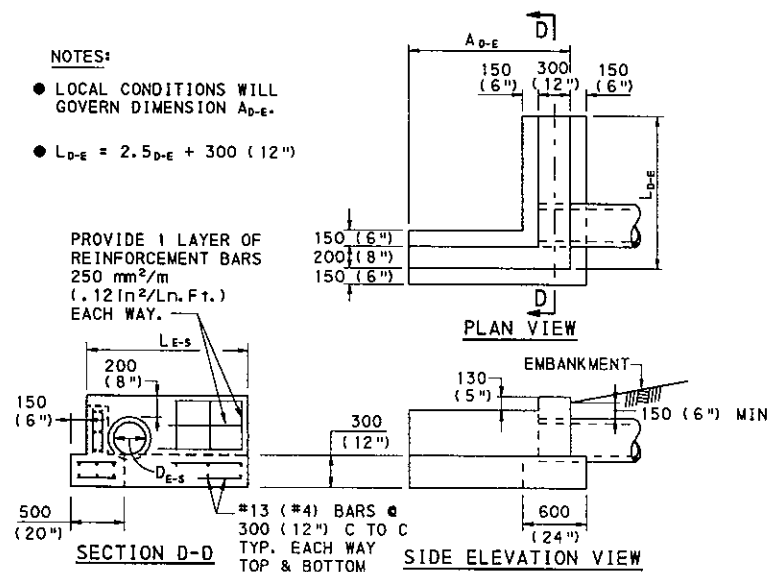
RECOMMENDED APR. 16, 2001
 RECOMMENDED APR. 16, 2001
 SHT 1 OF 1
 DIRECTOR, BUREAU OF DESIGN
 CHIEF ENGINEER
 RC-28M

09-APR-2001

NOTES:

- LOCAL CONDITIONS WILL GOVERN DIMENSION A_{D-E}.
- L_{D-E} = 2.5D_E + 300 (12")

PROVIDE 1 LAYER OF REINFORCEMENT BARS 250 mm²/m (.12 in²/Ln. Ft.) EACH WAY.

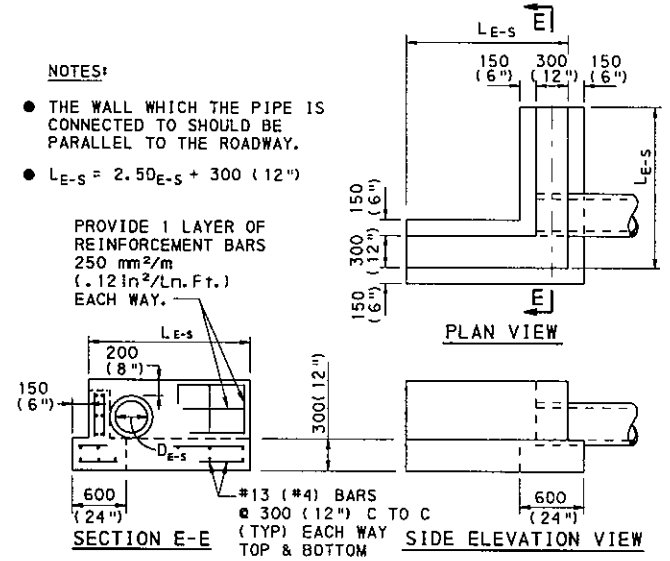


TYPE D-E ENDWALL

NOTES:

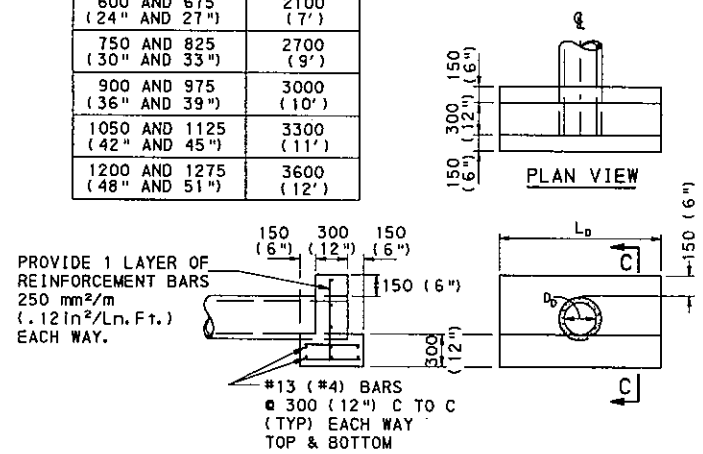
- THE WALL WHICH THE PIPE IS CONNECTED TO SHOULD BE PARALLEL TO THE ROADWAY.
- L_{E-S} = 2.5D_{E-S} + 300 (12")

PROVIDE 1 LAYER OF REINFORCEMENT BARS 250 mm²/m (.12 in²/Ln. Ft.) EACH WAY.

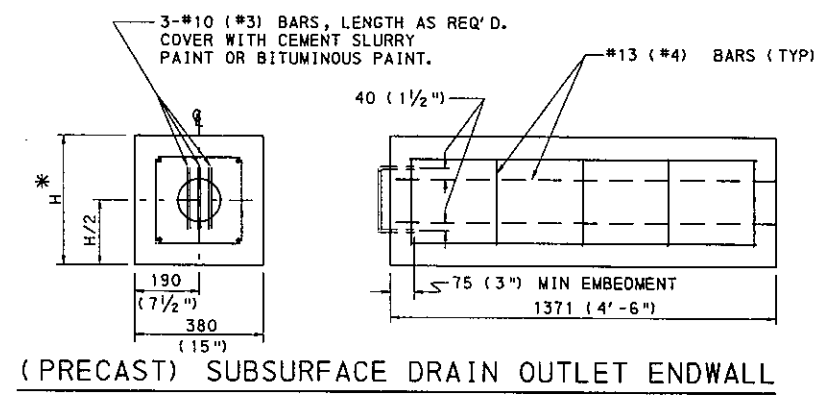


TYPE E-S ENDWALL

PIPE DIAMETER	L _D
450 AND 525 (18" AND 21")	1500 (5')
600 AND 675 (24" AND 27")	2100 (7')
750 AND 825 (30" AND 33")	2700 (9')
900 AND 975 (36" AND 39")	3000 (10')
1050 AND 1125 (42" AND 45")	3300 (11')
1200 AND 1275 (48" AND 51")	3600 (12')

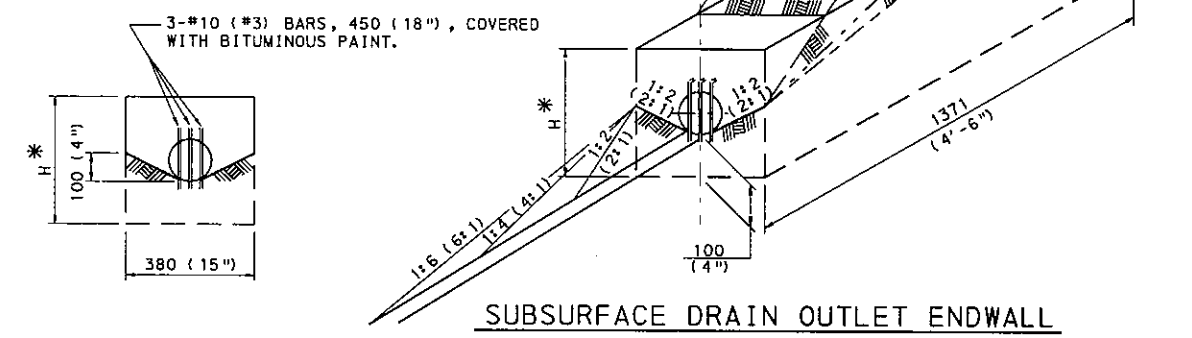


TYPE D ENDWALL

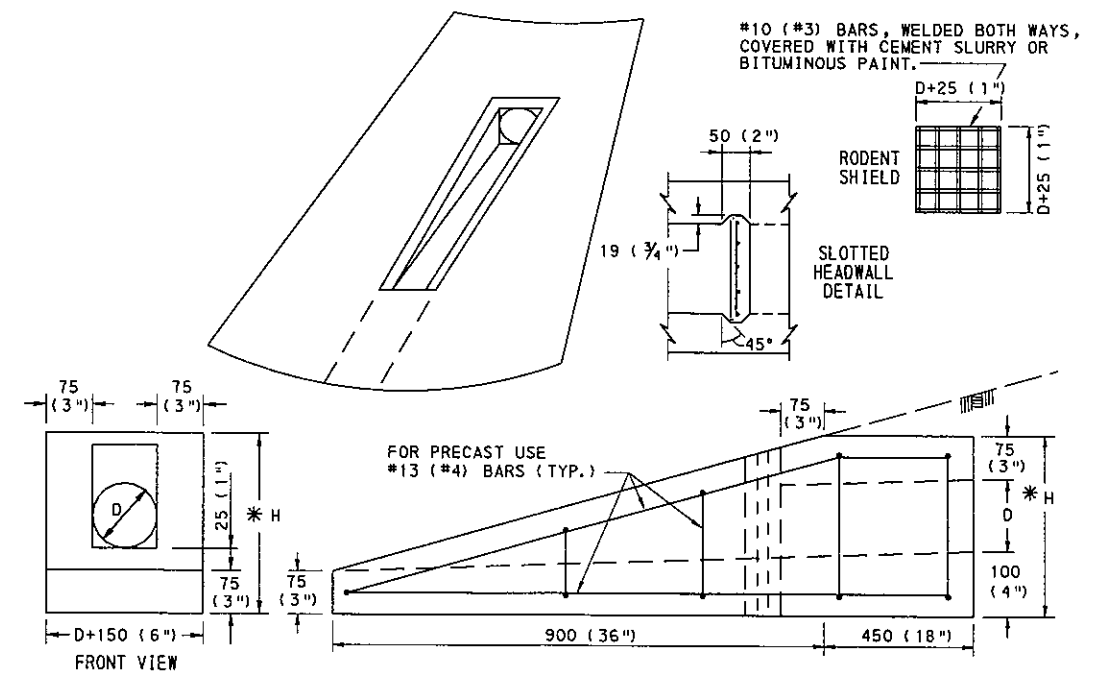


(PRECAST) SUBSURFACE DRAIN OUTLET ENDWALL

- * H = 300 (12") FOR 100 (4") Ø PIPE
- 380 (15") FOR 150 (6") Ø PIPE
- 400 (16") FOR 200 (8") Ø PIPE
- 450 (18") FOR 250 (10") Ø PIPE



SUBSURFACE DRAIN OUTLET ENDWALL



SUBSURFACE DRAIN OUTLET ENDWALL (SLOPED)

NOTES

- PROVIDE MATERIALS AND WORKMANSHIP IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408, SECTION 605 AND SECTION 714.
- THIS STANDARD DEPICTS THE SHAPE AND DIMENSIONS REQUIRED FOR UNIFORMITY AND COMPATIBILITY. PERMIT ONLY ITEMS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR DEVIATIONS OR MODIFICATIONS TO THE STANDARDS, SUBMIT SHOP DRAWINGS FOR APPROVAL.
- USE CLASS A CONCRETE OR BETTER & CHAMFER EXPOSED EDGES AT 25 (1").
- PROVIDE PIPE OPENING SIZE IN PRECAST UNITS AT LEAST 50 (2") BUT NOT MORE THAN 100 (4") LARGER THAN THE OUTSIDE DIAMETER OF THE PIPE.
- PROVIDE SUITABLE LIFTING DEVICES FOR HANDLING AND INSTALLATION OF PRECAST ENDWALLS. GALVANIZE METAL DEVICES AS SPECIFIED IN PUB 408/2000 SECTION 1105.
- PROVIDE NON-SHRINK EPOXY GROUT THROUGHOUT THE CONTACT SURFACE WHEN CONNECTING WING AND HEADWALL SECTION TO BASE SECTION. PROVIDE JOINT SEALANT MATERIAL ALONG INTERFACE BETWEEN WING AND HEADWALL SECTION AND BASE SECTION.
- PROVIDE MORTAR BED OF 25 (1") PLACED ON TOP OF THE SUBBASE MATERIAL FOR LEVELING PURPOSES, WHEN REQUIRED.
- PROVIDE REINFORCEMENT, 250 mm²/m (.12 in²/Ln. Ft.) IN ACCORDANCE WITH PUBLICATION 408, SECTION 709.
- THE SLOPED SUBSURFACE DRAIN OUTLET ENDWALL IS DESIGNATED FOR INSTALLATION ALONG INTERSTATES AND EXPRESSWAYS WHERE THE SUBSURFACE DRAIN WILL OUTLET ON MEDIAN AND/OR OUTSIDE SLOPES THAT ARE SUBJECT TO MOWING.
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

ENDWALLS
CAST-IN-PLACE & PRECAST

METRIC EQUATION

$$**SD = \frac{D_{D-W}}{\cos \theta} = \frac{D_{D-W}}{\sin \text{SKEW } \alpha}$$

$$L_{D-W} = SD + 0.70 \text{ m}$$

$$W_1 = \frac{2D_{D-W} - 0.60 \text{ m}}{\cos \theta}$$
 FOR 1:2 SLOPE

$$W_1 = \frac{X}{\cos \theta} (D_{D-W} - 0.5 \frac{1.0}{X})$$
 (FOR VARIABLE SLOPE WHEN X EQUALS HORIZONTAL DIMENSION OF THE SLOPE DESIGNATION.)

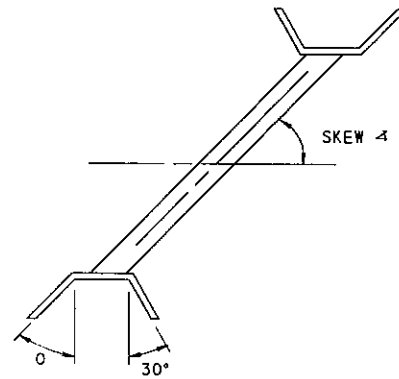
ENGLISH EQUATION

$$**SD = \frac{D_{D-W}}{\cos \theta} = \frac{D_{D-W}}{\sin \text{SKEW } \alpha}$$

$$L_{D-W} = SD + 2.3'$$

$$W_1 = \frac{2D_{D-W} - 2.0'}{\cos \theta}$$
 FOR 2:1 SLOPE

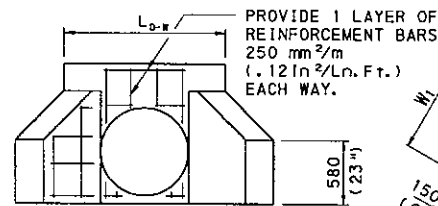
$$W_1 = \frac{X}{\cos \theta} (D_{D-W} - 0.5 \frac{1.0}{X})$$
 (FOR VARIABLE SLOPE WHEN X EQUALS HORIZONTAL DIMENSION OF THE SLOPE DESIGNATION.)



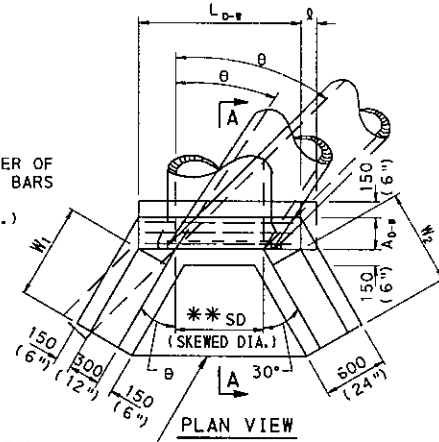
#13 (#4) BARS @ 300 (12") C TO C TYP. EACH WAY TOP & BOTT.



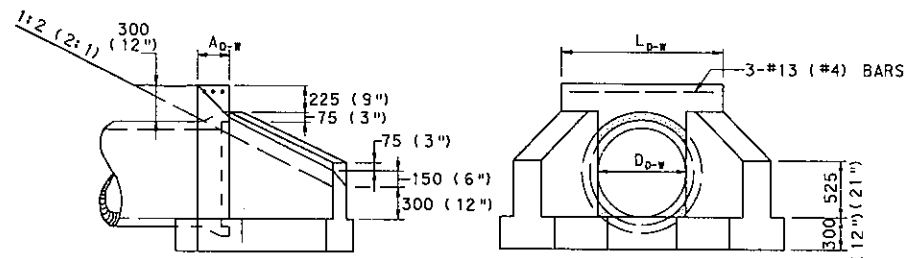
FRONT ELEVATION VIEW
BASE SECTION FOR TYPE D-W



FRONT ELEVATION VIEW
HEAD & WINGWALL SECTION
FOR TYPE D-W



ALLOW FOR OPTIONAL APRON ON PRECAST UNITS.



SECTION A-A

FRONT ELEVATION VIEW

TYPE D-W ENDWALL

(SEE TABLE A FOR DIMENSIONS NOT INDICATED.)

TABLE A (mm)
1 : 2 EMBANKMENT SLOPES

PIPE DIAMETER	SKEW $\alpha = 90^\circ$ TO 60° $\theta = 30^\circ$			SKEW $\alpha = 55^\circ$ $\theta = 35^\circ$			SKEW $\alpha = 50^\circ$ $\theta = 40^\circ$			SKEW $\alpha = 45^\circ$ $\theta = 45^\circ$			SKEW $\alpha = 40^\circ$ $\theta = 50^\circ$			SKEW $\alpha = 30^\circ$ $\theta = 60^\circ$			SKEW $\alpha = 20^\circ$ $\theta = 70^\circ$			SKEW $\alpha = 10^\circ$ $\theta = 80^\circ$			W ₂	A _{D-W}	
	D _{D-W} (mm)	L _{D-W} (m)	W ₁ (m)	L _{D-W} (m)	W ₁ (m)	L _{D-W} (m)	W ₁ (m)	L _{D-W} (m)	W ₁ (m)	L _{D-W} (m)	W ₁ (m)	L _{D-W} (m)	W ₁ (m)	L _{D-W} (m)	W ₁ (m)	L _{D-W} (m)	W ₁ (m)	L _{D-W} (m)	W ₁ (m)	L _{D-W} (m)	W ₁ (m)	L _{D-W} (m)	W ₁ (m)	L _{D-W} (m)			W ₁ (m)
900	1.74	0	1.39	1.80	0.10	1.46	1.87	0.15	1.57	1.97	0.20	1.70	2.10	0.23	1.87	2.50	0.41	2.40	3.33	0.53	3.51	5.88	1.52	6.91	1.39	300	
1050	1.91	0	1.73	1.98	0.10	1.83	2.07	0.15	1.96	2.18	0.20	2.12	2.33	0.23	2.33	2.80	0.41	3.00	3.77	0.53	4.39	6.75	1.52	8.64	1.73	300	
1200	2.09	0	2.08	2.16	0.10	2.20	2.27	0.15	2.35	2.40	0.20	2.55	2.57	0.23	2.80	3.10	0.41	3.60	4.21	0.53	5.26	7.61	1.52	10.37	2.08	300	
1350	2.26	0	2.42	2.35	0.10	2.56	2.46	0.15	2.74	2.61	0.20	2.97	2.80	0.23	3.27	3.40	0.41	4.20	4.65	0.53	6.14	8.47	1.52	12.09	2.42	300	
1500	2.43	0	2.77	2.53	0.10	2.93	2.66	0.15	3.13	2.82	0.20	3.39	3.03	0.23	3.73	3.70	0.41	4.80	5.09	0.53	7.02	9.34	1.52	13.82	2.77	375	
1800	2.78	0	3.46	2.90	0.10	3.66	3.05	0.15	3.92	3.25	0.20	4.24	3.50	0.23	4.67	4.30	0.41	6.00	5.96	0.53	8.77	11.07	1.52	17.28	3.46	375	

TABLE A (inches)
2 : 1 EMBANKMENT SLOPES

PIPE DIAMETER	SKEW $\alpha = 90^\circ$ TO 60° $\theta = 30^\circ$			SKEW $\alpha = 55^\circ$ $\theta = 35^\circ$			SKEW $\alpha = 50^\circ$ $\theta = 40^\circ$			SKEW $\alpha = 45^\circ$ $\theta = 45^\circ$			SKEW $\alpha = 40^\circ$ $\theta = 50^\circ$			SKEW $\alpha = 30^\circ$ $\theta = 60^\circ$			SKEW $\alpha = 20^\circ$ $\theta = 70^\circ$			SKEW $\alpha = 10^\circ$ $\theta = 80^\circ$			W ₂	A _{D-W}	
	D _{D-W} (IN.)	L _{D-W} (FT.)	W ₁ (FT.)	L _{D-W} (FT.)	W ₁ (FT.)	L _{D-W} (FT.)	W ₁ (FT.)	L _{D-W} (FT.)	W ₁ (FT.)	L _{D-W} (FT.)	W ₁ (FT.)	L _{D-W} (FT.)	W ₁ (FT.)	L _{D-W} (FT.)	W ₁ (FT.)	L _{D-W} (FT.)	W ₁ (FT.)	L _{D-W} (FT.)	W ₁ (FT.)	L _{D-W} (FT.)	W ₁ (FT.)	L _{D-W} (FT.)	W ₁ (FT.)	L _{D-W} (FT.)			W ₁ (FT.)
36	5.8	0	4.6	6.0	.33	4.9	6.2	.5	5.2	6.5	.67	5.7	7.0	.75	6.2	8.3	1.33	8.0	11.1	1.75	11.7	19.6	5.0	23.0	4.6	12	
42	6.3	0	5.8	6.6	.33	6.1	6.9	.5	6.5	7.3	.67	7.1	7.8	.75	7.8	9.3	1.33	10.0	12.5	1.75	14.6	22.5	5.0	28.8	5.8	12	
48	6.9	0	6.9	7.2	.33	7.3	7.5	.5	7.8	8.0	.67	8.5	8.5	.75	9.4	10.3	1.33	12.0	14.0	1.75	17.5	25.3	5.0	34.6	6.9	12	
54	7.5	0	8.0	7.8	.33	8.5	8.2	.5	9.1	8.7	.67	9.9	9.3	.75	10.9	11.3	1.33	14.0	15.5	1.75	20.5	28.2	5.0	40.3	8.0	12	
60	8.1	0	9.2	8.4	.33	9.8	8.8	.5	10.4	9.4	.67	11.3	10.1	.75	12.5	12.3	1.33	16.0	16.9	1.75	23.4	31.1	5.0	46.0	9.2	15	
72	9.2	0	11.5	9.6	.33	12.2	10.1	.5	13.0	10.8	.67	14.1	11.7	.75	15.6	14.3	1.33	20.0	19.8	1.75	29.2	36.9	5.0	57.6	11.5	15	

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

ENDWALLS
CAST-IN-PLACE & PRECAST

NOTES

1. CONSTRUCTION REQUIREMENTS:
 - A. CONSTRUCT IN ACCORDANCE WITH PUBLICATION 408, SECTIONS 605, 606 AND 714; AND AS MODIFIED HEREIN.
 - B. MINIMUM CONCRETE CLASS:

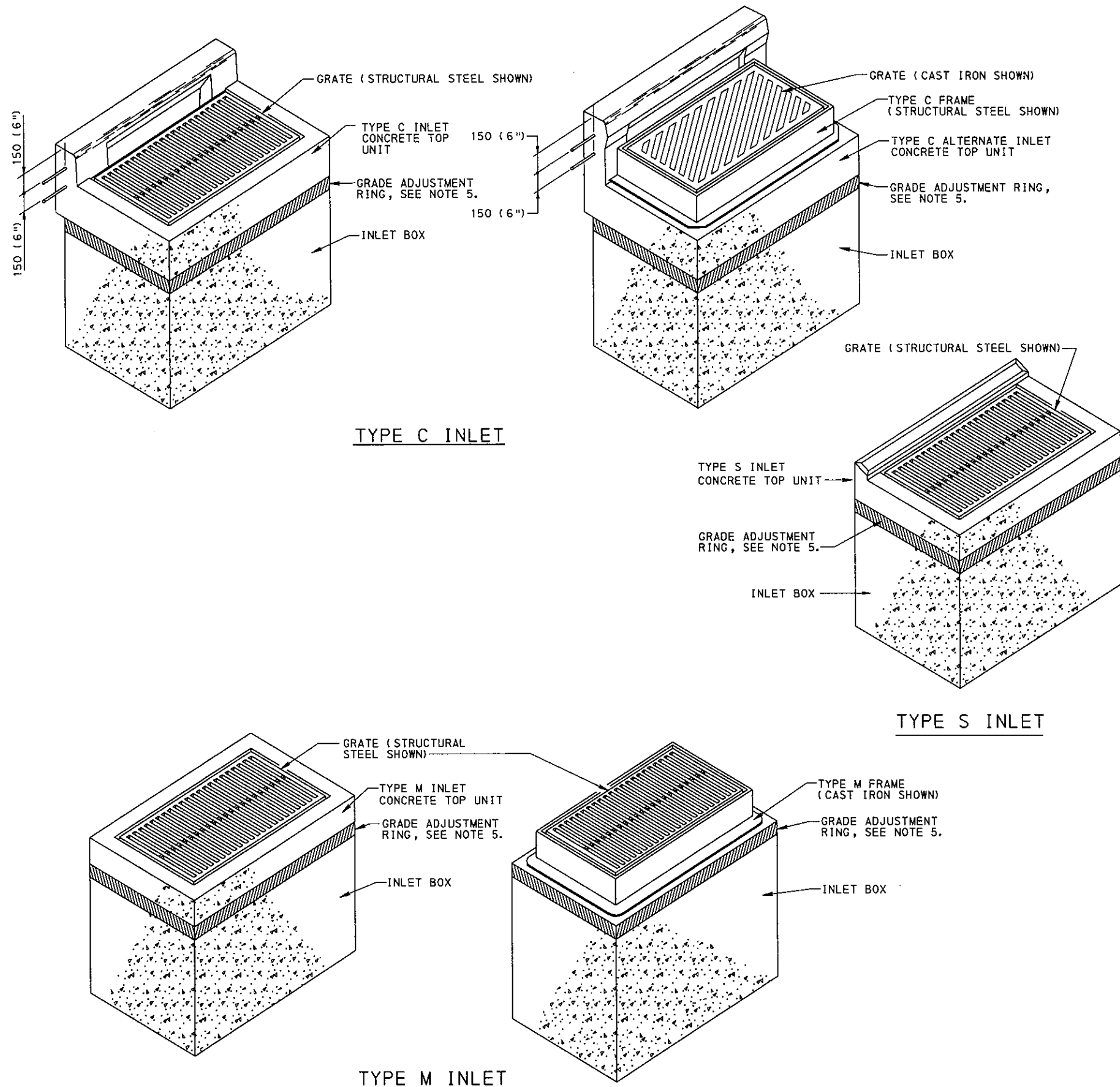
CAST-IN-PLACE	CLASS A
PRECAST	CLASS AA
 - C. PROVIDE STEEL REINFORCEMENT IN ACCORDANCE WITH PUBLICATION 408, SECTION 709. PROVIDE MINIMUM YIELD STRENGTH OF 400 MPa (60,000 PSI).
 - D. CLEAR COVER FOR STEEL:

WALLS:	CAST-IN PLACE	50 (2")
	PRECAST	40 (1 1/2")
FOOTINGS:	CAST-IN PLACE	60 (2 1/2") TOP BARS
		80 (3") BOTTOM BARS
		50 (2") SIDE COVER
	PRECAST	50 (2") TOP BARS
	40 (1 1/2") BOTTOM BARS	
	40 (1 1/2") SIDE COVER	
SLABS:	CAST-IN PLACE	50 (2") TOP & BOTTOM BARS
2. THIS SHEET DEPICTS THE VARIOUS COMPONENTS REQUIRED FOR COMPLETE INLET ASSEMBLIES. FOR INDIVIDUAL COMPONENTS AND OTHER SPECIAL DETAILS, SEE THE FOLLOWING:
 - SHEET 2 OF 10 FOR CONCRETE TOP UNITS.
 - SHEET 3, 4 & 5 OF 10 FOR GRATES AND GRADE ADJUSTMENT RINGS.
 - SHEET 6 OF 10 FOR FRAMES.
 - SHEET 7 OF 10 FOR STANDARD INLET BOXES (CAST-IN-PLACE).
 - SHEET 8 OF 10 FOR STANDARD INLET BOXES (PRECAST).
 - SHEET 9 OF 10 FOR MODIFIED INLET BOXES (CAST-IN-PLACE AND PRECAST).
 - SHEET 10 OF 10 FOR TYPE D-H INLET.
3. EACH TYPE OF INLET SHOWN IS SUITED FOR A PARTICULAR SITUATION AS FOLLOWS:
 - TYPE C INLET IS DESIGNATED FOR INSTALLATION WITH NON-MOUNTABLE CURBS.
 - TYPE M INLET IS DESIGNATED FOR INSTALLATION IN MEDIAN AREAS AND MOUNTABLE CURBS.
 - TYPE S INLET IS DESIGNATED FOR INSTALLATION IN SHOULDER SWALE AREAS.
4. THE SELECTION OF COMPONENTS TO ACHIEVE A SPECIFIED INLET ASSEMBLY IS THE CONTRACTOR'S RESPONSIBILITY.
5. USE PRECAST CONCRETE OR STEEL GRADE ADJUSTMENT RINGS WHEN REQUIRED. (REHABILITATION PROJECTS)
6. FOR WALL REINFORCEMENT, BOTH DIRECTIONS, USE 250 (10") 2/m MIN EACH WAY, EACH FACE 152 (6") MAX. SPACING.
7. FOR FOOTING REINFORCEMENT, TOP AND BOTTOM, USE #13 (#4) BARS AT 300 (12") CENTERS EACH WAY OR 420 (17") 2/m WWF 152 (6") MAX. SPACING.
8. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.
9. PROVIDE WEEP HOLES ON INLET BOXES WHEN REQUIRED.

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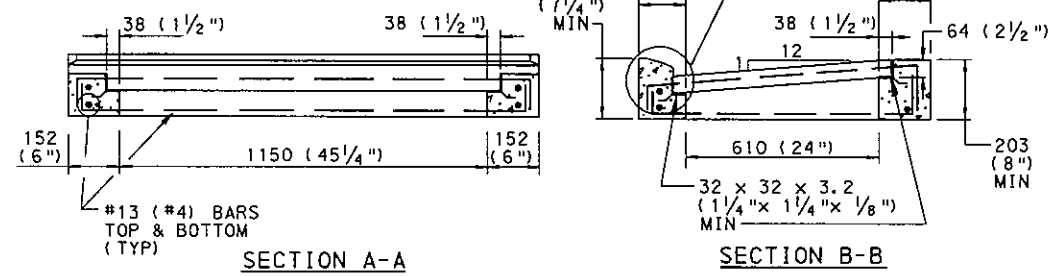
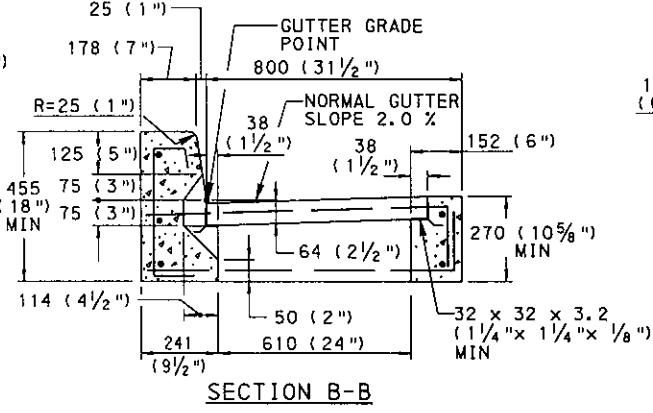
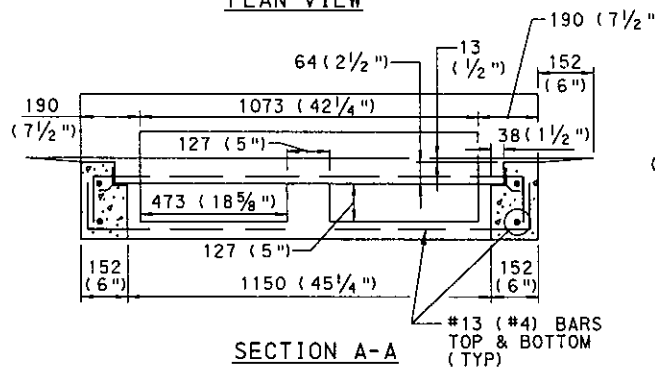
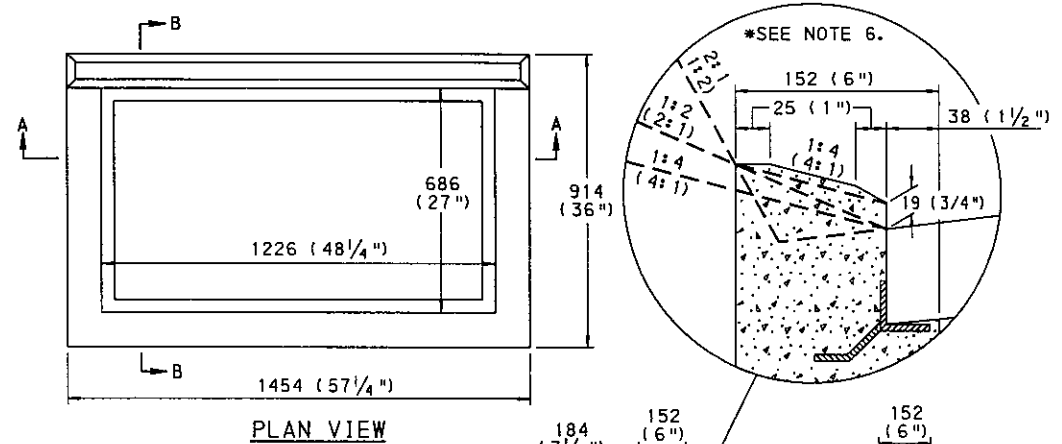
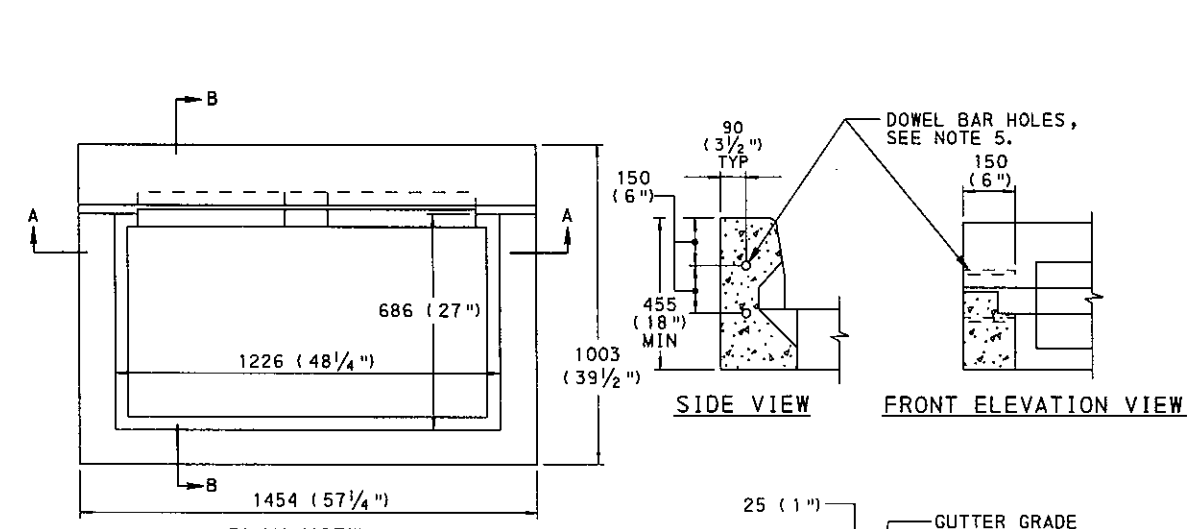
INLETS
INLET ASSEMBLIES



TYPE C INLET

TYPE S INLET

TYPE M INLET



TYPE S

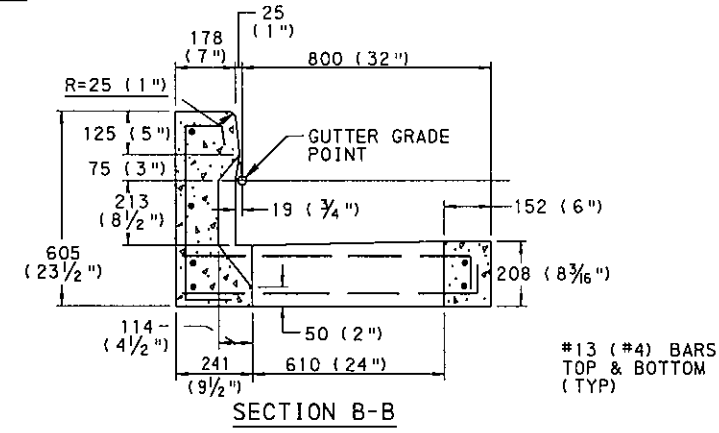
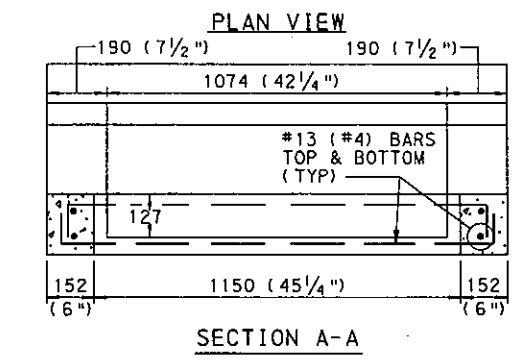
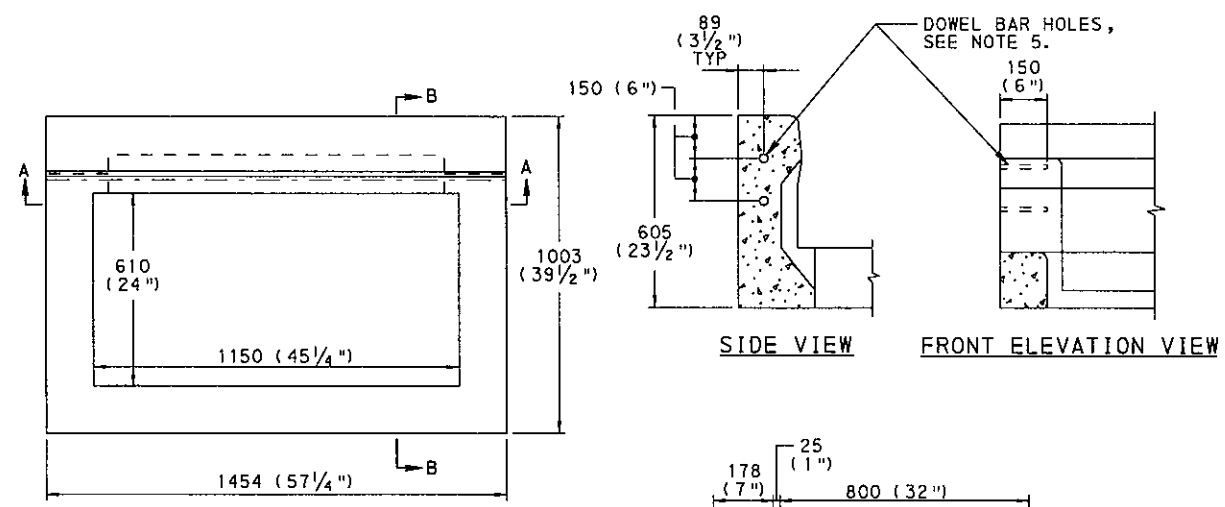
- NOTES**
1. THIS SHEET DEPICTS THE SHAPE AND DIMENSIONS REQUIRED FOR UNIFORMITY AND COMPATIBILITY. PERMIT ONLY TOP UNITS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR DEVIATIONS OR MODIFICATIONS OF THE STANDARDS SUBMIT SHOP DRAWINGS FOR APPROVAL.
 2. CAST-IN-PLACE TOP UNITS MAY BE MONOLITHIC WITH THE INLET BOX.
 3. PROVIDE ANGLES EMBEDDED IN THE CONCRETE AS A BEARING AREA FOR THE GRATE FOR ALL TOP UNITS WHICH SEAT THE GRATE DIRECTLY WITHIN THE UNIT.
 4. PLACE A TYPE M INLET ADJACENT TO THE BACK EDGE OF THE CURB, FLUSH WITH THE PAVEMENT SURFACE, WHEN REQUIRED WITHIN A CONCRETE MOUNTABLE CURB SECTION.
 5. DOWEL TYPE C INLET TOP UNITS WITH 2-#25 x 300 (2-#8 x 1'-0") DOWEL BARS AND PLACE PREMOLDED EXPANSION JOINT FILLER 6 (1/4) WIDE WHEN CONNECTING TO ADJACENT CURB SECTIONS.
 6. THE PLACEMENT OF THE TYPE S INLET RELATIVE TO THE GUTTER INVERT IS DEPENDENT ON THE RATE OF BACK SLOPE. FOR BACK SLOPES GREATER THAN 1:2 (2:1), LOCATE THE INLET WHERE THE BACK SLOPE LINE INTERSECTS THE BACK, TOP, OUTSIDE CORNER OF THE INLET. FOR BACK SLOPES LESS THAN 1:2 (2:1), LOCATE THE INLET WHERE THE BACK SLOPE LINE INTERSECTS THE EDGE OF THE INLET GRATE.
 7. TAPERS MAY BE PROVIDED ON INSIDE VERTICAL FACES OF PRECAST INLET TOPS TO FACILITATE FORM STRIPPING. TAPERS WILL RESULT IN INTERNAL BOTTOM DIMENSIONS THAT VARY TO A MAXIMUM OF 25 mm (1").

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

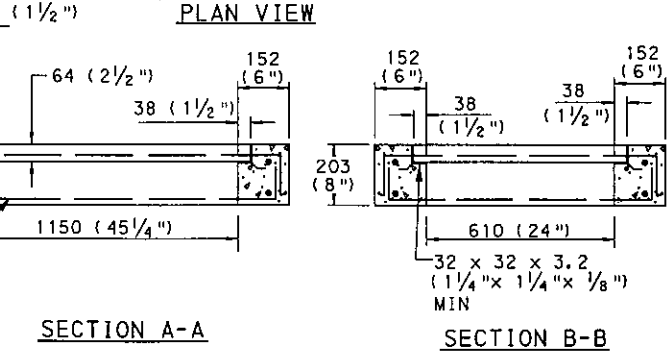
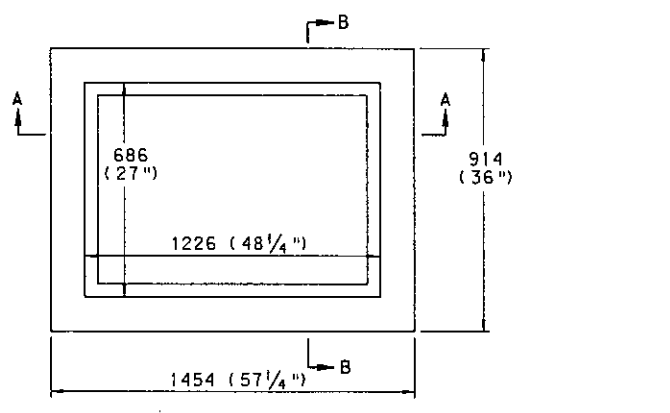
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

INLETS
CONCRETE TOP UNITS
CAST-IN-PLACE AND PRECAST

TYPE C



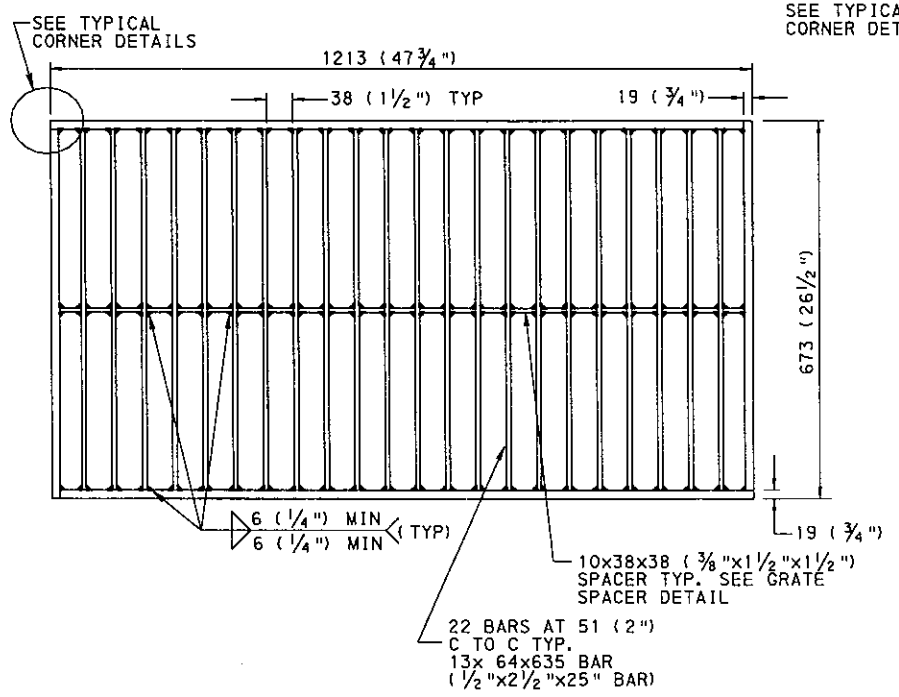
TYPE C ALTERNATE



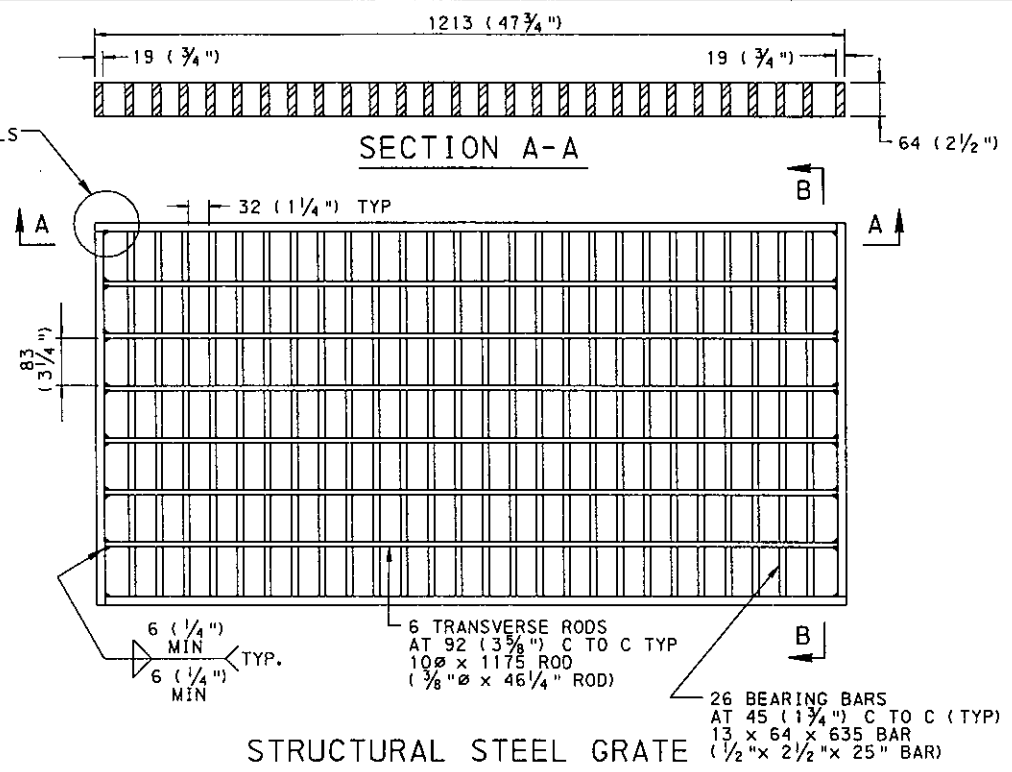
TYPE M

NOTES

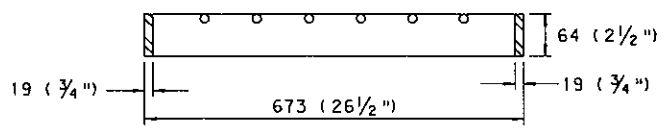
1. THIS SHEET DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. IT DOES NOT INCLUDE DETAILS REQUIRED FOR FABRICATION OR MANUFACTURING. PERMIT ONLY GRATES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR DEVIATIONS OR MODIFICATIONS OF THE STANDARDS SUBMIT SHOP DRAWING FOR APPROVAL.
2. WELD STRUCTURAL STEEL GRATES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408, SECTION 1105.03(r).
3. PROVIDE TRANSVERSE BARS MEETING THE REQUIREMENTS OF PUBLICATION 408.
4. PROVIDE BICYCLE-SAFE, STRUCTURAL STEEL OR CAST IRON VANE GRATES FOR INSTALLATION WHERE BICYCLE TRAFFIC IS ANTICIPATED, SUCH AS CURBED ROADWAYS IN URBAN AREAS OR ROADWAYS SPECIFICALLY ESTABLISHED AND SIGNED AS BIKEWAYS OR HAVING BIKE LANES. ALTERNATE BICYCLE-SAFE GRATE DESIGNS SHALL REQUIRE A SHOP DRAWING SUBMISSION, AS SPECIFIED IN NOTE 1, AND SHALL CONFORM TO THE DIMENSIONAL REQUIREMENTS FOR PROPER INSTALLATION WITH THE CURRENT CONCRETE TOP UNITS.
5. FABRICATE SLOTS BY BURNING, DRILLING, SHEARING OR PUNCHING. HAVE THE BOTTOM OF ALL BURNED OR DRILLED SLOTS CONFORM TO THE SHAPE OF THE ROD.
6. PROVIDE STRUCTURAL STEEL GRATES WITH THE GRATE SPACERS LOCATED FLUSH ALONG THE TOP SURFACE OF THE GRATE.



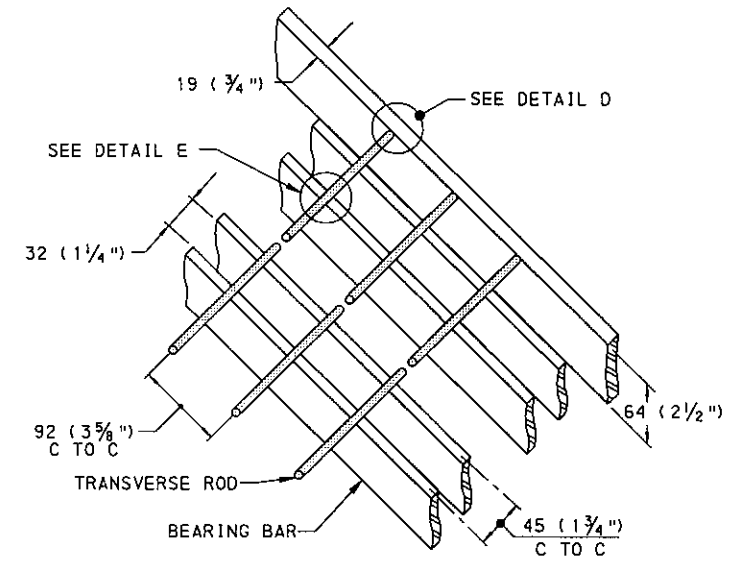
STRUCTURAL STEEL GRATE



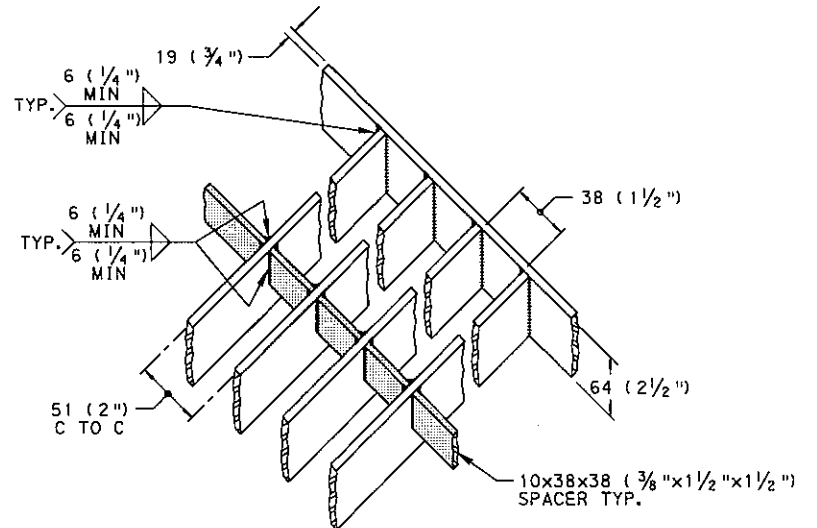
STRUCTURAL STEEL GRATE BICYCLE SAFE



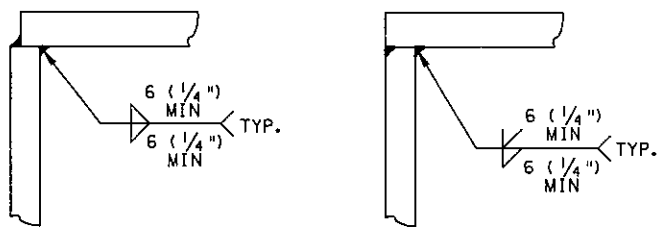
SECTION B-B



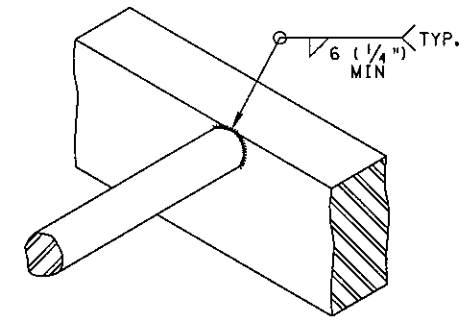
BAR & ROD SPACING DETAIL



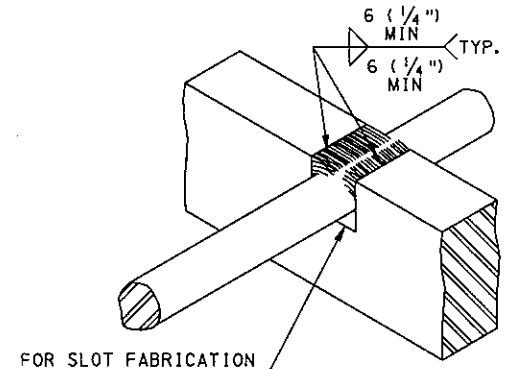
GRATE SPACER DETAIL



TYPICAL CORNER DETAILS



DETAIL D



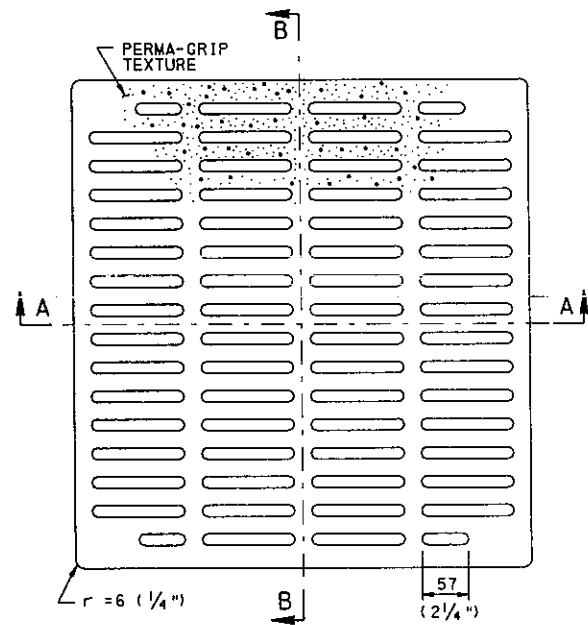
DETAIL E

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

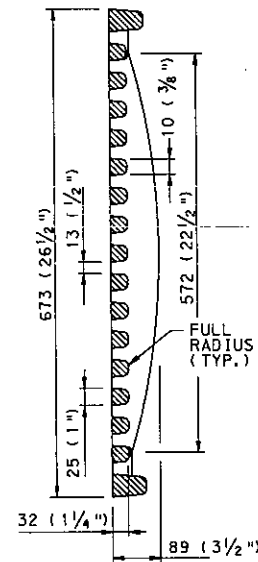
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

INLET GRATES

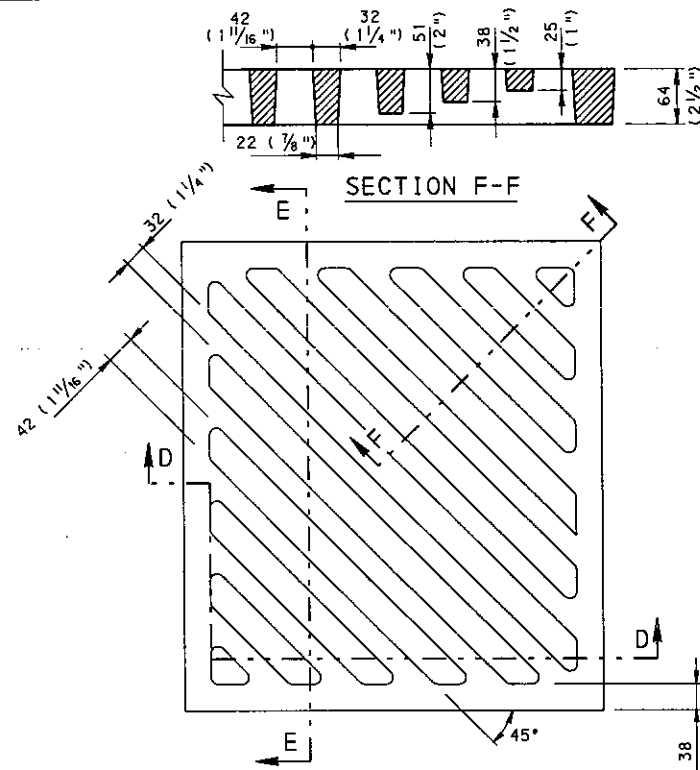
RECOMMENDED APR. 16, 2001 <i>Dean A. Schmitz</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>Henry J. Hoffman</i> CHIEF ENGINEER	SHT 3 OF 10 RC-34M
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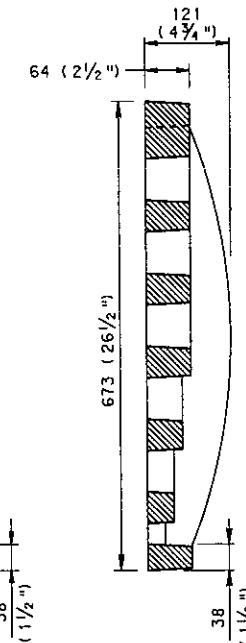
PLAN - BICYCLE-SAFE GRATE



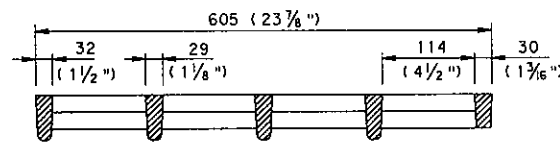
SECTION B-B



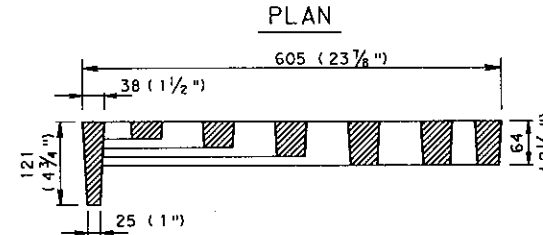
SECTION F-F



SECTION E-E

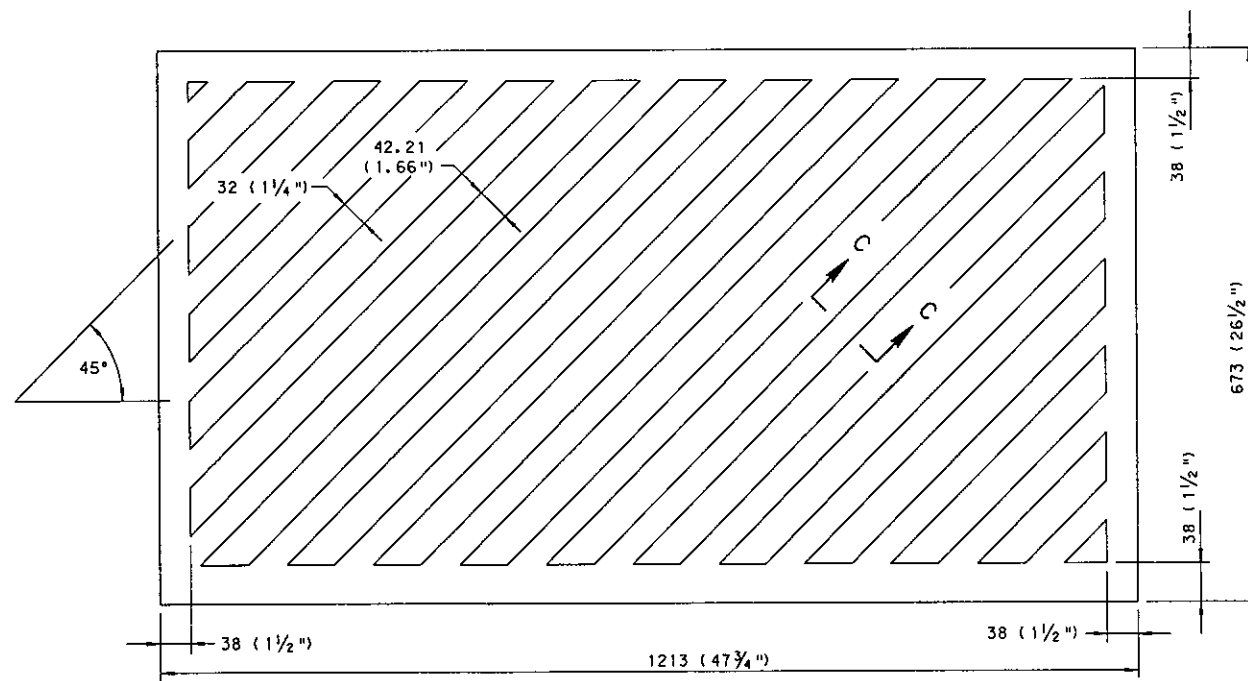


SECTION A-A

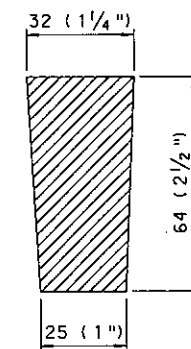


SECTION D-D

TWO PIECE GRATES



PLAN - ONE PIECE GRATE



SECTION C-C

CAST GRAY IRON GRATES

ASTM A-48, CLASS 35B
(SEE NOTE 3)

NOTES

1. THIS SHEET DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. IT DOES NOT INCLUDE DETAILS REQUIRED FOR FABRICATION OR MANUFACTURING. PERMIT ONLY GRATES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR DEVIATIONS OR MODIFICATIONS OF THE STANDARDS SUBMIT SHOP DRAWINGS FOR APPROVAL.
2. PROVIDE BICYCLE-SAFE, STRUCTURAL STEEL OR CAST IRON VANE GRATES FOR INSTALLATION WHERE BICYCLE TRAFFIC IS ANTICIPATED, SUCH AS CURBED ROADWAYS IN URBAN AREAS OR ROADWAYS SPECIFICALLY ESTABLISHED AND SIGNED AS BIKEWAYS OR HAVING BIKE LANES. ALTERNATE BICYCLE-SAFE GRATE DESIGNS SHALL REQUIRE A SHOP DRAWING SUBMISSION, AS SPECIFIED IN NOTE 1, AND SHALL CONFORM TO THE DIMENSIONAL REQUIREMENTS FOR PROPER INSTALLATION WITH THE CURRENT CONCRETE TOP UNITS.
3. CAST IRON GRATES MAY BE USED AS ALTERNATES TO STRUCTURAL STEEL GRATES PROVIDED THEY ARE SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15 AND APPROVED FOR HS25 LOADING. CAST IRON GRATES NOT APPROVED FOR HS25 LOADING MAY BE USED OUTSIDE OF THE TRAVEL LANES; AT THE EDGE OF OUTSIDE SHOULDERS, SWALES, WIDE MEDIAN SWALES AND INFIELD AREAS.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

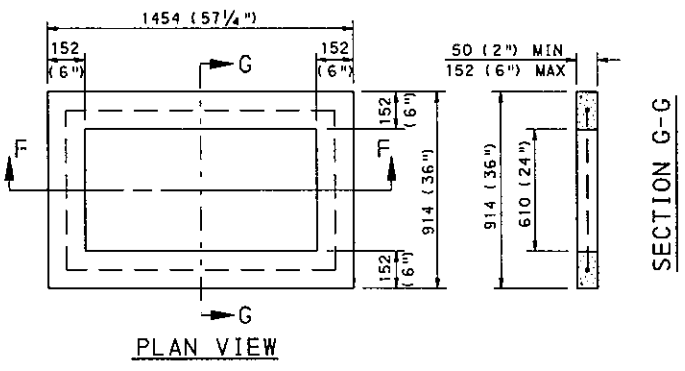
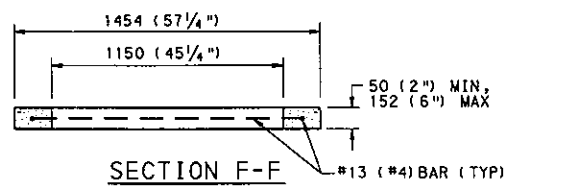
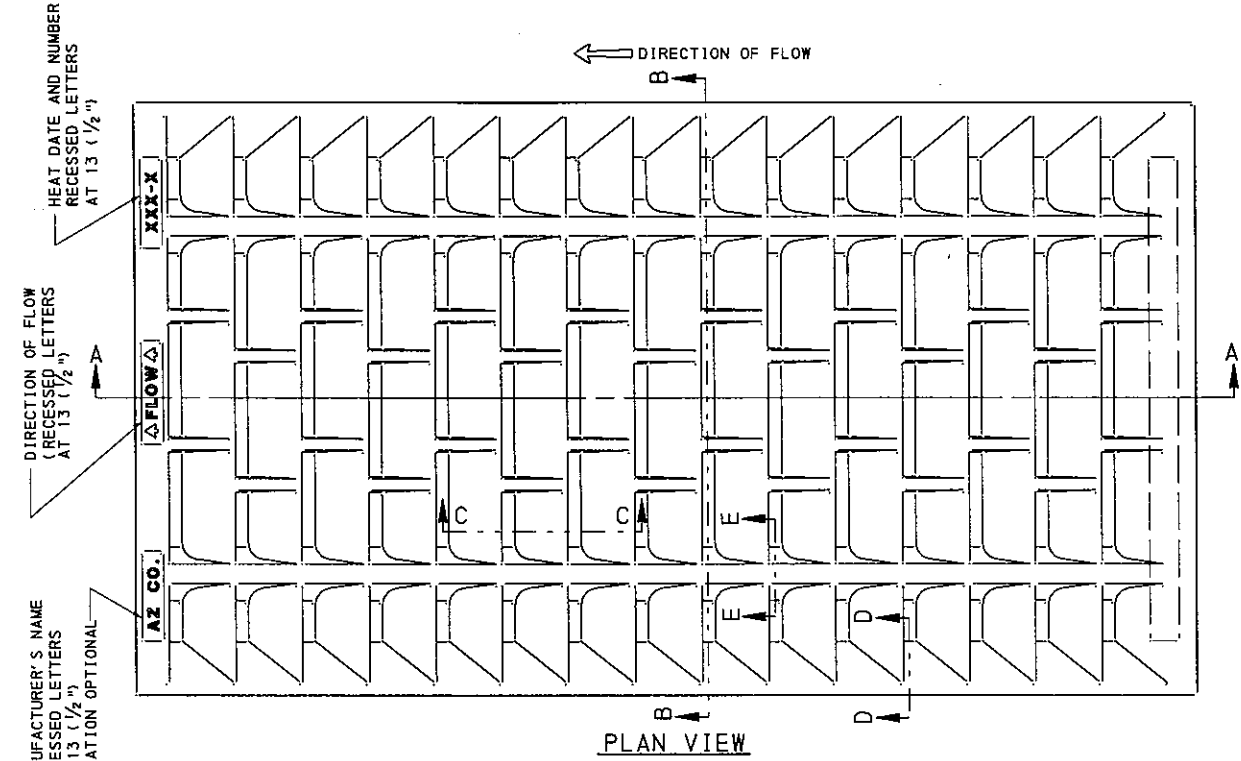
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLET
GRATES

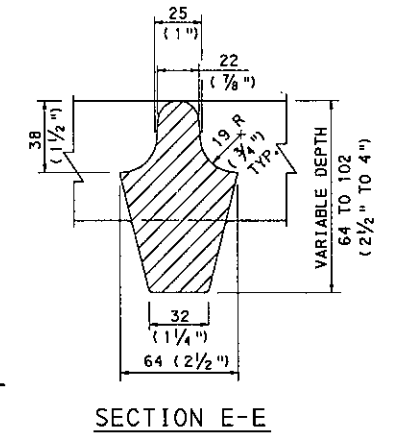
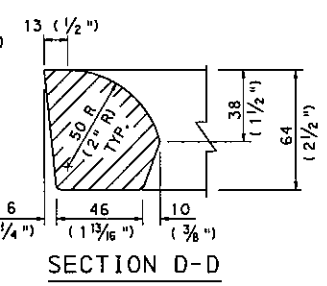
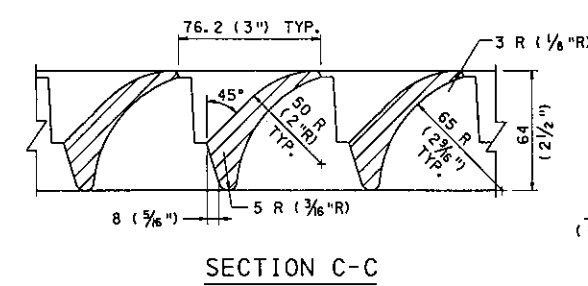
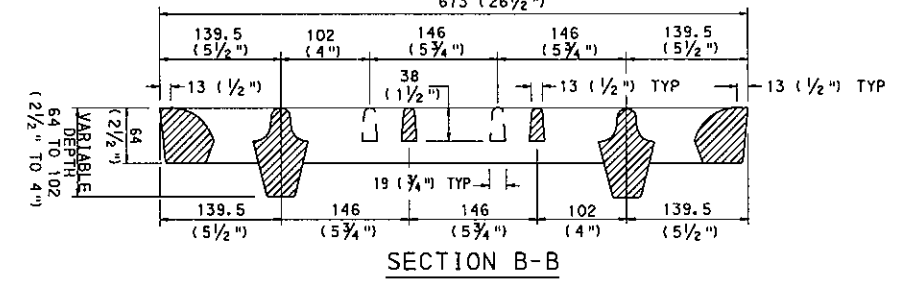
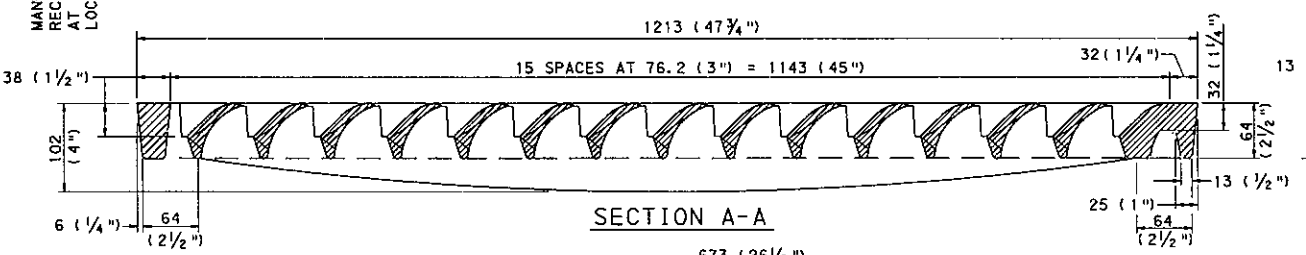
RECOMMENDED APR. 16, 2001 RECOMMENDED APR. 16, 2001 SHT 4 OF 10
Near H. Schur *Gary J. Hoffman*
 DIRECTOR, BUREAU OF DESIGN CHIEF ENGINEER
 RC-34M

NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408, SECTIONS 605, 606 AND 714. PERMIT ONLY GRATES AND GRADE ADJUSTMENT SYSTEMS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR DEVIATIONS OR MODIFICATIONS OF THE STANDARDS SUBMIT SHOP DRAWINGS FOR APPROVAL.
2. INSTALL VANE GRATES WITH CURVE VANES FACING THE DIRECTION OF FLOW.
3. GRADE ADJUSTMENT RINGS :
 - A. CUSTOM FABRICATE EACH ADJUSTMENT RING FROM MEASUREMENTS PROVIDED WITH EACH ORDER.
 - B. MANUFACTURE BAR STOCK AND RETAINER CLIP FROM U.S. MADE CARBON STEEL MEETING OR EXCEEDING THE MINIMUM REQUIREMENTS OF ASTM A-36M AND AASHTO TABLE 10.32.1A.
 - C. REQUIRE FULL CIRCUMFERENTIAL WELDS ON BOTH TOP AND BOTTOM RINGS. MAKE THE INNER WELD A BEVEL GROOVE WELD (FLUSH FINISH) FOR PROPER SEATING OF GRATE AND MAKE THE OUTER WELD A FILLET WELD.
 - D. PROVIDE AN ADJUSTMENT RING WHICH IS FLUSH WITH COVER AND DOES NOT ALLOW EXCESSIVE MOVEMENT. PROVIDE AN ADJUSTMENT RING WHICH CONFORMS TO THE SHAPE OF THE ORIGINAL FRAME.
4. PROVIDE RADIUS OF 3 (1/8") TYPICAL FOR ALL FILLETS AND ROUNDS, UNLESS NOTED.
5. ATTACH STEEL GRADE ADJUSTMENT RINGS RIGIDLY TO THE FRAME AND SET PRECAST CONCRETE GRADE ADJUSTMENT RINGS ON A MORTAR BED.
6. CAST IRON GRATES MAY BE USED AS ALTERNATES TO STRUCTURAL STEEL GRATES PROVIDED THEY ARE SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15 AND APPROVED FOR HS25 LOADING. CAST IRON GRATES NOT APPROVED FOR HS25 LOADING MAY BE USED OUTSIDE OF THE TRAVEL LANES, AT THE EDGE OF OUTSIDE SHOULDERS, SWALES, WIDE MEDIAN SWALES AND INFIELD AREAS.

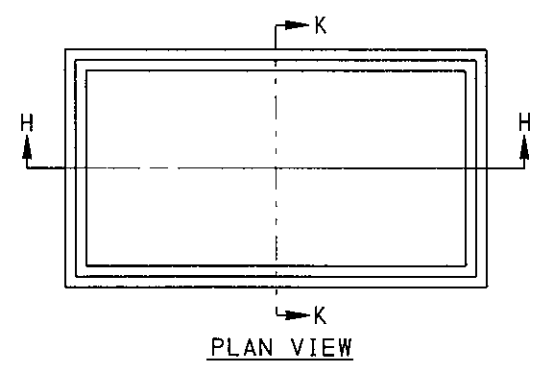
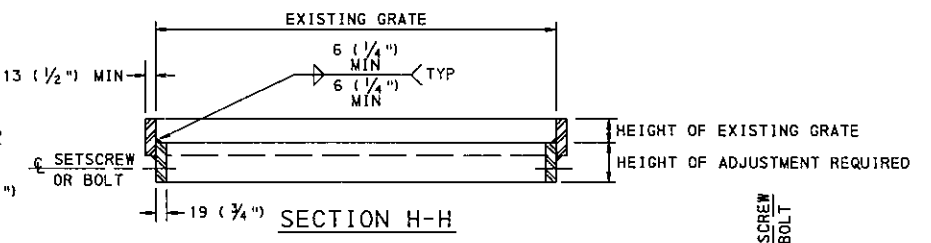


PRECAST CONCRETE GRADE ADJUSTMENT RINGS



CAST IRON VANE GRATE

SEE NOTE 7



STRUCTURAL STEEL GRADE ADJUSTMENT RINGS

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

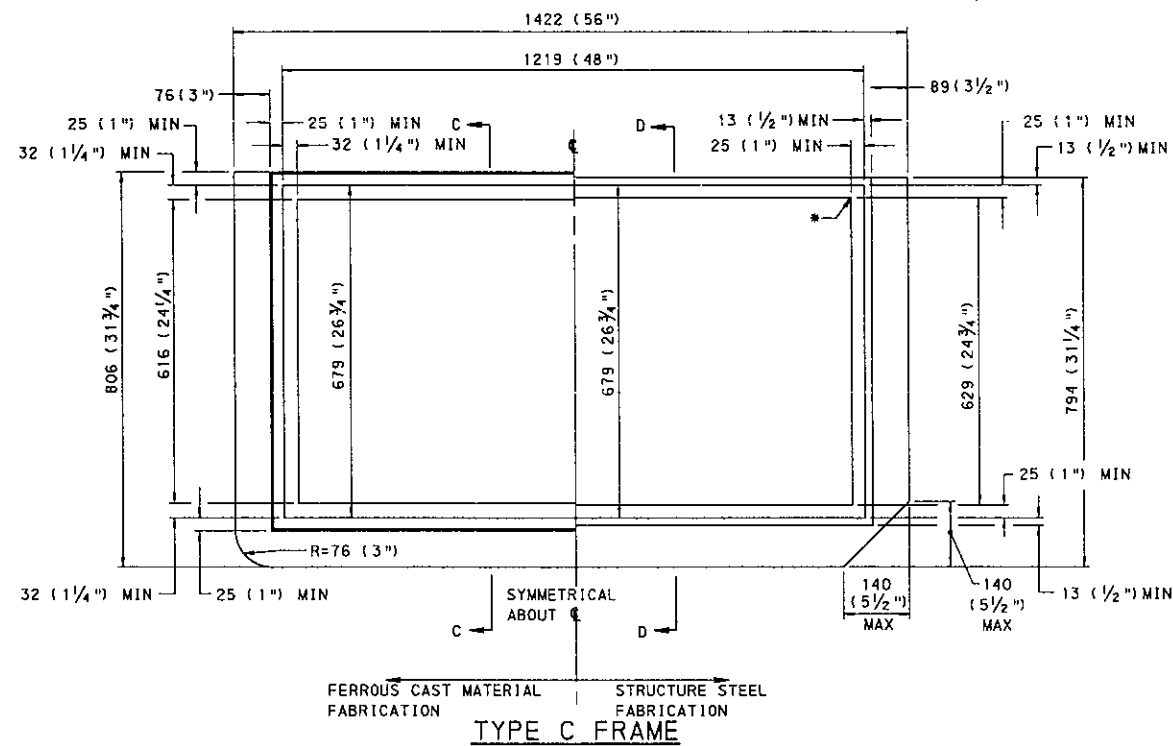
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

INLET GRATES & GRADE ADJUSTMENT RINGS

RECOMMENDED APR. 16, 2001
 DIRECTOR, BUREAU OF DESIGN

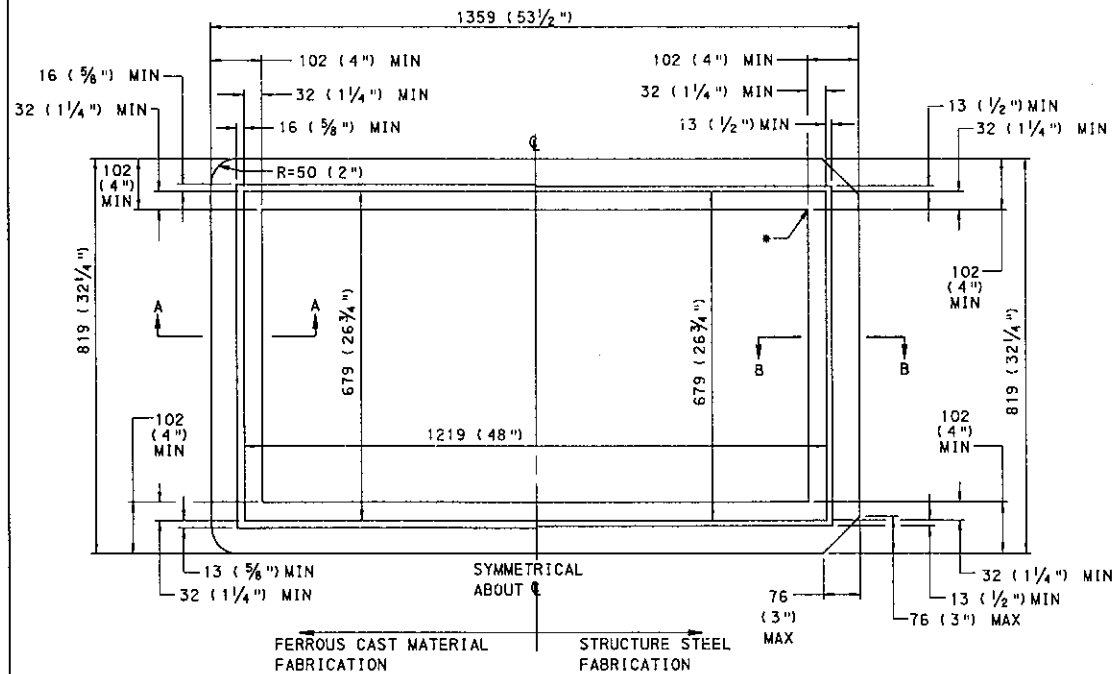
RECOMMENDED APR. 16, 2001
 CHIEF ENGINEER

SHT 5 OF 10
 RC-34M

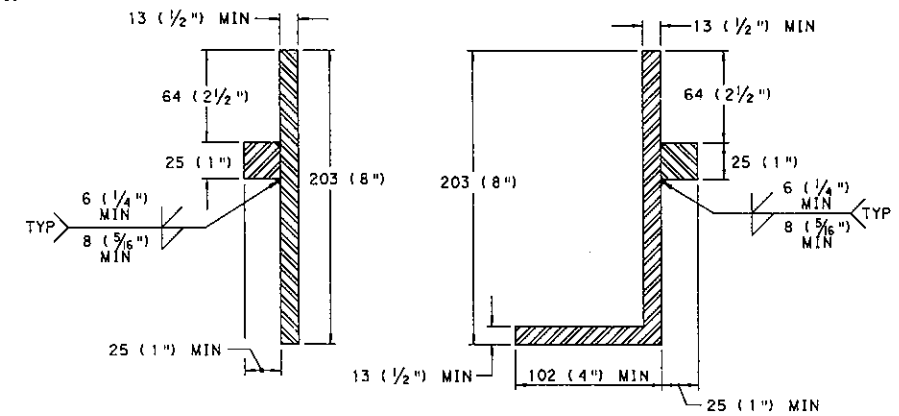
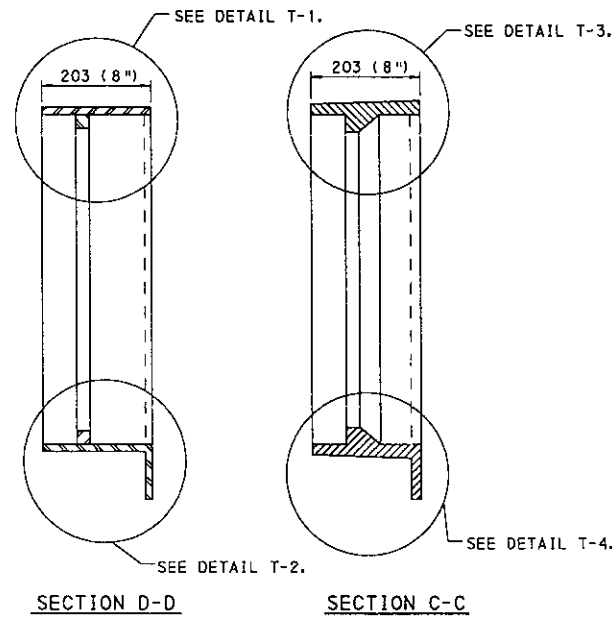


TYPE C FRAME

*CORNER CONFIGURATION DETAILS ARE THE FABRICATOR'S RESPONSIBILITY AND ARE APPROVED BY THE INSPECTOR.

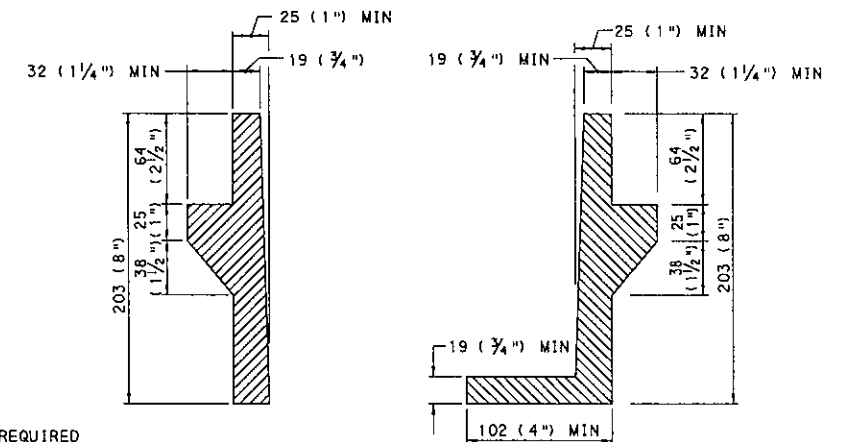


TYPE M FRAME



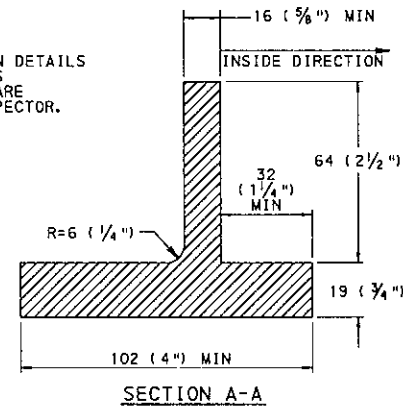
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DETAIL T-2

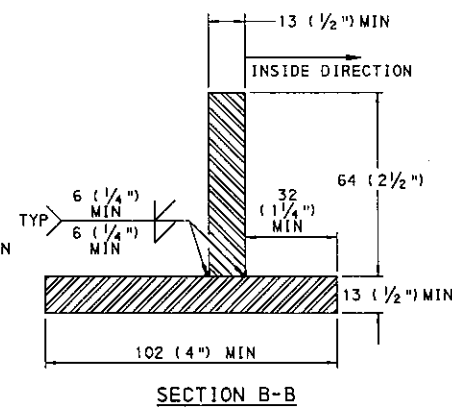


DETAIL T-3

DETAIL T-4



SECTION A-A



SECTION B-B

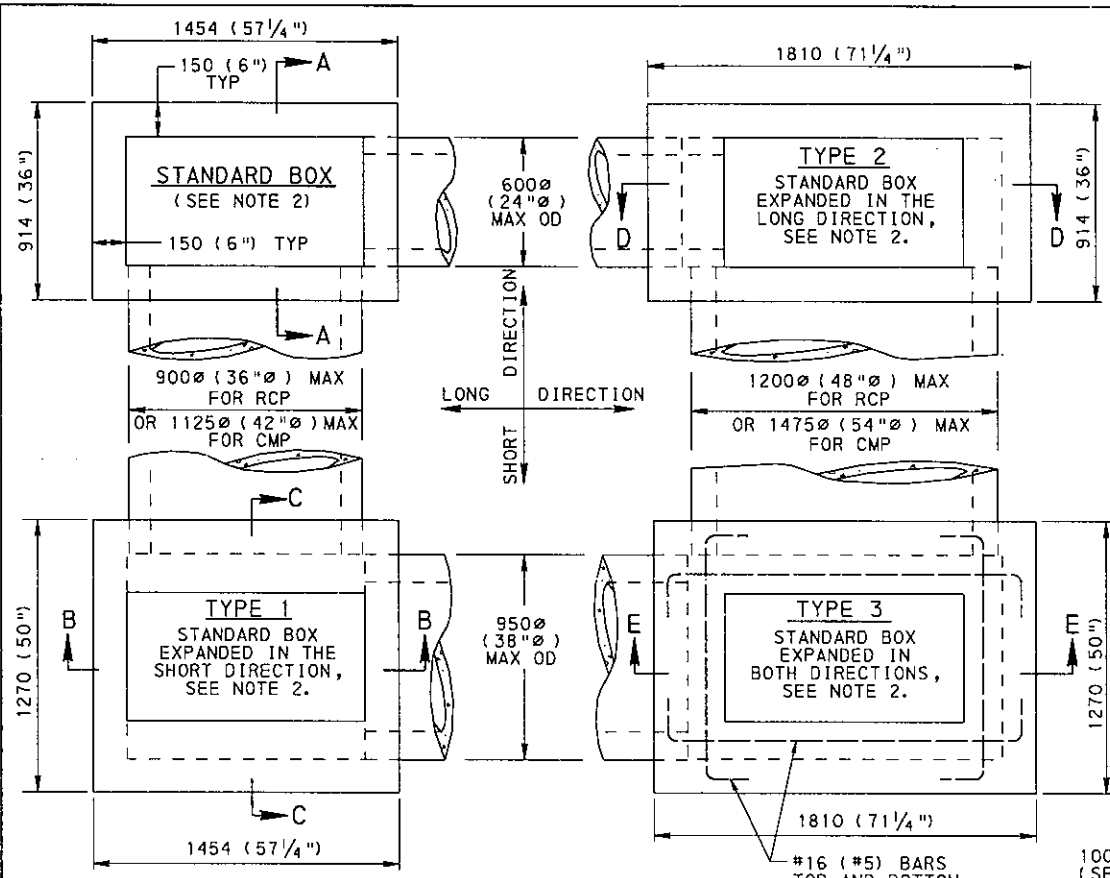
NOTES

1. THIS SHEET DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. IT DOES NOT INCLUDE DETAILS REQUIRED FOR FABRICATION OR MANUFACTURING. PERMIT ONLY FRAMES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR DEVIATIONS OR MODIFICATIONS OF THE STANDARDS SUBMIT SHOP DRAWINGS FOR APPROVAL.
2. PROVIDE EITHER GRAY, MALLEABLE OR DUCTILE IRON CASTINGS OR STRUCTURAL STEEL FRAMES.
3. WELD STRUCTURAL STEEL FRAMES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408, SECTION 1105.03(r).

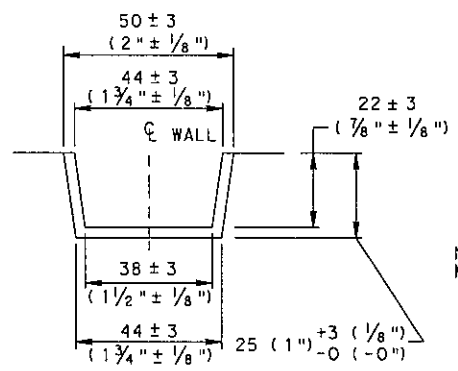
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

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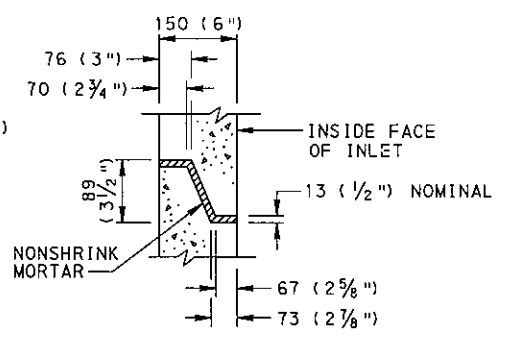
INLET
FRAMES



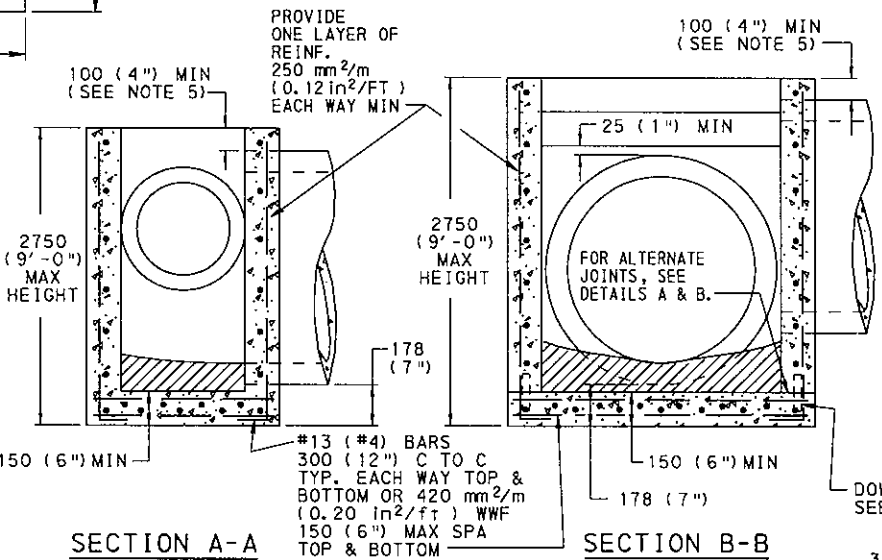
PLAN - INLET BOXES



DETAIL A

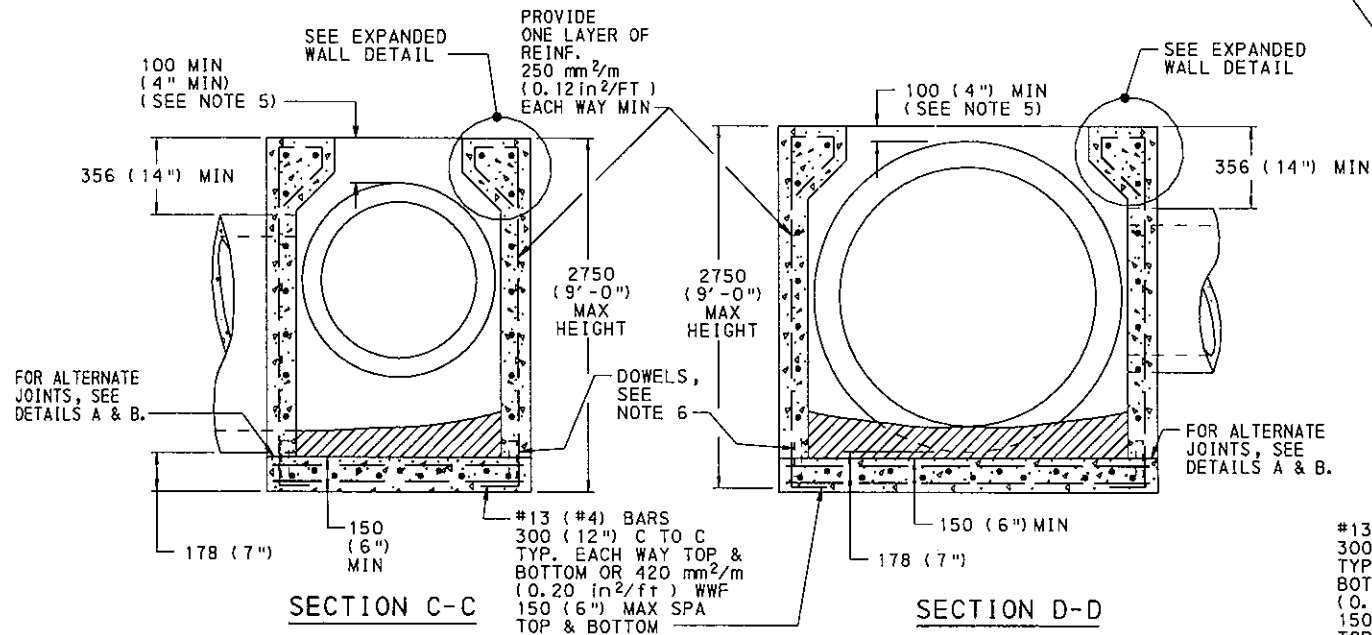


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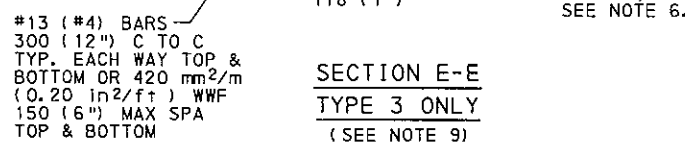
SECTION A-A

SECTION B-B

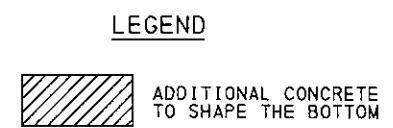


SECTION C-C

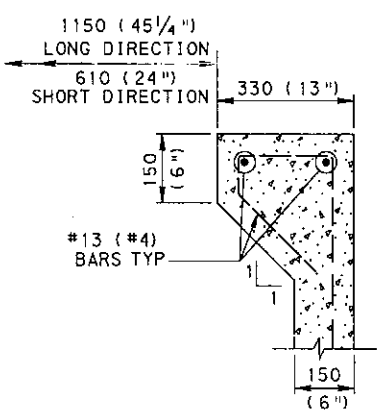
SECTION D-D



SECTION E-E
TYPE 3 ONLY
(SEE NOTE 9)



LEGEND



EXPANDED WALL DETAIL

NOTES

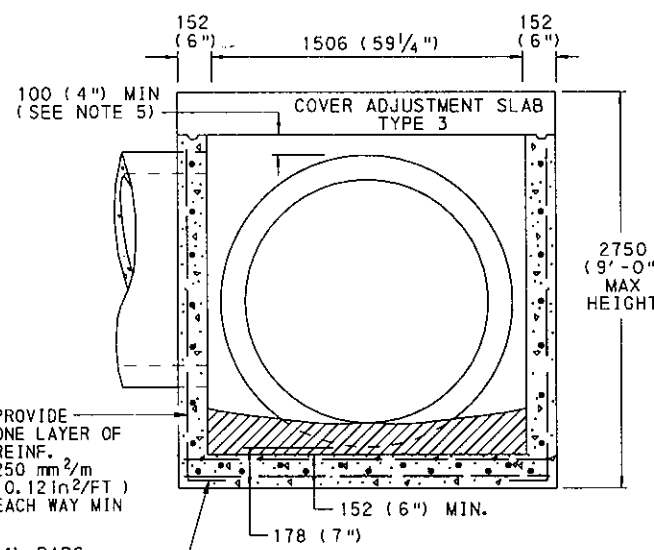
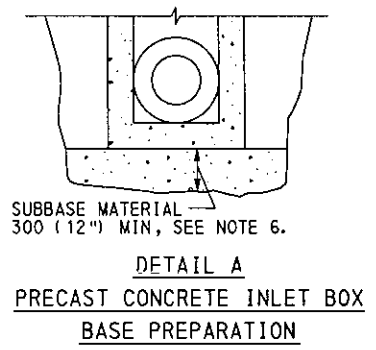
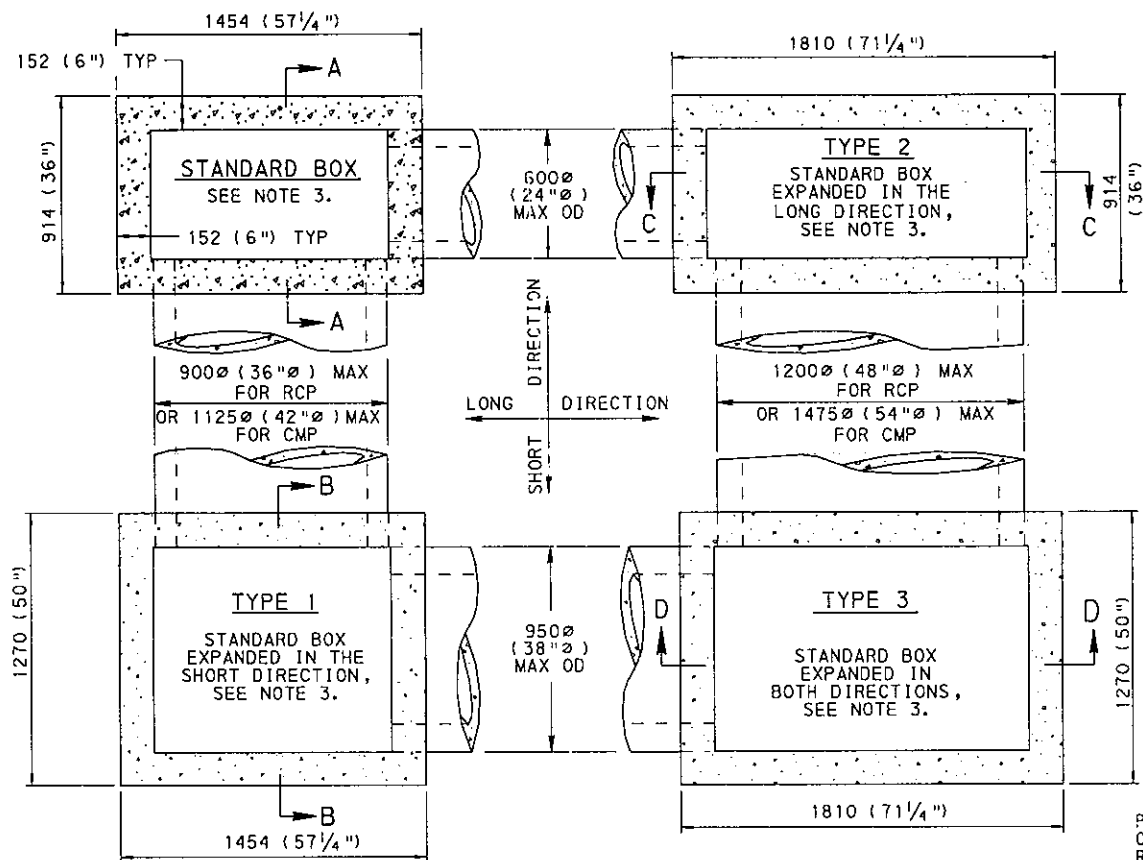
1. CONSTRUCT INLET BOXES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408, SECTION 605.
2. PROVIDE INLET BOXES WITH 610 x 1150 (24"x 45 1/4") STANDARD OPENING TO ACCOMMODATE THE STANDARD TOP COMPONENTS.
3. FOR CAST-IN-PLACE OR PRECAST CONSTRUCTION, PROVIDE INLET WALLS 150 (6") THICK, UNLESS OTHERWISE INDICATED.
4. INLETS THAT EXCEED THE MAXIMUM HEIGHT SHOWN SHALL REQUIRE SPECIAL DETAILS AND DESIGN FOR THE INLET WALLS AND BASE. CONSTRUCT INLETS THAT EXCEED 1500 (5') IN HEIGHT WITH STEPS SIMILAR TO MANHOLES. SEE RC-39M.
5. LOCATE PIPE OR PIPES, AS INDICATED, WITH THE INLET BOTTOM SHAPED TO CHANNEL THE FLOW TOWARD THE OUTLET PIPE. WHEN PROJECT CONDITIONS REQUIRE PIPES TO BE LOCATED WITHIN 100 (4") FROM THE TOP OF THE INLET BOX, PROVIDE AN ADDITIONAL #10 (#3) REINFORCEMENT BAR LOCATED 40 (1 1/2") FROM THE TOP OF THE INLET BASE, FULL WIDTH ALONG THE INLET FACE. IF REINFORCED CONCRETE PIPE IS USED, THE PIPE BLOCKOUT MAY BE FORMED 'FLUSH' WITH THE INLET BASE. LIMIT PIPE BLOCKOUT OF WALL TO 25 mm (1").
6. PLACE #13 (#4) REINFORCEMENT BARS, MINIMUM 300 (12") LONG, SPACED AT 300 (12") C TO C, AS DOWELS BETWEEN THE INLET BASE AND WALLS WHEN THE CONCRETE WALLS AND INLET BASE ARE NOT CONSTRUCTED MONOLITHICALLY. THE DOWELS MAY BE ELIMINATED IF AN ALTERNATE JOINT IS CONSTRUCTED AS SHOWN IN DETAILS A & B.
7. FOR CAST-IN-PLACE CONSTRUCTION, WHEN THE BASE IS CONSTRUCTED MONOLITHICALLY WITH THE VERTICAL WALLS, PROVIDE 75 (3") MINIMUM FROM THE BOTTOM OF THE PIPE TO THE BOTTOM OF THE INLET BOX.
8. FOR PIPE DIAMETERS LARGER THAN 1200 (48") RCP OR 1350 (54") CMP USE A MODIFIED INLET BOX. SEE SHEET 9.
9. FOR INLETS OTHER THAN AS SHOWN ON THE STANDARDS, PROVIDE REINFORCEMENT BASED ON PHL 93 AND P-82 LOADING AND IN ACCORDANCE WITH PUBLICATION 408.
10. CONSTRUCTION JOINTS AND KEYS MAY BE CONSTRUCTED UPWARDS OR DOWNWARDS. CLEAN JOINTS AND KEYS THOROUGHLY BEFORE PLACING NEXT CONCRETE SEGMENT.
11. FOR SUBBASE, SEE NOTE 6 ON SHEET 8.
12. WHEN NECESSARY, THE BLOCKOUT MAY REMOVE UP TO 25 mm (1") OF EACH WALL AT 3:00/9:00 LOCATIONS FOR RC PIPE CONNECTIONS.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

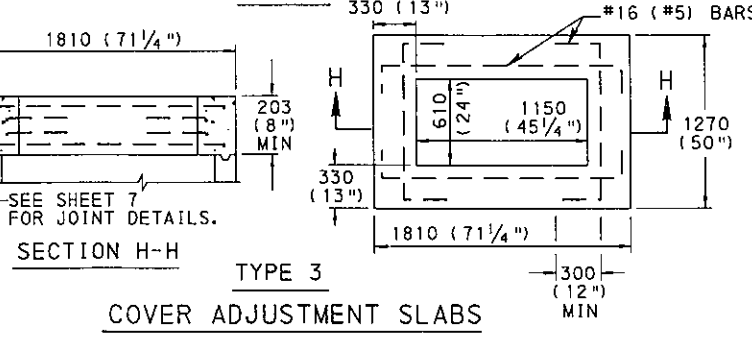
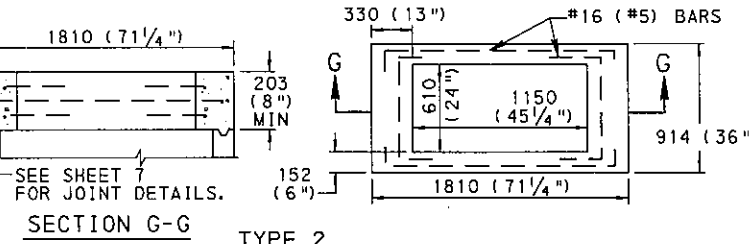
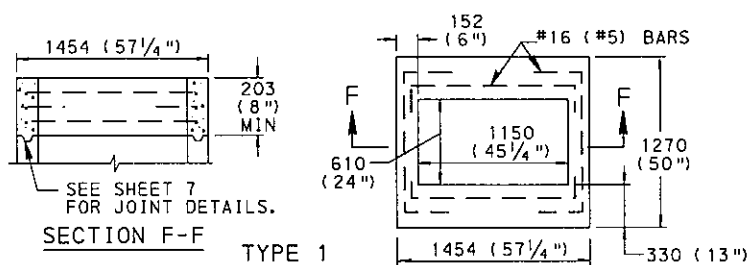
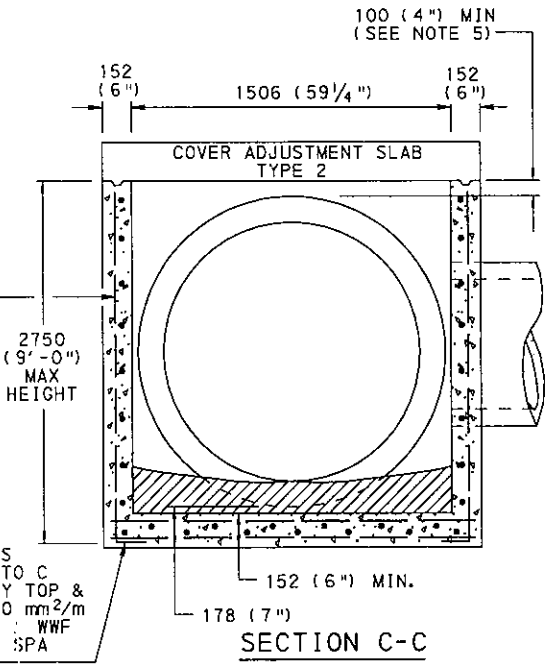
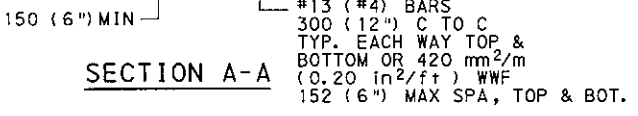
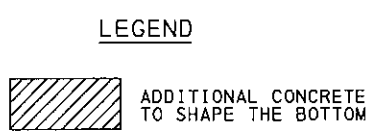
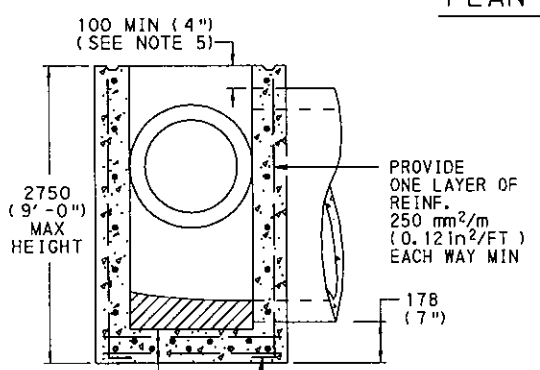
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
STANDARD INLET BOXES
(CAST-IN-PLACE)

RECOMMENDED APR. 16, 2001 <i>Dean S. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>Glenn J. Hoffman</i> CHIEF ENGINEER	SHT 7 OF 10 RC-34M
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- NOTES**
- CONSTRUCT INLET BOXES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408, SECTION 714.
 - PERMIT ONLY PRECAST INLET BOXES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. USE CLASS AA CEMENT CONC FOR PRECAST BOXES. FOR DEVIATIONS OR MODIFICATIONS OF THE STANDARDS, SUBMIT SHOP DRAWINGS FOR APPROVAL.
 - PROVIDE STANDARD INLET BOXES AND COVER ADJUSTMENT SLABS WITH A 610 x 1150 (24"x 46") OPENING TO ACCOMMODATE STANDARD TOP COMPONENTS.
 - FOR INLETS THAT DEVIATE FROM THE STANDARD SUBMIT SPECIAL DETAILS AND DESIGN FOR THE INLET WALLS AND BASE TO THE BUREAU OF CONSTRUCTION FOR REVIEW AND APPROVAL. CONSTRUCT INLETS THAT EXCEED 1500 (5') IN HEIGHT WITH STEPS SIMILAR TO MANHOLES (SEE RC-39W). FOR INLETS OTHER THAN AS SHOWN ON THE STANDARDS, PROVIDE REINFORCEMENT BASED ON PHL 93 (HS 25) LOADING AND IN ACCORDANCE WITH PUBLICATION 408M.
 - LOCATE PIPE OR PIPES, AS INDICATED, WITH THE INLET BOTTOM SHAPED TO CHANNEL THE FLOW TOWARD THE OUTLET PIPE. WHEN PROJECT CONDITIONS REQUIRE PIPE BLOCKOUTS TO BE FORMED WITHIN 100 (4") FROM THE TOP OF THE INLET BOX, PROVIDE AN ADDITIONAL #10 (#3) REINFORCEMENT BAR LOCATED 40 (1 5/8") FROM THE TOP OF THE INLET BASE, FULL WIDTH ALONG THE INLET FACE. REMOVE ANY VISIBLE PORTION OF THE BAR, IF REQUIRED DURING INSTALLATION AND PRIOR TO JOINING THE PIPE TO THE INLET. IF REINFORCED CONCRETE PIPE IS USED, THE PIPE BLOCKOUT MAY BE FORMED 'FLUSH' WITH THE INLET BASE. LIMIT PIPE BLOCKOUT OF WALL TO 25 mm (1").
 - PLACE SUBBASE MATERIAL MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 350.2, IN LAYERS 100 (4") THICK, COMPACTED TO A DENSITY SATISFACTORY TO THE ENGINEER AND INCIDENTAL TO THE INLET PAY ITEM.
 - FOR PIPE DIAMETERS LARGER THAN 1200 (48") RCP OR 1350 (54") CMP, USE A MODIFIED INLET BOX, SHEET 9.
 - PROVIDE CONSTRUCTION JOINTS AS REQUIRED FOR INLET BOXES THAT ARE NOT MONOLITHIC. SEE DETAILS A & B SHEET 7.
 - TAPERS MAY BE PROVIDED ON VERTICAL FACES OF PRECAST INLET BOX BASE UNITS TO FACILITATE FORM STRIPPING. TAPERS WILL RESULT IN INTERNAL BOTTOM DIMENSIONS THAT VARY TO A MAXIMUM OF 25 mm (1").
 - PROVIDE SUITABLE LIFTING DEVICES FOR HANDLING AND INSTALLATION. GALVANIZE METAL DEVICES AS SPECIFIED IN PUB. 408 SECTION 1105. TAPERS MAY BE PROVIDED ON INSIDE VERTICAL FACES OF PRECAST INLET TOPS TO FACILITATE FORM STRIPPING. TAPERS WILL RESULT IN INTERNAL BOTTOM DIMENSIONS THAT VARY TO A MAXIMUM OF 25 mm (1").



NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

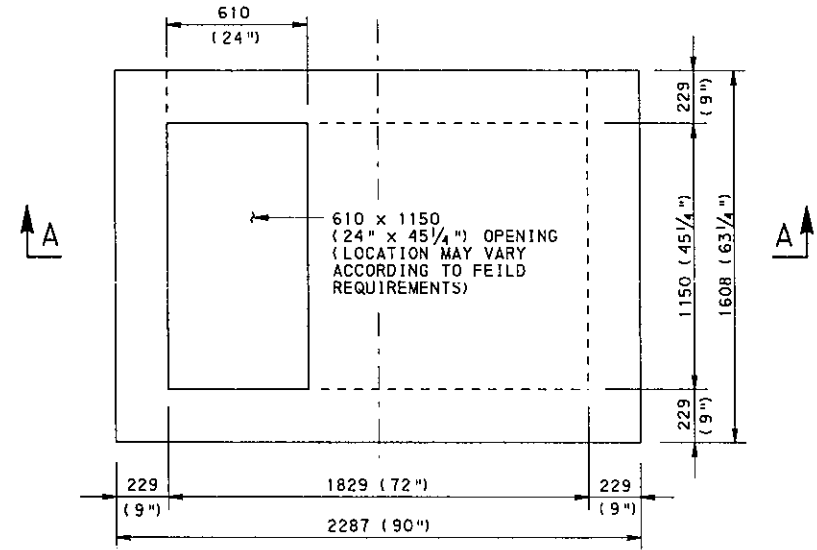
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

INLETS
STANDARD INLET BOXES
(PRECAST)

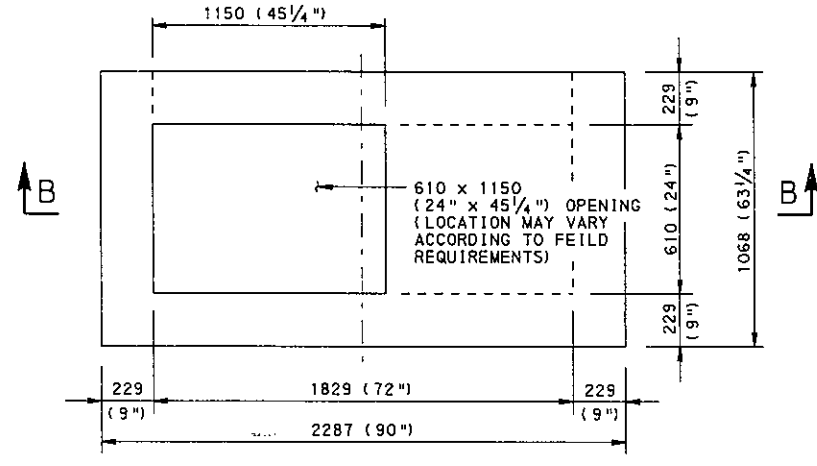
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 CHIEF ENGINEER

SHT 8 OF 10
 RC-34M



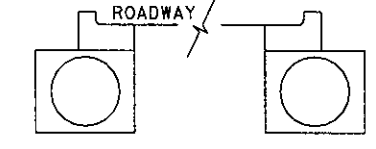
PLAN



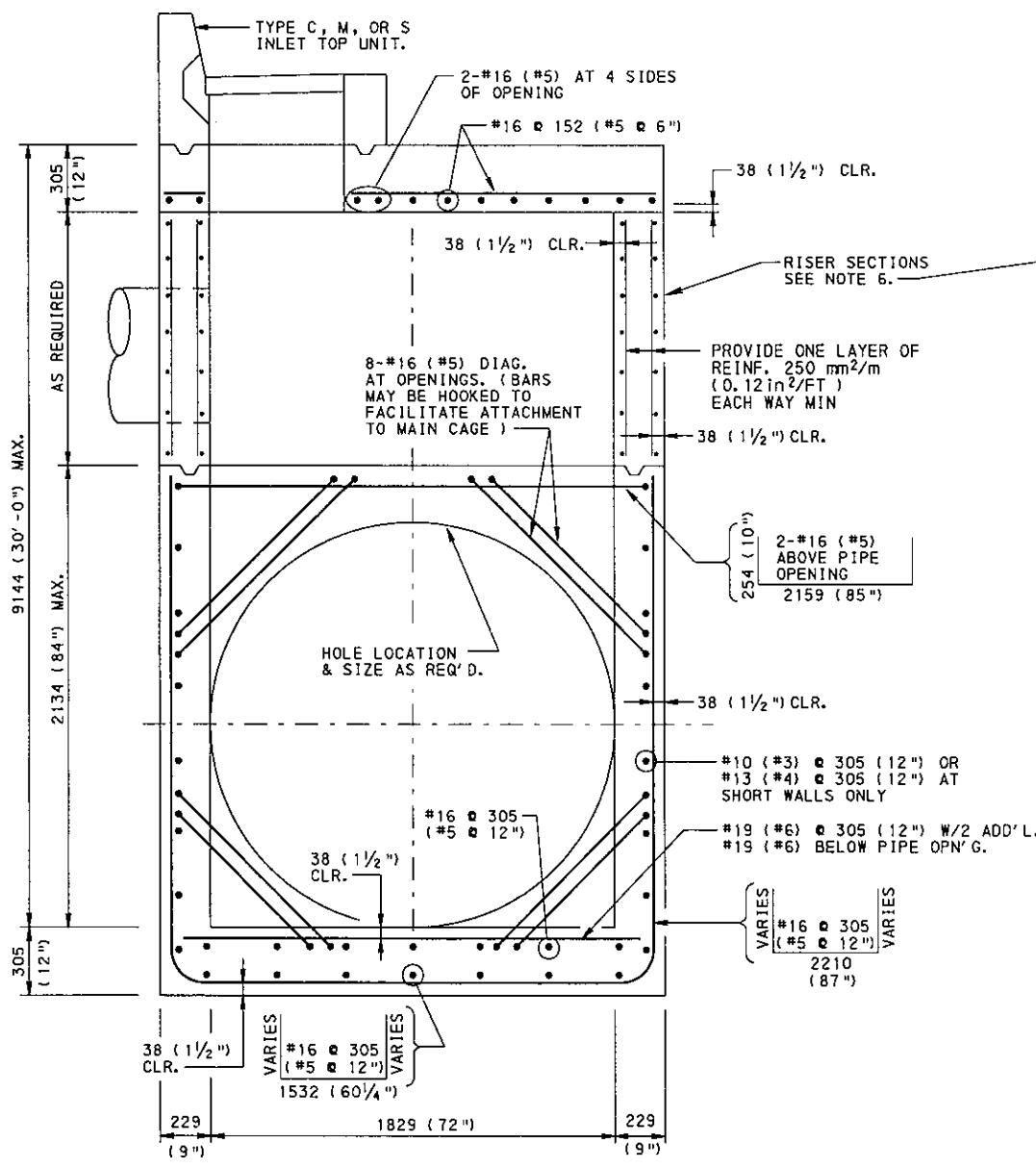
PLAN

NOTES

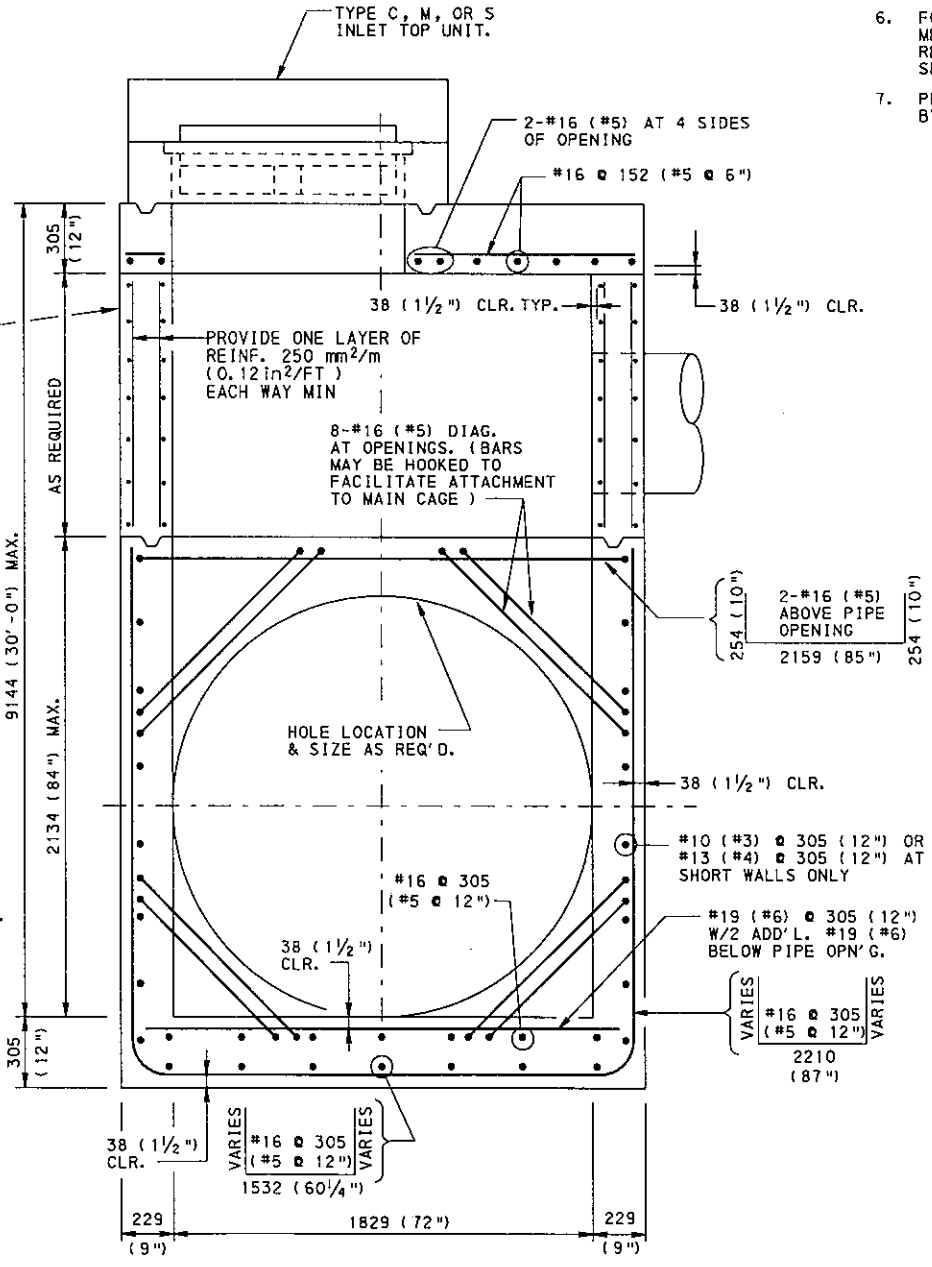
1. CONSTRUCT IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408, SECTION 605 AND SECTION 714.
2. PROVIDE INLETS WITH A MAXIMUM HEIGHT TO BE THE GRADE ELEVATION. WHEN THE REQUIRED HEIGHT EXCEEDS 2750 (9'), SHOW SPECIAL DETAILS AND DESIGN FOR THE INLET WALLS AND BASE. CONSTRUCT INLETS THAT EXCEED 1500 (5') IN HEIGHT WITH STEPS SIMILAR TO MANHOLES (SEE RC-39M)
3. WHEN A SITUATION CAN NOT BE SATISFIED BY THE MODIFIED INLET BOXES SHOWN, PROVIDE SPECIAL DETAILS AND DESIGNS.
4. FOR ORIENTATION OF THE TYPE C INLET TOP WITH MODIFIED TYPE I INLET BOX, THE TYPICAL INSTALLATION DETAILS ARE SHOWN BELOW. SHOW ANY VARIATION ON THE CONSTRUCTION DRAWINGS BY SPECIAL DETAILS.



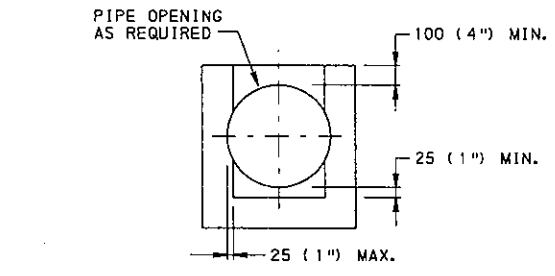
5. PROVIDE A MINIMUM HEIGHT OF 508 (20") MEASURED FROM THE TOP SURFACE OF THE TOP UNIT TO THE INSIDE TOP OF THE PIPE WHEN THE TOP UNIT AND EITHER A MODIFIED TYPE I OR A MODIFIED TYPE II INLET BOX ARE CONSTRUCTED MONOLITHICALLY.
6. FOR THAT PORTION OF THE INLET ASSEMBLY WHERE THE DEPTH MEASURED FROM GRADE IS LESS THAN 2759 (9'-0") A COVER REDUCTION SLAB AND STANDARD 610 x 1150 (24"x 45 1/4") RISER SECTION MAY BE UTILIZED.
7. PERMIT ONLY PRECAST MODIFIED INLET BOXES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15.



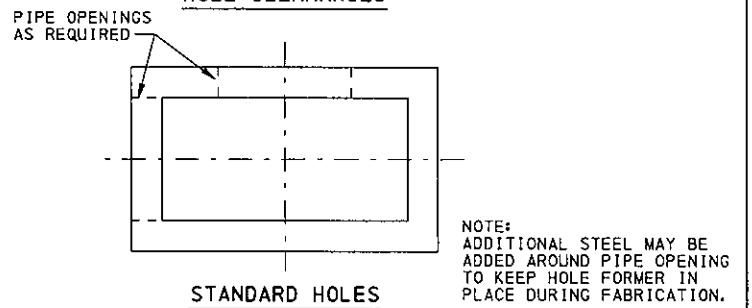
SECTION A-A



SECTION B-B



HOLE CLEARANCES



STANDARD HOLES

PIPE OPENING DETAILS

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

MODIFIED TYPE I INLET 1829 (72") x 1150 (45 1/4")

MODIFIED TYPE II INLET 610 (24") x 1829 (72")

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INLETS
MODIFIED INLET BOXES
(CAST-IN-PLACE AND PRECAST)

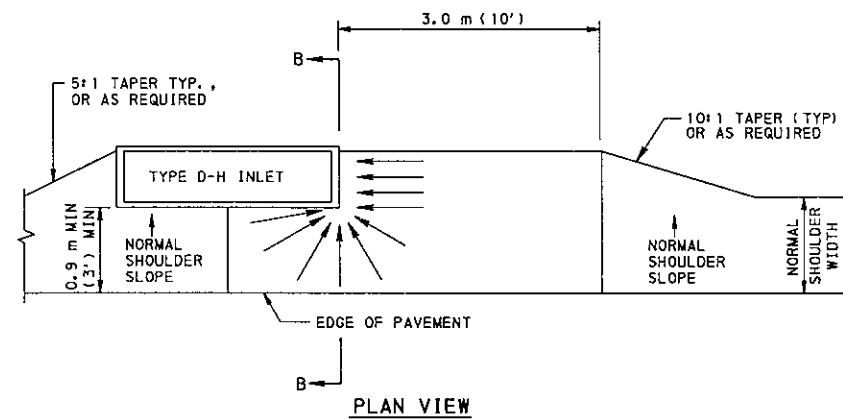
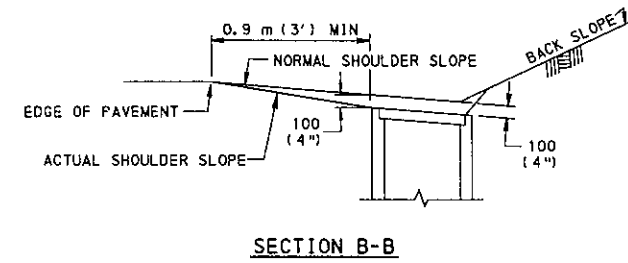
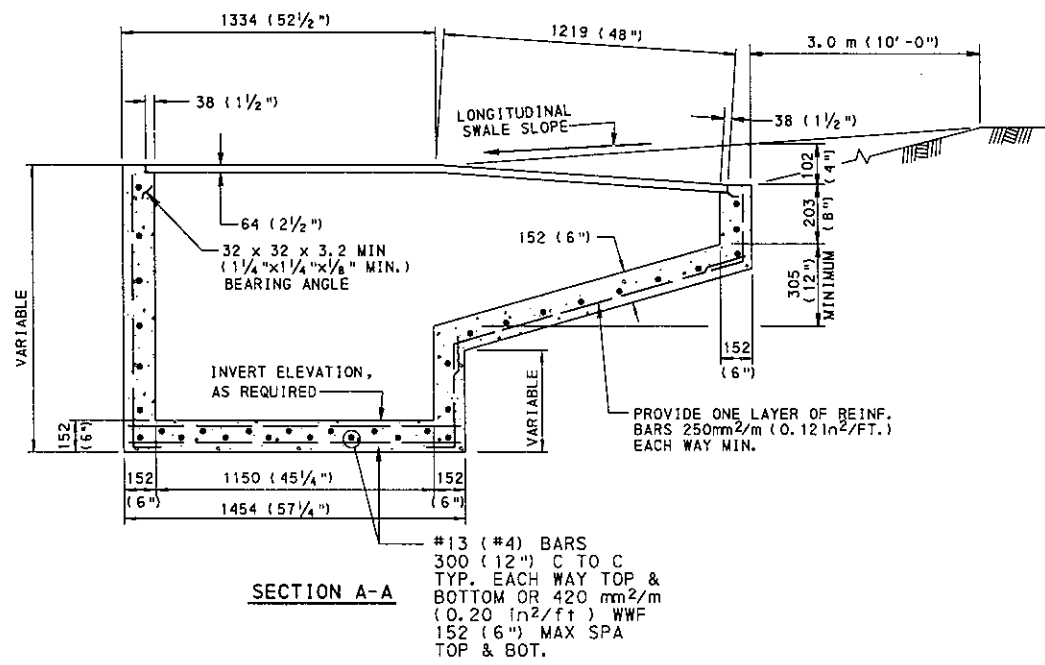
RECOMMENDED APR. 16, 2001
Alan A. Schmitt
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED APR. 16, 2001
Gregory J. Schmitt
CHIEF ENGINEER

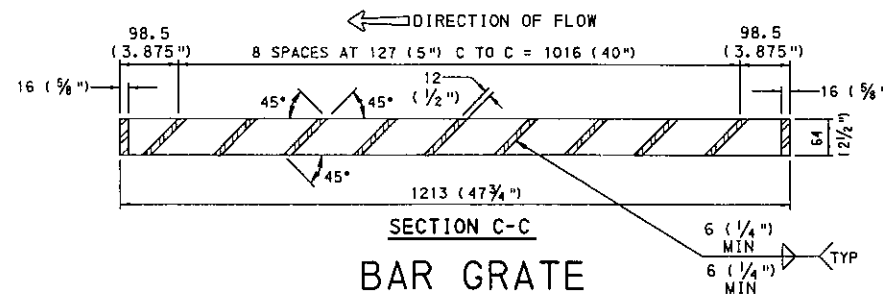
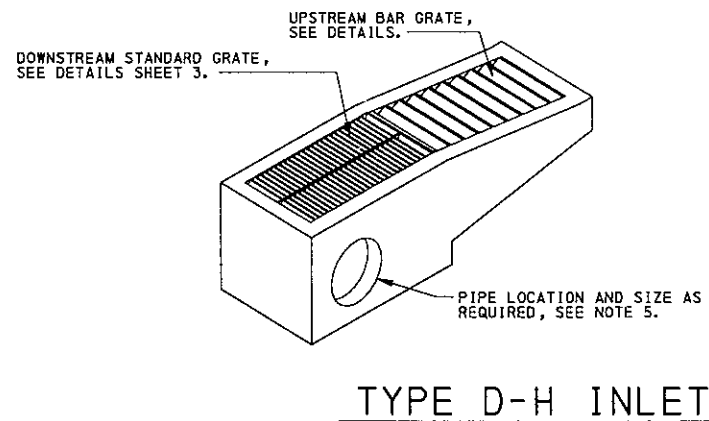
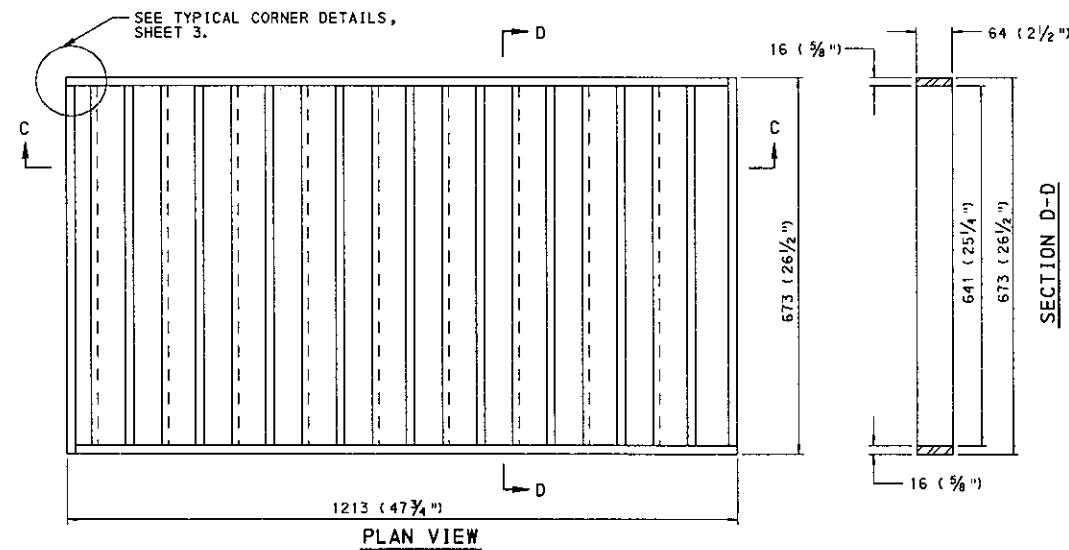
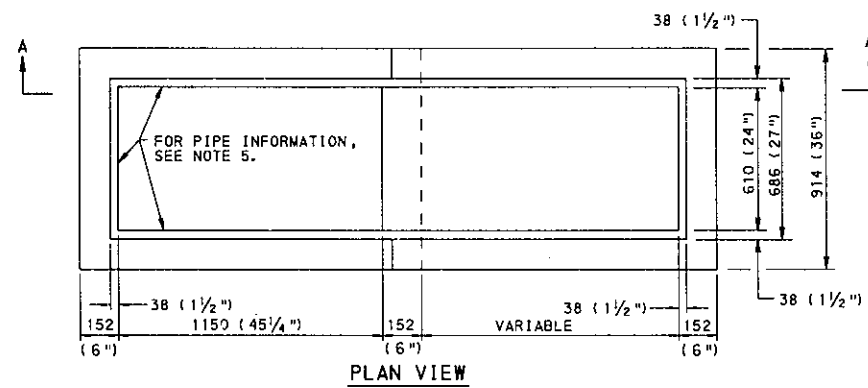
SHT 2 OF 10
RC-34M

NOTES

1. CONSTRUCT IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408 SECTION 605.
2. THIS SHEET DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. PERMIT ONLY GRATES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15.
3. WELD STRUCTURAL STEEL GRATES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408, SECTION 1105.03(r).
4. PROVIDE ANGLES EMBEDDED IN THE CONCRETE AS A BEARING AREA FOR THE GRATES FOR TYPE D-H INLETS WHICH SEAT THE GRATES DIRECTLY WITHIN THE UNIT.
5. FOR PIPE LOCATION AND MAXIMUM ALLOWABLE SIZES, SEE SHEET 8.



TYPICAL D-H INLET LOCATION



NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

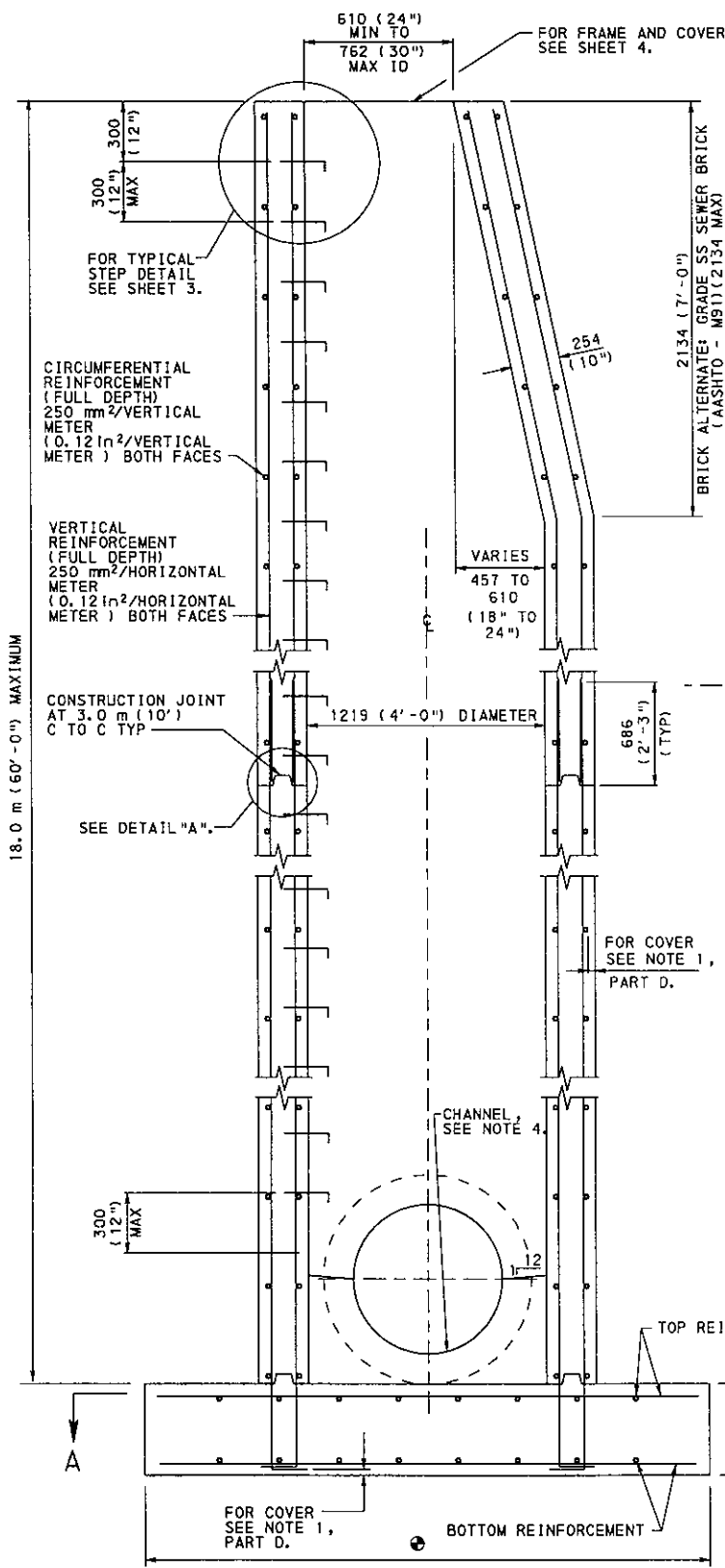
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INLETS
TYPE D-H INLET
(CAST-IN-PLACE AND PRECAST)

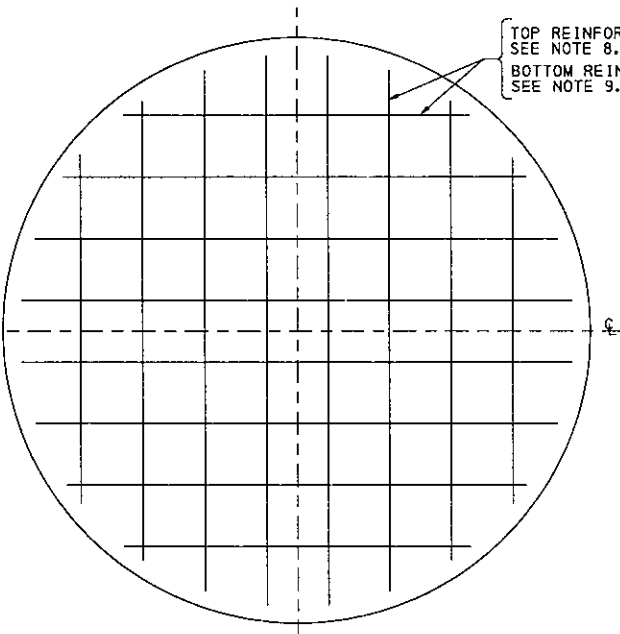
RECOMMENDED APR. 16, 2001
RECOMMENDED APR. 19, 2001
SHT 10 OF 10
RC-34M

Dean A. Schmitt
DIRECTOR, BUREAU OF DESIGN

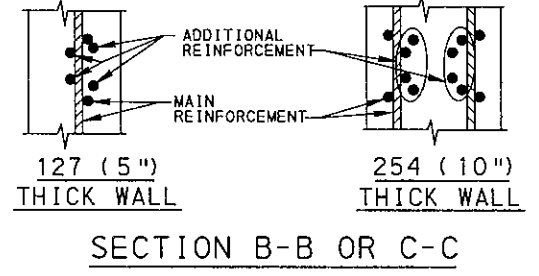
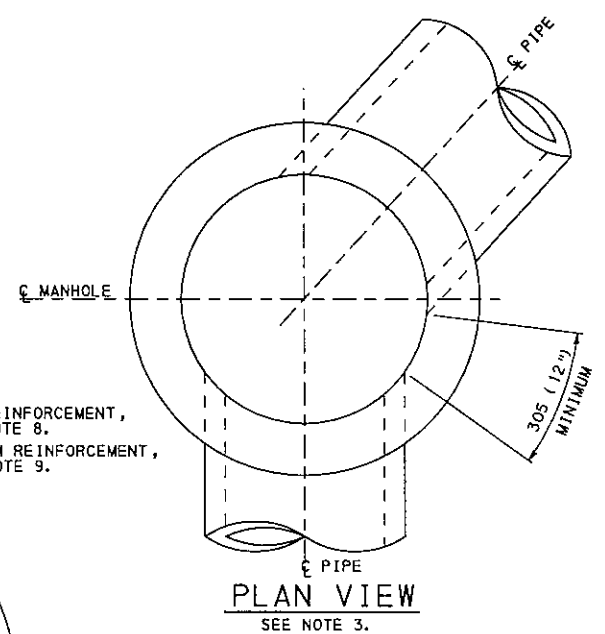
Samuel J. Hoffman
CHIEF ENGINEER



**DETAIL "A"
CONSTRUCTION JOINT**



SECTION A-A

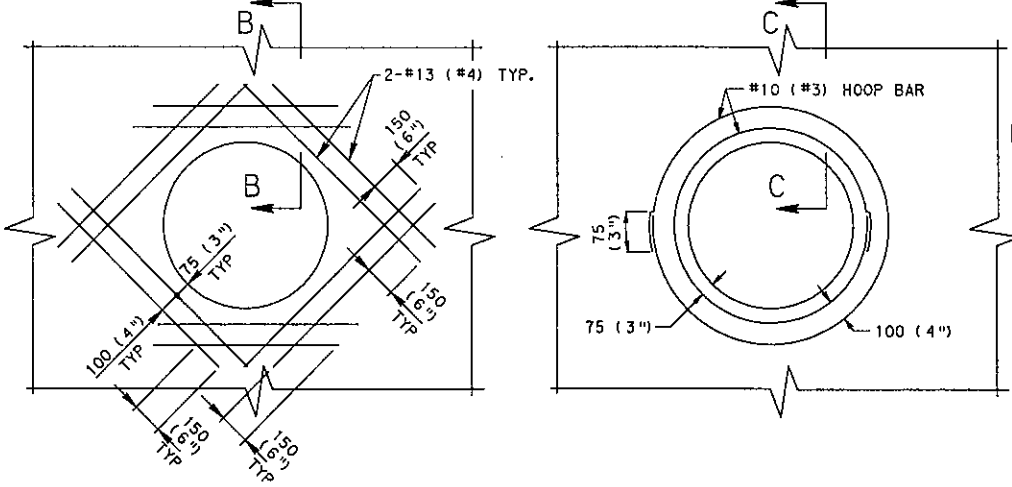


**TABLE A
BASE SLAB DIMENSIONS**

MAX DEPTH FROM TOP OF MANHOLE TO TOP OF FOOTING	AS DESIGNED (SEE NOTE 7)	
	FOOTING DIAMETER	FOOTING THICKNESS
3.0 m (10')	2060 (6'-9")	300 (1'-0")
6.0 m (20')	2060 (6'-9")	300 (1'-0")
9.0 m (30')	2060 (6'-9")	380 (1'-3")
12.0 m (40')	2210 (7'-3")	380 (1'-3")
15.0 m (50')	2440 (8'-0")	380 (1'-3")
18.0 m (60')	2590 (8'-6")	380 (1'-3")

**CAST-IN-PLACE MANHOLE
FOR PIPES WITH 750 (30") INSIDE DIAMETER AND LESS**

FOR BASE SLAB DIMENSIONS SEE TABLE A.



REINFORCEMENT DETAILS AT OPENINGS

NOTE: FOR WALL THICKNESSES 254 (10") OR GREATER PLACE ADDITIONAL REINFORCEMENT AS SHOWN ABOVE AT EACH FACE OF THE WALL INSIDE MAIN REINFORCEMENT. FOR WALLS 127 (5") THICK KEEP MAIN REINFORCEMENT CENTERED IN WALL. PROVIDE ADDITIONAL REINFORCEMENT AS SHOWN ABOVE, MAINTAINING REQUIRED COVER.

NOTES

- CONSTRUCTION REQUIREMENTS:
 - CONSTRUCT IN ACCORDANCE WITH PUBLICATION 408, SECTIONS 605, 606 AND 714; AND ASTM C-478M-90, STANDARD SPECIFICATION FOR PRECAST REINFORCED CONCRETE MANHOLE SECTIONS, AS MODIFIED HEREIN.
 - MINIMUM CONCRETE CLASS:

CAST-IN-PLACE	CLASS A
PRECAST	CLASS AA
 - PROVIDE STEEL REINFORCEMENT IN ACCORDANCE WITH ASTM A185, STEEL WELDED WIRE FABRIC; ASTM A663/A663M & A675/A675M, PLAIN BILLET STEEL BARS OR ASTM A615/A615M, DEFORMED BILLET STEEL BARS. PROVIDE MINIMUM YIELD STRENGTH OF 400 MPa (60,000 PSI).
 - CLEAR COVER FOR STEEL:

WALLS: CAST-IN-PLACE	50 (2")
PRECAST	40 (1 1/2")
FOOTINGS: CAST-IN-PLACE	60 (2 1/2") TOP BARS
	80 (3") BOTTOM BARS
PRECAST	50 (2") SIDE COVER
	50 (2") TOP BARS
	40 (1 1/2") BOTTOM BARS
SLABS: CAST-IN-PLACE	40 (1 1/2") SIDE COVER
	50 (2") TOP & BOTTOM BARS
- FOR PIPES WITH INSIDE DIAMETERS GREATER THAN 750 (30") SEE MODIFIED CAST-IN-PLACE MANHOLES, SHEET 2.
- PROVIDE 300 (12") MINIMUM HORIZONTAL CLEARANCE BETWEEN OPENINGS LOCATED AT THE SAME DEPTH. LOCATE PIPES NOT AT THE SAME DEPTH VERTICALLY AT LEAST ONE HALF THE MAXIMUM OPENING DIAMETER APART.
- FORM A CONCRETE CHANNEL AT THE BOTTOM OF THE MANHOLE CONFORMING TO THE SHAPE OF THE LOWER HALF OF THE INCOMING AND/OR OUTGOING PIPES. PROVIDE A FULL DEPTH U-SHAPED CHANNEL WHEN NECESSARY TO REDUCE ENERGY LOSSES.
- USE 127 (5") THICK WALLS WITH ONE (1) ROW OF REINFORCING, OR USE 254 (10") THICK OR GREATER WALLS WITH TWO (2) ROWS OF REINFORCING.
- CONSTRUCTION JOINTS AND KEYS MAY BE CONSTRUCTED UPWARDS OR DOWNWARDS. CLEAN JOINTS AND KEYS THOROUGHLY BEFORE PLACING NEXT CONCRETE SEGMENT.
- A SAFE BEARING CAPACITY OF 0.15 MPa (1.5 Tons Per S.F.) UNDER THE ENTIRE BASE SLAB IS ASSUMED TO DETERMINE THE BASE SIZE. WHEN THE SUBSOIL IS EXTREMELY POOR, PROCEED WITH CONSTRUCTION ONLY AFTER THE ENGINEER SPECIFIES AN ADEQUATE BASE DESIGN.
- FOR FOOTING TOP REINFORCEMENT, BOTH DIRECTIONS, USE NO. 19 (6) BARS AT 300 (12") FOR DEPTHS TO 18.0 m (60') OR 635 mm (25") WWF FOR DEPTHS TO 9.0 m (30') AND 680 mm (27") WWF FOR DEPTHS GREATER THAN 9.0 m (30') 152 (6") MAXIMUM SPACING FOR WWF.
- FOR FOOTING BOTTOM REINFORCEMENT, BOTH DIRECTIONS, USE NO. 13 (4) BARS AT 480 (18") FOR DEPTHS TO 18.0 m (60') OR 320 mm (12.5") WWF FOR DEPTHS TO 9.0 m (30') AND 340 mm (13.4") WWF FOR DEPTHS GREATER THAN 9.0 m (30') 152 (6") MAXIMUM SPACING FOR WWF.
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESES.

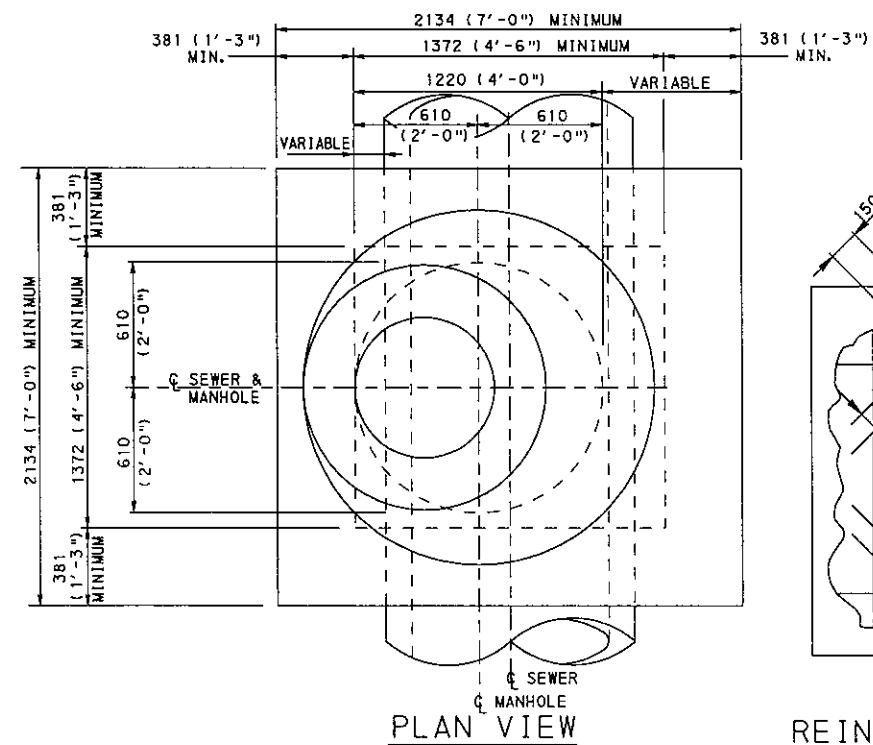
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN**

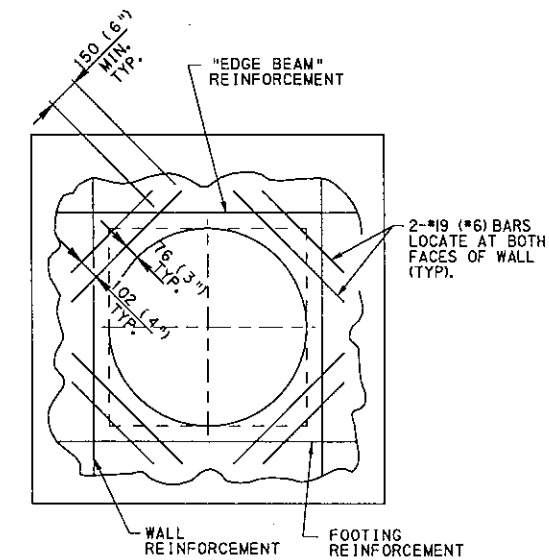
**STANDARD MANHOLES
CAST-IN-PLACE MANHOLES**

RECOMMENDED APR. 16, 2001
 DIRECTOR, BUREAU OF DESIGN
 RECOMMENDED APR. 16, 2001
 CHIEF ENGINEER
 SHT 1 OF 5
 RC-39M

23-EEB-2001



PLAN VIEW



REINFORCEMENT DETAILS AT VERTICAL OPENINGS

NOTE: ONLY BOX WITH MAIN REINFORCEMENT SHOWN FOR CLARITY.

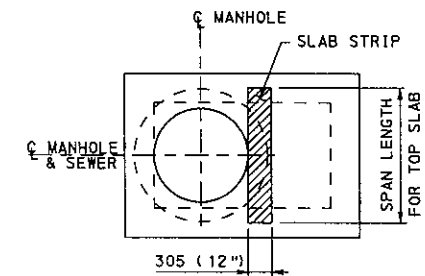


FIGURE 1
PLAN-TOP OF SLAB

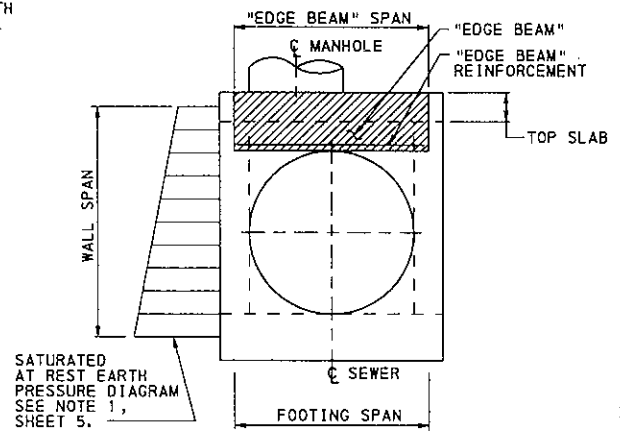


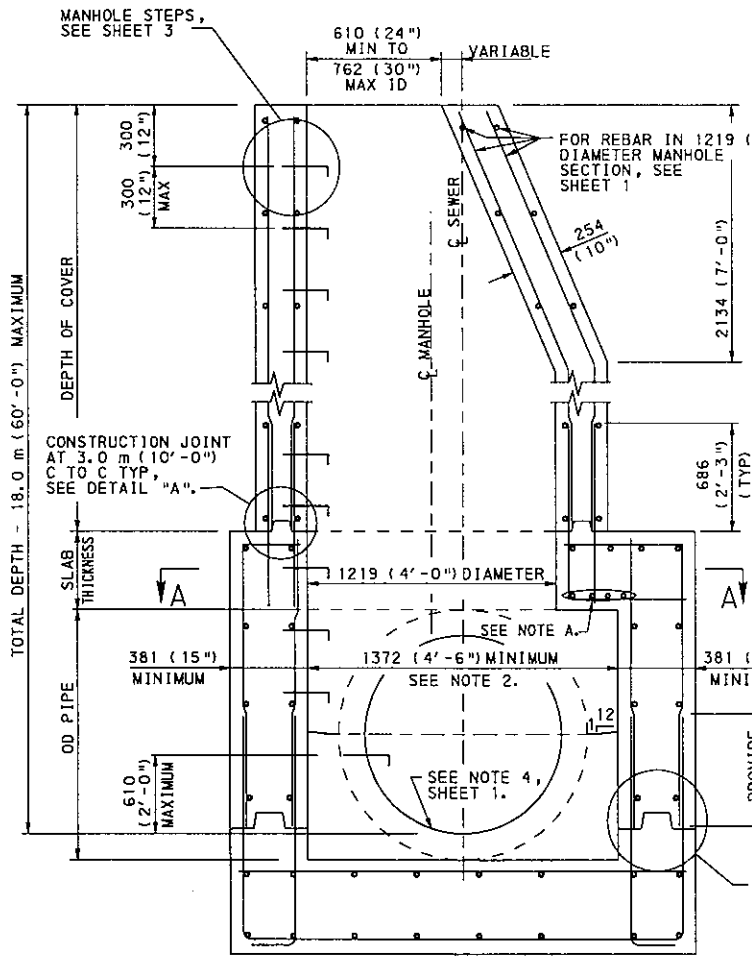
FIGURE 2
ELEVATION-OPENING

NOTES

1. FOR CONSTRUCTION REQUIREMENTS SEE NOTE 1, SHEET 1. FOR DESIGN REQUIREMENTS SEE NOTE 1, SHEET 5.
2. INCREASE BOX SIZE WHEN REQUIRED TO KEEP WALLS OF MANHOLE BOX SECTION FLUSH WITH THE OPENING FOR PIPES LARGER THAN 1050 (42") ID. INDICATE THE BOX SIZE ON THE CONSTRUCTION PLANS OR SHOP DRAWINGS BASED ON THE DESIGN PROCEDURES PROVIDED BELOW.
3. DESIGN PROCEDURE FOR MANHOLE BOX SECTION:
DESIGN ALL MEMBERS FOR MOMENT, CRACK CONTROL & SHEAR AT DISTANCE *d* (EFFECTIVE DEPTH OF MEMBER) FROM FACE OF SUPPORT. CALCULATE ALL SPAN LENGTHS FROM THE CENTER OF THE SUPPORTS.
 - 3A. TOP SLAB
 - DESIGN A 305 (12") WIDE SLAB STRIP FOR ONE-WAY ACTION TO CARRY DEAD LOAD, LIVE LOAD, AND WEIGHT OF EARTH. SPAN THE STRIP, SIMPLY SUPPORTED, ACROSS THE WIDTH OF THE BOX OR IN THE SHORT DIRECTION. SEE FIGURE 1 FOR DETAILS.
 - PLACE ADDITIONAL BARS IN THE SLAB AT 45° AROUND THE MANHOLE OPENING. SEE SECTION A-A FOR DETAILS.
 - 3B. "EDGE BEAM"

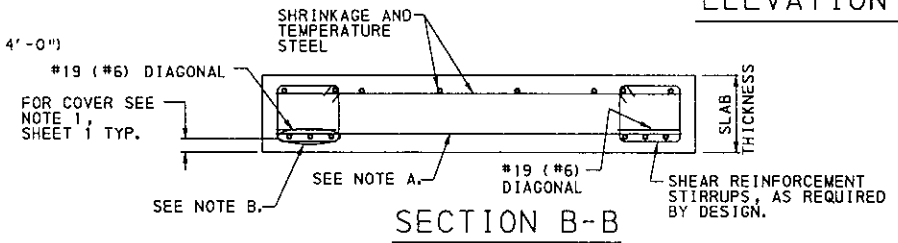
VIEWS SHOWING THE CONFIGURATION OF MANHOLE BOX SECTION ILLUSTRATE "EDGE BEAMS" TO BE THE SAME DEPTH AS THE TOP SLAB. TO ACHIEVE REQUIRED CAPACITY WHERE NECESSARY, INCREASE DEPTH OF "EDGE BEAM" BY PROVIDING ADDITIONAL CLEARANCE BETWEEN THE SLAB AND TOP OF OPENING. LOCATE HORIZONTAL STEEL FOR BEAM ABOVE THE SOFFIT OF THE OPENING. SEE FIGURE 2 FOR DETAILS.

 - DESIGN THE "EDGE BEAMS", SPANNING THE LENGTH OF THE BOX, TO CARRY A UNIFORMLY DISTRIBUTED LOAD EQUAL TO THE REACTION FROM THE SLAB.
 - 3C. WALLS
 - DESIGN THE WALLS TO CARRY THE AXIAL LOAD, DUE TO EARTH LOAD, LIVE LOAD, AND DEAD LOAD APPLIED DIRECTLY TO THE WALL, IN ADDITION TO REACTIONS FROM THE "EDGE BEAMS", AND THE VERTICAL MOMENT CAUSED BY SATURATED AT REST EARTH PRESSURE. SEE FIGURE 2 FOR PRESSURE DIAGRAM. CONSIDER THE WALL SIMPLY SUPPORTED BETWEEN TOP SLAB AND FOOTING. PROVIDE THE SAME REINFORCEMENT ON THE OUTSIDE FACE.
 - 3D. FOOTING
 - DESIGN SPAN NORMAL TO PIPE TO CARRY POSITIVE MOMENT OF $1/10 W L^2$ AND NEGATIVE MOMENT OF $1/12 W L^2$ WHERE *W* IS THE UNIFORM BEARING PRESSURE. DO NOT TAKE INTO ACCOUNT THE CONCRETE IN THE CHANNEL WHEN CALCULATING CAPACITY OF THE FOOTING.
 - AS A MINIMUM, PROVIDE NO. 13 (NO. 4) BARS AT 300 (12") CENTERS, TOP AND BOTTOM OF SLAB IN THE OPPOSITE DIRECTION.

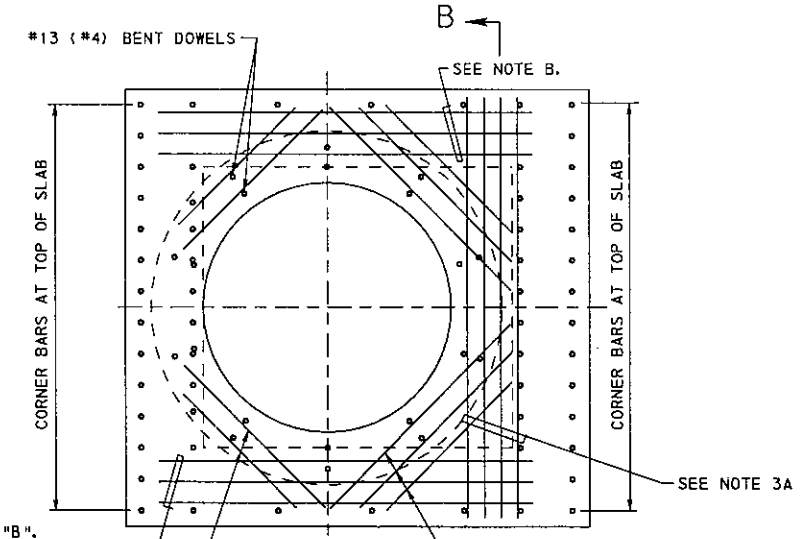


SECTION VIEW
MODIFIED MANHOLE

FOR PIPES GREATER THAN 750 (30") TO 2100 (84") INSIDE DIAMETER

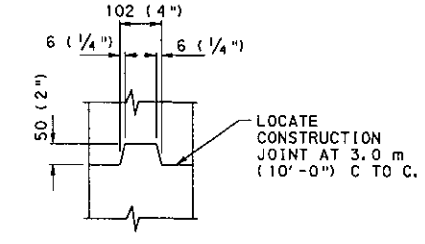


SECTION B-B

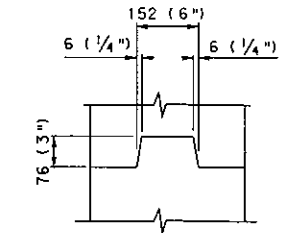


SECTION A-A

- NOTE A: BARS REQUIRED TO SPAN FROM WALL TO WALL.
- NOTE B: PROVIDE ADDITIONAL BARS AS REQUIRED BY DESIGN WHEN OPENING IN WALL IS PRESENT (TYP.).



DETAIL "A"
CONSTRUCTION JOINT
SEE NOTE 6, SHEET 1



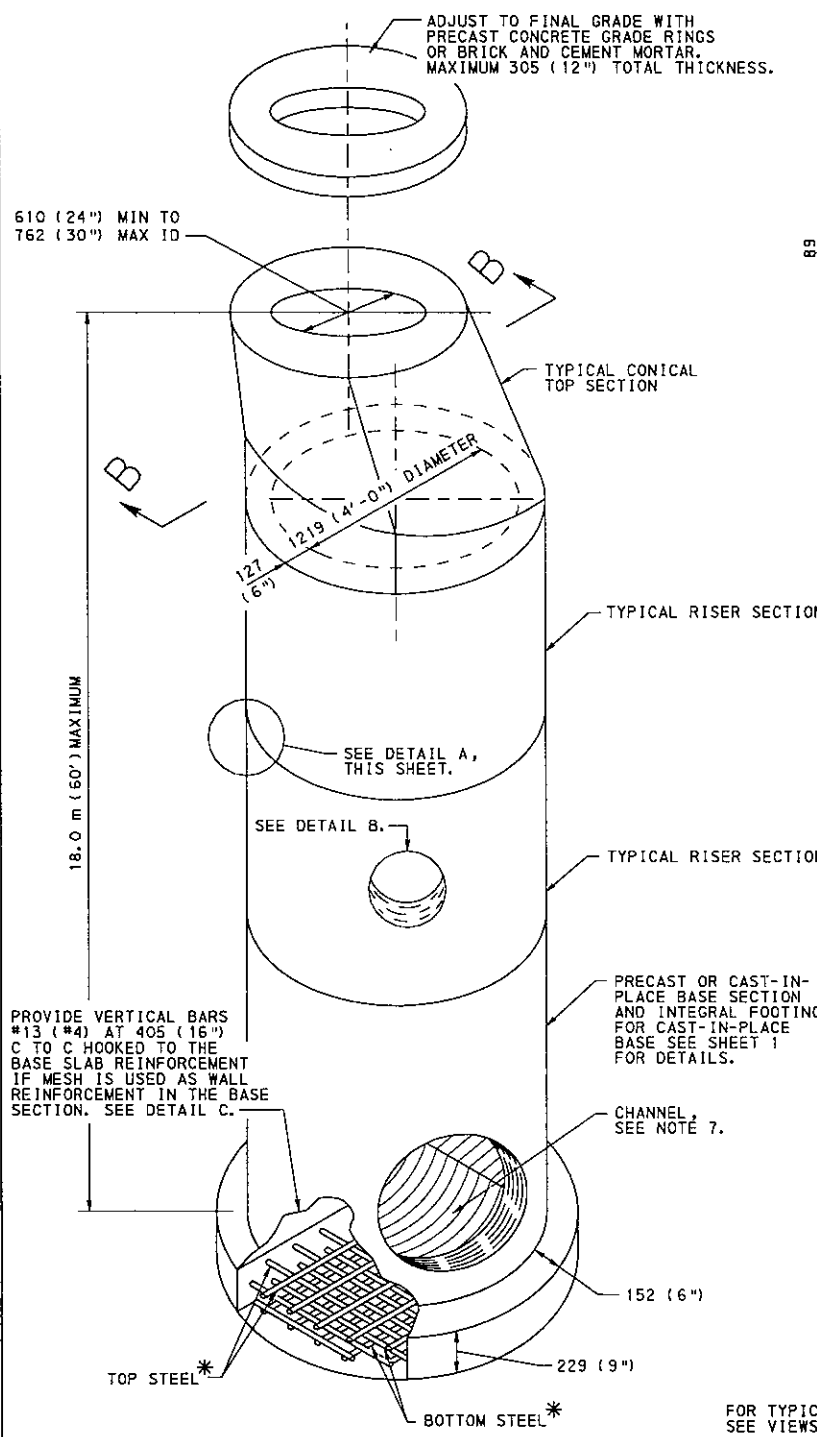
DETAIL "B"
KEYWAY
SEE NOTE 6, SHEET 1

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD MANHOLES
MODIFIED
CAST-IN-PLACE MANHOLES

RECOMMENDED APR. 16, 2001 <i>Dean A. Schuer</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>Henry J. Hoffman</i> CHIEF ENGINEER	SHT 2 OF 5 RC-39M
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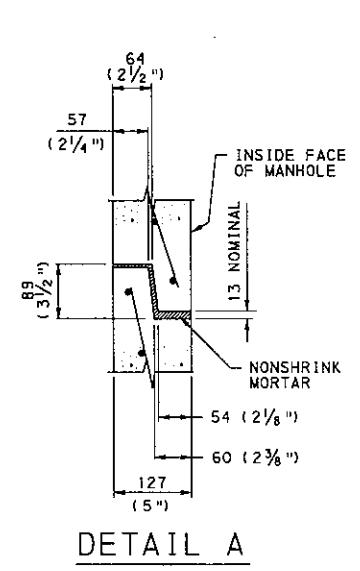


PRECAST MANHOLE

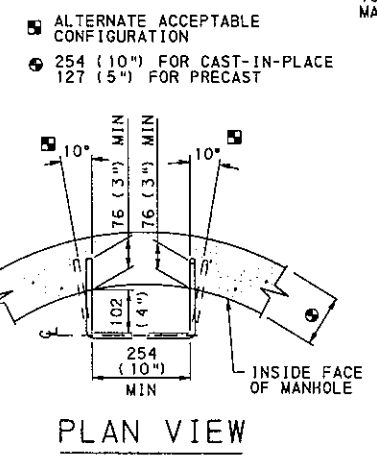
FOR PIPES 750 (30") INSIDE DIAMETER AND LESS

* SEE TABLE B FOR BASE SLAB STEEL REQUIREMENTS. PROVIDE WALL REINFORCEMENT DETAILS AT BASE SLAB TYPICAL OF CAST-IN-PLACE MANHOLE. SEE SHEET 1.

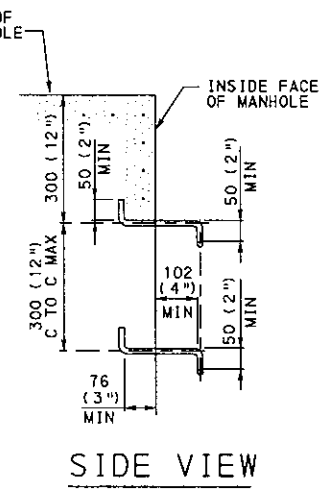
WALL REINFORCEMENT
CIRCUMFERENTIAL FULL DEPTH
250 mm²/VERTICAL m
(0.12 in²/VERTICAL FT.)
VERTICAL FULL DEPTH
170 mm²/HORIZONTAL m
(0.12 in²/HORIZONTAL FT.)
PLACE REINFORCEMENT MESH CENTRALLY IN WALL.
SEE NOTES 5 AND 6 FOR STEEL REQUIREMENTS AT OPENINGS.



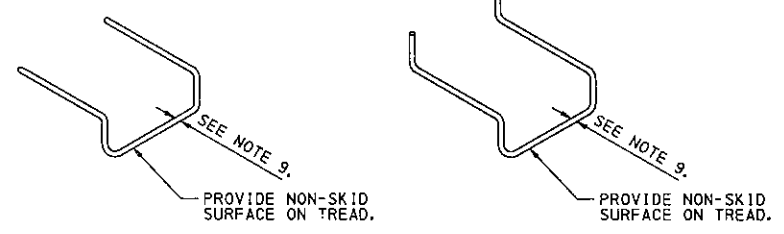
DETAIL A



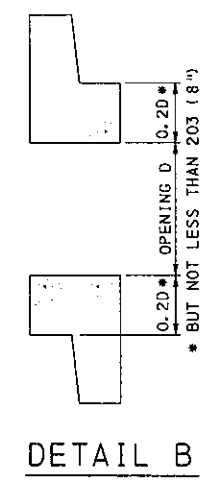
PLAN VIEW



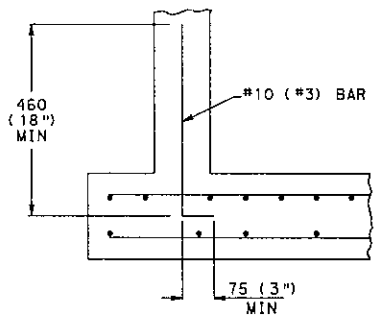
SIDE VIEW



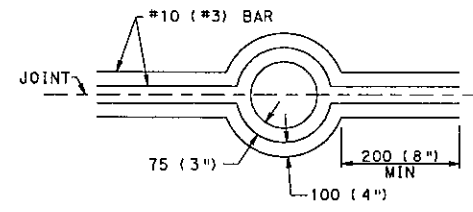
TYPICAL STEP CONFIGURATION
MANHOLE STEPS



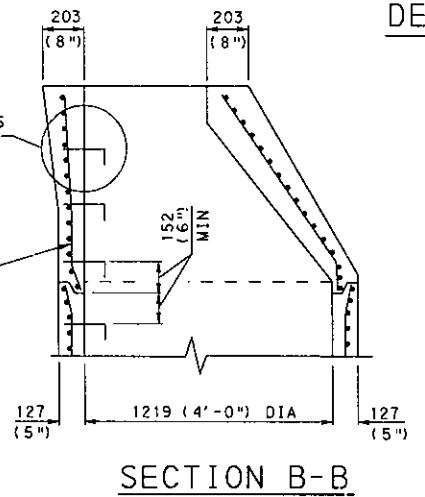
DETAIL B



DETAIL C



ALTERNATE DETAIL AT OPENINGS



SECTION B-B

SEE NOTE 7, SHEET 1

NOTES

1. PRECAST MANHOLES MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 714, MAY BE SUBSTITUTED FOR THE STANDARD CAST-IN-PLACE MANHOLE. FOR DEVIATION OR MODIFICATION OF THE STANDARDS, SUBMIT SHOP DRAWINGS FOR APPROVAL.
2. FOR CONSTRUCTION REQUIREMENTS SEE NOTE 1, SHEET 1. FOR DESIGN REQUIREMENTS SEE NOTE 1, SHEET 5.
3. FOR PERMISSIBLE LOCATION OF PIPES SEE PLAN VIEW AND NOTE 3, SHEET 1.
4. FOR RISERS OR BASE SECTIONS WITH OPENINGS, PROVIDE A MINIMUM HEIGHT OF SECTION SO AS TO PROVIDE AN UNCLUT WALL EQUAL TO 20% OF THE OPENING, BUT NO LESS THAN 203 (8"); BETWEEN THE OPENING AND THE CLOSEST JOINT BETWEEN RISERS - SEE DETAIL B.
5. FOR PRECAST RISER OR BASE SECTIONS WITH ONE OPENING LOCATED AT DEPTHS TO 18.0 m (60'), PROVIDE CIRCUMFERENTIAL REINFORCEMENT IN ACCORDANCE WITH SECTION B-B. FOR SECTIONS WITH TWO OR MORE OPENINGS, LOCATED AT DEPTH OF 3.0 m (10') AND LESS, PROVIDE CIRCUMFERENTIAL REINFORCEMENT EQUAL TO 340 mm²/VERTICAL m (0.16 in²/VERTICAL FT.) FOR THE HEIGHT OF RISER OR BASE SECTION.
6. FOR RISERS OR BASE SECTIONS WITH TWO OR MORE OPENINGS, LOCATED AT DEPTH GREATER THAN 3.0 m (10'), BUT LESS THAN OR EQUAL TO 7.6 m (25'), PROVIDE CIRCUMFERENTIAL REINFORCEMENT EQUAL TO 930 mm²/VERTICAL m (0.44 in²/VERTICAL FT.) FOR THE HEIGHT OF THE RISER OR BASE SECTION.
7. FOR RISERS OR BASE SECTIONS WITH TWO OR MORE OPENINGS, LOCATED AT DEPTHS GREATER THAN 7.6 m (25'), USE A 254 (10") THICK WALL RISER OR BASE SECTION WITH CIRCUMFERENTIAL REINFORCEMENT EQUAL TO 470 mm²/VERTICAL m (0.22 in²/VERTICAL FT.) EACH FACE.
8. MARK RISERS OR BASE SECTIONS WITH HOLES CLEARLY WITH MAXIMUM ALLOWABLE DEPTH.
9. PROVIDE ADDITIONAL REINFORCEMENT BARS AROUND OPENINGS AS SHOWN ON REINFORCEMENT DETAILS AT OPENINGS SHEET 1.
10. FOR CHANNEL DETAILS IN PRECAST MANHOLE SEE CAST-IN-PLACE MANHOLE SHEET 1.
11. PROVIDE MANHOLE STEPS MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 605.2(c). ALTERNATE CONFIGURATIONS AND DIMENSIONS, AS APPROVED BY THE ENGINEER, MAY BE USED.
12. PROVIDE MINIMUM 25 (1") SECTION DIMENSION FOR METAL STEPS. PROVIDE MINIMUM 19 (3/4") SECTION DIMENSION FOR NON-DETERIORATING MATERIAL STEPS.
13. MECHANICAL ANCHOR REQUIRED FOR INSTALLATION OF STEPS WITHOUT HOOKS.
14. THE ALTERNATE OPENING REINFORCEMENT DETAIL IS NOT DESIRABLE BY DESIGN. USE IT TO MEET EXISTING PIPE ELEVATIONS.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

TABLE B

PRECAST MANHOLE HEIGHT	TOP STEEL REQUIREMENTS	BOTTOM STEEL REQUIREMENTS
0.0 m TO 9.0 m (0'-0" TO 30'-0")	NO. 13 BARS AT 150 C TO C OR 700 mm ² /m WWF 152 MAXIMUM SPACING (NO. 4 BARS AT 6" C TO C) OR 0.33 in ² /FT WWF 6" MAXIMUM SPACING	NO. 13 BARS AT 300 C TO C OR 340 mm ² /m WWF 152 MAXIMUM SPACING (NO. 4 BARS AT 6" C TO C) OR 0.16 in ² /m WWF 6" MAXIMUM SPACING
> 9.0 m TO 18.0 m (> 30'-0" TO 60'-0")	NO. 16 BARS AT 150 C TO C OR 1190 mm ² /m WWF 152 MAXIMUM SPACING (NO. 5 BARS AT 6" C TO C) OR 0.56 in ² /FT WWF 6" MAXIMUM SPACING	NO. 13 BARS AT 150 C TO C OR 575 mm ² /m WWF 152 MAXIMUM SPACING (NO. 4 BARS AT 6" C TO C) OR 0.27 in ² /FT WWF 6" MAXIMUM SPACING

**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN**

**STANDARD MANHOLES
PRECAST MANHOLES &
MANHOLE STEPS**

NOTES

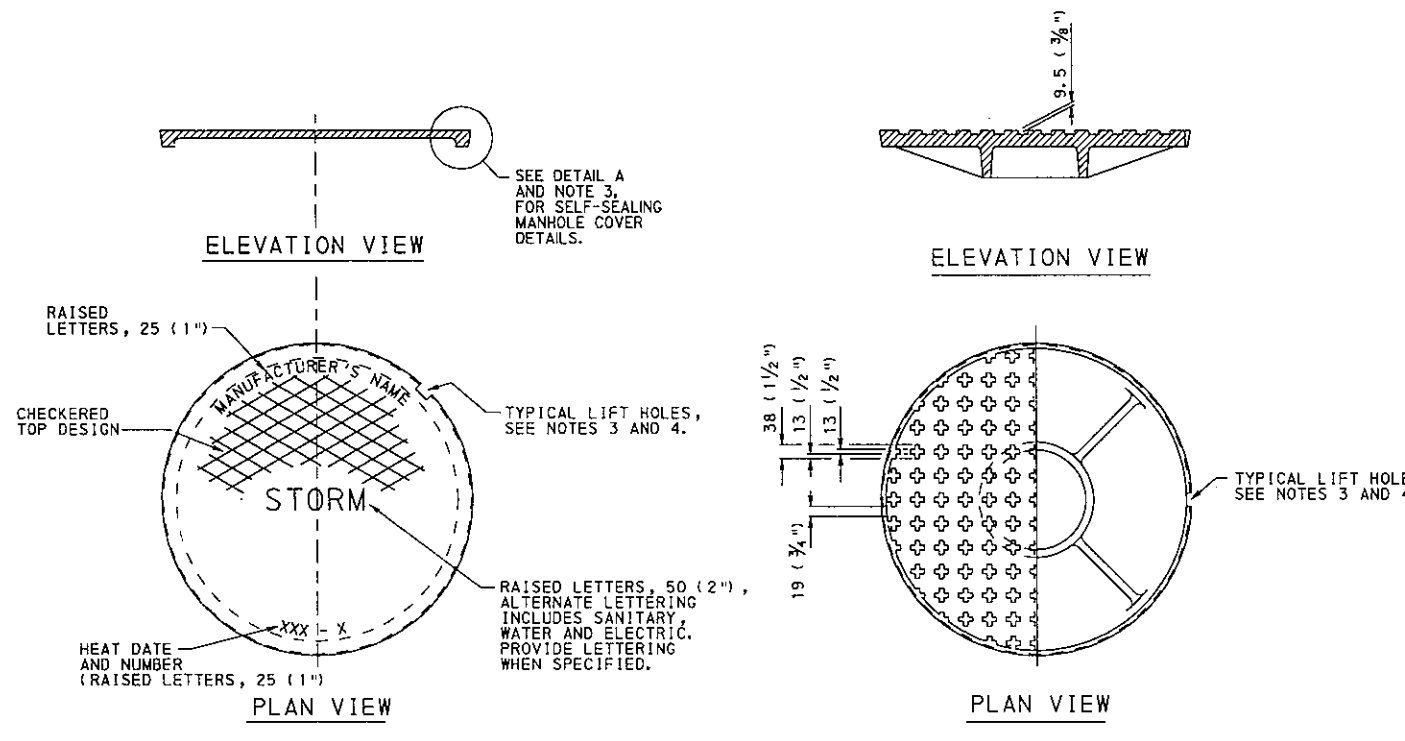
1. PROVIDE MANHOLE FRAMES AND COVERS MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 605.2(b). DESIGN MANHOLE FRAME, COVER AND GRADE ADJUSTMENT RINGS FOR PHL 93 (HS25) LIVE LOAD. IF MANHOLES ARE NOT IN OR ADJACENT TO ROADWAY, DESIGN FOR ALL POSSIBLE LIVE LOADS AS APPROVED BY THE DEPARTMENT.
2. PROVIDE MANHOLE FRAMES, COVERS AND GRADE ADJUSTMENT RISERS SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15. FOR DEVIATION OR MODIFICATION TO THE STANDARDS, SUBMIT SHOP DRAWINGS FOR APPROVAL.
3. PROVIDE A GASKET SEALING SYSTEM, DOVETAIL GROOVE AND CONTINUOUS GASKET, AS INDICATED IN DETAIL A, TO PREVENT INFLOW THROUGH THE BEARING SURFACES, OF SURFACE RUNOFF WATER INTO THE MANHOLE SYSTEM, WHEN SPECIFIED. PROVIDE 6 (1/4") DIA ONE PIECE SELF-SEAL POLYISOPRENE ROUND GASKET, 40 DUROMETER GLUED IN PLACE. PROVIDE TWO (2) LIFT HOLES AT 180° TO FACILITATE COVER REMOVAL FOR SELF-SEALING MANHOLE COVER.
4. PROVIDE ONE LIFT HOLE TO FACILITATE COVER REMOVAL FOR NON-SEALING MANHOLE COVER.
5. FRAME AND GRADE ADJUSTMENT RISER TO HAVE A MINIMUM BEARING SEAT OF 25 (1") FOR COVER.
6. LOCATE TOP OF FRAME OR ADJUSTMENT RISER 3 (1/8") BELOW THE TOP OF ROADWAY SURFACE.
7. PROVIDE GRADE ADJUSTMENT RISERS MEETING THE REQUIREMENTS OF PUBLICATION 408 SPECIFICATIONS, SECTION 606, AND AS MODIFIED HEREIN:
 - A. CUSTOM FABRICATE EACH ADJUSTMENT RISER FROM MEASUREMENTS PROVIDED WITH EACH ORDER.
 - B. MANUFACTURE BAR STOCK AND RETAINER CLIP FROM U.S. MADE CARBON STEEL MEETING OR EXCEEDING THE MINIMUM REQUIREMENTS OF ASTM A-36M.
 - C. REQUIRE FULL CIRCUMFERENTIAL WELDS ON BOTH TOP AND BOTTOM RINGS. MAKE THE INNER WELD A BEVEL GROOVE WELD (FLUSH FINISH) FOR PROPER SEATING OF MANHOLE LID AND MAKE THE OUTER WELD A FILLET WELD.
 - D. MAKE THE MINIMUM WIDTH OF BOTTOM AND TOP BAR STOCK 25 (1") AND 10 (3/8"), RESPECTIVELY.
 - E. TAP THE BOTTOM BAR STOCK FOR MULTI-PIECE ADJUSTMENT RISER FOR M14 ADJUSTMENT BOLT.
 - F. REINFORCE THE ADJUSTMENT RISER ADEQUATELY TO PREVENT BENDING.
 - G. PROVIDE AN ADJUSTMENT RISER WHICH IS FLUSH WITH COVER AND DOES NOT ALLOW EXCESSIVE MOVEMENT. PROVIDE AN ADJUSTMENT RISER WHICH CONFORMS TO THE SHAPE OF THE ORIGINAL FRAME.
8. ATTACH FRAME AND/OR PRECAST CONCRETE GRADE RINGS RIGIDLY TO TOP OF MANHOLE. USE 3-M14 THREADED STUDS WITH HEX HEAD NUTS AND WASHERS INSERTED THROUGH AT 16 (3/8") DIA HOLES THROUGH FRAME AND/OR RINGS. SPACE HOLES AT 120° AND 50 (2") FROM OUTSIDE EDGE OF FRAME. EMBED STUDS 102 (4") MINIMUM INTO MANHOLE. GROUT STUDS INTO MANHOLE.
9. SET THE BASE OF THE FRAME AND/OR PRECAST CONCRETE GRADE RINGS IN A BED OF CEMENT MORTAR.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

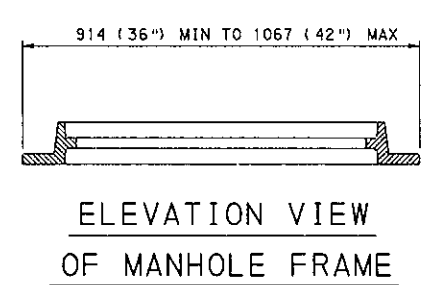
STANDARD MANHOLES
COVERS, FRAMES AND
ADJUSTMENT RISERS

RECOMMENDED APR. 16, 2001 <i>Alan A. Schaefer</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>David L. Johnson</i> CHIEF ENGINEER	SHT 4 OF 5 RC-39M
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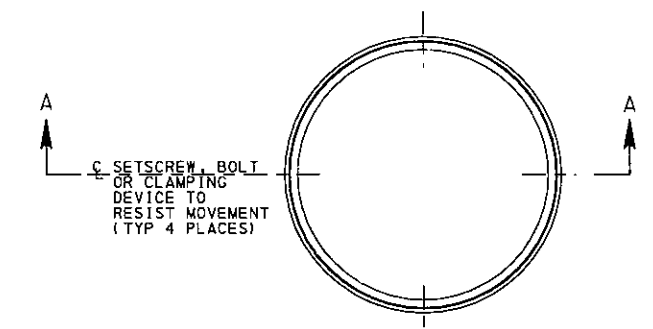


CAST IRON MANHOLE COVER
(PLATEN COVER)

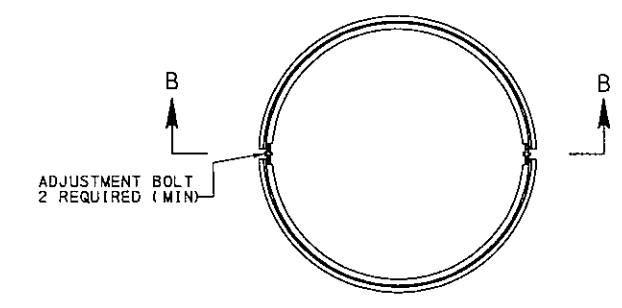
CAST IRON MANHOLE COVER
(STANDARD COVER)



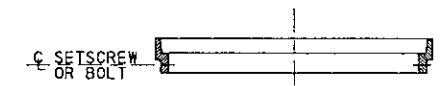
ELEVATION VIEW
OF MANHOLE FRAME



PLAN VIEW
ONE PIECE ADJUSTMENT RISER



PLAN VIEW
MULTI-PIECE ADJUSTMENT RISER

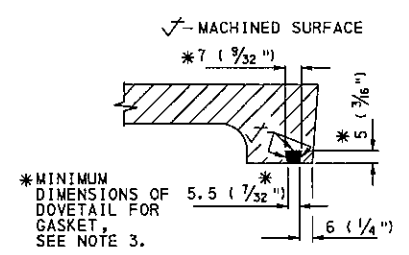


SECTION A-A



SECTION B-B

ADJUSTMENT RISERS



DETAIL A
GASKET SEALING SYSTEM

SEE DETAIL A AND NOTE 3, FOR SELF-SEALING MANHOLE COVER DETAILS.

TYPICAL LIFT HOLES, SEE NOTES 3 AND 4.

RAISED LETTERS, 50 (2"), ALTERNATE LETTERING INCLUDES SANITARY, WATER AND ELECTRIC. PROVIDE LETTERING WHEN SPECIFIED.

TYPICAL LIFT HOLE, SEE NOTES 3 AND 4.

C. SETSCREW, BOLT OR CLAMPING DEVICE TO RESIST MOVEMENT (TYP 4 PLACES)

ADJUSTMENT BOLT 2 REQUIRED (MIN)

*MINIMUM DIMENSIONS OF DOVETAIL FOR GASKET, SEE NOTE 3.

1. DESIGN REQUIREMENTS:

- A. DESIGN SPECIFICATIONS: DESIGN DIVISION 1 OF AASHTO, STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 1992, INCLUDING THE LATEST INTERIM SPECIFICATIONS AND AS SUPPLEMENTED BY THE DESIGN MANUAL, PART 4, AUGUST 1993 EDITION (INCLUDING LATEST REVISIONS). ASTM C 478M-90, STANDARD SPECIFICATIONS FOR PRECAST CONCRETE MANHOLE SECTIONS.
- B. CALCULATE FOUNDATION BEARING PRESSURES BY SERVICE LOAD METHODS. DESIGN ALL OTHER PORTIONS OF THE MANHOLES BY LOAD FACTOR METHODS.
- C. THE SAFE BEARING PRESSURE IS NOT TO EXCEED THE EXISTING STATE OF STRESS OR 0.15 MPa (1.5 TONS PER SQ. FT.), WHICHEVER IS GREATER.
- D. DESIGN THE MANHOLE FOR A LIVE LOAD OF PHL 93 (HS25) AND WITH 30% IMPACT, EXCEPT DO NOT USE IMPACT IN THE DESIGN OF THE FOOTING. IF MANHOLES ARE NOT IN OR ADJACENT TO A ROADWAY, DESIGN FOR ALL POSSIBLE LIVE LOADS AS APPROVED BY THE DEPARTMENT.

- E. DESIGN THE MANHOLE FOR:
 - ACCELERATION DUE TO GRAVITY, $g = 9.81 \text{ m/s}^2$
 - DENSITY OF EARTH, $\gamma_e = 1920 \text{ kg/m}^3$ (120#/CF)
 - $\phi =$ ANGLE OF INTERNAL FRICTION = 33°
 - DRY AT REST EARTH PRESSURE = $K_0 \gamma_e = 0.001(1 - \sin \phi) \gamma_e$
 $= 0.001 \times 0.46 \times 1920 \times 9.81 = 8.7 \text{ MPa}$
 - SATURATED AT REST EARTH PRESSURE = $K_0 [\gamma_e (\gamma_w - \gamma) + \gamma_w]$
 $= 0.46 [(0.001)(1920)(9.81) - 9.81] + 9.81$
 $= 14.0 \text{ MPa}$
 - (SATURATED AT REST EARTH PRESSURE = $0.46 \times 120 = 55 \text{ P.C.F.}$)
 $= 0.46 \times (120 - 62.4) + 62.4$
 $= 89 \text{ P.C.F.}$)

- F. PROVIDE AT LEAST MINIMUM REINFORCEMENT FOR SHRINKAGE AND TEMPERATURE AT ALL CONCRETE FACES WHERE REINFORCEMENT IS NOT REQUIRED BY DESIGN.
- G. FOR CONSTRUCTION REQUIREMENTS SEE NOTE 1, SHEET 1.

2. VERTICAL STEEL:

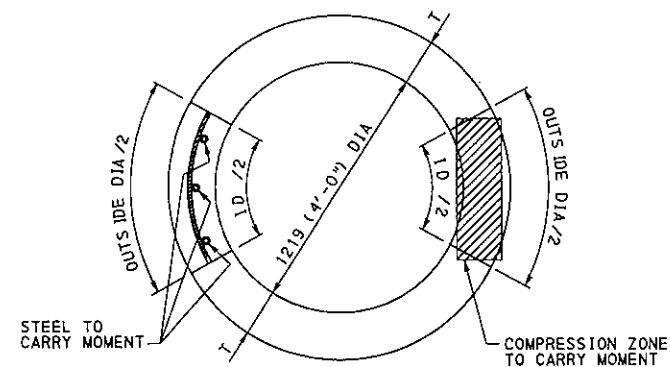
- A. THIS PROCEDURE IS REQUIRED ONLY WHEN A SIGNIFICANT LOADING EXISTS ON ONE SIDE OF THE MANHOLE AND LIMITED SUPPORT IS PROVIDED ON THE OTHER.
- B. DETERMINE MINIMUM AND MAXIMUM VERTICAL LOAD APPLIED TO MANHOLE AT DEPTH "H".
- C. DETERMINE OVERTURNING MOMENT FROM UNBALANCED EARTH PRESSURE.
- D. DETERMINE DIMENSIONS OF DESIGN SECTION TO CARRY MOMENT AS SHOWN IN FIGURE 1.

EQUIVALENT RECTANGULAR COMPRESSION ZONE DIMENSIONS TO CARRY MOMENT:
 T MILLIMETERS BY 1/4 INSIDE DIA + OUTSIDE DIA
 CENTROID OF RECTANGULAR SECTION IS AT CENTROID OF ARC SECTION.

- E. DESIGN REINFORCEMENT IN "COLUMN" TO CARRY AXIAL LOAD AND MOMENT. (USE TOTAL CROSS-SECTION TO CARRY AXIAL LOAD.)
- F. CHECK CRACK CONTROL UNDER SERVICE LOAD CONDITIONS.

$$Z = F_s \sqrt{\frac{dc \times 2dst \times b}{\text{NO. OF BARS}}} < 17.2 \text{ N/m} \quad \text{DM4-8-16-8-4}$$

(98 kips/FT)

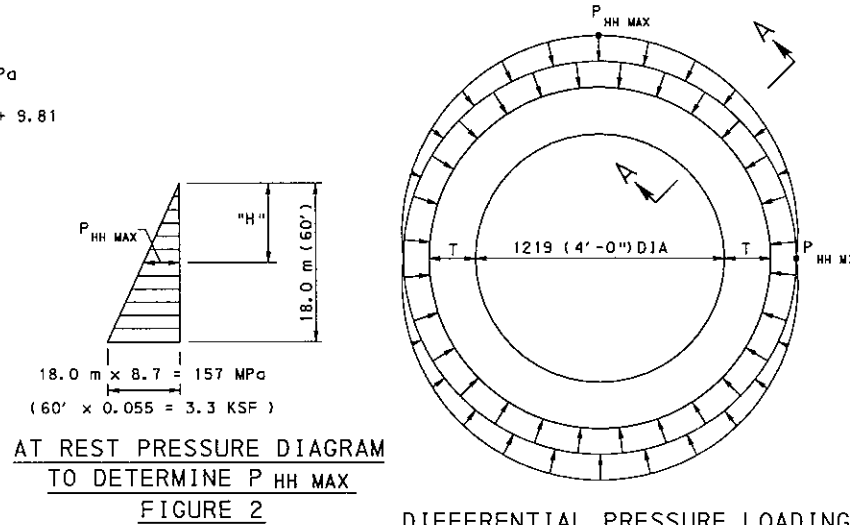


DESIGN SECTION TO CARRY MOMENT
 FIGURE 1

3. HOOP STEEL:

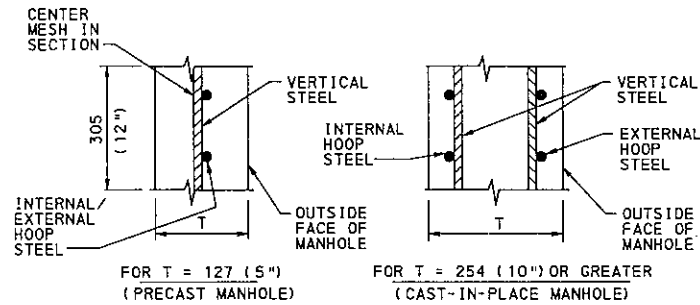
- A. DETERMINE SERVICE MOMENTS AND AXIAL THRUSTS USING FIGURE 2 AND FIGURE 3.
 $P_{HH \text{ MIN}}$ NOT TO BE GREATER THAN ONE-HALF OF $P_{HH \text{ MAX}}$.
- B. DESIGN HOOP REINFORCEMENT SHOWN IN SECTION A-A, TO CARRY THE MOMENT AND AXIAL THRUST.
- C. CHECK CRACK CONTROL UNDER SERVICE LOAD.

$$Z = F_s \sqrt{\frac{dc \times 2dst \times b}{\text{NO. OF BARS}}} < 17.2 \text{ N/m} \quad (98 \text{ kips/FT})$$



AT REST PRESSURE DIAGRAM
 TO DETERMINE $P_{HH \text{ MAX}}$
 FIGURE 2

DIFFERENTIAL PRESSURE LOADING
 TO DETERMINE HOOP MOMENTS
 FIGURE 3



FOR T = 127 (5") (PRECAST MANHOLE)
 FOR T = 254 (10") OR GREATER (CAST-IN-PLACE MANHOLE)

USE WALLS AT 127 (5") THICK WITH ONE (1) ROW OF REINFORCING,
 OR USE WALLS AT 254 (10") OR GREATER WITH TWO (2) ROWS OF REINFORCING.

SECTION A-A - DESIGN SECTION

4. FOOTING DESIGN:

- A. DETERMINE FOOTING SIZE (USE AN EQUIVALENT CIRCULAR FOOTING FOR DESIGN)

$$\frac{P + M}{A} < 290 \text{ KPa (3.0 KSF) OR MAXIMUM ALLOWABLE BEARING PRESSURE}$$

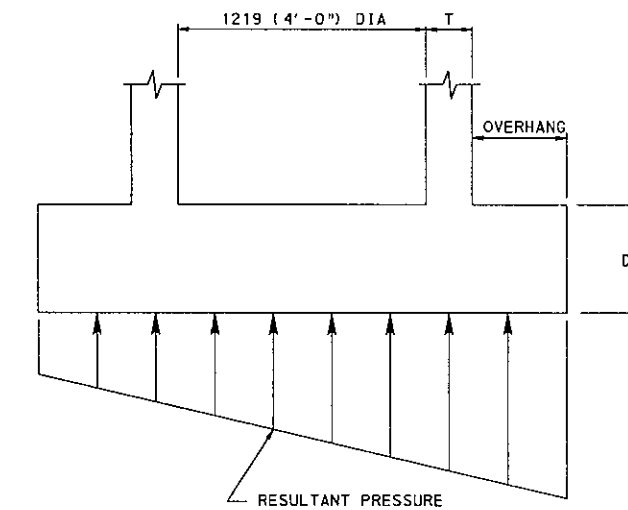
- $P = DL + LL + EP$
- DL = DEAD LOAD OF MANHOLE
- LL = PHL 93 (HS25) WHEEL LOAD (NO IMPACT)
- EP = EARTH LOAD ON OVERHANG
- A = BEARING AREA OF FOOTING
- M = MOMENT DUE TO DIFFERENTIAL LOADING (WHEN APPLICABLE)
- S = SECTION MODULUS OF FOOTING

SEPARATION BETWEEN THE FOOTING AND SOIL IS NOT PERMISSIBLE.

- B. DESIGN FOOTING TO CARRY MOMENT (BOTH MAXIMUM NEGATIVE AND POSITIVE) AND SHEAR DUE TO RESULTANT PRESSURE AS SHOWN IN FIGURE 4 AND APPLIED LOADS.

- C. CHECK CRACK CONTROL UNDER SERVICE LOAD.

$$Z = F_s \sqrt{\frac{dc \times 2dst \times b}{\text{NO. OF BARS}}} < 17.2 \text{ N/m} \quad (98 \text{ kips/FT})$$

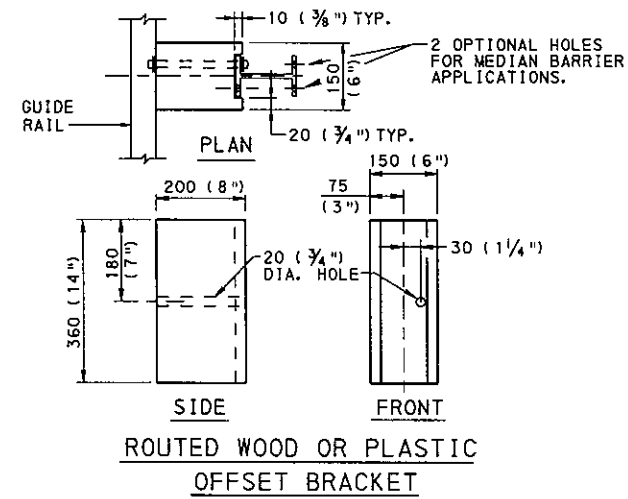


DIAMETRICAL SECTION THROUGH FOOTING
 FIGURE 4

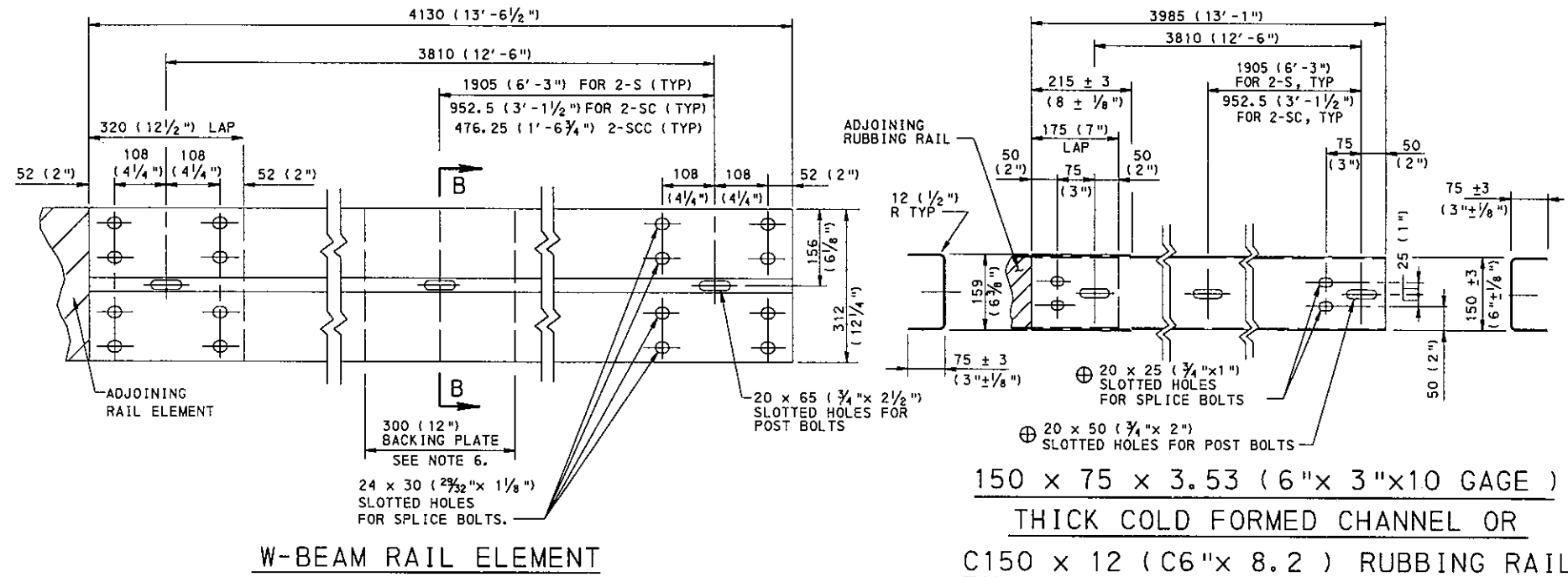
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
 DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

STANDARD MANHOLES
 DESIGN PROCEDURE



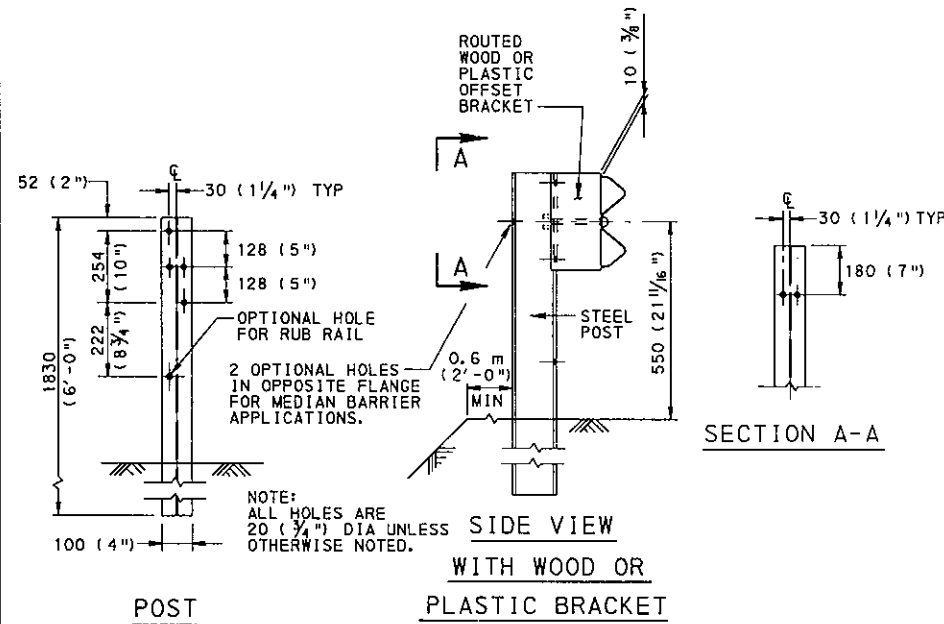
ROUTED WOOD OR PLASTIC
OFFSET BRACKET



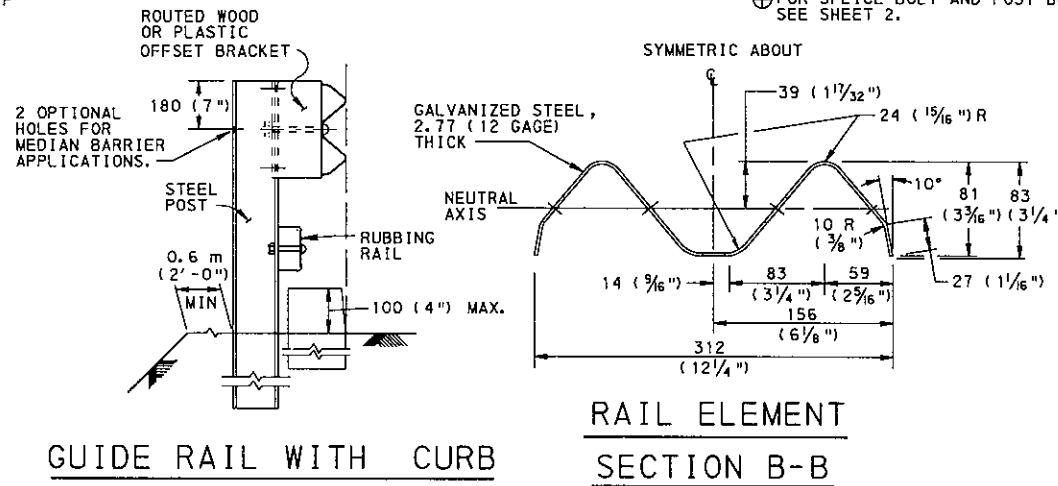
W-BEAM RAIL ELEMENT

150 x 75 x 3.53 (6" x 3" x 10 GAGE)
THICK COLD FORMED CHANNEL OR
C150 x 12 (C6" x 8.2) RUBBING RAIL

(SEE NOTE 4)



W150 x 13.5 (W6 x 8.5 or 9.0) POST DETAILS



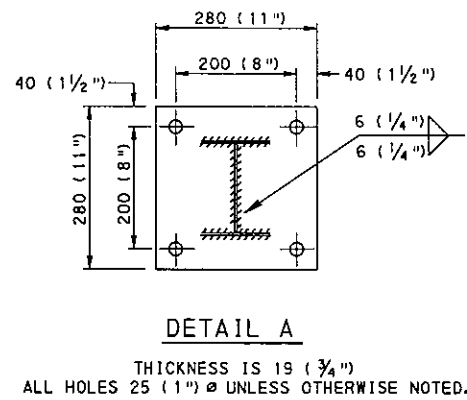
GUIDE RAIL WITH CURB
OR RUBBING RAIL

RAIL ELEMENT
SECTION B-B

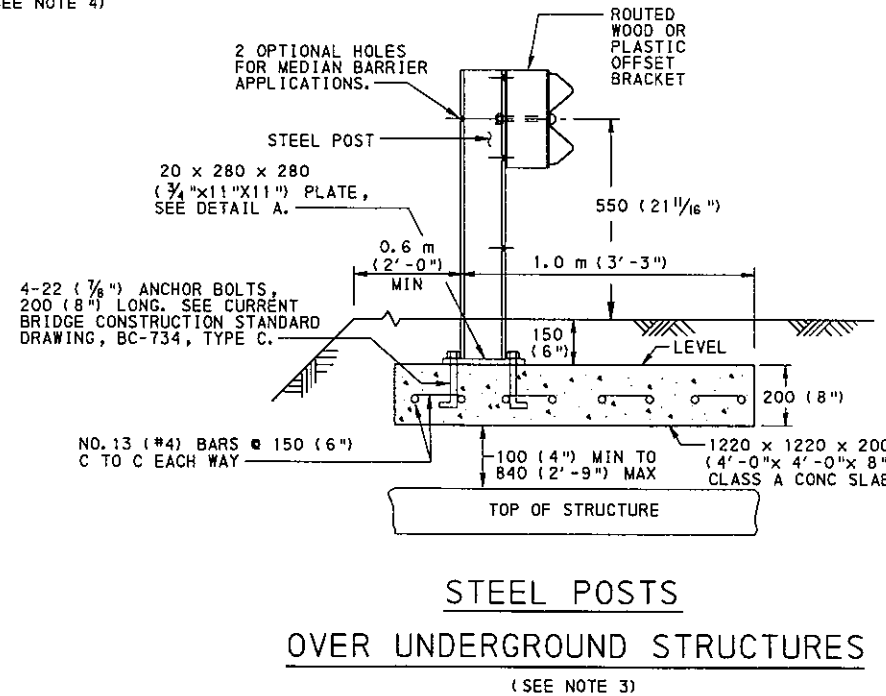
NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 620.
2. PROVIDE STEEL I-BEAM #150x13.5 (W6 x 8.5) POSTS WITH ROUTED WOOD, PLASTIC OR COMPOSITE OFFSET BRACKETS LISTED IN BULLETIN 15.
3. FOR INSTALLATION OF GUIDE RAIL OVER UNDERGROUND STRUCTURES, THE CONCRETE, REINFORCEMENT BARS AND HARDWARE ARE INCIDENTAL TO THE GUIDE RAIL PAY ITEM.
4. PROVIDE RUBBING RAIL WHEN THE HEIGHT OF STRONG POST GUIDE RAIL IS OVER 710 (28") IN TRANSITION AREAS TO EXISTING GUIDE RAIL.
5. ATTACH W-BEAM RAIL ELEMENTS TO EACH POST. SPLICE RAIL ELEMENTS ONLY AT POSTS AND LAP IN THE DIRECTION OF TRAFFIC.
6. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.
7. INSTALL GUIDE RAIL DELINEATORS IN ACCORDANCE WITH TC-7604.
8. FOR STRONG POST MEDIAN BARRIER APPLICATIONS, THE INSTALLATION IS A MIRROR IMAGE ON EACH SIDE OF THE POST.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.



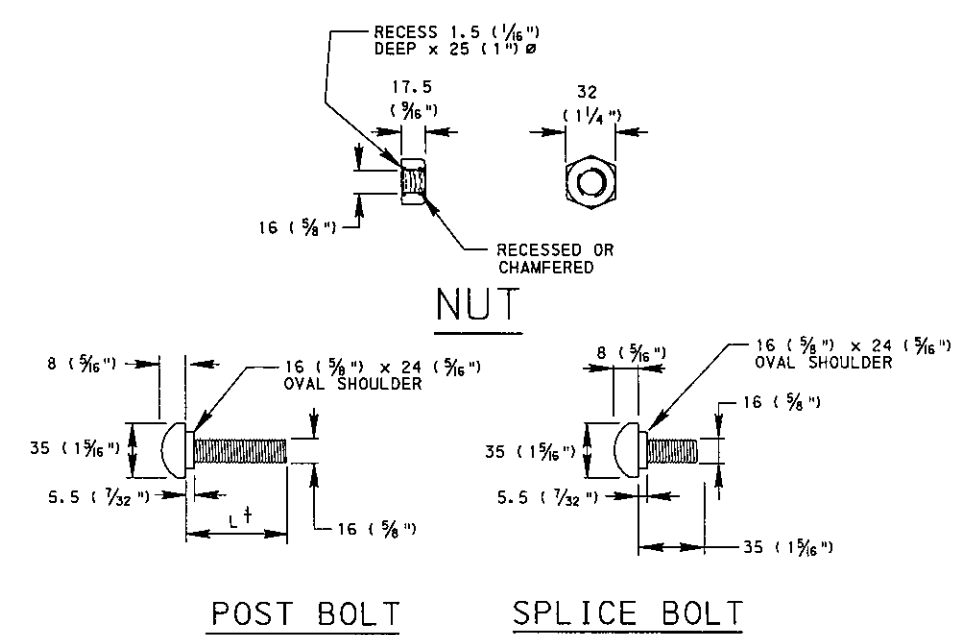
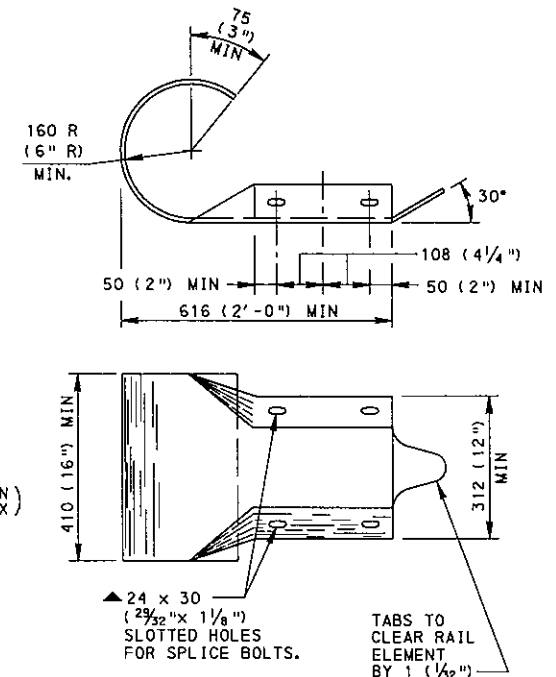
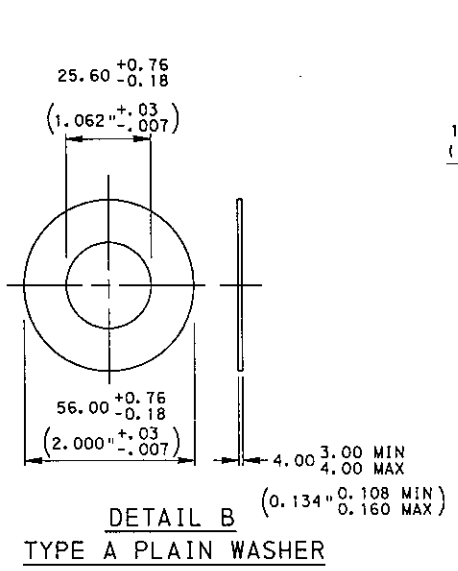
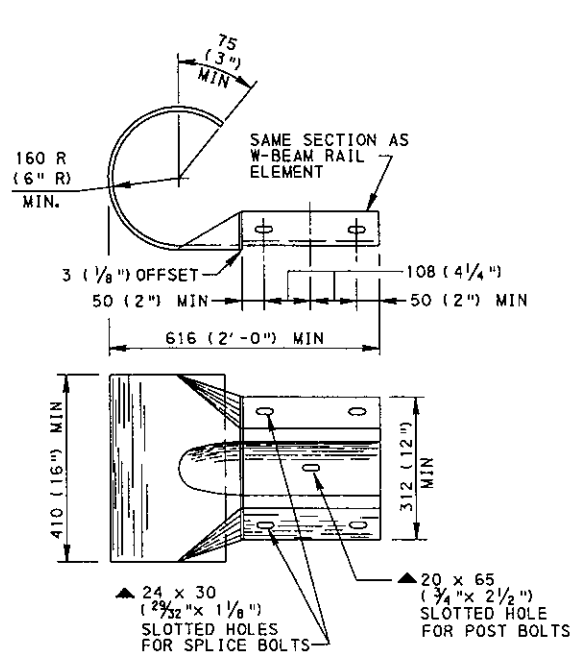
DETAIL A
THICKNESS IS 19 (3/4)
ALL HOLES 25 (1) Ø UNLESS OTHERWISE NOTED.



STEEL POSTS
OVER UNDERGROUND STRUCTURES
(SEE NOTE 3)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

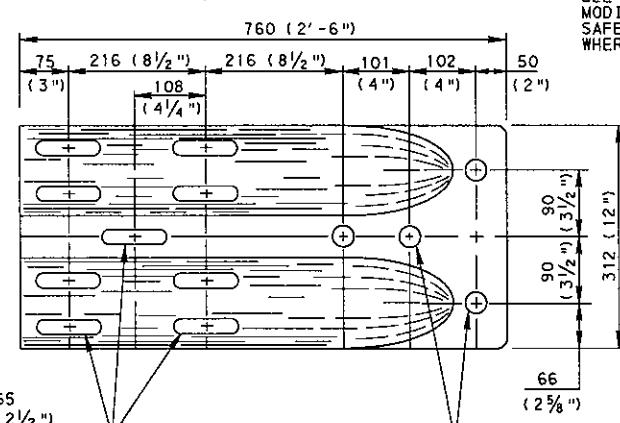
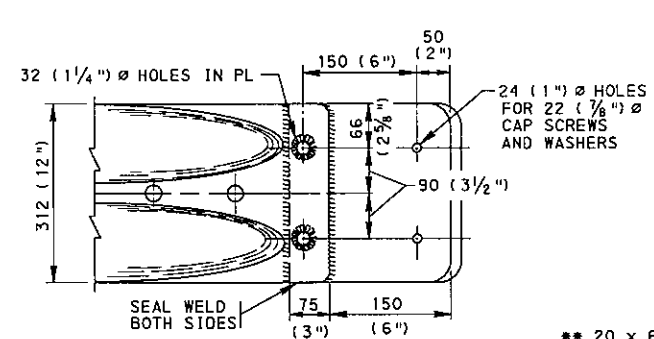
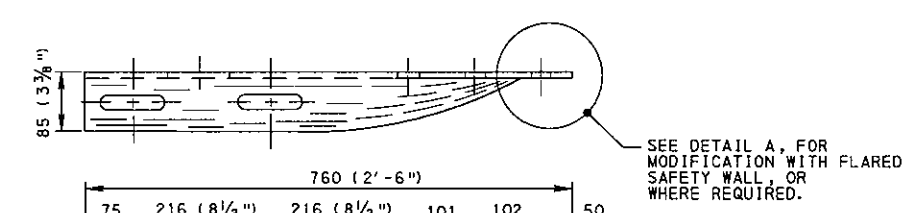
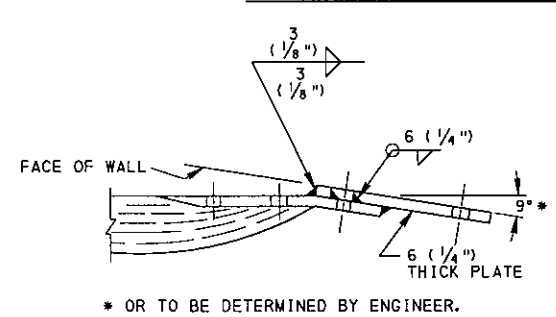
TYPE 2 STRONG POST
GUIDE RAIL



TERMINAL TO BE PLACED ON BACK OF RAIL ELEMENT

TERMINAL TO BE PLACED ON FACE OF RAIL ELEMENT

ALTERNATE TERMINAL SECTIONS



DETAIL A
(THE BRIDGE CONNECTION TERMINAL MODIFICATION MAY BE FABRICATED AS ONE PIECE TO ELIMINATE WELDING.)

** PROVIDE SPLICE BOLTS WITH A LOCK NUT OR DOUBLE NUT AND TIGHTEN ONLY TO A POINT THAT ALLOWS GUIDE RAIL TO BE FREE TO MOVE. CENTER SPLICE BOLTS IN THE SLOTTED HOLES. SEE CURRENT BRIDGE CONSTRUCTION DRAWINGS, BC-739M, FOR ATTACHMENT DETAILS.

TERMINAL SECTION BRIDGE CONNECTION

NOTES

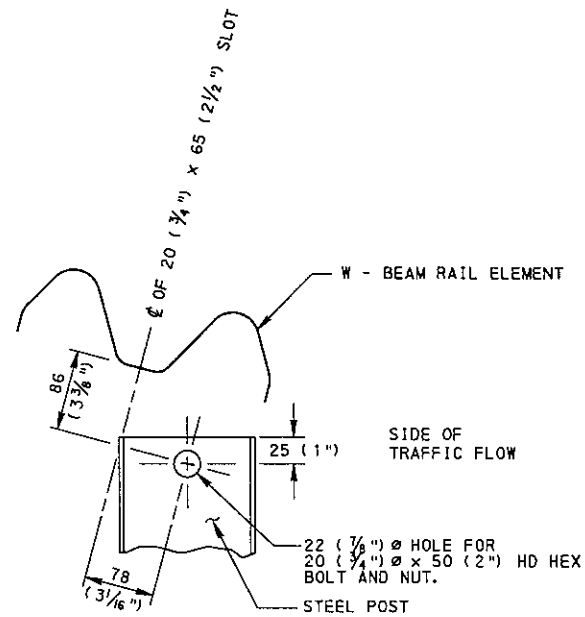
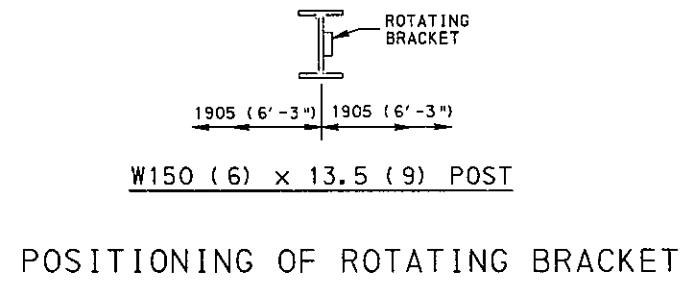
1. USE SPLICE BOLTS TO DEVELOP THE DESIGN STRENGTH OF THE RAIL ELEMENT.
2. PROVIDE TERMINAL SECTION BRIDGE CONNECTION, WITH WELDED PLATE FOR SAFETY, AS AN INCIDENTAL ITEM.
3. USE SLOTTED ROUND-HEADED BOLTS TO PROVIDE FOR WRENCH OR SCREWDRIVER.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST
GUIDE RAIL

RECOMMENDED APR. 16, 2001 <i>Dean A. Schwan</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>Harry D. Hoffman</i> CHIEF ENGINEER	SHT. 2 OF 6 RC-52M
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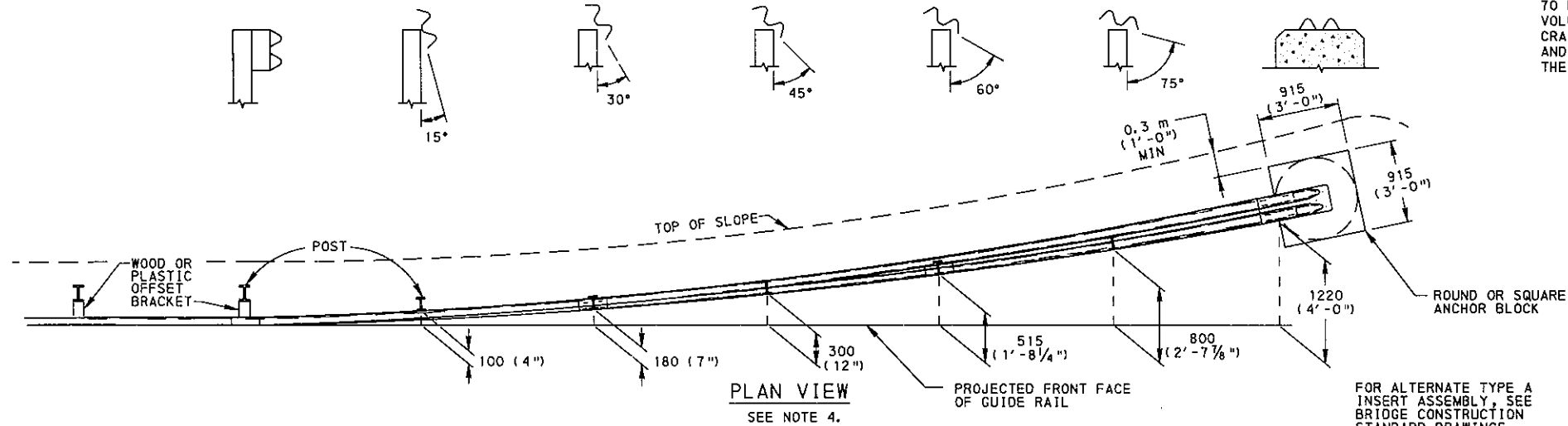
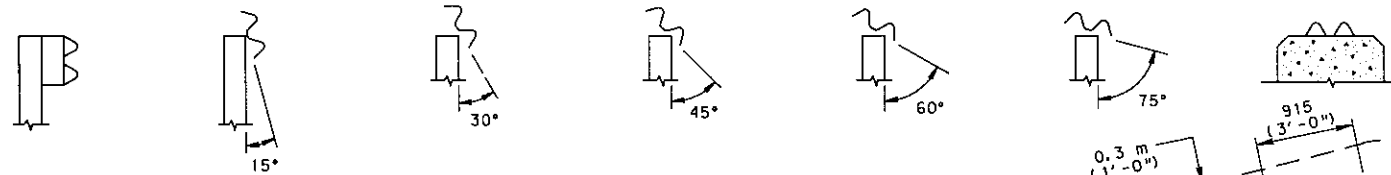
TYPICAL FOR
15° THRU 75° POSITIONS
ROTATING BRACKET

TABLE A

HEIGHT OF POST	430 (17")	370 (14 1/2")	300 (11 3/4")	215 (8 1/2")	115 (4 1/2")
ROTATION ANGLES	15°	30°	45°	60°	75°

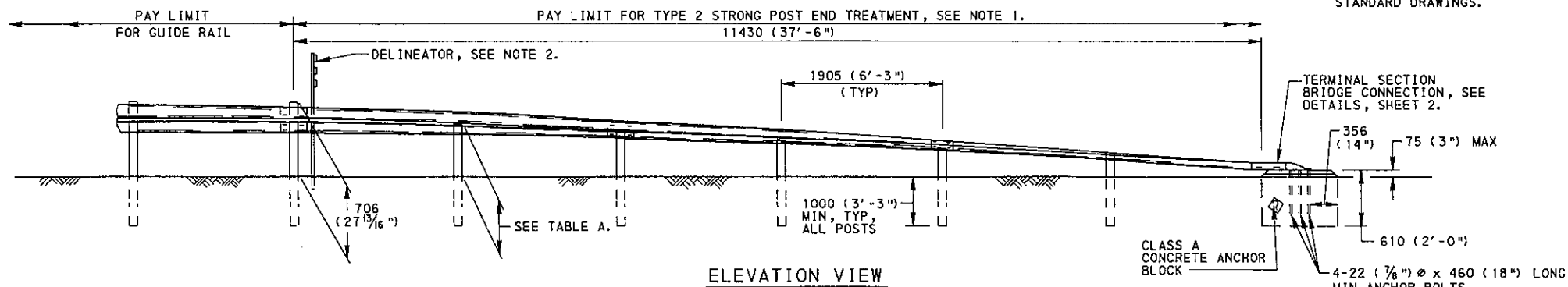
NOTES

- PAYMENT FOR TYPE 2 STRONG POST END TREATMENT INCLUDES 11430 (37'-6") OF SLOPING RAIL, TERMINAL SECTION, HARDWARE, EXCAVATION AND CONCRETE.
- INSTALL DELINEATOR ASSEMBLIES UNDER SEPARATE PAY ITEM OR CONTRACT. FOR ADDITIONAL DETAILS, SEE TRAFFIC STANDARD TC-7604.
- ONLY THE NECESSARY DIMENSIONS, FOR UNIFORMITY AND INTERCHANGEABILITY OF ROTATING BRACKETS, ARE INDICATED. PROVIDE ROTATING BRACKETS SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15.
- MEASURE OFFSETS FROM THE PROJECTED FRONT FACE OF THE GUIDE RAIL TO THE FRONT FACE OF THE POST.
- TYPE 2 STRONG POST END TREATMENTS CAN NOT BE USED TO TERMINATE THE APPROACH END OF a) ANY GUIDE RAIL ON THE NHS, or b) ANY GUIDE RAIL ON NON-NHS HIGH-SPEED, HIGH-VOLUME ROUTES. USE CRASHWORTHY END TREATMENTS ON ALL NHS ROUTES AND ON NON-NHS ROADWAYS WITH 70 km/h (45 mph) POSTED SPEED LIMIT & ABOVE AND WITH CURRENT TRAFFIC VOLUMES 4000 VEHICLES PER DAY & ABOVE. ON 2-LANE ROADWAYS WHERE CRASHWORTHY END TREATMENTS ARE REQUIRED, USE ON BOTH THE APPROACH AND TRAILING ENDS. TYPE 2 STRONG POST END TREATMENTS MAY BE USED ON THE TRAILING END OF GUIDE RAIL FOR HIGH SPEED NHS DIVIDED ROADWAYS.



FOR ALTERNATE TYPE A INSERT ASSEMBLY, SEE BRIDGE CONSTRUCTION STANDARD DRAWINGS.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.



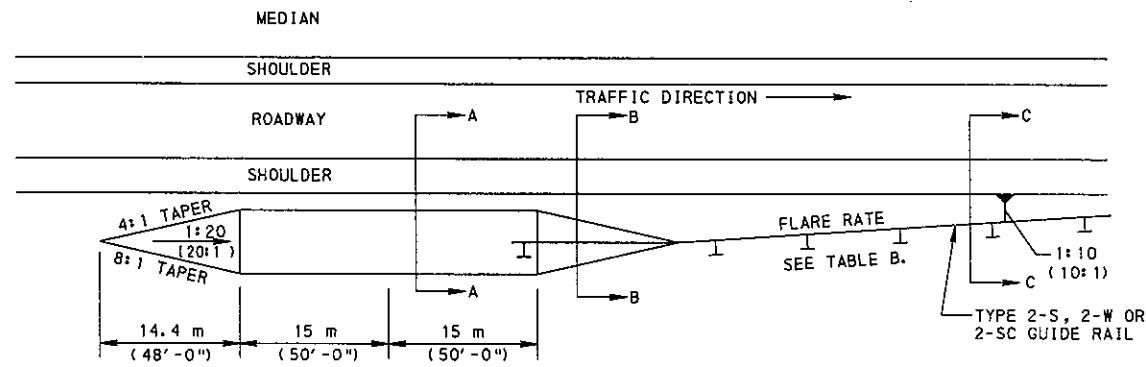
TYPE 2 STRONG POST END TREATMENT
SEE NOTE 5.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST
GUIDE RAIL
END TREATMENTS

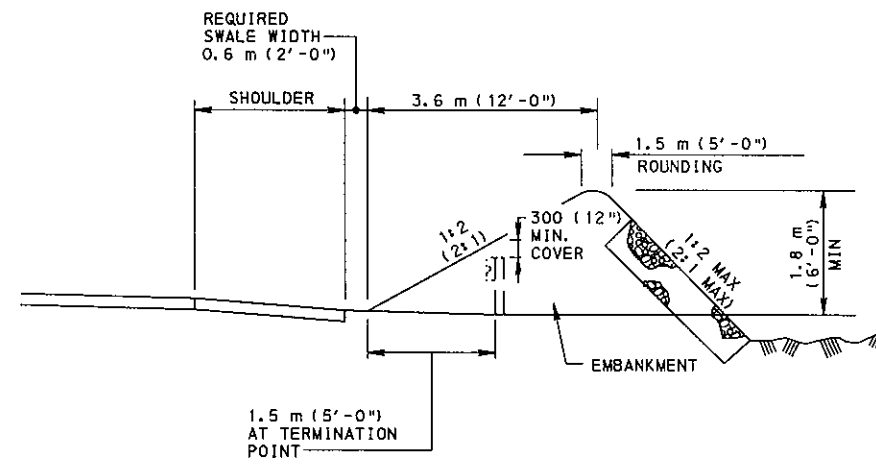
TABLE B
FLARE RATES
FOR BARRIER DESIGN

DESIGN SPEED		MAXIMUM FLARE RATES
km/h	(mph)	GUIDE RAIL
120	(75)	15 : 1
110	(65)	15 : 1
100	(60)	14 : 1
90	(55)	12 : 1
80	(50)	11 : 1
70	(45)	10 : 1
60	(35)	8 : 1
50	(30)	7 : 1

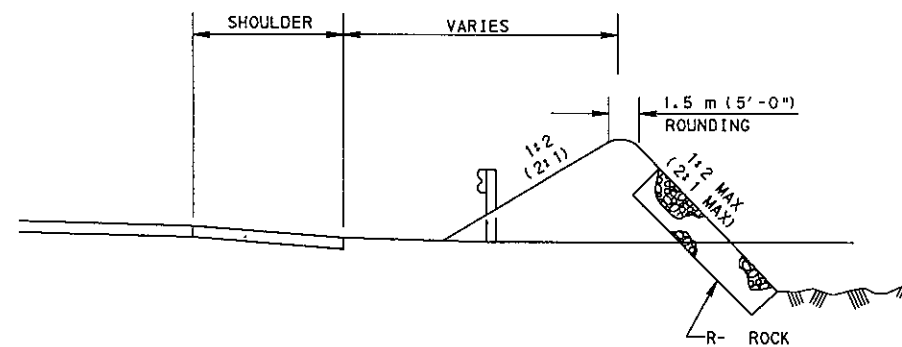


TYPICAL EARTH MOUND FOR BURYING GUIDE RAIL

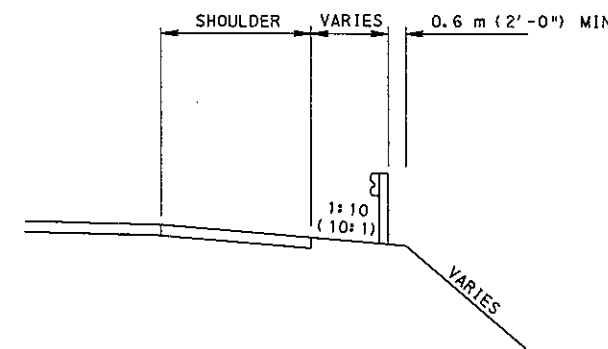
SEE NOTE 2.



SECTION A-A



SECTION B-B



SECTION C-C

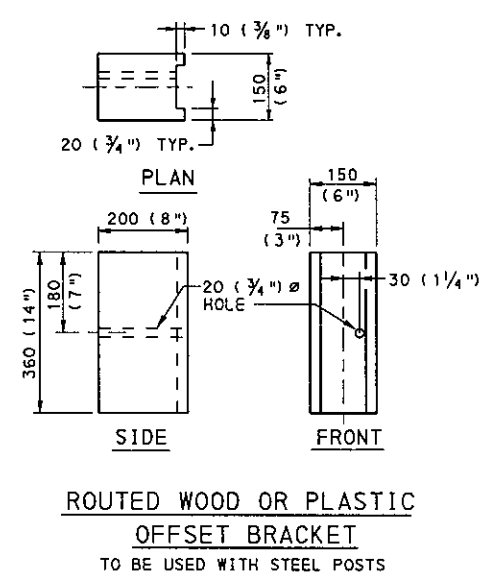
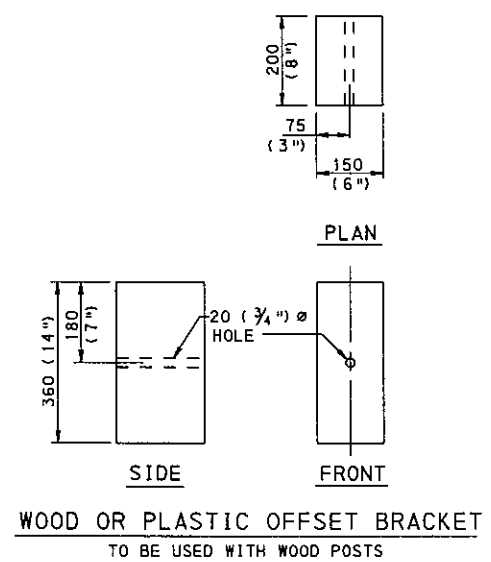
NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408.
2. ALL MATERIAL NECESSARY TO CONSTRUCT EARTH MOUNDS ARE IN ACCORDANCE WITH APPLICABLE SECTIONS OF PUBLICATION 408.
3. EARTHMONDS MAY BE USED TO BURY GUIDE RAIL ON HIGHWAYS WITH POSTED SPEEDS LESS THAN 70 km/h (45 mph) AND WITH CURRENT TRAFFIC VOLUME LESS THAN 4000 VEHICLES PER DAY OR WHEN THEY ARE CONSTRUCTED OUTSIDE THE CLEAR ZONE AS DETERMINED IN PUB. 13M, DESIGN MANUAL PART 2, CHAPTER 12.

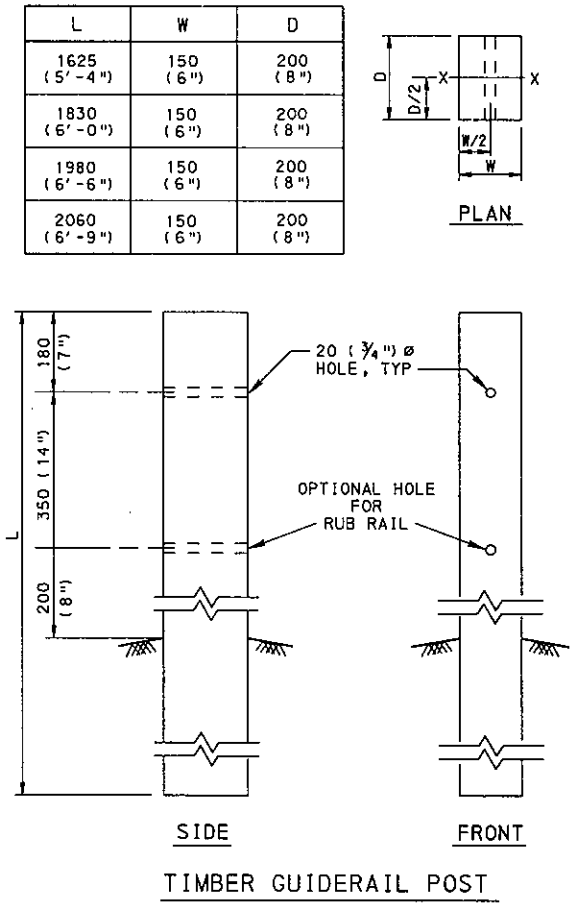
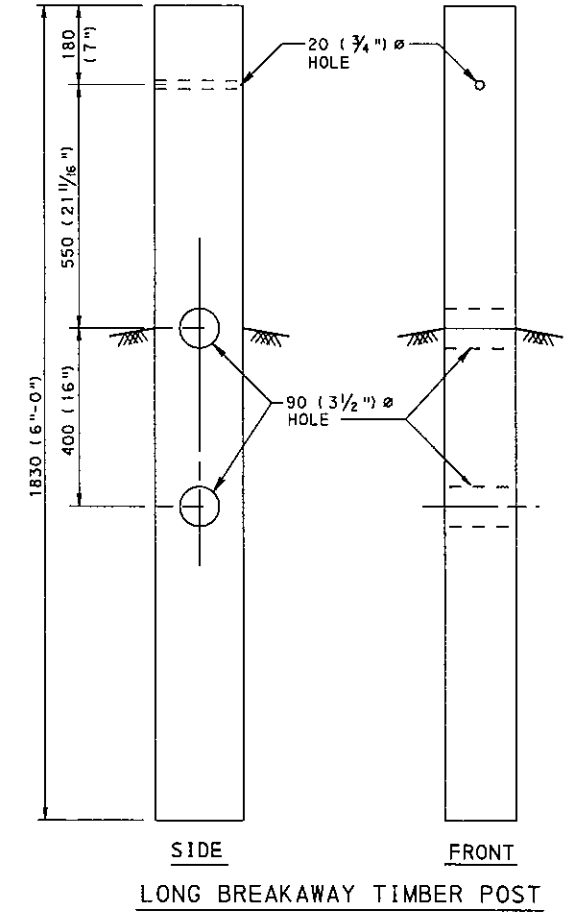
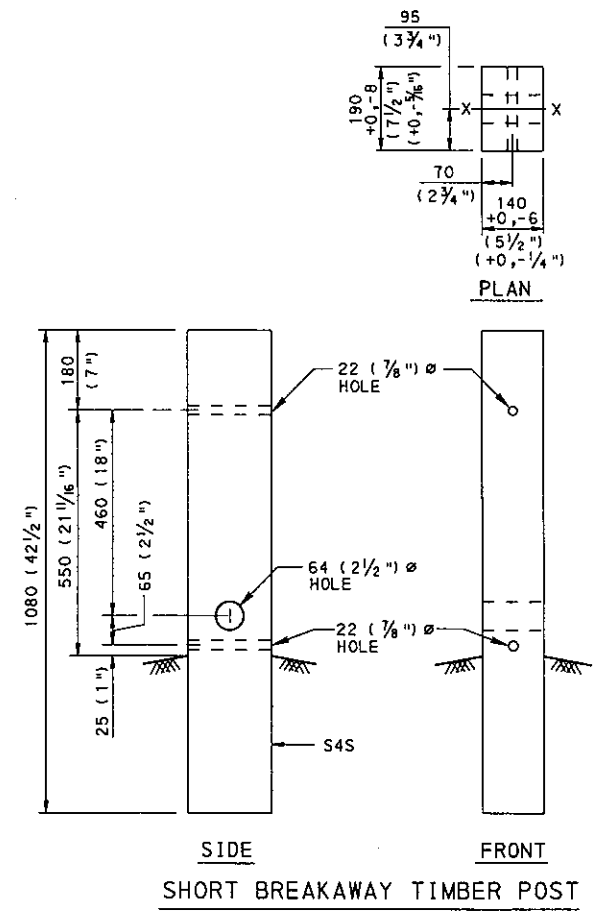
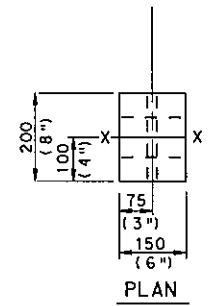
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST
GUIDE RAIL
END TREATMENTS



- NOTES**
1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408.
 2. WOOD POSTS ARE TO BE USED FOR END TREATMENTS AND SPECIAL CONDITIONS ON A CASE BY CASE BASIS. THEY ARE NOT TO BE USED AS ALTERNATES TO STEEL POSTS FOR GUIDE RAIL.

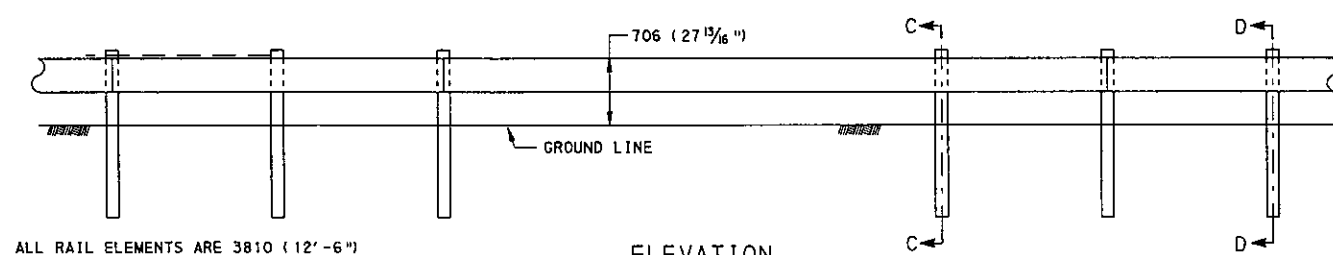
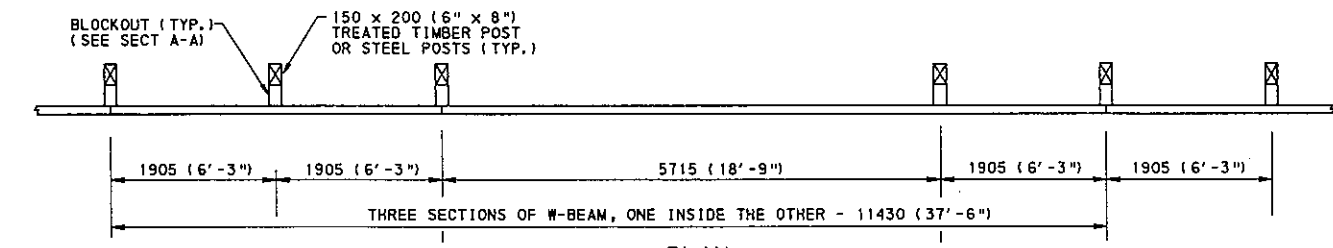


NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST
GUIDE RAIL
POSTS AND OFFSET BRACKETS

RECOMMENDED APR. 16, 2001 <i>Dean H. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>David Hoffman</i> CHIEF ENGINEER	SHT. 5 OF 6 RC-52M
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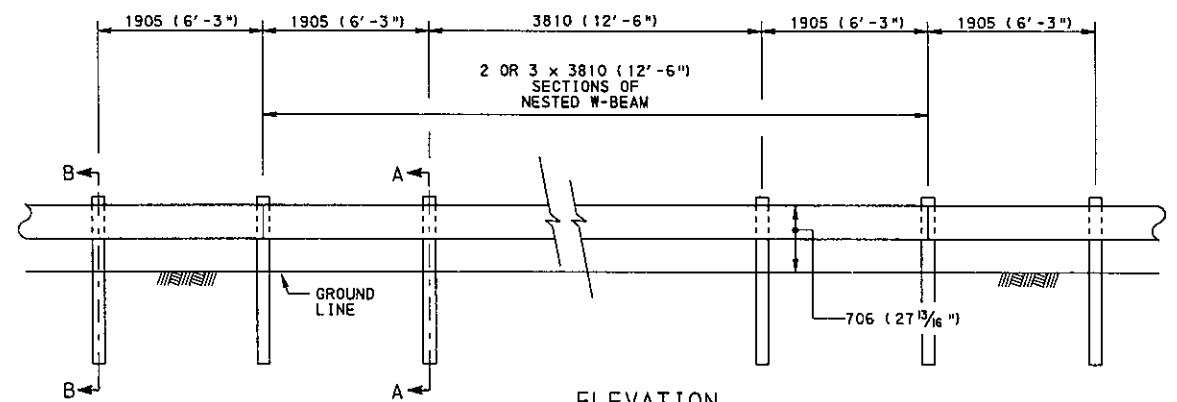


ALL RAIL ELEMENTS ARE 3810 (12'-6")

PLAN

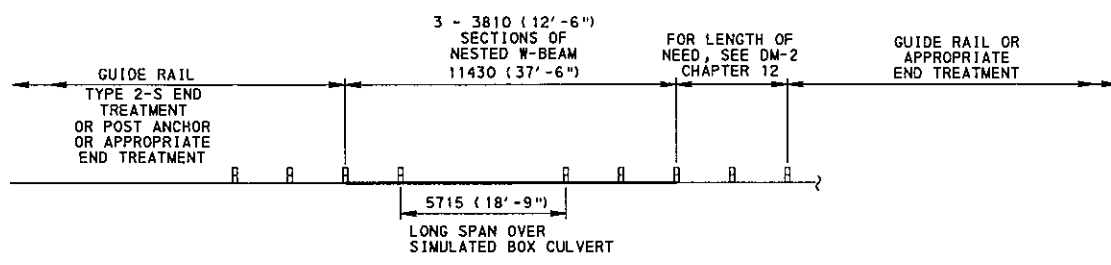
ELEVATION

CASE 2

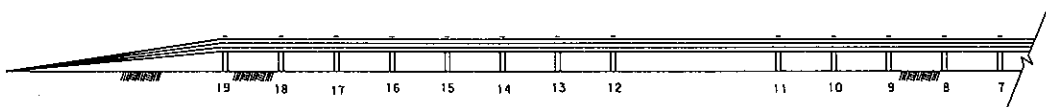


ELEVATION

CASE 1

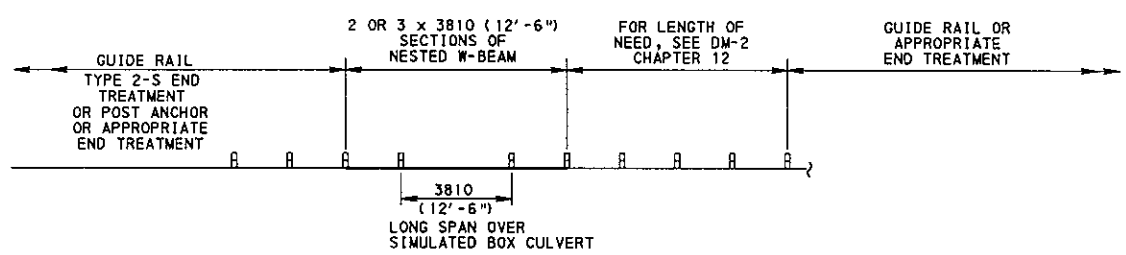


PLAN



ELEVATION

5715 (18'-9") SPAN
DETAILS OF NESTED W-BEAM (TYPE 2-S) GUIDERAIL
ACROSS LOW-FILL CULVERTS
CASE 2

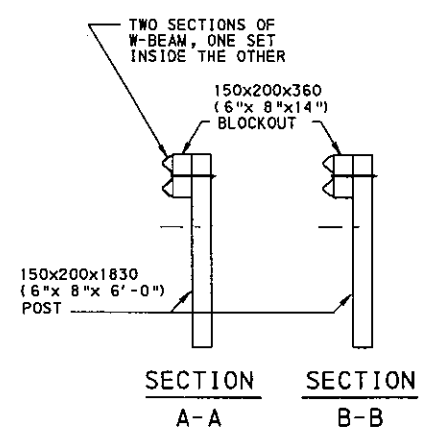
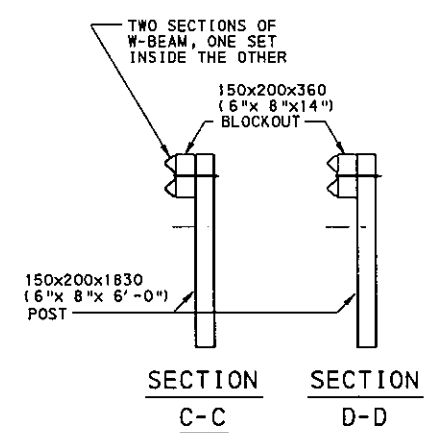


PLAN



ELEVATION

3810 (12'-6") SPAN
DETAILS OF NESTED W-BEAM (TYPE 2-S) GUIDERAIL
ACROSS LOW-FILL CULVERTS
CASE 1

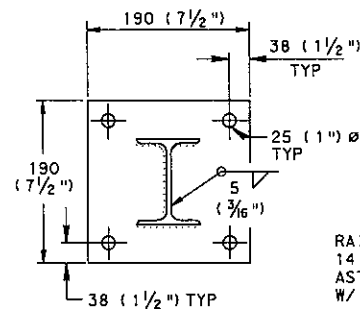
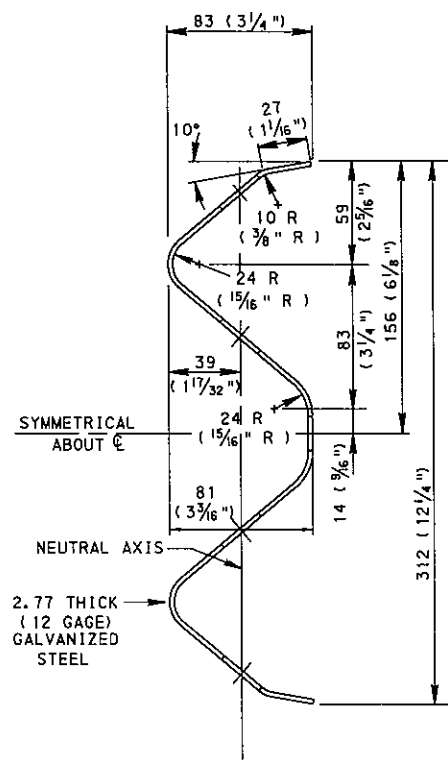


NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST
GUIDERAIL
ACROSS CULVERTS

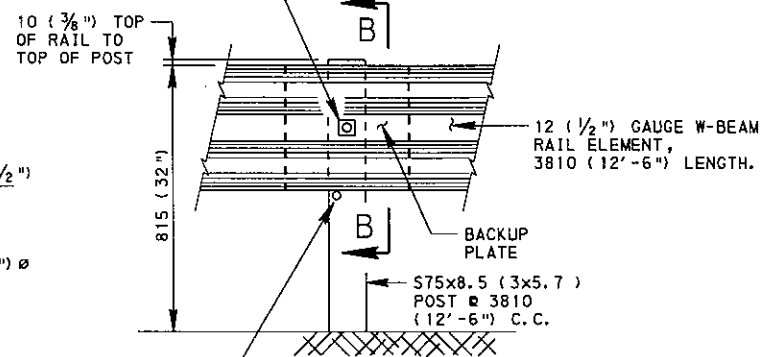
RECOMMENDED APR. 16, 2001 <i>Dean A. Schwa</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>Henry R. Hoffman</i> CHIEF ENGINEER	SHT. 6 OF 6 RC-52M
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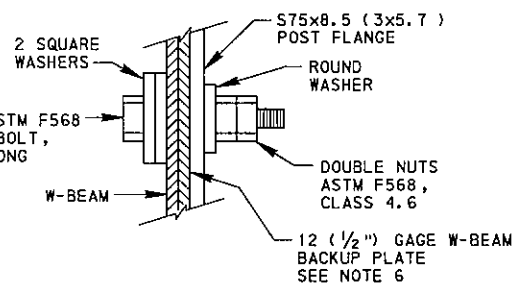
DETAIL C
BASE PLATE

USE BASE PLATE FOR 86x57 (3 3/8" x 2 1/4") COLD FORMED CHANNEL POST, ALUMINUM ALLOY POST AND S75x8.5 (3x5.7) POST.

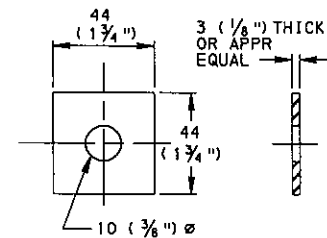
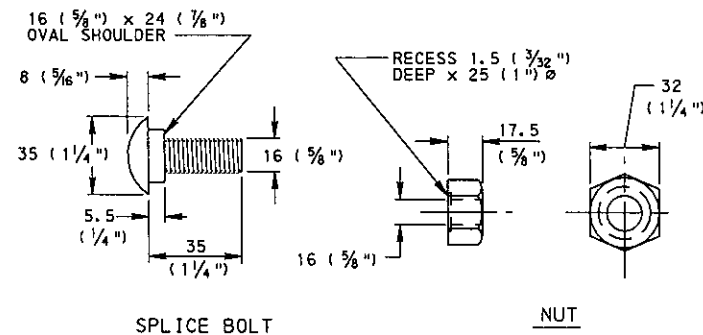
8 (5/16") Ø POST BOLT AND NUT, ASTM F 568, CLASS 4.6. 60 (2 3/8") LONG FULLY THREADED DOUBLE NUTS, TWO SQ. WASHERS AND ONE ROUND WASHER. NUTS SHALL BE PUT ON FINGER TIGHT. ENGAGE TOP AND BOTTOM EDGES OF BACKUP PLATE WITH THE POST AND THEN TIGHTENED AT LEAST ONE FULL TURN WITH A WRENCH, THEN SECURE WITH SECOND NUT.



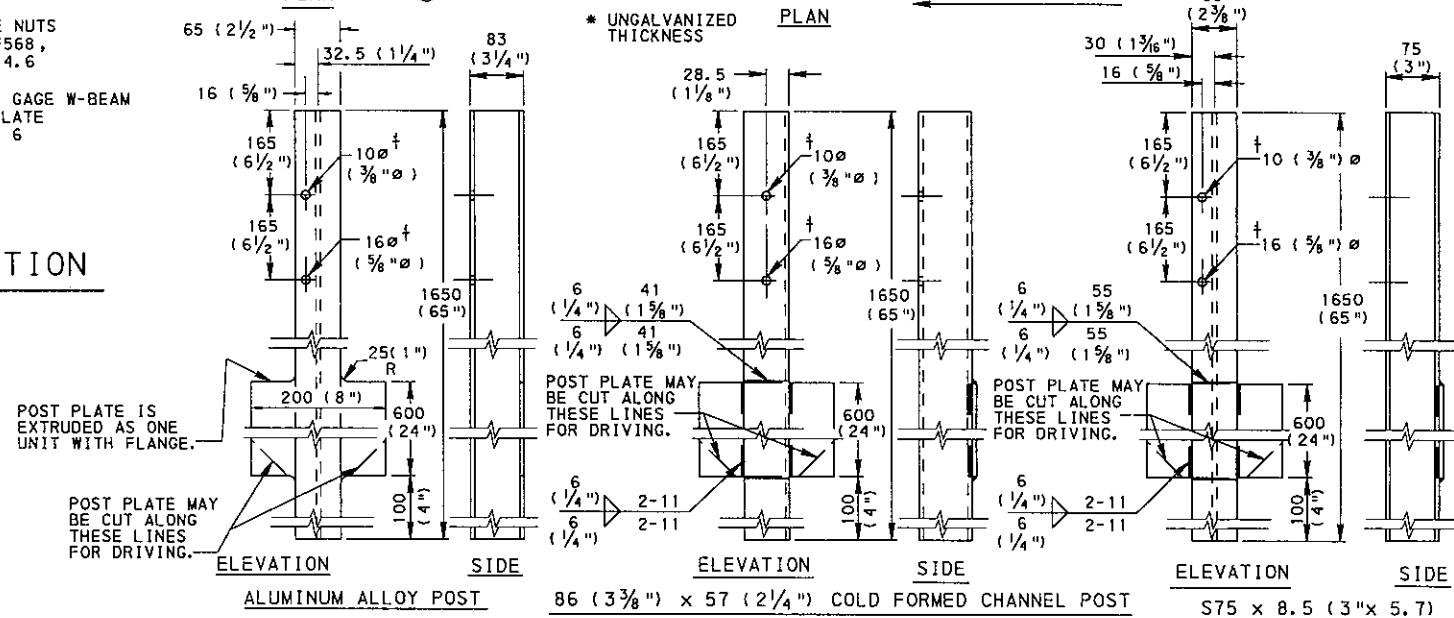
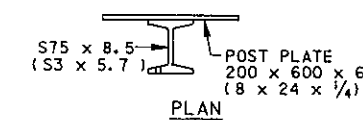
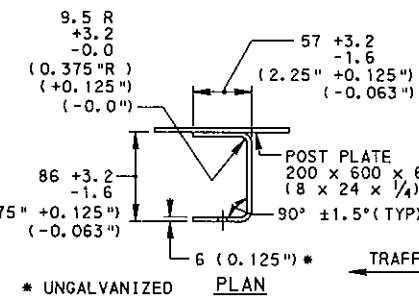
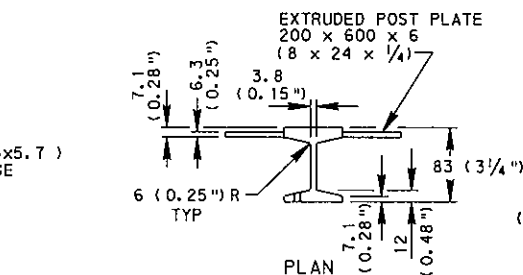
RAIL SUPPORT BOLTS
14 (1/2") Ø x 40 (1 1/2") LONG
ASTM F 568, CLASS 4.6 BOLT
W/ TWO ASTM A563M HEX NUTS



SECTION B-B
TYPICAL INSTALLATION



- NOTES
1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 620.
 2. THE 86 (3 3/8") x 57 (2 1/4") COLD FORMED CHANNEL POST, S75 (S3) x 8.5 (5.7) POST AND ALUMINUM ALLOY POST MAY BE BID AS ALTERNATES FOR TYPE 2 WEAK POST GUIDE RAIL SYSTEM; HOWEVER, MIXING OF DIFFERENT POSTS IS NOT ACCEPTABLE WITHIN A PROJECT.
 3. DURING ERECTION, USE SUPPORT BOLTS TO SUPPORT THE RAIL ELEMENT UNTIL THE 8 (5/16") Ø POST BOLTS ARE PROPERLY TORQUED. LEAVE SUPPORT BOLTS IN PLACE AFTER CONSTRUCTION.
 4. ATTACH W-BEAM RAIL ELEMENT TO EACH POST. SPLICE ONLY AT MID-SPAN AND LAP IN THE DIRECTION OF TRAFFIC.
 5. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.
 6. USE 12" BACKING PLATES FOR THE W-BEAM RAIL ELEMENTS AT ALL POSTS WITH THE SAME SECTION AS THE W-BEAM RAIL ELEMENT.



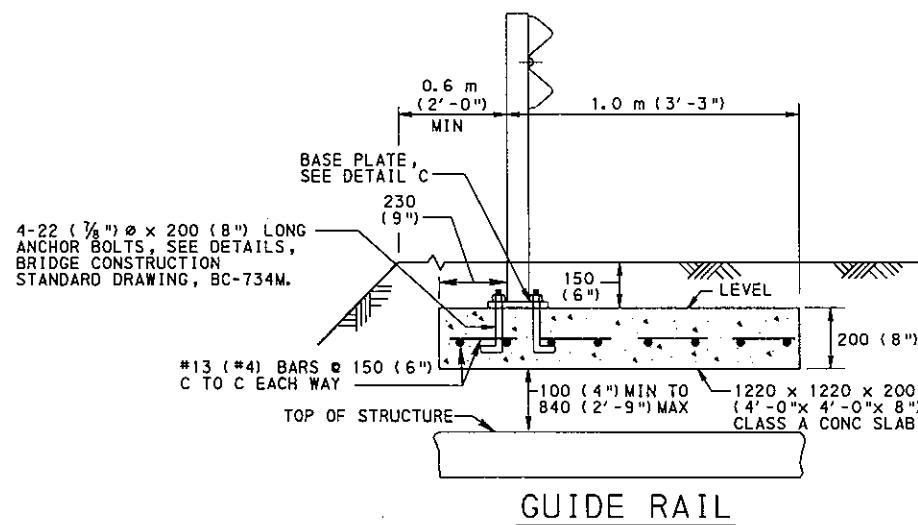
† CONFORM POST DETAILS FOR TYPE 2-WM MEDIAN BARRIER TO THE DETAILS AS SHOWN, EXCEPT LOCATE THE POST BOLT AND SUPPORT BOLT HOLES ON THE FRONT AND REAR FLANGES.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

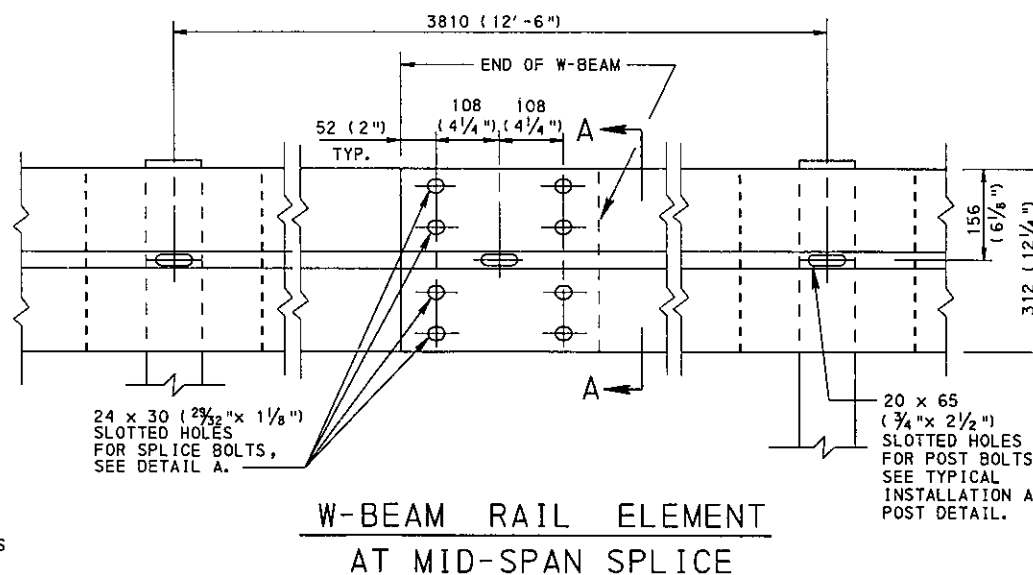
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 WEAK POST
GUIDE RAIL

RECOMMENDED APR. 16, 2001
RECOMMENDED APR. 16, 2001
SHT 1 OF 2
RC-53M



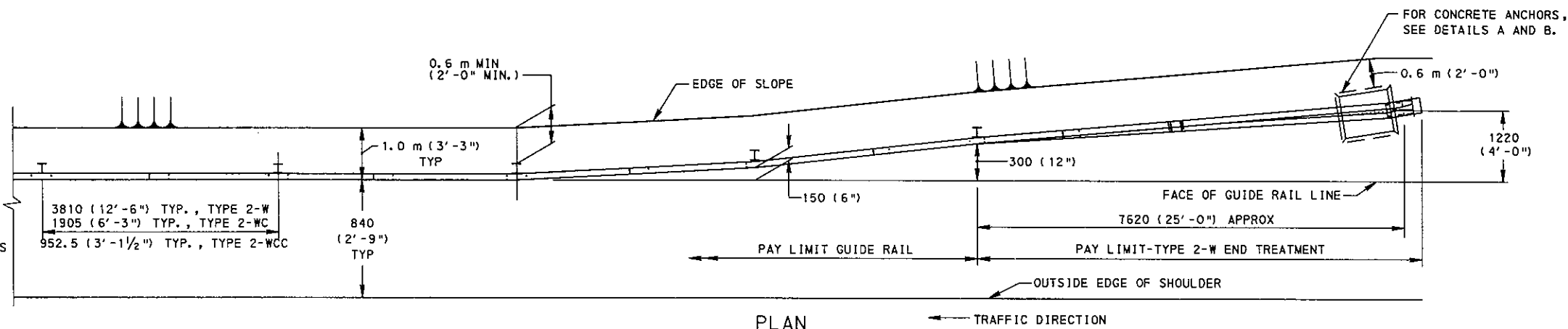
MAKE NO SEPARATE PAYMENT FOR INSTALLATION OF GUIDE RAIL OVER UNDERGROUND STRUCTURES. CONSIDER CONCRETE, REINFORCEMENT BARS AND HARDWARE INCIDENTAL TO THE GUIDE RAIL PAY ITEM.



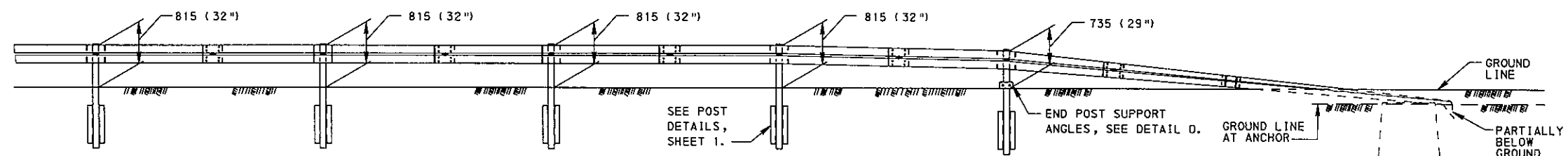
NOTES

1. TYPE 2 WEAK POST END TREATMENTS CAN NOT BE USED TO TERMINATE THE APPROACH END OF a) ANY GUIDE RAIL ON THE NHS, or b) ANY GUIDE RAIL ON NON-NHS HIGH-SPEED, HIGH-VOLUME ROUTES. USE CRASHWORTHY END TREATMENTS ON ALL NHS ROUTES AND ON NON-NHS HIGH-SPEED, HIGH-VOLUME ROADWAYS WITH TO km/h (45 mph) POSTED SPEED LIMIT & ABOVE AND WITH CURRENT TRAFFIC VOLUMES 4000 VEHICLES PER DAY & ABOVE. ON 2-LANE ROADWAYS WHERE CRASHWORTHY END TREATMENTS ARE REQUIRED, USE ON BOTH THE APPROACH AND TRAILING ENDS. IF CRASHWORTHY END TREATMENTS ARE REQUIRED, WEAK POST GUIDERAIL MUST BE TRANSITIONED WITH A 15.2 m (50'-0") TYPE 2S GUIDERAIL SECTION TO ANCHOR THE 2-W GUIDERAIL PRIOR TO THE ATTACHMENT OF A CRASHWORTHY END TREATMENT.

2. SEE RC-52W, FOR END TREATMENT BURIED INTO EARTH MOUNDS.

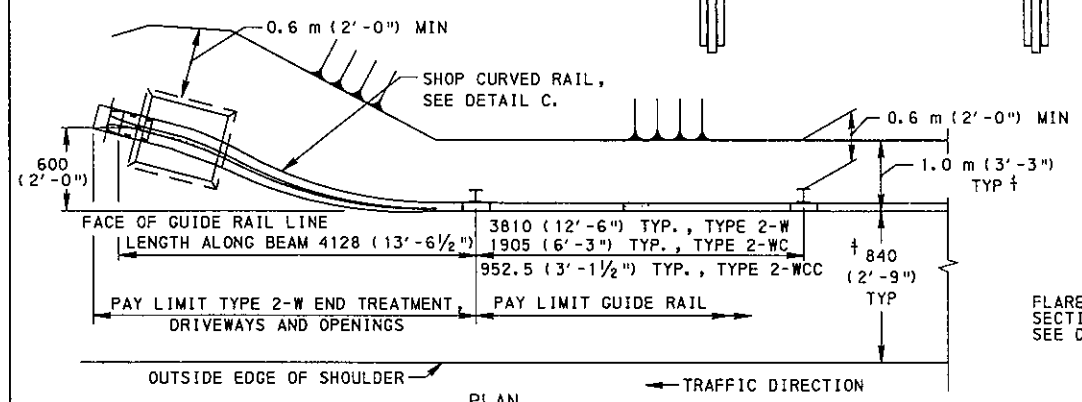


PLAN

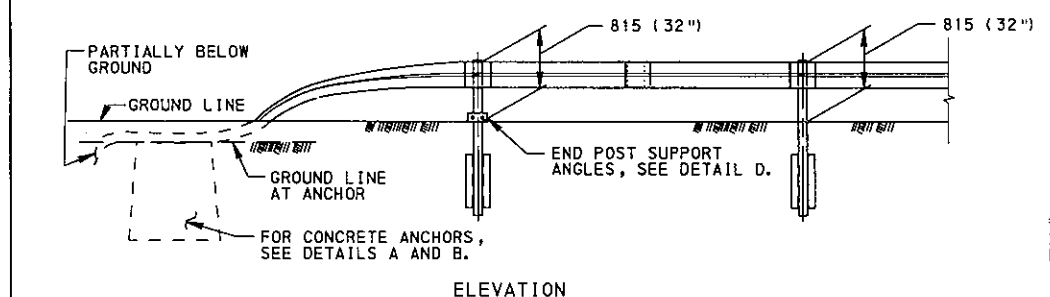


ELEVATION

TYPE 2-WEAK POST END TREATMENT
(SEE NOTE 1)

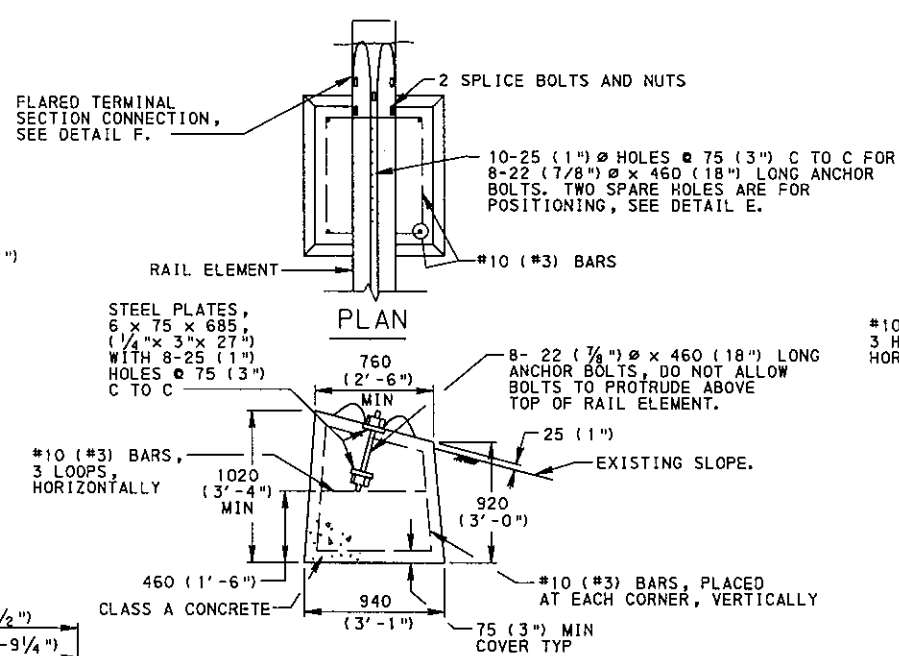


PLAN

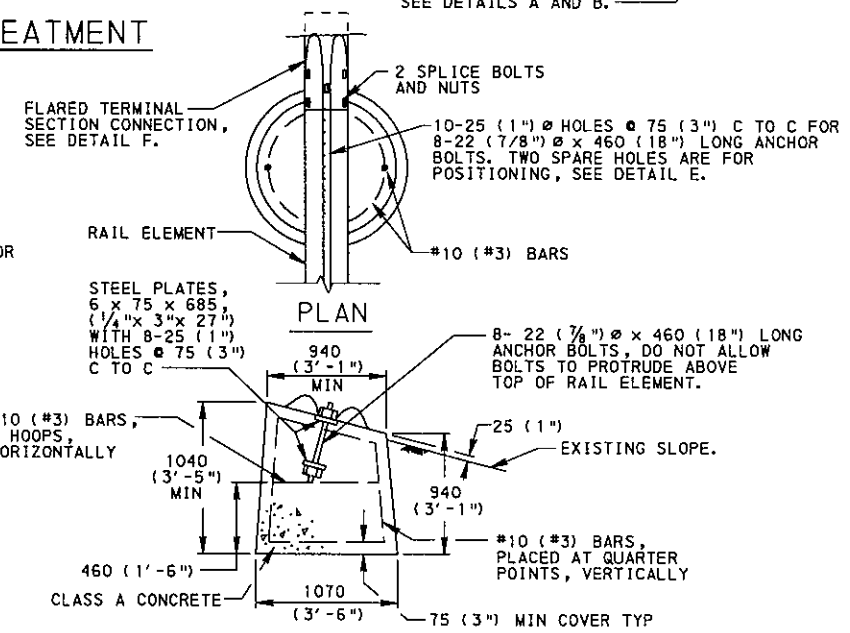


ELEVATION

TYPE 2-W END TREATMENT AT DRIVEWAYS & OPENINGS
(USE ON BOTH SIDES OF DRIVEWAYS & OPENINGS)



**ELEVATION
DETAIL A**



**ELEVATION
DETAIL B (ALTERNATE)**

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

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DEPARTMENT OF TRANSPORTATION
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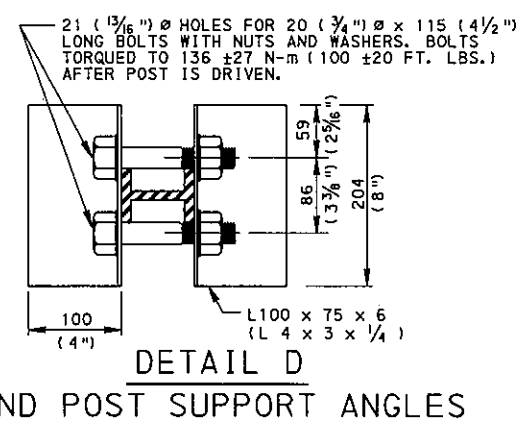
**TYPE 2 WEAK POST
GUIDE RAIL
END TREATMENTS**

RECOMMENDED APR. 16, 2001

RECOMMENDED APR. 16, 2001

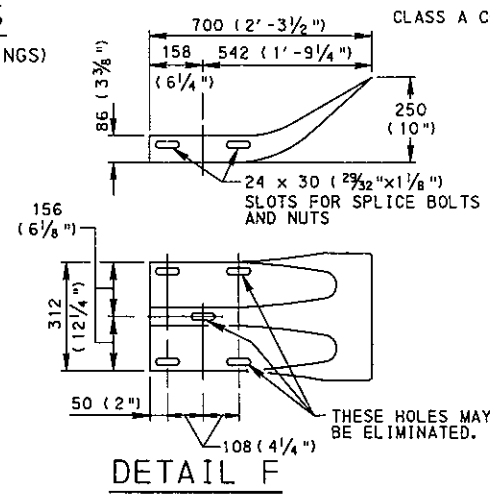
SHT 2 OF 2

RC-53M



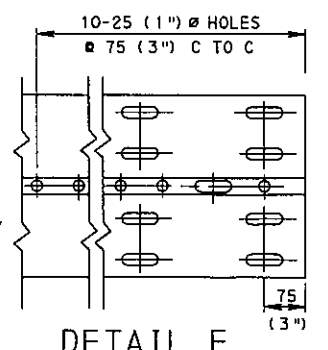
DETAIL D

END POST SUPPORT ANGLES

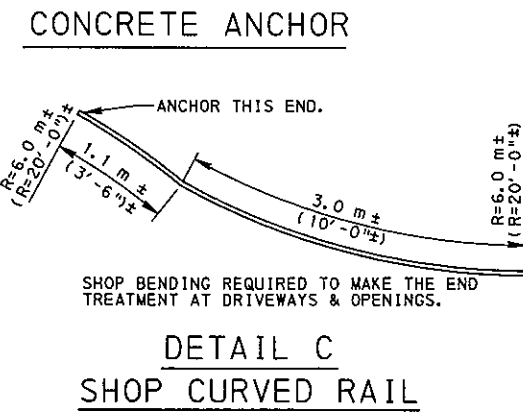


DETAIL F

FLARED TERMINAL SECTION



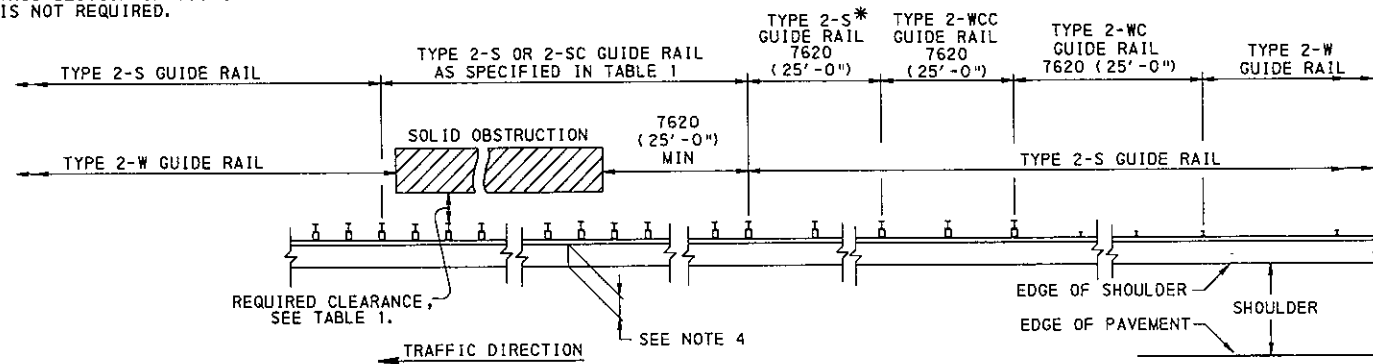
DETAIL E



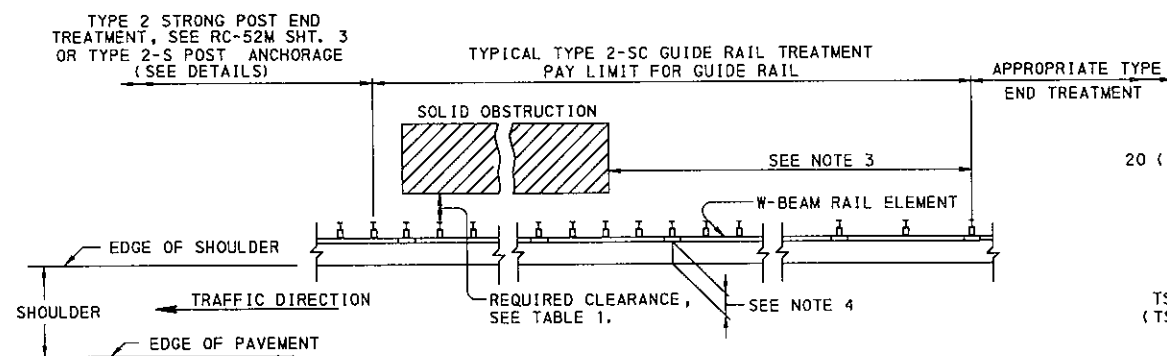
DETAIL C

SHOP CURVED RAIL

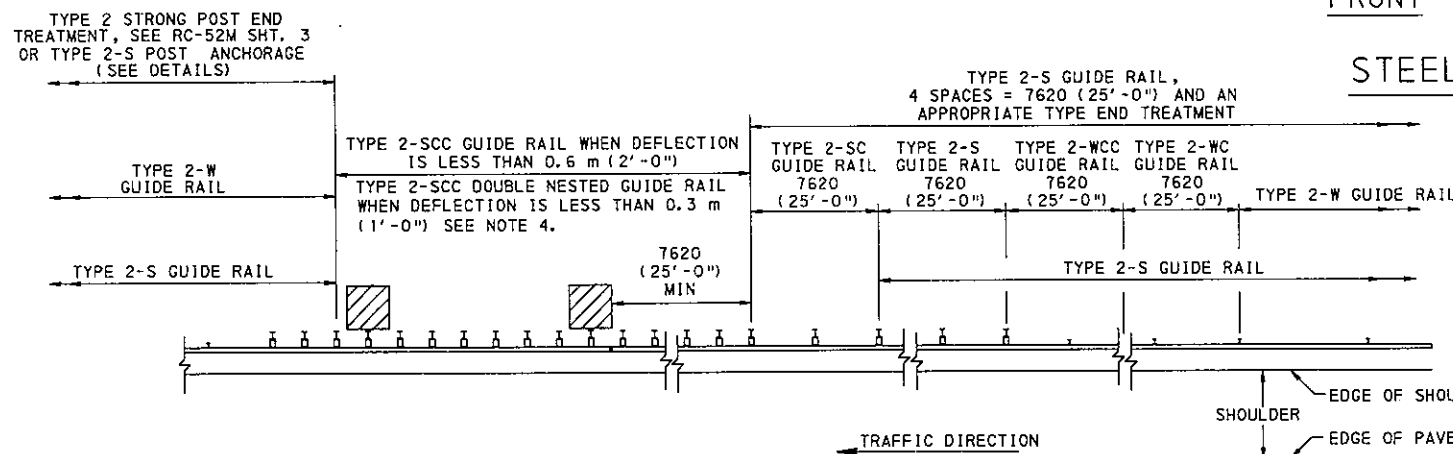
* IF TYPE 2-S GUIDE RAIL IS USED AT THE OBSTRUCTION, THIS SECTION OF GUIDE RAIL IS NOT REQUIRED.



TYPICAL GUIDE RAIL TREATMENT
WHEN THE REQUIRED CLEARANCE TO OBSTRUCTION IS AVAILABLE



TYPICAL GUIDE RAIL TREATMENT
WHEN THE REQUIRED CLEARANCE TO OBSTRUCTION IS AVAILABLE



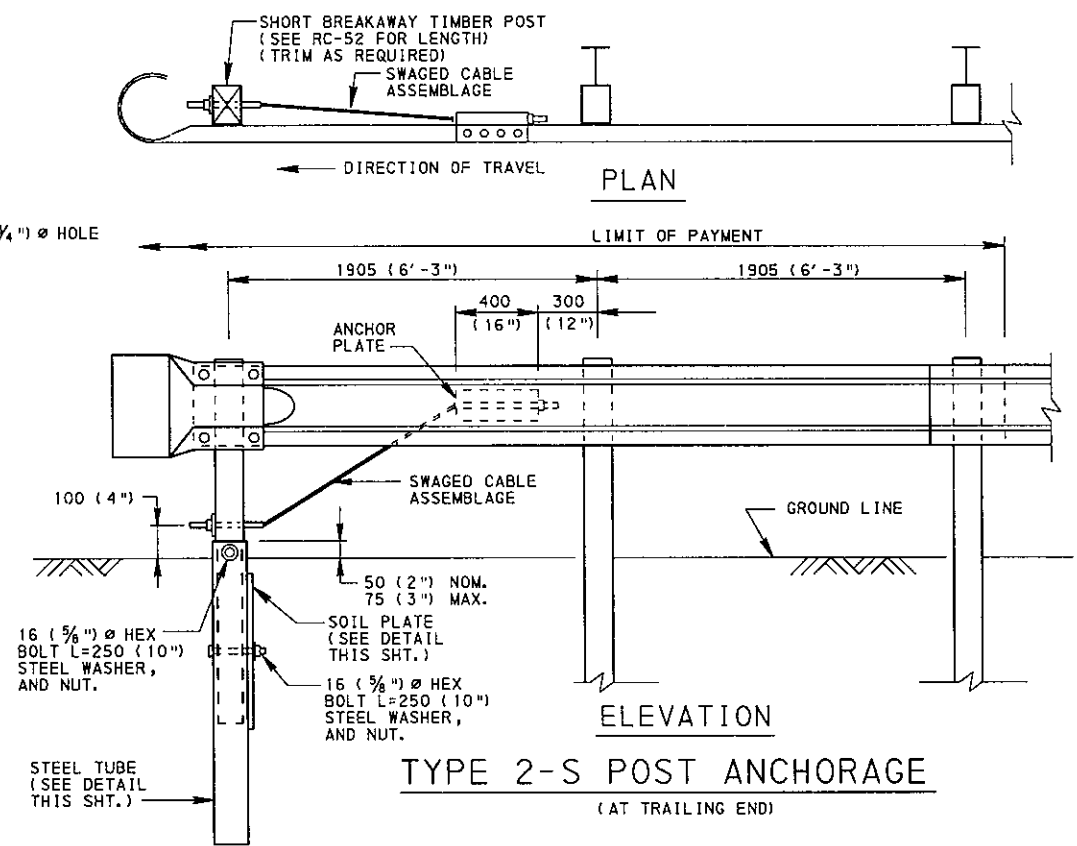
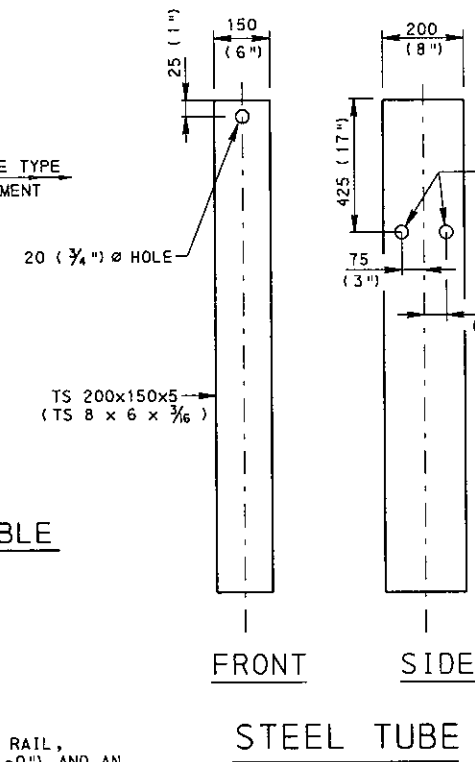
TYPICAL GUIDE RAIL TREATMENT WHEN THE REQUIRED
CLEARANCE TO OBSTRUCTION IS NOT AVAILABLE

TABLE 1

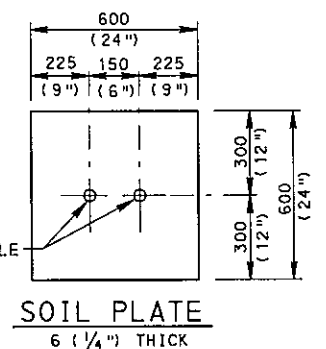
TYPE OF GUIDE RAIL	REQUIRED † CLEARANCES
2-SCC	0.3 m (1'-0")
2-SC	0.6 m (2'-0")
2-S	0.9 m (3'-0")
2-WCC	1.2 m (4'-0")
2-WC	1.5 m (5'-0")
2-W	2.1 m (7'-0")

† THE MINIMUM UNOBSTRUCTED DISTANCE FROM BACK OF GUIDE RAIL POST TO FACE OF OBSTRUCTION.

- NOTES**
1. THE TREATMENTS SHOWN ARE FOR FOUR LANE DIVIDED HIGHWAYS. USE THE APPROACH END TREATMENT AT BOTH SIDES OF THE OBSTRUCTION ON TWO-LANE FACILITIES WITH TWO-WAY TRAFFIC.
 2. THIS STANDARD HAS BEEN PREPARED AS A GUIDE FOR THE PLACEMENT OF GUIDE RAIL AND MEDIAN BARRIER. IT IS IMPRACTICAL TO PROVIDE A STANDARD FOR ALL POSSIBLE CONDITIONS. MODIFICATIONS OF TREATMENTS CAN BE MADE TO FIT EXISTING CONDITIONS; HOWEVER, FOLLOW THE RECOMMENDED GUIDELINES IN PUBLICATION 13M, DM-2, CHAPTER 12.
 3. THIS DISTANCE VARIES. DETERMINE THE REQUIRED LENGTH USING THE GUIDELINES FOUND IN PUBLICATION 13M, DM-2, CHAPTER 12, AND SHOW ON THE TABULATIONS. WHERE CALCULATIONS SHOW A DISTANCE LESS THAN 15 m (50'-0"), USE 15 m (50'-0") AS A MINIMUM DISTANCE.
 4. WHERE THE 0.6 m (2'-0") REQUIRED CLEARANCE TO OBSTRUCTION IS NOT AVAILABLE, USE 2-SCC GUIDE RAIL AND 2-SCC DOUBLE NESTED RAIL WHEN THE DEFLECTION IS LESS THAN 0.3 m (1'-0").
 5. THE TYPICAL DISTANCE FROM THE EDGE OF SHOULDER TO THE FRONT FACE OF THE W-BEAM RAIL ELEMENT IS 840 (2'-9"). THIS MAY VARY; BASE THE ACTUAL PLACEMENT OF THE GUIDE RAIL SYSTEM SELECTED ON FIELD CONDITIONS. LOCATE THE SYSTEM SELECTED AS FAR FROM THE EDGE OF SHOULDER AS POSSIBLE AND STILL MAINTAIN REQUIRED CLEARANCES DETERMINED FROM TABLE 1.
 6. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

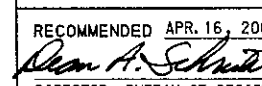
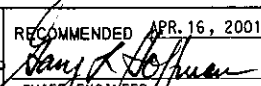


NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

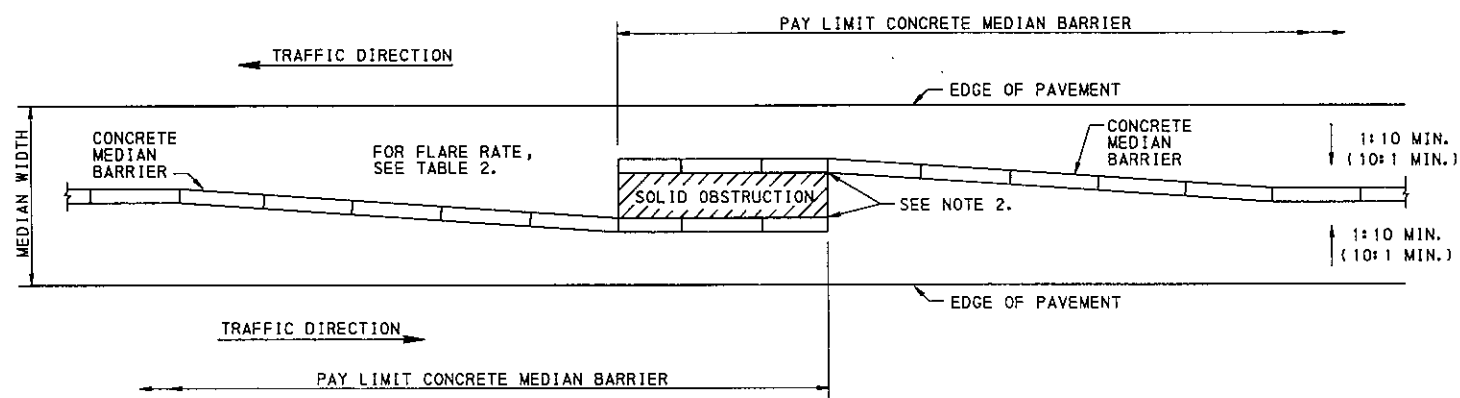


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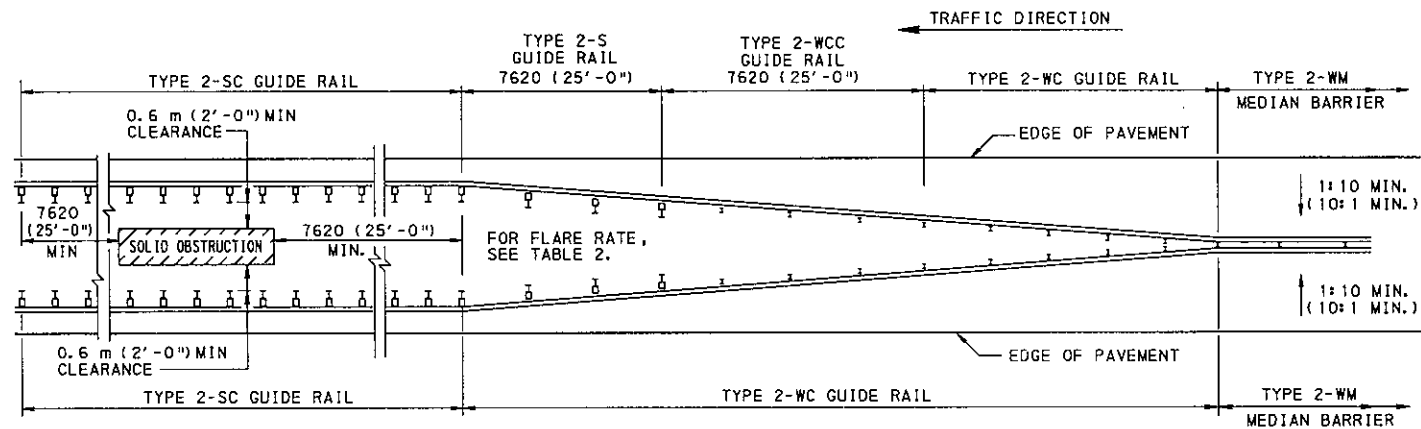
BARRIER PLACEMENT AT OBSTRUCTIONS

RECOMMENDED APR. 16, 2001
 DIRECTOR, BUREAU OF DESIGN
 CHIEF ENGINEER

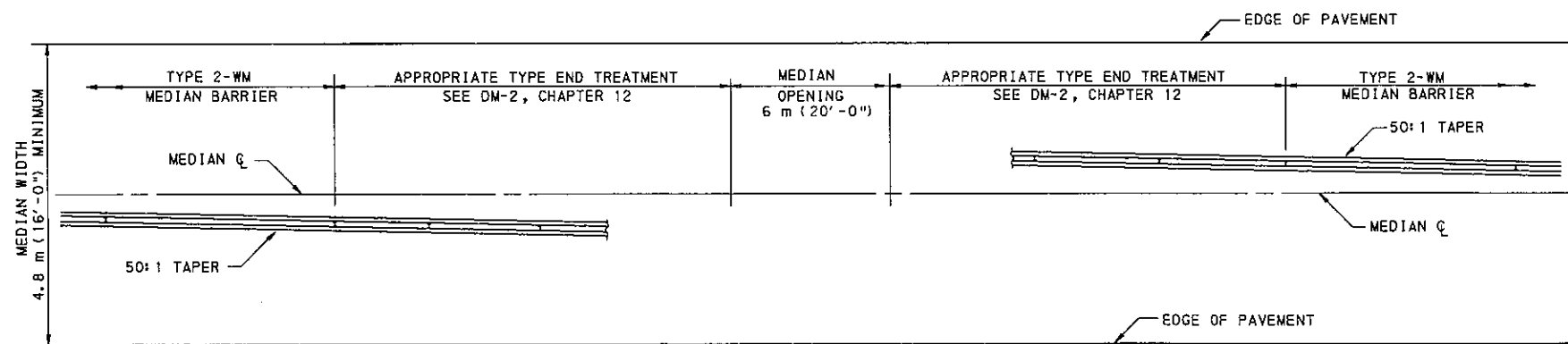
SHT. 1 OF 7
RC-54M



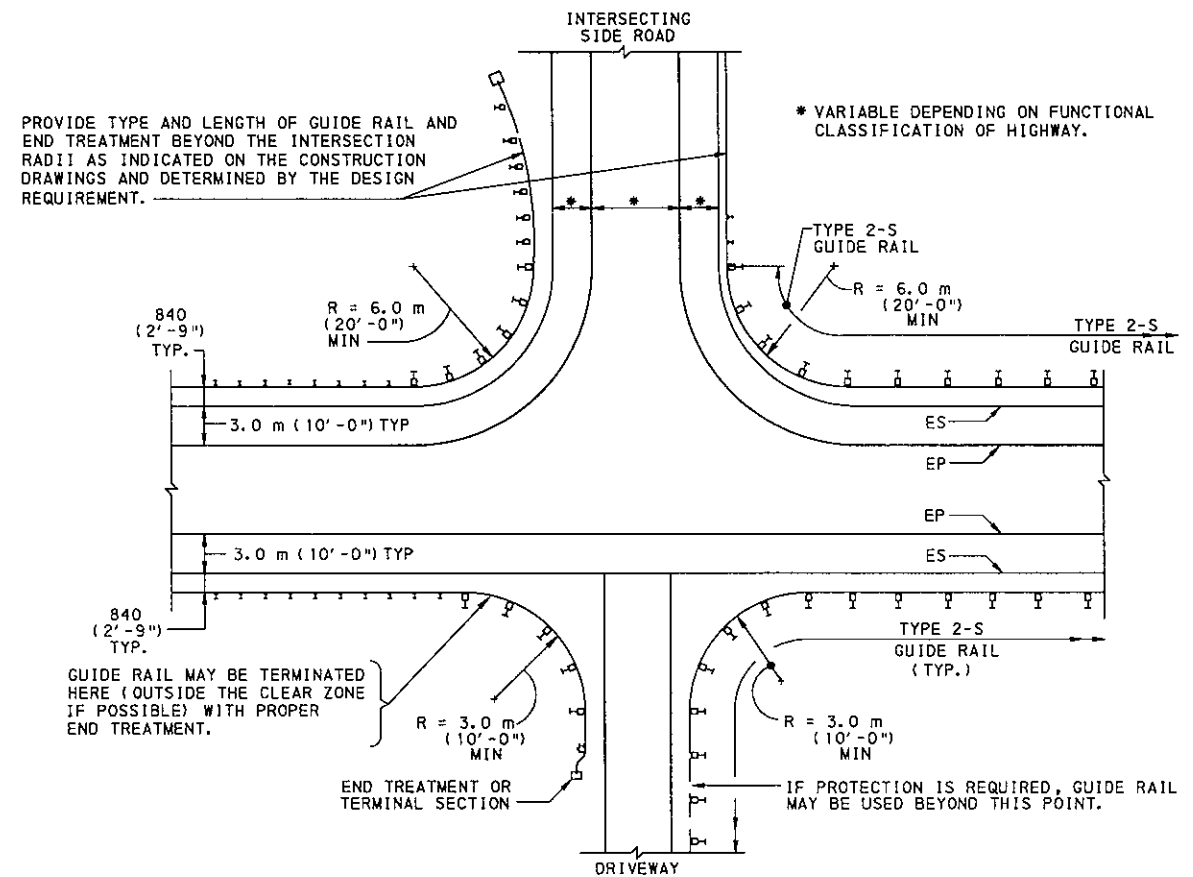
TREATMENT AT OBSTRUCTION FOR MEDIAN WIDTHS 6.0 m (20') OR LESS WHERE CONTINUOUS BARRIER IS REQUIRED



TREATMENT AT OBSTRUCTION FOR MEDIAN WIDTHS OF 6.0 m (20') TO 10.0 m (30') WHERE CONTINUOUS BARRIER IS REQUIRED



TREATMENT FOR TYPE 2-WM MEDIAN BARRIER CROSS-OVER



TREATMENT AT INTERSECTIONS AND DRIVEWAYS

TABLE 2
FLARE RATES FOR BARRIER DESIGN

DESIGN SPEED	MAXIMUM FLARE RATES		
	CONCRETE BARRIER	GUIDE RAIL	
Km/h	mph		
120	75	20 : 1	15 : 1
110	70	20 : 1	15 : 1
100	60	18 : 1	14 : 1
90	55	16 : 1	12 : 1
80	50	14 : 1	11 : 1
70	45	12 : 1	10 : 1
60	35	10 : 1	8 : 1
50	30	8 : 1	7 : 1

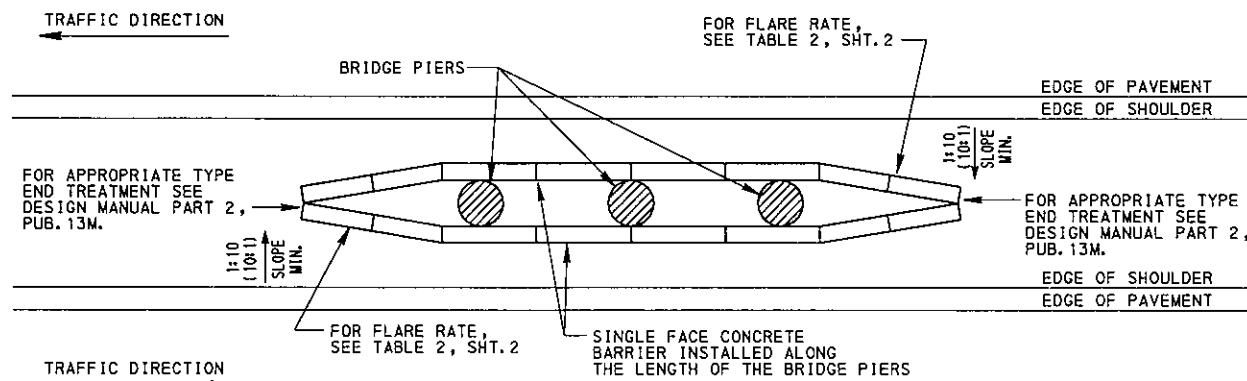
NOTES

1. THIS STANDARD HAS BEEN PREPARED AS A GUIDE FOR THE PLACEMENT OF GUIDE RAIL AND MEDIAN BARRIER. IT IS IMPRACTICAL TO PROVIDE A STANDARD FOR ALL POSSIBLE CONDITIONS. MODIFICATIONS OF TREATMENTS CAN BE MADE TO FIT EXISTING CONDITIONS; HOWEVER, FOLLOW RECOMMENDED GUIDELINES IN DESIGN MANUAL, PART 2.
2. PROVIDE SINGLE FACE CONCRETE BARRIER THROUGH THE AREA OF THE OBSTRUCTION. NO MINIMUM BARRIER-TO-OBSTRUCTION DISTANCE IS REQUIRED. FOR DETAILS, SEE RC-58M.

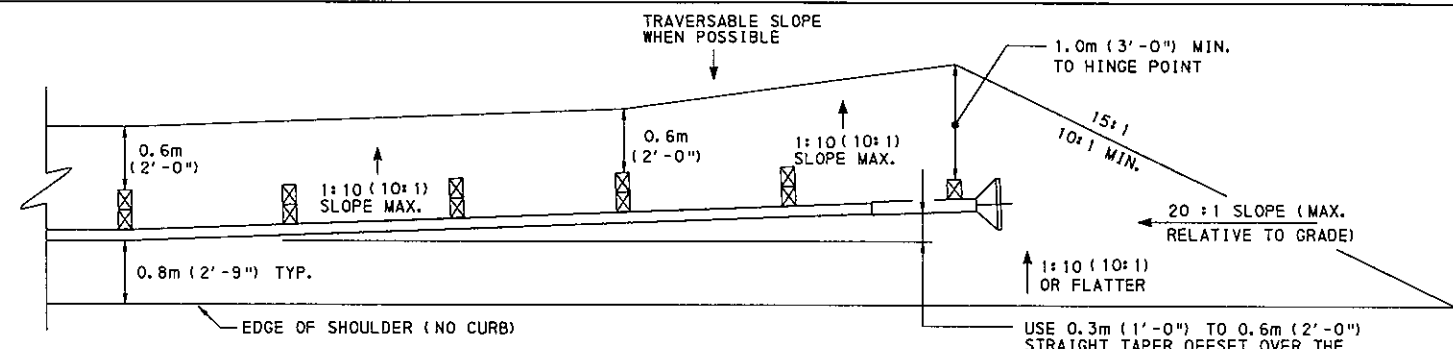
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

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DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

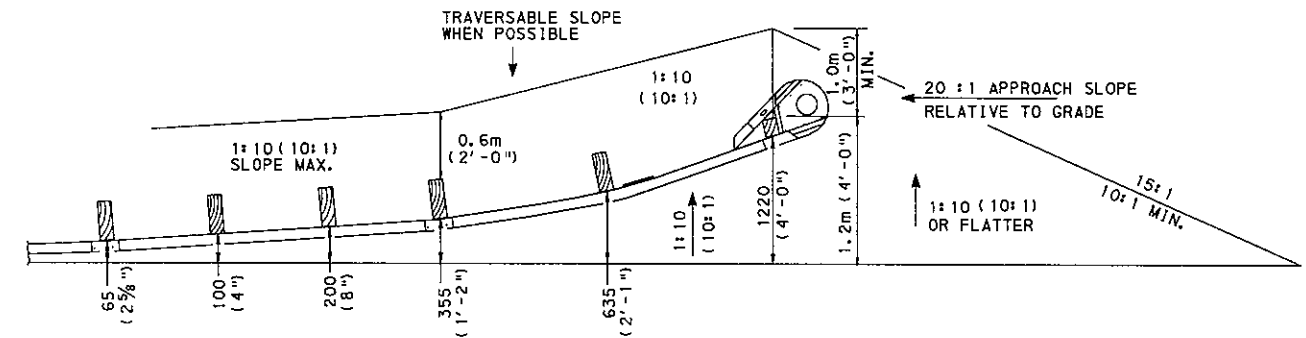
BARRIER PLACEMENT
AT OBSTRUCTIONS



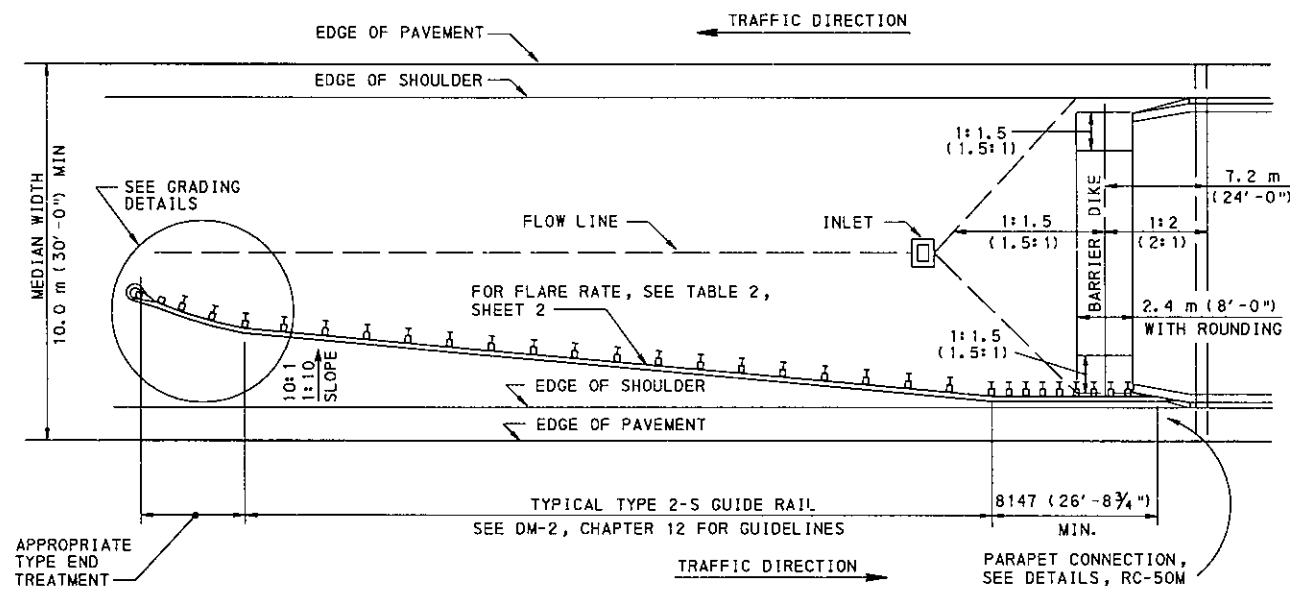
**TREATMENT AT OBSTRUCTIONS FOR
MEDIAN WIDTHS GREATER THAN 6.0 m (20'-0")
WHERE CONTINUOUS BARRIER IS NOT REQUIRED**



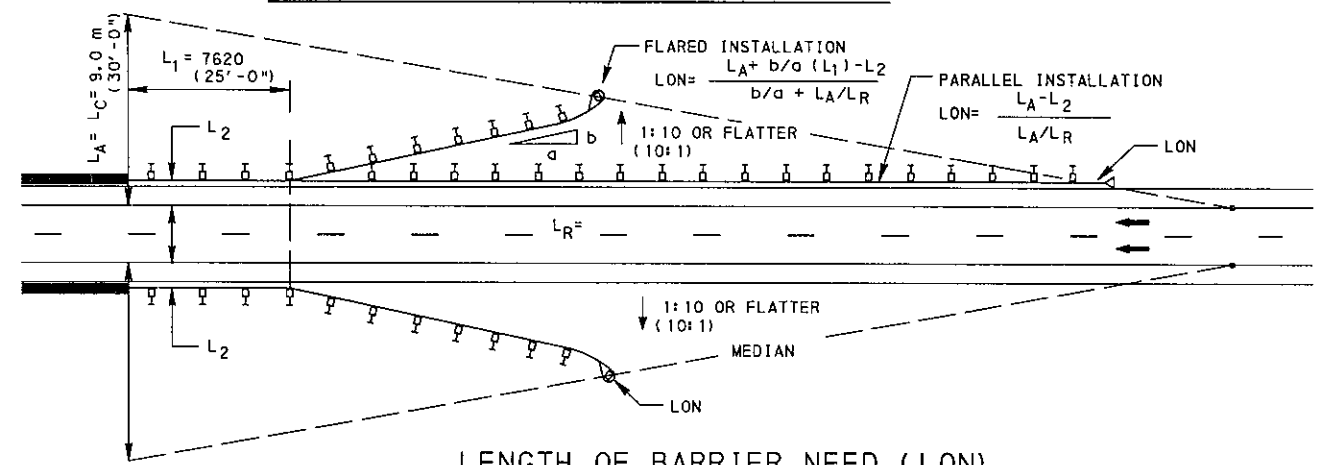
GRADING DETAIL FOR PARALLEL TERMINALS



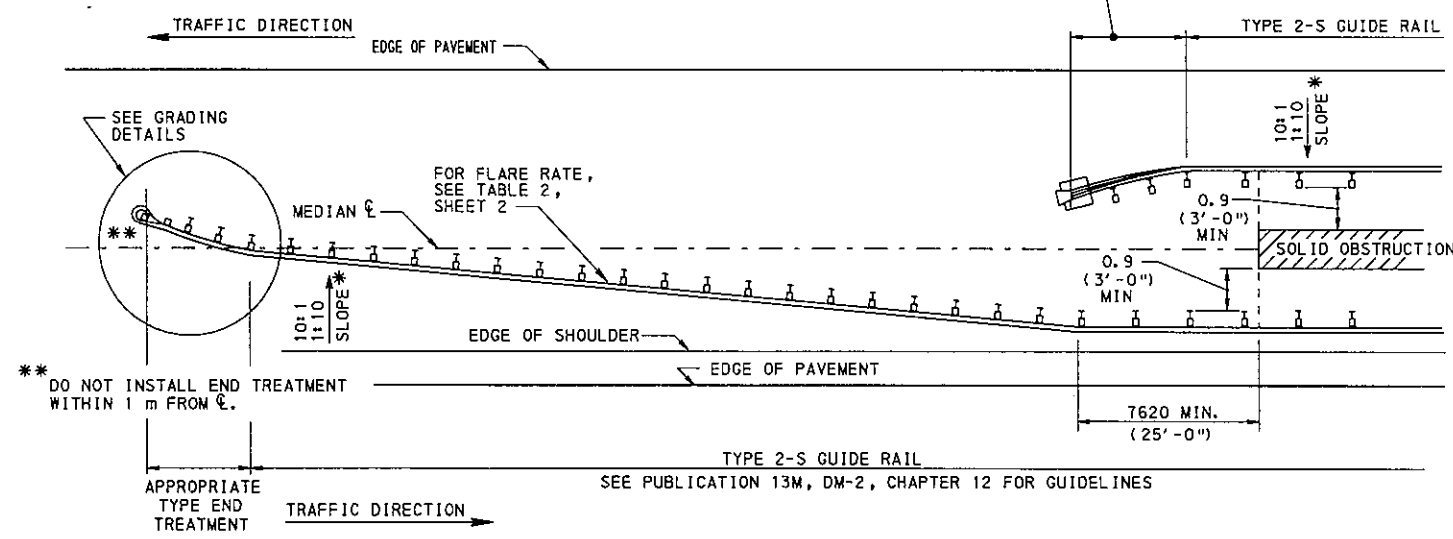
GRADING DETAIL FOR FLARED TERMINALS



MEDIAN TREATMENT AT DUAL STRUCTURES



LENGTH OF BARRIER NEED (LON)



**TREATMENT AT OBSTRUCTION FOR
MEDIAN WIDTHS GREATER THAN 10.0 m (30'-0")
WHERE CONTINUOUS BARRIER IS NOT REQUIRED**

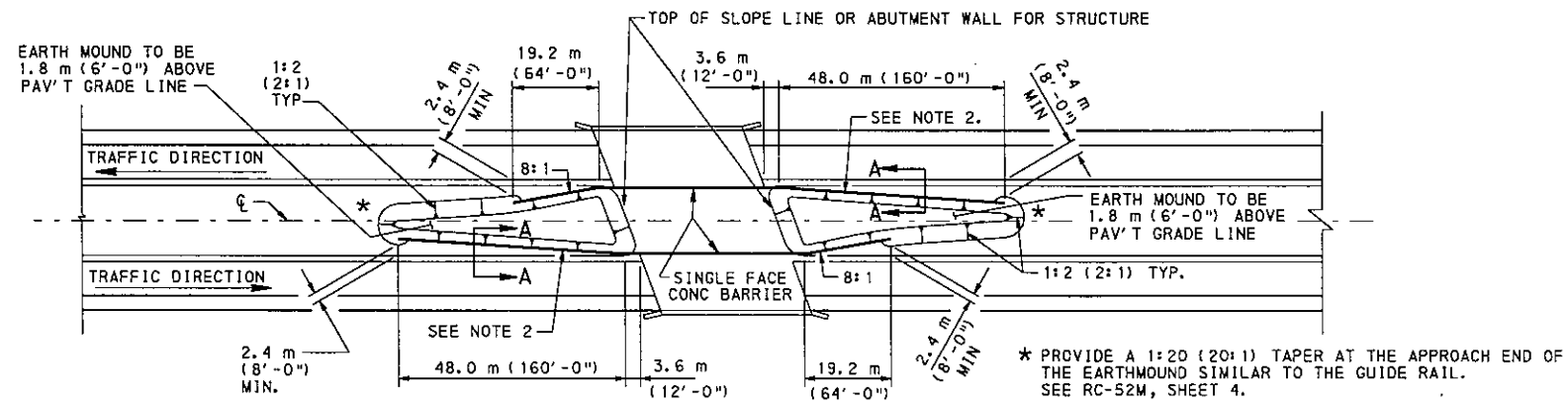
* A 1:10 (10:1) SLOPE MINIMUM IS REQUIRED IN FRONT OF THE BARRIER, IF ANY PORTION OF THE BARRIER IS LOCATED WITHIN 3.6 m (12'-0") FROM THE EDGE OF SHOULDER (HINGE POINT). BARRIER MUST NOT BE PLACED ON SLOPES STEEPER THAN 1:6 (6:1).

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

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DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN**

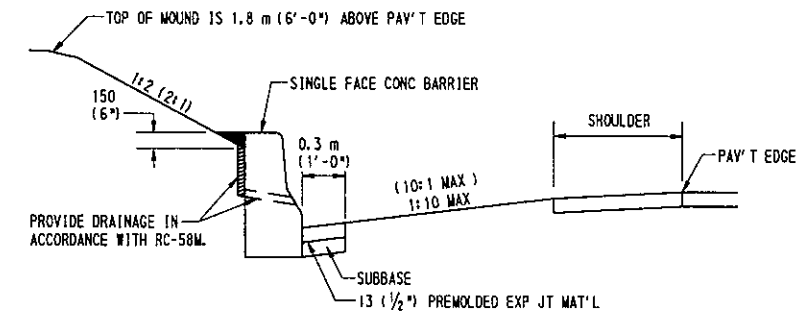
**BARRIER PLACEMENT
AT OBSTRUCTIONS**

RECOMMENDED APR. 16, 2001 <i>Dean P. Schick</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT 3 OF 7 RC-54M
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TYPICAL MEDIAN EARTH MOUND DETAIL FOR AT-GRADE DUAL BRIDGES

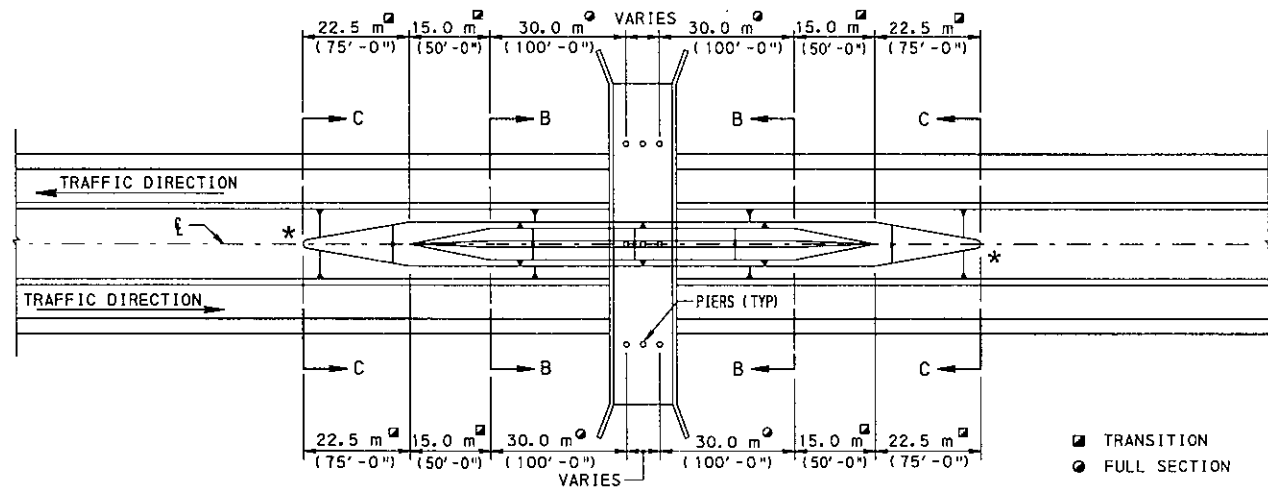
SEE NOTE 4



SECTION A-A

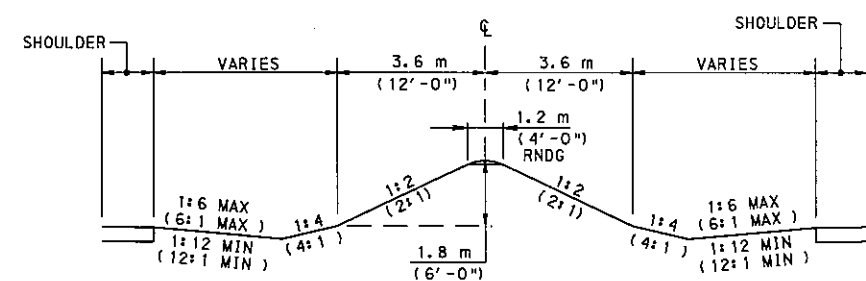
NOTES

1. THIS STANDARD HAS BEEN PREPARED AS A GUIDE FOR THE PLACEMENT OF EARTH MOUNDS IN THE MEDIAN. IT IS IMPRACTICAL TO PROVIDE A STANDARD FOR ALL POSSIBLE CONDITIONS. MODIFICATIONS OF TREATMENTS CAN BE MADE TO FIT EXISTING CONDITIONS.
2. FOR FLARE RATES, SEE TABLE 2, SHEET 2.
3. CONSIDER EXPANSION JOINT MATERIAL, COARSE AGGREGATE, FILTER DRAIN AND WEEP HOLES INCIDENTAL TO SINGLE FACE CONC. BARRIER.
4. ALL MATERIALS NECESSARY TO CONSTRUCT EARTH MOUNDS ARE IN ACCORDANCE WITH APPLICABLE SECTIONS OF PUBLICATION 408.

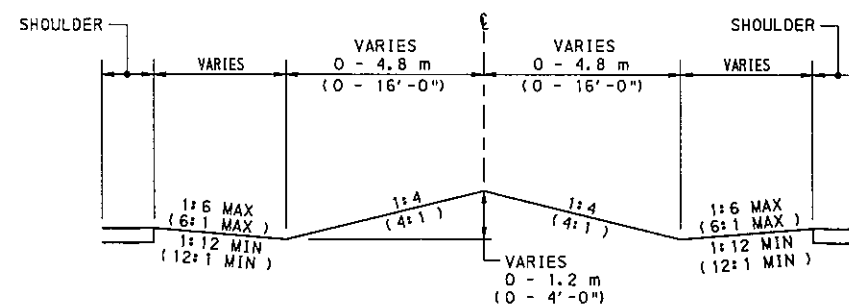


TYPICAL MEDIAN EARTH MOUND DETAIL FOR OVERHEAD STRUCTURES FOR MEDIAN WIDTHS OF 18.0 M (60'-0") OR GREATER

SEE NOTE 4



SECTION B-B



SECTION C-C

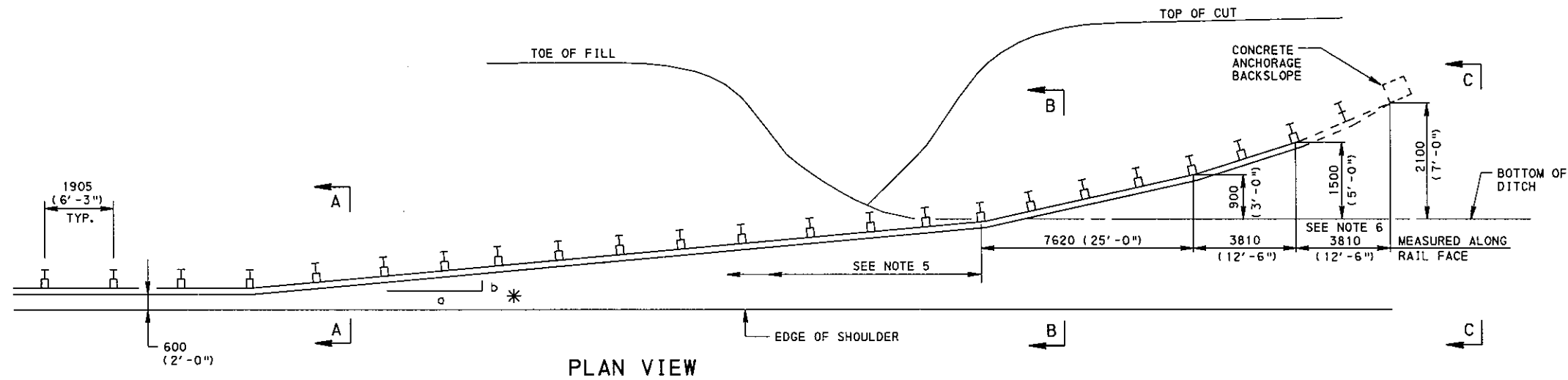
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BARRIER PLACEMENT
AT OBSTRUCTIONS
EARTH MOUNDS

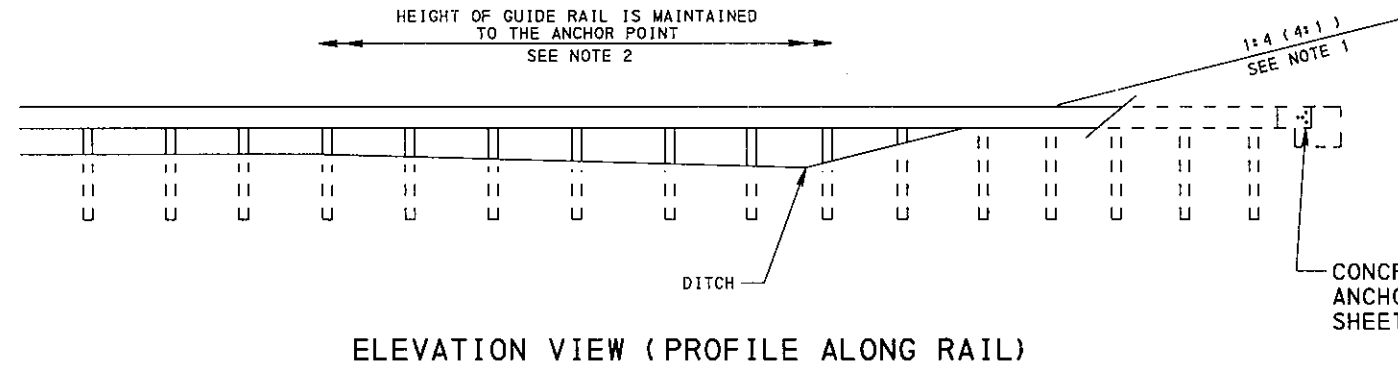
GENERAL NOTES:

1. A 1:4 (4:1) BACK SLOPE IS DESIRABLE. HOWEVER, STEEPER SLOPES MAY BE USED.
2. HEIGHT OF GUIDE RAIL MAY BE TAPERED DOWN TO MAINTAIN 450 (18") MAXIMUM HEIGHT FROM GROUND ELEVATION TO BOTTOM OF THE RAIL ELEMENT.
3. WHEN THE GUIDE RAIL LENGTH OF NEED FALLS NEAR A CUT TO FILL SLOPE, THE PREFERRED TREATMENT IS TO ANCHOR THE GUIDE RAIL TO THE CUT SLOPE.
4. THE BACKSLOPE ANCHOR TERMINAL HAS BEEN CRASH TESTED TO NCHRP 350 CRITERIA FOR A 1:6 (6:1) SLOPE [rehab.] AND A 10:1 (1:10) SLOPE [new construction]. IT CAN BE ANCHORED WITH A CONCRETE BLOCK OR A POST ANCHOR.
5. PROVIDE 23.0 m (75'-0") MINIMUM FROM WHERE THE GUIDE RAIL CROSSES THE SWALE LINE TO THE BEGINNING OF THE HAZARD.
6. BACKSLOPE ANCHOR TERMINAL PAY LIMIT INCLUDES THE CONCRETE OR POST ANCHORAGE, 3810 (12'-6") OF RAIL ELEMENT AND HARDWARE.

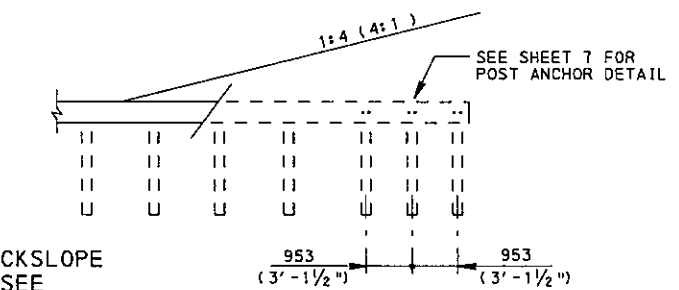


* a:b = 12.5 : 1
 9 : 1 LOWSPEED
 (LESS THAN 45 mph)

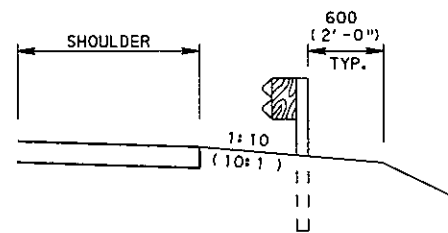
PLAN VIEW



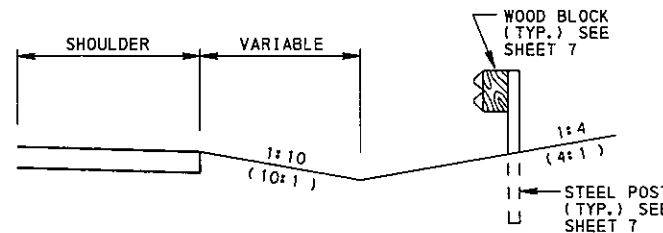
ELEVATION VIEW (PROFILE ALONG RAIL)



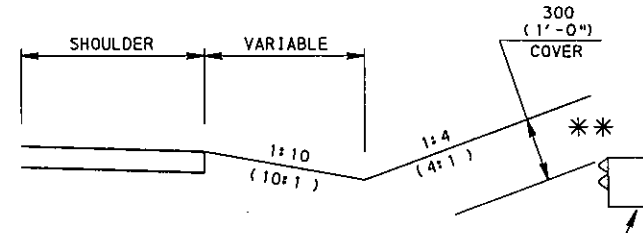
POST BACKSLOPE ANCHORAGE



SECTION A-A



SECTION B-B



SECTION C-C

** ROCK ANCHORAGE DOES NOT REQUIRE THE 300 (1'-0") BURIAL.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

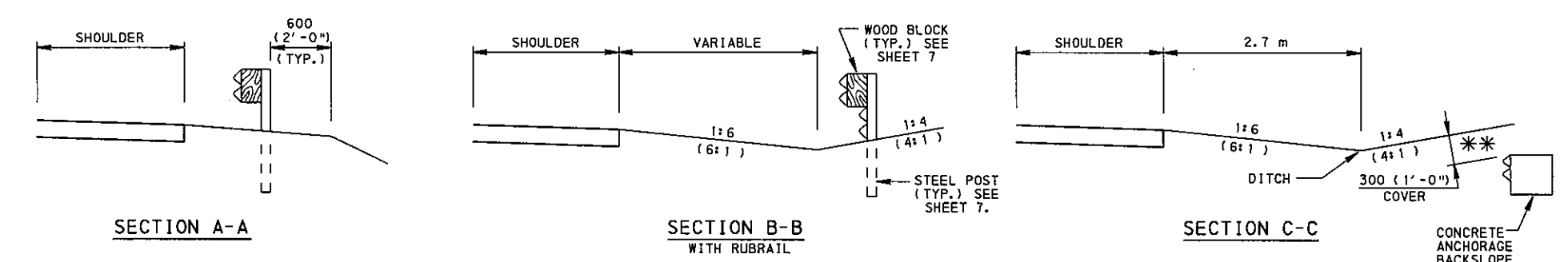
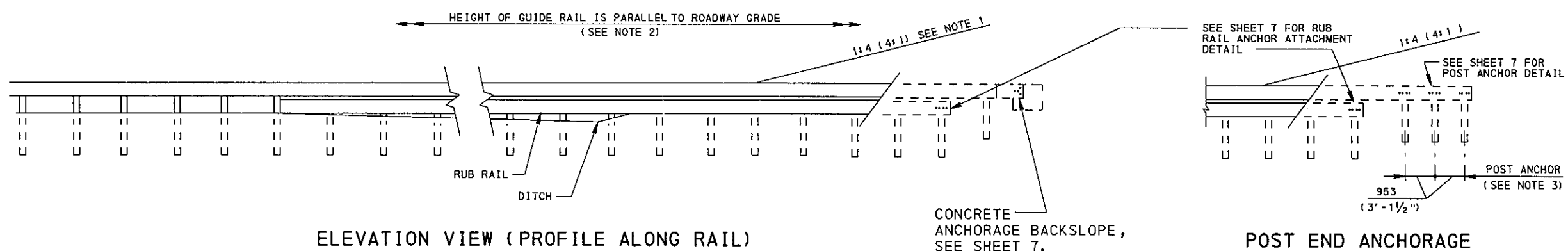
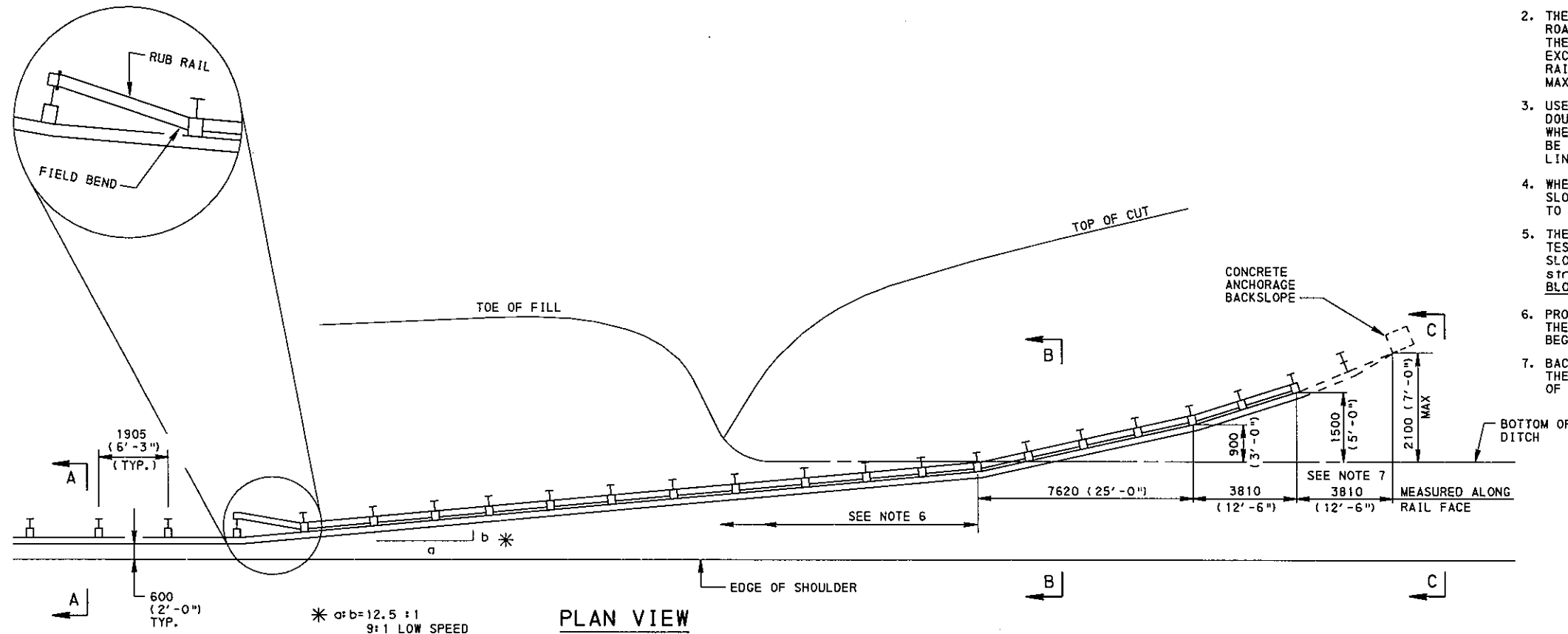
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

GUIDE RAIL
BACKSLOPE
ANCHOR TERMINAL
 (NEW CONSTRUCTION OR RECONSTRUCTION)

RECOMMENDED APR. 16, 2001 <i>Alan A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>Harry J. Hoffman</i> CHIEF ENGINEER	SHT 5 OF 7 RC-54M
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GENERAL NOTES:

1. A 1:4 (4:1) BACK SLOPE IS DESIRABLE. HOWEVER, STEEPER SLOPES MAY BE USED.
2. THE TOP OF THE W-BEAM RAIL IS HELD CONSTANT RELATIVE TO ROADWAY PROFILE GRADE. A SECOND W-BEAM RAIL IS REQUIRED WHERE THE DISTANCE BETWEEN THE GROUND AND BOTTOM OF THE TOP RAIL EXCEEDS 430 (17") AND IS INCREASING. MAXIMUM HEIGHT OF DOUBLE RAIL SYSTEM IS 1140 (45"), TAPER BOTH RAILS TO MAINTAIN MAXIMUM HEIGHT. FLARE RATE FOR THE RAIL IS 12 1/2:1.
3. USE 2449 (8'-0") LONG POSTS FOR ALL POST LOCATIONS WITH A DOUBLE RAIL. POSTS FOR THE POST ANCHOR ARE 1830 (6'-0") LONG. WHEN A DOUBLE RAIL INSTALLATION IS REQUIRED, EACH RAIL WILL BE MEASURED AND PAID FOR AT THE CONTRACT UNIT PRICE PER LINEAR FOOT OF GUIDE RAIL.
4. WHEN THE GUIDE RAIL LENGTH OF NEED FALLS NEAR A CUT TO FILL SLOPE, THE PREFERRED TREATMENT IS TO ANCHOR THE GUIDE RAIL TO THE CUT SLOPE.
5. THE BACKSLOPE ANCHOR TERMINAL HAS BEEN CRASH TESTED TO NCHRP 350 CRITERIA FOR A 1:6 (6:1) SLOPE [rehab.] AND A 1:10 (10:1) SLOPE [new construction]. IT CAN BE ANCHORED WITH A CONCRETE BLOCK OR A POST ANCHOR.
6. PROVIDE 23.0 m (75'-0") MINIMUM FROM WHERE THE GUIDE RAIL CROSSES THE SWALE LINE TO THE BEGINNING OF THE HAZARD.
7. BACKSLOPE ANCHOR TERMINAL PAY LIMIT INCLUDES THE CONCRETE OR POST ANCHORAGE, 3810 (12'-6") OF RAIL ELEMENT POSTS AND HARDWARE.



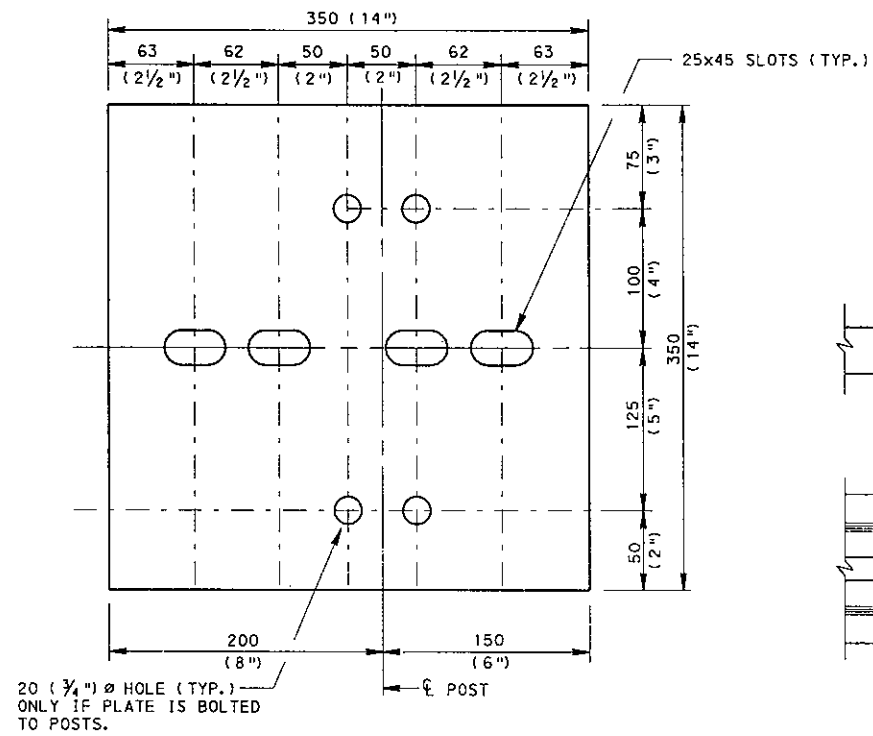
** ROCK ANCHORAGE DOES NOT REQUIRE THE 300 (1'-0") BURIAL.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

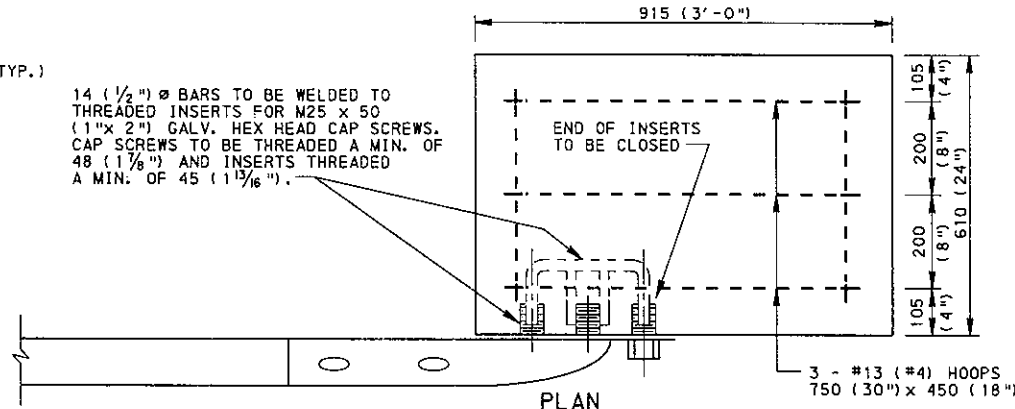
GUIDE RAIL
BACKSLOPE
ANCHOR TERMINAL
(REHAB. PROJECTS)

RECOMMENDED APR. 16, 2001	RECOMMENDED APR. 16, 2001	SHT 6 OF 7
<i>Sean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	<i>Joseph J. Hoffman</i> CHIEF ENGINEER	RC-54M

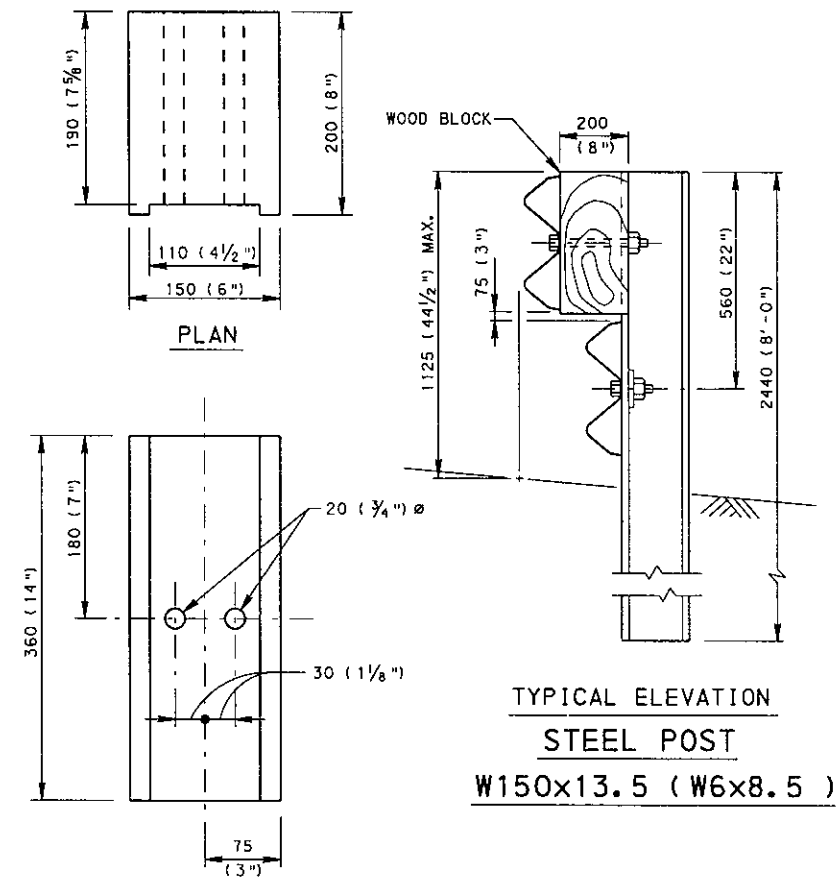


STEEL PLATE - 13 mm (1/2")
GALVANIZED
WELED OR BOLTED TO POST

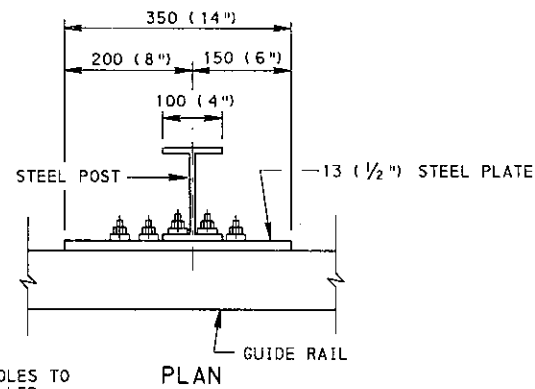
14 (1/2") Ø BARS TO BE WELDED TO THREADED INSERTS FOR M25 x 50 (1" x 2") GALV. HEX HEAD CAP SCREWS. CAP SCREWS TO BE THREADED A MIN. OF 48 (1 7/8") AND INSERTS THREADED A MIN. OF 45 (1 13/16").



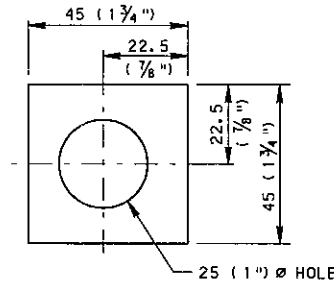
CONCRETE BLOCK ANCHOR



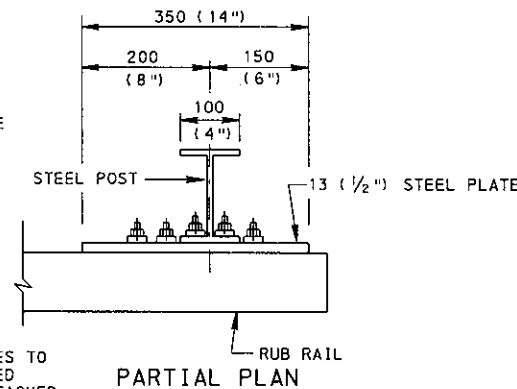
**TYPICAL ELEVATION
STEEL POST
W150x13.5 (W6x8.5)**



PLAN

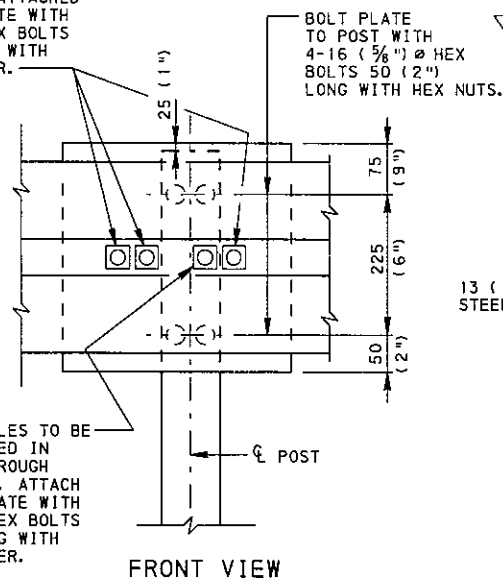


SQUARE WASHER
5 (1/4") THICK - GALVANIZED



PARTIAL PLAN

3-25 (1") Ø HOLES TO BE FIELD DRILLED IN RAIL AND ATTACHED TO STEEL PLATE WITH 22 (7/8") Ø HEX BOLTS 50 (2") LONG WITH SQUARE WASHER.



FRONT VIEW

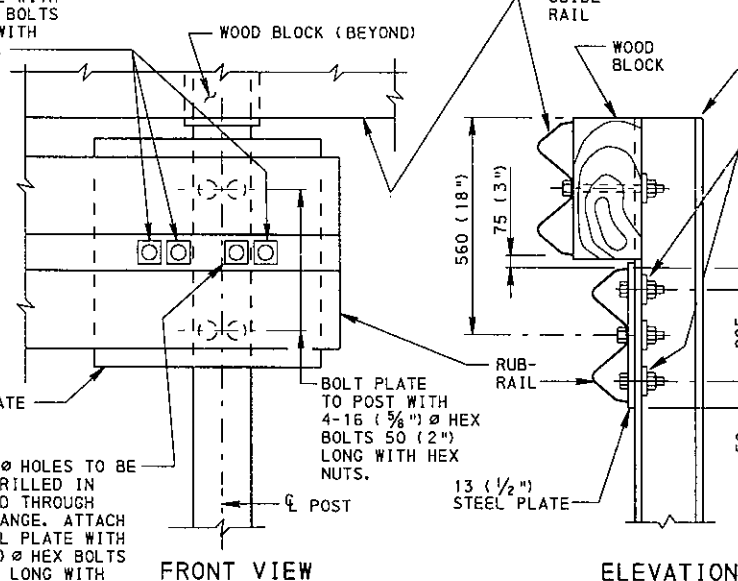
POST ANCHOR DETAIL
DIMENSIONS ARE TYPICAL

3-25 (1") Ø HOLES TO BE FIELD DRILLED IN RAIL AND ATTACHED TO STEEL PLATE WITH 22 (7/8") Ø HEX BOLTS 50 (2") LONG WITH SQUARE WASHER.



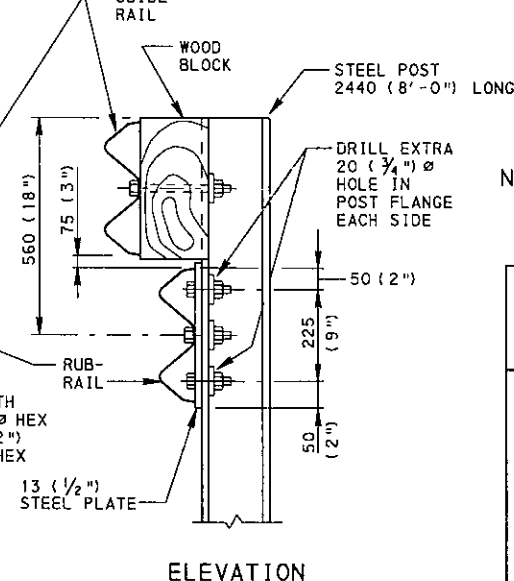
ELEVATION

DRILL EXTRA 20 (3/4") Ø HOLE IN POST FLANGE EACH SIDE



FRONT VIEW

RUBRAIL ANCHOR ATTACHMENT



ELEVATION

**ELEVATION
WOOD BLOCK**

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN**

**BACKSLOPE
ANCHOR TERMINAL
END ANCHORAGE DETAILS**

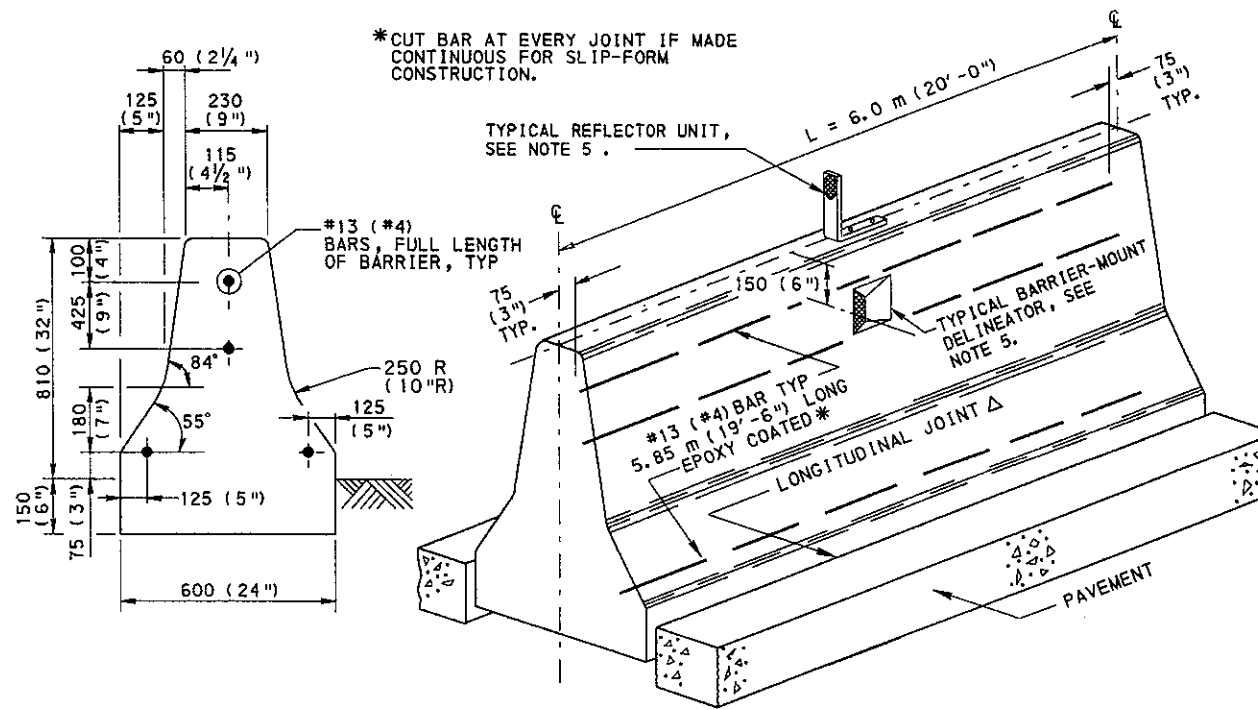
RECOMMENDED APR. 16, 2001
Dean A. Schuck
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED APR. 16, 2001
Gary J. Hoffman
CHIEF ENGINEER

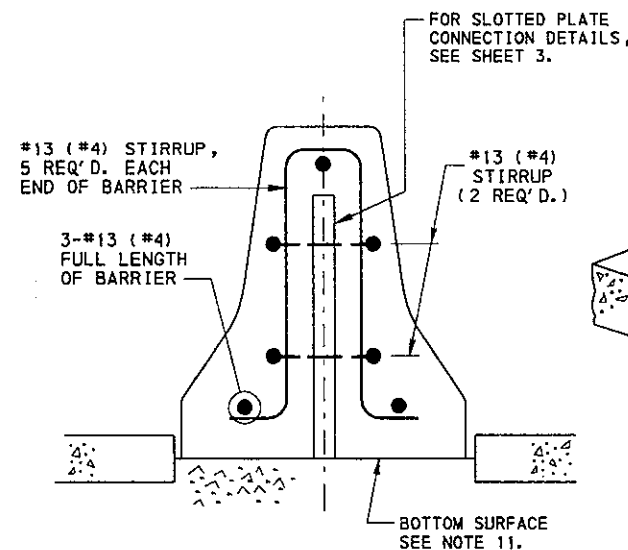
SHT 1 OF 1
RC-54M

NOTES

1. PROVIDE CONCRETE MEDIAN BARRIER MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 623.
2. PROVIDE PRECAST CONCRETE BARRIER SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15. FOR DEVIATIONS OR MODIFICATIONS OF THE STANDARDS, SUBMIT SHOP DRAWINGS FOR REVIEW AND APPROVAL.
3. FOR CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION, USE PREMOLDED JOINT MATERIAL AT ALL CONSTRUCTION JOINTS.
4. CONCRETE MEDIAN BARRIER CONSTRUCTION ON EXISTING PAVEMENT REQUIRES SPECIAL DETAILS TO BE SHOWN ON THE CONSTRUCTION DRAWINGS.
5. FOR PERMANENT AND TEMPORARY BARRIER INSTALLATIONS, USE SIDE-MOUNT (BARRIER-MOUNT DELINEATOR) OR TOP-MOUNT DELINEATORS (BARRIER-MOUNT DELINEATOR OR REFLECTOR UNIT) AS DETERMINED ON A PROJECT BY PROJECT BASIS. LOCATE SIDE-MOUNT DELINEATORS 660 (26") FROM THE PAVEMENT TO THE CENTER OF THE DELINEATOR. INSTALL TOP-MOUNT DELINEATORS AS FOLLOWS:
 - (1) CENTER BARRIER-MOUNT DELINEATOR ALONG LONGITUDINAL CENTERLINE OF MEDIAN BARRIER.
 - (2) LOCATE REFLECTOR UNITS AS SHOWN ON TRAFFIC STANDARD TC-7604.
 FOR PERMANENT INSTALLATIONS, PLACE DELINEATORS AT A MAXIMUM LONGITUDINAL SPACING OF 25 m (80'-0") FOR TANGENT SECTIONS AND 12 m (40'-0") FOR CURVE SECTIONS WITH A HORIZONTAL RADIUS LESS THAN 305 m (1000').
6. COMPACT NO. 2A OR NO. OGS MATERIAL IN ACCORDANCE WITH PUBLICATION 408, SECTION 350. A LAYER 25 (1") THICK OF NON-SHRINK MORTAR MAY BE USED ON TOP OF THE SUBBASE MATERIAL FOR LEVELING PURPOSES. A RIGID BASE MAY BE USED INSTEAD OF SUBBASE.
7. PROVIDE PRECAST CONCRETE MEDIAN BARRIER FOR USE AS TEMPORARY (MPT) AND IN PERMANENT INSTALLATIONS. FOR TEMPORARY INSTALLATIONS, EMBEDMENT IS NOT REQUIRED.
8. ROUND OR CHAMFER ALL EDGES WITH A RADIUS OF 25 (1") EXCEPT AS SHOWN.
9. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.
10. FABRICATE REINFORCEMENT BARS ACCORDING TO PENNDOT BRIDGE CONSTRUCTION STANDARD, BC-736M.
11. TO LIMIT LATERAL DISPLACEMENT OF PORTABLE BARRIER WHEN USED IN WORK ZONES, PROVIDE A ROUGH FINISH AT THE BOTTOM SURFACE. BEFORE THE CONCRETE HAS INITIALLY SET, FINISH THE BOTTOM SURFACE WITH STIFF, WIRE BROOM OR SPECIAL TEMPLATE IN A LATITUDINAL DIRECTION TO PRODUCE SCORES APPROXIMATELY 4 (1/8") IN DEPTH.

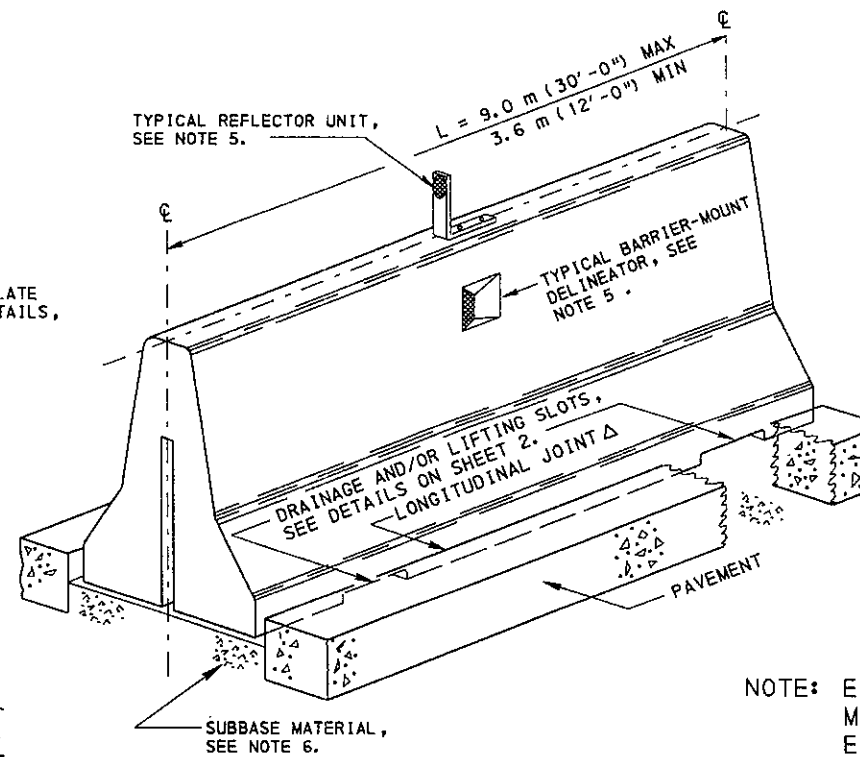


TYPICAL CAST-IN-PLACE BARRIER



TYPICAL PRECAST BARRIER

FOR DIMENSIONS AND DETAILS, SEE REMAINING SHEETS OF THIS STANDARD.



△ SEAL JOINTS WITH AN APPROVED JOINT SEALER.

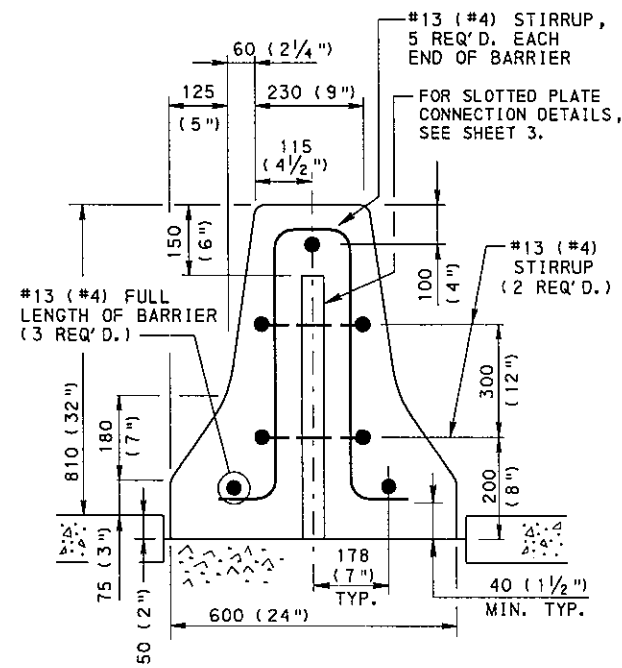
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

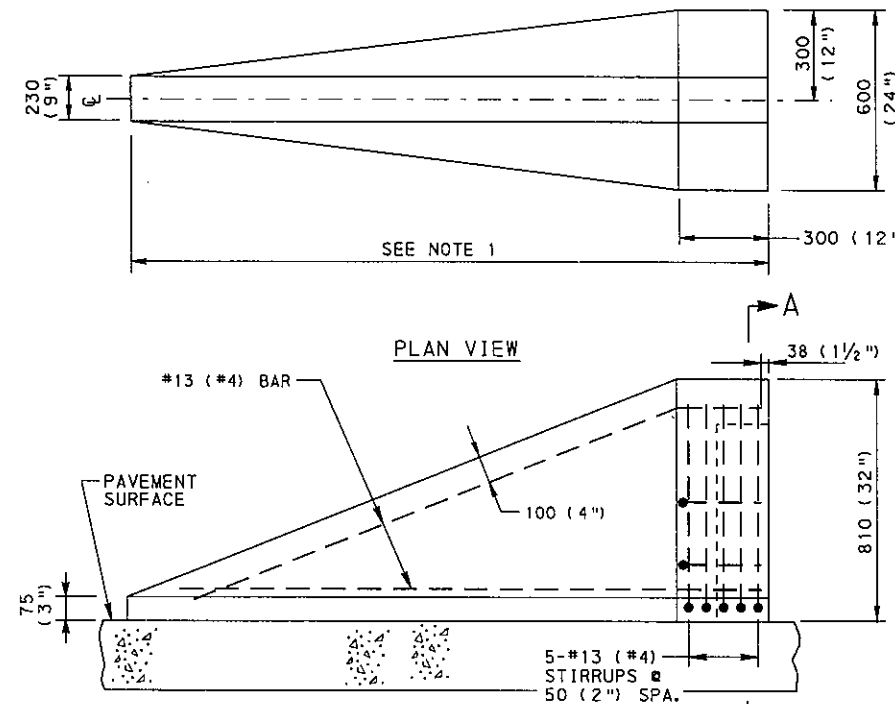
CONCRETE MEDIAN BARRIER
F-SHAPE

BC-736M	REINFORCEMENT BAR FABRICATION DETAILS
REFERENCE DRAWINGS	

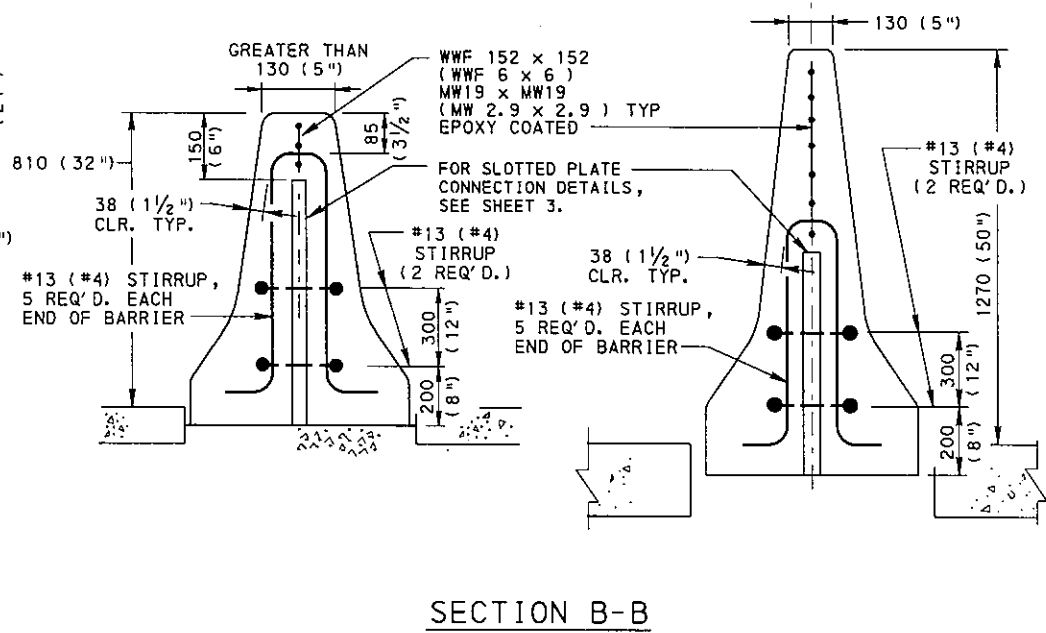
RECOMMENDED APR. 16, 2001 <i>Sean A. Schwartz</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>Gary D. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 6 RC-57M
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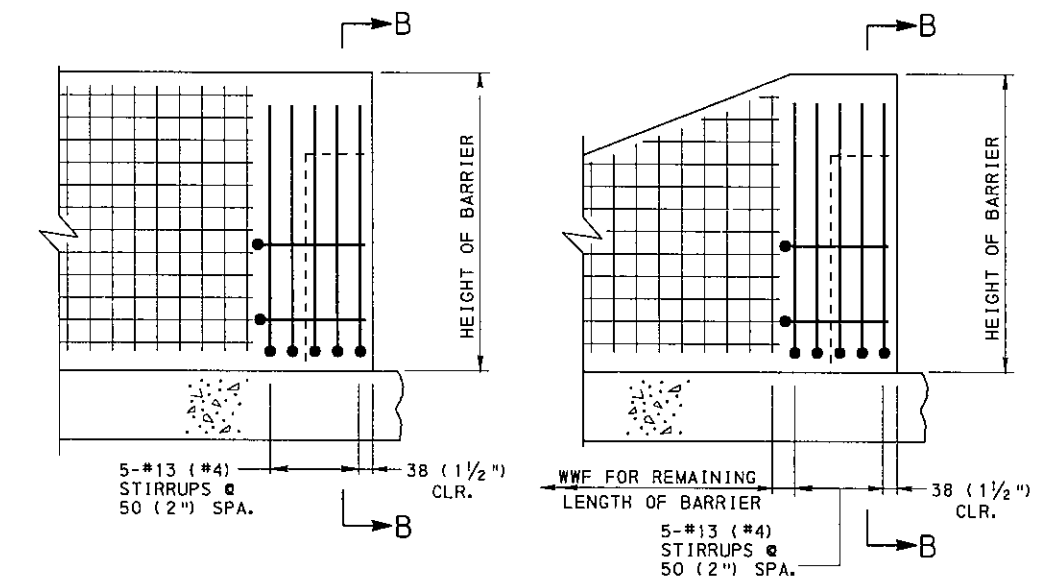
SECTION A-A



TYPICAL END TRANSITION



SECTION B-B



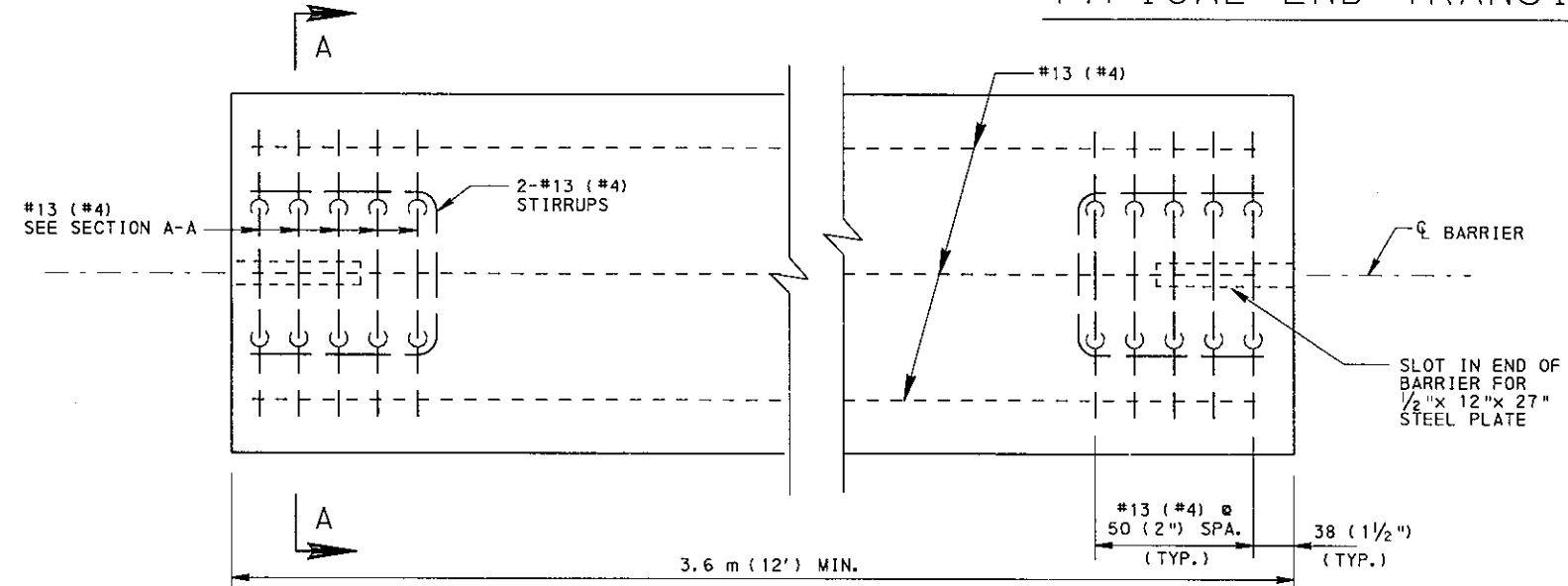
TYPICAL BARRIER ELEVATION

END TRANSITION ELEVATION

ALTERNATE WWF REINFORCEMENT DETAILS

WWF REPLACES THE #13 (#4) FULL LENGTH REBARS USED IN THE REBAR ALTERNATE. ALL OTHER DIMENSIONS ARE TYPICAL TO THE REBAR ALTERNATE.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.



TYPICAL BARRIER PLAN

BOTH ENDS OF BARRIER ARE TYPICAL.

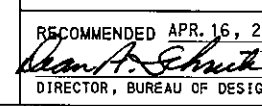
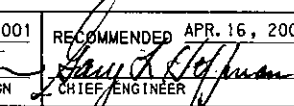
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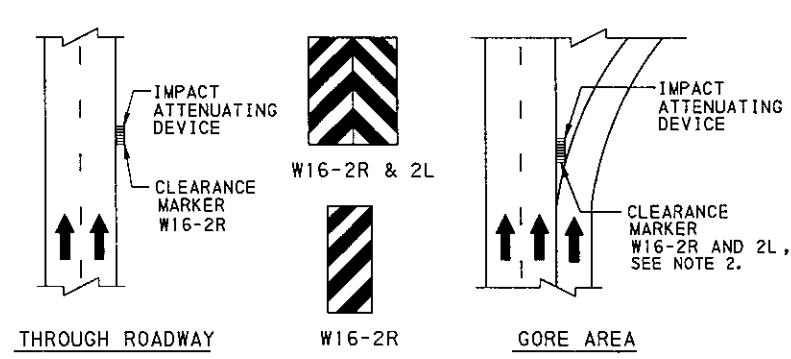
1. A TYPICAL END TRANSITION MAY BE USED FOR PERMANENT BARRIER INSTALLATIONS ONLY WHEN THE LAST BARRIER SECTION IS LOCATED OUTSIDE THE REQUIRED CLEAR ZONE, AS DETERMINED IN PUBLICATION 13M, DESIGN MANUAL, PART 2, CHAPTER 12. A 20:1 SLOPED END TRANSITION IS ACCEPTABLE FOR PERMANENT INSTALLATIONS WHERE THE LEGAL SPEED LIMIT IS 60 km/h (35 mph) OR LESS; OTHERWISE, USE AN IMPACT ATTENUATING DEVICE. WHEN CONCRETE BARRIER IS TERMINATED AT THE END OF PARALLEL RAMP OR T INTERSECTIONS, A 2.1 m (7'-0") END TRANSITION MAY BE USED WHERE THE LEGAL SPEED IS 60 km/h (35 mph) OR LESS. FOR BARRIER INSTALLATIONS, AN IMPACT ATTENUATING DEVICE IS NOT REQUIRED IF ANY OF THE FOLLOWING CONDITIONS ARE SATISFIED:
 - (A) THE BARRIER IS EXTENDED AT THE PROPER FLARE RATE UNTIL THE END OF THE BARRIER SYSTEM IS LOCATED OUTSIDE THE REQUIRED CLEAR ZONE AS DETERMINED IN PUBLICATION 13M, DESIGN MANUAL, PART 2, CHAPTER 12.
 - (B) THE BARRIER IS EXTENDED AT THE PROPER FLARE RATE UNTIL THE END OF THE BARRIER SYSTEM CAN BE BURIED IN A CUT SECTION.
 - (C) THE BARRIER IS EXTENDED AT THE PROPER FLARE RATE UNTIL THE END OF THE BARRIER SYSTEM IS PROPERLY CONNECTED OR OVERLAPPED WITH EXISTING GUIDE RAIL.
2. PROVIDE SUITABLE LIFTING DEVICES FOR HANDLING, INSTALLING AND REMOVING PRECAST CONCRETE BARRIER. GALVANIZE METAL DEVICES AS SPECIFIED IN PUBLICATION 408, SECTION 1105.02(s).
3. PROVIDE REINFORCEMENT STEEL MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 709 WITH A MINIMUM CONCRETE COVER OF 40 (1 1/2) INCHES.
4. EPOXY COATED REINFORCEMENT IS NOT REQUIRED WHEN PRECAST CONCRETE MEDIAN BARRIER IS TO BE USED IN TEMPORARY INSTALLATION ONLY, IN ACCORDANCE WITH SECTION 627, AND IDENTIFIED AS SUCH, AS SPECIFIED IN SECTION 714.61(c).
5. ROUND OR CHAMFER ALL EDGES WITH A RADIUS OF 25 (1) INCHES EXCEPT AS SHOWN.

REFER TO TABLE 1, SHEET 3, FOR FLARE RATE REQUIREMENTS.

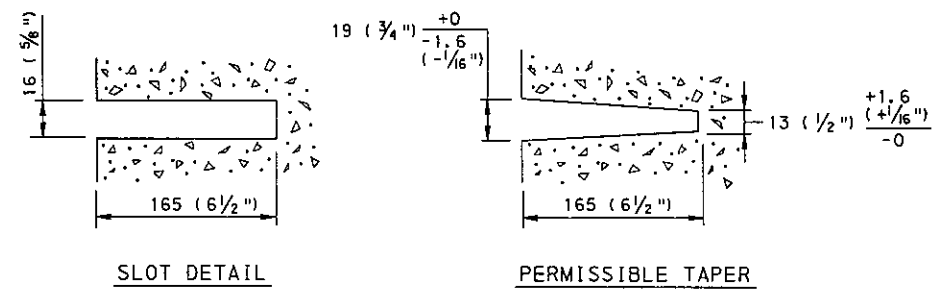
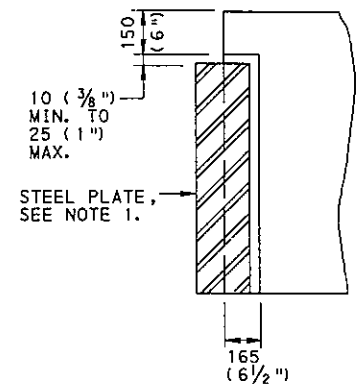
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER
F-SHAPE

RECOMMENDED APR. 16, 2001
 DIRECTOR, BUREAU OF DESIGN
 CHIEF ENGINEER
 SHT 2 OF 6
 RC-57M



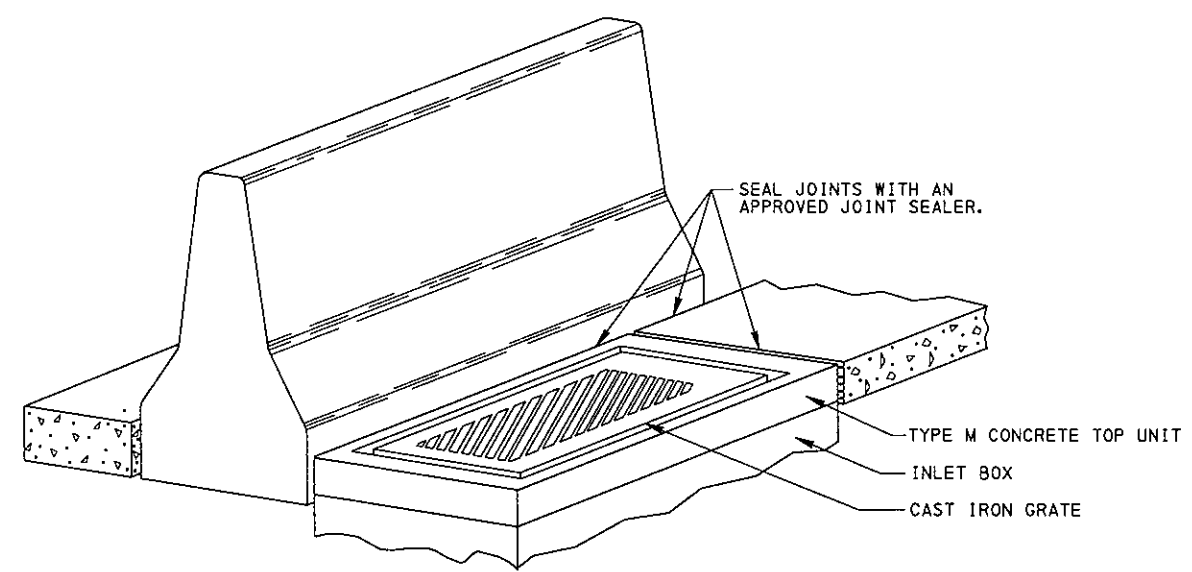
THROUGH ROADWAY
GORE AREA
DETAIL A
DELINEATION OF IMPACT ATTENUATING DEVICES



SLOTTED PLATE CONNECTION

NOTES

1. PROVIDE PLATES, 13 x 305 x 685 (1/2" x 12" x 27"), MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 1105.02(s). GALVANIZE PLATES AS SPECIFIED IN PUBLICATION 408, SECTION 1105.02(s).
2. PROVIDE VERTICAL RECTANGLE, STANDARD ALUMINUM, PRESSURE SENSITIVE CLEARANCE MARKERS, W16-2R AND/OR W16-2L, FABRICATED FROM CLASS II SHEETING MATERIAL, FOR DELINEATION OF IMPACT ATTENUATING DEVICES AS PRESENTED IN DETAIL A. ATTACH MARKERS DIRECTLY TO THE LEADING END OF IMPACT ATTENUATING DEVICES. ON INERTIAL BARRIERS (SAND BARRELS), PROVIDE SENSITIVE SHEETING, WITHOUT RIGID BACKING, DIRECTLY TO BARRIER FRONT OR NOSE SECTION. DO NOT POST-MOUNT MARKERS IN FRONT OF IMPACT ATTENUATING DEVICES. MARKERS ARE PROVIDED IN TWO SIZES: 305 x 914 (12" x 36") AND 457 x 914 (18" x 36"). WHEN ONE MARKER IS REQUIRED, USE 457 x 914 (18" x 36"). WHEN TWO MARKERS ARE REQUIRED SIDE BY SIDE, USE 305 x 914 (12" x 36"). PROVIDE COLOR FOR CLEARANCE MARKERS AS FOLLOWS:
 (A) MESSAGE : BLACK STRIPES (NON-REFLECTORIZED)
 (B) FIELD : YELLOW (REFLECTORIZED)
 ORANGE (REFLECTORIZED), CONSTRUCTION ZONES



TYPICAL INLET PLACEMENT AT
CONCRETE MEDIAN BARRIER

TABLE 1
FLARE RATES FOR BARRIER DESIGN

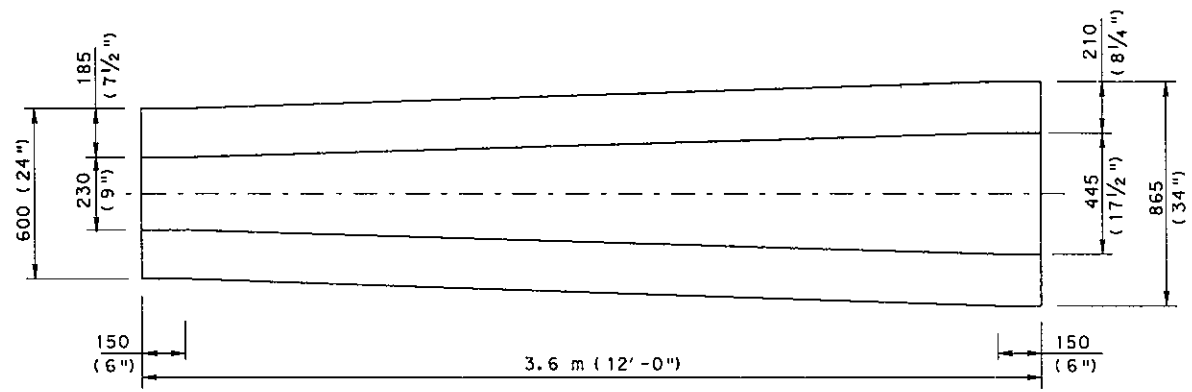
DESIGN SPEED		MAXIMUM FLARE RATES	
Km/h	(mph)	CONCRETE BARRIER	GUIDE RAIL
120	(75)	20 : 1	15 : 1
110	(70)	20 : 1	15 : 1
100	(60)	18 : 1	14 : 1
90	(55)	16 : 1	12 : 1
80	(50)	14 : 1	11 : 1
70	(45)	12 : 1	10 : 1
60	(35)	10 : 1	8 : 1
50	(30)	8 : 1	7 : 1

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

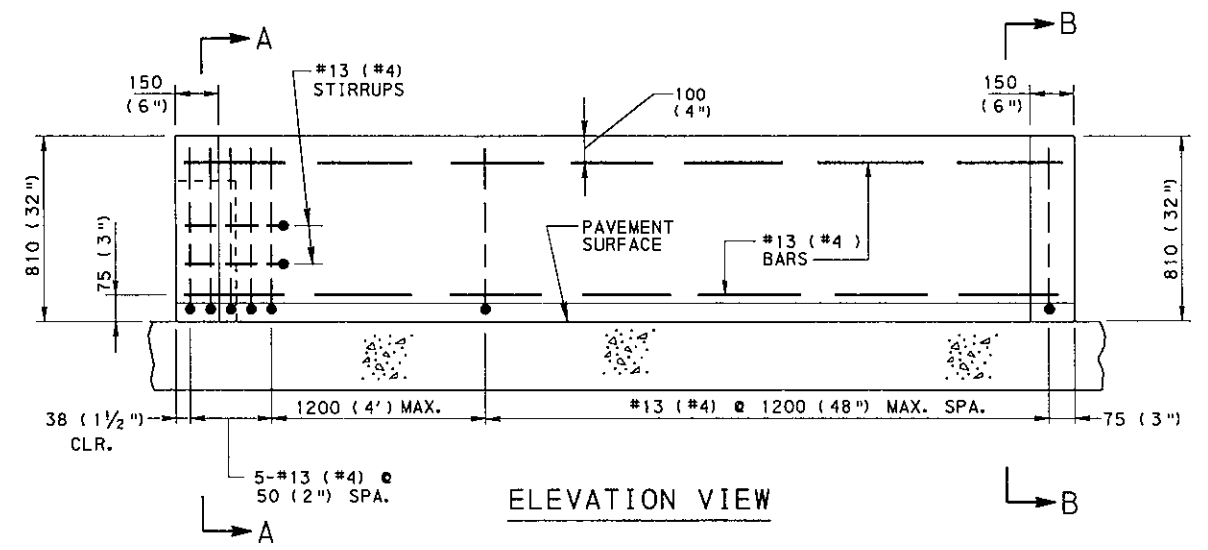
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER
F-SHAPE

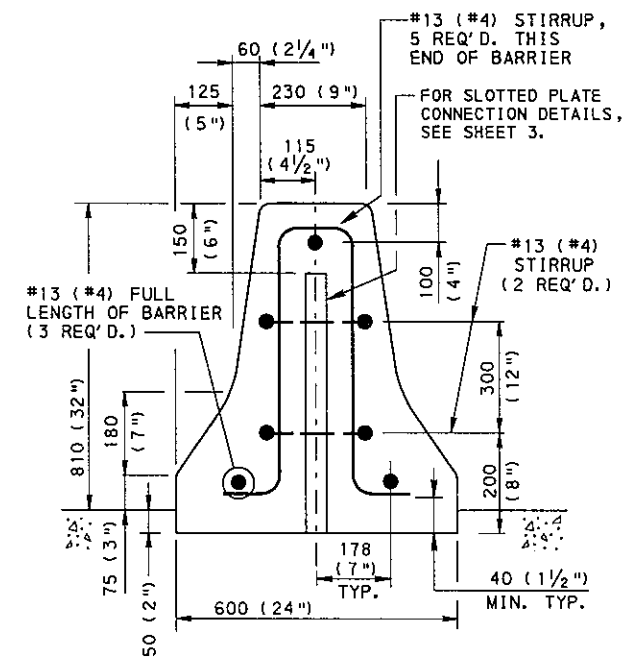
RECOMMENDED APR. 16, 2001 <i>Dean P. Schuch</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>Henry J. Hoffman</i> CHIEF ENGINEER	SHT 3 OF 6 RC-57M
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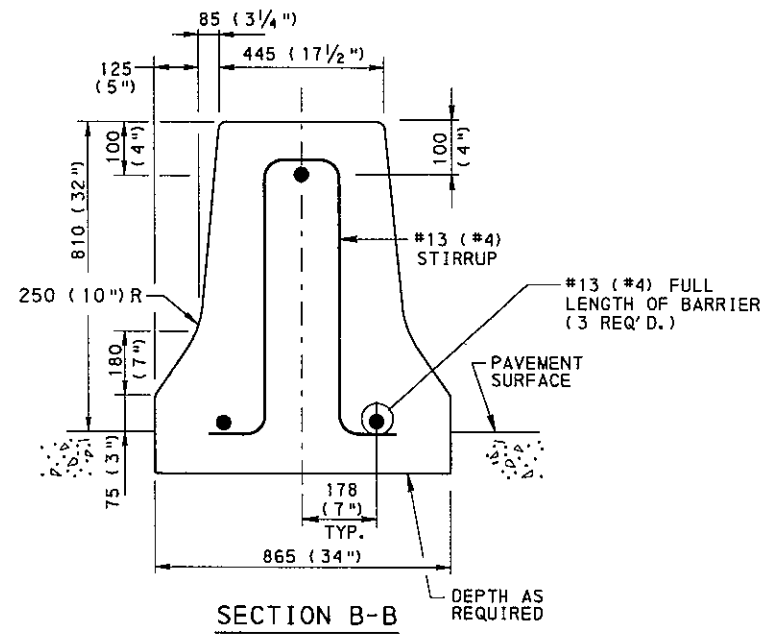
PLAN VIEW



ELEVATION VIEW



SECTION A-A

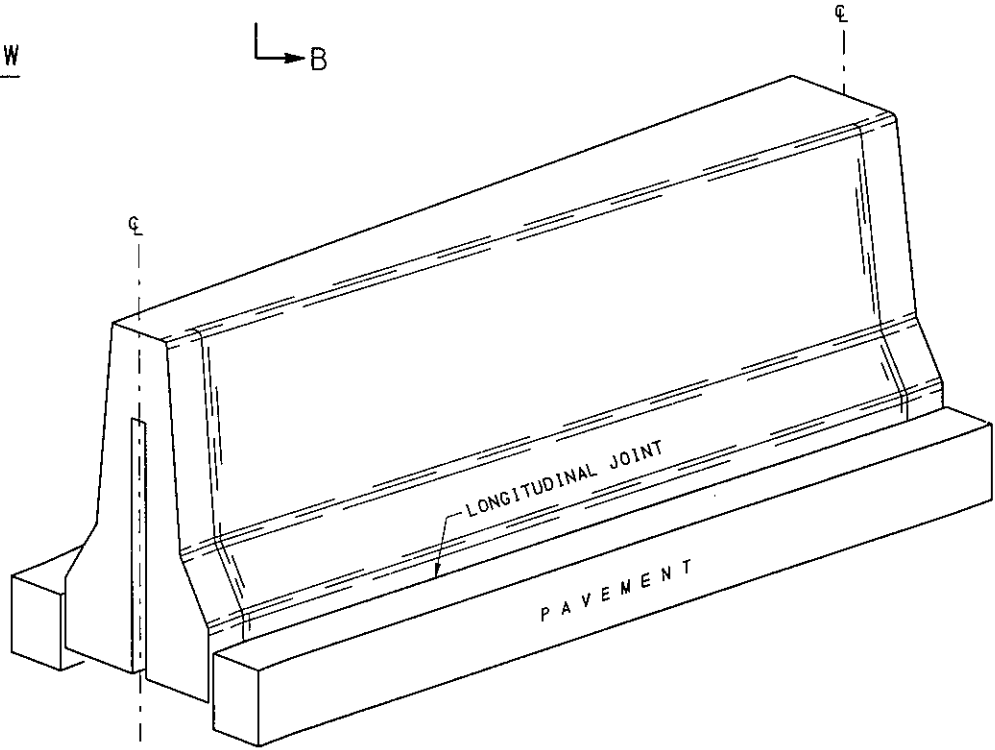


SECTION B-B

NOTES

1. PROVIDE REINFORCEMENT MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 709.
2. ROUND OR CHAMFER ALL EDGES WITH A RADIUS OF 25 (1") EXCEPT AS SHOWN.
3. FOR ALTERNATE WWF REINFORCED BARRIERS, SEE SHEET 2.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.



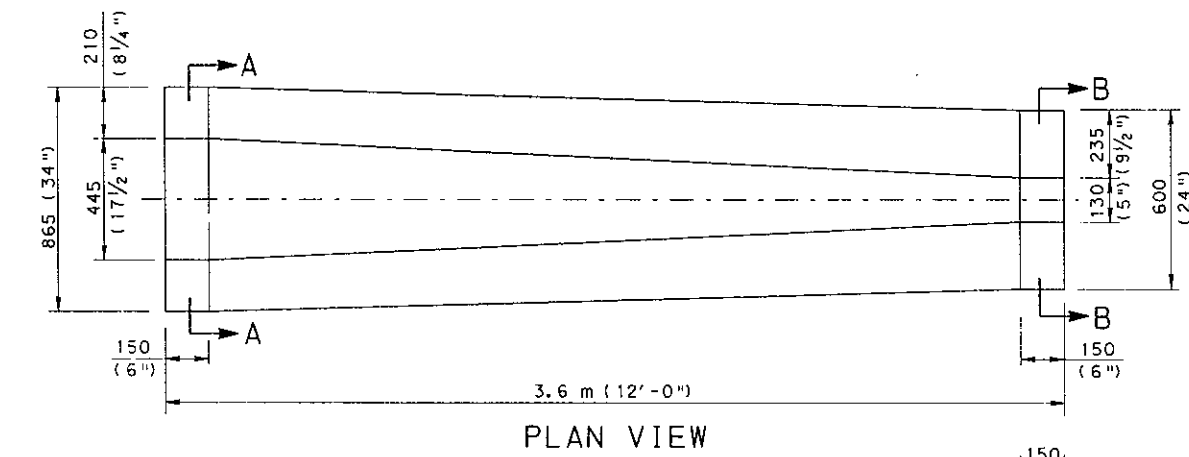
ORTHOGRAPHIC VIEW

TYPICAL 810 TO 810 (32" TO 32")
BRIDGE TO HIGHWAY TRANSITION

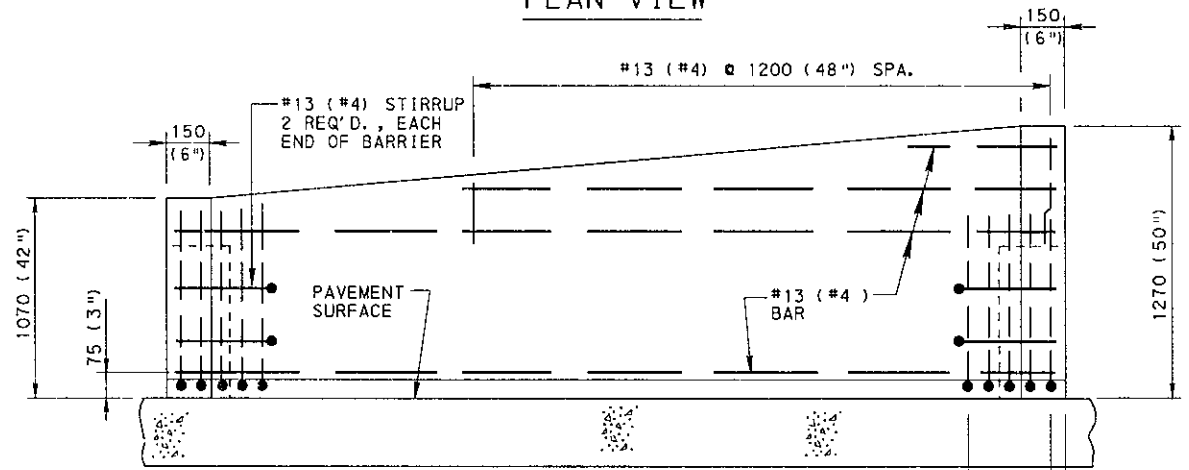
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER
F-SHAPE

RECOMMENDED APR. 16, 2001 <i>Dean A. Schaefer</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>Gary D. Hoffman</i> CHIEF ENGINEER	SHT 4 OF 6 RC-57M
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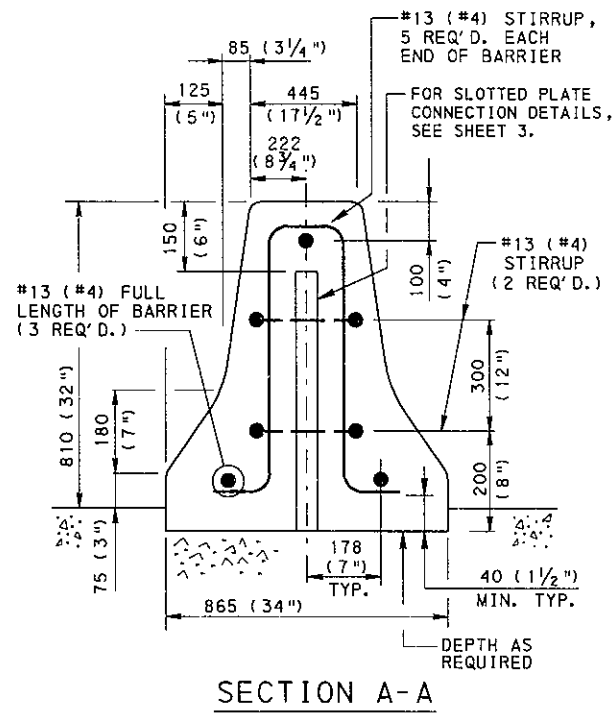


PLAN VIEW

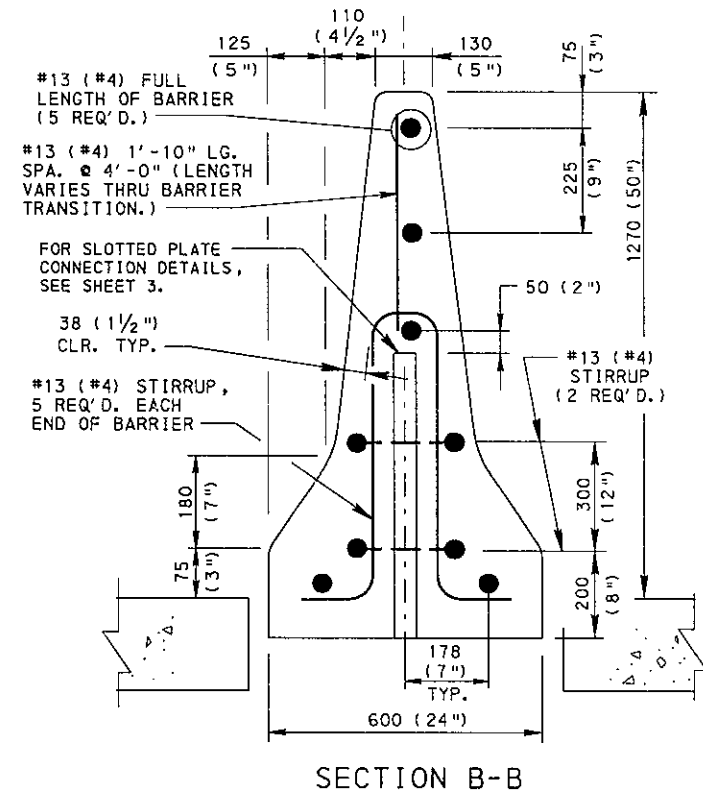


ELEVATION VIEW

38 (1 1/2) (TYP.)
5-#13 (#4) @ 50 (2) SPA. (TYP.)



SECTION A-A



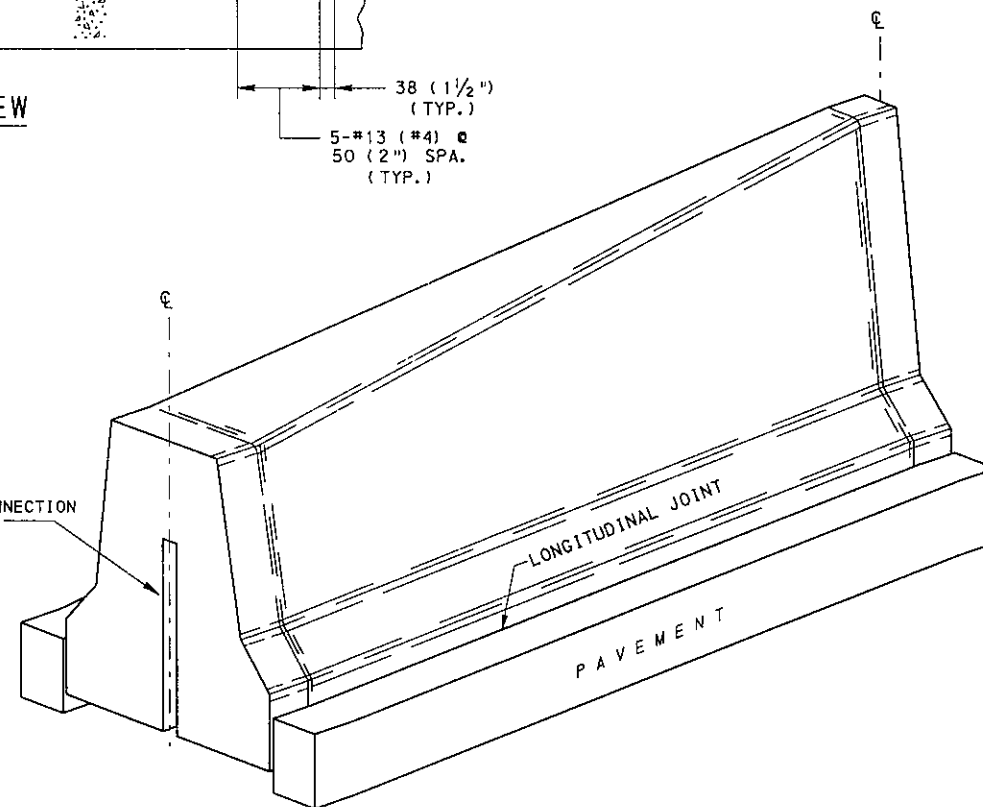
SECTION B-B

NOTES

1. PROVIDE REINFORCEMENT MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 709 WITH A MINIMUM CONCRETE COVER OF 40 (1 1/2").
2. ROUND OR CHAMFER ALL EDGES WITH A RADIUS OF 25 (1") EXCEPT AS SHOWN.
3. FOR ALTERNATE WWF REINFORCED BARRIERS, SEE SHEET 2.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

FOR SLOTTED PLATE CONNECTION DETAILS, SEE SHEET 3.



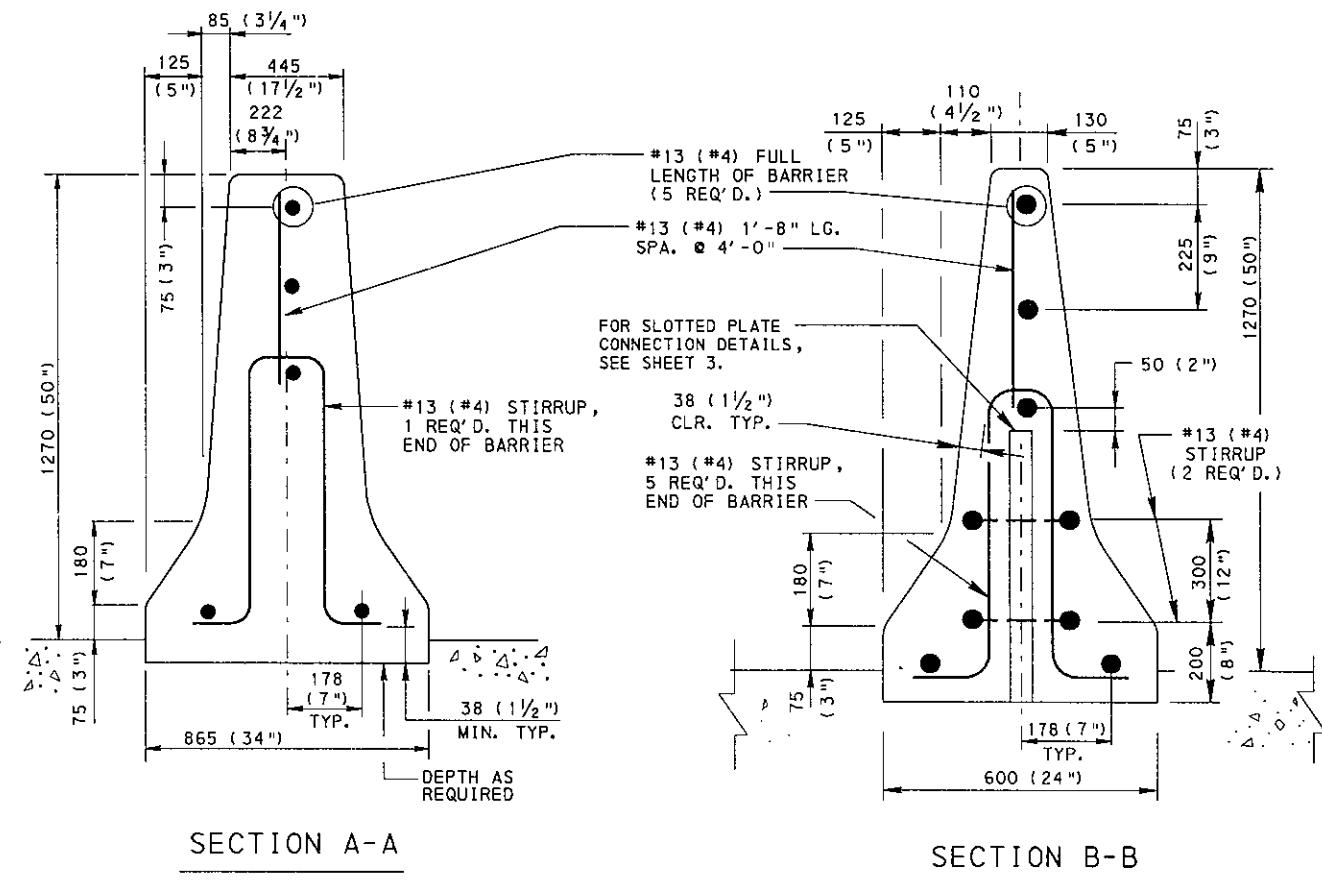
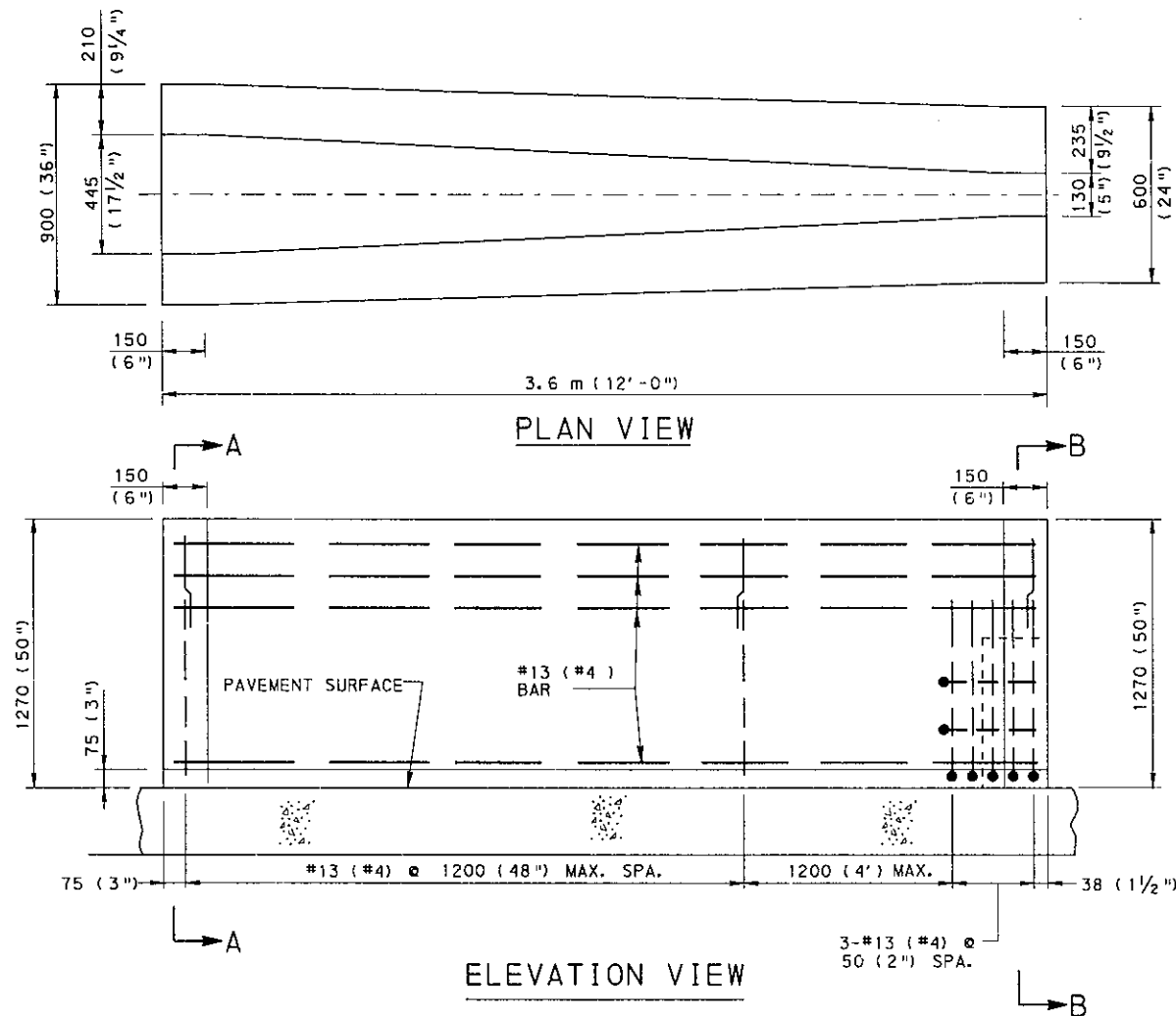
ORTHOGRAPHIC VIEW

TYPICAL 810 TO 1270 (32" TO 50") HIGHWAY TRANSITION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER
F-SHAPE

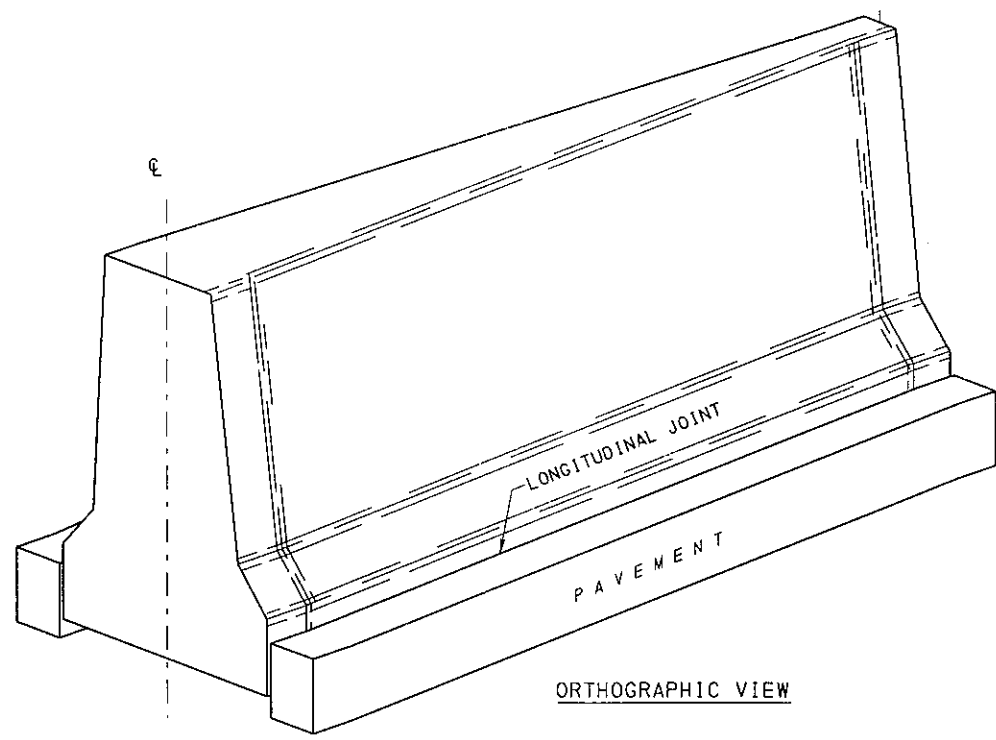
RECOMMENDED APR. 16, 2001 <i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>Barry J. Hoffman</i> CHIEF ENGINEER	SHT 5 OF 6 RC-57M
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ELEVATION VIEW

SECTION A-A

SECTION B-B



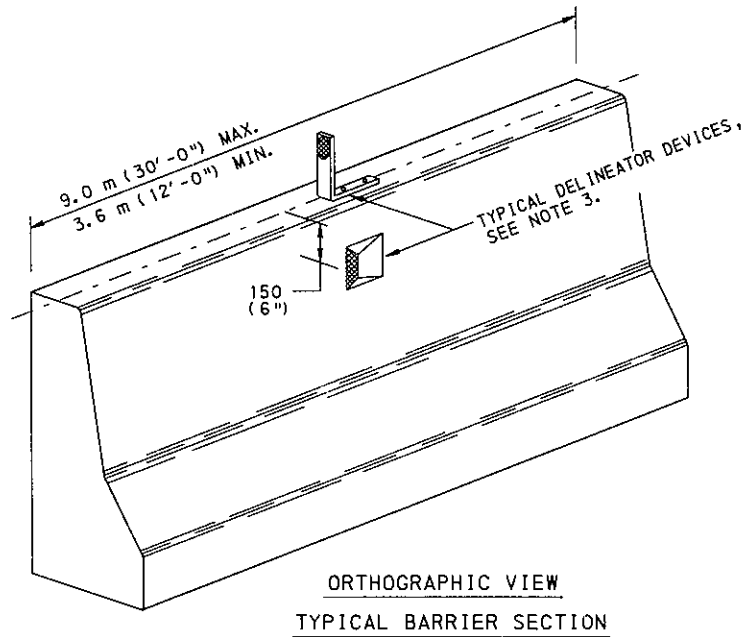
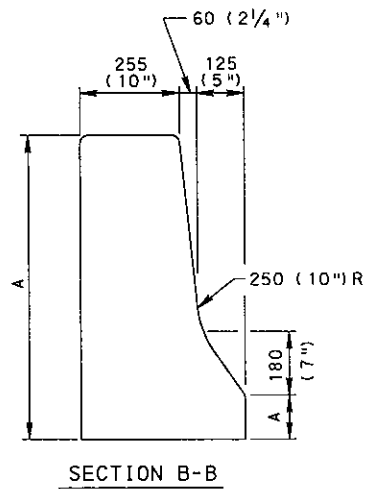
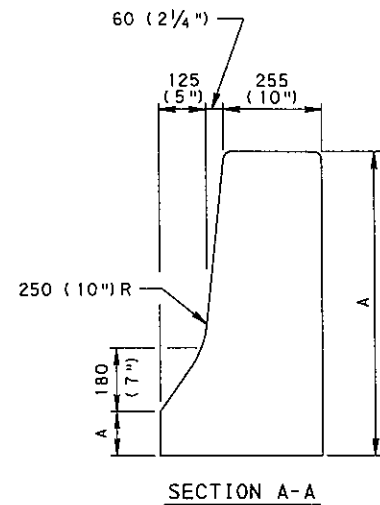
TYPICAL 1270 TO 1270 (50" TO 50") TRANSITION
BRIDGE TO HIGHWAY TRANSITION

NOTE

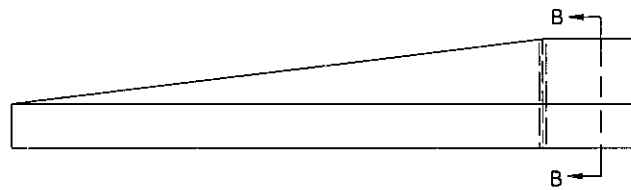
FOR ALTERNATE WWF REINFORCED BARRIERS, SEE SHEET 2.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

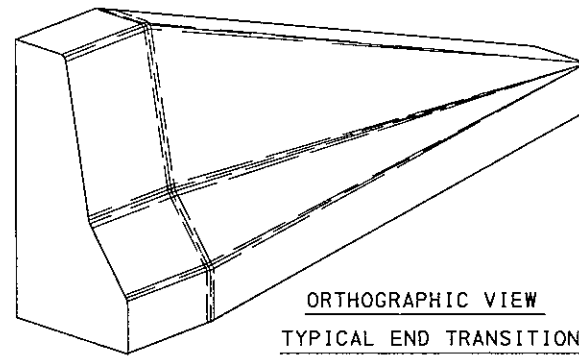
COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
CONCRETE MEDIAN BARRIER F-SHAPE		
RECOMMENDED APR. 16, 2001 <i>Dean A. Schuster</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>Gay D. Hoffman</i> CHIEF ENGINEER	SHT 6 OF 6 RC-57M



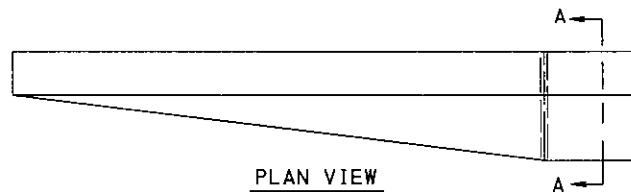
NOTE:
A = SEE TYPICAL SECTIONS,
SHEET 2.



PLAN VIEW
RIGHT END TRANSITION



ORTHOGRAPHIC VIEW
TYPICAL END TRANSITION
SEE NOTE 5.



PLAN VIEW
LEFT END TRANSITION

TYPICAL PRECAST OR CAST-IN-PLACE SINGLE FACE CONCRETE BARRIER

NOTES

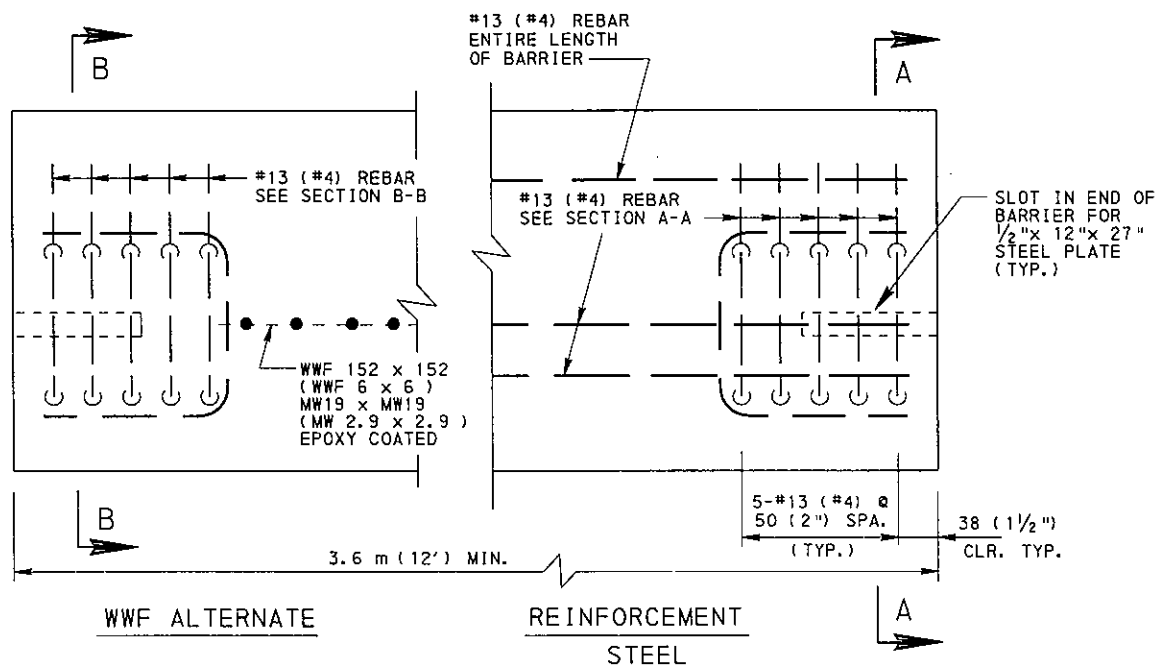
1. PROVIDE SINGLE FACE CONCRETE BARRIER MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 623.
2. PROVIDE PRECAST SINGLE FACE CONCRETE BARRIER SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15. MODIFICATIONS OR DEVIATIONS FROM THE STANDARD REQUIRE THE SUBMISSION OF SHOP DRAWINGS FOR REVIEW.
3. PROVIDE BARRIER-MOUNT OR REFLECTOR UNIT DELINEATORS, AS INDICATED ON RC-57M.
4. PROVIDE REINFORCEMENT FOR SINGLE FACE CONCRETE BARRIER AS INDICATED ON SHEET 2.
5. PROVIDE END TRANSITIONS OR IMPACT ATTENUATING DEVICES AS INDICATED ON RC-57M.
6. ROUND OR CHAMFER ALL EDGES WITH A RADIUS OF 25 (1") EXCEPT AS SHOWN.
7. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.
8. FABRICATE REINFORCEMENT BARS ACCORDING TO PENNDOT BRIDGE CONSTRUCTION STANDARD, BC-736M.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

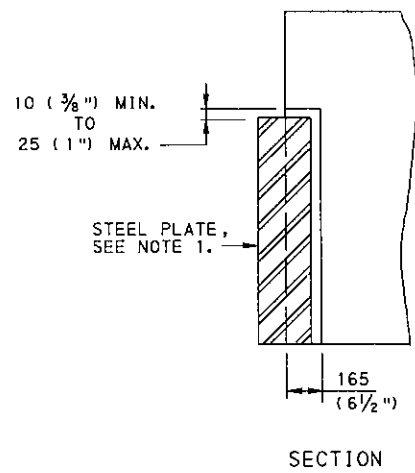
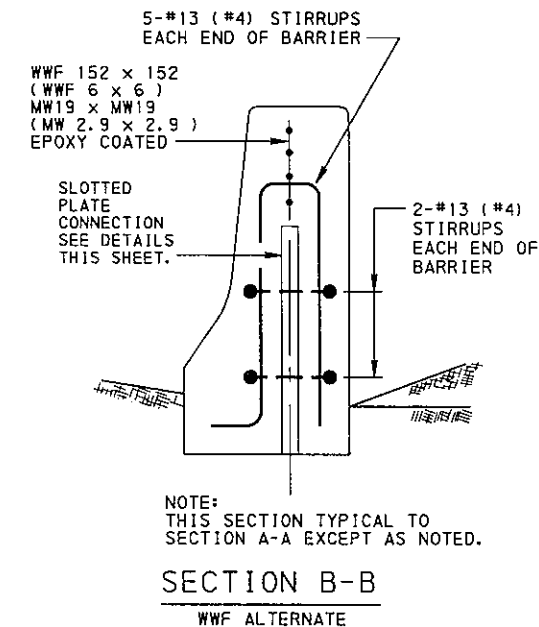
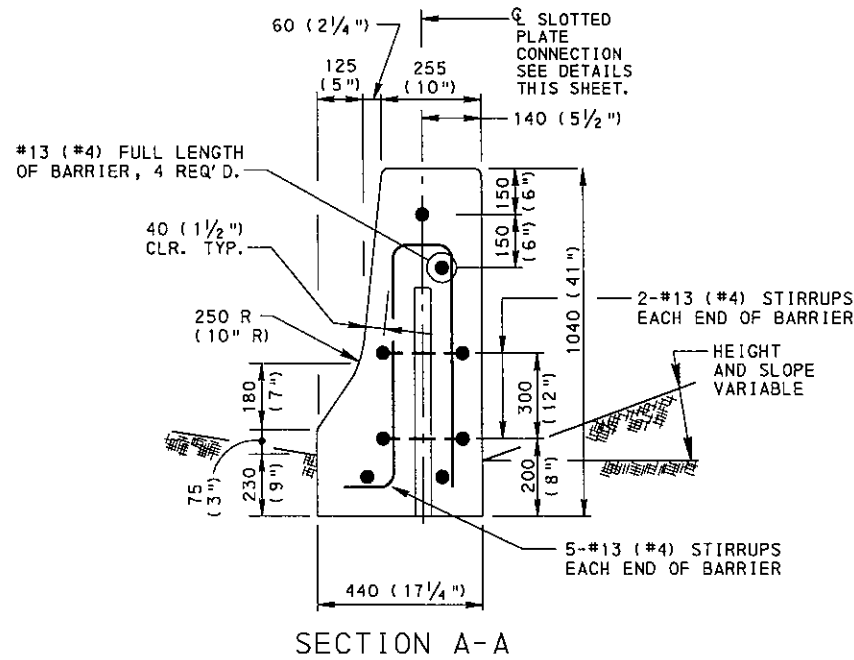
SINGLE FACE CONCRETE BARRIER

BC-736M	REINFORCEMENT BAR FABRICATION DETAILS	RECOMMENDED APR. 16, 2001	RECOMMENDED APR. 16, 2001	SHT 1 OF 5
REFERENCE DRAWINGS		<i>Mark A. Schaefer</i> DIRECTOR, BUREAU OF DESIGN	<i>Gary J. Hoffman</i> CHIEF ENGINEER	RC-58M

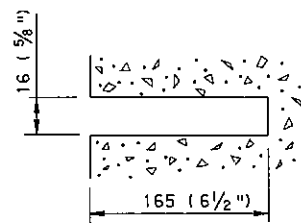


BARRIER PLAN

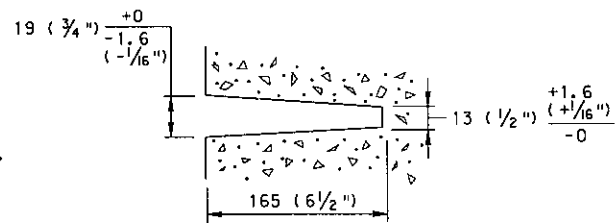
SHOWN WITH WWF ALTERNATE ON LEFT END OF BARRIER FOR DETAILING PURPOSES. BOTH ENDS OF BARRIER ARE TYPICAL.



SECTION



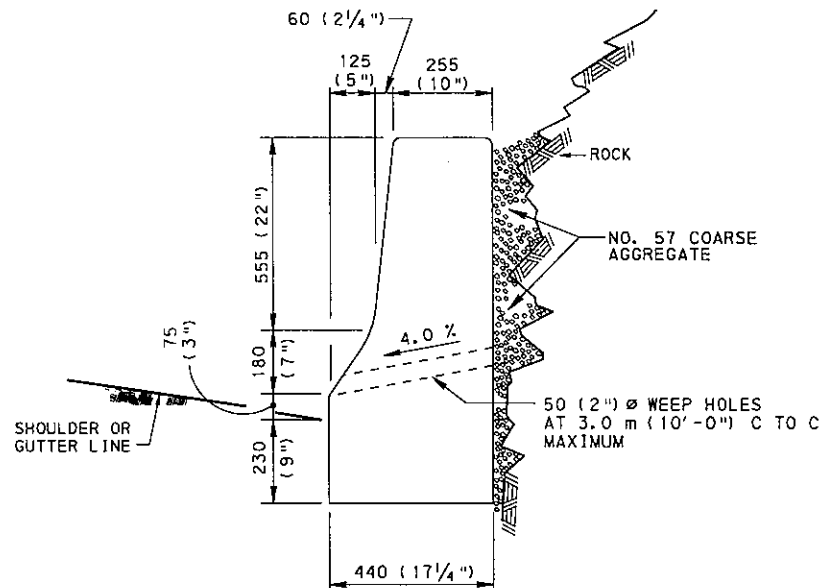
PLAN-SLOT DETAIL



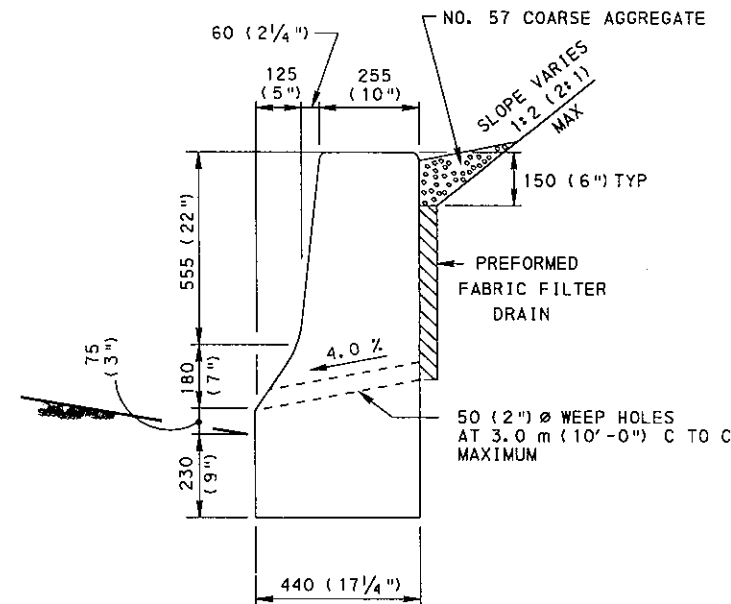
PLAN-PERMISSIBLE TAPER

SLOTTED PLATE CONNECTION

TYPICAL SINGLE FACE BARRIER SECTIONS



TYPICAL ROUGH ROCK TREATMENT



TYPICAL DRAINAGE TREATMENT

SEE NOTE 2.

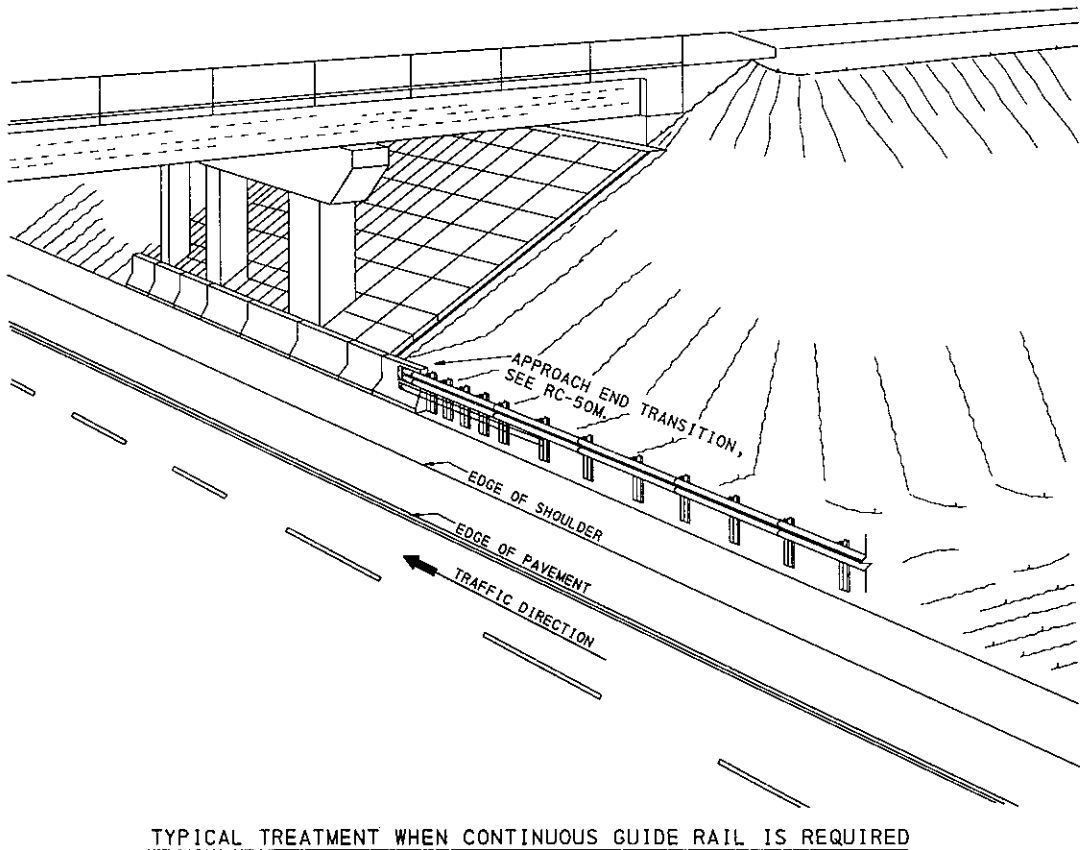
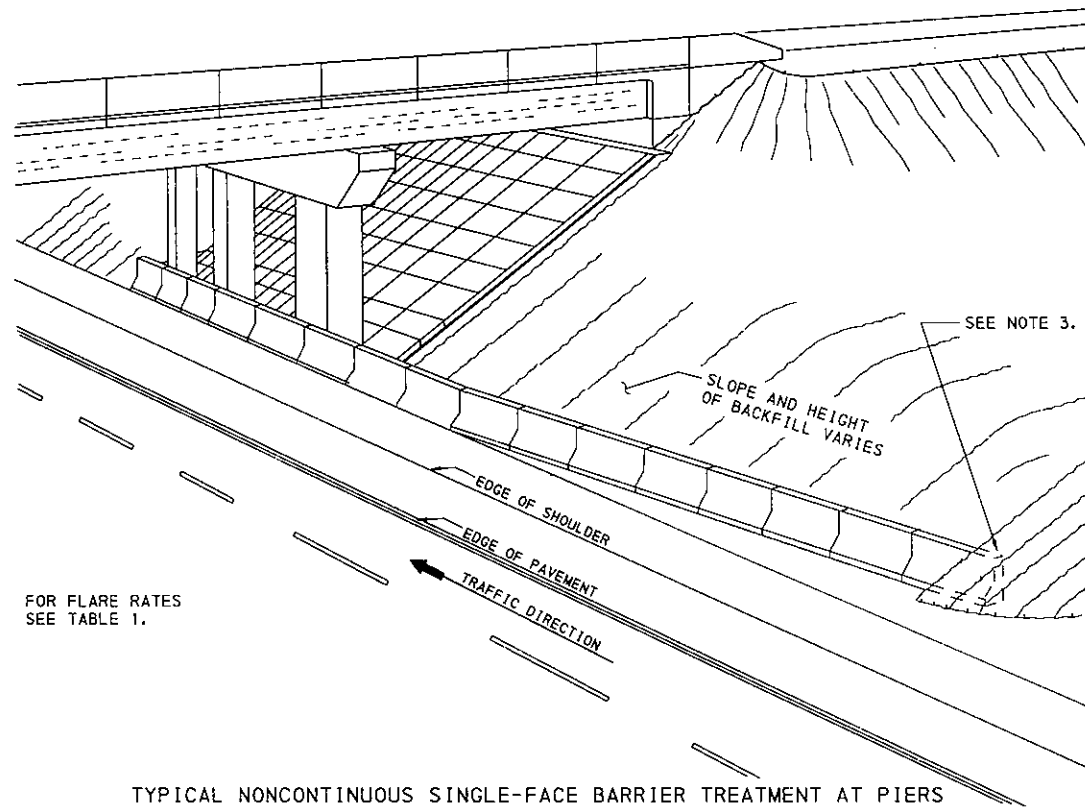
NOTES

1. PROVIDE PLATES MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 1105. GALVANIZE PLATES AS SPECIFIED IN PUBLICATION 408, SECTION 1105 ALTERNATE CONNECTIONS MAY BE USED AS APPROVED BY THE BUREAU OF DESIGN.
2. WHERE SINGLE FACE CONCRETE BARRIER IS SPECIFIED FOR USE AS A RETAINING WALL AND DRAINAGE TREATMENT IS NECESSARY, CONSTRUCT A PREFORMED FABRIC FILTER DRAIN AS INDICATED AND IN ACCORDANCE WITH PUBLICATION 408, SECTION 610. IF THE HEIGHT OR SLOPE IS INCREASED, PROVIDE OVERTURNING MOMENT COMPUTATIONS WITH THE CONSTRUCTION PLANS.
3. ROUND OR CHAMFER ALL EDGES WITH A RADIUS OF 25 (1'') EXCEPT AS SHOWN.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

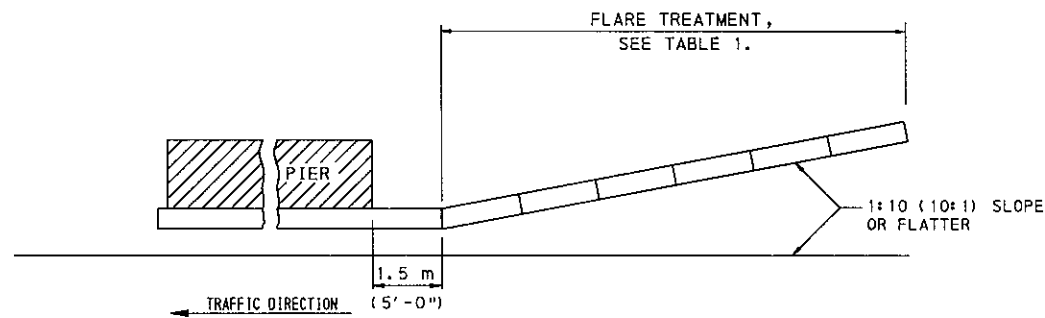
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER
F-SHAPE

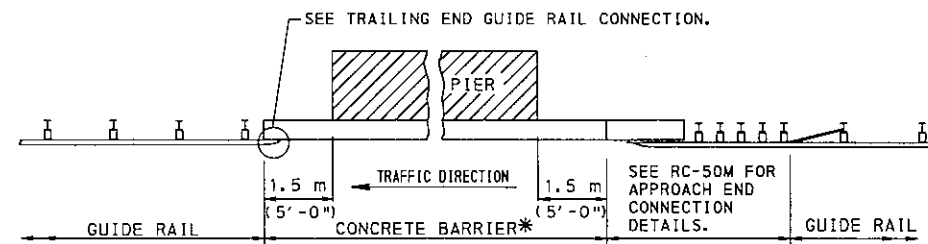


NOTES

1. PROVIDE SINGLE FACE CONCRETE BARRIER AND GUIDE RAIL MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTIONS 620 AND 623.
2. THE TREATMENTS SHOWN ARE FOR FOUR-LANE DIVIDED HIGHWAYS. USE THE APPROACH END TREATMENT ON BOTH SIDES OF THE OBSTRUCTION ON TWO-LANE FACILITIES WITH TWO-WAY TRAFFIC.
3. IF THE PREFERRED TREATMENT IS TO TERMINATE THE CONCRETE BARRIER WITHIN THE CLEAR ZONE, BURY IT INTO THE EXISTING SLOPE, PREFERABLY 1:2 (2:1), ONE FOOT DEEP OTHERWISE, USE AN IMPACT ATTENUATING DEVICE.



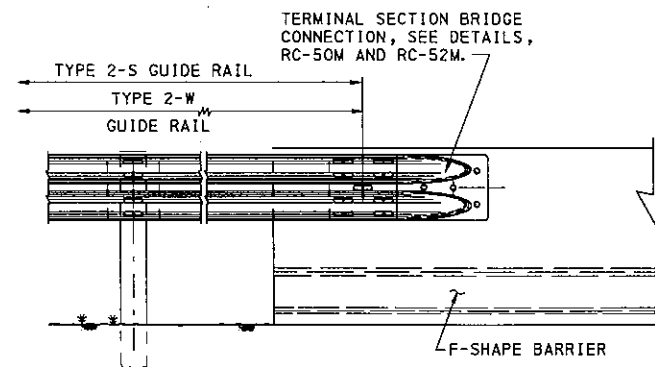
PLAN VIEW



CONTINUOUS GUIDE RAIL WITH SINGLE FACE BARRIER AT PIER

* IF ADEQUATE DEFLECTION DISTANCE IS PROVIDED (TABLE, RC-54M) BETWEEN THE BACK OF THE GUIDE RAIL POST AND FRONT OF OBSTRUCTION, DO NOT USE CONCRETE BARRIER; CONTINUE THE GUIDE RAIL.

PLAN VIEW



TRAILING END GUIDE RAIL CONNECTION TO F-SHAPE BARRIER

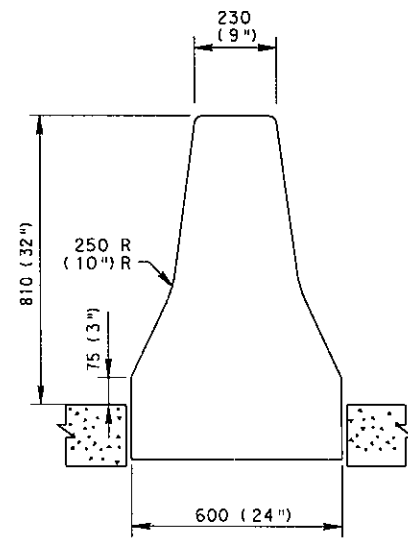
TABLE 1
FLARE RATES FOR BARRIER DESIGN

DESIGN SPEED	MAXIMUM FLARE RATES	
	CONCRETE BARRIER	GUIDE RAIL
120 (75)	20:1	15:1
110 (70)	20:1	15:1
100 (60)	18:1	14:1
90 (55)	16:1	12:1
80 (50)	14:1	11:1
70 (45)	12:1	10:1
60 (35)	10:1	8:1
50 (30)	8:1	7:1

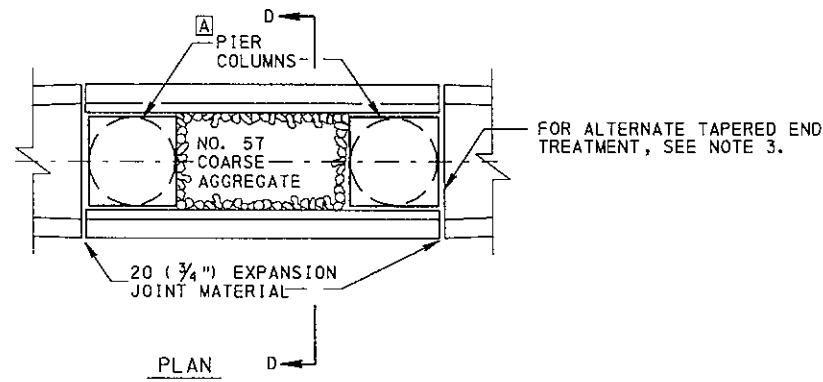
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

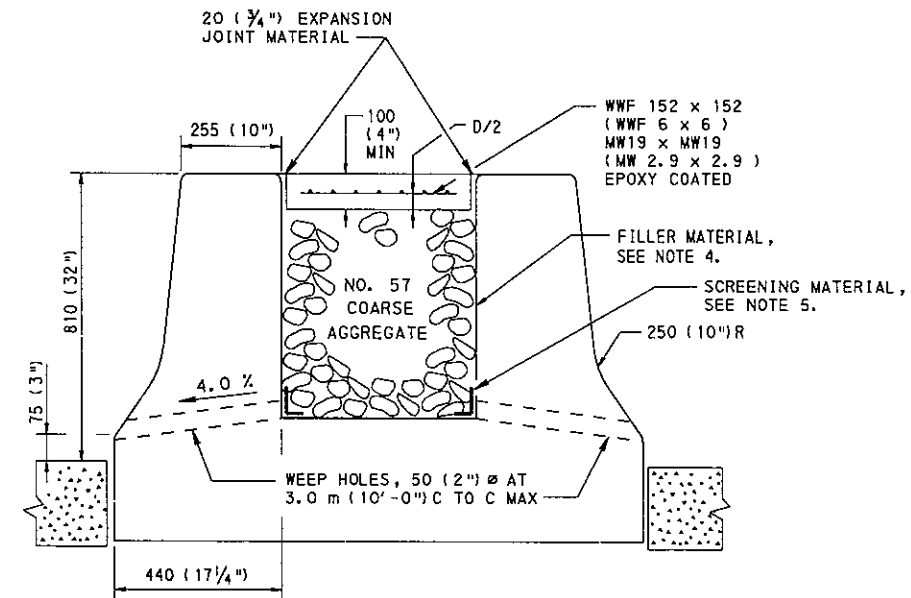
SINGLE FACE CONCRETE BARRIER
F-SHAPE
PLACEMENT AT SHOULDER PIERS



SECTION A-A

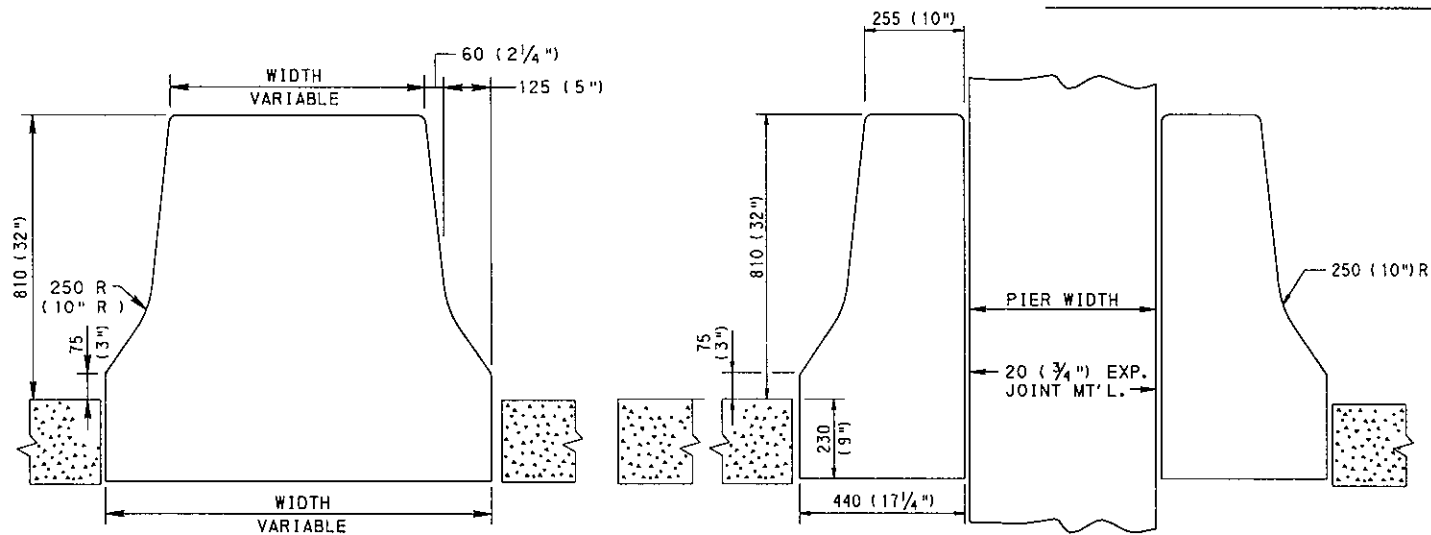


PLAN



SECTION D-D

TYPICAL ALTERNATE BARRIER TREATMENT AT PIERS



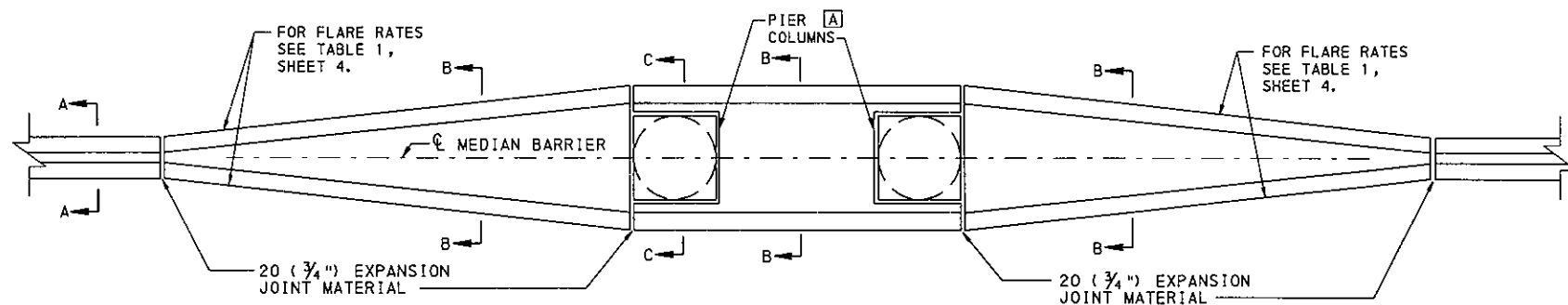
SECTION B-B

SECTION C-C

NOTES

1. REFER TO BRIDGE STANDARD DRAWINGS (BD-601M) FOR DETAILS OF CONCRETE MEDIAN BARRIER ACROSS STRUCTURES.
2. THE CONCRETE TRANSITIONS AND BARRIER TAPERS AT PIERS ARE INCIDENTAL TO THE MEDIAN BARRIER.
3. CAST ADDITIONAL VOIDS IN THE TAPERED END SECTIONS MEETING THE REQUIREMENTS PRESENTED IN SECTION D-D.
4. PROVIDE NO. 57 COARSE AGGREGATE THAT MEETS THE REQUIREMENTS OF PUBLICATION 408, SECTION 703.2. ALTERNATE SUITABLE GRANULAR MATERIAL MAY BE USED AS FILLER MATERIAL.
5. TO PREVENT INTRUSION OF COARSE AGGREGATE INTO WEEP HOLES, USE WIRE MESH SCREENING, GEOTEXTILES OR OTHER SUITABLE MATERIAL.
6. ROUND OR CHAMFER ALL EDGES WITH A RADIUS OF 25 (1 inch) EXCEPT AS SHOWN.

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.



TYPICAL BARRIER TREATMENT AT PIERS

USE 20 (3/4 inch) EXPANSION JOINT MATERIAL AROUND ALL PIERS.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER
F-SHAPE
PLACEMENT AT MEDIAN PIERS

RECOMMENDED APR. 16, 2001 <i>Alan A. Schuler</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 16, 2001 <i>Larry Z. Hoffmann</i> CHIEF ENGINEER	SHT 4 OF 5 RC-58M
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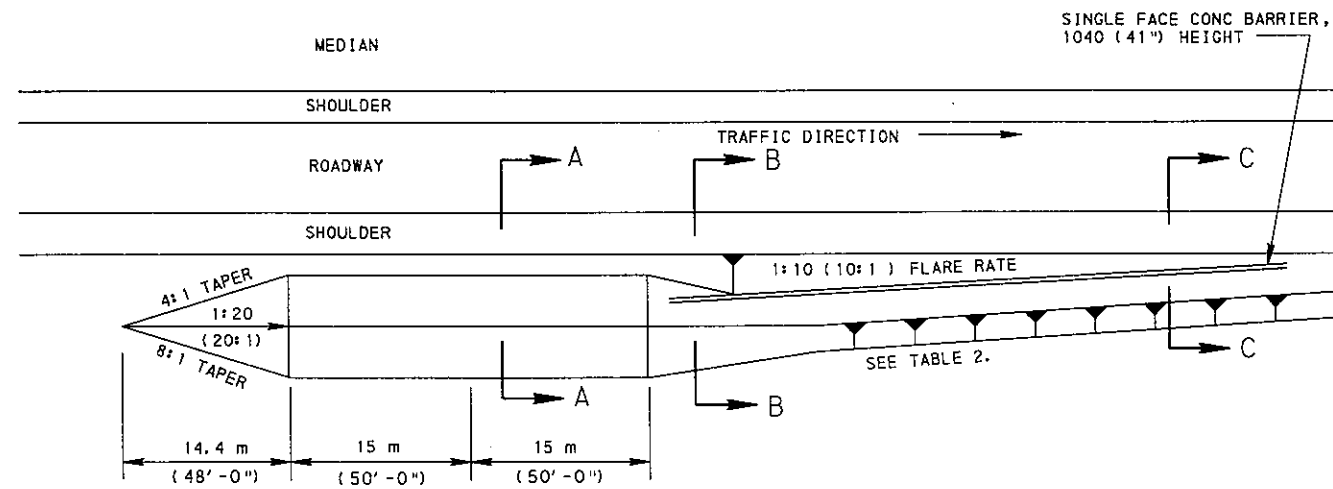


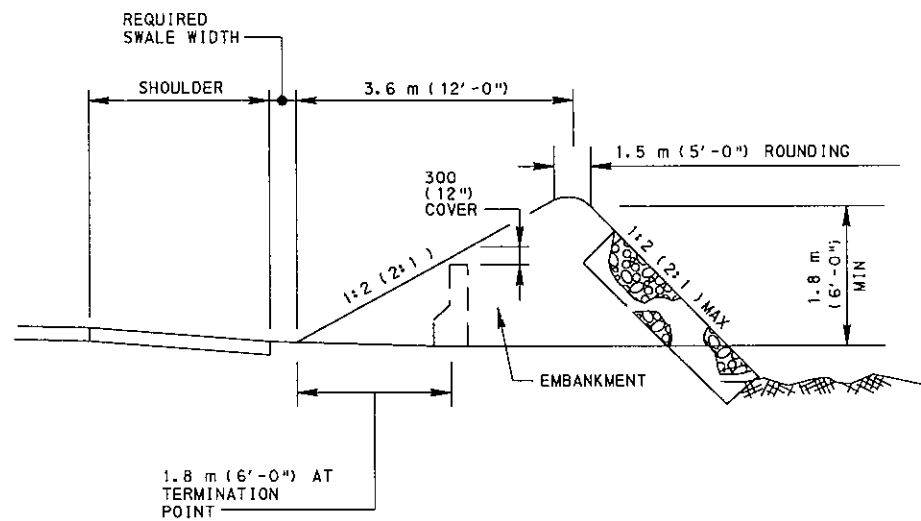
TABLE 2
FLARE RATES
FOR BARRIER DESIGN

DESIGN SPEED		MAXIMUM FLARE RATES CONCRETE BARRIER
km/h	(mph)	
120	(75)	20 : 1
110	(70)	20 : 1
100	(60)	18 : 1
90	(55)	16 : 1
80	(50)	14 : 1
70	(45)	12 : 1
60	(35)	10 : 1
50	(30)	8 : 1

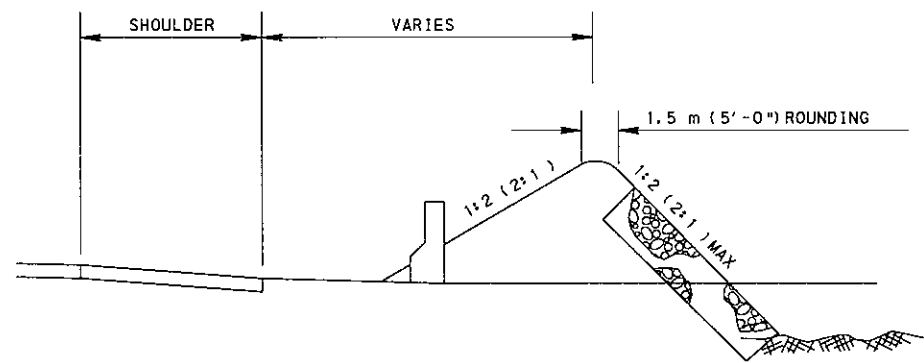
NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408.
2. ALL MATERIALS NECESSARY TO CONSTRUCT EARTH MOUNDS ARE IN ACCORDANCE WITH APPLICABLE SECTIONS OF PUBLICATION 408.
3. EARTHMONDS MAY BE USED TO BURY CONCRETE BARRIER ON HIGHWAYS WITH POSTED SPEEDS LESS THAN 70 km/h (45 mph) AND WITH CURRENT TRAFFIC VOLUME LESS THAN 4000 VEHICLES PER DAY OR WHEN THEY ARE CONSTRUCTED OUTSIDE THE CLEAR ZONE AS DETERMINED IN PUB. 13M, DESIGN MANUAL PART 2, CHAPTER 12.

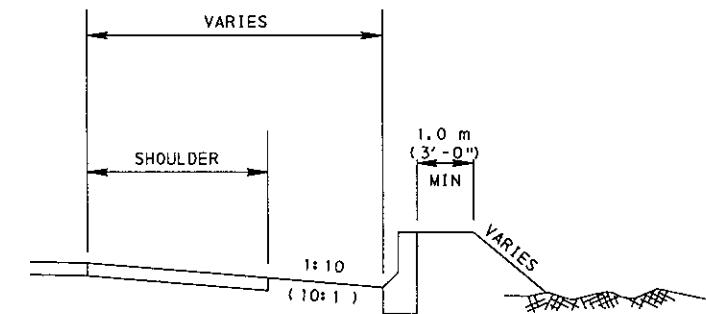
TYPICAL EARTH MOUND FOR BURYING CONCRETE BARRIER



SECTION A-A



SECTION B-B



SECTION C-C

NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER
F-SHAPE
END TREATMENT
BURYING INTO EARTH MOUND

RECOMMENDED APR. 16, 2001
Alan P. Schuch
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED APR. 16, 2001
Henry J. Hoffman
CHIEF ENGINEER

SHT 5 OF 5
RC-58M