OS-299 (8-72)

TRANSMITTAL LETTER

Change # 3
Pub. 72M
April 2000 Edition

DATE: August 21, 2002

SUBJECT:

Revisions to Standards for Roadway Construction RC's 20M, 23M, 24M, 25M, 26M, 27M, 39M, 52M, 54M, 57M, 58M, 59M, 66M, 82M, 91M

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 November 21, 2002, 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 - 20M	(1 of 3)	Added Detail C and Detail D; Revised Note 6 & 7; Revised Type P and Alternate Type P detail.
	(2 of 3)	Revised Note 12; Revised captions and combined drawings.
RC - 23M	(1 of 3)	Revised Note 4.
	(3 of 3)	Removed bevel in Detail B.
RC - 24M	(1 of 1)	Revised Section A - A, binder to base.
RC - 25M	(3 of 6)	Shoulder adjacent to Interstates removed 6.0m (20') joint spacing option; Section B- B revised text.
	(4 of 6)	Revised ramp detail to extend rumble strips and remove traffic separator; Revised text to be consistent with other RCs. Revised Notes 1 and 2 and deleted Note 4.
	(5 of 6)	Revised text to be consistent with other RCs. Revised Notes 1 and 3 and deleted Note 6.
	(6 of 6)	New sheet to show rumble strip details in gore areas.
RC - 26M	(1 of 5)	Revised Detail B from new joint to patching joint; Revised note labels to be consistent with details; changed Legend D to table with height and width of patching joint. Changed Legends B and C to Notes 6 and 7.
	(2 of 5)	Revised to show dowel bars in joints; Revised 6.0m (20') joint spacing to 4.5m (15') joint spacing.
	(3 of 5)	Revised Detail B from new joint to patching joint; Changed Legend B to table with height and width for patching joint.
	(5 of 5)	Changed Note 2 to table with height and width for patching joint. Revised sheet name.
RC - 27M	(1 of 1)	Revised Section A -A to line up extension line; Revised Notes 2, 4 and 5; Revised Note 6 to remove 6.0m (20') joint spacing. Deleted Note 7.
RC - 39M	(3 of 5)	Revised the width of manhole steps from 10" minimum to 12" minimum.
		Added base preparation detail for precast manholes and Note 15.
RC - 52M	(2 of 6)	Changed Splice Bolt dimension from 35(1 5/16") to 32 (1 ¼").
	(6 of 6)	Revised Wood Block to offset bracket for consistency and added Note 1.
RC - 54M	(2 of 7)	Revised Table 2.
	(5 of 7)	Deleted Notes 1 and 4.
		Revised title block and made some modification to the details relative to offset brackets and eliminated one post in the post backslope anchorage.
	(6 of 7)	Eliminated Notes 1 and 5 and added Note 2.
		Same changes as in sheet 5 second bullet.
	(7 of 7)	Changed wood block to routed offset bracket and rubrail to w-beam rail.
RC - 57M	(General)	Throughout RC 57M, minor changes were made to the dimensions for consistency between Metric and English.
		Also, changes were made to the bridge to roadway transitions due to changes in the Bridge Standards.
	(1 of 8)	Revised Note 1.
	(2 of 8)	Deleted the 1270 (50") detail in Section B - B.
	(3 of 8)	Revised Table 1.
	(5 & 8 of 8)	These are new sheets added to show additional bridge to roadway transitions.
RC - 58M	(1 of 5)	Revised Note 1 and added Note 9.
	(3 of 5)	Revised Table 1.
	(5 of 5)	Revised Table 2.
RC - 59M	(1 of 2)	Added Note 10.
	(2 of 2)	Revised Table 1.

RC - 66M	(1 of 1)	This standard has been deleted. Concrete and bituminous traffic separators are no longer used. Use rumble strips as per RC -25M. Also, guidance in DM-2 relative to traffic separators will be deleted in the next change to DM-2.
RC - 82M	(1&2 of 2)	This standard was spilt into 2 sheets for clarification.
RC - 91M	(1&2 of 2)	Revised planting pit requirements and bracing materials.

CANCEL THE FOLLOWING:

RC - 20M	Nov. 1, 2001
RC - 23M	Nov. 1, 2001
RC - 24M	Nov. 1, 2001
RC - 25M	Nov. 1, 2001
RC - 26M	Nov. 1, 2001
RC - 27M	Nov. 1, 2001
RC - 39M	Nov. 1, 2001
RC - 52M	Apr. 16, 2001
RC - 54M	Nov. 1, 2001
RC - 57M	Nov. 1, 2001
RC - 58M	Nov. 1, 2001
RC - 59M	Nov. 1, 2001
RC - 66M	Apr. 16, 2001
RC - 82M	Apr. 16, 2001
RC - 91M	Apr. 28, 2000

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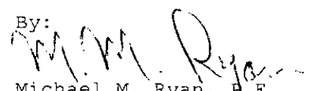

Michael M. Ryan, P.E.
Deputy Secretary for
Highway Administration

4320/PLK/kj/0715kj2-02

INDEX OF STANDARDS FOR ROADWAY CONSTRUCTION

STANDARD DRAWING NUMBER	DRAWING DATE	DESCRIPTION
EARTHWORK		
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)	NOV. 1, 2001	CONCRETE PAVEMENT JOINTS
RC-21M	APR 28, 2000	REINFORCED CONCRETE PAVEMENT
*RC-23M (3 Sheets)	NOV. 1, 2001	BRIDGE APPROACH SLAB
*RC-24M	NOV. 1, 2001	PAVEMENT RELIEF JOINT
*RC-25M (6 Sheets)	NOV. 1, 2001	SHOULDERS
*RC-26M (5 Sheets)	NOV. 1, 2001	CONCRETE PAVEMENT REHABILITATION
*RC-27M	NOV. 1, 2001	PLAIN CONCRETE PAVEMENT
RC-28M	APR 16, 2001	OVERLAY TRANSITIONS AND PAVING NOTCHES
DRAINAGE		
RC-30M (4 Sheets)	NOV. 1, 2001	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)	NOV. 1, 2001	INLETS
RC-35M	APR 28, 2000	DRAINAGE DIKE
RC-36M	APR 28, 2000	SPRING BOXES
*RC-39M (5 Sheets)	NOV. 1, 2001	STANDARD MANHOLES
RC-40M	APR 28, 2000	SLOPE PROTECTION
RC-43M	APR 28, 2000	GABIONS
GUIDE RAIL AND MEDIAN BARRIER		
RC-50M (2 Sheets)	NOV. 1, 2001	GUIDE RAIL TRANSITION AT END OF STRUCTURE
*RC-52M (6 Sheets)	APR 16, 2001	TYPE 2 STRONG POST GUIDE RAIL
RC-53M (2 Sheets)	NOV. 1, 2001	TYPE 2 WEAK POST GUIDE RAIL
*RC-54M (7 Sheets)	NOV. 1, 2001	BARRIER PLACEMENT AT OBSTRUCTIONS
RC-55M	APR 28, 2000	TYPE 2 WEAK POST MEDIAN BARRIER
*RC-57M (8 Sheets)	NOV. 1, 2001	CONCRETE MEDIAN BARRIER
*RC-58M (5 Sheets)	NOV. 1, 2001	SINGLE FACE CONCRETE BARRIER
*RC-59M (2 Sheets)	NOV. 1, 2001	CONCRETE GLARE SCREEN
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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	NOV. 1, 2001	CONCRETE MOUNTABLE CURBS
~~*RC-66M~~	~~APR 16, 2001~~	~~CONCRETE TRAFFIC SEPARATOR~~
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POLLUTION CONTROL		
RC-70M (6 Sheets)	NOV. 1, 2001	EROSION AND SEDIMENT POLLUTION CONTROL
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 (2 Sheets)	APR 16, 2001	HIGHWAY LIGHTING-JUNCTION BOXES-HEAVY DUTY
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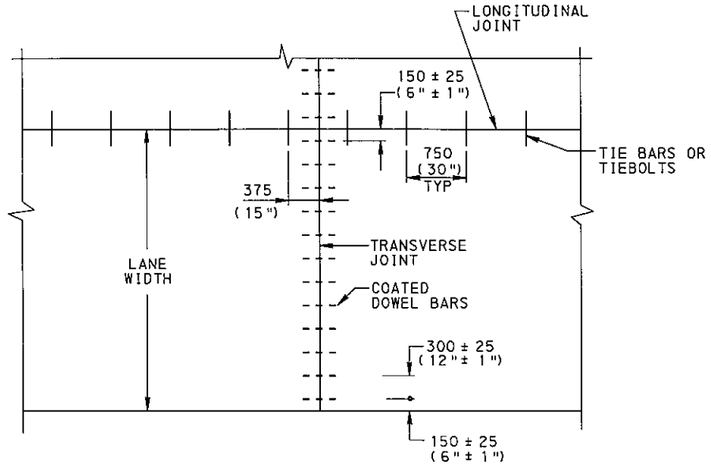
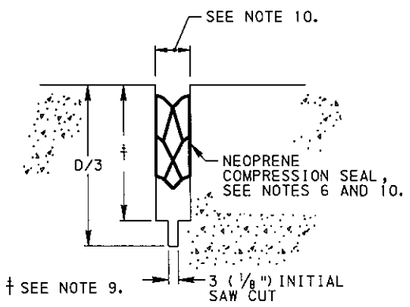
RC-84M	APR 28, 2000	HIGHWAY LIGHTING-LIGHTING AND ELECTRICAL DETAILS
ROADSIDE DEVELOPMENT AND PLANTING		
*RC-91M (2 Sheets)	APR 28, 2000	BRACING AND PLANTING DETAILS

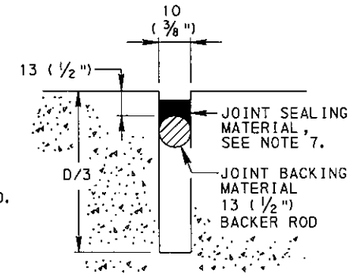
April, 2000 Edition
Change #1 April 16, 2001
Change #2 November 1, 2001
* Change #3 August 21, 2002



TYPICAL LAYOUT



DETAIL A



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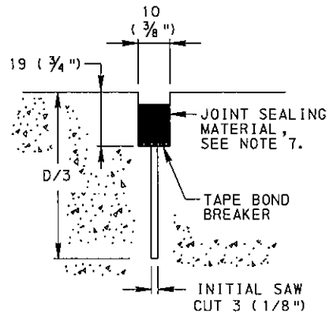

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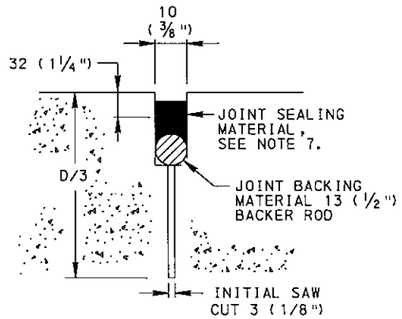
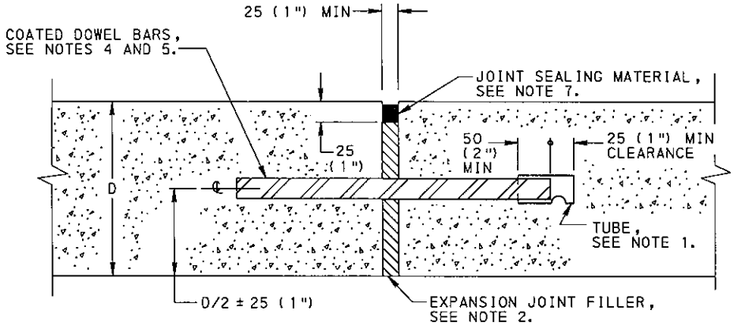
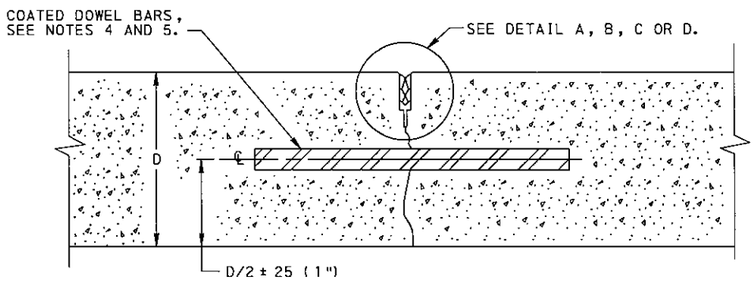


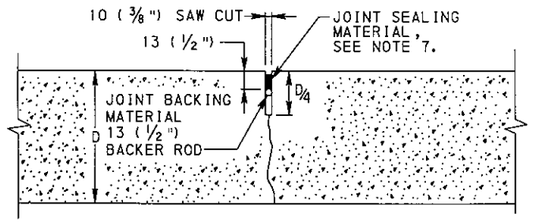
DETAIL D



TYPE E

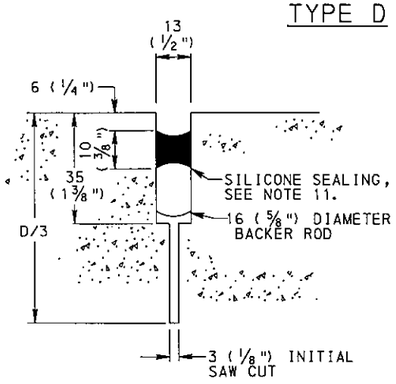


TYPE D



TYPE P

SEE RC-27M



ALTERNATE TYPE P

JOINT DETAIL

NOTES

1. PLACE A TUBE FROM A MANUFACTURER LISTED IN BULLETIN 15 OVER THE LUBRICATED END OF ALL DOWEL BARS USED IN TYPE E JOINTS AND PROVIDE A MINIMUM 25 (1") CLEARANCE POCKET ASSURED BY MEANS OF A POSITIVE SPACING DEVICE.
2. CUT EXPANSION JOINT FILLER MATERIAL TO CONFORM TO THE CROSS SECTION OF THE PAVEMENT AND FURNISH IN STRIPS EQUAL TO THE WIDTH OF THE PAVEMENT SLAB. MAKE THE TOP SURFACE SMOOTH AND HAVE HOLES PUNCHED FOR THE DOWEL BARS PROVIDE A SNUG FIT WITHOUT LOSS IN THICKNESS OF THE MATERIAL.
3. CONSTRUCT ALL TRANSVERSE JOINTS PERPENDICULAR TO THE CENTERLINE.
4. USE MINIMUM NO. 32 x 450 (1¼"ø x 18") LONG DOWEL BARS FOR PAVEMENT DEPTHS 250 (10") OR LESS AND MINIMUM NO. 38 x 450 (1½"ø x 18") LONG DOWEL BARS FOR PAVEMENT DEPTHS GREATER THAN 250 (10"). APPROVED ALTERNATE DOWEL BARS HAVING EQUIVALENT PROPERTIES TO CONVENTIONAL ROUND DOWEL BARS MAY BE USED.
5. PLACE DOWEL BARS PARALLEL TO THE CENTERLINE AND SURFACE OF THE SLAB.
6. USE ONLY APPROVED NEOPRENE SEALS, AS LISTED IN BULLETIN 15. INSTALL NEOPRENE SEALS TO A UNIFORM DEPTH WITH THE TOP OF THE SEAL FROM 6 (¼") TO 10 (⅜") BELOW THE LEVEL OF THE PAVEMENT SURFACE. MAKE THE TOP EDGES OF THE CONTACT SURFACES ON BOTH SIDES OF THE SEAL AT THE SAME ELEVATION.
7. MAKE THE TOP OF THE JOINT SEALING MATERIAL FROM 3 (⅛") TO 6 (¼") BELOW THE SURFACE OF THE PAVEMENT. USE HEAT RESISTANT JOINT BACKING MATERIAL FOR HOT POURED JOINTS.
8. THE INITIAL SAW CUT FOR TYPE D JOINT IS NOT REQUIRED FOR CONSTRUCTION JOINTS.
9. SAW DEPTHS OF NEOPRENE SEALS:

SEAL SIZE	SAW CUT DEPTHS
25 (1")	47-50 (1⅞"-2")
32 (1¼")	50-53 (2"-2⅛")

10. ADJUST THE WIDTH OF THE SECOND SAW CUT ACCORDING TO THE SEAL SIZE AND PAVEMENT SURFACE TEMPERATURE AT THE TIME OF SAWING, AS FOLLOWS:

JOINT SPACING	SEAL SIZE	WIDTH OF SAW CUT		
		<16°C	16°C TO 27°C	>27°C
4.5 m & 6.0 m	25	16	14	13
9.0 m	32	19	16	13

JOINT SPACING	SEAL SIZE	WIDTH OF SAW CUT		
		<60°F	60°F TO 80°F	>80°F
(15' & 20')	(1")	(⅝")	(9/16")	(½")
(30')	(1¼")	(¾")	(⅝")	(½")

11. WHEN SILICONE JOINT SEALING MATERIAL, AS SPECIFIED IN PUBLICATION 408, SECTION 705.4 (a), IS SELECTED FOR USE IN TRANSVERSE JOINTS (TYPE P ONLY) OR TRANSVERSE SHOULDER JOINTS, USE THE SAME JOINT SEALING MATERIAL IN THE LONGITUDINAL JOINTS (ALTERNATE TYPE L AND ALTERNATE LONGITUDINAL SHOULDER JOINTS).
12. ALL DIMENSIONS ARE GIVEN IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.
13. PROVIDE MATERIALS AND WORKMANSHIP IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408.

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

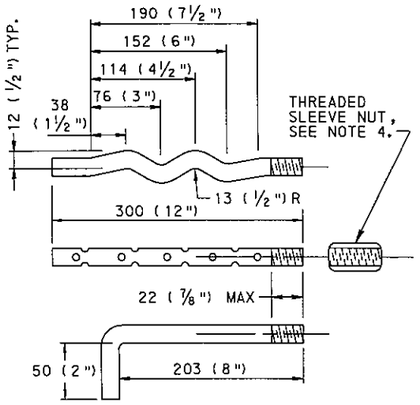
CONCRETE PAVEMENT JOINTS

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

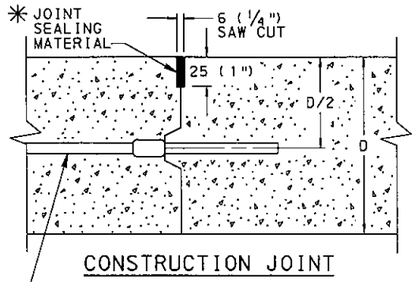
SHT. 1 OF 3

RC-20M

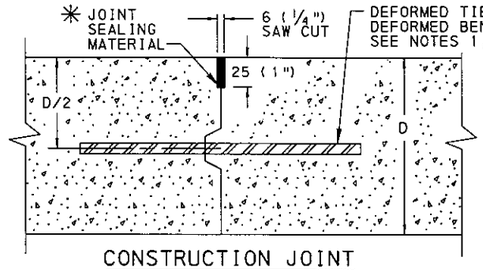


TIEBOLT DETAIL

MAKE TIEBOLTS 14 (9/16") ø BAR WITH ROLLED THREADS OR 16 (5/8") ø BAR WITH CUT THREADS. PERMIT ONLY TIEBOLTS WHICH ARE SUPPLIED BY AN APPROVED MANUFACTURER, AS LISTED IN BULLETIN 15. SEE PUBLICATION 408, SECTIONS 709.1 AND 705.2(b).



CONSTRUCTION JOINT



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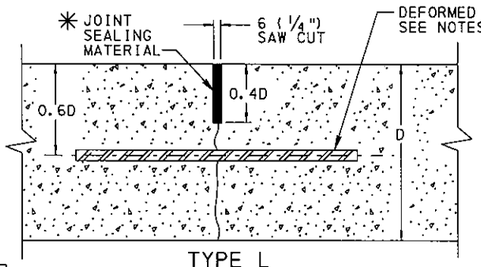
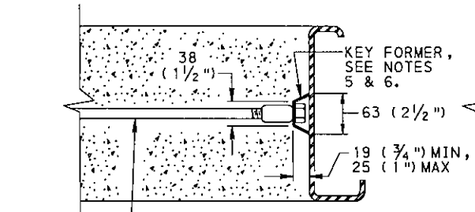
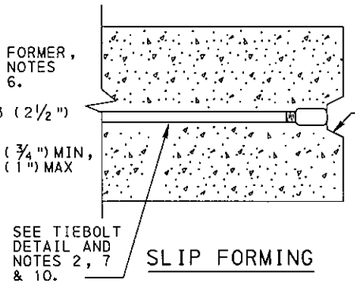


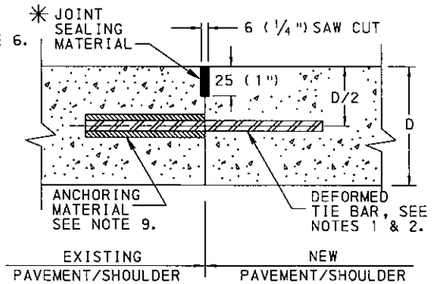
TYPE L
CONTRACTION JOINT



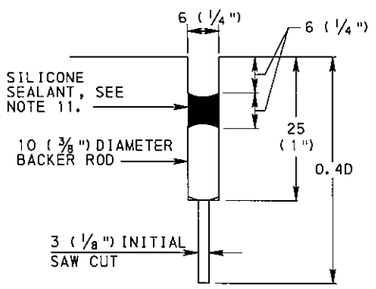
STATIONARY FORMING



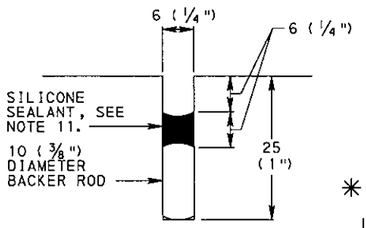
SLIP FORMING



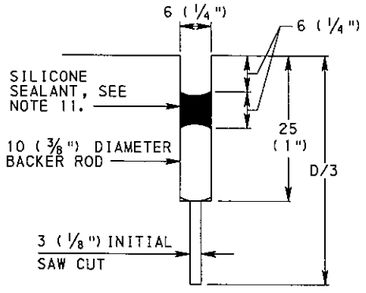
LONGITUDINAL JOINT
WHEN TYING INTO EXISTING
CONCRETE PAVEMENT/SHOULDER



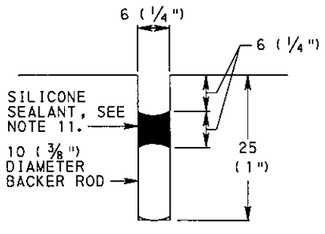
ALTERNATE TYPE L
CONTRACTION JOINT



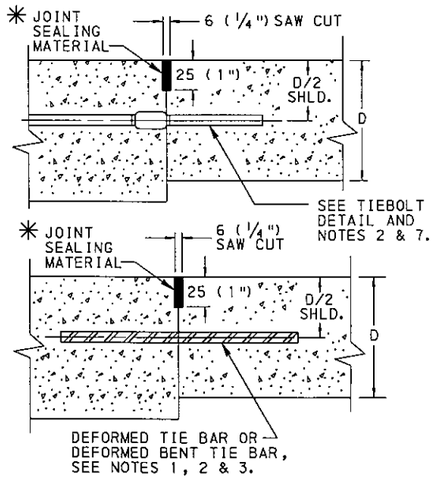
ALTERNATE TYPE L
CONSTRUCTION JOINT



ALTERNATE TRANSVERSE
SHOULDER JOINT

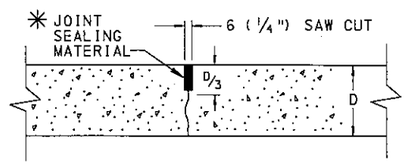


ALTERNATE
LONGITUDINAL
SHOULDER JOINT



LONGITUDINAL SHOULDER JOINTS
SEE NOTE 8

(*) DENOTES, SEE NOTE 12.



TRANSVERSE SHOULDER JOINT

NOTES

1. SPECIFY #16 (#5) TIE BARS 750 ±6 (30" ±¼") LONG, SPACED 750 (30") CENTER TO CENTER MAXIMUM. PLACE PERPENDICULAR TO AND CENTERED OVER THE LONGITUDINAL JOINT ±25 (±1"). EMBED TIE BARS D/2 ±20 (±¾") OR 100 ±13 (4" ±½"), WHICHEVER IS GREATER, EXCEPT FOR TYPE L CONTRACTION JOINTS. FOR TYPE L CONTRACTION JOINTS EMBED TIE BARS 0.6D. WHEN ADJOINING TO AN UNEQUAL PAVEMENT OR SHOULDER DEPTH, D IS THE DEPTH OF THE THINNER SECTION. TIE BARS MUST MEET THE MINIMUM PULL-OUT RESISTANCE SPECIFIED IN PUBLICATION 408, SECTION 501.3(i)1.
2. EPOXY COAT TIE BARS AS SPECIFIED IN PUBLICATION 408, SECTION 709.1(d). EPOXY COAT OR GALVANIZE TIEBOLTS AND THREADED SLEEVE NUTS, EXCLUDING THREADS, AS SPECIFIED IN PUBLICATION 408, SECTION 709.1(d) OR SECTION 1105.02(s) RESPECTIVELY.
3. STRAIGHTEN DEFORMED BENT TIE BARS SO THAT THE ANGLE MADE WITH THE LONGITUDINAL JOINT IS AT LEAST 60 DEGREES.
4. MAKE THREADED SLEEVE NUT FROM STEEL PIPE OR HEXAGONAL STEEL BAR 27ø x 48 (1 1/16"ø x 1⅞") LONG OR HIGH STRENGTH STEEL BAR 22ø x 50 (27/32"ø x 2") LONG.
5. SECURELY FASTEN THE KEY FORMER TO THE STEEL FORM. THE CONTRACTOR SHALL HAVE A METHOD, ACCEPTABLE TO THE ENGINEER, OF TEMPORARILY SECURING THE TIEBOLT TO THE KEY FORMER OR FORM DURING PLACEMENT OF THE CONCRETE.
6. ONLY FORM KEYWAYS FOR PAVEMENT DEPTHS GREATER THAN 250 (10") FORM ONLY FEMALE KEYWAYS.
7. PLACE TIEBOLTS AT 750 (30") CENTER TO CENTER MAXIMUM SPACING EMBED TIEBOLTS D/2 ±20 (±¾") OR 100 13 (4"±½"), WHICHEVER IS GREATER. WHEN ADJOINING TO AN UNEQUAL PAVEMENT OR SHOULDER DEPTH, D IS THE DEPTH OF THE THINNER SECTION. SCREW TIEBOLTS UNTIL SNUG. FOR 150, 180, AND 200 (6", 7" AND 8") PAVEMENTS AND/OR SHOULDERS, MAKE THE WIGGLE OR HOOK PORTION OF THE TIEBOLT PARALLEL TO THE GRADE. IF NECESSARY, LOOSEN TIEBOLTS SO THAT THE HOOK OR WIGGLE IS PARALLEL TO THE GRADE.
8. AT THE CONTRACTOR'S OPTION, THE CONCRETE SHOULDER MAY BE CONSTRUCTED AT THE SAME TIME AS THE PAVEMENT. IN THIS CASE, USE A TYPE L CONTRACTION JOINT.
9. USE AN APPROVED EPOXY ANCHORING MATERIAL TO WITHSTAND THE NECESSARY MINIMUM PULL-OUT RESISTANCE SPECIFIED IN PUBLICATION 408, SECTION 501.3(i)1. TIE BAR HOLE DIAMETER IN EXISTING PAVEMENT SHOULD BE AS PER MANUFACTURER'S RECOMMENDATION. USE ROTARY IMPACT DRILL TO AVOID IMPACTING FINES INTO HOLE.
10. DO NOT USE THE HOOK COMPONENT OF THE TIEBOLT ASSEMBLY WHEN SLIP FORMING.
11. WHEN SILICONE JOINT SEALING MATERIAL, AS SPECIFIED IN PUBLICATION 408, SECTION 705.4(o), IS SELECTED FOR USE IN TRANSVERSE JOINTS (TYPE P ONLY) OR TRANSVERSE SHOULDER JOINTS, USE THE SAME JOINT SEALING MATERIAL IN THE LONGITUDINAL JOINTS (ALTERNATE TYPE L AND ALTERNATE LONGITUDINAL SHOULDER JOINTS).
12. MAKE THE TOP OF THE JOINT SEALING MATERIAL FROM 3 (⅛") TO 6 (¼") BELOW THE PAVEMENT SURFACE. USE HEAT RESISTANT JOINT BACKING MATERIAL FOR HOT POURED SEALS.

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

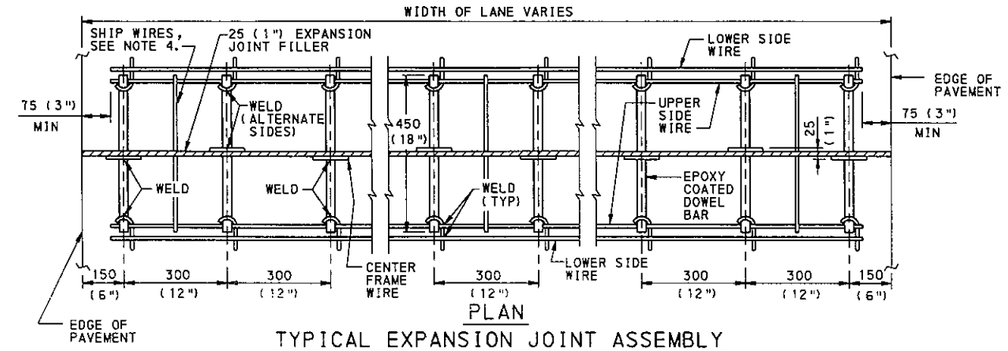
CONCRETE PAVEMENT JOINTS

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

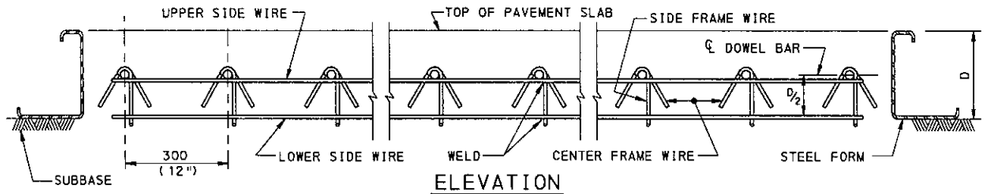
SHT 2 OF 3

RC-20M



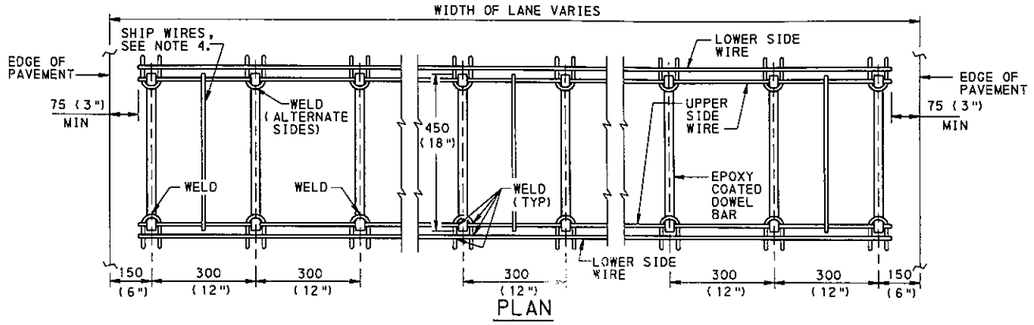
PLAN

TYPICAL EXPANSION JOINT ASSEMBLY



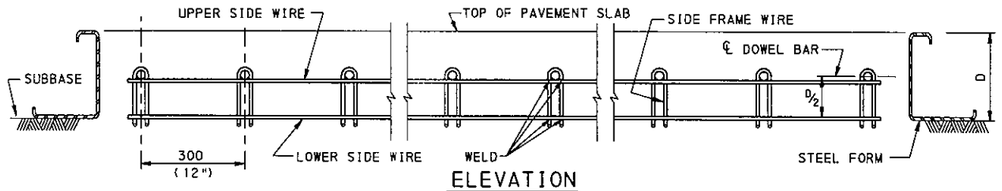
ELEVATION

EXPANSION JOINT ASSEMBLY



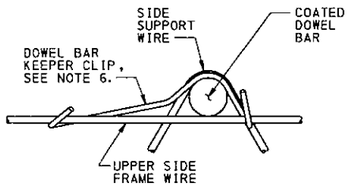
PLAN

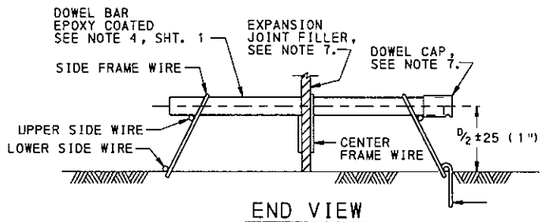
TYPICAL CONTRACTION JOINT ASSEMBLY



ELEVATION

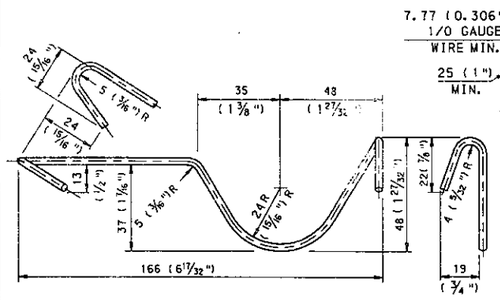
CONTRACTION JOINT ASSEMBLY



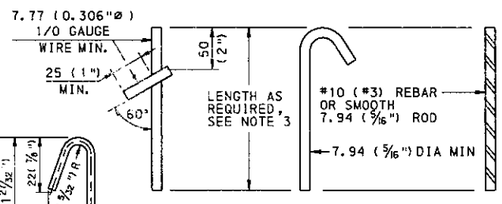


END VIEW

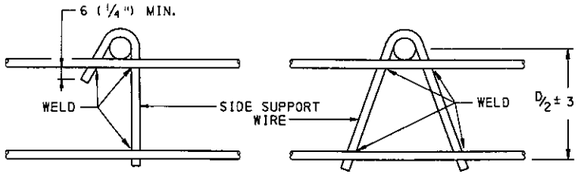
EXPANSION JOINT ASSEMBLY



DOWEL BAR KEEPER CLIP

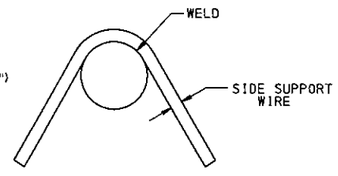


TYPICAL ANCHOR STAKE DETAILS



"J" DESIGN "A" DESIGN

TYPICAL SIDE FRAME DETAILS



CENTER FRAME WIRE DETAIL

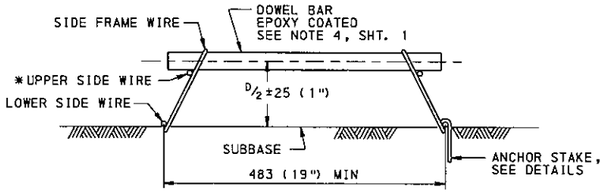
NOTES

1. THIS STANDARD DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND COMPATIBILITY. IT DOES NOT INCLUDE ALL THE DETAILS REQUIRED FOR FABRICATION. ONLY ITEMS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15 SHALL BE PERMITTED.
2. PROVIDE ANCHOR STAKES TO SECURE UNIT FROM MOVEMENT INCLUDING UPLIFT. A MINIMUM OF EIGHT STAKES ARE TO BE USED. FOR SLIP FORM PAVING, ANCHOR STAKES SHALL ENGAGE THE UPPER SIDE WIRE. FOR FIXED FORM PAVING, ANCHOR STAKES SHALL ENGAGE THE LOWER SIDE WIRE.
3. PROVIDE STAKES OF SUFFICIENT LENGTH SUCH THAT 400 (16") WILL BE EMBEDDED IF THE TOP COURSE IS OGS, ASPHALT TREATED PERMEABLE BASE COURSE, CEMENT TREATED PERMEABLE BASE COURSE OR 2A. WHEN LEAN CONCRETE BASE COURSE OR UNBONDED CONCRETE OVERLAY IS DESIGNED PROVIDE SUFFICIENT ANCHORAGE TO PREVENT MOVEMENT OF THE BASKET ASSEMBLY. THIS MAY INCLUDE ANCHOR PINS, HILTI NAILS, TIE STRAPS TIED TO THE TOP SIDE OF THE BASKET, OR OTHER ACCEPTABLE MEANS TO HOLD THE ASSEMBLY STATIONARY DURING THE PAVING OPERATION AS DIRECTED BY THE ENGINEER.
4. AFTER EACH LOAD TRANSFER ASSEMBLY IS SECURED IN PLACE, REMOVE AND PROPERLY DISPOSE OF ALL TIE WIRES OR SHIPPING WIRES PRIOR TO INSTALLING EXPANSION FIBRE.
5. PROVIDE SIDE SUPPORT ASSEMBLY WIRES CONFORMING TO THE CURRENT ASTM DESIGNATION A-510 SPECIFICATIONS FOR WIRE RODS AND COURSE ROUND WIRE, CARBON STEEL AND OF A MINIMUM ALLOWABLE SIZE AS FOLLOWS:

PAVEMENT THICKNESS	UPPER AND LOWER SIDE FRAME WIRES	"J" SIDE SUPPORT WIRES	"A" SIDE SUPPORT WIRES
250 (10") OR LESS	8.41 (0.331"ø MIN) 2/0 GAUGE	10.16 (0.400"ø MIN)	8.41 (0.331"ø MIN) 2/0 GAUGE
GREATER THAN 250 (10")	9.19 (0.362"ø MIN) 3/0 GAUGE	11.35 (0.437"ø MIN)	9.19 (0.362"ø MIN) 3/0 GAUGE

6. DOWEL BAR KEEPER CLIPS MAY BE USED IN LIEU OF TIE WIRES OR SHIPPING WIRES FOR CONSTRUCTION AND EXPANSION JOINT ASSEMBLIES.
7. FABRICATE AND SHIP NEST ALL DOWEL, SIDE SUPPORT AND CENTER SUPPORT ASSEMBLIES. ASSEMBLE EXPANSION JOINT FILLER, ANCHOR STAKES AND DOWEL CAPS IN THE FIELD.
8. PROVIDE DOWEL BARS PARALLEL TO THE CENTERLINE AND TO THE PAVEMENT SURFACE. MAKE TOLERANCE OF THIS PLACEMENT WITHIN ± 6 (±1/4") PER DOWEL BAR.
9. PROVIDE DOWELS AND ASSEMBLY DETAILS THAT CONFORM TO PUBLICATION 408.
10. WELD REQUIREMENTS AS LISTED BELOW AND TESTED PER MANUFACTURER'S QUALITY CONTROL PLAN FOR WELD SHEAR.
11. WIRE TOLERANCES PER ASTM 510M IS 0.05 mm (0.003 in.)

PAVEMENT THICKNESS	UPPER & LOWER WIRE TO "A"&"J" SIDE SUPPORT	DOWEL TO SUPPORT ASSEMBLY
250 (10") OR LESS	360 kg (794 lbs)	540 kg (1190 lbs)
GREATER THAN 250 (10")	540 kg (1190 lbs)	900 kg (1984 lbs)



END VIEW

CONTRACTION JOINT ASSEMBLY

TYPICAL LOAD TRANSFER ASSEMBLY		
LANE WIDTH	OVERALL UNIT LENGTH	NO. OF DOWELS
2.7 m (9'-0")	2.55 m (8'-6")	9
3.0 m (10'-0")	2.85 m (9'-6")	10
3.3 m (11'-0")	3.15 m (10'-6")	11
3.6 m (12'-0")	3.45 m (11'-6")	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

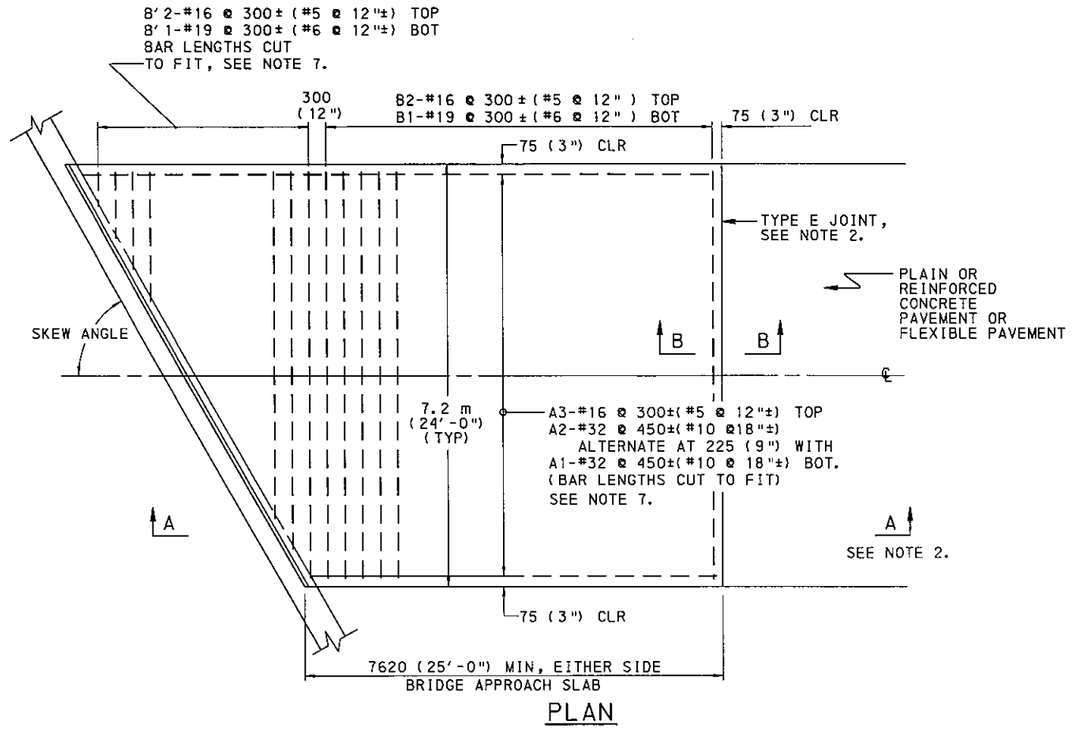
CONCRETE PAVEMENT JOINTS NON-SKEWED LOAD TRANSFER ASSEMBLIES

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

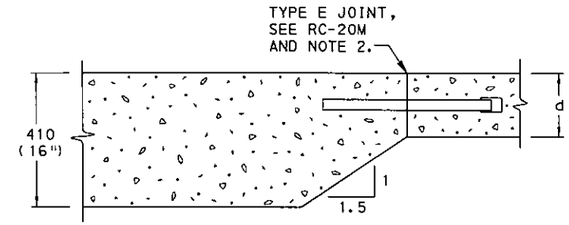
RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

SHT 3 OF 3

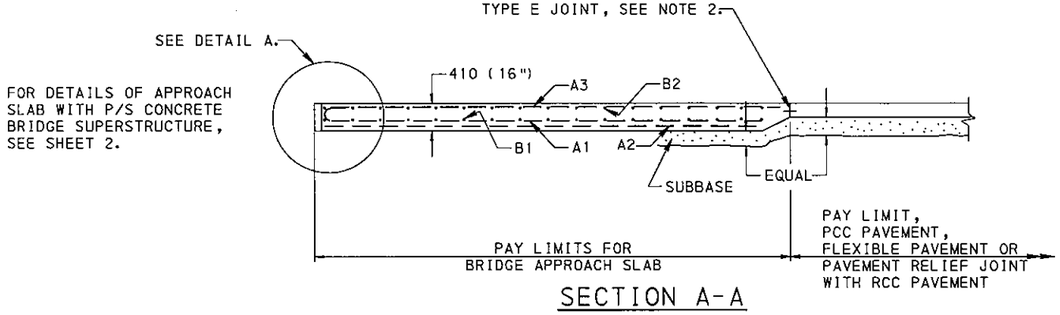
RC-20M



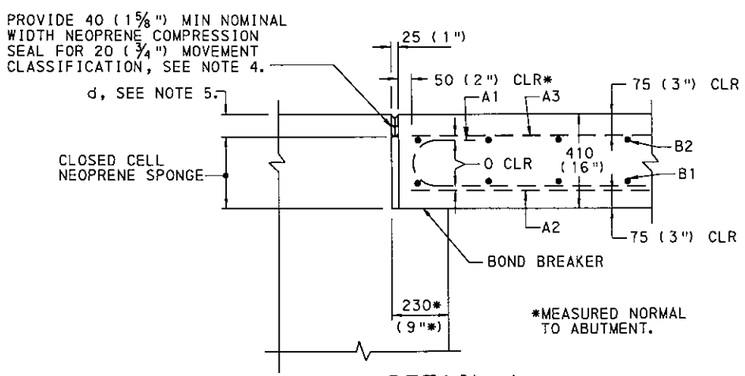
PLAN



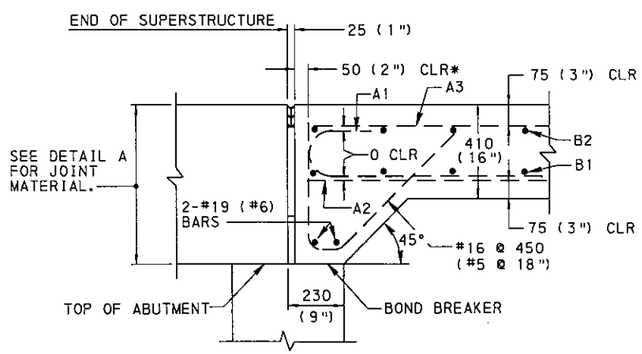
SECTION B-B



SECTION A-A



DETAIL A



DETAIL A (ALTERNATE)

TO APPLY ONLY WHEN INDICATED
ON STRUCTURE DRAWINGS

NOTES

1. CONSTRUCT IN ACCORDANCE WITH THIS STANDARD DRAWING OR AS INDICATED ON THE STRUCTURE DRAWINGS.
2. THE TYPE E JOINT DOES NOT APPLY WHEN APPROACH SLAB IS CONSTRUCTED IN CONJUNCTION WITH A PAVEMENT RELIEF JOINT OR WITH A FLEXIBLE PAVEMENT. SEE RC-24M.
3. WHEN CONSTRUCTION INVOLVES MORE THAN 2 LANES, CONNECT ADDITIONAL LANES REQUIRED TO STANDARD 2 LANE BRIDGE APPROACH SLAB USING TYPE L CONSTRUCTION JOINTS, AS SHOWN ON RC-20M, SHEET 2.
4. INSTALL NEOPRENE COMPRESSION SEALS TO A UNIFORM DEPTH WITH TOP OF THE SEAL FROM 6 (¼") TO 10 (⅜") BELOW THE LEVEL OF THE PAVEMENT SURFACE. MAKE THE TOP EDGES OF THE CONTACT SURFACES ON BOTH SIDES OF THE SEAL AT THE SAME ELEVATION.
5. DETERMINE "d" BY ADDING 20 (¾") TO THE MAXIMUM COMPRESSED HEIGHT OF THE NEOPRENE COMPRESSION SEAL. (SEE MANUFACTURER'S INFORMATION.)
6. CONSTRUCT THE BRIDGE APPROACH SLAB AFTER THE BRIDGE DECK IS CONSTRUCTED.
7. PROVIDE REINFORCEMENT BARS, EPOXY COATED IN ACCORDANCE WITH PUBLICATION 408, SECTION 709.
8. 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

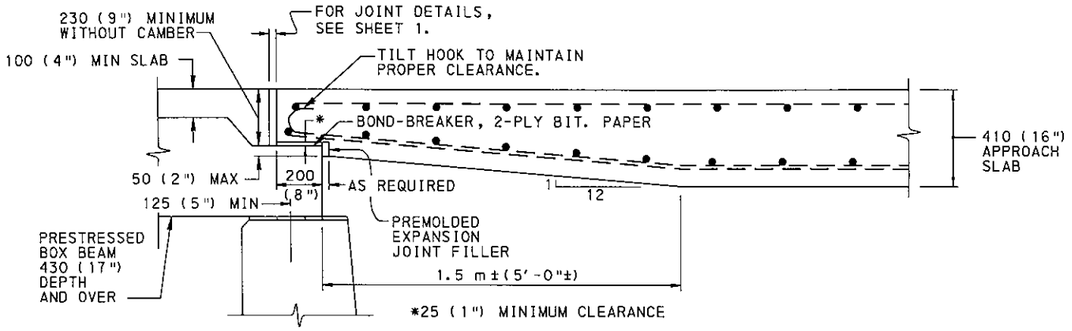
BRIDGE APPROACH SLAB

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

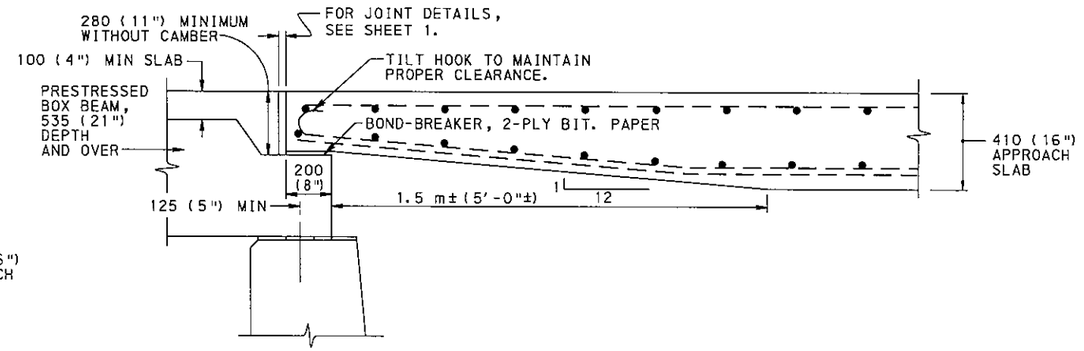
RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

SHT 1 OF 3

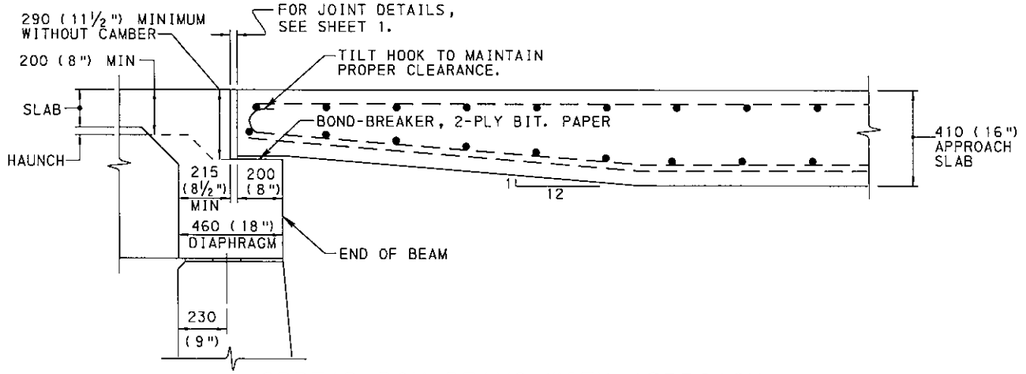
RC-23M



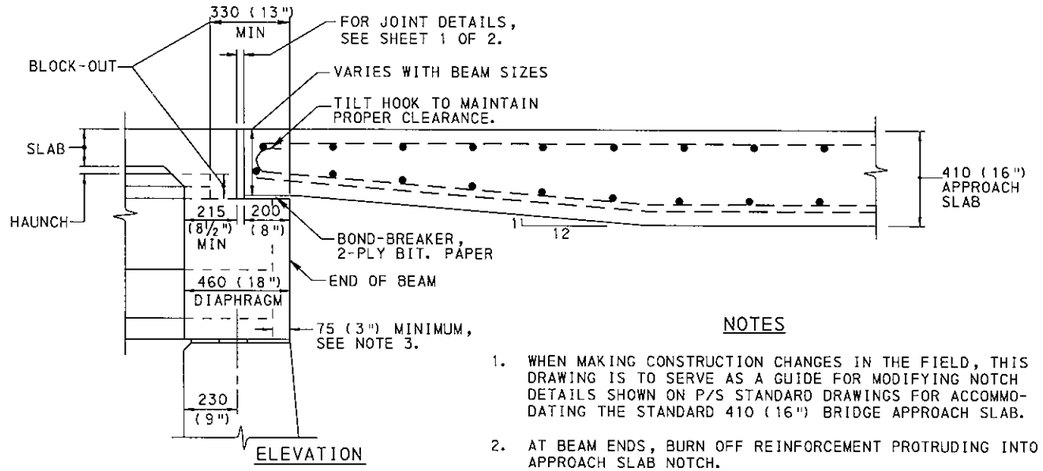
430 (17") DEEP ADJACENT COMPOSITE BOX BEAMS WITH 230 (9") DEEP APPROACH SLAB NOTCH



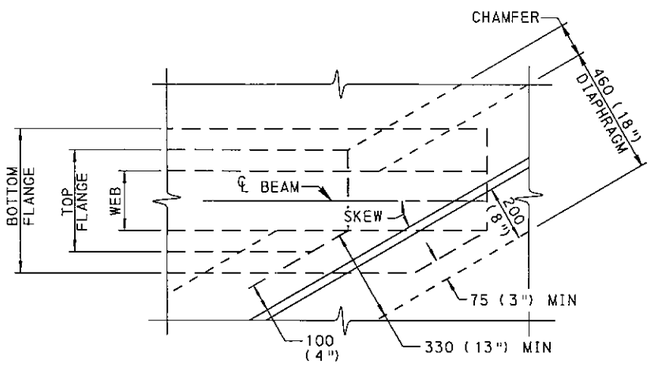
535 (21") TO 1220 (4'-0") DEEP ADJACENT COMPOSITE BOX BEAMS WITH 280 (11") DEEP APPROACH SLAB NOTCH



SPREAD BOX BEAMS WITH APPROACH SLAB NOTCH 290 (1½") OR DEEPER



ELEVATION



PLAN

I-BEAMS

NOTES

1. WHEN MAKING CONSTRUCTION CHANGES IN THE FIELD, THIS DRAWING IS TO SERVE AS A GUIDE FOR MODIFYING NOTCH DETAILS SHOWN ON P/S STANDARD DRAWINGS FOR ACCOMMODATING THE STANDARD 410 (16") BRIDGE APPROACH SLAB.
2. AT BEAM ENDS, BURN OFF REINFORCEMENT PROTRUDING INTO APPROACH SLAB NOTCH.
3. INCREASE IN FIELD, PROVIDING OVERHANG, IF REQUIRED.
4. PROVIDE REINFORCEMENT BARS, EPOXY COATED, IN ACCORDANCE WITH PUBLICATION 408, SECTION 709.

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

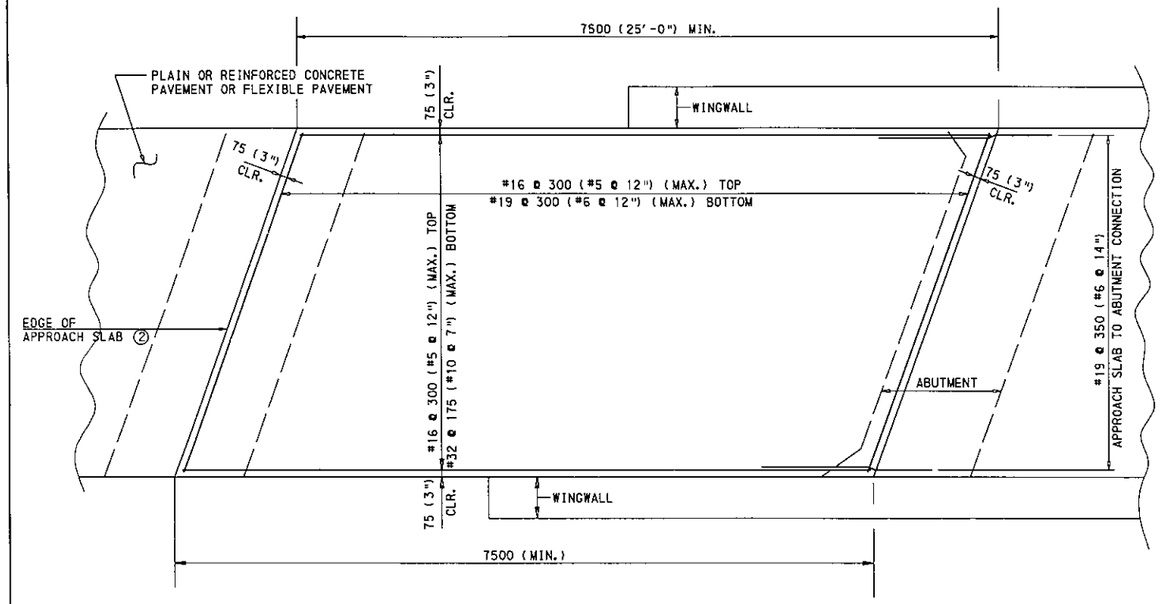
BRIDGE APPROACH SLAB

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

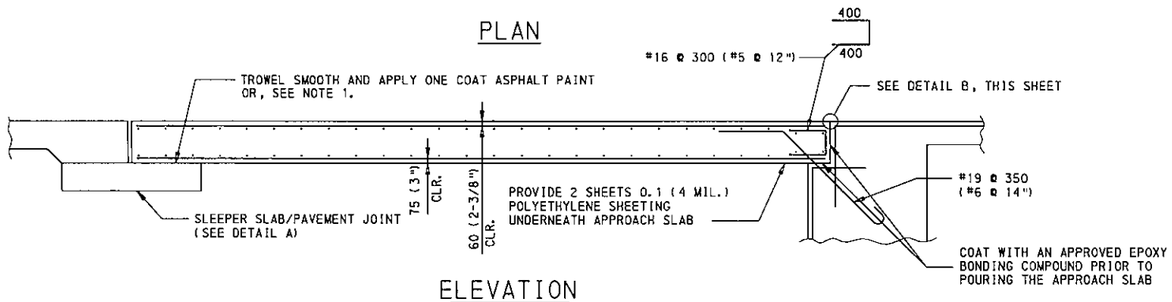
RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

SHT 2 OF 3

RC-23M

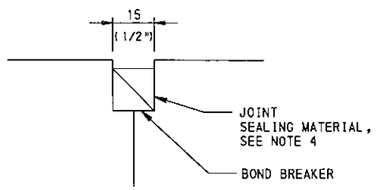


PLAN

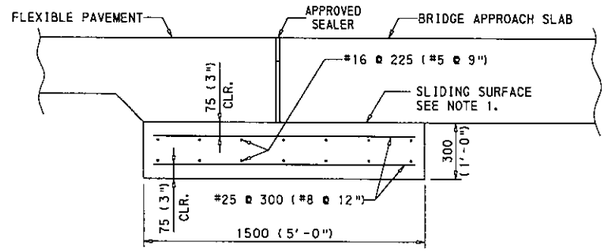


ELEVATION

APPROACH SLAB - INTEGRAL ABUTMENTS

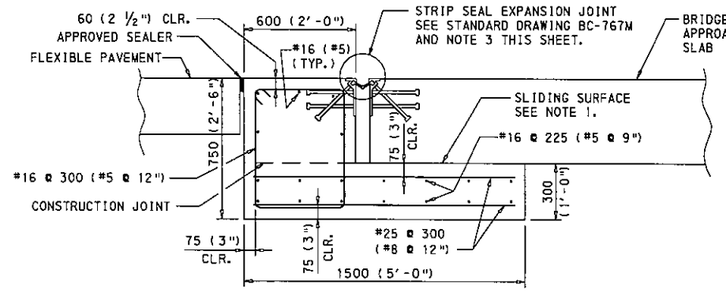


DETAIL B



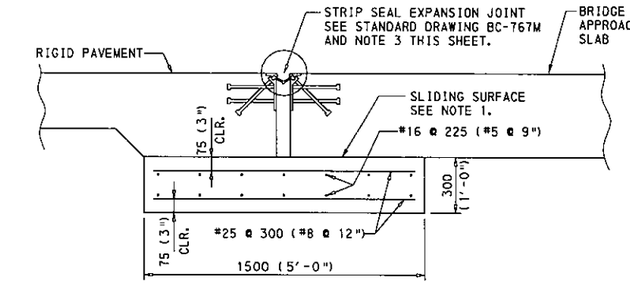
ROADWAY FLEXIBLE PAVEMENT

(BRIDGE TOTAL LENGTH LESS THAN 45 000 (150')



ROADWAY FLEXIBLE PAVEMENT

(BRIDGE TOTAL LENGTH EXCEEDS 45 000 (150')



ROADWAY RIGID PAVEMENT

DETAIL A

(SLEEPER SLAB)

NOTES:

1. TROWEL SMOOTH AND PLACE 2 LAYERS OF 0.1 mm (4 MIL.) POLYETHYLENE SHEETING AS BOND BREAKER.
2. ORIENT THE EDGE OF THE APPROACH SLAB PARALLEL TO THE INTEGRAL ABUTMENT FOR BRIDGE SKEWS LESS THAN 80.5 DEGREES i.e. 1:6 (6:1) SLOPE TO THE PERPENDICULAR TO THE DIRECTION OF TRAFFIC.

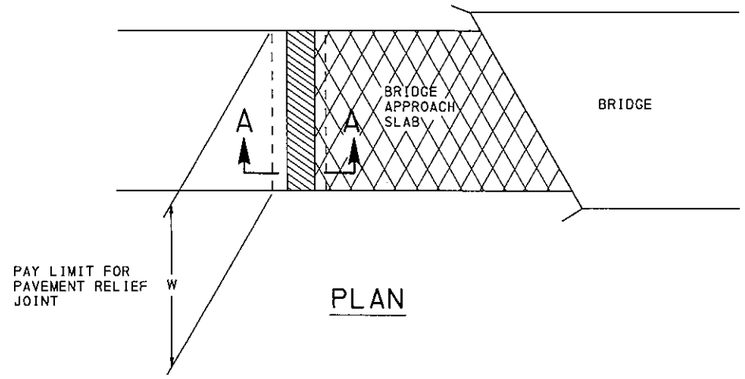
   FOR LARGER BRIDGE SKEWS, ORIENT THE EDGE OF THE APPROACH SLAB AT A SLOPE OF 1:6 (6:1) TO THE PERPENDICULAR TO THE DIRECTION OF TRAFFIC.
3. DETERMINE THE REQUIRED EXPANSION DAM OPENING AT THE TIME OF CONSTRUCTION AND THE MOVEMENT REQUIREMENTS OF THE EXPANSION JOINT AT THE END OF THE APPROACH SLAB IN ACCORDANCE WITH DESIGN MANUAL PART 4 AP.G.1.6.
4. MAKE THE TOP OF THE JOINT SEALING MATERIAL FROM 3 (1/8") TO 6 (1/4") BELOW THE SURFACE OF THE PAVEMENT.

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

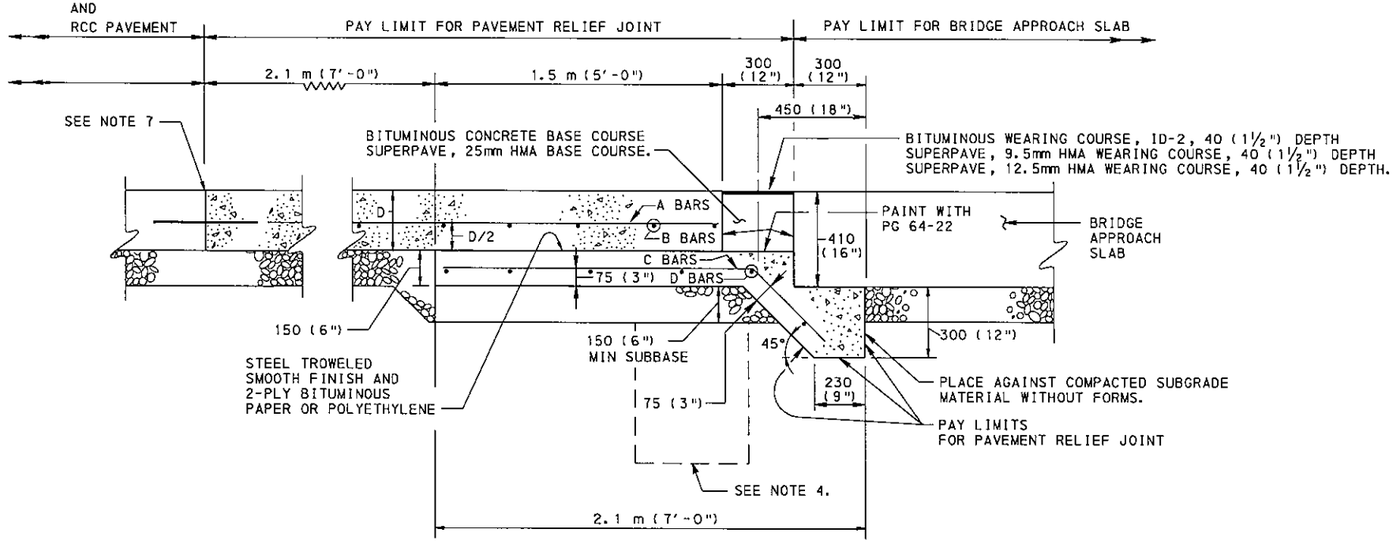
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BRIDGE APPROACH SLAB

BC-767M	NEOPRENE STRIP SEAL FOR PRESTRESSED CONCRETE AND STEEL I-BEAM BRIDGES	RECOMMENDED AUG. 21, 2002 DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 21, 2002 CHIEF ENGINEER	SHEET 3 OF 3
REFERENCE DRAWINGS				RC-23M



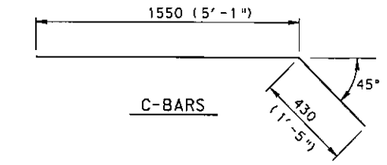
PLAN



SECTION A-A

SCHEDULE OF REINFORCEMENT STEEL

MARK	SIZE	SPACING C - C	LENGTH	NUMBER REQUIRED
A	#13 (#4)	300 (12")	3.2 m (10'-6")	W/0.3
B	#13 (#4)	300 (12")	W-100 (4")	5
C	#13 (#4)	150 (6")	2.0 m (6'-6")	W/0.3x2
D	#13 (#4)	300 (12")	W-100 (4")	7



NOTES

1. PAVEMENT RELIEF JOINTS ARE APPLICABLE FOR ALL CEMENT CONCRETE PAVEMENTS.
2. USE CLASS AA CONCRETE IN SUBSLAB. (AT CONTRACTOR'S OPTION, SUBSLAB CONCRETE MAY BE HES.)
3. INCLUDE PORTIONS OF REINFORCING BARS WHICH ARE LOCATED OUTSIDE THE INDICATED PAY LINES IN BID PRICE FOR PAVEMENT RELIEF JOINT.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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

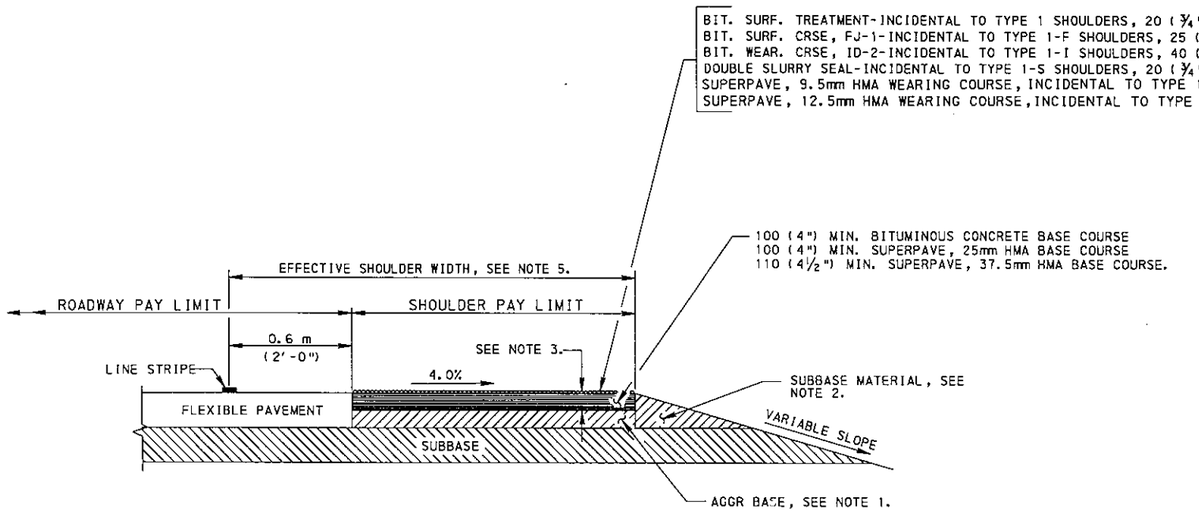
PAVEMENT RELIEF JOINT

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

SHT 1 OF 1

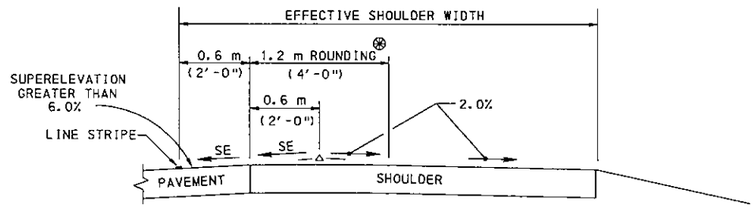
RC-24M



TYPE 1 SHOULDER
TYPE 1-F SHOULDER
TYPE 1-I SHOULDER
TYPE 1-S SHOULDER
TYPE 1-SP SHOULDER

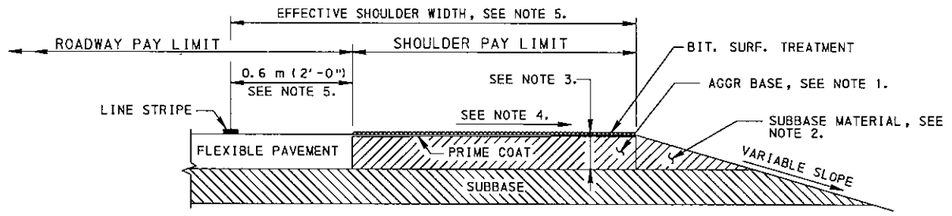
NOTES

1. CONSTRUCT AGGREGATE BASE AS SPECIFIED IN PUBLICATION 408, SECTION 350.3 AND CONSIDER AS PART OF THE SHOULDER.
2. CONSIDER THE PAYMENT FOR THIS AREA OF SUBBASE MATERIAL INCIDENTAL TO THE SHOULDER.
3. MAKE DEPTH OF SHOULDER THE COMBINED DEPTH OF SURFACE AND BASE COURSE.
4. SLOPE SHOULDER AT 6.0% FOR EFFECTIVE SHOULDER WIDTHS ≤ 2.4 m (8'). SLOPE SHOULDER AT 4.0% FOR EFFECTIVE SHOULDER WIDTHS > 2.4 m (8').
5. FOR EFFECTIVE SHOULDER WIDTHS 1.8 m (6') AND LESS, PAVE OUT-TO-OUT OF SHOULDERS WITH FULL DEPTH ROADWAY PAVEMENT.
6. FOR SHOULDERS THAT SPECIFY RUMBLE STRIPS INSTALLATIONS, USE ONLY BITUMINOUS WEARING COURSE, ID-2 OR ID-3, OR SUPERPAVE, 9.5mm OR 12.5mm, HMA WEARING COURSE, 40 (1½") DEPTH MINIMUM.
7. WHEN INSTALLING RUMBLE STRIPS ON A TYPE 1-I OR TYPE 1-SP SHOULDER, CONSTRUCT THE PAVEMENT / SHOULDER JOINT AT THE BEGINNING OF THE EFFECTIVE SHOULDER, OR PAVE FULL DEPTH INTO THE EFFECTIVE SHOULDER FAR ENOUGH SO THAT THE RUMBLE STRIPS ARE NOT CONSTRUCTED OVER THE LONGITUDINAL JOINT.
8. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.
9. SEE SHEETS 4 AND 5 FOR RUMBLE STRIPS DETAILS.



⊛ FOR SUPERELEVATION UNDER 6.0%, ELIMINATE THE 1.2 m (4'-0") ROUNDING AND USE THE 2.0% SHOULDER SLOPE BEGINNING FROM THE EDGE OF PAVEMENT.

SHOULDER ROUNDING ON HIGH SIDE OF SUPERELEVATED CURVES



TYPE 3 SHOULDER

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

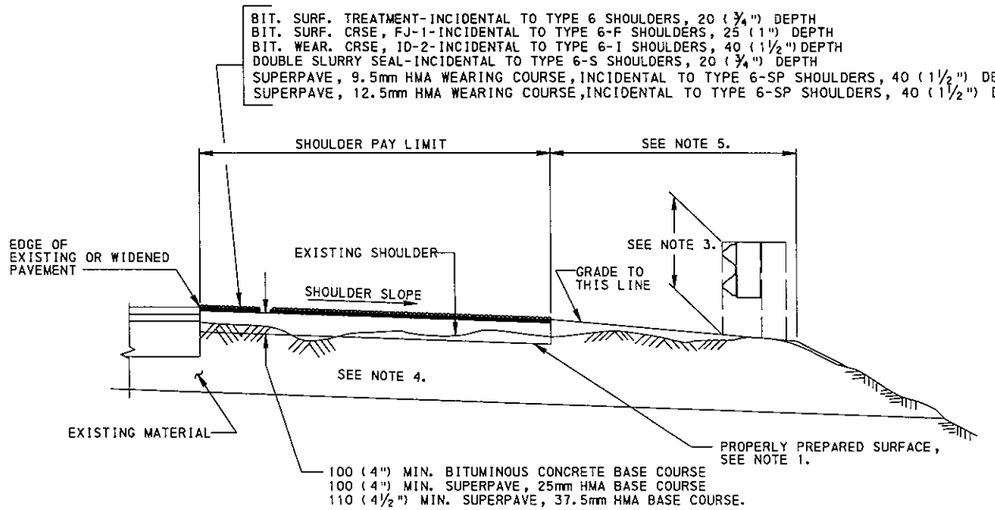
SHOULDERS

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

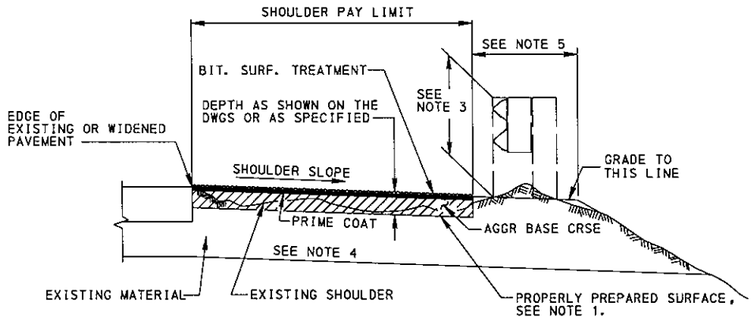
RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

SHT. 1 OF 6

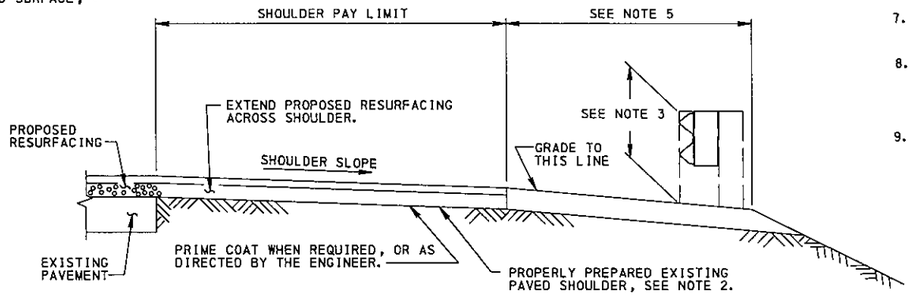
RC-25M



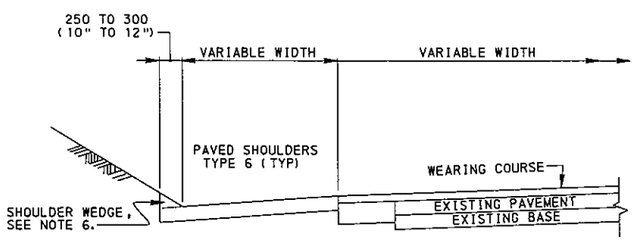
TYPE 6 SHOULDER
TYPE 6-F SHOULDER
TYPE 6-I SHOULDER
TYPE 6-S SHOULDER
TYPE 6-SP SHOULDER



TYPE 4 SHOULDER



TYPE 7 SHOULDER



TYPICAL SHOULDER DETAIL
WITH BITUMINOUS TAPER SHOULDER WEDGE

NOTES

1. FOR TYPE 4 AND TYPE 6 SHOULDERS PROPERLY PREPARE SURFACE BY EITHER SHAPING AND/OR SCARIFYING AND/OR COMPACTING. SHAPING INCLUDES REMOVAL OF EXISTING SHOULDER MATERIAL AND THE PLACEMENT OF GRADED MATERIAL FROM THE SHAPING OPERATION INTO THE LOW AREAS. WHERE THERE IS INSUFFICIENT GRADED MATERIAL FROM THE SHAPING OPERATION, COMPLETE THE WORK BY EITHER ADDING ADDITIONAL AGGR BASE CRSE MATERIAL MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 350 OR MILLED BITUMINOUS MATERIAL. THE ADDITIONAL MATERIAL IS INCIDENTAL TO THE SHOULDER ITEM.
2. FOR TYPE 7 SHOULDERS PROPERLY PREPARE EXISTING PAVED SHOULDER BY CLEANING AND PATCHING.
3. THE GUIDE RAIL TYPE, HEIGHT AND LOCATION FROM SHOULDER MAY VARY, BUT WHEN THE HEIGHT FROM THE TOP OF RAIL TO PROPOSED SURFACE BECOMES LESS THAN 610 (24"), REMOVE, REPLACE AND/OR RESET THE GUIDE RAIL IN ACCORDANCE WITH CURRENT GUIDE RAIL STANDARDS. WHERE GUIDE RAIL HAS RUBBING RAIL ATTACHED, REMOVE THE RUBBING RAIL WHEN THE HEIGHT OF GUIDE RAIL BECOMES LESS THAN 700 (27").
4. REMOVE UNSUITABLE MATERIAL AS DIRECTED, EXCAVATE, AND BACKFILL WITH MATERIAL MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 350. MEASURE AND PAY FOR SHOULDER EXCAVATION AND BACKFILL IN ACCORDANCE WITH PUBLICATION 408, SECTIONS 654 AND 656. (CROSS SECTIONS ARE NOT REQUIRED.)
5. CONSIDER GRADING INCIDENTAL TO THE SHOULDER PAY ITEM. WHERE THERE IS INSUFFICIENT GRADED MATERIAL FROM THE GRADING OPERATION TO COMPLETE THIS OPERATION, USE MATERIAL MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 350 AND PAY FOR AS TONNES OF SELECTED BORROW EXCAVATION. WHERE THERE IS AN EXCESS OF MATERIAL FROM THE SHOULDER EXCAVATION OR GRADING OPERATION, REMOVE THIS MATERIAL AS SOON AS POSSIBLE AND CONSIDER AS INCIDENTAL TO THE SHOULDER PAY ITEM.
6. PROVIDE BITUMINOUS TAPER SHOULDER WEDGE 250 (10") TO 300 (12") UP CUT SLOPE WHEN INDICATED ON THE PLANS AND CONSIDER AS INCIDENTAL TO THE SHOULDER PAY ITEM.
7. "LUMP SUM" ITEMS INCLUDE ALL MATERIALS AND OPERATIONS OF WORK NECESSARY TO COMPLETE THAT ENTIRE ITEM WHETHER TABULATED OR NOT.
8. FOR SHOULDERS THAT SPECIFY RUMBLE STRIP INSTALLATIONS, USE ONLY BITUMINOUS WEARING COURSE, ID-2 OR ID-3, OR SUPERPAVE, 9.5mm OR 12.5mm HMA WEARING COURSE, 40 (1½") DEPTH MINIMUM.
9. SEE SHEETS 4 AND 5 FOR RUMBLE STRIP DETAILS.

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

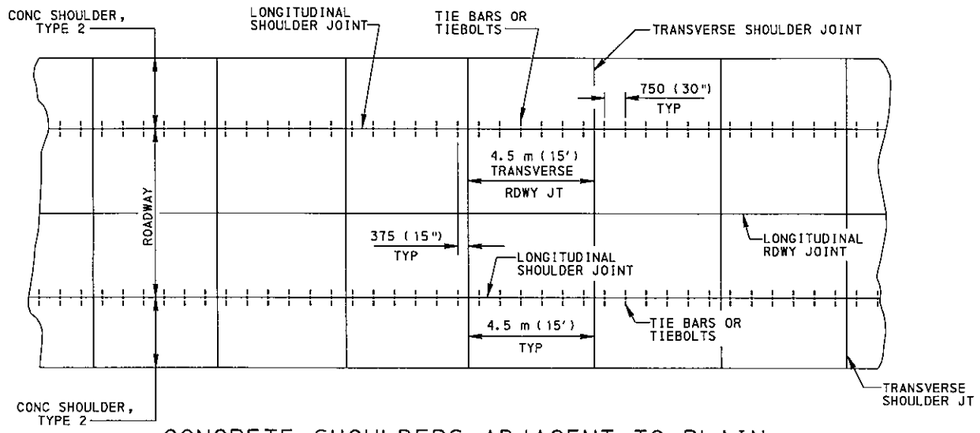
SHOULDERS (RECONSTRUCTED)

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

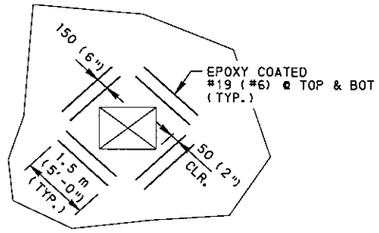
RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

SHT 2 OF 6

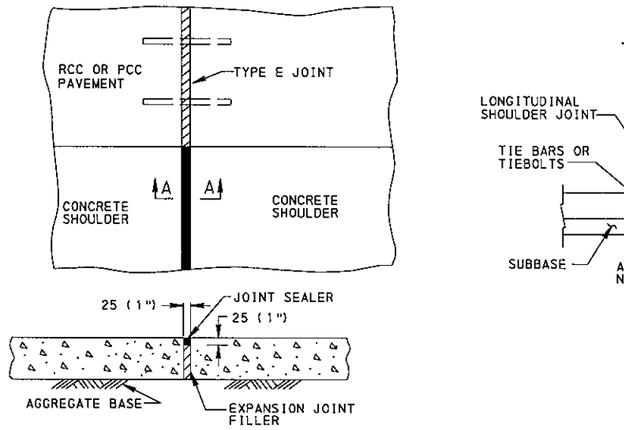
RC-25M



CONCRETE SHOULDERS ADJACENT TO PLAIN CONCRETE PAVEMENT FOR COLLECTORS AND LOCAL ROADS

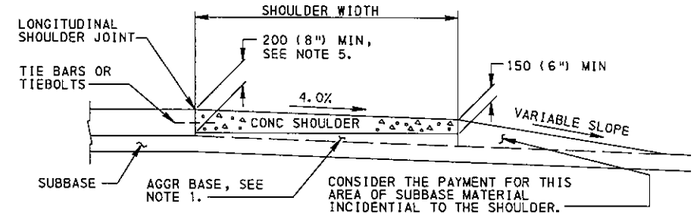


REINFORCEMENT AT OPENINGS

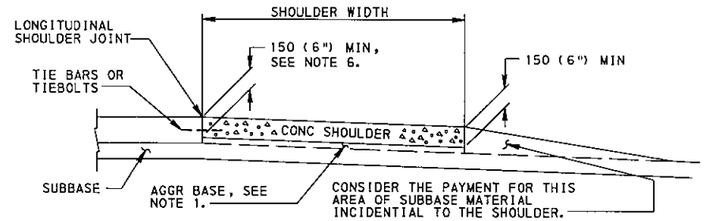


SECTION A-A

CONCRETE SHOULDER EXPANSION JOINTS



CONCRETE SHOULDER - TYPE 1



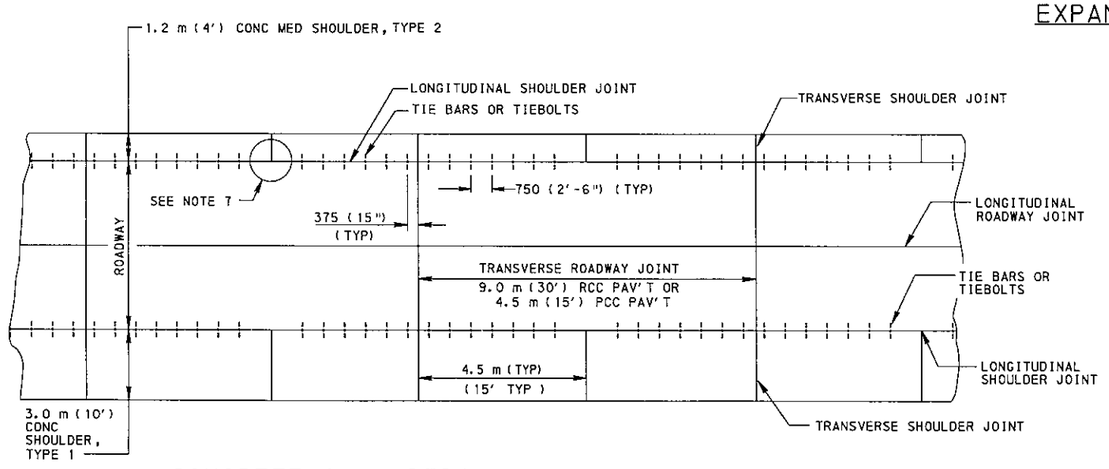
CONCRETE SHOULDER - TYPE 2

TYPICAL SECTIONS

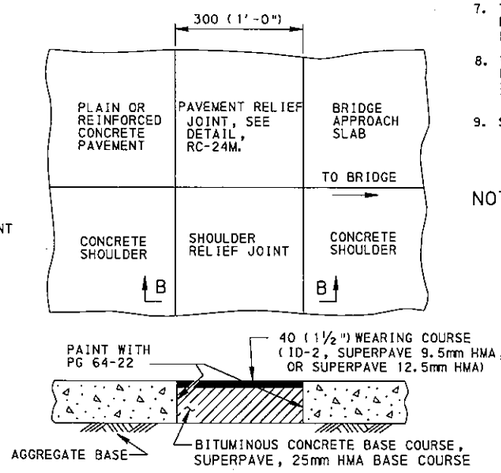
NOTES:

1. SPECIFY THE AGGREGATE BASE AS IN PUBLICATION 408 SECTION 350.3 AND CONSIDER INCIDENTAL TO THE SHOULDER.
2. SEAL ALL SHOULDER JOINTS IN ACCORDANCE WITH PUBLICATION 408, SECTION 501.3 (n).
3. FOR JOINT DETAILS, SEE RC-20M.
4. ALIGN SHOULDER TRANSVERSE JOINTS TO ADJACENT PAVEMENT JOINTS.
5. SEE RC-25M, SHEET 1, FOR SHOULDER ROUNDING DETAIL ON HIGH SIDE OF SUPERELEVATION.
6. AT THE CONTRACTOR'S OPTION, TYPE 2 CONCRETE SHOULDERS MAY BE CONSTRUCTED ON A TAPER, WITH A 150 (6") MINIMUM DEPTH, OR AT THE SAME DEPTH AS THE PAVEMENT, AT NO ADDITIONAL EXPENSE TO THE DEPARTMENT.
7. TYPICALLY, DO NOT PLACE TIE BARS OR TIEBOLTS ON EITHER SIDE OF INTERMEDIATE SHOULDER JOINTS ADJACENT TO RCC PAVEMENTS.
8. WHEN THE SHOULDER IS STRUCTURALLY PART OF A PARAPET MOMENT RESISTANCE SLAB (i.e. PARAPET/SLAB ON AN MSE WALL) SEE BC-799 SHEET 3 FOR REQUIRED MINIMUM SPACING OF THE TRANSVERSE SHOULDER JOINTS.
9. SEE SHEETS 4 AND 5 FOR RUMBLE STRIP DETAILS.

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



CONCRETE SHOULDERS ADJACENT TO RCC PAVEMENT AND PCC PAVEMENT FOR INTERSTATE AND OTHER LIMITED ACCESS FREEWAYS, ARTERIALS AND RAMPS



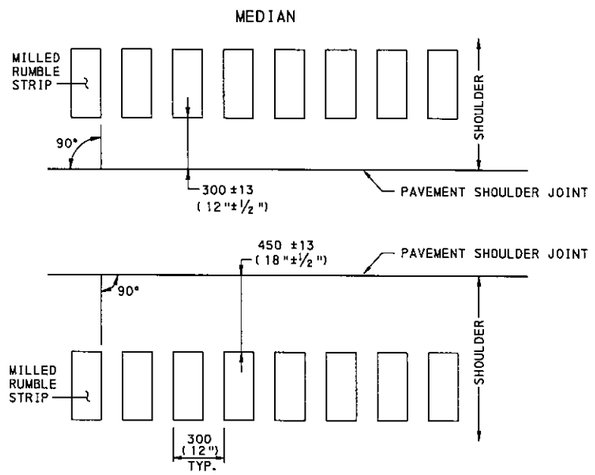
SECTION B-B

SHOULDER RELIEF JOINTS

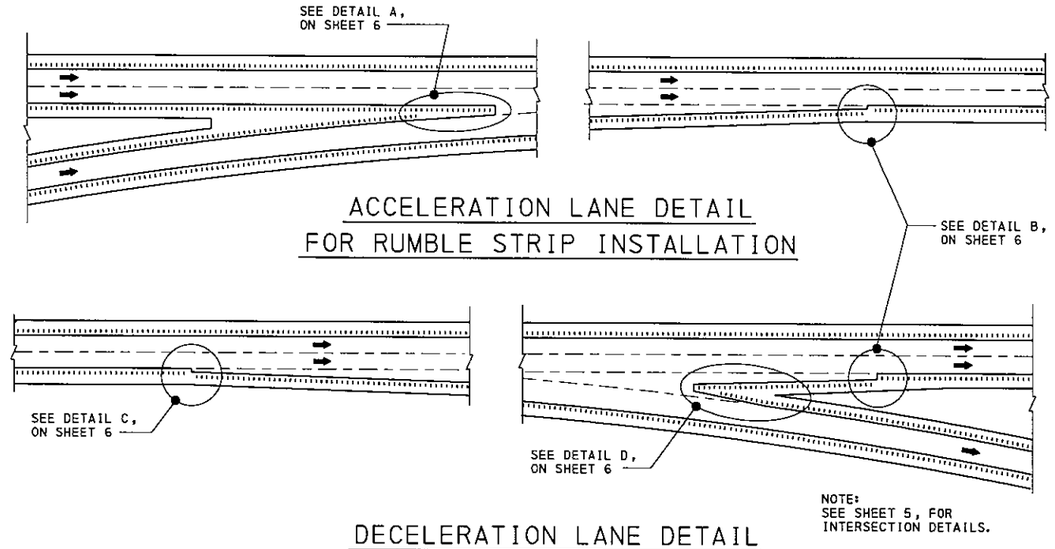
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SHOULDERS (CONCRETE)

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 3 OF 6
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-25M

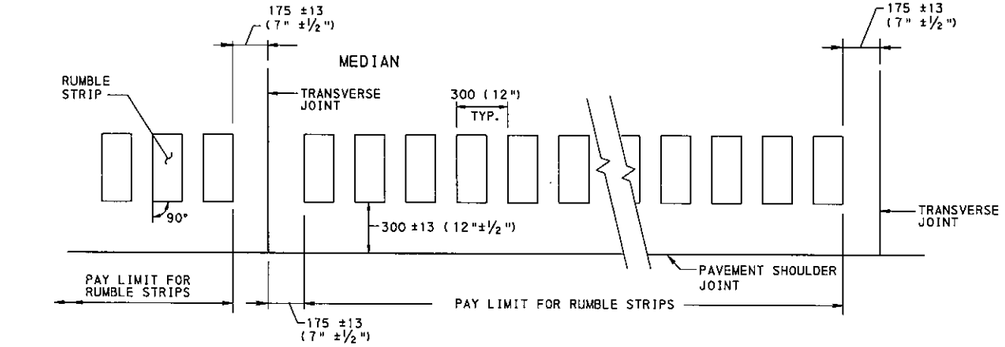


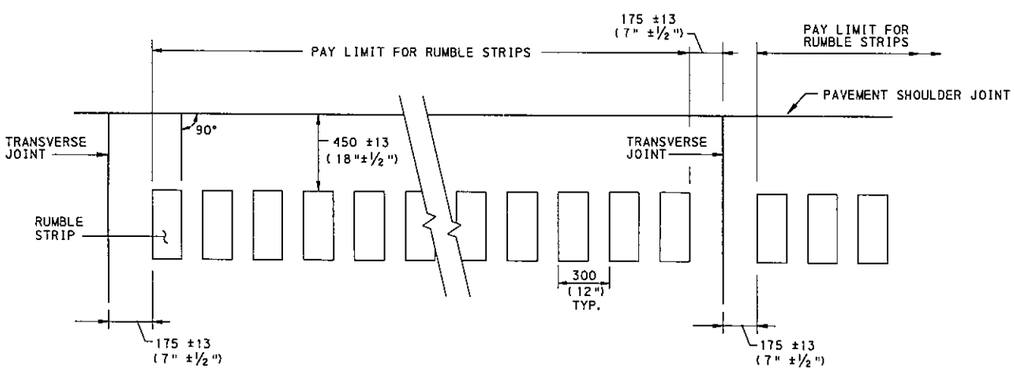
TYPICAL PLAN VIEW FOR MILLED
RUMBLE STRIPS ON BITUMINOUS SHOULDERS



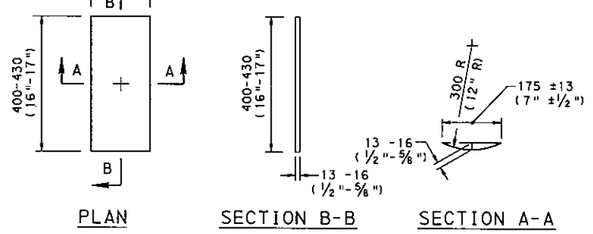
ACCELERATION LANE DETAIL
FOR RUMBLE STRIP INSTALLATION

DECELERATION LANE DETAIL
FOR RUMBLE STRIP INSTALLATION

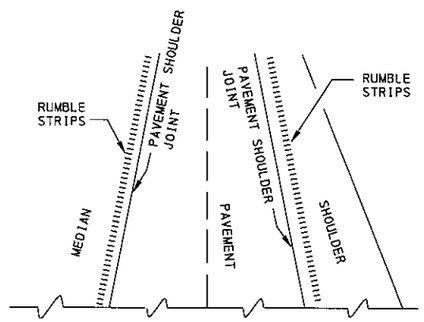




TYPICAL PLAN VIEW FOR MILLED
RUMBLE STRIPS ON CONCRETE SHOULDERS



SECTION DETAILS OF
RUMBLE STRIP PATTERN



GENERAL PLAN
RUMBLE STRIP PATTERN

NOTES

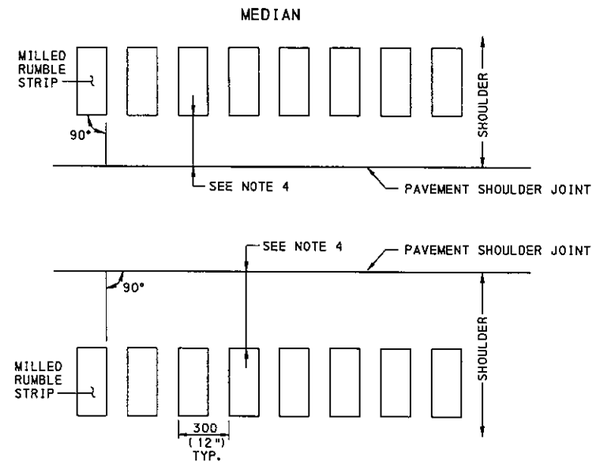
1. IF THERE IS NO ACTUAL PAVEMENT SHOULDER JOINT, MEASURE THE OFFSET FROM THE PAVEMENT SHOULDER TRAFFIC LINE.
2. DO NOT MILL SHOULDER RUMBLE STRIPS ACROSS A JOINT.
3. CONSTRUCT RUMBLE STRIPS IN ACCORDANCE WITH PUBLICATION 408 SECTION 660.

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

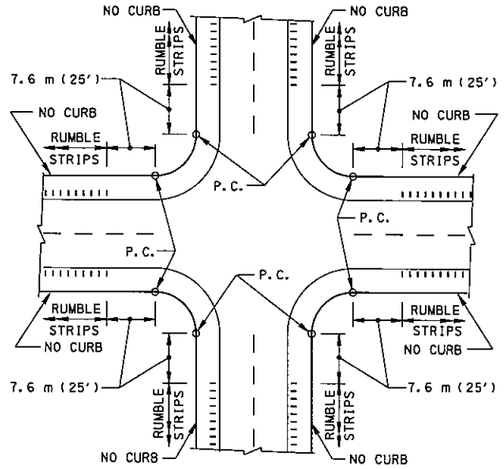
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SHOULDERS
RUMBLE STRIPS
(LIMITED ACCESS HIGHWAYS)

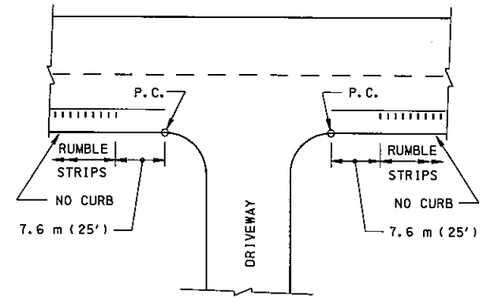
RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT. 4 OF 6
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-25M



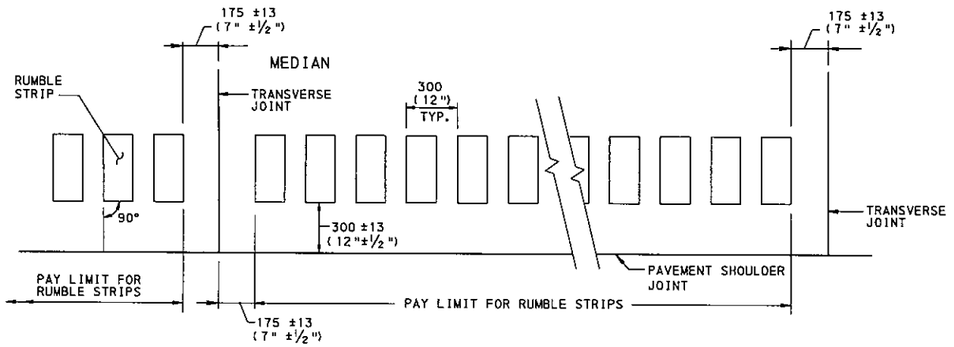
TYPICAL PLAN VIEW FOR MILLED RUMBLE STRIP ON BITUMINOUS SHOULDERS



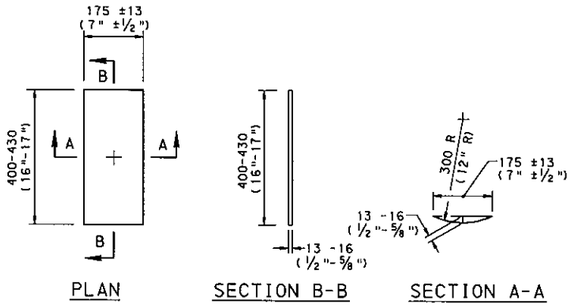
TYPICAL INTERSECTION DETAIL FOR RUMBLE STRIP INSTALLATION



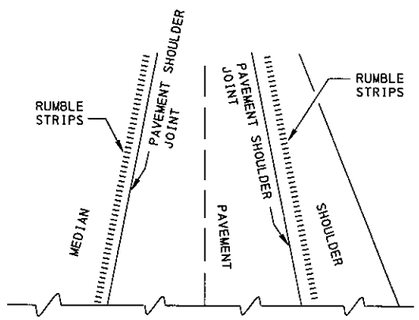
TYPICAL DRIVEWAY DETAIL FOR RUMBLE STRIP INSTALLATION



TYPICAL PLAN VIEW FOR MILLED RUMBLE STRIPS ON CONCRETE SHOULDERS



SECTION DETAILS OF RUMBLE STRIP PATTERN



GENERAL PLAN RUMBLE STRIP PATTERN

NOTES

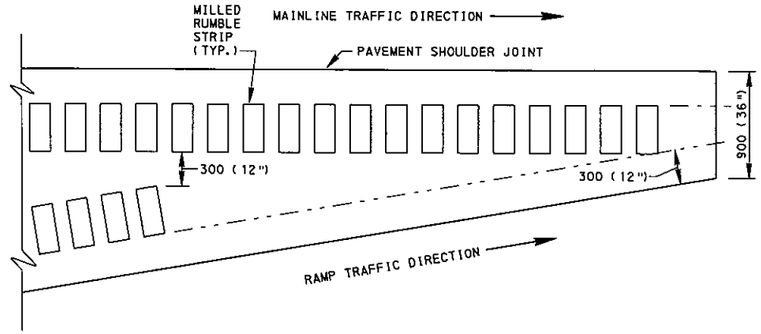
1. MILLED SHOULDER RUMBLE STRIPS FOR FREE ACCESS HIGHWAYS ARE CONSIDERED ON A PROJECT BY PROJECT BASIS AS INDICATED ON THE CONSTRUCTION PLANS.
2. CONSTRUCT RUMBLE STRIP IN ACCORDANCE WITH PUBLICATION 408, SECTION 660.
3. DO NOT MILL SHOULDER RUMBLE STRIPS ACROSS A JOINT.
4. 300 ±13 (12" ± ½") FOR LEFT (MEDIAN) SHOULDERS. 450 ±13 (18" ± ½") FOR RIGHT SHOULDERS ≥ 2.4 m (8') WIDE. FOR RIGHT SHOULDERS LESS THAN 2.4 m (8') WIDE, SEE CONSTRUCTION PLANS FOR OFFSET DIMENSION.
5. IF THERE IS NO ACTUAL PAVEMENT SHOULDER JOINT, MEASURE THE OFFSET FROM THE PAVEMENT SHOULDER TRAFFIC LINE.

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

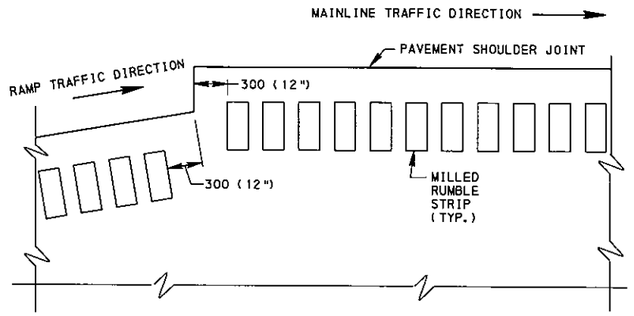
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SHOULDERS
RUMBLE STRIPS
(FREE ACCESS HIGHWAYS)

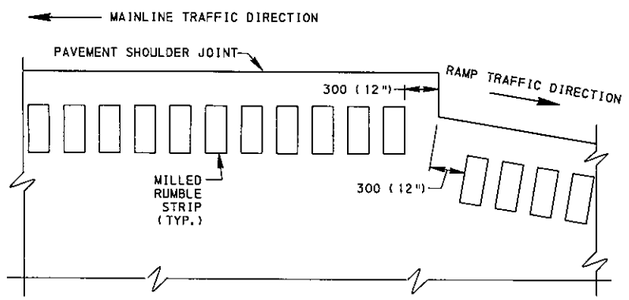
RECOMMENDED AUG. 21, 2002 DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 21, 2002 CHIEF ENGINEER	SHT. 5 OF 6 RC-25M



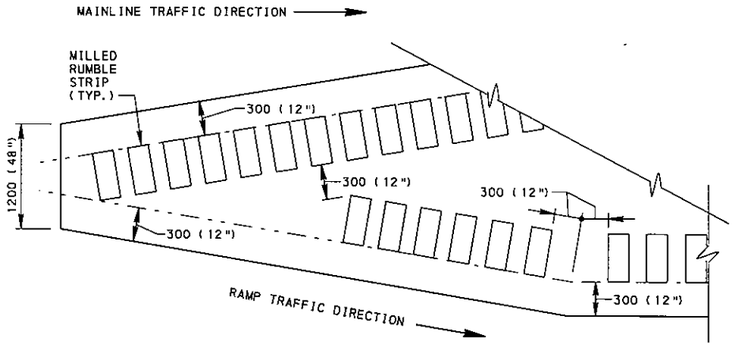
DETAIL A
ACCELERATION LANE
GORE AREA RUMBLE STRIPS



DETAIL B
ACCELERATION LANE
OUTSIDE SHOULDER RUMBLE STRIPS



DETAIL C
DECELERATION LANE
OUTSIDE SHOULDER RUMBLE STRIPS



DETAIL D
DECELERATION LANE
GORE AREA RUMBLE STRIPS

NOTES

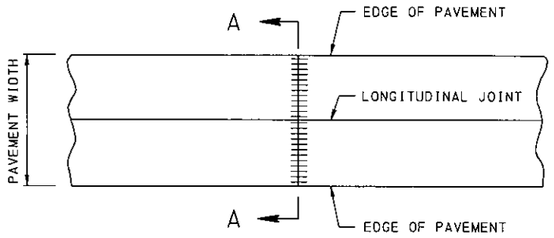
1. IF THERE IS NO ACTUAL PAVEMENT SHOULDER JOINT, MEASURE FROM THE PAVEMENT SHOULDER TRAFFIC LINE.
2. DO NOT MILL SHOULDER RUMBLE STRIPS ACROSS A JOINT.
3. CONSTRUCT RUMBLE STRIPS IN ACCORDANCE WITH PUBLICATION 408 SECTION 660.
4. SPACE CONTRACTION JOINTS IN UNIFORM LENGTHS OR SECTIONS SUCH THAT A CONTINUOUS TRANSVERSE JOINT IS FORMED ACROSS MAINLINE, SEPARATOR, AND RAMP PAVEMENTS.
5. FORM JOINTS IN GORE AREA CONNECTING MAINLINE AND RAMP TRANSVERSE JOINTS SUCH THAT ANGLES LESS THAN 80° ARE AVOIDED IN GORE PAVEMENT WHERE POSSIBLE.

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

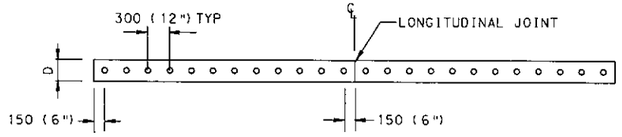
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SHOULDERS
RUMBLE STRIPS
(GORE AREA)

RECOMMENDED AUG. 21, 2002 DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 21, 2002 CHIEF ENGINEER	SHT. 6 OF 6 RC-25M

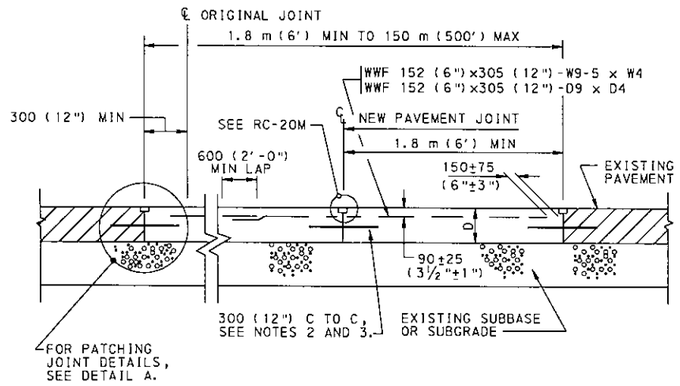


PLAN VIEW



SECTION A-A

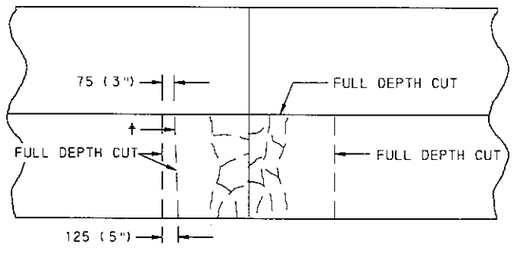
TYPICAL PAVEMENT PATCHING JOINT



TYPICAL SECTION

CONCRETE PAVEMENT PATCHING

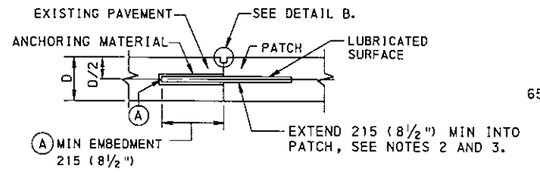
SEE NOTE 1.



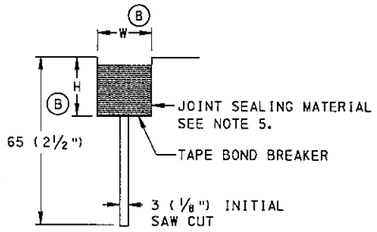
PLAN VIEW

† MAKE FULL DEPTH SAWCUT TO FACILITATE OPENING A TRENCH ACROSS THE SLAB TO RELIEVE COMPRESSION IN PAVEMENT PRIOR TO LIFTING OUT FAILED AREA. SAWCUT MAY BE OMITTED PROVIDED NO SPALLING ON SURFACE OR UNDERSIDE OF REMAINING CONCRETE PAVEMENT OCCURS. IF SPALLING OCCURS, MAKE THIS SAWCUT ON SUBSEQUENT PATCHES. SAWCUTS FOR COMPRESSION RELIEF NEED NOT BE AT PATCH EDGE. AT CONTRACTOR'S OPTION, MAKE ADDITIONAL SAWCUTS INSIDE REPAIR LIMITS TO FACILITATE REMOVAL.

SAW CUTS FOR LIFT OUT METHOD



DETAIL A



DETAIL B

PATCHING JOINT DETAILS

LEGEND

Ⓐ EMBEDDED END OF DOWEL BAR NEED NOT BE SQUARE. IF A CHISEL POINT IS NEEDED FOR EMBEDDING METHOD, INCREASE LENGTH OF DOWEL AND EMBEDMENT BY 25 (1").

Ⓑ

JOINT SPACING	W	H
≥15 M (50')	25 (1")	32 (1¼")
≥6 M (20') AND <15 M (50')	19 (¾")	25 (1")
<6 M (20')	10 (⅜")	19 (¾")

NOTES

1. WHEN ANY PAVEMENT PATCH REPLACES AN EXISTING EXPANSION JOINT AND THE EXISTING EXPANSION JOINT IN AN ADJACENT LANE REMAINS IN PLACE, INSTALL EXPANSION JOINT MATERIAL 19 (¾") THICK IN THE PATCHING JOINT OR NEW PAVEMENT JOINT NEAREST TO THE REMAINING EXPANSION JOINT. PLACE AN APPROVED TUBE HAVING A MINIMUM 25 (1") CLEARANCE POCKET OVER THE LUBRICATED END OF ALL DOWEL BARS IN THE NEW EXPANSION JOINT.
2. USE 32 (1¼") ø x 450 (18") LONG DOWEL BARS FOR PAVEMENT DEPTHS 250 (10") OR LESS AND 38 (1½") ø x 450 (18") LONG DOWEL BARS FOR PAVEMENT DEPTHS GREATER THAN 250 (10").
3. PLACE DOWEL BARS PARALLEL TO THE CENTERLINE AND SURFACE OF THE SLAB. THE VERTICAL OR HORIZONTAL SKEW FROM ONE END OF THE DOWEL BAR TO THE OTHER END IS NOT TO EXCEED 6 (¼").
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.
5. MAKE THE TOP OF THE JOINT SEALING MATERIAL FROM 3 (⅛") TO 6 (¼") BELOW THE SURFACE OF THE PAVEMENT.
6. INITIAL SAW CUT IS NOT REQUIRED AT PATCH JOINT OR WHEN EXPANSION JOINT MATERIAL IS REQUIRED.
7. WHEN PAVEMENT IS TO BE OVERLAID, ONLY THE INITIAL SAW CUT IS REQUIRED.

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 PAVEMENT REHABILITATION

(PATCHING)

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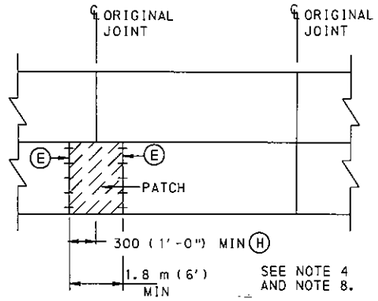
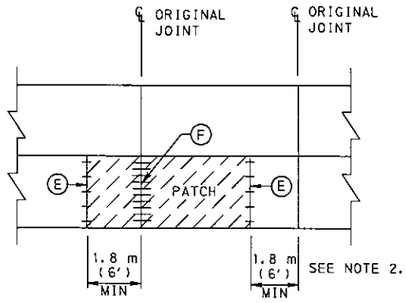
DIRECTOR, BUREAU OF DESIGN

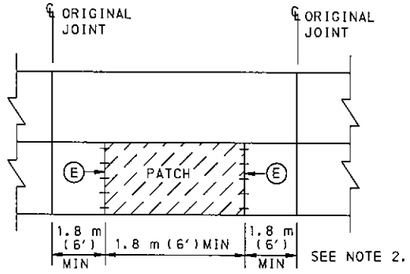
RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

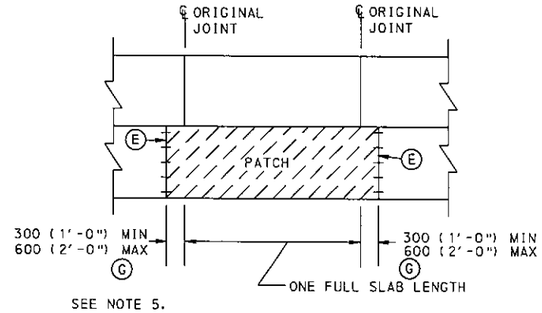
SHT 1 OF 5

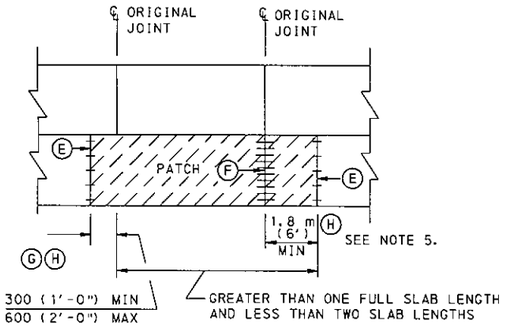
RC-26M

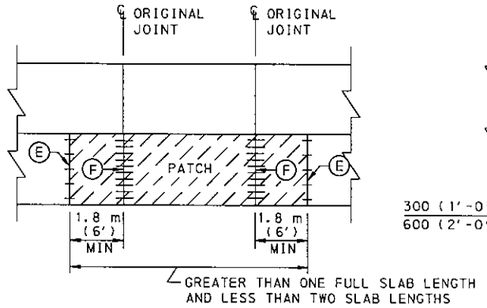


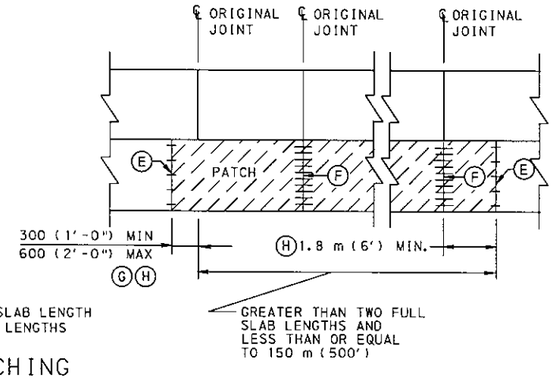




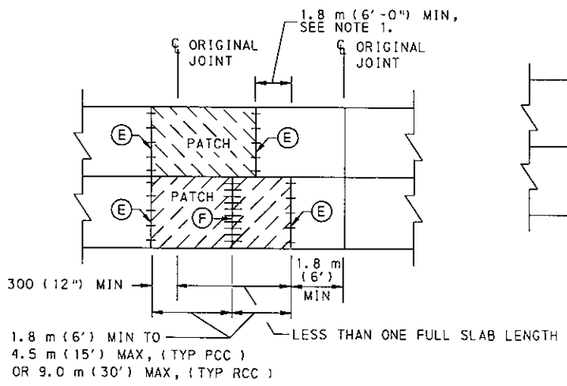


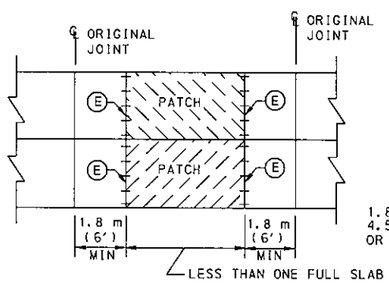


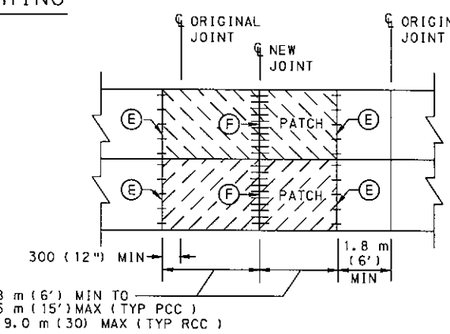


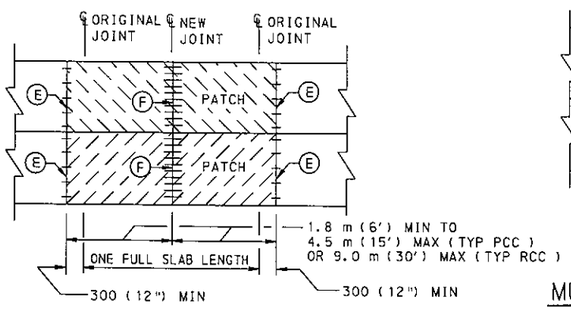


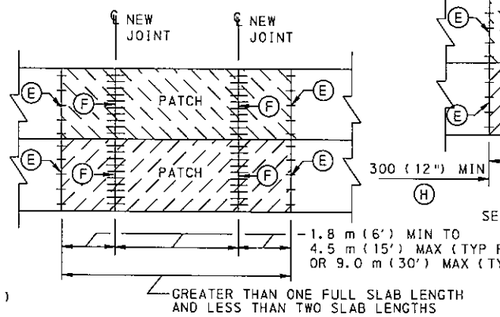
SINGLE LANE PAVEMENT PATCHING

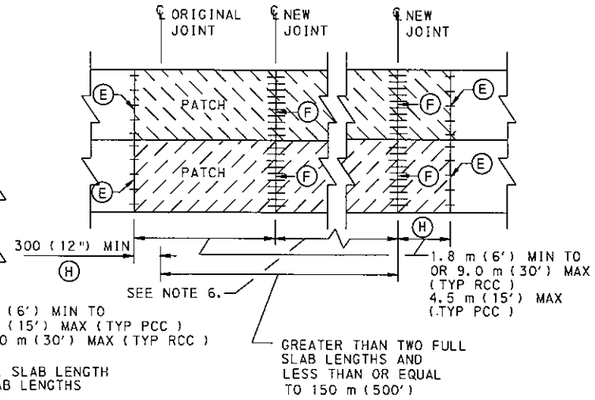












MULTI-LANE PAVEMENT PATCHING

LEGEND

- (E) PAVEMENT PATCHING JOINT, SEE SHEET 1.
- (F) NEW PAVEMENT JOINT, SEE RC-20M.
- (G) EXCEPTION TO 1.5 m (5') MAXIMUM REMOVAL.
- (H) DETAILS APPLY TO EITHER END OF PATCH.

NOTES

1. CONSTRUCT PAVEMENT PATCHES IN ADJACENT LANES, WITH LENGTHS THAT ARE WITHIN 1.8 m (6') OF EACH OTHER, TO THE SAME LENGTH. THIS LENGTH IS THE LENGTH OF THE LARGER PAVEMENT PATCH. IF THE PATCH LENGTHS DIFFER BY MORE THAN 1.8 m (6'), THEN CONSTRUCT TO THE REQUIRED LENGTHS.
2. DO NOT LEAVE LESS THAN 1.8 m (6') OF ORIGINAL PAVEMENT IN PLACE BETWEEN PATCHES OR BETWEEN JOINTS.
3. WHEN PERFORMING SINGLE LANE PAVEMENT PATCHING, OR PATCHING ONE LANE AT A TIME, PLACE A 6 (1/4"), FULL DEPTH, POLYSTYRENE BOARD BOND BREAKER IN THE LONGITUDINAL JOINT OF ALL PATCHES UNDER 20.0 m (60') IN LENGTH, PRIOR TO PLACING THE NEW CONCRETE IN THE PATCH AREA.
4. WHEN PATCHING ADJACENT TO AN EXISTING JOINT, REMOVE A MINIMUM OF 300 (12") OF PAVEMENT IN THE NEXT SLAB TO AVOID THE EXISTING DOWEL BARS.
5. WHEN REPLACING ONE FULL SLAB LENGTH AND THE DETERIORATION EXTENDS MORE THAN 600 (24") INTO THE NEXT SLAB, REMOVE A MINIMUM OF 1.8 m (6') AND INSTALL A NEW PAVEMENT JOINT IN THE SAME POSITION AS THE ORIGINAL JOINT.
6. WHEN PERFORMING MULTILANE PATCHING, AND THE PATCHES ARE GREATER THAN TWO SLAB LENGTHS AND LESS THAN OR EQUAL TO 150 m (500'), THE JOINT SPACING OF THE AREA BEING PATCHED IS TO CONFORM TO RC-21M OR RC-27M FOR THE SPECIFIC TYPE OF PAVEMENT BEING PLACED (I.E., RCC OR PCC).
7. THESE DRAWINGS ARE PROVIDED AS EXAMPLES TO SHOW CERTAIN PATCHING CRITERIA. THEY MAY NOT COVER EVERY FIELD SITUATION.
8. WHEN ONLY ONE LANE IS BEING PATCHED, DO NOT REMOVE MORE THAN 1.5 m (5') INTO NEXT SLAB. IF MORE THAN 1.5 m (5') IS REQUIRED, REMOVE A MINIMUM OF 1.8 m (6') AND PROVIDE NEW PAVEMENT JOINT AT ORIGINAL JOINT LOCATION. FOR EXCEPTION, SEE NOTE (G).

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
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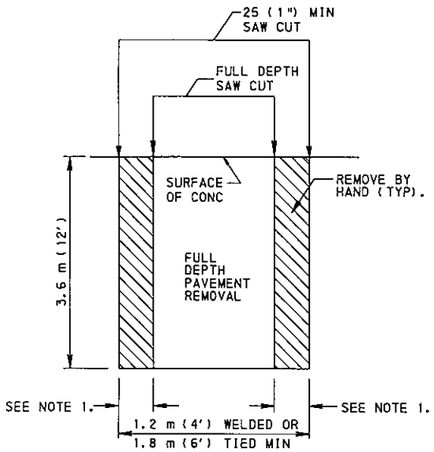
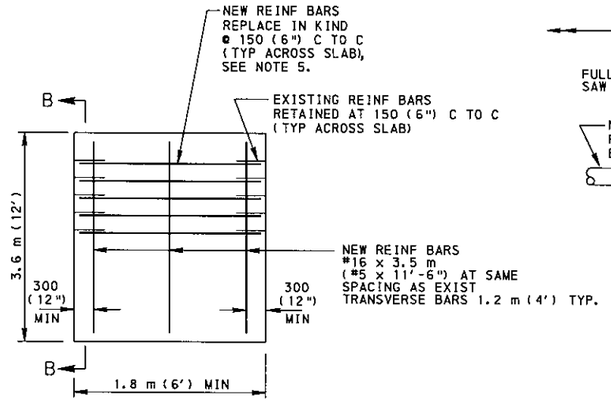
CONCRETE PAVEMENT REHABILITATION

(PATCHING)

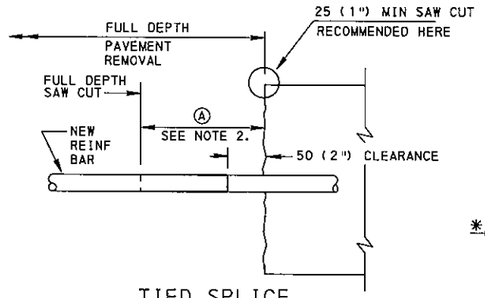
RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 2 OF 5
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-26M



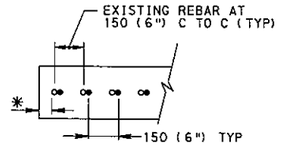
C R C PATCH



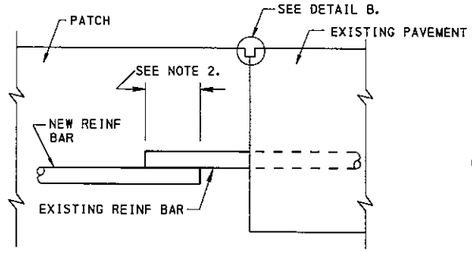
TIED SPLICE
REINFORCEMENT BAR DETAIL



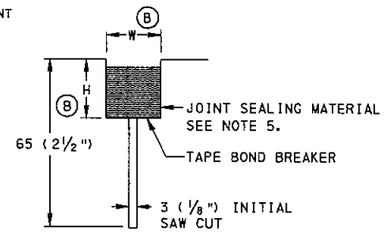
TIED SPLICE
TYPICAL SECTION



SECTION B-B



DETAIL A



DETAIL B

PATCHING JOINT DETAILS

LEGEND

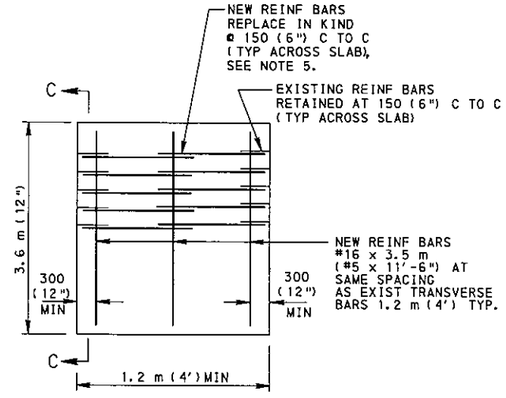
- * MAINTAIN EXISTING EDGE CLEARANCE.
- ○ EXISTING REBARS
- • NEW REBARS

(A) USE THE FOLLOWING TABLE TO DETERMINE DEVELOPMENT LENGTH:

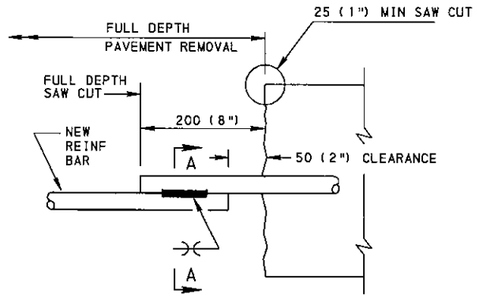
BAR SIZE	DEVELOPMENT LENGTH
#16 (#5)	480 (20")
#19 (#6)	585 (23")
#22 (#7)	755 (27")

(B)

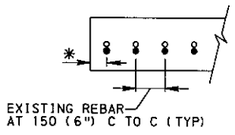
PATCH LENGTH	W	H
≥15 M (50')	25 (1")	32 (1¼")
≥6 M (20') AND <15 M (50')	19 (¾")	25 (1")
<6 M (20')	10 (⅜")	19 (¾")



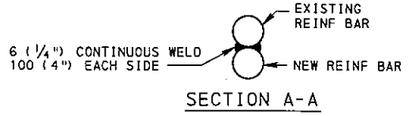
WELDED SPLICE
REINFORCEMENT BAR DETAIL



WELDED SPLICE
TYPICAL SECTION



SECTION C-C



SECTION A-A

NOTES

1. REMOVE 510 (20") MIN BY HAND FOR TIED SPLICES. REMOVE 200 (8") BY HAND FOR WELDED SPLICES.
2. OVERLAP TIED SPLICES BY AT LEAST 30 BAR DIAMETERS. OVERLAP WELDED SPLICES BY 150 (6").
3. REMOVE PAVEMENT FULL DEPTH UNDER RETAINED REINFORCEMENT BARS.
4. MINIMUM DISTANCE FROM PATCH EDGE TO EXISTING CRACK IN CRC PAVEMENT IS 600 (24").
5. WHEN TRANSVERSE SPACING OF LONGITUDINAL REINFORCING BARS IS OTHER THAN 150 (6") C TO C, MATCH EXISTING REINFORCING.
6. MAKE THE TOP OF THE JOINT SEALING MATERIAL FROM 3 (⅛") TO 6 (¼") BELOW THE PAVEMENT SURFACE.

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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CONCRETE PAVEMENT REHABILITATION

(C R C PATCHING)

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CHIEF ENGINEER

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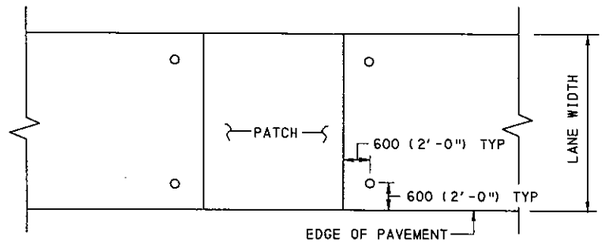
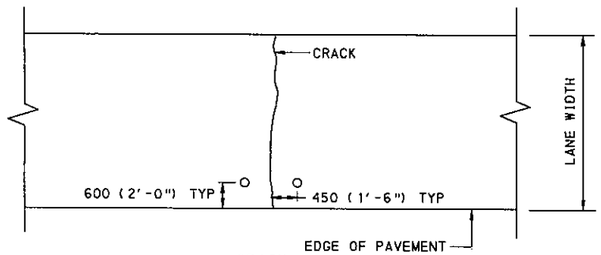
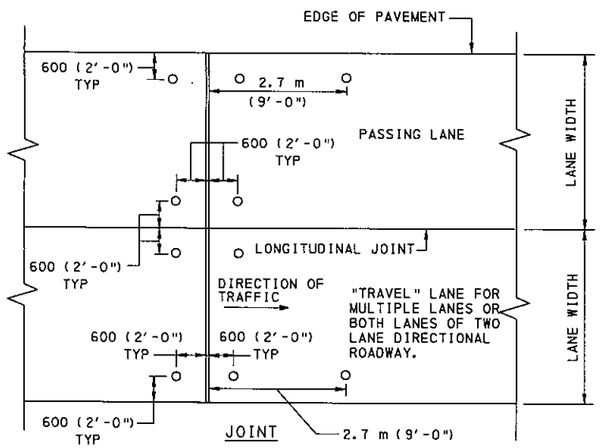


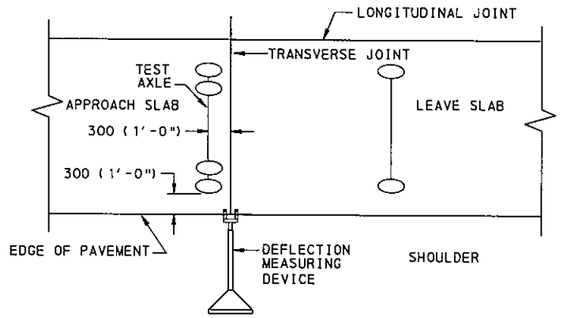
PATCH



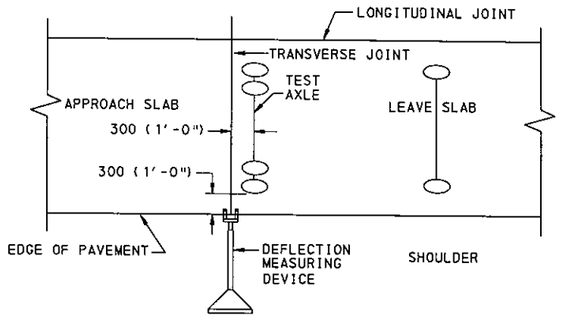
CRACK



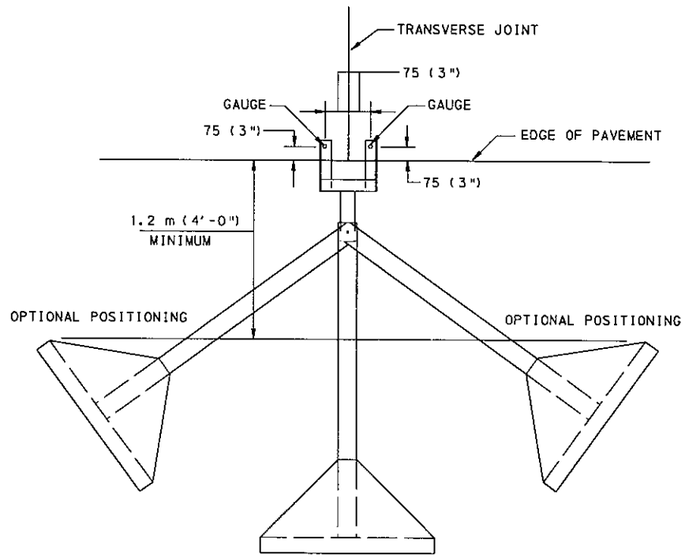
HOLE PATTERNS FOR PAVEMENT SLAB STABILIZATION



POSITION OF TEST AXLE FOR TAKING DEFLECTIONS WITH LOADED APPROACH SLAB

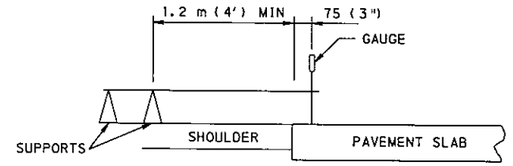


POSITION OF TEST AXLE FOR TAKING DEFLECTIONS WITH LOADED LEAVE SLAB



PLAN VIEW

TYPICAL PLACEMENT OF APPROVED DEFLECTION MEASURING DEVICE AT JOINT



ELEVATION VIEW

NOTE

1. DRILL NEW HOLES FOR REGROUTING 150 (6") CLOSER TO JOINT OR CRACK.

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
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(PATCHING)

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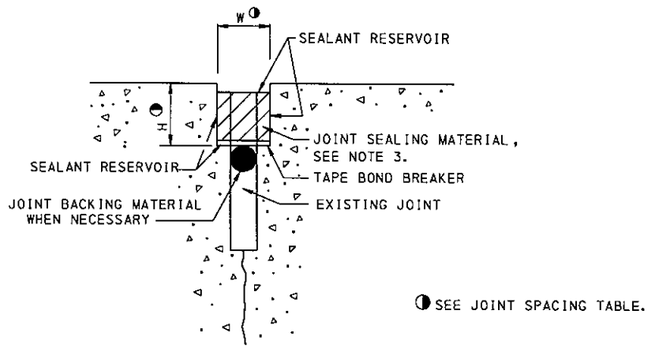
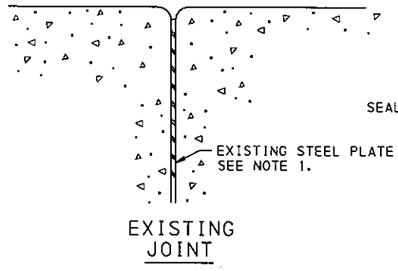
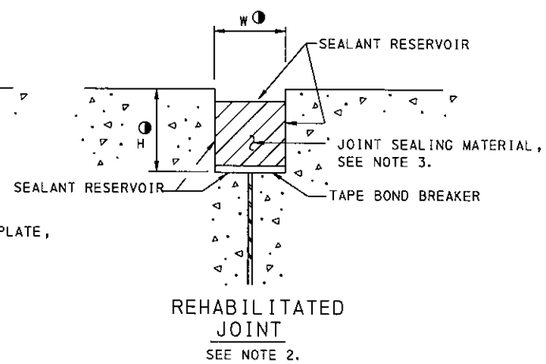


TYPE 1

◑ SEE JOINT SPACING TABLE.



EXISTING JOINT



REHABILITATED JOINT
SEE NOTE 2.

TYPE 2

JOINT REHABILITATION

JOINT SPACING	W	H
≥15 M (50')	25 (1")	32 (1 1/4")
≥6 M (20') AND <15 M (50')	19 (3/4")	25 (1")
<6 M (20')	10 (3/8")	19 (3/4")

NOTES

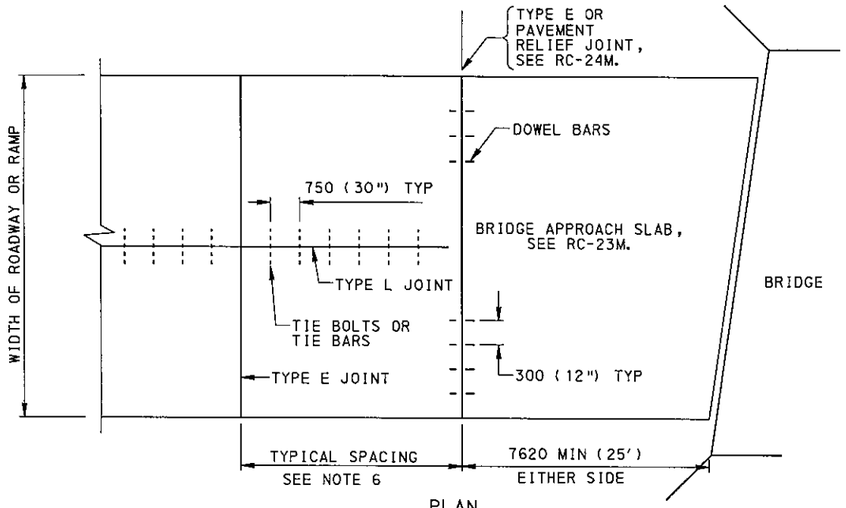
1. EXISTING STEEL PLATE IS EITHER 2.01 THICK (14 GAUGE) WITH LAPPED TOP OR FLAT PLATE 3 (1/8") THICK.
2. REMOVE THE STEEL PLATE WITHIN THE SEALANT RESERVOIR.
3. MAKE THE TOP OF THE JOINT SEALING MATERIAL FROM 3 (1/8") TO 6 (1/4") BELOW THE SURFACE OF THE PAVEMENT.

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

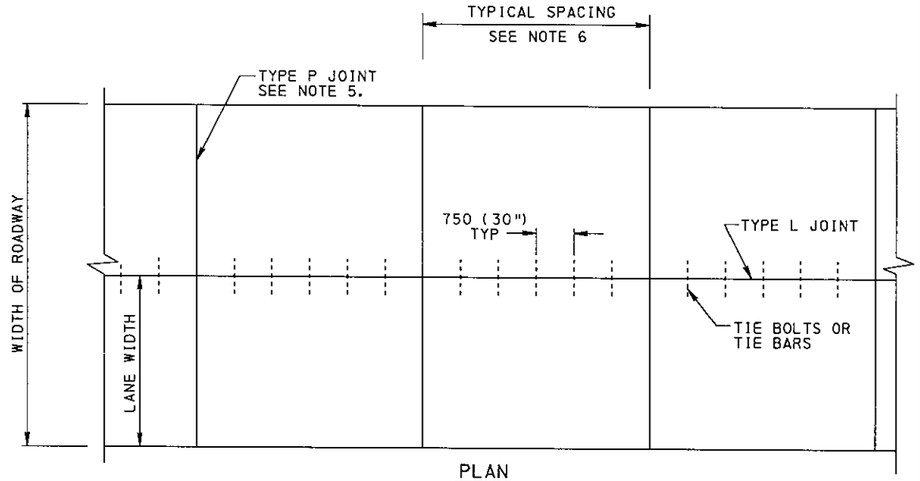
CONCRETE PAVEMENT REHABILITATION (JOINTS)

RECOMMENDED AUG. 21, 2002 DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 21, 2002 CHIEF ENGINEER	SHT 5 OF 5 RC-26M



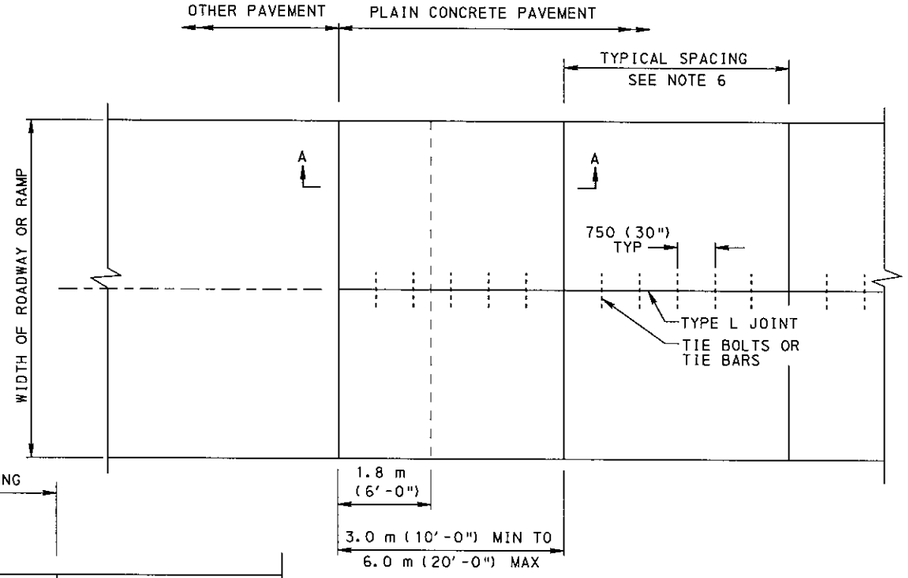
PLAN

BRIDGE APPROACHES



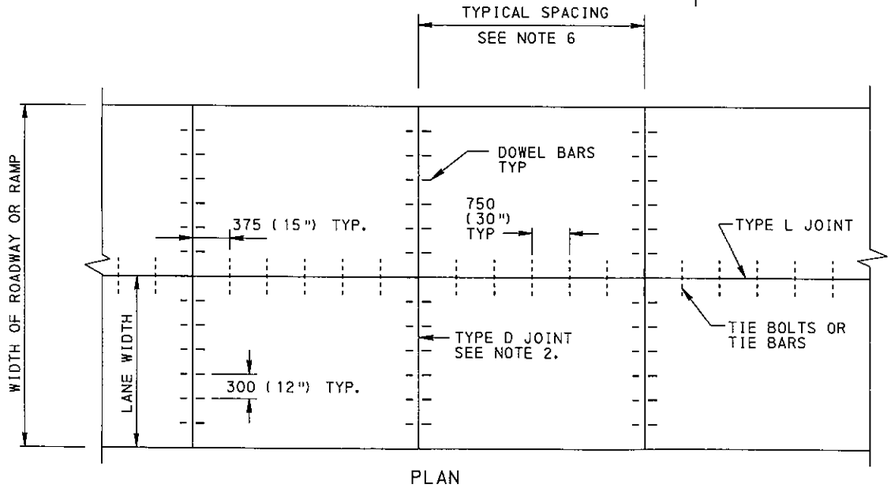
PLAN

COLLECTORS AND LOCAL ROADS

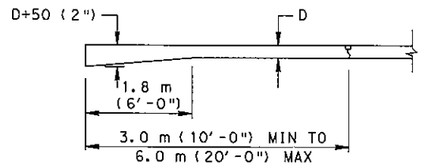


PLAN

TERMINAL SLAB



PLAN



SECTION A-A

INTERSTATE AND OTHER LIMITED ACCESS FREEWAYS, ARTERIALS AND RAMPS

NOTES

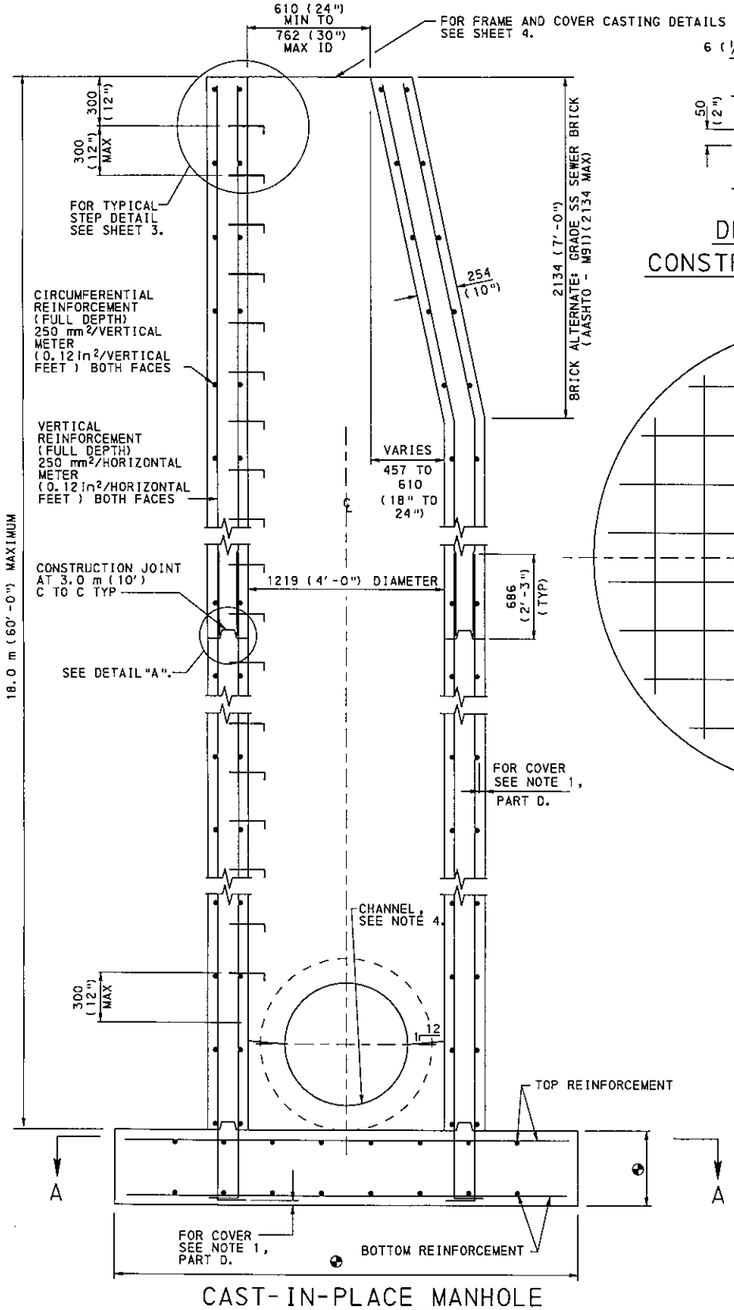
1. FOR JOINT DETAILS, SEE RC-20M.
2. CONSTRUCT TYPE D JOINTS ON INTERSTATE, EXPRESSWAY, ARTERIAL AND RAMP PAVEMENTS.
3. WHEN RAMP OR LANE WIDTH EXCEEDS 4.2 m (14'), A TYPE L JOINT IS REQUIRED AT THE MIDPOINT.
4. CONSTRUCT ACCELERATION AND DECELERATION PORTION OF RAMPS WITH THE SAME PAVEMENT STRUCTURE AS THE MAINLINE PAVEMENT TO THE FIRST TRANSVERSE JOINT BEYOND THE RAMP GORE.
5. CONSTRUCT TYPE P JOINT, AS INDICATED, ON COLLECTORS AND LOCAL ROADS.
6. USE A 4.5 m (15') JOINT SPACING ON ALL PAVEMENTS.
7. ON CURVES, THE JOINT SHALL BE CONSTRUCTED PERPENDICULAR TO THE TANGENT ON THE LONG RADIUS SIDE OF THE CURVE.
8. 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

PLAIN CONCRETE PAVEMENT

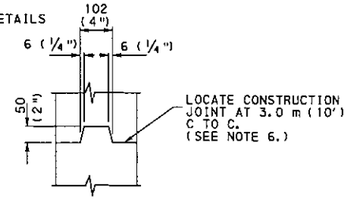
RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 1 OF 1
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-27M



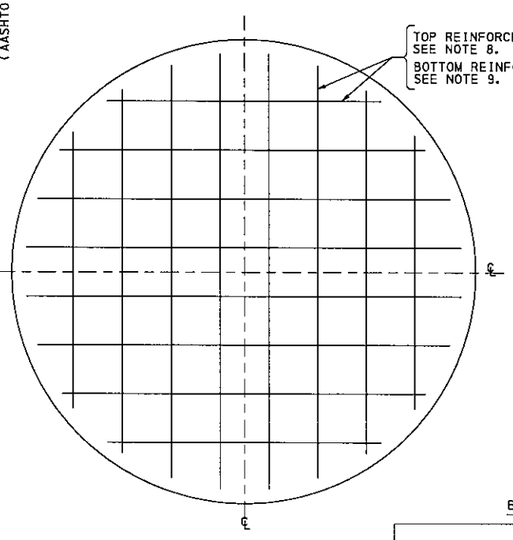
CAST-IN-PLACE MANHOLE

FOR PIPES WITH 750 (30") INSIDE DIAMETER AND LESS

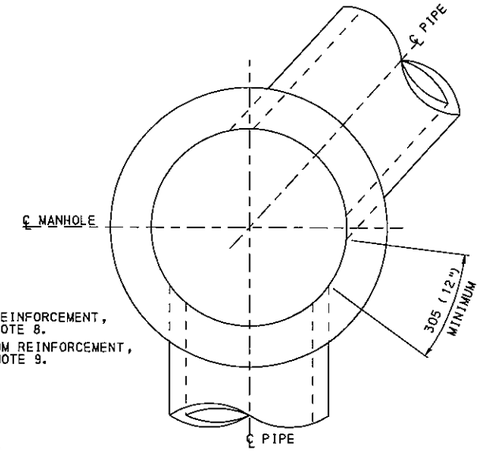
◆ FOR BASE SLAB DIMENSIONS SEE TABLE A.



DETAIL "A" CONSTRUCTION JOINT

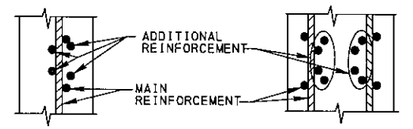


SECTION A-A



PLAN VIEW

SEE NOTE 3.

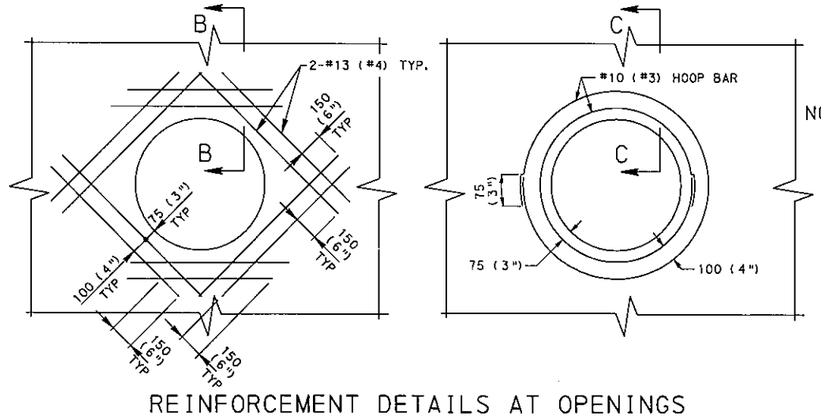


SECTION B-B OR C-C

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")



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

1. CONSTRUCTION REQUIREMENTS:
   - A. 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.
   - B. MINIMUM CONCRETE CLASS:
     CAST-IN-PLACE CLASS A
     PRECAST CLASS AA
   - C. 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).
   - D. CLEAR COVER FOR STEEL:

WALLS:	CAST-IN-PLACE	50 (2")	
	PRECAST	40 (1½")	
FOOTINGS:	CAST-IN-PLACE	60 (2½")	TOP BARS
		80 (3")	BOTTOM BARS
		50 (2")	SIDE COVER
	PRECAST	50 (2")	TOP BARS
		40 (1½")	BOTTOM BARS
		40 (1½")	SIDE COVER
SLABS:	CAST-IN-PLACE	50 (2")	TOP & BOTTOM BARS

2. FOR PIPES WITH INSIDE DIAMETERS GREATER THAN 750 (30") SEE MODIFIED CAST-IN-PLACE MANHOLES, SHEET 2.
3. 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.
4. 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.
5. 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.
6. CONSTRUCTION JOINTS AND KEYS MAY BE CONSTRUCTED UPWARDS OR DOWNWARDS. CLEAN JOINTS AND KEYS THOROUGHLY BEFORE PLACING NEXT CONCRETE SEGMENT.
7. 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.
8. FOR FOOTING TOP REINFORCEMENT, BOTH DIRECTIONS, USE NO. 19 (6) BARS AT 300 (12") FOR DEPTHS TO 18.0 m (60') OR 635 mm²/m (0.30 in²/FT) WWF FOR DEPTHS TO 9.0 m (30') AND 680 mm²/m (0.32 in²/FT) WWF FOR DEPTHS GREATER THAN 9.0 m (30') 152 (6") MAXIMUM SPACING FOR WWF.
9. FOR FOOTING BOTTOM REINFORCEMENT, BOTH DIRECTIONS, USE NO. 13 (4) BARS AT 480 (18") FOR DEPTHS TO 18.0 m (60') OR 320 mm²/m (0.15 in²/FT) WWF FOR DEPTHS TO 9.0 m (30') AND 340 mm²/m (0.16 in²/FT) WWF FOR DEPTHS GREATER THAN 9.0 m (30') 152 (6") MAXIMUM SPACING FOR WWF.
10. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

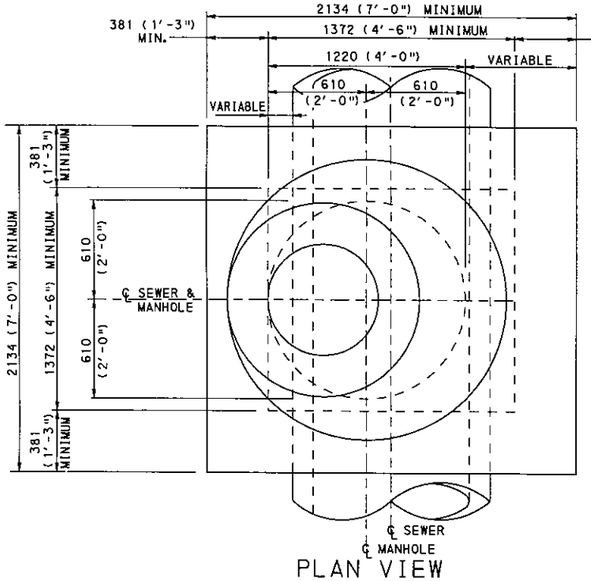
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

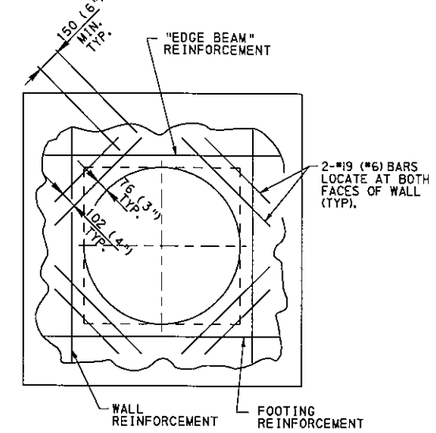
STANDARD MANHOLES
CAST-IN-PLACE MANHOLES

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 1 OF 5
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-39M

13-AUG-2002



PLAN VIEW



REINFORCEMENT DETAILS AT VERTICAL OPENINGS

NOTE: ONLY BOX WITH MAIN REINFORCEMENT SHOWN FOR CLARITY.

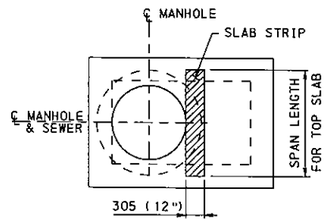


FIGURE 1

PLAN-TOP OF SLAB

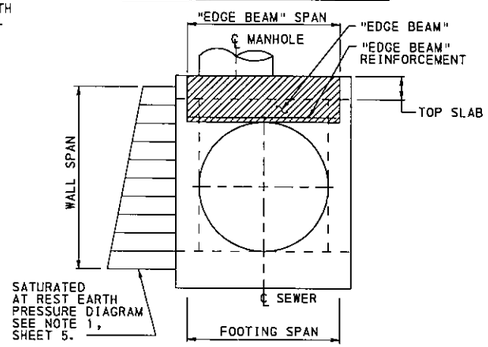


FIGURE 2

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.

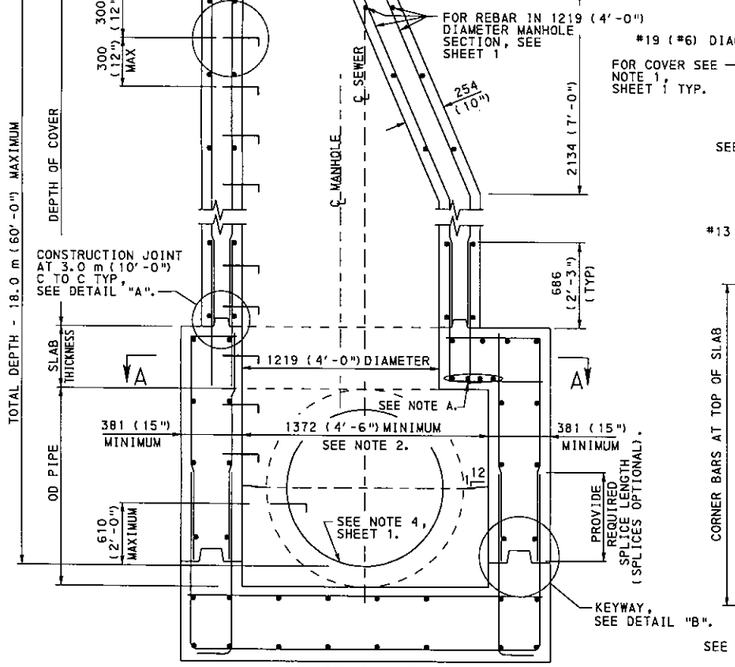
- DESIGN THE "EDGE BEAMS", SPANNING THE LENGTH OF THE BOX, TO CARRY A UNIFORMLY DISTRIBUTED LOAD EQUAL TO THE REACTION FROM THE SLAB.

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

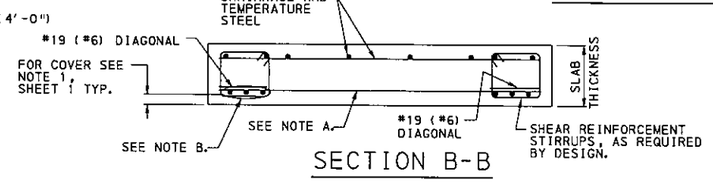
- DESIGN SPAN NORMAL TO PIPE TO CARRY POSITIVE MOMENT OF $1/10\ W\ell^2$ AND NEGATIVE MOMENT OF $1/12\ W\ell^2$ WHERE W IS THE UNIFORM BEARING PRESSURE. DO NOT TAKE INTO ACCOUNT THE CONCRETE IN THE CHANNEL WHEN CALCULATING CAPACITY OF THE FOOTING.
- AS A MINIMUM, PROVIDE NO. 13 (NO. 4) BARS AT 300 (12") CENTERS, TOP AND BOTTOM OF SLAB IN THE OPPOSITE DIRECTION.



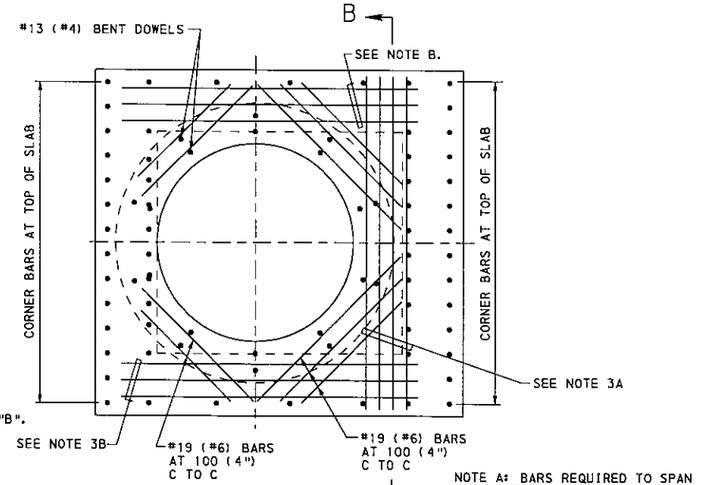
SECTION VIEW

MODIFIED MANHOLE

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



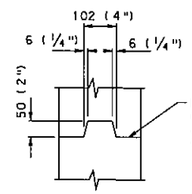
SECTION B-B



SECTION A-A

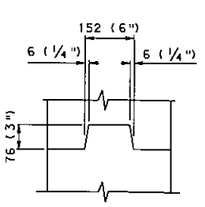
NOTE A: BARS REQUIRED TO SPAN FROM WALL TO WALL.

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

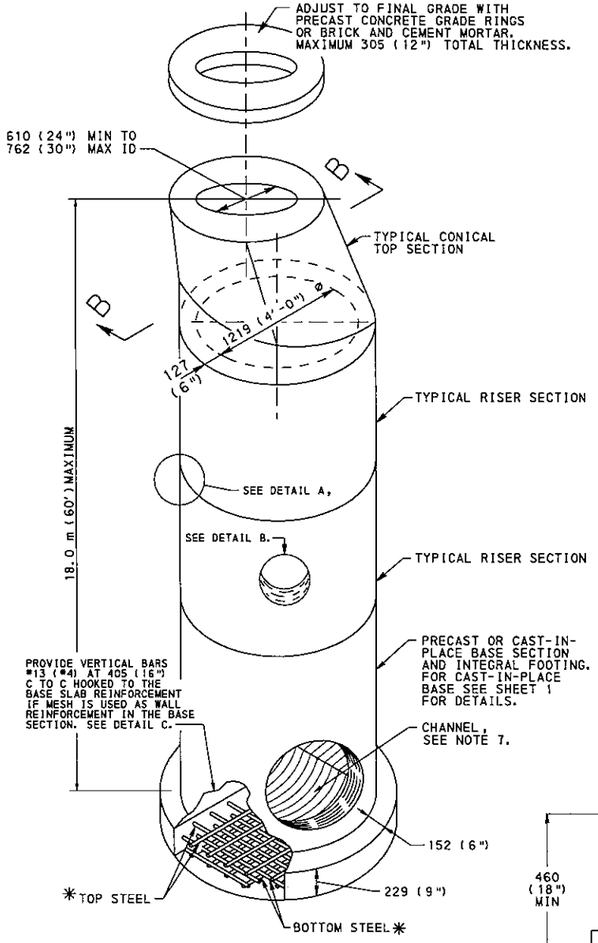
SEE NOTE 6, SHEET 1

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

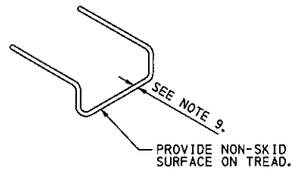
RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 2 OF 5
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-39M



PRECAST MANHOLE

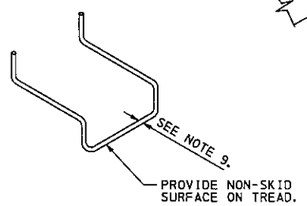
FOR PIPES 750 (30") INSIDE DIAMETER AND LESS

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

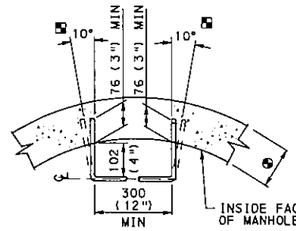


STEP WITHOUT HOOKS

SEE NOTE 10.



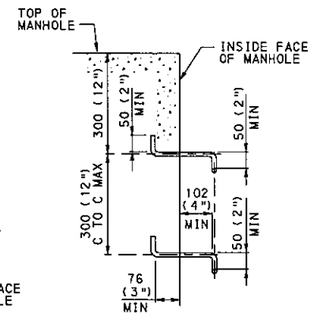
STEP WITH HOOKS



PLAN VIEW

■ ALTERNATE ACCEPTABLE CONFIGURATION

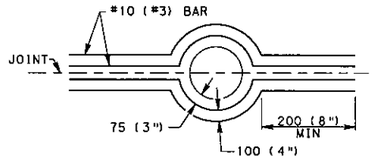
● 254 (10") FOR CAST-IN-PLACE
127 (5") FOR PRECAST



SIDE VIEW

TYPICAL STEP CONFIGURATION

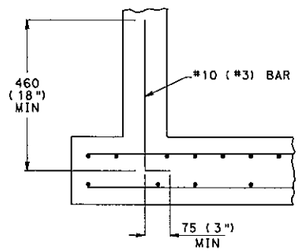
MANHOLE STEPS



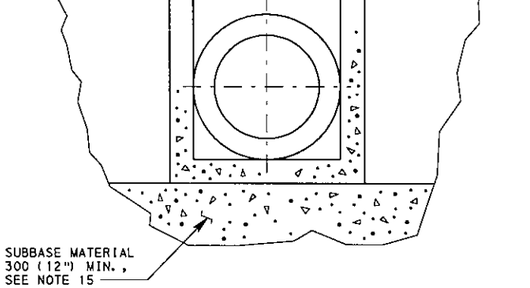
ALTERNATE DETAIL

AT OPENINGS

SEE NOTE 11.



DETAIL C

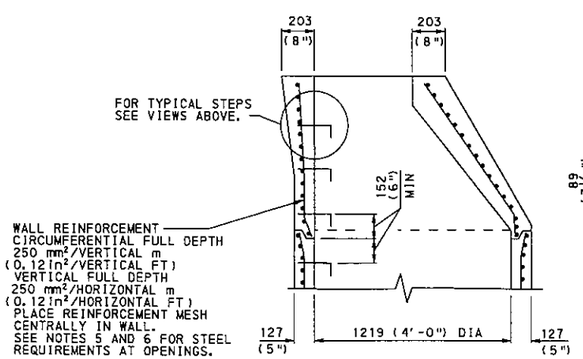


PRECAST MANHOLE

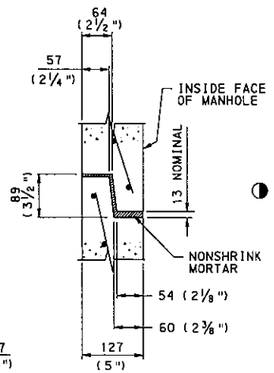
BASE PREPARATION

NOTES

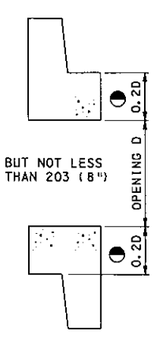
1. PRECAST MANHOLES MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 714, MAY BE SUBSTITUTED FOR THE STANDARD CAST-IN-PLACE MANHOLE. FOR DEVIATION OR MODIFICATION OF THE STANDARDS, SUBMIT SHOP DRAWINGS FOR APPROVAL.
2. FOR CONSTRUCTION REQUIREMENTS SEE NOTE 1, SHEET 1. FOR DESIGN REQUIREMENTS SEE 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 UNCUT 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 A 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 (¾") 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.
15. 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 MANHOLE PAY ITEM.



SECTION B-B



DETAIL A



DETAIL B

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 mm²/m WWF 152 MAXIMUM SPACING (NO. 4 BARS AT 6" C TO C OR 0.33 in²/FT WWF 6" MAXIMUM SPACING)	NO. 13 BARS AT 300 C TO C OR 340 mm²/m WWF 152 MAXIMUM SPACING (NO. 4 BARS AT 12" C TO C OR 0.16 in²/FT 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 mm²/m WWF 152 MAXIMUM SPACING (NO. 5 BARS AT 6" C TO C OR 0.56 in²/FT WWF 6" MAXIMUM SPACING)	NO. 13 BARS AT 150 C TO C OR 575 mm²/m WWF 152 MAXIMUM SPACING (NO. 4 BARS AT 6" C TO C OR 0.27 in²/FT WWF 6" MAXIMUM SPACING)

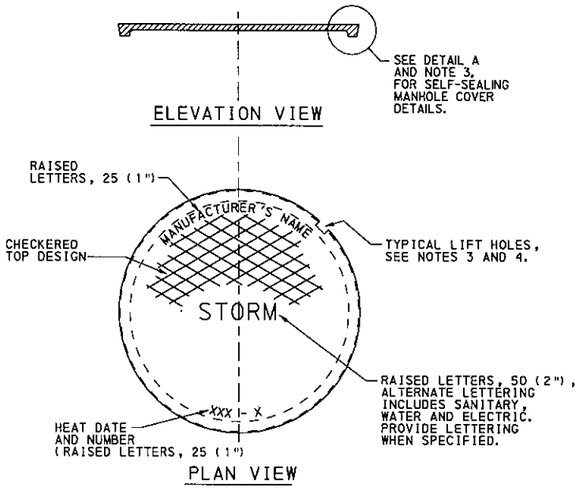
SEE NOTE 7, SHEET 1

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

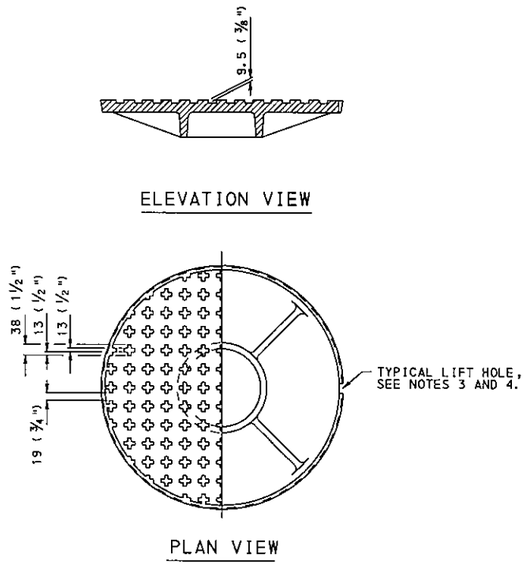
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD MANHOLES
PRECAST MANHOLES &
MANHOLE STEPS

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 3 OF 5
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-39M



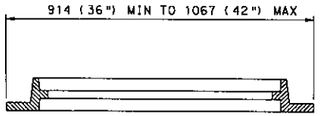
CAST IRON MANHOLE COVER
(PLATEN COVER)



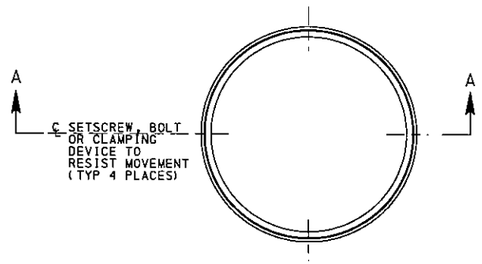
CAST IRON MANHOLE COVER
(STANDARD COVER)

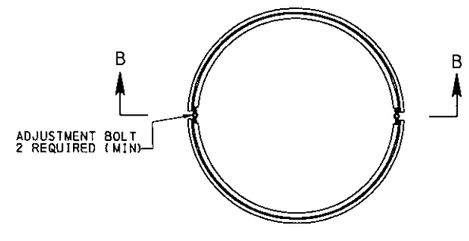
NOTES

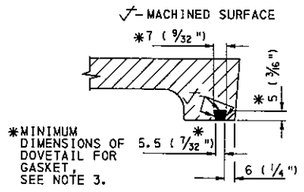
1. PROVIDE MANHOLE FRAMES AND COVERS MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 605.2(b). DESIGN MANHOLE FRAME, COVER AND GRADE ADJUSTMENT RINGS FOR PHL 93 (HS25) LIVE LOAD. IF MANHOLES ARE NOT IN OR ADJACENT TO ROADWAY, DESIGN FOR ALL POSSIBLE LIVE LOADS AS APPROVED BY THE DEPARTMENT.
2. PROVIDE 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 MINUMUM 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 (3/4") 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.



ELEVATION VIEW
OF MANHOLE FRAME







DETAIL A
GASKET SEALING SYSTEM

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

ADJUSTMENT RISERS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD MANHOLES COVERS, FRAMES AND ADJUSTMENT RISERS

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 4 OF 5
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-39M

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 (INCULDING 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, $g = 9.81\ m/s^2$

DENSITY OF EARTH, γ_E = 1920 kg/m³ (120#/CF)

ϕ = ANGLE OF INTERNAL FRICTION = 33°

DRY AT REST EARTH PRESSURE = $K_o\gamma_E = 0.001(1-\sin\phi)\gamma_{Eg}$
$= 0.001 \times 0.46 \times 1920 \times 9.81 = 8.7$ MPa

SATURATED AT REST EARTH PRESSURE = $K_o[0.001\gamma_{Eg} - \gamma_w] + \gamma_w$
$= 0.46\ [(0.001)(1920)(9.81) - 9.81] + 9.81$
$= 14.0$ MPa

$= 0.46 \times 120 = 55$ P.C.F.

(SATURATED AT REST EARTH PRESSURE = $K_o(\gamma_E - \gamma_w) + \gamma_w$
$= 0.46 \times (120 - 62.4) + 62.4$
$= 89$ 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.

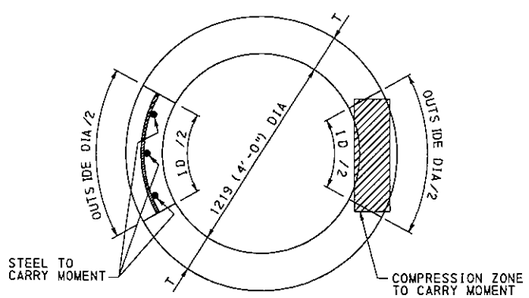
D. DETERMINE DIMENSIONS OF DESIGN SECTION TO CARRY MOMENT AS SHOWN IN FIGURE 1.

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.

$$Z = F_s \frac{\sqrt[3]{dc \times 2ds\text{t} \times b}}{\text{NO. OF BARS}} < 17.2\ \text{N/m}\ (98\ \text{kips/FT}) \qquad \text{DM4-8-16-8-4}$$



DESIGN SECTION TO CARRY MOMENT
FIGURE 1

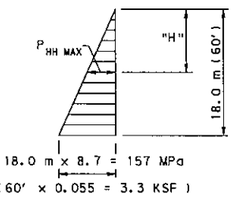
3. HOOP STEEL:

A. DETERMINE SERVICE MOMENTS AND AXIAL THRUSTS USING FIGURE 2 AND FIGURE 3. $P_{HH\ MIN}$ NOT TO BE GREATER THAN ONE-HALF OF $P_{HH\ MAX}$.

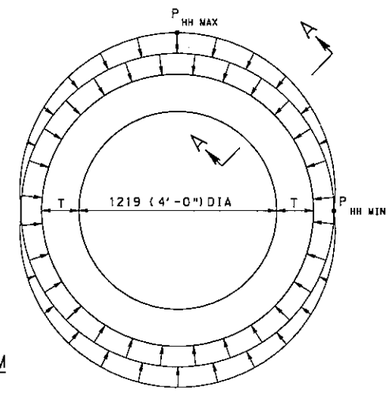
B. DESIGN HOOP REINFORCEMENT SHOWN IN SECTION A-A, TO CARRY THE MOMENT AND AXIAL THRUST.

C. CHECK CRACK CONTROL UNDER SERVICE LOAD.

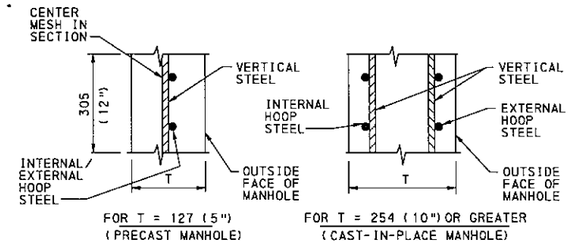
$$Z = F_s \frac{\sqrt[3]{dc \times 2ds\text{t} \times b}}{\text{NO. OF BARS}} < 17.2\ \text{N/m}\ (98\ \text{Kips/FT})$$



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



DIFFERENTIAL PRESSURE LOADING
TO DETERMINE HOOP MOMENTS
FIGURE 3



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)

$\frac{P}{A} \pm \frac{M}{S} < 290$ 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)

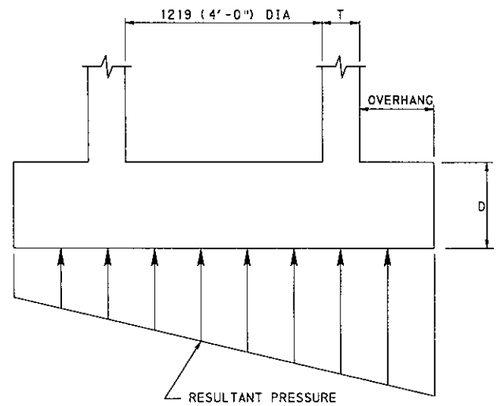
S = SECTION MODULUS OF FOOTING

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.

$$Z = F_s \frac{\sqrt[3]{dc \times 2ds\text{t} \times b}}{\text{NO. OF BARS}} < 17.2\ \text{N/m}\ (98\ \text{kips/FT})$$



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

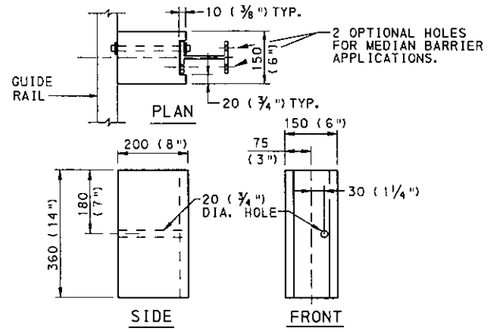
STANDARD MANHOLES DESIGN PROCEDURE

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

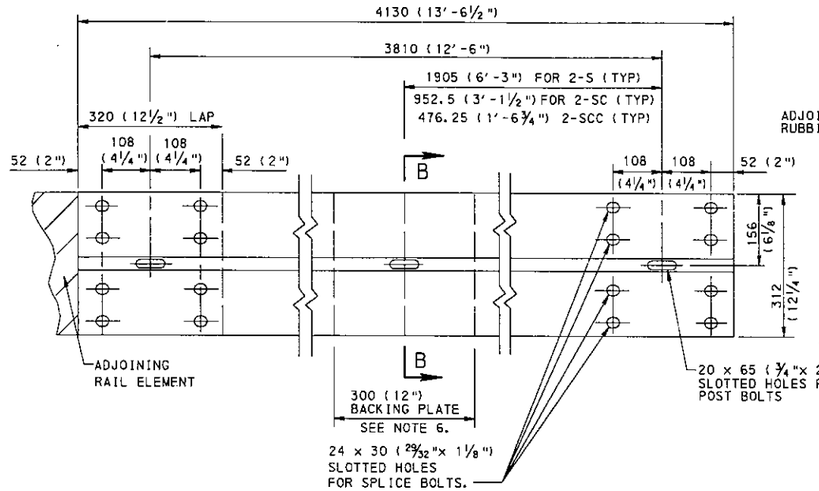
SHT 5 OF 5

RC-39M

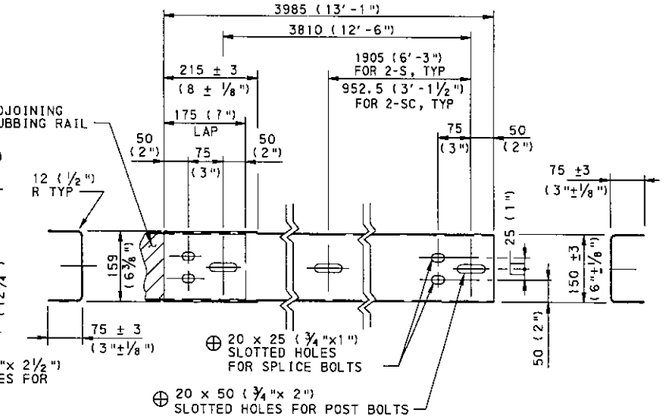


ROUTED OFFSET BRACKET

SEE SHEET 5

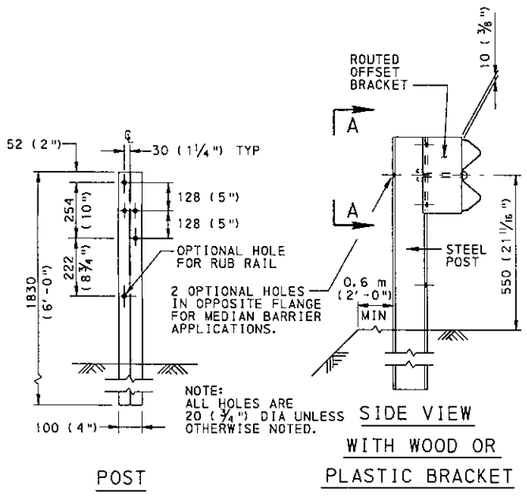


W-BEAM RAIL ELEMENT



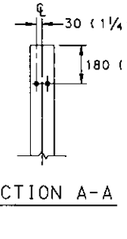
150 x 75 x 3.53 (6"x 3"x10 GAGE) THICK COLD FORMED CHANNEL OR C150 x 12 (C6"x 8.2) RUBBING RAIL

(SEE NOTE 4)



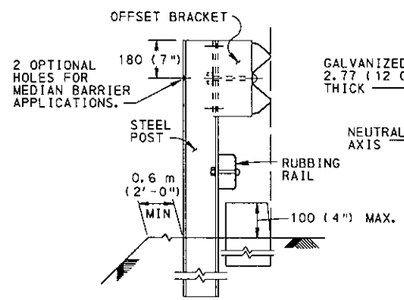
SIDE VIEW WITH WOOD OR PLASTIC BRACKET

POST



SECTION A-A

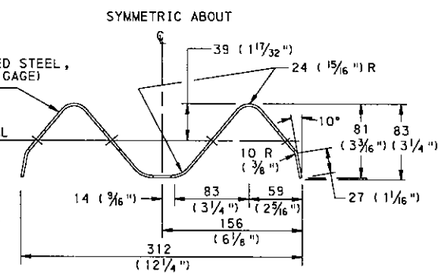
W150 x 13.5 (W6 x 8.5 or 9.0) POST DETAILS



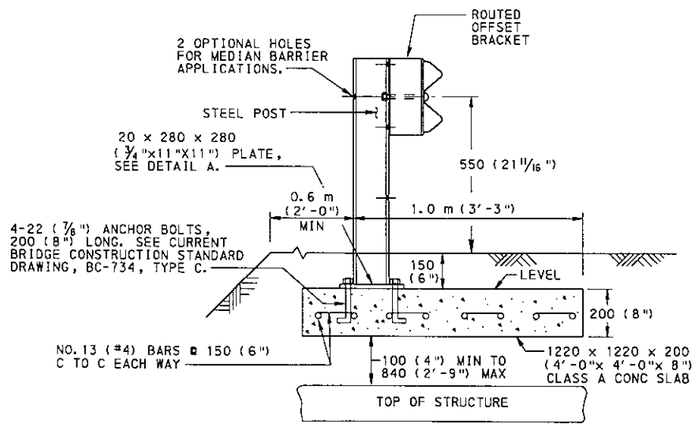
GUIDE RAIL WITH CURB OR RUBBING RAIL

(SEE NOTE 4)

⊕ FOR SPLICE BOLT AND POST BOLT DETAILS, SEE SHEET 2.

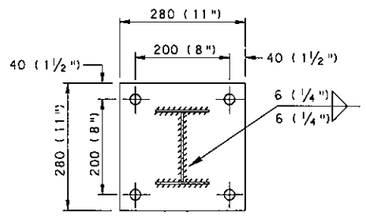


RAIL ELEMENT SECTION B-B



STEEL POSTS OVER UNDERGROUND STRUCTURES

(SEE NOTE 3)



DETAIL A

THICKNESS IS 19 (3/4 ")
ALL HOLES 25 (1") ø UNLESS OTHERWISE NOTED.

NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 620.
2. PROVIDE STEEL I-BEAM W150x13.5 (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.

RC-50M	GUIDE RAIL TRANSITION AT END OF STRUCTURE
BC-734M	STANDARD ANCHOR SYSTEMS
BC-739M	BRIDGE BARRIER TO GUIDE RAIL TRANSITION

REFERENCE DRAWINGS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

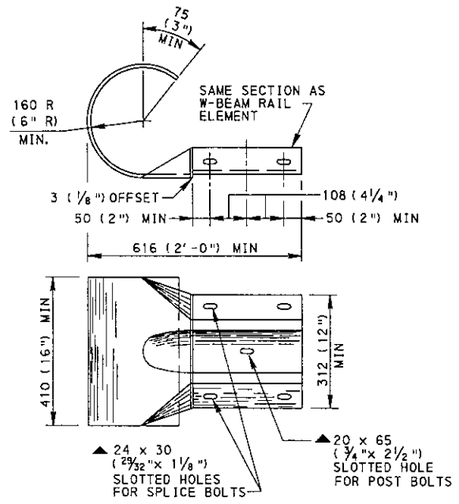
TYPE 2 STRONG POST GUIDE RAIL

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

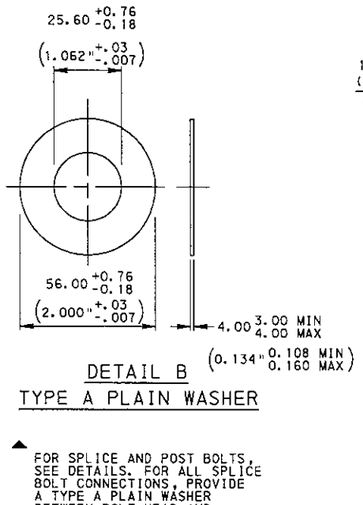
RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

SHT. 1 OF 6

RC-52M

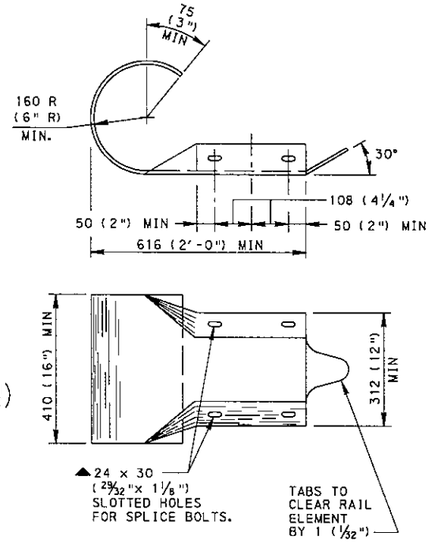


TERMINAL TO BE PLACED ON BACK OF RAIL ELEMENT

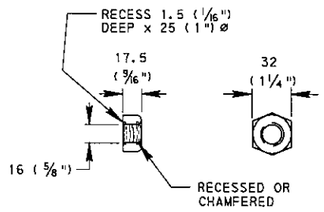


DETAIL B
TYPE A PLAIN WASHER

▲ FOR SPLICE AND POST BOLTS, SEE DETAILS. FOR ALL SPLICE BOLT CONNECTIONS, PROVIDE A TYPE A PLAIN WASHER BETWEEN BOLT HEAD AND TERMINAL SECTION. FOR WASHER, SEE DETAIL B.



TERMINAL TO BE PLACED ON FACE OF RAIL ELEMENT



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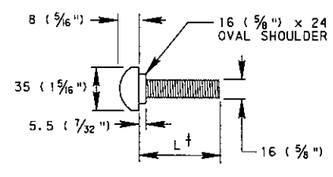
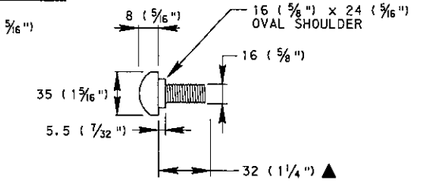


POST BOLT

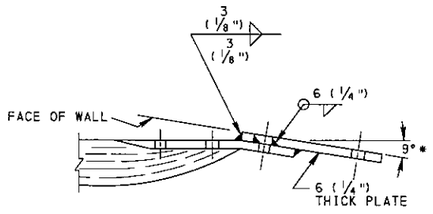


SPLICE BOLT

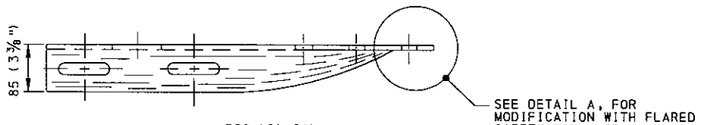
‡ USE L = 115 (4 1/2") FOR ALL RUBBING RAIL TO GUIDE RAIL POST CONNECTIONS AND USE L = 255 (10") FOR ALL W-BEAM RAIL ELEMENT TO GUIDE RAIL POST AND ROUTED OFFSET BRACKET CONNECTIONS.

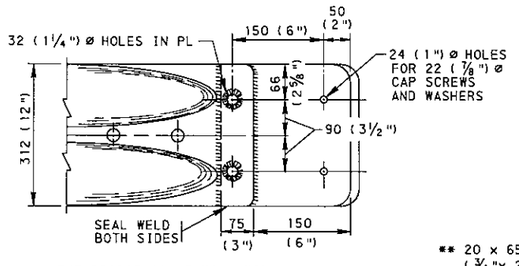
▲ FOR FOUR (4) PANEL NESTED RAIL ELEMENT USE 54 (2 1/8") SPLICE BOLT.

ALTERNATE TERMINAL SECTIONS



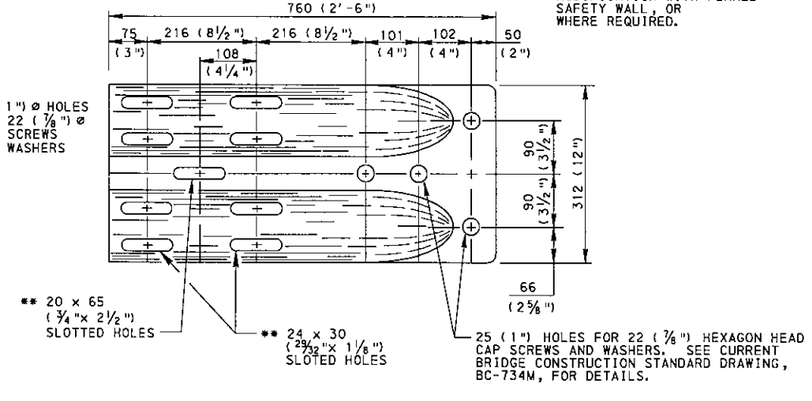
* OR TO BE DETERMINED BY ENGINEER.





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

DETAIL A



** 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.

TERMINAL SECTION BRIDGE CONNECTION

NOTES

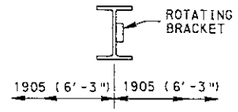
1. USE SPLICE BOLTS TO DEVELOP THE DESIGN STRENGTH OF THE RAIL ELEMENT.
2. PROVIDE TERMINAL SECTION BRIDGE CONNECTION, WITH WELDED PLATE FOR SAFETY, AS AN INCIDENTAL ITEM.
3. USE SLOTTED ROUND-HEADED BOLTS TO PROVIDE FOR WRENCH OR SCREWDRIVER.

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 AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT. 2 OF 6
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-52M

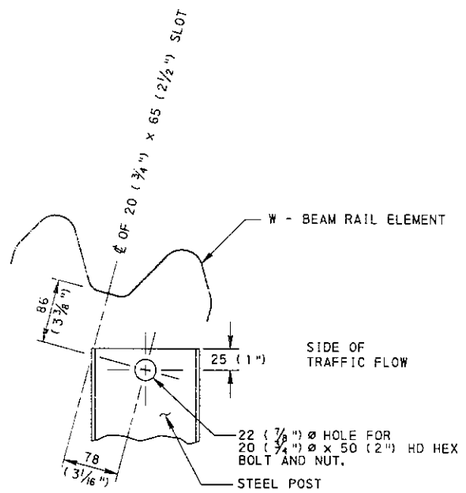


W150 (6) x 13.5 (9) POST

POSITIONING OF ROTATING BRACKET

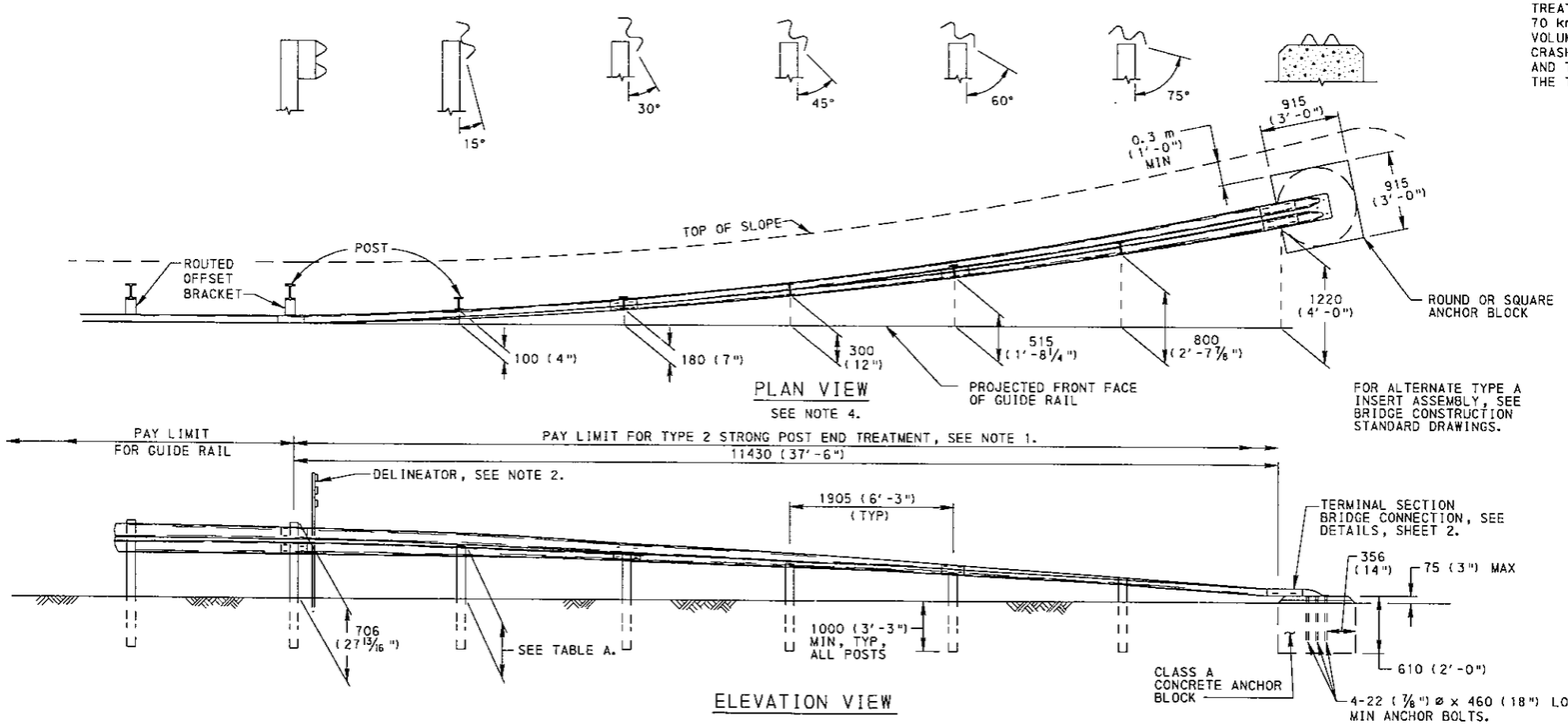
TABLE A

HEIGHT OF POST	430 (17")	370 (14½")	300 (11¾")	215 (8½")	115 (4½")
ROTATION ANGLES	15°	30°	45°	60°	75°



TYPICAL FOR
15° THRU 75° POSITIONS

ROTATING BRACKET



TYPE 2 STRONG POST END TREATMENT

SEE NOTE 5.

NOTES

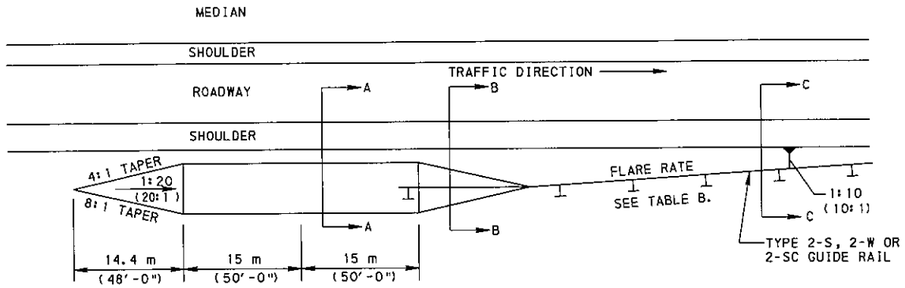
1. PAYMENT FOR TYPE 2 STRONG POST END TREATMENT INCLUDES 11430 (37'-6") OF SLOPING RAIL, TERMINAL SECTION, HARDWARE, EXCAVATION AND CONCRETE.
2. INSTALL DELINEATOR ASSEMBLIES UNDER SEPARATE PAY ITEM OR CONTRACT. FOR ADDITIONAL DETAILS, SEE TRAFFIC STANDARD TC-7604.
3. ONLY THE NECESSARY DIMENSIONS, FOR UNIFORMITY AND INTERCHANGEABILITY OF ROTATING BRACKETS, ARE INDICATED. PROVIDE ROTATING BRACKETS SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15.
4. MEASURE OFFSETS FROM THE PROJECTED FRONT FACE OF THE GUIDE RAIL TO THE FRONT FACE OF THE POST.
5. 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.

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

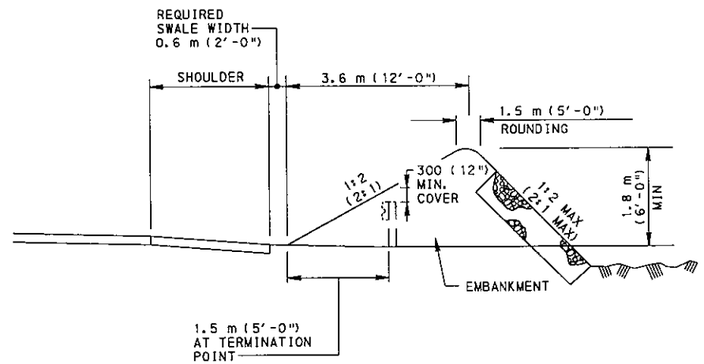
TYPE 2 STRONG POST GUIDE RAIL END TREATMENTS

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT. 3 OF 6
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-52M

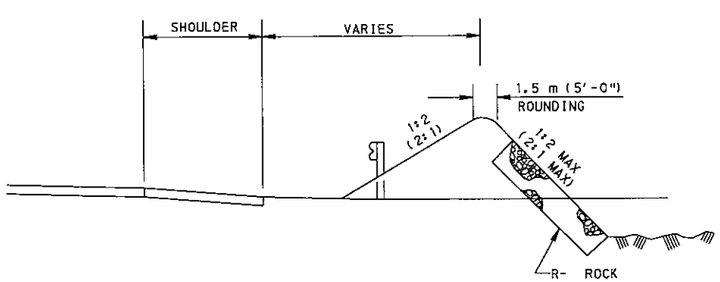


TYPICAL EARTH MOUND FOR BURYING GUIDE RAIL

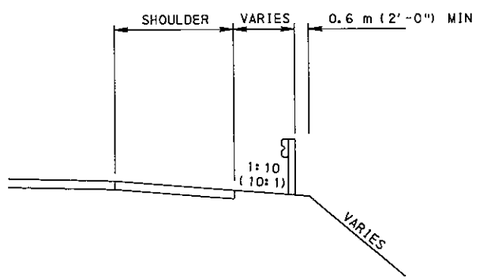
SEE NOTE 2.



SECTION A-A



SECTION B-B



SECTION C-C

TABLE B

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
105	65	19 : 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
65	40	11 : 1	9 : 1
60	35	10 : 1	8 : 1
50	30	8 : 1	7 : 1

NOTES

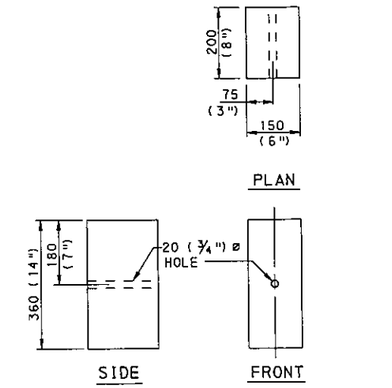
1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408.
2. ALL MATERIAL NECESSARY TO CONSTRUCT EARTH MOUNDS ARE IN ACCORDANCE WITH APPLICABLE SECTIONS OF PUBLICATION 408.
3. EARTHMOUNDS MAY BE USED TO BURY GUIDE RAIL ON HIGHWAYS WITH POSTED SPEEDS LESS THAN 70 km/h (45 mph) 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

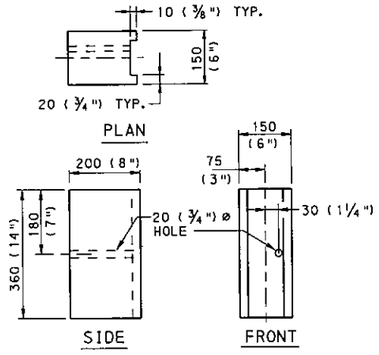
TYPE 2 STRONG POST GUIDE RAIL END TREATMENTS

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT. 4 OF 6
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-52M



WOOD OR PLASTIC OFFSET BRACKET

TO BE USED WITH WOOD POSTS

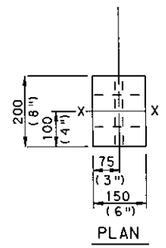


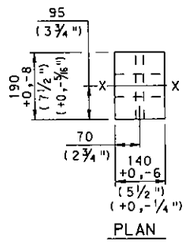
ROUTED OFFSET BRACKET

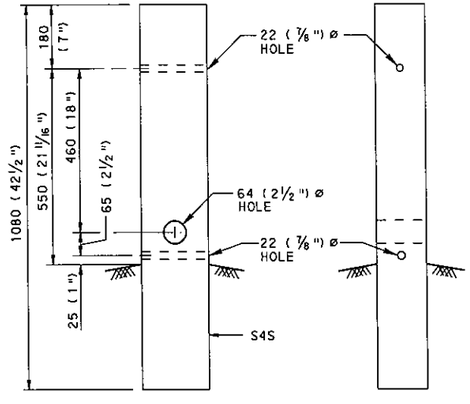
(WOOD, PLASTIC OR COMPOSITE)
TO BE USED WITH STEEL POSTS

NOTES

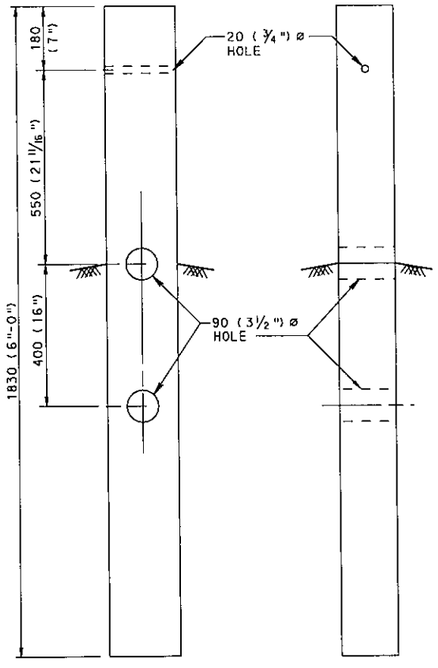
1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408.
2. WOOD POSTS ARE TO BE USED FOR END TREATMENTS AND SPECIAL CONDITIONS ON A CASE BY CASE BASIS. THEY ARE NOT TO BE USED AS ALTERNATES TO STEEL POSTS FOR GUIDE RAIL.





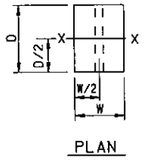


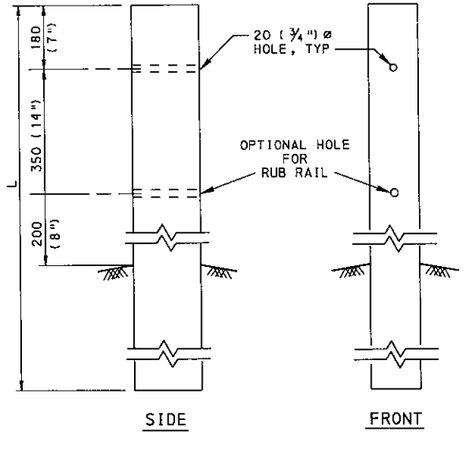
SHORT BREAKAWAY TIMBER POST



LONG BREAKAWAY TIMBER POST

L	W	D
1625 (5'-4")	150 (6")	200 (8")
1830 (6'-0")	150 (6")	200 (8")
1980 (6'-6")	150 (6")	200 (8")
2060 (6'-9")	150 (6")	200 (8")





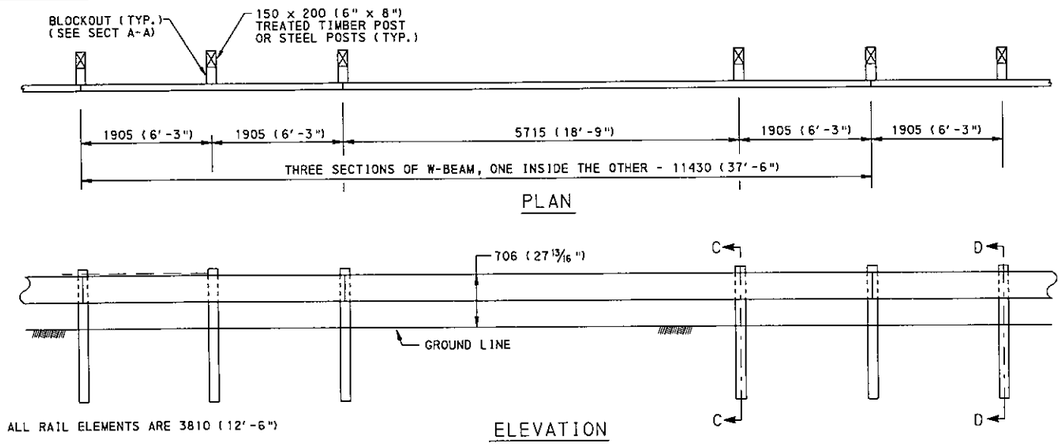
TIMBER GUIDERAIL POST

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

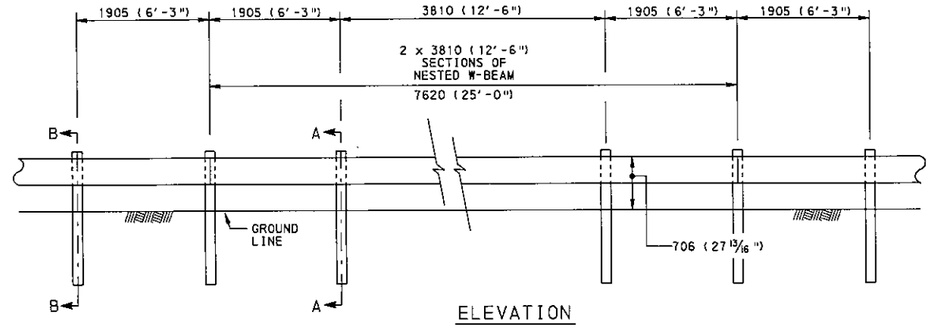
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST GUIDE RAIL POSTS AND OFFSET BRACKETS

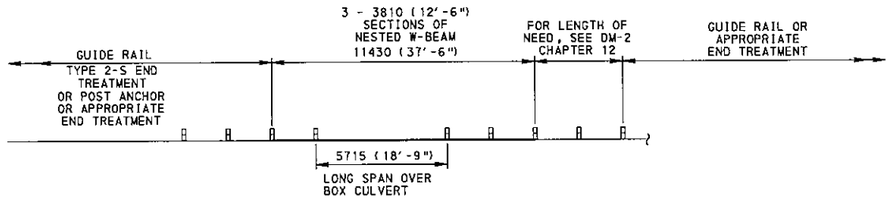
RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT. 5 OF 6
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-52M



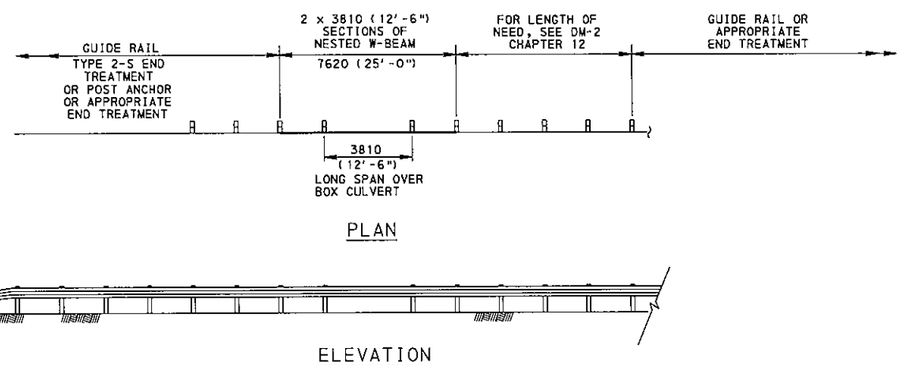
CASE 2



CASE 1



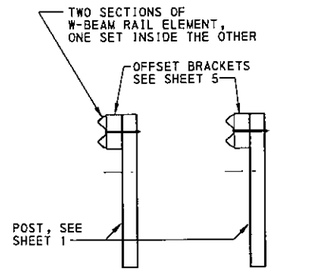
5715 (18'-9") SPAN
DETAILS OF NESTED W-BEAM (TYPE 2-S) GUIDERAIL
ACROSS LOW-FILL CULVERTS
CASE 2

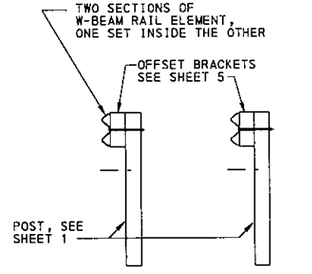


3810 (12'-6") SPAN
DETAILS OF NESTED W-BEAM (TYPE 2-S) GUIDERAIL
ACROSS LOW-FILL CULVERTS
CASE 1

NOTE

FOR CASE 1 OR CASE 2 INSTALLATIONS, THE LENGTH OF W-BEAM RAIL MAY BE LONGER THAN AS SHOWN TO ACCOMODATE SPLICING OF THE RAIL ELEMENTS. RAIL ELEMENTS MAY BE CUT OR STAGGERED AND LONGER SPLICE BOLTS MAY BE USED. LAP RAIL ELEMENTS IN THE DIRECTION OF TRAFFIC.





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 ACROSS CULVERTS

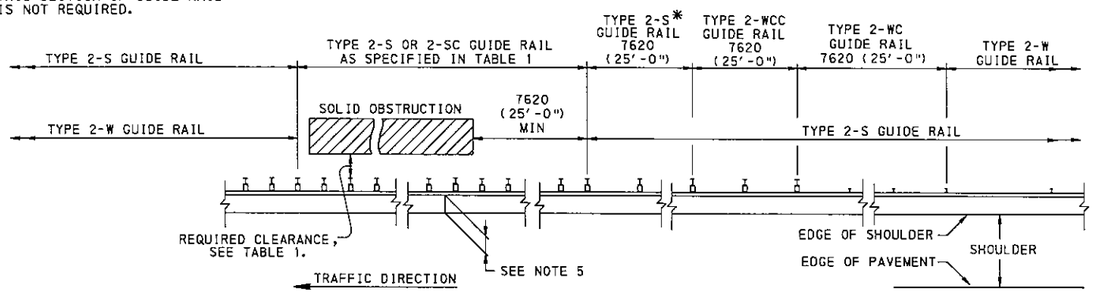
RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

SHT. 6 OF 6

RC-52M

* 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

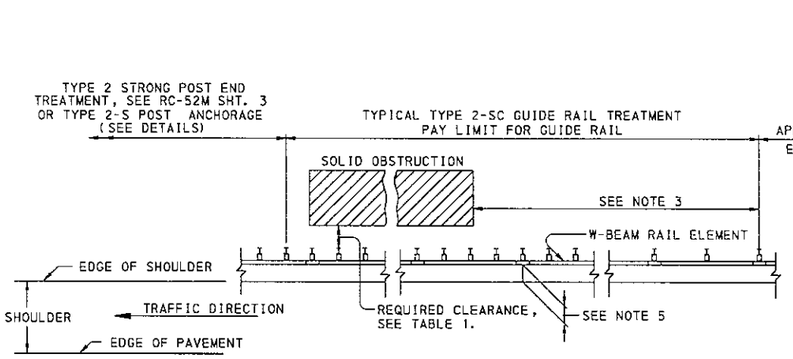
TABLE 1

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")

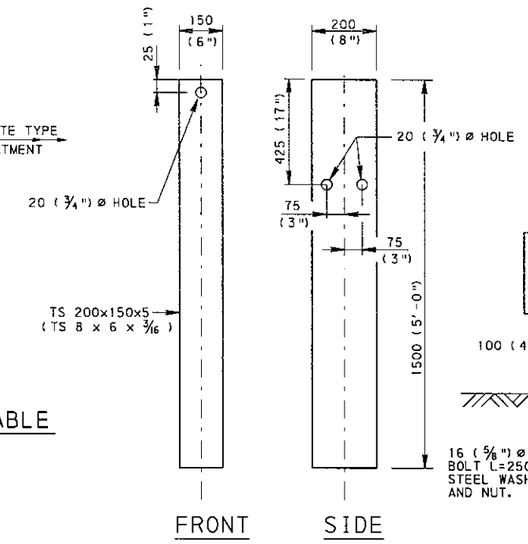
† THE MINIMUM UNOBSTRUCTED DISTANCE FROM BACK OF GUIDE RAIL POST TO FACE OF OBSTRUCTION.

NOTES

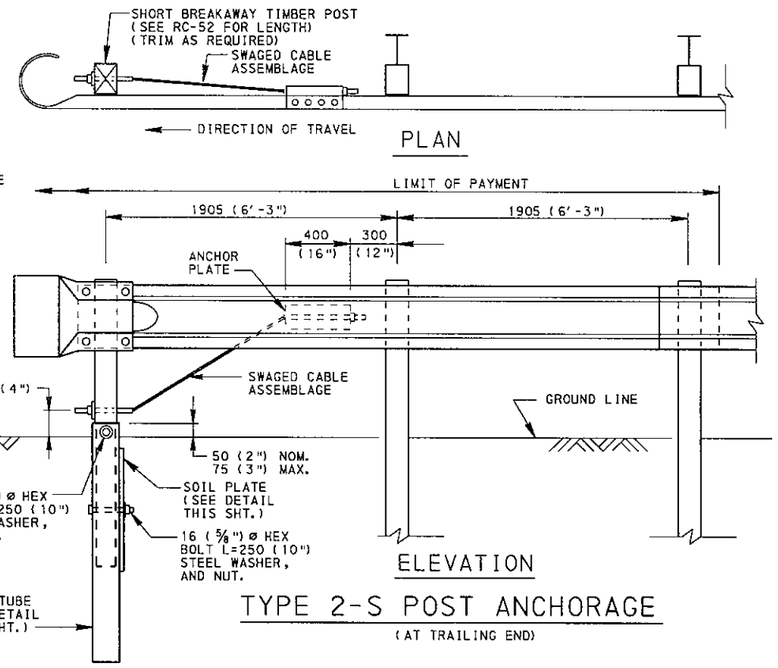
1. THE TREATMENTS SHOWN ARE FOR FOUR LANE DIVIDED HIGHWAYS. USE THE APPROACH END TREATMENT AT BOTH SIDES OF THE OBSTRUCTION ON TWO-LANE FACILITIES WITH TWO-WAY TRAFFIC.
2. THIS STANDARD HAS BEEN PREPARED AS A GUIDE FOR THE PLACEMENT OF GUIDE RAIL AND MEDIAN BARRIER. IT IS IMPRACTICAL TO PROVIDE A STANDARD 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.



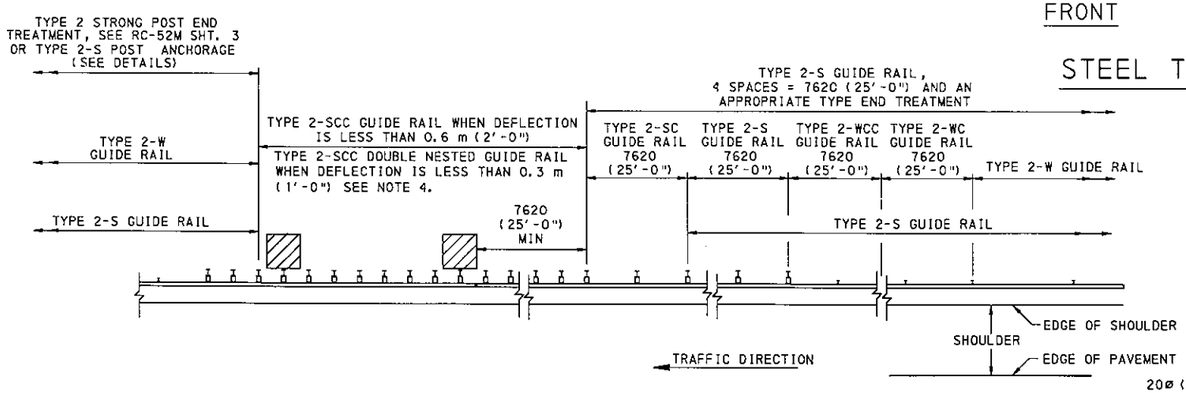
TYPICAL GUIDE RAIL TREATMENT
WHEN THE REQUIRED CLEARANCE TO OBSTRUCTION IS AVAILABLE



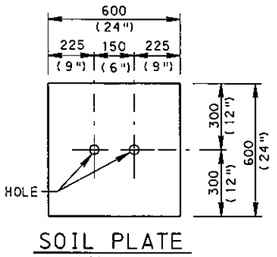
STEEL TUBE



TYPE 2-S POST ANCHORAGE
(AT TRAILING END)



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



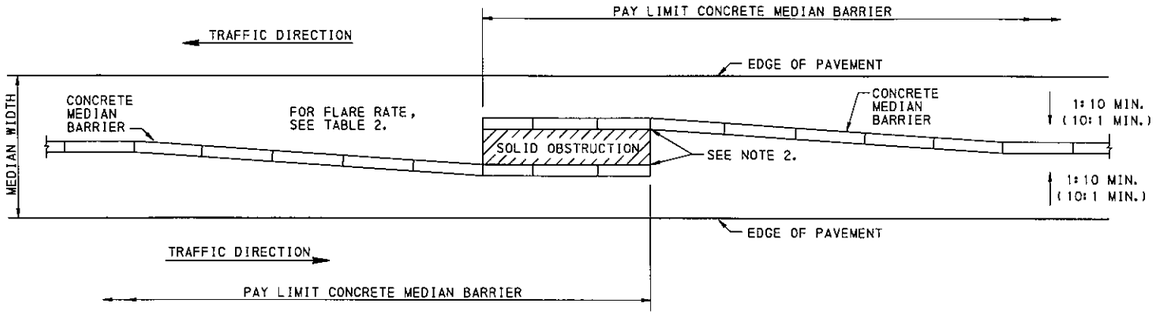
SOIL PLATE
6 (¼") THICK

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

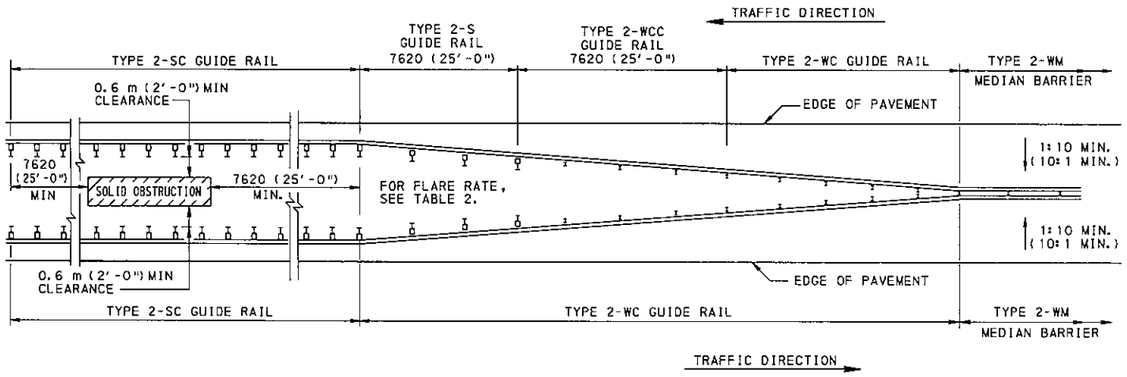
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BARRIER PLACEMENT AT OBSTRUCTIONS

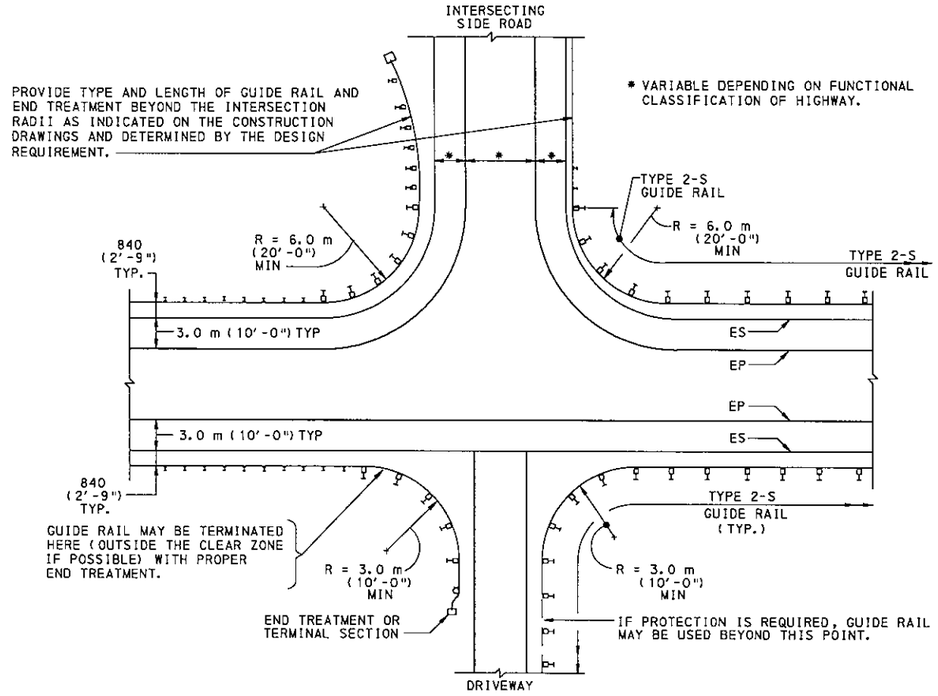
RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT. 1 OF 7
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-54M



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 AT INTERSECTIONS AND DRIVEWAYS

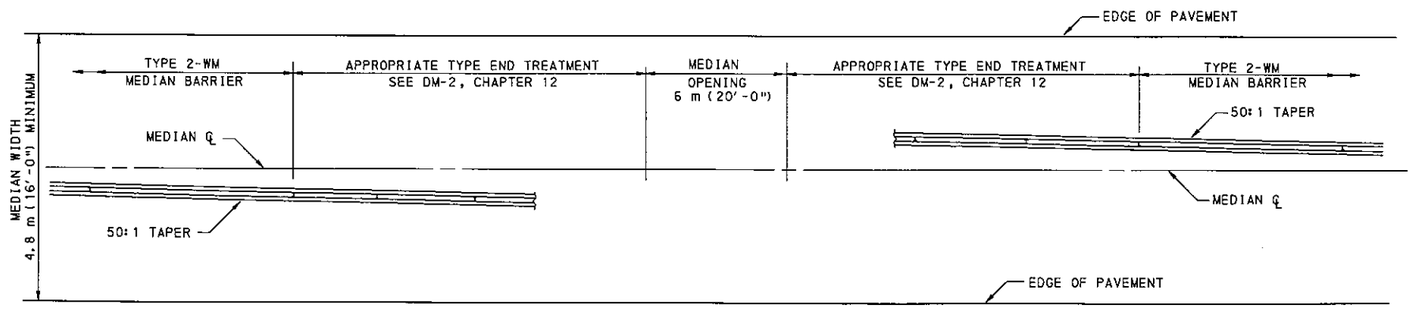
TABLE 2

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
105	65	19 : 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
65	40	11 : 1	9 : 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.



TREATMENT FOR TYPE 2-WM MEDIAN BARRIER CROSS-OVER

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

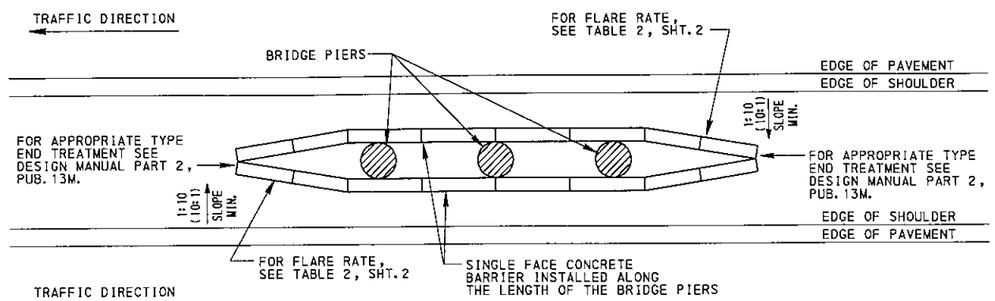
BARRIER PLACEMENT AT OBSTRUCTIONS

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

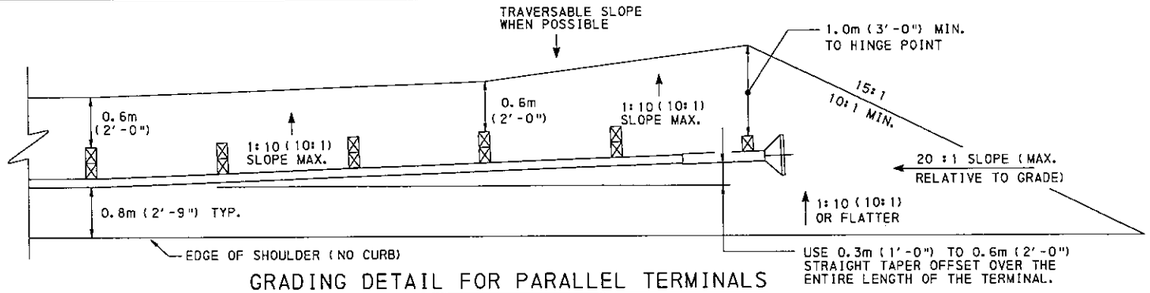
RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

SHT 2 OF 7

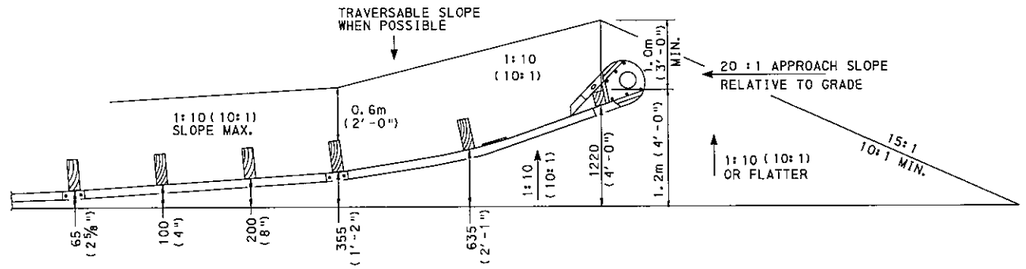
RC-54M



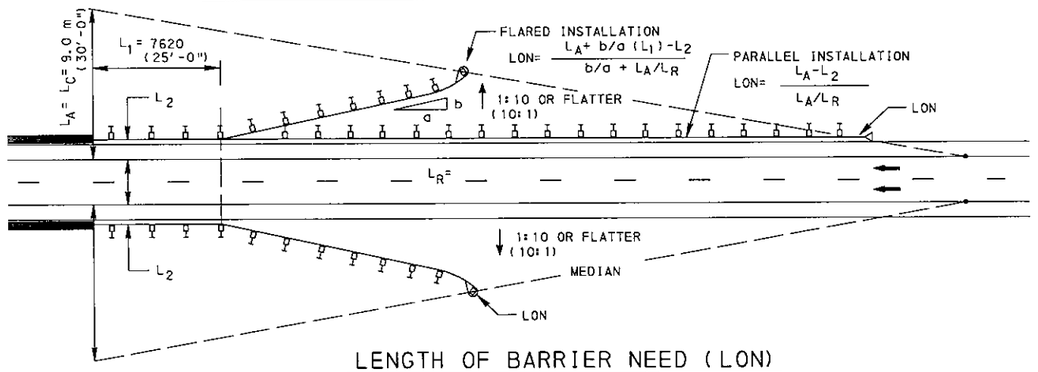
TREATMENT AT OBSTRUCTIONS FOR MEDIAN WIDTHS GREATER THAN 6.0 m (20'-0") WHERE CONTINUOUS BARRIER IS NOT REQUIRED



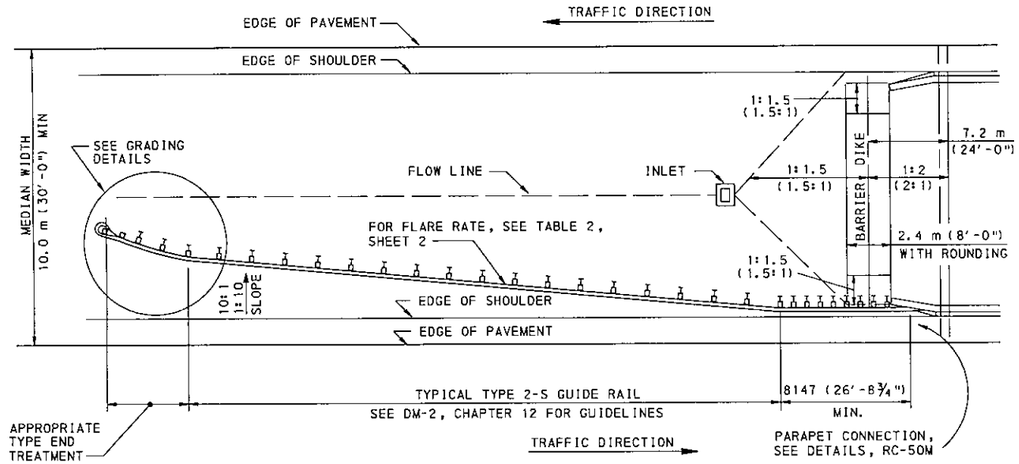
GRADING DETAIL FOR PARALLEL TERMINALS



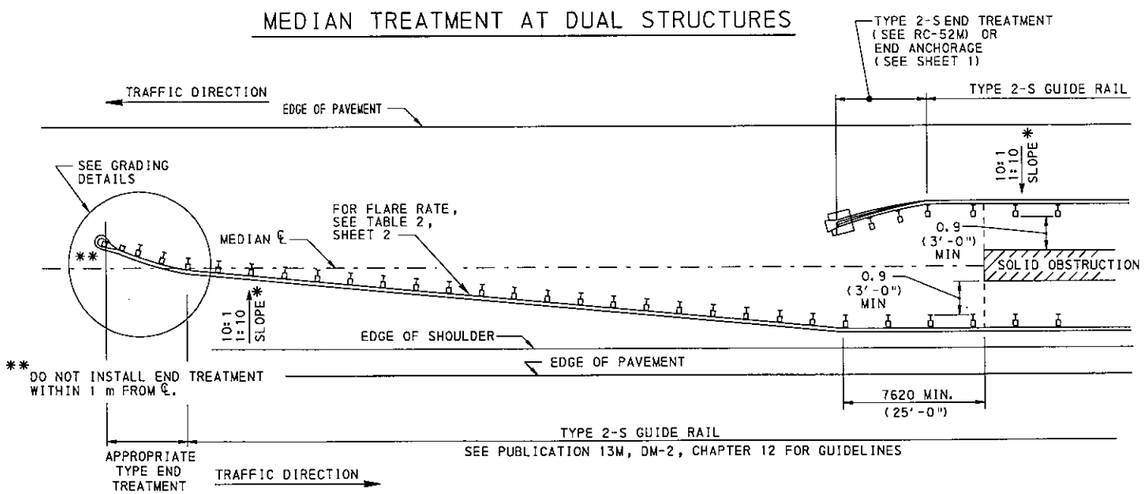
GRADING DETAIL FOR FLARED TERMINALS



LENGTH OF BARRIER NEED (LON)



MEDIAN TREATMENT AT DUAL STRUCTURES



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

NOTE:
FOR FURTHER END TREATMENT DETAILS SEE DM-2, CHAPTER 12 FOR GUIDELINES.

* 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.

COMMONWEALTH OF PENNSYLVANIA
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BARRIER PLACEMENT AT OBSTRUCTIONS

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 3 OF 7
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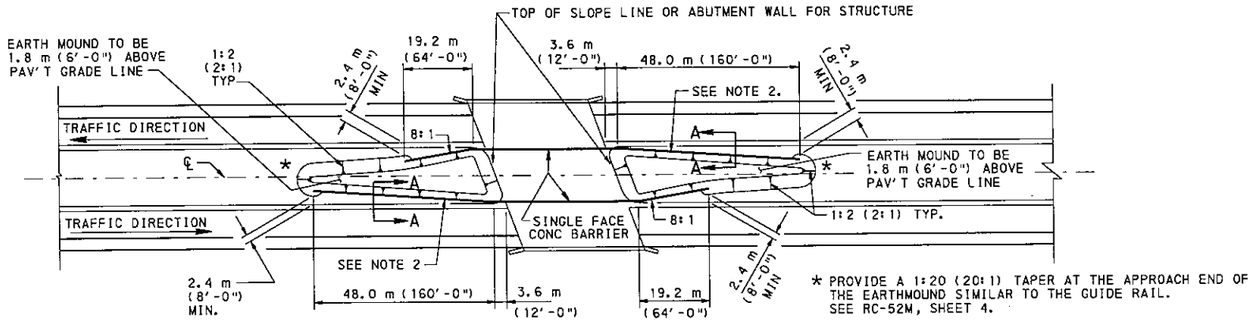
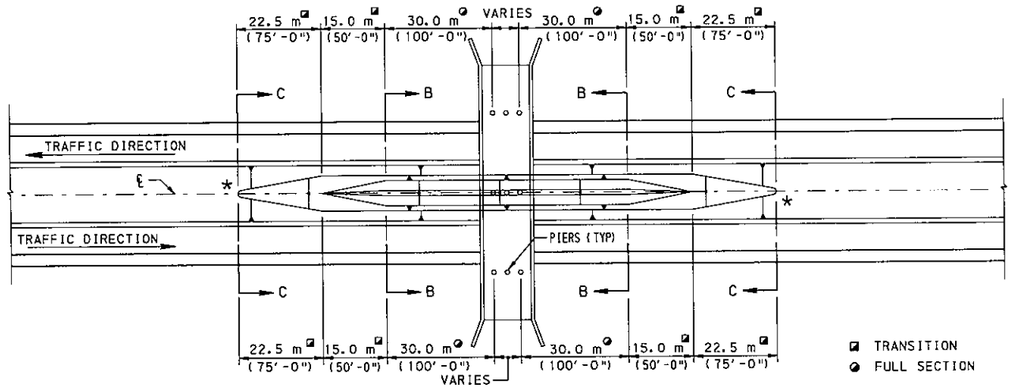


* PROVIDE A 1:20 (20:1) TAPER AT THE APPROACH END OF THE EARTHMOUND SIMILAR TO THE GUIDE RAIL. SEE RC-52M, SHEET 4.

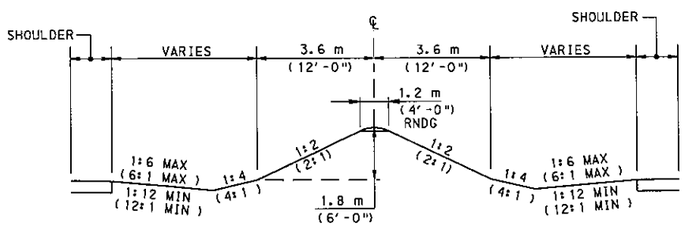
TYPICAL MEDIAN EARTH MOUND DETAIL FOR AT-GRADE DUAL BRIDGES

SEE NOTE 4

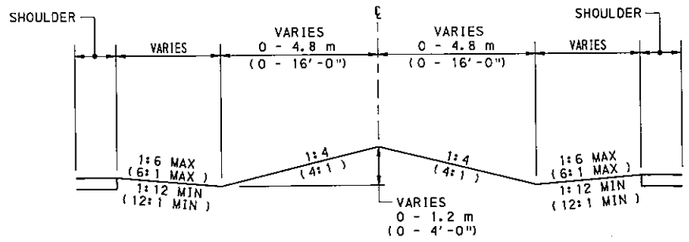


TYPICAL MEDIAN EARTH MOUND DETAIL FOR OVERHEAD STRUCTURES FOR MEDIAN WIDTHS OF 18.0 M (60'-0") OR GREATER

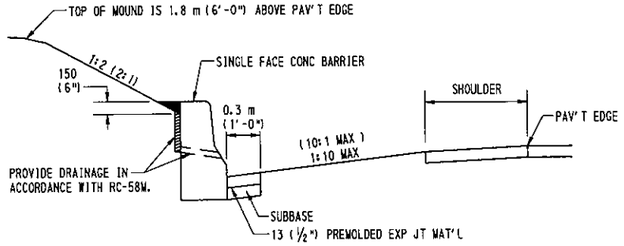
SEE NOTE 4



SECTION B-B



SECTION C-C



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.

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

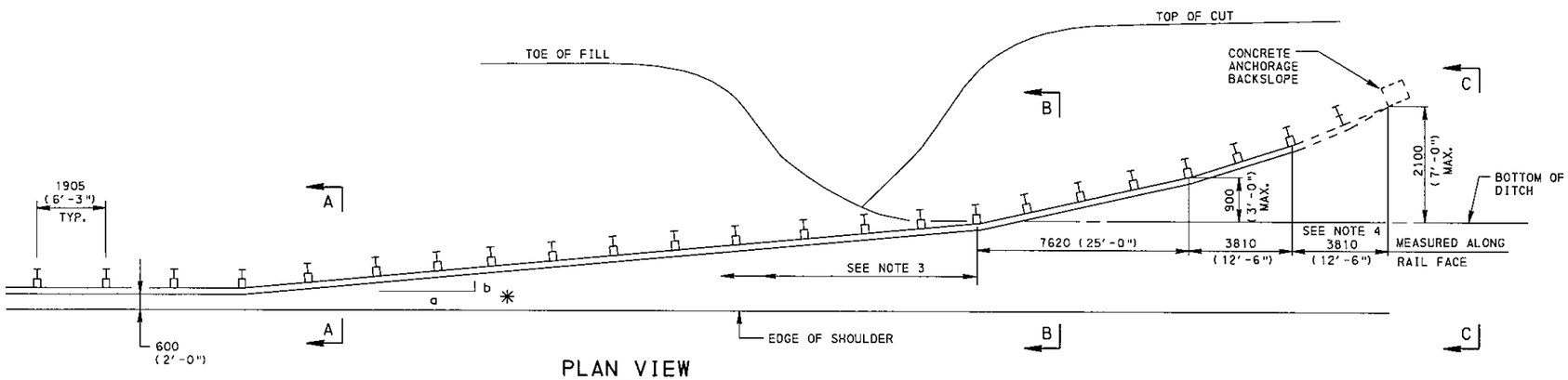
BARRIER PLACEMENT AT OBSTRUCTIONS

EARTH MOUNDS

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 4 OF 7
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-54M

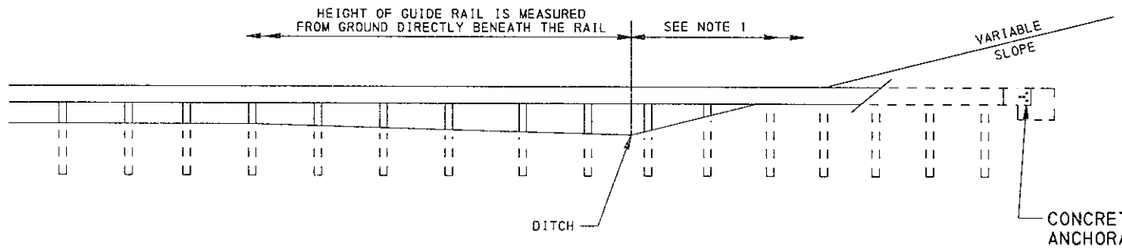
GENERAL NOTES:

1. HEIGHT OF GUIDE RAIL MAY BE TAPERED DOWN AFTER CROSSING DITCH BOTTOM TO ACHIEVE ONE FOOT OF COVER.
2. 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.
3. PROVIDE 23.0 m (75'-0") MINIMUM FROM WHERE THE GUIDE RAIL CROSSES THE SWALE LINE TO THE BEGINING OF THE HAZARD.
4. BACKSLOPE ANCHOR TERMINAL PAY LIMIT INCLUDES THE CONCRETE OR POST ANCHORAGE, 3810 (12'-6") OF RAIL ELEMENT AND HARDWARE.

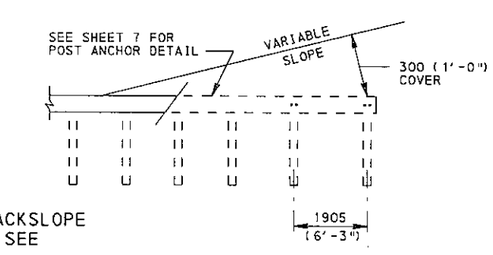


PLAN VIEW

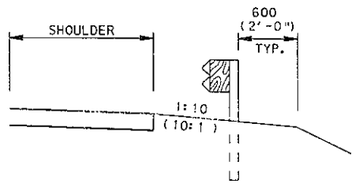
* a: b= 12.5 : 1
9 : 1 LOWSPEED
(LESS THAN 45 mph)



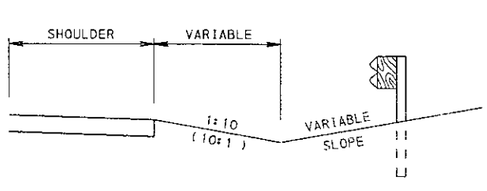
ELEVATION VIEW (PROFILE ALONG RAIL)



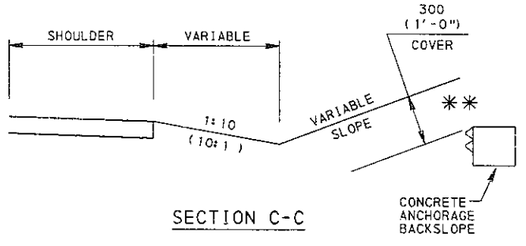
POST BACKSLOPE ANCHORAGE



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.

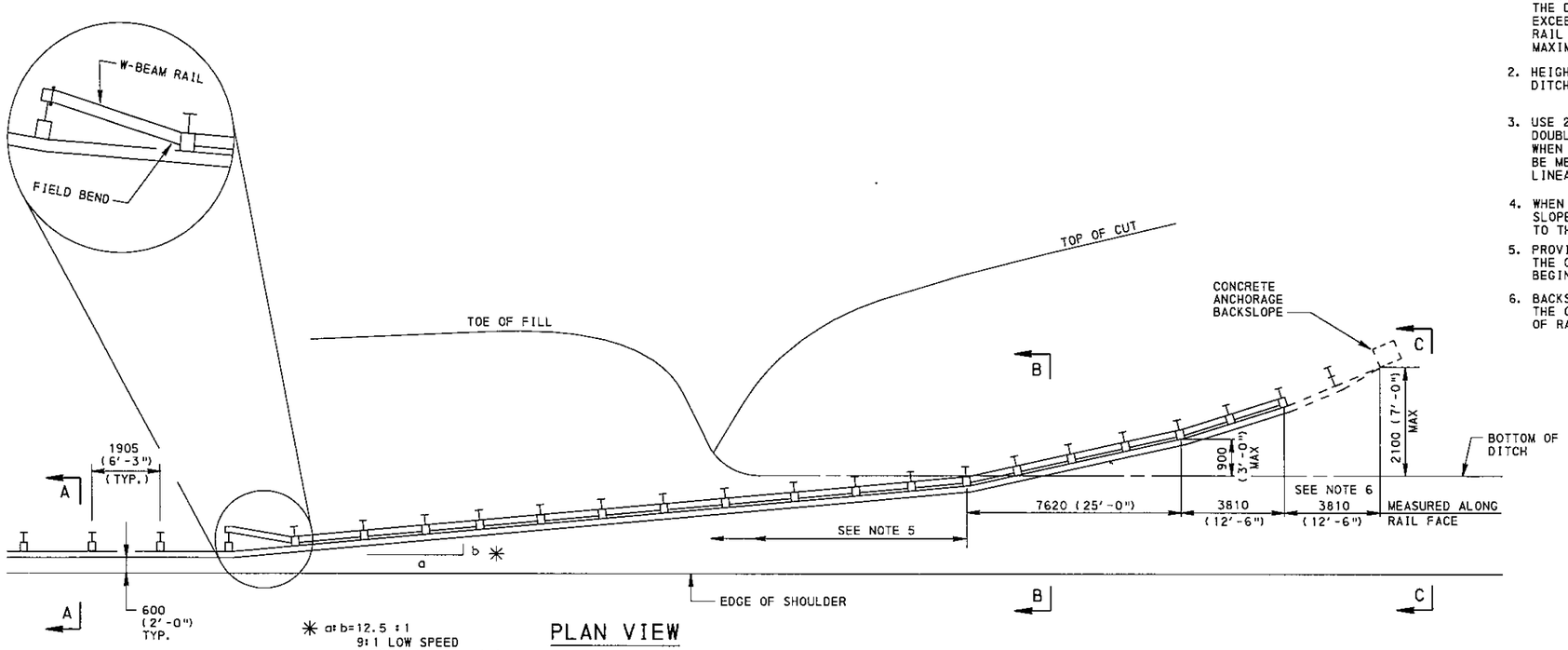
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

GUIDE RAIL BACKSLOPE ANCHOR TERMINAL SINGLE RAIL 10:1 FRONT SLOPE

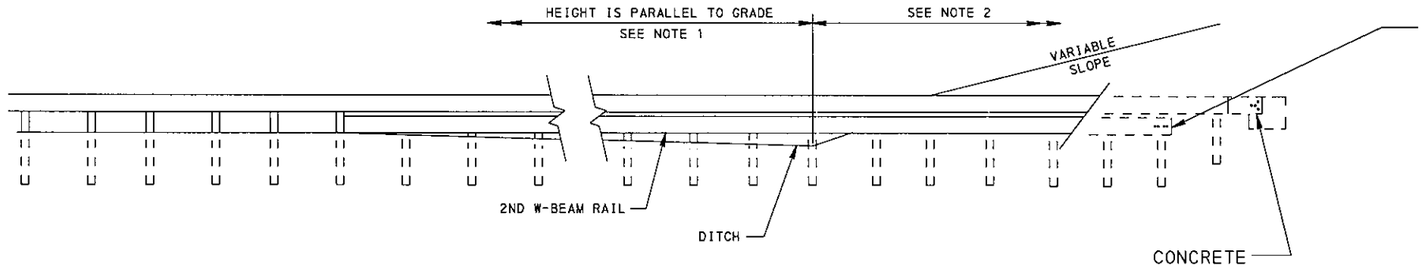
RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 5 OF 7
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-54M

GENERAL NOTES:

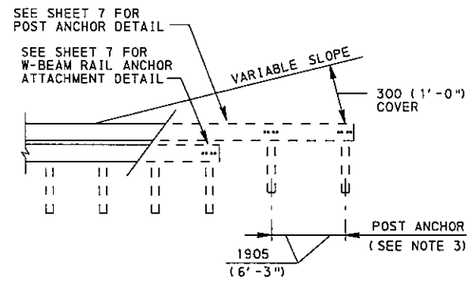
1. THE TOP OF THE W-BEAM RAIL IS HELD CONSTANT RELATIVE TO ROADWAY PROFILE GRADE. A SECOND W-BEAM RAIL IS REQUIRED WHERE THE DISTANCE BETWEEN THE GROUND AND BOTTOM OF THE TOP RAIL EXCEEDS 450 (18") AND IS INCREASING. MAXIMUM HEIGHT OF DOUBLE RAIL SYSTEM IS 1140 (45"), TAPER BOTH RAILS TO MAINTAIN MAXIMUM HEIGHT. FLARE RATE FOR THE RAIL IS 12½:1.
2. HEIGHT OF GUIDE RAIL MAY BE TAPERED DOWN AFTER CROSSING DITCH BOTTOM TO ACHIEVE ONE FOOT OF COVER.
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. PROVIDE 23.0 m (75'-0") MINIMUM FROM WHERE THE GUIDE RAIL CROSSES THE SWALE LINE TO THE BEGINING OF THE HAZARD.
6. BACKSLOPE ANCHOR TERMINAL PAY LIMIT INCLUDES THE CONCRETE OR POST ANCHORAGE, 3810 (12'-6") OF RAIL ELEMENT POSTS AND HARDWARE.



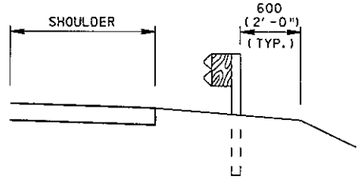
PLAN VIEW



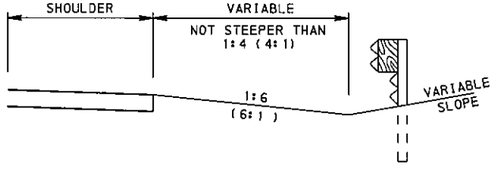
ELEVATION VIEW (PROFILE ALONG RAIL)



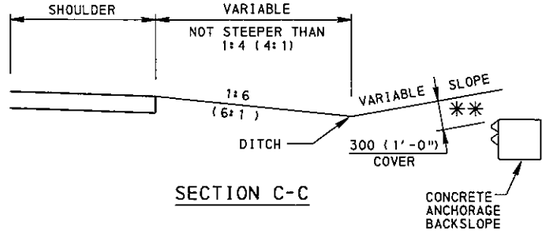
POST END ANCHORAGE



SECTION A-A



SECTION B-B
WITH W-BEAM RAIL



SECTION C-C

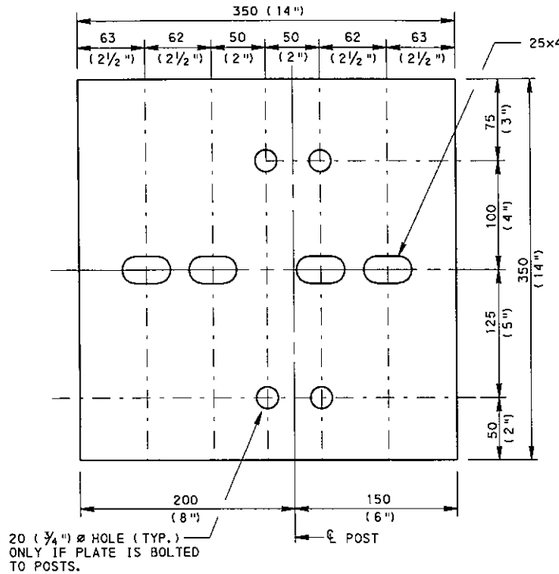
** ROCK ANCHORAGE DOES NOT REQUIRE THE 300 (1'-0") BURIAL.

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

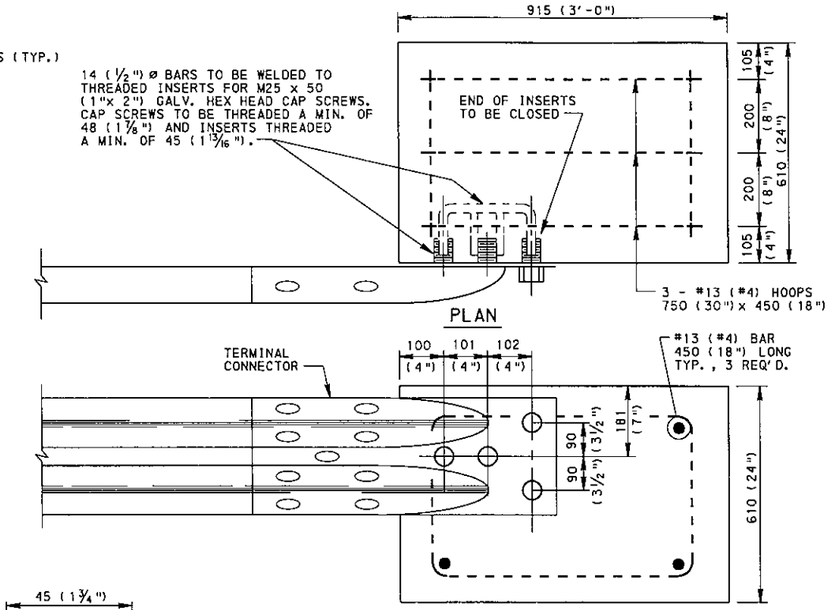
GUIDE RAIL BACKSLOPE ANCHOR TERMINAL 6:1 FRONT SLOPE

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 6 OF 7
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-54M

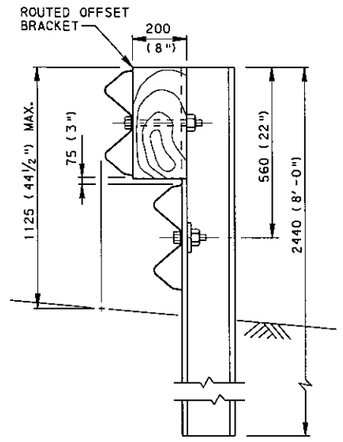


STEEL PLATE - 13 mm (½")

GALVANIZED
WELDED OR BOLTED TO POST

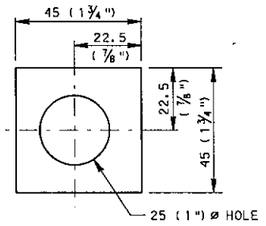


CONCRETE BLOCK ANCHOR



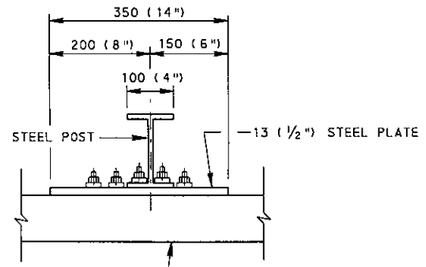
TYPICAL ELEVATION

STEEL POST
W150x13.5 (W6x8.5)

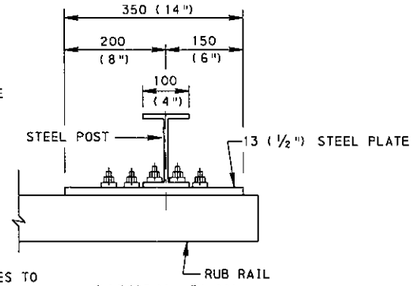


SQUARE WASHER

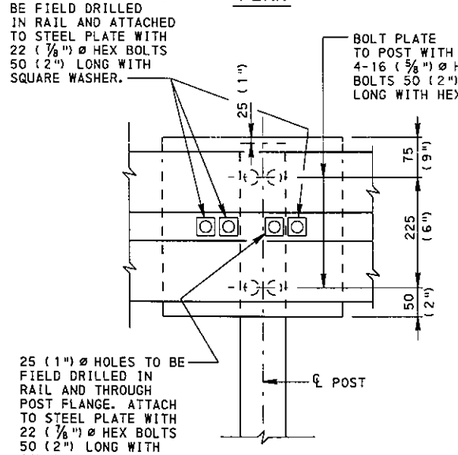
5 (¼") THICK - GALVANIZED



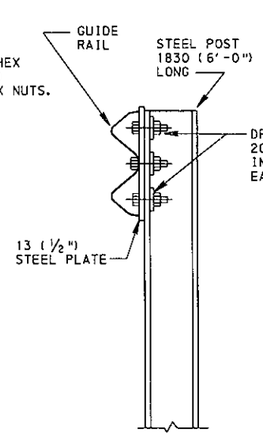
PLAN



PARTIAL PLAN



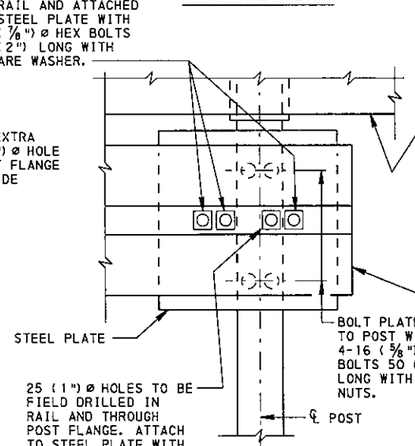
FRONT VIEW



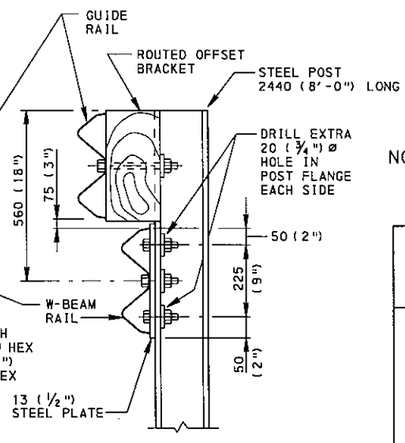
ELEVATION

POST ANCHOR DETAIL

DIMENSIONS ARE TYPICAL



FRONT VIEW



ELEVATION

W-BEAM RAIL ATTACHMENT

NOTE

FOR ROUTED OFFSET BRACKET DETAIL SEE RC-52M.

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

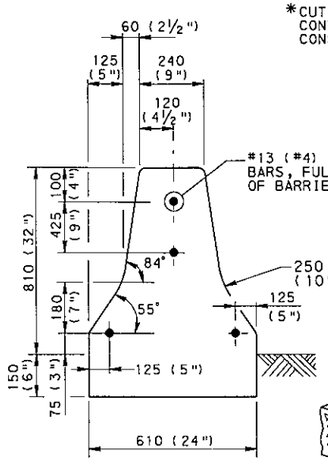
BACKSLOPE ANCHOR TERMINAL END ANCHORAGE DETAILS

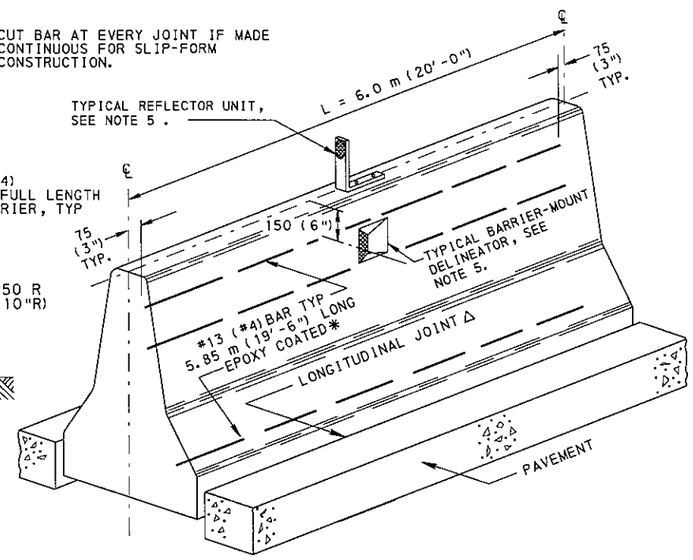
RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 1 OF 1
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-54M

NOTES

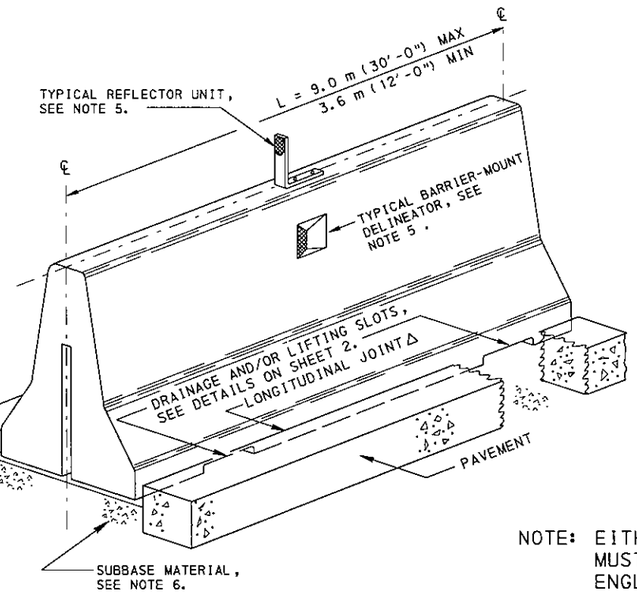
1. PROVIDE CONCRETE MEDIAN BARRIER MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 623.
   A. MINIMUM CONCRETE CLASS: AA, EXCEPT USE CLASS AAA CONCRETE FOR PRECAST BARRIER.
2. PROVIDE PRECAST CONCRETE BARRIER SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15. FOR DEVIATIONS OR MODIFICATIONS OF 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.

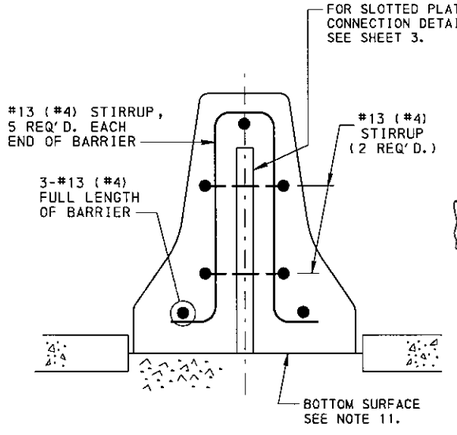
   FOR PERMANENT INSTALLATIONS, PLACE DELINEATORS AT A MAXIMUM LONGITUDINAL SPACING OF 25 m (80'-0") FOR TANGENT SECTIONS AND 12 m (40'-0") FOR CURVE SECTIONS WITH A HORIZONTAL RADIUS LESS THAN 305 m (1000').
6. COMPACT NO. 2A OR NO. 0GS MATERIAL IN ACCORDANCE WITH PUBLICATION 408, SECTION 350. A LAYER 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 LONGITUDINAL 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.

Δ SEAL JOINTS WITH AN APPROVED JOINT SEALER.

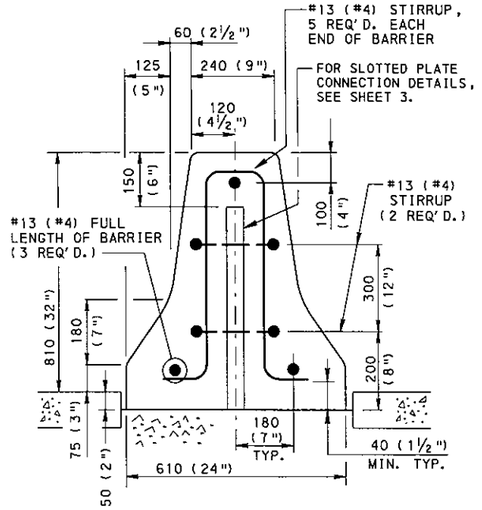
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

BC-736M	REINFORCEMENT BAR FABRICATION DETAILS
REFERENCE DRAWINGS	

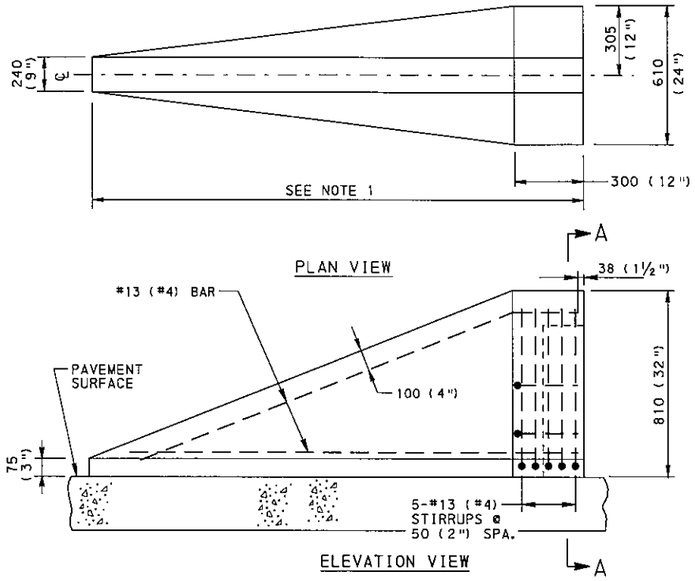
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER F-SHAPE

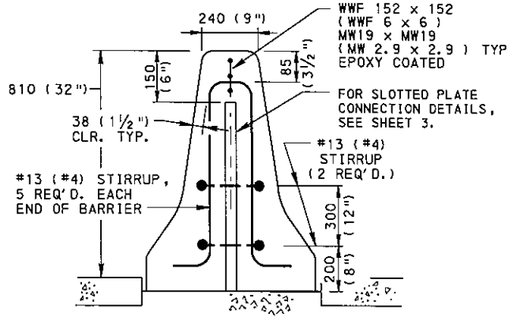
RECOMMENDED AUG. 21, 2002 DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 21, 2002 CHIEF ENGINEER	SHT 1 OF 8
		RC-57M



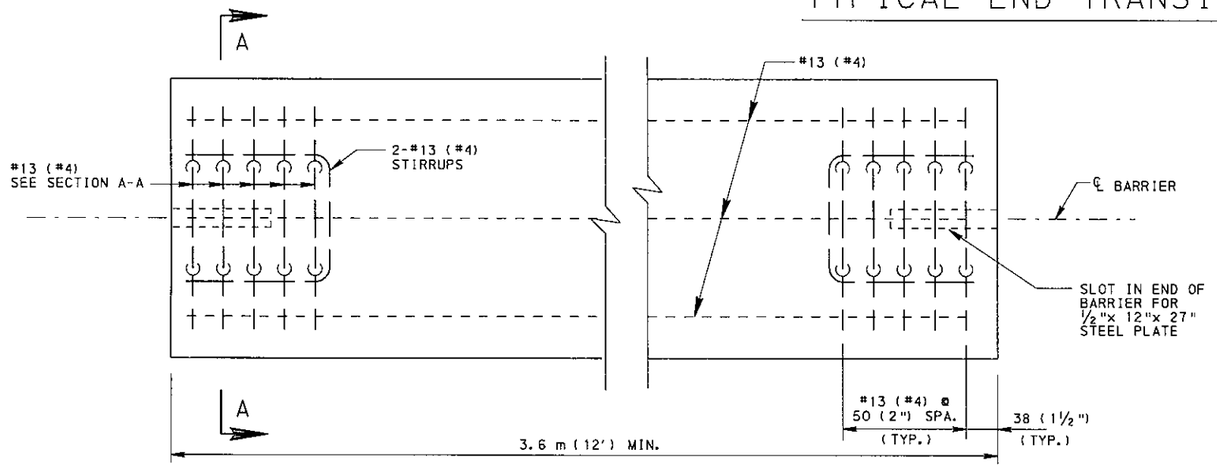
SECTION A-A



TYPICAL END TRANSITION

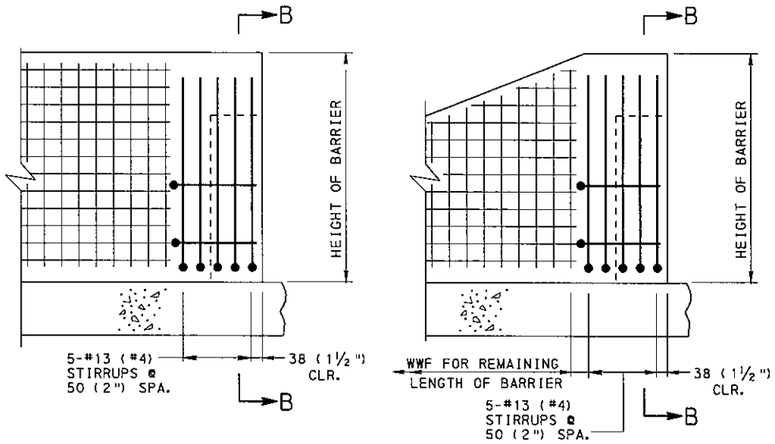


SECTION B-B



TYPICAL BARRIER PLAN

BOTH ENDS OF BARRIER ARE TYPICAL.



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.

NOTES

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 RAMPS 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.

   REFER TO TABLE 1, SHEET 3, FOR FLARE RATE REQUIREMENTS.
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 (1½").
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 714.6(c).
5. 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

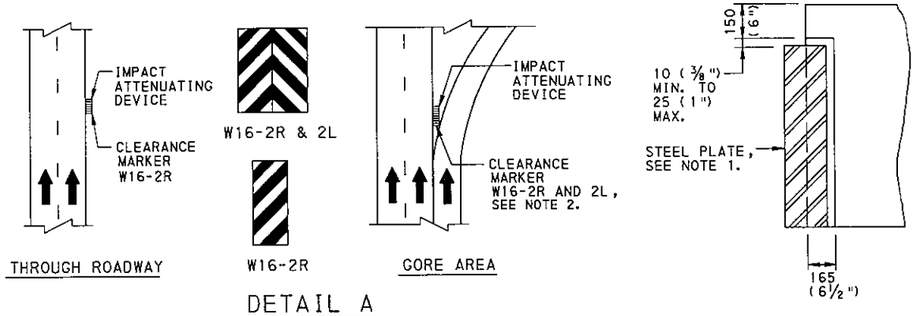
CONCRETE MEDIAN BARRIER F-SHAPE

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

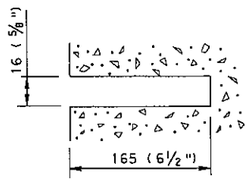
SHT 2 OF 8

RC-57M

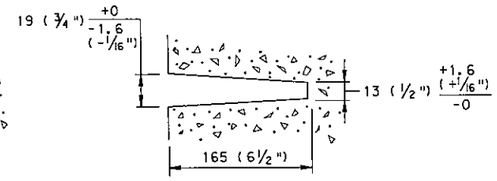


DETAIL A

DELINEATION OF IMPACT ATTENUATING DEVICES



SLOT DETAIL



PERMISSIBLE TAPER

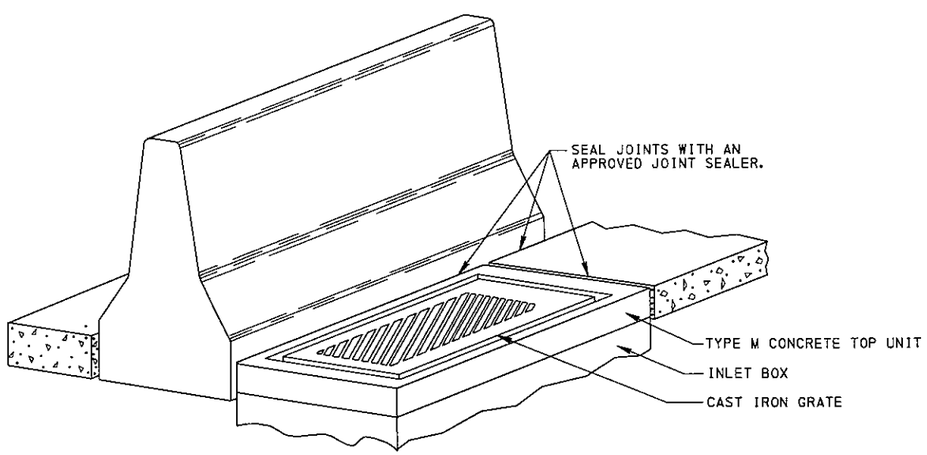
SLOTTED PLATE CONNECTION

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

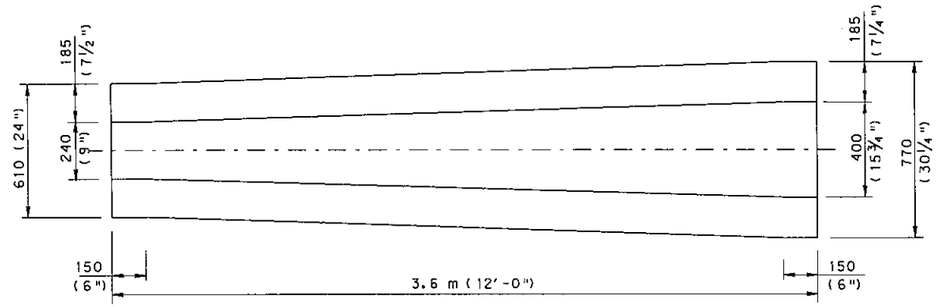
DESIGN SPEED		MAXIMUM FLARE RATES	
km/h	mph	CONCRETE BARRIER	GUIDE RAIL
120	75	20 : 1	15 : 1
110	70	20 : 1	15 : 1
105	65	19 : 1	15 : 1
100	60	18 : 1	14 : 1
90	55	16 : 1	12 : 1
80	50	14 : 1	11 : 1
70	45	12 : 1	10 : 1
65	40	11 : 1	9 : 1
60	35	10 : 1	8 : 1
50	30	8 : 1	7 : 1

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

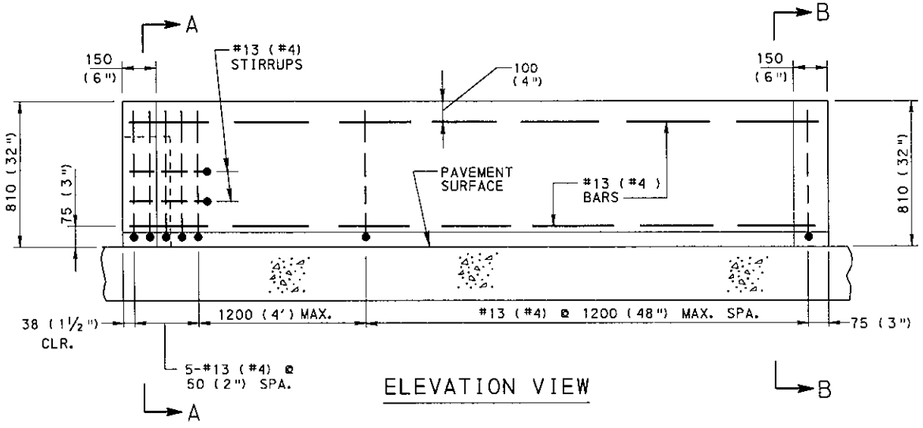
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER F-SHAPE

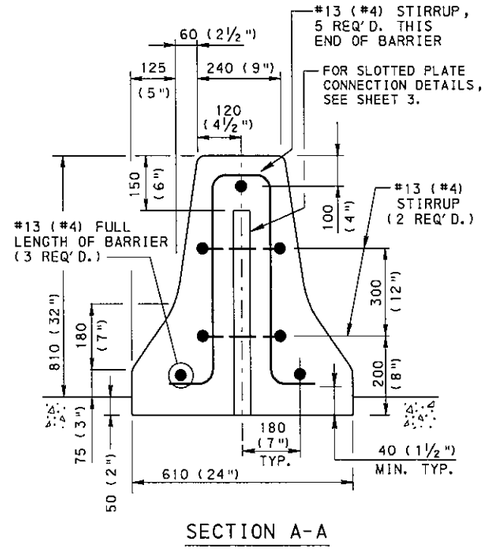
RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 3 OF 8
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-57M



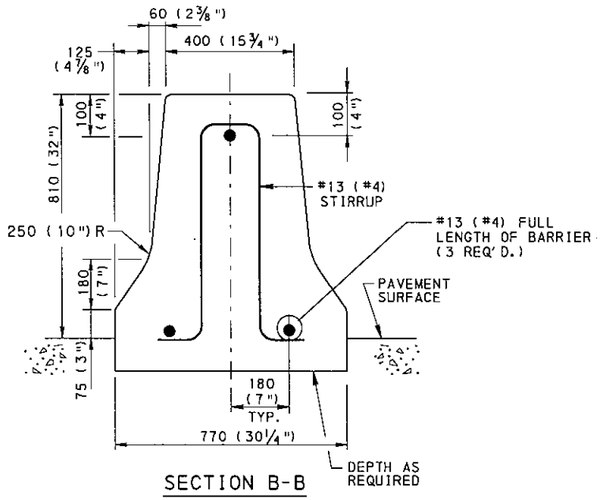
PLAN VIEW



ELEVATION VIEW

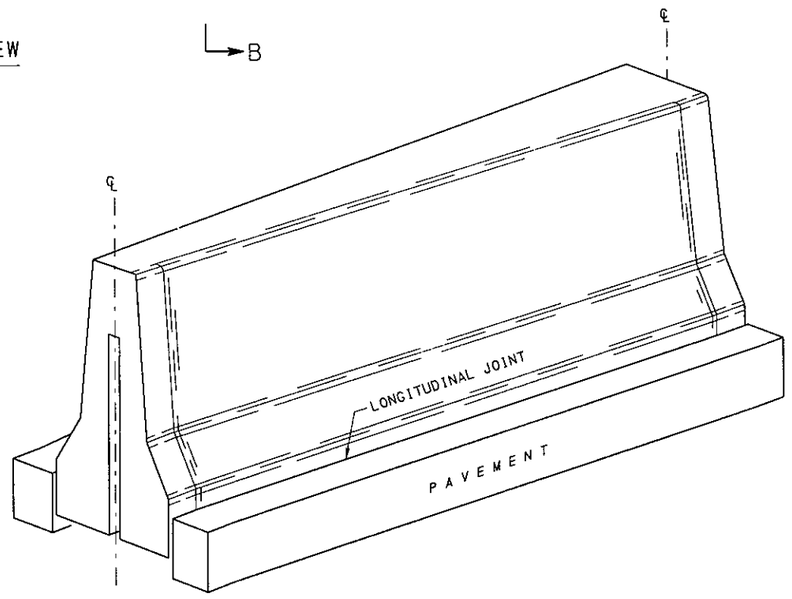


SECTION A-A



SECTION B-B

(ADJACENT TO BRIDGE WITH CONCRETE MEDIAN BARRIER)



ORTHOGRAPHIC VIEW

TYPICAL 810 TO 810 (32" TO 32")

BRIDGE TO HIGHWAY TRANSITION

(THE BRIDGE BARRIER IS A CONCRETE MEDIAN BARRIER)

NOTES

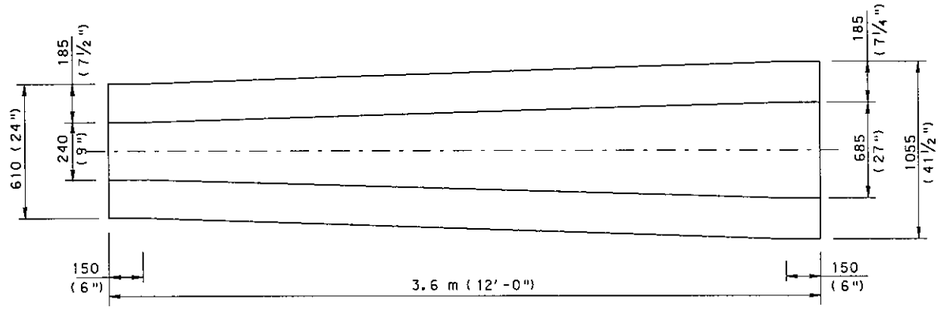
1. PROVIDE REINFORCEMENT MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 709.
2. ROUND OR CHAMFER ALL EDGES WITH A RADIUS OF 25 (1") EXCEPT AS SHOWN.
3. FOR ALTERNATE WWF REINFORCED BARRIERS, SEE SHEET 2.

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

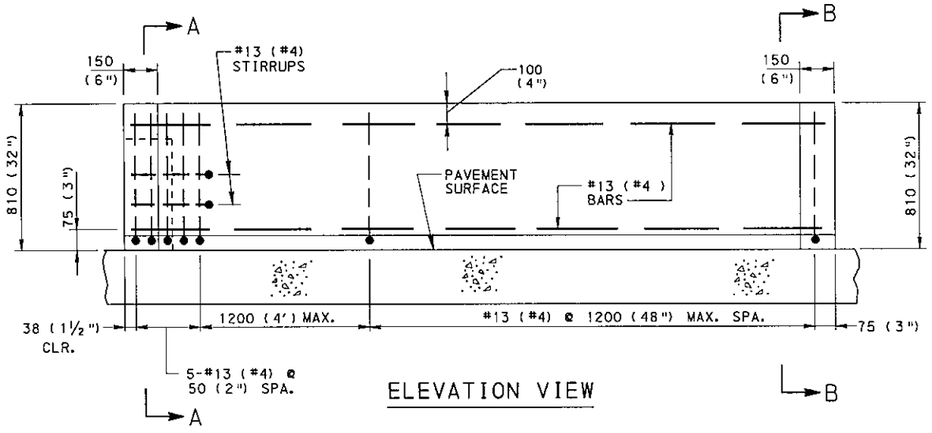
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER F-SHAPE

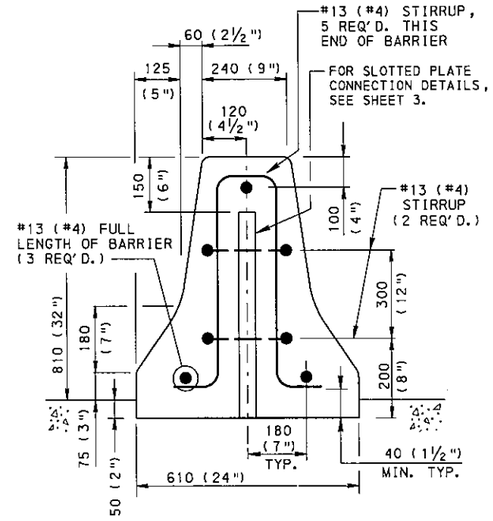
RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 4 OF 8
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-57M



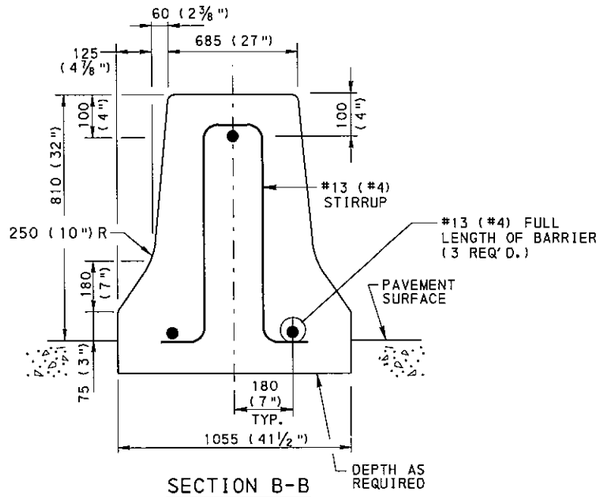
PLAN VIEW



ELEVATION VIEW

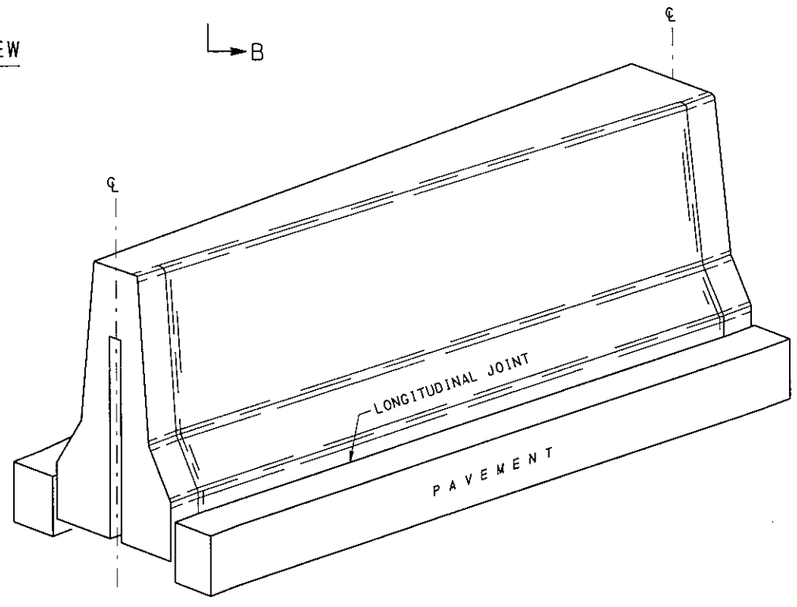


SECTION A-A



SECTION B-B

(ADJACENT TO BRIDGE WITH SPLIT CONCRETE MEDIAN BARRIER)



ORTHOGRAPHIC VIEW

TYPICAL 810 TO 810 (32" TO 32")

BRIDGE TO HIGHWAY TRANSITION

(THE BRIDGE BARRIER IS A SPLIT CONCRETE MEDIAN BARRIER)

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.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER
F-SHAPE

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

SHT 5 OF 8

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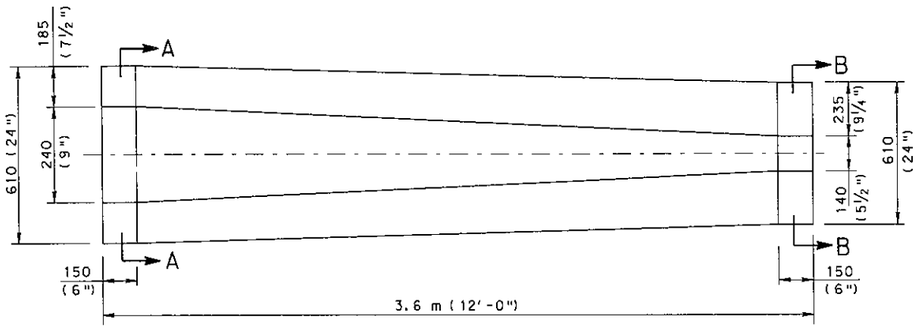
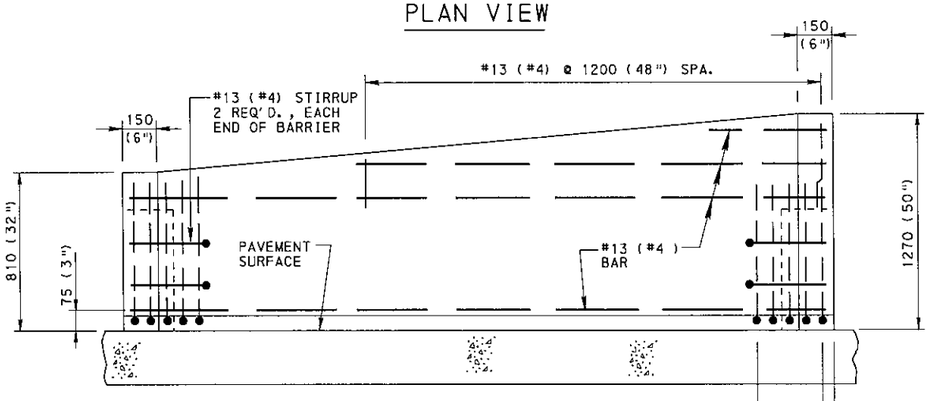
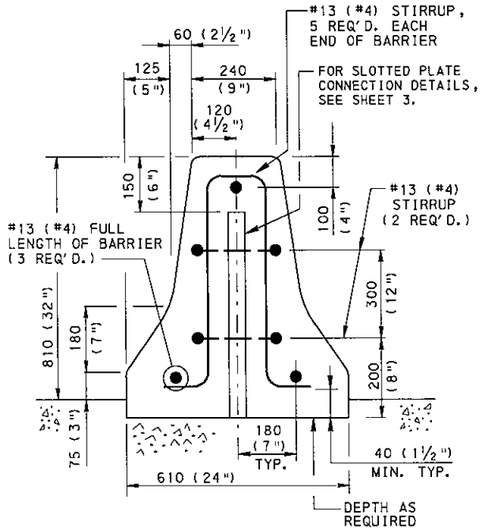


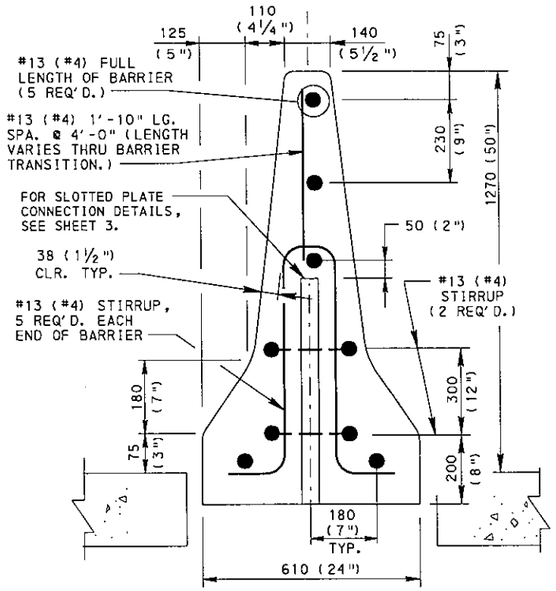
PLAN VIEW



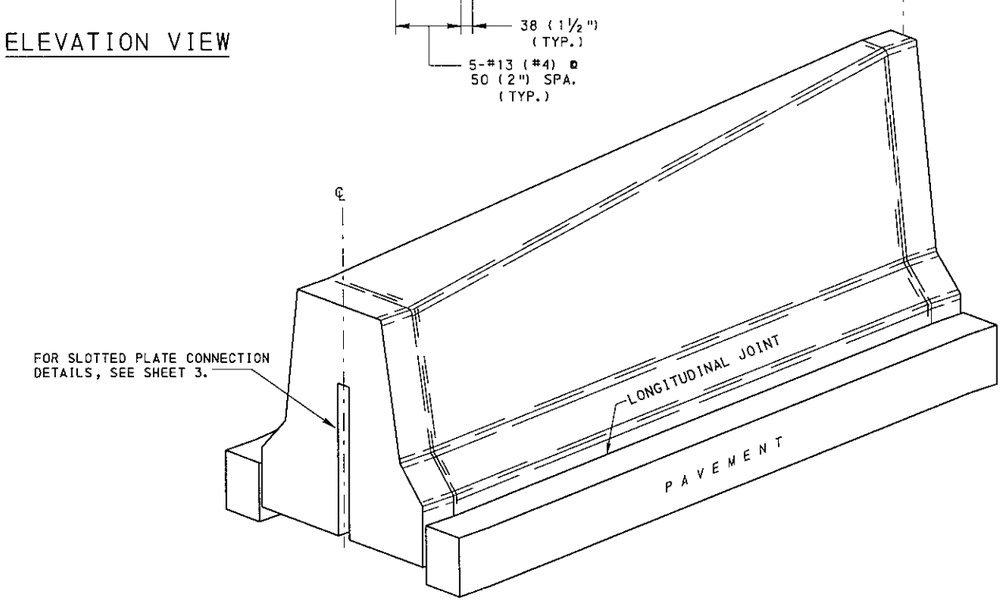
ELEVATION VIEW



SECTION A-A



SECTION B-B



ORTHOGRAPHIC VIEW

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

NOTES

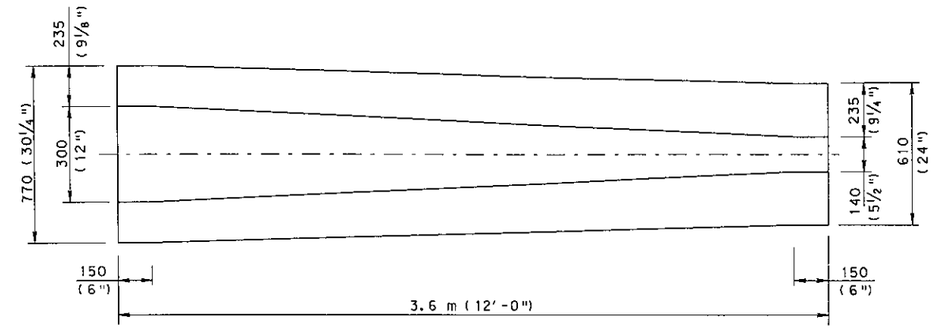
1. PROVIDE REINFORCEMENT MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 709 WITH A MINIMUM CONCRETE COVER OF 40 (1½").
2. ROUND OR CHAMFER ALL EDGES WITH A RADIUS OF 25 (1") EXCEPT AS SHOWN.
3. FOR ALTERNATE WWF REINFORCED BARRIERS, SEE SHEET 2.

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

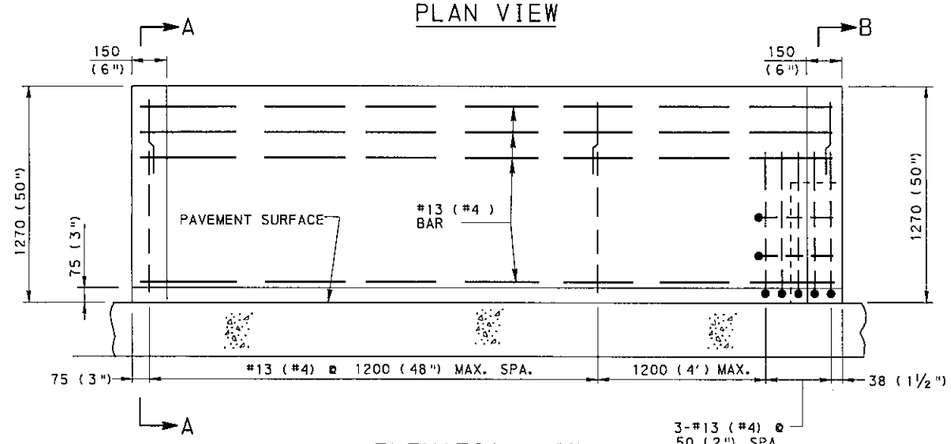
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER
F-SHAPE

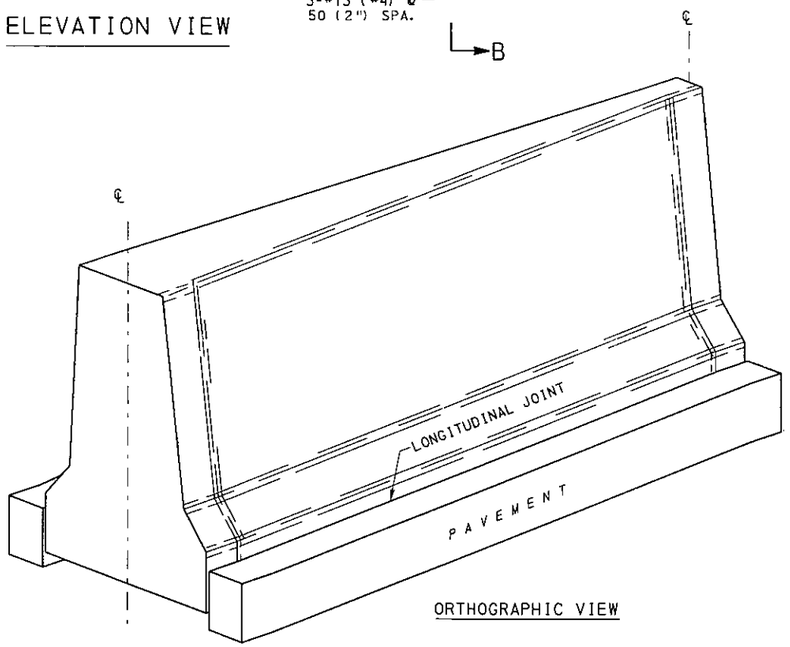
RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 6 OF 8
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-57M



PLAN VIEW



ELEVATION VIEW

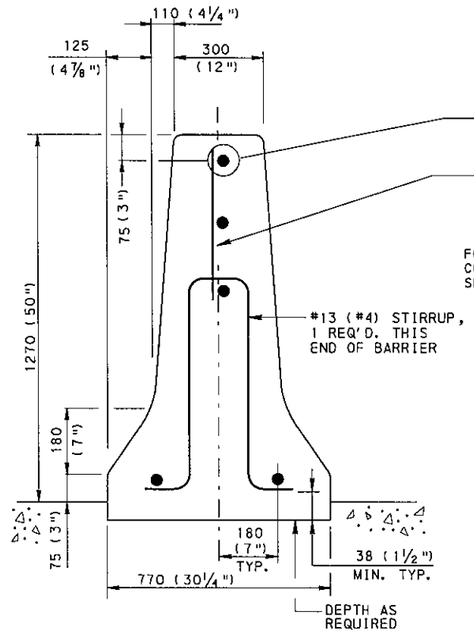


ORTHOGRAPHIC VIEW

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

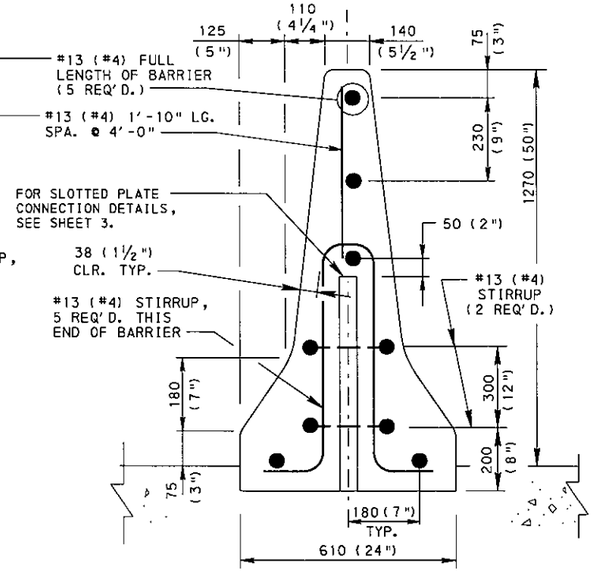
BRIDGE TO HIGHWAY TRANSITION

(THE BRIDGE BARRIER IS A CONCRETE GLARE SCREEN MEDIAN BARRIER)



SECTION A-A

(ADJACENT TO BRIDGE WITH CONCRETE GLARE SCREEN MEDIAN BARRIER)



SECTION B-B

NOTE

FOR ALTERNATE WWF REINFORCED BARRIERS, SEE SHEET 2.

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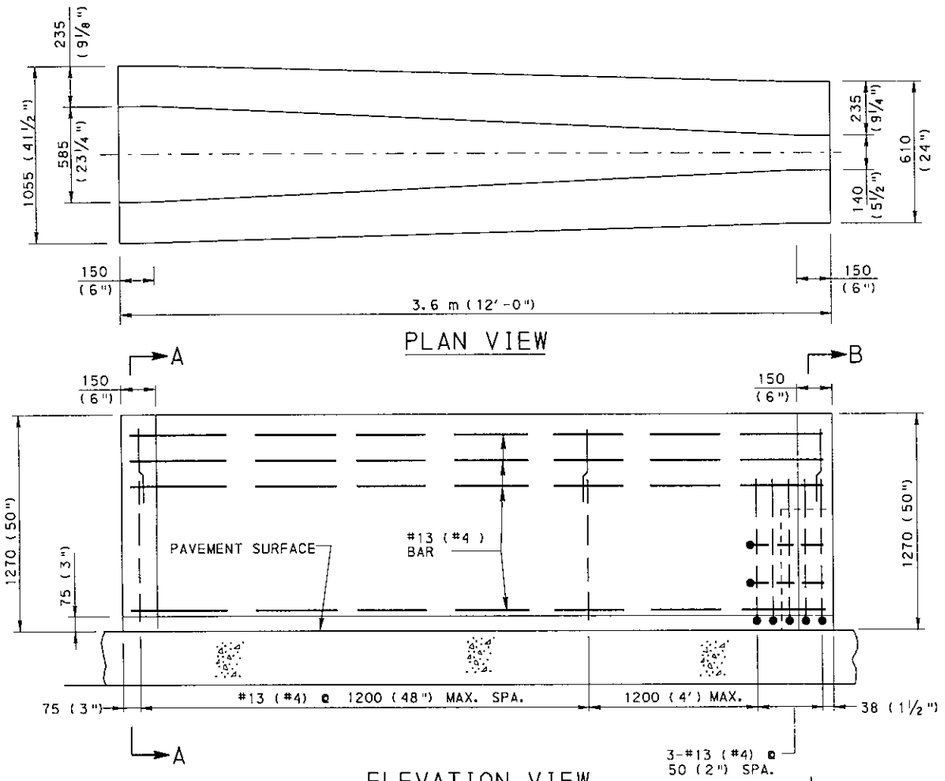
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

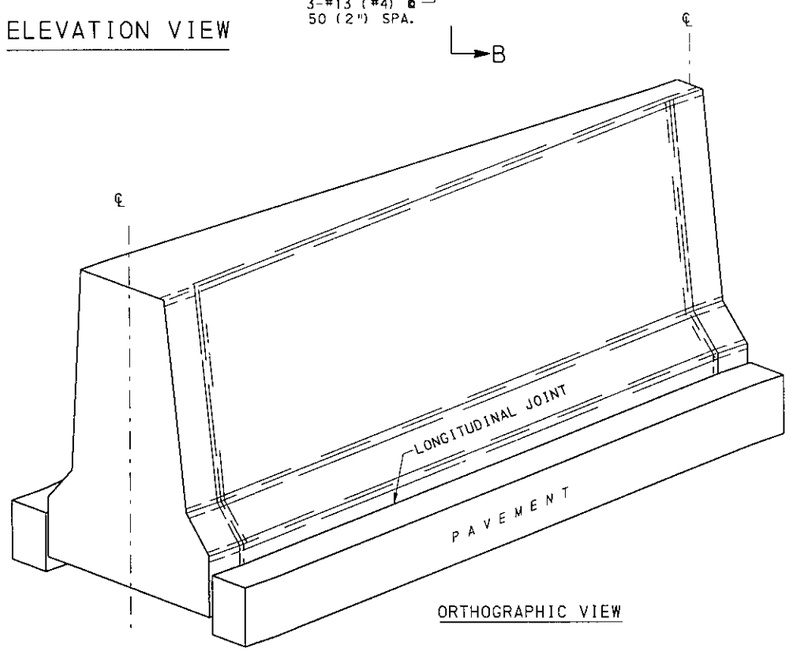
CONCRETE MEDIAN BARRIER F-SHAPE

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 7 OF 8
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-57M



PLAN VIEW

ELEVATION VIEW

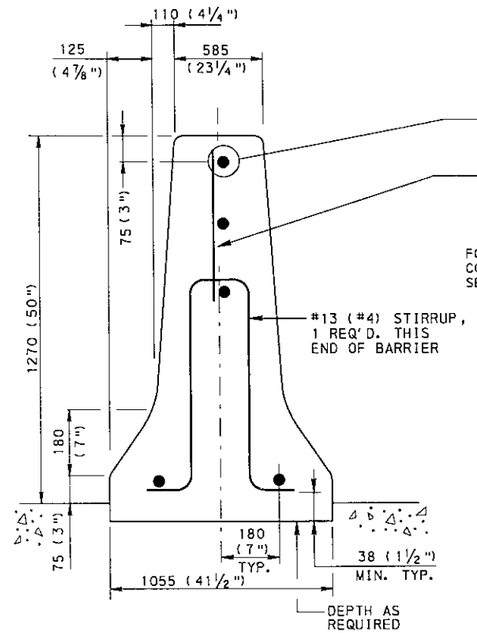


ORTHOGRAPHIC VIEW

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

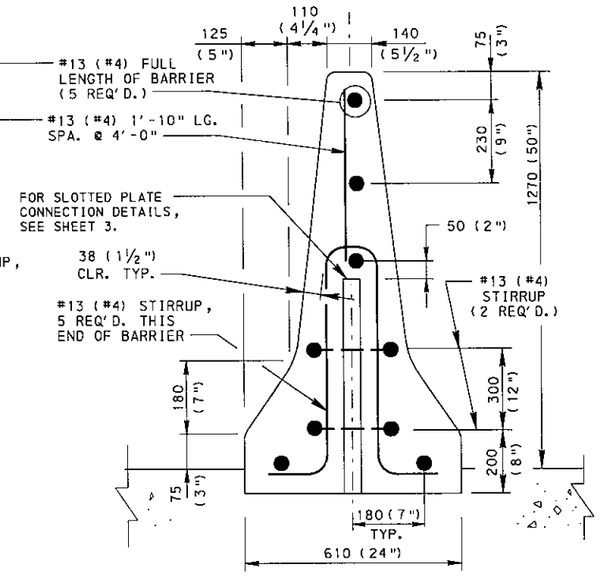
BRIDGE TO HIGHWAY TRANSITION

(THE BRIDGE BARRIER IS A SPLIT CONCRETE GLARE SCREEN MEDIAN BARRIER)



SECTION A-A

(ADJACENT TO BRIDGE WITH SPLIT CONCRETE GLARE SCREEN MEDIAN BARRIER)



SECTION B-B

NOTE

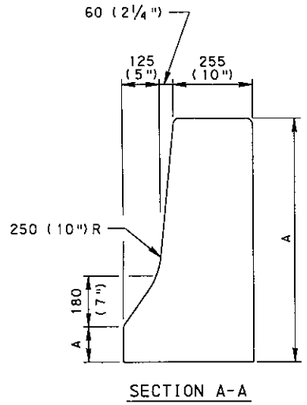
FOR ALTERNATE WWF REINFORCED BARRIERS, SEE SHEET 2.

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

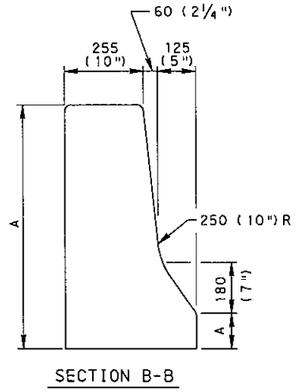
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER F-SHAPE

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 8 OF 8
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-57M

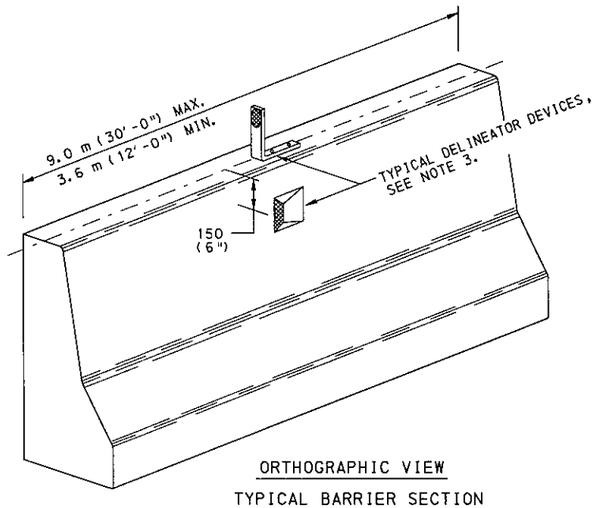


SECTION A-A



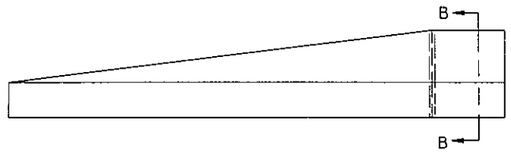
SECTION B-B

NOTE:
A = SEE TYPICAL SECTIONS, SHEET 2.

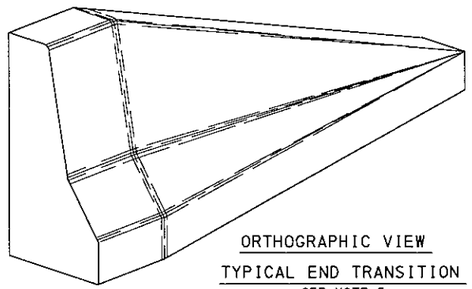


ORTHOGRAPHIC VIEW

TYPICAL BARRIER SECTION



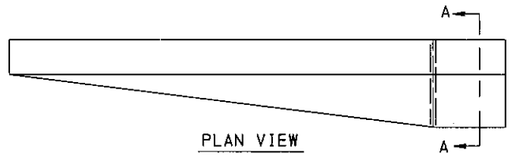
PLAN VIEW
RIGHT END TRANSITION



ORTHOGRAPHIC VIEW

TYPICAL END TRANSITION

SEE NOTE 5.



PLAN VIEW
LEFT END TRANSITION

NOTES

1. PROVIDE SINGLE FACE CONCRETE BARRIER MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTION 623.
   A. MINIMUM CONCRETE CLASS: AA, EXCEPT USE CLASS AAA CONCRETE FOR PRECAST BARRIER.
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.
9. 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 LONGITUDINAL DIRECTION TO PRODUCE SCORES APPROXIMATELY 4 (⅛") IN DEPTH.

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

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

BC-736M	REINFORCEMENT BAR FABRICATION DETAILS
REFERENCE DRAWINGS	

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

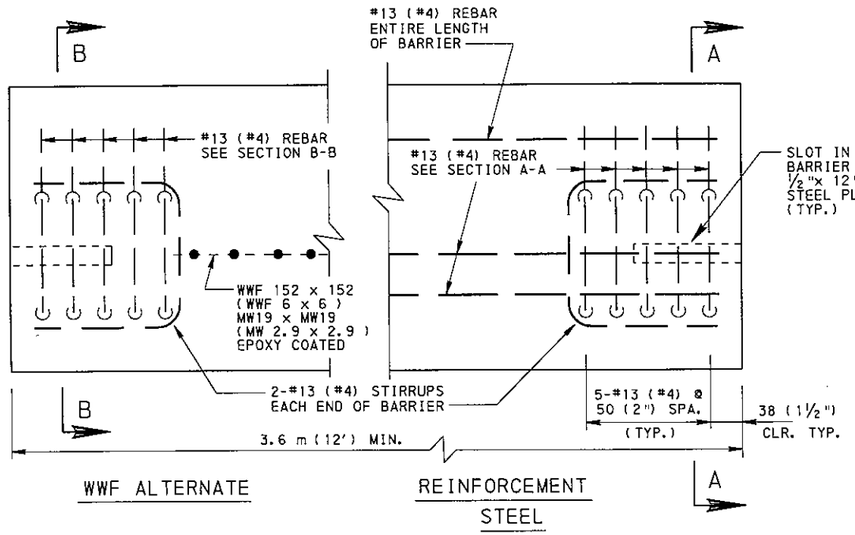
SINGLE FACE CONCRETE BARRIER

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

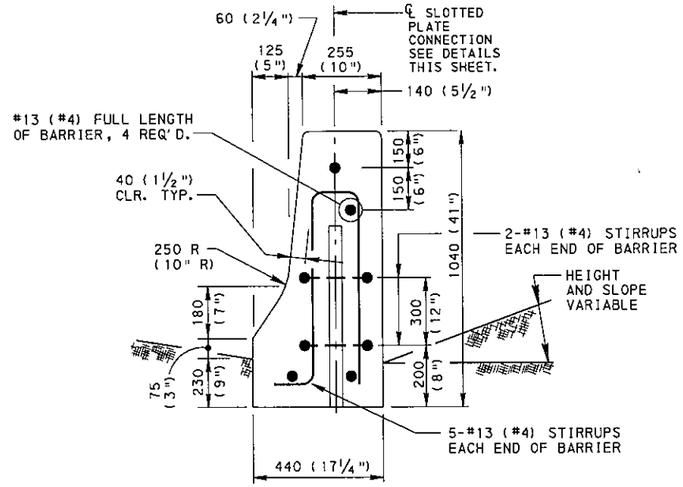
SHT 1 OF 5

RC-58M

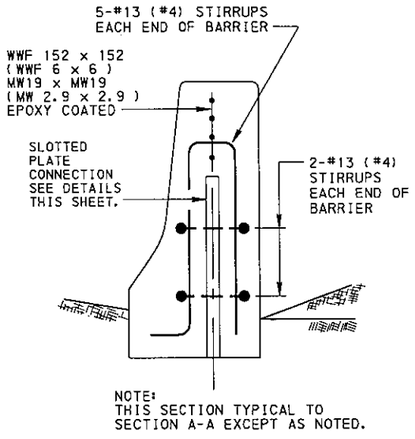


BARRIER PLAN

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

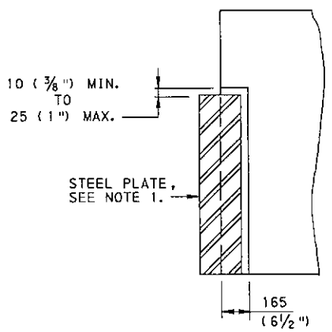


SECTION A-A

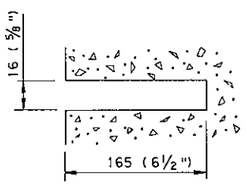


SECTION B-B

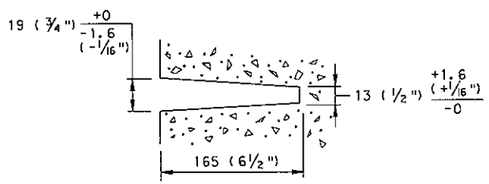
WWF ALTERNATE



SECTION

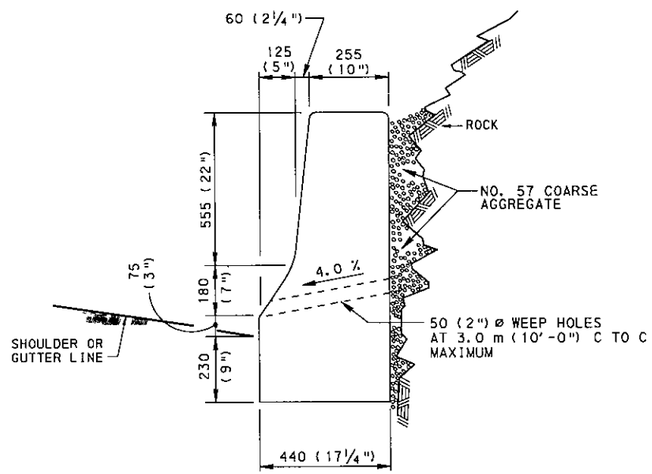


PLAN-SLOT DETAIL

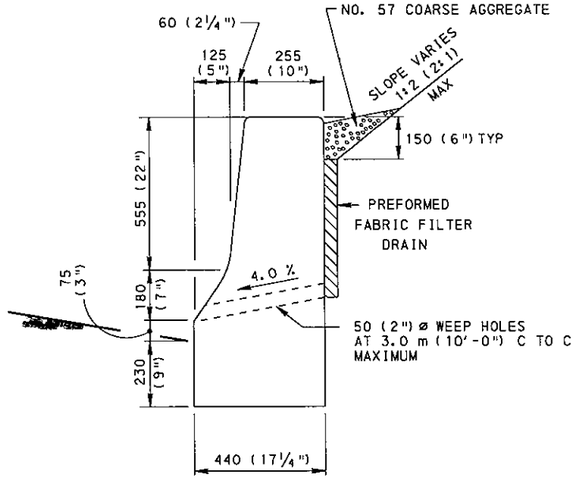


PLAN-PERMISSIBLE TAPER

SLOTTED PLATE CONNECTION



TYPICAL ROUGH ROCK TREATMENT



TYPICAL DRAINAGE TREATMENT

SEE NOTE 2.

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

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 OF THE BARRIER 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.

TYPICAL SINGLE FACE BARRIER SECTIONS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER
F-SHAPE

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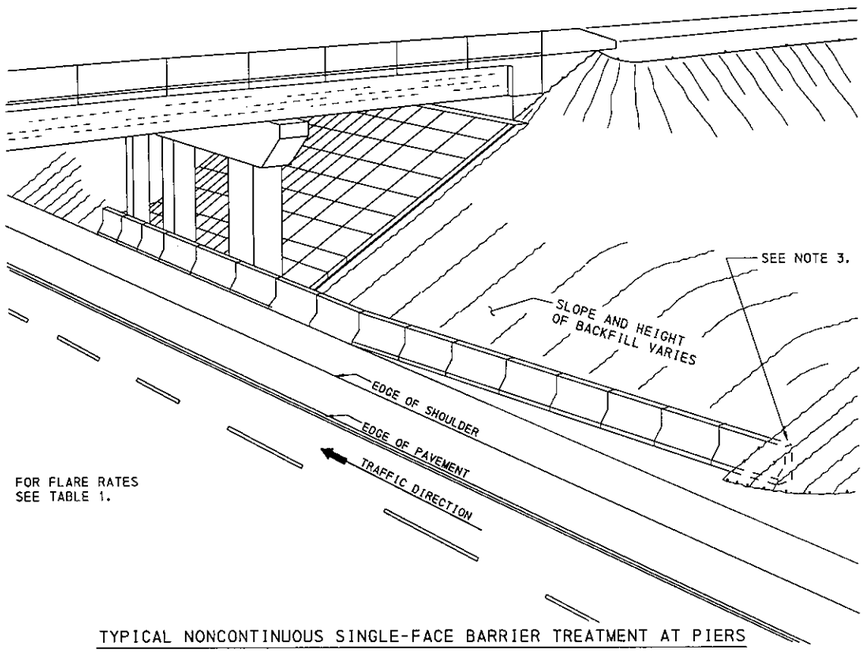
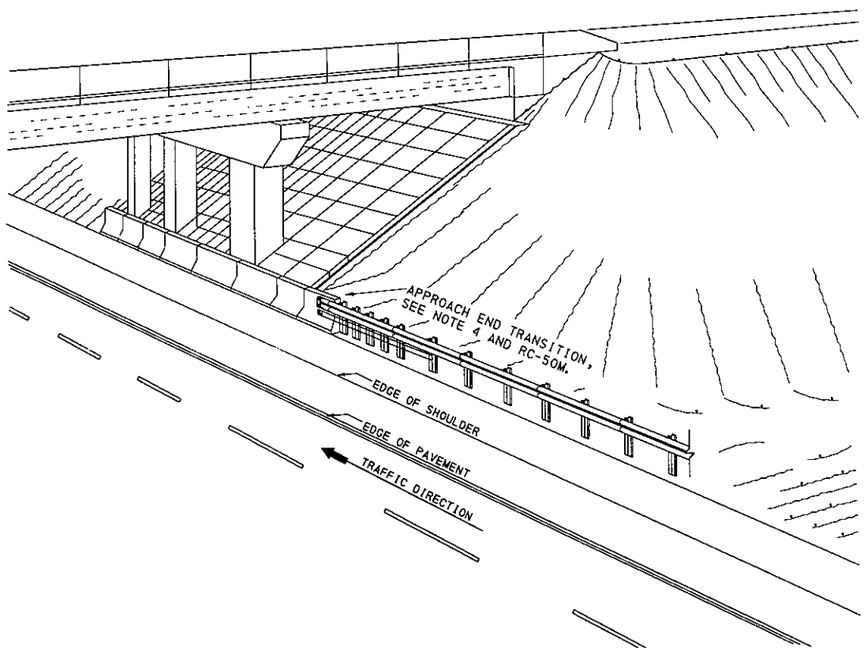


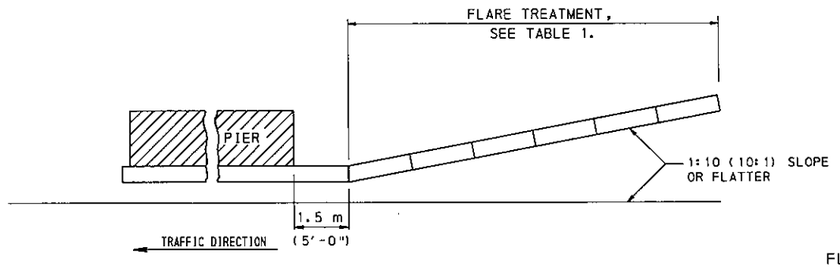
TYPICAL NONCONTINUOUS SINGLE-FACE BARRIER TREATMENT AT PIERS



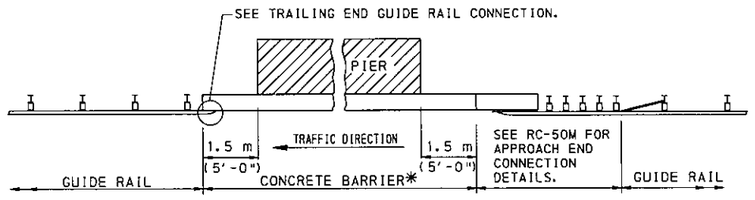
TYPICAL TREATMENT WHEN CONTINUOUS GUIDE RAIL IS REQUIRED

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.
4. THIS TRANSITION IS APPROPRIATE FOR CONNECTION TO A VERTICAL CONCRETE SHAPE AND SHOULD NOT BE CONNECTED DIRECTLY TO A CONCRETE SAFETY SHAPE. CONCRETE SAFETY SHAPES SHOULD BE TRANSITIONED TO A VERTICAL SHAPE AT THE GUIDE RAIL CONNECTION.



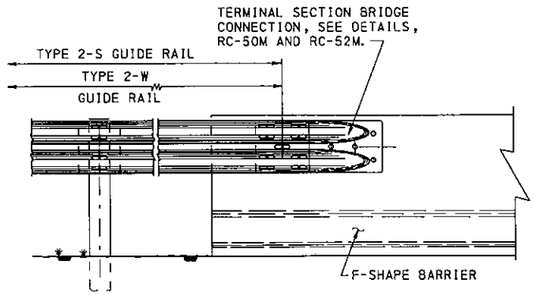
PLAN VIEW



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	
Km/h	mph	CONCRETE BARRIER	GUIDE RAIL
120	75	20:1	15:1
110	70	20:1	15:1
105	65	19:1	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
65	40	11:1	9:1
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

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

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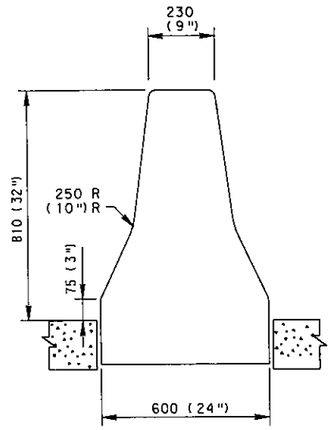
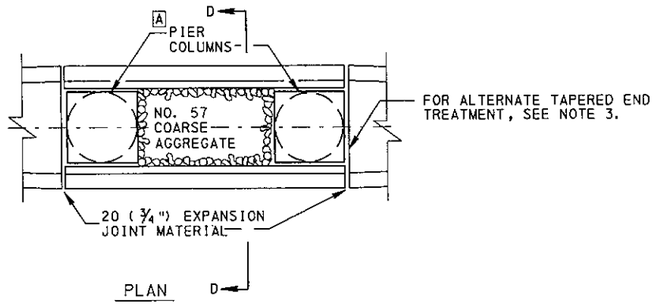
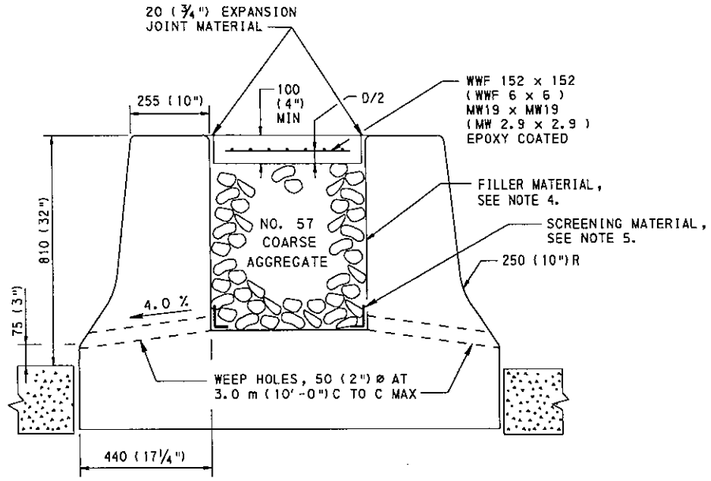


SECTION A-A

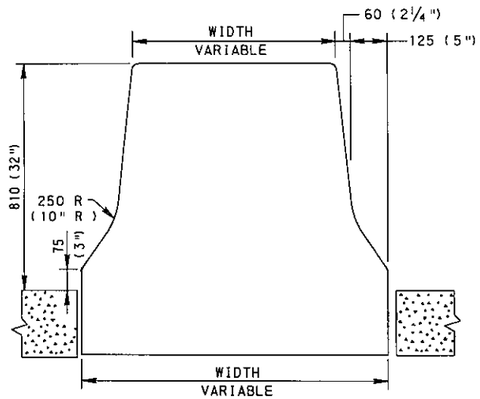


PLAN

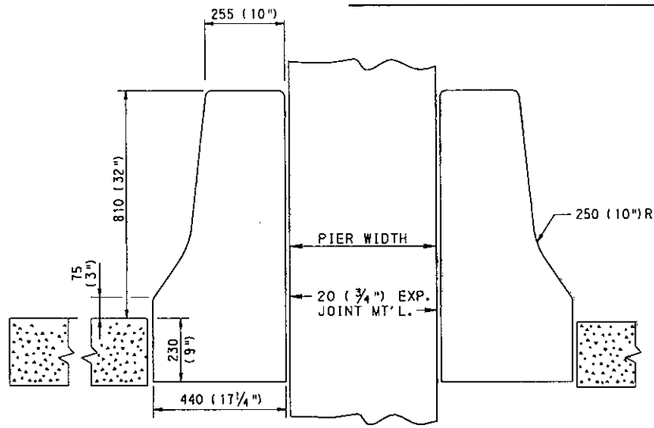


SECTION D-D

TYPICAL ALTERNATE BARRIER TREATMENT AT PIERS



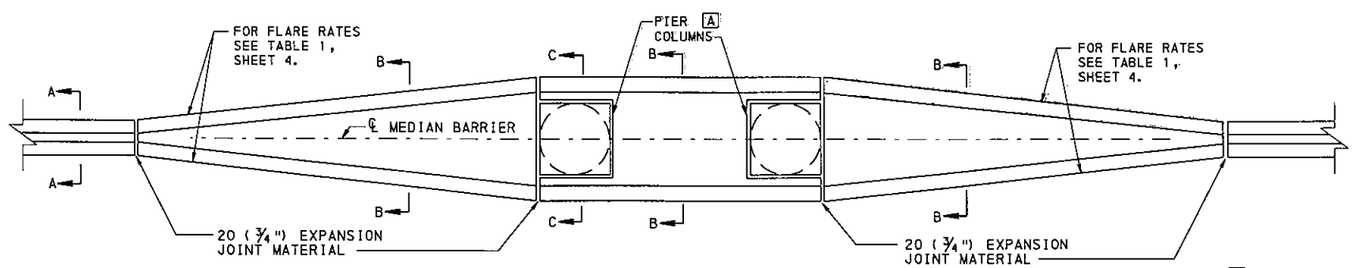
SECTION B-B



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") EXCEPT AS SHOWN.



TYPICAL BARRIER TREATMENT AT PIERS

A USE 20 (¾") EXPANSION JOINT MATERIAL AROUND ALL PIERS.

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 MEDIAN PIERS

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 4 OF 5
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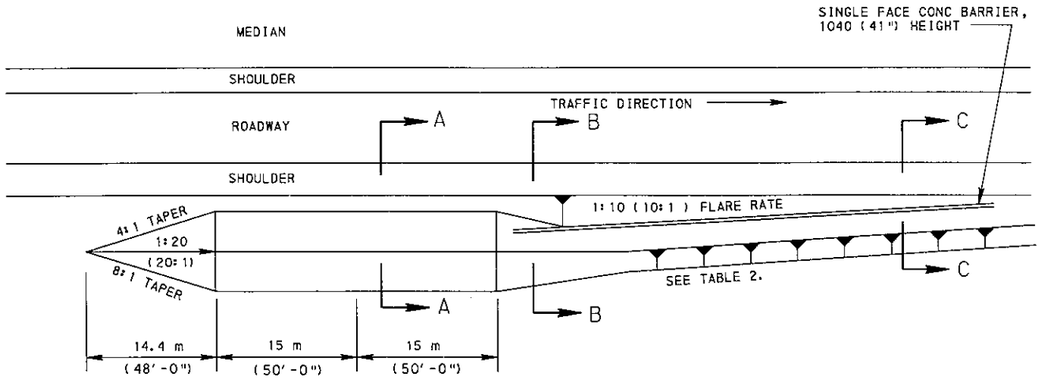


TABLE 2

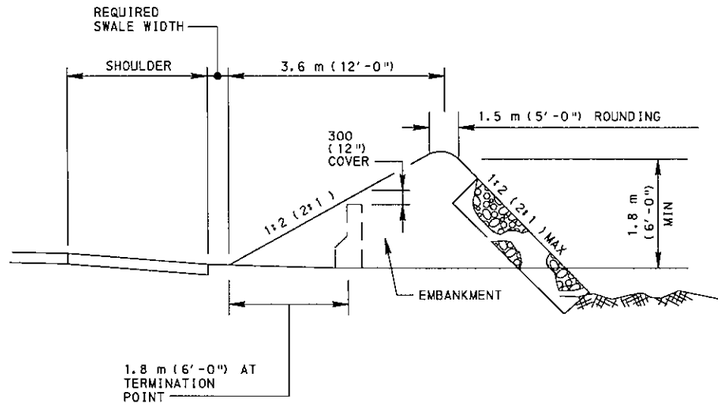
FLARE RATES
FOR BARRIER DESIGN

DESIGN SPEED		MAXIMUM FLARE RATES
km/h	mph	CONCRETE BARRIER
120	75	20 : 1
110	70	20 : 1
105	65	19 : 1
100	60	18 : 1
90	55	16 : 1
80	50	14 : 1
70	45	12 : 1
65	40	11 : 1
60	35	10 : 1
50	30	8 : 1

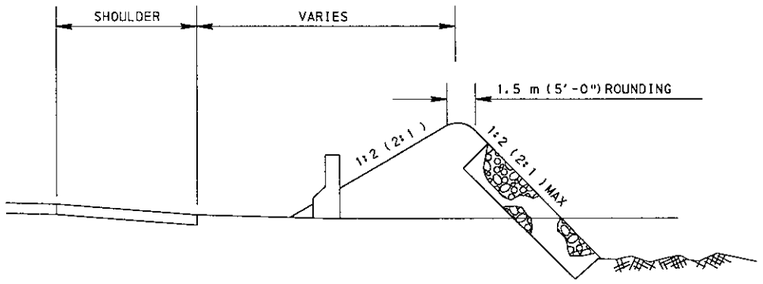
NOTES

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. EARTHMOUNDS 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.

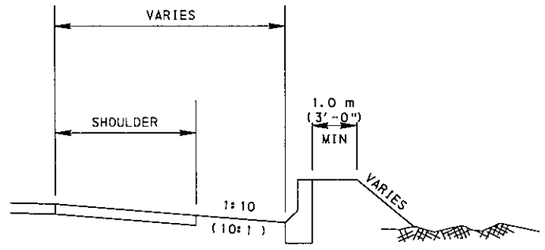
TYPICAL EARTH MOUND FOR BURYING CONCRETE BARRIER



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

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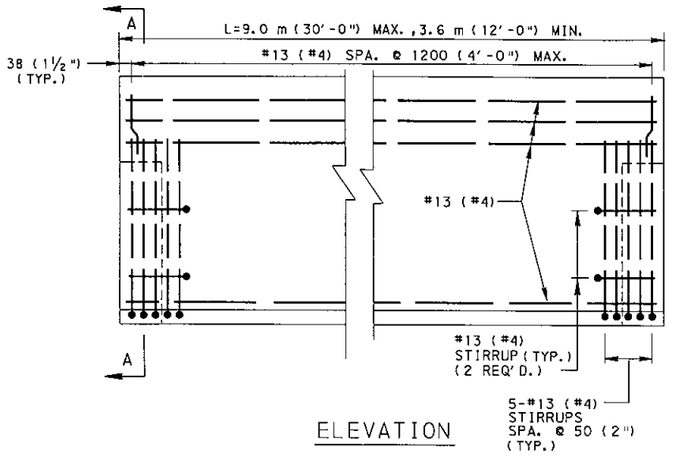
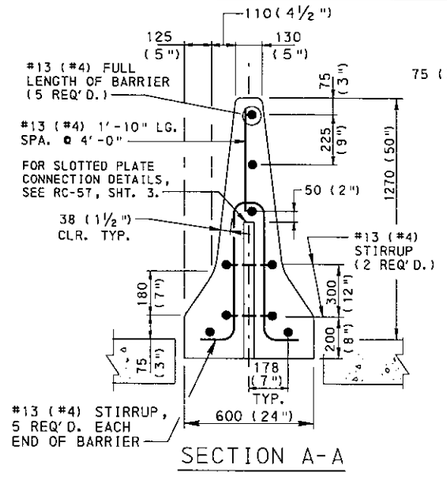
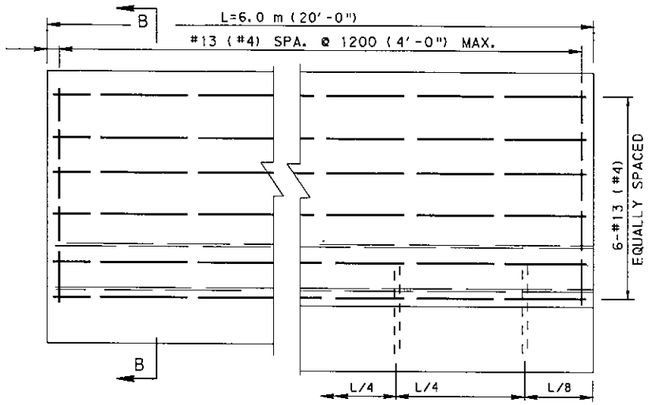


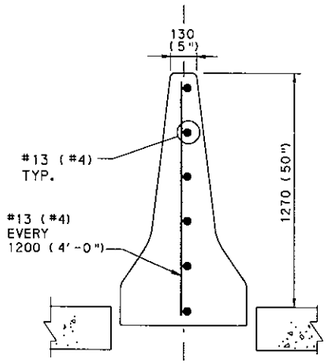
ELEVATION



SECTION A-A



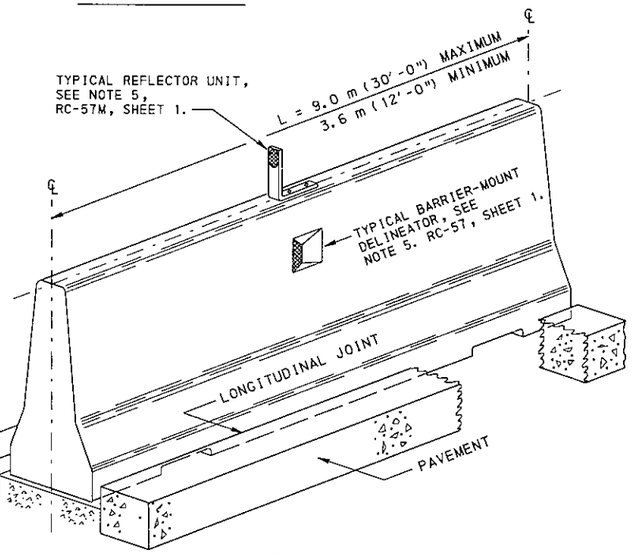
ELEVATION



SECTION B-B

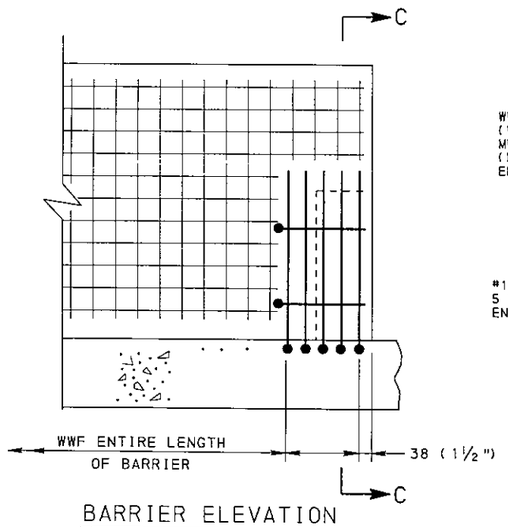
THIS SECTION TYPICAL TO SECTION A-A EXCEPT AS NOTED.

TYPICAL PRECAST

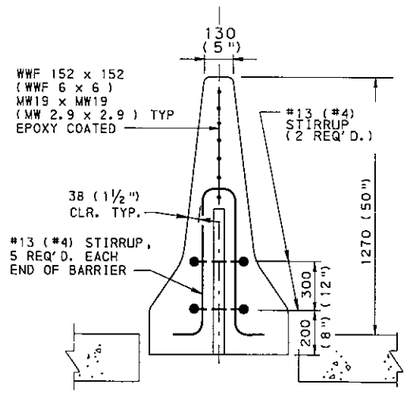


TYPICAL CAST-IN-PLACE

TYPICAL CAST-IN PLACE AND PRECAST BARRIER



BARRIER ELEVATION



SECTION C-C

THIS SECTION TYPICAL TO SECTION A-A EXCEPT AS NOTED.

WWF ALTERNATE

NOTES

1. PROVIDE CONCRETE GLARE SCREEN MEETING THE REQUIREMENTS OF PUBLICATION 408, SECTIONS 622 AND 714.
   A. MINIMUM CONCRETE CLASS: AA, EXCEPT USE CLASS AAA CONCRETE FOR PRECAST BARRIER.
2. FOR INSTALLATION OF GLARE SCREEN ON TOP OF EXISTING CONCRETE MEDIAN BARRIER, PROVIDE PLASTIC PADDLES OR MODULAR SYSTEMS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15.
3. FOR PRECAST BARRIERS, PROVIDE SLOTTED PLATE CONNECTIONS AS INDICATED ON RC-57M, SHEET 3.
4. PROVIDE PRECAST CONCRETE GLARE SCREEN SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15. FOR MODIFICATION OR DEVIATION OF THE STANDARDS SUBMIT SHOP DRAWINGS FOR APPROVAL.
5. PROVIDE PRECAST CONCRETE GLARE SCREEN FOR USE AS TEMPORARY (NPT) OR IN PERMANENT INSTALLATIONS. FOR TEMPORARY INSTALLATIONS, EMBEDMENT IS NOT REQUIRED.
6. EPOXY COATED REINFORCEMENT IS NOT REQUIRED WHEN PRECAST CONCRETE GLARE SCREEN IS TO BE USED IN TEMPORARY INSTALLATIONS ONLY, IN ACCORDANCE WITH SECTION 627, AND IDENTIFIED AS SUCH, AS SPECIFIED IN SECTION 714.6(c).
7. ROUND OR CHAMFER ALL EDGES WITH A RADIUS OF 25 (1") EXCEPT AS SHOWN.
8. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.
9. FABRICATE REINFORCEMENT BARS ACCORDING TO PENNDOT BRIDGE CONSTRUCTION STANDARD, BC-736M.
10. 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 LONGITUDINAL DIRECTION TO PRODUCE SCORES APPROXIMATELY 4 (⅛") IN DEPTH.

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

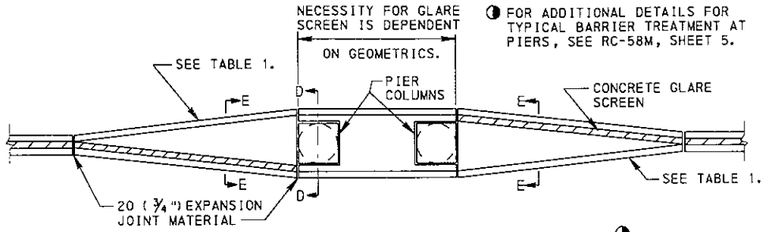
RC-57M	CONCRETE MEDIAN BARRIER, F-SHAPE
BC-736M	REINFORCEMENT BAR FABRICATION DETAILS

REFERENCE DRAWINGS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

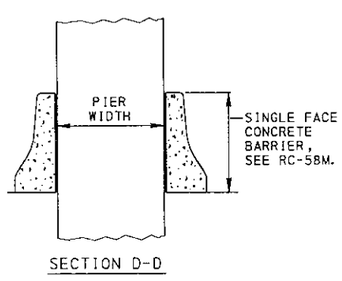
CONCRETE GLARE SCREEN
F-SHAPE

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 1 OF 2
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-59M

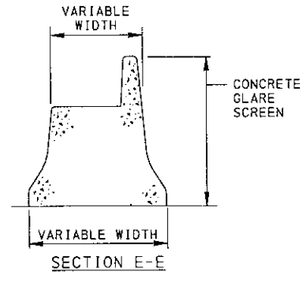


◑ FOR ADDITIONAL DETAILS FOR TYPICAL BARRIER TREATMENT AT PIERS, SEE RC-58M, SHEET 5.

TYPICAL TREATMENT AT PIERS◑



SECTION D-D



SECTION E-E

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
105	65	19 : 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
65	40	11 : 1	9 : 1
60	35	10 : 1	8 : 1
50	30	8 : 1	7 : 1

NOTE

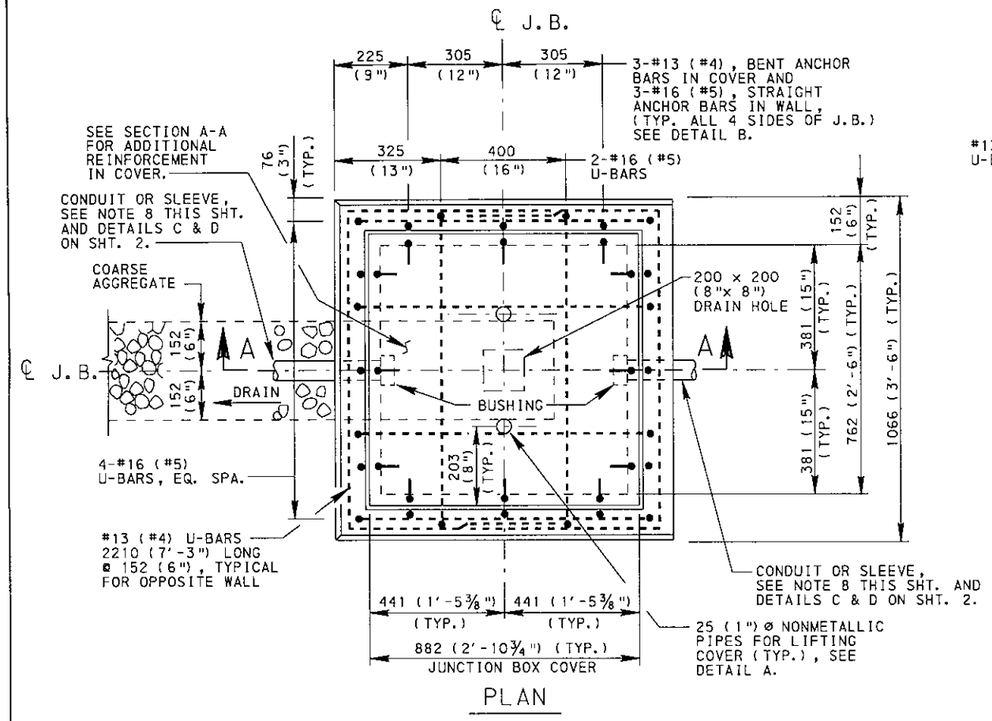
1. PROVIDE BARRIER-MOUNT DELINEATORS, WHEN INDICATED, AS SPECIFIED ON RC-57M, SHEET 1.

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

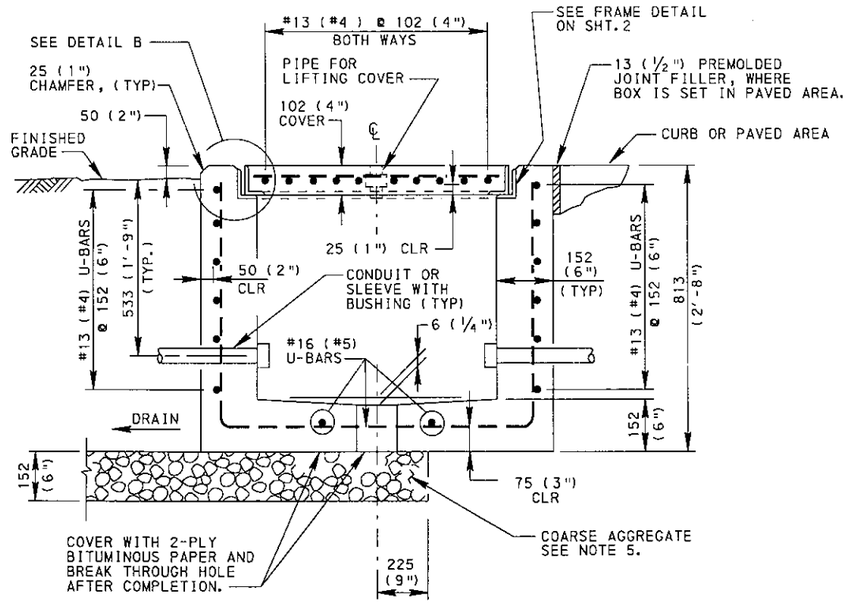
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE GLARE SCREEN
F-SHAPE

RECOMMENDED AUG. 21, 2002 DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 21, 2002 CHIEF ENGINEER	SHT 2 OF 2
		RC-59M

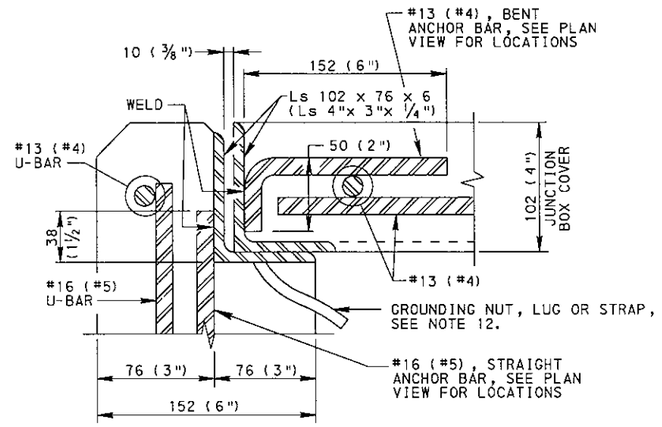


PLAN



SECTION A-A

JUNCTION BOX JB-11



DETAIL B

COVER FRAME AND SUPPORTING FRAME

NOTES

1. PROVIDE MATERIALS AND CONSTRUCT AS SPECIFIED IN PUBLICATION 408, SECTIONS 910 AND 1101.
2. USE JB-11 AND JB-12 JUNCTION IN SHOULDERS OR OTHER LOCATIONS SUBJECT TO VEHICULAR LOADS. USE JB-1 AND JB-2 JUNCTION BOXES IN LOCATIONS WITH PEDESTRIAN TYPE LOADINGS. SEE DETAILS ON RC-81M.
3. PROVIDE PRECAST CONCRETE JUNCTION BOXES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR DEVIATION OR MODIFICATION OF THE STANDARDS, SUBMIT SHOP DRAWINGS FOR APPROVAL.
4. PROTECTIVE COATING - STEEL FRAME. HOT DIP GALVANIZE IN ACCORDANCE WITH PUBLICATION 408, SECTION 1105.02(s).
5. PROVIDE 0.06 m^3 (2 $FT.^3$) OF NO. 57 OR NO. 67 COARSE AGGREGATE.
6. FOR THE LOCATION, SIZE AND NUMBER OF CONDUITS REQUIRED FOR EACH JUNCTION BOX, SEE THE LIGHTING PLANS.
7. IN SIDEWALK AREAS, CONSTRUCT TOP OF JUNCTION BOX TO CONFORM TO SIDEWALK SLOPE. WHEN INSTALLED IN THE RECOVERY AREA, PROVIDE A MAXIMUM OF 100 (4") TO THE TOP OF THE JUNCTION BOX, MEASURED FROM AN IMAGINARY 1.5 m (5'-0") CHORD ALIGNED RADIALLY, PERPENDICULAR, TO THE CENTERLINE OF THE ROADWAY, AND CONNECTING ANY POINT WITHIN THE LENGTH OF THE CHORD EXTENDING TO THE GROUND SURFACE ON BOTH SIDES OF THE JUNCTION BOX.
8. THE CONDUIT LOCATIONS SHOWN REPRESENT NORMAL POSITIONS. FOR CAST-IN-PLACE OR PRECAST CONSTRUCTION, WHEN TWO OR THREE CONDUITS ARE INDICATED ON THE SAME VERTICAL FACE, SPACE CONDUITS AT 150 C TO C AND SYMMETRICAL ABOUT THE CENTERLINE OF THE BOX, AS INDICATED IN DETAIL C, WITH FULL WALL THICKNESS BETWEEN OPENINGS. PROVIDE KNOCKOUTS FOR PRECAST UNITS AS INDICATED IN DETAIL D AND LOCATE AS INDICATED IN DETAIL C. GROUT THE CONDUIT OR SLEEVE IN ACCORDANCE WITH PUBLICATION 408, SECTION 910.3(p).
9. PROVIDE POSITIVE DRAINAGE, 38-50 (1 1/2"-2") NONMETALLIC CONDUIT, FOR JUNCTION BOXES WHEN FEASIBLE. PROVIDE RODENT PROOF DRAIN.
10. PROVIDE STRUCTURAL STEEL CONFORMING TO ASTM-A36/A36M. PROVIDE ALUMINUM CONFORMING TO ASTM-B221 ALLOY 6061 - T6.
11. PROVIDE AS A MINIMUM : CLASS A CONCRETE FOR CAST-IN-PLACE BOXES AND CLASS AA CONCRETE FOR PRECAST BOXES.
12. GROUND EXPOSED METAL PARTS OF JUNCTION BOXES. DO NOT CONNECT GROUND WIRE DIRECTLY TO LID.
13. ALL REINFORCEMENT STEEL BARS SHOWN TO MEET ASTM A 615M, A 616M AND A 706M.
14. 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
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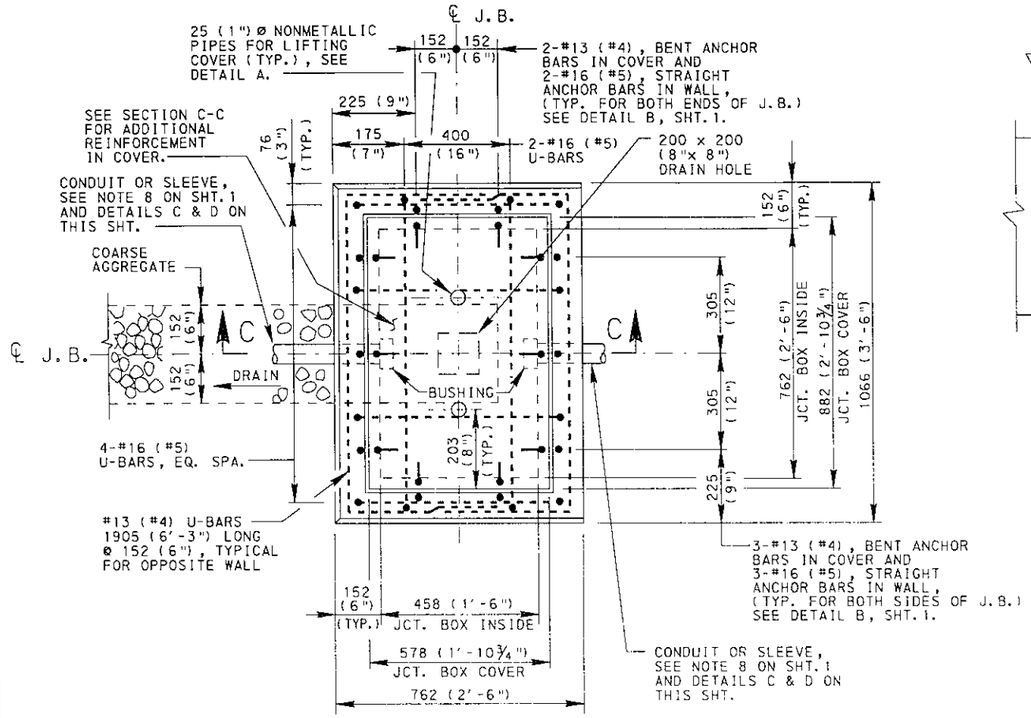
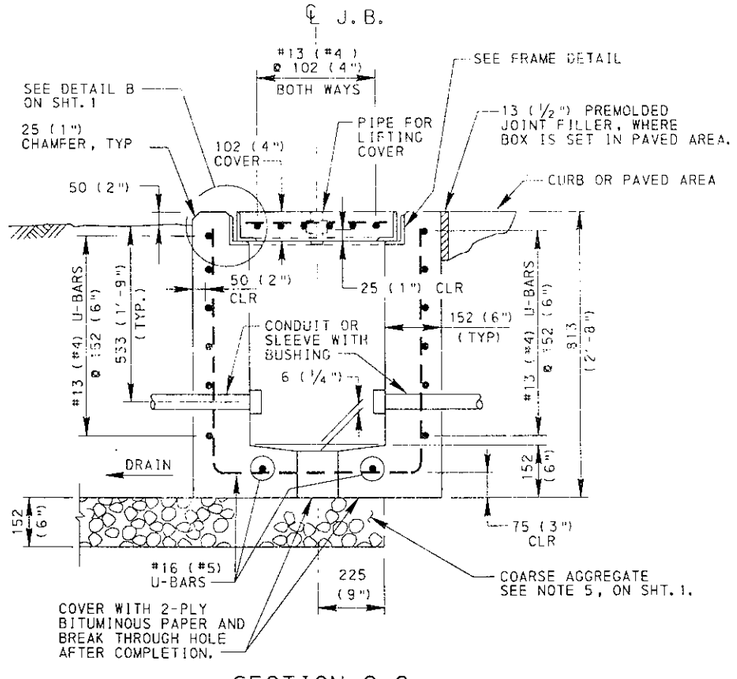
HIGHWAY LIGHTING JUNCTION BOXES-HEAVY DUTY CAST-IN-PLACE OR PRECAST

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 1 OF 2
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-82M

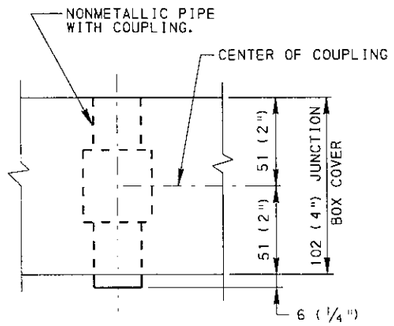


PLAN

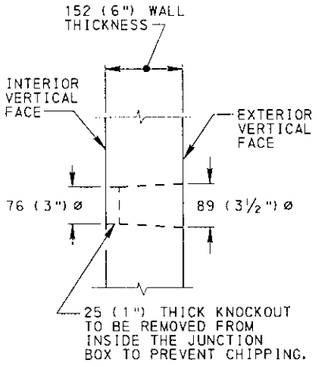


SECTION C-C

JUNCTION BOX JB-12



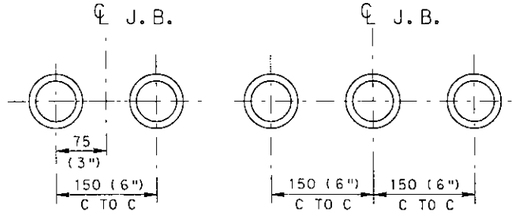
DETAIL A



DETAIL D

TYPICAL KNOCKOUT

(PRECAST UNITS ONLY)



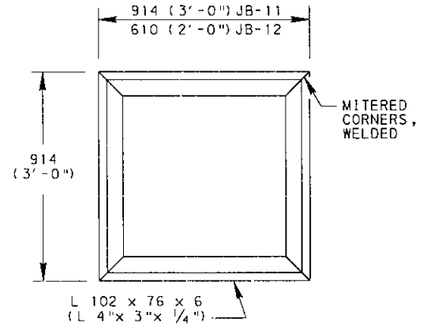
TWO CONDUITS PER VERTICAL FACE

THREE CONDUITS PER VERTICAL FACE

DETAIL C

MULTIPLE CONDUITS IN PLACE

CAST-IN-PLACE OR PRECAST UNITS



PLAN

FRAME DETAIL

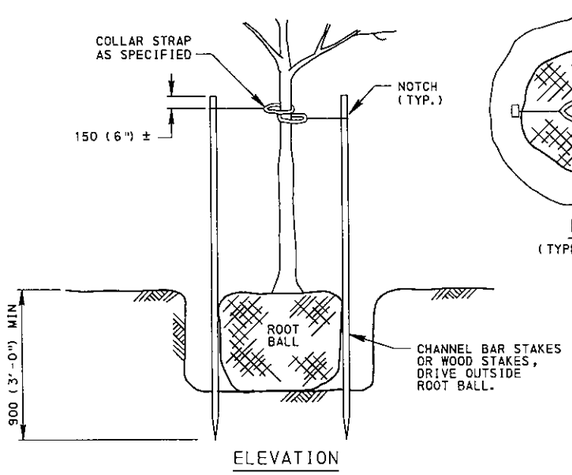
(STEEL OR ALUMINUM)

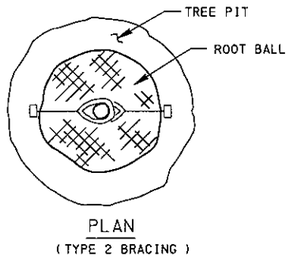
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

HIGHWAY LIGHTING
JUNCTION BOXES-HEAVY DUTY
CAST-IN-PLACE OR PRECAST

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 2 OF 2
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-82M



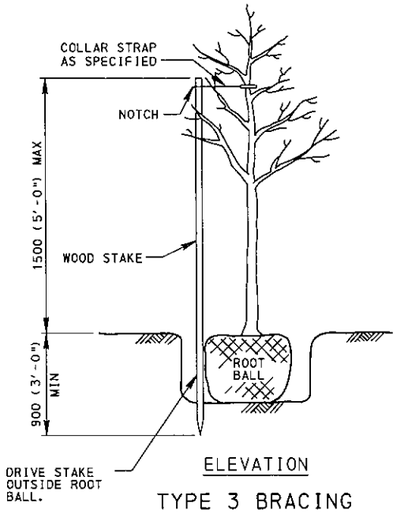


PLAN
(TYPE 2 BRACING)

ELEVATION

TYPE 2 BRACING

FOR DECIDUOUS TREES OVER 40 (1½") CALIPER AND ALL EVERGREEN TREES 1.2m (4'-0") TO 2.4m (8'-0") HT.



ELEVATION

TYPE 3 BRACING

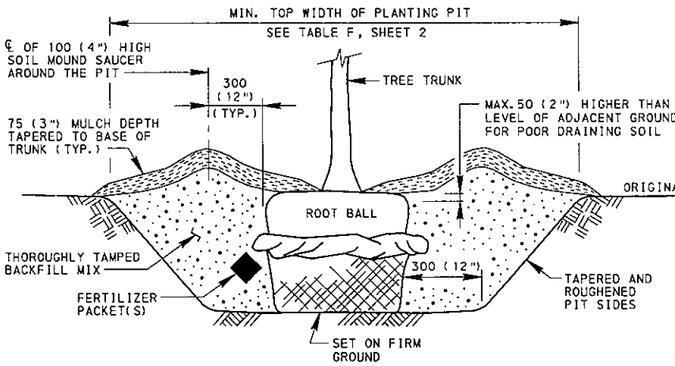
FOR DECIDUOUS TREES 1.5 m (5'-0") TO 40 (1½") CALIPER

NOTES

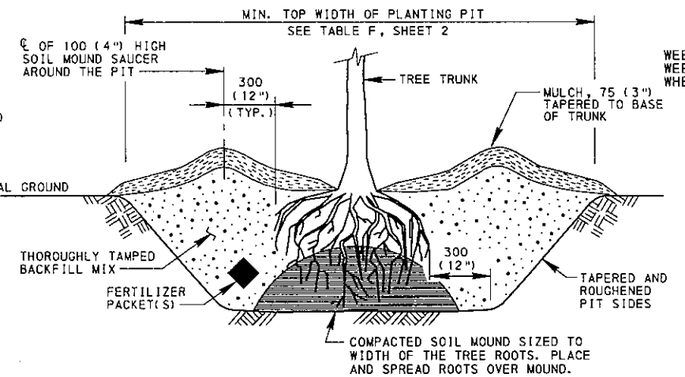
1. ALL MOUNDS CREATED IN THE PLANTING PIT SHALL CONSIST OF SOIL MATERIAL FROM THE PIT EXCAVATION FREE OF ALL STONES AND FOREIGN MATERIAL 50 (2") OR LARGER IN ANY DIMENSION.
2. SET TOP OF ROOT BALL 25 (1") TO 50 (2") HIGHER THAN SURROUNDING GROUND.
3. ATTACH COLLAR STRAPS TO THE TREE AT A POINT NOT LESS THAN 50% OF THE HEIGHT OF THE TREE.
4. SPACE ROOT CONTACT FERTILIZER PACKETS EQUALLY AROUND THE BALL OR ROOTS AND SET 150 (6") TO 200 (8") DEEP. PLACE FERTILIZER TABLETS AT THE ROOT ZONE APPROXIMATELY 75 (3") TO 100 (4") DEEP.
5. PROVIDE MATERIALS AND CONSTRUCT AS SPECIFIED IN PUBLICATION 408/2000, SECTION 808 AND 805.
6. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

BRACING DETAILS

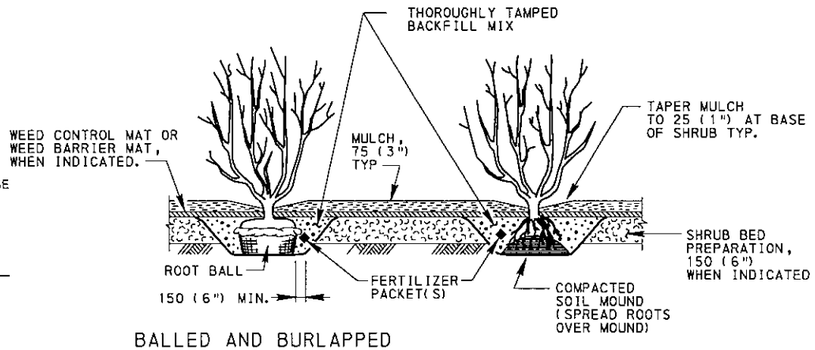
FOR BRACING REQUIREMENTS SEE TABLES A AND D, ON SHT. 2.



BALLED AND BURLAPPED OR CONTAINER



BARE ROOT



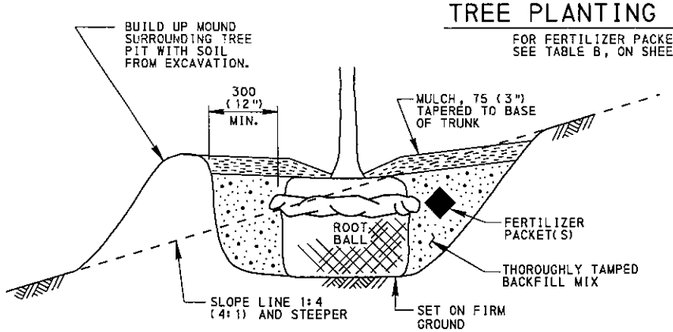
BALLED AND BURLAPPED OR CONTAINER

BARE ROOT

SHRUB PLANTING AND SHRUB BED PREPARATION DETAILS

TREE PLANTING DETAILS

FOR FERTILIZER PACKET SCHEDULE SEE TABLE B, ON SHEET 2.



SLOPE PLANTING DETAIL FOR DECIDUOUS AND EVERGREEN TREES

- USE TYPE 2 OR TYPE 3 BRACING, AS REQUIRED.
- FOR FERTILIZER PACKET SCHEDULE SEE TABLE B, ON 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

BRACING AND PLANTING DETAILS

RECOMMENDED AUG. 21, 2002	RECOMMENDED AUG. 21, 2002	SHT 1 OF 2
DIRECTOR, BUREAU OF DESIGN	CHIEF ENGINEER	RC-91M

TABLE A
BRACING REQUIREMENTS

BRACING TYPE	TREE SIZE		MINIMUM POST LENGTH	STAKE BRACE TYPE	REQUIRED POST SIZES †
	DECIDUOUS	EVERGREEN			
2	-----	1.2 m TO 1.8 m HT (4'-0" TO 6'-0" HT)	2.0 m (6'-6")	CHANNEL BAR	0.57 kg (1¼ LB) POST H2-1
				WOOD	50 (2") X 50 (2") FULL DIM
2	40 TO 60 CAL (1½" TO 2½" CAL)	1.8 m TO 2.4 m HT (6'-0" TO 8'-0" HT)	2.4 m (8'-0")	CHANNEL BAR	1.36 kg (3 LB) POST H2-2
				WOOD	50 (2") X 50 (2") FULL DIM
2	60 TO 90 CAL (2½" TO 3½" CAL)	-----	3.4 m (11'-0")	CHANNEL BAR	1.36 kg (3 LB) POST H2-2
				WOOD	75 (3") X 75 (3") FULL DIM
2	OVER 90 CAL (OVER 3½" CAL)	-----	3.8 m (12'-6")	CHANNEL BAR	1.36 kg (3 LB) POST H2-3
				WOOD	75 (3") X 75 (3") FULL DIM
3	1.5 m HT TO 40 CAL (5'-0" HT TO 1½" CAL)	-----	2.4 m (8'-0")	WOOD	50 (2") X 50 (2") FULL DIM

† ROUND WOOD STAKES MAY BE SUBSTITUTED AS FOLLOWS:
50 (2") X 50 (2") = 50 (2") DIAMETER ROUND STAKE AND
75 (3") X 75 (3") = 75 (3") DIAMETER ROUND STAKE.

TABLE B
110 g, 16-8-16 ROOT CONTACT FERTILIZER PACKET SCHEDULE

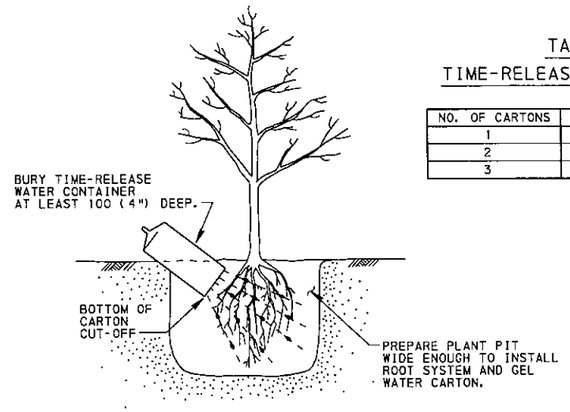
TREE SIZE		NUMBER OF PACKETS
DECIDUOUS	EVERGREEN	
UNDER 25 (1") CALIPER	450 (18") TO 900 (36") HEIGHT	1
25 (1") TO 50 (2") CALIPER	900 (3'-0") TO 1.8 m (6'-0") HEIGHT	2
50 (2") TO 60 (2½") CALIPER	1.8 m (6'-0") TO 2.4 m (8'-0") HEIGHT	3
60 (2½") TO 90 (3½") CALIPER	-----	4
90 (3½") TO 100 (4") CALIPER	-----	5
100 (4") TO 125 (5") CALIPER	-----	6
FLOWERING TREES		NUMBER OF PACKETS
1.5 m (5'-0") TO 3.0 m (10'-0") HEIGHT		3
SHRUBS		NUMBER OF PACKETS
300 (12") TO 600 (24") SPREAD OR HEIGHT		1
600 (24") TO 900 (36") SPREAD OR HEIGHT		2
900 (3'-0") TO 1.5 m (5'-0") HEIGHT		3

TABLE C
10 g, 20-10-5 FERTILIZER TABLET SCHEDULE

ALL EVERGREEN/DECIDUOUS SEEDLINGS	1 TABLET
ALL GROUNDCOVER MATERIAL	1 TABLET

TABLE D
COLLAR STRAP BRACING SCHEDULE

BRACING - RUBBER COLLAR STRAP SCHEDULE	
TREE SIZE	STRAP SIZE
TREES UNDER 50 (2") CALIPER	MIN. 38 (1½") WIDE x 335 (14") LENGTH
TREES 50 (2") CALIPER OR LARGER	MIN. 75 (3") WIDE x 480 (19") LENGTH
BRACING - FIBER COLLAR STRAP SCHEDULE	
ALL TREES-100 (4") CALIPER AND SMALLER	MIN. 20 (¾") WIDE x APPROPRIATE LENGTH-WITHOUT GROMMETS
TREES 75 (3") CALIPER AND SMALLER	MIN. 25 (1") WIDE x 450 (18") LENGTH-WITH GROMMETS
TREES LARGER THAN 75 (3") CALIPER	MIN. 25 (1") WIDE x 600 (24") LENGTH-WITH GROMMETS
TREES 100 (4") CALIPER AND SMALLER	MIN. 25 (1") WIDE x 850 (34") LENGTH-WITH NAIL TACK



PLANTING METHOD B
SEEDLING MATERIAL & SEEDLING TRANSPLANTS

TABLE E
TIME-RELEASE WATER CARTON

NO. OF CARTONS	PLANT HEIGHT
1	UP TO 300 (12")
2	300 (12") TO 600 (24")
3	600 (24") TO 900 (36")

TABLE F
TREE PLANTING PIT SIZE CRITERIA

DECIDUOUS TREES					EVERGREEN TREES	
B&B, AND WIRE ROOT PROTECTION DEVICES			CONTAINER GROWN		TREE HEIGHT	MIN. TOP DIAMETER OF PLANTING PIT
CALIPER	HEIGHT	MIN. TOP DIAMETER OF PLANTING PIT	HEIGHT	MIN. TOP DIAMETER OF PLANTING PIT		
25 (1")	——	1.5M (5')	1.2M (4') #2 CONTAINER	900 (3')	900-1.5M (3'-5')	1.5M (5')
40 (1½")	——	1.5M (5')	1.5M (5') #5 CONTAINER	1.2M (4')	1.8M-2.4M (6'-8')	1.8M (6')
50 (2")	——	1.8M (6')	1.8M (6') #5 CONTAINER	1.2M (4')		
60 (2½")	——	1.8M (6')				
80 (3")	——	2.0M (7')	30 (1¼") #10 CONTAINER	1.5M (5')		
90 (3½")	——	2.0M (7')				
100 (4")	——	2.5M (8')	40M (1½") #15 CONTAINER	1.5M (5')		
——	1.2M-2.4M (4'-8')	1.5M (5')				
BARE ROOT						
——	1.2M-2.4M (4'-8')	1.5M (5')				

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

BRACING AND PLANTING DETAILS

RECOMMENDED AUG. 21, 2002
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 21, 2002
CHIEF ENGINEER

SHT 2 OF 2

RC-91M