

(8-72)	TRANSMITTAL LETTER	Publication 72M April 2000 Edition
		DATE April 28, 2000

SUBJECT:
STANDARDS FOR ROADWAY CONSTRUCTION, RC 0M-100M

INFORMATION AND SPECIAL INSTRUCTIONS:

The attached April 2000 Edition of the Standards for Roadway Construction represents a complete Metric and English combined publication. This Edition supersedes the September 1995 Metric Edition and all subsequent changes.

The new standard drawings should be adopted as soon as possible on all new and existing designs and in conjunction with Publication 408/2000 Specifications and Bridge Standards that already have been issued with dual numbers (Metric and English).

Note: Either all metric or all English values must be used on plans. Metric and English values shown may not be mixed.

It is noted that the major changes to Publication 72M were to add English units in parenthesis. Also, the speed-volume criteria relative to the use of Type 2 Strong or Weak Post (Turned-down) End Treatments for guide rail, is reduced to 70km/h (45 mph) and 4000 ADT. Turned-down treatments cannot be used on the NHS regardless of speed or volume.

Any comments or questions on the new Edition relative to revisions, Metric or English numbers, may be directed to the Highway Quality Assurance Division.

In addition to the dual numbers on each standard drawing, there were a number of other changes made and are presented below. It is strongly advised that all recipients thoroughly review and become familiar with the April 2000 Edition.

<u>RC-Sheet#</u>	<u>Change Description</u>
General Changes	<ul style="list-style-type: none"> Added a Note to each sheet to indicate that either all Metric or all English values must be used on plans. The Note that indicates the Metric and English units appears only on the first sheet of each standard.

RC-52M (1 of 6)

- Added Note 7 to reference TC-7604 for the installation of delineators.

(3 of 6)

- Added Note 8 relative to Strong Post Median Barrier Applications.

- Revised Note 5 relative to the use of turned-down End Treatments.

RC-53M (2 of 2)

- Revised Note 1 relative to the use of Turned-down End Treatments.

RC-54M (1&2 of 7)

- Added 7620 mm (25') of WCC Guide Rail in the transition details between Weak-Post and Strong-Post to be consistent with other states in Region 3.

(5 of 7)

- Added Note 5 to provide 23.0m (75') from the swale line to the beginning of the hazard.

(6 of 7)

- Added Note 6 for the same reason as Sheet 5 of 7

RC-57M (1 of 3)

- Revised Note 5 and deleted Note 6.

CANCEL THE FOLLOWING: The September 1995 Edition of Publication 72M and all subsequent changes.	REQUEST ADDITIONAL COPIES FROM: Bureau of Office Services Publications Sales Office P.O. Box 2028 Middletown, PA 17120
	APPROVED FOR ISSUANCE BY: Bradley L. Mallory Secretary of Transportation By: <i>Gary F. Hoffman</i> Michael M. Ryan, P.E. Deputy Secretary for Highway Administration

INDEX OF STANDARDS FOR ROADWAY CONSTRUCTION

STANDARD DRAWING NUMBER	DRAWING DATE	DESCRIPTION
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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) ____	APR 28, 2000	CONCRETE PAVEMENT JOINTS
RC-21M _____	APR 28, 2000	REINFORCED CONCRETE PAVEMENT
RC-23M ____ (3 Sheets) ____	APR 28, 2000	BRIDGE APPROACH SLAB
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RC-25M ____ (5 Sheets) ____	APR 28, 2000	SHOULDERS
RC-26M ____ (5 Sheets) ____	APR 28, 2000	CONCRETE PAVEMENT REHABILITATION
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RC-28M _____	APR 28, 2000	OVERLAY TRANSITIONS AND PAVING NOTCHES

DRAINAGE

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

STANDARD DRAWING NUMBER	DRAWING DATE	DESCRIPTION
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GUIDE RAIL AND MEDIAN BARRIER

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

FENCES AND CURBS

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

POLLUTION CONTROL

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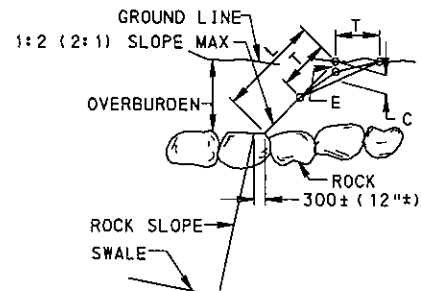
HIGHWAY LIGHTING

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

ROADSIDE DEVELOPMENT AND PLANTING

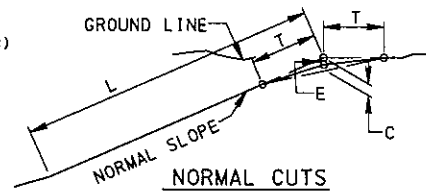
RC-91M ____ (2 Sheets) ____	APR 28, 2000	BRACING AND PLANTING DETAILS
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L=LENGTH OF SLOPE
 *T=3.0 m (10'-0"), WHERE L IS 3.0 m (10'-0") OR GREATER.
 *T=L, WHEN L IS LESS THAN 3.0 m (10'-0")
 E=C/2



APPLY ABOVE VALUES FOR ROUNDING THE TOP OF SLOPES OF DRAINAGE SWALES, CHANNELS, DITCHES AND PARALLEL DITCHES.

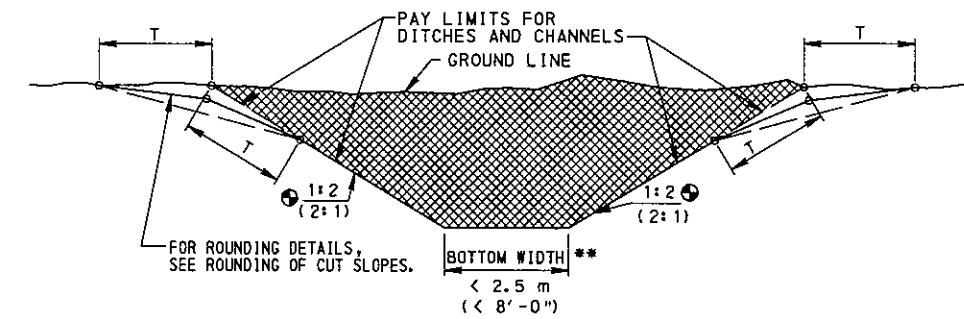
*EXCEPT IN HARD ROCK WITHOUT OVERBURDEN, AND EXCEPT AS INDICATED ON CONTOUR GRADING AND DRAINAGE PLANS, OR CROSS SECTIONS.



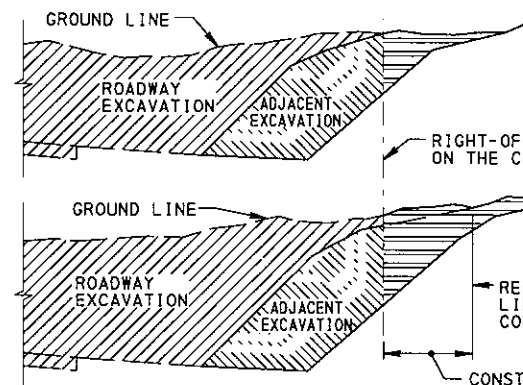
ROCK CUTS
 NORMAL CUTS
 ROUNDING OF CUT SLOPES

⊕ SLOPE AS INDICATED ON THE CROSS-SECTIONS.

** FOR BOTTOM WIDTHS > 2.5 m (8'-0"), EXCAVATION IS CLASS 1. PAYMENT FOR THIS AREA OF EXCAVATION IS INCIDENTAL TO EXCAVATION OF DITCH OR CHANNEL.



DITCHES AND CHANNELS



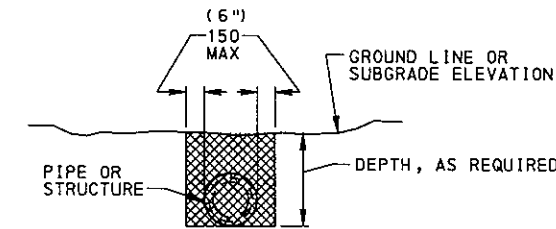
① THE CONTRACTOR SHALL OBTAIN WRITTEN AUTHORIZATION FROM THE ENGINEER AND MAKE HIS OWN ARRANGEMENTS FOR OBTAINING ALL BORROW AND WASTE AREAS AND PAY ALL COSTS INVOLVED.

RIGHT-OF-WAY LINE AS INDICATED ON THE CONSTRUCTION DRAWINGS.

REQUIRED LIMIT OF SLOPE LINE, IF INDICATED ON THE CONSTRUCTION DRAWINGS.

CONSTRUCTION OR SLOPE EASEMENT

① EXCAVATION ADJACENT TO ROADWAY IN LIEU OF COMMON BORROW EXCAVATION



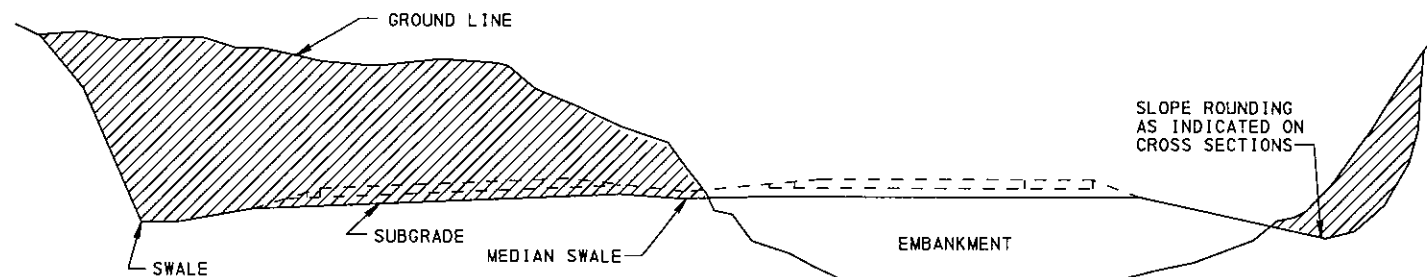
EXCAVATION FOR REMOVAL OF EXISTING PIPE OR STRUCTURE WHERE NO REPLACEMENT IS REQUIRED

NOTES

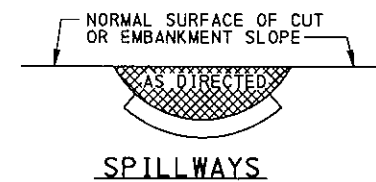
1. ALLOW NO PAYMENT FOR EXCAVATION IN EXCESS OF SPECIFIED LIMITS AND FOR ADDITIONAL BACKFILL MATERIAL REQUIRED.
2. ALL DIMENSIONS ARE GIVEN IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.
3. EXCAVATION FOR PIPE AND PIPE-ARCH WITH 1800 (6'-0") AND GREATER INSIDE DIAMETER OR SPAN IS CLASS 1 EXCAVATION.

LEGEND

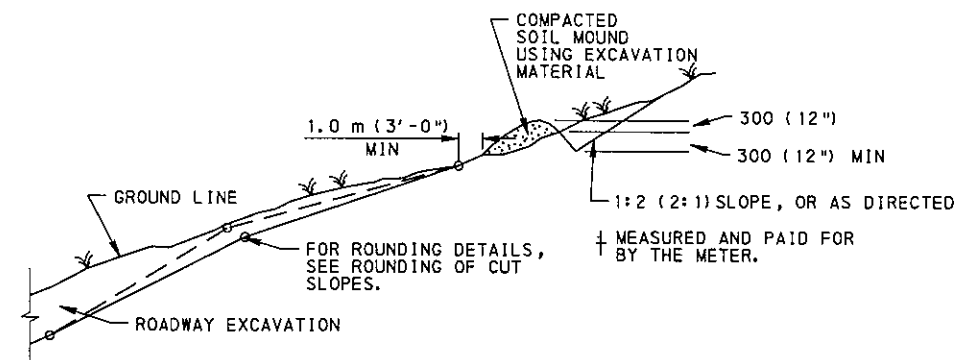
- CLASS 1 EXCAVATION
- CLASS 2 EXCAVATION
- COMMON BORROW EXCAVATION
- CLASS 1 OR COMMON BORROW EXCAVATION



ROADWAY SECTION SHOWING CLASS 1 EXCAVATION



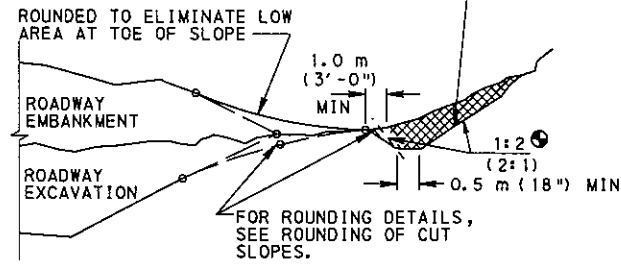
SPILLWAYS



† DIVERSION DITCH

⊕ SLOPE AS INDICATED ON THE CROSS-SECTIONS.

FOR PAY LIMITS, SEE DITCHES AND CHANNELS DETAIL.

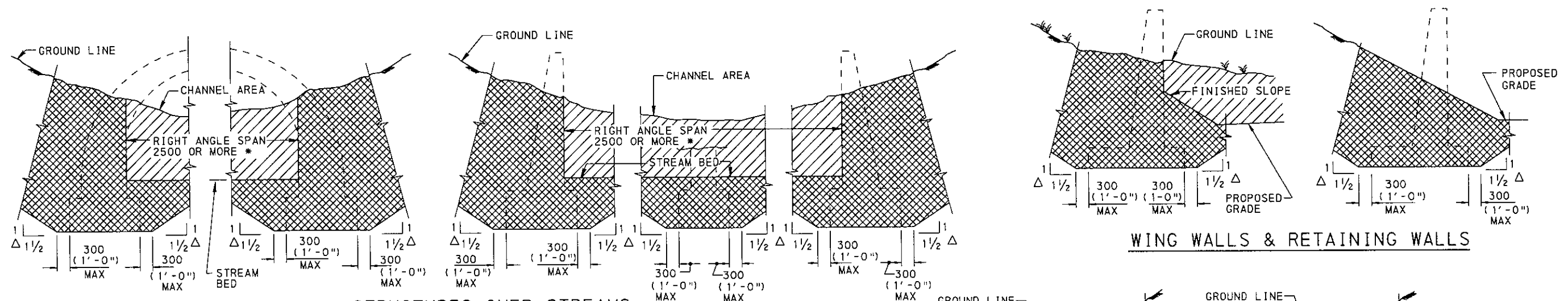


PARALLEL DITCH

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

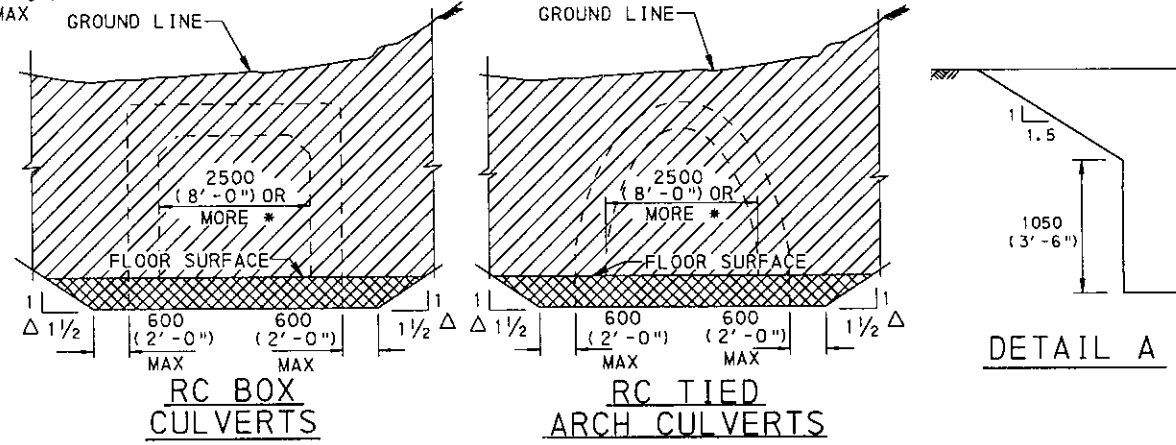
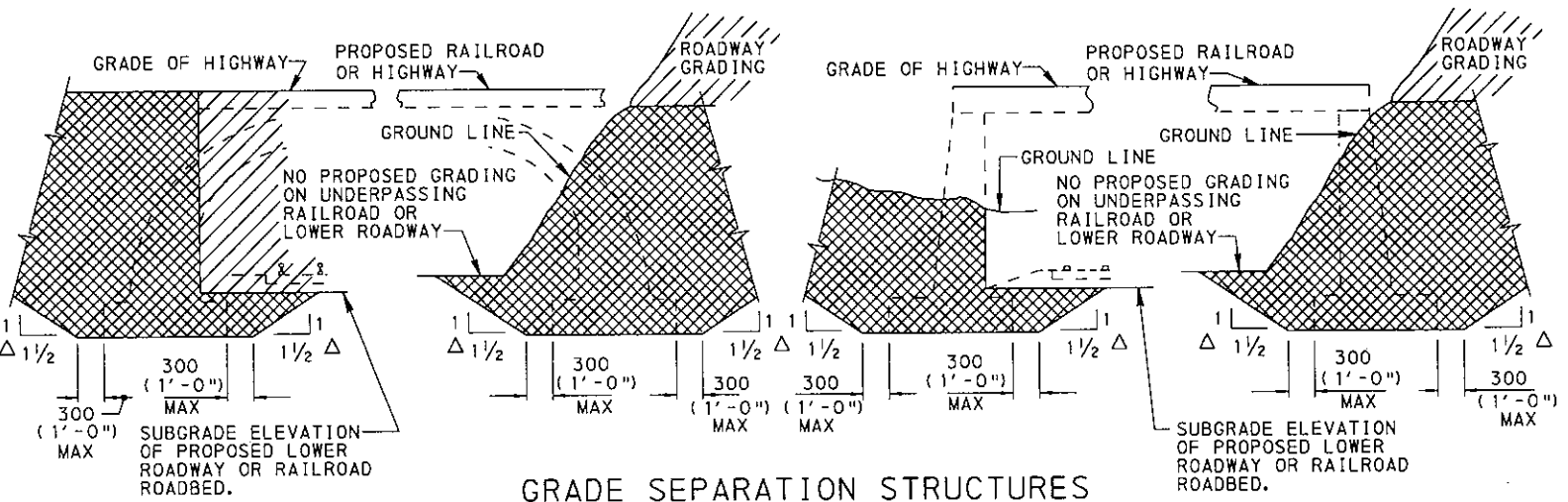
COMMONWEALTH OF PENNSYLVANIA
 DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

CLASSIFICATION OF EARTHWORK



STRUCTURES OVER STREAMS
INCLUDING METAL PLATE ARCH WITH FOOTING

* WHEN RIGHT ANGLE SPAN IS LESS THAN 2500, ALL EXCAVATION IS CLASS 3.



* WHEN LESS THAN 2500, ALL EXCAVATION IS CLASS 3.

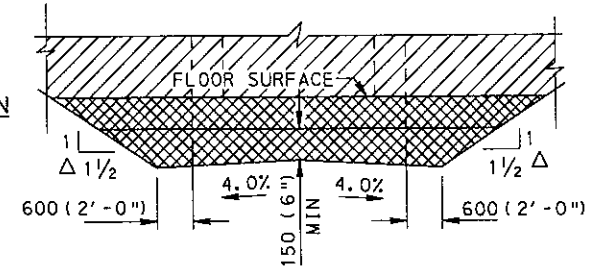
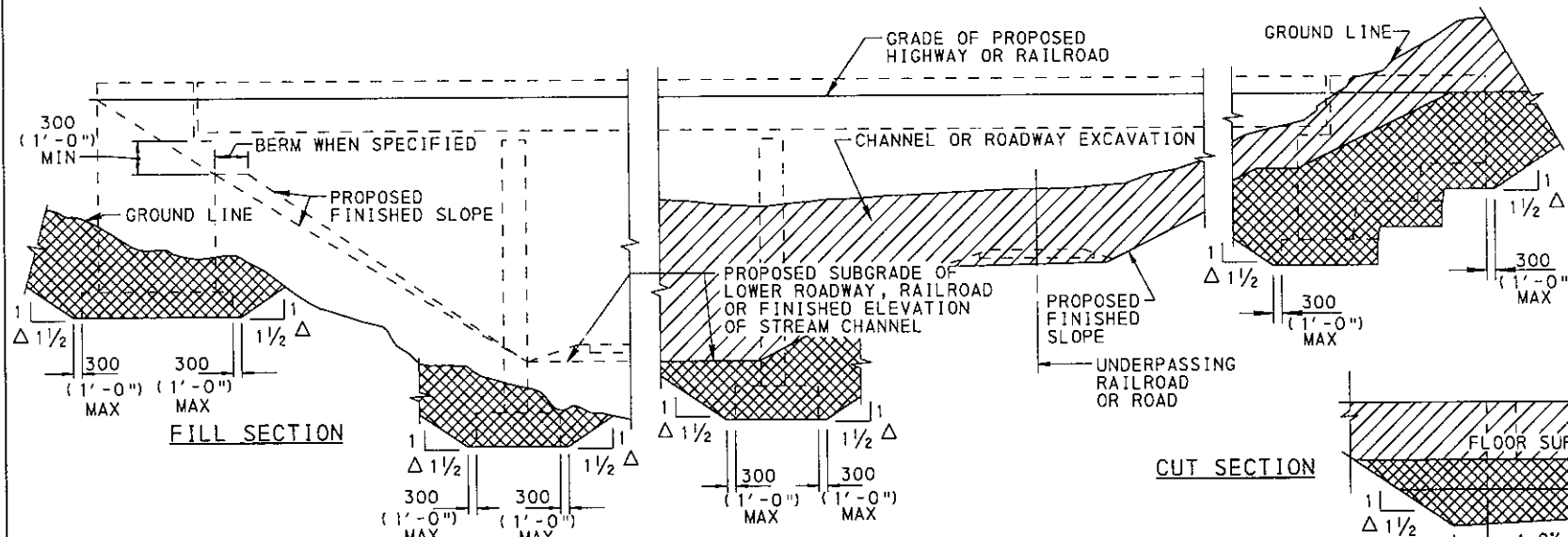
NOTES

1. FOLLOW OSHA SAFETY REQUIREMENTS IN ALL UNSHORED EXCAVATION AREAS. USE DETAIL 'A' FOR COHESIVE SOILS ONLY AS DEFINED IN OSHA CFR29 SECTION 1926.652 AND DETERMINED BY APPROPRIATE SOILS REPORT: 1500 (5'-0") MAXIMUM FOR VERTICAL CUT, OTHERWISE 1050 (3'-6") MAXIMUM FROM BOTTOM OF EXCAVATION TO START OF 1:1.5 (1 1/2:1) LAYBACK SLOPE. IF THE TOTAL EXCAVATION DEPTH EXCEEDS 4 m (12'-0"), DO NOT USE DETAIL 'A'.
2. NO PAYMENT WILL BE ALLOWED FOR EXCAVATION IN EXCESS OF SPECIFIED LIMITS AND FOR ADDITIONAL BACKFILL MATERIAL REQUIRED.
3. DEFINE SPECIAL SITUATIONS (SUCH AS ROCK EXCAVATION, SHORED CONSTRUCTION, ETC.), INVOLVING EXCAVATION NOT ENTIRELY COVERED BY THIS STANDARD, ON THE DESIGN DRAWING BY SKETCHES AND/OR DESCRIBE IN THE SPECIAL PROVISIONS.
4. ALL DIMENSIONS ARE GIVEN IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

LEGEND

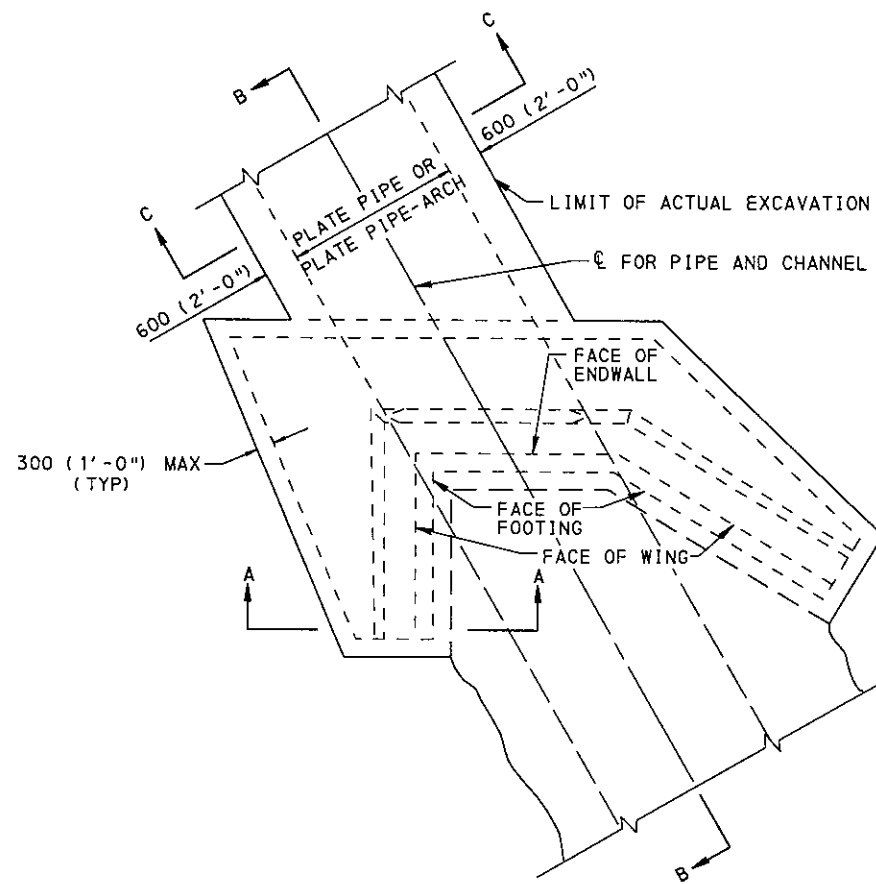
- CLASS 1 EXCAVATION (TO BE INCLUDED IN ROADWAY QUANTITIES)
- ROADWAY ITEM
- CLASS 3 EXCAVATION (TO BE INCLUDED IN STRUCTURE QUANTITIES)
- STRUCTURE ITEM
- CONTINUE 1 1/2:1 SLOPE FOR CLASS 3 EXCAVATION TO FINISH GRADE OR GROUND LINE, WHICHEVER COMES FIRST.

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

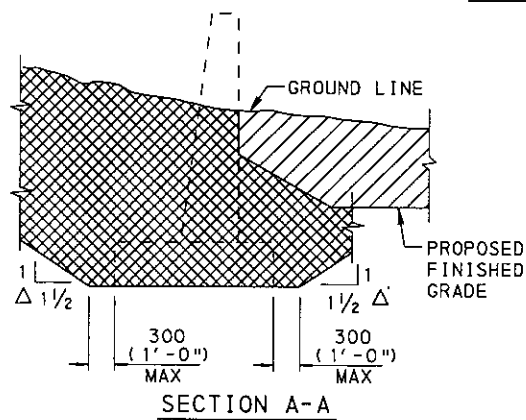


COMMONWEALTH OF PENNSYLVANIA
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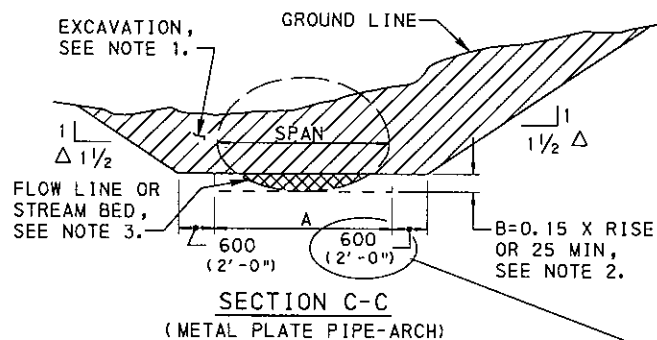
CLASSIFICATION OF EARTHWORK FOR STRUCTURES



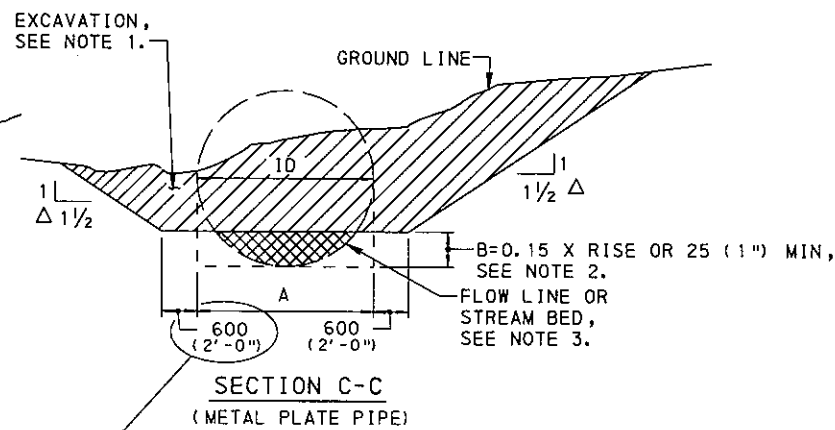
PLAN VIEW



SECTION A-A

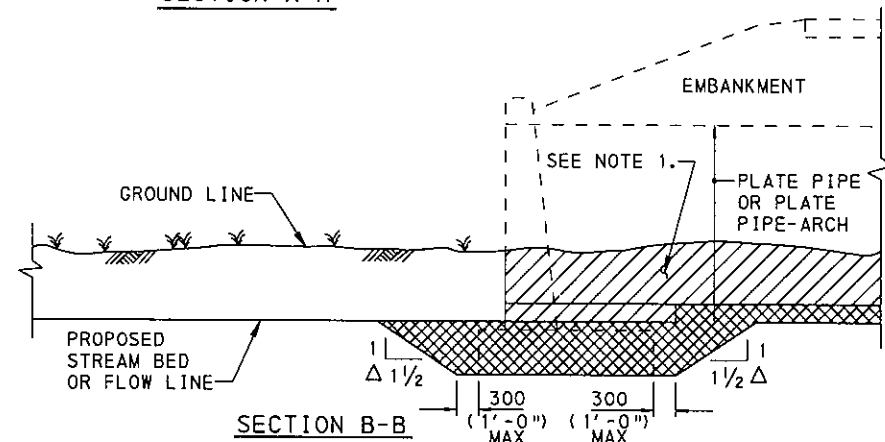


SECTION C-C
(METAL PLATE PIPE-ARCH)



SECTION C-C
(METAL PLATE PIPE)

SEE PUBLICATION 15M, DM-4,
SECTION 12.1.6.1(b)(1).



SECTION B-B

METAL PLATE PIPE AND METAL PLATE
PIPE-ARCH CULVERTS WITH ENDWALL

NOTES

1. PROVIDE EXCAVATION, INCLUDING THE PORTIONS OF ENDWALL ABOVE THE FLOW LINE AND TO A MAXIMUM OF 1200 (4'-0") ABOVE THE TOP OF THE PIPE OR PIPE-ARCH, AS CLASS 4 EXCAVATION FOR PIPE OR PIPE-ARCH LESS THAN 1200 (4'-0") INSIDE DIAMETER OR SPAN, RESPECTIVELY, AND CLASS 3 EXCAVATION FOR PIPE OR PIPE-ARCH 1200 (4'-0") OR GREATER INSIDE DIAMETER OR SPAN, RESPECTIVELY.
2. FOR PLATE PIPE OR PLATE PIPE-ARCH WITH 1200 (4'-0") OR GREATER INSIDE DIAMETER OR SPAN, RESPECTIVELY, PROVIDE EXCAVATION BETWEEN THE FLOW LINE AND THE LOWER LIMIT OF CLASS 1 EXCAVATION CONFORMING TO THE AREA SHOWN WITH THE CLASS 3 EXCAVATION SYMBOL.
3. WHEN DEEMED NECESSARY TO EXCAVATE BELOW THE BOTTOM OF THE FLOW LINE, PAY ALL EXCAVATION WITHIN THE LIMITS OF THE BOTTOM OF THE EXCAVATED TRENCH AND THE TOP OF THE EXISTING GROUND AS CLASS 1 EXCAVATION FOR PLATE PIPE OR PLATE PIPE-ARCH WITH 1200 (4'-0") OR GREATER INSIDE DIAMETER OR SPAN, RESPECTIVELY, AND AS CLASS 4 EXCAVATION FOR PLATE PIPE OR PLATE PIPE-ARCH LESS THAN 1200 (4'-0") INSIDE DIAMETER OR SPAN, RESPECTIVELY. PLACE AND SHAPE BACKFILL MATERIAL FOR THE UNDERCUT AREA CONFORMING TO THE BOTTOM OF THE CULVERT AND CONSIDER INCIDENTAL TO THE CLASS SPECIFIED.
4. MEASURE AND PAY EXCAVATION AS SHOWN IN SECTION A-A, SECTION B-B AND SECTION C-C.
5. ALL DIMENSIONS ARE GIVEN IN MILLIMETERS EXCEPT AS NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

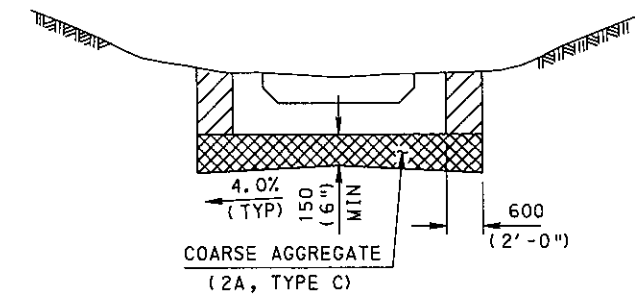
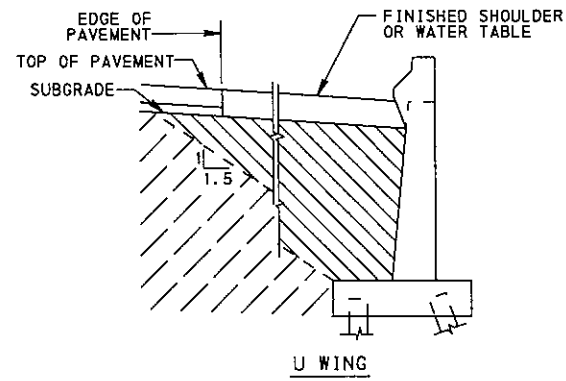
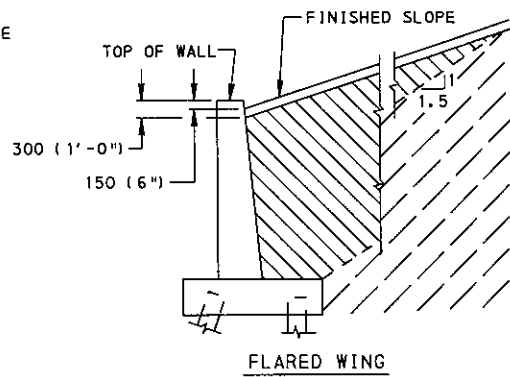
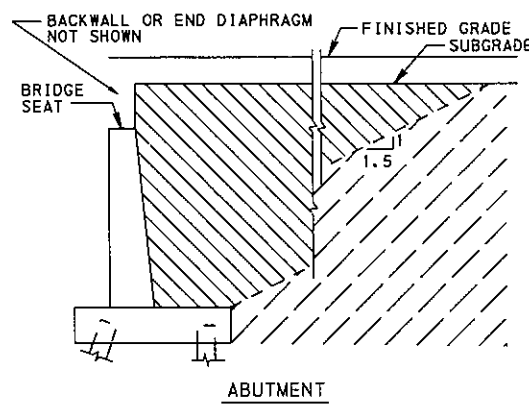
LEGEND

- CLASS 1 OR 4 EXCAVATION (TO BE INCLUDED IN ROADWAY QUANTITIES)
- CLASS 3 EXCAVATION (TO BE INCLUDED IN STRUCTURE QUANTITIES)
- △ CONTINUE 1 1/2:1 SLOPE FOR CLASS 3 EXCAVATION TO FINISH GRADE OR GROUND LINE, WHICHEVER COMES FIRST.

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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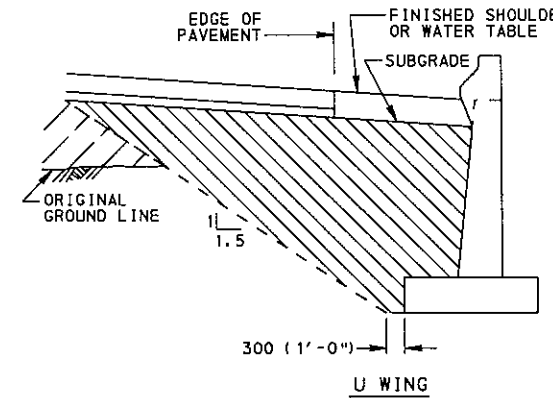
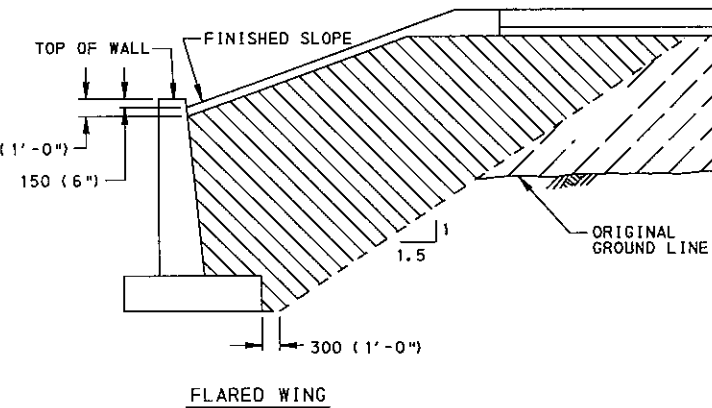
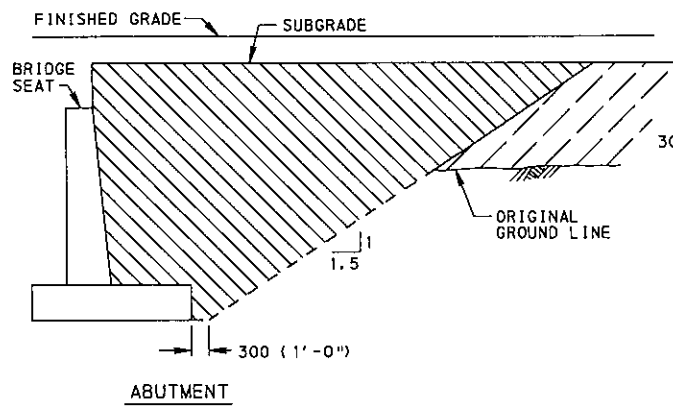
CLASSIFICATION OF EARTHWORK
FOR STRUCTURES





FOUNDATION PREPARATION FOR RC BOX AND ARCH CULVERTS ON FINE GRAIN SOIL ONLY

NOTE: EXCAVATE THE LAST 600 (2 ft) WITH BUCKET WITHOUT TEETH TO KEEP THE FOUNDATION FIRM. FOR CULVERTS WITH SPANS LESS THAN 2500 (8'-0"), BOTTOM MAY BE SLOPED IN ONE DIRECTION.

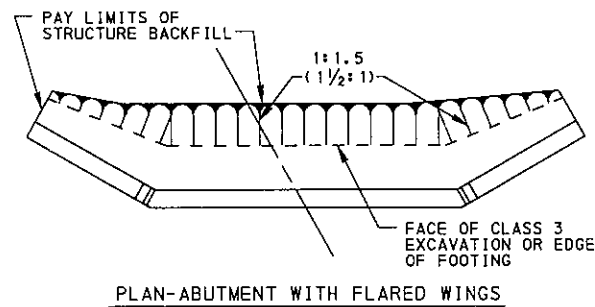
TYPICAL CROSS SECTIONS - ABUTMENTS ON FILL



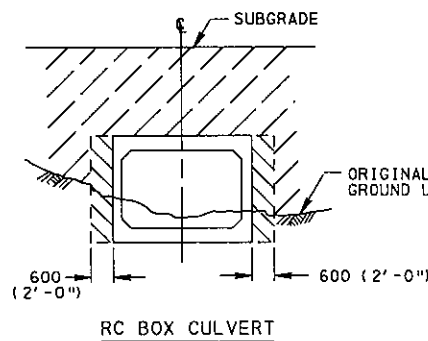
LEGEND

-  STRUCTURE BACKFILL
-  EMBANKMENT MATERIAL

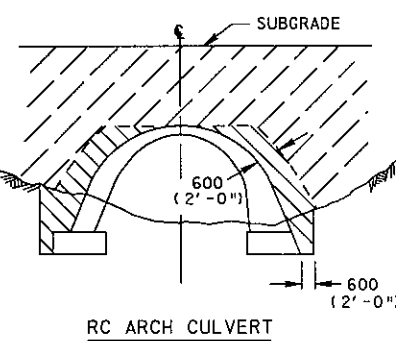
TYPICAL CROSS SECTIONS - ABUTMENTS IN CUT



PLAN-ABUTMENT WITH FLARED WINGS

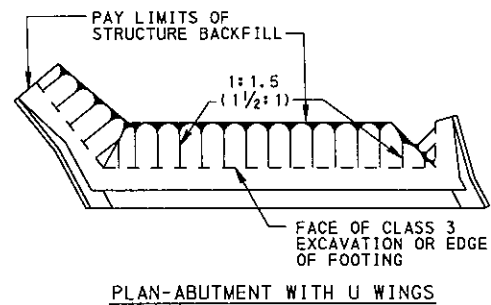


RC BOX CULVERT

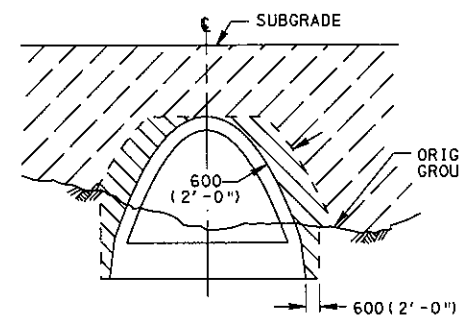


RC ARCH CULVERT

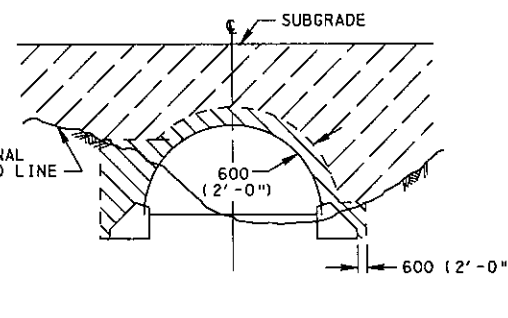
NOTE: SEE SHEET 2 FOR GENERAL NOTES.



PLAN-ABUTMENT WITH U WINGS



RC TIED ARCH CULVERT




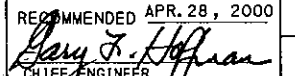
METAL PLATE ARCH CULVERT

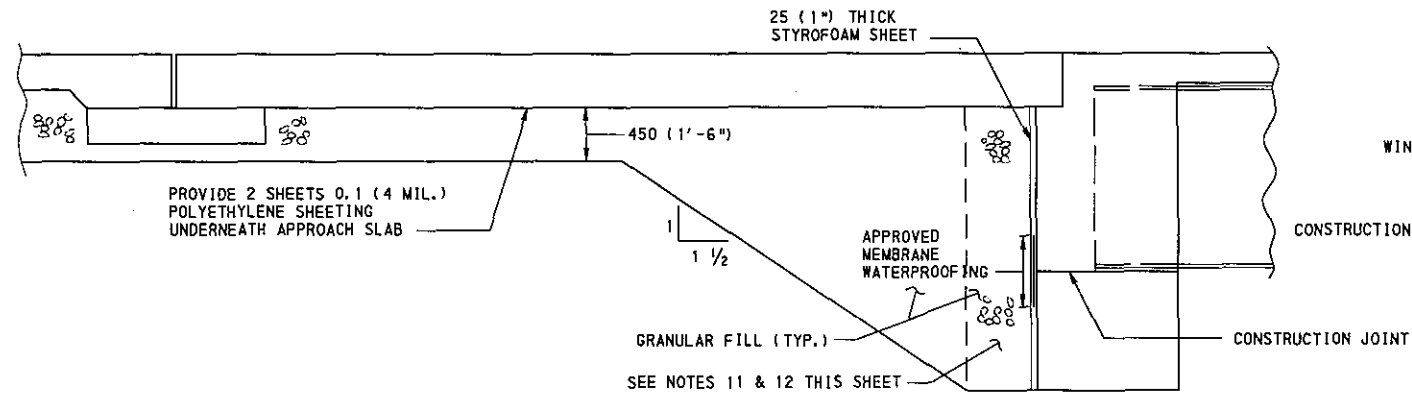
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

BACKFILL & EMBANKMENT CONSTRUCTION AT STRUCTURES

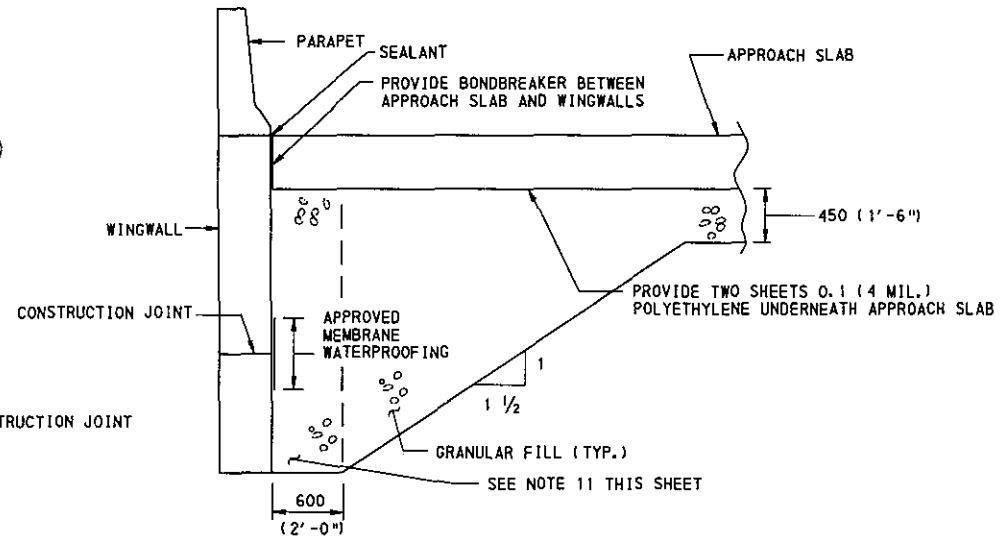
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BACKFILL AT STRUCTURES

RECOMMENDED APR. 28, 2000
 DIRECTOR, BUREAU OF DESIGN
 RECOMMENDED APR. 28, 2000
 CHIEF ENGINEER
 SHT. 1 OF 2
 RC-12M



LIMITS OF BACKFILL
INTEGRAL ABUTMENT



LIMITS OF BACKFILL
WINGWALLS OF INTEGRAL ABUTMENTS

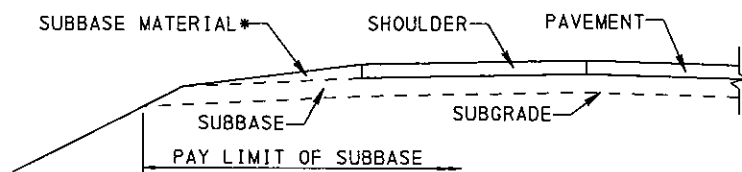
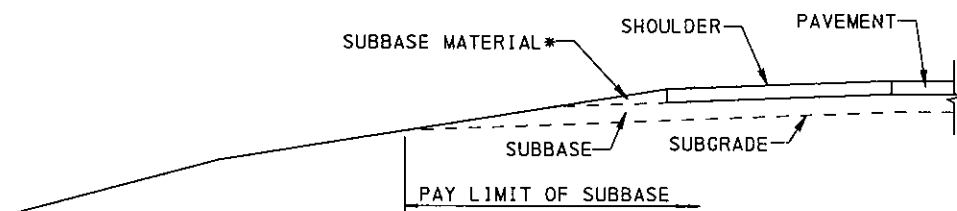
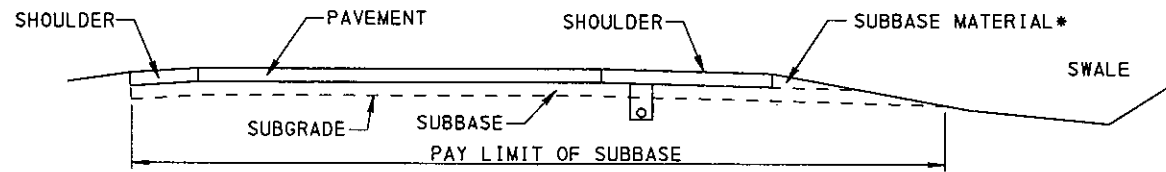
GENERAL NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUB 408/2000. PLACE BACKFILL AND EMBANKMENT IN ACCORDANCE WITH THIS STANDARD DRAWING UNLESS OTHERWISE SHOWN ON THE STRUCTURE DRAWINGS.
2. USE ONLY R-3 ROCK LINING, MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 850.2(1); AASHTO NO. 1, 3, 5 OR 57 COARSE AGGREGATES, MEETING AT LEAST THE TYPE C QUALITY REQUIREMENTS IN PUBLICATION 408M, SECTION 703.2, TABLE B; OR TYPE OGS COARSE AGGREGATE, MEETING AT LEAST THE TYPE C QUALITY REQUIREMENTS IN PUBLICATION 408M, SECTION 703.2, TABLE B. MEASURE AND PAY STRUCTURE BACKFILL AS SELECTED BORROW EXCAVATION-STRUCTURE BACKFILL. DO NOT USE R-3 FOR STRUCTURE BACKFILL FOR ANY TYPE RC OR METAL PLATE CULVERT. PLACE A CLASS 2, TYPE B GEOTEXTILE BLANKET AS A BARRIER BETWEEN THE STRUCTURE BACKFILL AND EXCAVATION/EMBANKMENT MATERIAL. PLACE A CLASS 2, TYPE B GEOTEXTILE BLANKET ON ENTIRE TOP OF THE COMPLETED STRUCTURE BACKFILL PRIOR TO PLACING ANY SUBBASE MATERIAL FOR THE ROADWAY. THE GEOTEXTILE IS CONSIDERED INCIDENTAL TO THE SELECTED BORROW EXCAVATION STRUCTURE BACKFILL AND WILL NOT BE PAID FOR SEPARATELY.
3. TREAT BACKFILL LIMITS AT RETAINING WALLS AND WINGWALLS FOR CULVERTS THE SAME AS FLARED ABUTMENT WINGWALLS.
4. TREAT BACKFILL CONSTRUCTION AT RC BOX CULVERTS WITH THE TOP SLAB AT ROADWAY GRADE THE SAME AS ABUTMENTS.
5. TREAT BACKFILL CONSTRUCTION AT CULVERTS, WHERE THE TOP OF THE CULVERT IS NEAR SUBGRADE, AS SHOWN ON THE STRUCTURE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
6. PLACE STRUCTURE BACKFILL AND ADJOINING EMBANKMENT SIMULTANEOUSLY UNLESS OTHERWISE PERMITTED BY THE ENGINEER.
7. REPLACE MATERIAL REMOVED BEYOND THE SPECIFIED LIMITS OF CLASS 1, 2 OR 3 EXCAVATION WITH STRUCTURE BACKFILL. CONSIDER MATERIAL REMOVED OR STRUCTURE BACKFILL PLACED BEYOND THE SPECIFIED LIMITS OF CLASS 1, 2 OR 3 EXCAVATION AS INCIDENTAL TO THE CLASS OF EXCAVATION SPECIFIED.
8. REFER TO STRUCTURE DRAWINGS FOR DRAINAGE DETAILS, WEEP HOLES, ETC.
9. INDICATE STRUCTURE BACKFILL QUANTITIES ON THE STRUCTURE DRAWINGS.
10. ALL DIMENSIONS ARE GIVEN IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.
11. PLACE BACKFILL WITHIN 600 mm FROM THE REAR FACE OF THE ABUTMENT AND THE WINGWALL IN LIFTS OF 100 mm. COMPACT EACH LAYER WITH TWO PASSES OF A WALK-BEHIND VIBRATORY PLATE SOIL COMPACTOR.
12. BACKFILL SIMULTANEOUSLY BEHIND BOTH ABUTMENTS. KEEP THE DIFFERENCE BETWEEN THE FILL HEIGHT AT BOTH ENDS OF THE BRIDGE BELOW 300 mm (12") AT ALL TIMES DURING BACKFILLING.

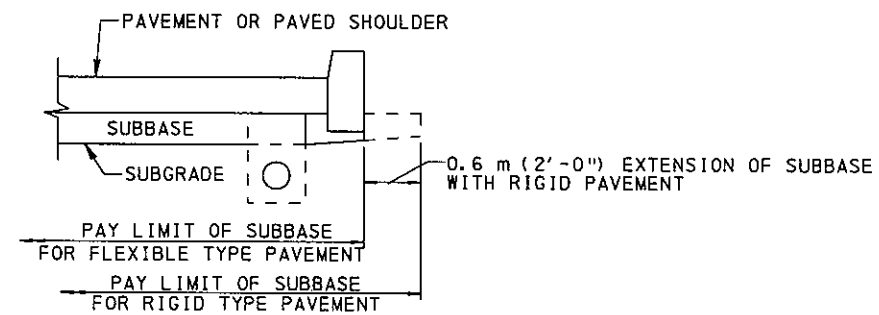
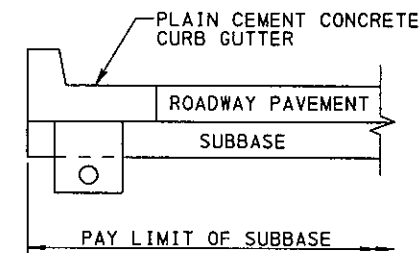
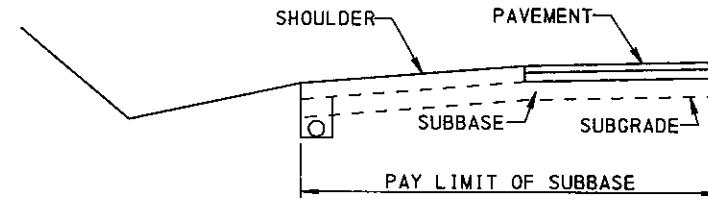
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
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BUREAU OF DESIGN

BACKFILL AT STRUCTURES



*CONSIDER THE PAYMENT FOR THIS AREA OF SUBBASE INCIDENTAL TO THE SHOULDER.



NOTE

1. CONSIDER PAYMENT FOR SUBGRADE INCIDENTAL TO THE ITEMS OF SUBBASE.
2. ALL DIMENSIONS ARE GIVEN IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
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PAY LIMIT OF SUBBASE

NOTES

- PLACE AN APPROVED TUBE 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.
- 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.
- CONSTRUCT ALL TRANSVERSE JOINTS PERPENDICULAR TO THE CENTERLINE.
- USE MINIMUM NO. 32 x 450 (1 1/4" x 18") LONG DOWEL BARS FOR PAVEMENT DEPTHS 250 (10") OR LESS AND MINIMUM NO. 38 x 450 (1 1/2" 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.
- PLACE DOWEL BARS PARALLEL TO THE CENTERLINE AND SURFACE OF THE SLAB.
- USE ONLY APPROVED NEOPRENE SEALS, AS LISTED IN BULLETIN 15. INSTALL NEOPRENE SEALS TO A UNIFORM DEPTH WITH THE TOP OF THE SEAL NOT LESS THAN 6 (1/4") NOR MORE THAN 10 (3/8") 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.
- MAKE THE TOP OF THE JOINT SEALING MATERIAL NO LESS THAN 2 (1/16") NOR MORE THAN 5 (3/16") BELOW THE SURFACE OF THE PAVEMENT.
- THE INITIAL SAW CUT FOR TYPE D AND TYPE G JOINTS IS NOT REQUIRED FOR CONSTRUCTION JOINTS.
- SAW DEPTHS OF NEOPRENE SEALS:

SEAL SIZE	SAW CUT DEPTHS
25 (1")	47-50 (1 7/8"-2")
32 (1 1/4")	50-53 (2"-2 1/8")
- 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

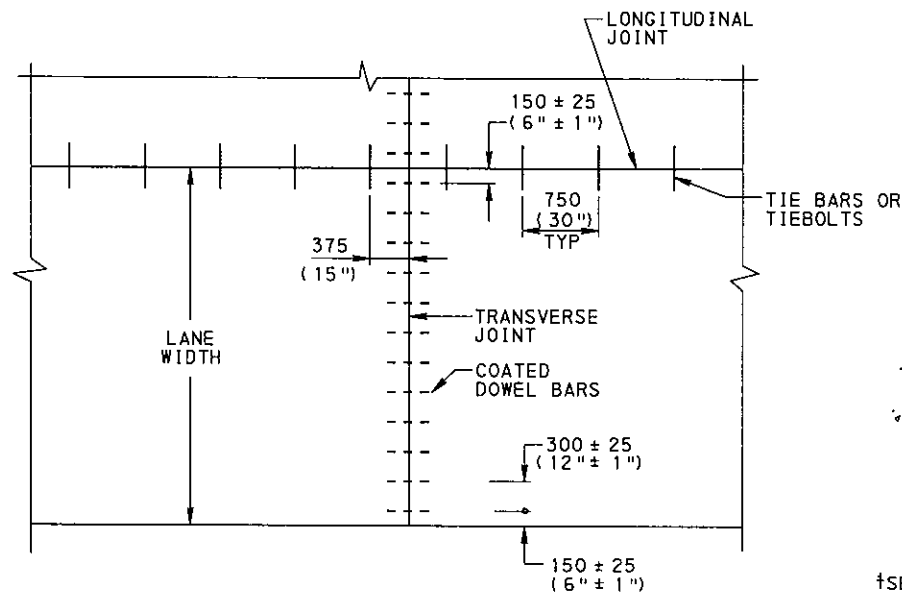
JOINT SPACING	SEAL SIZE	WIDTH OF SAW CUT		
		<60°F	60°F TO 80°F	>80°F
(15' & 20')	(1")	(5/8 ")	(9/16 ")	(1/2 ")
(30')	(1 1/4")	(3/4 ")	(5/8 ")	(1/2 ")

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

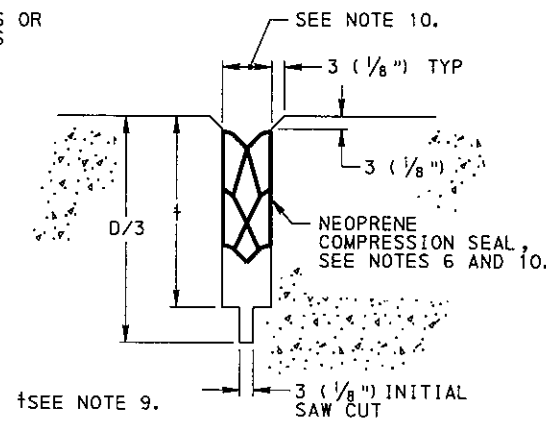
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**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
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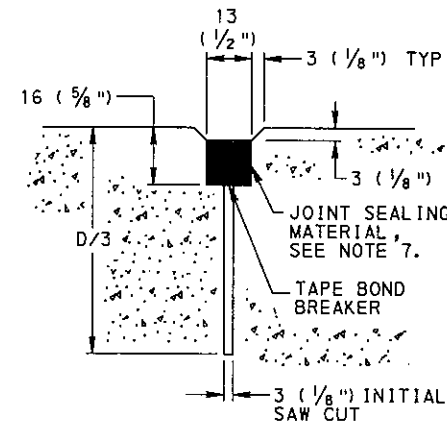
CONCRETE PAVEMENT JOINTS



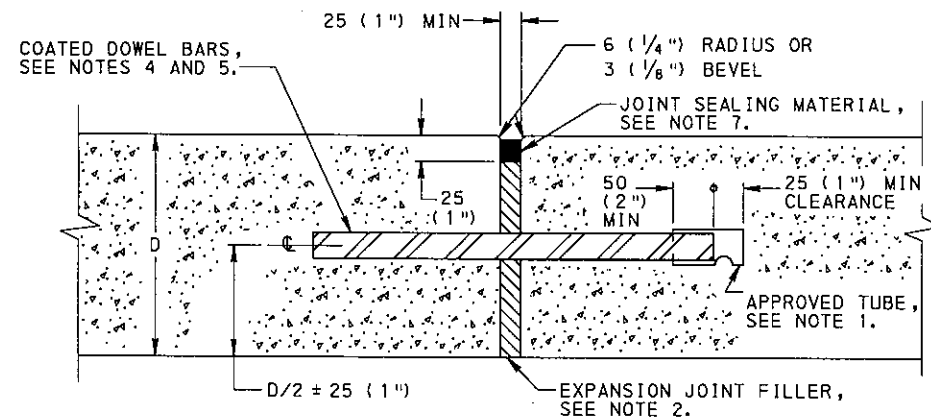
TYPICAL LAYOUT



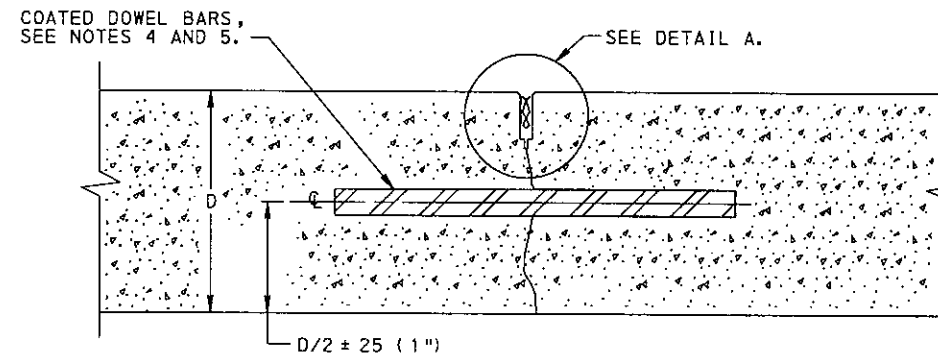
DETAIL A



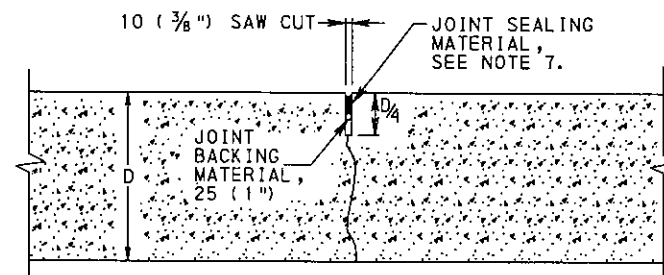
DETAIL B



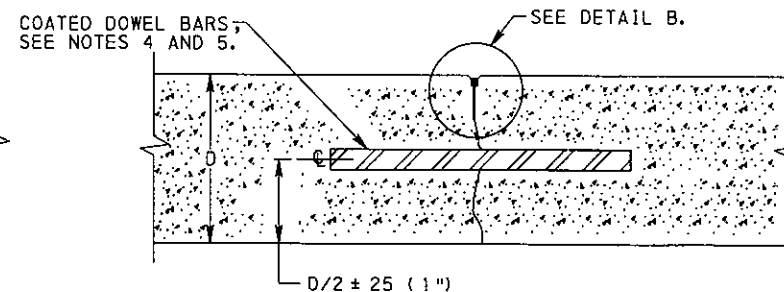
TYPE E



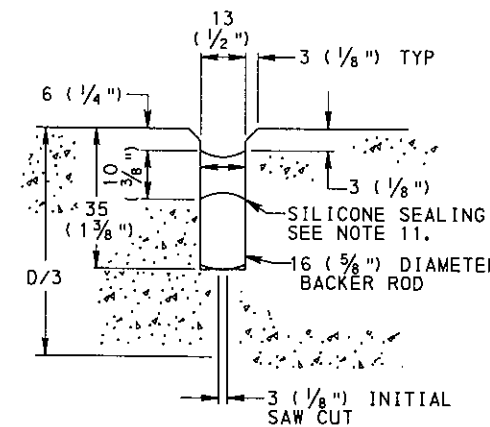
TYPE D



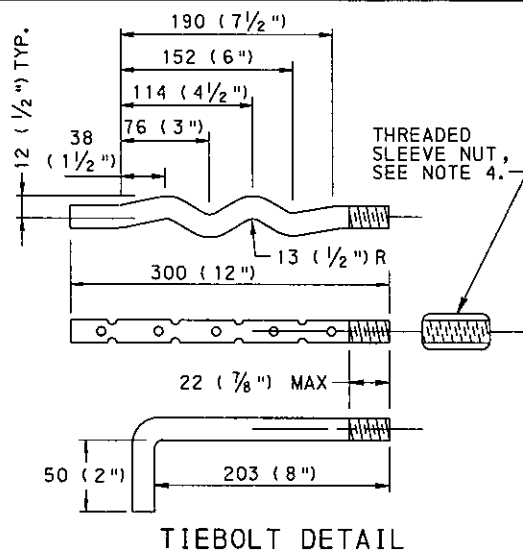
TYPE P
SEE RC-27M



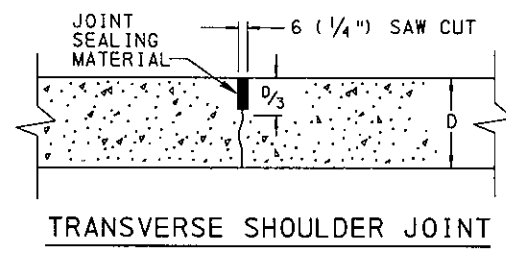
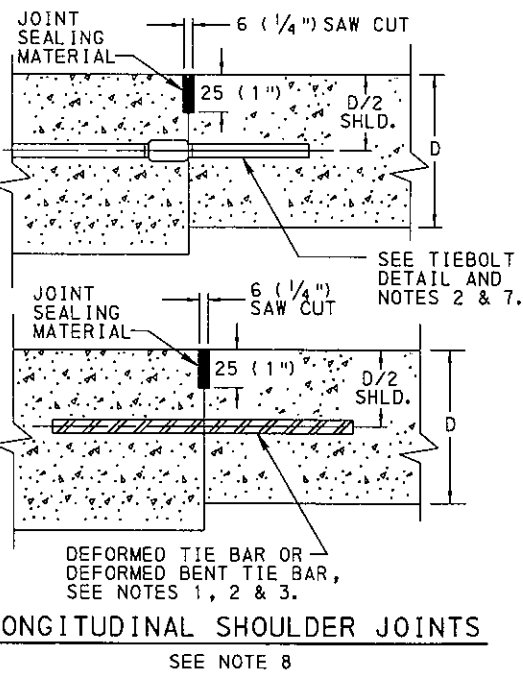
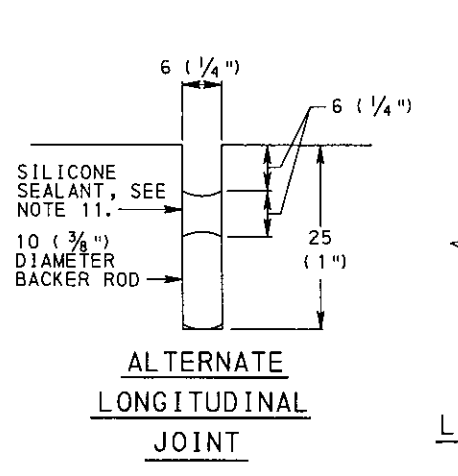
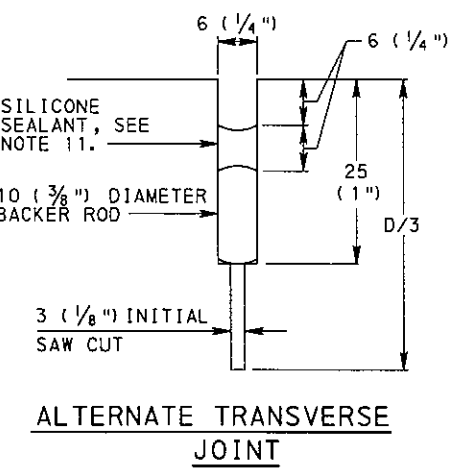
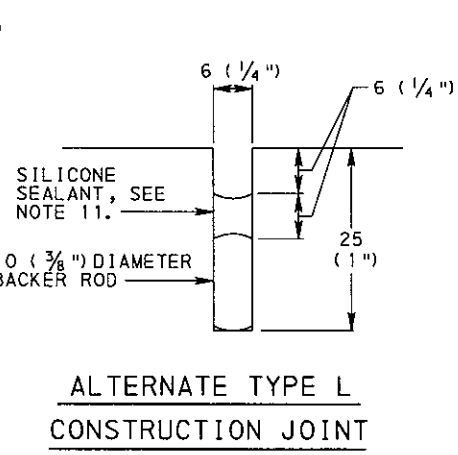
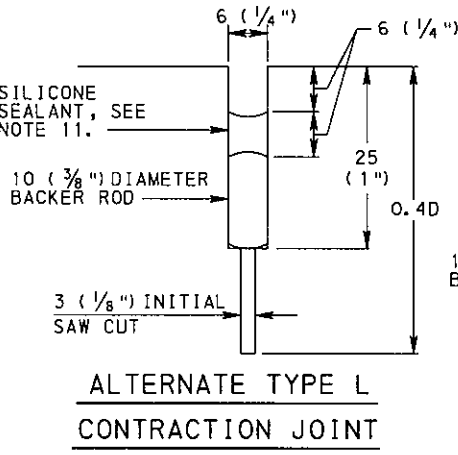
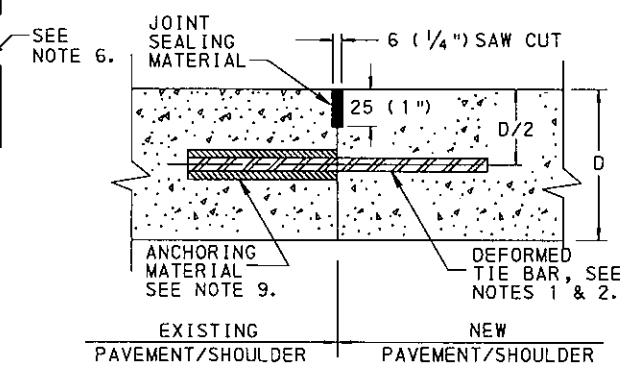
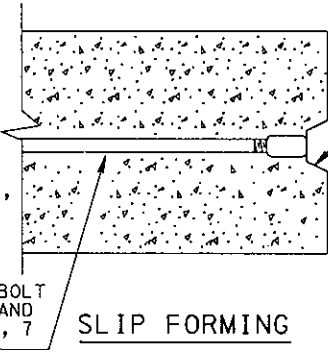
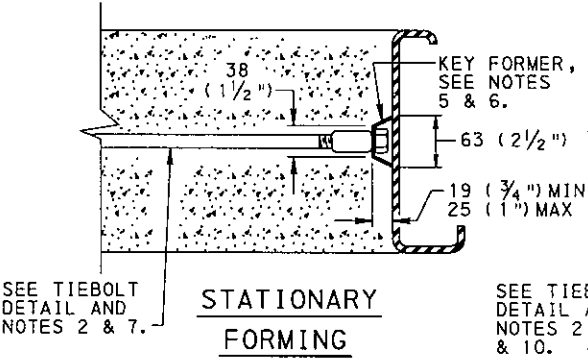
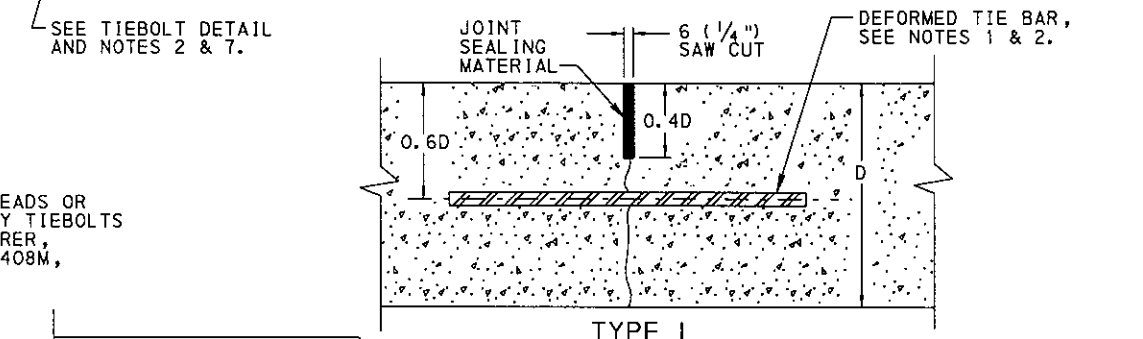
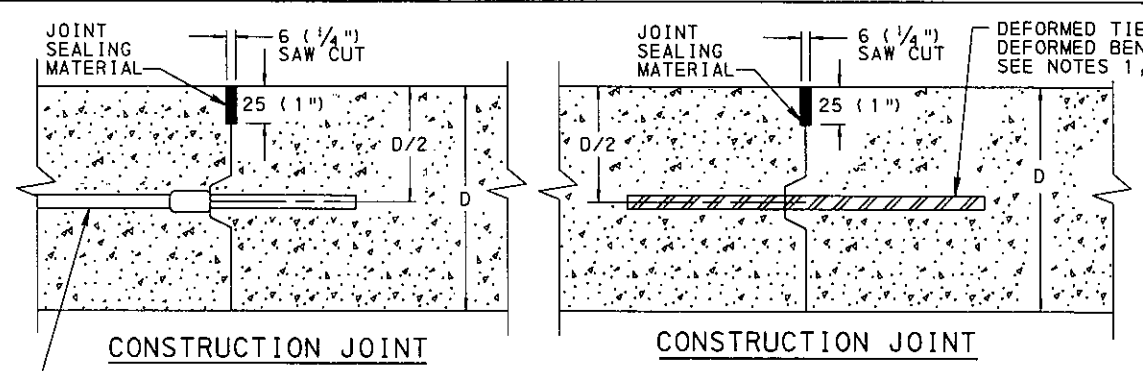
TYPE G
SEE RC-27M



**ALTERNATE TYPE P &
ALTERNATE TYPE G
JOINT DETAIL**



MAKE TIEBOLTS 14 (3/16) 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 408M, SECTIONS 709.1 AND 705.2(b).



NOTES

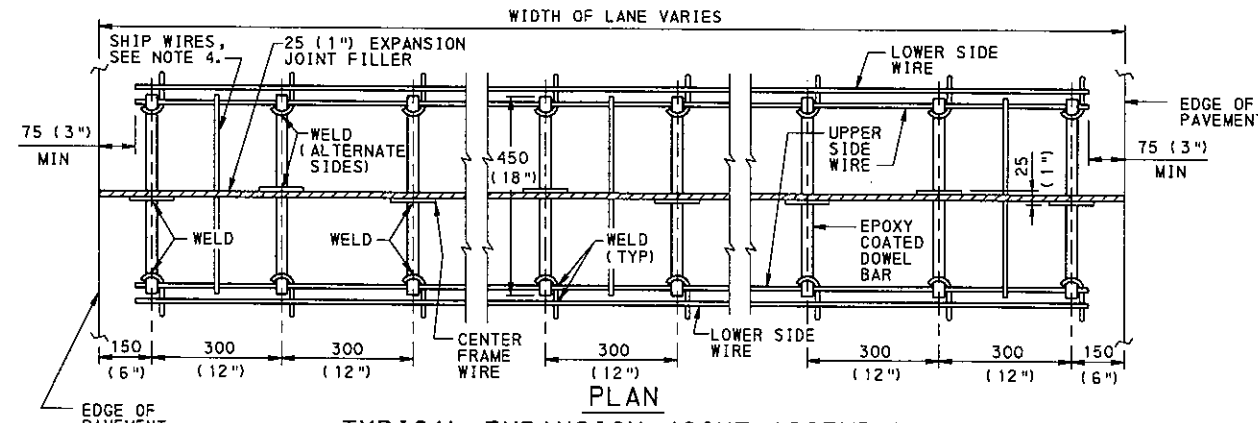
1. SPECIFY #16 (#5) TIE BARS 750 ±6 (30" ±1/4") LONG, SPACED 750 (30") CENTER TO CENTER MAXIMUM. PLACE PERPENDICULAR TO AND CENTERED OVER THE LONGITUDINAL JOINT ±25 (±1"). EMBED TIE BARS D/2 ±20 (±3/4") OR 100 ±13 (4" ±1/2"), WHICHEVER IS GREATER, EXCEPT FOR TYPE L CONTRACTION JOINTS. FOR TYPE L CONTRACTION 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 408M (408/2000), SECTION 501.3(i)1.
2. EPOXY COAT TIE BARS AS SPECIFIED IN PUBLICATION 408M (408/2000), SECTION 709.1(c). EPOXY COAT OR GALVANIZE TIEBOLTS AND THREADED SLEEVE NUTS, EXCLUDING THREADS, AS SPECIFIED IN PUBLICATION 408M (408/2000), SECTION 709.1(c) 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 1/8"Ø x 1 7/8") LONG OR HIGH STRENGTH STEEL BAR 22Ø x 50 (7/32"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. FORM ONLY FEMALE KEYWAYS.
7. PLACE TIEBOLTS AT 750 (30") CENTER TO CENTER MAXIMUM SPACING EMBED TIEBOLTS D/2 ±20 (±3/4") OR 100 ±13 (4" ±1/2"), 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 408M (408/2000), 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 408M (408/2000), SECTION 705.4(c), IS SELECTED FOR USE IN TRANSVERSE JOINTS (TYPE P OR TYPE G ONLY) OR TRANSVERSE SHOULDER JOINTS, USE THE SAME JOINT SEALING MATERIAL IN THE LONGITUDINAL JOINTS (ALTERNATE TYPE L AND ALTERNATE LONGITUDINAL SHOULDER JOINTS).

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

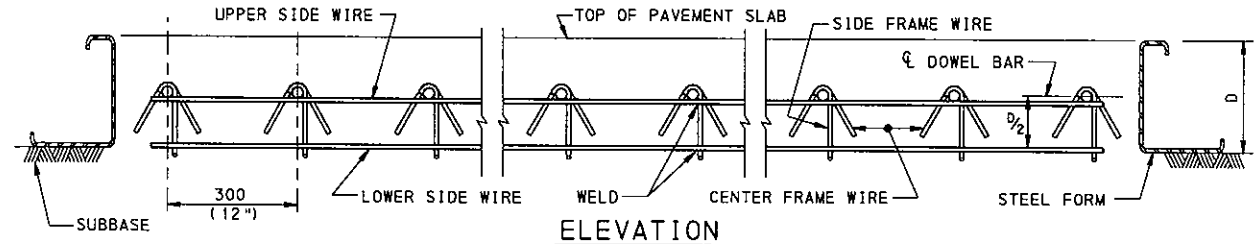
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

CONCRETE PAVEMENT JOINTS

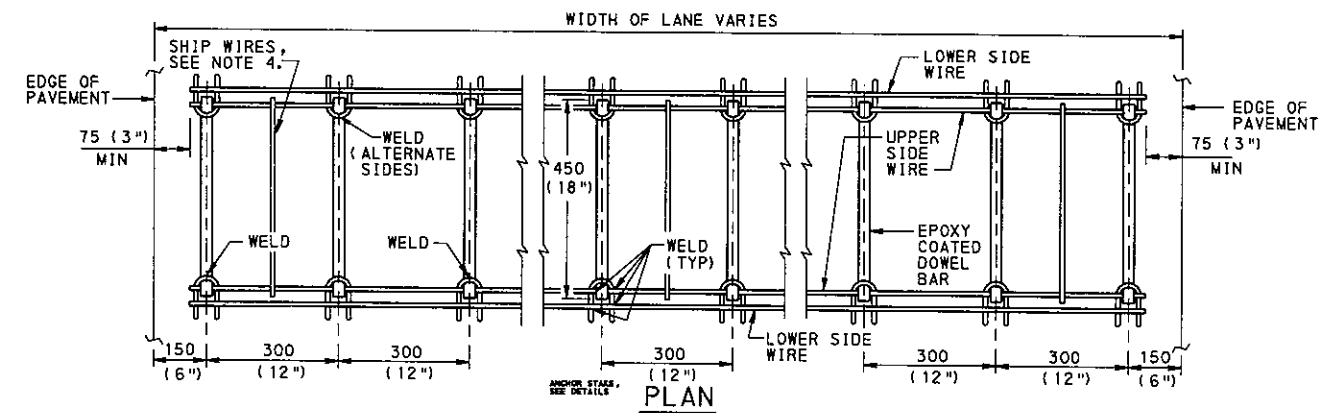
RECOMMENDED APR. 28, 2000 <i>Alan A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT 2 OF 3 RC-20M
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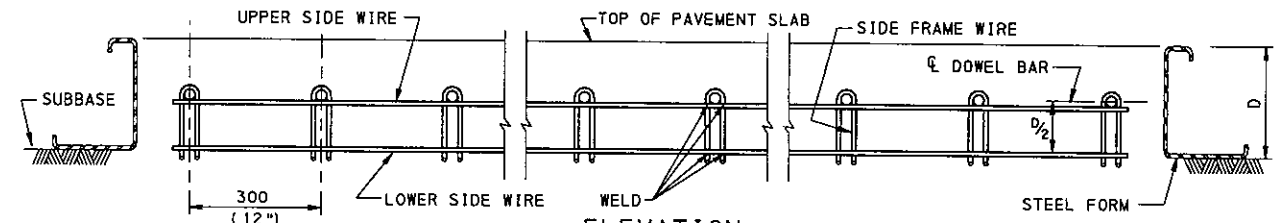
PLAN
TYPICAL EXPANSION JOINT ASSEMBLY



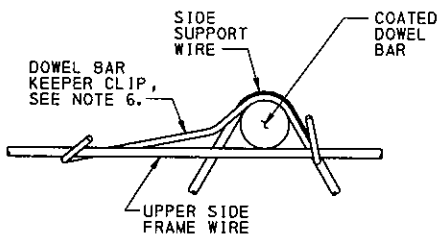
ELEVATION
EXPANSION JOINT ASSEMBLY



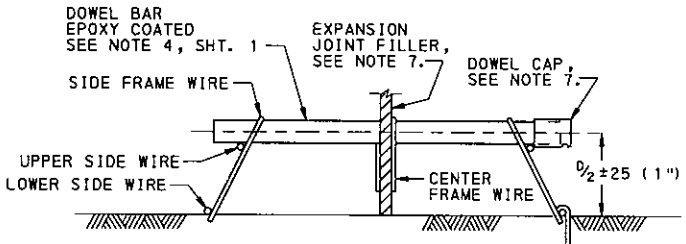
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TYPICAL CONTRACTION JOINT ASSEMBLY



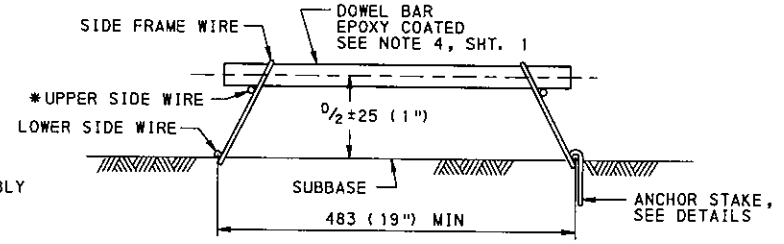
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CONTRACTION JOINT ASSEMBLY



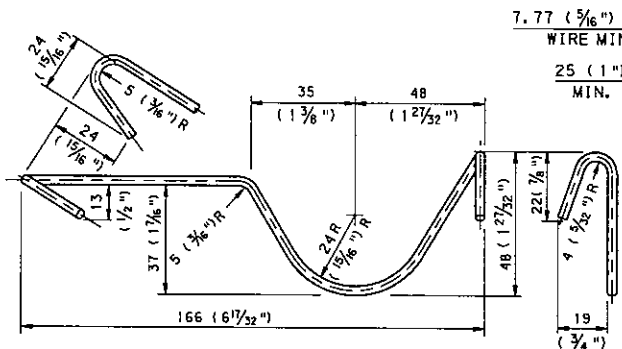
DOWEL BAR KEEPER CLIP



END VIEW
EXPANSION JOINT ASSEMBLY



END VIEW
CONTRACTION JOINT ASSEMBLY



TYPICAL ANCHOR STAKE DETAILS

NOTES

- 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.
- 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.
- PROVIDE STAKES OF SUFFICIENT LENGTH SUCH THAT 400 WILL BE EMBEDDED IF THE TOP COURSE IS OGS AND 300 WILL BE EMBEDDED IF THE TOP COURSE IS 2A. WHEN LEAN CONCRETE BASE COURSE OR UNBONDED CONCRETE OVERLY 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.
- 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.
- 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:

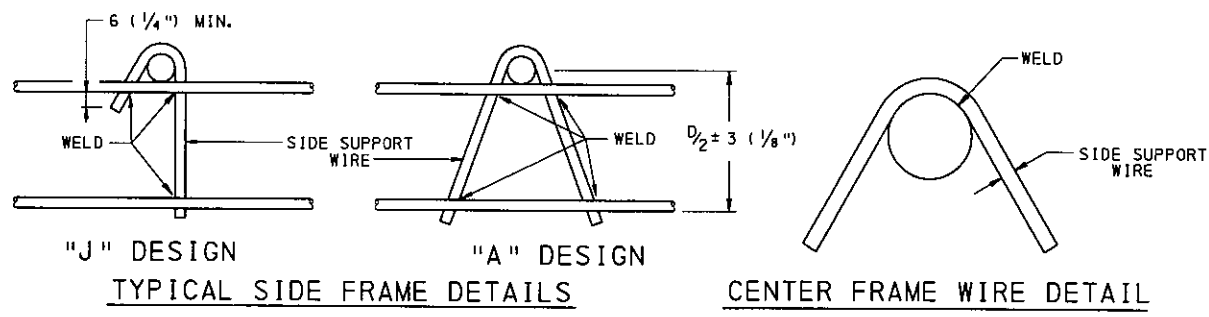
PAVEMENT THICKNESS	UPPER AND LOWER SIDE FRAME WIRES	"J" SIDE SUPPORT WIRES	"A" SIDE SUPPORT WIRES
250 (10") OR LESS	8.41 (5/16") Ø MIN	10.16 (3/8") Ø MIN	8.41 (5/16") Ø MIN
GREATER THAN 250 (10")	9.19 (5/16") Ø MIN	11.35 (3/8") Ø MIN	9.19 (5/16") Ø MIN

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

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.



"J" DESIGN
TYPICAL SIDE FRAME DETAILS

"A" DESIGN

CENTER FRAME WIRE DETAIL

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)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE PAVEMENT JOINTS
NON-SKEWED
LOAD TRANSFER ASSEMBLIES

RECOMMENDED APR. 28, 2000
Director, Bureau of Design

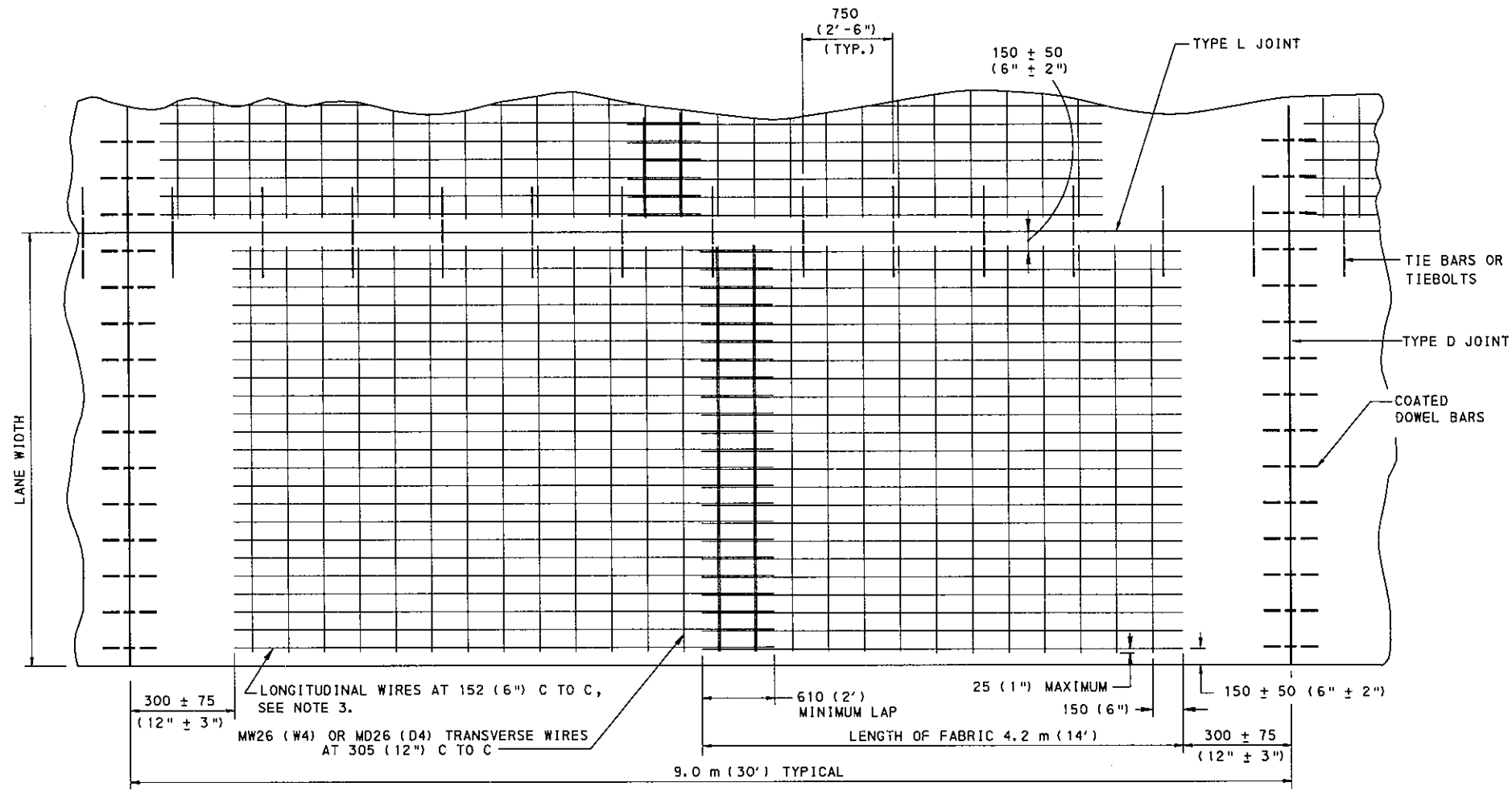
RECOMMENDED APR. 28, 2000
Chief Engineer

SHT 3 OF 3
RC-20M

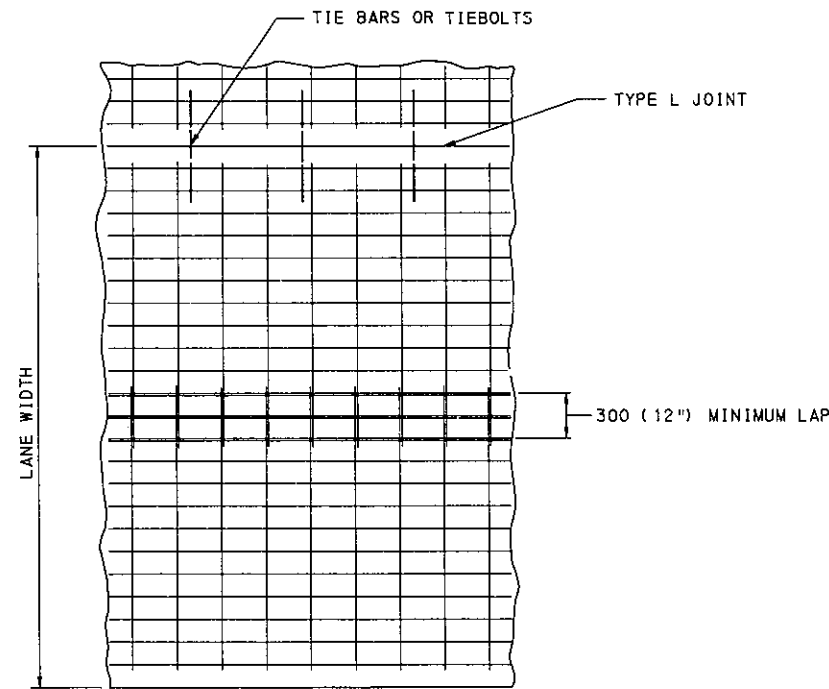
NOTES

- FOR VARIABLE WIDTH PAVEMENT CUT THE REINFORCEMENT AS REQUIRED.
- WIRE FABRIC REINFORCEMENT MAY BE PLACED WITH TRANSVERSE WIRES ABOVE OR BELOW LONGITUDINAL WIRES.
- PROVIDE LONGITUDINAL WIRES FOR WIRE FABRIC REINFORCEMENT OF THE FOLLOWING MINIMUM SIZES:

PAY' T DEPTH	MIN LONG WIRE SIZE
200 (8")	MW35 OR MD35 (W5.5 OR D5)
230 (9")	MW40 OR MD35 (W6 OR D5.5)
250 (10")	MW45 OR MD45 (W7 OR D6.5)
280 (11")	MW50 OR MD45 (W7.5 OR D7)
300 (12")	MW55 OR MD50 (W8 OR D7.5)
330 (13")	MW60 OR MD50 (W9 OR D8)
- HINGED FABRIC REINFORCEMENT MAY BE USED. HAVE HINGE DETAIL APPROVED BY THE ENGINEER.
- SECURELY TIE ALL LONGITUDINAL AND TRANSVERSE LAPS OF WIRE FABRIC REINFORCEMENT.
- ON PROJECTS WHERE ADDITIONAL LANES ARE ADDED TO EXISTING CEMENT CONCRETE PAVEMENTS AND THE EXISTING JOINT SPACING IS MORE THAN 14.2 m (46.5'), USE A MINIMUM LONGITUDINAL WIRE SIZE OF MW60 OR MD60 (W9.5 OR D9).
- WIRE FABRIC REINFORCEMENT MAY BE CONSTRUCTED OF SMOOTH WIRE (SIZES DESIGNATED BY W) OR DEFORMED WIRE (SIZES DESIGNATED BY D) OR A COMBINATION OF BOTH.
- SEE RC-20M FOR JOINT DETAILS.
- PROVIDE A MINIMUM DEPTH FOR PLACEMENT OF WIRE FABRIC REINFORCEMENT, MEASURED FROM TOP OF PAVEMENT TO TOP OF FABRIC OF 60 (2 1/2") TO A MAXIMUM OF ONE HALF THE PAVEMENT DEPTH MINUS 15 (1 1/2").
- WHEN THE RAMP OR LANE WIDTH EXCEEDS 4.2 m (14'), A TYPE L JOINT IS REQUIRED AT THE MID-POINT.
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.



WIRE FABRIC REINFORCEMENT



ALTERNATE LAPPED FABRIC

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

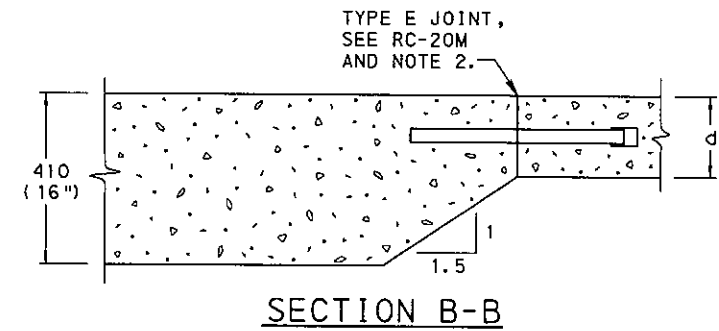
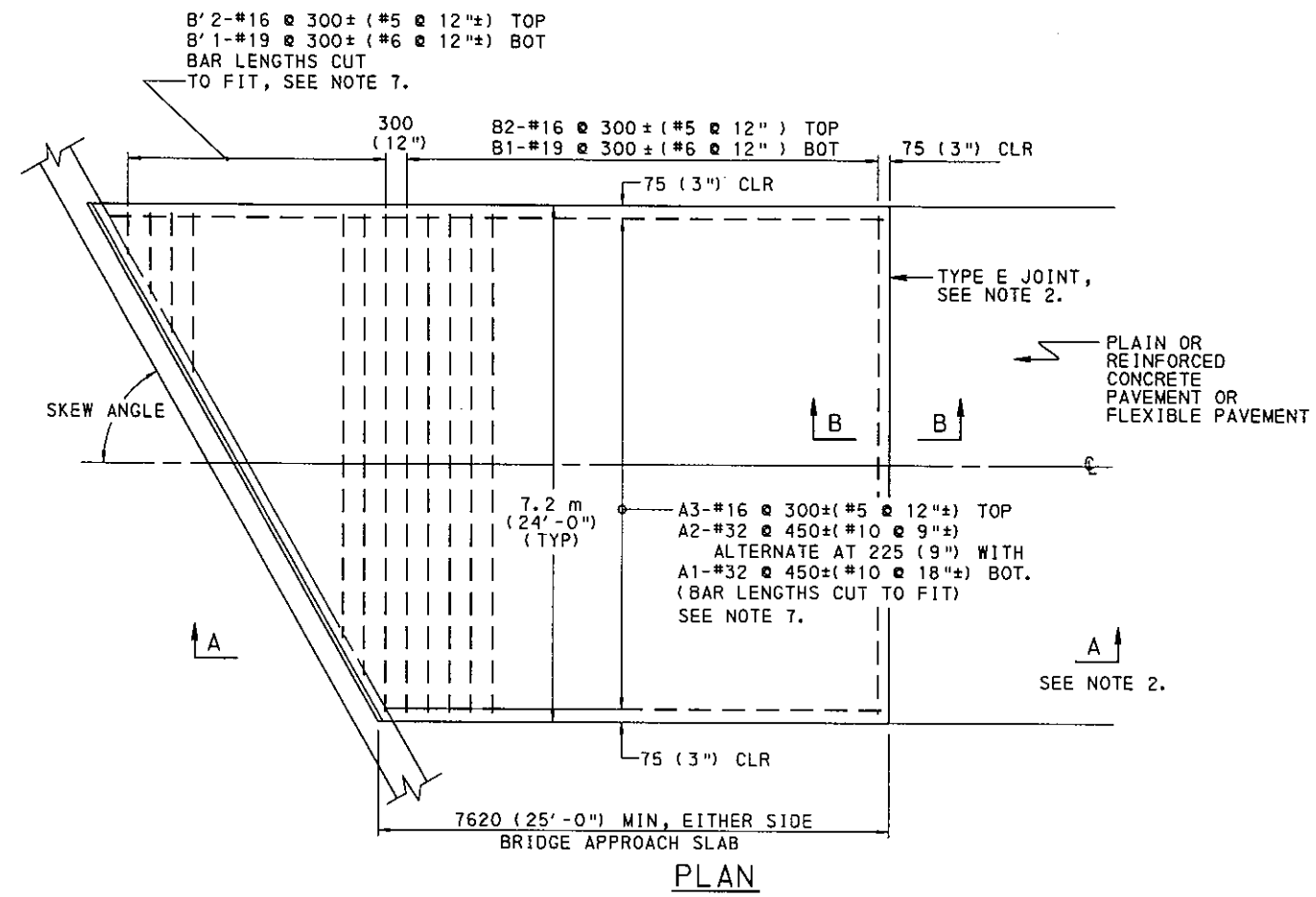
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

REINFORCED
CONCRETE PAVEMENT

RECOMMENDED APR. 28, 2000
 DIRECTOR, BUREAU OF DESIGN

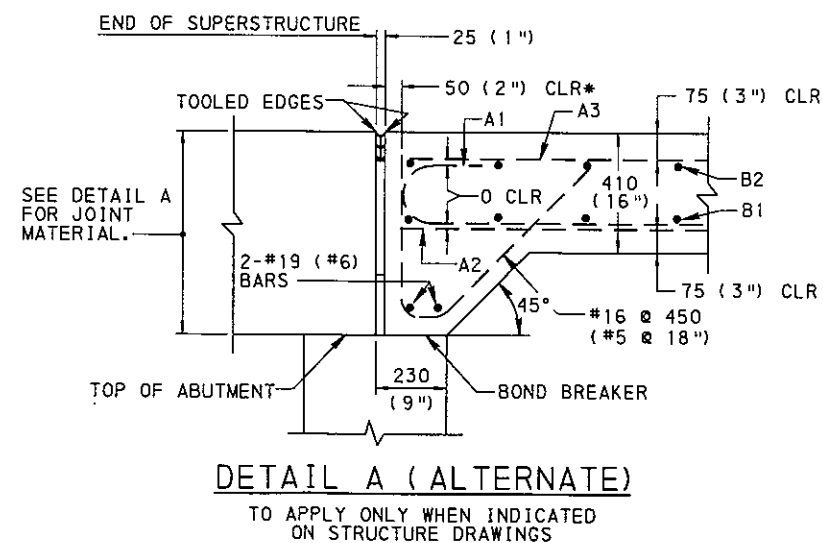
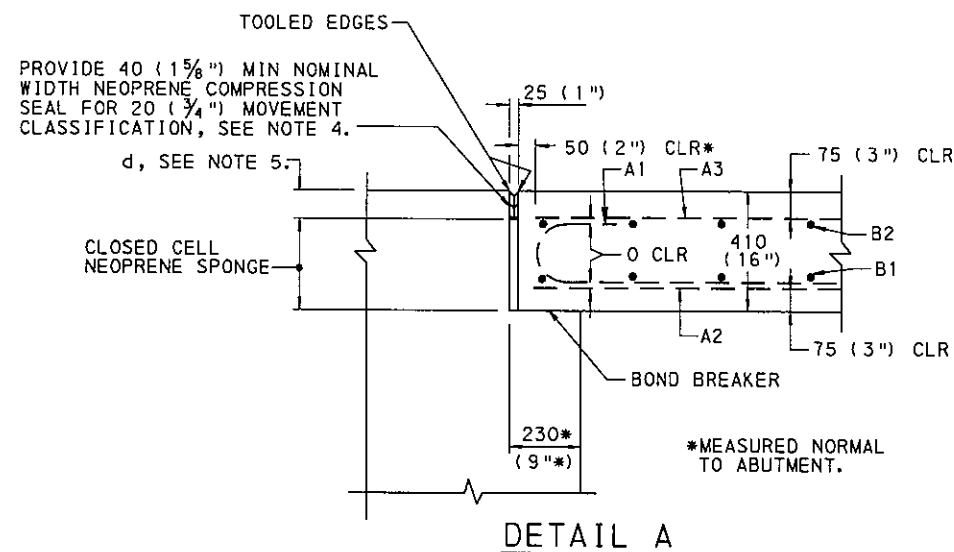
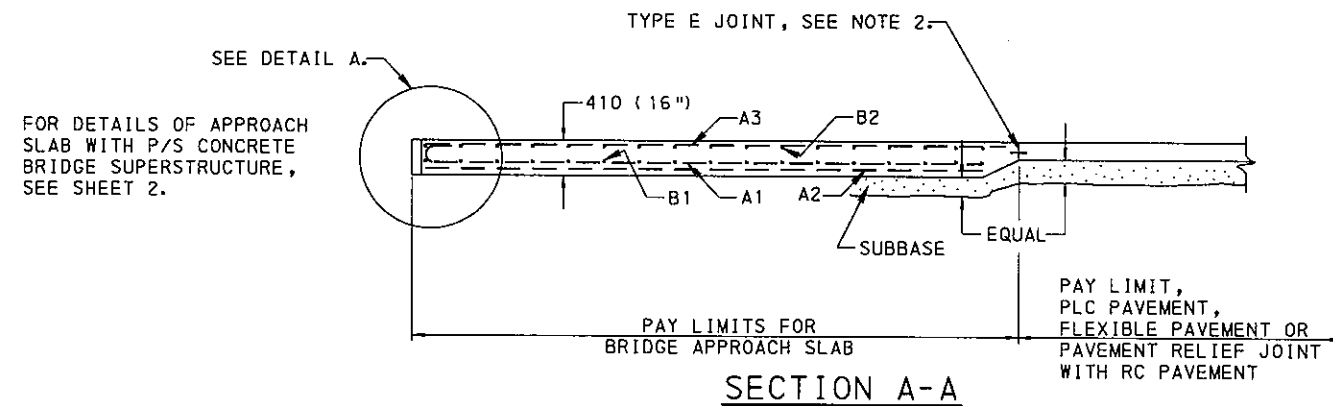
RECOMMENDED APR. 28, 2000
 CHIEF ENGINEER

SHT 1 OF 1
 RC-21M



NOTES

- CONSTRUCT IN ACCORDANCE WITH THIS STANDARD DRAWING OR AS INDICATED ON THE STRUCTURE DRAWINGS.
- 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.
- 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.
- INSTALL NEOPRENE COMPRESSION SEALS TO A UNIFORM DEPTH WITH TOP OF THE SEAL NOT LESS THAN 6 (1/4") NOR MORE THAN 10 (3/8") BELOW THE LEVEL OF THE PAVEMENT SURFACE. MAKE THE TOP EDGES OF THE CONTACT SURFACES ON BOTH SIDE OF THE SEAL AT THE SAME ELEVATION.
- DETERMINE "d" BY ADDING 20 (3/4") TO THE MAXIMUM COMPRESSED HEIGHT OF THE NEOPRENE COMPRESSION SEAL. (SEE MANUFACTURER'S INFORMATION.)
- CONSTRUCT THE BRIDGE APPROACH SLAB AFTER THE BRIDGE DECK IS CONSTRUCTED.
- PROVIDE REINFORCEMENT BARS, EPOXY COATED IN ACCORDANCE WITH PUBLICATION 408M (408/2000), SECTION 709.
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

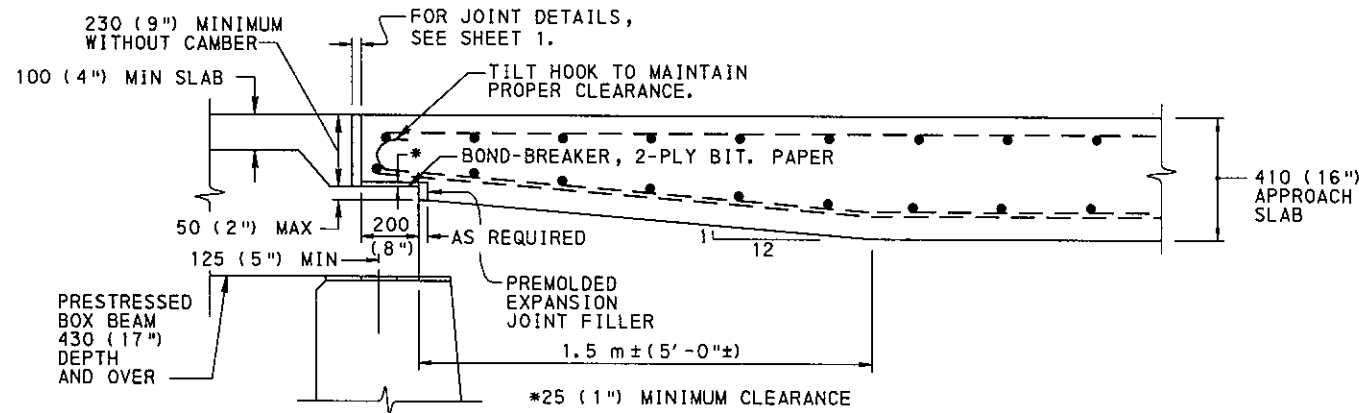


NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

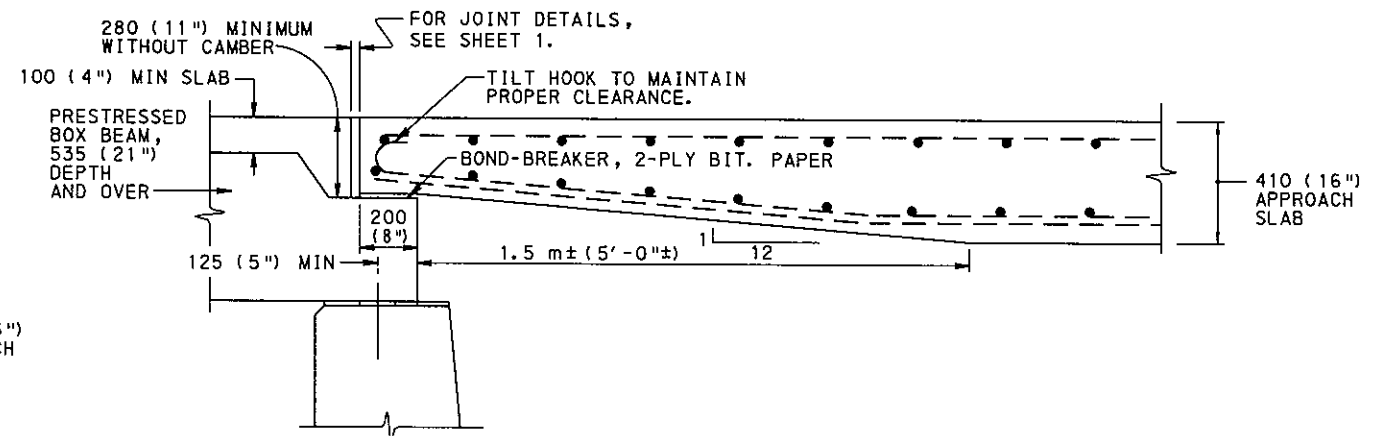
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

BRIDGE APPROACH SLAB

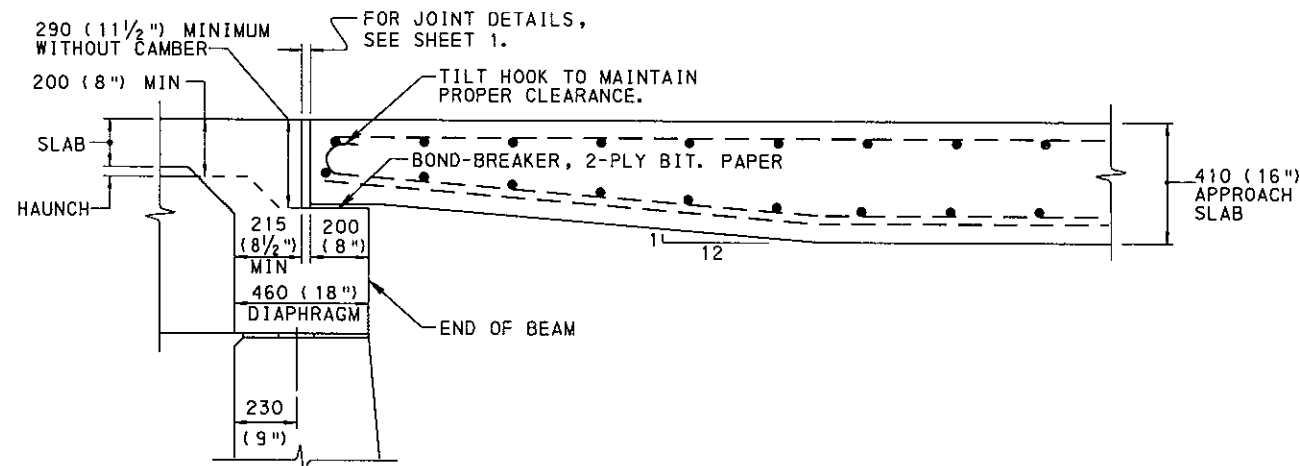
RECOMMENDED APR. 29, 2000 <i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary R. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 3 RC-23M
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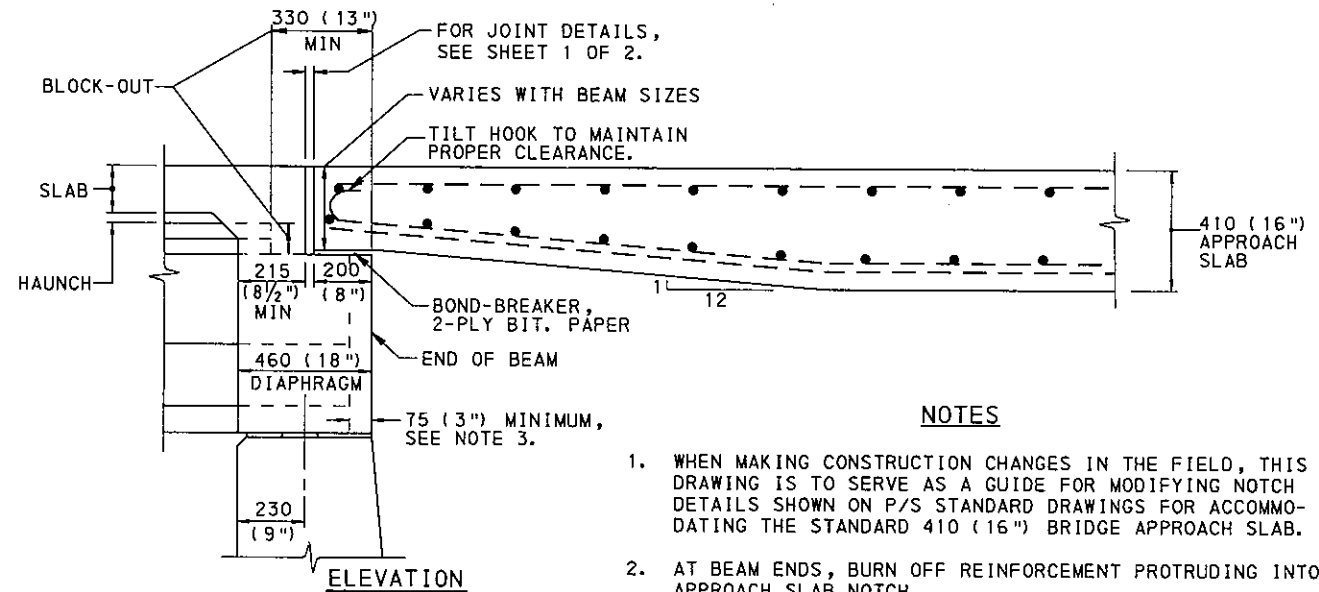
**430 (17") DEEP ADJACENT COMPOSITE BOX BEAMS
WITH 230 (9") DEEP APPROACH SLAB NOTCH**



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



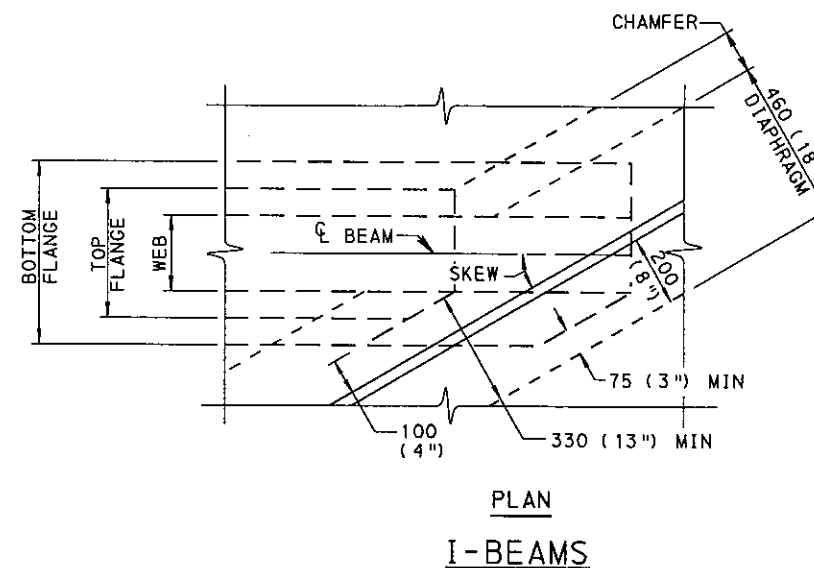
**SPREAD BOX BEAMS WITH APPROACH
SLAB NOTCH 290 (1 1/2") OR DEEPER**



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 408M (408/2000), SECTION 709.

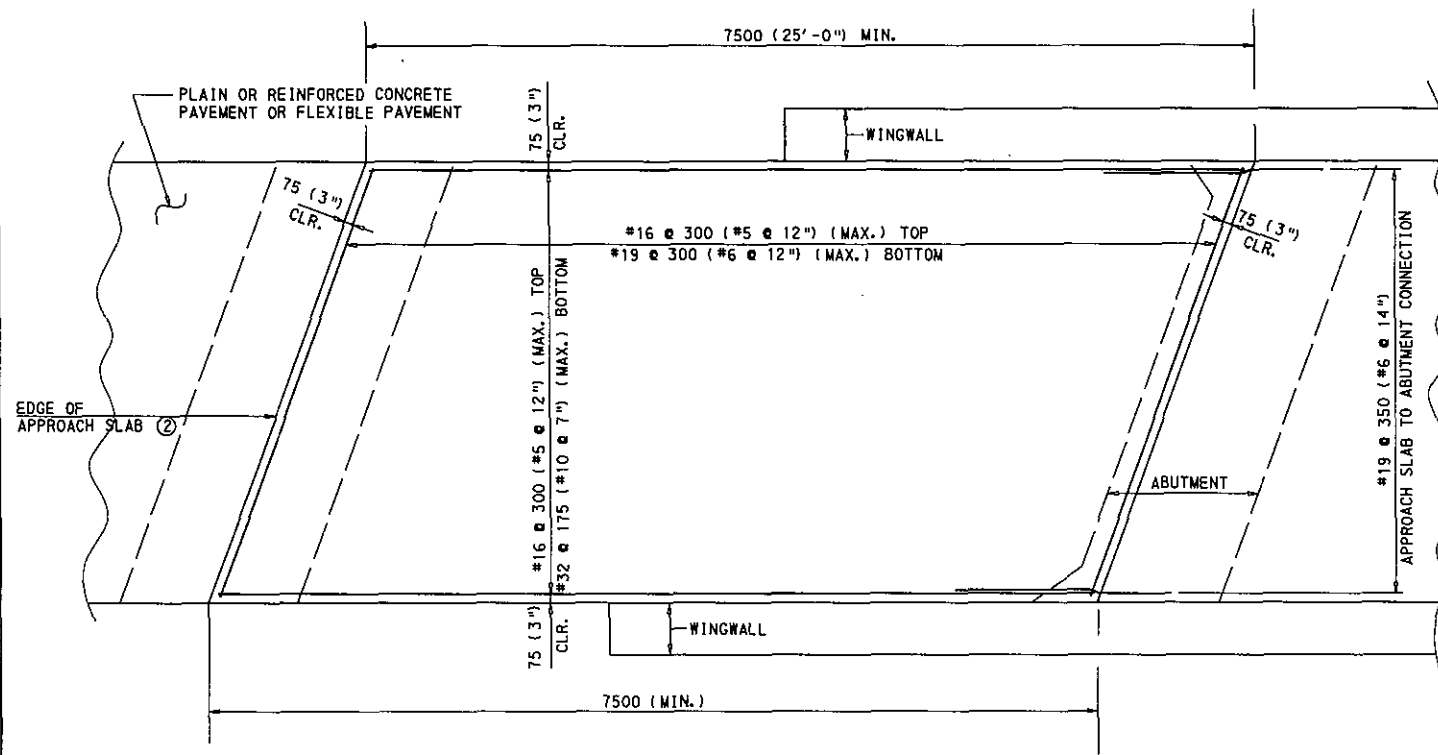
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.



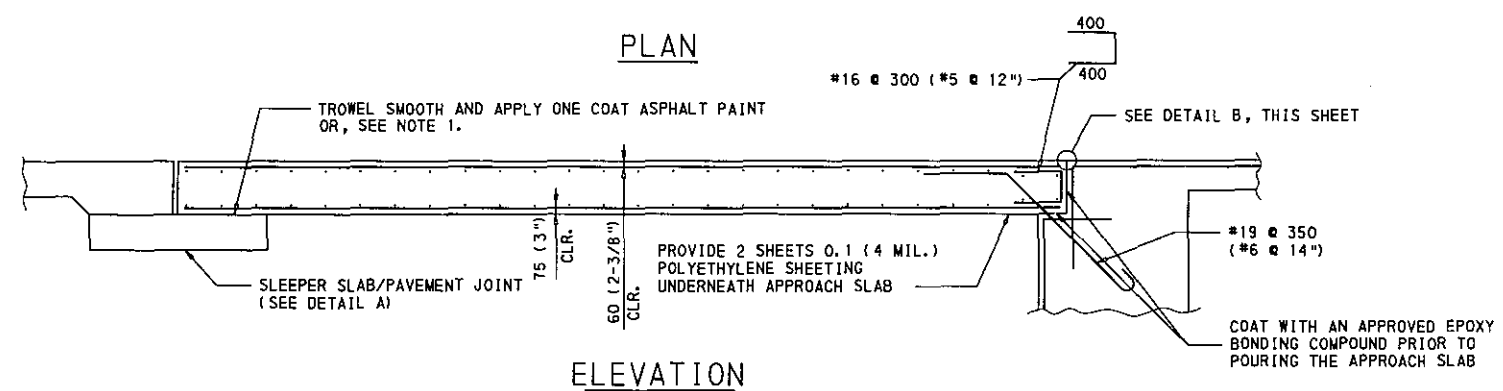
**PLAN
I-BEAMS**

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

BRIDGE APPROACH SLAB

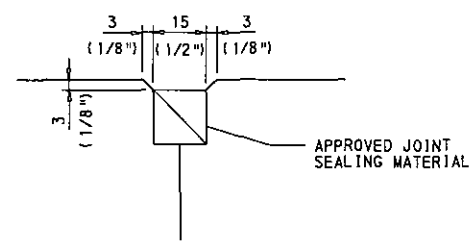


PLAN

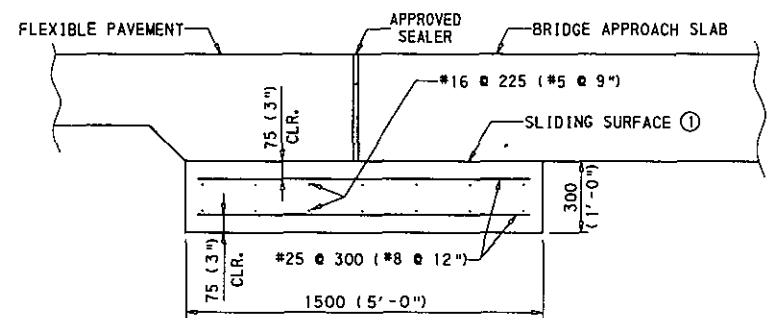


ELEVATION

APPROACH SLAB - INTEGRAL ABUTMENTS

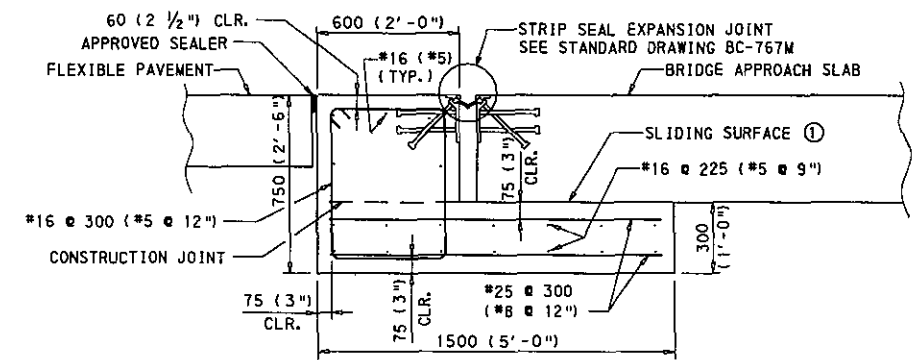


DETAIL B



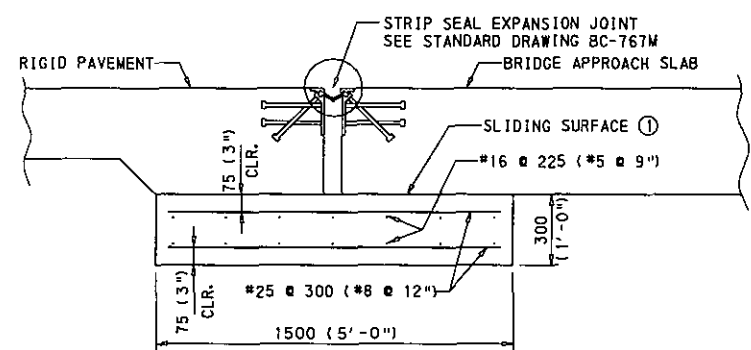
ROADWAY FLEXIBLE PAVEMENT

(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)

TROWEL SMOOTH AND PLACE 2 LAYERS OF 0.1 mm (4 MIL.) POLYETHYLENE SHEETING AS BOND BREAKER.

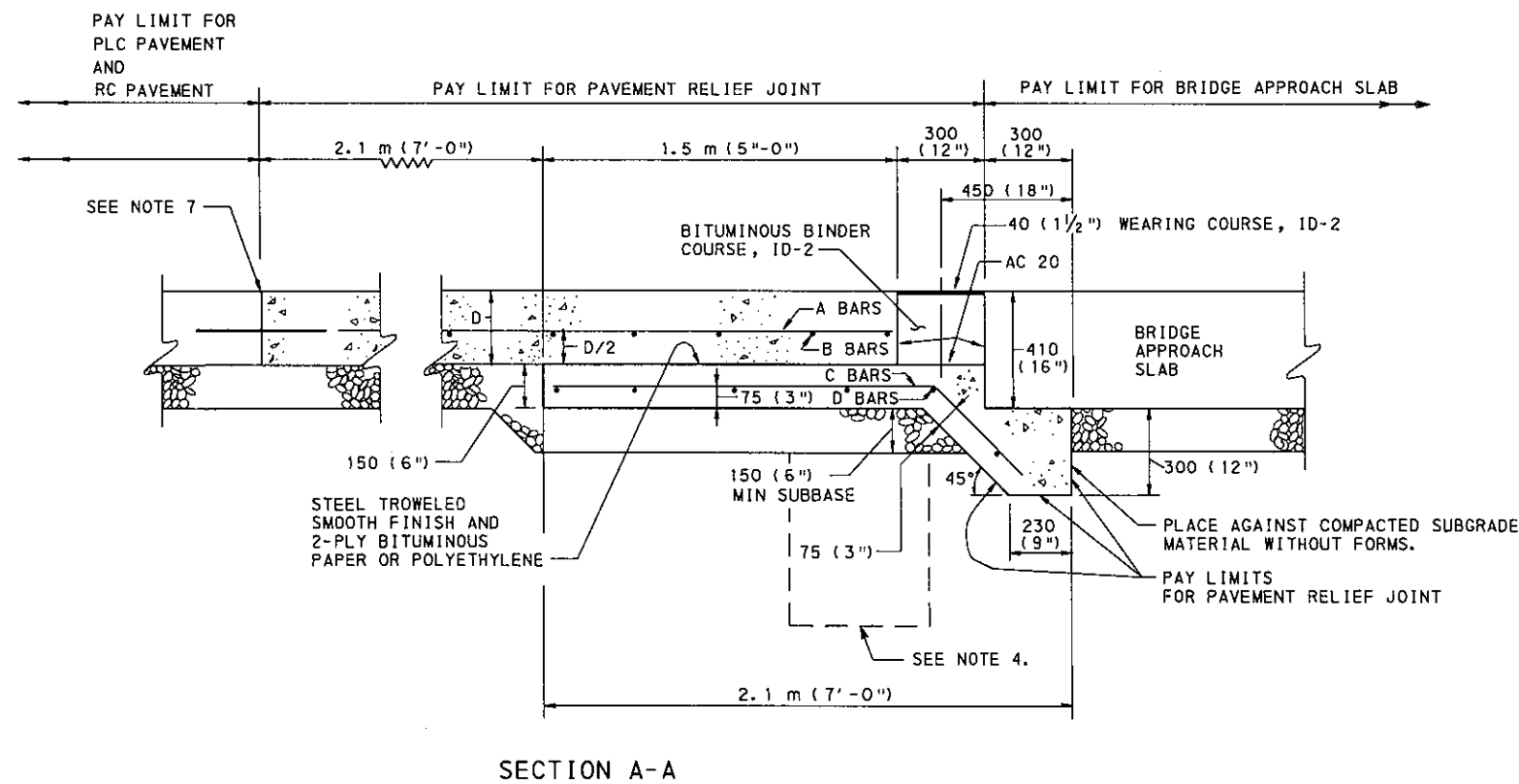
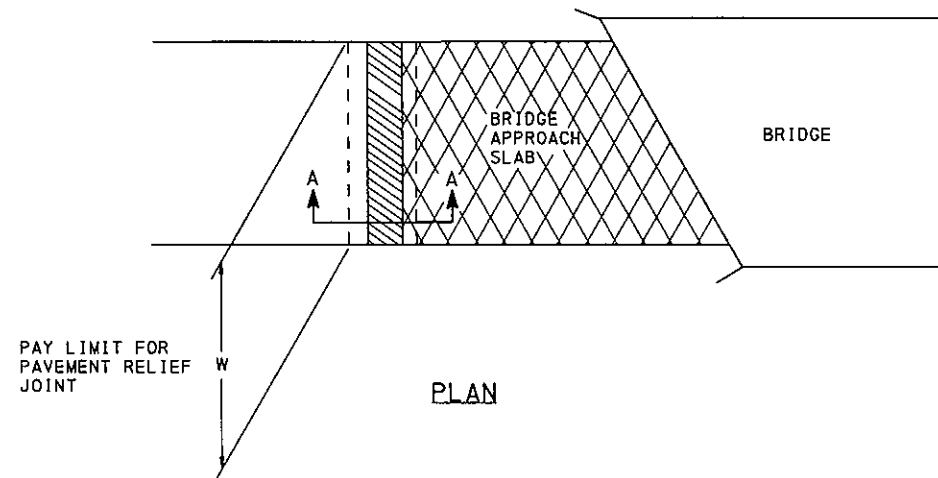
NOTES:

- 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.

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

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DEPARTMENT OF TRANSPORTATION
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BRIDGE APPROACH SLAB



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

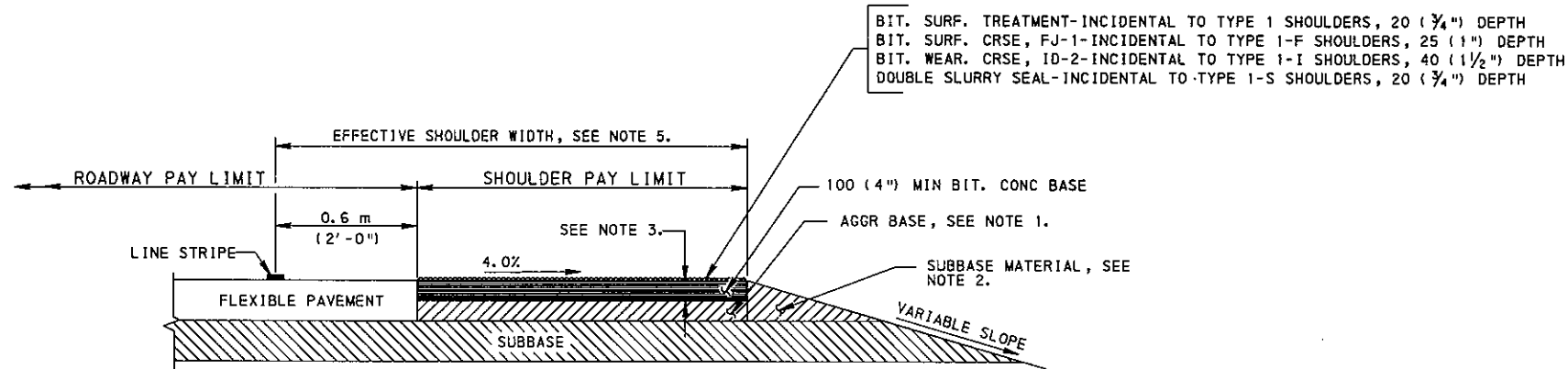
NOTES

- PAVEMENT RELIEF JOINTS ARE APPLICABLE FOR ALL CEMENT CONCRETE PAVEMENTS.
- USE CLASS AA CONCRETE IN SUBSLAB. (AT CONTRACTOR'S OPTION, SUBSLAB CONCRETE MAY BE HES.)
- INCLUDE PORTIONS OF REINFORCING BARS WHICH ARE LOCATED OUTSIDE THE INDICATED PAY LINES IN BID PRICE FOR PAVEMENT RELIEF JOINT.
- WHEN THE PAVEMENT GRADE CAUSES DRAINAGE TOWARDS THE BRIDGE, PLACE A SUBGRADE DRAIN (SEE RC-30M.) UNDER THE 150 (6") PORTION OF THE SUBSLAB. MEASURE AND PAY FOR AS SPECIFIED IN PUBLICATION 408M (408/2000), SECTION 612.
- WHERE BRIDGES ARE LOCATED LESS THAN 300 m (900') APART, AS MEASURED FROM THE FACE OF THE NEAREST ABUTMENTS, DO NOT USE A RELIEF JOINT BETWEEN THE BRIDGES.
- WHERE BRIDGES ARE LOCATED BETWEEN 300 m (900') AND 450 m (1350') APART, AND THE PAVEMENT STRUCTURE IS CEMENT CONCRETE, PLACE ONE RELIEF JOINT MIDWAY BETWEEN THE BRIDGES. IN THESE CASES, PROVIDE THE SUBSLAB AS A UNIFORM 150 (6") THICK AND 2.1 m (7') WIDE.
- FOR JOINT DETAILS ON NEW CONSTRUCTION, SEE RC-20M. FOR JOINT DETAILS ON RECONSTRUCTION, SEE RC-26M. IF THE DISTANCE TO THE NEAREST JOINT IS LESS THAN 3.0 m (10'), REMOVE THE EXISTING PAVEMENT TO THE JOINT.
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

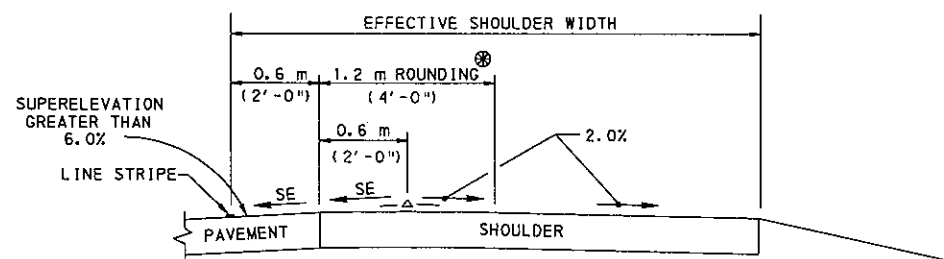
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

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PAVEMENT RELIEF JOINT



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

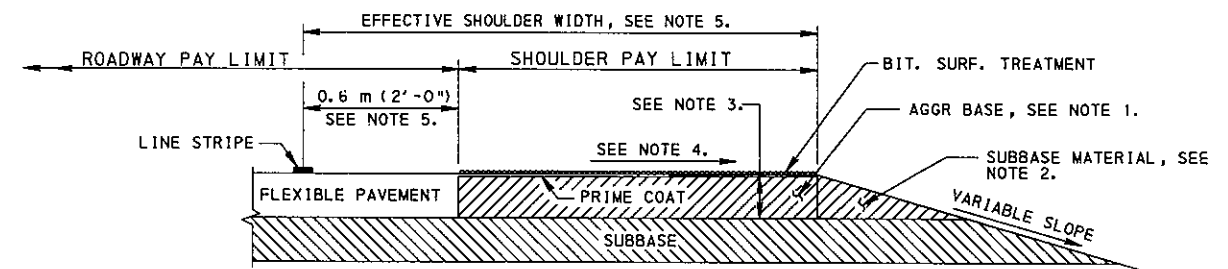


* FOR SUPERELEVATION UNDER 6.0%, ELIMINATE THE 1.2 m (4'-0") ROUNING AND USE THE 2.0% SHOULDER SLOPE BEGINNING FROM THE EDGE OF PAVEMENT.

SHOULDER ROUNING ON HIGH SIDE
 OF SUPERELEVATED CURVES

NOTES

1. CONSTRUCT AGGREGATE BASE AS SPECIFIED IN PUBLICATION 408/2000, 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 \leq 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 MSRS INSTALLATIONS, USE ONLY BITUMINOUS WEARING COURSE, ID-2 OR ID-3, REGULAR OR HEAVY DUTY, 40 (1/2") DEPTH MINIMUM.
7. WHEN INSTALLING MSRS ON A TYPE 1-I 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 MSRS 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 MSRS DETAILS.



TYPE 3 SHOULDER

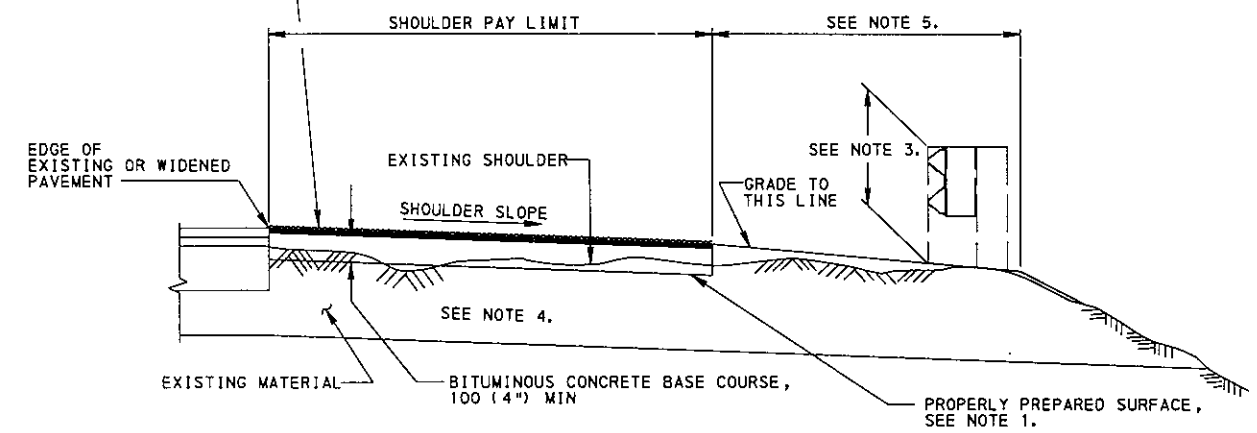
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

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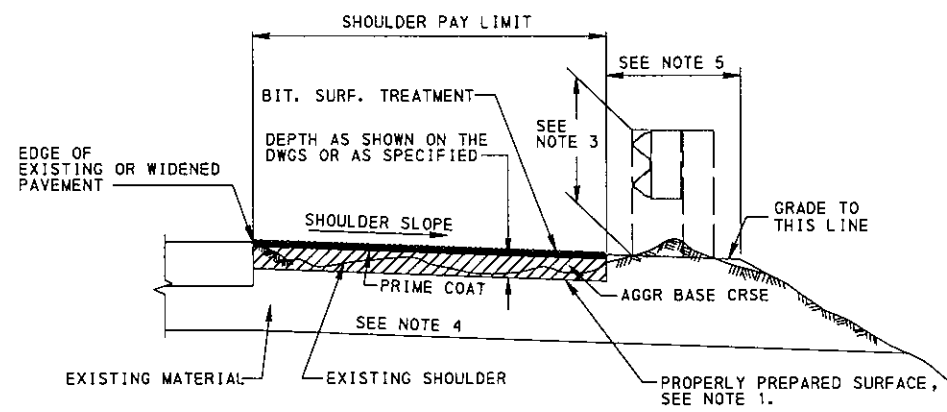
SHOULDERS

RECOMMENDED APR. 28, 2000 <i>Dean A. Schuch</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gregory J. Hoffmann</i> CHIEF ENGINEER	SHT. 1 OF 5 RC-25M
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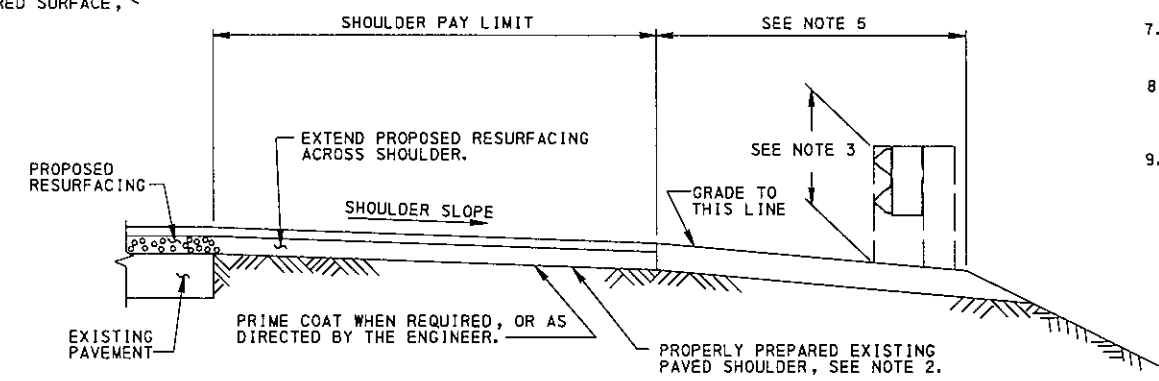
BIT. SURF. TREATMENT-INCIDENTAL TO TYPE 6 SHOULDERS, 20 (3/4") DEPTH
 BIT. SURF. CRSE, FJ-1-INCIDENTAL TO TYPE 6-F SHOULDERS, 25 (1") DEPTH
 BIT. WEAR. CRSE, ID-2-INCIDENTAL TO TYPE 6-I SHOULDERS, 40 (1 1/2") DEPTH
 DOUBLE SLURRY SEAL-INCIDENTAL TO TYPE 6-S SHOULDERS, 20 (3/4") DEPTH



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



TYPE 4 SHOULDER

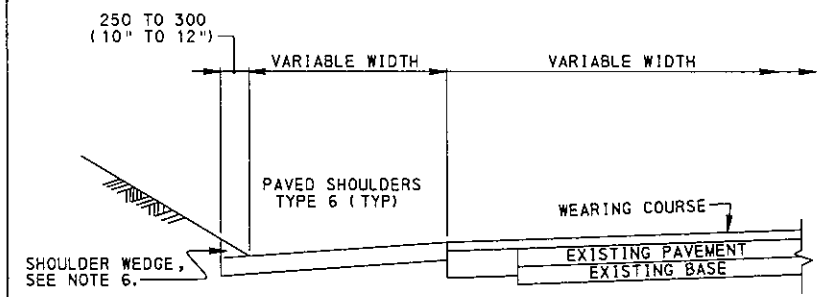


TYPE 7 SHOULDER

NOTES

- 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 408M, SECTION 350 OR MILLED BITUMINOUS MATERIAL. THE ADDITIONAL MATERIAL IS INCIDENTAL TO THE SHOULDER ITEM.
- FOR TYPE 7 SHOULDERS PROPERLY PREPARE EXISTING PAVED SHOULDER BY CLEANING AND PATCHING.
- 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").
- REMOVE UNSUITABLE MATERIAL AS DIRECTED, EXCAVATE, AND BACKFILL WITH MATERIAL MEETING THE REQUIREMENTS OF PUBLICATION 408M (408/2000), SECTION 350. MEASURE AND PAY FOR SHOULDER EXCAVATION AND BACKFILL IN ACCORDANCE WITH PUBLICATION 408/2000, SECTIONS 654 AND 656. (CROSS SECTIONS ARE NOT REQUIRED.)
- 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 408/2000, 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.
- 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.
- "LUMP SUM" ITEMS INCLUDE ALL MATERIALS AND OPERATIONS OF WORK NECESSARY TO COMPLETE THAT ENTIRE ITEM WHETHER TABULATED OR NOT.
- FOR SHOULDERS THAT SPECIFY MSRS INSTALLATIONS, USE ONLY BITUMINOUS WEARING COURSE, ID-2 OR ID-3, REGULAR OR HEAVY DUTY, 40 (1 1/2") DEPTH MINIMUM.
- SEE SHEETS 4 AND 5 FOR MSRS DETAILS.

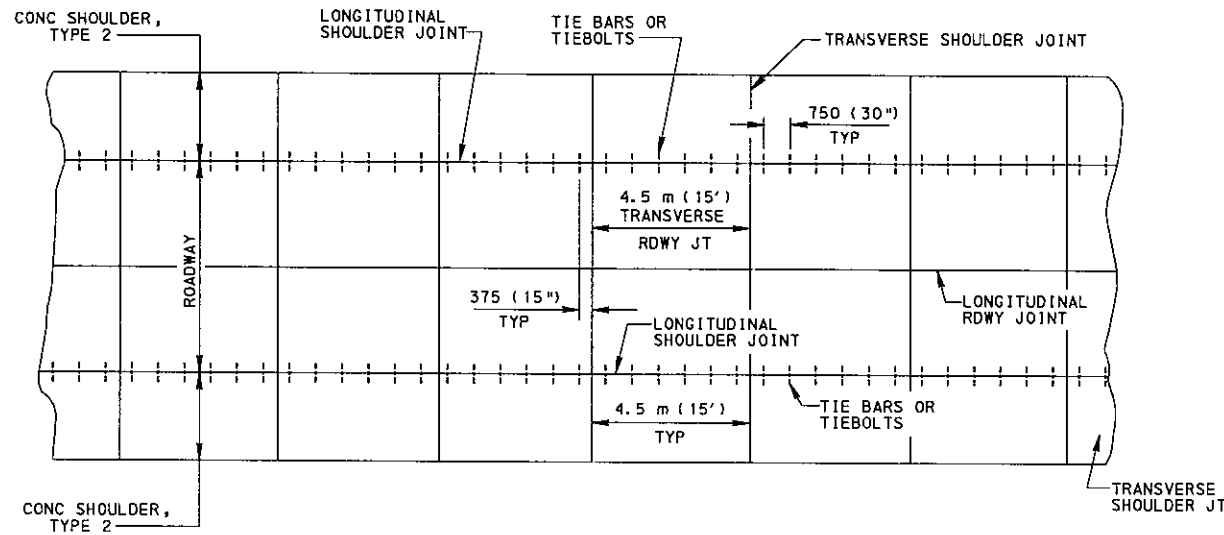
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.



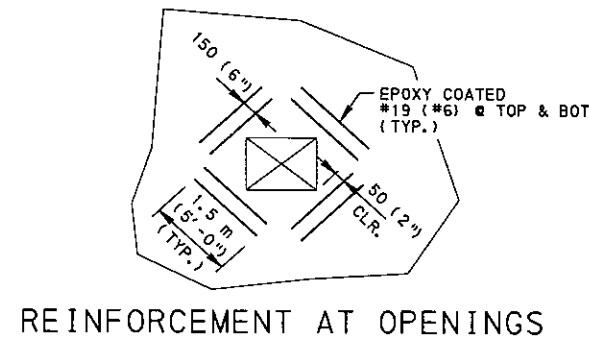
TYPICAL SHOULDER DETAIL
 WITH BITUMINOUS TAPER SHOULDER WEDGE

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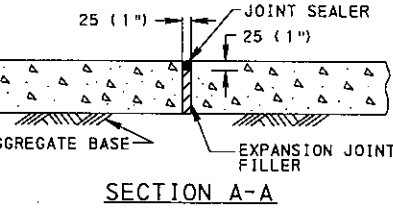
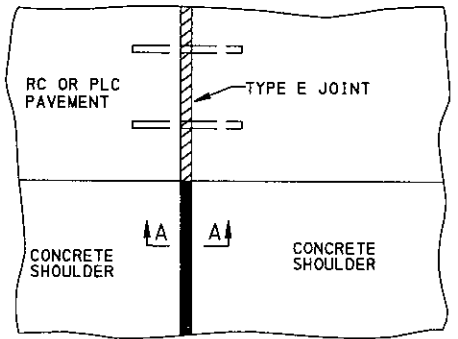
SHOULDERS
 (RECONSTRUCTED)



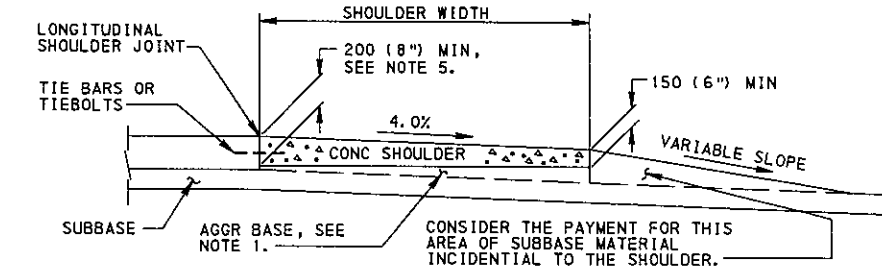
**CONCRETE SHOULDERS ADJACENT TO PLAIN
CONCRETE PAVEMENT FOR COLLECTORS AND LOCAL ROADS**



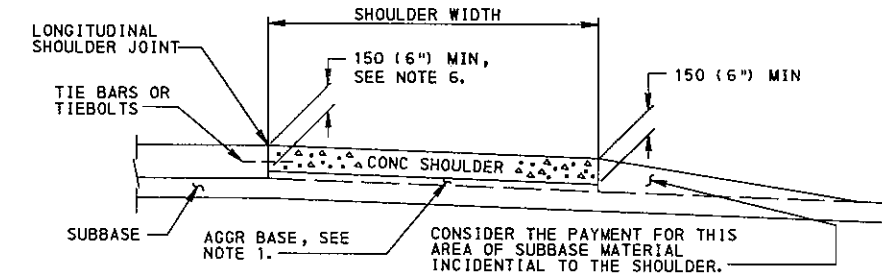
REINFORCEMENT AT OPENINGS



**SECTION A-A
CONCRETE SHOULDER
EXPANSION JOINTS**



CONCRETE SHOULDER - TYPE 1



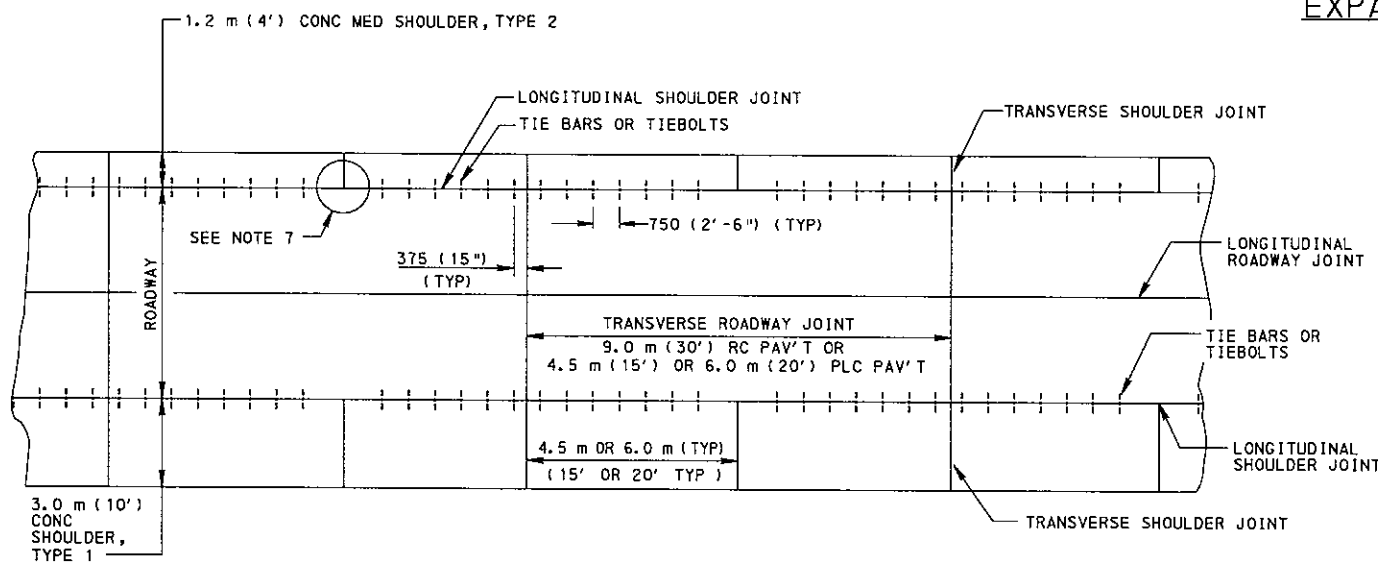
CONCRETE SHOULDER - TYPE 2

TYPICAL SECTIONS

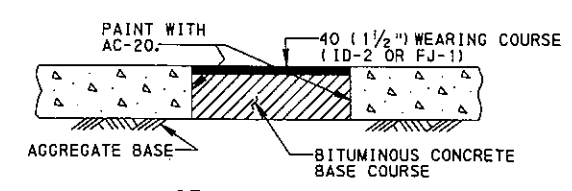
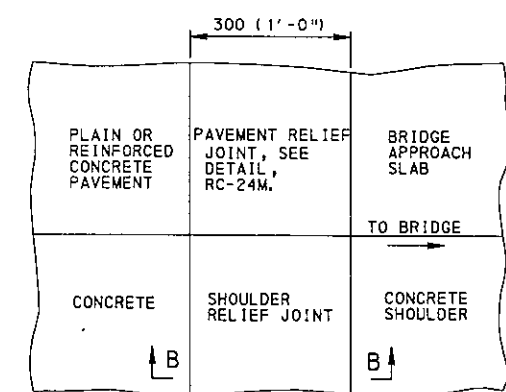
NOTES:

1. SPECIFY THE AGGREGATE BASE AS IN PUBLICATION 408/2000 SECTION 350.3 AND CONSIDER INCIDENTAL TO THE SHOULDER.
2. SEAL ALL SHOULDER JOINTS IN ACCORDANCE WITH PUBLICATION 408M (408/2000), 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 RC 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 MSRS 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 RC PAVEMENT
AND PLC PAVEMENT FOR INTERSTATE AND OTHER
LIMITED ACCESS FREEWAYS, ARTERIALS AND RAMPS**

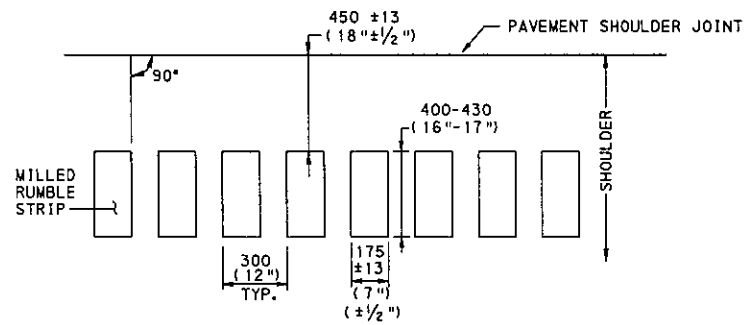
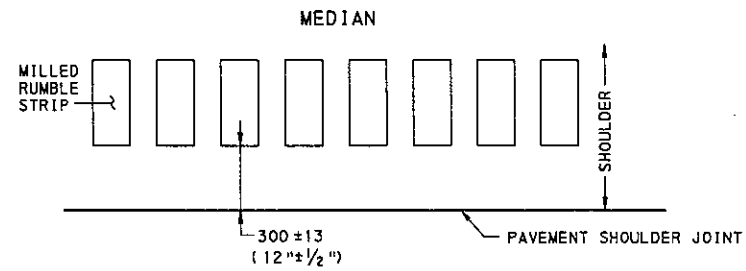


**SECTION B-B
SHOULDER
RELIEF JOINTS**

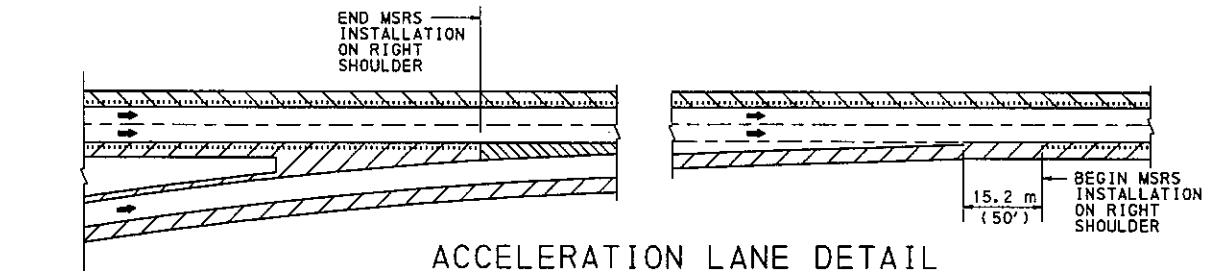
**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN**

**SHOULDERS
(CONCRETE)**

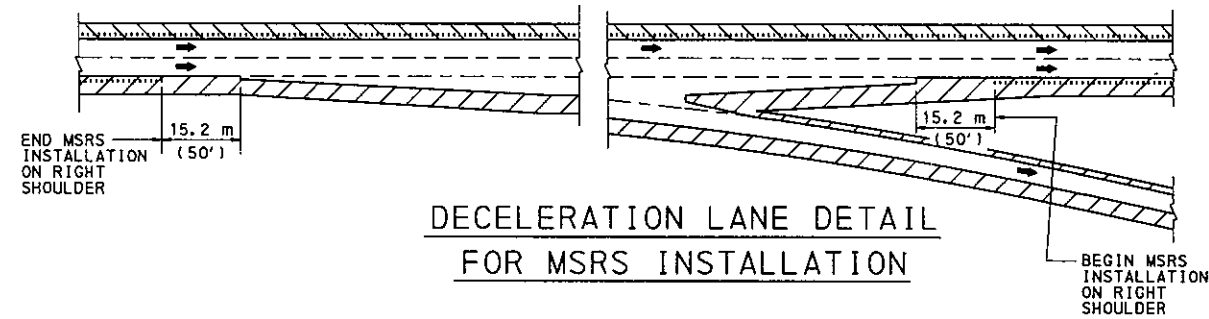
RECOMMENDED APR. 28, 2000 <i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT 3 OF 5 RC-25M
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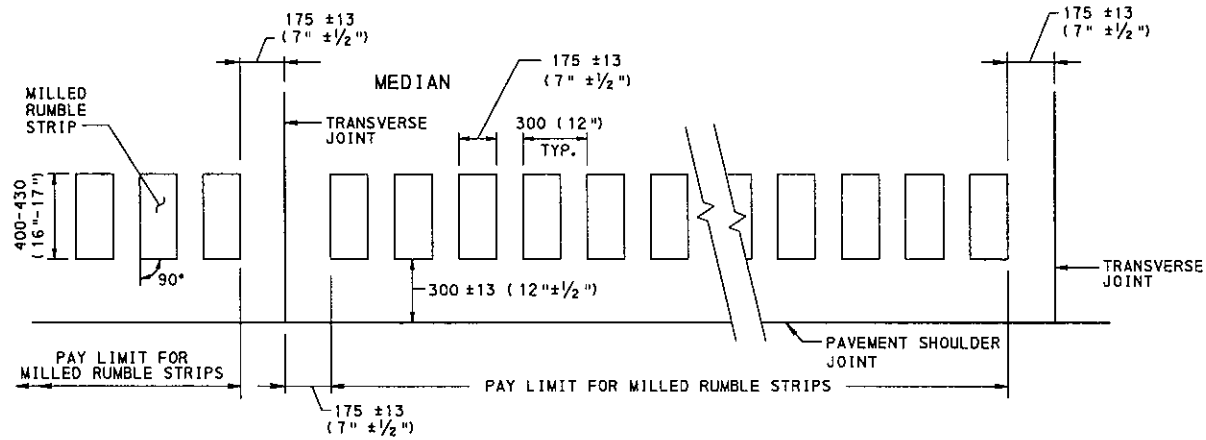
TYPICAL PLAN VIEW FOR MSRS PATTERN ON BITUMINOUS SHOULDERS



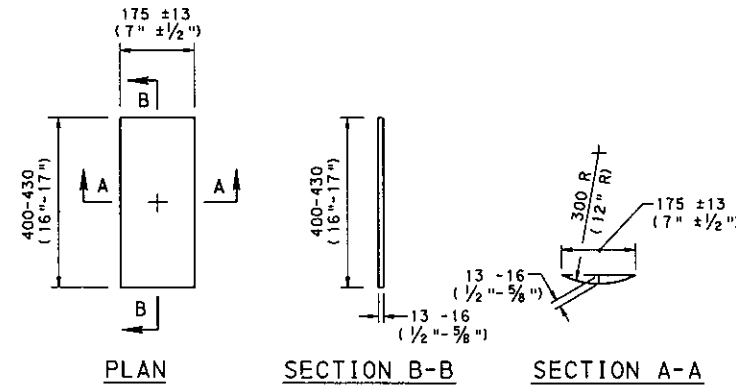
ACCELERATION LANE DETAIL FOR MSRS INSTALLATION



DECELERATION LANE DETAIL FOR MSRS INSTALLATION



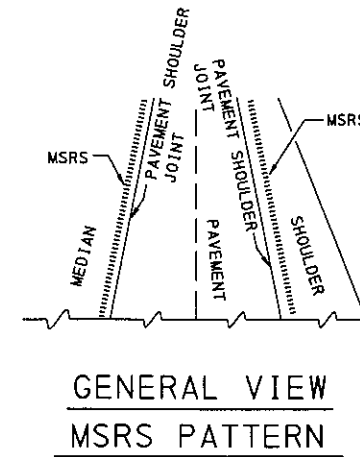
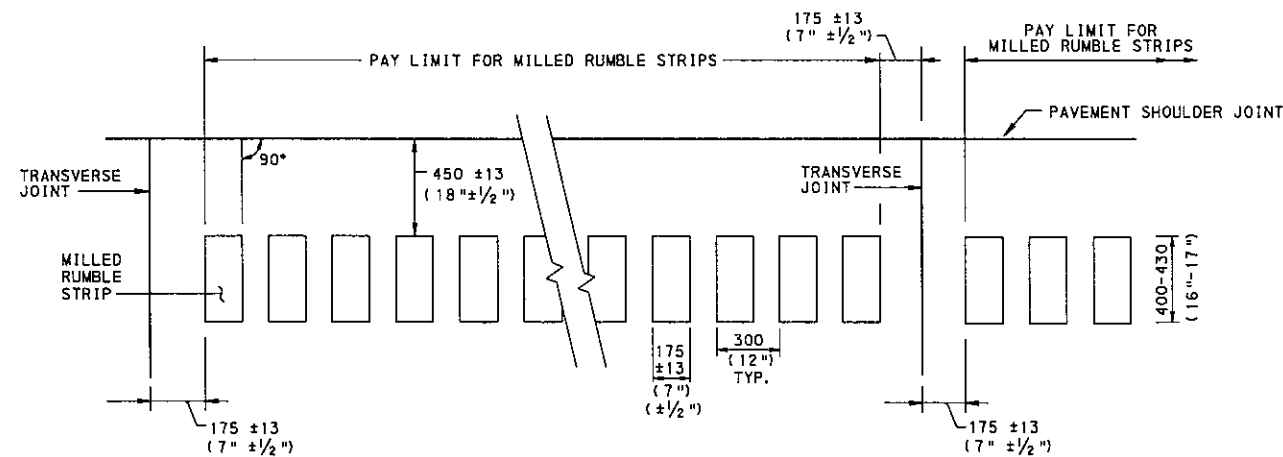
TYPICAL PLAN VIEW FOR MSRS PATTERN ON CONCRETE SHOULDERS



SECTION DETAILS OF MSRS PATTERN

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 MSRS IN ACCORDANCE WITH PUBLICATION 408/2000 SECTION 660.

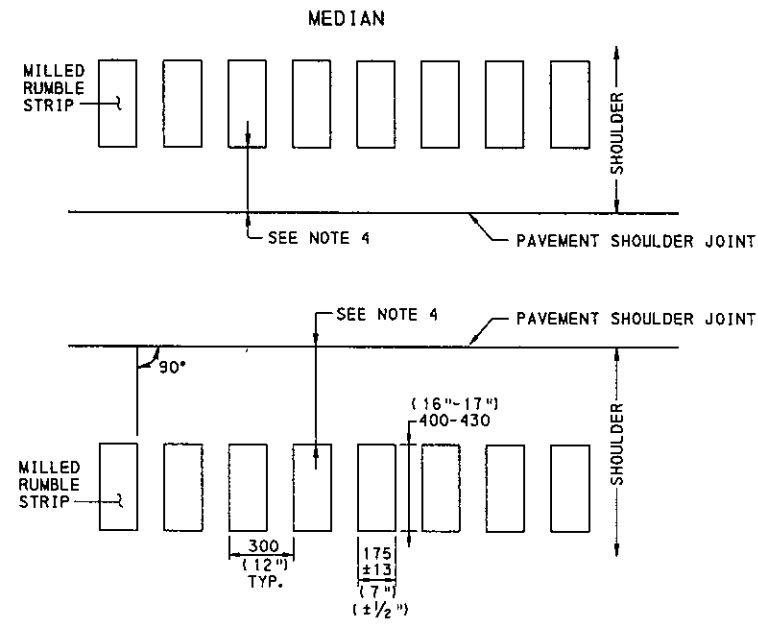


GENERAL VIEW MSRS PATTERN

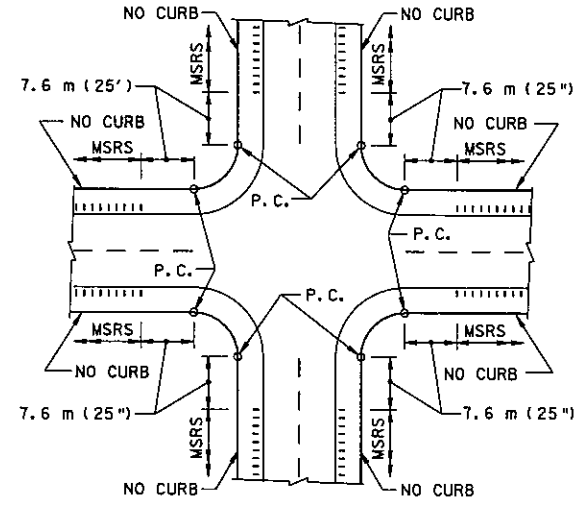
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

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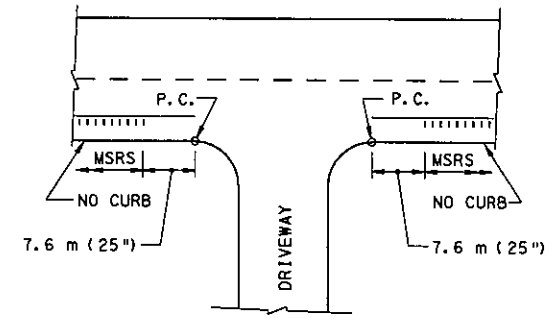
SHOULDERS
MILLED SHOULDER
RUMBLE STRIPS (MSRS)
(LIMITED ACCESS HIGHWAYS)



TYPICAL PLAN VIEW FOR MSRS PATTERN ON BITUMINOUS SHOULDERS



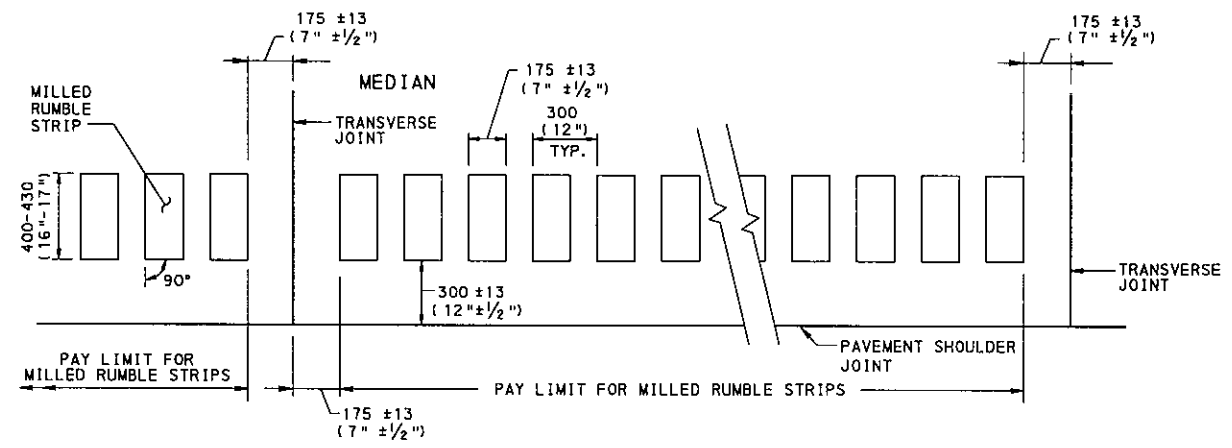
TYPICAL INTERSECTION DETAIL FOR MSRS INSTALLATION



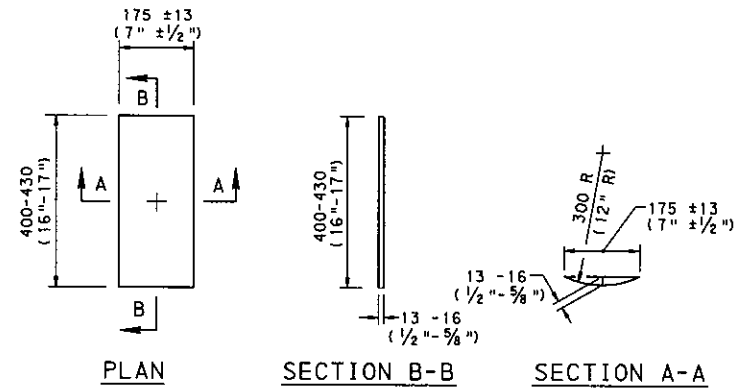
TYPICAL DRIVEWAY DETAIL FOR MSRS INSTALLATION

NOTES

1. MILLED SHOULDER RUMBLE STRIPS (MSRS) FOR FREE ACCESS HIGHWAYS ARE CONSIDERED ON A PROJECT BY PROJECT BASIS AS INDICATED ON THE CONSTRUCTION PLANS.
2. CONSTRUCT MSRS IN ACCORDANCE WITH PUBLICATION 408M, (408/2000) SECTION 660.
3. DO NOT MILL SHOULDER RUMBLE STRIPS ACROSS A JOINT.
4. 300 ± 13 (12" ± 1/2") FOR LEFT (MEDIAN) SHOULDERS. 450 ± 13 (18" ± 1/2") FOR RIGHT SHOULDERS ≥ 2.4 m (8') WIDE. FOR RIGHT SHOULDERS LESS THAN 2.4 m (8') WIDE, SEE CONSTRUCTION PLANS FOR OFFSET DIMENSION. IF THERE IS NO ACTUAL PAVEMENT SHOULDER JOINT, MEASURE FROM THE PAVEMENT SHOULDER TRAFFIC LINE.

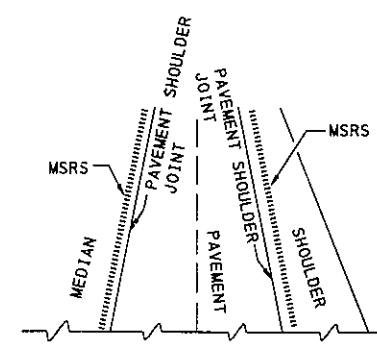


TYPICAL PLAN VIEW FOR MSRS PATTERN ON CONCRETE SHOULDERS



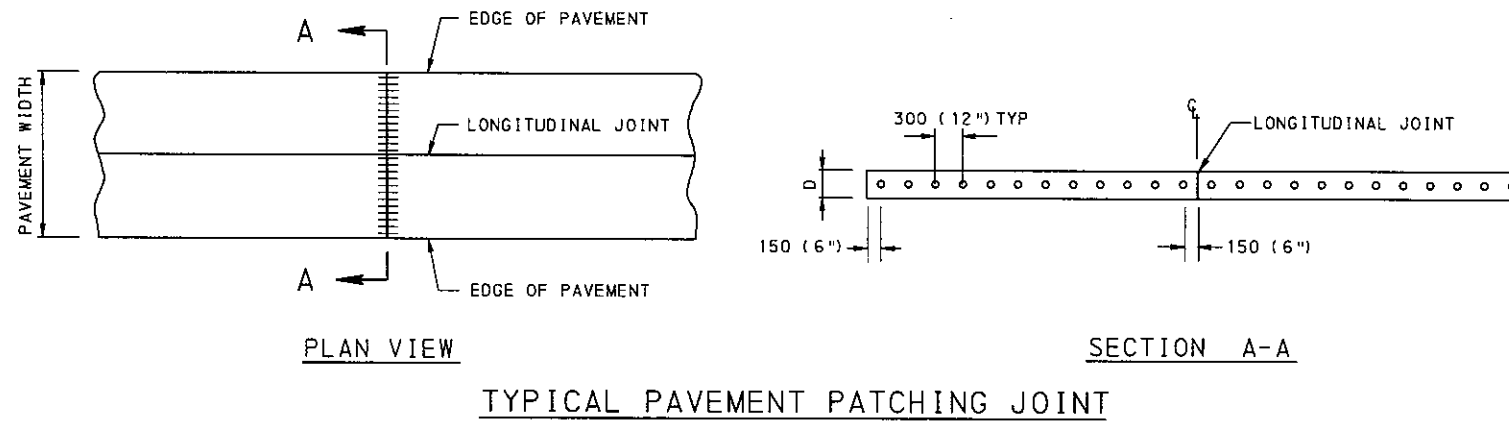
SECTION DETAILS OF MSRS PATTERN

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

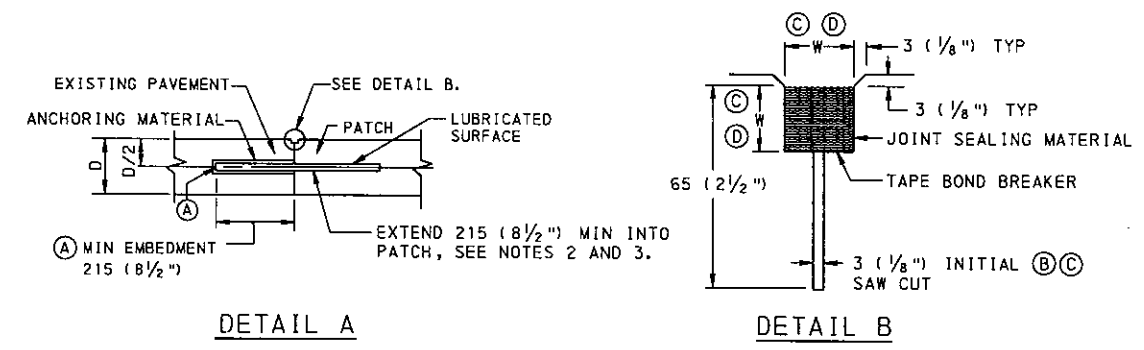


GENERAL VIEW MSRS PATTERN

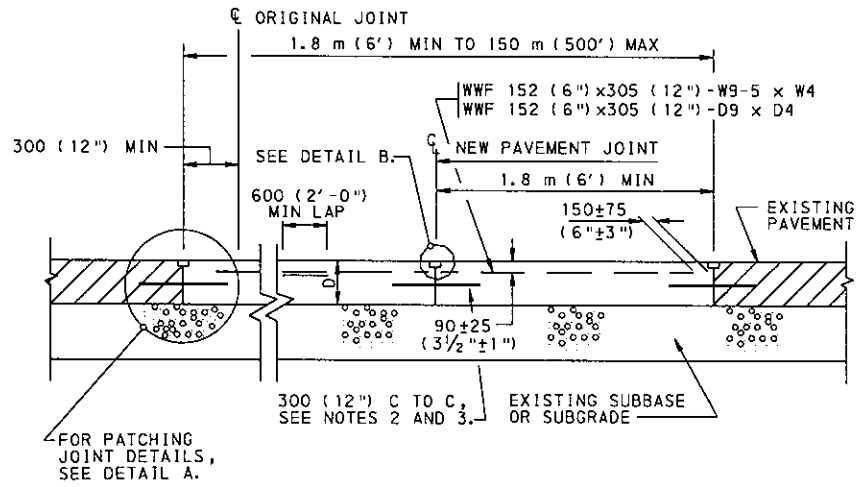
COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
SHOULDERS MILLED SHOULDER RUMBLE STRIPS (MSRS) (FREE ACCESS HIGHWAYS)		
RECOMMENDED APR. 28, 2000 <i>Dean A. Schuch</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Larry S. Hoffman</i> CHIEF ENGINEER	SHT. 5 OF 5 RC-25M



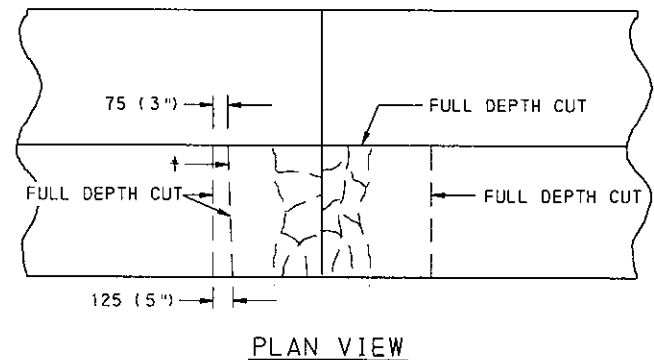
TYPICAL PAVEMENT PATCHING JOINT



PATCHING JOINT DETAILS



TYPICAL SECTION
CONCRETE PAVEMENT PATCHING
SEE NOTE 1.



PLAN VIEW
SAW CUTS FOR LIFT OUT METHOD

† 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.

LEGEND

- (A) 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").
- (B) INITIAL SAW CUT IS NOT REQUIRED AT PATCH JOINT OR WHEN EXPANSION JOINT MATERIAL IS REQUIRED.
- (C) WHEN PAVEMENT IS TO BE OVERLAID, ONLY THE INITIAL SAW CUT IS REQUIRED.
- (D) WHEN THE JOINT SPACING IS LESS THAN 15 m (50'), W = 19 (3/4)". WHEN JOINT SPACING IS 15 m (50') OR MORE, W = 25 (1").

NOTES

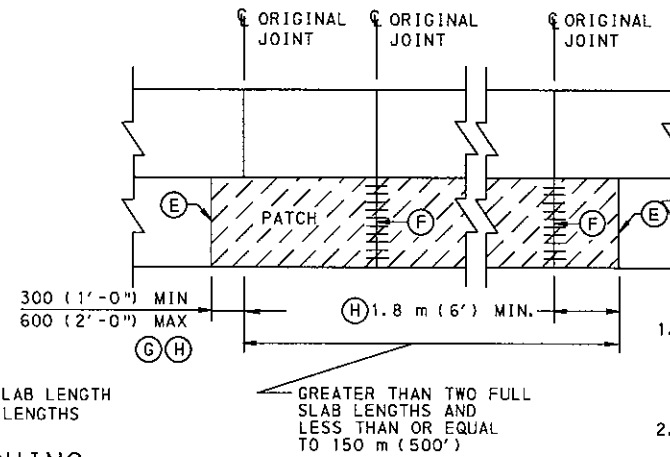
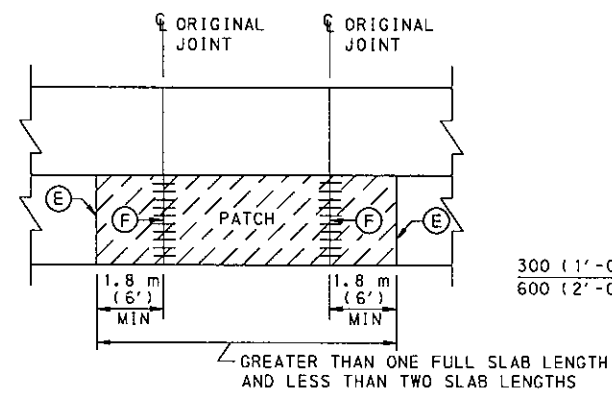
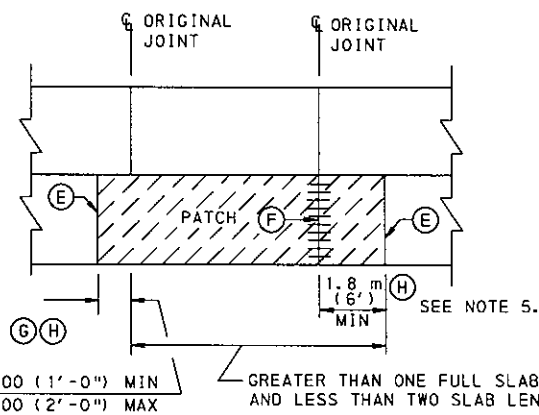
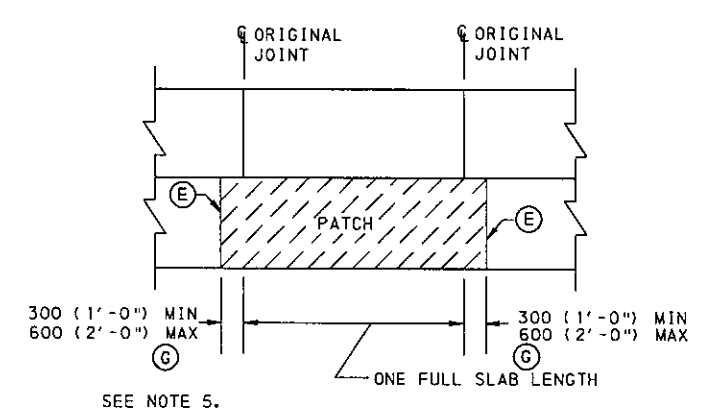
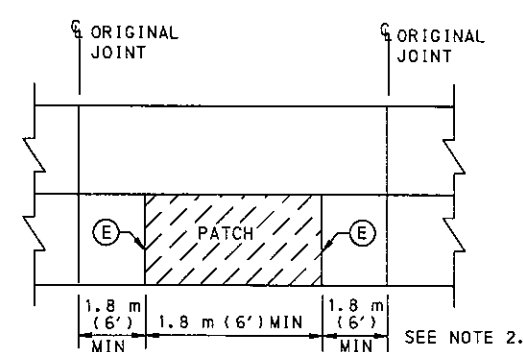
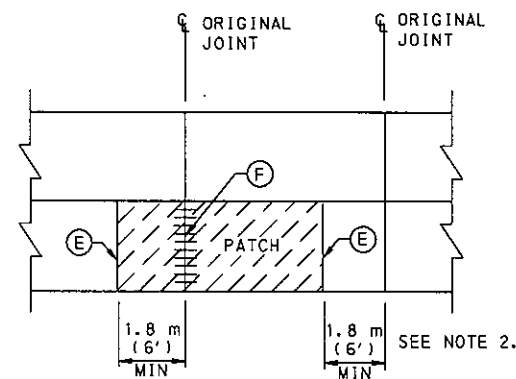
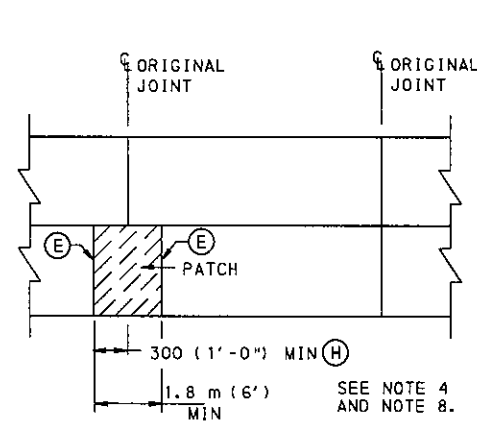
1. WHEN ANY PAVEMENT PATCH REPLACES AN EXISTING EXPANSION JOINT AND THE EXISTING EXPANSION JOINT IN AN ADJACENT LANE REMAINS IN PLACE, INSTALL EXPANSION JOINT MATERIAL 19 (3/4") THICK IN THE PATCHING JOINT OR NEW PAVEMENT JOINT NEAREST TO THE REMAINING EXPANSION JOINT. PLACE AN APPROVED TUBE HAVING A MINIMUM 25 (1") CLEARANCE POCKET OVER THE LUBRICATED END OF ALL DOWEL BARS IN THE NEW EXPANSION JOINT.
2. USE 32 (1 1/4") Ø x 450 (18") LONG DOWEL BARS FOR PAVEMENT DEPTHS 250 (10") OR LESS AND 38 (1 1/2") 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 (1/4)".
4. 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.

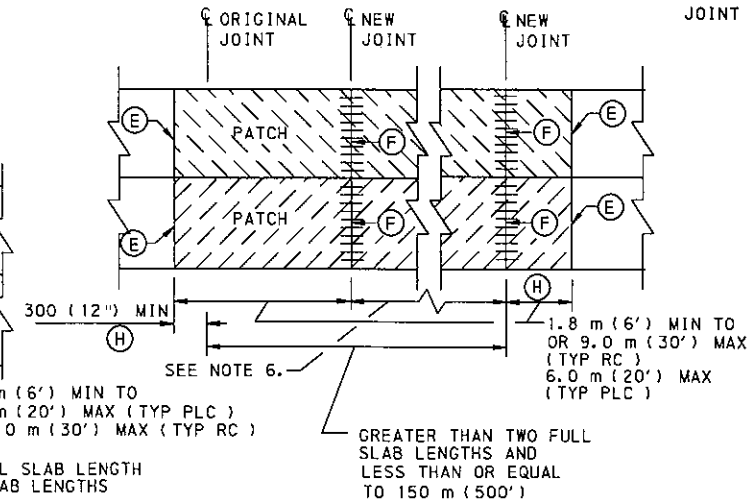
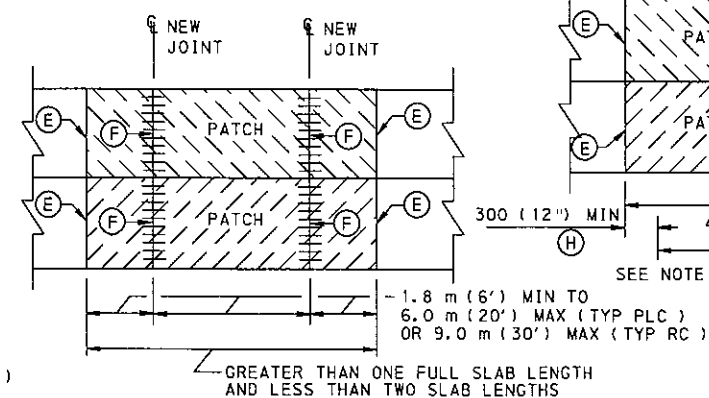
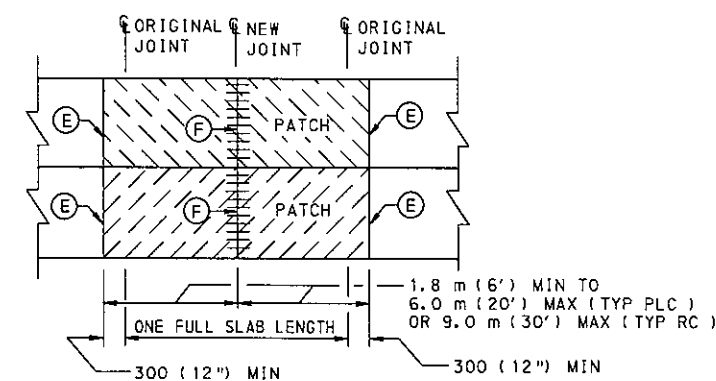
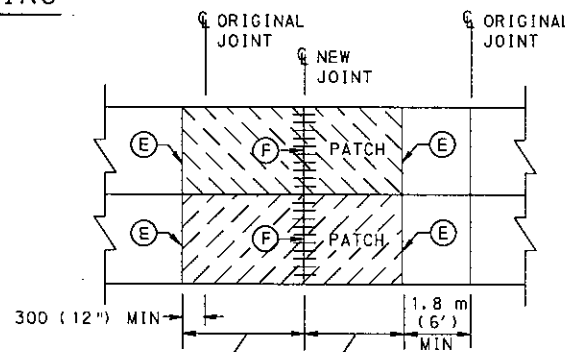
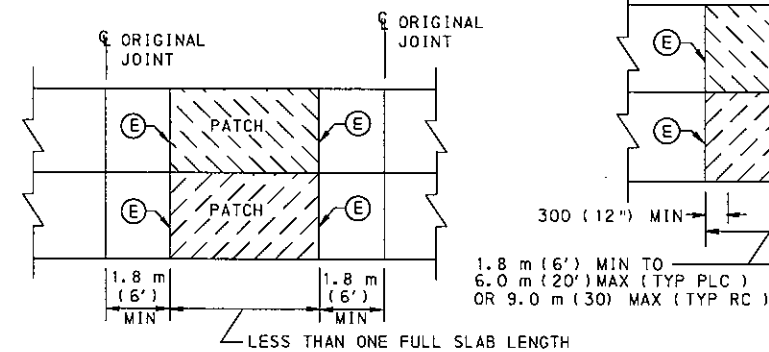
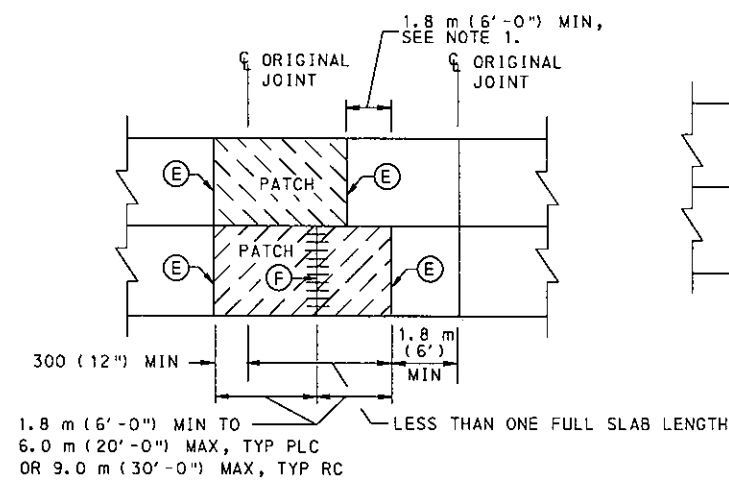
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE PAVEMENT
REHABILITATION
(PATCHING)

RECOMMENDED APR. 28, 2000 <i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Larry J. Hoffman</i> CHIEF ENGINEER	SHT <u>1</u> OF <u>5</u> RC-26M
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SINGLE LANE PAVEMENT PATCHING



MULTI-LANE PAVEMENT PATCHING

LEGEND

- ⓔ PAVEMENT PATCHING JOINT, SEE SHEET 1.
- ⓕ NEW PAVEMENT JOINT, SEE RC-20M.
- ⓖ EXCEPTION TO 1.5 m (5') MAXIMUM REMOVAL.
- ⓗ DETAILS APPLY TO EITHER END OF PATCH.

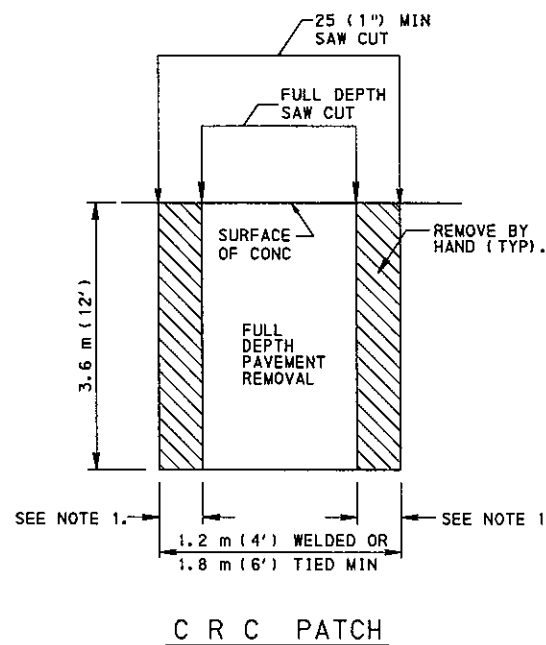
NOTES

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., RC OR PLC).
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).

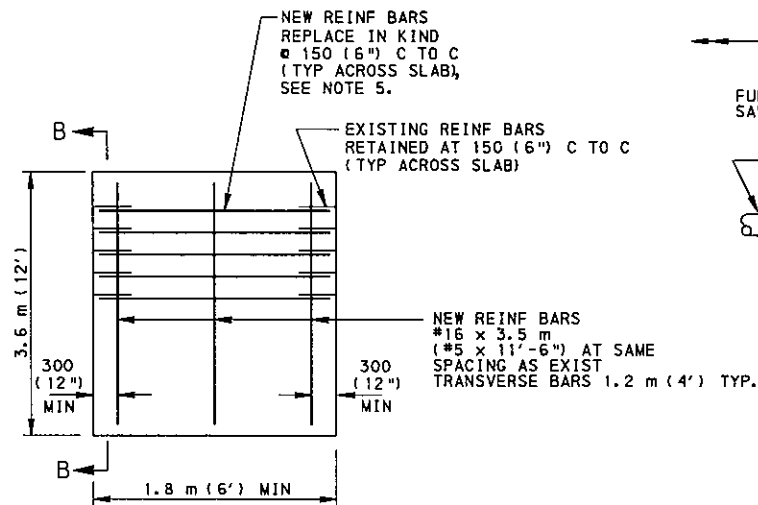
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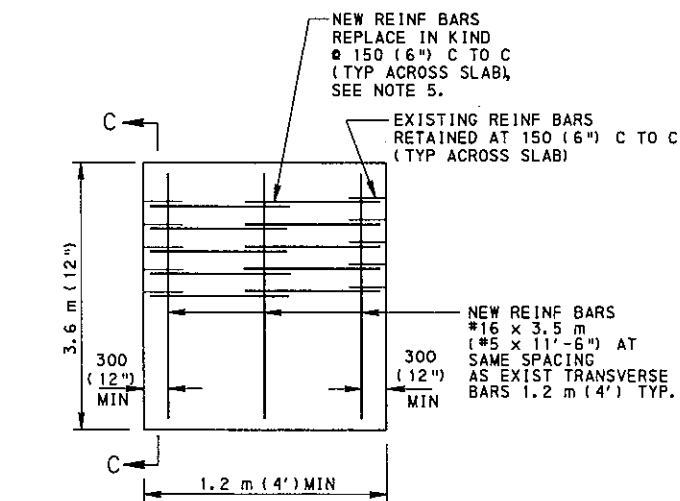
CONCRETE PAVEMENT
REHABILITATION
 (PATCHING)



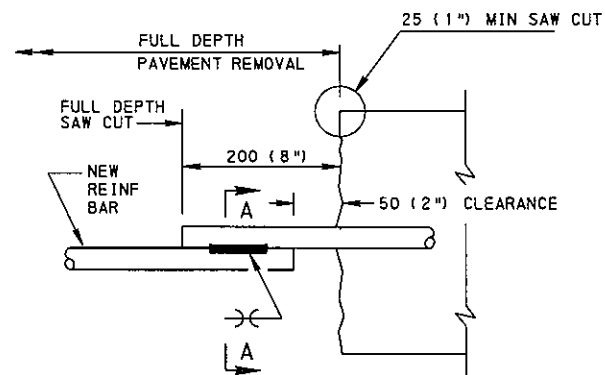
C R C PATCH



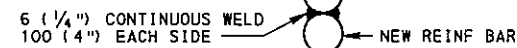
TIED SPLICE REINFORCEMENT BAR DETAIL



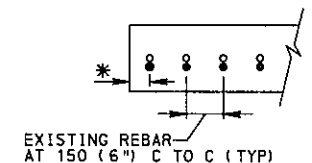
WELDED SPLICE REINFORCEMENT BAR DETAIL



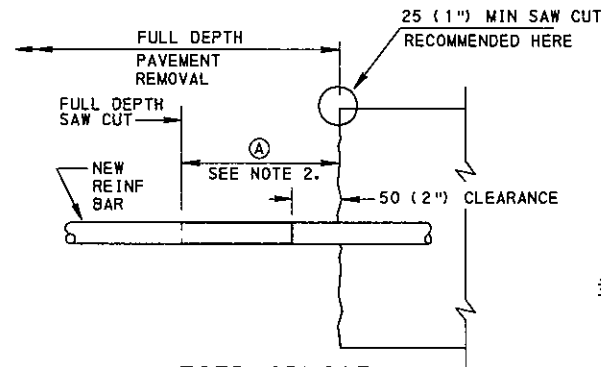
WELDED SPLICE TYPICAL SECTION



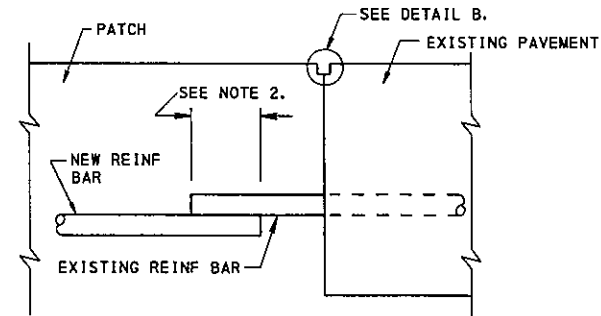
SECTION A-A



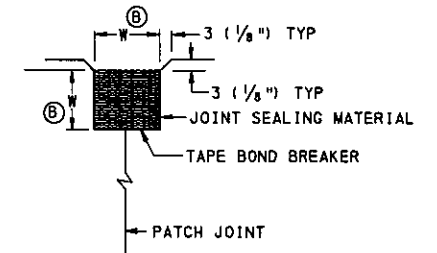
SECTION C-C



TIED SPLICE TYPICAL SECTION

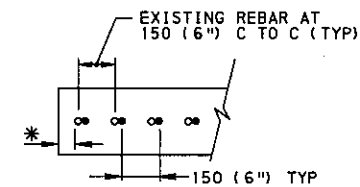


DETAIL A



DETAIL B

PATCHING JOINT DETAILS



SECTION B-B

LEGEND

- * MAINTAIN EXISTING EDGE CLEARANCE.
 - o 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) WHEN THE JOINT SPACING IS LESS THAN 15 m (50'), W = 19 (3/4"). WHEN JOINT SPACING IS 15 m (50') OR MORE, W = 25 (1").

NOTES


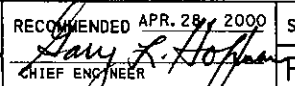
1. REMOVE 510 (20") MIN BY HAND FOR TIED SPLICES. REMOVE 200 (8") BY HAND FOR WELDED SPLICES.
2. OVERLAP TIED SPLICES BY AT LEAST 30 BAR DIAMETERS. OVERLAP WELDED SPLICES BY 150 (6").
3. REMOVE PAVEMENT FULL DEPTH UNDER RETAINED REINFORCEMENT BARS.
4. MINIMUM DISTANCE FROM PATCH EDGE TO EXISTING CRACK 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.

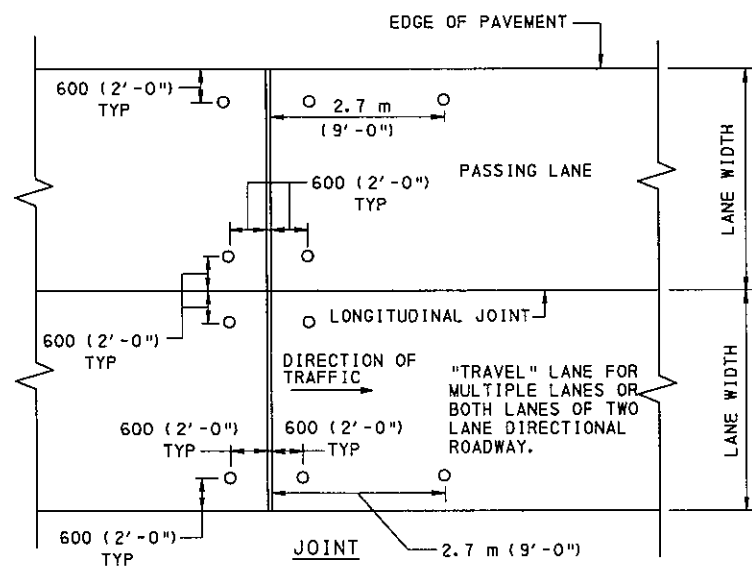
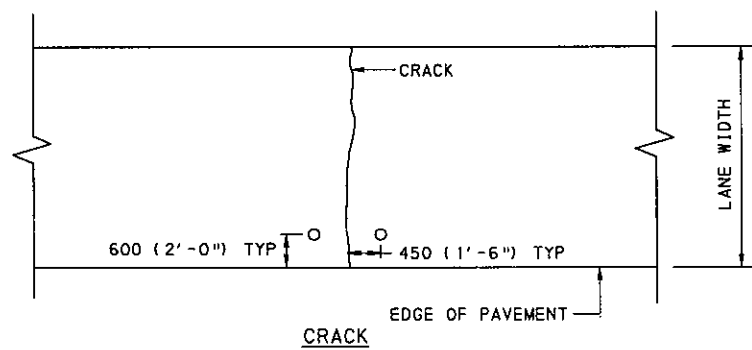
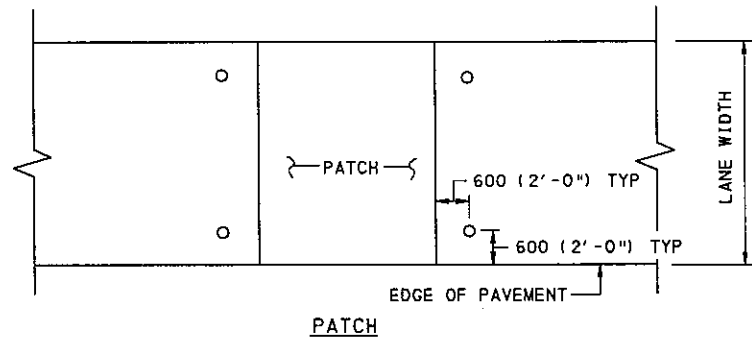
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COMMONWEALTH OF PENNSYLVANIA
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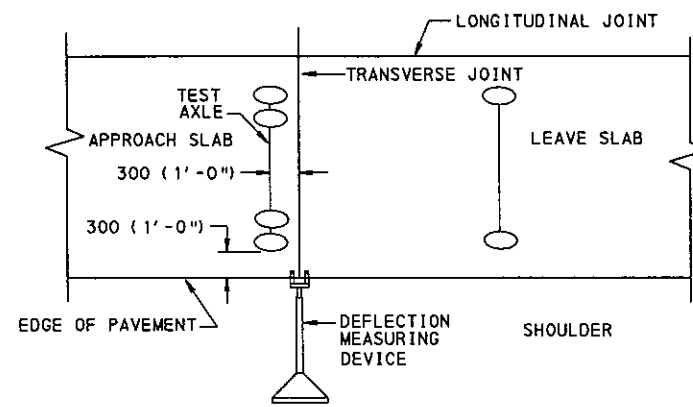
CONCRETE PAVEMENT
REHABILITATION

(C R C PATCHING)

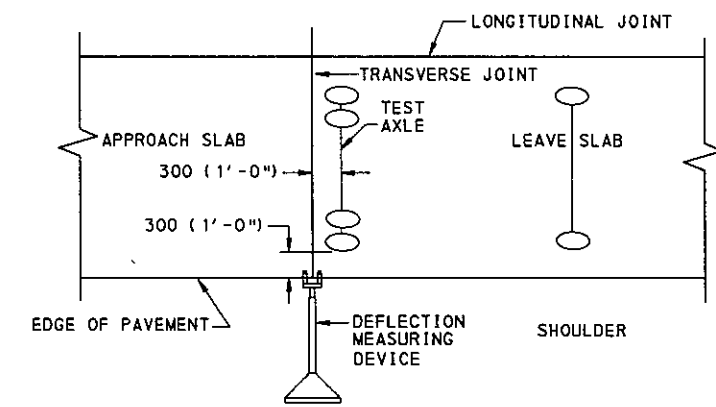
RECOMMENDED APR. 28, 2000
 DIRECTOR, BUREAU OF DESIGN
 RECOMMENDED APR. 28, 2000
 CHIEF ENGINEER
 SHT 3 OF 5
 RC-26M



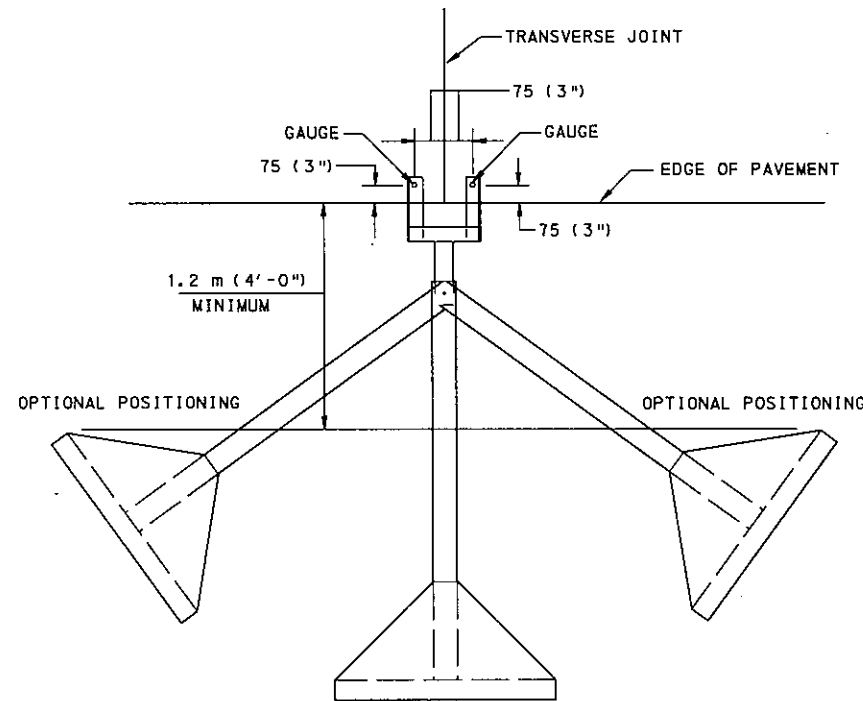
HOLE PATTERNS FOR PAVEMENT SLAB STABILIZATION



POSITION OF TEST AXLE FOR TAKING DEFLECTIONS WITH LOADED APPROACH SLAB

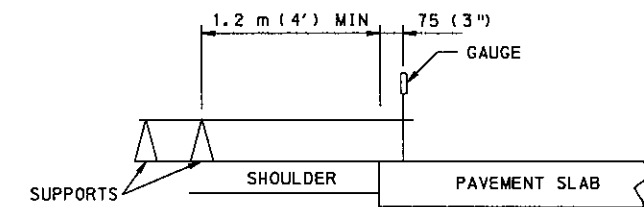


POSITION OF TEST AXLE FOR TAKING DEFLECTIONS WITH LOADED LEAVE SLAB



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.

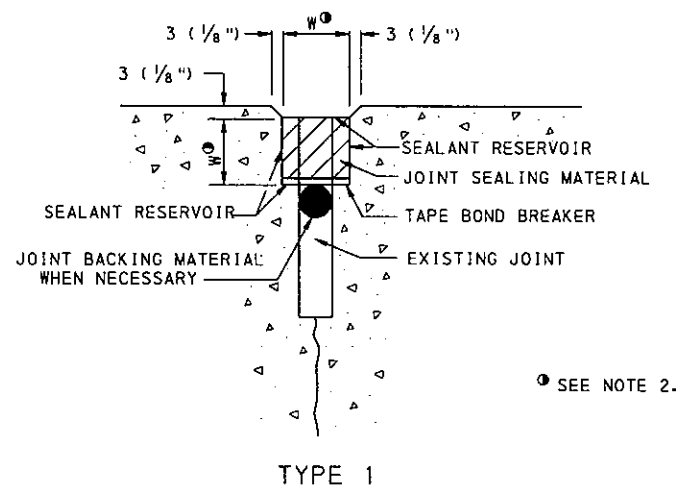
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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE PAVEMENT
REHABILITATION

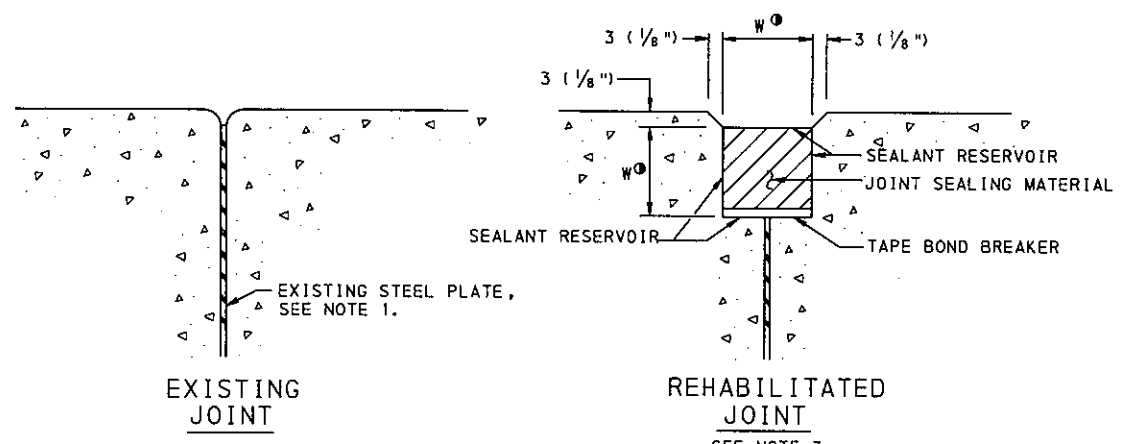
(PATCHING)

RECOMMENDED APR. 28, 2000 <i>Don A. Shaw</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT 4 OF 5 RC-26M
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SEE NOTE 2.

TYPE 1



REHABILITATED JOINT
 SEE NOTE 3.

TYPE 2

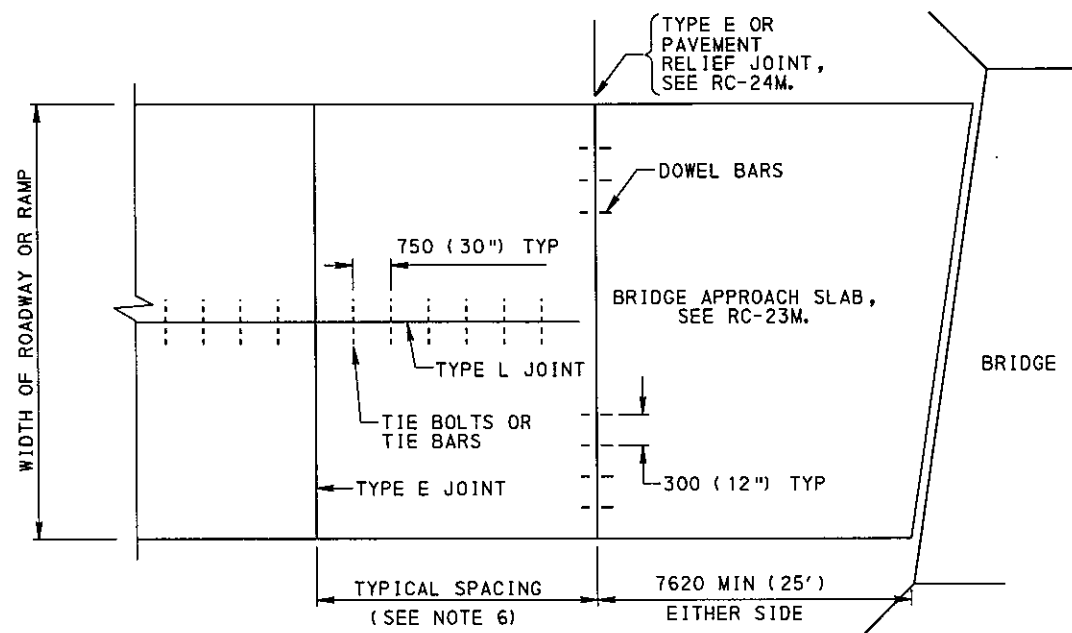
JOINT REHABILITATION

NOTES

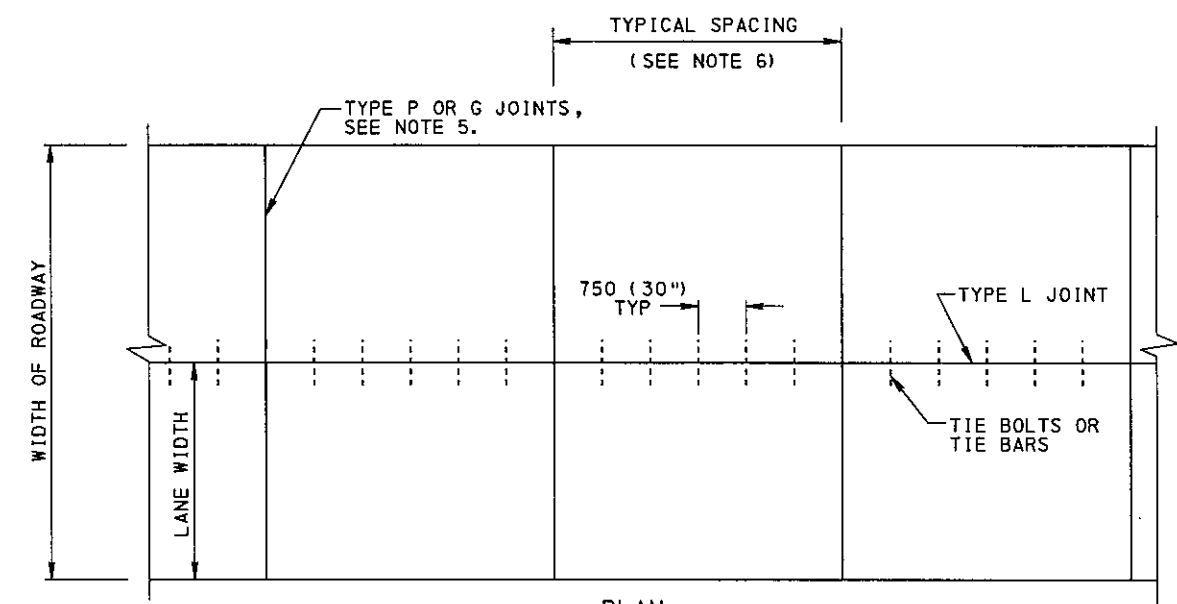
1. EXISTING STEEL PLATE IS EITHER 2.01 THICK (14 GAUGE) WITH LAPPED TOP OR FLAT PLATE 3 (1/8") THICK.
2. WHEN EXISTING JOINT SPACING IS LESS THAN 15 m (50'), W = 19 (3/4)". WHEN EXISTING JOINT SPACING IS 15 m (50') OR MORE, W = 25 (1").
3. REMOVE THE STEEL PLATE WITHIN THE SEALANT RESERVOIR.

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

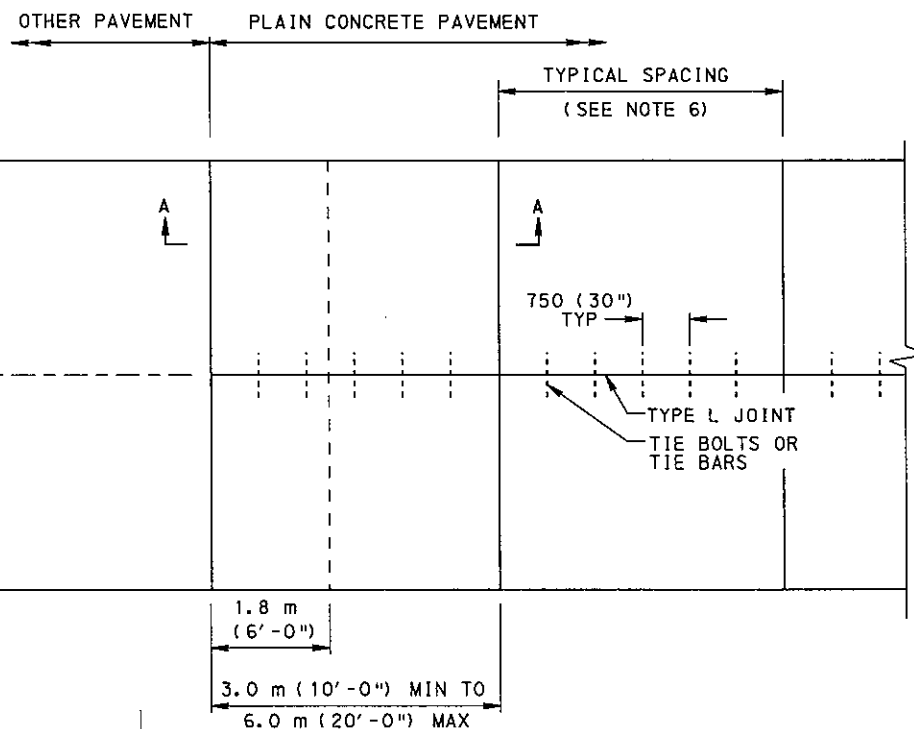
COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
CONCRETE PAVEMENT REHABILITATION (PATCHING)		
RECOMMENDED APR. 28, 2000 <i>Alan A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary R. Hoffman</i> CHIEF ENGINEER	SHT 5 OF 5 RC-26M



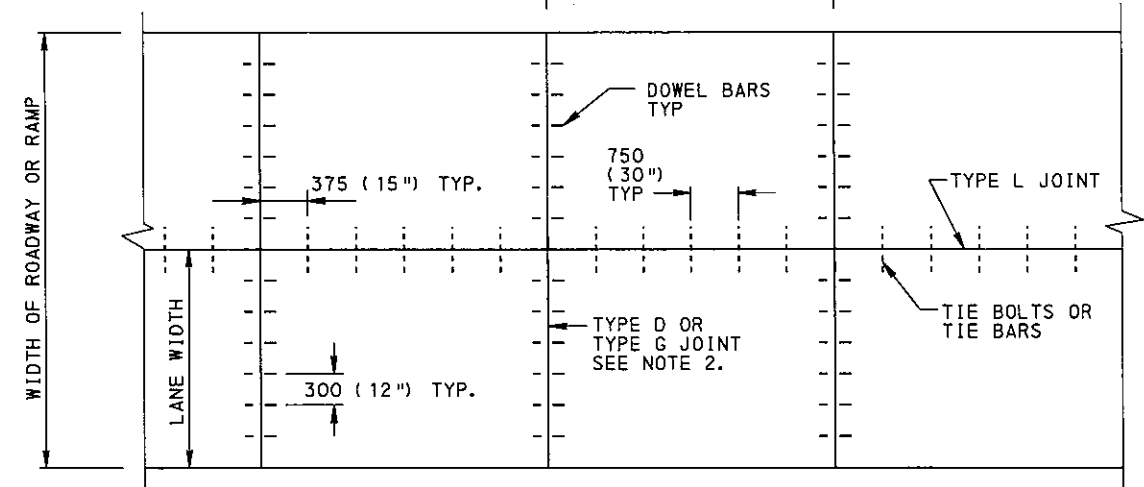
PLAN
BRIDGE APPROACHES



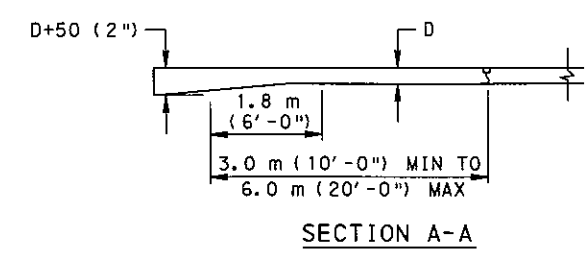
PLAN
COLLECTORS AND LOCAL ROADS



PLAN
TERMINAL SLAB



PLAN
INTERSTATE AND OTHER LIMITED ACCESS
FREEWAYS, ARTERIALS AND RAMPS



SECTION A-A

- NOTES**
- FOR JOINT DETAILS, SEE RC-20M.
 - CONSTRUCT TYPE D JOINTS ON INTERSTATE AND OTHER LIMITED ACCESS FREEWAYS AND RAMP PAVEMENTS. CONSTRUCT TYPE G JOINTS ON ARTERIAL PAVEMENTS. REFER TO THE TYPICAL SECTIONS TO DETERMINE WHICH TYPE OF JOINT APPLIES.
 - WHEN RAMP OR LANE WIDTH EXCEEDS 4.2 m (14'), A TYPE L JOINT IS REQUIRED AT THE MIDPOINT.
 - CONSTRUCT ACCELERATION AND DECELERATION PORTION OF RAMPS WITH THE SAME PAVEMENT STRUCTURE AS THE MAINLINE PAVEMENT TO THE FIRST TRANSVERSE JOINT BEYOND THE SHOULDER GORE.
 - ON COLLECTORS AND LOCAL ROADS, CONSTRUCT TYPE G OR P JOINTS, AS INDICATED.
 - A 4.5 m (15') JOINT SPACING IS TO BE USED ON ALL PAVEMENTS LESS THAN 250 (10") THICK. A 6.0 m (20') JOINT SPACING IS TO BE USED ON ALL PAVEMENTS EQUAL TO OR GREATER THAN 250 (10") THICK.
 - FOR ALTERNATE JOINTS, SEE RC-20M, SHEETS 1 AND 2.
 - ON CURVES, THE JOINT SHALL BE CONSTRUCTED PERPENDICULAR TO THE TANGENT ON THE LONG RADIUS SIDE OF THE CURVE.
 - ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U. S. CUSTOMARY UNITS IN () PARENTHESIS.

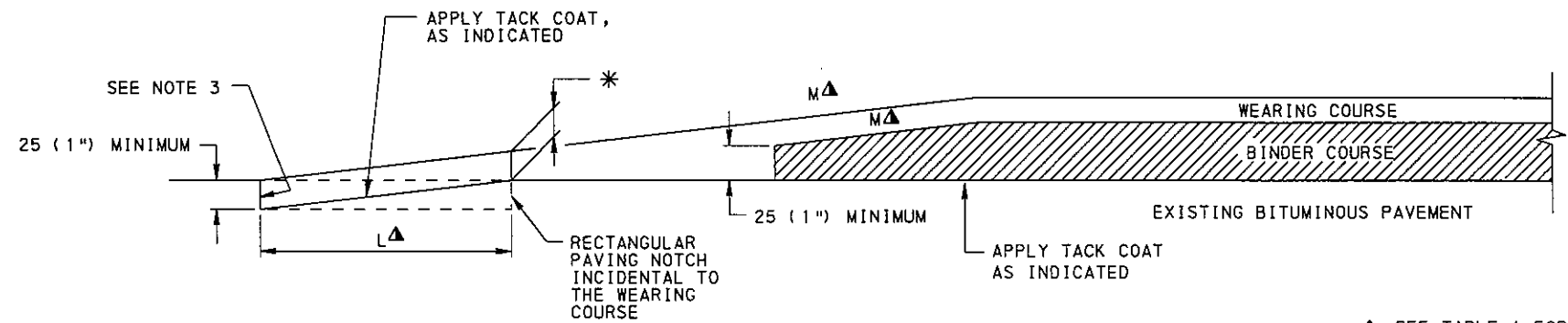
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PLAIN CONCRETE PAVEMENT

RECOMMENDED APR. 28, 2000 <i>Dean P. Schaefer</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 1 RC-27M
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17-APR-2000



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

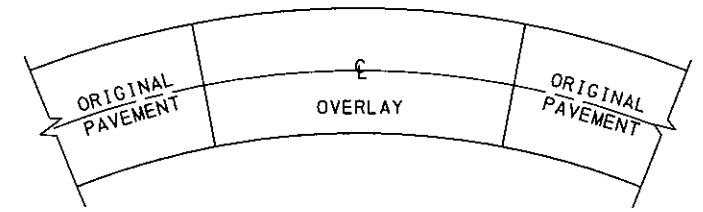
OVERLAY TRANSITION WITH PAVING NOTCH ON CONCRETE AND BITUMINOUS PAVEMENTS

TABLE A

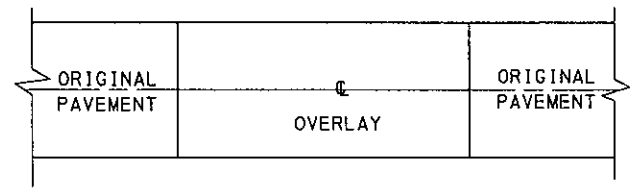
FUNCTIONAL CLASSIFICATION	SLOPE M (MAXIMUM)	PAVING NOTCH L (MINIMUM)
INTERSTATE AND OTHER LIMITED ACCESS FREEWAYS	0.55% (1" IN 15')	15 m (50')
ARTERRIALS > 70 km/h (45 MPH) SEE NOTE 2.	0.28% (1" IN 30')	9 m (30')
ARTERRIALS > 70 km/h (45 MPH) SEE NOTE 2	0.83% (1" IN 10')	3 m (10')
COLLECTORS AND LOCAL ROADS	0.83% (1" IN 10')	3 m (10')
CROSS STREETS SEE NOTE 1	8.33% (1" IN 12")	0.3 m (1')
DRIVEWAYS	8.33% (1" IN 12")	NO NOTCH

NOTES

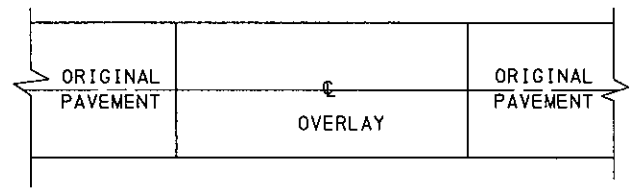
1. USE HIGHER APPROPRIATE CRITERIA IF A CROSS STREET HAS A FUNCTIONAL CLASSIFICATION OF COLLECTORS AND LOCAL ROADS OR HIGHER.
2. USE 85TH PERCENTILE SPEED, IF AVAILABLE. OTHERWISE, USE THE POSTED SPEED.
3. PLACE EDGE FLUSH WITH EXISTING PAVEMENT AND SEAL AS SPECIFIED IN PUBLICATION 408/2000, SECTION 401.3(j)3.
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.



PLAN VIEW
SUPERELEVATION SECTION



PLAN VIEW
TANGENT SECTION
TWO-LANE DIRECTIONAL



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

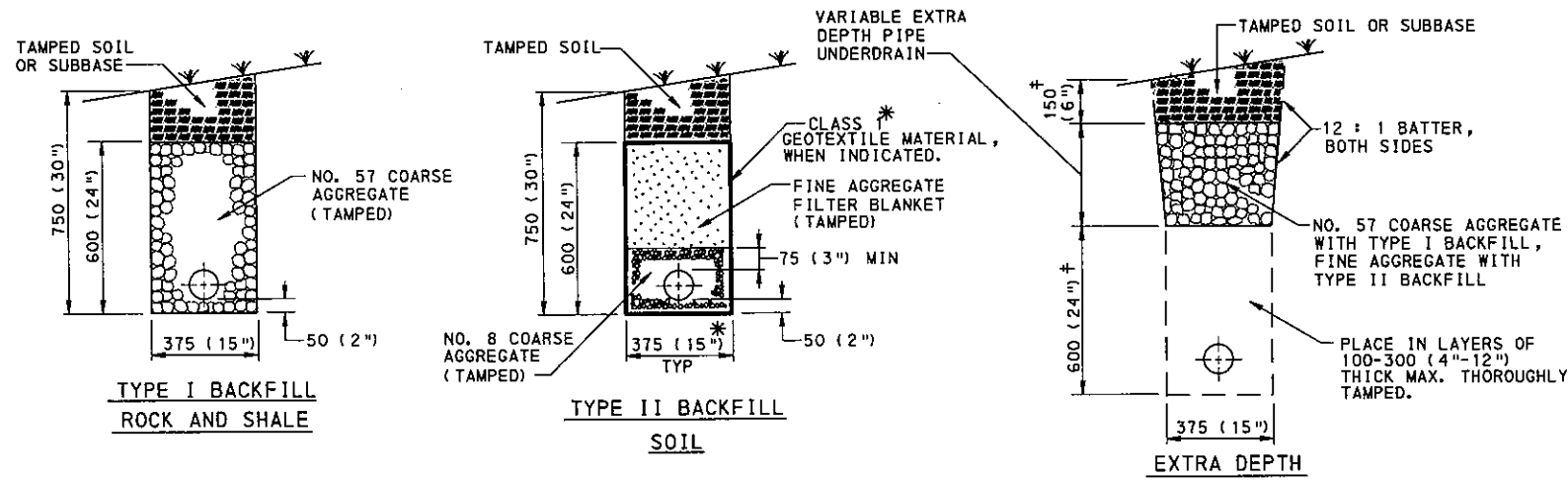
OVERLAY TRANSITIONS

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

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
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OVERLAY TRANSITIONS AND PAVING NOTCHES

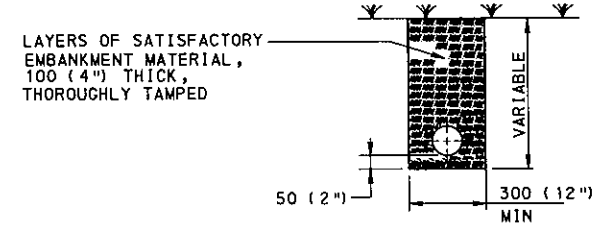
RECOMMENDED APR. 28, 2000 <i>Sean A. Schmo</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Dany R. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 1 RC-28M
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NOTES

1. PROVIDE MATERIALS AND CONSTRUCT AS SPECIFIED IN PUBLICATION 408M (408/2000), SECTION 610 FOR PIPE UNDERDRAIN AND PAVEMENT BASE DRAIN.
2. PROVIDE BITUMINOUS PAPER WHEN GEOTEXTILE MATERIAL IS NOT INDICATED.
3. FOR THE SUBSURFACE DRAIN OUTLET PROVIDE MATERIALS MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 615. A MINIMUM OF 600 (24") OF COVER OVER THE PIPE IS REQUIRED FOR OUTLETS CONSTRUCTED WITH THE SAME MATERIAL AS THE UNDERDRAIN OR PAVEMENT BASE DRAIN.
4. USE THE WIRE MESH SHIELD IN AREAS NOT SUBJECT TO MOWING OR DAMAGE BY EQUIPMENT OR VEHICLES. REFER TO RC-31M FOR CONSTRUCTION OF ENDWALLS FOR OUTLET PROTECTION.
5. LONGITUDINAL BASE DRAINS MAY RUN CONTINUOUSLY THROUGH TWO (2) OUTLETS. USE A 45° ELBOW ON THE THIRD OUTLET OF A SERIES. BEGIN THE DRAIN FOLLOWING THE THIRD OUTLET WITH AN END CAP.
6. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

PIPE UNDERDRAIN



EXCAVATION OVER 900 (36") IN DEPTH AND FOR A MAXIMUM WIDTH OF 600 (24") IS PAYABLE AS CLASS 4 EXCAVATION. USE SUBSURFACE DRAIN OUTLETS FOR ALL PIPE UNDERDRAIN AND PAVEMENT BASE DRAINS.

SUBSURFACE DRAIN OUTLETS
(SEE DETAIL A.)

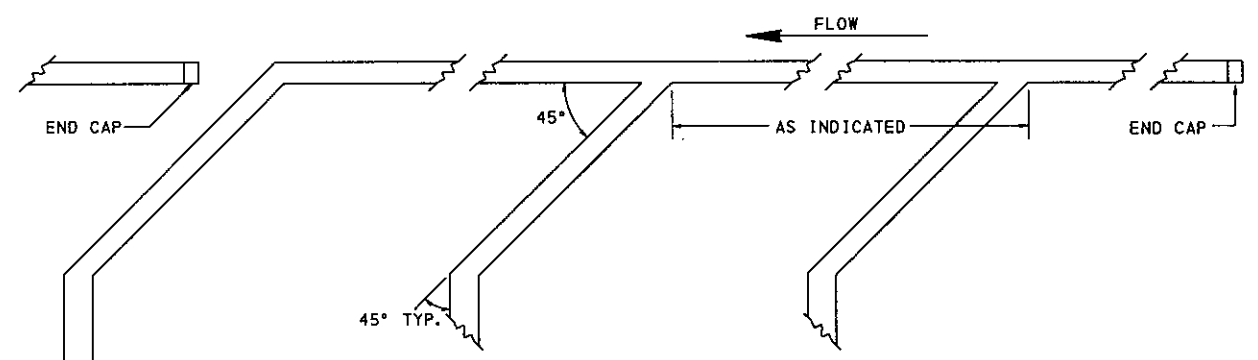
CRIMP AROUND OUTLET END OF PIPE AND SECURE TO PIPE WITH GALVANIZED STEEL WIRE OR OTHER ACCEPTABLE FASTENING METHODS. SEE NOTE 4



19 x 19 (3/4" x 3/4") WIRE MESH SCREENING, 1.37 THICK (17 GAGE) MINIMUM, GALVANIZED AFTER WEAVING.

**DETAIL A
WIRE MESH SHIELD**

CONSTRUCT THE OUTLET INVERT 100 (3") (MINIMUM) HIGHER THAN THE SWALE LINE ELEVATION.

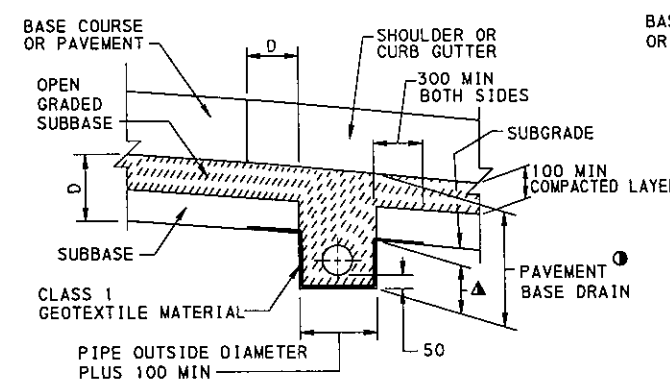


LONGITUDINAL BASE DRAIN AND OUTLET CONFIGURATION
SEE NOTE 5

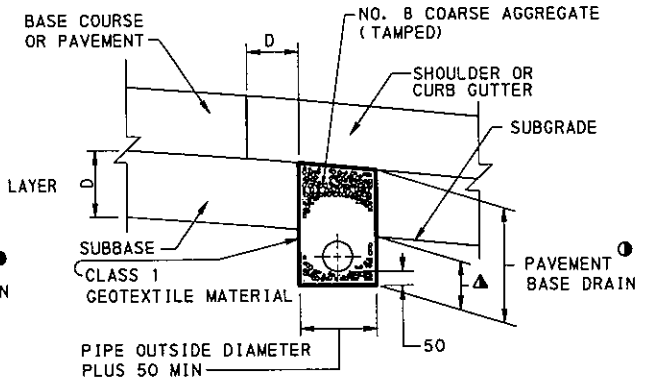
LEGEND

- ▲ DEPTH BELOW SUBBASE EQUAL TO THE OUTSIDE DIAMETER OF SPECIFIED PIPE PLUS 50 (2").
- WHEN STORM SEWER IS REQUIRED AND IT INTERFERES WITH PLACEMENT OF PAVEMENT BASE DRAIN, ELIMINATE THE PAVEMENT BASE DRAIN AND USE COMBINATION STORM SEWER AND UNDERDRAIN.
- * WHEN GEOTEXTILE MATERIAL IS USED FOR TYPE II BACKFILL, REPLACE FINE AGGREGATE FILTER BLANKET WITH EQUIVALENT DEPTH OF NO. 8 COARSE AGGREGATE. WHERE ACCESS BY TRENCH EQUIPMENT IS FEASIBLE, PROVIDE TRENCH WIDTH EQUAL TO PIPE OUTSIDE DIAMETER PLUS 50 (2"), BUT NOT LESS THAN 150 (6"), WHEN GEOTEXTILE MATERIAL IS INDICATED.
- † TYPE I OR TYPE II BACKFILL
- D= SUBBASE DEPTH

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

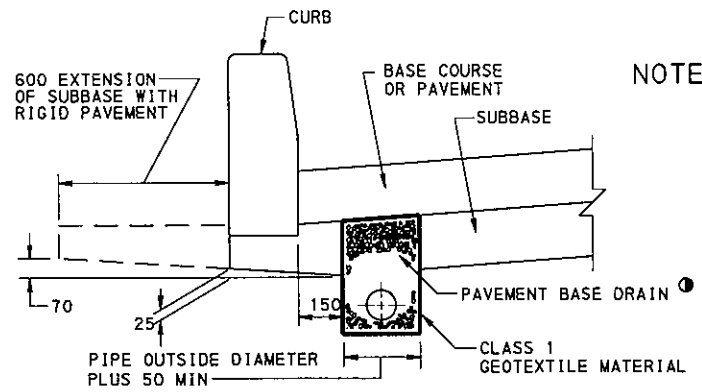


**TYPICAL PLACEMENT
(OPEN GRADED SUBBASE)**



**TYPICAL PLACEMENT
(STANDARD SUBBASE)**

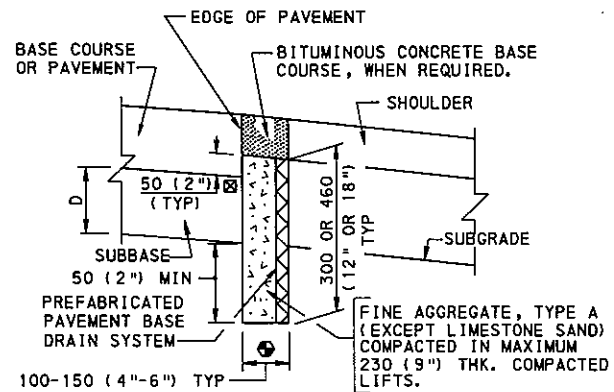
PAVEMENT BASE DRAIN



PLACEMENT AT CURB SECTION

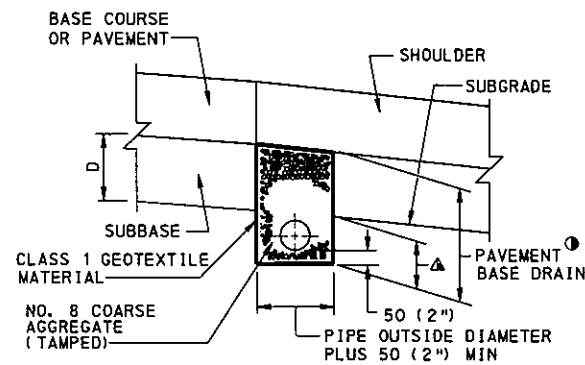
**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN**

SUBSURFACE DRAINS



**PREFABRICATED
PAVEMENT BASE DRAIN
(REHABILITATION)**

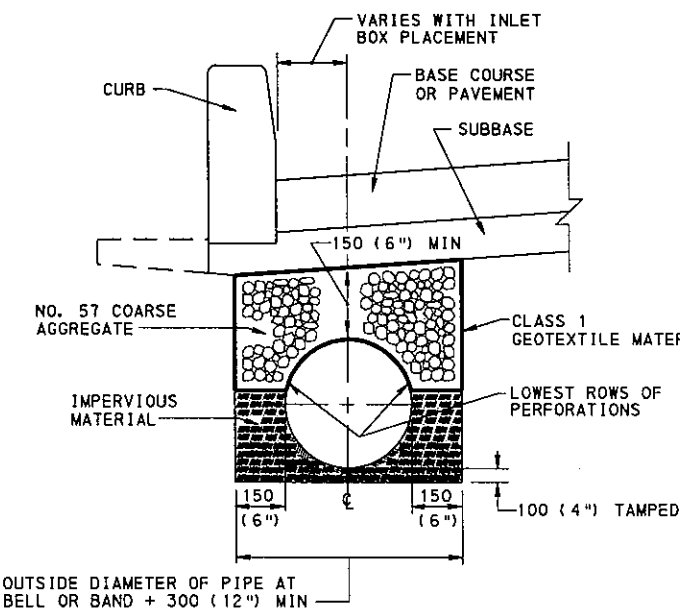
SEE NOTE 3.



**PAVEMENT BASE DRAIN
(REHABILITATION)**

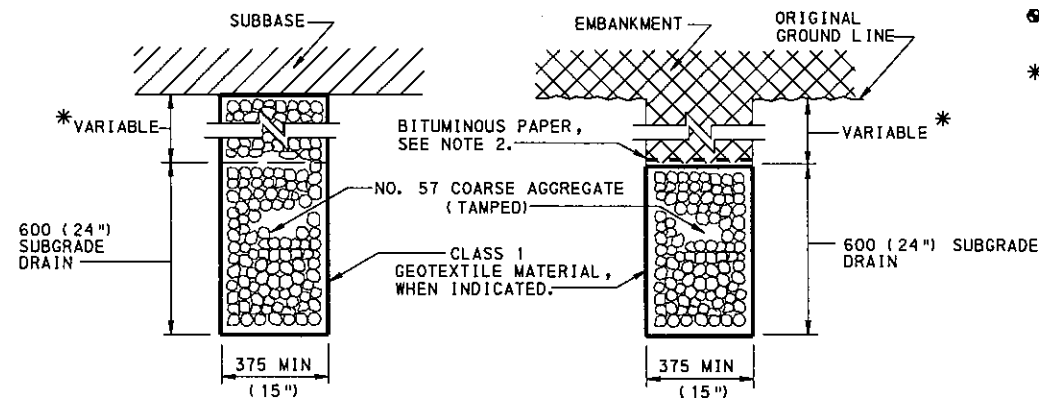
NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 610 FOR PAVEMENT BASE DRAIN, SECTION 612 FOR SUBGRADE DRAINS AND SECTION 604 FOR COMBINATION STORM SEWER AND UNDERDRAIN.
2. PROVIDE BITUMINOUS PAPER WHEN GEOTEXTILE MATERIAL IS NOT INDICATED.
3. PREFABRICATED PAVEMENT BASE DRAIN IS NOT RECOMMENDED UNDER CURBED SECTIONS AND ADJACENT TO WIDENED PAVEMENT.



**COMBINATION
STORM SEWER AND UNDERDRAIN**

NOTE: PLACE NO. 57 COARSE AGGREGATE, TAMPED IN LAYERS 150 (6") THICK, STARTING AT THE LOWEST ROWS OF PERFORATIONS OR THE START OF THE OPEN JOINT. PLACE GROUPS OF PERFORATIONS OR THE OPEN JOINT (1/3 PIPE CIRCUMFERENCE) SYMMETRICALLY ABOUT THE VERTICAL CENTER LINE.



**TREATMENT UNDER SUBBASE TREATMENT UNDER EMBANKMENT
SUBGRADE DRAIN**

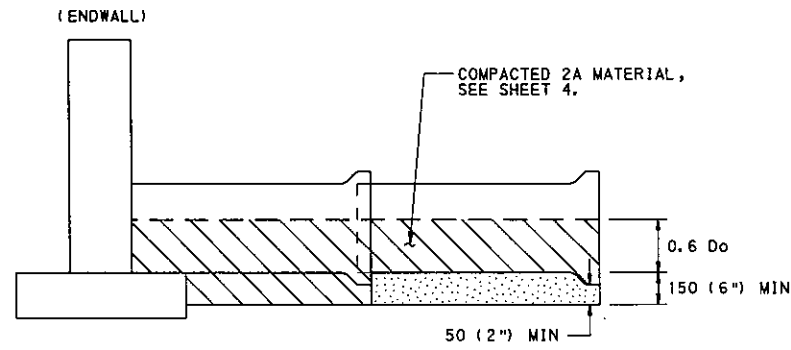
LEGEND

- ▲ DEPTH BELOW SUBBASE EQUAL TO THE OUTSIDE DIAMETER OF SPECIFIED PIPE PLUS 50 (2").
- ① WHEN STORM SEWER IS REQUIRED AND IT INTERFERES WITH PLACEMENT OF PAVEMENT BASE DRAIN, ELIMINATE THE PAVEMENT BASE DRAIN AND USE COMBINATION STORM SEWER AND UNDERDRAIN.
- D= SUBBASE DEPTH.
- ⊠ IF SLOUGHING OF THE SUBBASE MATERIAL FROM UNDER THE PAVEMENT IS OBSERVED DURING TRENCH EXCAVATION, COMPACT BACKFILL HYDRAULICALLY, AS DIRECTED BY THE ENGINEER.
- ⊙ WIDTH IS EQUAL TO 75-125 (3"-5") OF BACKFILL AGGREGATE PLUS 25 (1") FOR THE PREFABRICATED BASE DRAIN.
- * VARY TO MAINTAIN THE NECESSARY SUBGRADE SLOPE. CONSIDER ADDITIONAL AGGREGATE INCIDENTAL TO THE SUBGRADE DRAIN PAY ITEM.

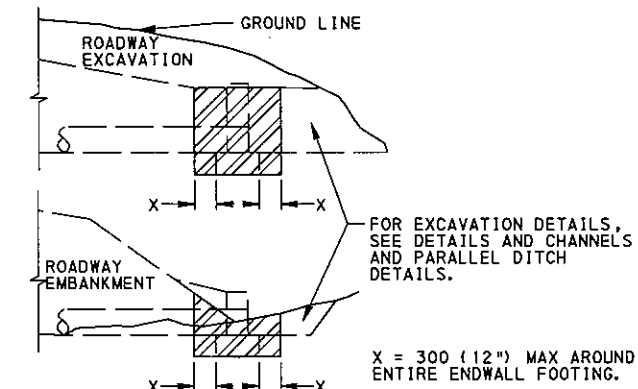
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**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN**

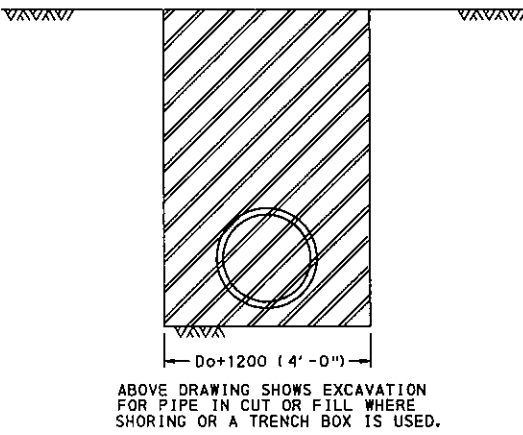
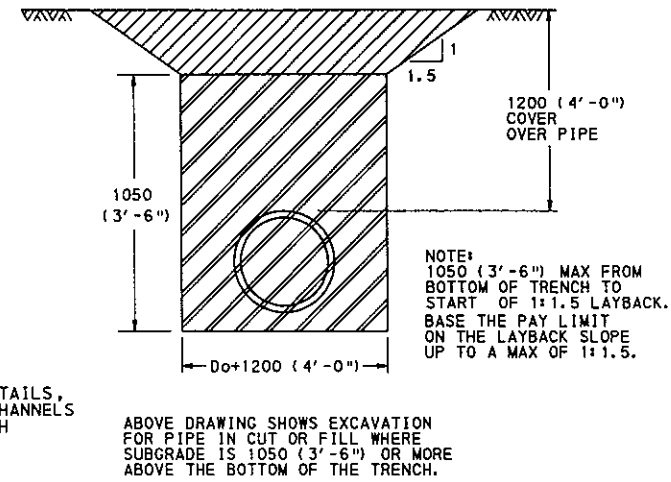
SUBSURFACE DRAINS



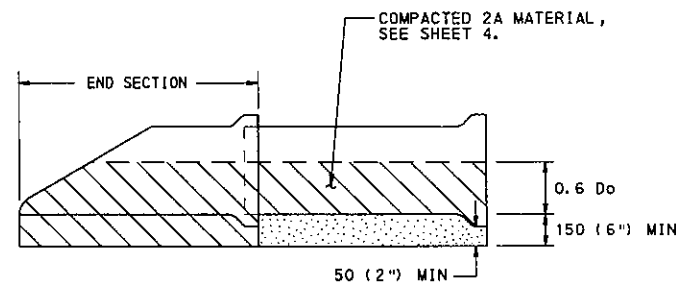
BACKFILL DETAIL AT ENDWALL
(FOR CONCRETE PIPE)



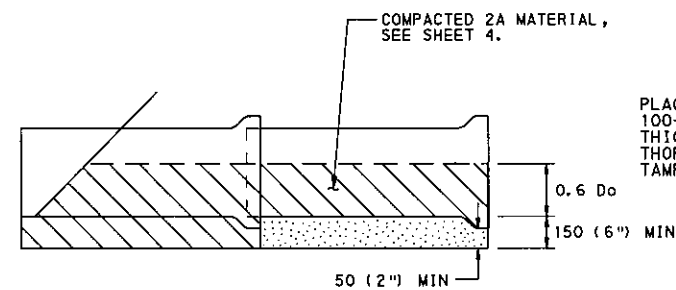
EXCAVATION FOR ENDWALLS



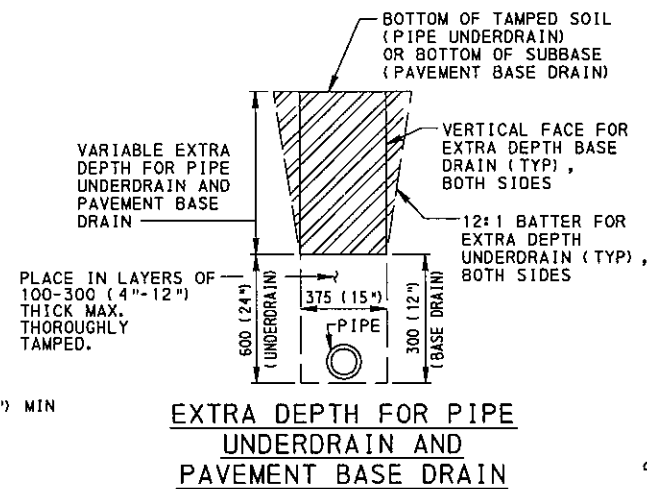
PAY LIMITS FOR PIPE EXCAVATION



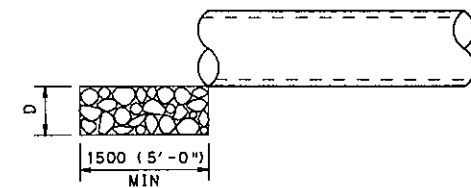
BACKFILL DETAIL AT END SECTION
(FOR CONCRETE PIPE)



BACKFILL DETAIL AT LAST SECTION OF PIPE
(FOR CONCRETE PIPE)



EXTRA DEPTH FOR PIPE UNDERDRAIN AND PAVEMENT BASE DRAIN


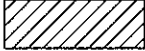

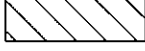


DETAIL A - PIPE INLET OR OUTLET PROTECTION

NOTES

1. PROVIDE MATERIALS AND CONSTRUCT AS SPECIFIED IN PUBLICATION 408/2000, SECTION 601 FOR PIPE CULVERTS, SECTION 602 FOR CORRUGATED METAL PIPE-ARCH CULVERTS AND SECTION 603 FOR METAL PLATE CULVERTS.
2. SHORING OR TRENCH BOX INSTALLATION FOR FLEXIBLE PIPE IS NOT NORMALLY USED. IF SHORING OR TRENCH BOX INSTALLATION IS PERMITTED IN SPECIAL CIRCUMSTANCES, REFER TO PUBLICATION 408/2000, SECTION 601.
3. IN ALL EXCAVATION AREAS FOLLOW OSHA SAFETY REQUIREMENTS.
4. DO NOT COMPACT NO. 8 MATERIAL USED FOR BEDDING UNDER CONCRETE PIPES.
5. ALLOW NO PAYMENT FOR EXCAVATION IN EXCESS OF SPECIFIED LIMITS AND FOR ADDITIONAL BACKFILL MATERIAL REQUIRED.
6. PAYMENT FOR THE BACKFILL ENVELOPE, INCLUDING BEDDING, COARSE AGGREGATE AND SUITABLE MATERIAL UP TO 300 (12") ABOVE THE PIPE IS INCIDENTAL TO THE PIPE.
7. FOR BOTTOM TRENCH WIDTHS ≥ 2.5 m (8'-0"), ALL EXCAVATION IS CLASS 1.
8. FOR INLET OR OUTLET PROTECTION SEE DETAIL A.

LEGEND

-  CLASS 4 EXCAVATION
-  CLASS 1 EXCAVATION
-  AGGREGATE FOR BEDDING (AASHTO NO. 8)
-  COARSE AGGREGATE (2A)

Do = OUTSIDE DIAMETER OF PIPE.

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

D = 450 (18"), R-4 ROCK, FOR PIPES LESS THAN 900 (36") INSIDE DIAMETER OR SPAN.
D = 600 (24"), R-5 ROCK, FOR PIPES 900 (36") AND GREATER INSIDE DIAMETER OR SPAN.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SUBSURFACE DRAINS
PIPE PLACEMENT
EXCAVATION - BEDDING - BACKFILL

RECOMMENDED APR. 28, 2000
Dean A. Schmitt
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED APR. 28, 2000
Larry S. Hoffman
CHIEF ENGINEER

SHT 3 OF 4
RC-30M

PIPE INSTALLATION PROCEDURES

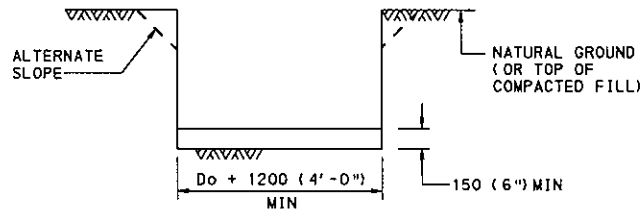
CONSTRUCTION DETAILS BELOW COVER THE FOLLOWING CONDITIONS:

- (A) PIPE LYING ON TOP OF THE NATURAL GROUND, ROCK OR COMPACTED (97% SPD) FILL.
- (B) THE EXISTING GROUND IS BETWEEN THE TOP AND THE BOTTOM OF THE PROPOSED PIPE AND THE PIPE IS TO BE COVERED WITH EARTH FILL.
- (C) THE TOP OF PIPE IS BELOW THE LEVEL OF THE NATURAL GROUND OR COMPACTED FILL (TO MINIMUM 97% SPD) AND TO BE COVERED WITH EARTH FILL TO HEIGHTS ABOVE THE NATURAL GROUND.

STEP 1 : REMOVE TOPSOIL (COMPRESSIBLE LAYER, FOR EXAMPLE, ORGANIC MATERIAL) TO A WIDTH EQUAL TO 5 OUTSIDE DIAMETERS OF THE PIPE IN ALL FILL CONDITIONS ABOVE (A), (B) & (C). ALSO IF SPECIFIED ON THE CONTRACT DRAWING, UNDERCUT FOR THE DEPTH BELOW THE BEDDING AS SHOWN BY DESIGN (MAKE MIN WIDTH 5 DIAMETERS OF PIPE). PAY AS CLASS 1 EXCAVATION.

STEP 2 : CONSTRUCT THE EMBANKMENT TO 1200 (4'-0") ABOVE THE TOP OF PIPE OR TO THE SUBGRADE ELEVATION, WHICHEVER IS LESS. FOR PIPES 1800 (72") OR GREATER SEE NOTE 1.

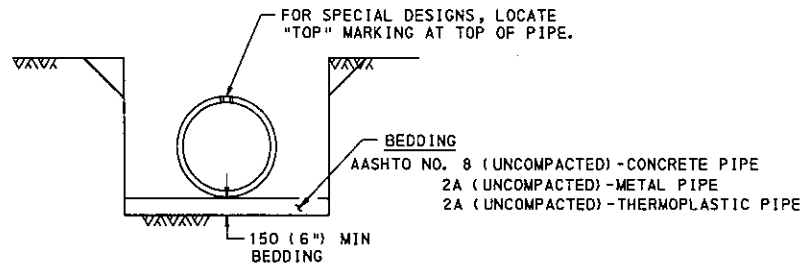
STEP 3 : EXCAVATE THE TRENCH TO THE WIDTH OF THE OUTSIDE DIAMETER OF THE PIPE PLUS 1200 (4'-0") AND CREATE AN APPROPRIATE BEDDING 150 (6") DEEP.



STEP 4 : FOR CONCRETE PIPE, IF THIS EXCAVATION IS THROUGH ROCK, OR HARD SHALE, OR IN AREAS OF UNDERCUT, PROVIDE 150+40 mm/m (6"+1/2" INCH/FT) OF, Do+1200 (4'-0"), BELOW THE INTENDED BOTTOM ELEVATION OF THE PIPE, 300 (12") MAX.

NOTE: IF UNSUITABLE MATERIAL IS FOUND, UNDERCUT AS DIRECTED AND BACKFILL WITH SUITABLE MATERIAL TO BOTTOM OF BEDDING ELEVATION. (UNLESS OTHERWISE SPECIFIED.)

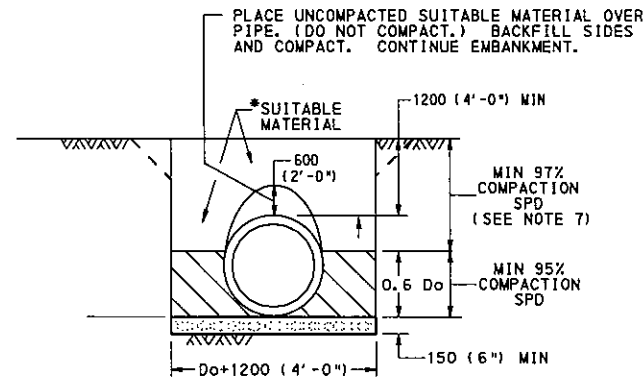
STEP 5 : LAY PIPE ON APPROPRIATE BEDDING. SEE STEP 6D FOR METAL PIPE ARCH AND METAL PLATE PIPE ARCH.



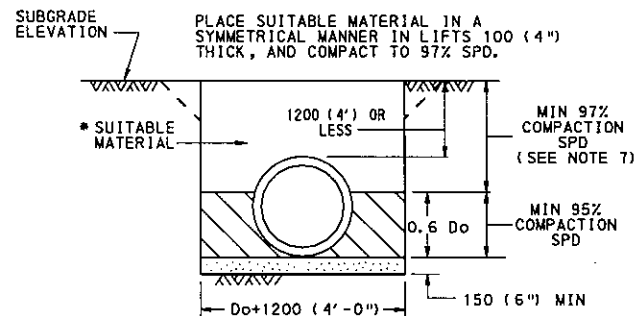
STEP 6 : FOR CONCRETE PIPE, SEE STEP 6A.
 FOR METAL PIPE AND METAL PLATE PIPE, SEE STEP 6B.
 FOR THERMOPLASTIC PIPE, SEE STEP 6C.
 FOR METAL PIPE ARCH AND METAL PLATE PIPE ARCH, SEE STEP 6D.

STEP 6A : CONCRETE PIPE

PLACE 2A COARSE AGGREGATE MATERIAL, IN LIFTS 100 (4") THICK, ADJACENT TO THE LOWER HAUNCHES TO A HEIGHT OF 0.6 Do. COMPACT TO 95% SPD. TEST THE SIDE BACKFILL MATERIAL AND CONTINUE EMBANKMENT IN ACCORDANCE WITH SECTION 601.



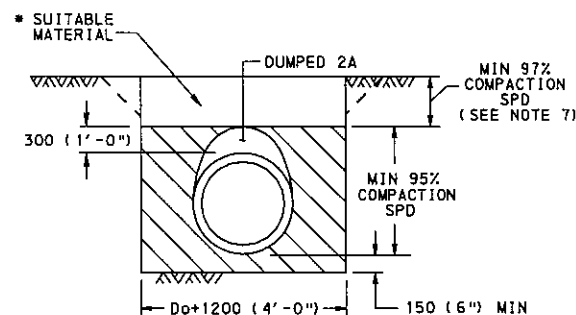
DEEP FILLS OVER 1200
CONCRETE PIPE



SHALLOW FILLS 1200 AND LESS
CONCRETE PIPE

STEP 6B : METAL PIPE AND METAL PLATE PIPE

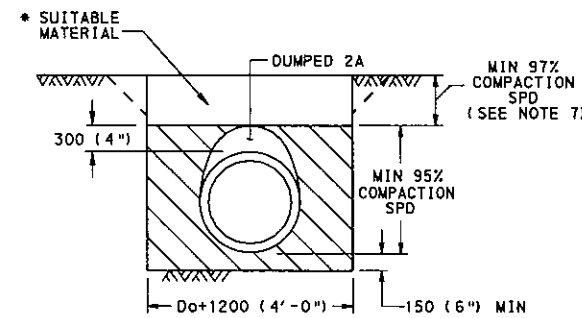
PLACE 2A COARSE AGGREGATE MATERIAL, IN LIFTS 100 (4") THICK, ADJACENT TO THE LOWER HAUNCHES TO A HEIGHT OF 300 (12") ABOVE TOP OF PIPE. COMPACT TO 95% SPD. TEST THE BACKFILL MATERIAL AND CONTINUE EMBANKMENT IN ACCORDANCE WITH SECTION 601.



METAL PIPE AND METAL PLATE PIPE

STEP 6C: THERMOPLASTIC PIPE

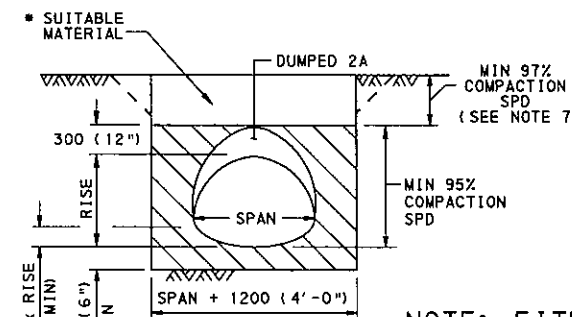
PLACE 2A COARSE AGGREGATE MATERIAL, IN LIFTS 100 (4") THICK, ADJACENT TO THE LOWER HAUNCHES TO A HEIGHT OF 300 (12") ABOVE TOP OF PIPE. COMPACT TO 95% SPD. TEST THE BACKFILL MATERIAL AND CONTINUE EMBANKMENT IN ACCORDANCE WITH SECTION 601.



THERMOPLASTIC PIPE

STEP 6D : METAL PIPE ARCH AND METAL PLATE PIPE ARCH

- (1) PLACE 2A COARSE AGGREGATE MATERIAL (0.15 x RISE) ON TOP OF THE BEDDING AND FORM THE CRADLE.
- (2) LAY THE PIPE ON THE PREPARED CRADLE.
- (3) PLACE 2A COARSE AGGREGATE MATERIAL, IN LIFTS 100 (4") THICK, ADJACENT TO THE LOWER HAUNCHES TO A HEIGHT OF 300 (12") ABOVE TOP OF PIPE. COMPACT TO 95% SPD. TEST THE BACKFILL MATERIAL AND CONTINUE EMBANKMENT IN ACCORDANCE WITH SECTION 601.



METAL PIPE ARCH AND METAL PLATE PIPE ARCH

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

NOTES

1. THE INSTALLATION OF PIPES 1800 (72") OR GREATER IN DIAMETER OR SPAN IS PERMITTED WITHOUT PLACING EMBANKMENT FIRST. MAKE THE BACKFILL ENVELOPE AS SHOWN ON THIS DRAWING EXCEPT PROVIDE THAT 2A MATERIAL ON EACH SIDE OF THE PIPE EQUAL TO ONE DIAMETER OR SPAN. FOR CONCRETE PIPE, THE WIDTH OF UNCOMPACTED AGGREGATE FOR BEDDING (AASHTO NO. 8) REMAINS AT Do + 1200 (4'-0"). PAYMENT FOR THE 2A MATERIAL IS AS PER NOTE 3.
2. A HIGHER STRENGTH PIPE THAN SPECIFIED MAY BE SUPPLIED AT NO ADDITIONAL COST TO THE DEPARTMENT.
3. PAYMENT FOR THE BACKFILL ENVELOPE INCLUDING BEDDING, COARSE AGGREGATE AND SUITABLE MATERIAL UP TO 300 (12") ABOVE THE PIPE IS INCIDENTAL TO THE PIPE.
4. TO PRECLUDE POINT LOADING ON RELATIVELY RIGID CONCRETE PIPE, DO NOT COMPACT AASHTO NO. 8 BEDDING MATERIAL.
5. FOR TRENCH BOX/SHORING INSTALLATION REQUIREMENTS REFER TO PUBLICATION 408/2000, SECTION 601.
6. PERMIT PLACEMENT OF BACKFILL MATERIAL IN LAYERS, LIFTS, 200 (8") THICK WHEN USING VIBRATORY COMPACTION EQUIPMENT.
7. COMPACT TOP 1.0m (3'-0") OF SUBGRADE TO 100% IN ACCORDANCE WITH SECTION 206.3.

LEGEND

- AGGREGATE FOR BEDDING (AASHTO NO. 8), UNCOMPACTED
- COARSE AGGREGATE (2A)

Do = OUTSIDE DIAMETER OF PIPE, MILLIMETERS
 SPD = STANDARD PROCTOR DENSITY
 ID = INSIDE DIAMETER

* SUITABLE = MATERIAL CONTAINING NO DEBRIS, ORGANIC MATTER, FROZEN MATERIAL OR LARGE STONES WITH A DIAMETER GREATER THAN ONE-HALF THE THICKNESS OF THE COMPACTED LAYERS BEING PLACED.

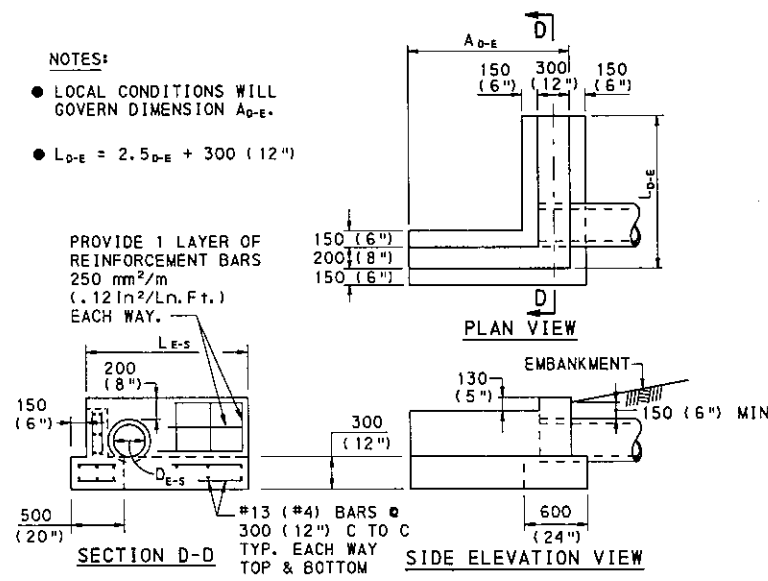
COMMONWEALTH OF PENNSYLVANIA
 DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

SUBSURFACE DRAINS
 PIPE PLACEMENT
 EXCAVATION - BEDDING - BACKFILL

NOTES:

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

PROVIDE 1 LAYER OF REINFORCEMENT BARS $250 \text{ mm}^2/\text{m}$ (.12 $\text{in}^2/\text{Ln. Ft.}$) EACH WAY.

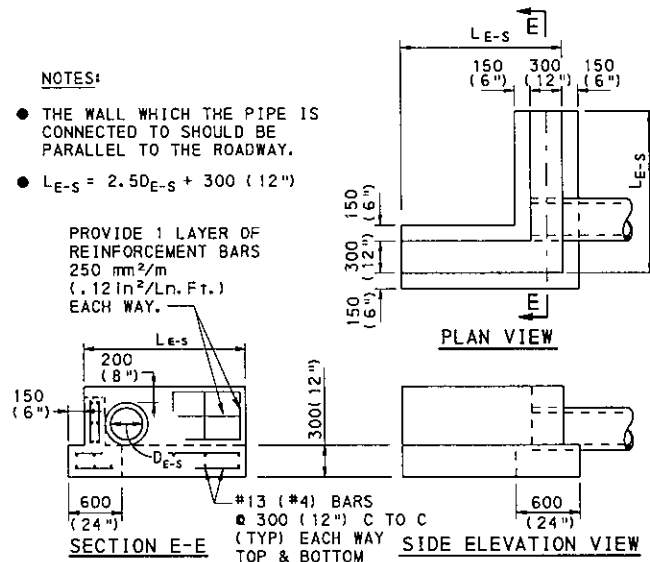


TYPE D-E ENDWALL

NOTES:

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

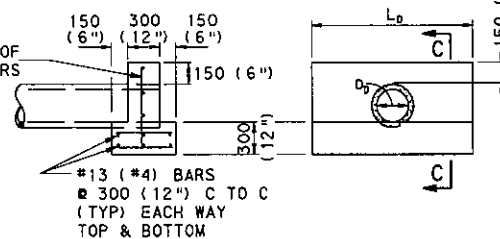
PROVIDE 1 LAYER OF REINFORCEMENT BARS $250 \text{ mm}^2/\text{m}$ (.12 $\text{in}^2/\text{Ln. Ft.}$) EACH WAY.



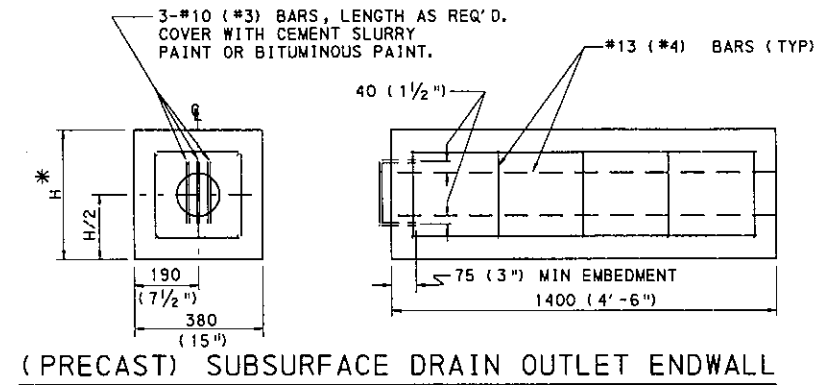
TYPE E-S ENDWALL

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

PROVIDE 1 LAYER OF REINFORCEMENT BARS $250 \text{ mm}^2/\text{m}$ (.12 $\text{in}^2/\text{Ln. Ft.}$) EACH WAY.

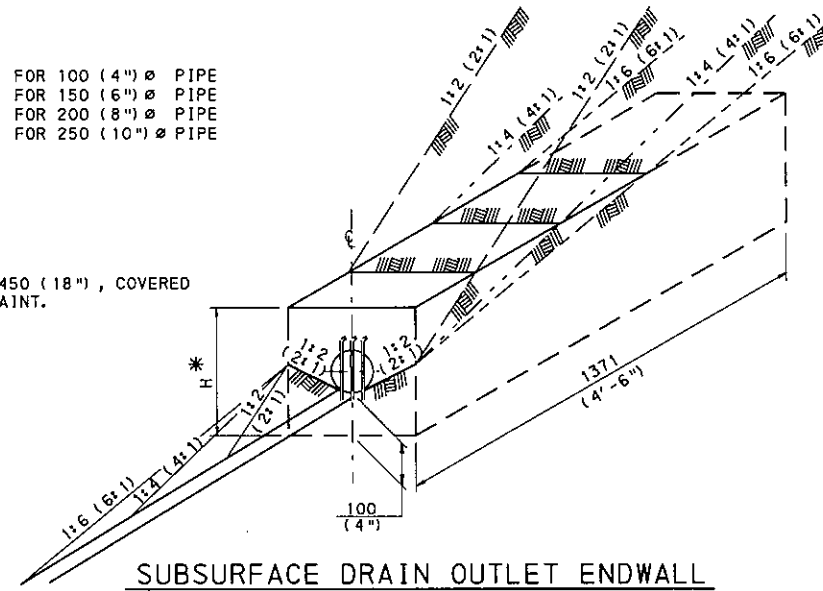
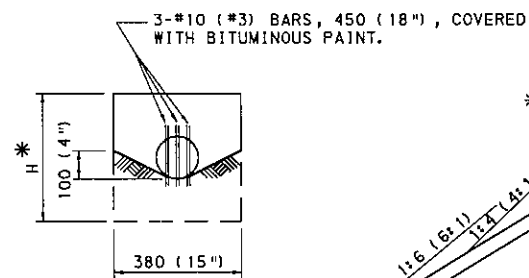


TYPE D ENDWALL

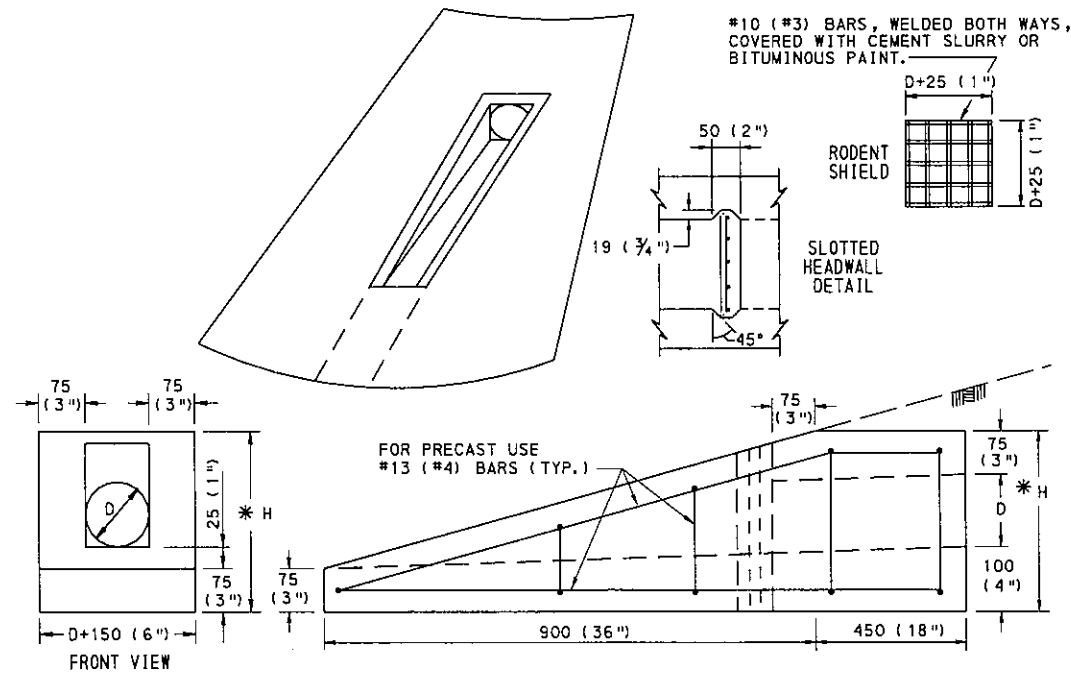


(PRECAST) SUBSURFACE DRAIN OUTLET ENDWALL

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



SUBSURFACE DRAIN OUTLET ENDWALL



SUBSURFACE DRAIN OUTLET ENDWALL (SLOPED)

NOTES

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

METRIC EQUATION

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

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

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

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

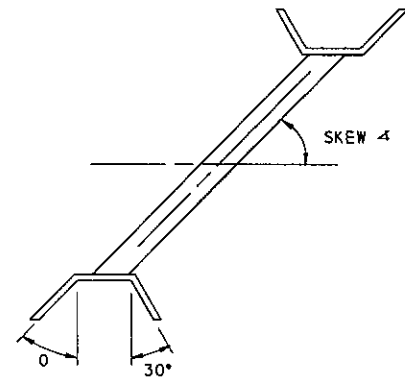
ENGLISH EQUATION

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

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

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

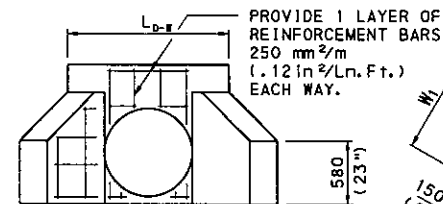
$$W_1 = \frac{X}{\cos \theta} (D_{D-W} - 0.5 \frac{1.0}{X}) \text{ (FOR VARIABLE SLOPE WHEN X EQUALS HORIZONTAL DIMENSION OF THE SLOPE DESIGNATION.)}$$



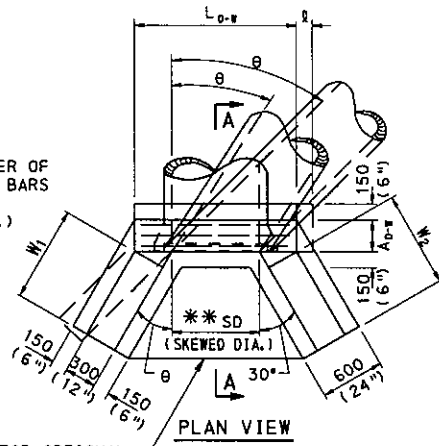
#13 (#4) BARS @ 300 (12") C TO C
TYP. EACH WAY TOP & BOTT.



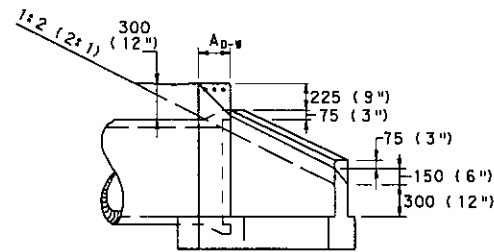
FRONT ELEVATION VIEW
BASE SECTION FOR TYPE D-W



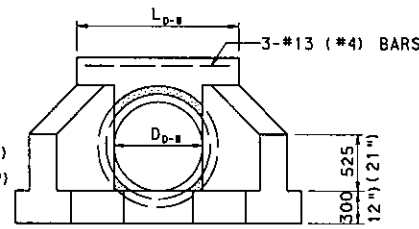
FRONT ELEVATION VIEW
HEAD & WINGWALL SECTION
FOR TYPE D-W



ALLOW FOR OPTIONAL APRON ON PRECAST UNITS.



SECTION A-A



FRONT ELEVATION VIEW

TYPE D-W ENDWALL

(SEE TABLE A FOR DIMENSIONS NOT INDICATED.)

TABLE A (mm)

1 : 2 EMBANKMENT SLOPES

PIPE DIAMETER	SKEW Δ = 90° TO 60° θ = 30°		SKEW Δ = 55° θ = 35°		SKEW Δ = 50° θ = 40°		SKEW Δ = 45° θ = 45°		SKEW Δ = 40° θ = 50°		SKEW Δ = 30° θ = 60°		SKEW Δ = 20° θ = 70°		SKEW Δ = 10° θ = 80°		X									
	D _{D-W} (mm)	L _{D-W} (m)	W ₁ (m)	W ₂ (m)	D _{D-W} (mm)	L _{D-W} (m)	W ₁ (m)	W ₂ (m)	D _{D-W} (mm)	L _{D-W} (m)	W ₁ (m)	W ₂ (m)	D _{D-W} (mm)	L _{D-W} (m)	W ₁ (m)	W ₂ (m)	D _{D-W} (mm)	A _{D-W} (mm)								
900	1.74	0	1.39	1.80	0.10	1.46	1.87	0.15	1.57	1.97	0.20	1.70	2.10	0.23	1.87	2.50	0.41	2.40	3.33	0.53	3.51	5.88	1.52	6.91	1.39	300
1050	1.91	0	1.73	1.98	0.10	1.83	2.07	0.15	1.96	2.18	0.20	2.12	2.33	0.23	2.33	2.80	0.41	3.00	3.77	0.53	4.39	6.75	1.52	8.64	1.73	300
1200	2.09	0	2.08	2.16	0.10	2.20	2.27	0.15	2.35	2.40	0.20	2.55	2.57	0.23	2.80	3.10	0.41	3.60	4.21	0.53	5.26	7.61	1.52	0.37	2.08	300
1350	2.26	0	2.42	2.35	0.10	2.56	2.46	0.15	2.74	2.61	0.20	2.97	2.80	0.23	3.27	3.40	0.41	4.20	4.65	0.53	6.14	8.47	1.52	2.09	2.42	300
1500	2.43	0	2.77	2.53	0.10	2.93	2.66	0.15	3.13	2.82	0.20	3.39	3.03	0.23	3.73	3.70	0.41	4.80	5.09	0.53	7.02	9.34	1.52	3.82	2.77	375
1800	2.78	0	3.45	2.90	0.10	3.66	3.05	0.15	3.92	3.25	0.20	4.24	3.50	0.23	4.67	4.30	0.41	6.00	5.96	0.53	8.77	1.07	1.52	17.28	3.46	375

TABLE A (inches)

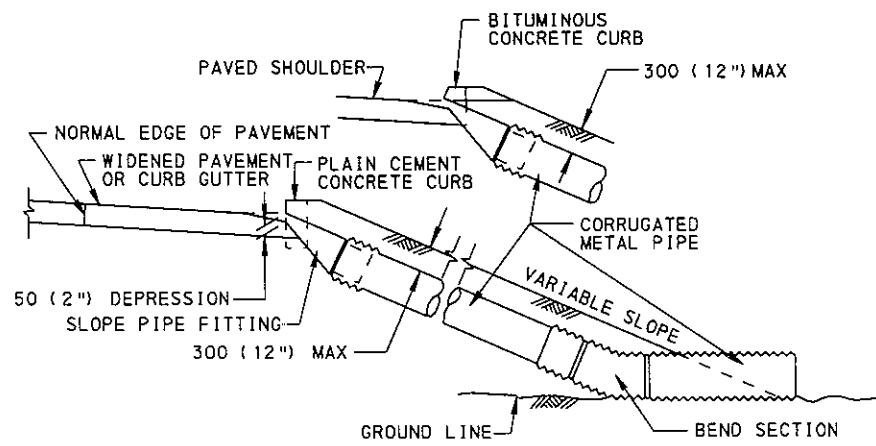
2 : 1 EMBANKMENT SLOPES

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

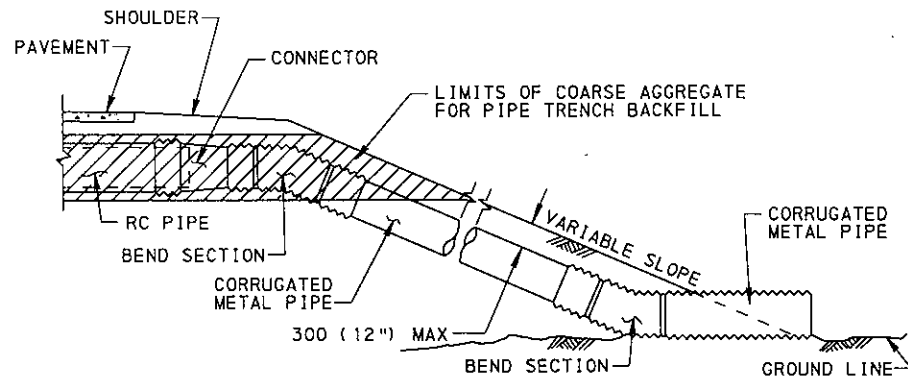
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

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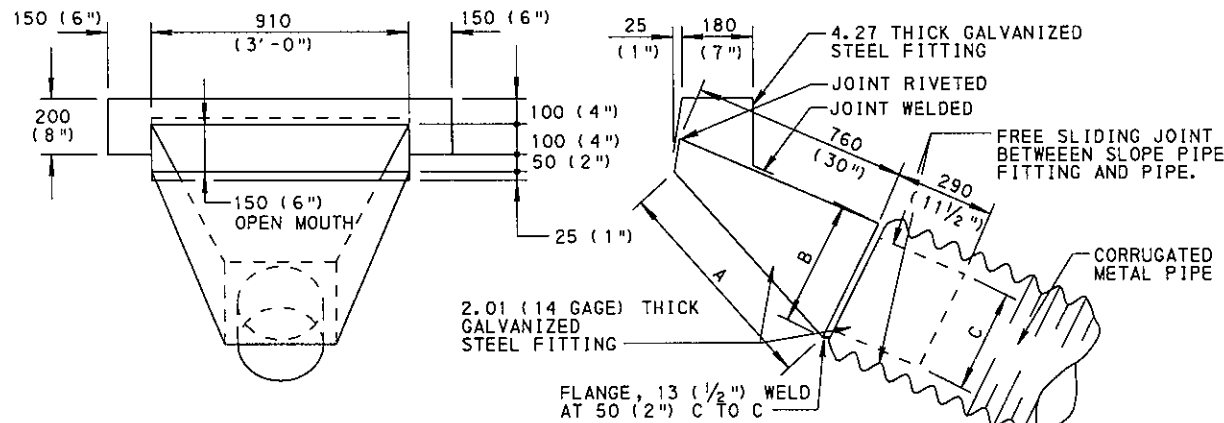
ENDWALLS
CAST-IN-PLACE & PRECAST



ADJACENT TO STRUCTURE AND/OR PAVED SHOULDER

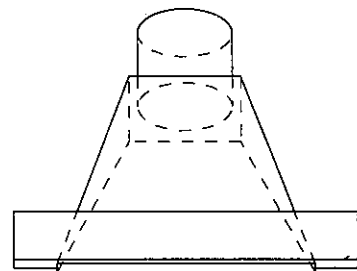


OUTLET PIPE THRU EMBANKMENT SLOPE



FRONT ELEVATION

SIDE ELEVATION

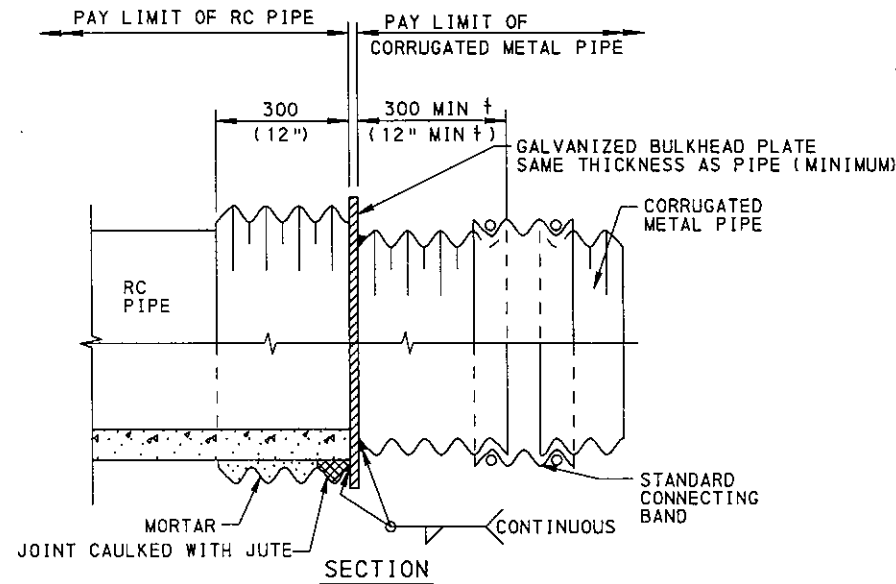


PLAN

SLOPE PIPE FITTING

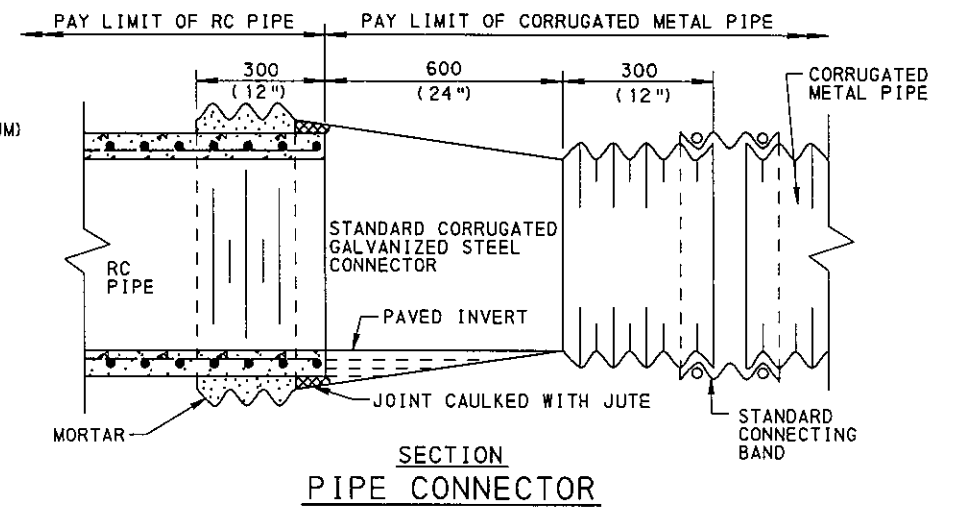
NOMINAL DIAMETER OF PIPE	DIMENSIONS FOR 1:2 (2:1) SLOPES		
	A	B	C
300 (12")	735 (28 5/8")	325 (13")	275 (11")
375 (15")	760 (29 5/8")	400 (16")	350 (14")
450 (18")	795 (31 1/8")	475 (19")	425 (17")

* RESTRICT SLOPE PIPES DRAINING ONLY SHOULDER AREAS IN EMBANKMENTS, OTHER THAN THOSE ADJACENT TO STRUCTURES, TO 300 (12") MINIMUM DIAMETER.

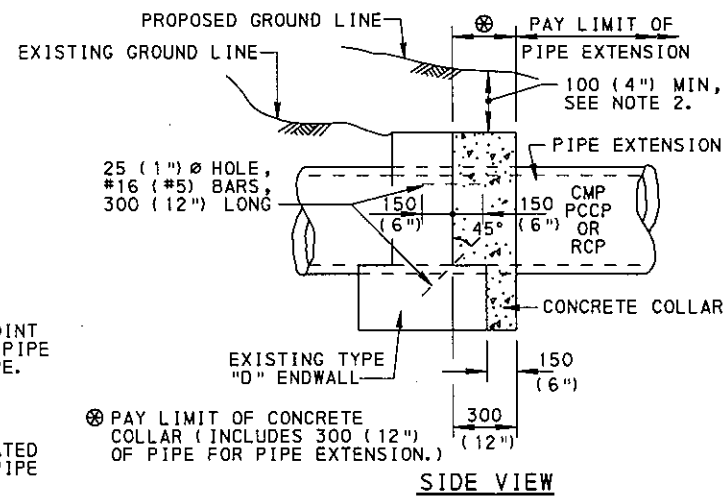


ALTERNATE PIPE CONNECTOR

† ADJUST LENGTH TO OBTAIN EVEN LENGTHS OF 600 (24") OF CONNECTING PIPE.



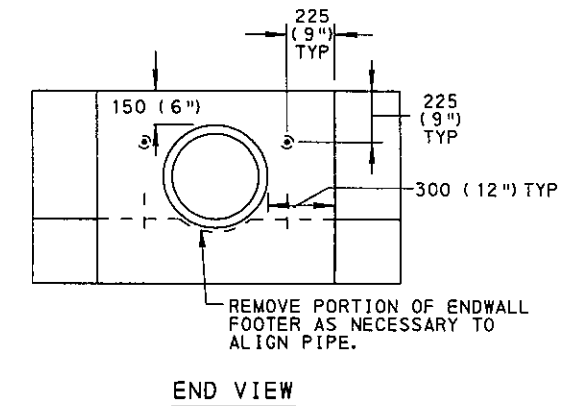
SECTION PIPE CONNECTOR



SIDE VIEW

CONCRETE COLLAR FOR PIPE EXTENSION

FOR PIPES UP TO AND INCLUDING 825 (33") Ø, SEE NOTE 1.



END VIEW

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

NOTES

1. FOR OTHER TYPES OF ENDWALLS AND FOR PIPES LARGER THAN 825 (33") Ø, A SPECIAL COLLAR DESIGN IS REQUIRED.
2. REMOVE PORTIONS OF EXISTING ENDWALL IF REQUIRED TO MAINTAIN 100 (4") GROUND COVER.
3. CONSTRUCT IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 616 FOR SLOPE PIPE FITTINGS AND SECTION 618 FOR CONCRETE COLLAR FOR PIPE EXTENSION.
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

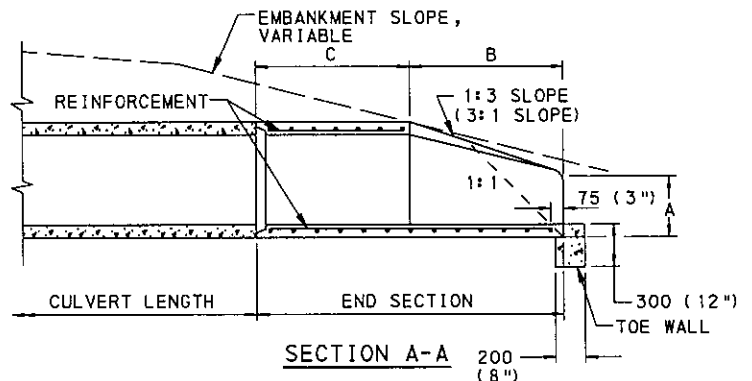
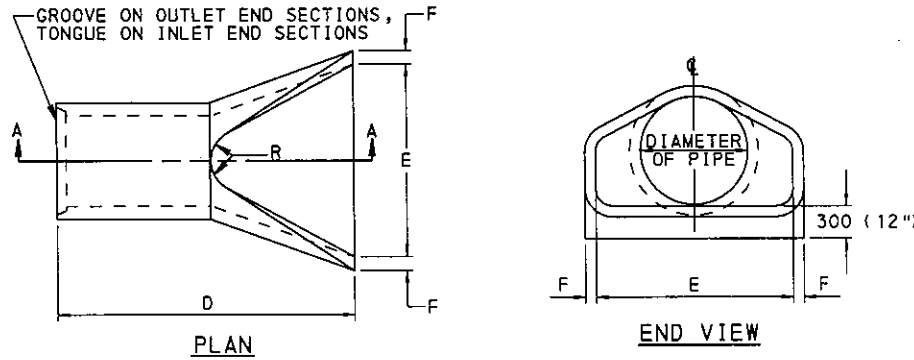
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SLOPE PIPE FITTINGS,
PIPE CONNECTORS AND CONCRETE
COLLAR FOR PIPE EXTENSION

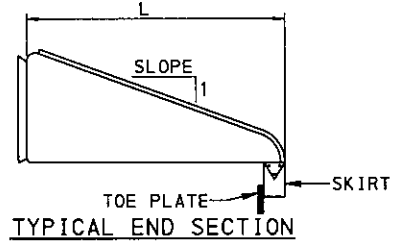
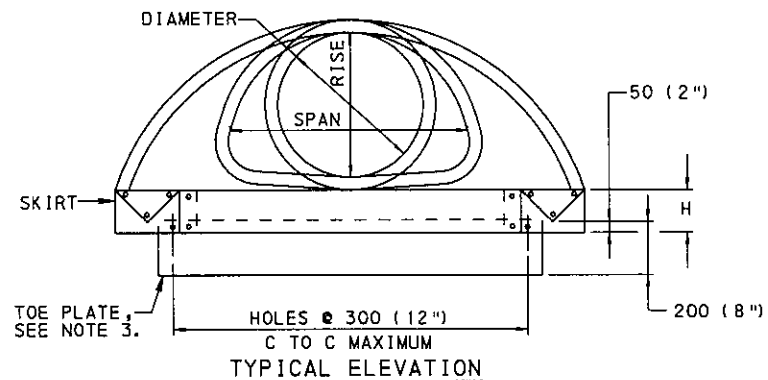
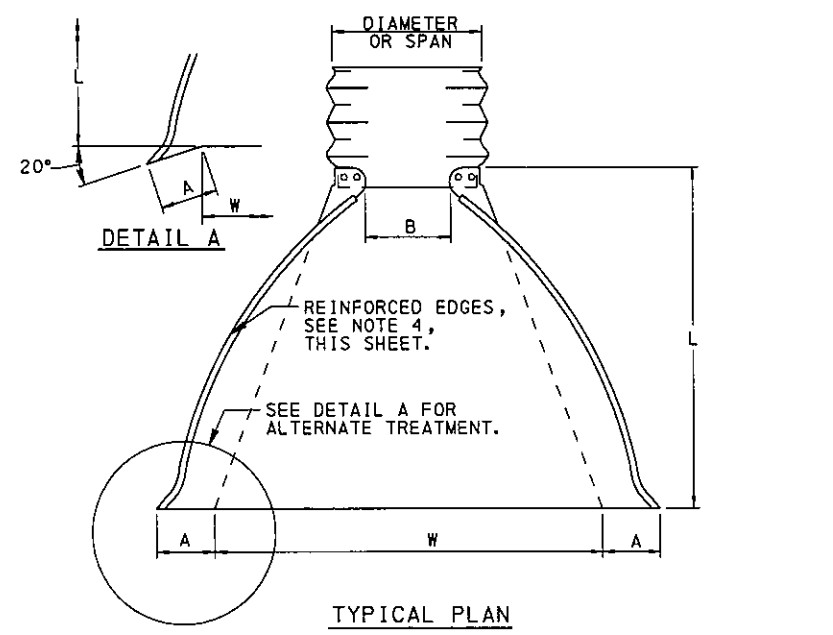
RECOMMENDED APR. 28, 2000
Blair A. Schmitt
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED APR. 28, 2000
Gary R. Hoffman
CHIEF ENGINEER

SHT 1 OF 1
RC-32M



SLOPE DETAIL
CONCRETE END SECTIONS



CORRUGATED METAL PIPE
END SECTIONS

GENERAL NOTES

1. PROVIDE END SECTIONS MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 616. PROVIDE GALVANIZED STEEL END SECTIONS WHEN SECTIONS ARE REQUIRED WITH ALUMINIZED STEEL PIPE OR PRECOATED GALVANIZED STEEL PIPE.
2. PROVIDE 2.77 THICK (12 GAGE) SIDES AND 3.50 THICK (10 GAGE) CENTER PANELS FOR 3 PIECE UNITS. PROVIDE CENTER PANEL WIDTH GREATER THAN 20% OF PIPE PERIPHERY. PROVIDE 50 LAP JOINT TIGHTLY FASTENED BY 10 (3/8") ϕ GALVANIZED OR ALUMINIZED RIVETS OR BOLTS FOR STEEL UNITS AND ALUMINUM ALLOY RIVETS OR BOLTS FOR ALUMINUM UNITS, ON CENTERLINE, SPACED 150 (6") C TO C FOR MULTIPLE PANEL UNITS. CONSTRUCT SKIRTS OF THE SAME THICKNESS AND PIECES AS THE END SECTION.
3. PROVIDE TOE PLATES OF THE SAME MATERIAL AS THE END SECTION. LOCATE PUNCHED HOLES IN PLATE TO MATCH HOLES IN SKIRT. PROVIDE 10 (3/8") ϕ GALVANIZED OR ALUMINIZED BOLTS AND NUTS FOR STEEL UNITS AND ALUMINUM ALLOY BOLTS AND NUTS FOR ALUMINUM UNITS. PROVIDE TOE PLATE LENGTHS AS FOLLOWS:
 PIPE-ARCH CULVERT 1060 x 740, 1010 x 790 (42"x 29", 40"x 31") OR SMALLER-W+250 (+10")
 PIPE-ARCH CULVERT 1240 x 840, 1160 x 920 (49"x 33", 46"x 36") OR LARGER-W+450 (+10")
 PIPE 750 (30") DIAMETER OR SMALLER-W+250 (+10")
 PIPE 900 (36") DIAMETER OR LARGER-W+550 (+22")
4. SUPPLEMENT REINFORCED EDGES WITH GALVANIZED STEEL STIFFENER ANGLES WITH GALVANIZED OR ALUMINIZED BOLTS AND NUTS OR ALUMINUM ALLOY STIFFENER ANGLES WITH ALUMINUM ALLOY NUTS AND BOLTS OF THE FOLLOWING SIZES:
 • 50 (2") x 50 (2") x 6 (1/4") FOR, 1500 (60") TO 1800 (72") DIAMETER PIPE, 1950 x 1320, 1850 x 1400 (77"x 52", 73"x 53") AND 2100 x 1450, 2050 x 1500 (83"x 57", 81"x 59") PIPE-ARCH CULVERT.
 • 63 (2 1/2") x 63 (2 1/2") x 6 (1/4") FOR, 1950 TO 2100 (78" TO 84") DIAMETER PIPE.
 PLACE ANGLE REINFORCEMENT UNDER THE CENTER PANEL SEAMS FOR, 1950 x 1320, 1850 x 1400 (77"x 52", 73"x 53") AND 2100 x 1450, 2050 x 1500 (83"x 57", 82"x 60") PIPE-ARCH CULVERTS.
5. ANCHOR ALUMINUM OR STEEL END SECTIONS, THAT ARE USED ON THE INLET END OF PIPE LARGER THAN 1350 (54") DIAMETER, AS INDICATED ON THE DRAWING.
6. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.
7. FOR DIMENSION TABLES 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.

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END SECTIONS FOR
PIPE CULVERTS

DIA	A	B	C	D	E	F	R
450	230	685	1170	1855	900	65	190
525	230	915	940	1855	1050	70	205
600	240	1105	760	1865	1200	75	205
675	265	1220	650	1865	1350	85	230
750	305	1370	500	1875	1500	90	205
825	345	1485	955	2440	1650	95	230
900	380	1600	840	2440	1800	100	255
1050	535	1600	840	2440	1950	115	280
1200	610	1830	610	2440	2100	125	305

DIA	THICKNESS	A (± 25)	B (MAX)	H (± 25)	L (± 40)	W (± 50)	BODY	SLOPE
450	1.63	205	255	150	785	900	1 PC	2.5
525	1.63	230	305	150	915	1050	1 PC	2.5
600	1.63	255	330	150	1040	1200	1 PC	2.5
750	2.01	305	405	205	1295	1500	1 PC	2.5
900	2.01	355	485	230	1525	1800	2 PC	2.5
1050	2.77	405	560	280	1755	2100	2 PC	2.5
1200	2.77	450	685	305	1980	2300	2 PC	2.25
1350	2.77	450	760	305	2135	2600	2 PC	2
1500	2.77	450	840	305	2210	2900	3 PC	1.75
1650	2.77	450	915	305	2210	3050	3 PC	1.5
1800	2.77	450	990	305	2210	3200	3 PC	1.33
1950	2.77	450	1070	305	2210	3350	3 PC	1.25
2100	2.77	450	1145	305	2210	3500	3 PC	1.17

75x25 AND 125x25 CORRUGATIONS		68x13 CORRUGATIONS		THICKNESS	A (± 25)	B (MAX)	H (± 25)	L (± 40)	W (± 50)	M	BODY	SLOPE
SPAN	RISE	SPAN	RISE									
---	---	430	330	1.63	180 [115]	230	150	485	750	305	1 PC	2.5
---	---	530	380	1.63	180 [135]	255	150	585	900	305	1 PC	2.5
---	---	610	460	1.63	205 [160]	305 [290]	150	710	1050	305	1 PC	2.5
---	---	710	510	1.63	230 [180]	355	150	815	1200	305	1 PC	2.5
---	---	885	610	2.01	255 [220]	405	150	990	1500	305	1 PC	2.5
1010	790	1060	740	2.01	305	455	205	1170	1900	305	1 PC	2.5
1160	920	1240	840	2.77	330	535	230	1345	2150	305	2 PC	2.5
1340	1050	1440	970	2.77	450	660	305	1600	2300	305	2 PC	2.5
1520	1170	1620	1100	2.77	450	760	305	1780	2600	610	2 PC	2.25
1670	1300	1800	1200	2.77	450	840	305	1955	2900	610	3 PC	2.25
1850	1400	1950	1320	2.77	450	915	305	1955	3200	610	3 PC	2
2050	1500	2100	1450	2.77	450	990	305	1955	3500	610	3 PC	2

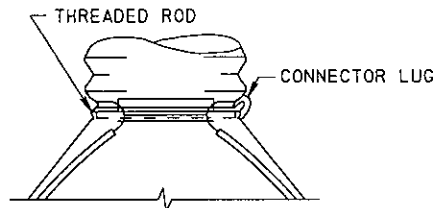
[] ACCEPTABLE ALTERNATE DIMENSIONS FOR PIPE-ARCH.

DIAM.	A	B	C	D	E	F	R
18"	9"	2'-3"	3'-10"	6'-1"	3'-0"	2 1/2"	7 1/2"
21"	9"	3'-0"	3'-1"	6'-1"	3'-6"	2 3/4"	8"
24"	9 1/2"	3'-7 1/2"	2'-6"	6'-1 1/2"	4'-0"	3"	8"
27"	10 1/2"	4'-0"	2'-1 1/2"	6'-1 1/2"	4'-6"	3 1/4"	9"
30"	12"	4'-6"	1'-7 3/4"	6'-1 3/4"	5'-0"	3 1/2"	8"
33"	13 1/2"	4'-10 1/2"	3'-1 1/2"	8'-0"	5'-6"	3 3/4"	9"
36"	15"	5'-3"	2'-9"	8'-0"	6'-0"	4"	10"
42"	21"	5'-3"	2'-9"	8'-0"	6'-6"	4 1/2"	11"
48"	24"	6'-0"	2'-0"	8'-0"	7'-0"	5"	12"

DIAM.	GAGE	A (± 1")	B (MAX.)	H (± 1")	L (± 1 1/2")	W (± 2")	BODY	SLOPE
18"	16	8"	10"	6"	31"	36"	1 PC.	2 1/2
21"	16	9"	12"	6"	36"	42"	1 PC.	2 1/2
24"	16	10"	13"	6"	41"	48"	1 PC.	2 1/2
30"	14	12"	16"	8"	51"	60"	1 PC.	2 1/2
36"	14	14"	19"	9"	60"	72"	2 PC.	2 1/2
42"	12	16"	22"	11"	69"	84"	2 PC.	2 1/2
48"	12	18"	27"	12"	78"	90"	2 PC.	2 1/4
54"	12	18"	30"	12"	84"	102"	2 PC.	2
60"	12	18"	33"	12"	87"	114"	3 PC.	1 3/4
66"	12	18"	36"	12"	87"	120"	3 PC.	1 1/2
72"	12	18"	39"	12"	87"	126"	3 PC.	1 1/4
78"	12	18"	42"	12"	87"	132"	3 PC.	1 1/4
84"	12	18"	45"	12"	87"	138"	3 PC.	1 1/6

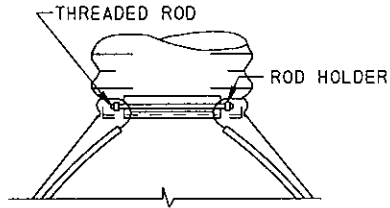
3"x1" AND 5"x1" CORRUGATIONS		2 2/3"x1/2" CORRUGATIONS		GAGE	A (± 1")	B (MAX.)	H (± 1")	L (± 1 1/2")	W (± 2")	M	BODY	SLOPE
SPAN	RISE	SPAN	RISE									
---	---	17"	13"	16	7"[4.5"]	9"	6"	19"	30"	12"	1 PC.	2 1/2
---	---	21"	15"	16	7"[5.25"]	10"	6"	23"	36"	12"	1 PC.	2 1/2
---	---	24"	18"	16	8"[6.25"]	12"[11.5"]	6"	28"	42"	12"	1 PC.	2 1/2
---	---	28"	20"	16	9"[7"]	14"	6"	32"[31.5"]	48"	12"	1 PC.	2 1/2
---	---	35"	24"	14	10"[8.75"]	16"	6"	39"[38.5"]	60"	12"	1 PC.	2 1/2
40"	31"	42"	29"	14	12"	18"	8"	46"	75"	12"	1 PC.	2 1/2
46"	36"	49"	33"	12	13"	21"	9"	53"	85"	12"	2 PC.	2 1/2
53"	41"	57"	38"	12	18"	26"	12"	63"	90"	12"	2 PC.	2 1/2
60"	46"	64"	43"	12	18"	30"	12"	70"	102"	24"	2 PC.	2 1/4
66"	51"	71"	47"	12	18"	33"	12"	77"	114"	24"	3 PC.	2 1/4
73"	55"	77"	52"	12	18"	36"	12"	77"	126"	24"	3 PC.	2
81"	59"	83"	57"	12	18"	39"	12"	77"	138"	24"	3 PC.	2

[] ACCEPTABLE ALTERNATE DIMENSIONS FOR PIPE-ARCH.



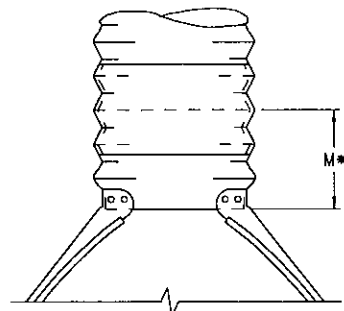
TYPE-1 CONNECTION

450ø TO 600ø
(18"ø x 24"ø)
CIRCULAR PIPE



TYPE-2 CONNECTION

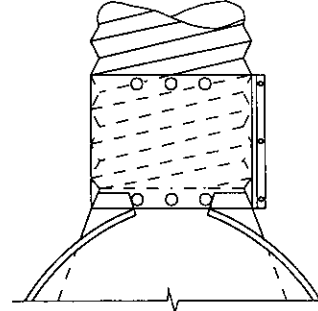
750ø TO 900ø (30"ø TO 36"ø)
CIRCULAR PIPE AND
1440 x 970, 1340 x 1050
(57" x 38", 53" x 41") OR
SMALLER PIPE-ARCH.



TYPE-3 CONNECTION

1050 (42")ø OR
LARGER CIRCULAR PIPE
AND 1620 x 1100, 1520 x 1170
(64" x 43", 60" x 46")
OR LARGER PIPE-ARCH.

* USE 300 (12") FOR CIRCULAR PIPE AND
TABLE C DIMENSIONS FOR PIPE-ARCH.



† TYPE-D CONNECTION

450ø TO 900ø (18"ø TO 36"ø)
CIRCULAR PIPE AND
1440 x 970, 1340 x 1050
(57" x 38", 53" x 41") OR
SMALLER PIPE-ARCH.

† FOR CONNECTING END
SECTIONS TO PIPE OR
PIPE-ARCH HAVING
OTHER THAN ANNULAR
CORRUGATIONS. ACCEPT
ALTERNATE DESIGNS
PROVIDED NO LEAKAGE
RESULTS.

NOTE:
FOR GENERAL NOTES SEE 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

END SECTIONS FOR
PIPE CULVERTS

ALTERNATE TYPE CONNECTIONS FOR
CORRUGATED METAL PIPE END SECTIONS

RECOMMENDED APR. 28, 2000
Alan A. Schmitt
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED APR. 28, 2000
Gary L. Hoffman
CHIEF ENGINEER

SHT 2 OF 2
RC-33M

NOTES

1. CONSTRUCTION REQUIREMENTS:
 - A. CONSTRUCT IN ACCORDANCE WITH PUBLICATION 408/2000, SECTIONS 605, 606 AND 714; AND AS MODIFIED HEREIN.
 - B. MINIMUM CONCRETE CLASS:

CAST-IN-PLACE	CLASS A
PRECAST	CLASS AA
 - C. PROVIDE STEEL REINFORCEMENT IN ACCORDANCE WITH PUBLICATION 408/2000, SECTION 709. PROVIDE MINIMUM YIELD STRENGTH OF 400 MPa (60,000 PSI).
 - D. CLEAR COVER FOR STEEL:

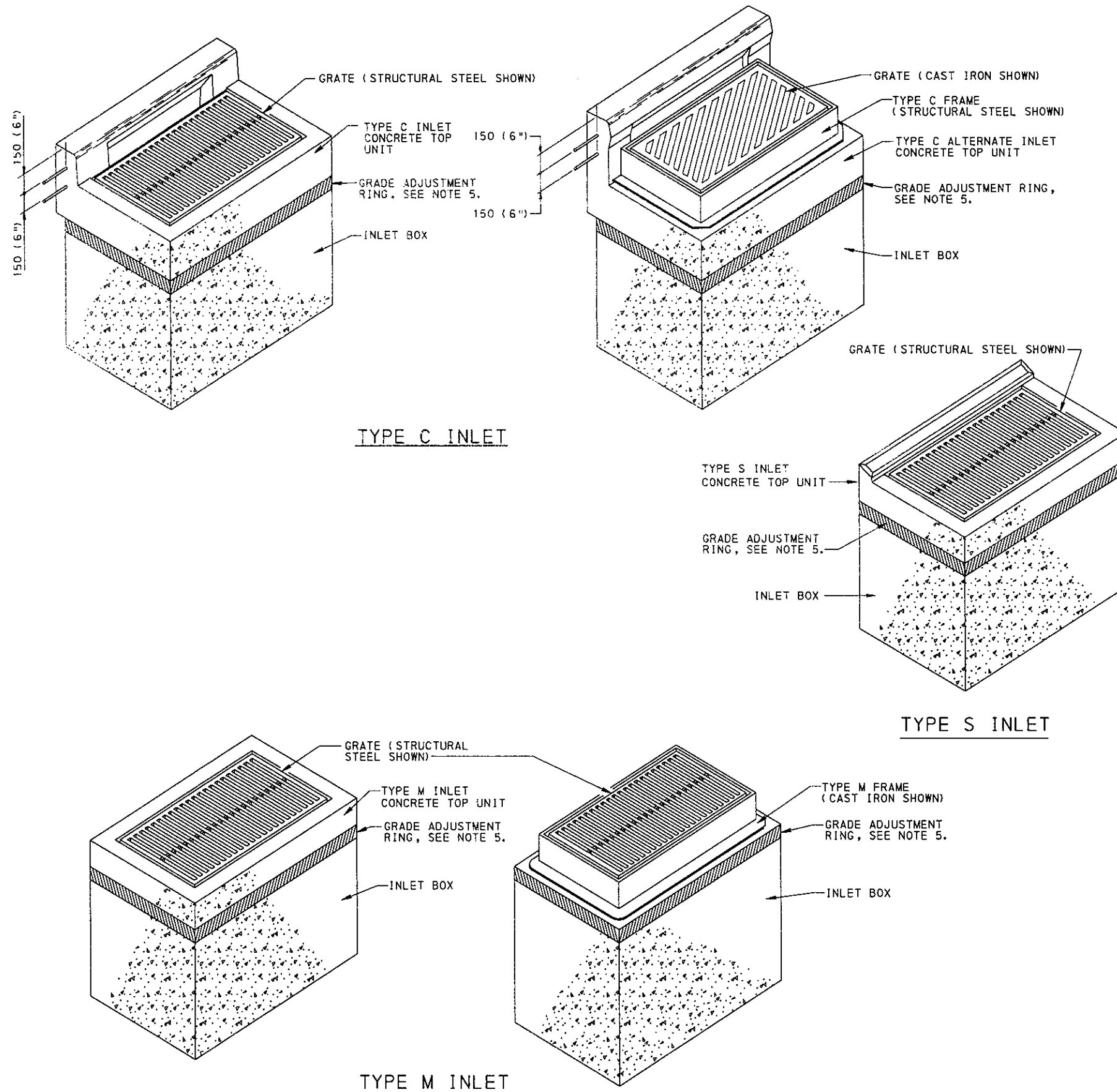
WALLS:	CAST-IN PLACE	50 (2")
	PRECAST	40 (1 1/2")
FOOTINGS:	CAST-IN PLACE	60 (2 1/2") TOP BARS
		80 (3") BOTTOM BARS
	PRECAST	50 (2") SIDE COVER
		50 (2") TOP BARS
		40 (1 1/2") BOTTOM BARS
		40 (1 1/2") SIDE COVER
SLABS:	CAST-IN PLACE	50 (2") TOP & BOTTOM BARS
2. THIS SHEET DEPICTS THE VARIOUS COMPONENTS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

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

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

INLETS
INLET ASSEMBLIES

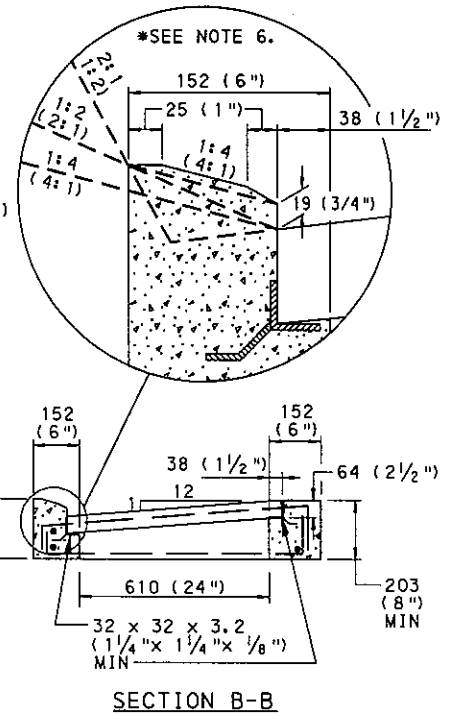
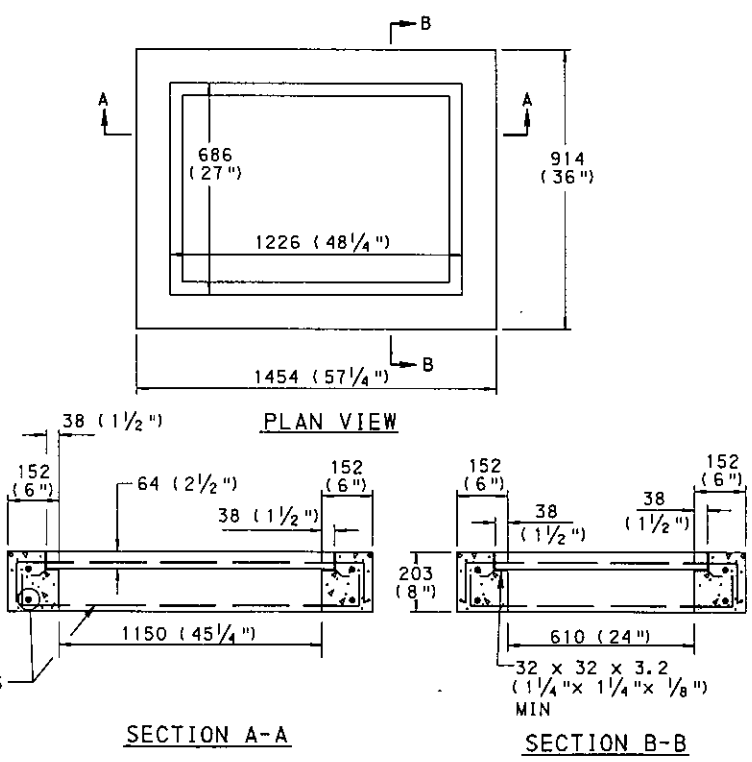
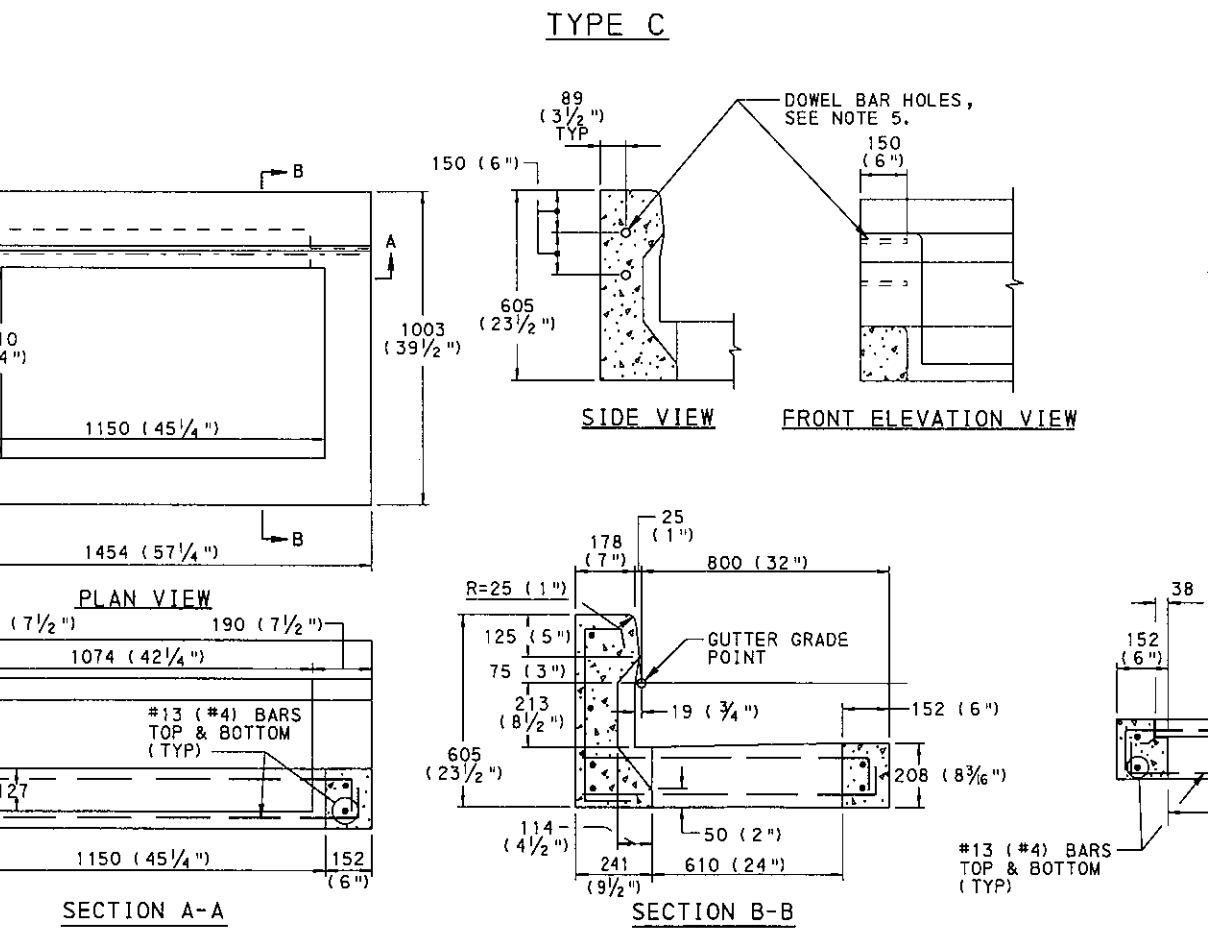
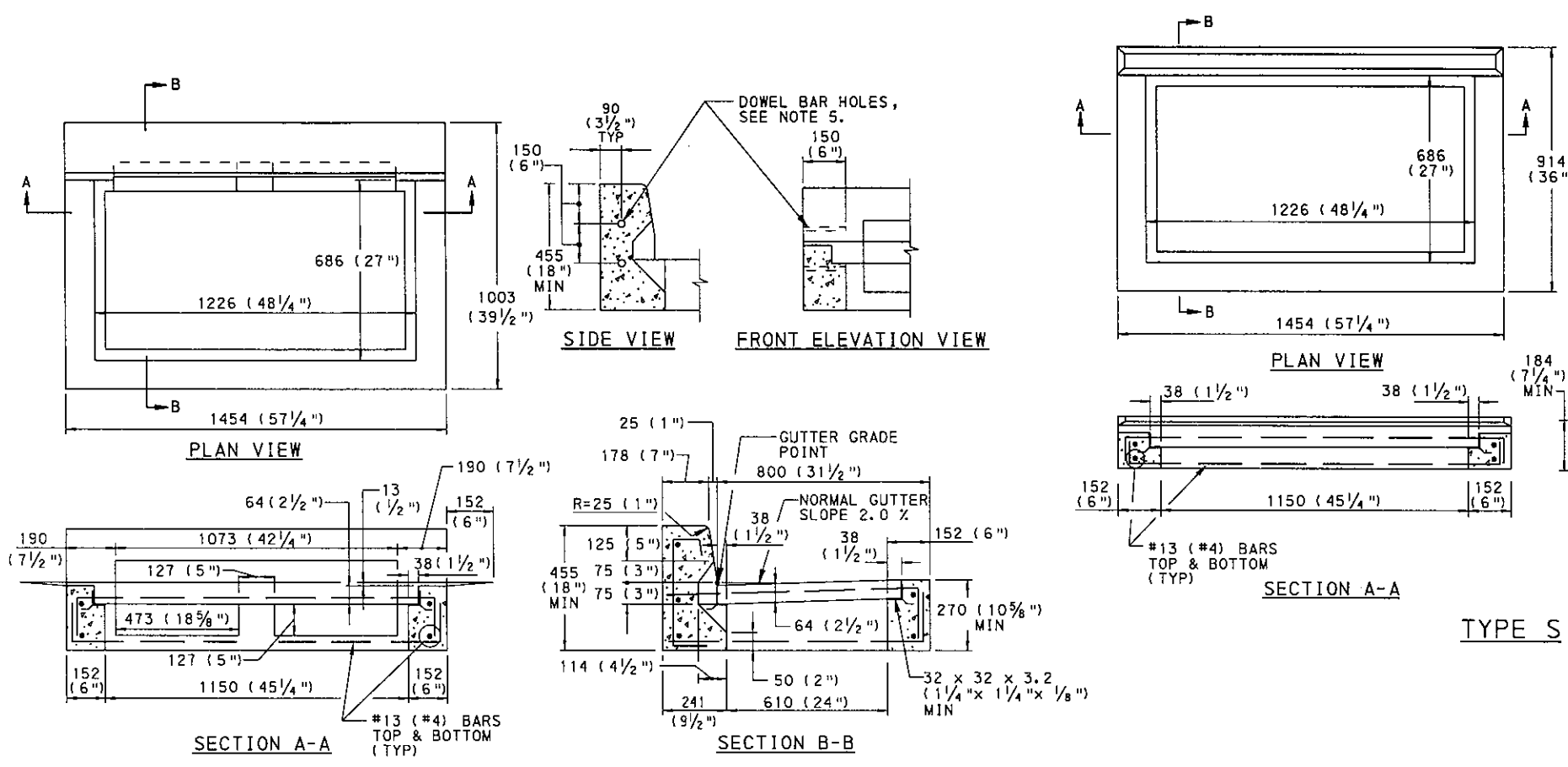
RECOMMENDED APR. 28, 2000 <i>Alan A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary S. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 10 RC-34M
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TYPE C INLET

TYPE S INLET

TYPE M INLET



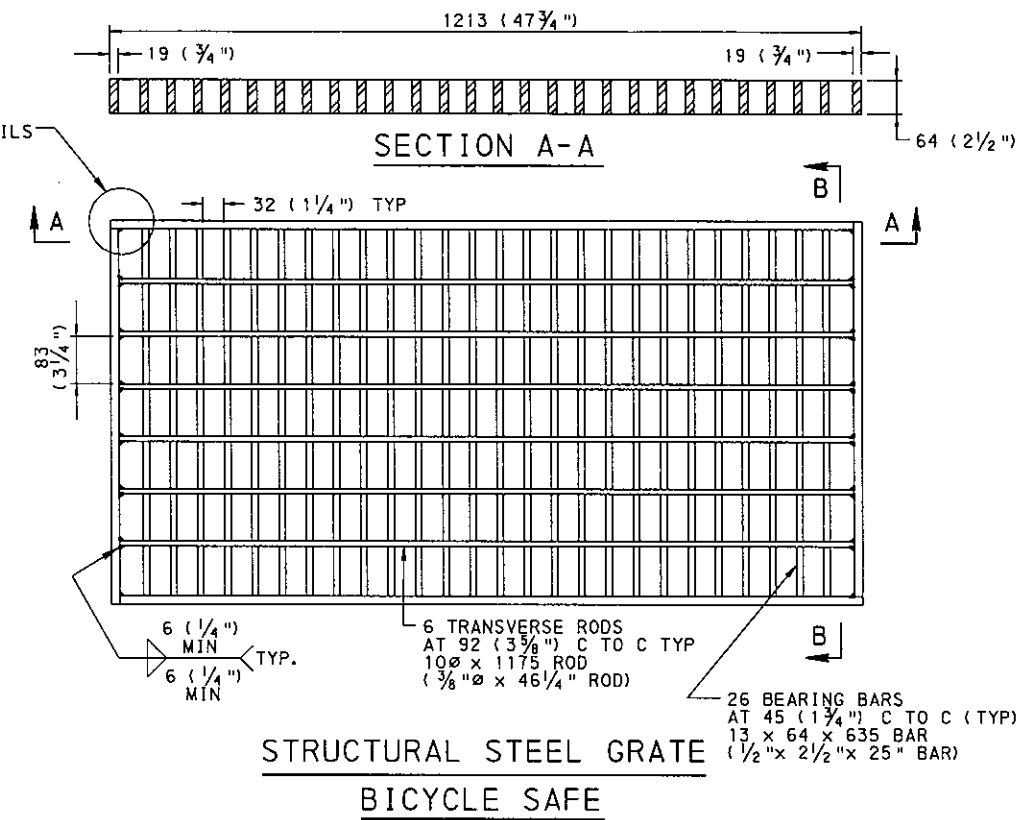
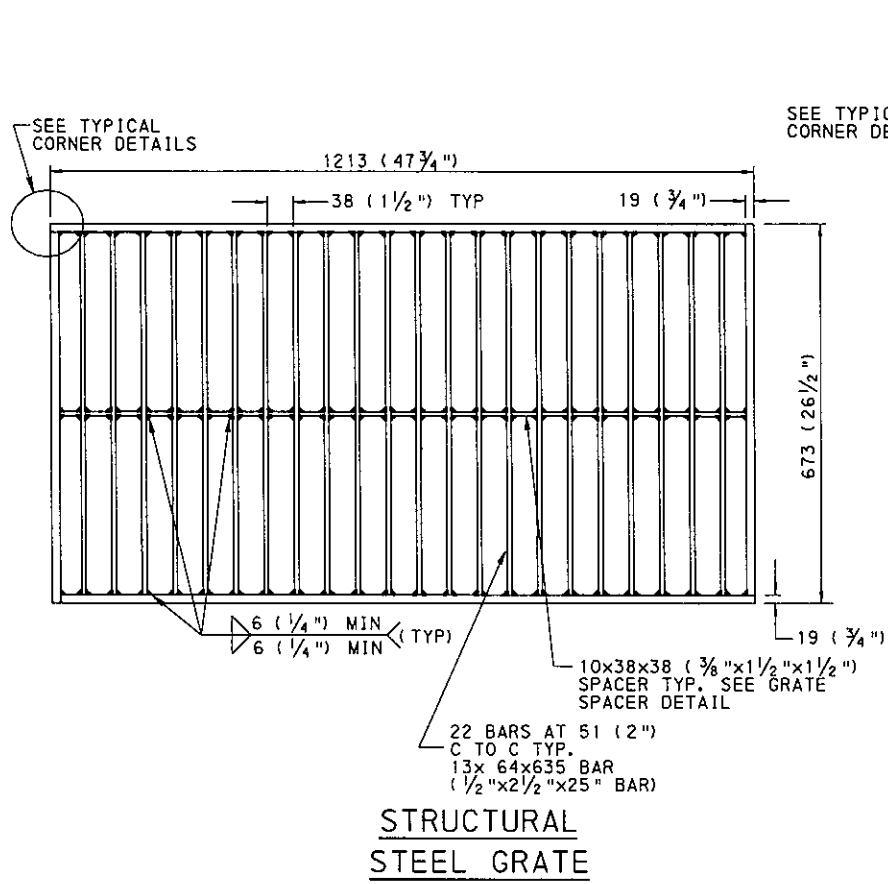
- NOTES**
- THIS SHEET DEPICTS THE SHAPE AND DIMENSIONS REQUIRED FOR UNIFORMITY AND COMPATIBILITY. PERMIT ONLY TOP UNITS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15.
 - CAST-IN-PLACE TOP UNITS MAY BE MONOLITHIC WITH THE INLET BOX.
 - PROVIDE ANGLES EMBEDDED IN THE CONCRETE AS A BEARING AREA FOR THE GRATE FOR ALL TOP UNITS WHICH SEAT THE GRATE DIRECTLY WITHIN THE UNIT.
 - PLACE A TYPE M INLET ADJACENT TO THE BACK EDGE OF THE CURB, FLUSH WITH THE PAVEMENT SURFACE, WHEN REQUIRED WITHIN A CONCRETE MOUNTABLE CURB SECTION.
 - DOWEL TYPE C INLET TOP UNITS WITH 2-#25 x 300 (2-#8 x 1'-0") DOWEL BARS AND PLACE PREMOLDED EXPANSION JOINT FILLER 6 (1/4") WIDE WHEN CONNECTING TO ADJACENT CURB SECTIONS.
 - THE PLACEMENT OF THE TYPE S INLET RELATIVE TO THE GUTTER INVERT IS DEPENDENT ON THE RATE OF BACK SLOPE. FOR BACK SLOPES GREATER THAN 1:2 (2:1), LOCATE THE INLET WHERE THE BACK SLOPE LINE INTERSECTS THE BACK, TOP, OUTSIDE CORNER OF THE INLET. FOR BACK SLOPES LESS THAN 1:2 (2:1), LOCATE THE INLET WHERE THE BACK SLOPE LINE INTERSECTS THE EDGE OF THE INLET GRATE.
 - TAPERS MAY BE PROVIDED ON INSIDE VERTICAL FACES OF PRECAST INLET TOPS TO FACILITATE FORM STRIPPING. HOWEVER, BOTTOM DIMENSIONS MUST NOT BE REDUCED.

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

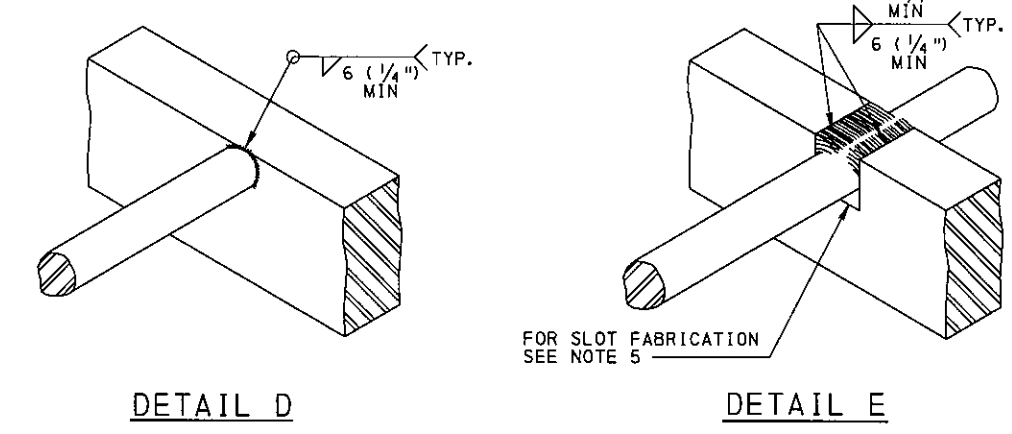
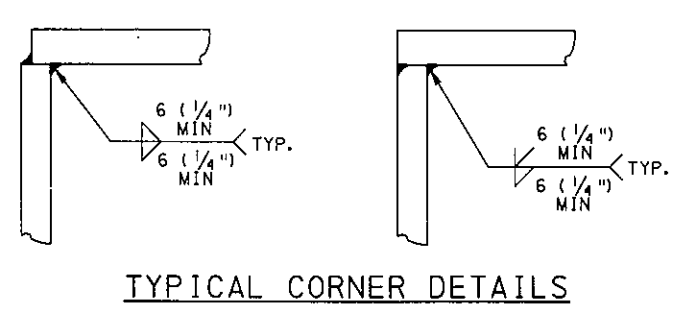
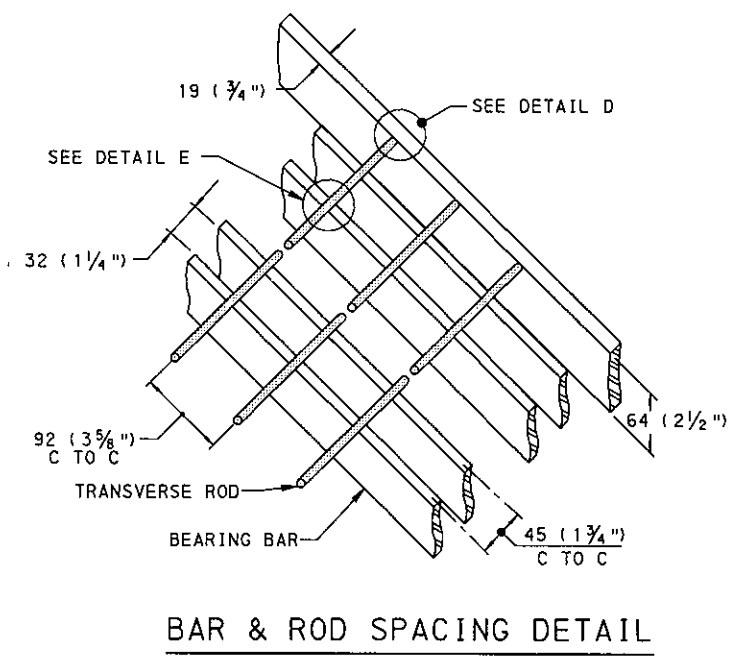
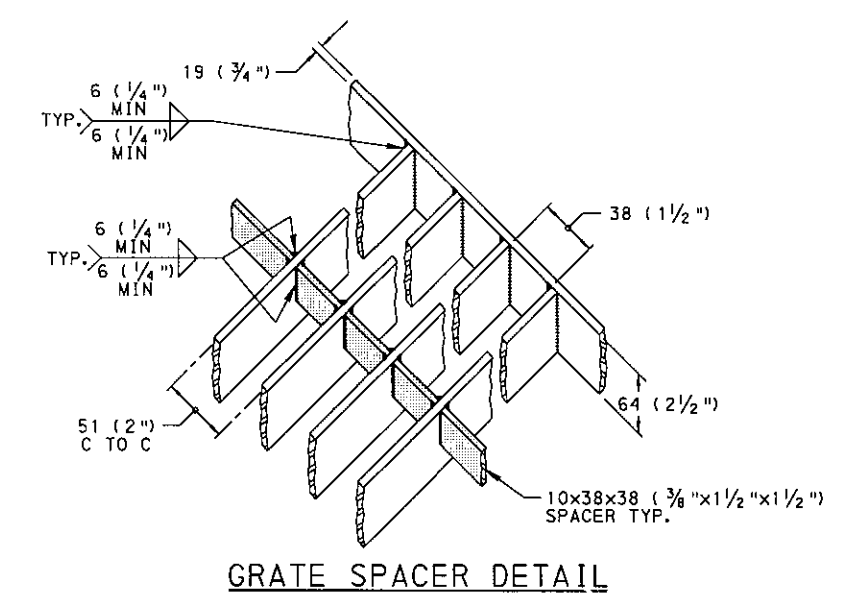
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

INLETS
CONCRETE TOP UNITS
CAST-IN-PLACE AND PRECAST

RECOMMENDED APR. 28, 2000 <i>Dean A. Schmitz</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT 2 OF 10 RC-34M
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- NOTES**
1. THIS SHEET DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. IT DOES NOT INCLUDE DETAILS REQUIRED FOR FABRICATION OR MANUFACTURING. PERMIT ONLY GRATES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT REPRODUCIBLE SHOP DRAWING TO THE BUREAU OF CONSTRUCTION AND MATERIALS, MATERIALS AND TESTING DIVISION FOR REVIEW AND APPROVAL.
 2. WELD STRUCTURAL STEEL GRATES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 1105.03(r).
 3. PROVIDE TRANSVERSE BARS MEETING THE REQUIREMENTS OF PUBLICATION 408M.
 4. PROVIDE BICYCLE-SAFE, STRUCTURAL STEEL OR CAST IRON VANE GRATES FOR INSTALLATION WHERE BICYCLE TRAFFIC IS ANTICIPATED, SUCH AS CURBED ROADWAYS IN URBAN AREAS OR ROADWAYS SPECIFICALLY ESTABLISHED AND SIGNED AS BIKEWAYS OR HAVING BIKE LANES. ALTERNATE BICYCLE-SAFE GRATE DESIGNS SHALL REQUIRE A SHOP DRAWING SUBMISSION, AS SPECIFIED IN NOTE 1, AND SHALL CONFORM TO THE DIMENSIONAL REQUIREMENTS FOR PROPER INSTALLATION WITH THE CURRENT CONCRETE TOP UNITS.
 5. FABRICATE SLOTS BY BURNING, DRILLING, SHEARING OR PUNCHING. HAVE THE BOTTOM OF ALL BURNED OR DRILLED SLOTS CONFORM TO THE SHAPE OF THE ROD.
 6. PROVIDE STRUCTURAL STEEL GRATES WITH THE GRATE SPACERS LOCATED FLUSH ALONG THE TOP SURFACE OF THE GRATE.

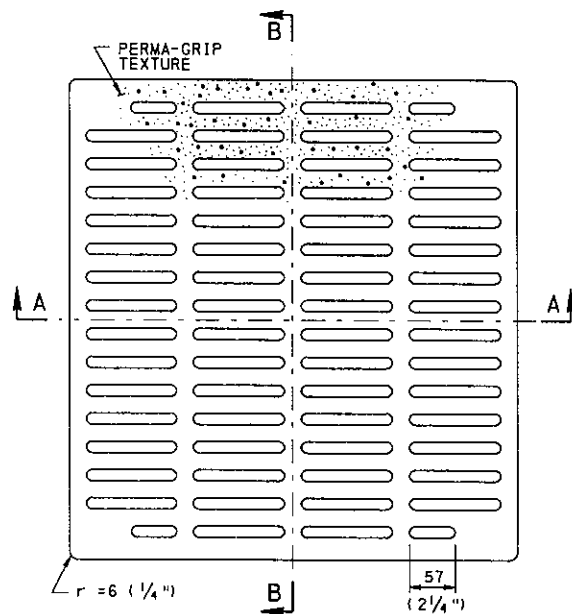


NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

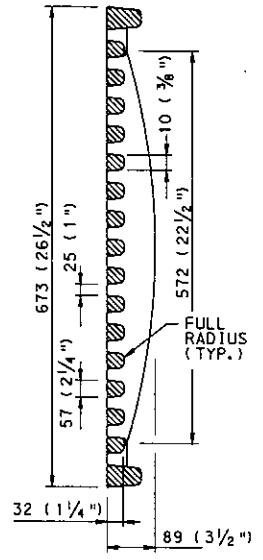
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

INLET GRATES

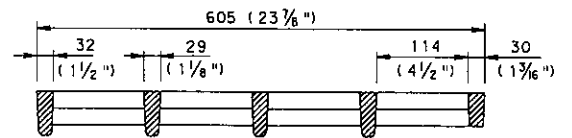
RECOMMENDED APR. 28, 2000 <i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary S. Hoffman</i> CHIEF ENGINEER	SHT 3 OF 10 RC-34M
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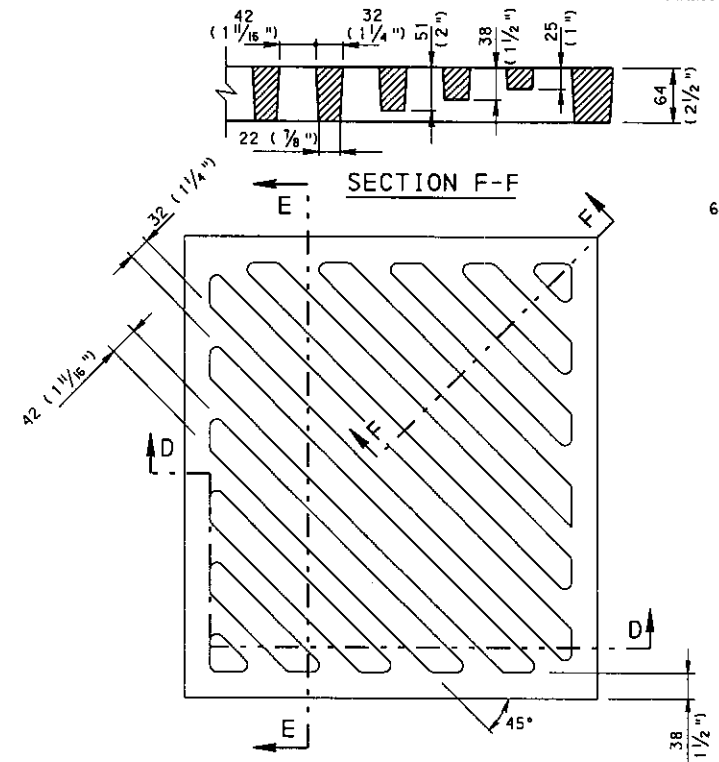
PLAN - BICYCLE-SAFE GRATE



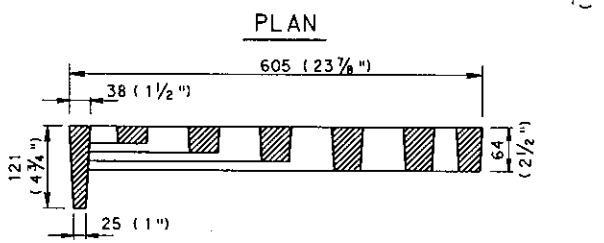
SECTION B-B



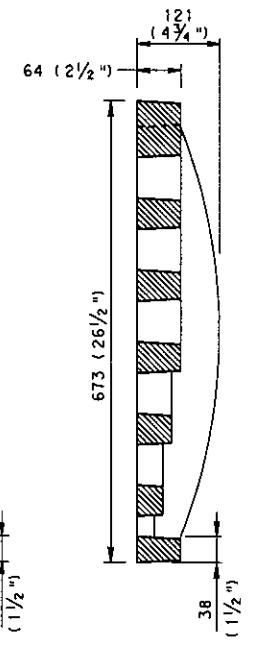
SECTION A-A



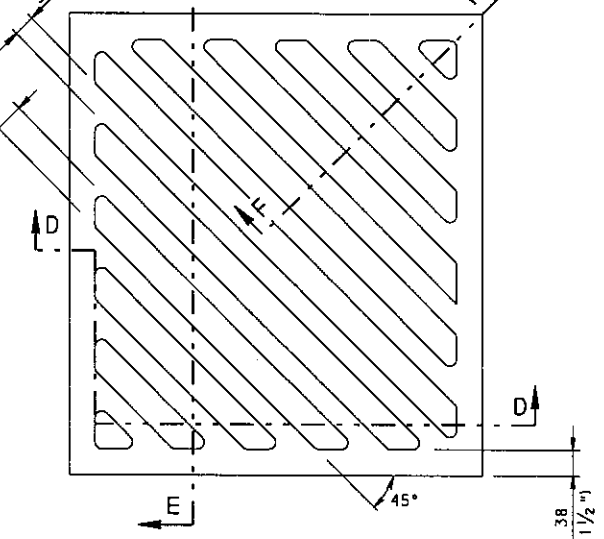
SECTION F-F



SECTION D-D

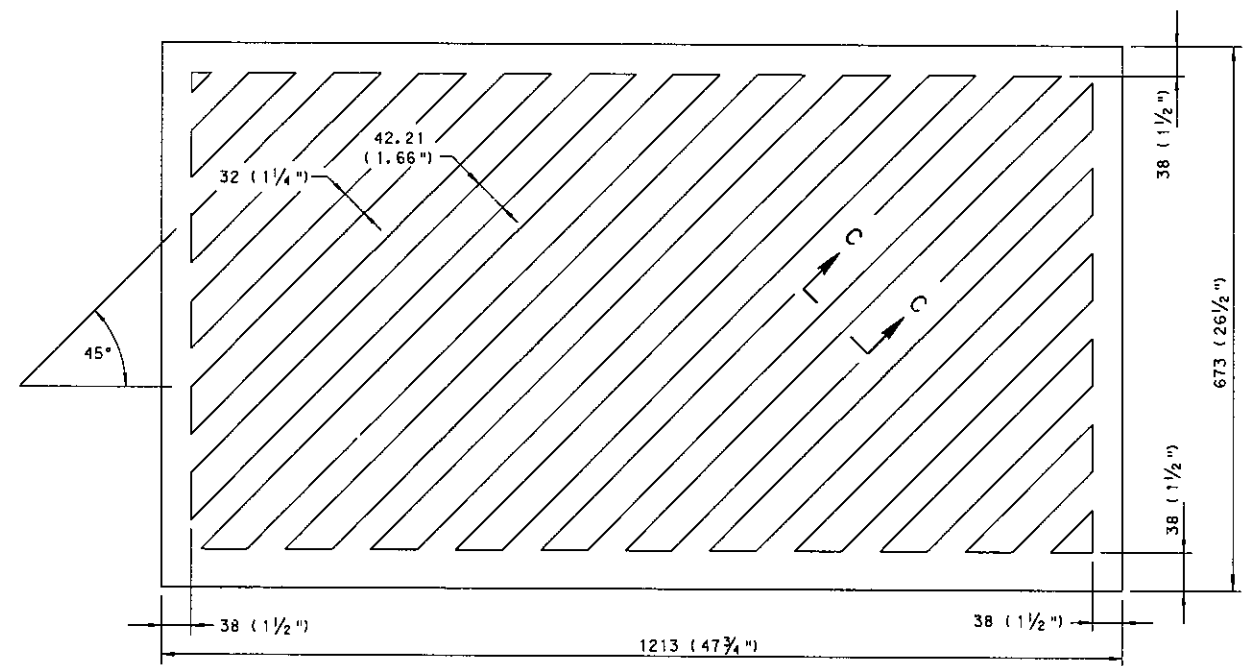


SECTION E-E

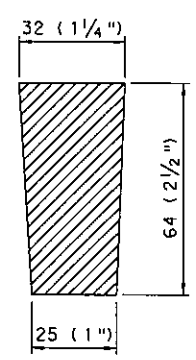


PLAN

TWO PIECE GRATES



PLAN - ONE PIECE GRATE



SECTION C-C

CAST GRAY IRON GRATES

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

NOTES

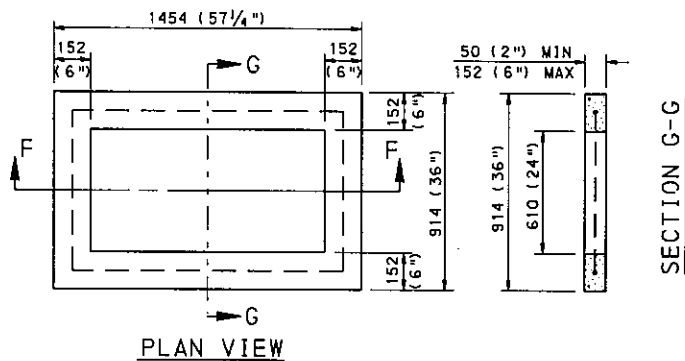
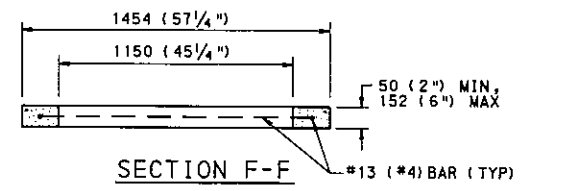
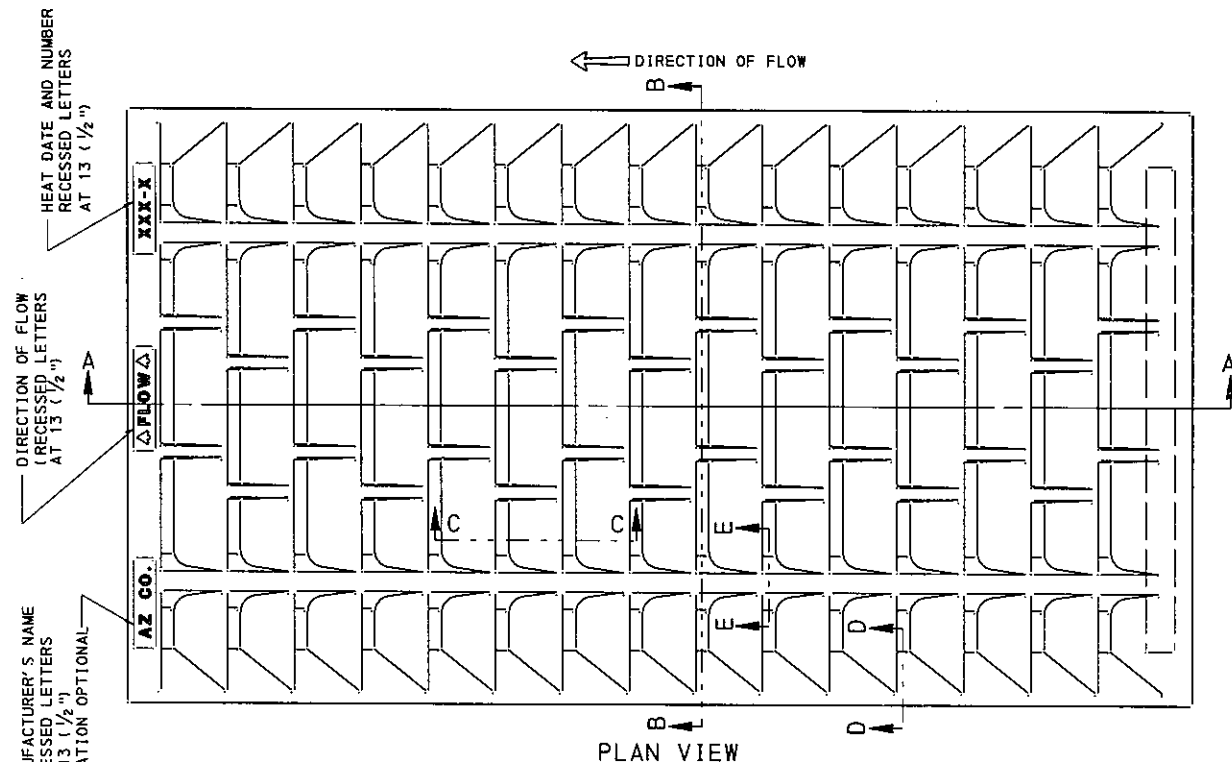
1. THIS SHEET DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. IT DOES NOT INCLUDE DETAILS REQUIRED FOR FABRICATION OR MANUFACTURING. PERMIT ONLY GRATES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT REPRODUCIBLE SHOP DRAWING TO THE BUREAU OF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

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

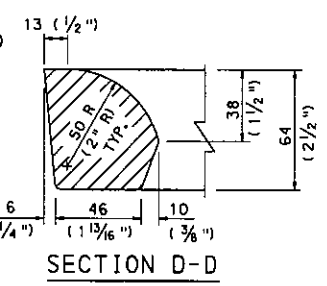
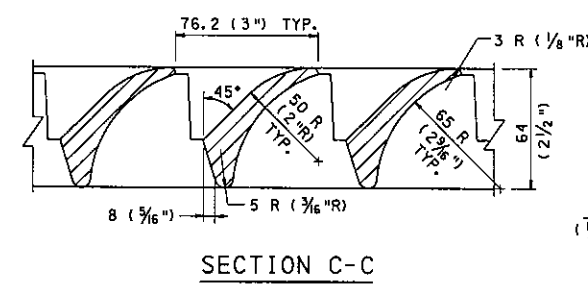
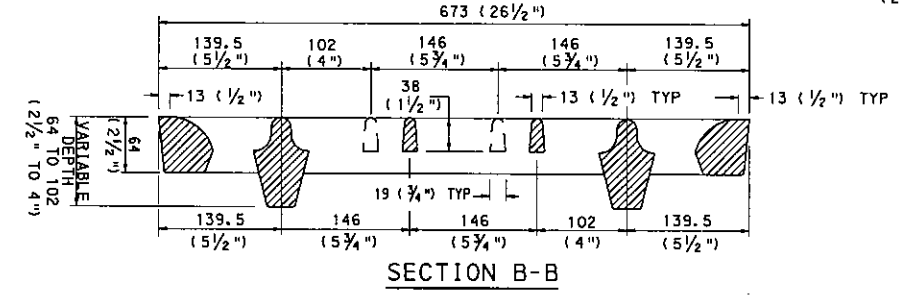
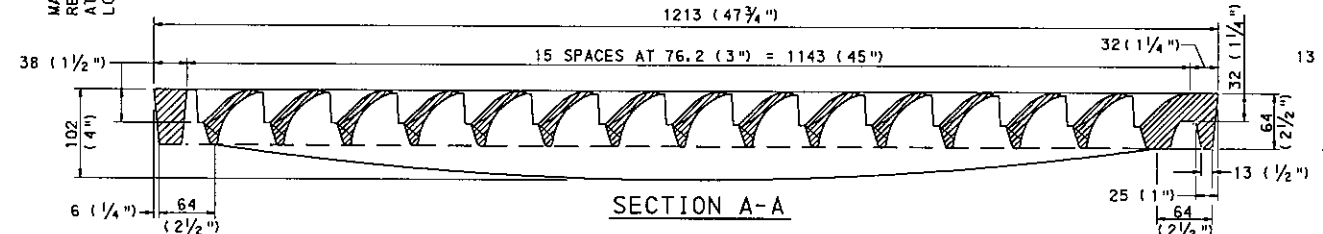
COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
INLET GRATES		
RECOMMENDED APR. 28, 2000 <i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT 4 OF 10 RC-34M

NOTES

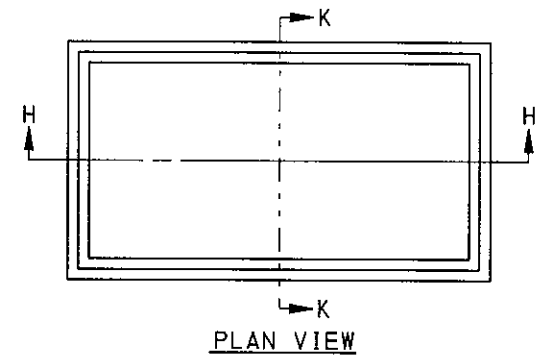
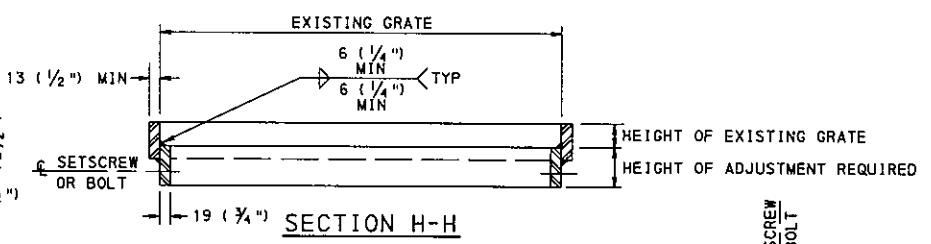
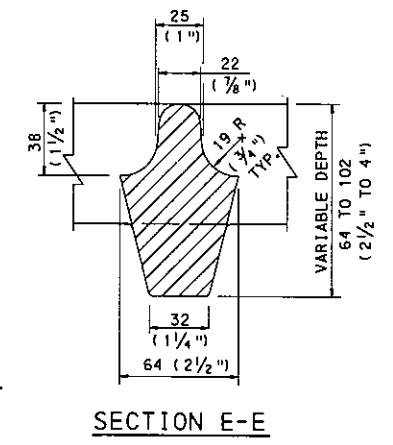
1. PROVIDE MATERIALS AND CONSTRUCTION IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408/2000, SECTIONS 605, 606 AND 714. PERMIT ONLY GRATES AND GRADE ADJUSTMENT SYSTEMS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT REPRODUCIBLE SHOP DRAWING TO THE MATERIALS AND TESTING DIVISION, BUREAU OF CONSTRUCTION AND MATERIALS FOR REVIEW AND APPROVAL.
2. INSTALL VANE GRATES WITH CURVE VANES FACING THE DIRECTION OF FLOW.
3. GRADE ADJUSTMENT RINGS :
 - A. CUSTOM FABRICATE EACH ADJUSTMENT RING FROM MEASUREMENTS PROVIDED WITH EACH ORDER.
 - B. MANUFACTURE BAR STOCK AND RETAINER CLIP FROM U.S. MADE CARBON STEEL MEETING OR EXCEEDING THE MINIMUM REQUIREMENTS OF ASTM A-36M AND AASHTO TABLE 10.32.1A.
 - C. REQUIRE FULL CIRCUMFERENTIAL WELDS ON BOTH TOP AND BOTTOM RINGS. MAKE THE INNER WELD A BEVEL GROOVE WELD (FLUSH FINISH) FOR PROPER SEATING OF GRATE AND MAKE THE OUTER WELD A FILLET WELD.
 - D. PROVIDE AN ADJUSTMENT RING WHICH IS FLUSH WITH COVER AND DOES NOT ALLOW EXCESSIVE MOVEMENT. PROVIDE AN ADJUSTMENT RING WHICH CONFORMS TO THE SHAPE OF THE ORIGINAL FRAME.
4. PROVIDE RADIUS OF 3 (1/8") TYPICAL FOR ALL FILLETS AND ROUNDS, UNLESS NOTED.
5. ATTACH STEEL GRADE ADJUSTMENT RINGS RIGIDLY TO THE FRAME AND SET PRECAST CONCRETE GRADE ADJUSTMENT RINGS ON A MORTAR BED.
6. CAST IRON GRATES MAY BE USED AS ALTERNATES TO STRUCTURAL STEEL GRATES PROVIDED THEY ARE SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15 AND APPROVED FOR HS25 LOADING. CAST IRON GRATES NOT APPROVED FOR HS25 LOADING MAY BE USED OUTSIDE OF THE TRAVEL LANES; AT THE EDGE OF OUTSIDE SHOULDERS, SWALES, WIDE MEDIAN SWALES AND INFIELD AREAS.



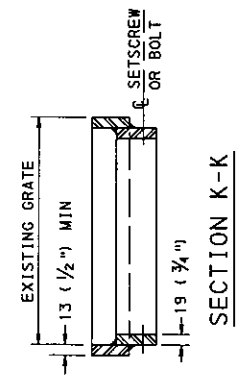
PRECAST CONCRETE GRADE ADJUSTMENT RINGS



CAST IRON VANE GRATE



STRUCTURAL STEEL GRADE ADJUSTMENT RINGS



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

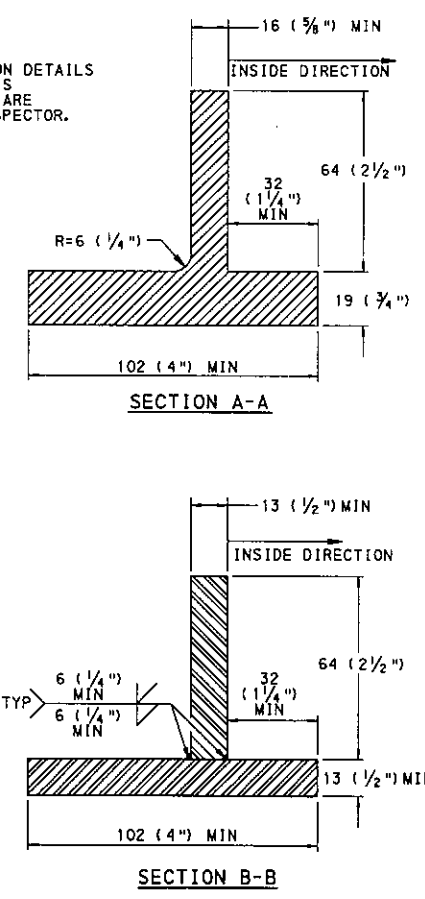
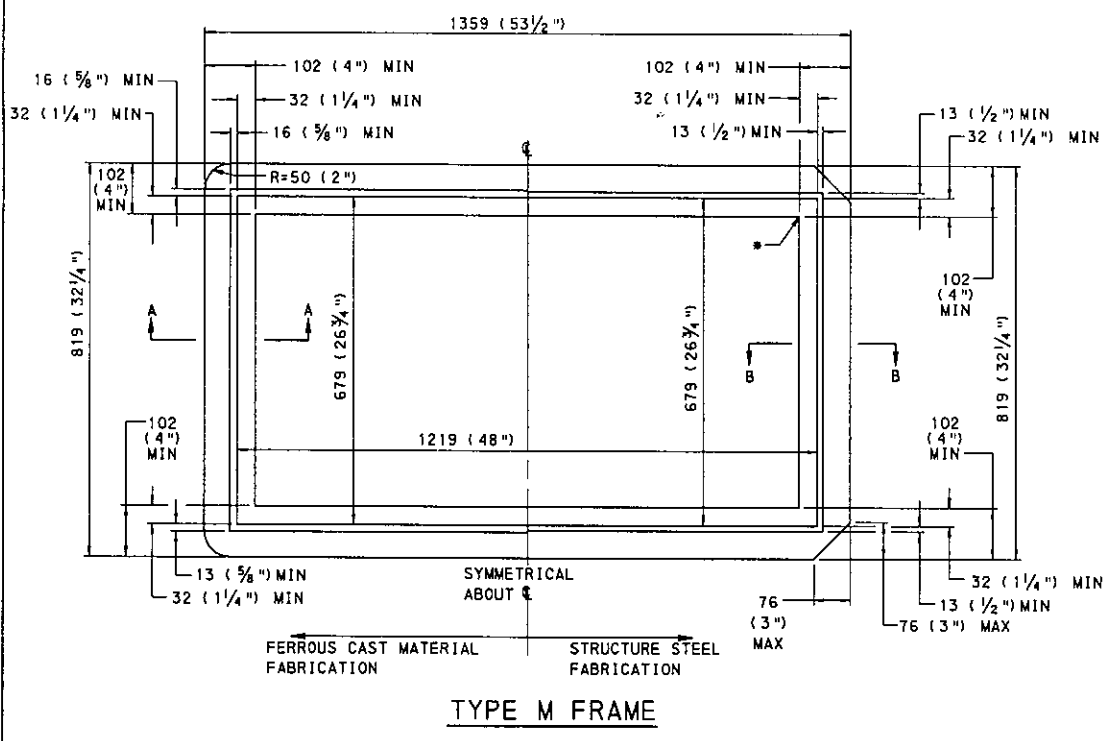
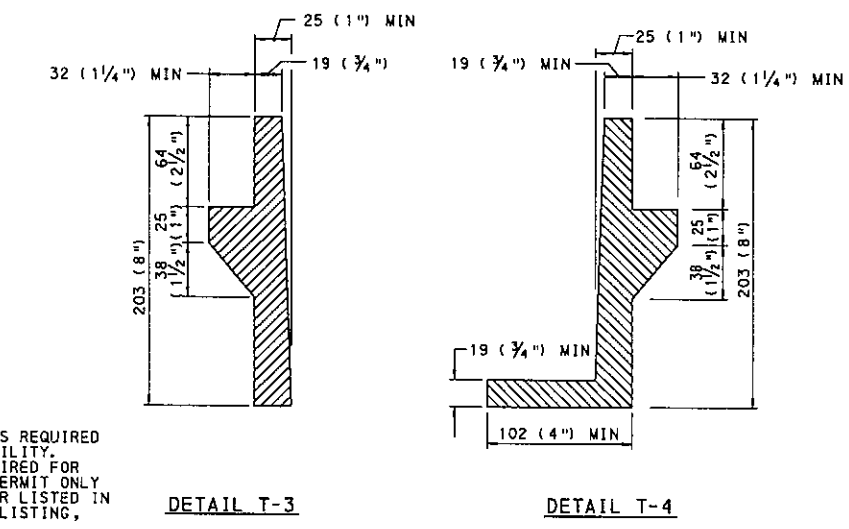
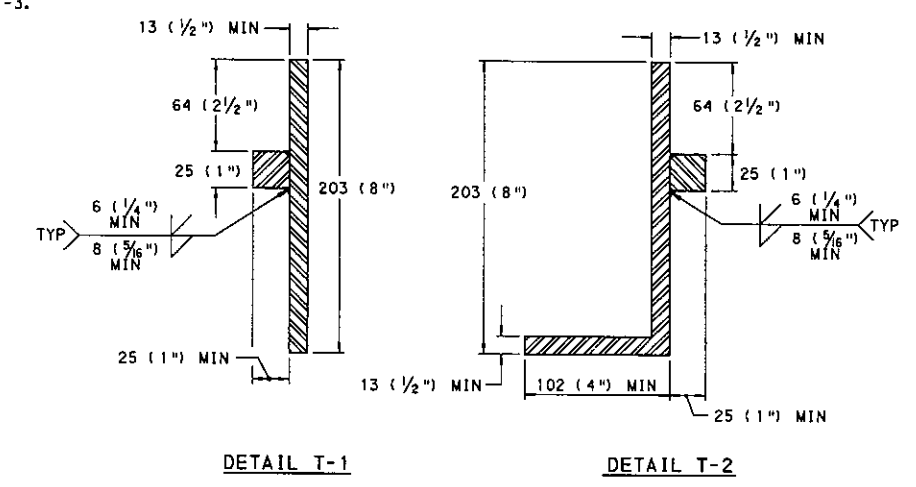
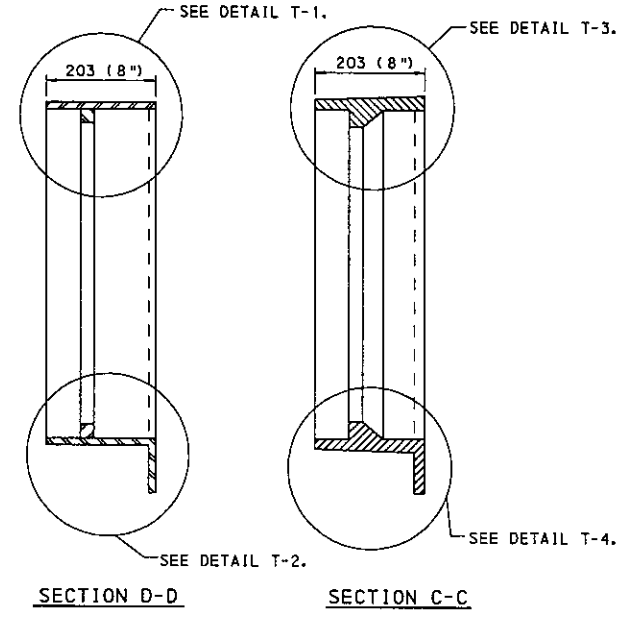
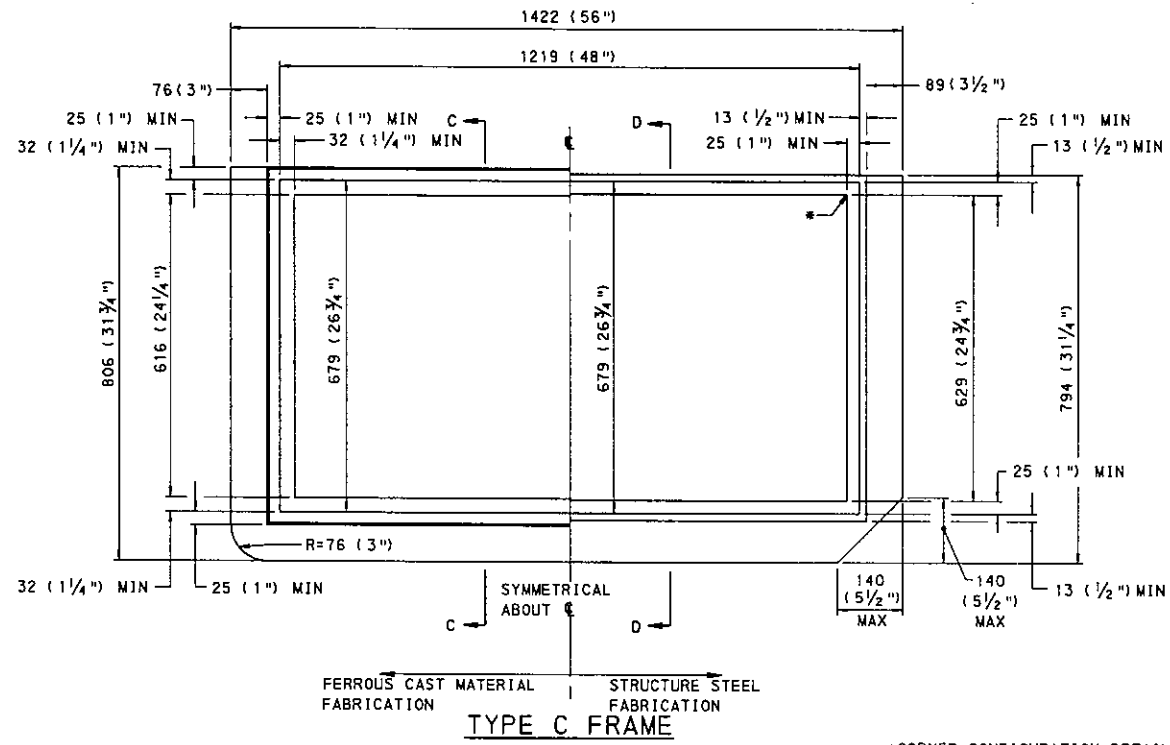
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

INLET GRATES & GRADE ADJUSTMENT RINGS

RECOMMENDED APR. 28, 2000
 DIRECTOR, BUREAU OF DESIGN

RECOMMENDED APR. 28, 2000
 CHIEF ENGINEER

SHT 5 OF 10
 RC-34M



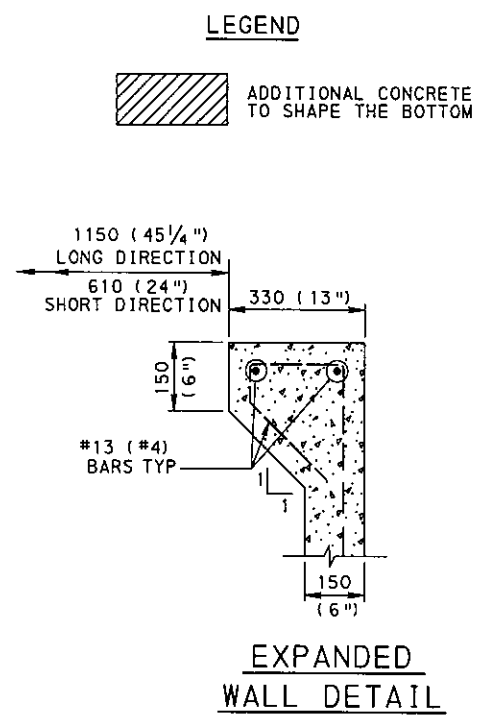
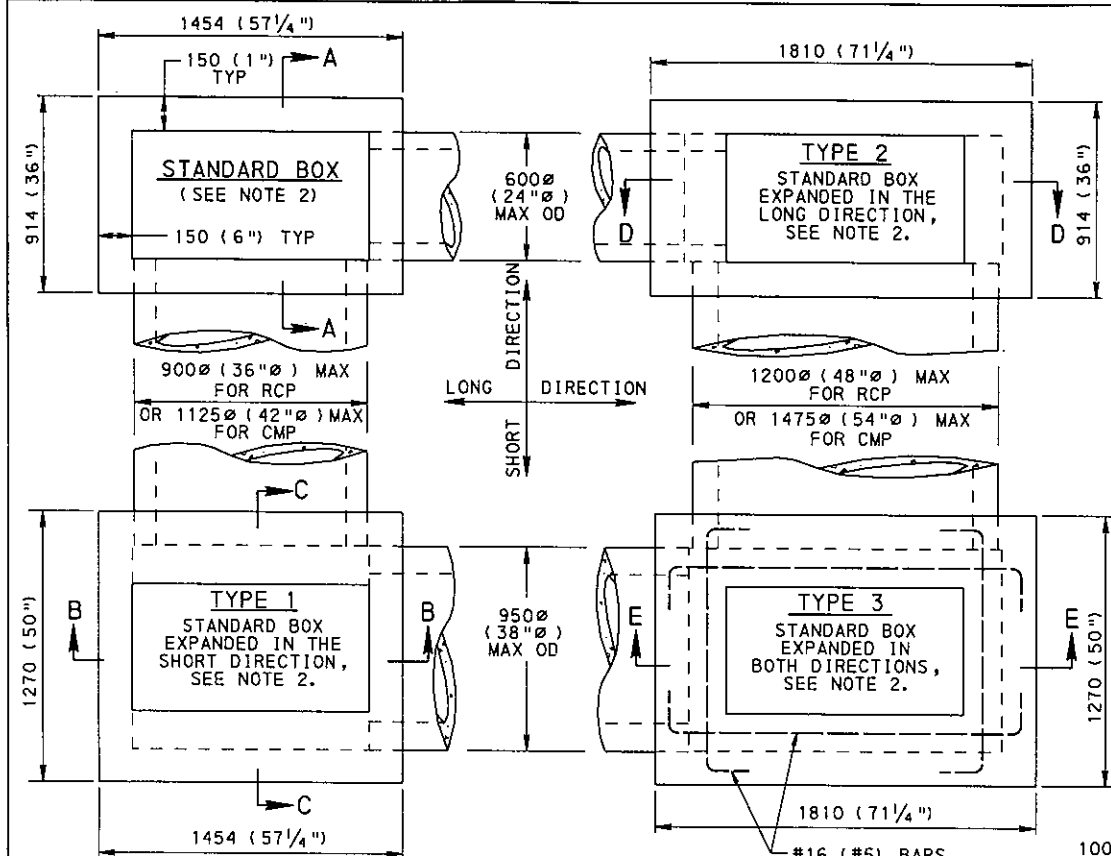
- NOTES**
1. THIS SHEET DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. IT DOES NOT INCLUDE DETAILS REQUIRED FOR FABRICATION OR MANUFACTURING. PERMIT ONLY FRAMES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT REPRODUCIBLE SHOP DRAWING TO THE MATERIALS AND TESTING DIVISION, BUREAU OF CONSTRUCTION AND MATERIALS FOR REVIEW AND APPROVAL.
 2. PROVIDE EITHER GRAY, MALLEABLE OR DUCTILE IRON CASTINGS OR STRUCTURAL STEEL FRAMES.
 3. WELD STRUCTURAL STEEL FRAMES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408M 408/2000, SECTION 1105.03(r).

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

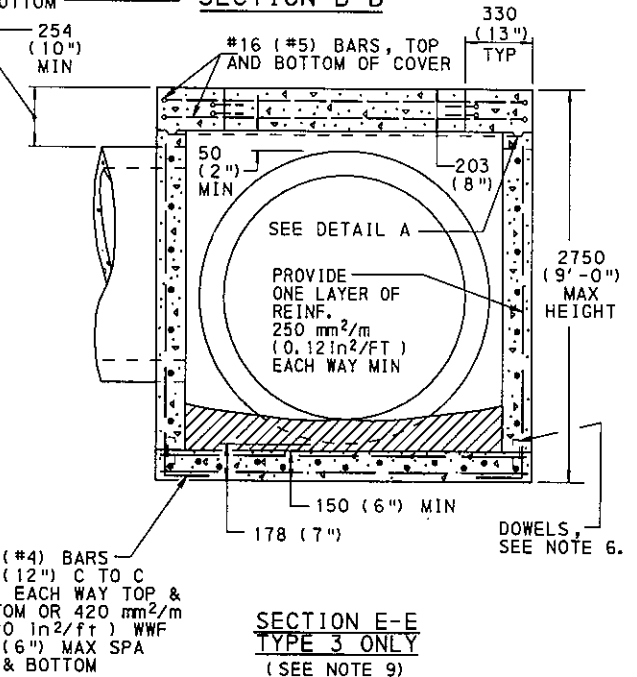
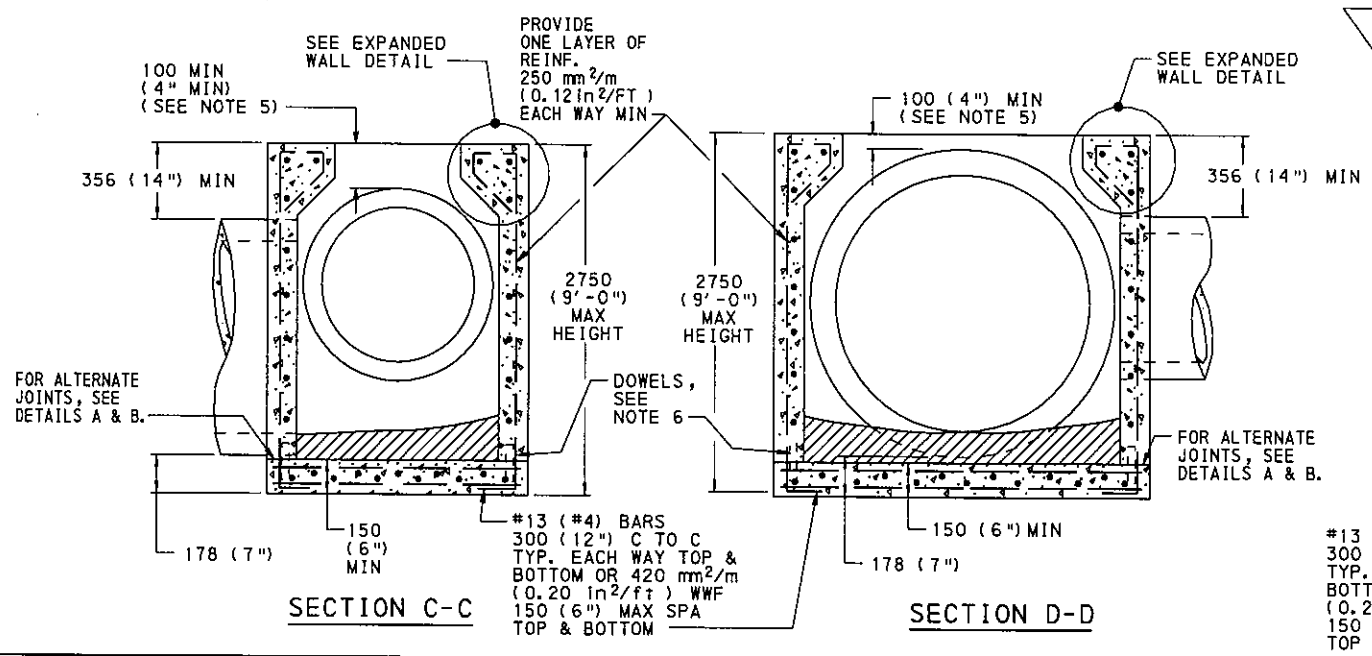
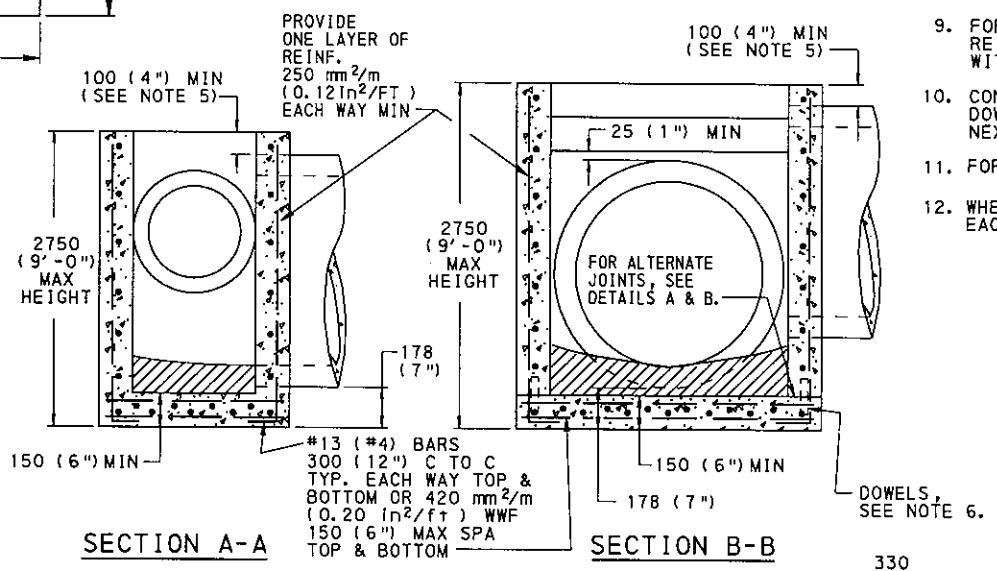
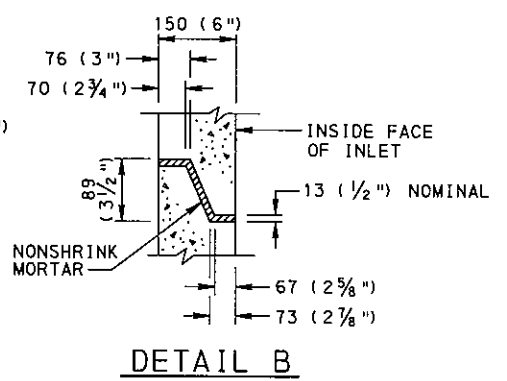
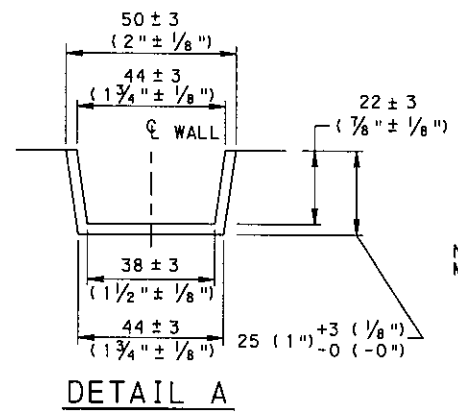
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

INLET FRAMES

RECOMMENDED APR. 28, 2000 <i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary S. Hoffman</i> CHIEF ENGINEER	SHT 6 OF 10 RC-34M
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- NOTES**
1. CONSTRUCT INLET BOXES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 605.
 2. PROVIDE INLET BOXES WITH 610 x 1150 (24"x 45 1/4") STANDARD OPENING TO ACCOMMODATE THE STANDARD TOP COMPONENTS.
 3. FOR CAST-IN-PLACE OR PRECAST CONSTRUCTION, PROVIDE INLET WALLS 150 (6") THICK, UNLESS OTHERWISE INDICATED.
 4. INLETS THAT EXCEED THE MAXIMUM HEIGHT SHOWN SHALL REQUIRE SPECIAL DETAILS AND DESIGN FOR THE INLET WALLS AND BASE. CONSTRUCT INLETS THAT EXCEED 1500 (5') IN HEIGHT WITH STEPS SIMILAR TO MANHOLES. SEE RC-39M.
 5. LOCATE PIPE OR PIPES, AS INDICATED, WITH THE INLET BOTTOM SHAPED TO CHANNEL THE FLOW TOWARD THE OUTLET PIPE. WHEN PROJECT CONDITIONS REQUIRE PIPES TO BE LOCATED WITHIN 100 (4") FROM THE TOP OF THE INLET BOX, PROVIDE AN ADDITIONAL #10 (#3) REINFORCEMENT BAR LOCATED 40 (1 1/2") FROM THE TOP OF THE INLET BASE, FULL WIDTH ALONG THE INLET FACE. IF REINFORCED CONCRETE PIPE IS USED, THE PIPE BLOCKOUT MAY BE FORMED 'FLUSH' WITH THE INLET BASE. LIMIT PIPE BLOCKOUT OF WALL TO 25 mm (1").
 6. PLACE #13 (#4) REINFORCEMENT BARS, MINIMUM 300 (12") LONG, SPACED AT 300 (12") C TO C, AS DOWELS BETWEEN THE INLET BASE AND WALLS WHEN THE CONCRETE WALLS AND INLET BASE ARE NOT CONSTRUCTED MONOLITHICALLY. THE DOWELS MAY BE ELIMINATED IF AN ALTERNATE JOINT IS CONSTRUCTED AS SHOWN IN DETAILS A & B.
 7. FOR CAST-IN-PLACE CONSTRUCTION, WHEN THE BASE IS CONSTRUCTED MONOLITHICALLY WITH THE VERTICAL WALLS, PROVIDE 75 (3") MINIMUM FROM THE BOTTOM OF THE PIPE TO THE BOTTOM OF THE INLET BOX.
 8. FOR PIPE DIAMETERS LARGER THAN 1200 (48") RCP OR 1350 (54") CMP USE A MODIFIED INLET BOX. SEE SHEET 9.
 9. FOR INLETS OTHER THAN AS SHOWN ON THE STANDARDS, PROVIDE REINFORCEMENT BASED ON PHL 93 (HS 25) LOADING AND IN ACCORDANCE WITH PUBLICATION 408/2000.
 10. CONSTRUCTION JOINTS AND KEYS MAY BE CONSTRUCTED UPWARDS OR DOWNWARDS. CLEAN JOINTS AND KEYS THOROUGHLY BEFORE PLACING NEXT CONCRETE SEGMENT.
 11. FOR SUBBASE, SEE NOTE 6 ON SHEET 8.
 12. WHEN NECESSARY, THE BLOCKOUT MAY REMOVE UP TO 25 mm (1") OF EACH WALL AT 3:00/9:00 LOCATIONS FOR RC PIPE CONNECTIONS.



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

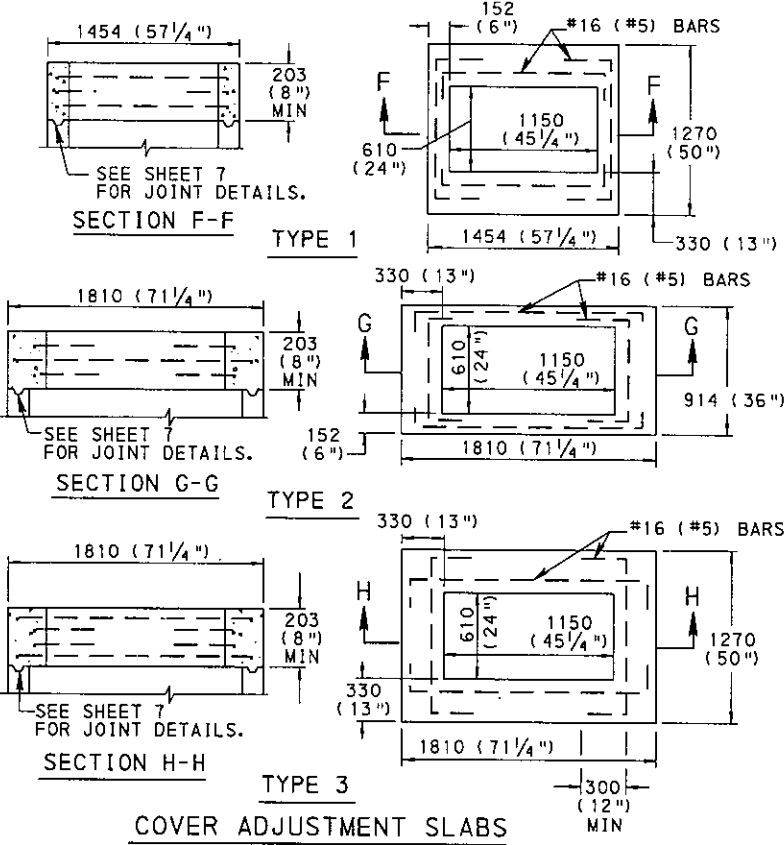
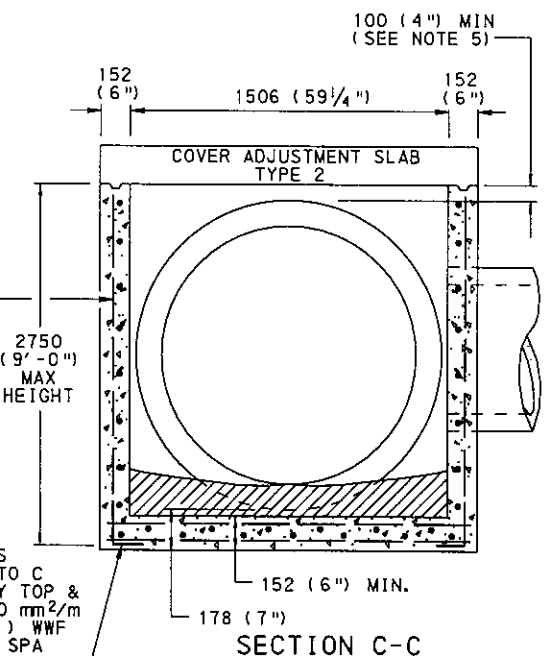
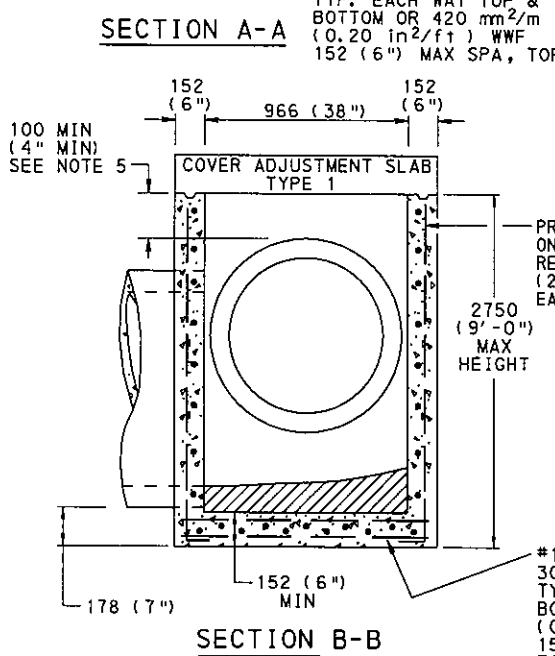
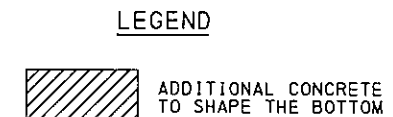
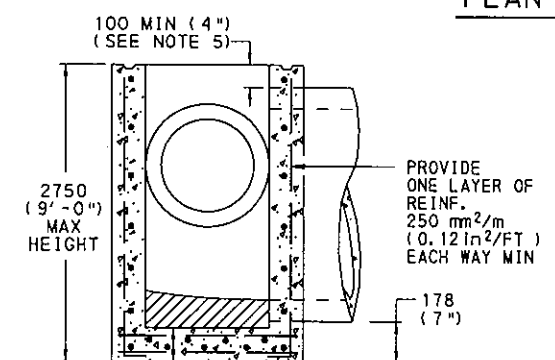
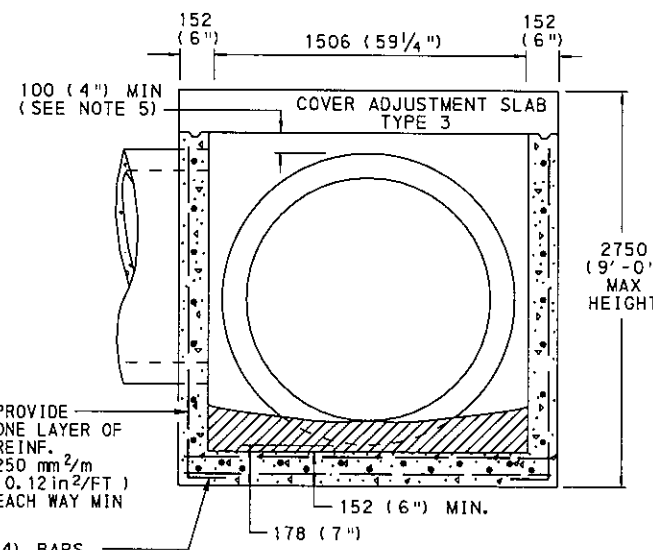
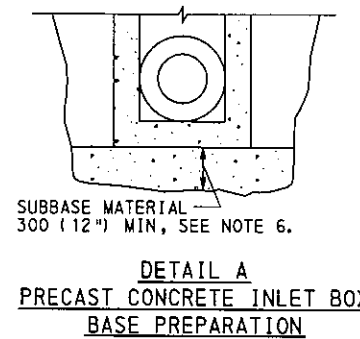
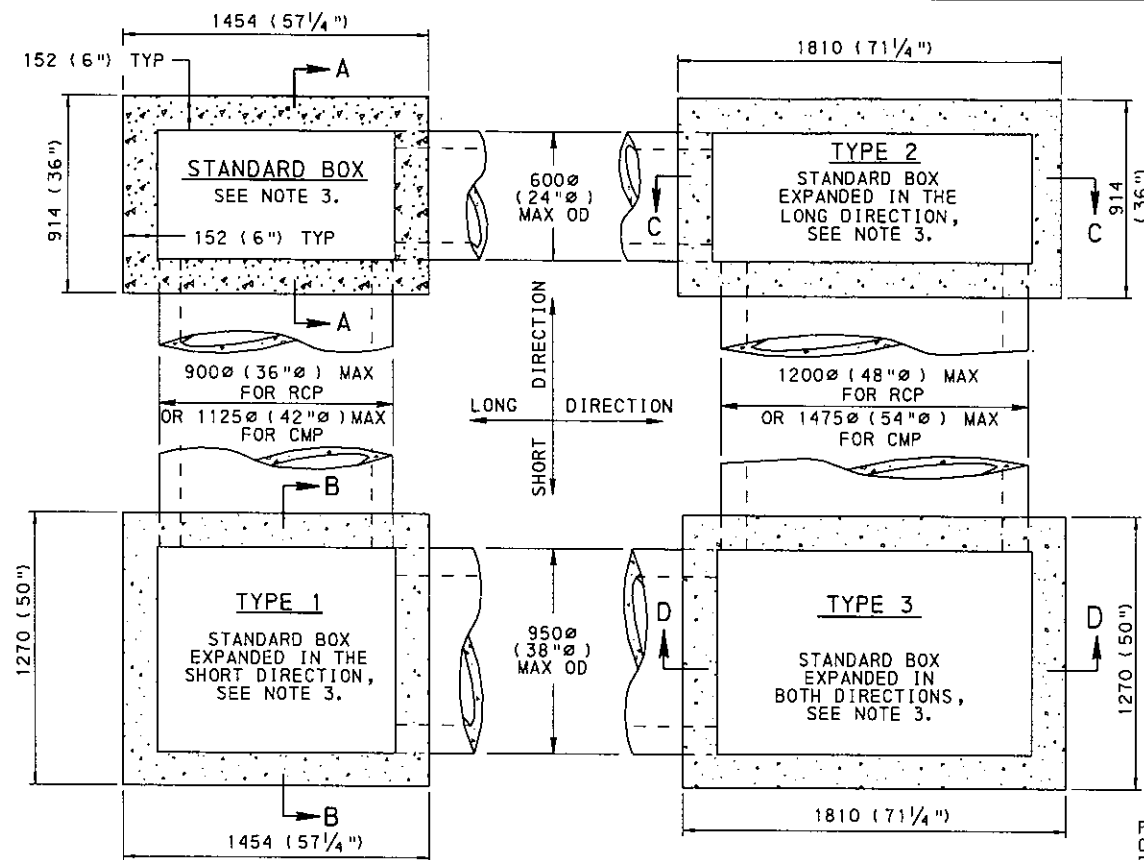
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
STANDARD INLET BOXES
(CAST-IN-PLACE)

RECOMMENDED APR. 28, 2000 <i>Sean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary J. Hoffman</i> CHIEF ENGINEER	SHT 7 OF 10 RC-34M
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NOTES

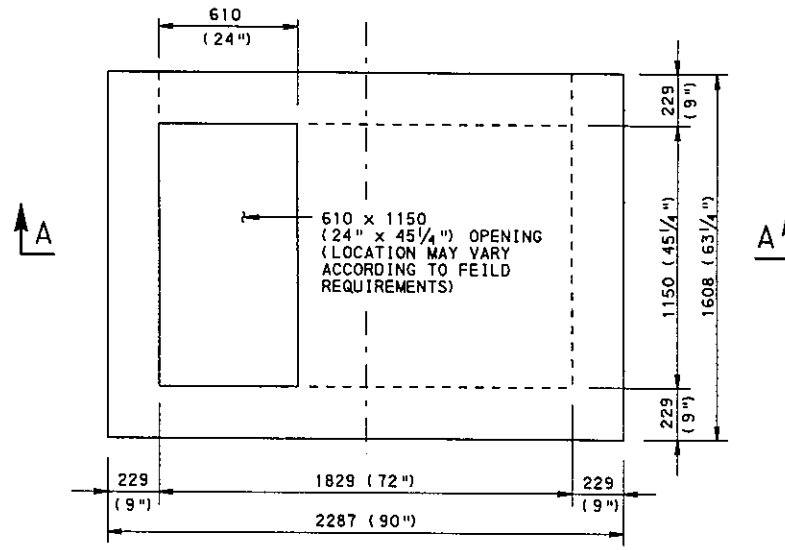
1. CONSTRUCT INLET BOXES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 714.
2. PERMIT ONLY PRECAST INLET BOXES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. USE CLASS AA CEMENT CONC FOR PRECAST BOXES.
3. PROVIDE STANDARD INLET BOXES AND COVER ADJUSTMENT SLABS WITH A 610 x 1150 (24"x 46") OPENING TO ACCOMMODATE STANDARD TOP COMPONENTS.
4. FOR INLETS THAT DEVIATE FROM THE STANDARD SUBMIT SPECIAL DETAILS AND DESIGN FOR THE INLET WALLS AND BASE TO THE BUREAU OF CONSTRUCTION FOR REVIEW AND APPROVAL. CONSTRUCT INLETS THAT EXCEED 1500 (5') IN HEIGHT WITH STEPS SIMILAR TO MANHOLES (SEE RC-39M). FOR INLETS OTHER THAN AS SHOWN ON THE STANDARDS, PROVIDE REINFORCEMENT BASED ON PHL 93 (HS 25) LOADING AND IN ACCORDANCE WITH PUBLICATION 408M.
5. LOCATE PIPE OR PIPES, AS INDICATED, WITH THE INLET BOTTOM SHAPED TO CHANNEL THE FLOW TOWARD THE OUTLET PIPE. WHEN PROJECT CONDITIONS REQUIRE PIPE BLOCKOUTS TO BE FORMED WITHIN 100 (4") FROM THE TOP OF THE INLET BOX, PROVIDE AN ADDITIONAL #10 (#3) REINFORCEMENT BAR LOCATED 40 (1 1/2") FROM THE TOP OF THE INLET BASE, FULL WIDTH ALONG THE INLET FACE. REMOVE ANY VISIBLE PORTION OF THE BAR, IF REQUIRED DURING INSTALLATION AND PRIOR TO JOINING THE PIPE TO THE INLET. IF REINFORCED CONCRETE PIPE IS USED, THE PIPE BLOCKOUT MAY BE FORMED "FLUSH" WITH THE INLET BASE. LIMIT PIPE BLOCKOUT OF WALL TO 25 mm (1").
6. PLACE SUBBASE MATERIAL MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 350.2, IN LAYERS 100 (4") THICK, COMPACTED TO A DENSITY SATISFACTORY TO THE ENGINEER AND INCIDENTAL TO THE INLET PAY ITEM.
7. FOR PIPE DIAMETERS LARGER THAN 1200 (48") RCP OR 1350 (54") CMP, USE A MODIFIED INLET BOX, SHEET 9.
8. PROVIDE CONSTRUCTION JOINTS AS REQUIRED FOR INLET BOXES THAT ARE NOT MONOLITHIC. SEE DETAILS A & B SHEET 7.
9. TAPERS MAY BE PROVIDED ON VERTICAL FACES OF PRECAST INLET BOX BASE UNITS TO FACILITATE FORM STRIPPING. HOWEVER, BOTTOM DIMENSIONS MUST NOT BE REDUCED.
10. PROVIDE SUITABLE LIFTING DEVICES FOR HANDLING AND INSTALLATION. GALVANIZE METAL DEVICES AS SPECIFIED IN PUB. 408/2000 SECTION 1105.



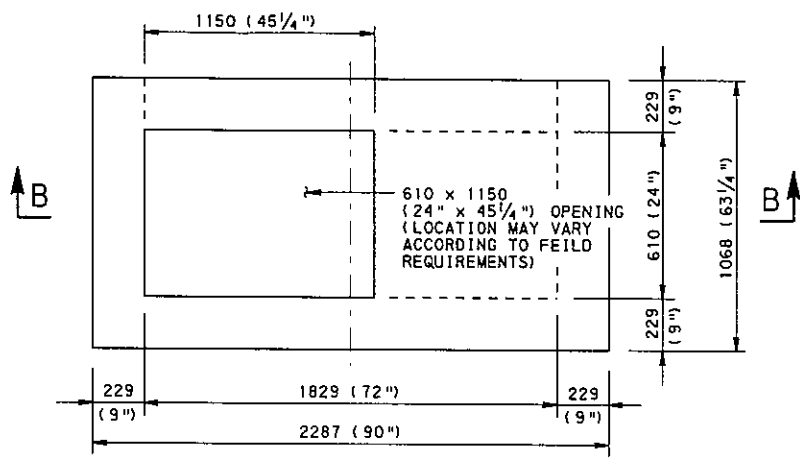
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

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

**INLETS
STANDARD INLET BOXES
(PRECAST)**



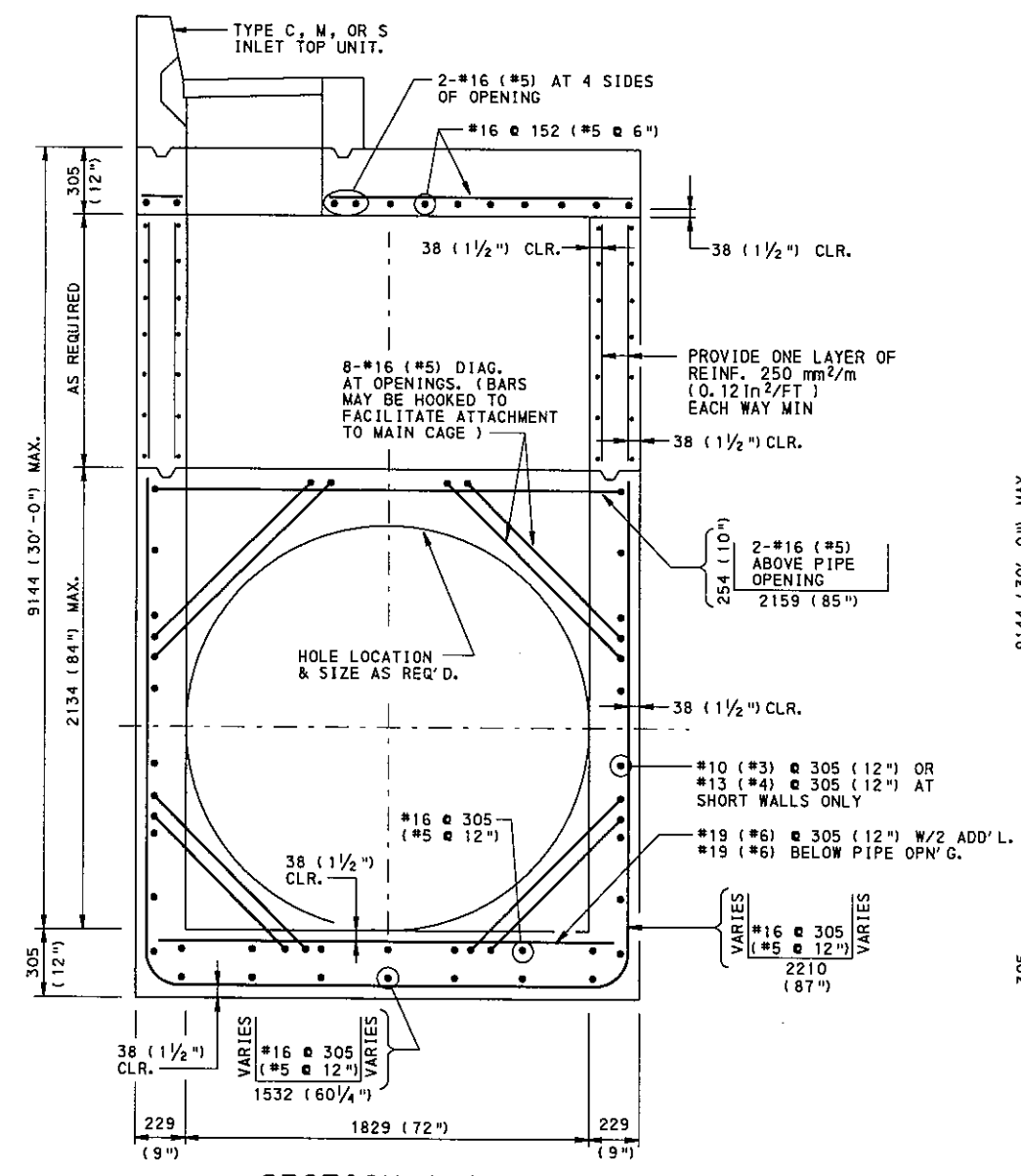
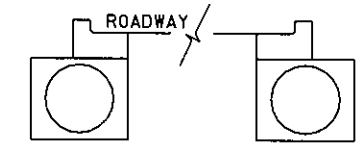
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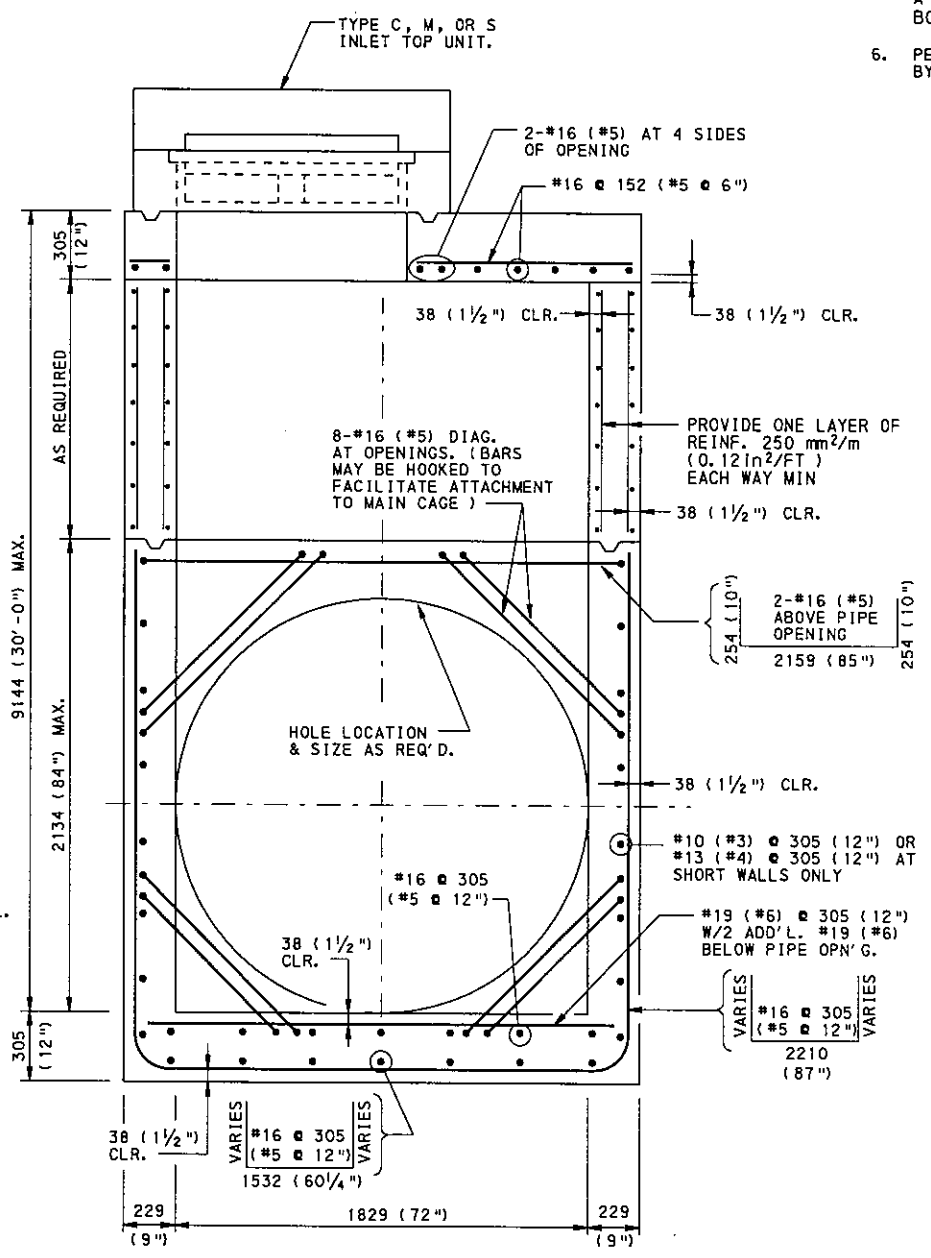
PLAN

NOTES

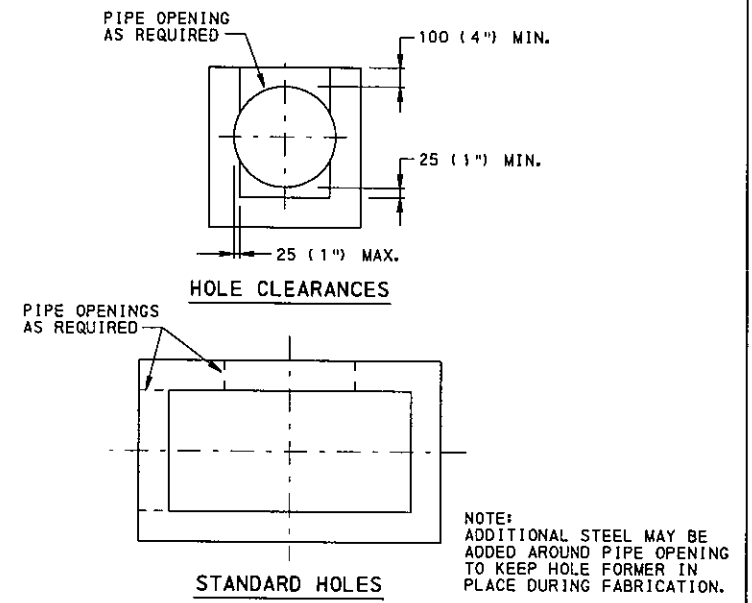
1. CONSTRUCT IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 605 AND SECTION 714.
2. PROVIDE INLETS WITH A MAXIMUM HEIGHT TO BE THE GRADE ELEVATION. WHEN THE REQUIRED HEIGHT EXCEEDS 2750 (9'), SHOW SPECIAL DETAILS AND DESIGN FOR THE INLET WALLS AND BASE. CONSTRUCT INLETS THAT EXCEED 1500 (5') IN HEIGHT WITH STEPS SIMILAR TO MANHOLES (SEE RC-39M)
3. WHEN A SITUATION CAN NOT BE SATISFIED BY THE MODIFIED INLET BOXES SHOWN, PROVIDE SPECIAL DETAILS AND DESIGNS.
4. FOR ORIENTATION OF THE TYPE C INLET TOP WITH MODIFIED TYPE I INLET BOX, THE TYPICAL INSTALLATION DETAILS ARE SHOWN BELOW. SHOW ANY VARIATION ON THE CONSTRUCTION DRAWINGS BY SPECIAL DETAILS.



SECTION A-A



SECTION B-B



PIPE OPENING DETAILS

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

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

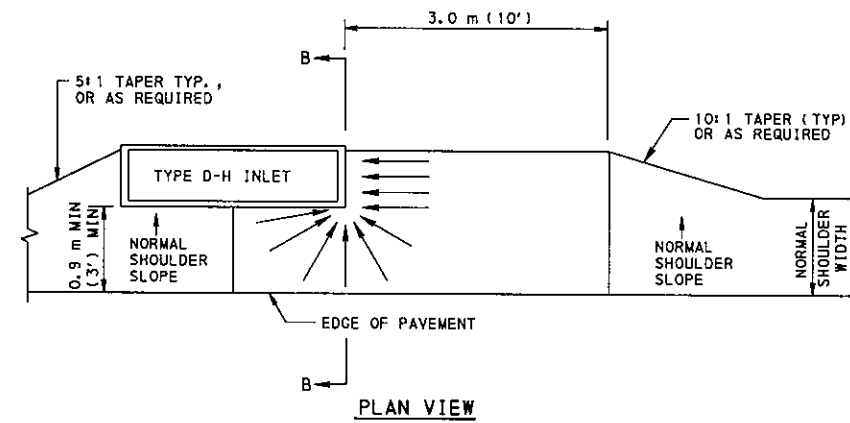
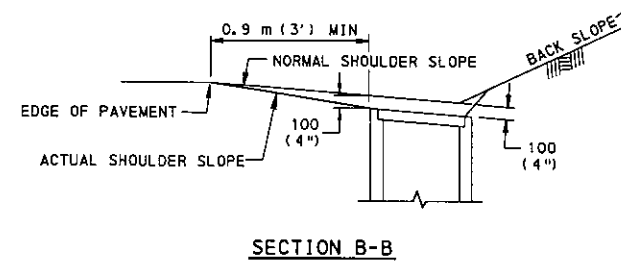
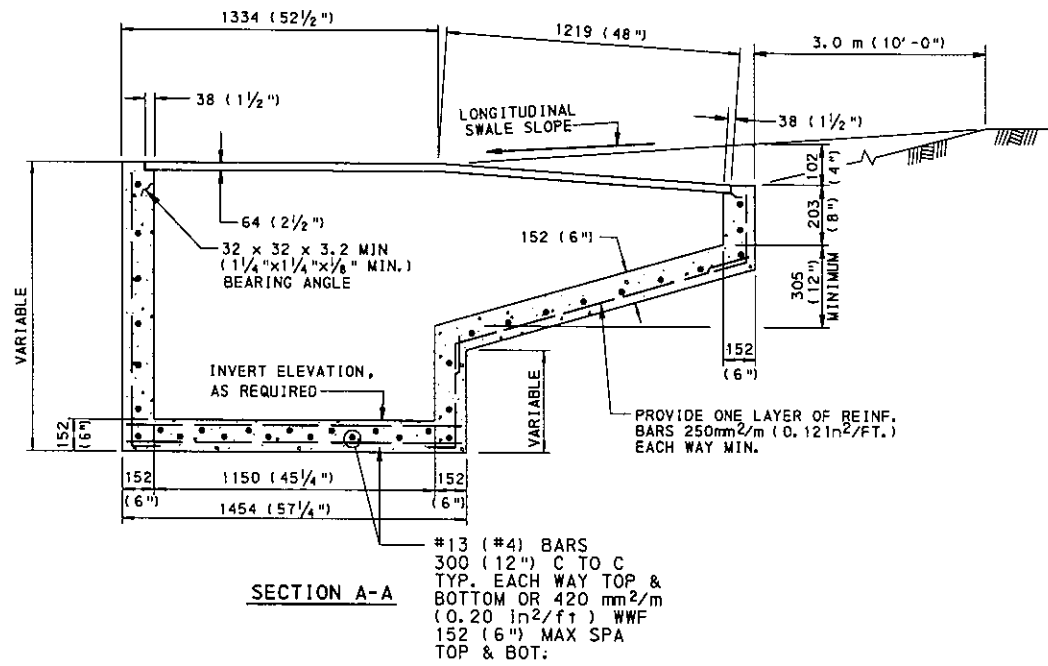
INLETS
MODIFIED INLET BOXES
(CAST-IN-PLACE AND PRECAST)

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

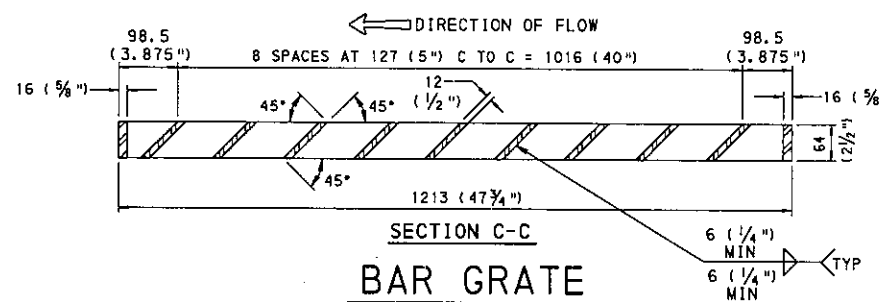
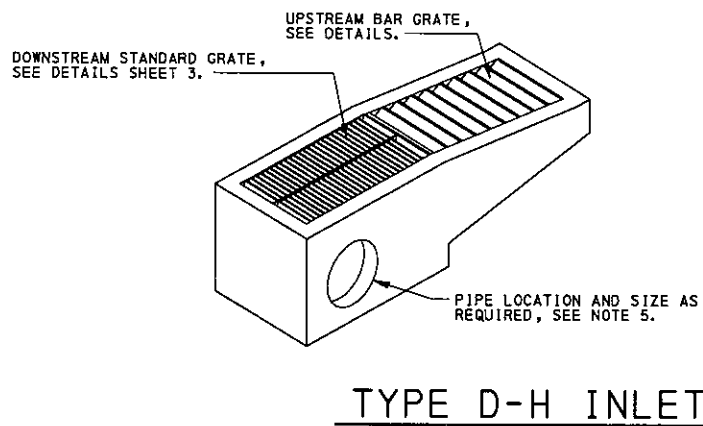
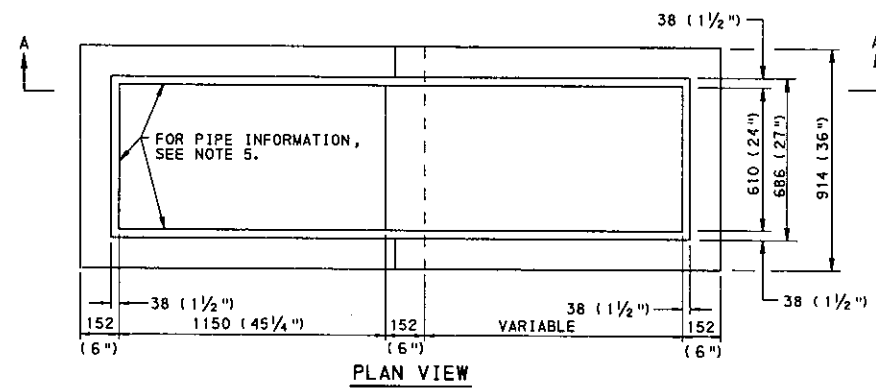
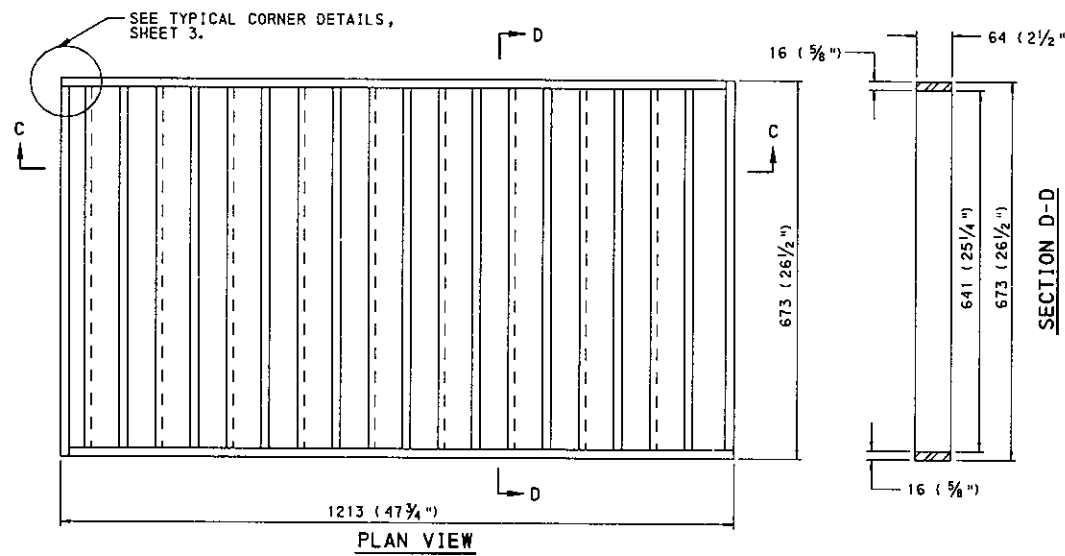
MODIFIED TYPE II INLET 610 (24") x 1829 (72")

NOTES

1. CONSTRUCT IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408/2000 SECTION 605.
2. THIS SHEET DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. PERMIT ONLY GRATES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15.
3. WELD STRUCTURAL STEEL GRATES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 1105.03(r).
4. PROVIDE ANGLES EMBEDDED IN THE CONCRETE AS A BEARING AREA FOR THE GRATES FOR TYPE D-H INLETS WHICH SEAT THE GRATES DIRECTLY WITHIN THE UNIT.
5. FOR PIPE LOCATION AND MAXIMUM ALLOWABLE SIZES, SEE SHEET 8.



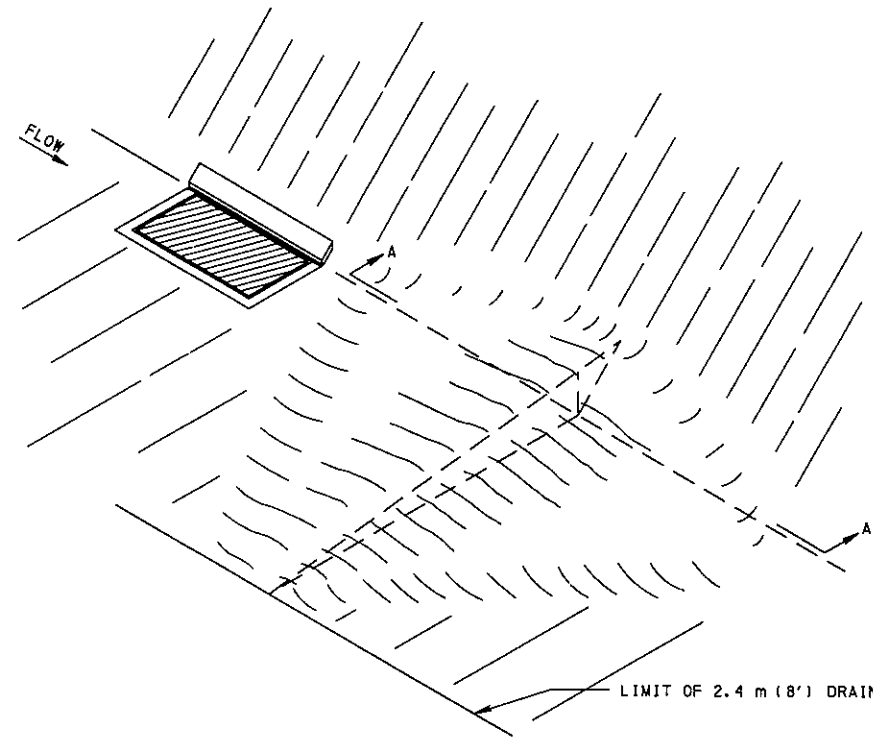
TYPICAL D-H INLET LOCATION



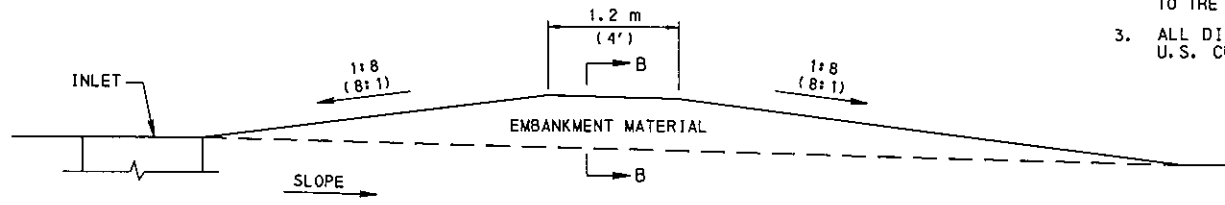
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

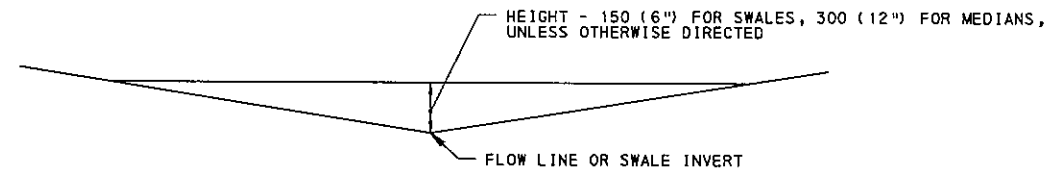
INLETS
TYPE D-H INLET
 (CAST-IN-PLACE AND PRECAST)



SWALE INSTALLATION
DRAINAGE DIKE



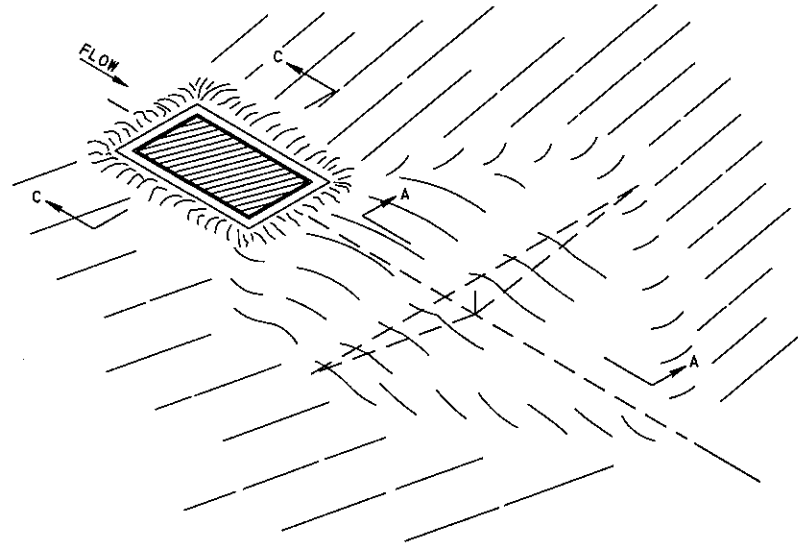
SECTION A-A



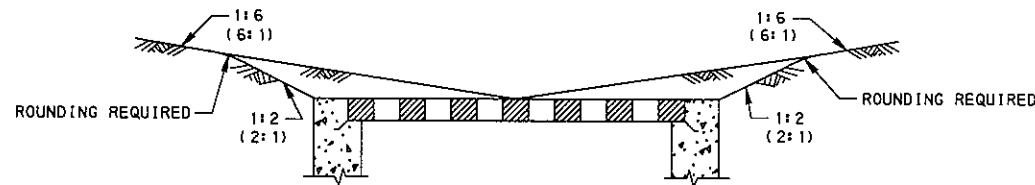
SECTION B-B

NOTES

1. DO NOT CONSTRUCT DRAINAGE DIKE TO A HEIGHT WHICH CAUSES FLOODING OF THE SUBBASE.
2. CONSIDER CONSTRUCTION OF THE DRAINAGE DIKE INCIDENTAL TO THE CLASS 1 EXCAVATION.
3. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.



MEDIAN INSTALLATION
DRAINAGE DIKE

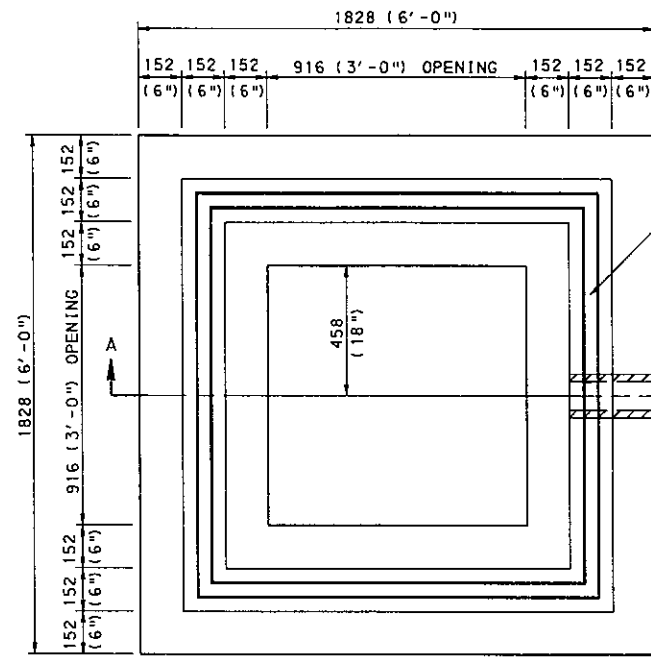


SECTION C-C

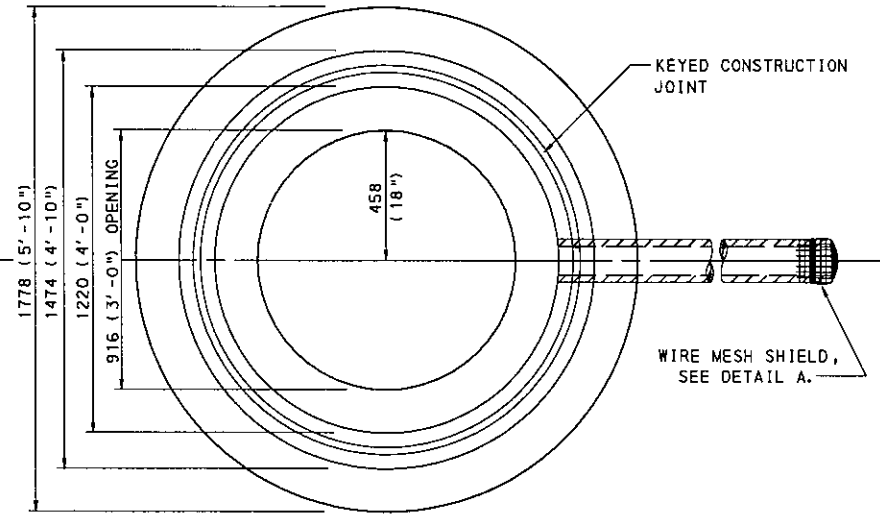
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

DRAINAGE DIKE



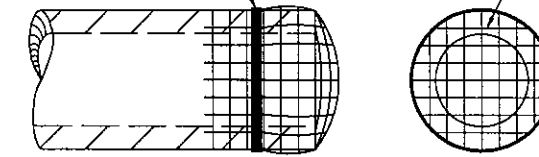
PLAN VIEW
(WITHOUT COVER)



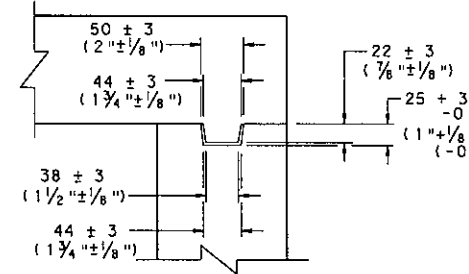
PLAN VIEW
(WITHOUT COVER)

CRIMP AROUND OUTLET END OF PIPE AND SECURE TO PIPE WITH GALVANIZED STEEL WIRE OR OTHER ACCEPTABLE FASTENING METHODS.

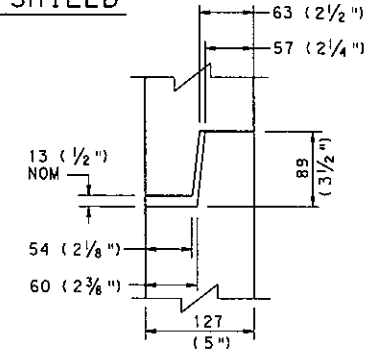
19 x 19 (3/4" x 3/4") WIRE MESH SCREENING, 1.37 (17 GAGE) THICK MINIMUM, GALVANIZED AFTER WEAVING.



DETAIL A
WIRE MESH SHIELD



DETAIL B



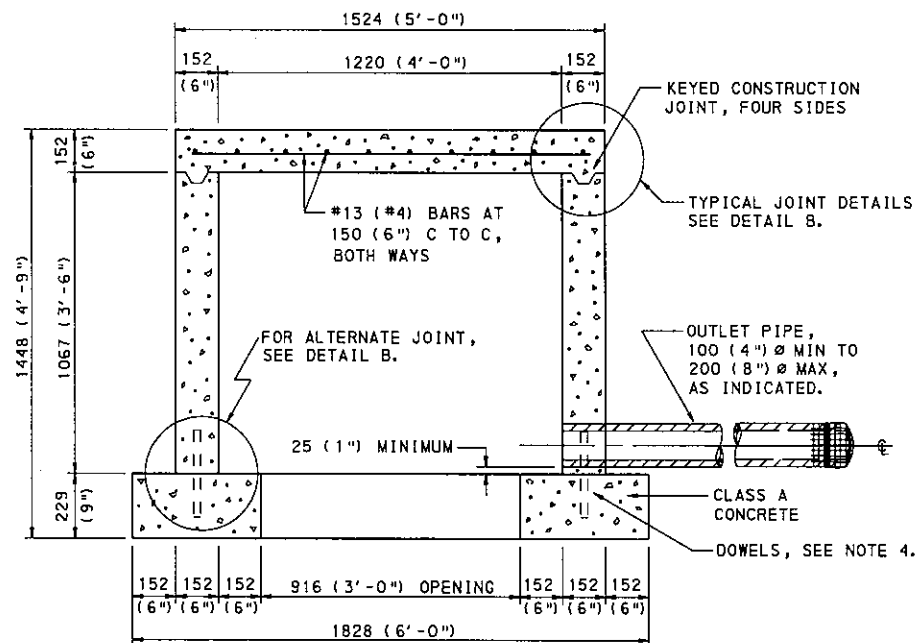
DETAIL C

TYPICAL JOINT DETAILS

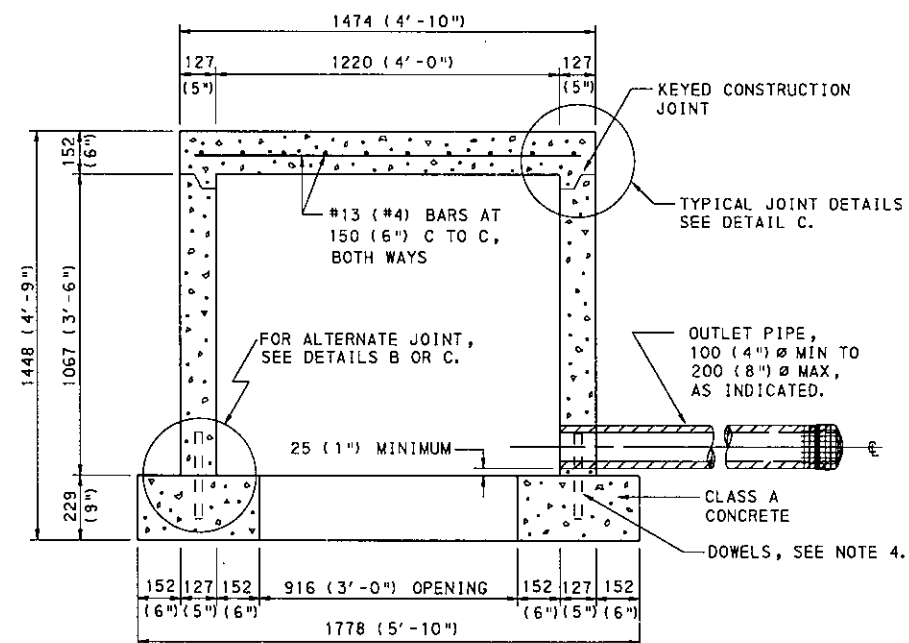
NOTES

1. PROVIDE SPRING BOXES MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 605.
2. PRECAST SPRING BOXES MAY BE USED IN LIEU OF CAST-IN-PLACE SPRING BOXES. PERMIT ONLY PRECAST BOXES SUPPLIED BY AN APPROVED MANUFACTURER LISTED IN BULLETIN 15.
3. LOCATE OUTLET PIPE AS REQUIRED TO SUIT FIELD CONDITIONS.
4. PLACE NO. 13 (NO. 4) REINFORCEMENT BARS, MINIMUM 305 (12") LONG, SPACED AT 300 (12") C TO C, AS DOWELS BETWEEN THE FOUNDATION AND WALLS WHEN THE CONSTRUCTION, EXCLUDING COVER, IS NOT MONOLITHIC. THE DOWELS MAY BE ELIMINATED IF THE ALTERNATE JOINTS SHOWN IN DETAILS B OR C ARE CONSTRUCTED.
5. PROVIDE REINFORCEMENT FOR WALLS AND FOUNDATIONS OF PRECAST BOXES MEETING THE REQUIREMENTS OF AASHTO-M199M.
6. WHEN FILL HEIGHT OVER TOP OF BOX EXCEEDS 3.0 m (10'), REQUIRE A SPECIAL DESIGN.
7. 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.



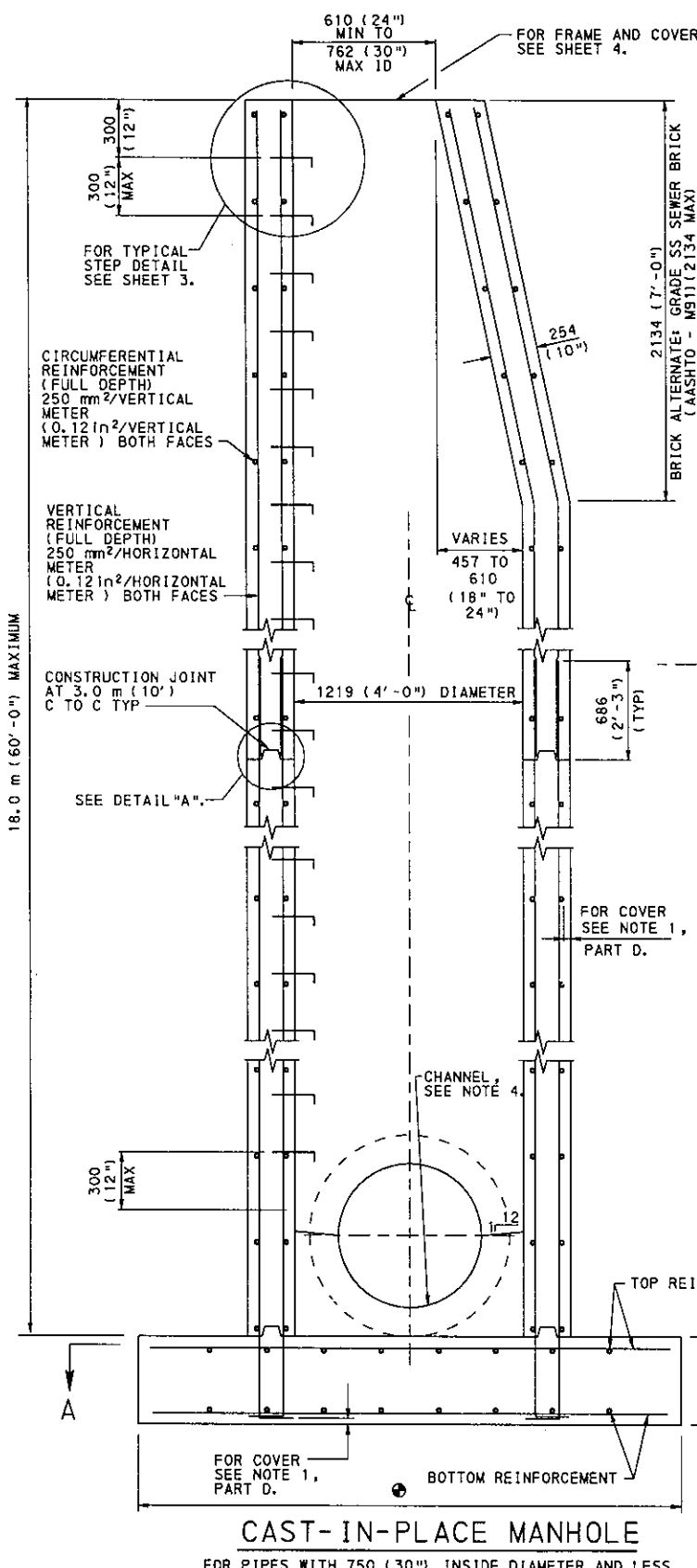
SECTION A-A
SQUARE SPRING BOX
TYPE A



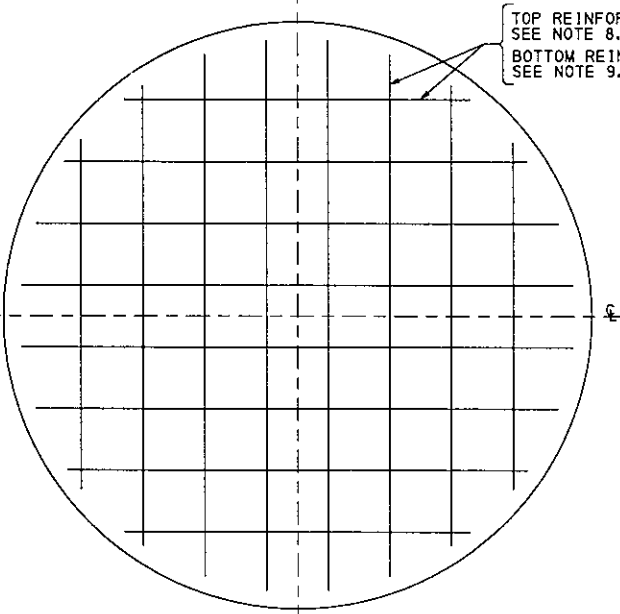
SECTION B-B
CIRCULAR SPRING BOX
TYPE B

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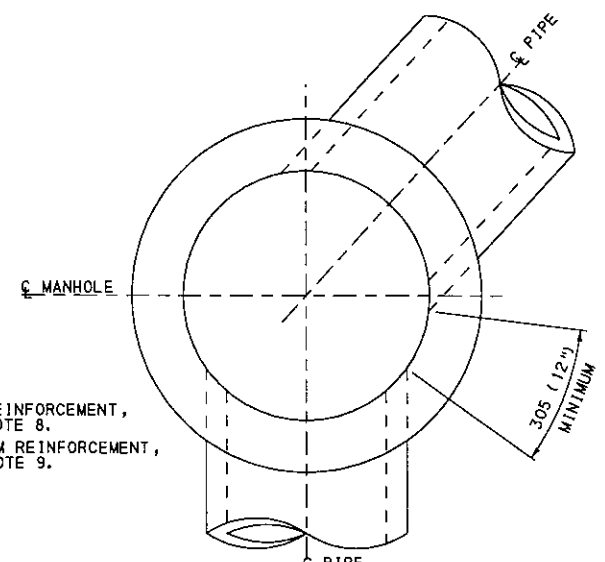
SPRING BOXES



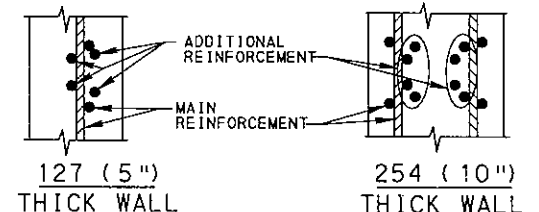
**DETAIL "A"
CONSTRUCTION JOINT**



SECTION A-A



PLAN VIEW



SECTION B-B OR C-C

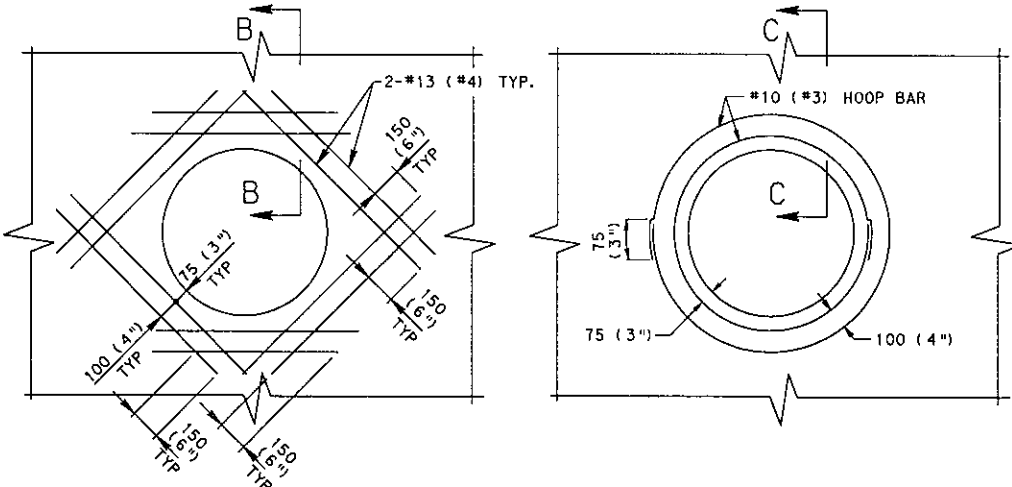
**TABLE A
BASE SLAB DIMENSIONS**

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")

CAST-IN-PLACE MANHOLE

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

FOR BASE SLAB DIMENSIONS SEE TABLE A.



REINFORCEMENT DETAILS AT OPENINGS

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

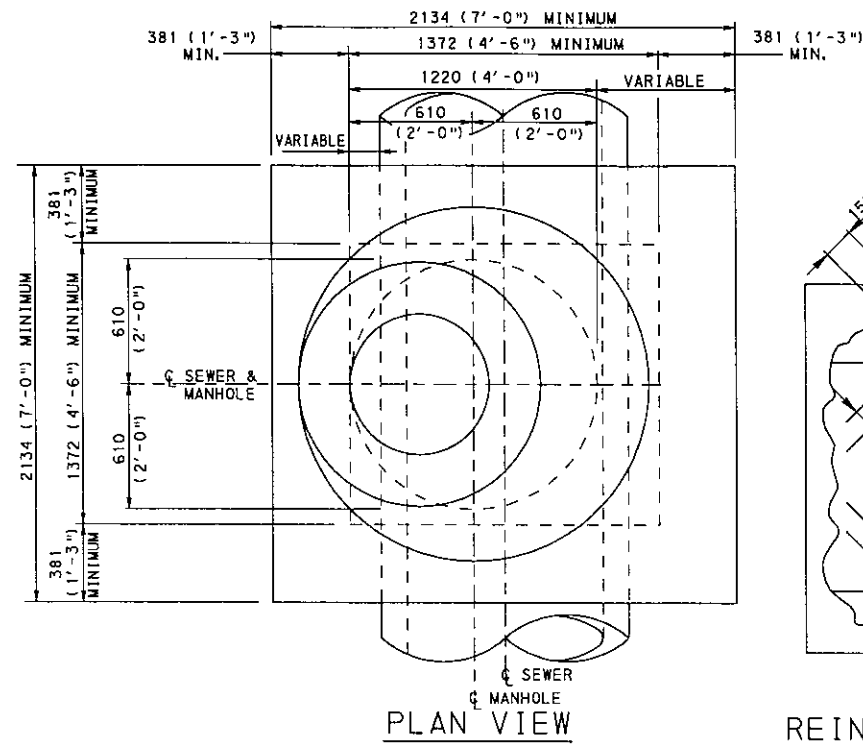
NOTES

- CONSTRUCTION REQUIREMENTS:
 - CONSTRUCT IN ACCORDANCE WITH PUBLICATION 408/2000, SECTIONS 605, 606 AND 714; AND ASTM C-478M-90, STANDARD SPECIFICATION FOR PRECAST REINFORCED CONCRETE MANHOLE SECTIONS, AS MODIFIED HEREIN.
 - MINIMUM CONCRETE CLASS: CAST-IN-PLACE CLASS A PRECAST CLASS AA
 - PROVIDE STEEL REINFORCEMENT IN ACCORDANCE WITH ASTM A185, STEEL WELDED WIRE FABRIC ASTM A663/A663M & A675/A675M, PLAIN BILLET STEEL BARS OR ASTM A615/A615M, DEFORMED BILLET STEEL BARS. PROVIDE MINIMUM YIELD STRENGTH OF 400 MPa (60,000 PSI).
 - CLEAR COVER FOR STEEL: WALLS: CAST-IN-PLACE PRECAST 50 (2") 40 (1 1/2") FOOTINGS: CAST-IN-PLACE PRECAST 60 (2 1/2") 80 (3") 50 (2") 50 (2") 40 (1 1/2") 40 (1 1/2") SLABS: CAST-IN-PLACE 50 (2") TOP & BOTTOM BARS TOP BARS BOTTOM BARS SIDE COVER TOP BARS BOTTOM BARS SIDE COVER TOP & BOTTOM BARS
- FOR PIPES WITH INSIDE DIAMETERS GREATER THAN 750 (30") SEE MODIFIED CAST-IN-PLACE MANHOLES, SHEET 2.
- PROVIDE 300 (12") MINIMUM HORIZONTAL CLEARANCE BETWEEN OPENINGS LOCATED AT THE SAME DEPTH. LOCATE PIPES NOT AT THE SAME DEPTH VERTICALLY AT LEAST ONE HALF THE MAXIMUM OPENING DIAMETER APART.
- FORM A CONCRETE CHANNEL AT THE BOTTOM OF THE MANHOLE CONFORMING TO THE SHAPE OF THE LOWER HALF OF THE INCOMING AND/OR OUTGOING PIPES. PROVIDE A FULL DEPTH U-SHAPED CHANNEL WHEN NECESSARY TO REDUCE ENERGY LOSSES.
- USE 127 (5") THICK WALLS WITH ONE (1) ROW OF REINFORCING, OR USE 254 (10") THICK OR GREATER WALLS WITH TWO (2) ROWS OF REINFORCING.
- CONSTRUCTION JOINTS AND KEYS MAY BE CONSTRUCTED UPWARDS OR DOWNWARDS. CLEAN JOINTS AND KEYS THOROUGHLY BEFORE PLACING NEXT CONCRETE SEGMENT.
- A SAFE BEARING CAPACITY OF 0.15 MPa (1.5 Tons Per S.F.) UNDER THE ENTIRE BASE SLAB IS ASSUMED TO DETERMINE THE BASE SIZE. WHEN THE SUBSOIL IS EXTREMELY POOR, PROCEED WITH CONSTRUCTION ONLY AFTER THE ENGINEER SPECIFIES AN ADEQUATE BASE DESIGN.
- FOR FOOTING TOP REINFORCEMENT, BOTH DIRECTIONS, USE NO. 19 (6) BARS AT 300 (12") FOR DEPTHS TO 18.0 m (60') OR 635 mm/m (0.30 in²/ft) WWF FOR DEPTHS TO 9.0 m (30') AND 680 mm/m (0.32 in²/ft) WWF FOR DEPTHS GREATER THAN 9.0 m (30') 152 (6") MAXIMUM SPACING FOR WWF.
- FOR FOOTING BOTTOM REINFORCEMENT, BOTH DIRECTIONS, USE NO. 13 (4) BARS AT 480 (18") FOR DEPTHS TO 18.0 m (60') OR 320 mm/m (0.15 in²/ft) WWF FOR DEPTHS TO 9.0 m (30') AND 340 mm/m (0.16 in²/ft) WWF FOR DEPTHS GREATER THAN 9.0 m (30') 152 (6") MAXIMUM SPACING FOR WWF.
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

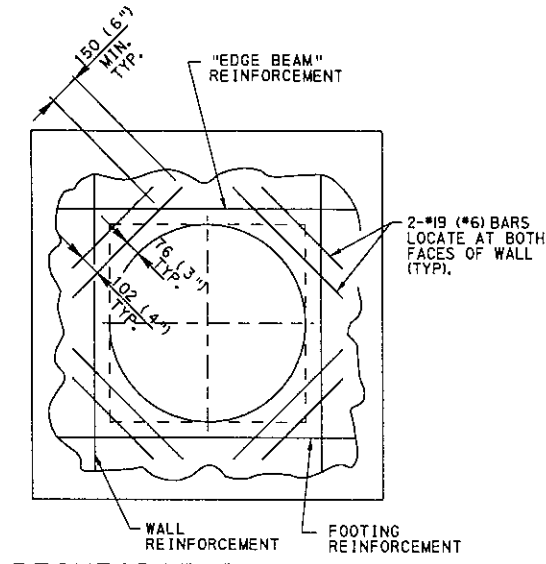
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

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

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



PLAN VIEW



REINFORCEMENT DETAILS AT VERTICAL OPENINGS

NOTE: ONLY BOX WITH MAIN REINFORCEMENT SHOWN FOR CLARITY.

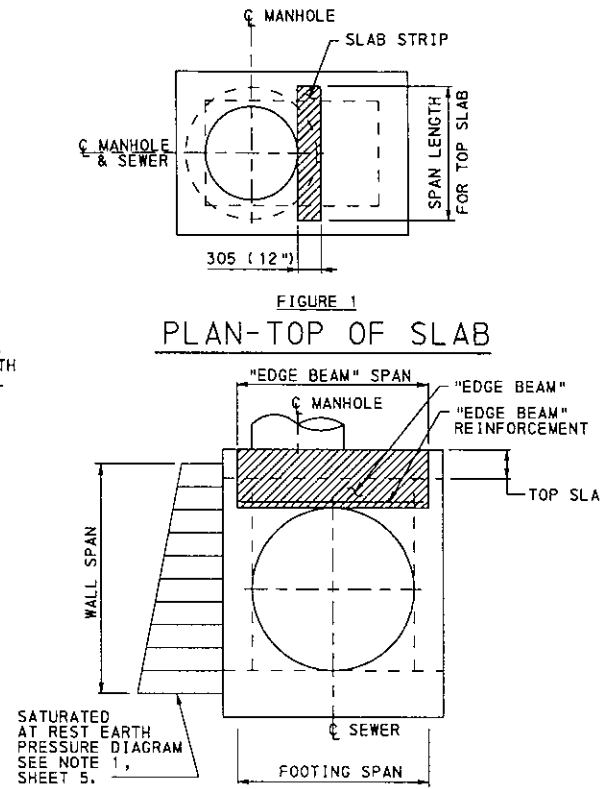


FIGURE 1 PLAN-TOP OF SLAB

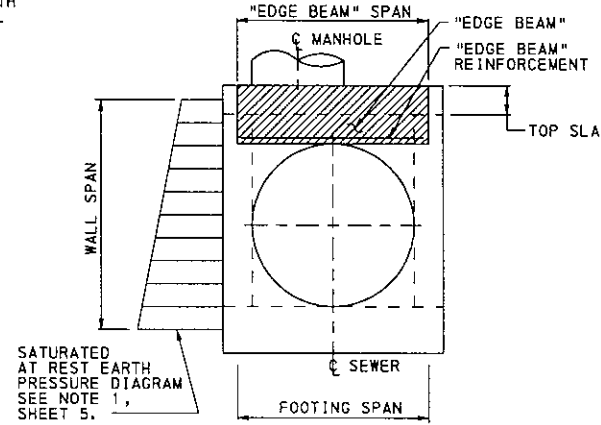
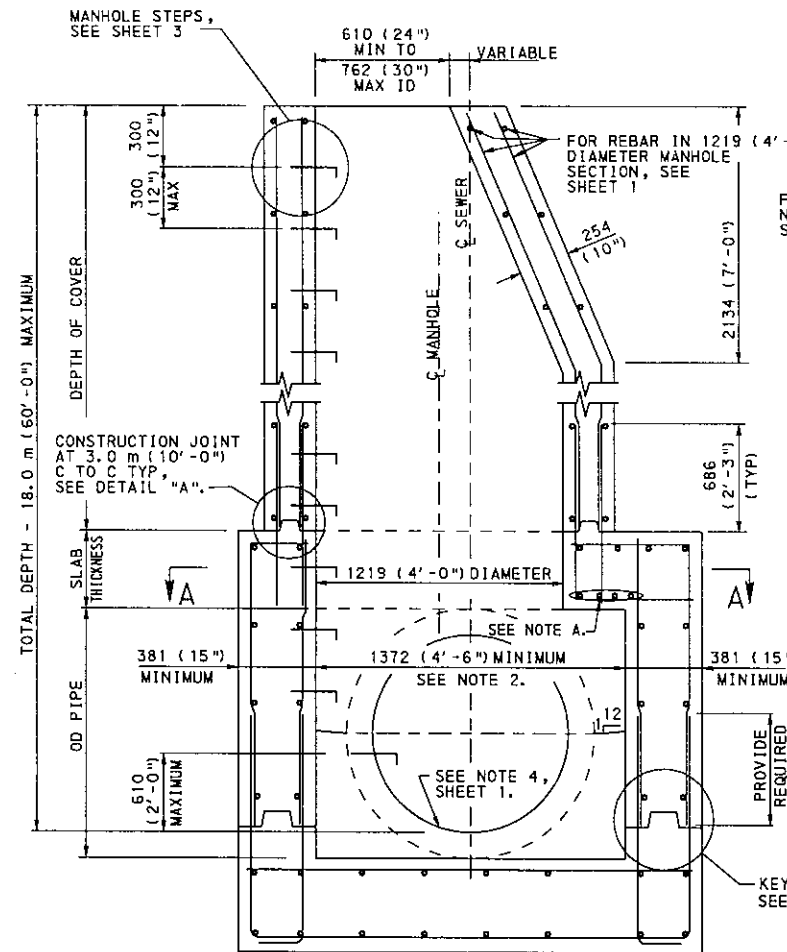


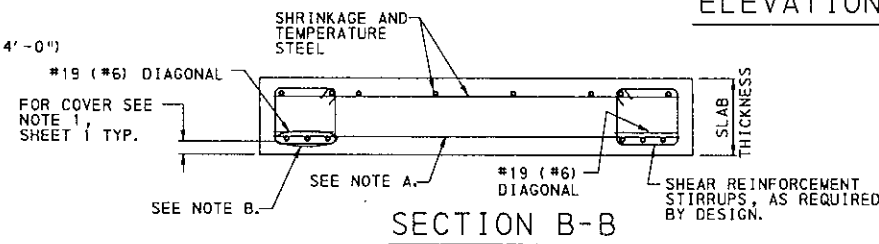
FIGURE 2 ELEVATION-OPENING

- NOTES**
- FOR CONSTRUCTION REQUIREMENTS SEE NOTE 1, SHEET 1. FOR DESIGN REQUIREMENTS SEE NOTE 1, SHEET 5.
 - 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.
 - 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.
 - 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.
 - "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.
 - 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.
 - FOOTING
 - DESIGN SPAN NORMAL TO PIPE TO CARRY POSITIVE MOMENT OF $1/10 W_e$ AND NEGATIVE MOMENT OF $1/12 W_e$ WHERE W_e IS THE UNIFORM BEARING PRESSURE. DO NOT TAKE INTO ACCOUNT THE CONCRETE IN THE CHANNEL WHEN CALCULATING CAPACITY OF THE FOOTING.
 - AS A MINIMUM, PROVIDE NO. 13 (NO. 4) BARS AT 300 (12") CENTERS, TOP AND BOTTOM OF SLAB IN THE OPPOSITE DIRECTION.

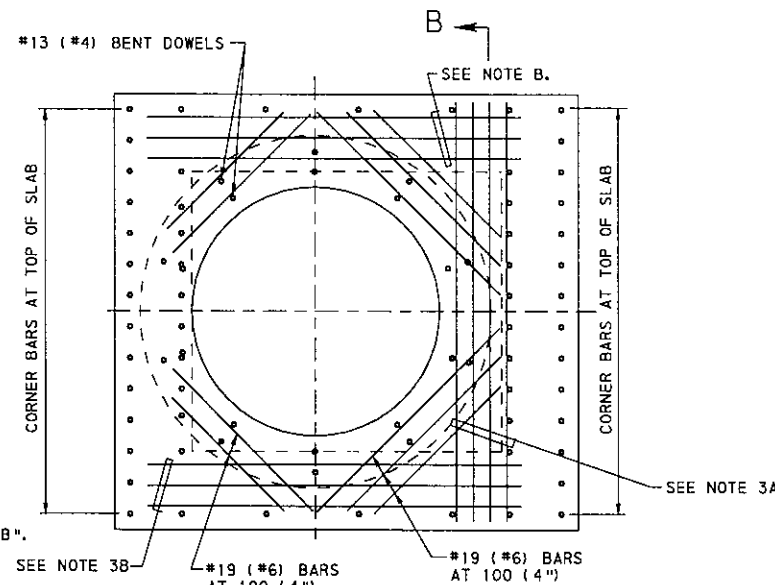


SECTION VIEW MODIFIED MANHOLE

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

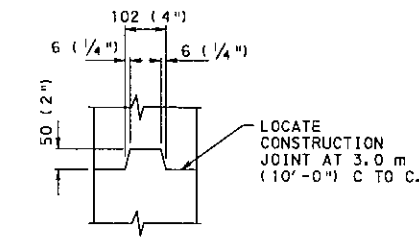


SECTION B-B



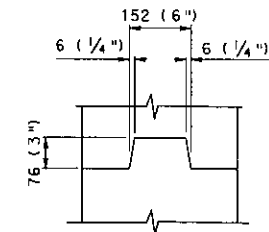
SECTION A-A

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



DETAIL "A" CONSTRUCTION JOINT

SEE NOTE 6, SHEET 1



DETAIL "B" KEYWAY

SEE NOTE 6, SHEET 1

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

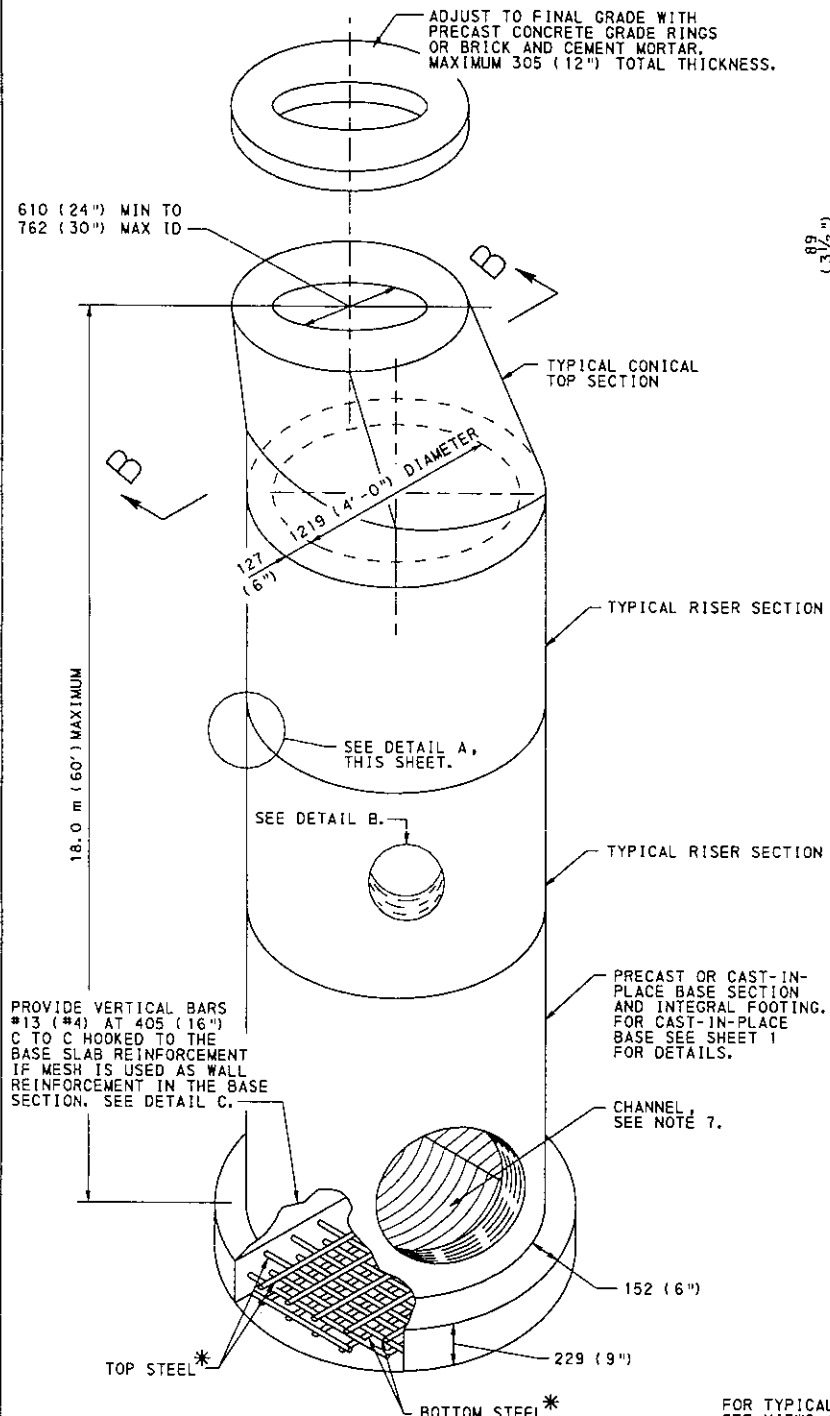
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD MANHOLES
MODIFIED
CAST-IN-PLACE MANHOLES

RECOMMENDED APR. 28, 2000
Dean A. Schmitt
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED APR. 28, 2000
Gary R. Hoffmann
CHIEF ENGINEER

SHT 2 OF 5
RC-39M

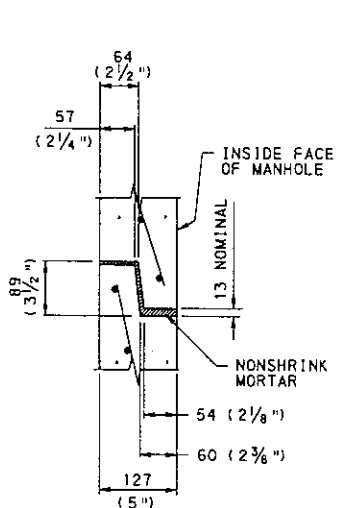


PRECAST MANHOLE

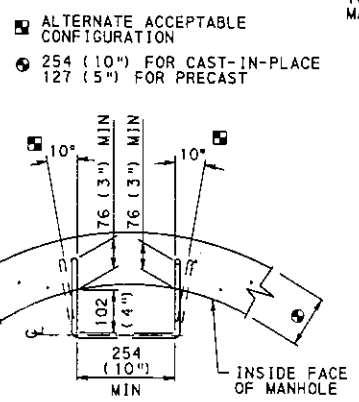
FOR PIPES 750 (30") INSIDE DIAMETER AND LESS

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

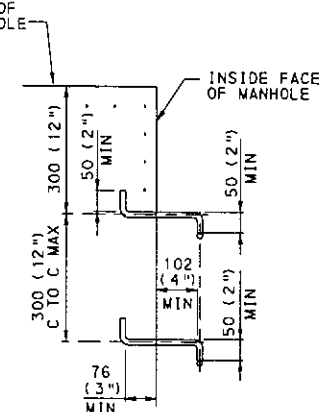
WALL REINFORCEMENT
CIRCUMFERENTIAL FULL DEPTH
250 mm²/VERTICAL m
(0.12 in²/VERTICAL FT.)
VERTICAL FULL DEPTH
170 mm²/HORIZONTAL m
(0.12 in²/HORIZONTAL FT.)
PLACE REINFORCEMENT MESH CENTRALLY IN WALL.
SEE NOTES 5 AND 6 FOR STEEL REQUIREMENTS AT OPENINGS.



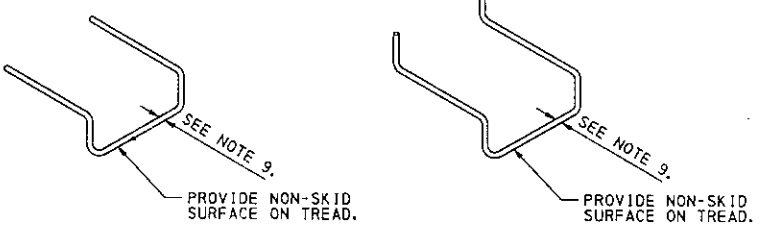
DETAIL A



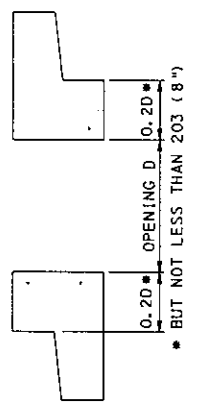
PLAN VIEW



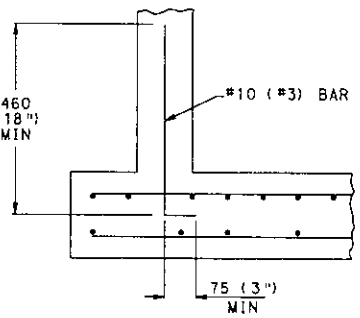
SIDE VIEW



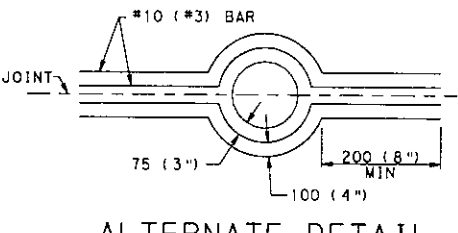
**TYPICAL STEP CONFIGURATION
MANHOLE STEPS**



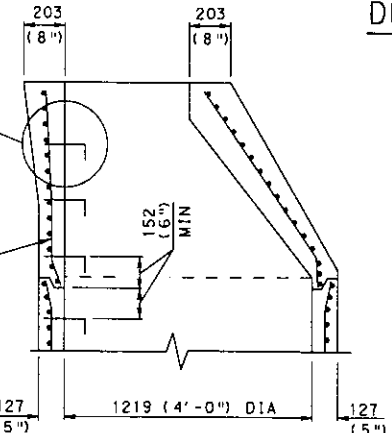
DETAIL B



DETAIL C



**ALTERNATE DETAIL
AT OPENINGS**
SEE NOTE 11.



SECTION B-B

- ALTERNATE ACCEPTABLE CONFIGURATION
- 254 (10") FOR CAST-IN-PLACE
- 127 (5") FOR PRECAST

NOTES

- PRECAST MANHOLES MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 714, MAY BE SUBSTITUTED FOR THE STANDARD CAST-IN-PLACE MANHOLE.
- FOR CONSTRUCTION REQUIREMENTS SEE NOTE 1, SHEET 1. FOR DESIGN REQUIREMENTS SEE NOTE 1, SHEET 5.
- FOR PERMISSIBLE LOCATION OF PIPES SEE PLAN VIEW AND NOTE 3, SHEET 1.
- FOR RISERS OR BASE SECTIONS WITH OPENINGS, PROVIDE A MINIMUM HEIGHT OF SECTION SO AS TO PROVIDE AN UN-CUT 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.
- 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.
- 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.
- 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.
- MARK RISERS OR BASE SECTIONS WITH HOLES CLEARLY WITH MAXIMUM ALLOWABLE DEPTH.
- PROVIDE ADDITIONAL REINFORCEMENT BARS AROUND OPENINGS AS SHOWN ON REINFORCEMENT DETAILS AT OPENINGS SHEET 1.
- FOR CHANNEL DETAILS IN PRECAST MANHOLE SEE CAST-IN-PLACE MANHOLE SHEET 1.
- PROVIDE MANHOLE STEPS MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 605.2(a). ALTERNATE CONFIGURATIONS AND DIMENSIONS, AS APPROVED BY THE ENGINEER, MAY BE USED.
- PROVIDE MINIMUM 25 (1") SECTION DIMENSION FOR METAL STEPS. PROVIDE MINIMUM 19 (3/4") SECTION DIMENSION FOR NON-DETERIORATING MATERIAL STEPS.
- MECHANICAL ANCHOR REQUIRED FOR INSTALLATION OF STEPS WITHOUT HOOKS.
- THE ALTERNATE OPENING REINFORCEMENT DETAIL IS NOT DESIRABLE BY DESIGN. USE IT TO MEET EXISTING PIPE ELEVATIONS.

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

TABLE B

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

SEE NOTE 7, SHEET 1

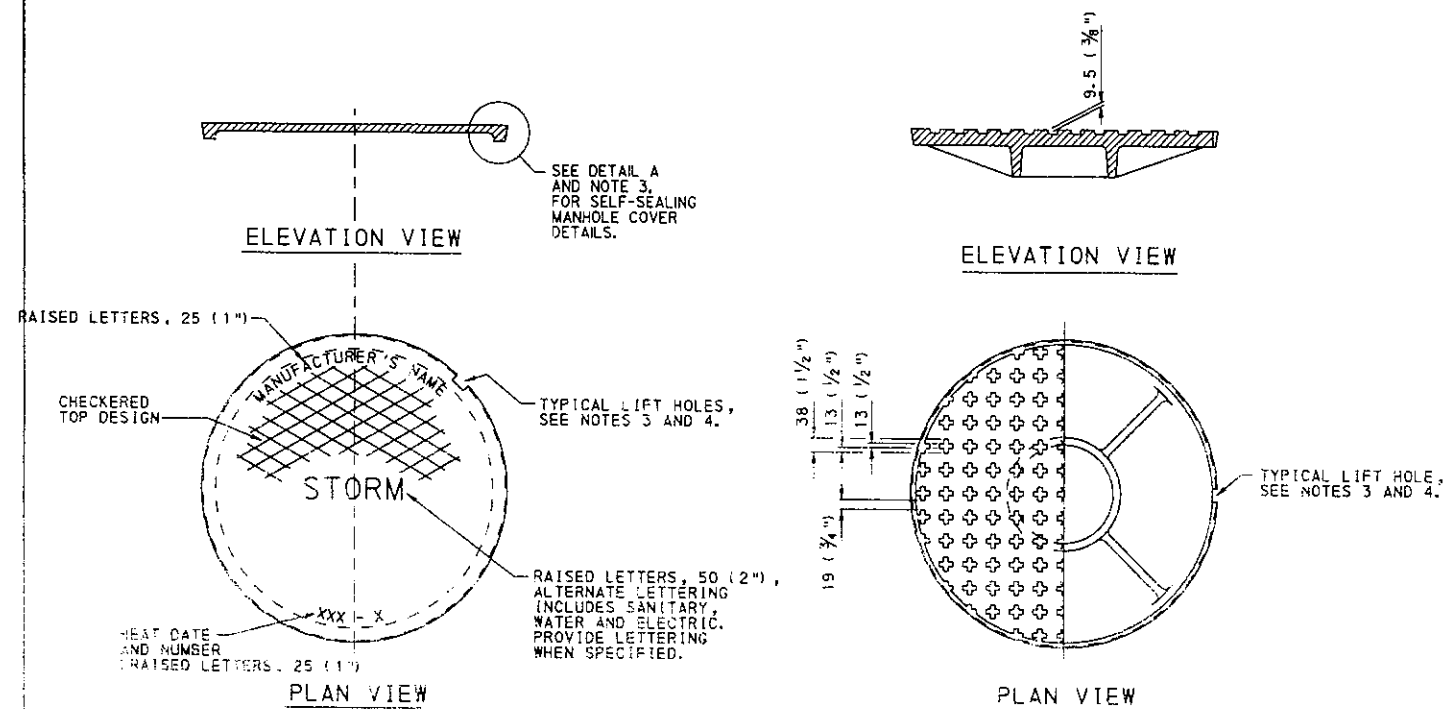
**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN**

**STANDARD MANHOLES
PRECAST MANHOLES &
MANHOLE STEPS**

NOTES

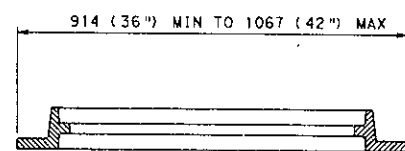
1. PROVIDE MANHOLE FRAMES AND COVERS MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 605.2(b). DESIGN MANHOLE FRAME, COVER AND GRADE ADJUSTMENT RINGS FOR PHL 93 (HS25) LIVE LOAD. IF MANHOLES ARE NOT IN OR ADJACENT TO ROADWAY, DESIGN FOR ALL POSSIBLE LIVE LOADS AS APPROVED BY THE DEPARTMENT.
2. PROVIDE MANHOLE FRAMES, COVERS AND GRADE ADJUSTMENT RISERS SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT REPRODUCIBLE SHOP DRAWING TO THE BUREAU OF CONSTRUCTION AND MATERIALS, MATERIALS AND TESTING DIVISION FOR REVIEW.
3. PROVIDE A GASKET SEALING SYSTEM, DOVETAIL GROOVE AND CONTINUOUS GASKET, AS INDICATED IN DETAIL A, TO PREVENT INFLOW THROUGH THE BEARING SURFACES, OF SURFACE RUNOFF WATER INTO THE MANHOLE SYSTEM, WHEN SPECIFIED. PROVIDE 6 (1/4") DIA ONE PIECE SELF-SEAL POLYISOPRENE ROUND GASKET, 40 DUROMETER GLUED IN PLACE. PROVIDE TWO (2) LIFT HOLES AT 180° TO FACILITATE COVER REMOVAL FOR SELF-SEALING MANHOLE COVER.
4. PROVIDE ONE LIFT HOLE TO FACILITATE COVER REMOVAL FOR NON-SEALING MANHOLE COVER.
5. FRAME AND GRADE ADJUSTMENT RISER TO HAVE A MINIMUM BEARING SEAT OF 25 (1") FOR COVER.
6. LOCATE TOP OF FRAME OR ADJUSTMENT RISER 3 (1/8") BELOW THE TOP OF ROADWAY SURFACE.
7. PROVIDE GRADE ADJUSTMENT RISERS MEETING THE REQUIREMENTS OF PUBLICATION 408/2000 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-36W.
 - C. REQUIRE FULL CIRCUMFERENTIAL WELDS ON BOTH TOP AND BOTTOM RINGS. MAKE THE INNER WELD A BEVEL GROOVE WELD (FLUSH FINISH) FOR PROPER SEATING OF MANHOLE LID AND MAKE THE OUTER WELD A FILLET WELD.
 - D. MAKE THE MINIMUM WIDTH OF BOTTOM AND TOP BAR STOCK 25 (1") AND 10 (3/8"), RESPECTIVELY.
 - E. TAP THE BOTTOM BAR STOCK FOR MULTI-PIECE ADJUSTMENT RISER FOR M14 ADJUSTMENT BOLT.
 - F. REINFORCE THE ADJUSTMENT RISER ADEQUATELY TO PREVENT BENDING.
 - G. PROVIDE AN ADJUSTMENT RISER WHICH IS FLUSH WITH COVER AND DOES NOT ALLOW EXCESSIVE MOVEMENT. PROVIDE AN ADJUSTMENT RISER WHICH CONFORMS TO THE SHAPE OF THE ORIGINAL FRAME.
8. ATTACH FRAME AND/OR PRECAST CONCRETE GRADE RINGS RIGIDLY TO TOP OF MANHOLE. USE 3-M14 THREADED STUDS WITH HEX HEAD NUTS AND WASHERS, INSERTED THROUGH AT 16 (3/8") DIA HOLES THROUGH FRAME AND/OR RINGS. SPACE HOLES AT 120° AND 50 (2") FROM OUTSIDE EDGE OF FRAME. EMBED STUDS 102 (4") MINIMUM INTO MANHOLE. GROUT STUDS INTO MANHOLE.
9. SET THE BASE OF THE FRAME AND/OR PRECAST CONCRETE GRADE RINGS IN A BED OF CEMENT MORTAR.

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

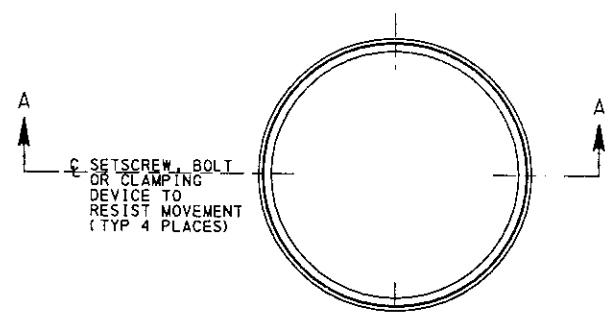


CAST IRON MANHOLE COVER
(PLATEN COVER)

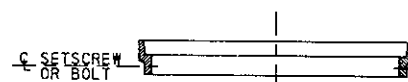
CAST IRON MANHOLE COVER
(STANDARD COVER)



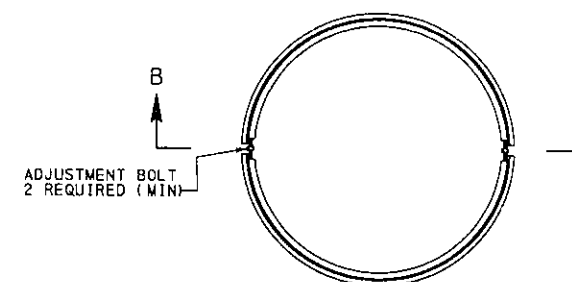
ELEVATION VIEW
OF MANHOLE FRAME



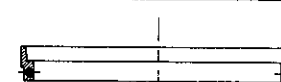
PLAN VIEW
ONE PIECE ADJUSTMENT RISER



SECTION A-A

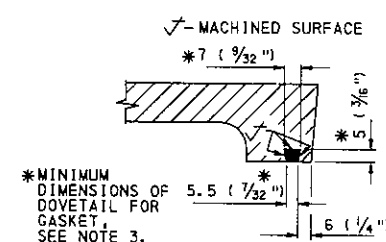


PLAN VIEW
MULTI-PIECE ADJUSTMENT RISER



SECTION B-B

ADJUSTMENT RISERS



DETAIL A
GASKET SEALING SYSTEM

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

STANDARD MANHOLES
COVERS, FRAMES AND
ADJUSTMENT RISERS

1. DESIGN REQUIREMENTS:

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

E. DESIGN THE MANHOLE FOR:

ACCELERATION DUE TO GRAVITY, $g = 9.81 \text{ m/s}^2$
 DENSITY OF EARTH, $\gamma_E = 1920 \text{ kg/m}^3$ (120#/CF)
 $\phi =$ ANGLE OF INTERNAL FRICTION = 33°
 DRY AT REST EARTH PRESSURE = $K_0 \gamma_E = 0.001(1 - \sin \phi) \gamma_E$
 $= 0.001 \times 0.46 \times 1920 \times 9.81 = 8.7 \text{ MPa}$
 SATURATED AT REST EARTH PRESSURE = $K_0 [0.001 \gamma_{E0} - \gamma_w] + \gamma_w$
 $= 0.46 [(0.001)(1920)(9.81) - 9.81] + 9.81$
 $= 14.0 \text{ MPa}$
 (SATURATED AT REST EARTH PRESSURE = $K_0 (\gamma_E - \gamma_w) + \gamma_w$)
 $= 0.46 \times 120 = 55 \text{ P.C.F.}$
 $= 0.46 \times (120 - 62.4) + 62.4$
 $= 89 \text{ P.C.F.}$

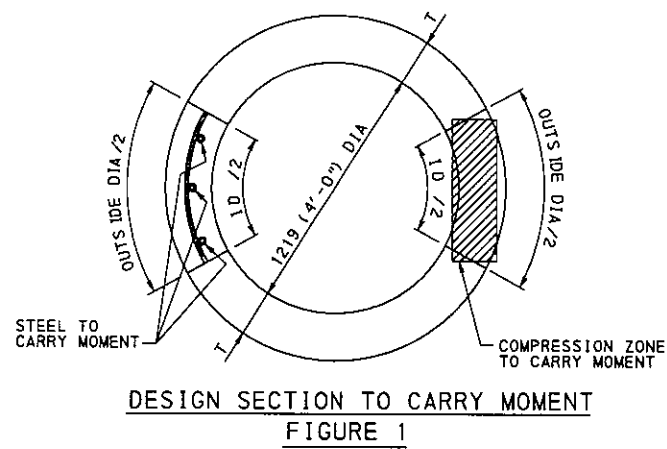
- F. PROVIDE AT LEAST MINIMUM REINFORCEMENT FOR SHRINKAGE AND TEMPERATURE AT ALL CONCRETE FACES WHERE REINFORCEMENT IS NOT REQUIRED BY DESIGN.
 - G. FOR CONSTRUCTION REQUIREMENTS SEE NOTE 1, SHEET 1.
2. VERTICAL STEEL:
- A. THIS PROCEDURE IS REQUIRED ONLY WHEN A SIGNIFICANT LOADING EXISTS ON ONE SIDE OF THE MANHOLE AND LIMITED SUPPORT IS PROVIDED ON THE OTHER.
 - B. DETERMINE MINIMUM AND MAXIMUM VERTICAL LOAD APPLIED TO MANHOLE AT DEPTH "H".
 - C. DETERMINE OVERTURNING MOMENT FROM UNBALANCED EARTH PRESSURE.
 - D. DETERMINE DIMENSIONS OF DESIGN SECTION TO CARRY MOMENT AS SHOWN IN FIGURE 1.

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

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

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

(98 kips/FT)



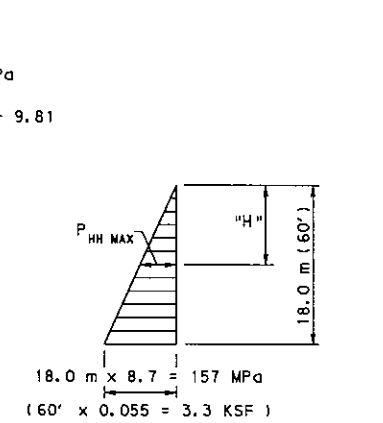
DESIGN SECTION TO CARRY MOMENT
 FIGURE 1

3. HOOP STEEL:

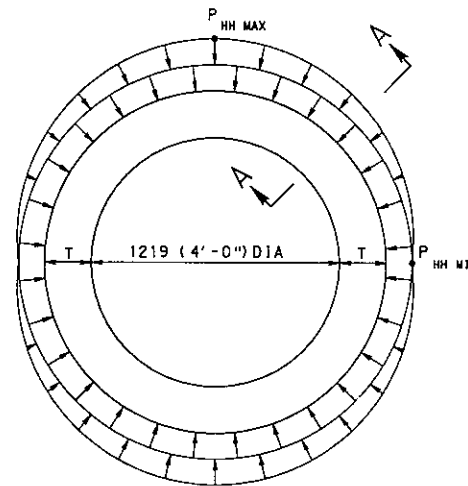
- A. DETERMINE SERVICE MOMENTS AND AXIAL THRUSTS USING FIGURE 2 AND FIGURE 3.
 $P_{HH \text{ MIN}}$ NOT TO BE GREATER THAN ONE-HALF OF $P_{HH \text{ MAX}}$.
- B. DESIGN HOOP REINFORCEMENT SHOWN IN SECTION A-A, TO CARRY THE MOMENT AND AXIAL THRUST.
- C. CHECK CRACK CONTROL UNDER SERVICE LOAD.

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

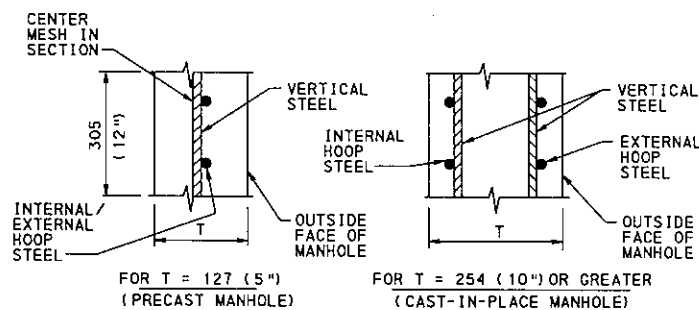
(98 kips/FT)



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



DIFFERENTIAL PRESSURE LOADING
 TO DETERMINE HOOP MOMENTS
 FIGURE 3



FOR T = 127 (5") (PRECAST MANHOLE)
 FOR T = 254 (10") OR GREATER (CAST-IN-PLACE MANHOLE)
 USE WALLS AT 127 (5") THICK WITH ONE (1) ROW OF REINFORCING,
 OR USE WALLS AT 254 (10") OR GREATER WITH TWO (2) ROWS OF REINFORCING.

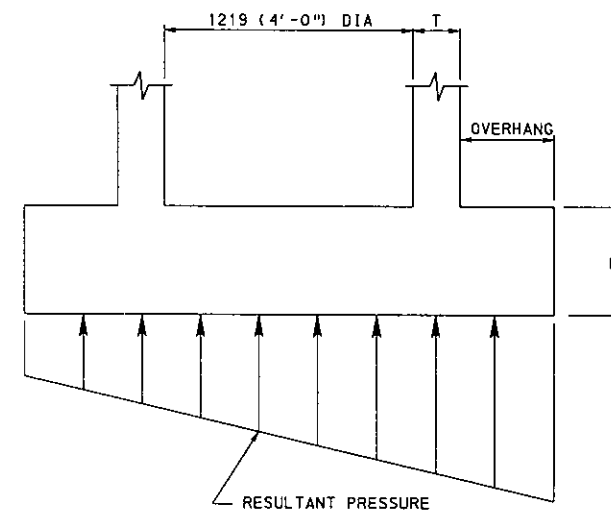
SECTION A-A - DESIGN SECTION

4. FOOTING DESIGN:

- A. DETERMINE FOOTING SIZE (USE AN EQUIVALENT CIRCULAR FOOTING FOR DESIGN)
 $\frac{P + M}{A \cdot S} < 290 \text{ kPa (3.0 KSF) OR MAXIMUM ALLOWABLE BEARING PRESSURE}$
 $P = DL + LL + EP$
 $DL =$ DEAD LOAD OF MANHOLE
 $LL =$ PHL 93 (HS25) WHEEL LOAD (NO IMPACT)
 $EP =$ EARTH LOAD ON OVERHANG
 $A =$ BEARING AREA OF FOOTING
 $M =$ MOMENT DUE TO DIFFERENTIAL LOADING (WHEN APPLICABLE)
 $S =$ SECTION MODULUS OF FOOTING
 SEPARATION BETWEEN THE FOOTING AND SOIL IS NOT PERMISSIBLE.

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

- C. CHECK CRACK CONTROL UNDER SERVICE LOAD.
 $Z = F_s \sqrt{\frac{dc \times 2dst \times b}{\text{NO. OF BARS}}} < 17.2 \text{ N/m}$
 (98 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.

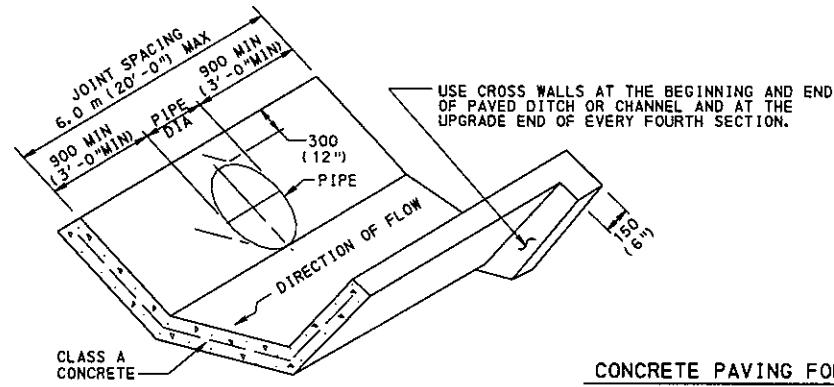
COMMONWEALTH OF PENNSYLVANIA
 DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

STANDARD MANHOLES
 DESIGN PROCEDURE

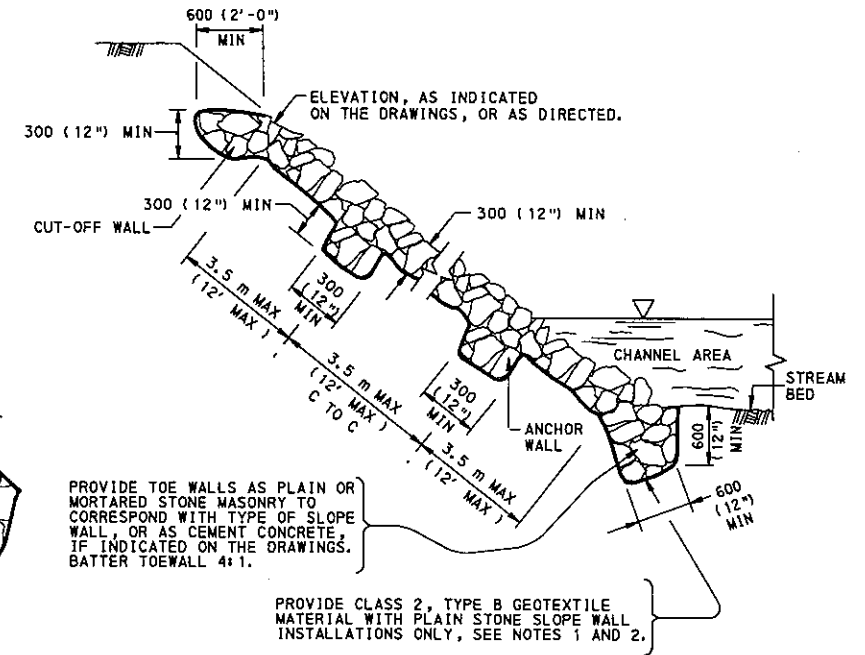
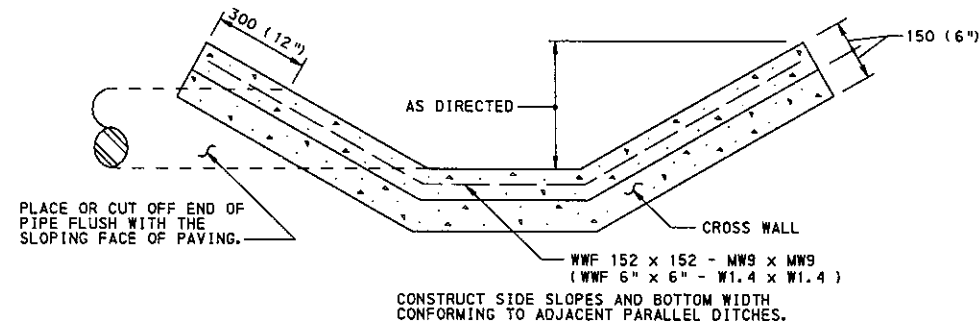
RECOMMENDED APR. 28, 2000
 DIRECTOR, BUREAU OF DESIGN

RECOMMENDED APR. 28, 2000
 CHIEF ENGINEER

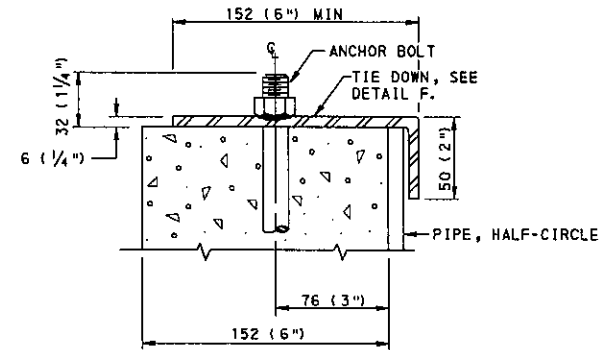
SHT 5 OF 5
 RC-39M



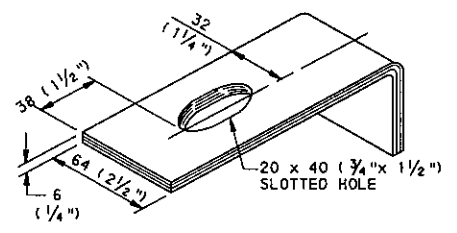
CONCRETE PAVING FOR STREAM BEDS



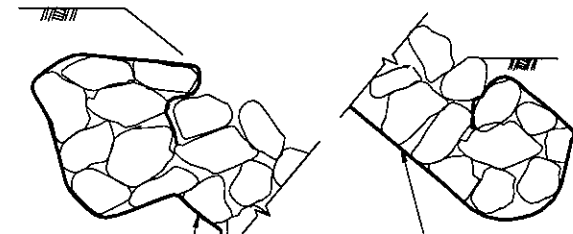
PLAIN AND MORTARED STONE SLOPE WALL



DETAIL E

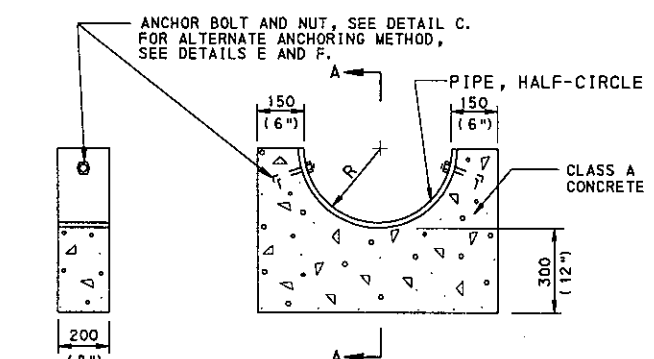


DETAIL F



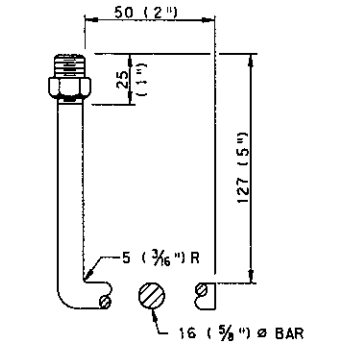
DETAIL A

DETAIL B

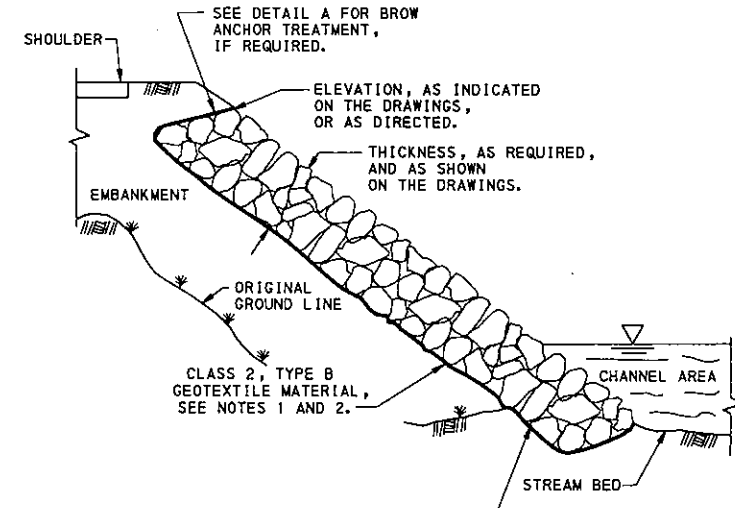


SECTION A-A

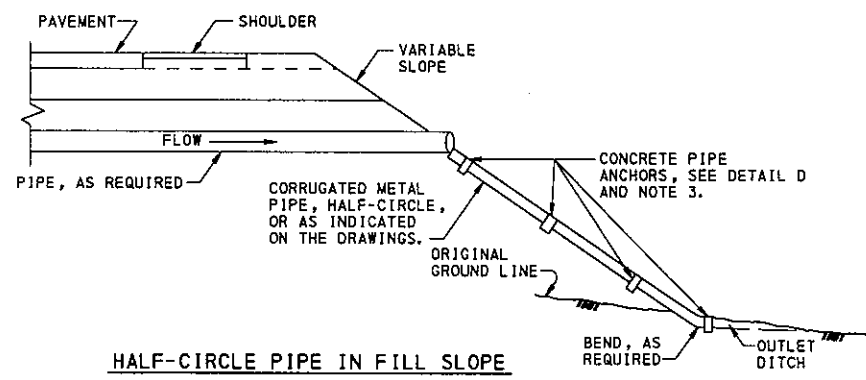
CEMENT CONCRETE PIPE ANCHOR
DETAIL D



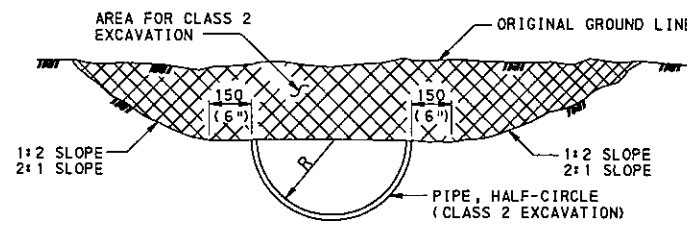
ANCHOR BOLT AND NUT
DETAIL C



ROCK EMBANKMENT



HALF-CIRCLE PIPE IN FILL SLOPE



TYPICAL CROSS SECTION

INSTALLATION DETAILS FOR HALF-CIRCLE PIPE

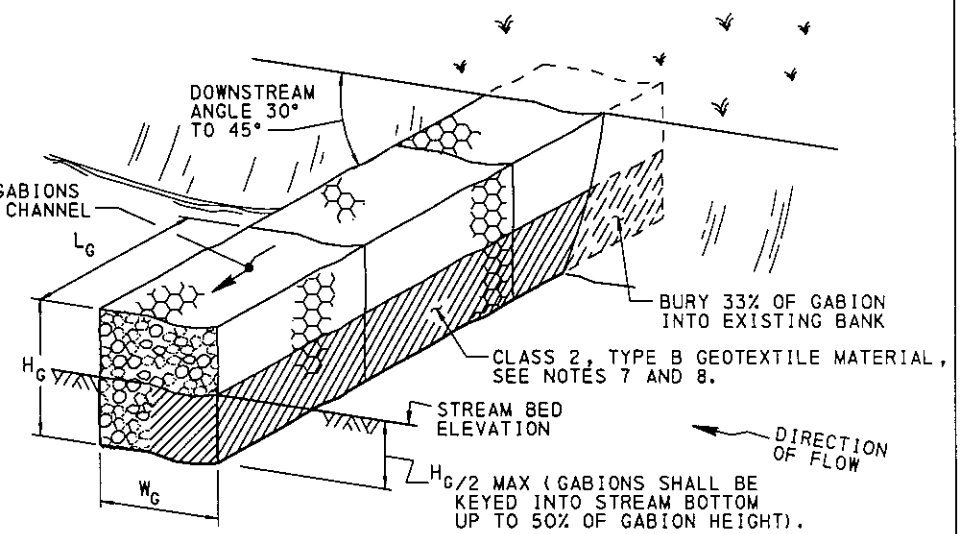
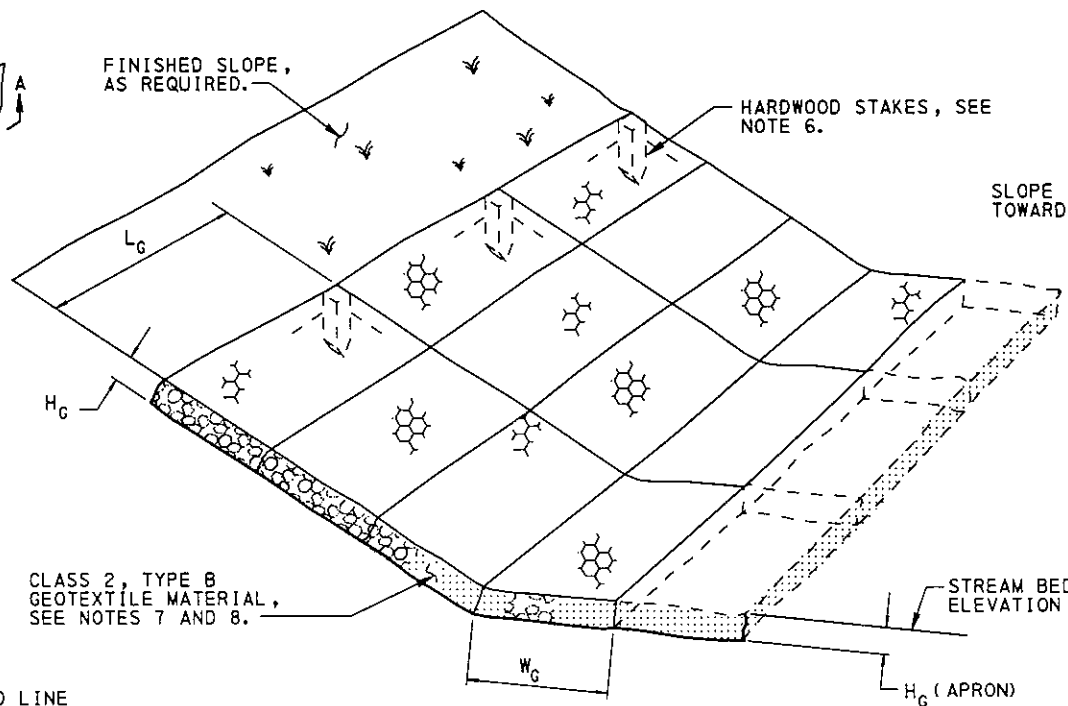
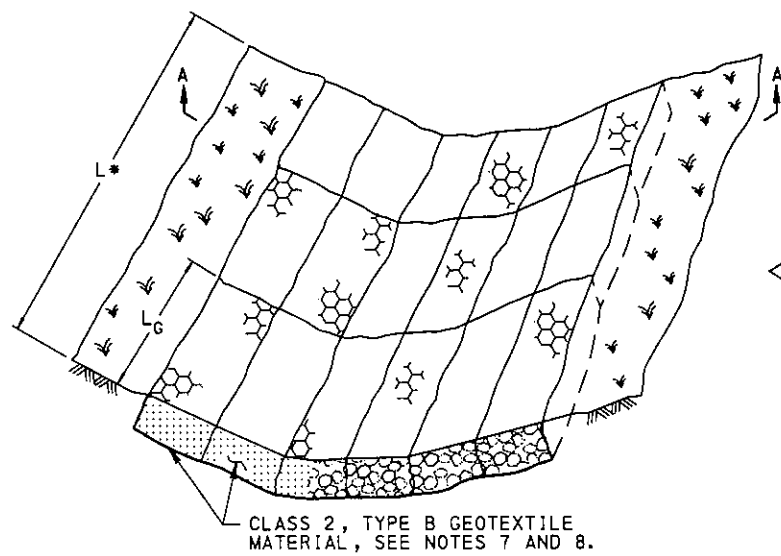
NOTES

1. PROVIDE GEOTEXTILE MATERIAL MEETING THE CONSTRUCTION REQUIREMENTS OF PUBLICATION 408/2000, SECTION 212 AND MATERIAL REQUIREMENTS OF SECTION 735.
2. INSTALL GEOTEXTILE MATERIAL ALONG ALL INTERFACE AREAS WITH GROUND CONTACT.
3. PLACE CONCRETE PIPE ANCHORS AT THE ENDS OF PIPE, UNDER ALL JOINTS AND AT INTERMEDIATE LOCATIONS AS REQUIRED. PROVIDE 3.0 m (10'-0") MAXIMUM SPACING BETWEEN ANCHORS.
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

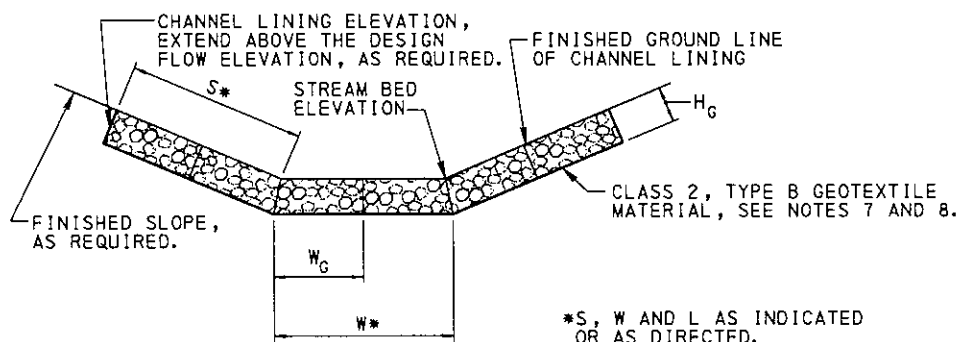
SLOPE PROTECTION



CHANNEL DEFLECTOR

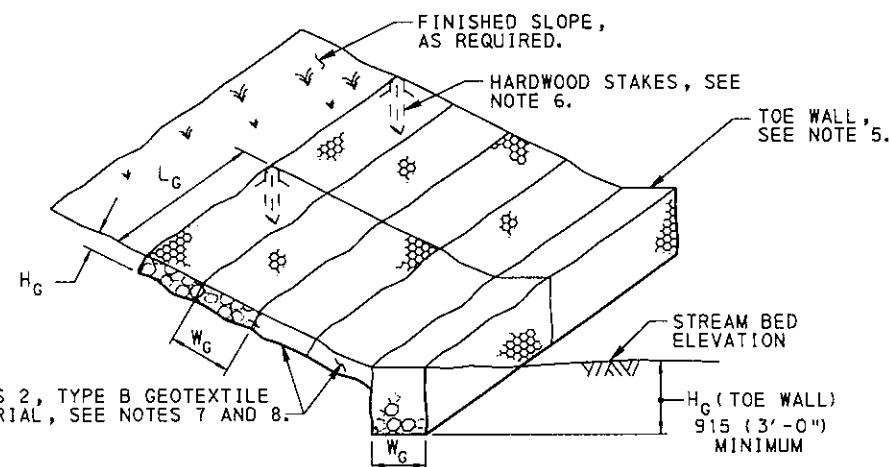
NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 626.
2. TYPE A GABIONS SHALL CONSIST OF WIRE-MESH BASKETS FILLED BY HAND PLACEMENT OF COARSE AGGREGATE, AT LEAST ALONG THE EXPOSED FACES, FOR A UNIFORM APPEARANCE.
3. SPECIFY TYPE B GABIONS OF WIRE-MESH BASKETS FILLED BY HAND PLACEMENT OR SMALL POWER EQUIPMENT PLACEMENT OF COARSE AGGREGATE.
4. MAKE CORROSION RESISTANT TYPE A AND TYPE B GABIONS THE SAME AS TYPE A AND TYPE B GABIONS EXCEPT SHEATH THE WIRE-MESH IN POLYVINYL CHLORIDE PLASTIC.
5. THE APRON OR TOE WALL IS REQUIRED WHERE THE SLOPE WALL IS INSTALLED ADJACENT TO WATER. MAKE THE APRON APPROXIMATELY TWO TIMES AS WIDE AS THE ANTICIPATED DEPTH OF SCOUR AND THE TOE WALL HEIGHT AT LEAST EQUAL TO THE ANTICIPATED DEPTH OF SCOUR.
6. WHEN GABIONS ARE PLACED ON A 1:1.5 (1.5:1) SIDE SLOPE OR STEEPER, DRIVE HARDWOOD STAKES THROUGH THE GABIONS, ALONG THE TOP EDGE, TO ANCHOR THE INSTALLATION. EMBED STAKES 450 (18") MINIMUM BELOW GABION BOTTOM.
7. PROVIDE GEOTEXTILE MATERIAL MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 212 AND SECTION 735.
8. INSTALL GEOTEXTILE MATERIAL ALONG ALL INTERFACE AREAS WITH GROUND CONTACT.
9. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

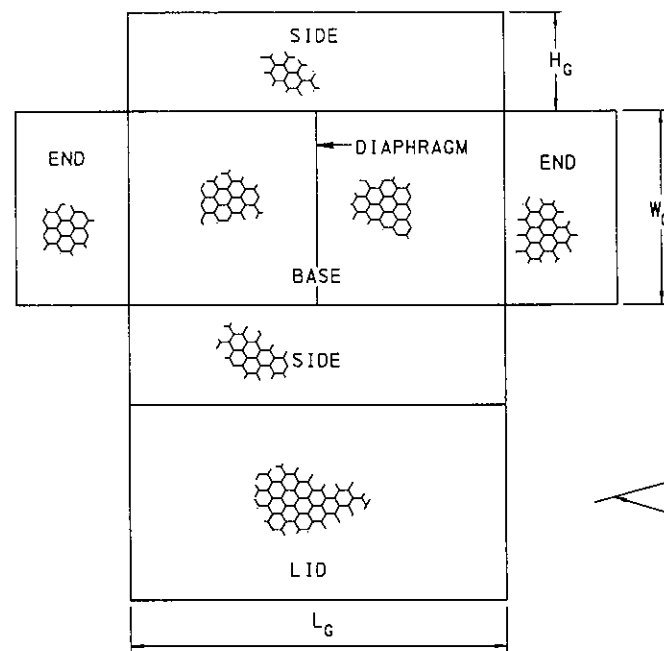


SECTION A-A CHANNEL LINING

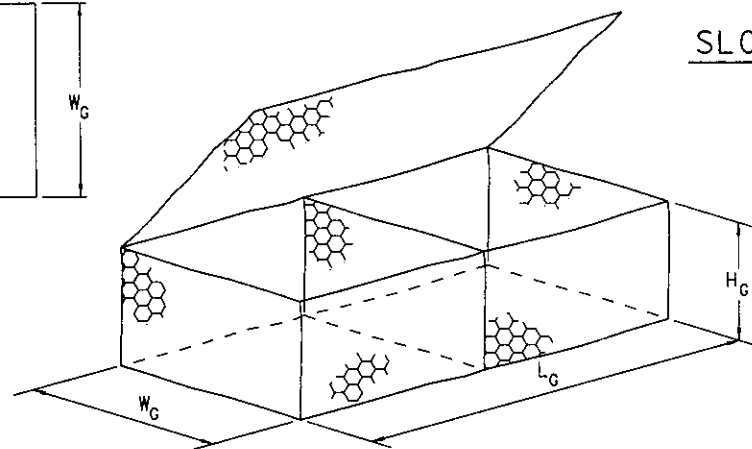
*S, W AND L AS INDICATED OR AS DIRECTED.



SLOPE WALLS



WIRE MESH BASKETS



GABIONS SIZES

MATTRESS TYPE		
W_G	L_G	H_G
1829 (6'-0")	2743 (9'-0")	229 (0'-9")
1829 (6'-0")	3658 (12'-0")	229 (0'-9")

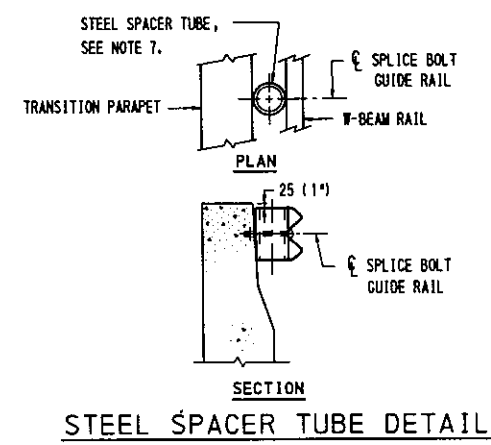
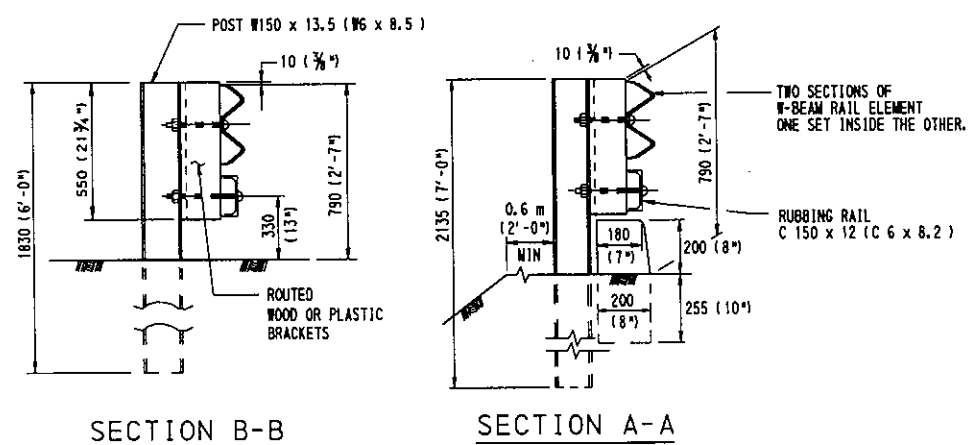
STANDARD		
W_G	L_G	H_G
914 (3'-0")	1829 (6'-0")	305 (1'-0")
914 (3'-0")	3658 (12'-0")	305 (1'-0")
914 (3'-0")	2743 (9'-0")	457 (1'-6")
914 (3'-0")	1829 (6'-0")	914 (3'-0")
914 (3'-0")	2743 (9'-0")	914 (3'-0")
914 (3'-0")	3658 (12'-0")	914 (3'-0")

ADDITIONAL SIZES MAY BE AVAILABLE ON A SPECIAL ORDER BASIS.

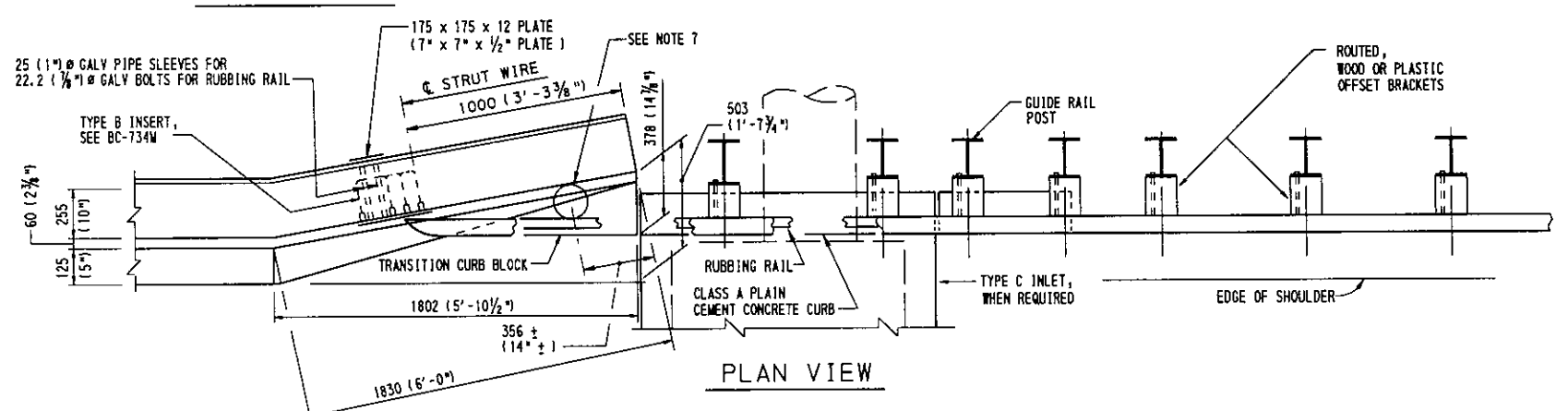
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
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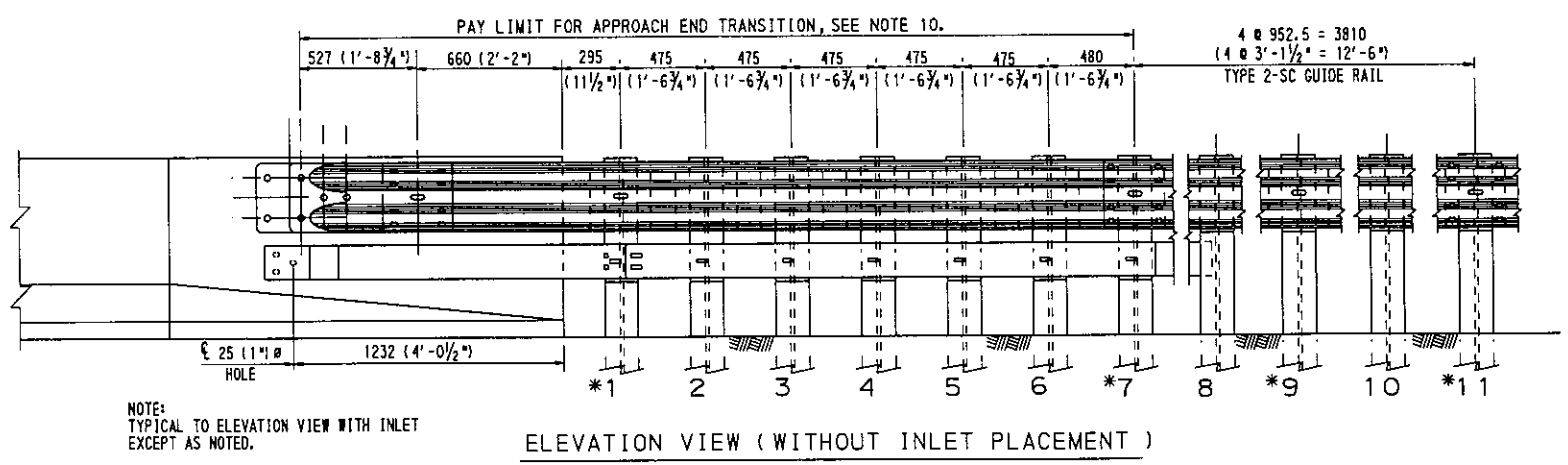
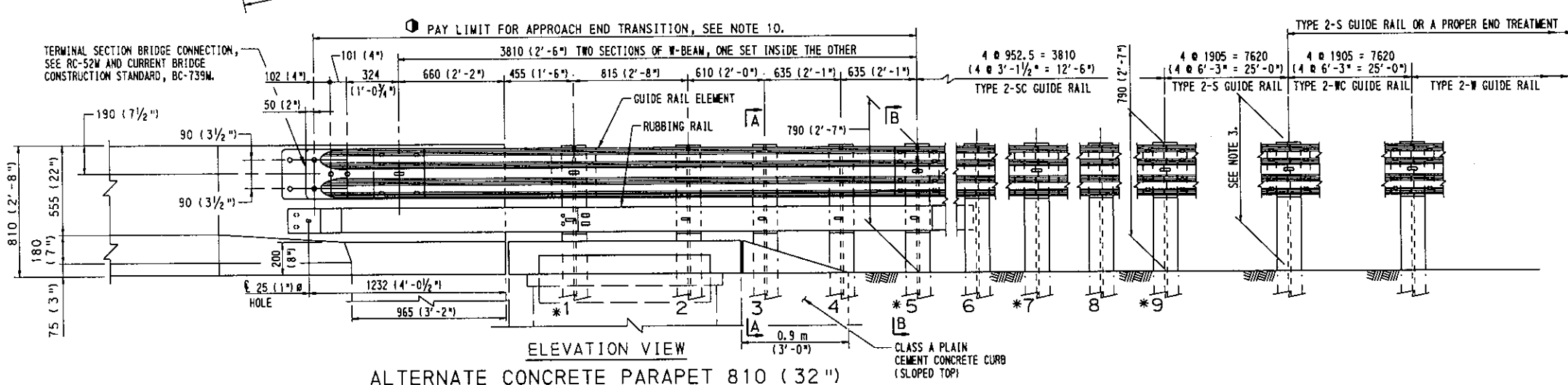
GABIONS



- NOTES**
1. PROVIDE MATERIALS AND WORKMANSHIP IN ACCORDANCE WITH PUBLICATION 408/2000.
 2. PROVIDE APPROACH END GUIDE RAIL TREATMENT AT BOTH THE APPROACH AND TRAILING ENDS OF STRUCTURE PARAPETS ON TWO LANE FACILITIES WITH TWO-WAY TRAFFIC. ON FOUR LANE DIVIDED HIGHWAYS, GUIDE RAIL IS NOT REQUIRED ON TRAILING ENDS OF PARAPETS UNLESS WARRANTED BY OTHER OBSTRUCTIONS.
 3. WHEN CONNECTING TO TYPE 2-S GUIDE RAIL OLD 840 (33"), NEW 706 (27") OR TYPE 2-W GUIDE RAIL 770 (30"), TRANSITION UP OR DOWN 25 (1") PER 7620 (25'-0").
 4. BOLT RUBBING RAIL TO POST WITHOUT WASHER.
 5. ATTACH TERMINAL SECTION AND RUBBING RAIL END FLUSH WITH SLOPED TOE OF F SHAPE. INSTALLATION CAN BE GREATLY SIMPLIFIED BY FABRICATING OR SHOP TWISTING TO BE CONSISTENT WITH THE SLOPE OF F SHAPE.
 6. PROVIDE #1, 2 & 3 POSTS 2130 (7'-0") LONG AND EMBED THEM 305 (12") DEEPER THAN THE OTHER POSTS.
 7. STEEL SPACER TUBE, SCHEDULE 40 GALVANIZED PIPE, 150 (6") ID x305 (12"). CONNECT TO THE RAIL ELEMENTS USING SPLICE BOLT.
 8. GALVANIZE ALL HARDWARE, GUIDE RAIL MATERIAL POSTS AND RUBBING RAIL IN ACCORDANCE WITH PUBLICATION 408/2000, SECTION 1109.
 9. CONCRETE PARAPET AND EMBEDDED COMPONENTS ARE BRIDGE ITEMS.
 10. PAYMENT FOR THE APPROACH END TRANSITION, EITHER WITH OR WITHOUT INLET PLACEMENT, INCLUDES THE TWO 3810 (2'-6") SECTIONS OF W-BEAM, POSTS, OFFSET BRACKETS, STEEL SPACER TUBE, RUBBING RAIL, RUBBING RAIL CONNECTIONS, TERMINAL SECTION BRIDGE CONNECTION AND ASSOCIATED HARDWARE.
 11. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.



- LEGEND**
- ① ON STRUCTURES WHERE STRUCTURE MOUNTED (TYPE 2-SC) GUIDE RAIL IS USED, THE APPROACH END TRANSITION IS NOT REQUIRED.
 - * POSTS THAT ARE DENOTED WITH (*) ARE BOLTED TO THE W-BEAM.



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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

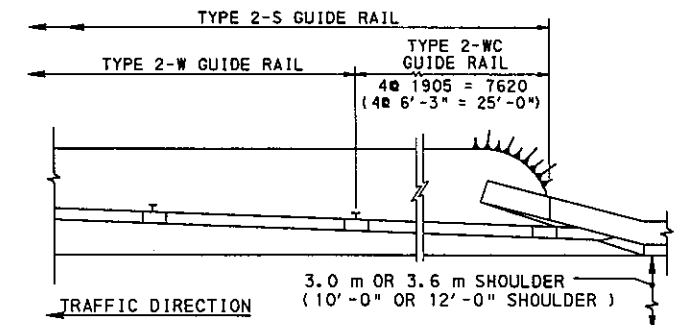
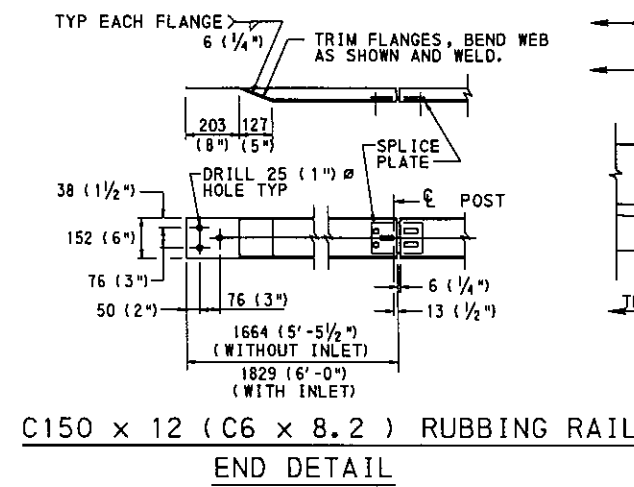
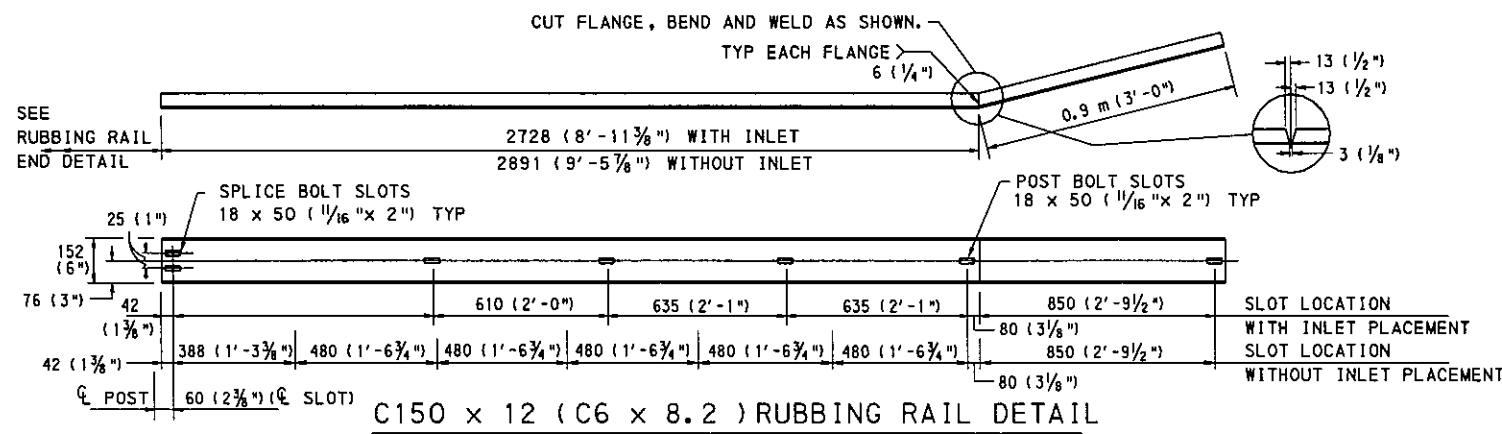
GUIDE RAIL TRANSITION AT
END OF STRUCTURE

RECOMMENDED APR. 28, 2000 RECOMMENDED APR. 28, 2000 SHT 1 OF 2

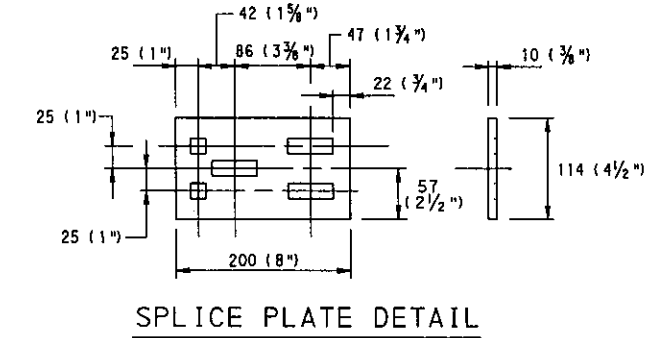
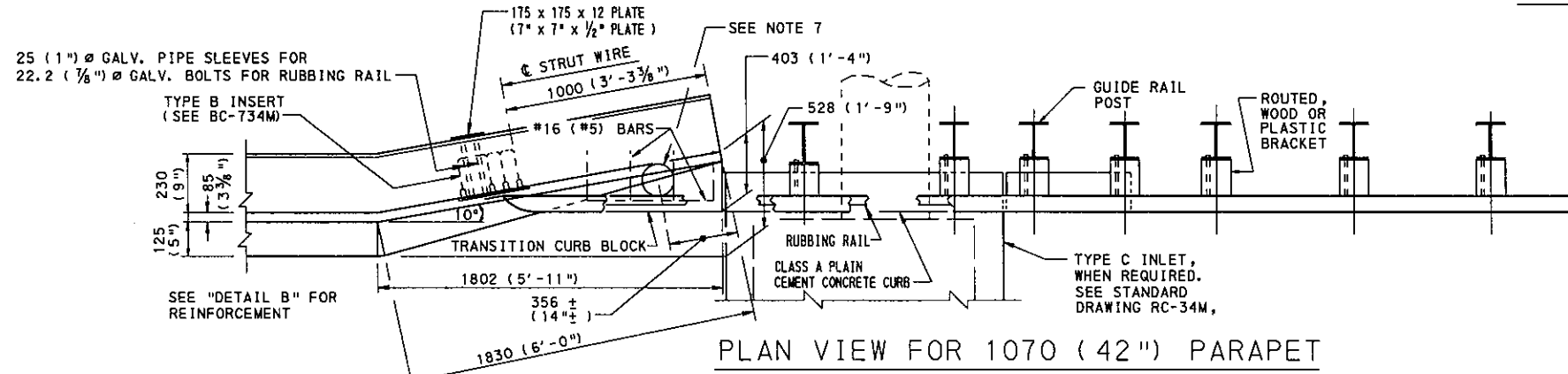
Dean A. Schmitt *Gary L. Hoffman*
 DIRECTOR, BUREAU OF DESIGN CHIEF ENGINEER

RC-50M

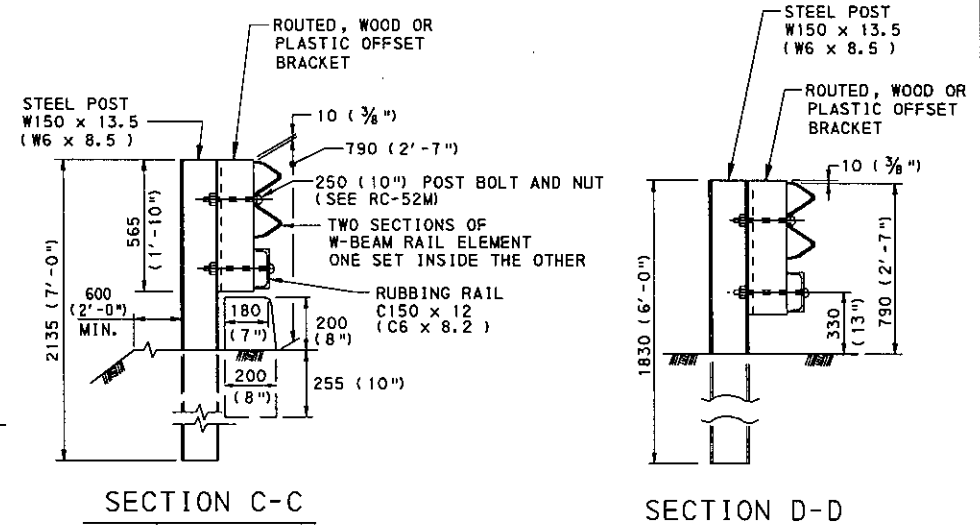
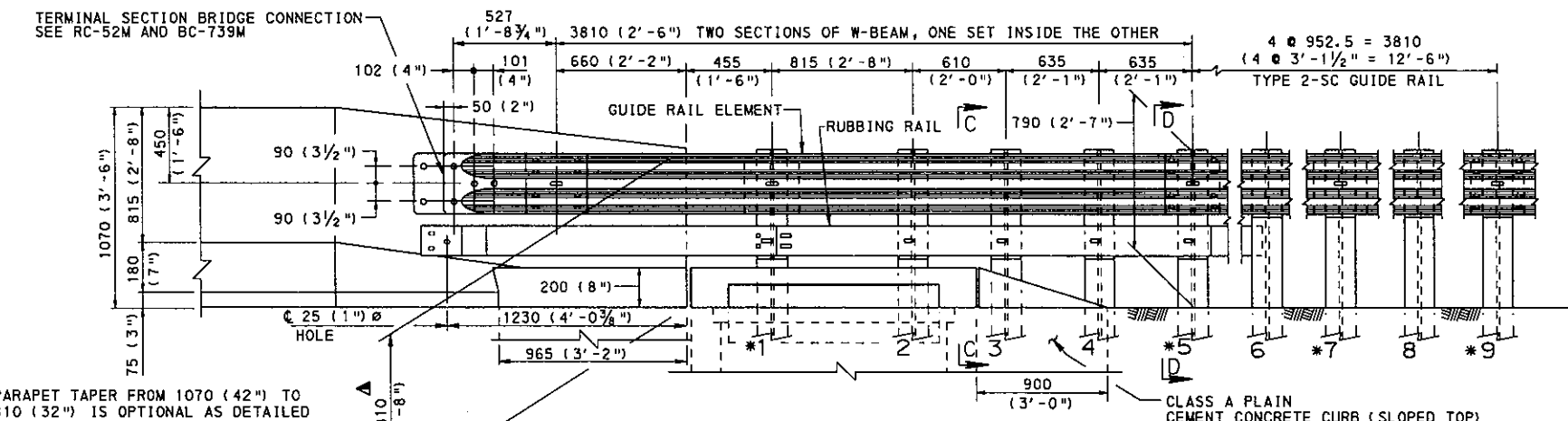
17-APR-2000



TRAILING END GUIDE RAIL AT STRUCTURE PARAPET
SEE NOTE 2, SHEET 1

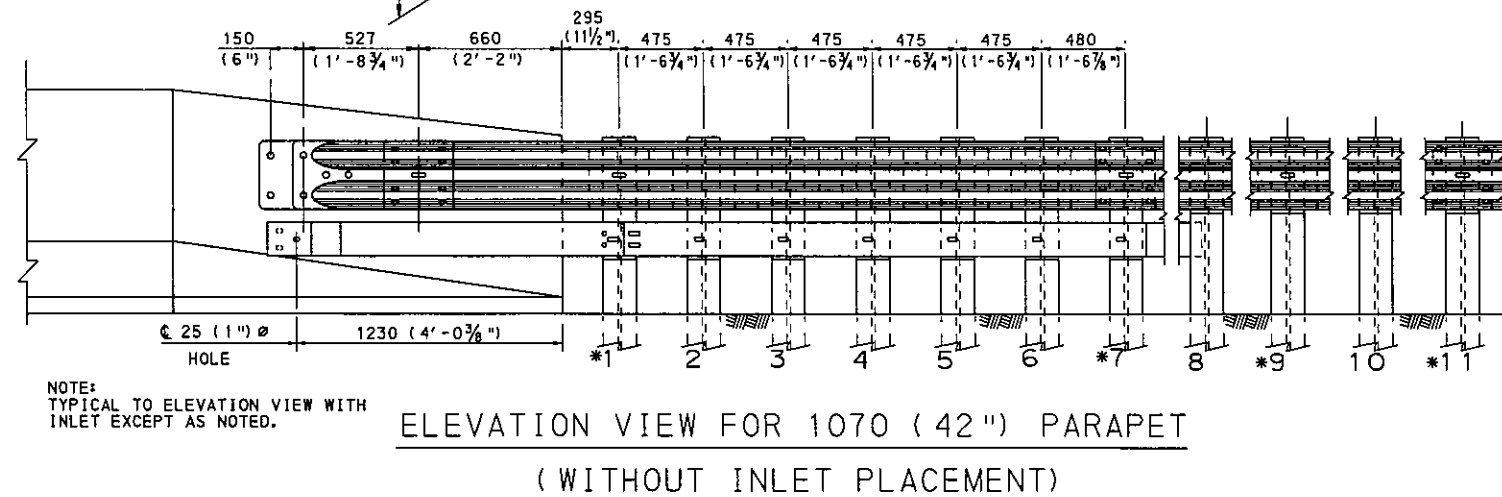


SPLICE PLATE DETAIL



SECTION C-C

SECTION D-D



ELEVATION VIEW FOR 1070 (42\") PARAPET
(WITHOUT INLET PLACEMENT)

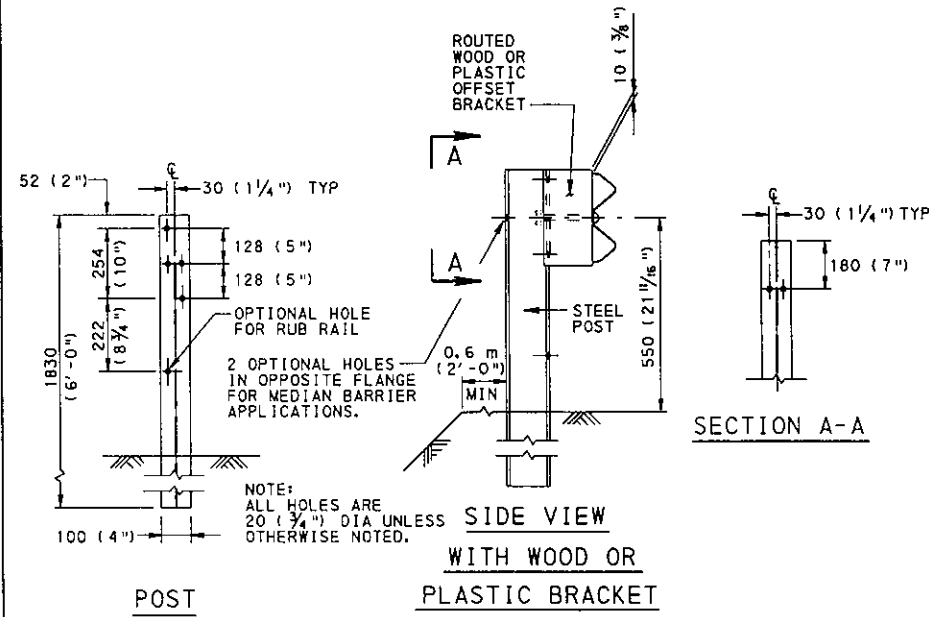
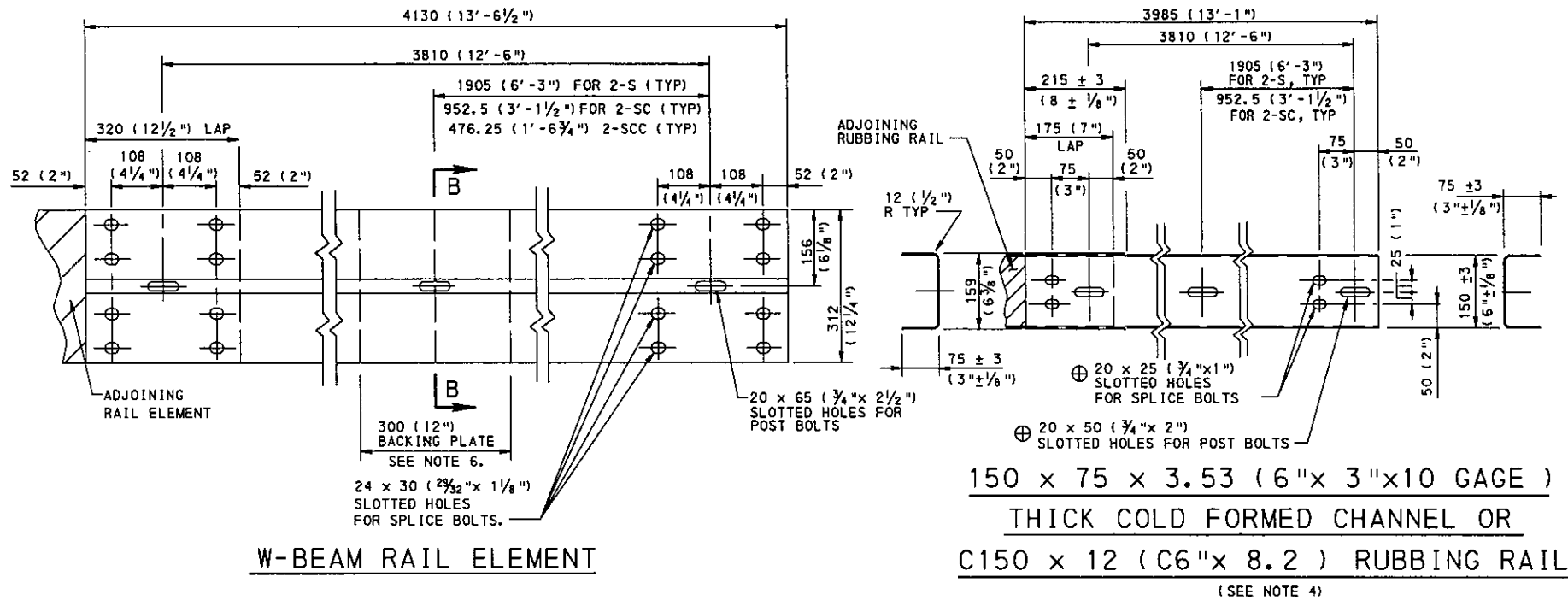
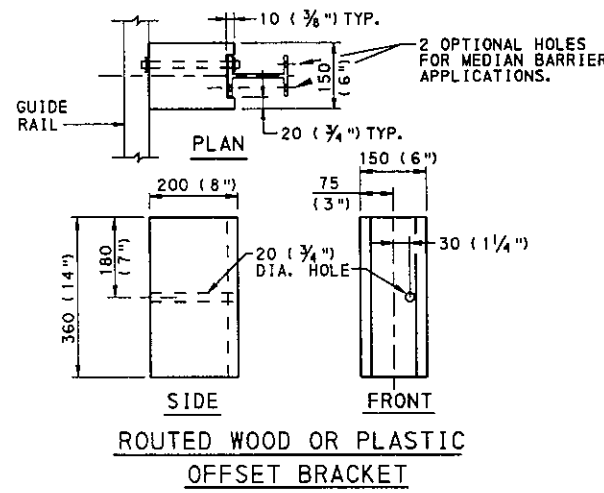
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

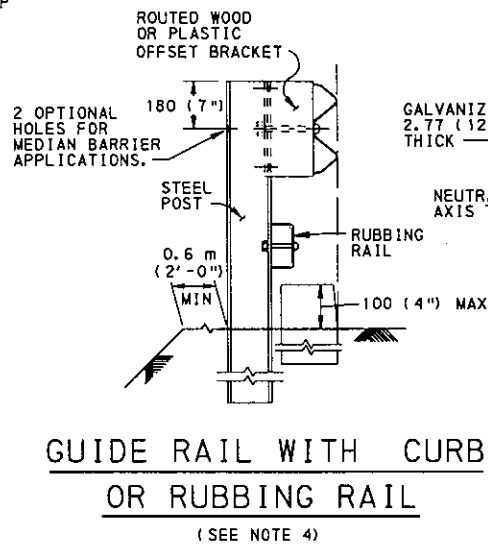
GUIDE RAIL TRANSITION AT
END OF STRUCTURE

RECOMMENDED APR. 28, 2000
RECOMMENDED APR. 28, 2000
SHT 2 OF 2
DIRECTOR, BUREAU OF DESIGN
CHIEF ENGINEER
RC-50M

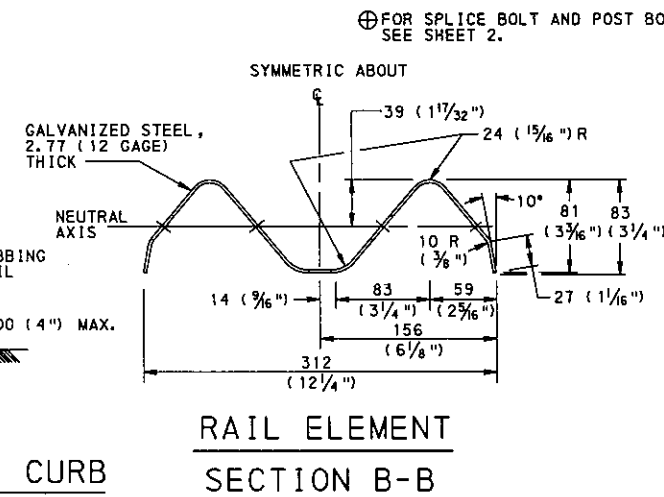
FOR NOTES, SEE SHEET 1.



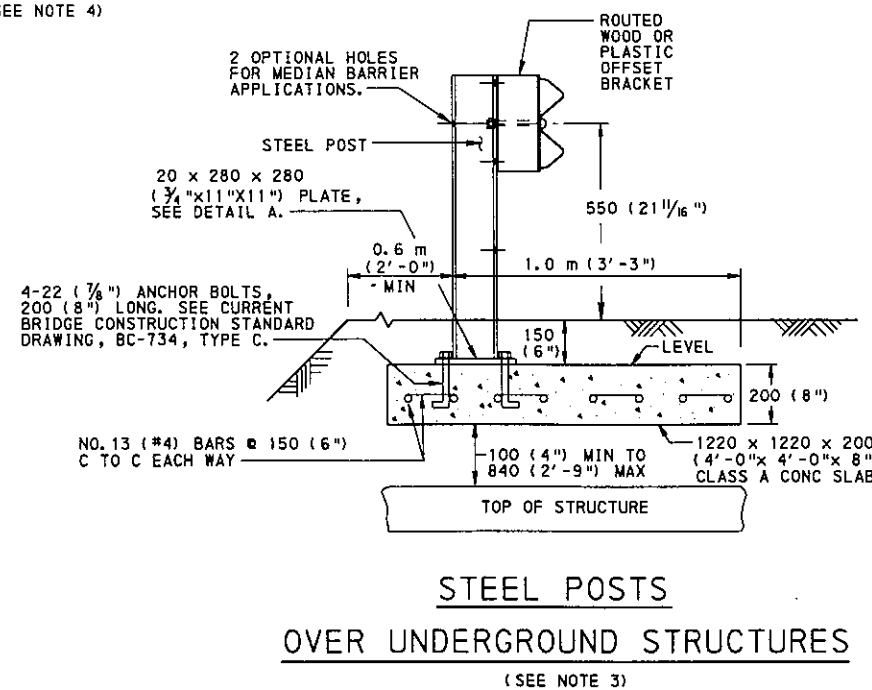
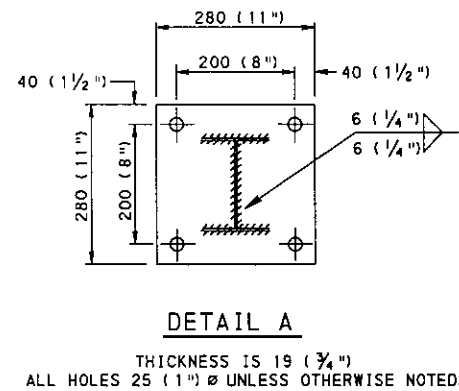
W150 x 13.5 (W6 x 8.5 or 9.0) POST DETAILS



GUIDE RAIL WITH CURB OR RUBBING RAIL (SEE NOTE 4)



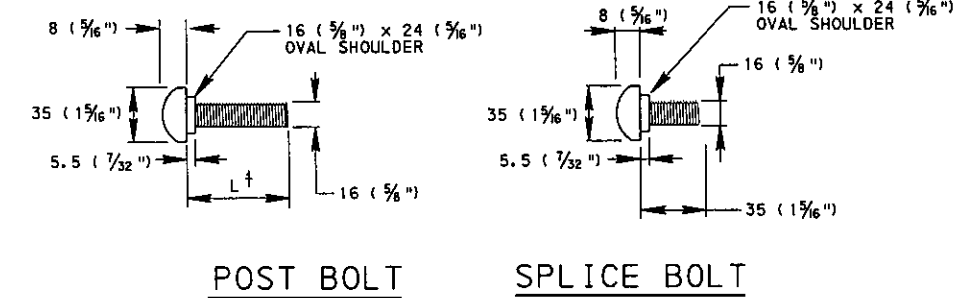
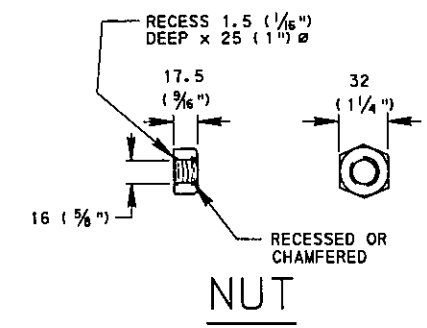
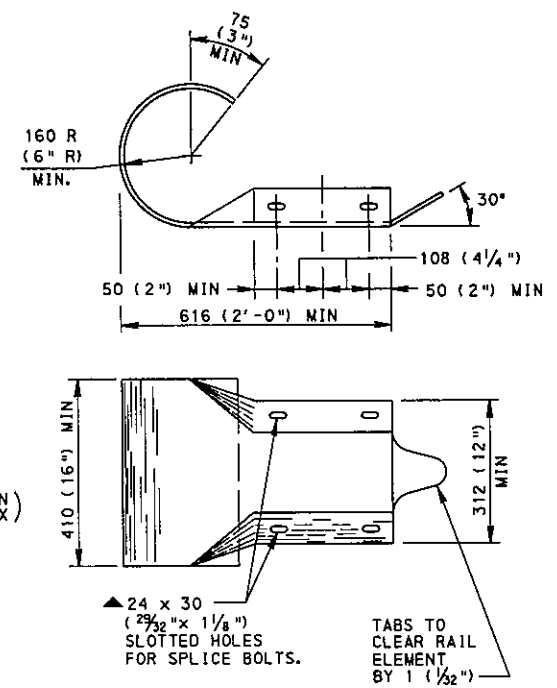
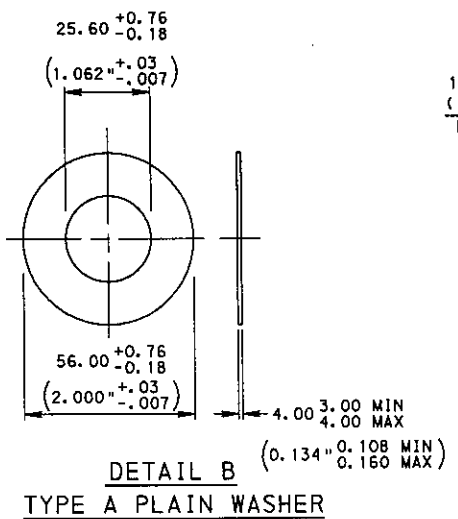
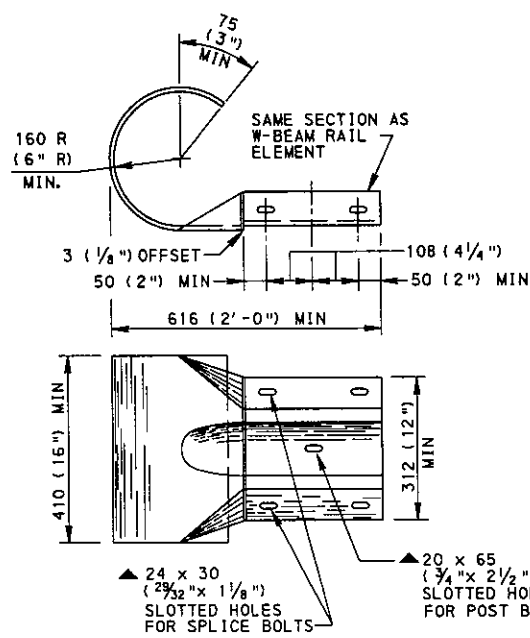
RAIL ELEMENT SECTION B-B



- NOTES
1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, 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 () PARENTHESES.
 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.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST
GUIDE RAIL

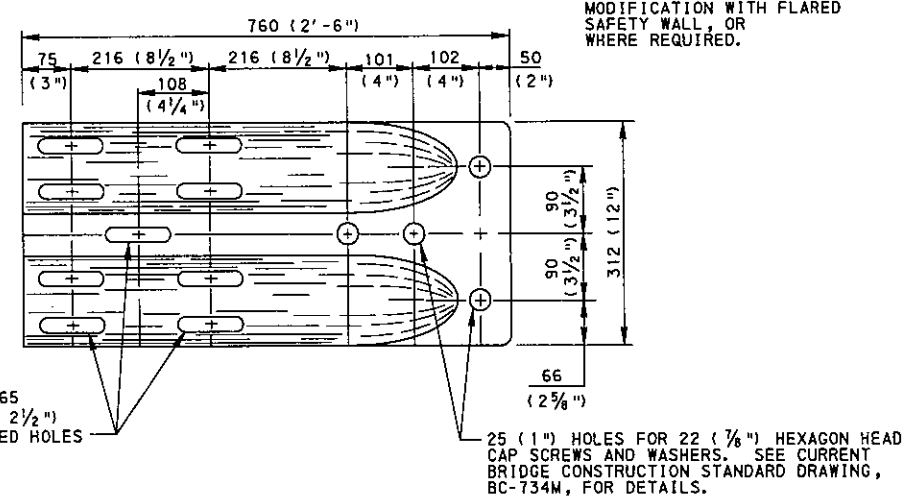
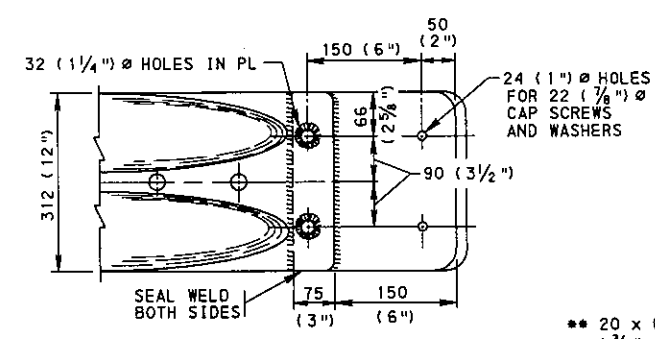
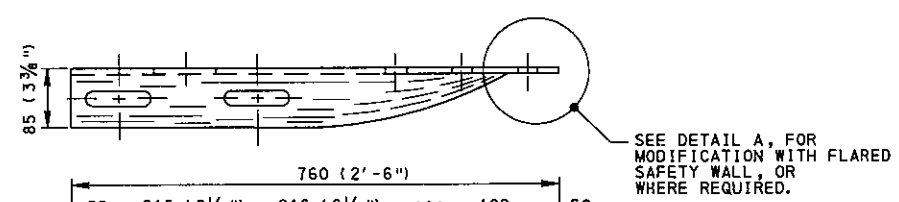
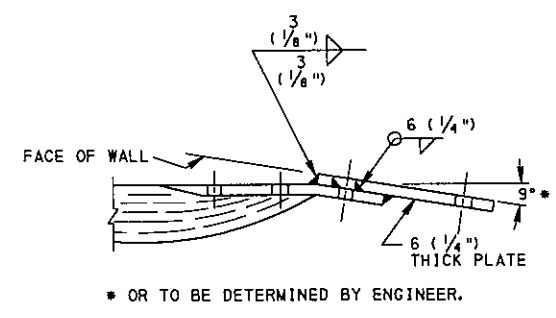


† USE L = 115 (4 1/2") FOR ALL RUBBING RAIL TO GUIDE RAIL POST CONNECTIONS AND USE L = 255 (10") FOR ALL W-BEAM RAIL ELEMENT TO GUIDE RAIL POST AND WOOD OR PLASTIC OFFSET BRACKET CONNECTIONS.

TERMINAL TO BE PLACED ON BACK OF RAIL ELEMENT

TERMINAL TO BE PLACED ON FACE OF RAIL ELEMENT

ALTERNATE TERMINAL SECTIONS



(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. SEE CURRENT BRIDGE CONSTRUCTION DRAWINGS, BC-739M, FOR ATTACHMENT DETAILS.

TERMINAL SECTION BRIDGE CONNECTION

NOTES

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

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

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

**TYPE 2 STRONG POST
GUIDE RAIL**

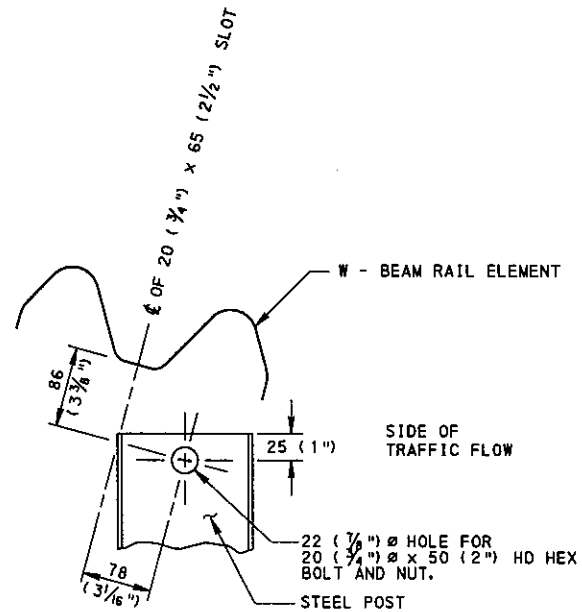
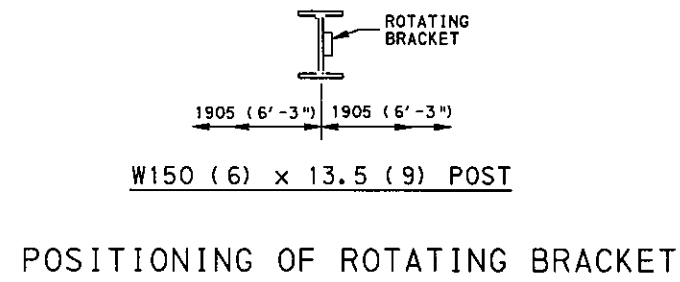
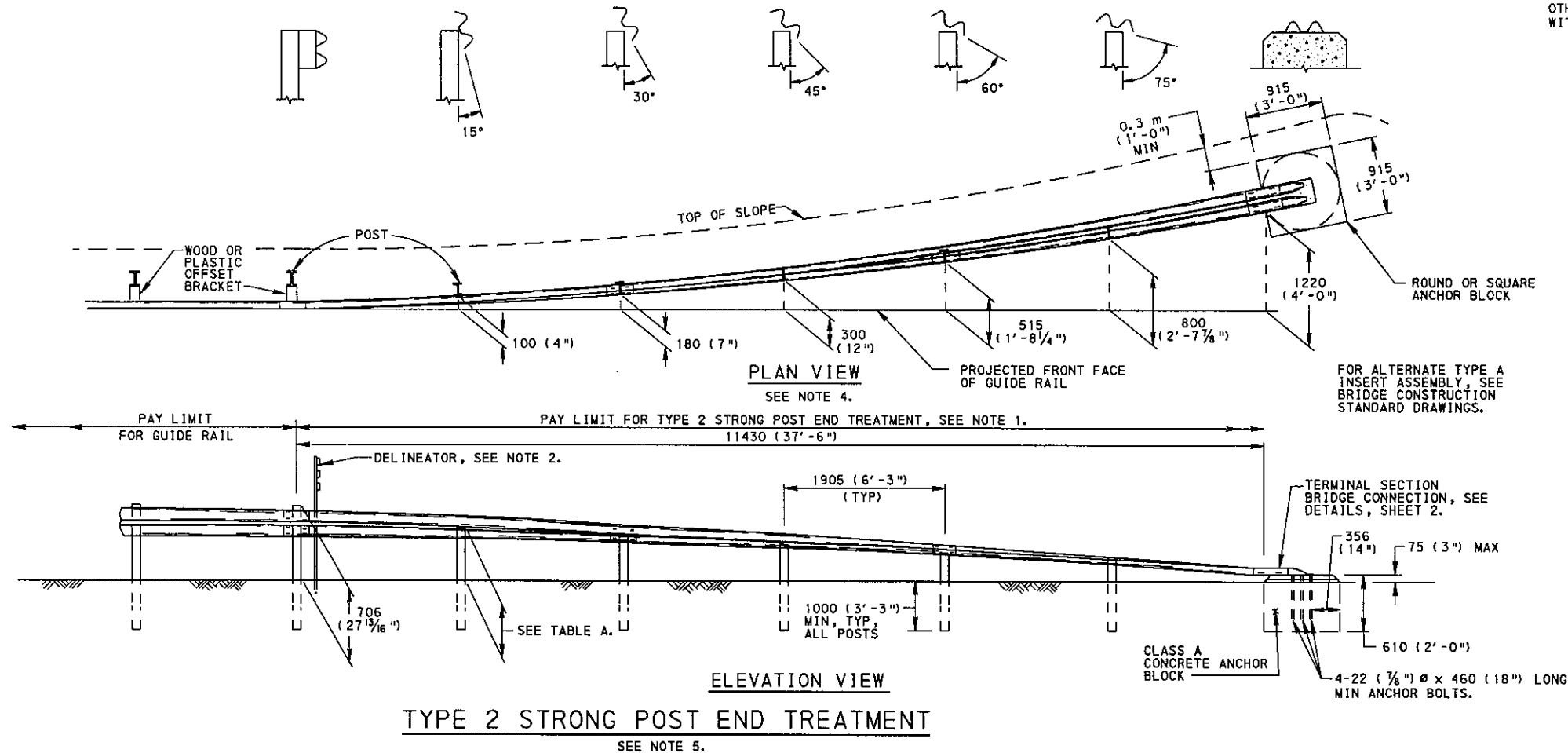


TABLE A

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

- NOTES
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 STRONG-POST GUIDE RAIL ON THE NHS. ALSO, THEY CAN NOT BE USED ON OTHER HIGHWAYS WITH POSTED SPEEDS 70 km/h (45 mph) AND ABOVE AND WITH CURRENT TRAFFIC VOLUMES 4000 VEHICLES PER DAY AND ABOVE.



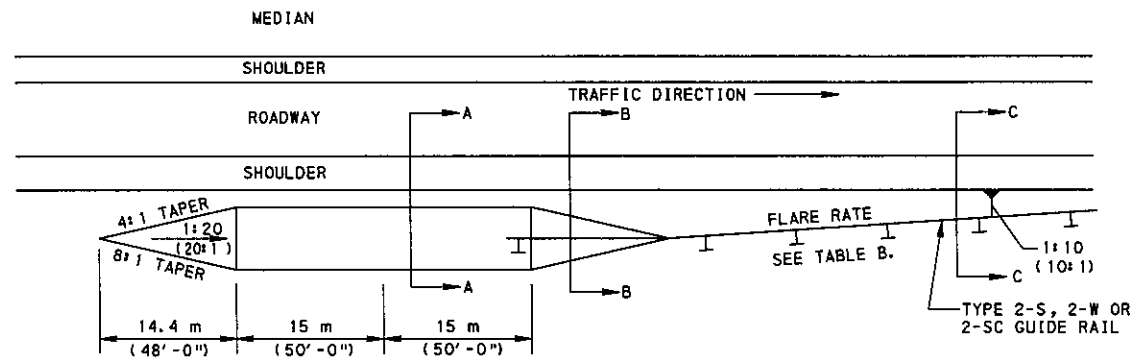
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST
GUIDE RAIL
END TREATMENTS

TABLE B
FLARE RATES
FOR BARRIER DESIGN

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

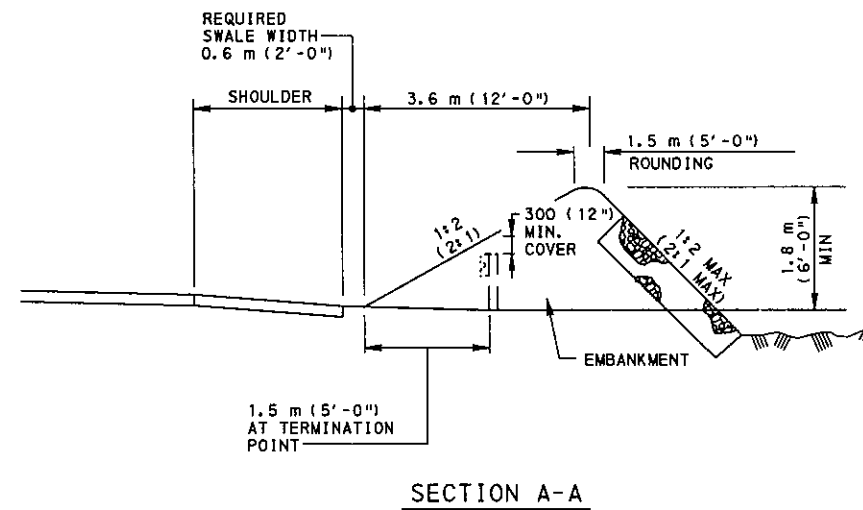


TYPICAL EARTH MOUND FOR BURYING GUIDE RAIL

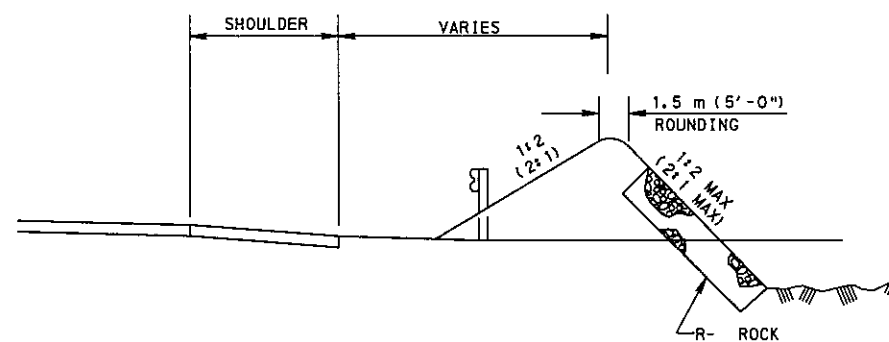
SEE NOTE 2.

NOTES

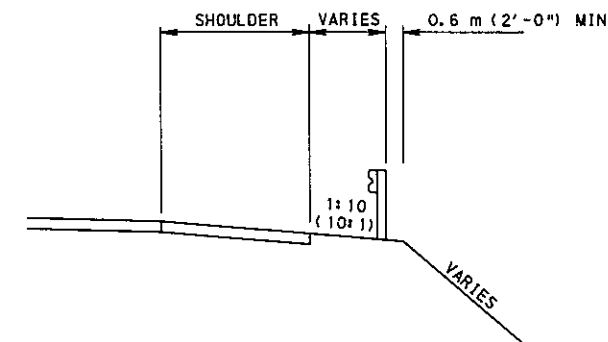
1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408/2000.
2. ALL MATERIAL NECESSARY TO CONSTRUCT EARTH MOUNDS ARE IN ACCORDANCE WITH APPLICABLE SECTIONS OF PUBLICATION 408/2000.



SECTION A-A



SECTION B-B

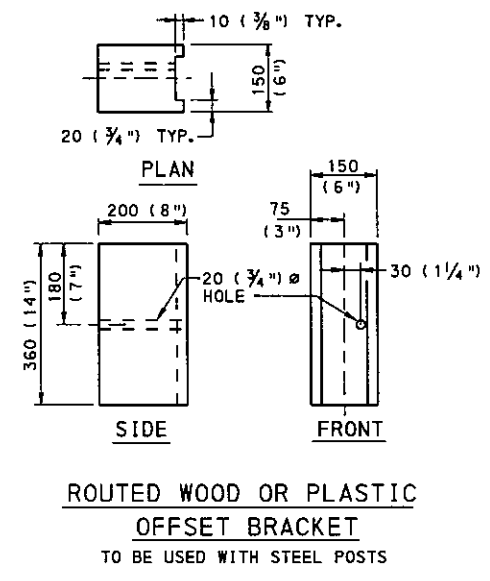
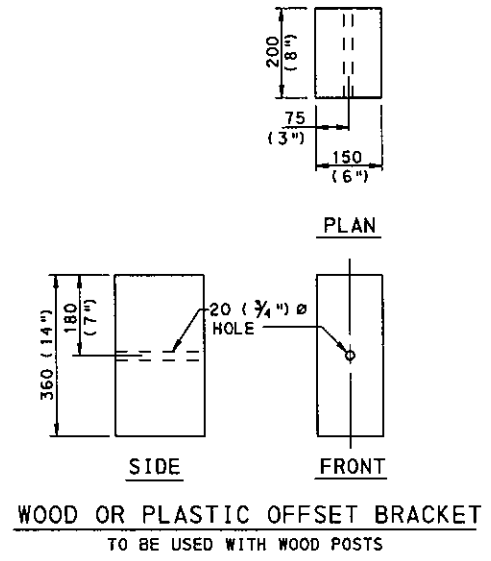


SECTION C-C

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

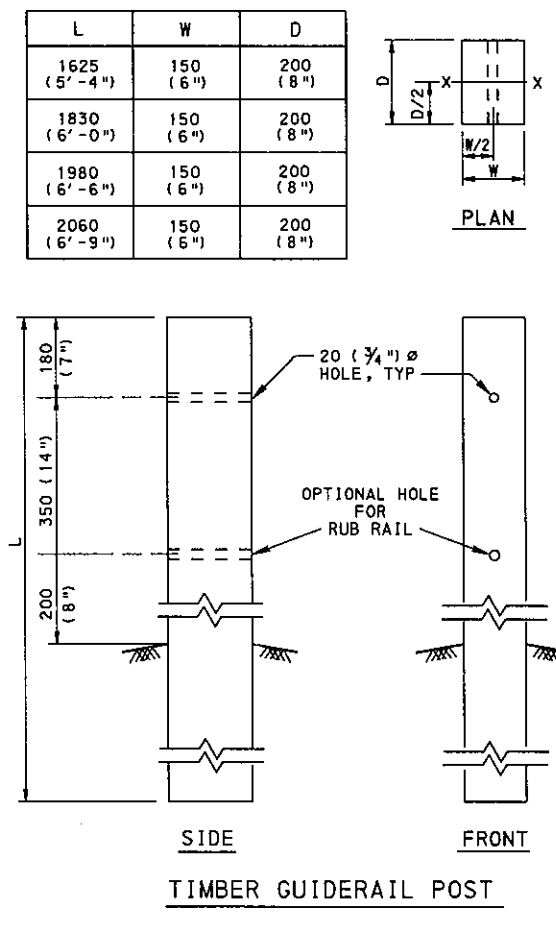
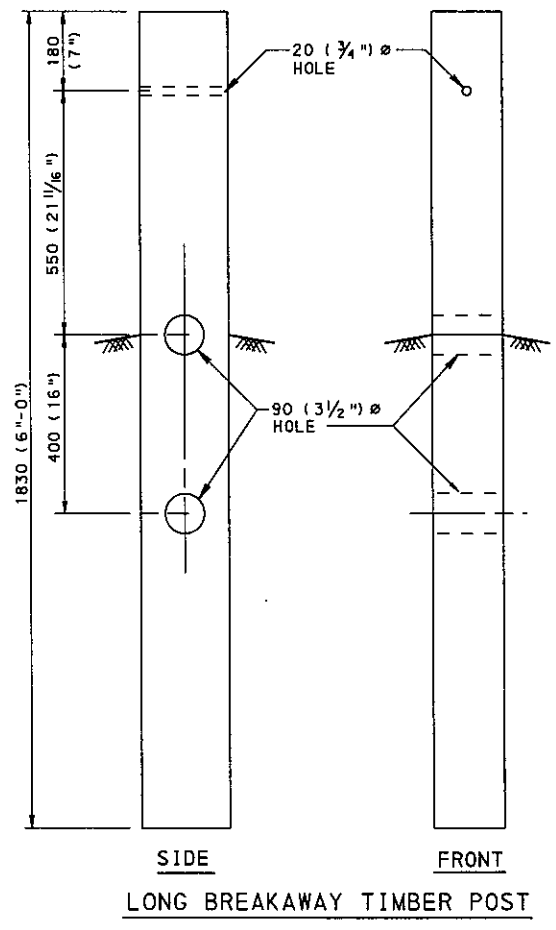
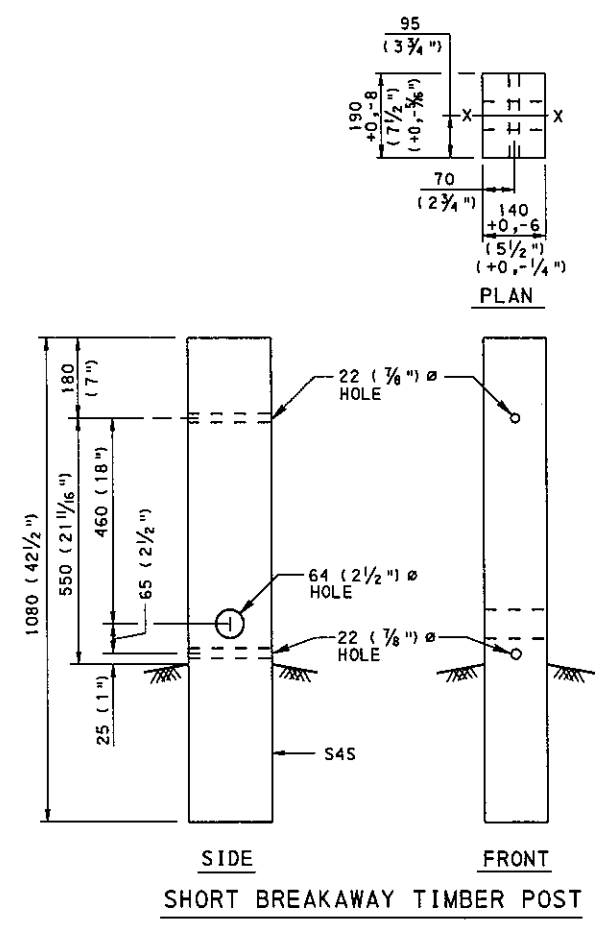
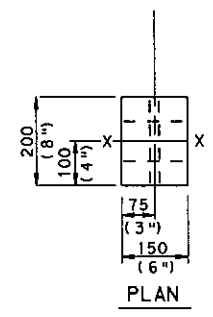
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST
GUIDE RAIL
END TREATMENTS



NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408/2000.
2. WOOD POSTS ARE TO BE USED FOR END TREATMENTS AND SPECIAL CONDITIONS ON A CASE BY CASE BASIS. THEY ARE NOT TO BE USED AS ALTERNATES TO STEEL POSTS FOR GUIDE RAIL.

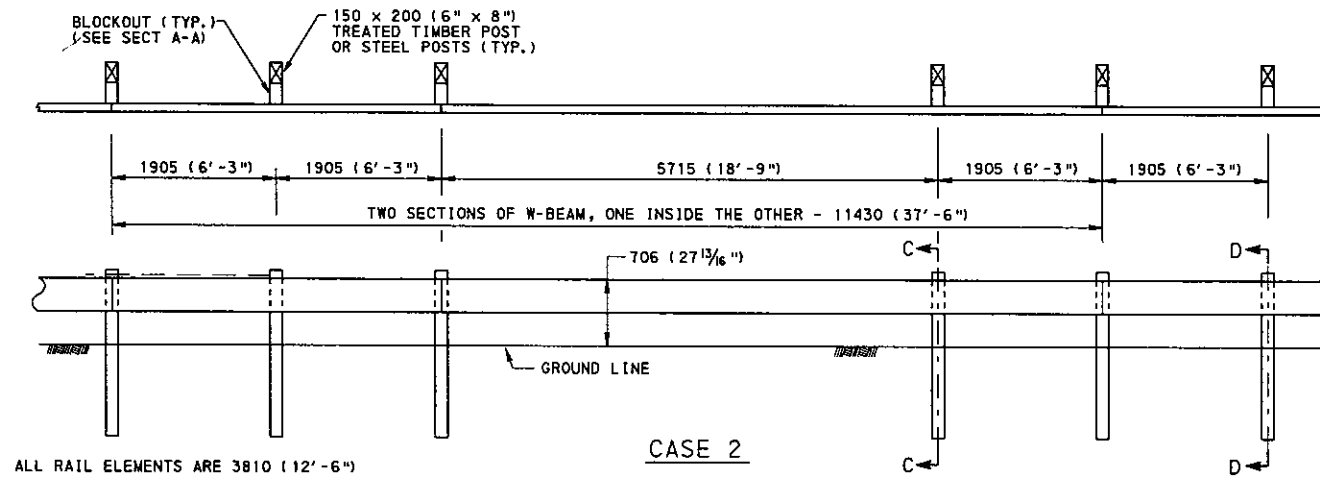


NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

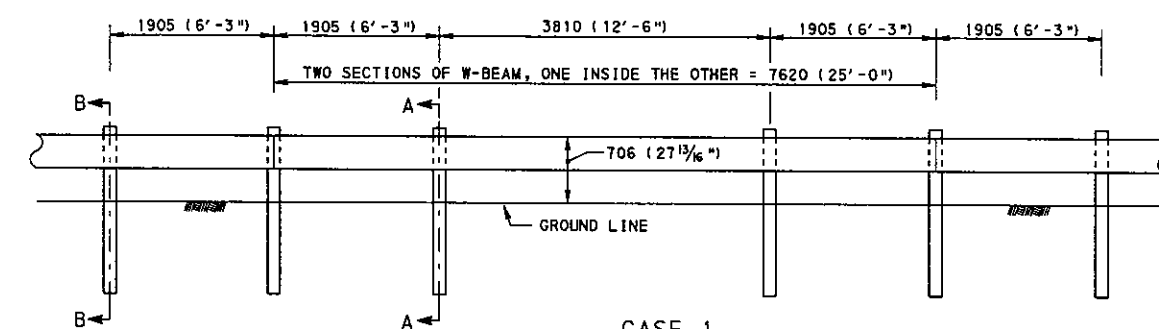
TYPE 2 STRONG POST
GUIDE RAIL
POSTS AND OFFSET BRACKETS

RECOMMENDED APR. 28, 2000 <i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary S. Hoffman</i> CHIEF ENGINEER	SHT. 5 OF 6 RC-52M
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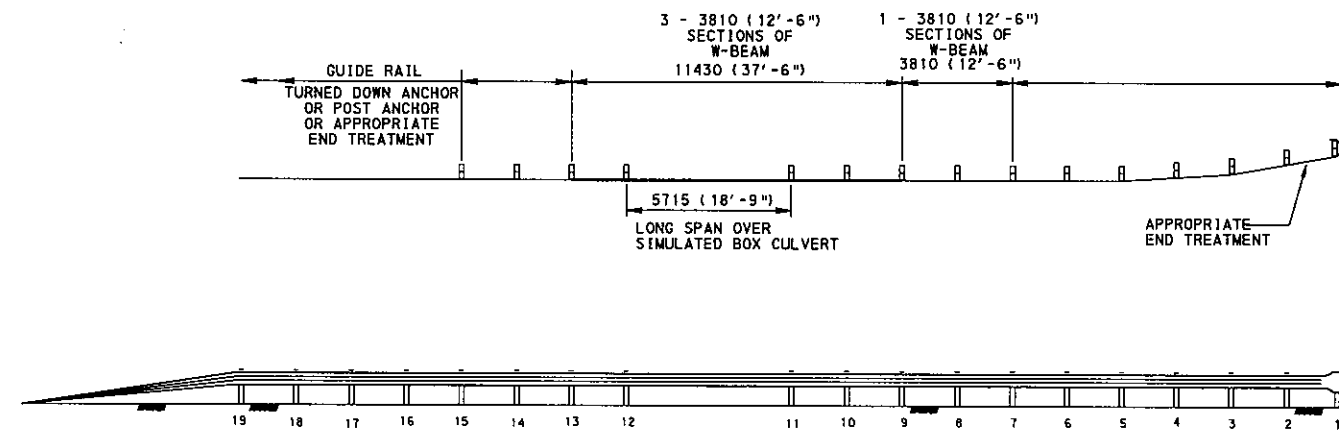


ALL RAIL ELEMENTS ARE 3810 (12'-6")

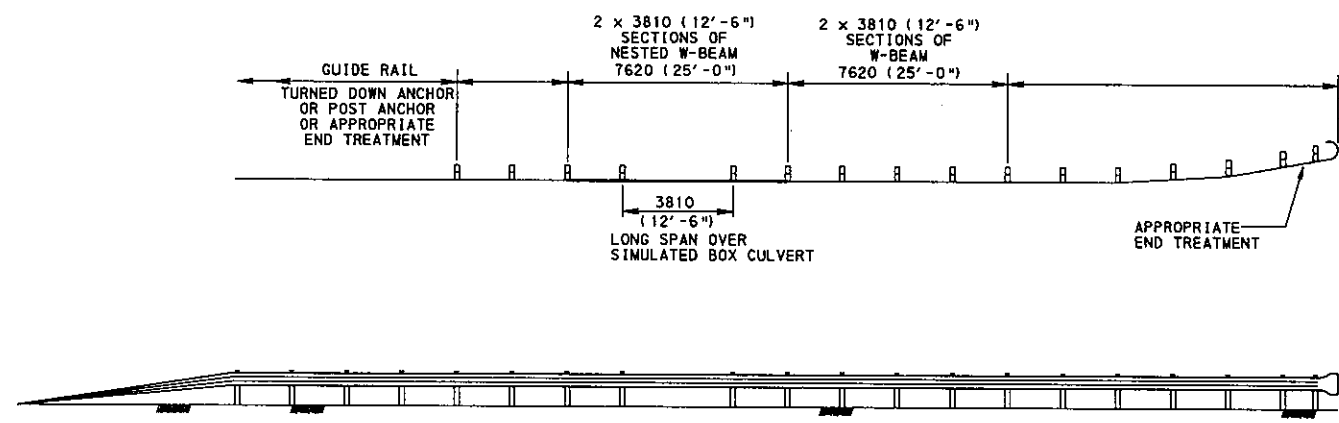
CASE 2



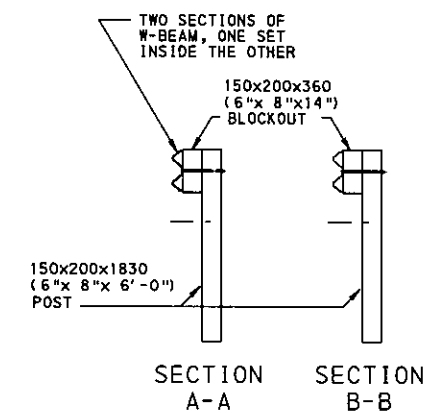
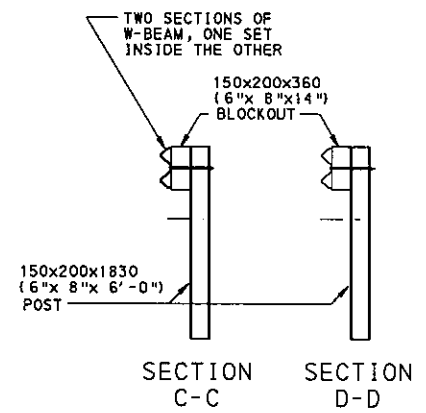
CASE 1



DETAILS OF NESTED W-BEAM (TYPE 2-S) GUIDERAIL ACROSS LOW-FILL CULVERTS. CASE 2



DETAILS OF NESTED W-BEAM (TYPE 2-S) GUIDERAIL ACROSS LOW-FILL CULVERTS. CASE 1

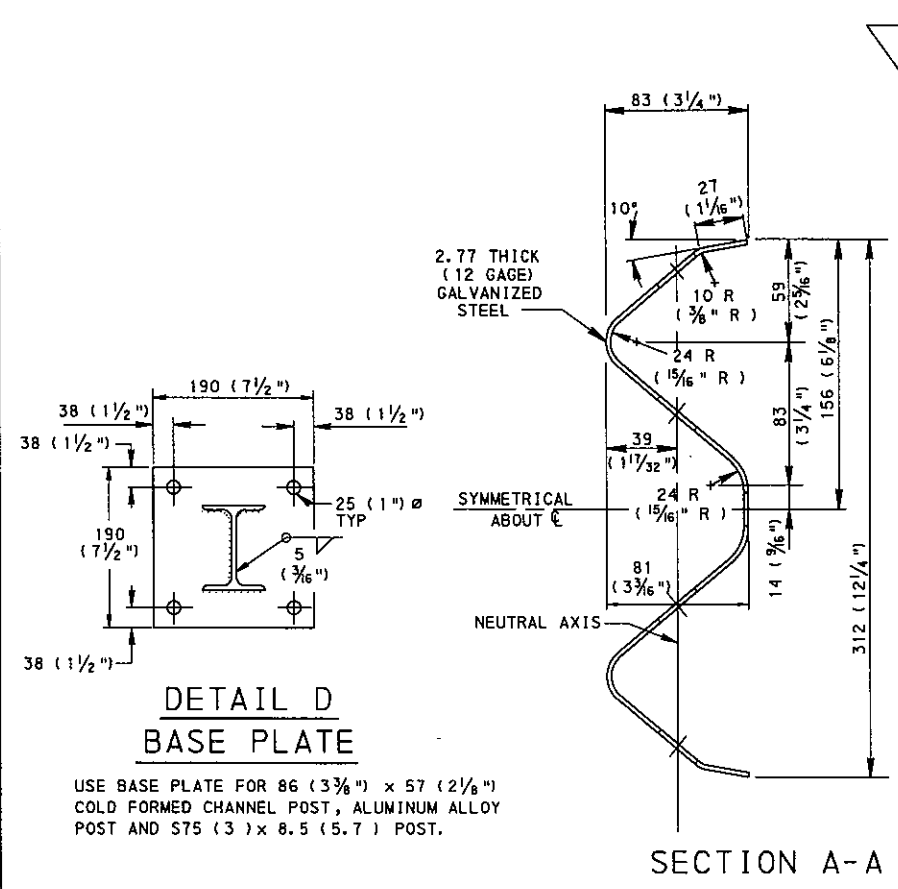


NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

TYPE 2 STRONG POST
GUIDERAIL
ACROSS CULVERTS

RECOMMENDED APR. 28, 2000 <i>Dean A. Edwards</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Harry L. Hoffman</i> CHIEF ENGINEER	SHT. 6 OF 6 RC-52M
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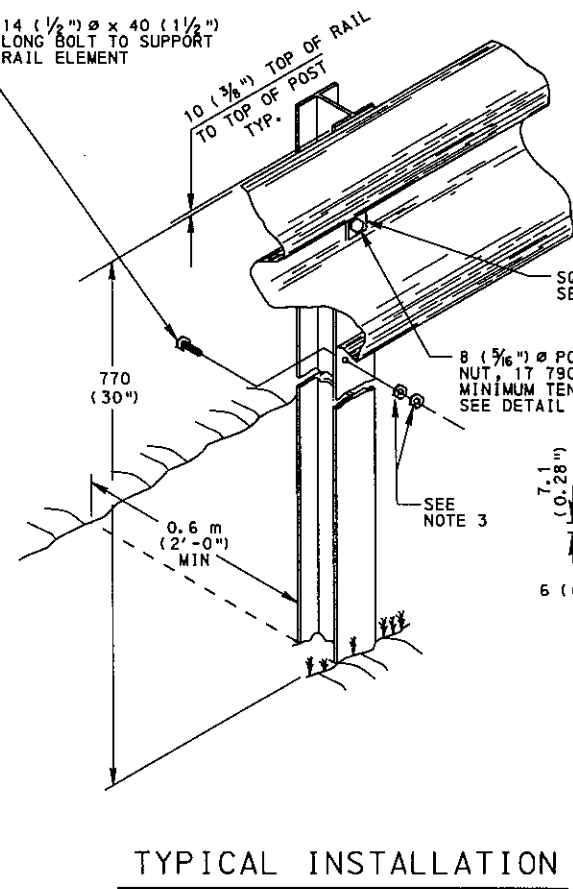


**DETAIL D
BASE PLATE**

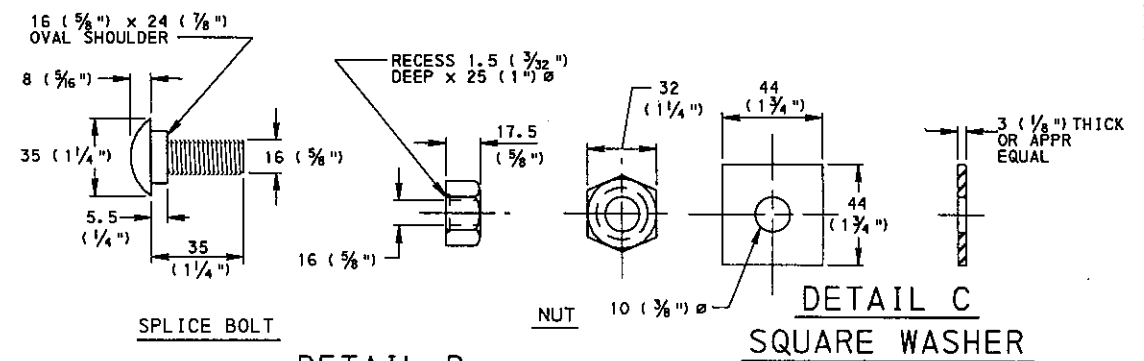
USE BASE PLATE FOR 86 (3 3/8) x 57 (2 1/4) COLD FORMED CHANNEL POST, ALUMINUM ALLOY POST AND S75 (3) x 8.5 (5.7) POST.

NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 620.
2. THE 86 (3 3/8) x 57 (2 1/4) COLD FORMED CHANNEL POST, S75 (S3) x 8.5 (5.7) POST AND ALUMINUM ALLOY POST MAY BE BID AS ALTERNATES FOR TYPE 2 WEAK POST GUIDE RAIL SYSTEM; HOWEVER, MIXING OF DIFFERENT POSTS IS NOT ACCEPTABLE WITHIN A PROJECT.
3. DURING ERECTION, USE SUPPORT BOLTS TO SUPPORT THE RAIL ELEMENT UNTIL THE 8 (5/16) POST BOLTS ARE PROPERLY TORQUED. LEAVE SUPPORT BOLTS IN PLACE AFTER CONSTRUCTION.
4. ATTACH W-BEAM RAIL ELEMENT TO EACH POST. SPLICE ONLY AT POSTS AND LAP IN THE DIRECTION OF TRAFFIC.
5. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.



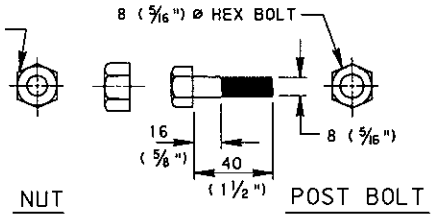
TYPICAL INSTALLATION



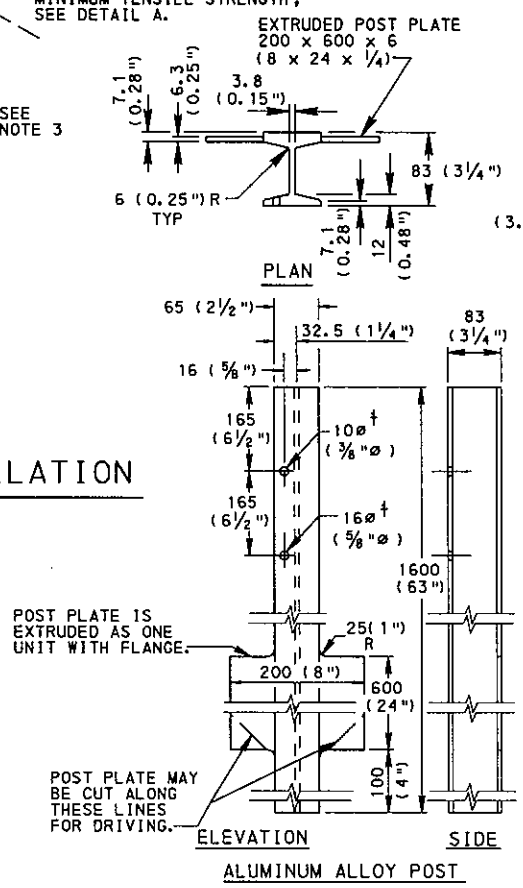
DETAIL B

**DETAIL C
SQUARE WASHER**

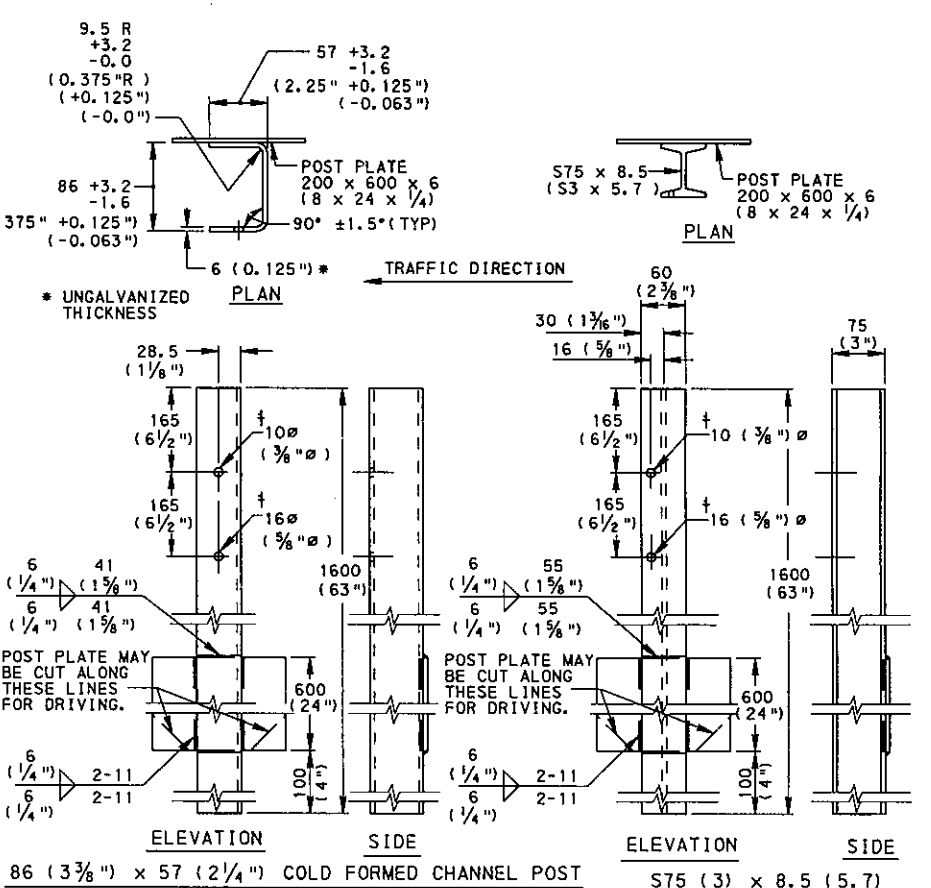
SECTION A-A



DETAIL A



ALUMINUM ALLOY POST

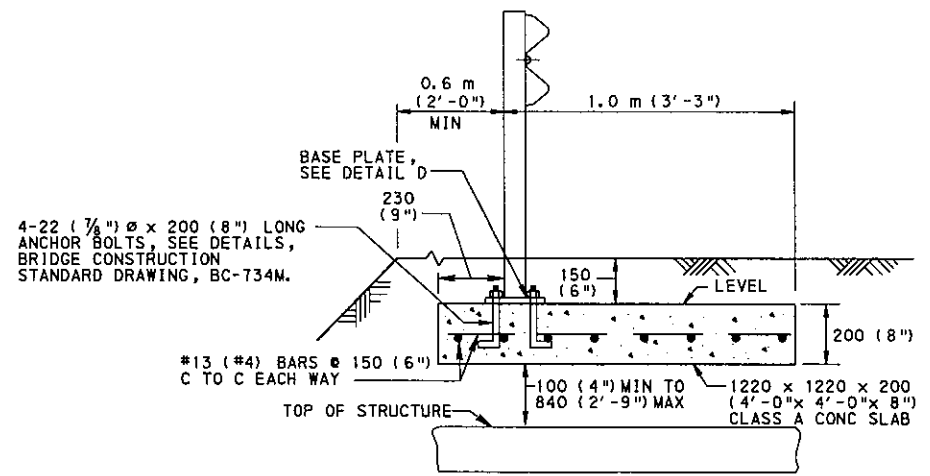


86 (3 3/8) x 57 (2 1/4) COLD FORMED CHANNEL POST
S75 (3) x 8.5 (5.7)

TYPE 2-W GUIDE RAIL POSTS

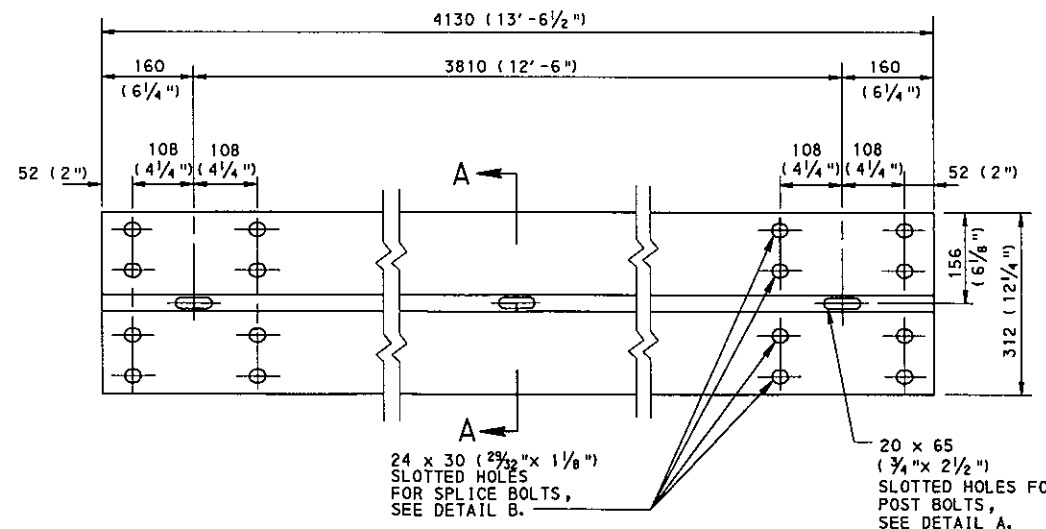
† CONFORM POST DETAILS FOR TYPE 2-WM MEDIUM BARRIER TO THE DETAILS AS SHOWN, EXCEPT LOCATE THE POST BOLT AND SUPPORT BOLT HOLES ON THE FRONT AND REAR FLANGES.

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



**GUIDE RAIL
OVER UNDERGROUND STRUCTURES**

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



*** W-BEAM RAIL ELEMENT**

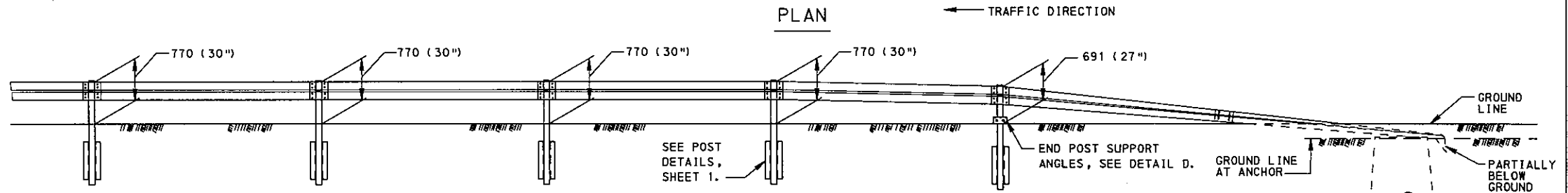
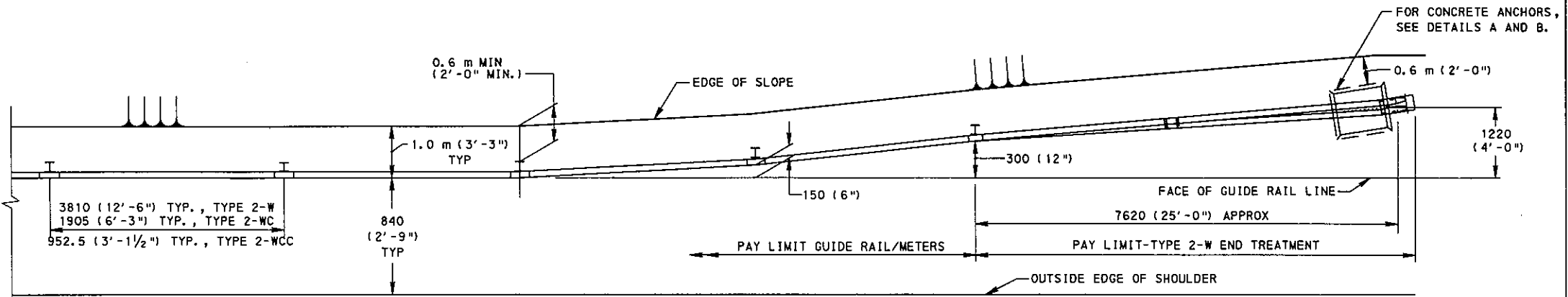
**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN**

**TYPE 2 WEAK POST
GUIDE RAIL**

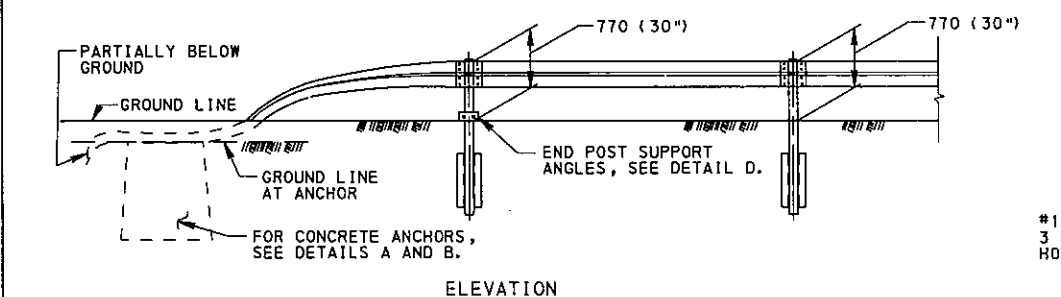
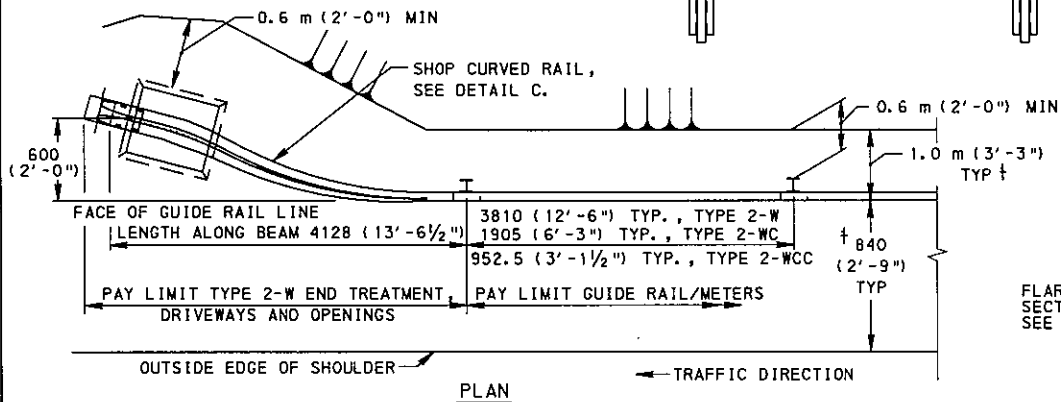
RECOMMENDED APR. 28, 2000 <i>Dean A. Schuch</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 2 RC-53M
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NOTES

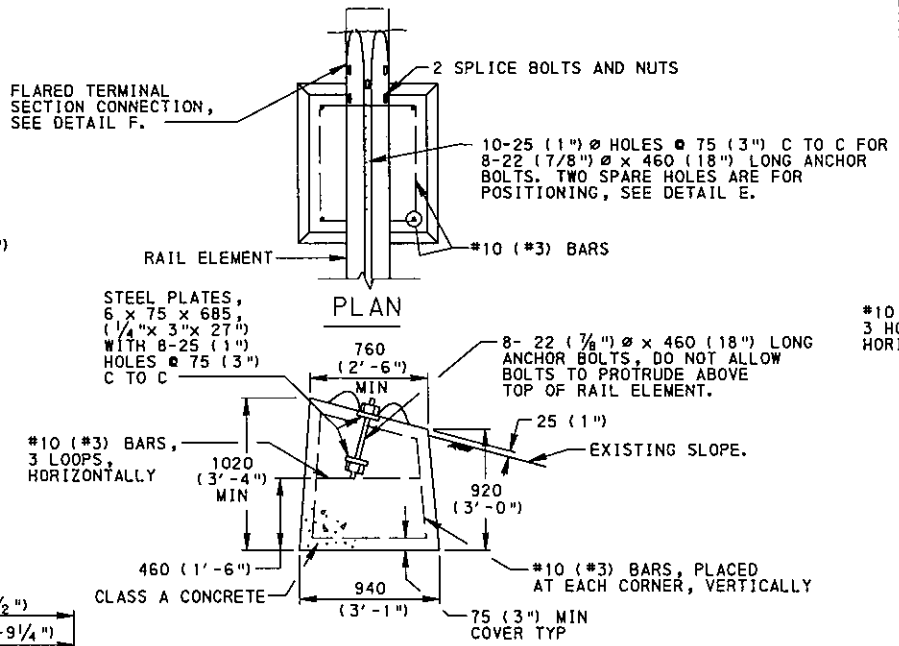
- FOR HIGH-SPEED HIGH-VOLUME ROADWAYS, 70 km/h (45 mph) AND ABOVE, AND WITH CURRENT TRAFFIC VOLUMES 4000 VEHICLES PER DAY AND ABOVE, USE CRASH WORTHY END TREATMENTS ON THE APPROACH END WITH A 15.2 m (50'-0") TYPE 2S GUIDE RAIL TRANSITION FOR ANCHORING THE 2-W GUIDE RAIL. CRASHWORTHY END TREATMENTS MUST BE USED ON ALL NHS ROUTES REGARDLESS OF SPEED AND VOLUME. ON 2-LANE ROADWAYS, USE CRASH WORTHY END TREATMENT ON BOTH, THE APPROACH AND TRAILING, ENDS.
- SEE RC-52M, FOR END TREATMENTS BURIED INTO EARTH MOUNDS.



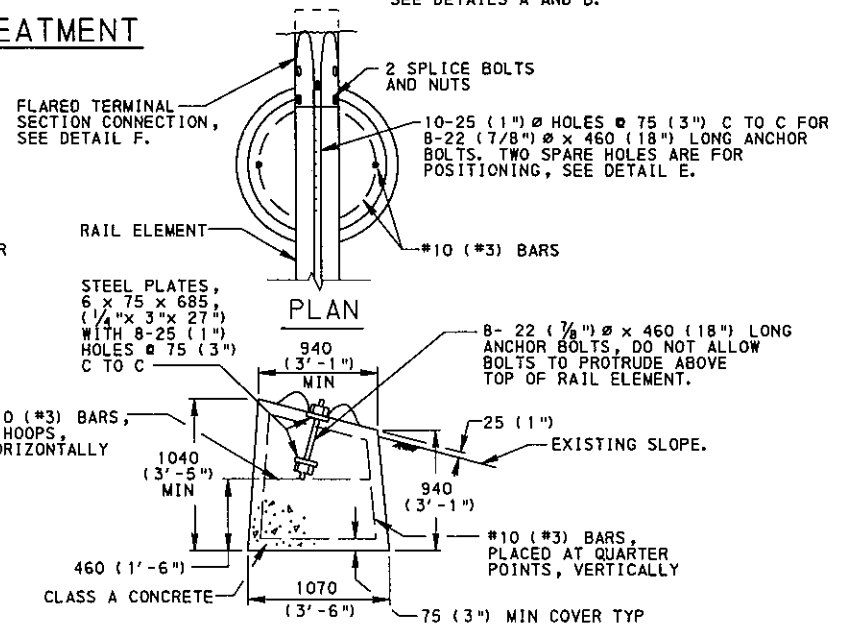
ELEVATION
TYPE 2-WEAK POST END TREATMENT
(SEE NOTE 1)



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



ELEVATION
DETAIL A



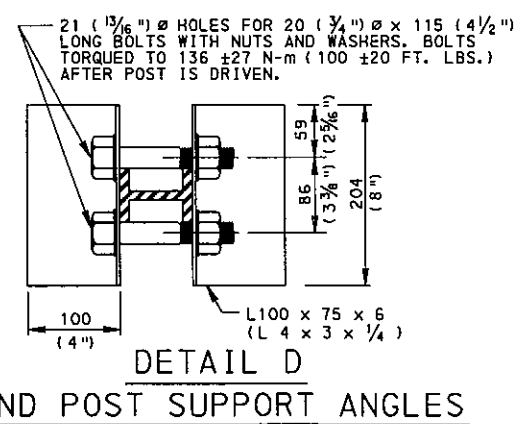
ELEVATION
DETAIL B (ALTERNATE)

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

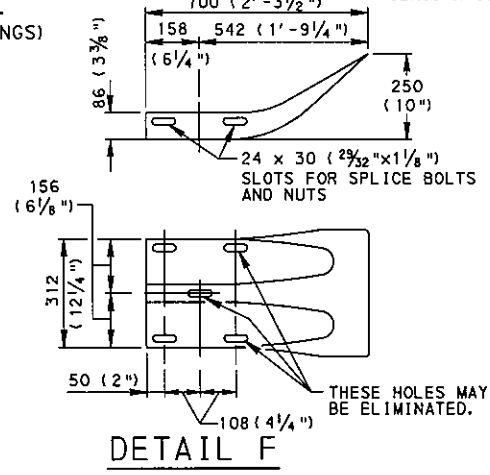
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 WEAK POST GUIDE RAIL END TREATMENTS

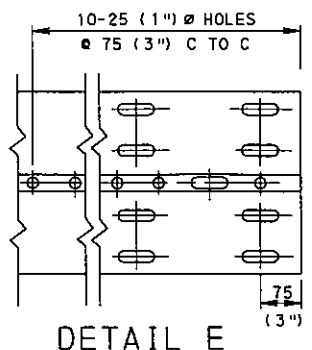
RECOMMENDED APR. 28, 2000
RECOMMENDED APR. 28, 2000
SHT 2 OF 2
RC-53M



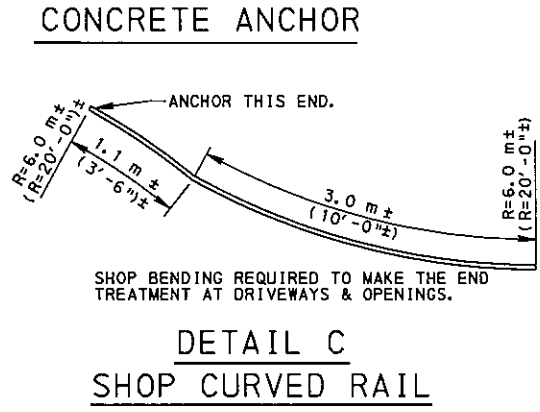
DETAIL D
END POST SUPPORT ANGLES



DETAIL F
FLARED TERMINAL SECTION



DETAIL E



DETAIL C
SHOP CURVED RAIL

NOTES

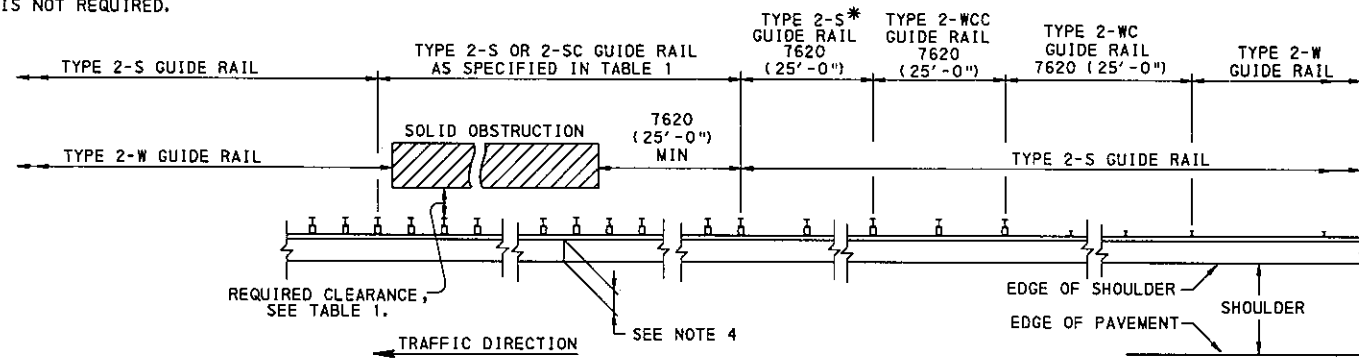
1. THE TREATMENTS SHOWN ARE FOR FOUR LANE DIVIDED HIGHWAYS. USE THE APPROACH END TREATMENT AT BOTH SIDES OF THE OBSTRUCTION ON TWO-LANE FACILITIES WITH TWO-WAY TRAFFIC.
2. THIS STANDARD HAS BEEN PREPARED AS A GUIDE FOR THE PLACEMENT OF GUIDE RAIL AND MEDIAN BARRIER. IT IS IMPRACTICAL TO PROVIDE A STANDARD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

TABLE 1

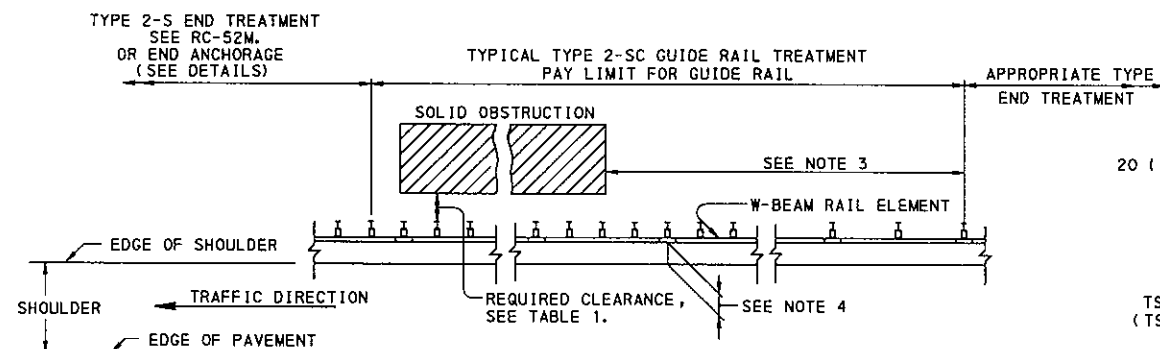
TYPE OF GUIDE RAIL	REQUIRED † CLEARANCES
2-SCC	0.3 m (1'-0")
2-SC	0.6 m (2'-0")
2-S	0.9 m (3'-0")
2-WCC	1.2 m (4'-0")
2-WC	1.5 m (5'-0")
2-W	2.1 m (7'-0")

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

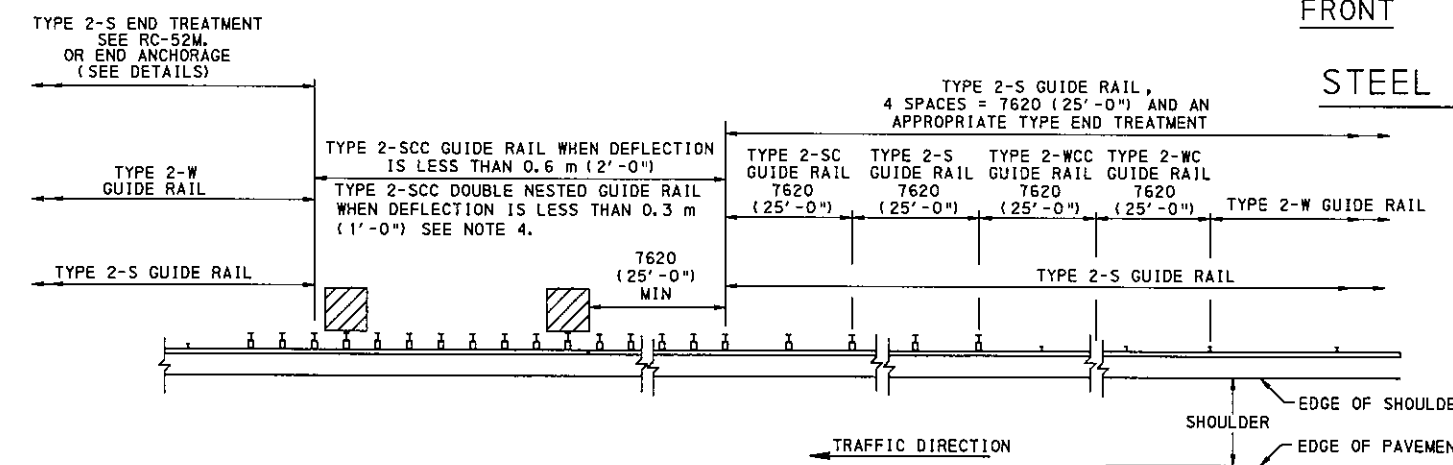
* IF TYPE 2-S GUIDE RAIL IS USED AT THE OBSTRUCTION, THIS SECTION OF GUIDE RAIL IS NOT REQUIRED.



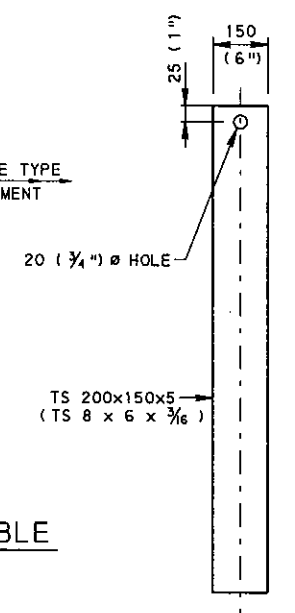
TYPICAL GUIDE RAIL TREATMENT WHEN THE REQUIRED CLEARANCE TO OBSTRUCTION IS AVAILABLE



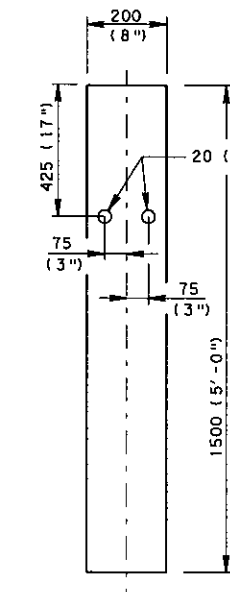
TYPICAL GUIDE RAIL TREATMENT WHEN THE REQUIRED CLEARANCE TO OBSTRUCTION IS AVAILABLE



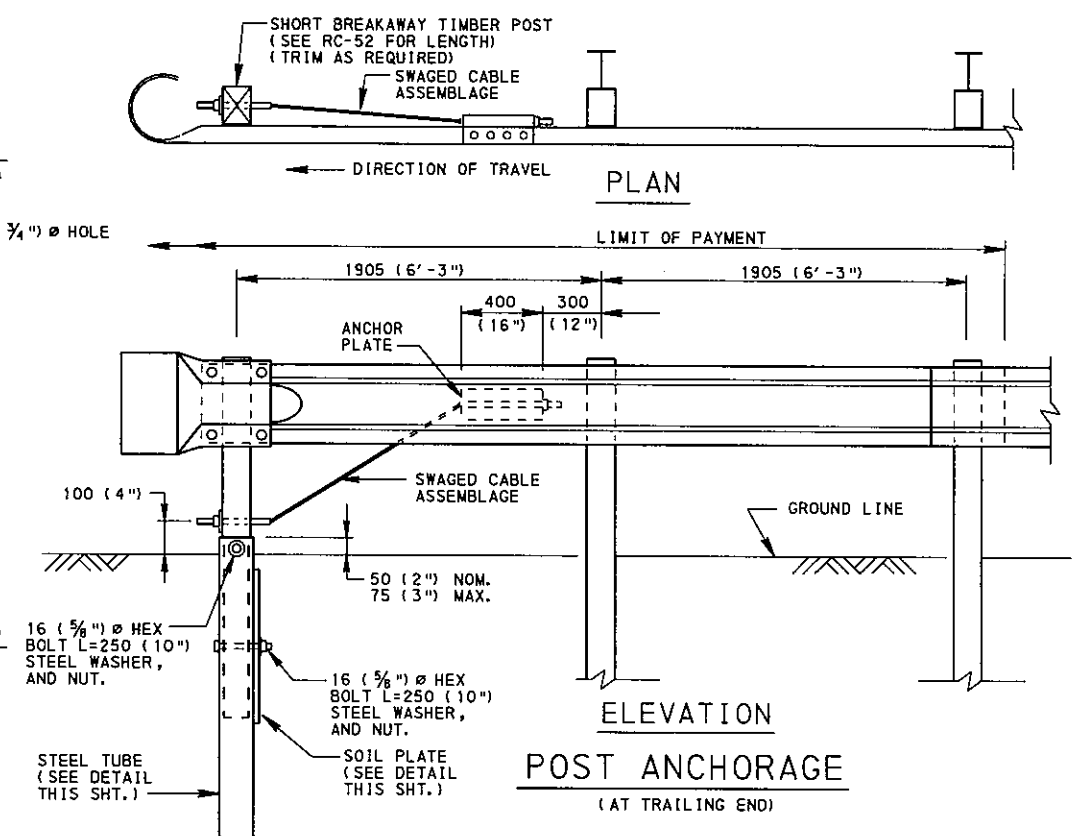
TYPICAL GUIDE RAIL TREATMENT WHEN THE REQUIRED CLEARANCE TO OBSTRUCTION IS NOT AVAILABLE



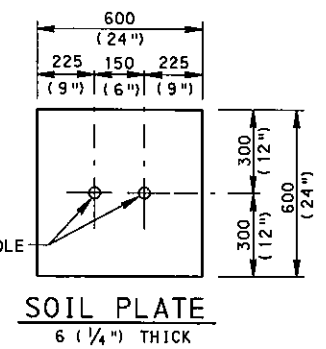
STEEL TUBE



SIDE



POST ANCHORAGE



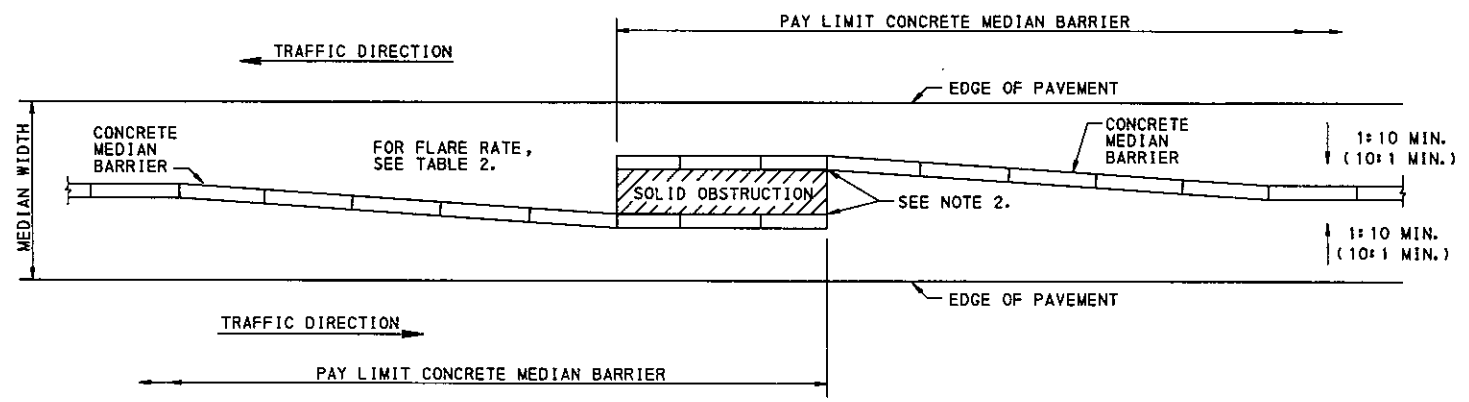
SOIL PLATE

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

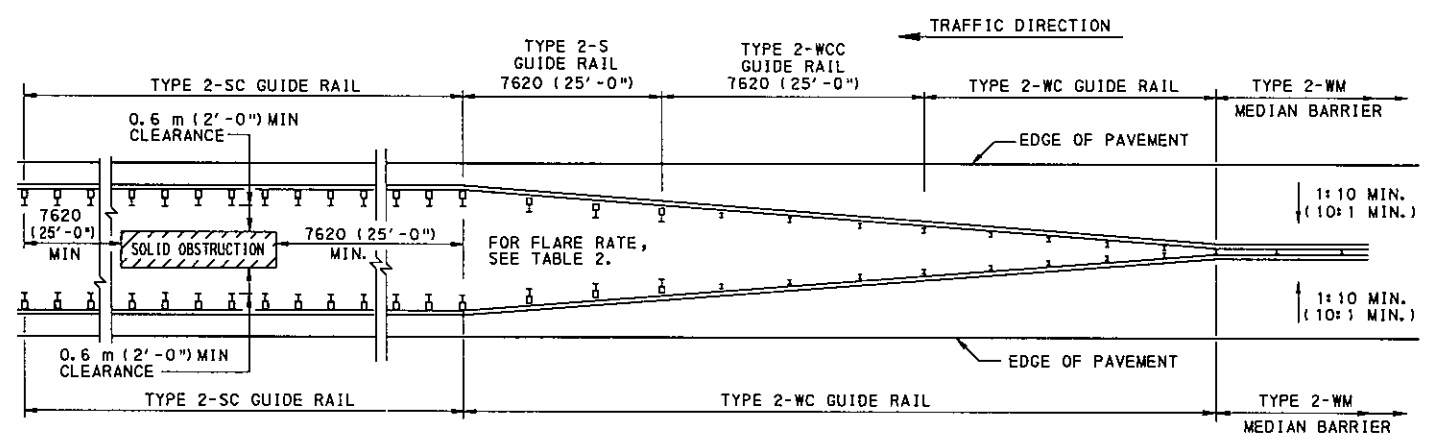
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

BARRIER PLACEMENT AT OBSTRUCTIONS

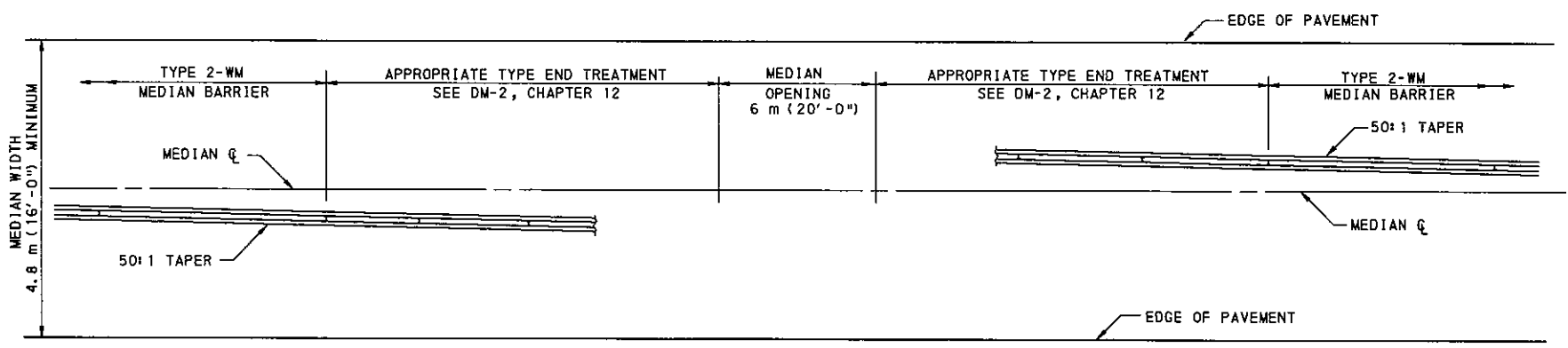
RECOMMENDED APR. 28, 2000 <i>Alan A. Schuch</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Henry L. Hoffman</i> CHIEF ENGINEER	SHT. 1 OF 7 RC-54M
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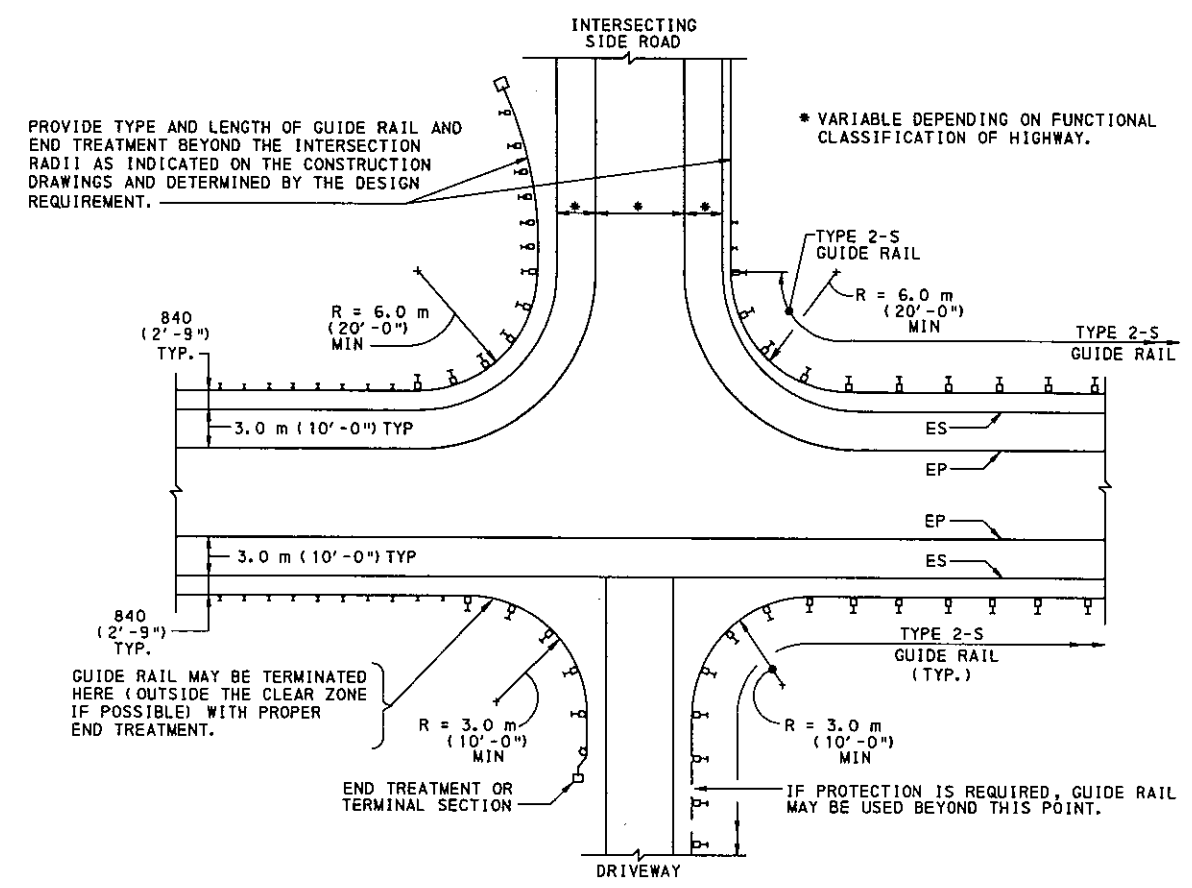
TREATMENT AT OBSTRUCTION FOR MEDIAN WIDTHS 6.0 m (20') OR LESS WHERE CONTINUOUS BARRIER IS REQUIRED



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



TREATMENT FOR TYPE 2-WM MEDIAN BARRIER CROSS-OVER



TREATMENT AT INTERSECTIONS AND DRIVEWAYS

TABLE 2
FLARE RATES FOR BARRIER DESIGN

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

NOTES

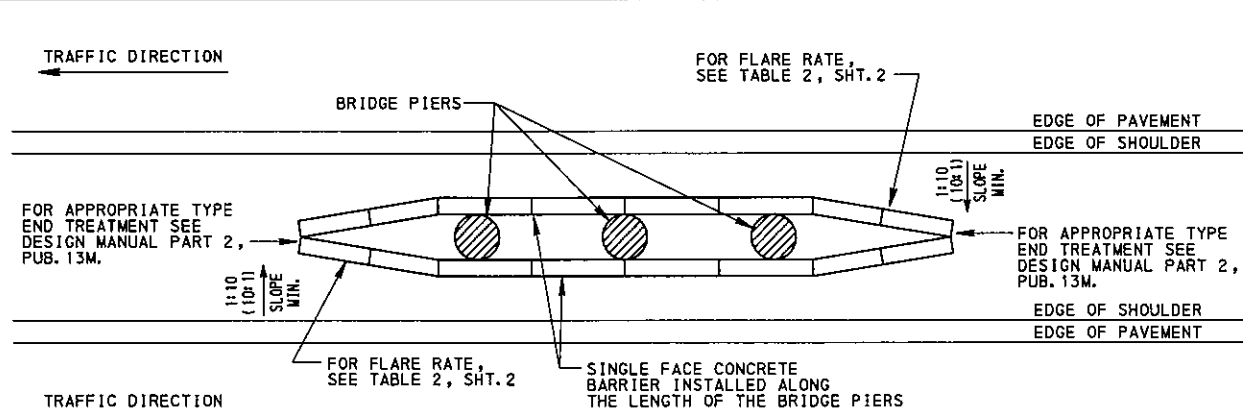
1. THIS STANDARD HAS BEEN PREPARED AS A GUIDE FOR THE PLACEMENT OF GUIDE RAIL AND MEDIAN BARRIER. IT IS IMPRACTICAL TO PROVIDE A STANDARD FOR ALL POSSIBLE CONDITIONS. MODIFICATIONS OF TREATMENTS CAN BE MADE TO FIT EXISTING CONDITIONS; HOWEVER, FOLLOW RECOMMENDED GUIDELINES IN DESIGN MANUAL, PART 2.
2.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

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

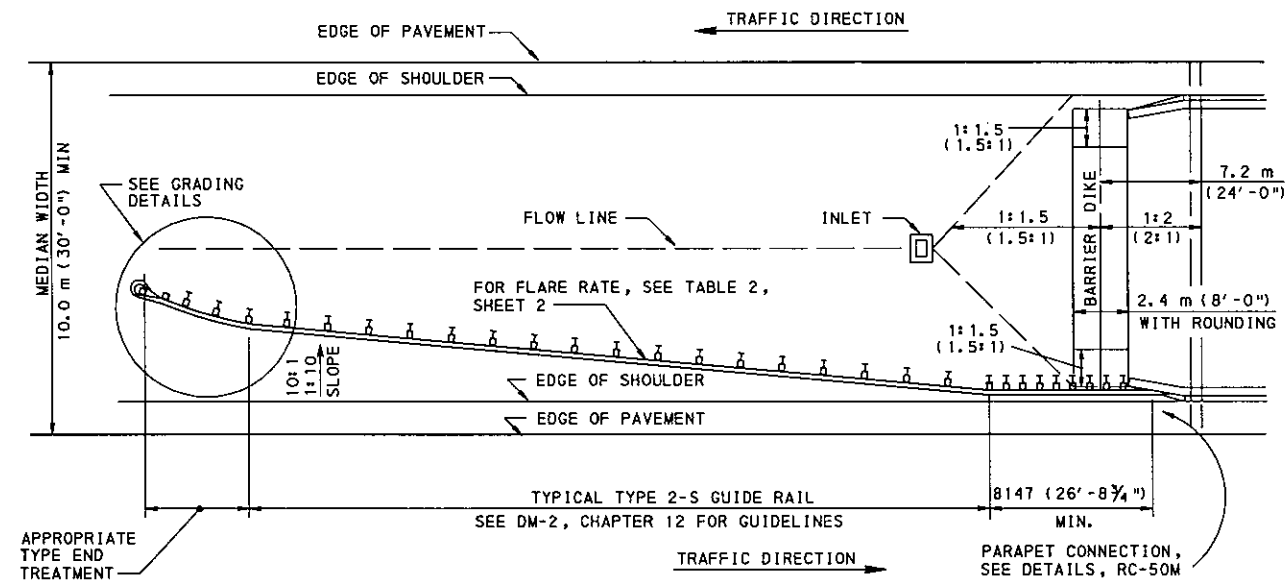
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

**BARRIER PLACEMENT
AT OBSTRUCTIONS**

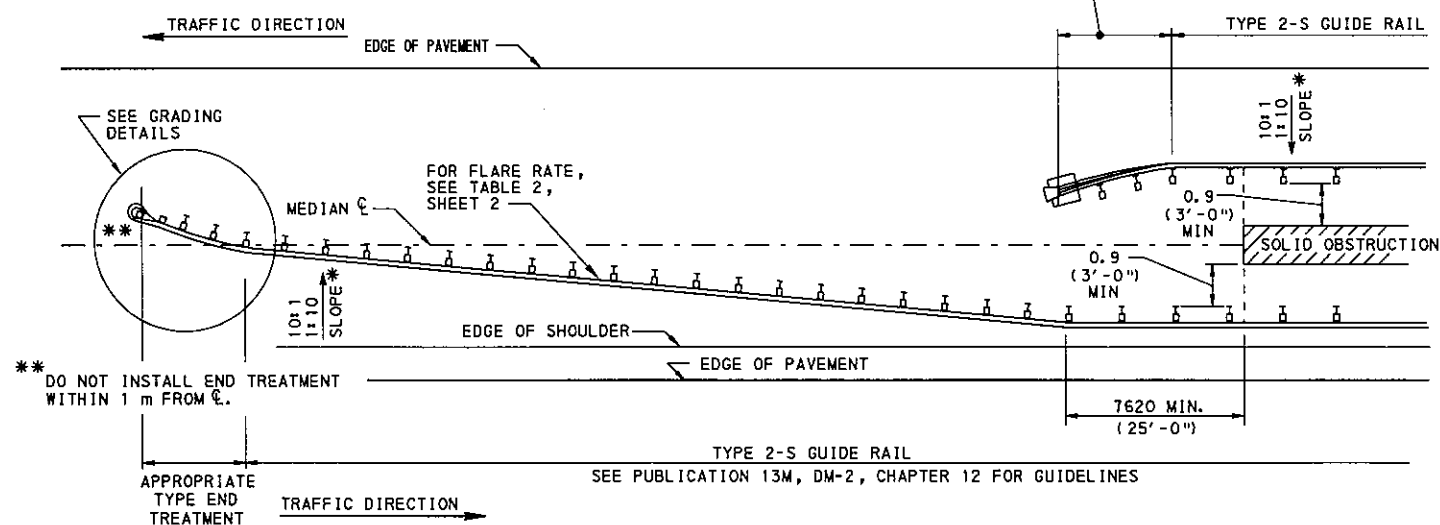
RECOMMENDED APR. 28, 2000 <i>Dean A. Schuch</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Harry L. Hoffman</i> CHIEF ENGINEER	SHT 2 OF 1 RC-54M
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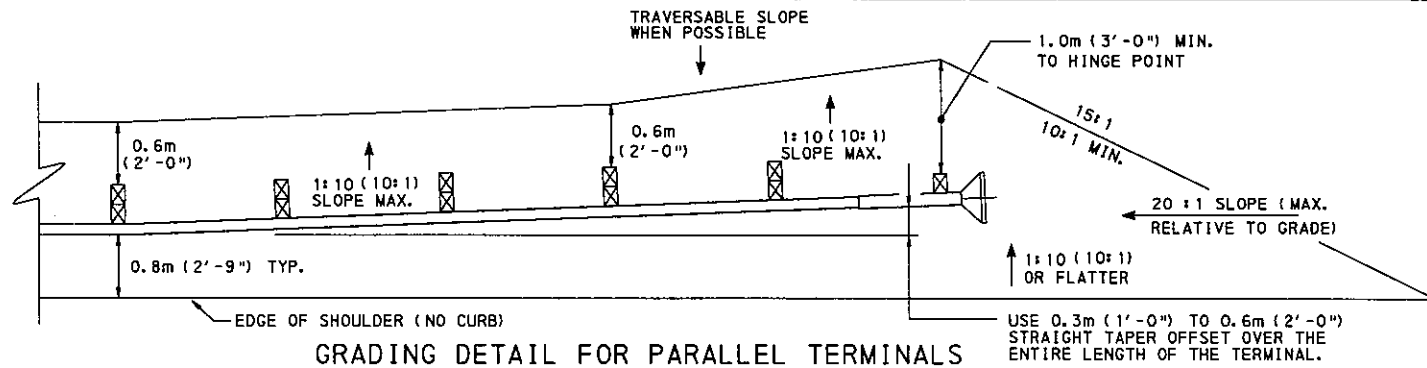
**TREATMENT AT OBSTRUCTIONS FOR
MEDIAN WIDTHS GREATER THAN 6.0 m (20'-0")
WHERE CONTINUOUS BARRIER IS NOT REQUIRED**



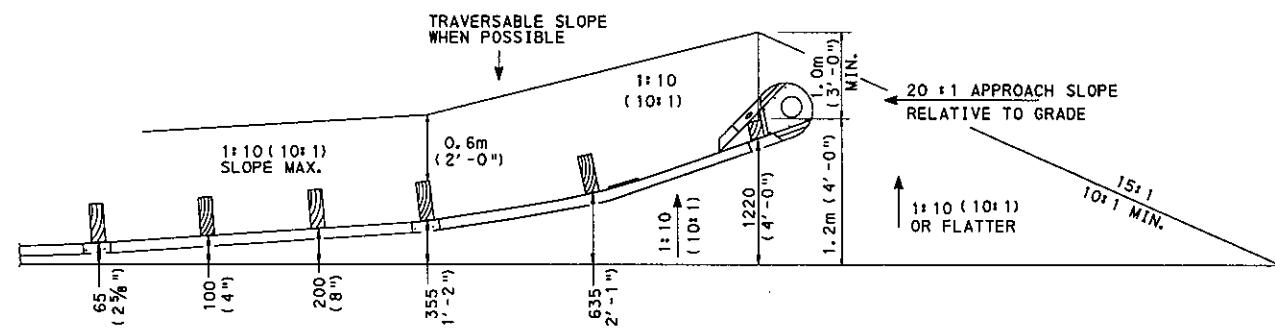
MEDIAN TREATMENT AT DUAL STRUCTURES



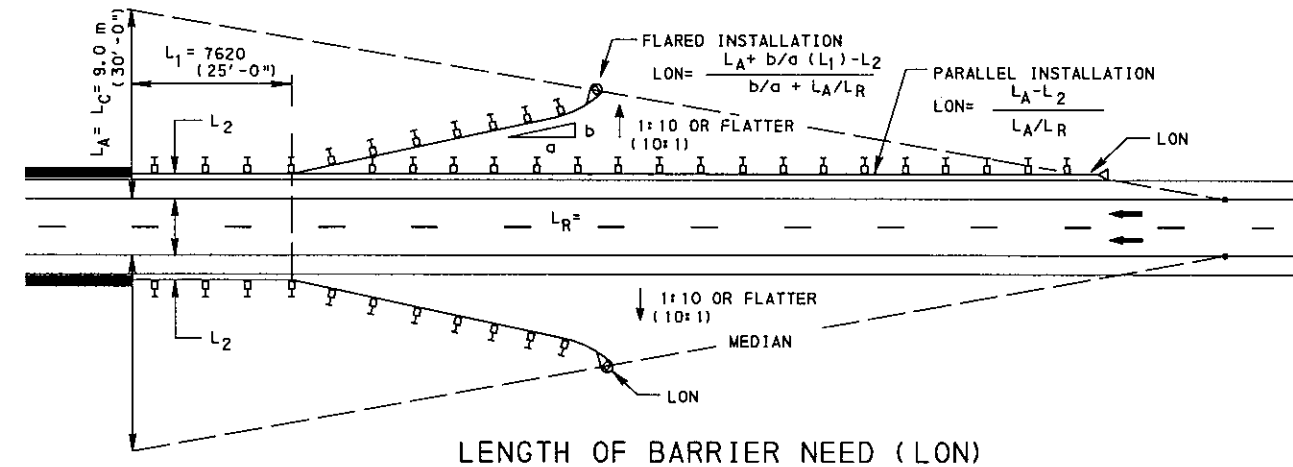
**TREATMENT AT OBSTRUCTION FOR
MEDIAN WIDTHS GREATER THAN 10.0 m (30'-0")
WHERE CONTINUOUS BARRIER IS NOT REQUIRED**



GRADING DETAIL FOR PARALLEL TERMINALS



GRADING DETAIL FOR FLARED TERMINALS



LENGTH OF BARRIER NEED (LON)

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

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).

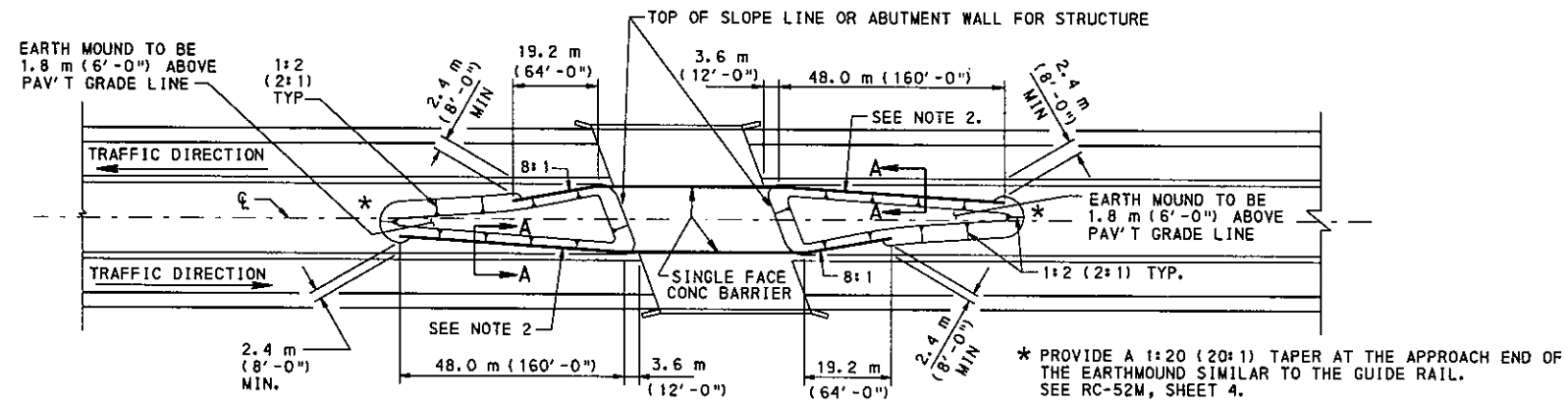
**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN**

**BARRIER PLACEMENT
AT OBSTRUCTIONS**

RECOMMENDED APR. 28, 2000
Alan P. Schuch
 DIRECTOR, BUREAU OF DESIGN

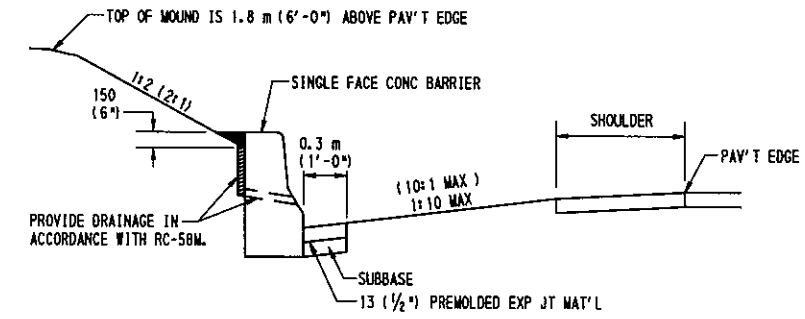
RECOMMENDED APR. 28, 2000
Harry J. Hoffman
 CHIEF ENGINEER

SHT 3 OF 1
RC-54M



TYPICAL MEDIAN EARTH MOUND DETAIL FOR AT-GRADE DUAL BRIDGES

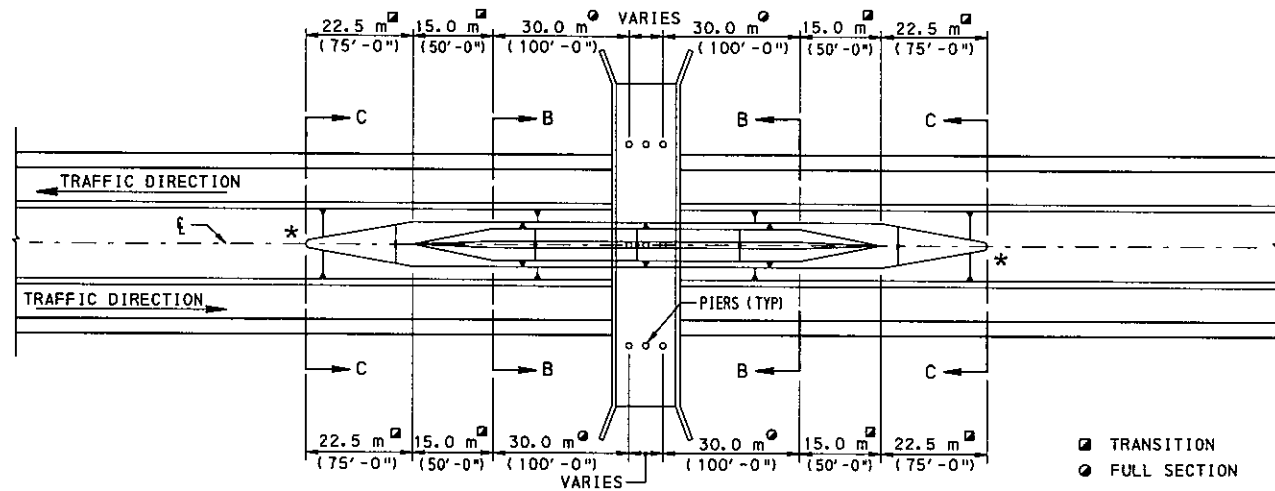
SEE NOTE 4



SECTION A-A

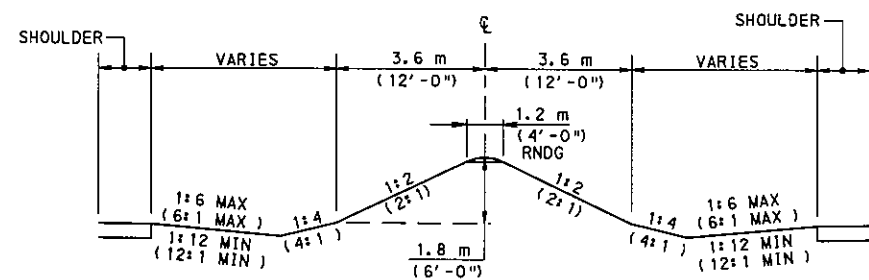
NOTES

1. THIS STANDARD HAS BEEN PREPARED AS A GUIDE FOR THE PLACEMENT OF EARTH MOUNDS IN THE MEDIAN. IT IS IMPRACTICAL TO PROVIDE A STANDARD FOR ALL POSSIBLE CONDITIONS. MODIFICATIONS OF TREATMENTS CAN BE MADE TO FIT EXISTING CONDITIONS.
2. FOR FLARE RATES, SEE TABLE 2, SHEET 2.
3. CONSIDER EXPANSION JOINT MATERIAL, COARSE AGGREGATE, FILTER DRAIN AND WEEP HOLES INCIDENTAL TO SINGLE FACE CONC. BARRIER.
4. ALL MATERIALS NECESSARY TO CONSTRUCT EARTH MOUNDS ARE IN ACCORDANCE WITH APPLICABLE SECTIONS OF PUBLICATION 408/2000.

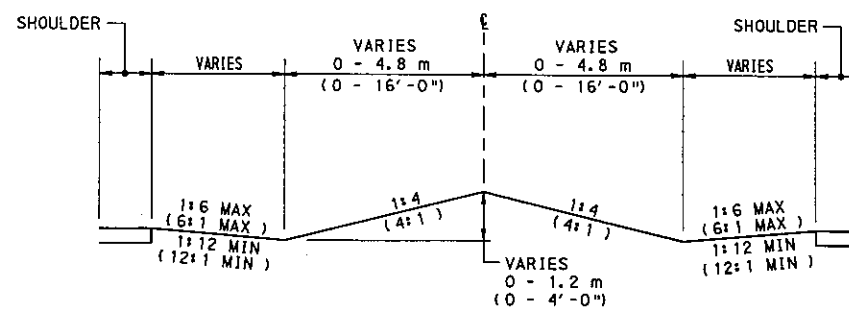


TYPICAL MEDIAN EARTH MOUND DETAIL FOR OVERHEAD STRUCTURES FOR MEDIAN WIDTHS OF 18.0 M (60'-0") OR GREATER

SEE NOTE 4



SECTION B-B



SECTION C-C

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

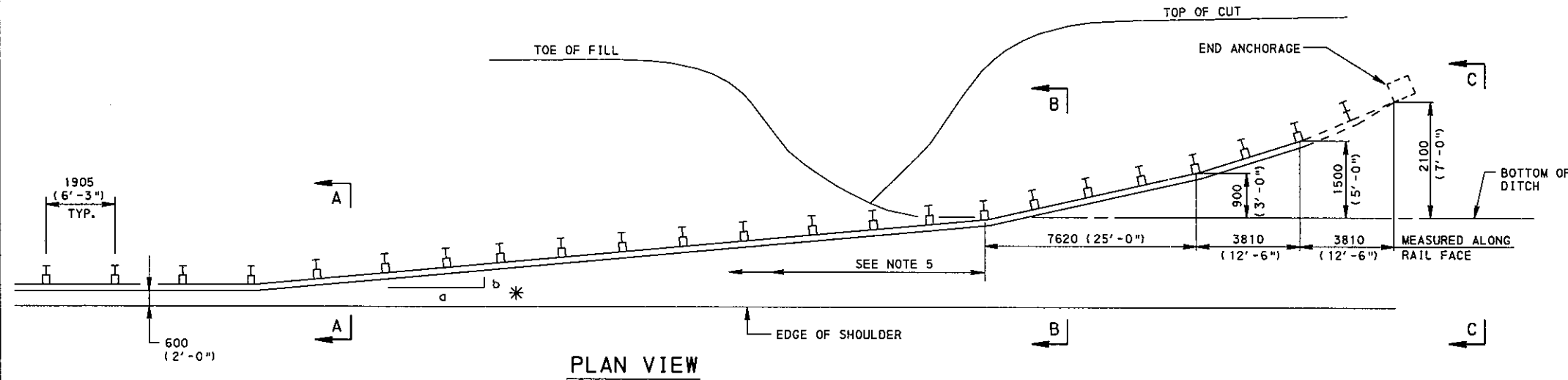
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
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BARRIER PLACEMENT
AT OBSTRUCTIONS

EARTH MOUNDS

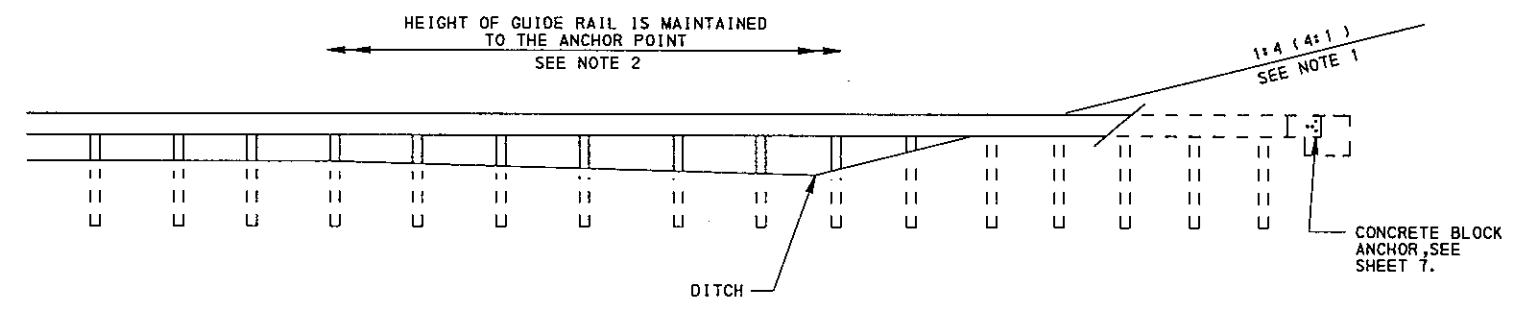
GENERAL NOTES:

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

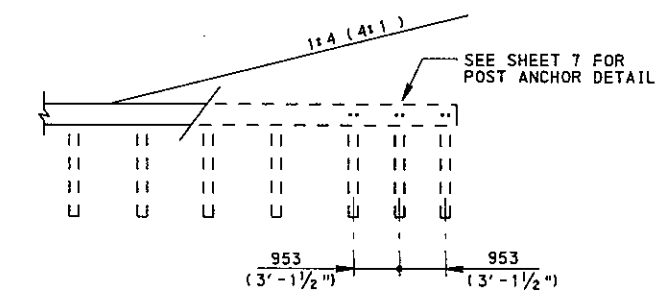


* a:b = 12.5 : 1
 9 : 1 LOWSPEED
 (LESS THAN 45 mph)

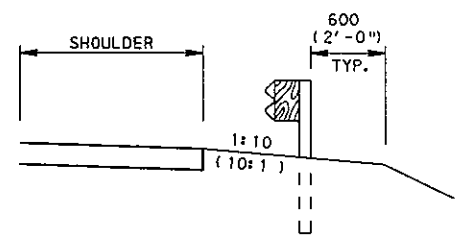
PLAN VIEW



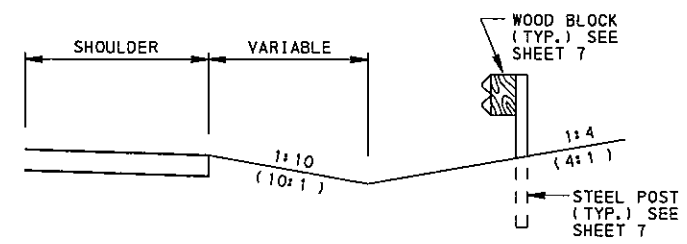
ELEVATION VIEW (PROFILE ALONG RAIL)



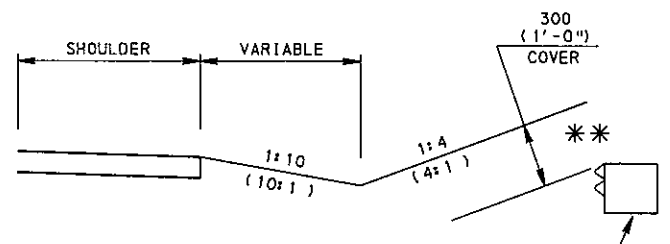
ALTERNATE END ANCHORAGE



SECTION A-A



SECTION B-B



SECTION C-C

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

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

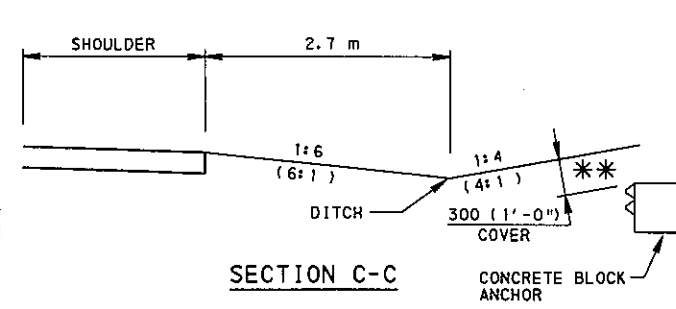
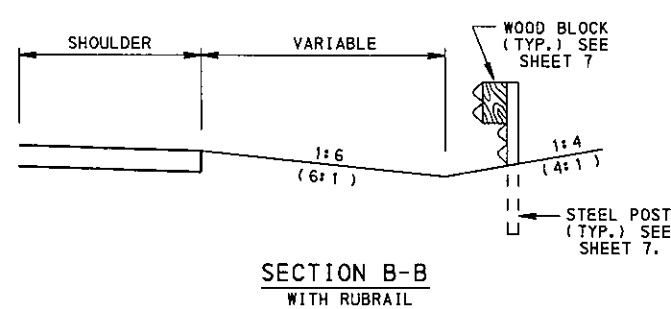
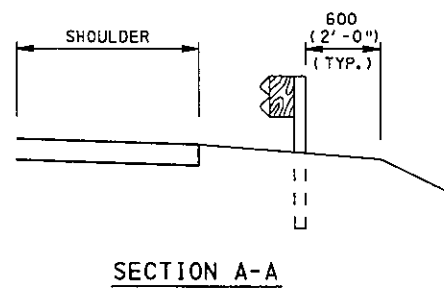
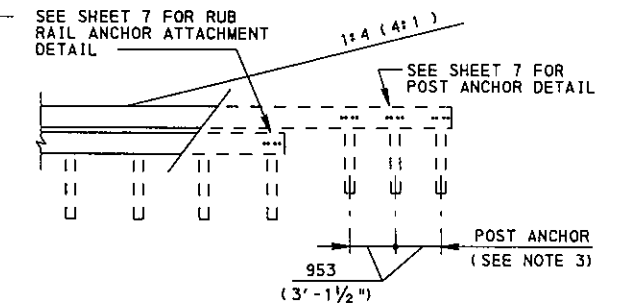
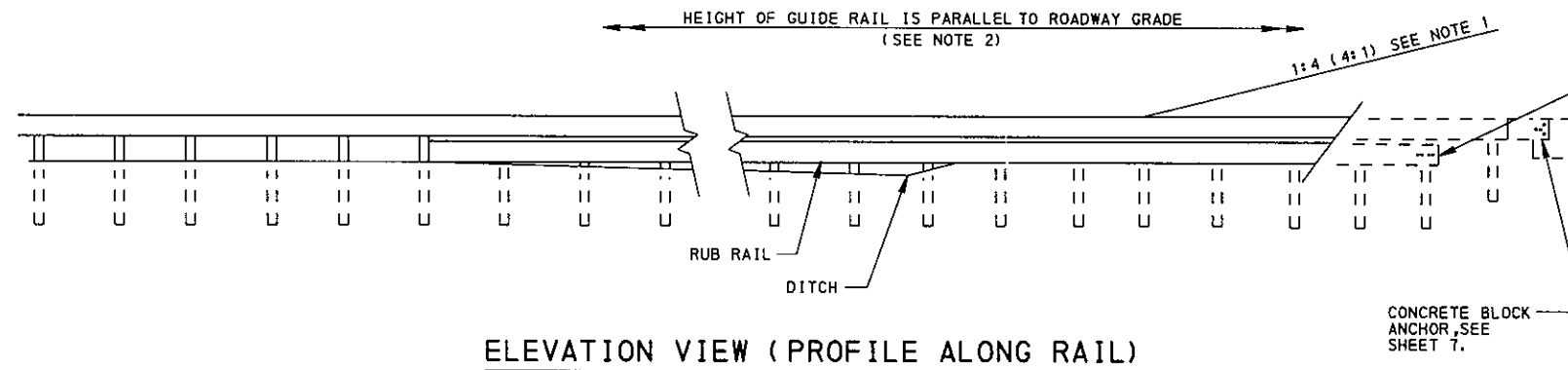
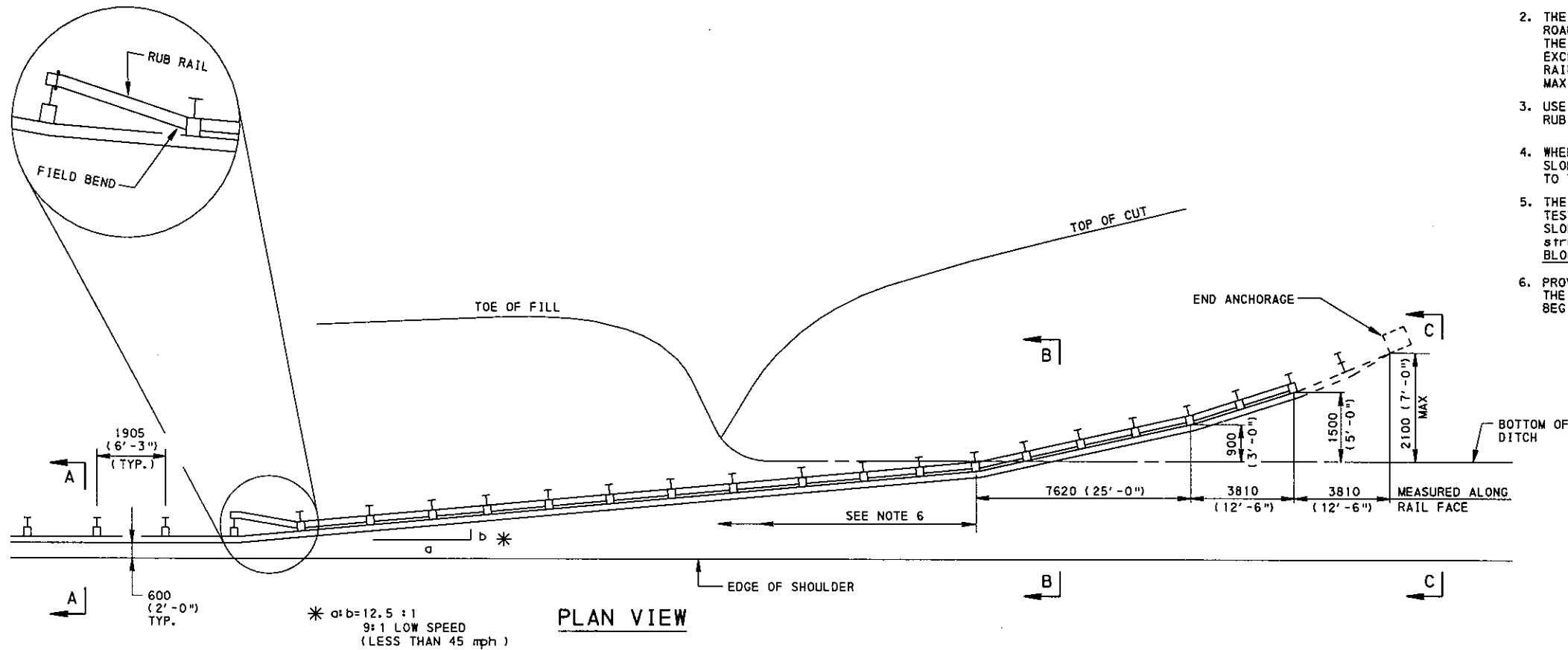
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

GUIDE RAIL
BACKSLOPE
ANCHOR TERMINAL
 (NEW CONSTRUCTION OR RECONSTRUCTION)

RECOMMENDED APR. 28, 2000 <i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary J. Hoffman</i> CHIEF ENGINEER	SHT 5 OF 7 RC-54M
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GENERAL NOTES:

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



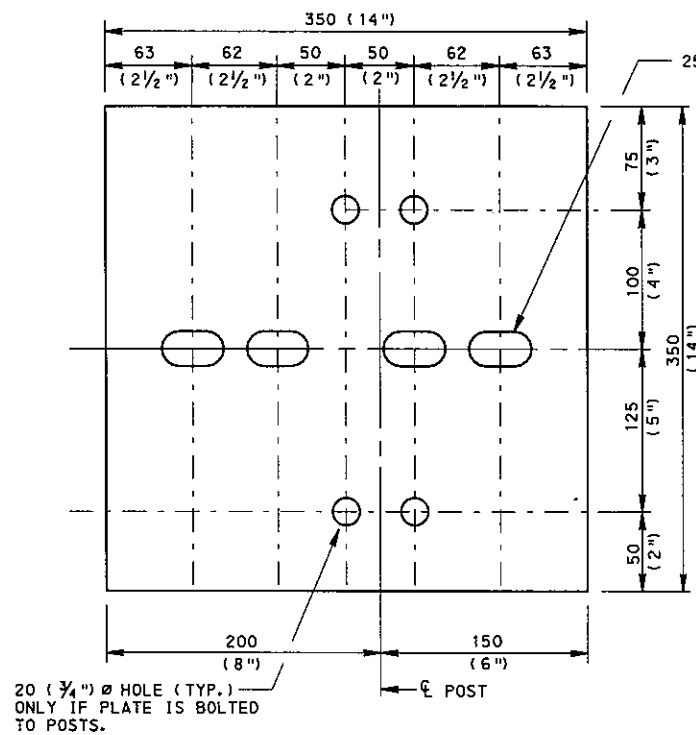
** ROCK ANCHORAGE DOES NOT REQUIRE THE 300 (1'-0") BURIAL.

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

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

GUIDE RAIL
BACKSLOPE
ANCHOR TERMINAL
(REHAB. PROJECTS)

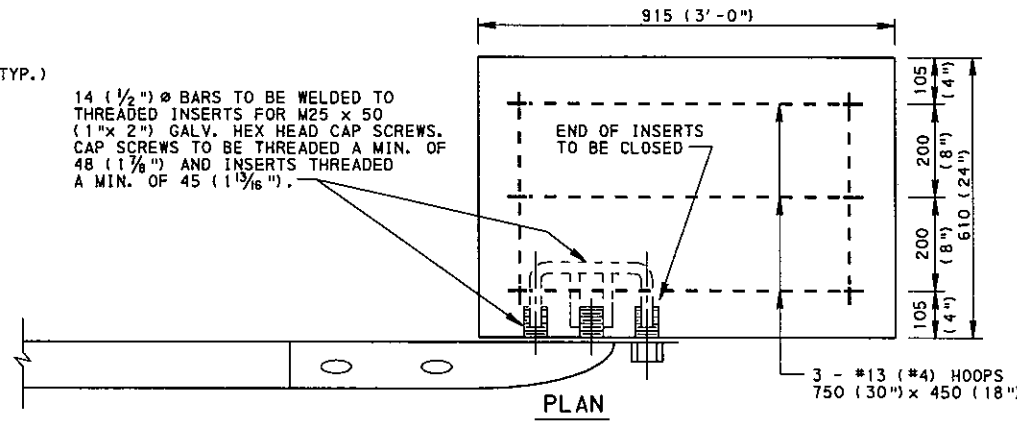
RECOMMENDED APR. 28, 2000
RECOMMENDED APR. 28, 2000
SHT 6 OF 7
RC-54M



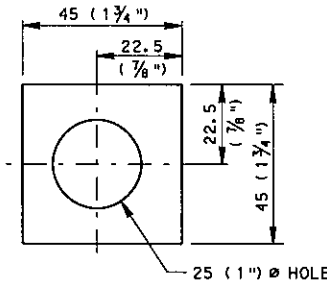
STEEL PLATE - 13 mm (1/2")

GALVANIZED
WELOED OR BOLTED TO POST

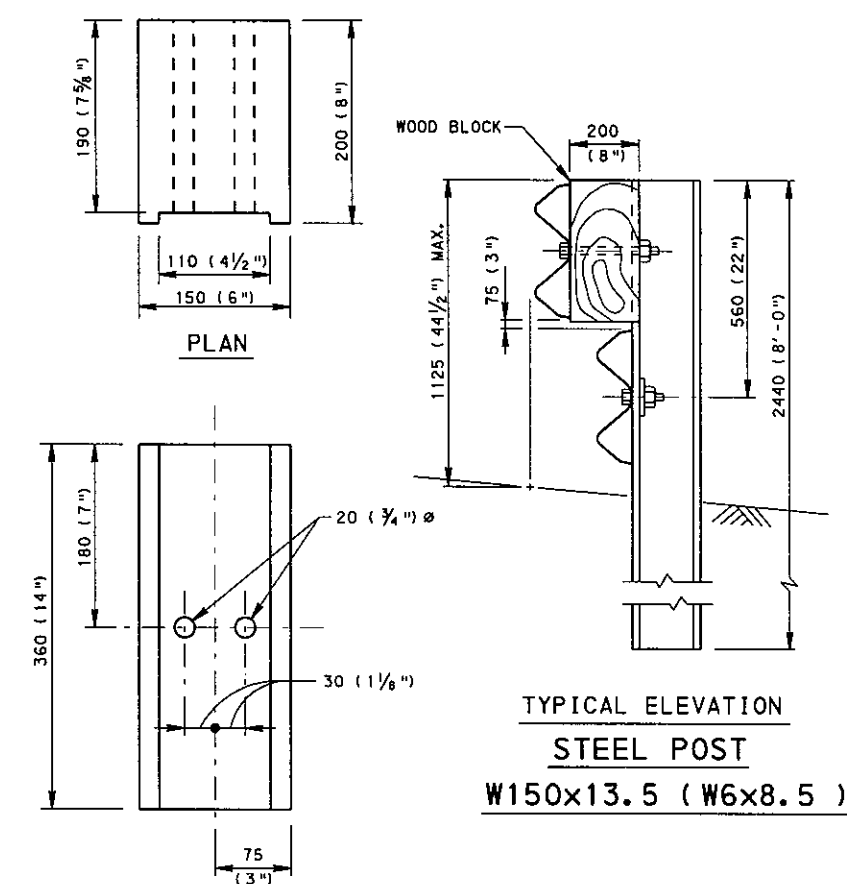
14 (1/2") Ø BARS TO BE WELDED TO
THREADED INSERTS FOR M25 x 50
(1" x 2") GALV. HEX HEAD CAP SCREWS.
CAP SCREWS TO BE THREADED A MIN. OF
48 (1 7/8") AND INSERTS THREADED
A MIN. OF 45 (1 15/16").



CONCRETE BLOCK ANCHOR

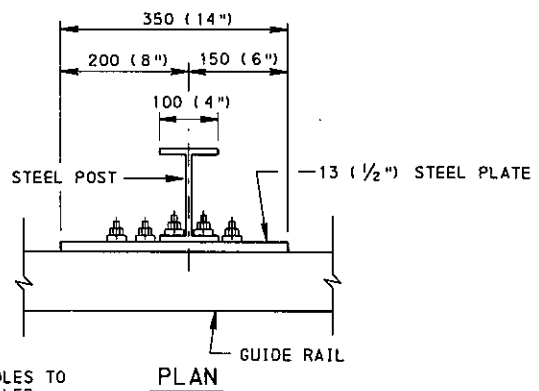


SQUARE WASHER
5 (1/4") THICK - GALVANIZED

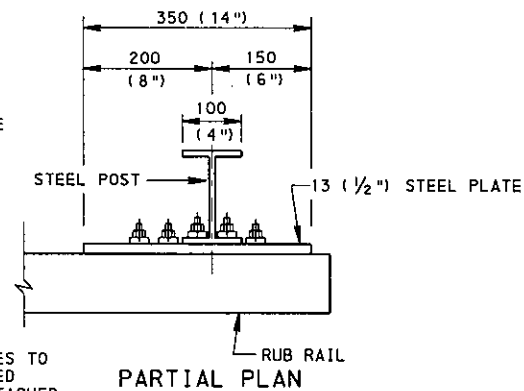


WOOD BLOCK

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



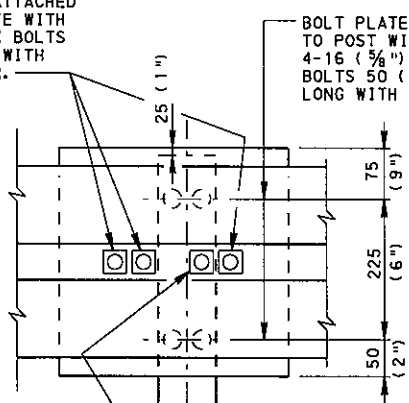
PLAN



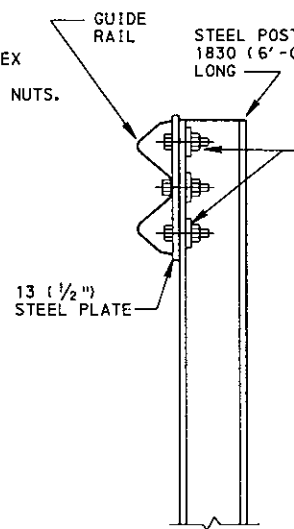
PARTIAL PLAN

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

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

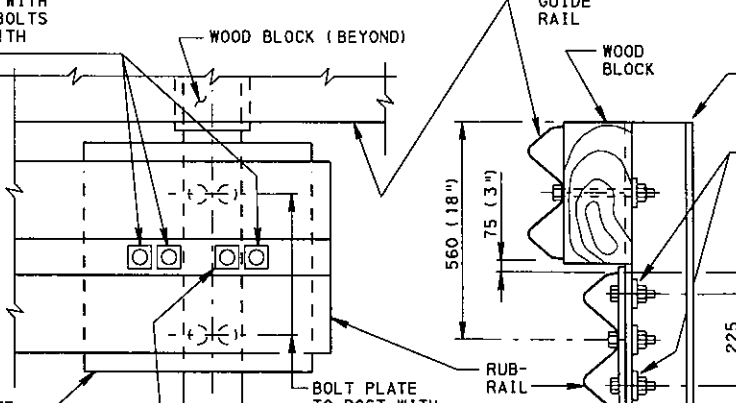


FRONT VIEW

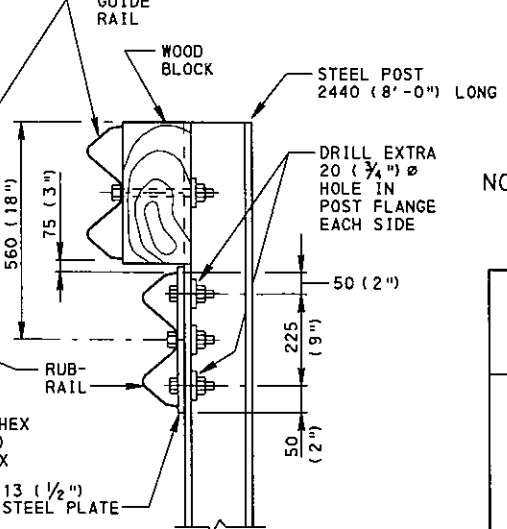


ELEVATION

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



FRONT VIEW



ELEVATION

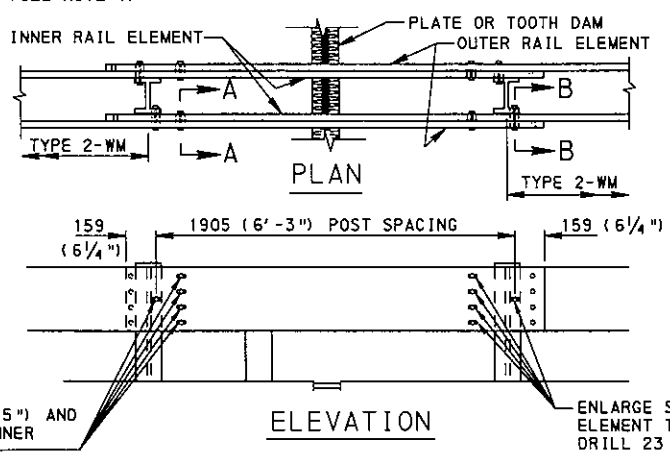
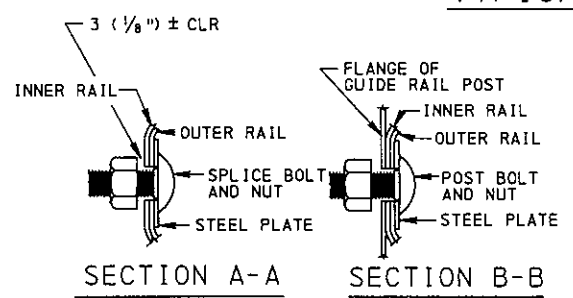
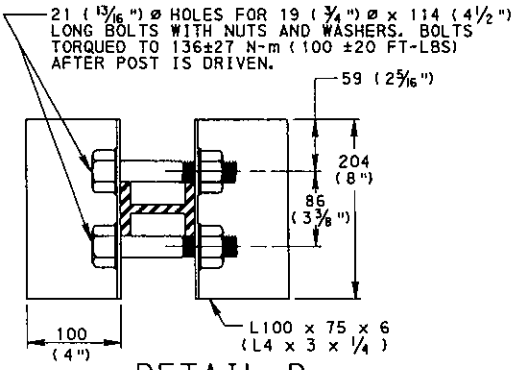
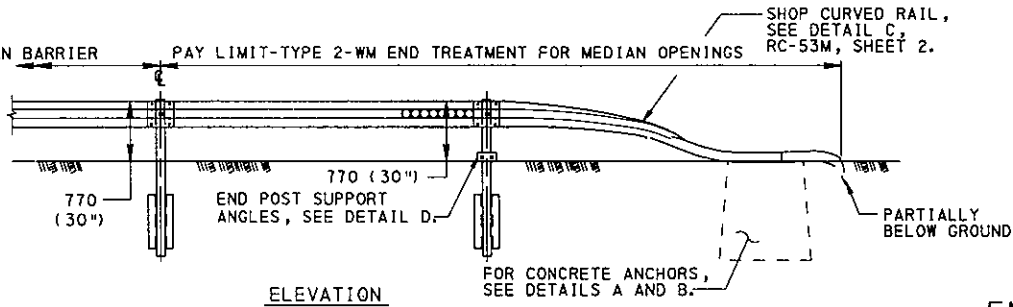
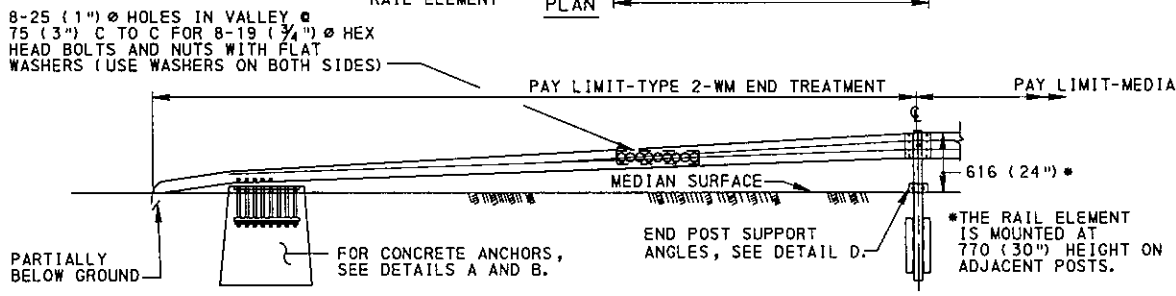
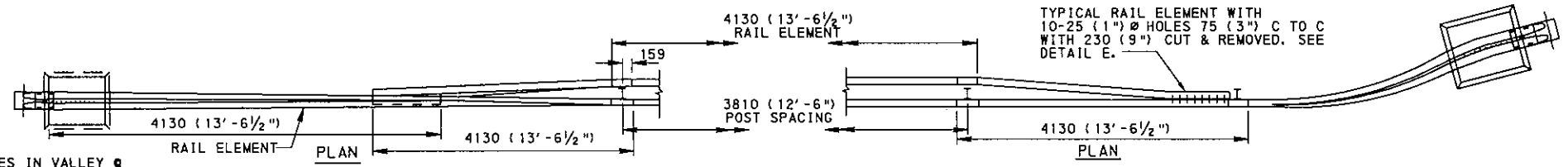
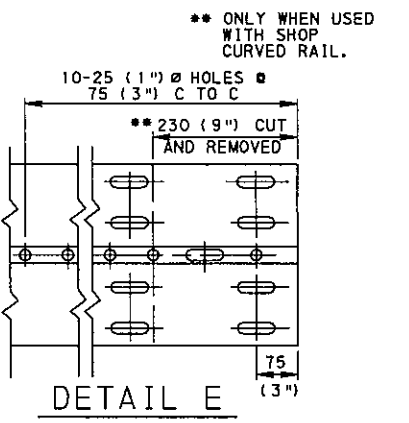
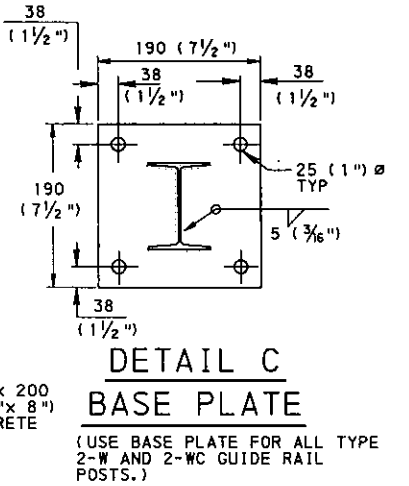
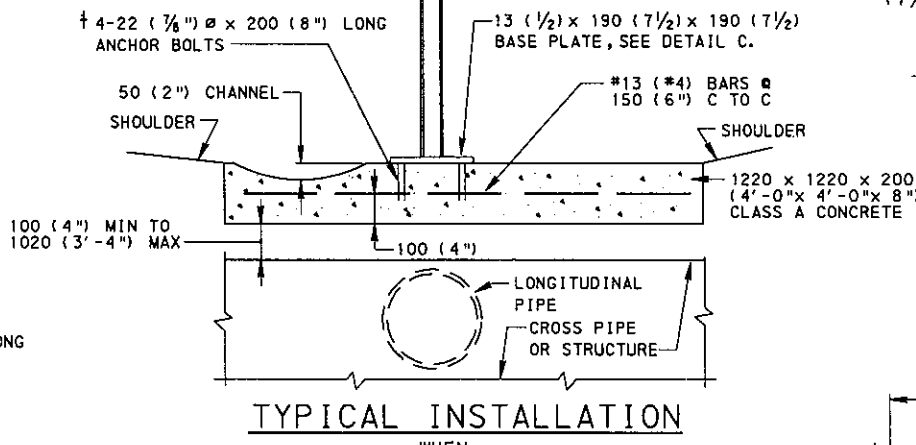
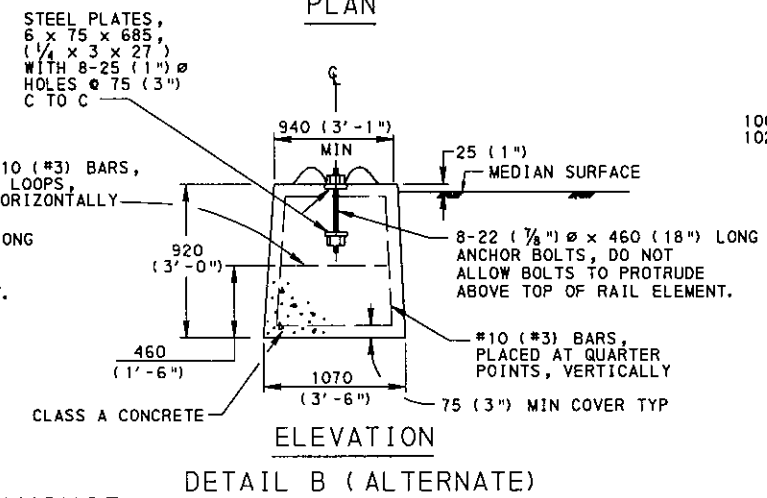
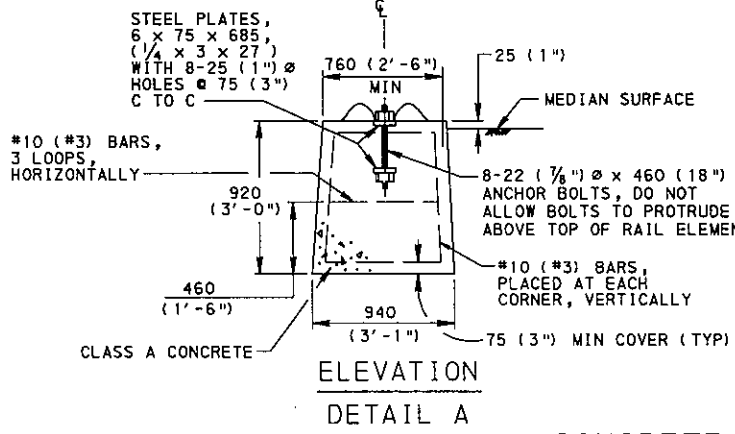
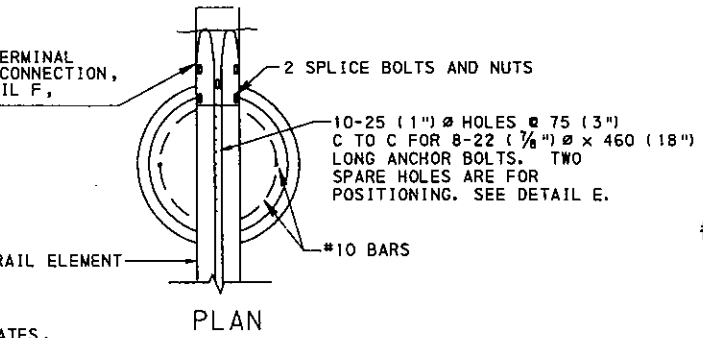
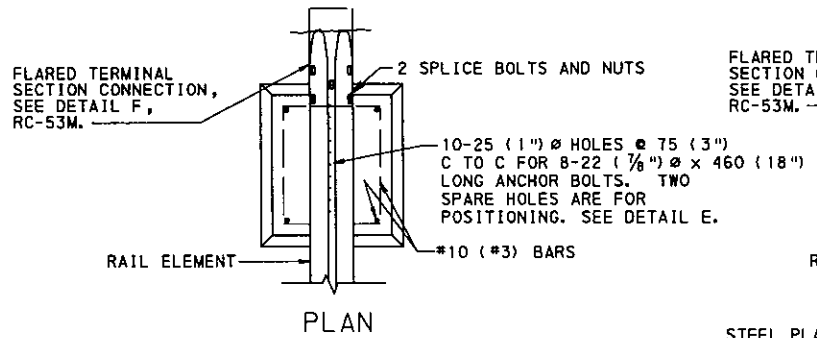
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES
MUST BE USED ON PLANS. METRIC AND
ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

**BACKSLOPE
ANCHOR TERMINAL
END ANCHORAGE DETAILS**

POST ANCHOR DETAIL
DIMENSIONS ARE TYPICAL

RUBRAIL ANCHOR ATTACHMENT



ENLARGE SLOT IN OUTER RAIL ELEMENT TO 23 (29/32") x 127 (5") AND DRILL 23 (29/32") Ø HOLES IN INNER RAIL ELEMENT FOR SPLICE.

ENLARGE SLOT IN OUTER RAIL ELEMENT TO 23 (29/32") x 127 (5") AND DRILL 23 (29/32") Ø HOLES IN INNER RAIL ELEMENT FOR SPLICE.

RAIL EXPANSION JOINT DETAIL

(MAKE NO SEPARATE OR ADDITIONAL PAYMENTS FOR INSTALLING RAIL EXPANSION JOINTS.)

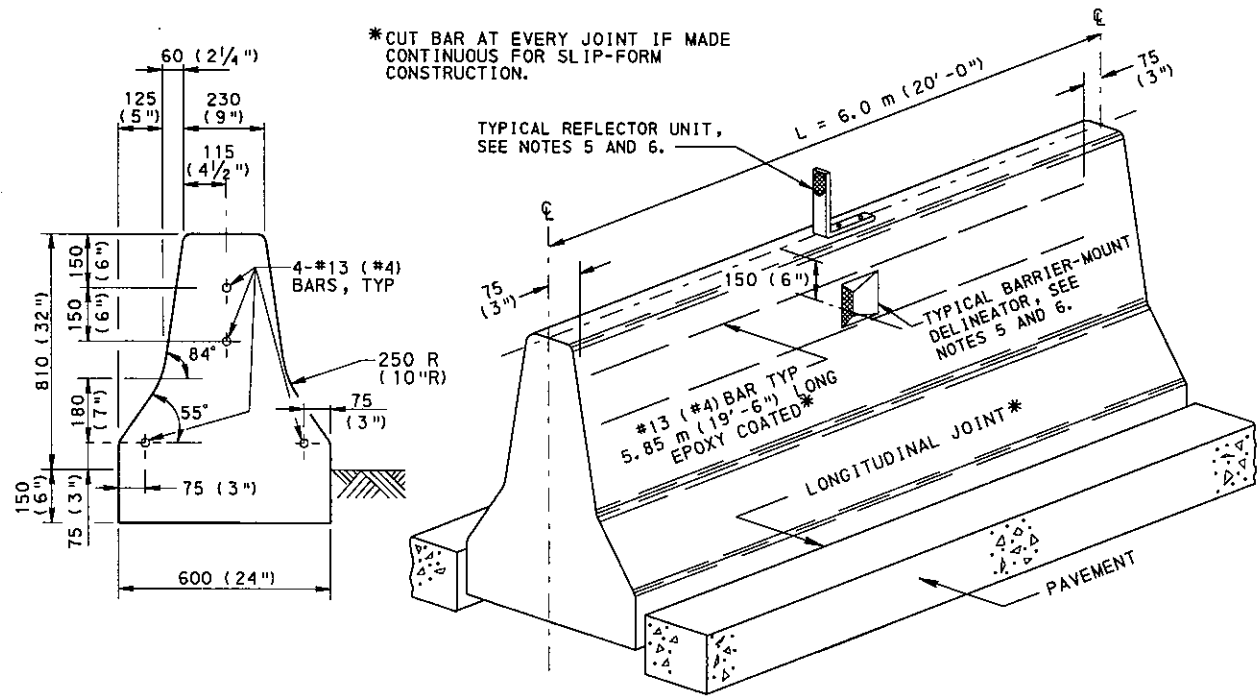
NOTES

1. USE CRASHWORTHY END TREATMENTS FOR HIGH-SPEED, HIGH-VOLUME HIGHWAYS, SEE NOTE 1, RC-53M, SHEET 2.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

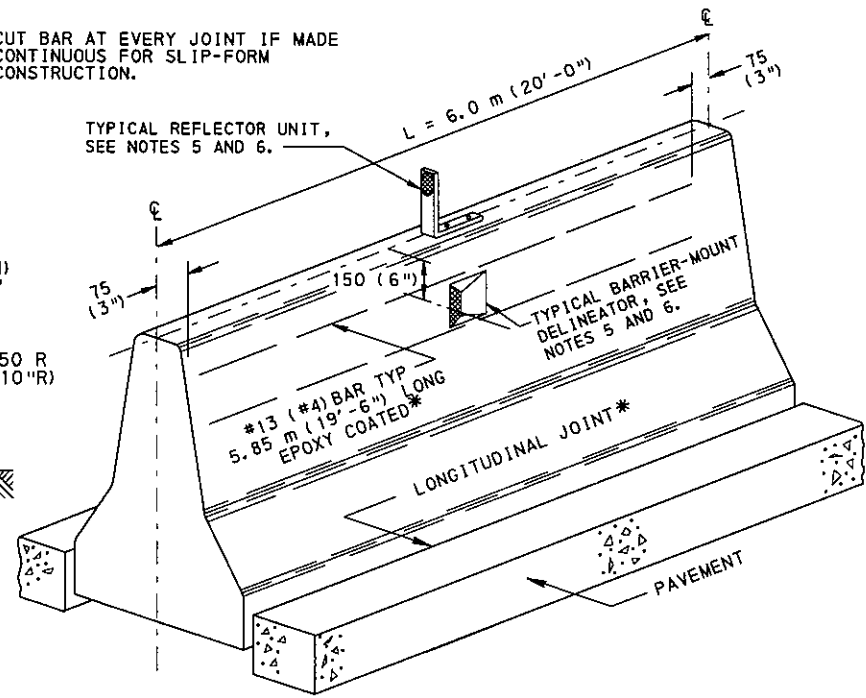
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

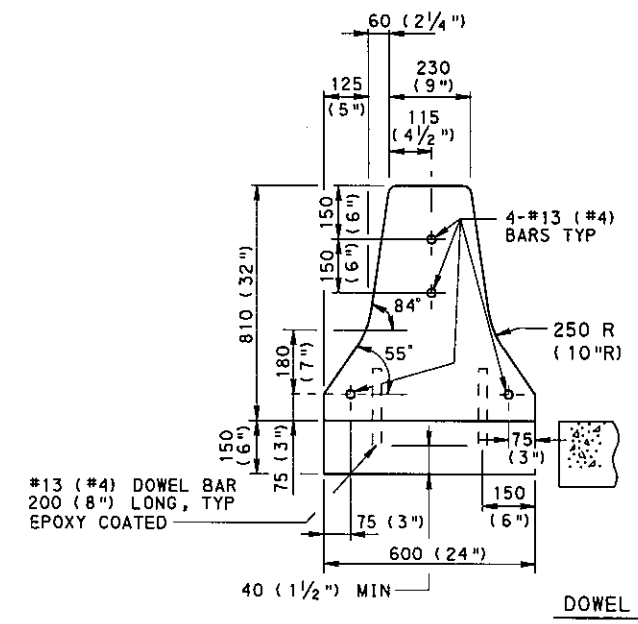
TYPE 2 WEAK POST
MEDIAN BARRIER



MONOLITHIC CONSTRUCTION



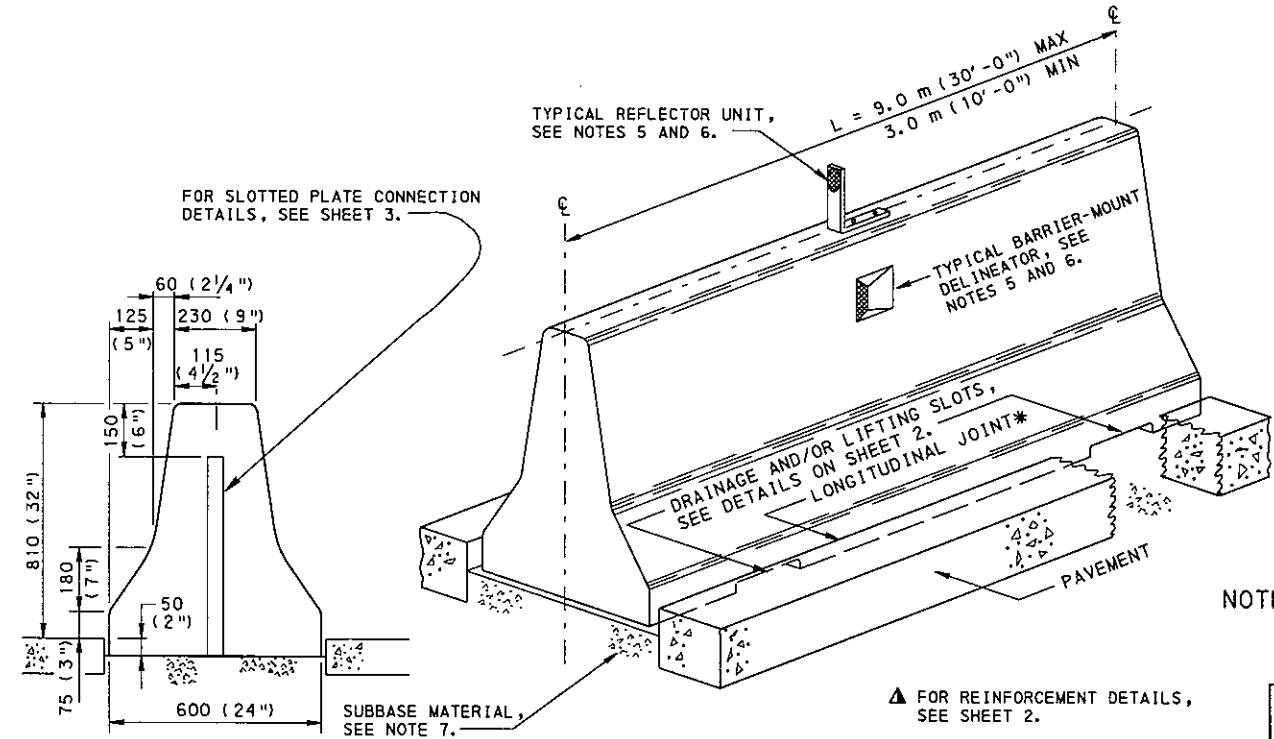
TYPICAL CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION



DOWEL CONSTRUCTION

NOTES

1. PROVIDE CONCRETE MEDIAN BARRIER MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 623.
2. PROVIDE PRECAST CONCRETE BARRIER SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15. FOR DEVIATIONS OR MODIFICATIONS FROM THE STANDARD, SUBMIT SHOP DRAWINGS FOR REVIEW AND APPROVAL.
3. FOR CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION, USE PREMOLDED JOINT MATERIAL AT ALL CONSTRUCTION JOINTS.
4. CONCRETE MEDIAN BARRIER CONSTRUCTION ON EXISTING PAVEMENT REQUIRES SPECIAL DETAILS TO BE SHOWN ON THE CONSTRUCTION DRAWINGS.
5. FOR PERMANENT AND TEMPORARY BARRIER INSTALLATIONS, USE SIDE-MOUNT (BARRIER-MOUNT DELINEATOR) OR TOP-MOUNT DELINEATORS (BARRIER-MOUNT DELINEATOR OR REFLECTOR UNIT) AS DETERMINED ON A PROJECT BY PROJECT BASIS. LOCATE SIDE-MOUNT DELINEATORS 660 (26") FROM THE PAVEMENT TO THE CENTER OF THE DELINEATOR. INSTALL TOP-MOUNT DELINEATORS AS FOLLOWS:
 (1) CENTER BARRIER-MOUNT DELINEATOR ALONG LONGITUDINAL CENTERLINE OF MEDIAN BARRIER.
 (2) LOCATE REFLECTOR UNITS AS SHOWN ON TRAFFIC STANDARD TC-7604.
 FOR PERMANENT INSTALLATIONS, PLACE DELINEATORS AT A MAXIMUM LONGITUDINAL SPACING OF 25 m (80'-0") FOR TANGENT SECTIONS AND 12 m (40'-0") FOR CURVE SECTIONS WITH A HORIZONTAL RADIUS LESS THAN 305 m (1000').
6. COMPACT NO. 2A OR NO. OGS MATERIAL IN ACCORDANCE WITH PUBLICATION 408/2000, SECTION 350. A LAYER 25 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 HORIZONTAL EDGES WITH A RADIUS OF 25 (1") EXCEPT AS SHOWN.
9. ANCHOR THE BARRIER AT THE ENDS OR AT INTERRUPTIONS WITH EITHER A DOWELED-IN CONNECTION OR A 250 (10") DEEP MONOLITHIC FOOTING.
10. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.



TYPICAL PRECAST CONSTRUCTION

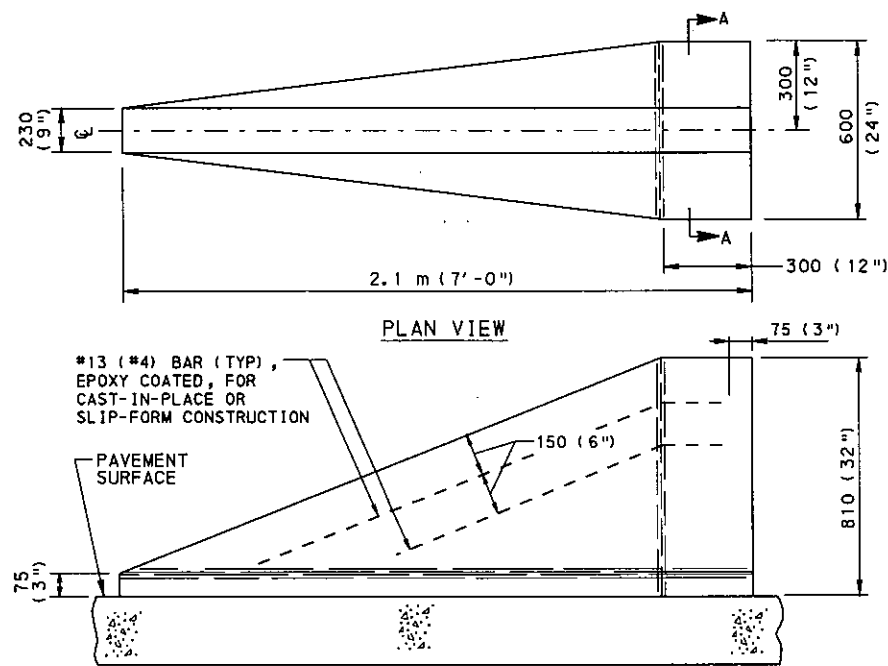
* SEAL JOINTS WITH AN APPROVED JOINT SEALER.

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

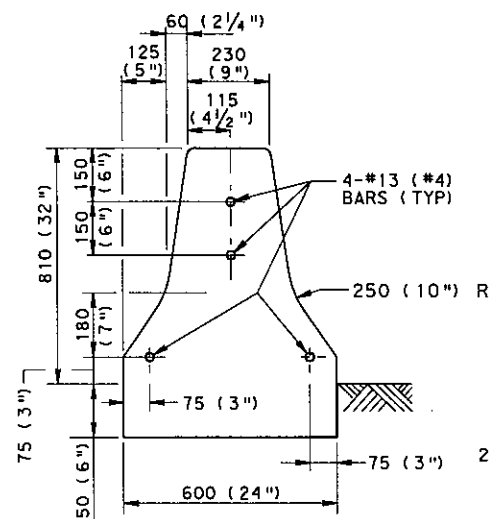
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER
 F-SHAPE
 CAST-IN-PLACE AND PRECAST

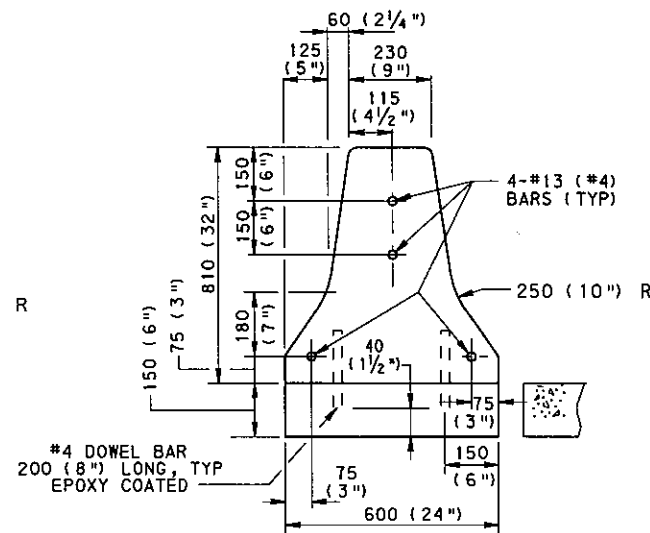
RECOMMENDED APR. 28, 2000 <i>Sean A. Eshbach</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 5 RC-57M
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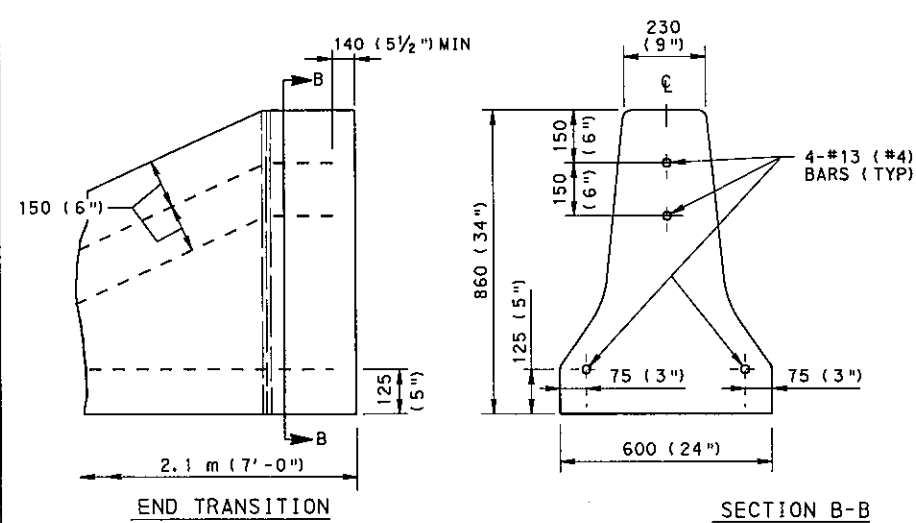
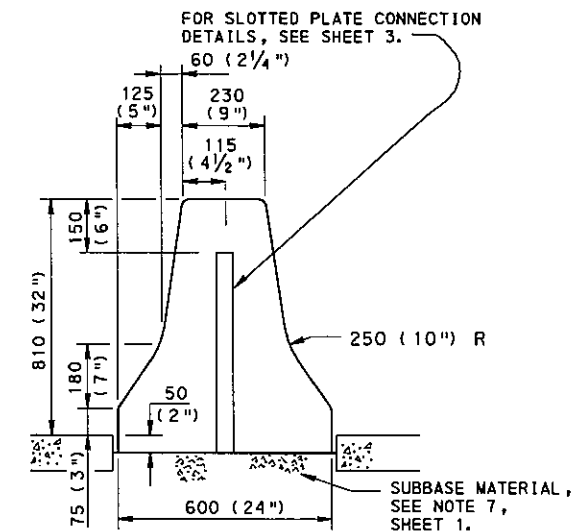
TYPICAL END TRANSITION CONSTRUCTION



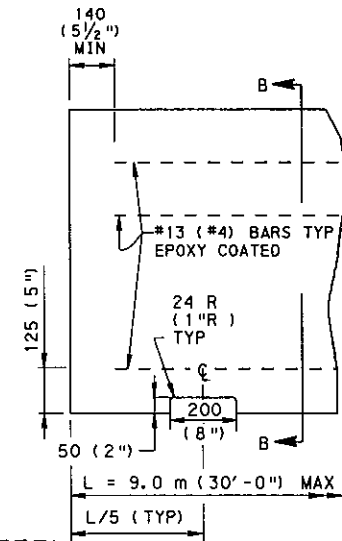
TYPICAL CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION



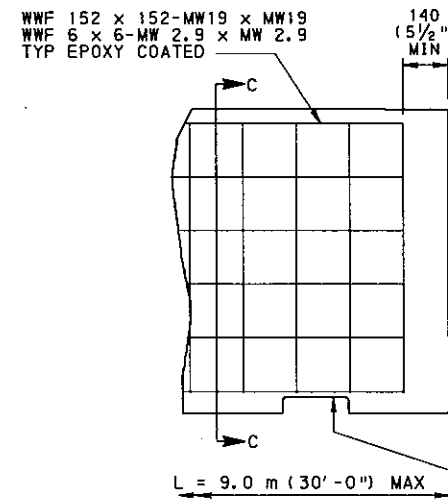
TYPICAL PRECAST CONSTRUCTION



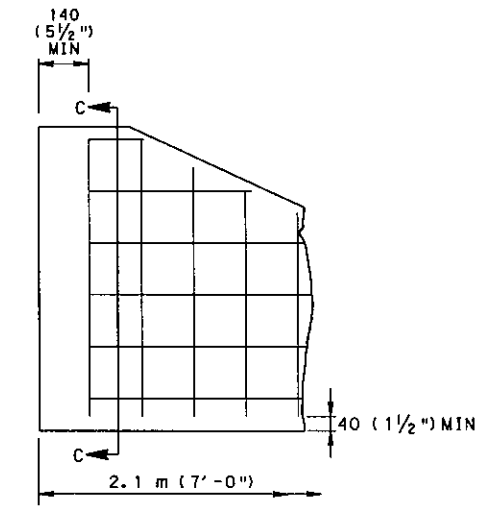
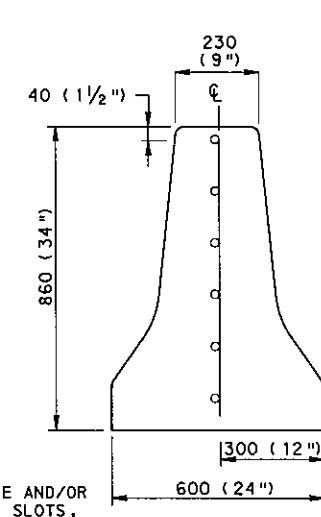
REINFORCEMENT STEEL



TYPICAL REINFORCEMENT DETAILS FOR PRECAST CONSTRUCTION



WELDED WIRE FABRIC



END TRANSITION

NOTES

- 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 DESIGNED TO ABSORB THE ENERGY OF AN IMPACTING VEHICLE IN THE WEIGHT RANGE OF 820 kg TO 2000 kg AT THE SPECIFIED DESIGN SPEED, WITH A MAXIMUM AVERAGE DECELERATION FORCE OF 8.5 g's (1800 TO 4500 lbs) AND A MAXIMUM PEAK DECELERATION FORCE OF 15 g's. 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:
 - 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.
 - THE BARRIER IS EXTENDED AT THE PROPER FLARE RATE UNTIL THE END OF THE BARRIER SYSTEM CAN BE BURIED IN A CUT SECTION.
 - 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.

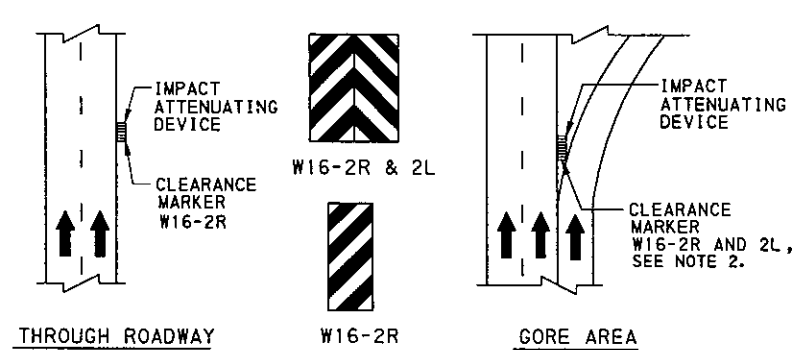
- PROVIDE SUITABLE LIFTING DEVICES FOR HANDLING, INSTALLING AND REMOVING PRECAST CONCRETE BARRIER. GALVANIZE METAL DEVICES AS SPECIFIED IN PUBLICATION 408/2000, SECTION 1105.02(s).
- PROVIDE REINFORCEMENT STEEL MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 709 WITH A MINIMUM CONCRETE COVER OF 40 (1 1/2").
- 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).
- ROUND OR CHAMFER HORIZONTAL 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

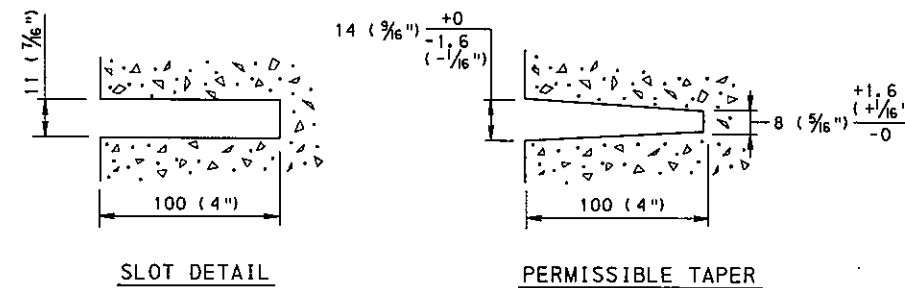
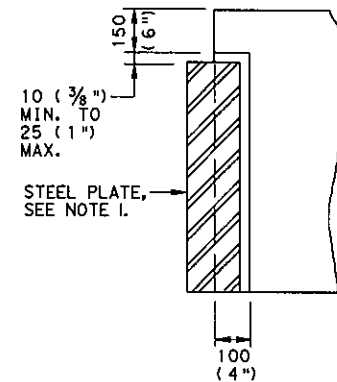
CONCRETE MEDIAN BARRIER
 F-SHAPE

RECOMMENDED APR. 28, 2000
 RECOMMENDED APR. 28, 2000
 SHT 2 OF 5
 RC-57M



DETAIL A

DELINEATION OF IMPACT ATTENUATING DEVICES

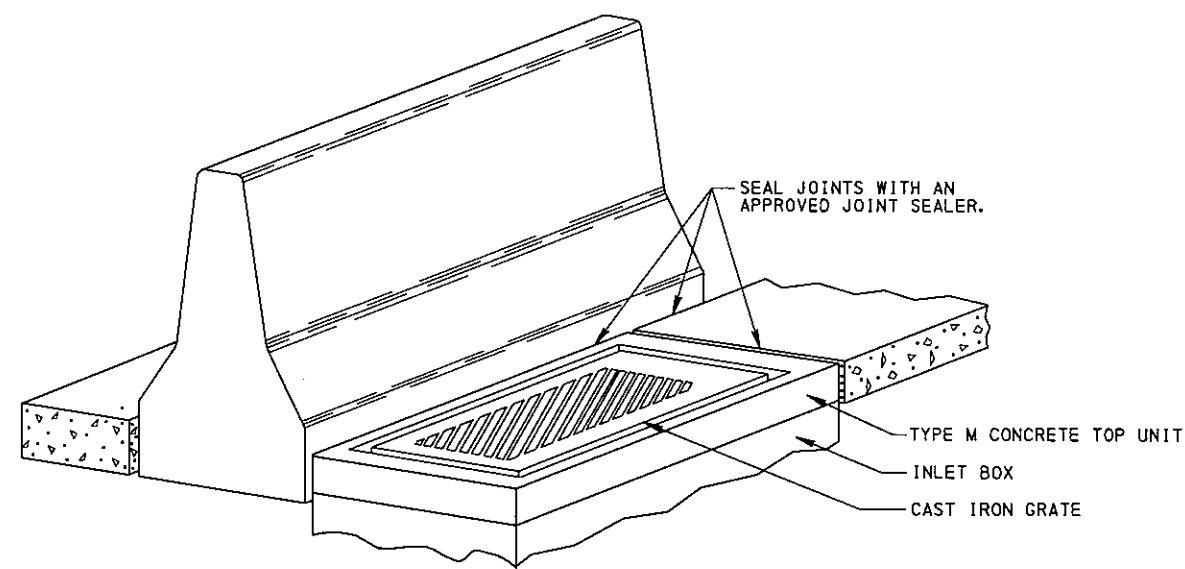


SLOTTED PLATE CONNECTION

NOTES

1. PROVIDE PLATES, 8 x 180 x 685 (5/16" x 7" x 27"), MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 1105.02(a). GALVANIZE PLATES AS SPECIFIED IN PUBLICATION 408/2000, SECTION 1105.02(a).
2. PROVIDE VERTICAL RECTANGLE, STANDARD ALUMINUM, PRESSURE SENSITIVE CLEARANCE MARKERS, W16-2R AND/OR W16-2L, FABRICATED FROM CLASS II SHEETING MATERIAL, FOR DELINEATION OF IMPACT ATTENUATING DEVICES AS PRESENTED IN DETAIL A. ATTACH MARKERS DIRECTLY TO THE LEADING END OF IMPACT ATTENUATING DEVICES. ON INERTIAL BARRIERS (SAND BARRELS), PROVIDE SENSITIVE SHEETING, WITHOUT RIGID BACKING, DIRECTLY TO BARRIER FRONT OR NOSE SECTION. DO NOT POST-MOUNT MARKERS IN FRONT OF IMPACT ATTENUATING DEVICES. MARKERS ARE PROVIDED IN TWO SIZES: 305 x 914 (12" x 36") AND 457 x 914 (18" x 36"). WHEN ONE MARKER IS REQUIRED, USE 457 x 914 (18" x 36"). WHEN TWO MARKERS ARE REQUIRED SIDE BY SIDE, USE 305 x 914 (12" x 36"). PROVIDE COLOR FOR CLEARANCE MARKERS AS FOLLOWS:

- (A) MESSAGE : BLACK STRIPES (NON-REFLECTORIZED)
- (B) FIELD : YELLOW (REFLECTORIZED)
ORANGE (REFLECTORIZED), CONSTRUCTION ZONES



TYPICAL INLET PLACEMENT AT CONCRETE MEDIAN BARRIER

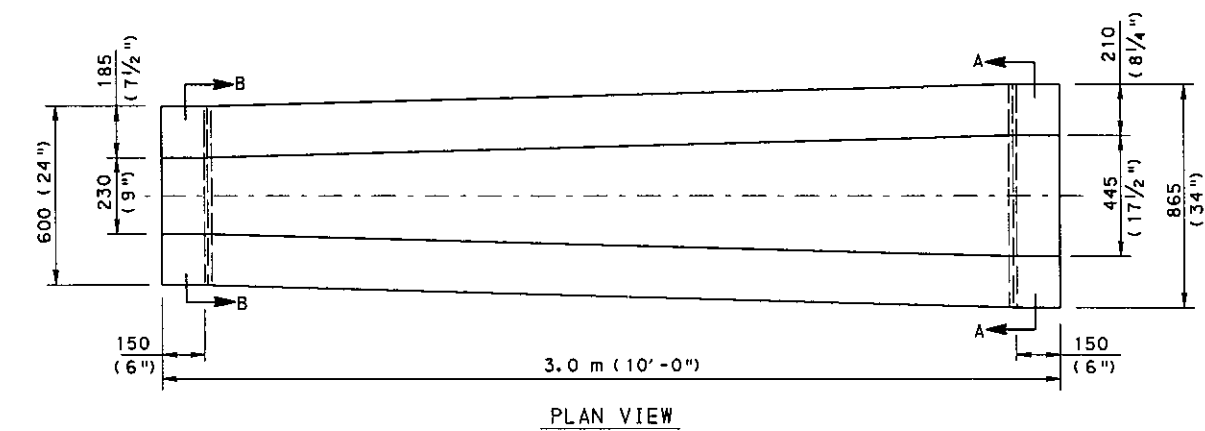
TABLE 1
FLARE RATES FOR BARRIER DESIGN

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

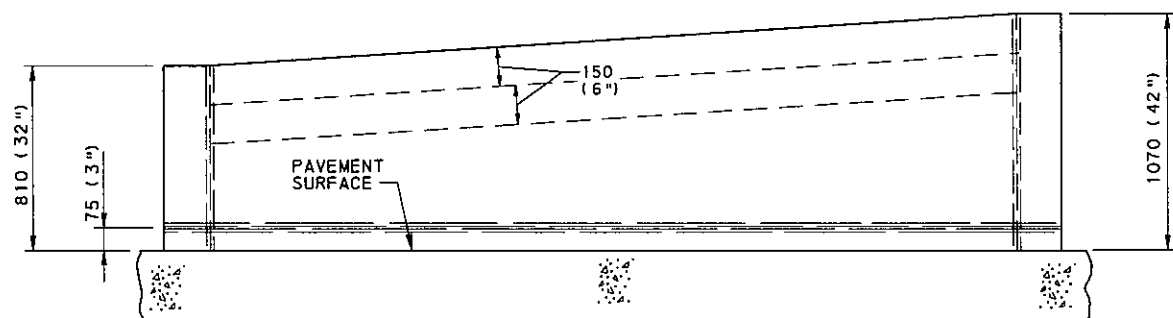
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

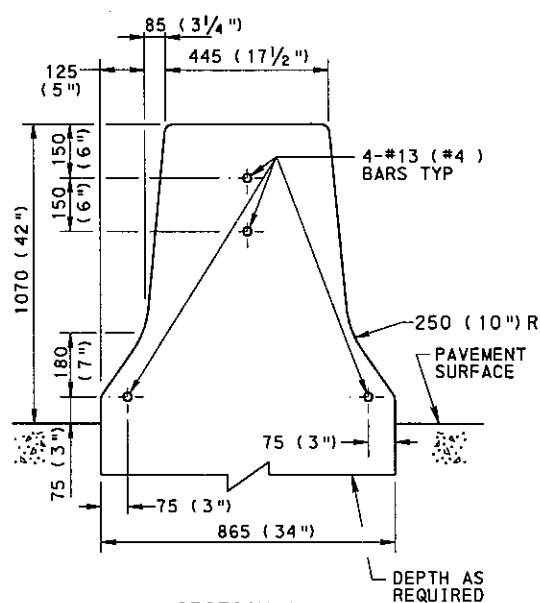
CONCRETE MEDIAN BARRIER
F-SHAPE



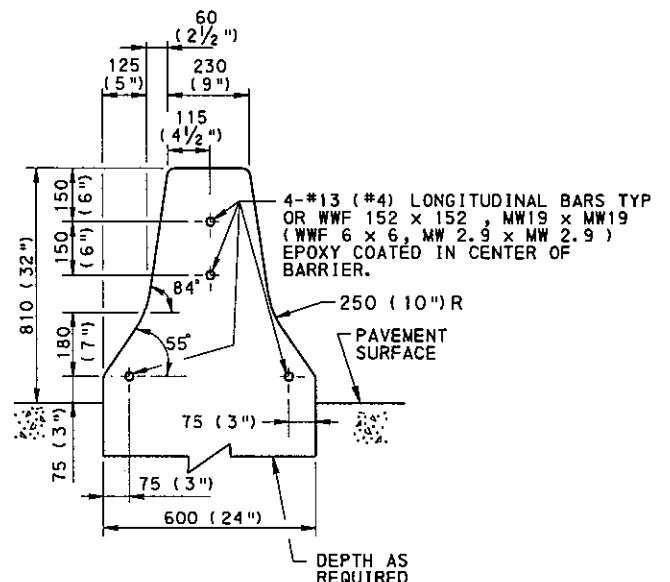
PLAN VIEW



ELEVATION VIEW



SECTION A-A

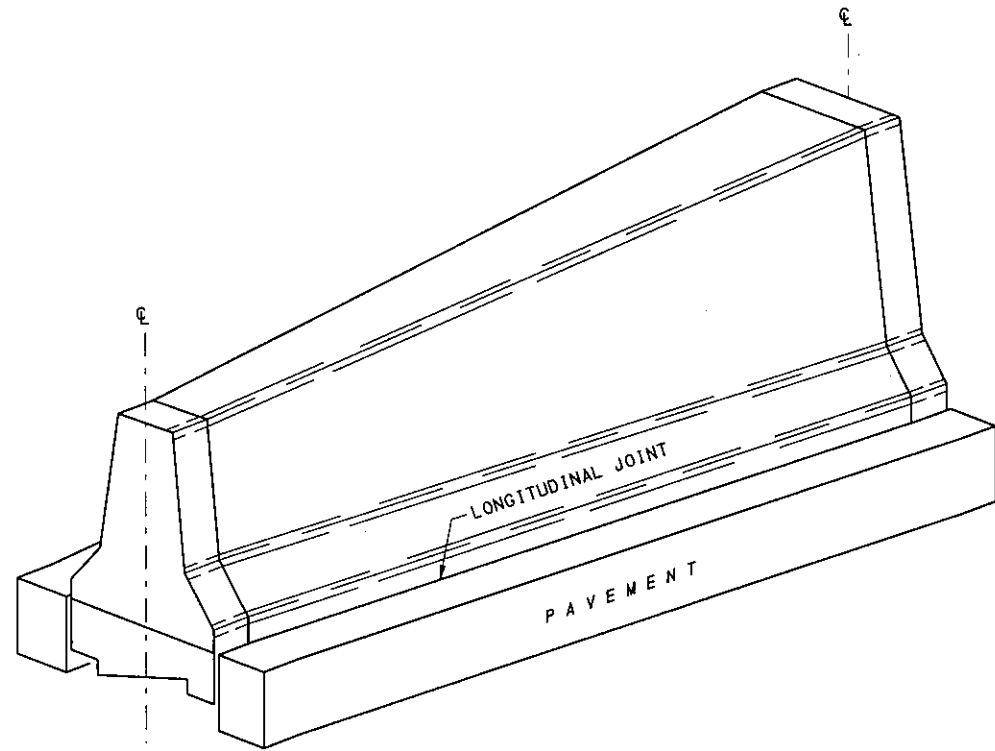


SECTION B-B

NOTES

1. PROVIDE REINFORCEMENT MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 709.
2. ROUND OR CHAMFER HORIZONTAL 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.



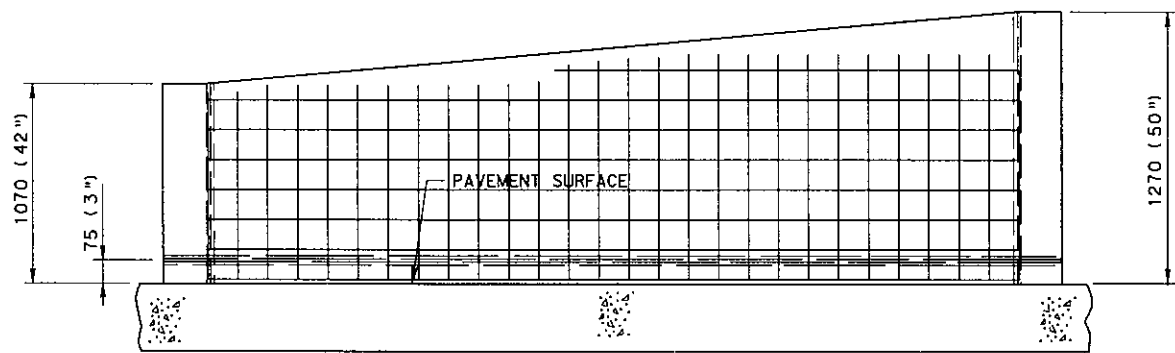
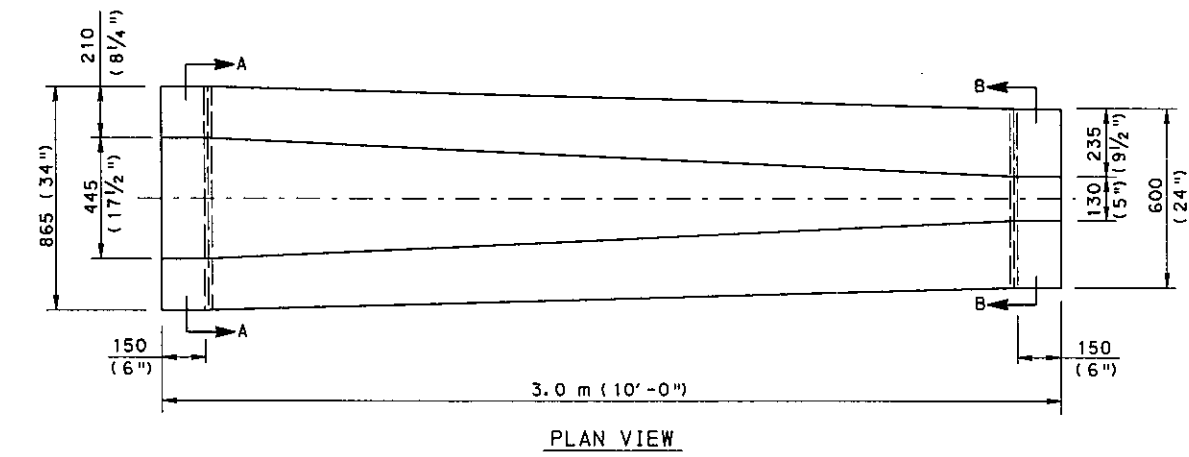
ORTHOGRAPHIC VIEW

TYPICAL 810 TO 1070 (32" TO 42")
TRANSITION CONSTRUCTION

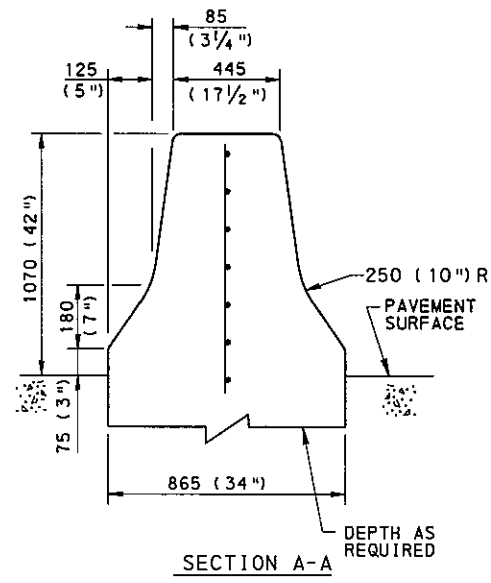
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER
F-SHAPE

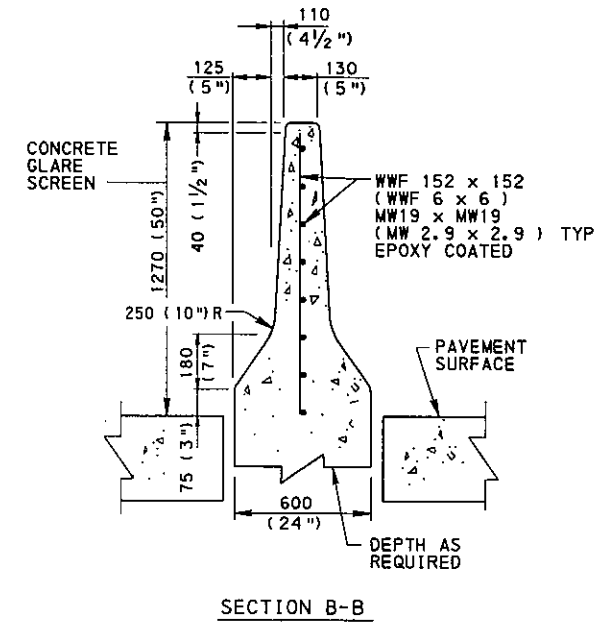
RECOMMENDED APR. 28, 2000	RECOMMENDED APR. 28, 2000	SHT 4 OF 5
<i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	<i>Gary L. Hoffman</i> CHIEF ENGINEER	RC-57M



ELEVATION VIEW



SECTION A-A

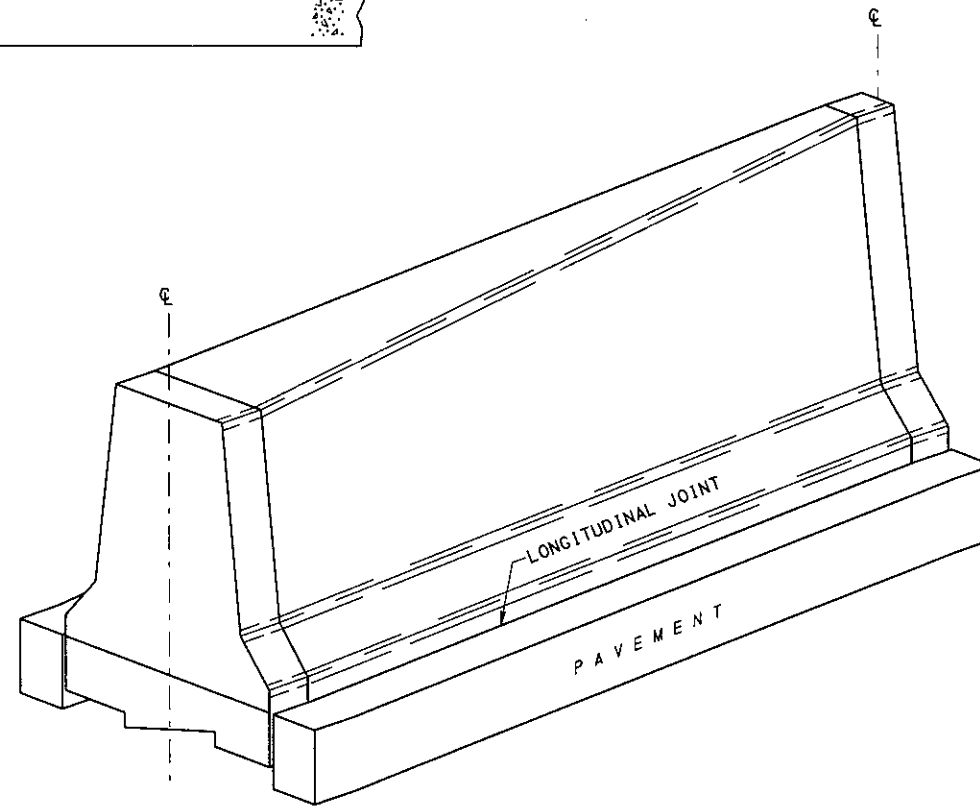


SECTION B-B

NOTES

1. PROVIDE REINFORCEMENT MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 709 WITH A MINIMUM CONCRETE COVER OF 40 (1 1/2").
2. ROUND OR CHAMFER HORIZONTAL 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.



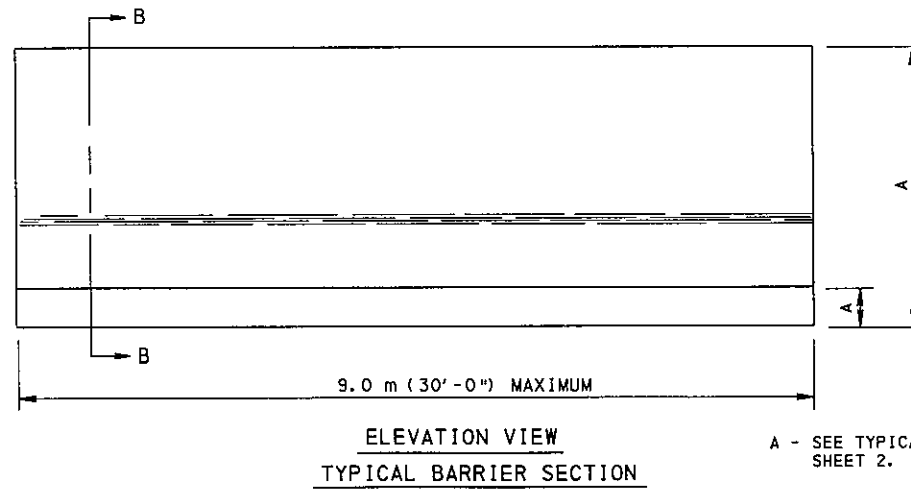
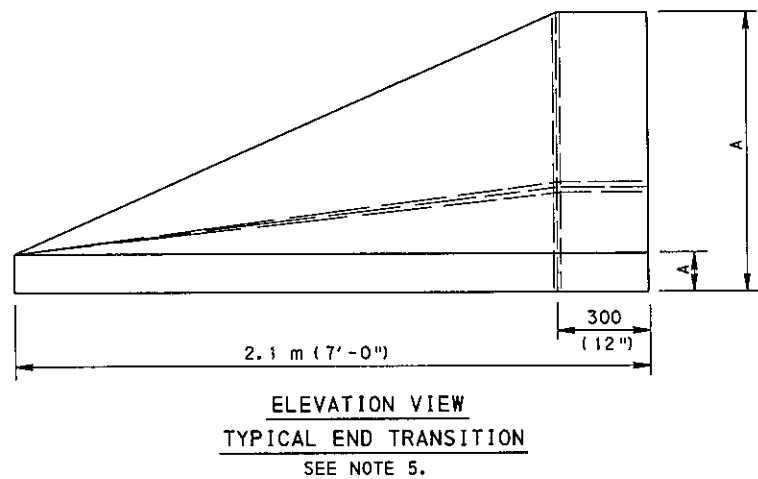
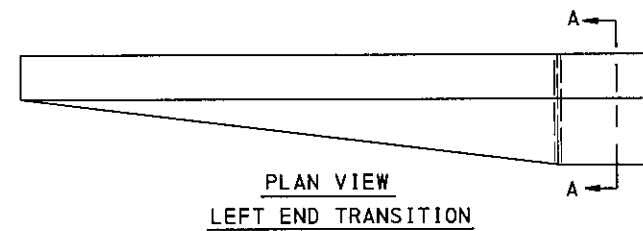
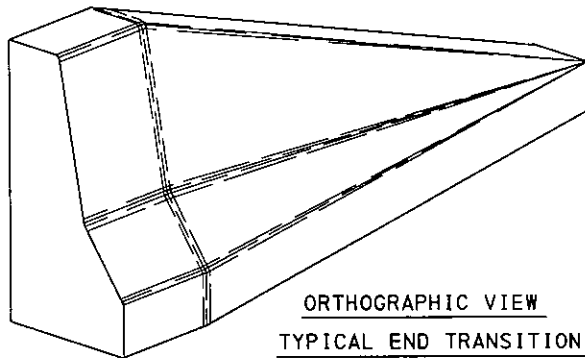
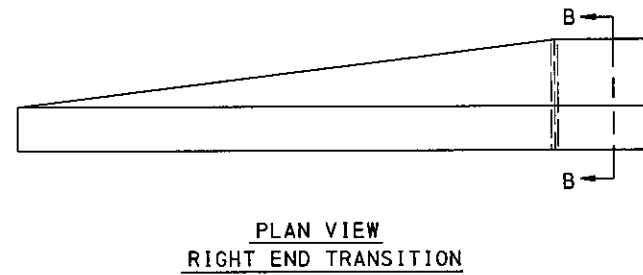
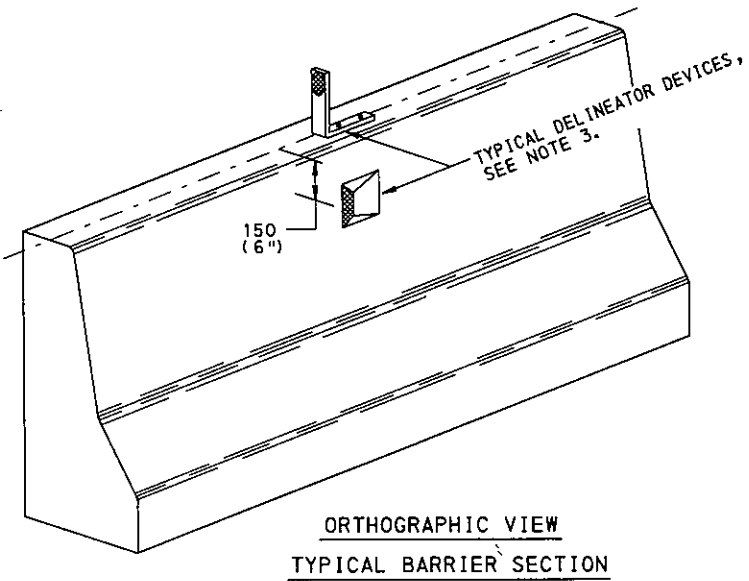
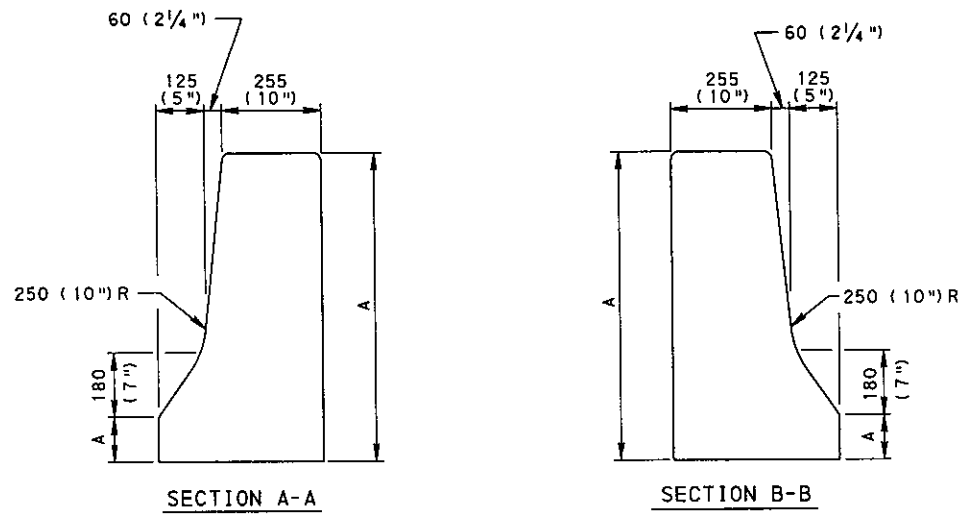
ORTHOGRAPHIC VIEW

TYPICAL 1070 TO 1270 (42" TO 50") TRANSITION CONSTRUCTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER
F-SHAPE

RECOMMENDED APR. 28, 2000 <i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary J. Hoffman</i> CHIEF ENGINEER	SHT 5 OF 5 RC-57M
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A - SEE TYPICAL SECTIONS, SHEET 2.

NOTES

1. PROVIDE SINGLE FACE CONCRETE BARRIER MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 623.
2. PROVIDE PRECAST SINGLE FACE CONCRETE BARRIER SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15. MODIFICATIONS OR DEVIATIONS FROM THE STANDARD REQUIRE THE SUBMISSION OF SHOP DRAWINGS FOR REVIEW.
3. PROVIDE BARRIER-MOUNT OR REFLECTOR UNIT DELINEATORS, AS INDICATED ON RC-57M.
4. PROVIDE REINFORCEMENT FOR SINGLE FACE CONCRETE BARRIER AS INDICATED ON SHEET 3.
5. PROVIDE END TRANSITIONS OR IMPACT ATTENUATING DEVICES AS INDICATED ON RC-57M.
6. ROUND OR CHAMFER HORIZONTAL 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.

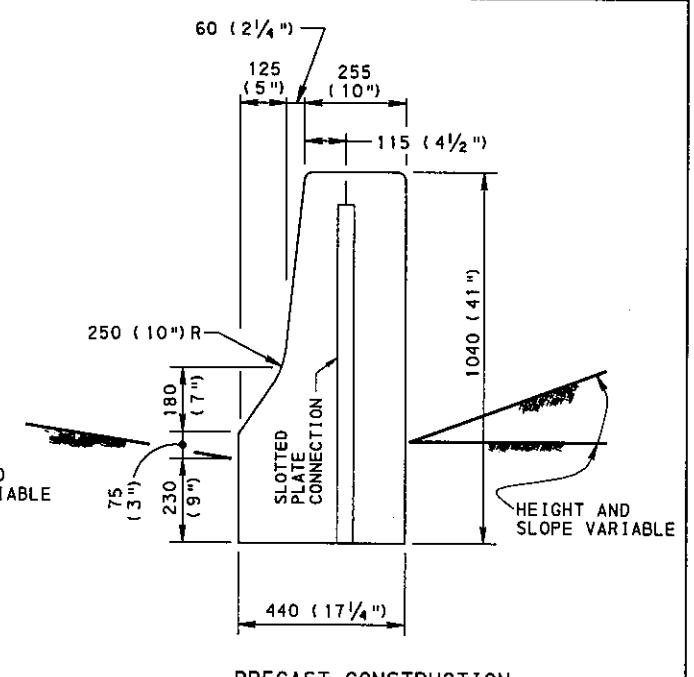
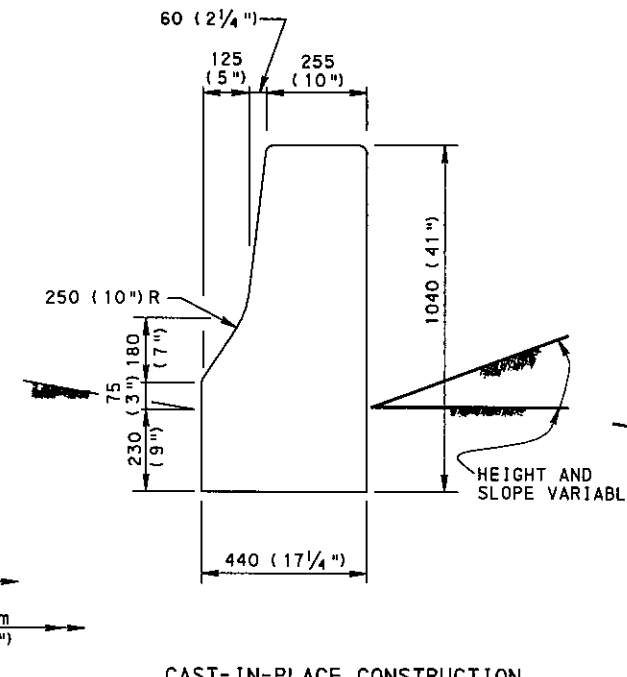
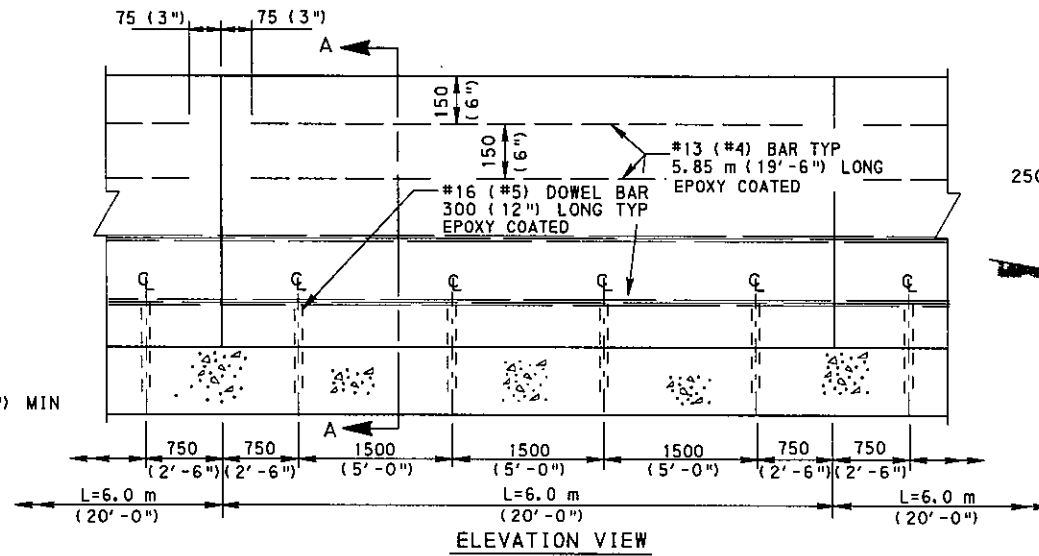
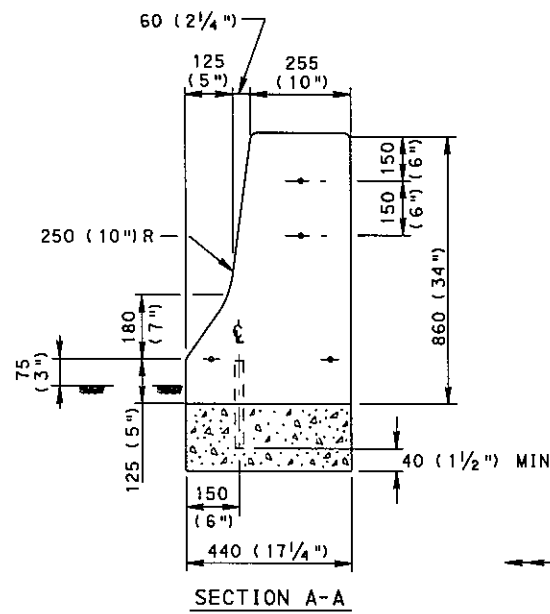
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
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SINGLE FACE CONCRETE BARRIER
CAST-IN-PLACE AND PRECAST

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

RECOMMENDED APR. 28, 2000 <i>Alan P. Schuch</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Larry R. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 6 RC-58M
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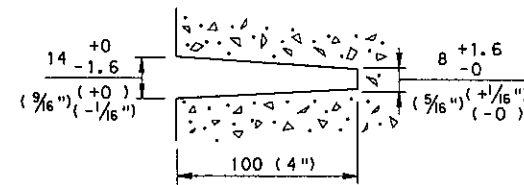
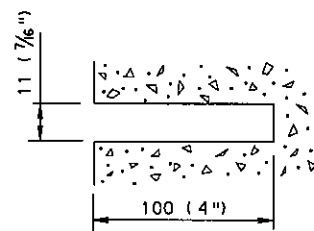
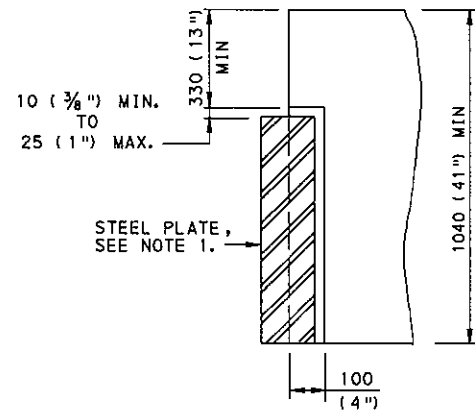
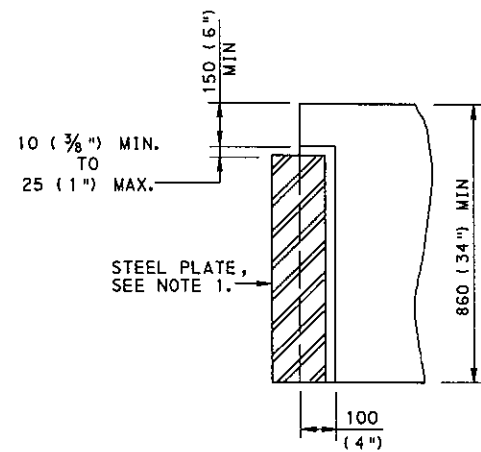


DOWEL CONSTRUCTION

CAST-IN-PLACE CONSTRUCTION

PRECAST CONSTRUCTION

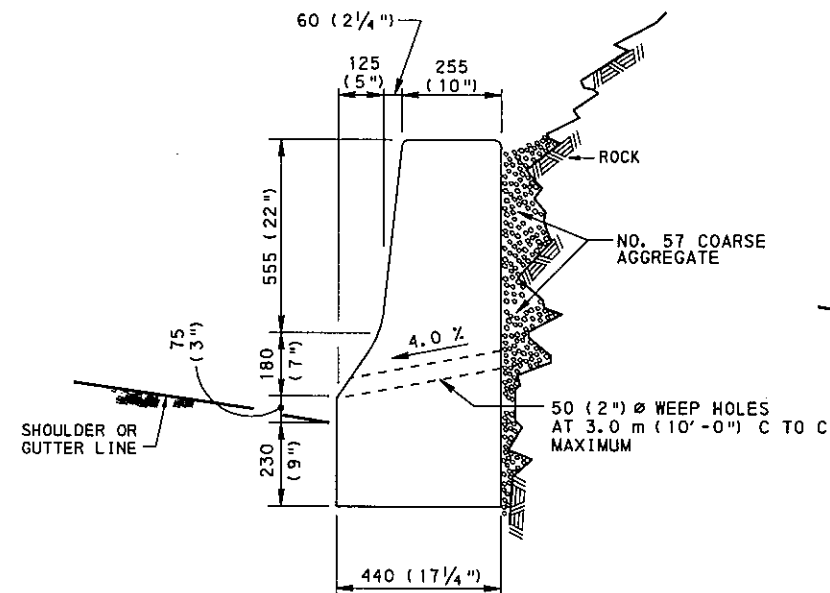
TYPICAL SINGLE FACE BARRIER SECTIONS



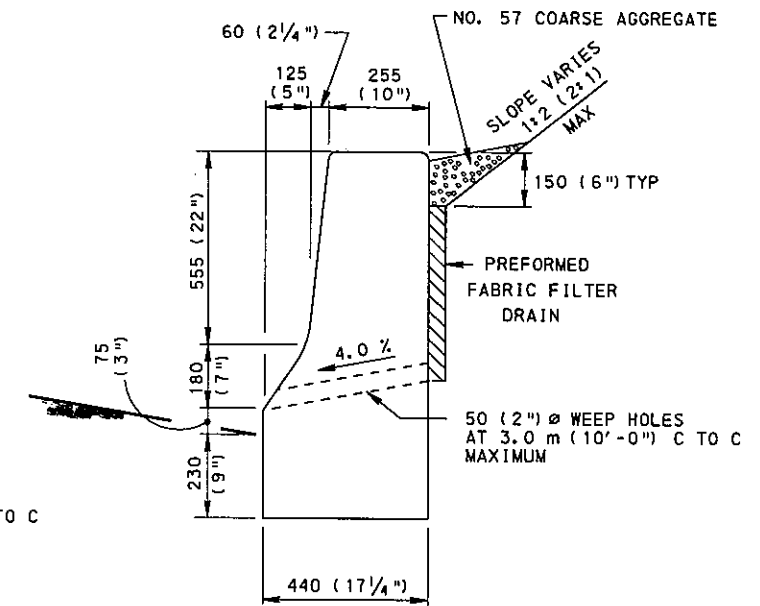
SLOT DETAIL

PERMISSIBLE TAPER

SLOTTED PLATE CONNECTION



TYPICAL ROUGH ROCK TREATMENT



TYPICAL DRAINAGE TREATMENT

SEE NOTE 2.

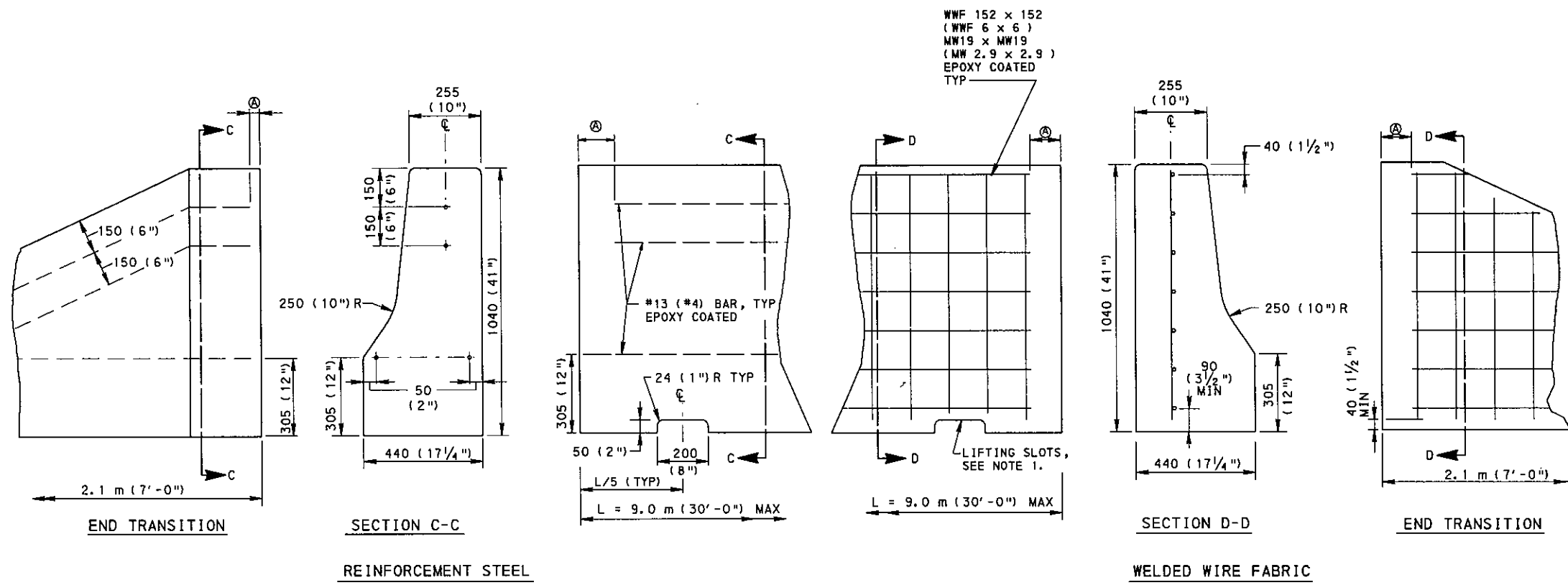
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

NOTES

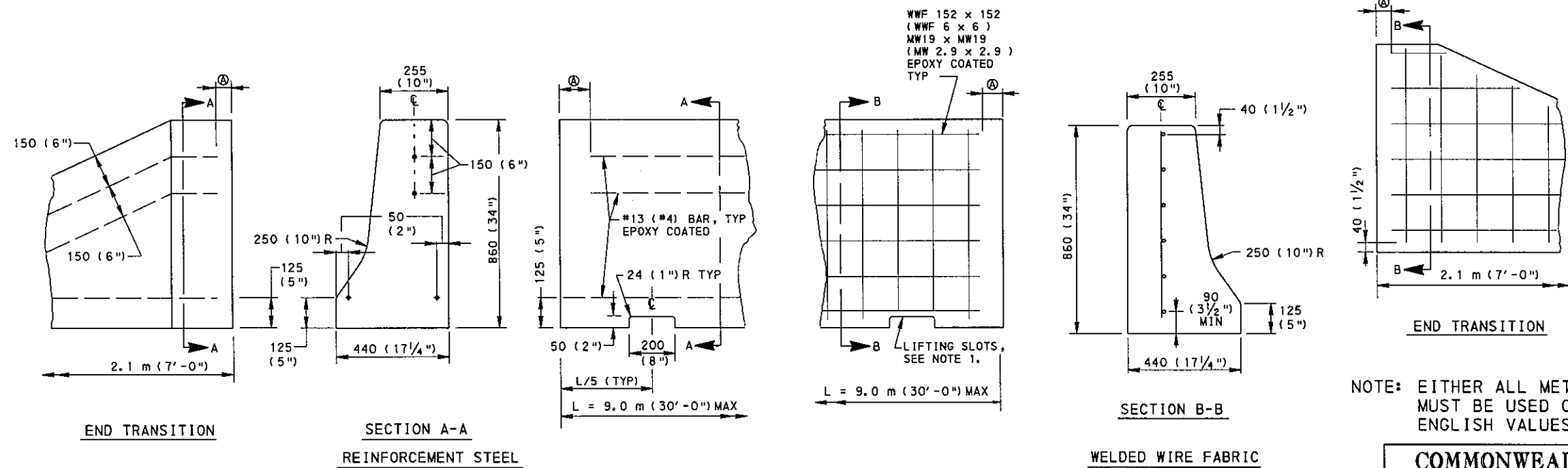
1. PROVIDE PLATES MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 1105. GALVANIZE PLATES AS SPECIFIED IN PUBLICATION 408/2000, SECTION 1105 ALTERNATE CONNECTIONS MAY BE USED AS APPROVED BY THE BUREAU OF DESIGN.
2. WHERE SINGLE FACE CONCRETE BARRIER IS SPECIFIED FOR USE AS A RETAINING WALL AND DRAINAGE TREATMENT IS NECESSARY, CONSTRUCT A PREFORMED FABRIC FILTER DRAIN AS INDICATED AND IN ACCORDANCE WITH PUBLICATION 408/2000, SECTION 610. IF THE HEIGHT OR SLOPE IS INCREASED, PROVIDE OVERTURNING MOMENT COMPUTATIONS WITH THE CONSTRUCTION PLANS.
3. ROUND OR CHAMFER HORIZONTAL EDGES WITH A RADIUS OF 25 (1) EXCEPT AS SHOWN.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER



TYPICAL REINFORCEMENT DETAILS FOR 1040 (41") BARRIER



TYPICAL REINFORCEMENT DETAILS FOR 860 (34") BARRIER

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

NOTES

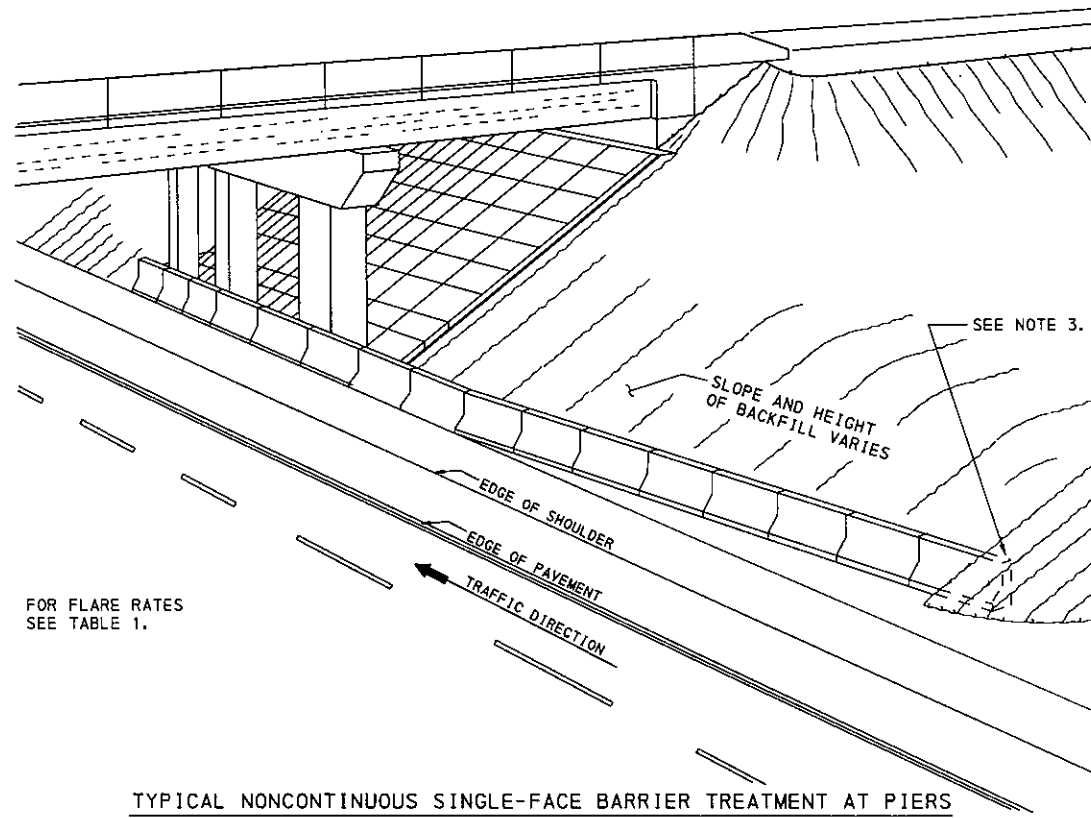
1. PROVIDE SLOTS OR OTHER ACCEPTABLE DEVICES FOR HANDLING, INSTALLING AND REMOVING PRECAST CONCRETE BARRIERS. GALVANIZE METAL DEVICES AS SPECIFIED IN PUBLICATION 408/2000, SECTION 1105.02 (s).
2. ROUND OR CHAMFER HORIZONTAL EDGES WITH A RADIUS OF (1") EXCEPT AS NOTED.

LEGEND

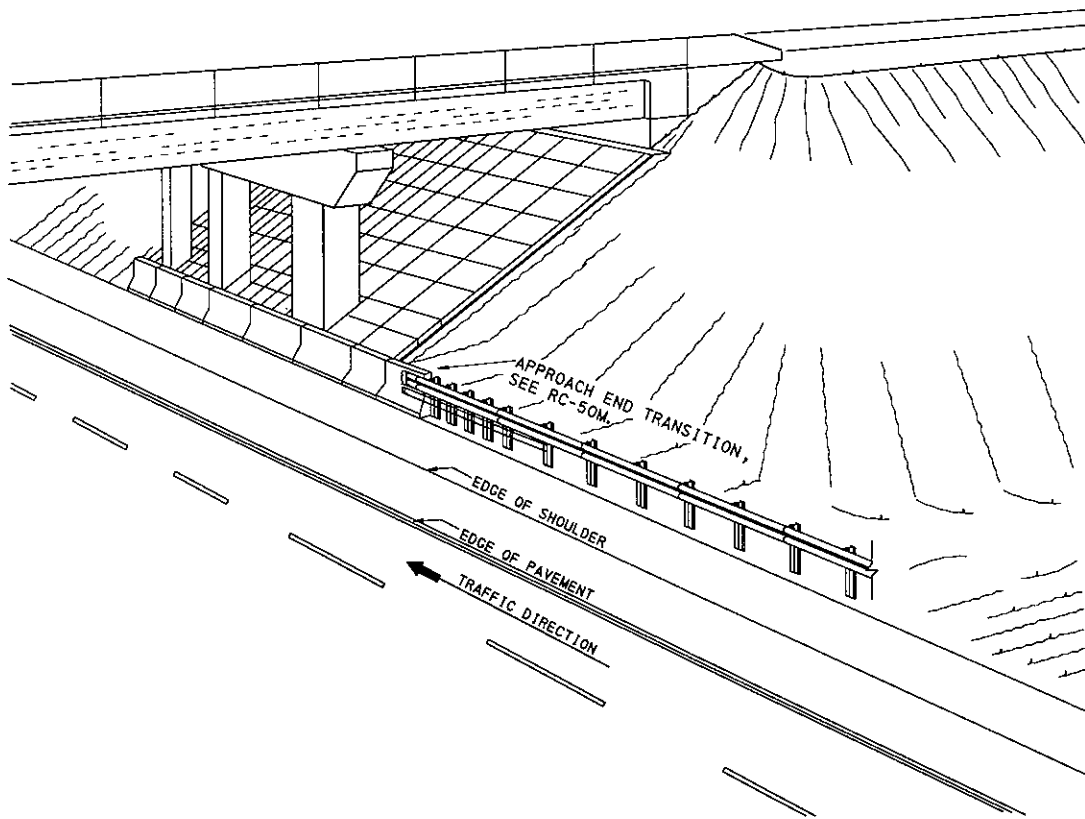
Ⓢ PROVIDE REINFORCEMENT MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 709 WITH A MINIMUM CONCRETE COVER OF 40 (1 1/2"). KEEP WIRE FABRIC OR BAR LIMITS AT 140 (5 1/2") MINIMUM FOR PRECAST BARRIER WITH PLATE CONNECTIONS.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER



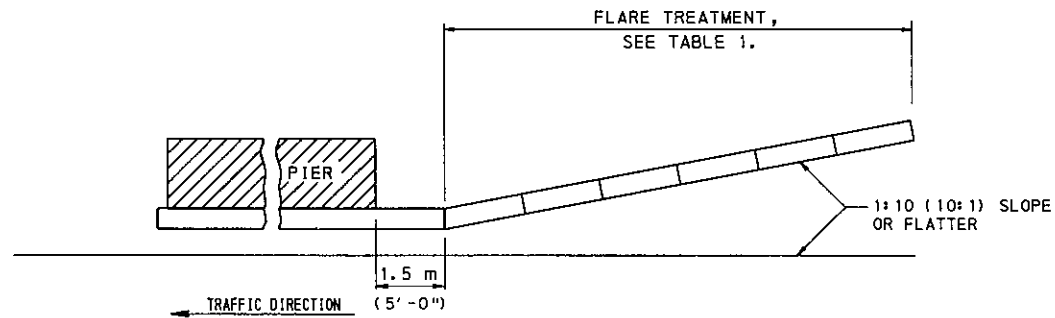
TYPICAL NONCONTINUOUS SINGLE-FACE BARRIER TREATMENT AT PIERS



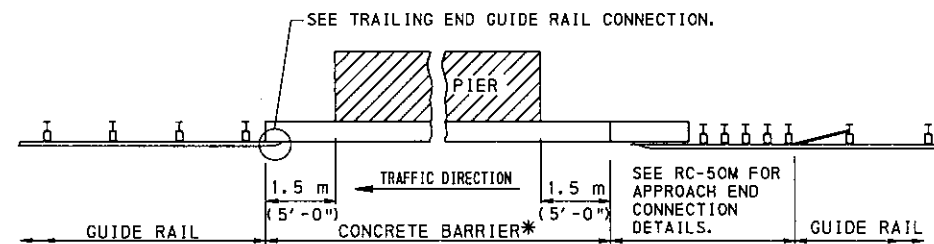
TYPICAL TREATMENT WHEN CONTINUOUS GUIDE RAIL IS REQUIRED

NOTES

1. PROVIDE SINGLE FACE CONCRETE BARRIER AND GUIDE RAIL MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTIONS 620 AND 623.
2. THE TREATMENTS SHOWN ARE FOR FOUR-LANE DIVIDED HIGHWAYS. USE THE APPROACH END TREATMENT ON BOTH SIDES OF THE OBSTRUCTION ON TWO-LANE FACILITIES WITH TWO-WAY TRAFFIC.
3. IF THE PREFERRED TREATMENT IS TO TERMINATE THE CONCRETE BARRIER WITHIN THE CLEAR ZONE, BURY IT INTO THE EXISTING SLOPE, PREFERABLY 1:2 (2:1), ONE FOOT DEEP OTHERWISE, USE AN IMPACT ATTENUATING DEVICE.



PLAN VIEW



CONTINUOUS GUIDE RAIL WITH SINGLE FACE BARRIER AT PIER

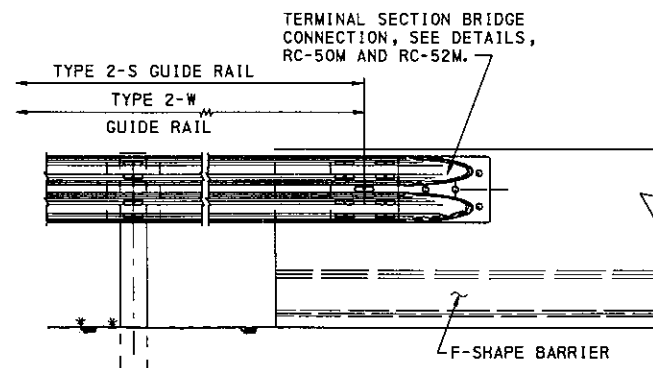
* IF ADEQUATE DEFLECTION DISTANCE IS PROVIDED (TABLE 1, RC-54M) BETWEEN THE BACK OF THE GUIDE RAIL POST AND FRONT OF OBSTRUCTION, DO NOT USE CONCRETE BARRIER; CONTINUE THE GUIDE RAIL.

PLAN VIEW

TABLE 1
FLARE RATES FOR BARRIER DESIGN

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

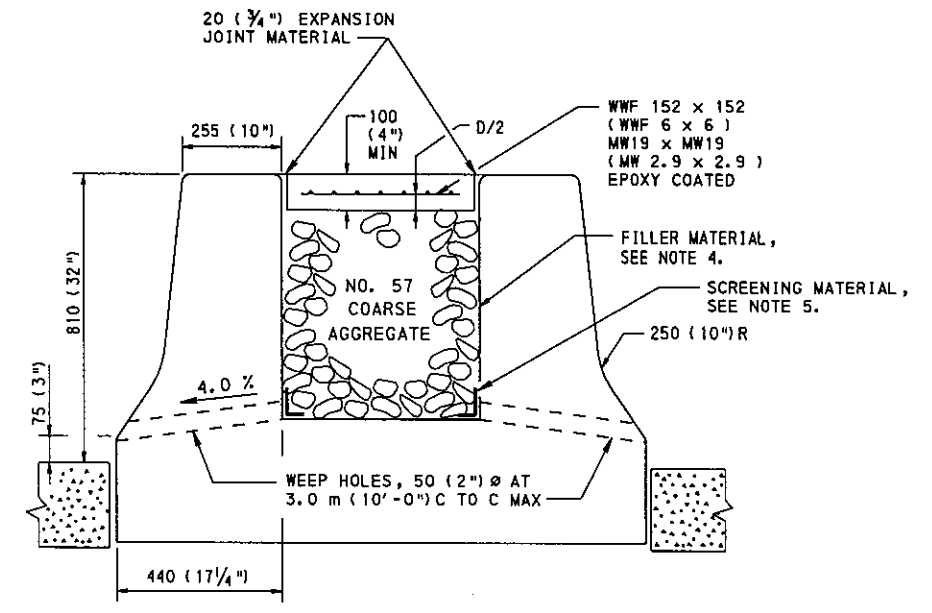
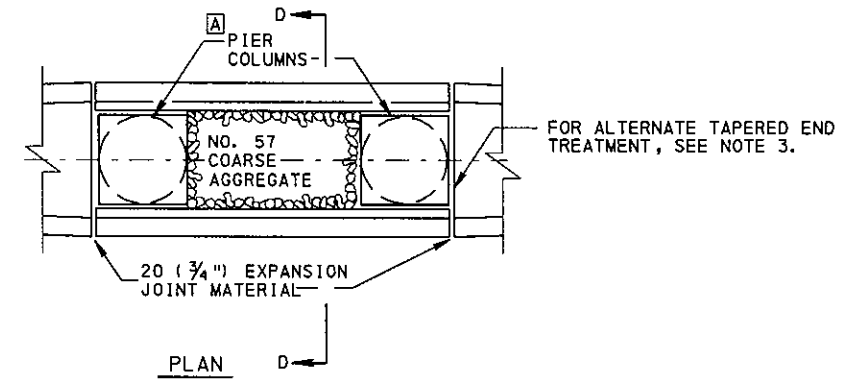
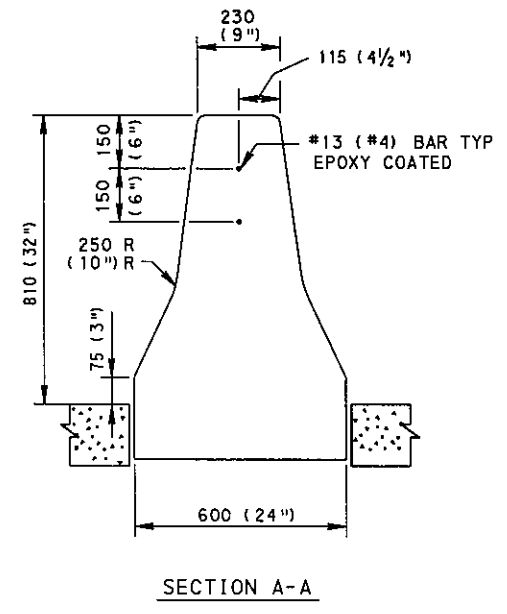
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.



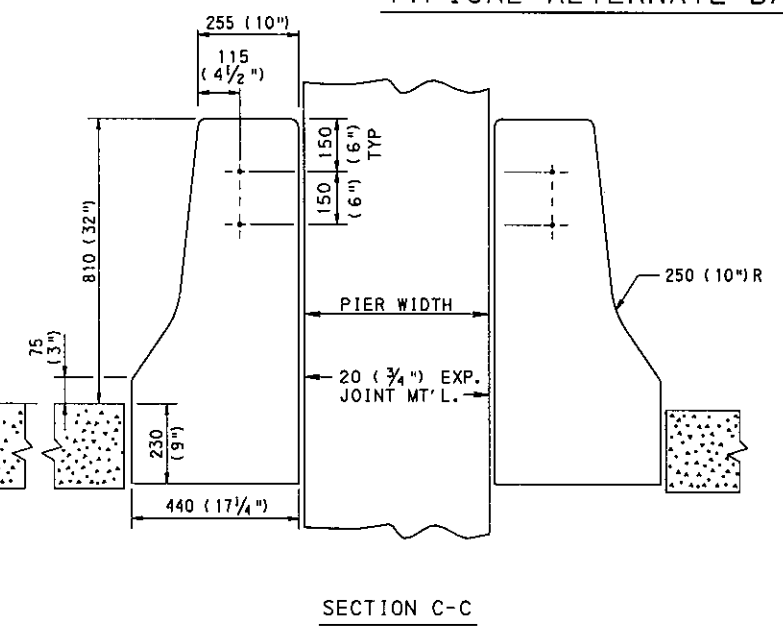
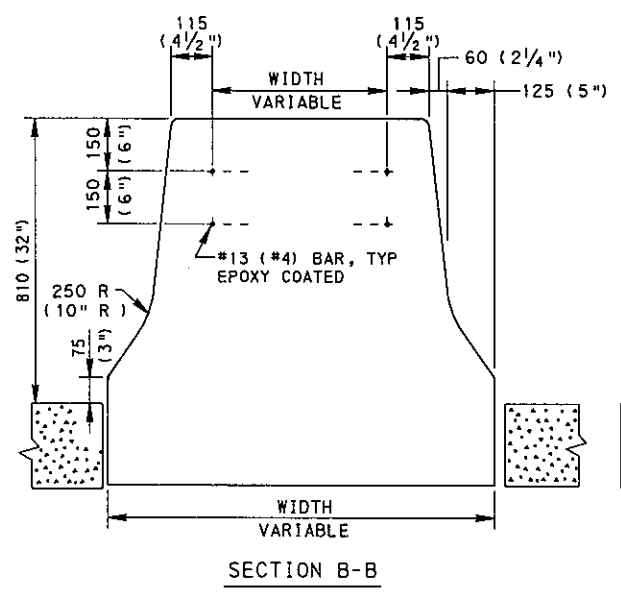
TRAILING END GUIDE RAIL CONNECTION TO F-SHAPE BARRIER

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER
PLACEMENT AT SHOULDER PIERS



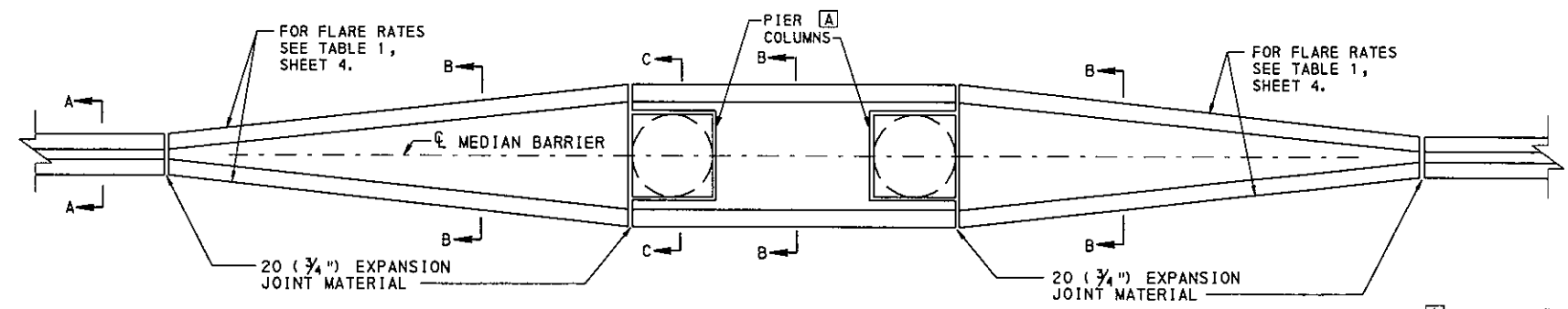
TYPICAL ALTERNATE BARRIER TREATMENT AT PIERS



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 408/2000, 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 HORIZONTAL EDGES WITH A RADIUS OF 25 (1 inch) EXCEPT AS SHOWN.

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



TYPICAL BARRIER TREATMENT AT PIERS

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

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER
PLACEMENT AT MEDIAN PIERS

RECOMMENDED APR. 28, 2000
Dean P. Schuch
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED APR. 28, 2000
Randy Hoffman
CHIEF ENGINEER

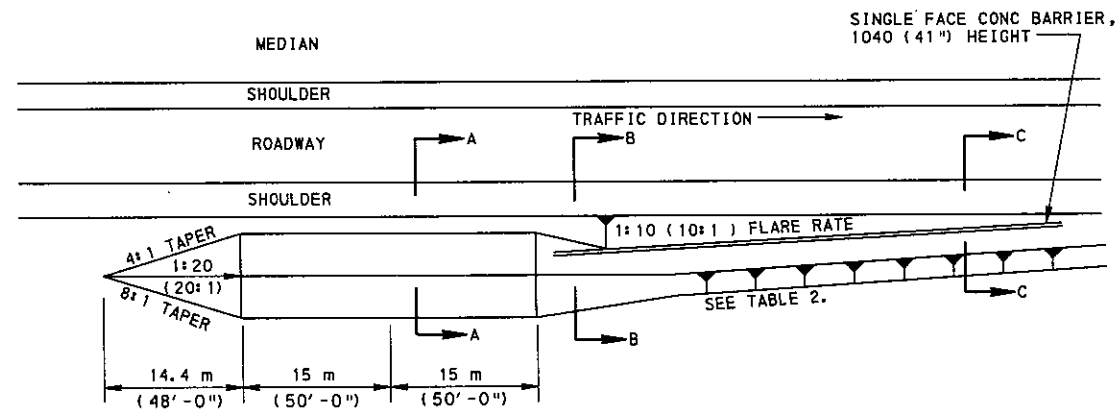
SHT 5 OF 6
RC-58M

**TABLE 2
FLARE RATES
FOR BARRIER DESIGN**

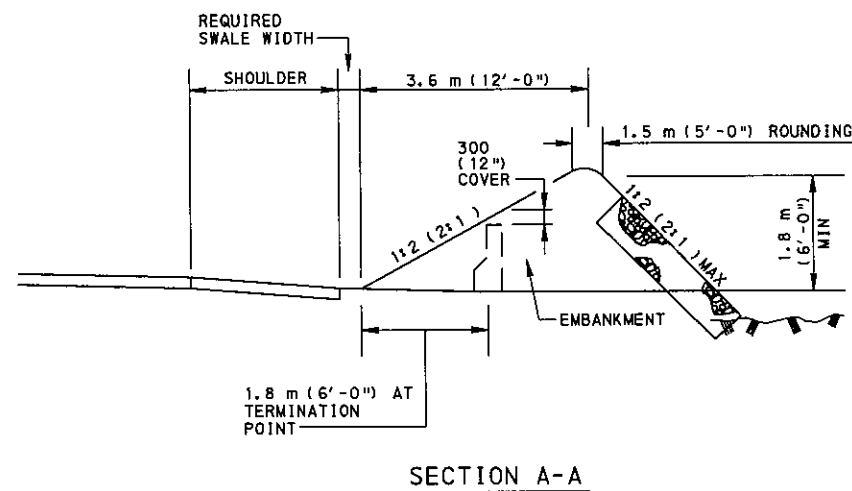
DESIGN SPEED		MAXIMUM FLARE RATES
Km/h	(mph)	CONCRETE BARRIER
120	(75)	20 : 1
110	(70)	20 : 1
100	(60)	18 : 1
90	(55)	16 : 1
80	(50)	14 : 1
70	(45)	12 : 1
60	(35)	10 : 1
50	(30)	8 : 1

NOTES

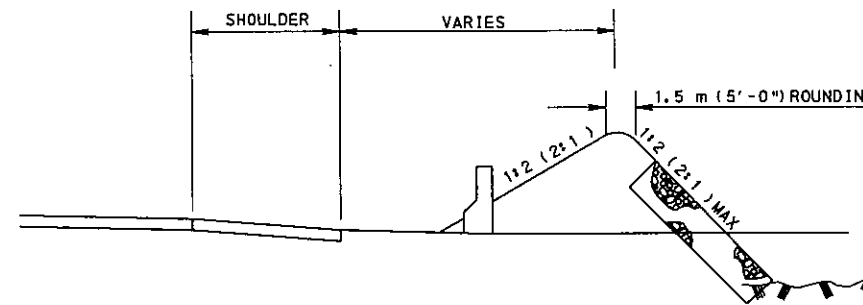
1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408/2000.
2. ALL MATERIALS NECESSARY TO CONSTRUCT EARTH MOUNDS ARE IN ACCORDANCE WITH APPLICABLE SECTIONS OF PUBLICATION 408/2000.
3. EARTHMOUNDS MAY BE USED TO BURY CONCRETE BARRIER ON HIGHWAYS WITH POSTED SPEEDS LESS THAN 80 km/h (50mph) AND WITH CURRENT TRAFFIC VOLUME LESS THAN 6000 VEHICLES PER DAY OR WHEN THEY ARE CONSTRUCTED OUTSIDE THE CLEAR ZONE AS DETERMINED IN PUB.13 M, DESIGN MANUAL PART 2, CHAPTER 12.



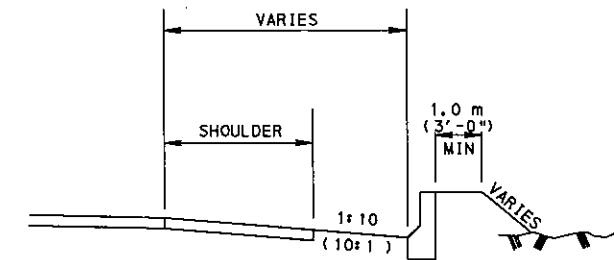
TYPICAL EARTH MOUND FOR BURYING CONCRETE BARRIER



SECTION A-A



SECTION B-B



SECTION C-C

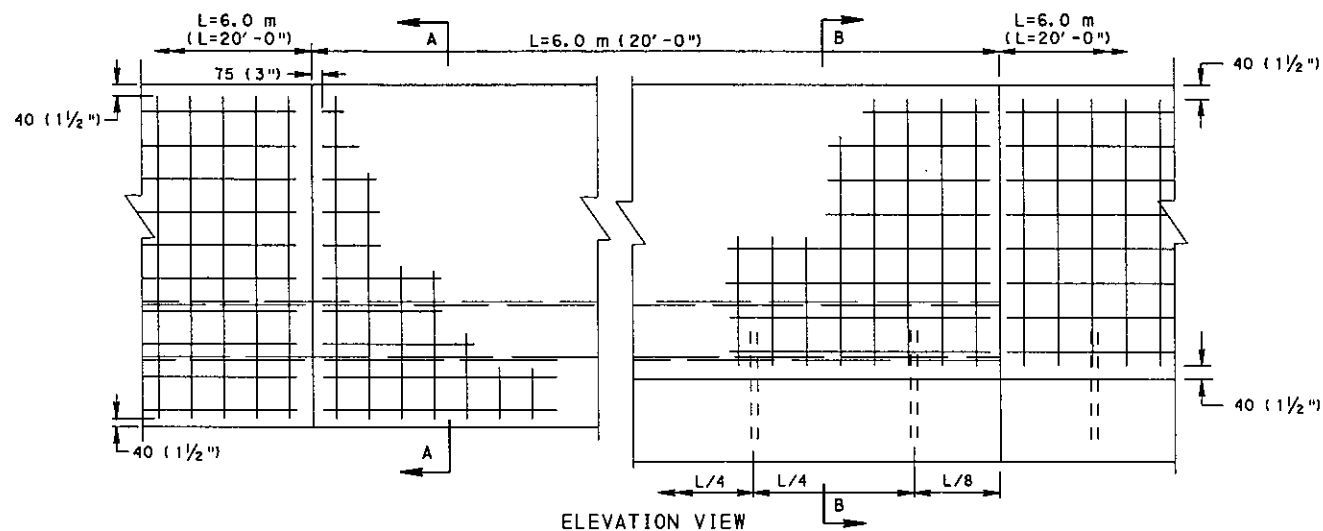
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

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

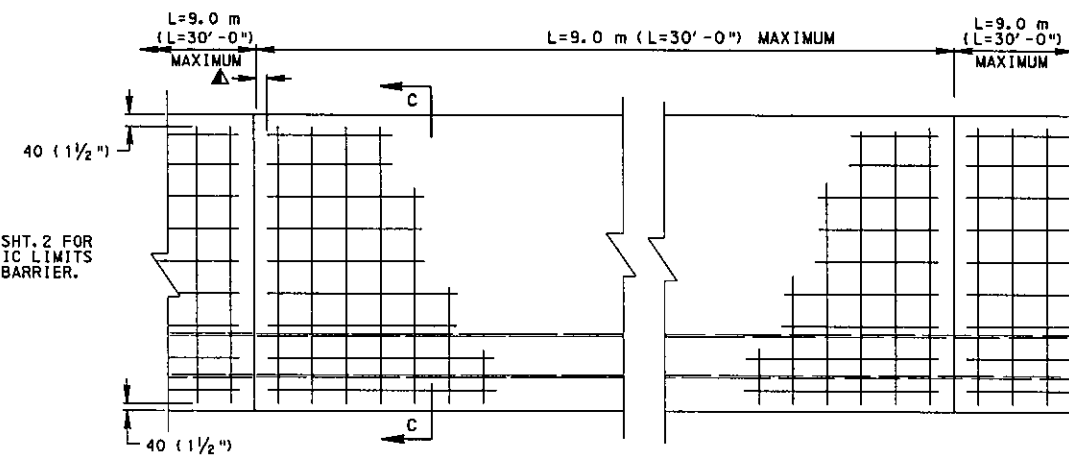
SINGLE FACE CONCRETE BARRIER

**END TREATMENT
BURYING INTO EARTH MOUND**

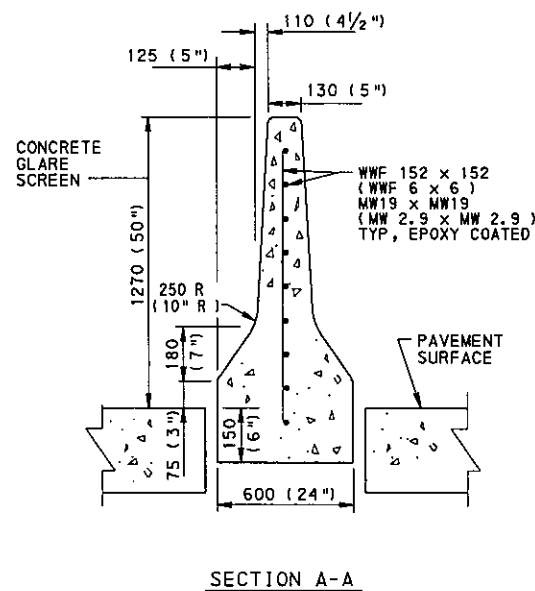
RECOMMENDED APR. 28, 2000
Dean P. Schuch DIRECTOR, BUREAU OF DESIGN
 RECOMMENDED APR. 28, 2000
Gary S. Hoffman CHIEF ENGINEER
 SHT 6 OF 6
 RC-58M



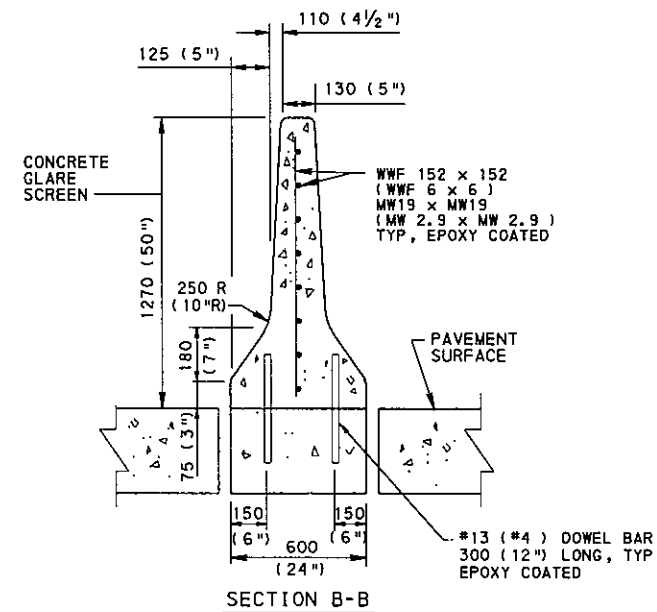
ELEVATION VIEW
TYPICAL CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION



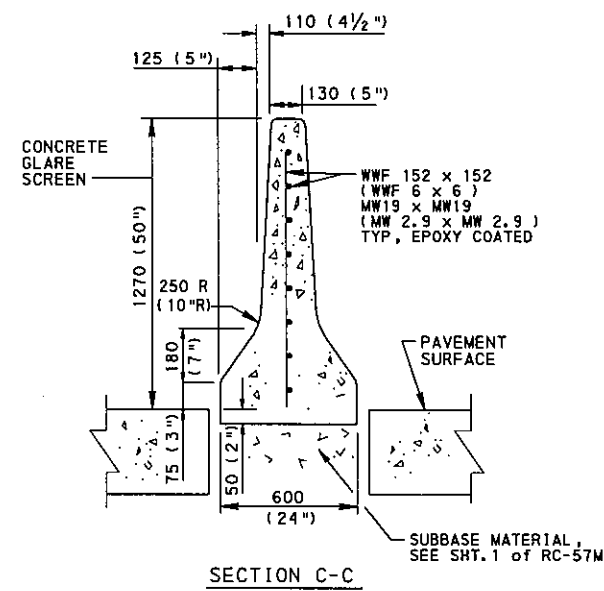
ELEVATION VIEW
PRECAST CONSTRUCTION



SECTION A-A



SECTION B-B

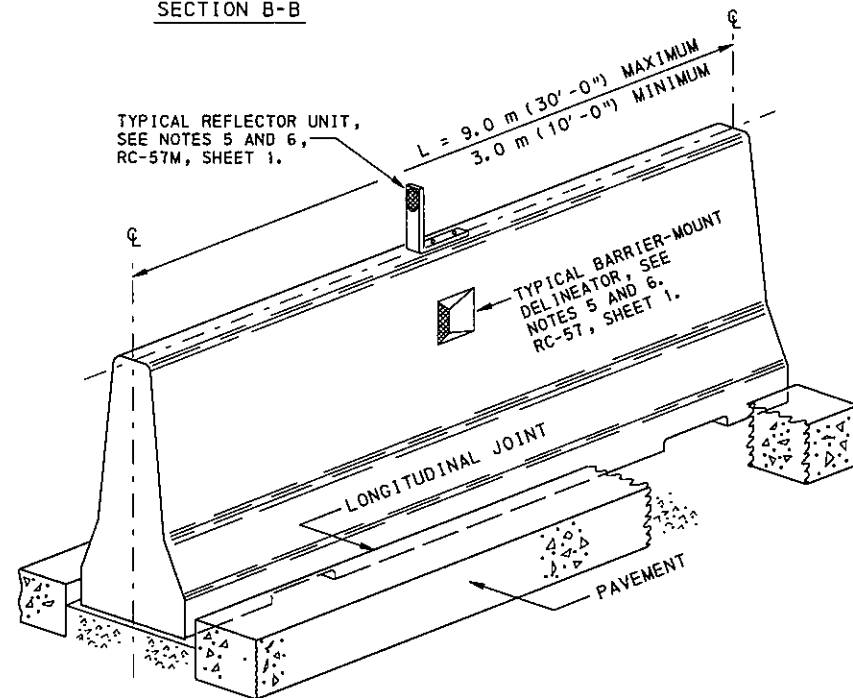


SECTION C-C

NOTES

1. PROVIDE CONCRETE GLARE SCREEN MEETING THE REQUIREMENTS OF PUBLICATION 40B/2000, SECTIONS 622 AND 714.
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. MODIFICATION OR DEVIATION FROM THE STANDARD REQUIRE THE SUBMISSION OF SHOP DRAWING FOR APPROVAL.
5. PROVIDE PRECAST CONCRETE GLARE SCREEN FOR USE AS TEMPORARY (MPT) 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 HORIZONTAL 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.

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

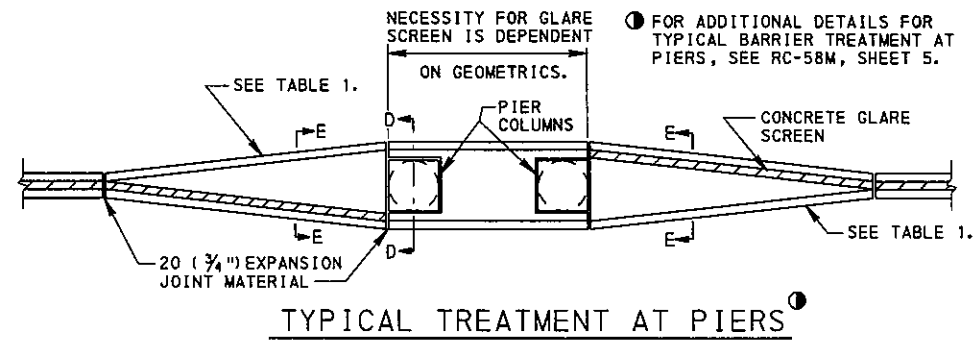


TYPICAL PRECAST CONSTRUCTION

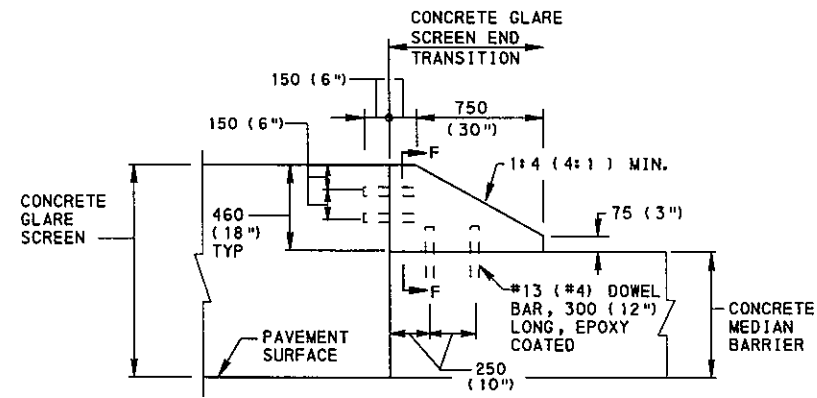
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE GLARE SCREEN
F-SHAPE
CAST-IN-PLACE AND PRECAST

RECOMMENDED APR. 28, 2000 <i>Alan A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Larry J. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 2 RC-59M
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TYPICAL TREATMENT AT PIERS



ELEVATION VIEW
TYPICAL END TRANSITION CONSTRUCTION
FOR CONCRETE GLARE SCREEN
(CAST-IN-PLACE CONSTRUCTION ONLY)

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

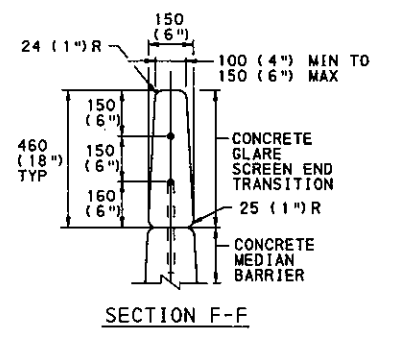
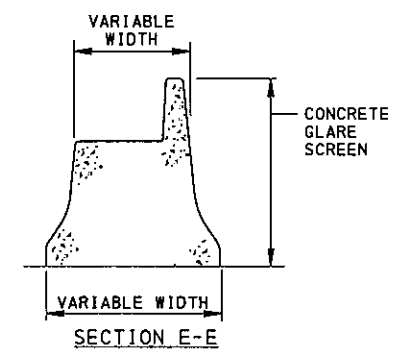
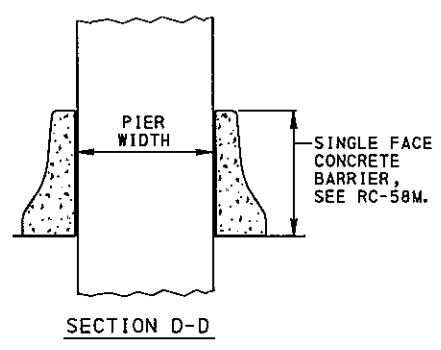


TABLE 1
FLARE RATES FOR BARRIER DESIGN

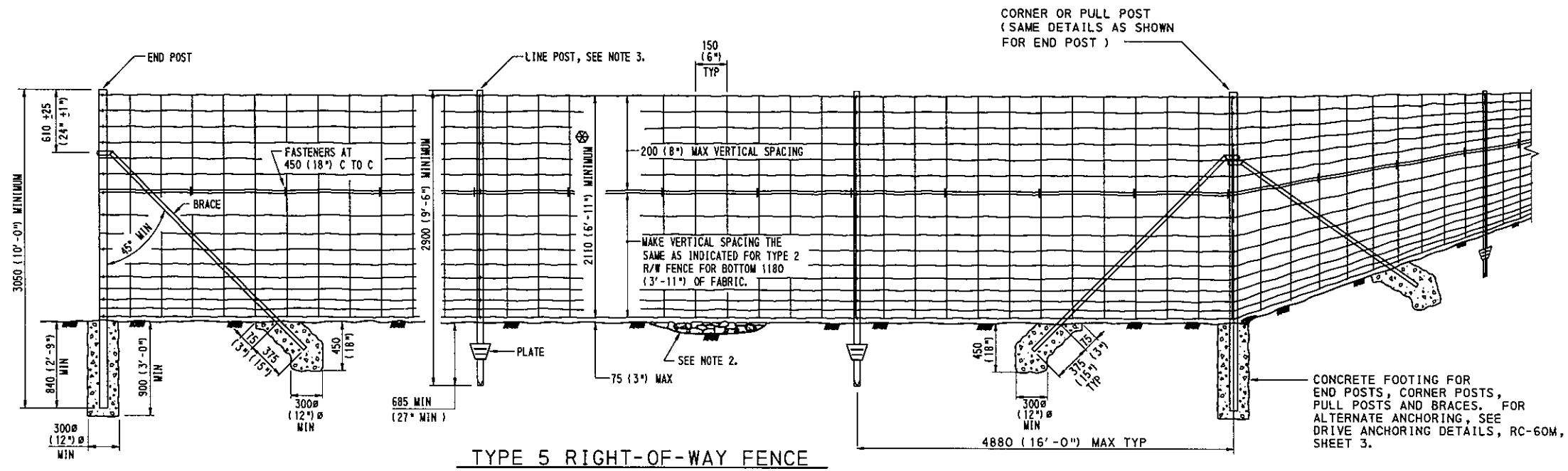
DESIGN SPEED	MAXIMUM FLARE RATES	
	CONCRETE BARRIER	GUIDE RAIL
120 (75)	20 : 1	15 : 1
110 (70)	20 : 1	15 : 1
100 (60)	18 : 1	14 : 1
90 (55)	16 : 1	12 : 1
80 (50)	14 : 1	11 : 1
70 (45)	12 : 1	10 : 1
60 (35)	10 : 1	8 : 1
50 (30)	8 : 1	7 : 1

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

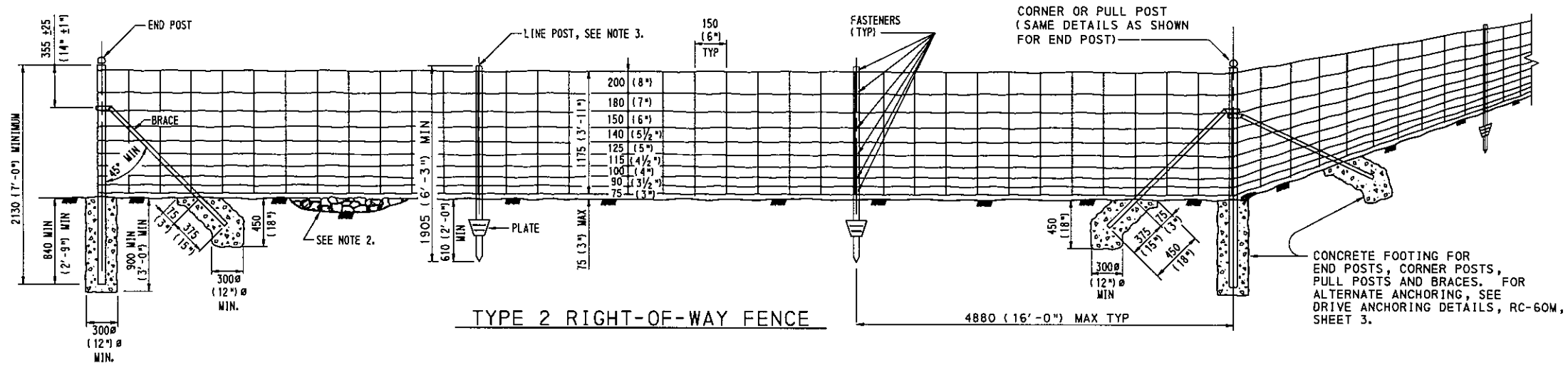
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE GLARE SCREEN
F-SHAPE

RECOMMENDED APR. 28, 2000 <i>Dean A. Schuch</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT 2 OF 2 RC-59M
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TYPE 5 RIGHT-OF-WAY FENCE



TYPE 2 RIGHT-OF-WAY FENCE

GENERAL NOTES

⊗ FABRIC SHALL BE AS FOLLOWS:

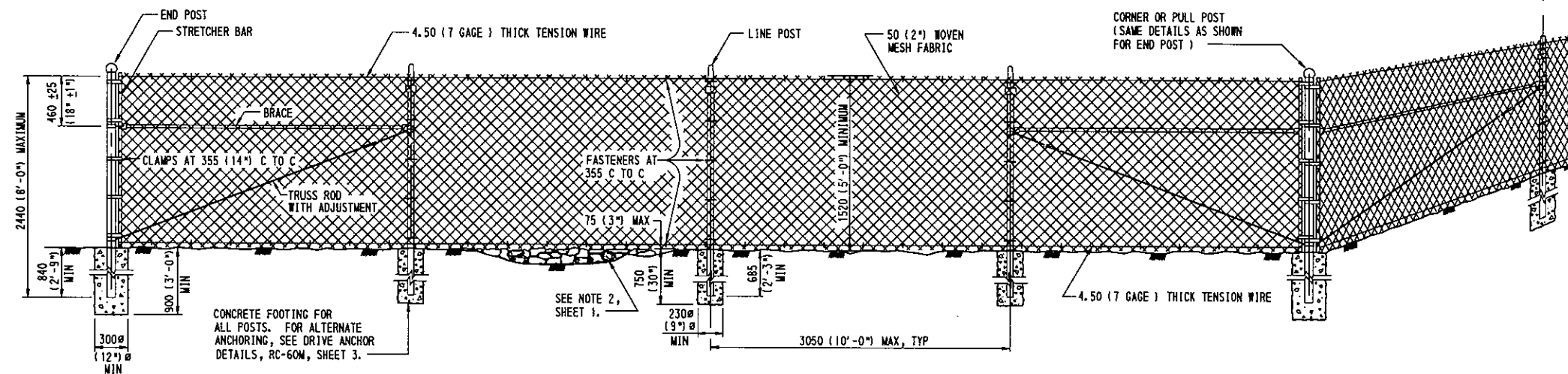
- (1.) TYPE 2 R/W FENCE FABRIC AND A 915 (36'') WIDE FABRIC CONNECTED AS SHOWN; OR
- (2.) A SINGLE FABRIC HAVING A MINIMUM WIDTH OF 2110 (83''); OR
- (3.) A COMBINATION OF TWO FABRICS TO ACHIEVE A MINIMUM WIDTH OF 2110 (83''). IF THE FABRICS ARE OVERLAPPED, CONNECT BY FASTENERS SPACED AT 450 (18'') C TO C AND STAGGERED ON EACH EDGE OF FABRIC ALONG THE JOINT.

1. CONSTRUCT IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 624.
2. FILL ALL DEPRESSIONS GREATER THAN 75 (3'') AND LESS THAN 300 (12'') WITH ROCKS OR COMPACTED EARTH TO PREVENT ANIMALS FROM GOING UNDER THE RIGHT-OF-WAY FENCE.
3. INSTALL CONCRETE FOOTING OR DRIVE ANCHORS AT MAXIMUM INTERVALS OF 50 m (160') FOR ALL LINE POSTS.
4. PLACE PULL POSTS AT ANGLE POINTS IN VERTICAL ALIGNMENT AT MAXIMUM INTERVALS OF 150 m (500') BETWEEN END AND/OR CORNER POSTS IN LEVEL TERRAIN AND/OR WHERE DIRECTED.
5. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

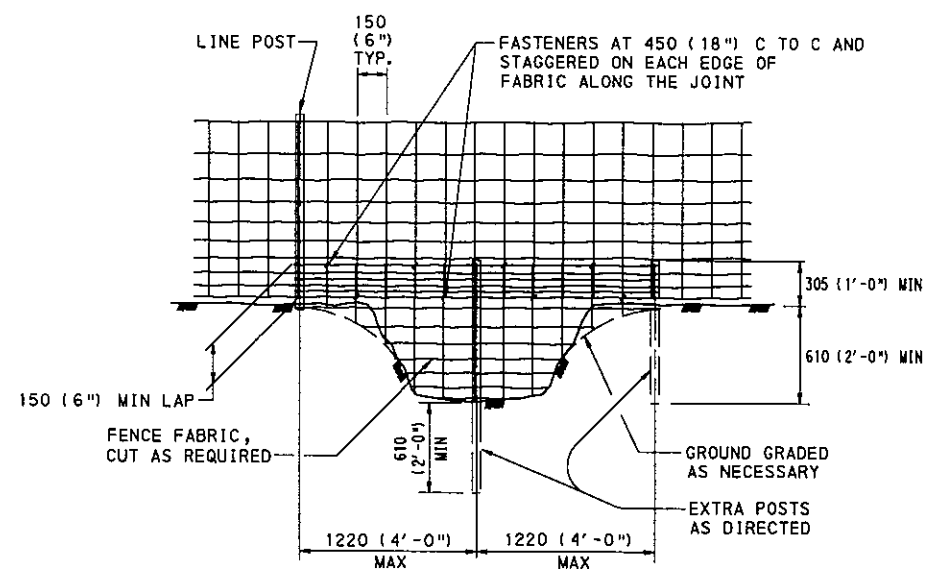
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

RIGHT-OF-WAY FENCE



TYPE 1 RIGHT-OF-WAY FENCE



TREATMENT AT GROUND DEPRESSIONS

GREATER THAN 300 (1'-0")

FOR TYPES 2 AND 5 RIGHT-OF-WAY FENCE
SEE SHEET 1

NOTE

1. FOR GENERAL NOTES SEE 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

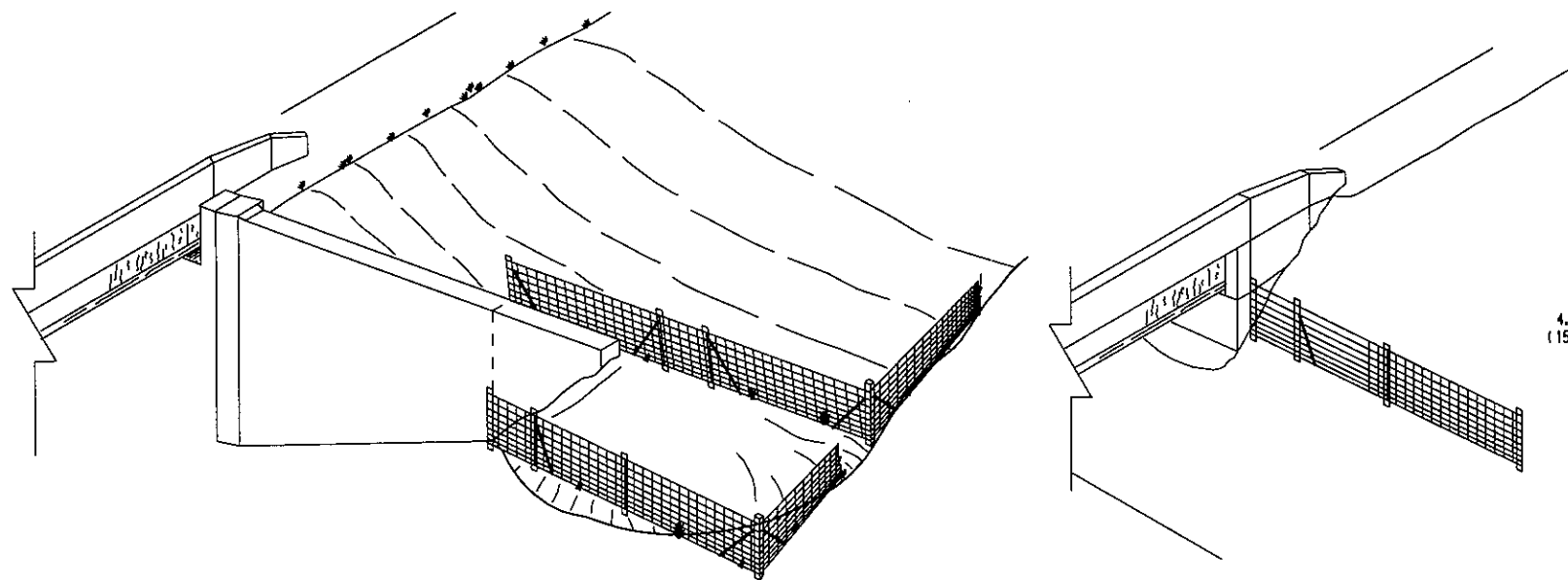
RIGHT-OF-WAY FENCE

RECOMMENDED APR. 28, 2000
Alan A. Schmit
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED APR. 28, 2000
Gary J. Hoffman
CHIEF ENGINEER

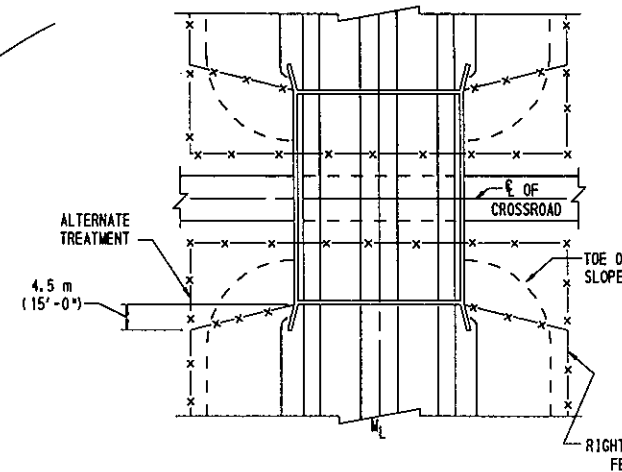
SHT 2 OF 3

RC-60M



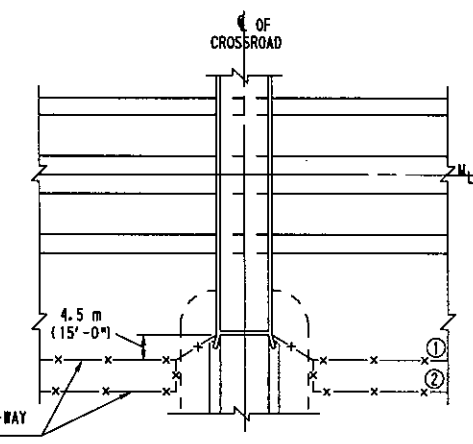
R/W FENCE TREATMENT AT HIGH WALLED ABUTMENT

R/W FENCE TREATMENT AT STUB ABUTMENTS



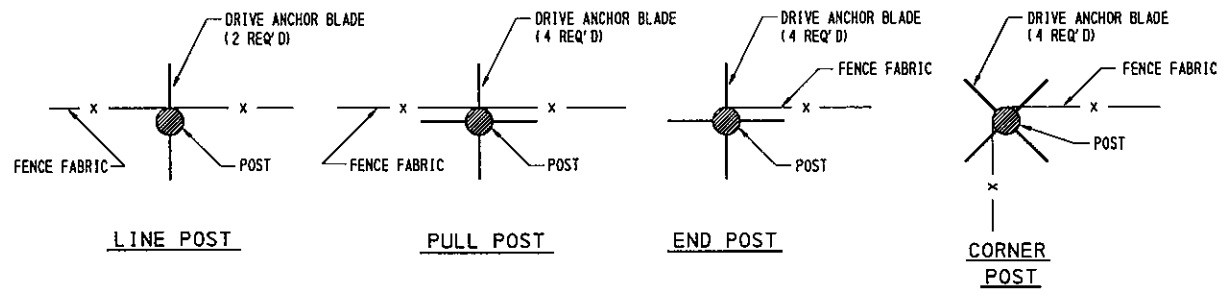
HIGHWAY OVER CROSSROAD

IF THE ROADWAY HAS DUAL STRUCTURES, ERECT THE RIGHT-OF-WAY FENCE TO CLOSE OFF THE MEDIAN AREA.

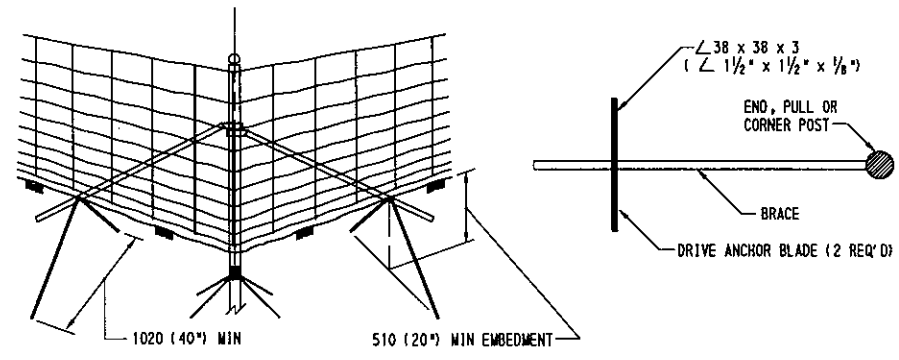


HIGHWAY UNDER CROSSROAD

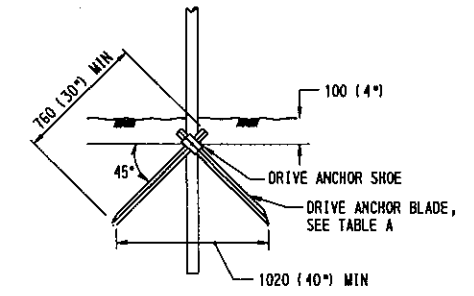
- ① IF RIGHT-OF-WAY FENCE IS WITHIN 4.5 m (15'-0") OR LESS OF THE PROJECTED FACE OF THE BACKWALL, ANGLE THE FENCE INTO THE ABUTMENT AS SHOWN.
- ② IF RIGHT-OF-WAY FENCE IS GREATER THAN 4.5 m (15'-0") FROM THE PROJECTED FACE OF THE BACKWALL, PLACE FENCE PARALLEL TO CROSSROAD AND ANGLE INTO ABUTMENT AS SHOWN.



DRIVE ANCHOR ORIENTATION

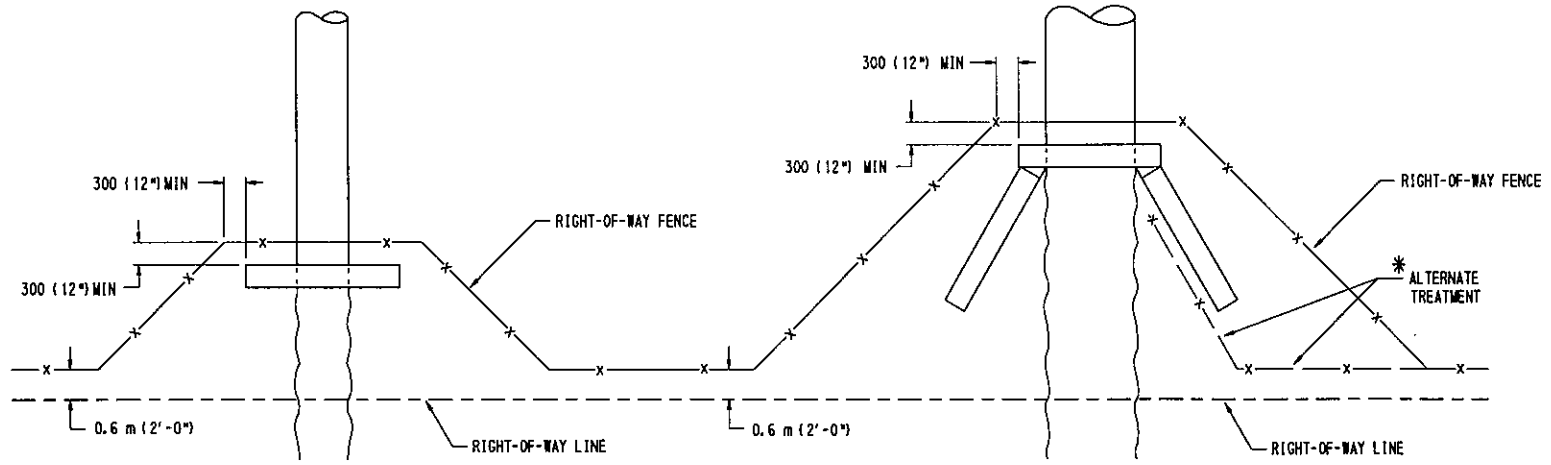


DRIVE ANCHOR DETAILS FOR POST BRACES ON TYPE 2 AND TYPE 5 R/W FENCE



DRIVE ANCHOR

(USE AS ALTERNATE TO CEMENT CONCRETE FOOTING FOR ALL TYPES OF RIGHT-OF-WAY FENCE.)



R/W FENCE TREATMENT AT CULVERTS

(EXERCISE CAUTION WHEN LOCATING POSTS NEAR THE CULVERT. ANY DAMAGE IS AT CONTRACTOR'S EXPENSE.)

* PLACE THE LAST POST WITHIN 150 (6") OF THE WALL AND AT A POINT WHERE THE WALL HEIGHT IS NOT LESS THAN 3.0 m (10'-0").

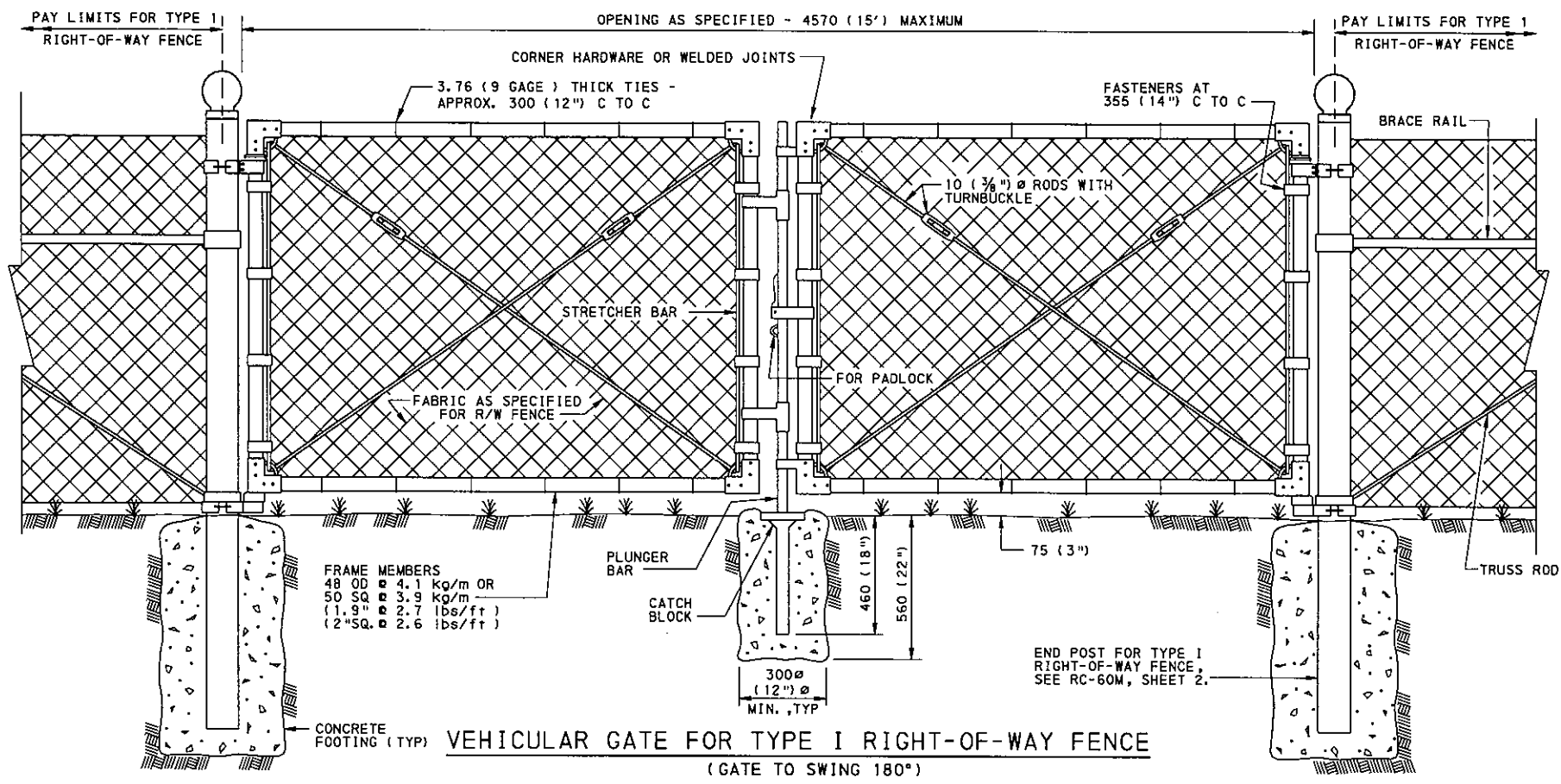
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

FENCE HEIGHT	MINIMUM BLADE SIZE
1520 (5'-0") OR LESS	25 x 25 x 3 (1" x 1" x 1/4")
GREATER THAN 1520 (5'-0") BUT LESS THAN 2130 (7'-0")	32 x 32 x 3 (1 1/4" x 1 1/4" x 1/4")
2130 (7'-0") OR GREATER	38 x 38 x 3 (1 1/2" x 1 1/2" x 1/4")

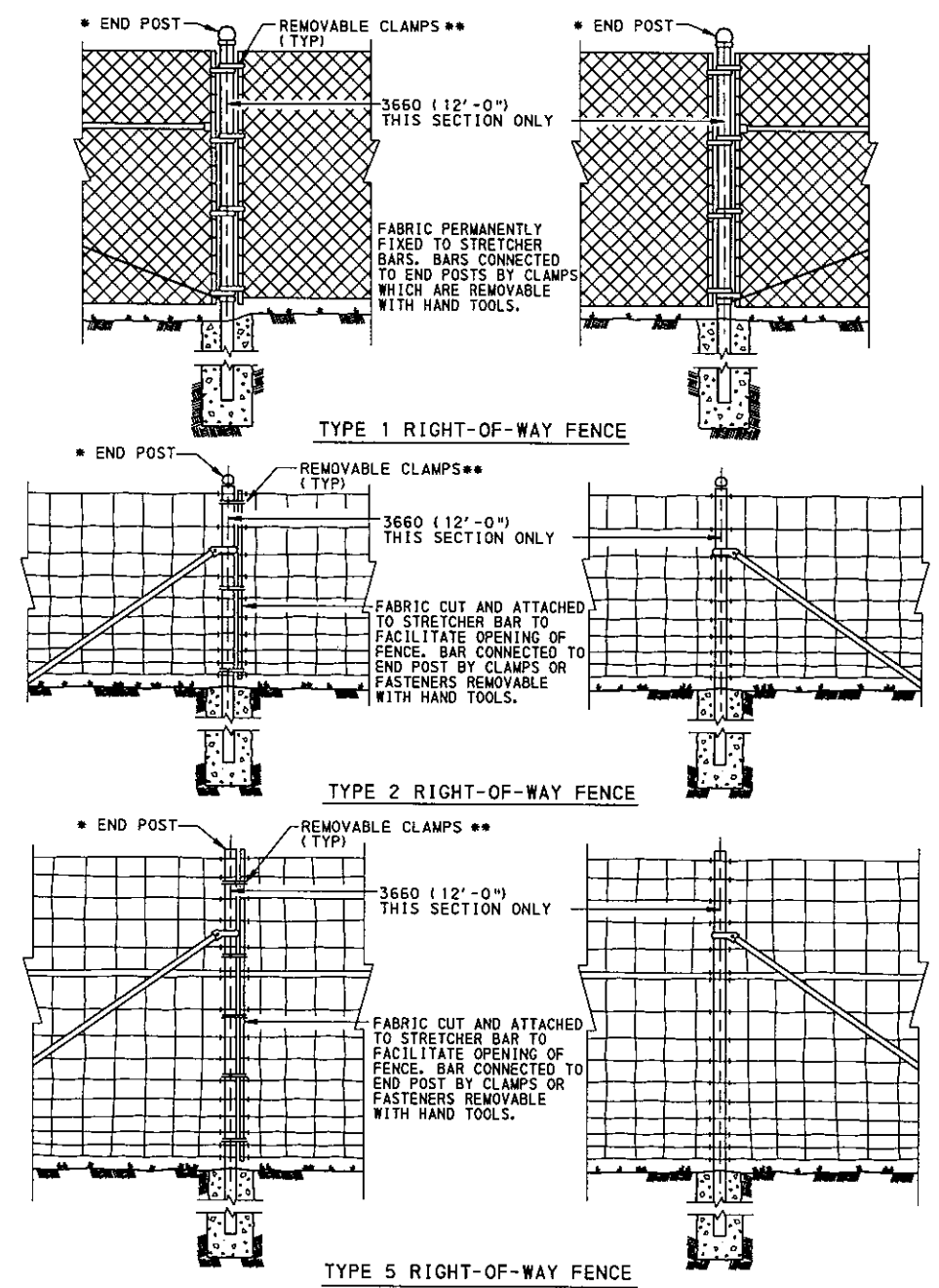
TABLE A

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

RIGHT-OF-WAY FENCE



VEHICULAR GATE FOR TYPE I RIGHT-OF-WAY FENCE
(GATE TO SWING 180°)

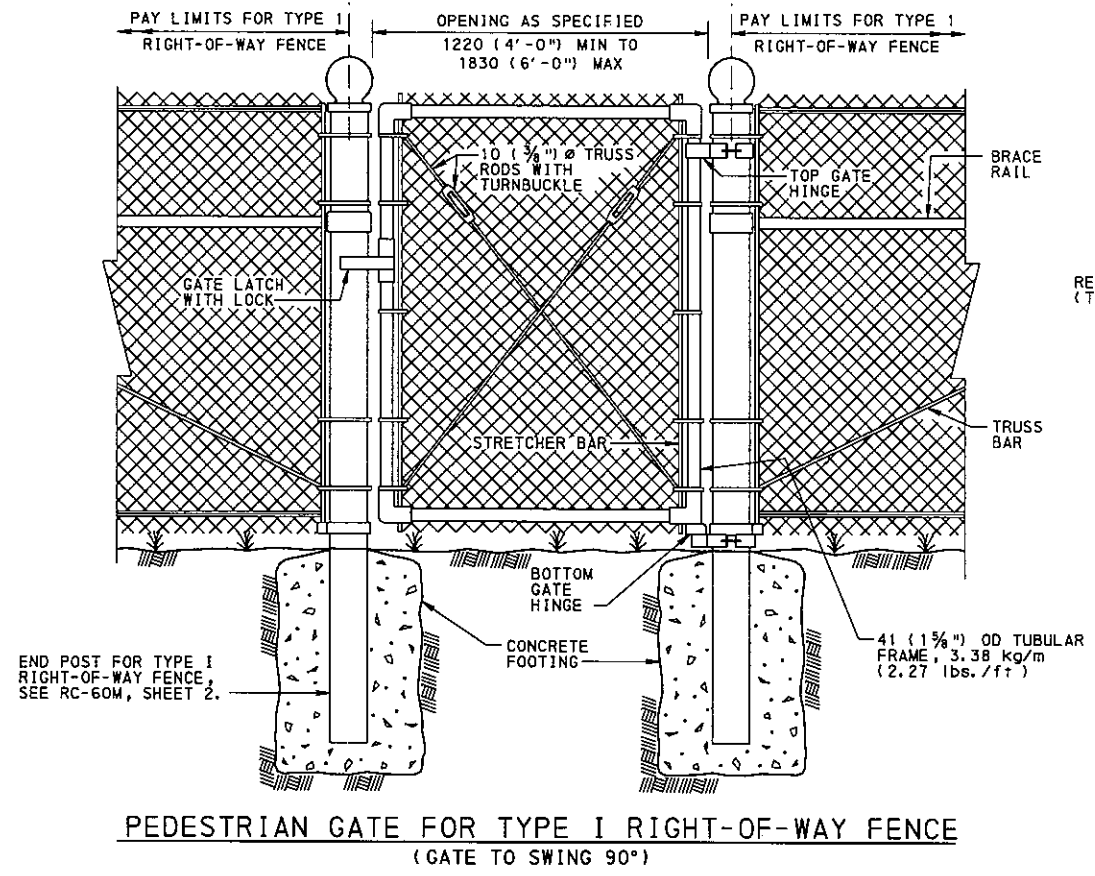


REMOVABLE FENCE SECTIONS

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

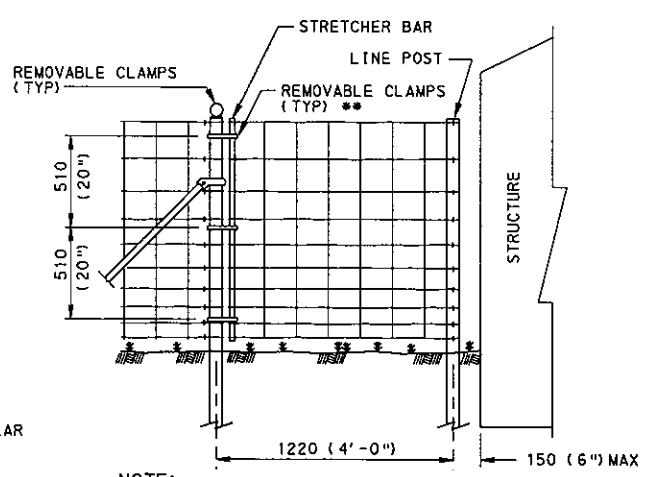
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

RIGHT-OF-WAY GATES
AND
REMOVABLE FENCE SECTIONS



PEDESTRIAN GATE FOR TYPE I RIGHT-OF-WAY FENCE
(GATE TO SWING 90°)

- * INCLUDES STRETCHER BAR, BRACE AND REMOVABLE CLAMPS OR FASTENERS. SEE RC-60M, SHEET 2, FOR END POST DETAILS.
- ** FOR TYPE 2 R/W FENCE USE 3 CLAMPS AS SHOWN. FOR TYPE 1 R/W FENCE USE 4 CLAMPS EQUALLY SPACED. FOR TYPE 5 R/W FENCE USE 5 CLAMPS EQUALLY SPACED.
- *** CONSIDER THE PAYMENT FOR REMOVABLE FENCE SECTIONS INCIDENTAL TO THE R/W FENCE.

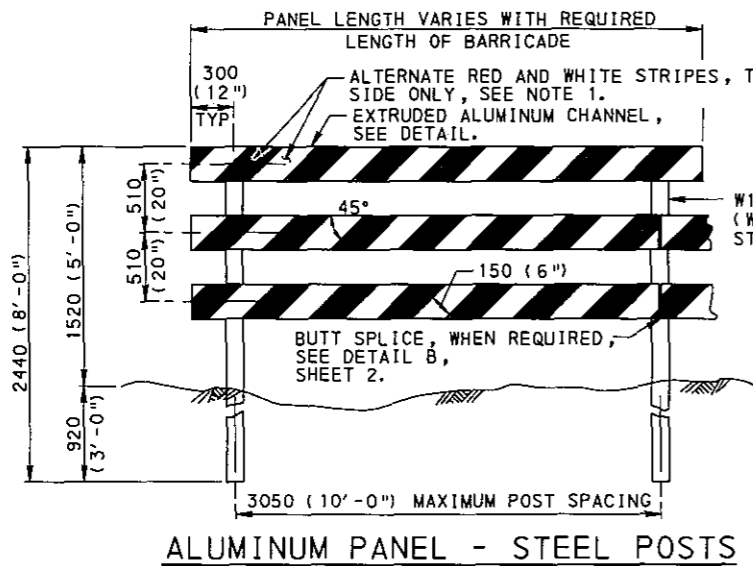


NOTE:
TWO END POSTS ARE REQUIRED IF REMOVABLE FENCE SECTIONS AT STRUCTURES ARE PLACED ANYWHERE IN THE RUN OF FENCE OTHER THAN THE END.

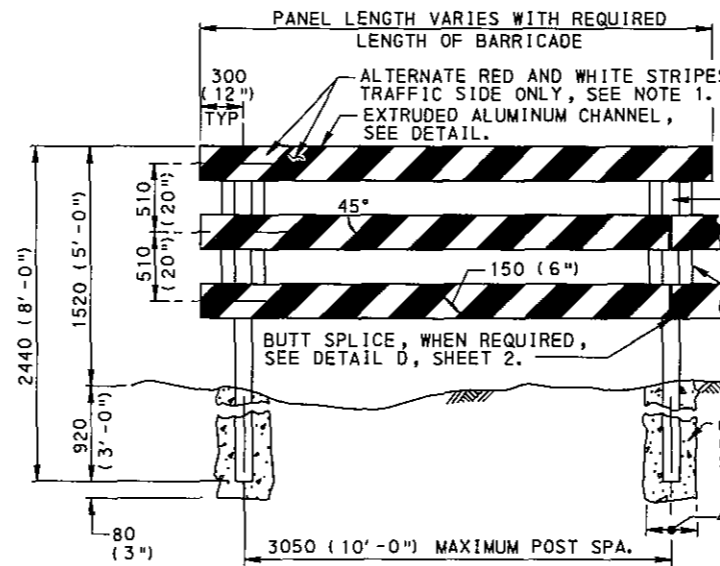
*****REMOVABLE FENCE SECTIONS AT STRUCTURES**

NOTE

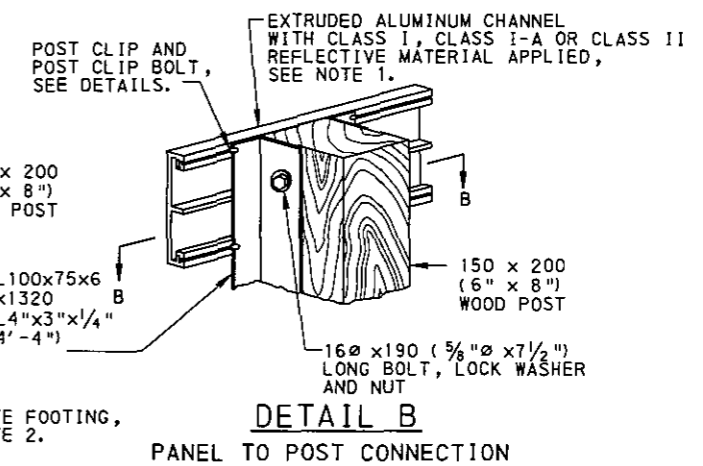
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.



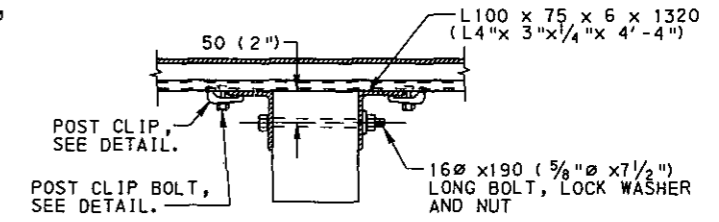
ALUMINUM PANEL - STEEL POSTS



ALUMINUM PANEL - WOOD POSTS



DETAIL B
PANEL TO POST CONNECTION



SECTION B-B

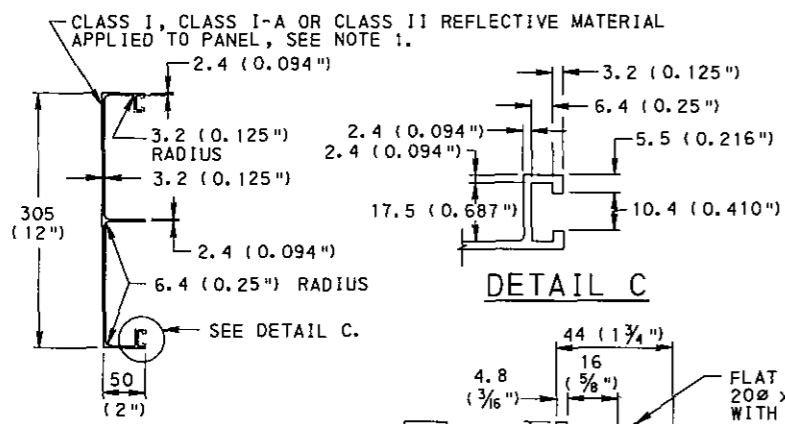
NOTES

1. PERMIT ONLY CLASS I, CLASS I-A OR CLASS II REFLECTIVE SHEETING MATERIAL SUPPLIED BY A MANUFACTURER, AS LISTED IN BULLETIN 15.
2. DRIVE POSTS MECHANICALLY OR ERECT IN CONCRETE FOOTING.
3. SEE RC-52M, SHEET 1, FOR MOUNTING OF STEEL POSTS ON CONCRETE PAVEMENT. SEE DETAIL D FOR MOUNTING OF WOOD POSTS ON CONCRETE PAVEMENT.
4. USE MATERIALS MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 678.
5. ALL WOOD METRIC DIMENSIONS ARE NOMINAL.
6. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

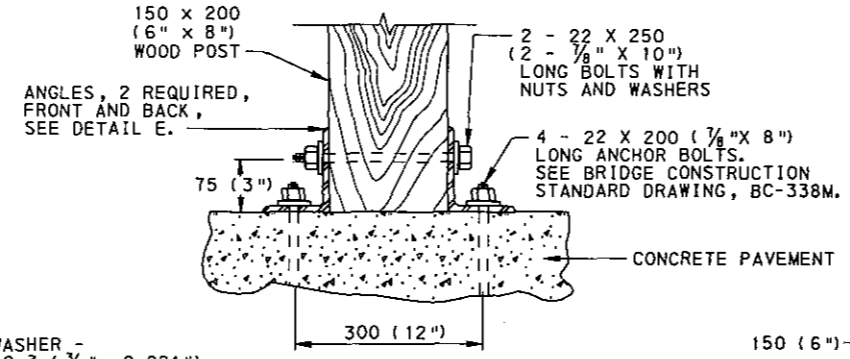
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

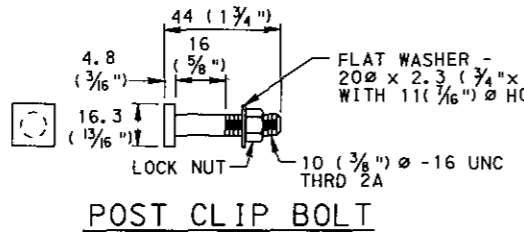
PERMANENT BARRICADES
ALUMINUM PANEL



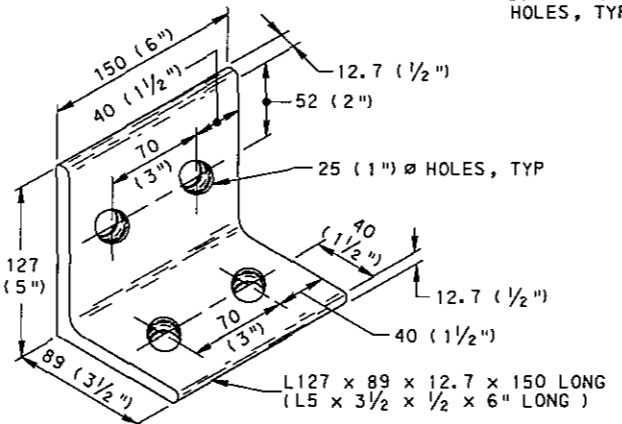
DETAIL C



DETAIL D



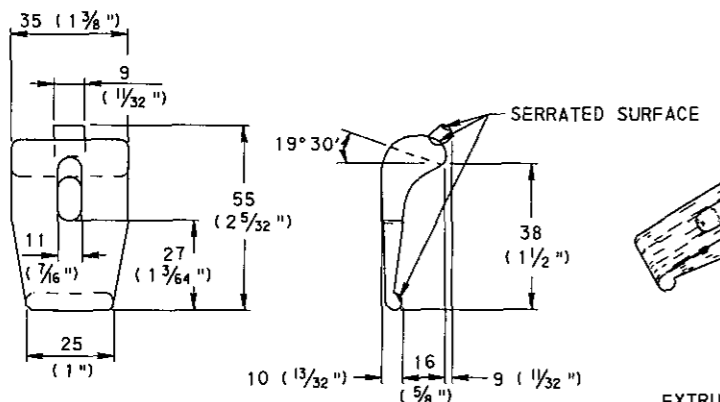
POST CLIP BOLT



DETAIL E

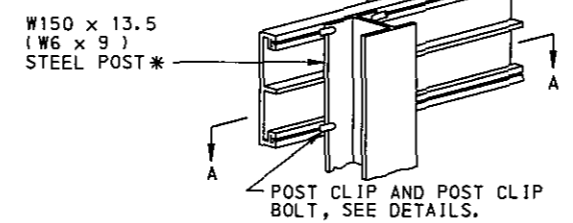
WOOD POST FOR ALUMINUM PANEL

EXTRUDED ALUMINUM CHANNEL
(DIMENSIONS FOR PANELS MAY VARY DEPENDING UPON MANUFACTURING COMPANY'S DESIGN.)

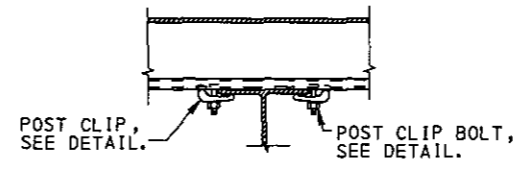


POST CLIP

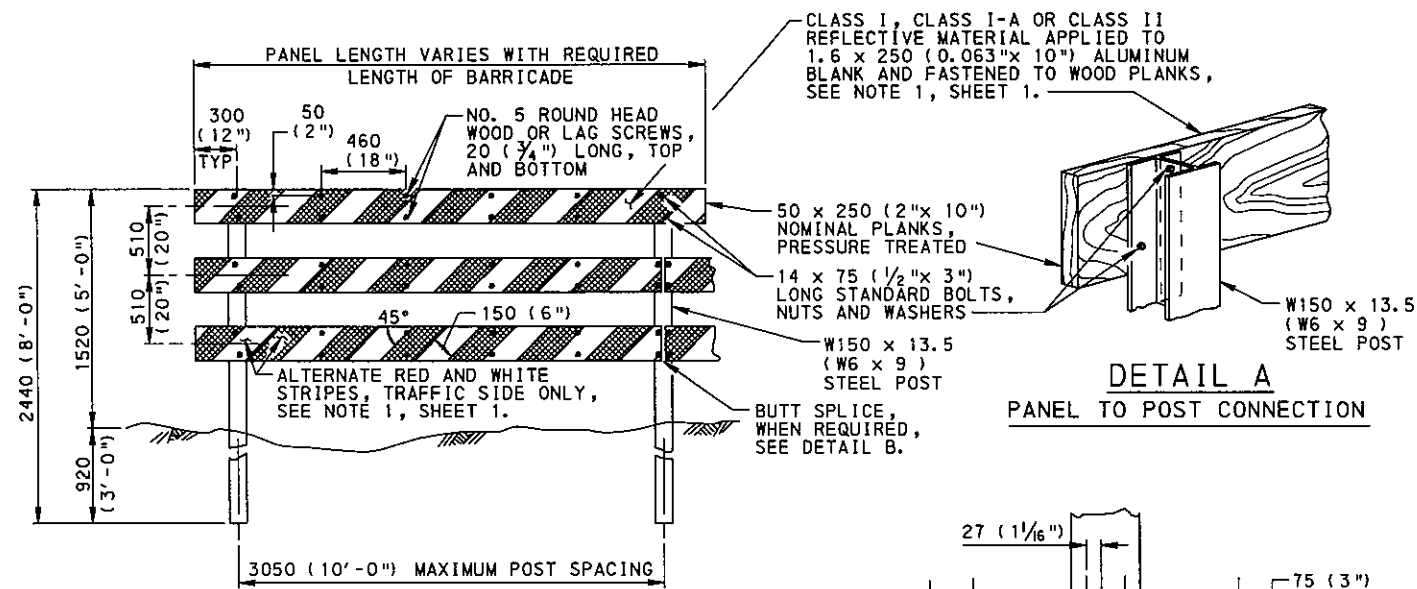
EXTRUDED ALUMINUM CHANNEL WITH CLASS I, CLASS I-A OR CLASS II REFLECTIVE MATERIAL APPLIED, SEE NOTE 1.



DETAIL A
PANEL TO POST CONNECTION

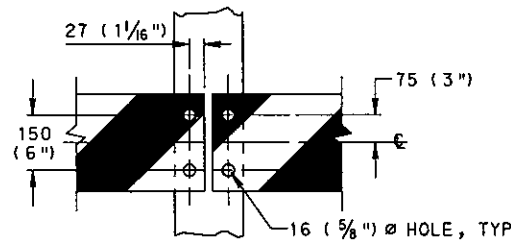


SECTION A-A

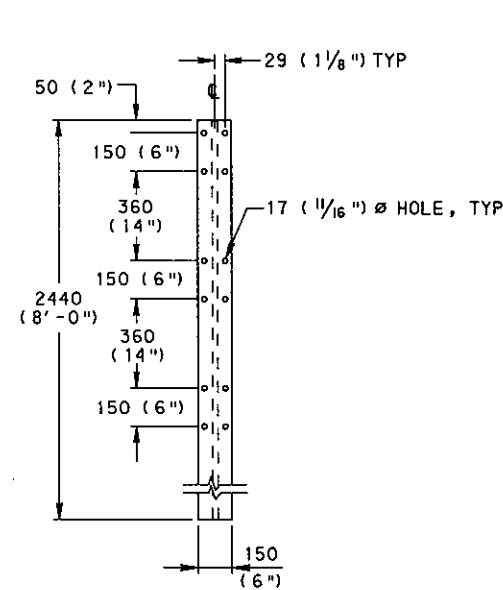


WOOD PANEL - STEEL POSTS

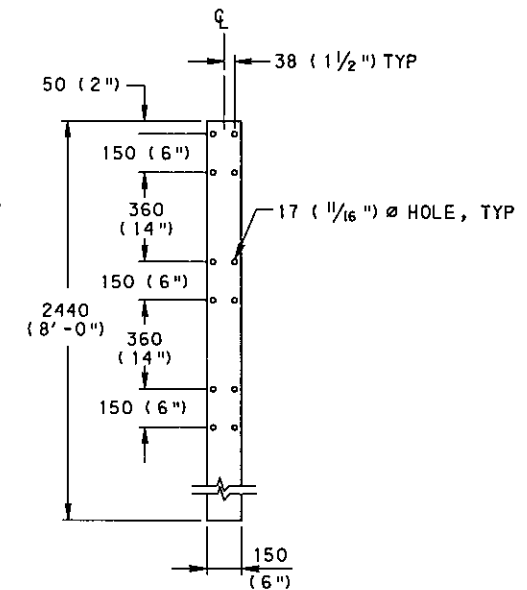
DETAIL A
PANEL TO POST CONNECTION



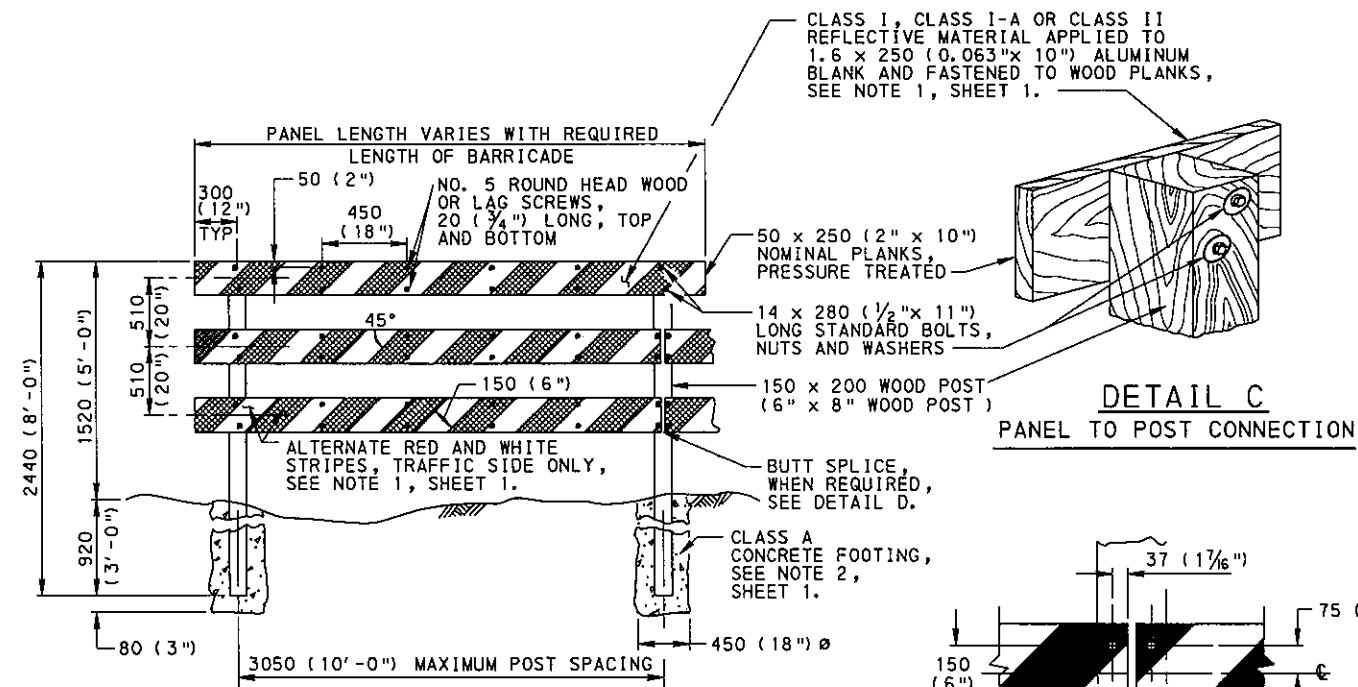
DETAIL B
BUTT SPLICE



STEEL POST FOR
WOOD PANEL

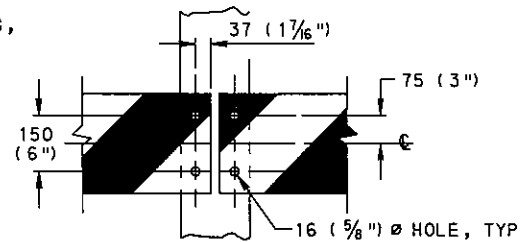


WOOD POST FOR
WOOD PANEL



WOOD PANEL - WOOD POSTS

DETAIL C
PANEL TO POST CONNECTION



DETAIL D

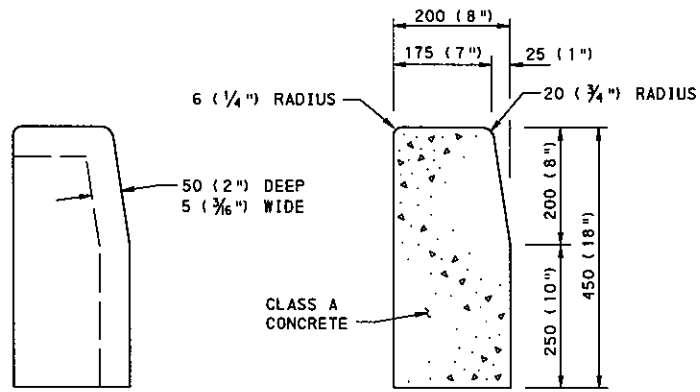
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PERMANENT BARRICADES
WOOD PANEL

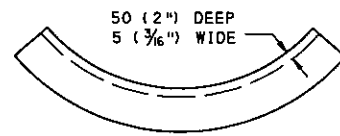
RECOMMENDED APR. 28, 2000


 DIRECTOR, BUREAU OF DESIGN CHIEF ENGINEER SHT 2 OF 2
 RC-63M

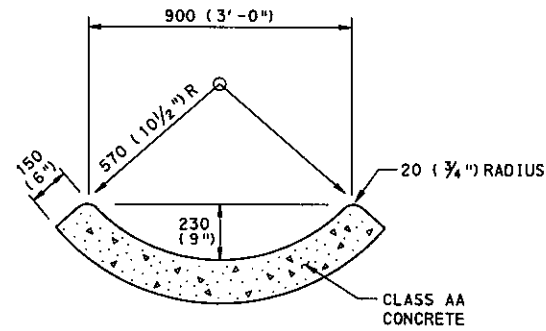


DETAIL A
CONTRACTION JOINT

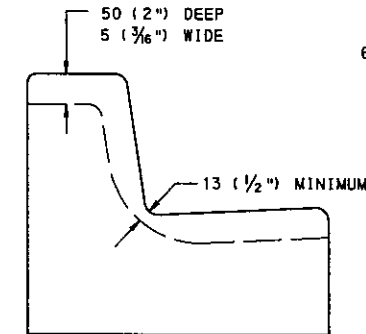
TYPICAL
CROSS SECTION



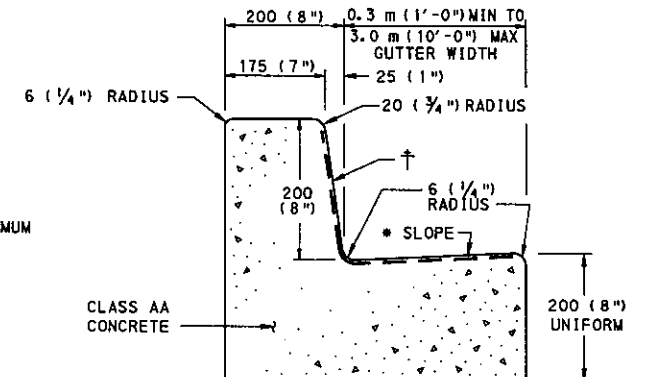
DETAIL B
CONTRACTION JOINT



TYPICAL
CROSS SECTION



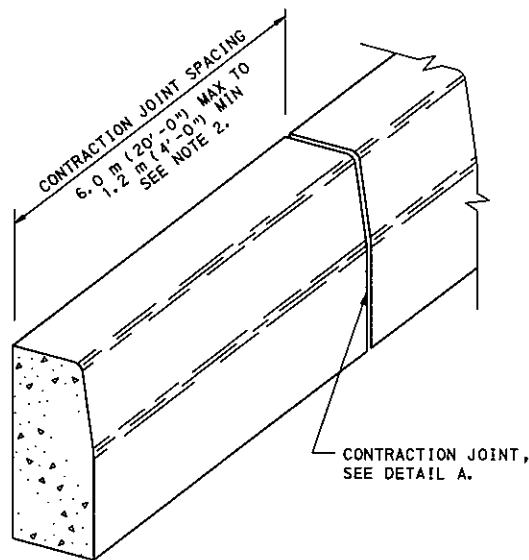
DETAIL C
CONTRACTION JOINT



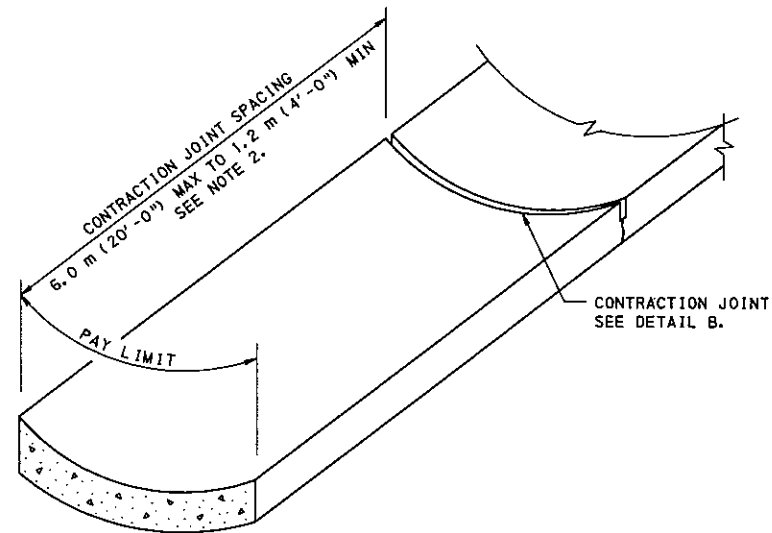
TYPICAL
CROSS SECTION

* UNDER 1.5 m (5'-0") GUTTER WIDTH = 8.0% (1"/FT) MIN.
1.5 m (5'-0") AND GREATER WIDTH = 4.0% (1/2"/FT) MIN.

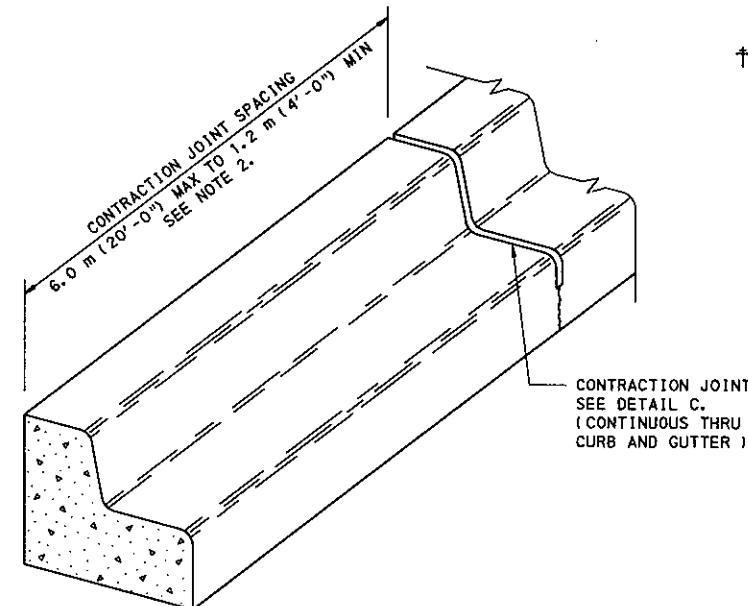
† --- REPRESENTS WIDTH OF GUTTER FOR COMPUTING PAY AREA.



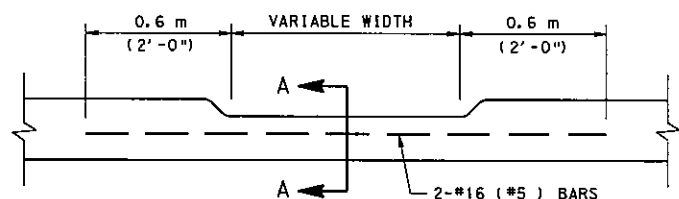
PLAIN CEMENT CONCRETE CURB



PLAIN CEMENT CONCRETE GUTTER

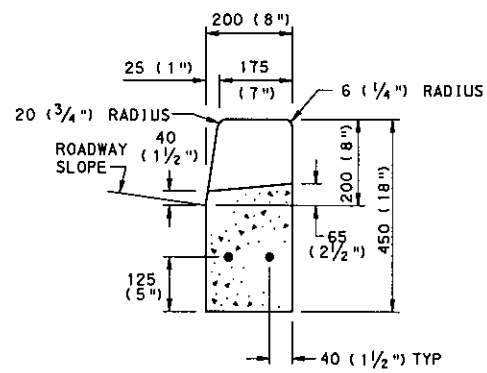


PLAIN CEMENT CONCRETE CURB GUTTER



PLAN VIEW

DEPRESSED CURB FOR DRIVES



SECTION A-A

NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 630 FOR PLAIN CEMENT CONCRETE CURB AND DEPRESSED CURB, SECTION 640 FOR PLAIN CEMENT CONCRETE GUTTER AND SECTION 641 FOR PLAIN CEMENT CONCRETE CURB GUTTER.
2. SPACE CONTRACTION JOINTS IN UNIFORM LENGTHS OR SECTIONS.
3. PLACE 20 (3/4") THICK PREMOLDED EXPANSION JOINT FILLER MATERIAL AT STRUCTURES AND AT THE END OF THE WORK DAY. CUT MATERIAL TO CONFORM TO AREA ADJACENT TO CURB OR TO CONFORM TO CROSS SECTIONAL AREA OF CURB.
4. SEE RC-50M FOR PLAIN CEMENT CONCRETE CURB SLOPED TOP TREATMENT AT END OF STRUCTURES.
5. 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

CURBS AND GUTTERS

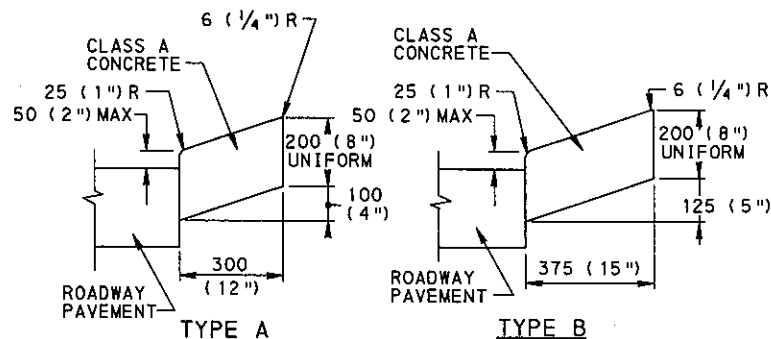
RECOMMENDED APR. 28, 2000
William A. Schmitt
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED APR. 28, 2000
CHIEF ENGINEER

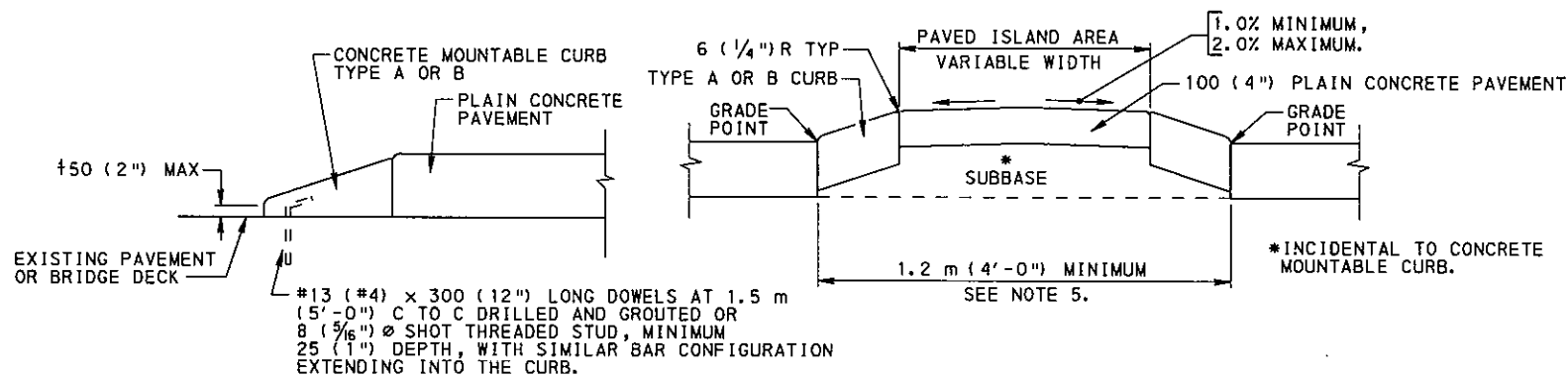
SHT 1 OF 1
RC-64M

NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 633.
2. INSTALL TYPE M INLET WITH CONCRETE MOUNTABLE CURBS AND LOCATE INLET AS SHOWN ON THE DRAWINGS. MAKE THE BACKSLOPE TRAVERSABLE IN THE AREA OF THE INLET AS INDICATED.
3. SPACE CONTRACTION JOINTS IN UNIFORM LENGTHS OR SECTIONS AND SEAL AS SPECIFIED IN PUBLICATION 408/2000, SECTION 501.3(n).
4. PLACE PREMOLDED EXPANSION JOINT FILLER MATERIAL 20 (3/4") THICK AT STRUCTURES AND AT THE END OF THE WORK DAY. CUT MATERIAL TO CONFORM TO AREA ADJACENT TO CURB OR TO CONFORM TO CROSS SECTIONAL AREA OF CURB.
5. PROVIDE ELONGATED ISLANDS NOT LESS THAN 1.2 m (4'-0") WIDE AND 6.0 m (20'-0") LONG, EXCEPT IN SPECIAL CASES WHERE SPACE IS SEVERELY LIMITED.
6. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.



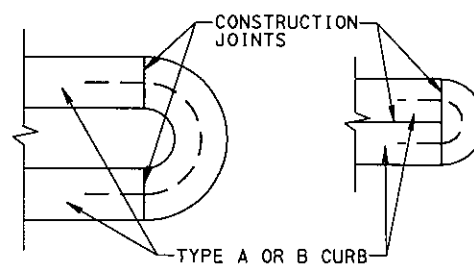
CONCRETE MOUNTABLE CURBS



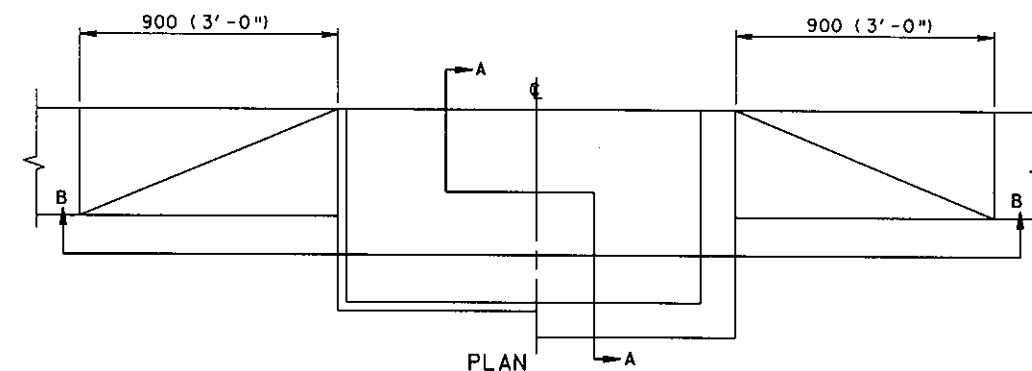
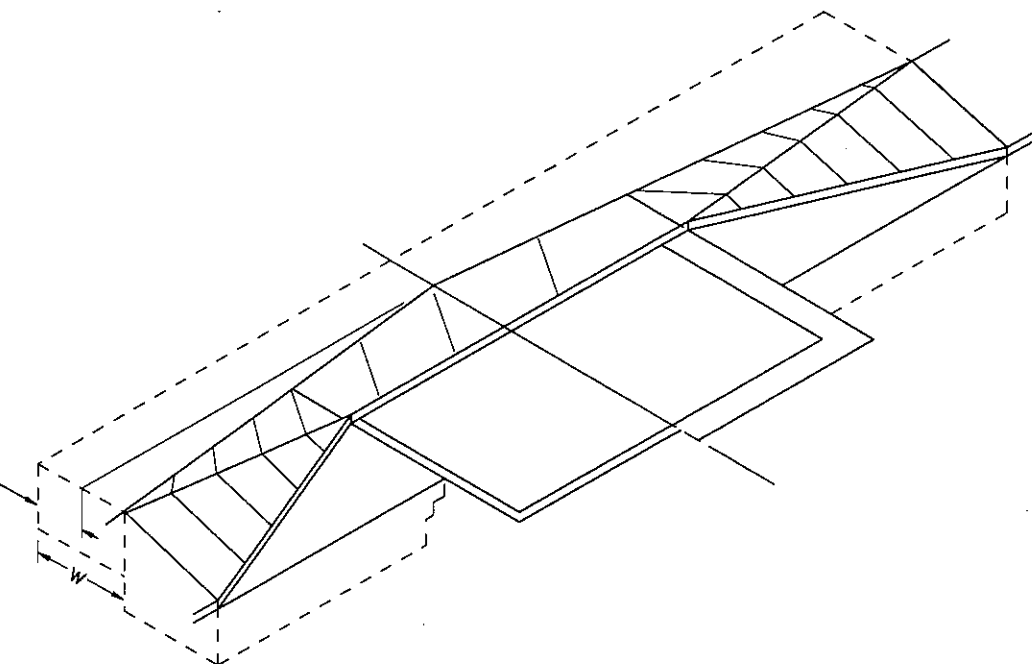
CONCRETE MOUNTABLE CURB ON EXISTING CONCRETE PAVEMENT AND BRIDGE DECKS

† PLANS MAY PROVIDE FOR A DEEPER FACE AT CURB WHEN AN OVERLAY IS PLACED ON THE EXISTING PAVEMENT. HOWEVER, BUILD EXPOSED FINAL FACE OF CURB AT 50 (2") MAXIMUM.

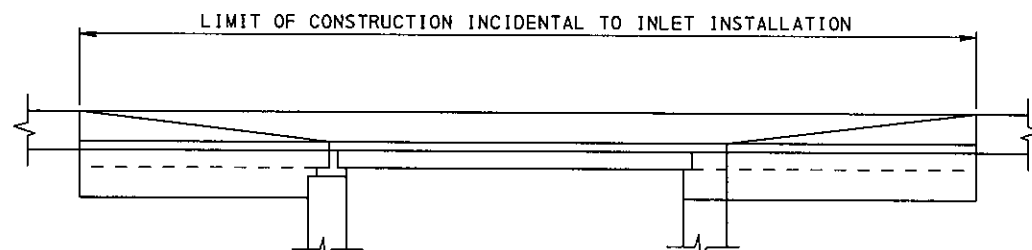
TYPICAL CONSTRUCTION



END DETAILS

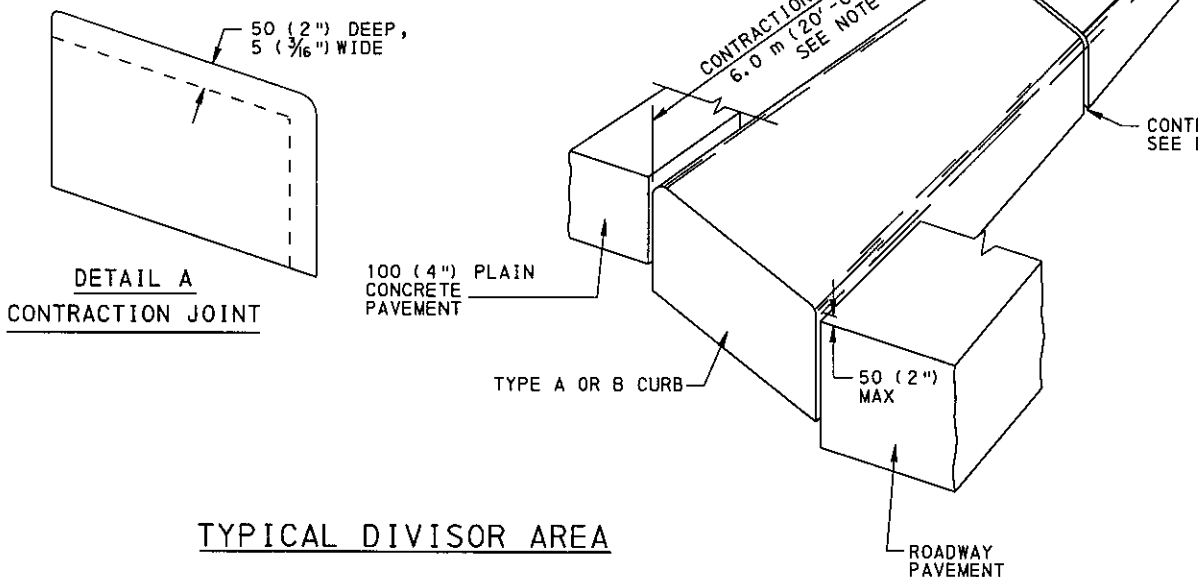


SECTION B-B



SECTION A-A

TREATMENT FOR CONCRETE MOUNTABLE CURBS AT INLETS



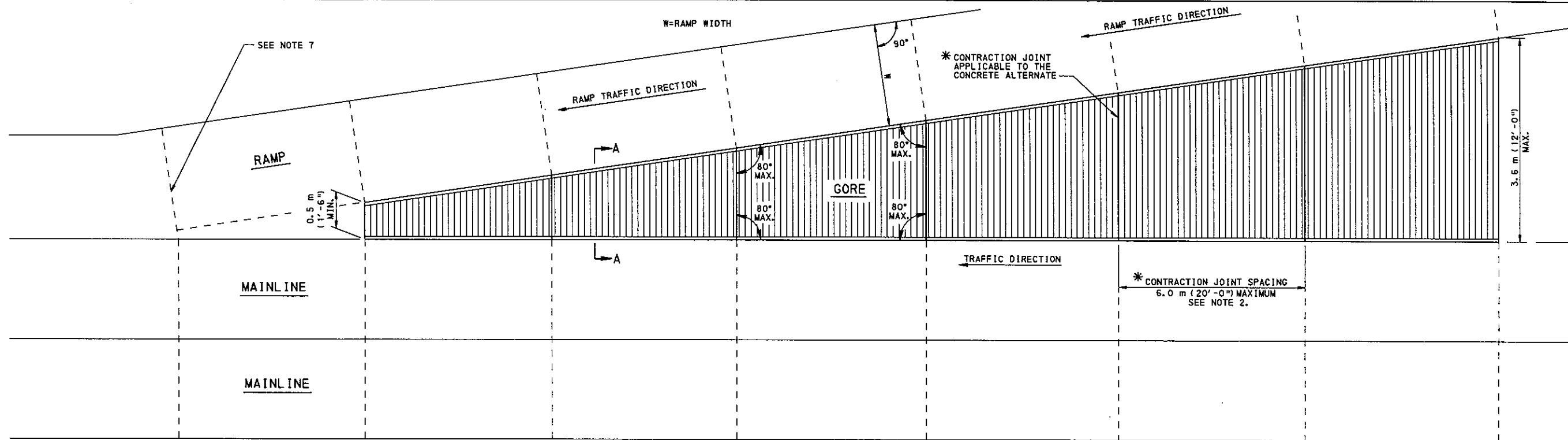
TYPICAL DIVISOR AREA

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

CONCRETE MOUNTABLE CURBS

RECOMMENDED APR. 28, 2000 RECOMMENDED APR. 28, 2000 SHT 1 OF 1
Alan A. Schuch *Gary R. Hoffman*
DIRECTOR, BUREAU OF DESIGN CHIEF ENGINEER

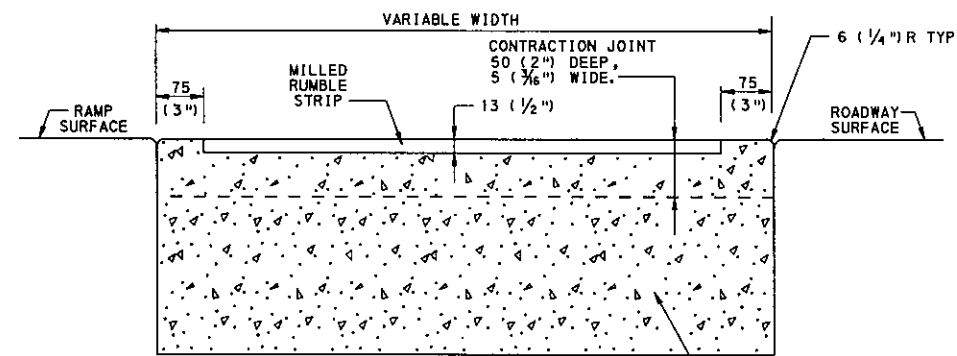
RC-65M



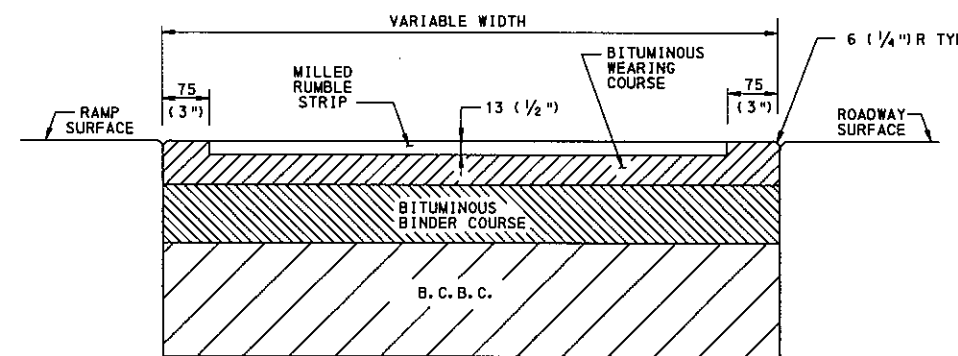
TRAFFIC SEPARATOR IN RAMP GORE AREA
CONCRETE AND BITUMINOUS ALTERNATES

NOTES

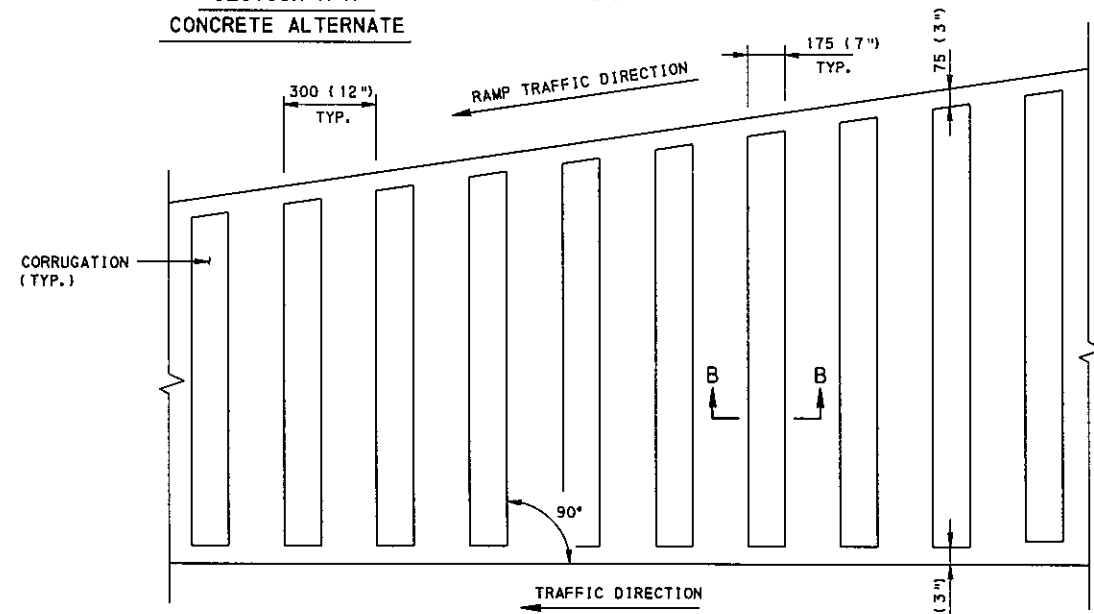
1. USE MATERIALS AND CONSTRUCTION METHODS WHICH MEET THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 629.
2. BEGIN AND END TRAFFIC SEPARATOR PAVEMENT AT MAINLINE TRANSVERSE JOINTS WITH A MINIMUM SEPARATOR PAVEMENT WIDTH OF 0.5m (1'-6") AND A MAXIMUM WIDTH OF 3.6m (12'-0").
3. SPACE CONTRACTION JOINTS IN UNIFORM LENGTHS OR SECTIONS SUCH THAT A CONTINUOUS TRANSVERSE JOINT IS FORMED ACROSS MAINLINE, SEPARATOR, AND RAMP PAVEMENTS.
4. FORM JOINTS IN CORE AREA CONNECTING MAINLINE AND RAMP TRANSVERSE JOINTS SUCH THAT ANGLES LESS THAN 80° ARE AVOIDED IN GORE PAVEMENT WHERE POSSIBLE.
5. PLACE 19.05 (¾") PREMOLDED EXPANSION JOINT FILLER MATERIAL AT STRUCTURES AND AT THE END OF THE WORK DAY, CUT MATERIAL TO CONFORM TO AREA ADJACENT TO CURB OR TO CROSS SECTIONAL AREA.
6. DO NOT MILL RUMBLE STRIPS ACROSS A JOINT.
7. WHEN RAMP OR LANE WIDTH EXCEEDS 4.2 m (14'-0"), A TYPE L JOINT IS REQUIRED AT THE MIDPOINT.
8. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.



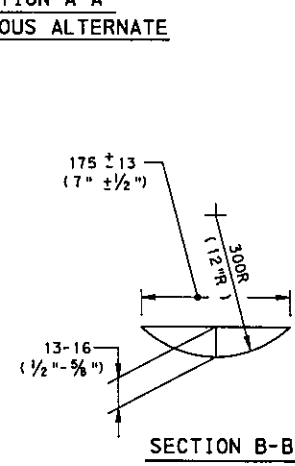
SECTION A-A
CONCRETE ALTERNATE



SECTION A-A
BITUMINOUS ALTERNATE



TYPICAL MILLED RUMBLE STRIP DETAIL



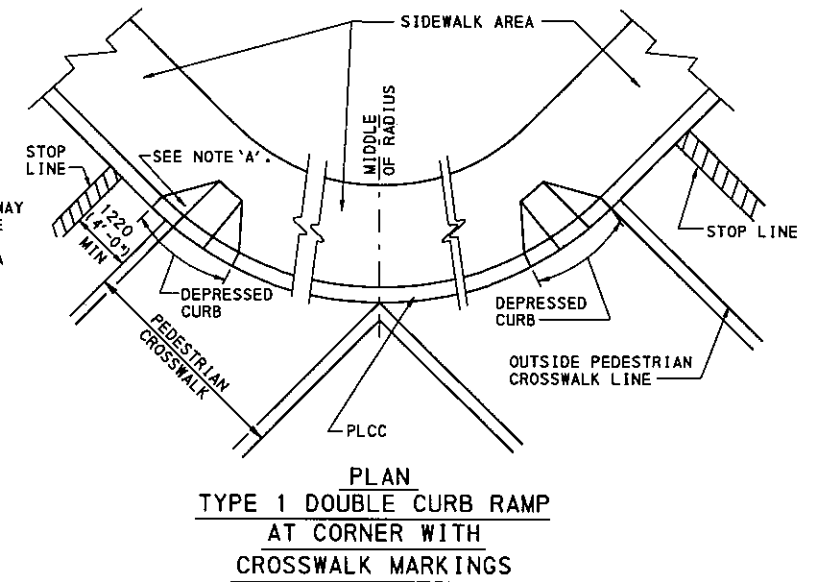
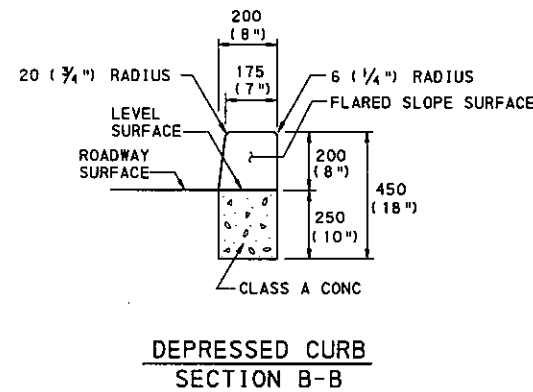
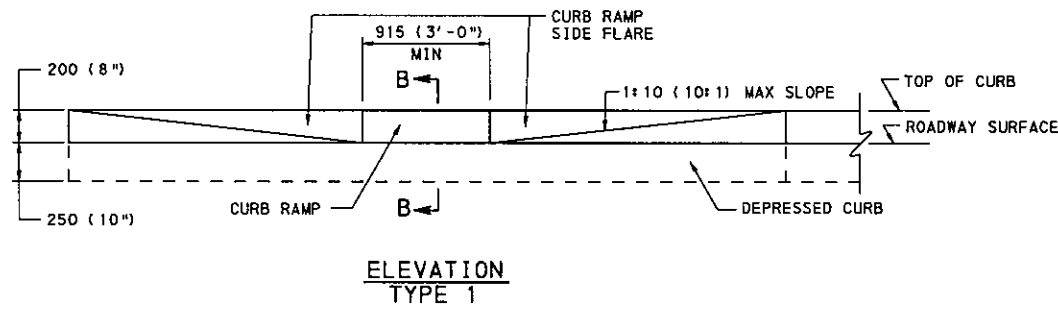
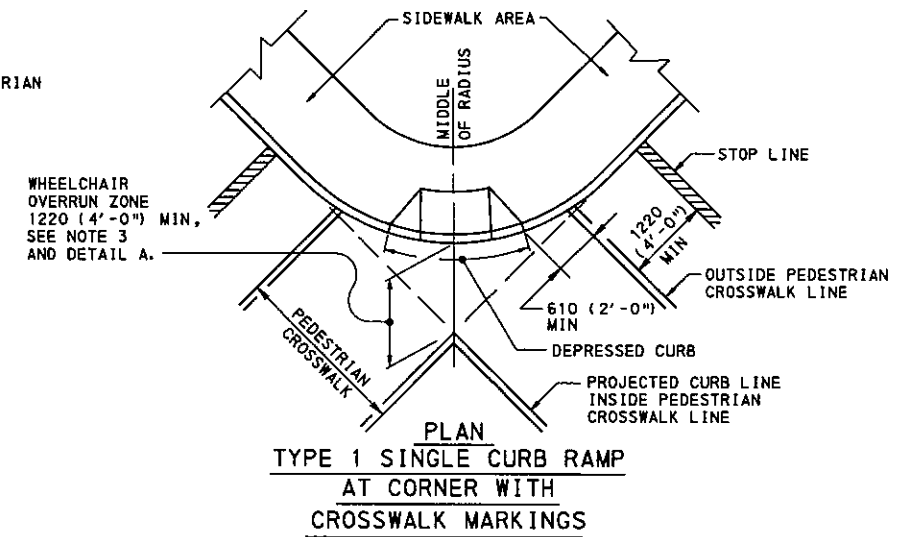
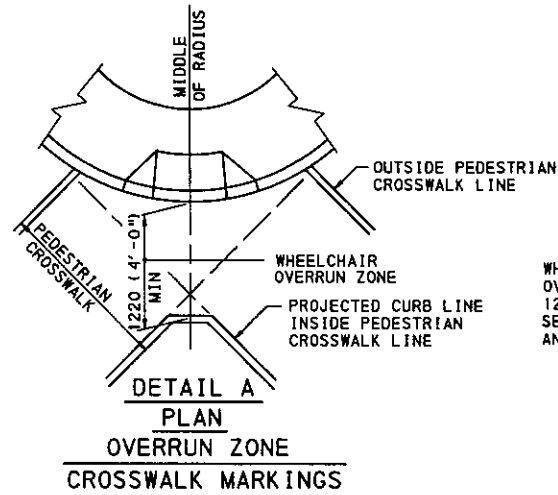
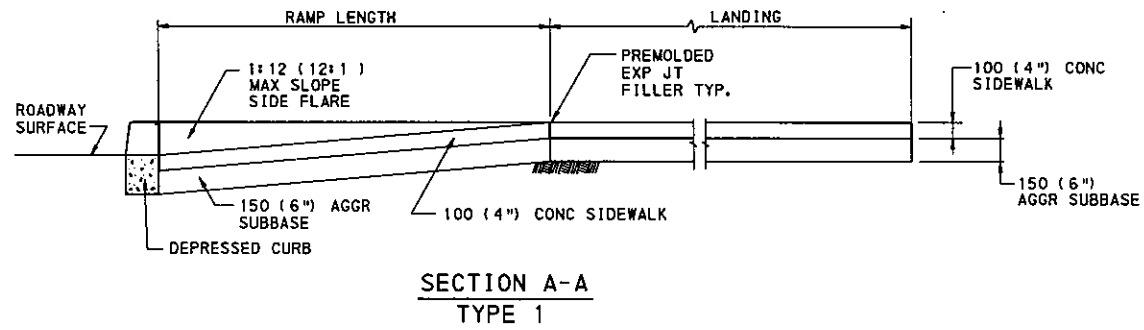
SECTION B-B

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

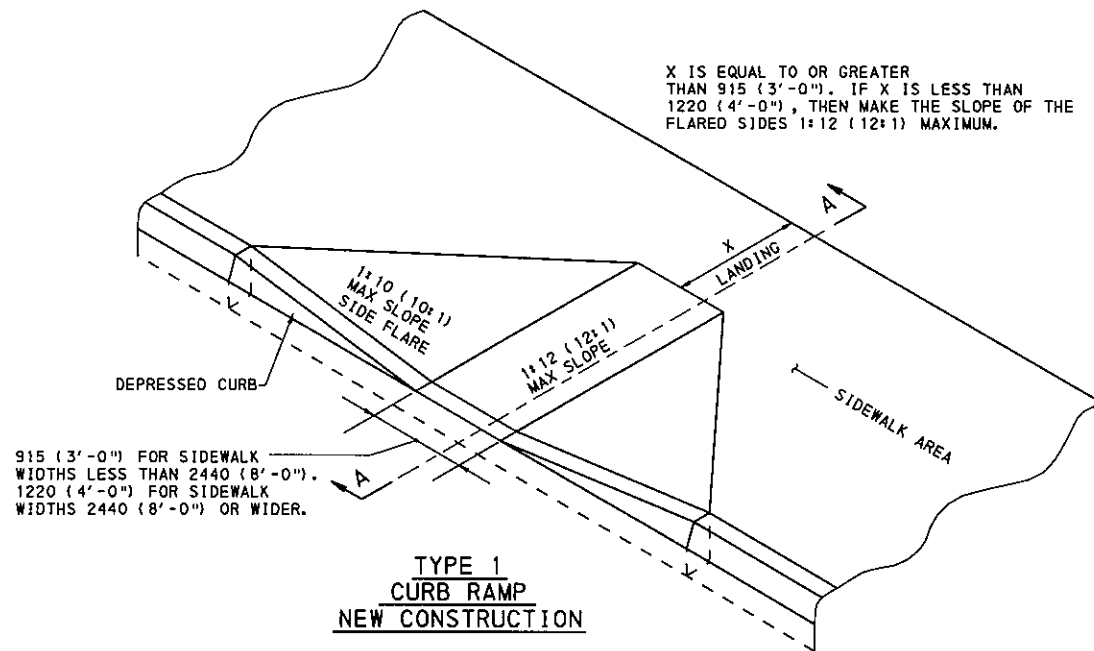
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE AND BITUMINOUS
TRAFFIC SEPARATOR

RECOMMENDED APR. 28, 2000 <i>Alan H. Schuch</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Larry L. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 1 RC-66M
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NOTE 'A':
FLARED SIDES MAY
EXTEND OUTSIDE
OF THE MARKED
CROSSWALK AREA
IF NECESSARY.



X IS EQUAL TO OR GREATER
THAN 915 (3'-0"). IF X IS LESS THAN
1220 (4'-0"), THEN MAKE THE SLOPE OF THE
FLARED SIDES 1:12 (12:1) MAXIMUM.

915 (3'-0") FOR SIDEWALK
WIDTHS LESS THAN 2440 (8'-0").
1220 (4'-0") FOR SIDEWALK
WIDTHS 2440 (8'-0") OR WIDER.

NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTIONS 420, 421, 422, 630 AND 676.
2. PROVIDE EXPANSION JOINT MATERIAL 13 (1/2") THICK WHERE CURB RAMP ADJOINS ANY RIGID PAVEMENT, SIDEWALK OR STRUCTURE WITH THE TOP OF JOINT FILLER FLUSH WITH ADJACENT CONCRETE SURFACE.
3. IF PEDESTRIAN CROSSWALKS ARE NOT WIDE ENOUGH TO PROVIDE MINIMUM 1220 (4'-0") WIDE WHEELCHAIR OVERRUN ZONE AT THE BOTTOM OF THE RAMP, POSITION CROSSWALKS AS INDICATED IN DETAIL A.
4. SEAL JOINTS WITH AN APPROVED SEALING MATERIAL.
5. PROVIDE SLIP RESISTANT TEXTURE ON CURB RAMP BY COARSE BROOMING TRANSVERSE TO THE SLOPE OF THE RAMP. EXTEND TEXTURE THE FULL WIDTH AND LENGTH OF THE CURB RAMP INCLUDING FLARED SIDE RAMPS.
6. MODIFY CONSTRUCTION DETAILS TO ADAPT DIMENSIONS TO EXISTING CURB ALTERATIONS WHERE THE CURB IS LESS THAN THE STANDARD 200 (8") HEIGHT.
7. CURB RAMP AND SIDE FLARE LENGTHS ARE VARIABLE AND BASED ON CURB HEIGHT AND THE SIDEWALK PITCH. SEE TABLE A (SHEET 2) FOR TYPICAL RAMP DIMENSIONS.
8. MEASURE AND PAY FOR DEPRESSED CURB IN ACCORDANCE WITH PUBLICATION 408/2000, SECTION 630.4.
9. WHENEVER POSSIBLE, CONSTRUCT THE TRANSITION SLOPE FROM THE CURB RAMP AND FLARE SIDES TO ADJOINING SURFACES WITH A GRADUAL CURVE RATHER THAN AN ABRUPT ANGLE.
10. CONSTRUCT BUILT-UP CURB RAMP OF BITUMINOUS MATERIAL AS INDICATED, INCLUDING SURFACE PREPARATION AND TACK COAT, AS REQUIRED.
11. 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.

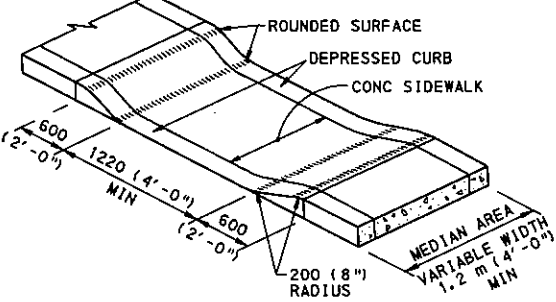
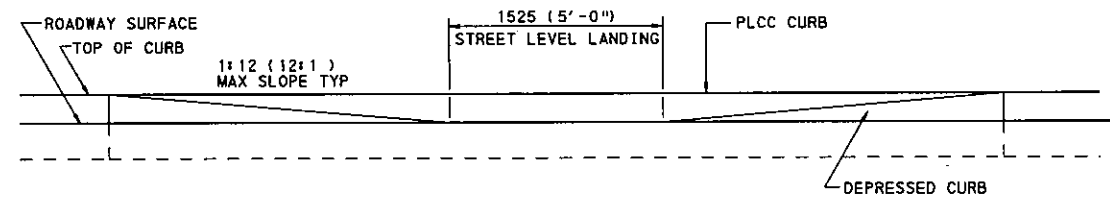
**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN**

CURB RAMPS

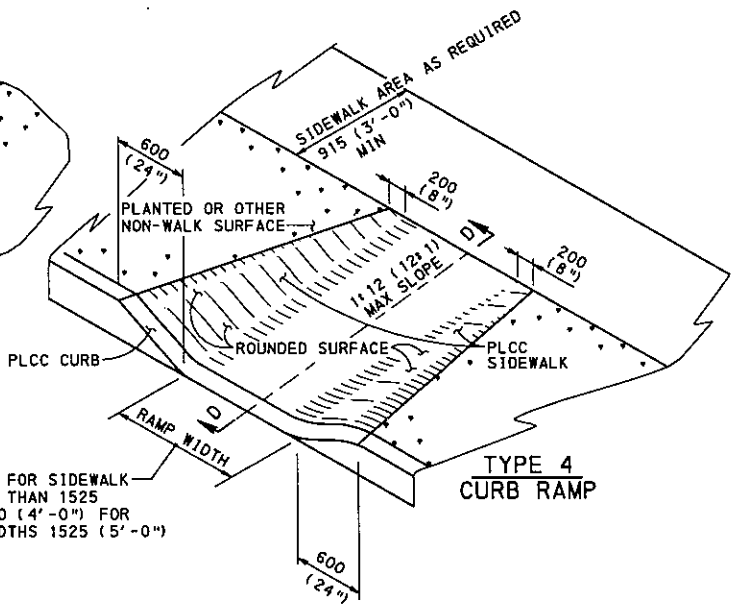
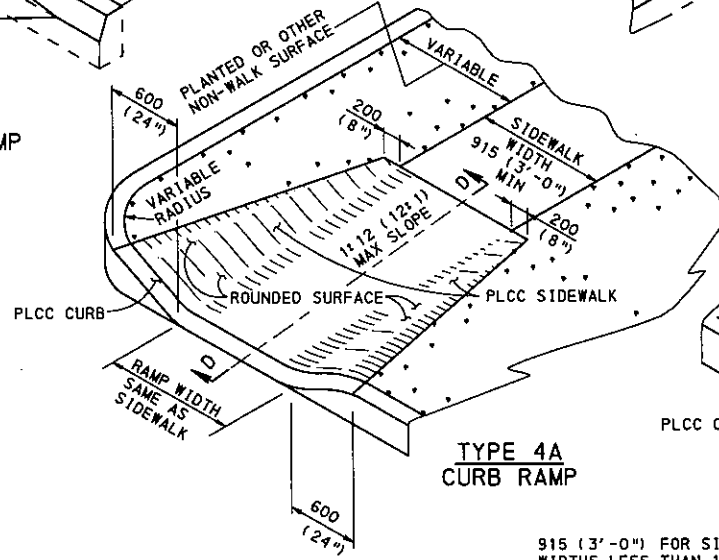
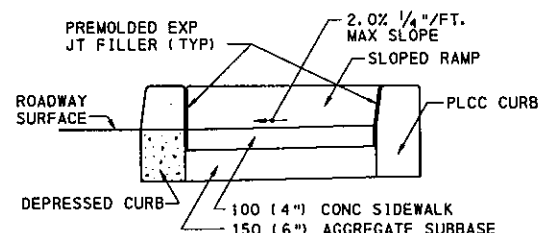
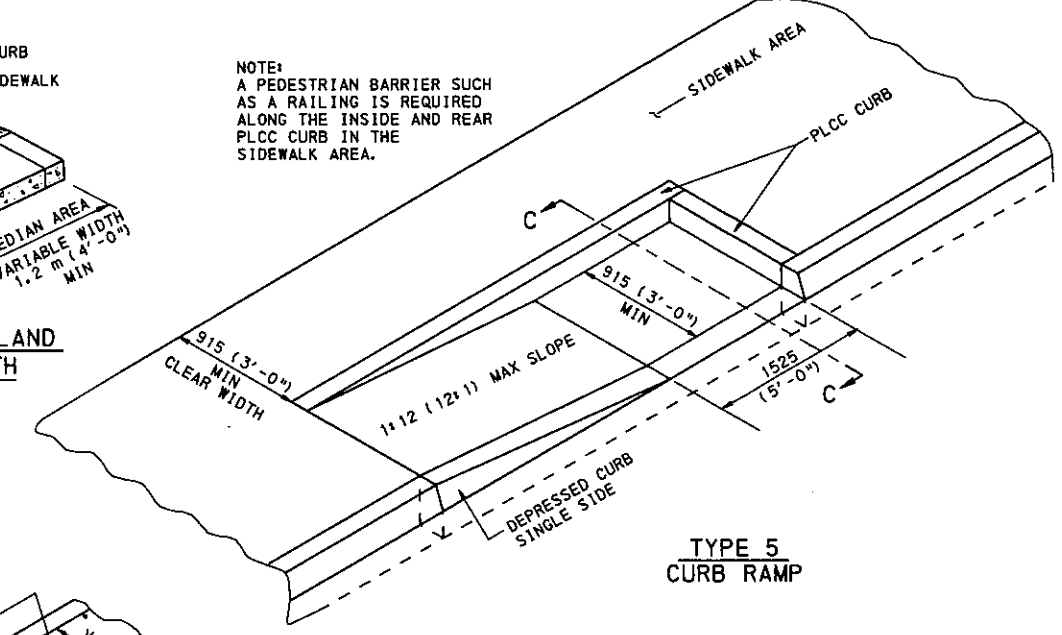
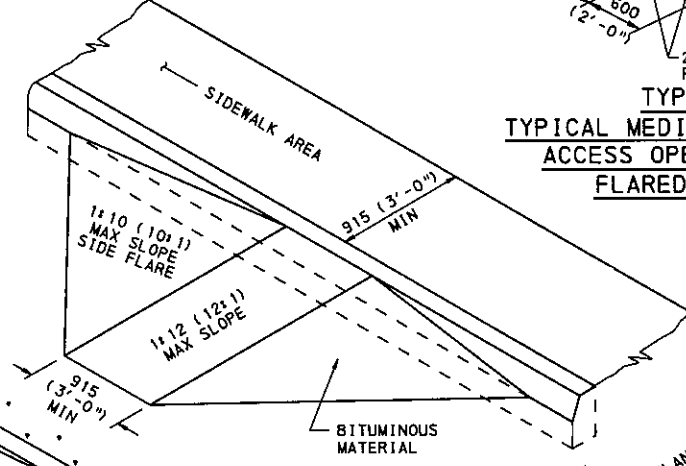
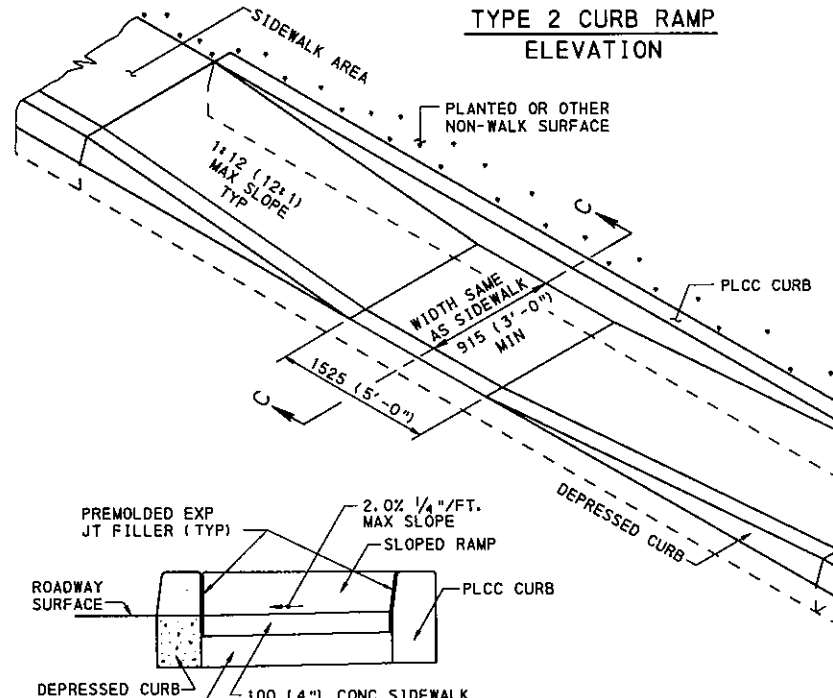
RECOMMENDED APR. 28, 2000
Alan P. Schwach
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED APR. 28, 2000
Larry A. Hoffman
CHIEF ENGINEER

SHT 1 OF 2
RC-67M



NOTE:
A PEDESTRIAN BARRIER SUCH AS A RAILING IS REQUIRED ALONG THE INSIDE AND REAR PLCC CURB IN THE SIDEWALK AREA.



TYPE 2 CURB RAMP AND TYPE 5 CURB RAMP SECTION C-C

TYPE 2 CURB RAMP

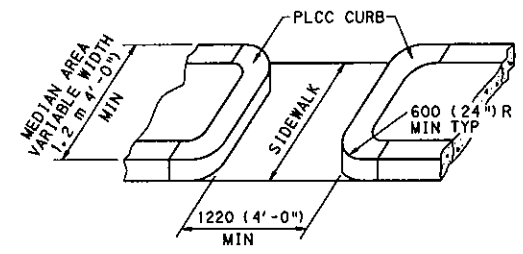
TYPE 3 BUILT-UP CURB RAMP

TYPE 4A CURB RAMP

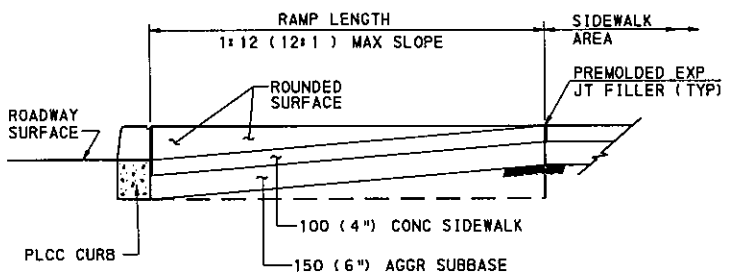
TYPE 4 CURB RAMP

TABLE A CURB RAMP DIMENSIONS NEW CONSTRUCTION				
● RISE OF RAMP	MAX RAMP SLOPE	NOMINAL RAMP LENGTH	SIDE FLARE DIMENSION AT CURB	SIDE FLARE DIMENSION AT CURB
75 (3')	1:12 (12:1)	900 (3.0')	750 (2.5')	900 (3'-0")
100 (4')	1:12 (12:1)	1200 (4.0')	1000 (3.3')	1200 (4'-0")
125 (5')	1:12 (12:1)	1500 (5.0')	1250 (4.2')	1500 (5'-0")
150 (6')	1:12 (12:1)	1800 (6.0')	1500 (5.0')	1800 (6'-0")
175 (7')	1:12 (12:1)	2100 (7.0')	1750 (5.8')	2100 (7'-0")
200 (8')	1:12 (12:1)	2400 (8.0')	2000 (6.7')	2400 (8'-0")
225 (9')	1:12 (12:1)	2700 (9.0')	2250 (7.5')	2700 (9'-0")
250 (10')	1:12 (12:1)	3000 (10.0')	2500 (8.4')	3000 (10'-0")
275 (11')	1:12 (12:1)	3300 (11.0')	2750 (9.2')	3300 (11'-0")
300 (12')	1:12 (12:1)	3600 (12.0')	3000 (10.0')	3600 (12'-0")
CURB RAMP DIMENSIONS EXISTING CONDITION*				
● MAX RISE OF RAMP	MAX RAMP SLOPE	NOMINAL RAMP LENGTH	SIDE FLARE DIMENSION AT CURB	SIDE FLARE DIMENSION AT CURB
75 (3')	1:8 (8:1)	600 (2.0')	750 (2.5')	900 (3'-0")
100 (4')	1:10 (10:1)	1000 (3.3')	1000 (3.3')	1200 (4'-0")
125 (5')	1:10 (10:1)	1250 (4.2')	1250 (4.2')	1500 (5'-0")
150 (6')	1:10 (10:1)	1500 (5.0')	1500 (5.0')	1800 (6'-0")

* USE ONLY WHEN SPACE LIMITATIONS PROHIBIT THE CONSTRUCTION OF 1:12 (12:1) OR FLATTER SLOPES.
● CURB HEIGHT PLUS RISE OF SIDEWALK CROSS SLOPE



TYPE A TYPICAL MEDIAN OR ISLAND ACCESS OPENING WITH CURB SIDES



TYPE 4 AND 4A SECTION D-D

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

CURB RAMPS

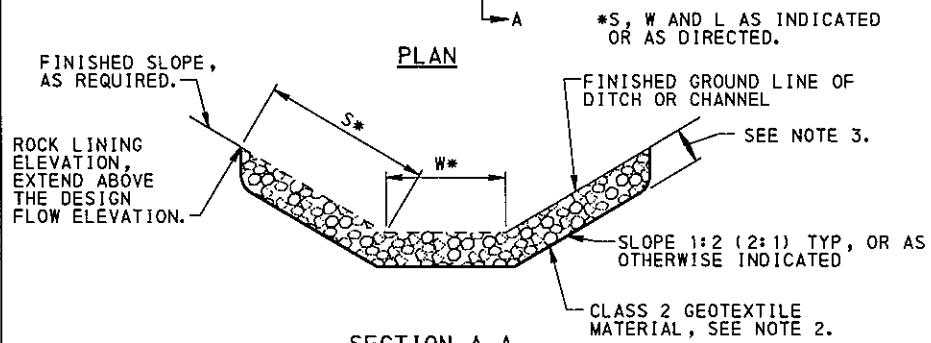
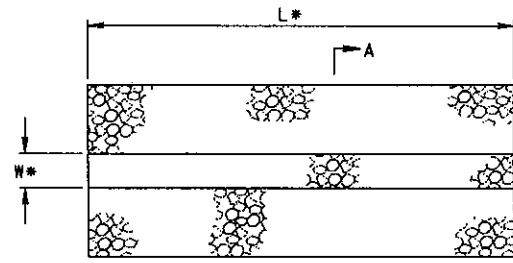
RECOMMENDED APR. 28, 2000
RECOMMENDED APR. 28, 2000
SHT 2 OF 2

Director, Bureau of Design
Chief Engineer

RC-67M

NOTES

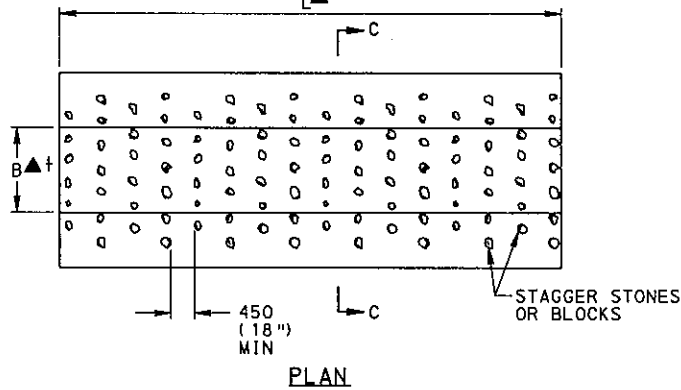
1. PROVIDE GEOTEXTILE MATERIAL MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 735 AND FURNISH AND INSTALL IN ACCORDANCE WITH SECTION 212.
2. PROVIDE GEOTEXTILE MATERIAL ALONG ALL INTERFACE AREAS WITH GROUND CONTACT.
3. ROCK SIZE AS PER DESIGN DRAWINGS. NOMINAL PLACEMENT THICKNESS AS PER PUBLICATION 408/2000, SECTION 850.
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.



**SECTION A-A
ROCK LINING**

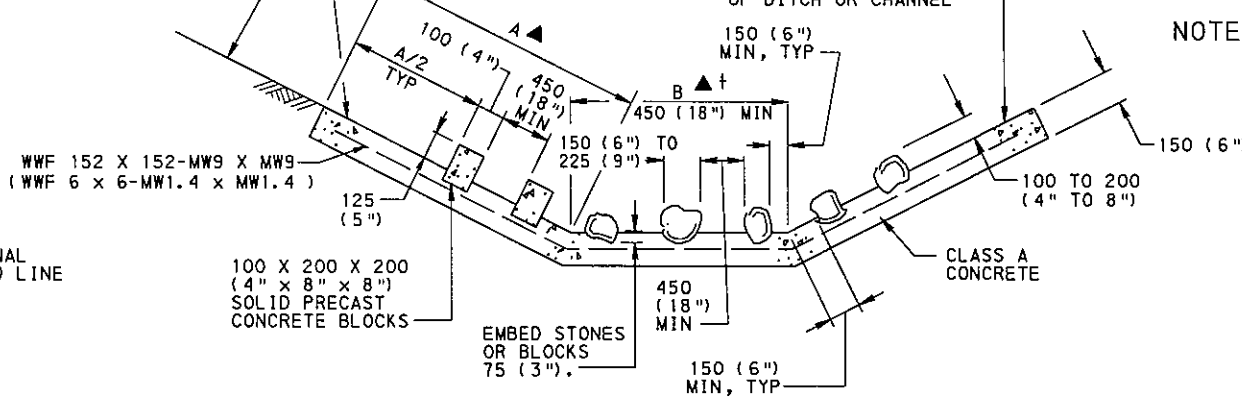
▲ A, B, AND L AS INDICATED OR AS DIRECTED.

† WHEN CHANNEL BOTTOM WIDTH IS LESS THAN 900 (3'-0"), USE A SINGLE, STAGGERED ROW OF STONES OR BLOCKS ALONG CHANNEL BOTTOM.

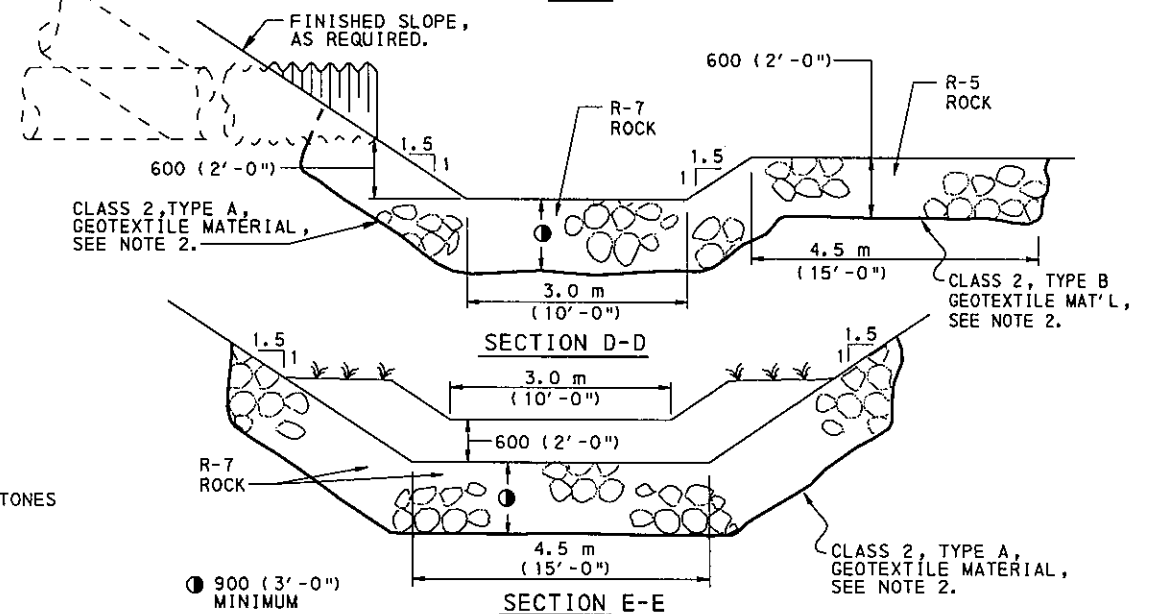
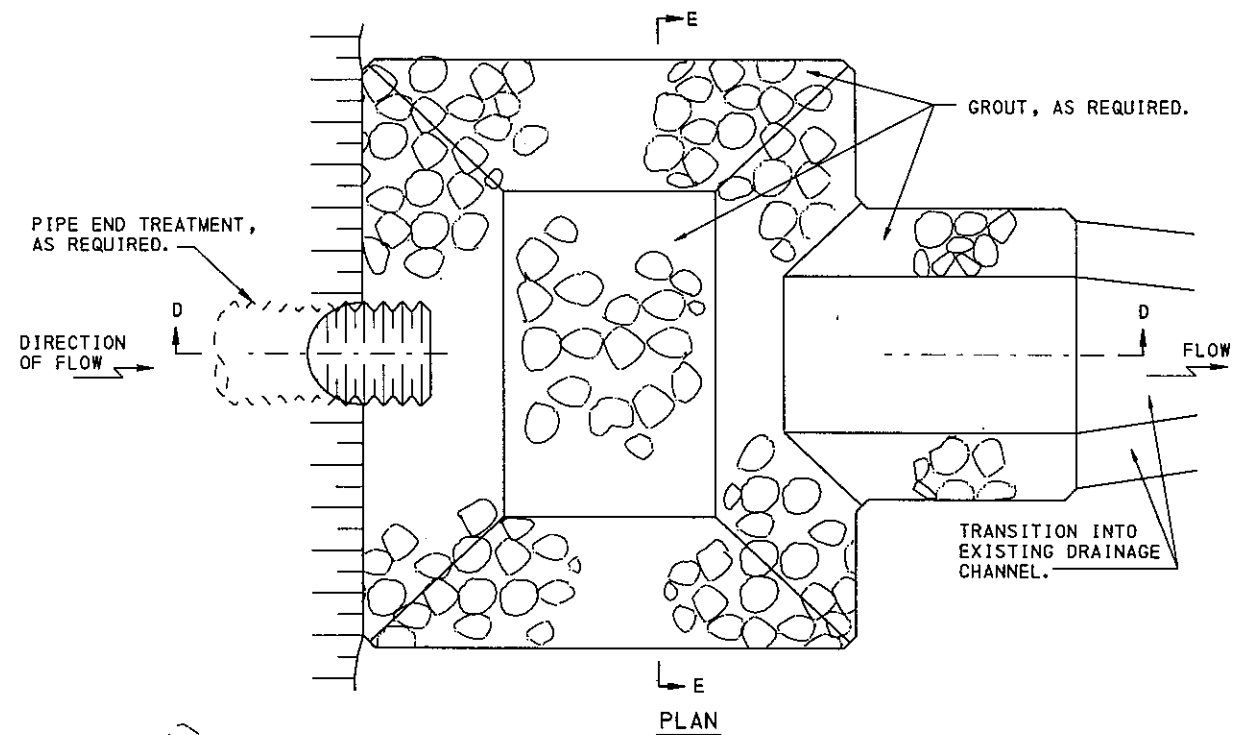


SLOPE 1:2 (2:1) TYP, OR AS SHOWN ON THE DRAWINGS

FINISHED SLOPE, AS REQUIRED.



**SECTION C-C
PAVED ENERGY DISSIPATOR**

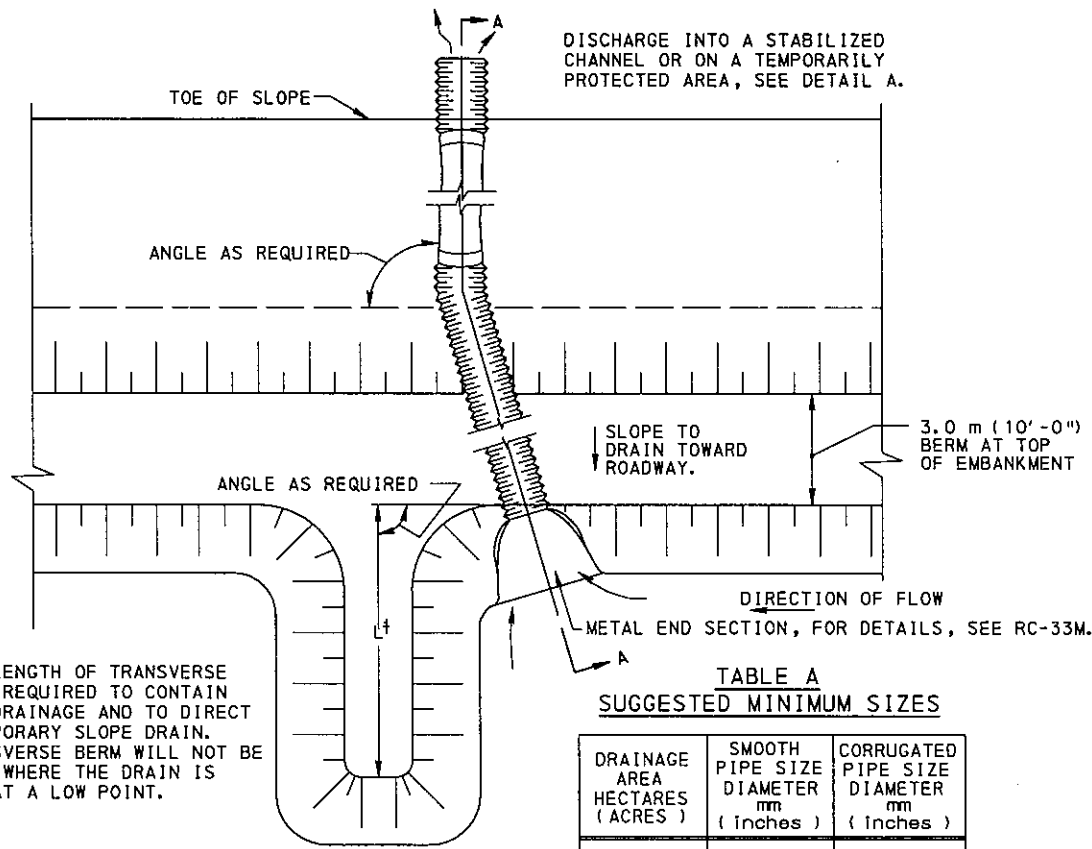


**SECTION E-E
ROCK ENERGY DISSIPATOR**

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

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DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN**

**EROSION AND SEDIMENT
POLLUTION CONTROL**

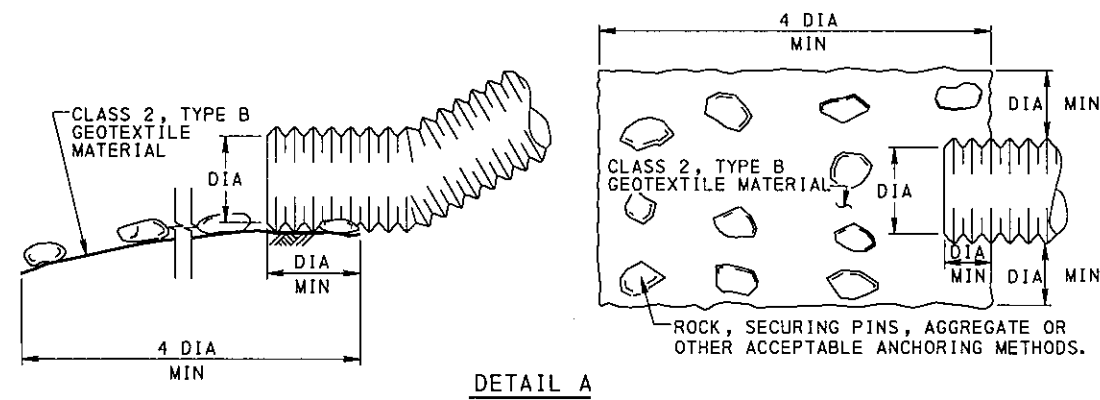


† PROVIDE LENGTH OF TRANSVERSE BERM (L) REQUIRED TO CONTAIN SURFACE DRAINAGE AND TO DIRECT INTO TEMPORARY SLOPE DRAIN. THE TRANSVERSE BERM WILL NOT BE REQUIRED WHERE THE DRAIN IS LOCATED AT A LOW POINT.

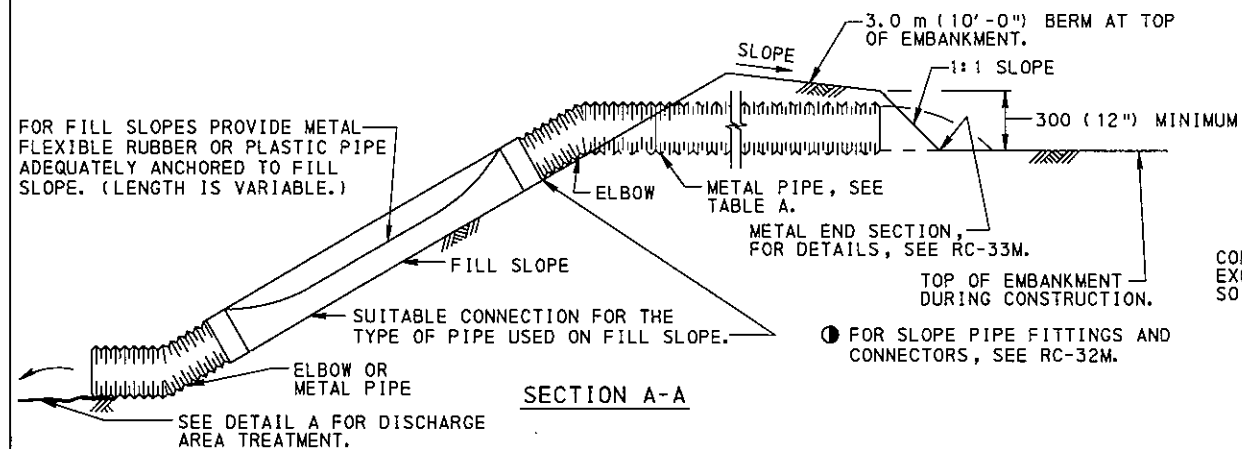
PLAN

TABLE A
SUGGESTED MINIMUM SIZES

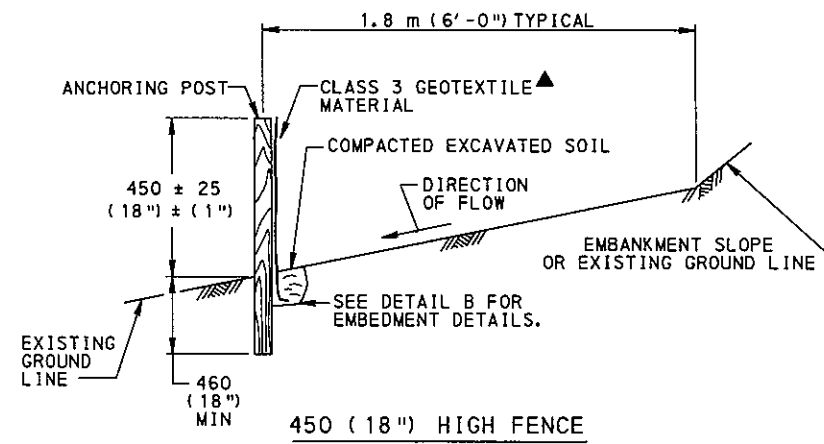
DRAINAGE AREA HECTARES (ACRES)	SMOOTH PIPE SIZE DIAMETER mm (inches)	CORRUGATED PIPE SIZE DIAMETER mm (inches)
0 TO 1.2 (0 TO 3)	200 (8")	300 (12")
1.2 TO 2.4 (3 TO 6)	250 (10")	375 (15")
2.4 TO 4.0 (6 TO 10)	300 (12")	450 (18")



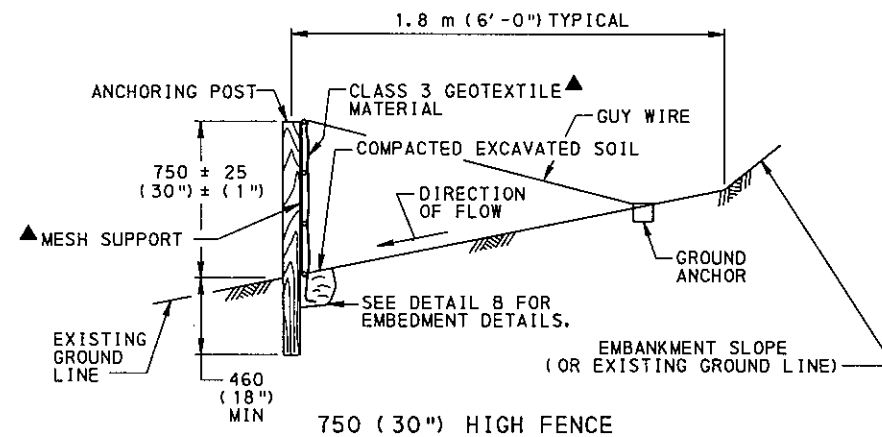
DETAIL A



TEMPORARY SLOPE PIPE DRAIN

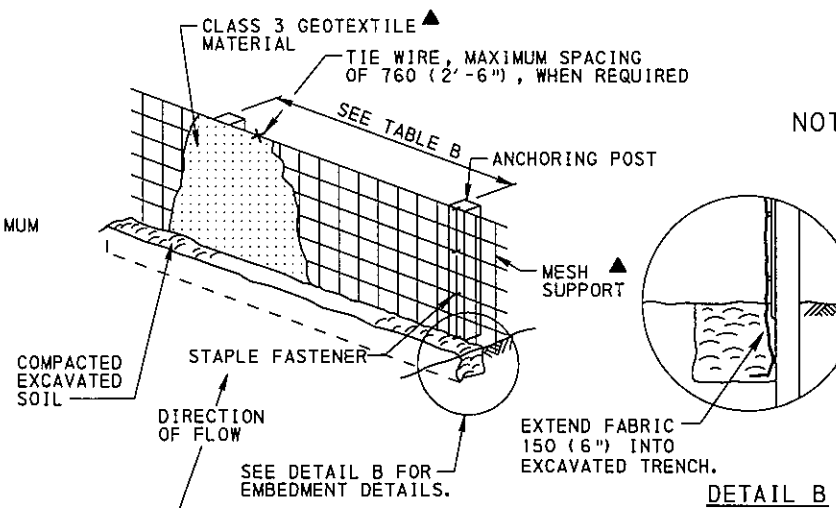


450 (18") HIGH FENCE



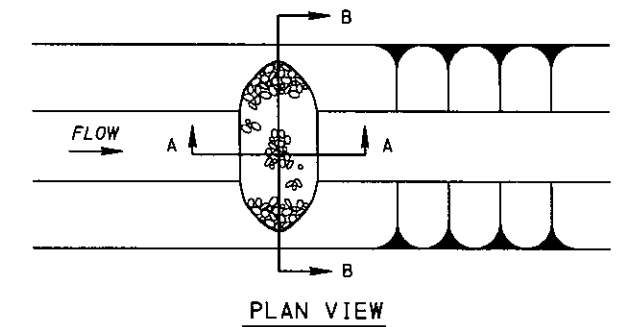
750 (30") HIGH FENCE

▲ SEE TABLE B.

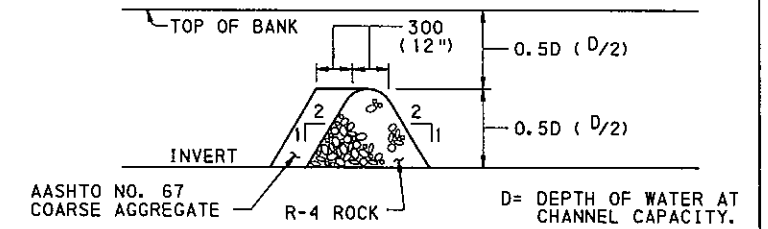


SILT BARRIER FENCE

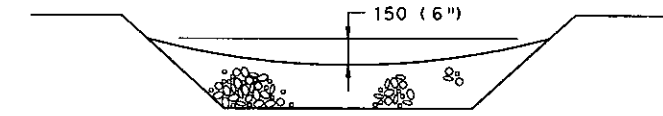
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.



PLAN VIEW



TYPICAL SECTION A-A



TYPICAL SECTION B-B
ROCK BARRIER

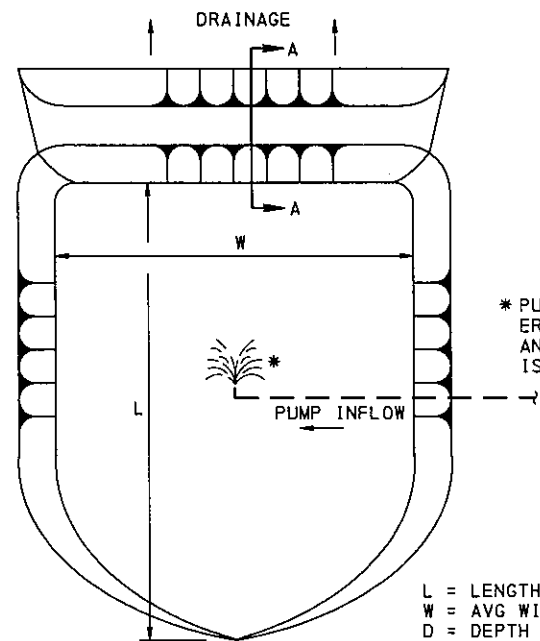
TABLE B
SILT BARRIER FENCE
GEOTEXTILE SELECTION

TYPE OF CLASS 3 GEOTEXTILE MATERIAL	NOMINAL FABRIC HEIGHT	MAX POST SPACING WITHOUT MESH SUPPORT	MAX POST SPACING WITH MESH SUPPORT
3A	450 (18")	2.4 m (8'-0")	NA
3A	750 (30")	NA	2.4 m (8'-0")
3B	450 (18")	1.2 m (4'-0")	NA
3B	750 (30")	NA	1.2 m (4'-0")

NA = NOT APPLICABLE

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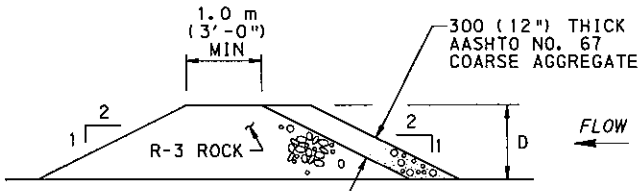
EROSION AND SEDIMENT
POLLUTION CONTROL



PLAN VIEW

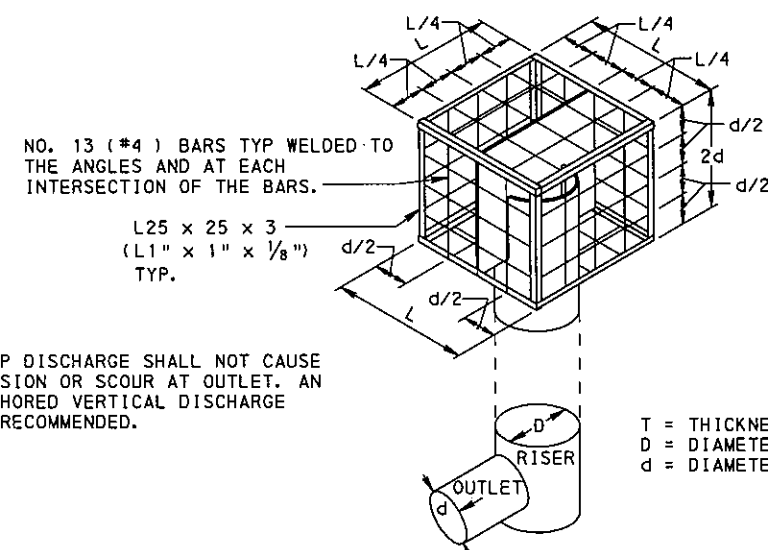
L = LENGTH
W = AVG WIDTH
D = DEPTH
WHERE = $L \times W \times D = 450 \text{ m}^3 \text{ per } 1 \text{ m}^3/\text{s}$
(100cf/100gpm INFLOW)

* PUMP DISCHARGE SHALL NOT CAUSE EROSION OR SCOUR AT OUTLET. AN ANCHORED VERTICAL DISCHARGE IS RECOMMENDED.



TYPICAL SECTION A-A

DEWATERING BASIN



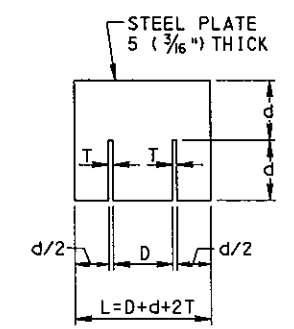
TRASH RACK AND ANTI-VORTEX DEVICE

NO. 13 (#4) BARS TYP WELDED TO THE ANGLES AND AT EACH INTERSECTION OF THE BARS.

L25 x 25 x 3 (L1" x 1" x 1/8") TYP.

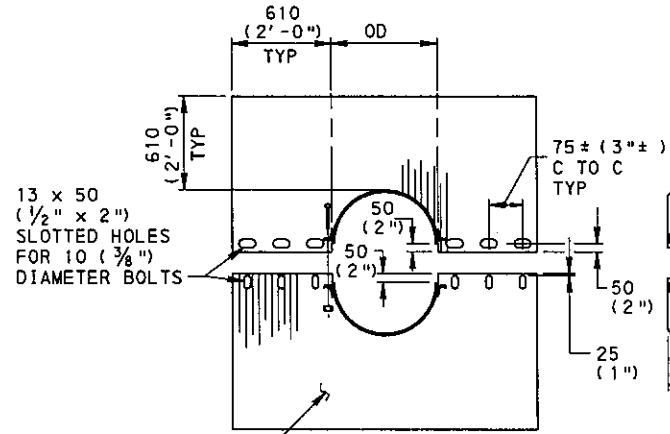
T = THICKNESS OF RISER PIPE.
D = DIAMETER OF RISER PIPE.
d = DIAMETER OF OUTLET PIPE.

ANTI-VORTEX DEVICE



13 x 50 (1/2" x 2") SLOTTED HOLES FOR 10 (3/8") DIAMETER BOLTS

1.6 (16 GAGE) THICK SHEET METAL
68 x 13 (1 1/16" x 1/2") CORRUGATIONS



ELEVATION

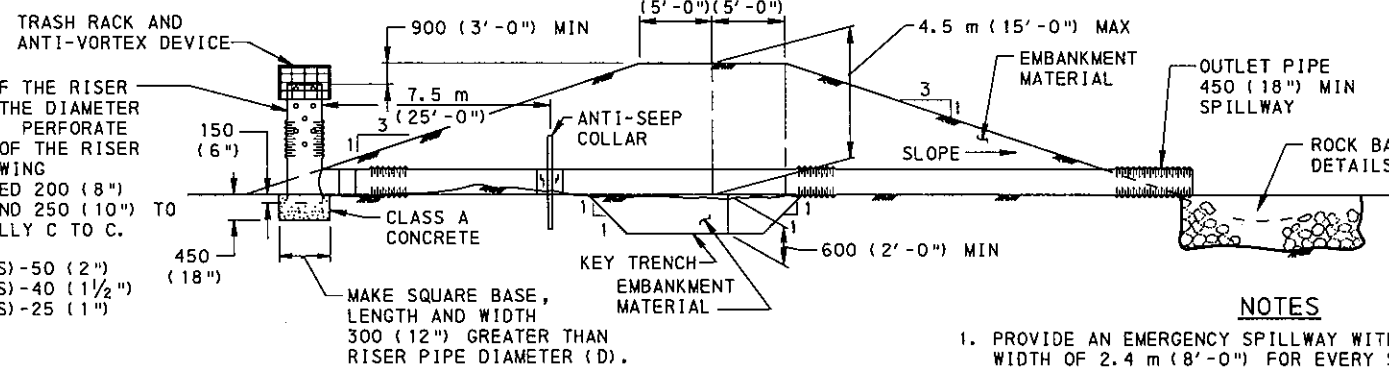
END VIEW

DETAIL OF ANTI-SEEP COLLAR

CAULK THE LAP BETWEEN THE TWO HALF-SECTIONS WITH BITUMINOUS MASTIC AT THE TIME OF INSTALLATION. MARK UNASSEMBLED COLLARS BY PAINTING OR TAGGING TO IDENTIFY MATCHING PAIRS.

MAKE THE DIAMETER OF THE RISER AT LEAST 1.5 TIMES THE DIAMETER OF THE OUTLET PIPE. PERFORATE THE TOP TWO-THIRDS OF THE RISER PIPE WITH THE FOLLOWING DIAMETER HOLES SPACED 200 (8") VERTICALLY C TO C AND 250 (10") 300 (12") HORIZONTALLY C TO C.

TOP ROW(S) - 50 (2")
MIDDLE ROW(S) - 40 (1 1/2")
BOTTOM ROW(S) - 25 (1")

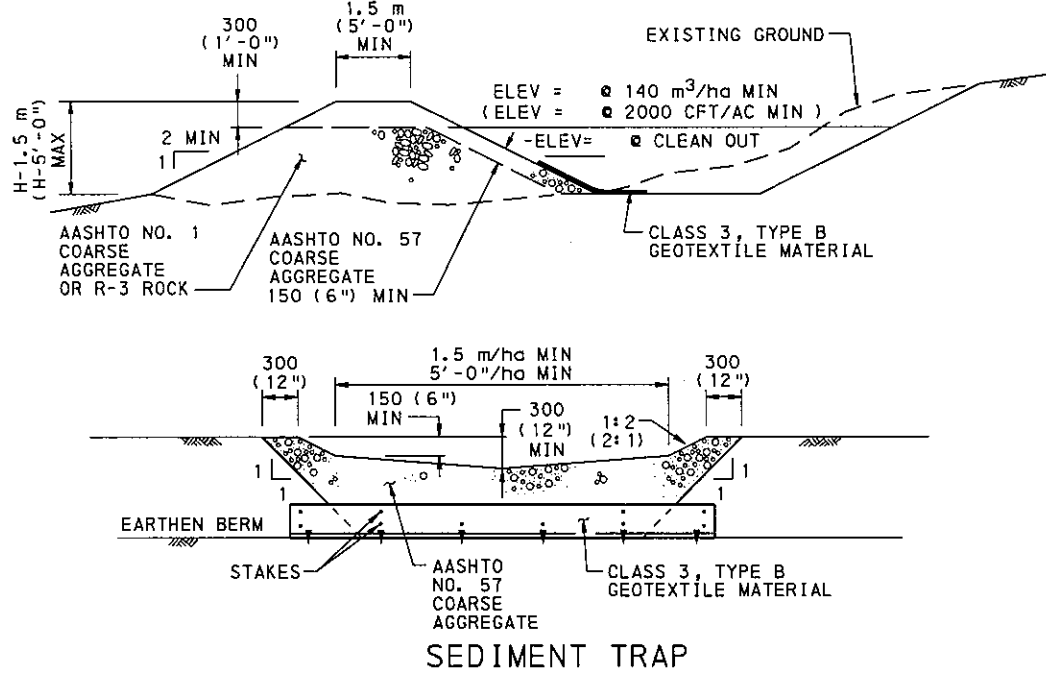


SECTION A-A SEDIMENTATION POND

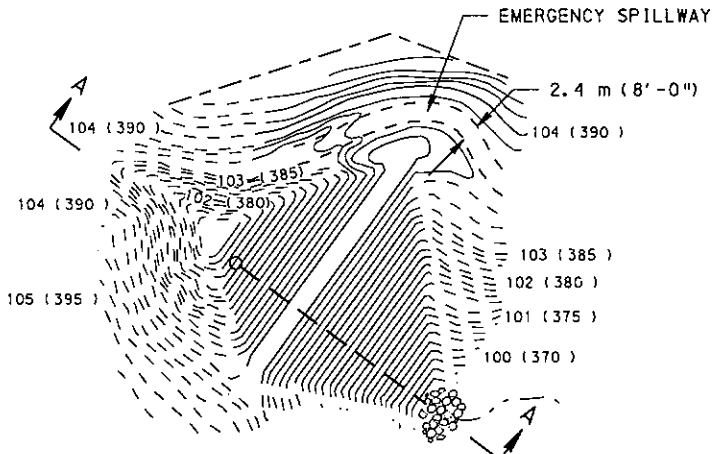
NOTES

1. PROVIDE AN EMERGENCY SPILLWAY WITH A MINIMUM BOTTOM WIDTH OF 2.4 m (8'-0") FOR EVERY SEDIMENTATION POND.
2. PLACE THE EMERGENCY SPILLWAY IN UNDISTURBED GROUND NOT IN EMBANKMENT AREAS. THE EMERGENCY SPILLWAY CAN GO OVER THE EMBANKMENT IF ROCK LINING IS USED.
3. MAKE THE ELEVATION OF THE EMERGENCY SPILLWAY SUCH THAT THE DAM IS AT LEAST 600 (2'-0") ABOVE THE MAXIMUM DESIGN FLOW OF THE SPILLWAY. MAKE THE COMBINED CAPACITY OF THE RISER AND EMERGENCY SPILLWAY AT LEAST 0.14 m³/s/ha (2 CFS/AC) FROM THE ENTIRE WATERSHED OF THE BASIN.
4. CONSTRUCT THE CREST OF THE EMERGENCY SPILLWAY 300 (1'-0") ABOVE THE TOP OF THE RISER.
5. WHERE THERE IS LIMITED ROOM FOR STORAGE AT THE BOTTOM PORTION OF THE POND, PERFORATE THE LOWEST HOLES IN THE RISER PIPE AT THE LEVEL OF TWO SEVENTHS OF THE TOTAL POND CAPACITY, TO PROVIDE ADEQUATE SEDIMENT STORAGE.

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



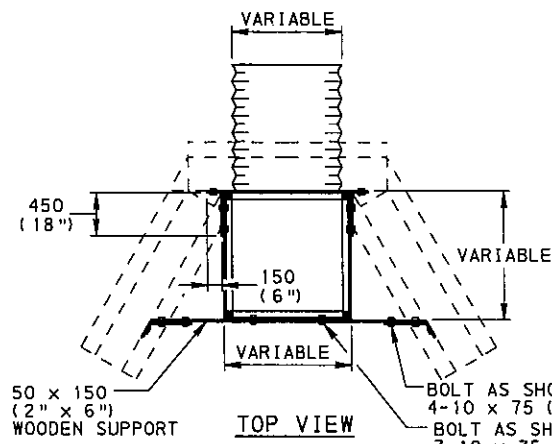
SEDIMENT TRAP



PLAN VIEW OF SEDIMENTATION POND WITH EMERGENCY SPILLWAY CUT INTO EXISTING GROUND

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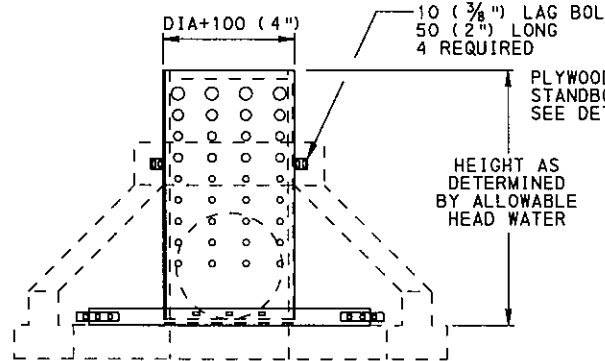
EROSION AND SEDIMENT POLLUTION CONTROL



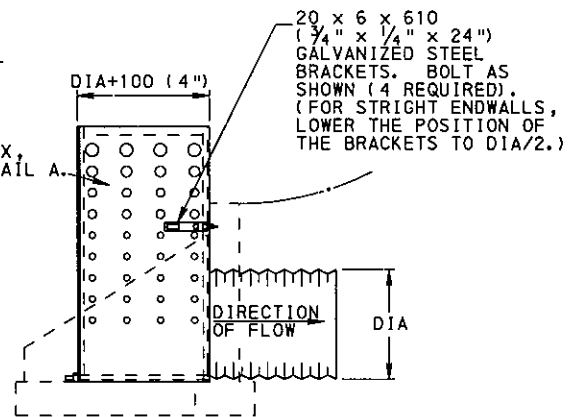
NOTES
 DRILL HOLES 50 (2") DEEP IN CONCRETE ENDWALL AND INSERT LEAD EXPANDER TO RECEIVE M10 Ø LAG BOLT. UPON REMOVAL OF STANDBOX, FILL HOLES IN THE ENDWALL WITH MORTAR MEETING THE REQUIREMENTS OF PUBLICATION 408/2000, SECTION 705.7.

** COVER 50% OF THE HEIGHT OF WIDTH AT THE BOTTOM OF THE STANDBOX. USE THE "EMBEDMENT DETAILS" SHOWN ON SHEET 2 IF BOTTOM IS NOT PAVED. USE ASPHALT MATERIAL FOR FASTENING IF PAVED APRON IS PROVIDED.

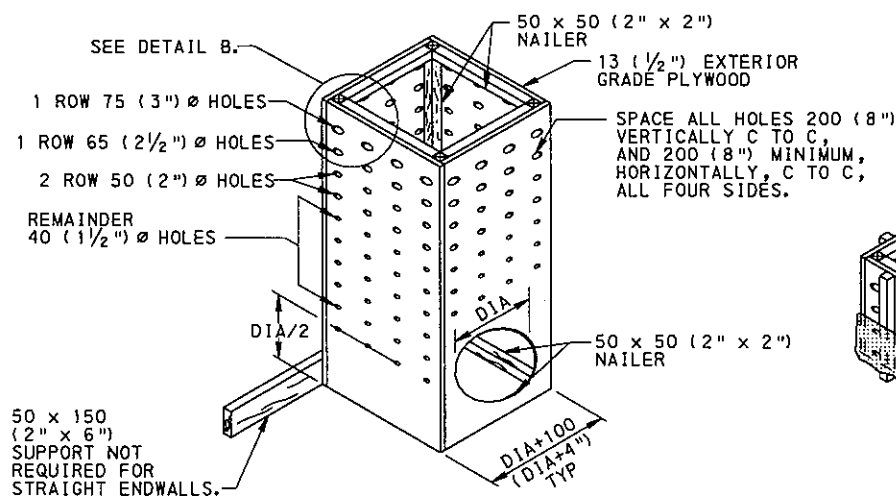
50 x 150 (2" x 6") WOODEN SUPPORT
 BOLT AS SHOWN 4-10 x 75 (3/8" x 3")
 BOLT AS SHOWN 3-10 x 75 (3/8" x 3")



END VIEW

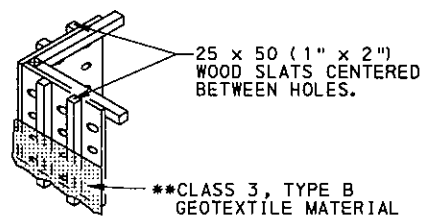


SIDE VIEW



DETAIL A

ENDWALL STANDBOX†

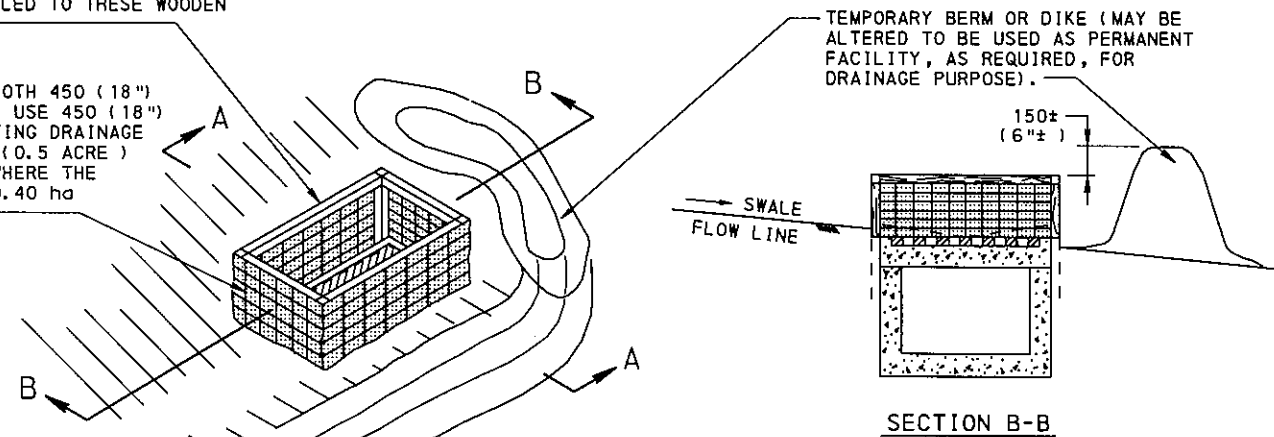


DETAIL B

† SUPPLY ALL ENDWALL STANDBOXES WITH CLASS 3 GEOTEXTILE MATERIAL AS SHOWN IN DETAIL B.

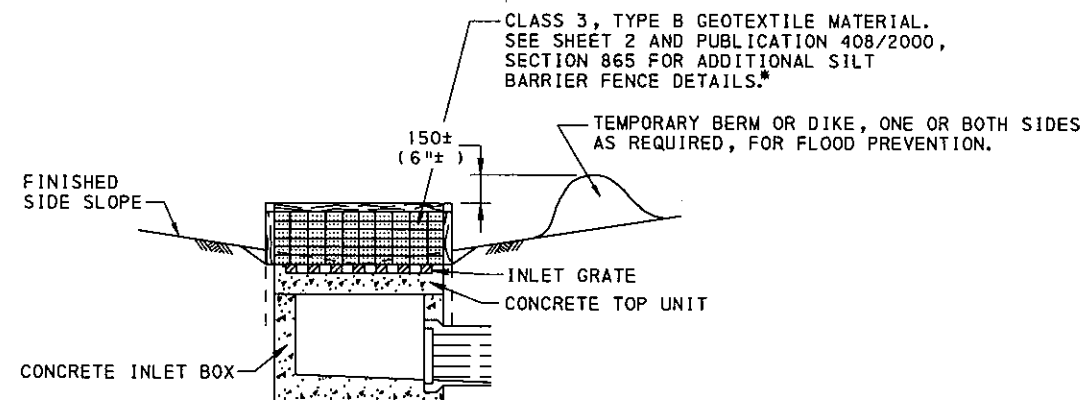
PLACE 50 x 50 (2" x 2") WOOD STRIPS AROUND THE TOP NAILED TO THE POSTS AND WITH THE GEOTEXTILE STAPLED TO THESE WOODEN PIECES.

PROVIDE MESH SUPPORT FOR BOTH 450 (18") AND 750 (30") HIGH FENCES. USE 450 (18") HIGH FENCE WHERE CONTRIBUTING DRAINAGE AREA IS LESS THAN 0.20 ha (0.5 ACRE) AND 750 (30") HIGH FENCE WHERE THE AREA IS BETWEEN 0.20 AND 0.40 ha (0.5 AND 1.0 ACRE).



SECTION B-B

* LOCATE SILT BARRIER FENCE TO PREVENT THE INFILTRATION OF FINES OR SEDIMENTS INTO THE INLET BOX. IF NO BACKFILL OPERATIONS ARE PERFORMED, LOCATE THE SILT BARRIER FENCE OUTSIDE THE AREA EXCAVATED FOR THE INLET BOX.



SECTION A-A

SILT BARRIER FENCE FOR INLET PROTECTION

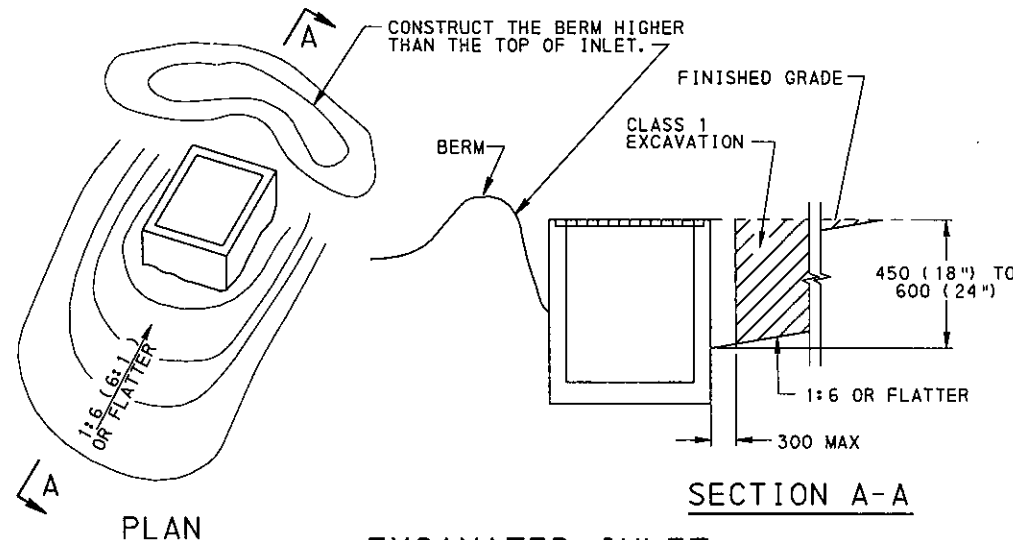
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

NOTES

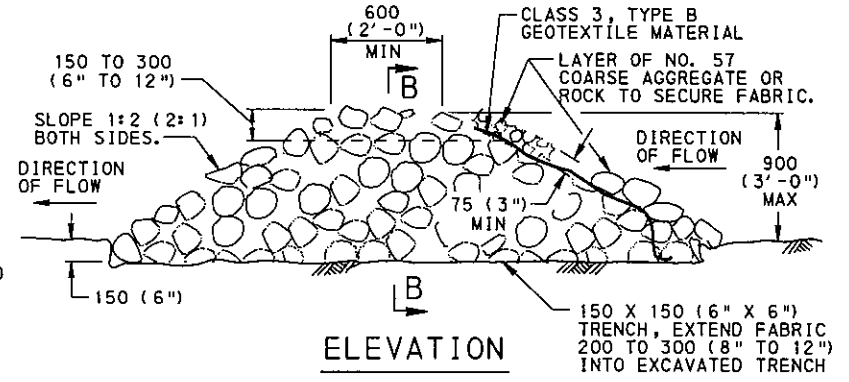
- UPON ESTABLISHMENT OF SUITABLE SOIL STABILIZATION AND AT THE DIRECTION OF THE ENGINEER, REMOVE THE ENDWALL STANDBOXES. STANDBOXES BECOME THE PROPERTY OF THE CONTRACTOR.
- CLEAN THE BASIN AND/OR AREA UPSTREAM FROM THE STANDBOX PERIODICALLY AND DEPOSIT THE SEDIMENT AND DEBRIS IN AN AREA APPROVED BY THE ENGINEER.

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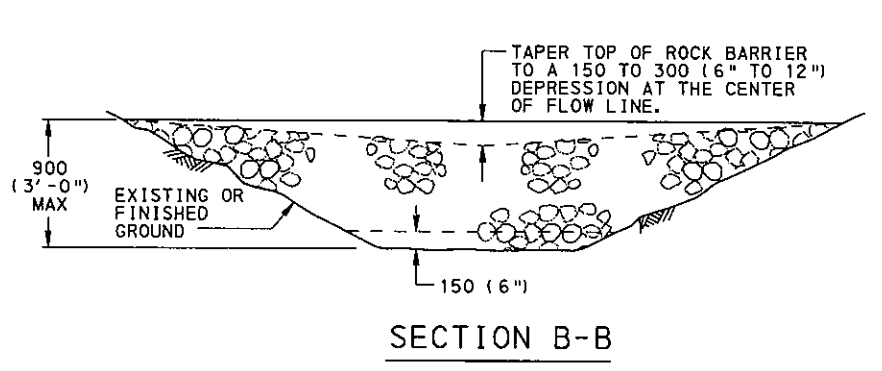
EROSION AND SEDIMENT POLLUTION CONTROL



**EXCAVATED INLET
SEDIMENT TRAP**

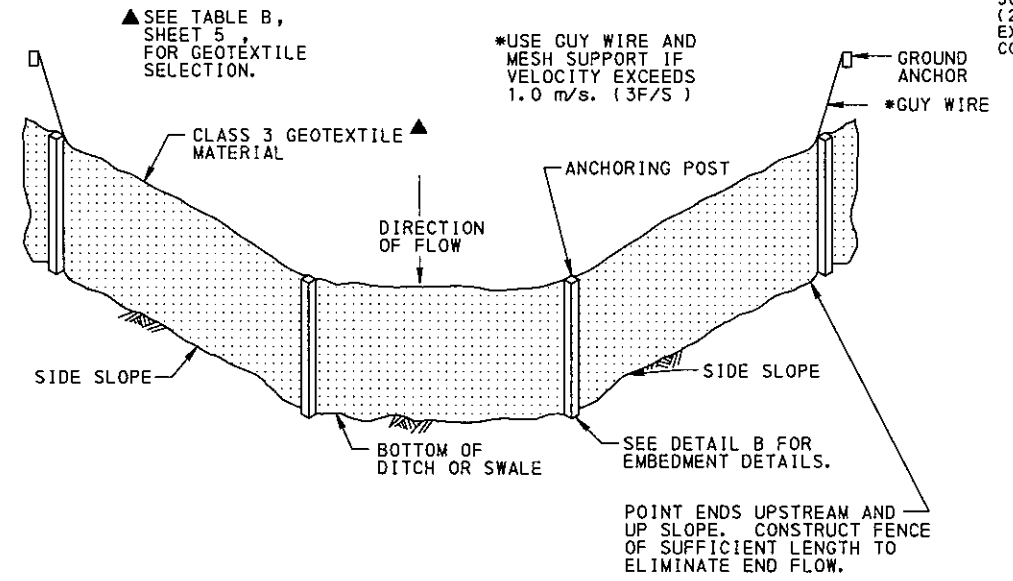


ELEVATION

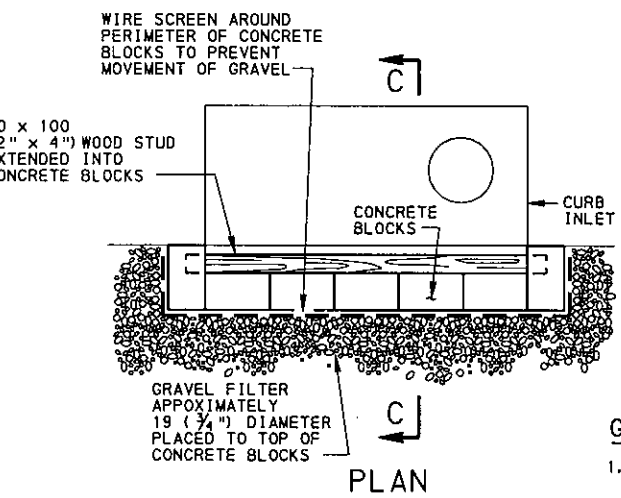


SECTION B-B

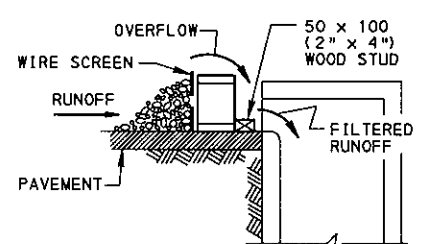
ROCK BARRIER



DITCH OR SWALE CONDITION

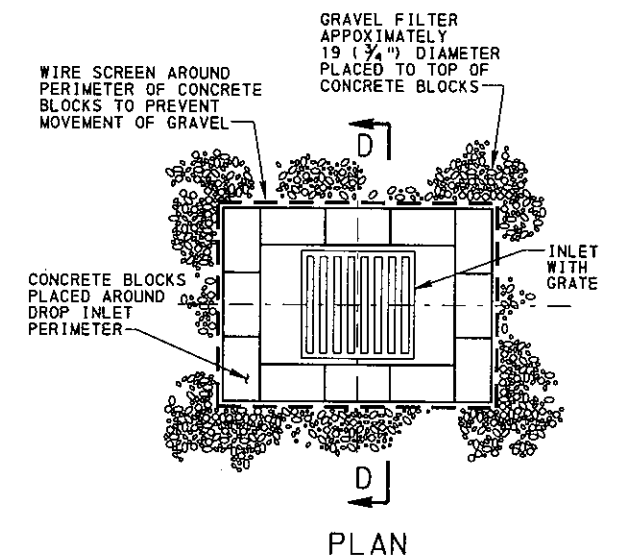


PLAN

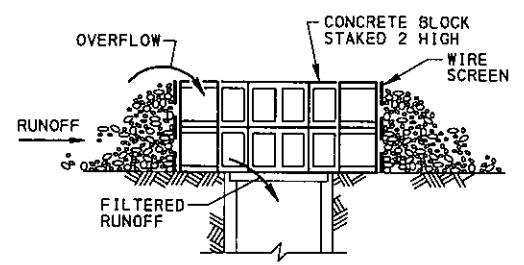


SECTION C-C

**GRAVEL FILTER FOR
CURB INLET**



PLAN

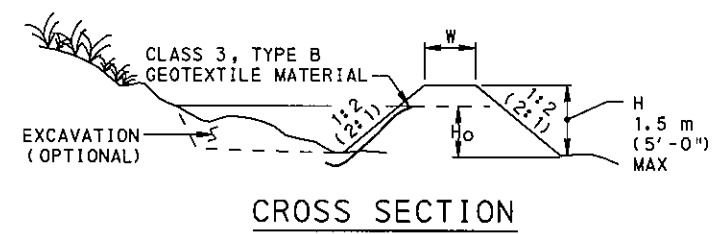


SECTION D-D

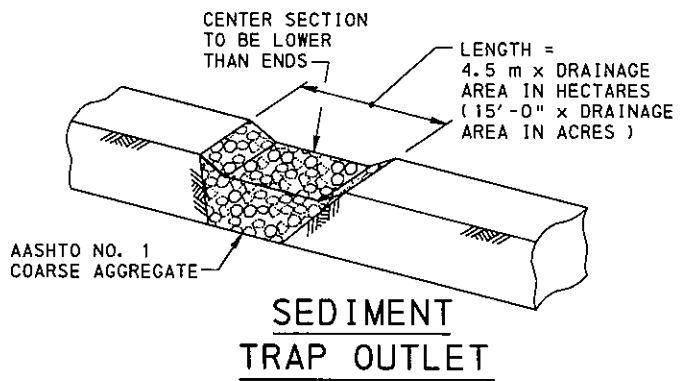
**GRAVEL FILTER FOR
AREA INLET**

GRAVEL FILTER NOTES:

1. GRAVEL FILTERS MAY BE USED ON PAVEMENT OR BARE GROUND.
2. ALL GRAVEL FILTERS INSTALLED AROUND AREA DRAINS SHOULD BE INSPECTED AND REPAIRED AFTER EACH RUNOFF EVENT. SEDIMENT SHOULD BE REMOVED WHEN MATERIAL IS WITHIN 25 (4") OF THE TOP OF THE CONCRETE BLOCKS. PERIODICALLY, THE GRAVEL SHOULD BE RAKED TO INCREASE INFILTRATION AND FILTERING OF RUNOFF WATERS.
3. SEDIMENT SHOULD BE REMOVED IMMEDIATELY FROM ANY TRAVELED WAY OF ROADS AND STREETS.



CROSS SECTION



**SEDIMENT
TRAP OUTLET**

**SIZING SEDIMENT
TRAP EMBANKMENTS**

meters (feet)		
H	H ₀	W
0.5 (1'-6")	0.2 (8")	0.6 (2'-0")
0.6 (2'-0")	0.3 (1'-0")	0.6 (2'-0")
0.8 (2'-6")	0.5 (1'-6")	0.8 (2'-6")
0.9 (3'-0")	0.6 (2'-0")	0.8 (2'-6")
1.0 (3'-3")	0.8 (2'-6")	0.9 (3'-0")
1.2 (4'-0")	0.9 (3'-0")	0.9 (3'-0")
1.4 (4'-6")	1.0 (3'-6")	1.2 (4'-0")
1.5 (5'-0")	1.2 (4'-0")	1.4 (4'-6")

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**

**EROSION AND SEDIMENT
POLLUTION CONTROL**

NOTES

1. PROVIDE MATERIALS AND CONSTRUCT AS SPECIFIED IN PUBLICATION 408/2000, SECTIONS 910 AND 1101.
2. LEVEL TOP OF FORMS IN BOTH DIRECTIONS.
3. GALVANIZE ALL ANCHORAGE HARDWARE, STEEL FLAT OR SPRING LOCK WASHERS AND TOP 300 (12") OF ANCHOR BOLTS.
4. GROUND ROD 13 (1/2") ϕ x 2.4 m (8'-0") MINIMUM, COPPER CLAD STEEL WITH 25 (1") Ω MAXIMUM RESISTANCE TO EARTH GROUND.
5. SEE RC-83M FOR POLE DETAILS.
6. FOR LIGHTING POLE ANCHORAGES ON BRIDGES, SEE BRIDGE CONSTRUCTION STANDARD DRAWINGS, BC-722M.
7. PROVIDE 750 (30") OF 21.15 mm² (#4) GROUND WIRE COILED ABOVE FOUNDATION, WIRE EXTENDS THROUGH CENTER OF FOUNDATION.
8. MINIMUM BEND RADIUS TO BE TWELVE TIMES CONDUIT DIAMETER, UNLESS OTHERWISE SPECIFIED.
9. TOP OF CONDUIT BUSHING NOT TO BE HIGHER THAN 25 (1") FROM THE TOP OF THE FOUNDATION.
10. THE LIGHTING POLE MANUFACTURER PROVIDES TEMPLATE FOR SETTING ANCHOR BOLTS FOR TYPE "A" OR TYPE "S" LIGHTING POLES, AND ALL HARDWARE, INCLUDING GALVANIZED HEX HEAD CAP BOLT OR STUD AND NUT OF APPROPRIATE LENGTH.
11. USE 3-CONDUIT ACCESS WHERE PLAN CIRCUITS INDICATE BRANCH TAP INSIDE POLE BASE. POSITION CONDUITS IN FOUNDATION TO AVOID UNNECESSARY BENDS. PROVIDE ONE, TWO OR THREE CONDUITS AS REQUIRED.
12. FOR TYPE S POLES - PROVIDE A MAXIMUM OF 100 (4") TO THE TOP OF THE FOUNDATION, ANCHOR BOLT, OR STUB OF BREAKAWAY DEVICE, WHICHEVER IS HIGHER, MEASURED FROM AN IMAGINARY 1.5 m (5'-0") LONG 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 SUPPORT. PROVIDE A MAXIMUM TAPER OF 45° TO THE EDGE OF THE FOUNDATION AS REQUIRED TO SATISFY THE ABOVE REQUIREMENT. BEGIN THE TAPER NOT LESS THAN 25 (1") FROM THE OUTSIDE OF THE BREAKAWAY BASE DIMENSION. MOUNTING SURFACE OF FOUNDATION IS TO EXTEND ABOVE THE GROUND LINE.
13. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

▲ FORM 150 (6") BELOW GROUND LEVEL. BELOW THIS POINT, PLACE CONCRETE AGAINST NATURAL GROUND.
 † DESIGNED FOR 9.1 m (30'-0") MAXIMUM ARM LENGTH. SEE TABLE A FOR FOUNDATION DIMENSIONS.
 SEE TYPE A POLE BASE FOUNDATION DETAILS FOR ADDITIONAL TYPE S POLE BASE FOUNDATION REQUIREMENTS.

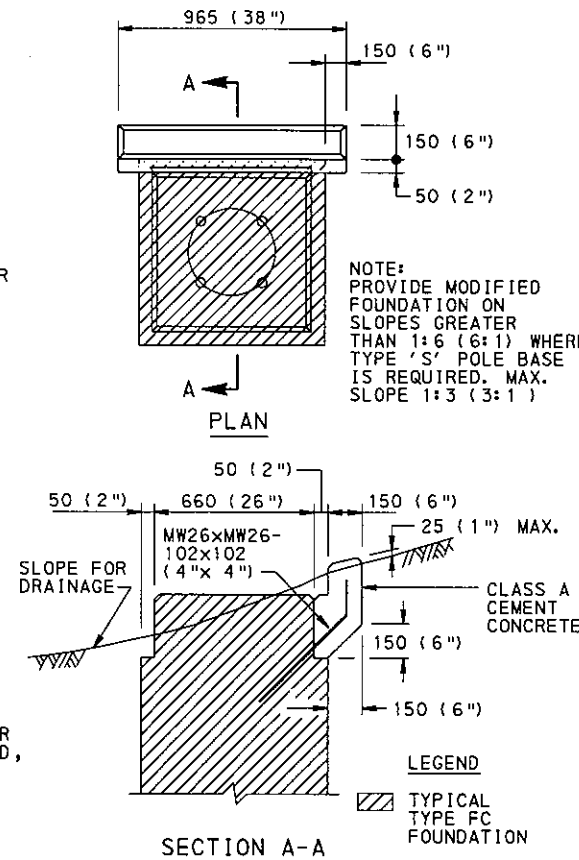
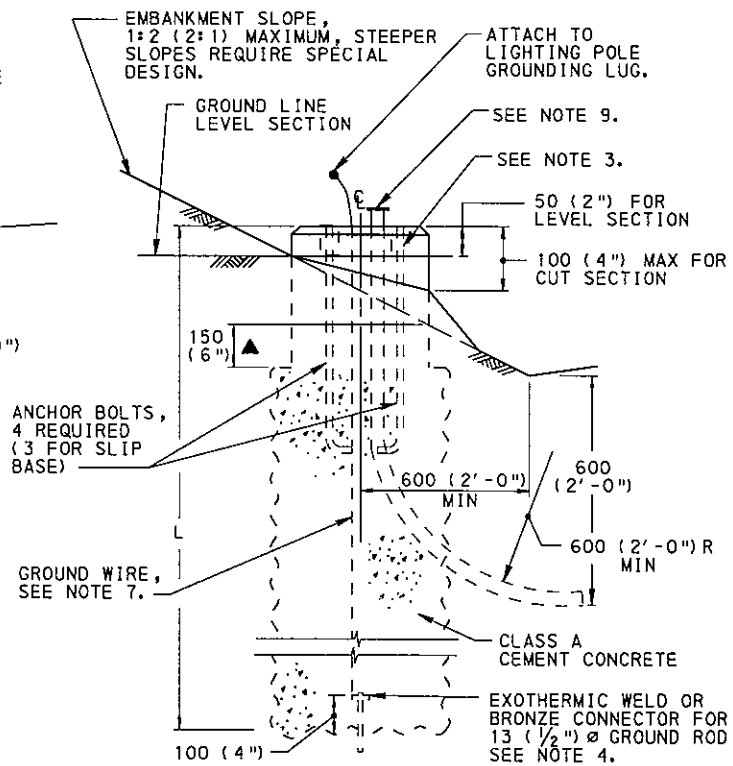
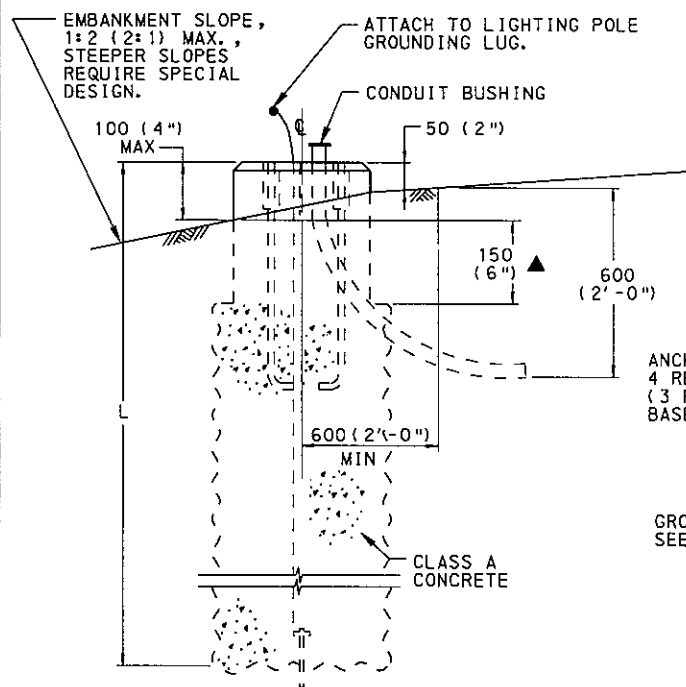
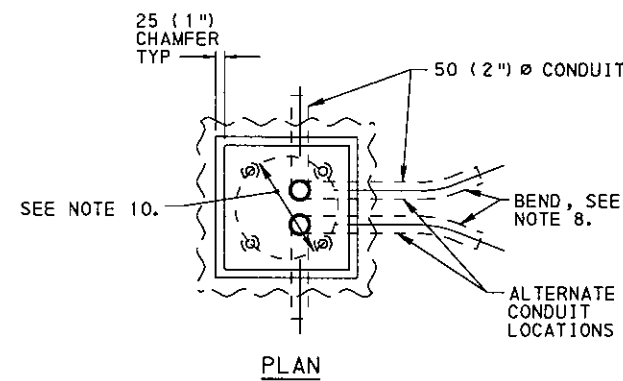
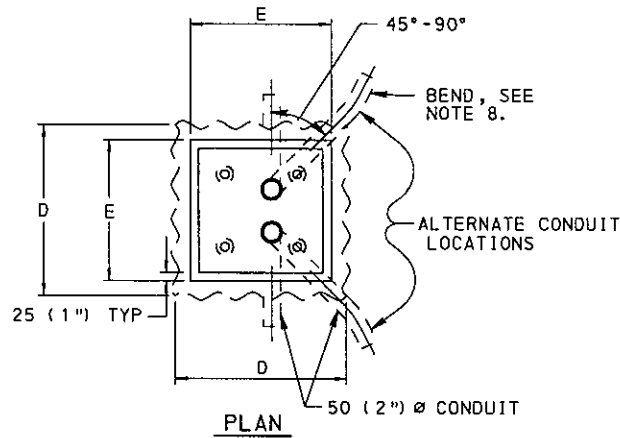
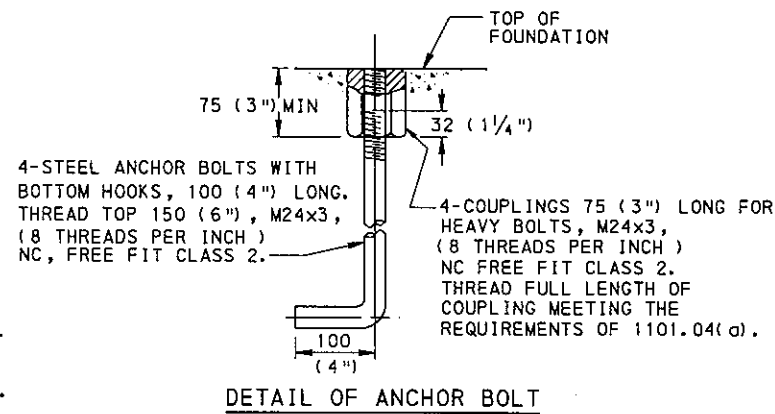
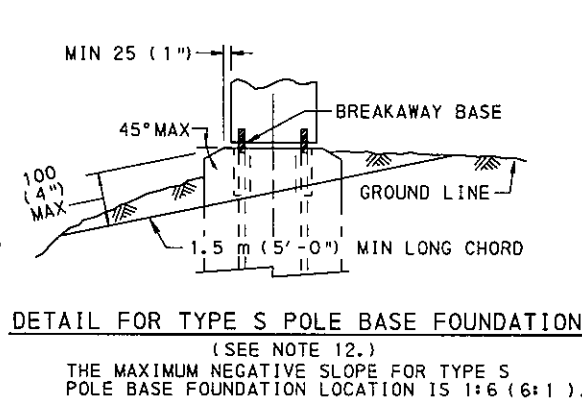


TABLE A
FOUNDATION DIMENSIONS

MOUNTING HEIGHT	D x D	E x E	AUGER DIAMETER	L
UP TO 9.1 m (UP TO 30')	610 x 610 (2'-0" x 2'-0")	510 x 510 (1'-8" x 1'-8")	710 (2'-4")	1800 (6'-0")
10.7 m (35')	760 x 760 (2'-6" x 2'-6")	660 x 660 (2'-2" x 2'-2")	865 (2'-10")	1800 (6'-0")
12.2 m (40')	760 x 760 (2'-6" x 2'-6")	660 x 660 (2'-2" x 2'-2")	865 (2'-10")	2000 (6'-6")
13.7 m (45')	760 x 760 (2'-6" x 2'-6")	660 x 660 (2'-2" x 2'-2")	865 (2'-10")	2100 (7'-0")
15.2 m (50')	760 x 760 (2'-6" x 2'-6")	660 x 660 (2'-2" x 2'-2")	865 (2'-10")	2300 (7'-6")

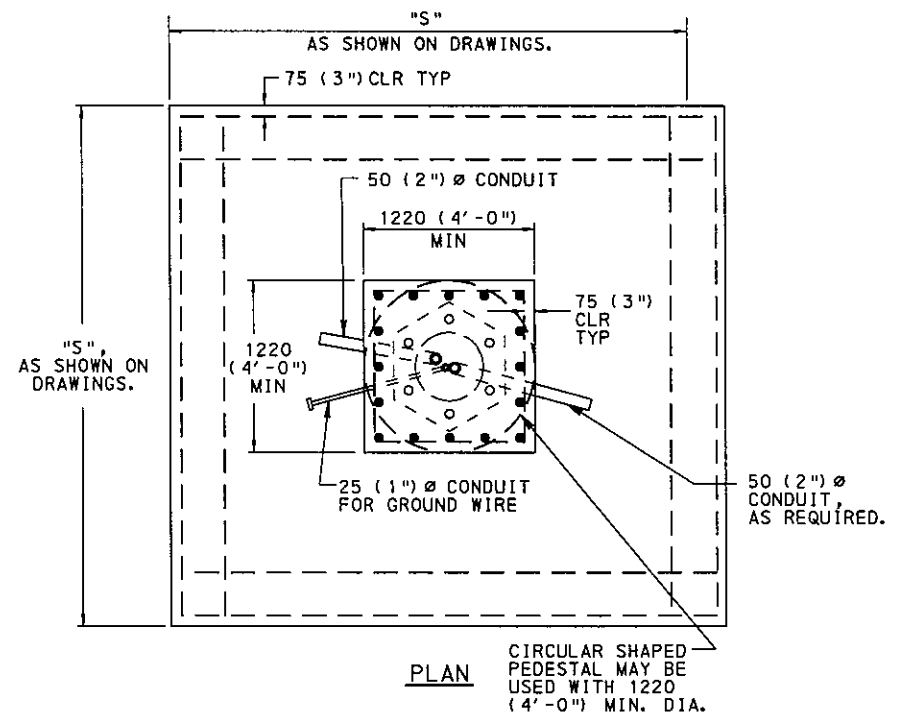
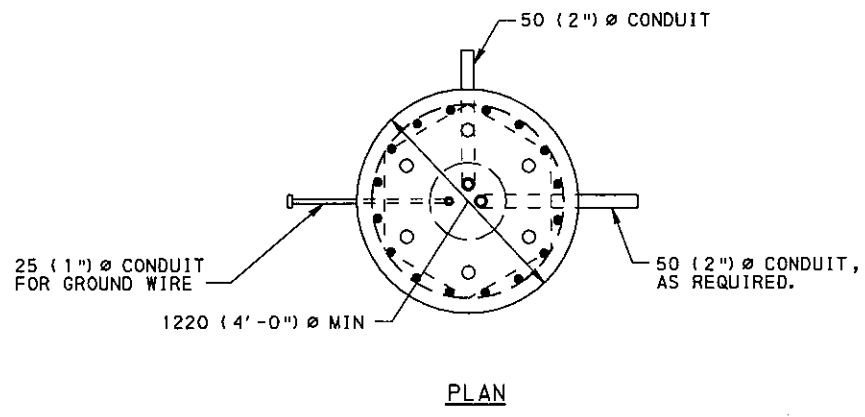
NOTE: EITHER ALL METRIC OR ALL ENGLISH VALUES MUST BE USED ON PLANS. METRIC AND ENGLISH VALUES SHOWN MAY NOT BE MIXED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

HIGHWAY LIGHTING FOUNDATIONS
CONVENTIONAL LIGHTING POLE

TYPE FC FOUNDATION[†]
 SEE NOTE 12.

TYPE FC MODIFIED FOUNDATION



- NOTES**
1. PROVIDE MATERIALS AND CONSTRUCT AS SPECIFIED IN PUBLICATION 408/2000, SECTIONS 910 AND 1101.
 2. PROVIDE A 750 (30") LENGTH OF 21.15 mm² (#4) GROUND WIRE COILED ABOVE FOUNDATION. EXTEND WIRE THROUGH THE 25 (1") Ø CONDUIT IN THE CENTER OF THE FOUNDATION.
 3. THE SIZE OF PEDESTAL OR DRILLED CAISSON SHOWN ACCOMMODATES THE PREASSEMBLED ANCHOR BOLT ASSEMBLY SUPPLIED BY THE MANUFACTURER FOR BOLT CIRCLE DIAMETERS 865 (34") OR LESS. FOR BOLT CIRCLE DIAMETERS GREATER THAN 865 (34"), MODIFY PEDESTAL OR DRILLED CAISSONS ACCORDINGLY.
 4. FOR REINFORCEMENT BAR FABRICATION DETAILS, SEE BRIDGE CONSTRUCTION STANDARD DRAWING, BC-736M. DEVELOPMENT AND LAP SPLICE LENGTHS ARE AS PER AASHTO ONLY.
 5. SEAL WITH GALVANIZED SCREEN, 6 (1/4") TO 10 (3/8") OPENING, TO PREVENT ENTRY OF RODENTS. SCREEN IS TO BE REMOVABLE AND ATTACHED TO BASE PLATE WITH SS HARDWARE. SCREEN IS TO BE OF SUFFICIENT STIFFNESS TO PREVENT ENTRY BETWEEN SCREEN AND FOUNDATION WHILE PERMITTING DRAINAGE.
 6. VERIFY THE GROUND ELEVATION AT THE FOUNDATION LOCATION FOR ALL HIGH MAST POLE FOUNDATIONS. NOTIFY THE DEPARTMENT OF ANY DISCREPANCY OF MORE THAN 1.5 m (5'-0") BEFORE PROCEEDING WITH CONSTRUCTION. THE POLE LENGTH MAY BE AFFECTED.

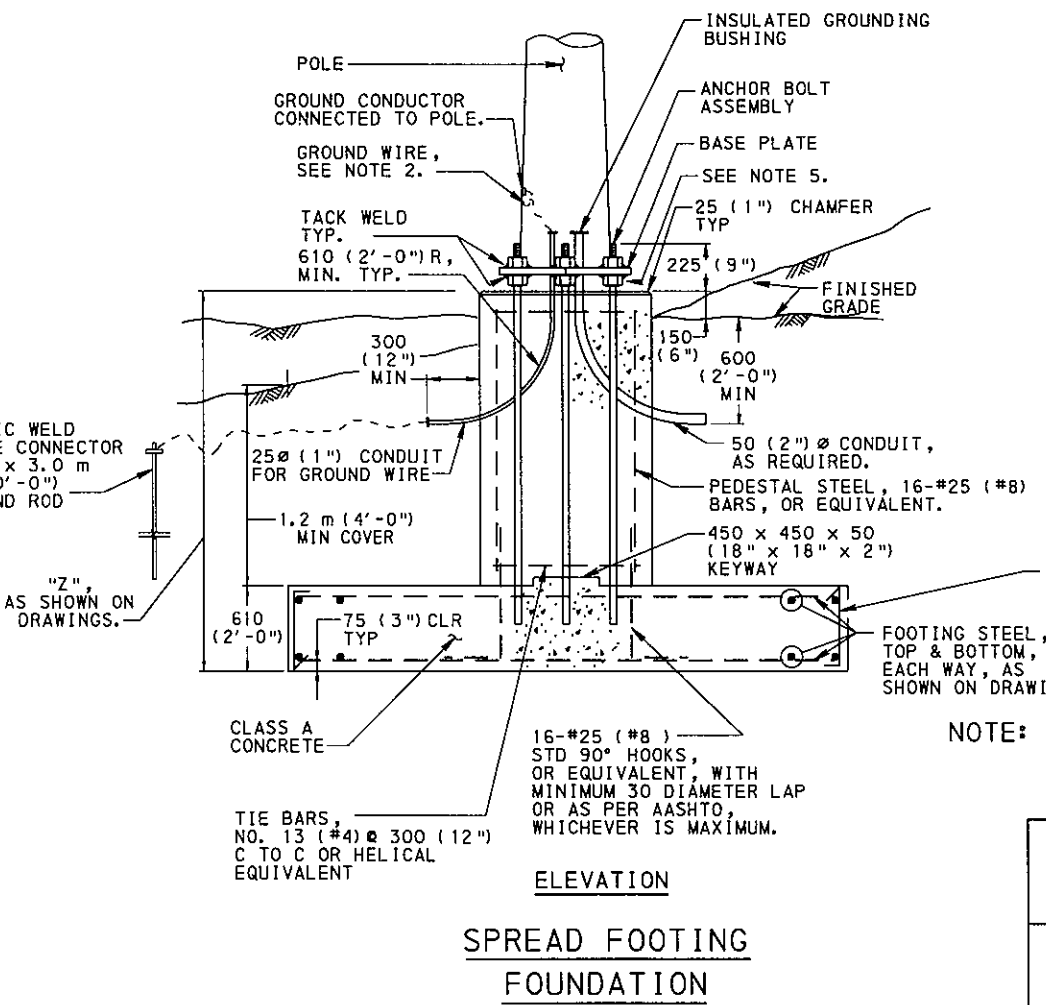
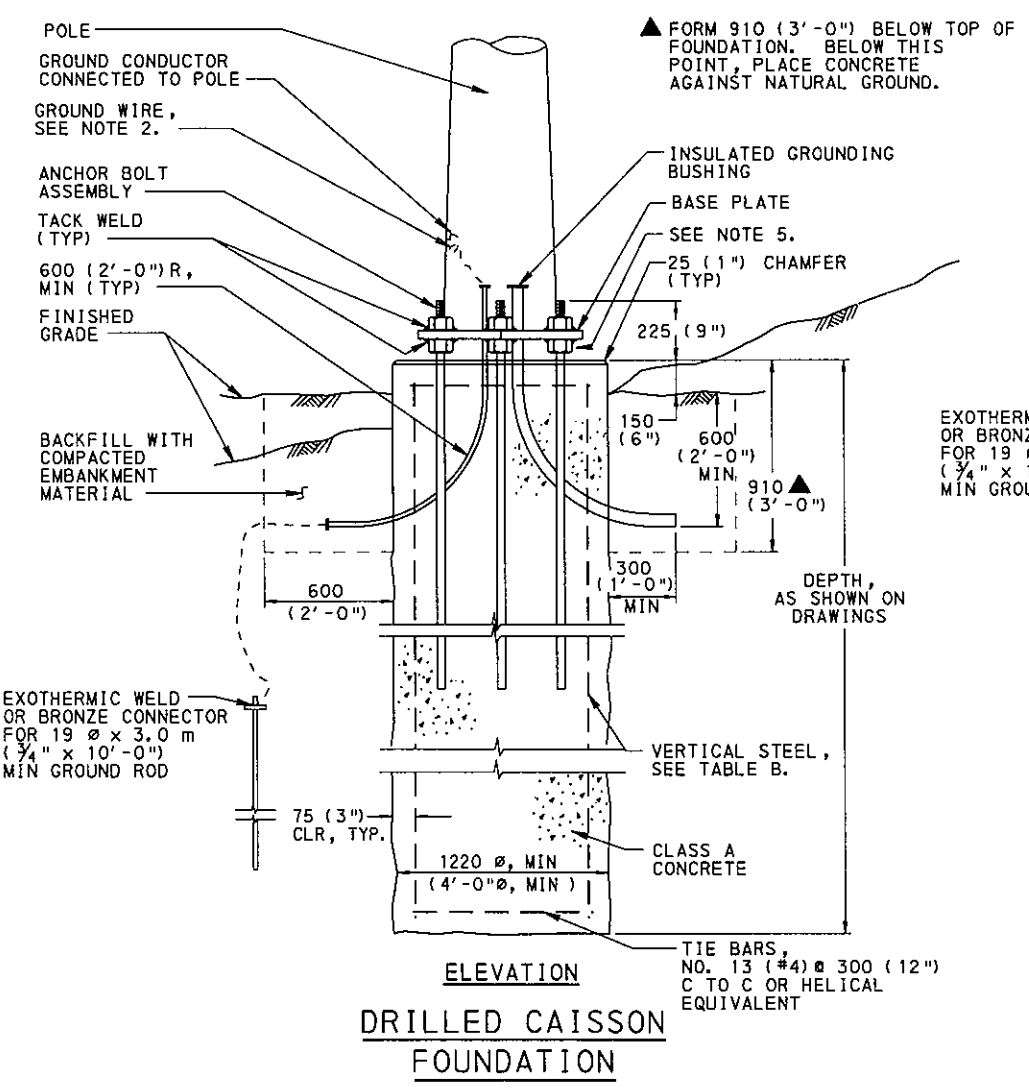


TABLE B

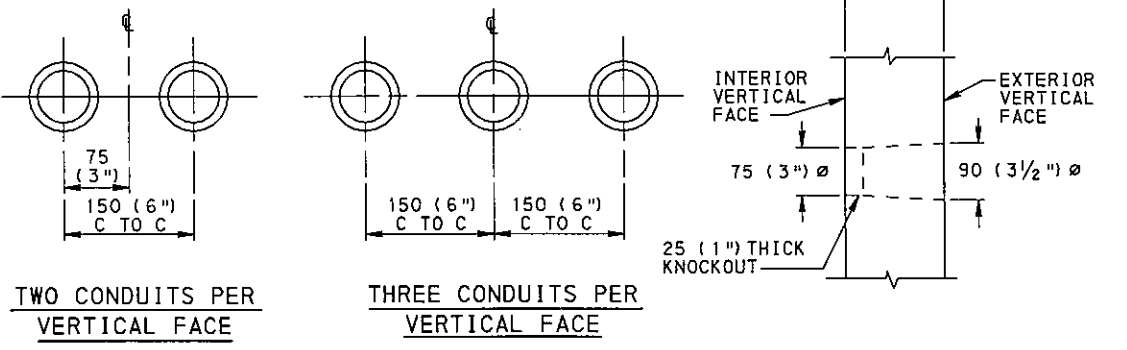
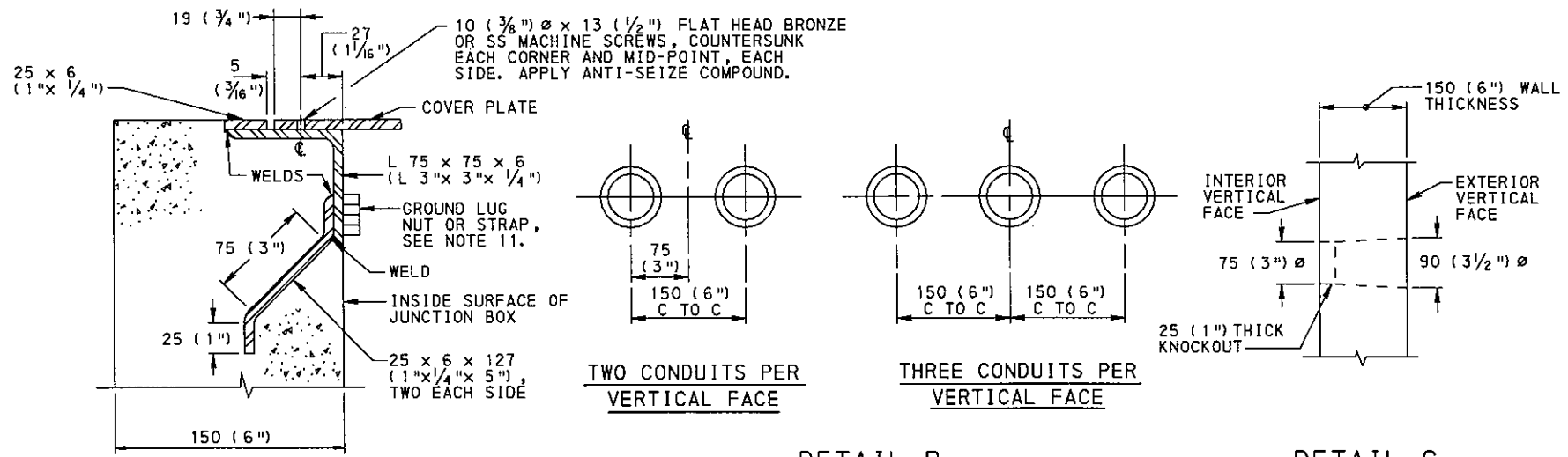
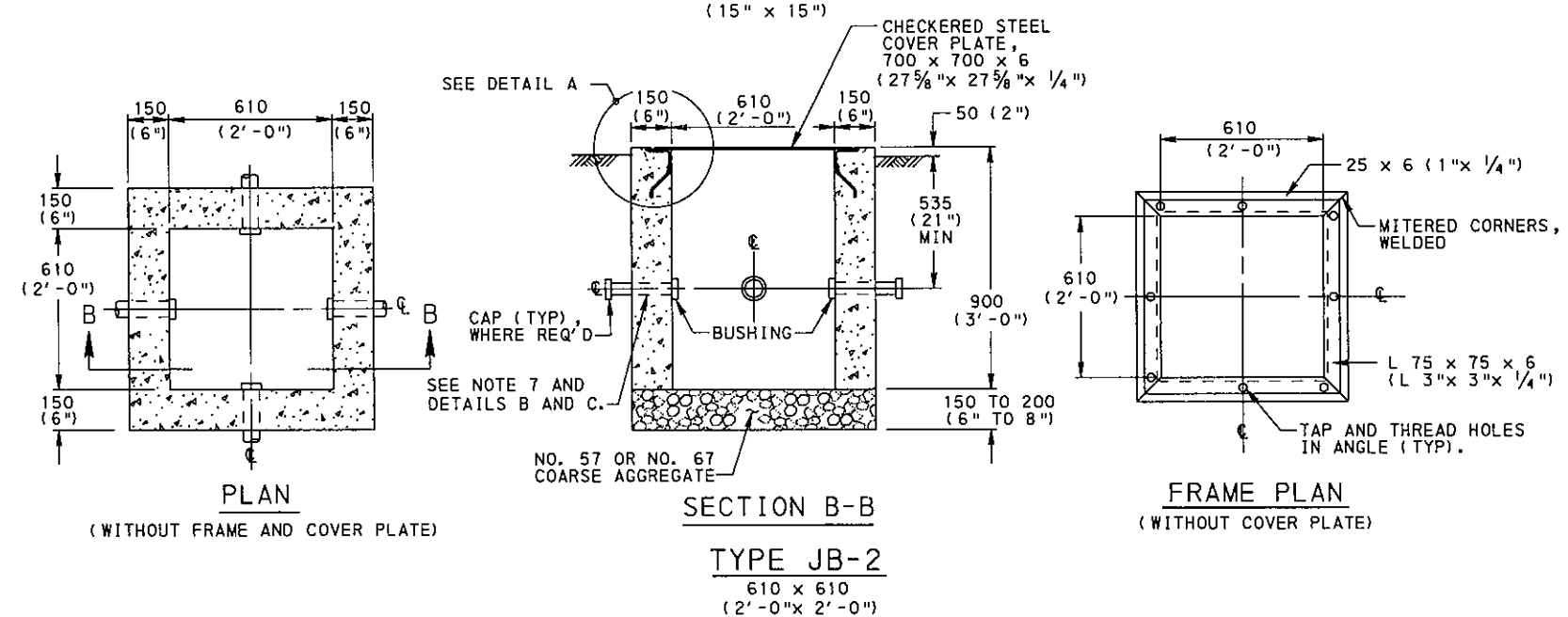
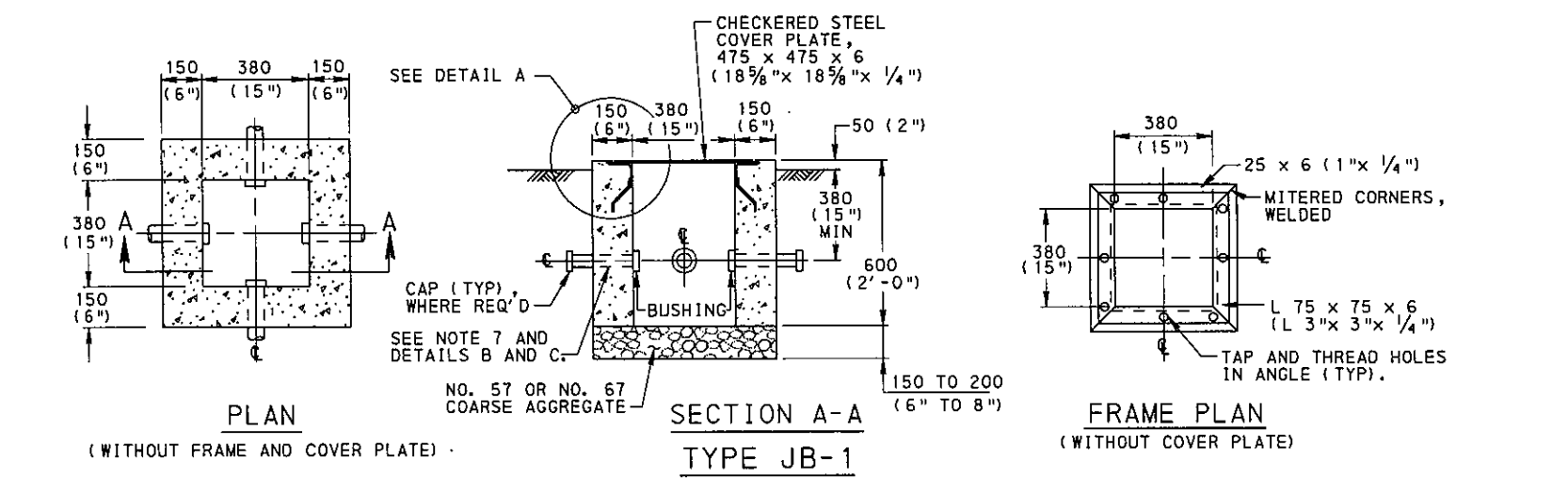
POLE HEIGHTS	VERTICAL STEEL
18.3 m (60'-0")	16-#29 (#9)
21.3 m (70'-0")	16-#29 (#9)
24.4 m (80'-0")	16-#29 (#9)
27.4 m (90'-0")	16-#29 (#9)
30.5 m (100'-0")	16-#29 (#9)
33.5 m (110'-0")	16-#29 (#9)
36.6 m (120'-0")	16-#36 (#11)

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
FOUNDATIONS
HIGH MAST LIGHTING POLE

UN-
-81M.
CT10'



- NOTES**
1. PROVIDE MATERIALS AND CONSTRUCT AS SPECIFIED IN PUBLICATION 408/2000, SECTION 910, AND 1101.
 2. USE JB-1 AND JB-2 JUNCTION BOXES IN LOCATIONS SUBJECT TO LOADS NO HEAVIER THAN PEDESTRIAN TRAFFIC. USE JB-11 AND JB-12 JUNCTION BOXES IN OTHER LOCATIONS AS SHOWN ON RC-82M.
 3. PROVIDE PRECAST CONCRETE JUNCTION BOXES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT REPRODUCIBLE SHOP DRAWING TO THE BUREAU OF CONSTRUCTION AND MATERIALS, MATERIALS AND TESTING DIVISION FOR REVIEW.
 4. PROTECTIVE COATING - STEEL FRAME AND STEEL COVER PLATE. HOT DIP GALVANIZE IN ACCORDANCE WITH PUBLICATION 408/2000, SECTION 1105.02(s).
 5. FOR THE LOCATION, SIZE AND NUMBER OF CONDUITS REQUIRED FOR EACH JUNCTION BOX, SEE THE LIGHTING PLANS.
 6. 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.
 7. 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 (6") C TO C AND SYMMETRICAL ABOUT THE CENTERLINE OF THE BOX, AS INDICATED IN DETAIL B, WITH FULL WALL THICKNESS BETWEEN OPENINGS. PROVIDE KNOCKOUTS FOR PRECAST UNITS AS INDICATED IN DETAIL C AND LOCATE AS INDICATED IN DETAIL B. GROUT THE CONDUIT OR SLEEVE IN ACCORDANCE WITH PUBLICATION 408/2000, SECTION 910.3(p).
 8. PROVIDE POSITIVE DRAINAGE 38 - 50 (1 1/2" - 2") NONMETALLIC CONDUIT FOR JUNCTION BOXES WHEN FEASIBLE. PROVIDE RODENT PROOF DRAIN. SEE NOTE 5, RC-82M.
 9. PROVIDE STRUCTURAL STEEL CONFORMING TO ASTM - A36M/A36M.
 10. PROVIDE AS A MINIMUM :
CLASS A CONCRETE FOR CAST-IN-PLACE BOXES AND
CLASS AA CONCRETE FOR PRECAST BOXES.
 11. GROUND EXPOSED METAL PARTS OF JUNCTION BOXES. DO NOT CONNECT GROUND WIRE DIRECTLY TO LID.
 13. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

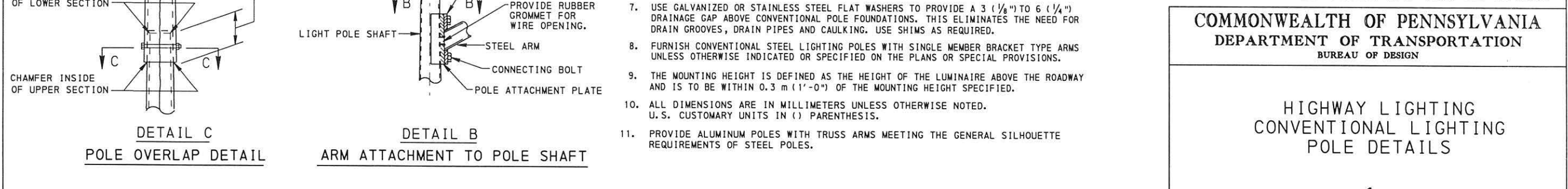
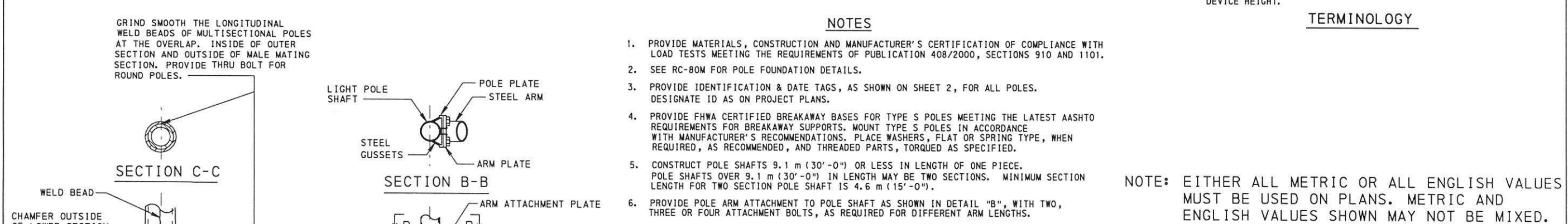
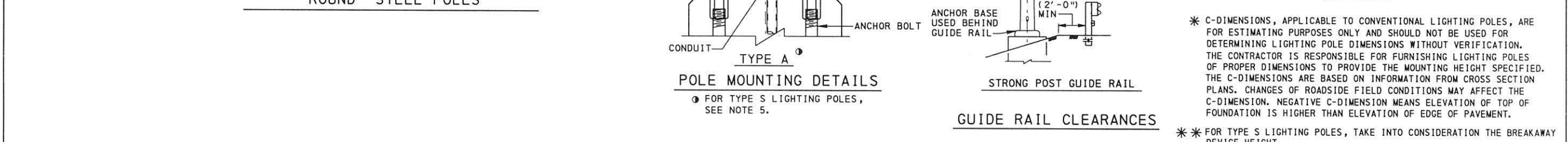
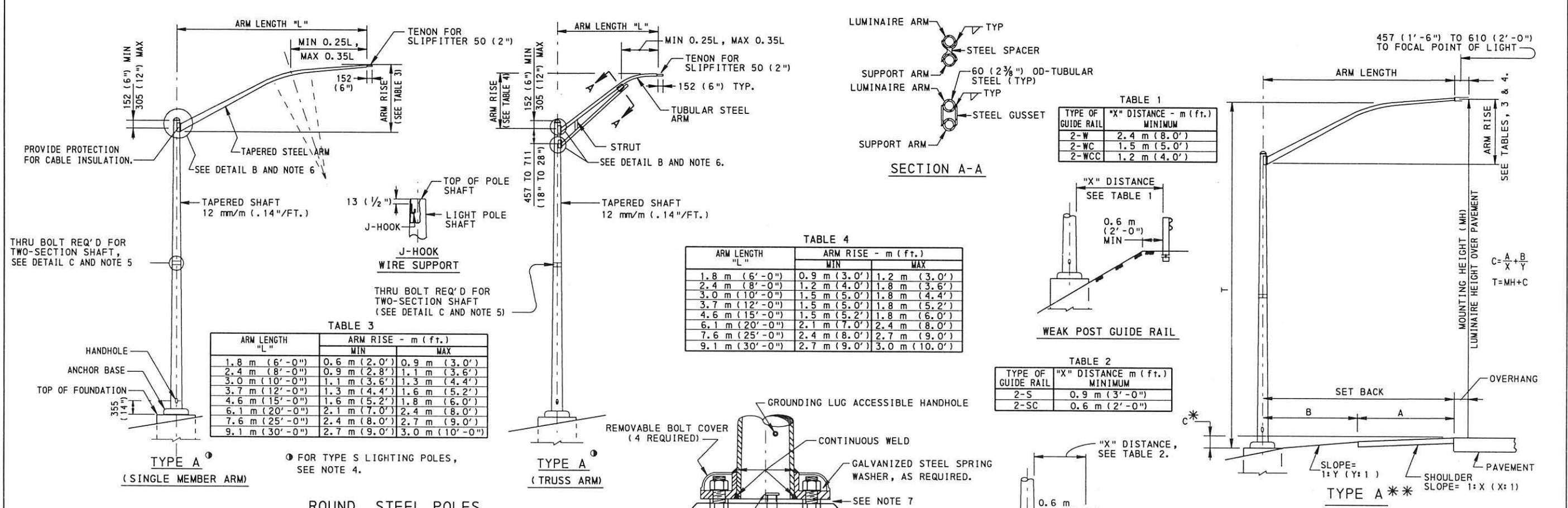
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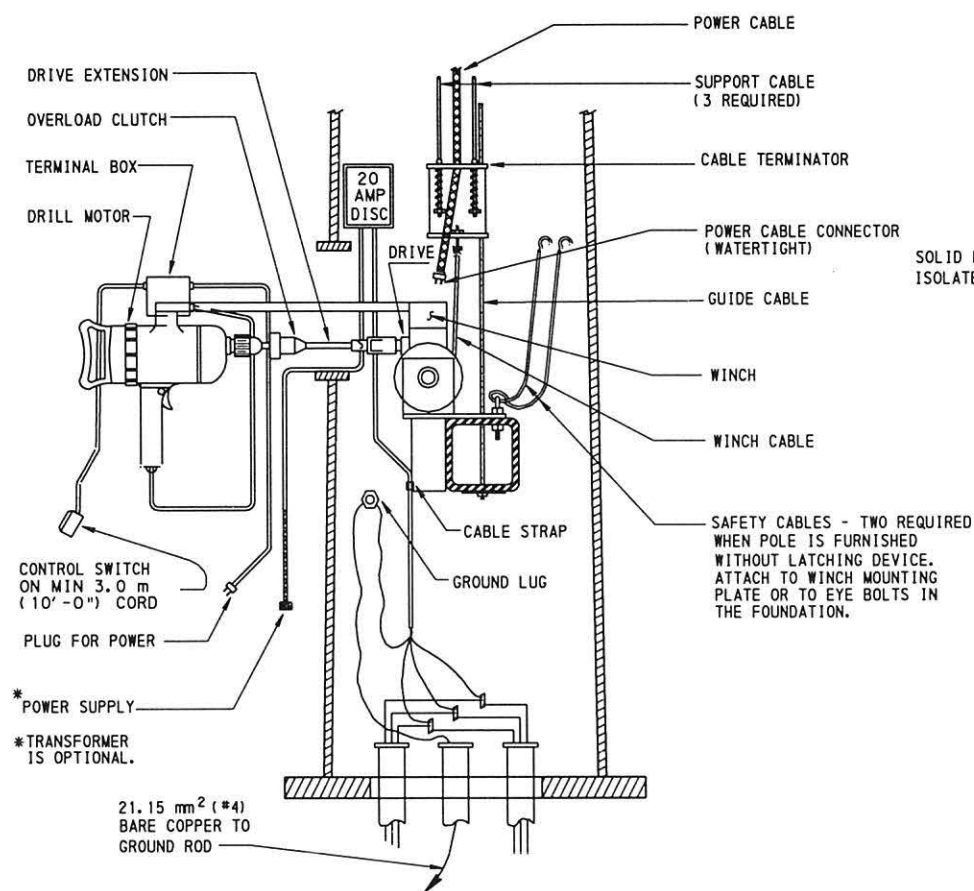
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

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

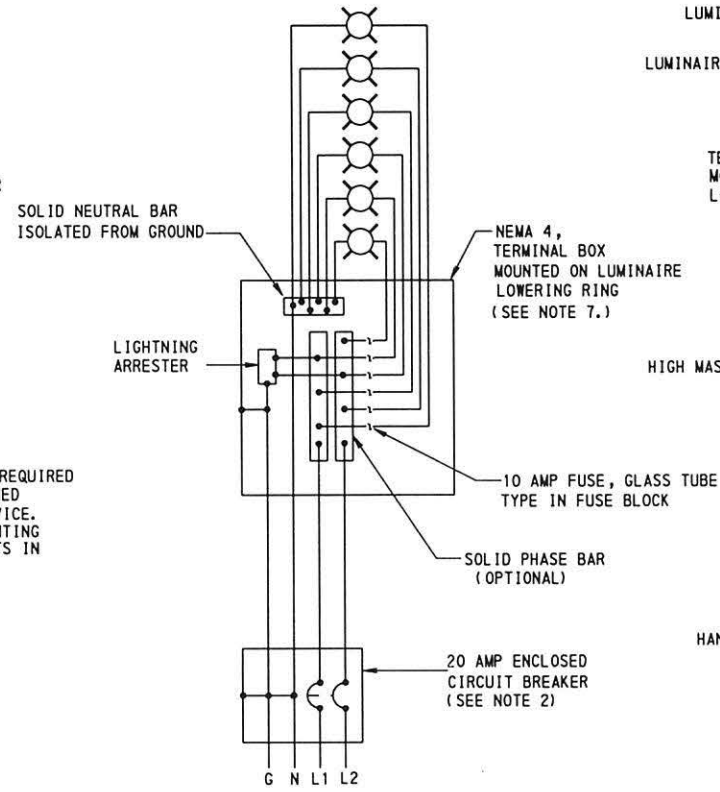
RECOMMENDED APR. 28, 2000 <i>Dean A. Schuchman</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED APR. 28, 2000 <i>Larry R. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 1 RC-81M
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S-Ht
0'

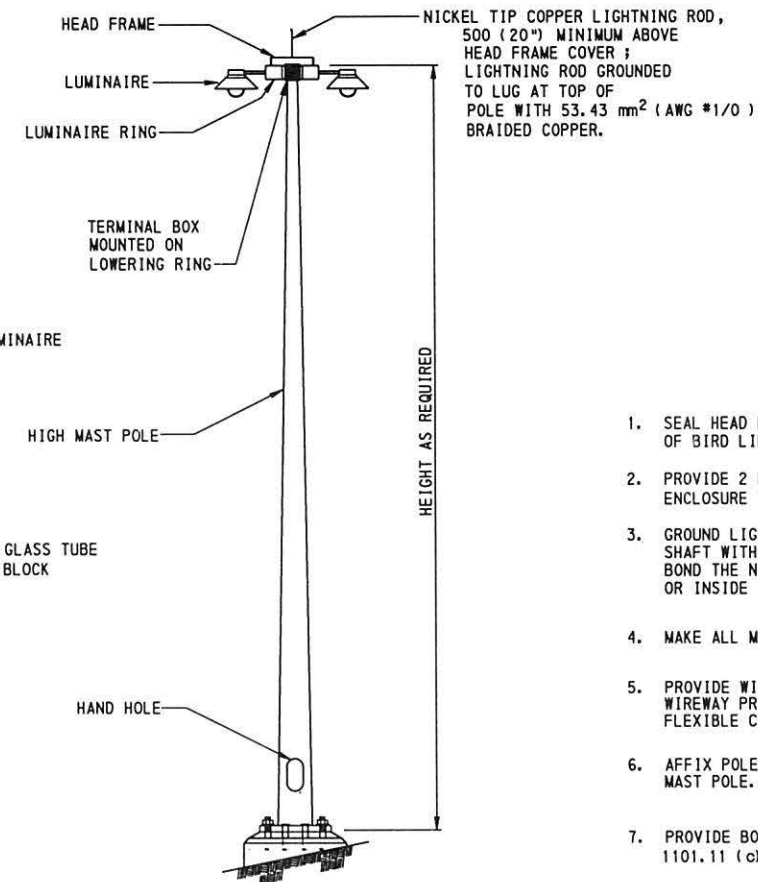




TYPICAL LOWER SECTION MECHANISM



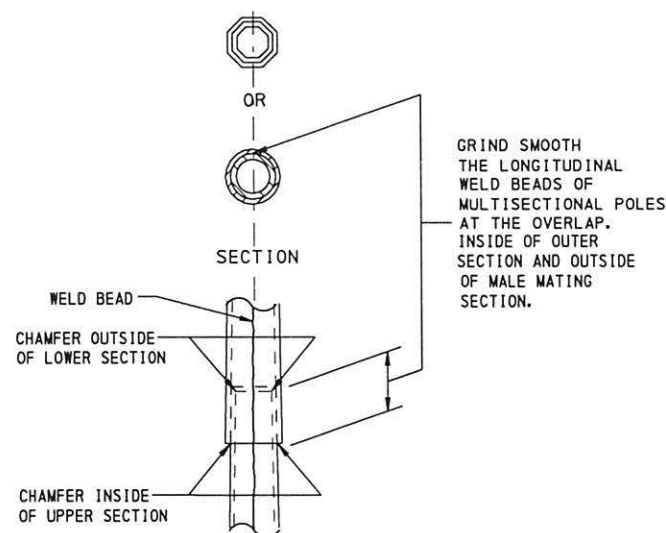
TYPICAL CIRCUIT SCHEMATIC



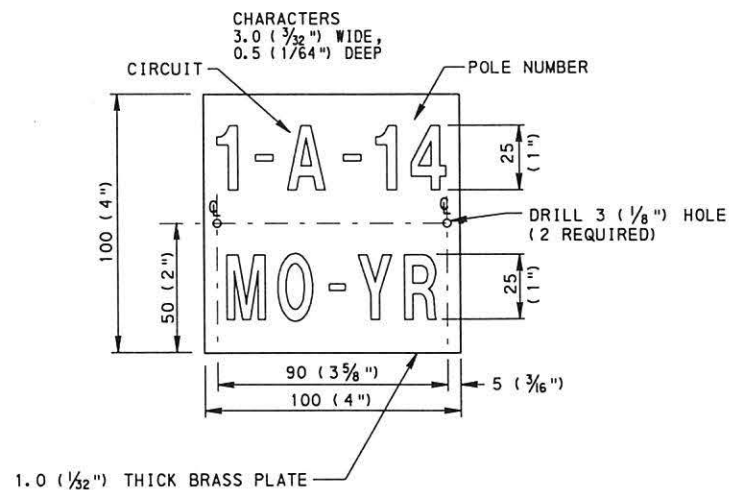
TYPICAL HIGH MAST POLE

NOTES

1. SEAL HEAD FRAME AND LUMINAIRE ASSEMBLIES TO PREVENT INTRUSION OF BIRD LIFE.
2. PROVIDE 2 POLE, CIRCUIT BREAKER DISCONNECT, IN NEMA 1 ENCLOSURE WITH EXTERNAL OPERATION.
3. GROUND LIGHTNING ROD GROUNDING CONDUCTOR DIRECTLY ON THE POLE SHAFT WITH LUGS PROVIDED BY THE MANUFACTURER OF LIGHTNING ROD. BOND THE NEUTRAL WIRE TO THE GROUND EITHER AT THE GROUND LUG OR INSIDE THE ENCLOSURE AT THE POLE BASE.
4. MAKE ALL MISCELLANEOUS HARDWARE STAINLESS STEEL.
5. PROVIDE WIRING, FROM TERMINAL BOX TO LUMINAIRE, IN WIREWAY PROVIDED IN LUMINAIRE RING OR IN SEALTITE FLEXIBLE CONDUIT.
6. AFFIX POLE IDENTIFICATION & DATE TAG TO EACH HIGH MAST POLE.
7. PROVIDE BOXES AS PER PUBLICATION 408/2000, SECTION 1101.11 (c). PADLOCKS ARE NOT REQUIRED FOR THE BOXES.



POLE OVERLAP DETAIL

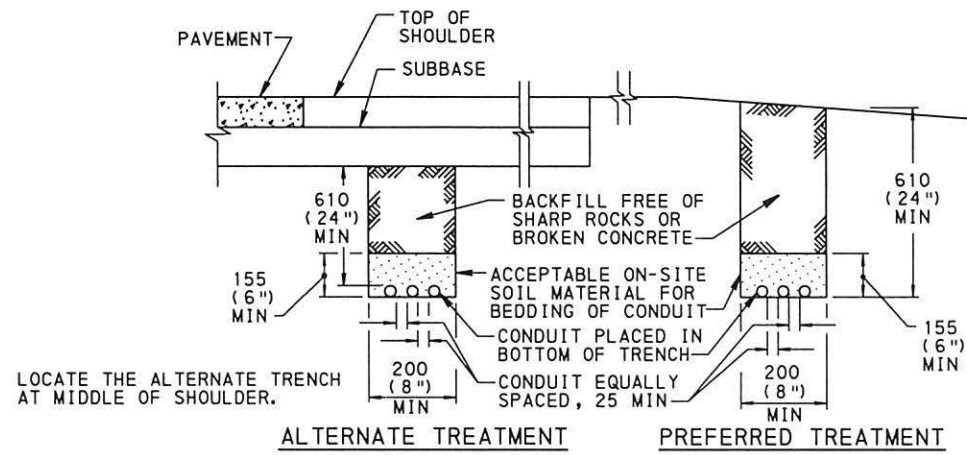


POLE IDENTIFICATION AND DATE TAG DETAIL
FOR CONVENTIONAL AND HIGH MAST POLES

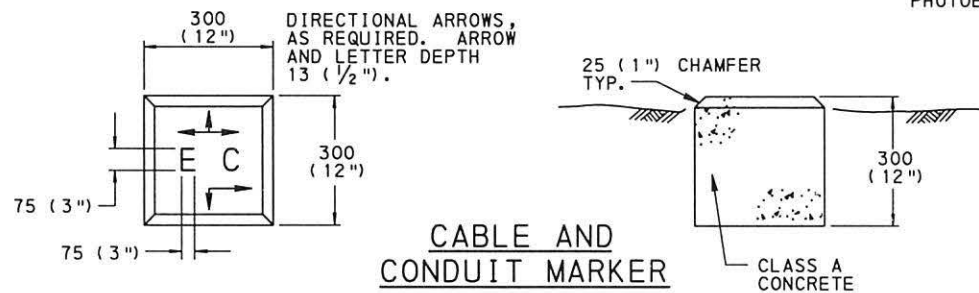
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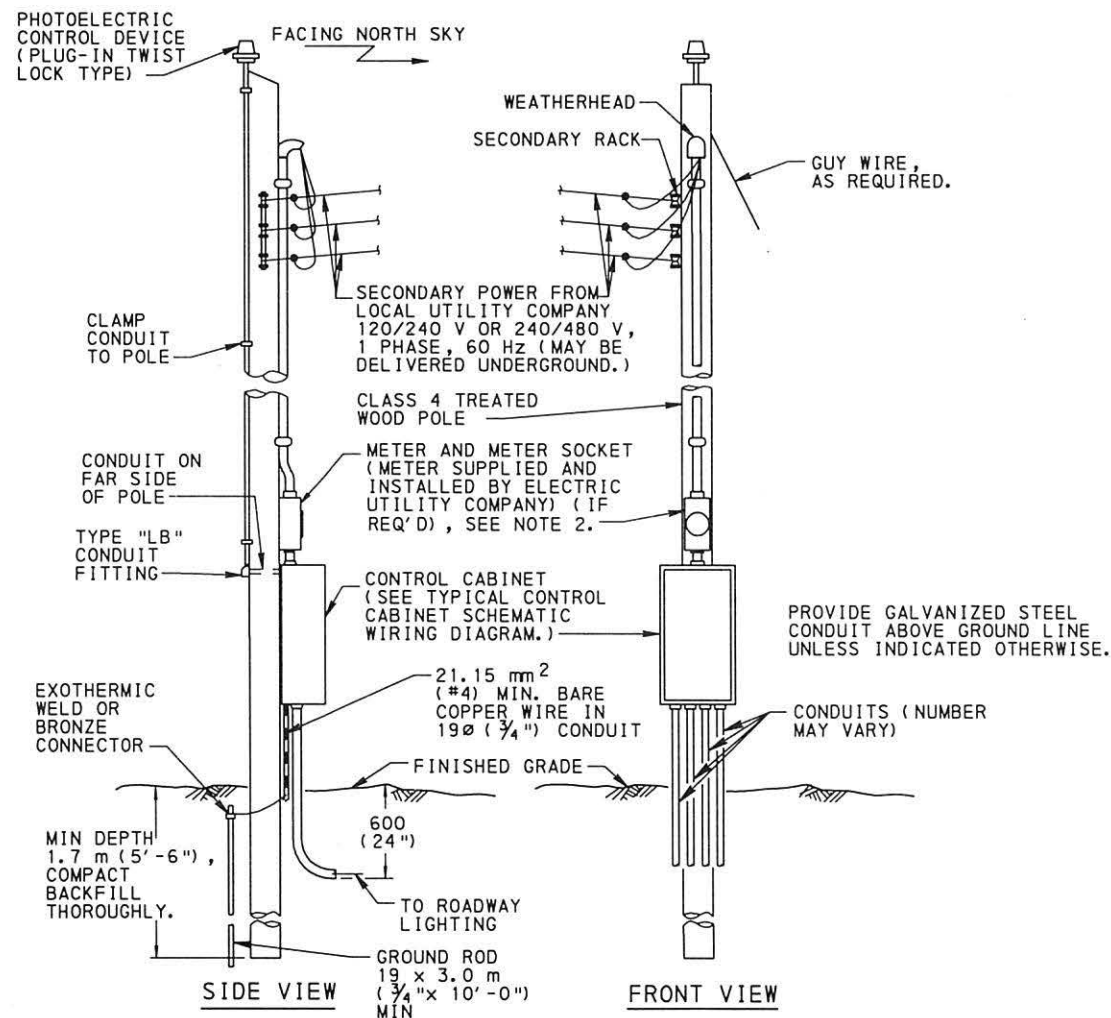
HIGHWAY LIGHTING
HIGH MAST LIGHTING
POLE DETAILS



DIRECT-BURIED CABLE AND CONDUIT



CABLE AND CONDUIT MARKER



TYPICAL TERMINAL POLE EQUIPMENT ARRANGEMENT FOR POWER SUPPLY

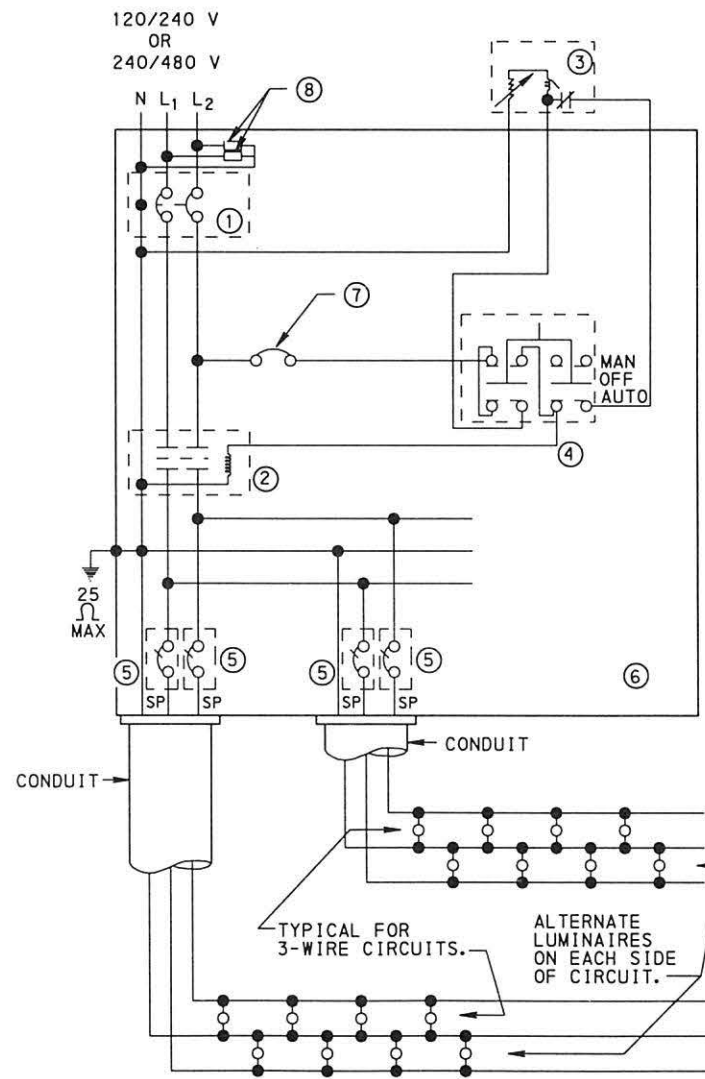
ITEMS

- N - NEUTRAL
- L₁ - LINE 1
- L₂ - LINE 2
- M - MANUAL
- A - AUTOMATIC
- ① - MAIN CIRCUIT BREAKER
- ② - CONTROL CONTACTOR
- ③ - PHOTOELECTRIC CELL (PLUG-IN TYPE)
- ④ - SELECTOR SWITCH
- ⑤ - DISTRIBUTION BREAKERS (10 000 AIC)
- ⑥ - CONTROL CABINET
- ⑦ - 15 A, SP BREAKER
- ⑧ - LIGHTNING ARRESTER
- SP - SINGLE POLE
- DP - DOUBLE POLE

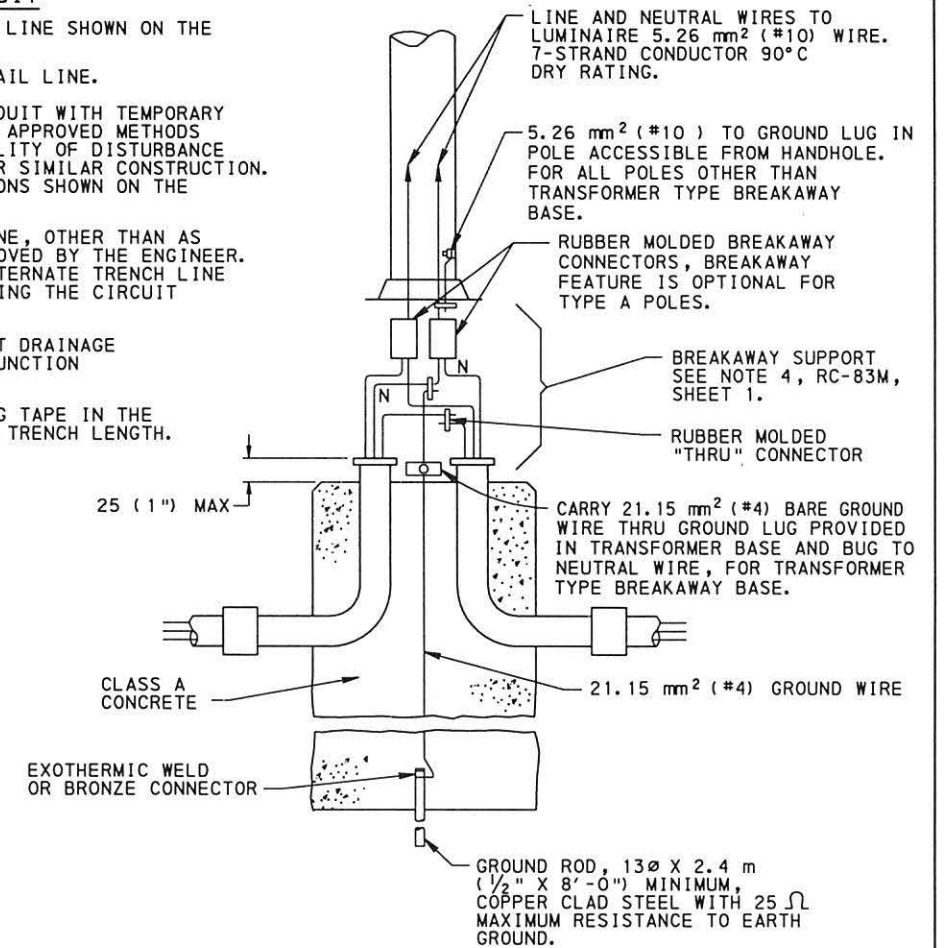
ITEMS ②, ③ AND ④ ARE NOT REQUIRED IF EACH LUMINAIRE HAS A PHOTOELECTRIC CONTROL ELEMENT.

NOTES FOR DIRECT-BURIED CABLE AND CONDUIT

- TRENCH ALONG THE GENERAL LINE SHOWN ON THE PLANS.
- DO NOT TRENCH IN GUIDE RAIL LINE.
- LOCATE DIRECT-BURIAL CONDUIT WITH TEMPORARY PLASTIC MARKERS OR OTHER APPROVED METHODS WHERE THERE IS A POSSIBILITY OF DISTURBANCE BY GUIDE RAIL ERECTION OR SIMILAR CONSTRUCTION. VERIFY GUIDE RAIL LOCATIONS SHOWN ON THE LIGHTING PLANS.
- HAVE ALTERNATE TRENCH LINE, OTHER THAN AS SHOWN ON THE PLANS, APPROVED BY THE ENGINEER. IN NO CASE APPROVE AN ALTERNATE TRENCH LINE WHICH RESULTS IN INCREASING THE CIRCUIT LENGTH MORE THAN 5%.
- INSTALL CONDUIT TO PERMIT DRAINAGE TOWARDS NEAREST EARTH JUNCTION BOX AS APPLICABLE.
- PROVIDE PERMANENT MARKING TAPE IN THE LAST LIFT FOR THE ENTIRE TRENCH LENGTH.



TYPICAL CONTROL CABINET SCHEMATIC WIRING DIAGRAM



WIRING DETAIL

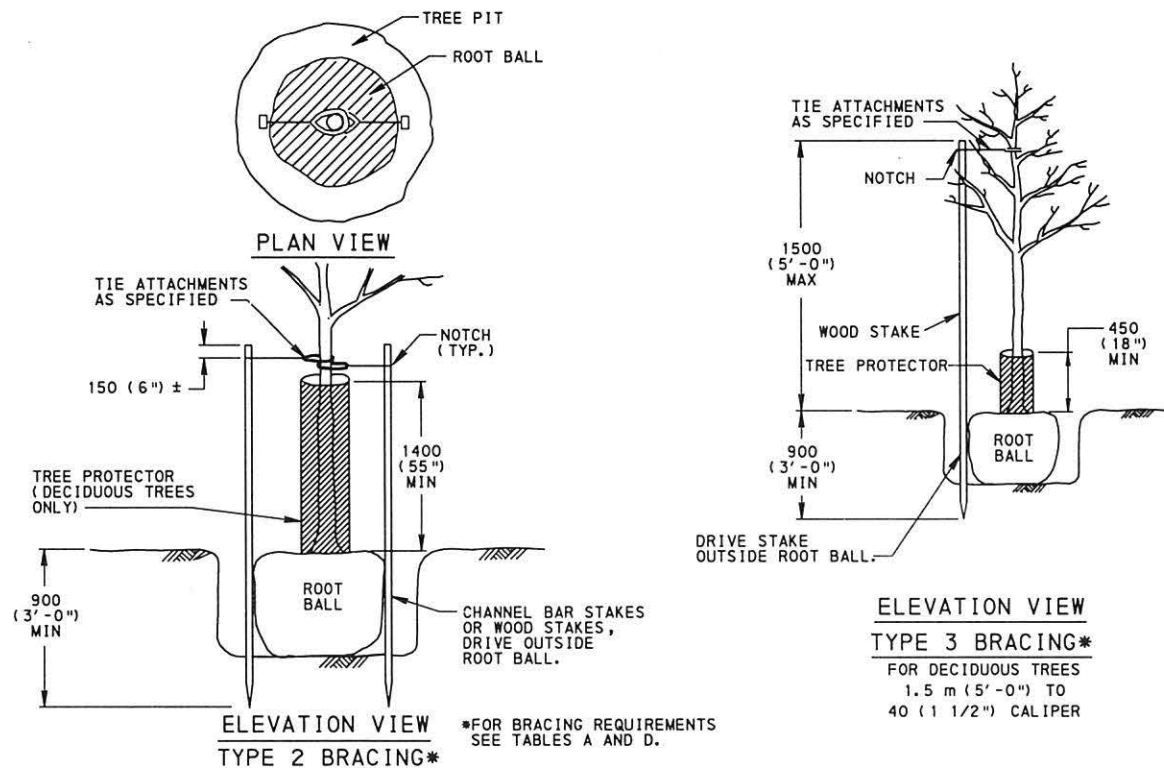
NOTES

1. PROVIDE MATERIALS AND CONSTRUCT AS SPECIFIED IN PUBLICATION 408/2000, SECTIONS 910 AND 1101.
2. PROVIDE METERED ELECTRIC SERVICE EXCEPT WHERE DEPARTMENT APPROVED SPECIAL UNMETERED ENERGY ONLY RATE IS AVAILABLE.
3. MAKE SPLICES WITH PRE-MOLDED, DISCONNECTABLE CONNECTOR KITS. PROVIDE SPLICES WITH FUSES FOR TAPS TO LUMINAIRES FOR CONVENTIONAL LIGHTING. CONNECT THE GROUND TO THE NEUTRAL WITH A SPLIT BOLT CONNECTOR AND COAT WITH CORROSION PROHIBITOR.
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.

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DEPARTMENT OF TRANSPORTATION
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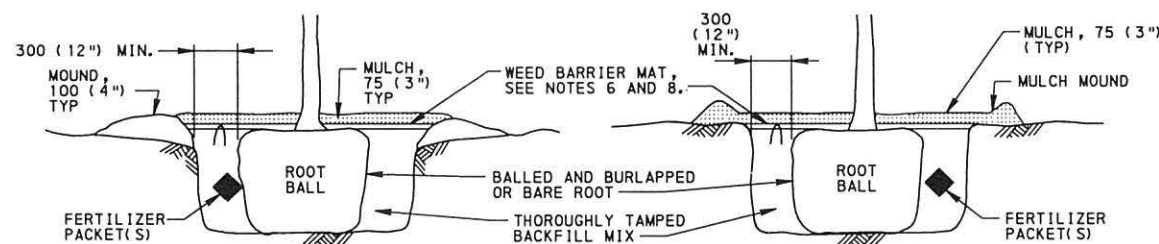
**HIGHWAY LIGHTING
LIGHTING AND ELECTRICAL DETAILS**



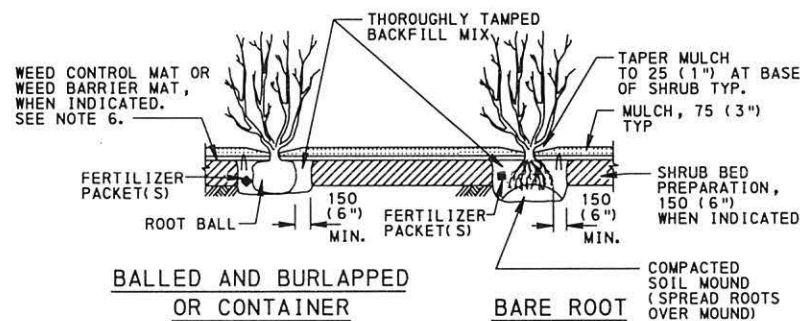
FOR DECIDUOUS TREES OVER 40 (1 1/2") CALIPER AND ALL EVERGREEN TREES 1.2m (4'-0") TO 2.4m (8'-0") HT.

*FOR BRACING REQUIREMENTS SEE TABLES A AND D.

BRACING DETAILS

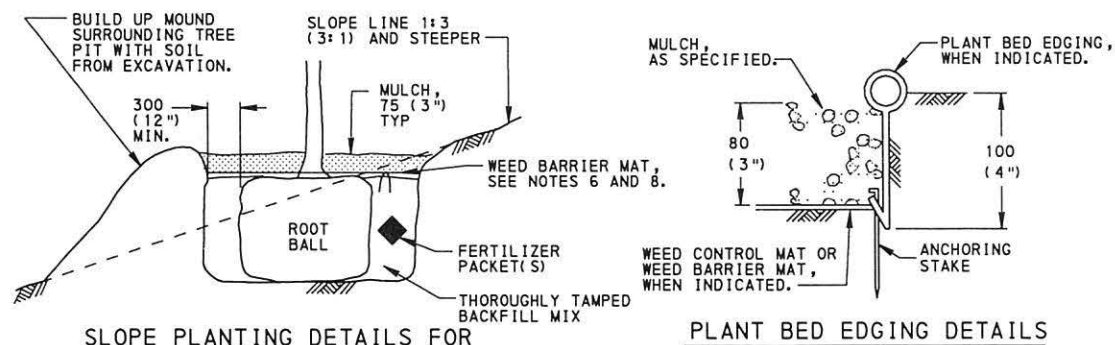


TREE PLANTING DETAILS



SHRUB PLANTING AND SHRUB BED PREPARATION DETAILS

- NOTES**
- USE MOUNDS CONSISTING OF SOIL MATERIAL FROM THE PIT EXCAVATION FREE OF ALL STONES AND FOREIGN MATERIAL 50 (2") OR LARGER IN ANY DIMENSION. USE FOR ALL TREE PLANTING EXCEPT FOR REST AREAS AND OTHER HIGH-MAINTENANCE AREAS, AS DIRECTED.
 - SET TOP OF ROOT BALL 25 (1") TO 50 (2") HIGHER THAN SURROUNDING GROUND WHERE MOUNDS ARE USED.
 - ATTACH TIES TO THE TREE AT A POINT NOT LESS THAN 50% OF THE HEIGHT OF THE TREE.
 - PROVIDE TREE PROTECTOR DIAMETERS AS FOLLOWS:
150 (6") DIAMETER OR 150 (6") SQUARE FOR TREES 100 (4") CALIPER AND UNDER.
300 (12") DIAMETER OR 300 (12") SQUARE FOR TREES OVER 100 (4") CALIPER.
USE PLASTIC PROTECTOR DEVICES OR HARDWARE CLOTH PROTECTORS IN UNMOWED AREAS.
 - FOR NORMALLY WET SOIL CONDITIONS PROVIDE BACKFILL MIX COMPOSED OF TOPSOIL ONLY, AS DETERMINED BY THE ENGINEER.
 - ANCHOR WEED BARRIER MAT FOR TREE PITS WITH A MINIMUM OF THREE (3) U-SHAPED STAPLES EQUALLY SPACED AROUND THE TREE. ANCHOR WEED BARRIER MAT FOR SHRUB BED AREAS WITH U-SHAPED STAPLES SPACED EVERY 900 (36") AT THE EDGES OF THE MAT AND ALONG ALL OVERLAPS OF THE MAT MATERIAL, OR AS DIRECTED.
 - 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.
 - DO NOT PLACE WEED BARRIER MAT IN THE PIT FOR TREES TO BE PLANTED IN UNMOWED AREAS. USE CRUSHED NO. 67 GRADATION AGGREGATE FOR MULCH.
 - PROVIDE MATERIALS AND CONSTRUCT AS SPECIFIED IN PUBLICATION 408/2000, SECTION 808 AND 805.
 - ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN () PARENTHESIS.



SLOPE PLANTING DETAILS FOR DECIDUOUS AND EVERGREEN TREES

USE TYPE 2 OR TYPE 3 BRACING, AS REQUIRED.

PLANT BED EDGING DETAILS

PLANTING 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

BRACING AND PLANTING DETAILS

RECOMMENDED APR. 28, 2000
DIRECTOR, BUREAU OF DESIGN
RECOMMENDED APR. 28, 2000
CHIEF ENGINEER
SHT 1 OF 2
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 WOOD	0.57 kg (1¼ LB) POST H2-1 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 WOOD	1.36 kg (3 LB) POST H2-2 50 (2") X 50 (2") FULL DIM
2	60 TO 90 CAL (2½" TO 3½" CAL)	-----	3.4 m (11'-0")	CHANNEL BAR WOOD	1.36 kg (3 LB) POST H2-2 75 (3") X 75 (3") FULL DIM
2	OVER 90 CAL (OVER 3½" CAL)	-----	3.8 m (12'-6")	CHANNEL BAR WOOD	1.36 kg (3 LB) POST H2-3 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

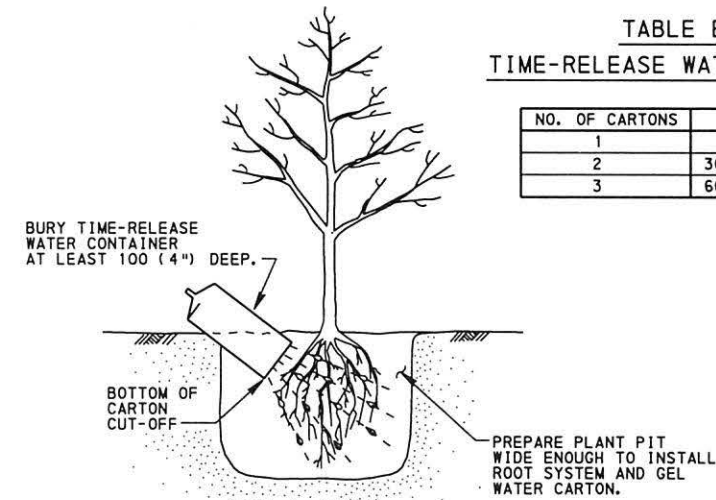
ALL EVERGREEN/DECIDUOUS SEEDLINGS	1 TABLET
ALL GROUND COVER MATERIAL	1 TABLET

TABLE D
TIE BRACING SCHEDULE

BRACING - RUBBER TIE SCHEDULE	
TREE SIZE	TIE 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 TIE SCHEDULE	
ALL TREES	MIN. 20 (¾") WIDE X APPROPRIATE LENGTH

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")



PLANTING METHOD B
SEEDLING MATERIAL &
SEEDLING TRANSPLANTS

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BRACING AND PLANTING
DETAILS

RECOMMENDED APR. 29, 2000
Director, Bureau of Design

RECOMMENDED APR. 28, 2000
Chief Engineer

SHT 2 OF 2
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