



OS-299 (8-72)

**TRANSMITTAL
LETTER**

Change #6
Publication 72M
September, 1995 Edition

DATE

August 16, 1999

SUBJECT:

Revisions to Standards for Roadway Construction RC's 12M, 20M, 21M, 25M, 28M, 30M, 34M, 52M, 53M, 54M and 58M.

INFORMATION AND SPECIAL INSTRUCTIONS:

Incorporate the attached revisions into the September 1995 Metric Edition of the Standards for Roadway Construction. These revisions should be adopted as soon as practical on all new and existing designs without affecting any letting schedules. PS&E submissions to Central Office after October 20, 1999 should include these revisions.

Please note that some of the revisions in Change #6 are relative to safety features. The Department's criteria for high-speed (100 km/h) high-volume (6,000 veh./day) safety features is being discussed with the FHWA and it may change in the near future. You will be advised accordingly by the Bureau of Design.

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

<u>RC-Sheet #</u>	<u>Change Description</u>
RC-12M (1 of 1)	<ul style="list-style-type: none"> Note 2 was revised. Section 703.1 was changed to Section 703.2 to agree with Publication 408M.
RC-20M (General)	<ul style="list-style-type: none"> Transverse joints were changed to perpendicular. Sheet 4 was deleted for the 6:1 skewed joints.
(1 of 3)	<ul style="list-style-type: none"> Dowel bars in Note 4 were changed (soft converted) to be the same whether English or Metric. Note 3 was revised.
(3 of 3)	<ul style="list-style-type: none"> Deleted the dimensions on the expansion and contraction joint details and made reference to Note 4 on Sheet 1.
RC-21M (1 of 1)	<ul style="list-style-type: none"> Changed transverse joints from a 1:6 skew to perpendicular.
RC-25M (3 of 5)	<ul style="list-style-type: none"> Changed transverse shoulder joints from a 1:6 skew to perpendicular and added Note 4.
(4 of 5)	<ul style="list-style-type: none"> Changed transverse shoulder joints from a 1:6 skew to perpendicular.
(5 of 5)	<ul style="list-style-type: none"> Same changes as in Sheet 4.

RC-28M (1 of 1)	<ul style="list-style-type: none"> Changed skewed joints perpendicular to the centerline.
RC-30M (3 of 4)	<ul style="list-style-type: none"> Changed the maximum height, in the pipe excavation detail, to agree with revised OSHA safety regulations (29 CFR, Sec. 1926.652).
RC-34M (4 of 10)	<ul style="list-style-type: none"> Added details for a two-piece cast iron inlet grate approved for HS25 loading.
(7 of 10)	<ul style="list-style-type: none"> Revised Note 5 relative to pipe location on precast inlet boxes.
(8 of 10)	<ul style="list-style-type: none"> Added Note 13 relative to blockouts.
(9 of 10)	<ul style="list-style-type: none"> Revised Note 4 to indicate the maximum height of inlets to be the grade elevation.
RC-52M (1 of 6)	<ul style="list-style-type: none"> Revised Note 2 to be the same as Note 4 on Sheet 8 of 10.
(2 of 6)	<ul style="list-style-type: none"> Deleted details for 150 Cold Formed C-Post since it is no longer being used. Also revised Note 2.
(3 of 6)	<ul style="list-style-type: none"> Deleted Note 6 to indicate that backing plates are no longer required since we changed to wood or plastic offset brackets.
(6 of 6)	<ul style="list-style-type: none"> Deleted detail for steel bracket to steel post bolt and nut.
RC-53M (1 of 2)	<ul style="list-style-type: none"> Revised the Type 2 Strong Post End Treatment detail to show a 1220 mm offset and deleted the detail for 150 C-Post.
(2 of 2)	<ul style="list-style-type: none"> Added notes to indicate that steel posts may be used as alternates to wood posts for guide rail across low-fill culverts and made reference to DM-2 for trailing end terminals.
RC-54M (1 of 7)	<ul style="list-style-type: none"> Revised Note 3 to indicate that support bolts remain in place after construction.
(3 of 7)	<ul style="list-style-type: none"> Revised Note 1 to indicate that proper terminals should be used with 2-W guide rail with a 50' transition of 2-S guide rail for high-speed facilities.
(3 of 7)	<ul style="list-style-type: none"> Modified the typical details to indicate that 7620 mm (25') of Type 2-WC guide rail is not required on trailing end of an obstruction.
(3 of 7)	<ul style="list-style-type: none"> Added a post end anchorage detail to develop the strength of the guide rail at the trailing end as an alternate to the Type 2-S end treatment.
(3 of 7)	<ul style="list-style-type: none"> Revised Note 4 to indicate the use of 2SCC or double nested guide rail when the required deflection is not available.
(3 of 7)	<ul style="list-style-type: none"> Modified the grading details for the flared and parallel terminals to indicate 1:15 max (1:10 min.) transition upstream of the terminal. Also made reference to the end anchorage detail.

(5, 6, & 7 of 7)

- Modified the length of need detail to indicate that the length of need is at the nose of the terminal.
- These three sheets were developed and added to RC-54 to provide installation guidelines for the Backslope Anchor Terminal.
- 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.
- The Backslope Anchor Terminal has been crash tested to NCHRP 350 criteria for a 6:1 slope (rehab.) and a 10:1 slope (new construction). It can be anchored with a concrete block or a post anchor.

RC-58M (4 of 6)

- Revised Note 3 to indicate that the barrier should be buried into the existing slope one foot deep and in a straight flare.
- Revised trailing end detail to show the 7620 mm (25') of 2-WC guide rail is not required.

(6 of 6)

- Changed the 1:8 approach slope to 1:20 and the rounding to 1.5m for the earth mound details.

CANCEL THE FOLLOWING:		REQUEST ADDITIONAL COPIES FROM:
Index Sheet	January 15, 1999	Bureau of Office Services
RC-12M	October 25, 1996	Publications Sales Office
RC-20M	May 16, 1997	P.O. Box 2028
RC 30M	September 30, 1998	Middletown, PA 17120
RC-34M	September 30, 1998	
RC-52M	January 15, 1999	
RC-53M	September 30, 1998	
RC-54M	September 30, 1998	
RC-58M	January 15, 1999	
SOL 430-99-07		
		APPROVED FOR ISSUANCE BY:
		Bradley L. Mallory Secretary of Transportation
		By: <i>Gary L. Hoffman</i>
		for Michael M. Ryan, P.E. Deputy Secretary for Highway Administration

INDEX OF STANDARDS FOR ROADWAY CONSTRUCTION

STANDARD DRAWING NUMBER	DRAWING DATE	DESCRIPTION
<u>EARTHWORK</u>		
RC-10M _____	SEP 25, 1995	CLASSIFICATION OF EARTHWORK
RC-11M (2 Sheets) _____	JAN 15, 1999	CLASSIFICATION OF EARTHWORK FOR STRUCTURES
* RC-12M _____	AUG 16, 1999	BACKFILL AT STRUCTURES
RC-13M _____	SEP 25, 1995	PAY LIMIT OF SUBBASE

PAVEMENTS

* RC-20M (3 Sheets) _____	AUG 16, 1999	CONCRETE PAVEMENT JOINTS
* RC-21M _____	AUG 16, 1999	REINFORCED CONCRETE PAVEMENT
RC-23M (2 Sheets) _____	MAR 06, 1998	BRIDGE APPROACH SLAB
RC-24M _____	MAR 06, 1998	PAVEMENT RELIEF JOINT
* RC-25M (5 Sheets) _____	AUG 16, 1999	SHOULDERS
RC-26M (5 Sheets) _____	MAR 06, 1998	CONCRETE PAVEMENT REHABILITATION
RC-27M _____	JAN 15, 1999	PLAIN CONCRETE PAVEMENT
* RC-28M _____	AUG 16, 1999	OVERLAY TRANSITIONS AND PAVING NOTCHES

DRAINAGE

* RC-30M (4 Sheets) _____	AUG 16, 1999	SUBSURFACE DRAINS
RC-31M _____	MAY 16, 1997	ENDWALLS
RC-32M _____	SEP 25, 1995	SLOPE PIPE FITTINGS, PIPE CONNECTORS AND CONCRETE COLLAR FOR PIPE EXTENSION
RC-33M _____	SEP 25, 1995	END SECTIONS FOR PIPE CULVERTS
* RC-34M (10 Sheets) _____	AUG 16, 1999	INLETS
RC-35M _____	SEP 25, 1995	DRAINAGE DIKE
RC-36M _____	MAY 16, 1997	SPRING BOXES
RC-39M (5 Sheets) _____	MAR 06, 1998	STANDARD MANHOLES
RC-40M _____	SEP 25, 1995	SLOPE PROTECTION
RC-43M _____	SEP 25, 1995	GABIONS

STANDARD DRAWING NUMBER	DRAWING DATE	DESCRIPTION
<u>GUIDE RAIL AND MEDIAN BARRIER</u>		

RC-50M (2 Sheets) _____	SEP 30, 1998	GUIDE RAIL TRANSITION AT END OF STRUCTURE
* RC-52M (6 Sheets) _____	AUG 16, 1999	TYPE 2 STRONG POST GUIDE RAIL
* RC-53M (2 Sheets) _____	AUG 16, 1999	TYPE 2 WEAK POST GUIDE RAIL
* RC-54M (4 Sheets) _____	AUG 16, 1999	BARRIER PLACEMENT AT OBSTRUCTIONS
RC-55M _____	SEP 30, 1998	TYPE 2 WEAK POST MEDIAN BARRIER
RC-57M (5 Sheets) _____	JAN 15, 1999	CONCRETE MEDIAN BARRIER
* RC-58M (6 Sheets) _____	AUG 16, 1999	SINGLE FACE CONCRETE BARRIER
RC-59M (2 Sheets) _____	SEP 30, 1998	CONCRETE GLARE SCREEN

FENCES AND CURBS

RC-60M (3 Sheets) _____	SEP 25, 1995	RIGHT-OF-WAY FENCE
RC-61M _____	SEP 25, 1995	RIGHT-OF-WAY GATES AND REMOVABLE FENCE SECTIONS
RC-63M (2 Sheets) _____	SEP 25, 1995	PERMANENT BARRICADES
RC-64M _____	MAY 16, 1997	CURBS AND GUTTERS
RC-65M _____	MAY 16, 1997	CONCRETE MOUNTABLE CURBS
RC-66M _____	MAR 06, 1998	CONCRETE TRAFFIC SEPARATOR
RC-67M (2 Sheets) _____	SEP 25, 1995	CURB RAMPS

POLLUTION CONTROL

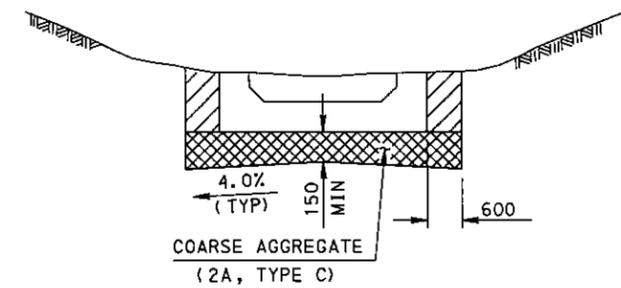
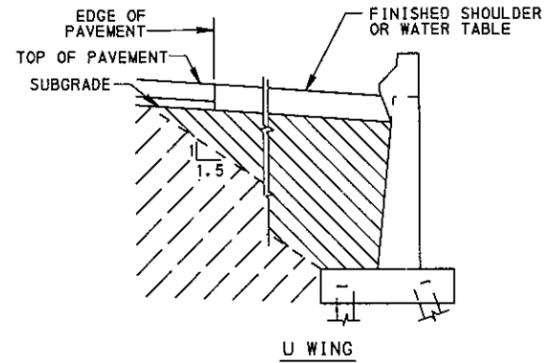
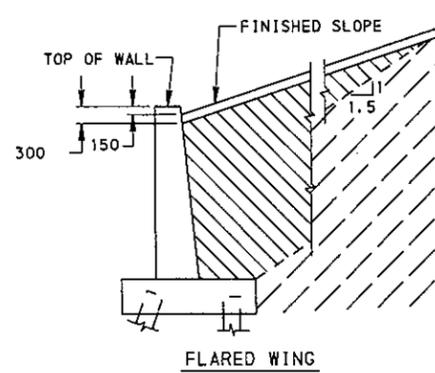
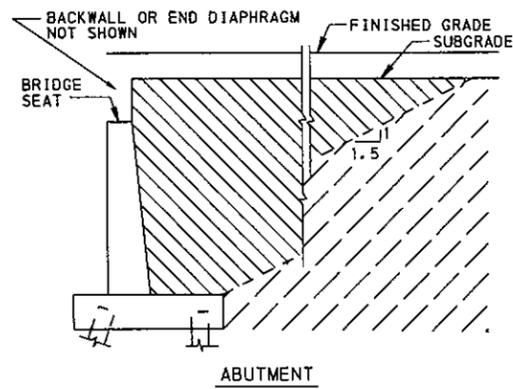
RC-70M (5 Sheets) _____	JAN 15, 1999	EROSION AND SEDIMENT POLLUTION CONTROL
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HIGHWAY LIGHTING

RC-80M (2 Sheets) _____	SEP 30, 1998	HIGHWAY LIGHTING-FOUNDATIONS
RC-81M _____	SEP 30, 1998	HIGHWAY LIGHTING-JUNCTION BOXES-LIGHT DUTY
RC-82M _____	SEP 30, 1998	HIGHWAY LIGHTING-JUNCTION BOXES-HEAVY DUTY
RC-83M (2 Sheets) _____	SEP 30, 1998	HIGHWAY LIGHTING-LIGHTING POLE DETAILS
RC-84M _____	SEP 30, 1998	HIGHWAY LIGHTING-LIGHTING AND ELECTRICAL DETAILS

ROADSIDE DEVELOPMENT AND PLANTING

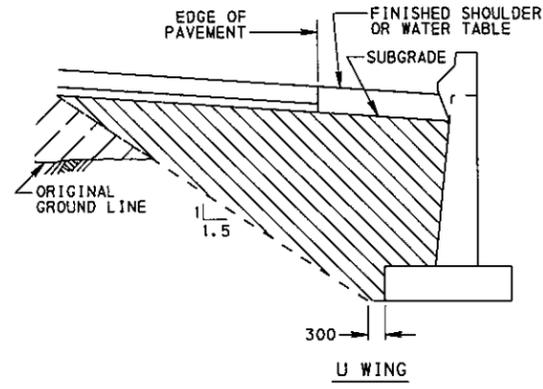
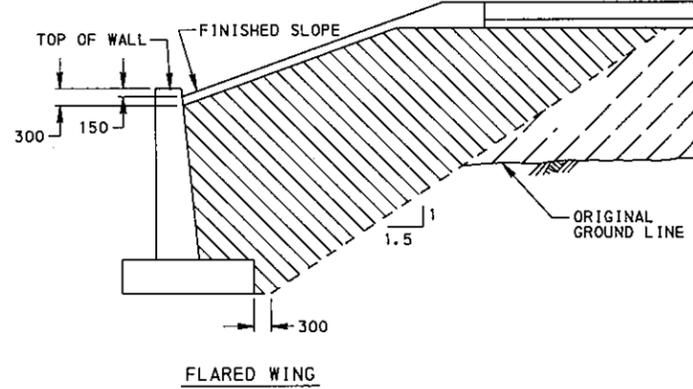
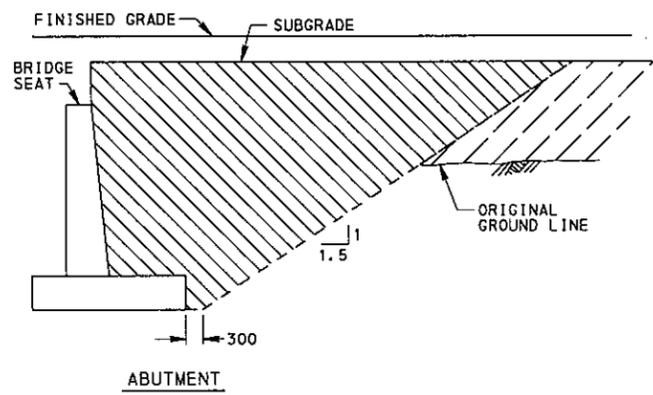
RC-91M _____	SEP 30, 1995	BRACING AND PLANTING DETAILS
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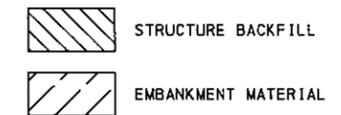
FOUNDATION PREPARATION FOR RC BOX AND ARCH CULVERTS ON FINE GRAIN SOIL ONLY

NOTE: EXCAVATE THE LAST 600 WITH BUCKET WITHOUT TEETH TO KEEP THE FOUNDATION FIRM. FOR CULVERTS WITH SPANS LESS THAN 2500, BOTTOM MAY BE SLOPED IN ONE DIRECTION.

TYPICAL CROSS SECTIONS - ABUTMENTS ON FILL



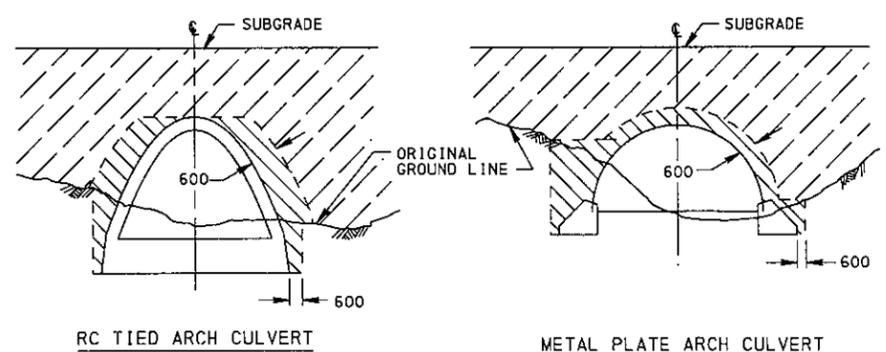
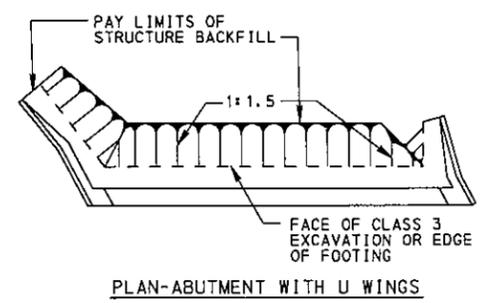
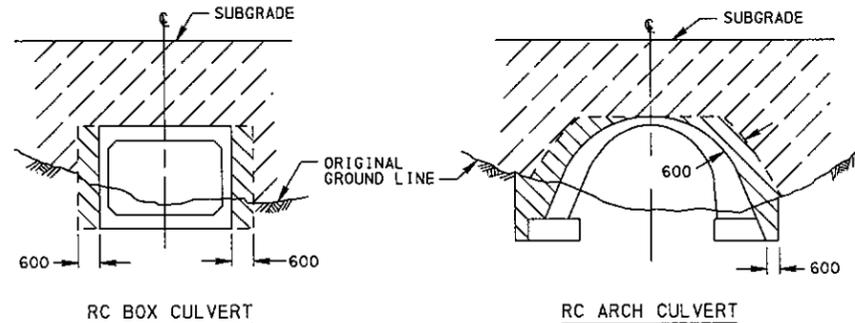
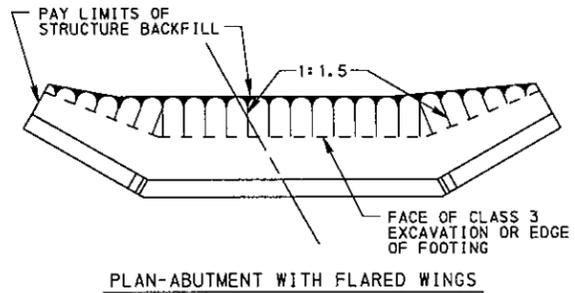
LEGEND



NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUB 408M. 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(c); 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 IN MILLIMETERS (mm) EXCEPT AS NOTED.

TYPICAL CROSS SECTIONS - ABUTMENTS IN CUT



BACKFILL & EMBANKMENT CONSTRUCTION AT STRUCTURES

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

BACKFILL AT STRUCTURES

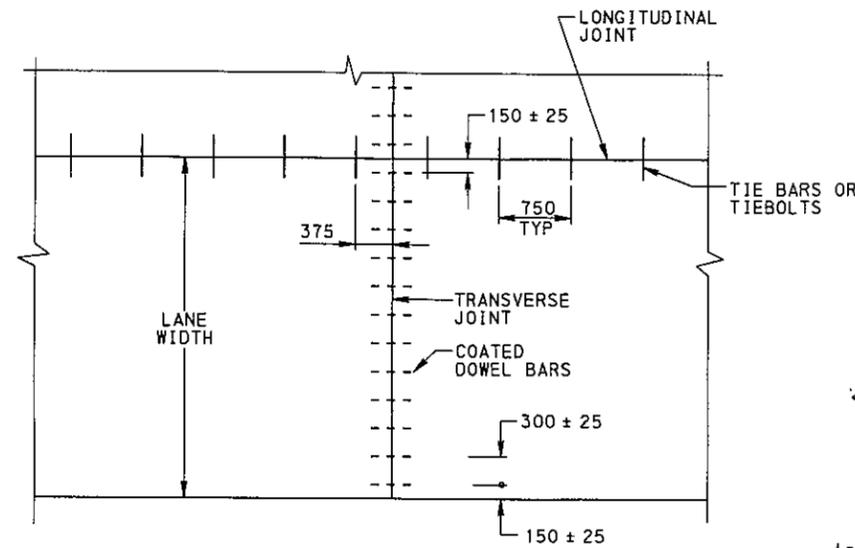
NOTES

- PLACE AN APPROVED TUBE OVER THE LUBRICATED END OF ALL DOWEL BARS USED IN TYPE E JOINTS AND PROVIDE A MINIMUM 25 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 LONG DOWEL BARS FOR PAVEMENT DEPTHS 250 OR LESS AND MINIMUM NO. 38 x 450 LONG DOWEL BARS FOR PAVEMENT DEPTHS GREATER THAN 250. 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 NOR MORE THAN 10 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 NOR MORE THAN 5 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:

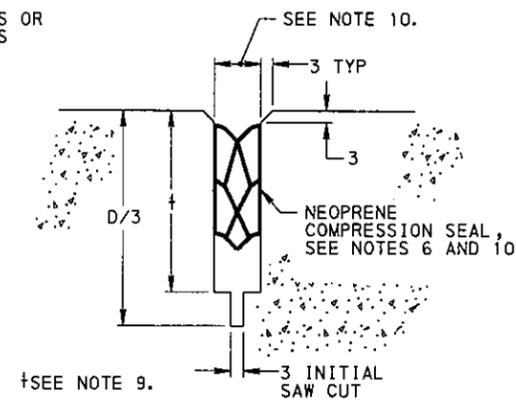
SEAL SIZE	SAW CUT DEPTHS
25	47-50
32	50-53
- ADJUST THE WIDTH OF THE SECOND SAW CUT ACCORDING TO THE SEAL SIZE AND PAVEMENT SURFACE TEMPERATURE AT THE TIME OF SAWING, AS FOLLOWS:

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

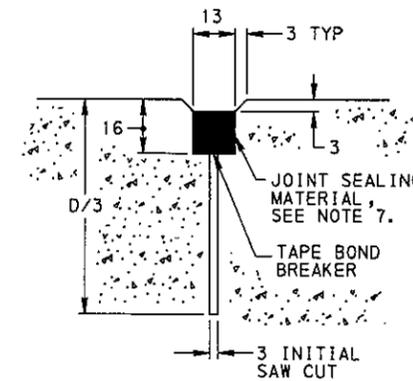
* PAVEMENT SURFACE TEMPERATURE, °C
- WHEN SILICONE JOINT SEALING MATERIAL, AS SPECIFIED IN PUBLICATION 408M, SECTION 705.4 (a), IS SELECTED FOR USE IN TRANSVERSE JOINTS (TYPE P OR TYPE G ONLY) OR TRANSVERSE SHOULDER JOINTS, USE THE SAME JOINT SEALING MATERIAL IN THE LONGITUDINAL JOINTS (ALTERNATE TYPE L AND ALTERNATE LONGITUDINAL SHOULDER JOINTS).
- ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.
- PROVIDE MATERIALS AND WORKMANSHIP IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408M.



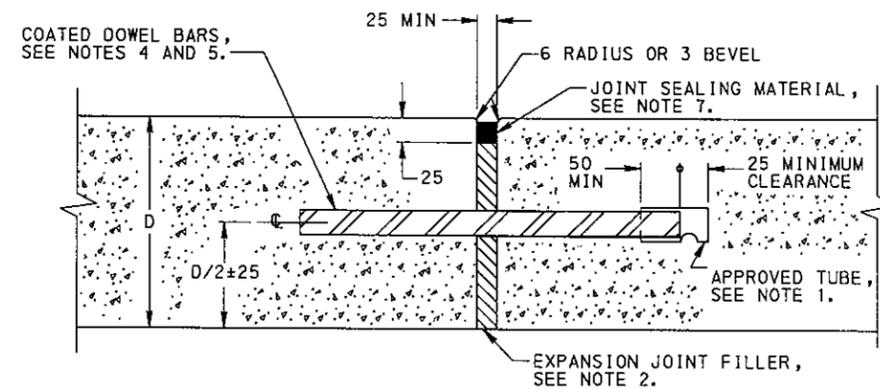
TYPICAL LAYOUT



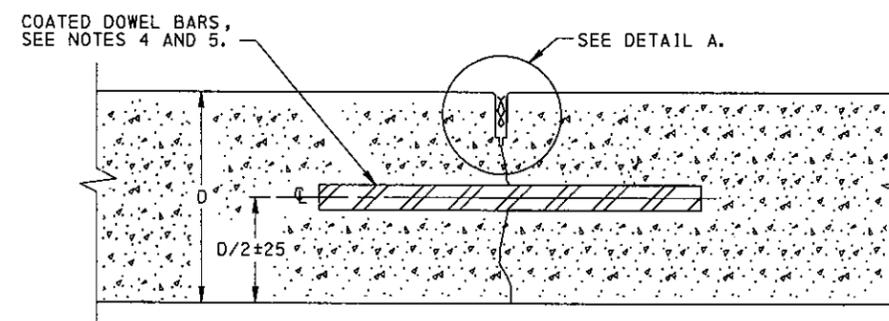
DETAIL A



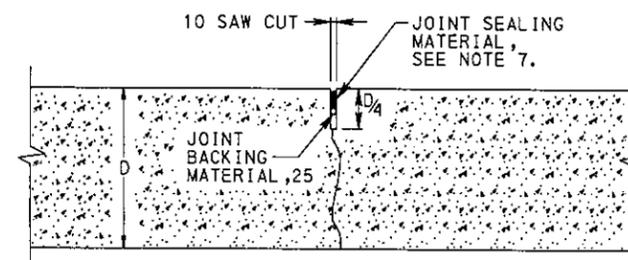
DETAIL B



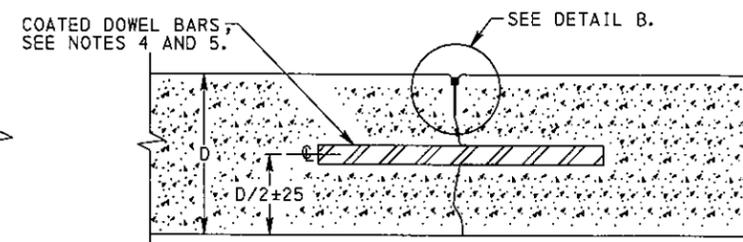
TYPE E



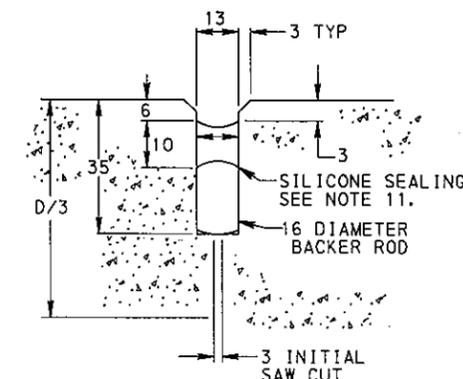
TYPE D



TYPE P
SEE RC-27M



TYPE G
SEE RC-27M

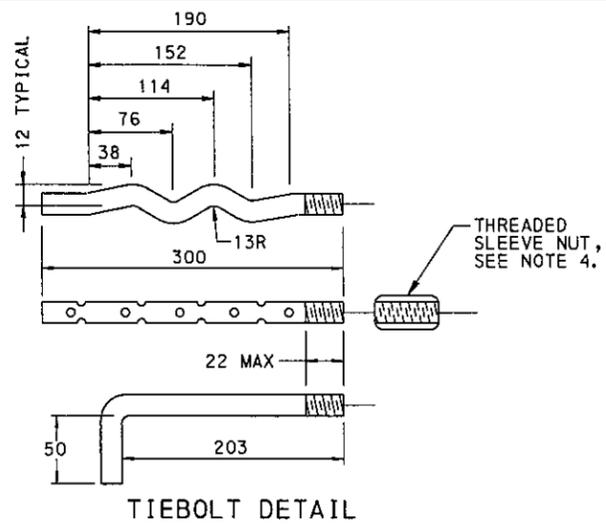


ALTERNATE TYPE P &
ALTERNATE TYPE G
JOINT DETAIL

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

CONCRETE PAVEMENT JOINTS

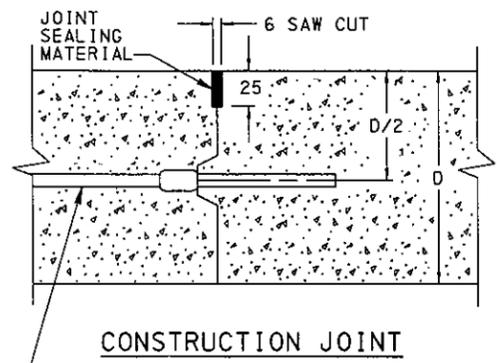
RECOMMENDED AUG. 16, 1999 <i>Dean A. Scher</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT. 1 OF 3 RC-20M
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TIEBOLT DETAIL

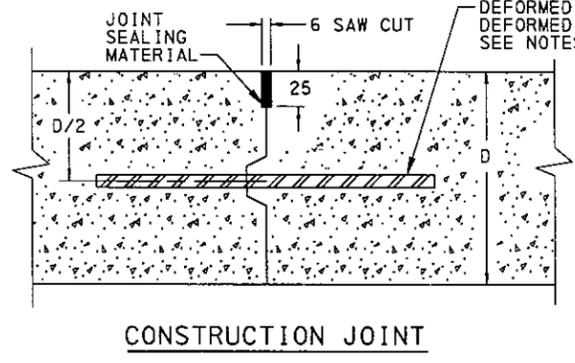
MAKE TIEBOLTS 14Ø BAR WITH ROLLED THREADS OR 16Ø BAR WITH CUT THREADS. PERMIT ONLY TIEBOLTS WHICH ARE SUPPLIED BY AN APPROVED MANUFACTURER, AS LISTED IN BULLETIN 15. SEE PUBLICATION 408M, SECTIONS 709.1 AND 705.2(b).

THREADED SLEEVE NUT, SEE NOTE 4.



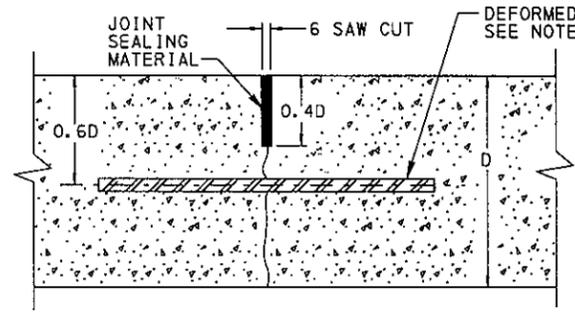
CONSTRUCTION JOINT

SEE TIEBOLT DETAIL AND NOTES 2 & 7.



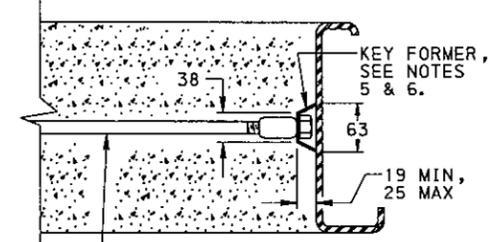
CONSTRUCTION JOINT

DEFORMED TIE BAR OR DEFORMED BENT TIE BAR, SEE NOTES 1, 2 & 3.



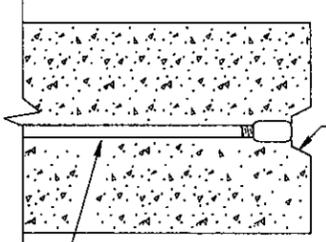
TYPE L CONTRACTION JOINT

DEFORMED TIE BAR, SEE NOTES 1 & 2.



STATIONARY FORMING

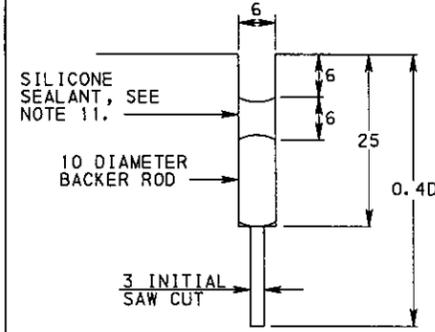
SEE TIEBOLT DETAIL AND NOTES 2 & 7.



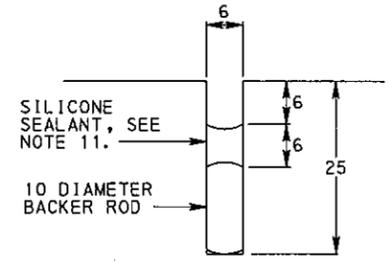
SLIP FORMING

SEE NOTE 6.

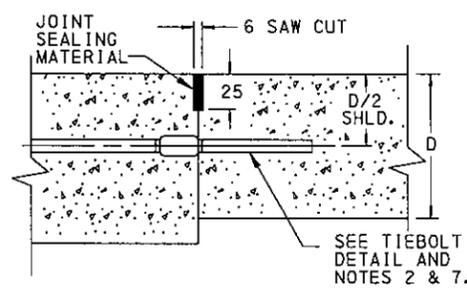
SEE TIEBOLT DETAIL AND NOTES 2, 7 & 10.



ALTERNATE TYPE L CONTRACTION JOINT



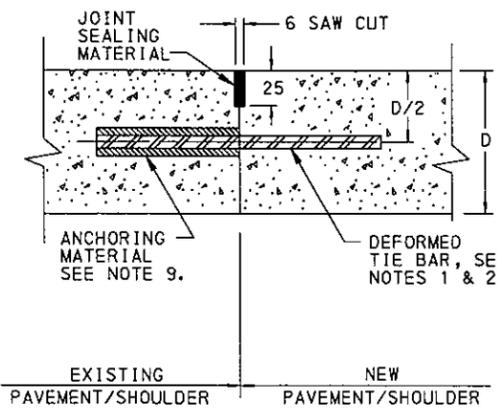
ALTERNATE TYPE L CONSTRUCTION JOINT



LONGITUDINAL SHOULDER JOINTS

SEE NOTE 8

SEE TIEBOLT DETAIL AND NOTES 2 & 7.

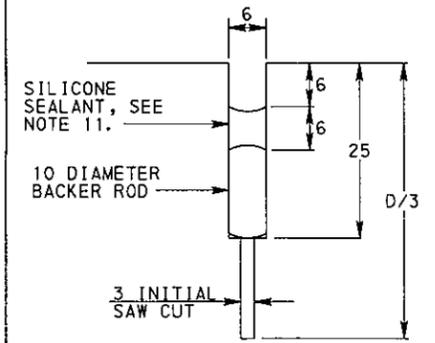


LONGITUDINAL JOINT WHEN TYING INTO EXISTING CONCRETE PAVEMENT/SHOULDER

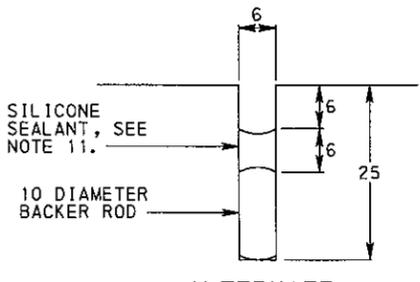
EXISTING PAVEMENT/SHOULDER NEW PAVEMENT/SHOULDER

ANCHORING MATERIAL SEE NOTE 9.

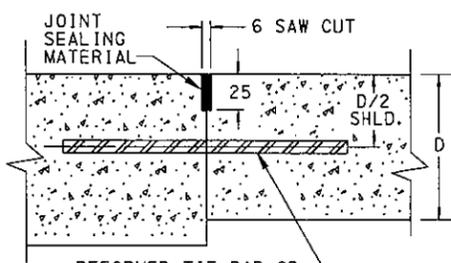
DEFORMED TIE BAR, SEE NOTES 1 & 2.



ALTERNATE TRANSVERSE JOINT



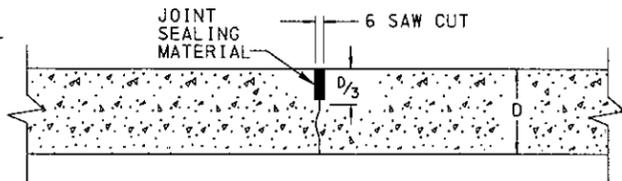
ALTERNATE LONGITUDINAL JOINT



LONGITUDINAL SHOULDER JOINTS

SEE NOTE 8

DEFORMED TIE BAR OR DEFORMED BENT TIE BAR, SEE NOTES 1, 2 & 3.



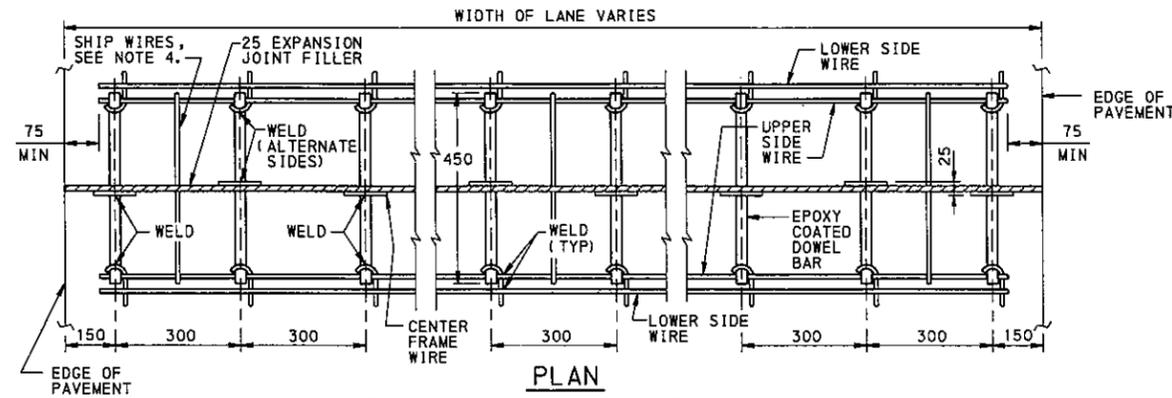
TRANSVERSE SHOULDER JOINT

NOTES

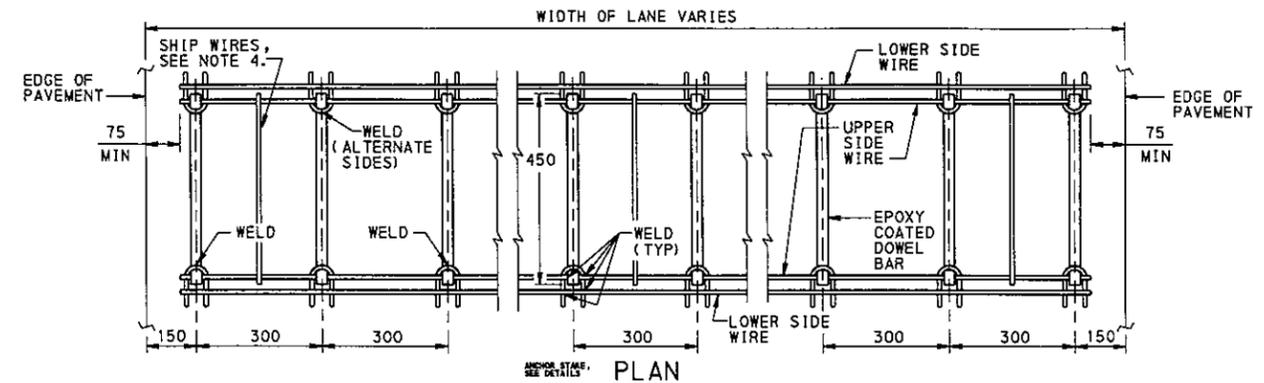
- SPECIFY #16 TIE BARS 750 ± 6 LONG, SPACED 750 CENTER TO CENTER MAXIMUM. PLACE PERPENDICULAR TO AND CENTERED OVER THE LONGITUDINAL JOINT ± 25. EMBED TIE BARS D/2 ± 20 OR 100 ± 13, WHICHEVER IS GREATER, EXCEPT FOR TYPE L CONTRACTION JOINTS. FOR TYPE L CONTRACTION JOINTS EMBED TIE BARS 0.6D. WHEN ADJOINING 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, SECTION 501.3(i) 1.
- EPOXY COAT TIE BARS AS SPECIFIED IN PUBLICATION 408M, SECTION 709.1(d). EPOXY COAT OR GALVANIZE TIEBOLTS AND THREADED SLEEVE NUTS, EXCLUDING THREADS, AS SPECIFIED IN PUBLICATION 408M, SECTION 709.1(d) OR SECTION 1105.02(g) RESPECTIVELY.
- STRAIGHTEN DEFORMED BENT TIE BARS SO THAT THE ANGLE MADE WITH THE LONGITUDINAL JOINT IS AT LEAST 60 DEGREES.
- MAKE THREADED SLEEVE NUT FROM STEEL PIPE OR HEXAGONAL STEEL BAR 27Ø x 48 LONG OR HIGH STRENGTH STEEL BAR 22Ø x 50 LONG.
- 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.
- FORM ONLY FEMALE KEYWAYS.
- PLACE TIEBOLTS AT 750 CENTER TO CENTER MAXIMUM SPACING. EMBED TIEBOLTS D/2 ± 20 OR 100 ± 13, 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 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.
- 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.
- USE AN APPROVED EPOXY ANCHORING MATERIAL TO WITHSTAND THE NECESSARY MINIMUM PULL-OUT RESISTANCE SPECIFIED IN PUBLICATION 408M, 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.
- DO NOT USE THE HOOK COMPONENT OF THE TIEBOLT ASSEMBLY WHEN SLIP FORMING.
- 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 IN MILLIMETERS (mm) EXCEPT AS NOTED.

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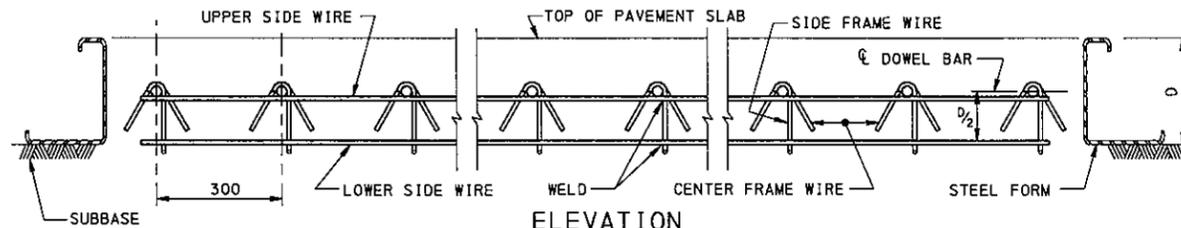
CONCRETE PAVEMENT JOINTS



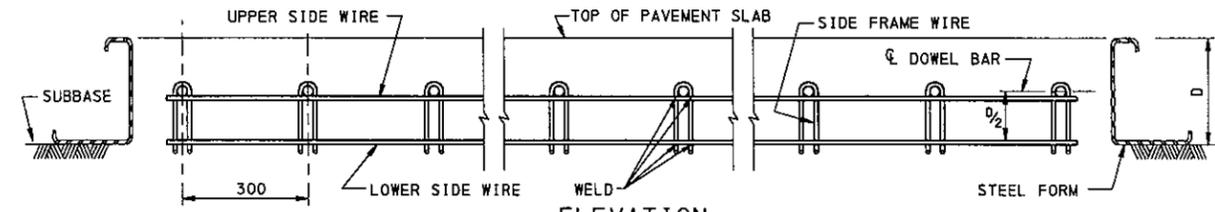
PLAN
TYPICAL EXPANSION JOINT ASSEMBLY



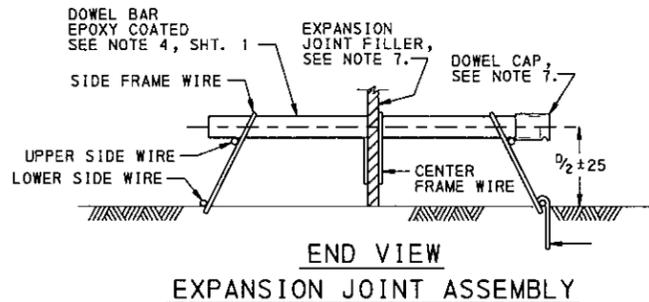
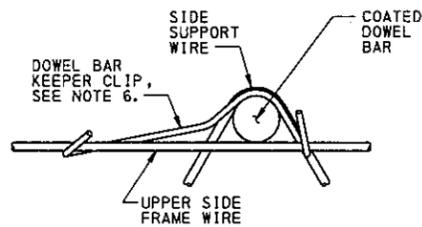
PLAN
TYPICAL CONTRACTION JOINT ASSEMBLY



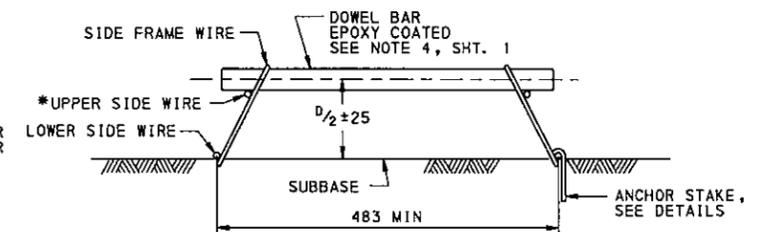
ELEVATION
EXPANSION JOINT ASSEMBLY



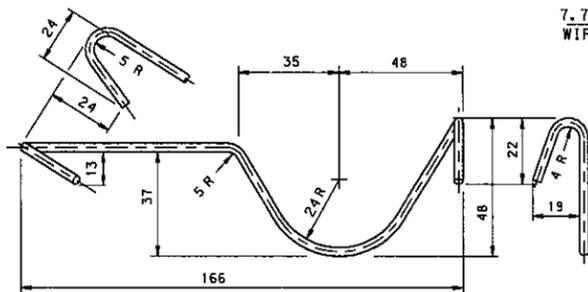
ELEVATION
CONTRACTION JOINT ASSEMBLY



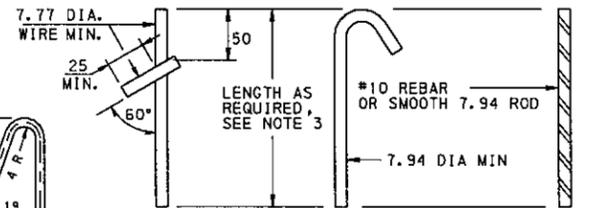
END VIEW
EXPANSION JOINT ASSEMBLY



END VIEW
CONTRACTION JOINT ASSEMBLY



DOWEL BAR KEEPER CLIP



TYPICAL ANCHOR STAKE DETAILS

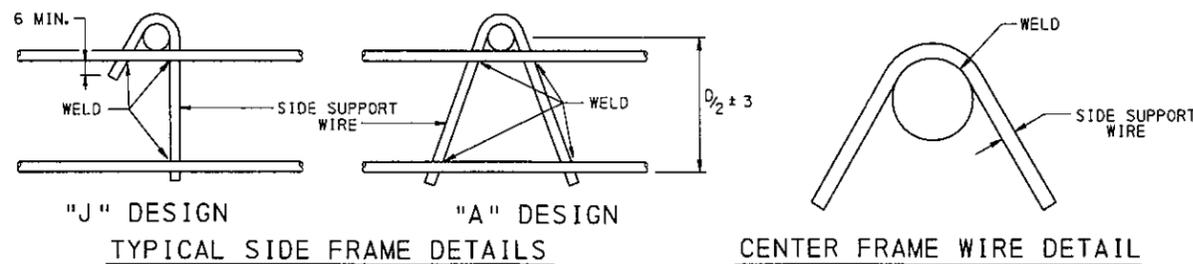
- NOTES**
- THIS STANDARD DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND COMPATIBILITY. IT DOES NOT INCLUDE ALL THE DETAILS REQUIRED FOR FABRICATION. ONLY ITEMS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15 SHALL BE PERMITTED.
 - PROVIDE ANCHOR STAKES TO SECURE UNIT FROM MOVEMENT INCLUDING UPLIFT. 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 OR LESS	8.41 Ø MIN	10.16 Ø MIN	8.41 Ø MIN
GREATER THAN 250	9.19 Ø MIN	11.35 Ø MIN	9.19 Ø MIN

- DOWEL BAR KEEPER CLIPS MAY BE USED IN LIEU OF TIE WIRES OR SHIPPING WIRES FOR CONSTRUCTION AND EXPANSION JOINT ASSEMBLIES. SEE SHT. 4 FOR DETAILS.
- 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 PER DOWEL BAR.
- PROVIDE DOWELS AND ASSEMBLY DETAILS THAT CONFORM TO PUBLICATION 408M.
- ALL DIMENSIONS ARE IN MILLIMETERS (MM) EXCEPT AS NOTED.
- WIRE TOLERANCES PER ASTM 510M IS 0.05 mm (0.003 in.)
- WELD REQUIREMENTS AS LISTED BELOW AND TESTED PER MANUFACTURER'S QUALITY CONTROL PLAN FOR WELD SHEAR.

PAVEMENT THICKNESS	UPPER & LOWER WIRE TO "A" & "J" SIDE SUPPORT	DOWEL TO SUPPORT ASSEMBLY
250 OR LESS	360 kg	540 kg
GREATER THAN 250	540 kg	900 kg

TYPICAL LOAD TRANSFER ASSEMBLY		
LANE WIDTH	OVERALL UNIT LENGTH	NO. OF DOWELS
2.7 m	2.55 m	9
3.0 m	2.85 m	10
3.3 m	3.15 m	11
3.6 m	3.45 m	12



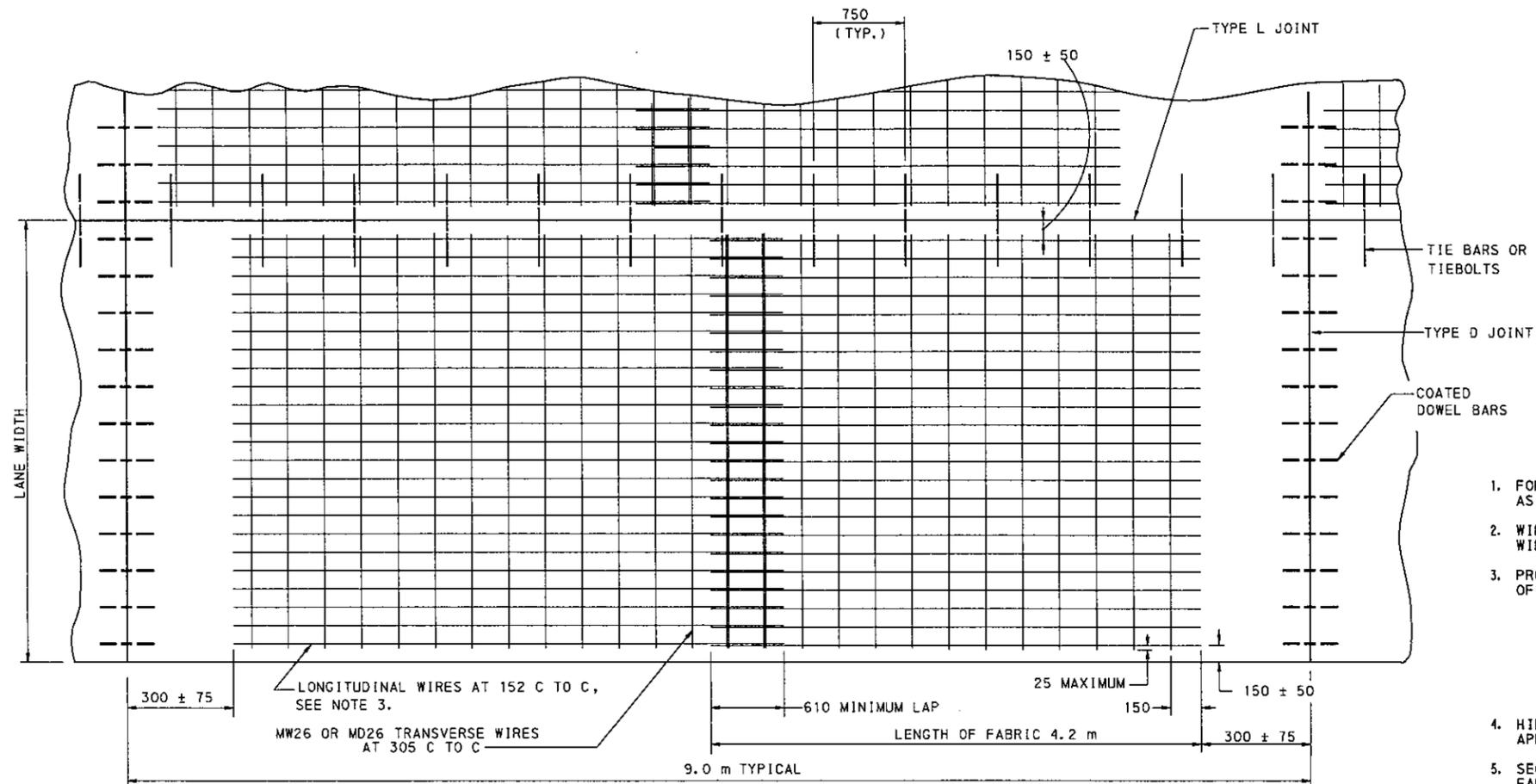
"J" DESIGN
TYPICAL SIDE FRAME DETAILS

"A" DESIGN

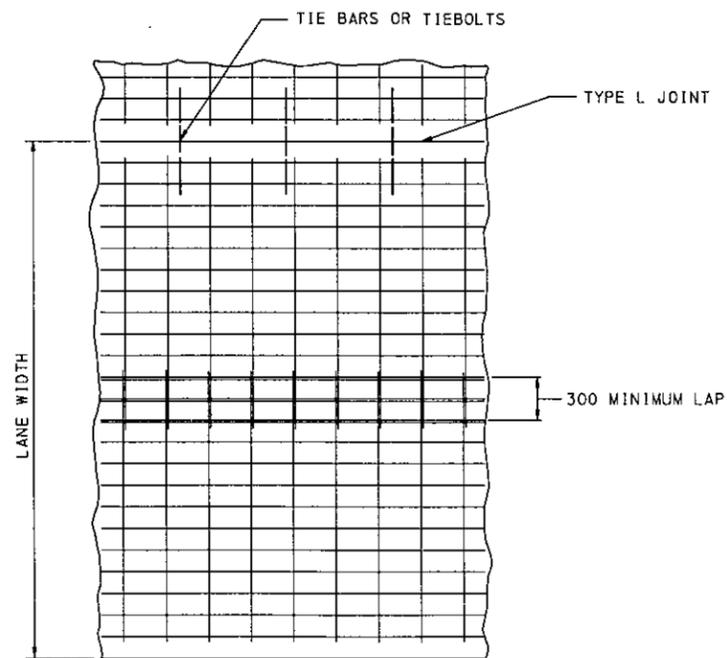
CENTER FRAME WIRE DETAIL

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CONCRETE PAVEMENT JOINTS
NON-SKEWED
LOAD TRANSFER ASSEMBLIES



WIRE FABRIC REINFORCEMENT



ALTERNATE LAPPED FABRIC

NOTES

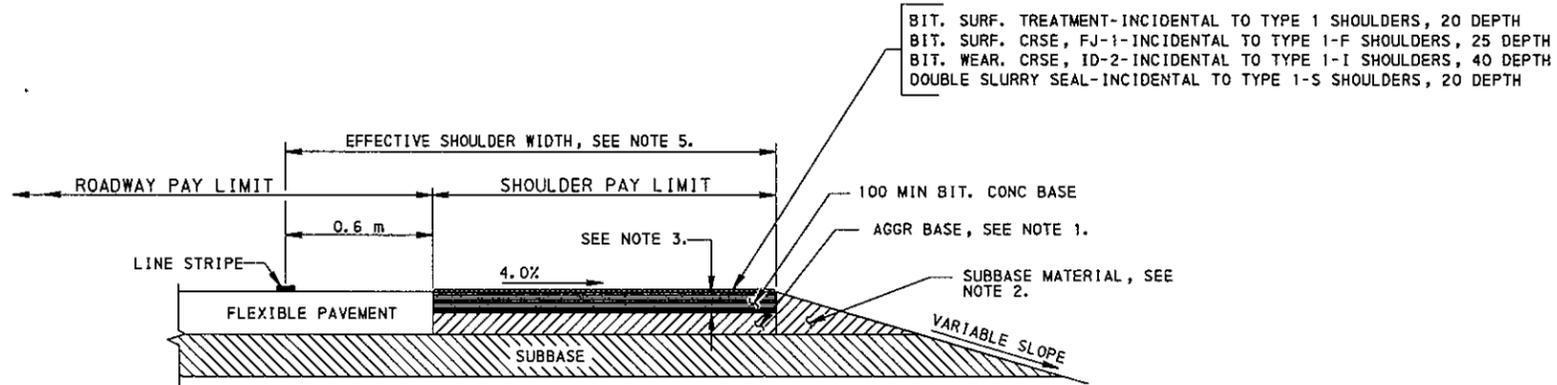
1. FOR VARIABLE WIDTH PAVEMENT CUT THE REINFORCEMENT AS REQUIRED.
2. WIRE FABRIC REINFORCEMENT MAY BE PLACED WITH TRANSVERSE WIRES ABOVE OR BELOW LONGITUDINAL WIRES.
3. PROVIDE LONGITUDINAL WIRES FOR WIRE FABRIC REINFORCEMENT OF THE FOLLOWING MINIMUM SIZES:

PAV'T DEPTH	MIN LONG WIRE SIZE
200	MW35 OR MD35
230	MW40 OR MD35
250	MW45 OR MD45
280	MW50 OR MD45
300	MW55 OR MD50
330	MW60 OR MD50
4. HINGED FABRIC REINFORCEMENT MAY BE USED. HAVE HINGE DETAIL APPROVED BY THE ENGINEER.
5. SECURELY TIE ALL LONGITUDINAL AND TRANSVERSE LAPS OF WIRE FABRIC REINFORCEMENT.
6. ON PROJECTS WHERE ADDITIONAL LANES ARE ADDED TO EXISTING CEMENT CONCRETE PAVEMENTS AND THE EXISTING JOINT SPACING IS MORE THAN 14.2 m, USE A MINIMUM LONGITUDINAL WIRE SIZE OF MW60 OR MD60.
7. WIRE FABRIC REINFORCEMENT MAY BE CONSTRUCTED OF SMOOTH WIRE (SIZES DESIGNATED BY MW) OR DEFORMED WIRE (SIZES DESIGNATED BY MD) OR A COMBINATION OF BOTH.
8. SEE RC-20M FOR JOINT DETAILS.
9. PROVIDE A MINIMUM DEPTH FOR PLACEMENT OF WIRE FABRIC REINFORCEMENT, MEASURED FROM TOP OF PAVEMENT TO TOP OF FABRIC OF 60 TO A MAXIMUM OF ONE HALF THE PAVEMENT DEPTH MINUS 15.
10. WHEN THE RAMP OR LANE WIDTH EXCEEDS 4.2 m, A TYPE L JOINT IS REQUIRED AT THE MID-POINT.
11. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

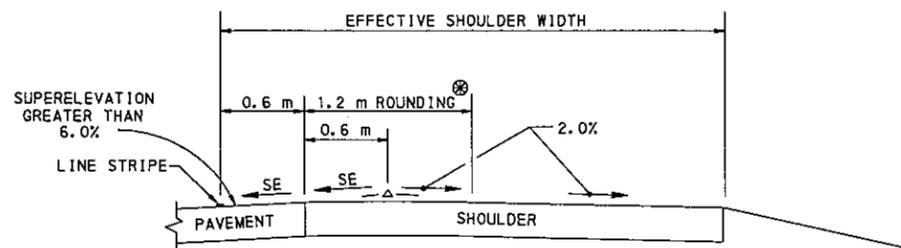
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REINFORCED
CONCRETE PAVEMENT

RECOMMENDED AUG. 16, 1999 DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 CHIEF ENGINEER	SHT 1 OF 1 RC-21M
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TYPE 1 SHOULDER
 TYPE 1-F SHOULDER
 TYPE 1-I SHOULDER
 TYPE 1-S SHOULDER

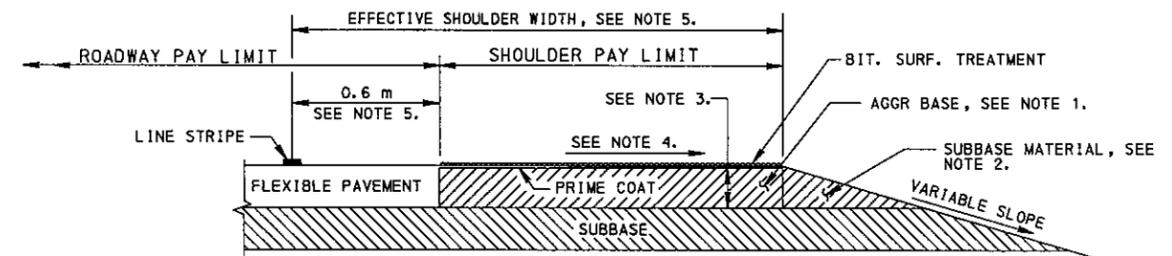


⊗ FOR SUPERELEVATION UNDER 6.0%, ELIMINATE THE 1.2 m ROUNDING AND USE THE 2.0% SHOULDER SLOPE BEGINNING FROM THE EDGE OF PAVEMENT.

SHOULDER ROUNDING ON HIGH SIDE
OF SUPERELEVATED CURVES

NOTES

1. CONSTRUCT AGGREGATE BASE AS SPECIFIED IN PUBLICATION 408M, SECTION 350.3 AND CONSIDER AS PART OF THE SHOULDER.
2. CONSIDER THE PAYMENT FOR THIS AREA OF SUBBASE MATERIAL INCIDENTAL TO THE SHOULDER.
3. MAKE DEPTH OF SHOULDER THE COMBINED DEPTH OF SURFACE AND BASE COURSE.
4. SLOPE SHOULDER AT 6.0% FOR EFFECTIVE SHOULDER WIDTHS ≤ 2.4 m. SLOPE SHOULDER AT 4.0% FOR EFFECTIVE SHOULDER WIDTHS > 2.4 m.
5. FOR EFFECTIVE SHOULDER WIDTHS 1.8 m 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 DEPTH MINIMUM.
7. WHEN INSTALLING MSRS ON A TYPE 1-1 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 (mm) EXCEPT AS NOTED.
9. SEE SHEETS 4 AND 5 FOR MSRS DETAILS.



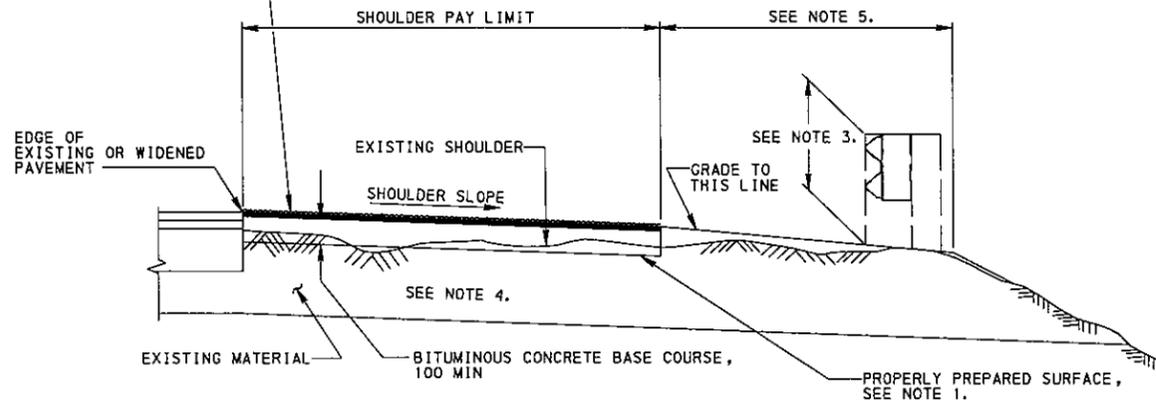
TYPE 3 SHOULDER

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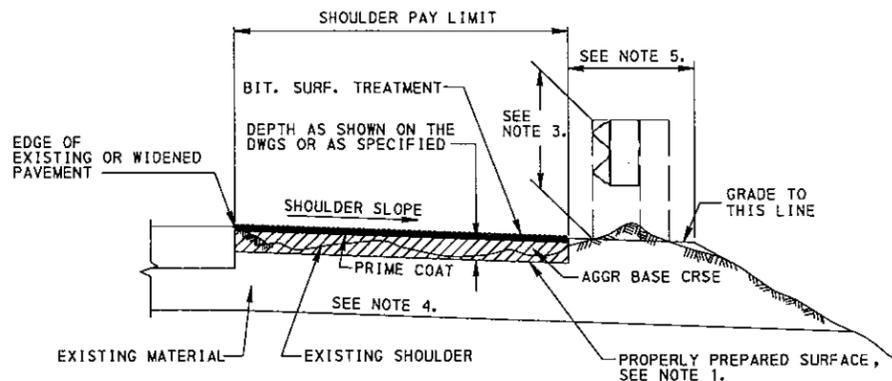
SHOULDERS

RECOMMENDED AUG. 16, 1999 <i>Alan A. Schuer</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT. 1 OF 5 RC-25M
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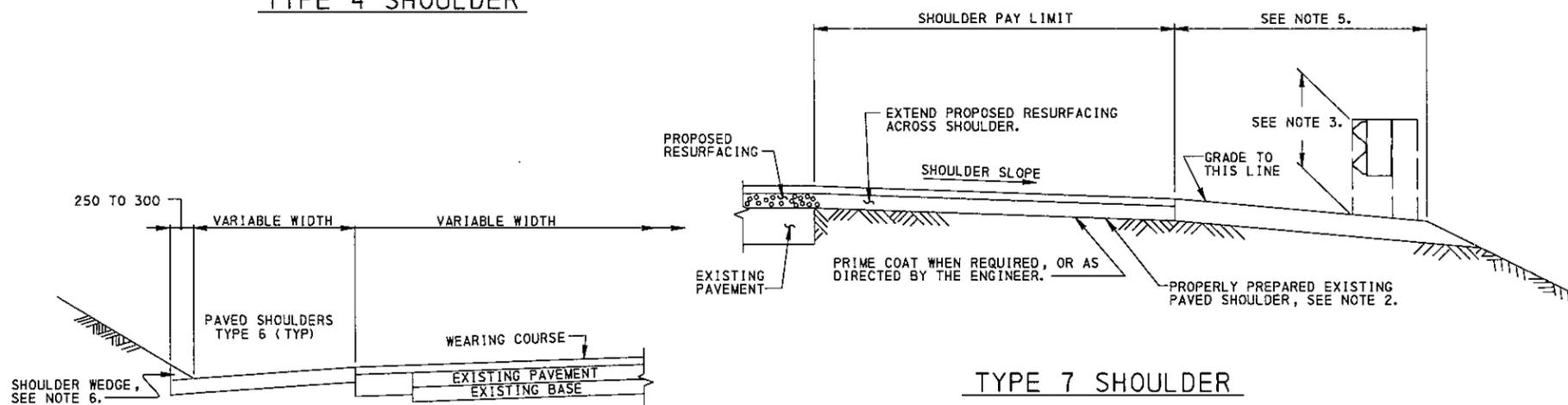
BIT. SURF. TREATMENT-INCIDENTAL TO TYPE 6 SHOULDERS, 20 DEPTH
 BIT. SURF. CRSE, FJ-1-INCIDENTAL TO TYPE 6-F SHOULDERS, 25 DEPTH
 BIT. WEAR. CRSE, ID-2-INCIDENTAL TO TYPE 6-I SHOULDERS, 40 DEPTH
 DOUBLE SLURRY SEAL-INCIDENTAL TO TYPE 6-S SHOULDERS, 20 DEPTH



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



TYPE 4 SHOULDER



TYPE 7 SHOULDER

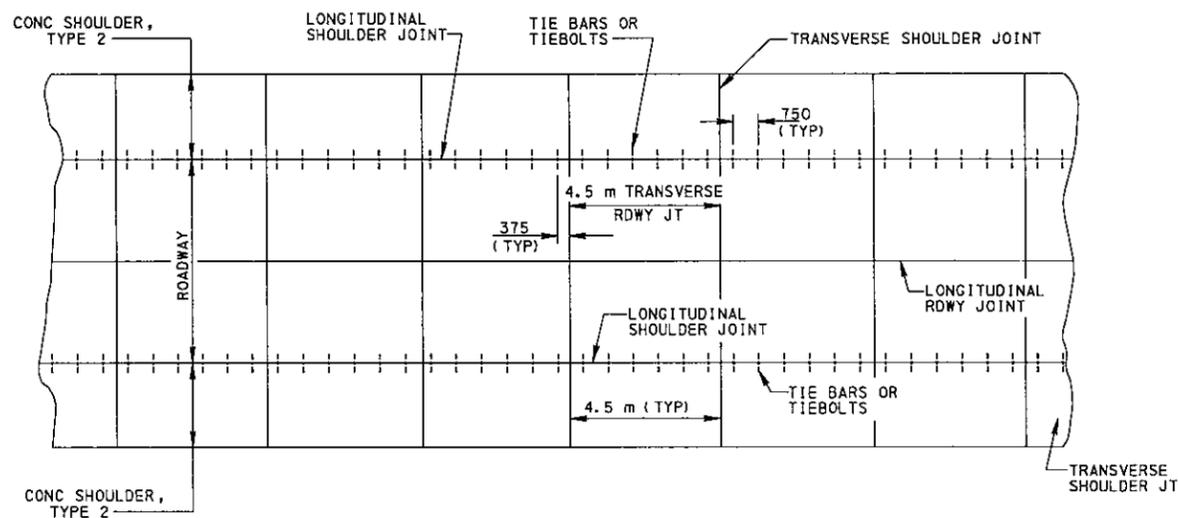
TYPICAL SHOULDER DETAIL
WITH BITUMINOUS TAPER SHOULDER WEDGE

NOTES

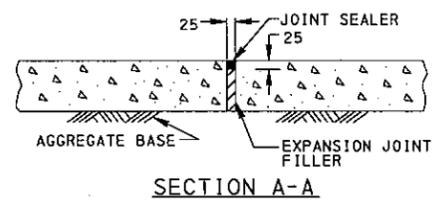
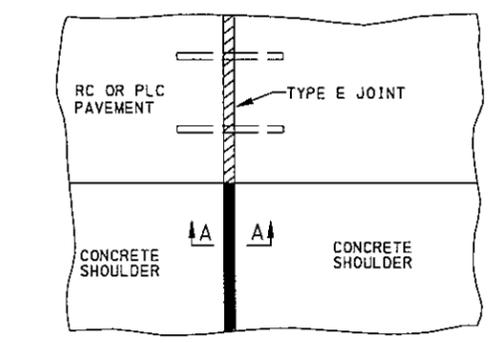
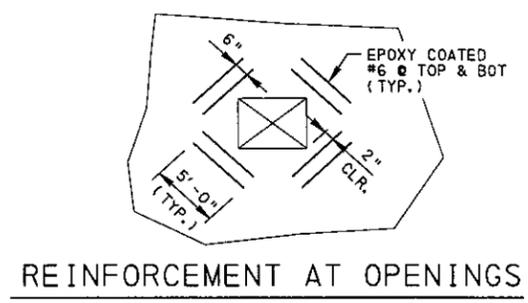
- FOR TYPE 4 AND TYPE 6 SHOULDERS PROPERLY PREPARE SURFACE BY EITHER SHAPING AND/OR SCARIFYING AND/OR COMPACTING. SHAPING INCLUDES REMOVAL OF EXISTING SHOULDER MATERIAL AND THE PLACEMENT OF GRADED MATERIAL FROM THE SHAPING OPERATION INTO THE LOW AREAS. WHERE THERE IS INSUFFICIENT GRADED MATERIAL FROM 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, 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.
- REMOVE UNSUITABLE MATERIAL AS DIRECTED, EXCAVATE, AND BACKFILL WITH MATERIAL MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 350. MEASURE AND PAY FOR SHOULDER EXCAVATION AND BACKFILL IN ACCORDANCE WITH PUBLICATION 408M, 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 408M, SECTION 350 AND PAY FOR AS TONNES OF SELECTED 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 TO 300 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 DEPTH MINIMUM.
- ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.
- SEE SHEETS 4 AND 5 FOR MSRS DETAILS.

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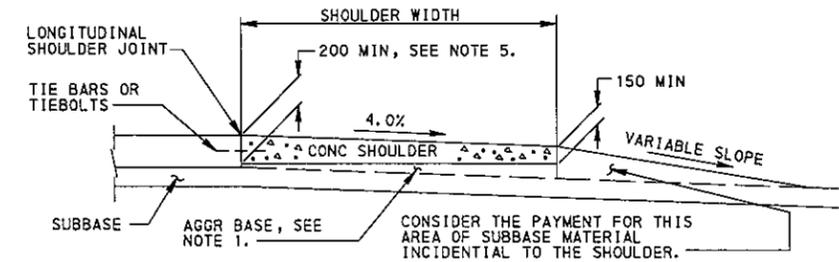
SHOULDERS
 (RECONSTRUCTED)



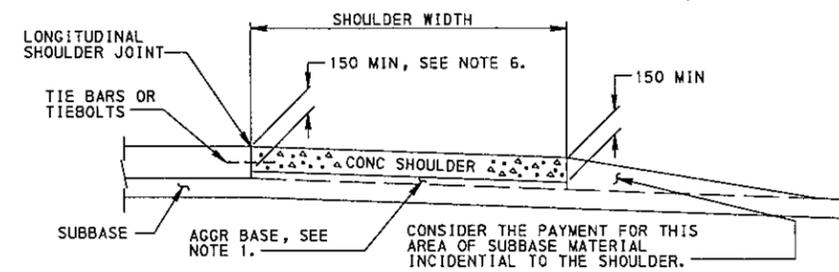
CONCRETE SHOULDERS ADJACENT TO PLAIN CONCRETE PAVEMENT FOR COLLECTORS AND LOCAL ROADS



CONCRETE SHOULDER EXPANSION JOINTS



CONCRETE SHOULDER - TYPE 1

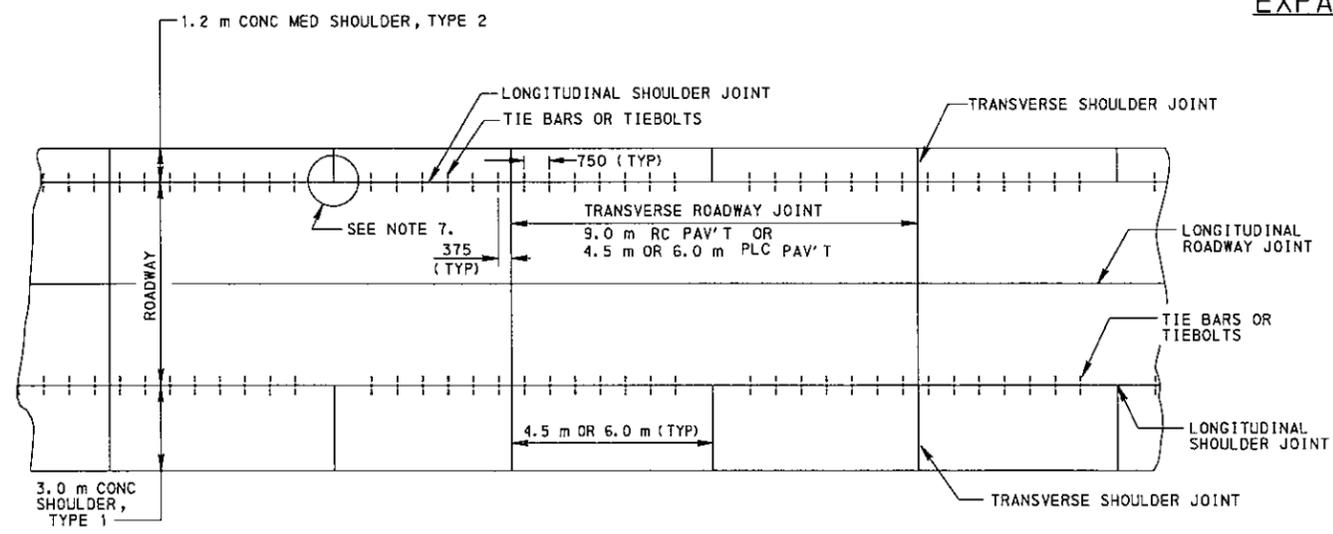


CONCRETE SHOULDER - TYPE 2

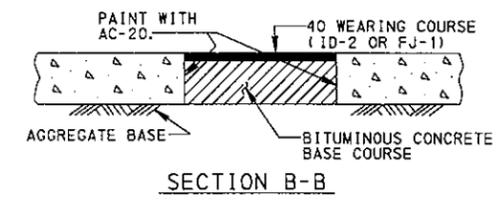
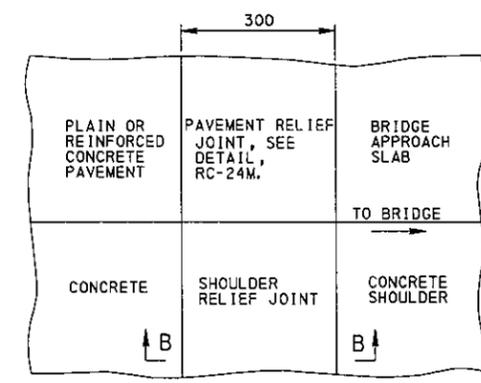
TYPICAL SECTIONS

NOTES:

1. SPECIFY THE AGGREGATE BASE AS IN PUBLICATION 408M, SECTION 350.3 AND CONSIDER INCIDENTAL TO THE SHOULDER.
2. SEAL ALL SHOULDER JOINTS IN ACCORDANCE WITH PUBLICATION 408M, 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 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. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.
9. 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.
10. SEE SHEETS 4 AND 5 FOR MSRS DETAILS.



CONCRETE SHOULDERS ADJACENT TO RC PAVEMENT AND PLC PAVEMENT FOR INTERSTATE AND OTHER LIMITED ACCESS FREEWAYS, ARTERIALS AND RAMPS

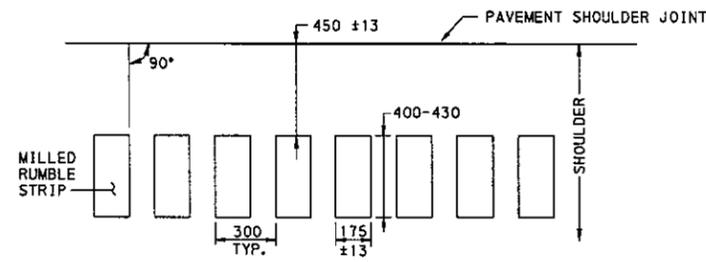
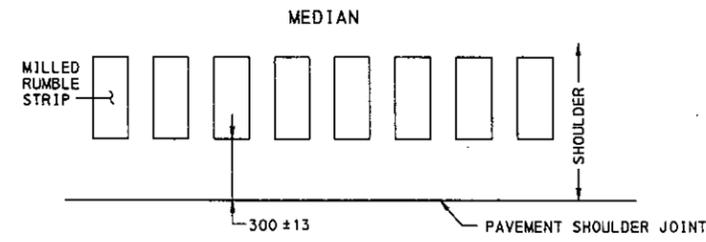


SHOULDER RELIEF JOINTS

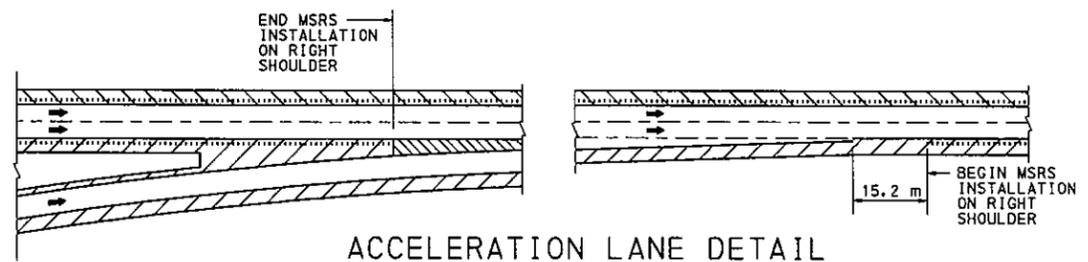
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SHOULDERS (CONCRETE)

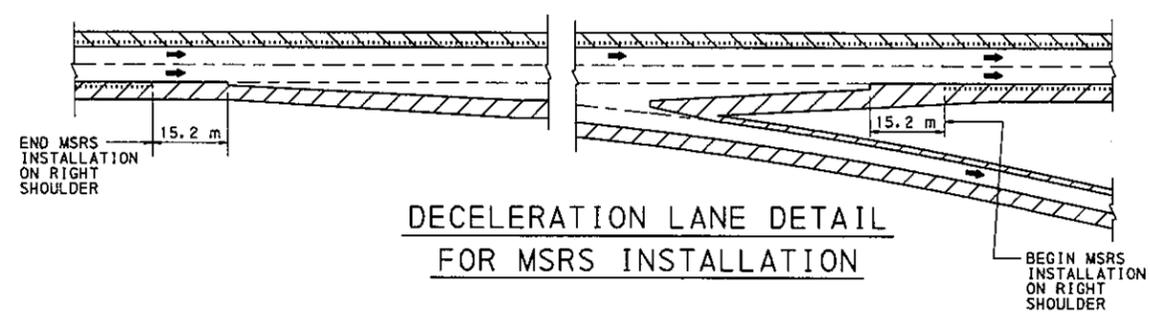
RECOMMENDED AUG. 16, 1999 <i>Alan H. Scher</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Darryl L. Hoffman</i> CHIEF ENGINEER	SHT 3 OF 5 RC-25M
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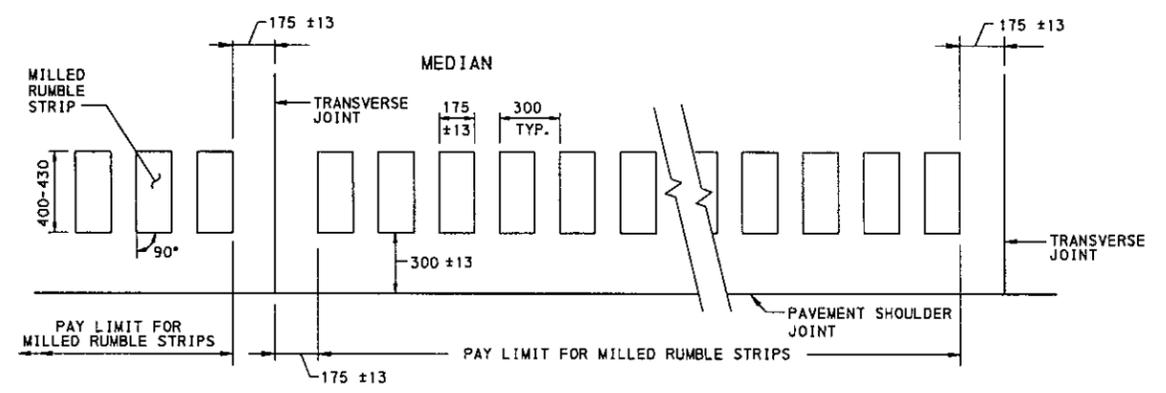
TYPICAL PLAN VIEW FOR MSRS PATTERN ON BITUMINOUS SHOULDERS



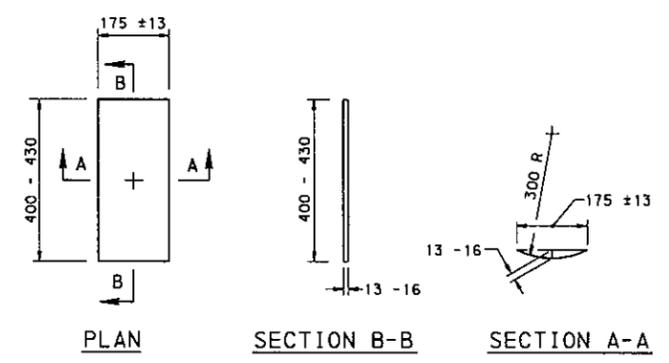
ACCELERATION LANE DETAIL FOR MSRS INSTALLATION



DECELERATION LANE DETAIL FOR MSRS INSTALLATION



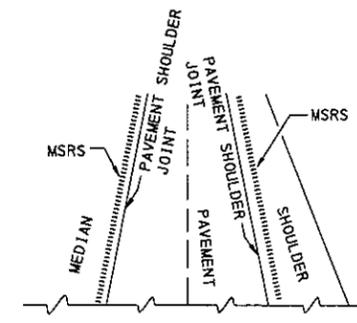
TYPICAL PLAN VIEW FOR MSRS PATTERN ON CONCRETE SHOULDERS



SECTION DETAILS OF MSRS PATTERN

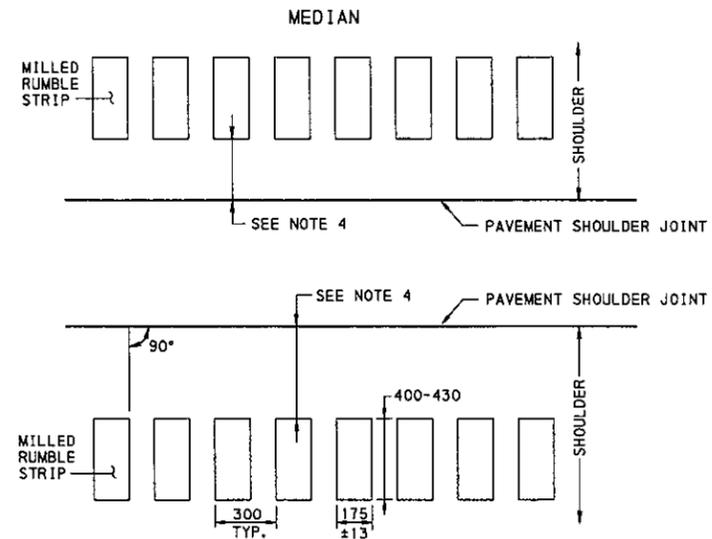
NOTES

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 408M SECTION 660.
4. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

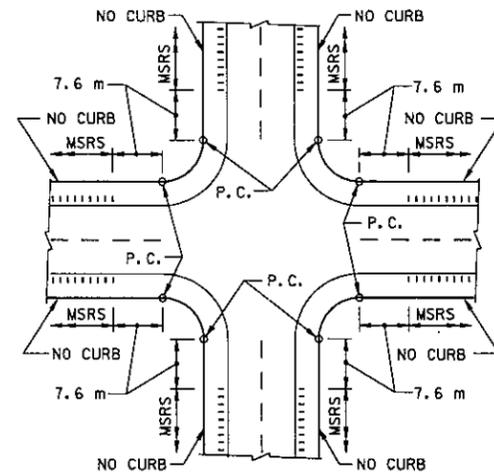


GENERAL VIEW MSRS PATTERN

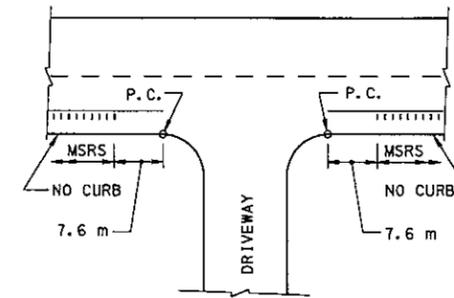
COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
SHOULDERS MILLED SHOULDER RUMBLE STRIPS (MSRS) (LIMITED ACCESS HIGHWAYS)		
RECOMMENDED AUG. 16, 1999 <i>Near A. Schu</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Gary J. Hoffman</i> CHIEF ENGINEER	SHT. 4 OF 5 RC-25M



TYPICAL PLAN VIEW FOR MSRS
PATTERN ON BITUMINOUS SHOULDERS



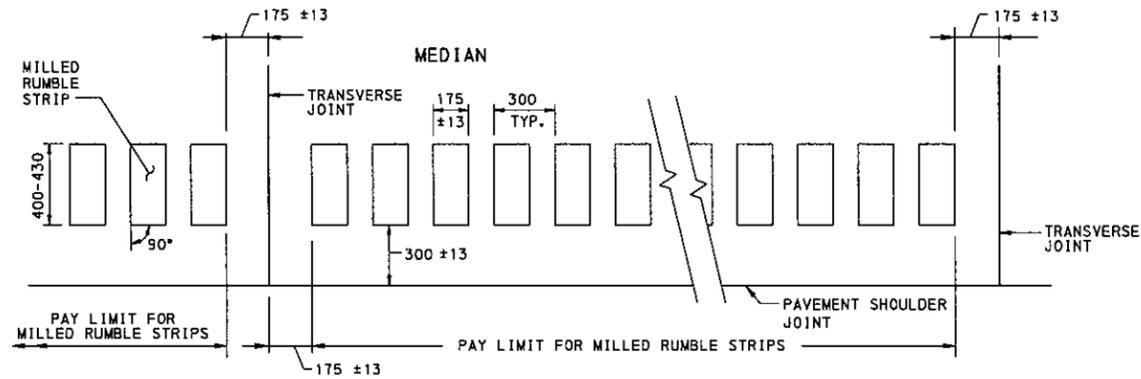
TYPICAL INTERSECTION DETAIL
FOR MSRS INSTALLATION



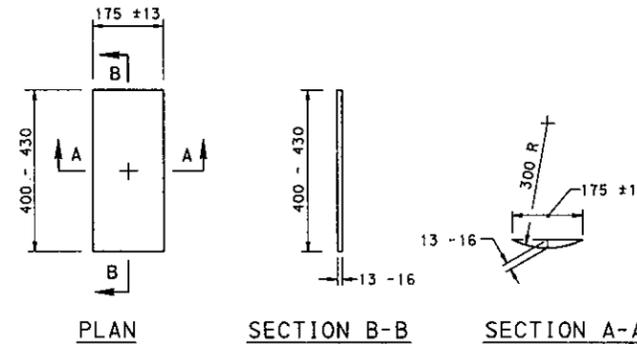
TYPICAL DRIVEWAY DETAIL
FOR MSRS INSTALLATION

NOTES

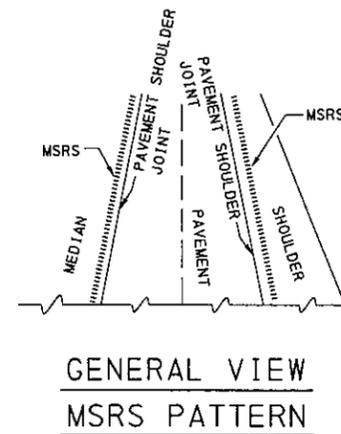
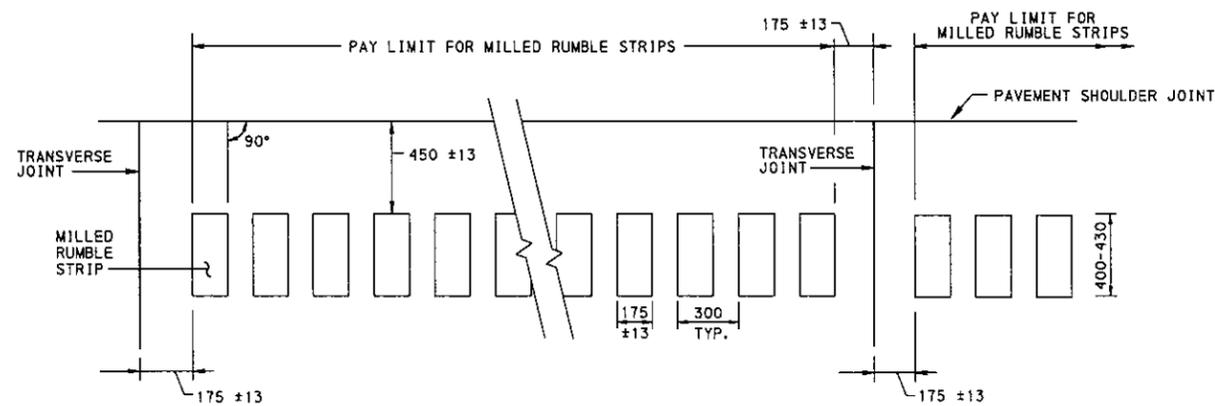
1. MILLED SHOULDER RUMBLE STRIPS (MSRS) FOR FREE ACCESS HIGHWAYS ARE CONSIDERED ON A PROJECT BY PROJECT BASIS AS INDICATED ON THE CONSTRUCTION PLANS.
2. CONSTRUCT MSRS IN ACCORDANCE WITH PUBLICATION 408M, SECTION 660.
3. DO NOT MILL SHOULDER RUMBLE STRIPS ACROSS A JOINT.
4. 300 ± 13 FOR LEFT (MEDIAN)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



TYPICAL PLAN VIEW FOR MSRS
PATTERN ON CONCRETE SHOULDERS



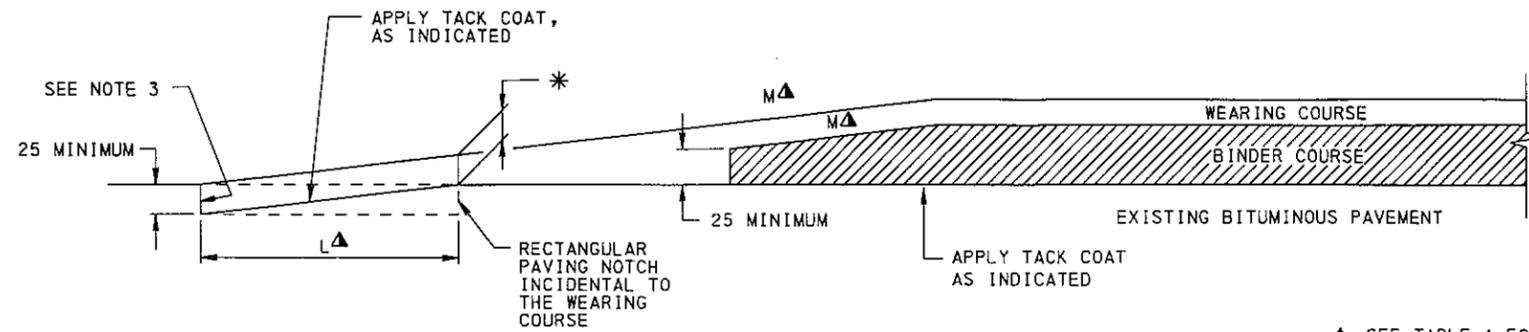
SECTION DETAILS OF
MSRS PATTERN



GENERAL VIEW
MSRS PATTERN

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

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



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

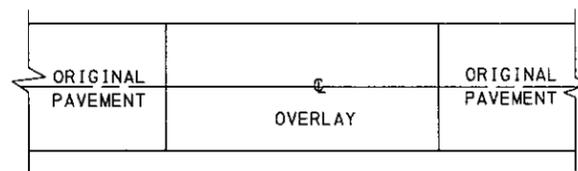
TABLE A

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

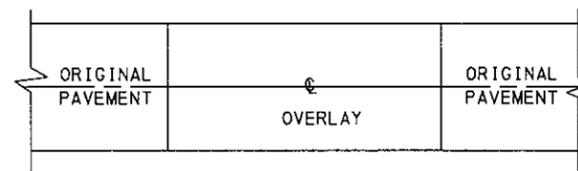
OVERLAY TRANSITION WITH PAVING NOTCH ON CONCRETE AND BITUMINOUS PAVEMENTS

NOTES

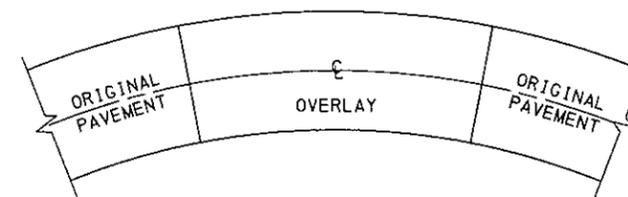
1. USE HIGHER APPROPRIATE CRITERIA IF A CROSS STREET HAS A FUNCTIONAL CLASSIFICATION OF COLLECTORS AND LOCAL ROADS OR HIGHER.
2. USE 85TH PERCENTILE SPEED, IF AVAILABLE. OTHERWISE, USE THE POSTED SPEED.
3. PLACE EDGE FLUSH WITH EXISTING PAVEMENT AND SEAL AS SPECIFIED IN PUBLICATION 408M, SECTION 401.3(j)3.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



PLAN VIEW
 TANGENT SECTION
 TWO-LANE DIRECTIONAL



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



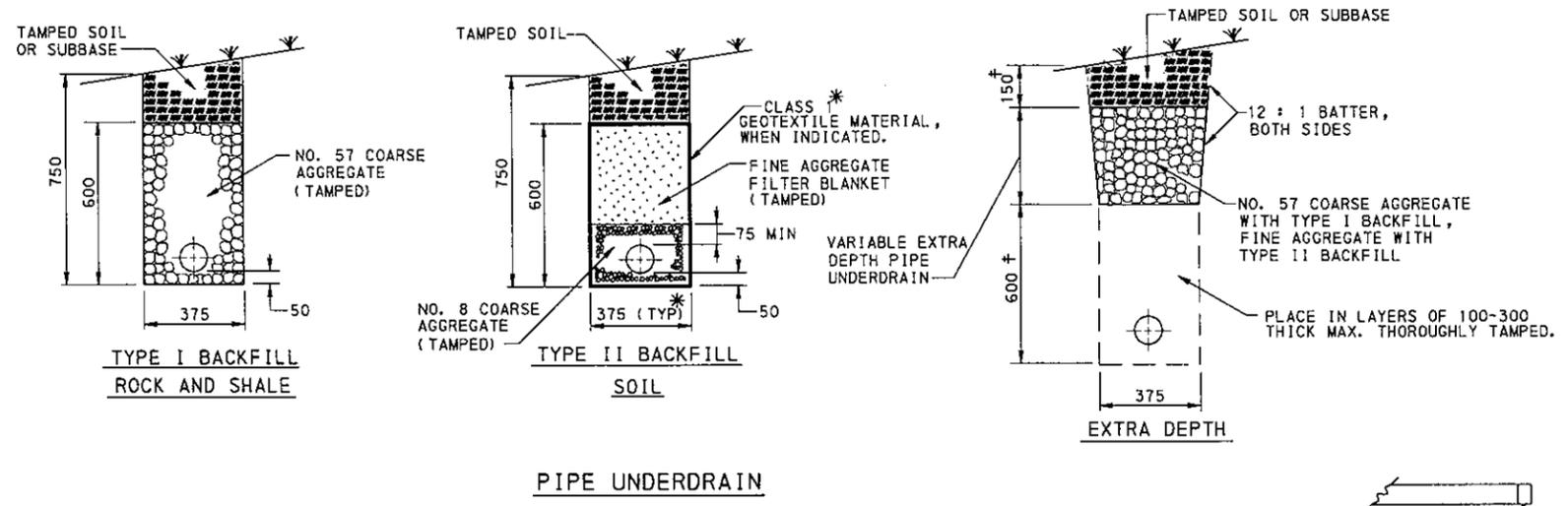
PLAN VIEW
 SUPERELEVATION SECTION

OVERLAY TRANSITIONS

COMMONWEALTH OF PENNSYLVANIA
 DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

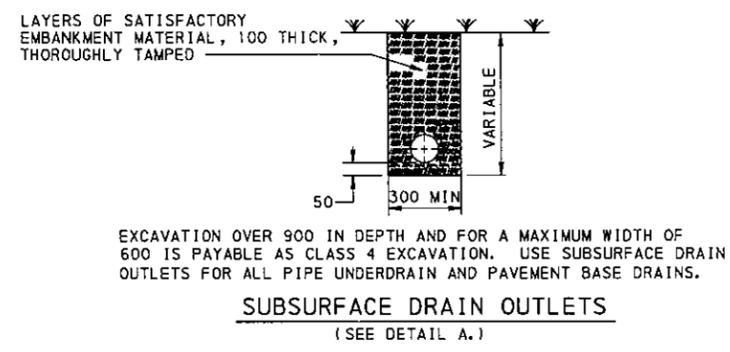
OVERLAY TRANSITIONS
 AND
 PAVING NOTCHES

RECOMMENDED AUG. 16, 1999
 Director, Bureau of Design
 RECOMMENDED AUG. 16, 1999
 Chief Engineer
 SHT 1 OF 1
 RC-28M



NOTES

1. PROVIDE MATERIALS AND CONSTRUCT AS SPECIFIED IN PUBLICATION 408M, 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 408M, SECTION 615. A MINIMUM OF 600 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 (mm) EXCEPT AS NOTED.



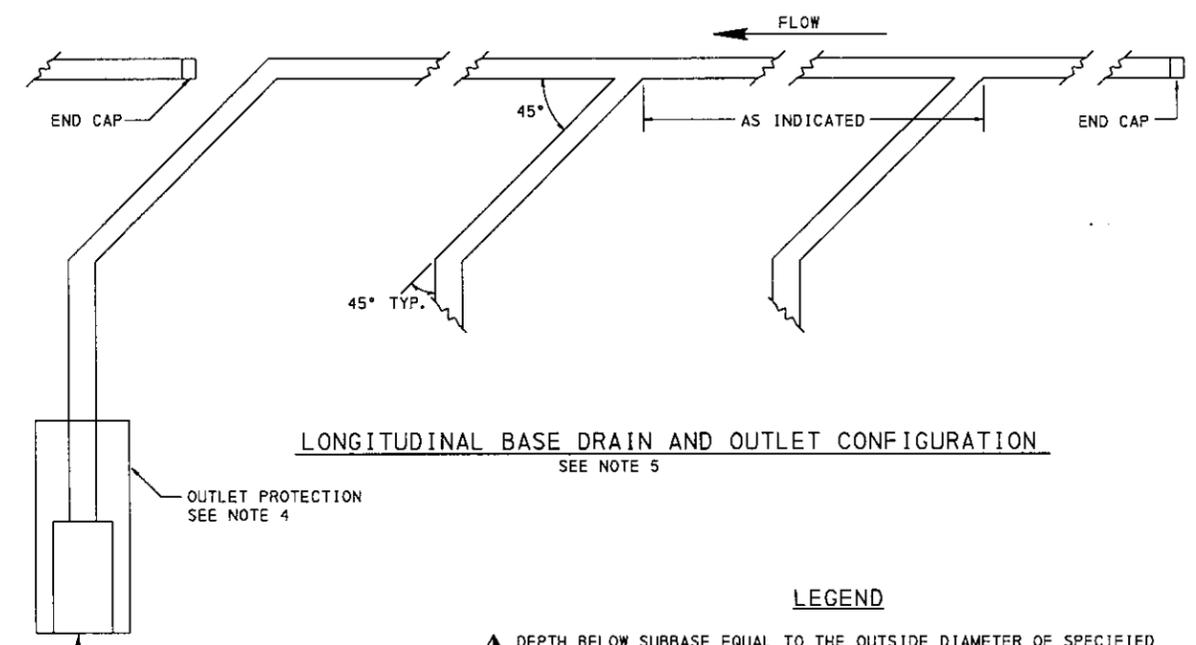
CRIMP AROUND OUTLET END OF PIPE AND SECURE TO PIPE WITH GALVANIZED STEEL WIRE OR OTHER ACCEPTABLE FASTENING METHODS. SEE NOTE 4



19 x 19 WIRE MESH SCREENING, 1.37 THICK MINIMUM, GALVANIZED AFTER WEAVING.

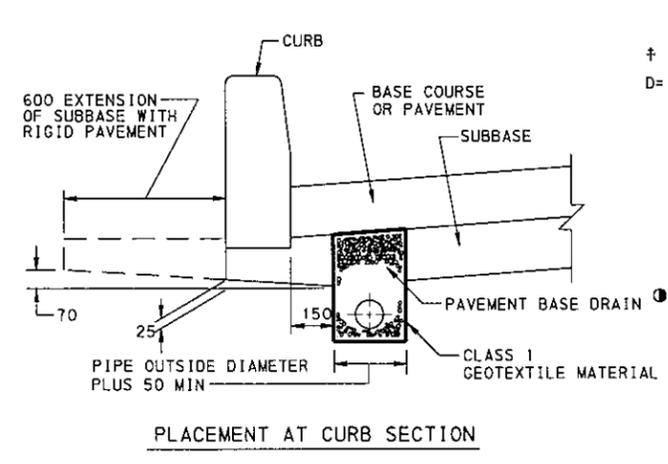
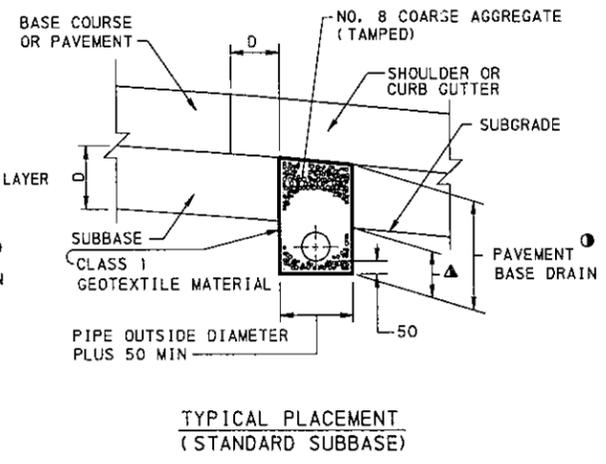
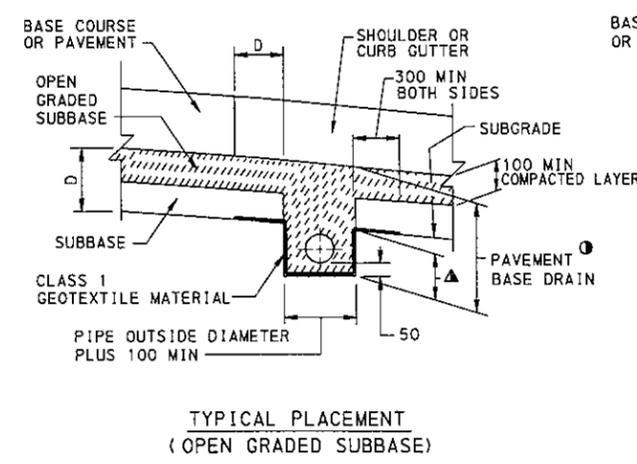
DETAIL A
WIRE MESH SHIELD

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



LEGEND

- ▲ DEPTH BELOW SUBBASE EQUAL TO THE OUTSIDE DIAMETER OF SPECIFIED PIPE PLUS 50.
- 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, BUT NOT LESS THAN 150, WHEN GEOTEXTILE MATERIAL IS INDICATED.
- ‡ TYPE I OR TYPE II BACKFILL
- D= SUBBASE DEPTH

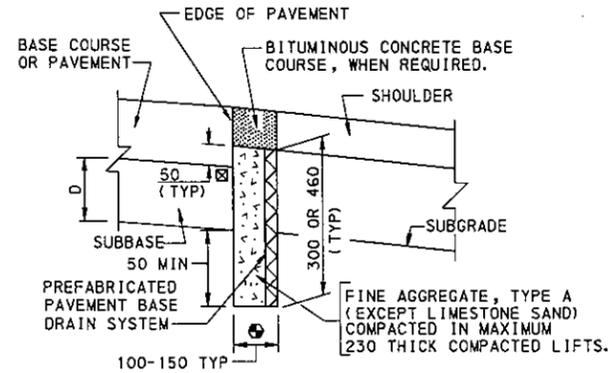


PAVEMENT BASE DRAIN

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

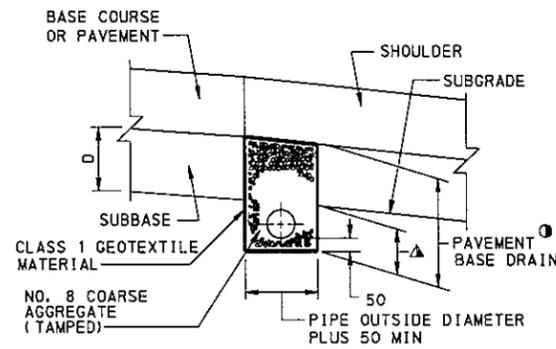
SUBSURFACE DRAINS

RECOMMENDED AUG. 16, 1999 <i>William A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 4 RC-30M
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**PREFABRICATED
PAVEMENT BASE DRAIN
(REHABILITATION)**

SEE NOTE 3.



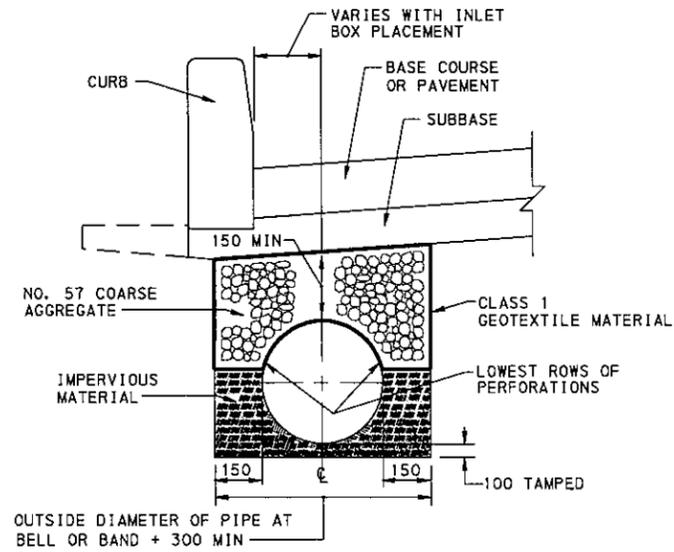
**PAVEMENT BASE DRAIN
(REHABILITATION)**

NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408M, 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.
4. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

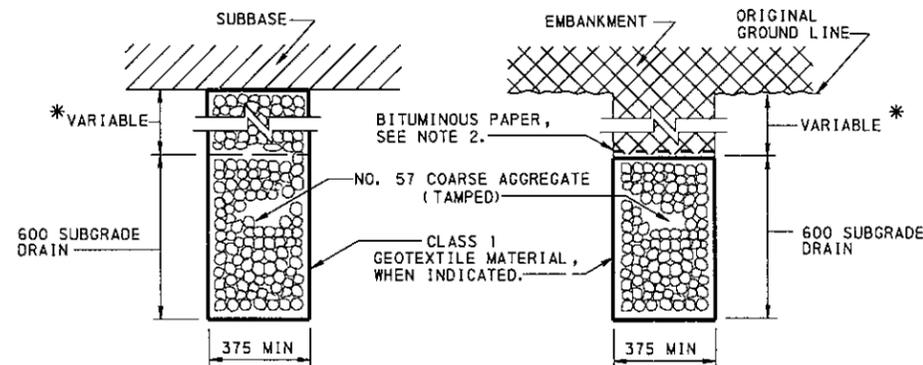
LEGEND

- ▲ DEPTH BELOW SUBBASE EQUAL TO THE OUTSIDE DIAMETER OF SPECIFIED PIPE PLUS 50.
- ⊙ 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 OF BACKFILL AGGREGATE PLUS 25 FOR THE PREFABRICATED BASE DRAIN.
- * VARY TO MAINTAIN THE NECESSARY SUBGRADE SLOPE. CONSIDER ADDITIONAL AGGREGATE INCIDENTAL TO THE SUBGRADE DRAIN PAY ITEM.



**COMBINATION
STORM SEWER AND UNDERDRAIN**

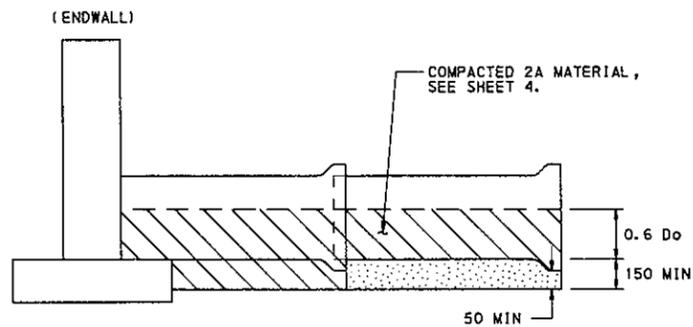
NOTE: PLACE NO. 57 COARSE AGGREGATE, TAMPED IN LAYERS 150 THICK, STARTING AT THE LOWEST ROWS OF PERFORATIONS OR THE START OF THE OPEN JOINT. PLACE GROUPS OF PERFORATIONS OR THE OPEN JOINT (1/3 PIPE CIRCUMFERENCE) SYMMETRICALLY ABOUT THE VERTICAL CENTER LINE.



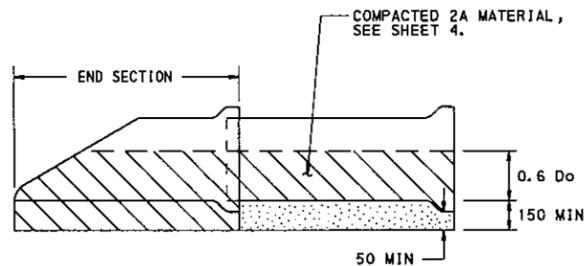
**TREATMENT UNDER SUBBASE TREATMENT UNDER EMBANKMENT
SUBGRADE DRAIN**

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

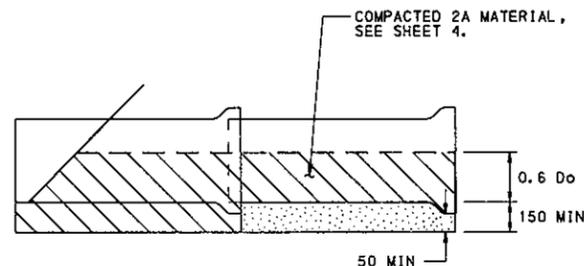
SUBSURFACE DRAINS



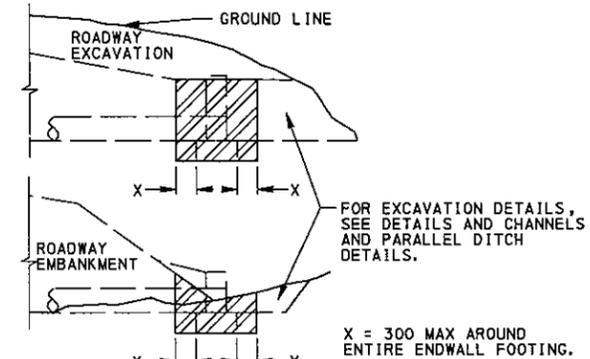
BACKFILL DETAIL AT ENDWALL
(FOR CONCRETE PIPE)



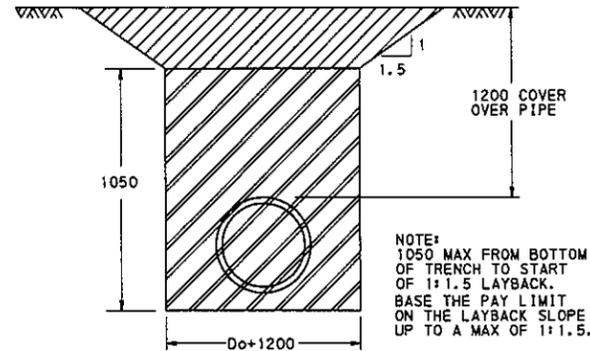
BACKFILL DETAIL AT END SECTION
(FOR CONCRETE PIPE)



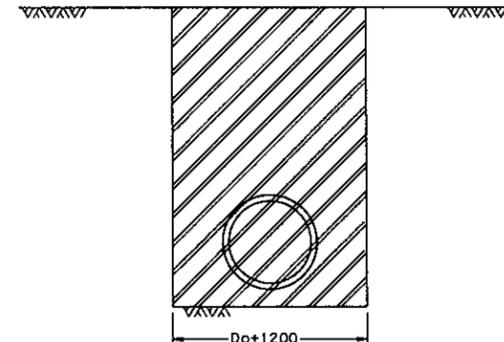
BACKFILL DETAIL AT LAST SECTION OF PIPE
(FOR CONCRETE PIPE)



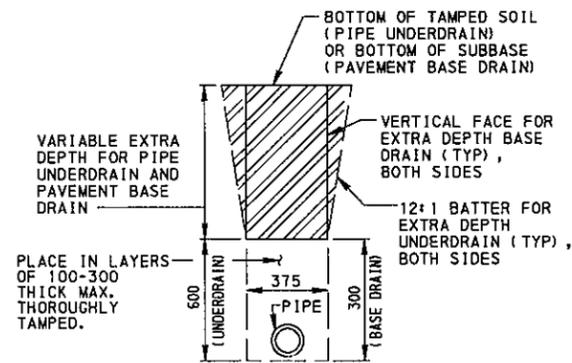
EXCAVATION FOR ENDWALLS



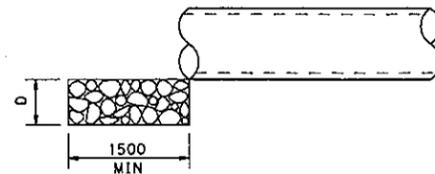
ABOVE DRAWING SHOWS EXCAVATION FOR PIPE IN CUT OR FILL WHERE SUBGRADE IS 1050 OR MORE ABOVE THE BOTTOM OF THE TRENCH.



PAY LIMITS FOR PIPE EXCAVATION



EXTRA DEPTH FOR PIPE UNDERDRAIN AND PAVEMENT BASE DRAIN



DETAIL A - PIPE INLET OR OUTLET PROTECTION

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

NOTES

1. PROVIDE MATERIALS AND CONSTRUCT AS SPECIFIED IN PUBLICATION 408M, 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 408M, 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 ABOVE THE PIPE IS INCIDENTAL TO THE PIPE.
7. FOR BOTTOM TRENCH WIDTHS ≥ 2.5 m, ALL EXCAVATION IS CLASS 1.
8. FOR INLET OR OUTLET PROTECTION SEE DETAIL A.
9. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

LEGEND

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

Do = OUTSIDE DIAMETER OF PIPE, MILLIMETERS.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SUBSURFACE DRAINS
PIPE PLACEMENT
EXCAVATION - BEDDING - BACKFILL

RECOMMENDED AUG. 16, 1999
Sean A. Egan DIRECTOR, BUREAU OF DESIGN
RECOMMENDED AUG. 16, 1999
Gary J. Hoffman CHIEF ENGINEER
SHT 3 OF 4
RC-30M

PIPE INSTALLATION PROCEDURES

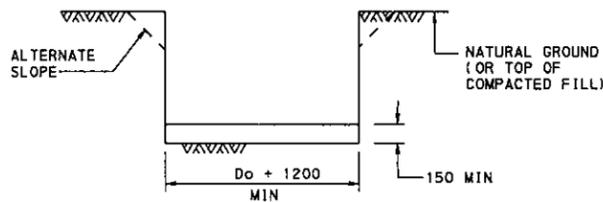
CONSTRUCTION DETAILS BELOW COVER THE FOLLOWING CONDITIONS:

- (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 ABOVE THE TOP OF PIPE OR TO THE SUBGRADE ELEVATION, WHICHEVER IS LESS. FOR PIPES 1800 OR GREATER SEE NOTE 1.

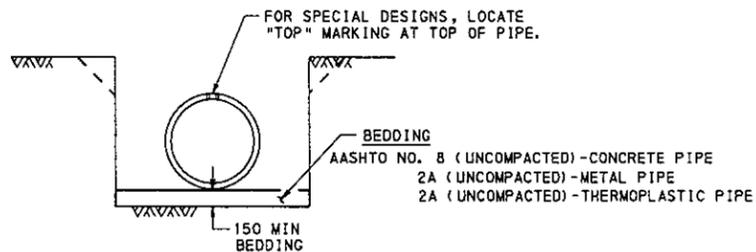
STEP 3: EXCAVATE THE TRENCH TO THE WIDTH OF THE OUTSIDE DIAMETER OF THE PIPE PLUS 1200 AND CREATE AN APPROPRIATE BEDDING 150 DEEP.



STEP 4: FOR CONCRETE PIPE, IF THIS EXCAVATION IS THROUGH ROCK, OR HARD SHALE, OR IN AREAS OF UNDERCUT, PROVIDE 150+40 mm/m OF (Do+1200) BELOW THE INTENDED BOTTOM ELEVATION OF THE PIPE. (300 MAX)

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

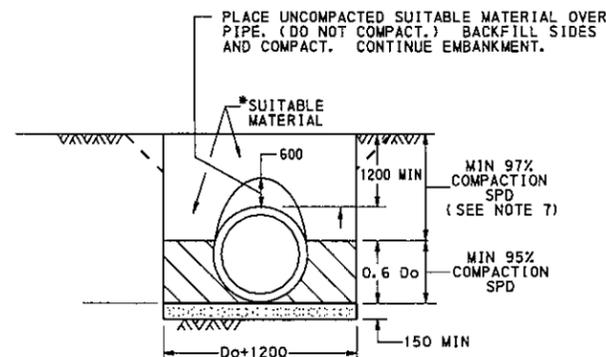
STEP 5: LAY PIPE ON APPROPRIATE BEDDING. SEE STEP 60 FOR METAL PIPE ARCH AND METAL PLATE PIPE ARCH.



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.

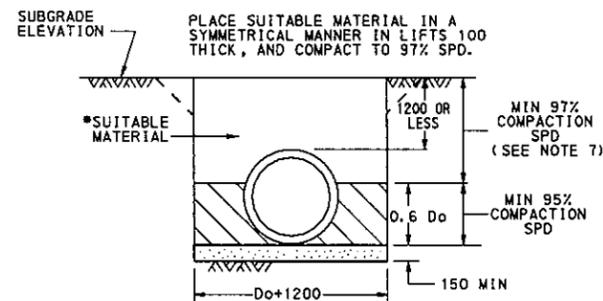
STEP 6A: CONCRETE PIPE

PLACE 2A COARSE AGGREGATE MATERIAL (IN LIFTS 100 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

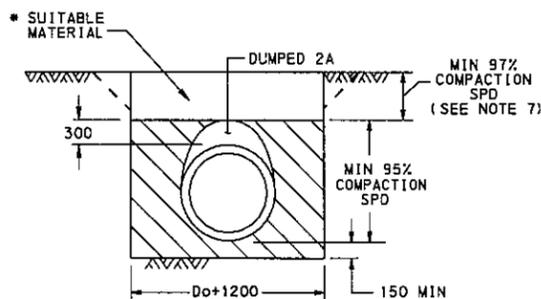


SHALLOW FILLS 1200 AND LESS

CONCRETE PIPE

STEP 6B: METAL PIPE AND METAL PLATE PIPE

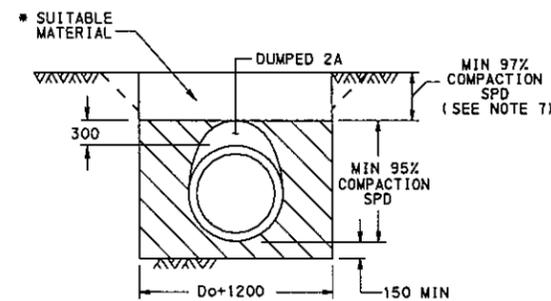
PLACE 2A COARSE AGGREGATE MATERIAL (IN LIFTS 100 THICK) ADJACENT TO THE LOWER HAUNCHES TO A HEIGHT OF 300 ABOVE TOP OF PIPE. COMPACT TO 95% SPD. TEST THE BACKFILL MATERIAL AND CONTINUE EMBANKMENT IN ACCORDANCE WITH SECTION 601.



METAL PIPE AND METAL PLATE PIPE

STEP 6C: THERMOPLASTIC PIPE

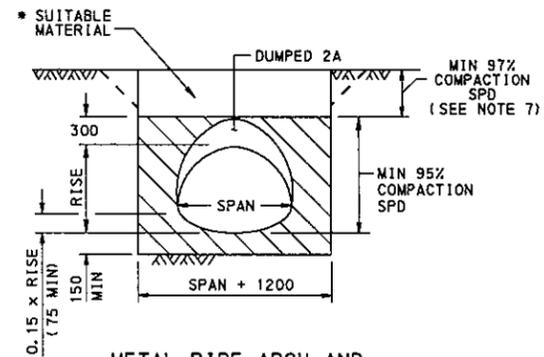
PLACE 2A COARSE AGGREGATE MATERIAL (IN LIFTS 100 THICK) ADJACENT TO THE LOWER HAUNCHES TO A HEIGHT OF 300 ABOVE TOP OF PIPE. COMPACT TO 95% SPD. TEST THE BACKFILL MATERIAL AND CONTINUE EMBANKMENT IN ACCORDANCE WITH SECTION 601.



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 THICK) ADJACENT TO THE LOWER HAUNCHES TO A HEIGHT OF 300 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

NOTES

1. THE INSTALLATION OF PIPES 1800 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. 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 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 408M, SECTION 601.
6. PERMIT PLACEMENT OF BACKFILL MATERIAL IN LAYERS (LIFTS) 200 THICK WHEN USING VIBRATORY COMPACTION EQUIPMENT.
7. COMPACT TOP 1.0m OF SUBGRADE TO 100% IN ACCORDANCE WITH SECTION 206.3.
8. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

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

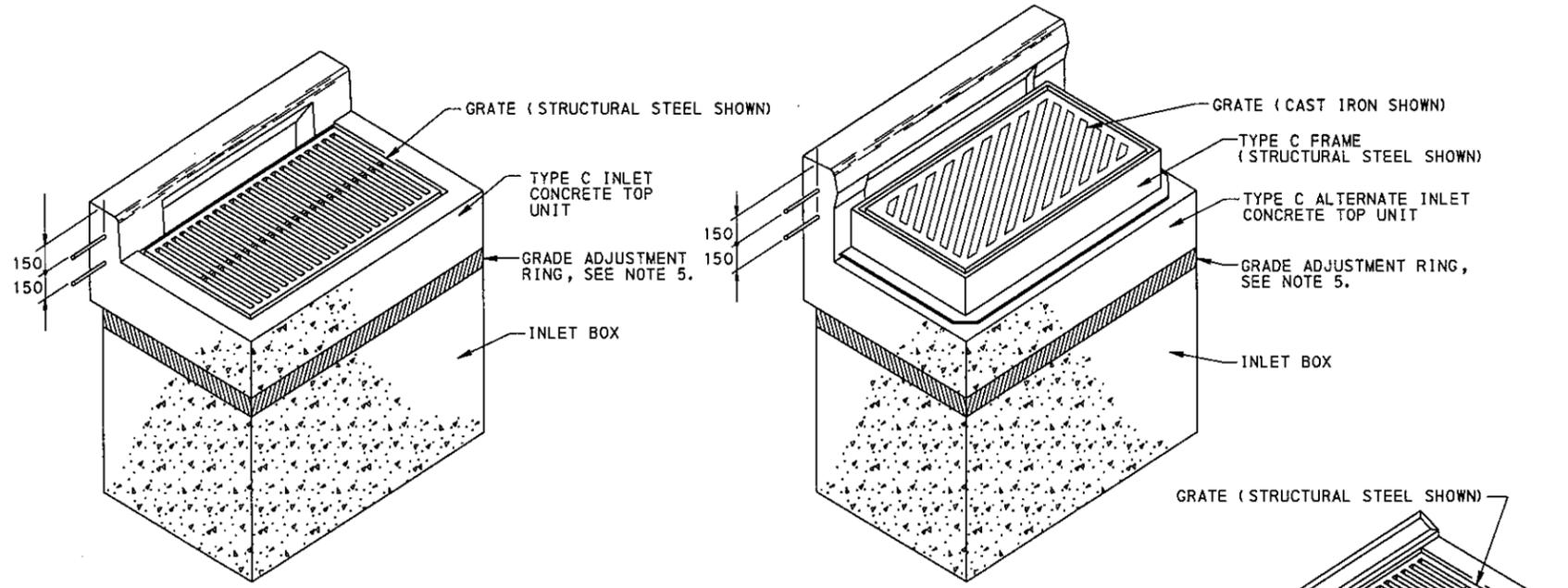
SUBSURFACE DRAINS
 PIPE PLACEMENT
 EXCAVATION - BEDDING - BACKFILL

NOTES

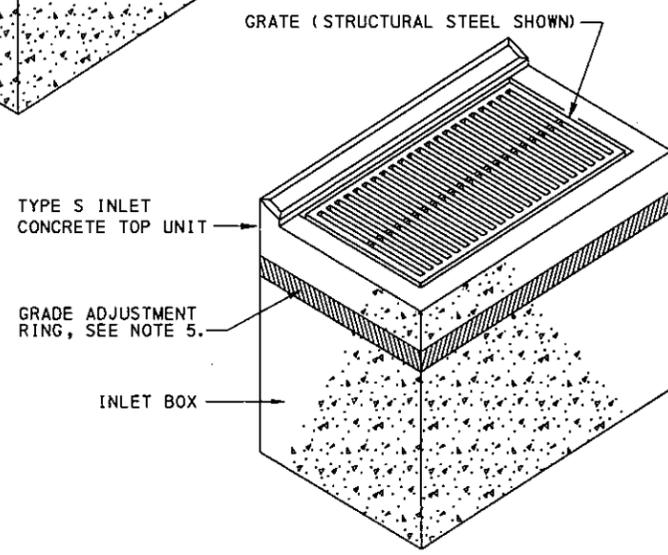
1. CONSTRUCTION REQUIREMENTS:
 - A. CONSTRUCT IN ACCORDANCE WITH PUBLICATION 408M, SECTIONS 605, 606 AND 714; AND AS MODIFIED HEREIN.
 - B. MINIMUM CONCRETE CLASS:

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

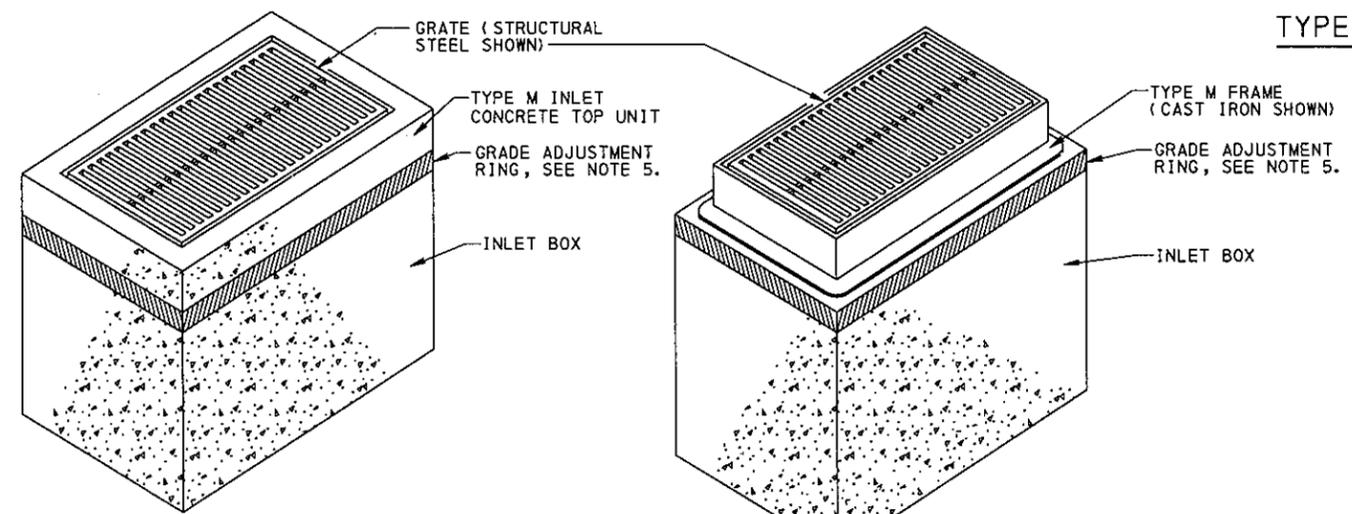
WALLS:	CAST-IN PLACE	50
	PRECAST	40
FOOTINGS:	CAST-IN PLACE	60 (TOP BARS)
		80 (BOTTOM BARS)
	PRECAST	50 (TOP BARS)
		40 (BOTTOM BARS)
		40 (SIDE COVER)
SLABS:	CAST-IN PLACE	50 (TOP & BOTTOM BARS)
2. THIS SHEET DEPICTS THE VARIOUS COMPONENTS REQUIRED FOR COMPLETE INLET ASSEMBLIES. FOR INDIVIDUAL COMPONENTS 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 mm \varnothing m MIN EACH WAY, EACH FACE.
7. FOR FOOTING REINFORCEMENT, TOP AND BOTTOM, USE NO. 13 BARS AT 300 CENTERS EACH WAY OR 420 mm /m WWF (152 MAX SPACING).
8. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.
9. PROVIDE WEEP HOLES ON INLET BOXES WHEN NECESSARY.



TYPE C INLET



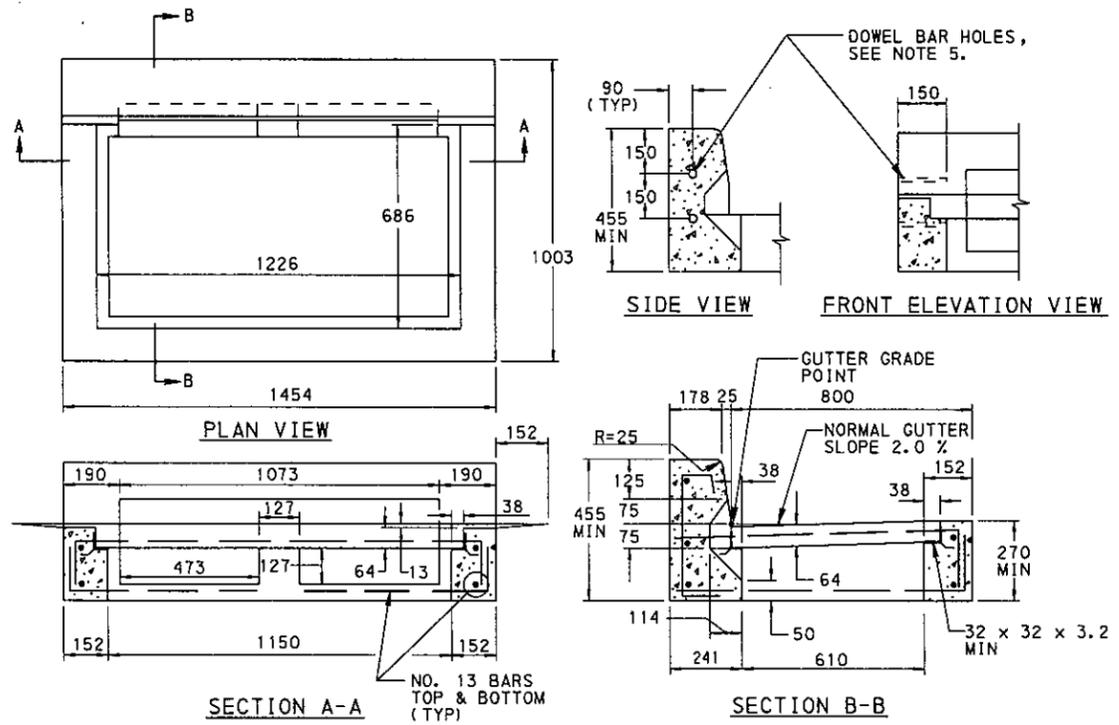
TYPE S INLET



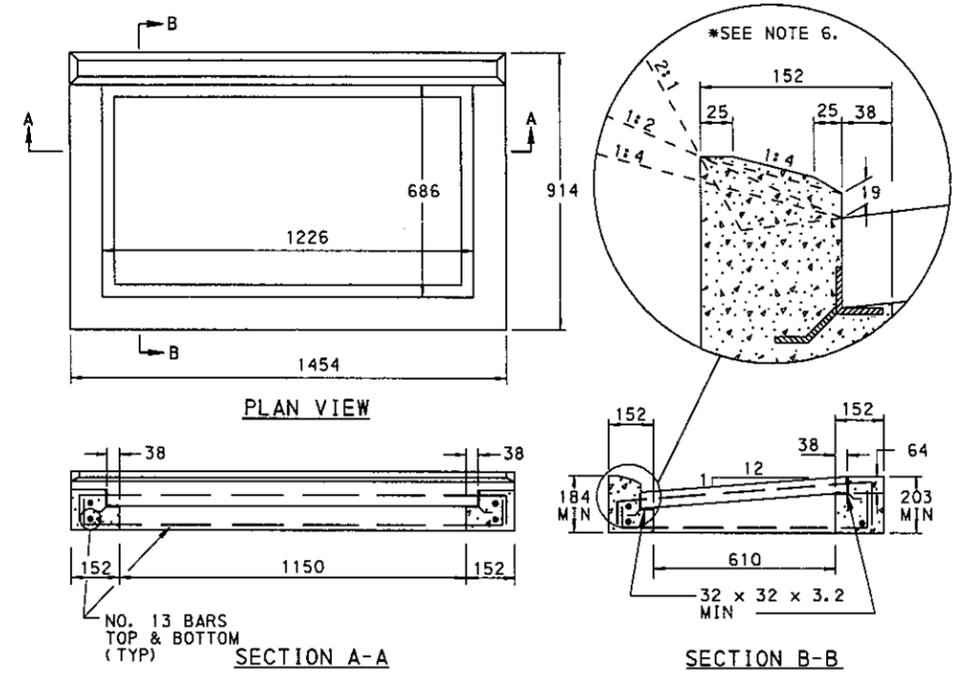
TYPE M INLET

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
INLETS INLET ASSEMBLIES		
RECOMMENDED AUG. 16, 1999 <i>Dean P. Schaefer</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Darryl L. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 10 RC-34M

LE-006-1112



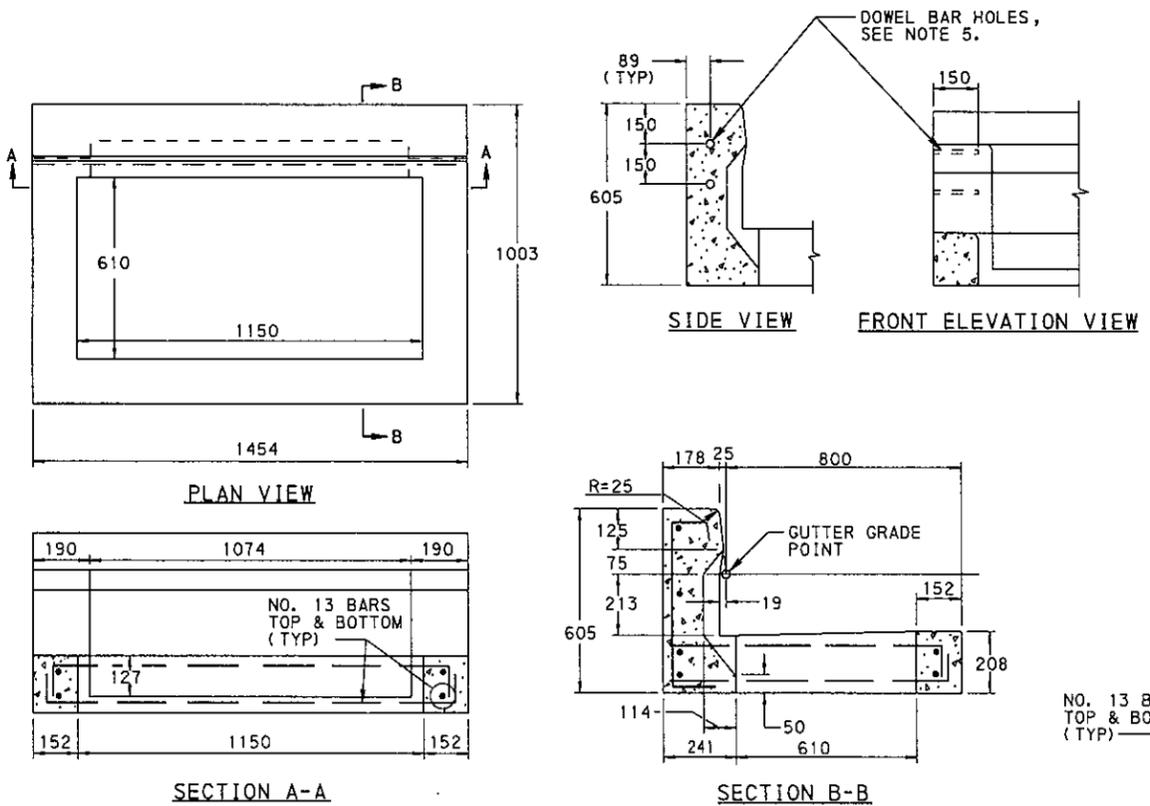
TYPE C



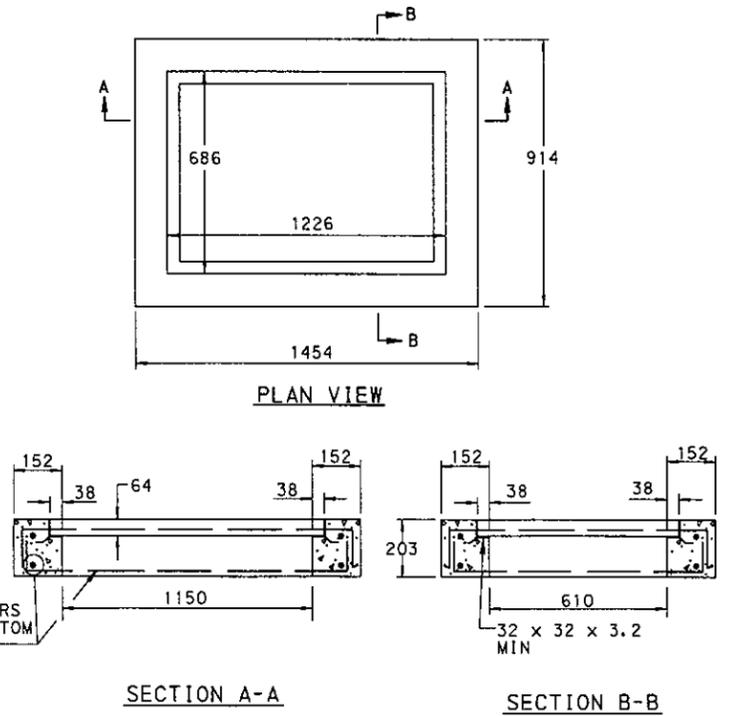
TYPE S

NOTES

1. THIS SHEET DEPICTS THE SHAPE AND DIMENSIONS REQUIRED FOR UNIFORMITY AND COMPATIBILITY. IT DOES NOT INCLUDE DETAILS REQUIRED FOR MANUFACTURING AND HANDLING PRECAST TOP UNITS. PERMIT ONLY TOP UNITS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT AN 841 x 594 REPRODUCIBLE SHOP DRAWING TO THE BUREAU OF CONSTRUCTION AND MATERIALS, MATERIALS AND TESTING DIVISION FOR REVIEW AND APPROVAL.
2. CAST-IN-PLACE TOP UNITS MAY BE MONOLITHIC WITH THE INLET BOX.
3. PROVIDE ANGLES EMBEDDED IN THE CONCRETE AS A BEARING AREA FOR THE GRATE FOR ALL TOP UNITS WHICH SEAT THE GRATE DIRECTLY WITHIN THE UNIT.
4. PLACE A TYPE M INLET ADJACENT TO THE BACK EDGE OF THE CURB, FLUSH WITH THE PAVEMENT SURFACE, WHEN REQUIRED WITHIN A CONCRETE MOUNTABLE CURB SECTION.
5. DOWEL TYPE C INLET TOP UNITS WITH 2-NO. 25 x 300 DOWEL BARS AND PLACE PREMOLED EXPANSION JOINT FILLER 6 WIDE WHEN CONNECTING TO ADJACENT CURB SECTIONS.
6. THE PLACEMENT OF THE TYPE S INLET RELATIVE TO THE GUTTER INVERT IS DEPENDENT ON THE RATE OF BACK SLOPE. FOR BACK SLOPES GREATER THAN 1:2, LOCATE THE INLET WHERE THE BACK SLOPE LINE INTERSECTS THE BACK, TOP, OUTSIDE CORNER OF THE INLET. FOR BACK SLOPES LESS THAN 1:2, LOCATE THE INLET WHERE THE BACK SLOPE LINE INTERSECTS THE EDGE OF THE INLET GRATE.
7. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



TYPE C ALTERNATE



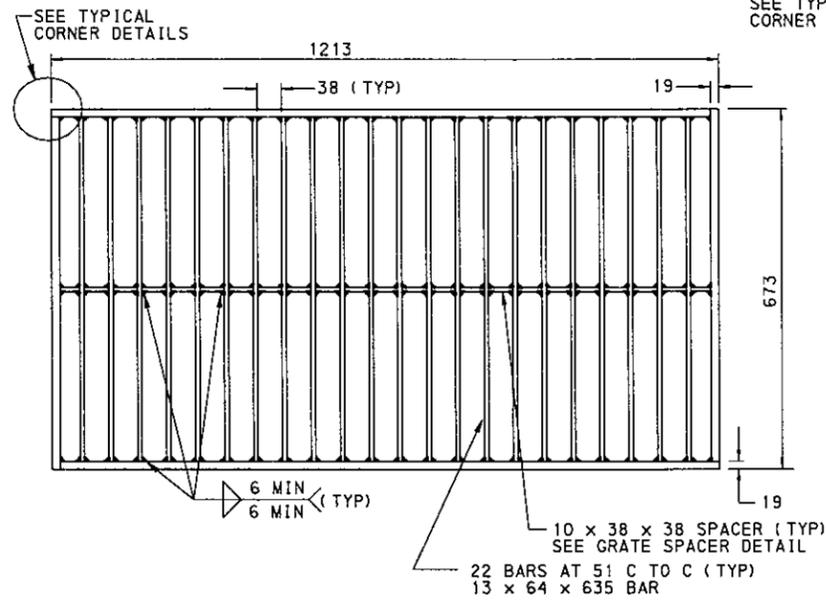
TYPE M

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

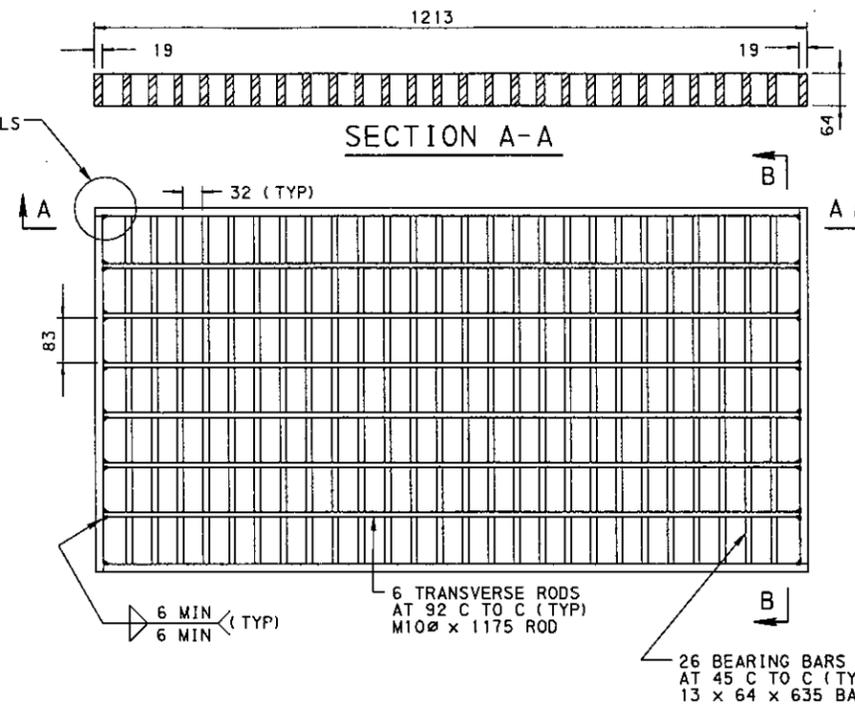
INLETS
CONCRETE TOP UNITS

NOTES

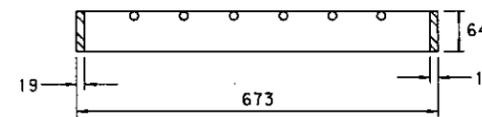
1. THIS SHEET DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. IT DOES NOT INCLUDE DETAILS REQUIRED FOR FABRICATION OR MANUFACTURING. PERMIT ONLY GRATES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT AN 841 x 594 REPRODUCIBLE SHOP DRAWING TO 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 408M, 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.
7. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



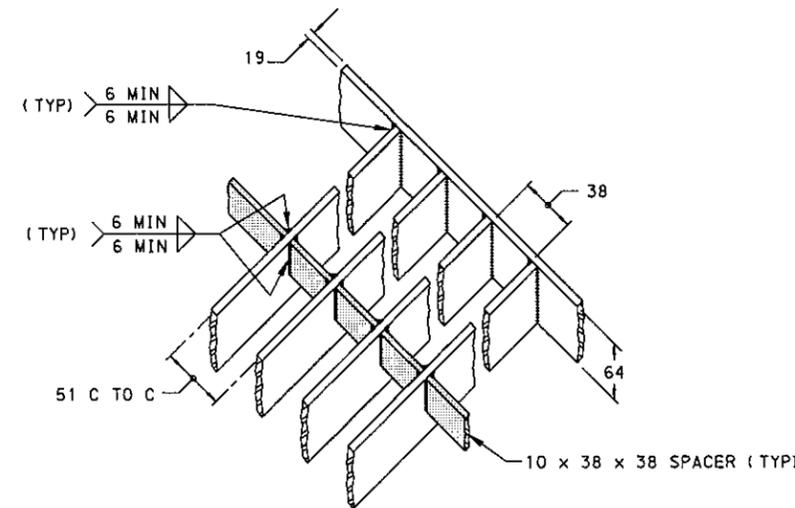
STRUCTURAL STEEL GRATE



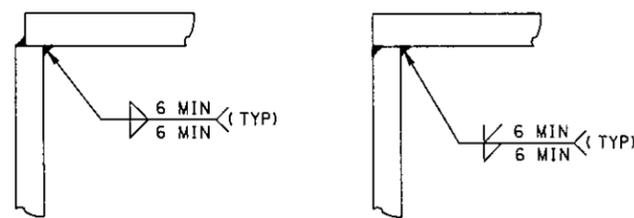
**STRUCTURAL STEEL GRATE
BICYCLE SAFE**



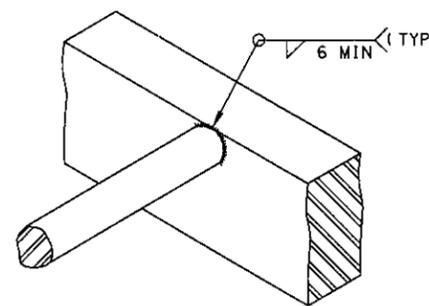
SECTION B-B



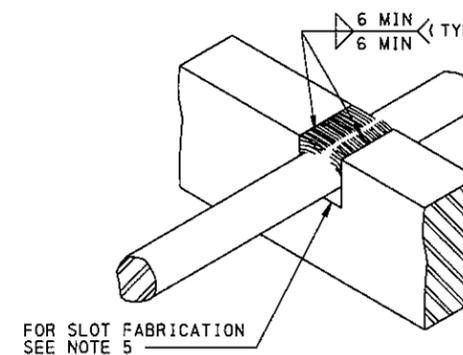
GRATE SPACER DETAIL



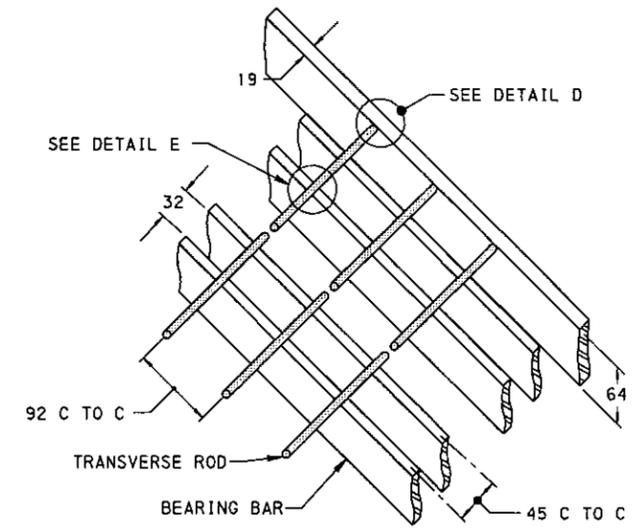
TYPICAL CORNER DETAILS



DETAIL D



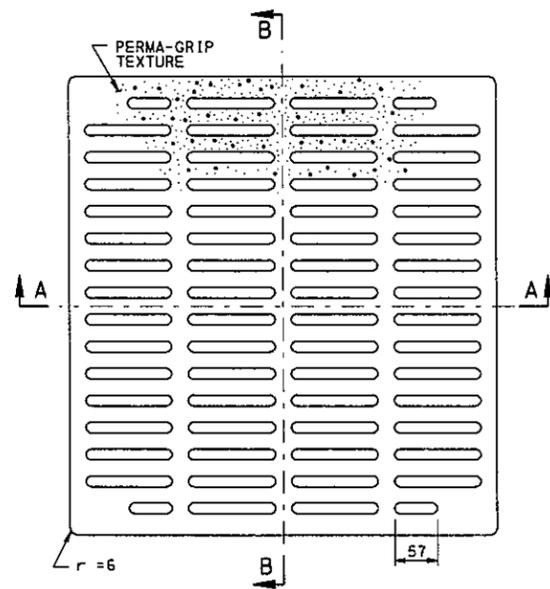
DETAIL E



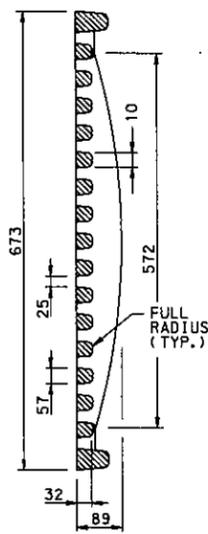
BAR & ROD SPACING DETAIL

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

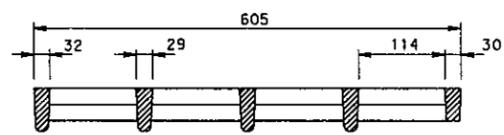
**INLET
GRATES**



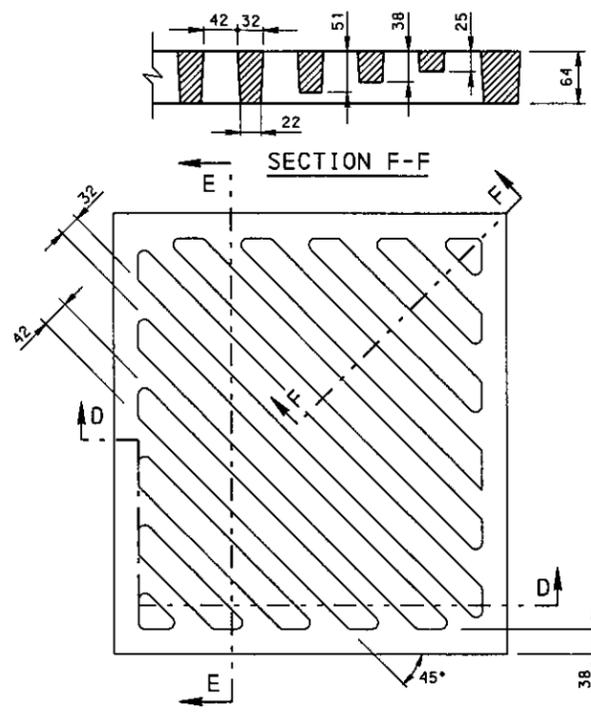
PLAN - BICYCLE-SAFE GRATE



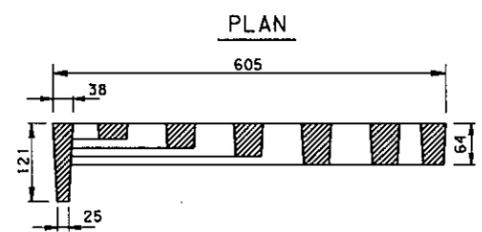
SECTION B-B



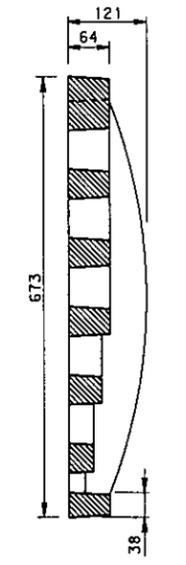
SECTION A-A



SECTION F-F

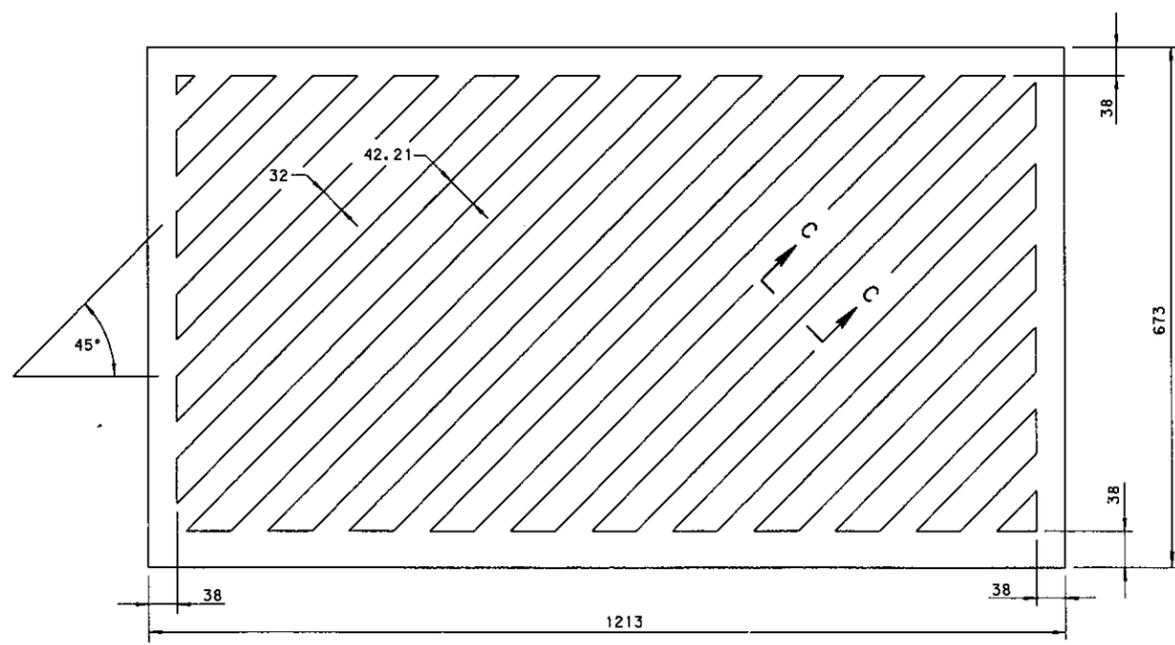


SECTION D-D

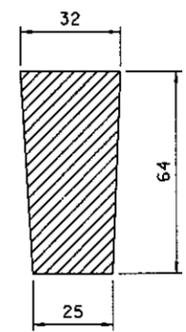


SECTION E-E

TWO PIECE GRATES



PLAN - ONE PIECE GRATE



SECTION C-C

CAST GRAY IRON GRATES

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

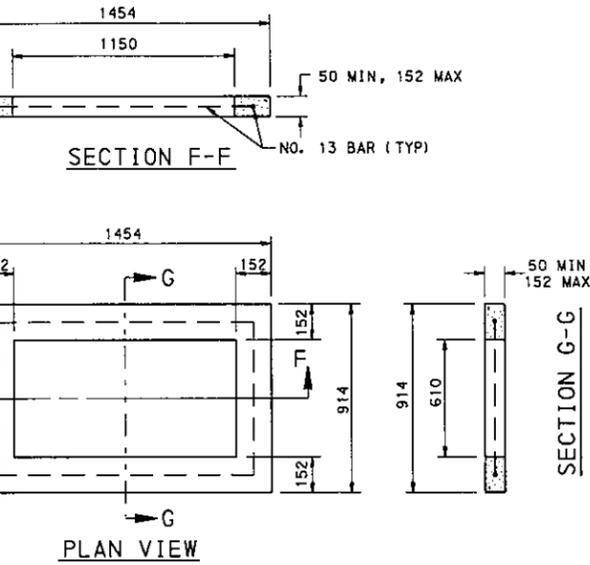
NOTES

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 AN 841 x 594 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.
4. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

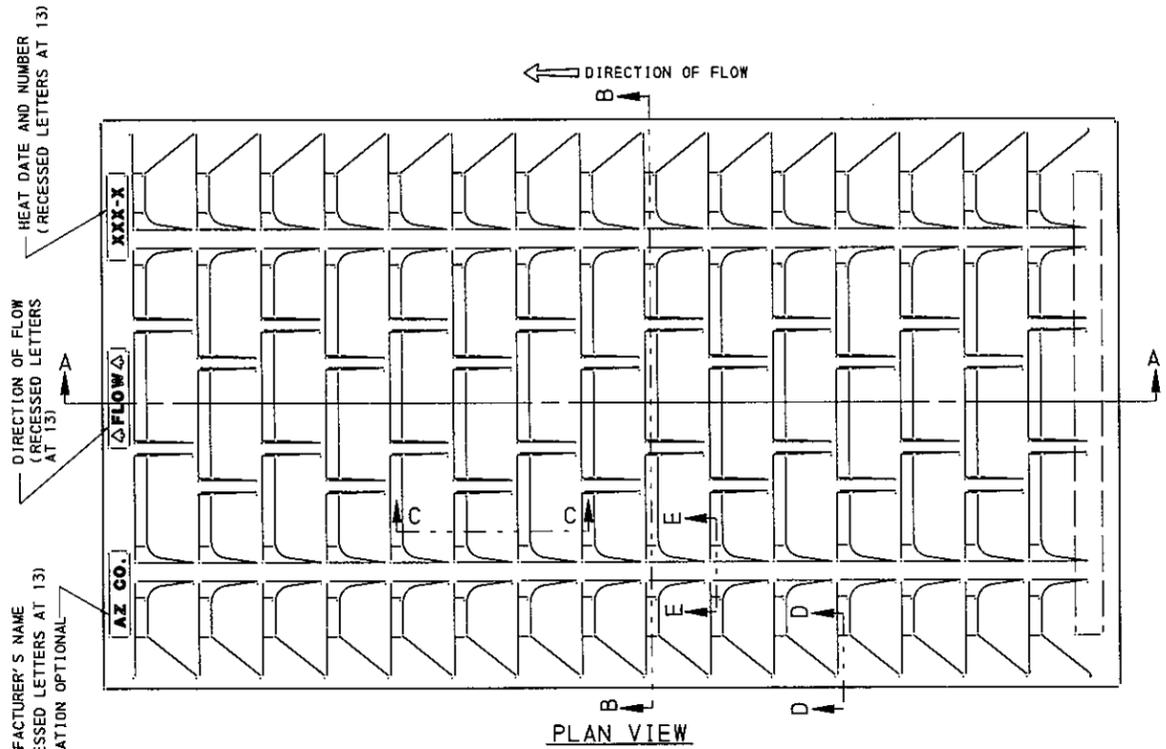
COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
INLET GRATES		
RECOMMENDED AUG. 16, 1999 <i>Sean A. Scher</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Gary J. Hoffman</i> CHIEF ENGINEER	SHT 4 OF 10 RC-34M

NOTES

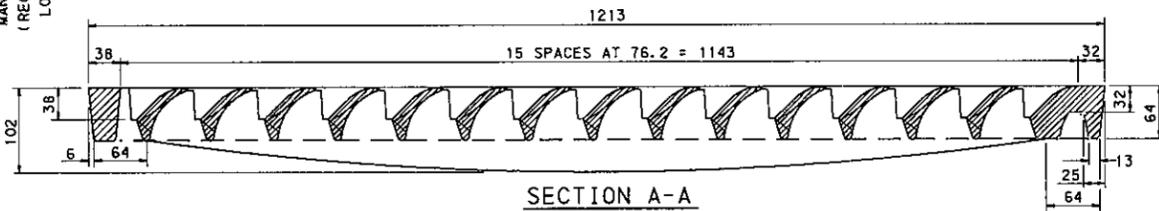
1. PROVIDE MATERIALS AND CONSTRUCTION IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408M, SECTIONS 605, 606 AND 714. PERMIT ONLY GRATES AND GRADE ADJUSTMENT SYSTEMS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT AN 841 x 594 REPRODUCIBLE SHOP DRAWING TO THE MATERIALS 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 (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.
7. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



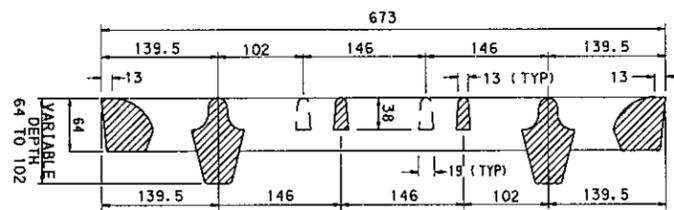
**PRECAST CONCRETE
GRADE ADJUSTMENT RINGS**



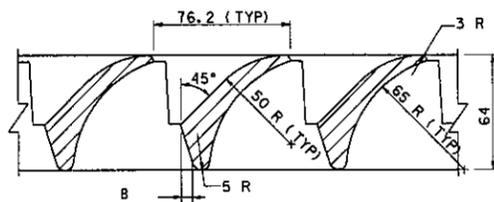
PLAN VIEW



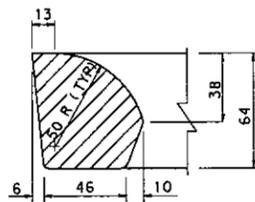
SECTION A-A



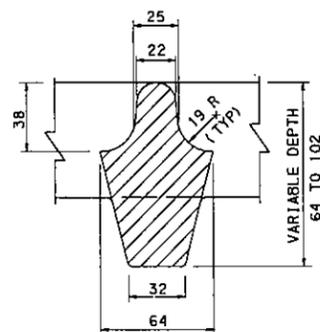
SECTION B-B



SECTION C-C



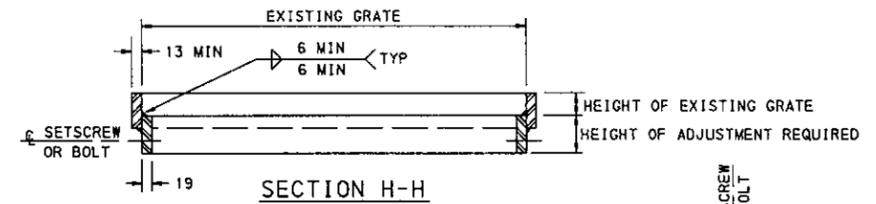
SECTION D-D



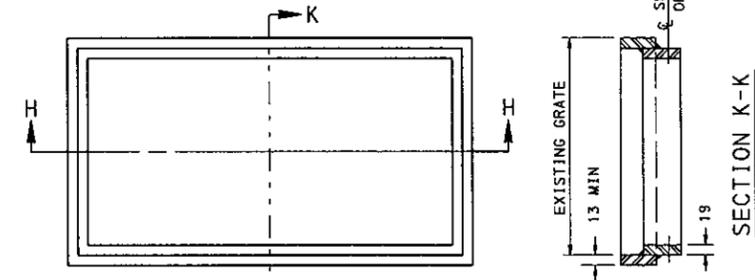
SECTION E-E

CAST IRON VANE GRATE

SEE NOTE 7



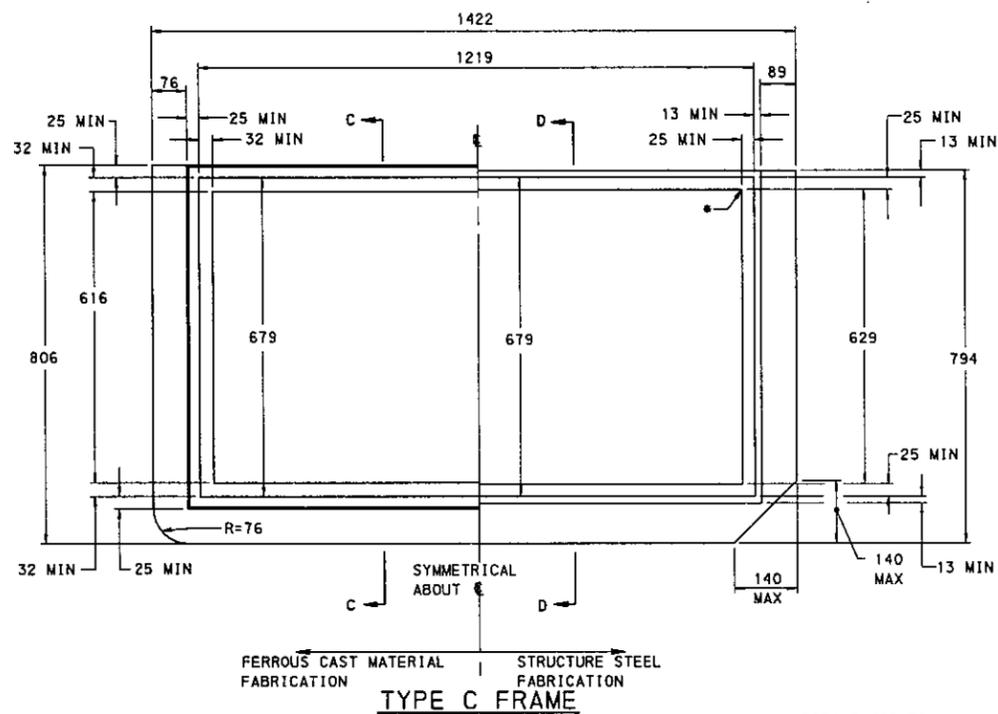
SECTION H-H



PLAN VIEW

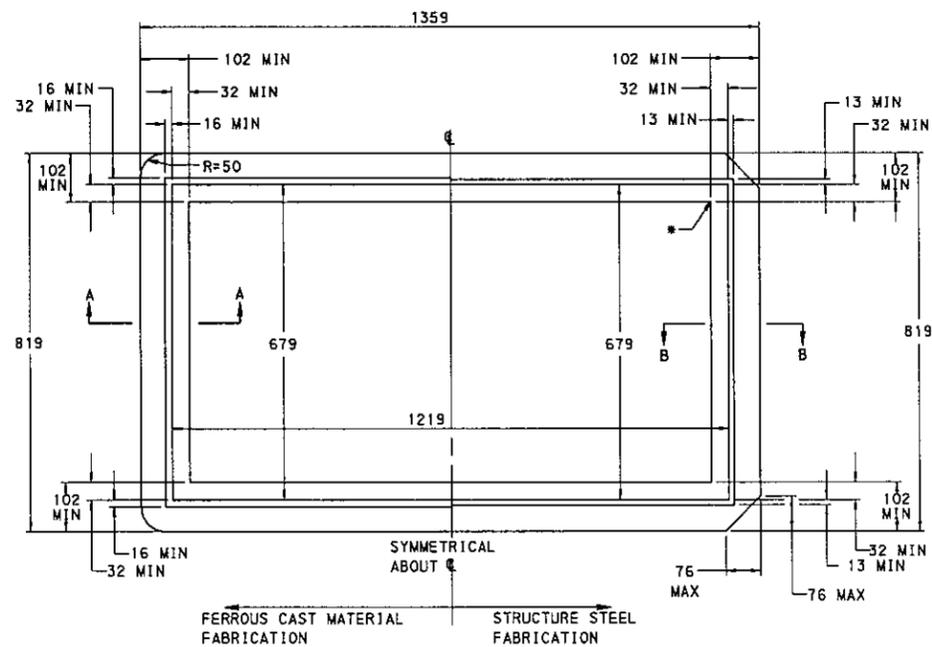
**STRUCTURAL STEEL
GRADE ADJUSTMENT RINGS**

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
INLET GRATES & GRADE ADJUSTMENT RINGS		
RECOMMENDED AUG. 16, 1999 <i>Alan A. Scher</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Charles L. Hoffman</i> CHIEF ENGINEER	SHT 5 OF 10 RC-34M

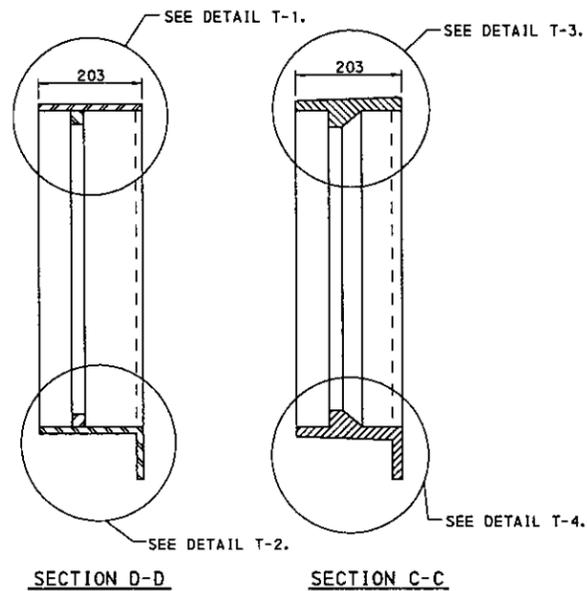


TYPE C FRAME

*APPROVE CORNER CONFIGURATION DETAILS THAT ARE THE FABRICATOR'S RESPONSIBILITY.

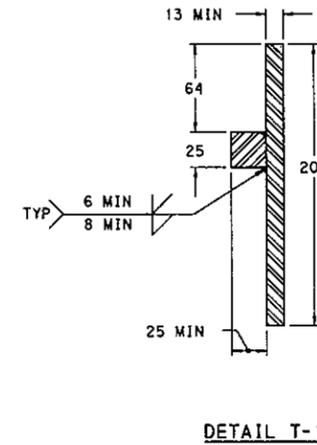


TYPE M FRAME

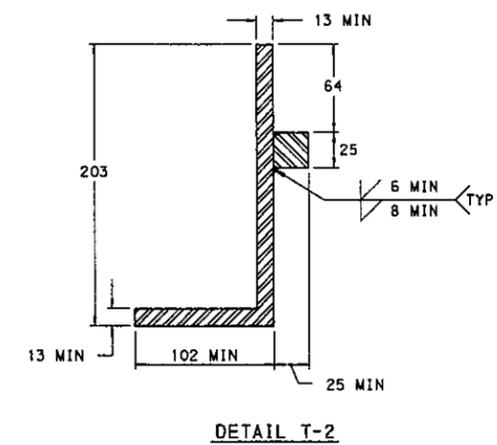


SECTION D-D

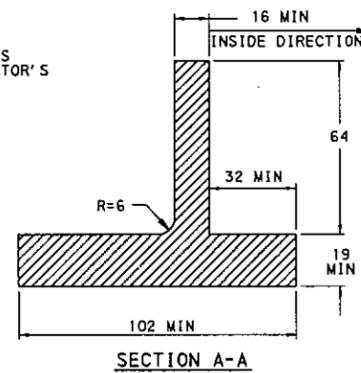
SECTION C-C



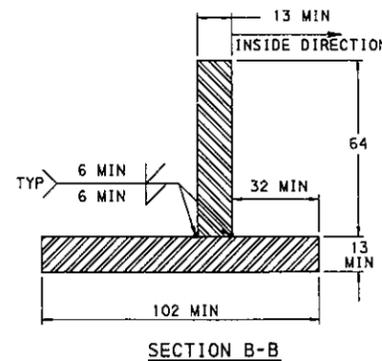
DETAIL T-1



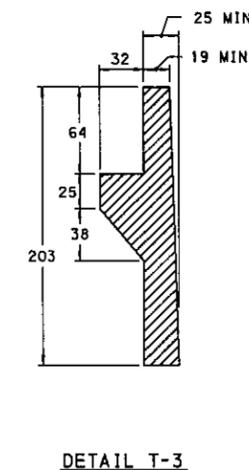
DETAIL T-2



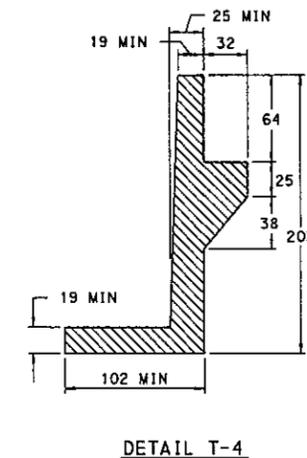
SECTION A-A



SECTION B-B



DETAIL T-3



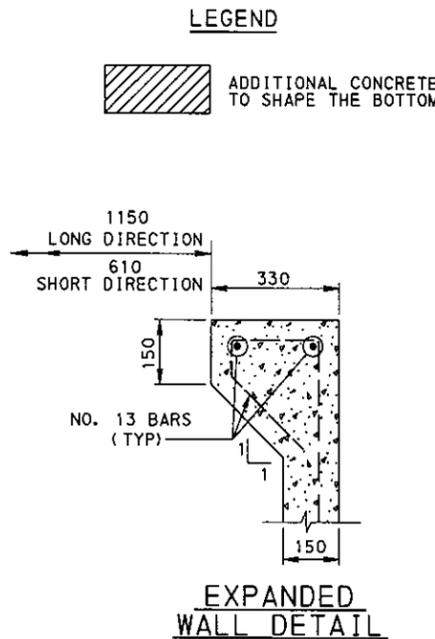
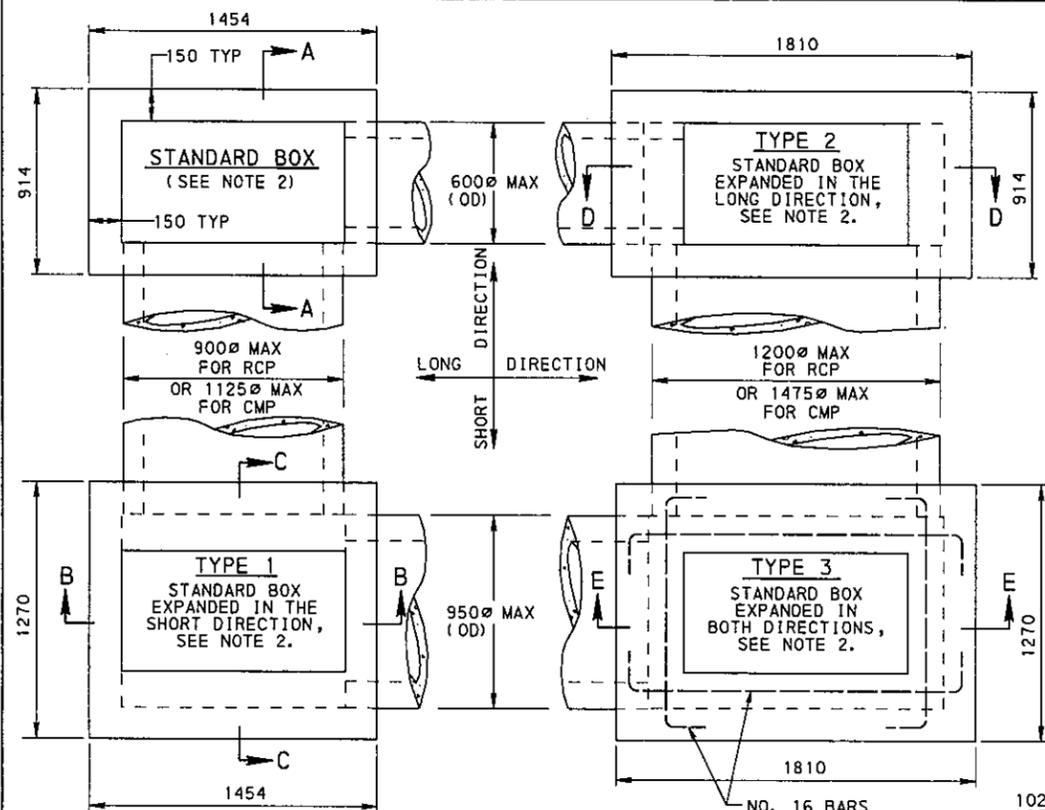
DETAIL T-4

NOTES

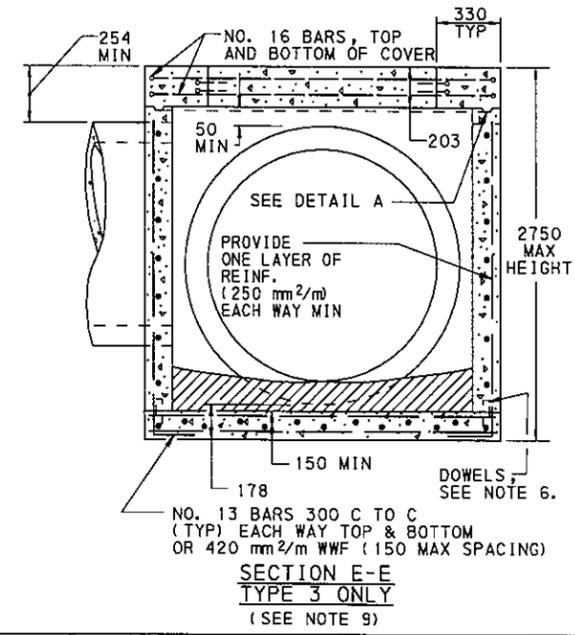
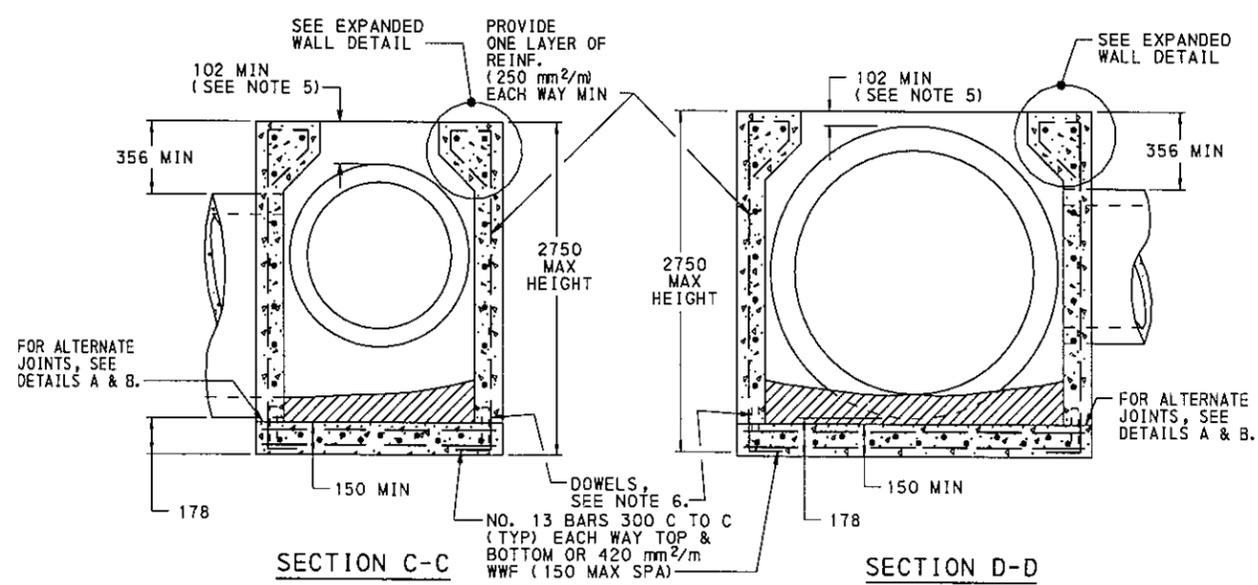
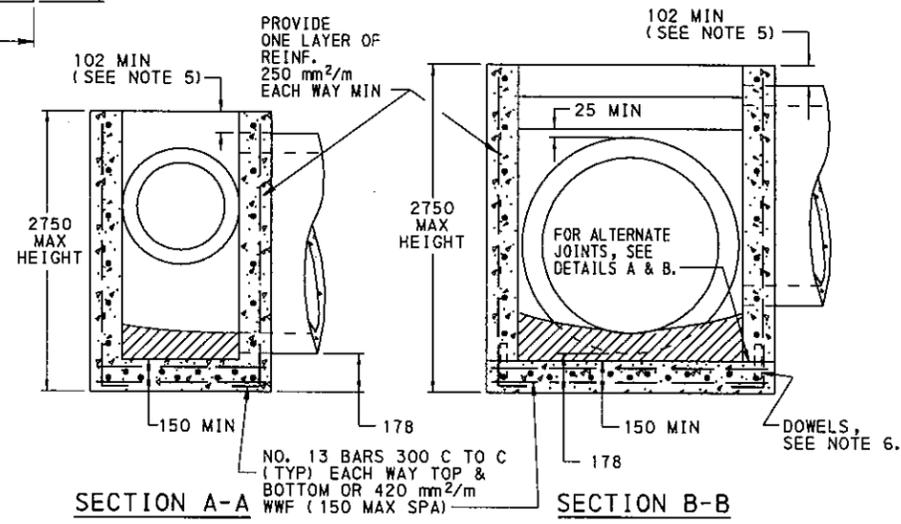
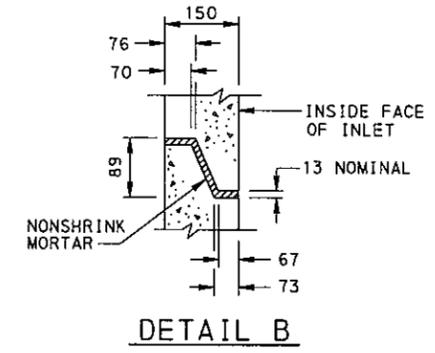
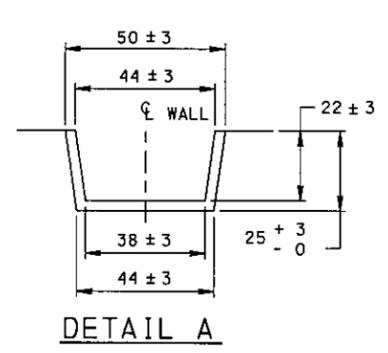
1. THIS SHEET DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. IT DOES NOT INCLUDE DETAILS REQUIRED FOR FABRICATION OR MANUFACTURING. PERMIT ONLY FRAMES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT AN 841 x 594 REPRODUCIBLE SHOP DRAWING TO 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, SECTION 1105.03(r).
4. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

**INLET
FRAMES**



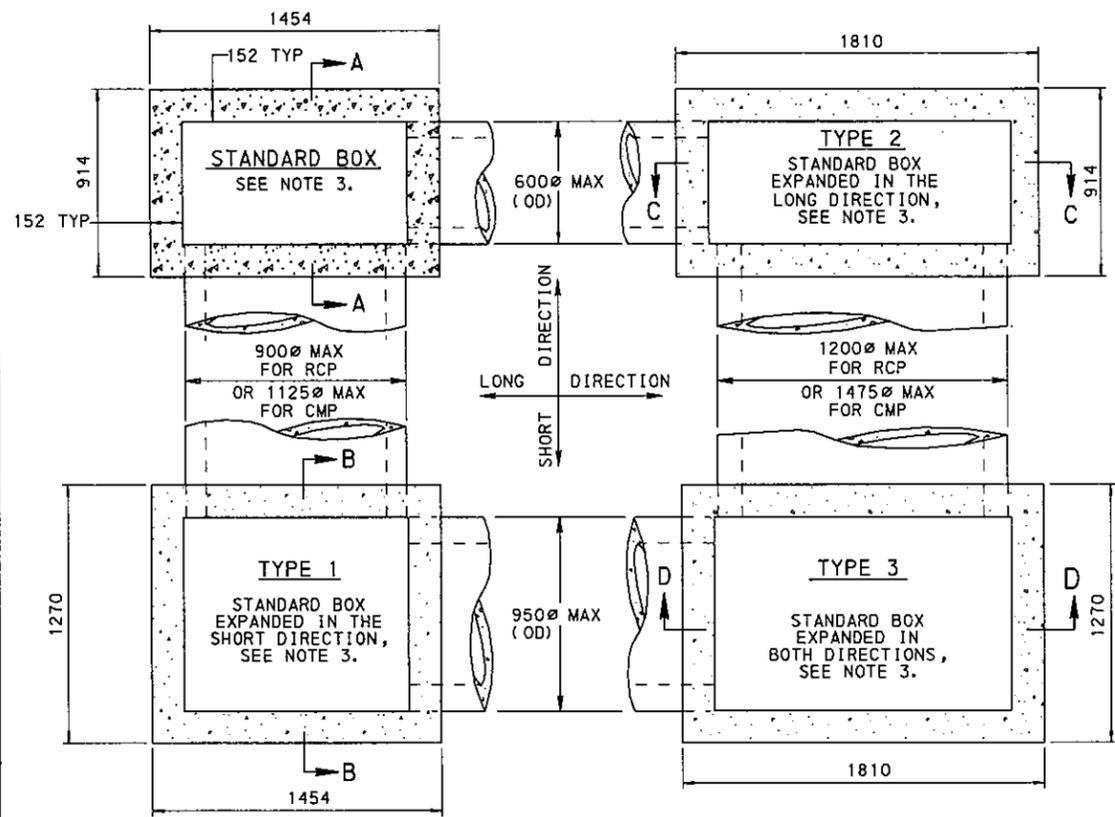
- NOTES**
1. CONSTRUCT INLET BOXES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408M, SECTION 605.
 2. PROVIDE INLET BOXES WITH 610 x 1150 STANDARD OPENING TO ACCOMMODATE THE STANDARD TOP COMPONENTS.
 3. FOR CAST-IN-PLACE OR PRECAST CONSTRUCTION, PROVIDE INLET WALLS 150 THICK, UNLESS OTHERWISE 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 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 FROM THE TOP OF THE INLET BOX, PROVIDE AN ADDITIONAL #10 REINFORCEMENT BAR LOCATED 40 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.
 6. PLACE #13 REINFORCEMENT BARS, MINIMUM 300 LONG, SPACED AT 300 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 MINIMUM FROM THE BOTTOM OF THE PIPE TO THE BOTTOM OF THE INLET BOX.
 8. FOR PIPE DIAMETERS LARGER THAN 1200 RCP OR 1350 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 LOADING AND IN ACCORDANCE WITH PUBLICATION 408M.
 10. CONSTRUCTION JOINTS AND KEYS MAY BE CONSTRUCTED UPWARDS OR DOWNWARDS. CLEAN JOINTS AND KEYS THOROUGHLY BEFORE PLACING NEXT CONCRETE SEGMENT.
 11. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.
 12. FOR SUBBASE, SEE NOTE 6 ON SHEET 8.
 13. WHEN NECESSARY, THE BLOCKOUT MAY REMOVE UP TO 25 mm (1") OF EACH WALL AT 3:00/9:00 LOCATIONS FOR RC PIPE CONNECTIONS.



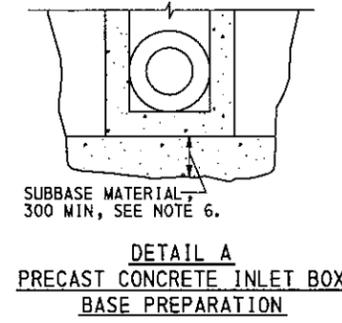
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

INLETS
STANDARD INLET BOXES
(CAST-IN-PLACE)

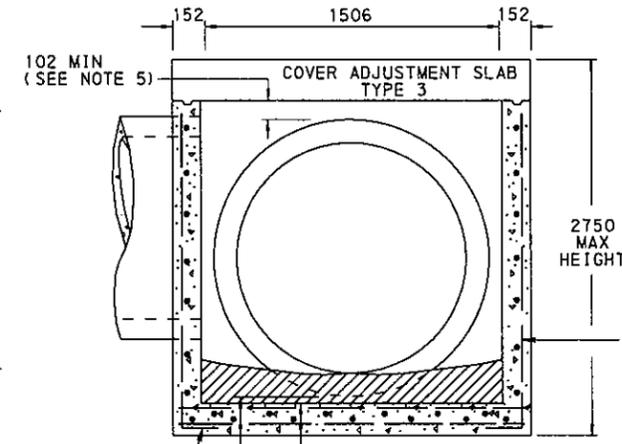
RECOMMENDED AUG. 16, 1999 <i>Sean H. Schurr</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Gary F. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 10 RC-34M
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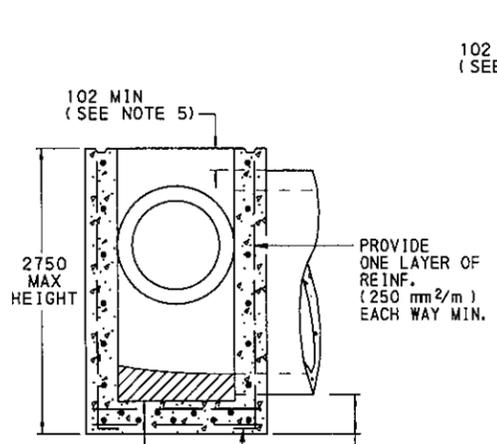
PLAN - INLET BOXES



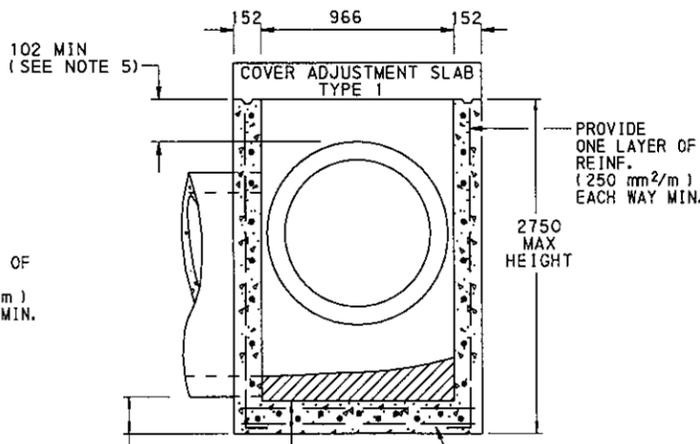
DETAIL A
PRECAST CONCRETE INLET BOX
BASE PREPARATION



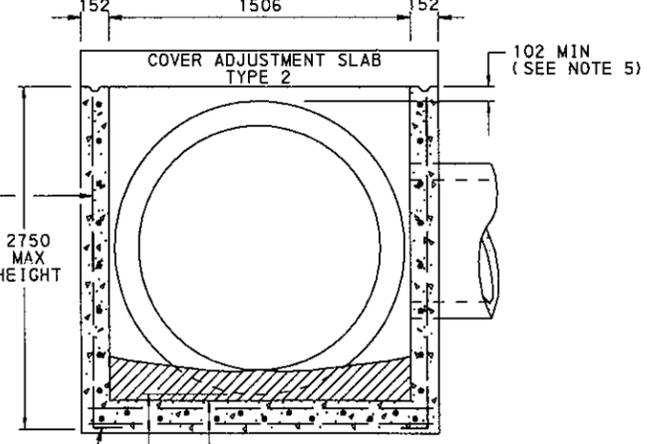
SECTION D-D
TYPE 3 ONLY



SECTION A-A

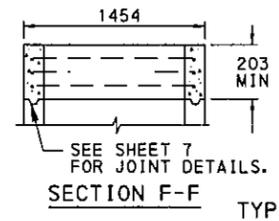


SECTION B-B

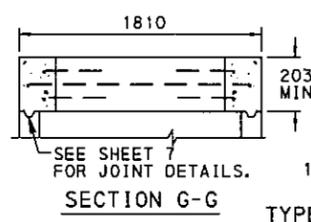
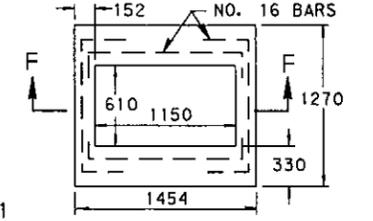


SECTION C-C

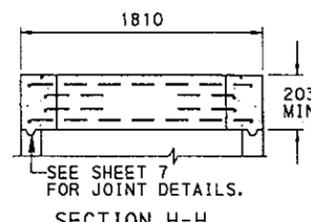
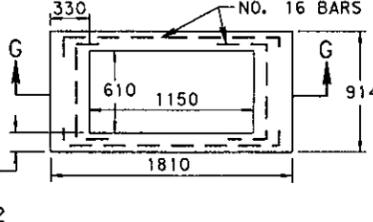
- NOTES**
1. CONSTRUCT INLET BOXES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408M, SECTION 714.
 2. PERMIT ONLY PRECAST INLET BOXES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT AN 841 x 594 REPRODUCIBLE SHOP DRAWING TO THE BUREAU OF CONSTRUCTION AND MATERIALS, MATERIALS AND TESTING DIVISION FOR REVIEW AND APPROVAL. USE CLASS AA CEMENT CONC FOR PRECAST BOXES.
 3. PROVIDE STANDARD INLET BOXES AND COVER ADJUSTMENT SLABS WITH A 610 x 1150 OPENING TO ACCOMMODATE STANDARD TOP COMPONENTS.
 4. PROVIDE INLETS WITH A MAXIMUM HEIGHT TO BE THE GRADE ELEVATION. WHEN THE REQUIRED HEIGHT EXCEEDS 2750, SHOW SPECIAL DETAILS AND DESIGN FOR THE INLET WALLS AND BASE. CONSTRUCT INLETS THAT EXCEED 1500 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 PIPE BLOCKOUTS TO BE FORMED WITHIN 100 FROM THE TOP OF THE INLET BOX, PROVIDE AN ADDITIONAL #10 REINFORCEMENT BAR LOCATED 40 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.
 6. PLACE SUBBASE MATERIAL MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 350.2, IN LAYERS 100 THICK, COMPACTED TO A DENSITY SATISFACTORY TO THE ENGINEER AND INCIDENTAL TO THE INLET PAY ITEM.
 7. FOR PIPE DIAMETERS LARGER THAN 1200 RCP OR 1350 CMP, USE A MODIFIED INLET BOX, SHEET 9.
 8. PROVIDE CONSTRUCTION JOINTS AS REQUIRED FOR INLET BOXES THAT ARE NOT MONOLITHIC. SEE SHEET 7.
 9. FOR INLETS OTHER THAN AS SHOWN ON THE STANDARDS, PROVIDE REINFORCEMENT BASED ON PHL 93 LOADING AND IN ACCORDANCE WITH PUBLICATION 408M.
 10. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



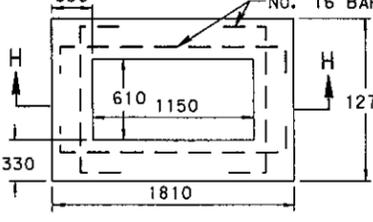
SECTION F-F
TYPE 1



SECTION G-G
TYPE 2



SECTION H-H
TYPE 3



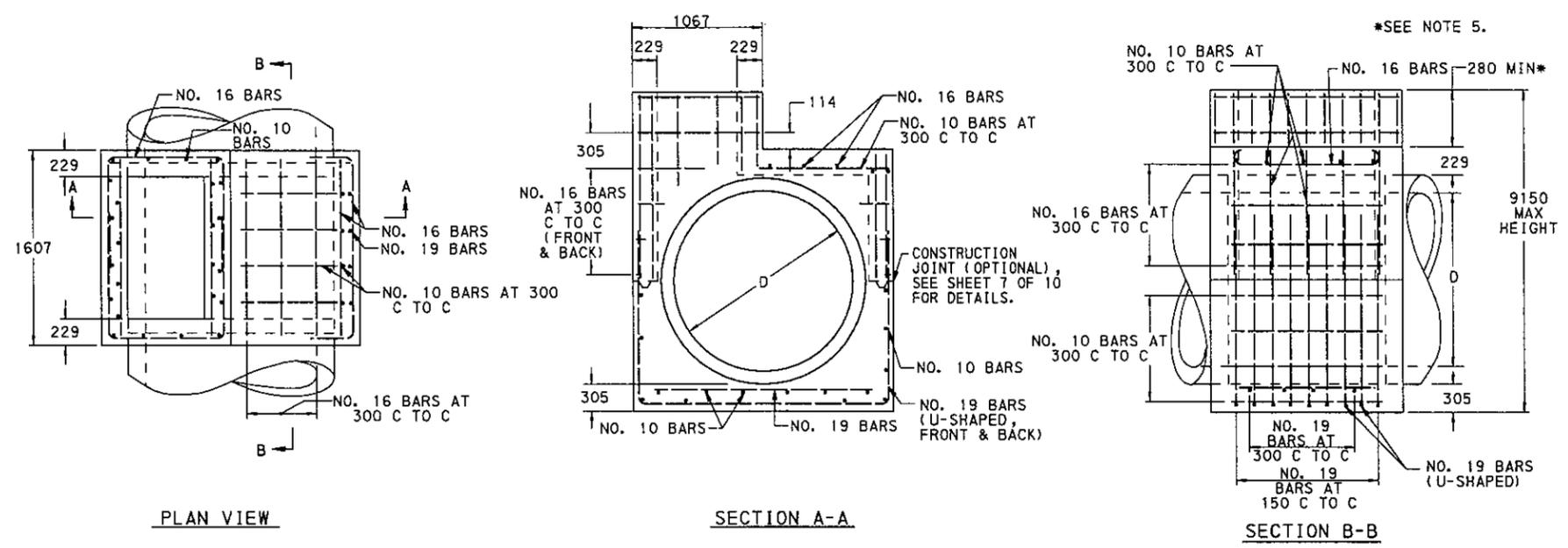
COVER ADJUSTMENT SLABS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

INLETS
STANDARD INLET BOXES
(PRECAST)

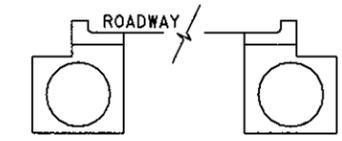
LEGEND
[Hatched Box] ADDITIONAL CONCRETE TO SHAPE THE BOTTOM

RECOMMENDED AUG. 16, 1999
[Signature] DIRECTOR, BUREAU OF DESIGN
RECOMMENDED AUG. 16, 1999
[Signature] CHIEF ENGINEER
SHT 8 OF 10
RC-34M

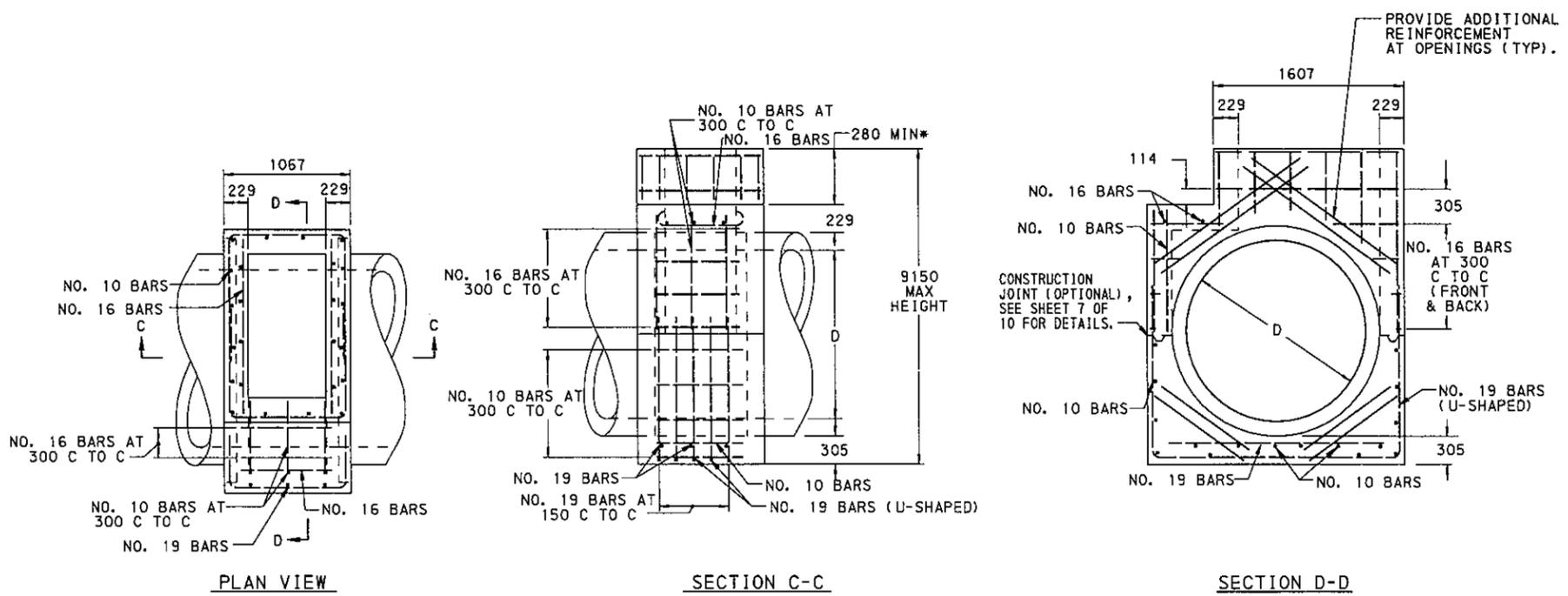


INLET BOX
MODIFIED TYPE I

- NOTES**
1. CONSTRUCT IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408M, SECTION 605 AND SECTION 714.
 2. PROVIDE INLETS WITH A MAXIMUM HEIGHT TO BE THE GRADE ELEVATION. WHEN THE REQUIRED HEIGHT EXCEEDS 2750, SHOW SPECIAL DETAILS AND DESIGN FOR THE INLET WALLS AND BASE. CONSTRUCT INLETS THAT EXCEED 1500 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 WITH MODIFIED TYPE I INLET BOX, THE TYPICAL INSTALLATION DETAILS ARE SHOWN BELOW. SHOW ANY VARIATION ON THE CONSTRUCTION DRAWINGS BY SPECIAL DETAILS.

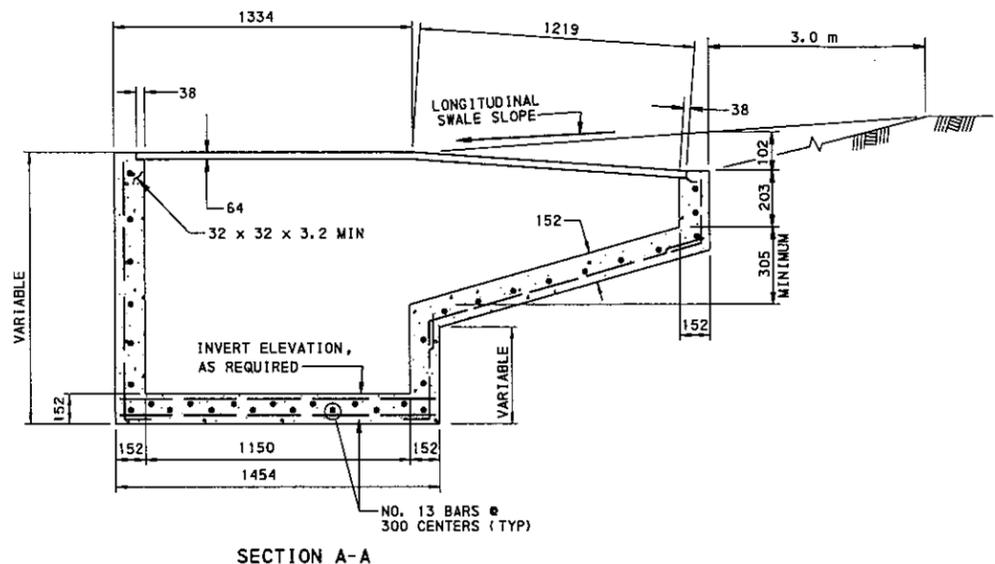


5. PROVIDE A MINIMUM HEIGHT OF 508 MEASURED FROM THE TOP SURFACE OF THE TOP UNIT TO THE INSIDE TOP OF THE PIPE WHEN THE TOP UNIT AND EITHER A MODIFIED TYPE I OR A MODIFIED TYPE II INLET BOX ARE CONSTRUCTED MONOLITHICALLY.
6. PERMIT ONLY PRECAST MODIFIED INLET BOXES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT AN 841 x 594 REPRODUCIBLE SHOP DRAWING TO THE BUREAU OF CONSTRUCTION AND MATERIALS, MATERIALS AND TESTING DIVISION FOR REVIEW AND APPROVAL.
7. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

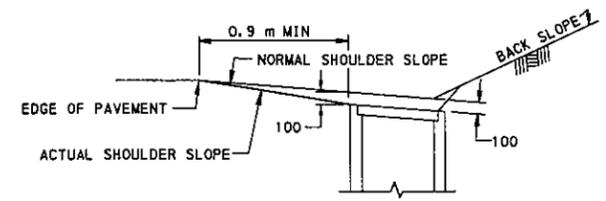


INLET BOX
MODIFIED TYPE II

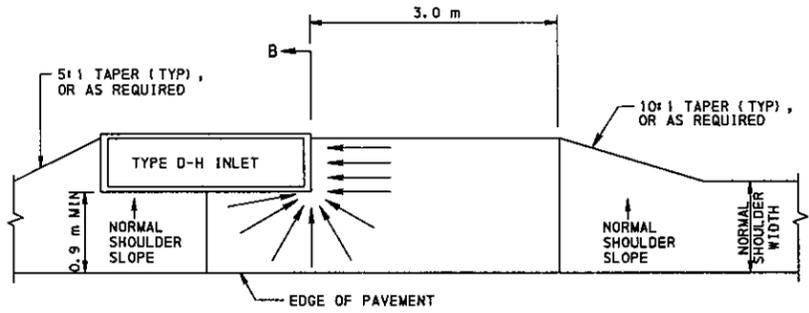
COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
INLETS MODIFIED INLET BOXES (CAST-IN-PLACE AND PRECAST)		
RECOMMENDED AUG. 16, 1999 <i>[Signature]</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>[Signature]</i> CHIEF ENGINEER	SHT 9 OF 10 RC-34M



SECTION A-A

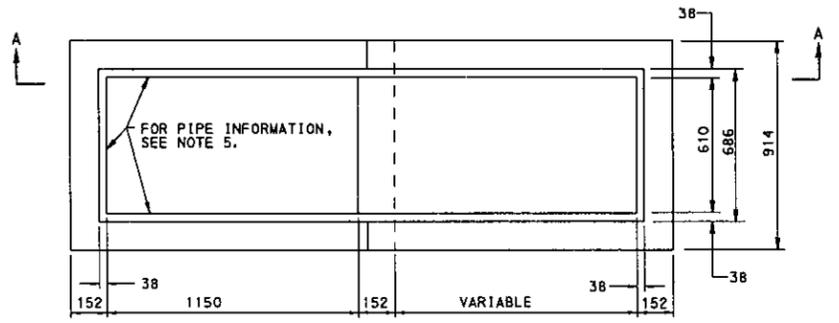


SECTION B-B

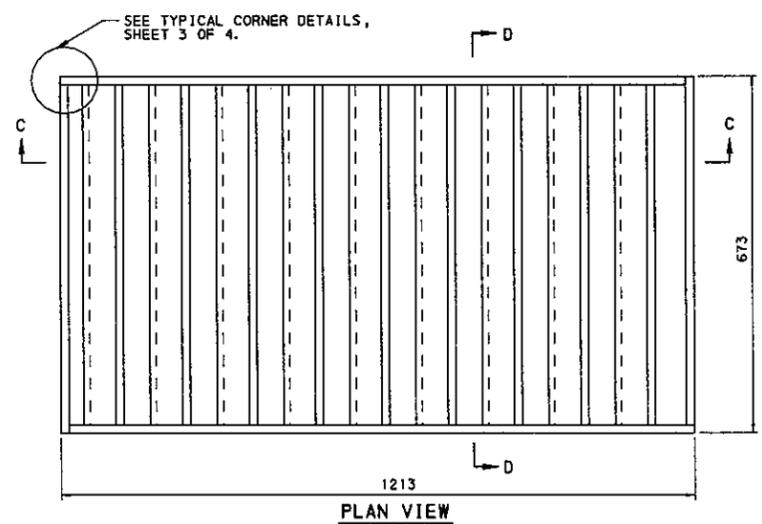


PLAN VIEW

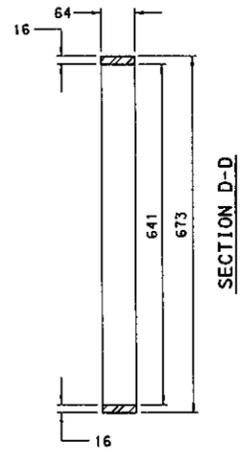
TYPICAL D-H INLET LOCATION



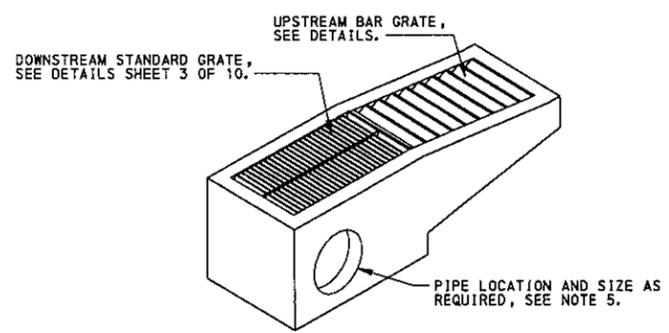
PLAN VIEW



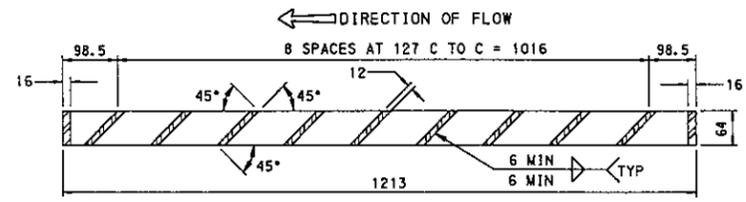
PLAN VIEW



SECTION D-D



TYPE D-H INLET



SECTION C-C

BAR GRATE

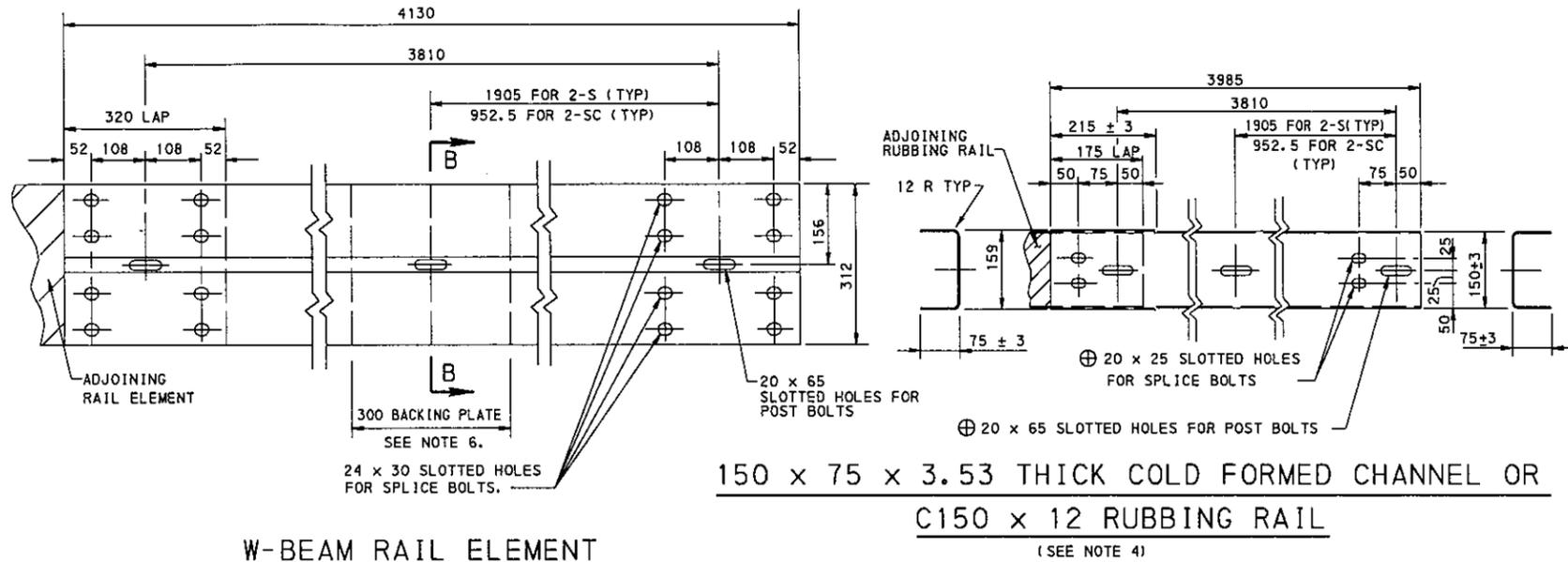
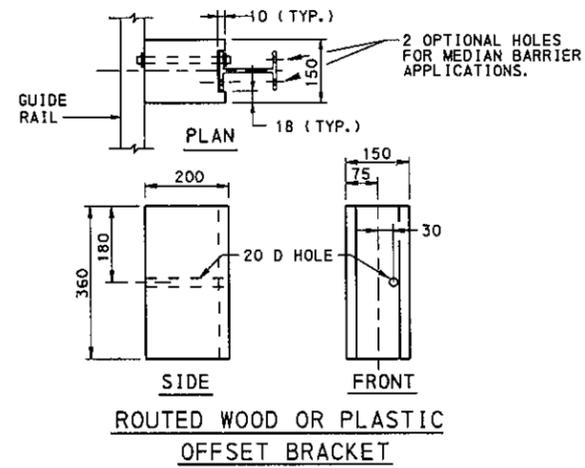
NOTES

1. CONSTRUCT IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408M, SECTION 605.
2. 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 LISTING, SUBMIT AN 841 x 594 REPRODUCIBLE SHOP DRAWING TO THE BUREAU OF CONSTRUCTION AND MATERIALS, MATERIALS AND TESTING DIVISION FOR REVIEW AND APPROVAL.
3. WELD STRUCTURAL STEEL GRATES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408M, 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 OF 10.
6. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

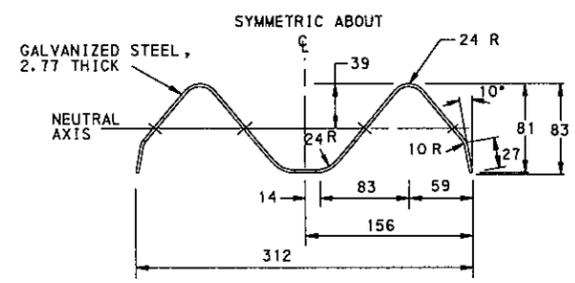
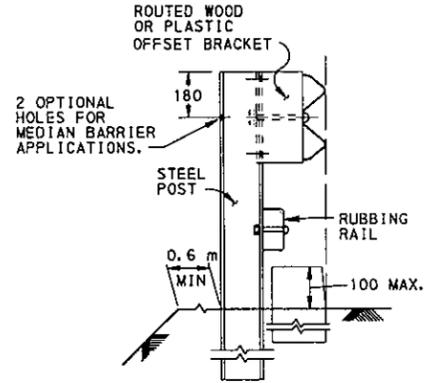
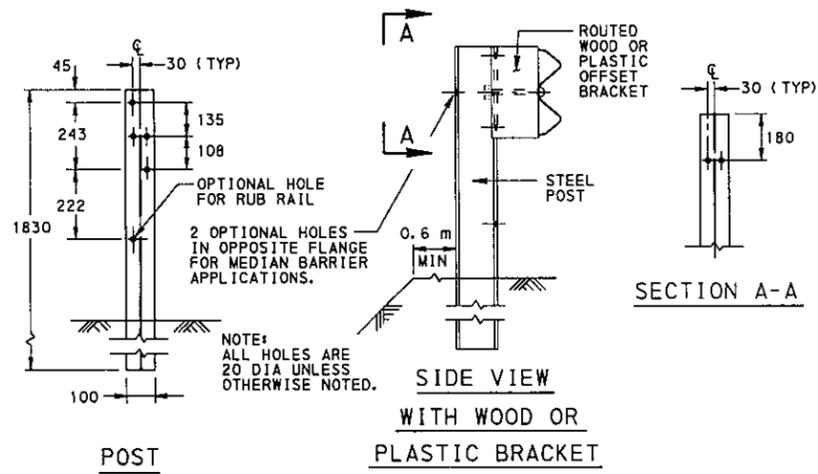
INLETS
TYPE D-H INLET

RECOMMENDED AUG. 16, 1999 <i>Dean A. Scher</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT 10 OF 10 RC-34M
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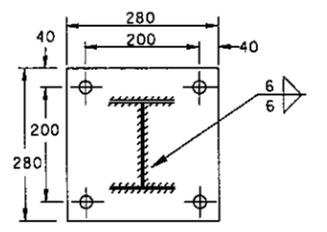
W-BEAM RAIL ELEMENT

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

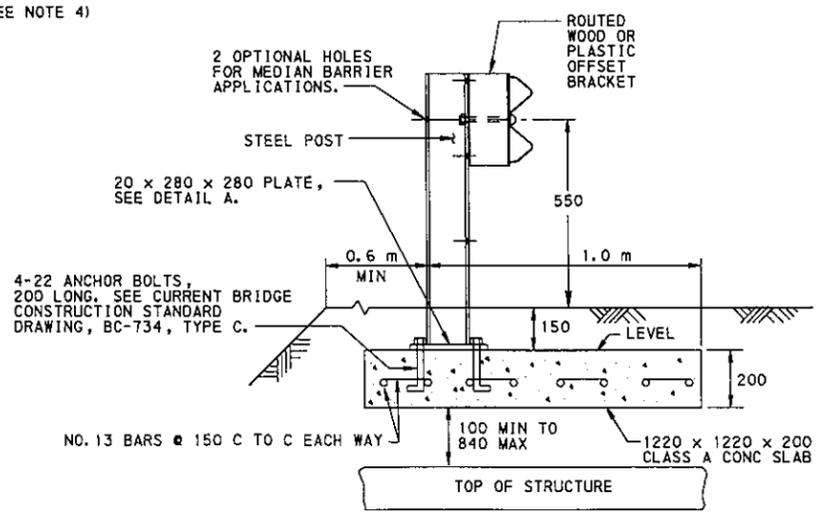


NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 620.
2. PROVIDE STEEL I-BEAM (W150x13.5) POSTS WITH ROUTED WOOD, PLASTIC OR COMPOSITE OFFSET BRACKETS LISTED IN BULLETIN 15.
3. MAKE NO SEPARATE PAYMENT FOR INSTALLATION OF GUIDE RAIL OVER UNDERGROUND STRUCTURES. 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 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 (mm) EXCEPT AS NOTED.



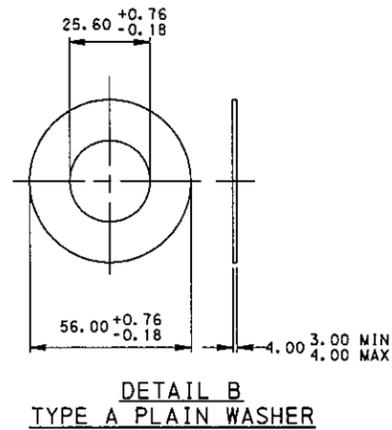
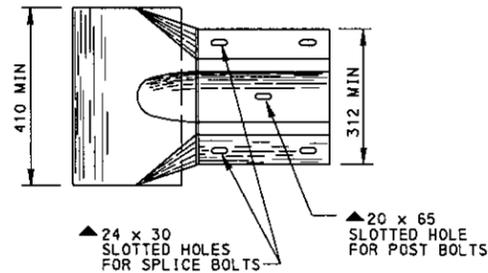
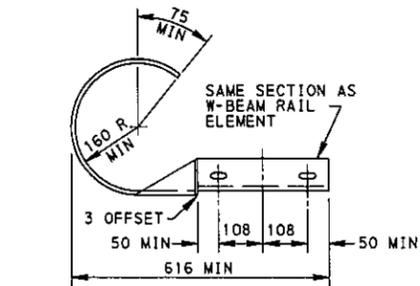
THICKNESS IS 19
ALL HOLES 25Ø UNLESS OTHERWISE NOTED.



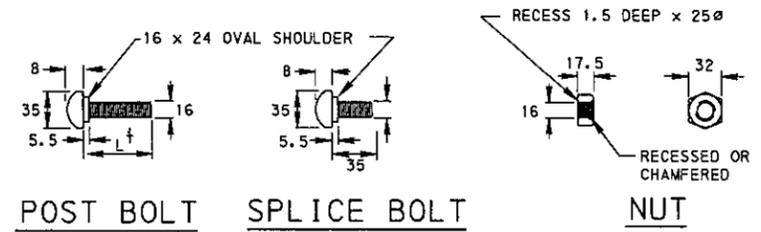
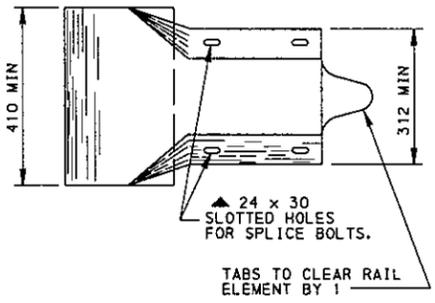
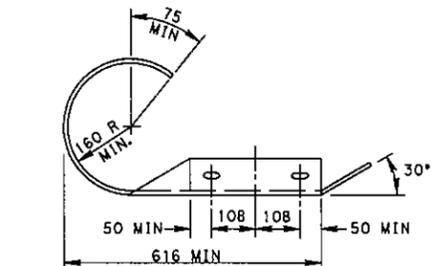
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST
GUIDE RAIL

RECOMMENDED AUG. 16, 1999 <i>David A. Egan</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Darryl L. Hoffman</i> CHIEF ENGINEER	SHT. 1 OF 6 RC-52M
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FOR SPLICE AND POST BOLTS, SEE DETAILS. FOR ALL SPLICE BOLT CONNECTIONS, PROVIDE A TYPE A PLAIN WASHER BETWEEN BOLT HEAD AND TERMINAL SECTION. FOR WASHER, SEE DETAIL B.

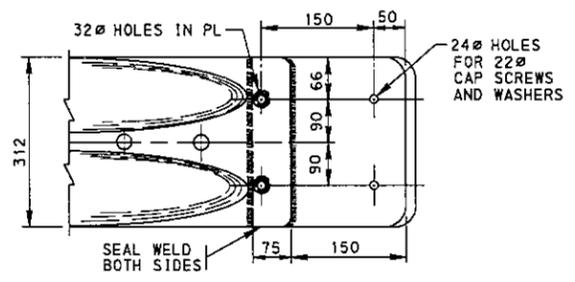
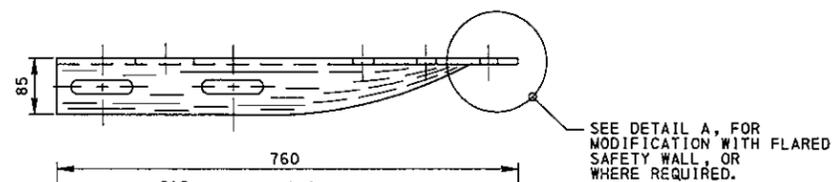
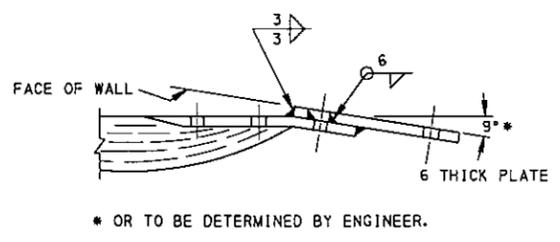


† USE L = 115 FOR ALL RUBBING RAIL TO GUIDE RAIL POST CONNECTIONS AND USE L = 255 FOR ALL W-BEAM RAIL ELEMENT TO GUIDE RAIL POST AND WOOD OR PLASTIC OFFSET BRACKET CONNECTIONS.

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



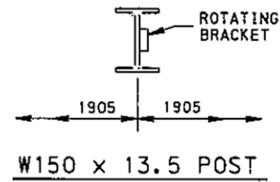
** PROVIDE SPLICE BOLTS WITH A LOCK NUT OR DOUBLE NUT AND TIGHTEN ONLY TO A POINT THAT ALLOWS GUIDE RAIL TO BE FREE TO MOVE. CENTER SPLICE BOLTS IN THE SLOTTED HOLES. SEE CURRENT BRIDGE CONSTRUCTION DRAWINGS, BC-739M, FOR ATTACHMENT DETAILS.

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.
4. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

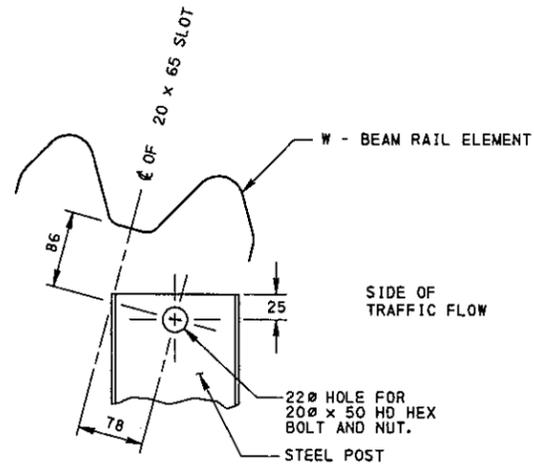
COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
TYPE 2 STRONG POST GUIDE RAIL		
RECOMMENDED AUG. 16, 1999 DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 CHIEF ENGINEER	SHT. 2 OF 6 RC-52M



POSITIONING OF ROTATING BRACKET

TABLE A

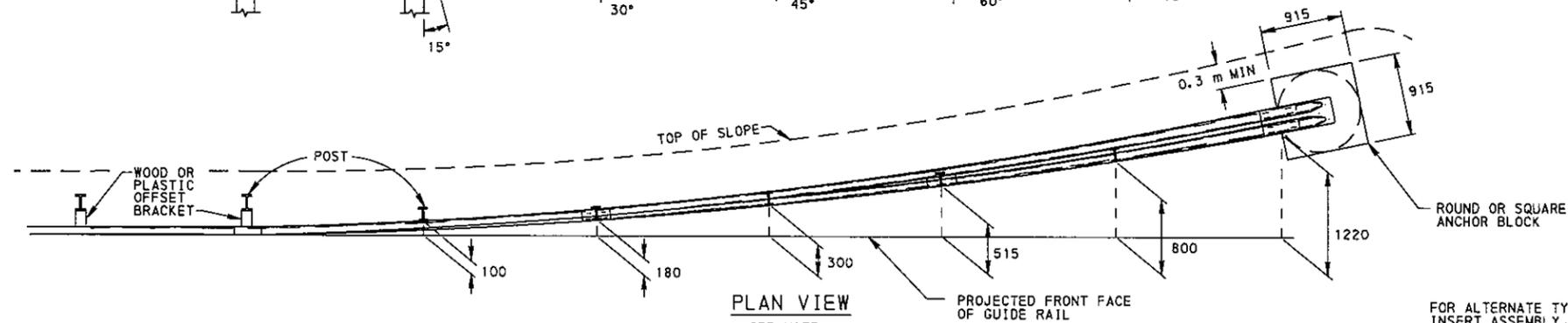
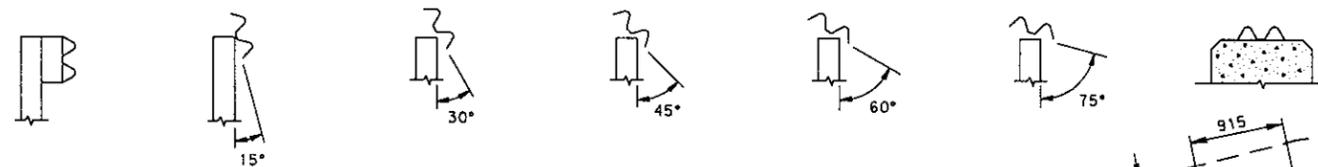
HEIGHT OF POST	430	370	300	215	115
ROTATION ANGLES	15°	30°	45°	60°	75°



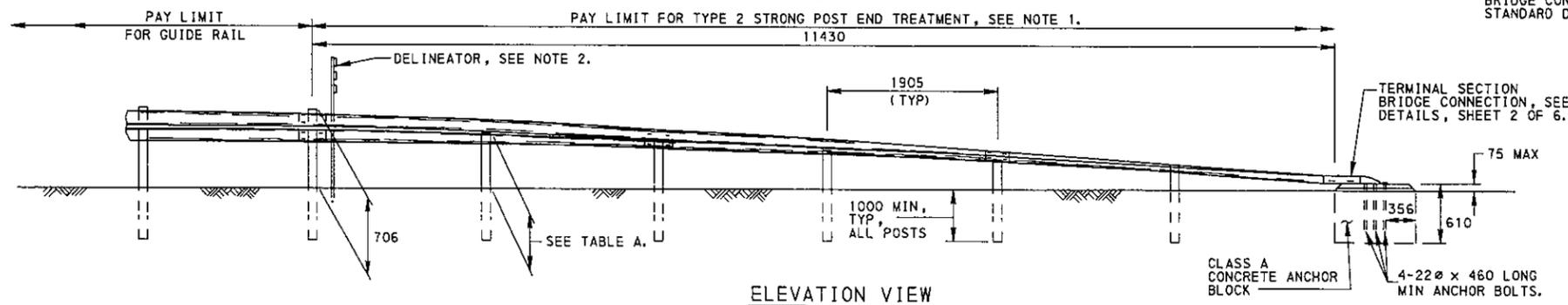
TYPICAL FOR 15° THRU 75° POSITIONS
ROTATING BRACKET

NOTES

1. PAYMENT FOR TYPE 2 STRONG POST END TREATMENT INCLUDES 11430 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-8709.
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 MAY BE USED TO TERMINATE STRONG POST GUIDE RAIL ON HIGHWAYS WITH POSTED SPEEDS LESS THAN 80 km/h AND WITH CURRENT TRAFFIC VOLUMES LESS THAN 6000 VEHICLES PER DAY.
6. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



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



TYPE 2 STRONG POST END TREATMENT

SEE NOTE 5.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST
GUIDE RAIL
END TREATMENTS

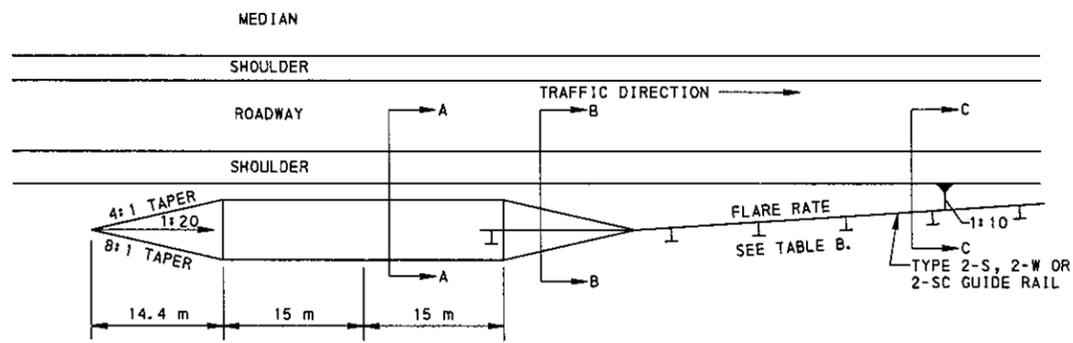
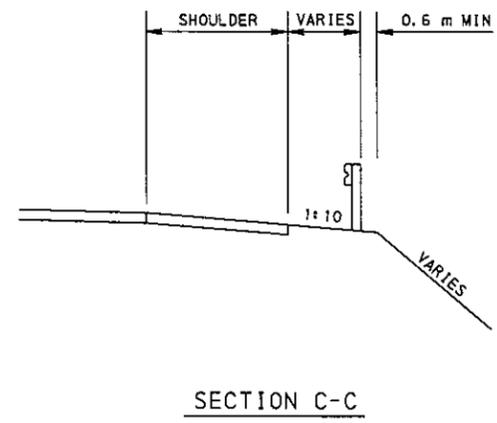
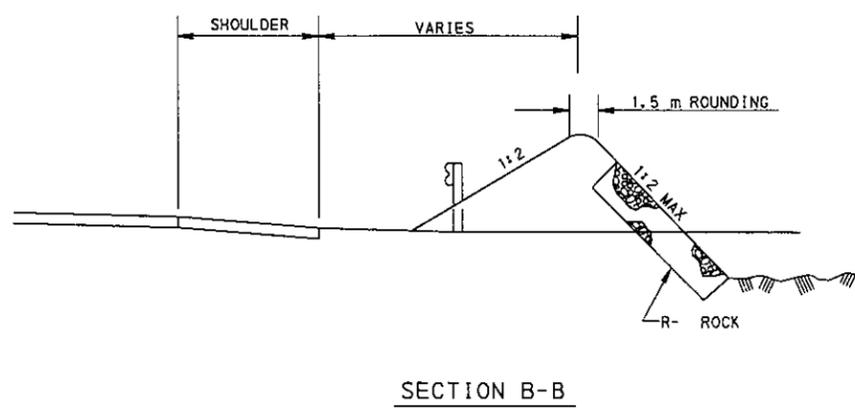
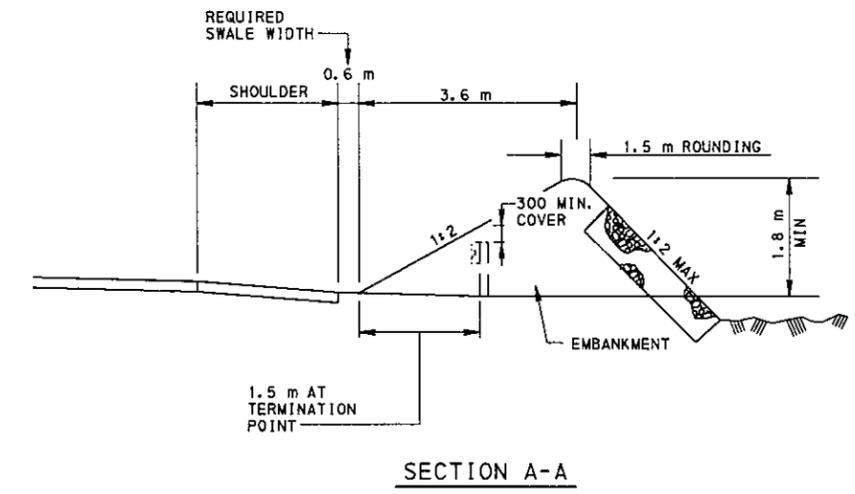


TABLE B
FLARE RATES
FOR BARRIER DESIGN

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

TYPICAL EARTH MOUND FOR BURYING GUIDE RAIL

SEE NOTE 2.

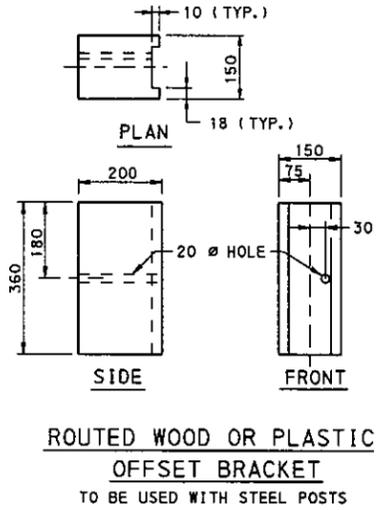
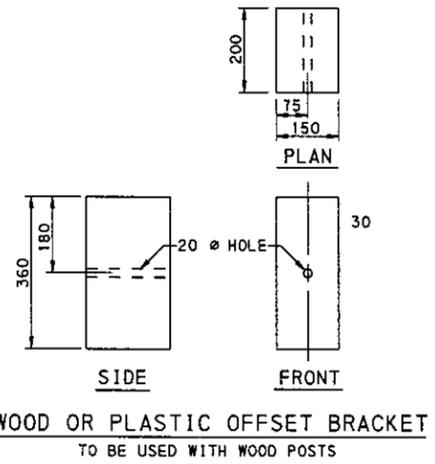


NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408M.
2. ALL MATERIAL NECESSARY TO CONSTRUCT EARTH MOUNDS ARE IN ACCORDANCE WITH APPLICABLE SECTIONS OF PUBLICATION 408M.
3. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

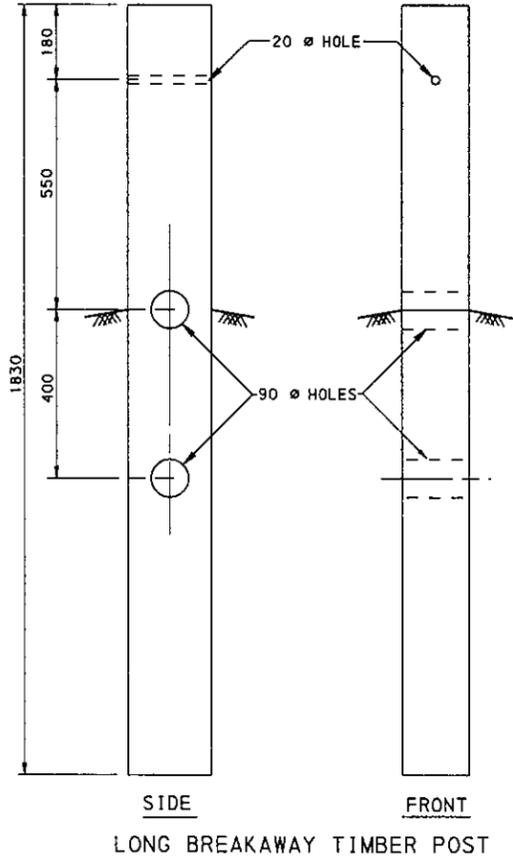
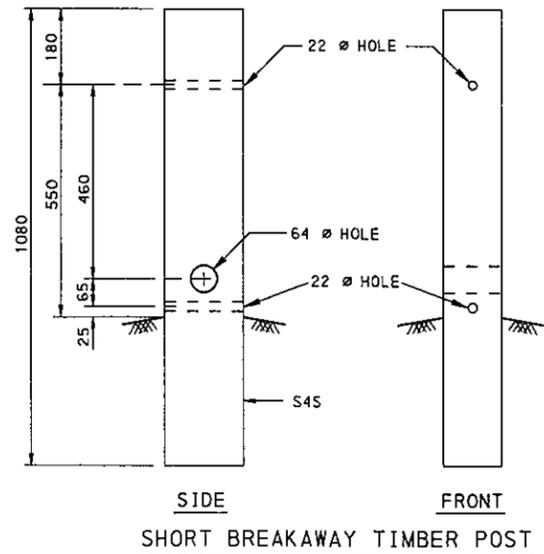
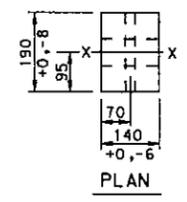
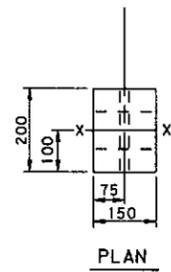
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST
GUIDE RAIL
END TREATMENTS

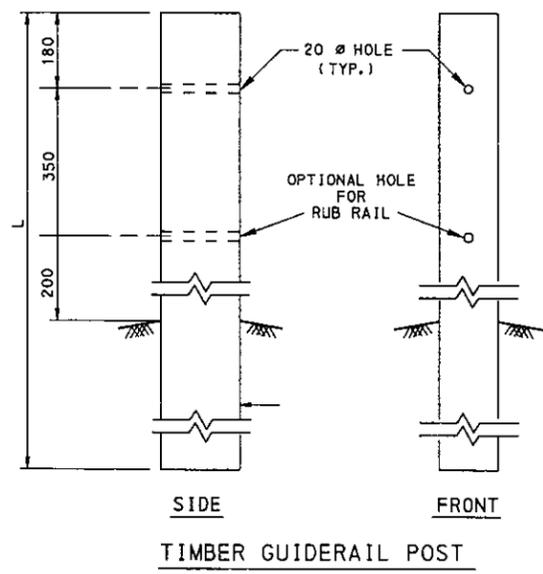
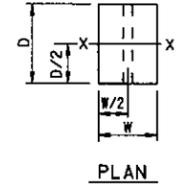


NOTES

1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408M.
2. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.
3. 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.



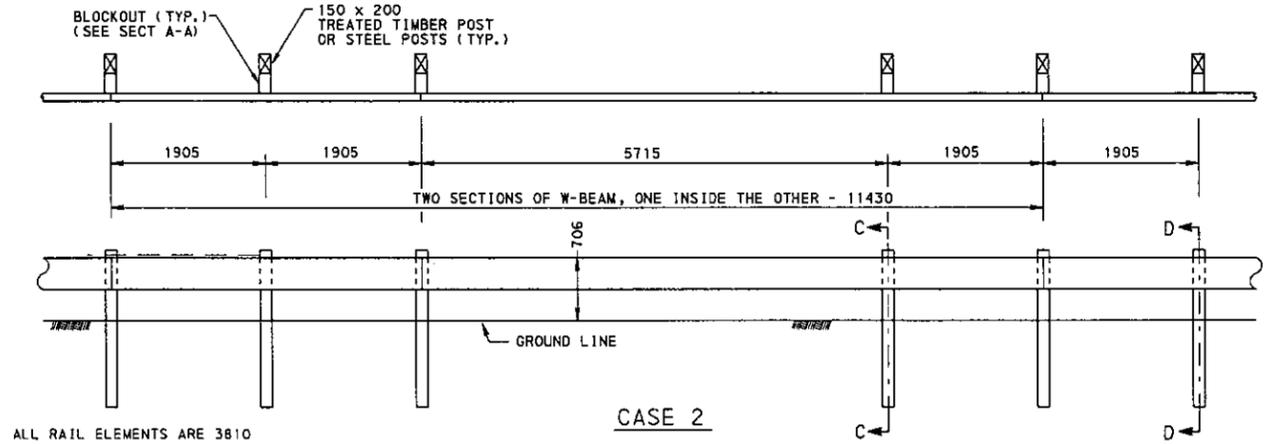
L	W	D
1625	150	200
1830	150	200
1980	150	200
2060	150	200



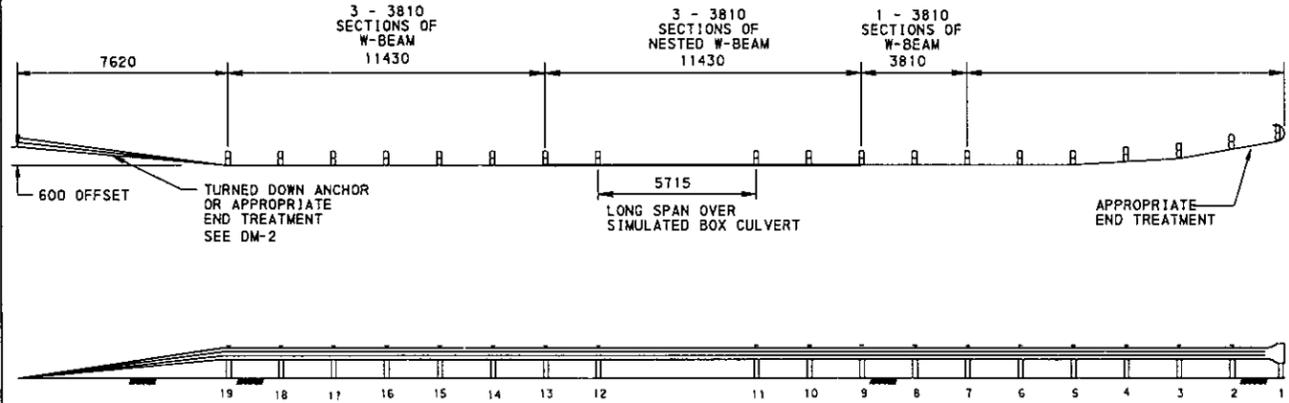
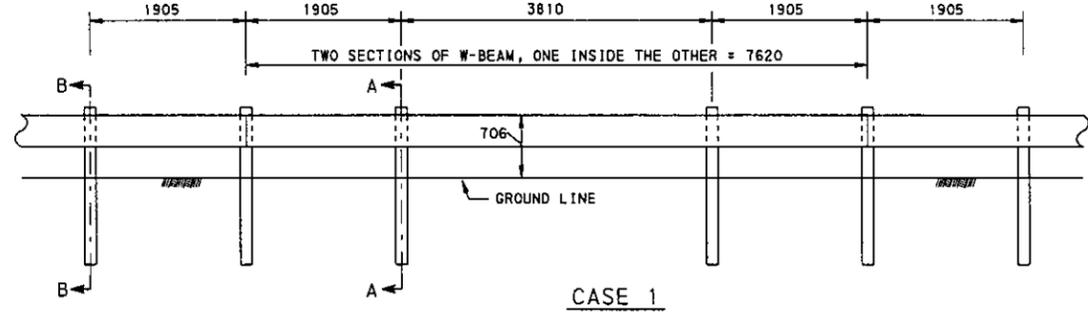
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
 BUREAU OF DESIGN

TYPE 2 STRONG POST
 GUIDE RAIL
 POSTS AND OFFSET BRACKETS

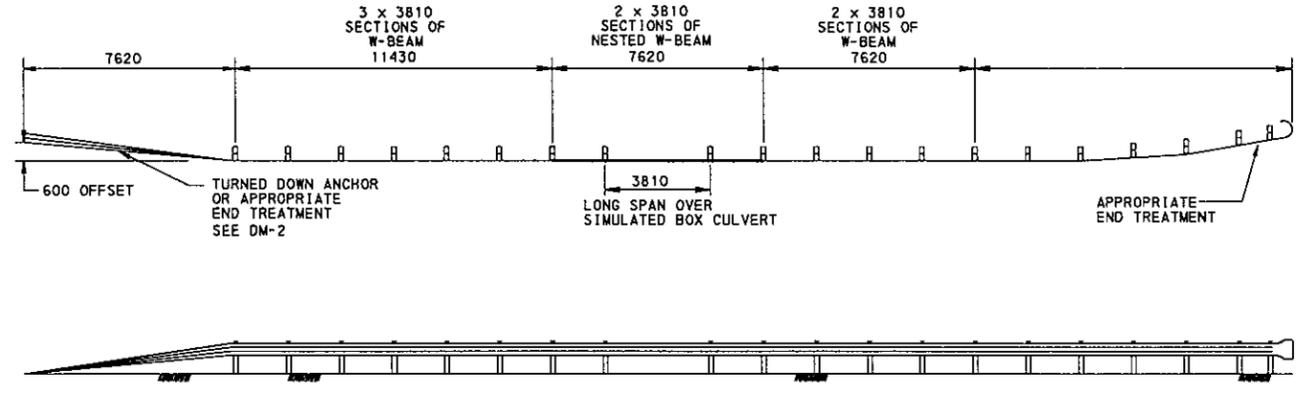
RECOMMENDED AUG. 16, 1999 <i>Dean A. Schaefer</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT. 5 OF 6 RC-52M
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ALL RAIL ELEMENTS ARE 3810

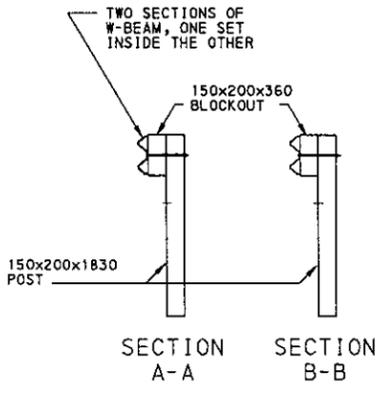
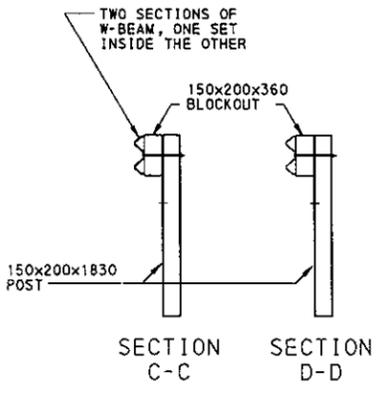


DETAILS OF NESTED W-BEAM GUIDERAIL ACROSS LOW-FILL CULVERTS. CASE 2



DETAILS OF NESTED W-BEAM GUIDERAIL ACROSS LOW-FILL CULVERTS. CASE 1

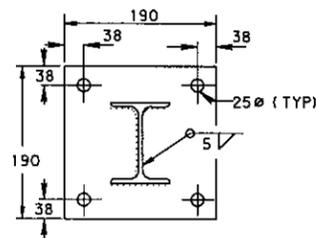
1. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 STRONG POST
GUIDE RAIL
ACROSS CULVERTS

RECOMMENDED AUG. 16, 1999 <i>Dean A. Schaefer</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Robert F. Hoffman</i> CHIEF ENGINEER	SHT. 6 OF 6 RC-52M
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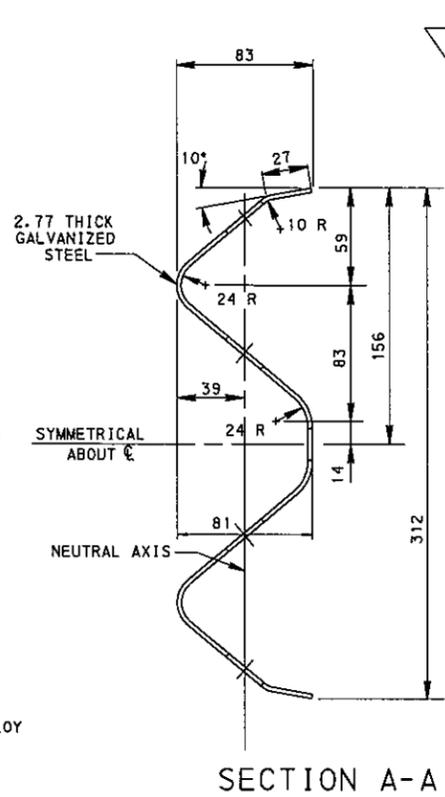


**DETAIL D
BASE PLATE**

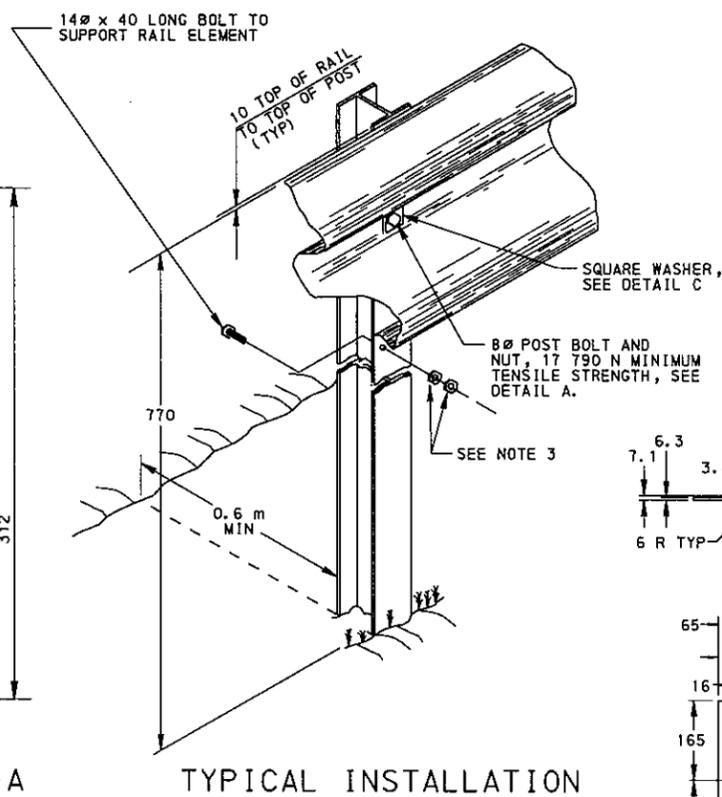
(USE BASE PLATE FOR 86 x 57 COLD FORMED CHANNEL POST, ALUMINUM ALLOY POST AND S75 x 8.5 POST.)

NOTES

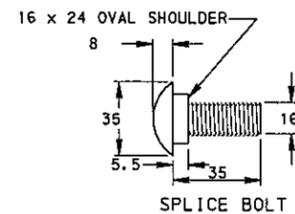
1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 620.
2. THE 86 x 57 COLD FORMED CHANNEL POST, S75 x 8.5 POST AND ALUMINUM ALLOY POST MAY BE BID AS ALTERNATES FOR TYPE 2 WEAK POST GUIDE RAIL SYSTEM; HOWEVER, MIXING OF DIFFERENT POSTS IS NOT ACCEPTABLE WITHIN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



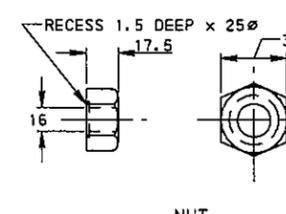
SECTION A-A



TYPICAL INSTALLATION

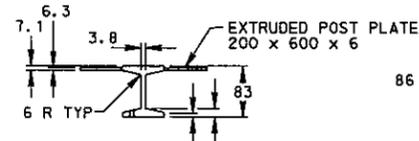


SPLICE BOLT

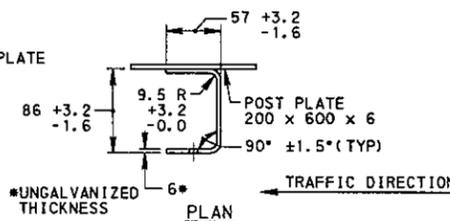


NUT

**DETAIL C
SQUARE WASHER**

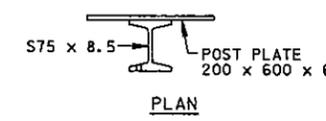


PLAN

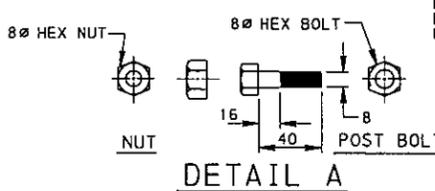


PLAN

UNGALVANIZED THICKNESS 6 TRAFFIC DIRECTION



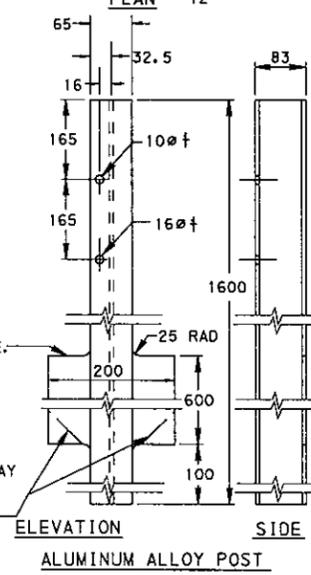
PLAN



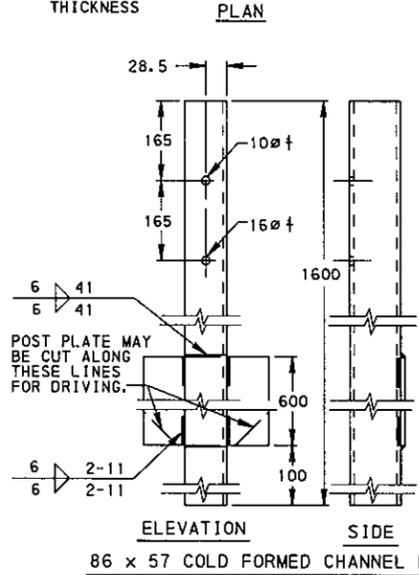
DETAIL A

POST PLATE IS EXTRUDED AS ONE UNIT WITH FLANGE.

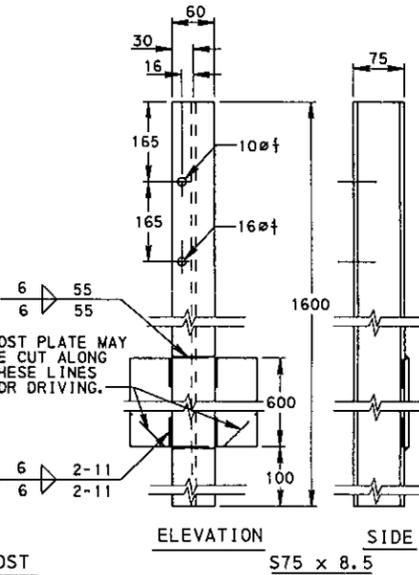
POST PLATE MAY BE CUT ALONG THESE LINES FOR DRIVING.



**ELEVATION SIDE
ALUMINUM ALLOY POST**



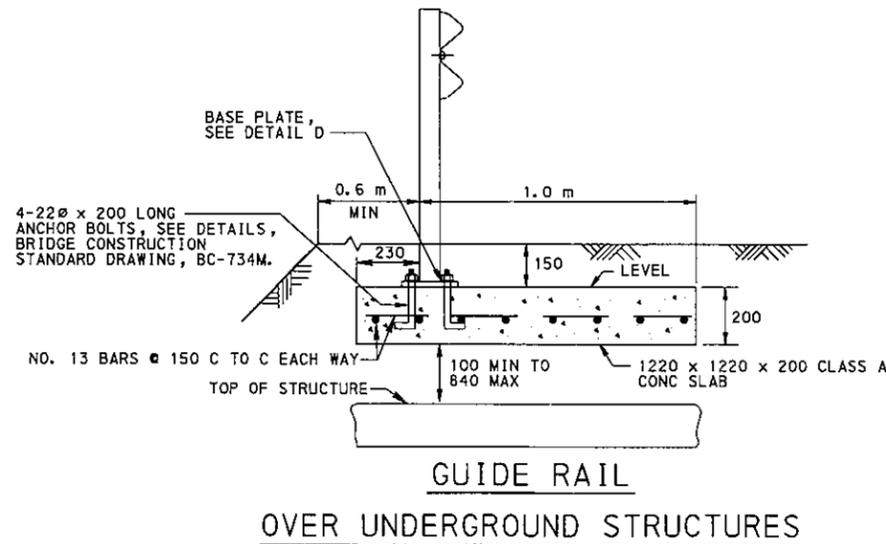
**ELEVATION SIDE
86 x 57 COLD FORMED CHANNEL POST**



**ELEVATION SIDE
S75 x 8.5**

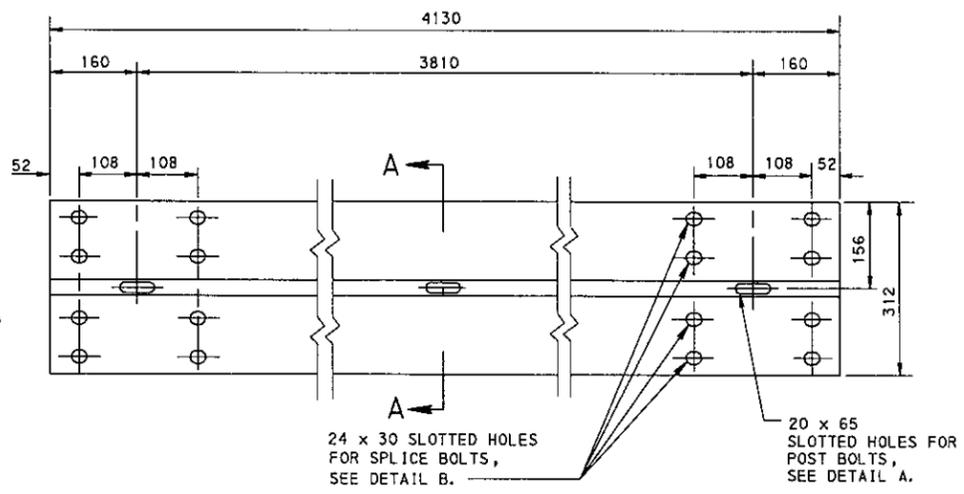
TYPE 2-W GUIDE RAIL POSTS

† 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.



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**

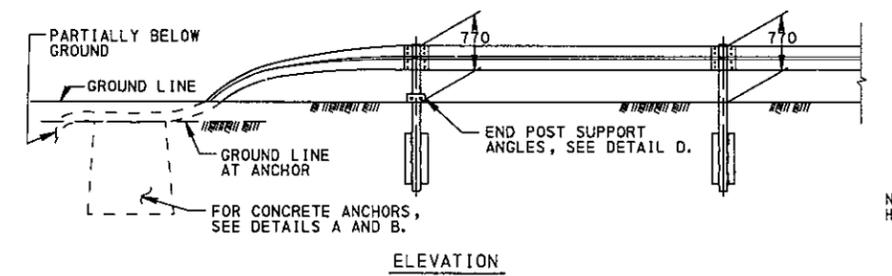
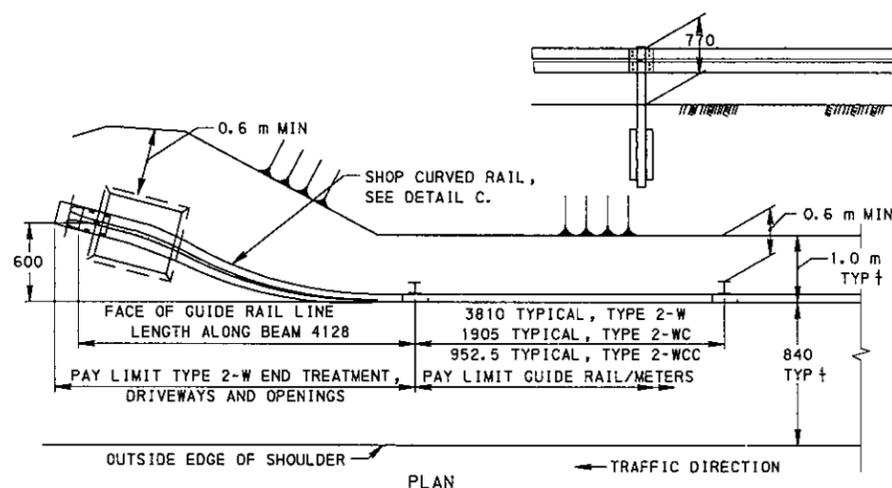
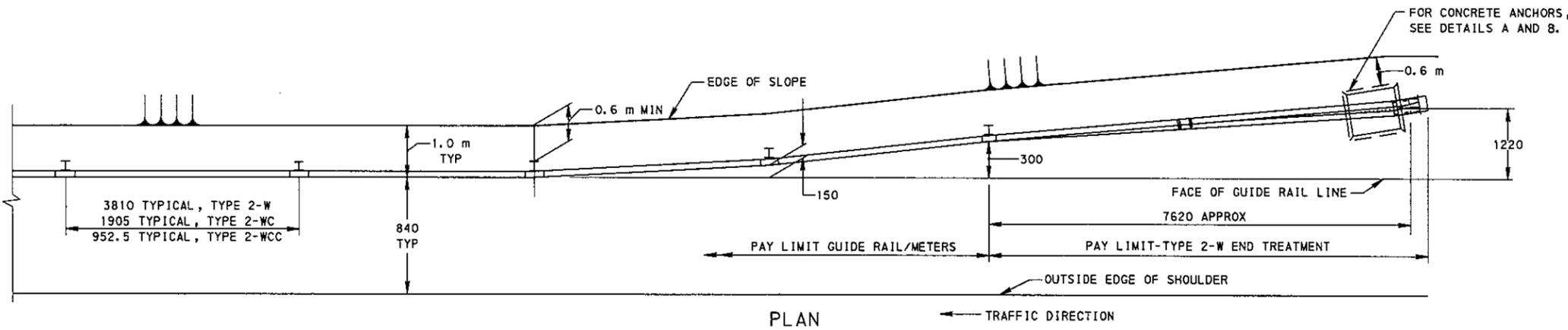
RECOMMENDED AUG. 16, 1999
Dean H. Schmitt
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 16, 1999
Gary L. Hoffman
CHIEF ENGINEER

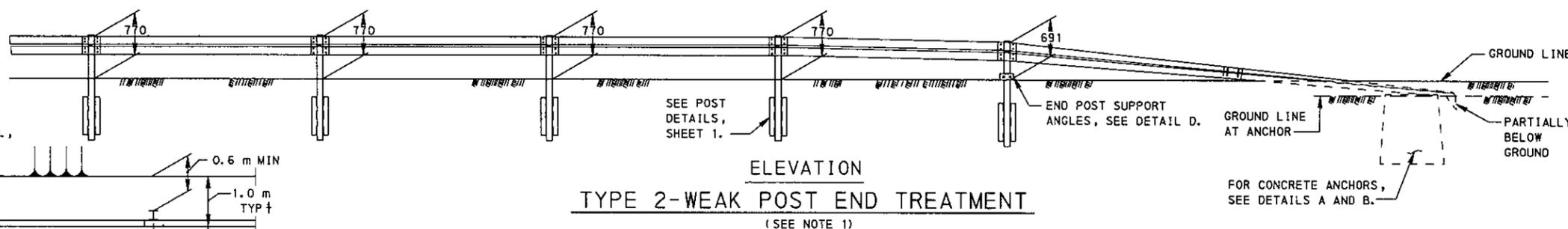
SHT 1 OF 2
RC-53M

NOTES

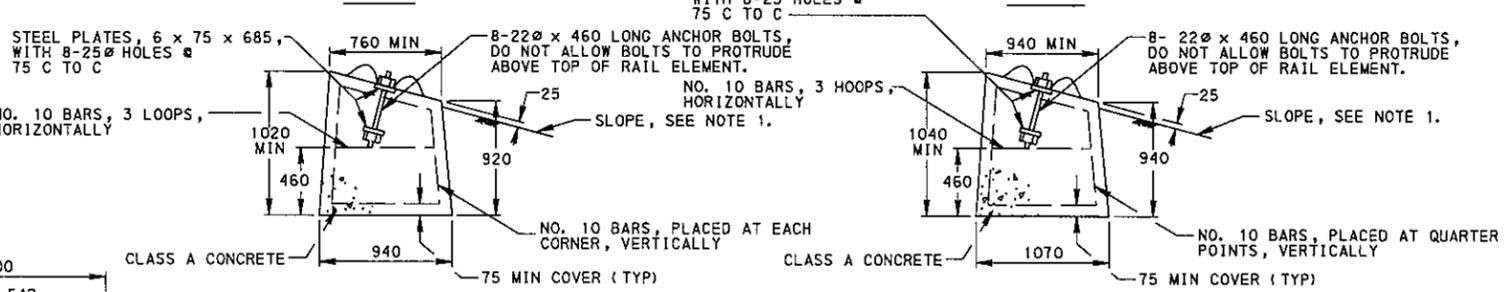
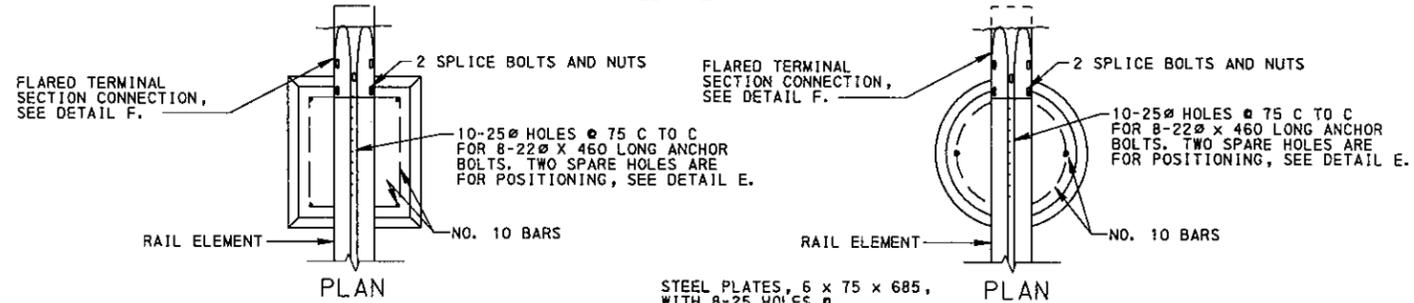
1. FOR HIGH-SPEED HIGH-VOLUME (80 km/h AND ABOVE, AND WITH CURRENT TRAFFIC VOLUMES 6000 VEHICLES PER DAY AND ABOVE) ROADWAYS, USE CRASH WORTHY END TREATMENTS ON THE APPROACH END WITH A 15.2 m TYPE 2S GUIDE RAIL TRANSITION FOR ANCHORING THE 2-W GUIDE RAIL. ON 2-LANE ROADWAYS, USE CRASH WORTHY END TREATMENT ON BOTH, THE APPROACH AND TRAILING, ENDS.
2. SEE RC-52M, FOR END TREATMENTS BURIED INTO EARTH MOUNDS.
3. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



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



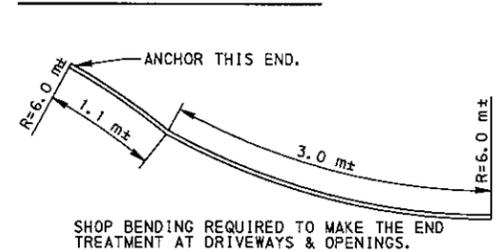
TYPE 2-WEAK POST END TREATMENT
(SEE NOTE 1)



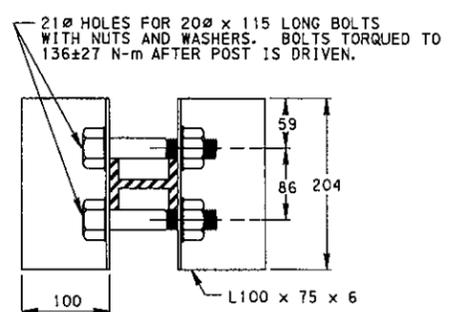
ELEVATION DETAIL A

ELEVATION DETAIL B (ALTERNATE)

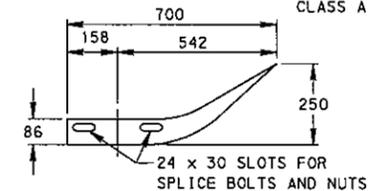
CONCRETE ANCHOR



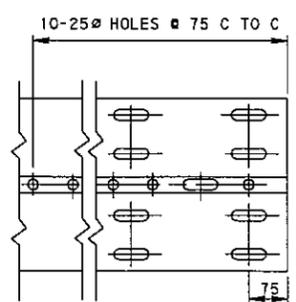
DETAIL C SHOP CURVED RAIL



DETAIL D END POST SUPPORT ANGLES



DETAIL F FLARED TERMINAL SECTION



DETAIL E

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

TYPE 2 WEAK POST GUIDE RAIL END TREATMENTS

RECOMMENDED AUG. 16, 1999
Don A. Schuler DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 16, 1999
Harry L. Heffernan CHIEF ENGINEER

SHT 2 OF 2
RC-53M

NOTES

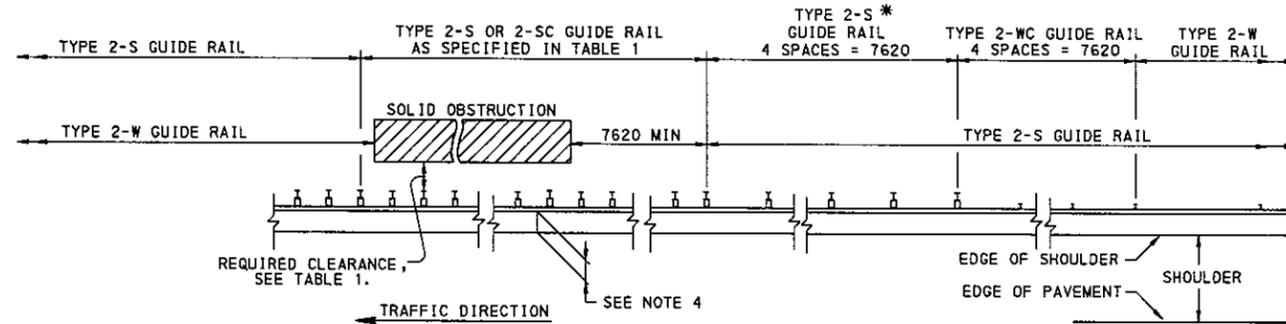
1. THE TREATMENTS SHOWN ARE FOR FOUR LANE DIVIDED HIGHWAYS. USE THE APPROACH END TREATMENT AT BOTH SIDES OF THE OBSTRUCTION ON TWO-LANE FACILITIES WITH TWO-WAY TRAFFIC.
2. THIS STANDARD HAS BEEN PREPARED AS A GUIDE FOR THE PLACEMENT OF GUIDE RAIL AND MEDIAN BARRIER. IT IS IMPRACTICAL TO PROVIDE A STANDARD 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, USE 15 m 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.
5. THE TYPICAL DISTANCE FROM THE EDGE OF SHOULDER TO THE FRONT FACE OF THE W-BEAM RAIL ELEMENT IS 840. 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 (mm) EXCEPT AS NOTED.

TABLE 1

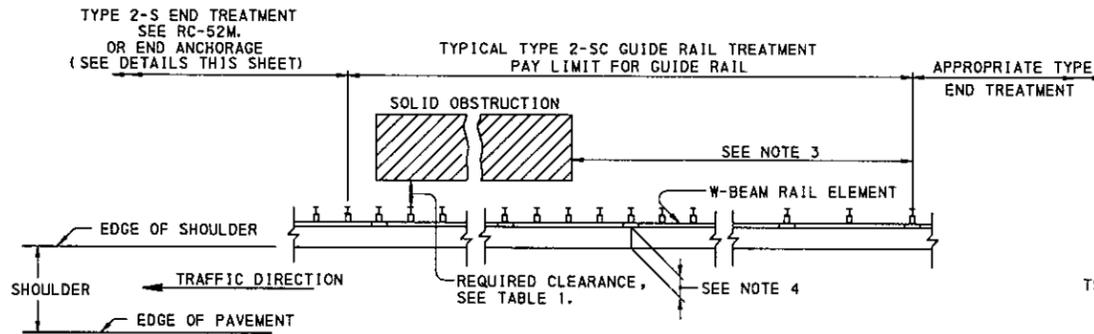
TYPE OF GUIDE RAIL	REQUIRED † CLEARANCES
2-SCC	0.3 m
2-SC	0.6 m
2-S	0.9 m
2-WCC	1.2 m
2-WC	1.5 m
2-W	2.1 m

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

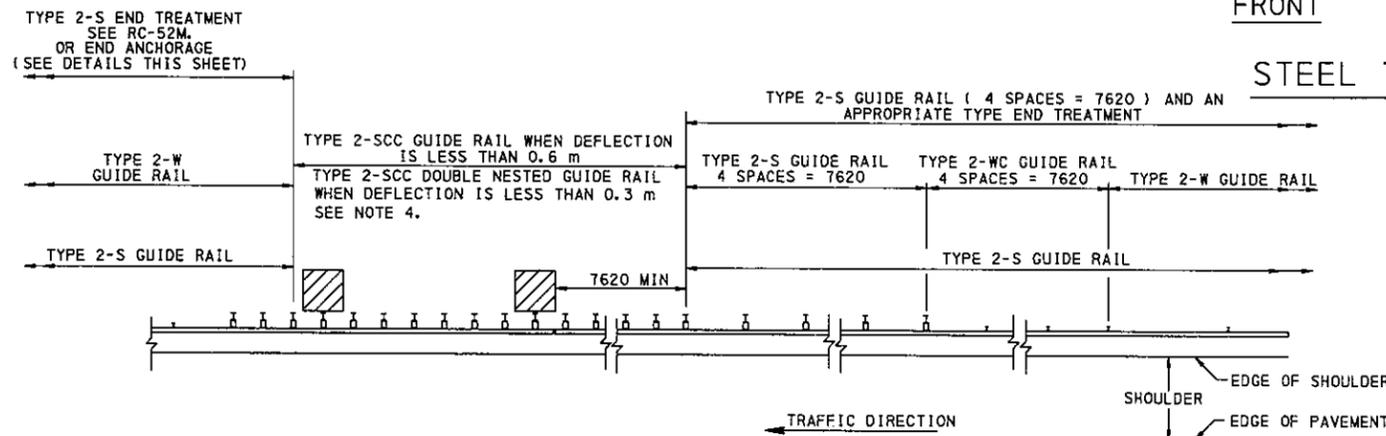
* IF TYPE 2-S GUIDE RAIL IS USED AT THE OBSTRUCTION, THIS SECTION OF GUIDE RAIL IS NOT REQUIRED.



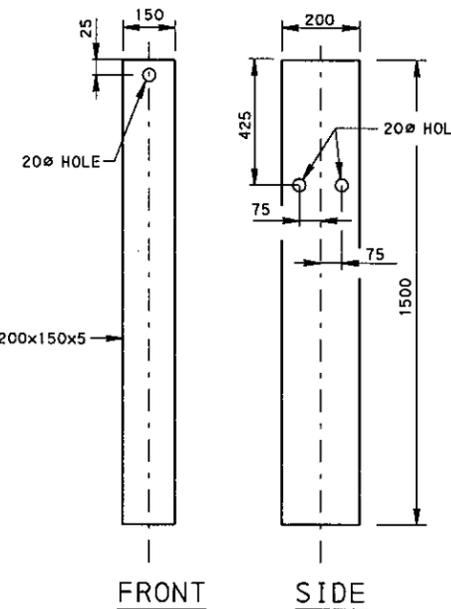
TYPICAL CONTINUOUS GUIDE RAIL TREATMENT WHEN THE REQUIRED CLEARANCE TO OBSTRUCTION IS AVAILABLE



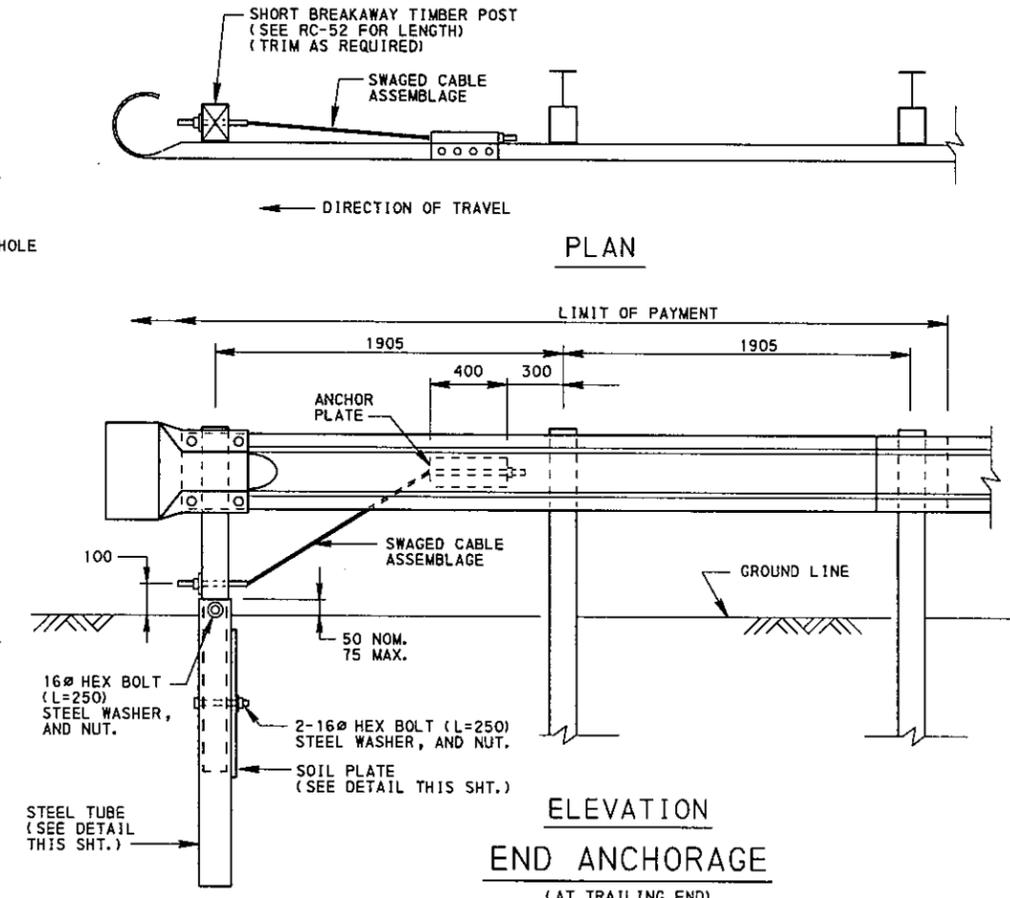
TYPICAL NON-CONTINUOUS GUIDE RAIL TREATMENT WHEN THE REQUIRED CLEARANCE TO OBSTRUCTION IS AVAILABLE



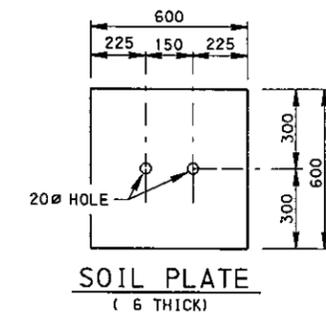
TREATMENT WHEN THE REQUIRED CLEARANCE TO OBSTRUCTION IS NOT AVAILABLE



STEEL TUBE



ELEVATION END ANCHORAGE (AT TRAILING END)



SOIL PLATE (6 THICK)

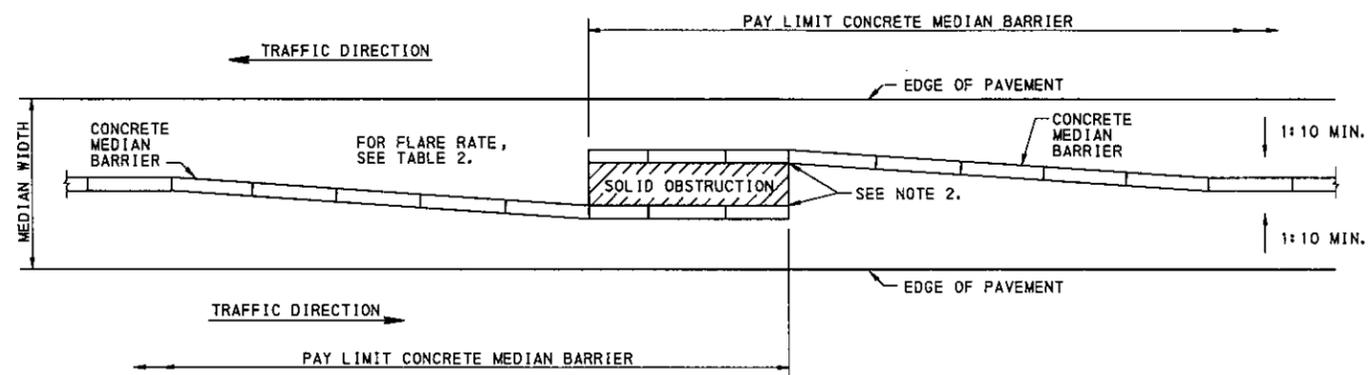
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BARRIER PLACEMENT
AT OBSTRUCTIONS

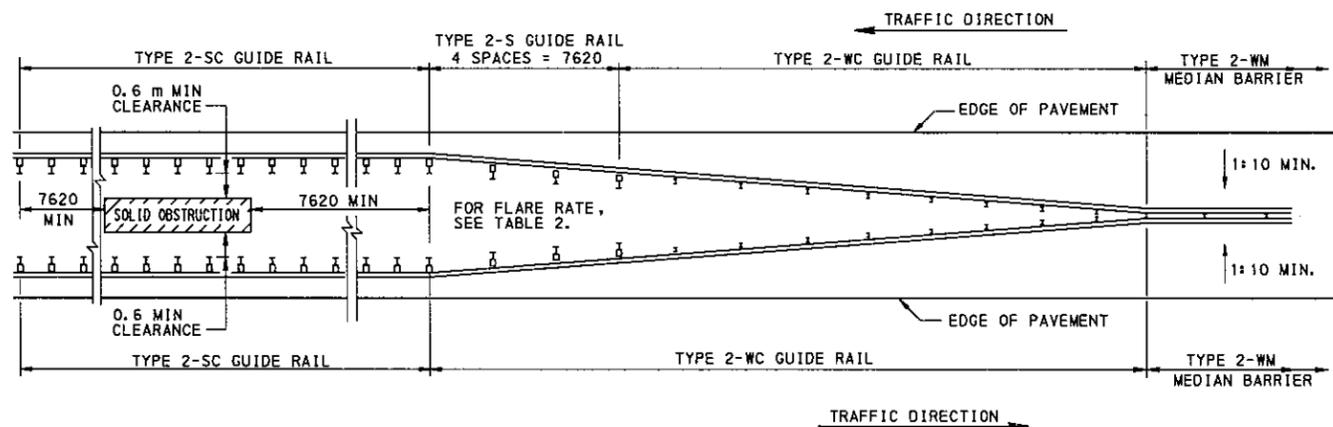
RECOMMENDED AUG. 16, 1999
Dean A. Schaefer
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 16, 1999
Gary L. Hoffman
CHIEF ENGINEER

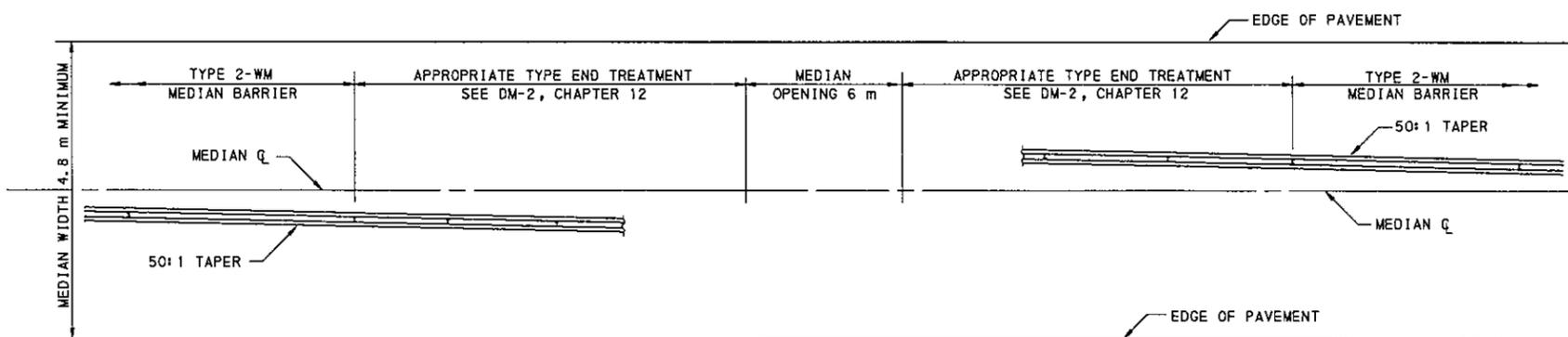
SHT. 1 OF 7
RC-54M



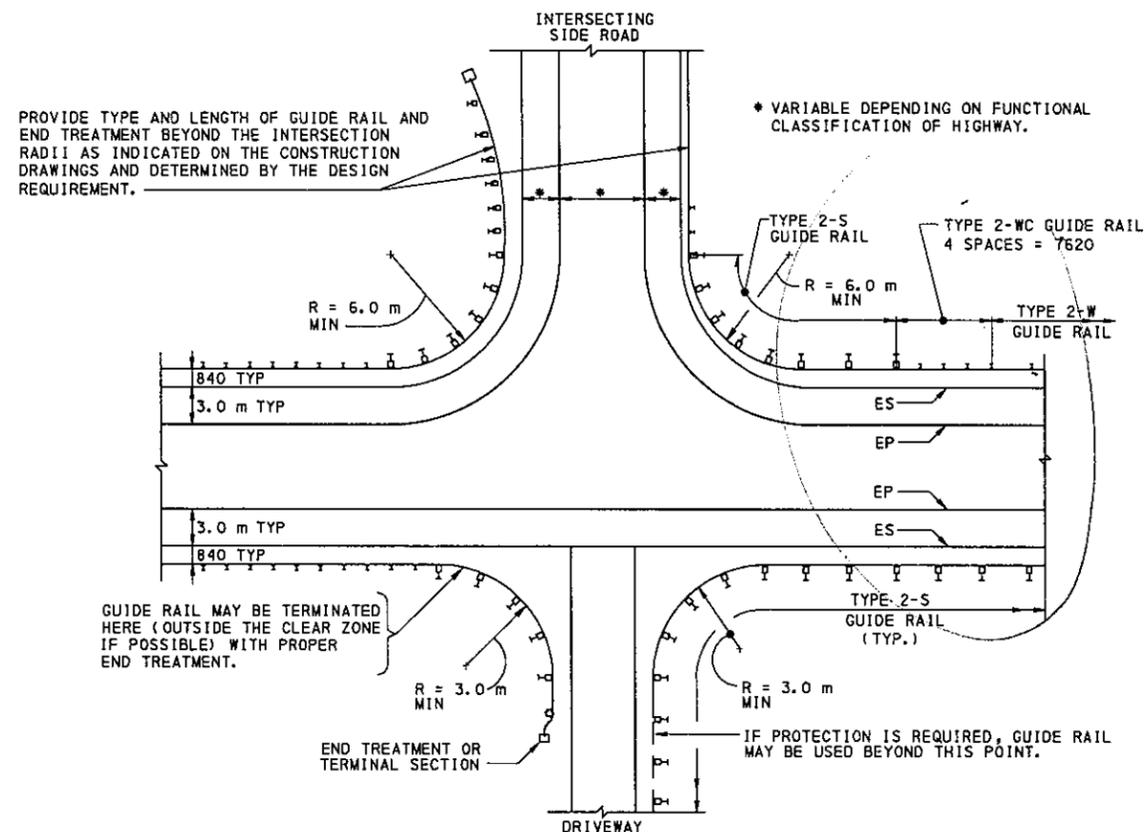
**TREATMENT AT OBSTRUCTION FOR MEDIAN WIDTHS 6.0 m OR LESS
WHERE CONTINUOUS BARRIER IS REQUIRED**



**TREATMENT AT OBSTRUCTION FOR MEDIAN WIDTHS OF 6.0 m TO 10.0 m
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**

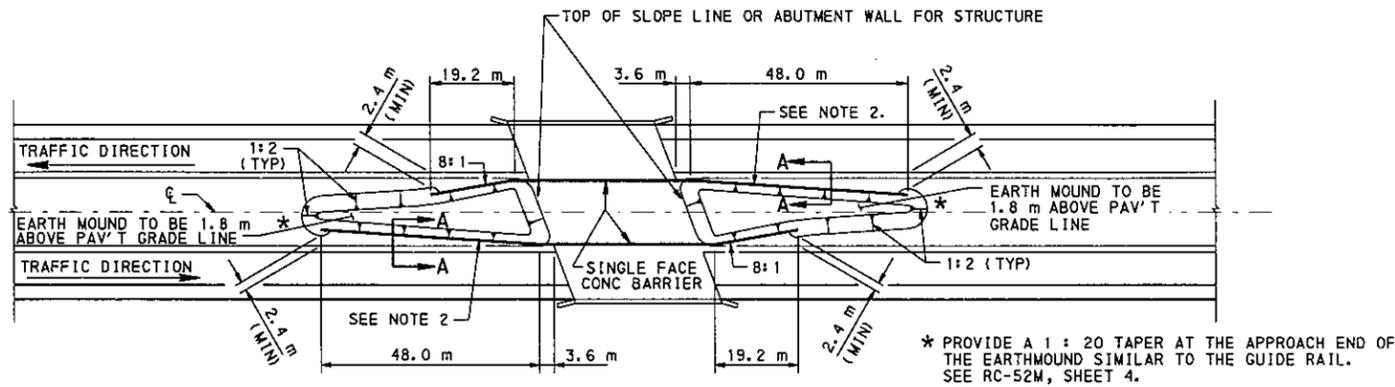
DESIGN SPEED (km/h)	MAXIMUM FLARE RATES	
	CONCRETE BARRIER	GUIDE RAIL
120	20 ± 1	15 ± 1
110	20 ± 1	15 ± 1
100	18 ± 1	14 ± 1
90	16 ± 1	12 ± 1
80	14 ± 1	11 ± 1
70	12 ± 1	10 ± 1
60	10 ± 1	8 ± 1
50	8 ± 1	7 ± 1

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.
3. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

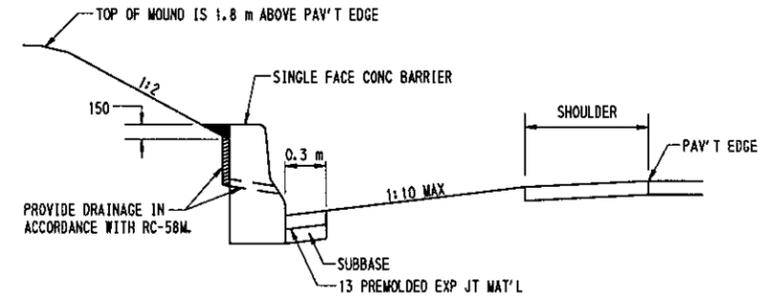
**COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN**

**BARRIER PLACEMENT
AT OBSTRUCTIONS**



TYPICAL MEDIAN EARTH MOUND DETAIL FOR AT-GRADE DUAL BRIDGES

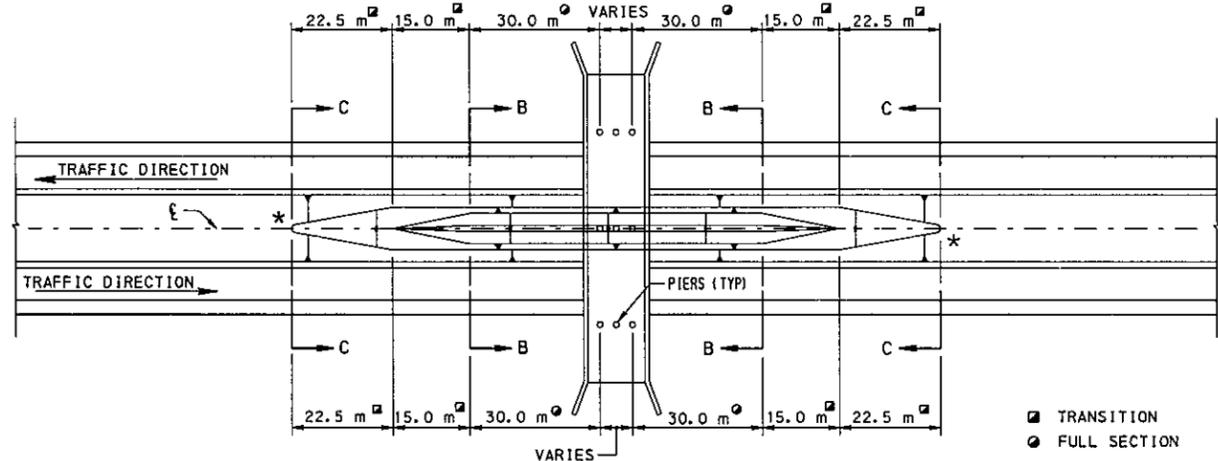
SEE NOTE 4



SECTION A-A

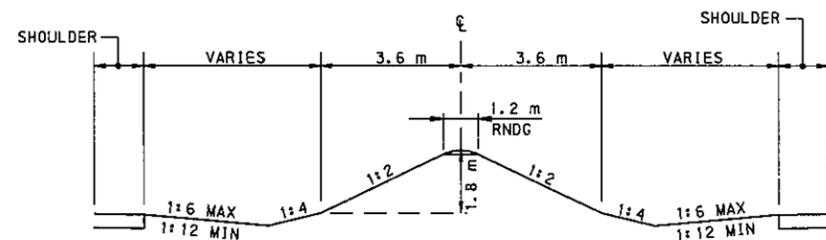
NOTES

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 408M.
5. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

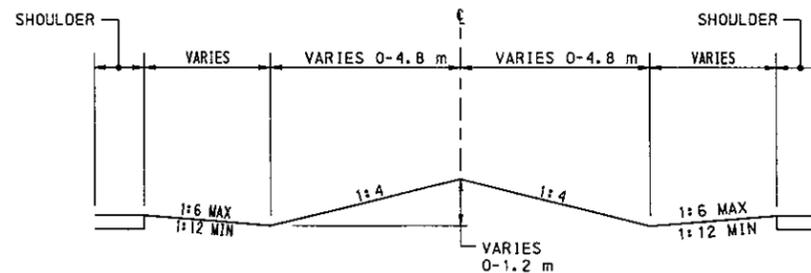


TYPICAL MEDIAN EARTH MOUND DETAIL FOR OVERHEAD STRUCTURES FOR MEDIAN WIDTHS OF 18.0 M OR GREATER

SEE NOTE 4



SECTION B-B



SECTION C-C

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BARRIER PLACEMENT
AT OBSTRUCTIONS

EARTH MOUNDS

RECOMMENDED AUG. 16, 1999

Dean A. Schick
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 16, 1999

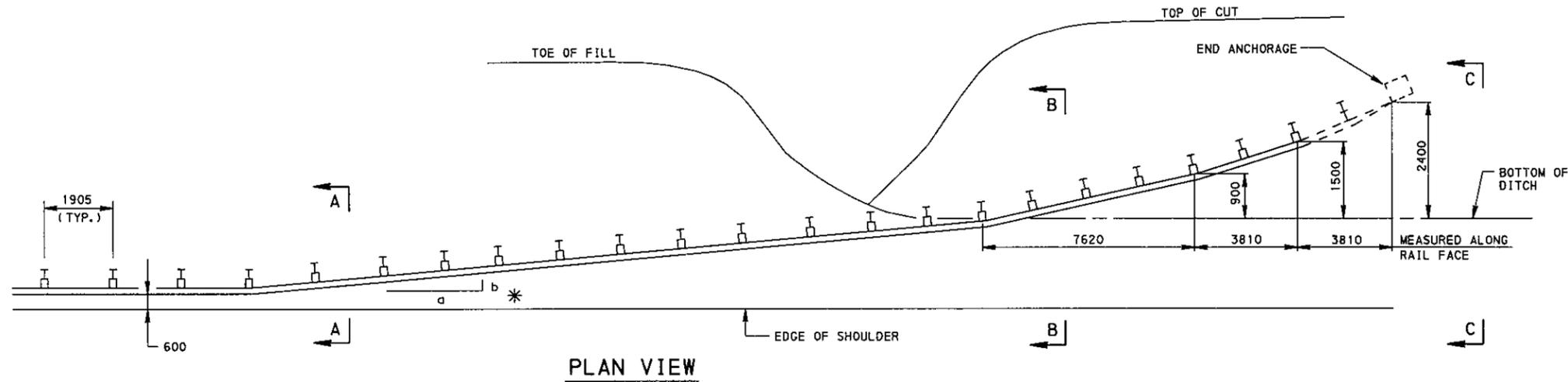
Gary L. Hoffman
CHIEF ENGINEER

SHT 4 OF 7

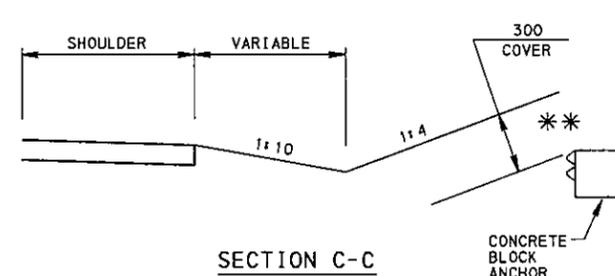
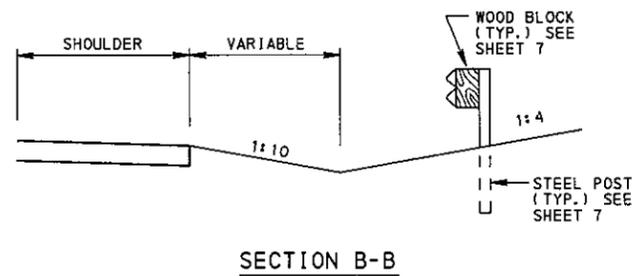
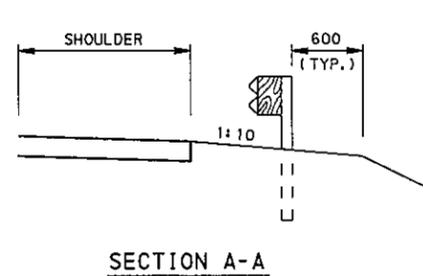
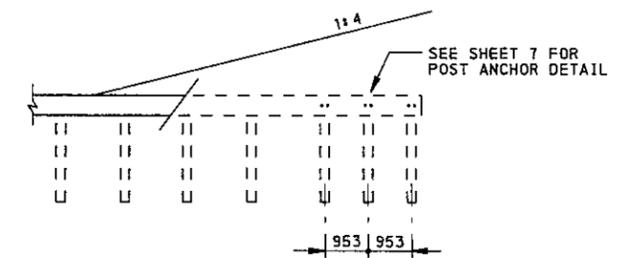
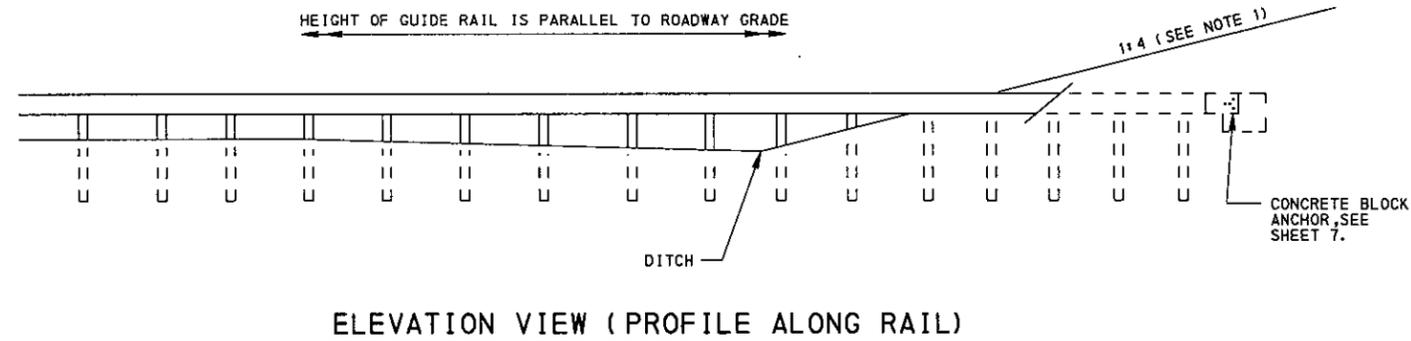
RC-54M

GENERAL NOTES:

1. A 1:4 BACK SLOPE IS DESIRABLE. HOWEVER, STEEPER SLOPES MAY BE USED.
2. HEIGHT OF GUIDE RAIL MAY BE TAPERED DOWN IN ELEVATION TO MAINTAIN 450 MAXIMUM HEIGHT FROM GROUND ELEVATION TO BOTTOM OF THE RAIL ELEMENT.
3. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.
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 6:1 SLOPE (rehab.) AND A 10:1 SLOPE (new construction). IT CAN BE ANCHORED WITH A CONCRETE BLOCK OR A POST ANCHOR.



* a:b = 12.5 : 1
9 : 1 LOWSPEED

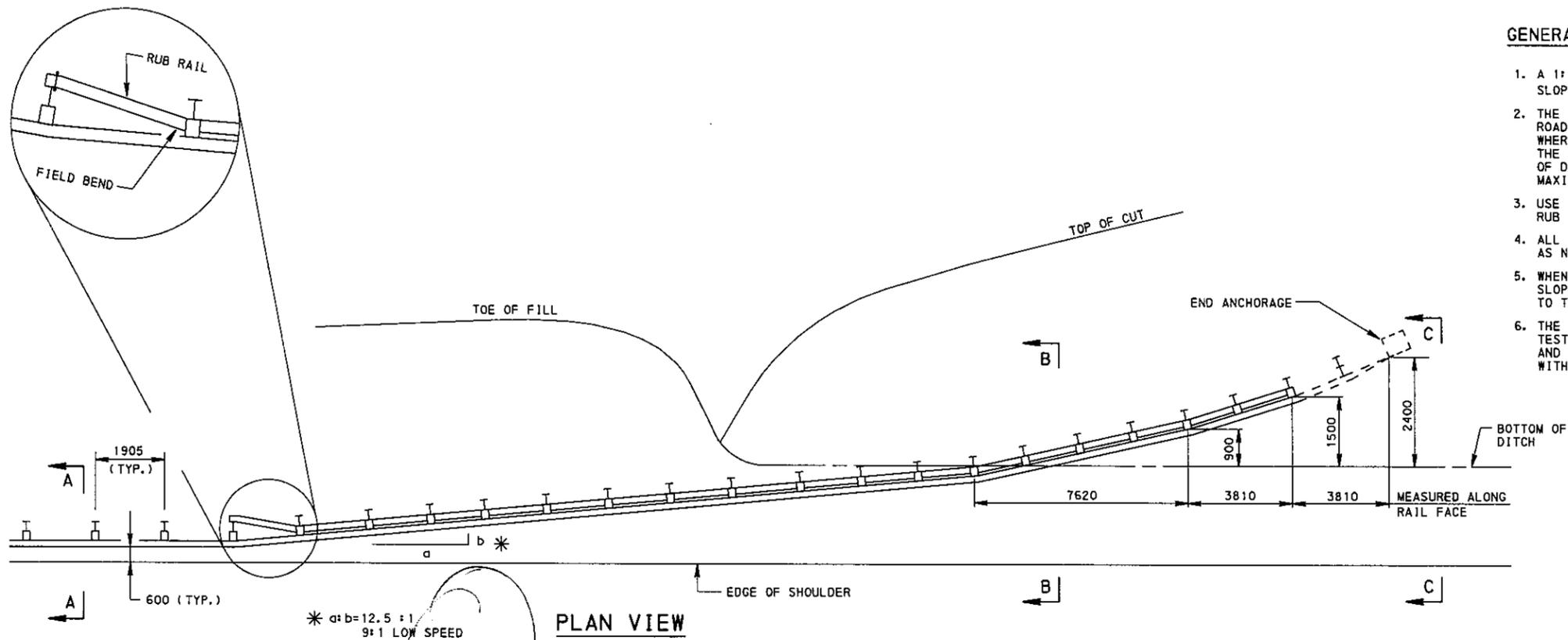


** ROCK ANCHORAGE DOES NOT REQUIRE THE 300 (1') BURIAL.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

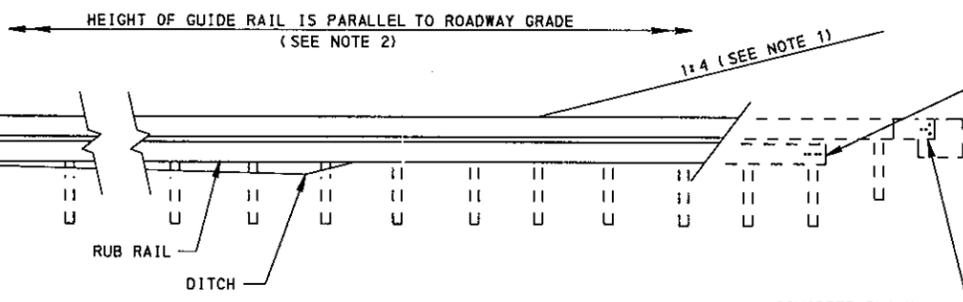
GUIDE RAIL
BACKSLOPE
ANCHOR TERMINAL
(NEW CONSTRUCTION OR
RECONSTRUCTION)

RECOMMENDED AUG. 16, 1999 <i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Gary J. Hoffman</i> CHIEF ENGINEER	SHT 5 OF 7 RC-54M
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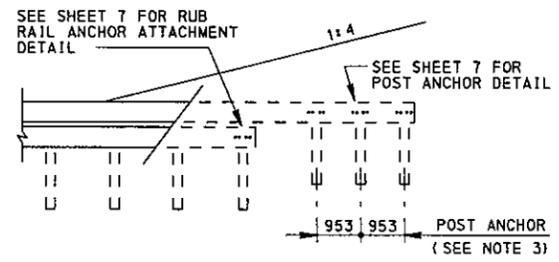


* a:b=12.5:1
9:1 LOW SPEED

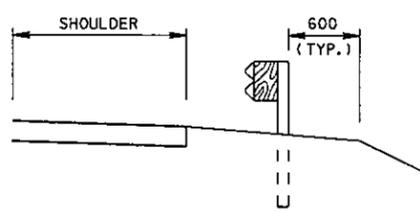
PLAN VIEW



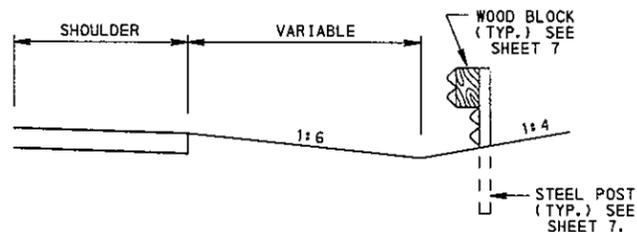
ELEVATION VIEW (PROFILE ALONG RAIL)



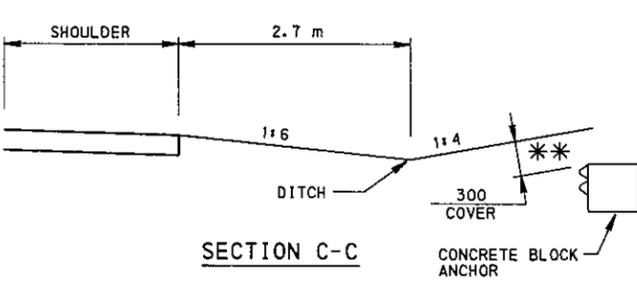
ALTERNATE END ANCHORAGE



SECTION A-A



SECTION B-B WITH RUBRAIL



SECTION C-C

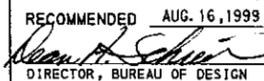
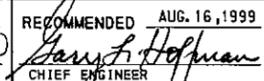
** ROCK ANCHORAGE DOES NOT REQUIRE THE 300 (1') BURIAL.

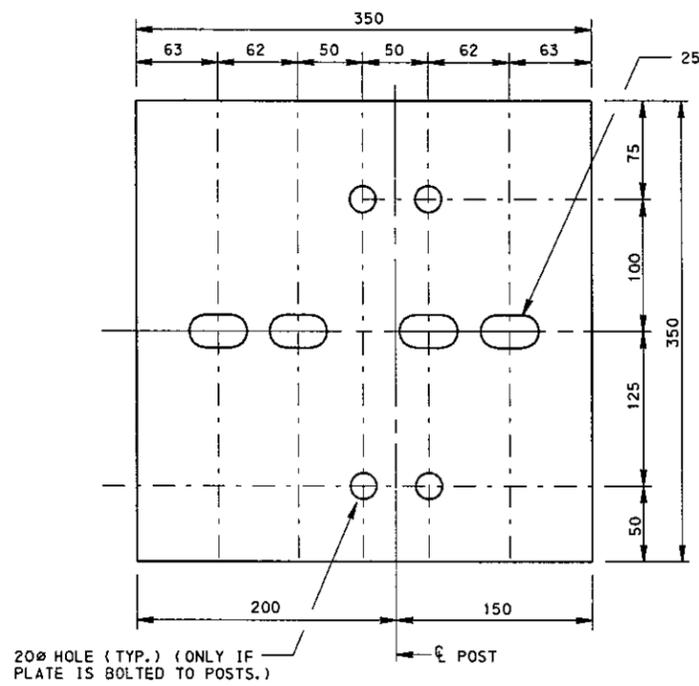
GENERAL NOTES:

1. A 1:4 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 17" (AND IS INCREASING). MAXIMUM HEIGHT OF DOUBLE RAIL SYSTEM IS 45", TAPER BOTH RAILS TO MAINTAIN MAXIMUM HEIGHT. FLARE RATE FOR THE RAIL IS 12 1/2:1.
3. USE 2449 (8') LONG POSTS FOR ALL POST LOCATIONS WITH A RUB RAIL. POSTS FOR THE POST ANCHOR ARE 1830 (6') LONG.
4. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.
5. 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.
6. THE BACKSLOPE ANCHOR TERMINAL HAS BEEN CRASH TESTED TO NCHRP 350 CRITERIA FOR A 6:1 SLOPE (rehab.) AND A 10:1 SLOPE (new construction). IT CAN BE ANCHORED WITH A CONCRETE BLOCK OR A POST ANCHOR.

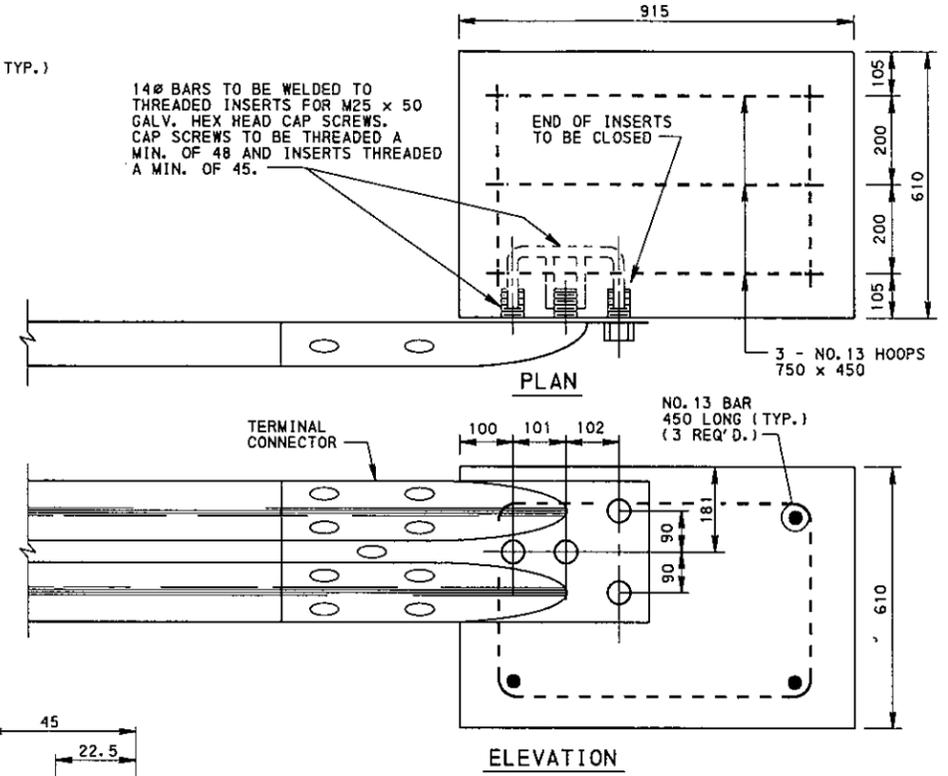
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

GUIDE RAIL
BACKSLOPE
ANCHOR TERMINAL
(REHAB. PROJECTS)

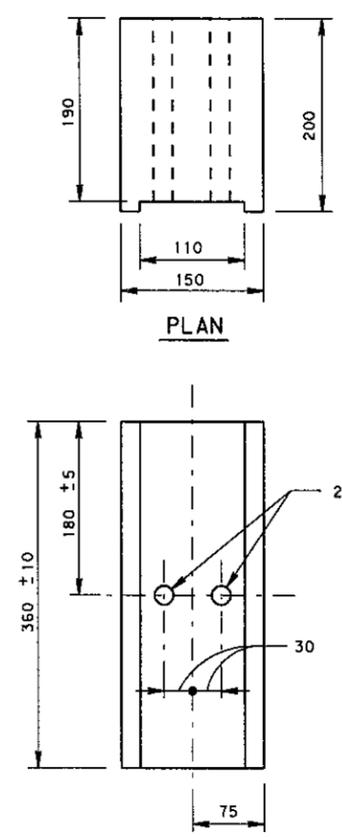
RECOMMENDED AUG. 16, 1999
 DIRECTOR, BUREAU OF DESIGN
 CHIEF ENGINEER
 SHT 6 OF 7
 RC-54M



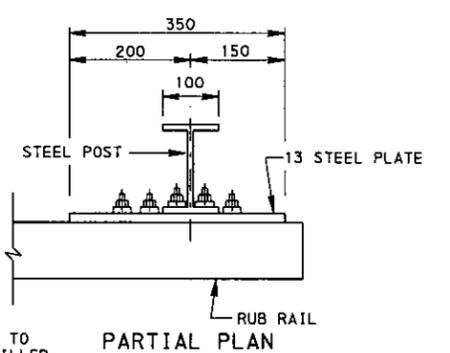
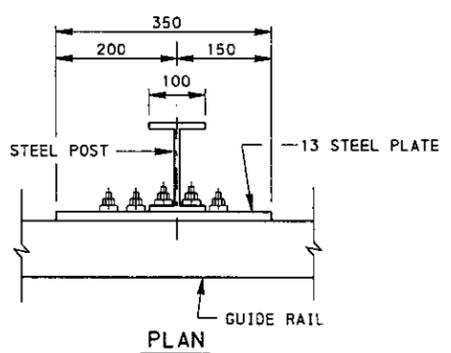
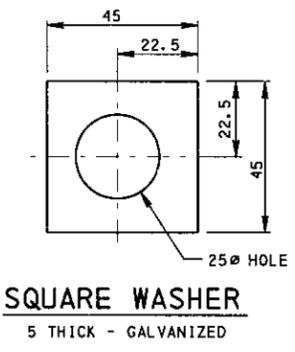
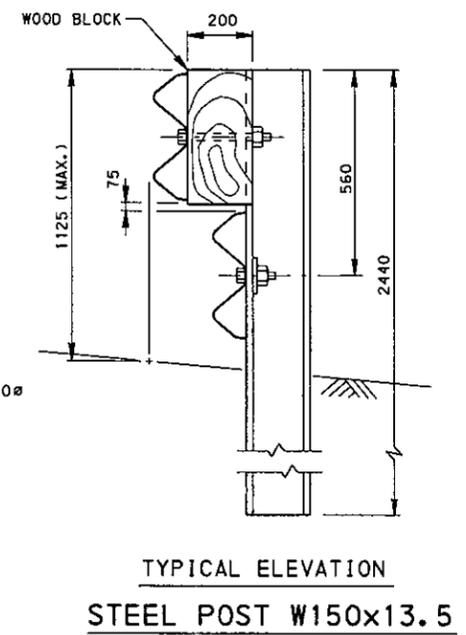
STEEL PLATE - 13 mm
GALVANIZED
WELDED OR BOLTED TO POST



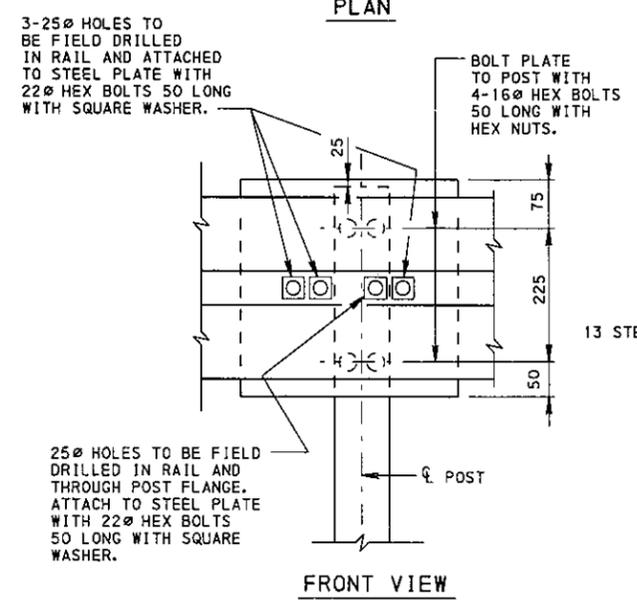
CONCRETE BLOCK ANCHOR



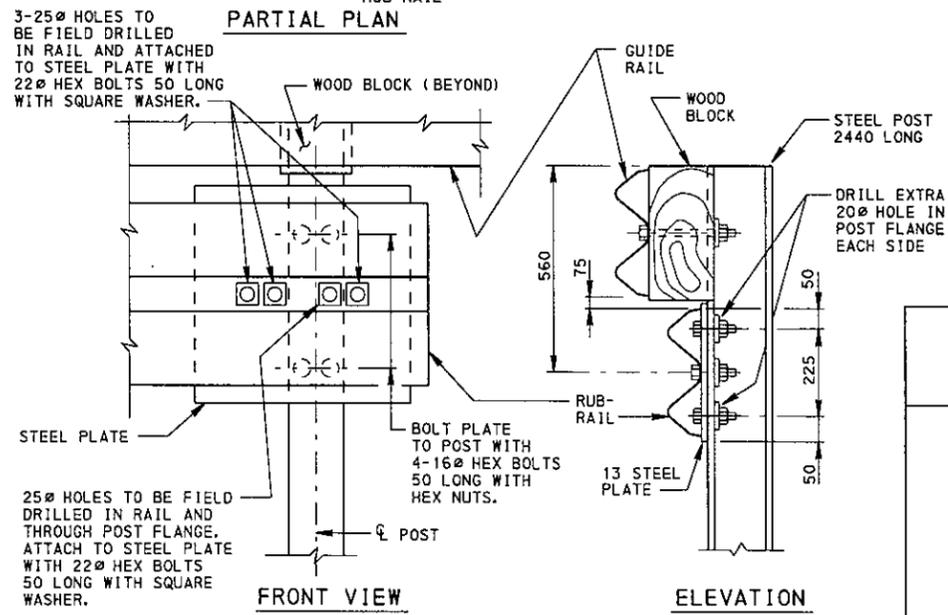
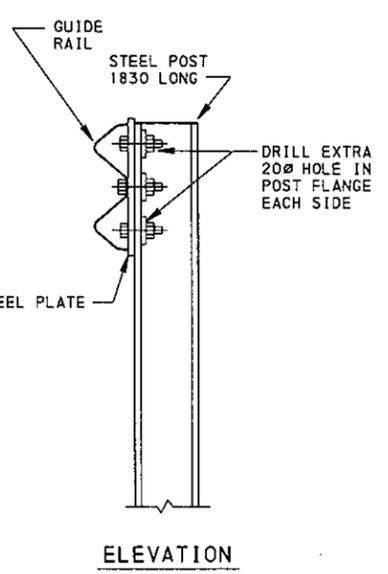
WOOD BLOCK



NOTE:
ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



POST ANCHOR DETAIL
DIMENSIONS ARE TYPICAL



RUBRAIL ANCHOR ATTACHMENT

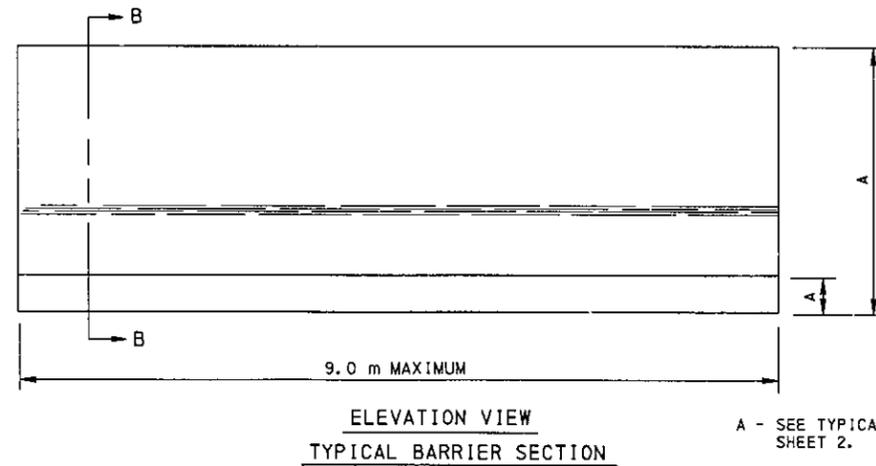
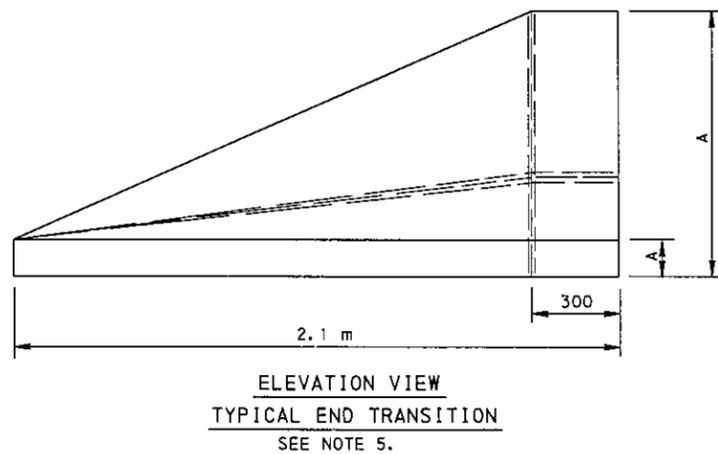
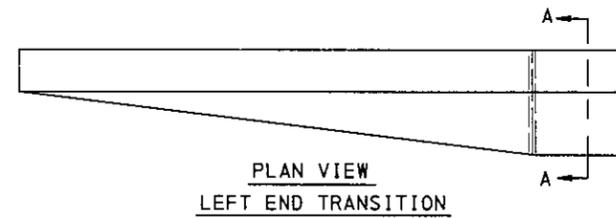
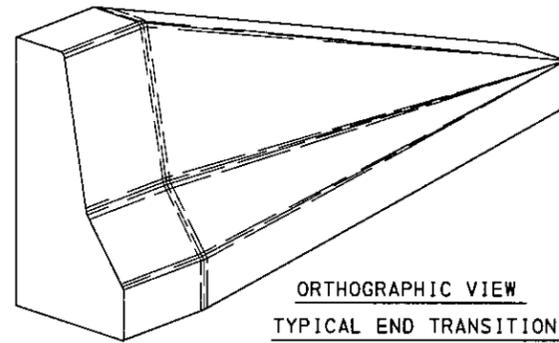
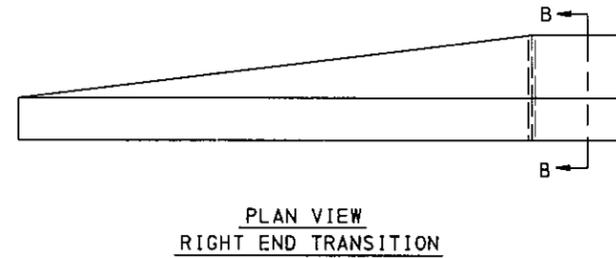
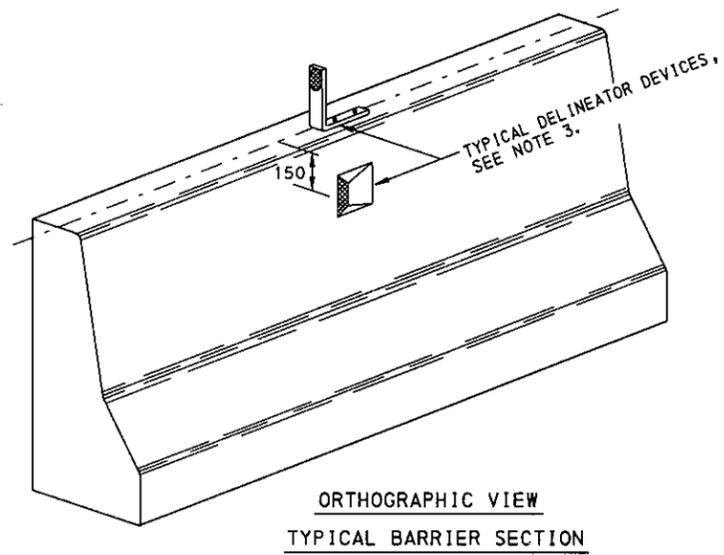
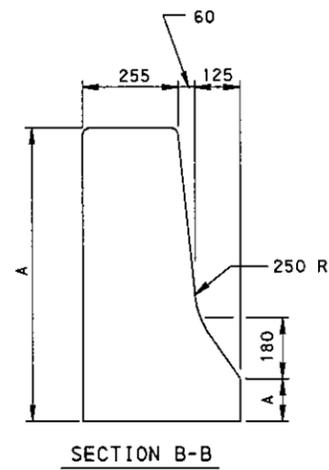
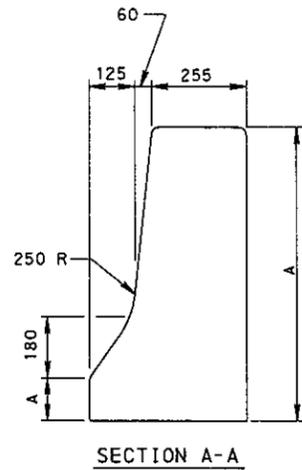
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

BACKSLOPE
ANCHOR TERMINAL
END ANCHORAGE DETAILS

RECOMMENDED AUG. 16, 1999
Shawn A. Schmitt
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED AUG. 16, 1999
Harry J. Hoffman
CHIEF ENGINEER

SHT 1 OF 1
RC-54M



A - SEE TYPICAL SECTIONS, SHEET 2.

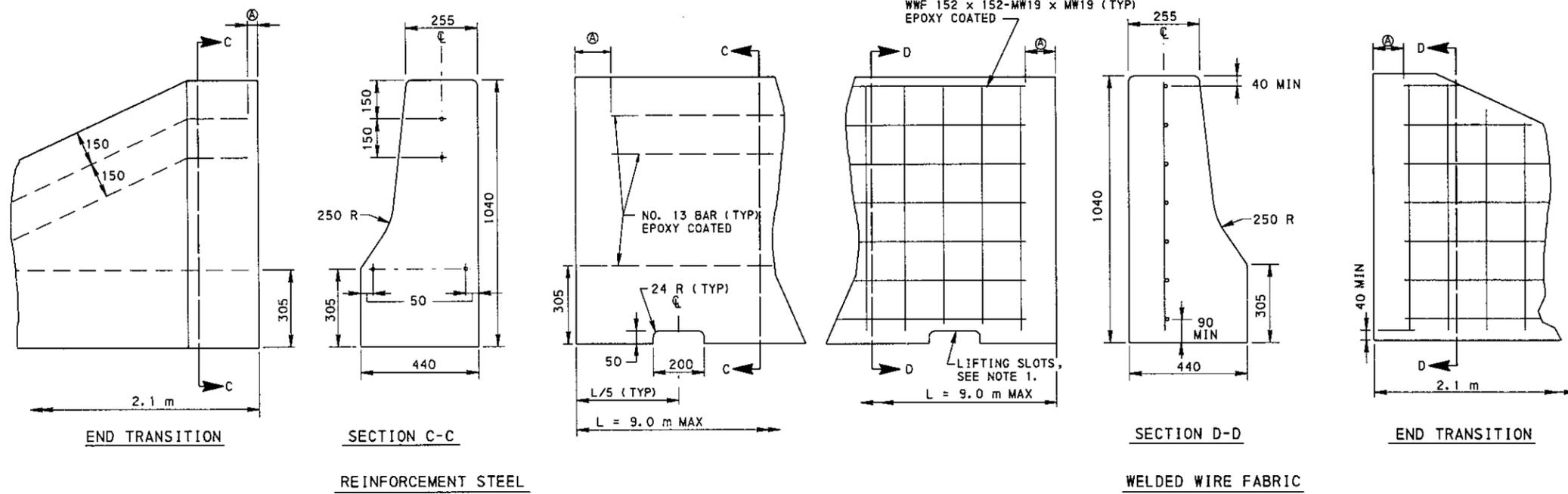
NOTES

1. PROVIDE SINGLE FACE CONCRETE BARRIER MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 623.
2. PROVIDE PRECAST SINGLE FACE CONCRETE BARRIER SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT AN 841 x 594 REPRODUCIBLE SHOP DRAWING TO THE BUREAU OF CONSTRUCTION AND MATERIALS, MATERIALS AND TESTING DIVISION FOR REVIEW. MODIFICATIONS OR DEVIATIONS FROM THE STANDARD ALSO 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 ALL EDGES WITH A RADIUS OF 24 EXCEPT AS SHOWN.
7. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

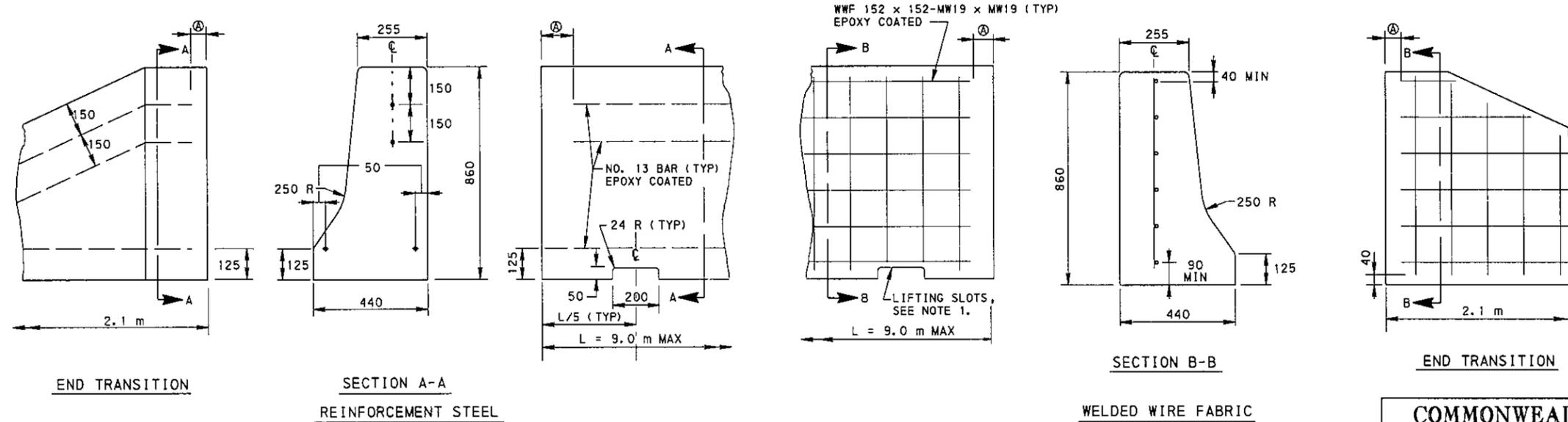
TYPICAL PRECAST OR CAST-IN-PLACE SINGLE FACE CONCRETE BARRIER

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF DESIGN		
SINGLE FACE CONCRETE BARRIER		
RECOMMENDED AUG. 16, 1999 <i>Alan A. Schick</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Gary J. Hoffman</i> BRIEF ENGINEER	SHT 1 OF 6 RC-58M

14-JUL-1999



TYPICAL REINFORCEMENT DETAILS FOR 1040 BARRIER



TYPICAL REINFORCEMENT DETAILS FOR 860 BARRIER

NOTES

1. PROVIDE SLOTS FOR HANDLING, INSTALLING AND REMOVING PRECAST CONCRETE BARRIERS. ALTERNATE METHODS OR DEVICES MAY BE USED AS APPROVED BY THE BUREAU OF DESIGN. GALVANIZE METAL DEVICES AS SPECIFIED IN PUBLICATION 408M, SECTION 1105.02(s).
2. ROUND ALL EDGES WITH A RADIUS OF 24 EXCEPT AS NOTED.
3. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

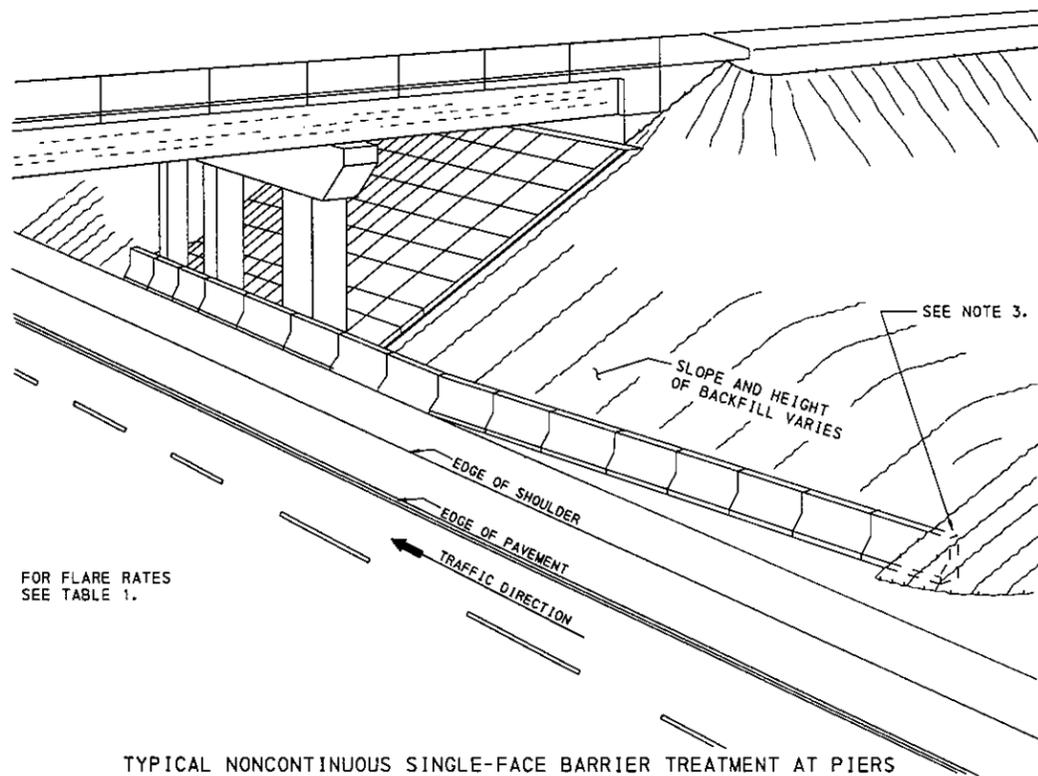
LEGEND

ⓐ PROVIDE REINFORCEMENT MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 709 WITH A MINIMUM CONCRETE COVER OF 40. KEEP WIRE FABRIC OR BAR LIMITS AT 140 MINIMUM FOR PRECAST BARRIER WITH PLATE CONNECTIONS.

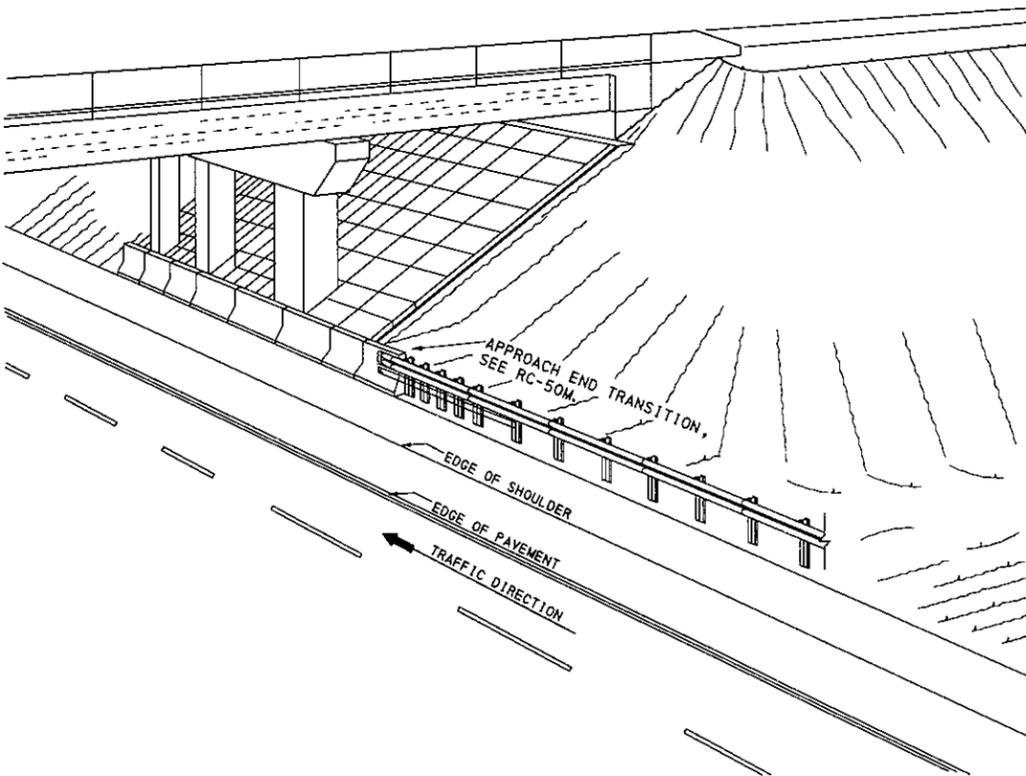
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER

RECOMMENDED AUG. 16, 1999 <i>Alan A. Schur</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Harry F. Hoffman</i> CHIEF ENGINEER	SHT 3 OF 6 RC-58M
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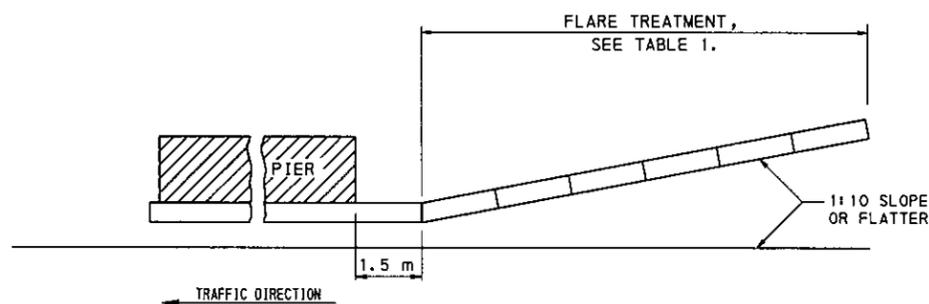
TYPICAL NONCONTINUOUS SINGLE-FACE BARRIER TREATMENT AT PIERS



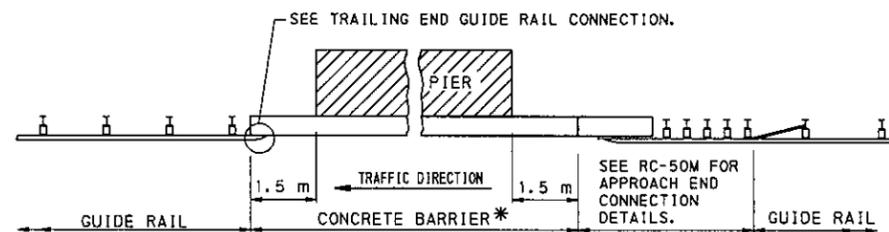
TYPICAL TREATMENT WHEN CONTINUOUS GUIDE RAIL IS REQUIRED

NOTES

1. PROVIDE SINGLE FACE CONCRETE BARRIER AND GUIDE RAIL MEETING THE REQUIREMENTS OF PUBLICATION 408M, 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. WHEN THE END OF CONCRETE BARRIER TERMINATES WITHIN THE CLEAR ZONE, BURY IT INTO THE EXISTING SLOPE (PREFERABLY 1:2) ONE FOOT DEEP OTHERWISE, USE AN IMPACT ATTENUATING DEVICE.
4. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



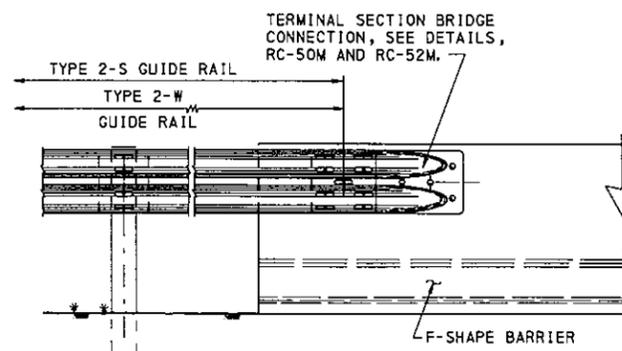
PLAN VIEW



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



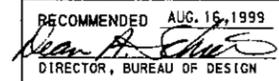
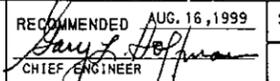
TRAILING END GUIDE RAIL CONNECTION TO F-SHAPE BARRIER

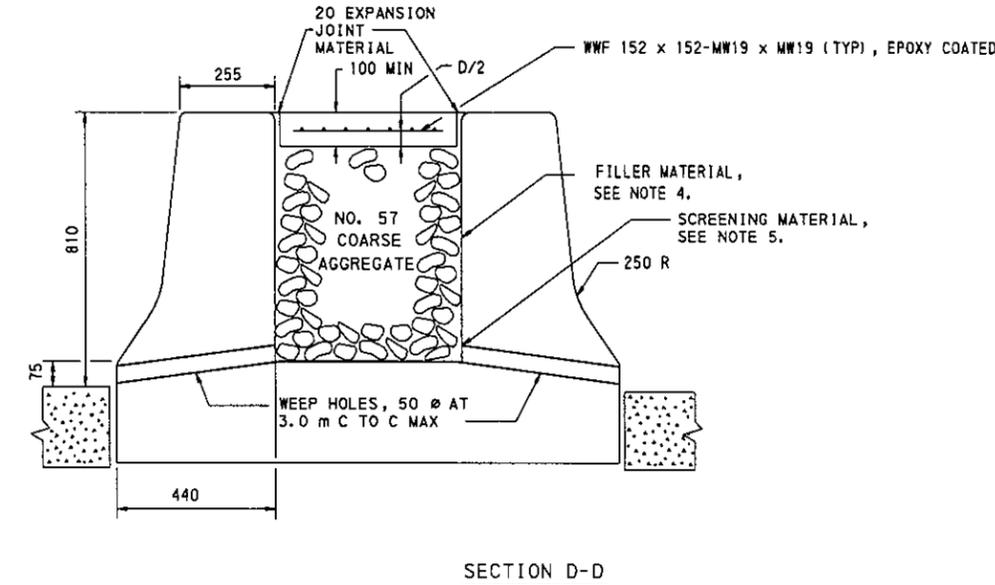
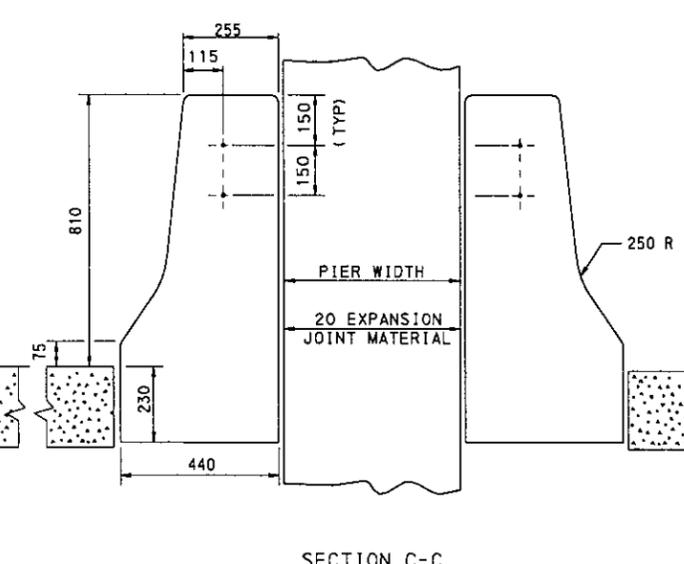
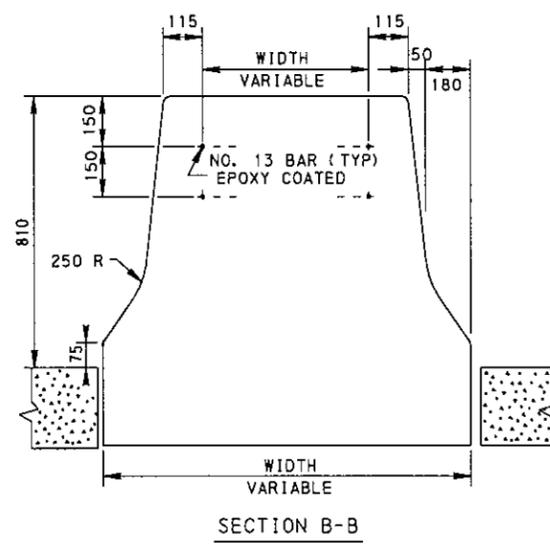
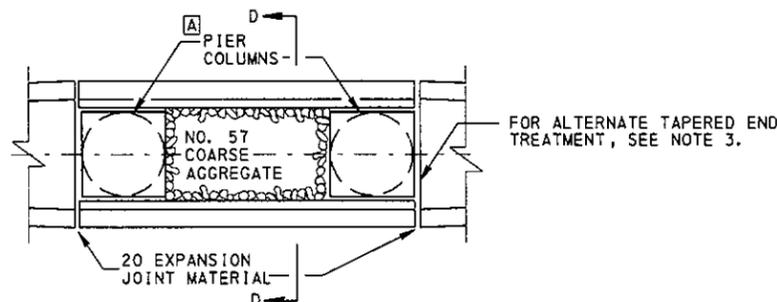
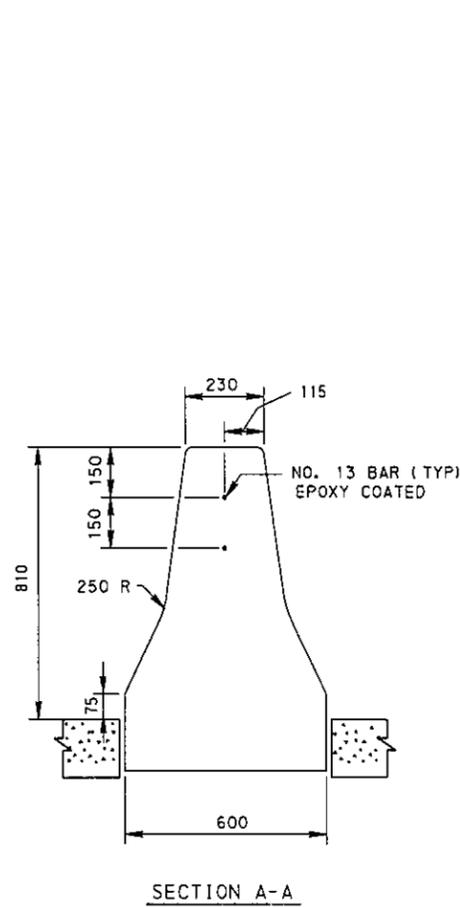
TABLE 1
FLARE RATES FOR BARRIER DESIGN

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

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER
PLACEMENT AT SHOULDER PIERS

RECOMMENDED AUG. 16, 1999
 DIRECTOR, BUREAU OF DESIGN
 RECOMMENDED AUG. 16, 1999
 CHIEF ENGINEER
 SHT 4 OF 6
 RC-58M

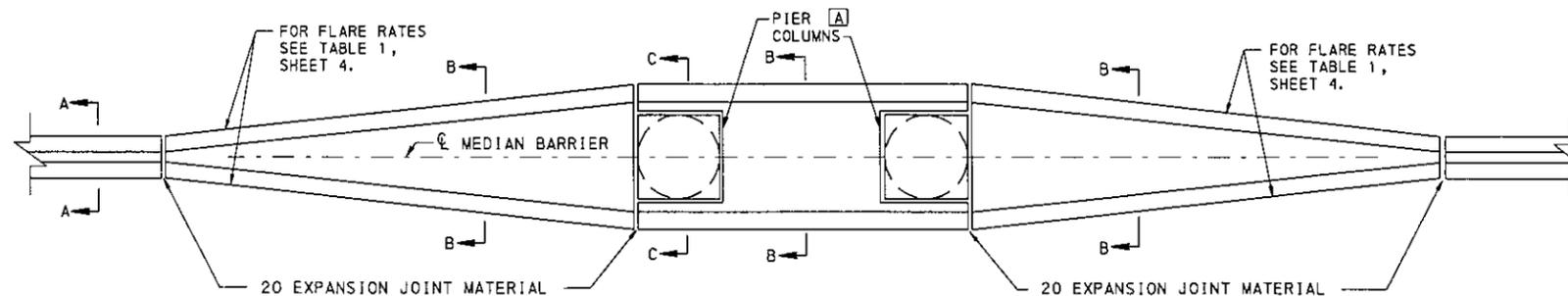


TYPICAL ALTERNATE BARRIER TREATMENT AT PIERS

SECTION D-D

NOTES

1. REFER TO BRIDGE STANDARD DRAWINGS (BD-601M) FOR DETAILS OF CONCRETE MEDIAN BARRIER ACROSS STRUCTURES.
2. ALLOW NO ADDITIONAL COMPENSATION FOR TRANSITIONS IN THE CONCRETE MEDIAN BARRIER AT PIERS OR STRUCTURES.
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 408M, 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 ALL EDGES WITH A RADIUS OF 24 EXCEPT AS SHOWN.
7. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



TYPICAL BARRIER TREATMENT AT PIERS

USE 20 EXPANSION JOINT MATERIAL AROUND ALL PIERS.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER
PLACEMENT AT MEDIAN PIERS

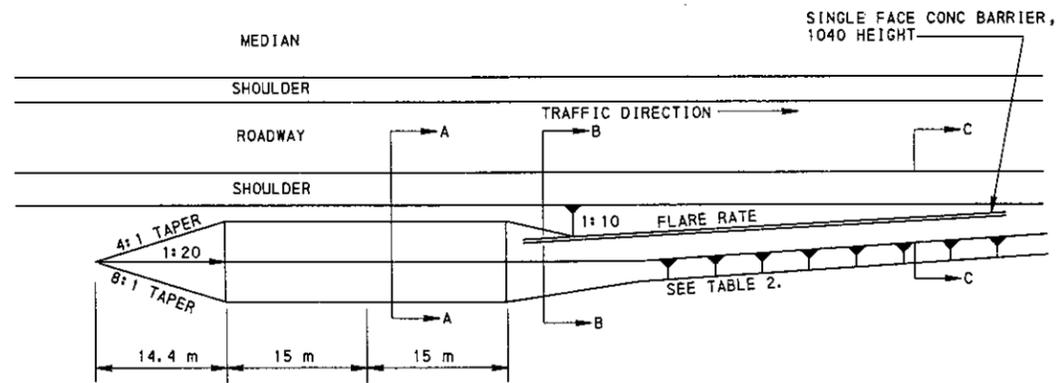
RECOMMENDED AUG. 16, 1999 <i>Alan P. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Gary B. Hoffman</i> CHIEF ENGINEER	SHT 5 OF 6 RC-58M
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TABLE 2
FLARE RATES
FOR BARRIER DESIGN

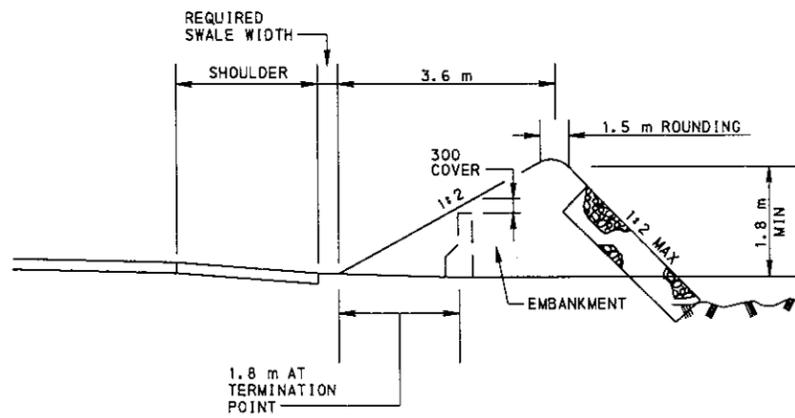
DESIGN SPEED (km/h)	MAXIMUM
	FLARE RATES CONCRETE BARRIER
120	20 : 1
110	20 : 1
100	18 : 1
90	16 : 1
80	14 : 1
70	12 : 1
60	10 : 1
50	8 : 1

NOTES

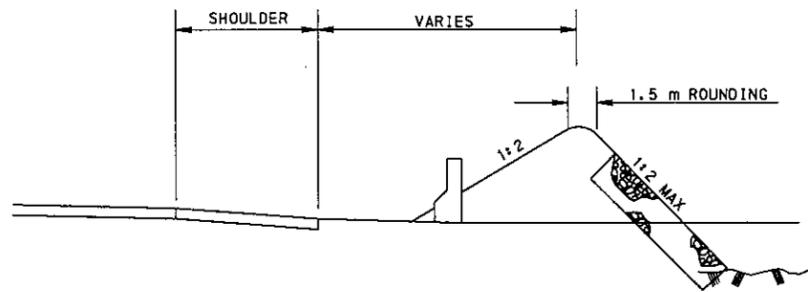
1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUBLICATION 408M.
2. ALL MATERIALS NECESSARY TO CONSTRUCT EARTH MOUNDS ARE IN ACCORDANCE WITH APPLICABLE SECTIONS OF PUBLICATION 408M.
3. EARTHMOUNDS MAY BE USED TO BURY CONCRETE BARRIER ON HIGHWAYS WITH POSTED SPEEDS LESS THAN 80 km/h (50mph) AND WITH CURRENT TRAFFIC VOLUME LESS THAN 6000 VEHICLES PER DAY OR WHEN THEY ARE CONSTRUCTED OUTSIDE THE CLEAR ZONE.
4. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



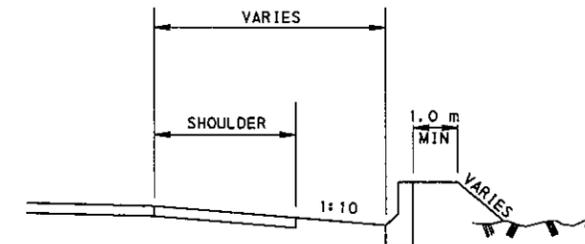
TYPICAL EARTH MOUND FOR BURYING CONCRETE BARRIER



SECTION A-A



SECTION B-B



SECTION C-C

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER

END TREATMENT
BURYING INTO EARTH MOUND

RECOMMENDED AUG. 16, 1999 <i>Alan H. Edm</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED AUG. 16, 1999 <i>Gary K. Hoffman</i> CHIEF ENGINEER	SHT 6 OF 6 RC-58M
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