



# TRANSMITTAL LETTER

Change #7  
Publication 72M  
September, 1995 Edition  
Date

February 18, 2000

299 (8-72)

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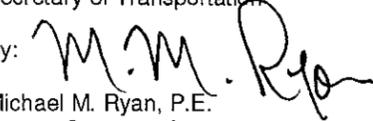
Revisions to Standards for Roadway Construction RC's 12M, 23M, 31M, 34M, 39M, 57M, 58M, 59M, 82M, 83M, and 84M.

### 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 should include these revisions.

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

<u>RC-Sheet #</u>	<u>Change Description</u>
RC-12M (1 of 2) (2 of 2)	<ul style="list-style-type: none"> <li>Previous 1 of 1. Changed title block to add sheet 2 of 2.</li> <li>This sheet was added to show limits of backfill at integral abutments.</li> </ul>
RC-23M (1 & 2 of 3) (3 of 3)	<ul style="list-style-type: none"> <li>Previous 1 and 2 of 2. Changed title blocks to add sheet 3 of 3.</li> <li>This sheet was added to show bridge approach slab details with integral abutments.</li> </ul>
RC-31M (1 of 1)	<ul style="list-style-type: none"> <li>Revised note 2 and added note 5.</li> <li>For Type D Endwall, the maximum pipe size was increased to 1275 MM.</li> </ul>
RC-34M (2 of 10) (8 of 10)	<ul style="list-style-type: none"> <li>Revised note 1 and added note 8.</li> <li>Added "CAST-IN-PLACE AND PRECAST" to the title block.</li> <li>Revised note 2 and combined notes 4 and 9.</li> <li>Added notes 10 and 11 relative to tapers and suitable lifting devices.</li> </ul>
(9 of 10)	<ul style="list-style-type: none"> <li>Modified inlet Boxes Type 1 and Type II have been redesigned to simplify manufacturing and construction. All of the details on this sheet have been revised including dimensions and reinforcement. Also revised Note 6.</li> </ul>
(10 of 10)	<ul style="list-style-type: none"> <li>Revised note 2 and added reinforcement notes in Section A-A.</li> <li>Added "CAST-IN-PLACE AND PRECAST" to the title block.</li> </ul>
RC-39M (1, 2 & 3 of 5)	<ul style="list-style-type: none"> <li>Minor changes to the metric dimensions for consistency</li> </ul>
RC- 57M(1 of 5) (3 of 5)	<ul style="list-style-type: none"> <li>Revised notes 2 and 9</li> <li>Revised note 1.</li> </ul>
(4 of 5)	<ul style="list-style-type: none"> <li>Revised the reinforcement note in Section B-B.</li> </ul>
RC-58M (1 of 6) (3 of 6)	<ul style="list-style-type: none"> <li>Revised notes 2 and 6</li> <li>Revised notes 1 and 2</li> </ul>

(5 of 6)	<ul style="list-style-type: none"> <li>Revised details in Section D-D</li> </ul>
RC-59M (1 of 2)	<ul style="list-style-type: none"> <li>Revised notes 4 and 7</li> </ul>
RC-82M (1 of 1)	<ul style="list-style-type: none"> <li>Revised note 2 and deleted note 9</li> </ul>
RC-83M (1 of 2)	<ul style="list-style-type: none"> <li>Deleted the reference to octagonal poles.</li> <li>Changed the minimum setback distance to 0.9M for Type 2-S guiderail.</li> <li>Added a note requiring that truss arm aluminum poles meet the silhouette requirement of steel poles.</li> </ul>
RC-84M (1 of 1)	<ul style="list-style-type: none"> <li>Added 120/240 volt as a typical supply voltage.</li> <li>Clarified that a split bolt connector can be used to connect the neutral to the ground in pole bases.</li> </ul>
<b>CANCEL THE FOLLOWING:</b>	<b>REQUEST ADDITIONAL COPIES FROM:</b>
Index Sheet RC - 12M RC - 23M RC - 31M RC - 34M RC - 39M RC - 57M RC - 58M RC - 59M RC - 82M RC - 83M RC - 84M	August 16, 1999 August 16, 1999 March 6, 1998 May 16, 1997 August 6, 1999 March 6, 1998 January 15, 1999 August 16, 1999 September 30, 1998 September 30, 1998 September 30, 1998 September 30, 1998
	Bureau of Office Services Publications Sales Office P.O. Box 2028 Middletown, PA 17120
	<b>APPROVED FOR ISSUANCE BY:</b>  Bradley L. Mallory Secretary of Transportation  By:  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 (2 Sheets) _____	FEB 18, 2000	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 (3 Sheets) _____	FEB 18, 2000	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 _____	FEB 18, 2000	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) _____	FEB 18, 2000	INLETS
RC-35M _____	SEP 25, 1995	DRAINAGE DIKE
RC-36M _____	MAY 16, 1997	SPRING BOXES
* RC-39M (5 Sheets) _____	FEB 18, 2000	STANDARD MANHOLES
RC-40M _____	SEP 25, 1995	SLOPE PROTECTION
RC-43M _____	SEP 25, 1995	GABIONS

STANDARD DRAWING NUMBER	DRAWING DATE	DESCRIPTION
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## GUIDE RAIL AND MEDIAN BARRIER

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) _____	FEB 18, 2000	CONCRETE MEDIAN BARRIER
* RC-58M (6 Sheets) _____	FEB 18, 2000	SINGLE FACE CONCRETE BARRIER
* RC-59M (2 Sheets) _____	FEB 18, 2000	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

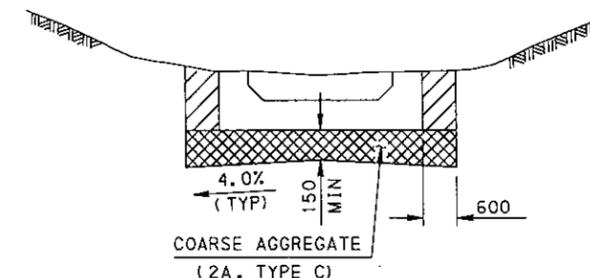
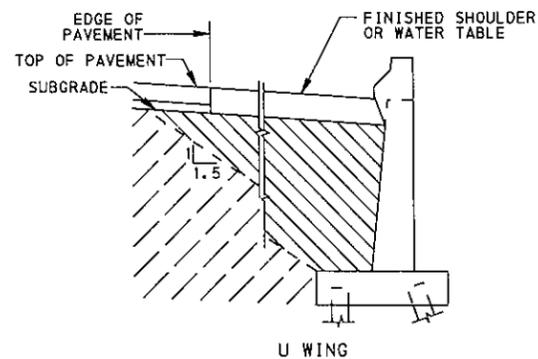
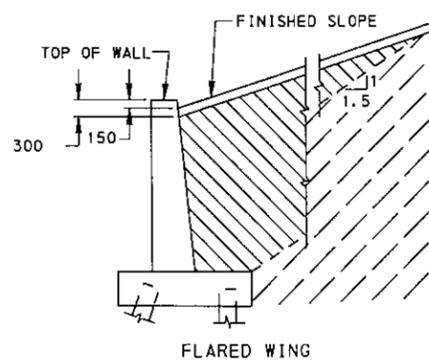
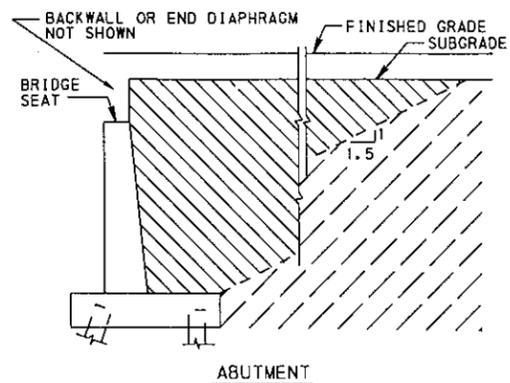
RC-70M (5 Sheets) _____	JAN 15, 1999	EROSION AND SEDIMENT POLLUTION CONTROL
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## HIGHWAY LIGHTING

RC-80M (2 Sheets) _____	SEP 30, 1998	HIGHWAY LIGHTING-FOUNDATIONS
RC-81M _____	SEP 30, 1998	HIGHWAY LIGHTING-JUNCTION BOXES-LIGHT DUTY
* RC-82M _____	FEB 18, 2000	HIGHWAY LIGHTING-JUNCTION BOXES-HEAVY DUTY
* RC-83M (2 Sheets) _____	FEB 18, 2000	HIGHWAY LIGHTING-LIGHTING POLE DETAILS
* RC-84M _____	FEB 18, 2000	HIGHWAY LIGHTING-LIGHTING AND ELECTRICAL DETAILS

## ROADSIDE DEVELOPMENT AND PLANTING

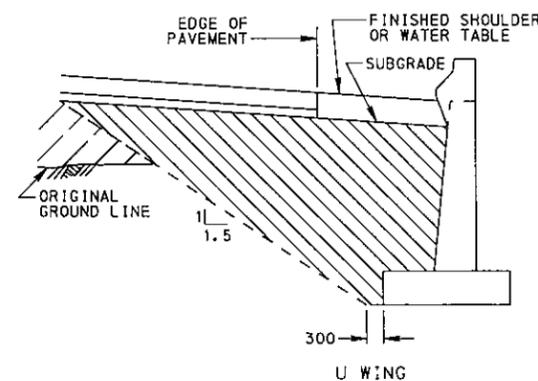
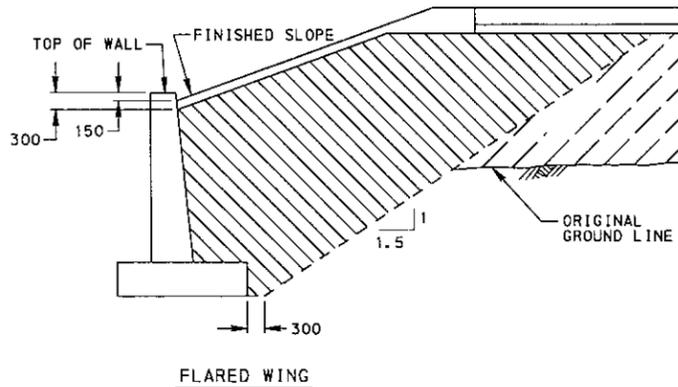
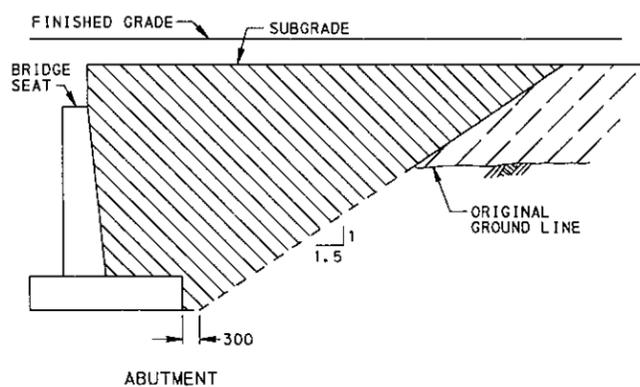
RC-91M _____	SEP 30, 1995	BRACING AND PLANTING DETAILS
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**FOUNDATION PREPARATION FOR RC BOX AND ARCH CULVERTS ON FINE GRAIN SOIL ONLY**

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**



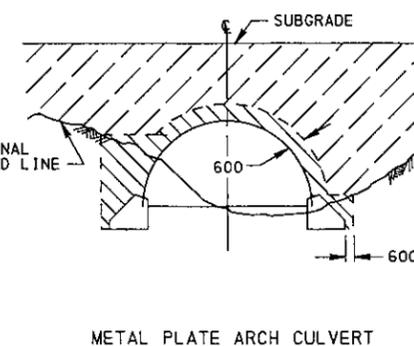
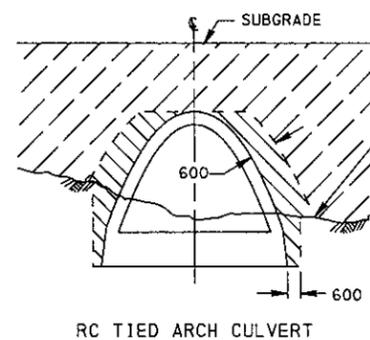
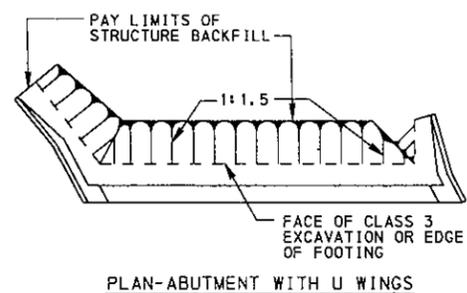
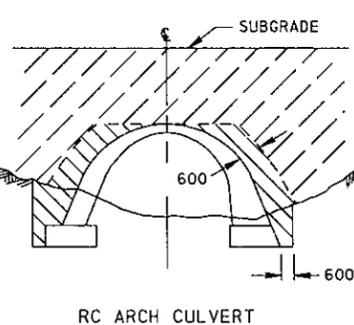
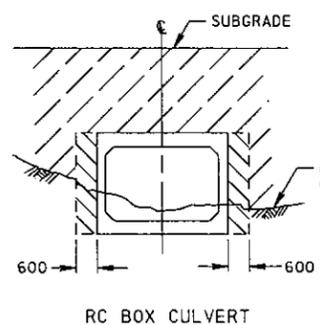
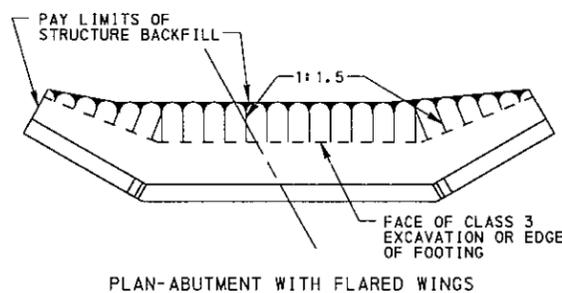
**LEGEND**

- STRUCTURE BACKFILL
- EMBANKMENT MATERIAL

**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 (d); 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 GGS 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**

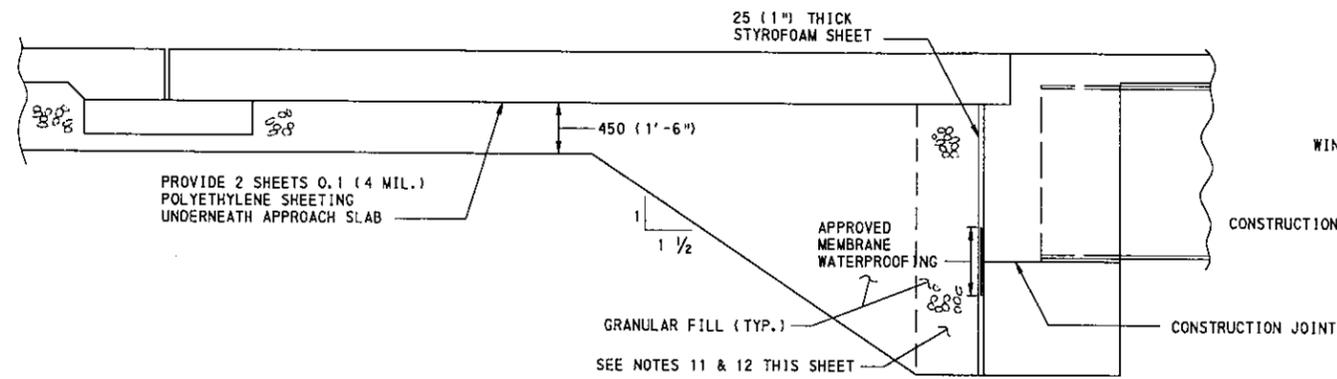
**COMMONWEALTH OF PENNSYLVANIA**  
**DEPARTMENT OF TRANSPORTATION**  
 BUREAU OF DESIGN

**BACKFILL AT STRUCTURES**

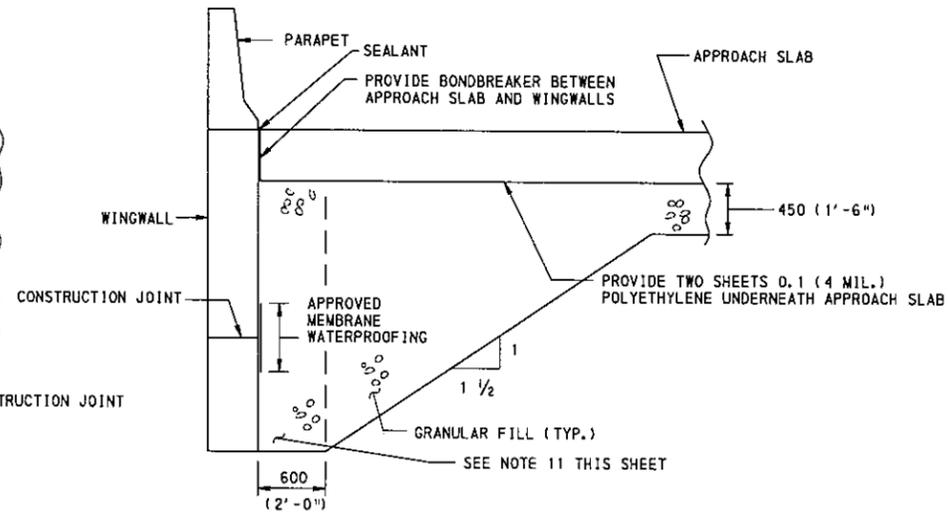
RECOMMENDED FEB. 18, 2000  
 DIRECTOR, BUREAU OF DESIGN

RECOMMENDED FEB. 18, 2000  
 CHIEF ENGINEER

SHT. 1 OF 2  
 RC-12M



LIMITS OF BACKFILL  
INTEGRAL ABUTMENT



LIMITS OF BACKFILL  
WINGWALLS OF INTEGRAL ABUTMENTS

GENERAL NOTES

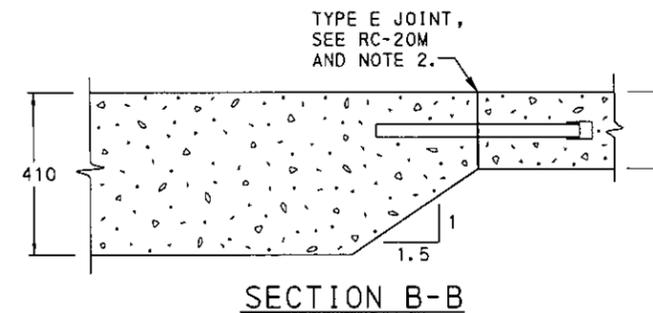
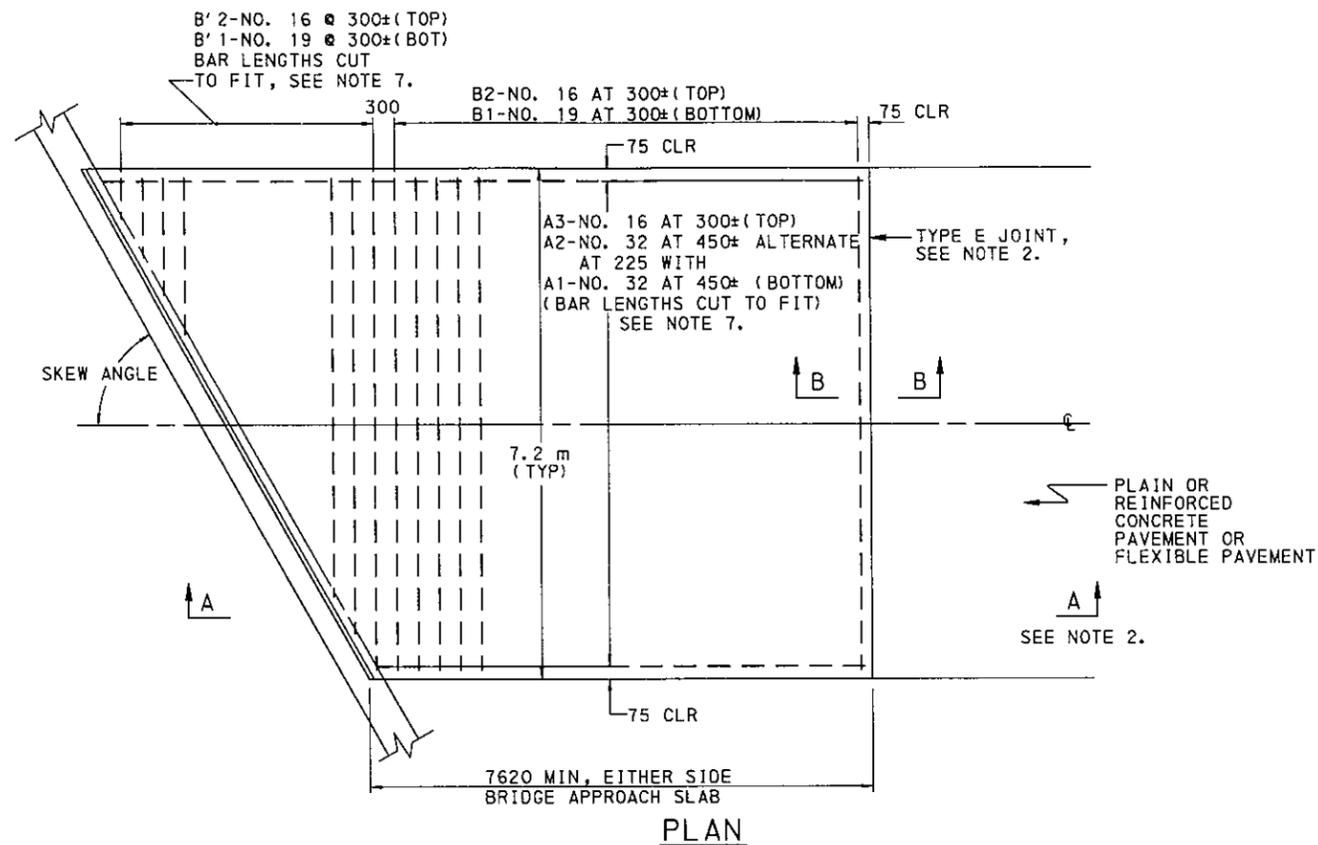
1. PROVIDE MATERIALS AND CONSTRUCTION MEETING THE REQUIREMENTS OF PUB 408/2000. PLACE BACKFILL AND EMBANKMENT IN ACCORDANCE WITH THIS STANDARD DRAWING UNLESS OTHERWISE SHOWN ON THE STRUCTURE DRAWINGS.
2. USE ONLY R-3 ROCK LINING, MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 850.2(d); AASHTO 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 OCS COARSE AGGREGATE, MEETING AT LEAST THE TYPE C QUALITY REQUIREMENTS IN PUBLICATION 408M, SECTION 703.2, TABLE B. MEASURE AND PAY STRUCTURE BACKFILL AS SELECTED BORROW EXCAVATION-STRUCTURE BACKFILL. DO NOT USE R-3 FOR STRUCTURE BACKFILL FOR ANY TYPE RC OR METAL PLATE CULVERT. PLACE A CLASS 2, TYPE B GEOTEXTILE BLANKET AS A BARRIER BETWEEN THE STRUCTURE BACKFILL AND EXCAVATION/EMBANKMENT MATERIAL. PLACE A CLASS 2, TYPE B GEOTEXTILE BLANKET ON ENTIRE TOP OF THE COMPLETED STRUCTURE BACKFILL PRIOR TO PLACING ANY SUBBASE MATERIAL FOR THE ROADWAY. THE GEOTEXTILE IS CONSIDERED INCIDENTAL TO THE SELECTED BORROW EXCAVATION STRUCTURE BACKFILL AND WILL NOT BE PAID FOR SEPARATELY.
3. TREAT BACKFILL LIMITS AT RETAINING WALLS AND WINGWALLS FOR CULVERTS THE SAME AS FLARED ABUTMENT WINGWALLS.
4. TREAT BACKFILL CONSTRUCTION AT RC BOX CULVERTS WITH THE TOP SLAB AT ROADWAY GRADE THE SAME AS ABUTMENTS.
5. TREAT BACKFILL CONSTRUCTION AT CULVERTS, WHERE THE TOP OF THE CULVERT IS NEAR SUBGRADE, AS SHOWN ON THE STRUCTURE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
6. PLACE STRUCTURE BACKFILL AND ADJOINING EMBANKMENT SIMULTANEOUSLY UNLESS OTHERWISE PERMITTED BY THE ENGINEER.
7. REPLACE MATERIAL REMOVED BEYOND THE SPECIFIED LIMITS OF CLASS 1, 2 OR 3 EXCAVATION WITH STRUCTURE BACKFILL. CONSIDER MATERIAL REMOVED OR STRUCTURE BACKFILL PLACED BEYOND THE SPECIFIED LIMITS OF CLASS 1, 2 OR 3 EXCAVATION AS INCIDENTAL TO THE CLASS OF EXCAVATION SPECIFIED.
8. REFER TO STRUCTURE DRAWINGS FOR DRAINAGE DETAILS, WEEP HOLES, ETC.
9. INDICATE STRUCTURE BACKFILL QUANTITIES ON THE STRUCTURE DRAWINGS.
10. ALL DIMENSIONS ARE GIVEN IN MILLIMETERS UNLESS OTHERWISE NOTED. U.S. CUSTOMARY UNITS IN ( ) PARENTHESIS.
11. PLACE BACKFILL WITHIN 600 mm FROM THE REAR FACE OF THE ABUTMENT AND THE WINGWALL IN LIFTS OF 100 mm. COMPACT EACH LAYER WITH TWO PASSES OF A WALK-BEHIND VIBRATORY PLATE SOIL COMPACTOR.
12. BACKFILL SIMULTANEOUSLY BEHIND BOTH ABUTMENTS. KEEP THE DIFFERENCE BETWEEN THE FILL HEIGHT AT BOTH ENDS OF THE BRIDGE BELOW 300 mm (12 inches) AT ALL TIMES DURING BACKFILLING.

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

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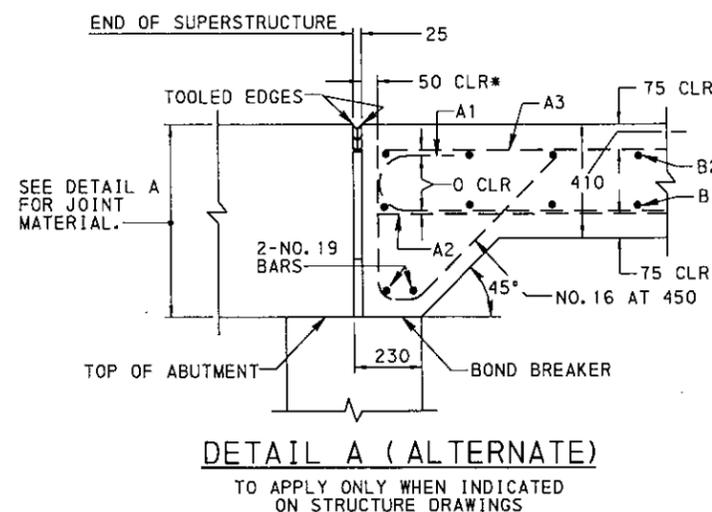
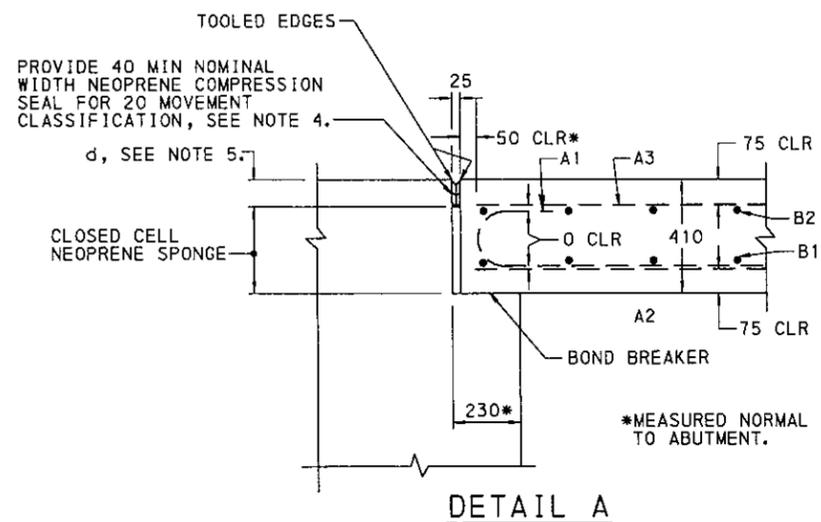
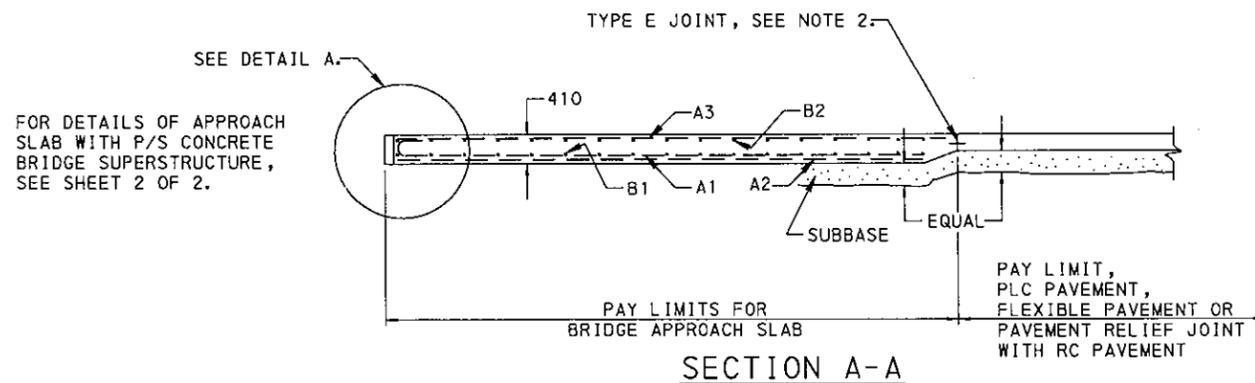
BACKFILL AT STRUCTURES

RECOMMENDED FEB. 18, 2000 <i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED FEB. 18, 2000 <i>Gary J. Hoffman</i> CHIEF ENGINEER	SHEET 2 OF 2 RC-12M
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**NOTES**

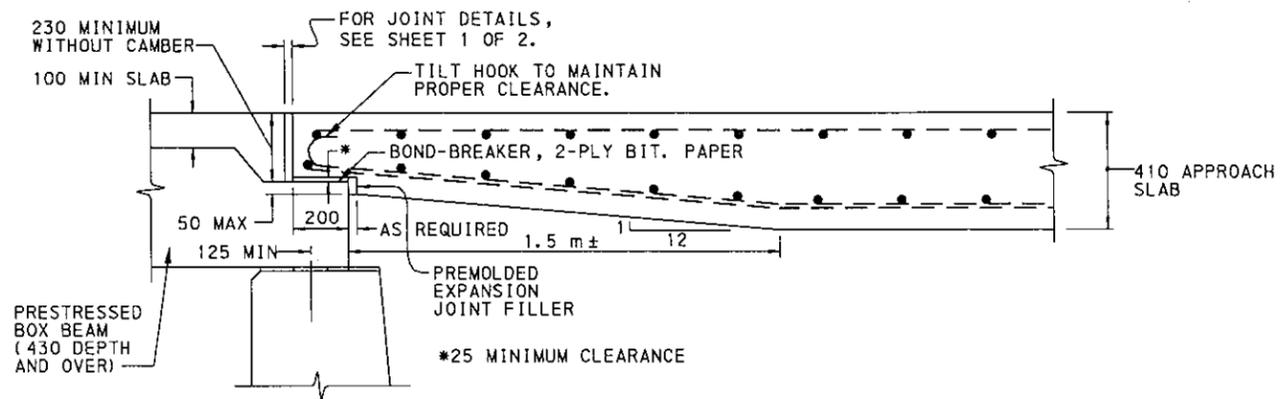
1. CONSTRUCT IN ACCORDANCE WITH THIS STANDARD DRAWING OR AS INDICATED ON THE STRUCTURE DRAWINGS.
2. THE TYPE E JOINT DOES NOT APPLY WHEN APPROACH SLAB IS CONSTRUCTED IN CONJUNCTION WITH A PAVEMENT RELIEF JOINT OR WITH A FLEXIBLE PAVEMENT. SEE RC-24M.
3. WHEN CONSTRUCTION INVOLVES MORE THAN 2 LANES, CONNECT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



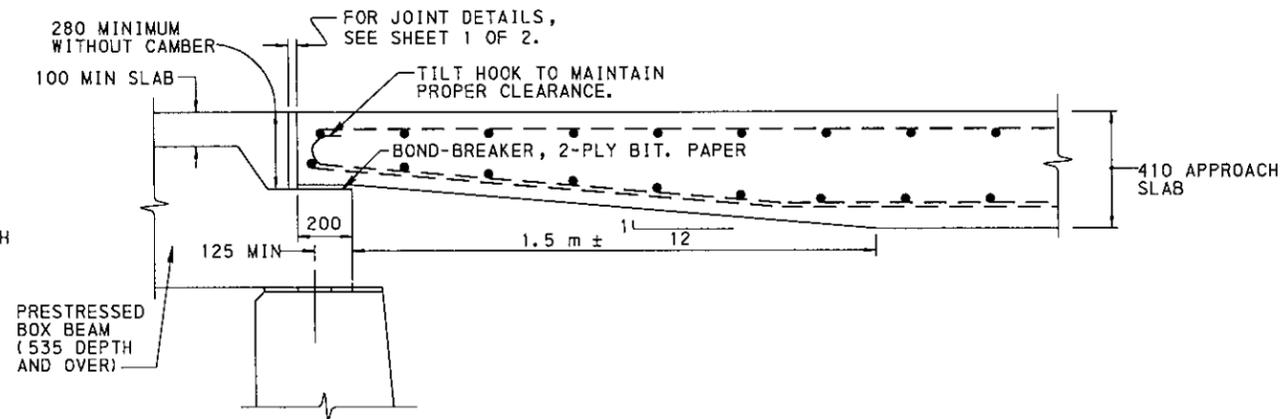
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**BRIDGE APPROACH SLAB**

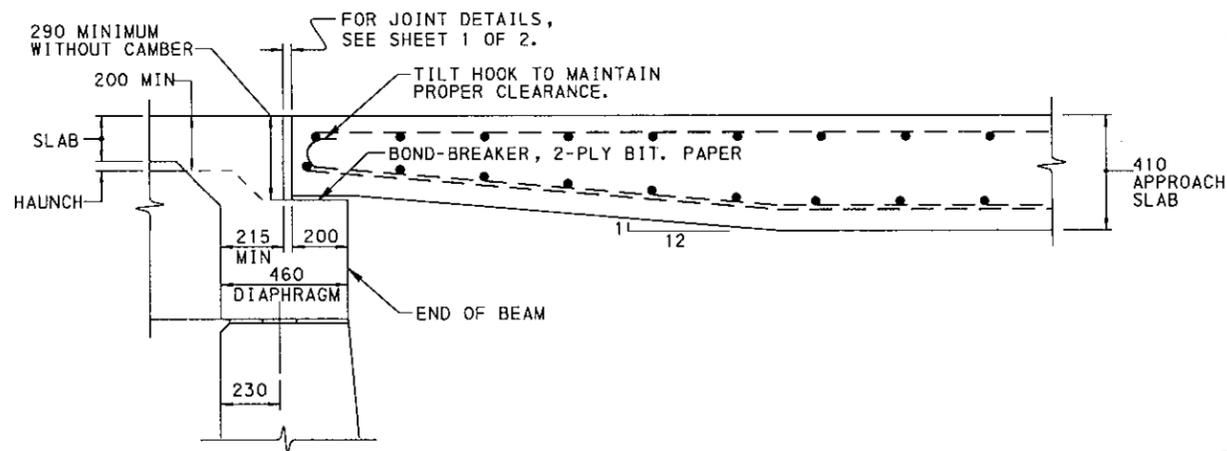
RECOMMENDED FEB. 18, 2000 <i>Dean H. Scher</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED FEB. 18, 2000 <i>Gary J. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 3 RC-23M
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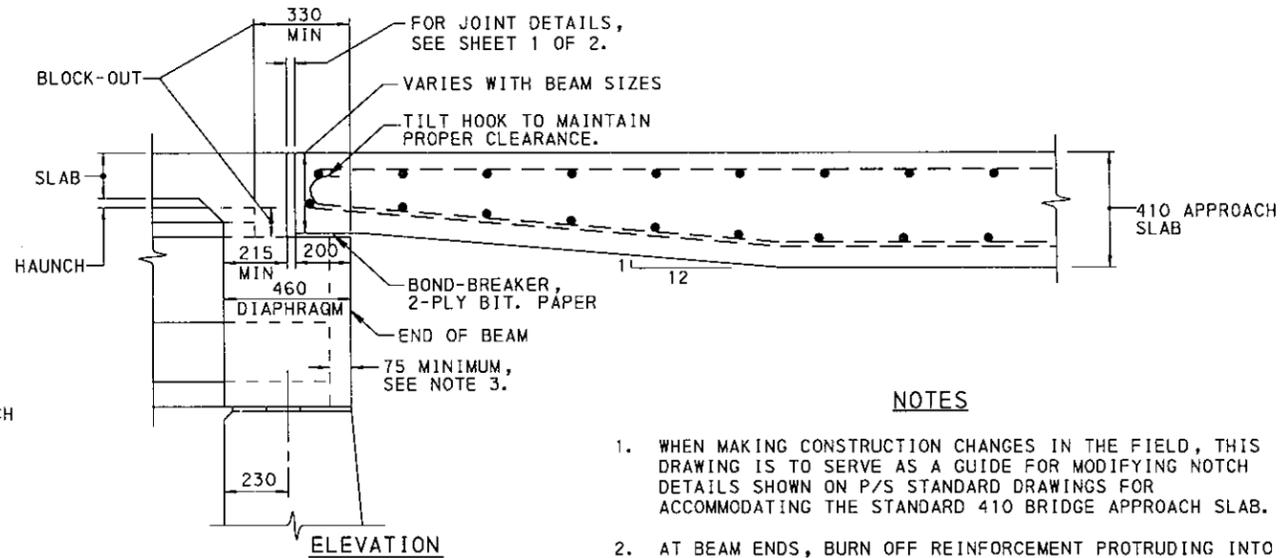
**430 DEEP ADJACENT COMPOSITE BOX BEAMS  
WITH 230 DEEP APPROACH SLAB NOTCH**



**535 TO 1220 DEEP ADJACENT COMPOSITE BOX BEAMS  
WITH 280 DEEP APPROACH SLAB NOTCH**

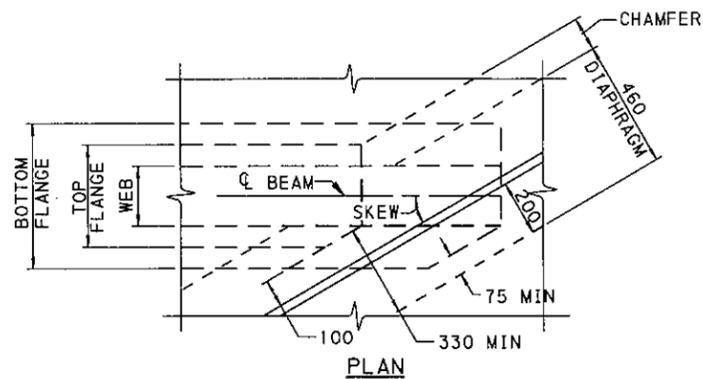


**SPREAD BOX BEAMS WITH APPROACH  
SLAB NOTCH 290 OR DEEPER**



**NOTES**

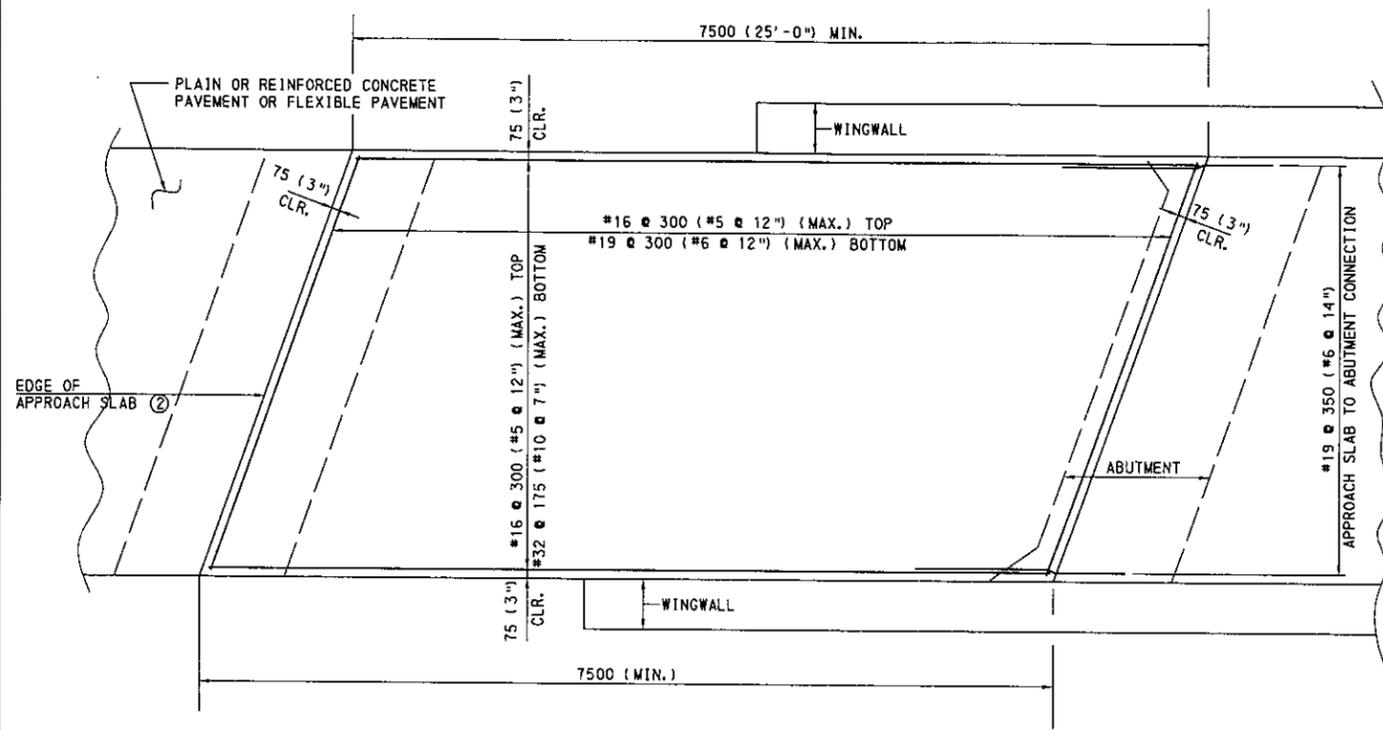
1. WHEN MAKING CONSTRUCTION CHANGES IN THE FIELD, THIS DRAWING IS TO SERVE AS A GUIDE FOR MODIFYING NOTCH DETAILS SHOWN ON P/S STANDARD DRAWINGS FOR ACCOMMODATING THE STANDARD 410 BRIDGE APPROACH SLAB.
2. AT BEAM ENDS, BURN OFF REINFORCEMENT PROTRUDING INTO APPROACH SLAB NOTCH.
3. INCREASE IN FIELD,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



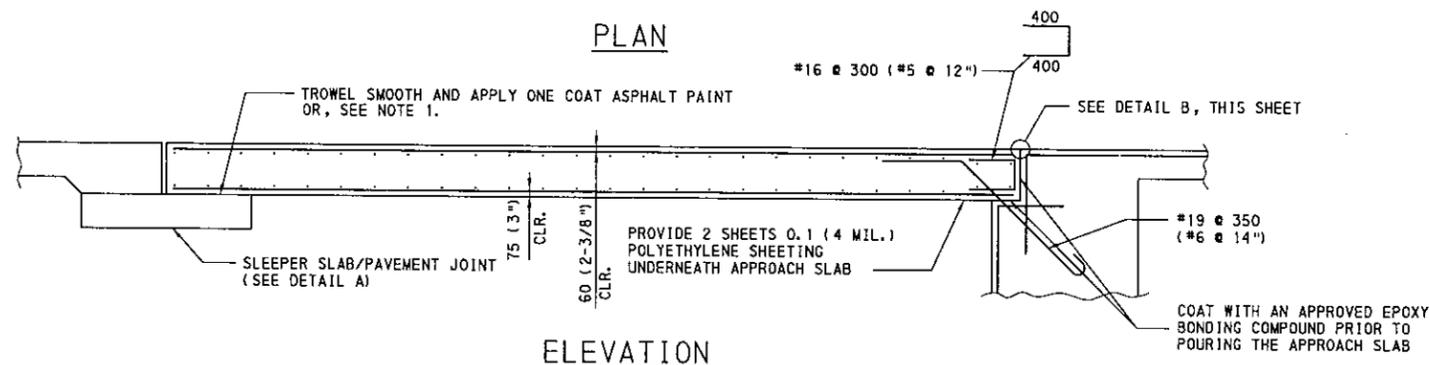
**I-BEAMS**

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

**BRIDGE APPROACH SLAB**

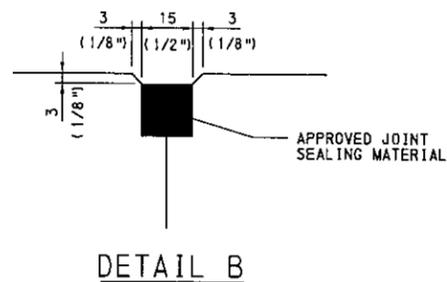


PLAN

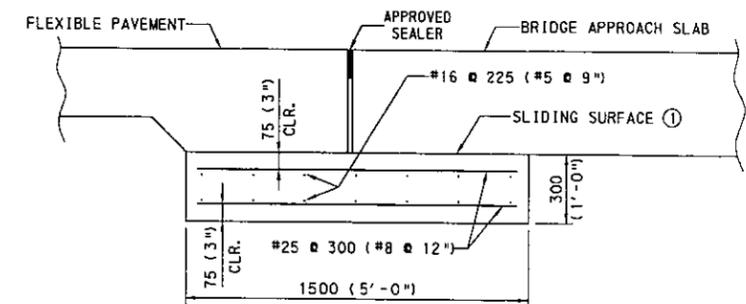


ELEVATION

APPROACH SLAB - INTEGRAL ABUTMENTS

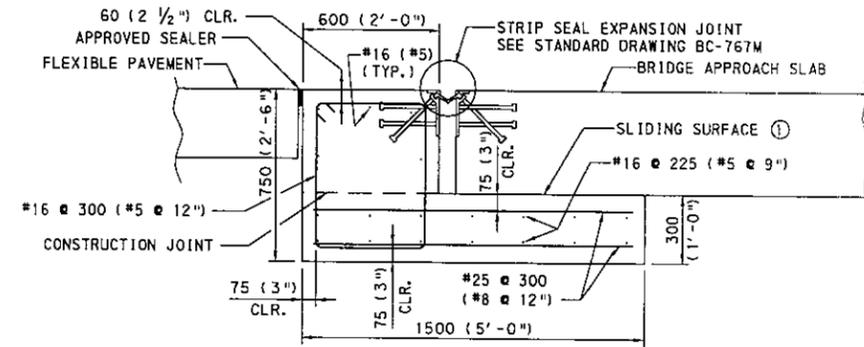


DETAIL B



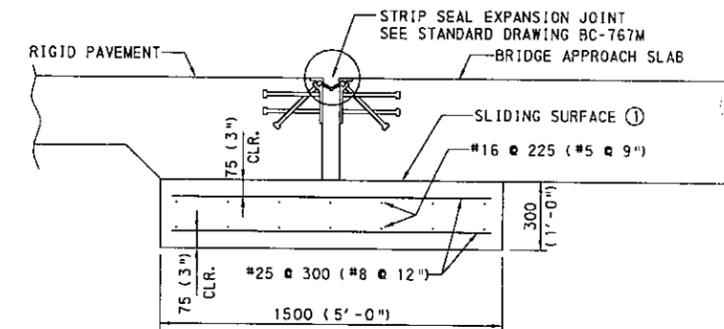
ROADWAY FLEXIBLE PAVEMENT

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



ROADWAY FLEXIBLE PAVEMENT

(BRIDGE TOTAL LENGTH EXCEEDS 45 000 (150'))



ROADWAY RIGID PAVEMENT

DETAIL A

(SLEEPER SLAB)

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

NOTES:

- ① TROWEL SMOOTH AND PLACE 2 LAYERS OF 0.1 mm (4 MIL.) POLYETHYLENE SHEETING AS BOND BREAKER.
- ② ORIENT THE EDGE OF THE APPROACH SLAB PARALLEL TO THE INTEGRAL ABUTMENT FOR BRIDGE SKEWS LESS THAN 80.5 DEGREES I.E. 1:6 (6:1) SLOPE TO THE PERPENDICULAR TO THE DIRECTION OF TRAFFIC.  
FOR LARGER BRIDGE SKEWS, ORIENT THE EDGE OF THE APPROACH SLAB AT A SLOPE OF 1:6 (6:1) TO THE PERPENDICULAR TO THE DIRECTION OF TRAFFIC.
- ③ DETERMINE THE REQUIRED EXPANSION DAM OPENING AT THE TIME OF CONSTRUCTION AND THE MOVEMENT REQUIREMENTS OF THE EXPANSION JOINT AT THE END OF THE APPROACH SLAB IN ACCORDANCE WITH DESIGN MANUAL PART 4 AP.G.1.6.

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

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
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BRIDGE APPROACH SLAB

BC-767M	NEOPRENE STRIP SEAL FOR PRESTRESSED CONCRETE AND STEEL I-BEAM BRIDGES	RECOMMENDED FEB. 18, 2000	RECOMMENDED FEB. 18, 2000	SHEET 3 OF 3
REFERENCE DRAWINGS		<i>Alan A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	<i>Gary L. Hoffman</i> CHIEF ENGINEER	RC-23M

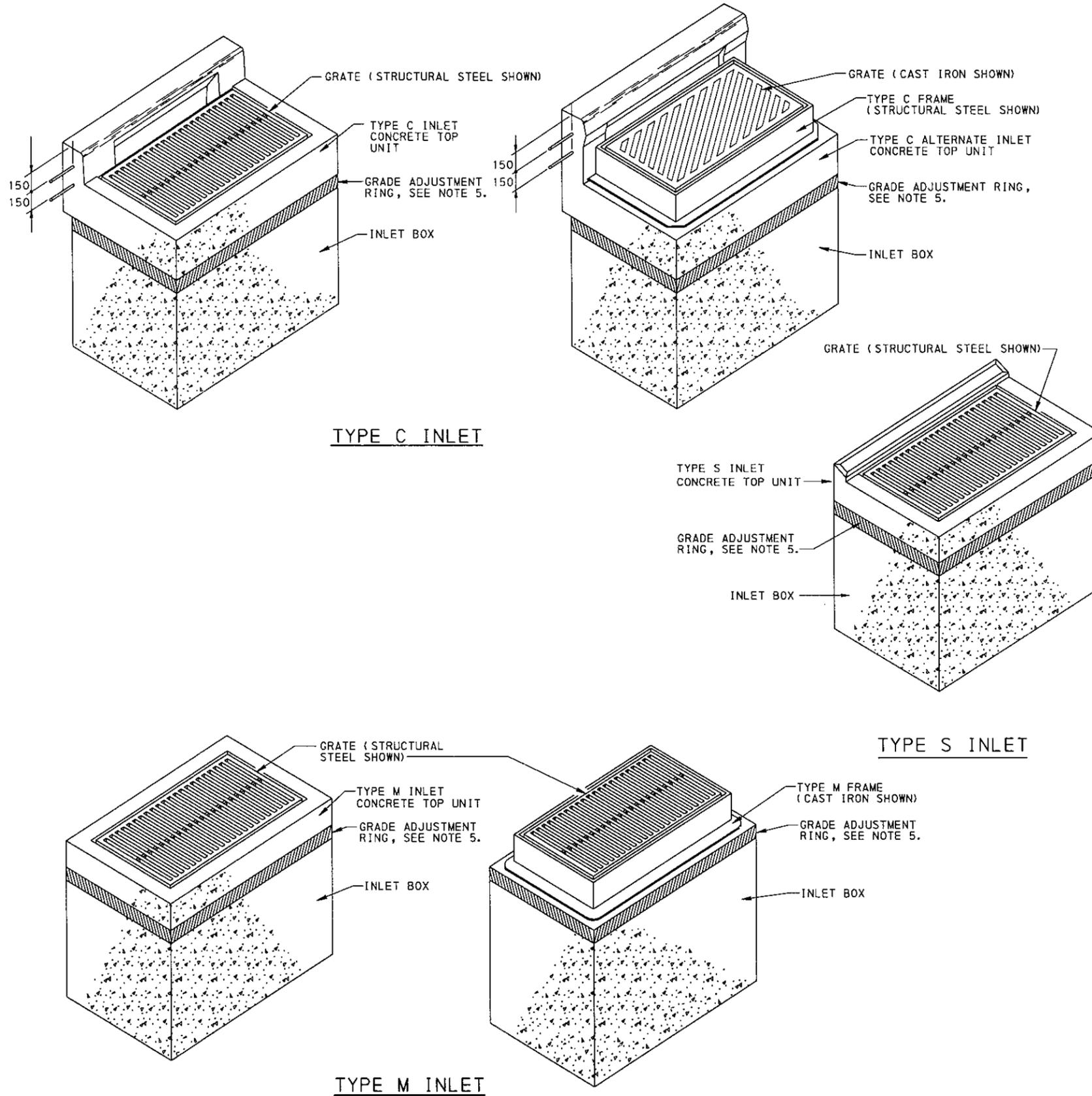


**NOTES**

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 (SIDE COVER)
		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 <sup>2</sup>/m MIN EACH WAY, EACH FACE (152 MAX. SPACING).
7. FOR FOOTING REINFORCEMENT, TOP AND BOTTOM, USE NO. 13 BARS AT 300 CENTERS EACH WAY OR 420 mm <sup>2</sup>/m<sup>2</sup> WWF (152 MAX. SPACING).
8. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.
9. PROVIDE WEEP HOLES ON INLET BOXES WHEN REQUIRED.



**TYPE C INLET**

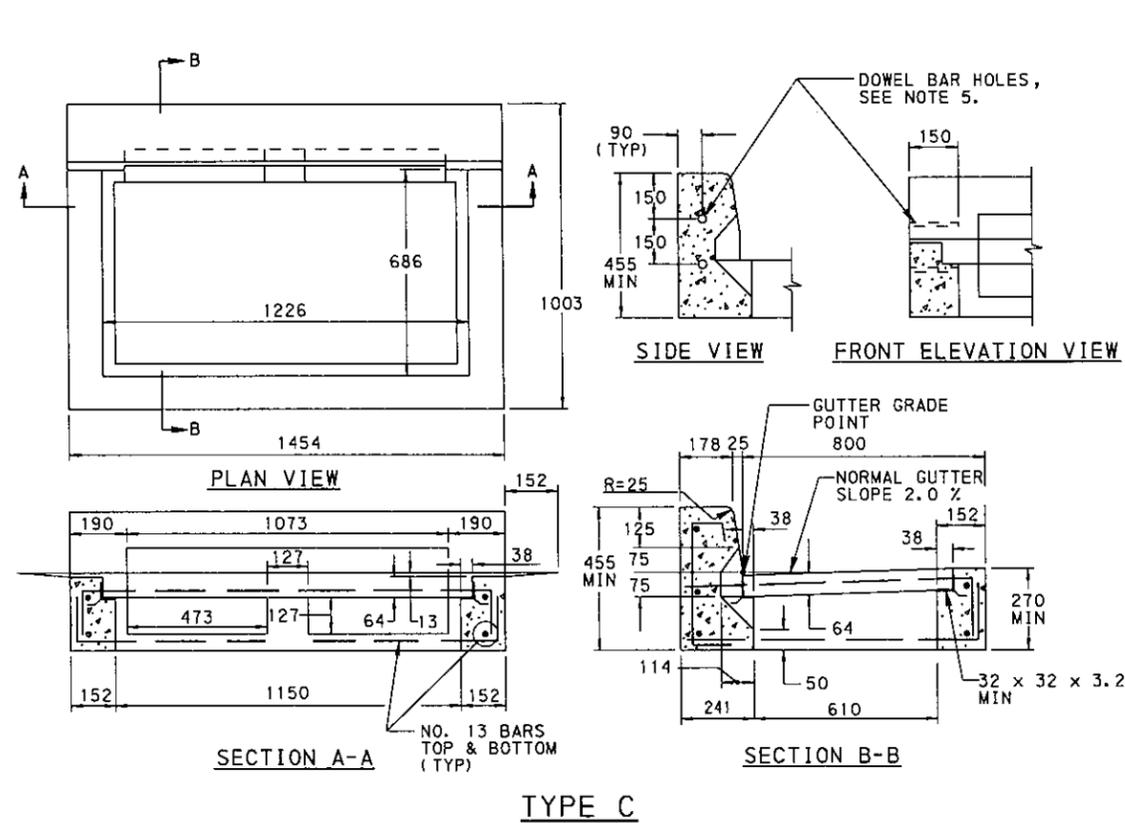
**TYPE S INLET**

**TYPE M INLET**

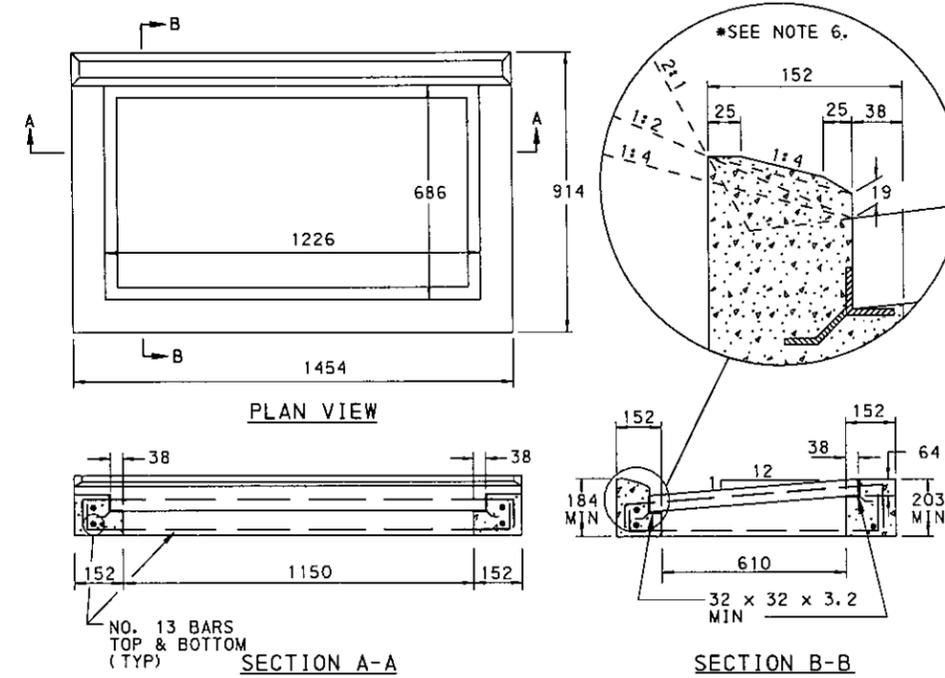
COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN

INLETS  
INLET ASSEMBLIES

RECOMMENDED FEB. 18, 2000 <i>Walter A. Schuler</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED FEB. 18, 2000 <i>Harry L. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 10 RC-34M
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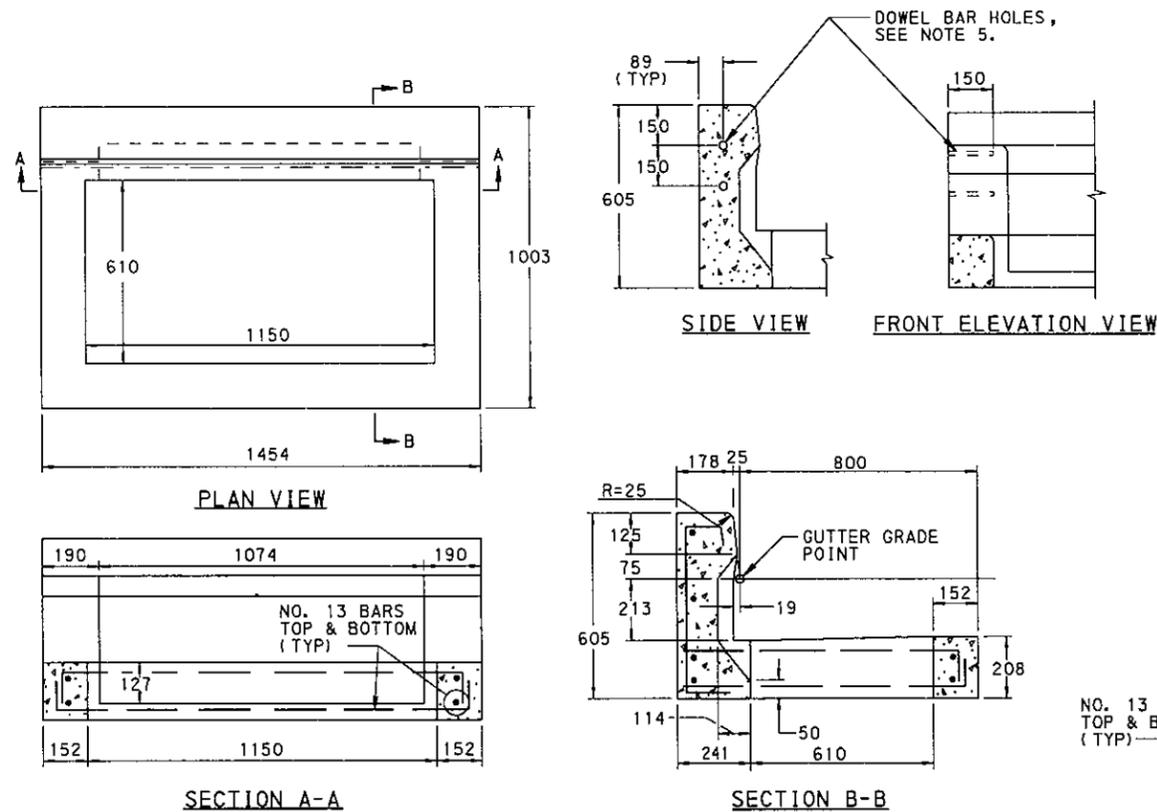
**TYPE C**



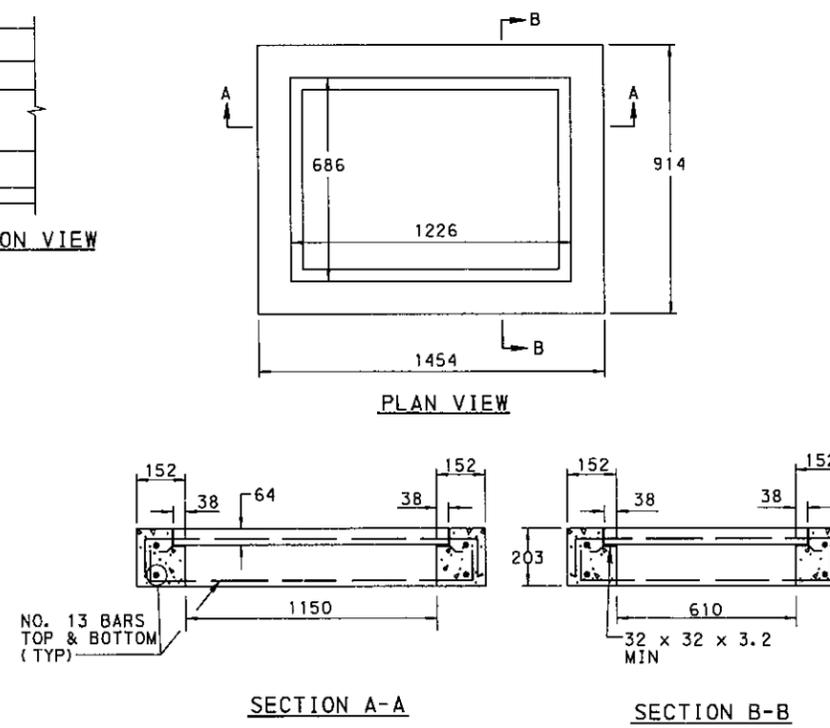
**TYPE S**

**NOTES**

1. THIS SHEET DEPICTS THE SHAPE AND DIMENSIONS REQUIRED FOR UNIFORMITY AND COMPATIBILITY. PERMIT ONLY TOP UNITS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15.
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 PREMOLDED 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.
8. TAPERS MAY BE PROVIDED ON INSIDE VERTICAL FACES OF PRECAST INLET TOPS TO FACILITATE FORM STRIPPING. HOWEVER, BOTTOM DIMENSIONS MUST NOT BE REDUCED.



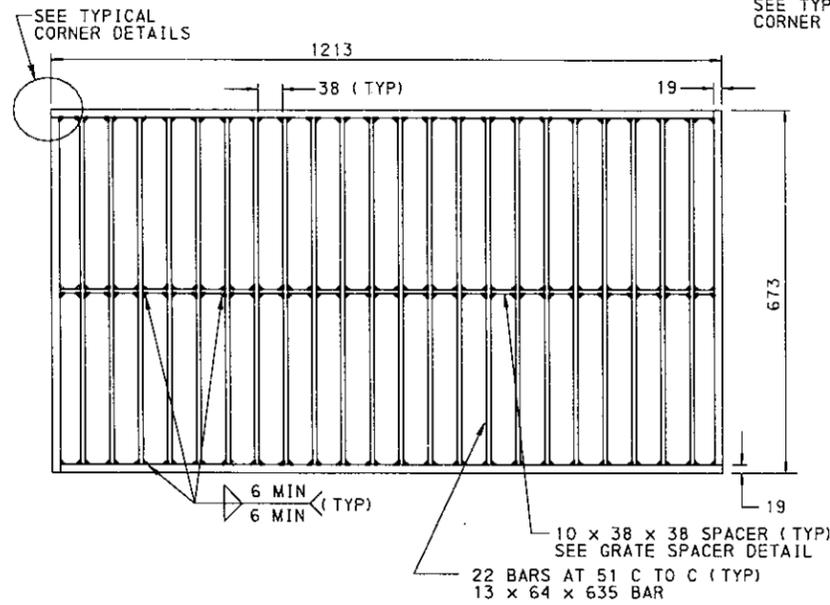
**TYPE C ALTERNATE**



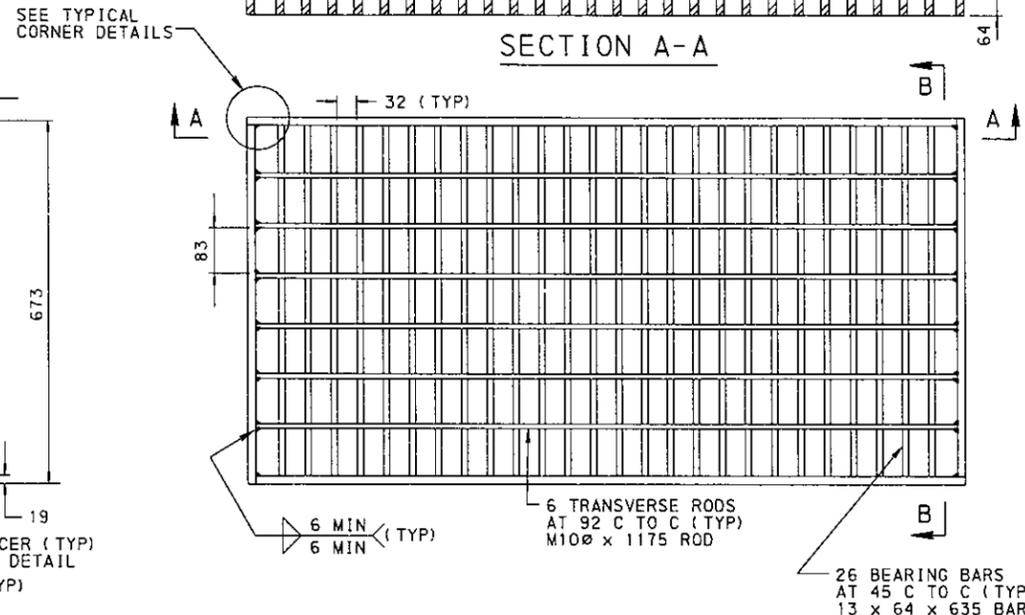
**TYPE M**

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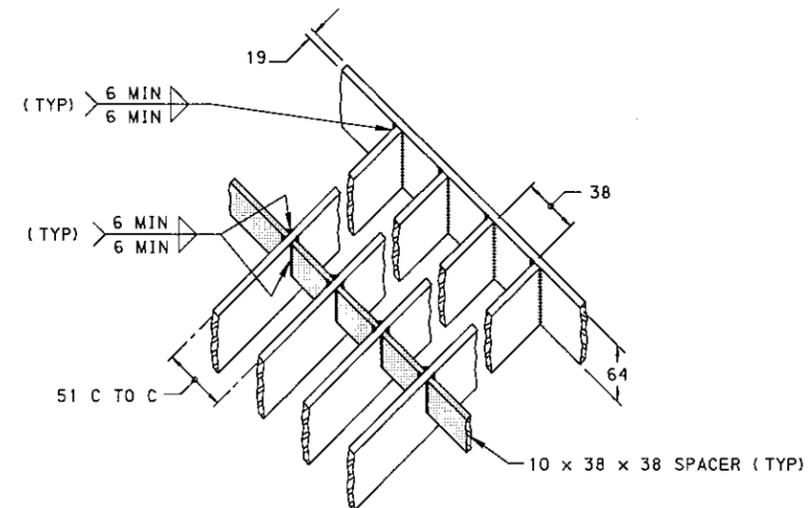
**INLETS**  
**CONCRETE TOP UNITS**  
**CAST-IN-PLACE AND PRECAST**



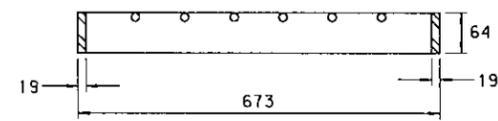
**STRUCTURAL  
STEEL GRATE**



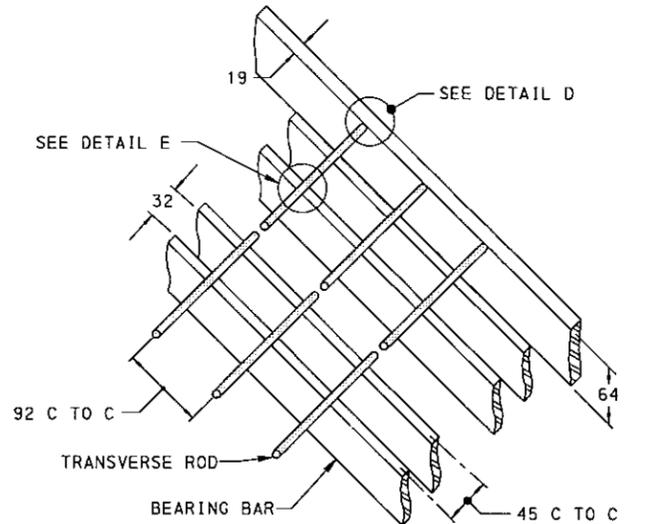
**STRUCTURAL STEEL GRATE  
BICYCLE SAFE**



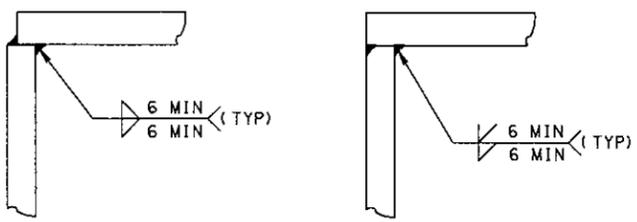
**GRATE SPACER DETAIL**



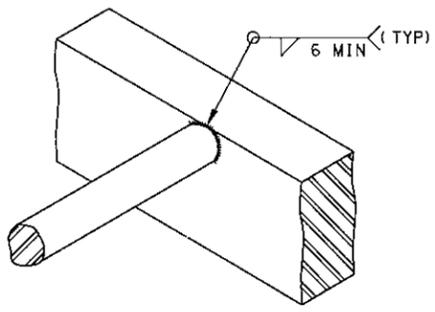
**SECTION B-B**



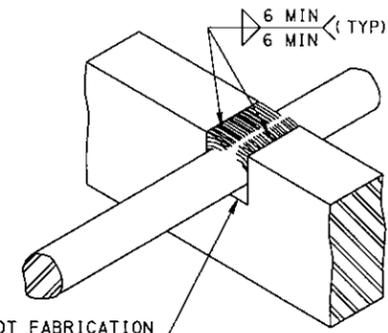
**BAR & ROD SPACING DETAIL**



**TYPICAL CORNER DETAILS**



**DETAIL D**



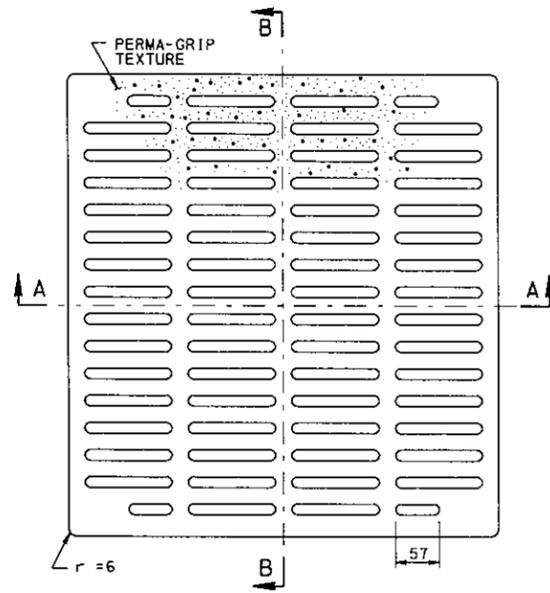
**DETAIL E**

**NOTES**

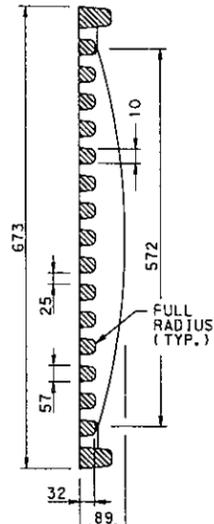
1. THIS SHEET DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. IT DOES NOT INCLUDE DETAILS REQUIRED FOR FABRICATION OR MANUFACTURING. PERMIT ONLY GRATES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT AN 841 x 594 REPRODUCIBLE SHOP DRAWING TO 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.

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

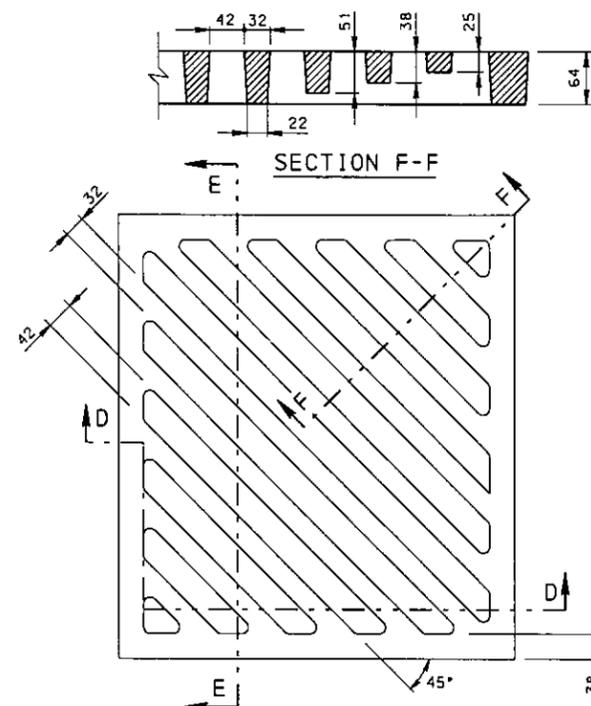
**INLET  
GRATES**



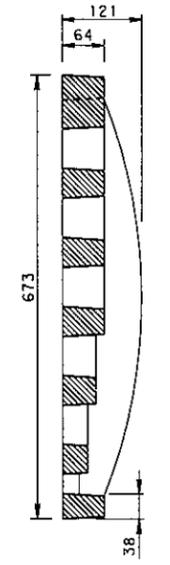
PLAN - BICYCLE-SAFE GRATE



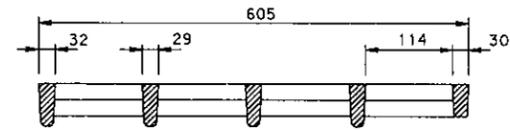
SECTION B-B



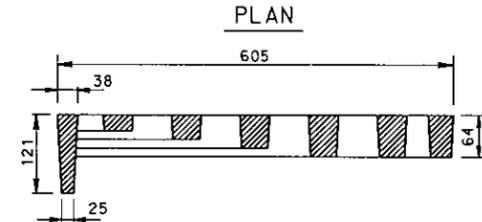
SECTION F-F



SECTION E-E

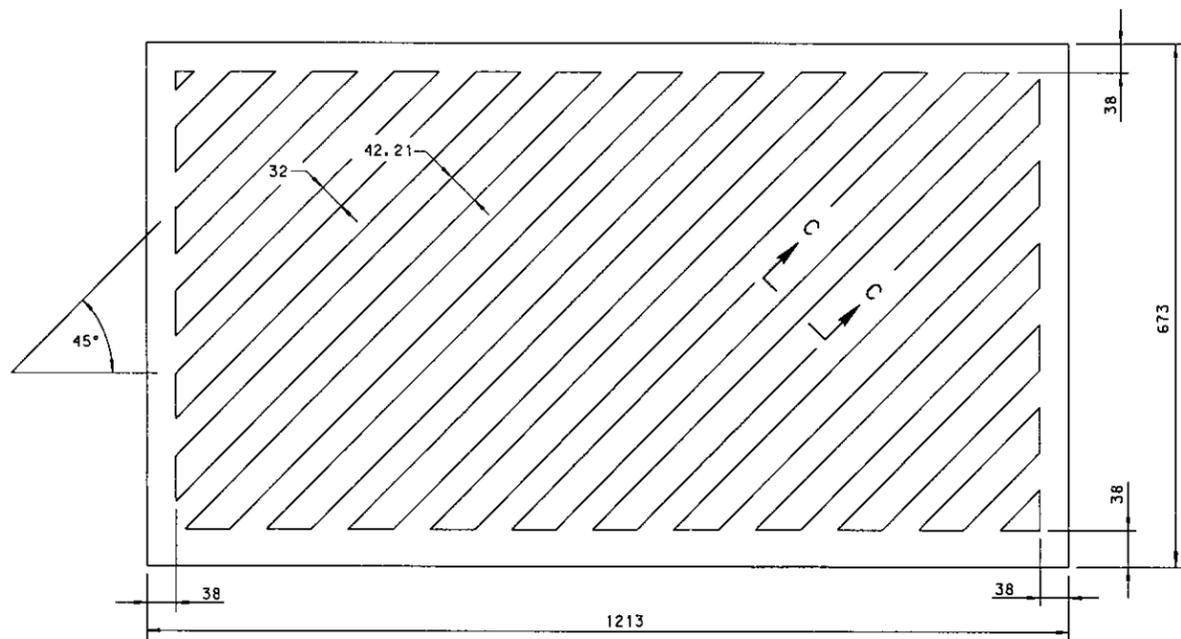


SECTION A-A

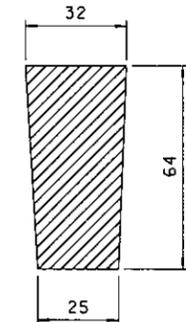


SECTION D-D

TWO PIECE GRATES



PLAN - ONE PIECE GRATE



SECTION C-C

CAST GRAY IRON GRATES

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

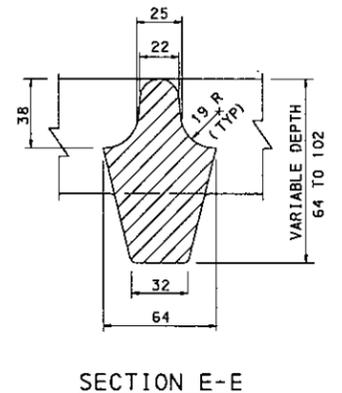
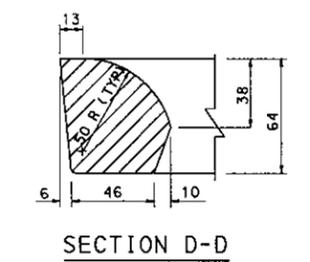
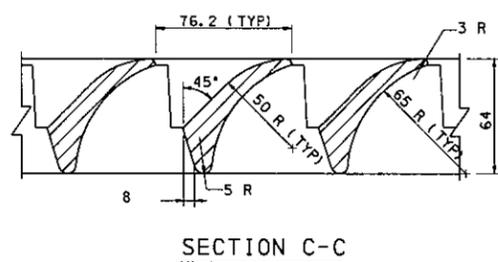
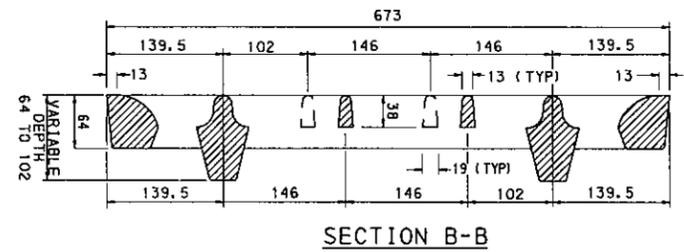
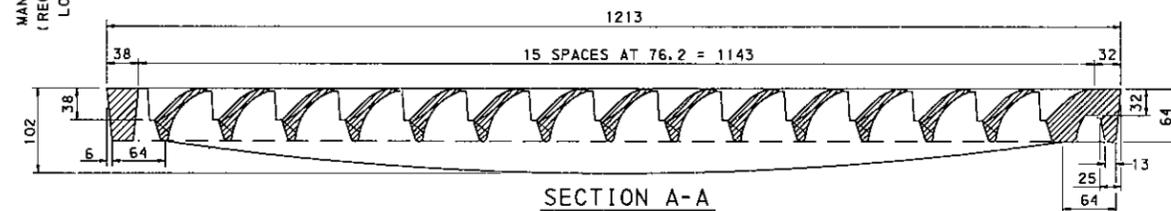
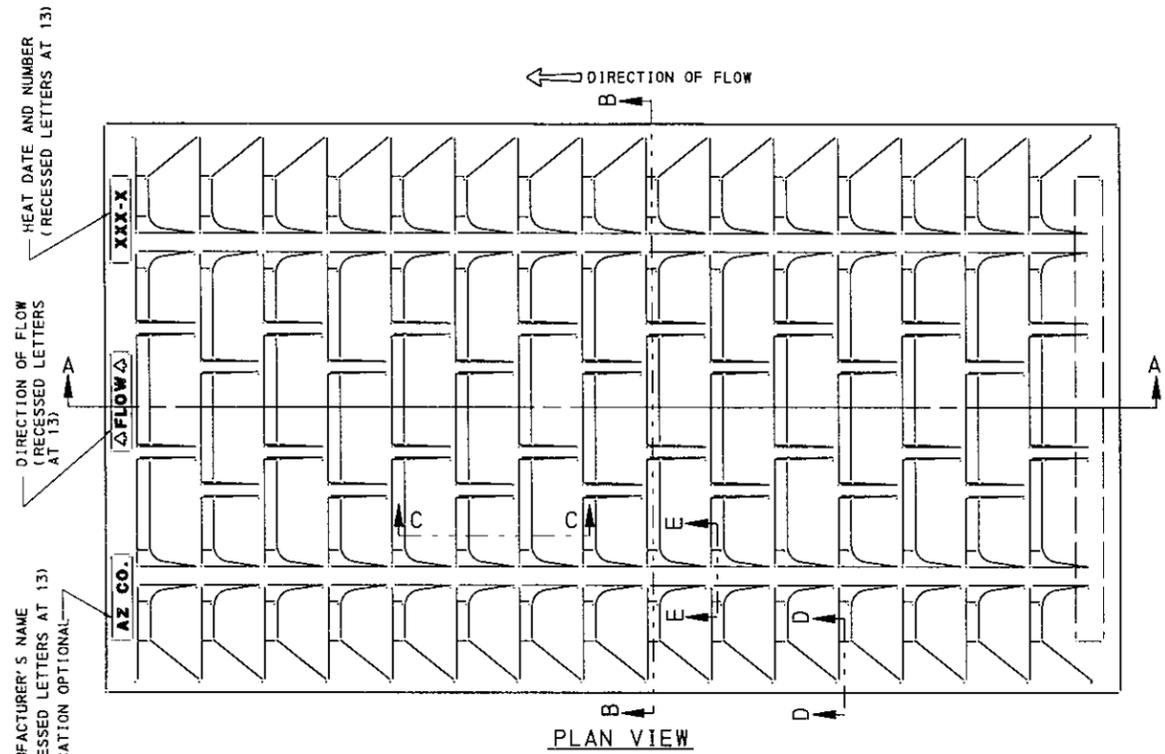
NOTES

1. THIS SHEET DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. IT DOES NOT INCLUDE DETAILS REQUIRED FOR FABRICATION OR MANUFACTURING. PERMIT ONLY GRATES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR 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.

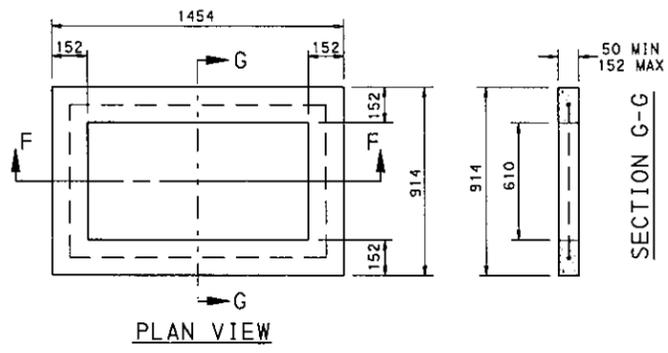
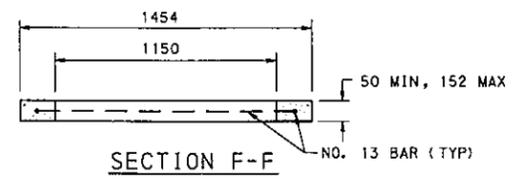
COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN

INLET  
GRATES

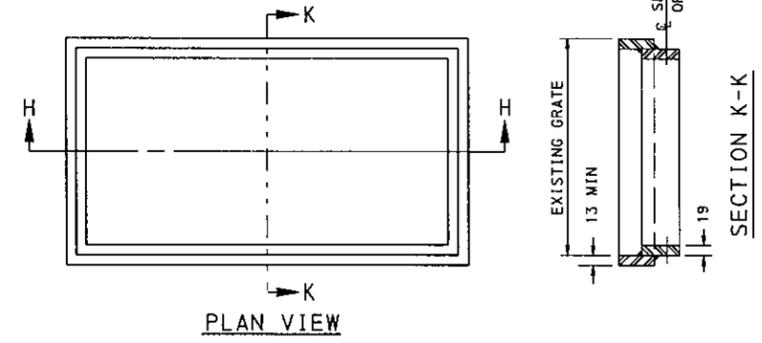
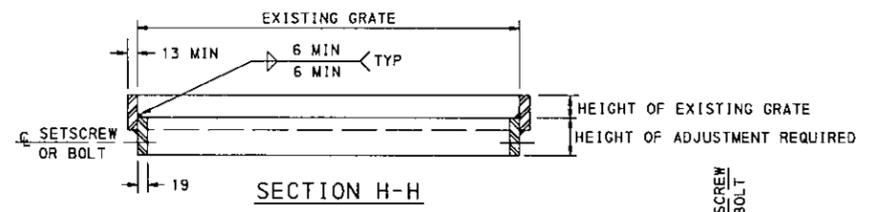
RECOMMENDED FEB. 18, 2000 <i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED FEB. 18, 2000 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT 4 OF 10 RC-34M
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**CAST IRON VANE GRATE**  
SEE NOTE 7



**PRECAST CONCRETE  
GRADE ADJUSTMENT RINGS**

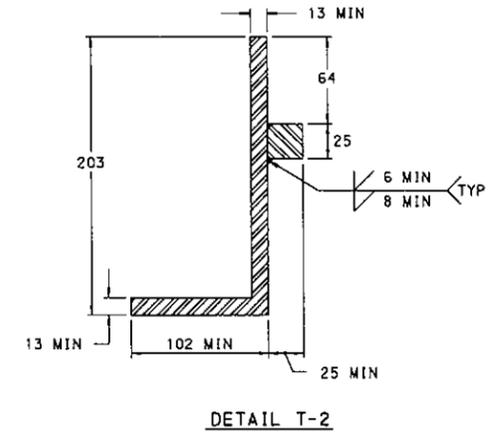
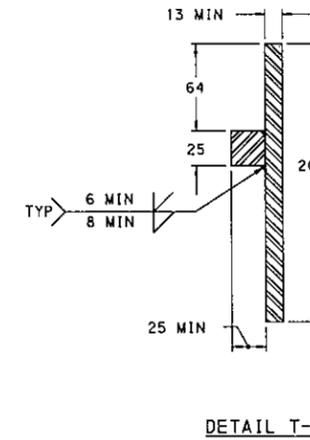
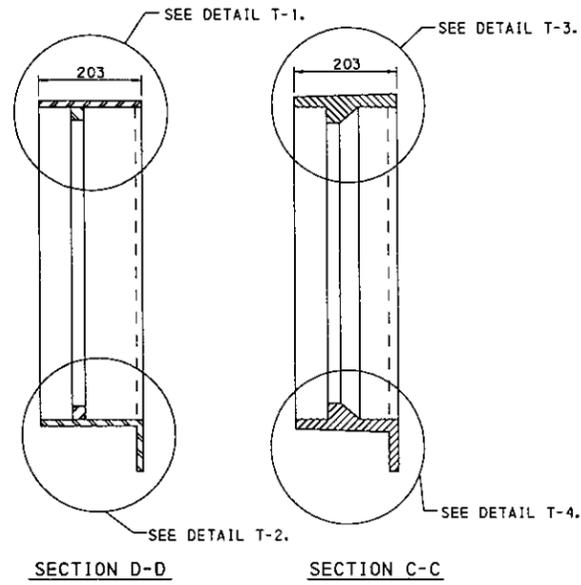
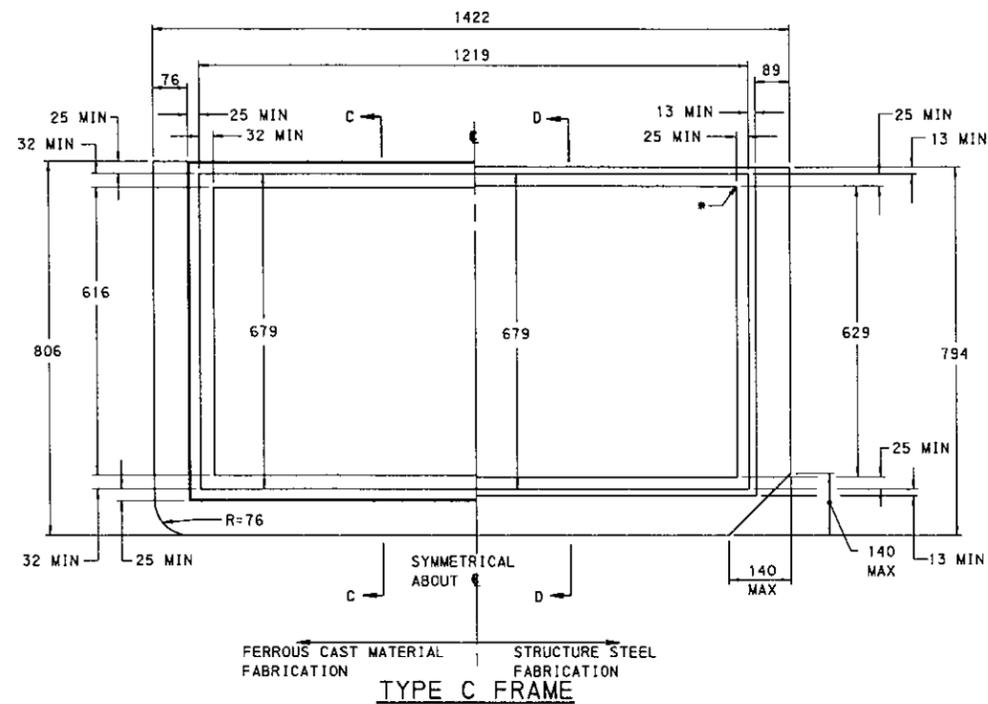


**STRUCTURAL STEEL  
GRADE ADJUSTMENT RINGS**

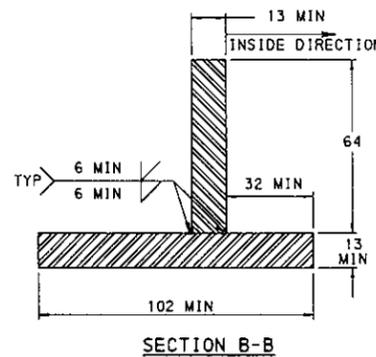
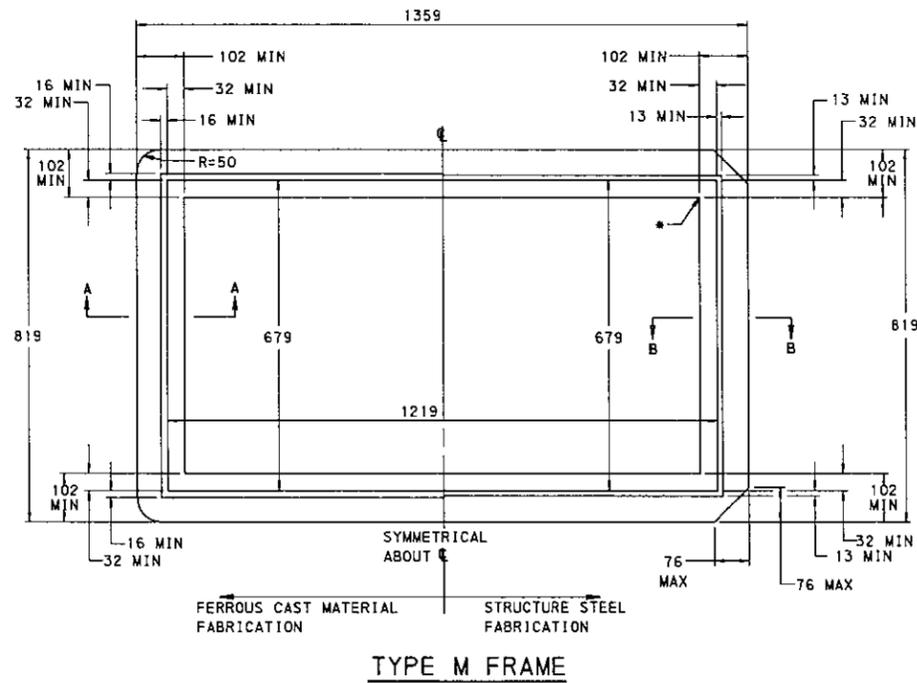
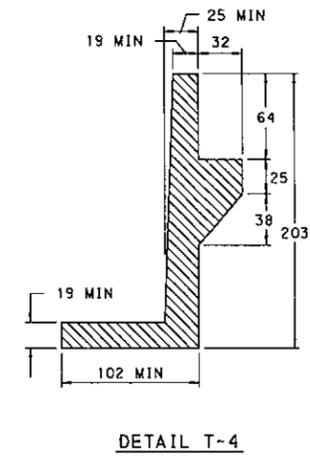
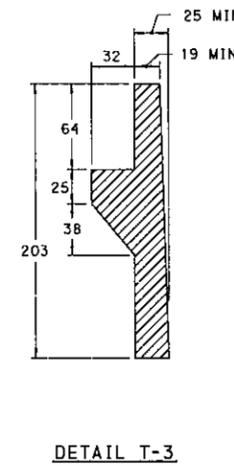
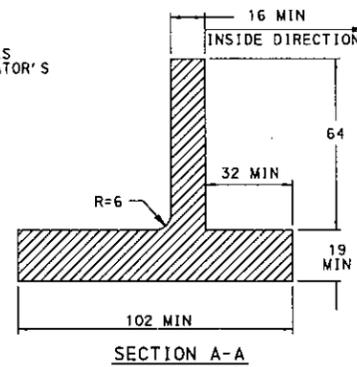
**NOTES**

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.

<b>COMMONWEALTH OF PENNSYLVANIA</b> <b>DEPARTMENT OF TRANSPORTATION</b> BUREAU OF DESIGN		
<b>INLET GRATES &amp; GRADE ADJUSTMENT RINGS</b>		
RECOMMENDED FEB. 18, 2000 <i>Sean A. Schutt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED FEB. 18, 2000 <i>Larry J. Hoffman</i> CHIEF ENGINEER	SHT 5 OF 10 <b>RC-34M</b>



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

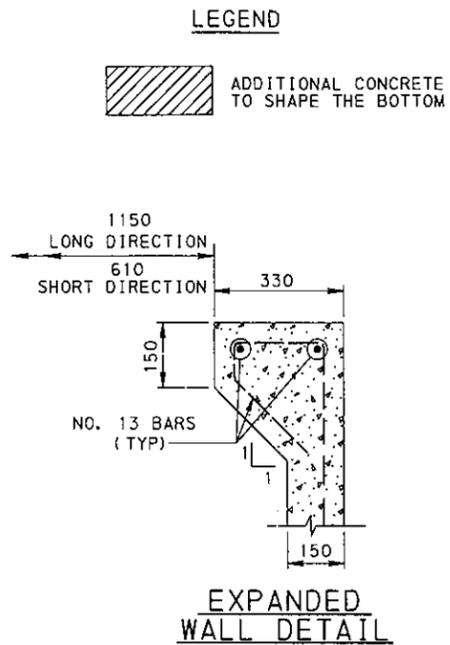
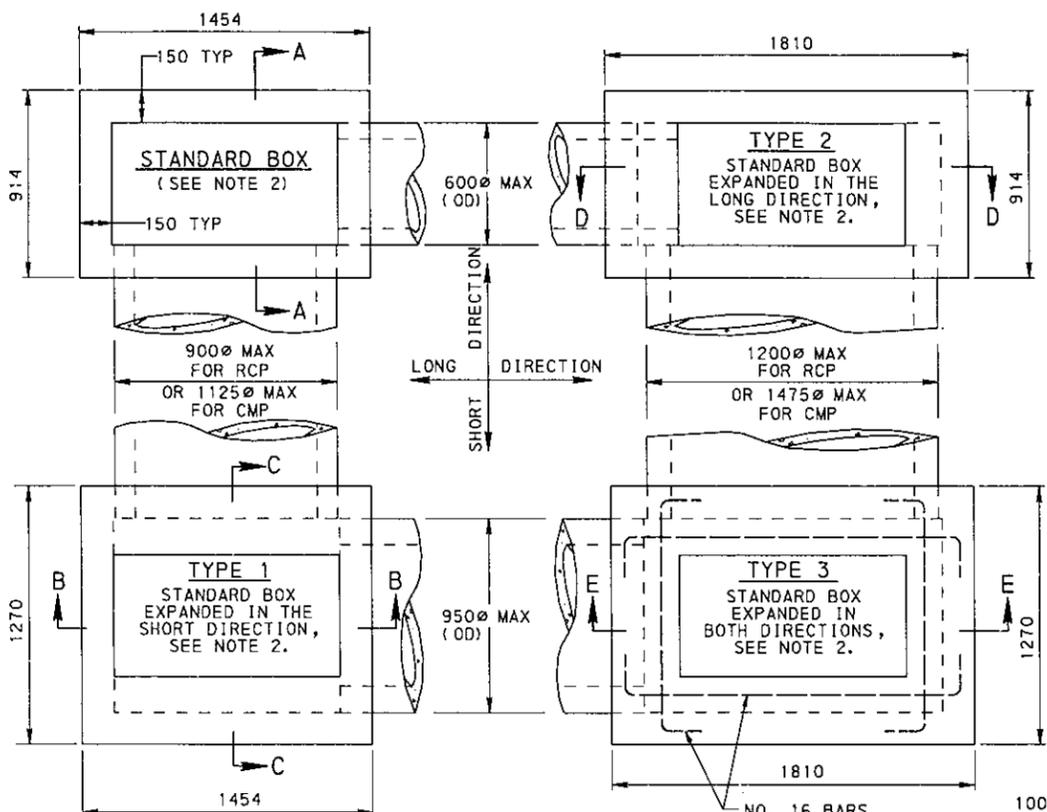


NOTES

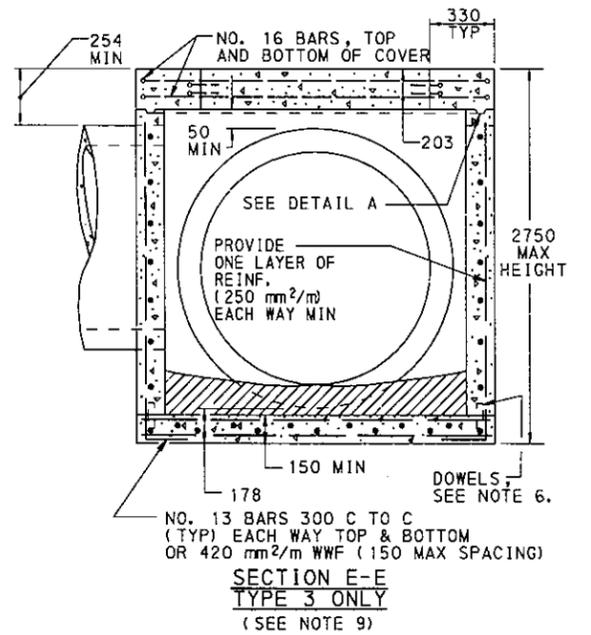
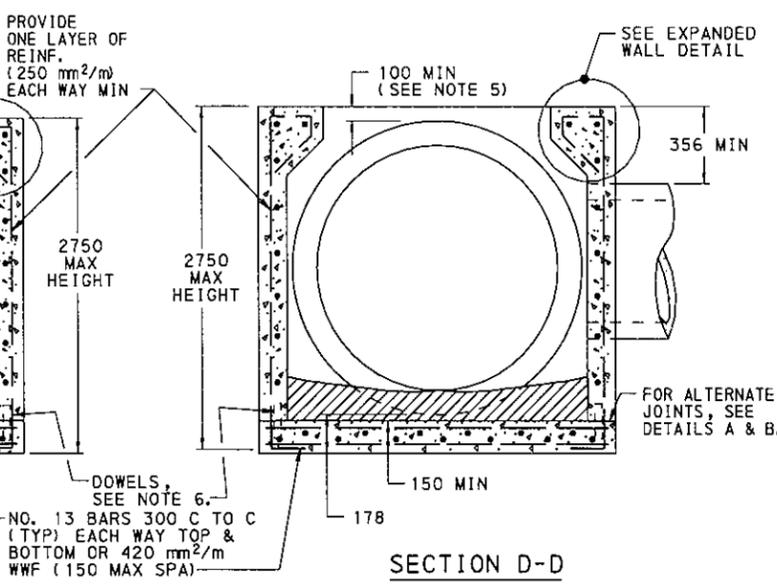
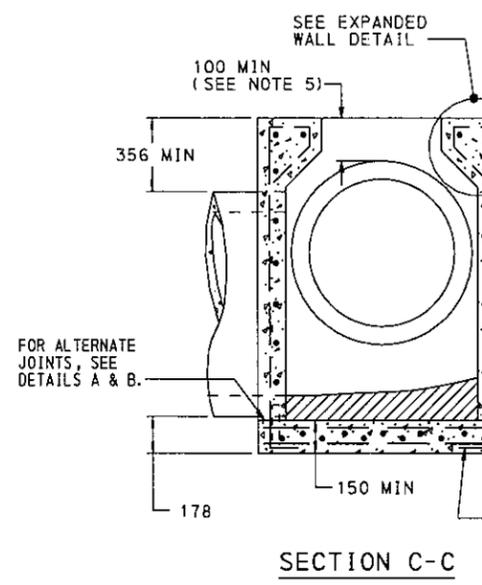
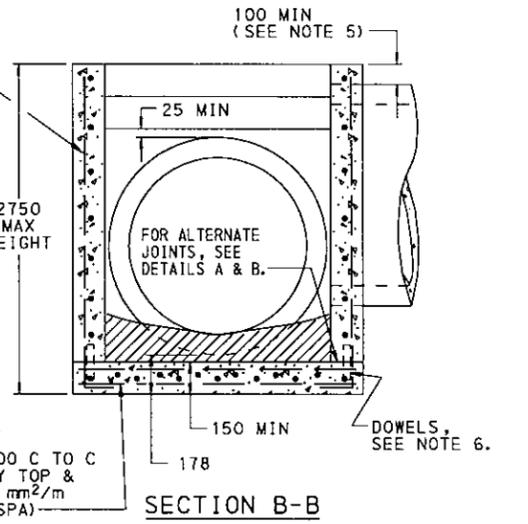
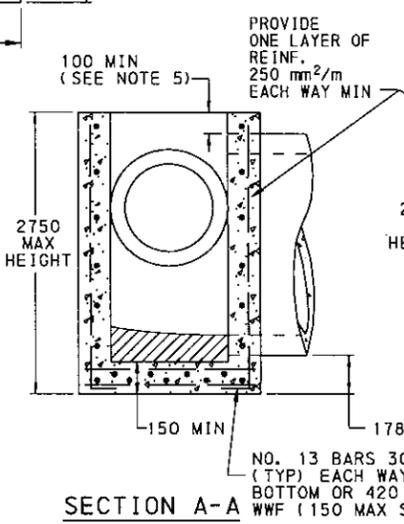
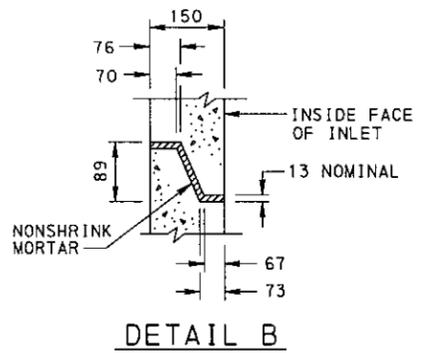
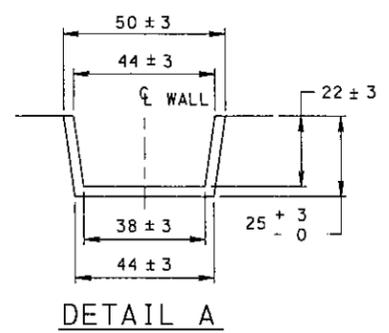
1. THIS SHEET DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. IT DOES NOT INCLUDE DETAILS REQUIRED FOR FABRICATION OR MANUFACTURING. PERMIT ONLY FRAMES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT AN 841 x 594 REPRODUCIBLE SHOP DRAWING TO 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. LIMIT PIPE BLOCKOUT OF WALL TO 25 mm.
  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.

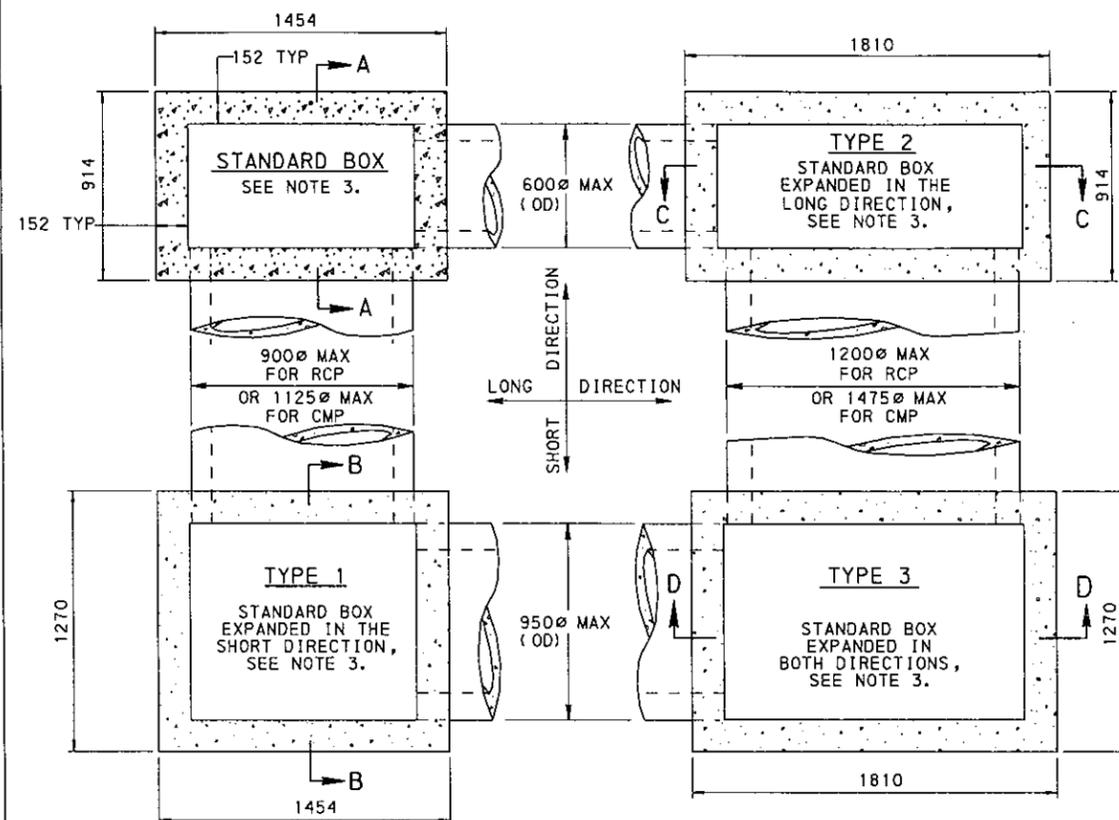


COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
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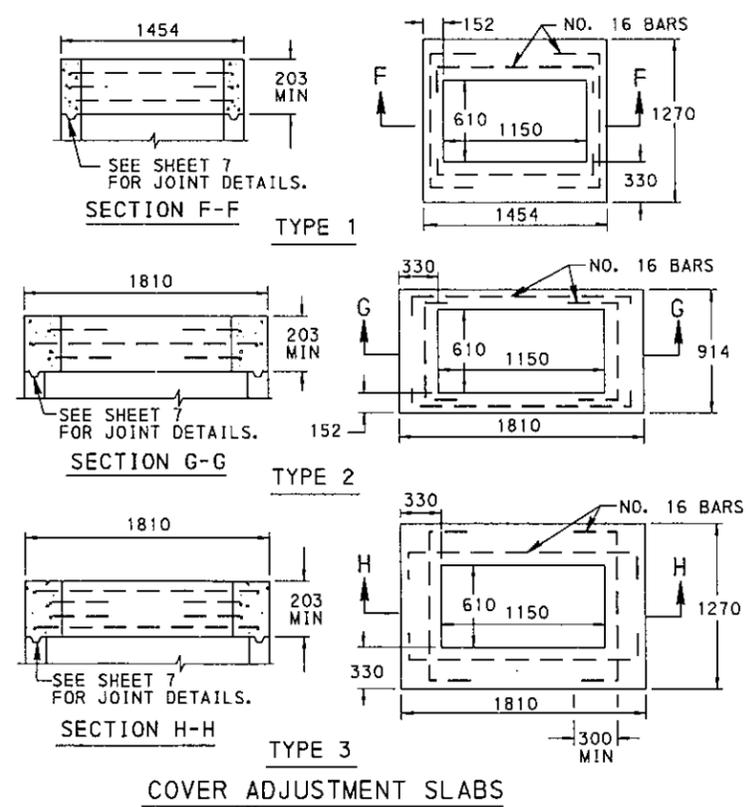
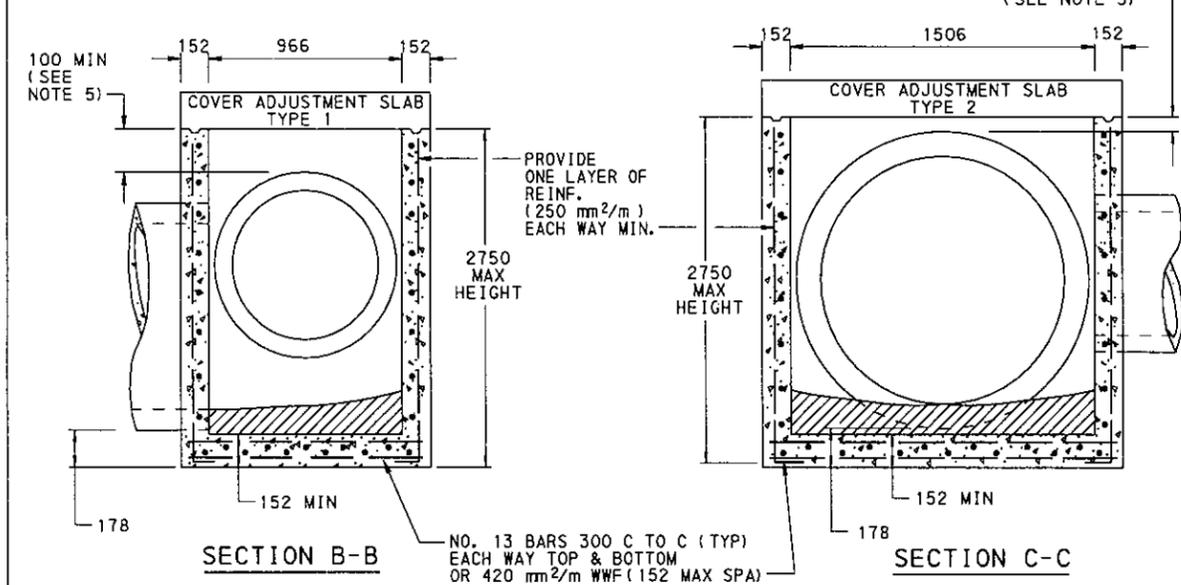
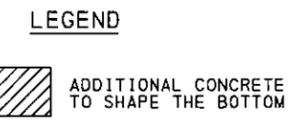
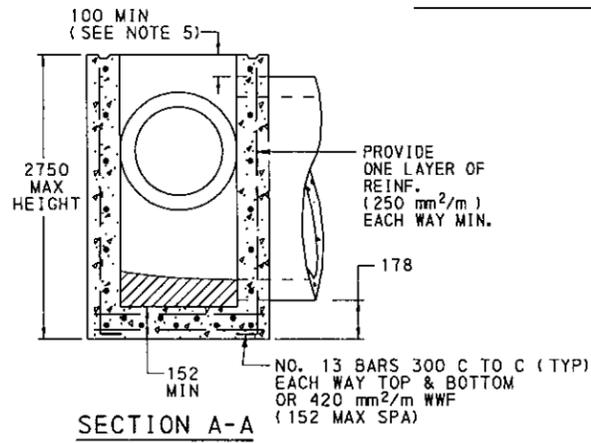
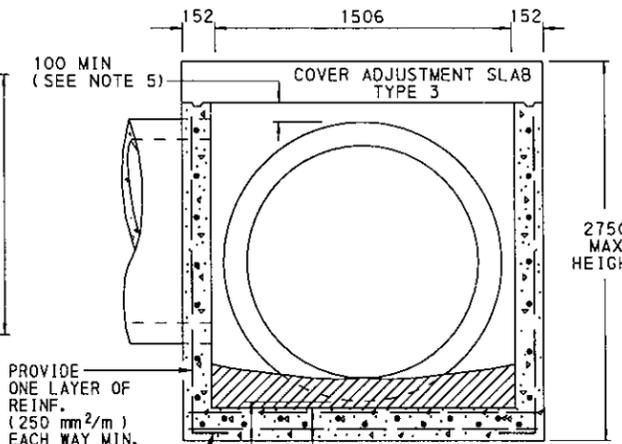
INLETS  
STANDARD INLET BOXES  
(CAST-IN-PLACE)

**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. 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. FOR INLETS THAT DEVIATE FROM THE STANDARD SUBMIT SPECIAL DETAILS AND DESIGN FOR THE INLET WALLS AND BASE TO THE BUREAU OF CONSTRUCTION FOR REVIEW AND APPROVAL. CONSTRUCT INLETS THAT EXCEED 1500 IN HEIGHT WITH STEPS SIMILAR TO MANHOLES (SEE RC-39M). FOR INLETS OTHER THAN AS SHOWN ON THE STANDARDS, PROVIDE REINFORCEMENT BASED ON PHL 93 LOADING AND IN ACCORDANCE WITH PUBLICATION 408M.
5. LOCATE PIPE OR PIPES, AS INDICATED, WITH THE INLET BOTTOM SHAPED TO CHANNEL THE FLOW TOWARD THE OUTLET PIPE. WHEN PROJECT CONDITIONS REQUIRE PIPE BLOCKOUTS TO BE FORMED WITHIN 100 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. LIMIT PIPE BLOCKOUT OF WALL TO 25 mm.
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 DETAILS A & B SHEET 7.
9. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.
10. TAPERS MAY BE PROVIDED ON VERTICAL FACES OF PRECAST INLET BOX BASE UNITS TO FACILITATE FORM STRIPPING. HOWEVER, BOTTOM DIMENSIONS MUST NOT BE REDUCED.
11. PROVIDE SUITABLE LIFTING DEVICES FOR HANDLING AND INSTALLATION. GALVANIZE METAL DEVICES AS SPECIFIED IN PUB.408M SECTION 1105.

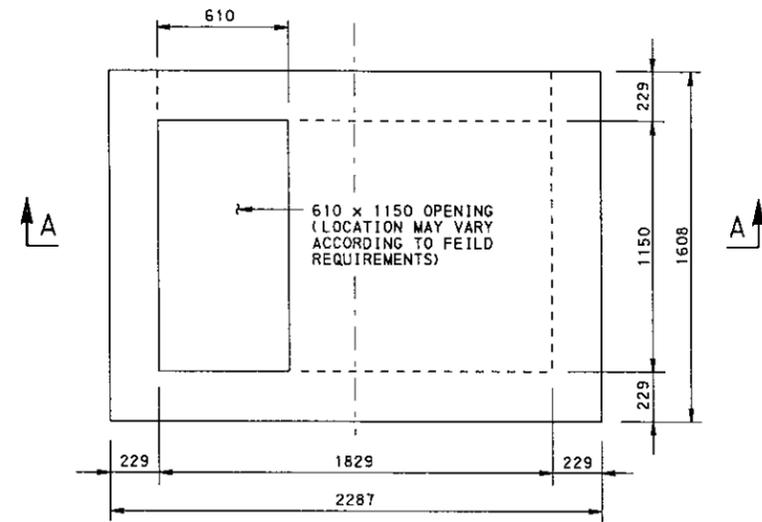


**DETAIL A  
PRECAST CONCRETE INLET BOX  
BASE PREPARATION**

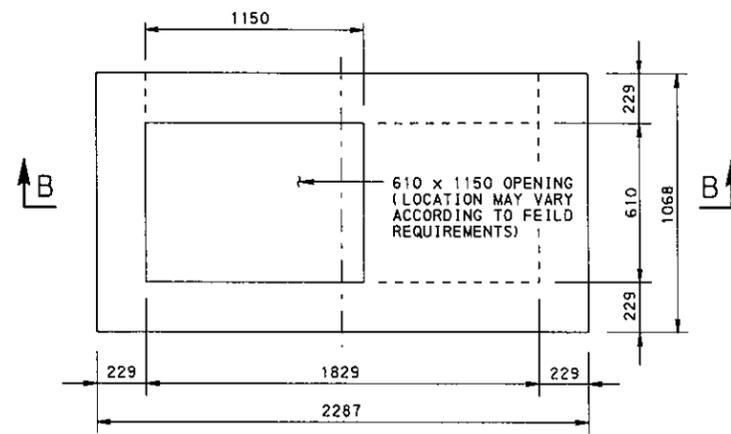


**COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN**

**INLETS  
STANDARD INLET BOXES  
(PRECAST)**



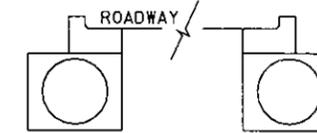
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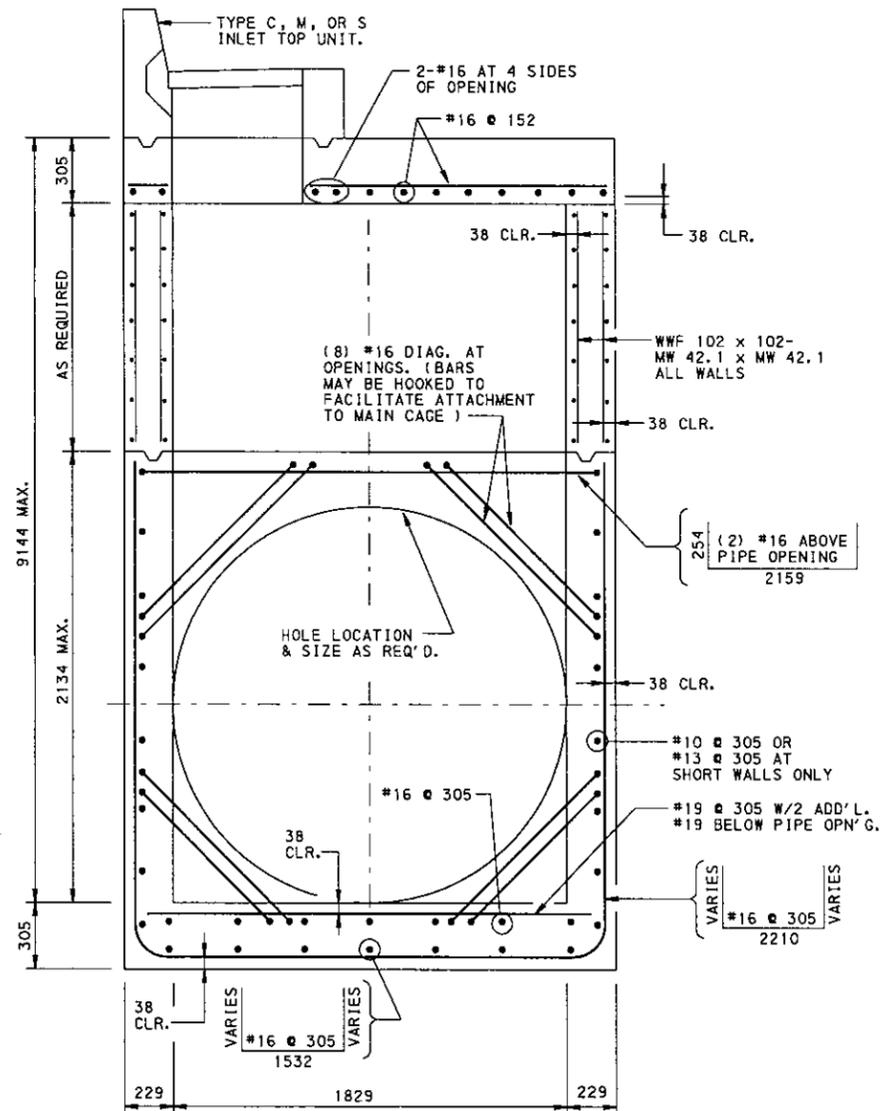
PLAN

NOTES

1. CONSTRUCT IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 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 TOP WITH MODIFIED TYPE I INLET BOX, THE TYPICAL INSTALLATION DETAILS ARE SHOWN BELOW. SHOW ANY VARIATION ON THE CONSTRUCTION DRAWINGS BY SPECIAL DETAILS.

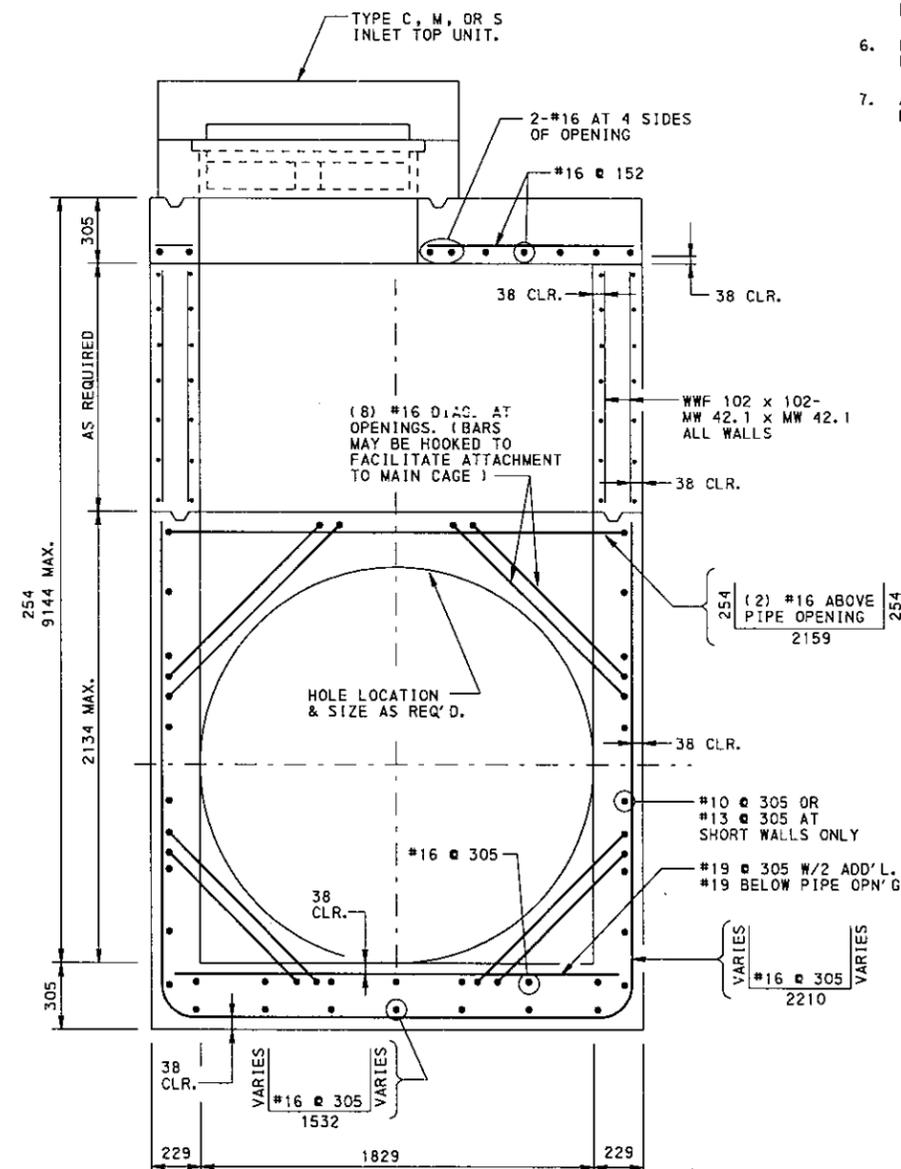


5. PROVIDE A MINIMUM HEIGHT OF 508 MEASURED FROM THE TOP SURFACE OF THE TOP UNIT TO THE INSIDE TOP OF THE PIPE WHEN THE TOP UNIT AND EITHER A MODIFIED TYPE I OR A MODIFIED TYPE II INLET BOX ARE CONSTRUCTED MONOLITHICALLY.
6. PERMIT ONLY PRECAST MODIFIED INLET BOXES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15.
7. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



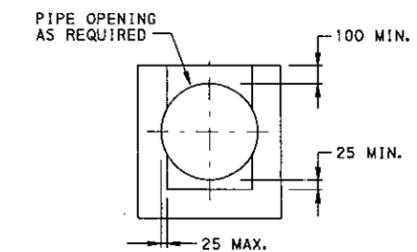
SECTION A-A

MODIFIED TYPE I INLET 1829 x 1150

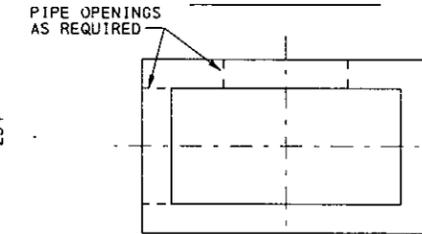


SECTION B-B

MODIFIED TYPE II INLET 610 x 1829



HOLE CLEARANCES



STANDARD HOLES

NOTE: ADDITIONAL STEEL MAY BE ADDED AROUND PIPE OPENING TO KEEP HOLE FORMER IN PLACE DURING FABRICATION.

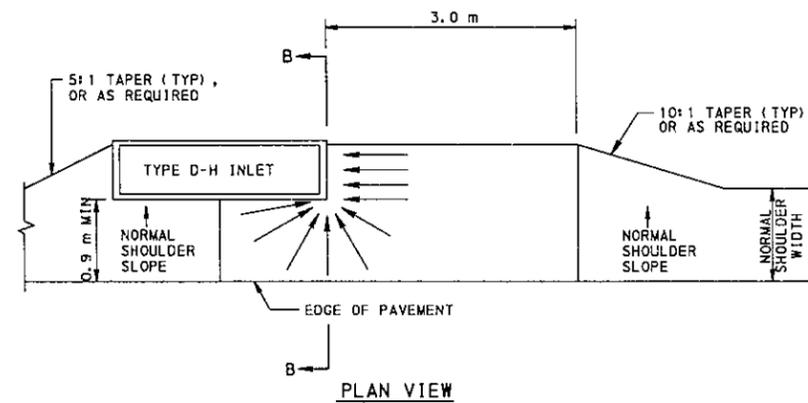
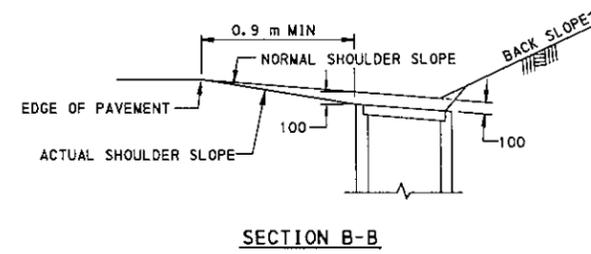
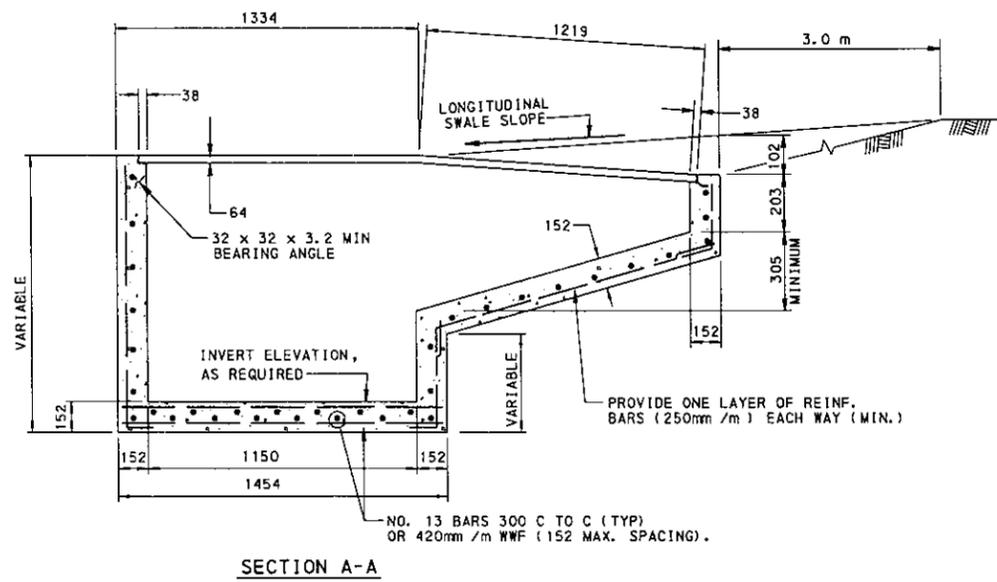
PIPE OPENING DETAILS

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN

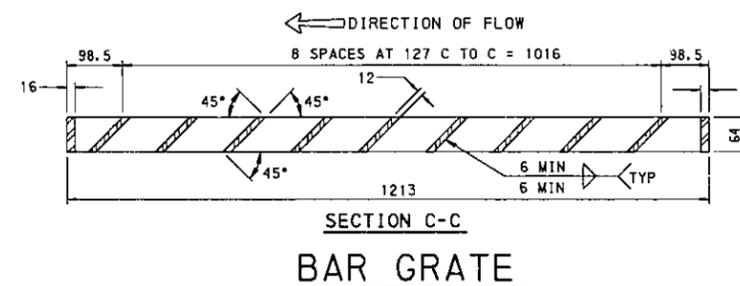
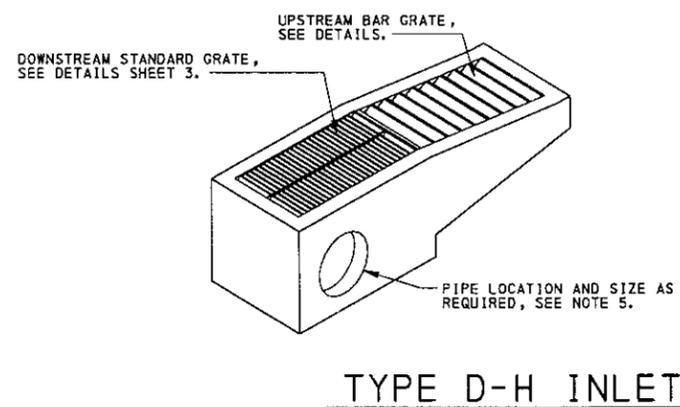
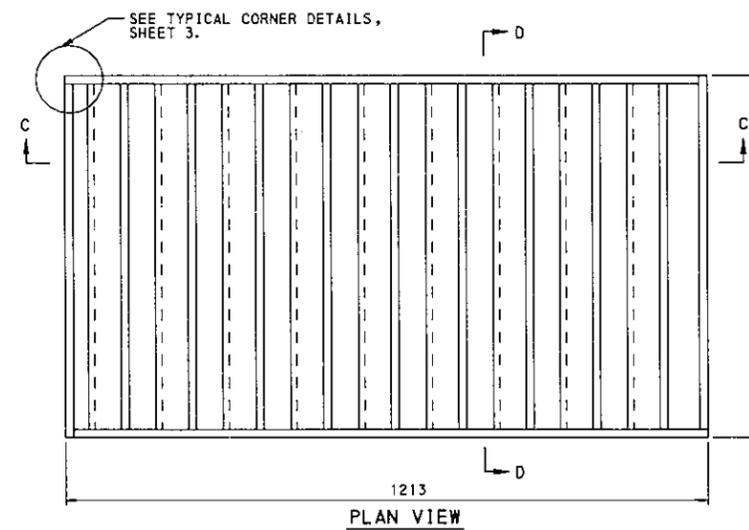
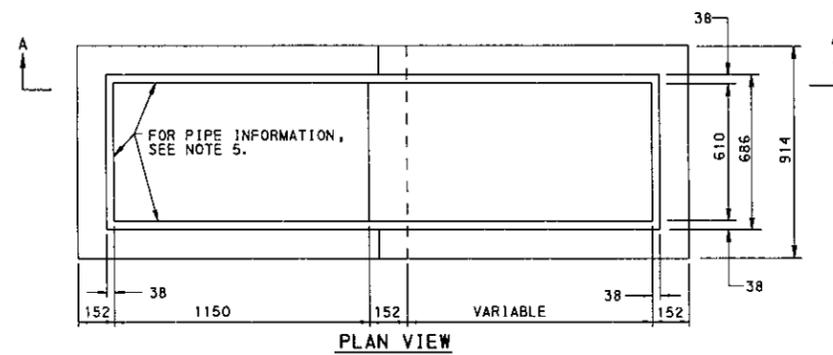
INLETS  
MODIFIED INLET BOXES  
(CAST-IN-PLACE AND PRECAST)

NOTES

1. CONSTRUCT IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408M, SECTION 605.
2. THIS SHEET DEPICTS THE DIMENSIONS REQUIRED FOR UNIFORMITY AND INTERCHANGEABILITY. PERMIT ONLY GRATES SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15.
3. WELD STRUCTURAL STEEL GRATES IN ACCORDANCE WITH THE REQUIREMENTS OF PUBLICATION 408M, SECTION 1105.031(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.
6. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



TYPICAL D-H INLET LOCATION



COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN

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

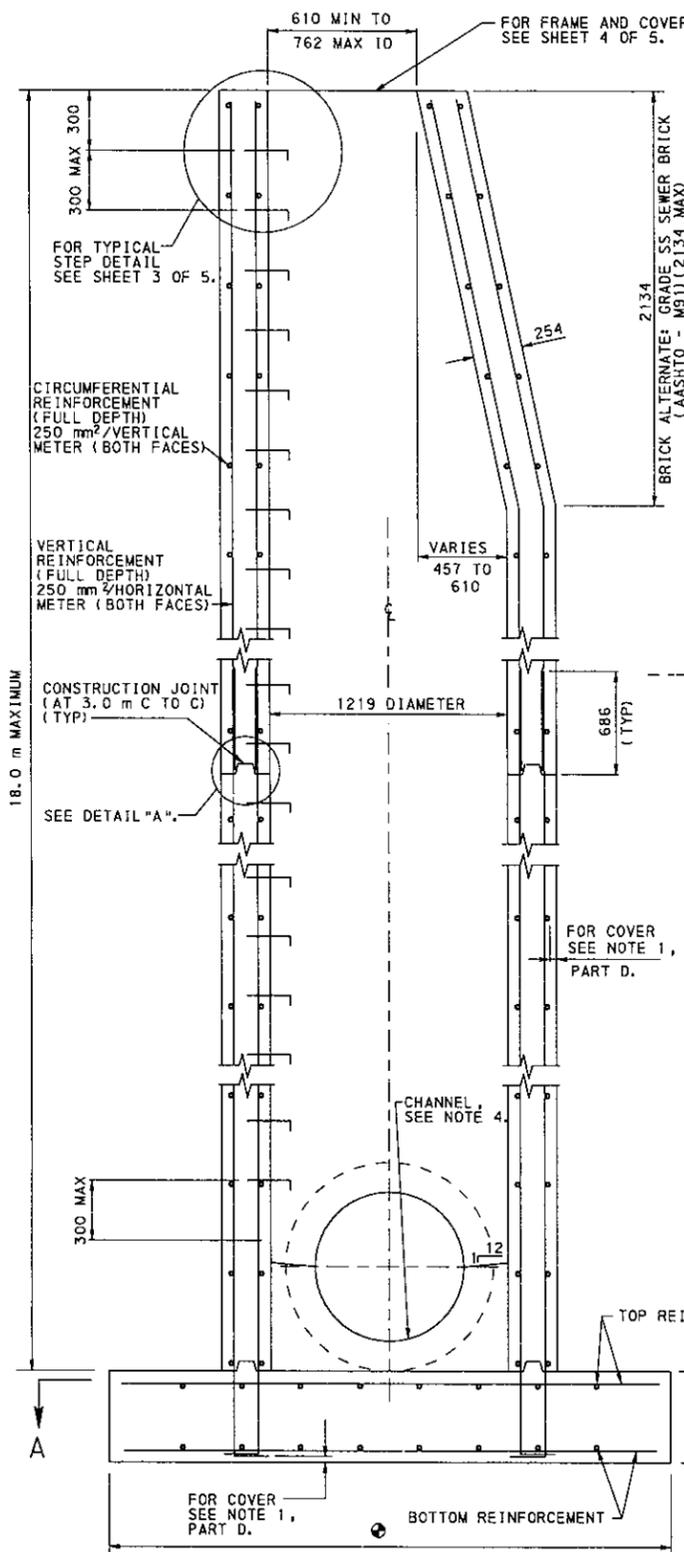
RECOMMENDED FEB. 18, 2000 <i>Dean A. Schum</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED FEB. 18, 2000 <i>Gary J. Hoffman</i> CHIEF ENGINEER	SHT 10 OF 10 RC-34M
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**NOTES**

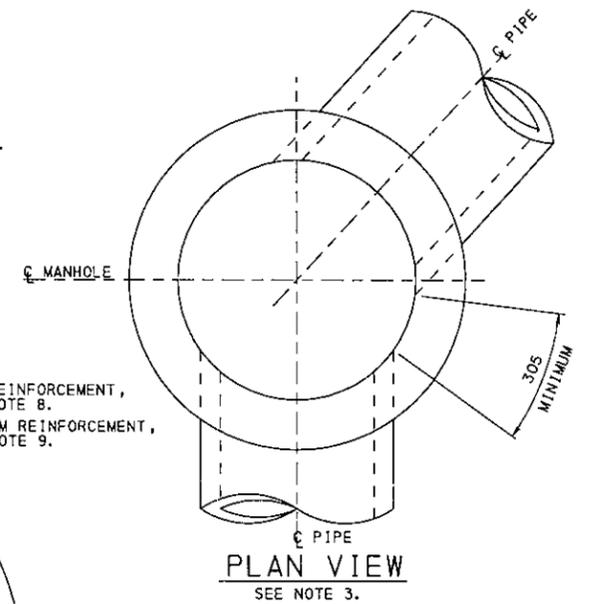
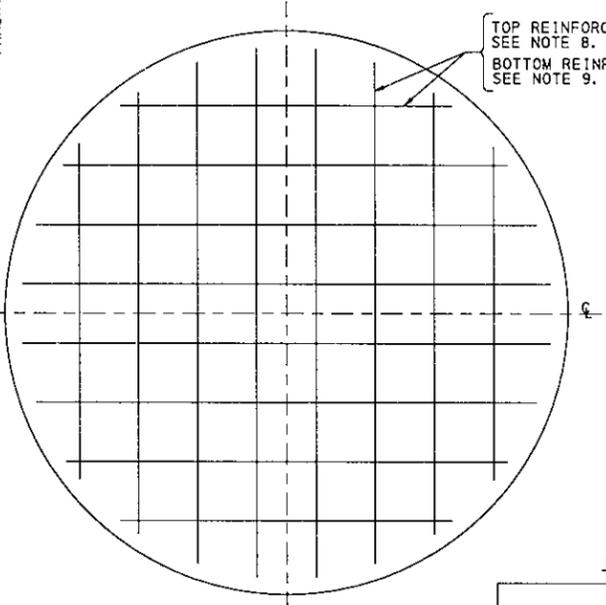
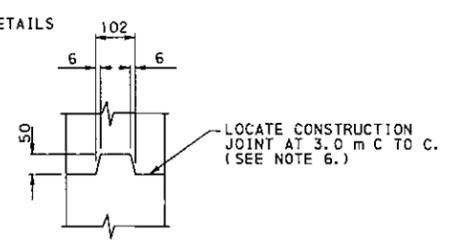
1. CONSTRUCTION REQUIREMENTS:
  - A. CONSTRUCT IN ACCORDANCE WITH PUBLICATION 408M, SECTIONS 605, 606 AND 714; AND ASTM C-478M-90, STANDARD SPECIFICATION FOR PRECAST REINFORCED CONCRETE MANHOLE SECTIONS, AS MODIFIED HEREIN.
  - B. MINIMUM CONCRETE CLASS:
 

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

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



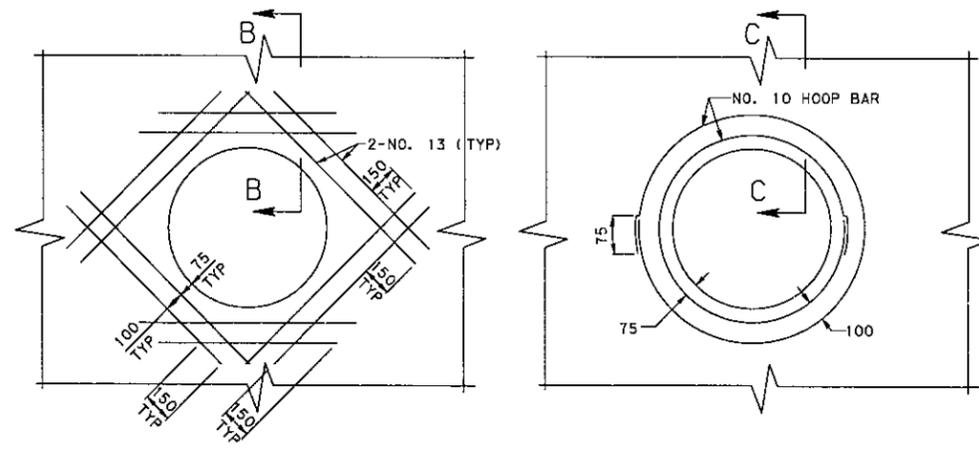
**DETAIL "A"  
CONSTRUCTION JOINT**



**TABLE A  
BASE SLAB DIMENSIONS**

MAX DEPTH FROM TOP OF MANHOLE TO TOP OF FOOTING	AS DESIGNED (SEE NOTE 7.)	
	FOOTING DIAMETER	FOOTING THICKNESS
3.0 m	2060	300
6.0 m	2060	300
9.0 m	2060	380
12.0 m	2210	380
15.0 m	2440	380
18.0 m	2590	380

**CAST-IN-PLACE MANHOLE**  
FOR PIPES WITH 750 INSIDE DIAMETER AND LESS



**REINFORCEMENT DETAILS AT OPENINGS**

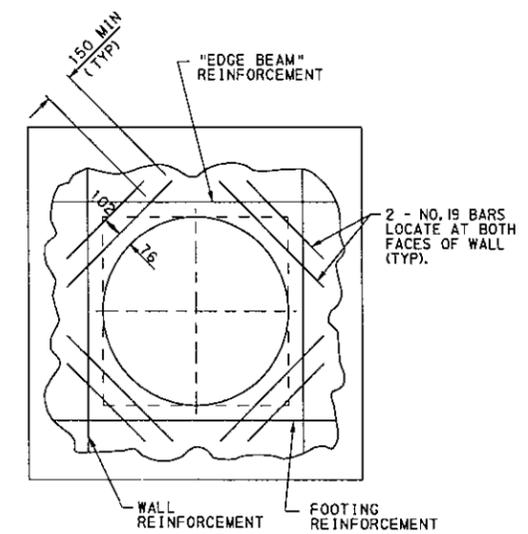
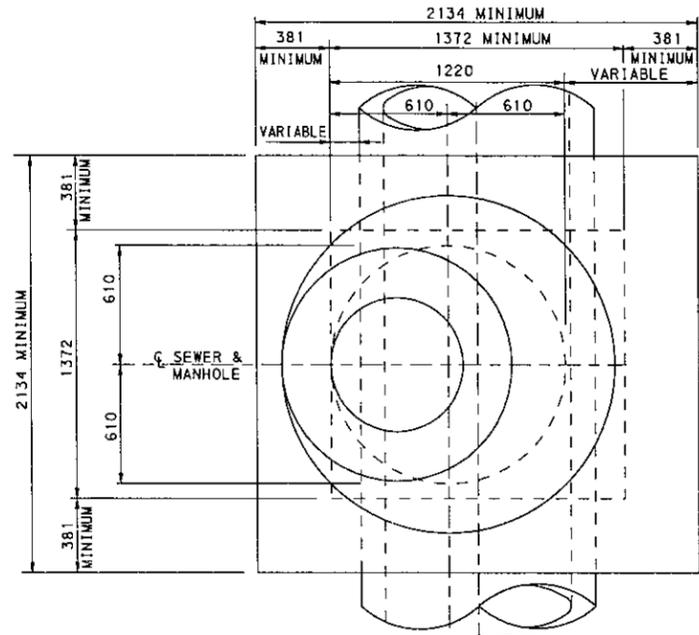
NOTE: FOR WALL THICKNESSES 254 OR GREATER PLACE ADDITIONAL REINFORCEMENT AS SHOWN ABOVE AT EACH FACE OF THE WALL INSIDE MAIN REINFORCEMENT. FOR WALLS 127 THICK KEEP MAIN REINFORCEMENT CENTERED IN WALL. PROVIDE ADDITIONAL REINFORCEMENT AS SHOWN ABOVE, MAINTAINING REQUIRED COVER.

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

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

RECOMMENDED FEB. 19, 2000  
 Director, Bureau of Design  
 RECOMMENDED FEB. 19, 2000  
 Chief Engineer  
 SHT 1 OF 5  
 RC-39M

07-JAN-2000



REINFORCEMENT DETAILS AT VERTICAL OPENINGS

NOTE: ONLY BOX WITH MAIN REINFORCEMENT SHOWN FOR CLARITY.

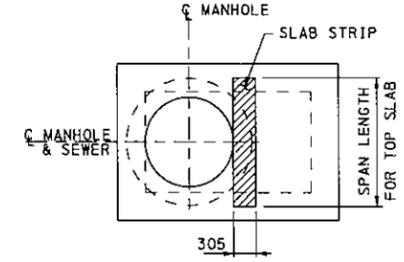


FIGURE 1  
PLAN-TOP OF SLAB

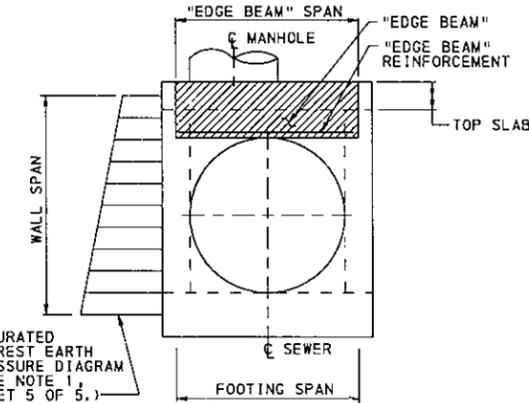
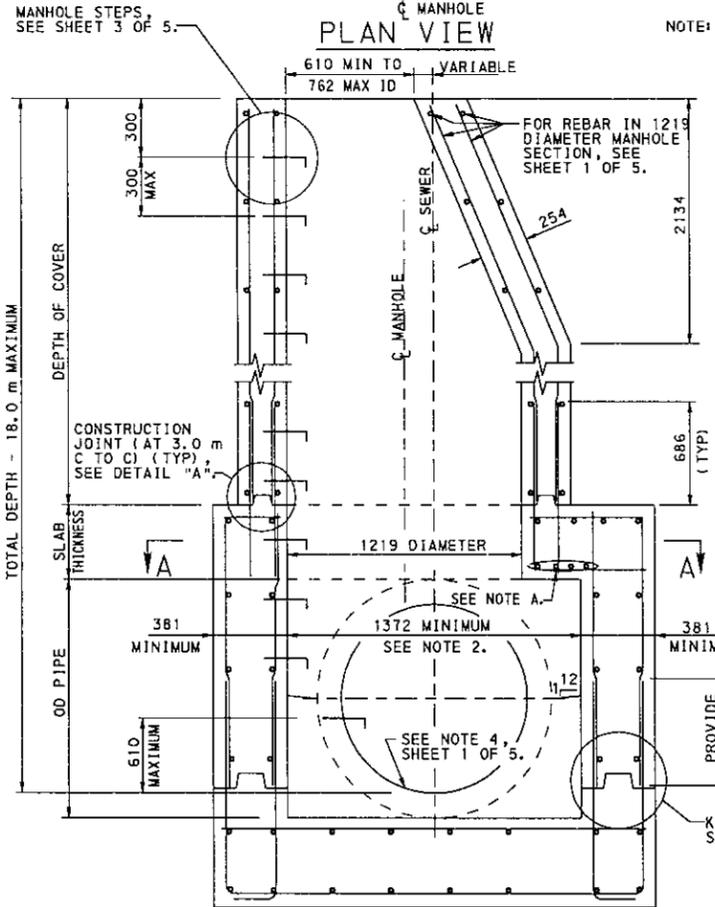


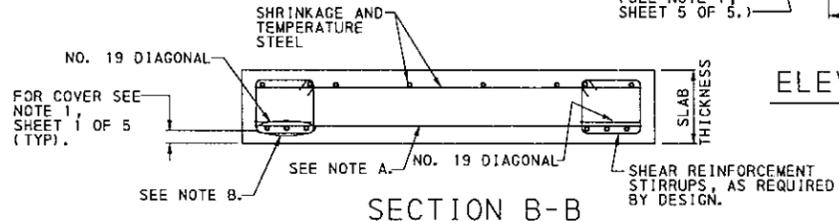
FIGURE 2  
ELEVATION-OPENING

NOTES

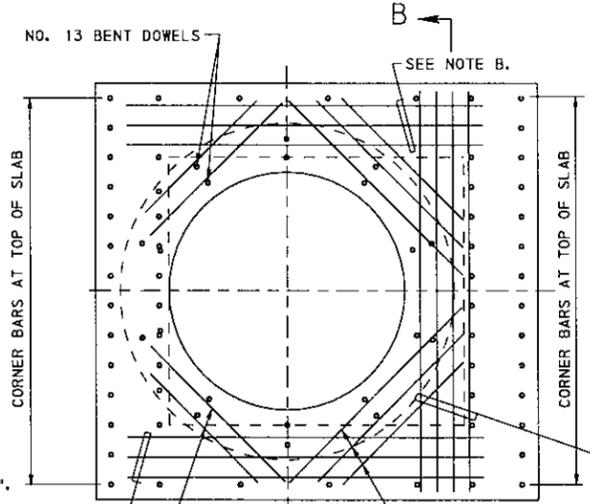
- FOR CONSTRUCTION REQUIREMENTS SEE NOTE 1, SHEET 1 OF 5. FOR DESIGN REQUIREMENTS SEE NOTE 1, SHEET 5 OF 5.
- INCREASE BOX SIZE WHEN REQUIRED TO KEEP WALLS OF MANHOLE BOX SECTION FLUSH WITH THE OPENING FOR PIPES LARGER THAN 1050 ID. INDICATE THE BOX SIZE ON THE CONSTRUCTION PLANS OR SHOP DRAWINGS BASED ON THE DESIGN PROCEDURES PROVIDED BELOW.
- DESIGN PROCEDURE FOR MANHOLE BOX SECTION:
  - DESIGN ALL MEMBERS FOR MOMENT, CRACK CONTROL & SHEAR AT DISTANCE  $d$  (EFFECTIVE DEPTH OF MEMBER) FROM FACE OF SUPPORT. CALCULATE ALL SPAN LENGTHS FROM THE CENTER OF THE SUPPORTS.
  - TOP SLAB
    - DESIGN A 305 WIDE SLAB STRIP FOR ONE-WAY ACTION TO CARRY DEAD LOAD, LIVE LOAD, AND WEIGHT OF EARTH. SPAN THE STRIP, SIMPLY SUPPORTED, ACROSS THE WIDTH OF THE BOX OR IN THE SHORT DIRECTION. SEE FIGURE 1 FOR DETAILS.
    - PLACE ADDITIONAL BARS IN THE SLAB AT 45° AROUND THE MANHOLE OPENING. SEE SECTION A-A FOR DETAILS.
  - "EDGE BEAM"
    - VIEWS SHOWING THE CONFIGURATION OF MANHOLE BOX SECTION ILLUSTRATE "EDGE BEAMS" TO BE THE SAME DEPTH AS THE TOP SLAB. TO ACHIEVE REQUIRED CAPACITY WHERE NECESSARY, INCREASE DEPTH OF "EDGE BEAM" BY PROVIDING ADDITIONAL CLEARANCE BETWEEN THE SLAB AND TOP OF OPENING. LOCATE HORIZONTAL STEEL FOR BEAM ABOVE THE SOFFIT OF THE OPENING. SEE FIGURE 2 FOR DETAILS.
    - DESIGN THE "EDGE BEAMS", SPANNING THE LENGTH OF THE BOX, TO CARRY A UNIFORMLY DISTRIBUTED LOAD EQUAL TO THE REACTION FROM THE SLAB.
  - WALLS
    - DESIGN THE WALLS TO CARRY THE AXIAL LOAD, DUE TO EARTH LOAD, LIVE LOAD, AND DEAD LOAD APPLIED DIRECTLY TO THE WALL, IN ADDITION TO REACTIONS FROM THE "EDGE BEAMS", AND THE VERTICAL MOMENT CAUSED BY SATURATED AT REST EARTH PRESSURE. SEE FIGURE 2 FOR PRESSURE DIAGRAM. CONSIDER THE WALL SIMPLY SUPPORTED BETWEEN TOP SLAB AND FOOTING. PROVIDE THE SAME REINFORCEMENT ON THE OUTSIDE FACE.
  - FOOTING
    - DESIGN SPAN NORMAL TO PIPE TO CARRY POSITIVE MOMENT OF  $1/10 W L^2$  AND NEGATIVE MOMENT OF  $1/12 W L^2$  WHERE  $W$  IS THE UNIFORM BEARING PRESSURE. DO NOT TAKE INTO ACCOUNT THE CONCRETE IN THE CHANNEL WHEN CALCULATING CAPACITY OF THE FOOTING.
    - AS A MINIMUM, PROVIDE NO. 13 BARS AT 300 CENTERS, TOP AND BOTTOM OF SLAB IN THE OPPOSITE DIRECTION.
- ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



SECTION VIEW  
MODIFIED MANHOLE  
FOR PIPES GREATER THAN 750 TO 2100 INSIDE DIAMETER

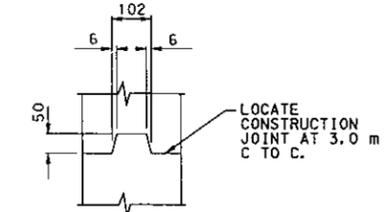


SECTION B-B

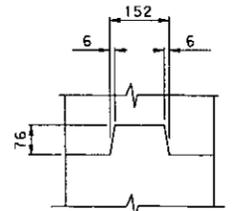


SECTION A-A

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



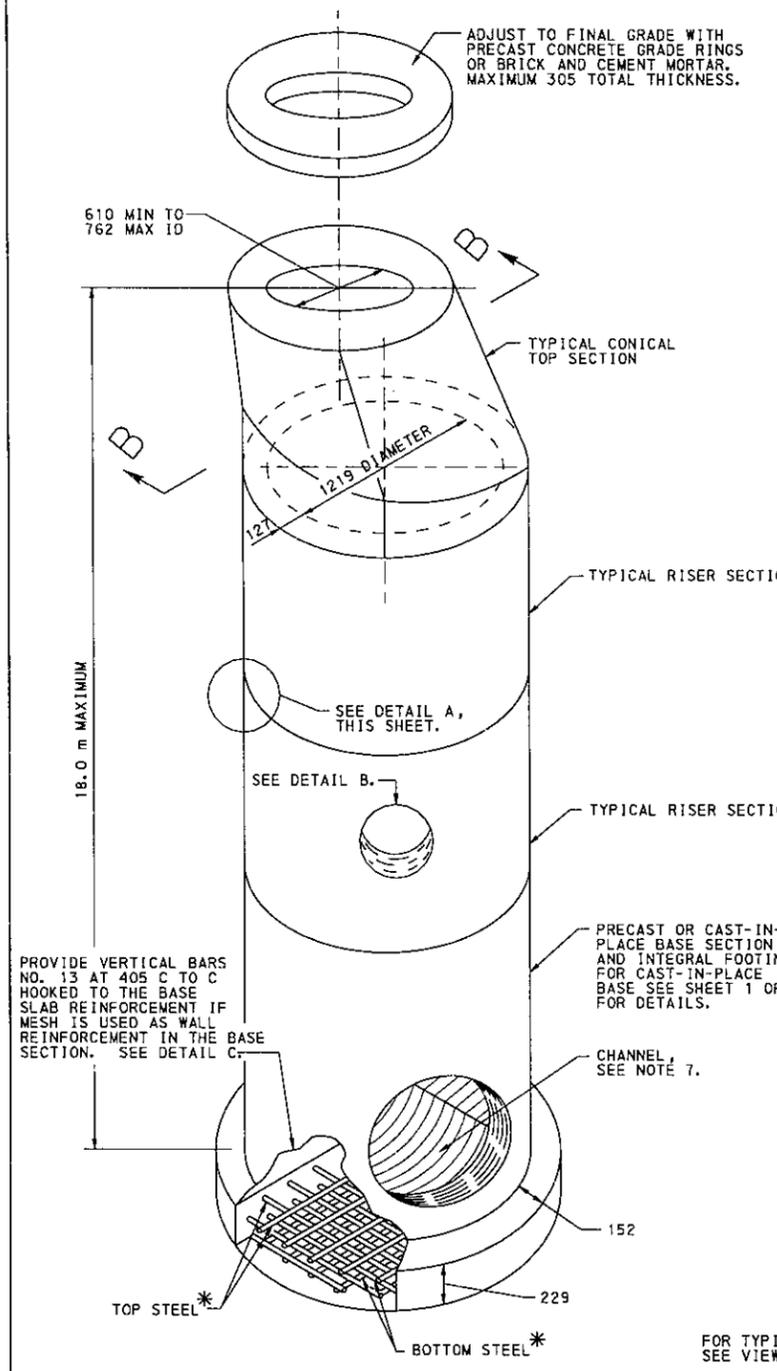
DETAIL "A"  
CONSTRUCTION JOINT  
SEE NOTE 6, SHEET 1 OF 5.



DETAIL "B"  
KEYWAY  
SEE NOTE 6, SHEET 1 OF 5.

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN

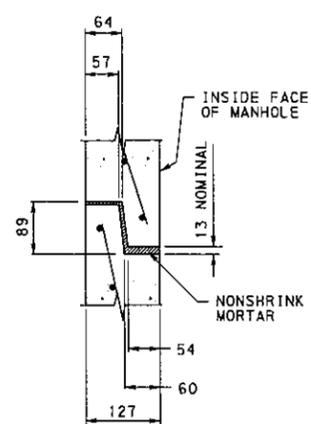
STANDARD MANHOLES  
MODIFIED  
CAST-IN-PLACE MANHOLES



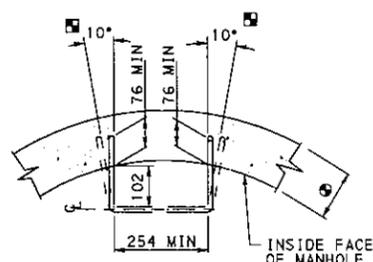
**PRECAST MANHOLE**  
FOR PIPES 750 INSIDE DIAMETER AND LESS

\* SEE TABLE B FOR BASE SLAB STEEL REQUIREMENTS. PROVIDE WALL REINFORCEMENT DETAILS AT BASE SLAB TYPICAL OF CAST-IN-PLACE MANHOLE. SEE SHEET 1 OF 5.

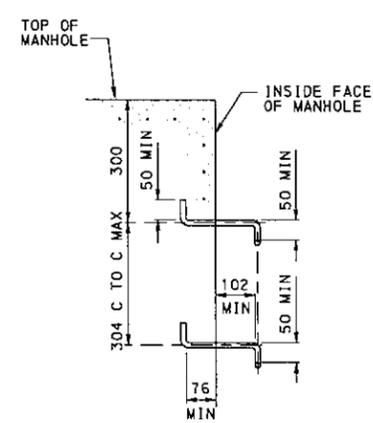
WALL REINFORCEMENT CIRCUMFERENTIAL FULL DEPTH 250 mm<sup>2</sup>/VERTICAL m VERTICAL FULL DEPTH 170 mm<sup>2</sup>/HORIZONTAL m PLACE REINFORCEMENT MESH CENTRALLY IN WALL. SEE NOTES 5 AND 6 FOR STEEL REQUIREMENTS AT OPENINGS.



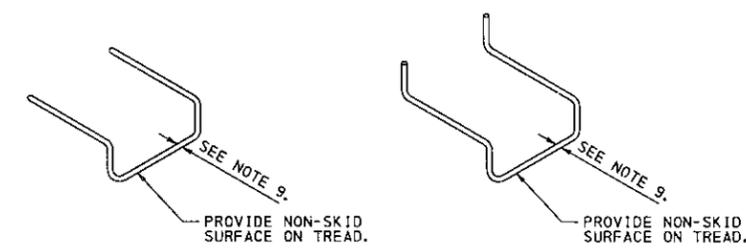
**DETAIL A**



**PLAN VIEW**



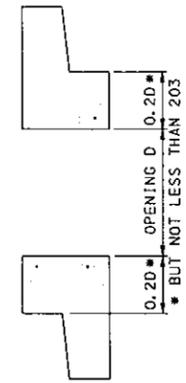
**SIDE VIEW**



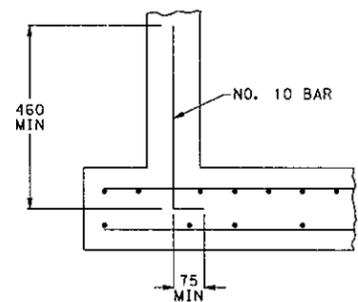
**STEP WITHOUT HOOKS**      **STEP WITH HOOKS**

SEE NOTE 10.

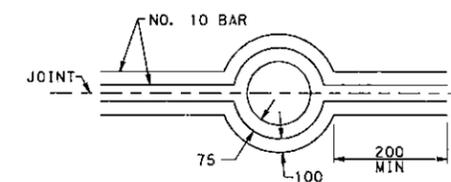
**TYPICAL STEP CONFIGURATION**  
**MANHOLE STEPS**



**DETAIL B**



**DETAIL C**



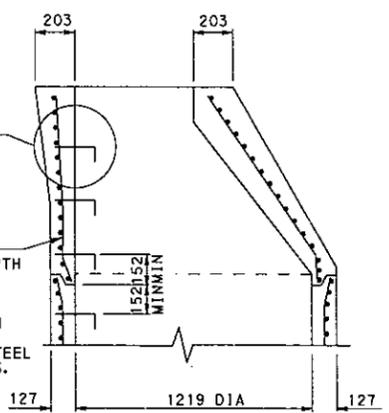
**ALTERNATE DETAIL AT OPENINGS**

SEE NOTE 11.

**TABLE B**

PRECAST MANHOLE HEIGHT	TOP STEEL REQUIREMENTS	BOTTOM STEEL REQUIREMENTS
0.0 m TO 9.0 m	NO. 13 BARS AT 150 C TO C OR 700 mm <sup>2</sup> /m WWF (152 MAXIMUM SPACING)	NO. 13 BARS AT 300 C TO C OR 340 mm <sup>2</sup> /m WWF (152 MAXIMUM SPACING)
> 9.0 m TO 18.0 m	NO. 16 BARS AT 150 C TO C OR 1190 mm <sup>2</sup> /m WWF (152 MAXIMUM SPACING)	NO. 13 BARS AT 150 C TO C OR 575 mm <sup>2</sup> /m WWF (152 MAXIMUM SPACING)

SEE NOTE 7, SHEET 1 OF 5.



**SECTION B-B**

**NOTES**

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

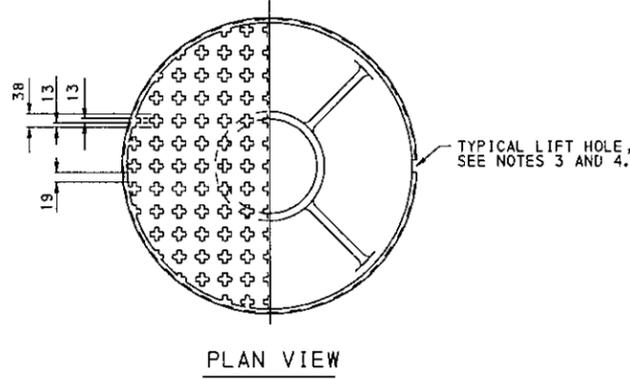
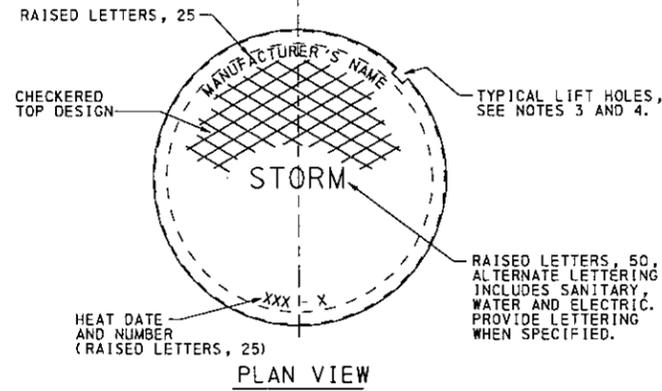
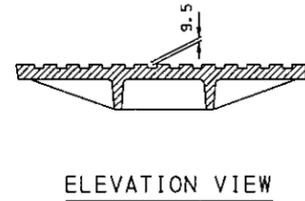
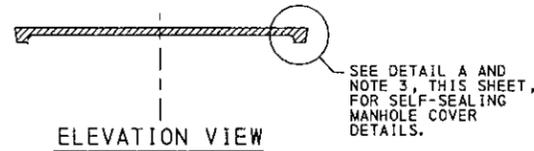
⊕ MAX 152 SPACING

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

**STANDARD MANHOLES**  
**PRECAST MANHOLES &**  
**MANHOLE STEPS**

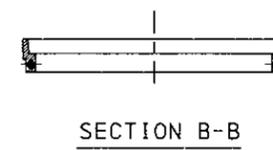
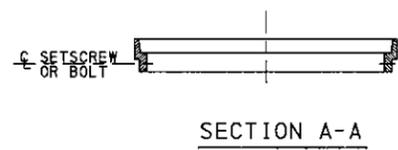
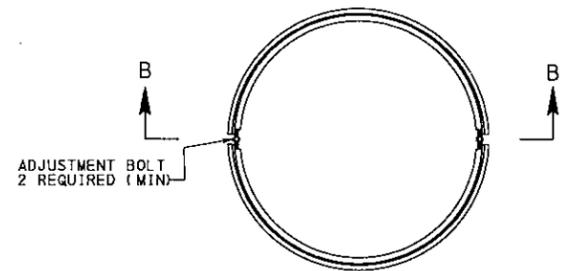
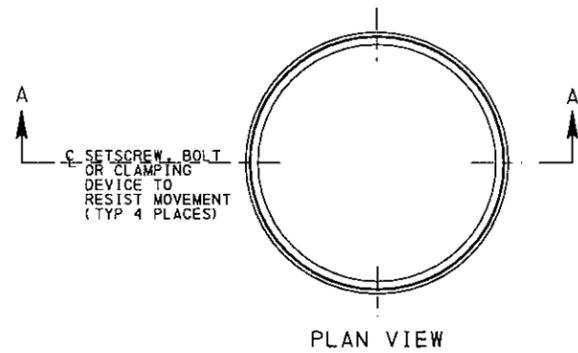
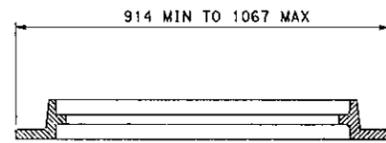
NOTES

1. PROVIDE MANHOLE FRAMES AND COVERS MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 605.2(b). DESIGN MANHOLE FRAME, COVER AND GRADE ADJUSTMENT RINGS FOR PHL 93 LIVE LOAD. IF MANHOLES ARE NOT IN OR ADJACENT TO ROADWAY, DESIGN FOR ALL POSSIBLE LIVE LOADS AS APPROVED BY THE DEPARTMENT.
2. PROVIDE MANHOLE FRAMES, COVERS AND GRADE ADJUSTMENT RISERS SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15. FOR A BULLETIN 15 LISTING, SUBMIT AN 841 x 594 REPRODUCIBLE SHOP DRAWING TO THE BUREAU OF CONSTRUCTION AND MATERIALS, MATERIALS AND TESTING DIVISION FOR REVIEW.
3. PROVIDE A GASKET SEALING SYSTEM (DOVETAIL GROOVE AND CONTINUOUS GASKET), AS INDICATED IN DETAIL A, TO PREVENT INFLOW THROUGH THE BEARING SURFACES, OF SURFACE RUNOFF WATER INTO THE MANHOLE SYSTEM, WHEN SPECIFIED. PROVIDE 6 DIA ONE PIECE SELF-SEAL POLYISOPRENE ROUND GASKET, 40 DUROMETER GLUED IN PLACE. PROVIDE TWO (2) LIFT HOLES AT 180° TO FACILITATE COVER REMOVAL FOR SELF-SEALING MANHOLE COVER.
4. PROVIDE ONE LIFT HOLE TO FACILITATE COVER REMOVAL FOR NON-SEALING MANHOLE COVER.
5. FRAME AND GRADE ADJUSTMENT RISER TO HAVE A MINIMUM BEARING SEAT OF 25 FOR COVER.
6. LOCATE TOP OF FRAME OR ADJUSTMENT RISER 3 BELOW THE TOP OF ROADWAY SURFACE.
7. PROVIDE GRADE ADJUSTMENT RISERS MEETING THE REQUIREMENTS OF PUBLICATION 408M SPECIFICATIONS, SECTION 606, AND AS MODIFIED HEREIN:
  - A. CUSTOM FABRICATE EACH ADJUSTMENT RISER FROM MEASUREMENTS PROVIDED WITH EACH ORDER.
  - B. MANUFACTURE BAR STOCK AND RETAINER CLIP FROM U.S. MADE CARBON STEEL MEETING OR EXCEEDING THE MINIMUM REQUIREMENTS OF ASTM A-36M.
  - C. REQUIRE FULL CIRCUMFERENTIAL WELDS ON BOTH TOP AND BOTTOM RINGS. MAKE THE INNER WELD A BEVEL GROOVE WELD (FLUSH FINISH) FOR PROPER SEATING OF MANHOLE LID AND MAKE THE OUTER WELD A FILLET WELD.
  - D. MAKE THE MINIMUM WIDTH OF BOTTOM AND TOP BAR STOCK 25 AND 10, RESPECTIVELY.
  - E. TAP THE BOTTOM BAR STOCK FOR MULTI-PIECE ADJUSTMENT RISER FOR M14 ADJUSTMENT BOLT.
  - F. REINFORCE THE ADJUSTMENT RISER ADEQUATELY TO PREVENT BENDING.
  - G. PROVIDE AN ADJUSTMENT RISER WHICH IS FLUSH WITH COVER AND DOES NOT ALLOW EXCESSIVE MOVEMENT. PROVIDE AN ADJUSTMENT RISER WHICH CONFORMS TO THE SHAPE OF THE ORIGINAL FRAME.
8. ATTACH FRAME AND/OR PRECAST CONCRETE GRADE RINGS RIGIDLY TO TOP OF MANHOLE. USE 3-M14 THREADED STUDS WITH HEX HEAD NUTS AND WASHERS, INSERTED THROUGH AT 16 DIA HOLES THROUGH FRAME AND/OR RINGS. SPACE HOLES AT 120° AND 50 FROM OUTSIDE EDGE OF FRAME. EMBED STUDS 102 (MINIMUM) INTO MANHOLE. GROUT STUDS INTO MANHOLE.
9. SET THE BASE OF THE FRAME AND/OR PRECAST CONCRETE GRADE RINGS IN A BED OF CEMENT MORTAR.
10. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

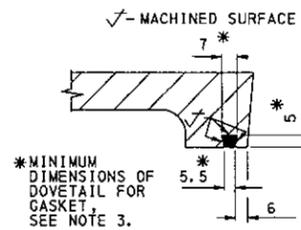


CAST IRON MANHOLE COVER  
(PLATEN COVER)

CAST IRON MANHOLE COVER  
(STANDARD COVER)



ADJUSTMENT RISERS



COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN

STANDARD MANHOLES  
COVERS, FRAMES AND  
ADJUSTMENT RISERS

1. DESIGN REQUIREMENTS:

- A. DESIGN SPECIFICATIONS: DESIGN DIVISION 1 OF AASHTO, STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 1992, INCLUDING THE LATEST INTERIM SPECIFICATIONS AND AS SUPPLEMENTED BY THE DESIGN MANUAL, PART 4, AUGUST 1993 EDITION (INCLUDING LATEST REVISIONS), ASTM C 478M-90, STANDARD SPECIFICATIONS FOR PRECAST CONCRETE MANHOLE SECTIONS.
- B. CALCULATE FOUNDATION BEARING PRESSURES BY SERVICE LOAD METHODS. DESIGN ALL OTHER PORTIONS OF THE MANHOLES BY LOAD FACTOR METHODS.
- C. THE SAFE BEARING PRESSURE IS NOT TO EXCEED THE EXISTING STATE OF STRESS OR 0.15 MPa, WHICHEVER IS GREATER.
- D. DESIGN THE MANHOLE FOR A LIVE LOAD OF PHL 93 AND WITH 30% IMPACT, EXCEPT DO NOT USE IMPACT IN THE DESIGN OF THE FOOTING. IF MANHOLES ARE NOT IN OR ADJACENT TO A ROADWAY, DESIGN FOR ALL POSSIBLE LIVE LOADS AS APPROVED BY THE DEPARTMENT.
- E. DESIGN THE MANHOLE FOR:
  - ACCELERATION DUE TO GRAVITY,  $g = 9.81 \text{ m/s}^2$
  - DENSITY OF EARTH,  $\gamma_e = 1920 \text{ kg/m}^3$
  - $\phi =$  ANGLE OF INTERNAL FRICTION =  $33^\circ$
  - DRY AT REST EARTH PRESSURE =  $K_0 \gamma_e = 0.001(1 - \sin \phi) \gamma_e$   
 $= 0.001 \times 0.46 \times 1920 \times 9.81 = 8.7 \text{ MPa}$
  - SATURATED AT REST EARTH PRESSURE =  $K_0 [\gamma_e \gamma_w + \gamma_w]$   
 $= 0.46 [(0.001)(1920)(9.81) + 9.81] + 9.81$   
 $= 14.0 \text{ MPa}$
- F. PROVIDE AT LEAST MINIMUM REINFORCEMENT FOR SHRINKAGE AND TEMPERATURE AT ALL CONCRETE FACES WHERE REINFORCEMENT IS NOT REQUIRED BY DESIGN.
- G. FOR CONSTRUCTION REQUIREMENTS SEE NOTE 1, SHEET 1 OF 5.

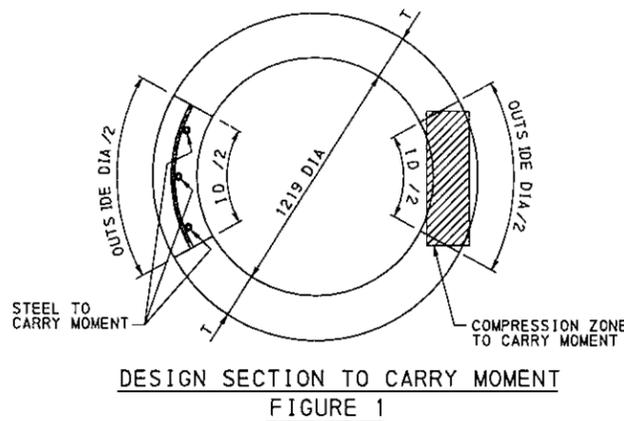
2. VERTICAL STEEL:

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

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

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

$$Z = F_s \sqrt{\frac{d_o \times 2d_{st} \times b}{\text{NO. OF BARS}}} < 17.2 \text{ MN/m} \quad (\text{DM4-8-16-8-4})$$

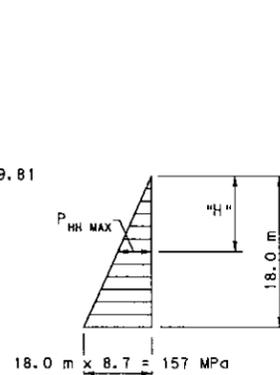


DESIGN SECTION TO CARRY MOMENT  
 FIGURE 1

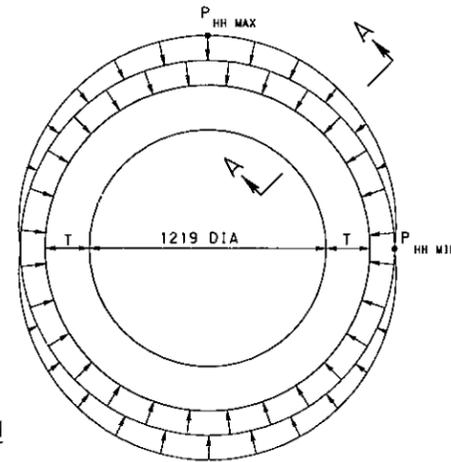
3. HOOP STEEL:

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

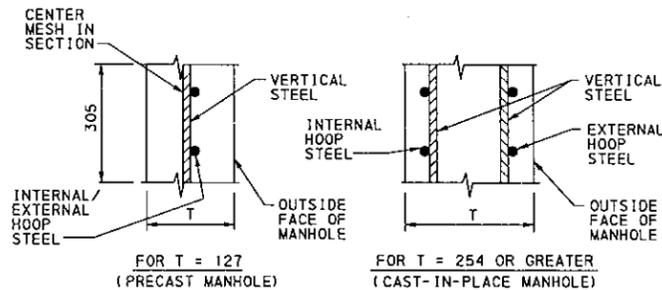
$$Z = F_s \sqrt{\frac{d_o \times 2d_{st} \times b}{\text{NO. OF BARS}}} < 17.2 \text{ MN/m}$$



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



DIFFERENTIAL PRESSURE LOADING  
 TO DETERMINE HOOP MOMENTS  
 FIGURE 3



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

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

SECTION A-A - DESIGN SECTION

4. FOOTING DESIGN:

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

$$\frac{P + M}{A S} < 290 \text{ kPa OR MAXIMUM ALLOWABLE BEARING PRESSURE}$$

$$P = DL + LL + EP$$

DL = DEAD LOAD OF MANHOLE

LL = PHL 93 WHEEL LOAD (NO IMPACT)

EP = EARTH LOAD ON OVERHANG

A = BEARING AREA OF FOOTING

M = MOMENT DUE TO DIFFERENTIAL LOADING (WHEN APPLICABLE)

S = SECTION MODULUS OF FOOTING

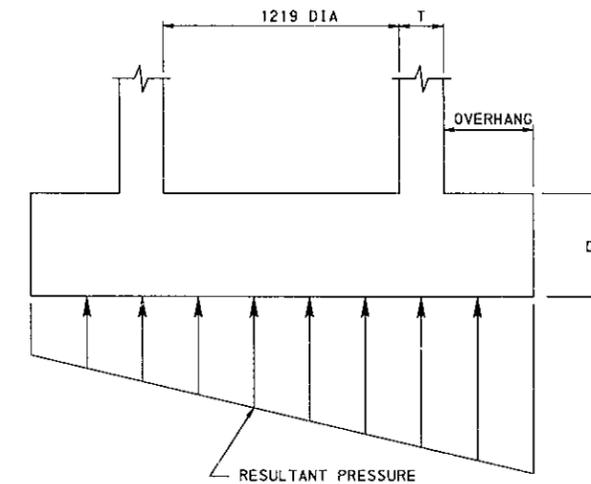
SEPARATION BETWEEN THE FOOTING AND SOIL IS NOT PERMISSIBLE.

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

- C. CHECK CRACK CONTROL UNDER SERVICE LOAD.

$$Z = F_s \sqrt{\frac{d_o \times 2d_{st} \times b}{\text{NO. OF BARS}}} < 17.2 \text{ MN/m}$$

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



DIAMETRICAL SECTION THROUGH FOOTING  
 FIGURE 4

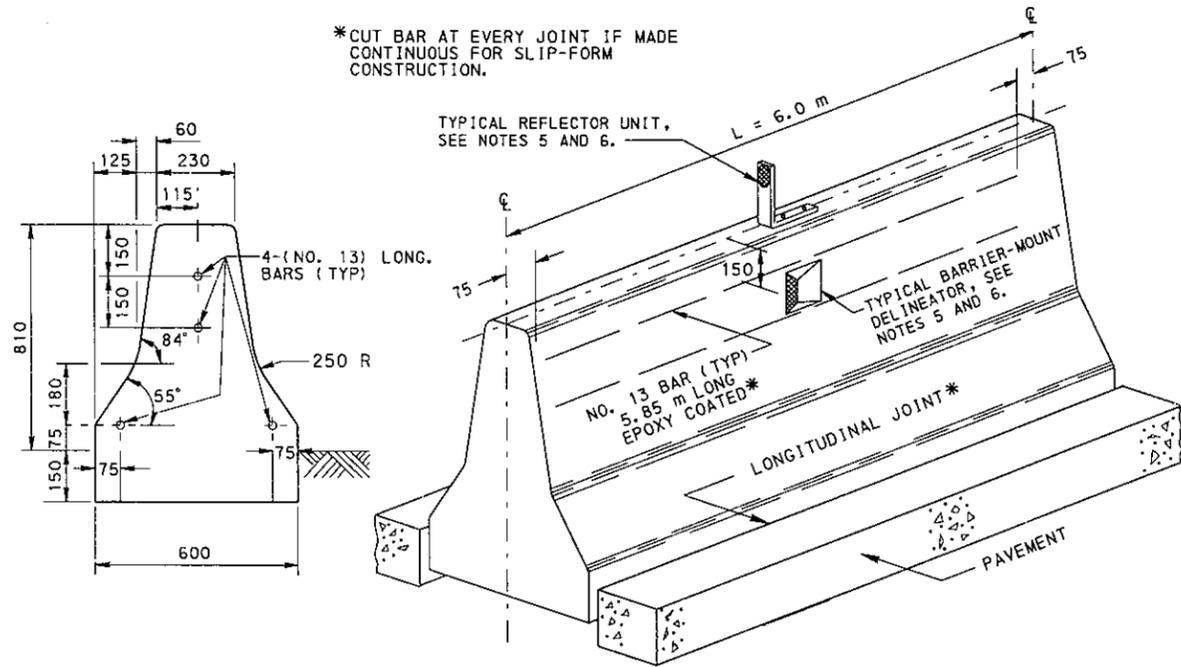
COMMONWEALTH OF PENNSYLVANIA  
 DEPARTMENT OF TRANSPORTATION  
 BUREAU OF DESIGN

STANDARD MANHOLES  
 DESIGN PROCEDURE

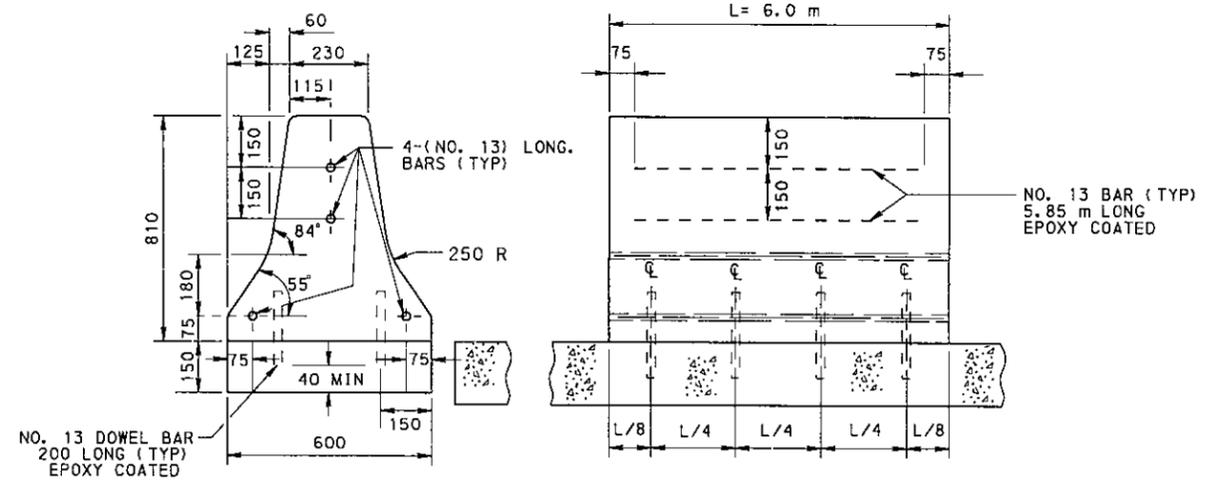
RECOMMENDED FEB. 18, 2000  
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 DIRECTOR, BUREAU OF DESIGN

RECOMMENDED FEB. 18, 2000  
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 CHIEF ENGINEER

SHT 5 OF 5  
 RC-39M



MONOLITHIC CONSTRUCTION

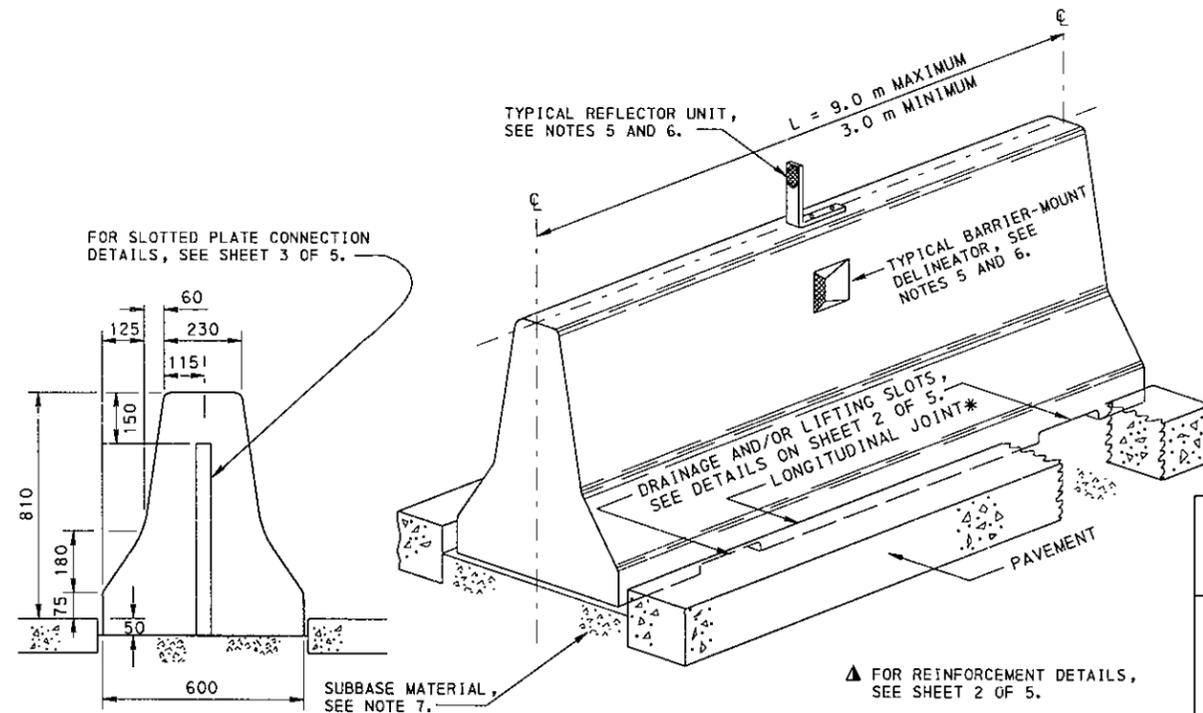


DOWEL CONSTRUCTION

TYPICAL CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION

NOTES

1. PROVIDE CONCRETE MEDIAN BARRIER MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 623.
2. PROVIDE PRECAST CONCRETE BARRIER SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15. FOR DEVIATIONS OR MODIFICATIONS FROM THE STANDARD, SUBMIT SHOP DRAWINGS FOR REVIEW AND APPROVAL.
3. FOR CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION, USE PREMOLDED JOINT MATERIAL AT ALL CONSTRUCTION JOINTS.
4. CONCRETE MEDIAN BARRIER CONSTRUCTION ON EXISTING PAVEMENT REQUIRES SPECIAL DETAILS TO BE SHOWN ON THE CONSTRUCTION DRAWINGS.
5. FOR PERMANENT AND TEMPORARY BARRIER INSTALLATIONS, USE SIDE-MOUNT (BARRIER-MOUNT DELINEATOR) OR TOP-MOUNT DELINEATORS (BARRIER-MOUNT DELINEATOR OR REFLECTOR UNIT) AS DETERMINED ON A PROJECT BY PROJECT BASIS. LOCATE SIDE-MOUNT DELINEATORS 150 FROM THE TOP OF THE BARRIER TO THE CENTER OF THE DEVICE. INSTALL TOP-MOUNT DELINEATORS AS FOLLOWS:
  - (1) CENTER BARRIER-MOUNT DELINEATOR ALONG LONGITUDINAL CENTERLINE OF MEDIAN BARRIER.
  - (2) LOCATE REFLECTOR UNITS AS SHOWN ON TRAFFIC STANDARD TC-8709.
 FOR PERMANENT INSTALLATIONS, PLACE DELINEATORS AT A MAXIMUM LONGITUDINAL SPACING OF 25 m FOR TANGENT SECTIONS AND 20 m FOR CURVE SECTIONS WITH A HORIZONTAL RADIUS LESS THAN 700 m. FOR TEMPORARY INSTALLATIONS, PLACE DELINEATORS AT A MAXIMUM LONGITUDINAL SPACING OF 12 m AND LOCATE AT L/2 ON THE DESIGNATED BARRIER SECTION. USE BARRIER-MOUNT DELINEATORS OR REFLECTOR UNITS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15.
6. WARNING LIGHTS MAY BE PROVIDED IN LIEU OF TOP OR SIDE-MOUNT DELINEATORS ON BARRIERS USED TEMPORARILY. INSTALL AT A MAXIMUM SPACING OF 24 m AND LOCATE AT L/2 ON THE DESIGNATED BARRIER SECTION. ONLY THE FIRST TWO LIGHTS AT THE START OF THE BARRIER MAY BE YELLOW TYPE 'A' FLASHING LIGHTS. PROVIDE YELLOW TYPE 'C' STEADY BURN LIGHTS FOR ALL OTHER WARNING LIGHTS. USE LIGHTS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15.
7. COMPACT NO. 2A OR NO. OGS MATERIAL IN ACCORDANCE WITH PUBLICATION 408M, SECTION 350. A LAYER 25 THICK OF NON-SHRINK MORTAR MAY BE USED ON TOP OF THE SUBBASE MATERIAL FOR LEVELING PURPOSES. A RIGID BASE MAY BE USED INSTEAD OF SUBBASE.
8. PROVIDE PRECAST CONCRETE MEDIAN BARRIER FOR USE AS TEMPORARY (MPT) AND IN PERMANENT INSTALLATIONS. FOR TEMPORARY INSTALLATIONS, EMBEDMENT IS NOT REQUIRED.
9. ROUND OR CHAMFER HORIZONTAL EDGES WITH A RADIUS OF 25 EXCEPT AS SHOWN.
10. ANCHOR THE BARRIER AT THE ENDS OR AT INTERRUPTIONS WITH EITHER A DOWELED-IN CONNECTION OR A 250 DEEP MONOLITHIC FOOTING.
11. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



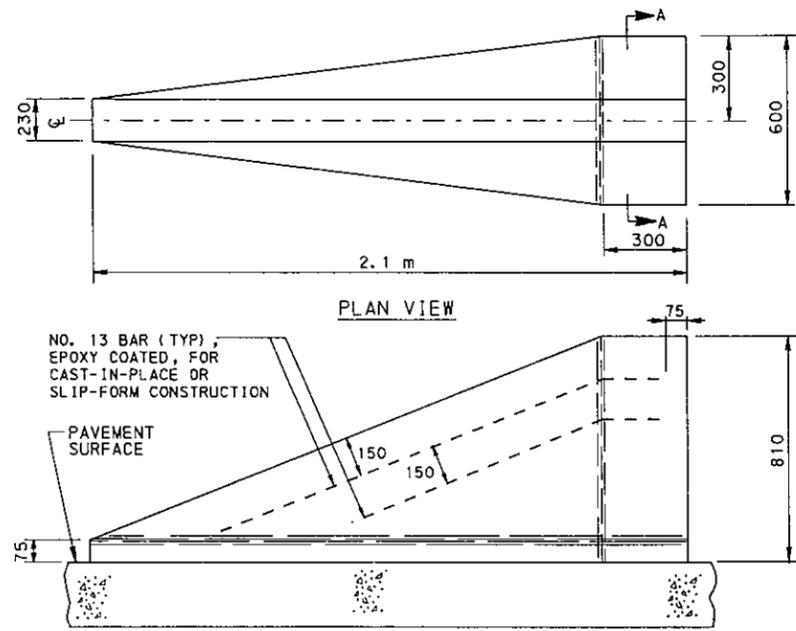
TYPICAL PRECAST CONSTRUCTION

\* SEAL JOINTS WITH AN APPROVED JOINT SEALER.

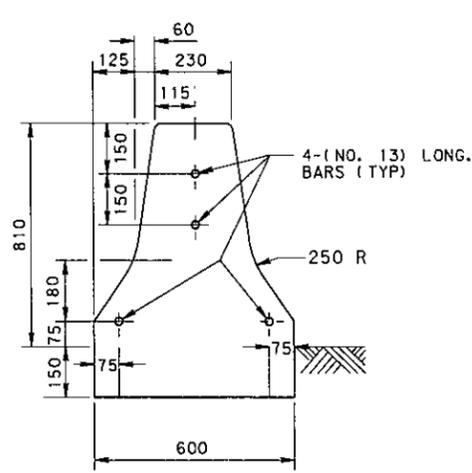
COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN

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

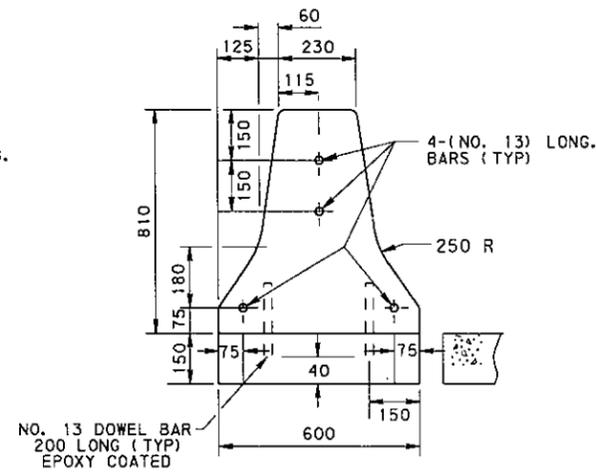
RECOMMENDED FEB. 18, 2000 <i>Dean A. Schaefer</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED FEB. 18, 2000 <i>Gary L. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 5 RC-57M
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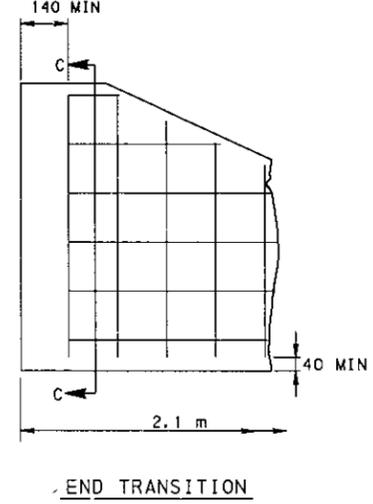
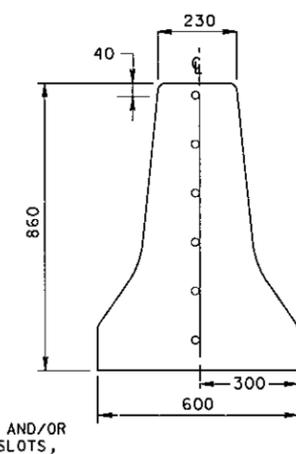
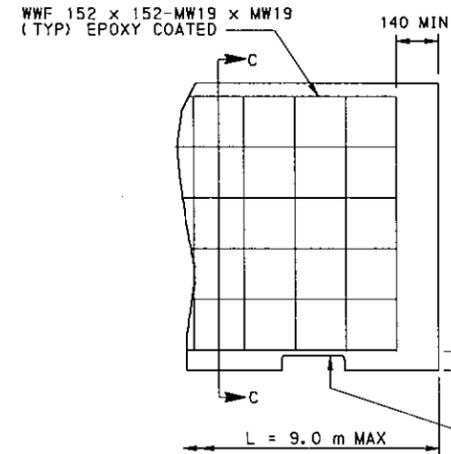
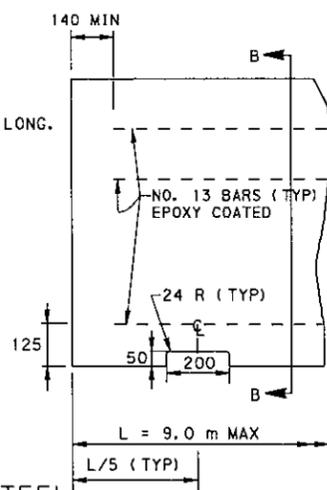
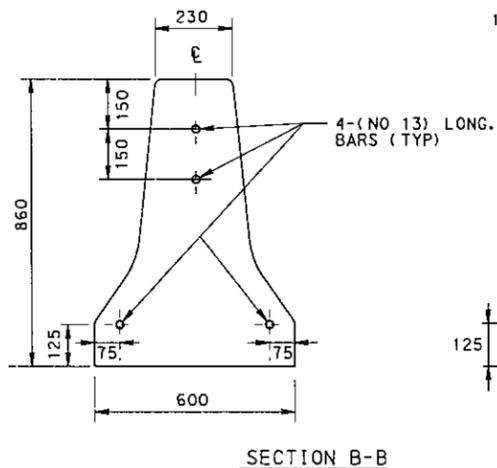
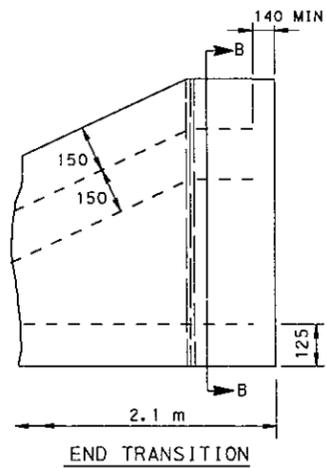
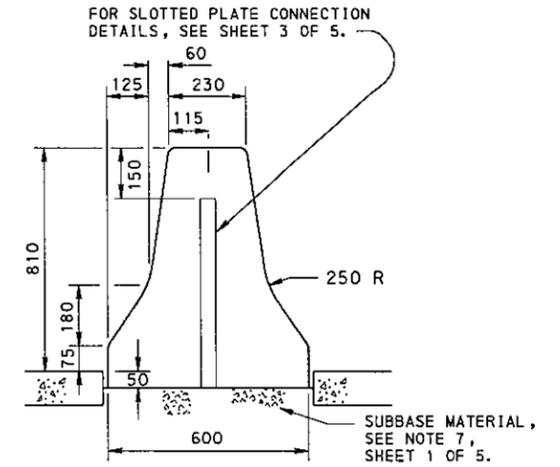
PLAN VIEW  
ELEVATION VIEW  
TYPICAL END TRANSITION CONSTRUCTION



SECTION A-A  
MONOLITHIC CONSTRUCTION  
TYPICAL CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION



SECTION A-A  
DOWEL CONSTRUCTION  
TYPICAL PRECAST CONSTRUCTION



TYPICAL REINFORCEMENT DETAILS FOR PRECAST CONSTRUCTION

NOTES

1. A TYPICAL END TRANSITION MAY BE USED FOR PERMANENT BARRIER INSTALLATIONS ONLY WHEN THE LAST BARRIER SECTION IS LOCATED OUTSIDE THE REQUIRED CLEAR ZONE, AS DETERMINED IN PUBLICATION 13M, DESIGN MANUAL, PART 2, CHAPTER 12. A 20:1 SLOPED END TRANSITION IS ACCEPTABLE FOR PERMANENT INSTALLATIONS WHERE THE LEGAL SPEED LIMIT IS 60 km/h OR LESS; OTHERWISE, USE AN IMPACT ATTENUATING DEVICE DESIGNED TO ABSORB THE ENERGY OF AN IMPACTING VEHICLE IN THE WEIGHT RANGE OF 820 kg TO 2000 kg AT THE SPECIFIED DESIGN SPEED, WITH A MAXIMUM AVERAGE DECELERATION FORCE OF 8.5 G's AND A MAXIMUM PEAK DECELERATION FORCE OF 15 G's. WHEN CONCRETE BARRIER IS TERMINATED AT THE END OF PARALLEL RAMPS OR T INTERSECTIONS, A 2.1 m END TRANSITION MAY BE USED WHERE THE LEGAL SPEED IS 60 km/h OR LESS. FOR BARRIER INSTALLATIONS, AN IMPACT ATTENUATING DEVICE IS NOT REQUIRED IF ANY OF THE FOLLOWING CONDITIONS ARE SATISFIED:

- (A) THE BARRIER IS EXTENDED AT THE PROPER FLARE RATE UNTIL THE END OF THE BARRIER SYSTEM IS LOCATED OUTSIDE THE REQUIRED CLEAR ZONE AS DETERMINED IN PUBLICATION 13M, DESIGN MANUAL, PART 2, CHAPTER 12.
- (B) THE BARRIER IS EXTENDED AT THE PROPER FLARE RATE UNTIL THE END OF THE BARRIER SYSTEM CAN BE BURIED IN A CUT SECTION.
- (C) THE BARRIER IS EXTENDED AT THE PROPER FLARE RATE UNTIL THE END OF THE BARRIER SYSTEM IS PROPERLY CONNECTED OR OVERLAPPED WITH EXISTING GUIDE RAIL.

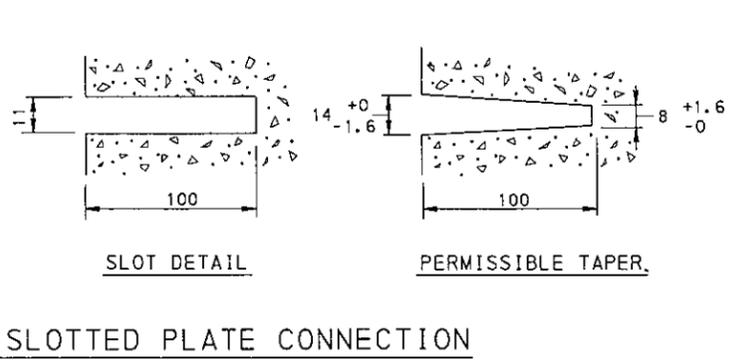
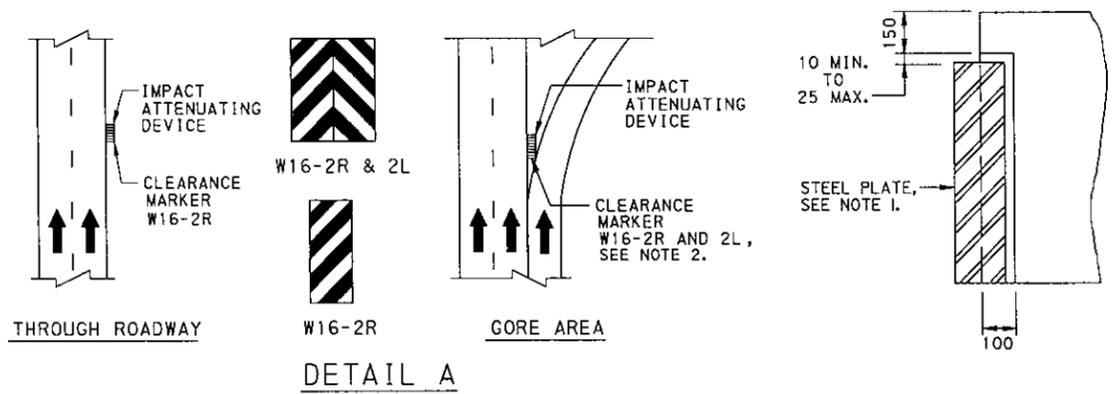
REFER TO TABLE 1, SHEET 3, FOR FLARE RATE REQUIREMENTS.

- 2. PROVIDE SUITABLE LIFTING DEVICES FOR HANDLING, INSTALLING AND REMOVING PRECAST CONCRETE BARRIER. GALVANIZE METAL DEVICES AS SPECIFIED IN PUBLICATION 408M, SECTION 1105.02(a).
- 3. PROVIDE REINFORCEMENT STEEL MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 709 WITH A MINIMUM CONCRETE COVER OF 40.
- 4. EPOXY COATED REINFORCEMENT IS NOT REQUIRED WHEN PRECAST CONCRETE MEDIAN BARRIER IS TO BE USED IN TEMPORARY INSTALLATION ONLY, IN ACCORDANCE WITH SECTION 627, AND IDENTIFIED AS SUCH, AS SPECIFIED IN SECTION 714.6(c).
- 5. ROUND OR CHAMFER HORIZONTAL EDGES WITH A RADIUS OF 25 EXCEPT AS SHOWN.
- 6. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER  
F-SHAPE

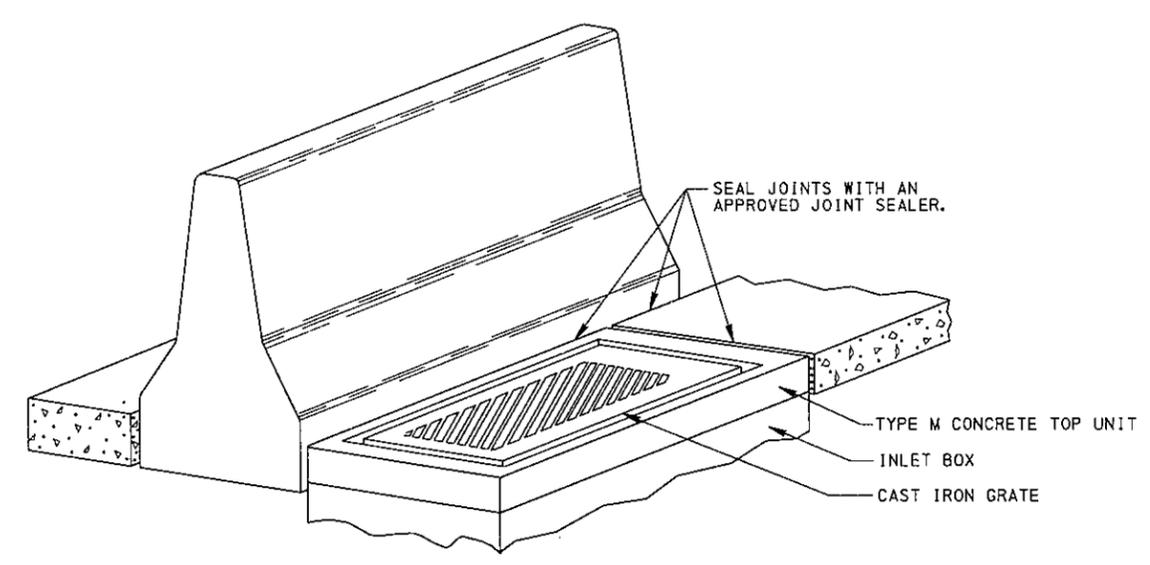
RECOMMENDED FEB. 18, 2000  
RECOMMENDED FEB. 18, 2000  
SHT 2 OF 5  
RC-57M



DETAIL A  
 DELINEATION OF IMPACT ATTENUATING DEVICES

NOTES

1. PROVIDE PLATES, 8 x 180 x 685, MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 1105.02(s), GALVANIZE PLATES AS SPECIFIED IN PUBLICATION 408M, SECTION 1105.02(s).
2. PROVIDE VERTICAL RECTANGLE, STANDARD ALUMINUM, PRESSURE SENSITIVE CLEARANCE MARKERS, W16-2R AND/OR W16-2L, FABRICATED FROM CLASS II SHEETING MATERIAL, FOR DELINEATION OF IMPACT ATTENUATING DEVICES AS PRESENTED IN DETAIL A. ATTACH MARKERS DIRECTLY TO THE LEADING END OF IMPACT ATTENUATING DEVICES. ON INERTIAL BARRIERS (SAND BARRELS), PROVIDE SENSITIVE SHEETING, WITHOUT RIGID BACKING, DIRECTLY TO BARRIER FRONT OR NOSE SECTION. DO NOT POST-MOUNT MARKERS IN FRONT OF IMPACT ATTENUATING DEVICES. MARKERS ARE PROVIDED IN TWO SIZES: 305 x 914 AND 457 x 914. WHEN ONE MARKER IS REQUIRED, USE 457 x 914. WHEN TWO MARKERS ARE REQUIRED SIDE BY SIDE, USE 305 x 914. PROVIDE COLOR FOR CLEARANCE MARKERS AS FOLLOWS:  
 (A) MESSAGE : BLACK STRIPES (NON-REFLECTORIZED)  
 (B) FIELD : YELLOW (REFLECTORIZED)  
 ORANGE (REFLECTORIZED), CONSTRUCTION ZONES
3. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



TYPICAL INLET PLACEMENT AT  
 CONCRETE MEDIAN BARRIER

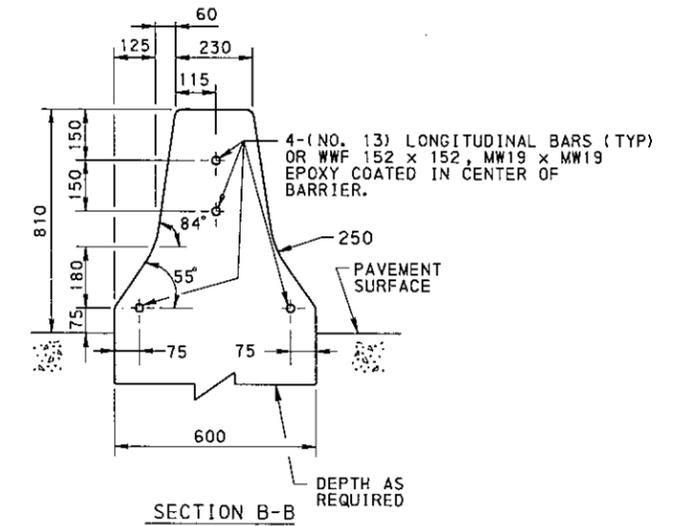
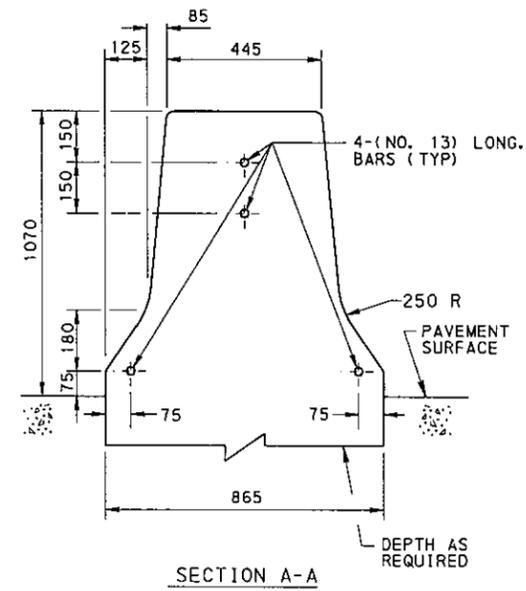
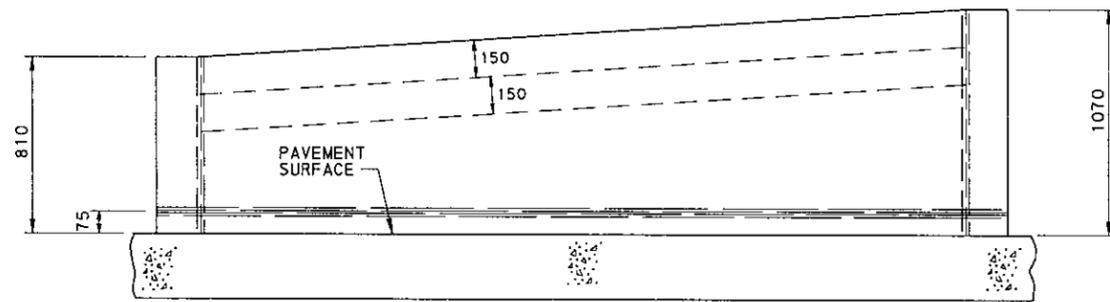
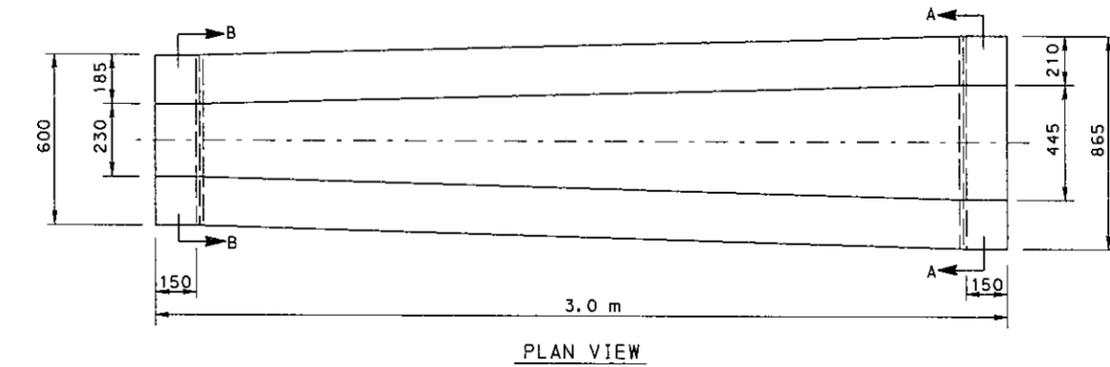
TABLE 1  
 FLARE RATES FOR BARRIER DESIGN

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

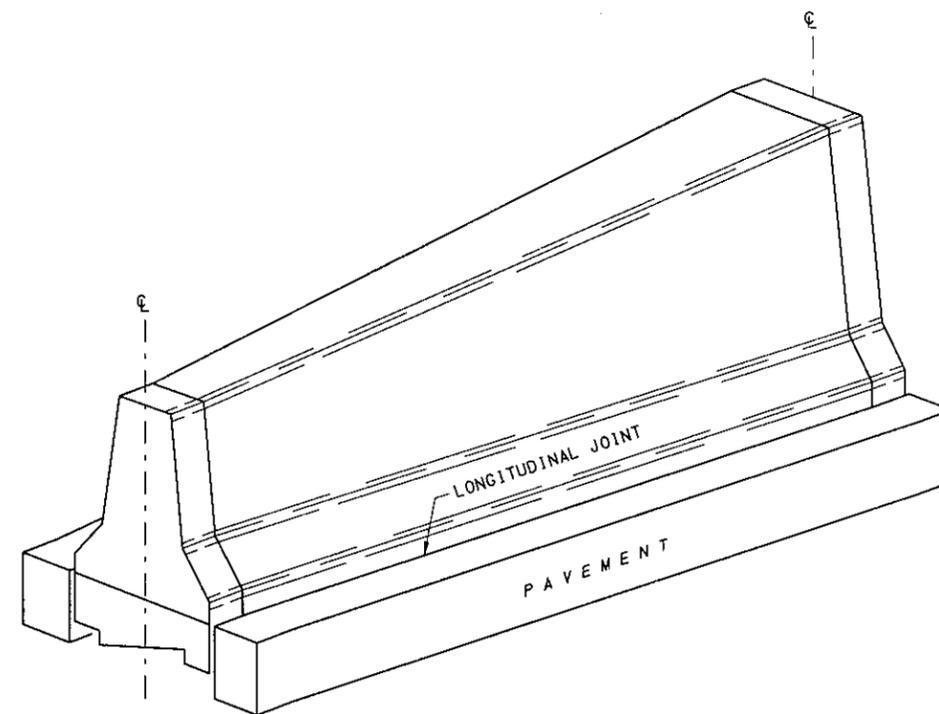
**CONCRETE MEDIAN BARRIER**  
**F-SHAPE**

RECOMMENDED FEB. 18, 2000 <i>Sean P. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED FEB. 18, 2000 <i>Gay L. Hoffman</i> CHIEF ENGINEER	SHT 3 OF 5 <b>RC-57M</b>
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NOTES

1. PROVIDE REINFORCEMENT MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 709.
2. ROUND OR CHAMFER HORIZONTAL EDGES WITH A RADIUS OF 25 EXCEPT AS SHOWN.
3. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

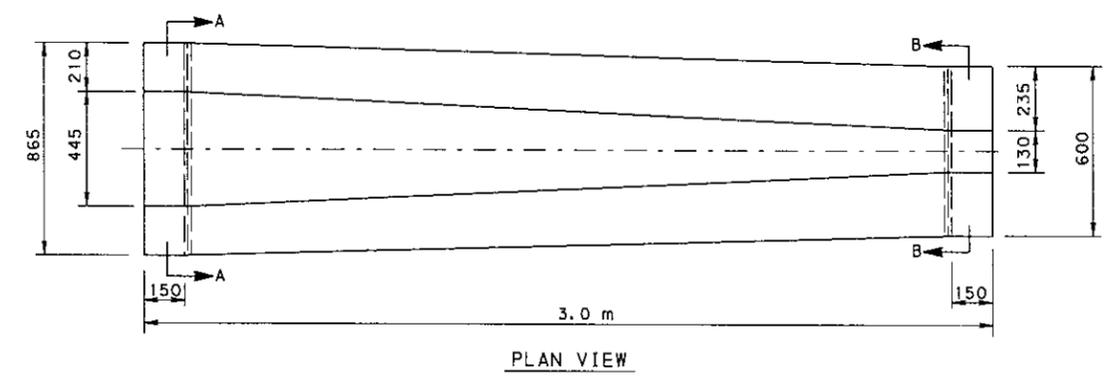


TYPICAL 810 TO 1070 TRANSITION CONSTRUCTION

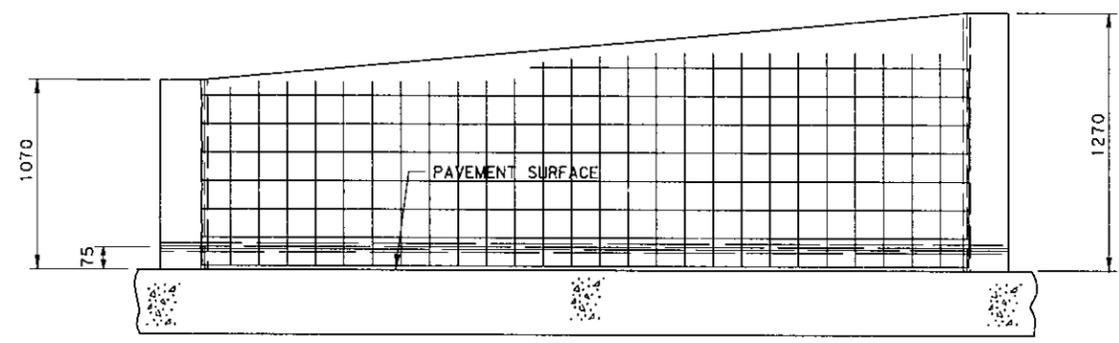
COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN

CONCRETE MEDIAN BARRIER  
F-SHAPE

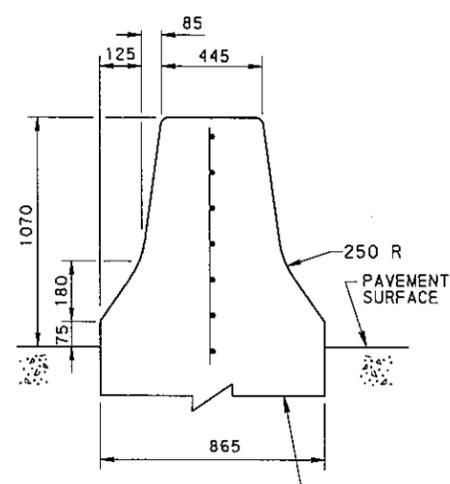
RECOMMENDED FEB. 18, 2000 <i>Dean A. Schaefer</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED FEB. 18, 2000 <i>Harry L. Hoffman</i> CHIEF ENGINEER	SHT 4 OF 5 RC-57M
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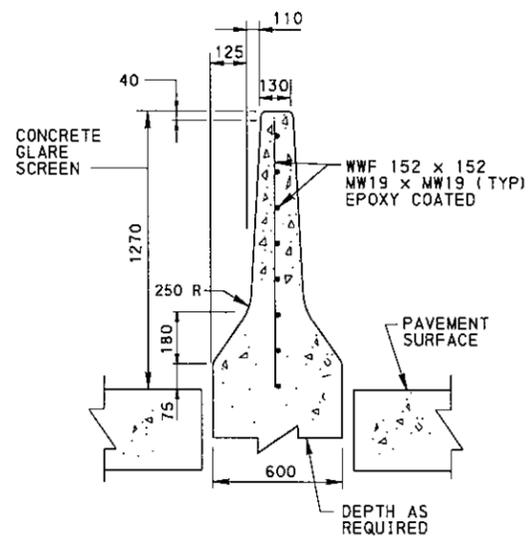
PLAN VIEW



ELEVATION VIEW



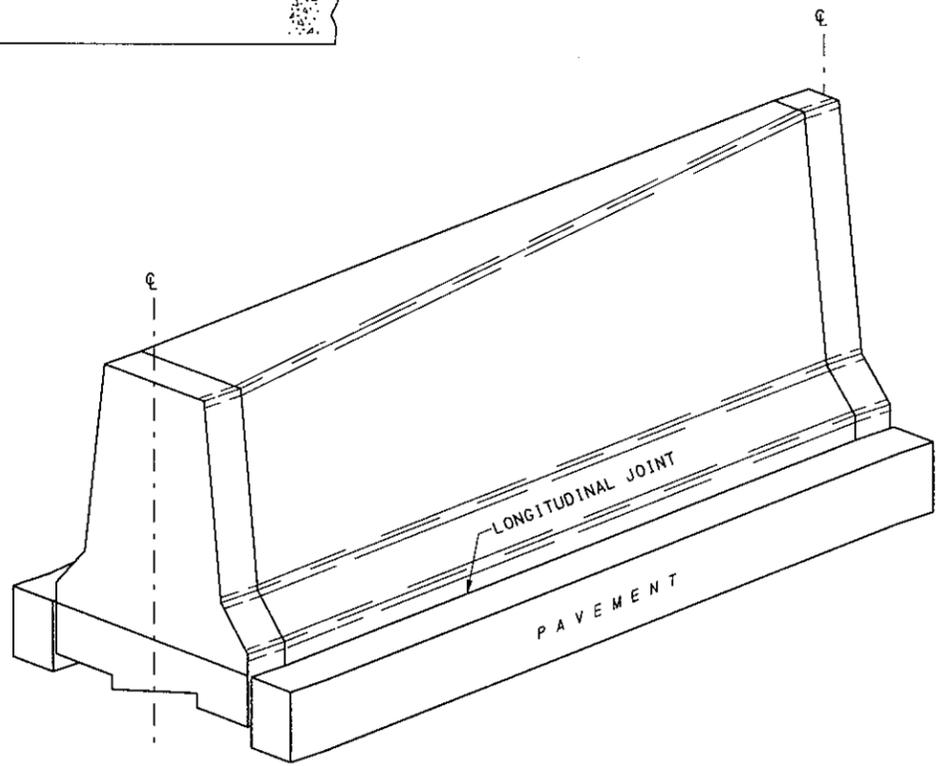
SECTION A-A



SECTION B-B

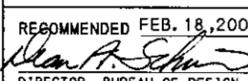
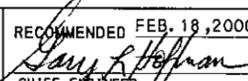
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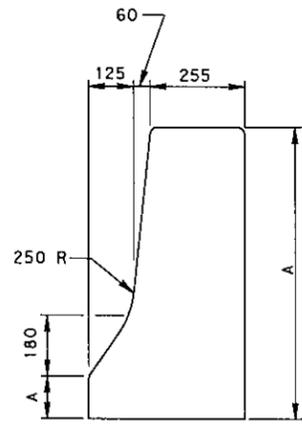
1. PROVIDE REINFORCEMENT MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 709 WITH A MINIMUM CONCRETE COVER OF 40.
2. ROUND OR CHAMFER HORIZONTAL EDGES WITH A RADIUS OF 25 EXCEPT AS SHOWN.
3. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



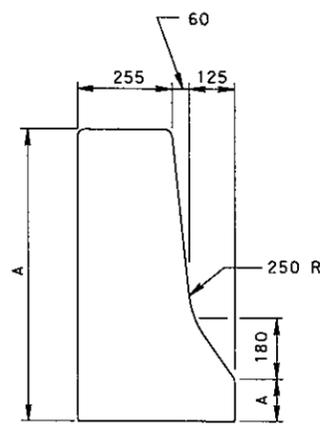
ORTHOGRAPHIC VIEW

TYPICAL 1070 TO 1270 TRANSITION CONSTRUCTION

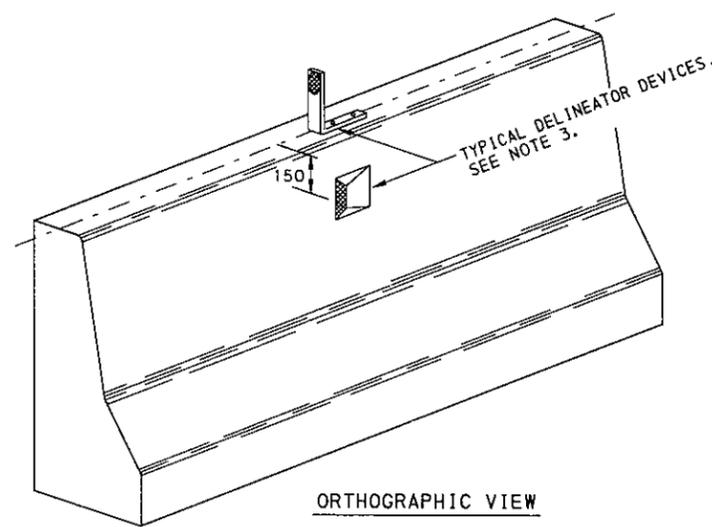
<b>COMMONWEALTH OF PENNSYLVANIA</b> <b>DEPARTMENT OF TRANSPORTATION</b> BUREAU OF DESIGN		
<b>CONCRETE MEDIAN BARRIER</b> <b>F-SHAPE</b>		
RECOMMENDED FEB. 18, 2000  DIRECTOR, BUREAU OF DESIGN	RECOMMENDED FEB. 18, 2000  CHIEF ENGINEER	SHT 5 OF 5 <b>RC-57M</b>



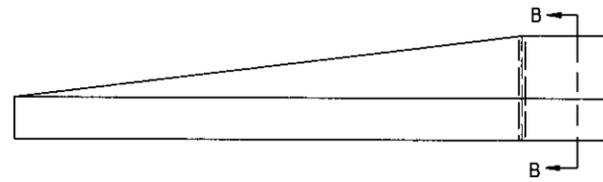
SECTION A-A



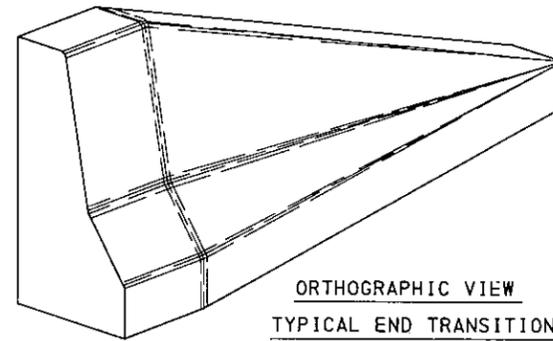
SECTION B-B



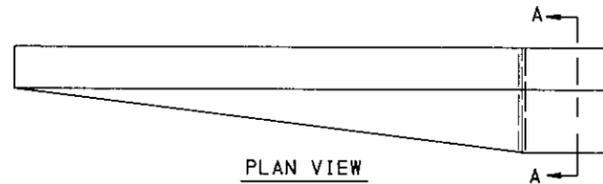
ORTHOGRAPHIC VIEW  
TYPICAL BARRIER SECTION



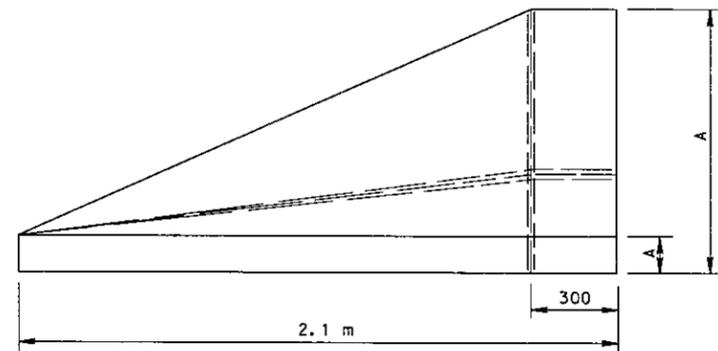
PLAN VIEW  
RIGHT END TRANSITION



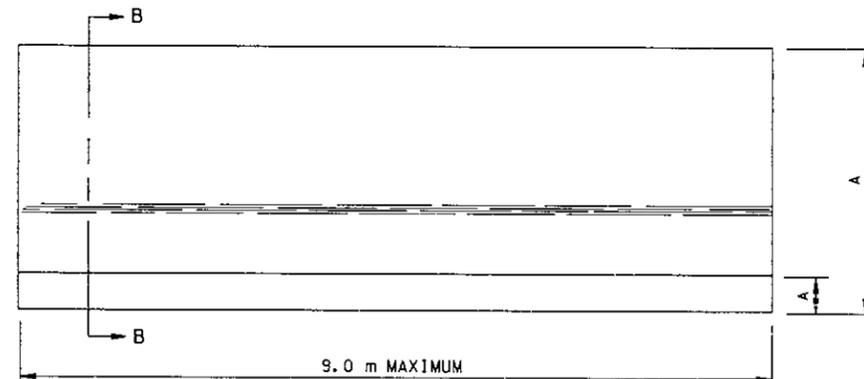
ORTHOGRAPHIC VIEW  
TYPICAL END TRANSITION



PLAN VIEW  
LEFT END TRANSITION



ELEVATION VIEW  
TYPICAL END TRANSITION  
SEE NOTE 5.



ELEVATION VIEW  
TYPICAL BARRIER SECTION

A - SEE TYPICAL SECTIONS,  
SHEET 2.

NOTES

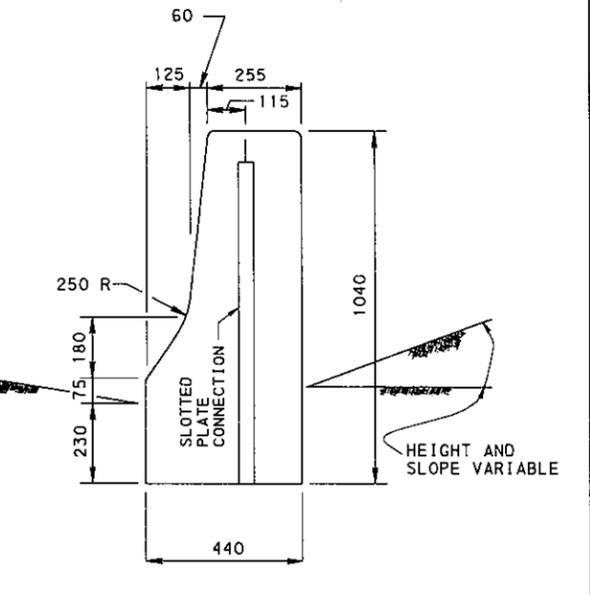
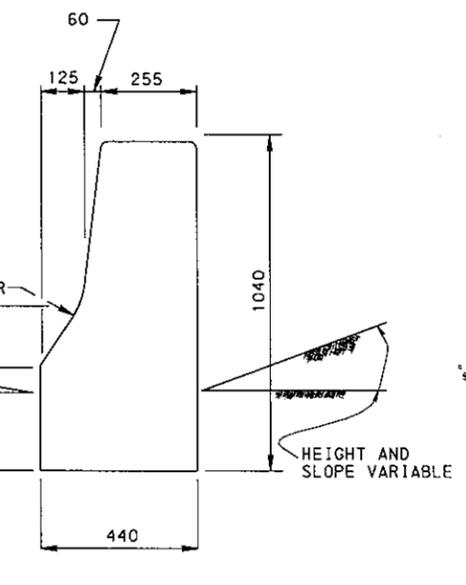
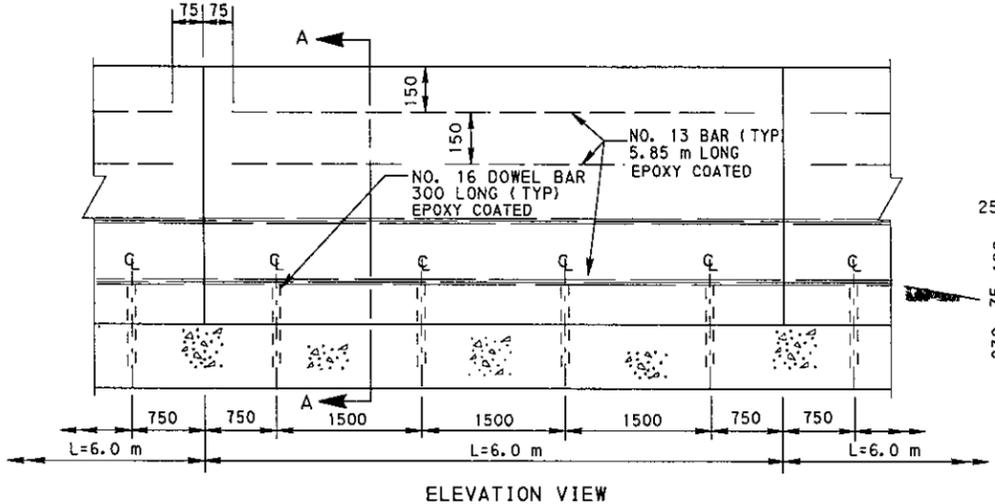
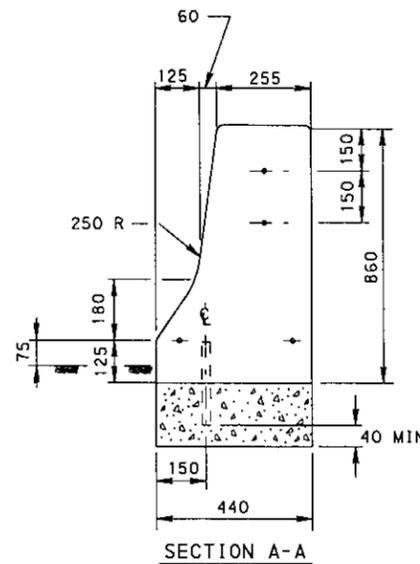
1. PROVIDE SINGLE FACE CONCRETE BARRIER MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 623.
2. PROVIDE PRECAST SINGLE FACE CONCRETE BARRIER SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15. MODIFICATIONS OR DEVIATIONS FROM THE STANDARD REQUIRE THE SUBMISSION OF SHOP DRAWINGS FOR REVIEW.
3. PROVIDE BARRIER-MOUNT OR REFLECTOR UNIT DELINEATORS, AS INDICATED ON RC-57M.
4. PROVIDE REINFORCEMENT FOR SINGLE FACE CONCRETE BARRIER AS INDICATED ON SHEET 3.
5. PROVIDE END TRANSITIONS OR IMPACT ATTENUATING DEVICES AS INDICATED ON RC-57M.
6. ROUND OR CHAMFER HORIZONTAL EDGES WITH A RADIUS OF 25 EXCEPT AS SHOWN.
7. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER  
CAST-IN-PLACE AND PRECAST

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

RECOMMENDED FEB. 18, 2000 <i>Dean P. Schum</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED FEB. 18, 2000 <i>Amy J. Hoffman</i> CHIEF ENGINEER	SHT 1 OF 6 RC-58M
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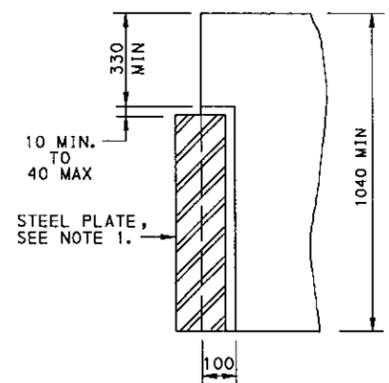
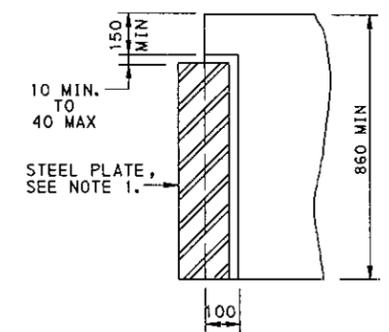


DOWEL CONSTRUCTION

CAST-IN-PLACE CONSTRUCTION

PRECAST CONSTRUCTION

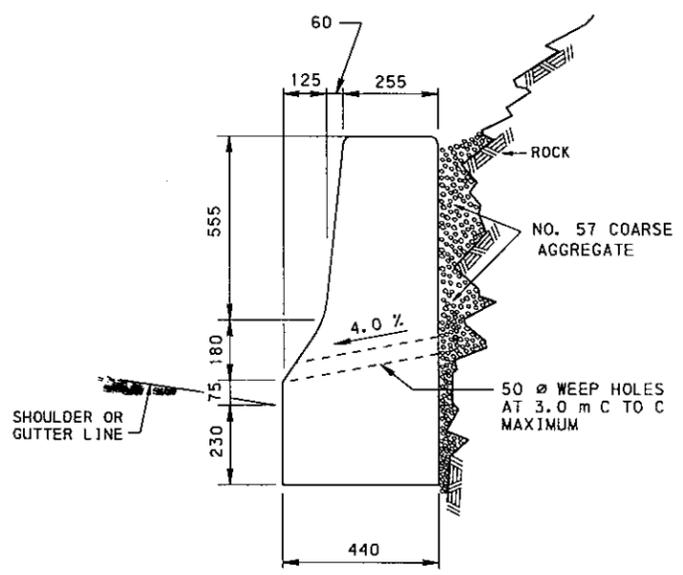
TYPICAL SINGLE FACE BARRIER SECTIONS



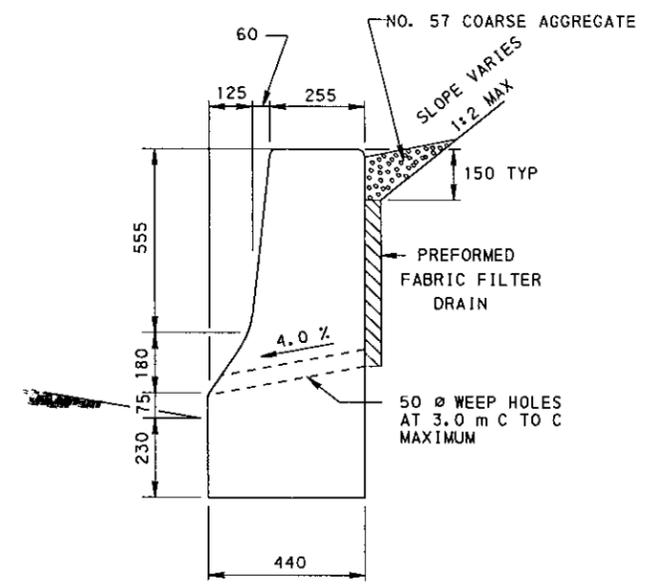
SLOT DETAIL

PERMISSIBLE TAPER

SLOTTED PLATE CONNECTION



TYPICAL ROUGH ROCK TREATMENT



TYPICAL DRAINAGE TREATMENT

SEE NOTE 2.

NOTES

1. PROVIDE PLATES MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 1105.02(a)2. GALVANIZE PLATES AS SPECIFIED IN PUBLICATION 408M, SECTION 1105.02(a)5. ALTERNATE CONNECTIONS MAY BE USED AS APPROVED BY THE BUREAU OF DESIGN.
2. WHERE SINGLE FACE CONCRETE BARRIER IS SPECIFIED FOR USE AS A RETAINING WALL AND DRAINAGE TREATMENT IS NECESSARY, CONSTRUCT A PREFORMED FABRIC FILTER DRAIN AS INDICATED AND IN ACCORDANCE WITH PUBLICATION 408M, SECTION 610. IF THE HEIGHT OR SLOPE IS INCREASED, PROVIDE OVERTURNING MOMENT COMPUTATIONS WITH THE CONSTRUCTION PLANS.
3. ROUND OR CHAMFER HORIZONTAL EDGES WITH A RADIUS OF 25 EXCEPT AS SHOWN.
4. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

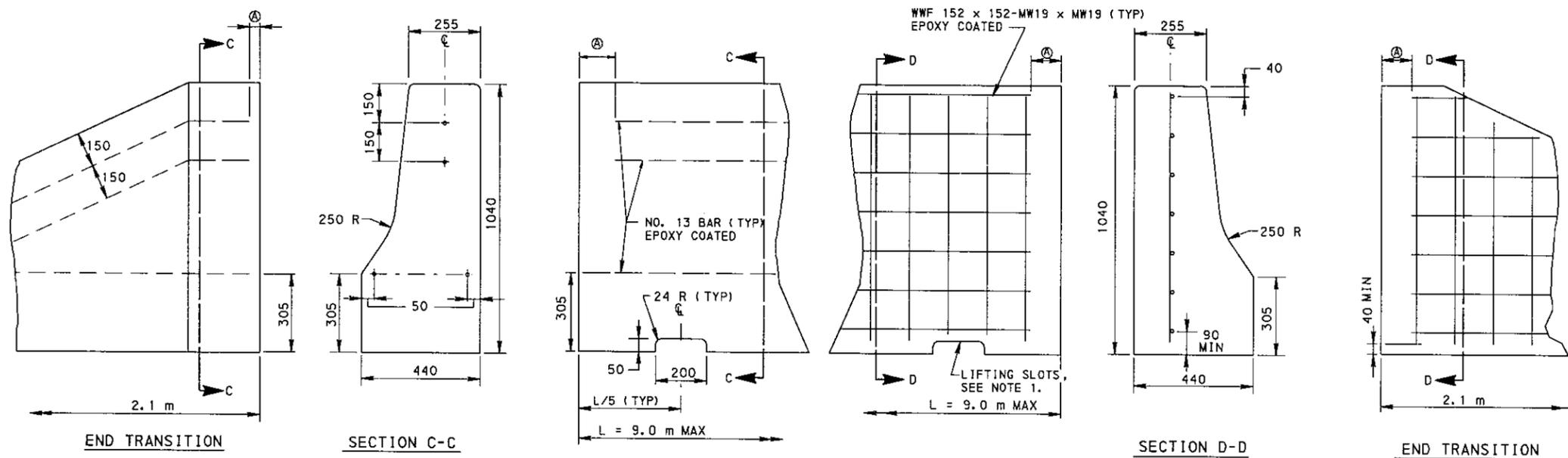
COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER

RECOMMENDED FEB. 18, 2000  
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED FEB. 18, 2000  
CHIEF ENGINEER

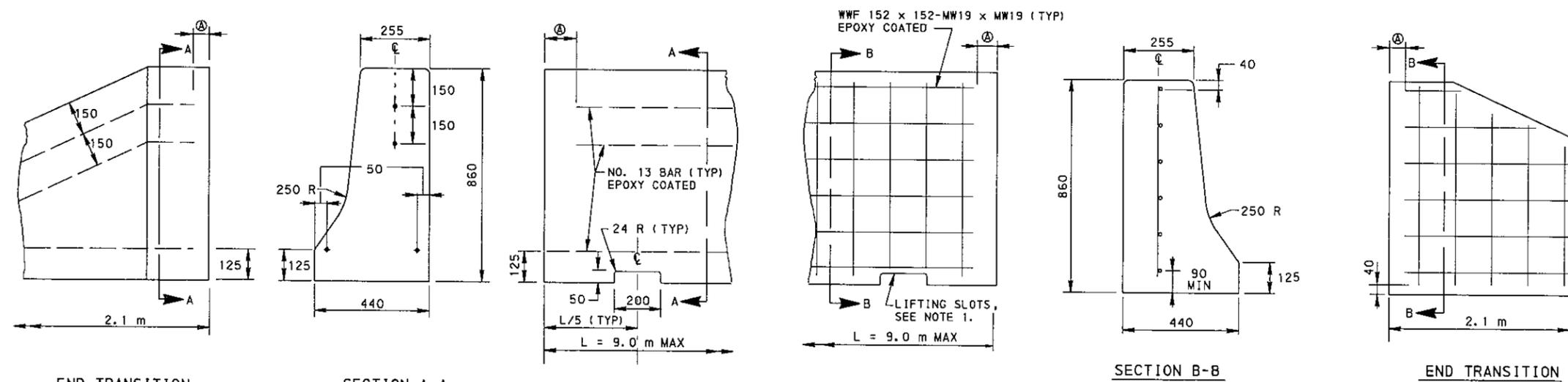
SHT 2 OF 6  
RC-58M



REINFORCEMENT STEEL

WELDED WIRE FABRIC

TYPICAL REINFORCEMENT DETAILS FOR 1040 BARRIER



REINFORCEMENT STEEL

WELDED WIRE FABRIC

TYPICAL REINFORCEMENT DETAILS FOR 860 BARRIER

NOTES

1. PROVIDE SLOTS OR OTHER ACCEPTABLE DEVICES FOR HANDLING, INSTALLING AND REMOVING PRECAST CONCRETE BARRIERS. GALVANIZE METAL DEVICES AS SPECIFIED IN PUBLICATION 408M, SECTION 1105.02(s).
2. ROUND OR CHAMFER HORIZONTAL EDGES WITH A RADIUS OF 25 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

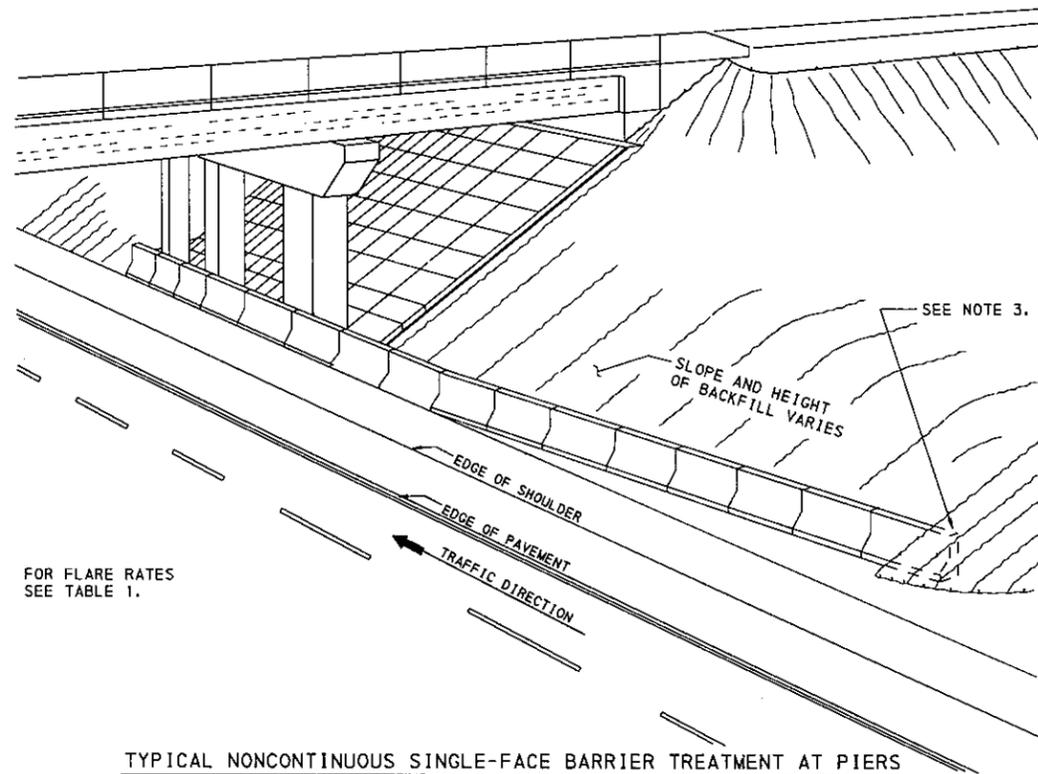
SINGLE FACE CONCRETE BARRIER

RECOMMENDED FEB. 18, 2000  
*Sean H. Schmitz*  
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED FEB. 18, 2000  
*James R. Hoffman*  
CHIEF ENGINEER

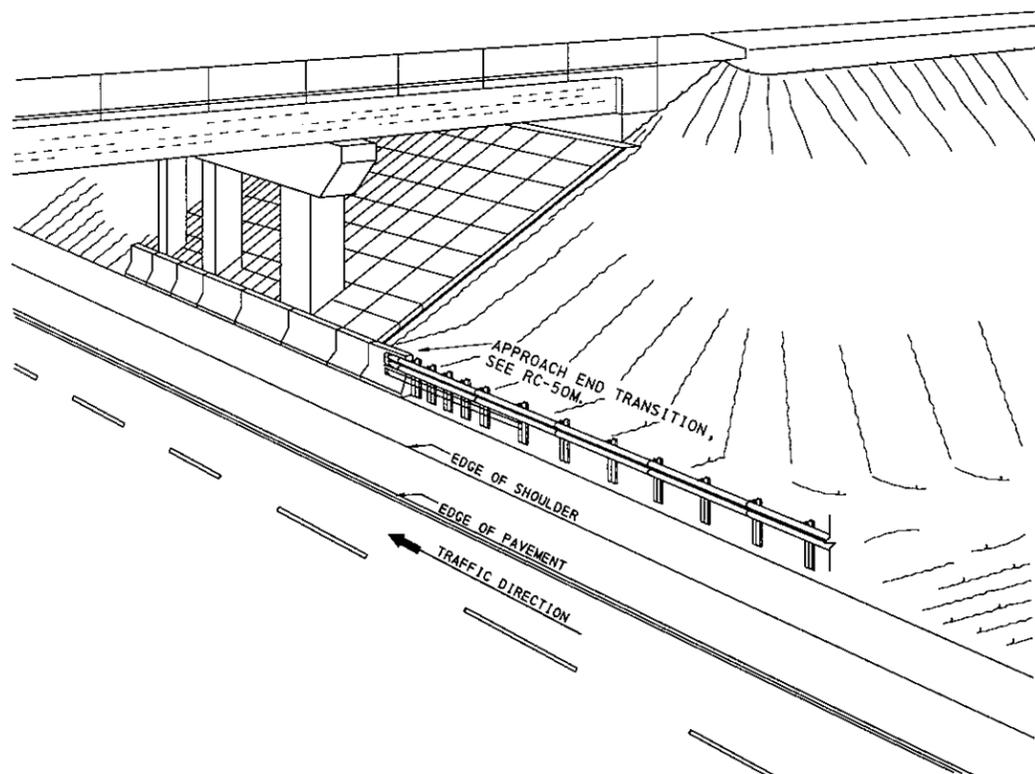
SHT 3 OF 6

RC-58M



FOR FLARE RATES  
SEE TABLE 1.

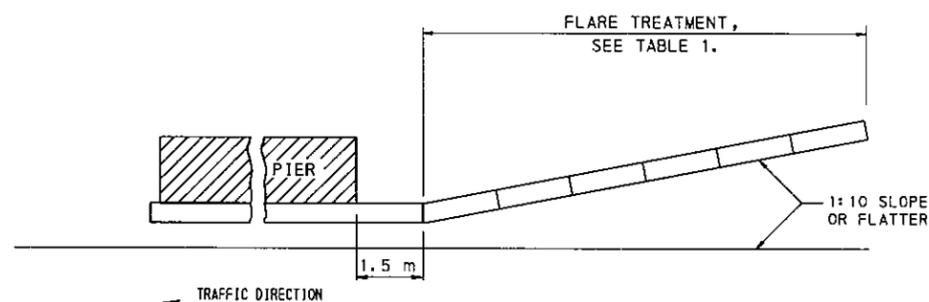
TYPICAL NONCONTINUOUS SINGLE-FACE BARRIER TREATMENT AT PIERS



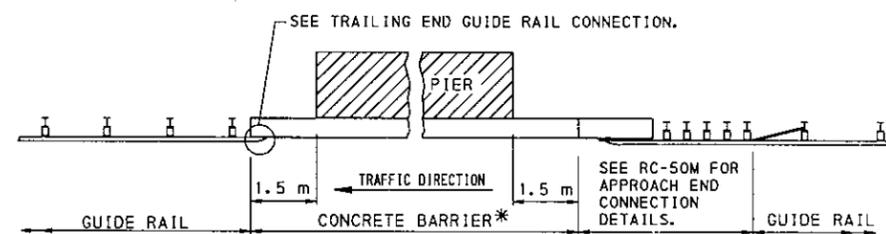
TYPICAL TREATMENT WHEN CONTINUOUS GUIDE RAIL IS REQUIRED

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. IF THE PREFERRED TREATMENT IS TO TERMINATE THE CONCRETE BARRIER 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.



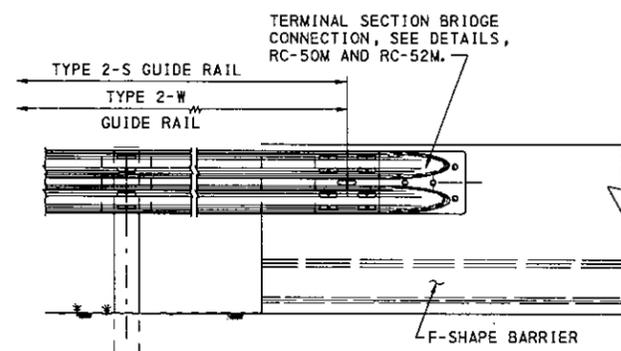
PLAN VIEW



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

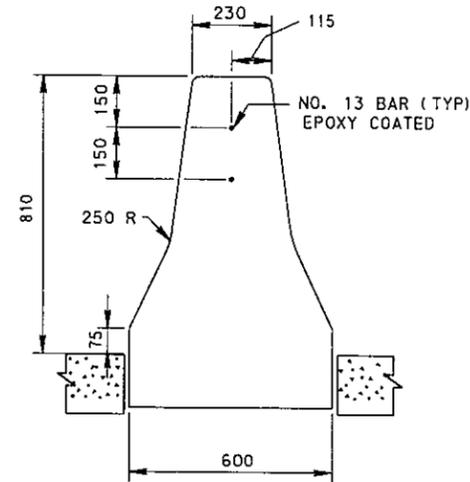
COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN

SINGLE FACE CONCRETE BARRIER  
PLACEMENT AT SHOULDER PIERS

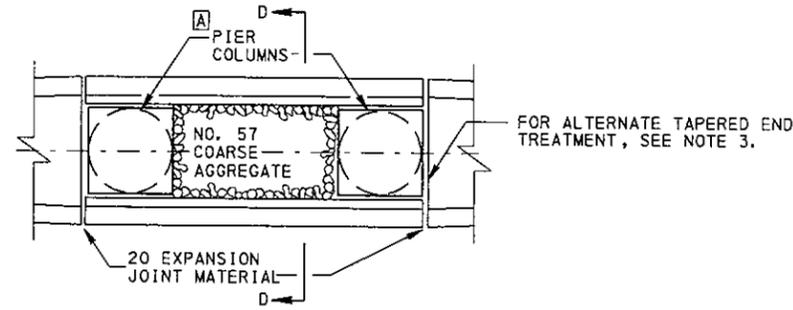
RECOMMENDED FEB. 18, 2000  
*Dean P. Schwan*  
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED FEB. 18, 2000  
*Darryl Z. Hoffman*  
CHIEF ENGINEER

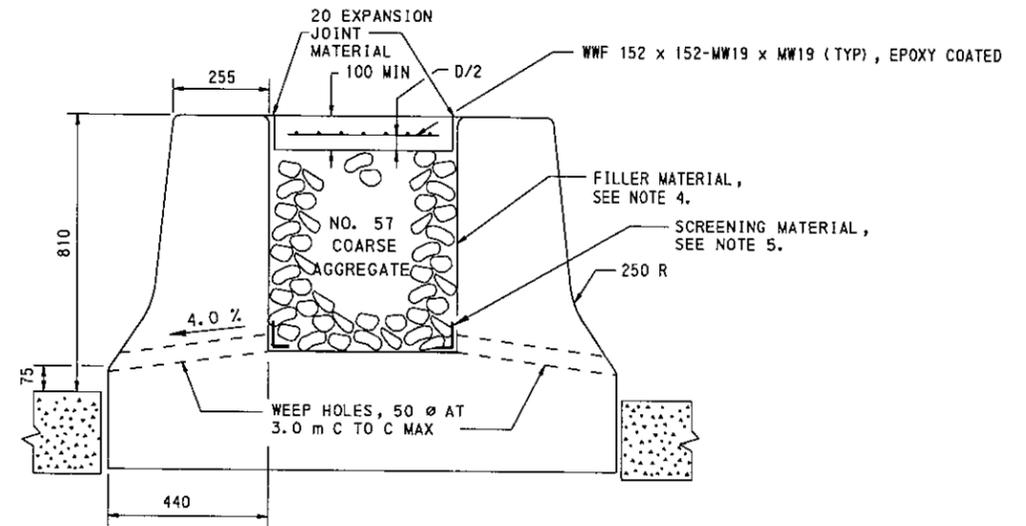
SHT 4 OF 6  
RC-58M



SECTION A-A

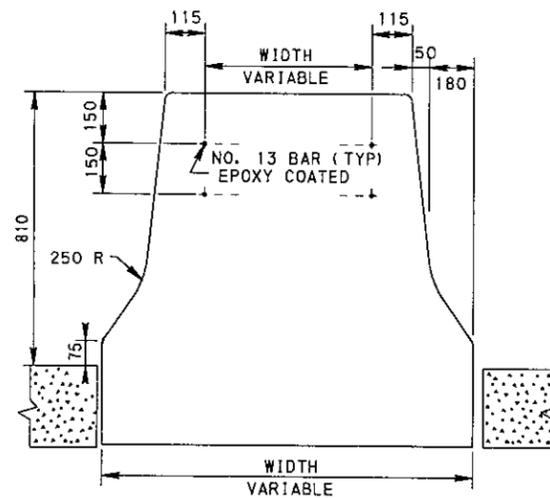


PLAN

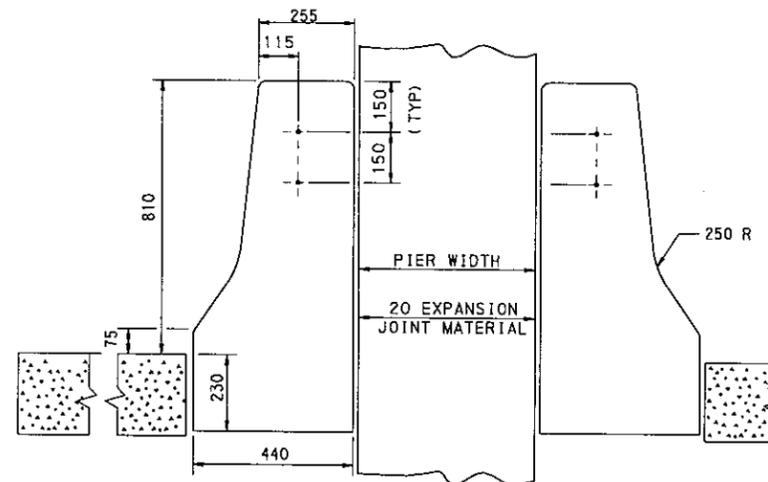


SECTION D-D

TYPICAL ALTERNATE BARRIER TREATMENT AT PIERS



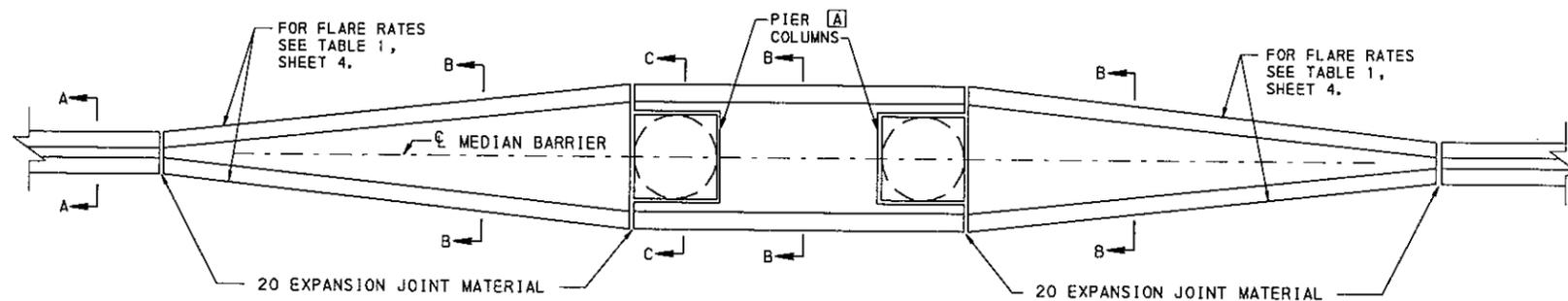
SECTION B-B



SECTION C-C

NOTES

1. REFER TO BRIDGE STANDARD DRAWINGS (BD-601M) FOR DETAILS OF CONCRETE MEDIAN BARRIER ACROSS STRUCTURES.
2. THE CONCRETE TRANSITIONS AND BARRIER TAPERS AT PIERS ARE INCIDENTAL TO THE MEDIAN BARRIER.
3. CAST ADDITIONAL VOIDS IN THE TAPERED END SECTIONS MEETING THE REQUIREMENTS PRESENTED IN SECTION D-D.
4. PROVIDE NO. 57 COARSE AGGREGATE THAT MEETS THE REQUIREMENTS OF PUBLICATION 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 OR CHAMFER HORIZONTAL EDGES WITH A RADIUS OF 25 EXCEPT AS SHOWN.
7. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.



TYPICAL BARRIER TREATMENT AT PIERS

[A] USE 20 EXPANSION JOINT MATERIAL AROUND ALL PIERS.

COMMONWEALTH OF PENNSYLVANIA  
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SINGLE FACE CONCRETE BARRIER  
PLACEMENT AT MEDIAN PIERS

RECOMMENDED FEB. 18, 2000 <i>Dean A. Schmitt</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED FEB. 18, 2000 <i>Gary R. Hoffman</i> CHIEF ENGINEER	SHT 5 OF 6 RC-58M
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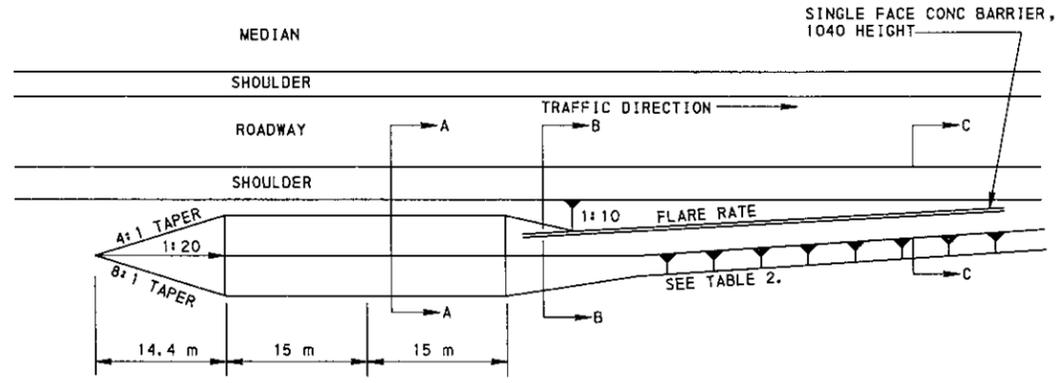


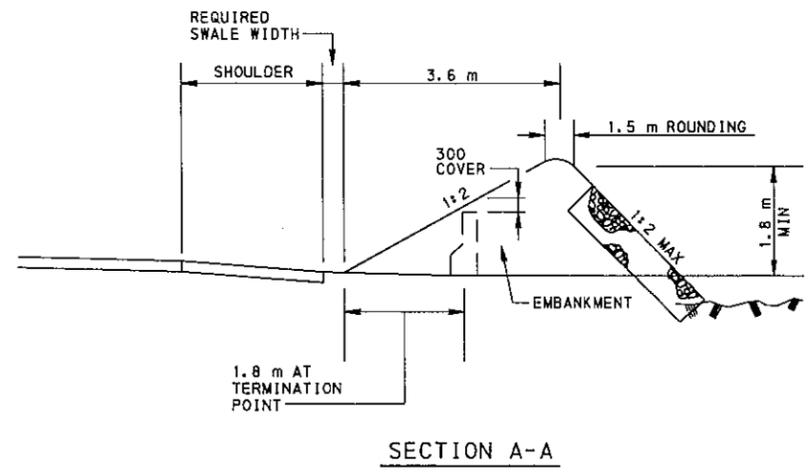
TABLE 2  
FLARE RATES  
FOR BARRIER DESIGN

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

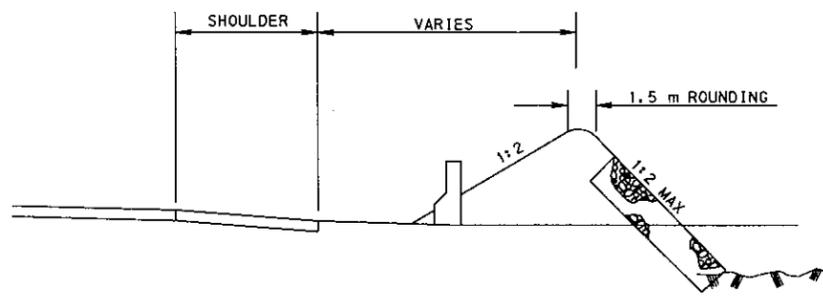
NOTES

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 AS DETERMINED IN PUB. 13 M, DESIGN MANUAL PART 2, CHAPTER 12.
4. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

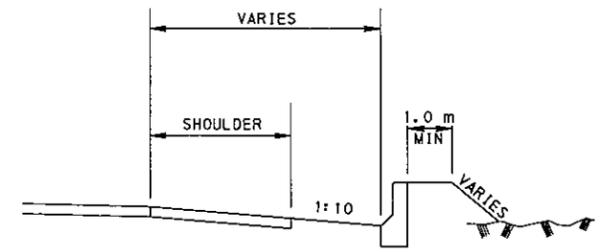
TYPICAL EARTH MOUND FOR BURYING CONCRETE BARRIER



SECTION A-A



SECTION B-B



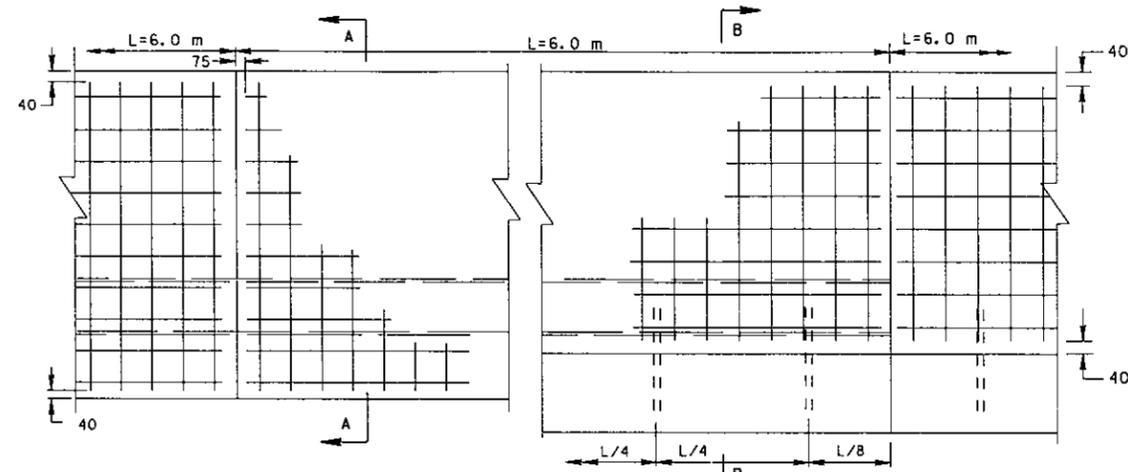
SECTION C-C

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN

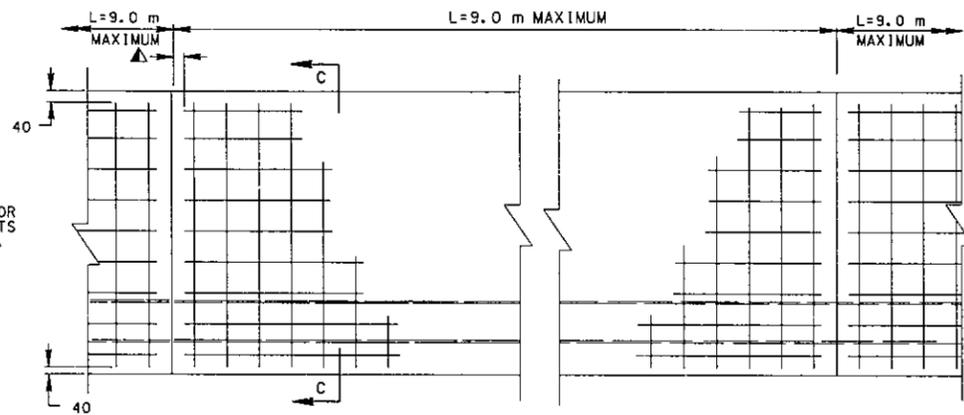
SINGLE FACE CONCRETE BARRIER

END TREATMENT  
BURYING INTO EARTH MOUND

RECOMMENDED FEB. 18, 2000 <i>Alan P. Schaefer</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED FEB. 18, 2000 <i>Barry R. Hoffman</i> CHIEF ENGINEER	SHT 6 OF 5 RC-58M
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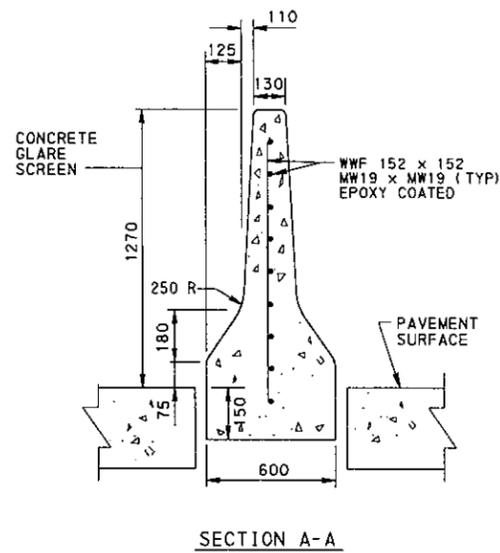


ELEVATION VIEW  
TYPICAL CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION

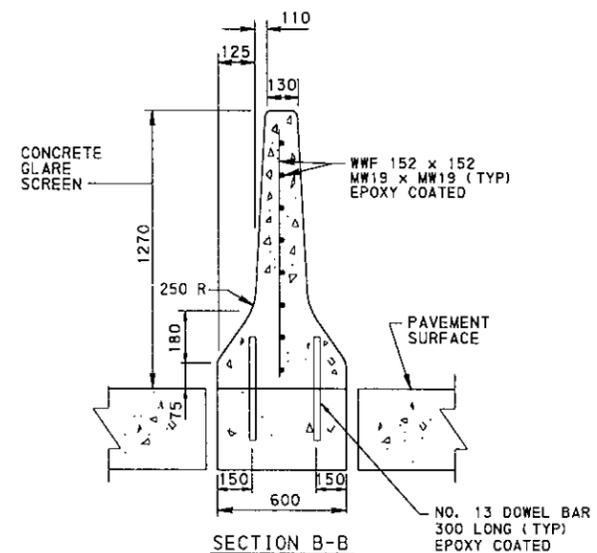


ELEVATION VIEW  
PRECAST CONSTRUCTION

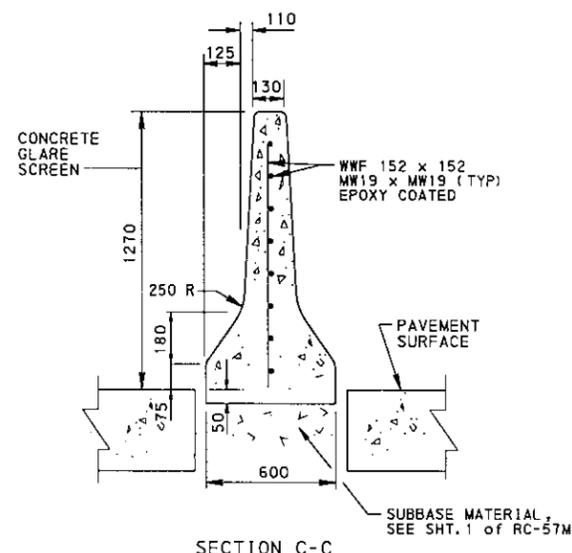
SEE RC-57M, SHT. 2 FOR MINIMUM FABRIC LIMITS FOR PRECAST BARRIER.



SECTION A-A



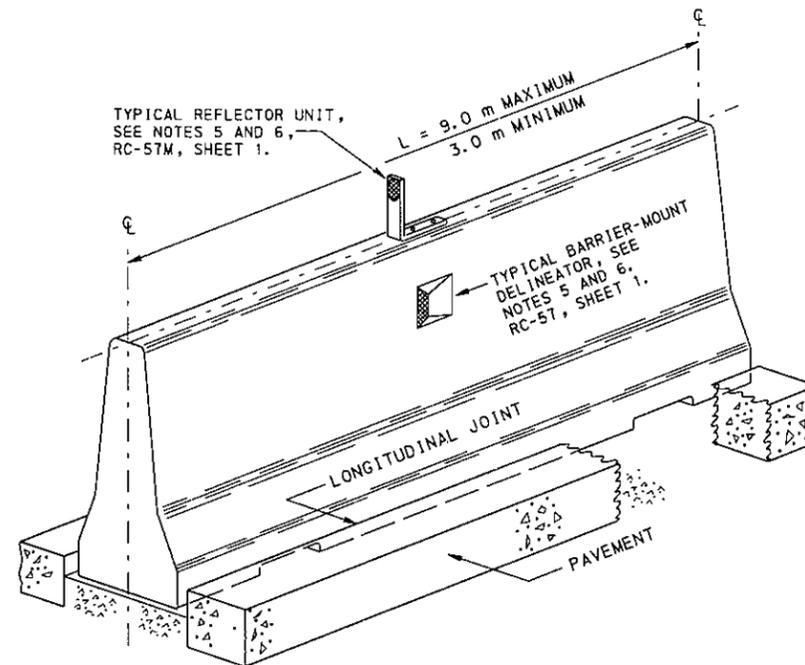
SECTION B-B



SECTION C-C

NOTES

1. PROVIDE CONCRETE GLARE SCREEN MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTIONS 622 AND 714.
2. FOR INSTALLATION OF GLARE SCREEN ON TOP OF EXISTING CONCRETE MEDIAN BARRIER, PROVIDE PLASTIC PADDLES OR MODULAR SYSTEMS SUPPLIED BY A MANUFACTURER LISTED IN BULLETIN 15.
3. FOR PRECAST BARRIERS, PROVIDE SLOTTED PLATE CONNECTIONS AS INDICATED ON RC-57M, SHEET 3.
4. PROVIDE PRECAST CONCRETE GLARE SCREEN SUPPLIED BY A MANUFACTURER AS LISTED IN BULLETIN 15. MODIFICATION OR DEVIATION FROM THE STANDARD REQUIRE THE SUBMISSION OF SHOP DRAWING FOR APPROVAL.
5. PROVIDE PRECAST CONCRETE GLARE SCREEN FOR USE AS TEMPORARY (MPT) OR IN PERMANENT INSTALLATIONS. FOR TEMPORARY INSTALLATIONS, EMBEDMENT IS NOT REQUIRED.
6. EPOXY COATED REINFORCEMENT IS NOT REQUIRED WHEN PRECAST CONCRETE GLARE SCREEN IS TO BE USED IN TEMPORARY INSTALLATIONS ONLY, IN ACCORDANCE WITH SECTION 627, AND IDENTIFIED AS SUCH, AS SPECIFIED IN SECTION 714.6(c).
7. ROUND OR CHAMFER HORIZONTAL EDGES WITH A RADIUS OF 25 EXCEPT AS SHOWN.
8. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS SHOWN.



TYPICAL PRECAST CONSTRUCTION

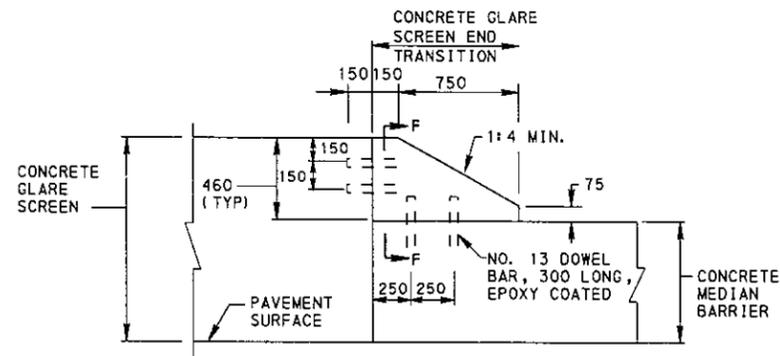
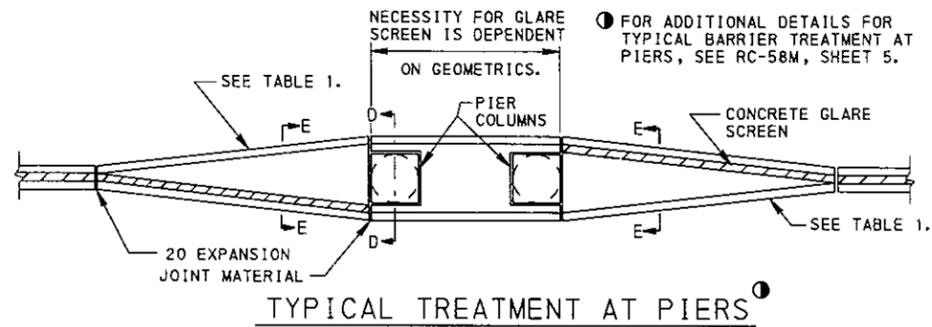
COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF DESIGN

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

RECOMMENDED FEB. 18, 2000  
*Sean A. Schmit*  
DIRECTOR, BUREAU OF DESIGN

RECOMMENDED FEB. 18, 2000  
*Harry L. Hoffman*  
CHIEF ENGINEER

SHT. 1 OF 2  
RC-59M



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

- NOTES
1. PROVIDE BARRIER-MOUNT DELINEATORS, WHEN INDICATED, AS SPECIFIED ON RC-57M, SHEET 1.
  2. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.

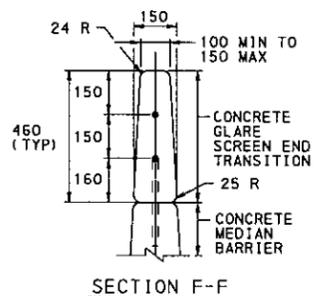
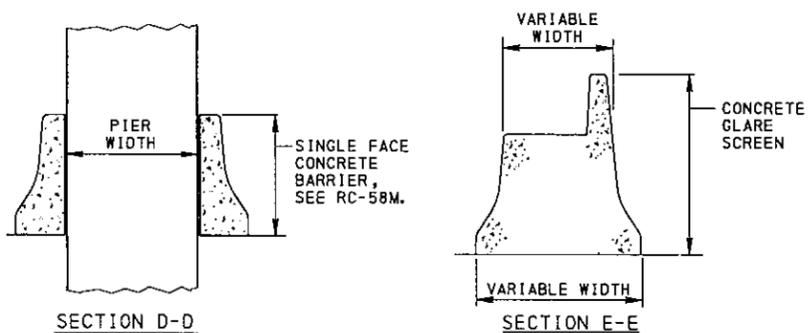


TABLE 1  
FLARE RATES FOR BARRIER DESIGN

DESIGN SPEED (MPH)	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

CONCRETE GLARE SCREEN  
F-SHAPE

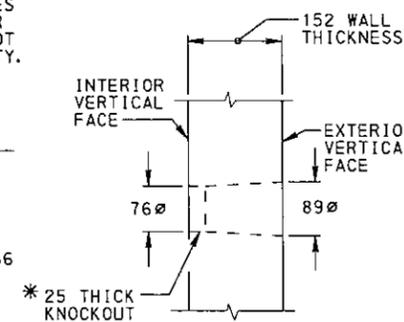
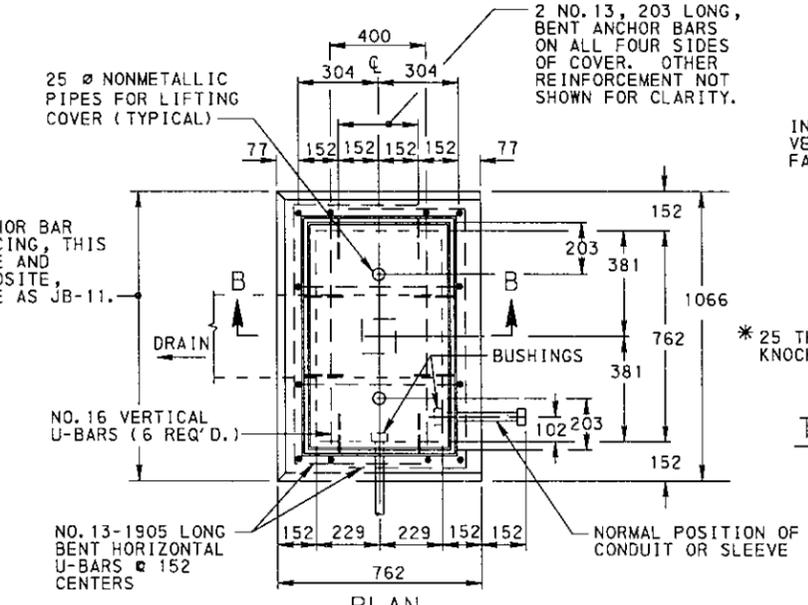
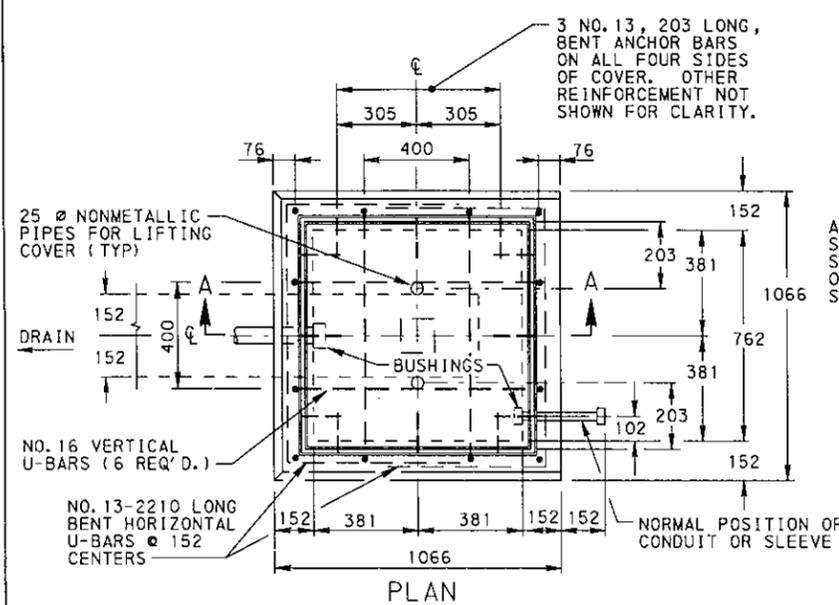
RECOMMENDED FEB. 18, 2000  
RECOMMENDED FEB. 18, 2000  
SHT 2 OF 2  
RC-59M

*Sean P. Schaefer*  
DIRECTOR, BUREAU OF DESIGN

*Gregory R. Hoffman*  
CHIEF ENGINEER

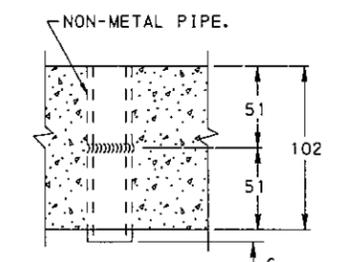
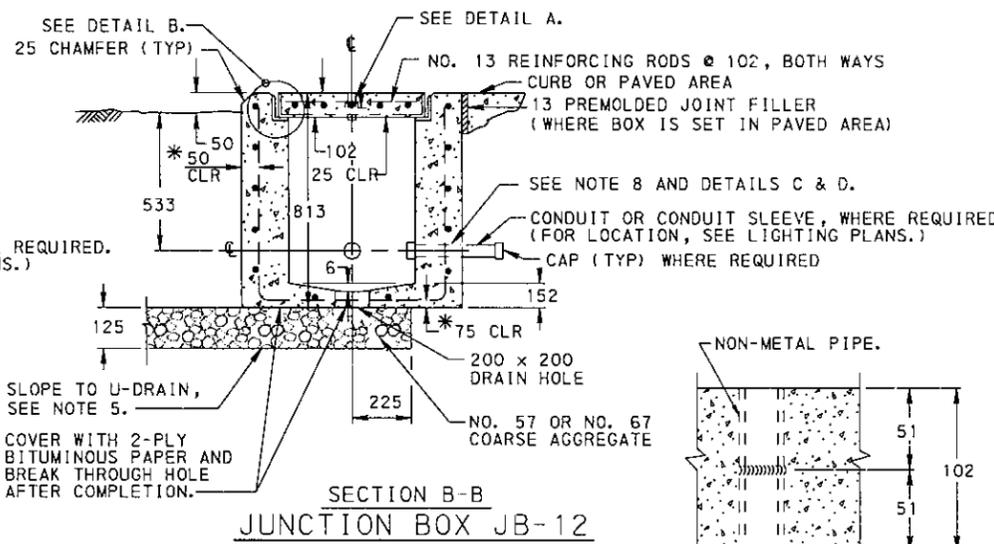
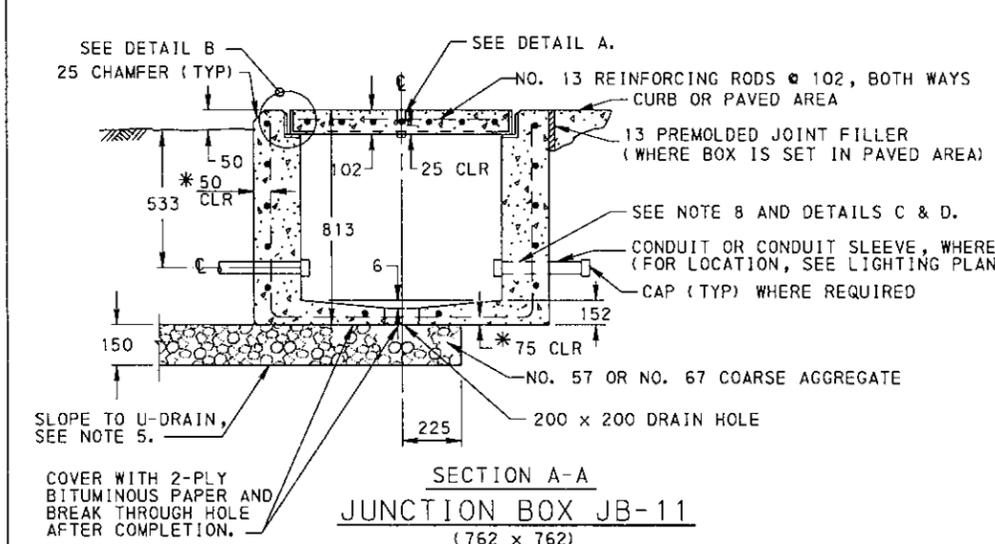
**NOTES**

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



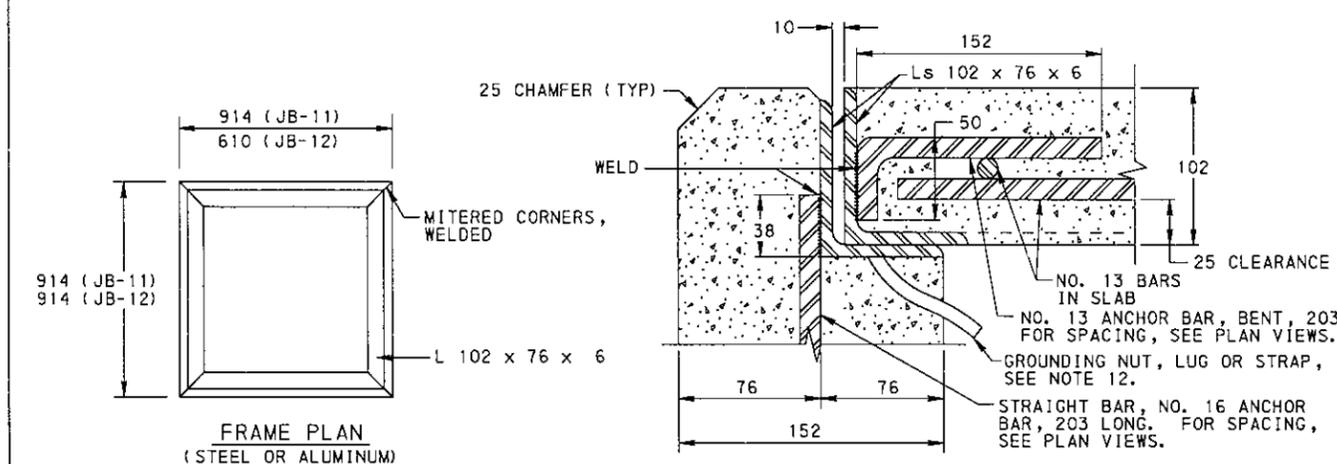
**DETAIL D**  
**TYPICAL KNOCKOUT**  
(PRECAST UNITS ONLY)

\* REMOVE THE KNOCKOUT FROM INSIDE THE BOX TO PREVENT CHIPPING.

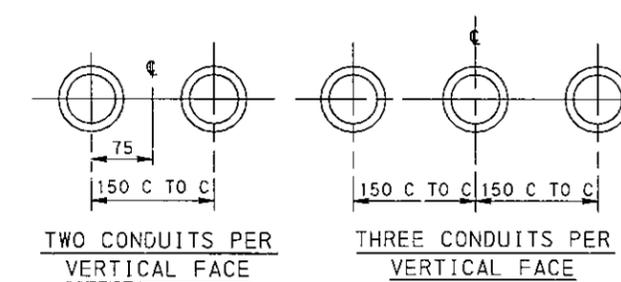


**DETAIL A**

\* FOR PRECAST-40 CLR MIN. TO THE FACE OF THE CLOSEST REBAR



**DETAIL B**  
**COVER FRAME AND SUPPORTING FRAME**



**DETAIL C**  
**MULTIPLE CONDUITS IN PLACE**  
(CAST-IN-PLACE OR PRECAST UNITS)

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

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

RECOMMENDED FEB. 18, 2000 <i>Dean P. Edmister</i> DIRECTOR, BUREAU OF DESIGN	RECOMMENDED FEB. 18, 2000 <i>Gary L. Hoffmann</i> CHIEF ENGINEER	SHT 1 OF 1 <b>RC-82M</b>
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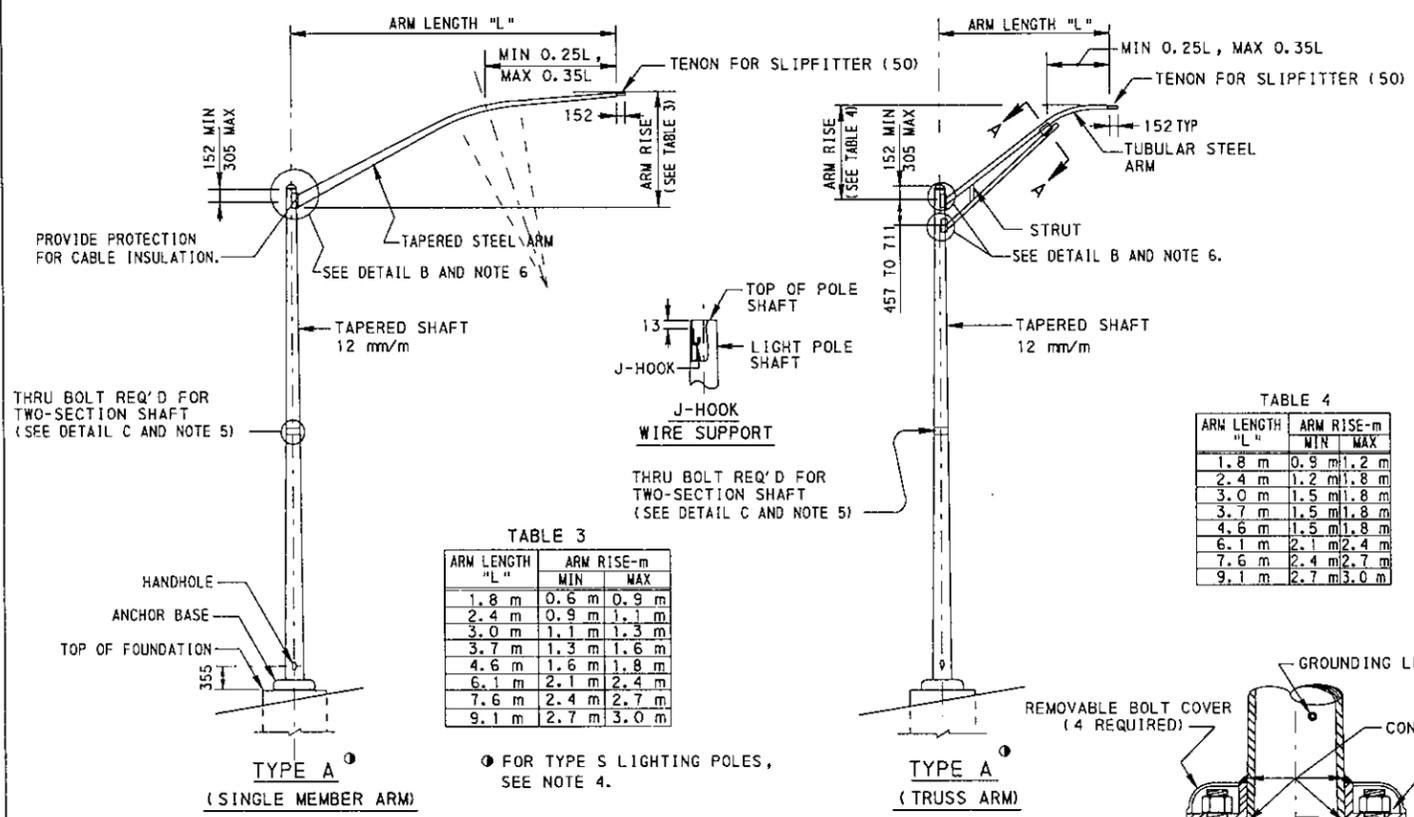


TABLE 3

ARM LENGTH "L"	ARM RISE-m	
	MIN	MAX
1.8 m	0.6 m	0.9 m
2.4 m	0.9 m	1.1 m
3.0 m	1.1 m	1.3 m
3.7 m	1.3 m	1.6 m
4.6 m	1.6 m	1.8 m
6.1 m	2.1 m	2.4 m
7.6 m	2.4 m	2.7 m
9.1 m	2.7 m	3.0 m

TABLE 4

ARM LENGTH "L"	ARM RISE-m	
	MIN	MAX
1.8 m	0.9 m	1.2 m
2.4 m	1.2 m	1.8 m
3.0 m	1.5 m	1.8 m
3.7 m	1.5 m	1.8 m
4.6 m	1.5 m	1.8 m
6.1 m	2.1 m	2.4 m
7.6 m	2.4 m	2.7 m
9.1 m	2.7 m	3.0 m

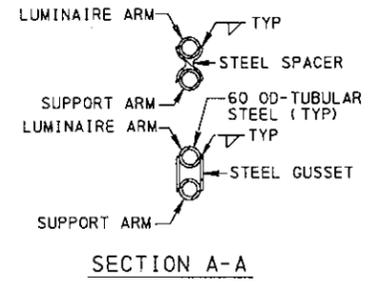


TABLE 1

TYPE OF GUIDE RAIL	X-DISTANCE (MINIMUM)
2-W	2.4 m
2-WC	1.5 m
2-WCC	1.2 m

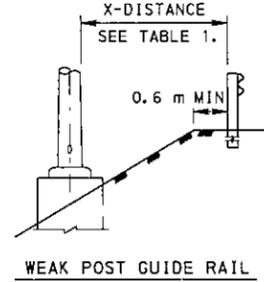
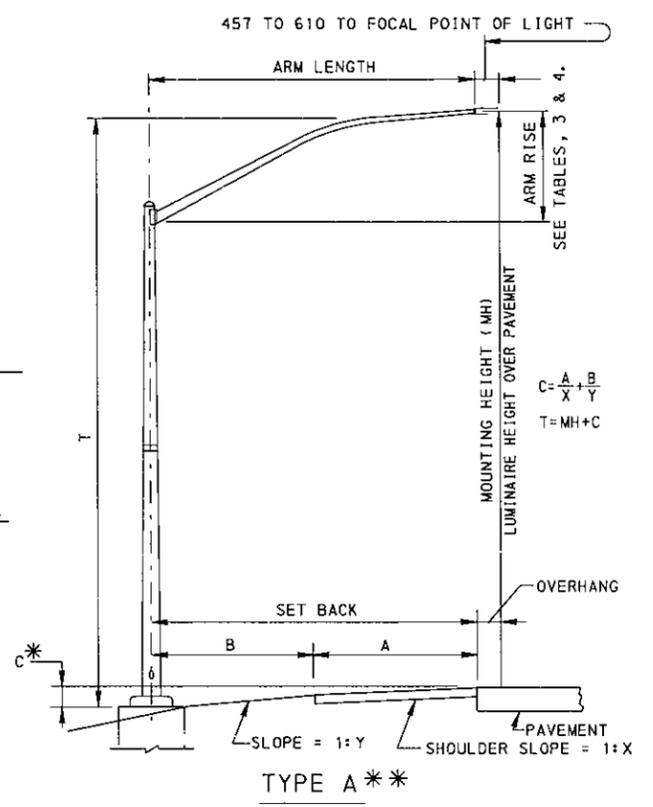
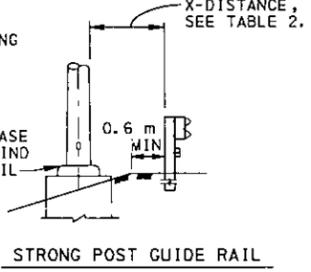


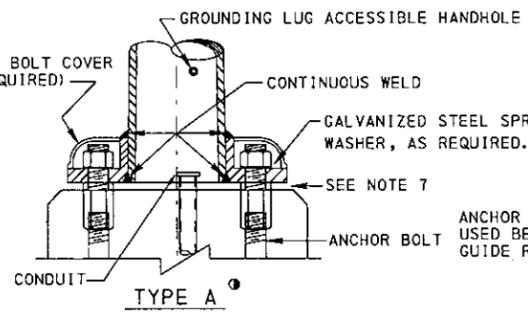
TABLE 2

TYPE OF GUIDE RAIL	X-DISTANCE (MINIMUM)
2-S	0.9 m
2-SC	0.6 m



\* C-DIMENSIONS, APPLICABLE TO CONVENTIONAL LIGHTING POLES, ARE FOR ESTIMATING PURPOSES ONLY AND SHOULD NOT BE USED FOR DETERMINING LIGHTING POLE DIMENSIONS WITHOUT VERIFICATION. THE CONTRACTOR IS RESPONSIBLE FOR FURNISHING LIGHTING POLES OF PROPER DIMENSIONS TO PROVIDE THE MOUNTING HEIGHT SPECIFIED. THE C-DIMENSIONS ARE BASED ON INFORMATION FROM CROSS SECTION PLANS. CHANGES OF ROADSIDE FIELD CONDITIONS MAY AFFECT THE C-DIMENSION. NEGATIVE C-DIMENSION MEANS ELEVATION OF TOP OF FOUNDATION IS HIGHER THAN ELEVATION OF EDGE OF PAVEMENT.

\*\* FOR TYPE S LIGHTING POLES, TAKE INTO CONSIDERATION THE BREAKAWAY DEVICE HEIGHT.



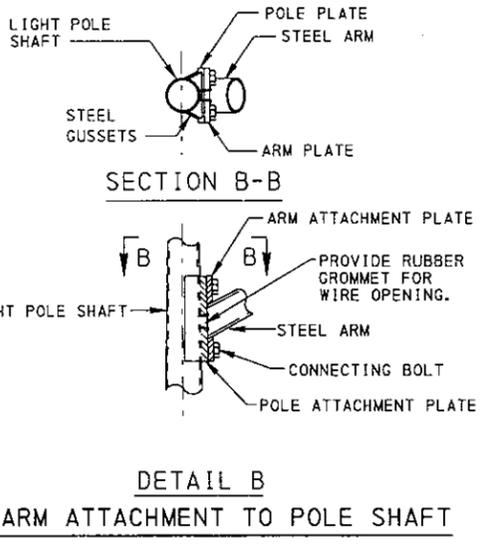
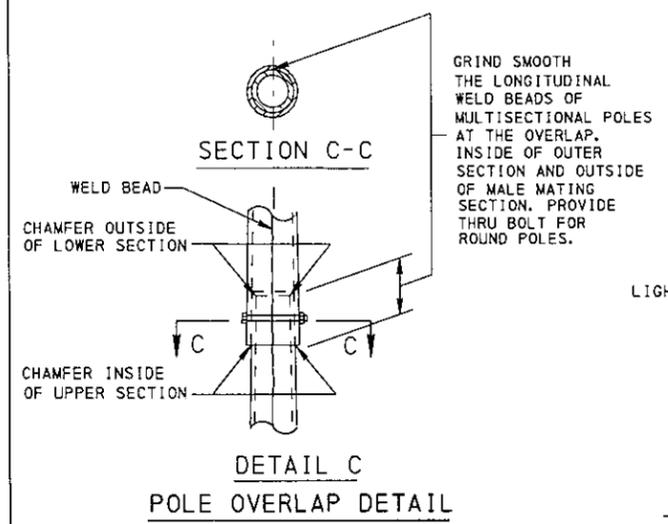
POLE MOUNTING DETAILS  
 FOR TYPE S LIGHTING POLES, SEE NOTE 5.

GUIDE RAIL CLEARANCES

NOTES

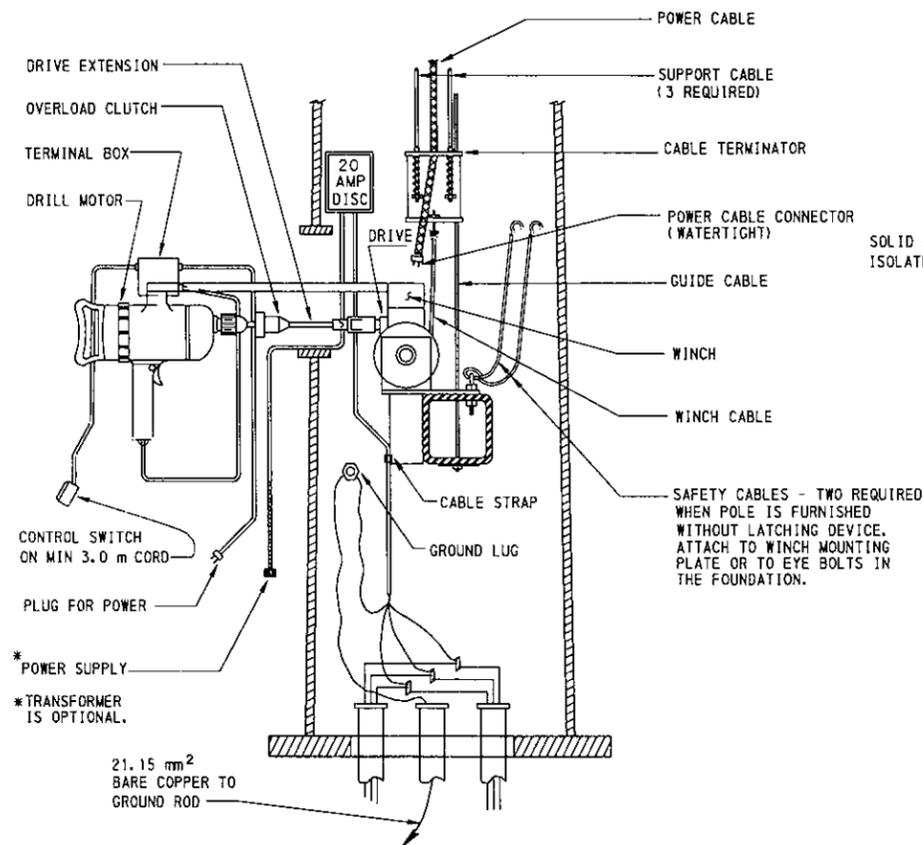
1. PROVIDE MATERIALS, CONSTRUCTION AND MANUFACTURER'S CERTIFICATION OF COMPLIANCE WITH LOAD TESTS MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTIONS 910 AND 1101.
2. SEE RC-80M FOR POLE FOUNDATION DETAILS.
3. PROVIDE IDENTIFICATION & DATE TAGS, AS SHOWN ON SHEET 2, FOR ALL POLES. DESIGNATE ID AS ON PROJECT PLANS.
4. PROVIDE FHWA CERTIFIED BREAKAWAY BASES FOR TYPE S POLES MEETING THE LATEST AASHTO REQUIREMENTS FOR BREAKAWAY SUPPORTS. MOUNT TYPE S POLES IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. PLACE WASHERS, FLAT OR SPRING TYPE, WHEN REQUIRED, AS RECOMMENDED, AND THREADED PARTS, TORQUED AS SPECIFIED.
5. CONSTRUCT POLE SHAFTS 9.1 m OR LESS IN LENGTH OF ONE PIECE. POLE SHAFTS OVER 9.1 m IN LENGTH MAY BE TWO SECTIONS. MINIMUM SECTION LENGTH FOR TWO SECTION POLE SHAFT IS 4.6 m.
6. PROVIDE POLE ARM ATTACHMENT TO POLE SHAFT AS SHOWN IN DETAIL "B", WITH TWO, THREE OR FOUR ATTACHMENT BOLTS, AS REQUIRED FOR DIFFERENT ARM LENGTHS.
7. USE GALVANIZED OR STAINLESS STEEL FLAT WASHERS TO PROVIDE A 3 TO 6 DRAINAGE GAP ABOVE CONVENTIONAL POLE FOUNDATIONS. THIS ELIMINATES THE NEED FOR DRAIN GROOVES, DRAIN PIPES AND CAULKING. USE SHIMS AS REQUIRED.
8. FURNISH CONVENTIONAL STEEL LIGHTING POLES WITH SINGLE MEMBER BRACKET TYPE ARMS UNLESS OTHERWISE INDICATED OR SPECIFIED ON THE PLANS OR SPECIAL PROVISIONS.
9. THE MOUNTING HEIGHT IS DEFINED AS THE HEIGHT OF THE LUMINAIRE ABOVE THE ROADWAY AND IS TO BE WITHIN 0.3 m OF THE MOUNTING HEIGHT SPECIFIED.
10. ALL DIMENSIONS ARE IN MILLIMETERS (mm) EXCEPT AS NOTED.
11. PROVIDE ALUMINUM POLES WITH TRUSS ARMS MEETING THE GENERAL SILHOUETTE REQUIREMENTS OF STEEL POLES.

TERMINOLOGY

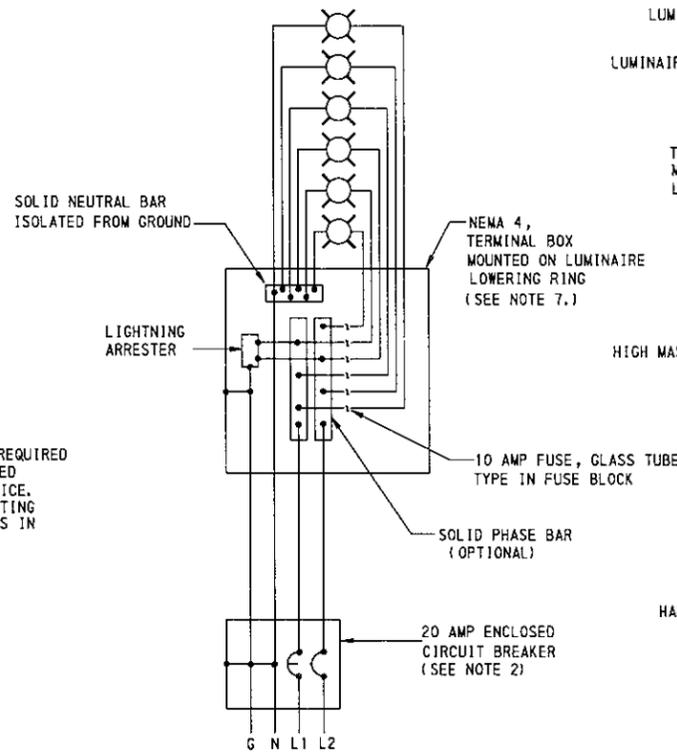


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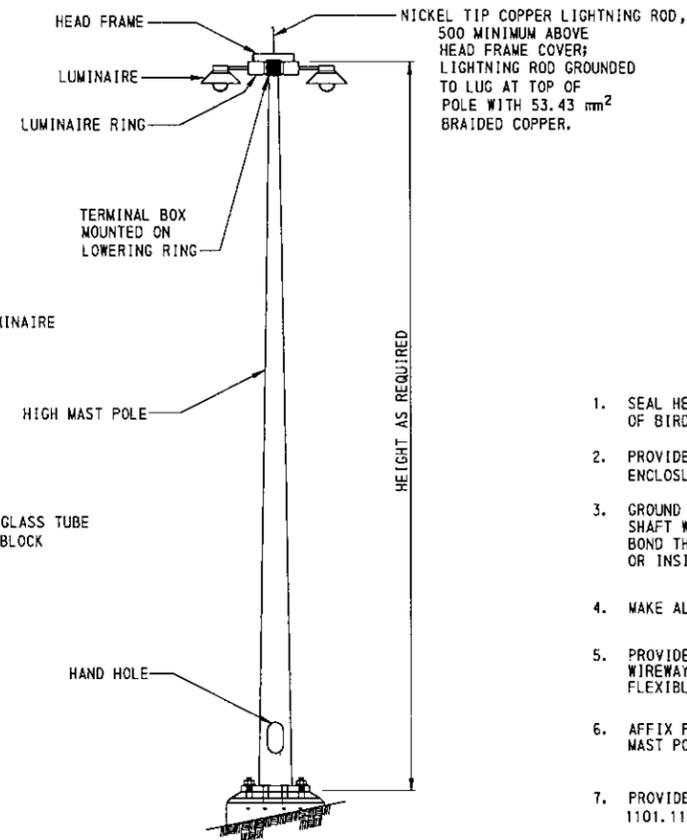
HIGHWAY LIGHTING  
 CONVENTIONAL LIGHTING  
 POLE DETAILS



TYPICAL LOWER SECTION MECHANISM



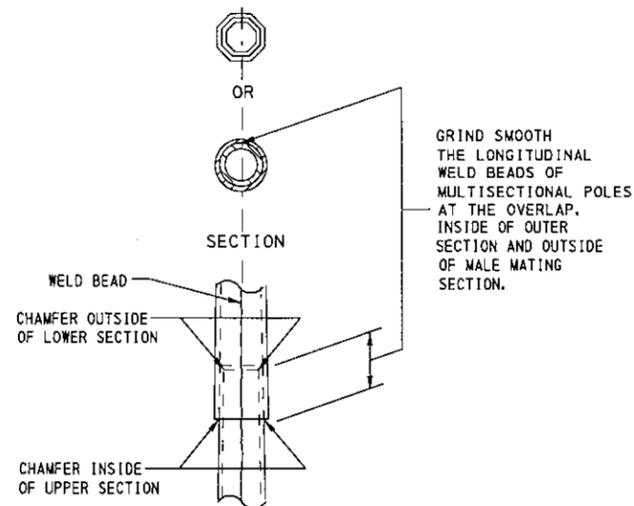
TYPICAL CIRCUIT SCHEMATIC



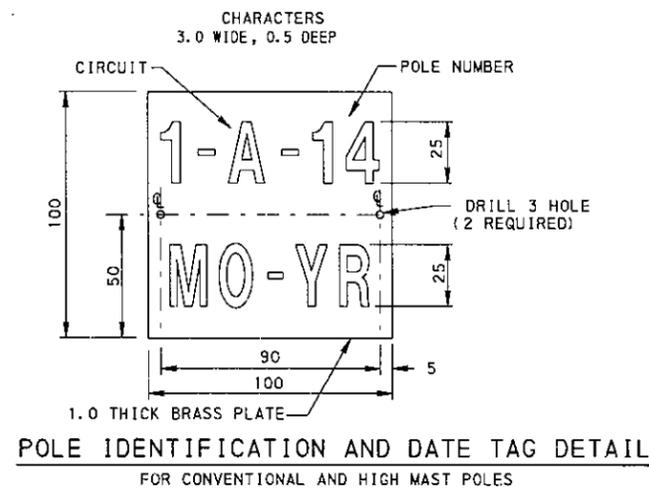
TYPICAL HIGH MAST POLE

NOTES

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



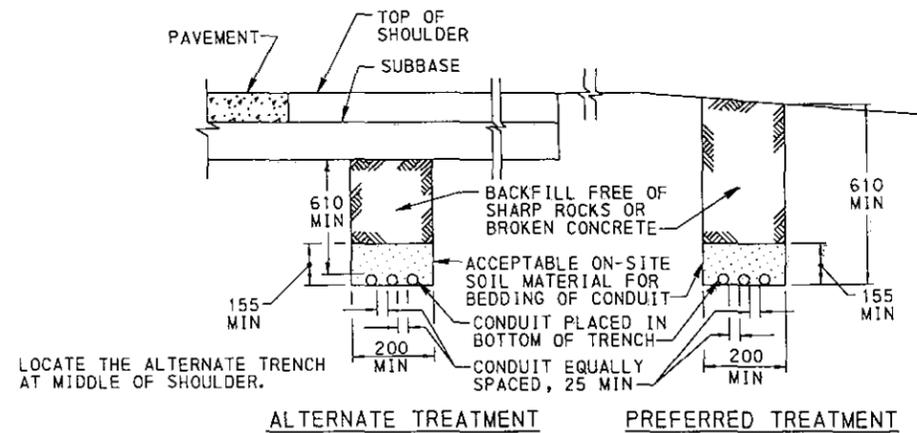
POLE OVERLAP DETAIL



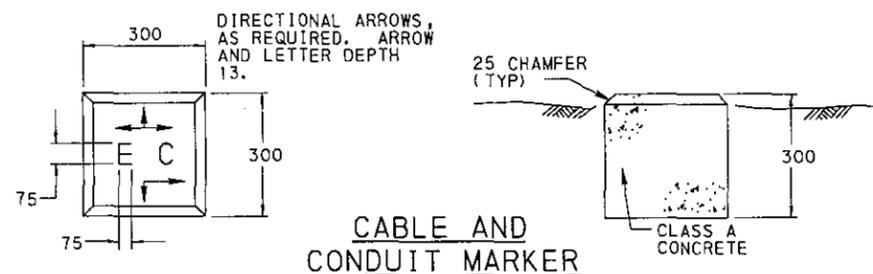
POLE IDENTIFICATION AND DATE TAG DETAIL FOR CONVENTIONAL AND HIGH MAST POLES

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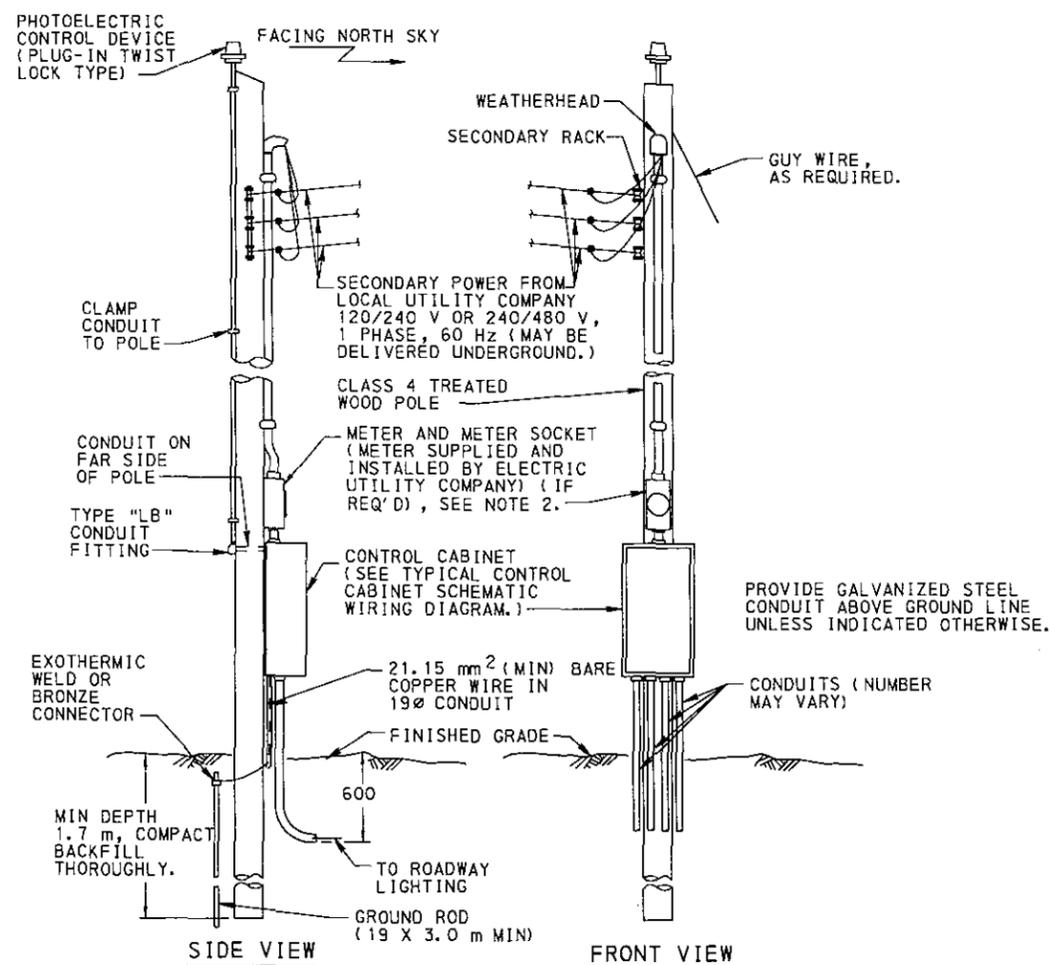
HIGHWAY LIGHTING  
HIGH MAST LIGHTING  
POLE DETAILS



**DIRECT-BURIED CABLE AND CONDUIT**



**CABLE AND CONDUIT MARKER**



**TYPICAL TERMINAL POLE EQUIPMENT ARRANGEMENT FOR POWER SUPPLY**

**ITEMS**

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

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

**NOTES FOR DIRECT-BURIED CABLE AND CONDUIT**

TRENCH ALONG THE GENERAL LINE SHOWN ON THE PLANS.

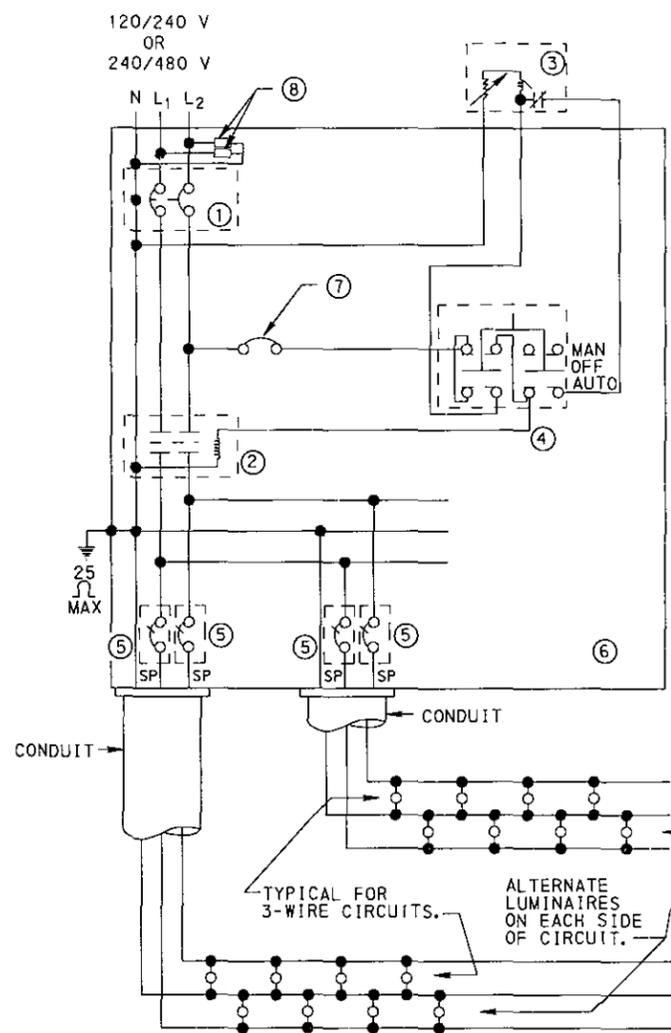
DO NOT TRENCH IN GUIDE RAIL LINE.

LOCATE DIRECT-BURIAL CONDUIT WITH TEMPORARY PLASTIC MARKERS OR OTHER APPROVED METHODS WHERE THERE IS A POSSIBILITY OF DISTURBANCE BY GUIDE RAIL ERECTION OR SIMILAR CONSTRUCTION. VERIFY GUIDE RAIL LOCATIONS SHOWN ON THE LIGHTING PLANS.

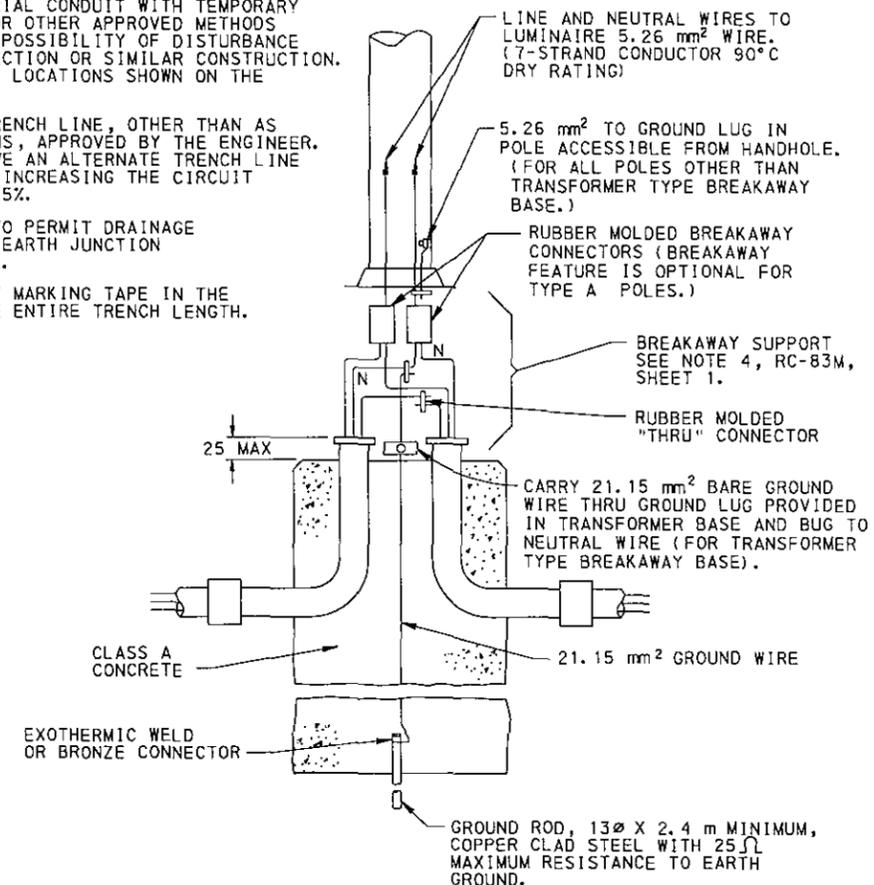
HAVE ALTERNATE TRENCH LINE, OTHER THAN AS SHOWN ON THE PLANS, APPROVED BY THE ENGINEER. IN NO CASE APPROVE AN ALTERNATE TRENCH LINE WHICH RESULTS IN INCREASING THE CIRCUIT LENGTH MORE THAN 5%.

INSTALL CONDUIT TO PERMIT DRAINAGE TOWARDS NEAREST EARTH JUNCTION BOX AS APPLICABLE.

PROVIDE PERMANENT MARKING TAPE IN THE LAST LIFT FOR THE ENTIRE TRENCH LENGTH.



**TYPICAL CONTROL CABINET SCHEMATIC WIRING DIAGRAM**



**WIRING DETAIL**

**NOTES**

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

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**HIGHWAY LIGHTING LIGHTING AND ELECTRICAL DETAILS**